

RICHMOND 300

A Guide for Growth

*Designing an equitable,
sustainable, and beautiful
Richmond for its 300th
birthday in 2037*



Master Plan
City of Richmond, Virginia

Final | September 29, 2020

Amended | July 10, 2023



City of Richmond

900 East Broad Street
2nd Floor of City Hall
Richmond, VA 23219
www.rva.gov

Legislation Text

File #: ORD. 2023-281, Version: 1

To approve an amendment to the Master Plan for the City of Richmond, adopted by the City Planning Commission on Oct. 5, 2020, and approved by the City Council by Ord. No. 2020-236, adopted Dec. 14, 2020, to incorporate the Priority Neighborhoods Master Plan Amendment designating Creighton Court, Fairfield Court, Hillside Court, Mosby Court North, Mosby Court South, and Whitcomb Court as priority growth neighborhoods.

WHEREAS, pursuant to section 17.06 of the Charter of the City of Richmond (2020), as amended, the City Planning Commission adopted and certified a Master Plan for the City of Richmond on October 5, 2020; and

WHEREAS, by Ordinance No. 2020-236, adopted December 14, 2020, the Council of the City of Richmond approved a Master Plan for the City of Richmond pursuant to a request by the City Planning Commission that the Council approve such a Master Plan; and

WHEREAS, the Priority Neighborhood Master Plan Amendment amends the Master Plan by designating Creighton Court, Fairfield Court, Hillside Court, Mosby Court North, Mosby Court South, and Whitcomb Court as priority growth neighborhoods; and

WHEREAS, the City Planning Commission conducted a public hearing on April 3, 2023, for the purpose of receiving public comment relative to incorporating the Priority Neighborhood Master Plan Amendment as an amendment to the Master Plan; and

WHEREAS, by a resolution dated July 17, 2023, a copy of which is attached to this ordinance, the City Planning Commission adopted the proposed amendment to incorporate the Priority Neighborhood Master Plan Amendment as part of the Master Plan; and

WHEREAS, it is the consensus of the Council that it is in the best interest of the City of Richmond that the Council, for and on the behalf of the City of Richmond, consent to and adopt the aforesaid amendment to the Master Plan;

NOW, THEREFORE,

THE CITY OF RICHMOND HEREBY ORDAINS:

§ 1. That the amendment to the Master Plan, consisting of a document entitled “Richmond 300: A Guide for Growth,” dated September 29, 2020, and last amended July 10, 2023, a copy of which is attached to and incorporated into this ordinance, as adopted by the City Planning Commission at its meeting on July 17, 2023, be and is hereby approved as set out in the City Planning Commission’s resolution of that date.

§ 2. That the amendment to the Master Plan adopted by section 1 of this ordinance shall supersede all other parts of the Master Plan adopted prior to the effective date of this ordinance with which it conflicts.

§ 3. This ordinance shall be in force and effect upon adoption.



DEPARTMENT OF
**PLANNING AND
DEVELOPMENT
REVIEW**

**CITY PLANNING
COMMISSION**

July 17, 2023

CPCR.2023.020

RESOLUTION OF THE CITY OF RICHMOND PLANNING COMMISSION

**TO ADOPT THE PRIORITY NEIGHBORHOODS MASTER PLAN AMENDMENT TO
THE RICHMOND 300 MASTER PLAN**

WHEREAS, the City Planning Commission adopted the *Richmond 300: A Guide for Growth Master Plan* on October 5, 2020 by resolution 2020.050; and the City Council approved said *Master Plan* by Ordinance 2020-236 on December 14, 2020; and

WHEREAS, City Council Resolution 2022-R015 tasked the City Planning Commission to prepare, submit to public hearing, and adopt an amendment to the *Master Plan* making certain changes to the *Master Plan* for the inclusion of Creighton Court, Fairfield Court, Gilpin Court, Hillside Court, Mosby Court North, Mosby Court South, and Whitcomb Court as priority growth nodes; and

WHEREAS, in response to City Council Resolution 2022-R015, the Department of Planning and Development Review engaged the public and the Richmond Redevelopment and Housing Authority to develop a draft *Master Plan* amendment that adds a Priority Neighborhoods section to the *Master Plan* and makes certain edits to text and maps throughout the *Master Plan*; and

WHEREAS, the City Planning Commission conducted a public hearing on April 3, 2023 on the draft *Master Plan* amendments; and

WHEREAS, the Richmond Redevelopment and Housing Authority approved the draft *Master Plan* amendments on June 21, 2023; and

NOW, THEREFORE BE IT RESOLVED that the City of Richmond City Planning Commission hereby adopts the Priority Neighborhoods *Master Plan* amendment, which includes a new Priority Neighborhoods section and amends text and maps to make references to the Priority Neighborhoods, to the *Richmond 300: A Guide for Growth Master Plan*, and

BE IT FURTHER RESOLVED that the Planning Commission forwards the amended *Master Plan* to the City Council with the recommendation of approval.


Rodney Poole
Chair, Planning Commission


Alyson Oliver
Secretary, Planning Commission

INTRODUCED: November 9, 2020

AN ORDINANCE No. 2020-236

To approve the action of the City Planning Commission adopting “Richmond 300: A Guide for Growth” as the Master Plan of the City of Richmond, and to repeal Ord. No. 2000-371-2001-11, adopted Jan. 8, 2001, and all amendments thereto, with the exception of the Riverfront Plan as contained in Ord. No. 2012-202-190, adopted Nov. 26, 2012, the VUU/Chamberlayne Neighborhood Plan as contained in Ord. No. 2016-002, adopted Feb. 8, 2016, the Pulse Corridor Plan as contained in Ord. No. 2017-127, adopted Jul. 24, 2017, the Riverfront Plan as contained in Ord. No. 2017-148, adopted Sept. 25, 2017, the Public Art Master Plan as contained in Ord. No. 2018-205, adopted Sept. 24, 2018, and the James River Park Systems Master Plan as contained in Ord. No. 2019-337, adopted Jan. 27, 2020.

Patron – Mayor Stoney

Approved as to form and legality by
the City Attorney

PUBLIC HEARING: DEC 14 2020 AT 6 P.M.

WHEREAS, the City Planning Commission last adopted a new Master Plan for the City of Richmond on November 6, 2000, which Master Plan the City Council approved by Ordinance No. 2000-371-2001-11, adopted January 8, 2001, in accordance with section 17.06 of the Charter of the City of Richmond (2020), as amended; and

AYES: 9 NOES: 0 ABSTAIN: _____

ADOPTED: DEC 14 2020 REJECTED: _____ STRICKEN: _____

WHEREAS, to facilitate the City Planning Commission's performance of its duties under sections 17.04 through 17.06 of the Charter of the City of Richmond (2020), as amended, the City's Department of Planning and Development Review presented to the City Planning Commission a new Master Plan entitled "Richmond 300: A Guide for Growth" and dated September 29, 2020, to replace the Master Plan adopted on November 6, 2000; and

WHEREAS, in its consideration of the proposed new Master Plan, the City Planning Commission received comments resulting from numerous meetings with individual citizens, civic groups, and City departments that would be affected by the proposed new Master Plan; and

WHEREAS, the Department of Planning and Development Review contacted 8,573 attendees, received 4,990 survey responses, hosted 111 "Richmond 300" meetings, attended 229 community and stakeholder meetings, reviewed over 2,000 comments, and received over 90 letters and electronic mail messages over the course of three years to create the new Master Plan; and

WHEREAS, pursuant to the provisions of section 17.06 of the Charter of the City of Richmond (2020), as amended, the City Planning Commission held public hearings on September 21, 2020, and October 5, 2020, for the purposes of receiving additional public comments relative to the proposed new Master Plan; and

WHEREAS, following its second public hearing on the proposed new Master Plan, the City Planning Commission adopted a resolution, entitled "Resolution of the City of Richmond Planning Commission, Adopting Richmond 300: A Guide for Growth as the Master Plan of the City of Richmond" and dated October 5, 2020, a copy of which is attached to this ordinance; and

WHEREAS, the new Master Plan as adopted by the City Planning Commission on October 5, 2020, encompasses a plan for guiding and accomplishing a coordinated, adjusted, and harmonious development of the city and its environs that will, in accordance with existing and future needs, best promote health, safety, morals, comfort, prosperity, and general welfare, as well

as efficiency and economy in the process of development, as provided in section 17.04 of the Charter of the City of Richmond (2020), as amended; and

WHEREAS, it is the consensus of the Council that it is in the best interest of the City of Richmond that the Council, for and on behalf of the City of Richmond, consent to and approve the new Master Plan;

NOW, THEREFORE,

THE CITY OF RICHMOND HEREBY ORDAINS:

§ 1. That the new Master Plan as adopted by the City Planning Commission at its hearing on October 5, 2020, entitled “Richmond 300: A Guide for Growth” and dated September 29, 2020, a copy of which is attached to and made a part of this ordinance, be and is hereby approved and from the effective date of this ordinance shall be the Master Plan for the City of Richmond.

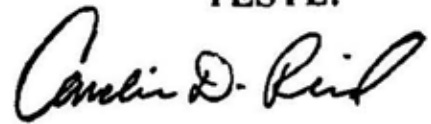
§ 2. That Ordinance No. 2012-202-190, adopted November 26, 2012, which approved the Riverfront Plan, Ordinance No. 2016-002, adopted February 8, 2016, which approved the VUU/Chamberlayne Neighborhood Plan, Ordinance No. 2017-127, adopted July 24, 2017, which approved the Pulse Corridor Plan, Ordinance No. 2017-148, adopted September 25, 2017, which approved the Riverfront Plan, Ordinance No. 2018-205, adopted September 24, 2018, which approved the Public Art Master Plan, and Ordinance No. 2019-337, adopted January 27, 2020, which approved the James River Park Systems Master Plan, all of which are hereinafter referred to collectively as the “Amendments,” shall remain in effect and be deemed part of the Master Plan approved by section 1 of this ordinance, provided, however, that all references to and illustrations of “future land use map” and “future land use categories” in the Amendments shall be deemed to refer to, and shall be deemed to be replaced by, the future land use map and future land use categories of the Master Plan approved by section 1 of this ordinance.

§ 3. That Ordinance No. 2000-371-2001-11, adopted January 8, 2001, and all amendments thereto, with the exception of the Amendments, shall be and are hereby repealed.

§ 4. This ordinance shall be in force and effect upon adoption.

A TRUE COPY:

TESTE:

A handwritten signature in black ink, appearing to read "Camille D. Rind". The signature is written in a cursive, flowing style.

City Clerk



CITY OF RICHMOND

PLANNING COMMISSION

October 5, 2020

CPCR.2020.050: RESOLUTION OF THE CITY OF RICHMOND PLANNING COMMISSION

ADOPTING RICHMOND 300: A GUIDE FOR GROWTH AS THE MASTER PLAN OF THE CITY OF RICHMOND

WHEREAS, Section 17.06 of the City Charter authorizes the City Planning Commission to adopt a Master Plan; and

WHEREAS, harmonious development, a sound economy, attractive residential areas, and the health, safety, and general welfare of the citizens of Richmond can best be achieved with the guidance of a long-range Master Plan; and

WHEREAS, the present Master Plan the City Planning Commission adopted on November 6, 2000, and the City Council approved by Ordinance No. 2000-371-2001-11 is now outdated; and

WHEREAS, the City Planning Commission appointed an Advisory Council by City Planning Commission Resolution 2017-79 to guide the planning process, the staff of the Department of Planning and Development Review held and attended hundreds of meetings and collected thousands of comments and survey responses over the course of three years to create the new Master Plan, and the Advisory Council recommended that the City Planning Commission adopt the new Master Plan at a meeting held on September 16, 2020; and

WHEREAS, the City Planning Commission conducted a public hearing on the Draft Master Plan on June 1, 2020, and a public hearing on the Pre-Final Master Plan on September 21, 2020 for the purpose of receiving public comment relative to the Master Plan; and

WHEREAS, the City Planning Commission has reviewed the proposed plan, taken into consideration comments received at its public hearing, and received a report from the Director of the Department of Planning and Development Review, which is contained in the record of this Commission's proceedings;

NOW, THEREFORE BE IT RESOLVED that the City of Richmond City Planning Commission hereby adopts the *Richmond 300: A Guide for Growth* Master Plan dated September 29, 2020 as the City of Richmond's official Master Plan, which will supersede all parts of the 2001 Master Plan and all amendments thereto, with exception of the Riverfront Plan (Ord. 2012-202-190 and Ord. 2017-148), VUU/Chamberlayne Neighborhood Plan (Ord. 2016-022), Pulse Corridor Plan (Ord. 2017-127), James River Park Systems Master Plan (Ord. 2019-337), and

Public Art Master Plan (Ord. 2018-205) (collectively, the Amendments) which Amendments shall remain in effect and be adopted as part of *Richmond 300: A Guide for Growth Master Plan*; and

BE IT FURTHER RESOLVED that the Amendments are deemed to incorporate the future land use map and future land use categories of *Richmond 300: A Guide for Growth Master Plan*; and

BE IT FURTHER RESOLVED that the Planning Commission forwards the *Richmond 300: A Guide for Growth Master Plan* and the Amendments, collectively the 2020 Master Plan, to the City Council with the recommendation of approval.



Rodney M. Poole
Chair, City Planning Commission



Matthew J. Ebinger
Secretary, City Planning Commission



Dear Fellow Richmonders,

I want to personally thank the thousands of Richmonders who have participated in creating Richmond 300: A Guide for Growth, the city's updated Master Plan. An updated master plan built upon community consensus is an essential tool for guiding the future of our growing city and for ensuring that new development aligns with citywide goals.

Richmond 300 envisions an equitable, sustainable and beautiful Richmond that ensures a high quality of life for all existing and future residents. To achieve this vision, the plan includes goals to create and maintain high-quality neighborhoods, develop an equitable transportation network that prioritizes the movement of people over the movement of vehicles, foster a diverse economy, provide inclusive housing with access to quality housing choices for all Richmonders, and support a thriving environment with healthy air, clean water, and a flourishing ecosystem. This vision is embodied in and supported by 17 goals, 70 objectives, and over 400 strategies.

Richmond 300: A Guide for Growth is a visionary document that seeks to expand equity throughout the city and prioritizes impactful "Big Moves" that will forever change our city for the better. It plans to reconnect the historically Black neighborhood of Jackson Ward by building over the highway, create a redevelopment plan for Gilpin Court, and provide park access to allow all Richmonders to live within a 10-minute walk of a park – all initiatives founded in long overdue racial justice.

The work of Richmond 300 does not end with City Council's adoption of the Master Plan. The next phase of the plan is the most important: implementation. To implement the plan as written, with all its focus on righting wrongs and building community, we need you to continue to support the vision and goals established in Richmond 300.

Stay involved. Take the time to read this plan and learn how you, as an invested resident, can use Richmond 300 to facilitate the growth of the city and build One Richmond.

With gratitude,



Mayor Levar M. Stoney



Dear Richmonders,

When we began pulling together Richmond 300 in 2017, as the first comprehensive update to the City's Master Plan in almost two decades, our goal was to engage a representative cross-section of the public and City staff to articulate a shared vision for the city. Through the voices of thousands of Richmonders—who gave their time and talent to this process—we are pleased to present to the citizens and other community stakeholders Richmond 300: A Guide for Growth.

Master Plans are clearly a product of their time. But more than that, well-crafted plans are stories; stories of the aspirations of the many who contributed to its creation, and who represent a collective voice guiding the future of the city. They guide and advise the Planning Commission and City Council on major land use decisions that will shape the city for decades.

Richmond 300: A Guide for Growth—the result of this collaborative process—is different than any of our previous Master Plans.

- Our first Master Plan of 1946 (Bartholomew) looked to the advent of the automobile and the movement of households and economic activity to the suburbs. The mixed-use character of the city was an issue. Today, Richmond 300 focuses on celebrating and building on the mixed-use character of Richmond to enhance an authentic urban experience.
- All of the Master Plans after 1946 were about managing decline. Today, after 20 years of population growth, Richmond 300 focuses on guiding the city's next 20 years of growth to help address the pressing sustainability and social-equity issues of our time.
- Richmond 300 reimagines areas of the city by revitalizing critical nodes and corridors, and creating entire new neighborhoods for the next 100 years; places that future generations will adopt as their own as these new neighborhoods grow and mature. Think about it:
 - The Southside Plaza area is a bustling center of South Richmond.
 - Route 1 is a beautiful mixed-use corridor.
 - Greater Scott's Addition, previously envisioned in earlier plans as only an industrial neighborhood, is a shining example of a 900+ acre collection of new mixed use neighborhoods, anchored by the visionary Crescent Park and a true multi-modal network.

But beyond the plan, Richmond 300 is just the first step in realizing the vision so clearly outlined in this document. The critical next step is implementation, using all of the tools the City has at its disposal, the expertise of those that build the city, and the continued engagement of our stakeholders in realizing that long-term vision. It will take all of us to create the high-quality, livable, and inclusive city that Richmond 300 establishes.

As we look to implement the plan, please stay involved and connected in the process as we will continue to need your voices.

Let's get started.

A handwritten signature in black ink, appearing to read "Mark A. Olinger", is positioned above the printed name.

Mark A. Olinger
Director, Dept. of Planning and
Development Review

A handwritten signature in black ink, appearing to read "Rodney M. Poole", is positioned above the printed name.

Rodney M. Poole
Chair, City Planning Commission

RICHMOND 300

A Guide for Growth

City-Wide Master Plan City of Richmond, Virginia

Final – September 29, 2020
City Planning Commission Adopted – October 5, 2020
City Council Adopted – December 14, 2020

Amended - July 10, 2023
City Planning Commission Adopted Amended Plan - July 17, 2023
City Council Adopted Amended Plan - September 26, 2023



ACKNOWLEDGMENTS

This document reflects the consensus reached by thousands of Richmonders on guiding the future growth of Richmond. The content in this plan arose from the time, attention, expertise, and passion of thousands of people. The individuals listed here are elected officials, commission members, City staff, and citizens who participated in various Richmond 300 groups.

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3rd District
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role during the process

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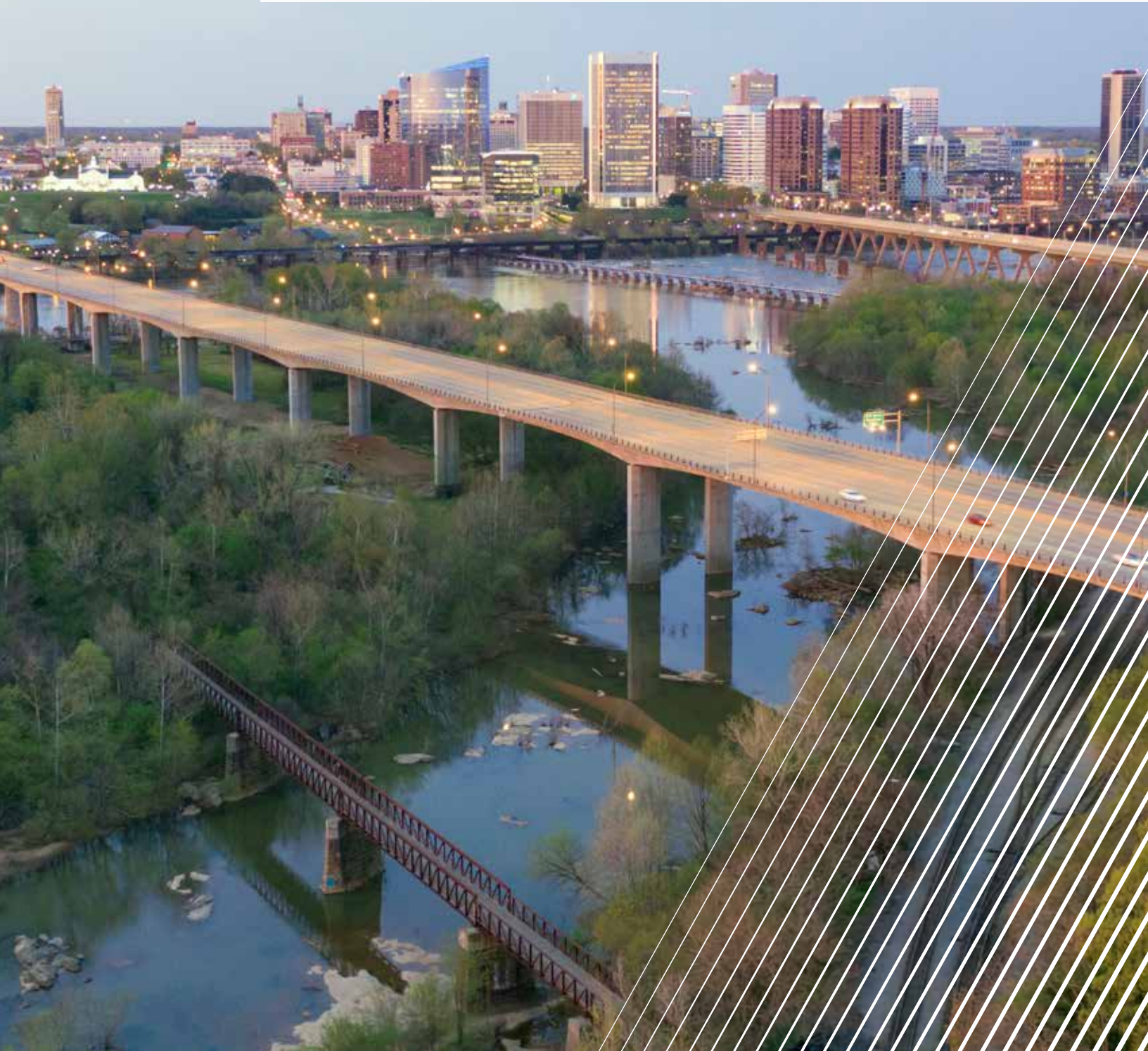
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Introduction

The Department of Planning and Development Review (PDR) developed this new city-wide Master Plan with extensive community engagement to plan for and guide Richmond's future growth.



Master Plan Purpose and Process

Purpose

The Master Plan is an important document because it provides a framework for the City, the development community, business owners, and residents to shape the growth of Richmond.

This Master Plan also sets the guidance to initiate and evaluate policies, programs, and zoning changes, and to guide the City's capital improvement plan.

Richmond is 62.5 square miles and is not allowed to annex land. The Master Plan helps determine how to plan for growth within the constrained footprint of the city. Furthermore, every jurisdiction in Virginia is required to prepare a master plan (also known as the comprehensive plan) per the Code of Virginia (§ 15.2-2223) and review it every 5 years.

Process

Richmond 300 was developed by thousands of Richmonders. The process to develop the Master Plan included reaching over 8,500 people during over 100 Richmond 300-sponsored meetings and over 220 civic association meetings, City Council district meetings, and festivals such as the 2nd Street Festival and National Night Out. During the planning and draft review process from September 2018 to August 2020, City Staff received and read nearly 5,000 responses to Richmond 300 surveys and over 2,100 comments on the draft Master Plan maps and content. In addition to the 21-member Advisory Council who dedicated 2.5 years to this process, another 209 people served on Working Groups to shape the content of the plan. Please see the Appendix for a detailed description of the community engagement process.

Master Plan Users

CITY STAFF, COMMISSIONS,
& ELECTED OFFICIALS

- Identify areas well-positioned for growth and reinvestment
- Strengthen/grow neighborhoods and Nodes
- Determine how to maximize return on public investment
- Manage capital funds projects
- Develop budgets
- Pursue federal, state, and other grants
- Advance priorities for community wealth building

DEVELOPERS, DESIGNERS,
& BUILDERS

- Purchase real estate
- Decide whether it is most appropriate to reuse or construct new buildings in a given location
- Identify likely hot spots for development
- Understand the City's development priorities
- Align design/development ideas with City goals

RESIDENTS, NON-PROFITS,
& BUSINESS OWNERS

- Expand, start, or relocate a business
- Purchase real estate
- Renovate an existing building
- Improve a local park
- Find a suitable location for a community garden
- Attract a new business or service to a neighborhood business district

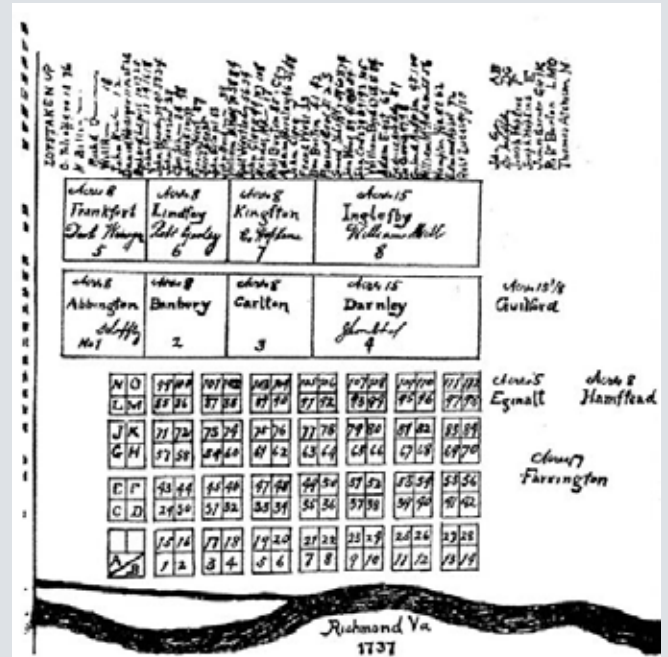
How to Use this Plan

Richmond 300: A Guide for Growth outlines a vision statement, goals, strategies, and actions that will shape our land, neighborhoods, and places. The plan will influence decisions made in the city for the next 20 years and serves several important roles: 1) Setting direction for City Administration, City Staff, and elected and appointed officials including City Planning Commissioners regarding the long-range needs of the city; 2) Informing non-profits, business owners, developers, designers, and builders of Richmond's plans for the future and development priorities; and 3) Communicating the agreed upon future form of the City to provide citizens with a plan to hold decision makers accountable to achieving.

The plan consists of both written policy recommendations and maps, which should be used together when making decisions. Section 15.2-2224 of the Virginia Code identifies several methods available to local governments for implementation of the Master Plan, including a capital improvements program, a subdivision ordinance, and a Zoning Ordinance and zoning district map. In addition to these tools, the city creates plans in many areas including transportation, sustainability, water, sewage, public health, and economic development which support and implement the strategies within Richmond 300. These plans included but are not limited to the Bike Master Plan, the Vision Zero Plan, the RVA Clean Water Plan, the Richmond Connects Plan, RVAgreen 2050, the James River Park Master Plan, the Public Art Master Plan, and the Consolidated Plan.

The Master Plan is a "living document" and should be flexible to respond to changing conditions, modify existing policies, or examine an area of the city in greater detail. This document should be reviewed and revised at least every 5 years to reflect the availability of new implementation tools, changes in state and federal law, changes in funding sources, the results of monitoring the effectiveness of existing policies, and the impacts of past decisions, as well as to reflect changes in the community's vision for the future.

Why is it called Richmond 300?



In 1737, Richmond is platted by Major William Mayo for William Byrd II.

Source: The Valentine

Richmond was founded in 1737. As we look forward to the city's 300th anniversary in 2037, how do we want Richmond to look, feel, and work? How do we want our city to feel and grow over the next 20 years so that when we celebrate our 300th anniversary we are proud of where we are? Richmond 300: A Guide for Growth will articulate our vision for Richmond in 2037 and outline recommendations to get us there.

Master Plan Context

Richmond is on the map.

Richmond has been experiencing remarkable growth. Richmond added more than 32,000 residents between 2000 and 2019, as shown in Figure 1.

Richmond's sustained growth in population is something the city has not experienced in over a century. From 2000 to 2019, Richmond's population increased by 17% from 197,790 in 2000 to 230,436 in 2019. The last time the city grew over a 20-year period without annexing land was from 1920 to 1940, when the population increased by 12%. The last time the city population grew over a 20-year period by more than 17% without annexing land was from 1880 to 1900, when Richmond grew by 34%, as shown in Table 1.

Young adults and retirees are driving the growth, as shown in Figure 2. Population growth is driven by a number of factors—but mainly, Richmond's population growth comes from people leaving more expensive metropolitan areas in search of less expensive housing and a high-quality of life. Richmond has a higher growth rate in millennials and baby boomers as compared to the neighboring counties. From 2010 to 2018, the number of 25- to 34-year-olds in Richmond grew by 43% compared to 6% and 11% growth in Henrico and Chesterfield, respectively. During the same time period,

32,000+

number of residents
Richmond added from 2000
to 2019

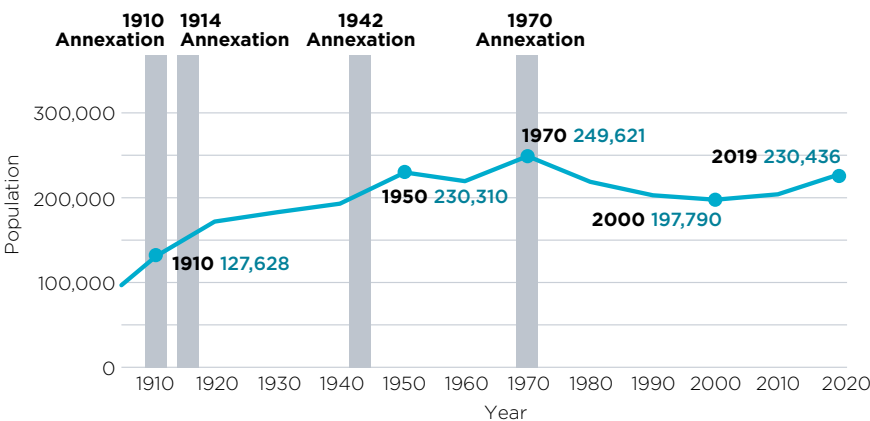


FIGURE 1 // Historic Population

Source: U.S. Census Bureau: 1910, 1950, 1970, 2000 Censuses, 2019 Population Est.

TABLE 1 // 20-Year Population Growth and Annexation, 1880-2019

20-Year Span	Absolute Growth	% Growth	Land Annexed?
1880 to 1900	21,450	34%	No
1890 to 1910	46,240	57%	1906 – 4.5 sq. mi.
1900 to 1920	86,617	102%	1906, 1910, 1914 – 18.5 sq. mi.
1910 to 1930	55,301	43%	1910, 1914 – 14 sq. mi.
1920 to 1940	21,375	12%	No
1930 to 1950	47,381	26%	1942 – 16.1 sq. mi.
1940 to 1960	26,916	14%	1942 – 16.1 sq. mi.
1950 to 1970	19,311	8%	1970 – 23 sq. mi.
1960 to 1980	- 744	0%	1970 – 23 sq. mi.
1970 to 1990	- 46,565	-19%	1970 – 23 sq. mi.
1980 to 2000	- 21,424	-10%	No
1990 to 2010	1,158	1%	No
2000 to 2019	32,646	17%	No

Source: U.S. Census Bureau: 1910, 1950, 1970, 2000 Censuses, 2019 Population Est.

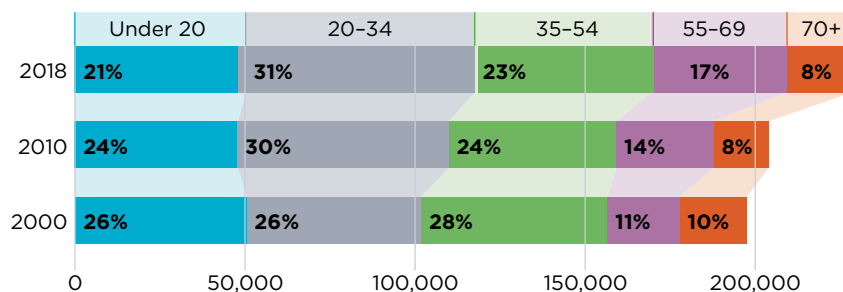


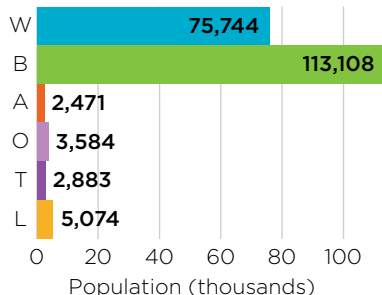
FIGURE 2 // Population by Age, 2000-2018
Percentages shown are percent of that year's population in a given age group.

Source: U.S. Census Bureau: 2000 Census, 2010 Census, 2015

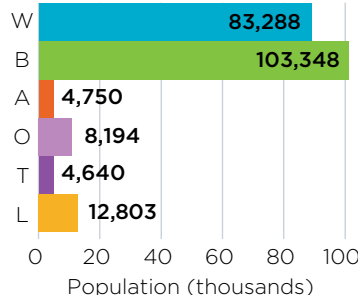
the population of 55- to 74-year-olds grew by 38%, compared to 32% and 33% for Henrico and Chesterfield, respectively.

The racial composition of Richmond has shifted since 2000. Increases in White, Latino, and Asian populations are driving Richmond's growth, as shown in Figure 3. The number of Whites, Latinos, and Asians grew in population by over 32,000, 11,000, and 3,000 people, respectively from 2000 to 2018. The number of Blacks decreased by nearly 6,500 people over the same time period. The number of people identifying with Two or More Races increased by nearly 4,000. It is impossible to know which two races those individuals identify with, but irrespective, Richmond is becoming more diverse.

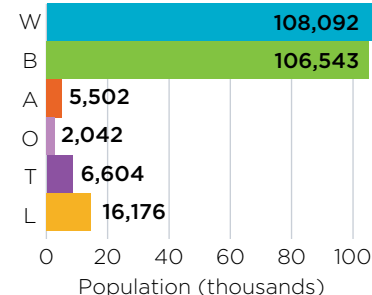
2000 Census



2010 Census



2018 1-Year ACS



Legend

W White or Caucasian B Black
A Asian O Other Race*
T Two or More Races L Latino**

* Includes some other race, American Indian, Alaska Native, Native Hawaiian, and Other Pacific Islander.

** The U.S. Census categorizes "Latino" as an ethnicity, not a race. Therefore, Latinos identify their race as White, Black, or some other race, as well as identifying their ethnicity as "Latino."

FIGURE 3 // Population by Race and Ethnicity, 2000, 2010, and 2018

Source: U.S. Census Bureau: 2000 Census, 2010 Census, 2018 ACS 1-Year Est.

24.5%

Richmond residents live in poverty

Richmond's growth has not benefited everyone.

Richmond's poverty level remains persistently high. The poverty rate increased from 21.4% in 2000 to 25.5% in 2016 and has since decreased to 24.5% in 2019. Poverty rates are highly concentrated in certain areas of the city, particularly the East End which has the largest share of public housing in the city, as well as in large portions of the South Richmond, as shown in Figure 6. Between 2000 and 2014, the median household income in large areas along Route 1 in South Richmond decreased by more than 50%.

Inflation-adjusted median income has decreased. In absolute terms, Richmond's median household income appears to be increasing, but when adjusted for inflation, median household incomes are lower than they were in 1990 and 2000, as shown in Figure 4.

Housing costs in Richmond have outpaced income growth for low- and very-low income households. According to the U.S. Department of Housing and Urban Development (HUD), from 2000 to 2016, the proportion of housing-cost-burdened households (spending more than 30% of income on housing) increased from 33% to 42%. There is a substantial need for more housing for very-low-income

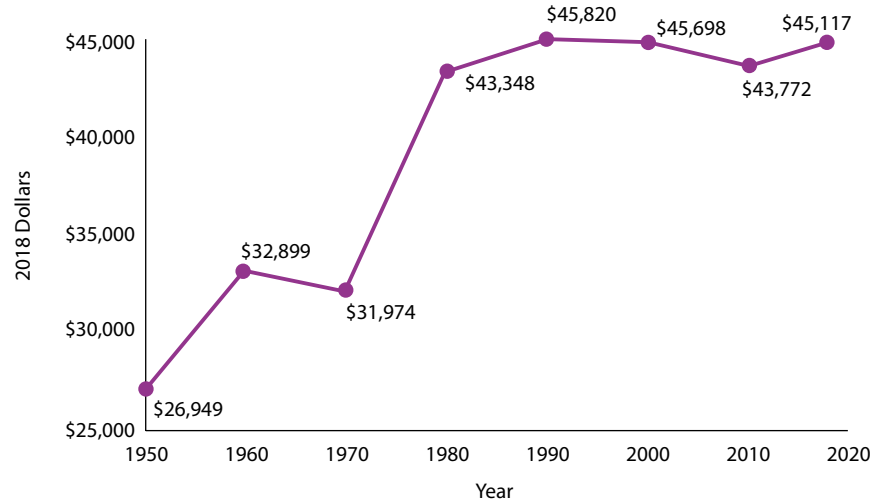
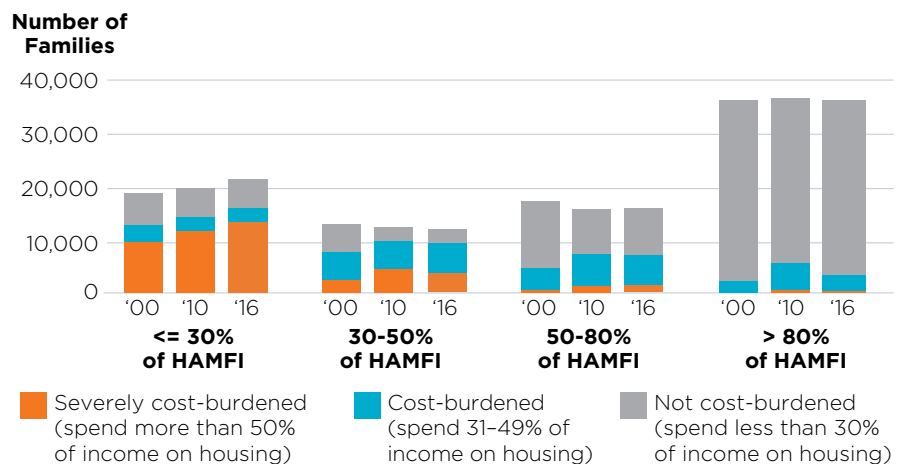


FIGURE 4 // Inflation-Adjusted Median Household Income, 1950-2018

Source: U.S. Census: 1950-2000 Censuses, 2010 ACS 1-Year Estimates, 2014-18 ACS 5-Year Estimates



HAMFI = HUD Area Median Family Income

FIGURE 5 // Housing Cost Burden by Household Income, 2000-2016
Housing cost burden has increased across all income levels between 2000 and 2016 and decreased slightly at some income levels between 2010 to 2016.

Source: Comprehensive Housing Affordability Strategy (CHAS): 2000, 2006-2010 5-yr average, and 2012-2016 5-yr average

and low-income households in Richmond and the Richmond region. Figure 5 shows that the number of families earning less than 30% of the HUD Area Median Family Income has been increasing, and within that category, there are more severely cost-burdened households.

Racial inequities persist in the local and regional labor market. Blacks are employed predominantly in low-wage occupations. White workers in the Richmond region are about three times as likely as Black workers to be employed in management occupations, which earn on average \$128,000, the highest-paying job occupations (14.5% of white workers are in management position compared to 5.8% Black workers). Moreover, Black workers are more likely to be employed in the lowest-paying occupations, which pay on average below \$27,000.

Education rates have increased across all levels since 1970 but parts of the Southside have experienced a decline in educational attainment since 2000. In 2016, 86% of Richmonders over age 25 had a high school diploma. Between 2000 and 2016, all areas of the city experienced a growth in high school graduation rates, except for parts of the Southside, which showed declining high school graduation rates. Between 2000 and 2016, as shown in Figure 7, in some areas of the Southside, one-third to over one-half of residents over 25 years old do not have a high school diploma. This trend is especially pronounced in neighborhoods along Hull Street and Route 1.

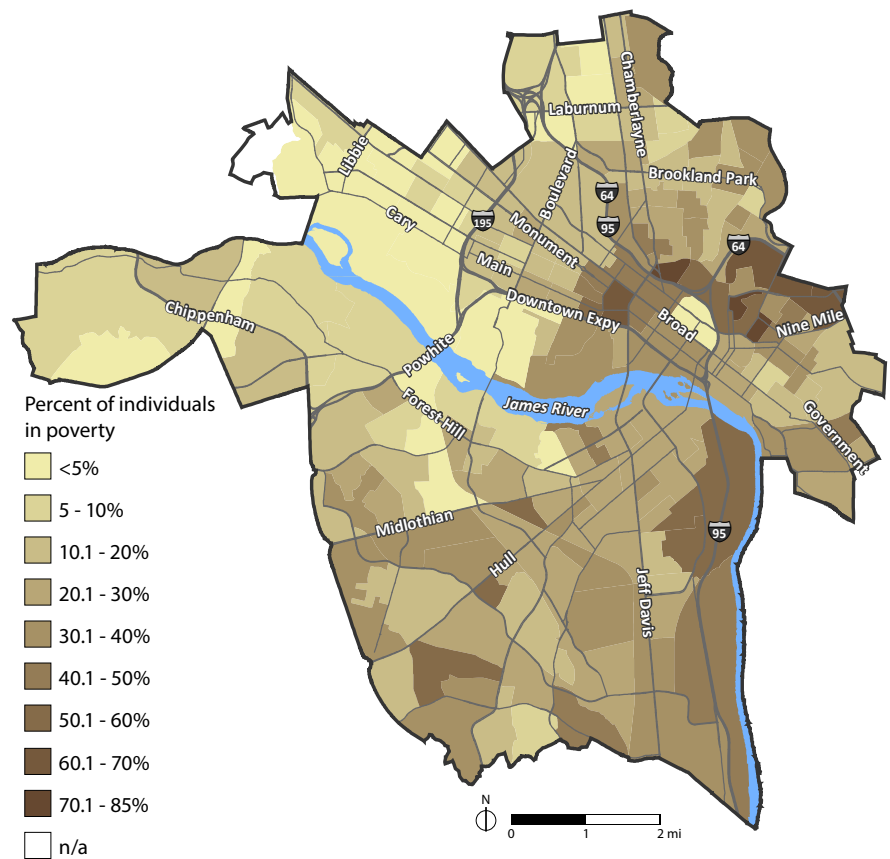


FIGURE 6 // Individuals in Poverty, 2016

Source: U.S. Census Bureau: 2012-2016 ACS 5-year Estimates

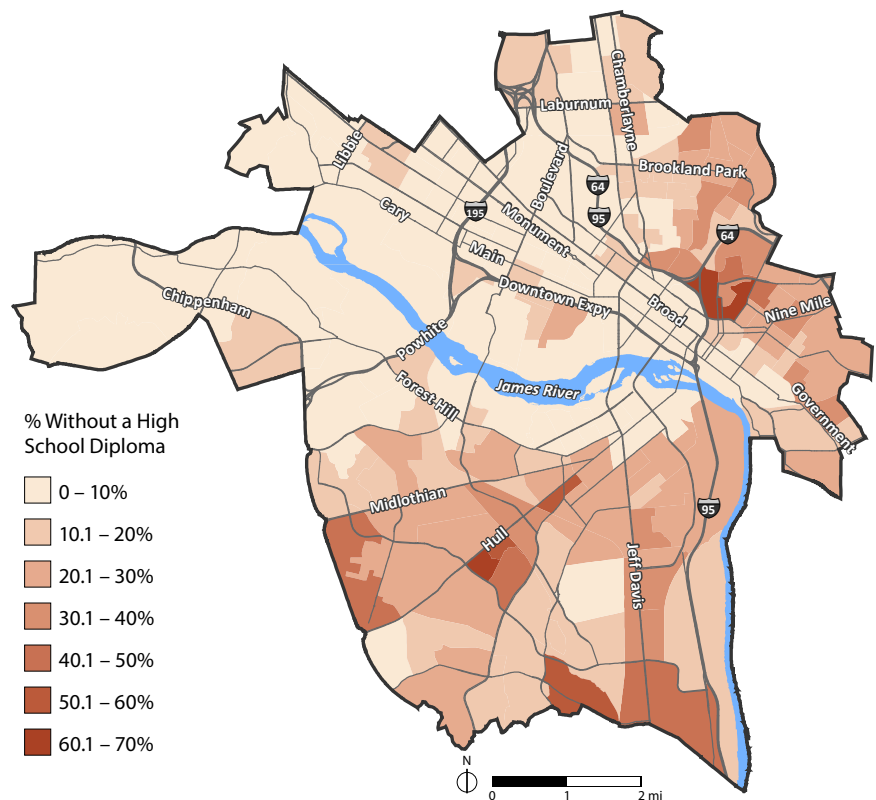


FIGURE 7 // Population Lacking a High School Diploma, 2016

The percentage of individuals over 25 who did not graduate high school.

Source: U.S. Census Bureau: 2012-2016 ACS 5-year Estimates

Richmond's central location within Virginia and the East Coast makes the city well-positioned for economic growth and prosperity.

Richmond is located 90 minutes from the beach, the mountains, and the Nation's Capital. Richmond is an ideal place for commerce and innovation to thrive. Located at the convergence of I-95 and I-64, the highest navigable point on the James River, and the crossroads of multiple rail lines, Richmond's central location attracts businesses and residents. Businesses are keen on the Richmond's easy access to the interstates, marine terminal, airport, freight and passenger rail lines, and thousands of graduates of Virginia's exemplary colleges and universities. Residents are attracted to Richmond's roaring James River, easy access to mountain and beach vacations, historic urban authenticity, a culture that supports starting a new business, cultural and artistic vibrancy, higher-education opportunities, and lower housing cost (relative to other larger cities).



Source: Department of Economic Development, City of Richmond

Richmond has an entrepreneurial spirit. In 2019, the Region was home to 42 Inc. 5000 firm (the fastest-growing private companies in the U.S)—compared to the Nashville Region, a celebrated entrepreneurial hub, which had 43 Inc. 5000 firms. The City of Richmond is home to two-thirds of the 42 firms. The businesses include finance and tech firms, as well as design and creative firms.

Richmond has a diverse economy with government and anchor institutions providing stability and innovation. As the Capital of the Commonwealth of Virginia, Richmond's government and anchor institutions provide a stable employment base and opportunities for public-private innovation and training. Virginia Commonwealth University's (VCU) Monroe Park Campus and VCU Health Campus have increased in student population by over 7,000 between 2000 and 2018. The growth of VCU and its investment in programs that spark innovation, like the da Vinci Center and the Brandcenter, have built upon and expanded the entrepreneurial and artistic spirit of Richmond.

Richmond's art and food scene are attracting national attention. In 2019, the Virginia Museum of Fine Arts unveiled a new statue, *Rumors of War* by Kehinde Wiley, which garnered national press for its commentary on Confederate monuments. The VCU Arts program has continued to be a top-rated public university arts program. Festivals like the Street Art Festival, Fire, Flour & Fork, and the Afrikana Film Festival invigorate Richmond's arts and food scene. Several Richmond restaurants and breweries have been featured in 10-lists by national press, and several chefs have been nominated for the James Beard Awards.

Business are expanding or relocating into Richmond. Companies with suburban headquarters, like Capitol One and CarMax, have opened large offices in the City of Richmond to help attract creative talent to their companies. The CoStar Group expanded from its corporate headquarters in Washington D.C. to open a research headquarters with over 700 employees along the James River near Brown's Island. Over the past several years, many small- and medium-sized private and non-profit companies have moved from suburban locations into revitalized neighborhoods like Scott's Addition and Manchester.

Richmond: A Very Brief History

The James River. The founding and growth of Richmond is tied to its location along the fall line of the James River. Goods such as wheat and tobacco came down the river from the interior, and sea-going vessels came up the river as far as they could to Richmond's merchants and factories. The James River has not only served as a means of transportation, it has also powered mills and factories, making Richmond one of the most industrialized cities in the south in the late-1700s and early 1800s. With the expansion of the railroad and the invention of steam power in the mid-1800s, the canal and the river no longer formed the core of Richmond's economic base. Today, the river is the heart of a linear park system on both banks.

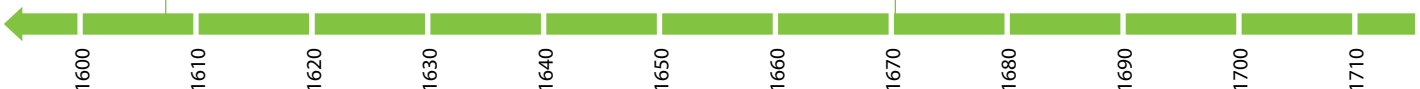
1607

Christopher Newport and John Smith sail up the James River to the fall line, marked by rapids, where the Piedmont and Atlantic Coastal plain meet.

The fall line is the seat of the Powhatan chiefdom — a confederation of 14,000 to 21,000 Algonquian-speaking people — when the British arrive. From first contact, tensions are high between the Native peoples and the British and numerous battles ensue. By 1646, the Powhatan's chiefdom ceased to exist. Following the 1656 Battle of Bloody Run, near Chimborazo, Native populations relinquish their lands in the Richmond area.

c. 1670

William Byrd I inherits the 1,800-acre Falls Plantation on the south side of the James River near present day Manchester. In 1678, he receives a grant of 7,351 acres beginning at Shockoe Creek and running upriver about 5 miles, including Downtown Richmond, the Fan, the Museum District, Windsor Farms, and more. The Byrd family holdings grow to over 79,000 acres in and around present day Richmond (outlined in red in the map below). In 1768, William Byrd III is forced to sell by lottery his holdings in Richmond and Rocky Ridge (Manchester) to pay his gambling debts.



Growth and Expansion. Over 233 years, 1737 to 1970, Richmond would grow through a series of annexations of land from Henrico and Chesterfield Counties. These annexations were fueled by industrial and economic growth and the expansion of transportation systems — the improvement of roads and turnpikes, the introduction of a horse-drawn car line, the establishment of the first financially successful electric trolley in the United States, and the construction of highways. Additionally, later annexations were fueled by a desire by some political leaders to maintain a white majority of the population to retain control of the city government.

1737

Richmond is founded and the city is platted by Major William Mayo for William Byrd II. The streets and blocks run parallel to the James River and encompass an area of only 0.23 square miles. This geometry is repeated as the city grows and has influenced the design of the city for 280 years, only being modified to accommodate the turns in the river and topography.

1742

King George II grants a charter to William Byrd II to establish Richmond as a town.

1780

The state capitol is moved from Williamsburg to Richmond.

1782

Richmond is incorporated as a city with a population of 1,800 — half of whom are enslaved people.

1785

The James River Company is established to improve navigation through dredging, blasting channels through the rocks, and building canals in two places around the rapids.

1792

Thomas Jefferson's "temple on the hill" is complete. The Neoclassical design of the Virginia Capitol building would influence architecture in the United States for decades to come.

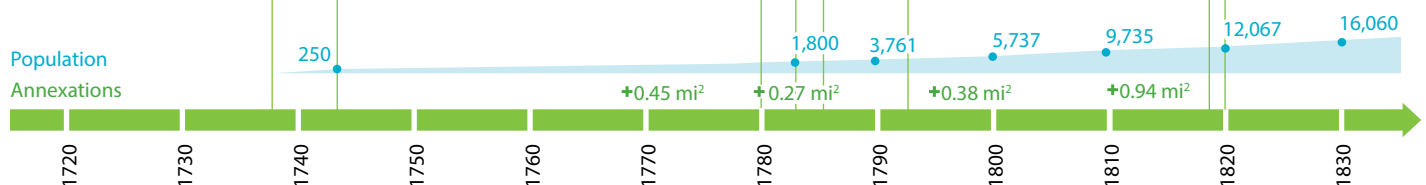


1819

By 1819, there are eleven plants processing tobacco, four iron works, and three flour mills in Richmond.

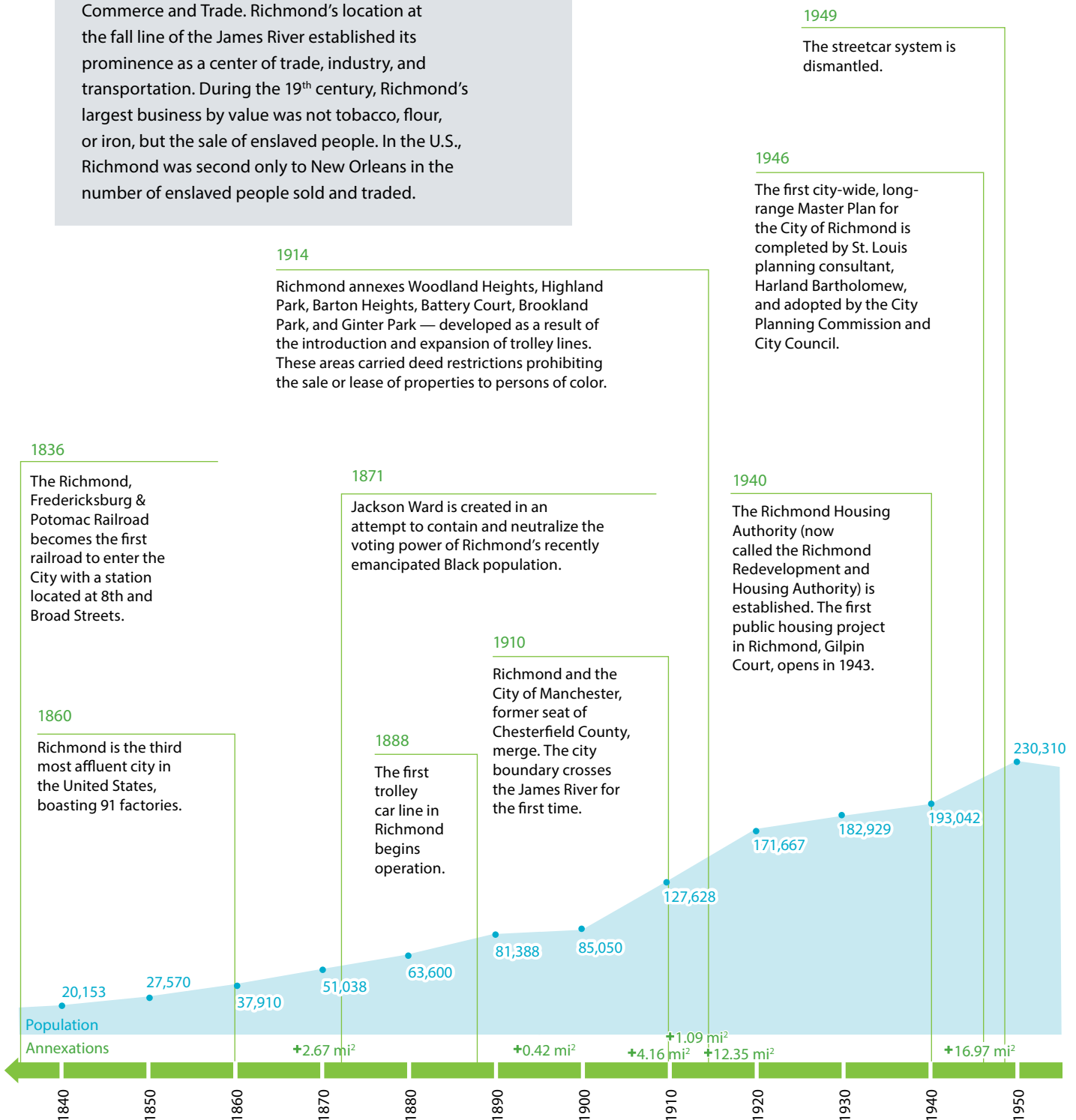
1820

By 1820, the Kanawha Canal extends 197 miles upriver from Richmond.



Richmond: A Very Brief History (continued)

Commerce and Trade. Richmond's location at the fall line of the James River established its prominence as a center of trade, industry, and transportation. During the 19th century, Richmond's largest business by value was not tobacco, flour, or iron, but the sale of enslaved people. In the U.S., Richmond was second only to New Orleans in the number of enslaved people sold and traded.



1957

Construction of the Richmond-Petersburg Turnpike (now part of I-95) is complete and Jackson Ward, a historically Black neighborhood, is divided in two by a major highway — resulting in the demolition of a significant portion of the neighborhood.

1970

Richmond City Council votes to clear Historic Fulton a predominantly Black neighborhood. Over 800 buildings on about 350 acres are demolished as part of an Urban Renewal Plan. The City also annexed over 20 square miles of land from Chesterfield County, which would end up being its last annexation.

1976

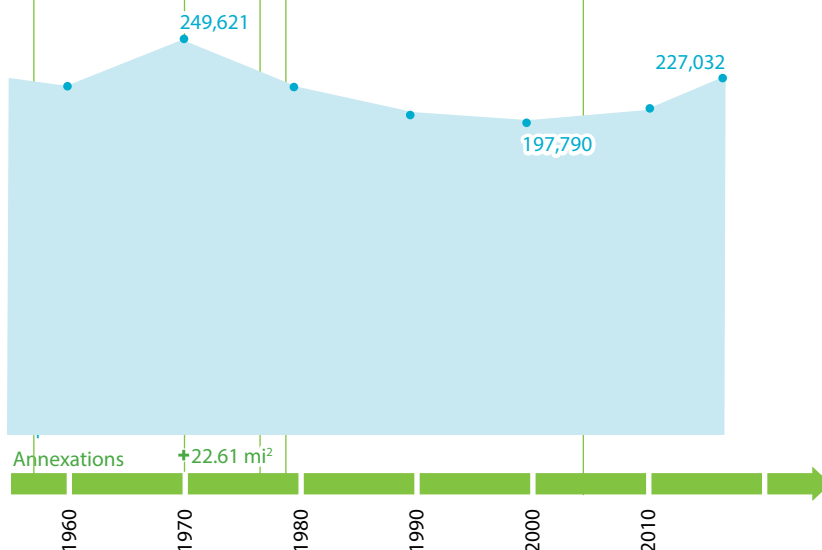
The Downtown Expressway opens to vehicular traffic. Construction of this highway involves demolishing portions of Byrd Park, Randolph, and Oregon Hill.

1979

The Virginia General Assembly adopts legislation granting counties meeting certain standards immunity from annexation by cities with a population over 100,000, thus ending the City of Richmond's ability to expand its boundaries.

2004

Richmond adopts a "strong mayor" form of government.



Policy. Local, state, and federal policies and ordinances did much to shape Richmond, especially laws based on racial segregation and policies that prescribed where investments should be made. Richmond passed a residential segregation ordinance in 1911, which was determined unconstitutional by the U.S. Supreme Court in 1917. Despite this ruling, deeds still carried restrictions against leasing or selling to persons of color. The Home Owners Loan Corporation created "residential security maps," better known as redlining in 1935. These maps discouraged investment in certain areas. The Fair Housing Act of 1968 was designed to put an end to housing discrimination but it was not until 1975, with lending disclosure laws, that practices became more transparent. The disinvestment in and segregation of areas of Richmond made them easy targets for highway construction and urban renewal in the 50s, 60s, and 70s.

Charting Richmond's Future Growth

No one truly knows how much the City of Richmond will grow over the next 20 years. However, having a strategy to manage growth is critical to ensuring that new development, if and when it comes, aligns with city-wide goals. The Center for Urban and Regional Analysis (CURA) at Virginia Commonwealth University developed three growth scenarios, as shown in Figure 8, with housing, land use, and population projections for Richmond 300 to establish several potential benchmarks to guide future growth.

Moderate Growth Projection

2037 Population: 260,000 people (increase of 40,000 compared to 2015)

- Assumes the continuation of the recent 15-year trend of attracting people of college age, young adults, empty-nesters, and retirees
- Continued out-migration of families with school-age children
- Assumes an annual growth rate of 0.76%—the growth rate that Richmond experienced between 2000 and 2015
- Potential new housing units need:
 - Single-family: 8,179
 - Multi-family: 4,748
- Potential land demand (for housing, commercial, mixed-use): 1,800 acres

Strong Growth Projection

2037 Population: 300,000 people (increase of 80,000 compared to 2015)

- Assumes that Richmond will become increasingly attractive to young, working, and older adults
- Some families with young children will move out of the city, yielding a negative net migration for children 0 to 4 years old
- Assumes an annual growth rate of 1.5%—the Richmond annual regional growth rate projected by the University of Virginia Weldon Cooper Center for Public Service in 2012
- Potential new housing units need:
 - Single-family: 15,804
 - Multi-family: 17,866
- Potential land demand (for housing, commercial, mixed-use): 2,900 acres

Aggressive Growth Projection

2037 Population: 340,000 people (increase of 120,000 compared to 2015)

- Assumes strong growth of families with children, young and old adults, and dynamic job growth within the city
- Assumes an annual growth rate of 2.5%
- Potential new housing units need:
 - Single-family: 22,518
 - Multi-family: 27,086
- Potential land demand (for housing, commercial, mixed-use): 3,500 acres

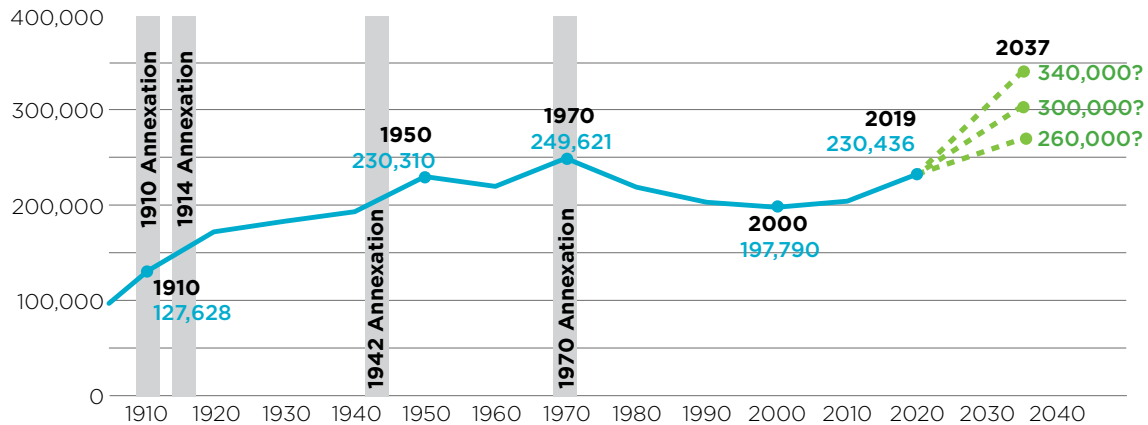


FIGURE 8 // Historic and Projected Population, 1910-2037

Source: U.S. Census Bureau: 1910, 1950, 1970, 2000 Censuses, 2019 Population Est.; Population Projections by the Center for Urban and Regional Analysis at Virginia Commonwealth University, 2017

A lot can change in 20 years.

Back in 2001, when the last city-wide Master Plan was adopted, the city was a fairly different place:

- Richmond was home to 32,000 fewer residents.
- The VMFA did not have a modern addition — the expansion and new campus design was unveiled in 2010.
- Richmond did not have a Folk Festival — it was established in 2005.
- The Mayor was elected by City Council — Richmond switched to a strong mayor format in 2004.
- Nokia was the largest cell phone provider. The Motorola Razr was released in 2003 and the iPhone in 2007.
- People rented movies from 6,500+ Blockbusters nationwide.
- VCU had 7,000 fewer students.

Room to Grow

Richmond's 62.5 square miles provide ample opportunity to grow the population and the economy. As of a July 2020 field survey, there were 1,693 vacant buildings in Richmond, 20.6% of which had a property violation, and 7.7% of which were abandoned. The majority of the vacant buildings were residential structures (87%). In addition to the vacant structures, there are 3,595 acres of vacant land and 6,153 acres of under-developed land (where the building is less than twice the value of the land), as shown in Figure 9.

Manage Growth

Not all growth is good growth. Richmond 300 outlines strategies to intentionally grow Richmond equitably, sustainably, and beautifully. Using Richmond 300 as a guide, the City is in a position to become a welcoming, inclusive, diverse, innovative, and equitable city of thriving neighborhoods, ensuring a high quality of life for all.

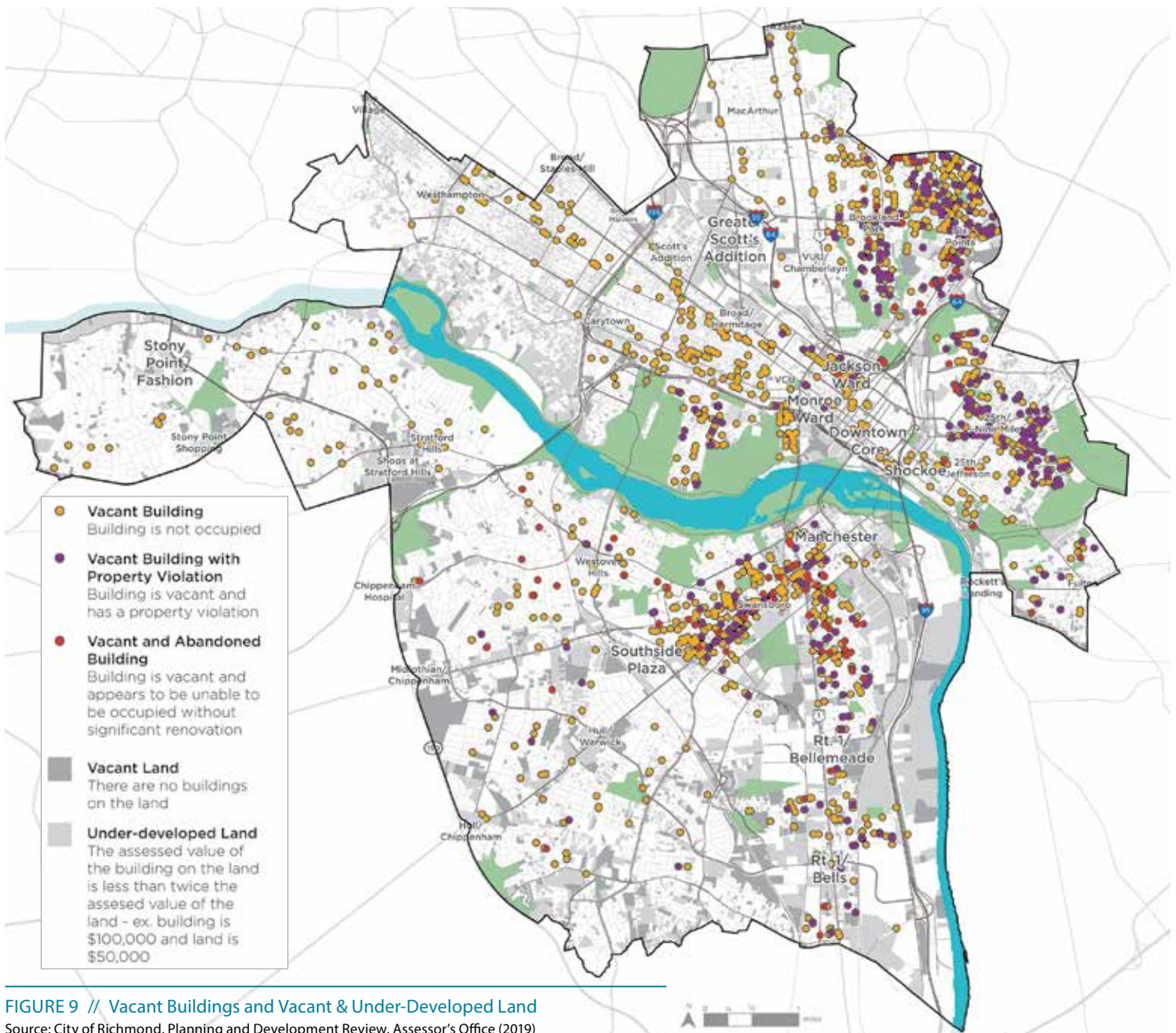


FIGURE 9 // Vacant Buildings and Vacant & Under-Developed Land

Source: City of Richmond, Planning and Development Review, Assessor's Office (2019)

Richmond 300 Plan Structure

The Richmond 300: A Guide for Growth Vision is implemented via the Nodes Map, the Priority Neighborhoods Map, the Future Land Use Map, the Future Connections Map, and policy recommendations for land use, transportation, economic development, housing, and environment. This plan has six sections:

1. **Vision and Core Concepts:** includes the city-wide vision for 2037 and detailed descriptions of the core concept that drives the four important maps—Nodes, Priority Neighborhoods, Future Land Use, and Future Connections—that are referenced throughout the document.
2. **High-Quality Places:** includes recommendations related to land use, public facilities and public land, historic preservation, urban design, and public engagement.
3. **Equitable Transportation:** includes recommendations related to transportation planning, vision zero, bike/pedestrian/transit infrastructure, streets, and emerging mobility.
4. **Diverse Economy:** includes recommendations related to growing, retaining, and attracting businesses, tourism, and anchor institutions.
5. **Inclusive Housing:** includes recommendations related to housing.
6. **Thriving Environment:** includes recommendations related to clean air, clean water, and resilient communities.
7. **Implementation:** outlines how to implement Richmond 300 using metrics, 6 Big Moves, and reporting.

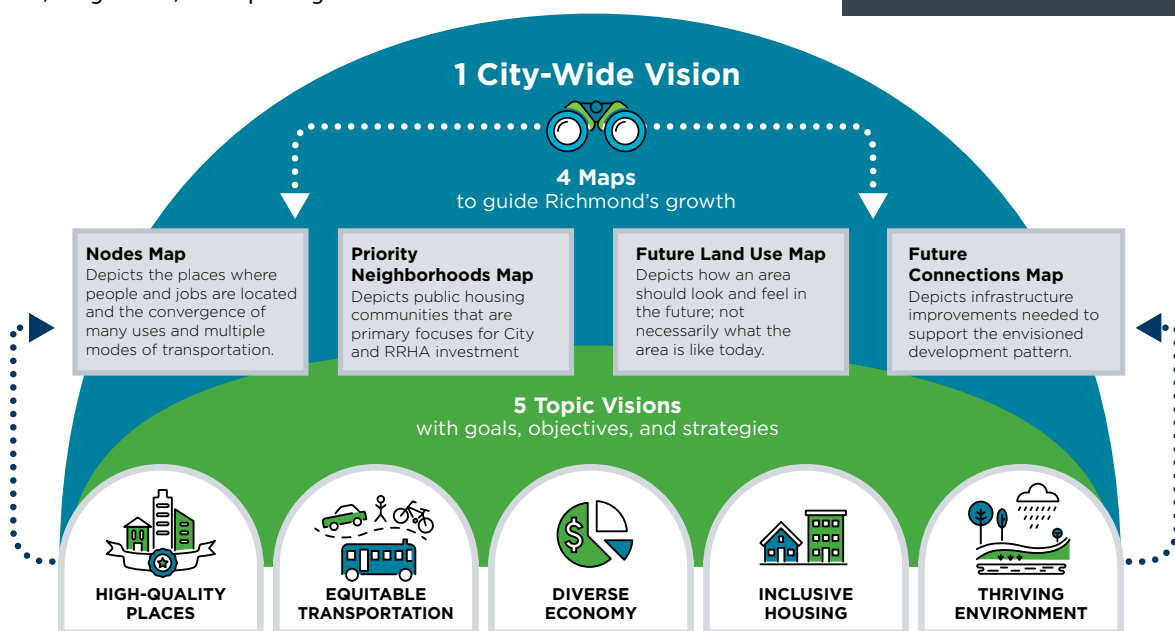
The Richmond 300: A Guide for Growth uses four key terms:

VISION: A statement articulating what we want our city to look and feel like in the future.

GOAL: Broad, long-term aim that defines fulfillment of the vision.

OBJECTIVE: Specific, quantifiable, realistic targets that measure the accomplishment of the goal.

STRATEGY: A policy, infrastructure improvement, partnership, or other activity required to achieve an objective, create a critical condition, or overcome a barrier.



Plan Structure Diagram. Richmond 300 has four maps that present a growth strategy centered on great places and networks and 5 topics to achieve the 20-year city-wide vision.

Planning for a Post-Pandemic World

As the Department of Planning and Development Review (PDR) was in the midst of finishing up this draft Master Plan document, the World entered a global pandemic. The long-term effects of the pandemic on how people use and move around cities and neighborhoods are unknown. However, the U.S. has in the short-term seen many pre-pandemic trends accelerate during the pandemic, such as, an increasing economic disparity (particularly among Blacks and Latinos), an increase in teleworking, and an increase in biking and walking. The longer-term effects of COVID-19 are unknown but countless webinars, articles, and conferences are sprouting up as developers, planners, architects, demographers, public health experts, social scientists, and other experts discuss the potential effects of the pandemic. How will this pandemic affect life in cities? in America?

PDR hosted a questionnaire from April to August 2020 to gather Richmonders' ideas on how the pandemic may change how they live in Richmond. Some takeaways from the 536 responses received to the survey are listed below.

Outmigration: 52% of respondents believe there will be small out migration of individuals from the densest urban areas of the U.S. (such as New York City, Los Angeles, etc.).

Growth in mid-size and small cities, and suburbs: For individuals leaving dense urban areas, respondents selected mid-sized city (67%), suburban area (52%), and small city (36%).

Continued population growth for Richmond: 69% of respondents believe that Richmond will continue to grow at a steady annual rate of 0.87% (39%) or a moderate annual rate of 1.4% (30%). One respondent wrote: "Current pandemic will not be a factor, but increasing costs of living in major urban areas will be. RVA has a lot to offer (and room to grow) while costs are significantly lower than NYC/Boston/DC Area."

More balconies and porches: The number one feature respondents (over 84%) believe individuals will want in their home is a private balcony or porch.

More sidewalks: 97% of respondents said that individuals will absolutely want to have sidewalks in their neighborhood in a post-pandemic society.

More teleworking: 97% of respondents believe that office workers will work much more (48%) or somewhat more (49%) than they did pre-pandemic.

More parks: 93% of respondents believe individuals will seek access to parks much more (53%) or somewhat more (40%) than they did pre-pandemic.

More bike riding: 88% of respondents believe individuals will ride bikes much more (39%) or somewhat more (49%) than they did pre-pandemic.

More walking: 92% of respondents believe individuals will walk for pleasure or exercise much more (45%) or somewhat more (47%) than they did pre-pandemic.

Return to transit: 36% of respondents believe individuals will ride transit a little less and 51% believe individuals will return to pre-pandemic transit use.

Prioritize pedestrians, bikes, and transit at the curb: Respondents believe the top users that should be prioritized at the curb are pedestrians (86%), bicycles (74%), and transit (55%).

More digital engagement: 89% of respondents believe digital public engagement will be used much more (52%) or somewhat more (37%) than it was pre-pandemic.



CHAPTER 1

Vision and Core Concepts

Richmond 300: A Guide for Growth realizes the city-wide vision and goals by supporting the equitable and sustainable growth of Nodes throughout Richmond connected by viable commercial corridors. The Master Plan strengthens Nodes by aligning future land use, future connections, and public policy (related to land use, transportation, economic development, housing, and the environment) to increase the vitality of these critical emerging places within Richmond.



City-Wide Vision

City-Wide Vision:

In 2037, Richmond is a welcoming, inclusive, diverse, innovative, sustainable, and equitable city of thriving neighborhoods, ensuring a high quality of life for all.

The city-wide vision is a wide reaching vision that touches on all aspects of city management—not just land use management—but also social and cultural aspects of city life that are not within the scope of this Master Plan document. This document focuses on land- and place-based strategies to achieve the city-wide vision.

Vision Values

The city-wide vision embraces several important values:

WELCOMING

Feeling accepted and comfortable despite age, gender, race, sexuality, or income

INCLUSIVE

Accepting differences and intentionally involving diverse opinions, attitudes, and behaviors

DIVERSE

Intentionally creating a state of mixed people, institutions, and mixed-use places

INNOVATIVE

Nurturing new ideas, methods, devices, or businesses

SUSTAINABLE

Meeting the current environmental, social, and economic needs of our community without compromising the ability of future generations to meet those same needs

EQUITABLE

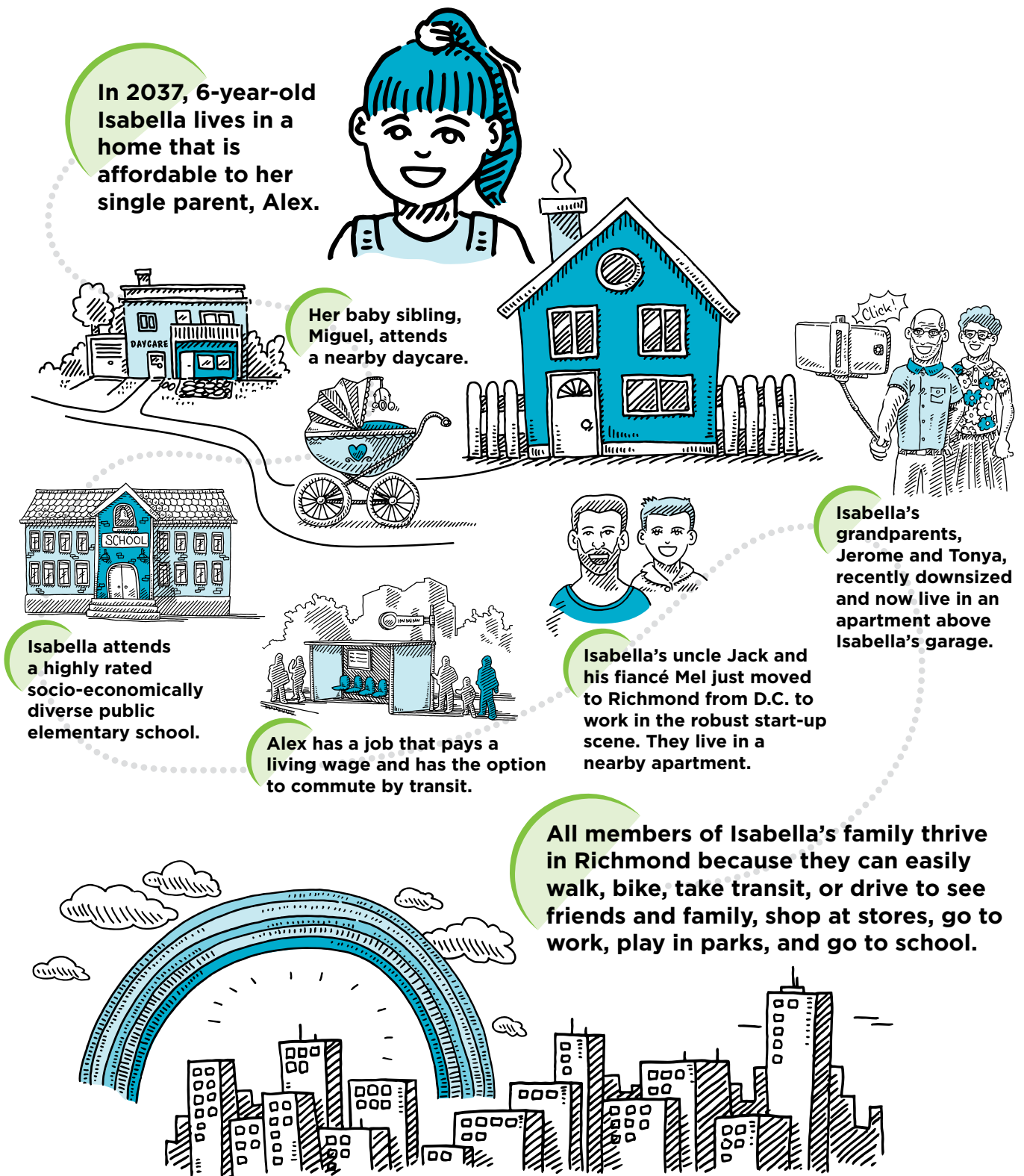
Providing equal or equivalent access to goods, services, status, rights, power, and amenities

THRIVING

Energizing communities with opportunities for and support of cultural, civic, and economic involvement

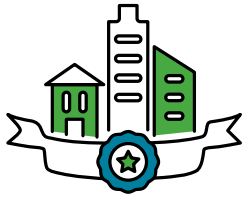
Vision Story

The city-wide vision story helps to illustrate how the city-wide vision could be realized in the lives of Richmonders in 2037. What vision story would you tell?



Topic Visions

Five topic visions speak to how the city should physically grow over the next 20 years.



High-Quality Places

Richmond is a well-designed city of communities interconnected by a network of Nodes, public facilities, and open spaces providing services to residents, businesses, and visitors.

As the Capital of the Commonwealth, Richmond leads the region in high-quality business and residential growth. Richmond's unique neighborhoods and districts, both historical and new, support a diversity of uses, the equitable accommodation of all phases of life, and the efficient use of land to promote sustainable and healthy lifestyles.



Equitable Transportation

Richmond prioritizes the movement of people over the movement of vehicles through a safe, reliable, equitable, and sustainable transportation network. Walking, biking, and transit options are the most convenient and used forms of transportation in Richmond, thereby improving the natural environment and our health. Richmond's multi-modal transportation system is high-quality and easy for all people to use regardless of income and physical abilities, seamlessly connecting Richmond neighborhoods and attractions to each other, the region, and the nation.



Diverse Economy

Richmond is home to a variety of businesses and industries that offer opportunities for quality employment and capital investment.

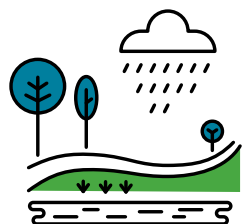
Richmond is a first choice location for businesses and investment because the city's transportation, housing, cultural, outdoor, commercial, and institutional amenities create a vibrant city. Richmonders of all income levels have opportunities for life-long learning and skill-building.



Inclusive Housing

Richmond is a city where all people can access quality housing choices.

By preserving and increasing housing options, Richmond supports existing and new residents, regardless of income. As the city grows, Richmond provides options to existing residents, preventing involuntary displacement and reducing housing disparities. Housing is the foundation of inclusive Richmond neighborhoods that are walkable with adequate linkages to services, goods and open spaces.



Thriving Environment

Richmond is a sustainable and resilient city with healthy air, clean water, and a flourishing ecosystem.

Carbon emissions are low, air and water quality are high, and city-wide solid waste production is minimal. The City is positively adapting to the effects of a changing climate, with a built environment that enhances and protects natural assets, including the James River. All residents have equitable access to nature and a healthy community.

Goals

Seventeen goals, grouped under the five topic areas, have objectives and strategies that provide policy, infrastructure, partnership, or other recommendations to achieve the topic and city-wide visions.

HIGH-QUALITY PLACES	Goal 1	Complete Neighborhoods: Establish a city of complete neighborhoods that have access to Nodes and Priority Neighborhoods connected by major corridors in a gridded street network.
	Goal 2	City-Owned Assets: Efficiently manage City-owned land and facilities.
	Goal 3	Historic Preservation: Support growth that preserves the historical urban fabric and enhances understanding of Richmond's multi-faceted past.
	Goal 4	Urban Design: Establish a distinctive city comprising architecturally significant buildings connected by a network of walkable urban streets and open spaces to support an engaging built environment.
	Goal 5	Planning Engagement: Foster a planning engagement culture that effectively and equitably builds people's capacity to organize to improve the city and their neighborhoods.
EQUITABLE TRANSPORTATION	Goal 6	Land Use & Transportation Planning: Align future land use and transportation planning to support a sustainable and resilient city.
	Goal 7	Vision Zero: Systemically change the built environment to shift our safety culture and ensure that individuals are not killed or seriously injured on city streets.
	Goal 8	Non-Car Network: Enhance walking, biking, and transit infrastructure to provide universal access to all users, prioritizing low-income areas and areas within the high-injury street network.
	Goal 9	Streets, Bridges, & Connections: Build and improve streets and bridges to expand connectivity for all users.
	Goal 10	Emerging Transportation Technologies: Incorporate emerging technology into the transportation network in ways that seek to reduce single-occupancy vehicle use and reduce greenhouse gas emissions.
DIVERSE ECONOMY	Goal 11	Businesses & Jobs: Foster an environment that supports the growth of existing and new small, medium, and large businesses, focusing on Nodes, Priority Neighborhoods, major corridors, and industrial centers.
	Goal 12	Tourism: Develop tourism and attractions to further elevate Richmond's image and to continue to delight existing and future residents, employees, and visitors.
	Goal 13	Anchor Institutions: Leverage institutions to strengthen job sectors and collaborate on land planning.
INCLUSIVE HOUSING	Goal 14	Housing: Preserve, expand, and create mixed income communities, by preserving existing housing units and developing new ones—both renter- and owner-occupied—throughout the city.
THRIVING ENVIRONMENT	Goal 15	Clean Air: Improve air quality within the city and the region, achieve a 45% reduction in greenhouse gas emissions within the city by 2030, and achieve net zero greenhouse gas emissions within the city by 2050 via RVAgreen 2050.
	Goal 16	Clean Water: Improve local water quality and manage the built environment to enhance and protect natural assets such as the James River.
	Goal 17	Resilient & Healthy Communities: Positively adapt to the effects of a changing climate via RVAgreen 2050, and ensure that all residents have equitable access to nature and a healthy community.

Nodes

Nodes are places in Richmond where people and jobs are today and continue to grow into the future. Nodes are the places of convergence of many uses and include offices, shopping, housing, and/or public gathering places as well as access to multiple modes of transportation.

Nodes are important places in Richmond and deserve special attention in the Master Plan to ensure that land use planning, transportation planning, and public policy align to make thriving crossroads in Richmond's communities. The Nodes are places in Richmond that can either 1) accommodate additional growth in jobs and population or 2) are major activity centers today and should be preserved/enhanced. The Nodes Map, as shown in Figure 10, depicts the location and scale of each Node:

Regional/National Node: A center with significant cultural, entertainment, government, and business destinations as well as shopping, housing, and unique place-based attractions.

Neighborhood Node: A local crossroads typically within or next to larger residential areas that offers goods and services to nearby residents, employees, and visitors.

Micro Node: A notable place within a neighborhood that generally provides goods and services to the immediate residents but may attract visitors.

The Nodes map also highlights the Priority Growth Nodes where the City is encouraging the most significant growth in population and development over the next 20 years. This section of the Plan includes descriptions for the Nodes designated as primary growth areas.

Descriptions for all the Regional/National Nodes and the Neighborhood Nodes can be found in Appendix C of this Plan. Micro Nodes are not described in detail in the Plan, but are called out on the Node Map because the Micro Nodes provide mixed-use destinations within primarily residential areas and help create a unique sense of place within many of Richmond's historic urban neighborhoods. Micro Nodes are a model for future development as new neighborhoods emerge.

PRIORITY GROWTH NODES

Downtown. As the regional center of employment, the Capital of the Commonwealth of Virginia, and the home to a major state university and hospital system, the Downtown Area contains five sub-Nodes:

- Downtown Core
- Jackson Ward
- Monroe Ward
- Shockoe
- Manchester

Greater Scott's Addition

Route 1/Bellemeade Rd

Route 1/Bells Rd

Southside Plaza

Stony Point Fashion Park

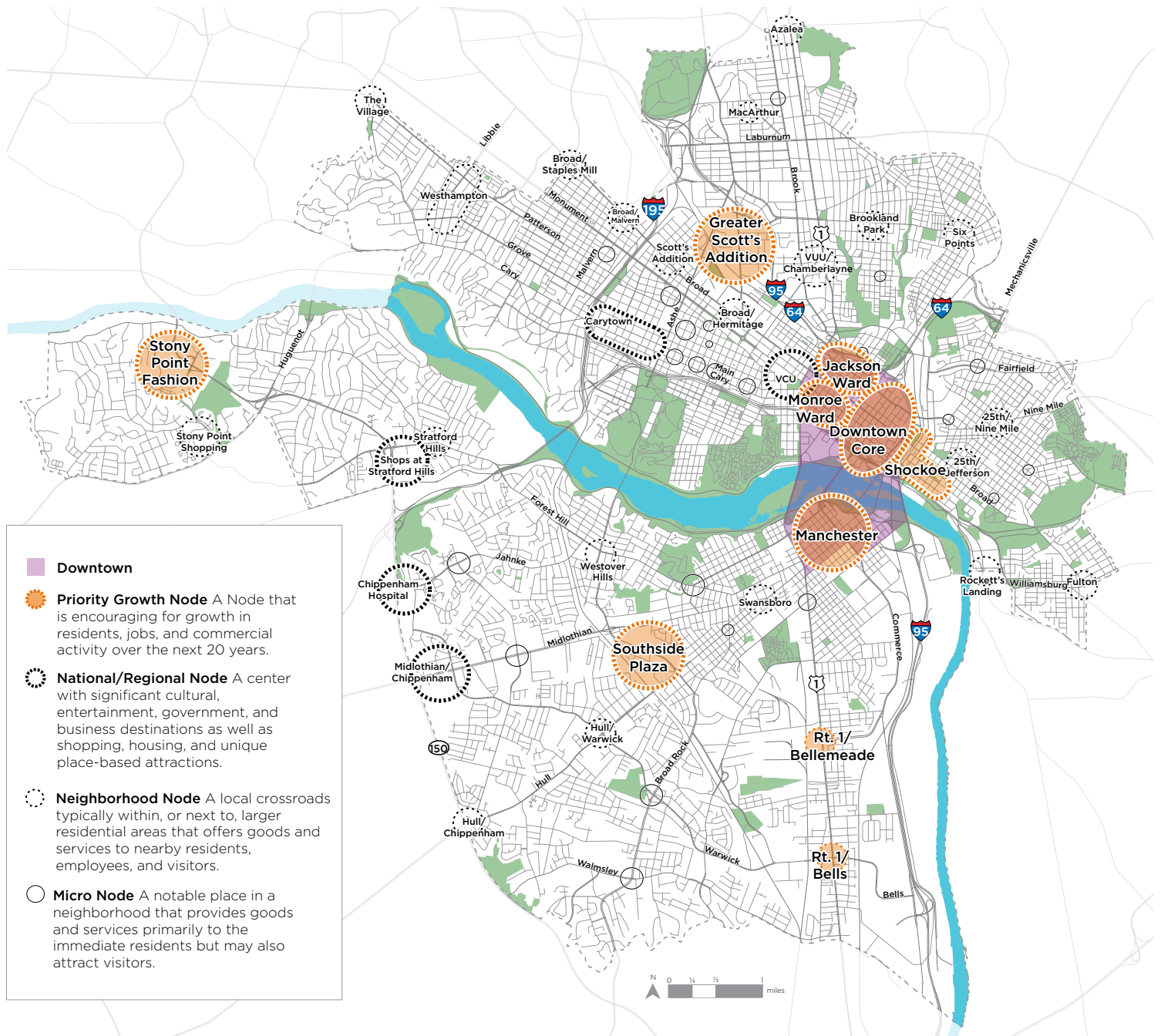


FIGURE 10 // Nodes Map

Nodes are places in Richmond that can either 1) accommodate additional growth in jobs and population or 2) are major activity centers today and should be preserved/enhanced.

Priority Growth Node

Downtown — Downtown Core

Vision

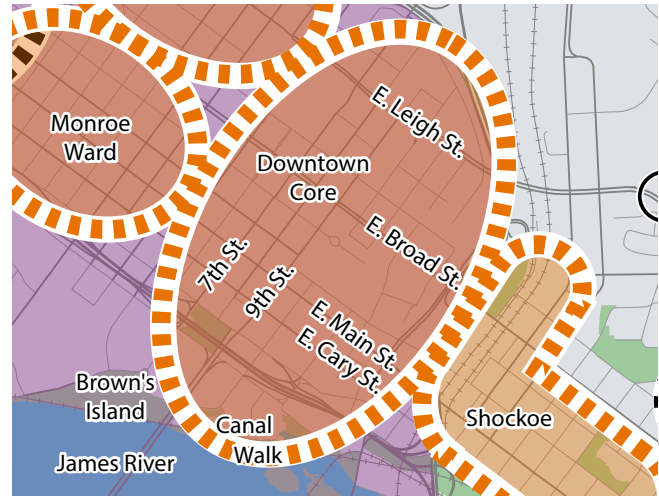
As the highest density of office employment in the region, the Downtown Core continues to serve as the backbone of the local, state, and federal government in Richmond as well as a financial, insurance, bio-tech, and healthcare center. Over the next 20 years, the Downtown Core continues to transition from a primarily office district to an 18-hour district (18 hours of the day are lively and 6 are sleepy) with a mix of uses, including entertainment, residential, and retail uses. New infill development matches the intensity of existing buildings and includes active ground floor uses that enliven the sidewalks. Signature public spaces and greenways connect the Downtown Core's sub-districts to one another and generate activity at the pedestrian level by increasing pedestrian, bike, and transit connections among the various sub-districts, plazas, parks, and the James River. City-owned property, such as the Coliseum, are redeveloped to foster a mixed-income, mixed-use development that enlivens Downtown by drawing people to Downtown in the evenings and on the weekend.

Growth Potential

In 2019, there were approximately 77 acres of vacant/underdeveloped land in the Downtown Core, representing 26% of the Downtown Core's total land area.

Primary Next Steps

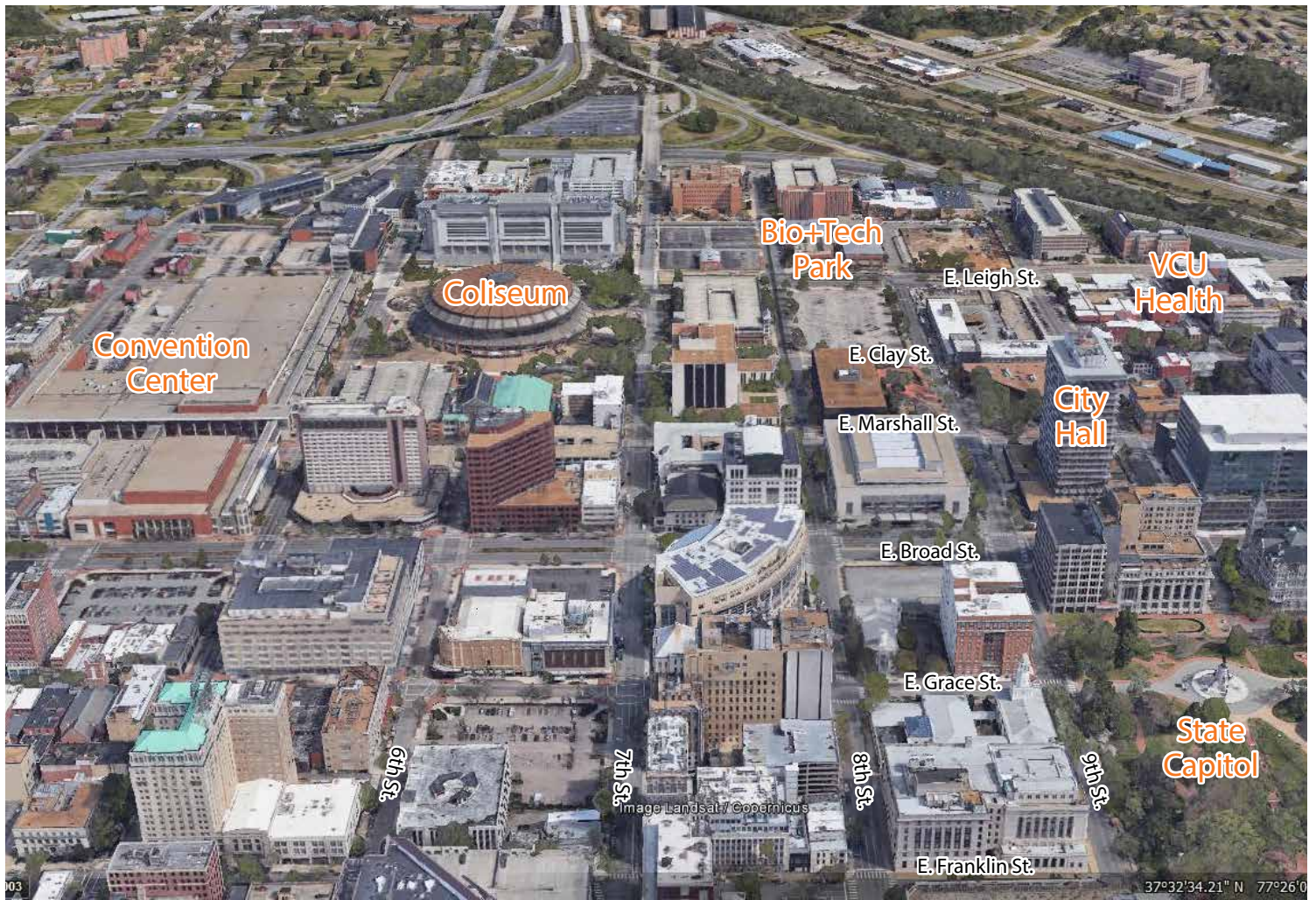
- Coliseum Plan: Develop the Coliseum Area Framework Plan with community engagement (Goal 1).
- Coliseum Redevelopment: Create and issue a Request for Proposals for the Coliseum area using the guidance from the Coliseum Area Framework Plan to reposition City-owned assets into revenue-generating properties (Goal 1, Goal 2).
- Highway Capping: Examine process to sell the air-rights above the Downtown Expressway between Canal, Byrd, 6th, and 7th Streets (Goal 9).



Downtown Core — Regional/National Node

The seat of local and state governments, the financial/office district, the Canal Walk, Shockoe Slip, the Convention Center, and the Coliseum Area.

- Two-Way Streets: Continue to convert streets from one-way to two-way as appropriate (Goal 9).
- Life Sciences Cluster: Market and expand growth opportunities for life science-focused businesses and supporting entities clustered near VA Bio+Tech Park and VCU Health (Goal 11).
- Downtown Marketing & Services: Continue to market Downtown as a the cultural, business, government, and recreation destination of the Richmond Region and support cleaning, event, and placemaking services throughout Downtown (Goal 4).
- Riverfront Plan: Continue to implement the Phase 1 recommendations outlined in the Riverfront Plan to improve access from Downtown to the James River (Goal 4, Goal 17).
- Non-Car Connectivity: Improve non-car connectivity by encouraging urban design that promotes walking, continuing to improve transit access, and developing on-street bike facilities and greenways to Jackson Ward, the Riverfront (per the Riverfront Plan), Church Hill, and other areas (Goal 4, Goal 8, Goal 17).



Coliseum Area Aerial

The defunct Coliseum and expanse of vacant land and buildings around it present an opportunity for the City to fill a void in the middle of the Downtown Core with tax-producing properties and a building, use, and street network that connect the area to the larger Downtown community.



Brown's Island Improvements

Venture Richmond has undertaken a public process to implement improvements on Brown's Island identified in the Riverfront Plan.

Source: Brown's Improvement Plan, September 2019



Downtown to River Connections

Since the Downtown Expressway acts a barrier between the Downtown Core and the James River, connectivity improvements, such as creating the 13th Street tunnel and capping the highway between 7th, Byrd, and Canal Streets, will help improve Riverfront access.

Source: Richmond Riverfront Plan, November 2012

Priority Growth Node

Downtown — Monroe Ward

Vision

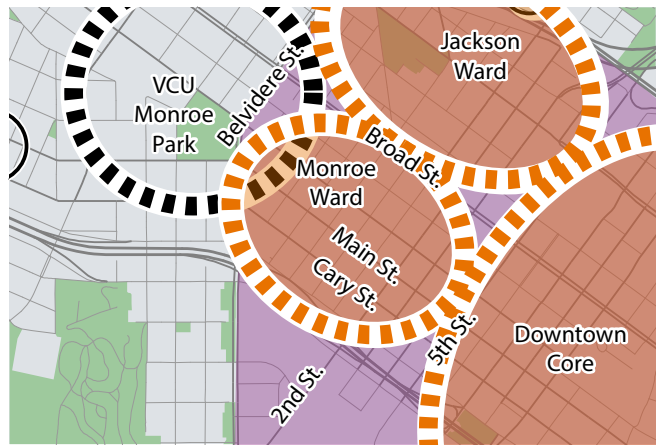
Monroe Ward is transformed from the detached parking garage of the Downtown Core into a significant residential and office mixed-use district between two of the region's greatest concentrations of activity—the VCU Monroe Park Campus and the Downtown Core. Historic buildings are preserved and complemented by denser development on vacant lots that generate activity. There is a critical mass of residents, shoppers, workers, and tourists who

are attracted to the residential options, retail and restaurant destinations, jobs, and cultural attractions in Jackson Ward, the Arts District, and the Downtown Core. New pocket parks provide outdoor greenspace for Monroe Ward's residents, workers, and visitors, and are connected to other Downtown districts via greenways, bike lanes, and transit.



Monroe Ward Conceptual Site Plan

There is great potential for Monroe Ward to redevelop into a vibrant extension of the Downtown Core.



Monroe Ward — Regional/National Node

Situated between VCU's Monroe Park Campus and the Downtown Core, in 2020, Monroe Ward is home to many surface parking lots, several historic buildings, a restaurant row along Grace Street, and a scattering of newer buildings.



Growth Potential

In 2019, there were approximately 40 acres of vacant/underdeveloped land in Monroe Ward, representing 49% of Monroe Ward's total land area.

Primary Next Steps

- Transit: Increase frequency and hours of the #5 bus route that runs along Cary and Main Streets (Goal 8).
- Bike Facilities: Build bike lanes on 1st, 2nd, and/or 3rd Streets (Goal 8).
- Grace Street: Convert Grace Street from 4th Street to Belvidere Street into a two-way street (Goal 9).
- Marketing: Promote Monroe Ward as a prime location to attract and grow target industries in corporate headquarters, professional services, and financial services (Goal 11).
- Greenway: Develop the Ashland to Petersburg Trail through Monroe Ward (Goal 8, Goal 17).
- Parks: Identify key parcels for creation of pocket parks (Goal 17).

Priority Growth Node

Downtown — Jackson Ward

Vision

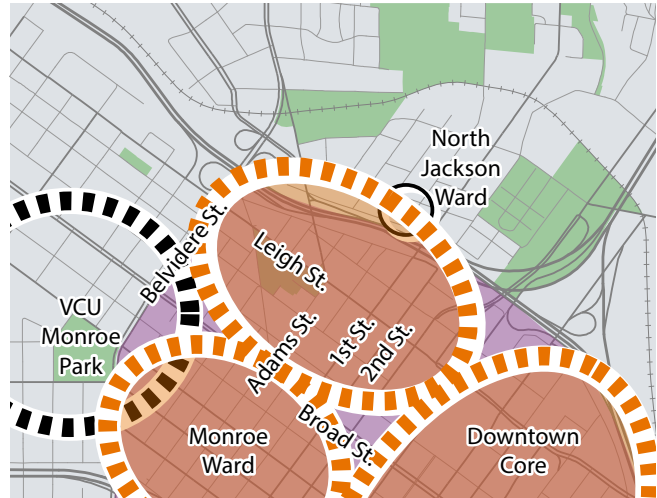
Jackson Ward has retained historic buildings and plays a leading role in supporting Black cultural and economic vitality. Jackson Ward continues to be a residential neighborhood with non-residential uses scattered throughout at corners and along major roads—such as 1st Street, 2nd Street, and Marshall Street. New infill developments incorporate high-quality architecture and complement the character of historic buildings. Jackson Ward is better connected to the rest of Downtown with the conversion of one-way streets to two-way, greenways, transit, a new park, and bridges connecting Jackson Ward to North Jackson Ward over the highway. Decking over the highway will reunite the two sides of Jackson Ward that were divided in the 1950s by the construction of the highway.

Growth Potential

In 2019, there were approximately 29 acres of vacant/underdeveloped land in Jackson Ward, representing 33% of the Jackson Ward's total land area.

Primary Next Steps

- Highway Deck Study: Commence a planning study to analyze the feasibility of building a park, roads, and buildings over I-95 and I-64, reconnecting Jackson Ward and North Jackson Ward (Goal 8, Goal 9, Goal 17).
- Business Growth: Increase the number and support the growth of minority-owned businesses (Goal 11).
- Historic and Cultural Attractions: Maintain, grow, and market historic attractions such as the Black History Museum and Maggie L. Walker's Home (Goal 13).
- Gilpin Court Transformation: Develop a plan with existing community input to include Gilpin Court and vacant land in North Jackson Ward to transform the neighborhood into a mixed-use, mixed-income, walkable, and transit-adjacent community that provides both housing and jobs for residents (Goal 1, Goal 14).



Jackson Ward — Regional/National Node

This Node centers on the Historic Jackson Ward neighborhood but also extends north slightly to connect to North Jackson Ward.



Reconnecting Jackson Ward

By capping the highway with streets, parks, and buildings, Jackson Ward will once again be one neighborhood.



In 2017, the City's Public Art Commission unveiled the Maggie Lena Walker Plaza at a gateway to Jackson Ward.

Priority Growth Node

Downtown — Shockoe

Vision

Shockoe is a national destination for historic tourism, education, and interpretation as well as a regional and neighborhood destination. Shockoe is connected to other neighborhoods and amenities, such as the Virginia Capital Trail and the Canal Walk. New development complements historic sites and supports public space amenities such as the 17th Street Farmer's Market Plaza, the Low Line, and a new park. Main Street Station continues to serve as the multi-modal transportation hub of Richmond by augmenting its offerings to include more transportation options and high-speed rail service. Uses around Main Street Station support the bustle of a train station with amenities that serve commuters, visitors, residents, and employment base.

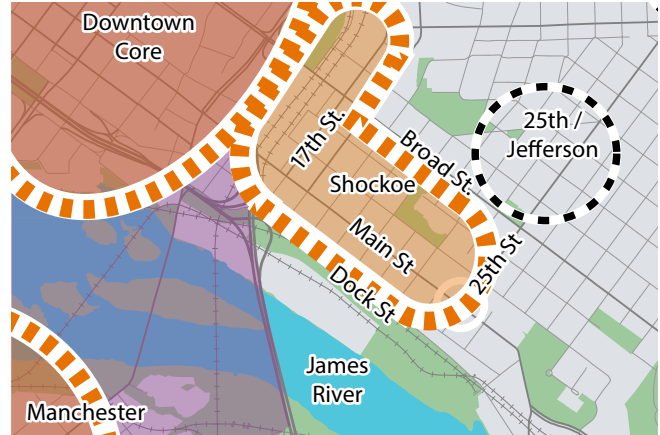
Growth Potential

In 2019, there were approximately 44 acres of vacant/underdeveloped land in Shockoe, representing 35% of Shockoe's total land area.

Primary Next Steps

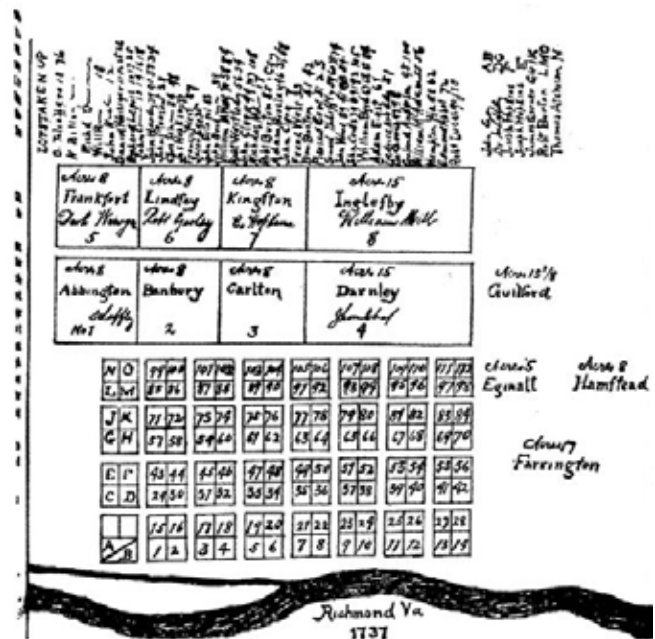
Implement the recommendations in the Shockoe Area Plan, some of which include:

- Small Area Plan: Complete and adopt the Shockoe Small Area Plan (which is under development), as an element of Richmond 300 (Goal 1).
- Rezoning: Rezone the Shockoe area in alignment with the Future Land Use Map to allow appropriate growth while also protecting and enhancing significant historic sites (Goal 1).
- Archeology: Adopt an archaeological ordinance to provide guidance to public and private land owners in conducting and managing archaeological discoveries (Goal 3).
- Memorialization: Continue efforts to commemorate, memorialize, and interpret sites of historical and cultural significance in Shockoe. Advocate for additional state and federal funding to fund commemoration efforts (Goal 3).
- High-Speed Rail: Advocate for the creation of a high-speed rail station at Main Street Station



Shockoe — Regional/National Node

The oldest part of the city, this Node includes the original 1737 plat established by Major William Mayo.



In 1737, Richmond is platted by Major William Mayo for William Byrd II and only includes 0.25 miles of land, known as Shockoe.

Source: The Valentine

to further Main Street Station's position as the regional mass transit hub with the convergence of rail, BRT, regional bus, and GRTC local bus routes (Goal 8)..



The City is developing a Small Area Plan for Shockoe under the guidance of the Shockoe Alliance. The Shockoe Alliance's mission is to guide design and implementation of concepts and recommendations for the future of Shockoe as a holistic area rooted in history and informed by those with shared interests to advance these efforts in support of the mission. Shockoe was the center of the Powhatan Confederacy for thousands of years prior to the arrival of the British in 1607. By the mid-1840s, Richmond was one of the large centers of domestic trade in enslaved Africans [top left: Slavery Reconciliation Statue; top right: a Richmond Slave Trail Marker; middle right: site of the Lumpkins Slave Jail]. It was also a transportation and manufacturing Center [middle left: Main Street Station Head House; bottom left: renovated Main Street Station Train Shed].

Priority Growth Node

Downtown — Manchester

Vision

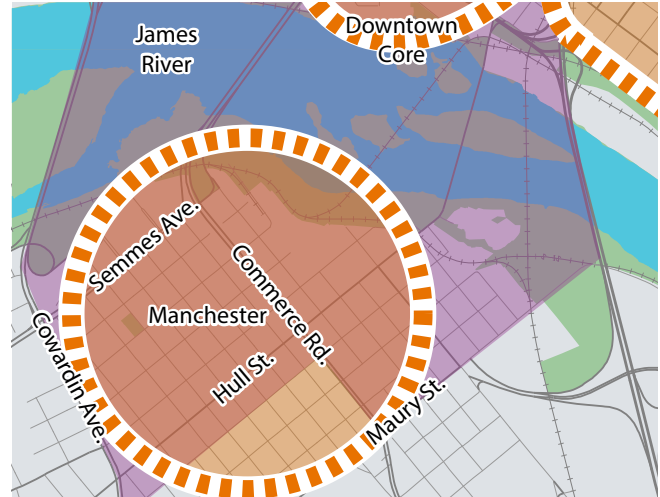
Manchester continues to increase in population and economic activity to support a thriving business corridor along Hull Street. The formerly industrial part of Manchester provides jobs as well as housing. Manchester is connected to South Richmond and the Downtown Core by a network of greenways along former railways, along roads, and along Manchester Canal. A variety of housing options in Manchester are available to low-, moderate-, and high-income individuals. Manchester's interconnected street grid is enhanced with street trees and improved infrastructure to support pedestrians, bicyclists, and transit riders.

Growth Potential

In 2019, there were approximately 162 acres of vacant/underdeveloped land in Manchester, representing 55% of Manchester's total land area.

Primary Next Steps

- Corridor Plan: Develop a corridor plan for Commerce Road with recommendations on how to transform the road into a Great Street with amenities such as buildings addressing the street, a greenway (the Ashland to Petersburg Trail), street trees, underground utilities, lighting, and other amenities and encourage redevelopment and business growth (Goal 1, Goal 8, Goal 9).
- Rezone: Rezone areas of Manchester in alignment with the Future Land Use Plan to allow residential development in the Industrial Mixed-Use areas that do not currently allow residential uses (Goal 1, Goal 14).
- Design: Implement design standards to create a high-quality, well-designed urban realm, including elements such as street lights and exploring the creation of signature public art (Goal 4).
- Riverfront Plan: Implement the Phase 1 recommendations identified in the Riverfront Plan for Manchester (Goal 4, Goal 17).
- Ped/Bike Infrastructure: Improve pedestrian and bike infrastructure to/from this Node, specifically



Manchester — Regional/National Node
Once a separate locality, Manchester merged with Richmond in 1910.

- improving Manchester Canal, developing rails-to-trails greenways connecting to South Richmond, and developing the Ashland to Petersburg Trail. Advocate for state and federal funding for the canal and trails (Goal 8, Goal 17).
- Transit Alignment: With community input, develop a preferred alignment for a North-South BRT line through Manchester, either along Cowardin or along Hull Street, and then traveling down Midlothian, Hull, or Route 1 (Goal 8).
- Mayo Bridge: Develop and implement the plan for rehabilitating/replacing the Mayo Bridge that incorporates pedestrian and bicycle infrastructure (Goal 9).



Manchester Conceptual Aerial

Manchester's proximity to Downtown Core and the James River is strengthened over the next 20 years with investments in improving connections, such as enhanced transit on Hull Street, improved bridges, the Ashland to Petersburg Trail, and an improved Manchester Canal.



Following the adoption of the Downtown Plan in 2010, the City rezoned about 700 properties in Industrial Manchester from M-2 (heavy industrial) to RF-2 and B-7, two districts that allow a mix of uses, including residential. Since the rezoning, Industrial Manchester has added several dozen new developments.



Property owners have built low-scale infill residential developments, such as these two-family homes, in the primarily residential neighborhood of Manchester. New projects are designed to complement the "front door" character of Manchester.

Priority Growth Node

Greater Scott's Addition

Vision

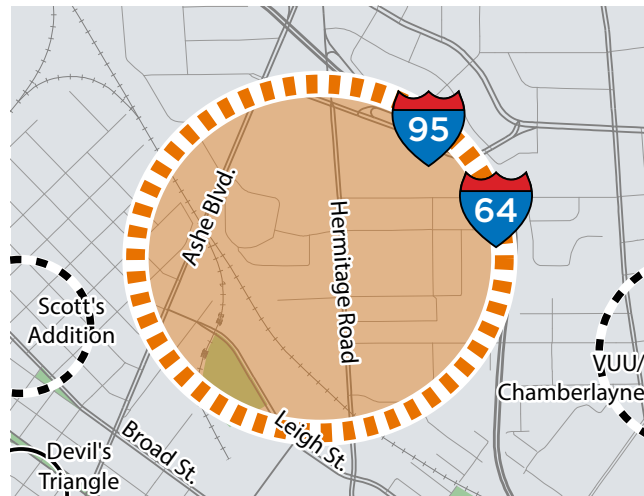
Greater Scott's Addition is home to a series of neighborhoods that provide new employment and housing developments connected by a series of open spaces and a transportation network that support families and aging-in-place. The variety of housing options and employment in Greater Scott's Addition provide opportunities for low-income, moderate-income, and high-income households. The Diamond is demolished and a new multi-purpose stadium is constructed along Hermitage. Uses along Hermitage, a public plaza, and the crescent park complement the new stadium development. Visitors to Greater Scott's Addition have the option to safely arrive by foot, bike, transit, or car. Parking is centralized in a few parking garages to encourage users to park once and visit multiple destinations. The signature public park, a crescent park, between Ashe and Hermitage serves as a central convening space and is connected with greenways to multiple smaller public parks.

Growth Potential

In 2019, there were approximately 458 acres of vacant/underdeveloped land in Greater Scott's Addition, representing 60% of Greater Scott's Addition's total land area.

Primary Next Steps

- Rezoning: Rezone Greater Scott's Addition in alignment with the Future Land Use Plan (Goal 1).
- Request for Proposals: Issue a Request for Proposals to redevelop the City-owned land between N. Ashe Boulevard and Hermitage Road using the Greater Scott's Addition Framework Plan and including elements such as crescent park, low-income housing, breaking up super blocks to create a street grid incorporating features that support walking, biking, and transit such as engaging architecture, public space, sidewalks, street trees, buildings built to the street, and street furniture (Goals 2, 4, 8, 9, 14, 17)
- Great Streets: Transform N. Ashe Boulevard and Hermitage Road into Great Streets, featuring buildings addressing the street, underground



Greater Scott's Addition — Regional/National Node
This area has excellent access to I-95/I-64 and features the Baseball Diamond and primarily industrial areas that are transitioning to mixed-use.

utilities, street trees, lighting, enhanced transit, and other amenities (Goal 9, Goal 17).

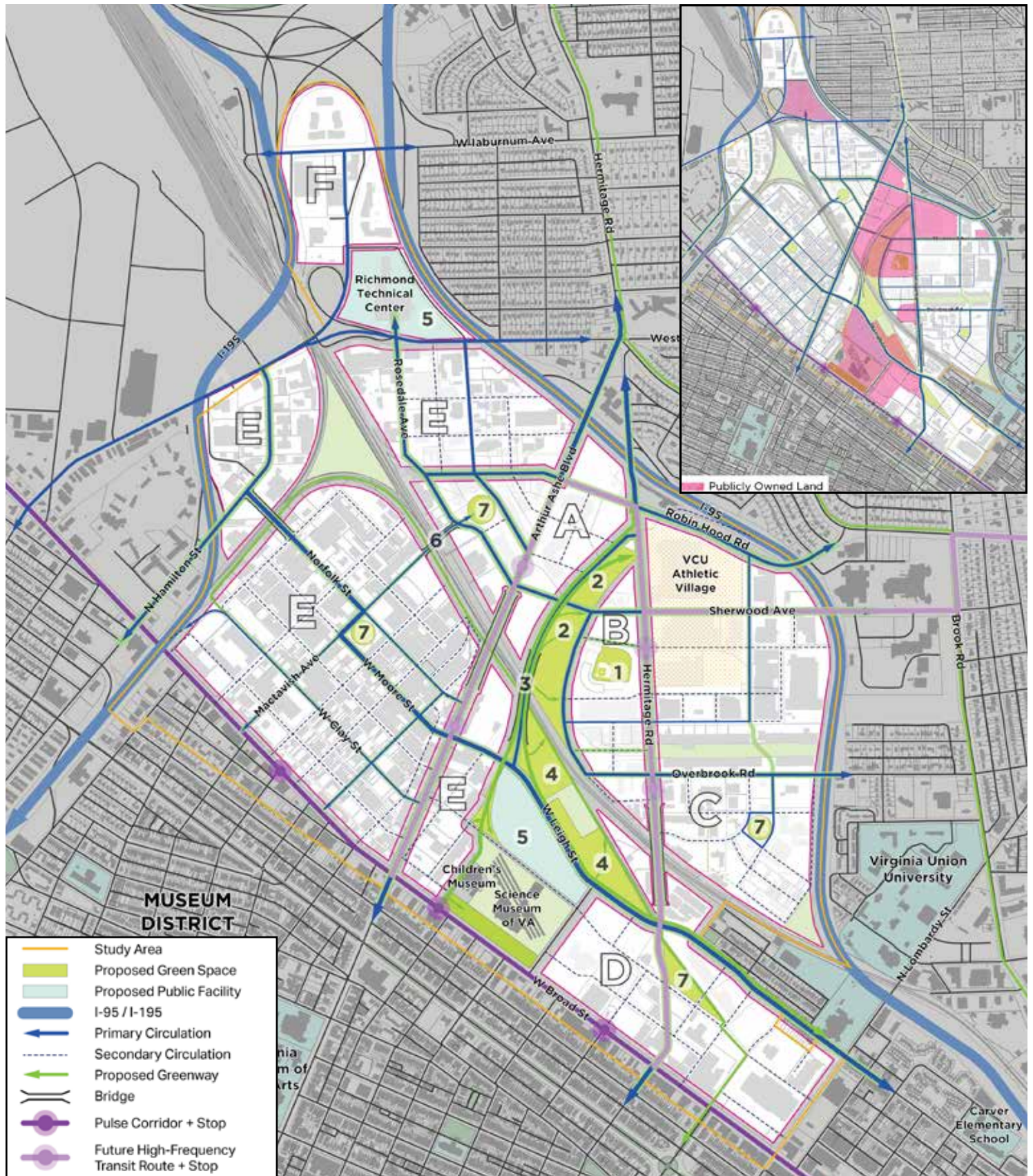
- Bridge Feasibility: Increase connectivity and access among neighborhoods in Greater Scott's Addition by creating new bridges from Leigh Street to the Diamond, Mactavish Street to Rosedale Avenue, and Norfolk to Hamilton Street (Goal 9).
- Marketing: Market Greater Scott's addition to grow, retain, and attract businesses in the target industries (Goal 11).
- Green Infrastructure: As part of the redevelopment of the Diamond site, develop a district-wide green infrastructure system to reduce flow of stormwater into the Combined Sewage System, reduce the heat-island effect, and increase the tree canopy, among other benefits (Goal 17).
- Housing: As part of the redevelopment of the Diamond site, create more housing, rental and ownership, at various price points, including units for low-income households (Goal 14).
- Park Creation: As part of the redevelopment of the Diamond site, develop a series of parks, including the signature crescent park, and



Greater Scott's Addition Complete Street Illustration

Streets for everyone designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists, and transit riders while also incorporating stormwater infrastructure

investigate a funding source for park creation and maintenance, such as a bond or a special park district assessment to fund more parks in the area (Goal 17).



Greater Scott's Addition Framework Plan

This Framework Plan is the result of a planning process in 2019-2020 that included public meetings and three surveys with over 1,300 responses. The Framework Plan envisions several districts connected by a series of open spaces and Complete Streets (described on the next two pages).

Districts

A | GATEWAY DISTRICT

Regional destination for offices, shopping, and entertainment with landmark architecture



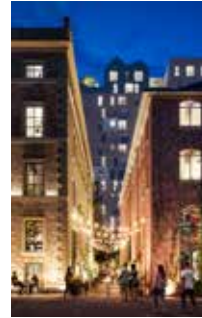
B | BALLPARK AND ENTERTAINMENT DISTRICT

Lively community integrated with entertainment and a new sports venue



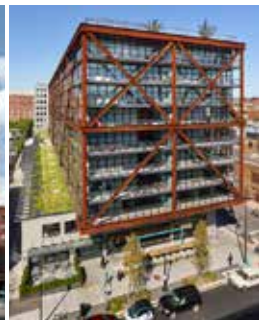
C | OWNBY DISTRICT

A core of dense mixed-use development employing the latest in sustainable practices relating to energy and water on a district scale



D | ALLISON DISTRICT

Dense, compact, transit-oriented mixed-use development anchored by a reconnected street grid



E | INDUSTRIAL MIXED-USE

Continued evolution of Scott's Addition combining entertainment, residential, office, and light industrial uses



F | OFFICE PARK

Office park development

Open Space Network

1 | BALLPARK AND PLAZA

Vibrant outdoor space activated by the baseball stadium

Example Open Spaces and Features from Other Cities



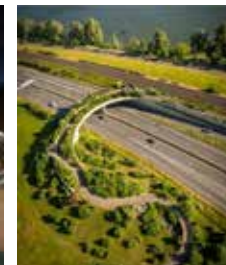
2 | CRESCENT PARK

Signature urban public space with passive lawns and a relaxing atmosphere with integrated green infrastructure to support water quality (site for large-scale community events)



3 | LANDMARK BRIDGE

Bridge over the CSX tracks connecting the crescent park and development on the north side to the Pulse Corridor



4 | SOUTHERN PARK

Public space with sports fields and active-use areas for youth with integrated green infrastructure that supports water quality



5 | PUBLIC FLEX SITE

Space to meet future community needs such as a school, library, rec center, or public space

6 | PEDESTRIAN & BICYCLE BRIDGE

Safe and comfortable urban bridges over the train tracks



7 | NEIGHBORHOOD PARKS

Small Nodes of public space in which neighborhood activities are centered





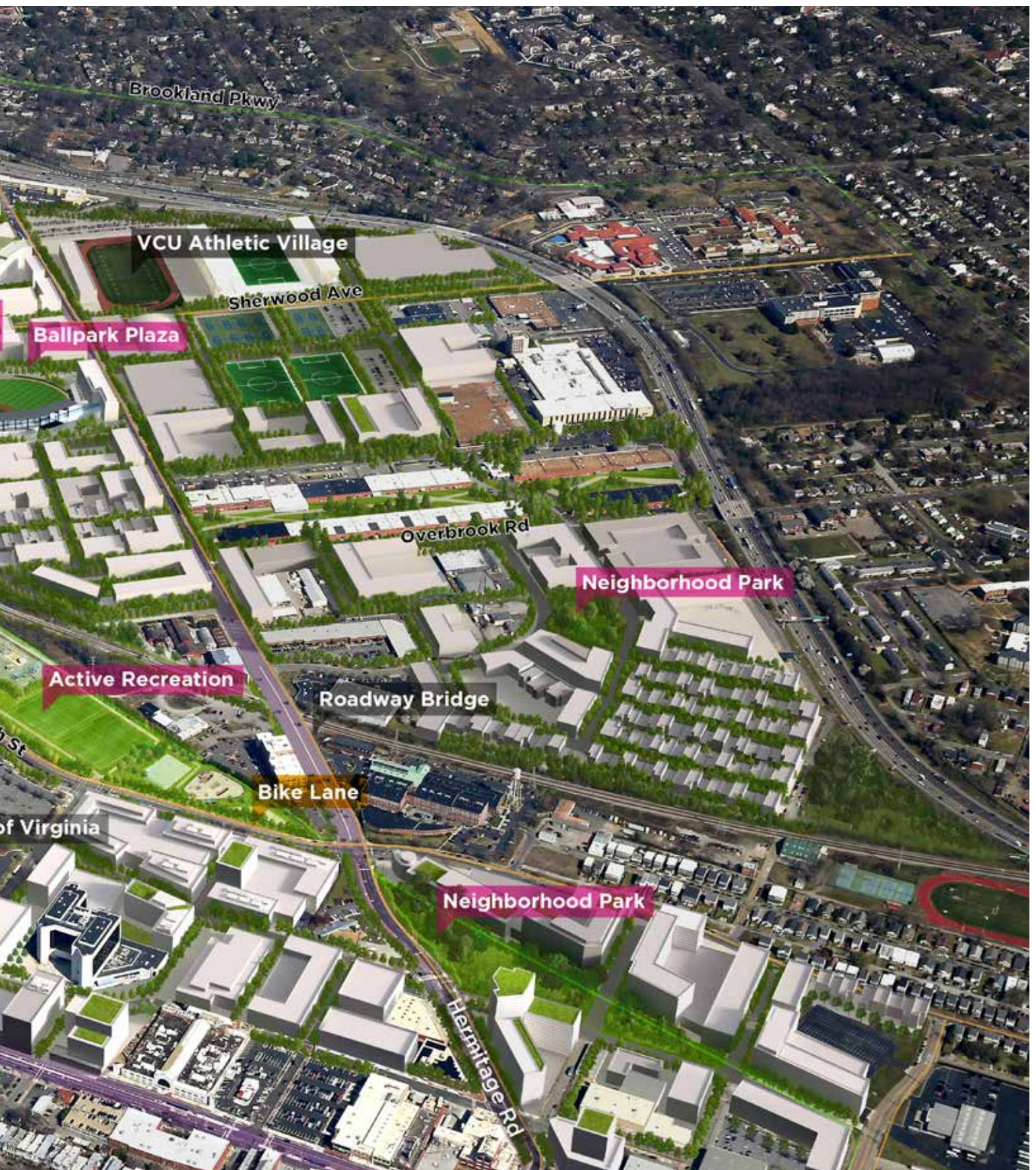
Diamond Site Potential Transformation

The urban neighborhood created along N. Arthur Ashe Boulevard [top] is possible because the grand Crescent park [bottom] tucked in the middle of the site establishes a strong design edge, providing an oasis to enjoy nature, gather, and relax.



Greater Scott's Addition Conceptual Aerial

Crescent park, a signature element, anchors a series of green spaces that connect a new baseball stadium, residential areas, and employment.



Priority Growth Node

Route 1 / Bellemeade Road

Vision

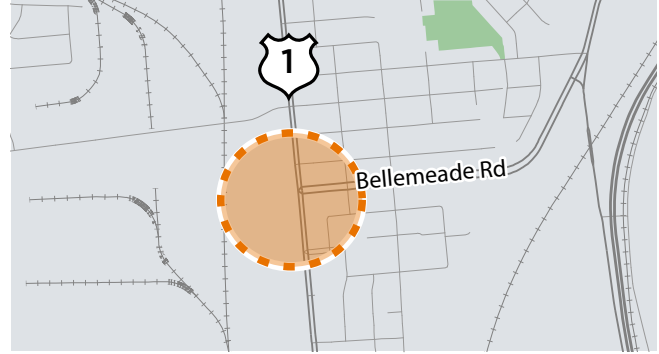
The intersection of Route 1 and Bellemeade Road is a walkable, well-connected, mixed-use Node with medium-scale buildings that are complementary with the surrounding single-family neighborhoods. Commercial development includes both neighborhood-serving commercial uses and job-generating businesses. The warehouses on the west side of Route 1 are redeveloped into a mix of medium-density residential projects and job-generating businesses. The apartment complexes at the southeastern corner of the intersection are redeveloped into medium-scale, mixed-use development that continues to provide affordable multi-family housing units in addition to market rate housing and commercial uses. The increased residential development along the corridors and in the neighboring Nodes establishes a market for services and amenities, such as a grocery store. New buildings address the corridors to create a pleasant pedestrian environment with parking minimized. Both Route 1 and Bellemeade Road are Great Streets with street trees, pedestrian amenities, enhanced transit, and greenways.

Growth Potential

In 2019, there were approximately 21 acres of vacant/underdeveloped land in the Route 1/Bellemeade area, representing 21% of Route 1/Bellemeade's total land area.

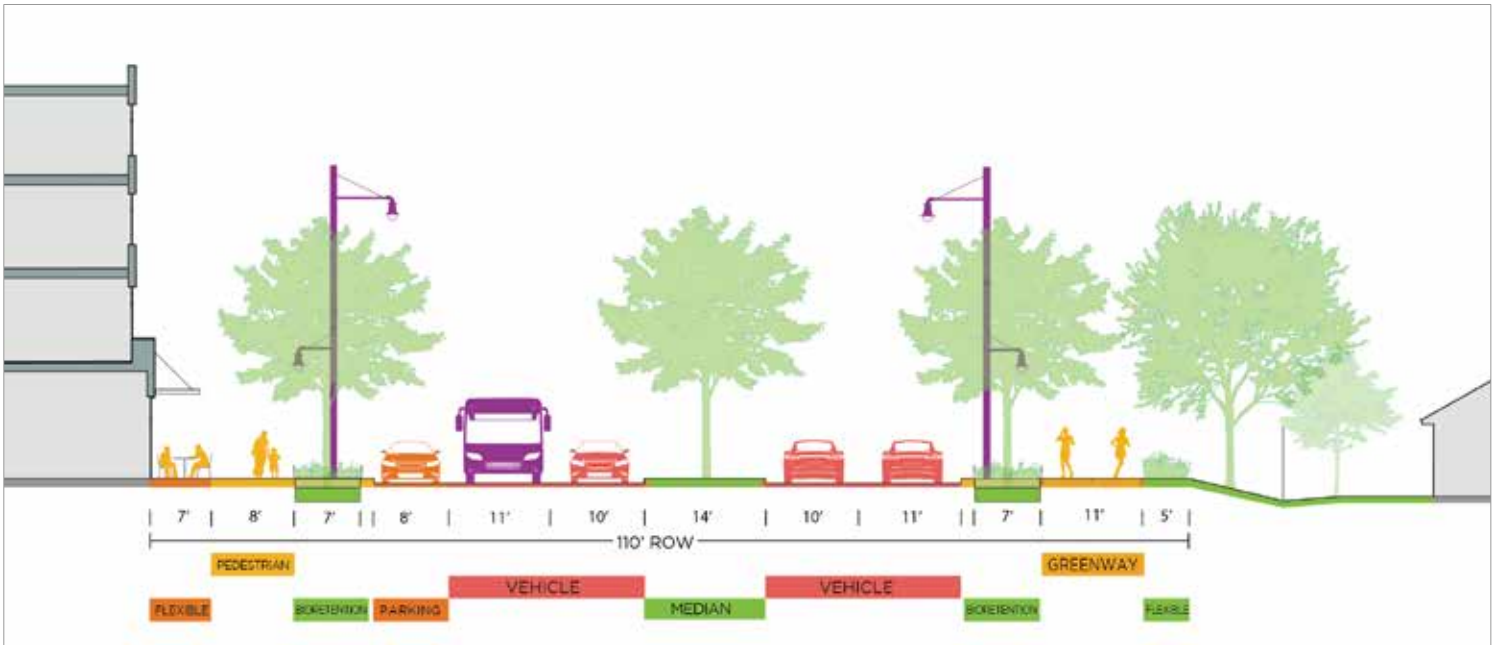
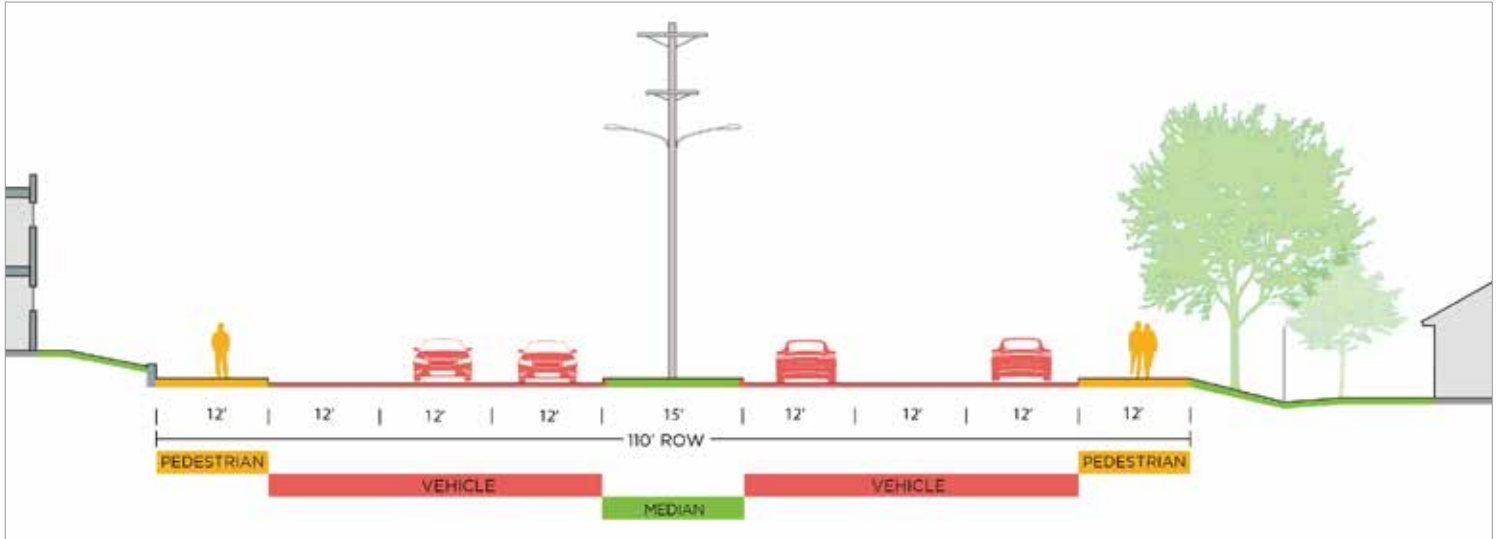
Primary Next Steps

- Corridor Plan: Develop a corridor plan for Route 1 with recommendations on how to transform the road into a Great Street with amenities such as buildings addressing the street, a greenway (the Ashland to Petersburg Trail), street trees, underground utilities, lighting, and other amenities and encourage redevelopment and business growth (Goal 1, Goal 8, Goal 9).
- Rezone: Prioritize the rezoning of this Node to align with the Future Land Use Plan to encourage the residential development and economic revitalization of the corridor in a building form



Route 1 / Bellemeade — Neighborhood Node

- that improves the pedestrian environment (Goal 1, Goal 11, Goal 14).
- Greenway: Develop the Ashland to Petersburg Trail and provide enhanced transit along Route 1 (Goal 4, Goal 8, Goal 17).
- Transit Alignment: With community input, develop a preferred alignment for a North-South BRT line through Manchester, either along Cowardin or along Hull Street, and then traveling down Midlothian, Hull, or Route 1 (Goal 8).
- Incentives: Explore the creation of a Technology Zone and other new economic development incentives to encourage the economic revitalization of the Route 1 corridor (Goal 11).
- Quality Homes: Develop programs that permit homeowners to remain in their homes, in high-quality structures to limit the involuntary displacement of residents in the surrounding single-family neighborhoods (Goal 14).
- New Park: Transfer city-owned property to PRCF to develop a park within a 10-minute walk of this Node and host community planning sessions to develop ideas for the park design (Goal 2, Goal 17).



Route 1 Potential Street Section Transformation

The existing street section [top] has more travel lanes than is necessary for the amount of vehicles that travel on Route 1. The street can be transformed [bottom] into a complete street with various elements such as outdoor seating, sidewalk trees, pedestrian-level lighting, on-street parking, enhanced transit, car lanes, median trees, and a wide greenway (the Ashland to Petersburg Trail).

Priority Growth Node

Route 1 / Bells Road

Vision

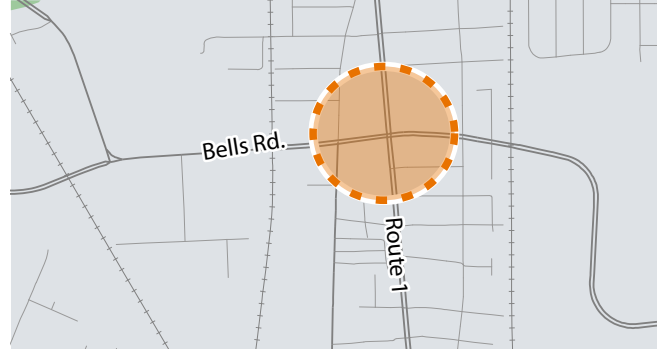
In 2037, the Route 1 corridor is home to a dynamic mix of uses with increased intensity at the intersection of Bells Road and Route 1. This intersection serves as a gateway into South Richmond from I-95, and Route 1 and Bells Road are Great Streets with sidewalks, street trees, pedestrian amenities, enhanced transit, and bicycle amenities. The commercial and mixed-use development along Route 1 provides neighborhood-serving shopping and service destinations in a building form that improves the pedestrian environment by locating the buildings close to the street, limiting driveways, and encouraging access from existing or new alleys. Predatory commercial uses, including pawn shops and check cashing businesses are limited. Office and industrial uses complement the nearby Port of Richmond and heavy industrial uses at the Philip Morris Plant. Vacant land on Route 1 and Bells Road is redeveloped to provide housing options at varying affordability levels in medium-scale buildings compatible with the surrounding residential area.

Growth Potential

In 2019, there were approximately 13 acres of vacant/underdeveloped land in the Route 1/Bells area, representing 34% of Route 1/Bells' total land area.

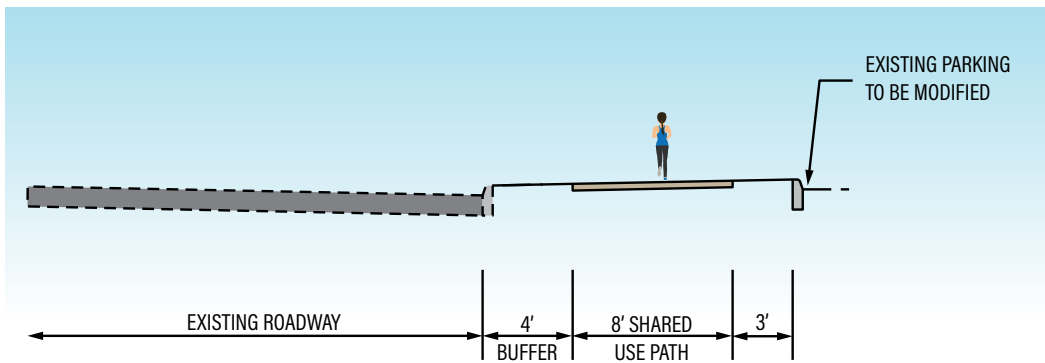
Primary Next Steps

- Corridor Plan: Develop a corridor plan for Route 1 with recommendations on how to transform the road into a Great Street with amenities such as buildings addressing the street, a greenway (the Ashland to Petersburg Trail), street trees, lighting, and other amenities and encourage redevelopment and business growth (Goal 1, Goal 8, Goal 9).
- Rezone: Prioritize the rezoning of this Node to align with the Future Land Use Plan to encourage the residential development and economic revitalization of the corridor in a building form that improves the pedestrian environment (Goal 1, Goal 11, Goal 14).



Route 1 / Bells — Neighborhood Node

- Greenway: Develop the Ashland to Petersburg Trail and provide enhanced transit along Route 1 (Goal 4, Goal 8, Goal 17).
- Transit Alignment: With community input, develop a preferred alignment for a North-South BRT line through Manchester, either along Cowardin or along Hull Street, and then traveling down Midlothian, Hull, or Route 1 (Goal 8).
- Incentives: Explore the creation of a Technology Zone and other new economic development incentives to encourage the economic revitalization of the Route 1 corridor (Goal 11).
- Quality Homes: Develop programs that allow homeowners to remain in their homes in high-quality structures to limit the involuntary displacement of residents in the surrounding single-family neighborhoods (Goal 14).
- New Park: Identify land within a 5-minute walk of this Node for a new park, transfer land to PRCF ownership, and host community planning sessions to develop ideas for the park design (Goal 2, Goal 17).



Ashland to Petersburg Trail Conceptual Images

The Virginia Department of Transportation is leading a multi-locality planning effort to create the Ashland to Petersburg Trail, a greenway (also referred to as a shared-use path) from Ashland to Petersburg [see right image for the trail alignment]. The Ashland to Petersburg Trail will run along the eastern side of Route 1 [see top image for the plan and bottom image for the section].

Source: Ashland to Petersburg Trail Study, Virginia Department of Transportation, February 2020



Priority Growth Node

Southside Plaza Area

Vision

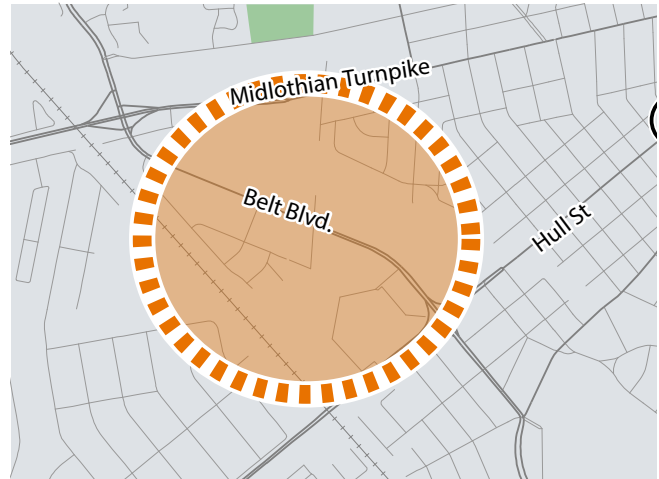
The Southside Plaza Area is the bustling center of South Richmond, offering employment, housing, recreation, and entertainment in a walkable human-scale environment. This area serves as a multi-modal transportation hub with connections to a regional greenway system via the James River Branch Trail and to the regional transit system with multiple bus lines converging in the Southside Plaza area. New City facilities anchor the redevelopment of this area by providing government services and green space.

Growth Potential

In 2019, there were approximately 54 acres of vacant/underdeveloped land in the Southside Plaza Area, representing 32% of the Southside Plaza Area's total land area.

Primary Next Steps

- Small Area Plan: Develop a Small Area Plan with community input for the Southside Plaza area that provides details on the opportunities for redevelopment and a system of public open space, greenways, and streets improve connectivity (Goal 1).
- Rezone: Rezone the Southside Plaza area in alignment with the Future Land Use Plan (Goal 1).
- Catalyst: Acquire land to catalyze the redevelopment of the Southside Plaza Area (Goal 2).
- Greenway: Build the James River Branch Trail on abandoned CSX right-of-way and connect adjacent neighborhoods to the trail (Goal 8, Goal 17).
- Transit Alignment: With community input, develop a preferred alignment for a North-South BRT line through Manchester, either along Cowardin or along Hull Street, and then traveling down Midlothian, Hull, or Route 1 (Goal 8).
- Great Streets: Transform Belt Boulevard and Hull Street into Great Streets featuring buildings addressing the street, underground utilities, street trees, lighting, enhanced transit, and other amenities (Goal 4, Goal 9).



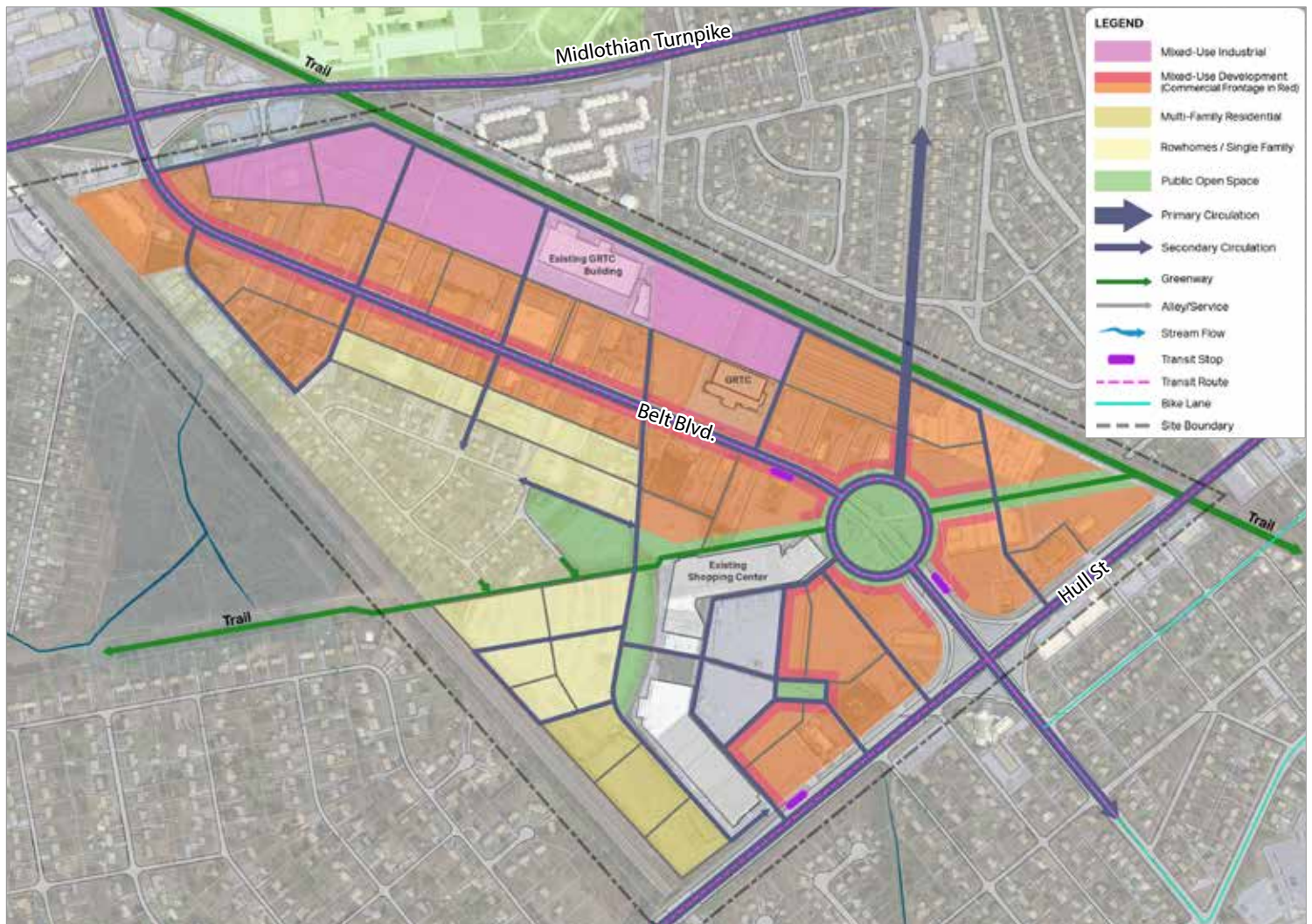
Southside Plaza Area — Regional/National Node

- New Park: Identify land within a 10-minute walk of this Node for a new park, transfer land to PRCF ownership, and host community planning sessions to develop ideas for the park design (Goal 2, Goal 17).



The Southside Plaza Area in 1960

Source: The Library of Virginia



Southside Plaza Area Conceptual Plan

Southside Plaza has the potential to be transformed into the bustling center of South Richmond, offering employment, housing, recreation, and entertainment in a walkable, human-scaled environment.

Priority Growth Area

Stony Point Fashion Park

Vision

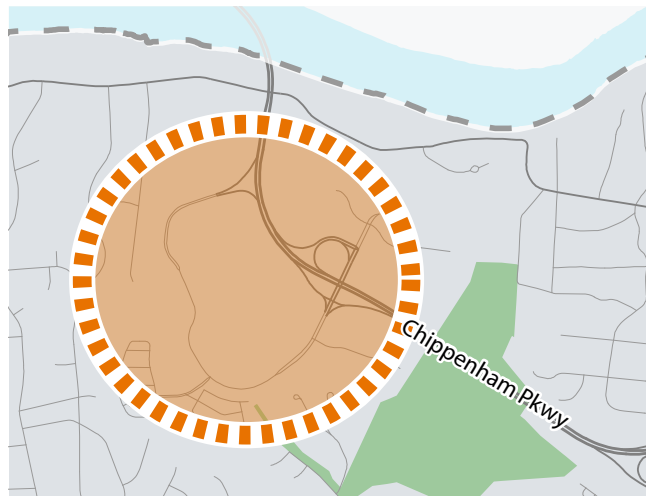
Stony Point Fashion Park is transformed from a declining mall in 2020 to a village-style development that has expanded its significant residential community to complement office and retail uses. The redevelopment of Stony Point Fashion Park has capitalized on its strong regional highway connections, while also providing bike, pedestrian, and transit connections to adjacent neighborhoods and the greater Richmond region.

Growth Potential

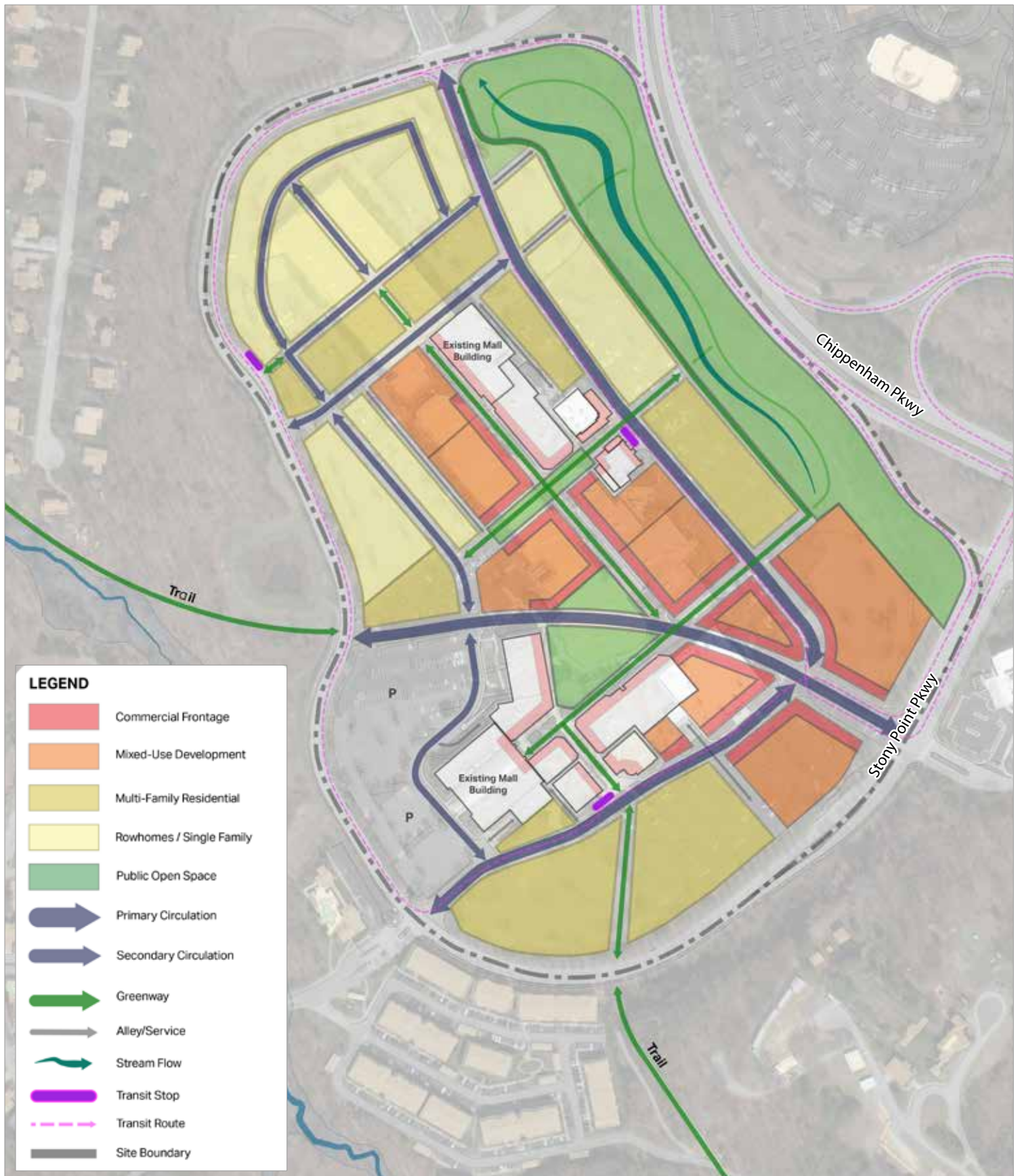
In 2019, there were approximately 72 acres of vacant/underdeveloped land in Stony Point Fashion Park, representing 27% of the Stony Point Fashion Park's total land area.

Primary Next Steps

- Small Area Plan: Develop a Small Area Plan with community input for the Stony Point Fashion Park that provides details on the opportunities for redevelopment and a system of public open space, greenways, and streets to improve connectivity (Goal 1).
- Rezone: Rezone the Stony Point Fashion Park area in alignment with the Future Land Use Plan (Goal 1).
- Greenway: Build greenways and connect adjacent neighborhoods to the greenways (Goal 8, Goal 17).
- Transit Expansion: Once enough demand exists, expand transit service to reach Stony Point Fashion Park (Goal 8).
- Target Industries: Consider marketing this area for business creation and attraction, targeting corporate headquarters and professional services (Goal 11).
- Housing: As part of the Small Area Plan, identify areas for more housing, rental and ownership, at various price points, including units for low-income households (Goal 14).
- New Park: Identify land within the Stony Point Fashion Park area for a new park, transfer land to PRCF ownership, and host community planning sessions to develop ideas for the park design (Goal 2, Goal 17).



Stony Point Fashion Park — Regional/National Node



Stony Point Fashion Park Conceptual Plan

The Shopping Mall is transformed into a village-style community that expands existing residential options and provides office and retail space.

Priority Neighborhoods

Priority Neighborhoods are the primary focus of investment for the City of Richmond and the Richmond Redevelopment and Housing Authority. Priority Neighborhoods consist of public housing and land owned or recently transferred by RRHA that play an integral role in communities across the city.

Priority Neighborhoods are located within some of today’s most established and distinguished Richmond communities and adjacent to many of the city’s most renown institutions and landmarks. Priority Neighborhoods, many of which date back to the 1950s, are home to multiple-generation residents whose families have significantly contributed to Richmond’s culture and institutions. While Priority Neighborhoods carry significant stories and lessons of Richmond’s past, including the painful legacy of racial discrimination, they also hold the promise of the city’s transformational future.

The redevelopment of Priority Neighborhoods is an opportunity to redesign the city around the needs, assets, and aspirations of valuable yet historically overlooked communities. By redeveloping Priority Neighborhoods, the City and RRHA will leverage their collective resources and partnerships to provide quality infrastructure, affordable housing, human services, and economic development opportunity for all Richmonders, especially those living in or seeking public housing. Through community-oriented planning and strategic City investment in infrastructure, priority neighborhoods will become high-quality, well-connected, and equitable mixed-use developments that catalyze the Richmond300 vision throughout the city.

**PRIORITY
NEIGHBORHOODS**
The following areas shown
in Figure 11 are prioritized
for investment.

- Gilpin
- Creighton
- Fairfield
- Mosby
- Whitcomb
- Hillside
- Blackwell
- Highland Grove

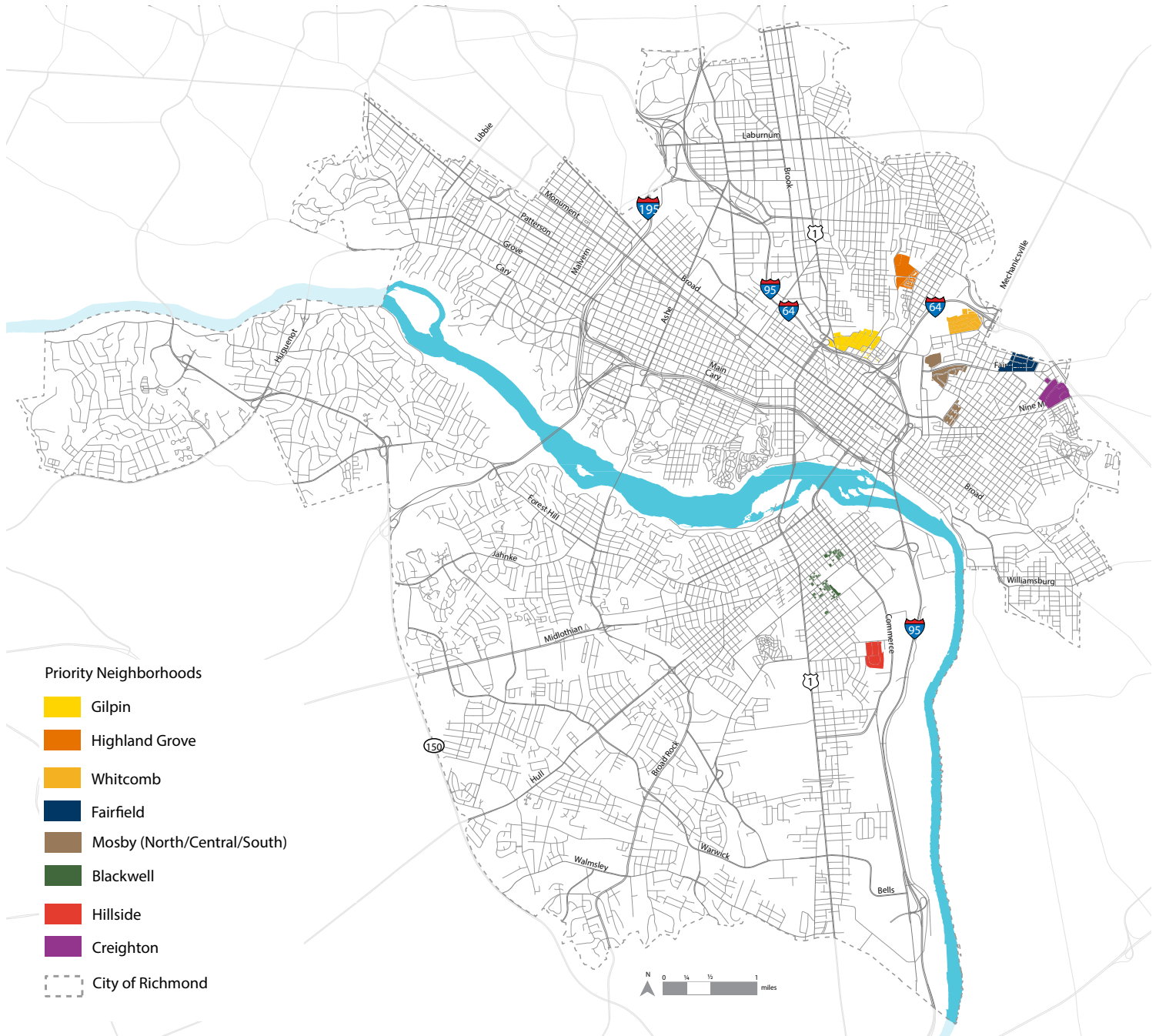


FIGURE 11 // Priority Neighborhoods Map
Priority Neighborhoods are a primary focus of investment for the City and RRHA.

Very Brief Overview of Richmond Public Housing

RRHA is the largest public housing authority in the Commonwealth of Virginia, serving over 10,000 residents and managing nearly 4,000 units. Upon its establishment in 1940, RRHA received \$1.97 million from the U.S. Housing Authority for two slum clearance projects which laid the groundwork for Gilpin Court.

Between 1942 and 1962, RRHA built nine large-scale federally subsidized housing developments to house Richmond's poorest families. These urban renewal projects were aimed at replacing "unsafe and unsanitary dwelling units" with "decent, safe, and sanitary dwellings." However, the majority of Richmond's public housing developments were built to house residents from neighborhoods destroyed by strategic slum clearance and large public infrastructure projects, such as the Richmond-Petersburg Turnpike (I-95/I-64) in 1957 and the 17th Street Redevelopment Project in 1961. These public housing developments were largely situated in redlined areas that were socially, economically, and physically isolated from the rest of the city.

Beginning with the Community Development Block Grant Program in 1975, RRHA shifted from building large-scale publicly owned housing for the city's poorest residents to providing public funding to privately developed, smaller-scale housing for low to moderate income families.

Today, the majority of Richmond's public housing residents continue to live in the city's six largest public housing developments: Gilpin, Hillside, Creighton, Fairfield, Whitcomb, and Mosby. These developments are now functionally obsolete and subject to disproportionately high levels of crime, concentrated poverty, disinvestment, inadequate infrastructure, and a deficiency of basic services.

Learning from the past, RRHA recognizes the potential for redeveloping public housing sites to better serve the overall needs of their communities. The City and RRHA have made it their long-term goal to deconcentrate poverty and provide affordable and safe public housing as part of mixed-income and mixed-use neighborhoods. This goal can only be met by first addressing the conditions of the city's current public housing stock, the oldest along the east coast. Therefore, the City and RRHA commit to transforming each large public housing development site into a thriving, well-connected, civically engaged, mixed-use, mixed-income development that becomes a community of choice and strengthens the vibrancy of the surrounding neighborhoods.

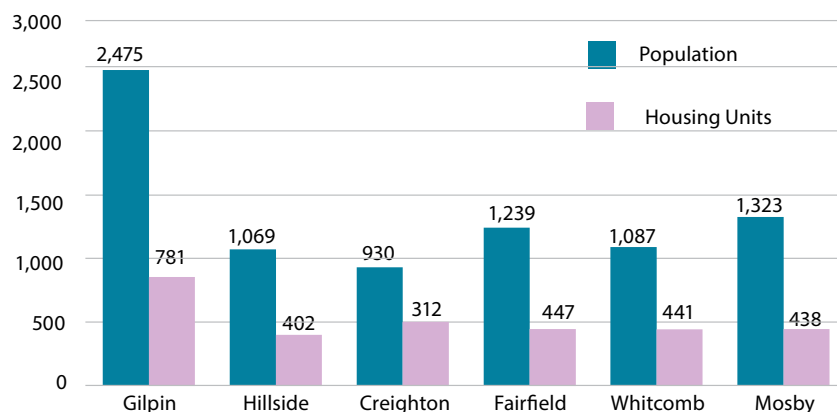


FIGURE 12 // Population and Units in Large Public Housing Developments, 2019

Source: RRHA, 2019

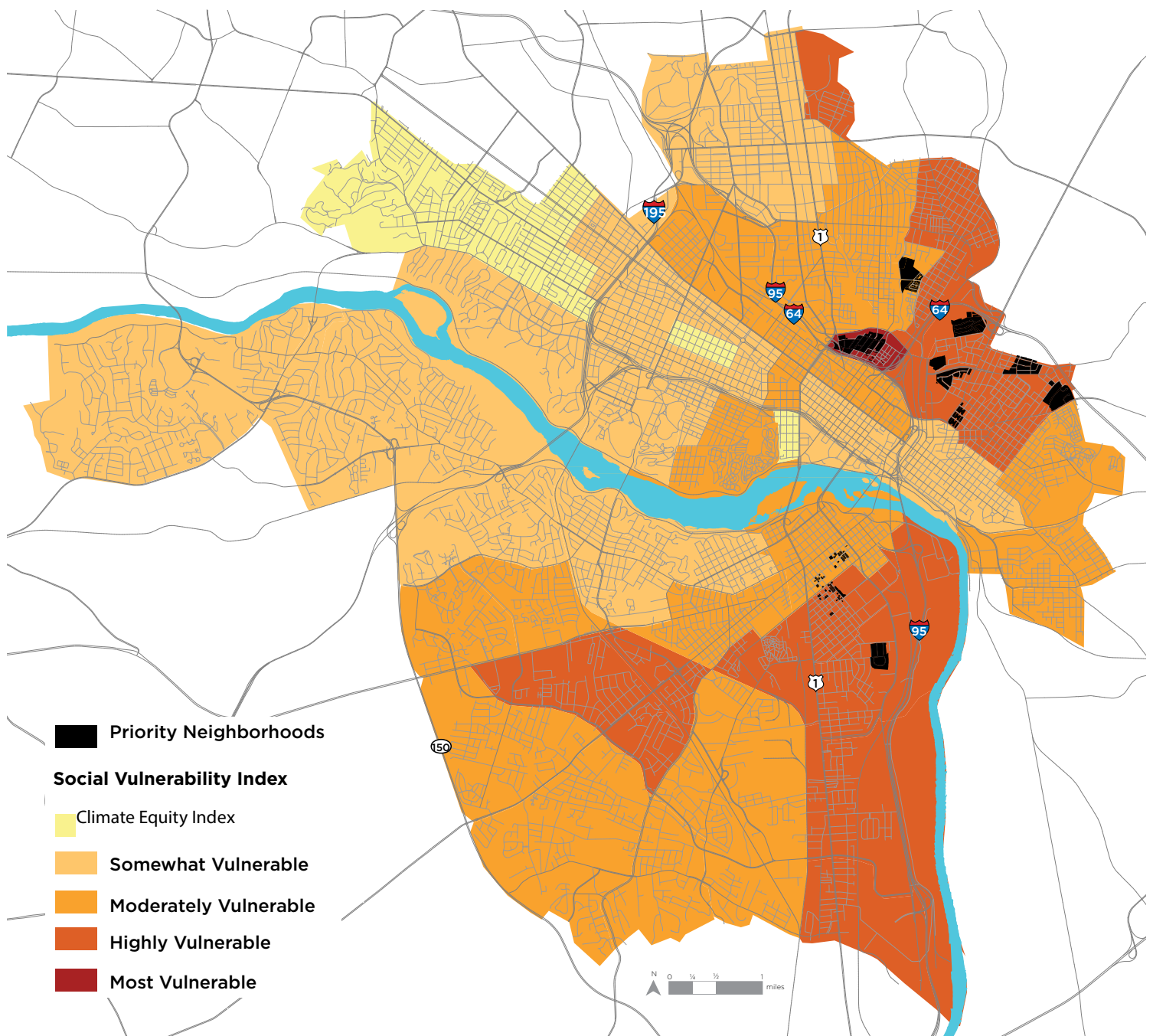


FIGURE 13 // Climate Equity Index Map
Social vulnerability based on the RVAgreen 2050 Climate Equity Index (2021)
 Source: Richmond Office of Sustainability

Priority Neighborhoods are in areas containing the city's greatest social vulnerability as measured by the Climate Equity Index. Social vulnerability refers to the potential negative effects on communities caused by external stresses to human health. The Climate Equity Index is measures social vulnerability by assessing multiple factors such as employment, poverty, transportation access, food access, and proximity to environmental hazards. Communities in areas of great social vulnerability are disparately impacted by legacies of public disinvestment, environmental negligence, and discriminatory policies and practices. These inequitable social, economic, and environmental conditions place households at greater risk of experiencing poverty, displacement, poor health, and homelessness.

Priority Neighborhoods Program

This Master Plan recommends establishing a Priority Neighborhoods Program that seeks to systematically target planning, policy, and investment to improve the Priority Neighborhoods. The Priority Neighborhoods Program will build off of the values, commitments, and process outlined in the following pages.

Values

The City and RRHA's commitment to the Priority Neighborhood Program is based on the following values



EVERYONE BELONGS.

Cities become inclusive communities by incorporating housing and resources that serve people of all incomes and housing experiences throughout the city (temporary, transitional, long-term).



PEOPLE ARE DYNAMIC.

The aesthetic, design, and function of neighborhoods may evolve with the changing needs and ideas of their residents.



EVERYONE'S VOICE IS VALUED.

Every neighborhood is made up of distinctive individuals with diverse goals, interests, and experiences. There is no one "community" voice that can represent an entire neighborhood.



EVERYONE NEEDS SUPPORT.

Life is unpredictable. We all are a few events away from being in dire need. Everyone benefits from living in a strong and connected community.



QUALITY HOUSING COMES IN DIFFERENT FORMS.

There are many different types of quality housing. Neighborhoods must have options that account for all people. There is no one size fits all solution.



GREAT NEIGHBORHOODS ARE CONNECTED.

Neighborhoods should connect neighbors with other neighbors, employment, amenities, open space/recreation, education, and more.



EQUITY IS ESSENTIAL.

All people in every housing experience should have access to opportunities for building wealth and capacity.



INVESTMENTS HELP NEIGHBORS.

Redevelopment should strategically support existing residents and prevent displacement and other harmful effects of gentrification. Opportunities for newcomers should not come at the expense of current residents.

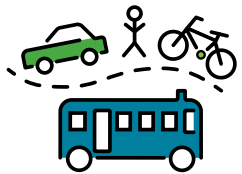
Commitments

The City and RRHA commit, at a minimum, to the following for each of the Priority Neighborhoods. These commitments are not meant to be all-inclusive. As the City and RRHA develop plans and implement programs in the Priority Neighborhoods, the commitments will be further developed through a community-led process.



CREATE HIGH-QUALITY PLACES

- Share public infrastructure and amenities costs with private developers
- Upgrade sewer, water, communications, and electric utility connections
- Create a high-quality public realm with well-designed lighting, signage, seating, crosswalks, public art, and public open space.
- Provide easy access to city facilities such as schools, recreational facilities, libraries, etc.
- Create opportunities for neighborhood-scale retail
- Provide public open space designed with resident input



INCREASE ACCESS AND MOBILITY THROUGHOUT THE CITY

- Build network of connected and complete streets with space for vehicular, pedestrian, bike, and transit travel
- Increase frequency of transit service
- Add EV Charging Stations and space for other emerging transportation technologies



FOSTER INCLUSIVE ECONOMIC GROWTH

- Generate strategies for supporting the overall health and well-being of residents
- Support workforce development and education opportunities for residents
- Provide amplified case management, social services, and healthcare for public housing residents during re-location and transitional periods
- Consider cooperative businesses or incubator/entrepreneurial space as well as other equity models



PROVIDE INCLUSIVE HOUSING

- Create opportunity for all existing public housing tenants to live in newly renovated areas
- Develop a tenant-desired plan for temporary relocation during project construction
- Support programs that prepare and prioritize public housing tenants for home ownership
- Develop public housing for households at or below 30% of the AMI
- Create a mixed-income community

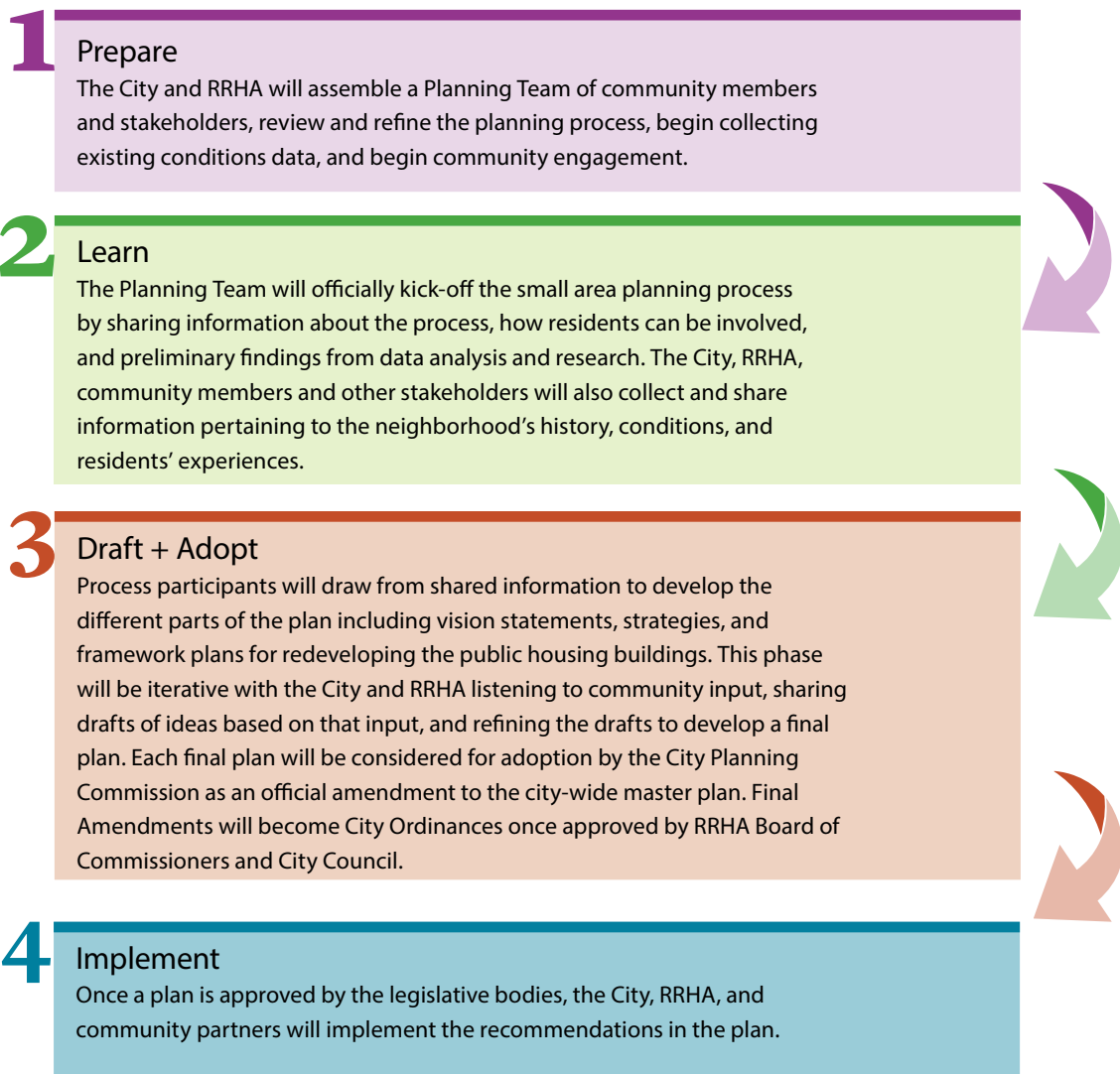


DEVELOP SUSTAINABLE, RESILIENT, AND GREEN ENVIRONMENTS

- Create accessible, green network throughout development
- Develop high-quality and universally designed parks and plazas
- Develop sustainable and educational stormwater facilities
- Consider community renewable energy programs and building level renewable energy
- Develop buildings using sustainable building practices

Small Area Planning Process

Through the Priority Neighborhood Program, the City will partner with RRHA to lead a Small Area Planning Process for designated areas. The resident-driven planning process is designed to generate implementable strategies for resident-desired neighborhood improvements. Specific focus will be given to the well-being, education, job training, and generational wealth building of Richmonders living in Priority Neighborhoods. Each of the small area planning processes will have four phases: Prepare, Learn, Draft + Adopt, and Implement.



Community Engagement

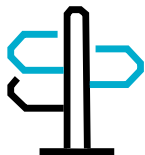
The City and RRHA will provide a wide range of opportunities for community members to participate in and drive the planning process for each of the priority neighborhood redevelopments. Community engagement will vary from plan to plan according to the scope of each project and residents' preferences. Here are some general methods by which the City and RRHA may seek to connect with community members throughout the Priority Neighborhood Program. The exact engagement methods must be catered to each community.



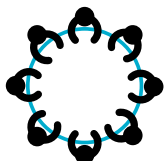
One-on-one and small group interviews. City and RRHA convene with residents to listen to and learn from their lived experiences and discuss elements of the planning process and plan strategies.



Surveys. City and RRHA develop community surveys to better understand overall neighborhood conditions, trends, and resident experiences and desires.



Tours. City Departments along with neighborhood organizations lead community tours to share certain neighborhood resources, conditions, and stories that are pertinent to the planning process.



Focus groups. The community meetings for each planning process include small group discussion and work. Residents will have an opportunity to share with one another and to develop strategies collaboratively.



Workshops. Hands-on workshops are an opportunity for community members to quickly and collaboratively design and prototype ideas for the redevelopment plan.



Tenant Bill of Rights. For each Priority Neighborhood, community members will have the opportunity to negotiate terms of the redevelopment with the City and RRHA through the creation of a Tenant Bill of Rights.

Priority Neighborhood

Gilpin Court

Background

Gilpin Court was the first of RRHA's public housing developments and was constructed in three phases beginning in 1942 and ending in 1971. The construction was aided by a 1942 slum clearance project which demolished hundreds of homes and displaced much of the neighborhood's majority Black and immigrant population. The development was named after Charles Gilpin, one of the most famous and early Black stage actors in the country and a Richmond local.

Gilpin is located in Jackson Ward, once the epicenter of Richmond's African-American community. In the 1920s and 1940s, Jackson Ward was known as both the "Harlem of the South" and the "Black Wall Street" due to its emergence as both a place for entertainment and a hub of economic opportunities for Black Richmonders.

In 1957, the construction of the Richmond-Petersburg Turnpike (I-95/I-64) bisected Jackson Ward, leaving Gilpin Court isolated from the rest of the neighborhood and the city. Due to discriminatory planning decisions, structural disinvestment, segregation, and concentrated poverty, the neighborhood struggled and many of its cultural landmarks were destroyed.

Today

Today, Gilpin Court is the most populated public housing development in Richmond with nearly 2475 residents. The poverty rate is nearly 3.5 times that of the city at 80% and the violent crime rate is 2.4 times the city rate. The majority of Gilpin households have an annual income of less than \$10,000.

Gilpin is surrounded by rich community resources and Richmond landmarks including: the Calhoun Community Center, historic Shockoe Hill Cemetery and African Burying Ground, Abner Clay Park, the Black History Museum and Cultural Center of Virginia, Hippodrome Theater, Maggie L. Walker Plaza and Statue, and Sixth Mount Zion Baptist Church.

GILPIN COURT

Year Built: 1942, 1957, 1971

Total Acreage: 38

Public Housing Units: 781

Est. Public Housing Population (2019): 2,475

Public Housing Median Household Income (2019): \$9,800



Gilpin Court Aerial

Source: Richmond Times-Dispatch



Gilpin Court

1005-1009 Chamberlayne Parkway in Gilpin Court is a typical representation of the development's Phase 1 multi-family dwellings.

Source: RRHA, 2020



Gilpin Priority Neighborhood

In 2022, the City secured a grant from the U.S. Department of Transportation to study the feasibility of new infrastructure reconnecting Gilpin with the Jackson Ward neighborhood south of Interstates 95 and 64.

In 2021 RRHA and the City won a HUD Choice Neighborhood Planning grant to plan for the redevelopment of Gilpin Court. RRHA and the City are leading a community-led planning process in collaboration with the Richmond Health District. The final plan will be finished at the end of 2023.

Primary Next Steps

- Jackson Ward Community Plan: Adopt the plan as an element of the City's master plan.
- Development Partner: Select a master development via RRHA's competitive bid process to redevelop Gilpin Court
- Calhoun Center: Renovate the Calhoun Center into a 21st century facility with a functioning pool.
- Calhoun Recreational Space: Improve the green space east of the Calhoun to add a splash pad, playground equipment, exercise equipment, a

walking path, public art, and improvements to the community garden.

- Fay Towers: RRHA will self develop Fay Towers to provide housing options for residents of Gilpin Court.
- Section 18: RRHA will submit a Section 18 application to HUD's Special Applications Center (SAC) to begin the redevelopment process of Gilpin Court.
- Tenant Bill of Rights: RRHA will meet with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options

Priority Neighborhood

Creighton Court

Background

Creighton Court was built in 1952 as public housing solely for African-American residents. Many of the original Creighton residents had been displaced from their neighborhoods by federally funded slum clearance projects. Creighton was constructed adjacent to the Oakwood Cemetery which was a segregated burial ground for “African African-Americans and the city’s paupers” until 1968.

Since the 2011 East End Transformation Plan, the revitalization of Creighton Court has been an RRHA priority. In 2014, RRHA selected The Community Builders to lead the Creighton Court redevelopment. Creighton Court revitalization began in 2017 with the transformation of the former Armstrong High School site. The rental portion of the new Armstrong Renaissance was finished in 2022 and contains 220 housing units. A homeownership component, including 36 single-family homes, is still being constructed by the Better Housing Coalition.

In 2020, the Richmond Tenant’s organization, the Creighton Court Tenant Council, RRHA, and the City adopted the Creighton Court Redevelopment Tenants’ Bill of Rights to ensure the Creighton Court redevelopment was implemented according to the community’s desires. In 2021, Richmond City Council approved a Creighton Court master plan created by RRHA and the Community Builders with input from Creighton Court families. The New Creighton Court Community will include between 600 to 700 housing units, including nearly 200 Project Based Voucher Units that will be prioritized for Creighton affected families. The first of eleven construction phases is projected to be completed by the Summer of 2024.

CREIGHTON COURT

Year Built: 1952

Total Acreage: 35.5

Public Housing Units: 312

Est. Public Housing Population (2019): 930

Public Housing Median Household Income (2019): \$9,517



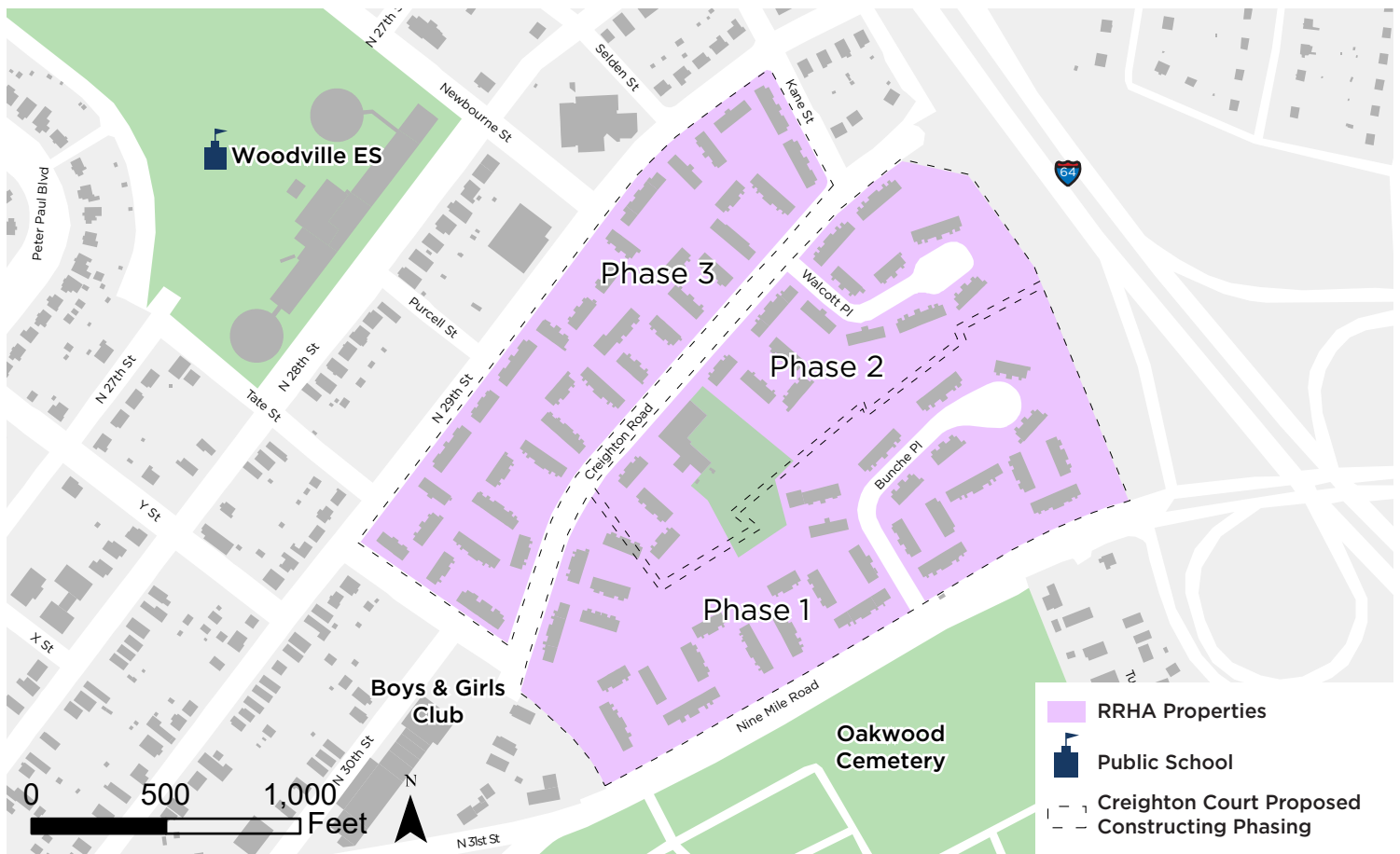
Creighton Court dedication ceremony on October 2, 1953

Source: Library of Virginia



Armstrong Renaissance Apartments

Source: RRHA, 2023



Creighton Priority Neighborhood

Today

Today, all households residing in Phase 1 of Creighton Court have been successfully relocated, either permanently or temporarily, and the infrastructure construction of Phase 1 continues. Many of the Creighton tenants displaced by the Creighton Court redevelopment now reside in the Armstrong Renaissance Community.

Primary Next Steps

- Phase 1 Redevelopment: construct infrastructure and lease up phase 1
- Phase 2 Redevelopment: relocate residents, demolish structures, construct infrastructure and lease up phase 2
- Phase 3 Redevelopment: relocate residents, demolish structures, construct infrastructure and lease up phase 3



Master Plan Rendering of New Creighton Court

Source: RRHA 2023

Priority Neighborhood

Hillside Court

Background

Hillside Court was built in 1952 as public housing for white residents only. Located between a redlined district to the west and industrial uses to the east, the development was constructed on land less desirable for private housing development. The intentional and considerable spatial separation of the entirely White Hillside Court from the entirely Black Creighton Court accentuated the role of segregation in the city and Richmond's public housing.

Today

Following the U.S. Fair Housing Act of 1968, Hillside experienced a dramatic demographic shift. Today, nearly 97% of the residents of the historically White public housing development are Black. Like much of Richmond's public housing, Hillside Court is isolated due to its super-block design and surrounding uses. Hillside Court is flanked by industrial uses to the north, south, and east.

In 2021, Citizen HKS led Hillside Court residents in a community process for the redesign of the Hillside Playground. The first phase was completed with a \$600,000 renovation of the playground in Hillside Court that sits behind the management office at 1500 Harwood St. The next phases will include a children's playground, walking trail, and other community amenities.

Beginning in the Spring of 2023, the City and RRHA will be leading the Oak Grove/Hillside/Bellemeade Small Area Plan, which will include redevelopment strategies and design for Hillside Court. With many great assets in the Oak Grove and Bellemeade neighborhoods such as the Bellemeade Park, the Oak Grove Elementary School, and the future affordable, multifamily housing development at the old Oak Grove Elementary School site, Hillside Court has the potential to become a crucial and thriving node in Southside Richmond.

HILLSIDE COURT

Year Built: 1952

Total Acreage: 30

Public Housing Units: 402

Est. Public Housing Population (2019): 1069

Public Housing Median Household Income (2019): \$8,644



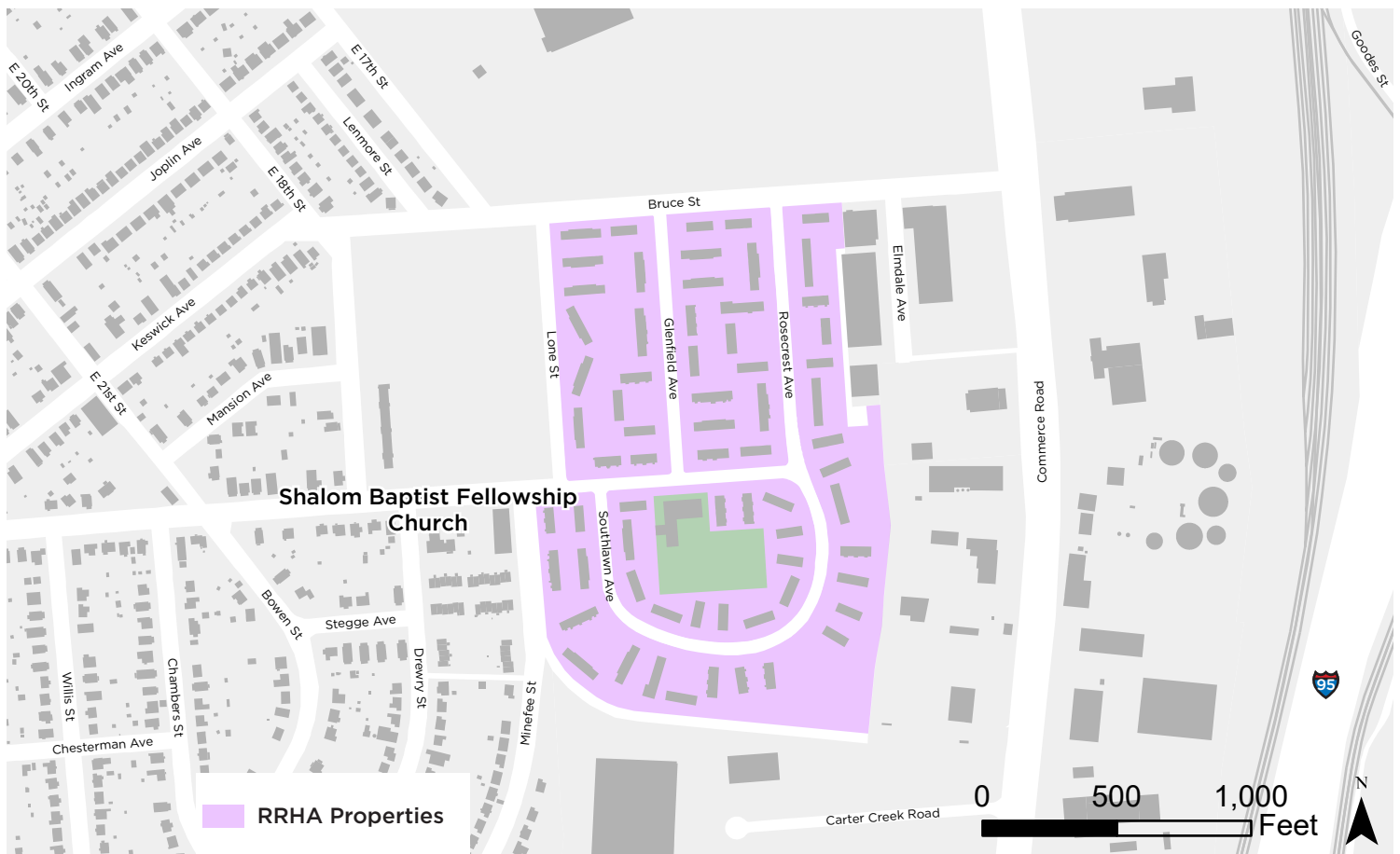
Hillside Court dedication ceremony on October 9, 1953

Source: Library of Virginia



New Hillside Playground

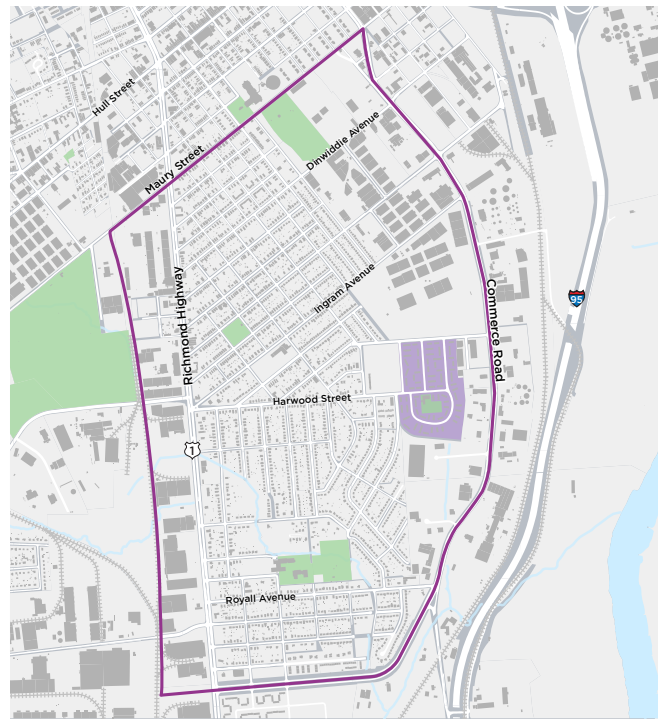
Source: Citizen HKS



Hillside Priority Neighborhood

Primary Next Steps

- Oak Grove/Hillside/Bellemeade Small Area Plan: Develop the small area plan to guide the development of this area.
- Maintenance: RRHA will keep units at Hillside Court in safe and sanitary conditions.
- Improvements: RRHA will use capital funds for unit modernization and site improvements
- Development Partner: RRHA will solicit a request for a Hillside Court development partner.
- Tenant Bill of Rights: RRHA will meet with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options



Oak Grove/Hillside/Bellemeade Small Area Plan Area

Priority Neighborhood

Fairfield Court

Background

In 1958, Fairfield Court was constructed as low-income public housing for African-American residents displaced by major transportation projects. Fairfield Court was located in previously redlined neighborhoods at the edge of Richmond city limits, perpetuating Richmond's racial segregation and concentration of poverty.

Today

Fairfield Court is the third most populated public housing development in Richmond. Located adjacent to Fairfield Court, Fairfield Elementary School and the Giles Community Center are two neighborhood assets serving Fairfield residents. In 1995, a former Fairfield student and resident, Charles Gill Sr. donated money to construct the Giles Community Center which is utilized for community and city-wide programs, as well as additional Fairfield Court ES classroom space.

FAIRFIELD COURT

Year Built: 1958

Total Acreage: 28.2

Public Housing Units: 447

Est. Public Housing Population (2019): 1239

Public Housing Median Household Income (2019): \$9,969



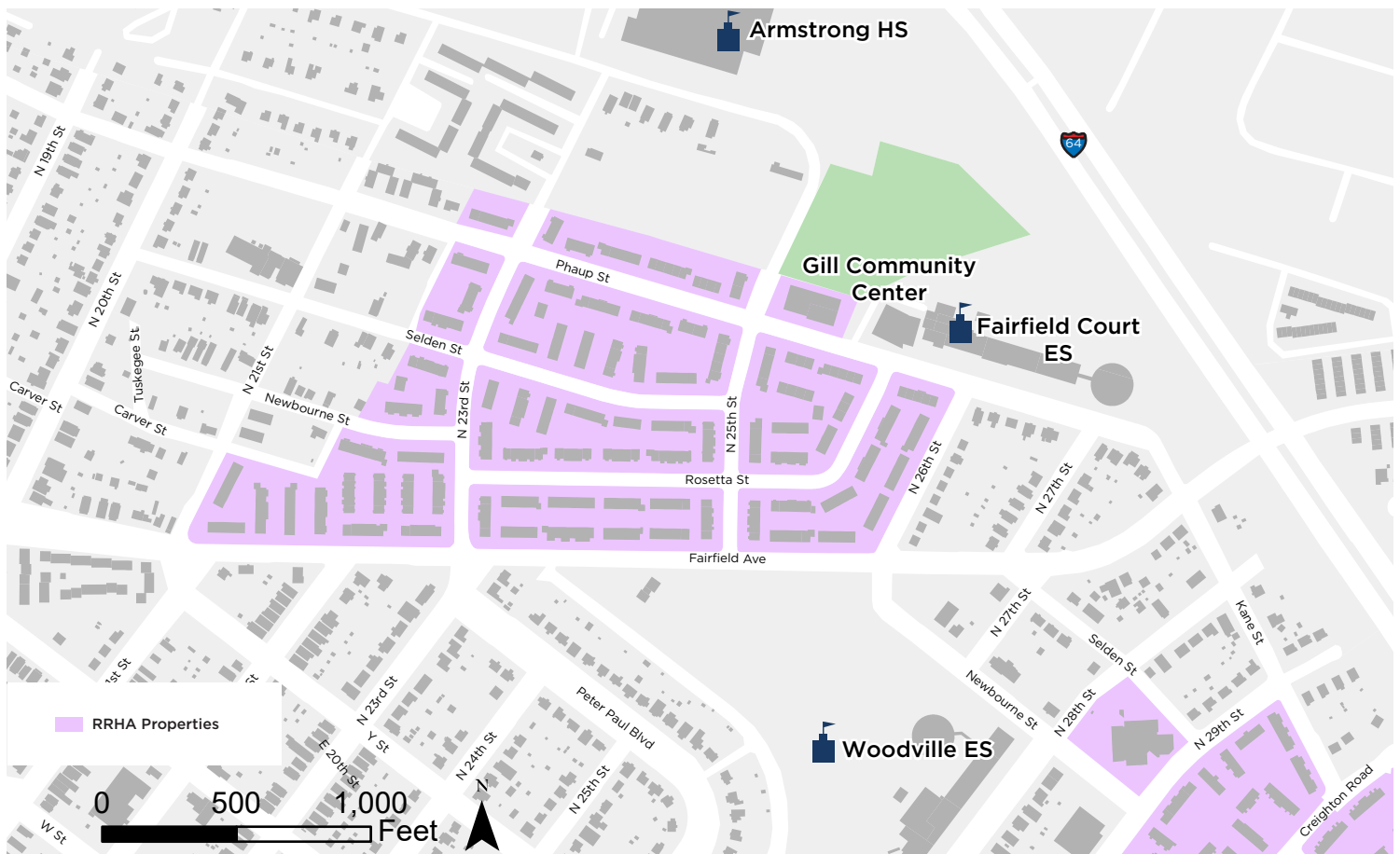
2516-2526 Fairfield Avenue in Fairfield Court (2020)

Source: Commonwealth Preservation Group



Aerial Photograph of Richmond-Petersburg Turnpike Construction (date unknown)

Source: Library of Virginia



Fairfield Priority Neighborhood

Primary Next Steps

- Maintenance: RRHA will keep units in Fairfield court in safe and sanitary conditions.
- Improvements: RRHA will use capital funds for unit modernization and site improvements
- Small Area Plan: RRHA and the City will initiate a planning process for Fairfield Court
- Tenant Bill of Rights: RRHA will meet with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options



Charles and Wanda Gill Center

Source: City of Richmond

Priority Neighborhood

Whitcomb Court

Background

In 1958, RRHA constructed Whitcomb Court along with Fairfield Court as low-income housing for African American residents displaced by major transportation projects. Whitcomb Court was originally surrounded by a cemetery associated with St. Joseph's, a Black Catholic church in Jackson Ward. After the Catholic Diocese of Richmond closed St. Joseph's church in an attempt to desegregate its local congregations, the remains of approximately 150 persons were moved from St. Joseph's cemetery and reinterred in other Catholic cemeteries in Richmond. The cemetery remained abandoned and neglected until the Catholic Diocese in Richmond sold it to RRHA for use as a playground in 1971.

In 1958, Whitcomb Court Elementary School was constructed to educate children from Whitcomb Court. The school was built just east of the Whitcomb development on top of a former landfill. In 1975, the school's program was immediately relocated after significant levels of methane emissions were detected.

Today

Today Whitcomb Court has high vacancy rates due to its poor conditions. The surrounding land formerly used as landfill, including the former Whitcomb Court Elementary site, remains vacant and unusable due to environmental contamination. Whitcomb Court along with some of the other large public housing developments, maintains one of the highest homicide rates in the city. These challenges have been met with multiple grassroots efforts from organizations such as the nearby Pilgrim Baptist Church and the Substance Abuse & Addiction Recovery Alliance of Virginia. Building upon the existing community effort, the City and RRHA commit to transforming Whitcomb into a safe, welcoming, and opportunity-rich center of East End.

WHITCOMB

Year Built: 1958

Total Acreage: 42.6

Public Housing Units: 441

Est. Public Housing Population (2019): 1,087

Public Housing Median Household Income (2019): \$9,599



Ambrose Street in Whitcomb Court

Source: Commonwealth Preservation Group



Former Whitcomb Court Elementary School
demolished 2016

Source: Richmond Times-Dispatch



Whitcomb Priority Neighborhood

Primary Next Steps

- Maintenance: RRHA will keep units at Whitcomb in safe and sanitary conditions.
- Improvements: RRHA will use capital funds for unit modernization and site improvements.
- Small Area Plan: RRHA and the City will initiate a planning process for Whitcomb Court.
- Tenant Bill of Rights: RRHA will meet with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options



Whitcomb Back to School Event (Summer 2022)

Source: City of Richmond

Priority Neighborhood

Mosby Court

Background

RRHA opened Mosby Court in 1962 to house residents displaced by the 17th Street Redevelopment project. The 17th Street project cleared 150 acres of east side neighborhoods deemed to be slums and displaced more than thirteen hundred citizens. Continuing the city's practice of racial residential segregation, Mosby was located within previously redlined east end neighborhoods. However, unlike the other 5 large public housing courts, Mosby was constructed as three separate developments. Mosby represented a shift away from the concentration of large public housing projects to smaller developments with Modern residential buildings. Mosby was constructed with various building types and styles in order to better integrate into the surrounding neighborhoods.

Today

In 2014, the newly renovated Martin Luther King Jr. Middle School officially opened. The new building is the result of a \$40 million project that transformed the 1964 original into a LEED Silver Certified learning space complete with open-air courtyards, theater-quality performance spaces, and extensive lighting. Since 2017, the school has been part of Turnaround Arts, a Kennedy Center program that transforms schools through the strategic use of the arts. Martin Luther King Jr. Middle School is a significant resource for Mosby children and their families.

Primary Next Steps

- Mosby South Plan: Planning process for Mosby South with RRHA's selected development partner
- Section 18: Apply for Section 18 Demolition & Disposition with HUD's Special Applications Center (SAC)
- Tenant Bill of Rights: RRHA will meet with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options

MOSBY COURT

Year Built: 1962

Total Acreage: 46.5

Public Housing Units: 438

Est. Public Housing Population (2019): 1323

Public Housing Median Household Income (2019): \$9,433



Typical Mosby Court South Duplex (2020)

Source: Commonwealth Preservation Group



Martin Luther King Jr. Middle School

Source: Howard Shockey & Sons



Mosby Priority Neighborhood

Priority Neighborhood

Blackwell

Background

Beginning in the late 1960s, RRHA began acquiring and demolishing properties to build scattered public housing sites in Blackwell. The scattered sites program containing 464 units was occupied in 1970.

Between 1999 and 2001, RRHA demolished 440 of the scattered public housing units in Blackwell using HOPE VI funds. These units were replaced by Townes at River South, a private development of 161 multi-family apartments with 75 units designated for families who qualify for public housing. As a result of this redevelopment, many of the displaced public housing residents in Blackwell struggled to find housing and were scattered across different parts of the city or surrounding counties.

Today

Today many of the Blackwell properties that were acquired and demolished by RRHA remain vacant and serve as a reminder of the displaced families who once resided there. RRHA currently owns and manages 24 senior housing units at 1200 Decatur St and plans to build another phase of senior housing nearby. More recently, the area has seen an increase in home renovations and sales due to the growing commercial and residential development of Manchester.

Primary Next Steps

- Disposition: RRHA will dispose of 55 lots to awarded development partners for homeownership opportunities and 3 lots to the Department of Parks, Recreation and Community Facilities
- Senior Cottages: RRHA will complete Senior Cottages Phase 2.
- Development Partner: RRHA will solicit a request for a development partner for the remaining 44 lots.
- Tenant Bill of Rights: RRHA will meet with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options.

BLACKWELL

Year Built: 1970 (Demolished by 2001)

Total Acreage: 14.4

Public Housing Units: 14

Est. Public Housing Population (2019): 14

Public Housing Median Household Income (2019): \$7,502.14



Townes at Rivers South Apartments

Source: RRHA



Blackwell Priority Neighborhood



James H. Blackwell Elementary School
Source: City of Richmond



200 - 216 East 17th Street Vacant Properties
Source: City of Richmond

Priority Neighborhood

Highland Grove

Background

In 1973, RRHA constructed Dove Court, a 60-unit public housing development in what is today Highland Park- Southern Tip. The development followed a drastic demographic shift in the neighborhood. Highland Park was a middle class, White neighborhood until fears of neighborhood integration caused most White homeowners to move out during the 1960s. As soon as 1970, Black residents became the overwhelming majority of Highland Park. Those homes that were sold to Black residents were sold at high rates, creating high housing cost burdens for many of the neighborhood's new families.

In 2008, RRHA demolished Dove Court. In collaboration with RRHA and the City, the private developer Laurel Street Residential constructed 128 mixed-income, tax credit units on the former Dove Court site. The new development, Highland Grove Apartments, was fully occupied by 2017.

Today

In 2016, the City conveyed a 40 acre piece of land formerly used by the Virginia National Guard to RRHA for the purpose of affordable housing. In 2019, the City approved a Community Use Plan for the area and RRHA selected Better Housing Coalition (BHC) as the Master Developer for the site. Since, BHC has brought on Maggie Walker Community Land Trust, project:HOMES, and the Richmond Metropolitan Habitat for Humanity as development partners. BHC also contracted Storefront for Community Design to lead a community engagement process to receive feedback and ideas specific to the elements of the Highland Grove Community Use Plan. Based on community feedback, BHC plans to develop a \$35 million mixed-income subdivision with a minimum of 122 new single family-units and townhomes. The new development will provide opportunities for homeownership at various levels of affordability.

HIGHLAND GROVE

Year Built: 2014

Total Acreage: 6.81

Public Housing Units: 38

Est. Public Housing Population (2019): ?

Public Housing Median Household Income (2019): \$4,937.43



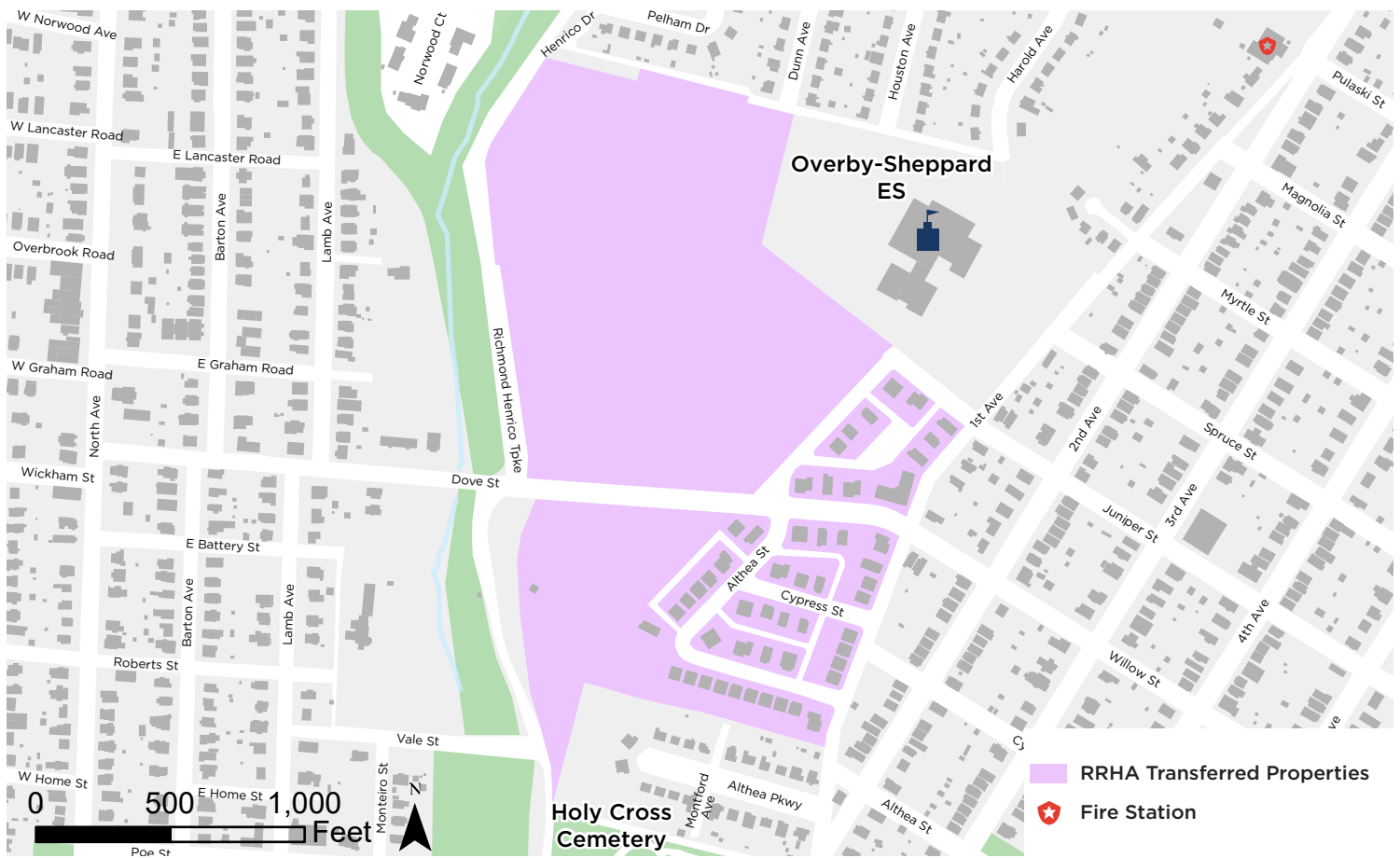
Highland Grove Apartments

Source: City of Richmond



Rendering of Proposed Highland Grove Development

Source: Urban Design Associated



Highland Grove Priority Neighborhood

Primary Next Steps

- Redevelopment: Better Housing Coalition (BHC) will begin infrastructure work for the homeownership development site. BHC and partners will develop mixed-income homeownership units.



Preliminary Highland Grove Site Plan

Source: Urban Design Associates

Citywide Affordable Housing

Background

Priority Neighborhoods is a significant part of the City and RRHA's vision of inclusive housing. As seen in Table 2, RRHA provides various housing options across the city in addition to priority neighborhood developments. Even accounting for the many current options, the need for affordable housing is far greater than the city's supply. There is especially a need for quality rental housing and owner occupied housing that is affordable to households earning less than 30% Area Median Income (AMI). According to the 2011 - 2015 CHAS and ACS data, there were 21,165 households earning less than 30% AMI. However, there were only 6,040 rental units and 2,011 owner occupied units affordable to this income bracket. With Richmond's population growth and escalating housing prices, this discrepancy continues to widen. To learn more about the strategies for increasing affordable housing options for these households, please refer to the Richmond300 Inclusive Housing chapter, the RRHA's Annual Agency Plan, RRHA's strategic plan, and the City's 5-Year Consolidated Plan.

TABLE 2 // Additional RRHA Housing

Property	Type	Program	Units	Year Built/Renovated
Blackwell Senior Cottages 408 - 432 E. 16th Street 409 - 445 E 15th St	Public Housing	Senior	14	2014
1200 Decatur St	Public Housing	Senior	24	1971
1920 Stonewall Ave	Public Housing	Senior	70	1978
2301 - 2307 Bainbridge St	Ground Lease	Family	18	1971
101 - 126 W 24th St	Ground Lease	Family	30	1984
18 - 44 W 27th St	Public Housing	Senior	50	1985
1611 4th Ave	Public Housing	Senior	105	1977

Property	Type	Program	Units	Year Built/Renovated
3900 Old Brook Cir	Public Housing	Senior	25	1978
Armstrong Renaissance (1A, 1B, 2A, 2B) 1665 N. 31st Street	Ground Lease/Project Based Voucher	Family/Senior	220	2016-2020
100 W. Baker St	Ground Lease	Senior	50	2021
736 North 2nd Street	Ground Lease	Senior	72	2020
726 North 2nd Street	Ground Lease	Family	36	2020
300 South Allen Avenue	Ground Lease	Family	52	1984
2321 Afton Avenue	Ground Lease	Family	40	1980
3801 Glenwood Avenue	Project Based Voucher	Family	20	2016
5409 Hull Street	Project Based Voucher	Family	60	2010
2230 Venable Street	Project Based Voucher	Family	6	2018
2000-2021 W Cary Street	Project Based Voucher	Family	20	2018
1090 German School Road	Project Based Voucher	Family	5	2020
1125 West Clay Street	Project Based Voucher	Supportive	20	2018
401 Kingsridge Road	Project Based Voucher	Family	18	2018
390 Kingsridge Road	Project Based Voucher	Family	8	2021
1401 Bickerstaff Road	Project Based Voucher	Family	6	2022

Future Land Use

Future land use designations are both visionary and strategic, and include language about how the area should look and feel in the future, but do not specify what an owner can or cannot legally do with their property.

Future land use is an important tool in helping communities envision the future of a place without getting into the implementation of how, specifically, the buildings, streets, public spaces, and parks will be designed and built.

Once a future land use map is adopted, the City and others, utilize various tools (zoning, streetscape projects, park and open space projects, transportation improvements, and economic development programs) to achieve its vision.

Each Future Land Use Category is realized with a variety of zoning districts. Each Future Land Use Category does not align with only one zoning district, but rather, several zoning districts.

Each Node has a varying set of future land use designations, depending on the unique characteristics and scale of the Node. See the previous section for descriptions of the Priority Growth Nodes and the Appendix C for all the other Node descriptions.

The future land use map shown in Figure 14 depicts the city with 10 different future land use designations described in detail in this section. Each future land use designation is described with the following elements:

- Description: a brief sentence conveying the general intent of the district.
- Development Style: describes how the area looks and feels today and provides general guidance on how new development should look and feel.
- Ground Floor: some of the categories include descriptions of how the ground floor should be designed and used.
- Mobility: describes how people are envisioned to move around the area.
- Intensity: describes the prevailing lot size and general heights of the buildings.
- Primary Uses: describes the predominant uses that are found in the area and that establish the basic characteristics of the area.
- Secondary Uses: describes the supporting uses that are sometimes found in the area.

The aforementioned characteristics are intended to provide general guidance on the future look and feel of areas of the city. The future land use categories are not zoning. Revising the Zoning Ordinance to implement the vision of the future land use map is a Big Move identified in the Implementation Chapter to advance the vision and goals outlined in Richmond 300.

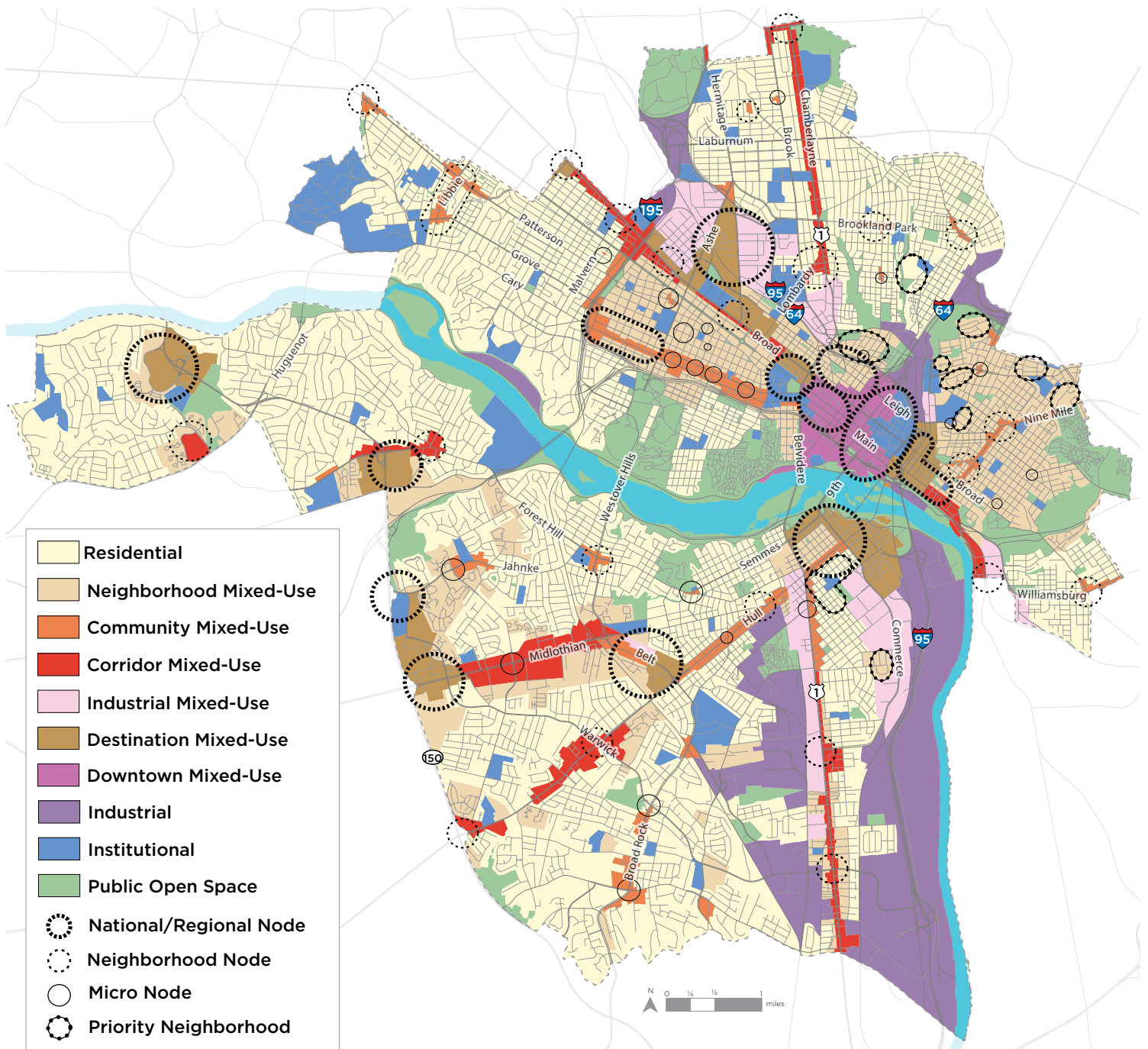


FIGURE 14 // Future Land Use Map

Residential

Neighborhood consisting primarily of single-family houses on large- or medium-sized lots more homogeneous in nature.

Development Style: Houses on medium-sized and large-sized lots in a largely auto-dependent environment. Homes are setback from the street. Future developments continue and/or introduce a gridded street pattern to increase connectivity. Future single-family housing, accessory dwelling units, duplexes, and small multi-family residential buildings are built to a scale and design that is consistent with existing buildings.

Ground Floor: Not applicable.

Mobility: Bicycle and pedestrian access are prioritized and accommodated. Low residential density means that it is not possible to provide frequent transit within these areas;

however, frequent transit may be found at the edges of these areas within more intense future land use designations. Many homes have driveways and/or garages, which are located off an alley behind the home if an alley is present.

Intensity: Buildings are generally one to three stories. Lot sizes generally range up to 5,000 to 20,000+ sq. ft. Residential density of 2 to 10 housing units per acre.

Primary Uses: Single-family houses, accessory dwelling units, and open space.

Secondary Uses: Duplexes and small multi-family buildings (typically 3-10 units), institutional, and cultural. Secondary uses may be found along major streets (see Street Typologies Map).



Duplexes, also known as two-family homes [top], and small multi-family buildings [bottom] are secondary uses.



Residential Diagram 1



When the neighborhood lacks alleys, such as the ranch style homes [top], driveways may be present; however, if the neighborhoods has alleys, driveways are not advised as shown in the large estate home [bottom].

Homes in the Residential category may be rather close to one another on medium-sized lots [top] or further apart on larger lots [bottom].



Residential Diagram 2

Neighborhood Mixed-Use

Existing or new highly-walkable urban neighborhoods that are predominantly residential with a small, but critical, percentage of parcels providing retail, office, personal service, and institutional uses.

Development Style: These areas feature a variety of building types that are close to one another and create a unified street wall. The building size, density, and zoning districts for these areas vary depending on historical densities and neighborhood characteristics. Future development should generally complement existing context. Setbacks, plazas, and parks create a sense of place and community gathering areas. New developments on larger parcels continue or introduce a gridded street pattern to increase connectivity within the neighborhood and to adjacent neighborhoods. In historic

neighborhoods, small-scale commercial uses exist today or should be allowed to reestablish. In new neighborhoods, small scale commercial buildings should be introduced.

Ground Floor: Regardless of use, buildings should engage the street with features such as street-oriented façades with windows and door openings along street frontages. Appropriate setbacks, open space, front porches, elevated ground floors, and other features that provide a sense of privacy should be provided for residential uses.

Mobility: Pedestrian, bicycle, and transit access are prioritized and accommodated. Bike parking is provided. New driveways are prohibited on Priority and Principal Street frontages. Vehicular access to parcels should use alleys wherever possible.

Parking areas should be located to the rear of street-facing buildings.

Intensity: Building heights are generally two to four stories. Buildings taller than four stories may be found along major streets (see Street Typologies Map). Parcels are generally between 1,500 and 5,000 sq. ft.

Primary Uses: Single-family houses, accessory dwelling units, duplexes, small multi-family buildings (typically 3-10 units), and open space.

Secondary Uses: Large multi-family buildings (10+units), retail/office/personal service, institutional, cultural, and government.



Neighborhood Mixed-Use Diagram

A mix of housing types with features that engage the street and opportunities for small-scale commercial uses at the corner.



Neighborhood mixed-use areas are predominantly residential with various home styles (top row) and a small percentage of non-residential uses, such as restaurants, churches, and retail (bottom row).



Neighborhood Mixed-Use Perspective
Residential buildings address the street but are slightly set back to provide residents with a sense of privacy.

Community Mixed-Use

Cluster of medium-density, walkable commercial and residential uses that provide neighborhood services to nearby residential communities and sometimes feature regional attractions.

Development Style: The building size, density, and zoning districts for these areas may vary significantly depending on historical densities and neighborhood characteristics. Future development should generally complement existing context. Uses may be mixed horizontally in several buildings on a block or vertically within the same building. Developments continue or introduce a gridded street pattern to increase connectivity.

Ground Floor: Ground floor uses engage with, and enliven, the street. Monolithic walls are discouraged, while windows, doors, storefronts, and other features that allow transparency and interaction between building and street are encouraged.

Mobility: Pedestrian, bicycle, and transit access are prioritized and accommodated. Bike parking is provided. Driveway entrances are required to be off alleys whenever possible; new driveways are prohibited on priority and principal streets. Parking areas are located within the structure and to the rear of buildings and require screening; shared parking requirements are encouraged.

Intensity: Buildings generally ranging from two to six stories, based on street widths and depending on the historic context and stepping down in height adjacent to residential areas, as necessary. New buildings that are taller than historical buildings should step back from the build-to line after matching the height of the predominant cornice line of the block.

Primary Uses: Retail/office/personal service, multi-family residential, cultural, and open space.

Secondary Uses: Single-family houses, institutional, and government.



Community Mixed-Use Diagram

The building size, density, and zoning districts for these areas may vary depending on historical densities and neighborhood characteristics. The common theme among all Community Mixed-Use areas is that a mix of uses are allowed and buildings must address the street.



Community mixed-use areas have commercial and residential buildings built to the sidewalk and parking located at the curbside or at the rear of the building.



Community Mixed-Use Perspective

Residential and commercial buildings with windows and doors that open to the street enliven the sidewalk and help create a engaging environment with street trees, sidewalks, and no off-street parking visible from the street.

Corridor Mixed-Use

Found along major commercial corridors and envisioned to provide for medium- to medium-high-density pedestrian- and transit-oriented development.

Development Style: The building size, density, and zoning districts for these areas may vary significantly depending on historical densities and neighborhood characteristics. Future development should generally complement existing context. Uses may be mixed horizontally in several buildings on a block or vertically within the same building. Developments continue introduce a gridded street pattern to increase connectivity.

Ground Floor: Ground floor uses engage with, and enliven, the street. Monolithic walls are discouraged, while windows,

doors, storefronts, and other features that allow transparency and interaction between building and street are encouraged. Active commercial ground floor uses are required on street-oriented commercial frontages.

Mobility: Pedestrian, bicycle, and transit access are prioritized and accommodated. Bike parking is provided. Driveway entrances are required to be off alleys whenever possible; new driveways are prohibited on priority and principal streets. Parking areas are located within the structure and to the rear of buildings and require screening; shared parking requirements are encouraged.

Intensity: Buildings generally ranging from two to ten stories, based on street widths and depending on the historic context and stepping down in height adjacent to residential areas. New buildings that are taller than historical buildings should step back from the build-to line after matching the height of the predominant cornice line of the block.

Primary Uses: Retail/office/personal service, multi-family residential, cultural, and open space.

Secondary Uses: Single-family houses, institutional, and government.



Corridor Mixed-Use Diagram

The building size, density, and zoning districts for these areas may vary significantly depending on historical densities and neighborhood characteristics. In some areas, the Corridor Mixed-Use will look like the three buildings in the middle and in other areas, taller buildings are appropriate. The common theme among all Corridor Mixed-Use areas is that a mix of uses are allowed and buildings must address the street.



Corridor Mixed-Use areas have commercial and residential buildings built to the sidewalk and parking located at the curbside or at the rear of the building.



Corridor Mixed-Use Perspective
Residential and commercial buildings with windows and doors that open to the street enliven the sidewalk and help create an engaging environment with street trees, sidewalks, and no off-street parking visible from the street.

Industrial Mixed-Use

Formerly traditional industrial areas that are transitioning to mixed-use because of their proximity to growing neighborhoods and changes in market conditions. These areas may still retain some light industrial uses.

Development Style: A mix of building types with low-scale, post-industrial buildings that are adapted for a new use are adjacent to new taller residential and/or office buildings. These areas allow "maker uses" to continue while encouraging more individuals to live, work, and play in the area. Buildings should have street-oriented façades with windows and door openings along street frontages. New light industrial uses are compatible

with residential and office uses, and are attractively buffered. New developments continue or introduce a gridded street pattern to increase connectivity.

Ground Floor: Ground floor uses engage with and enliven the street. Monolithic walls are discouraged, while windows, doors, storefronts, and other features that allow transparency and interaction between building and street are encouraged. Active commercial ground floor uses are required on street-oriented commercial frontages.

Mobility: Pedestrian, bicycle, and transit access are prioritized and accommodated. Bike parking is provided. New driveway entrances are prohibited on priority and

principal street frontages and minimal driveway entrances are allowed on secondary streets. Vehicular access to parcels should use alleys where possible. Loading for trucks must be provided off-street. Parking lots and parking areas should be located to the rear of street-facing buildings.

Intensity: Medium- to high-density, three to eight stories.

Primary Uses: Retail/office/personal service, multi-family residential, cultural, and open space.

Secondary Uses: Institutional and government.



Industrial Mixed-Use Diagram

A mix of building types with low-scale, post-industrial buildings adjacent to new taller residential and/or office buildings.



Industrial mixed-use areas feature residential, retail, office, and light industrial users in buildings that are a historic renovations [top] or new construction [bottom].



Industrial Mixed-Use Perspective
Ground floor uses engage with and enliven the street. Buildings have street-oriented façades with windows and door openings along street frontages.

Destination Mixed-Use

Key gateways featuring prominent destinations, such as retail, sports venues, and large employers, as well as housing and open space. Located at the convergence of several modes of transportation, including Pulse BRT or other planned transit improvements.

Development Style: Higher-density, transit-oriented development encouraged on vacant or underutilized sites. New development should be urban in form, may be of larger scale than existing context, and, where relevant, should pay special attention to the historic character of the existing context. Development should enhance the public realm and create a sense of place. Many buildings are vertically mixed-use. Developments continue or introduce a gridded street pattern to increase connectivity.

Ground Floor: Ground floor uses engage with, and enliven, the street. Monolithic walls are

discouraged, while windows, doors, storefronts, and other features that allow transparency and interaction between building and street are encouraged. Active commercial ground floor uses are required on street-oriented commercial frontages.

Mobility: Pedestrian, bicycle, and transit access are prioritized and accommodated. Bike parking is provided. Driveway entrances are required to be off alleys whenever possible; new driveways are prohibited on priority and principal street frontages. Surface parking is prohibited as a principal use; when surface parking is provided as an accessory use, it should be located to the rear of buildings and screened. Parking requirements are reduced to allow more market-based parking strategies, including shared parking.

Intensity: Buildings typically a minimum height of five stories.

Primary Uses: Retail/office/personal service, multi-family residential, cultural, and open space.

Secondary Uses: Institutional and government.



Destination mixed-use areas include a mix of commercial and residential buildings with features that encourage walking and buildings that are generally at least five stories tall.



Destination Mixed-Use Perspective
Buildings enhance the public realm
and create a sense of place



Destination Mixed-Use Diagram
Higher-density, transit-oriented development encouraged on vacant or underutilized sites. Future development is urban in form and may be of larger scale than existing context.

Downtown Mixed-Use

Central business district of the Richmond region features high-density development with office buildings, residential buildings, and a mix of complementary uses, including regional destinations in a highly-walkable urban environment.

Development Style: Higher-density pedestrian- and transit-oriented development encouraged on vacant or underutilized sites. Historic buildings are adapted for new uses. Future development should be urban in form and may be of larger scale than existing context. Plazas and setbacks create an engaging street life. Many buildings are vertically mixed-use.

New developments continue or introduce a gridded street pattern to increase connectivity.

Ground Floor: Ground floor uses engage with and enliven the street. Monolithic walls are discouraged, while windows, doors, storefronts, and other features that allow transparency and interaction between building and street are encouraged. Active commercial ground floor uses required on street-oriented commercial frontages.

Mobility: Pedestrian, bicycle, and transit access are prioritized and accommodated. Bike parking is provided. Driveway entrances are required to be off alleys whenever possible; new driveways

are prohibited on priority and principal street frontages. Surface parking is prohibited as a principal use. Parking requirements are substantially less in these areas than other areas of the City and are largely eliminated.

Intensity: Buildings typically a minimum height of five stories.

Primary Use: Retail/office/personal service, multi-family residential, cultural, institutional, government, and open space.

Secondary Uses: Not applicable.

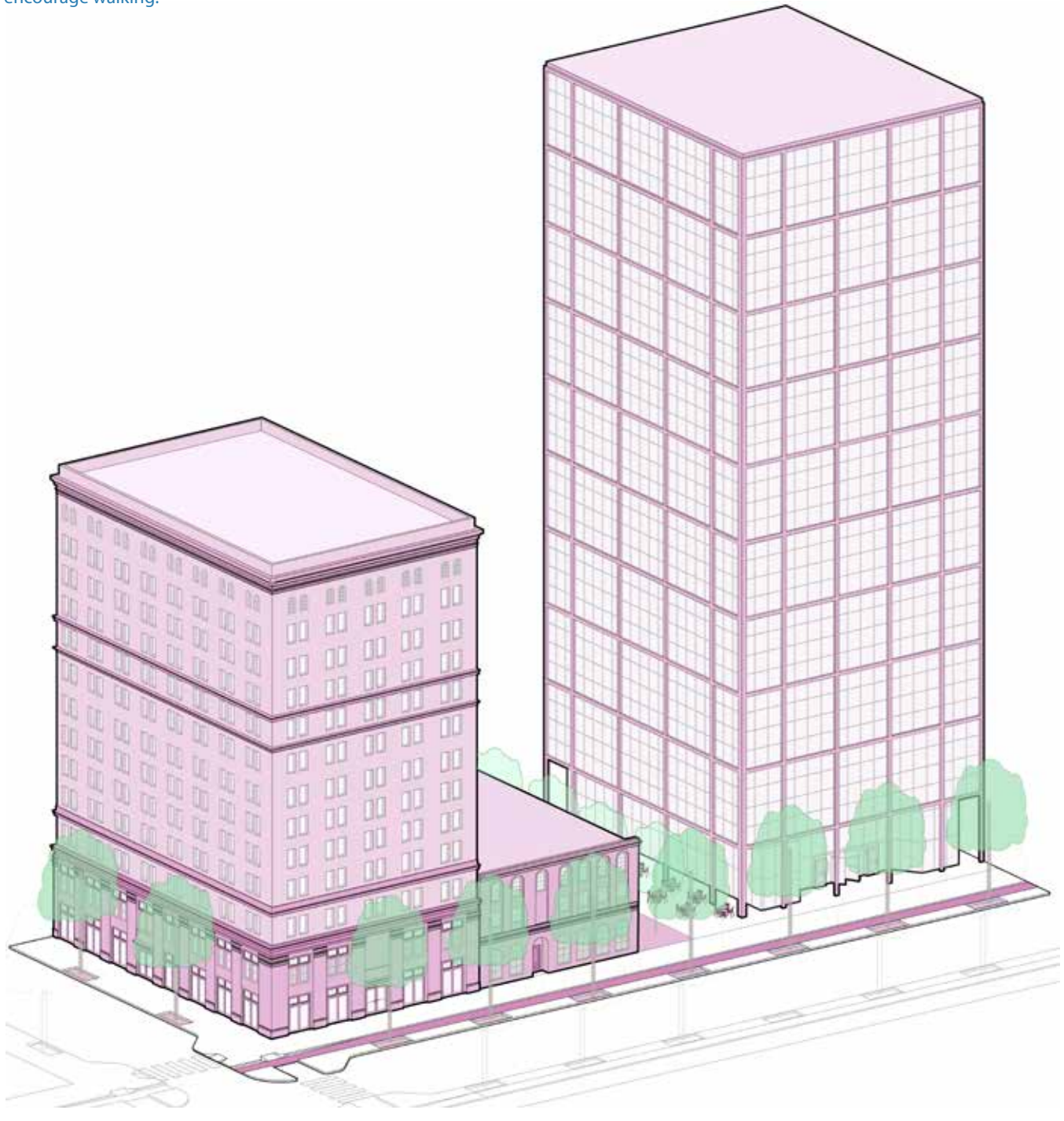


Downtown Mixed-Use Perspective

The architectural variety of historic and new construction creates visual interest and tells a compelling story about the evolution of Richmond's built environment.



The tallest buildings in the city with a mix of commercial and residential buildings with features that encourage walking.



Downtown Mixed-Use Diagram

The most intense of all the land uses, downtown mixed-use features the tallest buildings in Richmond which are often alongside shorter, historic buildings that have been adapted and reused for new uses.

Industrial

Manufacturing and production areas that primarily feature processing, research and development, warehousing, and distribution.

Development Style: The arrangement of structures, parking and circulation areas, and open spaces should recognize the unique needs of industrial users. Industrial areas have a design aesthetic that buffers industrial uses from other adjacent uses.

Ground Floor: Not applicable.

Mobility: Pedestrian, bicycle, and transit access is accommodated. Bike parking is provided. Parking lots and parking areas are located to the rear of street-facing buildings. Vehicle entrances are located off alleys or secondary streets.

Intensity: One to three stories with exceptions for unique building features relating to that industrial use.

Primary Uses: Industrial and open space.

Secondary Uses: Retail/office/personal service.



Industrial users range in scale and level of intensity of production and manufacturing.

Institutional

Public and quasi-public entities, such as local, state, and federal government, hospitals, universities, schools, and religious institutions.

Development Style: Several buildings owned by an institution are often connected by an engaging character that creates a campus-like environment.

Ground Floor: Active commercial ground floor uses are required on street-oriented commercial frontages. Residential uses may be permitted on the ground floor in certain sections of the area. Regardless, ground floor residential units should still have street-oriented façades with setbacks, front yards, and balconies where appropriate.

Mobility: Pedestrian, bicycle, and transit access are prioritized and accommodated. Bike parking is provided. New driveway entrances are prohibited on priority and principal street frontages and minimal driveway entrances are allowed on secondary streets. Ground floor parking is prohibited on principal street frontages.

Intensity: Varies.

Primary Uses: Institutional, cultural, government, and open space.

Secondary Uses: Retail/office/personal service and multi-family.



There are several campuses throughout Richmond. A campus is a contiguous space with multiple buildings connected by park-like open space.

Public Open Space

Public and quasi-public parks, recreation areas, open spaces, and cemeteries.

Development Style: Includes passive and active recreation, natural habitats, cemeteries, and large plazas.

Ground Floor: Not applicable.

Access: Designed in a manner to allow access by all modes of transportation, while emphasizing connections to bicycle and pedestrian amenities, such as sidewalks, bike lanes, and shared-use paths. Bike parking and other such amenities are provided as well.

Density/Height: Not applicable.

Primary Uses: Open space.

Secondary Uses: Cultural, institutional, and governmental.



Parks in Richmond have many features, including playgrounds [top], passive recreation areas [middle], and garden-like settings [bottom].



Parks are a variety of scales, ranging from regional parks, like the James River Park System [top] to community gardens [left] and pocket parks [right].

Future Connections

The Future Connections Map depicts the envisioned transportation networks that will provide access to and among Nodes.

The elements in the Future Connections Map described in this section are great streets, street typologies, greenways and on-street bike facilities, enhanced transit, street connections, interchanges, and bridges. The policy recommendations related to these future connections are found in Goals 6 through 10.

Great Streets

Great Streets, shown in Figure 15, are significant entrances to the city and serve as major connectors between city destinations. Great Streets are roadways that require robust attention to make them prominent promenades to the city. Some parts of the Great Streets shown on the Future Connections Map are quite beautiful and should be replicated in other parts of the city. For instance, Ashe Boulevard as it runs through the Museum District is a beautiful promenade with wide sidewalks, street trees, buried power lines, and buildings that address the street with windows, doors, and porches that engage the street. However, as it travels north toward I-95/I-64, its splendor is diminished. As the areas around Ashe Boulevard near the Diamond Site are redeveloped, it is envisioned that the street would be beautified and become a truly Great Street.

Street Typologies

The character of a street changes as the adjacent land uses change. The Street Typology Map, shown in Figure 15, depicts four Street Typologies which are applied to the most frequently-used streets (those with high annual average daily traffic (AADT)). When planners, developers, and transportation engineers plan for changes to buildings and the street along the streets identified in this map, they should all work closely together to ensure the street design meets the needs of the envisioned land uses:

Major Mixed-Use Streets

- Carry high volumes of vehicles, pedestrians, and bicycles, through commercial and mixed-use areas
- Prioritize use and density-scaled sidewalks and crosswalks
- Require form elements, such as buildings to the street with parking in the rear, as well as building windows and entrances on the street
- Incorporate streetscape features, such as trees, benches, and trash receptacles
- Ideal locations for transit routes and transit stops
- Prioritize the curbside for walking, bicycling, transit, and short-term parking access and loading for local shops and restaurants

Major Residential Streets

- Carry high volumes of vehicles, as well as pedestrians and bicycles, through residential neighborhoods
- Prioritize for creating sidewalks and crosswalks
- Install street trees as a buffer between sidewalk and street
- Ideal locations for transit routes and transit stops
- Ensure low street speed by utilizing traffic calming measures

Major Industrial Streets

- Carry high volumes of vehicles, including a high percentage of truck traffic, through industrial areas
- Prioritize sidewalks and crosswalks
- Install street trees with a buffer between sidewalk and street
- Ideal locations for transit routes and transit stops

Limited Access Highways

- Interstate, Downtown Expressway, Chippenham Parkway, and other limited-access highways that do not allow for non-vehicular access

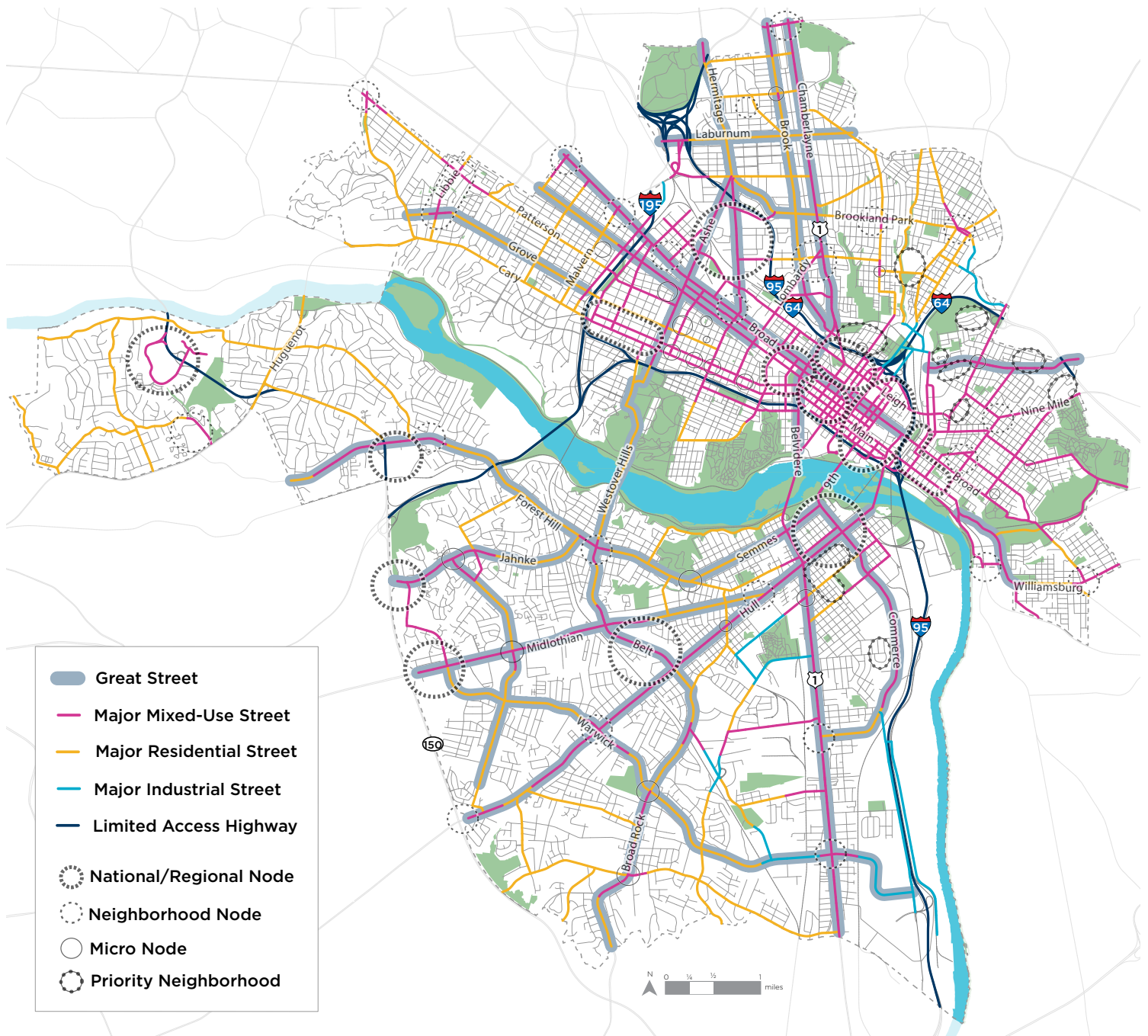


FIGURE 15 // Great Streets and Street Typologies Map

Greenways

Richmond 300 identifies a network of greenways. A greenway is a universally accessible paved path that is a minimum of 8-feet wide and intended for non-vehicle users. Examples of greenways in Richmond are the Canon Creek Greenway and the Virginia Capital Trail. Greenways are sometimes also referred to as shared use-paths. Non-vehicle users are pedestrians, joggers, cyclists, rollerbladers, skateboarders, wheelchair users, people pushing strollers, and other users that are not using a vehicle for transportation.

Multi-use trails are not shown on this map. Multi-trails are very important recreation routes in the city and should be expanded and maintained, but Richmond 300 does not include multi-use trails on these future connections maps. A multi-use trail is a single track or natural surface trail that is open to one or more user groups. In Richmond multi-use trail users groups are hikers and bikers, but elsewhere user groups might include horses, ATV's etc.

The objectives and strategies related to greenways are found in multiple sections of Richmond 300, but mainly in Goal 8 and Goal 17.

On-Street Bicycle Facilities

Figure 16 also depicts existing and proposed On-Street Bicycle Facilities, which were adapted from the Bike Master Plan and the Pulse Corridor Plan. The intent of the On-Street Bicycle Facilities is to provide infrastructure for bicycles and other non-vehicle users. Richmond 300 does not specify the exact type of On-Street Bicycle Facility (i.e., buffered bike lane, protected bike-lane, cycle track, bike/walk boulevard, etc.) but rather by showing these lines on the Future Connections Map, this Plan is stating that some type of bike infrastructure should be included on this road. This Plan does not consider a sharrow as an adequate form of on-street bicycle infrastructure. The objectives and strategies related to on-street bicycle facilities are in Goal 8.

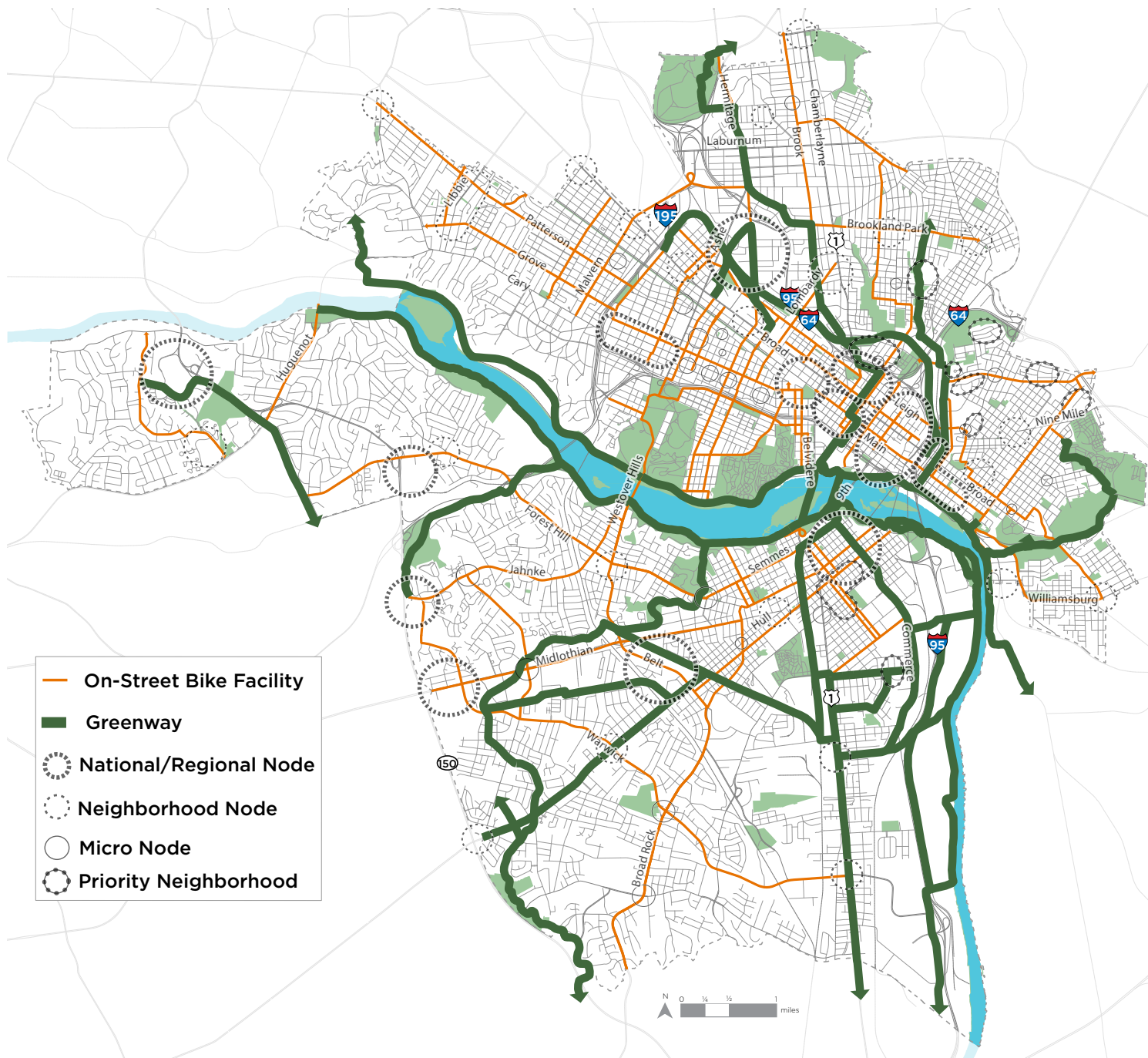


FIGURE 16 // Greenways & On-Street Bike Facilities Map

Enhanced Transit Routes

The Enhanced Transit Routes shown in Figure 17 are transit corridors envisioned to have high-frequency service (ideally every 10 minutes, but likely 15 minutes) and longer service hours (ideally 24/7, but likely less). The Future Land Use Map shows a mix of residential, employment, and commercial uses along these Enhanced Transit Routes to accommodate a higher number of future riders (residents, visitors, and employees) within close proximity of the Enhanced Transit Route. These objectives and strategies related to Enhanced Transit are in Goal 8.

Street Connections, Interchanges, and Bridges

Urban planners and transportation planners have long argued in favor of creating gridded street networks. Gridded street networks allow all users to easily traverse an area without getting lost in dead ends and being funneled to congested main roads. Gridded street networks also increase the connectivity of an area and make it easier to reach key destinations. Figure 18 shows areas of the City where there are large-scale opportunities to introduce a gridded street network, such as the Ashe/Hermitage site.

Figure 18 also identifies several locations for highway interchange improvements, bridge rehabilitation or replacement, and new bridge connections, which are briefly described below and in Goal 9.

- 1 Improvements at the interchange of Saunders Avenue with Westwood Avenue.
- 2 Improvements at the interchange of I-95/64 with Arthur Ashe Boulevard.
- 3 A new bridge over the CSX railroad that connects Norfolk Street from Scott's Addition to Hamilton Street to the west increases connectivity between these neighborhoods.
- 4 A new pedestrian/bike bridge over the CSX railroad that connects Scott's Addition to the north increases connectivity and provides direct access to Greater Scott's Addition, an area of great redevelopment potential.
- 5 A new landmark bridge between W. Leigh Street and the Diamond site increases connectivity and provides direct access to Greater Scott's Addition, an area of great redevelopment potential.
- 6 Improvements at the interchange of I-95/64 with Chamberlayne Avenue.
- 7 Capping the existing I-95/64 interstate between Jackson Ward and Gilpin Court with future development and/or open space reconnects previously severed neighborhoods to each other, providing not only enhanced connectivity but a sense of place and continuum of urban design that a bridge alone would not provide.
- 8 Capping the existing Downtown Expressway between lower Monroe Ward and Gambles Hill with future development and/or open space reconnects previously severed neighborhoods to each other, providing not only enhanced connectivity but a sense of place and continuum of urban design that a bridge alone would not provide.
- 9 Improvements at this interchange of I-95 with Broad Street.
- 10 Rehabilitation of the Nickel Bridge to expand accommodations for pedestrians and bicycles, and add transit.
- 11 Rewatering of the historic Kanawha Canal serves as a recreational amenity and tourism attraction that would provide small, non-motorized boats access between Byrd Park and the James River, as well as enhance the sense of place along a proposed future greenway.
- 12 Rehabilitation or placement of the Mayo Bridge.
- 13 Reopening of the historic canal locks serves as a recreational amenity and tourism attraction that would provide boats access between the James River and the Haxall Canal.
- 14 A new street connection resulting from the extension of Carnation Street under Chippenham Parkway increases access and connectivity between neighborhoods in Richmond and Chesterfield County.
- 15 A new street connection between Richmond and Chesterfield County under Chippenham Parkway would connect the recent development at Stonebridge in Chesterfield County with potential future development of the large tract of land south of Midlothian Turnpike.

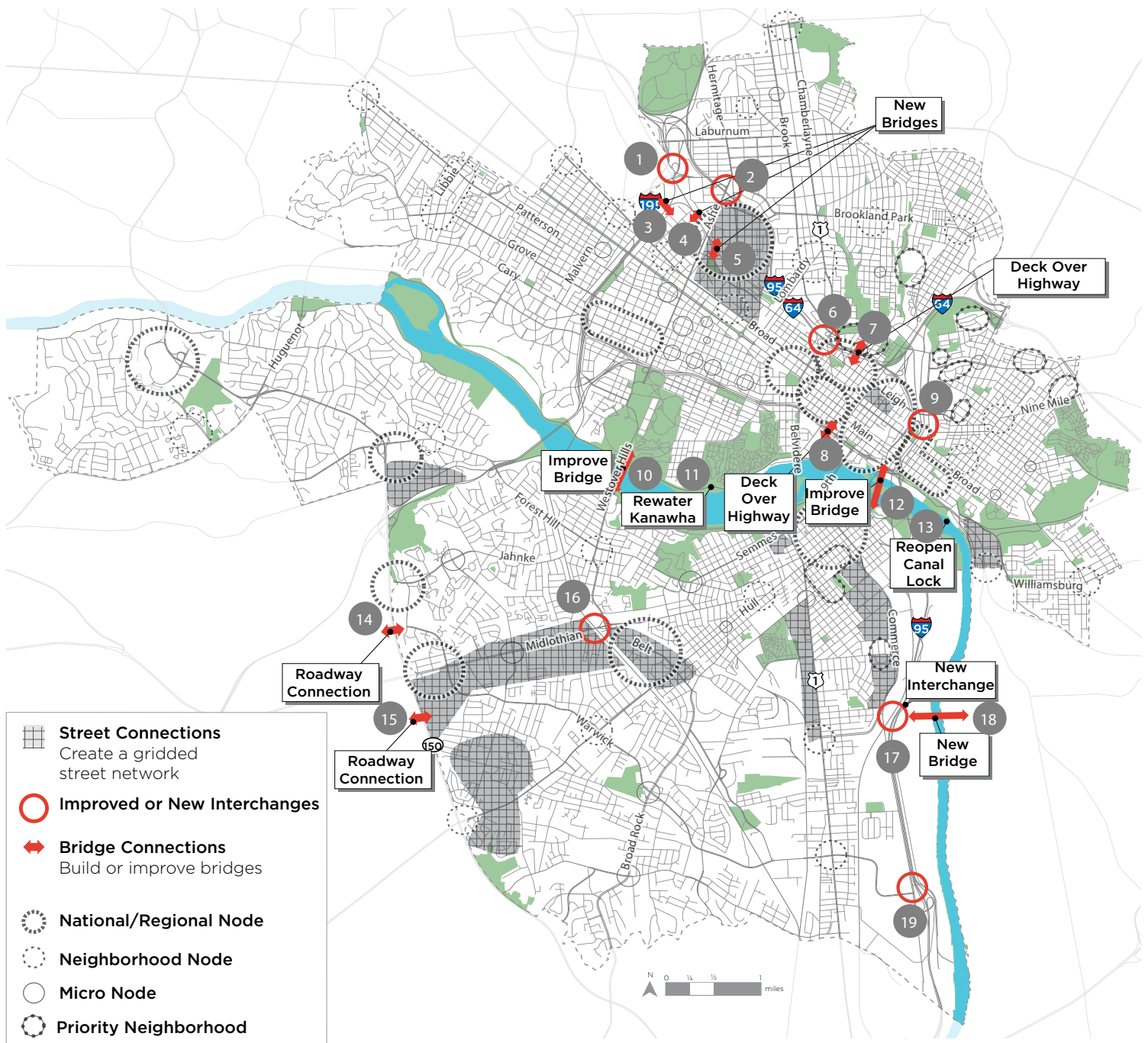
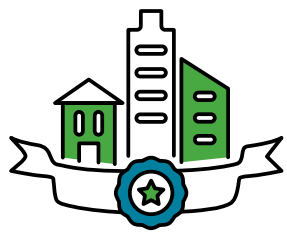


FIGURE 18 // Connections, Interchanges, and Bridges Map

- 16 A reconfigured interchange of Midlothian Turnpike and Belt Boulevard would increase pedestrian and bicycle safety. Changing this interchange to an at-grade intersection would soften the overall impact of roadway infrastructure on the area, enhancing the overall urban design as potential future redevelopment takes place around the interchange and south to Southside Plaza.
- 17 A new interchange of I-95/64 with Bellemeade Rd would provide direct access to industrial areas along the River and alleviate the need for trucks to travel longer distances through residential neighborhoods.
- 18 A new, multi-modal bridge across the James River connecting Richmond and Henrico County, providing enhanced regional connections and access to I-95 that would divert traffic away from local roadways, including E. Main Street through Shockoe Bottom which is stressed by continued development in eastern Henrico County.
- 19 Improvements at the interchange of I-95 with Bells Road allows for better access and connectivity by providing more movement directions than the current interchange allows, supporting operations at the Richmond Marine Terminal.



CHAPTER 2

High-Quality Places

Vision: Richmond is a well-designed city of communities interconnected by a network of Nodes, public facilities, and open spaces providing services to residents, businesses, and visitors.

As the Capital of the Commonwealth, Richmond leads the region in high-quality business and residential growth. Richmond's unique neighborhoods and districts, both historical and new, support a diversity of uses, the equitable accommodation of all phases of life, and the efficient use of land to promote sustainable and healthy lifestyles.



Goals, Objectives, and Strategies

Goal 1: Complete Neighborhoods



Establish a city of complete neighborhoods that have access to Nodes and Priority Neighborhoods connected by major corridors in a gridded street network.

Existing Context

Many of Richmond’s neighborhoods are growing in population. Richmond is largely a city of single-family neighborhoods with 33% of its real estate devoted to single-family houses, as shown in Figure 19. Neighborhoods are served and connected to each other by commercial corridors and mixed-use centers.

Richmond has created entirely new residential areas in the past 20 years.

The population has significantly increased in areas of the city that previously had nearly no residents. These parts of the city in particular, which are not traditional single-family neighborhoods, account for the largest share of Richmond’s growth over the last 20 years, with the emergence of 18-hour neighborhoods in Downtown, Shockoe Bottom, Manchester, and Scott’s Addition.

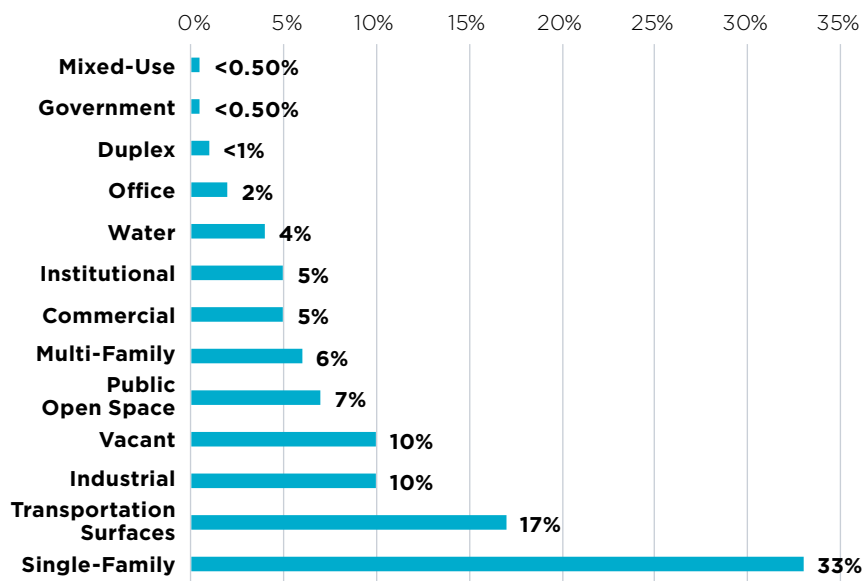


FIGURE 19 // Existing Land Use Land Area
Source: City of Richmond’s Assessor’s Office

From 1950 to 2000, a great deal of Richmond's single-family neighborhoods experienced a decrease in population that resulted in the demolition of many homes and the abandonment of structures.

However, since 2000, many of the previously abandoned homes and vacant lots have been redeveloped. The population has increased in Richmond's urban neighborhoods, such as the Fan, the Museum District, and Church Hill as people across the country are seeking walkable, mixed-use

neighborhoods with many amenities nearby. The population has also steadily increased in Richmond streetcar suburbs, which feature slightly larger homes on larger lots, such as Bellevue, Barton Heights, Ginter Park, Woodland Heights, Spring Hill, and others. Even with this increase in population, several neighborhoods still have many abandoned structures and vacant lots, such as Barton Heights, Washington Park, Swansboro, and more (please see Figure 20).

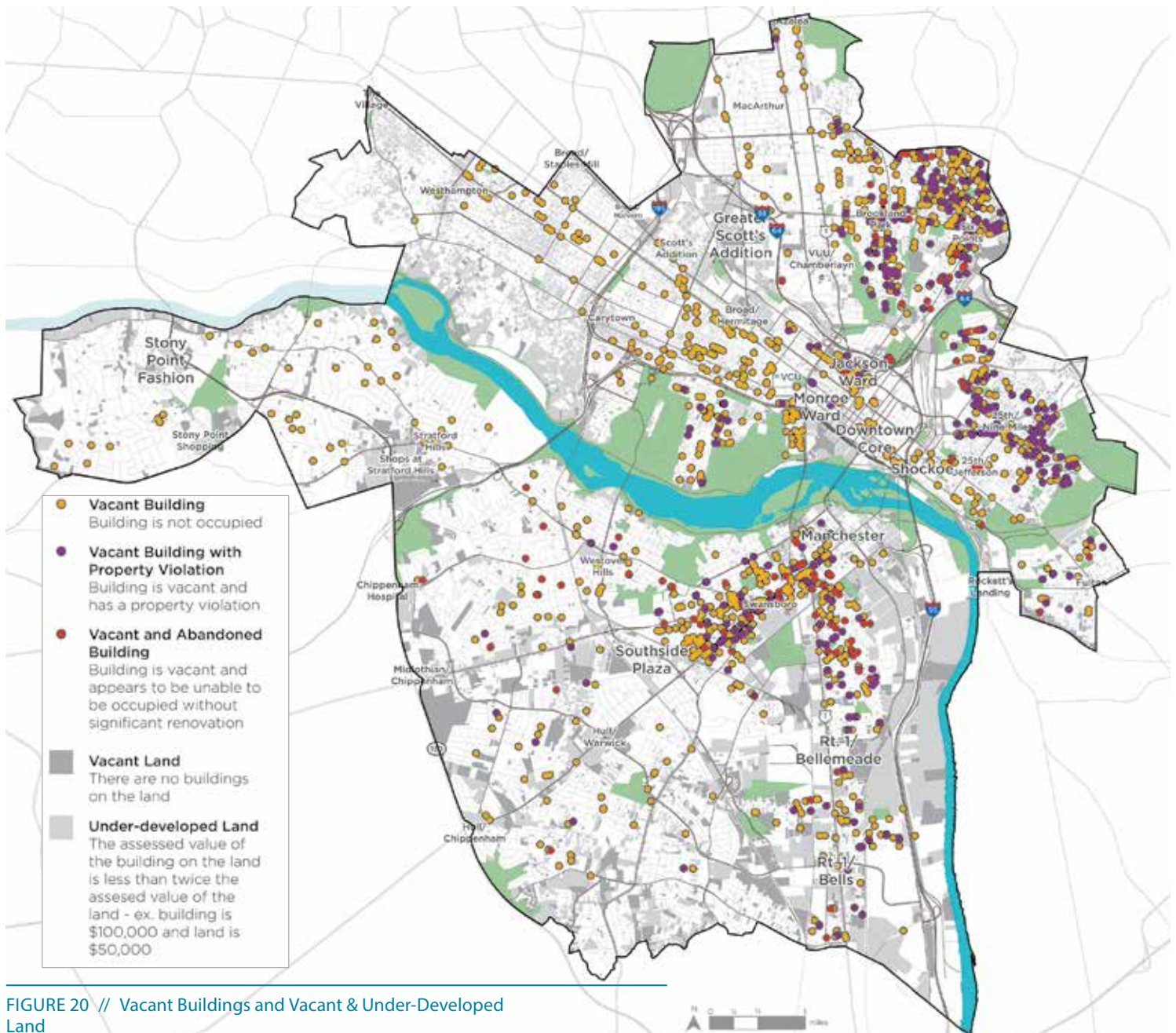


FIGURE 20 // Vacant Buildings and Vacant & Under-Developed Land

Source: City of Richmond, Planning and Development Review, Assessor's Office (2019)

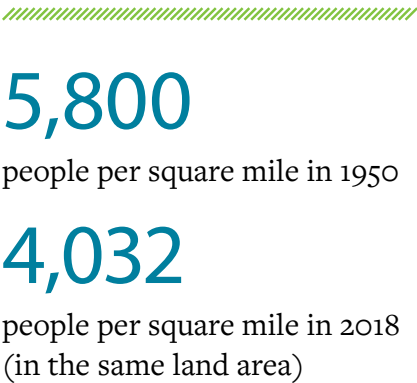
Richmond is less dense than it was in 1950. Richmond has a total residential density of about 3,500 people per square mile (sq. mi.). Richmond’s population density in 2019 was less than it was in 1950 (5,800 people/sq. mi.)—even when the area annexed in 1970 is removed. Richmond is slightly less dense than cities of comparable population and comparable land area (please see Table 3).

Richmond’s Zoning Ordinance is evolving to allow more mixed-use, form-based development. The current Zoning Ordinance was adopted in the mid-1970s and was a single-use, or Euclidean zoning document, meaning that it sought to separate uses, allowing only residential in some areas, and allowing only commercial and office in others. Single-use zoning across the nation has been shown to lead to sprawling auto-dependent communities. Due to changes in housing preference and a concern for reducing the negative effects of climate change, individuals are increasingly drawn to mixed-use, transit-supporting, walkable neighborhoods. The Zoning Ordinance has been amended in recent years to allow for more mixed-use districts that allow a combination of uses, with fewer requirements for parking and more focus on building form (size and shape). This was evident in the adoption of the Pulse Corridor Plan (2017) and subsequent rezonings of Scott’s Addition and Monroe Ward to support the Pulse Corridor Plan.

TABLE 3 // 2016 Density Comparison
Source: U.S. Census Bureau: 2016 ACS 1-Year Estimates

City	Population	Size (mi²)	Density (ppl/ mi²)	Population change ('10-'16)
Washington, D.C.	681,170	61.0	11,167	13.20%
Minneapolis	413,645	54.0	7,660	7.51%
Pittsburgh	303,624	55.4	5,481	-0.68%
Norfolk	245,115	54.1	4,531	0.95%
Richmond	223,170	62.5	3,571	9.28%

Note: These cities were chosen as comparative cities because they are a similar geographic size as Richmond and they do not have the ability to annex land.



Objective 1.1
Rezone the city in accordance with the Future Land Use Plan, as shown in Figure 21 and described in Chapter 1.

- a. Re-write the Zoning Ordinance to achieve the goals set forth in Richmond 300.
- b. Prioritize rezoning parcels in Primary Growth Nodes and Priority Neighborhoods (see Figure 221 for locations of Priority Neighborhoods and Figure 22 for the location of Primary Growth Nodes).
- c. Evaluate zoning districts in historical areas that were developed prior to the advent of zoning regulations to ensure new construction similar in form to the historical context is allowed (see Goal 3).
- d. Reduce the Special Use Permit (SUP) cost for small commercial uses to allow small businesses to open in small spaces (see Goal 11).
- e. Rezone parcels in Nodes and Priority Neighborhoods with design requirements that encourage walking, such as providing sidewalks, street trees, shade structures, pedestrian-level lighting, street furniture, and street-level windows and doors; prohibiting parking facing the street; and limiting driveway entrances. Descriptions of the Priority Growth Nodes are found starting on page 2624 and descriptions of the other National/Regional Nodes and Neighborhood Nodes are on page C-1 (see Goal 4 and Goal 8). Priority Neighborhoods descriptions start on page 52.
- f. Rezone to allow more housing types throughout the city (see Goal 14).

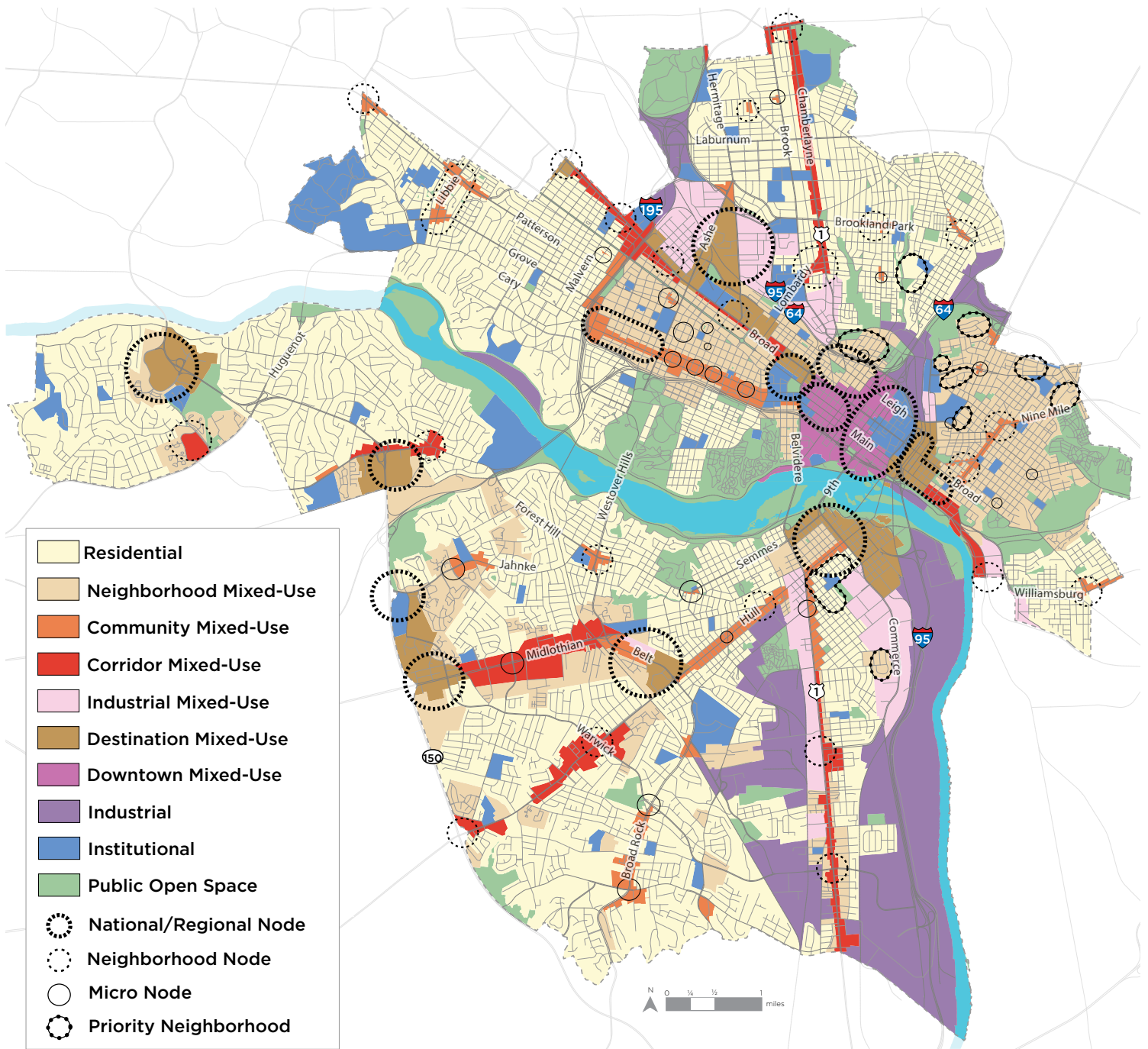


FIGURE 21 // Future Land Use Map
See Chapter 1 for descriptions of the Future Land Use categories.

Objective 1.2

Develop and adopt small area plans for areas that require more examination.

- a. Develop a Coliseum Framework Plan.
- b. Develop small area plans for the Primary Growth Nodes at Shockoe, the Southside Plaza Area and Stony Point to evaluate and suggest specific opportunities for placemaking, connectivity, mixed-income housing, economic development, and open space.
- c. Develop a detailed corridor plans for Commerce Road and for Route 1 with specific recommendations on how to transform the road into a Great Street with amenities such as buildings addressing the street, a greenway (the Ashland to Petersburg Trail), street trees, lighting, and other amenities and encourage redevelopment and business growth.

Objective 1.3

Support the growth of jobs and housing in Nodes and Priority Neighborhoods by using placemaking, clustering community-serving facilities at Nodes and Priority Neighborhoods, and prioritizing infrastructure projects that encourage multi-modal accessibility to and from Nodes and Priority Neighborhoods, as shown in Figure 221 and 22.

- a. Coordinate public and private investments to create innovative mixed-used developments.
- b. Co-locate, consolidate, and modernize community-serving public facilities, and locate them in or near Nodes and Priority Neighborhoods (see Goal 2).

- c. Utilize public art and the public realm to create unique features within Nodes and Priority Neighborhoods (see Goal 4).
- d. Increase the number of transportation options viable at each Node and Priority Neighborhood by utilizing a Complete Streets approach to allocating space in the right-of-way (see Node descriptions for future connections improvements and Goals 6–10).
- e. Develop marketing plans, including signage, graphics, and branding, to differentiate the Nodes and Priority Neighborhoods from one another and retain, create, and attract/retain businesses (see Goals 11–13).
- f. Implement housing strategies that increase housing at all income levels along corridors and at Nodes and Priority Neighborhoods (see Goal 14).
- g. Develop new parks at Nodes and Priority Neighborhoods and connect them via greenways to one another (Goal 8 and Goal 17).

Objective 1.4

Maintain and improve primarily residential areas by increasing their linkages to Nodes, Priority Neighborhoods, corridors, parks, and open space, and maintaining high-quality design standards.

- a. Implement urban design and architecture strategies that maintain and enhance the unique character of Richmond's residential districts (see Goals 3–4).
- b. Implement transportation strategies that increase access among residential areas, Nodes, Priority Neighborhoods, and corridors (see Goals 6–10).

FUTURE OF SHOPPING CENTERS

In 2020, retail uses in varying forms including big box shopping centers, strip commercial centers, and malls compose approximately 600 acres of the city. As the retail landscape of the country changes with increased online shopping, the future of these commercial centers must be explored. The goals and objectives of Richmond 300 encourage the redevelopment of these centers in a more urban form with less emphasis on parking and more flexibility to incorporate multiple uses. As Richmond 300 is implemented, the future of shopping centers and the tools to revitalize and support these centers must be explored.



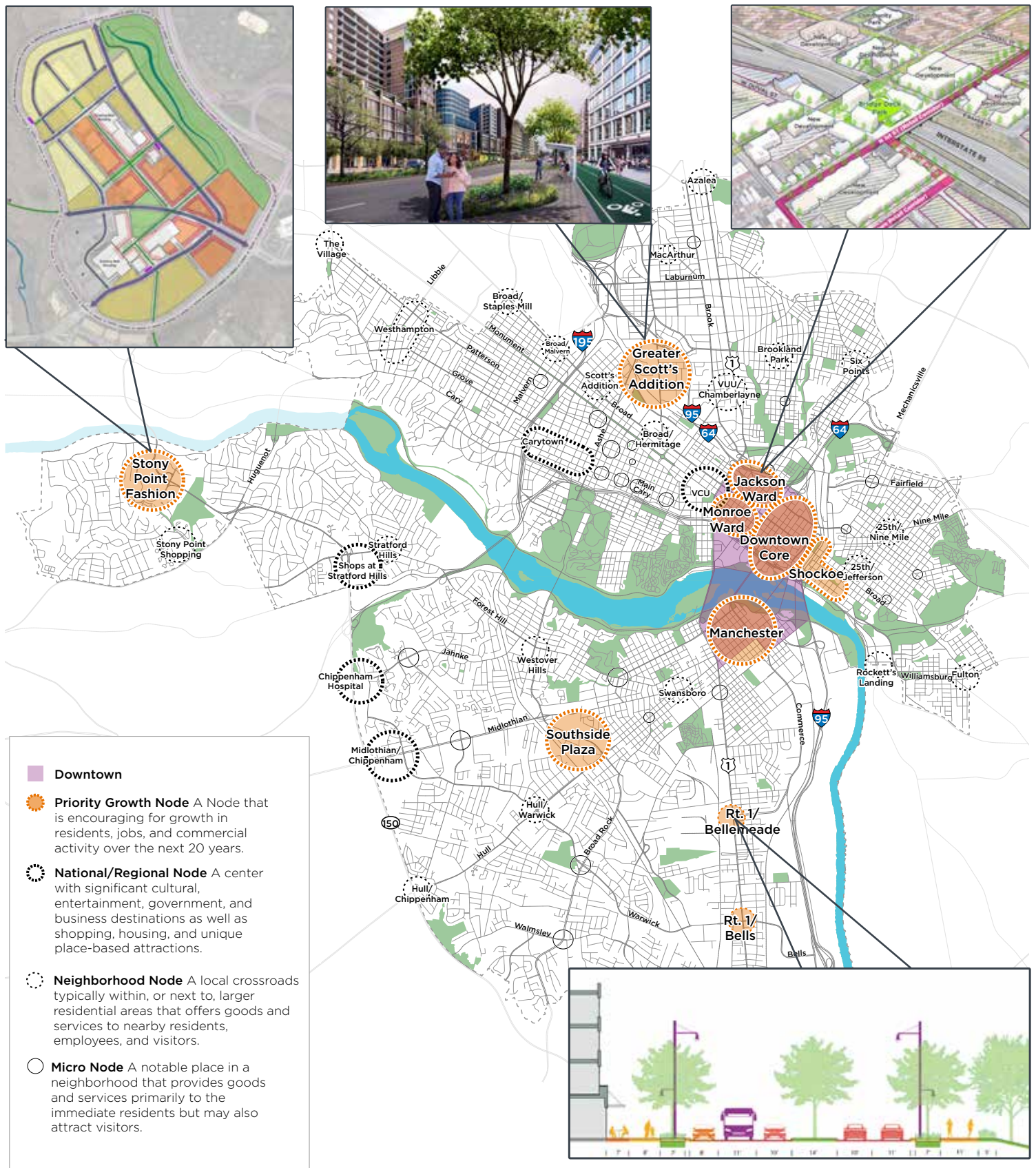


FIGURE 22 // Nodes Map with Illustrations

Nodes in Richmond are of two types: 1) places that can accommodate additional growth in jobs and population or 2) places where major activity exists today and should be preserved/enhanced. Descriptions of the Priority Growth Nodes are found starting on page 26 and descriptions of the other National/Regional Nodes and Neighborhood Nodes are on page C-1.

Goal 2: City-Owned Assets



Efficiently manage City-owned land and facilities

The City of Richmond owns 4,400 acres of land.

The City of Richmond operates a wide range of facilities that serve the public good, providing services to residents both directly and indirectly.

The City owns 4,400 acres of real estate, making it one of the largest landowners in the city, as shown in the hatched shade in Figure 23.

The management of this land is under various City departments and includes:

- 100s of individual facilities, ranging from City Hall to facilities that support various City department functions;
- 21 community centers providing after-school programming, adult continuing education, athletic fields, swimming pools, and other enrichment activities;
- 25 fire stations and support facilities that support the City's Fire Department and provide fire-fighting services to the City's residents and businesses;
- 4 police precincts and support facilities, including five police stations, in order to facilitate public safety and deter crime;
- 8 branch libraries and one main library located throughout the city that provide access to printed and digital resources for all Richmonders; and
- 47 public schools, including 27 elementary schools, seven middle schools, eight high schools, and several specialty schools.

The Capital Improvement Budget must align with the Master Plan.

There is limited funding to maintain the City's existing facilities and to build new facilities; however, the City's Biennial Capital Improvement Budget outlines priorities for incrementally addressing facility needs.

Per the City Charter, the Capital Improvement Budget must align with the Master Plan. Since 2001, when the last city-wide Master Plan was adopted, the City has completed many projects, including the renovation of all eight library branches, the construction of four new schools, the exterior re-cladding of City Hall, the construction of a new Justice Center, and countless other projects. Given that many of the City's facilities are over 50 years old, new facility needs will continue to arise. Furthermore, as the population shifts, the City must incrementally adjust services to serve the changing geography of its residents and businesses.

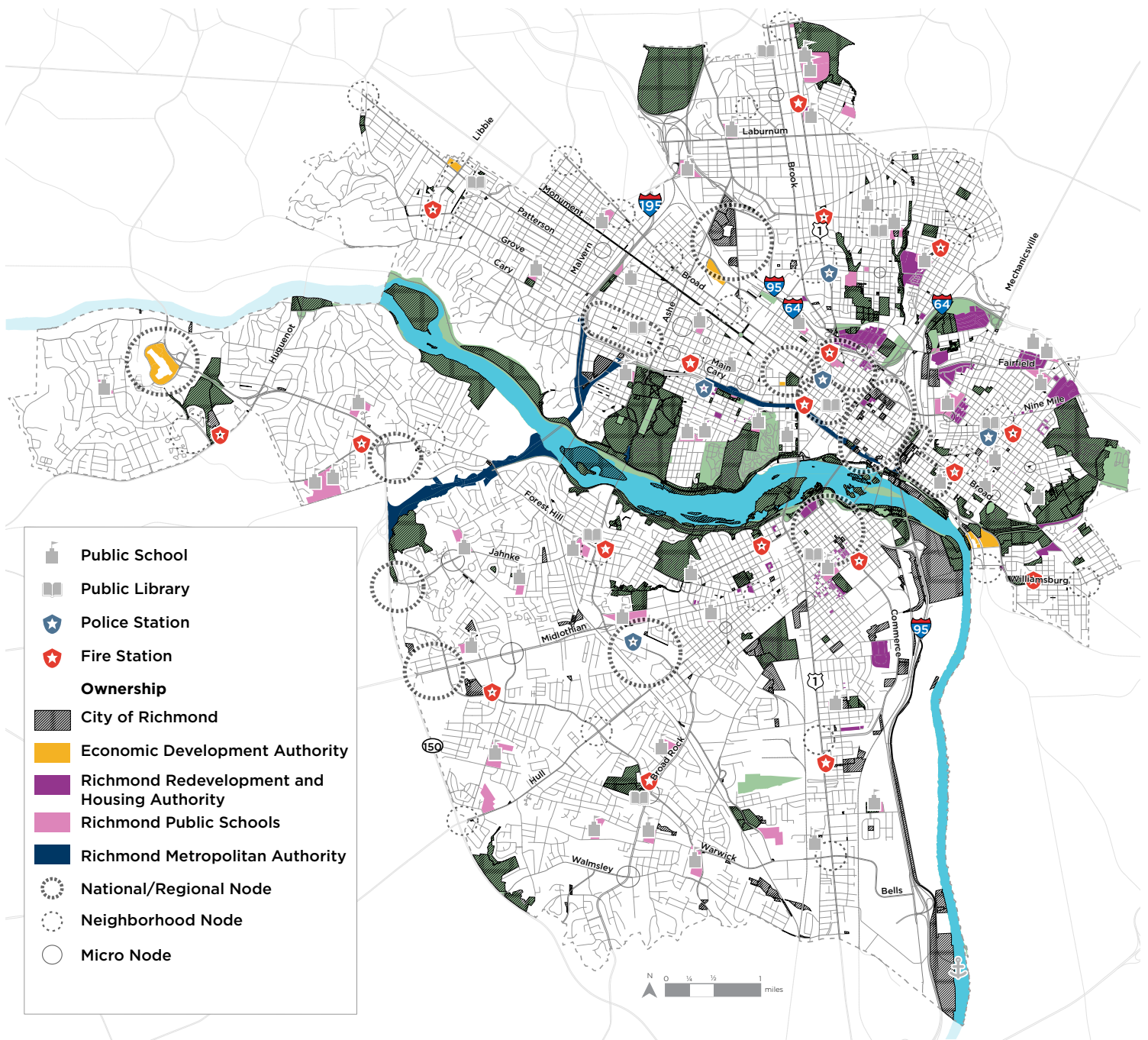


FIGURE 23 // City Buildings, City-Owned Land, and Other Key Ownership

Objective 2.1

Align new facilities and improve existing City-owned facilities with the Future Land Use Plan.

- a. Develop and maintain a facility assessment inventory of all City-owned facilities to track the longevity and maintenance of major systems (building envelope, plumbing, security, HVAC, roof, etc.) and plan for repair and replacement.
- b. Analyze police precincts and fire stations within the context of the Future Land Use Plan and determine whether there are needs for creating, relocating, and/or closing police and fire stations to align with population projections and meet minimum response times.
- c. Develop a schools facility master plan based within the context of the Future Land Use Plan to determine whether there are needs for creating, relocating, and/or closing schools to align with population projections.
- d. Finish implementing the Libraries Master Plan by renovating the Main Library, and then explore creating a new Libraries Master Plan to plan facilities improvements for the next generation of library users and incorporating other community-serving services.
- e. Develop a parks and community facilities master plan based within the context of the Future Land Use Plan that seeks to ensure all Richmonders live within a 10-minute walk of a park (see Goal 17).
- f. Implement programs to improve the energy efficiency of City-owned buildings (see strategies in Thriving Environment).

Objective 2.2:

Create a real estate acquisition and disposition strategy, prioritizing increasing jobs, housing, access to parks, and other basic needs of low-income and traditionally marginalized communities.

- a. Create and implement a real estate disposition strategy that aligns disposition with helping to reach Richmond 300 goals, and includes redeveloping surplus public facilities, including, but not limited to, school facilities, the Diamond site, and the Coliseum.
- b. Create, implement, and fund a real estate acquisition strategy that includes key reasons for acquiring land, such as, assembling parcels for economic development, open space, and public facilities.

Objective 2.3:

Plan for expansion and improvement of utilities to support housing and employment centers.

- a. During the creation of Small Area Plans and other planning efforts, include staff from the Department of Public Utilities to ensure utility infrastructure plans align with anticipated growth in housing and/or employment areas (Goal 1).
- b. Implement energy retrofits and other energy initiatives in the Clean Air Goal of Richmond 300 to reduce greenhouse gas emissions and energy consumption (Goal 15).
- c. Implement green infrastructure measures and other measures outlined in RVA H2O Plan and in the Clean Water Goal of Richmond 300 to improve water quality and reduce stormwater runoff (Goal 16).
- d. Improve communications infrastructure by expanding broadband internet access, focusing on low-income areas (Goal 11).

Goal 3: Historic Preservation



Support growth that preserves the historical urban fabric and enhances understanding of Richmond's multi-faceted past.

Existing Context

One-third of Richmond's real estate is located within a historic district.

Historic preservation not only saves historic buildings, but also helps protect authentic and unique neighborhoods, which are highly valued by Richmond residents and also serve as great tourist attractions and economic development assets. Approximately 25,000 properties in the city are located in either a City Old & Historic District or a National Register Historic District, representing one-third of all city real estate, as shown in Figure 24.

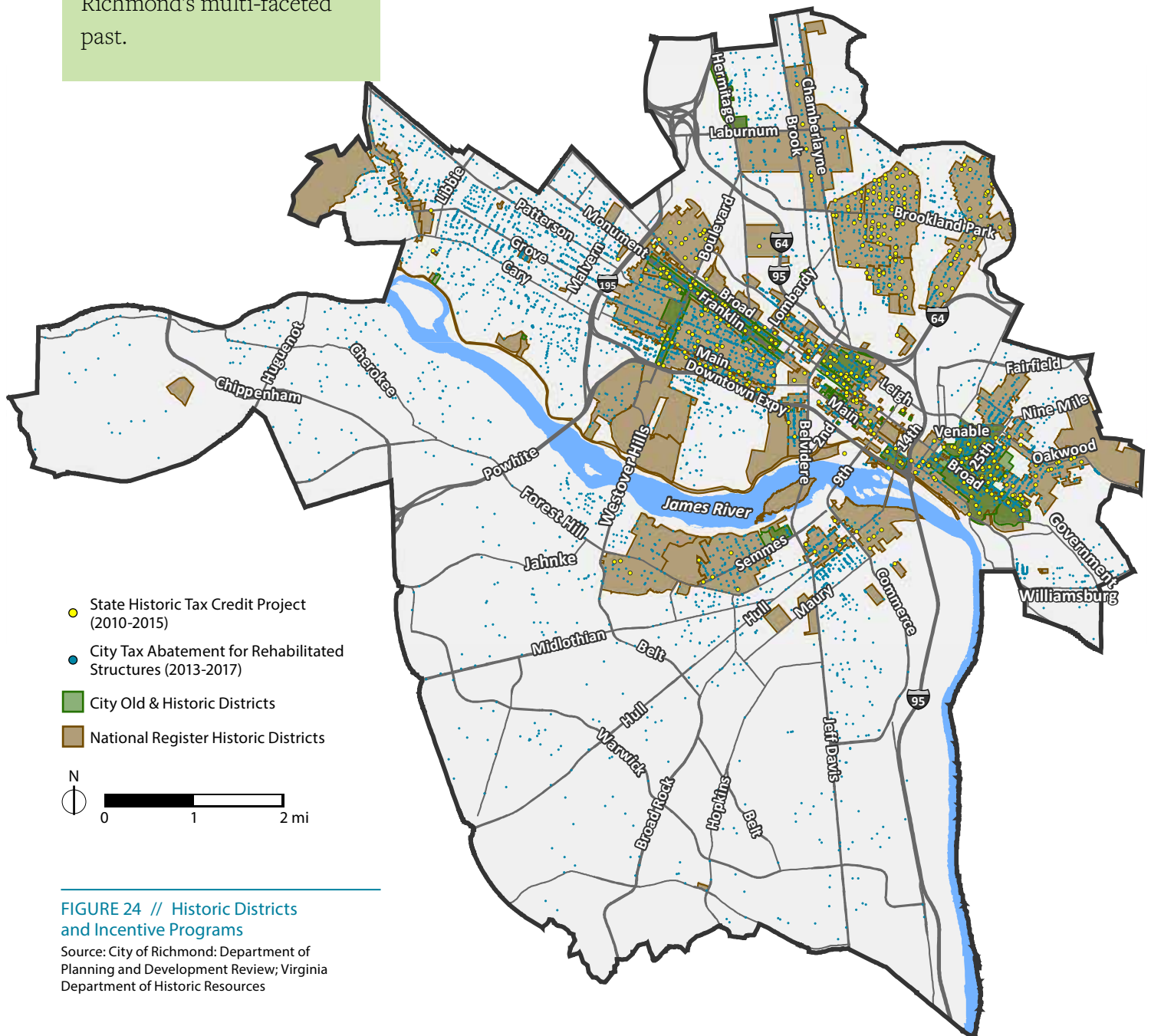


FIGURE 24 // Historic Districts and Incentive Programs

Source: City of Richmond: Department of Planning and Development Review; Virginia Department of Historic Resources

City Old & Historic Districts preserve the physical appearance of structures.

City Old & Historic Districts preserve historic neighborhoods by requiring exterior modifications, new construction, and additions to be reviewed by the Commission of Architectural Review (CAR). These local historic districts, first established in 1957, are among the earliest local districts in the country. In total, 45 such districts exist in the city, with approximately 4,500 properties, representing about 6% of all city parcels. Staff from PDR facilitate the review and approval of thousands of changes to properties in these districts over the years.

National Register Historic Districts provide property owners the opportunity to access tax credits to rehabilitate their property.

National Register Historic Districts are not directly managed by the City and do not place any requirements on property owners whose land is located within them. These districts are designated by the Virginia Department of Historic Resources and managed by the U.S. National Park Service (NPS). Properties located in these districts are eligible for state and federal tax credits, which encourage the rehabilitation of historic structures. The use of historic tax credits has accelerated significant redevelopment and rehabilitation throughout Richmond's historic neighborhoods. There are 135 such districts throughout the city. National Register Historic Districts are purely honorific and do not offer any protections to properties located within their boundaries, except when state or federal funds are involved, leaving much of Richmond's historical fabric vulnerable to development pressures.

Historic landscapes, especially historic cemeteries are often overlooked in the preservation process. The city has at least 15 historic cemeteries, containing nearly 700 acres. Some are privately owned, like Hollywood, while others, like Oakwood, are owned and operated by the City of Richmond. Richmond's historic Black cemeteries have not fared well, suffering from neglect and abandonment to nearly complete destruction. There are a number of small cemeteries, especially in south Richmond, that have long been abandoned that are uncovered during development and are not properly documented or dealt with. Cemeteries provide access to greenspace, nature, history, and genealogy. Although Richmond values its history and historic neighborhoods, it has never had a comprehensive process for



Top: Cary Street in Shockoe Slip
Bottom: Homes in the Fan

identifying, evaluating, and protecting historic buildings, neighborhoods, and landscapes, especially historically Black communities and cemeteries.

87% of the city's buildings were built prior to 1987. In 2037, buildings that were built prior to 1987 will be at least 50 years old, which is the current NPS eligibility threshold for establishing historic districts, as shown in Figure 25. Given that in 2020, 80 percent of the city's buildings are over 50 years old, in 2037 the city will have even more old buildings. Not all the old buildings are well-built or of historical value,

however, as the city changes over the next 20 years, planners, developers, and the general public will want to ensure that Richmond's residents have high-quality structures in which to live, work, and play.

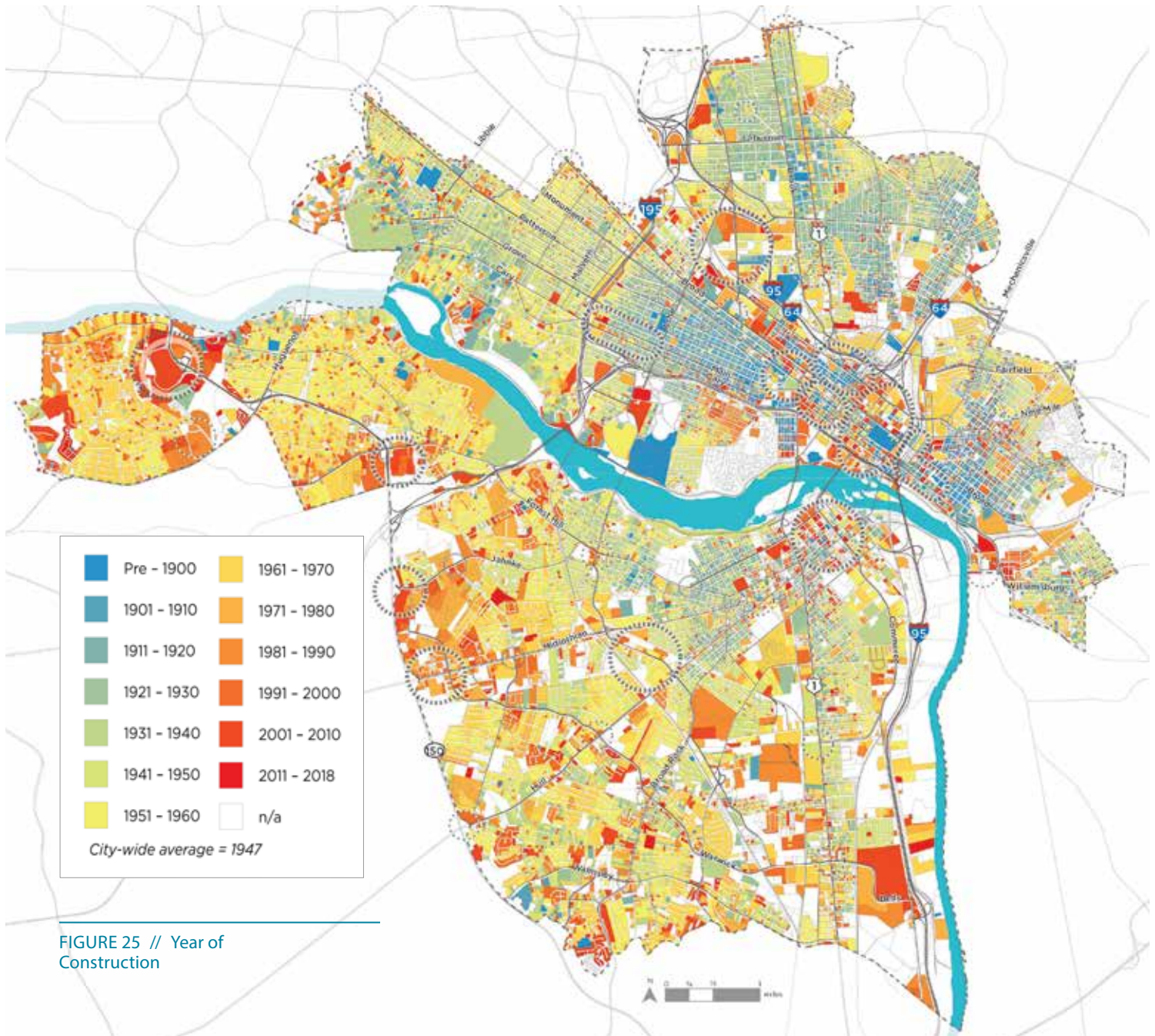


FIGURE 25 // Year of Construction

Objective 3.1

Preserve culturally, historically, and architecturally significant buildings, sites, structures, neighborhoods, cemeteries, and landscapes that contribute to Richmond's authenticity.

- a. Develop and regularly update a city-wide preservation plan to establish near- and long-term preservation priorities and to identify proactive and innovative strategies to protect the character, quality, and history of the city.
- b. Identify partnerships and funding sources for the identification, protection, preservation, and if needed acquisition of abandoned and neglected cemeteries, especially Black cemeteries
- c. Complete and maintain a historic resources inventory that is current, comprehensive, and cost-effective.
- d. Identify areas of the city where we should restore and maintain historic paving, while also balancing the access needs of all users.
- e. Review and revise the CAR's Guidelines to improve the clarity and usability and regularly update the Guidelines to respond to new technologies and market demand.
- f. Develop stronger code enforcement tools for violations in City Old & Historic Districts.
- g. Utilize the city historic resources inventory, and identify additional districts for varying levels of protections.
- h. Establish controls to ensure that archaeological sites and subsurface materials are properly identified, evaluated, and mitigated. This should include proactive measures to prevent disturbance and potential destruction.
- i. Utilize historic preservation best practices for City-owned resources to prioritize preservation and reuse activity more heavily than new construction or demolition of historically and culturally significant resources.
- j. Evaluate the City's tax abatement program to incentivize preservation best practices, energy efficiency, and projects providing affordable housing.



Renovating historic buildings helps retain a place's authenticity and character while also sometimes honoring specific individuals or events that happened in the past. Adaptive reuse projects can be found throughout Richmond and have included turning a car dealership into an office/apartment building [top], a cookie factory into condominiums [middle], and a carriage house into a church and then into apartments [bottom].

- k. Lobby the General Assembly to maintain historic rehabilitation tax credits and adopt other legislation that improves the quality and character of Richmond's neighborhoods.
- l. Establish viewshed protections to protect/enhance views of critical natural features, such as the Libby Hill looking down river.

Objective 3.2

Reduce the demolition of historical buildings.

- a. Create flexibility in the Zoning Ordinance to encourage the adaptive reuse of historical buildings and deter demolition, such as allowing for compatible densities and uses in historical areas (e.g., reduce parking requirements for historical institutional buildings that are changing uses).
- b. Increase property maintenance code enforcement as a proactive tool to prevent demolition by neglect.
- c. Re-evaluate, fund, and utilize the City's Spot Blight property acquisition process, and prioritize disposition to non-profit housing developers and/or the Land Bank.
- d. Re-evaluate and utilize the City's demolition by neglect ordinance to preserve "at risk" resources.
- e. Increase funding for the Spot Blight acquisition program and explore additional programs to reduce blight.
- f. Develop a city-wide demolition review policy to ensure historic resources are considered before any demolition can proceed.

Objective 3.3

Broaden the constituency for historic preservation by more equally representing, preserving, and sharing the sites related to traditionally under-represented groups (e.g., Native Americans, Blacks).

- a. Increase education and outreach efforts regarding the preservation of neighborhood character and available incentive programs for historic preservation, adaptive reuse, and place-based economic development.
- b. Ensure that historic preservation values and interests are coordinated with economic development groups, affordable housing developers, and advocates and ethnic and cultural groups.
- c. Strengthen programs and partnerships that engage the public in exploring community history and places of significance.
- d. Work with the Richmond Public Library to develop oral history projects.
- e. Pursue public and private partnerships to fund the preservation of significant sites.

ADAPTIVE REUSE OF INSTITUTIONAL BUILDINGS

In 2020, over 150 religious institutions were located in Richmond. These institutions own over 470 acres of land, which include religious buildings, parking lots, and vacant land. Several institutions are major property owners within communities throughout the city. As congregations decrease in size, religious institutions have sought to sell their buildings and properties. This has resulted in the adaptive reuse of churches as residential buildings and new construction occurring on vacant lots and parking lots owned by religious institutions. As Richmond 300 is implemented, religious institutions and the future owners of formerly-religious buildings should work closely with PDR staff as they plan for the adaptive reuse of these unique buildings, which are often signature buildings in the community and can be challenging to retrofit for new uses.

Goal 4: Urban Design



Establish a distinctive city comprising architecturally significant buildings connected by a network of walkable urban streets and open spaces to support an engaging built environment.

Existing Context

Quality urban design is what makes a place feel like true neighborhood, not just a collection of buildings.

Urban design refers to how the built environment looks and feels, how buildings relate to one another, and how the “public realm” (streets, sidewalks, parks, etc.) enables such uses to function. Richmond has a wide variety of urban design, ranging from historic single-family neighborhoods to new Downtown high-rises.

Half of Richmonders live in streetcar suburbs or post-war suburbs. Historic urban neighborhoods and post-industrial neighborhoods have grown the most since 2000.

In preparation for Richmond 300, the Center for Urban and Regional Analysis at VCU completed an examination of the city's “urban design typologies,” which classifies city neighborhoods into eleven typologies, as shown in Figure 26. Two main trends emerge when looking at Richmond’s population in regard to these typologies. First, nearly half of all Richmond residents live in either a streetcar neighborhood (older suburbs that were originally served by the Richmond streetcar system) or a post-war suburb (car-dependent neighborhoods built after World War II). The second main takeaway is that the typologies that have seen the most population growth since 2010 are downtown, post-industrial neighborhoods (e.g., Scott’s Addition), and historic urban neighborhoods (e.g., the Fan, Church Hill, Union Hill).



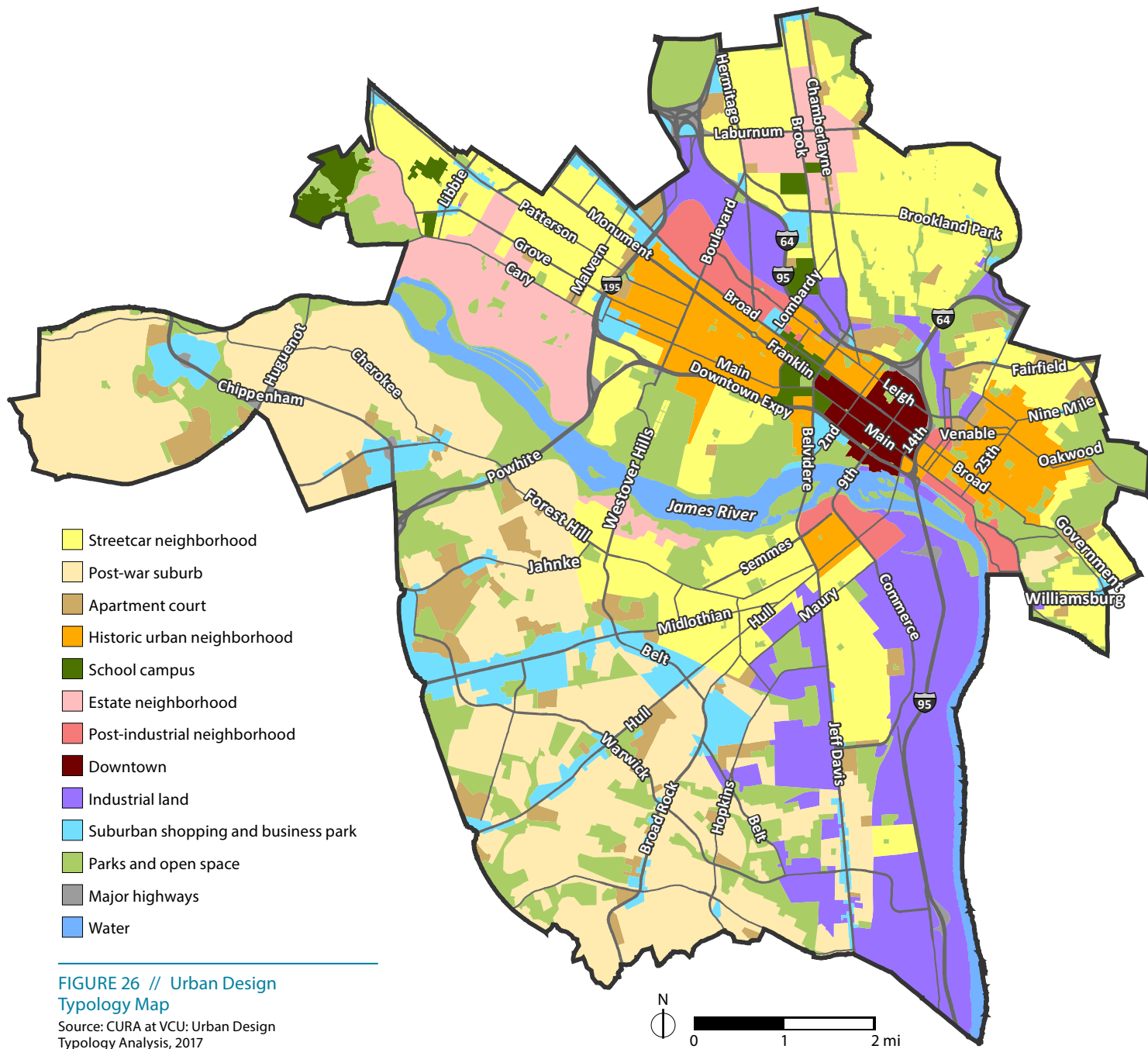
Streetcar neighborhood



Post-war suburb



Apartment court



Historic urban neighborhood



Estate neighborhood



Post-industrial neighborhood

Homebuyers are increasingly drawn to walkable urban neighborhoods. Across the country, individuals are seeking neighborhoods that embody walkable urbanism, whether they are historic neighborhoods that are reemerging, such as the Fan and Church Hill, or new urbanist neighborhoods, such as Libbie Mill in Henrico. Walkable urbanism describes places that are overall less-reliant on the automobile and feature non-residential destinations within a short walk, bike ride, or transit trip. While auto-oriented residential neighborhoods continue to flourish in and around the city, newer neighborhoods that are closer to the city's core have been built with greater focus on the pedestrian experience. The City has sought to encourage this trend by eliminating parking minimums, removing parking lots as a principal use in several zoning districts, and requiring sidewalks and other amenities, such as street trees, with new developments.

“Good urban design doesn’t solve everything but bad urban design doesn’t solve anything.”

—Mark A. Olinger, Director,
Department of Planning
and Development Review,
City of Richmond



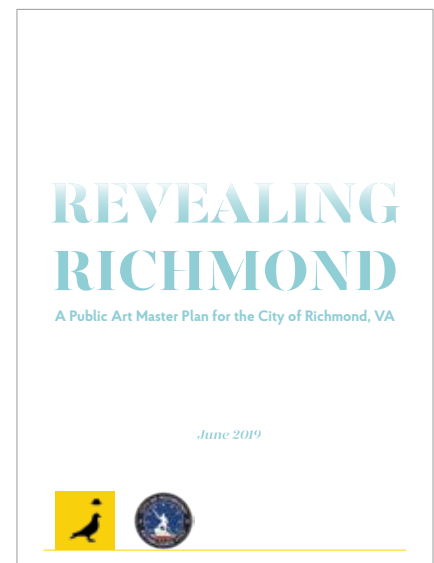
Homes in Northside [top] and Oregon Hill [bottom].

75% of Richmonders live within a 10-minute walk of a public park. Public parks serve a vital role to the health and well-being of Richmond's residents and its environment. As more residents live closer to the city's center in either multi-family apartment buildings or in houses with very small yards, greater importance has been given to the City's public parks system. The City's nearly 3,000 acres of parkland include pocket parks nestled in the Fan and regional attractions such as the James River Park System and Byrd Park.

From 2010 to 2020, the City improved several parks and plazas and constructed new ones, such as the Maggie L. Walker Plaza, Kanawha Plaza, Monroe Park, and the improvements to the Riverfront, including the T. Tyler Potterfield Memorial Bridge. Having a park within walking distance of every resident of the city is a Big Move of Richmond 300. Currently, about three-quarters of Richmonders live within a 10-minute walk of a public park. Large areas of the city are not within a 10-minute walk of a park, especially in the areas of South Richmond that were annexed from Chesterfield County in 1942 and 1970.

Public art is critical to showcase a place's uniqueness, culture, and history.

Richmond has a Percent for Art Ordinance that requires large capital improvement projects to allocate 1% of the budget to a public art fund that is administered by the Public Art Commission. The Public Art Commission completed a Public Art Master Plan in 2018, which guides the City's investments in public art. Recent public art projects include the Maggie L. Walker statue, the rings at the foot of the T. Tyler Potterfield Memorial Bridge, and the medallion at the Hull Street Courthouse. Future public art projects and improved streetscapes in all parts of the city set the tone for high-quality development and create pride for residents as they look forward to the future prosperity of their neighborhood and their personal household.

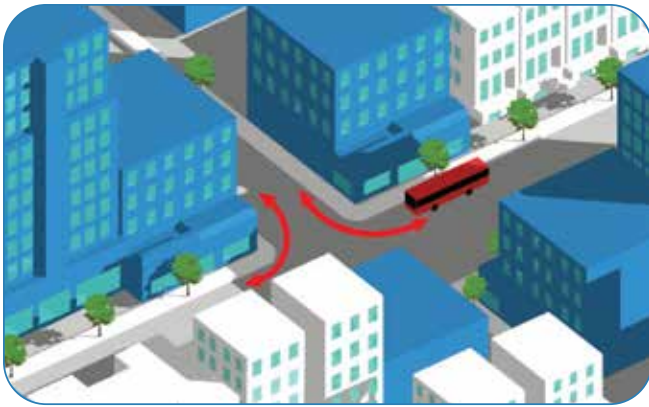


Relaxing at Byrd Park [left]. In 2018, City Council and City Planning Commission adopted the Public Art Master Plan [right] as part of the City's Master Plan. The Public Art Master Plan provides a 10-year vision to guide the City's investments in Public Art.

Objective 4.1

Create and preserve high-quality, distinctive, and well-designed neighborhoods and Nodes throughout the city.

- a. Develop zoning districts that support protect and enhance neighborhood character, especially in areas that are not protected by City Old & Historic Districts.
- b. Allow and encourage a variety of architectural styles.
- c. On development sites that encompass most of a city block or block frontage, require multiple buildings and/or façade articulation to increase visual interest, require massing that is responsive to the human-scale, and consider pedestrian through-block connections through existing super blocks to establish a street grid.
- d. Require sites with frontage on Great Streets to meet special design guidelines, such as burying power lines and the six design elements outlined in the Pulse Corridor Plan, to ensure the buildings enhance and support the Great Street.
- e. Encourage development that respects and preserves the natural features of the site through sensitive site design, avoids substantial changes to the topography, and minimizes property damage and environmental degradation resulting from disturbance of natural systems.
- f. Ensure that building materials are durable, sustainable, and create a lasting addition to the built environment, and provide maximum adaptability for environmental change, change of use, and efficiency.
- g. Require the screening of utilities, communication, transformers, and other service connections to buildings.
- h. Require adequate distribution of windows and architectural features in order to create visual interest.
- i. Encourage design approaches that support creative solutions for transitions among varying intensities of building types and land uses.
- j. Apply design standards, guidance, and regulation consistently across the city regardless of market conditions or rent structure of development.
- k. Promote an attractive environment by minimizing visual clutter and confusion caused by a proliferation of signage, ensuring that public and private signage is appropriately scaled to the pedestrian experience.
- l. Encourage roof lines and upper levels of tall buildings to be articulated with a distinguishable design.
- m. Require the podiums of tall buildings to reflect the human-scale, with design elements and active uses on the ground level.
- n. Prohibit driveways for new small-scale residential buildings on blocks that have alley access.
- o. Increase building permeability by requiring new buildings to have functioning entrances from the sidewalk and restricting blank walls at ground level.
- p. Encourage building placement and massing design that reduces the heat island effect by varying building heights in neighborhoods to increase airflow.
- q. Expand the City's façade improvement program.



Hold the Corner



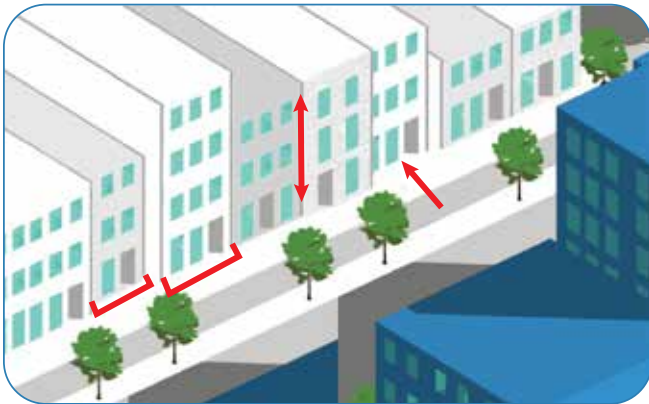
Appropriate Setbacks/Stepbacks



Entrances Face the Street



Transparency



Façade Articulation



Screened Parking/Services

Pulse Corridor Plan of Development Overlay Form Elements. Under the Pulse Corridor Plan of Development Overlay, developers must make considerations to each of the six elements in site plan design, which are key in creating an engaging pedestrian environment.

Objective 4.2

Integrate public art into the built environment to acknowledge Richmond's unique history and neighborhood identity, and engage the creative community, focusing public art efforts in areas that do not have public art today.

- a. Develop public art projects within Nodes and Priority Neighborhoods to elevate the place's unique character through creative placemaking.
- b. Utilize public art projects to preserve the cultural heritage of places, prioritizing areas that are experiencing major changes in demographics and development.
- c. Link public art with major public facility initiatives (e.g., plazas, buildings, parks, bridges) and expand the definition of public art to include architectural embellishments of buildings, or landscape features.
- d. Encourage outdoor art features on private land and buildings as part of a city-building aesthetic.
- e. Implement the Public Art Master Plan.

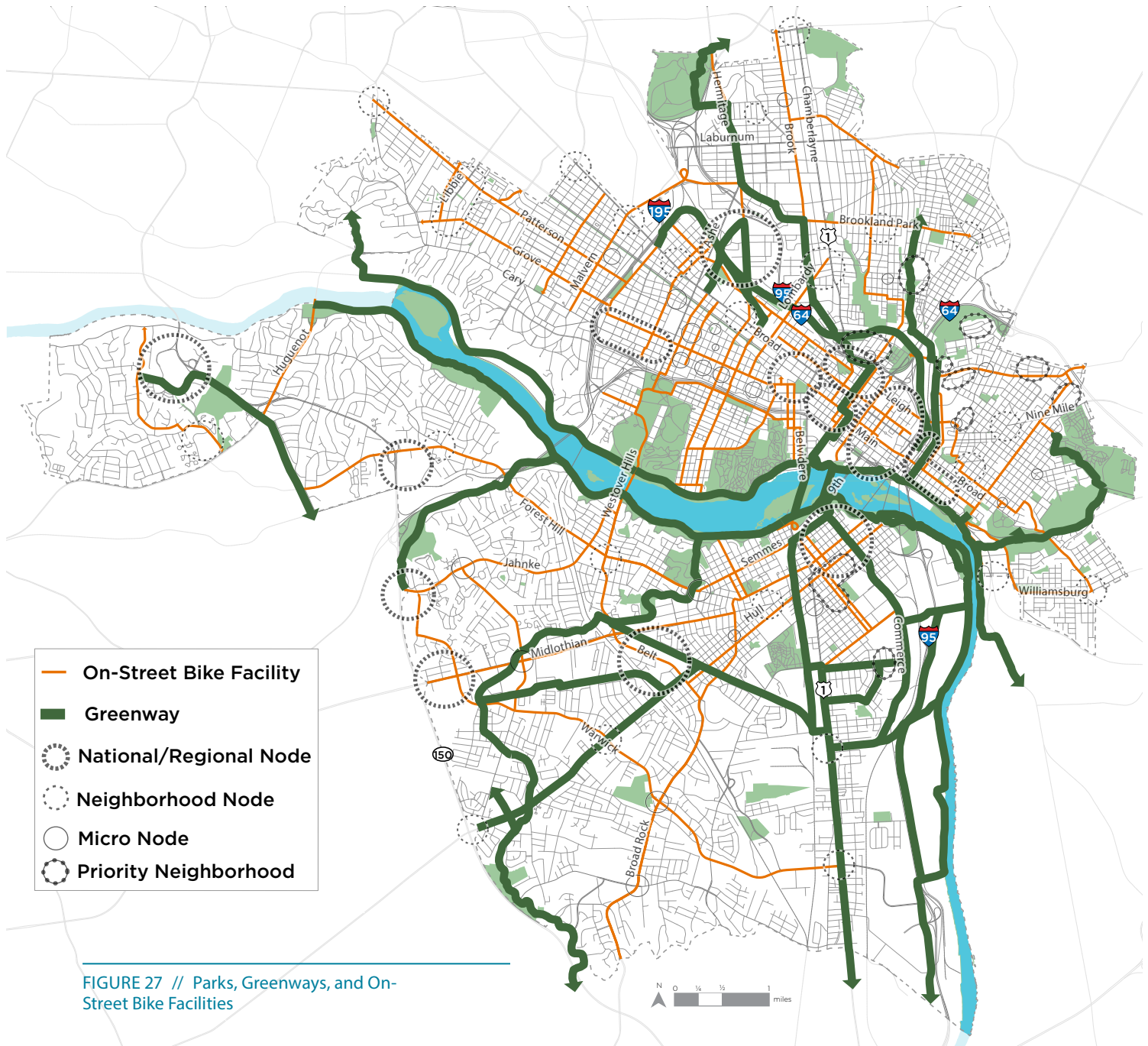


Public art can include traditional statues, such as the Maggie L. Walker statue and plaza, which were unveiled in 2017 [top], and also architectural embellishments as shown on Main Street Station [bottom].

Objective 4.3

Increase neighborhood access to, and through, a well-designed network of open spaces.

- Develop a Park Master Plan providing all Richmonders access to a quality public park within a 10-minute walk of their home, as shown in Figure 27 (see Goal 2 and Goal 17).
 - Integrate natural features, history, culture, and art to enhance public open spaces throughout the city.
- Revise the Zoning Ordinance to change the definition of open space to require private land owners to include usable open space, small parks, playgrounds, green roofs, courtyards, etc. in their developments and link the open spaces to the city-wide open space network.
 - Protect and restore natural resources (see Goals 15–17).
 - Utilize conservation easements to expand the open space network (see Goals 15–17).



- f. Require any new development along the river and canals to provide for public access and activated ground levels (see Goal 2 and Goal 15).
- g. Provide for the continuing maintenance of common open space; provision may include joint ownership by all residents in a homeowners association, donation of open space or conservation easements to a land trust or government entity, or other measures.
- h. Reserve appropriate riverfront and canal-facing sites for public amenities and river-related development such as boating services, picnics, etc.
- i. Work with other stakeholders to improve, restore, and maintain the historical canal system (see Goals 6–10).
- j. Implement the Richmond Riverfront Plan and the James River Park Master Plan.
- k. Encourage the creation of a balance of natural rather than hard landscape in creating and improving parks.

Objective 4.4

Increase Richmond's walkability along all streets.

- a. Develop city-wide public realm standards to include shade trees, bike parking, bike share, signage, public art, screened parking, street furniture, pedestrian-level lighting, and other elements in the public right-of-way that enhance walkability.
- b. Strengthen the streetscape connections by installing pedestrian infrastructure such as sidewalks, crosswalks, pathway, and trails where such infrastructure is missing.
- c. Bury utilities underground along all Great Streets and bury utilities underground where possible on all other streets.



The Fan is a very walkable neighborhood because it has sidewalks, street trees, homes and businesses with windows, doors, and porches, and other elements that create a pleasant walking environment.

Goal 5: Planning Engagement



Foster a planning engagement culture that effectively and equitably builds people's capacity to organize to improve the city and their neighborhoods.

Existing Context

Engagement between the City and the community is essential to ensure that the public's needs are being met and that their vision for the city is being fulfilled.

PDR values the input of residents, businesses, and property owners to help guide the development of plans that will affect the future of neighborhoods and the city-at-large. The department notifies property owners directly when there are projects being considered by public bodies that are within proximity to their property. The boards and commissions that are managed by PDR staff, which notify property owners and/or civic associations, include City Planning Commission, Board of Zoning Appeals, Commission of Architectural Review, and Urban Design Committee.

Currently, 130 civic associations are listed on the City's official Civic Association website.

PDR reaches out to local civic groups as part of the overall planning process, and in regard to specific projects. These groups have defined boundaries, which range from a single neighborhood to a collection of neighborhoods covering large areas of the city. The City does not directly manage these groups or their boundaries, which has resulted in many overlapping boundaries by multiple groups, and also areas of the city, particularly South Richmond, that have no formally established civic associations. During the implementation of Richmond 300, great potential exists to strengthen the bond between City and resident through the continuing public engagement process. This can be done by educating community members on the importance of their involvement in the planning process and including those that have been traditionally under-represented in the process.



Public engagement takes many forms, which may include office hours in community businesses [left] or large public meetings [right], two types of meetings held during the Richmond 300 planning process.

Objective 5.1

Increase public knowledge of planning processes and continuously engage civic associations, special interest groups, and traditionally under-represented groups in the planning process.

- a. Create a Richmond planning knowledge program administered by PDR for everyday Richmonders to learn about the planning process and understand how their voices can be incorporated into the planning decision-making processes, such as special use permits, rezonings, City Old & Historic Districts, and other planning regulations.
- b. Issue an annual Richmond 300 report that tracks how the City is implementing Richmond 300 strategies.
- c. Host annual events about Richmond 300 to ensure Richmond's existing and new residents are aware of the visions, goals, objectives, and strategies outlined in the plan.
- d. Maintain and share the Civic Association database with city residents and City staff.
- e. Create a process to officially register civic associations with the City, eliminate overlapping boundaries, and assist in establishing civic associations where none exist.
- f. Review and update Richmond's Guide to Neighborhood Associations.
- g. Develop a set of unique and targeted engagement methods, beyond conventional surveys and town halls, to engage traditionally under-represented groups in the planning process.

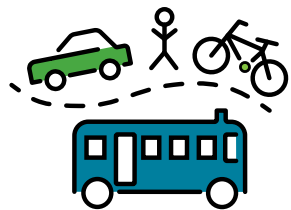
Objective 5.2

Engage City staff, appointed commissioners, and elected officials in the planning process.

- a. Develop on-boarding training materials about Richmond 300 for Human Resources to share with new City employees.
- b. Present the Richmond 300 annual report at the City Council's Organizational Development Standing Committee and other relevant commissions and committees to continue to educate new and existing council members and commissioners about Richmond 300.



Richmond 300 retreat with the City Planning Commission [top]. Community members provide their Big Ideas for South Richmond during Community Consultation #1

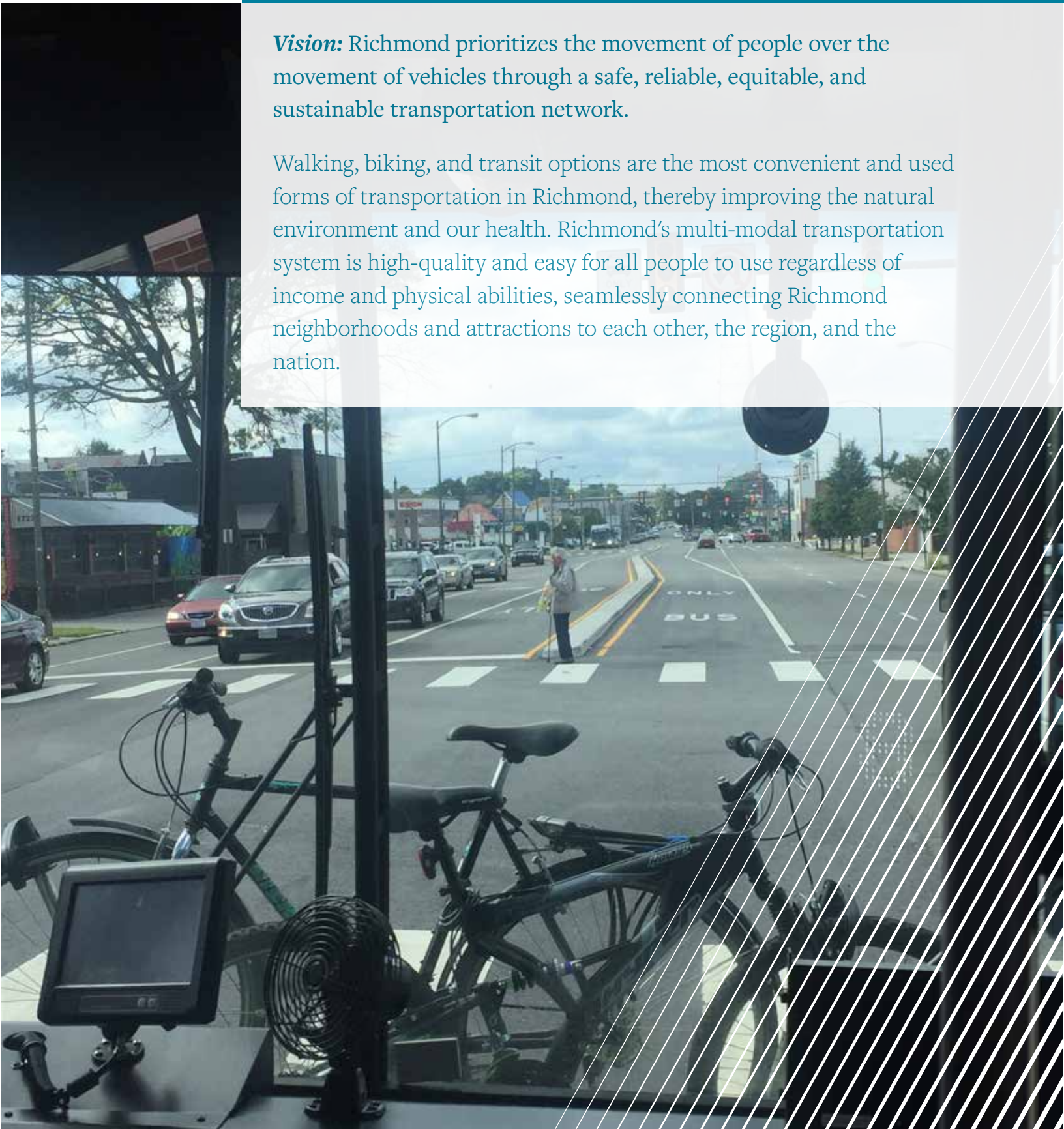


CHAPTER 3

Equitable Transportation

Vision: Richmond prioritizes the movement of people over the movement of vehicles through a safe, reliable, equitable, and sustainable transportation network.

Walking, biking, and transit options are the most convenient and used forms of transportation in Richmond, thereby improving the natural environment and our health. Richmond's multi-modal transportation system is high-quality and easy for all people to use regardless of income and physical abilities, seamlessly connecting Richmond neighborhoods and attractions to each other, the region, and the nation.



Goals, Objectives, and Strategies

Goal 6: Land Use and Transportation Planning



Align future land use and transportation planning to support a sustainable and resilient city.

Existing Context

Creating excellent places is paramount. Historically, across the United States, transportation investments have prioritized the movement of people from one place to another as safely and quickly as possible, which has resulted in an exclusive focus on designing roads and less attention on designing excellent destinations. Richmond 300 focuses on creating high-quality places with features and amenities. Goal 6 of Richmond 300 is critical to ensuring transportation projects do not singularly focus on moving people expeditiously, but instead prioritize creating great places for people that are supported by well-designed transportation networks because, ultimately, the place matters more than how fast people got there.

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In the planning and design of cities, far more attention must go toward serving the needs and aspirations of people and the creation of great places as opposed to expediting movement.

—Robert Cervero, et al., *Beyond Mobility*

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Objective 6.1

Increase the number of residents and jobs at Nodes, Priority Neighborhoods, and along enhanced transit corridors in a land development pattern that prioritizes multi-modal transportation options.

- a. Rezone the city in accordance with the Future Land Use Plan (see Goal 1).
- b. Develop housing at all income levels in and near Nodes, Priority Neighborhoods, and along major corridors (see strategies Goal 14).
- c. Support the retention, creation, and attraction of businesses in and near Nodes, Priority Neighborhoods, and major corridors (see strategies in Goal 11).
- d. Encourage collaboration across PDR, the Department of Economic Development (DED),
- e. Update the Richmond Connects Plan, in collaboration with PDR, DED, HCD, DPW, GRTC, the Virginia Department of Transportation, PlanRVA, the Richmond Regional Transportation Planning Organization, and the general public, to include a specific project list to develop more multi-modal transportation options in a safe network tied to the Future Land Use Plan.
- f. Develop a network of Great Streets with urban design and multi-modal access that creates beautiful and welcoming corridors throughout the city (see Goal 4).

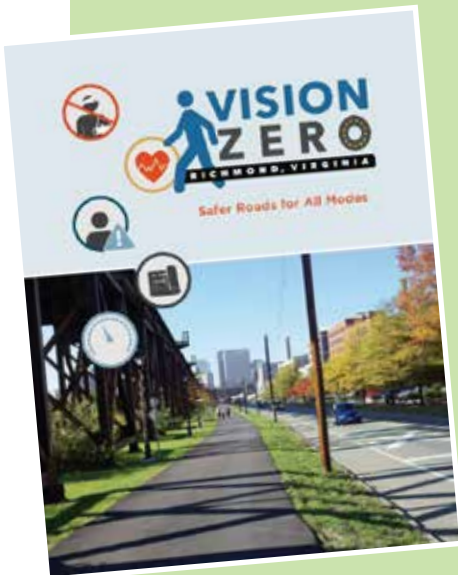


The proposed transformation of N. Arthur Ashe Boulevard near the Diamond accommodates multiple modes of transportation, which in turn support a new series of urban neighborhoods.

Goal 7: Vision Zero



Systemically change the built environment to shift our safety culture and ensure that individuals are not killed or seriously injured on city streets.



Existing Context

Richmond is a Vision Zero city.

Vision Zero emerged in the 1990s in Sweden when the Swedes realized that traditional road safety techniques and programs were never going to significantly reduce or eliminate fatal crashes. The Swedes lobbied their government to implement sweeping reforms to improve the safety of transportation infrastructure to reduce deaths and injuries in traffic crashes to zero. In 2018, the City of Richmond released its Vision Zero Action Plan, which outlines a number of actions and strategies, such as addressing dangerous behavior, designing a safe transportation system for all road users, and developing education and awareness campaigns, to reduce traffic deaths and injuries to zero by 2030.

Traffic deaths and injuries are a continuing problem.

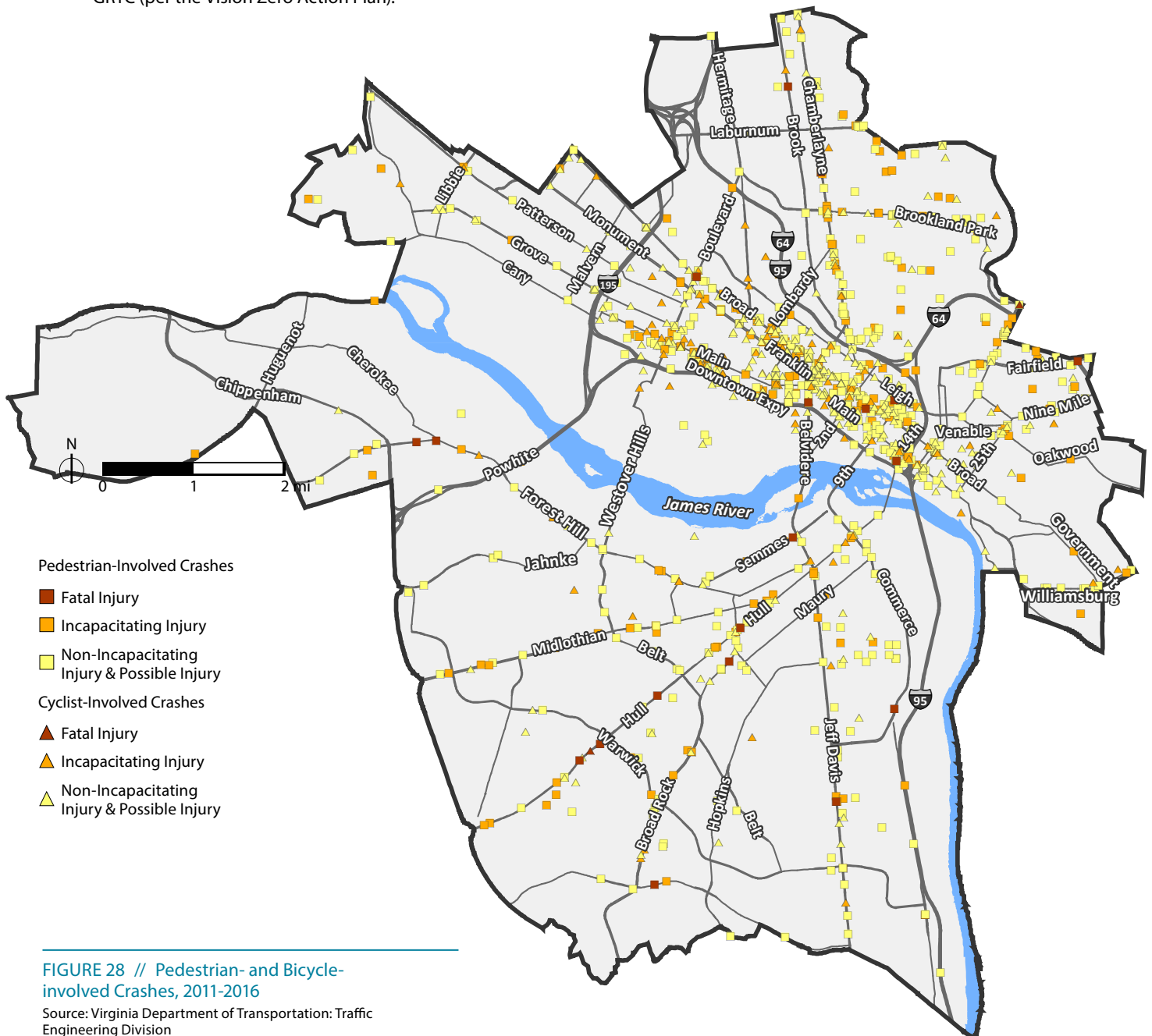
The prevalence of traffic crashes is a health crisis. The top behaviors that lead to injury or death in crashes are not wearing a seatbelt, driving under the influence of alcohol and drugs, distracted driving, and speeding. People walking and biking are the most vulnerable users, 28% of pedestrians involved in traffic crashes are killed. From 2011 through 2016, there were a total of 22 deaths and 313 incapacitating injuries in Richmond involving pedestrians and cyclists, representing 1.9% and 27% of all crashes, respectively. Compare this to traffic crashes involving only vehicles, where during the same time frame there were 56 deaths (0.2% of all vehicle crashes), and 1,062 incapacitating crashes (3.7% of all vehicle crashes). This suggests that a pedestrian or cyclist involved in a crash is 9.8 times more likely to die and 7.4 times more likely to experience an incapacitating injury than a motorist involved in a crash with another motorist. Pedestrian and cyclist deaths rose to a 30-year high in 2018 nationally. While the objectives in Goal 7 of Richmond 300 seek to ensure Vision Zero is upheld in Richmond, there are many objectives in other parts of this Plan that will help the City reach its Vision Zero goal, such as the objectives listed in Goal 6, Goal 8, Goal 9, and Goal 10. Figure 28 shows the locations of pedestrian- and bicycle-involved crashes from 2011 to 2016 in the City of Richmond.

Objective 7.1

Reduce all traffic-related deaths and serious injuries to zero by implementing the Vision Zero Action Plan.

- Prioritize and implement safety treatments on the high-injury street network, especially those aimed to reduce speeding (per the Vision Zero Action Plan).
- Provide safe and Americans with Disabilities Act (ADA)-compliant access to transit stops in the high-injury street network as determined by GRTC (per the Vision Zero Action Plan).

- Conduct engineering surveys to determine the appropriate level of traffic control required for pedestrians to cross at intersections.
- Expand the Safe Routes to Schools program to all schools and conduct formal audits.



Goal 8: Non-Car Network



Enhance walking, biking, and transit infrastructure to provide universal access to all users, prioritizing low-income areas and areas within the high-injury street network.

Existing Context

Richmond has an average Walk Score® of 51.

Walkable neighborhoods can help to make physical activity an inherent part of a resident's day and provide alternative transportation options to vehicles. Richmond's average Walk Score® is 51, or "somewhat walkable," with the most walkable areas being Downtown, Carytown, and VCU, as shown in Figure 29. Walk Score® uses the street grid and proximity to retail, amenities, and attractions to generate the score. Walk Score® does not factor in the quality of the pedestrian environment, as such there may be places in the Walk Score® map that have a high Walk Score® but do not have good pedestrian infrastructure. This goal, along with the High-Quality Places Goals and Thriving Environment Goals, seeks to create a better walkable urban environment throughout Richmond's neighborhoods to increase health equity and resiliency.

50 miles of sidewalk repaired or replaced in last 5 years.

DPW is responsible for maintaining the 836 miles of sidewalks throughout the city, as well as installing new segments of sidewalks where they are missing. Approximately 50 miles of sidewalk have been repaired or replaced from 2015 to 2019 through the Capital Improvement Program, which is funded through a combination of federal, state, and city funds. The City continues to fund sidewalk repair and installation and requires new developments to install sidewalks.

Richmond is investing in bike infrastructure.

During the 20th century, the transportation industry nationwide focused on transport by vehicles. For most of the 21st century, transportation professionals have been working on behalf of all modes, including biking and walking. In 2011, the City hired its first bicycle, pedestrian, and trails coordinator. In 2012, Bike Walk RVA, an advocacy program of the non-profit Sports Backers, dedicated to advocating for the growth of biking and walking in the region, was established. In 2015, DPW developed a Bike Master Plan for the city with extensive community engagement. By the end of 2020, there will be 50 miles of bike lanes in the city, of which about 16 miles are buffered or barrier-separated. An additional 20 miles of bike lanes are designed or under construction. The Virginia Capital Trail was completed in 2015, providing a 52-mile multi-use trail between Richmond and Williamsburg.

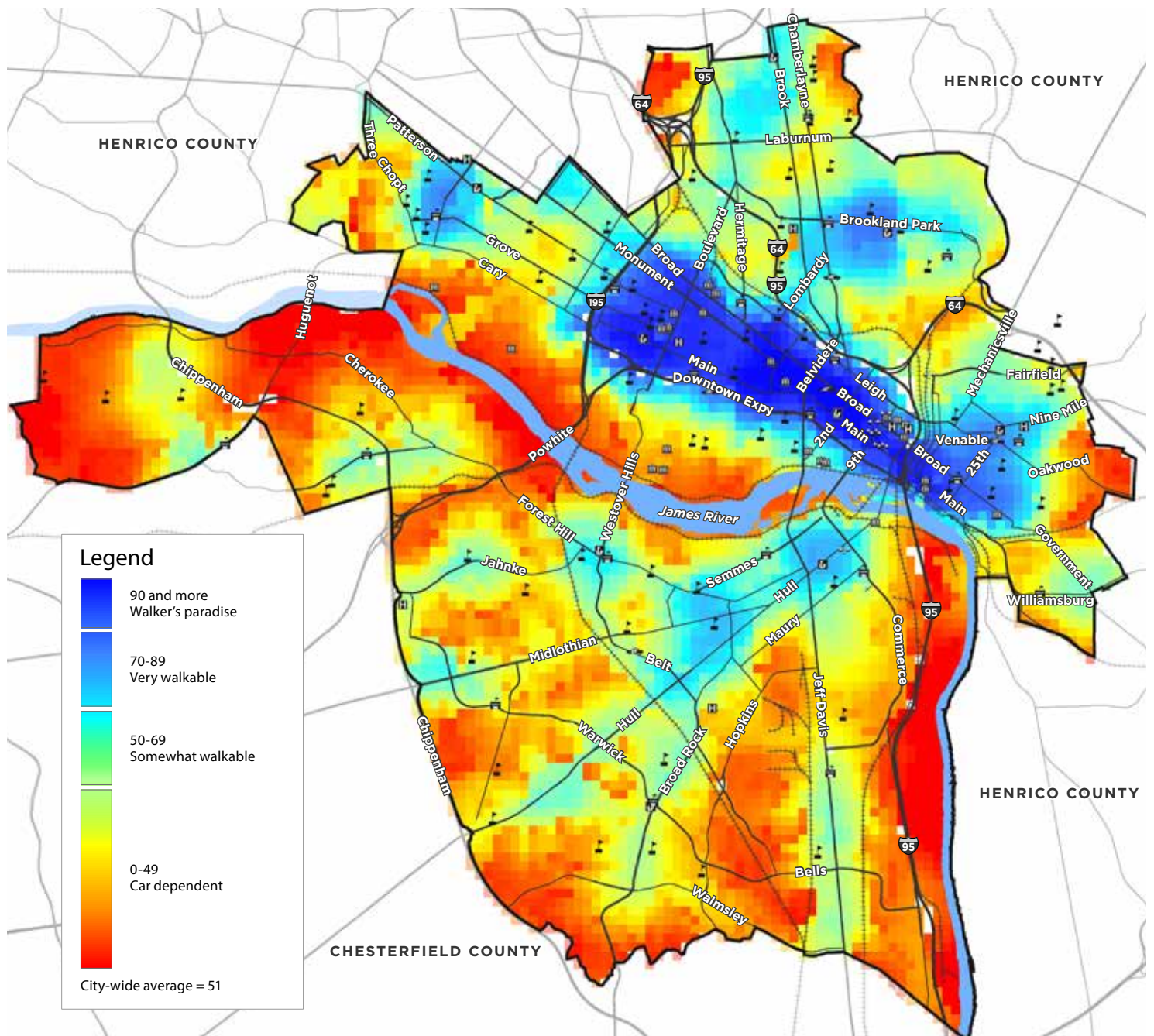


FIGURE 29 // Walk Score® Map

The Walk Score® Map is a tool for showing how close amenities such as businesses, parks, and schools are to a specific place in the city. The city-wide Walk Score® is 51, meaning that on average, the city is somewhat walkable with some errands accomplished on foot, but the majority of errands require a car. This map shows the divide in walkability between areas of Richmond that are north of the James River, which are generally walkable, and the south side of the James River, which are generally car dependent. The re-write of the Zoning Ordinance will seek to improve walkability by creating form requirements and allow more urban mixed-use districts.

Data source: Walk Score® (2016)

Bus ridership is increasing.

Bus ridership has increased since June 2018, when GRTC launched the Pulse BRT and new bus system routing tied to the Pulse, the first time since the 1960s that the bus system has been redesigned. In Fiscal Year 2019 (July 2018 to June 2019), bus ridership increased by 16% compared to FY 2018. Since the launch of the new system, GRTC has been investing in bus shelter improvements and expanding routes outside the city, such as the new routes to Short Pump in Henrico County and along Route 1 in Chesterfield County.

Inter-city train ridership is increasing.

In 2003, Main Street Station re-opened to passenger rail service (passenger rail service had stopped in 1975). The February 2020 ridership statistics from AMTRAK showed a 1.6% increase from FY2019 to FY2020 in on and offs at Main Street Station (compared to Staples Mill Station, which had an increase of 16.26% in the same time period). The difference in ons and offs between the two stations can primarily be attributed to the fact that Main Street Station receives fewer trains than Staples Mill Station, which is the terminus of the Northeast Regional Route that operates between Boston's South Station and Richmond's Staples Mill Station. In 2019, the Virginia Department of Rail and Public Transportation and the U.S. Department of Transportation's Federal Railroad Administration released a Record of Decision outlining the preferred alignment for high-speed rail from DC to Richmond. The preferred alignment calls for creating new high-speed rail stations in the Richmond region at Main Street Station in Richmond and at Staples Mill Station in Henrico.

The objectives listed under Goal 8 of Richmond 300 seek to elevate the prominence of the non-car network and make walking, biking, and taking transit easier, safer, and generally an excellent experience.



Top: Pulse Bus Rapid Transit Stop
Middle: RVA Bike Share Station
Bottom: Bike/Walk Boulevard on Floyd Avenue

Objective 8.1

Improve pedestrian experience by increasing and improving sidewalks and improving pedestrian crossings and streetscapes, prioritizing low-income areas.

- a. Conduct and maintain a sidewalk inventory.
- b. Require developers to construct sidewalks and street trees as part of their development projects (see Goal 4), including single-family infill developments in neighborhoods.
- c. Reduce the creation of driveways and car access curb cuts, especially if there is alley access to the parcel and/or multiple parcels can utilize the same car access curb cut to access their sites.
- d. Construct ADA-compliant sidewalks and street crossing and retrofit existing sidewalks with ADA-compliant ramps, per federal requirements.
- e. Improve street furniture, plant shade trees, and install pedestrian-level lights and other streetscape improvements (see Goal 4).
- f. Consider permanent or temporary street closures and expanding and improving bike-walk streets, which are not entirely closed to cars but use physical infrastructure to slow cars. This could include, but is not limited to, weekend closures of Riverside Drive for bicycle and pedestrian use and/or weekend closures of Cary Street in Carytown for bicycle, pedestrian, and retail use.
- g. Implement strategies to increase connectivity of the street network (see Goal 9).
- h. Implement traffic-calming measures to slow down traffic.



A new sidewalk in Church Hill includes ADA-compliant ramps at the intersection.

Objective 8.2

Increase the miles of greenways in an interconnected, regional network.

- a. Develop greenways throughout the city connecting Nodes, Priority Neighborhoods, and adjacent localities; focus efforts specifically in South Richmond and including, but not limited to, the following greenways: Ashland to Petersburg, James River Branch, Kanawha Canal, Manchester Canal, and South Bank of the James River (see Future Connections Map for the network of greenways).
- b. Coordinate greenway development with adjacent jurisdictions to develop a regional network.
- c. Collaborate with freight rail companies to develop rails-to-trails projects and trails-next-to-rails projects.



Top: Canon Creek Greenway
Bottom: The Virginia Capital Trail

Objective 8.3

Expand and improve on-street networks and amenities serving bicyclists and other non-vehicle users, as shown in Figure 30.

- a. Expand, improve, and maintain on-street bike networks as shown in the Future Connections Map, which amends the networks proposed in the Bike Master Plan and in the Pulse Corridor Plan; prioritize the creation of separated, buffered bike lanes.
- b. Expand the users of bike lanes to include other non-vehicle users, such as scooters and electric bicycles.
- c. Expand the bike sharing program to include more stations in a larger footprint adjacent to high-priority transit stops and other destinations (e.g., museums, parks, shopping districts).
- d. Install amenities (e.g., shelters, benches, parking, maintenance tools, restrooms, bike parking, water fountains with bottle-refill stations) along enhanced transit routes and greenways (see Goal 12).
- e. Revise the Zoning Ordinance to require bike parking for more uses.
- f. Increase the number of bike racks on sidewalks and/or use the curb to provide on-street bike parking.

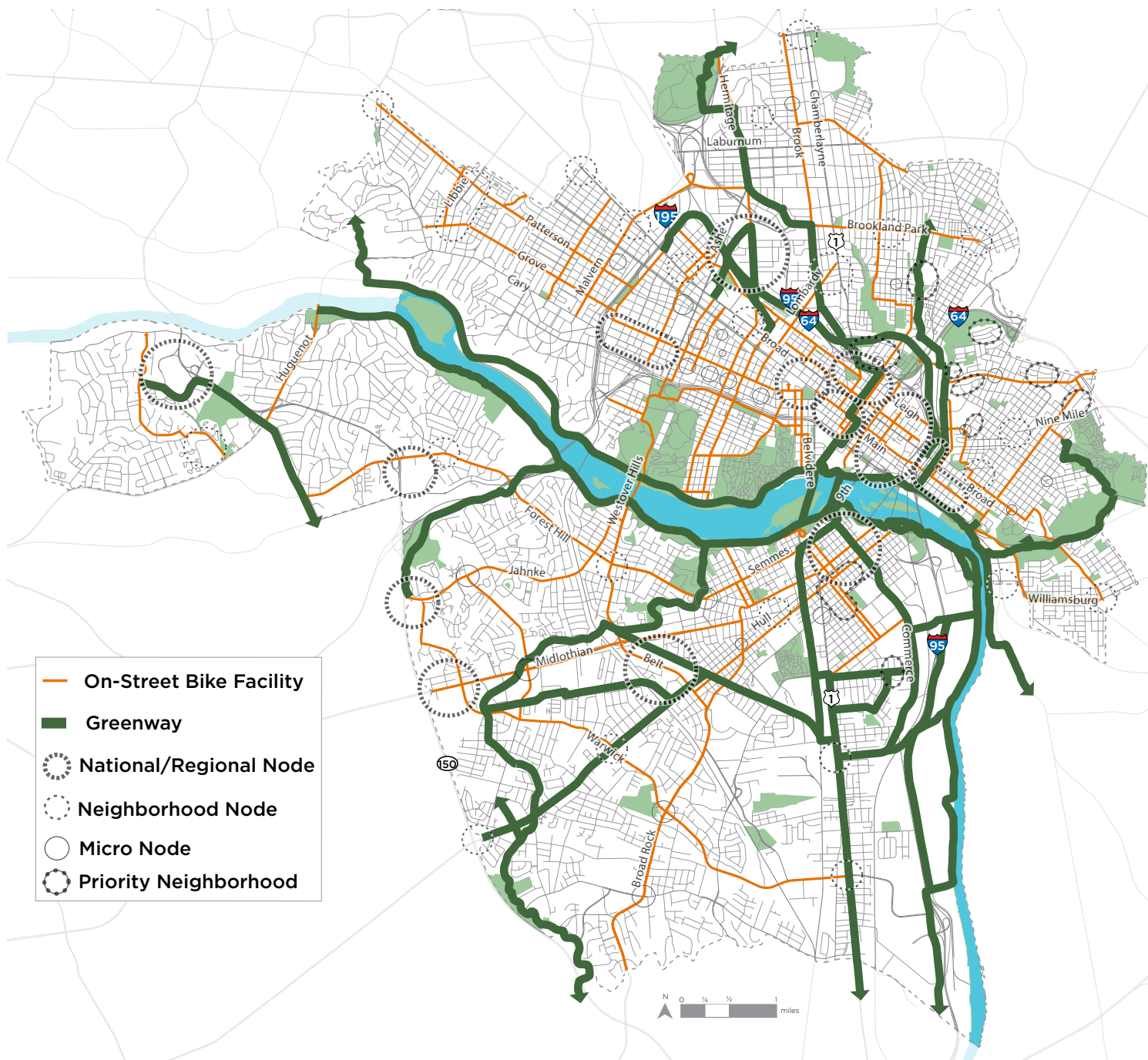


FIGURE 30 // Greenways & On-Street Bike Facilities Map

Objective 8.4

Increase transit service to serve existing and new riders so that 75% of residents live within a half mile of a transit line with service that comes every 15 minutes by 2040, as shown in Figure 31.

- a. Increase high-frequency transit service to serve existing and new riders where the density of jobs and housing are high, and encourage higher density of jobs and housing where high-frequency transit services exists.
- b. Improve and maintain priority transit stops with amenities such as shelters, benches, trash cans, and bike parking, focusing first on improving stops in Priority Neighborhoods.
- c. With community input, develop a preferred alignment for a North-South BRT line through Manchester, either along Cowardin or along Hull Street, and then traveling down Midlothian, Hull, or Route 1.
- d. Create frequent service transit stops to the Riverfront and airport with additional lines, if needed.
- e. Extend service hours along all routes, prioritizing routes that serve under-served and poorly connected communities.
- f. Ask GRTC to review the productivity of the transit network at least every 3 years.
- g. Evaluate creating an infill BRT station at or near Malvern/W. Broad and Lombardy/W. Broad.
- h. Coordinate seamless transit service with the surrounding localities.
- i. Ask GRTC to conduct annual customer satisfaction surveys.
- j. Working with GRTC, evaluate the need for transfer centers at critical points of the bus system and if a transfer center is needed, design the center so it supports walkable urban design.

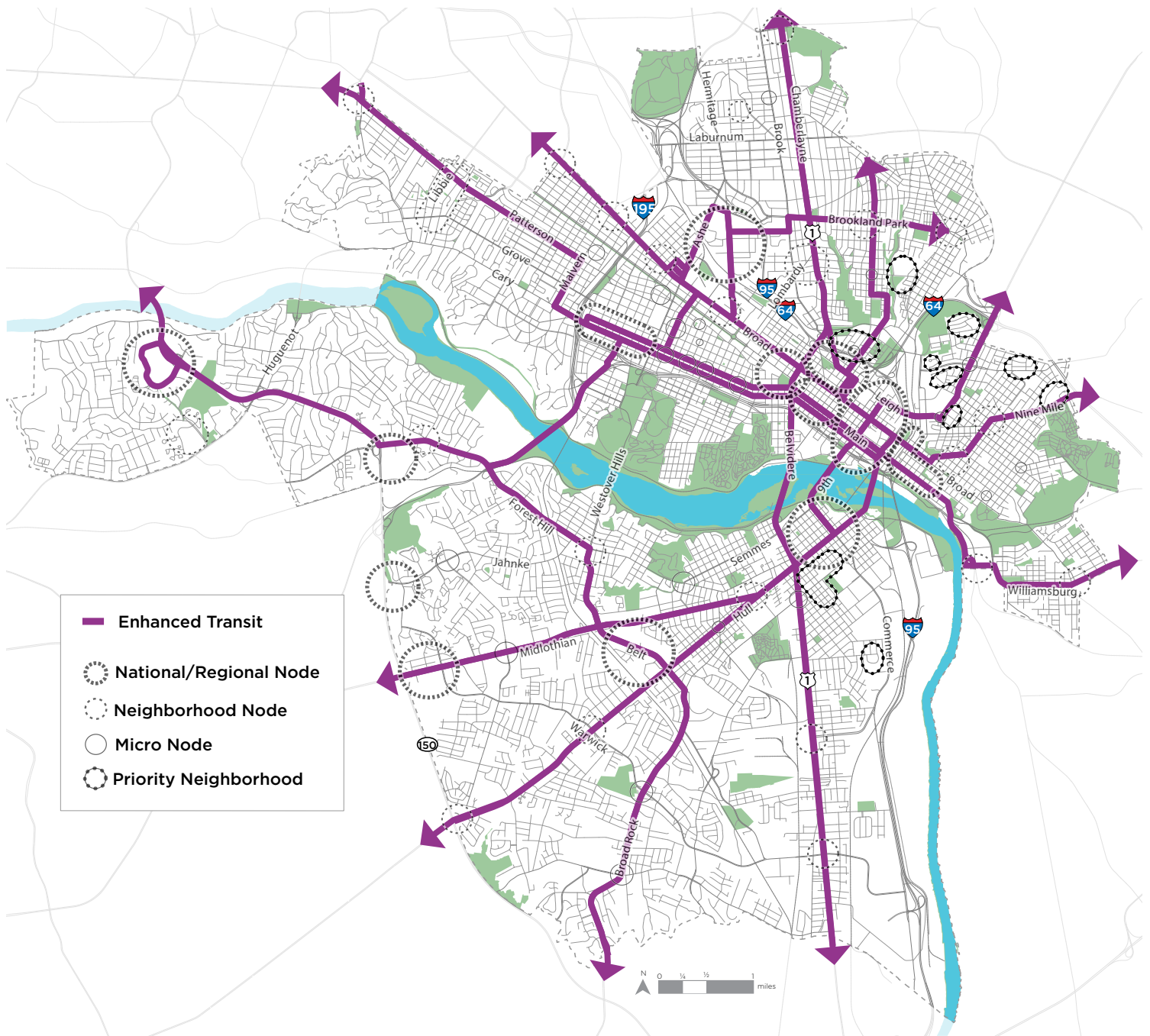
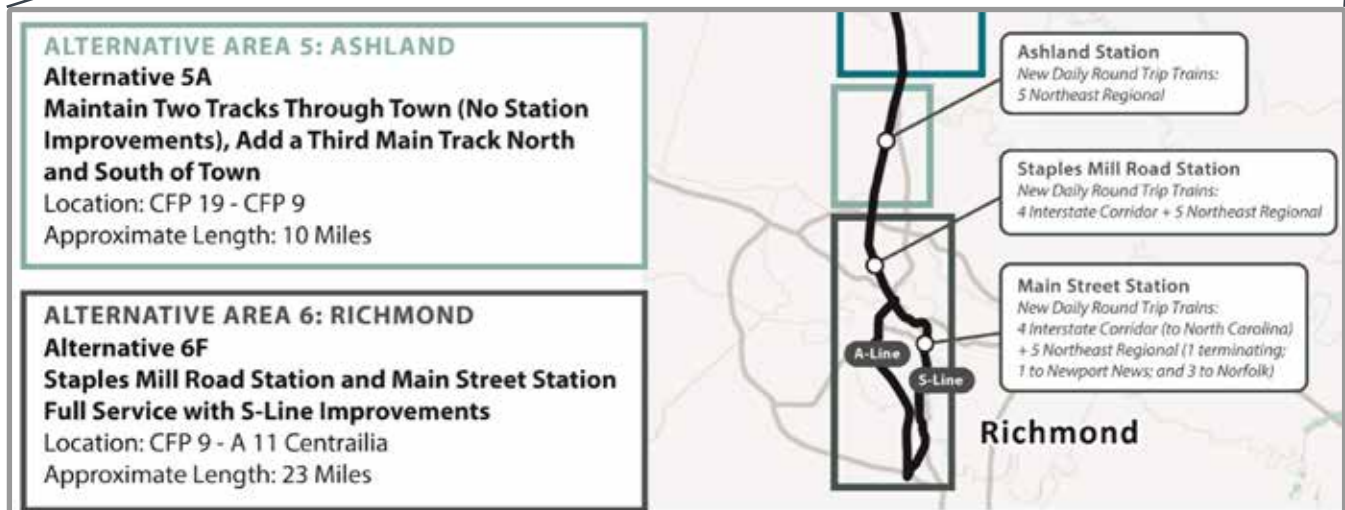
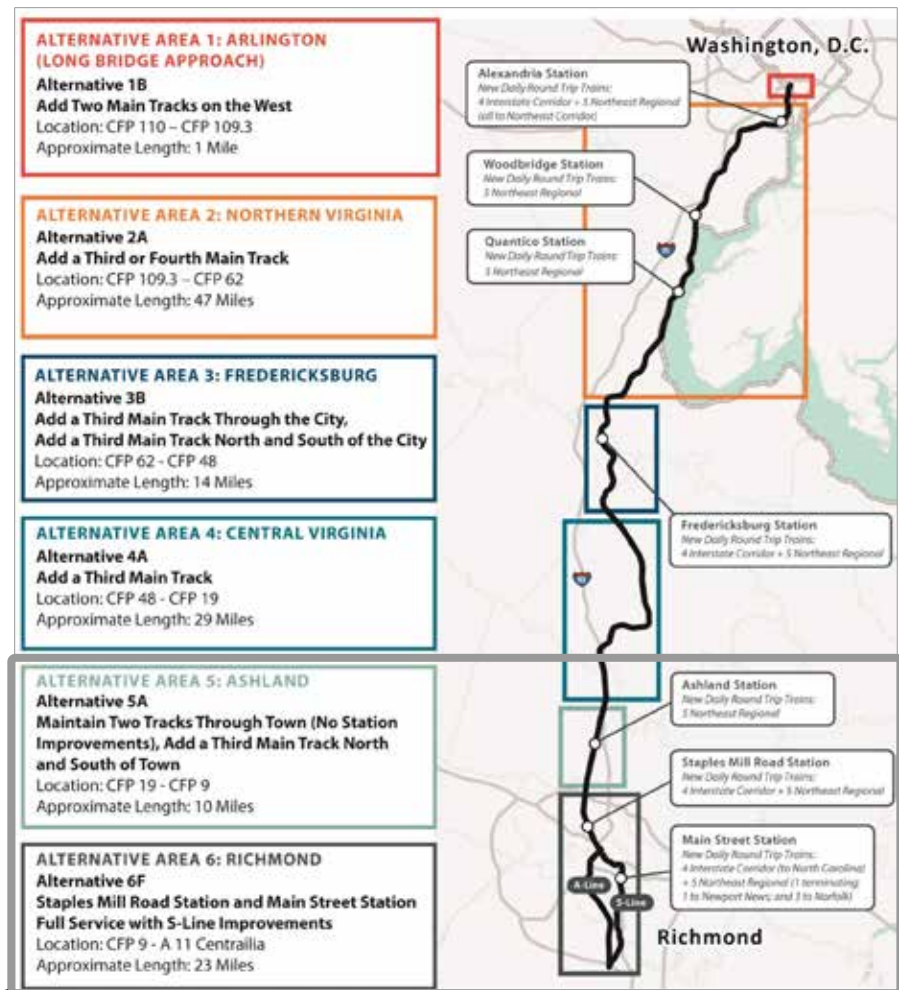


FIGURE 31 // Enhanced Transit Map

Objective 8.5

Increase the number of intercity travel options connecting the Richmond region to other regions and cities.

- Expand and maintain passenger rail service to Main Street Station, including exploring the creation of regional rail service to Charlottesville.
- Implement the Washington, D.C. and Richmond Southeast High Speed Rail project and other high-speed rail projects to Raleigh and Hampton Roads, and eliminate at-grade crossings.
- Continue to offer regional bus service and ensure multi-modal options are available near regional bus stations to included better transit connections with amenities.
- Expand transit service to Richmond International Airport.



The preferred alignment for the DC to Richmond High Speed Rail Project

Source: DC to Richmond Southeast High Speed Rail Record of Decision, U.S. Dept. of Transportation Federal Railroad Administration, Virginia Department of Rail and Public Transportation, September 2019

Objective 8.6

Increase the number of employers implementing Transportation Demand Management (TDM) strategies to shift individuals from single-occupancy vehicles to biking, walking, and transit for daily tasks (see Table 4 for the mode split in 2000 and 2018).

- Develop and maintain a database of employers with TDM plans.
- Develop a menu of tools to incentivize employers to offer TDM plans and determine which incentives and/or requirements to implement, including reduced parking requirements; increased transit, carpool, vanpool, and bicycle amenities; showers and lockers for bike commuters; and tax abatements.
- Advertise and promote TDM benefits.
- Explore tax breaks for individuals who participate in a TDM program.
- Expand the City's TDM program.
- Leverage technology to share travel time by all modes of transportation with users.
- Expand the current Congestion Mitigation and Air Quality (CMAQ) city employee trip reduction program to other employers in the city.

74.5%

of working Richmonders
drove alone to work in 2018
(compared to 72.2 in 2000)

TABLE 4 // Means of Transportation to Work for Workers 16 Years and Over, 2000 and 2018

Source: U.S. Census Bureau: 2000 Census,, 2018 ACS 1-Year Estimates

	2000 Census		2018 1-Year ACS		% change from 2000-2018
	Number	Percent	Number	Percent	
Drove Alone	62,743	72.2%	83,742	74.5%	3%
Carpooled	11,165	12.8%	10,001	8.9%	-30%
Public Transit	7,354	8.5%	7,441	6.6%	-22%
Bicycle	969	1.1%	3,734	3.3%	202%
Walked	3,941	4.5%	5,160	4.6%	2%
Other means	729	0.8%	2,303	2.0%	156%

Goal 9: Streets, Bridges & Connections



Build and improve streets and bridges to expand connectivity for all users.

Existing Context

Building and improving Richmond's street network and bridges is critical to connect our neighborhoods to one another and provide multiple routes for pedestrians, cyclists, and transit moving around the city.

The design of streets and bridges greatly affects their functionality and ability to support other land use goals. Seemingly inconsequential items, such as the width of the planting strip along the street and the burying of power lines, have rippling effects on many of the goals outlined in this plan. If a planting strip is too narrow, street trees cannot survive and thrive and therefore are unable to serve critical functions like providing shade and natural habitats, cooling areas during Richmond's heatwaves, and retaining rain water during Richmond's intense rain storms. Burying power lines not only makes a street more aesthetically pleasing but also increases Richmond's resiliency.

The older parts of Richmond that were built before cars became prevalent, such as the Fan, Spring Hill, and Bellevue, have gridded street networks.

Newer parts of Richmond, such as the 1970 Chesterfield annexation which was built to rural and post-WWII suburban design standards, have culdesacs that funnel all traffic to major roads. The objectives in Goal 9 of Richmond 300 seek to better connect our city using roads that provide access to all Richmonders.



Complete Street Illustration

Streets for everyone designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists, and transit riders while also incorporating stormwater infrastructure.

Objective 9.1

Improve streets for all users by aligning future land use categories with Complete Streets recommendations, prioritizing low-income areas and areas within the high-injury network.

- a. In the update to Richmond Connects, include develop complete street recommendations to improve access for all users on the street typologies shown in Figure 32.

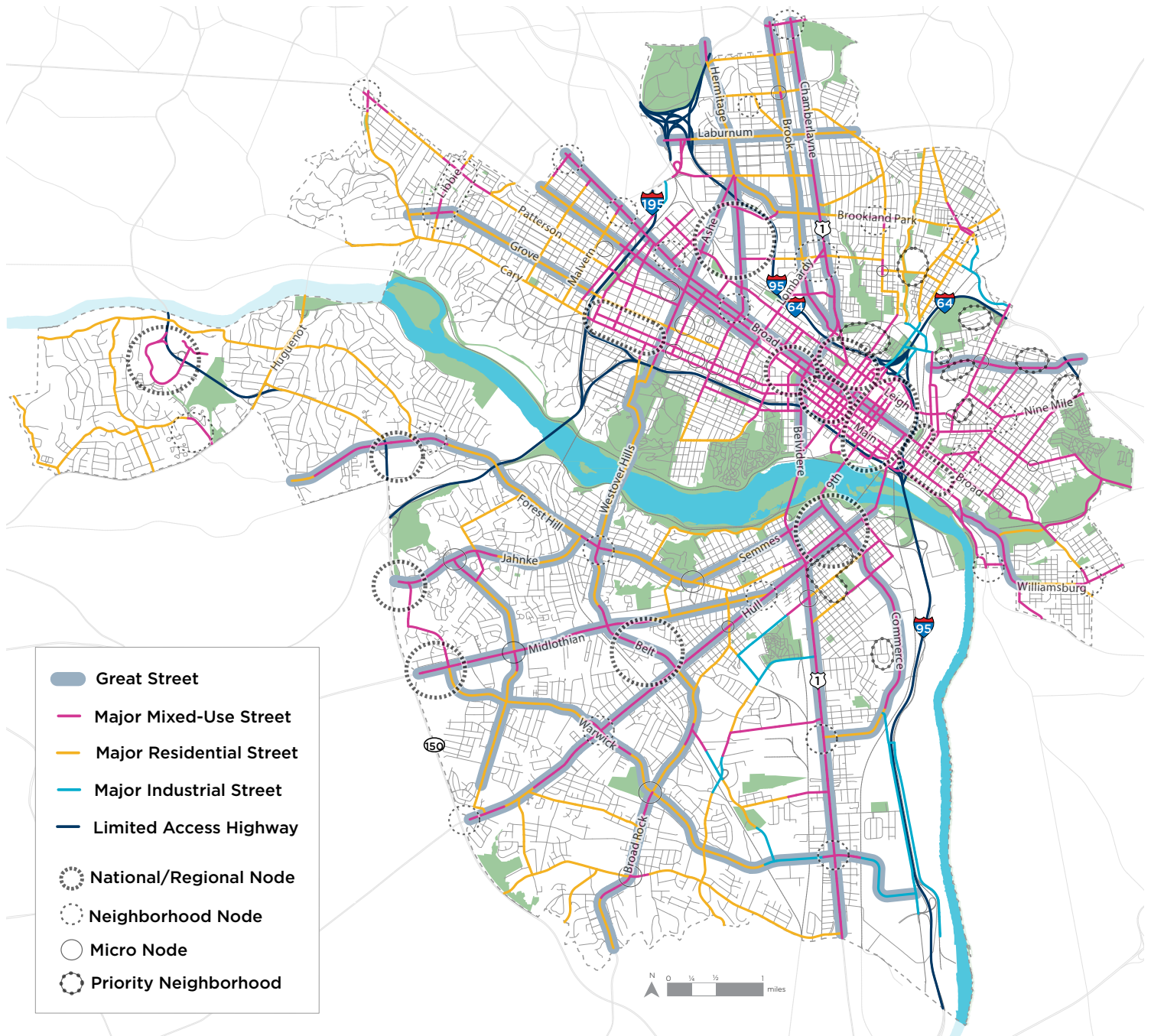
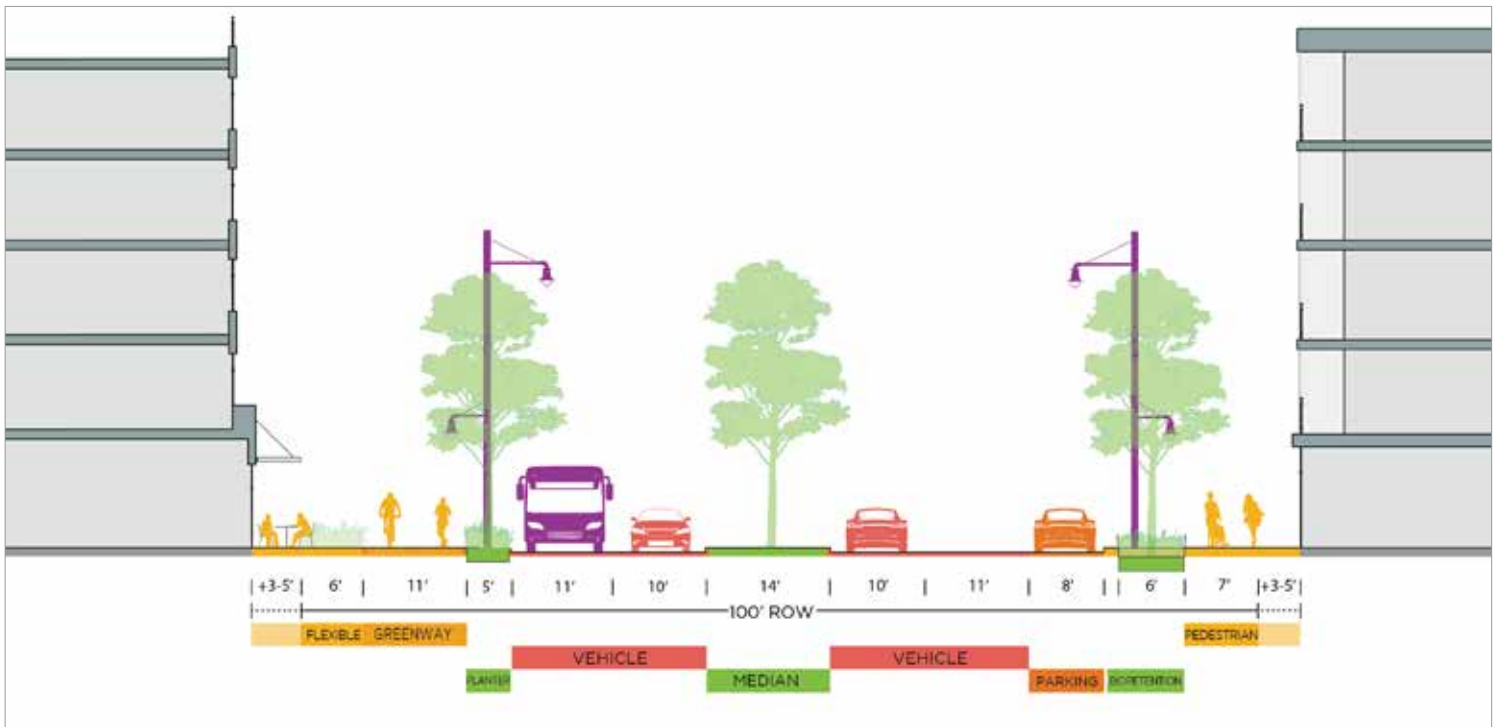
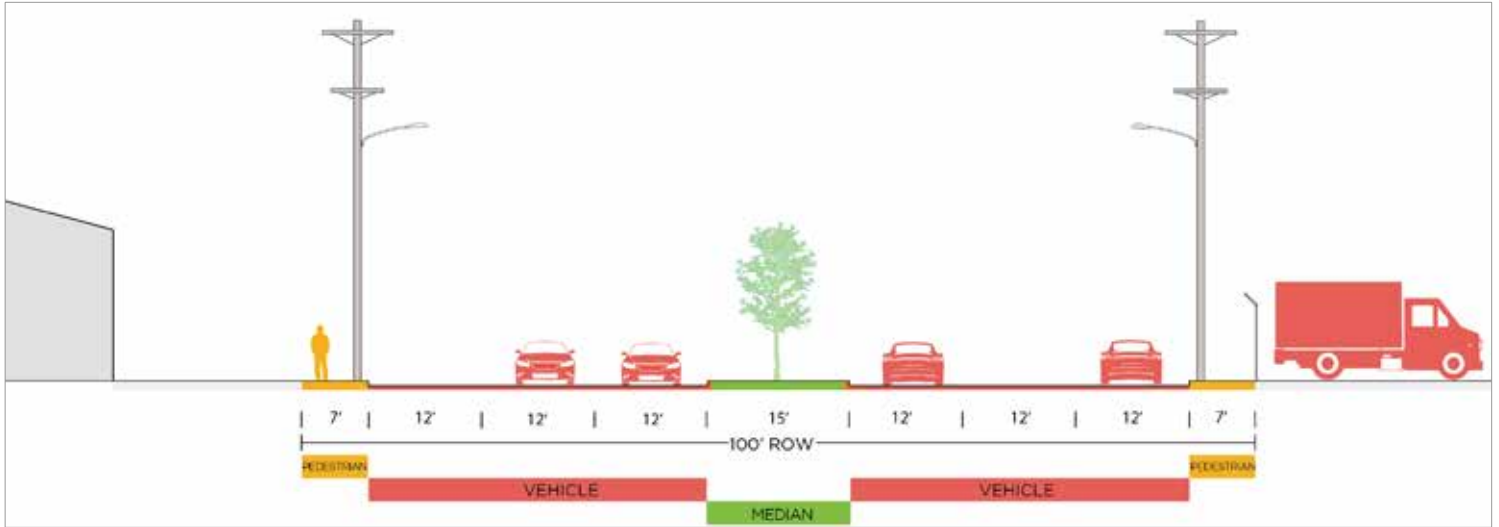


FIGURE 32 // Great Streets and Street Typologies Map



Commerce Road Potential Street Section Transformation

The existing street section [top] has more travel lanes than is necessary for the amount of vehicles that travel on Commerce Road. The street can be transformed [bottom] into a Great Street with various elements such as outdoor seating, sidewalk trees, pedestrian-level lighting, on-street parking, enhanced transit, car lanes, median trees, and a wide greenway (the Ashland to Petersburg Trail).

Objective 9.2

Improve and create bridges to strive for a high level of reliability, access, and safety, as shown in Figure 33.

- a. Develop and implement a plan to rehabilitate and repair city bridges so that less than 10% of bridges are rated as structurally deficient and all bridges have been substantially renovated and maintained.
 - Implement the projects outlined in the I-95/I-64 Overlap Study, ensuring that neighborhoods do not lose access to I-95/I-64, and that changes to ramp alignment do not place significant traffic burdens on neighborhoods or remove significant redevelopment potential.
 - Develop and implement a plan for rehabilitating the Mayo Bridge, Lee Bridge, and the Nickel Bridge that adds accommodations for pedestrians, bicycles, and transit.
- Improve pedestrian crossing experiences on all bridges over barriers (e.g., James River, the Downtown Expressway, I-195, I-95/I-64, rail lines); pedestrian improvements should include not only sidewalks, but also shading and plantings that improve the walking experience.
- b. Develop and implement a plan for building bridges that connect Norfolk Street to Hamilton Street and connect W. Leigh Street to the Diamond Site.
- c. Explore capping highways to re-establish connections between disconnected areas, focusing first on the Downtown Expressway between 2nd and 7th, and I-95/I-64 at Jackson Ward.



By capping the highway with streets, parks, and buildings, Jackson Ward will once again be one neighborhood.



Proposed new bridges connect areas near Scott's Addition and the Diamond that are severed by railroads and highways: a bridge connects Norfolk Street to Hamilton Street, a pedestrian bridge connects Mactavish to Rosedale [left], and a landscaped landmark bridge connects Leigh Street to the crescent park.

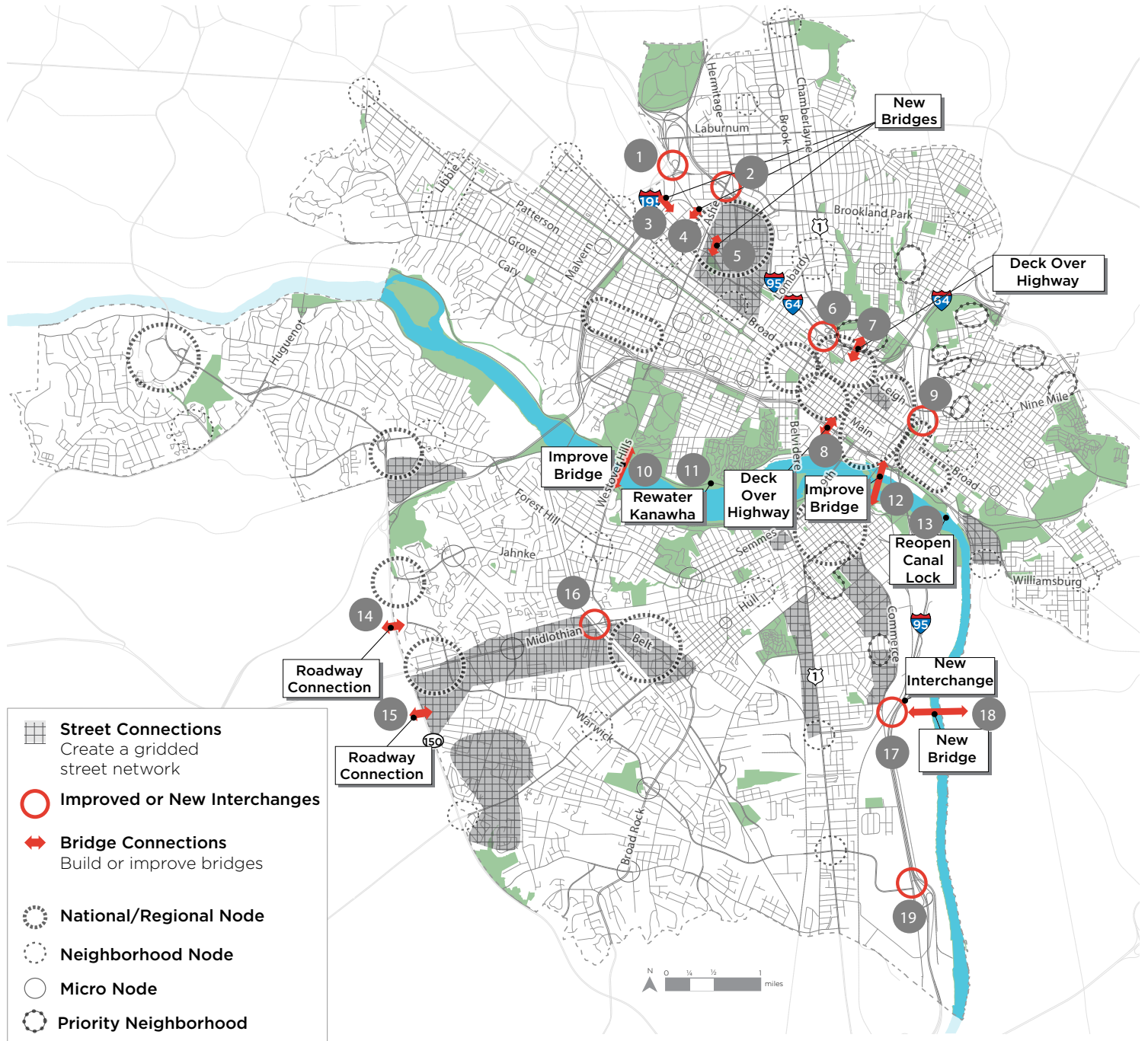


FIGURE 33 // Connections, Interchanges, and Bridges Map

Objective 9.3

Increase the miles of alleyways and improve existing alleyways to manage circulation.

- a. Maintain and improve existing alleyways.
- b. Encourage homeowners and developers to utilize and upgrade existing alleyways in their development site plans or create new alleyways as part of redevelopment efforts.
- c. Expand the green alleyway program.
- d. Create new alleyways.
- e. Seek funding to maintain alleys via two potential methods: 1) lobby the General Assembly to change the funding structure of roadways to include funding maintenance of alleyways, and/or 2) pass an ordinance to assess fees to maintain alleyways.

Objective 9.4

Strengthen the street network by preventing superblocks and encouraging gridded street networks and two-way streets.

- a. Update the subdivision ordinance to require new large developments to tie into existing streets and prohibit culdesacs to support the creation a gridded street network.
- b. Seek to reduce culdesacs by connecting roads where possible; where roadway connections are not possible, seek to provide bike and pedestrian connections at a minimum to establish greater connectivity.
- c. Where feasible, convert one-way streets to two-way streets in consultation with the City's Transportation Engineers, evaluating balancing the needs of various uses—sidewalks, on-street parking, bicycle infrastructure, and transit access.

Objective 9.5

Improve 80% of street pavement to a condition index of good or better.

- a. Maintain the pavement condition inventory.
- b. Develop and implement a plan to maintain roadways and also seek to reduce urban heat by investigating pavement options that reflect light (see Goal 17).



Alleyways serve critical functions in the city's street network by assisting with circulation and providing a location of back-of-house functions such as trash pick-up.

Objective 9.6

Implement parking strategies that effectively manage supply and demand of parking, as identified in the Parking Study Report, as shown in Figure 34, and improve the physical appearance of parking.

- Discourage the creation of new surface parking lots along pedestrian-oriented and transit-accessible corridors (see Goal 4).
- Develop parking lot and parking garage screening standards to safely and beautifully screen unsightly parking facilities from the street.
- Standardize on-street parking by clearly marking no parking zones per current ordinance at intersections, curb cuts, and fire hydrants (see Parking Study).
- Develop multi-use on-street parking programs that accommodate residents, visitors, customers, and employees at appropriate time intervals (see Parking Study).
- Amend parking requirements in the Zoning Ordinance (see Parking Study).
- Expand on-street fee-for-use parking to more parts of the city to encourage turn over (see Parking Study).
- Periodically evaluate on-street fee-for-use parking to ensure time frames and fees are still appropriate (see Parking Study).
- Universally enforce on-street parking regulations (see Parking Study).
- Encourage property owners to consider shared parking spaces (see Parking Study).
- Improve pedestrian infrastructure so pedestrians feel safe and comfortable walking from their parking spot to their destination (see Parking Study).
- Develop strategic parking assets where feasible (see Parking Study).

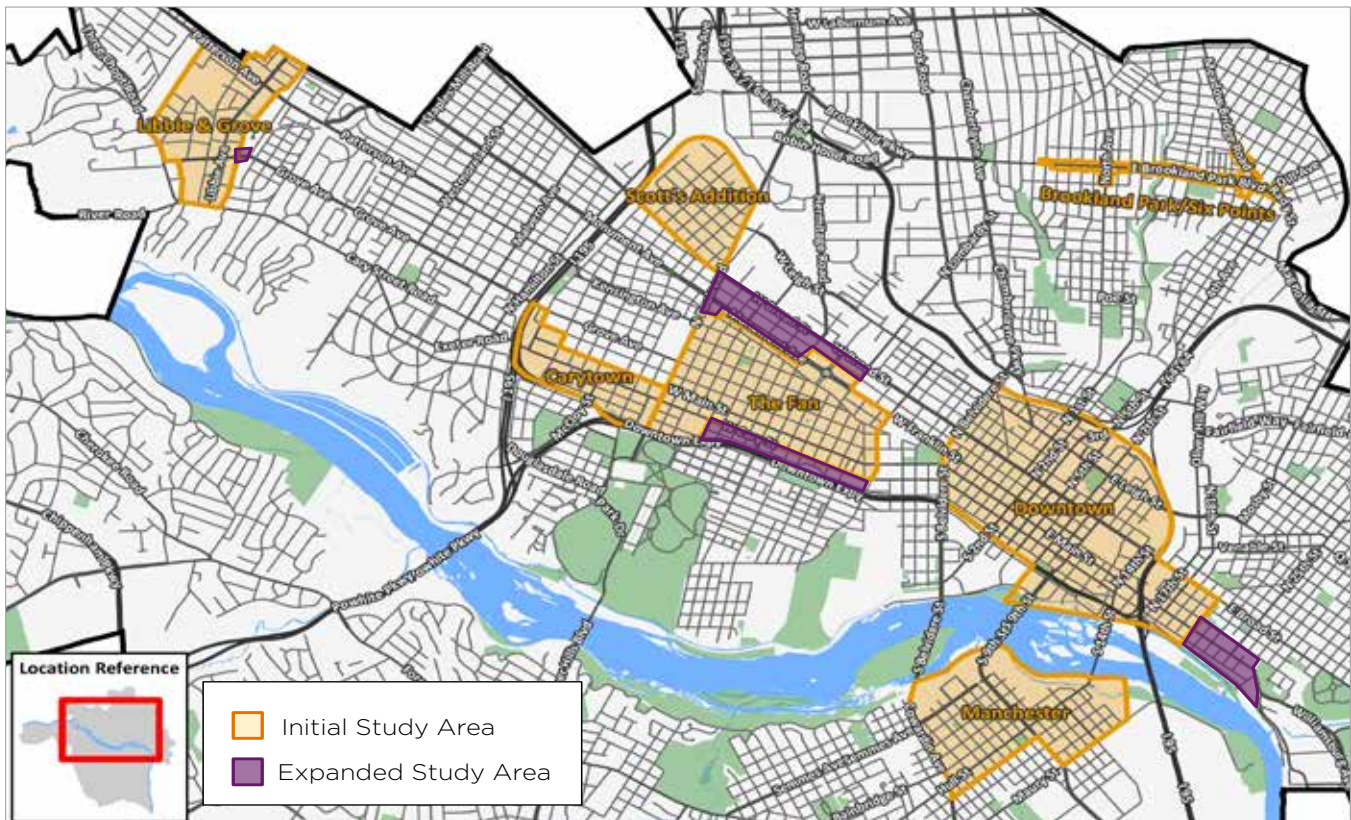


FIGURE 34 // Parking Study Areas

In 2018 and 2019, Richmond 300 hosted three rounds of meetings for each of these seven study areas to discuss existing conditions analysis and develop parking recommendations for each area. These recommendations are listed in Objective 9.6 and outlined in the Parking Study Report (available in Richmond 300 Supporting Materials). Although the Parking Study focused on these areas, the recommendations are intended to be transferable to other areas of the city.

Goal 10: Emerging Transportation Technologies



Incorporate emerging technology into the transportation network in ways that seek to reduce single-occupancy vehicle use and reduce greenhouse gas emissions.

Existing Context

The transportation landscape is changing.

Ridesharing, bikesharing, autonomous vehicles, and other transportation innovations are changing how people move around cities. The exact effect of transportation innovations is not entirely known, but preliminarily, DPW is seeing an increase in demand for “curb space,” meaning many different users are seeking to use the side of the road for various activities: Uber/Lyft loading zones, parking lanes, bike lanes, travel lanes, bus lanes, truck loading, valet parking stations, and more. There is limited curbside; therefore, stakeholders will need to weigh the various demands on this shared space and determine the best use and best price based upon demand on any given street. The objectives of Goal 10 of Richmond 300 seek to make the City more nimble in responding to the changing transportation environment.

Objective 10.1

Expand and maintain the Richmond Signal System for better managed and safer transportation options.

- a. Continue to implement technology that prioritizes traffic signal timing for walking, biking, and transit.
- b. Capture and share movement data within the city to help people make transportation decisions.
- c. Consider the deployment of Intelligent Transportation Systems (ITS).
- d. Collaborate with other jurisdictions to create regional ITS.
- e. Leverage new and existing technologies to accommodate individuals with visual impairments.

Objective 10.2

Develop programs to manage new mobility and emerging shared transportation technologies.



- a. Develop a new mobility policy to manage relationships with transportation network companies (TNCs) and other emerging programs.
- b. Charge a fee for autonomous vehicles (AVs) and TNCs that drive without paying passengers.
- c. Require AVs and TNCs to share data with the City to help shape future policy.
- d. Develop programs to ensure equitable access to new mobility for individuals who are un-banked and/or do not have smart phones, and who are physically disabled.
- e. Prioritize improvements to public transit, bike, and pedestrian infrastructure over the accommodation of AVs.
- f. Create a policy to encourage car-sharing programs to locate in Richmond to help reduce car ownership rates.
- g. Request that the General Assembly develop legislation outlining requirements for AVs, including making sure AVs can recognize people walking, biking, and of different skin tones.

Objective 10.3

Utilize technology to manage and monetize the curb to reduce vehicle miles traveled related to circling the block.

- a. Inventory curb management data and evaluate curb use and then consider equitable pricing models to ensure space availability.
- b. Create permitting process for existing and new mobility services, slow-moving vehicles (e.g., scooters, Segways, electric bicycles), and other users (commercial vehicles in loading zones) to access the curb.
- c. Create a real-time, demand-based, on-street pricing program that guides vehicles to empty spots.

Objective 10.4

Increase the number of low-emission vehicles.



- a. Support the expansion of the electric charging network for vehicles and bicycles on privately owned land.
- b. Seek opportunities to install electric charging stations on publicly owned land, balancing the needs of pedestrians, cyclists, and transit users.
- c. Shift the City's vehicle fleet to modes of transportation that are zero-emission, such as electric vehicles and electric bicycles.



CHAPTER 4

Diverse Economy

Vision: Richmond is home to a variety of businesses and industries that offer opportunities for quality employment and capital investment.

Richmond is a first choice location for businesses and investment because the city's transportation, housing, cultural, outdoor, commercial, and institutional amenities create a vibrant city. Richmonders of all income levels have opportunities for life-long learning and skill-building.



Goals, Objectives, and Strategies

Goal 11: Businesses & Jobs



Foster an environment that supports the growth of existing and new small, medium, and large businesses, focusing on Nodes, Priority Neighborhoods, major corridors, and industrial centers.

Existing Context

Richmond does not live in a bubble.

Cities and counties across the country compete to attract businesses to their locality, oftentimes “poaching” companies from one place to another. Localities offer incentives and tax structures that help attract businesses. A strong economic development approach can help the City of Richmond remain competitive while also implementing economic opportunities to benefit all Richmonders. DED is developing an Economic Development Strategic Plan to equitably guide the growth of Richmond’s economy while positioning Richmond to be competitive.

Job growth in Richmond lags population growth.

While Richmond’s population growth rate from 2010 to 2019 was higher than the surrounding counties, job growth has not kept pace. Total employment in Richmond has grown modestly since 2010, but the number of jobs in 2019 is still below that of 2001 (171,000 jobs in 2019 compared with 184,000 in 2001).

Richmond’s job growth has not kept pace with the suburbs.

Job growth in Henrico, Chesterfield, and Hanover has outpaced Richmond’s job growth over the past two decades. Richmond lost nearly 10,000 jobs from 2001 to 2018 but the surrounding counties added 66,000 jobs. In 2018 and 2019, several companies announced new office locations in Richmond’s urban core suggesting that companies are starting to move into more urban locations in order to attract talent; however, the onset of the COVID-19 pandemic, may have impacts on commercial office markets that are unknown.

Downtown is the job center for the City with 77,465 jobs, more than 53% of city-wide jobs. Downtown has many public sector jobs but private jobs growth was strong between 2010-2017. Private jobs have increased by 28%, or 11,105 positions in Downtown since 2010.

Racial inequities persist in the local and regional labor market.

Blacks are employed predominantly in low-wage occupations. White workers in the Richmond region are about three times as likely as Black workers to be employed in management occupations, which earn on average \$128,000, the highest-paying job occupations (14.5% of white workers are in management position compared with 5.8% Black

workers). Moreover, Black workers are more likely to be employed in the lowest-paying occupations, which pay on average below \$27,000. Reducing segregation and expanding opportunity for low-income earners and Blacks can expand economic opportunity for all of Richmond.

Federal, state, and local policies, and private industry practices have segregated Richmond over the past 100+ years.

These include everything from Urban Renewal to practices like redlining,¹ deed restrictions,² exclusionary zoning,³ and sub-prime lending. These practices are not unique to Richmond and have happened across the nation. A study of segregation in Chicago found that if the city were less segregated, the City would see "\$4.4 billion in additional income each year, a 30 percent lower homicide rate and 83,000 more bachelor's degrees."⁴ The cost of segregation is high for all income earners. The City of Richmond, along with several non-profits, is intentionally seeking to reduce the concentration of poverty and expand economic opportunity. The strategies outlined in Goal 11 of this Plan seek to make Richmond more competitive in the regional and national marketplace and increase equity and opportunity for all Richmonders, but specifically low-income earners and Blacks.

¹ Redlining is a discriminatory practice by which insurance companies, banks, and others denied services to residents based on the racial or ethnic composition of their neighborhoods.

² Deed restrictions, which prohibited the sale of homes to buyers from certain racial and ethnic groups, primarily Blacks and Jews.

³ Exclusionary zoning is the practice of using the Zoning Ordinance to intentionally exclude certain types of land uses from a given community. For example, an upper class community may use zoning to exclude multifamily housing in their neighborhood.

⁴ The Cost of Segregation, Metropolitan Planning Council.



\$84M = \$1M

In 2020, \$84 million of assessed land value yields \$1 million in tax revenue for the City



Objective 11.1

Increase the areas of appropriately zoned land near various transportation modes and housing to retain, create, and attract employers.

- a. Support rezonings in alignment with the Future Land Use Plan (see Goal 1).
- b. Strategically acquire land for economic development within Nodes and Priority Neighborhoods, specifically focusing on land banking near Priority Growth Nodes (see Goal 2). For example, Chesterfield and Henrico Counties acquired privately held land to spur the redevelopment of Regency Square, Virginia Center Commons, and Clover Leaf Mall.
- c. Develop a Site-Readiness Program to identify and implement public and private investments to advance the redevelopment speed and attractiveness of these strategic properties near/within Nodes and Priority Neighborhoods to attract target industries: 1) corporate headquarters and professional services, 2) life sciences and education, 3) financial services, 4) transportation and logistics, and 5) specialty beverages and foods.
- d. Encourage the development of a variety of quality housing types to house employees across the economic spectrum (see Goal 14).
- e. Support infrastructure projects with transportation options to move individuals from their homes to their jobs and also create job opportunities near where people live, specifically focused on low-income areas, low car-ownership areas, and areas along the high-injury network (see Goals 6-10).
- f. Evaluate how existing economic development tools (Opportunity Zones, Enterprise Zones, CARE districts) align with Nodes, Priority Neighborhoods, major corridors, and industrial centers, and make adjustments to those tools and/or create new ones to drive economic development, as shown in Figure 35.
- g. Evaluate revisions to the City's Redevelopment and Conservation Areas and Rehabilitation Districts to facilitate expanded use of the City's Partial Tax Exemption Program, which was implemented to reduce or eliminate concentrations of blight, stimulate investment and encourage new construction and improvement of real property in areas designated by the City.
- h. Implement Technology Zones in the study areas along Route 1, Hull Street, Belt Boulevard, Midlothian Turnpike, and other areas of the city, as applicable.

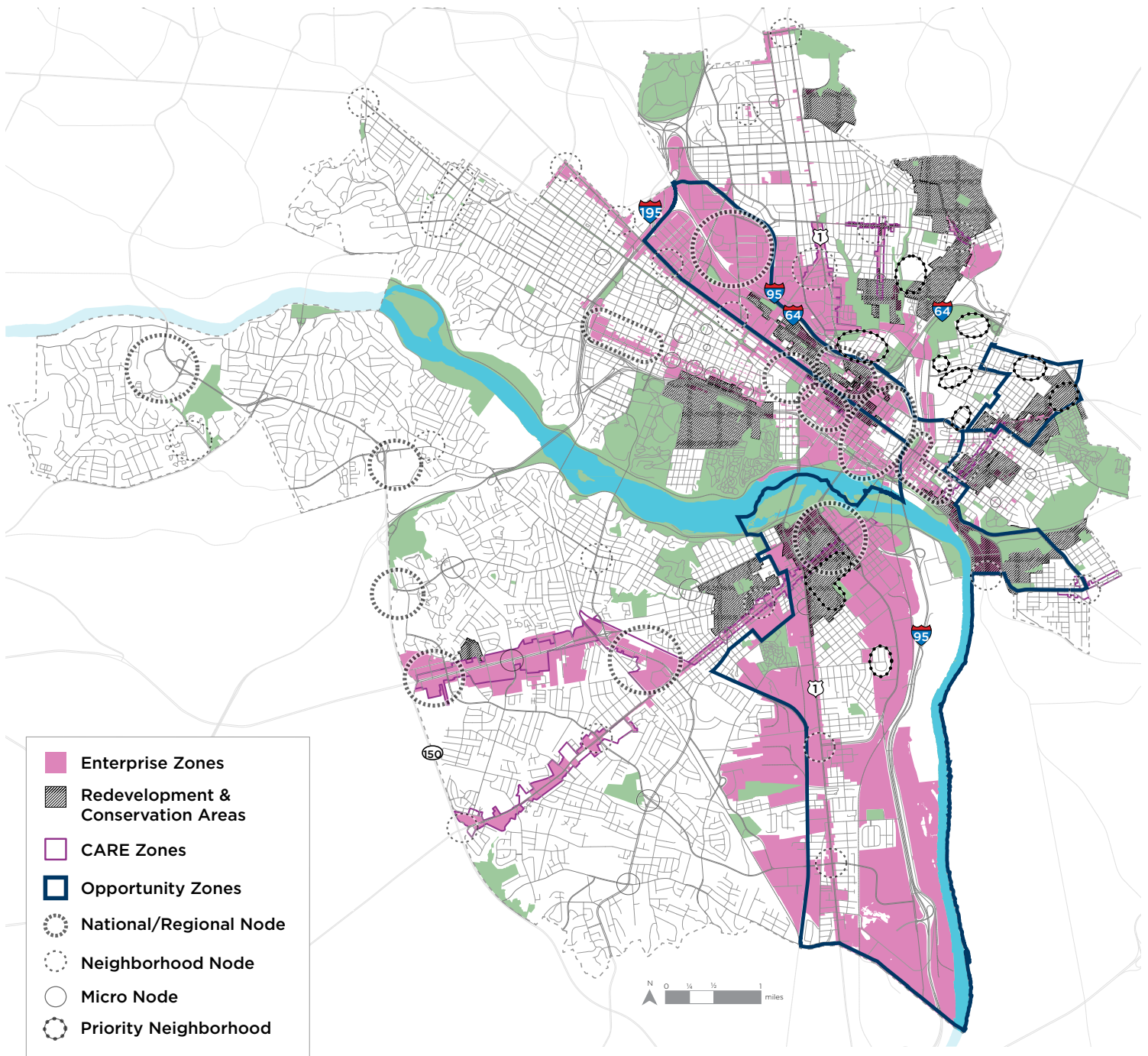


FIGURE 35 // Economic Development Programs and Nodes

Objective 11.2

Implement equitable economic development strategies to expand inclusivity and opportunity.

- a. Develop equity scorecard to evaluate public-private development projects, including items such as ensuring residents within a community are first hired/considered for development projects.
- b. Support the expansion of broadband internet so that all Richmonders have access to high-speed internet (see Goal 2).
- c. For projects using economic development incentives, develop community benefit agreements, which could include items such as creating jobs, utilizing local workforce development agencies to assist with hiring local, creating public open space, supporting local businesses, meeting minority business hiring goals, creating low-income housing, and more.
- d. Encourage a range of employment opportunities that provide on-the-job training and facilitate upward mobility through investment in workforce development initiatives and collaboration with employers to create a pipeline of employees for existing and future positions.



A start-up business in Church Hill in an adaptive reuse structure.

Objective 11.3

Increase the number and support the growth of small businesses, start-ups, and women-owned and minority-owned businesses.

- a. Create a business guide to help new and small businesses navigate City incentive programs and permitting, building code, zoning, and licensing processes.
- b. Institute policies and practices that facilitate business formation in the city.
- c. Explore the creation of a small business program within DED dedicated to supporting the development, growth, and retention of small businesses, prioritizing business development by people of color, women, and those with low incomes.
- d. Encourage the creation of new businesses and growth of small businesses by promoting and identifying smaller spaces (typically found along historic commercial corridors) for small businesses to start and grow.
- e. Assist long-term businesses in redeveloping areas by providing them rehabilitation grants and/or loans, and tax relief as property taxes increase.
- f. Partner with the Virginia Department of Small Business and Supplier Diversity to reduce barriers to obtaining the "Small, Woman- and Minority-Owned Business" certification by offering support services and creating phased entry into the program based on years of operation.
- g. Support the minority business development efforts managed by the Metropolitan Business League, Central Virginia African American Chamber of Commerce, Virginia Hispanic Chamber of Commerce, Kinfolk Community Empowerment Center, and other organizations focused on minority business growth in Richmond.

Objective 11.4

Determine the acres of land needed and locations for future industrial users.

- a. Examine zoning, parking ratios, and height limits for industrial zones to be accommodating to current needs, given that the needs of industrial users are shifting.
- b. Develop industrial park design standards to ensure industrial areas have trees, green space, sidewalks, and other urban design elements.
- c. Implement strategies to support the Richmond Marine Terminal and freight rail as economic development engines for the City.
 - Ensure truck access to the Richmond Marine Terminal is in alignment with Vision Zero objectives (see Goal 7).
 - Engage with the Commerce Road improvements projects, making sure that truck access is improved while also making sure pedestrians, cyclists, and transit-users are not forgotten, particularly to ensure workers have multiple transportation options to access industrial jobs (see Goal 8).
- d. Capitalize on fiber-optic speed internet infrastructure being developed along I-95/I-64 by identifying land that could be used for data centers and identifying locations for tech businesses and jobs.
- e. Provide environmental remediation programs and funding for industrial site assemblage to create development-ready sites.

Objective 11.5

Increase the number of jobs in Nodes and Priority Neighborhoods by branding and marketing the Nodes and Priority Neighborhoods.

- a. Continue to support Venture Richmond as the Downtown Business Improvement District.
- b. Create new Business Improvement Districts to help market Nodes and Priority Neighborhoods.
- c. Support existing and help establish new business associations in Nodes and Priority Neighborhoods.
- d. Develop marketing materials for Nodes that highlight the uniqueness of each Node and Priority Neighborhood, the forthcoming zoning and infrastructure improvements, and information on economic development incentives that are available in the area.
- e. Develop marketing materials to attract target industries: 1) corporate headquarters and professional services, 2) life sciences and education, 3) financial services, 4) transportation and logistics, and 5) specialty beverages and foods.

Goal 12: Tourism



Develop tourism and attractions to further elevate Richmond's image and to continue to delight existing and future residents, employees, and visitors.

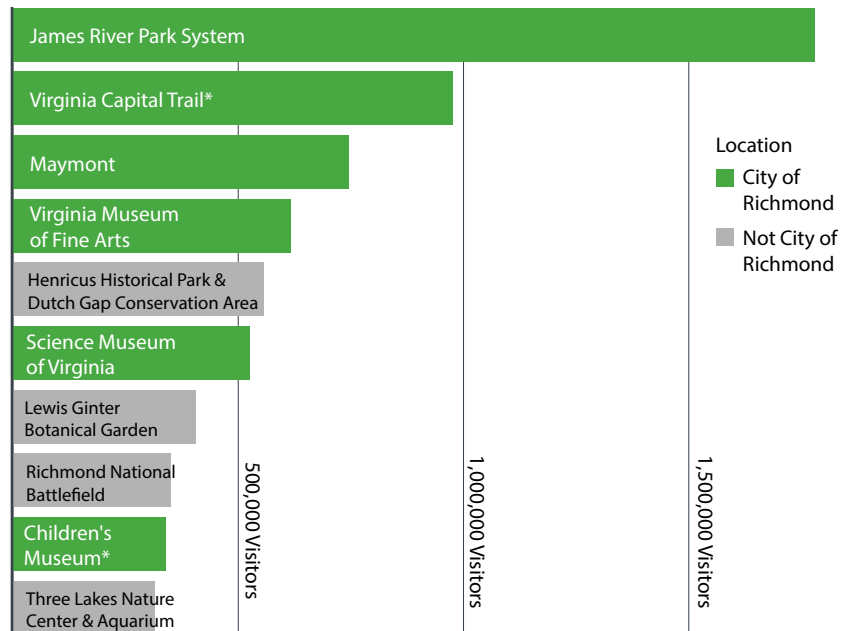
While you weren't looking,
Richmond got cool.

– Frommer's

Existing Context

"While you weren't looking, Richmond got cool." – Frommer's
Richmond is a food and beer destination. Since the passage of SB 604 in 2012, which allowed breweries to serve beer without serving food, the Richmond Region has gone from two breweries to over 30. Richmond restaurants and bakeries have received national acclaim. While Richmond's 11% population growth since 2010 has created a larger market for local food establishments, the growth of the tourism industry in Richmond is bringing Richmond's "coolness" to a national stage. Richmond is routinely listed on national lists, most recently, #7 of Trip Advisor's Ten Top Destinations on the Rise in the U.S. and #7 on the Lonely Planet's 2018 Best in the U.S.

Richmond's attracts and diverse festivals attract millions of visitors. Six of the top ten attractions in the Richmond Region are found in Richmond, as shown in Figure 36. The natural splendor and recreation opportunities on the James River makes it, by far, the most visited attraction in the Region. From flying dogs and paddleboards at Dominion River Rock to jazz at Maymont or food at the Second Street festival, there is an event for everyone in Richmond. The Folk Festival alone attracts over 200,000 people annually and Richmond hosts a variety of outdoor cultural events that add to the boom of tourism in the region.



* Virginia Capital Trail runs from Williamsburg to Richmond. The Children's Museum of Richmond has locations in Richmond, Chesterfield, and Henrico.

FIGURE 36 // Top Ten Attraction Attendance, FY 2018-19

Source: Richmond Region Tourism: Impact of Tourism, 2018-19

Objective 12.1

Maintain, grow, and market Richmond's tourism attractions.

- a. Fully implement the Riverfront Plan and the James River Park System Master Plan (see Goals 4 and 17).
- b. Support heritage tourism and expand the number of tourism sites that tell stories that have not yet been shared.
- c. Develop Nodes and Priority Neighborhoods as destinations through creative place making and branding (see Goal 4).
- d. Preserve and enhance Richmond's beauty and unique community character; natural, historic, and cultural resources; and public art (see Goals 3 and 4).

Objective 12.2

Host regional, national, and international events.

- a. Implement the Visit Richmond Tourism Plan.
- b. Promote performance venues of varying sizes to attract acts and visitors.
- c. Promote the region as a location for sports events, such as the Union Cycliste Internationale (UCI) Bike Race and the Monument Avenue 10K.

Objective 12.3

Increase the availability and options for lodging in the city.

- a. Encourage the development of hotel rooms in Nodes and Priority Neighborhoods.

Objective 12.4

Increase the availability and options for lodging in the city.

- a. Expand wayfinding signage throughout the city connecting more of the city to visitors to Richmond.
- b. Include accessible public restrooms throughout the city, including at City facilities and parks.
- c. Support the increase of the multi-modal transportation network to ensure tourists and visitors can easily move around the city (see strategies in Equitable Transportation).

Goal 13: Anchor Institutions



Leverage institutions to strengthen job sectors and collaborate on land planning.

Existing Context

Six of Richmond's top 10 largest employers are government entities, as shown in Table 5.

As the Capital of the Commonwealth of Virginia and home to VCU, Richmond is home to many local, state, and federal entities that employ tens of thousands of people who live throughout the region.

Richmond's universities are major attractions for students, faculty, research, and culture. VCU, the largest university in Richmond, is ranked as the #1 public institution for fine arts in the country. According to the State Council of Higher

Education for Virginia, in the 2017-2018 academic year, 85% of post-secondary students in Richmond were VCU students. As shown in Figure 37, VCU's student population increased by 29% (6,970 students) from '00-'01 to '17-'18 and on-campus students nearly doubled from 2,602 to 5,061. During that same period, the University of Richmond's student population decreased by 7% (302 students) and Virginia Union University's student population increased by 9% (131 students).

TABLE 5 // Top 10 Largest Employers

	Employer
1	Virginia Commonwealth University
2	VCU Health
3	Richmond Public Schools
4	City of Richmond
5	U.S. Dept. of Veterans Affairs
6	HCA Virginia Health System
7	University of Richmond
8	Federal Reserve Bank, Richmond
9	Philip Morris U.S.A., Inc.
10	MCV Physicians

Source: Virginia Employment Commission, Economic Information & Analytics, Quarterly Census of Employment and Wages (QCEW), 4th Quarter (October, November, December) 2017



Richmond is the Capital of the Commonwealth of Virginia.

30% of the City's land is not taxable. Real estate taxes are only collected on 70% of the City's total land area because 30% is owned by entities who do not pay property tax, such as government institutions and some non-profits. Furthermore, the City does not have land use authority over state-owned parcels, meaning the Commonwealth of Virginia does not have to follow the City's land use plan and Zoning Ordinance when developing state-owned parcels. Cities across the nation, like Boston, have payment-in-lieu-of-tax (PILOT) programs where large non-profit institutions, such as universities, give a payment to the City to cover some or all of the property taxes that institution would be paying if it were a for-profit entity.

In 2017, real estate tax income accounted for 33% of the City's total budget.

Property tax is the single largest source of income for the City. These revenues are critical in providing vital services to city residents, such as public safety, infrastructure, and public education.

Richmond's anchor institutions provide stability and foster innovation.

VCU's investment in programs that spark innovation, like the da vinci Center and the Brandcenter, have built upon and expanded the entrepreneurial and artistic spirit of Richmond. UofR has programs, like the Bonner Center for Civic Engagement,

which actively fosters life-long learning and civic engagement. VUU has established partnerships with RPS and the City to provide academic scholarships to 8th grade students. Beyond specific programs, anchor institutions employ thousand of people that support households across the city and educate the future business owners, thinkers, and leaders of the City.

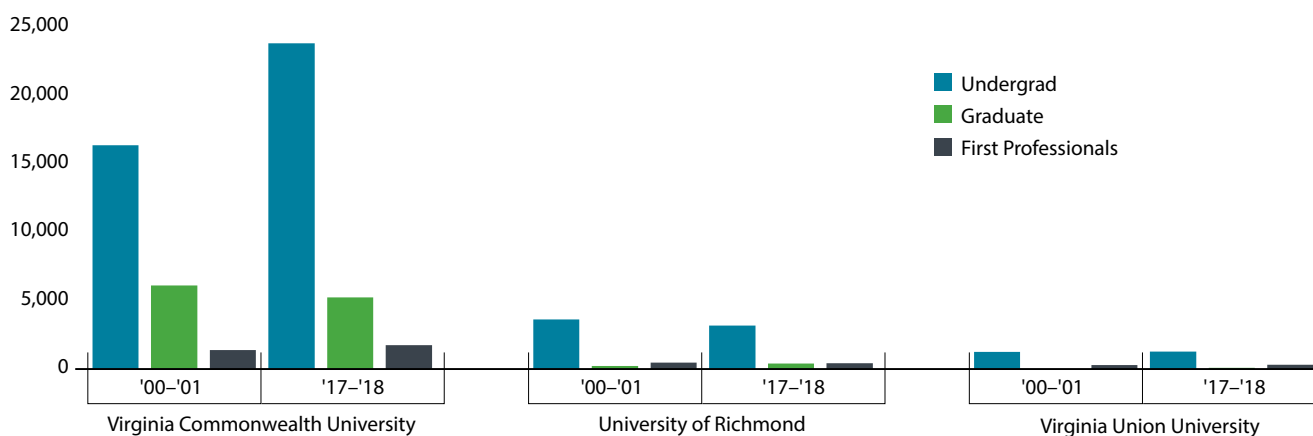


FIGURE 37 // University Enrollment, '00-'01, '17-'18

Source: State Council of Higher Education for Virginia. 2000-2001, 2017-2018

Objective 13.1

Create new and support existing cooperative relationships between institutions and neighborhoods.

- a. Encourage higher education institutions to create neighborhood partnerships for the improvement of K-12 schools, public safety, neighborhood amenities, housing, and mentorship/apprentice programs.
- b. Adapt the educational and skill training offered by local institutions to match the current and future needs of local companies.

Objective 13.2

Encourage institutional development and expansion through policy and careful consideration of land resources.

- a. Work collaboratively with institutions to ensure that master plans for their campuses are presented to the Planning Commission for review.
- b. Explore creation of a payment-in-lieu-of-taxes (PILOT) for institutions.



Richmond is home to three universities: Virginia Commonwealth University [top], Virginia Union University [middle], and University of Richmond [bottom].

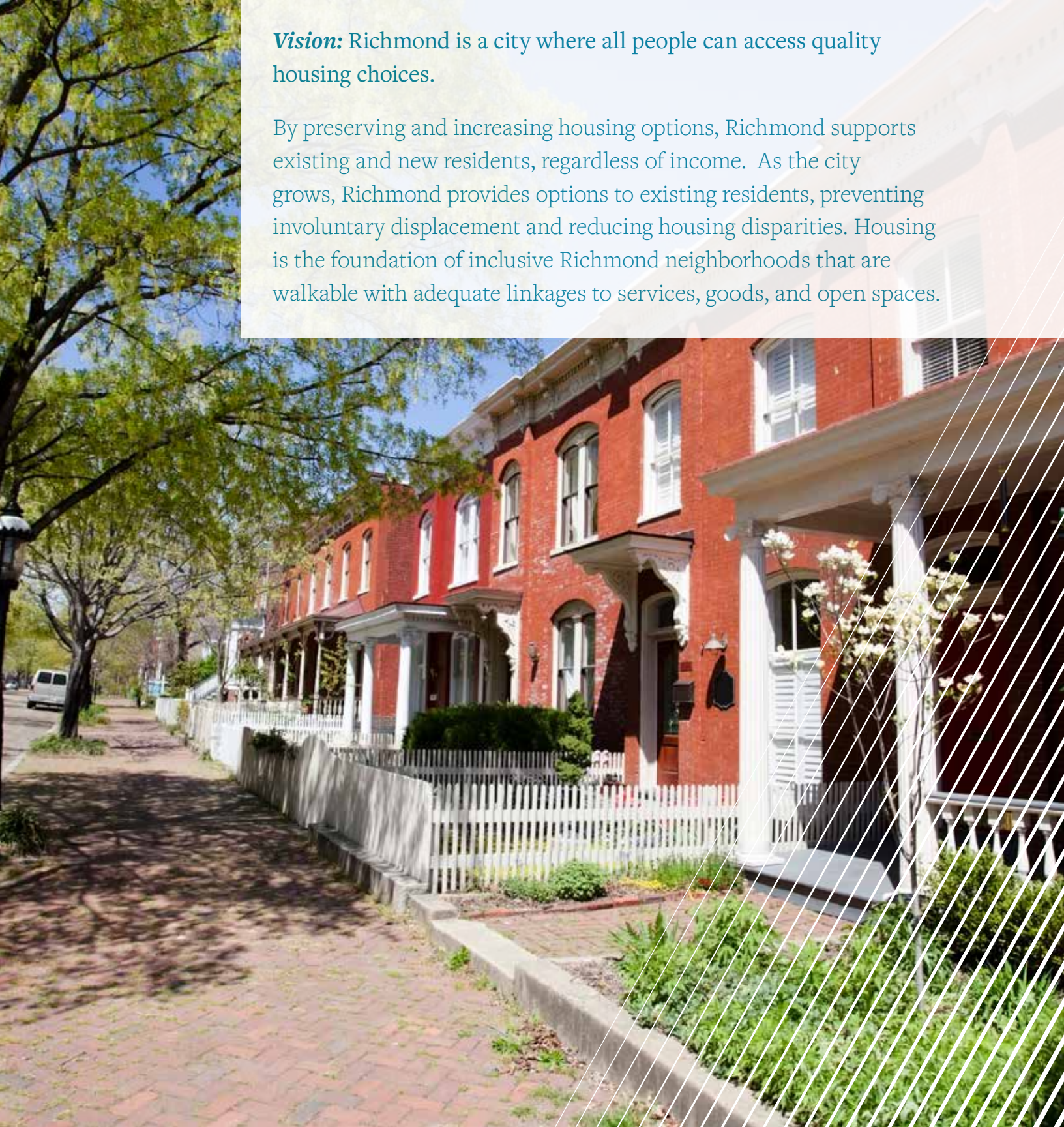


CHAPTER 5

Inclusive Housing

Vision: Richmond is a city where all people can access quality housing choices.

By preserving and increasing housing options, Richmond supports existing and new residents, regardless of income. As the city grows, Richmond provides options to existing residents, preventing involuntary displacement and reducing housing disparities. Housing is the foundation of inclusive Richmond neighborhoods that are walkable with adequate linkages to services, goods, and open spaces.



Goals, Objectives, and Strategies

Goal 14: Housing



Preserve, expand, and create mixed income communities, by preserving existing housing units and developing new ones—both renter- and owner-occupied—throughout the city.

Existing Context

Richmond has not experienced this kind of residential growth since the late 1800s.

As shown in Figure 38, between 2000 and 2019, Richmond added 32,646 residents and its population grew by 17%. That 19-year growth rate is the highest absolute and highest growth rate in population since 1930 to 1950, when the city grew by over 47,381 residents or 26% and also annexed nearly 17 square miles, which accounted for 41% of the total land area in 1942. Richmond has not experienced this kind of population growth — a significant growth in residents over a 20-year period without also annexing land — since the late 1800s. Despite this significant growth in population since 2000, in 2019 many of Richmond's neighborhoods still had less population than in the 1970s and continued to have vacant houses and parcels.

\$72,000

Households earning as high as \$72,000 cannot afford to live in most of the Richmond region.

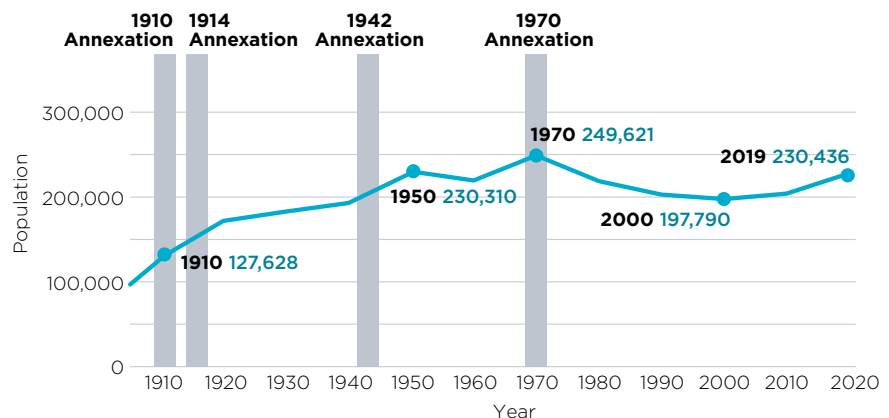


FIGURE 38 // Historic Population

Source: U.S. Census Bureau: 1910, 1950, 1970, 2000 Censuses, 2019 Population Est.

TABLE 6 // Housing Sale Prices

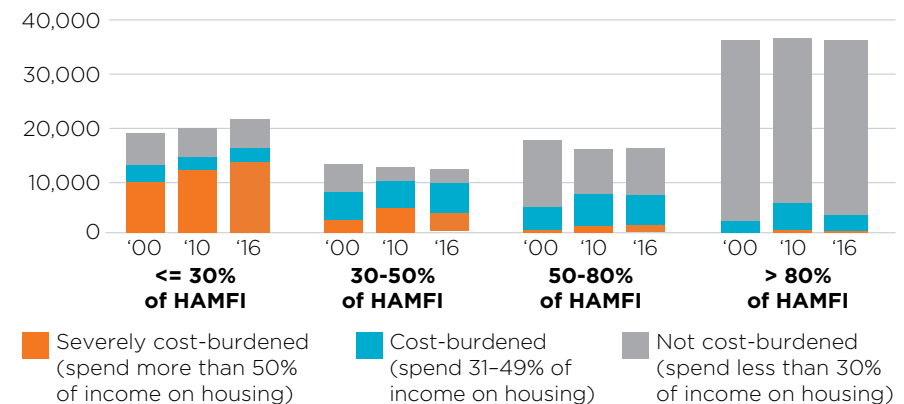
	2009			2018			Percent Change '09-'18
	Avg. price	vs. Region		Avg. Price	vs. Region		
Richmond	\$ 159,000	\$ (51,000)	-24%	\$ 248,000	\$ (13,290)	-5%	56%
Henrico	\$ 211,250	\$ 1,250	1%	\$ 255,000	\$ (6,290)	-2%	21%
Chesterfield	\$ 215,000	\$ 5,000	2%	\$ 260,000	\$ (1,290)	0%	21%
Hanover	\$ 246,975	\$ 36,975	18%	\$ 302,125	\$ 40,835	16%	22%
Ashland	\$ 202,000	\$ (8,000)	-4%	\$ 251,250	\$ (10,040)	-4%	24%
Region	\$ 210,000			\$ 261,290			24%

Source: Richmond MLS

Richmond's housing prices are catching up with the region. The increase in population since 2000 has generally been middle- and high-income earning households who are reinvesting in neighborhoods and bringing average housing prices into parity with the region. Average housing prices increased by 56% from 2009 to 2018, putting Richmond at the fastest price increase in the region. However, in 2009 Richmond's average housing price was 24% below the regional average, whereas in 2018 the average housing price was 5% below the regional average, as shown in Table 6.

Housing costs in Richmond have outpaced income growth for low- and very low-income households. From 2000 to 2016, the proportion of housing-cost-burdened households (spending more than 30% of income on housing) increased from 33 to 42%, as shown in Figure 39. In 2016, two-thirds of households earning less than 80 percent of the HUD area median family income (HAMFI) were housing cost-burdened; whereas, in 2000 half of households earning less than 80% of HAMFI were housing cost-burdened. Given these

Number of Families



HAMFI = HUD Area Median Family Income

FIGURE 39 // Housing Cost Burden by Household Income, 2000–2016
Housing cost burden has increased across all income levels between 2000 and 2016 and decreased slightly in some income levels between 2010 to 2016.

Source: Comprehensive Housing Affordability Strategy (CHAS): 2000, 2010, and 2010-2016

data, there is a substantial need for more housing for low income and very low-income households in Richmond and the Richmond region. The Partnership for Housing Affordability, a regional non-profit, authored a Richmond Regional Housing Framework Plan to develop strategies for all Richmond localities to create more affordable housing throughout the region.

Housing prices limit mobility and concentrate poverty.

According to the 2017 Market Value Analysis (MVA) by the Reinvestment Fund shown in Figure 40, households earning as high as \$72,000 (120% of the Area Median Income [AMI]) can only afford to live in the lowest housing markets in the Richmond region; whereas, in comparable regions (such as Akron and Pittsburgh), moderate income households are able to afford housing in the middle housing markets as well as the low housing markets. This means that in Richmond low- and moderate-income households must live in concentrated pockets of poverty because affordable housing choices do not exist in middle and strong housing markets.

The MVA identifies nine housing market types.

A – High sales prices, higher percentage of recently built houses, primarily owner-occupied, low vacancy rates, low level of bank sales, few publicly-subsidized rental housing options, and the least dense across all categories.

B – Similar to “A” category, but with much higher levels of renter-occupied units (33% of households in the region), with higher vacancy rates than “A” but lower than the regional average. Also the highest density of all market types in the region.

C – More suburban in form than other market types, sales price above the regional average, primarily owner-occupied, few publicly-subsidized rental housing options, more bank sales than “A” and “B” market types.

D – Slightly below regional average in sales price, low rate of owner-occupied housing, low vacancy, and relatively high subsidized rental housing options.

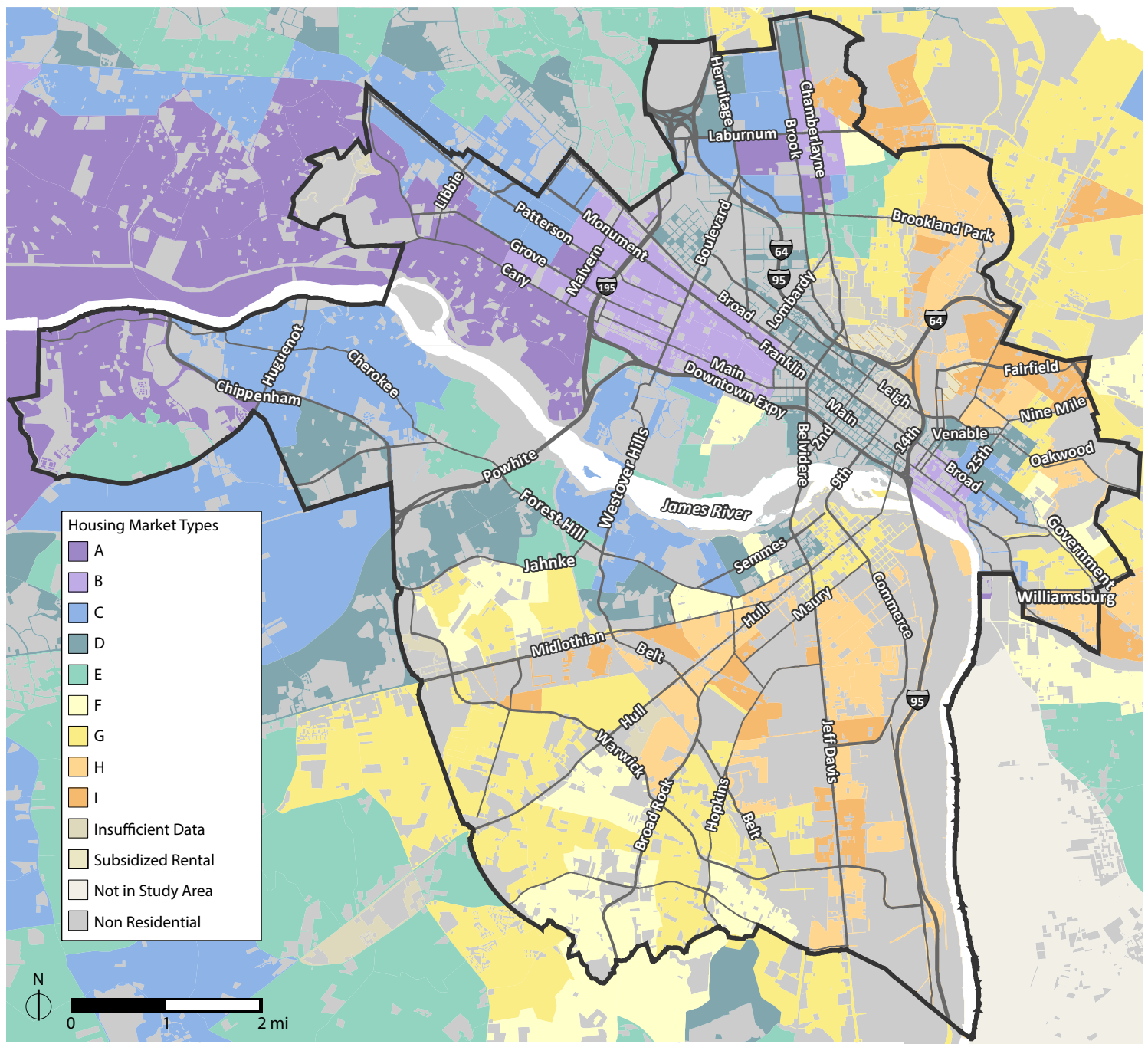
E – Below regional average in sales price, mainly owner-occupied, bank sales equal to the regional average, and low rates of vacancy.

F – About 2/3 of the regional average in sales price, with high percentage of bank sales, even split between owner- and renter-occupied households, high amount of publicly-subsidized rental housing options.

G – About 1/3 of the regional average in sales price, with high percentage of bank sales, slightly more owner-occupied than renter-occupied households, high vacancy rates, low amount of publicly-subsidized rental housing options.

H – Below 1/3 of the regional average in sales price, high percentage of bank sales, low permit activity, majority renter-occupied households, higher amount of publicly-subsidized rental housing options, high vacancy rate.

I – About 1/4 of the regional average in sales price, low permitting activity, majority renter-occupied households, high amount of publicly-subsidized rental housing options, low permitting activity.



	Number of Block Groups	Median Sales Price 2015-2016	Sales Price Variance	Percent Bank Sales	Owner Occupancy	Percent Subsidized Rental	Percent Vacant Residential	Housing Units per Acre	Residential Parcels Built 2008-up	Residential Parcels w/Permits 2015-2016
A	32	\$ 501,292	0.39	2.6%	90.1%	0.4%	0.4%	1.9	5.9%	11.6%
B	23	\$ 425,851	0.47	3.3%	32.9%	10.3%	1.5%	17.2	4.7%	5.0%
C	82	\$ 274,479	0.34	5.5%	83.2%	3.4%	0.6%	3.2	2.7%	7.2%
D	53	\$ 195,175	0.35	9.4%	28.8%	6.9%	1.2%	9.8	3.4%	5.7%
E	103	\$ 182,686	0.32	13.3%	79.8%	2.7%	0.9%	2.8	2.6%	5.5%
F	30	\$ 140,358	0.38	20.5%	48.4%	77.3%	1.8%	4.0	2.5%	4.0%
G	62	\$ 117,611	0.39	29.1%	58.9%	6.5%	3.0%	4.2	2.7%	4.9%
H	31	\$ 63,465	0.61	32.8%	41.0%	12.0%	8.5%	5.6	1.9%	3.7%
I	18	\$ 53,597	0.60	37.3%	30.1%	88.9%	3.2%	7.2	2.0%	2.0%

FIGURE 40 // Richmond Region Market Value Analysis, 2017

Source: The Reinvestment Fund, 2017

Objective 14.1

Increase city-wide awareness of the importance of integrating housing at all income levels into every residential neighborhood so every household has housing choice throughout the city.

- a. Develop and fund a housing policy educational program for newly elected officials and City staff involved in planning, housing, and community development activities.
- b. Create a Richmond Housing Collaborative comprising of eight areas of influence, including housing thought leaders from City government, public housing administration and resident leaders, philanthropic and housing finance leaders, non-profit and for-profit housing development leaders, and housing advocacy leaders to discuss, innovate, create, test, and implement solutions to the City's housing needs.
- c. Increase awareness and improve relationships with landlords regarding the Housing Choice Voucher program, particularly in areas within Nodes, Priority Neighborhoods, and a half mile of high-frequency transit stops, and highlight the new State Law (HB6 Virginia Fair Housing Law), which prevents landlords from discriminating against renters with Housing Choice Vouchers.
- d. Create a center for homeownership that is a clearinghouse for information on City programs, grants, loans, and education, partnering with state agencies such as Virginia Housing Development Authority (VHDA) and the Virginia Department of Housing and Community Development to increase homeownership, particularly among Black and Latino households.
- e. Create an update to the MVA, use the updated analysis to compare changes in housing markets since the 2017 MVA, communicate how changes have impacted housing access, evaluate the effect of policies and programs on local housing markets and sub-markets, and develop new programs as markets change.

“You Don’t Have to Live Here”

Why Housing Messages Are Backfiring and 10 Things We Can Do About It



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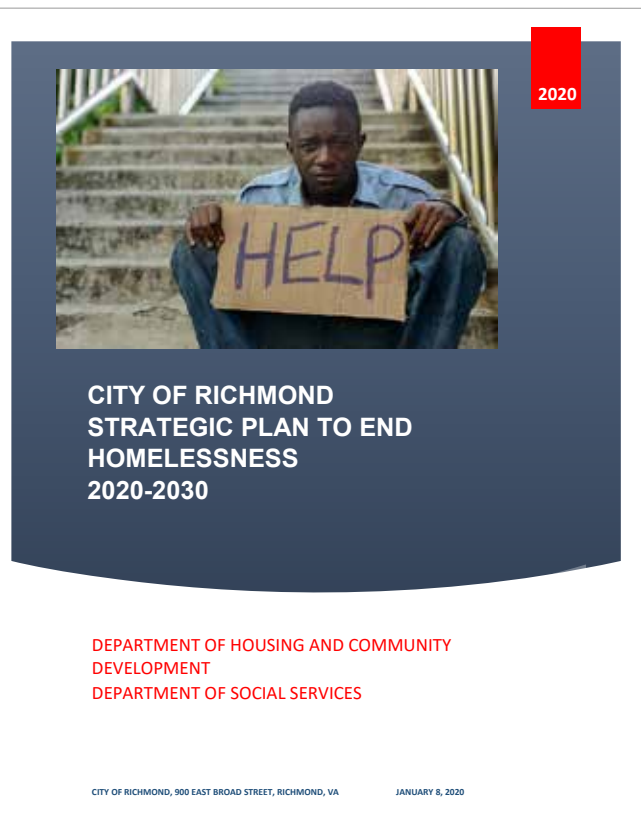
October 2016

Campaigns like the one pictured here from Enterprise help unpack the language and communications messaging that has been used in the past and works to change the narrative about housing.

Objective 14.2

Ensure that homelessness is rare, brief, and one-time.

- a. Create a minimum of 300 units of permanent supportive housing to house persons with special needs by 2024 in partnership with Virginia Supportive Housing and other local housing organizations.
- b. Create a minimum of 250 new emergency shelter units to provide additional housing for persons experiencing homelessness by 2021.
- c. Ensure that individuals and families facing eviction due to late- and/or non- payment of rent receive free legal assistance, one-time rental assistance, and personal finance education to prevent eviction.
- d. Amend the Zoning Ordinance to allow by right emergency shelter units and permanent supportive housing units in zoning districts where currently permitted by conditional use permits only.
- e. Create siting criteria and program requirements for City-wide emergency housing facilities to include a maximum number of units permitted, the maximum travel distance permitted to public transit, on-site management, food services, social services, housing services, and facility security for both the residents and community.
- f. Expand partnerships serving the homeless to provide small year-round emergency housing facilities for all homeless populations that include supportive services and food.
- g. Amend zoning definitions related to services and facilities serving people experiencing homelessness (including group homes, lodging houses, and multi-family/permanent supportive housing) to support best and emerging practices as designated by the U.S. Interagency Council on Homelessness.
- h. Leverage the housing and funding expertise of the Virginia Department of Housing and Community Development to increase permanent affordable housing to Richmonders exiting homelessness.



In January 2020, the City developed the Strategic Plan to End Homeless, which outlines a multi-sector approach to ensuring homelessness is rare, brief, and one-time.

- i. Review City properties for suitability for conversion to emergency housing or services to meet the needs of Richmonders experiencing homelessness.
- j. Develop a Memorandum of Understanding or other formal partnership agreement between the Greater Richmond Continuum of Care, the designated "Collaborative Applicant" (Homeward), and appropriate City stakeholders and our neighboring counties and cities to address the regional presence of persons experiencing homelessness.

Objective 14.3

Create 10,000 new affordable housing units for low- and very low-income households over the next 10 years.

- a. Commit to providing a dedicated revenue source to annually fund the Affordable Housing Trust Fund and prioritize funding projects that provide housing to very low-income individuals and families, including supportive housing, within a half mile of high-frequency transit stops.
- b. Amend the rehabilitation tax abatement program to provide incentives for for-profit developers to create mixed-income residential housing where at least 20% of the units are affordable to households earning less than 50% of the AMI.
- c. Lobby the General Assembly to give Richmond powers under 15.2-2304, which allows localities to adopt mandatory inclusionary zoning programs.
- d. Support new construction technologies that standardize housing design and construction to reduce the cost of building affordable housing.

Objective 14.4

Increase the number of mixed-income communities along enhanced transit corridors.

- a. Prioritize the development review process for applications for mixed-income housing that includes 20% or more of the units at 50% AMI.
- b. Incorporate mixed-income housing as an element of the small area plans identified in Goal 1 (see Goal 1).
- c. Coordinate with GRTC to develop new station locations and routes where development is occurring to ensure mixed-income communities have access to transit to reach jobs, goods, and services (see Goal 8).
- d. Create affordable housing tax-increment finance (TIF) zones for land within a half mile of Pulse stations and direct the future incremental tax revenues funds from the TIF to the Affordable Housing Trust Fund for funding mixed-income projects within the Pulse TIF zone; establish similar TIF zones along future enhanced transit corridors.

- e. Lobby the VHDA to update the Qualified Allocation Plan (QAP) to encourage more Low-Income Housing Tax Credit (LIHTC) projects near transit in urban areas and in non-low-income areas, and require open space for children, and to review the regional distribution of LIHTC projects.
- f. Create a database to monitor LIHTC projects to track expiring affordable housing and determine ways to preserve the affordability (possibly including programs to allow tenants to purchase units and programs allowing the City to purchase expiring projects), focusing on LIHTC projects within a half mile of high-frequency transit stops.

Objective 14.5

Encourage more housing types throughout the city and greater density along enhanced transit corridors and at Nodes and Priority Neighborhoods (shown in Figure 4141) by amending the Zoning Ordinance.

- a. Rezone corridors, Nodes, and Priority Neighborhoods consistent with the Future Land Use Plan (see Goal 1).
- b. As part of the Zoning Ordinance update, revise the Affordable Dwelling Unit density bonus process to make it easier to accomplish.
- c. Update Zoning Ordinance to allow for accessory dwelling units by-right with form-based requirements in all residential zones.
- d. Adapt obsolete City-owned buildings into affordable and market rate housing (see Goal 2).
- e. Allow the development of middle housing (2- to 4-unit buildings) by-right within a half mile of high-frequency transit stops.
- f. Explore expanding the Maggie Walker Community Land Trust scope to create small multi-family buildings (2- to 4-units) where one unit is owned by a low-income household and the other unit(s) are rented to low-income households with Housing Choice Vouchers.

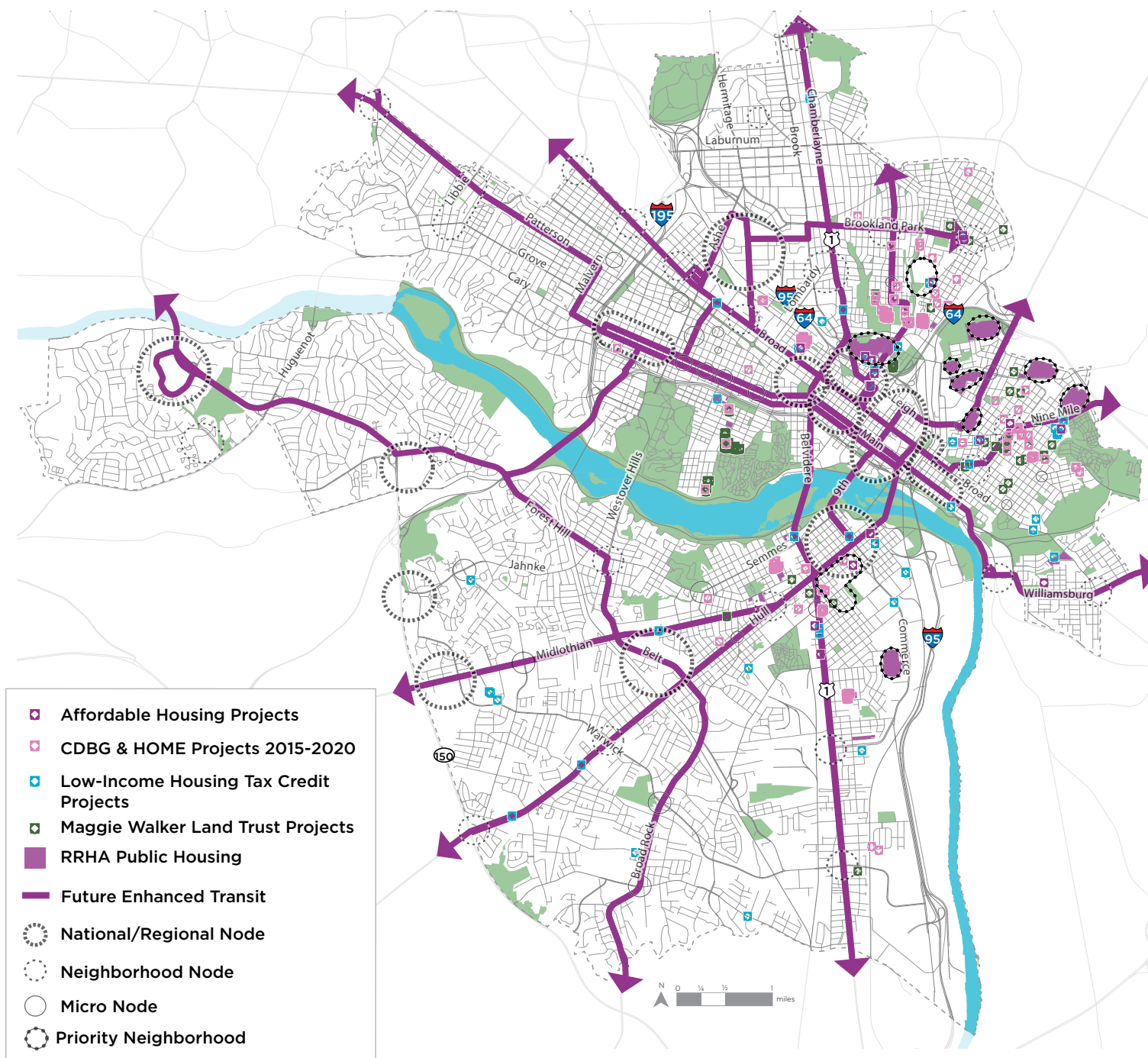


FIGURE 41 // Existing Affordable Housing with Nodes and Enhanced Transit

Objective 14.6

Transform Richmond Redevelopment and Housing Authority (RRHA) public housing properties into well-designed, walkable, mixed-use, mixed-income, transit-adjacent communities.

- a. Identify revenue streams dedicated to the transformation of public housing into mixed-income residential neighborhoods.
- b. Develop small area plans with inclusive community input (including existing RRHA residents) to plan for the redevelopment of Priority Neighborhoods at 1) Gilpin Court, 2) Mosby South, 3) Creighton Court, 4) Mosby North, 5) Fairfield Court, 6) Whitcomb Court, and 7) Hillside Court.
- c. Ensure that all RRHA residents have quality housing and choice by working with public housing residents to consider forming homeowner associations or cooperative housing corporations by rehabilitating and then purchasing their current housing for a nominal cost.
- d. Partner with the RRHA to assist over-income public housing residents transition to market rate housing by providing wrap-around supportive services to increase confidence and financial security.
- e. Partner with the RRHA and develop an agreement that integrates the City's and the RRHA's housing objectives into a comprehensive strategy to end poverty and to assist public housing residents build wealth.
- f. Partner with RRHA to provide community members the opportunity to negotiate the terms of redevelopment for each Priority Neighborhood through the creation of a Tenant Bill of Rights.



The Armstrong High School site was redeveloped into a mixed-income community by RRHA, including housing for very-low and low-income households.

Objective 14.7

Re-imagine the future of manufactured home parks.

- a. Develop an action plan to revitalize the physical condition of the manufactured home parks into desirable tiny home communities.
- b. Promote non-profit investment and cooperative ownership in existing manufactured home parks.

Objective 14.8

Develop inclusionary and equitable housing options for our gentrifying neighborhoods to prevent involuntary displacement.

- a. Create a tax fund to help qualifying low-income residents remain in their homes as their assessments increase by involving the philanthropic community.
- b. Fund home repair and energy efficiency programs to assist individuals with deferred maintenance (see Objective 14.9).
- c. Create and fund new programs and coordinate existing programs that will reduce evictions, such as emergency rental assistance and tenant and landlord education and training.
- d. Create and then fund an emergency rental and utility assistance program.
- e. Support marketing efforts that encourage landlords to accept housing vouchers.
- f. Reduce the impediments to fair housing choice by implementing the first-tier priorities outlined in the Analysis of Impediments to Fair Housing Choice report (2017–2020), many of which directly align with the recommendations outlined in this Goal of Richmond 300.
 - Increase access to accessible housing
 - Decrease racial/ethnic disparities in access to opportunity
 - Decrease disproportionate housing needs among minority and low-income households
 - Expand fair housing capacity
 - Deconcentrate publicly-supported housing
 - Reduce concentrated areas of racial/ethnic poverty
 - Decrease residential segregation

Objective 14.9

Assist households that desire to age in place in their neighborhoods.

- a. Track and report annually the funding that the City allocates to existing moderate- and low-income homeowners, and elderly homeowners to fix their homes.
- b. Increase education/promotion of existing programs and expand programs to aid homeowners in implementing energy efficiency and stormwater upgrades, including establishing a Residential PACE (Property Assessed Clean Energy) Program (see Goal 15).
- c. Continue to allocate Housing Opportunities Made Equal (HOME) Investment Partnerships Program and Community Development Block Grant (CDBG) funds to non-profit affordable housing developers to create or preserve homeownership opportunities, especially in neighborhoods experiencing gentrification.
- d. Analyze City-owned parcels that are located in neighborhoods that are conducive for low-income homeownership opportunities and transfer to the Maggie Walker Community Land Trust.
- e. Coordinate and promote existing Green and Healthy Homes programs to address and promote the basic healthy homes principles of dry, clean, ventilated, free from pests and contaminants, well-maintained, and safe.
- f. Partner with non-profits and philanthropic institutions to develop a grant program to assist low- and very low-income homeowners renovate their homes and to address building and property maintenance code violations.
- g. Encourage and facilitate property tax relief for very-low and low-income seniors to allow them to stay in their neighborhoods.
- h. Amend the Zoning Ordinance to allow accessory dwelling units in all residential zones to allow for in-law apartments.
- i. Educate seniors about reverse mortgages to prevent seniors from agreeing to predatory agreements.
- j. Encourage the creation of 55+ senior communities within a half mile of high-frequency transit stops.



CHAPTER 6

Thriving Environment

Vision: Richmond is a sustainable and resilient city with healthy air, clean water, and a flourishing ecosystem.

Carbon emissions are low, air and water quality are high, and city-wide solid waste production is minimal. The City is positively adapting to the effects of a changing climate, with a built environment that enhances and protects natural assets, including the James River. All residents have equitable access to nature and a healthy community.



Goals, Objectives, and Strategies

Goal 15: Clean Air



Improve air quality within the city and the region, achieve a 45% reduction in greenhouse gas emissions within the city by 2030, and achieve net zero greenhouse gas emissions within the city by 2050 via RVAgreen 2050.

Existing Context

Richmond is in the midst of a global climate crisis. Much of the built environment and the means by which people and goods get around contribute to greenhouse gas (GHG) emissions and release of other pollutants to the atmosphere. While urban form and residential density will not solve these problems alone, houses built at lower densities that require an automobile for most trips use more energy and, therefore, create more pollution overall, as compared to neighborhoods that are built including a dense mix of uses and do not require an automobile for most trips.

RVAgreen 2050 was launched in with the goal of reducing greenhouse gas emissions within the city by 80% by 2050 and in 2020, this goal was increased to a 100% reduction by 2050.

The RVAgreen 2050 plan has not yet been developed, but will include ways to change the paradigm of how Richmonders get and use energy by transforming Richmond's energy system, guiding the city to more energy efficient buildings that save money for residents and businesses, and using cleaner and more reliable energy and transportation options that result in healthier air and a higher quality of life for our community. Goal 15 of Richmond 300 focuses on reducing energy consumption and shifting our energy production to renewable sources.

Greenhouse gas emissions in Richmond come from a variety of sources.

In 2015 in Richmond, 40% of community GHG emissions were from commercial buildings, 24% from the transportation sector, 23% from residential buildings, and 11% from industrial facilities. In 2015, 50% of community GHG emissions resulted from the use of electricity, 24% from gasoline/diesel consumption and 22% from natural gas consumption. Overall energy consumption in Richmond actually decreased by 2% between 2008 and 2015. According to the U.S. Energy Information Administration, in 2016 in the Commonwealth of Virginia, 45.6% of GHG emissions came from the transportation sector.

Renewable energy is beginning to take shape in Richmond.

In 2017, Richmond achieved SolSmart Silver designation for its efforts to provide resources and reduce barriers to make it faster, easier, and less expensive for the community to go solar. While only accounting for

0.08% of the total energy supply, the production of solar energy has increased by nearly 450% between 2008 and 2015. Analysis by VCU's Center for Urban and Regional Analysis shows great potential for rooftop solar panels to produce up to 12% of the city's energy demand; however, this would require upgrades to our electricity distribution and energy storage infrastructure.

Streetlights account for a major demand in the use of power by the City of Richmond.

The Department of Public Utilities (DPU) owns and operates 37,000 streetlights, as well as an electric distribution utility that supports their operation. The electric utility system grid is co-located on poles with Dominion Energy, Verizon, and some other isolated Telecom providers (i.e., Fiber, Radio Frequency, etc.). DPU is currently in a pilot phase of examining LED technology and its effects on lighting levels, color rendering, power usage, and various electrical grid effect characteristics. DPU works closely with Richmond Police Department (RPD) in various environmental impact initiatives to enhance or promote a sense of greater public safety.

Objective 15.1

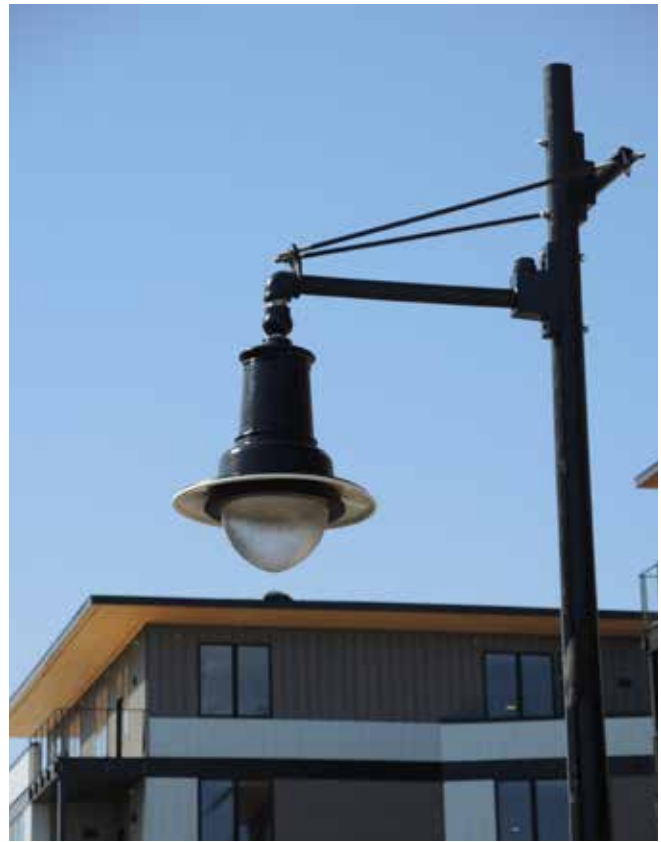
Reduce air pollution related to transportation.

- a. Increase the number of Richmonders living in a development pattern that encourages density and reduces dependency on single-occupancy vehicles (see Goal 1, Goal 8, Goal 14).
- b. Locate jobs near residents (see Goal 1, Goal 11).
- c. Transition public and private vehicles to modes that do not emit greenhouse gas (see Goal 10).
- d. Enforce the anti-idling policy for City vehicles.
- e. Adopt a Council resolution to encourage idling reduction community-wide.
- f. Increase use of mass and active transportation options (see Goal 8).
- g. Continue to engage with the CMAQ Program's measures to improve air quality in the city.

Objective 15.2

Reduce air pollution related to City infrastructure and facilities.

- a. Conduct an energy audit, publish grades for efficiency, and benchmark energy use for all City facilities.
- b. Develop an energy management program for City government to include:
 - i. Education programs for City procurement and capital project management staff on the provisions in City Council Resolution 2008-R152-2009-14 for green, high-performance building standards on City construction projects.
 - ii. Specific reduction goals for municipal greenhouse gas emissions by sector.
 - iii. A plan to retrofit all City buildings to improve efficiency.
 - iv. Installation of renewable energy (solar, wind, hydro, geothermal) on City buildings and land (methane-capture at landfill and wastewater treatment plant).
 - v. Identification of opportunities to reduce wastewater energy use.
 - vi. The purchase off-site renewable energy to cover remaining City demand after deployment of on-site solar and energy efficiency initiatives, and other strategies as appropriate.
- c. Convert streetlights to LED and/or solar.
- d. Conduct study on local and upstream methane leakage from DPU operations.
- e. Adopt a green building ordinance for municipal facilities.



Manchester streetlights are LED.

Objective 15.3

Reduce air pollution related to private buildings.

- a. Engage local professional expertise to develop incentives and/or other components of a robust Green Building program that may include:
 - i. Transitioning from natural gas to electric.
 - ii. Changing the Zoning Ordinance to encourage developers to renovate buildings with deep energy retrofits and/or build new construction following green building guidelines by creating incentives such as reducing parking requirements or density bonus.
 - iii. Upgrading energy efficiency of industrial facilities.
 - iv. Transitioning buildings from fuel oil to all electric.
 - v. Evaluating the potential of green development zones as permitted by state code.
- b. Work with local providers to market energy retrofit programs for low-income individuals.
- c. Encourage industrial facilities to use Combined Heat and Power to generate electricity and thermal energy.
- d. Create a Commercial Property Assessed Clean Energy (CPACE) program.
- e. Advocate in the General Assembly for enabling legislation allowing jurisdictions to:
 - i. Adopt residential PACE programs.
 - ii. Require energy benchmarking and public disclosure, and adopt local ordinance requiring benchmarking by large privately owned buildings.
 - iii. Adopt stricter energy efficiency requirements in their building codes.
- f. Advocate in the General Assembly to amend the statewide uniform building code to require greater energy efficiency.
- g. Review existing zoning and policy for impediments to renewable energy and revise them to reduce barriers.
- h. Evaluate establishing incentives to encourage the installation of solar panels on private buildings, such as matching the state's 30% incentive.

- i. Develop guide for high-performance / net zero energy new construction and historic retrofits to encourage green construction practices.
- j. Evaluate creating legislation to require stronger energy-efficiency and green-building standards of developers requesting zoning variance and/or site plan approvals.
- k. Develop a comprehensive 'green business' program, similar to that of Montgomery County, Maryland or the Loudoun County, Virginia Green Business Challenge.

Objective 15.4

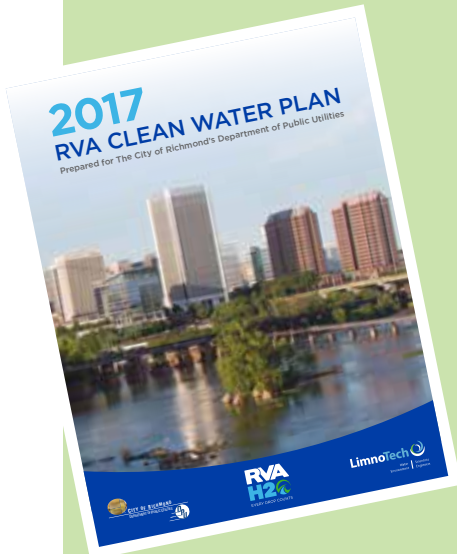
Reduce the amount of waste going to landfills.

- a. Develop and implement a multi-family and commercial recycling program.
- b. Increase the number of public recycling bins and increase the frequency that recycling is collected.
- c. Increase city-wide composting for residential, commercial, and industrial users by coordinating with private composting companies.
- d. Create incentives for construction and demolition material recycling.
- e. Create "pay-as-you-throw" program.
- f. Demonstrate sustainable consumption, sustainable building practices, and zero-waste behaviors in the design and expansion of City operations.
- g. Require new construction projects to provide areas for dumpsters, recycling, and composting.
- h. Advocate in the General Assembly for enabling legislation allowing cities to ban or tax plastic bags, single-use plastics, balloons, and Styrofoam.
- i. Lobby the General Assembly to encourage bottle deposit to decrease litter, especially near the river.
- j. Expand the City's Adopt-a-Street Program to include waterways, greenways, and bike lanes.

Goal 16: Clean Water



Improve local water quality and manage the built environment to enhance and protect natural assets such as the James River.



Existing Context

Clean water not only improves the natural environment that supports plant and animal life, but also improves human health, as the James River is the source of the city's drinking water.

Pollutants from impervious surface runoff and other pollutants that find their way into the James River degrade water quality. Goal 16 of Richmond 300 includes recommendations that seek to improve the quality of the water in all of the city's waterways.

The James River's water quality is steadily improving.

The James River is a natural habitat, recreational destination, and the source for drinking water for the Richmond Metropolitan Region. The quality of the water in the James River affects habitats, recreation, and public health. In 2013, the City began an initiative called RVAH2O to focus on water quality and quantity issues within the city. Part of the initiative was the development of the RVA Clean Water Plan, which seeks to create one systematic approach to management of the city's water resources.

Similar to other older cities, Richmond is partially within a combined sewer system (CSS), meaning that sanitary sewage and stormwater are combined in one pipe system.

Approximately 32% of the city's land area is within the combined sewer area with 52% of the city's population. During major storms, the CSS can be overwhelmed, resulting in untreated sewage being released directly into the James River, as shown in Figure 42. There are 25 overflow points. The City and Commonwealth have invested close to \$300 million since the 1980s to make improvements to the CSS infrastructure to reduce combined sewage overflow (CSO) events and are engaged in a \$117 million effort to reduce these events further.



Green infrastructure improves water quality and reduces the amount of water runoff that enters the CSS, resulting in fewer CSO events. Stormwater runoff, a major cause of water pollution in urban areas, carries trash, bacteria, heavy metals, and other pollutants from the urban landscape to waterways. Higher flows resulting from heavy rains also can cause erosion and flooding in streams, damaging habitat, property, and infrastructure. The City is actively installing green infrastructure, a cost-effective, resilient approach to managing rain event effects, using vegetation, soils, and other elements to manage water and create healthier urban environments. In 2020, the City kicked off a green infrastructure Master Planning process for three watersheds prioritized in the RVA Clean Water Plan: Shockoe, Gillies, and Manchester Canal.

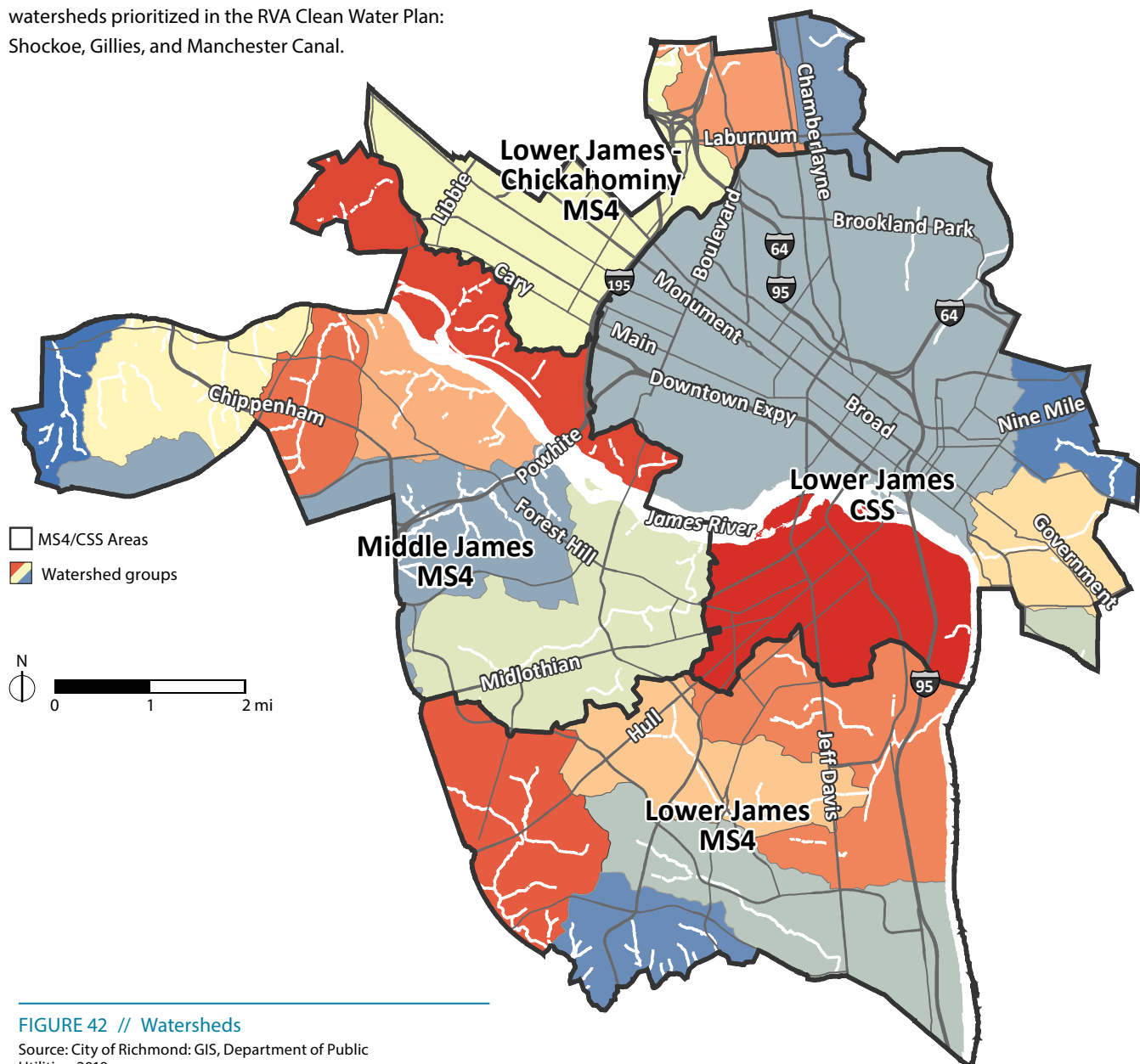


FIGURE 42 // Watersheds

Source: City of Richmond: GIS, Department of Public Utilities, 2019

Objective 16.1

Restore all streams into healthy riparian areas.

- a. Reduce parking requirements and increase landscaping requirements particularly in industrial areas along the James River south of downtown (see Goal 4).
- b. Replant stream buffers in riparian areas on City-owned property, and encourage private property owners to do same.
- c. Prevent building in riparian areas.
- d. Create watershed plans for each of the watersheds in the city, on both public and private land, including impervious reduction targets.
- e. Implement the RVA Clean Water strategy to replace or restore 10 acres of riparian buffers according to state guidance.
- f. Implement the RVA Clean Water strategy to restore 2,500 linear feet of stream.
- g. Explore programs to daylight streams and de-culvert streams.
- h. Implement strategies to reduce pollutants entering waterways (shown in Figure 43), such as encouraging the reduction of lawn chemicals and preventing debris from entering streams.
- i. Identify brownfields for redevelopment and explore programs to incentivize redevelopment of the brownfields into appropriate uses.
- j. Implement RVA Clean Water strategy to reduce contribution of pollutants to the Municipal Separate Storm Sewer System (MS4).
- k. Implement RVA Clean Water strategy to construct Long-Term Control Plan projects.
- l. Reduce litter in the city, by encouraging more trash/receptacles and more frequent cleaning/management of areas with a lot of litter, so the litter does not flow into city waterways.

Objective 16.2

Place an additional 100 acres under conservation easement, prioritizing conservation of land that creates connected green corridors.

- a. Identify properties to acquire and set aside money to acquire the properties.
- b. Implement RVA Clean Water strategy to place an additional 10 acres under conservation easement.

Objective 16.3

Reduce water consumption by 10% per capita.

- a. Implement RVA Clean Water strategy to implement new water conservation technologies and promote water conservation efforts.
- b. Encourage on-site graywater uses in public and private facilities.
- c. Minimize drinking water waste through infrastructure improvements.
- d. Encourage planting of drought-resistant species.
- e. Adjust pricing to encourage conservation/utility bills reflective of use, and ensure there are programs to teach people about water conservation so that low-income families are not burdened with unexpectedly high bills.
- f. Develop incentives for commercial/institutional water reduction.
- g. Benchmark water usage in utility bills by comparing usage to average usage.
- h. Benchmark water usage in all City facilities and develop plan to reduce consumption.

Increase green stormwater infrastructure throughout the city, prioritizing areas with a high heat vulnerability index score.

-
- This map illustrates environmentally sensitive areas within the James River watershed. The James River is shown as a prominent light blue feature flowing through the center. Surrounding the river and its tributaries are various colored regions: light green for Resource Management Areas, medium green for Resource Protection Areas, and light blue for Wetlands. Purple outlines delineate the 100-year and 500-year floodplains. The map includes numerous neighborhood names such as White, Patterson, Monument, Grove, Cary, Waverly, Boulevard, Broad, Lenhardt, Main, Franklin, Leigh, Venable, Br 22nd, Nine Mile, Oakwood, Government, Williamsburg, Commerce, Jaffews, Hopkins, Broad Rock, Waverly, Hull, Midlothian, Belt, Jahnke, Forest Hill, Powhite, Cherokee, Chippenham, Huguenot, Laburnum, Brookland Park, and Fairfield. Major roads like I-64, I-95, and I-195 are also marked. A legend in the bottom left corner defines the symbols for floodplains, wetlands, and resource areas. A scale bar and north arrow are also present.
- 100-year Floodplain
500-year Floodplain
Wetlands
Resource Protection Areas
Resource Management Areas
- 0 1 2 mi
- FIGURE 43 // Environmentally Sensitive Areas

RICHMOND
300 AMENDED - JULY 2023

Goal 17: Resilient & Healthy Communities



Positively adapt to the effects of a changing climate via RVAgreen 2050, and ensure that all residents have equitable access to nature and a healthy community.

Existing Context

The manner in which humans design and use land has significant effects on the natural environment and an individual's health. The Science Museum of Virginia predicts that due to a changing climate, Richmond will experience more days over 95 degrees and more major rain events. Urban form, land use, and transportation systems have direct effects on public health, and can influence factors such as obesity, diabetes, and asthma rates, as well as overall fitness. The recommendations outlined in Goal 17 of this Plan seek to make Richmond more resilient and healthy with a focus on natural habitats, open space, parks, and agriculture. In addition to Goal 17, various sections of this Plan outline many recommendations that seek to improve the health of Richmonders; for example, Goals 1 and 4 describe strategies to create walkable neighborhoods and destinations, Goal 8 outlines recommendations to increase active transportation options, Goal 14 presents strategies for creating and improving quality housing, and Goals 15 and 16 provide recommendations for improving air and water quality.

Richmonders are vulnerable to urban heat. Urban heat vulnerability is a term used to describe an area's conditions that make it more or less sensitive to heat. Currently, 21.5% of Richmonders live in census tracts designated as "highest" in terms of urban heat vulnerability, while 19.6% live in census tracts designated as "high." These areas correspond with some of the densest areas of the city and areas of the city with the highest poverty rates. As Richmond continues to experience longer and hotter heat waves, implementing strategies to make the city cooler will be increasingly critical to keep Richmonders healthy and our natural environment thriving.

Two in five Richmonders do not have easy access to quality food. Based on 2015 data from the U.S. Department of Agriculture, 40% of Richmonders live in a food desert, meaning they live over a mile away from a full-service grocery store. Having access to quality food can decrease overweight and obesity rates, which are currently increasing.

The City of Richmond has sought to understand the factors that influence these concentrated areas with limited access and identify local solutions.

In 2011, the Mayor's Office appointed community advocates, academics, community leaders, business owners, and others to the Food Policy Taskforce, which was charged with providing recommendations on food policy and land use planning that would promote greater access to healthy foods. In 2014, the City conducted a Food Policy Analysis, which was used to inform a city-wide community engagement campaign conducted by the Richmond Food Justice Alliance (RFJA) in 2019. RFJA collaborated with a committed group of impacted residents to develop and implement the campaign. This 8-month effort allowed for individuals who experience food insecurity firsthand to identify the

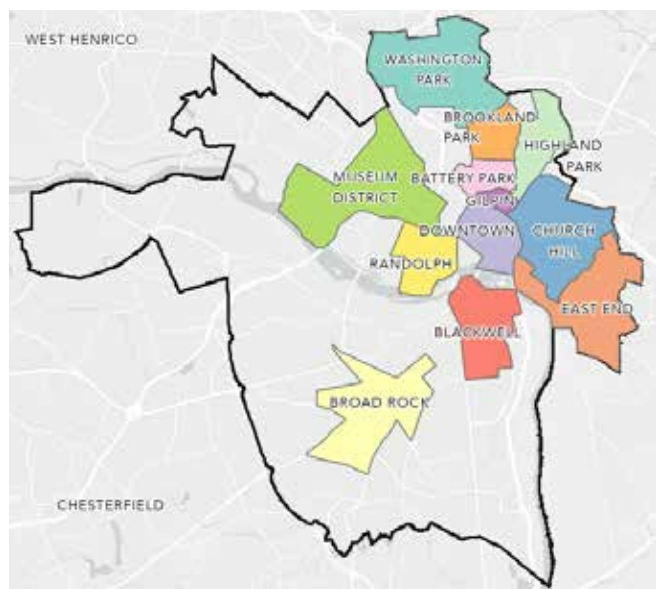
solutions that would benefit them and their families most. Relevant land use and city planning policies that were identified in the campaign are included in objective 17.4.

Access to open space and natural systems can decrease the risk of diseases like obesity and asthma and increase biodiversity and overall environmental health.

Asthma, diabetes, and obesity rates are higher in areas of concentrated poverty. According to the Centers for Disease Control and Prevention (CDC), asthma rates in adults living in the East End and the Southside, in areas of concentrated poverty, are double that of adults living in the West End (14% and 7%, respectively). Asthma rates are linked to pollution and poor housing conditions. Across the city, diabetes rates vary from less than 5% in the West End to over 20% in the East End and the Southside, which is higher than the highest state averages in the U.S. (West Virginia has the highest statewide diabetes rate at 15%). According the CDC, in 2014, 65.3% of Richmonders were considered overweight or obese, a 25% increase since 2011, when the rate was 52%.

The James River is rich and critical habitat for thousands of plant and animal species.

The James River Park System is biodiverse and hosts a rich array of species, 14 mammal species, 170 bird species, 10 frog species, 100 insect species, and more than 450 species of wildflowers, grasses, trees, shrubs, and wetland/aquatic plants. However, these plant communities are under stress from invasive species. The James River also serves as spawning ground for migratory fish, such as shad, herring, perch, and bass that swim from the ocean and the Chesapeake Bay to spawn at and above the James River Fall Zone.



Throughout the engagement process, RFJA [some members of RFJA are picture in the top photo] asked community members to self-identify the community they belong to, instead of staying strict to their current zip code or the name associated with a census tract. Note that the colored regions in the map [bottom image] are not representative of specific boundaries but instead represent a grouping of multiple areas with similar experiences under a common, recognizable name from that area. Therefore, the absence of neighborhood titles on the map does not mean they were ignored.

Objective 17.1

Increase the percentage of Richmonders within a 10-minute walk of quality open space to 100%, prioritizing low-income areas with a high heat vulnerability index rating, with a long-term goal of having all Richmonders within a 5-minute walk of a quality open space, as shown in Figure 44 and Figure 45.

- a. Utilize the Maggie Walker Community Land Trust to create public open space.
- b. Revise the Zoning Ordinance to include a green space/green amenity minimum (see Goal 4).
- c. Engage residents (particularly traditionally under-represented communities), developers, government, technical experts, and other stakeholders in defining and encouraging excellence in design of public open and green space.
- d. Develop a strategy for acquiring land for new parks and open spaces, and develop a Parks Master Plan (see Goal 2).
- e. Implement strategies in Goal 8 to connect parks and increase access to parks.
- f. Promote the Parklet Program, encourage the development of parklets throughout the City.
- g. Rely on principles of crime prevention through environmental design rather than police presence to ensure park safety.
- h. In designating and designing new parks, consider and mitigate potential negative effects, such as increased adjacent property values, cultural displacement, and increased regulation of public space.
- i. Amend City ordinances to allow public access to school yards and playgrounds during non-school hours.
- j. Create public-private partnerships to help the City maintain and manage high-quality parks, green infrastructure, and public open space.
- k. Create dedicated funding for the creation and maintenance of new and existing parks, public open space, plazas, and greenways, such as 1) a bond referendum and/or 2) a neighborhood-based program where landowners and developers pay fees that will be used to create a park in their neighborhood.

- I. Develop incentives to create publicly accessible open space as part of private development (see Goal 4).

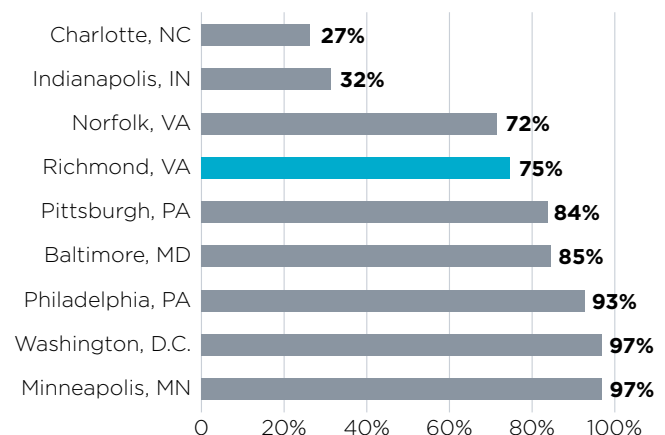


FIGURE 44 // Percentage of Population within 10-minute Walk of Parks

Source: City of Richmond, Trust for Public Land, 2017

75%

of Richmonders lived within
a 10-minute walk of a park in
2017

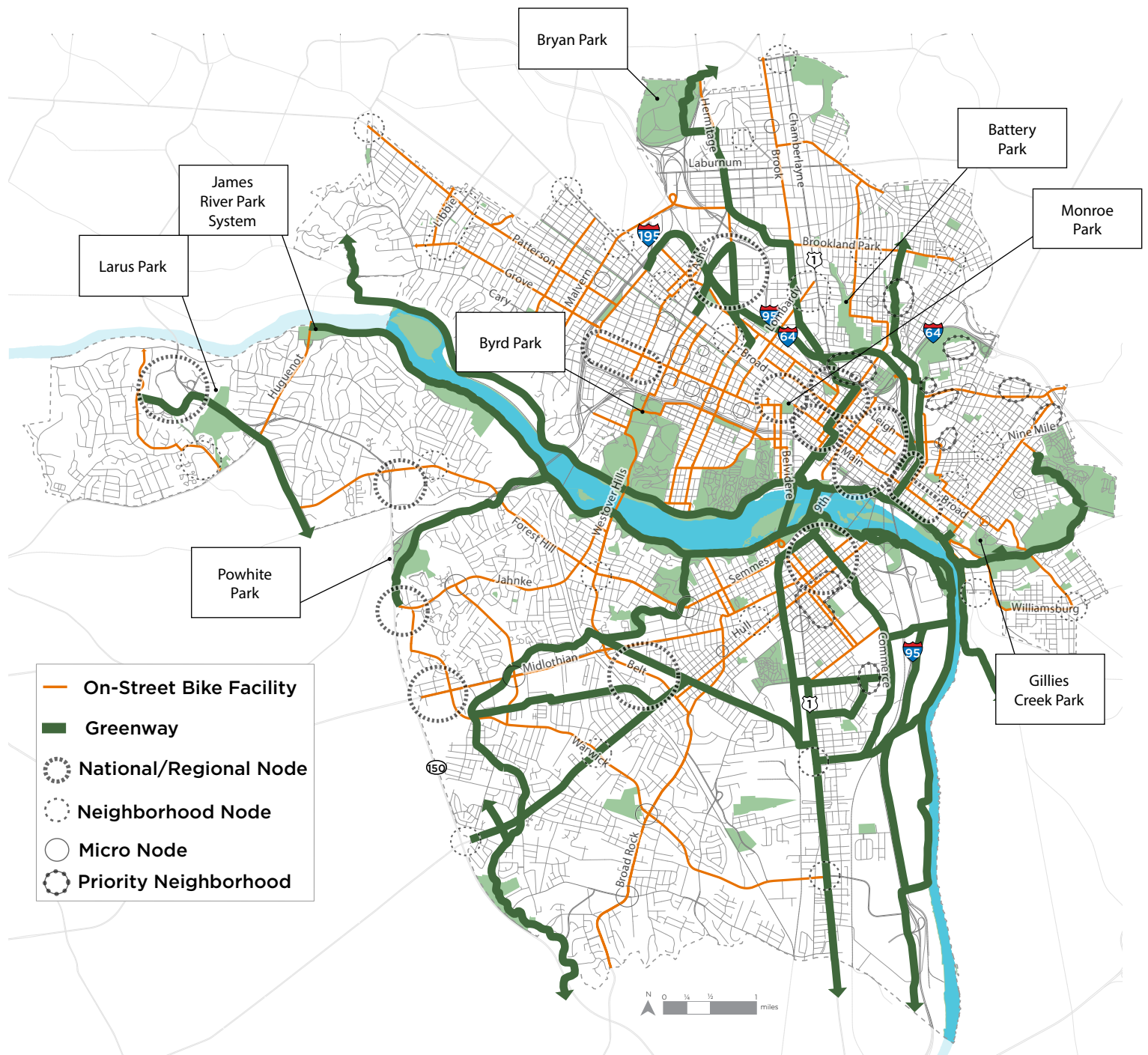


FIGURE 45 // Parks, Greenways, and Bike Facilities Map

Objective 17.2

Increase city-wide tree canopy from 42% to 60% (see Figure 46) and seek to achieve a 30% tree canopy in all neighborhoods, prioritizing areas with a high heat vulnerability index rating and low tree canopy coverage.

- Develop education and incentive programs to encourage private land owners to plant trees and care for existing trees.
- Develop a tree management plan that provides specific guidance on tree planting, care, species options, and other strategies.
- Develop an urban forest master plan.
- Expand the Adopt-A-Tree program for community organizations to buy trees in bulk and commit to steward the trees.
- Train neighborhood groups on how to manage trees.
- Revise the Zoning Ordinance to increase the parking screening requirements and require a 10% tree canopy coverage of surface parking lots.
- Explore incentives, programs, and requirements for new developments and additions to existing buildings to retain mature trees, replace lost trees, and plant more trees if none were there originally.
- Implement RVA Clean Water strategy to increase tree canopy on City property by 5%.
- Reinstate the Urban Forestry Commission.
- Revise the subdivision ordinance to regulate neighborhoods to include street terraces.
- Relocate overhead utilities to alleys or bury overhead utilities to accommodate mature canopy street tree planting.
- Revise the Zoning Ordinance to plant trees during the redevelopment process, per the Code of Virginia 15.2-961.

42%

of Richmond is covered by tree canopy

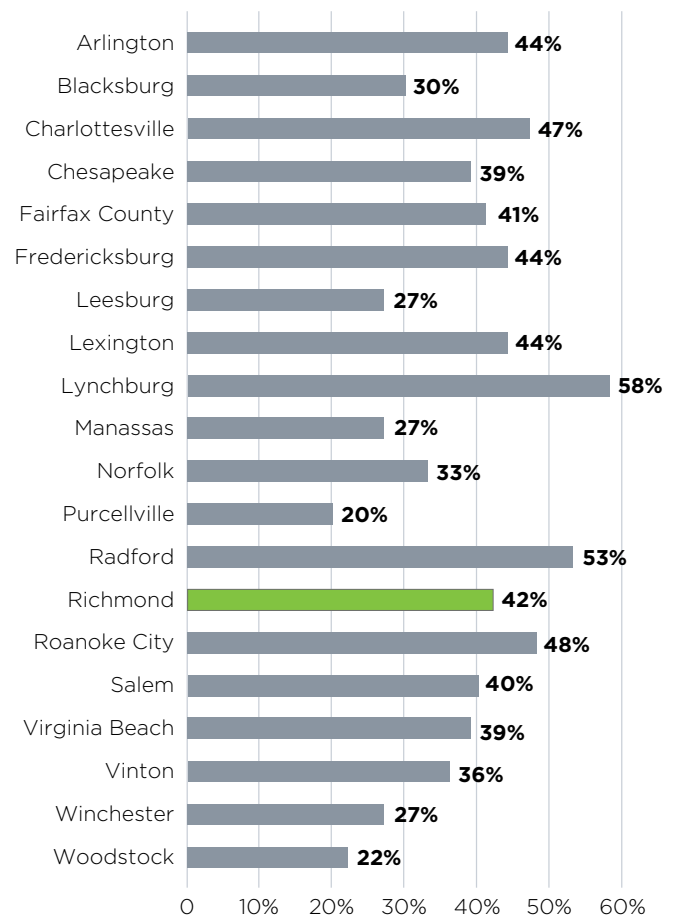


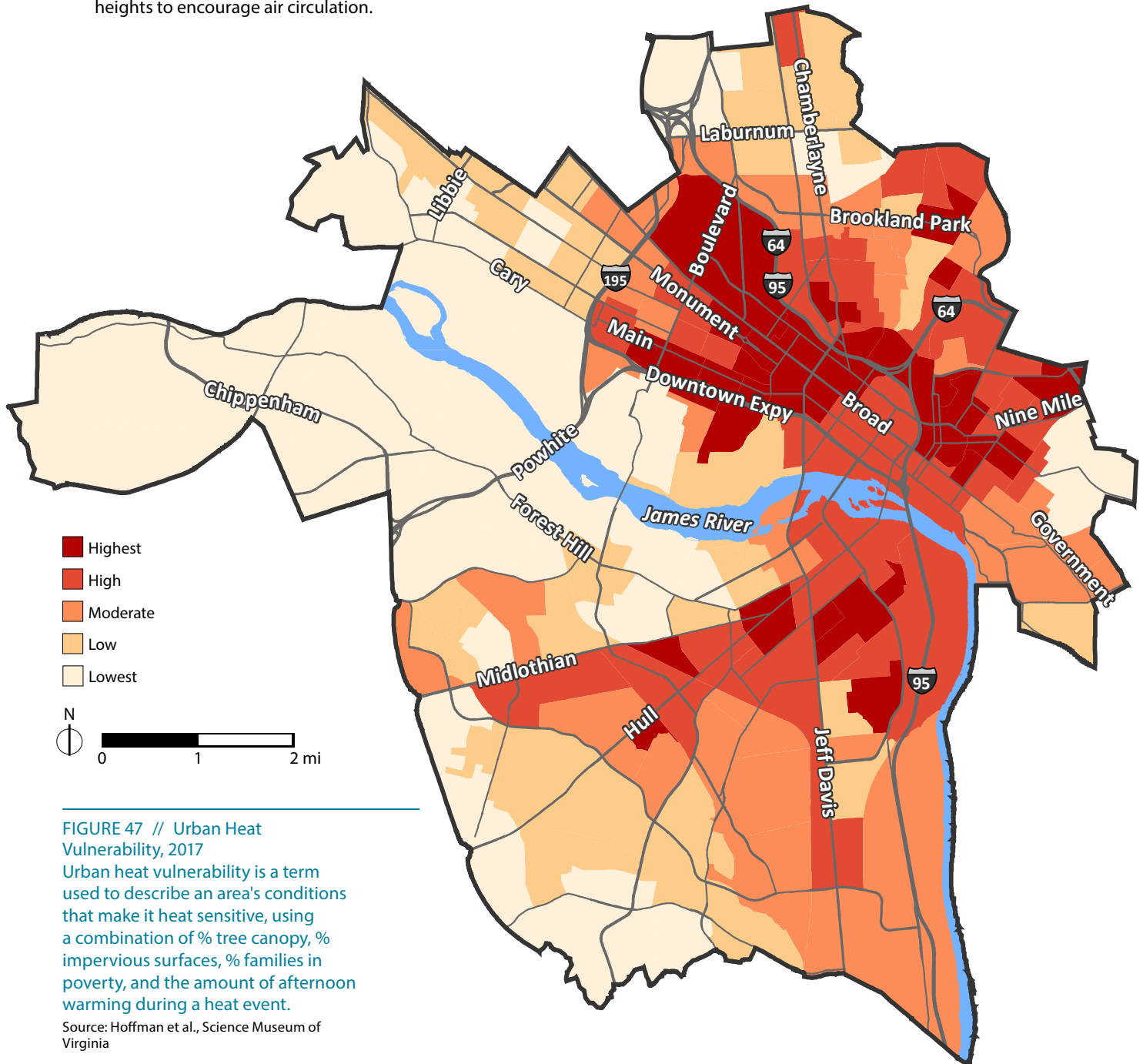
FIGURE 46 // Comparison of Existing Urban Tree Canopy Coverage in Virginia Localities, 2010

Source: McKee, Jennifer, A Report on the City of Richmond's Existing and Possible Urban Tree Canopy, Virginia Tech: 2010

Objective 17.3

Reduce urban heat, prioritizing areas with a high heat vulnerability index rating, as shown in Figure 47.

- Encourage lighter-colored surfaces for roads and roofs to reflect sunlight.
- Identify opportunities for green roofs on public facilities, and encourage green roofs in private development.
- Design neighborhoods with a variation in building heights to encourage air circulation.
- Encourage redevelopment of surface parking lots into mixed-use developments and/or park area, potentially taxing properties with parking lots as a primary use at a higher rate.
- Increase the tree canopy and overall green spaces throughout the city (see related strategies in Goal 17).
- Reduce parking minimums in the Zoning Ordinance.



Objective 17.4

Expand access to the local healthy food system, prioritizing residents in low-income areas.

- a. Expand the community garden program by developing standards and guidelines for community gardens on public lands to ensure transparency, continuity of use, community benefit, and access to a water source.
- b. Develop and promote content explaining where urban agriculture is permitted by right in the Zoning Ordinance and explore expanding where it is permitted as a by-right use.
- c. Create opportunities for funding technical support, tools, and processes for all residents to participate in urban agriculture.
- d. Attract healthy food retailers to low-income areas by increasing residential density and providing financial and technical support for retailer creation, expansion, remodeling, or equipment upgrades.
- e. Expand where farmers' markets, grocery stores, and other healthy food retailers are permitted, especially in Nodes, Priority Neighborhoods, and along enhanced transit corridors.
- f. Coordinate City resources, such as facilities, land, or infrastructure, to promote center processing and efficient distribution of regionally grown, healthy foods to Richmond Public Schools.



Grocery Store Market Analysis

CONTEXT

Richmond: Over the past several years, City staff have heard the desires of many residents to have a grocery locate in their neighborhood. For these residents, having access to a grocery store in their neighborhood provides easy access to high-quality food options that may not be available at convenience stores and very small independent groceries where the breadth of selection or overall prices are not as competitive as they are in other neighborhoods.

Market: The nature of the grocery business has changed over the past fifty years, more retail establishments (beyond the traditional grocery store) sell grocery items and grocery stores have continued to get larger (with the additional parking and delivery needs that come with the larger size). With traditional narrow margins, the market for grocery stores has transitioned to larger stores that service a larger trade area (with higher household incomes) and require more real

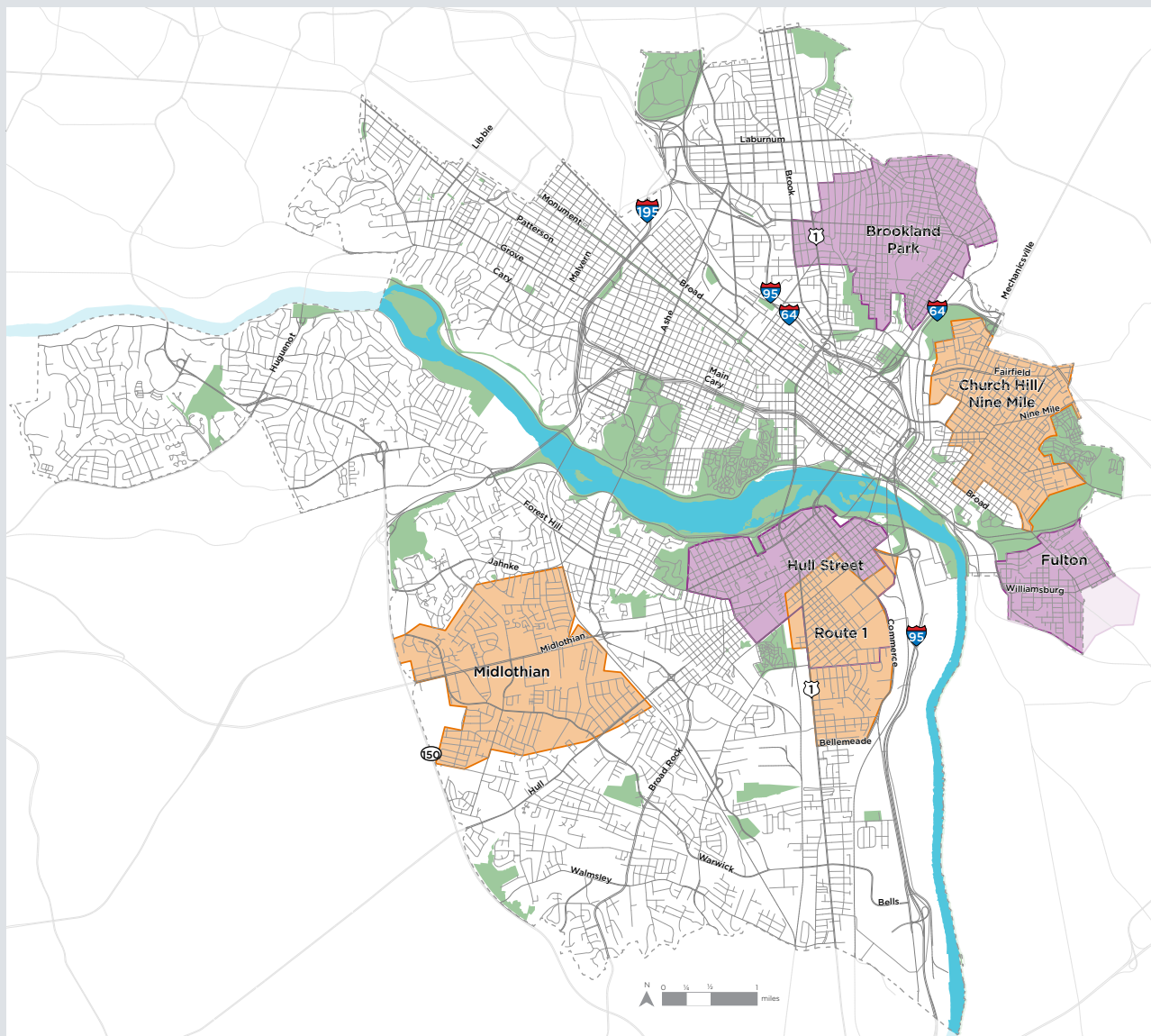


FIGURE 48 // Trade Areas Studied in the Grocery Store Market Analysis

estate than what many older areas of the city have available. While there are alternative models of grocery stores, e.g., member-owned food co-ops, the alternative models are also difficult to organize.

MARKET ANALYSIS

Purpose: The effort to locate grocery stores traditionally focuses on increasing supply in neighborhoods. However, at the beginning of the Richmond 300 process, PDR hired VCU CURA to analyze six neighborhoods in Richmond and determine what market factors would need to change in order to attract a grocery store. Figure 48 shows the six neighborhoods and associated trade areas used in the analysis included in this analysis. The trade areas are for a local grocery store and also took into account traffic volumes on major roads. The full description of VCU CURA's research can be found in the Richmond 300 Supporting Reports (under separate cover).

Findings: Food deserts usually exist because there is a lack of market demand to support a grocery store because the neighborhood is either low-density, low-income, or both.

VCU CURA found that traditional methods to reduce food deserts have not included policies related to attracting a new supply of housing units in the neighborhood to increase demand within the area for a grocery store. Traditional methods to reduce food deserts have included providing grants to incentivize grocers to open in food deserts, increasing participation in Supplemental Nutrition Assistant Program (SNAP), increasing public transit and other transportation modes, increasing education about healthy food, and advocating for policy change at the state and federal levels.

VCU CURA's analyses estimated how many additional households earning the area median income would be required to economically support a small or large grocery store.¹ The analyses showed that four of six neighborhoods may support a small grocery store using the 2014 population estimate. An increase of 1,000 households earning the regional median

household income would allow almost all trade areas to support a small grocery store. However, few operators of stores of that size exist in today's market, and most operators would want to see a larger market area than what may barely support one store. Although none of the neighborhoods in question could support a large grocery store with their 2014 populations, three neighborhoods currently had near 80% of the minimum potential demand. See Table 7 for a summary of the analyses.

While total number of households in some of these neighborhoods has increased between 2000 and 2017, none of the neighborhoods have regained the level of population they once had. For example, the Brookland Park Boulevard Area lost nearly half its population between 1970 and 2010 (population of 24,000 in 1970 and 13,000 in 2010). See Table 7 for a summary of the analyses.

Conclusion: Based on these analyses, in addition to the aforementioned traditional methods, policy makers should also consider encouraging the creation of more housing units within food deserts as another solution to reduce food deserts. That said, there are a couple of caveats: 1) the continuous change in how people buy food and the changing grocery market will continue to be challenge as the City develops policy and implements programs to expand food access; and 2) there are grocery stores just outside of the city limits that do affect the opportunities for grocery store location in Richmond as many of our neighborhoods (including these 6) are in relatively close proximity to grocery stores in neighboring communities that feature auto-oriented grocery stores.

Finally, with rare exceptions, following the traditional suburban model of grocery store trade area analysis will not work for Richmond. Richmond 300 is about creating a specific identity for the city that is authentically Richmond. That will mean creating high-quality, accessible, and inclusive neighborhoods of sufficient population and household income to become attractive to the market.

¹ A small grocery store is assumed to be 25,000 square feet, the estimated size of an urban neighborhood supermarket. A large grocery store is assumed to be 44,094 square feet, the median gross leasable area of U.S. neighborhood supermarkets according to Dollars and Cents of Shopping Centers/The SCORE 2008 (Urban Land Institute).

TABLE 7 // Grocery Store Market Analyses Findings

	Support small grocery store?			Support large grocery store?		
	2014 Households	+1,000 Households	+5,000 Households	2014 Households	+1,000 Households	+5,000 Households
Brookland Park	Maybe 130% demand	Yes 160% demand	Yes 280% demand	No 80% demand	No 90% demand	Yes 160% demand
Church Hill/ Nine Mile	Maybe 130% demand	Yes 160% demand	Yes 280% demand	No 80% demand	No 90% demand	Yes 160% demand
Fulton	No 60% demand	No 90% demand	Yes 210% demand	No 30% demand	No 50% demand	Maybe 120% demand
Hull Street (including Manchester)	Maybe 100% demand	Maybe 130% demand	Yes 250% demand	No 60% demand	No 70% demand	Maybe 140% demand
Midlothian	Maybe 140% demand	Yes 170% demand	Yes 290% demand	No 80% demand	Maybe 100% demand	Yes 160% demand
Route 1 (South Richmond)	No 80% demand	No 110% demand	Yes 220% demand	No 40% demand	No 60% demand	Maybe 130% demand

Table Notes:

- 2014 Households is based on the 2010-2014 ACS 5-year Estimates. Additional households are assumed to earn the regional median household income of \$59,677 (2010-2014 ACS 5-year Estimates)
- Percent demand means the amount of households that exist to meet the demand to support the grocery store. A demand of 80% means that there the trade area only has 80% of the households needed to support the grocery store. Usually grocers want to see a demand of at least 150% before moving into a market.

Objective 17.5

Reduce the effect from heavy rainfall events and sea level rise.

- a. Request that the Federal Emergency Management Agency update the flood plain maps.
- b. Encourage development in areas at lower risk of flooding.
- c. Evaluate the transportation investments needed to create emergency egress from areas at risk of flooding.
- d. Where possible, expand wetlands and other features that manage flooding identified in the RVA Clean Water Plan.
- e. Conduct a sea-level-rise impact analysis to identify areas in Richmond that may be affected.
- f. Reduce impervious surfaces (see Goal 16).
- g. Identify opportunities for acquiring land in the Resource Management Areas (RMAs) and Resource Protection Areas (RPAs), shown in Figure 43, at high risk of flooding, as shown in Figure 49, to conserve, discourage development, and implement strategies to slow, spread, and infiltrate floodwater.

Objective 17.6

Increase the resiliency of infrastructure and community assets.

- a. Bury power lines and locate key energy network assets to enhance grid resilience.
- b. Establish assessment guidelines for public infrastructure that ensure resilience to current and future hazards.
- c. Increase local renewable energy generation (see Goal 16).
- d. Evaluate transportation networks to identify emergency routes and promote redundancy.
- e. Develop micro-grids with on-site energy storage for critical public facilities.
- f. Develop microgrid communities with on-site energy storage.
- g. Support increased usage of energy storage technology, including small-scale storage systems in residential, commercial, and industrial buildings, vehicle-to-grid infrastructure, and larger stand-alone storage facilities where appropriate.
- h. Identify community facilities to serve as resilience hubs and update systems to be more resilient.

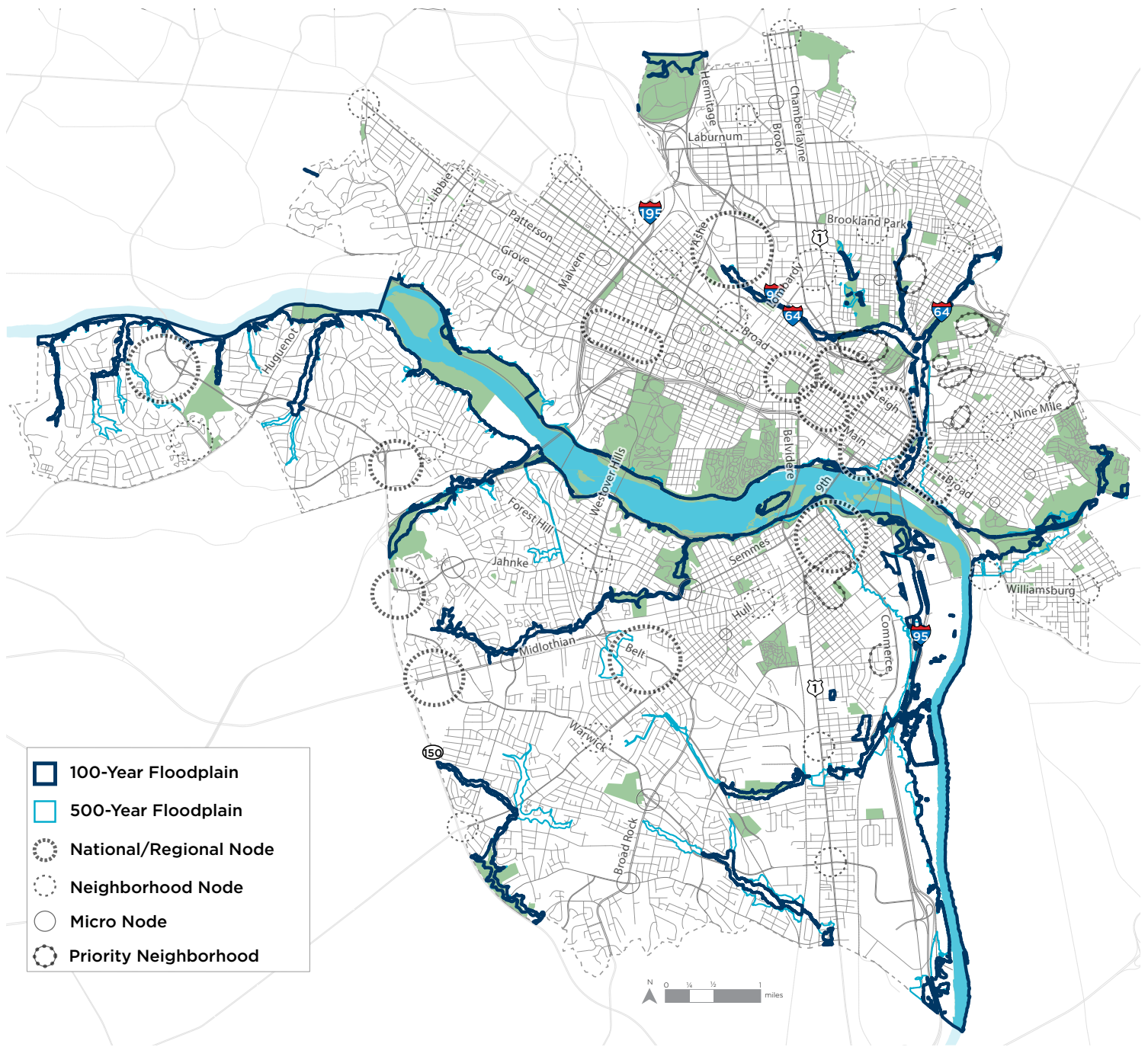


FIGURE 49 // Floodplains with Nodes

Source: Digital Flood Insurance Rate Map (DFIRM) database, which is administered by the Federal Emergency Management Agency (FEMA), 2018

Objective 17.7

Increase and enhance biodiversity within Richmond.

- a. Implement strategies in Equitable Transportation to connect parks via greenways that could also serve as animal habitat corridors, explore using RMAs and RPAs to create green ribbons through the city.
- b. Increase the prevalence of native plant species and plants for healthy pollinator communities at public facilities and promote such planting on private lands.
- c. Implement the RVA Clean Water strategy to use 80% native plants in new landscaping at public facilities by 2023.
- d. Develop a strategy to integrate invasive plant management into existing city programs and reduce invasive plant coverage within the city.
- e. Discourage use of pesticides and herbicides and encourage organic practices to improve and maintain soil health and healthy habitat and ecosystems.
- f. Encourage use of bird-safe glass and other building materials and features that protect and enhance natural ecologies where appropriate.
- g. Encourage bird houses, bat houses, and other structures that provide important and safe shelters for wildlife.
- h. Revise the City's weed ordinance to allow for exemptions for native plant species and plants for healthy pollinator communities on private lands.
- i. Convert large City-managed non-recreational mown areas, such as floodwall impoundment areas, to native community wildflower/pollinator species meadows, mown or bush-hogged once or twice each year.

Objective 17.8

Reduce light pollution.

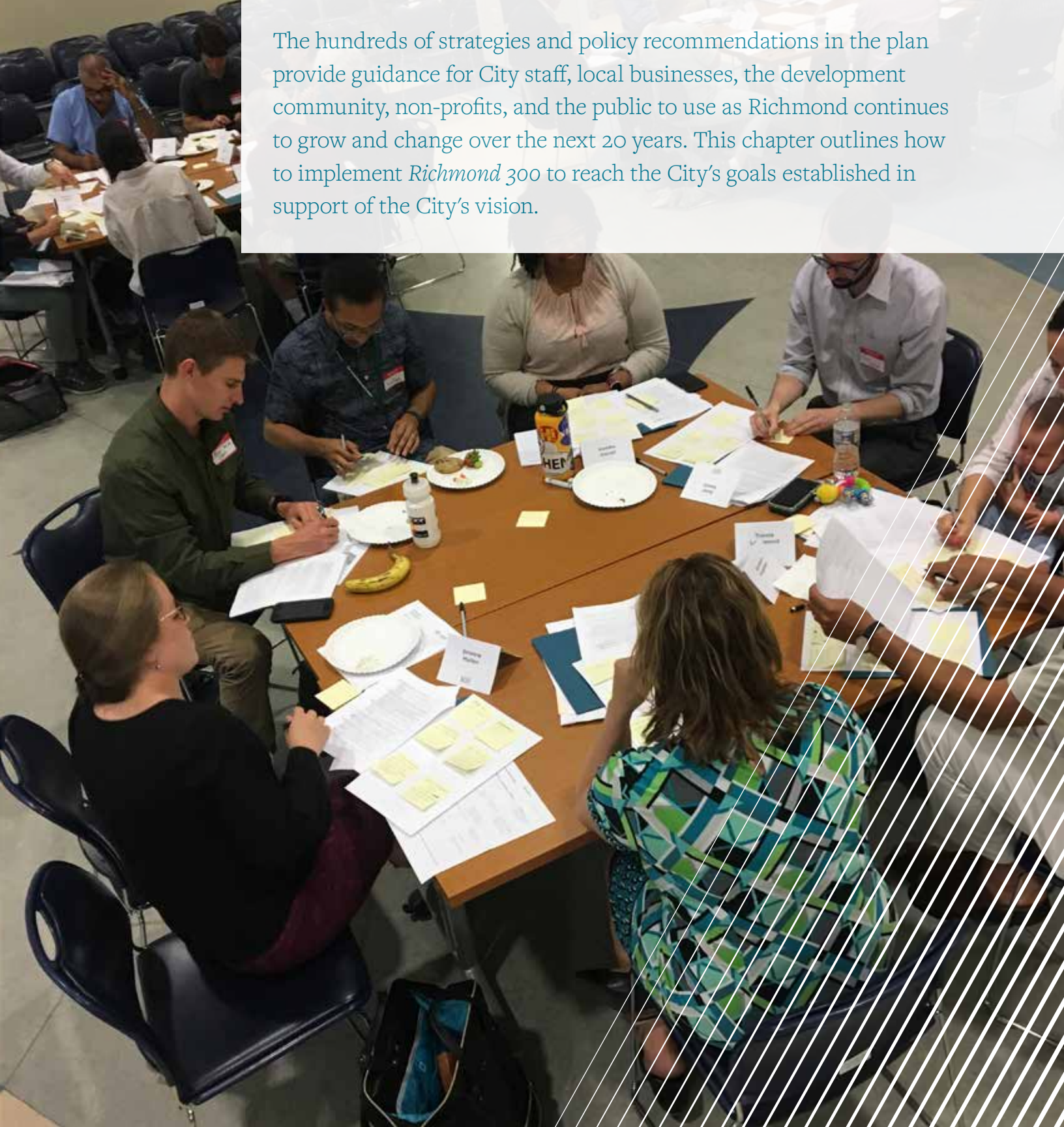
- a. Seek and develop strategies to achieve certification as an International Dark Sky Association International Dark Sky Community.
- b. Install hooded light fixtures on public rights-of-way and buildings to reduce light pollution and reduce effect on nocturnal species.



A blue heron descends into the James River.

Implementation

The hundreds of strategies and policy recommendations in the plan provide guidance for City staff, local businesses, the development community, non-profits, and the public to use as Richmond continues to grow and change over the next 20 years. This chapter outlines how to implement *Richmond 300* to reach the City's goals established in support of the City's vision.



Implementation Approach

This 200+ page document outlines one city-wide vision, five topic visions, 17 goals, 73 objectives, and 415 strategies. The expansive nature of the Master Plan, touching on a myriad topics shaping Richmond's growth, can make it difficult to implement.

The sheer breadth and length of any comprehensive plan can make it difficult to execute; therefore, Richmond 300 outlines six Big Moves to deliberately advance over the next 5 years, several metrics for the City to track, and an annual reporting system to document progress.

- Metrics. Key benchmarks for the City to track as it implements the Master Plan.
- Big Moves. Wide-reaching initiatives that touch many goals of the plan that will set Richmond on track to reach its vision for 2037.
- Reporting. Annual reporting will help implement the plan and communicate the progress with other City departments and with the general public.

Metrics

The metrics are not tied to specific goals in the plan but rather are benchmarks to see how the city is changing over time.

Oftentimes, metrics shift due to trends outside of the City's control; therefore, it is problematic to tie metric movement directly to City actions. New data for the metrics should be gathered every other year and shared in the annual report.

TABLE 8 // Metrics

Metric	Desired Trend	Baseline Statistic	Baseline Year	Data Source	Data Notes
Total population	Increase	230,436	2019	Census	Census, 2019 Population Estimates
Total Jobs	Increase	204,125	2020	Census	ESRI Business Analyst Online, Business Summary
% population in poverty	Decrease	21.9%	2018	Census	2018 ACS 1-Year Estimates (Table S1701) 47,857 (+/- 6,758) / 219,006 (+/- 1,770)
% population with a high-school degree	Increase	85.1%	2018	Census	2018 ACS 1-Year Estimates (Table S1501) 137,195 (+/- 3,294) high school graduate or higher / 161,126 (+/- 274) population 25 years and over
% of population with a post-secondary degree	Increase	41.9%	2018	Census	2018 ACS 1-Year Estimates (Table S1501) 67,516 (+/- 3,246) bachelor's degree or higher / 161,126 (+/- 274) population 25 years and over
Median income (adjusted for inflation using 2019 as baseline for inflation)	Increase	\$61,937	2018	Census	2018 ACS 1-Year Estimates (Table S1901) \$61,937 (+/- 94)
City-wide WalkScore	Increase	52	2020	WalkScore	WalkScore.com
% population living within 1/2 mile of high-frequency transit*	Increase	51.7%	2014-2018	Census, GRTC	ESRI Business Analyst Online, 2014-2018 ACS 5-Year Estimates 115,800 (+/- 2,720) / 223,787
% of jobs within 1/2 mile of high-frequency transit*	Increase	77.7%	2020	Census, GRTC	ESRI Business Analyst Online, Business Summary 158,644 / 204,125
# of deaths and severe injuries due to transportation crashes	Decrease	193	2019	VDOT	VDOT Crash Data
Miles of bike lanes	Increase	49	2020	City	DPW

Metric	Desired Trend	Baseline Statistic	Baseline Year	Data Source	Data Notes
Miles of sidewalks	Increase	836	2020	City	DPW
% of workers who drive alone to work	Decrease	71.7%	2018	Census	2018 ACS 1-Year Estimates (Table B08006) 83,742 (+/- 4,230) / 116,812 (+/- 3,875) Workers 16 years and over
% of workers who bike, walk, take transit to work	Increase	14.0%	2018	Census	2018 ACS 1-Year Estimates (Table B08006) 7,441 (+/- 2,017) + 3,734 (+/- 1,601) + 5,160 (+/- 1,216) / 116,812 (+/- 3,875) Workers 16 years and over
% of homes occupied by a homeowner	Increase	42.1%	2018	Census	2018 ACS 1-Year Estimates (Table S2502) 38,430 (+/- 2,235) / 91,359 (+/- 1,702)
% of Blacks who are homeowners	Increase	31.4%	2018	Census	2018 ACS 1-Year Estimates (Table S2502) 11,825 (+/- 1,504) / 37,649 (+/- 1,988)
% population that is housing-cost burdened (housing >= 30% of income)	Decrease	41.4%	2013-2017	HUD, CHAS	CHAS (2013-2017 ACS) 17,790 + 19,130 / 89,240
% population in poverty that are housing-cost burdened	Decrease	74.8%	2013-2017	HUD	CHAS (2013-2017 ACS) 15,990 / 21,370
Annual per capita greenhouse gas emissions (metric tons of CO ₂)	Decrease	11.81	2018	City	
Daily per capita residential water usage (gallons)	Decrease	34.12	FY19	City	DPU, FY19, Multi-Family Usage + Residential Usage / 2019 Population / 365
% of population living within a 10-minute walk of a park	Increase	78%		parkscore.org	
% of urban tree canopy	Increase	42%	2010	Virginia Tech	McKee, Jennifer, A Report on the City of Richmond's Existing and Possible Urban Tree Canopy, Virginia Tech: 2010

* High-frequency transit = transit that arrives at least every 15 minutes

Big Moves

The six Big Moves intentionally seek to expand equity, increase the sustainability of our city, and beautify our city.

The Big Moves

Re-Write the Zoning Ordinance:
Direct growth to appropriate areas while maintaining existing neighborhoods as well as creating new authentic neighborhoods adjacent to enhanced transit.

Re-Imagine Priority Growth Nodes: Target growth in jobs and population to Downtown, Greater Scott's Addition, Route 1 Corridor, Southside Plaza, and Stony Point Fashion Park.

Expand Housing Opportunities:
Encourage the development of housing options throughout the city to expand the geography of opportunity by de-concentrating poverty.

Provide Greenways & Parks for All: Develop parks and greenways so that by 2037 100% of Richmonders live within a 10-minute walk of a park.

Reconnect the City: Cap highways to reknit neighborhoods destroyed by interstates, build/improve bridges, introduce street grids, and make the city easier to access by foot, bike, and transit.

Realign City Facilities: Improve City buildings (schools, libraries, fire stations, police stations, etc.) to provide better services in efficient, shared-use, accessible facilities to better match and serve the growing city.

Because these moves are wide-reaching, there are several strategies throughout Richmond 300 that relate to each Big Move. If the City can advance each of the Big Moves over the next 5 years, Richmond will be well on its way to realize its 20-year vision.

Each Big Move description in this Chapter includes:

- Big Move name
- Description
- Key benefits
- Description of how the Big Move advances equity, sustainability, and beauty
- Alignment with Richmond 300 goals and objectives
- Actions that may be implemented to further the Big Move
- Type of actions:

Legislative: actions that result in a new ordinance for City Council to adopt

Planning: actions that result in plans to guide future work

Advocacy: actions that require the City and other organizations to advocate the state or federal government for funding or legislative changes

Administrative: actions that City staff can undertake as part of their regular duties

Capital Improvement Project (CIP): actions that require City funding to create a new park, infrastructure, building, or any other physical asset the City will own

- Time Frame for implementation is shown using the City's Fiscal Year (FY) which runs July to June:

FY22 = July 2021–June 2022

FY23 = July 2022–June 2023

FY24 = July 2023–June 2024

FY25 = July 2024–June 2025

FY26 = July 2025–June 2026

Big Move | Re-Write the Zoning Ordinance

Direct growth to appropriate areas while maintaining existing neighborhoods as well as creating new authentic neighborhoods adjacent to enhanced transit.

Description

Re-writing the Zoning Ordinance means developing new zoning category descriptions for the entire city and then mapping the new zoning categories to every parcel in the city. The re-write of the Zoning Ordinance is a 3- to 5-year process. The last comprehensive re-write was in the mid-1970s

The Zoning Ordinance is a legal document that outlines what property owners may build on their land and how the building and site must be designed. The current Zoning Ordinance was primarily written in 1976, but has been amended over the past several decades. Many of the objectives in Richmond 300 have strategies that suggest revisions to the Zoning Ordinance.

Key Benefits

- Move from Euclidean to Form-Based: The current Zoning Ordinance is predominantly a Euclidean approach to zoning, meaning uses are separated into distinct districts with limited mixing of uses. Over the past few years, the City has developed zoning districts that allow a mix of uses within the same district but also require certain form elements (such as windows and doors that open to the street and buildings built to the sidewalk). The re-write of the Zoning Ordinance will likely include a further look at using more form-based elements.
- Prepare for Opportunity: By rezoning the city, Richmond can prepare certain areas for anticipated development, such as the Priority Growth Nodes and industrial areas, to retain, attract, and grow companies to employ new and existing Richmonders. Additionally, directing growth into the corridors and Nodes will allow the City to retain the character of older existing neighborhoods.
- Rethink the B-3 District: Predominantly found along major streets in South Richmond, the B-3 zoning district is a district that promotes the development of car-oriented commercial buildings. The B-3 zoning district has been flagged by City Council and City Planning Commission for review to improve the form and function of the buildings in those commercial areas.
- Improve Health, Resiliency, and Access: By re-writing the Zoning Ordinances in accordance with the Future Land Use Map, the City will align land use and transportation planning to create compact and mixed Nodes connected by walkable neighborhoods and corridors. Increasing walkability and access to non-car transportation modes has various benefits, such as improving public health, increasing resiliency in response to the existing climate emergency, and expanding ease of access by bringing homes, jobs, retail, and services closer together.
- Expand Options: The re-write of the Zoning Ordinance should include examining residential zoning districts to make sure they provide many housing options at various price points throughout the city; this will help further the Big Move related to housing.

Vision Alignment

Equity: A new Zoning Ordinance has the potential to expand opportunities for all Richmonders, regardless of race or income, to live in more parts of the city by expanding the types of housing allowed to be developed by-right throughout the city. A new Zoning Ordinance has the potential to identify key industry clusters for employment opportunities at various pay scales and located within multi-modal transportation networks.

Sustainability: Land use patterns are major determinants in reducing greenhouse gas emissions related to transportation. A new Zoning Ordinance has the potential to support multi-modal land use, creating neighborhoods and destinations that are easily accessible by foot, bike, and transit. A new Zoning Ordinance can also include language to make on-site renewable energy production by-right, increase open space and/or permeability requirements, and require other measures to protect and enhance the natural environment.

Beauty: A new Zoning Ordinance should include measures to preserve the authentic character of Richmond's older neighborhoods and to create new neighborhoods with design elements that create a distinctive city. These measure could include form-based elements such as massing and fenestration requirements, as well as open space and yard requirements to create a walkable, engaging built environment.

Goal Alignment

Each of the five topic areas contain many recommendations that refer to specific elements to consider when rewriting the Zoning Ordinance, just some of the objectives are highlighted below.

High-Quality Places: Objective 1.1 calls for rezoning the city in accordance with the Future Land Use Plan in order to establish a city of complete neighborhoods that have access to Nodes and Priority Neighborhoods connected by major corridors in a gridded street network. Objective 4.1 calls for various recommendations to create and preserve high-quality, distinctive, and well-designed neighborhoods and Nodes throughout the city. Objective 4.3 calls for reviewing the Zoning Ordinance to change open space requirements and definitions.

Equitable Transportation: Objective 6.1 calls for increasing the number of residents and jobs at Nodes and along enhanced transit corridors in a land development pattern that supports multi-modal transportation options.

Diverse Economy: Objective 11.1 calls for increasing the areas of appropriately zoned land near various

transportation modes and housing to retain, create, and attract employers.

Inclusive Housing: Objective 14.5 calls for encouraging more housing types throughout the city and greater density along enhanced transit corridors and at Nodes by amending the Zoning Ordinance.

Thriving Environment: Objective 15.1 calls for reducing air pollution related to transport by developing in patterns that reduce dependency on single-occupancy vehicles. Objective 15.3 calls for revising the Zoning Ordinance to reduce any impediments to installing renewable energy on buildings. Objective 16.4 calls for exploring incentives or requirements in the Zoning Ordinance that encourage the creation of green infrastructure on private property.

Action Steps

Actions May Include	Type	R300 Reference	Lead*	Time Frame
B-3 Rezoning: Per Council Ordinance, amend the B-3 Zoning District.	Legislative	Goal 1	PDR	FY22
Pulse Rezoning: Rezone the remaining Priority Stations Areas that have not yet been rezoned as identified in the Pulse Corridor Plan: Allison Station Area and Main Street Station Area.	Legislative	Goal 1	PDR	FY22
RFP and Contracting: Develop and issue a Request for Proposals (RFP) for a consultant team to assist the City in re-writing the Zoning Ordinance.	Administrative	Goal 1	PDR	FY22
Zoning Rewrite: With community input, develop new zoning categories that achieve the goals set forth in Richmond 300 and then map the categories to all the parcels across the city.	Planning	Goal 1	PDR	FY22-FY25
Zoning Ordinance Adoption: Adopt the new Zoning Ordinance and Map as the official Zoning Ordinance for the City of Richmond.	Legislative	Goal 1	PDR	FY26

* see Acronym list for definition of acronyms

Big Move | Re-Imagine Priority Growth Nodes

Target growth in jobs and population to Downtown, Greater Scott's Addition, Route 1 Corridor, Southside Plaza, and Stony Point Fashion Park.

Description

People want to go to great places. The Priority Growth Nodes are places in Richmond that can be elevated to become even greater places than they are in 2020. Over the next 20 years, not all of Richmond will experience population and job growth, but these Nodes are the places where the City is targeting the greatest growth in jobs and population.

Key Benefits

- Open for Business: Signals to the business attraction community that there are locations in the city where they can locate and expand.
- Create New Neighborhoods: Identifies new areas for increased residential growth with housing at various income levels by creating entirely new neighborhoods.
- Promote Smart Growth: Create neighborhoods for the next 100 years that improve environmental conditions by focusing on creating amazing destinations with housing and jobs that are walkable and accessible by foot, bike, and transit, and by encouraging the reuse and rehabilitation of historic structures.
- Accessible New Services: Targeting these areas for new public buildings, parks, and businesses increases access to new amenities within Richmond for existing residents in adjacent neighborhoods.

Vision Alignment

Equity: The Priority Growth Nodes are distributed throughout the city to ensure all Richmonders have access to the goods, services, jobs, and open spaces that are envisioned at these Nodes. All the Nodes

(per Goal 14) provide housing options at various price points (including low- and very low-income households), tenure (ownership and rental), and size. The Priority Growth Nodes are targeted for employment growth that includes low-skill, as well as high-skill positions (per Goal 11) and will have multi-modal access (per Goals 6 and 8). The Priority Growth Node model seeks to provide housing, jobs, and services at strategic locations in the city, thereby increasing access to employment, housing, and services for all Richmonders, but being intentional not to leave out low-income households from the housing and jobs provided at the Nodes.

Sustainability: By focusing growth at these Priority Growth Nodes, the City is advancing sustainability goals by clustering development in a way that supports multi-modal transportation and directs growth to brownfields and areas poised for redevelopment, rather than greenfields at the edge of the city that are not easy to integrate into existing transportation and service infrastructure.

Beauty: Focusing attention on these five Priority Growth Nodes presents an opportunity to target investment to create attractive places with parks, public art, amenities, and features that create authentic places that help enhance and elevate Richmond beauty.

Goal Alignment

All of the goals in Richmond 300 refer to Nodes:

High-Quality Places: These strategies create activity centers at Nodes by supporting housing, employment, services, City facilities, and parks; preserving historic structures and sites, establishing a strong urban design character; and creating inclusive engagement processes.

Equitable Transportation: These strategies connect the Nodes with a transportation network that prioritizes the movement of people over the movement of vehicles to connect the Nodes to one another and adjacent neighborhoods by foot, bike, bus, and car.

Diverse Economy: These strategies target industries to establish/expand in and near Nodes, to incorporate tourism, and to leverage relationships with anchor institutions to create jobs.

Inclusive Housing: These strategies create and preserve housing in and near Nodes for all income levels, but particularly for low- and very low-income levels.

Thriving Environment: These strategies preserve and enhance an environment that has clean air and clean water, offers access to public open space connected by greenways, and increases Richmond's climate resiliency.

Action Steps

Actions May Include	Type	R300 Goal	Lead*	Time Frame
DOWNTOWN: DOWNTOWN CORE				
Coliseum Plan: Develop the Coliseum Area Framework Plan with community engagement.	Planning	Goal 1	PDR	FY22
Coliseum Redevelopment: Create and issue a RFP for the Coliseum area using the guidance from the Coliseum Area Framework Plan to reposition City-owned assets into revenue-generating properties.	Administrative Legislative	Goal 1 Goal 2	PDR	FY23- FY26
Highway Capping: Examine process to sell the air-rights above the Downtown Expressway between Canal, Byrd, 6th, and 7th Streets.	Administrative	Goal 9	PDR	FY22
Two-Way Streets: Continue to convert streets from one-way to two-way as appropriate.	Infrastructure	Goal 9	DPW	FY22- 26
Life Sciences Cluster: Market and expand growth opportunities for life science-focused businesses and supporting entities clustered near VA Bio+Tech Park and VCU Health.	Administrative	Goal 11	DED	FY22- 26
Downtown Marketing & Services: Continue to market Downtown as a the cultural, business, government, and recreation destination of the Richmond Region and support cleaning, event, and placemaking services throughout Downtown.	Administrative	Goal 4 Goal 11	Venture Richmond	FY22- 26
Riverfront Plan: Continue to implement the Phase 1 recommendations outlined in the Riverfront Plan to improve access from Downtown to the James River.	CIP	Goal 4 Goal 17	PDR	FY22- 26+
Non-Car Connectivity: Improve non-car connectivity by encouraging urban design that promotes walking, continuing to improve transit access, and developing on-street bike facilities and greenways to Jackson Ward, the Riverfront (per the Riverfront Plan), Church Hill, and other areas.	CIP	Goal 4 Goal 8 Goal 17	DPW	FY22- 26

Actions May Include	Type	R300 Goal	Lead*	Time Frame
DOWNTOWN: MONROE WARD				
Transit: Increase frequency and hours of the #5 bus route that runs along Cary and Main Streets.	Operations	Goal 8	GRTC	FY22
Bike Facilities: Build bike lanes on 1st, 2nd, and/or 3rd Streets.	CIP	Goal 8	DPW	FY23-24
Grace Street: Convert Grace Street from 4th Street to Belvidere Street into a two-way street.	Infrastructure	Goal 9	DPW	FY23-24
Marketing: Promote Monroe Ward as a prime location to attract and grow target industries in corporate headquarters, professional services, and financial services.	Administration	Goal 11	DED	FY22-26
Greenway: Develop the Ashland to Petersburg Trail through Monroe Ward.	CIP	Goal 8 Goal 17	DPW	FY22-26
Parks: Identify key parcels for creation of pocket parks.	Administrative	Goal 17	PDR	FY22
DOWNTOWN: JACKSON WARD				
Highway Deck Study: Commence a planning study to analyze the feasibility of building a park, roads, and buildings over I-95 and I-64, reconnecting Jackson Ward and North Jackson Ward.	Planning	Goal 8 Goal 9 Goal 17	PDR	FY23-24
Business Growth: Increase the number and support the growth of minority-owned businesses.	Administrative	Goal 11	DED	FY22-26+
Historic and Cultural Attractions: Maintain, grow, and market historic attractions, such as the Black History Museum and Maggie L. Walker's Home.	Administrative	Goal 13	Venture Richmond	FY22-26
Gilpin Court Transformation: Develop a plan with existing community input to include Gilpin Court and vacant land in North Jackson Ward to transform the neighborhood into a mixed-use, mixed-income, walkable, and transit-adjacent community that provides both housing and jobs for residents.	Planning	Goal 1 Goal 14	RRHA [w/ PDR, DED, HCD]	FY22-23
DOWNTOWN: SHOCKOE				
Rezoning: Rezone the Shockoe area in alignment with the Future Land Use Map to allow appropriate growth while also protecting and enhancing significant historic sites.	Legislation	Goal 1	PDR	FY22
Small Area Plan: Complete and adopt the Shockoe Small Area Plan (which is under development) as an element of Richmond 300.	Planning	Goal 1	PDR	FY22
Archeology: Adopt an archaeological ordinance to provide guidance to public and private land owners in conducting and managing archaeological discoveries.	Legislation	Goal 3	PDR	FY22

Actions May Include	Type	R300 Goal	Lead*	Time Frame
Memorialization: Continue efforts to commemorate, memorialize, and interpret sites of historical and cultural significance in Shockoe. Advocate for additional state and federal funding to fund commemoration efforts.	Advocacy CIP	Goal 3	Shockoe Alliance	FY22-26+
High-Speed Rail: Advocate for the creation of a high-speed rail station at Main Street Station to further Main Street Station's position as the regional mass transit hub with the convergence of rail, BRT, regional bus, and GRTC local bus routes.	Advocacy	Goal 8	City	FY22-26+

DOWNTOWN: MANCHESTER

Corridor Plan: Develop a corridor plan for Commerce Road with recommendations on how to transform the road into a Great Street with amenities such as buildings addressing the street, a greenway (the Ashland to Petersburg Trail), street trees, underground utilities, lighting, and other amenities and encourage redevelopment and business growth.	Planning	Goal 1 Goal 8 Goal 9	PDR	FY22-23
Rezone: Rezone areas of Manchester in alignment with the Future Land Use Plan to allow residential development in the Industrial Mixed-Use areas that do not currently allow residential uses.	Legislation	Goal 1 Goal 14	PDR	FY23
Design: Implement design standards to create a high-quality, well-designed urban realm, including elements such as street lights and exploring the creation of signature public art.	CIP	Goal 4	PDR	FY22-26+
Riverfront Plan: Implement the Phase 1 recommendations identified in the Riverfront Plan for Manchester.	CIP	Goal 4 Goal 17	PDR	FY22-26+
Ped/Bike Infrastructure: Improve pedestrian and bike infrastructure to/from this Node, specifically improving Manchester Canal, developing rails-to-trails greenways connecting to South Richmond, and developing the Ashland to Petersburg Trail. Advocate for state and federal funding for the canal and trails.	CIP Advocacy	Goal 8 Goal 17	DPW	FY22-26+
Transit Alignment: With community input, develop a preferred alignment for a North-South BRT line through Manchester, either along Cowardin or along Hull Street, and then traveling down Midlothian, Hull, or Route 1.	Planning	Goal 8	GRTC	FY23
Mayo Bridge: Develop and implement the plan for rehabilitating/replacing the Mayo Bridge that incorporates pedestrian and bicycle infrastructure.	CIP	Goal 9	DPW	FY24-26+

Actions May Include	Type	R300 Goal	Lead*	Time Frame
GREATER SCOTT'S ADDITION				
Rezoning: Rezone Greater Scott's Addition in alignment with the Future Land Use Plan.	Legislation	Goal 1	PDR	FY22
Request for Proposals: Issue a RFP to redevelop the City-owned land between N. Ashe Boulevard and Hermitage Road using the Greater Scott's Addition Framework Plan and including elements such as crescent park and low-income housing, breaking up super blocks to create a street grid incorporating features that support walking, biking, and transit such as engaging architecture, public space, sidewalks, street trees, buildings built to the street, and street furniture.	Administrative	Goal 2 Goal 4 Goal 8 Goal 9 Goal 14 Goal 17	DED	FY23
Great Streets: Transform N. Ashe Boulevard and Hermitage Road into Great Streets, featuring buildings addressing the street, underground utilities, street trees, lighting, enhanced transit, and other amenities.	CIP	Goal 9 Goal 17	DPW	FY24- 26+
Bridge Feasibility: Increase connectivity and access among neighborhoods in Greater Scott's Addition by creating new bridges from Leigh Street to the Diamond, Mactavish Street to Rosedale Avenue, and Norfolk to Hamilton Street.	Planning	Goal 9	DPW	FY23- 25
Marketing: Market Greater Scott's addition to grow, retain, and attract businesses in the target industries.	Administrative	Goal 11	DED	FY23- 26+
Green Infrastructure: As part of the redevelopment of the Diamond site, develop a district-wide green infrastructure system to reduce flow of stormwater into the CSS, reduce the heat-island effect, and increase the tree canopy, among other benefits.	CIP	Goal 17	DPU	FY23- 26+
Housing: As part of the redevelopment of the Diamond site, create more housing, rental and ownership, at various price points, including units for low-income households.	Administrative	Goal 14	HCD	FY23- 26+
Park Creation: As part of the redevelopment of the Diamond site, develop a series of parks, including the signature crescent park, and investigate a funding source for park creation and maintenance, such as a bond or a special park district assessment to fund more parks in the area.	CIP	Goal 17	PRCF	FY23- 26+

Actions May Include	Type	R300 Goal	Lead*	Time Frame
ROUTE 1 & BELLEMEADE				
Corridor Plan: Develop a corridor plan for Route 1 with recommendations on how to transform the road into a Great Street with amenities such as buildings addressing the street, a greenway (the Ashland to Petersburg Trail), street trees, underground utilities, lighting, and other amenities and encourage redevelopment and business growth.	Planning	Goal 1 Goal 8 Goal 9	PDR	FY22-23
Rezone: Prioritize the rezoning of this Node to align with the Future Land Use Plan to encourage the residential development and economic revitalization of the corridor in a building form that improves the pedestrian environment.	Legislation	Goal 1 Goal 11 Goal 14	PDR	FY23-24
Greenway: Develop the Ashland to Petersburg Trail and provide enhanced transit along Route 1.	CIP	Goal 4 Goal 8 Goal 17	DPW	FY23-26+
Transit Alignment: With community input, develop a preferred alignment for a North-South BRT line through Manchester, either along Cowardin or along Hull Street, and then traveling down Midlothian, Hull, or Route 1.	Planning	Goal 8	GRTC	FY23
Incentives: Explore the creation of a Technology Zone and other new economic development incentives to encourage the economic revitalization of the Route 1 corridor.	Legislative	Goal 11	DED	FY22-23
Quality Homes: Develop programs that permit homeowners to remain in their homes, in high-quality structures to limit the involuntary displacement of residents in the surrounding single-family neighborhoods.	Administrative	Goal 14	HCD	FY22-26+
New Park: Transfer city-owned property to PRCF to develop a park within a 10-minute walk of this Node and host community planning sessions to develop ideas for the park design.	Legislative CIP	Goal 2 Goal 17	PRCF	FY22-24
ROUTE 1/BELLS				
Corridor Plan: Develop a corridor plan for Route 1 with recommendations on how to transform the road into a Great Street with amenities such as buildings addressing the street, a greenway (the Ashland to Petersburg Trail), street trees, lighting, and other amenities and encourage redevelopment and business growth.	Planning	Goal 1 Goal 8 Goal 9	PDR	FY22-23
Rezone: Prioritize the rezoning of this Node to align with the Future Land Use Plan to encourage the residential development and economic revitalization of the corridor in a building form that improves the pedestrian environment.	Legislation	Goal 1 Goal 11 Goal 14	PDR	FY23-24

Actions May Include	Type	R300 Goal	Lead*	Time Frame
Greenway: Develop the Ashland to Petersburg Trail and provide enhanced transit along Route 1.	CIP	Goal 4 Goal 8 Goal 17	DPW	FY22-25+
Transit Alignment: With community input, develop a preferred alignment for a North-South BRT line through Manchester, either along Cowardin or along Hull Street, and then traveling down Midlothian, Hull, or Route 1.	Planning	Goal 8	GRTC	FY22
Incentives: Explore the creation of a Technology Zone and other new economic development incentives to encourage the economic revitalization of the Route 1 corridor.	Legislative	Goal 11	DED	FY22-23
Quality Homes: Develop programs that allow homeowners to remain in their homes in high-quality structures to limit the involuntary displacement of residents in the surrounding single-family neighborhoods.	Administrative	Goal 14	HCD	FY22-26+
New Park: Identify land within a 5-minute walk of this Node for a new park, transfer land to PRCF ownership, and host community planning sessions to develop ideas for the park design.	Legislative CIP	Goal 2 Goal 17	PRCF	FY22-25

SOUTHSIDE PLAZA AREA

Small Area Plan: Develop a Small Area Plan with community input for the Southside Plaza area that provides details on the opportunities for redevelopment and a system of public open space, greenways, and streets to improve connectivity.	Planning	Goal 1	PDR	FY22
Rezone: Rezone the Southside Plaza area in alignment with the Future Land Use Plan.	Legislation	Goal 1	PDR	FY23
Catalyst: Acquire land to catalyze the redevelopment of the Southside Plaza Area.	CIP	Goal 2	DED	FY22-24
Greenway: Build the James River Branch Trail on abandoned CSX right-of-way and connect adjacent neighborhoods to the trail.	CIP	Goal 8 Goal 17	DPW	FY23-24
Transit Alignment: With community input, develop a preferred alignment for a North-South BRT line through Manchester, either along Cowardin or along Hull Street, and then traveling down Midlothian, Hull, or Route 1.	Planning	Goal 8	GRTC	FY23
Great Streets: Transform Belt Boulevard and Hull Street into Great Streets featuring buildings addressing the street, underground utilities, street trees, lighting, enhanced transit, and other amenities.	CIP	Goal 4 Goal 9	DPW	FY24-26+
New Park: Identify land within a 10-minute walk of this Node for a new park, transfer land to PRCF ownership, and host community planning sessions to develop ideas for the park design.	Legislative CIP	Goal 2 Goal 17	PRCF	FY22-25

Actions May Include	Type	R300 Goal	Lead*	Time Frame
STONY POINT FASHION PARK				
Small Area Plan: Develop a Small Area Plan with community input for the Stony Point Fashion Park that provides details on the opportunities for redevelopment and a system of public open space, greenways, and streets to improve connectivity.	Planning	Goal 1	PDR	FY22
Rezone: Rezone the Stony Point Fashion Park area in alignment with the Future Land Use Plan.	Legislation	Goal 1	PDR	FY23
Greenway: Build greenways and connect adjacent neighborhoods to the greenways.	CIP	Goal 8 Goal 17	DPW	FY23-24
Transit Expansion: Once enough demand exists, expand transit service to reach Stony Point Fashion Park.	Administrative	Goal 8	GRTC	FY23
Target Industries: Consider marketing this area for business creation and attraction, targeting corporate headquarters and professional services.	Administrative	Goal 11	DED	FY22-26+
Housing: As part of the Small Area Plan, identify areas for more housing, rental and ownership, at various price points, including units for low-income households.	Administrative	Goal 14	HCD	FY23-26+
New Park: Identify land within the Stony Point Fashion Park area for a new park, transfer land to PRCF ownership, and host community planning sessions to develop ideas for the park design.	Legislative CIP	Goal 2 Goal 17	PRCF	FY22-25

* see Acronym list for definition of acronyms

Big Move | Expand Housing Opportunities

Encourage the development of housing options throughout the city to expand the geography of opportunity by de-concentrating poverty.

Description

Richmond offers many housing options; however, the city is intensely segregated by socio-economic status and race. This Big Move seeks to elevate the importance of creating more housing opportunities in more parts of the city for all income earners.

Key Benefits

- Expand the Geography of Opportunity. In 2017, the Reinvestment Fund found that very large portions of the city were entirely unavailable to people earning up to 120% of the AMI because the housing costs were too high in those areas. Expanding housing opportunities for all income earners by encouraging the development of housing options throughout the city will expand the areas where people of various income levels can live and give them more opportunities to live near work and other amenities.
- Improve Health Outcomes. Having a solid roof over your head and a safe place to sleep is a basic need. Quality housing is essential in improving health outcomes for all ages. Too many low-income Richmonders, who are disproportionately Black or Latino, live in poor quality housing that is expensive for their limited budgets and may be hazardous to their health. Expanding the number of quality housing units that are affordable to lower-income households is essential in narrowing the health disparities in Richmond.
- Provide Housing for a Growing City Population. Creating more housing opportunities throughout the city helps provide homes for a growing population. An increase in residents in Richmond helps create demand for services,

such as grocery stores and pharmacies. As of 2019, Richmond has still not reached 249,621 population it had in 1970, after the Chesterfield annexation; nor is the city as dense as it was in 1950, when the density was 5,800 people/square mile compared to 4,032 people/square mile in 2018 in the same 1950-city footprint.

Vision Alignment

Equity: Equal access to quality housing, regardless of race, income, and sexual orientation, is essential to creating a Richmond where all people thrive in high-quality neighborhoods.

Sustainability: A significant amount of greenhouse gas emissions come from energy use from buildings. Improving existing housing stock to improve energy efficiency and ensuring new homes are built using efficient and energy-saving methods will help reduce energy consumption and greenhouse gas emissions related to buildings.

Beauty: The design, form, and architecture of houses and multi-family housing can shape beautiful places within Richmond to create distinctive neighborhoods and communities that make Richmonders proud. Beyond the form of the actual structures, the yards, plazas, and open spaces created within and near housing create environments that not only beautify our city but also create opportunities for recreation and healthy living.

Goal Alignment

High-Quality Places: The High-Quality Places section of the plan includes recommendations related to creating mixed-income communities and urban design strategies to shape how open space is designed. All Richmonders deserve to live in great neighborhoods.

Equitable Transportation: The Equitable Transportation section has strategies related to expanding transit options and improving bike and pedestrian infrastructure in lower-income areas in order to increase access for non-car households.

Diverse Economy: The Diverse Economy section has strategies related to ensuring there are housing options at various price points for the employees of future companies that may grow or move to Richmond. When looking to grow and relocate, companies look at the local housing market to make sure their employees (at various pay scales) can find quality housing that meets their needs.

Inclusive Housing: The Inclusive Housing section of this plan includes nine objectives and over 50 strategies to meet the Inclusive Housing vision,

"Richmond is a city where all people can access quality housing choices."

Thriving Environment: Goals 14, 15, and 16 speak to the importance of access to clean air, clean water, and healthy and resilient communities to create housing and neighborhoods that are healthy by-design.

Action Steps

Actions May Include	Type	R300 Reference	Lead*	Time Frame
Officials & Staff Education: Develop and fund a housing policy educational program for newly elected officials and City staff involved in planning, housing, and community development activities.	Administrative	14.1.a	HCD	FY22
Richmond Housing Collaborative: Create a Richmond Housing Collaborative comprising of eight areas of influence including housing thought leaders from City government, public housing administration and resident leaders, philanthropic and housing finance leaders, non-profit and for-profit housing development leaders, and housing advocacy leaders to discuss, innovate, create, test, and implement solutions to the City's housing needs.	Administrative	14.1.b	HCD	FY22
Housing Choice Awareness: Increase awareness and improve relationships with landlords regarding the Housing Choice Voucher program, particularly in areas within Nodes and a 1/2 mile of high-frequency transit stops, and highlight the new State Law (HB6 Virginia Fair Housing Law), which prevents landlords from discriminating against renters with Housing Choice Vouchers.	Administrative	14.1.c	HCD	FY22
Homeownership: Create a center for homeownership that is a clearinghouse for information on City programs, grants, loans, and education, partnering with state agencies, such as VHDA and the Virginia Department of Housing and Community Development, to increase homeownership particularly among Black and Latino households.	Administrative	14.1.d	HCD	FY23
MVA Update: Create an update to the MVA and use the updated analysis to compare changes in housing markets since the 2017 MVA to communicate how changes have impacted housing access, to evaluate the effect of policies and programs on local housing markets and sub-markets, and to develop new programs as markets change.	Planning	14.1.e	RMHF	FY23

* see Acronym list for definition of acronyms

Actions May Include	Type	R300 Goal	Lead*	Time Frame
Priority Neighborhoods Task Force: Convene an inter-agency task force to devise a Memorandum of Understanding between the City and RRHA to determine roles and responsibilities, schedule, project workflow, and a funding strategy for the Priority Neighborhood Program. The Memorandum of Understanding will be adopted by City Council and the RRHA Board of Commissioners.	Administrative Legislation	Goal 1 3.3 Goal 4 Goal 5 Goal 6 Goal 8 11.2 11.3 Goal 14 Goal 15 16.4 Goal 17	PDR	FY23- FY24
GILPIN COURT				
Jackson Ward Community Plan: Adopt the plan as an element of the City's master plan.	Legislation	" "	PDR/RRHA	FY24
Development Partner: Support RRHAA select a development partner through a competitive bid process to redevelop Gilpin Court	Administrative	" "	PDR/RRHA	FY24
Calhoun Recreational Space: Improve the green space east of the Calhoun to add a splash pad, playground equipment, exercise equipment, a walking path, public art, and improvements to the community garden.	Planning	" "	PDR	FY23
Calhoun Center: Renovate the Calhoun Center into a 21st century facility with a functioning pool.	Planning	" "	PRCF	FY23- 25
Fay Towers: Support RRHA with redeveloping Fay Towers to provide housing options for residents of Gilpin Court.	Administrative	" "	PDR	FY24- 25
Private rental units: Support RRHA and its development partner to build rental units on RRHA owned property in the Jackson Ward Community.	Administrative Legislation	" "	PDR	FY24- 25
Tenant Bill of Rights: Support RRHA's engagement of with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options	Administrative	" "	PDR	FY24

Actions May Include	Type	R300 Goal	Lead*	Time Frame
CREIGHTON COURT				
Creighton Court Redevelopment: Support RRHA with Phase 1 Infrastructure Construction, Phase A Construction, Construction of Phase B (~72 units), Phase 2 Resident Relocation, Phase 2 Demolition, Phase 2 Infrastructure, and Construction of next phases.	Administrative	" "	PDR/HCD/RRHA	FY24-FY26+
HILLSIDE COURT				
Oak Grove/Bellemeade Small Area Plan: Develop a Small Area Plan with community input for the Oak Grove/Bellemeade Area that provides strategies for fostering equitable growth and improvement.	Planning	" "	PDR/HCD/RRHA	FY23-24
Hillside Court Development Partner: Support RRHA in soliciting a request for a Hillside Court development partner.	Administrative	" "	PDR/HCD/RRHA	FY24
Tenant Bill of Rights: Support RRHA's engagement of with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options	Administrative	" "	PDR/HCD/RRHA	FY24
FAIRFIELD COURT				
Fairfield Small Area Plan: Develop a Small Area Plan with community input for the Fairfield Priority Neighborhood Area that provides strategies for fostering equitable growth and improvement.	Planning	" "	PDR/HCD/RRHA	FY24-26
Tenant Bill of Rights: Support RRHA's engagement of with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options.	Administrative	" "	PDR/HCD/RRHA	FY25-26
WHITCOMB COURT				
Whitcomb Small Area Plan: Develop a Small Area Plan with community input for the Whitcomb Priority Neighborhood Area that provides strategies for fostering equitable growth and improvement	Planning	" "	PDR/HCD/RRHA	FY24-26
Tenant Bill of Rights: Support RRHA's engagement of with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options.	Administrative	" "	PDR/HCD/RRHA	FY24-26

Actions May Include	Type	R300 Goal	Lead*	Time Frame
MOSBY COURT				
Mosby Court Planning Process: Support RRHA and its selected development partner with planning process for Mosby Court redevelopment.	Planning	" "	PDR/HCD/RRHA	FY24-26
Tenant Bill of Rights: Support RRHA's engagement of with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options.	Administrative	" "	PDR/HCD/RRHA	FY24-FY26
BLACKWELL				
Disposal of 55 RRHA lots: Support RRHA will disposal of 55 lots to awarded development partners for homeownership opportunities.	Administrative	" "	PDR/HCD/RRHA	FY24-FY25
Receipt of 3 RRHA lots: Parks & Rec will receive 3 lots from RRHA for the purposes of park space.	Administrative Legislation	" "	PDR/HCD/RRHA	FY24
Develop 44 vacant lots: Support RRHA with the solicitation of a request for a development partner for their remaining 44 vacant lots.	Administrative	" "	PDR/HCD/RRHA	FY24-FY25
Tenant Bill of Rights: Support RRHA's engagement of with residents and tenant council to establish a Tenant Bill of Rights to ensure residents have right to return and access to housing options.	Administrative	" "	PDR/HCD/RRHA	FY24
HIGHLAND GROVE				
Better Housing Coalition (BHC) Development: Support BHC with infrastructure work for new development and construction of homeownership units.	Administrative	" "	PDR/HCD/RRHA	FY24-26

Big Move | Provide Greenways & Parks for All

Develop parks and greenways so that by 2037 100% of Richmonders live within a 10-minute walk of a park.

Description

Create a parks system that is easily accessible by all Richmonders and connected by a greenway network.

Key Benefits

- Reduce the Heat-Island Effect: Richmond's heat-island effect is more pronounced in areas of high poverty because there are not many parks, a lot of pavement, and a thin tree canopy.
- Manage Rainfall: Green space manages rainfall and reduces the amount of rainwater that flows into the City's drainage and sewage systems.
- Improve Health Outcomes: Proximity to a park and greenway system can help reduce chronic conditions, such as asthma, diabetes, and obesity.
- Anchor New and Existing Neighborhoods: Parks and greenway systems create a gathering place in communities and can serve as catalysts to spur private investment in the city.
- Increase Resiliency to a Changing Climate: Vegetation sequesters carbon dioxide, which helps reduce the total amount of emissions in the city and a network of greenways encourages biking and walking, instead of driving, thereby potentially reducing per capita carbon emissions.
- Expand Transportation Options: Greenways provide a safe, dedicated route for non-vehicle users to travel. Greenways support active transportation which help increase physical activity and can potentially improve public health outcomes. Greenways also support non-vehicle modes of transportation, which in turn may decrease vehicle use and therefore, decrease greenhouse gas emissions related to vehicle use.

Vision Alignment

Equity: According to life expectation analysis conducted by the VCU Center for Society and Health, life expectation in areas of concentrated poverty is 20 years less than in wealthy areas. Areas of concentrated poverty are also more likely to be extremely hot during extreme heat days because those areas lack trees and parks, and have a lot of pavement, according to the Science Museum of Virginia. Increasing access to parks, focusing first on areas of poverty, can help improve the health outcomes of low-income Richmonders and support a more equitable built environment.

Sustainability: As mentioned in the key benefits section, parks offer many environmental benefits that increase the City's ability to adapt to a changing climate. Parks help manage rainfall during rain events, cool down the temperature by creating micro-climates and provide habitats for flora and fauna, among many other benefits. Expanding public green space helps the city meet its vision to create a more resilient and healthy city.

Beauty: Landmark parks, such as the James River Park System, Byrd Park, and Jefferson Park, are lush, beautiful environments for Richmonders to experience nature. Parks, trees, and vegetation help beautify Richmond and should be preserved and enhanced.

Goal Alignment

High-Quality Places: Creating great public parks and green space is a fundamental element in establishing high-quality neighborhoods and Nodes throughout the city. The High-Quality Places section of the plan refers to parks and greenways in several parts, most notably in objectives to reach Goal 1 and Goal 4.

Equitable Transportation: Connecting parks with greenways is a core component of Goal 8 within the Equitable Transportation section, which focuses on expanding the non-car transportation network.

Diverse Economy: Parks, greenways, and recreation spaces are key drivers in Richmond's tourism economy (see Goal 12). A robust parks system can also help retain, grow, and attract businesses within Richmond as parks help attract employees to live and work in the city (see Goal 11).

Inclusive Housing: Oftentimes, after parks are developed in areas that have lacked green space, property values increase and there is the potential for existing residents to be displaced. At the same time, access to a park is essential for low-income

communities to help improve their health outcomes. Therefore, the Inclusive Housing section of the plan has several strategies to preserve and expand housing for lower-income households and there is also a Big Move related to housing.

Thriving Environment: A system of parks and greenways is essential in reaching the clean air (Goal 15), clean water (Goal 16), and resilient and healthy community (Goal 17) goals listed in the Thriving Environment section.

Action Steps

Actions May Include	Type	R300 Reference	Lead*	Time Frame
Zoning Ordinance: Revise the Zoning Ordinance to include a green space/green amenity minimum; see the Zoning Ordinance Big Move.	Legislative	Goal 4 Goal 17	PDR	FY 22-27
Land Acquisition and Planning: Develop a strategy for acquiring land for new parks and open spaces, and a Parks Master Plan that includes 1) engaging residents (particularly traditionally under-represented communities), developers, government, technical experts, and other stakeholders in defining and encouraging excellence in design of public open and green space; 2) considering and mitigating potential negative effects of new park space, such as increased adjacent property values, cultural displacement, and increased regulation of public space; and 3) creating public-private partnerships to help the City maintain and manage high-quality parks, green infrastructure, and public open space.	Administrative Planning	Goal 2 Goal 17	PRCF [w/ PDR]	FY22-25
Land Trust: Utilize the Maggie Walker Community Land Trust to create public open space.	Administrative	Goal 17	PRCF	FY22-26+
Connections: Implement strategies in Goal 8 to connect parks and increase access to parks.	CIP	Goal 8 Goal 17	DPW	FY22-26+
Parklets: Promote the Parklet Program and encourage the development of parklets throughout the City.	Administrative	Goal 17	PDR	FY22-26+
School Yards: Amend City ordinances to allow public access to school yards and playgrounds during non-school hours.	Legislative	Goal 17	PRCF (RPS)	FY23-24
Maintenance: Create dedicated funding for the creation and maintenance of new and existing parks, public open space, plazas, and greenways, such as 1) a bond referendum and/ or 2) a neighborhood-based program where landowners and developers pay parkland dedication fees that will be used to create a park in their neighborhood.	Legislative	Goal 17	PRCF	FY23-26

* see Acronym list for definition of acronyms

Big Move | Reconnect the City

Cap highways to reknit neighborhoods destroyed by interstates, build/improve bridges, introduce street grids. and make the city easier to access by foot, bike, and transit.

Description

In the 1950s, the Richmond-Petersburg Turnpike (now I-95/I-64) was built through Jackson Ward, cutting the neighborhood in half and destroying over 900 buildings. The main project of this Big Move is to cap the highway and build a park, buildings, and roads on top of the highway in an effort to heal the wound caused by the highway construction.

Key Benefits

- One Neighborhood: Jackson Ward and North Jackson Ward feel like two entirely different places, but capping the highway will make them feel as one.
- Improve Access: Connections to North Jackson Ward are limited today. It is difficult to get in and out of the area. Adding another street connection over the highway will make it easier to get to North Jackson Ward from Downtown by walking, biking, bus, or car.
- Placemaking: A park and buildings on top of the highway have the opportunity for distinctive architecture and public art that highlight Jackson Ward's history and also serve as a gateway to Richmond.

Vision Alignment

Equity: In the 1950s, Jackson Ward, a thriving Black neighborhood, was broken apart with the creation of I-95/I-64. In capping the highway and increasing access to North Jackson Ward, this Big Move seeks to reconcile the past by re-knitting the community.

Sustainability: The chasm created by I-95/I-64 deeply divides two sections of the city, making it difficult to connect the two sides of Jackson Ward. By decking the highway and creating another street connection, the area will become more connected and make it easier to traverse by foot, bike, bus, or car. The bridge park can also reduce the heat island effect by introducing trees and other vegetation.

Beauty: The I-95/I-64 highway is not particularly beautiful from within the city, nor does it offer a nice view of the city for drivers and passengers on the highway itself. By capping the highway at this prominent location, the City will have the opportunity to design and showcase a beautiful destination.

Goal Alignment

Several strategies within the Equitable Transportation section of Richmond 300 seek to reconnect Richmond, such as capping the Downtown Expressway, building a bridge over the tracks from Leigh Street to the Diamond Site, and general recommendations about creating street grids to encourage walking and increase access. A move such as capping the I-95/I-64 highway at Jackson Ward aligns with the primary sections of the plan.

High-Quality Places: Goals 1, 4, and 5 speak to creating complete neighborhoods, designing a distinctive city, and implementing inclusive planning engagement strategies.

Equitable Transportation: Goal 9 is about seeking to creating more transportation connections throughout Richmond, including strategies such as decking I-95/I-64 to reconnect Jackson Ward.

Diverse Economy: Improving transportation infrastructure that improves the movement of people and goods throughout Richmond helps to support a growing economy.

Inclusive Housing: Large infrastructure investments in neighborhoods can increase property values and lead to involuntary displacement; however, it is important to improve access to North Jackson Ward,

which was disconnected from the rest of the city when the highway was constructed. Therefore, the strategies in the Inclusive Housing section of the plan seek to continue to provide housing opportunities for low- and very low-income households in redeveloping neighborhoods.

Thriving Environment: Increasing access to greenspace, which a bridge park would create, directly aligns with many of the strategies in the Thriving Environment section, as well as the Parks and Greenways Big Move.

Action Steps

Actions May Include	Type	R300 Reference	Lead*	Time Frame
Feasibility Study: Develop a feasibility study with community input to create a schematic plan for the bridge park, roadways, and buildings on top of the capped highway.	Planning	Goal 5 Goal 9	DPW	FY23
Funding: Investigate federal and state funding mechanisms to assist in financing this infrastructure program.	Planning	Goal 9	DPW	FY23
Gilpin Court Transformation: As part of the Gilpin Redevelopment Plan (see Nodes Big Move), plan for multi-modal connections across I-95/I-64 and to adjoining neighborhoods.	Planning	Goal 1 Goal 8 Goal 9 Goal 14	RRHA [w/ PDR, DED, HCD]	FY22- 23

* see Acronym list for definition of acronyms

Big Move | Realign City Facilities

Improve City buildings (schools, libraries, fire stations, police stations, etc.) to provide better services in efficient, shared-use, accessible facilities.

Description

As the city grows, there will be new residents living in new areas of the city and filling out existing neighborhoods. This growth will likely lead to new demand in City services and require City facilities to move, expand, close, or co-locate. Cities across the country are creating innovative strategies to co-locate city facilities and better serve residents, such as adding clinics to fire stations and reexamining how public libraries deliver all kinds of information in various formats (not just books).

Key Benefits

- **Efficiently Manage City Resources.** The City has finite resources to manage its facilities and provide services to residents. By aligning City facilities to explore shared-use and consolidation, the City can improve how it efficiently delivers services.
- **Energy Management.** Given its purchasing power and number of facilities, the City is well-positioned to provide on-site renewable energy and also improve building by applying energy retrofits across its portfolio.
- **Nodal Focus.** By locating customer-serving facilities near/within Nodes, the City will be anchoring key locations within Richmond communities with public facilities and also providing services at locations that are accessible via multiple modes of transportation.

Vision Alignment

Equity: Co-locating and consolidating City services within communities of great need can help increase access to services that provide critical care and support to low- and very low-income families and

thereby attempt to increase equity. For instance, the Health District has placed clinics within RRHA facilities in order to provide direct care to some of Richmond's most vulnerable populations.

Sustainability: Locating customer-facing City services near/within Nodes helps reduce greenhouse gas emissions associated with transportation by supporting non-car transportation modes. Also, City facilities can help showcase green building features, such as the DPU facility on Commerce Road, which includes many examples of green infrastructure.

Beauty: Oftentimes, City facilities not only provide critical services to communities, but also serve as beautiful landmarks that anchor a neighborhood and create a distinctive place through architecture and site design.

Goal Alignment

High-Quality Places: Goal 2 of the Plan has three objectives related to city facilities, land, and infrastructure.

Equitable Transportation: The Goals in this section seek to align transportation infrastructure with land use planning using a nodal network. Any customer-facing City facilities should endeavor to locate near/within the Nodes so that customers have multiple transportation options to reach services.

Diverse Economy: The City has the opportunity to strategically acquire property to spur economic development. For example, Henrico and Chesterfield purchased defunct malls to reposition them for redevelopment.

Inclusive Housing: The City can use City-owned land to create more housing that is affordable to low-income and very low-income households and seek to meet the Richmond 300 Inclusive Housing vision.

Thriving Environment: City-owned buildings and land are opportunities for energy retrofits and green infrastructure to further Goals 15 and 16, as well as locations for new parks, urban agriculture, and resiliency hubs to further Goal 17.

Action Steps

Actions May Include	Type	R300 Reference	Lead*	Time Frame
Facilities Inventory: Develop and maintain a facility assessment inventory of all City-owned facilities.	Administrative	Goal 2	DPW	FY23-26+
Police and Fire: Analyze police precincts and fire stations within the context of the Future Land Use Plan and determine whether there are needs for creating, relocating, and/or closing police and fire stations to align with population projections and meet minimum response times.	Planning	Goal 1 Goal 2	PDR [w/ RFD, RPD	FY23-24
Schools: Develop a schools facility master plan based within the context of the Future Land Use Plan to determine whether there are needs for creating, relocating, and/or closing schools to align with population projections. Explore the creation of a new school in the Downtown area.	Planning	Goal 1 Goal 2	RPS [w/ PDR]	FY23-24
Parks: Develop a parks and community facilities master plan based within the context of the Future Land Use Plan that seeks to ensure all Richmonders to live within a 10-minute walk of a park.	Planning	Goal 1 Goal 2 Goal 17	PRCF [PDR]	FY23-24
Libraries: Finish implementing the Libraries Master Plan by renovating the Main Library, and then explore creating a new Libraries Master Plan to plan facilities improvements for the next generation of library users and incorporating other community-serving services.	Planning	Goal 1 Goal 2	RPL	FY23-24
Energy Retrofits: Implement programs to improve the energy efficiency of City-owned buildings.	CIP	Goal 2 Goal 15	DPU, DPW	FY23-26+
Infrastructure Planning: During small area planning and other development efforts, coordinate across departments to plan for any infrastructure improvements necessary to support the development and redevelopment at Nodes.	Planning	Goal 1 Goal 2	PDR [w/ DPU, DPW]	FY22-26+

* see Acronym list for definition of acronyms

Reporting

Every year PDR staff should create a Richmond 300 Annual Report, post the Annual Report on its website, and present the Annual Report to the City Planning Commission and City Council. The Annual Report may include the following sections:

- Metrics: Updated every other year, this section includes new statistics for the metrics described at the beginning of each this chapter.
- Big Moves: A summary of the actions that have transpired to advance each Big Move since the last Annual Report was published. The actions may include, but are not limited to, the action steps outlined in this chapter.
- Other Goals: A summary of any other actions undertaken in an effort to advance any of the 17 Goals outlined in Chapters 2 through 6 of Richmond 300 that have transpired since the last Annual Report was published.
- The Annual Report for the 2024-25 Fiscal Year should include a plan for updating Richmond 300. Per State Code, Master Plan should be updated every 5 years.

Since Richmond 300 touches on many topics that are not directly under the purview of PDR and many of the goals outlined in Richmond 300 will require cross-departmental collaboration, as well as collaboration with outside groups, the Annual Report may include descriptions of actions undertaken by groups other than PDR.

Appendices

- A. Acronyms and Glossary
- B. Creating the *Richmond 300* Plan
- C. Nodes Descriptions
- D. Updating the Master Plan

Appendix A

Acronyms Definitions

Term	Definition
ACS	American Community Survey
ADA	Americans with Disabilities Act
ADT	Average daily traffic
AMI	Area median income
AV	Autonomous vehicle
BRT	Bus rapid transit
CAR	Commission of Architectural Review
CDBG	Community Development Block Grant program
CHP	Combined Heat and Power
CIP	Capital Improvement Program
CMAQ	Congestion Mitigation and Air Quality
CPACE	Commercial Property Assessed Clean Energy
CSO	Combined sewage overflow
CSS	Combined sewer system
CURA	Center for Urban and Regional Analysis at Virginia Commonwealth University
DED	Department of Economic Development
DPU	Department of Public Utilities
DPW	Department of Public Works
GHG	Greenhouse gas
GRTC	Greater Richmond Transit Company
HAMFI	HUD Area Median Family Income
HCD	Housing and Community Development
HOME	Housing Opportunities Made Equal
HUD	Department of Housing and Urban Development
ITS	Intelligent Transportation Systems
LIHTC	Low-Income Housing Tax Credit
MS4	Municipal Separate Storm Sewer System
MVA	Market Value Analysis
NPS	National Park Service
PACE	Property Assessed Clean Energy
PDR	Department of Planning and Development Review
PILOT	Payment-in-lieu of taxes
QAP	Qualified Allocation Plan
RFJA	Richmond Food Justice Alliance

Term	Definition
RIC	Richmond International Airport
RMA	Resource Management Area as defined by the Chesapeake Bay Preservation Act, which includes all Resource Protection Areas plus the 100-year floodplain, soils that erode easily, steep slopes, non-tidal wetlands, 500-foot separation from Resource Protection Area and 600-foot separation from streams
RPA	Resource Protection Area as defined by the Chesapeake Bay Preservation Act, which includes land next to water bodies and land, that if developed, may worsen water quality of water bodies; includes tidal wetlands, non-tidal wetlands, water bodies that flow continuously (i.e., rivers and streams), tidal shores, other land that should be protected to improve water quality, and land within a 100-foot strip next to all previously listed areas
RPD	Richmond Police Department
RPL	Richmond Public Library
RRHA	Richmond Redevelopment and Housing Authority
SUP	Special Use Permit - allows for an applicant to receive approval for a development that does not conform to the existing zoning district
TDM	Transportation Demand Management
TIF	Tax increment finance
TNC	Transportation Network Companies (Uber, Lyft)
TOD	Transit-Oriented Development
VCU	Virginia Commonwealth University
VDOT	Virginia Department of Transportation
VHDA	Virginia Housing Development Authority

Glossary

Term	Definition
Blighted property	Land that is dilapidated, unsafe, and/or in unsightly condition
Brownfield	A former industrial or commercial site where future use is affected by real or perceived environmental contamination
Built Environment	Consists of buildings, parks, roads, infrastructure, and other physical parts that set the stage for human activity within a city; the human-made space in which people live, work, and recreate on a daily basis
Carbon Neutrality	Achieving net zero carbon dioxide emissions by balancing carbon emissions with carbon removal or simply eliminating carbon emissions altogether
Commercial	Retail and business uses such as shops, convenience stores, big box stores, and restaurants
Duplex	(2-family): one building housing two "families" in two separate units that are on top of one another or next to each other
Enclosure	The ratio of height to width; good sense of enclosure means that the height of the buildings is in proportion to the width of the intervening public space
Euclidean zoning	Single-use zoning by specific and uniform geographical division
Floodplains	The 100-year floodplain represents areas that have a 1% chance of flooding in a given year, or once every 100 years. The 500-year floodplain represents areas that have a 0.02% chance of flooding in a given year, or once every 500 years.

Term	Definition
Food desert	An area that has limited access to affordable and nutritious food from grocery stores or vegetable shops
Government	Uses that are owned or operated by a government agency such as the Commonwealth of Virginia, the City of Richmond, or the federal government. These include facilities such as police and fire stations, libraries, and City Hall
Graywater	The relatively clean wastewater from baths, sinks, washing machines, and other kitchen appliances
Greenway	A greenway is a universally accessible paved path that is a minimum of 8-feet wide and intended for non-vehicle users. Examples of greenways in Richmond are the Canon Creek Greenway and the Virginia Capital Trail. Greenways are sometimes also referred to as shared use-paths.
Heat island effect	An urban area that is significantly warmer than its surrounding rural areas due to urban elements such as buildings, roads and pavements, and lack of vegetation
Heat vulnerability index	A measure of how likely a person is to be injured or harmed during periods of hot weather, especially young children and older adults
Impervious surface	Describes paved areas because when it rains, the rain water that falls on the roofs of the buildings, roads, parking lots, and sidewalks does not immediately seep into the ground, but runs off the paved surfaces
Industrial	Industrial uses such as factories, processing facilities, manufacturing facilities, and warehouses
Institutional	Institutions such as universities, private schools, museums, theaters, and places of worship, which are typically not-for-profit organizations.
ITS	Intelligent Transportation Systems
JRPS	James River Park System
Landscape	All of the visible features of an area of countryside, land or street, often considered in terms of their aesthetic appeal
Light pollution	The presence of anthropogenic and artificial light in the night environment, inhibiting the observation of stars and planets
Mixed-use	A building or parcel with more than one use. Refers to either a building with different uses in it (such as a store, restaurant, or office on the ground floor with residences above), or to a parcel of land with more than one use on it
Multi-family	One building with three or more dwelling units in it that are either condominiums (each unit is owned individually) or apartments (each unit is rented and the entire building is owned by one entity)
Multi-use trails	Multi-use trails are not shown on this map. Multi-trails are very important recreation routes in the city and should be expanded and maintained, but Richmond 300 does not include them on these maps. A multi-use trail is a single track or natural surface trail that is open to one or more user groups. In Richmond multi-use trail users groups are hikers and bikers, but elsewhere user groups might include horses, ATV's etc.
Non-vehicle users	Non-vehicle users are pedestrians, joggers, cyclists, rollerbladers, skateboarders, wheelchair users, people pushing strollers, and other users that are not using a vehicle for transportation.
Office(s)	General office space for medical, professional, and research and development business
Placemaking	An approach to planning, design, and organization of public spaces that capitalizes on an area's assets; the goal is to create quality public spaces with strong character that encourages health and equity

Term	Definition
Priority streets	A designation that applies most to corner properties and requires the same form-based considerations which apply to principal streets (the highest order street fronting a parcel) to be applied to these other streets as well. This helps in a situation where a building is at the intersection of two major roads. Typically only one road would be the principal street requiring special treatment as outlined in the Zoning Ordinance. This requires that both roads receive special treatment in order to improve the design and function of the new development.
Public and Open Space	Publicly-owned land that has City parks or other types of open space such as cemeteries
Public Realm	Includes all exterior places, linkages, and built form elements that are physically and/or visually accessible regardless of ownership; defined as any publicly-owned streets, right-of-ways, parks, publicly-accessible open spaces, and any public and civic buildings and facilities
Rezoning	Refers to completely changing a parcel's zoning designation to a different one, or a conditional rezoning where the City places conditions on the zoning change such as limiting the height of the building or requiring certain improvements on- or off-site; the conditions cannot lessen the requirements of an existing zoning district
Riparian area	The interface between land and a river or stream
Setback	The distance from the property line in which building is prohibited
Single-family	Detached houses and attached rowhouses with one "family" per house
Transit-oriented development	Walkable development served by frequent transit with a mix of housing, retail, and employment choices designed to allow people to live and work with less or no dependence on a personal car
Tree canopy	The layer of leaves, branches, and stems of trees that cover the ground when viewed from above
Urban design	The process of creating the public realm through the artful arrangement of buildings and site elements as cities grow and change; successful urban designs create meaningful spaces that foster positive social interaction, cultural advancement, and civic identity
Vacant	Parcels of land that are not developed
Wetland	Land that is saturated in water, either permanently or seasonally and are important for the following reasons: they absorb water during rain and therefore help reduce flooding; help clean pollutants out of water; allow water to slowly seep into the ground and replenish groundwater; and are habitats for many different types of animals

Appendix B

Creating the Richmond 300 Plan

The process to update the plan was a city-wide conversation about change, focusing on where we have been, where we are now, and where we want to be in 20 years. Because every Richmonder should have a say in how the city grows, the Master Plan was developed with extensive community input. Several groups were established to help shape the content of *Richmond 300*.

Richmond 300 Groups

Technical Team

The Technical Team was comprised of staff from multiple City departments and quasi-City entities. The Technical Team provided input on technical planning, development, transportation, and myriad issues and provided input on interim work products. This team played a critical role in integrating existing City plans and policies, collecting baseline conditions data, and providing input to shape interim work products.

Advisory Council

The Advisory Council is an ad hoc sub-committee of the City Planning Commission established by City Planning Commission Resolution 2016-70 to “(1) assist in shaping and reviewing the content of the New Master Plan, (2) help build awareness of the New Master Plan, and (3) encourage community participation in the New Master Plan update process.” The Advisory Council adopted By-Laws to guide the groups.

Selection Process: In July 2017, the City released a call for applicants to the Advisory Council. PDR received 153 on-time applications to serve on the Advisory Council and an additional 21 applications after the application deadline, which were not considered. PDR originally envisioned creating an Advisory Council of no more than 15 members; 13 of which would be selected from an open call and 2 would be City Planning Commission members. However, after receiving such a large amount of qualified applicants, PDR increased the group to 21 members. The Advisory Council members were selected by 2 City Planning Commission members, the Director of PDR, and the Mayor’s Office.

Diversity: PDR sought to assemble a diverse Advisory Council by including individuals with expertise in planning, real estate, architecture, historic preservation, urban design, and law, as well as community members who are not necessarily in “typical” urban planning fields. Some members routinely work with PDR and have intimate knowledge of the Zoning Ordinance and the 2001 Master Plan; whereas other members do not. The



Advisory Council includes a mix of ages and ethnic/race groups, as well as people who live and work in all nine City Council districts. More than half of the members have lived in many parts of the city throughout their lives; while several members are new to Richmond.

Working Groups

The Working Groups were topic-specific sub-committees of the Advisory Council that were charged with creating the initial recommendations for Richmond 300, which were vetted and amended by the community-at-large during Community Consultation #2. The Working Groups met from March to July 2019 with 297 people attending 15 meetings over the five month period - many people attended multiple meetings for a total of 693 meeting visits. Each Working Group was co-chaired by members of the Advisory Council and the Technical Team and included At-Large, Technical Team, and Advisory Council members as well. At-Large Members were any members of the public who filled out the Working Group Interest Form. The Working Groups included policy experts, advocates, and individuals generally interested in the topic.



Process

Phase 1: Define the Plan (May 2016 to September 2018)

During the first phase of the Richmond 300 process, PDR set the stage for getting the plan started by kicking off the following tasks:

- Developing and vetting the process to create the new Master Plan update
- Developing a brand identity and establishing a web presence (website and social media accounts)
- Issuing Requests for Proposals to hire consultants for engagement and parking
- Meeting with City staff, elected officials, stakeholder groups, Council Districts, City Council, and City Planning Commission and attending 90 meetings with over 2,400 attendees total
- Establishing the 21-member Advisory Council (received 173 applications)
- Collecting existing data and developing reports
- Collecting parking data and hosting Parking Meetings #1
- Key documents created during this phase: Demographics, Housing and Land Use Analysis, and Urban Design Typology Analysis, Insights Report; and Map Books for each Council District

Phase 2: Develop the Plan (September 2018 to February 2020)

During the second phase, the Richmond community and PDR staff developed the draft content of the Master Plan, by completing these tasks:

- Outlining a city-wide vision and big ideas to reach that vision during Community Consultation #1: Visioning, which included reaching 1,558 people (at 40 existing community meetings and 7 open houses), and collecting 1,030 survey responses [September–October 2018]
- Reviewing preliminary parking policy recommendations during Parking Meetings #2, which were attended by 426 people and sharing a survey which garnered 800 responses [November 2018]
- Developing a vision for the city in 2037 and outlining key goals
- Defining policy recommendations for each of the key goals during 15 working group meetings that had 693 total attendees [January–July 2019]
- Reviewing the draft content and providing comments during Community Consultation #2: Recommendations, which included reaching 2,014 (at 62 existing meetings, 21 sharing sessions and 7 forums), collecting 1,015 survey responses, collecting 612 comments on draft maps and strategies, and receiving 20 letters and emails [September–November 2019]
- Hosting 2 meetings focused on the Greater Scott's Addition area with 170 attendees and collecting 1,148 survey responses to 2 surveys [June 2019 – February 2020]
- Writing the draft Richmond 300: A Guide for Growth document [December 2019–June 2020]
- Releasing the Draft Richmond 300: A Guide for Growth Master Plan [September 2020]
- Releasing Parking Study [June 2020]
- Key Documents from this phase: Parking Study, Community Consultation #1 Report, Community Consultation #2 Report, Draft Richmond 300: A Guide for Growth Master Plan

Phase 3: Refine & Adopt the Plan (March 2020 to December 2020)

During the third phase, PDR finalized the plan:

- Discussing final edits and plan implementation during Community Consultation #3: Draft Plan, which reached 1,187 people (at 23 existing meetings and 16 summits) and receiving 1,137 comments on the Draft Plan and 90 letters and emails [June–July 2020]
- Hosting 2 meetings focused on the Coliseum area with 215 attendees and collecting 997 survey responses to 2 surveys [June – July 2020]
- Reviewing and reconciling all comments received on the draft plan [July–September 2020]
- Releasing the Pre-Final and Final Richmond 300: A Guide for Growth Master Plan [September 2020]
- Presenting the final Richmond 300 plan to City Planning Commission and City Council for adoption [September–December 2020]
- Key Documents from this phase: Pre-Final Richmond 300: A Guide for Growth Master Plan, Final Richmond 300: A Guide for Growth Master Plan

Phase 4: Implement the Plan (2021-2026)

During the fourth phase, City staff, elected officials, and the community at-large will implement the plan by:

- Publishing the City Council-adopted Plan [December 2020]
- Implementing recommendations outlined in the Plan [2021-2026]
- Annually reviewing work toward implementing recommendations [2021-2026]
- Updating the Plan five years after adoption [2026]
- Key Documents from this phase: Annual Reports

Appendix C

Nodes

Nodes are places in Richmond where people and jobs are today and continue to grow into the future. Nodes are the places of convergence of many uses and include offices, shopping, housing, and/or public gathering places as well as access to multiple modes of transportation.

Nodes are important places in Richmond and deserve special attention in the Master Plan to ensure that land use planning, transportation planning, and public policy align to make thriving crossroads in Richmond's communities. The Nodes are places in Richmond that can either 1) accommodate additional growth in jobs and population or 2) are major activity centers today and should be preserved/enhanced. The Nodes Map, as shown in Figure 10, depicts the location and scale of each Node:

Regional/National Node: A center with significant cultural, entertainment, government, and business destinations as well as shopping, housing, and unique place-based attractions.

Neighborhood Node: A local crossroads typically within or next to larger residential areas that offers goods and services to nearby residents, employees, and visitors.

Micro Node: A notable place within a neighborhood that generally provides goods and services to the immediate residents but may attract visitors.

The Nodes map also highlights the Priority Growth Nodes where the City is encouraging the most significant growth in population and development over the next 20 years. This section of the Plan includes descriptions for the Nodes designated as primary growth areas.

Chapter 1 of the Plan includes descriptions for the Nodes designated as Primary Growth Nodes. Descriptions for all the Regional/National Nodes and the Neighborhood Nodes are found in this Appendix. Micro Nodes are not described in detail in the Plan, but are called out on the Node Map because the Micro Nodes provide mixed-use destinations within primarily residential areas and help create a unique sense of place within many of Richmond's historic urban neighborhoods. Micro Nodes are a model for future development as new neighborhoods emerge.

PRIORITY GROWTH NODES

See Chapter 1 for descriptions of the Priority Growth Nodes and Chapter 7 for implementation steps related to these Nodes

Downtown. As the regional center of employment, the Capital of the Commonwealth of Virginia, and the home to a major state university and hospital system, the Downtown Area contains five sub-Nodes:

- Downtown Core
- Jackson Ward
- Monroe Ward
- Shockoe
- Manchester

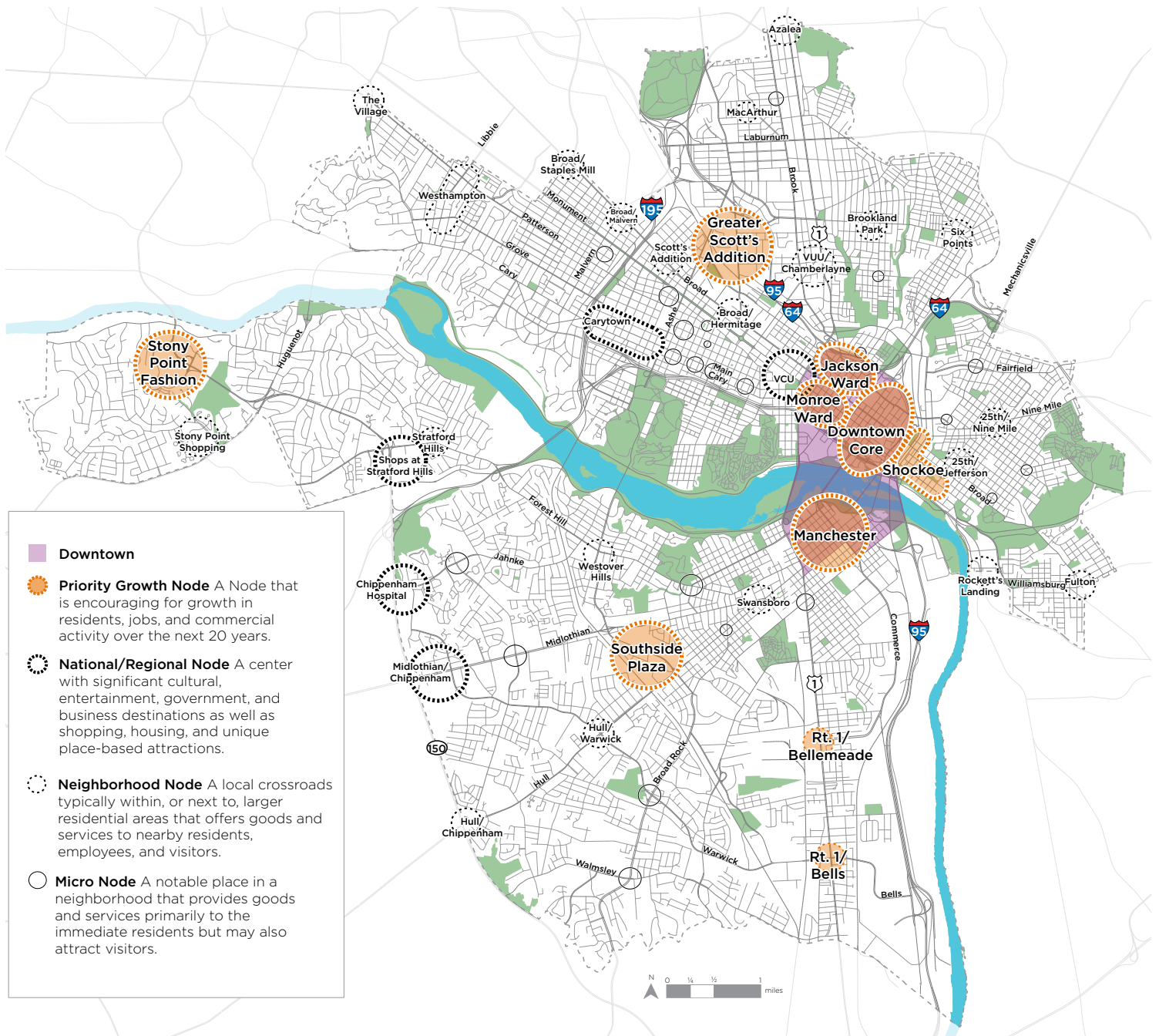
Greater Scott's Addition

Route 1/Bellemeade Rd

Route 1/Bells Rd

Southside Plaza

Stony Point Fashion Park



Nodes Map

Nodes are places in Richmond that can either 1) accommodate additional growth in jobs and population or 2) where major activity existing today and should be preserved/enhanced.

South Richmond — Western Nodes

Stony Point Shopping

Type: Neighborhood Node

Vision: The Stony Point Shopping Node currently consists of a suburban shopping center, a suburban office park, both multi- and single-family dwellings, and a park. In the future, this Node can function as the walkable, village center for the Bon Air and Huguenot neighborhoods in Richmond and Chesterfield County by continuing to support a mix of uses in a more pedestrian-friendly and transit-ready environment. This mixed-use Node will continue to be a neighborhood shopping destination with a unique mix of restaurants, retail, neighborhood services, and entertainment options. New development or the redevelopment of the existing suburban commercial and office development would be enhanced by encouraging a more urban form with buildings that are closer to the street and parking located in the rear in shared lots, and the inclusion of some residential units. The inclusion of green space and unique landscaping incorporated into developments will continue to be a character defining feature of this Node. Pedestrian and bicycle connections throughout the Node, across Huguenot Road, and to Larus Park should be improved. Transit service should continue to be improved to provide access to more destinations and improved bus stop amenities.

Growth Potential: Medium – The surface parking lots and underdeveloped strip commercial can be redeveloped to provide a mix of uses including residential.

Primary Next Steps

- Rezone the Corridor Mixed-Use and Neighborhood Mixed-Use areas of this Node in alignment with the Future Land Use Plan to allow for a mix of uses and increased residential density by-right. (see Goal 1 and Goal 14)
- Implement design standards to create a high-quality and well-designed neighborhood Node with extensive green space incorporated in developments and explore the creation of signature public art in a central gathering space. (see Goal 4 and Goal 17)
- Improve pedestrian and bike infrastructure to/from this Node – specifically improving connections to Larus Park, the James River, and Stony Point Fashion Park, in coordination with Chesterfield County, across and along Huguenot Road. (see Goal 4 and Goal 8)
- Expand transit service to this Node and improve bus stop amenities. (Goal 8)

Shops at Stratford Hills

Type: Regional Node

Vision: The Shops at Stratford Hills Node consists of two large commercial shopping centers which are dominated by big box retailers and parking and strip commercial along Forest Hill Avenue. While residents value the presence of large anchor establishments, in the future, this Node can be the walkable, mixed-use neighborhood center for Stratford Hills by incorporating a diverse mix of uses including unique shopping, service, and entertainment establishments and residential units. The existing suburban-style development patterns focus around large parking lots that in the future could be redeveloped into a more urban, gridded pattern with buildings that address the street. In addition to improved connections within the Node, Forest Hill Avenue needs to be improved to reduce vehicle and pedestrian conflicts and improve pedestrian, bicycle, and transit access to the Node. New development should have a cohesive plan, high quality design and include street trees and other open space. Any new development in the areas to the south and east of the Node which are designated Neighborhood Mixed-Use should complement the design of the Node and be connected by both streets and sidewalks.

Growth Potential: Medium – The surface parking lots and underdeveloped strip commercial can be redeveloped to provide a mix of uses including residential.

Primary Next Steps

- Rezone this Node in alignment with the Future Land Use Plan to allow for a mix of uses and increased residential density by-right. (see Goal 1 and Goal 14)
- Implement design standards to create a high-quality and well-designed regional Node with green space and street trees incorporated in developments and explore the creation of signature public art in a central gathering space. (see Goal 4 and Goal 17)
- Incorporate a gridded street network as a part of the cohesive redevelopment of this Node. (See Goal 9)
- Improve pedestrian and bike infrastructure to/from this Node – specifically improving connections into the residential neighborhoods and along Forest Hill Avenue.(see Goal 4 and Goal 8)
- Implement high-frequency transit along Forest Hill Avenue (see Goal 8)

Stratford Hills

Type: Neighborhood Node

Vision: Currently, the Stratford Hills Node consists of two strip commercial centers on the north and south sides of Forest Hill Avenue, strip commercial along Forest Hill Avenue, multi-family dwellings including a 13-story condominium tower, and parking lots adjacent to wooded residential neighborhoods. Additionally, this Node is situated near entrances to the James River Park System; and in the future, the connections to the Park should be improved. In 2037, the parking lots and dated commercial structures can be redeveloped into a walkable mixed-use community center that continues to include unique local restaurants, retail, and neighborhood services catering to the surrounding neighborhood and to differentiate this Node while also incorporating multi-family residential units. Additional auto-related uses on the Forest Hill corridor should be discouraged. Future development should encourage high-quality design and an urban form with medium-scale buildings that are located closer to the street with parking located in the rear in shared lots. There is the potential for additional larger multi-family and mixed-use development to complement the Hathaway Towers. Enhancements are needed to improve the safety of pedestrians and bicyclist along Forest Hill Avenue and access to the Node from the surrounding neighborhoods. The existing transit should be supported and enhanced with more frequent routes and improved access to and amenities at the transit stops.

Growth Potential: Medium – The surface parking lots and underdeveloped strip commercial can be redeveloped to provide a mix of uses including residential.

Primary Next Steps

- Rezone this Node in alignment with the Future Land Use Plan to allow for a mix of uses and increased residential density by-right and discourages auto-related uses and suburban strip commercial development form. (see Goal 1 and Goal 14)
- Implement design standards to create a high-quality and well-designed neighborhood Node that includes creative solutions for transitions between varying intensities of building types and land uses. (see Goal 4)
- Improve pedestrian and bike infrastructure to/from this Node – specifically improving connections into the residential neighborhoods, along Forest Hill Avenue, and to the James River.(see Goal 4 and Goal 8)
- Implement high-frequency transit along Forest Hill Avenue and connect riders to the bus stops along Forest Hill by providing increased pedestrian connections from the residential neighborhoods (see Goal 8)



Stratford Hills Conceptual Site Plan

South Richmond — Central Nodes

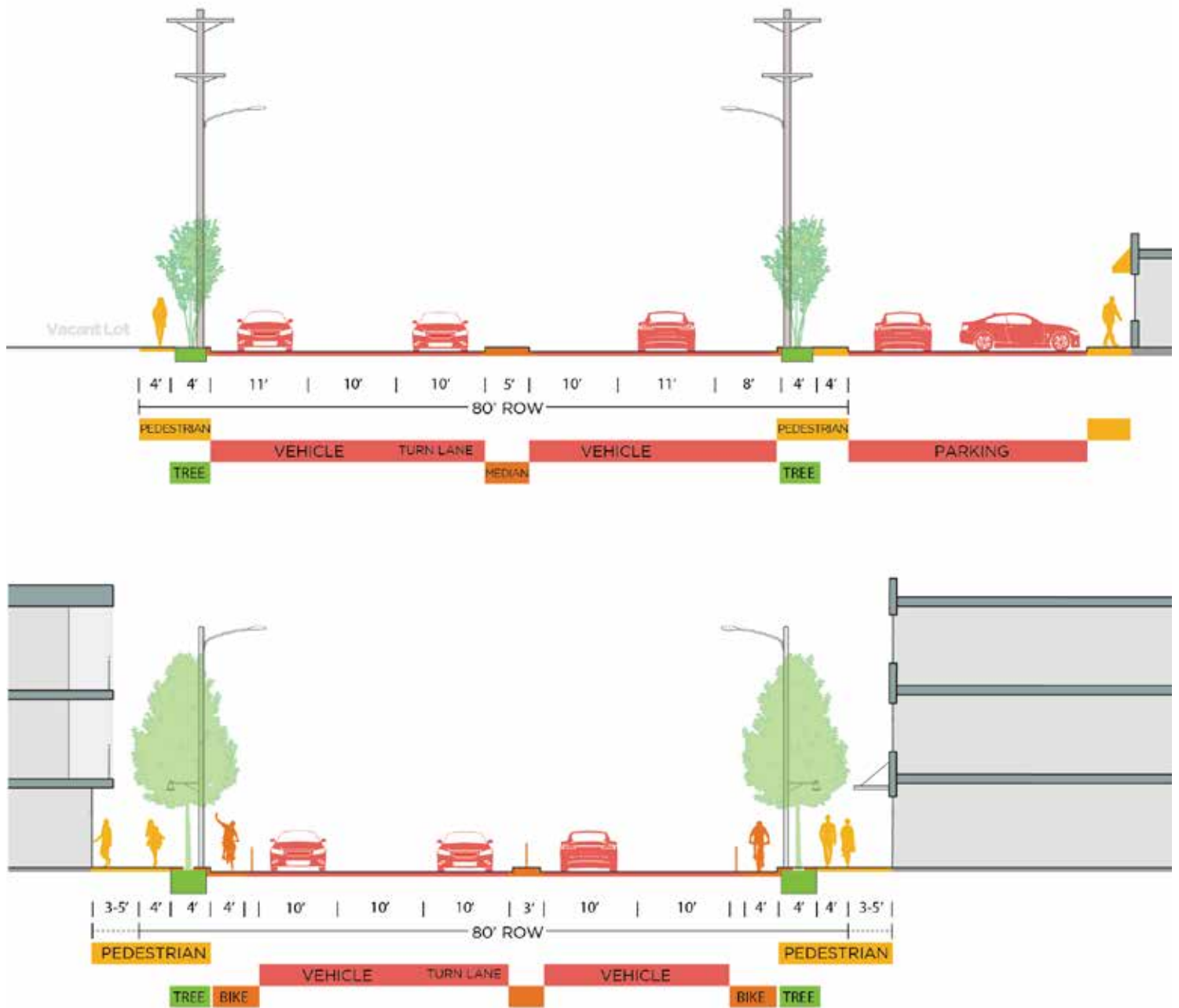
Westover Hills

Type: Neighborhood Node

Vision: Westover Hills has a village-like quality with small retail, services, and restaurant offerings that serve primarily the surrounding neighborhoods, but does attract outside visitors. Over the next twenty years, the Westover Hills Node could be enhanced by 1) discouraging suburban development pattern (where buildings are pushed back with parking in front of them) and encouraging urban form with buildings that are closer to the street and parking located in the rear in shared lots, and 2) utilizing a Complete Streets approach to street design to ensure pedestrians, bicyclists, and transit users are adequately and safely accommodated



Westover Hills Conceptual Site Plan



Westover Hills Potential Street Section Transformation

By bringing buildings just up to the sidewalk, leaving 3 to 5 feet for extra sidewalk space and/or outdoor seating, [as shown in the bottom section], the Forest Hill street section can transform from feeling like a suburban-strip commercial intersection [top] to an urban village intersection [bottom].

in the public right-of-way. Additionally, the four corners of the Westover Hills/Forest Hill intersection can be improved by bring buildings to the corner and introducing landmark public art.

Growth Potential: Low - while this is an important neighborhood Node in this area of the city and there are parcels that could be redeveloped and improve the walkability and placemaking of this Node, the overall growth potential, as compared to other Nodes city-wide, is low.

Primary Next Steps

- Rezone the area to allow for residential uses by-right in the mixed-use area (see Goal 1 and Goal 14)
- Implement design standards to create a high-quality and well-designed neighborhood Node and explore the creation of signature public art (see Goal 4 and Goal 17)
- Improve pedestrian, bike, and transit infrastructure to/from this Node (see Goal 4 and Goal 8)
- Implement high-frequency transit along Forest Hill Avenue and Westover Hills Boulevard (see Goal 8)

Chippenham Hospital

Type: National/Regional Node

Vision: The Chippenham Hospital Node is currently a job center anchored by HCA Healthcare Chippenham Hospital. Additionally, there are many different housing options provided in the area including new and older single-family homes, townhomes, and low-scale multi-family residential communities. This Node will continue to provide high quality jobs associated with the hospital and medical office-related uses. Additionally, the older multi-family residential communities can be redeveloped into higher density, mixed-use neighborhoods. The redesign of these communities should emphasize walkable, well-connected communities with well-designed buildings, a street grid, sidewalks, and street trees. New commercial uses incorporated into the mixed-use communities and along Jahnke Road should serve both the residential population and hospital employees and visitors. As this Node is located partially in Chesterfield County, connections to the County especially the adjacent Boulder's Office Park should be improved. Additionally, connections into Powwhite Park should be improved to increase accessibility to the park from the adjacent residential neighborhoods.

Growth Potential: Medium – The older low-density, multi-family developments can be redeveloped with a mix of uses, higher residential densities and a mix of housing types.

Primary Next Steps

- Rezone the Destination Mixed-Use and Neighborhood Mixed-Use areas of this Node in alignment with the Future Land Use Plan to allow for a mix of uses and increased residential density by-right. (see Goal 1 and Goal 14)
- Rezone the Institutional areas of this Node in alignment with the Future Land Use Plan to require a master plan to be reviewed by Planning Commission for changes to the HCA Healthcare Chippenham Hospital campus. (Goal 13)
- Improve pedestrian and bike infrastructure to/from this Node – specifically improving connections into the residential neighborhoods, along Jahnke Road and Hioaks Road, and to Powwhite Park. (see Goal 4 and Goal 8)
- Connect Powwhite Park to other City and regional parks through a system of greenways. (Goal 8 and Goal 17)
- Improve connections into Chesterfield County by extending Carnation Street under Chippenham Parkway to connect to Boulder's Parkway in Chesterfield County. (see Goal 9)

Midlothian/Chippenham

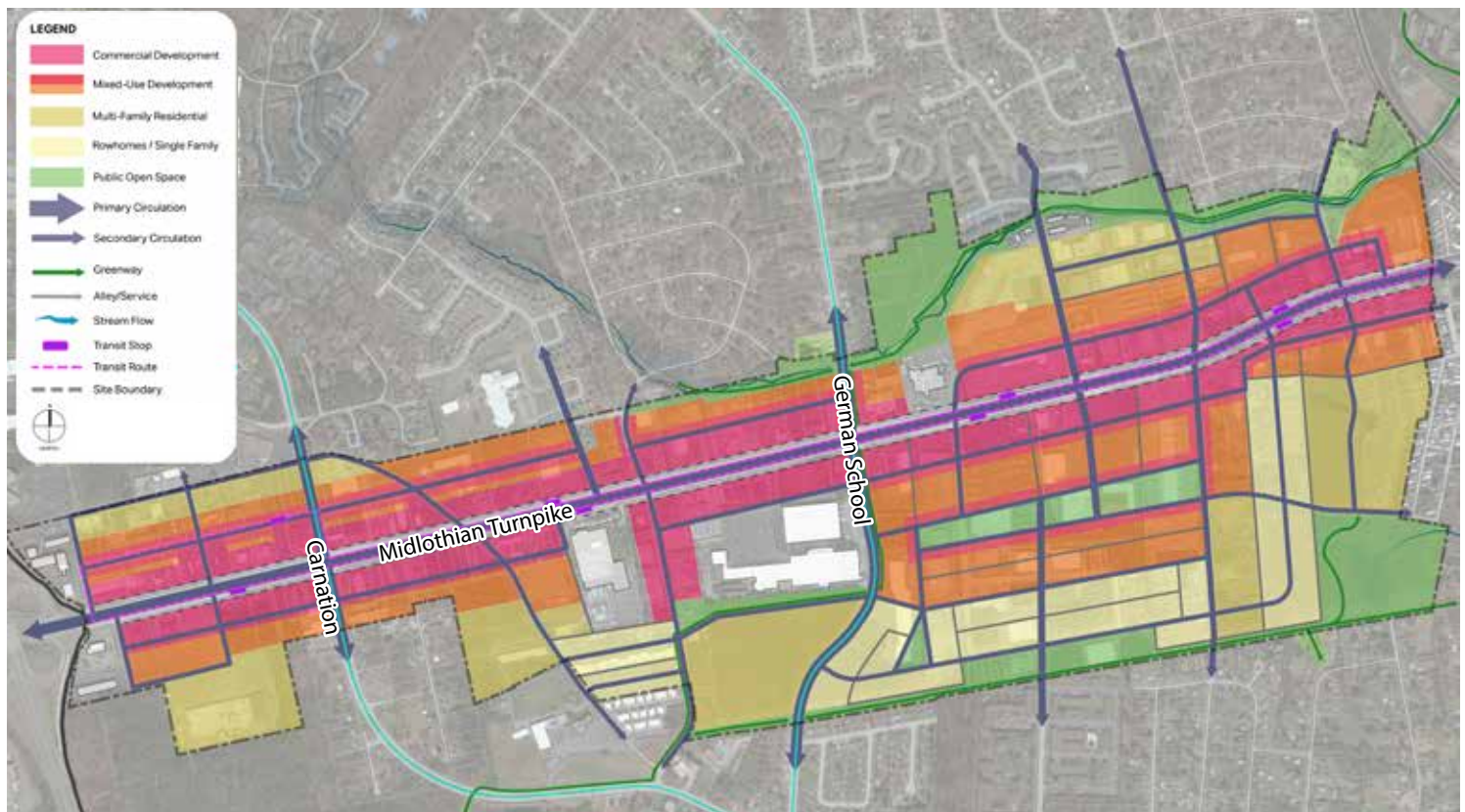
Type: National/Regional Node

Vision: The Node at Midlothian Turnpike and Chippenham Parkway serves as a gateway into the city of Richmond from Chesterfield County. Currently, this Node is developed with strip commercial, hotels, and a large off-track betting facility with a large surface parking lot. In 2037, this Node could become a walkable, village center that connects to the Stonebridge development in Chesterfield County and has its own unique identity as an attractive gateway into the city. The existing parking lots and undeveloped land at the southern edge can be redeveloped into a mixed-use community that includes a mix of housing types at varying affordability levels and community serving commercial uses. The scale of development should complement the surrounding neighborhoods and could include taller, signature buildings that serve to distinguish this Node. The development pattern should create a walkable environment by introducing a street grid to break up the larger parcels along Midlothian Turnpike and encouraging urban form with buildings that are closer to the street and parking located in the rear in shared lots. Enhancements are needed to improve the safety of pedestrians and bicyclist along Midlothian Turnpike at the intersection with Chippenham Parkway. Additional access into the Node from the county should be created by creating new streets.

Growth Potential: High – The existing parking lots and undeveloped land at the southern edge can be redeveloped into a mixed-use community that includes a mix of housing types at varying affordability levels and community serving commercial uses.

Primary Next Steps

- Rezone this Node in alignment with the Future Land Use Plan to allow for a mix of uses and increased residential density by-right and discourages auto-related uses and suburban strip commercial development form (see Goal 1 and Goal 14)



Midlothian Conceptual Plan

- Create an identity to differentiate this Node through branding and creative placemaking (see Goals 1 and 4)
- Incorporate a gridded street network as a part of the cohesive redevelopment of this Node (see Goal 9)
- Improve pedestrian and bike infrastructure to/from this Node – specifically improving connections along Midlothian Turnpike into Chesterfield County and to the Southside Community Center (see Goal 4 and Goal 8)
- Improve connections into Chesterfield County by creating new streets under Chippenham Parkway to the Stonebridge development in Chesterfield County (see Goal 9)
- Implement high-frequency transit along Midlothian Turnpike (see Goal 8)

Swansboro

Type: Neighborhood Node

Vision: Centered at a truly unique intersection of Midlothian Turnpike, Hull Street, and Clopton Street; the Swansboro Node contains a mix of historic commercial storefronts, warehouses, and suburban form commercial buildings surrounded by diverse residential neighborhoods. In the future, the empty historic storefronts will be rehabilitated and filled with neighborhood-serving businesses. On the vacant parcels, 2-to-3 story, mixed-use, infill development should occur in a building form similar to the historic structures that maintains the existing streetwall. The character of the surrounding residential neighborhoods should be preserved with investments targeted to programs that allow homeowners to remain in their homes in high-quality structures and traffic calming measures to slow vehicles on the residential streets. Open space opportunities should be considered, even in the form of smaller pocket parks or plazas, where the opportunity presents themselves, such as at the triangle formed by Hull Street and Midlothian Turnpike. Investments should be made to improve the pedestrian experience by planting street trees and expanding sidewalks.

Growth Potential: Medium - The vacant lots and underdeveloped strip commercial can be redeveloped to provide a mix of uses including residential units.

Primary Next Steps

- Prioritize the rezoning of the B-3 zoned parcels along Hull Street in alignment with the Future Land Use Plan to encourage the economic revitalization of the corridor in a building form that improves the pedestrian environment (Goal 1 and Goal 11).
- Encourage the redevelopment of vacant structures while preserving the historic urban fabric (Goal 1, Goal 3).
- Explore designation as a National Register Historic District (Goal 3).
- Use the interesting grids and angles to create dynamic architecture (Goal 4).
- Improve pedestrian, bike, and transit infrastructure to/from this Node – specifically including streetscape improvements of street trees, wider sidewalks, and pedestrian amenities along the corridors and providing high frequency transit along Midlothian Turnpike and Hull Street (see Goal 4, Goal 8, and Goal 17).
- Explore the creative opportunities for developing open space for a neighborhood gathering location including the development of a pocket park or parklets (see Goal 4 and Goal 17).
- Implement high-frequency transit along Midlothian Turnpike and Hull Street (see Goal 8).



Swansboro Conceptual Plan

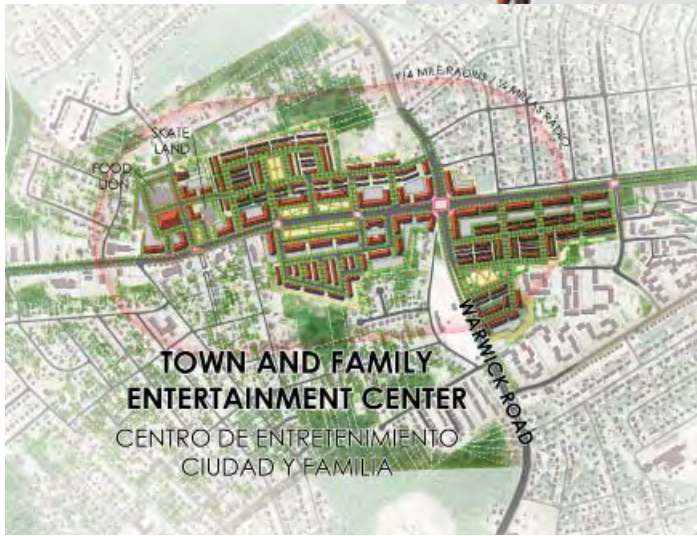
South Richmond – Eastern Nodes

Hull/Warwick

Type: Neighborhood Node

Vision: The Node at Hull Street and Warwick Road is currently developed with small, single-use commercial structures and strip commercial centers supporting drugstores, small markets and auto-related businesses. The surrounding residential neighborhoods are composed of a mix of housing stock including single-family homes, a large apartment complex, and a manufactured home park. In the future, this Node can serve as a strong entrance into the city and function as a town and family entertainment center with mixed-use developments to include residential units and neighborhood serving commercial uses. Future development should encourage high-quality design and an urban form with medium-scale buildings that are located closer to the street with parking located in the rear in shared lots. The intersection of Hull Street and Warwick Road should be anchored on each corner by mixed-use buildings that are designed to enhance the “nodal” feeling of the area. Housing options at varying affordability levels should be provided throughout the Node by supporting and improving the existing housing stock and encouraging the construction of new housing units. Creative open space opportunities should be considered including in the form of smaller pocket parks or plazas. Pedestrian safety improvements including adequate sidewalks and lighting should be prioritized to improve the pedestrian experience.

Growth Potential: Medium – There is large parcel in the southeast quadrant of the Warwick intersection that is almost entirely forested that can be developed as a significant mixed-use development to define the corner.



Conceptual Images for Town and Family Entertainment Center at Hull and Warwick

Source: Hull Street Corridor Revitalization Plan, January 2013

Additionally, many parcels are currently underdeveloped with significant surface parking lots which can be redeveloped.

Primary Next Steps

- Prioritize the rezoning of the B-3 and OS zoned parcels along Hull Street in alignment with the Future Land Use Plan to encourage the economic revitalization of the corridor in a building form that improves the pedestrian environment. (Goal 1 and Goal 11)
- Support existing residents by developing programs that allow homeowners to remain in their homes in high-quality structures and improving the quality of housing in the existing manufactured home parks (Goal 14)
- Improve pedestrian, bike, and transit infrastructure to/from this Node – specifically including streetscape improvements of street trees, wider sidewalks, and lighting along the corridors and providing high frequency transit along Hull Street. (see Goal 4, Goal 8, and Goal 17)
- Explore the creative opportunities for developing open space for a neighborhood gathering location including the development of a pocket park or a village green along Hull Street (see Goal 4 and Goal 17)

Hull/Chippenham

Type: Neighborhood Node

Vision: At the edge of the city, the Node at Hull Street and Chippenham Parkway is developed with a large strip commercial center, smaller commercial buildings on Hull Street, low-density multi-family apartment complexes, the new Cardinal Middle School, and surrounding single-family neighborhoods. This Node will attract both city and county residents by providing neighborhood serving commercial and housing at varying affordability levels in a more urban form. New development should include the redevelopment of the parking lots along both sides of Hull Street with medium-scale buildings built closer to the street and parking located in the rear in shared lots. Additionally, the low-density multi-family residential communities can be redeveloped into higher-density, mixed-use neighborhoods. The redesign of these communities should emphasize creating walkable, well-connected communities with well-designed buildings, a street grid, sidewalks, and street trees. Improving pedestrian safety should be prioritized especially connections to the new school. The creation of new open space and improved connections to Pocosham Park should be explored to provide additional access to open space for residents of this community.

Growth Potential: Medium – There is development opportunity at Chippenham Mall Shopping Center, either in the form of redevelopment, or existing large parking lots. The existing multi-family may be redeveloped a mix of housing types at varying affordability levels and community-serving commercial uses. Many parcels in the area are environmentally constrained due to the presence of Pocosham Creek.

Primary Next Steps

- Prioritize the rezoning of the B-2 and B-3 zoned parcels along Hull Street in alignment with the Future Land Use Plan to encourage the economic revitalization of the corridor and the inclusion of residential units in a building form that improves the pedestrian environment. (Goal 1, Goal 11, and Goal 14)
- Improve pedestrian, bike, and transit infrastructure to/from this Node – specifically including streetscape improvements of street trees, wider sidewalks, and lighting along the corridors and providing high frequency transit along Hull Street. (see Goal 4, Goal 8, and Goal 17)
- Incorporate a gridded street network as a part of the cohesive redevelopment of this Node (see Goal 9)
- Improve connections to Pocosham Park through the implementation of the Pocosham Greenway (Goal 8 and Goal 17)

West End Nodes

The Village

Type: Neighborhood Node

Vision: The Village is currently a suburban strip commercial district with many retail and office destinations; however in the future, to support a more walkable, bikeable, and transit-ready environment, new developments at the Village adopt a traditional “village center” feel with buildings at least 2-to-3 stories tall, located closer to the street and with parking lots behind the buildings, and pedestrian and bike infrastructure. New development should consider the addition of some residential units. The Community Mixed-Use future land use designation at The Village allows for medium-scale mixed-use development, which is in harmony with the surrounding residential neighborhoods and supports high-frequency transit.

Growth Potential: Low – since most of the land at this Node is in Henrico County, there is not much development opportunity within the City

Primary Next Steps

Since the majority of The Village is in Henrico County, all planning should occur in close collaboration with Henrico:

- Rezone The Village to allow for residential uses and increase height maximums (current B-2 prohibits buildings taller than 35 feet) (see Goal 1 and Goal 14)
- Implement design standards to create a high-quality and well-designed neighborhood Node and explore the creation of signature public art at this gateway (see Goal 4)
- Improve pedestrian and bike infrastructure through The Village and specifically from The Village to Bandy Park (see Goal 4, Goal 8, and Goal 17)
- Implement high-frequency transit along Patterson Avenue with a transit stop at Patterson Avenue and Three Chopt Road (see Goal 8)

Broad/Staples Mill

Type: Neighborhood Node

Vision: The area around the intersection of W. Broad Street and Staples Mill Road capitalizes on its proximity to Willow Lawn, Scott's Addition, Libbie Mill, and the Pulse BRT Staples Mill Station to redevelop underdeveloped parcels into a walkable Node with new, denser, mixed-use buildings, and streetscape improvements along Broad transform Broad Street into a truly Great Street. The Destination Mixed-Use future land use designation at intersection of Broad and Staples Mill encourages the development of landmark buildings that identify this area as a major gateway into the city. The Corridor Mixed-Use future land use designations encourages the development of buildings that address the street and support a walkable environment along Broad Street.

Growth Potential: Medium – There are several large parcels with surface parking lots and low-slung buildings that could be redeveloped to capitalize on the proximity to high-frequency transit by providing employment and housing.

Primary Next Steps

Since a portion of this area is in Henrico County, all of the next steps should occur in close collaboration with Henrico:

- Rezone the area to allow for residential uses and increase height maximums (current B-3 promotes single-use suburban strip commercial development, not transit-oriented development) (see Goal 1 and Goal 14)
- Implement design standards to create a high-quality and well-designed neighborhood Node and explore the creation of signature public art and/or open space at this gateway (see Goal 4 and Goal 17)
- Improve pedestrian and bike infrastructure to/from the Pulse BRT Staples Mill Station (see Goal 4 and Goal 8)
- Improve W. Broad Street to transform it into a Great Street by creating a bus-only lane, widening sidewalks, burying power lines, enhanced landscape, and requiring buildings to address the street (see Goal 1, Goal 4, and Goal 9)

Westhampton

Type: Neighborhood Node

Vision: The Node that stretches from Libbie and Grove to Libbie and Patterson provides retail and services to nearby residents and attracts visitors from across the region to its businesses. Over time, a few underdeveloped parcels redevelop in a manner that complements and enhances the existing village-scale

feel of the area. The Community Mixed-Use future land use designation permits the creation of additional residential units and business, while also ensuring that new buildings are an appropriate scale the existing commercial buildings and promote walkability by placing vehicular access to the rear of the building. The intersection of Libbie and Patterson should be carefully planned and redeveloped to support and increase access to the high-frequency transit planned for Patterson Avenue.

Growth Potential: Low – While this is an important neighborhood Node in this area of the city, aside from the redevelopment of a handful parcels, this Node will not significantly change over the next 20 years

Primary Next Steps

- Rezone the area to allow for residential uses by-right in the Community Mixed-use area and retain a maximum height of three stories (see Goal 1 and Goal 14).
- Implement design standards to create a high-quality and well-designed neighborhood Node that is consistent with the village-feel of the area, and explore the creation of signature public art (see Goal 4 and Goal 17).
- Improve pedestrian and bike infrastructure to/from this Node (see Goal 4 and Goal 8).
- Implement high-frequency transit along Patterson Avenue with a transit stop at Patterson Avenue and Libbie (see Goal 8).

Broad/Malvern

Type: Neighborhood Node

Vision: This Node is no longer a “dead spot” between Scott’s Addition and Willow Lawn; but rather a place with multi-family residential options mixed with retail and offices. New development supports walkable, bikeable, and transit-ready environment to support a new Pulse BRT Station at Malvern and Broad.

Growth Potential: Medium – There are several large parcels with surface parking lots and buildings that could be redeveloped to capitalize on the proximity to high-frequency transit by providing employment and housing.

Primary Next Steps

- Rezone the area to allow for residential uses by-right in the Corridor Mixed-Use area (see Goal 1 and Goal 14).
- Engage with GRTC to discuss the next steps to develop an infill station at Broad and Malvern (Goal 8).

Near West End Nodes

Carytown

Type: Regional/National Node

Vision: The Carytown Node is a lively mixed-use neighborhood that is home to Richmond’s premier shopping destination. The establishments in Carytown include an eclectic mix of local and national retail, dining, entertainment, and service uses anchored by the historic Byrd Theater to the east and multiple grocery stores to the west. The retail corridor is surrounded by diverse residential neighborhoods which include a variety housing stock. In 2037, Carytown will continue to be a successful, walkable, mixed-use destination. Additional residential units at a range of affordability levels can be developed through compatible infill development and developing 2 to 3 stories of residential above existing commercial structures. New development should be compatible with the existing historic structures, and efforts should be made to preserve the existing

historic fabric. Though Carytown currently is a walkable Node, the movement of people not cars should be further prioritized by limiting vehicular access to Cary Street, whether permanently or temporarily, while accommodating other modes of transportation. Pedestrian amenities including street trees and larger sidewalks should be included on Cary Street and into the surrounding residential communities. Opportunities to create new open space and improve existing spaces including the Grayland Tot Lot should be realized.

Growth Potential: Medium – New development is limited to existing parking lots and the redeveloping single- and two-story structures into taller structures.

Primary Next Steps

- Rezone the area to allow for residential uses and increase height maximums (current B-3 promotes single-use suburban strip commercial development, not transit-oriented development, and UB prohibits buildings taller than 28 feet) (Goal 1 and Goal 14).
- Explore the opportunity for permanent or temporary street closure of Cary Street in Carytown to limit use to bicycle, pedestrian, transit, and retail use (Goal 8).
- Implement design standards to create a high-quality and well-designed neighborhood Node while preserving the existing historic fabric and explore the creation of signature public art (Goal 3, Goal 4).
- Improve pedestrian, bike, and transit infrastructure to/from this Node – specifically including streetscape improvements of street trees, wider sidewalks, and lighting into the surrounding neighborhoods including into Carytown South and City Stadium neighborhoods and across I-195 and providing high frequency transit along Cary Street and Ellwood Avenue (Goal 4, Goal 8, and Goal 17).
- Explore the creative opportunities for developing open space for a neighborhood gathering location including the development of a pocket park or parklets (Goal 4 and Goal 17).
- Implement the recommendations of the Parking Study (Goal 9)
- Consider creating a Business Improvement District for Carytown (Goal 11)

Scott's Addition

Type: Regional/National Node

Vision: Scott's Addition continues its evolution as a mixed-use neighborhood by adding more residential, office, entertainment, and "maker" uses. The area adds neighborhood amenities, such as a park or parklets, sidewalks, street trees, and other features that enhance the public realm. Scott's Addition is better connected to the West and North by new bridges and is served by high-frequency transit. W. Broad Street and Arthur Ashe Boulevard transform into a pair of high-quality urban avenues that are safe to cross, while becoming a destination in their own right for residential, office, retail and compatible entertainment uses.

Growth Potential: Medium/High — There are still several surface parking lots and buildings that could be redeveloped

Primary Next Steps

- Explore incentives and programs to encourage private developers to create more publicly-accessible greenspace on their properties (Goal 4).
- Improve pedestrian, bike, and transit infrastructure to/from this Node — specifically including a greenway around the perimeter of Scott's Addition and streetscape improvements of street trees, wider sidewalks, and lighting (Goal 4, Goal 8, and Goal 17).
- Provide high-frequency transit along Arthur Ashe Boulevard and into Scott's Addition (Goal 8).
- Implement the recommendations to improve circulation within Scott's Addition found in the Scott's Addition Circulation Study (Goal 9).

- Build a pedestrian bridge from Mactavish to Rosedale and a car/bike/transit/pedestrian bridge from Norfolk to Hamilton (Goal 9).
- Implement the recommendations of the Parking Study (Goal 9).
- Consider creating a Business Improvement District for Scott's Addition (Goal 11).
- Develop a pocket park at Cutshaw and a larger park within Scott's Addition (Goal 17).

Broad/Hermitage

Type: Regional/National Node

Vision: Building off its excellent access to high-frequency transit with the Pulse Rapid Transit Allison Station, the Broad/Hermitage is known as the Alison District, a dense, compact, transit-oriented mixed-use development anchored by a reconnected street grid. Major redevelopment around the Allison Station breaks up superblocks by introducing a street grid, developing a series of parks connected by greenways, and creating a walkable environment with high-density, mixed-use buildings on the north side of W. Broad Street; medium-density, mixed-use buildings infill the south side of W. Broad Street.

As redevelopment proceeds, an infill Pulse station at Lombardy Street facilitates transit connections and access to jobs, daily shopping, and homes at the Lombardy Street and W. Broad Street intersection. Redevelopment occurs on sites with auto-oriented uses and deep setbacks that currently disrupt the historic pattern of the street-oriented commercial corridor. Historic building stock is preserved and adapted for reuse. New development provides adequate buffers to residential neighborhoods. W. Broad Street transforms into a high-quality Great Street that is safe to cross, while becoming a destination in its own right for residential, office, retail and compatible entertainment uses.



Broad/Hermitage Conceptual Aerial

A greenway and series of parks add public green space to the Broad/Hermitage area

Growth Potential: Medium/High — There are still several surface parking lots and buildings that could be redeveloped.

Primary Next Steps

- Rezone the Broad/Hermitage area to align with the Future Land Use Map. (Goal 1)
- Work with Sauer Properties to develop an urban form master plan. Take advantage of the large concentration of single-owner redevelopment properties north of W. Broad Street and work together towards a high-density, urban form. (Goal 1, Goal 4)
- Introduce a street grid north of W. Broad Street using Complete Streets guidelines. Continue Clay Street from DMV Drive to Lombardy Street, Marshall Street from DMV Drive to Bowe Street, Meadow Street from Clay Street to Leigh Street, and Allison Street to Clay Street as redevelopment occurs. (Goal 9)
- Improve north-south crossings of A. Broad Street for pedestrians and cyclists in the general vicinity of Hermitage and Lombardy Streets and explore the creation of an east-west bike route between Belvidere Street and Boulevard. (Goal 8)
- Prioritize the segment of W. Broad Street from Lombardy Street to Boulevard for streetscape improvements to transform W. Broad Street a Great Street. (Goal 9)
- Build a landscaped bridge from W. Leigh Street to the Diamond Site and eliminate the at-grade crossing at Hermitage and the railroad tracks in order to increase safety and accommodate the DC to Richmond Southeast High Speed Rail. (Goal 9)
- Work with the Commonwealth to retain state employees and improve existing development, including looking at opportunities for repurposing large amounts of surface parking at the DMV Headquarters and the fleet facility on W. Leigh. (Goal 1, Goal 11)

VCU/Monroe Park

Type: Regional/National Node

Vision: VCU/Monroe Park continues to provide shopping, dining, and housing for students and neighborhood residents alike. VCU is a major job center and nexus of activity with services and cultural attractions for the region. The intersection of Belvidere and W. Broad Streets becomes a signature intersection with new development complementing the VCU Institute for Contemporary Art with prominent architecture. A new high-frequency transit line runs down Belvidere with a stop at Belvidere and W. Broad Street. VCU's campus evolves as VCU continues to modernize its buildings. W. Broad Street and Belvidere transform into a high quality urban avenues that are safe to cross, while becoming destinations in their own right for residential, office, retail and compatible entertainment uses.

Growth Potential: Low — While there are some opportunities for VCU to redevelop its buildings and land; there are not many.

Primary Next Steps

- Continue to improve pedestrian, bike, and transit infrastructure to/from this Node – specifically connecting to the Monroe Park campus east across Belvidere to Monroe Ward (Goal 4, Goal 8, and Goal 17)
- Provide high-frequency transit along down Route 1 with a major stop at Broad and Belvidere (Goal 8)
- Continue to reinforce the gridded street network by reducing superblocks and maintaining connectivity (Goal 9)
- Explore a PILOT program for large non-profit institutions in the city (Goal 13)



A portion of VCU's Master Plan showing the Monroe Park Campus
source: One VCU Master Plan

North Richmond Nodes

Azalea

Type: Neighborhood Node

Vision: The Azalea Node is located on the border with Henrico County and is centered at the intersection of Azalea and Chamberlayne Avenues. Today the area consists of auto-oriented businesses such as gas stations, banks, and fast food restaurants, surrounded by residential neighborhoods to the south. In the future, the area can be transformed into a mixed-use area with a more urban form and a higher image quality as a major gateway into the city of Richmond. While there is not a lot of vacant land, the presence of auto-oriented businesses with large parking lots provides the opportunity for ample redevelopment. New development should be between 2 and 5 stories in height and have buildings that face the street with parking in the rear. Improved streetscapes with wider sidewalks and more trees will enhance the look and feel of the area, and improved transit, bicycle, and pedestrian access will make the area safer and more accessible to all.

Growth Potential: Medium – Many of the existing businesses uses sit on large parcels with more space devoted to parking than to buildings. Redevelopment of these structures provide an excellent opportunity to add more commercial and residential uses while overhauling the character of this Node.

Primary Next Steps

- Rezone the Corridor Mixed-Use areas of this Node along Azalea Avenue, which is currently zoned “B-2 Community Business District”, in alignment with the Future Land Use Plan to allow for a mix of uses and increased residential density by-right (see Goal 1 and Goal 14).
- Implement high-frequency transit along Brook Road and Chamberlayne Avenue (see Goal 8).



Potential Transformation of MacArthur

A new building could potentially fill in across the street from the existing stores and restaurants across the street.

- Improve pedestrian and bike infrastructure to/from this Node – specifically improving the streetscapes of Azalea Avenue, Brook Road, and Chamberlayne Avenue (see Goal 4 and Goal 8).
- Implement design standards to create a high-quality and well-designed neighborhood Node and explore the creation of signature public art (see Goal 4 and Goal 17).

MacArthur

Type: Neighborhood Node

Vision: The MacArthur Node is a small and cherished commercial area embedded within the Bellevue neighborhood in Northside, located along MacArthur Avenue. Currently and in the future, the Node provides commercial uses within walking distance to the surrounding community at a scale and intensity that is compatible with the residential neighborhood which surrounds it. Existing structures are between 1 and 2 stories in height, and future development should be between 2 and 4 stories in height. There are currently no vacant parcels within the commercial area of the Node, but there are opportunities for redevelopment as there are several parcels that have either an excess of parking or a form and character that does not enhance the overall neighborhood commercial corridor. For instance, the apartment court on the west side of MacArthur Avenue could be redeveloped into a mixed-use structure that fronts the street and has parking underground.

Growth Potential: Low – There are opportunities for redevelopment of underutilized parcels which should be at a scale and intensity that is compatible with the existing commercial corridor and surrounding residential neighborhood.

Primary Next Steps

- Rezone this Node, the commercial portion of which along MacArthur Avenue is zoned “B-1 Neighborhood Business District” in alignment with the Future Land Use Plan to allow for a mix of uses and increased



Redeveloped Façades on Brookland Park Boulevard

Source: Brookland Park Boulevard Revitalization Plan, February 2013

residential density by-right and discourages auto-related uses and suburban strip commercial development form. (see Goal 1 and Goal 14)

- Implement design standards to ensure a high-quality and well-designed neighborhood Node and explore the creation of signature public art (see Goal 4)
- Improve pedestrian and bike infrastructure to/from this Node, including providing bike parking. (see Goal 4 and Goal 8)

Brookland Park

Type: Regional/National Node

Vision: Today Historic Brookland Park Boulevard is home to some local businesses that receive customers from all over the city; however, many storefronts are vacant and dilapidated. Brookland Park was developed when streetcars ran up North Avenue. In 2037, Brookland Park Boulevard will continue to feature long-term businesses, but as the adjacent residential neighborhoods continue to regain population, the empty storefronts will fill with neighborhood-serving businesses. Street landscaping will grow and new public art will recognize the unique character of this commercial corridor.

Growth Potential: Low — While there are empty parcels and storefronts, this Node will not see a significant proportion of the City's growth over the next 20 years

Primary Next Steps

- Encourage the redevelopment of vacant structures (Goal 1, Goal 3).
- Explore the creation of signature public art (Goal 4).
- Develop wayfinding and parking signage (Goal 4).



Potential Transformation of Six Points

Architecture firm, HKS, led a process to create a schematic plan for a building in Six Points. HKS created the plan through a robust community engagement process for a unique live/work building that is envisioned to incubate local businesses on the first floor and provide mixed-income housing above.

Source: re-imagining benefield, a plan for a property in Highland Park, HKS Architects, 2019

- Implement Parking Study recommendations (Goal 9).
- Assist long-term businesses in redeveloping areas by providing them rehabilitation grants and/or loans, and tax relief as property taxes increase (Goal 11).
- Support the Brookland Park Area Business Association in creating marketing and promotional materials (Goal 11).

Six Points

Type: Neighborhood Node

Vision: The Six Points Node is centered on a unique six-way intersection that was recently improved with a roundabout and landscaping. Small-scale, neighborhood commercial uses are located at the intersection and extend up Meadowbridge Road. The expansive Highland Park residential neighborhood surrounds this commercial area. In the future, this area can be a more enlivened community center with more neighborhood services and residential uses, better connectivity to and around the area, and more placemaking and public art amenities that focus on the history and cultural assets of the area. Future development should be between 2 and 4 stories and be sensitive to the surrounding residential neighborhood which exists in close proximity. The Hotchkiss Community Center and associated recreational assets can be better linked and incorporated to the activity of this Node.

Growth Potential: Low – The commercial area of the Node is relatively constrained and there are few vacant parcels. There are, however, several parcels that are underutilized and could be redeveloped into a building form and use that more closely fits with the vision of the area.

Primary Next Steps



Potential Transformation of Lombardy and Chamberlayne

The City adopted the VUU/Chamberlayne Neighborhood Plan to guide development. In 2019, the City rezoned this area of town to align with the Plan to encourage walkable urban development in the Lombardy/Chamberlayne area..

Source: rVUU/chamberlayne Neighborhood Plan, 2015

- Rezone the Community Mixed-Use areas of this Node at the intersection and along Meadowbridge Road in alignment with the Future Land Use Plan to allow for a mix of uses and increased residential density by-right (see Goal 1 and Goal 14).
- Improve pedestrian and bike infrastructure to/from this Node – specifically examining the feasibility of bicycle facilities (such as a bike lane) along Brookland Park Boulevard from this Node west to Chamberlayne Avenue (see Goal 4 and Goal 8).
- Implement design standards to create a high-quality and well-designed neighborhood Node and explore the creation of signature public art (see Goal 4 and Goal 17).
- Foster the unique identity of this Node through branding and creative placemaking (see Goals 1 and 4).

VUU/Chamberlayne

Type: Neighborhood Node

Vision: The VUU/Chamberlayne Node is centered at a unique V-shaped intersection of Chamberlayne Avenue and N. Lombardy Street. Commercial uses line both streets with surrounding residential neighborhoods. Virginia Union University exists to the southwest of the Node along N. Lombardy Street. Many of the commercial uses are auto-oriented with parking lots either in the front or side of the buildings. Commercial uses along N. Lombardy Street are more present along the street, but many are older car service businesses, some of which no longer appear to be operating.

The VUU/Chamberlayne Neighborhood Plan (2015) established a future vision for this Node through extensive community input: "Lombardy between Brook and Chamberlayne is an ideal location for a pedestrian-friendly retail and shopping district. Today, an overabundance of automobile- oriented uses, parking lots, and vacant buildings discourage the development of a strong connection between the surrounding neighborhoods and the commercial area. Lombardy and adjacent streets should be changed to

allow on-street parking, streetscaping, pedestrian lighting and signage. Curb cuts should be reduced to better control vehicular movement, and parking areas should be created behind buildings and in public lots. New commercial buildings with storefronts can be located along Lombardy, and selected historic buildings can be reused for shops and restaurants. The focus of the district will be a new public square at the intersection of Lombardy and Overbrook that will feature attractive landscaping and public art.”

In addition to the established vision, Richmond 300 envisions a future of this Node that is served by enhanced transit along Brook Road and Chamberlayne Avenue, improved bicycle facilities that make biking to and from the Node safer and easier, and roadway design improvements that see the pleasant, boulevard character of Brook Road and Chamberlayne Avenue to the north of the Node extended further south through the area and towards Downtown.

Growth Potential: Medium – Though the parcels are relatively small in size, the commercial area within this Node is fairly large in total. There are some vacant parcels and many parcels are underutilized because they are only 1-story in height or have an abundance of surface parking on them. Future development should be between 2 and 5 stories with sensitive design consideration where parcels abut residential neighborhoods.

Primary Next Steps

- Improve pedestrian and bike infrastructure to/from this Node – specifically examining the feasibility of bicycle facilities (such as a bike lane) along Chamberlayne Avenue (see Goal 4 and Goal 8).
- Construct the Ashland to Petersburg Trail which is proposed to be located along Brook Road and will serve as a bicycle/pedestrian connection between Ashland and Petersburg running through Richmond (see Goal 9).
- Improve the streetscape and extend the boulevard character of Chamberlayne Avenue and Brook Road further south through this Node (See Goal 4 and Goal 9).
- Implement design standards to create a high-quality and well-designed neighborhood Node and explore the creation of signature public art (see Goal 4 and Goal 17).
- Implement high-frequency transit along Brook Road and Chamberlayne Avenue (see Goal 8).

East End Nodes

25th and Nine Mile

Type: Neighborhood Node

Vision: The intersection of N. 25th Street and Nine Mile Road is located at the center of the East End, consisting of commercial and institutional uses. The long-envisioned grocery store has been realized in the form of the Market at the 25th which is located on formerly-vacant land on the north side of the intersection. Improvements to the intersection in the form of a new roundabout have been recently completed. Institutional uses that help anchor the Node, which are in addition to the commercial uses along N. 25th Street and Nine Mile Road, include the East End Library, the J. Sargent Reynolds Culinary School, and the Richmond Community Hospital run by Bon Secours.

In the future, this Node can be an even better version of itself, continuing to serve the commercial and civic needs of East End residents. Its location at the center of East End can be a bridge between the neighborhoods to the north and the Union Hill and Church Hill neighborhoods to the south. Vacant parcels that exist along the commercial corridor are developed into mixed-use and commercial uses that front the street. Underutilized parcels with non-historic structures and parking lots fronting the street are redeveloped. Vacant residentially-zoned parcels within proximity to the intersection of 25th and Nine Mile are developed into residential uses

that are complementary to the existing residential neighborhood and increase the population of the area to help support future commercial uses in the area.

Growth Potential: Medium – Vacant parcels, including an entire block between Nine Mile Road and T Street, as well as underutilized parcels with one-story structures offer an opportunity for mixed-use and commercial development in the future.

Primary Next Steps

- Rezone the Community Mixed-Use areas of this Node along N. 25th Street and Nine Mile Road, which are currently zoned “B-2 Community Business District”, in alignment with the Future Land Use Plan to allow for a mix of uses and increased residential density by-right (see Goal 1 and Goal 14).
- Implement design standards to create a high-quality and well-designed neighborhood Node and explore the creation of signature public art (see Goal 4 and Goal 17).
- Implement high-frequency transit along N. 25th Street and Nine Mile Road (see Goal 8).
- Improve pedestrian and bike infrastructure to/from this Node – specifically improving the streetscape along Nine Mile Road to tie in more seamlessly with the existing streetscape along N. 25th Street (see Goal 4 and Goal 8).

Jefferson, Marshall & 25th

Type: Neighborhood Node

Vision: The intersection of N. 25th Street and Jefferson Avenue is located between the Union Hill and Church Hill neighborhoods and provides a mix of commercial, residential, and institutional uses. In the future the Node is strengthened by new development on vacant parcels, increased connectivity, and re-imagined institutional and park uses. While the Node is mainly built-out and its historic properties are protected by local Old & Historic Districts, there is opportunity for infill development on vacant parcels. New development should be in keeping with the existing character of the area. Because the properties along N. 25th Street and Jefferson Avenue are a mix of commercial and residential uses, care should be taken to preserve the continuity of existing blocks. The City of Richmond’s East District Center, which is located on the east side of the 25th/ Jefferson intersection, is an opportunity to leverage future development while continuing to provide public services. The small, triangular park at Jefferson/Clay/23rd is improved using sustainable practices in a manner consistent with neighborhood open space goals.

Growth Potential: Low – Infill development opportunities existing at vacant parcels, most of which are located along either Jefferson Avenue or N. 25th Street. Future development complements the historic neighborhood.

Primary Next Steps

- Rezone the Community Mixed-Use areas of this Node along N. 25th Street and Jefferson Avenue in alignment with the Future Land Use Plan to allow for a mix of uses and increased residential density by-right. (see Goal 1 and Goal 14)
- Implement design standards to create a high-quality and well-designed neighborhood Node and explore the creation of signature public art (see Goal 4 and Goal 17).
- Implement high-frequency transit along Jefferson Avenue and N. 25th Street. (see Goal 8)



Potential Transformation of Fulton

Fulton

Type: Neighborhood Node

Vision: Today Fulton is a place that people pass through rather than come to. In 2037, Fulton is a neighborhood destination featuring buildings built to the sidewalk, unique public art, a high-frequency transit line connecting to the airport, and a mix of uses, including mixed-income housing. Fulton's walkable environment and connections to a robust open space network make it an attractive gateway to the city. The character of the surrounding single-family neighborhoods is preserved with programs that allow homeowners to live in high-quality homes and programs that increase homeownership opportunities.

Growth Potential: Medium — While this Node has great transformation potential, it will not experience as much growth as the priority growth Nodes.

Primary Next Steps

- Rezone the Fulton Node in accordance with the Future Land Use Map to allow a mix of uses and incorporate form-based requirements (Goal 1).
- Explore the creation of signature public art at this gateway (Goal 4).
- Improve pedestrian and bike infrastructure through Fulton (Goal 4, Goal 8, Goal 17).
- Implement high-frequency transit along Williamsburg Road to the airport with a transit stop at Government Road and Williamsburg Road (Goal 8).

Rocketts Landing

Type: Neighborhood Node

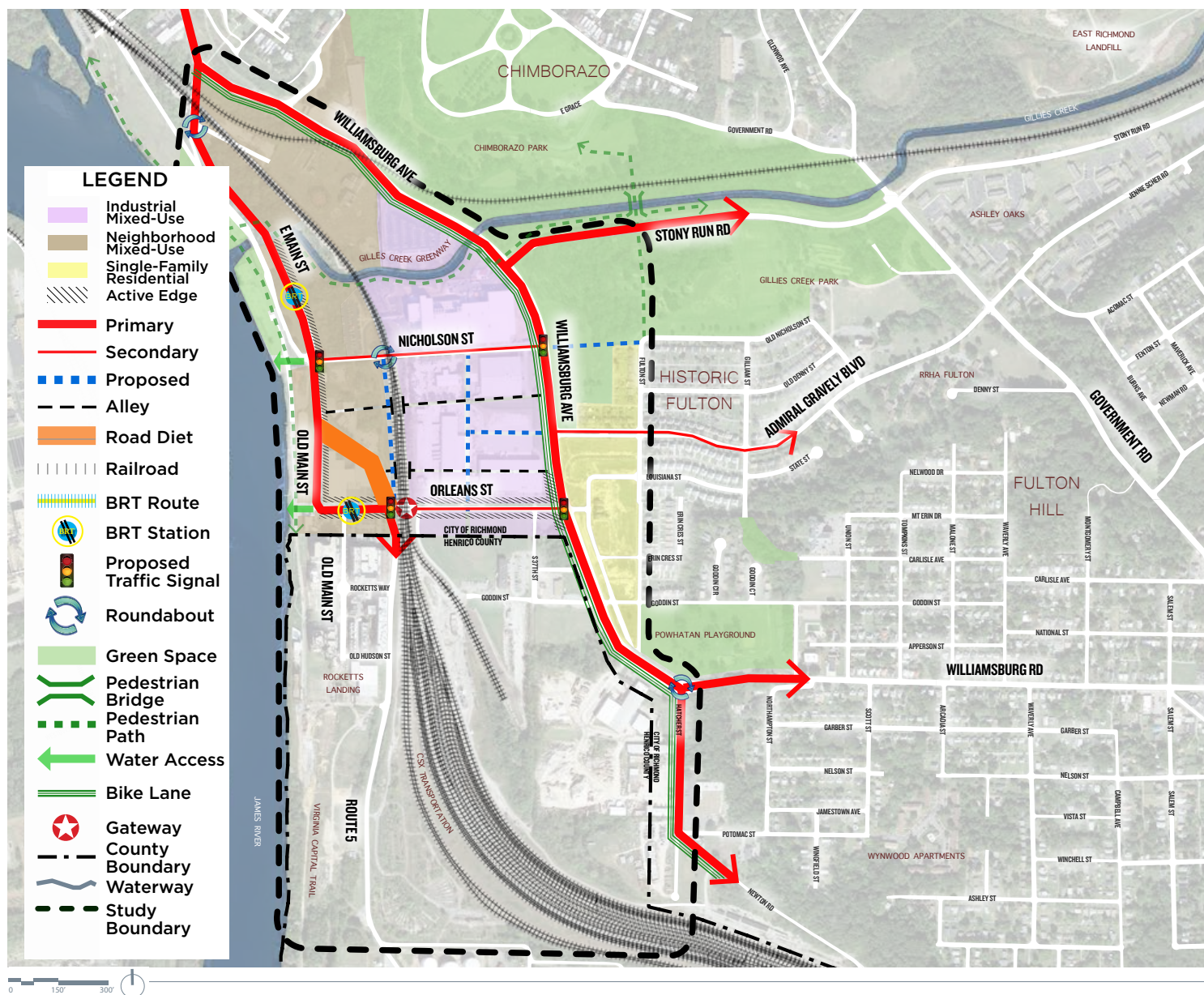
Vision: The Pulse Bus Rapid Transit Station at Rocketts Land is a dense, walkable destination for workers, residents, and visitors. The underdeveloped land north of the station is redeveloped to provide amenities to adjacent residents and visitors to the James River. Residents of Greater Fulton easily access the terminus station via Orleans Street which has become a major mixed-use area featuring active ground floor uses and a walkable environment. The Virginia Capital Trail is enhanced by the Gillies Creek Greenway that connects through Gillies Park and up into Church Hill. The character of single-family neighborhoods east of Williamsburg Avenue is preserved with programs that allow homeowners to live in high-quality homes and programs that increase homeownership opportunities. The history of Historic Fulton is shared and honored at the Historic Fulton Memorial Park at the base of Powhatan Hill.

Growth Potential: Medium — There is potential for redevelopment of underutilized industrial land.

Primary Next Steps

Since this Node is at the boundary with Henrico County, coordinate the next steps with Henrico County, where appropriate:

- Rezone land near in/this Node to align with the Future Land Use Map (Goal 1)
- Redevelop the Fulton Gas Works site and preserve the historic gasometer and the Fulton Works building. Continue the brownfield clean-up on this DPU-owned site to prepare it for higher and better uses once regulatory items have been addressed, such as environmental remediation and Section 106 review for historic resources. (Goal 2)
- Improve public art in this section of the Corridor, such as at the Dock & E. Main Streets roundabout, the CSX overpass at Orleans Street, or other locations as they become available. (Goal 4)
- Require developers to improve the streetscape of Orleans Street as parcels redevelop. (Goal 4)
- Improve pedestrian and bike connectivity through the area, specifically, construct the Gillies Creek Greenway, investigate installing a pedestrian bridge over the Norfolk-Southern at-grade rail line and Gillies Creek that connects Fulton Street to the bottom of Chimborazo Park., and install paths connecting Fulton Hill to Historic Fulton . (Goal 8, Goal 9, Goal 17)
- Recreate a street grid in the industrial area. Add new roads as development occurs in the block bound by the CSX railroad, Williamsburg Avenue, Nicholson Street, and Orleans Street. (Goal 9)
- Improve the former Lehigh Cement Property as per the Riverfront Plan (Goal 17)
- Implement high-frequency transit from the Rocketts Landing Station and along Orleans Street to Williamsburg Road to the airport (Goal 8)
- Develop the Fulton Memorial Park at the base of Powhatan Hill (Goal 17)



Rocketts Landing Station Area Plan

As part of the Pulse Corridor Plan, the City hosted a series of workshops with the Greater Fulton Community to create a Station Area Plan for the Rocketts Landing Pulse BRT Station.

Source: Pulse Corridor Plan, 2017

Appendix D

Updating the Master Plan

The Richmond 300 Master Plan should be updated every five years. The purpose of this appendix is to guide the update process that considers the various amendments, studies, and other material that has been produced or proposed since the adoption of Richmond 300 in 2020.

Updating the Master Plan provides an opportunity to check in to review and refine aspects of the plan. The Code of Virginia (§ 15.2-2223) requires localities to update their Master Plan every 5 years. Staff, City Planning Commission, and City Council may want to consider several key items, such as input from citizens; studies produced by committees, commissions, and stakeholder groups; information from City Council; changes in federal, state, and local policies and laws; and advancements in technology that inform how we use the built environment.

In 2023, City Council adopted Resolution 2021-R026 asking that suggestions for amendments to the Master Plan be included as an appendix to the Master Plan. In response to the amendment requests, City staff provided Council a memorandum categorizing the amendment requests into four categories; 'already in the plan', 'fundamental change', 'out of scope' and 'clarifying.' The amendment requests were not formally adopted to amend the Master Plan; however, they have been incorporated into this section and should be considered by staff, City Planning Commission, and City Council as part of the process to update the plan. Resolution 2021-R026 is included in this Appendix to the Master Plan. City staff prepared this Appendix D for the City Planning Commission to consider as an amendment to the Master Plan, which was originally adopted by City Planning Commission in October 2020 and approved by City Council in December 2020.

The next update will begin during the Implementation phase of the Master Plan and will happen concurrently with ongoing implementation work. A core piece of the Master Plan that will be underway during this time is the zoning ordinance re-write. The update process should not begin until after the zoning ordinance has been rewritten or it is substantially complete. The zoning ordinance is critical to directing the growth of Richmond to appropriate areas while maintaining existing neighborhoods and creating new authentic neighborhoods, enhanced transit options, and much more. Without a re-written ordinance, the update process will be difficult to complete.

As the process to updating the plan moves forward it is important to note that an update is limited in scope. The 5-year update is not a comprehensive rewrite of the entire Master Plan. These updates generally include text edits, refining goals and strategies, or small changes to maps or growth nodes based on the studies and other work that has been completed since the adoption of the Master Plan in 2020.

Process

Step 1: Insights and Information Gathering

During this step, PDR staff will gather reports that have been produced from city agencies and stakeholder groups and produce an insights report of existing conditions. Tasks may include:

- Collect existing conditions data and develop reports.
- Gather recent reports from city agencies, stakeholder groups, and the City Council proposed amendments and incorporate into an insights report.
- Release reports to the public.

Step 2: Community Engagement

PDR will host community engagement sessions to gather community input on the strengths and opportunities of the Richmond 300 plan. This is also the step to get feedback from the community on the Council proposed amendments. Tasks may include:

- Host public meetings to gather feedback on the master plan and the Council proposed amendments.
- Meet with city officials, community leaders, stakeholder and civic groups.
- Collect data and develop reports.

Step 3 – Review and Refine

Once community input and existing conditions data has been discussed and analyzed, PDR staff will review the information and produce a draft Update. Tasks may include:

- Write and release a draft Update.
- Gather any final community input on the draft update and make any changes necessary.
- Write and release a pre-final and final Update.

Step 4 – Introduce and Incorporate

During this step, the pre-final Update and final 2025 Update will be introduced to the Planning Commission for Commission discussion and public comment. City Council will formally adopt the Update and the changes will be incorporated into the Richmond 300 Master Plan document.

INTRODUCED: April 26, 2021

A RESOLUTION No. 2021-R026

As Amended

To ~~[direct]~~ request that the City Planning Commission ~~[to prepare, submit to public hearing, and consider an amendment making]~~ adopt as an appendix for consideration in 2025 certain changes to the Master Plan.

Patrons – President Newbille, Vice President Robertson, Ms. Jordan, Ms. Lambert,
Ms. Trammell, Mr. Jones and Ms. Lynch

Approved as to form and legality
by the City Attorney

PUBLIC HEARING: MAY 21 2021 AT 6 P.M.

WHEREAS, pursuant to section 17.06 of the Charter of the City of Richmond (2020), as amended, the City Planning Commission by resolution dated October 5, 2020, adopted a new master plan for the City of Richmond, and the City Council by Ordinance No. 2020-236, adopted December 14, 2020, approved the master plan adopted by the City Planning Commission (hereinafter the “Master Plan”); and

WHEREAS, although the Council recognizes that the Master Plan guides but legally does not regulate the use of land in the city, the Council desires that the Master Plan accurately

AYES: 9 NOES: 0 ABSTAIN: _____

ADOPTED: JAN 23 2023 REJECTED: _____ STRICKEN: _____

indicate the Council’s intended considerations when the Council adopts zoning ordinances to legally regulate the use of land in the city; and

WHEREAS, the Council consequently desires certain changes to the Master Plan to achieve the Master Plan’s purpose of guiding and accomplishing a coordinated, adjusted and harmonious development of the city and its environs that will, in accordance with existing and future needs, best promote health, safety, morals, comfort, prosperity and general welfare, as well as efficiency and economy in the process of development; and

WHEREAS, it is the consensus of the Council that it should ~~[direct]~~ request that the City Planning Commission ~~[to prepare, hold a public hearing on, and consider certain changes for incorporation into]~~ adopt an appendix to the Master Plan, as provided in section 17.06 of the Charter of the City of Richmond (2020), as amended, and section 15.2-2229 of the Code of Virginia (1950), as amended, that sets forth certain proposed changes to the Master Plan to be considered by the City Planning Commission in 2025;

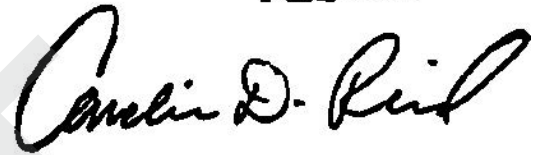
NOW, THEREFORE,

BE IT RESOLVED BY THE COUNCIL OF THE CITY OF RICHMOND:

That, in accordance with section 17.06 of the Charter of the City of Richmond (2020), as amended, and section 15.2-2229 of the Code of Virginia (1950), as amended, the City Planning Commission is hereby ~~[directed]~~ requested to ~~[(i) prepare an amendment to the Master Plan that addresses each of the issues raised in]~~ adopt the ~~[eight page]~~ nine-page document entitled ~~["Richmond City Council Amendment Requests for Richmond 300 Master Plan,"]~~ "Appendix D," a copy of which is attached to and hereby incorporated into this resolution, ~~[(ii) submit such amendment to public hearing and conduct all other proceedings as may be required by law within the 60 day timeframe specified by section 15.2-2229 of the Code of Virginia (1950), as amended,~~

~~and (iii) adopt and certify to the City Council the requisite resolution to adopt such amendment]~~ as a part of the Master Plan for further consideration in 2025 in accordance with section 17.06 of the Charter of the City of Richmond (2020), as amended~~[, as soon as possible after the conclusion of the required public hearing]~~.

**A TRUE COPY:
TESTE:**

A handwritten signature in black ink, reading "Carlin D. Reil".

City Clerk

DRAFT



Richmond City Council

The Voice of the People

Richmond, Virginia

RECEIVED

By Desiray Lowery at 10:49 am, Apr 21, 2021

Office of the Council Chief of Staff

Council Ordinance/Resolution Request

TO Haskell Brown, Interim Richmond City Attorney

FROM Joyce L. Davis, Interim Council Chief of Staff
Office of the Council Chief of Staff

COPY Cynthia Newbille, Council President
Ellen Robertson, Vice President
Katherine Jordan, 2nd District Councilmember
Ann Francis Lambert, 3rd District Councilmember
Stephanie Lynch, 5th District Councilmember
Reva Trammell, 8th District Councilmember
Tabrica Rentz, Interim Deputy City Attorney

DATE April 21, 2021

PAGE/s 1 of 1

TITLE RVA 300 Master Plan Amendments

This is a request for the drafting of an **Ordinance** ☒ **Resolution** ☐

REQUESTING COUNCILMEMBER/PATRON

President Cynthia Newbille, Vice
President Robertson, Councilmember
Jordan, Councilmember Lambert,
Councilmember Lynch, Councilmember
Trammell

SUGGESTED STANDING COMMITTEE

Land Use, Housing and Transportation

ORDINANCE/RESOLUTION SUMMARY

The patrons are requesting amendments to the RVA 300 Master Plan document.

BACKGROUND

This patrons are requesting the revisions to the RVA300 Master Plan document.
This requested date of introduction is April 26, 2021.

FISCAL IMPACT STATEMENT

Fiscal Impact	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Budget Amendment Required	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Estimated Cost or Revenue Impact	\$	

Attachment/s Yes ☒ No ☐

Richmond City Council Ordinance/Resolution Request Form/updated 1.10.2019/jm

Richmond City Hall | 900 East Broad Street, Suite 305 | Richmond, Virginia 23219 U.S.A. | 804.646.2778 (tel) | 804.646.5468 (fax) | www.richmondgov.com/citycouncil

APPENDIX D

Whereas: By Resolution No. 2020-236, adopted December 14, 2020, the Council of the City of Richmond (the “Council”) voted unanimously to adopt the Richmond 300 Master Plan (the “Master Plan”), but with the expectation that certain amendments, set forth below in the body of this Appendix D (the “Amendments”), would be made to the Master Plan soon thereafter; and

Whereas: As a result, the Council, pursuant to its power under section 15.2-2229 of the Code of Virginia (1950), as amended, to prompt consideration of amendments to the Master Plan by “direct[ing] the local planning commission to prepare an amendment and submit it to public hearing,” directed the City Planning Commission by Resolution No. 2021-R026, introduction on May 24, 2021 (the “Resolution”), to prepare and submit to public hearing within 60 days a resolution to adopt the Amendments as part of the Master Plan; and

Whereas: Pursuant to section 17.06 of the Charter of the City of Richmond (2020), as amended, the City Planning Commission may, but is not required to, adopt amendments to the Master Plan that the Council directs the City Planning Commission to consider; and

Whereas: The Council, in light of section 17.06 of the Charter of the City of Richmond (2020), as amended, and in recognition of Master Plan language that the Master Plan should be reviewed and revised every five years to address changes in community preferences driven by socioeconomic conditions, changes in laws, and the availability of new implementation tools and funding sources, has decided it would be appropriate to append the Amendments to the Master Plan and to have the City Planning Commission consider them for Master Plan incorporation in 2025; and

Whereas: The Council, therefore, requests that the City Planning Commission, as part of a robust, comprehensive public engagement process, to use the Amendments as a starting point in its effort to perform a 2025 update of the Master Plan;

NOW, THEREFORE, to memorialize the intent of the City Planning Commission and the Council that the Amendments serve as a starting point for the City Planning Commission’s effort to update the Master Plan in 2025, the Council has approved an amendment to the Resolution that replaces the directive to incorporate the Amendments into the Master Plan with a request that this document, with the Amendments herein, be appended to the Master Plan as “Appendix D” for reference by the City Planning Commission in 2025, which appendix the City Planning Commission has adopted as part of the Master Plan.

The Amendments are as presented in the following eight-page document entitled “Richmond City Council Amendment Requests for Richmond 300 Master Plan”:

Richmond City Council Amendment Requests

for

Richmond 300 Master Plan

- **Chapter 1: Vision and Core Concepts**

- Page 12: The Master Plan offers three possible population growths; moderate, strong, and aggressive. Amend the Plan to select growth at the aggressive. Option as a priority goal. Richmond cannot afford to consider moderate growth nor strong.
- Page 14, Figure 6: The Oak Grove-Bellemeade communities are just beginning to face realtors' speculative sales and increases in property values - although vacancy, code violations, and abandonment is shown in the Figure#6 map on pg. 14. Buffered by Route 1 and Commerce Rd., this is an ideal first-time homeowners' neighborhood where many long term seniors still live on fixed incomes. A special node for retainage of single family home owners is needed with a protected buffer of neighborhood mix-use on the Southside of Commerce Rd. and industrial and institutional on the Northside of Commerce Rd.
- Page 30: That Primary Next Steps on page 30 of the Richmond 300 (and throughout the plan as appropriate) be amended to add: Jackson Ward Community Plan & Overlay District: Develop a small area plan and design overlay district with the entire Jackson Ward community and related stakeholders to reconnect this historically Black neighborhood, preserve its historic and architectural integrity and manage potential involuntary displacement and inclusive housing.
- Page 32, Primary Next Steps:
 - **Small Area Plan:** Complete and adopt the Shockoe Small Area Plan (which is under development), as an element of Richmond 300 (Goal 1). **(Add:)** The Shockoe Small Area Plan will serve as the City's chief reference for developing rules to govern building height, land use intensity, density, and design in Shockoe Bottom. Amend the Future Land Use map in accordance with the Shockoe Small Area Plan.
 - **Rezoning:** Rezone the Shockoe area in alignment with the **(Add:)** Shockoe Small Area Plan to allow appropriate growth while also protecting and enhancing significant historic sites (Goal 1).
- Page 51, Figure 8: To increase businesses and job growth, destination mixed-use is requested on all of Route 1 and Chamberlayne, Midlothian and Hull now recommended for corridor mixed use.
- Page 51, Figure 8: Broad Street West, from Downtown to the Henrico county line, should be amended to be corridor mixed- use, not destination mixed-use. Add Mechanicsville and Forest Hill to corridor mixed-use).

- Pages 51 & 76: Land use must be more equitable for multi-family and single family housing, yielding an average of twenty percent (20%) for both housing options.
- Page 51, Figure 8 & Page 77, Figure 14: Increase density by greater future land use from residential to neighborhood mixed use in neighborhood shown in Figure 14 on page 77, where excessive blight, abandoned, vacant buildings, lands and under-developed land exists - which is currently experiencing high land values speculation, spikes in values, gentrification and dislocation of lower income seniors and rental housing. Special nodes are needed in these areas to retain owner occupancy, increase decent, and lower scale multifamily housing to cause inclusion, not displacement, and affordable diversity instead of only large lot single family housing racing to reach values of \$550,000. The Master Plan calls for aggressive code enforcement without incentives to retain existing owners. The neighborhood areas to be changed from residential to neighborhood mixed-use are Broad Rock, Jahnke Road, Cary (Far West), Broad Street (Far West), Brookland Park and Highland Park.
- Page 53: The areas shown on the land use map on page 53 of the Land Use Plan on the north side of Broad Street between Third Street and Arthur Ashe Boulevard, and including the several blocks north of Broad Street as designated in the Land Use map, should be changed from the designation of Mixed Use to Corridor Mixed Use.
- Page 53: The areas shown on the land use map on page 53 of the Land Use Plan on the south side of Broad Street between Ryland and Arthur Ashe Boulevard should abide by the Land Use terms as specified in the Pulse Corridor Plan.
- Page 53: The areas shown on the land use map on page 53 of the Land Use Plan that include Jackson Ward are hereby changed from Destination Mixed Use to Community Mixed Use.
- Page 53, Figure 11, and Page 85, Figure 18: Future Land Use Map:
 - **Insert footnote for Shockoe Bottom:** *The Future Land Use Map will be amended to reflect neighborhood designations approved in the pending Shockoe Small Area Plan.*
 - **Change** the designation east of 21st Street to Gillies Creek (at Main Street) to Neighborhood Mixed-Use.
- Page 53: Oregon Hill should be removed from the Neighborhood Mixed Use land use designation and instead be designated Residential.
 - If the relief requested in above is not granted, we request use of below:
 - If Oregon Hill is not designated Residential, the height limit in Neighborhood Mixed Use should be changed from “four” to “three” stories to reflect actual conditions in the neighborhood. A residential story is generally accepted to be 10' 8" in height; three stories

at this dimension results in a maximum height of 32 feet. To avoid a height limit less than the existing limit in R-7, we request the adoption of the existing R-7 height limit of 35 feet.

- Page 56: The second sentence of the paragraph titled “Intensity” on page 56 of the Master Plan should be amended to add: Jackson Ward Community Plan & Overlay District: Develop a small area plan and design overlay district with the entire Jackson Ward community and related stakeholders to reconnect this historically Black neighborhood, preserve its historic and architectural integrity and manage potential involuntary displacement and inclusive housing.
 - If this cannot be done, then we request the following: Remove South Laurel Street (south of Cary Street) and Idlewood Street from the street Typologies map on p. 73 from the “Major Street” designation that would allow the construction of buildings by right that are taller than the existing zoning allows.
- The second sentence of the paragraph titled “Intensity” on p.56 of the Master Plan should be deleted.
- The area of West Grace Street between Lombardy and Arthur Ashe Boulevard should be removed from the Great Streets designations (in any of its iterations, including Major Mixed Use Street) and map entirely.
- Page 58: Paragraph entitled “Intensity” on page 58 of the Master Plan, as such paragraph applies to the areas on the north side of Main Street from Shields to Boulevard, should be amended to allow buildings generally ranging from two to four stories, except where existing zoning prior to the adoption of the master plan allows for greater height or intensity.
- Page 79, Figure 15: Revise and replace the “Future Connections Map” to remove the proposed downriver bridge and Interstate highway interchange.
- Page 80: Delete #17 and #18, removing reference to the proposed downriver bridge and Interstate highway interchange.
- The Carver Community would like to request that land use designation of Destination Mixed-Use and Corridor Mixed-Use be changed to Community Mixed-Use.
- The 6-Public housing communities should be included in the future land use. All surplus city land assigned to the Land Bank should be reserved for housing at thirty percent (30%) of the area median income. Existing RRHA managed- HUD owned land that is deeded to the City for redevelopment should increase inclusive, low-income housing throughout each priority growth node.
- That the Historic and Cultural Attractions Primary Next Step on page 30 of the Richmond 300 (and throughout plan as appropriate) be amended to include the Historic Jackson Ward Neighborhood and 2nd Street (between Broad and Duval.) Revise as follows: Historic and Cultural attractions: Maintain, grow and market the historic Jackson Ward

neighborhood highlighting its unique history and architecture and historic attractions such as the Black History Museum, Maggie L. Walker's home and the 2nd Street. Corridor.

- **Chapter 2: High-Quality Places**

- Page 84: Add "Seek authority from the Virginia General Assembly to enact an Inclusionary Zoning ordinance to strengthen the City's ability to mandate the provision of affordable housing." as Objective 1.1(g).
- Page 85, Figure 18: Recommend a targeted amendment to the Future Land Use Map to make it clear that the Future Land Use map will be amended in accordance with the Shockoe Small Area Plan.
- Page 92, Goal 3, Historic Preservation, Existing Context, National Historic District:
 - Add: Where the Virginia Department of Historic Resources (DHR) holds easements written to preserve the character of a National Register Historic District land use rules applicable to land within those easements should reinforce those easements' intent. The easement in Shockoe Bottom that protects historic views between Tobacco Row, the St John's Church Old and Historic District, and the James River is a primary example of such easements.
- Page 95, Objective 3.1: Preserve culturally, historically, and architecturally significant buildings, sites, structures, neighborhoods, cemeteries, and landscapes that contribute to Richmond's authenticity:
 - L: Establish viewshed protections to protect and enhance views of critical natural features, such as the downriver view from Libby Hill.
 - *The viewshed provisions should be strengthened by stating explicitly: "Establish a means to protect and enhance views of critical natural features, particularly the downriver view from Libby Hill Park. Development on City-owned parcels within any defined and protected viewshed should not block such viewshed."* Edit the following sections accordingly:
 - ADD: Establish viewshed protections to protect and enhance views of critical natural features, such as the downriver view from Libby Hill. Development on city-owned parcels within the defined Libby Hill viewshed should not block views of the river from Libby Hill.
 - Page C-28, Priority Growth Nodes: Rocketts Landing, Primary Next Steps
 - Add: Protect and enhance views of critical natural features, particularly the downriver view from Libby Hill Park. Development on City-owned parcels within the defined viewshed should not block the views of the river.

- **Chapter 3: Equitable Transportation**

- Page 124: State explicitly that the intensity standard for the "major street" designation does not recommend raising building heights above that permitted by existing zoning in those areas. [This is intended to address the designation of Idlewood and South Laurel between Cary and

Idlewood as "major streets" (p. 124) that "Buildings taller than four stories may be found on major streets (p. 56)]

- Page 127, Figure 30: Revise and replace the "Connections, Interchanges, and Bridges Map" to remove the proposed downriver bridge and Interstate highway interchange.
- Page 138: Add "including increased business contracting opportunities for Section 3 resident owned businesses." to the end of Objective 11.2(a).
- Amend the plan to add priority nodes as follows:
 - Establish a "Smart Growth Priority Growth Node" for neighborhoods of the Big Six Public Housing neighborhoods of high density public housing to include amenities to achieve the qualities of life principles of the master plan, the grow of businesses and jobs within the node's areas, address food deserts, and provide blended economic scale of housing;
 - Create an overlay "Smart Growth Priority Node" in neighborhoods where gentrification is increasing sales and rents values greater than the average economy growth and growth in real estate assessment values by more than the average growth rate to include land use with promotes increased multi-family housing development and smaller lots size to promote increased density.

- **Chapter 4: Diverse Economy**

- **Chapter 5: Inclusive Housing**

- Page 151: Add "and commit to the establishment of a permanent inclement weather shelter for houseless people in the city of Richmond." to the end of Objective 14.2(i).
- Page 152: Add "Recommend AHTF funds be used for the creation of units as opposed to programming." to the end of Objective 14.3(a).
- Page 152: Add "Commit to requiring developers who purchase public land to provide affordable units for families and individuals making less than 30% AMI." as 14.3(e).
- Page 152: Change "...20% or more of units at 50% AMI." to "...20% or more of the units at or below 50% AMI." within Objective 14.4(a)
- Page 152: Delete Objective 14.4(d), "Create affordable housing tax-increment finance (TIF) zones for land within a half mile of Pulse stations and direct the future incremental tax revenues funds from the TIF to the Affordable Housing Trust Fund for funding mixed-income projects within the Pulse TIF zone; establish similar TIF zones along future enhanced transit corridors."
- Page 152: Add ", reserving some density for the purpose of negotiating for affordable housing units from private developers, to the extent that the General Assembly authorizes the City to lawfully engage in such an inclusionary zoning practice." to the end of the first sentence in Objective 14.5(a), after "(see Goal 1)."
- Page 152: Add "Use the density bonus process more consistently in higher-density areas of the city to secure greater contributions of affordable housing units." to the end of Objective 14.5(b).

- Page 152, Objective 14.5(c) (pg. 152) : Update Zoning Ordinance to allow for accessory dwelling units, (add “such as granny flat or alley flat”), with form based requirements (add “and regulations”).
- Page 154: Add “while guaranteeing one-for-one, physical unit replacement of like-kind for any public housing that is lost in the process of redevelopment.” to the end of Objective 14.6(a).
- Page 155: Within the bulleted list included in Objective 14.8(f), change the first bullet to “Increase access to accessible housing through implementation of an affordable housing ordinance.”, and change the fourth bullet to “Expand fair housing capacity by increasing number of affordable housing units through available legal means.”
- **Chapter 6: Thriving Environment**
- **Chapter 7: Implementation**
 - Big Move: Re-writing the Zoning Ordinance
 - Page 189, Big Moves: Change the Gilpin Court Transformational Study implementation due date from FY 22-23 to FY 20-21
 - Page 198, Big Moves: Provide Greenways and Parks for All, Action Steps
 - Add: Establish viewshed protections to protect and enhance views of critical natural features, such as the downriver view from Libby Hill Park. Development on City-owned parcels within the defined Libby Hill viewshed shall not block the views of the river from Libby Hill.
 - **Rezoning:** *Rezone the Shockoe area in alignment with the **(ADD:)** Shockoe Small Area Plan ~~Future Land Use Map~~ to allow appropriate growth while also protecting and enhancing significant historic sites.*
 - **Small Area Plan:** *Complete and adopt the Shockoe Small Area Plan (which is under development) as an element of Richmond 300. **(ADD:)** The Shockoe Small Area Plan will address heights, density, and design in Shockoe Bottom. Amend the Future Land Use map in accordance with the Shockoe Small Area Plan.*
- **Other & Comments**
 - Small area plan for rezoning the **North Jackson Ward** vacant land for high quality, mixed use development
 - New bridge over **2nd Street**
 - Future land use to include designation and conservation of **burial grounds**.
 - Increase land use on **Richmond Route 1**
 - Increase **land use density** in commercial corridors
 - Add **Jefferson Davis** into this plan
 - **Schools** need to be added to the plan
 - Amend the Plan to include the **Economic Development Plan**
 - The property near **Seibert's Towing** needs to remain commercial.
 - **Tobacco Row:** The 1989 easement between Tobacco Row and the Virginia Department of Historic Resources should be explicitly cited in the

plan as contributing guidance for the heights, location, and design of development between 21st Street and Rocketts Landing. The easement committed to protect the context and views to/from Tobacco Row and the St John's Church Old and Historic District as well as protect the views to/from Tobacco Row and the James River. Changing the designation for areas along east of 21st Street to Gillies Creek (at Main Street) to Neighborhood Mixed-Use with a maximum height of 4 stories would be appropriate.

- **Shockoe Bottom:** *The pending Shockoe Bottom plan should be explicitly cited in Richmond300 as "the plan to serve as the City's chief reference for developing rules to govern building height, land use intensity, density, and design in Shockoe Bottom."*
- **Add narrative for the National Slavery Museum:** Richmond intends to build a National Slavery Museum -- the Museum of the American Slave Trade, in Shockoe Valley, on the site of the largest slave market on the East Coast of America. The National Slavery Museum will include the excavation of Lumpkin's Slave Jail, known as the Devil's Half Acre. It will tell the truth about our history to Americans and to the world. We intend to overcome our history of racism and race-based slavery. Monument Avenue is gone. This Museum, on the major north-south highway of America's East Coast, will proclaim that Richmond is no longer the Capital of the Confederacy, but a Capital of Truth and Reconciliation.
The National Slavery Museum will be adjacent to the Main Street Station, located in a campus dedicated to Enslaved African Americans, including a Memorial Park and the African Burial Grounds. The city has already received plans and drawings for the National Slavery Museum, and a full preliminary study, including an award-winning design, prepared by the Smith Group, designers of the Museum of African American History on the Mall in Washington. The Smith Group is currently working out the relationship of the Museum to the flood plain of Shockoe Valley. When that is complete, the consultants will work with the City's new National Slavery Museum Foundation to complete the Museum plan, including full financial feasibility/economic impact, operations planning, and fund-raising.
- Very surprised to see a new **I-95 interchange** with Bellemeade Road and bridge across the James River to Henrico County in the area of Tree Hill Farm proposed on the map in the Draft Plan, with no text on it at all. This significant potential project received little to no attention in presentations. A bit of text was added to the Final Plan but this significant concept was not adequately vetted. The interchange may be OK, but the proposed new bridge in particular is problematic – they raise multiple community, land use, and environmental issues (such as the impact on truck traffic on South Side and adverse impacts on the historic Route 5 corridor). Suggest that references to the new interchange be deleted (Delete Item 18 from Figure 15, p. 79, the text on Item 18 on page 80, and the New Bridge in Figure 30, p 127).
- Significant changes were made between the draft and final plan to the Future Land Use Map for **Shockoe Bottom and Riverfront**, impacting things

like maximum height limits. And it is not clear how the Master Plan fits with the Shockoe Small Area Plan that is under development and the proposed Shockoe Bottom Memorial Park. Very concerned developers may seek rezoning and proceed under Richmond300 (which lacks maximum height limits and detailed commitments to the memorial park) before the Small Area Plan can be adopted. At the very least, would recommend a targeted amendment to the Future Land Use Map (Figure 11, p. 53, and Figure 18, p. 85) to make it clear that the Future Land Use map will be amended in accordance with the Shockoe Small Area Plan and amend bullets on pages 32 and 189 to make it clear that rezoning in the Shockoe area will be in alignment with the Shockoe Small Area Plan.

- **Inclusionary zoning:** The City should encourage use of its density bonus program in neighborhoods to increase the supply of affordable housing in new market rate multifamily developments. Additionally, we need to protect the public housing that exists and not continue mass evictions, given the unstable nature of our world in the global pandemic, in order to create enough vacancy to demolish the projects for private sector mixed income units that have significantly less oversight.
- **Strengthening mass transit:** As the transportation sector accounts for almost half of our carbon emissions in the Commonwealth, it is important that Richmond lead the way on a robust mass transit system in order to reduce the dependency on single occupancy vehicles, thereby mitigating climate change.
- State explicitly that Oregon Hill should retain its current R-7 residential zoning. This is intended to convey Oregon Hill's desire to retain its R-7 zoning because Neighborhood Mixed Use does not reflect the actual conditions found in Oregon Hill.
- **Future Land Use-** the proposed future land use continue the 30%-40% historic land use patterns for single family homes on large lots. For the City to grow, increased land mix-use provides the best option of high quality community places, increased population growth with a mix of housing choices, with less car dependency, increased businesses and job growth and enhance the per capita to attract quality neighborhood with food and finance anchors. The following amendments increase neighborhood mix-use, destination mix-use, adds institutional in the industrial future land use, and enhances corridor mixed-use.

Memorandum

To: Richmond City Council

From: Maritza Mercado Pechin, AICP, Deputy Director, Office of Equitable Development,
Department of Planning and Development Review

Date: July 6, 2021

Re: Responses to Richmond City Council Requested Amendments to the Richmond 300
Master Plan

Staff reviewed the requested amendments to the Master Plan and categorized them into 4 categories:

- Already in the plan: Amendments which are already part of the Richmond 300 master plan.
- Clarifying: Amendments that are mainly clarifying or explanatory.
- Out of Scope: Amendments which are either too specific or not relevant to a land use planning document
- Fundamental change: Amendments addressing elements of the plan which were vetted through extensive community input and would require significant public engagement at both the community and citywide scale

Chapter 1: Vision and Core Concepts

- 1.a Council Requested Amendment: Page 12: The Master Plan offers three possible population growths; moderate, strong, and aggressive. Amend the Plan to select growth at the aggressive. Option as a priority goal. Richmond cannot afford to consider moderate growth nor strong.
- Response: **Out of scope.** The growth scenarios presented in the introduction to the plan are projections based on recent trends. The plan does not promote one growth scenario above any other, and cannot directly control the amount of growth that occurs over the next 20 years. Rather, the plan seeks to accommodate future growth, though some strategies in the plan may positively affect the amount of growth.

Though no one truly knows how much the City of Richmond will grow over the next 20 years, Richmond 300 plans to accommodate and encourage the plan's Aggressive Growth Projections. The Vision for the High Quality Places chapter of the plan assumes there will be Aggressive Growth in the city as it states that "Richmond leads the region in high-quality business and residential growth." The Aggressive Growth Projection assumes strong growth of families with children, young and old adults, and dynamic job growth within the city. The Priority Goal of the plan is to have a city that will encourage this type of growth in an equitable and sustainable manner. By working to achieve the city-wide and 5 topic visions of the plan, this type of growth will occur because Richmond will be a well-designed city of communities where people will want to raise families, return to as a young adult or retiree, be able to age in place, and find a high quality job.

The potential land demand to meet the needs of the Aggressive Growth Projection is 3,500 acres for housing, commercial, and mixed-use development. There is currently 3,595 acres of vacant land and 6,153 acres of under-developed land in the city. The future land use map designates these areas a variety of categories to allow for the mix of uses needed to meet this type of growth.

The Implementation Chapter of the Plan states that the desired trend for "Total population" is "increase." (p.181).

- 1.b Council Requested Amendment: Page 14, Figure 6: The Oak Grove-Bellemeade communities are just beginning to face realtors' speculative sales and increases in property values - although vacancy, code violations, and abandonment is shown in the Figure#6 map on pg. 14. Buffered by Route 1 and Commerce Rd., this is an ideal first-time homeowners' neighborhood where many long term seniors still live on fixed incomes. A special node for retainage of single family home owners is needed with a protected buffer of neighborhood mix-use on the Southside of Commerce Rd. and industrial and institutional on the Northside of Commerce Rd.
Response: **Already in the plan.** See Objectives 14.8 and 14.9 on page 155, as well as the Route 1/ Bellemeade Priority Growth Node Description on page 44. A number of strategies to prevent involuntary displacement exist in the plan under Objective 14.8 on page 155 ("Develop inclusionary and equitable housing options for our gentrifying neighborhoods to prevent involuntary displacement") and Objective 14.9 ("Assist households that desire to age in place in their neighborhoods"). The Route 1/ Bellemeade Priority Growth Node Description on page 44 includes the following as a primary next step related to the surrounding single-family neighborhoods of Oak Grove and Bellemeade: "Develop programs that permit homeowners to remain in their homes, in high-quality structures to limit the involuntary displacement of residents in the surrounding single-family neighborhoods."
- 1.c Council Requested Amendment: Page 30: That Primary Next Steps on page 30 of the Richmond 300 (and throughout the plan as appropriate) be amended to add: Jackson Ward Community Plan & Overlay District: Develop a small area plan and design overlay district with the entire Jackson Ward community and related stakeholders to reconnect this historically Black neighborhood, preserve its historic and architectural integrity and manage potential involuntary displacement and inclusive housing.
Response: **Clarifying.** Much of the Jackson Ward neighborhood is within a City Old & Historic District. The community plan for Gilpin/Jackson Ward, which is just in early pre-planning stages, may eventually include recommendations related to historic preservation, involuntary displacement, and inclusive housing. A Primary Next Step on page 30 includes developing a plan for the Gilpin Court Transformation to include Gilpin Court and vacant land in North Jackson Ward. The scope of this plan has been modified to include all of Jackson Ward, from Broad Street to the railroad tracks and Belvidere Street to 3rd Street. While the language of this next step can be modified to reflect this change, it would be an inconsequential change given that the Gilpin/Jackson Ward Community Plan process is underway and the study area already reflects this requested change.
- 1.d Council Requested Amendment: Small Area Plan: Complete and adopt the Shockoe Small Area Plan (which is under development), as an element of Richmond 300 (Goal 1). (Add:) The Shockoe Small Area Plan will serve as the City's chief reference for developing rules to govern building height, land use intensity, density, and design in Shockoe Bottom. Amend the Future Land Use map in accordance with the Shockoe Small Area Plan.
Response: **Already in the plan.** The "Primary Next Steps" for the Downtown-Shockoe Node already states, "Implement the recommendations in the Shockoe Small Area Plan, some of which include: Complete and adopt the Shockoe Small Area Plan (which is under development), as an element of Richmond 300" (p. 32).
- 1.e Council Requested Amendment: Rezoning: Rezone the Shockoe area in alignment with the (Add:) Shockoe Small Area Plan to allow appropriate growth while also protecting and enhancing significant historic sites (Goal 1).
Response: **Already in the plan.** This is already implied in the plan as the Shockoe Small Area Plan will be adopted as part of Richmond 300 (p. 32).
- 1.f Council Requested Amendment: Page 51, Figure 8: To increase businesses and job growth, destination mixed-use is requested on all of Route 1 and Chamberlayne, Midlothian and Hull now recommended for corridor mixed use.

Response: Fundamental change. The Future Land Use Map in the plan was developed with extensive community and citywide input. Amending the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan. The Corridor Mixed-Use depicted for these areas will allow for a substantial job and population growth. (p. 60). The Plan notes Corridor Mixed-Use is “found along major commercial corridors and envisioned to provide for medium- to medium-high-density pedestrian- and transit-oriented development.” In addition to the character of and vision for the corridors, parcel depth and size was reviewed by staff and the Land Use Working Group when examining the appropriate designation for these corridors.

- 1.g Council Requested Amendment: Page 51, Figure 8: Broad Street West, from Downtown to the Henrico county line, should be amended to be corridor mixed- use, not destination mixed–use. Add Mechanicsville and Forest Hill to corridor mixed-use).

Response: Fundamental change. The Future Land Use map currently designates Broad Street as “Corridor Mixed-Use”. The portions of West Broad Street designated Destination Mixed-Use were designated Nodal Mixed-Use as part of the Pulse Corridor Plan which was created with extensive community engagement and received Council approval. The Nodal Mixed-Use category was renamed Destination Mixed-Use in *Richmond 300*. Portions of Mechanicsville and Forest Hill have Community Mixed-Use, Corridor Mixed-Use, Neighborhood Mixed-Use and Destination Mixed-Use to encourage growth at appropriate scales. Activity is concentrated at nodes and certain segments of these corridors. Amending the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan.

- 1.h Council Requested Amendment: Pages 51 & 76: Land use must be more equitable for multi-family and single family housing, yielding an average of twenty percent (20%) for both housing options.

Response: Out of scope. More clarification and guidance is needed to fully evaluate this amendment as the purpose is unclear. For reference, in 2015, 56% of all housing units were single-family and 38% were multi-family.

The Future Land Use map shows 45% of the City as “Residential” and 32% of the City designated land use categories that include some type of multi-family as a primary use. The “Residential” category states that duplexes and small multi-family buildings (typically 3-10 units) as a secondary use which may be found along major streets. The “Neighborhood Mixed-Use” category includes single-family residential as a primary use.

Richmond 300 identifies steps to encourage more diverse housing options throughout the city (see response to Comment #1). In creating the Richmond 300 Future Land Use Map, the Land Use Working Group intentionally eliminated the Single-Family Residential Land Use Category. Many neighborhoods which were designated Single-Family Residential are now designated Neighborhood Mixed-Use, a category that notes small multi-family buildings as a primary use and large multi-family buildings as a secondary use.

While engaging with residents throughout the city from the Oak Grove to Westhampton, PDR heard the desire to preserve the character of their residential neighborhoods. The Residential Land Use Category acknowledges this desire while still encouraging growth by noting accessory dwelling units as a primary use and duplexes and small multi-family buildings (typically 3-10 units) as a secondary use which may be found along major streets (see Street Typology Map). Additionally, Strategy 14.5.e allows for the development of middle housing (2- to 4-unit buildings) by-right within a half mile of high-frequency transit stops (p. 152). By allowing multi-family on major streets and within a half mile of high-frequency transit stops, there is opportunity for multi-family development within the residential land use category. The streets shown in yellow on Figure 12 on page 73 are major streets that run through areas that are designated as the “Residential” category. The Enhanced Transit Routes are shown in Figure 14 on page 77.

- 1.i Council Requested Amendment: Page 51, Figure 8 & Page 77, Figure 14: Increase density by greater future land use from residential to neighborhood mixed use in neighborhood shown in Figure 14 on page 77, where excessive blight, abandoned, vacant buildings, lands and under-developed land exists - which is currently experiencing high land values speculation, spikes in values, gentrification and dislocation of lower income seniors and rental housing. Special nodes are needed in these areas to retain owner occupancy, increase decent, and lower scale multifamily housing to cause inclusion, not displacement, and affordable diversity instead of only large lot single family housing racing to reach values of \$550,000. The Master Plan calls for aggressive code enforcement without incentives to retain existing owners. The neighborhood areas to be changed from residential to neighborhood mixed-use are Broad Rock, Jahnke Road, Cary (Far West), Broad Street (Far West), Brookland Park and Highland Park.

Response: **Fundamental change.** The Future Land Use Map in the plan was developed with extensive community and citywide input. Amending the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan. A number of strategies to prevent involuntary displacement exist in the plan under Objective 14.8 on page 155 (“Develop inclusionary and equitable housing options for our gentrifying neighborhoods to prevent involuntary displacement”) and Objective 14.9 (“Assist households that desire to age in place in their neighborhoods”).

The Final Plan reflects amendments to the Draft Plan to change the land use designations in some of the areas noted. Neighborhood Mixed-Use areas are those with smaller parcels (1,500 to 5,000 sf) in size. Residential areas are those with larger parcel size (5,000sf to 20,000 sf+). Most the neighborhoods mentioned are very established neighborhoods with homes on large parcel sizes, therefore the Residential category is most appropriate. Note that the “Residential” category states that duplexes and small multi-family buildings (typically 3-10 units) as a secondary use which may be found along major streets.

Broad Rock: The Future Land Use designation along much of Broad Rock has been changed to Neighborhood or Community Mixed-Use since the Draft version of the plan.

Jahnke Road: Portions of Jahnke are designated Neighborhood or Community Mixed-Use. The adjacent residential neighborhoods provide smaller scale single family housing stock that adds to the diversity of housing options available in the city.

Cary (Far West): This is an established residential corridor with limited opportunities for redevelopment. We have heard extensively from this community about the desire to maintain the Residential future land use category.

W. Broad Street (Far West): Broad Street is designated Corridor Mixed-Use and Destination Mixed- Use. There are several major streets that cross the neighborhoods to the south of W, Broad Street which could accommodate additional multi-family development.

Brookland Park and Highland Park: The corridors of the Brookland Park and Six Point nodes are designated Community Mixed-Use Nodes. The surrounding neighborhoods are primarily single-family neighborhoods with homes on large lots.

- 1.j Council Requested Amendment: Page 53: The areas shown on the land use map on page 53 of the Land Use Plan on the north side of Broad Street between Third Street and Arthur Ashe Boulevard, and including the several blocks north of Broad Street as designated in the Land Use map, should be changed from the designation of Mixed Use to Corridor Mixed Use.

Response: **Fundamental change.** The Future Land Use Map in the plan was developed with extensive community and citywide input. The portions of West Broad Street designated Destination Mixed-Use were designated Nodal Mixed-Use as part of the Pulse Corridor Plan which was created with extensive community engagement and received Council approval. The Nodal Mixed-Use category was renamed Destination Mixed-Use in Richmond 300. Amending

the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan.

- 1.k Council Requested Amendment: Page 53: The areas shown on the land use map on page 53 of the Land Use Plan on the south side of Broad Street between Ryland and Arthur Ashe Boulevard should abide by the Land Use terms as specified in the Pulse Corridor Plan.
Response: **Already in the plan.** The Future Land Use Map did not significantly change regarding the south side of W. Broad Street from the Pulse Plan to Richmond 300. In both plans the areas are shown as Corridor Mixed Use and the definition for Corridor Mixed-Use is substantively the same in both plans. The adopting ordinance for Richmond 300 explicitly states that the Pulse Corridor Plan is to be retained as an element of the City's Master Plan, so its guidance and recommendations (aside from the Future Land Use Map) are still relevant. That said, future land use designations are guidance for elected officials to follow in making land use decisions. Ultimately, the zoning district for each parcel of land will determine what is allowed to be built on that property. For instance, these text sections are still relevant:

The Corridor Mixed-Use area on the south side of W. Broad Street envisions more limited redevelopment at a smaller scale and height. New infill development should be limited in scope, prioritizing the preservation of significant historic buildings that embody the form and function of Corridor Mixed-Use. New development on the south side of W. Broad Street should be limited to four stories in height between Ryland and Strawberry Streets, and five stories in height between Strawberry Street and Boulevard, with the exception of key intersections, such as at W. Broad and Robinson Streets and W. Broad Street and N. Boulevard, which should be developed at a higher scale befitting their role as standout corners, with extensive discussion with the surrounding community. In order to reduce its effect on lower-scale residential uses to the south, any new development here should employ at 20' rear yard setback from alleys, as well as massing strategies, such as a two-story stepback from the rear, that push the massing toward W. Broad Street. (Pulse Corridor Plan, p. 63)

Recommendation SA.21 Rezone the areas around the Science Museum of Virginia and Allison Street stations to districts that align with the Future Land Use Map, working closely with neighborhood groups to ensure that future zoning districts are sensitive to the context of the neighborhood. Neighboring civic associations express a strong preference that new development along the south side of W. Broad Street be limited in height, promotes the preservation of historic building stock, and provides adequate buffers to the residential neighborhoods to the south. (Pulse Corridor Plan, p. 64)

- 1.l Council Requested Amendment: Page 53: The areas shown on the land use map on page 53 of the Land Use Plan that include Jackson Ward are hereby changed from Destination Mixed Use to Community Mixed Use.
Response: **Fundamental change.** The Future Land Use Map in the plan was developed with extensive community and citywide input. Jackson Ward is not shown as "Destination Mixed-Use" but rather, "Neighborhood Mixed-Use." Amending the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan.
- 1.m Council Requested Amendment: Page 53, Figure 11, and Page 85, Figure 18: Future Land Use Map: Insert footnote for Shockoe Bottom: The Future Land Use Map will be amended to reflect neighborhood designations approved in the pending Shockoe Small Area Plan.
Response: **Already in the plan.** The "Primary Next Steps" for the Downtown-Shockoe Node already states, "Implement the recommendations in the Shockoe Small Area Plan, some of which include: Complete and adopt the Shockoe Small Area Plan (which is under development), as an element of Richmond 300" (p. 32).
- 1.n Council Requested Amendment: Page 53, Figure 11, and Page 85, Figure 18: Future Land Use Map: Change the designation east of 21st Street to Gillies Creek (at Main Street) to Neighborhood Mixed-Use

Response: **Fundamental change.** The Future Land Use Map in the plan was developed with extensive community and citywide input. Amending the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan.

- 1.o Council Requested Amendment: Page 53: Oregon Hill should be removed from the Neighborhood Mixed Use land use designation and instead be designated Residential
Response: **Fundamental change.** The Future Land Use Map in the plan was developed with extensive community and citywide input. The definition of Neighborhood Mixed-Use was revised during the Richmond 300 plan development process to decrease intensity in response to community concerns. PDR staff and the Richmond 300 Advisory Council had multiple discussions specifically regarding the future land use designation of Oregon Hill at Advisory Council meetings and with the Oregon Hill community. Changes were made to the Neighborhood Mixed-Use Category to reflect concerns regarding scale while still allowing the district to be applicable citywide. Multiple zoning categories are appropriate in the Neighborhood Mixed-Use area including the R-7 district. Amending the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan.
- 1.p Council Requested Amendment: If the relief requested in above is not granted, we request use of below: If Oregon Hill is not designated Residential, the height limit in Neighborhood Mixed Use should be changed from “four” to “three” stories to reflect actual conditions in the neighborhood. A residential story is generally accepted to be 10’ 8” in height; three stories at this dimension results in a maximum height of 32 feet. To avoid a height limit less than the existing limit in R-7, we request the adoption of the existing R-7 height limit of 35 feet.
Response: **Out of scope.** This level of specificity is not appropriate for the scale of Richmond 300 nor Future Land Use designations, and is more at the level prescribed by the Zoning Ordinance and its districts, which have not been changed with the adoption of Richmond 300.
- 1.q Council Requested Amendment: Page 56: The second sentence of the paragraph titled “Intensity” on page 56 of the Master Plan should be amended to add: Jackson Ward Community Plan & Overlay District: Develop a small area plan and design overlay district with the entire Jackson Ward community and related stakeholders to reconnect this historically Black neighborhood, preserve its historic and architectural integrity and manage potential involuntary displacement and inclusive housing.
Response: **Clarifying.** Much of the Jackson Ward neighborhood is within a City Old & Historic District. The community plan for Gilpin/Jackson Ward, which is just in early pre-planning stages, may eventually include recommendations related to historic preservation, involuntary displacement, and inclusive housing. A Primary Next Step on page 30 includes developing a plan for the Gilpin Court Transformation to include Gilpin Court and vacant land in North Jackson Ward. The scope of this plan has been modified to include all of Jackson Ward, from Broad Street to the railroad tracks and Belvidere Street to 3rd Street. While the language of this next step can be modified to reflect this change, it would be an inconsequential change given that the Gilpin/Jackson Ward Community Plan process is underway and the study area already reflects this requested change.
- 1.r Council Requested Amendment: If this cannot be done, then we request the following: Remove South Laurel Street (south of Cary Street) and Idlewood Street from the street Typologies map on p. 73 from the “Major Street” designation that would allow the construction of buildings by right that are taller than the existing zoning allows.
Response: **Fundamental change.** The Street Typologies Map was developed based on VDOT’s Road Classification and the proposed Future Land Use. The designation of Idlewood Avenue as a “Major Mixed-Use Street” does not change what can be constructed “by-right” which is based on what the Zoning Ordinance prescribes, not what Richmond 300 recommends. The Future Land Use description for “Neighborhood Mixed Use” only states that,

“Buildings taller than four stories may be found along major streets (see Street Typologies Map),” a guiding principles that would be applied in cases needing Council approval such as a rezoning or Special Use Permit.

- 1.s Council Requested Amendment: The second sentence of the paragraph titled “Intensity” on p.56 of the Master Plan should be deleted.
Response: **Fundamental change.** This would affect potential intensity across many neighborhoods and is a key strategy for adding some more appropriate density along major streets. This does not change the zoning or what is allowed “by-right”, and any future development relying on this recommendation would still need special approval by Council if it is not allowed by the zoning district in which the property is located.
- 1.t Council Requested Amendment: The area of West Grace Street between Lombardy and Arthur Ashe Boulevard should be removed from the Great Streets designations (in any of its iterations, including Major Mixed Use Street) and map entirely.
Response: **Fundamental change.** W. Grace Street is not designated as a Great Street, only a Major Mixed Use Street. The Street Typologies Map was developed based on VDOT’s Road Classification and the proposed Future Land Use. W. Grace Street is a “Major Collector” and is located in a “Neighborhood Mixed Use” Future Land Use category, which is why it is designated as a “Major Mixed Use Street.” All Major Collectors throughout the City have a “street typology” designation based on the Future Land Use Category the street runs through.
- 1.u Council Requested Amendment: Page 58: Paragraph entitled “Intensity” on page 58 of the Master Plan, as such paragraph applies to the areas on the north side of Main Street from Shields to Boulevard, should be amended to allow buildings generally ranging from two to four stories, except where existing zoning prior to the adoption of the master plan allows for greater height or intensity.
Response: **Fundamental change.** Revisions to the Future Land Use category of “Community Mixed-Use” would apply citywide to all similarly-designated corridors, and would need to be undertaken as part of a concerted re-examination of the entire Future Land Use Map. The Future Land Use does not change the zoning or what is allowed “by-right”, and any future development relying on this recommendation would still need special approval by Council if it is not allowed by the zoning district in which the property is located. Additionally, the Intensity Section on page 58 notes that appropriate building height within the range is “based on street widths and depending on the historic context.”
- 1.v Council Requested Amendment: Page 79, Figure 15: Revise and replace the “Future Connections Map” to remove the proposed downriver bridge and Interstate highway interchange.
Response: **Fundamental change.** Both of these proposed transportation projects are preliminary concepts that require future study and engagement. While the Future Connections Map promotes a variety of multi-modal transportation improvements, continued investment and improvement of the city’s and the region’s highways and roads cannot be discounted. The proposed interchange of I-95 at Bellemeade Rd has been an idea since at least the last full master plan adoption in 2001, and may be a worthwhile project that would provide alternate access to and from I-95, while decreasing the amount of truck traffic through residential neighborhoods. The conceptual bridge across the James River could provide commuters (whether by car, bus, bike, etc.) living in eastern Henrico with easy access to I-95 and into the city, as opposed to further exacerbating the congestion along Route 5 and E. Main Street.
- 1.w Council Requested Amendment: Page 80: Delete #17 and #18, removing reference to the proposed downriver bridge and Interstate highway interchange.
Response: **Fundamental change.** Please see above comments in response to Amendment “1V”.

- 1.x Council Requested Amendment: The Carver Community would like to request that land use designation of Destination Mixed-Use and Corridor Mixed-Use be changed to Community Mixed-Use.
Response: **Fundamental change.** Destination Mixed-Use is the appropriate category for the parts of Carver along Broad street because those parcels are zoned B-4 today. The interior of the Carver community is shown as Neighborhood Mixed-Use on the Future Land Use Map. Because the Future Land Use Map in the plan was developed with extensive community and citywide input, amending the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan.
- 1.y Council Requested Amendment: The 6-Public housing communities should be included in the future land use. All surplus city land assigned to the Land Bank should be reserved for housing at thirty percent (30%) of the area median income. Existing RRHA managed- HUD owned land that is deeded to the City for redevelopment should increase inclusive, low-income housing throughout each priority growth node.
Response: **Already in the plan.** The 6 public housing courts are included in the Future Land Use Map and shown as “Neighborhood Mixed-Use.” Objective 14.6 on page 154 is to transform Richmond Redevelopment and Housing Authority (RRHA) public housing properties into well-designed, walkable, mixed-use, mixed-income, transit-adjacent communities. Additional considerations for the land bank and RRHA managed-HUD owned land that is deeded to the City is beyond the scope of the master plan is more appropriate for a Housing Plan.
- 1.z Council Requested Amendment: That the Historic and Cultural Attractions Primary Next Step on page 30 of the Richmond 300 (and throughout plan as appropriate) be amended to include the Historic Jackson Ward Neighborhood and 2nd Street (between Broad and Duval.) Revise as follows: Historic and Cultural attractions: Maintain, grow and market the historic Jackson Ward neighborhood highlighting its unique history and architecture and historic attractions such as the Black History Museum, Maggie L. Walker’s home and the 2nd Street Corridor.
Response: **Clarifying.** Richmond 300 lists a couple examples of Jackson Ward’s architecture and historic attractions as examples of such. If an attraction or historic site is not listed in the plan that does not mean it is not relevant. There are several recommendations in Goal 3: Historic Preservation and Goal 12: Tourism that relate to the topic of preserving and maintaining Richmond’s historical assets and authenticity.

Chapter 2: High-Quality Places

- 2.a Council Requested Amendment: Page 84: Add “Seek authority from the Virginia General Assembly to enact an Inclusionary Zoning ordinance to strengthen the City’s ability to mandate the provision of affordable housing.” as Objective 1.1(g).
Response: **Already in the plan.** This is already in the “Inclusive Housing” section, under Objective 14.3, Strategy c: “Lobby the General Assembly to give Richmond powers under 15.2-2304, which allows localities to adopt mandatory inclusionary zoning programs” (p. 152).
- 2.b Council Requested Amendment: Page 85, Figure 18: Recommend a targeted amendment to the Future Land Use Map to make it clear that the Future Land Use map will be amended in accordance with the Shockoe Small Area Plan.
Response: **Already in the plan.** The “Primary Next Steps” for the Downtown-Shockoe Node already states, “Implement the recommendations in the Shockoe Small Area Plan, some of which include: Complete and adopt the Shockoe Small Area Plan (which is under development), as an element of Richmond 300” (p. 32).
- 2.c Council Requested Amendment: Page 92, Goal 3, Historic Preservation, Existing Context, National Historic District: Add: Where the Virginia Department of Historic Resources (DHR) holds easements written to preserve the character of a National Register Historic District land use rules applicable to land within those easements should reinforce those easements’ intent.

The easement in Shockoe Bottom that protects historic views between Tobacco Row, the St John's Church Old and Historic District, and the James River is a primary example of such easements.

Response: Out of scope. After consultation with the City Attorney, PDR decided not to highlight existing easements or other legal contracts which are not affected by Richmond 300 or otherwise have any relation to the Master Plan.

- 2.d **Council Requested Amendment:** The viewshed provisions should be strengthened by stating explicitly: "Establish a means to protect and enhance views of critical natural features, particularly the downriver view from Libby Hill Park. Development on City-owned parcels within any defined and protected viewshed should not block such viewshed." Edit the following sections accordingly:

- **ADD:** Establish viewshed protections to protect and enhance views of critical natural features, such as the downriver view from Libby Hill. Development on city-owned parcels within the defined Libby Hill viewshed should not block views of the river from Libby Hill.

Response: Out of scope. This is too specific and will be determined by zoning and the aforementioned viewshed overlay district.

- 2.e **Council Requested Amendment:** Page C-28, Priority Growth Nodes: Rocketts Landing, Primary Next Steps Add: Protect and enhance views of critical natural features, particularly the downriver view from Libby Hill Park. Development on City-owned parcels within the defined viewshed should not block the views of the river.

Response: Out of scope. This is too specific and will be determined by zoning and the aforementioned viewshed overlay district.

Chapter 3: Equitable Transportation

- 3.a **Council Requested Amendment:** Page 124: State explicitly that the intensity standard for the "major street" designation does not recommend raising building heights above that permitted by existing zoning in those areas. [This is intended to address the designation of Idlewood and South Laurel between Cary and Idlewood as "major streets" (p. 124) that "Buildings taller than four stories may be found on major streets (p. 56)]

Response: Out of scope. The Future Land Use introduction on p. 52 of the plan already explains that Future Land Use is visionary and does "not specify what an owner can or cannot legally do with their property."

- 3.b **Council Requested Amendment:** Page 127, Figure 30: Revise and replace the "Connections, Interchanges, and Bridges Map" to remove the proposed downriver bridge and Interstate highway interchange.

Response: Fundamental change. Both of these proposed transportation projects are preliminary concepts that require future study and engagement. While the Future Connections Map promotes a variety of multi-modal transportation improvements, continued investment and improvement of the city's and the region's highways and roads cannot be discounted. The proposed interchange of I-95 at Bellemeade Rd has been an idea since at least the last full master plan adoption in 2001, and may be a worthwhile project that would provide alternate access to and from I-95, while decreasing the amount of truck traffic through residential neighborhoods.

The conceptual bridge across the James River could provide commuters (whether by car, bus, bike, etc.) living in eastern Henrico with easy access to I-95 and into the city, as opposed to further exacerbating the congestion along Route 5 and E. Main Street.

- 3.c **Council Requested Amendment:** Page 138: Add "including increased business contracting opportunities for Section 3 resident owned businesses." to the end of Objective 11.2(a).

Response: **Out of scope.** This seems overly specific given the scope of the master plan though this is something to explore for inclusion in the City's proposed Community Benefits Agreements which are currently being drafted.

- 3.d Council Requested Amendment: Amend the plan to add priority nodes as follows: Establish a "Smart Growth Priority Growth Node" for neighborhoods of the Big Six Public Housing neighborhoods of high density public housing to include amenities to achieve the qualities of life principles of the master plan, the grow of businesses and jobs within the node's areas, address food deserts, and provide blended economic scale of housing;

Response: **Already in the plan.** Objective 14.6, along with numerous strategies, already states: "Transform Richmond Redevelopment and Housing Authority (RRHA) public housing properties into well-designed, walkable, mixed use, mixed-income, transit-adjacent communities" (p. 154). This includes a strategy (14.6.b) to develop small area plans with inclusive community input (including existing RRHA residents) to plan for the redevelopment of mixed-income neighborhoods on public housing sites for 1) Gilpin Court, 2) Mosby South, 3) Creighton Court, 4) Mosby North, 5) Fairfield Court, 6) Whitcomb Court, and 7) Hillside Court. (p. 154).

- 3.e Council Requested Amendment: Amend the plan to add priority nodes as follows: Create an overlay "Smart Growth Priority Node" in neighborhoods where gentrification is increasing sales and rents values greater than the average economy growth and growth in real estate assessment values by more than the average growth rate to include land use with promotes increased multi-family housing development and smaller lots size to promote increased density.

Response: **Already in the plan.** A number of strategies to prevent involuntary displacement exist in the plan under Objective 14.8 on page 155 ("Develop inclusionary and equitable housing options for our gentrifying neighborhoods to prevent involuntary displacement") and Objective 14.9 ("Assist households that desire to age in place in their neighborhoods").

Chapter 4: Diverse Economy

Chapter 5: Inclusive Housing

- 5.a Council Requested Amendment: Page 151: Add "and commit to the establishment of a permanent inclement weather shelter for houseless people in the city of Richmond." to the end of Objective 14.2(i).

Response: **Out of scope.** The City's Strategic Plan to End Homelessness calls for eliminating the need for a City-sponsored permanent inclement weather shelter by partnering with nonprofit and faith-based organizations to create more emergency shelter beds and creating more permanent supportive housing (Strategy #2 on page 27).

- 5.b Council Requested Amendment: Page 152: Add "Recommend AHTF funds be used for the creation of units as opposed to programming." to the end of Objective 14.3(a).

Response: **Out of scope.** This would need to be vetted with HCD and other stakeholders and is more appropriate for a Housing Plan.

- 5.c Council Requested Amendment: Page 152: Add "Commit to requiring developers who purchase public land to provide affordable units for families and individuals making less than 30% AMI." as 14.3(e).

Response: **Out of scope.** This may not be feasible and should be addressed during the sale of City-owned real estate, such as through an issuance of an RFP. This idea is something to explore for inclusion in the City's proposed Community Benefits Agreements which are currently being drafted.

- 5.d Council Requested Amendment: Page 152: Change "...20% or more of units at 50% AMI." to "...20% or more of the units at or below 50% AMI." within Objective 14.4(a)

Response: **Clarifying.**

- 5.e Council Requested Amendment: Page 152: Delete Objective 14.4(d), “Create affordable housing tax-increment finance (TIF) zones for land within a half mile of Pulse stations and direct the future incremental tax revenues funds from the TIF to the Affordable Housing Trust Fund for funding mixed-income projects within the Pulse TIF zone; establish similar TIF zones along future enhanced transit corridors.”
Response: **Fundamental change.** This strategy was promoted as a way of providing affordable housing near areas that are well served by transit.
- 5.f Council Requested Amendment: Page 152: Add “, reserving some density for the purpose of negotiating for affordable housing units from private developers, to the extent that the General Assembly authorizes the City to lawfully engage in such an inclusionary zoning practice.” to the end of the first sentence in Objective 14.5(a), after “(see Goal 1).”
Response: **Out of scope.** The City administration is currently rewriting the Affordable Density Bonus Program in order to make it more effective at providing affordable housing units.
- 5.g Council Requested Amendment: Page 152: Add “Use the density bonus process more consistently in higher-density areas of the city to secure greater contributions of affordable housing units.” to the end of Objective 14.5(b).
Response: **Out of scope.** The City administration is currently rewriting the Affordable Density Bonus Program in order to make it more effective at providing affordable housing units.
- 5.h Council Requested Amendment: Page 152, Objective 14.5(c) (pg. 152): Update Zoning Ordinance to allow for accessory dwelling units, (add “such as granny flat or alley flat”), with form based requirements (add “and regulations”).
Response: **Clarifying.** While this change provides an additional level of clarification on the definition of an accessory dwelling unit, the edit does not change the intention of the objective and therefore is unnecessary. Similarly, the Zoning Ordinance is a regulation, therefore the change from “requirements” to “regulations” does not change the intention of the objective.
- 5.i Council Requested Amendment: Page 154: Add “while guaranteeing one-for-one, physical unit replacement of like-kind for any public housing that is lost in the process of redevelopment.” to the end of Objective 14.6(a).
Response: **Out of scope.** This seems overly prescriptive as Richmond 300 does not focus specifically on the redevelopment of public housing courts. Plans for those initiatives would provide a better opportunity for promoting this.
- 5.j Council Requested Amendment: Page 155: Within the bulleted list included in Objective 14.8(f), change the first bullet to “Increase access to accessible housing through implementation of an affordable housing ordinance.”, and change the fourth bullet to “Expand fair housing capacity by increasing number of affordable housing units through available legal means.”
Response: **Fundamental change.** This goal is cited directly from the “Analysis of Impediments to Fair Housing Choice.”

Chapter 6: Thriving Environment

Chapter 7: Implementation

- 7.a Council Requested Amendment: Page 189, Big Moves: Change the Gilpin Court Transformational Study implementation due date from FY 22-23 to FY 20-21
Response: **Out of scope.** This does not seem feasible given the current timeframe for this plan.
- 7.b Council Requested Amendment: Page 198, Big Moves: Provide Greenways and Parks for All, Action Step: Add: Establish view shed protections to protect and enhance views of critical natural features, such as the downriver view from Libby Hill Park. Development on City-owned

parcels within the defined Libby Hill viewshed shall not block the views of the river from Libby Hill.

Response: **Out of scope.** This is too specific by focusing explicitly on City-owned land.

- 7.c Council Requested Amendment: Big Move: Re-writing the Zoning Ordinance: Rezoning: Rezone the Shockoe area in alignment with the (ADD:) Shockoe Small Area Plan ~~Future Land Use Map~~ to allow appropriate growth while also protecting and enhancing significant historic sites.

Response: **Already in the Plan.** An action step outlined in the Rezoning Big Move calls for rewriting the zoning ordinance with community input to achieve the goals outlined in Richmond 300. When the Shockoe Small Area Plan is adopted, it will amend the Master Plan and therefore guide the rezoning effort.

- 7.d Council Requested Amendment: Big Move: Re-writing the Zoning Ordinance: Small Area Plan: Complete and adopt the Shockoe Small Area Plan (which is under development) as an element of Richmond 300. (ADD:) The Shockoe Small Area Plan will address heights, density, and design in Shockoe Bottom. Amend the Future Land Use map in accordance with the Shockoe Small Area Plan.

Response: **Already in the plan.** The “Primary Next Steps” for the Downtown-Shockoe Node already states, “Implement the recommendations in the Shockoe Small Area Plan, some of which include: Complete and adopt the Shockoe Small Area Plan (which is under development), as an element of Richmond 300” (p. 32).

Other & Comments

- 8.a Council Requested Amendment: Small area plan for rezoning the North Jackson Ward vacant land for high quality, mixed use development

Response: **Already in the plan.** This already found in the Primary Next Steps for the Downtown – Jackson Ward Node: “Gilpin Court Transformation: Develop a plan with existing community input to include Gilpin Court and vacant land in North Jackson Ward to transform the neighborhood into a mixed-use, mixed-income, walkable, and transit-adjacent community that provides both housing and jobs for residents (Goal 1, Goal 14)” (p.30).

- 8.b Council Requested Amendment: New bridge over 2nd Street

Response: **Out of scope.** The exact location of bridges to reconnect Jackson Ward will be determined during the Feasibility Study.

- 8.c Council Requested Amendment: Future land use to include designation and conservation of burial grounds.

Response: **Out of scope.** This is not a Future Land Use element. Additionally, Strategy 3.1.b. on page 94 states: Identify partnerships and funding sources for the identification, protection, preservation, and if needed acquisition of abandoned and neglected cemeteries, especially Black cemeteries.

- 8.d Council Requested Amendment: Increase land use on Richmond Route 1

Response: **Fundamental change.** The Future Land Use Map in the plan was developed with extensive community and citywide input. Amending the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan.

- 8.e Council Requested Amendment: Increase land use density in commercial corridors

Response: **Fundamental change.** The Future Land Use Map in the plan was developed with extensive community and citywide input. Amending the adopted Future Land Use map would require new community engagement and/or the creation of a small area plan.

- 8.f Council Requested Amendment: Add Jefferson Davis into this plan

Response: **Already in the plan.** Route 1 is addressed in the plan, specifically at two Priority Growth Nodes, Route 1 / Bellemeade Road and Route 1 / Bells Road.

- 8.g Council Requested Amendment: Schools need to be added to the plan
Response: **Already in the plan.** Schools are considered and addressed as much as is appropriate for this type of plan and as much as RPS was able to engage with developing such strategies. Strategy 2.1.c. on page 90 addresses schools: Develop a schools facility master plan based within the context of the Future Land Use Plan to determine whether there are needs for creating, relocating, and/or closing schools to align with population projections.
- 8.h Council Requested Amendment: Amend the Plan to include the Economic Development Plan
Response: **Out of scope.** The Economic Development Plan does not exist yet. It can be adopted as part of the master plan if City Council and the City administration choose to do so.
- 8.i Council Requested Amendment: The property near Seibert's Towing needs to remain commercial.
Response: **Already in the plan.** The Future Land Use map designated this area "Neighborhood Mixed-Use" which would allow for a mix of uses, including commercial.
- 8.j Council Requested Amendment: Tobacco Row: The 1989 easement between Tobacco Row and the Virginia Department of Historic Resources should be explicitly cited in the plan as contributing guidance for the heights, location, and design of development between 21st Street and Rocketts Landing. The easement committed to protect the context and views to/from Tobacco Row and the St John's Church Old and Historic District as well as protect the views to/from Tobacco Row and the James River. Changing the designation for areas along east of 21st Street to Gillies Creek (at Main Street) to Neighborhood Mixed-Use with a maximum height of 4 stories would be appropriate.
Response: **Out of scope.** After consultation with the City Attorney, PDR decided not to highlight existing easements or other legal contracts which are not affected by Richmond 300 or otherwise have any relation to the Master Plan.
- 8.k Council Requested Amendment: Shockoe Bottom: The pending Shockoe Bottom plan should be explicitly cited in Richmond300 as "the plan to serve as the City's chief reference for developing rules to govern building height, land use intensity, density, and design in Shockoe Bottom."
Response: **Already in the plan.** The "Primary Next Steps" for the Downtown-Shockoe Node already states, "Implement the recommendations in the Shockoe Small Area Plan, some of which include: Complete and adopt the Shockoe Small Area Plan (which is under development), as an element of Richmond 300" (p. 32).
- 8.l Council Requested Amendment: Add narrative for the National Slavery Museum: Richmond intends to build a National Slavery Museum -- the Museum of the American Slave Trade, in Shockoe Valley, on the site of the largest slave market on the East Coast of America. The National Slavery Museum will include the excavation of Lumpkin's Slave Jail, known as the Devil's Half Acre. It will tell the truth about our history to Americans and to the world. We intend to overcome our history of racism and race-based slavery. Monument Avenue is gone. This Museum, on the major north-south highway of America's East Coast, will proclaim that Richmond is no longer the Capital of the Confederacy, but a Capital of Truth and Reconciliation.
The National Slavery Museum will be adjacent to the Main Street Station, located in a campus dedicated to Enslaved African Americans, including a Memorial Park and the African Burial Grounds. The city has already received plans and drawings for the National Slavery Museum, and a full preliminary study, including an award-winning design, prepared by the Smith Group, designers of the Museum of African American History on the Mall in Washington. The Smith Group is currently working out the relationship of the Museum to the flood plain of Shockoe Valley. When that is complete, the consultants will work with the City's new National Slavery Museum Foundation to complete the Museum plan, including full financial feasibility/economic impact, operations planning, and fund-raising.

Response: Out of scope. This narrative would be better included as part of the Shockoe Small Area Plan.

- 8.m **Council Requested Amendment:** Very surprised to see a new I-95 interchange with Bellemeade Road and bridge across the James River to Henrico County in the area of Tree Hill Farm proposed on the map in the Draft Plan, with no text on it at all. This significant potential project received little to no attention in presentations. A bit of text was added to the Final Plan but this significant concept was not adequately vetted. The interchange may be OK, but the proposed new bridge in particular is problematic – they raise multiple community, land use, and environmental issues (such as the impact on truck traffic on South Side and adverse impacts on the historic Route 5 corridor). Suggest that references to the new interchange be deleted (Delete Item 18 from Figure 15, p. 79, the text on Item 18 on page 80, and the New Bridge in Figure 30, p 127).

Response: Fundamental change. While the Future Connections Map promotes a variety of multi-modal transportation improvements, continued investment and improvement of the city's and the region's highways and roads cannot be discounted. The conceptual bridge across the James River could provide commuters (whether by car, bus, bike, etc.) living in eastern Henrico with easy access to I-95 and into the city, as opposed to further exacerbating the congestion along Route 5 and E. Main Street.

- 8.n **Council Requested Amendment:** Significant changes were made between the draft and final plan to the Future Land Use Map for Shockoe Bottom and Riverfront, impacting things like maximum height limits. And it is not clear how the Master Plan fits with the Shockoe Small Area Plan that is under development and the proposed Shockoe Bottom Memorial Park. Very concerned developers may seek rezoning and proceed under Richmond300 (which lacks maximum height limits and detailed commitments to the memorial park) before the Small Area Plan can be adopted. At the very least, would recommend a targeted amendment to the Future Land Use Map (Figure 11, p. 53, and Figure 18, p. 85) to make it clear that the Future Land Use map will be amended in accordance with the Shockoe Small Area Plan and amend bullets on pages 32 and 189 to make it clear that rezoning in the Shockoe area will be in alignment with the Shockoe Small Area Plan.

Response: Already in the plan. The "Primary Next Steps" for the Downtown-Shockoe Node already states, "Implement the recommendations in the Shockoe Small Area Plan, some of which include: Complete and adopt the Shockoe Small Area Plan (which is under development), as an element of Richmond 300" (p. 32).

- 8.o **Council Requested Amendment:** Inclusionary zoning: The City should encourage use of its density bonus program in neighborhoods to increase the supply of affordable housing in new market rate multifamily developments. Additionally, we need to protect the public housing that exists and not continue mass evictions, given the unstable nature of our world in the global pandemic, in order to create enough vacancy to demolish the projects for private sector mixed income units that have significantly less oversight.

Response: Out of scope. The City administration is currently rewriting the Affordable Density Bonus Program in order to make it more effective at providing affordable housing units. There are many such strategies in the Inclusive Housing section of the plan.

- 8.p **Council Requested Amendment:** Strengthening mass transit: As the transportation sector accounts for almost half of our carbon emissions in the Commonwealth, it is important that Richmond lead the way on a robust mass transit system in order to reduce the dependency on single occupancy vehicles, thereby mitigating climate change.

Response: Already in the plan. There are many such strategies in the Equitable Transportation section of the plan.

- 8.q **Council Requested Amendment:** State explicitly that Oregon Hill should retain its current R-7 residential zoning. This is intended to convey Oregon Hill's desire to retain its R-7 zoning because Neighborhood Mixed Use does not reflect the actual conditions found in Oregon Hill.

Response: **Out of scope.** The plan does not make zoning recommendations, either explicitly or in the Future Land Use map.

- 8.r Council Requested Amendment: Future Land Use- the proposed future land use continue the 30%-40% historic land use patterns for single family homes on large lots. For the City to grow, increased land mix-use provides the best option of high quality community places, increased population growth with a mix of housing choices, with less car dependency, increased businesses and job growth and enhance the per capita to attract quality neighborhood with food and finance anchors. The following amendments increase neighborhood mix-use, destination mix-use, adds institutional in the industrial future land use, and enhances corridor mixed-use.
- Response: **Out of scope.** The Future Land Use map is reflective of existing conditions, and most single-family neighborhoods do not want multi-family developments, though there are ways of adding housing units to these neighborhoods. The “Residential” Future Land Use categories lists “Single-family houses” and “Accessory Dwelling Units” as Primary Uses, and “Duplexes and small multi-family buildings (typically 3-10 units)” as Secondary Uses.



DEPARTMENT OF
**PLANNING AND
DEVELOPMENT
REVIEW**

2017

RVA CLEAN WATER PLAN

Prepared for The City of Richmond's Department of Public Utilities



CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



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RVA Clean Water Plan

September 2017

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Appendices

Appendix A – RVA Clean Water Plan Modeling Report

Appendix B – Strategy Fact Sheets

Appendix C – Goals, objectives, and metrics

Appendix D – Excel-based strategy calculator tool

Appendix E – Strategy cost estimation information



Acronyms

CBP – Chesapeake Bay Program
CFU – coliform forming units
CPMI – Coastal Plain macroinvertebrate index
CSO – combined sewer overflow
CSS – combined sewer system
CWA – Clean Water Act
DPU – Department of Public Utilities
EFDC - Environmental Fluid Dynamics Code
EPA – Environmental Protection Agency
GI – green infrastructure
GIS – geographic information system
LA – load allocation
LTCP – long term control plan
MGD – million gallons per day
MS4 – municipal separate storm sewer system
NPDES – national pollution discharge elimination system
PRCF - Parks, Recreation, and Community Facilities
SSO – sanitary sewer overflow
STV – statistical threshold value
SWMM – stormwater management model
TN – total Nitrogen
TP – total Phosphorus
TSS – total suspended solids
TMDL – total maximum daily load
UAA – use attainability analysis
USGS – United States Geological Service
VDCR – Virginia Department of Conservation and Recreation
VDEQ – Virginia Department of Environmental Quality
VSCI – Virginia Stream Condition Index
VPDES – Virginia Pollutant Discharge Elimination System
WWTP – wastewater treatment plant



Executive Summary

The City of Richmond's Department of Public Utilities (DPU) manages five utilities, three of which address water and potentially influence local water resources: wastewater, stormwater, and drinking water. The wastewater utility operates the wastewater treatment plant (WWTP), which discharges treated effluent to the James River, a sanitary sewer and combined sewer collection system, pumping stations, the Hampton-McCloy Tunnel, and the Shockoe Retention Basin. The stormwater utility manages the stormwater that runs off impervious surfaces through underground storm sewer systems and open channels into the James River and its tributaries. Approximately two-thirds of the City of Richmond is served by a municipal separate storm sewer system (MS4). The drinking water utility manages the treatment plant and distribution system of water mains, pumping stations, and storage facilities that provide water to more than 500,000 customers in the city and surrounding area using water from the James River.

Historically, the three utilities were managed independently of one another, primarily driven by the fact the regulatory agencies implemented the regulations and permit requirements independently. This approach forced the City to make decisions related to compliance for each utility without being able to consider the interrelated impacts, especially on local waterways. Integration of all of the separate programs into a coordinated approach would eliminate redundant activities, be more efficient and effective addressing wet weather impacts, and improve water resources overall. USEPA has put a significant amount of effort in recent years into describing and publicizing holistic or integrated processes to protect water quality. Richmond has applied EPA's concepts to form a framework, documented in this Richmond, Virginia (RVA) Clean Water Plan, that allows the City to efficiently evaluate, manage, and implement water quality programs, work toward their goals and objectives, and culminate in a single, integrated VPDES permit that encompasses the City's wastewater, CSO, and stormwater discharges.

The James River and its tributaries drain a watershed of over 10,000 square miles. Within the City of Richmond, the James River flows for 24 miles, providing a substantial amount of waterfront. Major features in the river include Boshers' Dam, which is located just upstream of the City along the James River, and smaller dams, levees, and pipe crossings within the City. Just downstream of the City is the Presquile Wildlife Refuge, home to several species of birds and anadromous fish, including the endangered Atlantic sturgeon.

The focus of the RVA Clean Water Plan is on the portion of the James River watershed within the City's municipal boundary and on restoring and protecting the waterways in this watershed. This watershed-wide, water quality-based strategy allows the City to develop an effective and affordable management plan while also meeting regulatory requirements, and demonstrating to the public that the plan protects and improves the watershed and waterways. Richmond's Clean Water Plan includes six elements¹, which summarized here and discussed in more detail in this document.

¹ (1)Stakeholder Involvement; (2) Watershed Characterization; (3) Strategy Identification, Evaluation and Selection; (4) Program Implementation; (5) Progress Measurement; and (6) Adaptive Management



Stakeholder Involvement

Stakeholders can represent many different groups with an interest in the watershed, including, for example, advocates for wildlife and habitat protection; boaters; residential, commercial and business interests; and environmental justice groups. The City has incorporated stakeholder involvement throughout the entire planning process to help ensure stakeholders understood the process from the outset and were part of decision-making efforts throughout the development of the plan. The City's Watershed Characterization Report includes additional discussion of the various stakeholders that have been invited to participate and/or are participating within this planning process.

The City created and initiated RVAH2O (RVAH2O.org), the name representing a citywide effort to arrive at "Cleaner Water Faster", to disseminate outreach information and facilitate communication with stakeholders. Beginning with an initial meeting in November 2014, the City has held technical meetings every 2-3 months. The City also initiated a public outreach effort, including several open houses, to lay a foundation of understanding before laddering up to the more technical conversation around watershed integration. The City's Public Outreach Plan, which includes online and offline communication strategies, has a goal of reaching 20% of the City's population in the MS4 area by 2018. Progress towards this and other goals are being measured by tracking RVAH2O Facebook and Twitter traffic, email campaign, and flier distributions.

Watershed Characterization

Understanding existing water quality, along with the sources of pollutants or stressors that impact the City's waterbodies, are key elements for developing priority actions to address existing or potential problems and developing an effective integrated plan. Collection of data and characterization of the City's watersheds were the City's first steps towards development of the Clean Water Plan. Another key step towards was the development of a water quantity and quality modeling framework, that incorporates models for the CSO areas, the non-CSO areas (including Richmond's MS4 area), and for the James River itself. The purpose of the modeling framework was to quantify present day bacteria (*E. coli*) concentrations in the James River and to predict future bacteria concentrations under the Clean Water Plan strategies.

Watershed Data and Features

The western and very northern portions of the City have experienced the least amount of hydrologic modification and possess the lowest intensely developed land use and most forested land cover. These more western areas also correspond with areas with higher soil infiltrative capacity. Alternatively, the eastern portion of the City corresponds with a higher intensity of developed land and industrial land use corridor as well as the City's urban core. Consequently, this area also corresponds to soils that are considered urban and tend to have less infiltration capacity and possesses a topography that includes some considerably steep slopes.

The James River and several of its tributaries [(Almond Creek, Falling Creek, Goode Creek, Powhite Creek, Reedy Creek, Bernards Creek, and Gillies Creek and Upham Brook (which is a tributary to the Chickahominy River and ultimately the James River))] have all been listed as impaired due to *E. coli* levels. The sources of bacteria in these streams within the City limits include CSOs, the MS4, the WWTP, direct



discharge of urban runoff, and wildlife. Upstream sources also impact water quality in the City. Upstream sources include livestock, land application of manure, malfunctioning septic systems, illicit discharge of residential waste, other permitted waste treatment facilities. Reducing bacteria levels in these streams is consistent with the City's goal to provide safe recreational opportunities in the river.

The number of available water quality samples are biased heavily towards the James River, with little-to-no data available in tributary streams. Additionally, there is a lack of hydraulic data within the City, with the only local USGS gauges located outside the City limits. Biological samples and habitat assessments are also limited.

Water Quality Modeling

Water quantity and quality modeling was conducted to allow for longer and continuous periods to be evaluated relative to the water quality monitoring program. The purpose of the modeling framework is to quantify present day bacteria (*E. coli*) loads and concentrations in the James River and to predict future bacteria loads and concentrations under the Clean Water Plan strategies. The modeling framework also allowed for the quantification of discharge flows and volumes, as well as the occurrence of CSO events.

Three models were used to achieve the modeling objectives and include:

- A watershed model, created using EPA's Stormwater Management Model (SWMM), to simulate flow and bacteria loads from contributing areas of tributaries to the James River within the greater Richmond area, as well as from Richmond's Municipal Separate Storm Sewer System (MS4), but excluding the combined sewer system.
- A collection system model, created using EPA's SWMM framework, to simulate flow and bacteria loads from the combined sewer system (CSS).
- A receiving water quality model, created using EPA's Environmental Fluid Dynamics Code (EFDC) model, which computes bacteria concentrations in the James River resulting from the various sources of bacteria to the river. The outputs of the watershed and CSS models are used as inputs to the receiving water quality model.

After the water quality modeling tools were developed and calibrated, they were jointly applied to assess water quality benefits associated with the selected strategies (described further below). Under current conditions, the model results illustrate that the James River is in violation of both the geometric mean and the statistical threshold value water quality standard criteria for some months out of the three year model simulation period, and the primary cause of a water quality criteria violation can sometimes be linked to Richmond's combined sewer overflows, while at other times it is due to upstream sources coming in from outside of the City. Background (mainly wildlife) and stormwater sources play a smaller overall role in the bacteria water quality violations. The WWTP does not contribute significantly to bacteria water quality violations.



Strategy Identification, Evaluation & Selection

Goals and Objectives Selection

The City implemented a multi-step process with stakeholders to form consolidated lists of overarching goals, refined goals, and objectives. Although a number of opinions and viewpoints were represented through the stakeholder process, ultimately, stakeholders achieved consensus on the overarching goal, refined goals, and objectives.

Weighting was incorporated into this process to reflect the priorities of the City and its stakeholders. This weighting process not only allowed for an understanding of how one goal or objective ranked in relation to another, it also provided information on the extent of the importance of these priorities to one another. The result of this process was a prioritization of refined goals as well as a prioritization of objectives associated with each of these goals.

The goals, objectives, and respective weights are summarized in Table ES.1.

Table ES.1 Clean Water Plan goals and objectives with associated weights

Goals (with weights)	Objectives	Weights
19%: Manage wastewater and stormwater to improve the water quality and water quantity of ground water and surface water.	Develop one stormwater management plan to cover the City's four watershed groupings based on the City's watershed characterization report.	19%
	Reduce nitrogen, phosphorus, and sediment in discharges to achieve VPDES permit requirements (Chesapeake Bay TMDL).	18%
	Reduce bacteria levels to achieve VPDES permit requirements (local TMDL and water quality standards).	18%
	Reduce toxics (e.g., mercury, PAHs, PCBs), trash and other pollutants and address TMDLs for these pollutants.	17%
	Develop green infrastructure, including riparian buffers, and removal of impervious surfaces on development, existing development, and redevelopment.	27%
15%: Protect and restore aquatic and terrestrial habitats to support balanced indigenous ² communities	Restore streams to improve, restore, and enhance native ecological communities.	25%
	Identify, protect, and restore critical habitats.	36%
	Enhance aquatic and terrestrial habitat connectivity.	23%
	Investigate, and where feasible, promote actions that might surpass regulatory requirements.	16%
14%: Engage and educate the public to share responsibility and take action on achieving healthy watersheds.	Engage and efficiently educate the public about standards, processes, and actions associated with watershed health and public health.	25%
	Assist in the education of citizens about overall water quality issues, benefits of improved water quality.	30%
	Support and encourage local action to improve water quality.	24%
	Provide quicker public notifications of spills or pollution from regulators or other "river watchers"	21%
12%: Implement land	Protect, restore, and increase riparian buffers	21%

² The language included here was crafted based on Technical Stakeholder discussion and a resulting consensus process. For clarification, however, this refers to balanced indigenous ecological communities.



conservation and restoration and incorporate these into planning practices to improve water quality.	Reduce impervious surfaces	19%
	Increase natural land cover with a focus on preserving, maintaining, and increasing tree canopy.	24%
	Incorporate green infrastructure in new development and redevelopment	18%
	Conserve lands where possible and consistent with Richmond's Comprehensive Plan	18%
11%: Create partnerships across the watersheds internal and external to the City of Richmond to maximize benefits and minimize impacts to all stakeholders	Develop and implement a source water prevention plan/strategy	33%
	Establish public-private partnerships to secure funding, implement strategies and projects, and to achieve plan goals.	40%
	Maintain and expand the RVAH20 group.	27%
10%: Maximize water availability through efficient management of potable, storm, and wastewater.	Reduce use of potable water for industry and irrigation.	39%
	Achieve water conservation by improving the existing water conveyance system.	30%
	Achieve water conservation by incentivizing upgrades to end-user water fixtures where appropriate.	31%
9%: Provide safe, accessible, and ecologically sustainable water-related recreational opportunities for all.	Improve water quality to promote safe recreation consistent with the City's Riverfront Plan.	36%
	Promote ecologically sustainable management of riverfront and riparian areas.	40%
	Improve river and waterfront access for recreation.	24%
9%: Work collaboratively to gather consistent high-quality data to characterize the status and trends of water resources and to gauge the effectiveness of restoration efforts.	Conduct water quality and biological monitoring	28%
	Provide timely water quality information.	19%
	Collaborate with citizens and local/state agencies for coordinated monitoring.	23%
	Utilize results to target restoration efforts and convey progress.	30%

Strategy Identification

The next step in this process was the identification of strategies that can be expected to achieve the previously identified goals and objectives. Strategies were defined as activities, actions, or items that will help meet goals and objectives.

The first step in brainstorming potential strategies included a workshop for DPU staff involved in stormwater, wastewater, and CSO-related projects. Because the Clean Water Plan would be implemented during the next VPDES permit cycle (2018 - 2023), staff compiled a list of projects that had been identified or proposed to meet various programmatic needs and could be implemented over that period. Because many of these projects impact small-scale areas, these City projects were "rolled up" to a strategy scale where necessary.

In addition to these DPU projects, stakeholders were also asked to submit suggestions for strategies that they felt would achieve the agreed upon goals and objectives. The Clean Water Plan development team created a synthesized set of draft strategies that consolidated ideas put forth by both stakeholders and DPU staff.



Once the draft set of strategies was identified, it was important to determine if these strategies were feasible. Because DPU is ultimately responsible for implementation of this program, the feasibility of strategies was defined as efforts that DPU has the authority to implement.

Final draft strategies and supporting actions were presented to stakeholders who were given the opportunity to edit them further. Supporting actions include efforts that may broaden the main strategy, add specificity on how a strategy could be implemented, or identify additional resources and data needs to fully implement the main strategy. Each of the strategies referenced in the remainder of the Clean Water Plan are considered to be “feasible” and agreed upon by the Technical Stakeholder group (Table ES.2).

Table ES.2. Strategies and associated details

Strategy	Strategy Details
Riparian Areas	Replace or restore 10 acres of riparian buffers according to state guidance. <ul style="list-style-type: none"> • In MS4 and/or CSS area • Evaluate opportunities for inclusion of access points to waterbody for recreational activities
Green Infrastructure in MS4	Install or retrofit GI draining 104 acres of impervious surfaces, including efforts such as: <ul style="list-style-type: none"> • 30 acres on DPU property • 18 acres on City-owned vacant properties • 20 acres on Parks department property (one playground/park per year, cemetery roadways, impervious to pervious area in park properties, vacant properties) • Install 100 trees in tree boxes (e.g., Filtera-type practices); 30 acres total drained to this practice • Retrofit 4 DPU stormwater BMPs (e.g., dry ponds to more efficient BMPs), draining at least 6 acres of impervious surface
Green Infrastructure in CSS	Install or retrofit GI draining 18 acres of impervious surfaces, including efforts such as: <ul style="list-style-type: none"> • 6 acres on DPU property • 2 acres on City-owned vacant properties • 2 acres on Parks department property (one playground/park per year, cemetery roadways, impervious to pervious area in park properties, vacant properties) • Install 24 trees in tree boxes (e.g., Filtera-type practices); 8 acres total drained to this practice
Stream Restoration	Restore 2,500 linear feet of stream: <ul style="list-style-type: none"> • Through removal of concrete channels, repair of incised banks, etc. • In MS4 and/or CSS area • Evaluate opportunities for inclusion of access points to waterbody for recreational activities
Natives/Invasives	Use 80% native plants in new landscaping at public facilities by 2023.
Trees	<ul style="list-style-type: none"> • Increase tree canopy on City property by 5% (80 acres added) • Protect existing tree canopy by following maintenance addressed in the Tree Planting Master Plan
Land Conservation	Place an additional 10 acres under conservation easement, prioritizing conservation of land that creates connected green corridors. <ul style="list-style-type: none"> • Evaluate opportunities for inclusion of access points to waterbody for recreational



	activities
Water Conservation	<p>Reduce water consumption by 10% through implementation of new water conservation technologies and promotion of water conservation efforts, including:</p> <ul style="list-style-type: none"> • Installing water-efficient fixtures as a policy by 2023 in all new public facility construction • Implementing incentive programs • Encouraging water conservation on City properties
Pollution Identification and Reduction	<p>Reduce contribution of pollutants to the MS4 through:</p> <ul style="list-style-type: none"> • Conducting at least one special study per year in hot spot areas to identify illicit discharges/connections. (Studies will meet the criteria necessary to achieve Bay TMDL pollutant reduction requirements. Assume that, over five years, three of these studies will result in pollutant reductions that meet Bay TMDL requirements.) • Collecting data associated with non-structural BMPs to facilitate quantification of pollutant reduction (e.g., storm drain clean-outs, pet waste stations, street sweeping)
CSS Infrastructure	<p>LTCP projects, including:</p> <ul style="list-style-type: none"> • Installing wet weather interceptor to convey more flow to the WWTP • Increasing WWT to 300 MGD at the treatment plant • Expanding secondary treatment at the WWTP to 85 MGD • Expanding Shockoe retention basin by 15 MG to capture more overflow • Disinfecting overflow at Shockoe retention basin (wet weather disinfection facility) <p><i>Note that the modeling framework will be applied during the summer and fall of 2017 to evaluate alternative CSS reduction projects that may provide similar benefits to the LTCP projects, but at a reduced cost.</i></p>

Strategy Evaluation

Once strategies were drafted, an analysis was needed to determine which ones would be best for implementation. There are multiple factors at play that influence the selection of strategies. A strategy may do well with one factor, such as permit-related pollutant reductions, but not so well with others, like cost. As a result, the analysis of the various factors did not result in a clear and decisive outcome of one strategy that performed the best across all factors. What the strategy evaluation did determine was that all of the “pieces of the puzzle” needed to be evaluated collectively to achieve a complete picture of how well strategies achieve specific goals (Figure ES.1).



Figure ES.1. Puzzle piece conceptual model demonstrating how various factors fit together to inform the decision making process



An Excel-based strategy scoring calculator was developed to compare the various strategies proposed through this stakeholder process. This tool helped in the decision-making process by allowing the City and stakeholders to evaluate various alternatives by assigning scores to the alternative strategies.

The methodology used for this scoring calculator is a multi-objective decision analysis (MODA). A set of metrics was developed that includes a method of measurement. At least one metric was identified for each objective.

Multiple “puzzle pieces”, or factors, were taken into consideration in the analysis of strategies (Figure ES.1). The **Permit** puzzle piece represents the VPDES permit-related requirements that establish pollutant reduction targets by which the strategies were compared.

The **Strategy Score** “puzzle piece” involved using the calculator tool to evaluate strategy scores in several different ways. These analyses included evaluating:

- Permit-related metrics – metrics that related to total Nitrogen (TN), total Phosphorus (TP), total suspended solids (TSS) and bacteria were isolated in the calculator and scores associated with just these metrics were used to evaluate the effectiveness of strategies in reducing these pollutants of concern
- “Standardization” of strategies addressing permit-related metrics – strategies, which varied in size, were all standardized to 10 acres to compare these permit-related metrics in an “apples to apples” manner
- All metrics – including the full set of metrics associated with all of the objectives in addition to the pollutant-related metrics
- “Standardization” of all metrics – comparing how the same sized strategies (all 10 acres) address all metrics

The calculator tool was also tied to the **Strategy Cost** information. Metrics specific to pollutant reductions (e.g., pounds of pollutant removed by a strategy) were used to calculate **Cost Effectiveness**. Overall, strategy costs were then evaluated in association with **Affordability**.

Another puzzle piece, **Modeling Results**, provided the bacteria reductions associated with several strategies that were used as raw score inputs into the calculator. Modeling results also provided information pertaining to the relative nature of bacteria sources to the James River and tributaries.

After taking the evaluation process through the “Standardization of all metrics”, the following top-ranked strategies resulted:

1. Riparian Area Restoration
2. Stream Restoration
3. Green Infrastructure in the CSS area
4. Green Infrastructure in the MS4

The various “pieces of the puzzle” were used to understand how to best prioritize activities for implementation. What these analyses have shown is that no one strategy consistently scores the highest or performed the best across the analyses, however, several strategies consistently performed well (a summary of the analyses are included in Table ES.3; green highlighted information depicts those that consistently score highest).



Table ES.3. Summary of Strategy Analysis and Strategy Prioritization

Rank	Pollutants of Concern Metrics	Pollutants of Concern Metrics: Standardized*	All Metrics	All Metrics: Standardized*	Cost Effectiveness (TN)	Cost Effectiveness (TP)	Cost Effectiveness (TSS)	Cost Effectiveness (bacteria)
1	CSO Infrastructure	Stream restoration	GI in MS4	Riparian	Stream restoration	Stream restoration	Stream restoration	CSO Infrastructure
2	Stream restoration	GI in CSS	Riparian	Stream restoration	Water conservation	Pollution ID and reduction	Pollution ID & reduction	GI in CSS
3	Pollution ID & reduction	GI in MS4	Stream restoration	GI in the CSS	GI in MS4	GI in MS4	GI in MS4	GI in MS4
4	GI in MS4	Riparian	CSO Infrastructure	GI in MS4	GI in CSS	GI in CSS	GI in CSS	Riparian
5	GI in CSS	Water conservation	Water Conservation	Water Conservation	Pollution Identification	Water conservation	Water conservation	
6	Riparian	Trees	Trees	Land Conservation	CSO Infrastructure	Riparian areas	Riparian areas	
7	Trees	Pollution ID & reduction	Natives/ invasives	Natives/ invasives	Riparian	CSO Infrastructure	CSO Infrastructure	
8	Water Conservation	Natives / invasives	Land Conservation	Trees	Trees	Trees	Trees	
9	Natives/ invasives	Land Conservation	GI in the CSS	Pollution Identification				
10	Land Conservation		Pollution ID and reduction					

*WWTP/CSO strategy cannot be evaluated on a 10-acre basis so it is not included herein

To allow for the consideration of multiple factors in determining priorities, it was determined that rather than ranking 10 strategies individually, that strategies would be grouped into one of three tiers based on effectiveness (Figure ES.2). Tier 1 includes those strategies that best address metrics associated with the pollutants of concern (total Nitrogen, TN; total Phosphorus, TP; total suspended solids, TSS; bacteria) as well as the non-pollutant related metrics. These strategies were also the most cost effective. Tier 2 also addressed pollutant and non-pollutant related metrics, but not as efficiently or cost effectively as those in the Tier 1 grouping. Tier 3 are those strategies that do not address the pollutants of concern.



Figure ES.2. Organization of strategies into tiers for prioritization

It is important to note that while select strategies may be *prioritized*, it does not mean that the remaining strategies will be disregarded. Implementation of these strategies will be assessed based on additional resources available to DPU or priorities and resources available from other City departments or other partners.

It is also important to note that this analysis was done at a high level. As DPU moves toward implementation and conducts a more refined evaluation of strategies, there may be modifications to this prioritization.

Program Implementation

An important part of this RVA Clean Water Plan is developing an approach that can help the City implement these strategies in the most efficient and cost effective manner possible. DPU will use a “Framework Planning” approach. The Framework Planning approach provides a methodology that ties together different strategies (and, subsequently, site-specific projects) and, where possible, aligns these strategies with other City or stakeholder-driven initiatives. The goal of the Framework Planning Approach is to identify and sequence a blend of activities that yield the greatest environmental benefit (as measured by identified metrics) in the most cost-effective (and affordable) manner. The Framework Planning approach includes the following elements:

- 1) Data and information gathering
- 2) Identification of potential opportunities

- 3) Prioritization
- 4) Plan development
- 5) Implementation

There are several important concepts that will be taken into account through implementation. For instance, it is envisioned that implementation will occur incrementally over the course of the permit cycle (e.g., 10 acres of riparian buffers will not necessarily be restored all at once or within only one project, but may be addressed through the implementation of several projects/project clusters). Flexibility is incorporated into implementation through adaptive management. If it is found that one strategy cannot be implemented in whole or in part, DPU will work to identify an alternative approach to achieving the same or similar pollutant reductions and other identified goals and objectives.

Implementation of projects, particularly those that involve stakeholders or other City departments, will require significant coordination. In addition to regular Technical Stakeholder meetings to provide updates on progress, DPU will convene a workgroup of those organizations involved in these implementation efforts. As projects are implemented, associated benefits (pollutant reductions, area treated, other metrics addressed) will be tracked as well.

Progress Measurement

As the City's implementation moves forward, measuring progress will include determining if goals have been met, if progress has been deemed sufficient, or if changes should be made within the program to try to improve the level of progress made. Measuring progress; however, can be complex. Targets may be established at various scales (i.e., site scale, sub-watershed, watershed, city scale). Implementation actions can also include a wide range of options including structural and non-structural practices as well as practices that address various source sectors (i.e., stormwater, wastewater, non-point sources). As a result, the approach used for measuring progress under the City's program must be flexible enough to account for these variations in scale and options that will be employed to mitigate pollutants and meet the City's goals.

Measuring progress will be done in a holistic manner based on data from the City's monitoring programs, modeling efforts, and other programmatic information (e.g., implementation targets, such as miles of stream buffers restored per year or number of residents reached by outreach efforts). Each element of this process to evaluate Clean Water Plan progress will occur on a regular/annual basis over the course of the permit. Each of these elements is outlined in Table ES.4.



Table ES.4. Monitoring activities and associated outcomes implemented under the Clean Water Plan

Activities		Outcomes
Water Quality Monitoring	Instream water quality, biological (e.g., macroinvertebrates), CSO and WWTP discharge monitoring	Progress made toward pollutant reduction targets in permit
		Progress toward achieving WQS (e.g., measure improvement in aquatic life designated use)
		Identify sources, stressors, or pollutants of concern
		Identify trends over time
	BMP monitoring	Effectiveness of specific BMPs or source reduction efforts
		Progress toward achieving WQS (e.g., measure improvement in aquatic life designated use)
Programmatic Monitoring	Tracking strategy implementation	Progress made toward strategy implementation goals (e.g., acres of green infrastructure implemented)
		Progress made in pollutant reduction through strategy implementation (e.g., pounds of TN reduced through green infrastructure implemented)
		Progress made toward pollutant reduction targets identified in permit
Modeling	Receiving water, CSS, and watershed modeling and analysis	Progress made in bacteria WQS compliance
		Progress made in bacteria load reduction
		Progress made in reduction of CSO events or volume discharged

Next Steps

The RVA Clean Water Plan has resulted in a comprehensive understanding of the City's watersheds and associated water resources. The next step is to use the Clean Water Plan to develop a watershed-based VPDES permit. Watershed-based permitting has been long supported by EPA and allows multiple pollutant sources to be managed under one permit. For Richmond, these pollutant sources are CSO, wastewater, and stormwater via the MS4 and direct drainage. The Clean Water Plan provides the planning framework and strategies to manage these sources and prioritize control projects based on their improvements to local waterways. Therefore, the Clean Water Plan will be included in the VPDES permit as a source of data and provide information to be included in the "Special Condition" section related to best management practices (BMPs) to be implemented and additional monitoring to be done



to track progress. The Clean Water Plan will also be included in the Permit Fact Sheet as an information source.

Once the watershed-based VPDES permit is issued to the City, next steps include implementing the projects and programs in the Clean Water Plan and conducting monitoring and modeling to measure progress towards the goals of the plan. The City will also continue to engage stakeholders to inform them of activities and associated progress towards the goals of the Plan, and solicit their input on Plan updates.

The Modeling Framework will continue to be used as needed to evaluate the water quality improvements related to the implementation of projects and strategies. Additionally, it is anticipated that the modeling framework will be applied during the summer and fall of 2017 to evaluate alternative CSS reduction projects that may provide similar benefits to the Long Term Control Plan (LTCP) projects, but at a reduced cost.



1. Background and Introduction

The City of Richmond's Department of Public Utilities (DPU) manages five utilities, three of which address water: wastewater, stormwater, and drinking water. As all three of these utilities can influence local water resources, such as the James River, each operates under regulations and permit requirements established to ensure protection of the environment and public health.

The Wastewater Utility was implemented to operate and maintain the wastewater treatment plant (WWTP), which discharges treated effluent to the James River (45 MGD dry weather flow and 75 MGD wet weather flow). The Utility also operates and maintains a sanitary sewer and combined sewer collection system, pumping stations, and the Hampton-McCloy Tunnel, storage capacity of 7.2 million gallons, and the Shockoe Retention Basin, a 50-million gallon reservoir used during heavy rains.

The Stormwater Utility is relatively new compared to the other utilities. It was implemented in July 2009 to manage the stormwater that runs off impervious surfaces. The Stormwater Utility also enhances public safety and health and protects property by improving the quality and decreasing the quantity of polluted stormwater runoff. Approximately two-thirds of the City of Richmond is served by a municipal separate storm sewer system (MS4). This mixture of underground storm sewer systems and open channels are separate from the sanitary sewer system.

The City of Richmond is one of the largest water producers in Virginia, with a modern plant that can treat up to 132 million gallons of water a day from the James River at the western edge of the City. The Drinking Water Utility manages the treatment plant and distribution system of water mains, pumping stations, and storage facilities that provide water to more than 200,000 customers in the city. The facility also provides water to the surrounding area through wholesale contracts with Henrico, Chesterfield, and Hanover counties. All total, this results in a facility that provides water for approximately 500,000 people.

Historically, the three utilities were managed independently of one another, primarily driven by the fact the regulations and permit requirements established by the regulatory agencies were also implemented independently. This approach forced the City to make decisions related to compliance for each utility without being able to consider the interrelated impacts. There is often overlap in these requirements and sometimes an action occurring under one regulatory program has a direct impact on another. For instance, separating a combined section of sewer leads to impacts on the separate sanitary sewer system and the storm sewer system. Integration of all of the separate programs into a coordinated approach is necessary to eliminate redundant activities and be more efficient and effective addressing wet weather impacts and improving water resources overall.

USEPA Integrated Planning Frameworks

USEPA has put a significant amount of effort in recent years into describing and publicizing its vision of management of these separate programs through the concepts of Integrated Planning (EPA 2011, EPA 2012a), Integrated Watershed Management (EPA 1996, EPA 2008), and Watershed-based Permitting



(EPA 2007, EPA 2003). An emphasis within each of these concepts involves providing an opportunity to examine different possible ways to look at protecting water quality given very limited resources at both the City and the state level. Often these limited resources must be used to manage and implement multiple and costly regulatory requirements, such as:

- Replacing/repairing aging infrastructure;
- Developing and implementing long-term control plans (LTCPs) for combined sewer overflows (CSOs);
- Developing and implementing capacity, management, operation and maintenance programs for sanitary sewer overflows (SSOs);
- Improving peak flow management at WWTPs;
- Addressing requirements to control nutrients and emerging contaminants at the WWTP;
- Managing stormwater to mitigate flooding;
- Developing and implementing MS4 pollution prevention plans;
- Investing in treatment technologies to comply with effluent limits based on total maximum daily loads (TMDLs); and,
- Complying with Safe Drinking Water Act and/or National Pollutant Elimination Discharge System (NPDES) requirements.

All of these issues are currently of importance to the City of Richmond, or will be over time. All of these activities or requirements are rarely coordinated or considered in a holistic manner. Without coordination among these competing demands, the City's constrained resources aren't likely to achieve the maximum benefit to the utility, the public, and the environment. Too often, the need for investment (especially for wet weather controls) greatly exceeds the City's financial capacity, even over a 20-year period. As a result, there is uncertainty in prioritizing investments, and with how to create a plan that progressively moves toward meeting clean water goals.

To address these issues, Richmond is using EPA's Integrated Watershed Management and Integrated Planning frameworks for planning purposes. Because both of these have a number of consistencies between them, these approaches have been combined and organized to form a framework that allows the City to efficiently evaluate, manage, and implement water quality programs and work toward their goals and objectives (see Figure 1.1). The endpoint of this overall effort is a single, integrated VPDES permit that encompasses DPU's wastewater, CSO, and stormwater discharges.



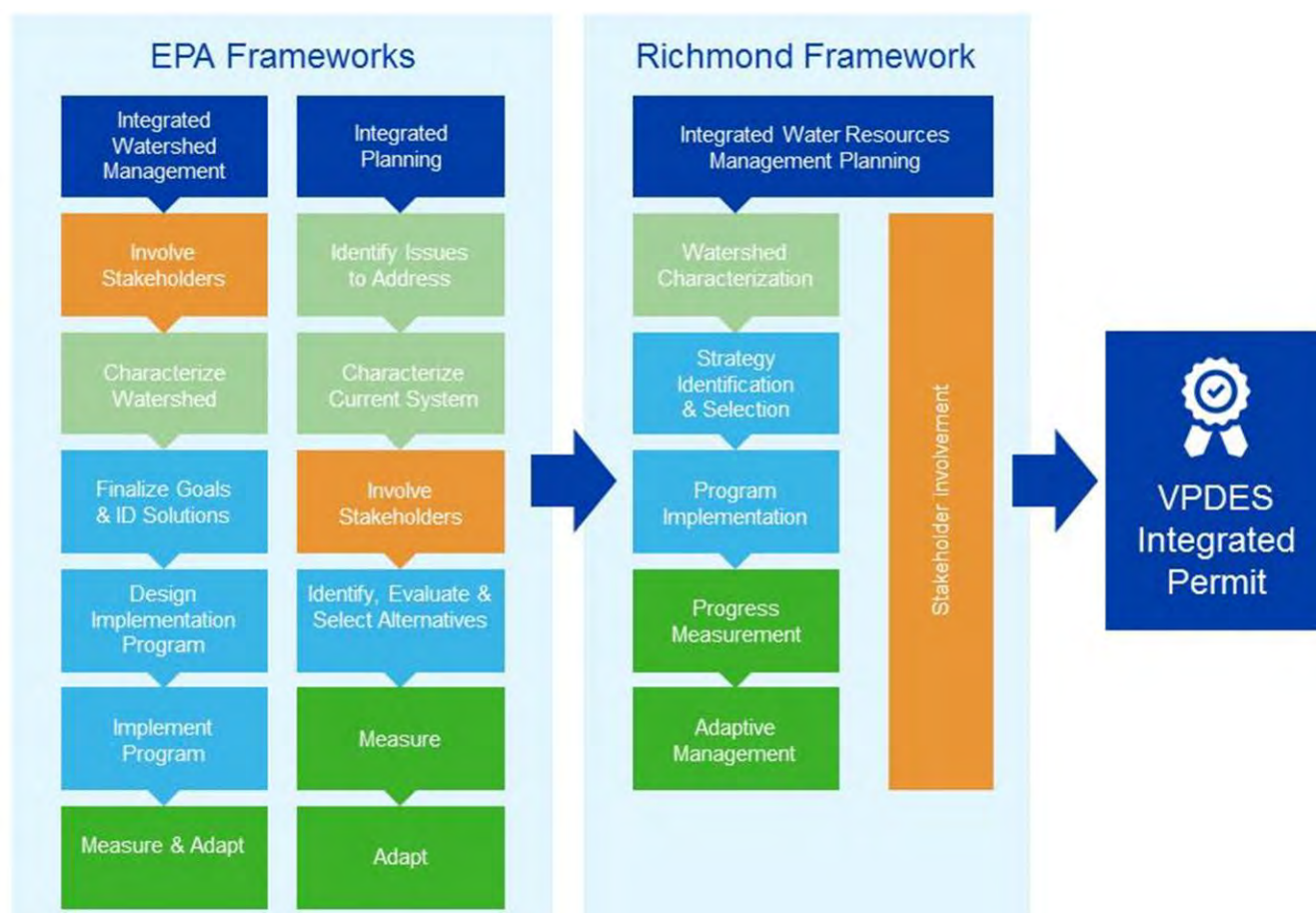


Figure 1.1 – Demonstration of the overlap in elements between EPA’s Integrated Watershed Management and Integrated Planning Approaches and how these elements have been merged to develop the framework for the Integrated Water Resources Management Plan where stakeholder involvement is a part of each step of the process.

Richmond’s Clean Water Plan Framework

Efforts to prioritize a community’s investments have traditionally tended to focus on meeting infrastructure-related goals, such as reduction in the number of CSOs. The focus of the RVA Clean Water Plan, however, is on the watershed and restoring and protecting the waterways in these watersheds. Given this focus, the Clean Water Plan is framed by water quality standards (WQS) and watershed goals rather than solely by municipal infrastructure project considerations. This watershed-wide, water quality-based strategy allows the City to develop an effective and affordable management plan while also meeting regulatory requirements and demonstrating to the public that the plan protects and improves the watershed and waterways. The integration includes the WWTP, CSO, and stormwater programs, and maintaining minimum in-stream flows. Richmond is also taking drinking water and source water protection into consideration to ensure a more comprehensive focus on overall watershed health.

The City’s Department of Public Utilities began the Clean Water Planning process in March of 2014 (see Figure 1.2), with the establishment of a Technical Stakeholder Group and related outreach plan. The effort continued in January, 2015 with a watershed characterization effort that culminated in the

development of a Watershed Characterization Report (Richmond DPU 2015). Work on the Clean Water Plan began in 2016, which will ultimately be used to inform the development of an integrated Virginia Pollutant Discharge Elimination System (VPDES) permit that collectively addresses DPU's discharge permit requirements. The permit application is due to VDEQ in January, 2018, with the Integrated VPDES permit expected to be reissued in June of 2018.

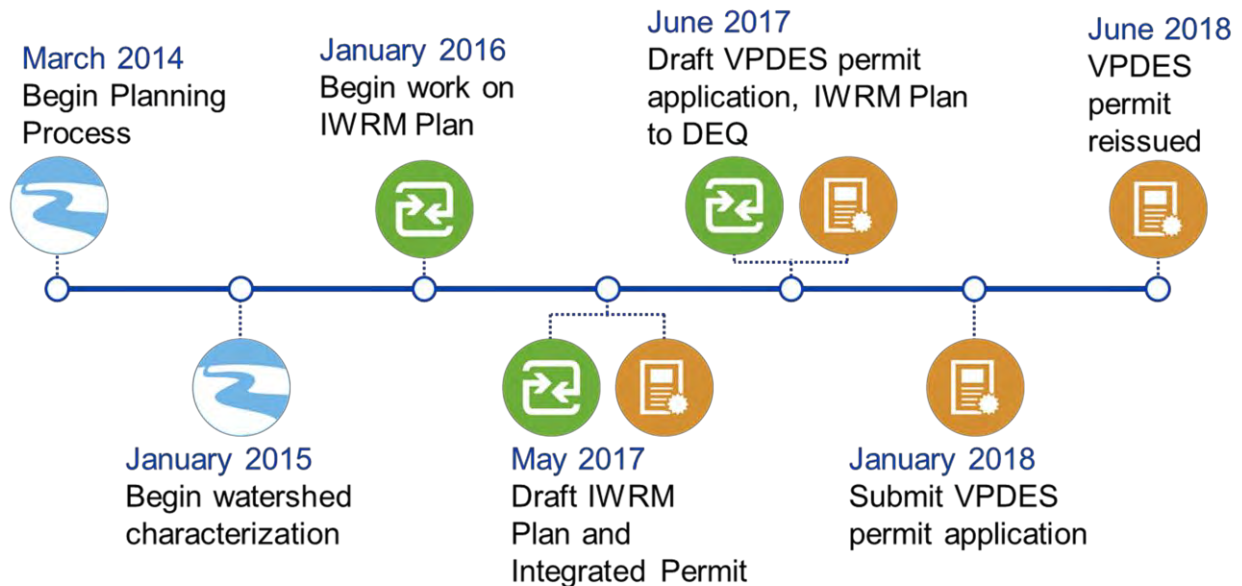


Figure 1.2– Richmond's schedule for the development of a Watershed Management Plan (WMP), Integrated Plan and Watershed-based Permit (WBP)

Richmond's Clean Water Plan includes six elements, which are summarized below and discussed in more detail in the subsequent sections of this document.

Stakeholder Involvement

DPU determined early on that community input and support would be key to the success of its Clean Water Plan as this support would facilitate development of an integrated VPDES permit as well as future implementation efforts. It was felt that this input and support could be gained by implementing a thoughtful, well-informed approach that demonstrates the Utility's commitment to improving the environment while continuing their good stewardship of their infrastructure assets and local water resources. Community support was especially important in considering priorities and options for improving and protecting the City's waters.

Watershed Characterization

The watershed characterization process within the Clean Water Plan provides the data needed to support this process. This includes data such as monitoring related to meeting receiving water standards and goals, and characterizing receiving water conditions and sources of pollutants throughout the watershed. Existing data are compiled and, if necessary, new data are collected to provide the data needed to complete the watershed characterization. Evaluating data from a watershed perspective

helps to facilitate a watershed-based approach to planning and, subsequently, implementation. Ongoing data collection will ensure the Clean Water Plan is up-to-date and accurate, and will facilitate future updates using an adaptive management approach. A beneficial outcome will be that data collected through watershed characterization efforts will serve multiple purposes. For instance the activities associated with the TMDL development and implementation will help determine appropriate targets for the Clean Water Plan.

Strategy Identification, Evaluation, and Selection

The data collected through the watershed characterization effort serves as the basis for helping to identify and quantify problems or issues of concern within the watersheds. This helped guide the selection of goals and objectives the City and its stakeholders identified for this process. As high-level strategies to meet these goals were identified, they were incorporated into an Excel-based strategy scoring calculator that included the weighting of these goals, associated objectives, and metrics by which these strategies were measured. Other factors, such as strategy costs, cost effectiveness, and watershed and water quality modeling results, were also used to prioritize strategies.

Program Implementation

After selection and prioritization of high-level strategies is completed, these high-level strategies (e.g., Green Infrastructure implementation in the MS4 area) will be translated into localized projects (e.g., two acres of bioretention and one acre of pervious pavement in a particular subwatershed). A “Framework Planning” approach is being used to strategically direct implementation in a way that aligns activities that yield the greatest environmental benefit in the most cost-effective manner.

Progress Measurement

Once projects and programs have been implemented, measuring progress will be accomplished through a three-pronged approach. This will include programmatic tracking, which will involve evaluating the progress made toward strategy implementation (e.g., acres or feet of implementation, etc.) as well as the pollutant reduction calculated through this implementation. The City will also conduct water quality monitoring to evaluate progress made toward pollutant reduction targets in the permit, progress made toward achieving WQS, and trends over time. Modeling will also be used to evaluate progress made toward bacteria-related WQS, bacteria load reductions, and reduction of CSO events or volume discharged. Progress will be reported annually through VPDES permit-related reporting.

Adaptive Management

Because the City, its waterbodies, regulatory drivers, and community needs are not static, City and stakeholder priorities may also change over time. The Clean Water Planning process incorporates flexibility to address these changing needs. This flexibility, or adaptive management, is an iterative, ongoing, learning process used to continually improve understanding of the City’s programs and practices by learning from their outcomes over time.

Adaptive management will be critical for the success of Richmond’s Clean Water Plan as new data collected through the course of this effort will be used to refine and modify the Plan so it is up-to-date and accurate.



2. Stakeholder Involvement

From the very beginning, the City knew stakeholder involvement would be a key component of developing and implementing an effective and successful integrated approach to the City's water resources management. While building partnerships is identified as one "Step" in both EPA's Integrated Watershed Management and Integrated Planning processes, the City has actually incorporated stakeholder involvement throughout the entire planning process to help ensure stakeholders understood the process from the very beginning and were part of decision-making efforts along the way. It also helped ensure that stakeholders had a voice to convey any concerns they may have or encourage sharing of data and information that could be helpful with planning, and subsequently, implementation efforts.

To aid in this communication effort as well as in the dissemination of outreach information, DPU created and initiated RVAH2O (RVAH2O.org). The name was formed from "RVA," which is popular shorthand for Richmond, Virginia, and "H2O," which is the chemical formula for water. Together, the name represents a citywide effort to arrive at "Cleaner Water Faster."

The RVAH2O.org website educates the community about ways to keep the City's waterways pollution-free and the importance of integrating drinking water, wastewater, and stormwater under one watershed management program. It is all water. The website is also used to share information conveyed during Technical Stakeholder and public meetings discussing the Clean Water Planning process. RVAH2O has also been expanded into a Facebook page and Twitter feed to reach a larger public audience. The logo and its clean water messages appear on billboards, bumper stickers, community meeting handouts, school bulletin boards, and on DPU booths and water stations at community events and water-related festivals.

A detailed discussion of each of the elements of the stakeholder involvement process is included below, as well as further detail surrounding public outreach.

Stakeholder Identification

Stakeholders can represent many different groups with an interest in the watershed, including, for example, advocates for wildlife and habitat protection; boaters; residential, commercial and business interests; and environmental justice groups. As discussed in the City's Watershed Characterization Report, an initial step in this process was the identification of groups or individuals that would be interested in being more involved in the City's water future and/or would potentially bring data, information, and insight to the table that could assist the City with reviewing the problems and looking at the relative contribution of all sources and stressors on the watershed.

The City reached out to a variety of stakeholders in and surrounding the City, including environmental advocates, recreational users of the James River, property owners, businesses, and state and local governmental agencies and representatives.



The initial stages of the stakeholder involvement process resulted in categorizing these participants into several groups based on expected technical knowledge and perceived level of interest and involvement. As a result, a Technical Workgroup was formed to provide technical insight and feedback on the Clean Water Planning process. This group included representatives of groups such as:

- Chesapeake Bay Foundation
- James River Association & Riverkeepers
- The Nature Conservancy
- Middle James Round Table
- Alliance for the Chesapeake Bay
- Virginia Department of Environmental Quality (VDEQ)
- Virginia Department of Health (VDH)
- City Department of Public Works (DPW)
- The Reedy Creek Coalition
- Fall of the James Scenic River Group
- James River Park System
- Virginia Commonwealth University (VCU)
- Richmond Regional Planning District Commission
- James River Outdoor Coalition
- Capital Region Land Conservancy
- Marine Resources Commission
- University of Richmond
- American Water
- Tree Stewards of Richmond
- The Counties of Hanover, Chesterfield & Henrico (reached through the Planning District Commission)

Additionally, a special interest and public stakeholder group was identified with participants anticipated to have a high level of involvement. This group included representatives of organizations such as:

- Friends of James River Park
- Sierra Club – Falls of the James Group
- Home Builders Association of Virginia
- Hispanic Chamber of Commerce
- Richmond City Council Districts
- Richmond Paddle Sports and other sports organizations

Participants in this special interest and public stakeholder group with an anticipated lower level of involvement included representatives from organizations such as:

- Richmond Audubon Society
- James River Advisory Committee
- Retail Merchants Associations
- Tenant, Civic and Neighborhood Associations

The City's Watershed Characterization Report includes additional discussion of the various stakeholders that have been invited to participate and/or are participating within this planning process.

Once stakeholders were identified, kick-off meetings were held in November 2014 to speak with the technical stakeholders and the special interest/non-technical stakeholder group. A meeting schedule was developed early on to ensure consistent communication with the technical stakeholders on a quarterly basis and with the special interest/public stakeholder group approximately every six months.



Technical Stakeholder Meetings

Since the initial meetings in November 2014, technical stakeholder meetings have been held regularly every two to three months and have accomplished several specific objectives including: identifying issues of concern, setting goals, developing indicators to track progress, and conducting public outreach. Information on the Technical Stakeholder meetings (including when and what information was discussed at each meeting) can be found on the RVAH2O.org website under meetings.

The activities of the Technical Stakeholder workgroup have included:

- Determining the overarching goal for the City of Richmond's watershed plan
- Identifying and weighting goals and multiple objectives and strategies
- Meeting bi-monthly to shape the plan's contents and discuss outstanding issues
- Forming partnership agreements that will aid in achieving cleaner water faster

The majority of technical stakeholders have found the meetings to be important opportunities to learn about and discuss watershed issues, and have expressed interest in continuing to meet regularly once the Plan and Permit are in place.

Public Meetings

At the outset of this initiative, a survey of the Richmond public was conducted to establish a baseline of knowledge about Richmond's water systems. It was determined that Richmond residents had limited knowledge about water sources, water quality and their role in helping to keep waterways clean and litter-free. Using RVAH2O as a platform, 2015 was the start of a public outreach effort to lay a foundation of understanding before laddering up to the more technical conversation around watershed integration.

First, a flier was created to illustrate how a household contributes to stormwater pollution. This was widely distributed at libraries, schools, neighborhood meetings, and public events.

Then, a series of posters were created to be put up around the City, each with a theme related to its location: 1) Pet waste poster mounted at dog parks and veterinary offices; 2) Automotive oil poster mounted at service stations and oil-changing stations; 3) Cigarette butt poster mounted at workplaces where people take smoking breaks, etc. In all, six themed posters were created.

An initial public meeting was held in October of 2014. This provided an opportunity for a high-level introduction to the City's regulatory requirements, what has been done to date to address water quality in the City, and the City's goals moving forward. On June 9, 2015, an open house was held at the Science Museum of Virginia to provide opportunity for the general public to be introduced to the City's Integrated Planning process (Figure 2.1). Five different stations were set up, each at which a different topic area was discussed. There were over 50 attendees recorded from the general public. Each station was staffed with members of the RVAH2O team or other DPU staff. This provided a one on one opportunity for the public to ask questions about each station including:

- The watersheds



- The stormwater, sanitary, and wastewater collection systems
- Stormwater issues
- The James River and associated creeks and streams
- Outreach and educational information

A station was also set up at which the public could sit down and anonymously submit questions and comments for the RVAH2O team.

In general, it was observed that attendees expressed knowing little about the river's needs coming in, but by the end, their post-it note comments and comment cards seemed to demonstrate that they had obtained a real grasp of the needs and concerns for water quality in Richmond.

This public open house was deemed a success and in the following year, August 2016 and September 2016, two more open houses were held in local parks (Figure 2.2). Attendance at the first 2016 event was 52; at the second, due to a storm, attendance was less than 10. However, this format for sharing information as the watershed program evolves will continue.

Conducting Public Outreach

While technical stakeholders have been involved during each step of the Clean Water Planning process, the City also recognized the need to conduct a wider public outreach effort related to the City's water resources. The RVAH2O initiative also aims to further educate and identify ways in which the community can be involved in clean water management. The benefits of the effort are two-fold: to help ensure a wider dissemination of information associated with the RVAH2O initiative (integrated water resources planning) as well as to conduct outreach and education related to the City's various water related programs.

Outreach and involvement in association with the Clean Water Planning process are also closely coordinated and consistent with other DPU and City communication programs. For instance, a plan for public outreach and communication will be incorporated as part of the monitoring plan, to achieve the objective of making the monitoring data (historical and current) available to the public. This plan includes a web-based component as well as other print media.



Figure 2.1. Flier advertising the June 9, 2015 community open house

Both online and offline communication strategies make up a Public Outreach Plan that builds awareness and encourages support for the goals of RVAH2O. This effort has also been designed to meet the requirement of the City's VPDES MS4 permit, which is to reach 20% of the City's population in the MS4 area by 2018.

DPU, using RVAH2O as the communications platform, has invited the public to numerous events and shared its water quality message widely through email, social media, the RVAH2O website, billboards, fliers, school education and community meetings. For example:

- Thousands of Richmonders and others were able to fuel themselves with public water at the September 2015 Union Cycliste Internationale (UCI) bike competitions, where eight drinking stations were hooked up to fire hydrants and draped with RVAH2O logo and information.
- At the 2016 Earth Day and Riverrock festivals, DPU employees at an RVAH2O booth greeted nearly 1,100 people personally, passed out literature, and held drawings for rain barrels.
- The first annual Storm Drain Art Contest attracted several dozen entries and drove hundreds of visitors to RVAH2O social media pages; over 450 people voted for their favorite Storm Drain. Each drain selected flows directly into the James River; one of the requirements was that each drain feature a stormwater/pollution message.
 - This contest's art submissions were showcased at Richmond City Hall for one month.
 - The contest received numerous online and print articles, with front page news in the Richmond Times Dispatch on two occasions when the City's mayor toured the drains in July 2016.
 - The project won a national award by the National Association of Clean Water Agencies and Richmond local ad club award, furthering the news coverage.



Figure 2.2. Flier for Watershed Open House public meeting held at a local park

- A “How-To” flier was created to assist other U.S. municipalities in setting up their own storm drain projects. So far, approximately two dozen communities have requested guidance.
- The 2017 RVAH2O Storm Drain Art Project has already launched, and storm drains for this annual promotional effort are earmarked through 2020.
- RVAH2O took its message to neighborhood associations and universities, engaging students at VCU and the University of Richmond, some of whom have joined outreach causes.
- RVAH2O representatives have met with the James River Association to help them further their outreach efforts with a storm drain stencil art project. It’s anticipated that more collaboration with special interest groups will take place in the future.
- A billboard campaign took place throughout the summer of 2016 in both English and Spanish and will be repeated in 2017 and include bus wraps on routes passing through under-served neighborhoods.
- 100 sets of “James River Pollution and Water Conservation” messages have been printed for bulletin boards in elementary school classes, libraries and community centers.

The Future of Public Outreach

The goals associated with stakeholder involvement and transparency to the public are critical and have been incorporated into this process to ameliorate concerns regarding:

- If progress is being made;
- If limited resources are being expended wisely;
- If benefits are being realized; and,
- If adjustments are being made based on what has been learned.

With a foundation of knowledge about the importance of keeping Richmond’s waterways litter-free, Richmond’s water sources and systems, and the public’s role and responsibility in assuring a cleaner water future, DPU will turn its attention to bringing Richmonders up to speed on the Clean Water Planning process. In late 2017, it will focus more attention on business and civic leaders as well as on partnerships with the technical stakeholders to deliver a unified message to the public.

Tracking process of outreach efforts included (depicted in Figure 2.3):

- Email campaign to “public” attendees
- Flier distributed at Riverrock 2015
- Social media campaign drove up on-line engagement

On Facebook:

- RVAH2O Facebook page likes increased by 8%
- RVAH2O received at least 25 direct event responses and reached 4,967 people through Facebook Ads –on less than a \$70 budget



- 45 people joined the event through Facebook (organic and paid)

On Twitter:

- Tweet mentions were up 28.6%.
- RVAH2O followers increased by 14.85%.

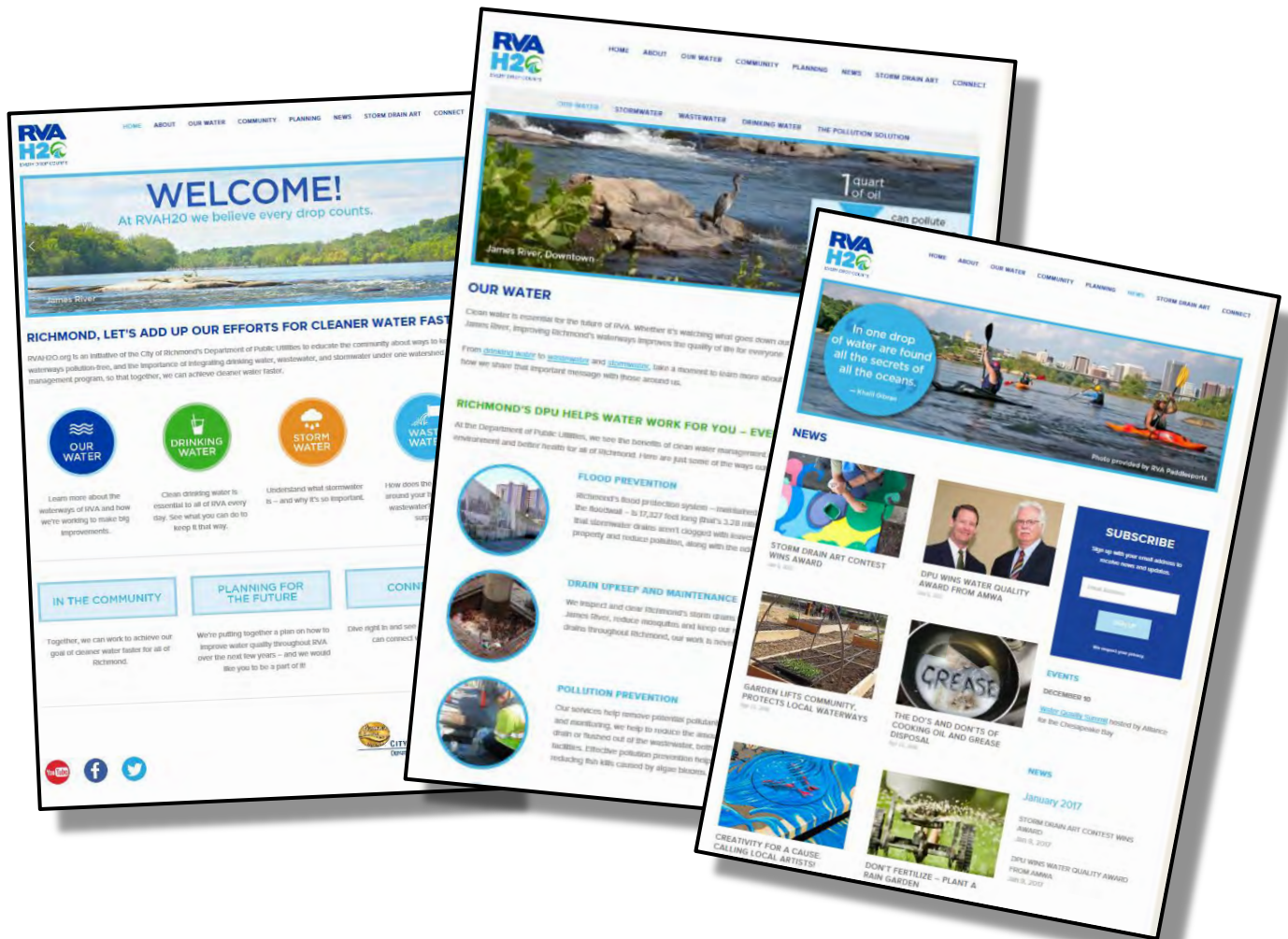


Figure 2.3. Examples of RVAH2O website and Facebook pages.

Stakeholder Partnerships

As discussed further in Chapter 5 (Strategy Identification), DPU is limited in terms of the land and other resources available for strategy implementation. Opportunities to expand strategies will require tapping into the resources from other entities, including other City departments and stakeholder organizations within the City. One way to address this challenge was to create partnerships among the RVAH2O technical stakeholders who have an interest in helping the City implement the goals and objectives that form the basis for the RVA Clean Water Plan.

DPU presented on partnerships at several Technical Stakeholder meetings and discussed ways organizations may wish to partner by making commitments at varying levels of involvement. Examples include participating in the ongoing RVAH2O technical advisory committee, providing volunteer assistance for different types of work (e.g., water quality monitoring, habitat monitoring, tree planting and maintenance), or partnering on larger projects involving land conservation, green infrastructure or stream restoration.



Figure 2.4 Partnership survey circulated to technical stakeholders

A partnership survey was circulated to stakeholders (Figure 2.4) and additional detail on partnership efforts will be documented as these conversations continue over 2017.

3. Watershed and System Characterization

Effective integrated planning and watershed management rely upon identification of the conditions and issues that characterize the watershed. Understanding existing water quality, along with the sources of pollutants or stressors that impact the City's waterbodies, are key elements for developing priority actions to address any existing or potential problems. Characterization of existing collection systems and drainage areas within the City also helps assist in meeting regulatory requirements and implementing other watershed improvements.

Collection of data and characterization of the City's watersheds were the City's first steps towards development of the Clean Water Plan. The City's Watershed Characterization Report (Richmond DPU 2015) includes a detailed discussion of this information. This chapter summarizes this information and highlights how the information and data collected through the effort served as the foundation for subsequent steps of the watershed planning process.

Another key step towards the development of the Plan was the development of a water quantity and quality modeling framework, that incorporates models for the CSO areas, the non-CSO areas (including Richmond's MS4 area), and for the James River itself. The purpose of the modeling framework was to quantify present day bacteria (*E. coli*) concentrations in the James River and to predict future bacteria concentrations under the Clean Water Plan strategies. The modeling framework also allowed for the quantification of discharge flows and volumes, as well as the occurrence of CSO events. The City's Clean Water Plan Modeling Report (Appendix A) includes a detailed discussion of the model development, calibration, and application.

Regulatory Drivers

To understand how the characterization of the collection systems and the City's watersheds can help assist in meeting regulatory requirements, it is important to first understand the regulatory drivers associated with the design and management of these systems and associated programs. Each of these drivers is discussed further below.

Water Quality Standards (WQS)

The Clean Water Act (CWA) establishes the requirement for states to develop and set WQS (see CWA § 303(c)). Once approved by EPA, the WQS are then to be used for CWA purposes, such as in establishing VPDES permit requirements.

The WQS have three distinct parts:

- A designated use;
- Criteria to protect the designated use (generally referred to as ambient water quality criteria and often expressed as chemical-specific concentration values); and



- An antidegradation policy and implementation method.

The designated uses are established based upon data available and are expected to be consistent with the goals established in § 101 of the CWA.

Virginia's regulations set at a minimum that all waters have these designated uses:

- recreational uses (e.g., swimming and boating);
- propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them;
- wildlife; and
- production of edible and marketable natural resources (e.g., fish and shellfish).

The regulations provide authority to establish more specific subcategories of designated uses, such as for the Chesapeake Bay – “Subcategories of the propagation and growth of a balanced indigenous population of aquatic life, including game fish designated use for waters in the Chesapeake Bay and its tidal tributaries are listed in this subsection.”

As noted, water quality criteria are required as part of the WQS and must be established at a level to protect the designated use. Criteria protecting recreational uses rely primarily on fecal indicator bacteria levels to prevent an unacceptable level of illnesses when recreating on or in the water.

Criteria for aquatic life uses, such as cold water fishery or areas designated as habitat for specific sensitive species can include temperature,

dissolved oxygen, and toxic pollutant limitations designed to ensure healthy populations of organisms that are expected to be present in those areas. Criteria for aquatic life uses may also be based on biological indices. States may designate water bodies for agricultural water supply to ensure that water quality is appropriate for irrigation of crops.

The applicable WQS can be found at:

9VAC25-260

<http://leg1.state.va.us/000/lst/h2568263.HTM>

The third part of the WQS is the antidegradation policy and its purpose is to protect existing uses and the level of water quality necessary to support these uses, to protect high quality waters, and to provide a transparent analytic process for states and tribes to use to determine whether limited degradation of high quality waters is appropriate and necessary. It is important to note that antidegradation focuses on “existing uses” not “designated uses.”

Assessing Water Quality Standard Attainment and Total Maximum Daily Loads (TMDLs)

In addition to addressing state requirements to develop WQS, § 303 of the CWA requires states to periodically assess whether waters are attaining WQS and provide a list to EPA detailing the locations of nonattainment and the suspected reasons for impairments. States submit this list for EPA approval every two years and it is referred to as the “impaired waters list” or 303(d) list. For waters placed on the 303 (d) list, states are also required to develop a TMDL. A TMDL calculates the maximum pollutant load that the water body can receive and still attain WQS. The CWA requires that the “load shall be established at a level necessary to implement the applicable WQS with seasonal variations and a margin



of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality³.”

The CWA categorizes pollutant sources as either point sources or non-point sources. A point source is defined as any discernible, confined and discrete conveyance, such as a pipe, ditch, channel, tunnel, conduit, or container. Control of point sources is handled primarily through the NPDES permit program, in Virginia it is the state VPDES permit program. In the CWA, point sources are clearly the focal point to be controlled, as the legal prohibition against pollutant discharge without a permit or other specific allowance applies only to point source discharges.

A nonpoint source is not specifically defined in the CWA, but is any source that is not a point source. Typical nonpoint sources include runoff from rural areas, including farming, animal grazing, and timber harvesting. The CWA does not establish a control program for nonpoint sources, as it did for point sources. Nonpoint sources are primarily addressed through voluntary programs that include grant funding as incentive for reducing pollutant loads. Significant differences between the two approaches to source control are problematic, especially in situations involving TMDLs for waterbodies with both point sources and nonpoint sources. In many cases, the focus to achieve pollutant reductions will be on point sources regardless of the load delivered by point sources versus nonpoint sources.

The TMDL establishes a ceiling for the sum of individual waste load allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources, natural background sources, seasonal variations, and a margin of safety. EPA has issued numerous guidance documents and policy memos to assist states (and stakeholders) in developing TMDLs, as well as in developing permits and assessing WQS attainment⁴.

VPDES WWTP Permit

The City has a VPDES permit for discharges into the James River from the wastewater treatment plant. The permit, issued by the Virginia Department of Environmental Quality, regulates discharges from the WWTP and the CSOs, which serve as relief points in the combined sewer system (CSS). The permit includes effluent limits and monitoring requirements, as well as nine minimum control measures required for the combined sewer system under EPA’s 1994 Combined Sewer Overflow Policy. Development of a Long Term Control Plan (LTCP) for the CSS is also required under this permit.

Richmond’s CSO LTCP involves construction of conveyance systems and retention facilities to help control discharges from the combined sewer system (Richmond DPU 2002). The goals of the LTCP are to correct or minimize the public health, water quality, and aesthetic impact on the James River caused by CSOs.

State Consent Order

Implementation of Richmond’s CSO LTCP is required under a consent order from the State Water Control Board. The consent order was issued in 2005 and includes an implementation schedule and a

³ See CWA Section 303(d)(1)(C)

⁴ Guidance and information on impaired waters and TMDLs can be found at: <https://www.epa.gov/tmdl/impaired-waters-and-tmdls-tmdl-information-and-support-documents>



description of LTCP projects that will be implemented. These projects were used as the basis for the CSO Infrastructure strategy that is discussed further in Chapter 5.

VPDES General Nutrient Watershed Permit

The General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed is also applicable to the City. The City's WWTP has nutrient discharge limits that are established by this permit. These limits were used in the evaluation of the Clean Water Plan strategies (see Chapter 5 for additional discussion).

VPDES MS4 General Permit

The City's MS4 system is authorized to discharge into the James River and its tributaries under a general VPDES permit. The permit requires compliance with TMDL waste load allocations and implementation of minimum control measures, including public education/involvement, illicit discharge detection and elimination, runoff control at construction sites and new developments, and pollution prevention/good housekeeping to the maximum extent practicable.

Watershed Data

As discussed above, the previously developed Watershed Characterization Report compiled a significant amount of information on the following elements that was used to inform the Clean Water Planning process:

- Evaluation of existing geospatial (GIS) data including watershed features
 - Physical and natural features (including topography, soils, hydrology, geology, and land cover)
 - Land use and population characteristics
 - Infrastructure features
 - Wastewater collection system
 - Wastewater treatment system
 - Stormwater system
 - Sensitive areas
- Water quality data
 - Designated uses
 - 303(d) status / TMDLs (water quality issues - identification and characterization of water quality impairments and threats - and WLAs of approved TMDLs)
 - Monitoring programs
 - Water quality data
 - Flow data
 - Biological conditions
 - Pollutant sources
 - Stressors



A summary of some of this key information is discussed below in addition to how it has helped direct the Clean Water Planning process.

Watershed Features

The James River and its tributaries drain a watershed of over 10,000 square miles. Within the City of Richmond, the James River flows for 24 miles, providing a substantial amount of waterfront. Because of its location and access to the waterfront, Richmond was established as a shipping and industrial center. While shipping is still an important function of the river, it also provides passive and active recreation through its waterfront and rapids, and serves as the drinking water source for the City and most of the metropolitan area. Major features in the river include Boshers' Dam, which is located just upstream of the City along the James River, and smaller dams, levees, and pipe crossings within the City. There are multiple locations along the river for swimming, kayaking, and canoeing. These include:

- Huguenot Flatwater – near the crossing of N. Huguenot Road and the James River, this site provides canoes, kayaks, and inner tubes. This is also a popular fishing spot.
- Pony Pasture – a popular swimming and sunbathing area, the site provides access for Class II whitewater boating and fishing.
- Texas Beach – at the end of Texas Avenue, a trail leads to a sandy beach and sunbathing rocks and connects to the Belle Isle Pedestrian Bridge to the east.
- Ancarrow's Landing/Manchester Slave Docks – this is a popular fishing spot and includes boat ramp.
- James River Park – near the crossing of Riverside Road and Hillcrest Road, this location provides the opportunity for Class IV whitewater boating

Just downstream of the City is the Presquile Wildlife Refuge, home to several species of birds and anadromous fish, including the endangered Atlantic sturgeon.

Physical and Natural Features and Land Use Characteristics

There are a number of observations that can be made about the City's watersheds. The western and very northern portions of the City have experienced the least amount of hydrologic modification and possess the lowest intensely developed land use and most forested land cover. These more western areas also correspond with areas with higher soil infiltrative capacity. Alternatively, the eastern portion of the City corresponds with a higher intensity of developed land and industrial land use corridor as well as the City's urban core. Consequently, this area also corresponds to soils that are considered urban and tend to have less infiltration capacity and possesses a topography that includes some considerably steep slopes.

While any project slated for implementation will require a more detailed, site-specific assessment, the watershed-scale analysis in the Watershed Characterization Report provided information that helped guide the selection of high-level strategies. These strategies were created at this larger scale, rather than at a localized or neighborhood scale at which a project would be identified, to allow flexibility in the subsequent stages of integrated planning. For instance, in the assessment of green infrastructure as



a strategy, GIS data were evaluated. Given the presence of steep slopes and soils in certain areas of the City that are not conducive to the infiltration necessary for green infrastructure, the total available land for this strategy was reduced by half. This conservative approach to identifying land availability incorporates an inherent flexibility that can allow for inclusion of additional acres into the strategy as more site specific data are collected. Chapter 5 includes additional discussion on strategies identification, Chapter 6 discusses the evaluation and prioritization of these strategies and Chapter 7 discusses implementation.

Infrastructure and Collection Systems

Similar to other older cities, especially in the eastern United States, the City of Richmond is served by both a CSS and a MS4. The distribution of area covered by these systems is shown in Table 3.1 and depicted in Figure 3.1.

Table 3.1. Area located within sewered sections of the City

Sewered Area	Area Served by (acres)
Combined Sewer System	12,000
Separate Sewer System	26,000 (24,500 in MS4; 1,500 in direct drainage)
Total	38,000

In dry weather conditions, both sanitary discharges and flows from the CSS are treated by the Richmond WWTP. The capacity of the City's WWTP, which serves approximately 215,000 people, is 45 million gallons per day during dry weather and up to 75 million gallons per day during wet weather. Combined sewer flows during wet weather events which would exceed the plant's capacity can be stored at the Shockoe Retention basin with a capacity of 44 million gallons⁵ as well as the Hampton / McCloy CSS retention tunnel with a capacity of seven million gallons. Any remaining wet weather flow volumes are discharged through the City's 26 active CSOs.

The MS4 system, in the remaining portion of the City, includes over 220 miles of pipe, 280 miles of open channel and 50 miles of culverts that discharge stormwater flows at over 1,200 outfalls into receiving waters. Additional discussion of the MS4 area as well as the sanitary and combined sewer systems is included in the City's Watershed Characterization Report (2015).

⁵ The basin holds 35 MGD, while in-line storage holds an additional 9 MGD



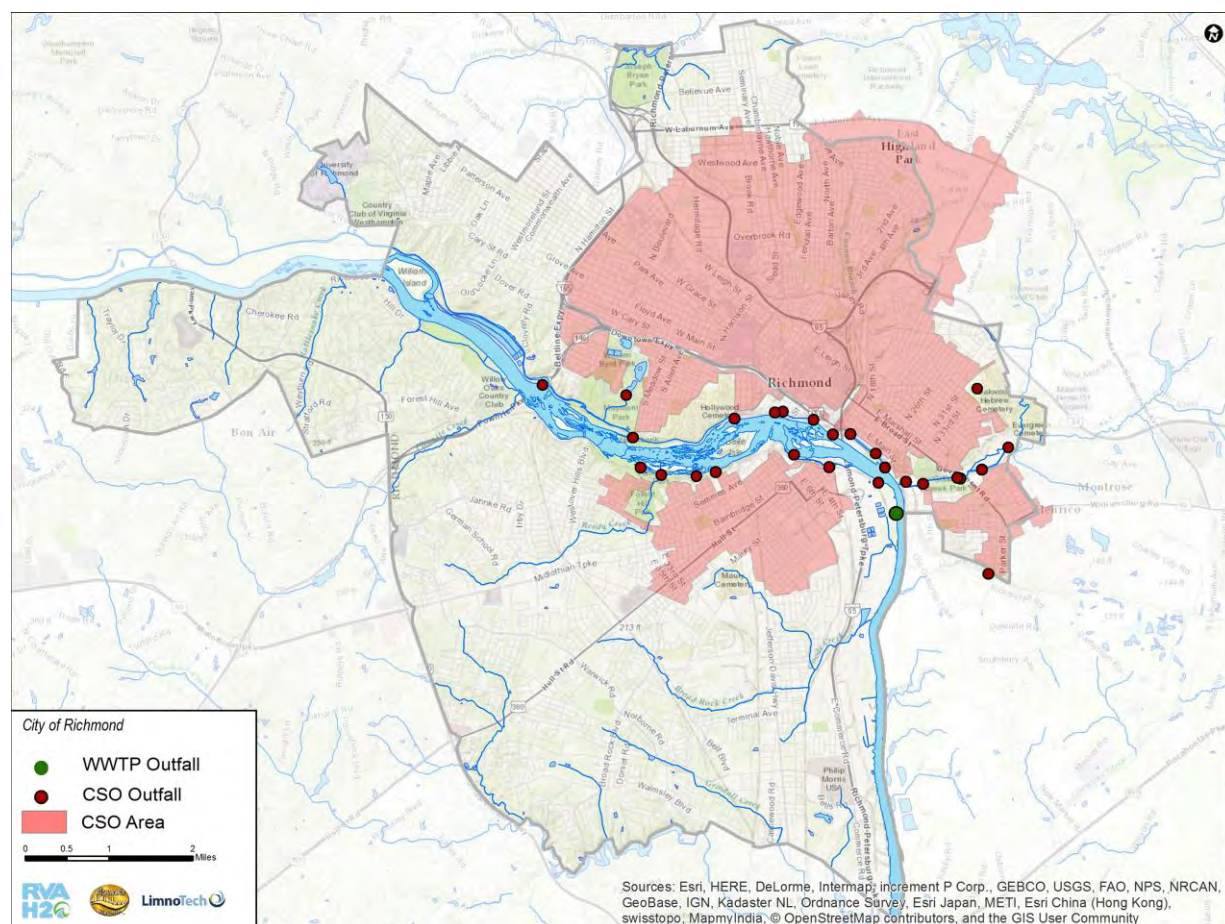


Figure 3.1. Combined sewer overflow area within the City of Richmond and location of CSOs

Understanding these areas within the City, and their associated sources and stressors, were essential to determining the extent to which they were contributing to impairments and the strategies that would be necessary to help the City mitigate these impacts.

Sensitive Areas

EPA's CSO Control Policy (Federal Register 59 [April 19, 1994]: 18688-18698) provides a framework for the control of CSO discharges through the NPDES permitting process. This policy establishes the expectation that CSO communities will give the highest priority to the control of CSO discharges within "sensitive areas". The Policy and EPA Combined Sewer Overflows Guidance for Long-Term Control Plans (EPA 832-B-95-002) define sensitive areas as:

- Outstanding National Resource Waters ("Exceptional State Waters" or "Tier III" waters in Virginia)
- National Marine Sanctuaries
- Waters with threatened or endangered species or their designated critical habitat
- Primary contact recreation waters, such as bathing beaches
- Public drinking water intakes or their designated protection areas

- Shellfish beds

While this sensitive area analysis is applicable only to Richmond's CSO area, the data and information provided do help better characterize the City and potential concerns that should be taken into consideration in the development of goals, objectives, and high-level strategies for future implementation.

The City's LTCP discusses how the six criteria for sensitive areas identified in the CSO policy were evaluated for the James River and its tributaries in the vicinity of Richmond's CSO outfalls. No Outstanding National Resource Waters have been designated in the vicinity of Richmond (State of Virginia, 9 VAC 25-260). No National Marine Sanctuaries have been designated within the state of Virginia. Additionally, no commercial shellfish harvesters operate within the area.

The Virginia Department of Conservation & Recreation (DCR) Natural Heritage Program's Database was used to assess the presence of threatened or endangered species in the CSO area of Richmond. The database did not include or indicate the presence of any species on the Federal- or State-listed threatened or endangered species or critical habitat of any species in the CSO area.

Richmond's drinking water intake is on the James River over three miles upstream of the CSO area.

The original LTCP study identified the sensitive areas associated with the City's CSS as the south and north James River Park areas. These two areas are primarily in the vicinity of public contact recreation waters, especially the south side James River Park, which receives a large number of visitors each year, particularly during the summer months. CSOs in these areas discharge into canals and pools which can be slow moving and therefore have limited capability for flushing and diluting pollutants as they progress toward the main channel of the river. For this reason, CSO discharges to these areas exerted significant public health, aesthetic and water quality impacts, although the pollutant loads of these areas are relatively small compared to the total pollutant load for all CSOs in the City.

These issues are all of particular concern with regard to localized bacteria issues, especially in areas where in-stream recreation is common or where the community would like to expand on such in-stream recreational activities in the future.

Water Quality Data

In addition to geographical data, the Watershed Characterization Report included an extensive amount of water quality-related data on the following topics:

- Pollutant sources
- Stressors
- Designated uses
- 303(d) status / TMDLs (water quality issues - identification and characterization of water quality impairments and threats - and WLAs of approved TMDLs)
- Monitoring programs
- Water quality data



- Flow data
- Biological conditions

A summary of some of this key information is also discussed below in addition to how it has helped direct the Clean Water Planning process.

Sources and Stressors of Watershed Impacts

The 2012 Integrated Report GIS data included suspected pollutant sources for each impaired waterbody segment. Common impacts include:

- MS4 discharges
- Combined sewer overflows
- Non-point sources
- Wastewater discharges
- Industrial point source discharges
- Atmospheric deposition (nitrogen, toxics)
- Clean sediments
- Internal nutrient cycling
- Loss of riparian habitat

Waterbody stressors are described as actions or impacts that may adversely affect (apply some form of stress) the ecosystem in some way. Stressors are categorized by whether or not they have an accompanying water quality standard or screening value. Virginia DEQ has identified the following stressors as being most prevalent:

- Biomonitoring Indices (VSCI/CPMI)
- Streambed Sedimentation
- pH below 6
- Habitat Disturbance
- Nickel in Sediment
- Total Phosphorus
- Dissolved Nickel
- Total Nitrogen
- Dissolved Cadmium
- CCU Metals Index
- Mercury in Sediment
- Ionic Strength
- Dissolved Oxygen

Based on the watershed characterization analysis, key regulatory drivers, and additional modeling [discussed further in Appendix A], it was determined that the sources of particular concern include CSOs and MS4 discharges. Other sources, such as clean sediment (from in-stream erosion and scouring) and loss of riparian habitat, were taken into consideration in the development of strategies (see Chapter 5 on Strategy Identification for further discussion).

Again, key regulatory drivers, watershed analysis and modeling also focused the prioritization of stressors on total nitrogen, total phosphorus, total suspended solids, and bacteria. These key pollutants were used as a priority metric for evaluating the effectiveness of strategies in achieving goals and objectives related to water quality improvements.

Existing Water Quality Data

Obtaining sufficient water quality data to assess the status of the City's waterbodies and impacts to these waterbodies is essential to developing an effective Clean Water Plan. As part of the City's



Watershed Characterization process, monitoring data from all available sources were compiled from entities such as Virginia DEQ, local universities, and watershed groups. These data supported the watershed characterization as well as the City's watershed and water quality monitoring (discussed further in Chapter 3). Moving forward, this data assessment can help the City determine how its existing monitoring program may need to be modified or how to better coordinate with local partners to integrate monitoring efforts.

The existing water quality data analysis showed that the number of available samples across data types (water quality sampling, biological sampling, and habitat assessments) are biased heavily towards the James River, with little-to-no data available in tributary streams. Additionally, there is a lack of hydraulic data within the City, with the only local USGS gauges located outside the City limits. Table 3.2 summarizes samples by data type and receiving water category. This table also highlights the dearth of biological samples and habitat assessments.

Dividing the data on a regional basis (watershed groupings discussed in the Watershed Characterization Report) reveals that the majority of available water quality samples were collected in the Lower James CSO and Lower James MS4 watershed groupings, while the majority of biological and habitat samples were collected in the Lower James CSO and the Middle James MS4. Table 3.3 summarizes samples by data type and watershed group.

Table 3.2: Overall Sample/Assessment Counts by Data Type and Receiving Water Category

Data Type	James River	Tributaries
Water Quality	4,759	368
Biological	44	5
Habitat	44	5

Table 3.3: Overall Sample/Assessment Counts by Data Type and Watershed Group

Data Type	Lower James CSO	Lower James MS4	Lower James-Chickahominy MS4	Middle James MS4
Water Quality	2,012	2,341	85	689
Biological	30	1	3	15
Habitat	30	1	3	15

Other types of data, such as hydraulic and meteorological samples, are more limited. There are no hydraulic data available within the City limits. While there are two USGS stations within the City limits (James River at Boulevard Bridge [USGS #02037618] and James River at City Locks [USGS #02037705]), neither station has flow data. The two closest USGS gaging stations with daily flow data are James River and Kanawha Canal Near Richmond (USGS #02037000) and James River Near Richmond (USGS #02037500), both of which are located upstream of the city. There is meteorological data available, but



there are only two stations within the City (one in the Lower James CSO and another in the Lower James-Chickahominy MS4), both of which provide daily rainfall totals.

The lack of data in certain portions of the City and in the various tributaries emphasized the need for not only the collection of additional monitoring data, but the collection of monitoring data in a more coordinated manner between the City and various partners. Various supporting actions related to monitoring were recommended in association with the development of strategies. Part of supporting actions includes the establishment of a workgroup made up of the City and technical stakeholders to plan and implement an integrated monitoring strategy to identify efficiencies across partner monitoring efforts, coordinate efforts, and facilitate the sharing of data.

Surface Water Quality Issues

As discussed above, all Virginia waters are designated for the following uses:

- Recreation (e.g., swimming and boating);
- Propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them;
- Wildlife; and
- Production of edible and marketable natural resources (e.g., fish and shellfish)⁶.

Waterways may also be considered for primary shellfish harvesting status (Richmond DPU 2016).

The City's Watershed Characterization Report (2015) discusses the water quality criteria for the waterways in the Richmond area (Class II Estuarine waters for the tidal James River; Class III Non-tidal waters for the falls of the James and other tributaries).

Impairments to Richmond's waters are discussed further in the 2014 Integrated Report (VDEQ 2016) and are summarized in Table 3.4. Impairments include Chlorophyll-a, *E. coli*, Estuarine Bioassessments, benthic macroinvertebrate bioassessments, dissolved oxygen, PCB in fish tissue, PCB in water column, aquatic plants (macrophytes), pH, chlordane, DDE, DDT, and mercury in fish tissue.

The TMDLs applicable to the City include the James River bacteria TMDL and the Chesapeake Bay TMDL, which addresses total nitrogen, total phosphorus, and sediments. These TMDLs were identified as the main drivers behind this planning process. When other TMDLs, such as that for PCBs in the James River,

Waterbody Impairments

If a water body contains more contamination than allowed by water quality standards, it will not support one or more of its designated uses. Such waters have "impaired" water quality. In most cases, a cleanup plan (called a "total maximum daily load") must be developed and implemented to restore impaired waters.

- Virginia DEQ

⁶ See

<http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityStandards/DesignatedUses.aspx>



are developed, the City will evaluate the need to adjust the Clean Water Plan as part of the adaptive management approach.

Human, Aquatic Life, and Wildlife Health Issues

Several of the City's impaired waters pose health hazards for humans, aquatic life, and wildlife. The issues specifically addressed by this Clean Water Plan are those caused by bacteria, nutrients, and sediments. These are the same pollutants addressed by the TMDLs which will be included in the City's VPDES permit.

The James River (lower and tidal reaches) and several of its tributaries (Almond Creek, Falling Creek, Goode Creek, Powhite Creek, Reedy Creek, Bernards Creek, and Gillies Creek) and Upham Brook (which is a tributary to the Chickahominy River and ultimately the James River) have all been listed as impaired due to *E. coli* levels. These stream segments do not support the primary contact recreation use. The sources of bacteria in these streams within the City limits include CSOs, the MS4, the WWTP, direct discharge of urban runoff, and wildlife. Upstream sources also impact water quality in the City. Upstream sources include livestock, land application of manure, malfunctioning septic systems, illicit discharge of residential waste, other permitted waste treatment facilities. Presence of these bacteria is strongly linked with gastrointestinal illness in recreational users of the waterways. Reducing bacteria levels in these streams is consistent with the City's goal to provide safe recreational opportunities in the river.

While the James River bacteria TMDL addresses near-field water quality issues that must be addressed with localized strategies, the Chesapeake Bay TMDL, which applies to the James River and all its tributaries, sets targets for nutrient and sediment reductions downstream in the Chesapeake Bay. An excess of nutrients (nitrogen and phosphorus) in water can lead to an overgrowth of algae in water, or harmful algal blooms. Algal blooms can produce toxins harmful to humans and animals, create dead zones, and increase drinking water treatment costs for downstream communities. Sediments and algae in the water lead to murky conditions that block sunlight from underwater grasses and create low levels of oxygen for aquatic life. Safe nutrient and sediment levels are needed to maintain safe recreational opportunities and protect aquatic life in the river.

Again, while Richmond's waterbodies have impairments for a number of different pollutants (Table 3.4), the key focus for this Clean Water Plan are bacteria, nutrients, and sediment. Additional discussion of specific targets for these pollutants is included in Chapter 6.



Table 3.4 Impairments of waterbodies within the City of Richmond

River Segment	Segment	HUC Code(s)	Length (miles)	Benthic	Chlorophyll <i>a</i>	DO	E. coli	Estuarine Bioassessments	Macrophytes	Mercury	Chlordane	DDE	DDT	PCB	pH
North of the River															
Upham Brook	Flippen Creek to confluence with Chickahominy River	JL18	1.2			X									
Upham Brook	Headwaters to confluence with Chickahominy River	JL18	55.72				X								
Stony Run Creek	Headwaters to mouth of Gillie's Creek	JL01	3.23				X								
Gillie's Creek	Headwaters to mouth of James River	JL01	6.02				X							X	X
South of the River															
Powhite Creek	Headwaters to mouth of James River	JM86	8.05	X			X								
Rattlesnake Creek	Headwaters to mouth of James River	JM86	2.32				X								
Reedy Creek	Headwaters to trib above Roanoke St.	JM86	2.34			X	X								
Reedy Creek	Trib above Roanoke St to Forest Hill Ave.	JM86	0.6												X
Manchester Canal	Manchester Canal	JM86	0.75				X								
Pocoshock Creek	Headwaters to mouth of Falling Creek Reservoir	JL02	8.7				X								
Falling Creek Reservoir	Falling Creek Reservoir	JL02	88.37 (acres)			X	X								
Broad Rock Creek	Headwaters to mouth of Goode's Creek	JL01	3.15				X								
Goode's Creek	Mouth of Broad Rock Creek to confluence with James River	JL01	1.25				X							X	
James River															
James River	Blvd bridge to fall line at Mayo's Bridge	JM86	2.91			X	X			X	X	X	X		
James River	Mayo Bridge to mouth of Appomattox River	JM86, JL01	1.47		X	X	X	X	X						
James River	Big Island Dam to I-95 bridge		13.28											X	

Water Quality Modeling

Water quantity and quality modeling was conducted to allow for longer and continuous periods to be evaluated relative to the water quality monitoring program. Therefore, a key step towards the development of the Clean Water Plan was the development of a water quantity and quality modeling framework. The purpose of the modeling framework is to quantify present day bacteria (*E. coli*) loads and concentrations in the James River and to predict future bacteria loads and concentrations under the Clean Water Plan strategies. The modeling framework also allowed for the quantification of discharge flows and volumes, as well as the occurrence of CSO events. The City's Clean Water Plan Modeling Report (Appendix A) includes a detailed discussion of the model development, calibration, and application. A summary of each step is provided here.

Model Development

Three models were used to achieve the modeling objectives, and together they comprise the modeling framework. These three models include:

- A watershed model to simulate flow and bacteria loads from contributing areas of tributaries to the James River within the greater Richmond area, as well as from Richmond's Municipal Separate Storm Sewer System (MS4), but excluding the combined sewer system. This model was developed using the EPA SWMM software.
- A collection system model to simulate flow and bacteria loads from the combined sewer system (CSS). The CSS model is an existing model that is used to by the City of Richmond for Wastewater Master Planning, to support implementation of the CSO Long Term Control Plan, and to prepare the Annual CSS Reports. This model was developed using the EPA SWMM software, and was adapted for use in this study.
- A receiving water quality model that computes bacteria concentrations in the James River resulting from the various sources of bacteria to the river. The outputs of the watershed and CSS models are used as inputs to the receiving water quality model. The receiving water quality model was developed using the EPA-supported EFDC software.

Model Calibration

Model calibration is the process of adjusting model parameters and assumptions within defensible ranges to achieve reasonable agreement between modeled and observed environmental conditions. The calibration process demonstrated that the modeling framework is sufficiently well calibrated to support the following modeling objectives:

- Design the modeling framework to provide a reliable and reasonably complete accounting of bacteria sources to the James River;
- Develop the modeling framework using sufficiently complete and accurate site specific data;
- Calibrate the models using reasonable assumptions consistent with the site data, literature, and professional judgment;
- Achieve a level of model accuracy that is adequate to support decision making;



- Apply the models for a period including a wide range of common environmental conditions (i.e. river flow and precipitation conditions); and,
- Evaluate and synthesize model output to interpret major sources of current water quality impairment and to forecast future water quality conditions.

Model Application

After the water quality modeling tools were developed and calibrated, they were jointly applied to assess water quality benefits associated with the selected strategies. For this purpose, the model was applied for a 3-year simulation period that includes a dry year (less than normal precipitation), and average rain year, and a wet year (more than normal precipitation). To date, the model has been applied to evaluate the following conditions or strategies:

- Current conditions: Best representation of current conditions, and includes all the Phase I and Phase II CSO improvements from the CSO Long Term Control Plan (LTCP).
- Baseline Conditions: represents the current conditions, plus all the currently funded Phase III collection system improvement projects from the LTCP.
- Green Infrastructure in the MS4 area Strategy: represents the baseline conditions, plus the implementation of 104 acres of green infrastructure on city-owned area in the MS4.
- Green Infrastructure in CSS area Strategy: represents the baseline conditions, plus the implementation of 18 acres of green infrastructure on city-owned area in the CSS area.
- CSS Infrastructure Strategy: Implementation of CSS projects included in the LTCP: represents the baseline conditions, plus all the remaining unfunded Phase III collection system improvement projects from the LTCP.

These strategies were evaluated using several metrics related to bacteria reduction, including:

- Bacteria load reduction from combined sewer and tributary discharges, expressed as billion CFU per year
- Percent increase in monthly geomean water quality standard compliance in the James River at the downstream city limit
- Reduction in number of CSO events per year
- Reduction in CSO volume, expressed as million gallons per year

These water quality benefits were then entered into a calculator tool that integrates the benefits of strategies across a wide range of Goals and Objectives, as further explained in the next chapter. Water quality benefits were also assessed relative to the two existing water quality standards: a monthly geometric mean standard and a statistical threshold value (STV) standard.

Assessing Current Conditions

The Clean Water Plan Modeling Framework was applied to better understand the sources and impacts of bacteria in the James River. The main metrics evaluated by the model include average bacteria loads entering the river from the main sources, *E.coli* concentration in the James River and comparison to the water quality standards, number of CSO discharge events, and CSO discharge volume.



An evaluation of current conditions helped assess the impact of the five major sources of bacteria in Richmond (upstream, CSO, stormwater, background, and WWTP sources), and how each contributes to water quality standard exceedances relative to the other sources. Figure 3.2 graphically shows these results for both the monthly geomean and statistical threshold value (STV) standard. The model results illustrate that the James River is in violation of both the geometric mean and the statistical threshold value water quality criteria for some months out of the three year model simulation period, and the primary cause of a water quality criteria violation can sometimes be linked to Richmond's combined sewer overflows, while at other times it is due to upstream sources coming in from outside of the City. Background (mainly wildlife) and stormwater sources play a smaller overall role in the bacteria water quality violations. The WWTP does not contribute significantly to bacteria water quality violations.

Because the model shows that Richmond's CSOs contribute in large part to the bacteria water quality criteria exceedances, this information was used to support the prioritization of strategies, such as CSO infrastructure, to address this source. Figure 3.3 shows the relative volume of CSO discharges at the CSO outfalls (based on data from 2004 to 2016), and may present potential opportunities for targeting specific CSO discharge points.

Other important metrics evaluated by the model are shown below in Table 3.5.

Table 3.5 Model Output for Current Conditions

Model Output	Model Value
Average yearly E.coli load (billion cfu)	9.65E6
Average annual number of CSO events	53
Average yearly CSO volume discharged (million gallons)	1,670



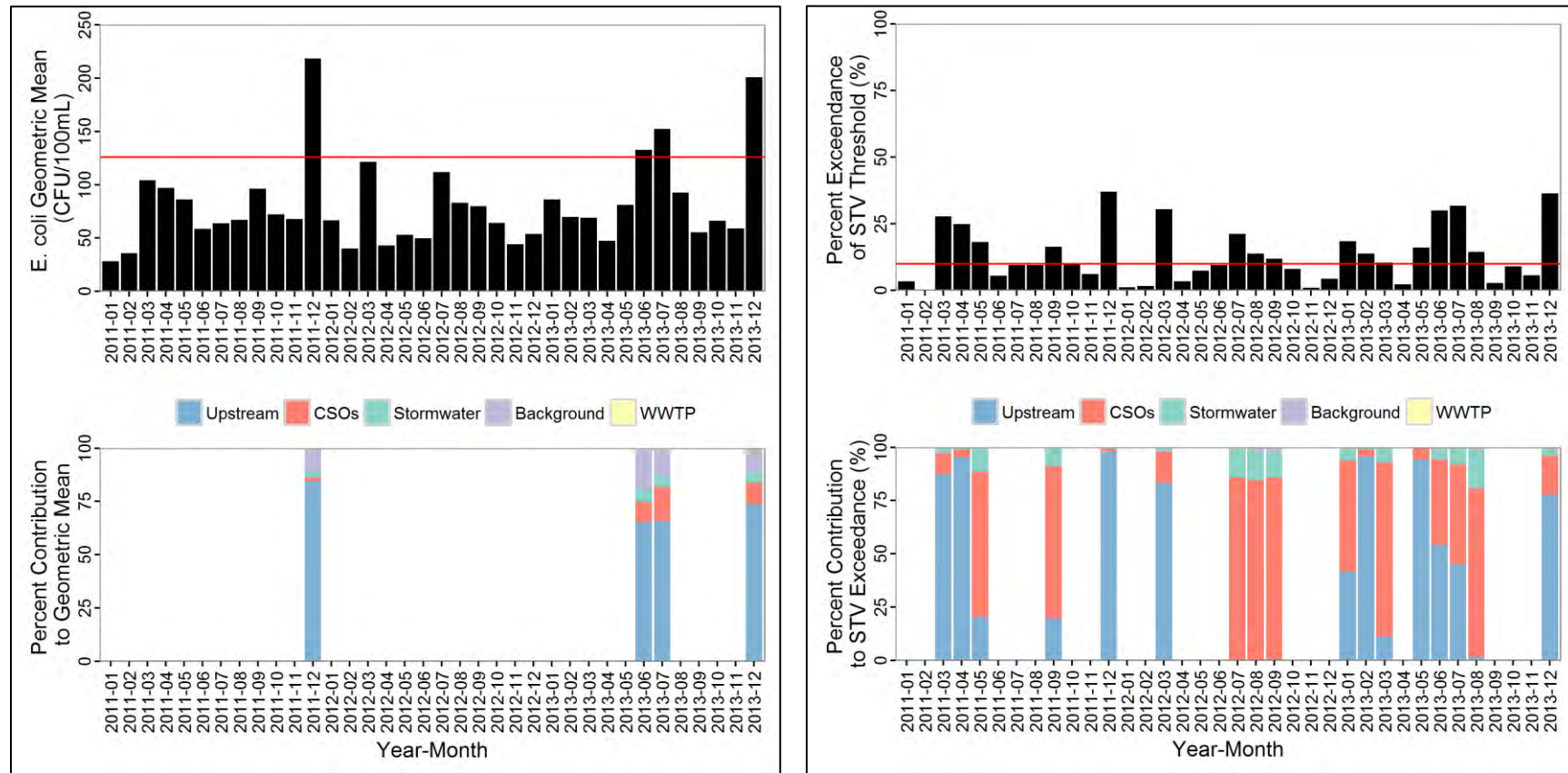


Figure 3.2. E.coli Monthly Geometric Mean and STV Standard Model Results for Current Conditions

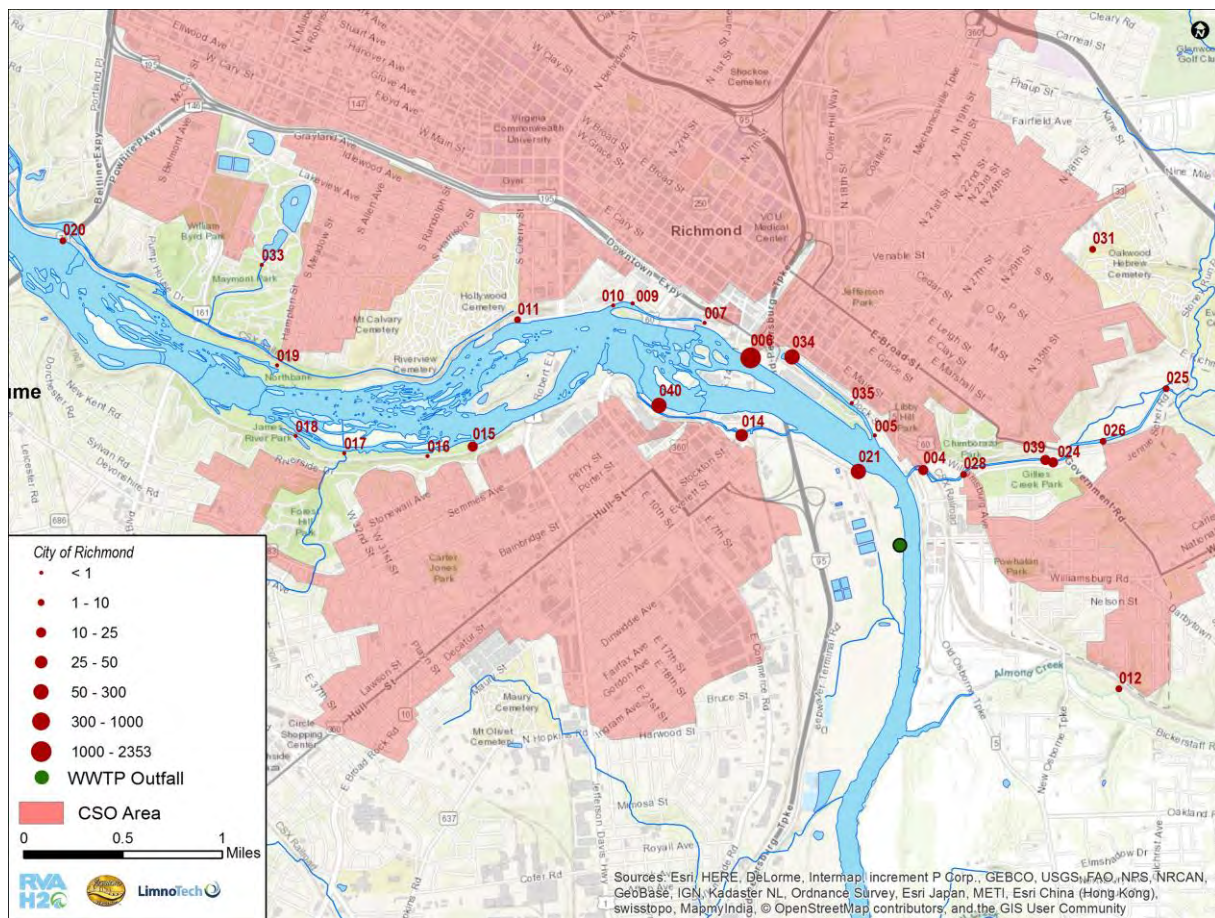


Figure 3.3. CSO Overflow volume by CSO outfall (million gallons/year)

Additional information on the modeling results can be found in Appendix A.

4. Goals & Objectives Selection

Traditional integrated planning efforts tend to focus on meeting infrastructure goals, such as reduction in the number of CSOs. The City's Clean Water Plan, however, is built around a watershed framework that accounts for the City's collective water needs and requirements (including, but not limited, to infrastructure) while considering watershed characteristics. While DPU's understanding of these needs and requirements provide a starting point for establishing the goals and objectives of the Clean Water Plan, DPU recognized that stakeholder input would also be critical to fully capturing the desired direction and outcome of the Plan. This process included not only extensive stakeholder feedback to develop the goals/objectives, but included a weighting process to assign a degree of relative importance of these goals/objectives to one another. The goals, objectives, and respective weights are summarized in Table 4.1 and the approach used to develop this is described below.

Table 4.1 Clean Water Plan goals and objectives with associated weights

Goals (with weights)	Objectives	Weights
19%: Manage wastewater and stormwater to improve the water quality and water quantity of ground water and surface water.	Develop one stormwater management plan to cover the City's four watershed groupings based on the City's watershed characterization report	19%
	Reduce nitrogen, phosphorus, and sediment in discharges to achieve VPDES permit requirements (Chesapeake Bay TMDL)	18%
	Reduce bacteria levels to achieve VPDES permit requirements (local TMDL and water quality standards)	18%
	Reduce toxics (e.g., mercury, PAHs, PCBs), trash and other pollutants and address TMDLs for these pollutants	17%
	Develop green infrastructure, including riparian buffers, and removal of impervious surfaces on development, existing development, and redevelopment	27%
15%: Protect and restore aquatic and terrestrial habitats to support balanced indigenous communities	Restore streams to improve, restore, and enhance native ecological communities	25%
	Identify, protect, and restore critical habitats	36%
	Enhance aquatic and terrestrial habitat connectivity	23%
	Investigate, and where feasible, promote actions that might surpass regulatory requirements	16%
14%: Engage and educate the public to share responsibility and take action on achieving healthy watersheds.	Engage and efficiently educate the public about standards, processes, and actions associated with watershed health and public health	25%
	Assist in the education of citizens about overall water quality issues, benefits of improved water quality	30%
	Support and encourage local action to improve water quality	24%
	Provide quicker public notifications of spills or pollution from regulators or other "river watchers"	21%
12%: Implement land conservation and restoration and incorporate these into	Protect, restore, and increase riparian buffers	21%
	Reduce impervious surfaces	19%
	Increase natural land cover with a focus on preserving, maintaining, and increasing tree canopy	24%



planning practices to improve water quality.	Incorporate green infrastructure in new development and redevelopment	18%
	Conserve lands where possible and consistent with Richmond's Comprehensive Plan	18%
11%: Create partnerships across the watersheds internal and external to the City of Richmond to maximize benefits and minimize impacts to all stakeholders	Develop and implement a source water prevention plan/strategy	33%
	Establish public-private partnerships to secure funding, implement strategies and projects, and to achieve plan goals	40%
	Maintain and expand the RVAH20 group	27%
10%: Maximize water availability through efficient management of potable, storm, and wastewater.	Reduce use of potable water for industry and irrigation	39%
	Achieve water conservation by improving the existing water conveyance system	30%
	Achieve water conservation by incentivizing upgrades to end-user water fixtures where appropriate	31%
9%: Provide safe, accessible, and ecologically sustainable water-related recreational opportunities for all.	Improve water quality to promote safe recreation consistent with the City's Riverfront Plan	36%
	Promote ecologically sustainable management of riverfront and riparian areas	40%
	Improve river and waterfront access for recreation	24%
9%: Work collaboratively to gather consistent high-quality data to characterize the status and trends of water resources and to gauge the effectiveness of restoration efforts.	Conduct water quality and biological monitoring	28%
	Provide timely water quality information	19%
	Collaborate with citizens and local/state agencies for coordinated monitoring	23%
	Utilize results to target restoration efforts and convey progress	30%



Establishing Goals & Objectives

The first step of the Clean Water Planning process was determining the direction in which the City and its stakeholders wished to take this effort. To accomplish this, goals and objectives were selected through an extensive stakeholder communications process. The watershed characterization efforts, described in Chapter 3, were used as a basis for understanding the City's watershed features, water quality, and any issues of concern within the watersheds. While this helped inform the City and stakeholders, the selection of overarching goals, refined goals, and objectives was also influenced by the mission of stakeholder organizations or City department as well as stakeholder's additional first-hand knowledge of local issues.

To account for the multiple opinions and perspectives that were anticipated, the City implemented a multi-step process to form consolidated lists of overarching goals, refined goals, and objectives. The first step in this process was to survey stakeholders (Figure 4.1). The City requested that stakeholders submit what they felt were appropriate overarching goals, refined goals, objectives, and metrics (discussed further in Chapter 6) based on definitions and guidance on what these terms included.

Fifteen stakeholders provided input through responding to the request. Given the large amount of feedback to discuss, the City addressed the discussion of overarching goals and refined goals during the February, 2015 meeting and objectives during the May, 2015 meeting.

Prior to the February meeting, the City evaluated all of these submissions and identified a number of themes. It was important to the City that no feedback was lost in this process, so all input was incorporated verbatim into one of these themes:

**CITY OF RICHMOND DPU
WATERSHED PLANNING INITIATIVE**

YOUR TECHNICAL STAKEHOLDER INPUT REQUESTED
Please respond by email or fax by Tuesday, January 26, to:
Grace.LeRose@RichmondGov.com; fax: 804-646-2870.

These three worksheets are designed to help you understand City of Richmond DPU's Goals, Objectives and Metrics for watershed management, and to help DPU understand yours.

Please submit all three worksheets to Grace LeRose by January 26 so that your organization is represented in the watershed integration planning process. Also, please plan to attend the next stakeholder meeting on Tuesday, February 9, from 2:30 to 4:30 p.m. at the Science Museum of Virginia. The results of this exercise will be shared with everyone in attendance that day, and future planning will begin.

Please refer to these definitions as you fill out the worksheets:

- GOALS**
Long-term aims the stakeholder, including the City, wants to accomplish
- OBJECTIVES**
Measurable results that can be achieved by implementing certain strategies
- STRATEGIES**
The projects and programs that will be implemented to meet the goals and objectives
- METRICS**
The metrics by which the objectives will be evaluated and ranked

Questions?
Please call Grace LeRose at 804-646-0033 or email Grace.LeRose@RichmondGov.com.

P.S. In addition to our next meeting on Tuesday, February 9, please mark your calendars for these quarterly meetings that have been scheduled to complete this planning process: Tuesday, May 10; Tuesday, August 9; and Tuesday, November 1.

RVA H2O
Watershed Partnership Council

CITY OF RICHMOND
Department of Public Utilities

Figure 4.1. Guidance provided to technical stakeholder to support the gathering of input on goals, objectives, and metrics.

Overarching Goal Themes:

- Collaboration
- Water consumption
- Preservation and restoration
- Water quality

Refined Goal Themes:

- Recreation
- Aquatic and riparian habitat
- Stormwater peak flows
- Pollution
- Land conservation and management
- Partnerships
- Monitoring
- Public engagement & action
- Water conservation

At the stakeholder meetings, attendees were broken into small groups with each group being provided one of these themes and its associated goals. Each small group was then asked to combine and synthesize the items within that theme. Goals could be combined, reworded, or moved to another goal topic area. Goals could also be re-categorized as an objective or a strategy if deemed more appropriate. Ultimately, one goal was developed for each topic area.

A similar approach was taken in developing a refined list of objectives. Stakeholders provided objectives associated with each of the proposed goals. Stakeholders then refined these objectives so there were between one and six objectives associated with each of the refined goals.

Striving for Consensus

A number of opinions and viewpoints were represented through the stakeholder process. While the City felt it was important for the Clean Water Planning process to reflect these views, it was also important for the process to move forward in a timely manner. To accomplish this, the City strived to reach consensus on each of the steps of this process and the associated decisions made.

The goal behind *striving* for consensus is that everyone will be able to live with and support the idea or issue, or, at least, no one opposes it. If the group was not able to support an element of the issue/item up for discussion, additional discussion was deemed necessary.

While stakeholders were a key part of the process for identifying goals and objectives, they did represent many different groups with interests in the City. To ensure stakeholders all shared the same amount of influence during this process, each interest group was allowed one member at the table who could participate (i.e., vote) in the consensus process.

As shown in Figure 4.2, each voting stakeholder could select either “1”, “2”, or “3” to represent their level of agreement with a particular goal or objective being discussed. If any stakeholder selected “1”, then the topic was discussed further until the stakeholder agreed, the item for discussion was modified so that all stakeholders could at least live with the decision, or the item/topic was removed from the options moving forward.

Ultimately, stakeholders achieved consensus on the overarching goal, refined goals, and objectives.



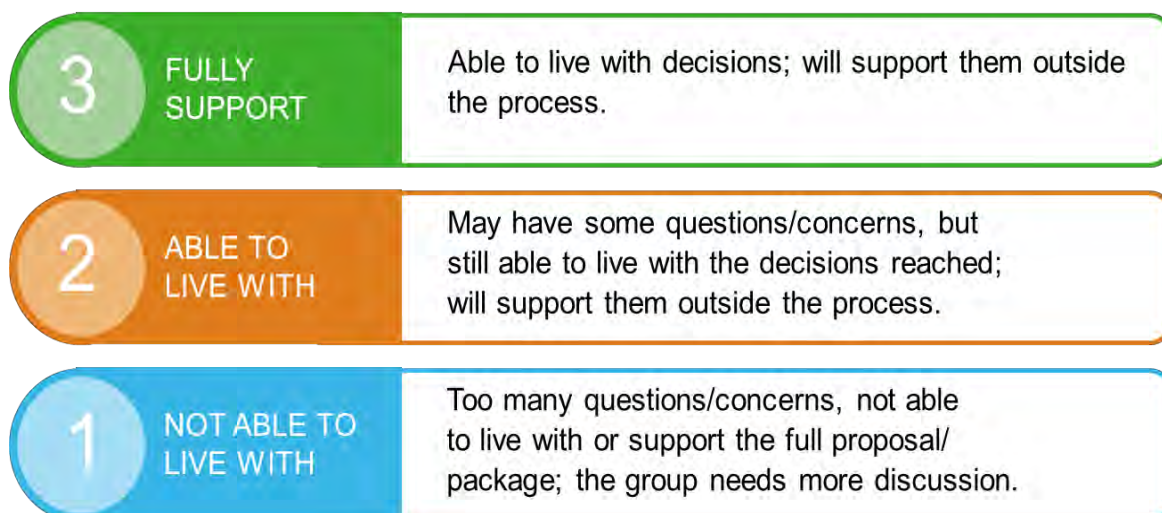


Figure 4.2 Consensus voting process for the Clean Water Plan

Prioritizing through Weighting

Weighting was incorporated into this process to reflect the priorities of the City and its stakeholders.

This weighting process not only allowed for an understanding of how one goal or objective ranked in relation to another, it also provided information on the extent of the importance of these priorities to one other.

Weighting included the process of assigning a portion of 100 points to each of the items in a grouping. As shown in the example in Table 4.2, 100 points are apportioned across a grouping of refined goals. In this example, refined goal #2 was given the highest priority, with 50 points. One or more objectives were assigned to each refined goal. Each grouping of objectives

Table 4.2 Example weighting process

Refined Goals	Weight	Objectives	Weight	
Refined goal #1	15	Objective #1	50	Total: 100
		Objective #2	30	
		Objective #3	10	
		Objective #4	10	
Refined goal #2	50	Objective #1	10	Total: 100
		Objective #2	60	
		Objective #3	30	
Refined goal #3	30	Objective #1	40	Total: 100
		Objective #2	60	
Refined goal #4	5	Objective #1	20	Total: 100
		Objective #2	40	
		Objective #3	10	
		Objective #4	30	
Total:	100			



was also given a proportion of 100 total points.

The result of this process was a prioritization of refined goals as well as a prioritization of objectives associated with each of these goals.

Once the goals and objectives were finalized by the City and its stakeholders, SurveyMonkey.com was used to circulate a questionnaire to each stakeholder organization to obtain their opinion on the weights of each goal and objective. The weights provided by each stakeholder organization were then averaged to produce a weight for each refined goal and for each objective. These averaged weights were presented and discussed at a technical stakeholder meeting. Stakeholders were allowed to suggest modifications to the weights of the goals or objectives as long as the overall ranking of these weights remained the same. Using the example in Table 4.1, while the order of the refined goals must remain #2, #3, #1, and #4, stakeholders might collectively decide that refined goal #3 should be 38 points, while refined goal #2 should be changed to 42 points.



5. Strategy Identification

The next step in this process was the identification of strategies that can be expected to achieve the previously identified goals and objectives. Strategies were defined as activities, actions, or items that will help meet goals and objectives. The process that was used to develop the strategies is discussed below.

Brainstorming Potential Strategies

Implementation of projects and programs that may benefit the City's water resources are undertaken by numerous departments within the City as well as other entities, such as local universities, watershed organizations, or private developers. While the City can coordinate or partner with these entities to implement such efforts (as was discussed in Chapter 2), DPU recognized that the starting point in determining a list of strategies for the Clean Water Plan was determining what projects and programs the Department could implement and maintain itself.

The first step in brainstorming potential strategies included a workshop for DPU staff involved in stormwater, wastewater, and CSO-related projects.

Staff compiled a list of projects that had been identified or proposed to meet various programmatic needs. Because the Clean Water Plan would be implemented during the next VPDES permit cycle (beginning in June of 2018), any project that would be funded, initiated, or implemented prior to this date was removed from the list. The resulting list included the remaining potential projects that could be implemented over the next VPDES permit cycle (2018 through 2023). City staff also brainstormed other ideas, such as opportunities for expanding existing efforts like the residential stormwater credit process, to help increase implementation.

It is important to note, however, that the initial stages of the Clean Water Planning process is being developed at a high-level scale (sub-watershed, watershed, to City-scale). Because many of these projects impact small-scale areas, these City projects were "rolled up" to a strategy scale where necessary. For example, several bioretention or permeable paving projects were rolled up, or grouped, into a Green Infrastructure strategy.

In addition to these DPU projects, stakeholders were also asked to submit suggestions for strategies that they felt would achieve the agreed upon goals and objectives. Numerous ideas were gathered with varying levels of detail. Because there were a number of distinct themes to these suggested strategies, the Clean Water Plan development team created a synthesized set of draft strategies that consolidated ideas put forth by both stakeholders and DPU staff.

It was determined that a number of the ideas put forth, while important, were not strategies in and of themselves. A number of these ideas could also be tied to more than one strategy. These ideas were defined as "supporting actions". Supporting actions include efforts that may broaden the main strategy,

Strategies vs. Projects

The Clean Water Plan-related planning is occurring at the sub-watershed to the City-scale. As such, projects or programs at a finer scale needed to be "rolled up", or grouped, to produce a higher level strategy.



add specificity on how a strategy could be implemented, or identify additional resources and data needs to fully implement the main strategy. These supporting actions are not necessarily quantifiable in and of themselves and may be components of multiple main strategies. Actions, such as those related to partnerships, may also involve activities on non-City property and rely on resources that are outside the DPU's authority.

Supporting actions include:

- Partnerships – establishing partners to facilitate a greater level of future implementation of projects and programs (partners include those within the City, such as the Department of Public Works (DPW), as well as with non-City agencies, such as watershed groups)
- Maintenance – including resources and funding to ensure a strategy will continue to meet its intended objectives
- Monitoring, Assessment & Planning – gathering data and information and using these results to help guide and implement future implementation
- Incentives/Credits – evaluating and implementing mechanisms to incentivize new initiatives or higher levels of future implementation
- Regulations/Ordinances/Codes – analyzing and modifying, if necessary, the framework within which implementation will occur
- Outreach – including ways to potentially expand upon future implementation by conveying information on resources available or ways for partners and the public support a strategy

Some of these Supporting Actions are specific to a particular strategy, but others, such as some related to monitoring or public outreach, cut across various strategies.

Strategy Feasibility

Once the draft set of strategies was identified, it was important to determine if these strategies were feasible. Because DPU is ultimately responsible for implementation of the Clean Water Planning program, the feasibility of strategies was defined as efforts that DPU has the authority to implement. For instance, a strategy could be identified as infeasible if it requires implementation on land not owned by the City, and where it is not possible for the City to purchase or obtain the land in some way.

Because the City's Parks, Recreation, and Community Facilities (PRCF) Department works so closely with DPU and shares similar departmental objectives for project implementation and maintenance, PRCF land was also considered to be available for the feasible implementation of a strategy.

Feasibility also takes into account the potential limitations on strategy implementation due to physical constraints such as steep slopes or soils with poor infiltration that are unsuitable for some strategies such as green infrastructure. Therefore, the acreage included in the strategies reflects a portion of DPU/PRCF in the City that is appropriate for that particular strategy. For example, based on an evaluation of slopes and soils GIS data and best professional judgement, a decision was made to conservatively include 50% of the total DPU and PRCF lands within the Green Infrastructure Strategy in both the MS4 and CSS areas. Details on assumptions made for each of the strategies is included in Appendix B.



Final Strategies

Once feasibility was evaluated, final draft strategies and supporting actions were presented to stakeholders who were given the opportunity to edit them further. Once all feedback was incorporated, a final set of strategies and supporting actions was presented to the stakeholders for a consensus vote.

Each of the strategies referenced in the remainder of the Clean Water Plan are considered to be “feasible” and agreed upon by the Technical Stakeholder group (Table 5.1).

Table 5.1. Strategies and associated details

Strategy	Strategy Details
Riparian Areas	Replace or restore 10 acres of riparian buffers according to state guidance. <ul style="list-style-type: none"> • In MS4 and/or CSS area • Evaluate opportunities for inclusion of access points to waterbody for recreational activities
Green Infrastructure in MS4	Install or retrofit GI draining 104 acres of impervious surfaces, including efforts such as: <ul style="list-style-type: none"> • 30 acres on DPU property • 18 acres on City-owned vacant properties • 20 acres on Parks department property (one playground/park per year, cemetery roadways, impervious to pervious area in park properties, vacant properties) • Install 100 trees in tree boxes (e.g., Filtera-type practices); 30 acres total drained to this practice • Retrofit 4 DPU stormwater BMPs (e.g., dry ponds to more efficient BMPs), draining at least 6 acres of impervious surface
Green Infrastructure in CSS	Install or retrofit GI draining 18 acres of impervious surfaces, including efforts such as: <ul style="list-style-type: none"> • 6 acres on DPU property • 2 acres on City-owned vacant properties • 2 acres on Parks department property (one playground/park per year, cemetery roadways, impervious to pervious area in park properties, vacant properties) • Install 24 trees in tree boxes (e.g., Filtera-type practices); 8 acres total drained to this practice
Stream Restoration	Restore 2,500 linear feet of stream: <ul style="list-style-type: none"> • Through removal of concrete channels, repair of incised banks, etc. • In MS4 and/or CSS area • Evaluate opportunities for inclusion of access points to waterbody for recreational activities
Natives/Invasives	Use 80% native plants in new landscaping at public facilities by 2023.
Trees	<ul style="list-style-type: none"> • Increase tree canopy on City property by 5% (80 acres added) • Protect existing tree canopy by following maintenance addressed in the Tree Planting Master Plan
Land Conservation	Place an additional 10 acres under conservation easement, prioritizing conservation of land that creates connected green corridors. <ul style="list-style-type: none"> • Evaluate opportunities for inclusion of access points to waterbody for recreational activities
Water Conservation	Reduce water consumption by 10% through implementation of new water conservation technologies and promotion of water conservation efforts, including: <ul style="list-style-type: none"> • Installing water-efficient fixtures as a policy by 2023 in all new public facility construction • Implementing incentive programs



	<ul style="list-style-type: none"> Encouraging water conservation on City properties
Pollution Identification and Reduction	<p>Reduce contribution of pollutants to the MS4 through:</p> <ul style="list-style-type: none"> Conducting at least 1 special study per year in hot spot areas to identify illicit discharges/connections. (Studies will meet the criteria necessary to achieve Bay TMDL pollutant reduction requirements. Assume that, over 5 years, 3 of these studies will result in pollutant reductions that meet Bay TMDL requirements.) Collecting data associated with non-structural BMPs to facilitate quantification of pollutant reduction (e.g., storm drain clean-outs, pet waste stations, street sweeping)
CSS Infrastructure	<p>LTCP projects, including:</p> <ul style="list-style-type: none"> Installing wet weather interceptor to convey more flow to the WWTP Increasing WWT to 300 MGD at the treatment plant Expanding secondary treatment at the WWTP to 85 MGD Expanding Shockoe retention basin by 15 MG to capture more overflow Disinfecting overflow at Shockoe retention basin (wet weather disinfection facility) <p><i>Note that that the modeling framework will be applied during the summer and fall of 2017 to evaluate alternative CSS reduction projects that may provide similar benefits to the LTCP projects, but at a reduced cost.</i></p>

Table 5.2 includes the final, agreed upon supporting actions for the strategies.

Table 5.2. Supporting Actions associated with the various strategies

Supporting Actions	Details
Partnerships	<p>Restore 20 acres of riparian buffers on private properties through efforts such as:</p> <ul style="list-style-type: none"> Purchases of land Partnerships with residents: Promote program for buffers on private properties (include tiers of level of involvement – (1) maintenance agreement with City, (2) conservation agreement/ easement.) Partnerships with Master Naturalists to enlist their support for assistance with riparian restoration. <hr/> <p>Implement 10 acres of GI on private property</p> <hr/> <p>Implement 5 acres of GI on DPW property (rights of way, roadways, green alleys) through efforts such as:</p> <ul style="list-style-type: none"> Adopt a rain garden program – coordinate with residents, non-profits, commercial entities Partnering with the City’s community garden program to identify 0.5 acres of area for additional GI implementation Partnering with Public Works to ensure City greenways include GI <hr/> <p>Develop a program to encourage the use of native plants in private landscaping – sign up 20 private landscapers.</p> <hr/> <p>Initiate an Adopt a Lot program (10 lots with invasive species removed, replanted and maintained)</p> <hr/> <p>Partner with organizations such as the James River Park System Invasive Plant Task Force to better determine areas with significant invasive species issues and identify resources to deal with the problem.</p> <hr/> <p>Partner with the public and other stakeholders, such as the Richmond Tree Stewards, to plant and maintain trees on public properties.</p>



	Promote requests for stream restoration by private landowners and streamline the process by which these requests are addressed.
	Hire DPU staff member or assign 1 FTE to coordinate volunteers from corporate entities, watershed/environmental groups and public with partnership opportunities associated with the IP effort. Staff to enlist/maintain 6 partnerships per year.
	Hold 3 stakeholder meetings per year to continue communication with partners/stakeholders and add purpose to the IP effort.
	Evaluate partnership network in 5 years (at the end of the permit cycle) to assess gaps and identify new public/private partners.
	Partner with the public and other stakeholders to identify land to put in conservation easements.
	Partner with the Richmond Redevelopment and Housing Authority to identify homes/properties that are eligible for upgrades to water-efficient fixtures.
	Partner with upstream localities and Virginia Department of Health to update/maintain Source Water Protection Plan.
Maintenance	Include funding to support maintenance of newly replanted/restored riparian buffers (to ensure success of plantings, prevention of establishment of invasive species, etc.).
	Include funding to support maintenance of newly planted native plants and maintain newly established plantings where invasives have been removed from the landscape.
	Provide funding to support maintenance of trees on City property to ensure their survival and health.
Monitoring, Assessments & Planning	Inventory and map riparian areas to better understand loss or growth of riparian buffers.
	Inventory and map locations of trees and tree boxes to better understand loss or growth of tree coverage.
	Continue monitoring of 8 locations across the City for macroinvertebrate, habitat and in-stream water quality. Continue monitoring at 2 locations for flow. Evaluate opportunities to expand the flow monitoring network across the City.
	Evaluate the development of a monitoring data portal to facilitate sharing of data collected within the City with stakeholders and the public.
	Initiate monitoring work group in year one made up of technical stakeholders and other key groups/individuals to evaluate current monitoring efforts and identify potential efficiencies and additional monitoring needs moving forward.
	Evaluate potential for conducting pre- and post-construction monitoring of key stormwater BMPs.
	Conduct assessments of 4 stream segments across the 4 watershed groupings to support the development of watershed restoration plans to address pollutant sources and watershed stressors.
	Monitor growth/expansion of invasive species.
	Implement IDDE-related monitoring to support this effort – supported by a desktop analysis of high-risk dischargers.
Incentives/credits	Reevaluate the stormwater credit program to determine potential to include practices such as replacing or restoring riparian buffers.
	Evaluate incentives/credits for purchasing/planting native species (such as Montgomery County, MD).
	Reevaluate the stormwater credit program to determine potential to include practices such as



	<p>planting trees on private property. Provide 500 trees for planting on private property or equivalent incentives to purchase native trees.</p>
	<p>Offer grants to replace 20% of inefficient fixtures in moderate- to low-income units Evaluate expansion of incentive program to cover washing machines and dishwashers</p>
Regulations/ ordinances/ codes	Evaluate expanding the regulatory buffer from 100 ft. to 200 ft.
	Evaluate inclusion of language in City zoning and planning-related ordinances to protect existing trees and add new trees on developed property.
	Adopt permitting standards for water-efficient appliances/fixtures in City code.
Outreach	Conduct outreach to educate the general public about the goals and objectives of RVAH2O, and the resources and services available through the City.
	Conduct outreach to advertise the resources, requirements and services available through the City related to green infrastructure for private property owners.
	Conduct outreach to advertise the resources, requirements and services available through City related to tree planting and maintenance.
	Promote ability to use grey water for toilet flushing as a way to achieve higher LEED standards
	Encourage and incentivize water capture and reuse for landscaping
	Promote water conservation for commercial, industrial and residential customers through efforts such as “Fix a Leak Week” and the City’s Every Drop Counts initiative.
	Conduct targeted outreach to high-risk industries, particularly in areas of the City identified as hot spots.



6. Strategy Evaluation

Once strategies were drafted, an analysis was needed to determine which ones would be best for implementation. Figure 6.1 provides an overview of the multi-step strategy evaluation process that was used to make this determination. This process constrains proposed strategies by feasibility, relative achievement of goals/objectives, compliance with permit and regulatory drivers, and cost-related factors.

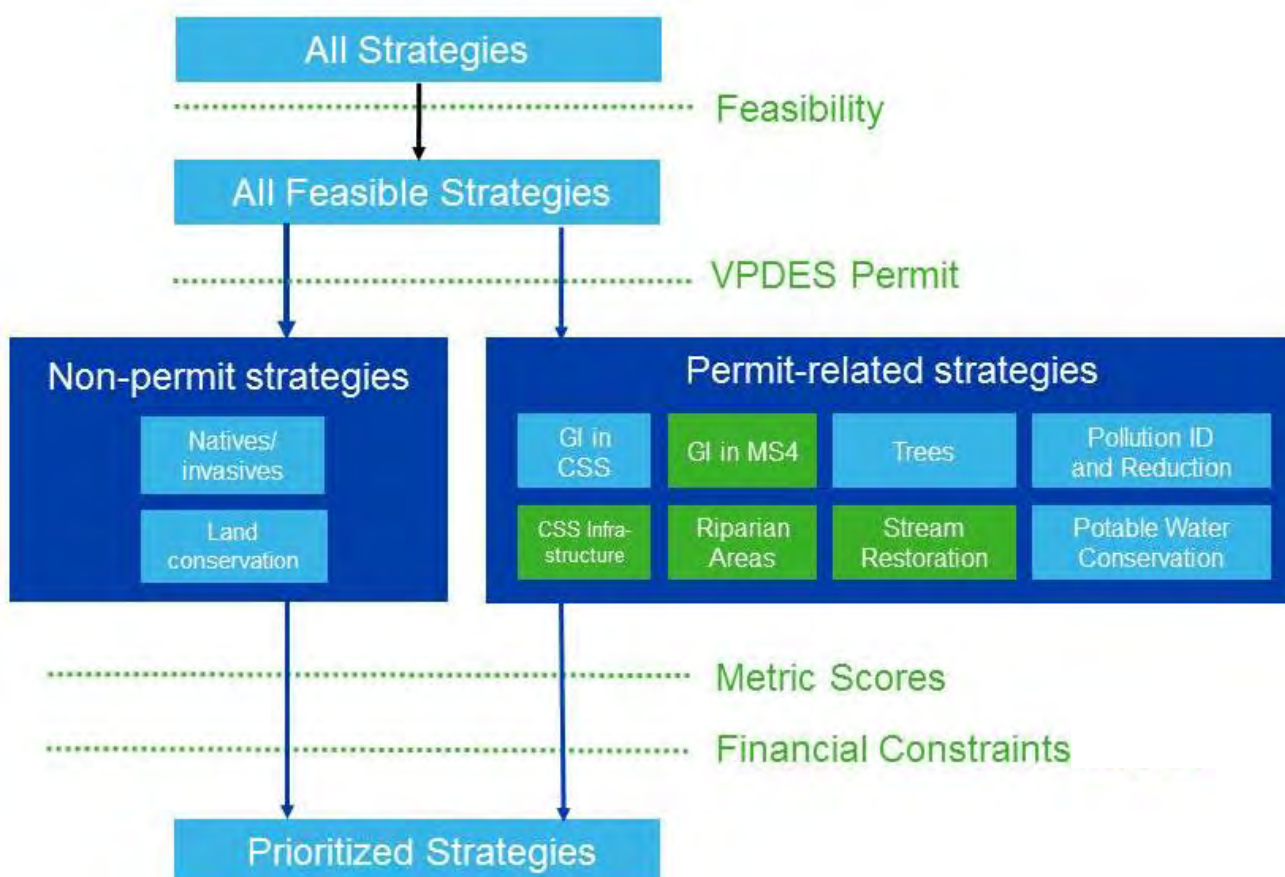


Figure 6.1. The process used for strategy evaluation

There are multiple factors at play that influence the selection of strategies. A strategy may do well with one factor, such as permit-related pollutant reductions, but not so well with others, like cost. As a result, the analysis of the various factors did not result in a clear and decisive outcome of one strategy that performed the best across all factors. What the strategy evaluation did determine was that all of the “pieces of the puzzle” needed to be evaluated collectively to achieve a complete picture of how well strategies achieve specific goals (Figure 6.2).

Each of the “puzzle pieces” (other than Feasibility, which was discussed in Chapter 5) is discussed further below.

Strategy Scores

A comparison of the various strategies proposed through this stakeholder process was needed. To accomplish this, an Excel-based strategy scoring calculator was developed. This tool helped in the decision-making process by allowing the City and stakeholders to evaluate various alternatives by assigning scores to the alternative strategies.

The methodology used for this scoring calculator is a multi-objective decision analysis (MODA). Decision-making based on consideration of multiple goals/objectives and metrics is a widely documented research discipline. While referred to by a variety of terms in the literature, this decision-making approach is used to evaluate how well each of the alternative strategies (e.g., management practices, policy options) achieves a desired outcome (a decision-making problem, goal, etc.) through the use of metrics⁷. This approach also helps facilitate the involvement of diverse stakeholders by accounting for competing priorities and preferences in the decision-making process through inclusion of the weighting process (Saarikoski et. al. 2015).

Development of calculator-based strategy scores to support strategy evaluation includes the development of metrics that are tied to the goals/objectives. The development of these metrics is discussed below. Also discussed is how the analysis of individual metrics helped to answer specific questions related to strategy effectiveness. These metric-based strategy scores were then used in conjunction with other factors, like cost, to comprehensively evaluate strategies.



Figure 6.2. Puzzle piece conceptual model demonstrating how various factors fit together to inform the decision making process

⁷ There are a number of names for this approach in the literature, which share similar methodologies. These include: Multi-Criteria Decision Analysis, Multi Criteria Evaluation, Multi-Criteria Preference Analysis, Multi Objective Evaluation, Multi-attribute Decision Analysis, Multi-attribute Utility Analysis, etc.

Developing Metrics

An important component of strategy scoring is the development of metrics. While stakeholders and City staff dedicated significant time to the establishment of Integrated Planning goals and objectives, a standard of measurement was needed to evaluate how well the strategies achieved these goals and objectives and how well the strategies compared to one another.

To accomplish this, a set of metrics was developed that includes a method of measurement. Table 4.2 provides examples of several metrics that were identified and how these are measured. Because metrics must be measureable, they are often quantitative. They may also be qualitative as long as there is a translation into a quantitative format. For instance, the “Stormwater Management Plan produced” in Table 6.1, is qualitative, but it is translated to a quantitative metric by incorporating a measuring

Metrics:

Measurable properties by which efficiency, performance, or progress can be assessed

Table 6.1 Example metrics and associated methods of measurement

Metric	Method of Measurement
Average yearly pollutant load reduction	Pounds of TN, TP, and TSS reduced Billion CFU of E.coli reduced
Percent increase towards meeting monthly geomean WQS compliance	Comparison of modeled E.coli concentration in the James River with the WQS standard
Riparian buffer restored/increased	Acres of riparian buffer
Partnerships implemented for Integrated Planning	Number of partnerships
Stormwater Management Plan produced	1=yes, 0=no
Amount of water conserved	Gallons

scheme of a scale of 0 or 1.

At least one metric was identified for each objective. An example is included in Table 6.2, which shows one of the Clean Water Planning goals. This goal includes several objectives (three of which are included here). Each objective is evaluated by at least one metric.



Table 6.2 Example of goal, objectives, metrics, and how metric is measured

Goal	Objectives	Metric	Measure of Metric
Protect and restore aquatic and terrestrial habitats to support balanced indigenous communities	Restore streams to improve, restore, and enhance native ecological communities.	Streams restored	Feet (of stream restored)
		Reduce stormwater volume discharging to streams	Millions of gallons
		Riparian buffers restored and/or increased	Acres (of buffer restored)
	Identify, protect, and restore critical habitats.	Habitat protected or restored	Acres (protected or restored)
	Enhance aquatic and terrestrial habitat connectivity.	Habitat connected by green corridor	Acres (included in “green corridor”)

Appendix C includes the complete list of the goals, objectives, metrics, and Appendix D (the Excel-based Strategy calculator tool, discussed below) also includes the raw scores that were identified for each strategy.

Raw Scores for Metrics

Each strategy was then given a raw score for each metric. Table 6.3 takes the example from Table 6.2 a step further and shows how a raw score is assigned to a metric. These scores can come from sources, such as the Integrated Plan model (e.g., number of extra days of bacteria compliance), from the literature (e.g., nitrogen reduced by an infiltration-based stormwater BMP), or from stakeholder input (e.g., number of acres of conservation easements that can be added).

Table 6.3. Example of how raw scores are assigned to each metric

	Riparian Areas Strategy	MS4 Green Infrastructure Strategy	Stream Restoration Strategy
Goal: Protect and restore aquatic and terrestrial habitats to support balanced indigenous communities			
Objective: Restore streams to improve, restore, and enhance native ecological communities			
Metric: Streams restored (in feet)	0	0	2,500
Metric: Reduce stormwater volume discharging to streams (in millions of gallons)	3	30	0
Metric: Riparian buffers restored and/or increased (in acres)	10	0	6

Once the raw scores were input into the calculator tool they were normalized and weighted. Normalization was performed to account for the various units represented (acres, pounds, feet, etc.). The normalized, weighted scores for each of strategies were summed to produce one score for each strategy. These final scores allowed strategies to be compared to one another. The calculator tool (in



Appendix D) includes all of the formulas necessary for one to understand how these final scores are developed. Additionally, a call-out box on page 53, explains the concept of normalization further.

Strategy Analysis

As discussed above, there are multiple “puzzle pieces”, or factors, that were taken into consideration in the analysis of strategies (Figure 6.2). The **Permit** puzzle piece represents the VPDES permit-related requirements that establish pollutant reduction targets by which the strategies were compared.

The Strategy Score “puzzle piece” involved using the calculator tool to evaluate **strategy scores** in several different ways. These analyses included evaluating:

- Permit-related metrics – metrics that related to total Nitrogen (TN), total Phosphorus (TP), total suspended solids (TSS) and bacteria were isolated in the calculator and scores associated with just these metrics were used to evaluate the effectiveness of strategies in reducing these pollutants of concern
- Standardization of strategies addressing permit-related metrics – strategies, which varied in size, were all standardized to 10 acres to compare these permit-related metrics in an “apples to apples” manner
- All metrics – including the full set of metrics associated with all of the objectives in addition to the pollutant-related metrics
- Standardization of all metrics – comparing how the same sized strategies (all 10 acres) address all metrics

The calculator tool was also tied to the **Strategy Cost** information. Metrics specific to pollutant reductions (e.g., pounds of pollutant removed by a strategy) were used to calculate Cost Effectiveness. Overall, strategy costs were then evaluated in association with Affordability.

Another puzzle piece, **Modeling Results**, provided the bacteria reductions associated with several strategies that were used as raw score inputs into the calculator. Modeling results also provided information pertaining to the relative nature of bacteria sources to the James River and tributaries.

Each of these specific analyses is discussed in more detail below.

The Permit Establishing Targets

Stakeholders and City staff have dedicated significant time to the establishment of Integrated Planning goals and objectives as well as strategies to help ensure these are achieved. While stakeholder concerns ranging from pollutant reduction to habitat restoration and invasive species removal are all considered in the Clean Water Plan, it is essential to remember that there are VPDES permit-related requirements that must be addressed and therefore, these requirements are key drivers behind the Plan. Therefore, it is important to understand that these VPDES permit requirements are water quality-focused and this permit-driven approach inherently prioritizes efforts that help improve water quality in Richmond’s waters. Determining the extent to which water quality needs to be improved and the targets that help guide these improvements is a key step in the strategy analysis. Once these targets are determined, the



next step is to evaluate how the strategies themselves help the City best (efficiently and effectively) achieve these targets.

One pollutant the City must work toward reducing is bacteria. Table 6.4 includes the existing bacteria (*E.coli*) loads and the allowable pollutant loading (the Waste Load Allocation, or WLA) for the City's MS4 (as documented in the Bacteria TMDL Action Plan based upon the James River Bacteria TMDL) and for the CSO/WWTP discharges (as documented in the James River Bacteria TMDL). These loads and the WLAs are summed in this table to provide an overall bacteria reduction by watershed addressed by the TMDL.

Table 6.4. E.coli Bacteria reduction requirements for Richmond's WWTP/CSS and MS4 systems

	MS4			WWTP			CSO		
	Existing Load	WLA	Load Reduction Target	Existing Load	WLA	Load Reduction Target	Existing Load	WLA	Load Reduction Target
Bacteria (BCFU)	606,312	221,842	384,470	6,792	444,000	(437,208)	16,511,684	3,025,710	13,485,974

What Table 6.4 shows is that the MS4 and CSOs in particular are still the biggest sources of bacteria and will drive additional reductions. The WWTP is reducing bacteria efficiently. The existing bacteria load from the plant, therefore, is far below the WLA, which produces a "credit" for bacteria (this negative number is denoted by parenthesis around the load reduction target).

The City also has total Nitrogen (TN), total Phosphorus (TP), and total suspended solids (TSS) pollutant loading reduction targets driven by the Chesapeake Bay TMDL. TN and TP reductions are also reflected in the VPDES Watershed General Permit for Nutrient Discharges to the Chesapeake Bay. Table 6.5 identifies the WLA and reduction goals associated with the City's WWTP and its CSOs as well as with its MS4 program.

Table 6.5. TN, TP, and TSS reduction requirements for Richmond's WWTP/CSS and MS4 systems

	MS4			WWTP			CSO		
	Existing Load	Waste Load Allocation	Load Reduction Target	Existing Load	Waste Load Allocation	Load Reduction Target	Existing Load	Waste Load Allocation	Load Reduction Target
TN (lbs)	166,955	154,901	12,054	338,328	1,093,652	(755,324)	141,759	409,557	(267,798)
TP (lbs)	19,813	17,262	2,550	29,411	55,754	(26,343)	17,720	31,642	(13,922)
TSS (lbs)	6,327,579	5,223,204	1,104,375	361,031	847,754	(486,723)	2,303,581	3,396,550	(1,092,969)



Table 6.5 shows that the WWTP is very efficient in reducing these pollutants and resulting load reduction targets for Nitrogen, Phosphorus, and sediment are not only met, but exceeded.

As will be discussed in further in Chapter 9, the intent of the watershed-based integrated VPDES permit is to look at the City's source sectors collectively to determine greatest impacts. In an effort to do this, bacteria, nutrient and sediment targets for the MS4, WWTP, and CSOs are aggregated (Table 6.6).

Table 6.6. Aggregated annual load reduction targets

	Waste Load Allocation	Existing Load	Load Reduction Target
TN (lbs)	1,658,110	647,042	(1,011,068)
TP (lbs)	104,658	66,943	(37,715)
TSS (lbs)	9,467,508	8,992,191	(475,317)
Bacteria (BCFU)	3,691,552	17,124,789	13,433,236

These aggregated annual load reduction targets reflect the effectiveness of the WWTP in reducing nutrients and sediment in general. While this Clean Water Plan will still continue to emphasize additional reductions of these pollutants in the MS4 and its impacts to tributaries in particular, this information helps inform DPU as to where its most significant pollutant reductions are needed. This information will be taken into consideration in the following analyses and how this influences strategy prioritization.

Strategy Scores

Permit-Related Metrics

Permit-related metrics are defined as those that address TN, TP, TSS, or bacteria (the pollutants of concern). Through the population of the Excel-based strategy scoring calculator, each strategy was evaluated to determine what amount of, if any, pollutant reduction was achieved. Table 6.7 includes the strategies that are expected to result in reductions in permit-targeted pollutants associated with the Chesapeake Bay TMDL (TN, TP, and TSS) and bacteria TMDL (for compliance with recreational water quality standards). The values in Table 6.7 are excerpted from the strategy scoring calculator. How well each of these strategies addresses these pollutants is also conveyed in this table by color coding the cells based on the strategies that best address these pollutants of concern:

- **Green** – address all pollutants of concern (light green addresses fewer metrics)
- **Orange** – Address nutrients and sediments, but not bacteria
- **Red** – don't address any pollutants of concern, but can be used as supplemental strategies that can be incorporated as appropriate and as resources and opportunities allow



Table 6.7. How strategies address pollutants of concern*

	Riparian areas	GI in MS4	GI in CSS	Stream restoration	Natives/ invasives	Trees	Land conservation	Water conservation	Pollution ID	CSOs / WWTP Infrastructure
Objective: Reduce nitrogen, phosphorus, and sediment in discharges to achieve VPDES permit requirements (Chesapeake Bay TMDL).										
Average yearly TN load reduction (lbs)	19	414	74	188	0	30	0	11	448	7,066
Average yearly TP load reduction (lbs)	4	90	16	170	0	4	0	1	162	903
Average yearly TSS load reduction (lbs)	1,081	42,397	7,393	75,013	0	447	0	422	57,893	116,843
Objective: Reduce bacteria levels to achieve VPDES permit requirements (local TMDL and water quality standards).										
Percent increase in monthly geomean WQS compliance	0	0	0	0	0	0	0	0	0	11
Average yearly E.coli load reduction (billion cfu)	83	3,531	40,642	0	0	0	0	0	0	3,551,112
Average yearly reduction in CSO events (number)	0	0	0	0	0	0	0	0	0	1
Average yearly reduction in CSO volume discharged (million gallons)	0	0	5	0	0	0	0	0	0	962

*(Associated with the goal: Manage wastewater and stormwater to improve the water quality and water quantity of ground water and surface water.)

The results of this comparison show the following:

- Strategies that address all pollutants including TN, TP, TSS and bacteria
 - CSO/WWTP Infrastructure
 - Green Infrastructure (in the MS4/CSS areas)
 - Riparian Areas
- Strategies that address TN, TP, TSS, but not bacteria
 - Stream restoration
 - Trees
 - Water conservation
 - Pollution identification

Additionally, strategies that can be implemented, but do not help achieve permit requirements include:



- Native/invasives
- Land conservation

The “raw” scores in Table 6.7 were then normalized and weighted (additional information on these processes is included on the call-out box on the following page). These values are included in Table 6.8.

*Table 6.8. Normalized and weighted scores of strategies in addressing pollutants of concern**

	Riparian areas	GI in MS4	GI in CSS	Stream restoration	Natives/invasives	Trees	Land conservation	Water conservation	Pollution ID	CSOs / WWTP Infrastructure
Objective: Reduce nitrogen, phosphorus, and sediment in discharges to achieve VPDES permit requirements (Chesapeake Bay TMDL).										
Average yearly TN load reduction (lbs)	0.3**	6.8	1.2	3.1	0.0	0.5	0.0	0.2	7.4	116.0
Average yearly TP load reduction (lbs)	0.5	11.6	2.0	21.8	0.0	0.5	0.0	0.2	20.9	116.0
Average yearly TSS load reduction (lbs)	1.1	42.1	7.3	74.5	0.0	0.4	0.0	0.4	57.5	116.0
Objective: Reduce bacteria levels to achieve VPDES permit requirements (local TMDL and water quality standards).										
Percent increase in monthly geomean WQS compliance	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	87.0
Ave. yearly E.coli load reduction (billion cfu)	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	87.0
Average yearly reduction in CSO events (number)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.0
Average yearly reduction in CSO volume discharged (million gallons)	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	87.0
Score	1.9	61.4	12.9	99.4	0.0	1.5	0.0	0.8	85.7	696.2
Rank	6	4	5	2	9	7	9	8	3	1

*(Associated with the goal: Manage wastewater and stormwater to improve the water quality and water quantity of ground water and surface water.)

** All scores multiplied by 100 for clarification purposes. Total score may be off due to rounding.



Normalizing & Weighting Scores

The intent of the strategy scoring process is to produce a value that demonstrates how well each strategy addresses the metrics of interest. The metrics used to evaluate the strategies; however, can vary in the way they are measured (e.g., pounds of total Nitrogen reduced, acres of impervious surface treated, etc.).

Because of the varying units represented, raw scores cannot simply be added together to obtain a score for each strategy. A normalization process is required to adjust these raw scores to a common scale.

To accomplish the normalization process, the raw score is divided by the maximum of the raw scores associated with that particular metric. In the example below, each of the numbers in the red box would be divided by 7,066 to produce the associated normalized scores for this metric.

Additionally, because the metrics may not all be of equal importance, various weights were also applied to them. In the example below TN reduction was considered most important and given a higher weight (50%) than the other metrics. Normalized scores are multiplied by the associated weight to produce a final weighted, normalized score. In the example below, each of the normalized scores in the orange box is multiplied by 50% to produce the associated values in the green box. A strategy's weighted, normalized scores are added together to produce a final score for that strategy. In the example below, Strategy B, with a score of 30, best achieves these four metrics.

Example scoring process

		Raw Scores			Normalized Scores			Weighted, Normalized Scores		
	Weight	Strategy A	Strategy B	Strategy C	Strategy A	Strategy B	Strategy C	Strategy A	Strategy B	Strategy C
Average yearly TN load reduction (lbs)	50%	19	11	7,066	0.003	0.002	1.0	0	0	1.2
Average yearly E. coli load reduction (BCFU)	20%	83	0	3,551,112	0	0	1	0	0	0.9
Impervious Surface reduced or treated (acres)	15%	2	5	0	0.4	1	0	6	15	0
Potable water consumption reduced (gallons)	15%	0	0	250	0	1.0	0	0	15	0
Total	100%							6	30	2.1

The normalized, weighted scores for each strategy are summed, which results in a final score for the strategy. The top ranked strategies for achieving key pollutant reduction include:

1. CSO/WWTP Infrastructure
2. Stream Restoration
3. Pollution Identification
4. GI in MS4

“Standardization” of Permit-Driven Metrics

As previously stated, the numeric targets of the strategies were based on the amount of DPU/PRCF land/resources available for that particular strategy. As a result, each strategy addresses a different amount of area (e.g., 10 acres of land for riparian area restoration vs. 104 acres of land in the MS4 for implementation of green infrastructure, etc.). To evaluate strategies in a “standardized” manner (all strategies being comparable in size to one another in an “apples to apples” manner), strategies were evaluated as if they would be implemented on 10 acres of land (Table 6.9).

It is important to note that the CSO/WWTP strategy is based on reducing the combined sewer overflow volume and frequency, which is not based on acreage of implementation. As such, this strategy cannot be standardized in this way and is not included in the analysis reflected in Table 6.9.



Table 6.9. How “standardized” strategies address pollutants of concern*

	Riparian areas	GI in MS4	GI in CSS	Stream restoration	Natives/ invasives	Trees	Land conservation	Water conservation	Pollution ID
Objective: Reduce nitrogen, phosphorus, and sediment in discharges to achieve VPDES permit requirements (Chesapeake Bay TMDL).									
Average yearly TN load reduction (lbs)	19	40	41	327	0	4	0	22	1
Average yearly TP load reduction (lbs)	4	9	9	296	0	4	0	1	0
Average yearly TSS load reduction (lbs)	1,081	4,077	4,107	130,702	0	56	0	845	341
Objective: Reduce bacteria levels to achieve VPDES permit requirements (local TMDL and water quality standards).									
Percent increase in monthly geomean WQS compliance	0	0	0	0	0	0	0	0	0
Average yearly E.coli load reduction (billion cfu)	83	340	22,579	0	0	0	0	0	0
Average yearly reduction in CSO events (number)	0	0	0	0	0	0	0	0	0
Average yearly reduction in CSO volume discharged (million gallons)	0	0	3	0	0	0	0	0	0

*(Associated with the goal: Manage wastewater and stormwater to improve the water quality and water quantity of ground water and surface water.)

Table 6.10 shows the normalized, weighted scores for these strategies standardized across 10 acres. Again, note that the CSO/WWTP strategy is not included in Table 6.10 as it cannot be standardized across 10 acres of land.



Table 6.10. Standardized strategies that have been normalized and weighted for pollutants of concern*

	Riparian areas	GI in MS4	GI in CSS	Stream restoration	Natives/ invasives	Trees	Land conservation	Water conservation	Pollution ID
Objective: Reduce nitrogen, phosphorus, and sediment in discharges to achieve VPDES permit requirements (Chesapeake Bay TMDL).									
Average yearly TN load reduction (lbs)	6.6	14.1	14.7	116.0	0.0	1.4	0.0	8.0	0.5
Average yearly TP load reduction (lbs)	1.5	2.8	3.0	116.0	0.0	0.2	0.0	1.1	0.0
Average yearly TSS load reduction (lbs)	1.0	2.4	2.5	116.0	0.0	0.0	0.0	0.8	0.3
Objective: Reduce bacteria levels to achieve VPDES permit requirements (local TMDL and water quality standards).									
Percent increase in monthly geomean WQS compliance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ave. yearly E.coli load reduction (billion cfu)	0.3	1.3	87	0.0	0.0	0.0	0.0	0.0	0.0
Average yearly reduction in CSO events (number)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average yearly reduction in CSO volume discharged (million gallons)	0.0	0.0	87.0	0.0	0.0	0.0	0.0	0.0	0.0
Score	9.4	22.5	195.8	348	0	1.6	0	9.9	0.8
Rank	5	3	2	1	8	6	8	4	7

*(Associated with the goal: Manage wastewater and stormwater to improve the water quality and water quantity of ground water and surface water.)

** All scores multiplied by 100 for clarification purposes



All Metrics

While evaluating key permit related pollutants is important, numerous other metrics were also identified for other goals and objectives (Appendix C). Table 6.11 shows the score (obtained from the strategy scoring calculator) for each strategy that takes all of the metrics collectively into consideration.

Table 6.11 – Scores and ranks of all feasible strategies – total acres/resources available

	Riparian	GI in MS4	GI in CSS	Stream Restoration	Natives/ Invasives	Trees	Land Conservation	Water Conservation	Pollution ID	CSO/WWTP
Scores	54.90	57.53	39.88	47.82	43.10	44.80	42.02	45.00	35.29	46.22
Rank	2	1	9	3	7	6	8	5	10	4

The results of the scoring process (including all metrics and strategies) results in the following ranking of strategies:

1. Green Infrastructure in the MS4
2. Riparian Area Restoration
3. Stream Restoration
4. CSO/WWTP Infrastructure

“Standardization” of All Metrics

While these available acreages are very important for future implementation purposes, a “standardized” comparison of the strategies with regard to all other metrics was also performed. Again, this analysis assumed 10 acres of implementation for each of the strategies and, as discussed above, the CSO/WWTP strategy was not included in this standardized analysis as it cannot be evaluated on a 10-acre basis. The CSO/WWTP strategy is therefore evaluated separately below. Table 6.12 shows the scoring of the strategies if all were implemented on the same amount of acreage.

Table 6.12 – Scores and ranks of feasible strategies – 10 acres for each strategy

	Riparian	GI in MS4	GI in CSS	Stream Restoration	Natives/ Invasives	Trees	Land Conservation	Water Conservation	Pollution ID
Scores	66.87	55.46	57.67	67.74	44.44	43.83	46.49	56.33	36.27
Rank	2	5	3	1	7	8	6	4	9



The results of these scores produce in the following top-ranked strategies:

1. Stream Restoration
2. Riparian Area Restoration
3. Green Infrastructure in the CSS area
4. Water Conservation

Evaluation of CSS Infrastructure Projects

The CSS Infrastructure strategy was evaluated in previous sections as a whole, but this strategy consist of several different projects outlined in the LTCP, including:

- Installing wet weather interceptor in Lower Gillies to convey more flow to the WWTP
- Increasing WWT (wet weather treatment) at the WWTP to 300 MGD and expanding secondary treatment at the WWTP to 85 MGD
- Replacement of CSO 021 regulator and additional 2MG storage at CSO 021
- Expanding Shockoe retention basin by 15 MG to capture more overflow
- Disinfecting overflow at Shockoe retention basin (wet weather disinfection facility)

Each project was evaluated in isolation to determine individual impact on bacteria load reduction. These CSS “scenarios” are summarized in Table 6.13, below.

Table 6.13. Description of CSS Projects Evaluated by the Water Quality Model

CSS Scenario	CSS Project Name	CSS Project Description
Existing	Existing Conditions	Existing sewer conditions, including all LTCP Phase I and Phase II projects.
14-3	Baseline Conditions	Includes the currently funded projects: --CSO 028A & 028E disconnection --WWTP wet weather treatment up to 140 MGD
14-2	Gillies Conveyance	Lower Gillies Wet Weather Conveyance Interceptor to convey more flow to the WWTP
15-4	300 MGD Wet Weather Treatment	WWTP wet weather treatment up to 300 MGD
15-5	CSO 21 Replacement	Replacement of the CSO 21 regulator and additional 2MG storage
18-4	SRB Expansion	Shockoe retention basin (SRB) expansion to 15MG
18-5	SRB Expansion and Disinfection	SRB Expansion to 15MG and chlorine disinfection of the SRB discharge at CSO 06
19-3A	Full LTCP	All 10 Phase III projects, Full LTCP achieved.



Bacteria load reductions from each CSS scenario is shown in Figure 6.4, below.

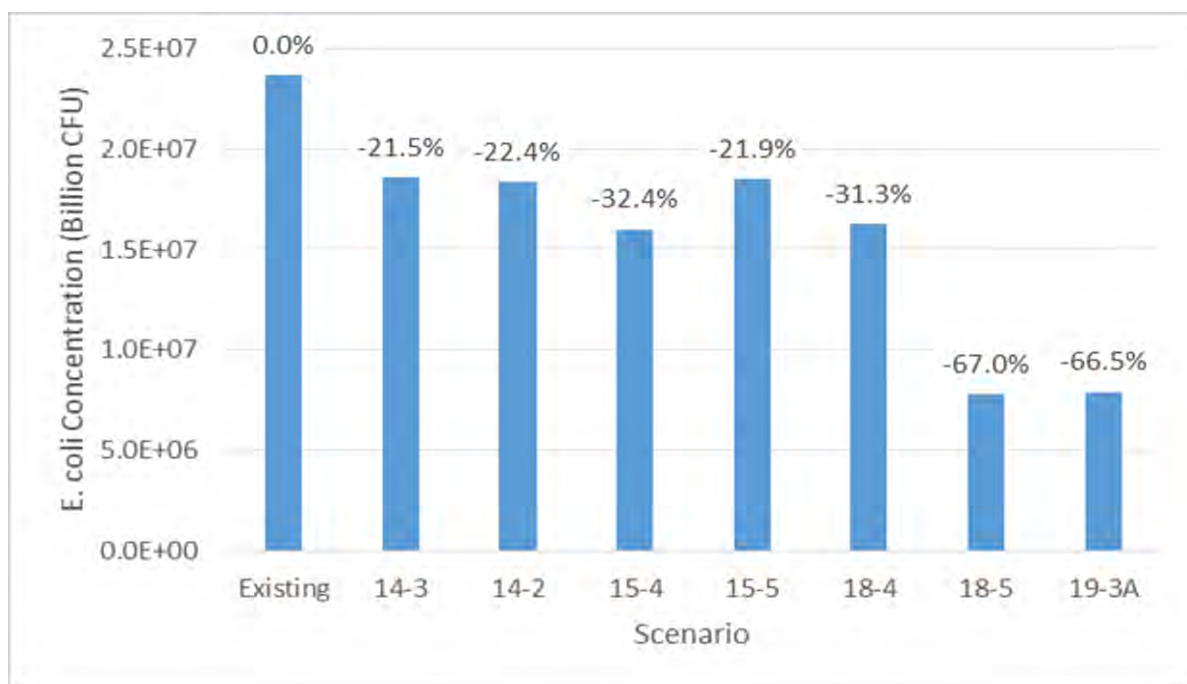


Figure 6.4 Bacteria load reductions from each CSS Infrastructure Project

Additional new projects, or variations to the existing projects, are currently being evaluated to determine if these alternative projects could accomplish similar or greater bacteria load reductions compared to the existing projects, and if this could be done in a more cost efficient way. Those alternative evaluations are currently ongoing, and include projects such as controlling discharge from CSO-040 and other combined sewer outfalls, and different types of disinfection for wet weather treatment at the wastewater treatment plant and at Shockoe retention basin.

Comparison of Targets with Load Reductions

The aim of the Integrated VPDES permit is to more efficiently control the discharge of pollutants from all DPU sources. In order to do this, it is necessary to look at the ultimate targets and all the sources together and assess where it is possible to get the greatest gains. It is also important to recognize not all pollutants will be assessed in the same way, different pollutants have different impacts. Some pollutants have far field effects and can be assessed based upon total load delivered while others must be looked at based on localized effects. For instance, an aggregate approach can be done for TN, TP, and TSS because the TMDL allows the targets to be assessed for the City as a whole to ultimately achieve improvements downstream to the Chesapeake Bay. The bacteria numbers can also be aggregated to show the overall scale of needed reductions, but it must be remembered that bacteria allocations exist for specific watersheds, and those need to be met at the local scale, rather than at the aggregate scale. These aggregated targets are depicted in Table 6.14.

Table 6.14. Aggregated Annual Load Reduction Targets

	Existing Load	Waste Load Allocation	Load Reduction Target
TN (lbs)	647,042	1,658,110	(1,011,068)
TP (lbs)	66,943	104,658	(37,715)
TSS (lbs)	8,992,191	9,467,508	(475,317)
Bacteria (BCFU)	17,124,789	3,691,552	13,433,236

While Table 6.14 shows (on an aggregated scale) targets for TN, TP, TSS are already met, bacteria still needs additional reductions in order to meet targets. These targets can be compared to the load reductions achieved by the strategies, shown previously in Table 6.6.

Costs

Financial constraints referred to in Figure 6.1 include the costs of the strategies and supporting actions and cost effectiveness of these strategies. Affordability is considered the overarching mechanism within which these elements can be paid for in an affordable manner by DPU. Each of these factors is discussed in more detail below.

Strategy Costs

The cost associated with the full implementation of the strategies included in Table 5.1 was also estimated (Table 6.15). For the purpose of estimating costs most consistently across strategies, the assumption was that the strategy would be implemented in the first year of the permit (capital costs) with maintenance being required for the strategy in years two through five of the permit.

Table 6.15. Cost of main strategies broken out by capital and maintenance

Main Strategy	Capital	O&M	Total
Riparian Areas	\$900,000	\$200,000	\$1,100,000
Green Infrastructure in the MS4	\$10,500,000	\$2,000,000	\$12,500,000
Green Infrastructure in the CSS	\$2,600,000	\$750,000	\$3,350,000
Stream Restoration	\$1,700,000	\$1,200,000	\$2,900,000
Native/ Invasives	\$70,000	\$95,000	\$165,000
Trees	\$1,600,000	\$600,000	\$2,200,000
Land Conservation	\$ -	\$ -	\$ -
Water Conservation	\$220,000	\$ 50,000	\$270,000
Pollution Identification & Reduction ⁸	\$16,385,000	\$ -	\$16,385,000
CSO Infrastructure ⁹	\$374,800,000	\$17,400,000	\$392,200,000
Total	\$408,775,000	\$22,295,000	\$431,070,000

The cost of additional supporting actions was also estimated in Table 6.16.

⁸ As street sweeping and catch basin clean-outs are ongoing efforts for the City, these activities are calculated for each of the five years of the permit.

⁹ Note that the cost for the CSO Infrastructure strategy is over 30 years, while the costs of the other nine strategies are over five years.



Table 6.16. Cost of supporting actions

Supporting Actions	
Partnerships	\$700,000
Monitoring, Assessments & Planning	\$1,300,000
Incentives/ Credits	\$1,250,000
Regs/ Ordinance/ Code	\$ -
Outreach	\$500,000
Total	\$ 3,750,000

The source of all cost information as well as any assumptions that were made in association with the calculation of final cost estimates is discussed further in Appendix E.

Cost Effectiveness

While cost is important from the perspective of how it can be achieved within a certain budget, cost effectiveness of a particular strategy can be more informative because it provides an indication of the return on the investment. Cost effectiveness was evaluated for each strategy for the permit-driven metrics (TN, TP, TSS, bacteria) discussed above, and expressed as cost per unit pollutant removed. Cost effectiveness comparisons in Table 6.17 are also based on the strategies that included the fill size/acreage/ resources (again it should be noted that the Natives & Invasives strategy and the Land Conservation strategy are not included in this table because neither, as they are written, results in the reduction of these key pollutants).



Table 6.17. Pollutant reduction and associated cost effectiveness of strategies

	Riparian areas	GI in MS4	GI in CSO	Stream restoration	Trees	Water conservation	Pollution Identification	CSOs / WWTP Infrastructure
Average yearly TN load reduction (lbs)	19	414	74	188	30	11	448	7,066
Average yearly TP load reduction (lbs)	4	90	16	170	4	1	162	903
Average yearly TSS load reduction (lbs)	1,081	42,397	7,393	75,013	447	422	57,893	116,843
Average yearly E.coli load reduction (billion cfu)	83	3,531	40,642	0	0	0	0	3,551,112
Cost	\$1,100,000	\$12,500,000	\$3,350,000	\$2,900,000	\$2,200,000	\$270,000	\$16,385,000	\$392,200,000
Cost per pound TN removed	\$58,902	\$30,181	\$45,270	\$15,467	\$72,158	\$24,092	\$36,597	\$55,507
Cost per pound TP removed	\$292,553	\$138,687	\$209,375	\$17,059	\$520,833	\$195,744	\$100,882	\$434,293
Cost per pound TSS removed	\$1,017	\$295	\$453	\$39	\$4,925	\$639	\$284	\$3,357
Cost per billion E.coli removed	\$13,190	\$3,540	\$82	--	--	--	--	\$110

The green highlighted items in Table 6.17 identify those strategies that are most cost effective for the various pollutants.

Affordability

The intent of the Clean Water Planning process is to make sure that each dollar spent gets the greatest environmental benefit. While this is important to rate payers in general, it is additionally important because the City already has a large number of people who are below the poverty line and currently can't afford their utility bills. So, while the City was evaluating ways to make smart water quality decisions, it was also looking for ways to keep rates affordable.

While developing its Integrated Plan, DPU analyzed the impact annual spending would have on rates over time, and subsequently customer bills. This analysis was done to define and measure affordability, so that unaffordable bills and financial impacts can be mitigated to the greatest degree on an annual basis.

To accomplish this, DPU evaluated customer impacts on a localized level (at the census tract level shown here) throughout the City by measuring bill impacts against various affordability and income metrics, like “living wages”.

The results of this affordability analysis are summarized in Figure 6.2, demonstrating where rates are unaffordable by census tract. Between 2016 and 2045, the financial model shows the situation would get much worse (assuming rate increases remain at their current pace and economic conditions remain constant).

What this also shows is that if the City continues to attempt to comply with various water quality regulations with the “do everything, everywhere simultaneously” approach this is the probable outcome. Alternatively, the Clean Water Plan focuses strategic decisions for cleaner water faster, but in a more affordable way.

The budget within which strategies will be implemented within the Clean Water Planning effort have been set, or constrained, by affordability. It is important to note that a high cost of a given strategy may not take it off the table, but simply require it to be implemented over time or other strategies are prioritized ahead of it.

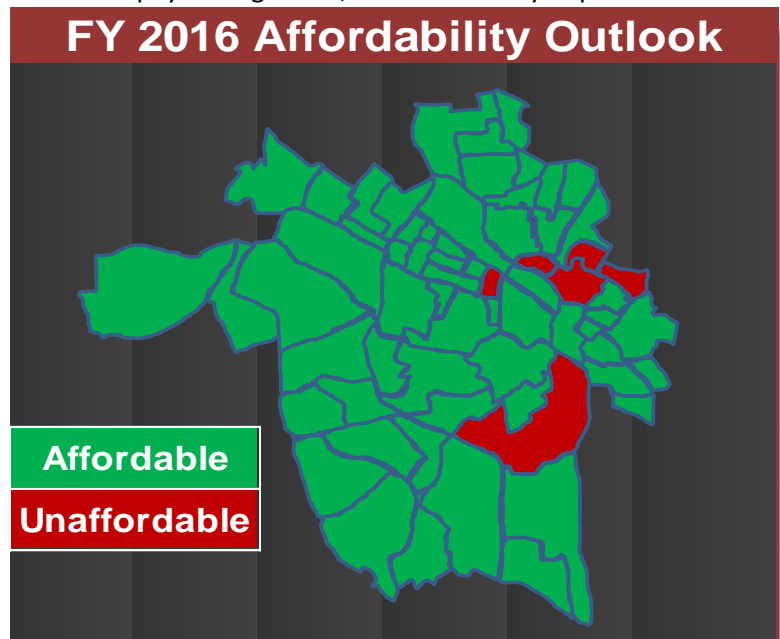


Figure 6.2 With current rates, those census tracts that cannot afford utility rates in 2016

Strategy Prioritization

The various “pieces of the puzzle”, discussed above, were used to understand how to best prioritize activities for implementation. As each of these analyses tells only a piece of the story, it is important to look at these analyses collectively. What these analyses have shown is that no one strategy consistently scores the highest or performed the best across the analyses, however, several strategies consistently performed well (a summary of the analyses are included in Table 6.18; green highlighted information depicts those that consistently score highest).

To allow for the consideration of multiple factors in determining priorities, it was determined that rather than ranking 10 strategies individually, that strategies would be grouped into one of three tiers based on effectiveness (Figure 6.3). Tier 1 includes those strategies that best address metrics associated with the pollutants of concern (TN, TP, TSS, bacteria) as well as the non-pollutant related metrics. These strategies were also the most cost effective. Tier 2 also addressed pollutant and non-pollutant related metrics, but not as efficiently or cost effectively as those in the Tier 1 grouping. Tier 3 includes those strategies that do not address the pollutants of concern.



Figure 6.3. Organization of strategies into tiers for prioritization

It is important to note that while select strategies may be *prioritized* it does not mean that the remaining strategies will be disregarded. Implementation of these strategies will be assessed based on additional resources available to DPU or priorities and resources available from other City departments or other partners.

It is also important to note that this analysis was done at a high level. As DPU moves toward implementation and conducts a more refined evaluation of strategies, there may be modifications to

this prioritization. For instance, the Green Infrastructure strategy includes bioretention, green roofs, permeable pavement, engineered tree boxes, rain barrels, and stormwater pond retrofits. If other green infrastructure practices are identified as alternatives, details, such as cost, amount of pollutant reduction, and how the practices achieves other metrics, will all be taken into consideration.



Table 6.18 Summary of Strategy Analysis and Strategy Prioritization

Rank	Pollutants of Concern Metrics	Pollutants of Concern Metrics: Standardized*	All Metrics	All Metrics: Standardized*	Cost Effectiveness (TN)	Cost Effectiveness (TP)	Cost Effectiveness (TSS)	Cost Effectiveness (bacteria)
1	CSO Infrastructure	Stream restoration	GI in MS4	Stream restoration	Stream restoration	Stream restoration	Stream restoration	GI in CSS
2	Stream restoration	GI in CSS	Riparian areas	Riparian areas	Water conservation	Pollution ID and reduction	Pollution ID & reduction	CSO Infrastructure
3	Pollution ID & reduction	GI in MS4	Stream restoration	GI in the CSS	GI in MS4	GI in MS4	GI in MS4	GI in MS4
4	GI in MS4	Water conservation	CSO Infrastructure	Water Conservation	Pollution Identification	Water conservation	GI in CSS	Riparian areas
5	GI in CSS	Riparian areas	Water Conservation	GI in MS4	GI in CSS	GI in CSS	Water conservation	Water conservation
6	Riparian areas	Trees	Trees	Land Conservation	CSO Infrastructure	Riparian areas	Riparian areas	
7	Trees	Pollution ID & reduction	Natives/ invasives	Natives/ invasives	Riparian areas	CSO Infrastructure	CSO Infrastructure	
8	Water Conservation	Natives / invasives	Land Conservation	Trees	Trees	Trees	Trees	
9	Natives/ invasives	Land Conservation	GI in the CSS	Pollution Identification				
10	Land Conservation		Pollution ID and reduction					

*WWTP/CSO strategy cannot be evaluated on a 10-acre basis so it is not included herein

7. Implementation Program

As discussed in Chapter 5, high-level strategies to achieve goals and objectives were developed to include quantifiable targets that DPU can work towards implementing (e.g., 10 acres of riparian buffer restoration, implementation of 104 acres of green infrastructure in the MS4 area of the City, etc.). An important part of this Clean Water Plan is developing an approach that can help the City implement these strategies in the most efficient and cost effective manner possible.

Framework Planning

In order to most efficiently and effectively implement its IWPM Plan, DPU will use a “Framework Planning” approach. The Framework Planning approach provides a methodology that ties together different strategies (and, subsequently, site-specific projects) and, where possible, aligns these strategies with other City or stakeholder-driven initiatives.

This Framework Planning approach is intended to be:

- A comprehensive and action-oriented blueprint for near- and long-range decision making
- A planning guide for the implementation of a set of strategies and serves to create a “framework” around multiple other efforts (e.g. Master Plan, guidelines for new/existing development, other City planning efforts, etc.) to guide planning in a cohesive way
- Designed for flexibility and choices that will enable different entities (City Departments, partners, etc.) to act both collaboratively and independently, over different periods of time, but in a coordinated way

The goal of the Framework Planning approach is to identify and sequence a blend of activities that yield the greatest environmental benefit (as measured by identified metrics) in the most cost-effective (and affordable) manner.

Framework Planning Process

As discussed in previous chapters, the Clean Water Planning process involved the development of goals and objectives, and high-level strategies that could meet these goals and objectives. For implementation purposes, these strategies will be translated into projects (e.g., 104 acres for the Green Infrastructure in the MS4 strategy could be implemented as 50 engineered tree boxes, 10 acres of permeable pavers, etc., which will, in total, drain 104 acres).

As depicted in Figure 7.1, strategies are prioritized (into Tiers, as discussed in Chapter 6) (#1), but they are still disparate strategies (#2). An example is the Green Infrastructure in the MS4 area strategy (which targeted 104 acres, 44 acres of which were estimated to include bioretention). Assuming each of these bioretention facilities drains one acre, 44 facilities would then be implemented across the City’s MS4 area. Implementing these facilities in a piecemeal approach would still meet the target of implementing 44 acres and would still achieve pollutant load reductions estimated for these facilities.



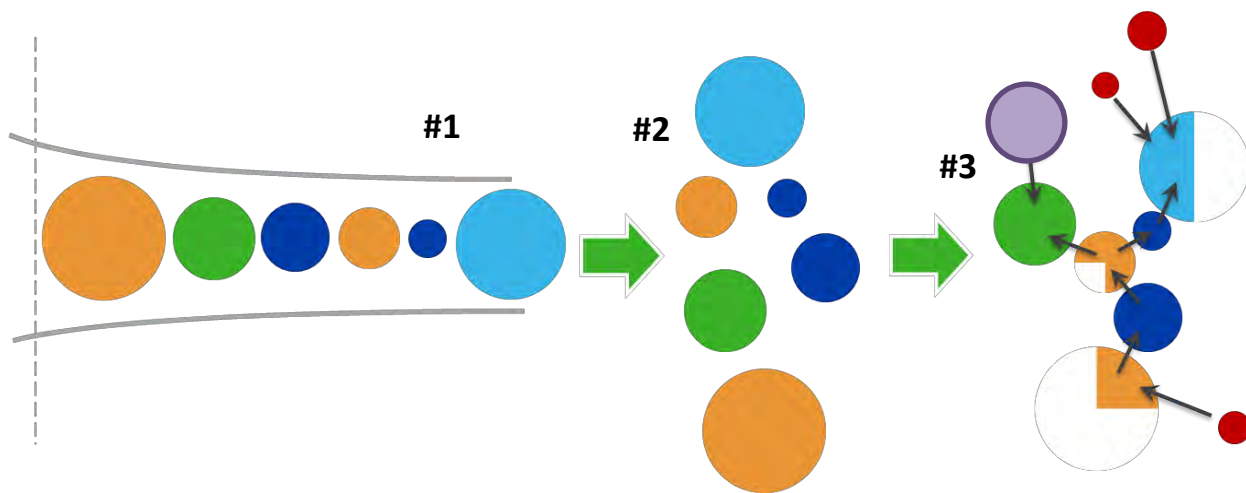


Figure 7.1 Framework Planning includes the interface of various elements together in the landscape in a way that makes the most sense for implementation.

Alternatively, DPU and its stakeholders can look collectively at the City for not only where the opportunities are for implementing bioretention, but where these practices can be implemented within the context of a more comprehensive planning and coordination effort under a Framework Planning umbrella. This Framework Planning process provides the structure for implementation of strategies/projects in a more integrated and cohesive way by leveraging opportunities with other city-led projects such as, for example, Richmond's Riverfront Plan, or stakeholder efforts such as, for example, EnRichmond's tree planting efforts (shown with the red and purple circles in Figure 7.1, #3). The Framework Planning process may also lead to the identification of new ideas and opportunities that can be pushed forward by DPU itself.

While DPU recognizes that some implementation may need to occur in a piecemeal fashion, its goal, where feasible, is that Framework Planning will drive implementation of the strategies. Framework Planning will meet the objectives and goals of the Clean Water Plan, while at the same time supporting and leveraging the overall growth and planning at the City or Stakeholder level.

An example of a Framework Planning-based clustered project is depicted in Figure 7.2, which is included in Arkansas' Conway Urban Watershed Framework Plan (2016). This example depicts Green Streets and parks that tie together the implementation of various types of green infrastructure while addressing other community needs, such as traffic calming, inclusion of recreational opportunities, and expanding parking. Figure 7.3 shows another example from the Conway Urban Watershed Framework Plan, which includes transportation corridors (streets and trails) and recreational amenities with riparian area restoration and green infrastructure. Additional detail on the Conway Framework Plan is included in the Case Study below, and provides additional context about what Framework Planning includes, and is consistent with the Clean Water Plan Framework Planning approach.

Green Streets and Parks
 Refool streets, car parking, and parks with a low impact development network hosting vegetated filter strips and bioswales connected to a wetland that creates a new civic green utility.

Shared Street Type

Somewhat unfamiliar to American cities, though growing in popularity, the *shared street* is a right-of-way designed as a park to reclaim pedestrian space while calming traffic. The street's integrated landscape systems can also double as low impact development facilities.

New Neighborhood Town Square

Substitute the manicured lawn with a large bio-retention mat featuring a wild landscape for water volume management in a low-lying area. The square contains an amphitheater, passive recreation, public art, and other community facilities.

Green Street Type

This local street type offers green infrastructure services from pervious sidewalk paving, curbside bioswales and tree box filters, to system-wide tree lined lawns and medians that can handle five year storm events—the majority of the area's storm events.

Green Alley Type

Alleys as service corridors are overlooked opportunities for stormwater management. Many cities like Minneapolis, Baltimore, and Chicago have implemented green alley programs to deliver ecosystem services. Here, an underground stream can be "daylighted" to restore ecological functioning and also serve expanded parking needs.

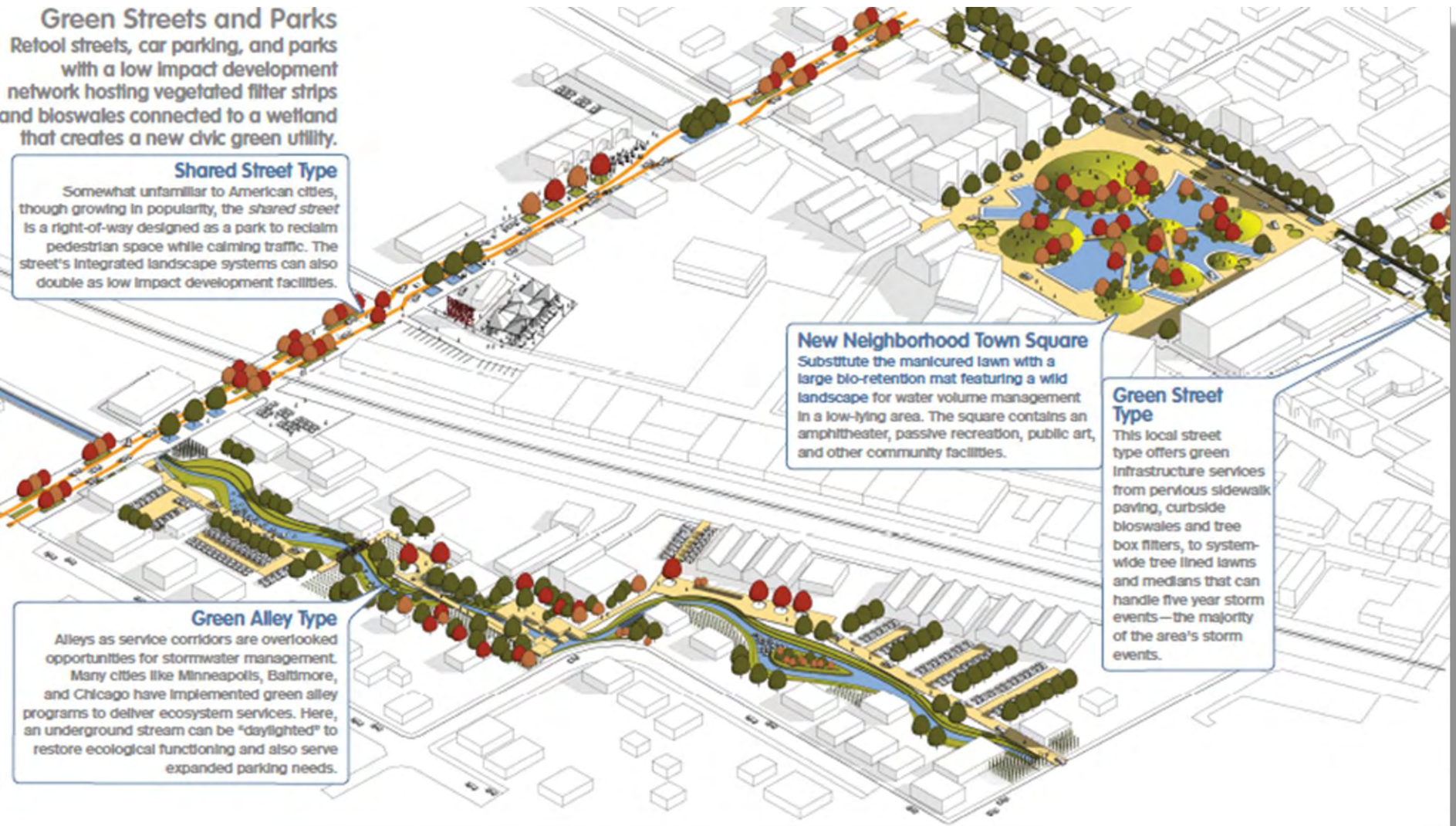


Figure 7.2. Example from the Conway Urban Watershed Framework Plan that shows how multiple strategies (green infrastructure, trees, riparian areas, natives/invasives) can be implemented in holistic way that also addresses other City priorities (traffic calming, recreation, beautification, etc.)

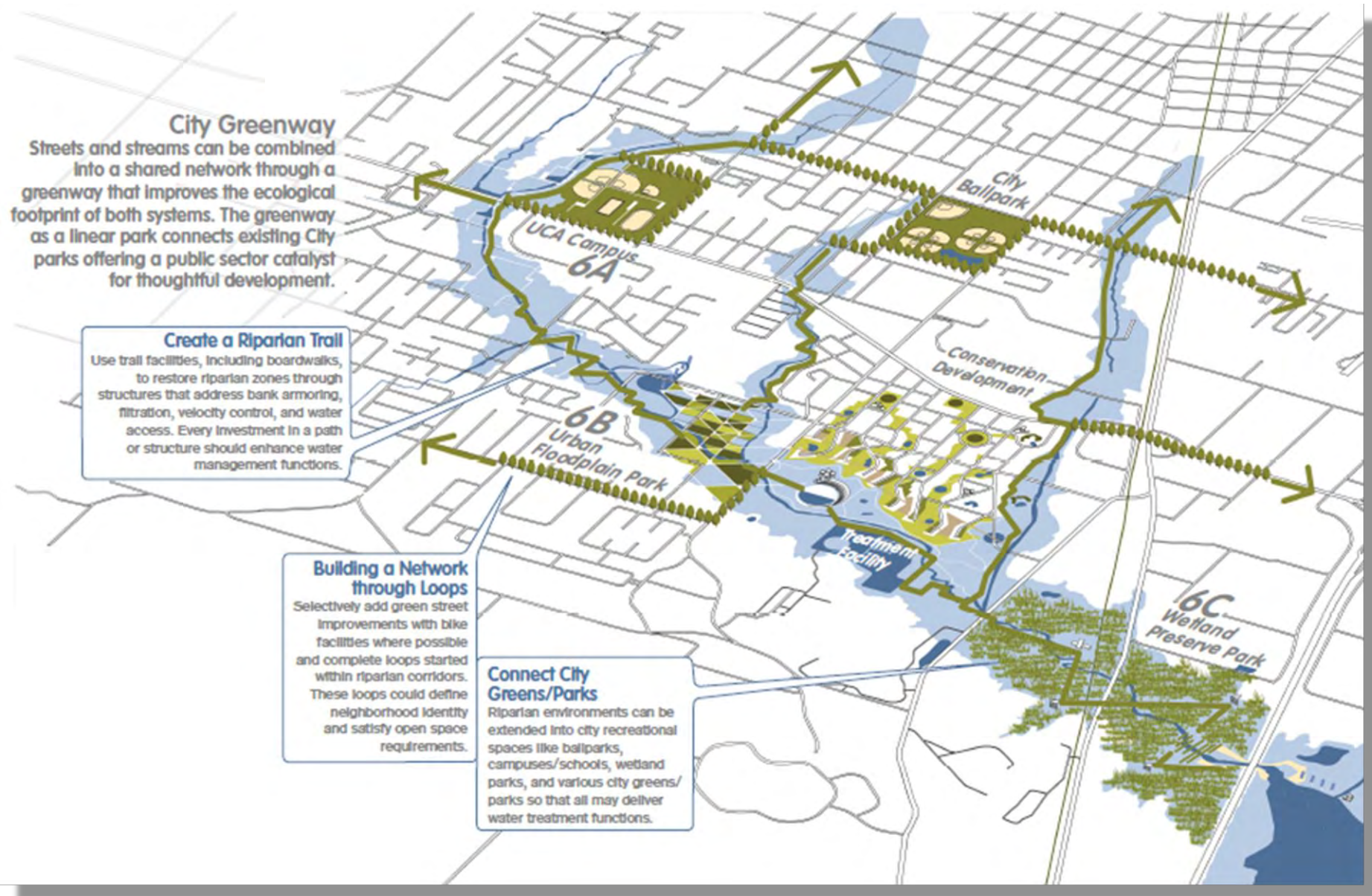


Figure 7.3. Example from the Conway Urban Watershed Framework Plan that shows how Greenways can incorporate strategies like green infrastructure and riparian area restoration with transportation corridors, parks, etc.

Case Study on Urban Framework Planning: Conway, Arkansas

An excerpt from the Conway Urban Watershed Framework Plan

The Framework Plan operates evolutionarily through a set of retrofit types that are incremental, contextual, and successional. The Framework Plan is incremental, relying on participation from various interests— public, private, or a combination thereof—to develop projects as funding and opportunity permit. Projects can be implemented step-wise and successively across various fronts in the urbanized area. Unlike the master plan which is totalizing and shows only a climax condition, the Framework Plan can be pioneered beginning with modest cumulative efforts that cohere from shared ecological design practices.

The Framework Plan is contextual, working through landscape architectural adaptations responsive to local ecologies and urban water problems. Soft engineering accounts for local soils, and vegetative and wildlife communities in place-based solutions that substitute for universal metrics and costly “over-engineered” outcomes driven by worst-case scenarios. The goal is to deliver ecological services through installing sustainable soft infrastructure. Soft engineering’s use of adaptive management lessens long-term maintenance burdens associated with hard-engineered infrastructure.

The Framework Plan is successional, understanding that cities are not built at once and that pioneer stages of development are rudimentary as they minimize start-up costs. The Framework Plan works initially through tactical demonstration projects, which if approved after assessment, can be mainstreamed into future projects and policies. This way the city or project developer can evaluate new practices without committing permanently to an untested development and business model. Cities do not have to retool policies without the chance to pursue due diligence. Stakeholders in decision-making, including the city and the area’s new watershed alliances (e.g., the Lake Conway-Point Remove Watershed Alliance), can collaborate as learning communities removing adversarial relationships so redolent in municipal planning processes. Without demonstration projects, conventional development approaches will remain entrenched despite the presence of more value-added approaches.

The Framework Plan places Conway ahead of the curve in addressing the greatest ongoing challenge to planning: development of urban form in human-dominated ecosystems. More cities are tasking urban infrastructure with regeneration of diminished ecosystems to support livable communities. Besides solving for water management problems like flooding, the collateral benefits of implementing the plan include greater livability, sustained economic development, improved community resilience to disruption and shocks, and exemplary beauty in the civic realm that creates enduring value and symbolism.

(University of Arkansas Community Design Center 2016)

The Framework Planning approach includes the following elements that are discussed further below:

- 1) Data and information gathering
- 2) Identification of potential opportunities
- 3) Prioritization
- 4) Plan development
- 5) Implementation

Data and Information Gathering

A significant data gathering effort was undertaken early in the City's Clean Water Planning process with the development of the Watershed Characterization Plan and Water Quality Model that helped characterize Richmond's watersheds and the James River and tributaries. The type of data that was collected for these two efforts included, for example, impervious surfaces, impaired waterways, City-owned properties, existing stormwater BMPs, and water quality sampling data. The Framework Planning process will facilitate the identification of additional information deemed important to the City and stakeholders, including information such as, for example, ongoing or planned restoration projects or watershed-scale initiatives, places (parks, neighborhoods) that draws people in, and areas challenged by socio-economic issues. DPU initiated discussion of such information at its March 21, 2017 Technical Stakeholder meeting (Figure 7.4). This initial meeting included discussion of what stakeholders felt were existing needs or challenges in the City. This included not only water quality-related issues, but transportation or other socially-driven challenges.



Figure 7.4. Initial Technical Stakeholder brainstorming session on challenges and opportunities to be considered in the Framework planning process

Figure 7.5 depicts examples of other data types that will be looked at collectively through this process, including location of parks (or lack thereof), bike paths, priority conservation areas, commercial areas targeted for revitalization, etc.

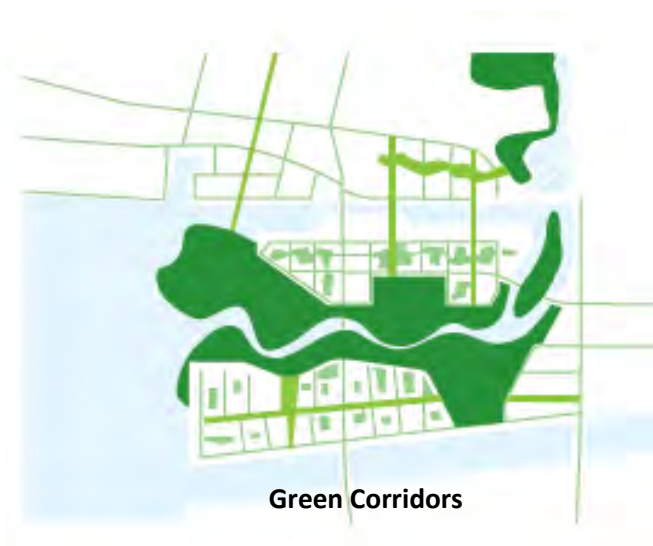
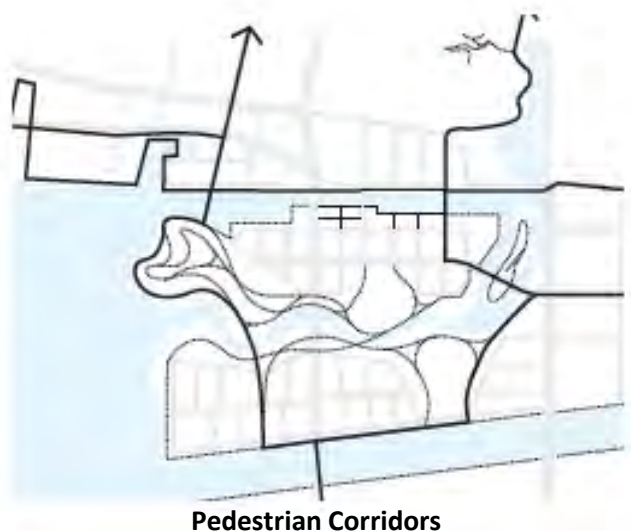


Figure 7.5 Examples of data types that will be considered within the Framework Planning Process

Several additional brainstorming meetings are scheduled to occur with Technical Stakeholders over the course of this project. Additionally, DPU will meet with other City departments to discuss opportunities for collaboration that will allow DPU to not only address its goals and objectives, but those of the City as a whole.

Identification of Potential Opportunities

As meetings with stakeholders and City staff continue, they are expected to evolve from identifying available information, concerns, and areas of interest within the City, to evaluating and assessing this information, and ultimately identifying areas of potential opportunities where strategy implementation could occur through the leveraging of planned or existing initiatives.

For example, a stream, such as Goode Creek requires bacteria reductions per the James River bacteria TMDL. In this same watershed, there are also Commercial Area Revitalization Effort (CARE) neighborhoods (yellow areas in Figure 7.6) that could be targeted for tree planting or implementation of green infrastructure for beautification purposes. Additionally, GIS analysis has identified stretches of Goode Creek as having deficient stream buffers (pink lines within the circled area in Figure 7.6). DPU and

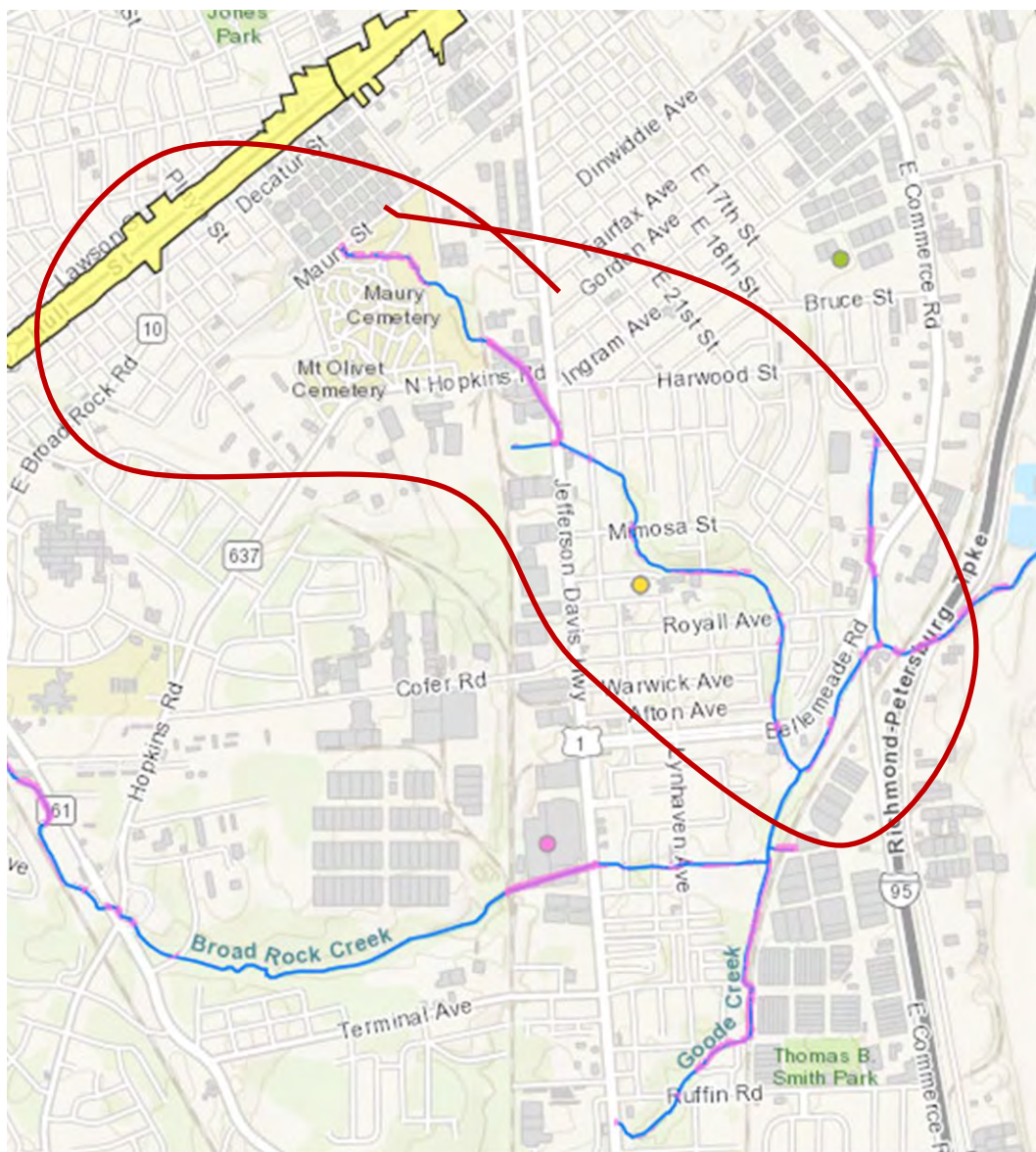


Figure 7.6. ArcGIS online map depicting the region near Goode Creek that contains City park property (Maury Cemetery), CARE neighborhoods (yellow), and buffer deficient streams (pink)

its stakeholders could identify potential project clusters such as these for additional evaluation of opportunities for strategy implementation.

Prioritization

Once data and information have been assessed and opportunities for projects or project clusters have been identified, these must be prioritized for further analysis and subsequent implementation. Regardless of projects being implemented piecemeal or in an integrated manner, there may continue to be diverging priorities driving implementation. A key element of this Framework Planning effort will involve identifying criteria by which these projects or project clusters are prioritized. This criteria development process will involve discussions with Technical Stakeholders over the summer of 2017. Several examples of criteria that may be used to evaluate projects or project clusters include if they:

- Address priority pollutants (and how much)
- Address other metrics identified by stakeholders (and how much)
- Address public health concerns
- Can be enhanced by partner resources (staff, funding, etc.)
- Include an educational component
- Address the social or economic elements of the Triple Bottom Line (Figure 7.7)
 - Are environmental justice concerns addressed?
 - Are lower SES neighborhoods targeted?
- Account for the City's Affordability Analysis
 - Can it be implemented with existing resources or does it require additional funding?
- Have stakeholder support

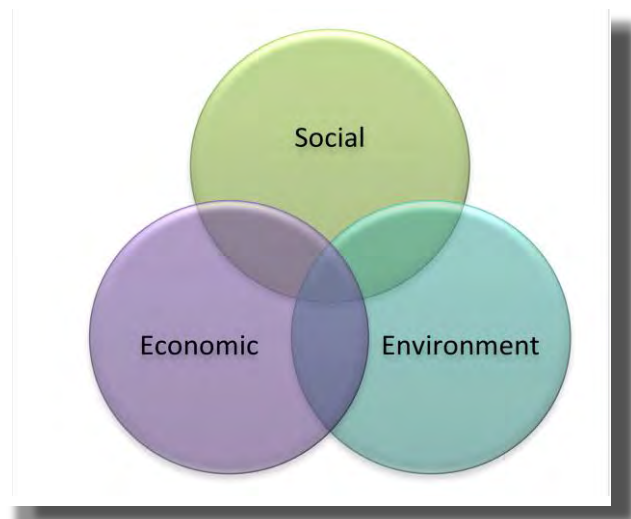


Figure 7.7 Elements of the Triple Bottom Line

Based on the number of criteria met, the projects/project clusters will be sorted into “very high”, “high”, “medium”, and “low” priority projects. Additional detail on this prioritization process will be developed over the summer of 2017.

Plan Development

The Framework Planning process and the identification and prioritization of projects and project clusters will be documented in the Framework Plan. The Framework Plan will also demonstrate how the projects and project clusters will meet the goals and objectives of the Clean Water Plan, including the numeric targets of the strategies.

Schedule

The Framework Plan will reflect efforts to be implemented over the course of the five year permit cycle. While most of the strategies that have been developed for the Clean Water Plan are based on a five year timeframe, other, more resource intensive projects, such as those related to the CSO Infrastructure strategy, may require a longer time frame for full implementation. NPDES permits typically allow flexible compliance schedules for meeting the state WQS. These schedules can be as long as necessary to achieve the water quality objectives. The federal regulations specifically require the schedule in the permit to achieve limits “as soon as possible.”

Funding

An appropriate level of funding will be important to the success of the City’s approach to integrated planning on a watershed basis. The various programs involved in this planning process (i.e., stormwater, wastewater, CSOs, drinking water) have funding mechanisms available to them. Specific project funding will be developed concurrently with the development of the City’s annual budget cycle. DPU’s funding sources will be evaluated to determine the anticipated costs, funds available, and any anticipated funding gaps. Overall, it will be imperative that implementation takes into account the findings of the City’s affordability analysis, which is expected to be finalized in 2017.

Implementation

The framework planning process will lead to the identification and prioritization of projects or project clusters that the City will fund for implementation. The sum of these projects will be consistent with the high level strategies defined in the Clean Water Plan.

There are several important concepts that will be taken into account through implementation. For instance, it is envisioned that implementation will occur incrementally over the course of the permit cycle (e.g., 10 acres of riparian buffers will not necessarily be restored all at once or within only one project, but may be addressed through the implementation of several projects/project clusters). Additionally, it may be determined that once more refined analysis is performed during or prior to the design/build phase of a project, that a particular project or project element cannot be achieved in its entirety. Flexibility is incorporated into implementation through adaptive management. If it is found that one strategy cannot be implemented in whole or in part, DPU will work to identify an alternative approach to achieving the same or similar pollutant reductions and other identified goals and objectives.

Implementation of projects, particularly those that involve stakeholders or other City departments, will require significant coordination. In addition to regular Technical Stakeholder meetings to provide updates on progress, DPU will convene a workgroup of those organizations involved in these implementation efforts. As projects are implemented, associated benefits (pollutant reductions, area



treated, other metrics addressed) will be tracked as well. Measuring progress made under the Clean Water Plan as a result of project implementation is discussed further in Chapter 8.



8. Measuring Progress

Once targets have been established and strategies have been identified to address watershed goals, an approach must be developed to monitor and measure progress made in association with these implementation efforts. As the City's implementation moves forward, measuring progress will include determining if goals have been met, if progress has been deemed sufficient, or if changes should be made within the program to try to improve the level of progress made.

Determining the level of progress that has been made as a result of the City's investments is a key element to the success of the Clean Water Plan and its ultimate support by the public, stakeholders, and elected officials. Measuring progress; however, can be complex. Targets may be established at various scales (i.e., site scale, sub-watershed, watershed, city scale). Implementation actions can also include a wide range of options including structural and non-structural practices as well as practices that address various source sectors (i.e., stormwater, wastewater, non-point sources). As a result, the approach used for measuring progress under the City's program must be flexible enough to account for these variations in scale and options that will be employed to mitigate pollutants and meet the City's goals.

Measuring progress will be done in a holistic manner based on data from the City's monitoring programs, modeling efforts, and other programmatic information (e.g., implementation targets, such as miles of stream buffers restored per year or number of residents reached by outreach efforts). Each of these elements is outlined in Table 8.1 and is discussed further below.

Table 8.1. Monitoring activities and associated outcomes implemented under the Clean Water Plan

Activities		Outcomes
Water Quality Monitoring	Instream water quality, biological (e.g., macroinvertebrates), CSO and WWTP discharge monitoring	Progress made toward pollutant reduction targets in permit
		Progress toward achieving WQS (e.g., measure improvement in aquatic life designated use)
		Identify sources, stressors, or pollutants of concern
		Identify trends over time
	BMP monitoring	Effectiveness of specific BMPs or source reduction efforts
		Progress toward achieving WQS (e.g., measure improvement in aquatic life designated use)
Programmatic Monitoring	Tracking strategy implementation	Progress made toward strategy implementation goals (e.g., acres of green infrastructure implemented)
		Progress made in pollutant reduction through strategy implementation (e.g., pounds of TN reduced through green infrastructure implemented)



		Progress made toward pollutant reduction targets identified in permit
Modeling	Receiving water, CSS, and watershed modeling and analysis	Progress made in bacteria WQS compliance
		Progress made in bacteria load reduction
		Progress made in reduction of CSO events or volume discharged

Each element of this process to evaluate Clean Water Plan progress will occur on a regular/annual basis over the course of the permit. Reporting on each of these elements will occur annually per VPDES permit requirements. At the end of the permit cycle a more comprehensive review of the progress made within this integrated planning framework will be compiled and included with the next VPDES permit application.

Water Quality Monitoring

As part of the watershed characterization effort, described in Chapter 3, historical water quality monitoring was compiled and evaluated including:

- James River monitoring carried out by VCU and other agencies
- In-stream monitoring of streams like Gillies Creek and other small tributaries within the city
- End-of pipe monitoring of CSO and WWTP discharges
- Data on other sources of pollution within the City

These data were organized and incorporated into a GIS-based geo-database. These water quality data were used to assess spatial and temporal trends, identify data gaps, and provide the water quality monitoring data needed to assess baseline conditions. Once implementation of the projects and programs in the Clean Water Plan has commenced, newly collected monitoring data can be used to evaluate changes from these baseline conditions.

Monitoring Program Development

Drivers behind the development of a monitoring program are often the regulatory requirements specifying monitoring objectives or collection of specific data elements. For DPU, these requirements will stem from the VPDES permit. As the Clean Water Plan and associated integrated watershed-based VPDES permit is finalized, DPU will assess its existing monitoring program to determine if it will provide the data needed to achieve the objectives of the permit. Examples of monitoring objectives include:

- Assess spatial and temporal trends of monitoring sites along the James River and its tributaries
- Evaluate the performance of specific BMPs or source reduction efforts
- Evaluate the health of the City's waterbodies
- Identify or evaluate parameters of concern
- Identify or evaluate potential sources of stressors
- Assess progress toward permit targets

Permit-driven objectives along with the identification of any additional data needs will ultimately determine the monitoring design. For instance, to evaluate stressors in a watershed, targeted monitoring would be conducted upstream and downstream of a key source(s). Monitoring could include sampling during different environmental conditions (e.g. dry and wet weather, high and low flow,



seasonal effects), and point source and BMP flow and quality sampling. Conducting biological and habitat assessments also provide links between instream conditions and pollutants.

Alternatively, to evaluate the overall health of the City's waterbodies, a probabilistic monitoring design would be developed that includes multiple randomly selected sites throughout the City. This approach would allow DPU to show overall conditions and, as Clean Water Plan implementation occurs over time, how integrated planning is benefitting the City's waterbodies.

In addition to DPU's own objectives, the City may want to determine if other local stakeholders have monitoring objectives that complement its own. Broader coordination can result in the development an integrated monitoring program that could broaden the scope of the monitoring plan while identifying efficiencies to reduce resources directed at monitoring efforts.

Programmatic Monitoring

As a number of the City's watersheds reach past Richmond's borders and are impacted by sources outside the City's control, water quality monitoring efforts alone will not necessarily provide an accurate representation of the City's progress in achieving the goals and objectives of the Clean Water Plan. In addition to water quality monitoring, a programmatic approach will be evaluated to determine its effectiveness.

As discussed in Chapter 4, an extensive effort was undertaken to develop goals and objectives for this Clean Water Plan as well as strategies that would achieve these goals and objectives. Tracking these strategies to measure progress will occur in several ways.

Tracking Strategy Implementation Targets

Each strategy was written to include quantifiable targets for implementation (e.g., acres of green infrastructure, acres of riparian area restored, miles of stream reengineered, etc.). Evaluating the extent to which the strategies are being implemented and targets are being met will be an important mechanism for tracking progress. If targets are not being met or strategies are not being implemented, the City will evaluate why this is the case and determine if other alternatives are available that will result in achieving the same or similar progress towards goals and objectives.

Strategies are comprised of multiple implementation efforts (e.g., all of the projects that would result in 104 acres of green infrastructure implementation in the MS4 area). DPU will continue to use several tools to track these projects. Currently, a database is used to track practices as they are implemented. The City's existing GIS will also serve as the basis for this tracking effort.

Tracking Strategy Pollutant Reductions

Tracking the anticipated pollutant reductions associated with these strategies will also be an important component of measuring progress of the Clean Water Plan. EPA's Chesapeake Bay Program (CBP) has established pollutant reduction credits for many of the stormwater BMPs proposed in association with the Clean Water Plan strategies. To ensure consistency with the CBP and the targets established for the City through the Chesapeake Bay TMDL, these BMP credits will be used as the basis for tracking of pollutant reductions through implementation of strategies.



As strategies are implemented, associated pollutant reductions for total nitrogen, total phosphorus, and total suspended solids will be calculated. These credits will be tracked in a geodatabase, which will allow for the geolocation of associated projects within the City's various watersheds.

While the Chesapeake Bay TMDL pollutants have established pollutant reduction credits assigned to various practices, bacteria, the other key pollutant in this Clean Water Plan does not. As a result, bacteria reductions achieved through strategy implementation will be based on literature values as well as the results of modeling efforts (discussed further below).

Comparing Pollutant Reductions to Targets

As discussed previously in Chapter 6, pollutant reduction targets (see Table 6.6) will be included in the City's VPDES permit. Tracking of progress toward these targets will help assess strategy implementation in the various watersheds¹⁰. This will help DPU determine if sufficient progress is being made, if larger implementation efforts are required, if more funding is necessary, or if additional partners are needed to increase implementation. To help make these determinations, funding and other staff resources and amount of stakeholder participation will be evaluated in comparison to implementation of programs and practices and, ultimately to environmental improvements. Based on Clean Water Plan evaluation, modifications will be made to the program as part of the Plan's adaptive management approach.

Evaluating pollutant reductions as well as locations of these reductions within the City will help DPU not only determine if targets are being achieved, but if various watersheds or sections of the City should receive additional focus for implementation.

Modeling

The Modeling Framework will continue to be used as needed to evaluate the water quality improvements related to the implementation of projects and strategies. Metrics that will be evaluated by the Modeling Framework include progress made in bacteria WQS compliance, progress made in overall bacteria load reduction, and progress made in reducing CSO events or volume discharged. The quantification of these metrics will be used as part of the programmatic monitoring efforts (as discussed in the previous section).

¹⁰ While water quality monitoring will be used, in part, to evaluate progress toward achieving targets, EPA's CBP promotes tracking of progress through credits applied to various implementation types. This approach will also be used to evaluate Clean Water Plan progress.



9. Next Steps

The Clean Water Plan has resulted in a comprehensive understanding of the City's watersheds and associated water resources. This includes an understanding of the pollutant sources and stressors within the City; the monitoring data that has been collected to date, as well as where additional data area needed; and the characteristics of the watersheds, such as soils and impervious surfaces. Additionally, the Clean Water Planning process has identified the goals and objectives and associated metrics that will guide the City moving forward. It also includes a plan for identifying control projects and programs that can be updated and adapted throughout the plan's implementation.

The next step is to use the Clean Water Plan to develop a watershed-based VPDES permit. Watershed-based permitting has been long supported by EPA and allows multiple pollutant sources to be managed under one permit. For Richmond, these pollutant sources are CSO, wastewater, and stormwater via the MS4 and direct drainage. The Clean Water Plan provides the planning framework and strategies to manage these sources and prioritize control projects based on their improvements to local waterways. Therefore, the Plan will be included in the VPDES permit as a source of data and provide information to be included in the "Special Condition" section related to BMPS to be implemented and additional monitoring to be done to track progress. The Clean Water Plan will also be included in the Permit Fact Sheet as an information source.

Once the watershed-based VPDES permit is issued to the City, next steps include implementing the projects and programs in the Clean Water Plan and conducting monitoring and modeling to measure progress towards the goals of the plan. While this first permit cycle will include targets consistent with the strategies identified in the planning process, continued implementation will be a long-term process that will span multiple five-year VPDES permit cycles. Therefore, the Clean Water Plan will require updating for each successive VPDES permit using the adaptive management approach described in the previous section. Future VPDES permits will be pursued as watershed-based permits until the Clean Water Plan is fully implemented.

The City will also continue to engage stakeholders to inform them of activities and associated progress towards the goals of the Clean Water Plan, and solicit their input on Plan updates. This engagement process will likely be simplified now that the considerable effort to develop the initial Plan has been completed.

More information on EPA's perspective on watershed-based permitting as it pertains to a watershed-based VPDES permit for the City is provided in the following section to illustrate the consistency between its requirements and the Clean Water Plan elements.

Adaptive Management

The adaptive management approach to water resources and regional wastewater management is increasingly recognized as the most appropriate and economically efficient way to identify problems, assess alternative solutions, and implement targeted corrective actions. The adaptive management



approach has been, and will continue to be, implemented during each step of the Clean Water Planning process.

Adaptive management will be critical for the success of Richmond's plan as any new data collected through the course of this effort will need to be reviewed on a regular basis and used to refine/modify the Clean Water Plan so it is up-to-date and accurate. An adaptive management approach will also be a key component of the framework the City will use to monitor the progress made through the Clean Water Plan. As mentioned above, assessment of progress will involve periodic comparison to the various targets established through previous steps of this process.

While strategies include targets, the Clean Water Planning process includes an adaptive management component that provides flexibility should some unforeseen issue arise regarding a particular strategy. For example, it may be determined over time that green infrastructure in the MS4 is only feasible on 80 acres (rather than 104 acres), or it may be riparian area restorations will require more implementation on private land than originally calculated. In such situations, the City will have to evaluate ways to expand other strategies/opportunities to work toward achieving the Clean Water Plan's goals and objectives. This may include expanding other strategies so that a similar pollutant reduction is accomplished or measures of additional metrics are reached. Alternatively, as implementation moves forth, stakeholders or additional Departments within the City may participate more than originally planned. This could add resources, expand implementation, and potentially result in efficiencies that can further streamline the Clean Water Plan effort.

Adaptive management can also be informed by the monitoring conducted by the City. If water quality monitoring data are not showing expected improvements, the Clean Water Plan can be modified to increase levels of implementation, accelerate implementation schedules, alter BMP types planned for the watershed, etc. For example, a watershed where BMPs have been implemented, but in which the water quality or biological communities do not show improvement, may need additional implementation efforts. Alternatively, upstream water quality monitoring (e.g., from outside the City's boundaries) may show that the water quality upstream is also not meeting WQS, which may explain the lack of improvement despite BMP implementation. In contrast, improved water quality or functioning of biological communities may show that the implementation has been successful. It should be emphasized, however, that BMP implementation often results in a significant (years, decades) lag time in instream response to this implementation. This will be taken into consideration when evaluating progress. An alternative situation may occur where WQS are not being met, but a local biological community is no longer impaired. In such an instance, a use attainability analysis (UAA) may be warranted and would offer an alternative to expending money and resources to implement projects in areas that are not causing exceedance of the WQS.

While adaptive management will play a key role in keeping the City's planning efforts on track, it should be noted that implementation of a sufficient amount of control to meet the City's goals may take many years. Once controls are implemented, it may take even more time for in-stream benefits to be measurable, especially in the biological community or habitat conditions. The tracking framework will take long-term implementation into account and will be reflected within the tracking of targets.



Watershed-based VPDES Permit

The intent of the Clean Water Plan is to feed into an Integrated VPDES permitting process. The CWA (§ 402) established the NPDES permit (VPDES in Virginia) as the primary tool for controlling point source discharges, and therefore municipal discharges. An integrated approach would then allow the City to address all of its regulatory requirements (stormwater, CSOs, wastewater) as well as source water protection within the same plan thereby providing better and more efficient coordination of requirements.

Watershed-based permitting is an integrated approach to developing VPDES permits for multiple point sources within a defined geographic area (watershed boundaries).

The primary difference between this and the traditional approach to permitting is the consideration of watershed goals and the impact of multiple pollutant sources and stressors, including nonpoint source contributions, to receiving waters.

For many years, the EPA has supported and encouraged a watershed approach to addressing water quality problems. The approach is very flexible so watershed-based permitting can encompass a variety of activities ranging from synchronizing permit issuance, review and renewal of NPDES permits within a basin, to developing water quality-based effluent limits using a multiple

discharger modeling analysis. One key component in the overall watershed-based permitting process is the integration of programmatic requirements. The watershed-based permitting framework provides the structure for examining a specific area and all of the stressors within that area, data related to the stressors and water quality goals, and prioritizing actions based on those data.

Additionally, as described in EPA's 2003 Watershed-based Permitting Policy:

A holistic watershed management approach provides a framework for addressing all stressors within a hydrologically defined drainage basin instead of viewing individual sources in isolation. Within a broader watershed management system, the watershed-based permitting approach is a tool that can assist with implementation activities. The utility of this tool relies heavily on a detailed, integrated and inclusive watershed planning process. Watershed planning includes monitoring and assessment activities that generate the data necessary for clear watershed goals to be established and permits to be designed to specifically address the goals.

US EPA Support of Watershed-based Permitting

As discussed in more detail in Richmond's Methodology for Integrated Watershed Management (2014), EPA developed several guidance documents upon which the City has based its approach for Watershed-based permitting. These guidance documents include:

- Committing EPA's Water Program to Advancing the Watershed Approach (2002)*
- Watershed-based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance (2003)*
- Watershed-based NPDES Permitting Technical Guidance (2007)*



This Clean Water Plan provides the mechanism for identifying goals and pollutant sources that may impact the goals. This Plan also provides the framework for consolidating DPU's sources (MS4, CSO, WWTP) together and determining the best distribution of investment in these sources to produce the greatest environmental gain.

The watershed-based permitting process provides the tools to apply resources to protect the goals and serves as the mechanism to drive integrated planning in the City. The permit will include a "Special Condition" that will recognize specific components of the Clean Water Plan. The permit will require data collection that will serve to support the evaluation of program effectiveness. The permit will also include controls (limits or pollutant reduction targets) that look collectively at DPU's various sources and allow the City to work toward the goal of greater environmental benefit.

This approach was successfully demonstrated with the issuance of the watershed-based permit to Clean Water Services in Oregon. The permit provided for trading between point and nonpoint sources to address temperature issue in the receiving water. Additionally, the Neuse River Compliance Association holds a permit for discharges from 20 WWTPs in the watershed. These entities all share a collective nutrient limits that they must achieve collectively.

In the case of Richmond, a single permit will be appropriate given the discharges are all controlled by DPU. Regardless of format, the permit will focus on watershed needs.



References

- EPA. 2007. Watershed based National Pollutant Discharge Elimination System (NPDES) Permitting Technical Guidance. EPA 833-B-07-004.
- EPA. 2008. Handbook for Developing Watershed Plans to Restore and Protect our Waters. EPA 841-B-08-002.
- EPA. 2011. Memorandum from Nancy Stoner and Cynthia Giles on Achieving Water Quality through Integrated Municipal Stormwater and Wastewater Plans. October 27, 2011.
- EPA. 2012a. Memorandum from Nancy Stoner and Cynthia Giles on Integrated Municipal Stormwater and Wastewater Planning Approach Framework. June 5, 2012.
- EPA. 2003. Watershed-based National Pollutant Discharge Elimination (NPDES) Permitting Implementation Guidance. EPA 833-B-03-004.
- EPA. 2013. A Quick Guide to Developing Watershed Plans to Restore and Protect our Waters. EPA 841-R-13-003.
- Richmond DPU. 2002. Combined Sewer Overflow (CSO) Study: Long-term CSO Control Plan Re-evaluation
- Richmond DPU. 2015. Watershed Characterization Report.
- Richmond DPU. 2016. Richmond James River Bacteria TMDL Action Plan.
- Saarikoski, H.; Barton, D.N.; Mustajoki, J.; Keune, H.; Gomez-Baggethun, E. and J. Langemeyer. 2015. Multi-criteria decision analysis (MCDA) in ecosystem service valuation. In: Potschin, M. and K. Jax (eds): OpenNESS Ecosystem Service Reference Book. EC FP7 Grant Agreement no. 308428. Available via: http://www.openness-project.eu/sites/default/files/SP_MCDA.pdf
- Virginia DEQ. 2016. Final 2014 Integrated Report



Appendix 1. Modeling Report

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1 Executive Summary

1.1 Introduction

In 2014, the City of Richmond began a multi-year effort to develop an Integrated Water Resources Management Plan (herein after called the RVA Clean Water Plan). The goal of this plan is to achieve improvements to water quality that will help the city meet its regulatory obligations under the Clean Water Act (CWA). Part of the Clean Water Plan involves developing strategies for the coordinated management of the City's water utilities, including wastewater treatment, drinking water treatment, stormwater runoff, combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs), all of which are assets that are typically permitted and managed separately. By holistically considering all of the City's water utilities in the development of the Clean Water Plan, the City will be more efficient and cost-effective with their ratepayer-funded resources, and provide greater benefit to local waterways than the traditional siloed approach used for permitting and management.

A key step towards the development of the Clean Water Plan was the development of a water quantity and quality modeling framework. The purpose of the modeling framework is to quantify present day bacteria (*Escherichia coli* form [*E.coli*]) loads and concentrations in the James River and to predict future bacteria loads and concentrations under the RVA Clean Water Plan-related strategies. The modeling framework also allowed for the quantification of discharge flows and volumes, as well as the occurrence of CSO events. Additionally, the modeling framework provides a platform for comparing the CSO reduction projects included in the City's CSO Long Term Control Plan (LTCP) against alternative CSO reduction projects that may provide similar benefits but at a reduced cost.

The purpose of this report is to document the development, calibration, and application of these models.

1.2 Model Development

Three models were used to achieve the modeling objectives, and together they comprise the modeling framework (Figure 1-1). These three models include:

- A watershed model to simulate flow and bacteria loads from contributing areas of tributaries to the James River within the greater Richmond area, as well as from Richmond's Municipal Separate Storm Sewer System (MS4), but excluding the combined sewer system (CSS) service area. This model was developed using the EPA Storm Water Management Model (SWMM) software.
- A collection system model to simulate flow and bacteria loads from the CSS. The CSS model is an existing model that is used by the City of Richmond for Wastewater Master Planning to support implementation of the CSO Long Term Control Plan and to prepare the Annual CSS Reports. This model was developed using the EPA SWMM software, and was adapted for use in this study.
- A receiving water quality model that computes bacteria concentrations in the James River resulting from the various sources of bacteria to the river. The outputs of the watershed and CSS models are used as inputs to the receiving water quality model. The receiving water quality model was developed using the EPA-supported Environmental Fluid Dynamics Code (EFDC) software.



Water quality data were used to inform the development and calibration of the models. Section 2.2 contains detailed figures showing the extent and key features included for each model.

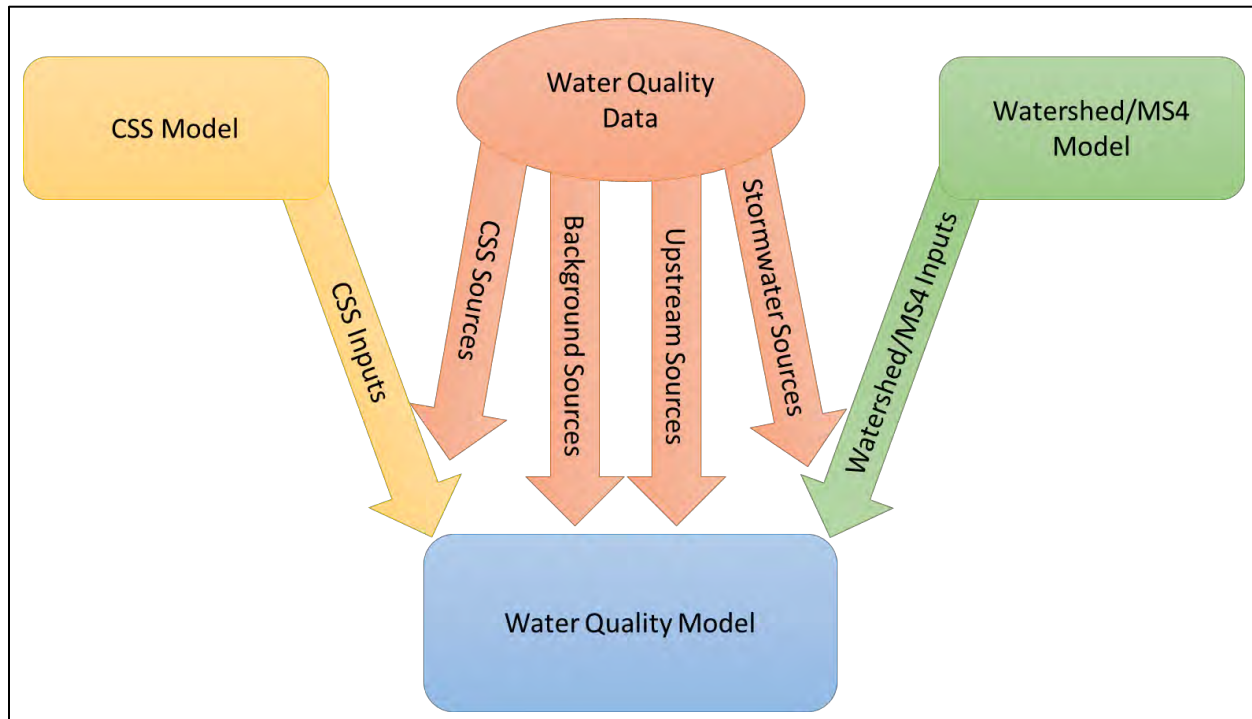


Figure 1-1: Modeling Framework Schematic

1.3 Model Calibration

- Model calibration is the process of adjusting model parameters and assumptions within defensible ranges to achieve reasonable agreement between modeled and observed environmental conditions. The calibration process demonstrated that the modeling framework is sufficiently well calibrated to support the following modeling objectives:
- Design the modeling framework to provide a reliable and reasonably complete accounting of bacteria sources to the James River;
- Develop the modeling framework using sufficiently complete and accurate site specific data;
- Calibrate the models using reasonable assumptions consistent with the site data, literature, and professional judgment;
- Achieve a level of model accuracy that is adequate to support decision making;
- Apply the models for a period including a wide range of common environmental conditions (i.e. river flow and precipitation conditions); and,
- Evaluate and synthesize model output to interpret major sources of current bacteria water quality impairment and to forecast future bacteria water quality conditions.

1.4 Model Application

After the water quality modeling tools were developed and calibrated, they were jointly applied to assess water quality benefits associated with the selected strategies. For this purpose, the model was applied for

a 3-year simulation period, 2011 through 2013, that includes an average rain year (2011), a dry year (2012, less than normal precipitation), and a wet year (2013, more than normal precipitation). To date, the model has been applied to evaluate the following conditions or strategies:

- **Current conditions:** Best representation of current conditions, and includes all the combined sewer system improvement projects that were included in Phase I and Phase II of the CSO Long Term Control Plan.
- **Baseline Conditions:** represents the current conditions, plus all the currently funded Phase III CSS improvement projects from the LTCP.
- **Green Infrastructure in the MS4 Area Strategy:** represents the baseline conditions, plus the implementation of 104 acres of green infrastructure on city-owned area in the MS4.
- **Green Infrastructure in CSS Area Strategy:** represents the baseline conditions, plus the implementation of 18 acres of green infrastructure on city-owned area in the CSS area.
- **CSS Infrastructure Strategy:** Implementation of CSS projects included in the LTCP: represents the baseline conditions, plus all the remaining unfunded Phase III collection system improvement projects from the LTCP.

The sequencing of the modeling applications is shown in the figure below.

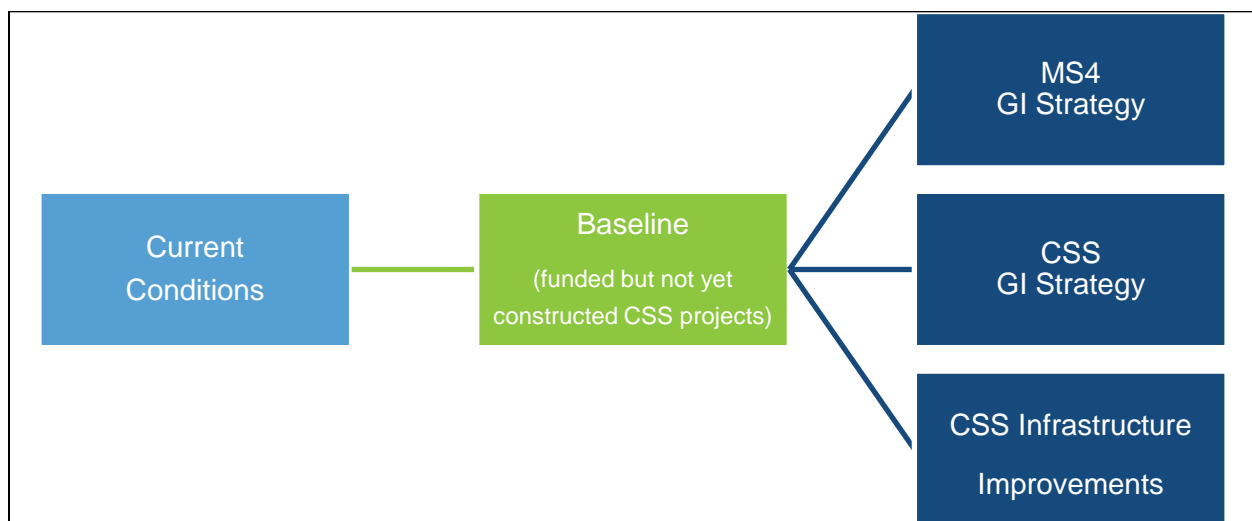


Figure 1-2: Sequencing of Model Applications

These strategies were evaluated using several metrics related to bacteria reduction, including:

- Bacteria load reduction from combined sewer and tributary discharges (which can include pollutant loads from the City's MS4), expressed as billion CFU per year
- Overall average percent increase in monthly geometric mean (geomean) water quality standard (WQS) compliance in the James River at the downstream city limit
- Reduction in number of CSO events per year
- Reduction in CSO volume, expressed as million gallons per year

These water quality benefits were then entered into an Excel-based strategy scoring calculator tool that integrates the benefits of strategies across a wide range of Goals and Objectives. More information on the strategy calculator can be found in Appendix D of the RVA Clean Water Plan. Water quality benefits were

also assessed on a monthly basis relative to the two existing water quality standards: a monthly geometric mean standard and a statistical value threshold (STV) standard.

1.5 Major Model Findings

Major findings of the water quality modeling are as follows:

- Current *E.coli* bacteria water quality standards are sometimes exceeded in the James River in Richmond.
- The two largest contributors to exceedances of WQS are sources upstream of the City of Richmond and CSOs.
- Eliminating the City of Richmond bacteria sources alone would not achieve compliance with WQS in the James River.
- Reducing CSOs via the RVA Clean Water Plan strategies would improve compliance with WQS.

1.6 Future Use of Model

The Modeling Framework will continue to be used as needed to evaluate the water quality improvements related to the implementation of projects and strategies. Additionally, it is anticipated that the modeling framework will be applied during the summer and fall of 2017 to evaluate alternative CSS reduction projects that may provide similar benefits to the LTCP projects, but at a reduced cost. Metrics that will be evaluated by the Modeling Framework include progress made in bacteria WQS compliance, progress made in overall bacteria load reduction, and progress made in reducing CSO events and volume discharged.



2 Introduction

In 2014, the City of Richmond began a multi-year effort to develop an Integrated Water Resources Management (IWRM) Plan (herein after called the RVA Clean Water Plan). The goal of this plan is to achieve improvements to water quality that will help the city meet its regulatory obligations under the Clean Water Act (CWA). Part of the Clean Water Plan involves developing strategies for the coordinated management of many of the City's water utilities, including wastewater treatment, drinking water treatment, stormwater runoff, combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs), all of which are assets that are typically permitted and managed separately. By holistically considering all of the City's water utilities in the development of the Clean Water Plan, the City will be more efficient and cost-effective with their ratepayer-funded resources, and provide greater benefit to local waterways than the traditional siloed approach used for permitting and management.

A key step towards the development of the RVA Clean Water Plan was the development of a water quantity and quality modeling framework. The purpose of the modeling framework is to quantify present day bacteria (*Escherichia coliform [E.coli]*) loads and concentrations in the James River and to predict future bacteria loads and concentrations under the Clean Water Plan-related strategies. The modeling framework also allowed for the quantification of discharge flows and volumes, as well as the occurrence of CSO events. The purpose of this report is to document the development, calibration, and application of these models.

2.1 Model Purpose, Objectives, and Functions

The purpose of the modeling framework is to quantify present day *E.coli* concentrations in the James River and to predict future *E.coli* concentrations under management strategies that were developed by the city and stakeholders. The following modeling objectives supported the attainment of this project goal:

- Design the modeling framework to provide a reliable and reasonably complete accounting of *E.coli* sources to the James River;
- Develop the modeling framework using sufficiently complete and accurate site specific data;
- Calibrate the models using reasonable assumptions consistent with the site data, literature, and professional judgment;
- Achieve a level of model accuracy that is adequate to support decision making;
- Apply the models for a period including a wide range of common environmental conditions (i.e. river flow and precipitation conditions); and,
- Evaluate and synthesize model output to interpret major sources of current water quality impairment and to forecast future water quality conditions.

The following report documents how these objectives were achieved through the process of selecting, developing, calibrating, and applying the water quality modeling framework.



2.2 Model Selection

Three models, which comprise the Modeling Framework (Figure 2-1), were used to achieve the modeling objectives. These three models include:

- A watershed model to simulate flow and *E.coli* loads from contributing areas of tributaries to the James River within the greater Richmond area, as well as from Richmond's Municipal Separate Storm Sewer System (MS4), but excluding the combined sewer system service area;
- A collection system model to simulate flow and *E.coli* loads from the combined sewer system (CSS); and
- A receiving water quality model that computes *E.coli* concentrations in the James River resulting from the various sources of *E.coli* to the river.

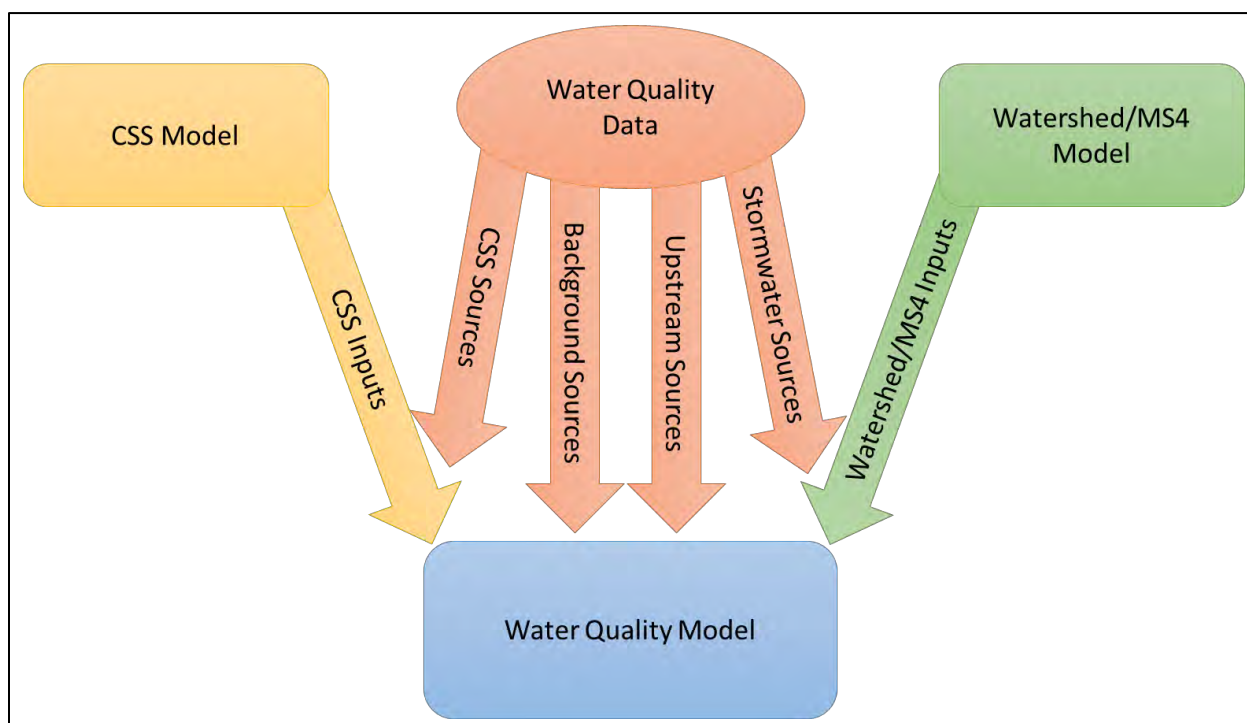


Figure 2-1: Modeling Framework Schematic

2.2.1 Watershed Model

Many watershed model software packages are available and these models vary in their recognition by USEPA and their applicability to the James River and its tributaries. The watershed model framework applied for this project is EPA Storm Water Management Model (SWMM), which is supported by the USEPA and has been successfully applied by the project team at similar sites and for related purposes. SWMM is a dynamic rainfall-runoff simulation model used for single event or continuous simulation of runoff quantity and quality from primarily urban areas (USEPA, 2015). Additionally, the CSS model was also developed using the SWMM software, so choosing SWMM for the watershed model provides consistency.

A variety of enhanced SWMM platforms are available that integrate the EPA SWMM software with user friendly interfaces and GIS capabilities. For this project, PCSWMM, developed by Computational

Hydraulics International (CHI), was used. The watershed model was developed using SWMM engine version 5.1.010, which is consistent with the version used for the CSS model.

2.2.2 CSS Model

The combined sewer system (CSS) model used for this study is based on the Wet Weather Combined Sewer (WWCS) model developed by Greeley and Hansen (GH) to support Richmond's wastewater collection system master planning, Long Term Control Plan (LTCP) implementation, and combined sewer system annual reporting. The CSS model is based upon the EPA Storm Water Management Model (SWMM) framework and uses the SWMM engine version 5.1.010. The model is operated within the PCSWMM environment.

2.2.3 Receiving Water Quality Model

The receiving water quality model was developed based on the EFDC modeling framework (Environmental Fluid Dynamics Code). This model has been applied to support numerous CSO water quality projects and is suitable for representing hydrodynamic conditions occurring in the James River, including the transition from riverine to estuarine conditions, and low head dam hydraulics. EFDC is a state-of-the-art finite difference model that can be used to simulate hydrodynamic and water quality behavior in one, two, or three dimensions in riverine, lacustrine, and estuarine environments (TetraTech 2007a, 2007b). The model was developed by John Hamrick at the Virginia Institute of Marine Science in the 1980s and 1990s, and it is currently maintained under support from the USEPA. The model has been applied to hundreds of water bodies, including Chesapeake Bay and the Delaware River.

The EFDC model is both public domain and open source, meaning that the model can be used free of charge, and the original source code can be modified to tailor the model to the specific needs of a particular application. As a result, EFDC provides a powerful and highly flexible framework for simulating hydrodynamic behavior and water quality dynamics in the James River.

2.3 Model Extent

The model extent defines the spatial or geographic boundary to which the model applies. The extents of the three models are described further below.

2.3.1 Watershed Model

The watershed model incorporates watersheds for 23 tributaries that contribute flow to the portion of the James River that falls within the receiving water quality model extent, and is shown in Figure 2-2 below. The tributaries represented in the watershed model were selected based on two criteria: they have been classified as impaired for *E.coli* on the 2014 VADEQ 303(d) list, or they are expected to contribute significant flows or *E.coli* loads to the James River receiving water quality model. Key features represented in the model include time-variable meteorology, watershed land use and land cover, topography (slopes), land use based pollutant loading, CSO flows and *E.coli* loads (simulated with the CSS model) to tributaries, and basic stream network geometry. The area serviced by the combined sewer system was excluded from the watershed model, as this area is represented in the CSS model. The final watershed model includes 44 square miles within the City of Richmond and 133 square miles outside the city.

2.3.2 CSS Model

The City of Richmond Collection System model simulates all sanitary flows from areas that are connected to the wastewater treatment plant as well as surface runoff from within the combined area. The model is



described in the Wastewater Collection System Master Plan (Greeley and Hansen, 2015), and includes the following major features, as shown in Figure 2-3:

- The model contains 227 subsheds, including 99 subsheds representing 44,346 acres of sanitary area and 128 subsheds representing 11,523 acres of combined area. Storm water runoff from the sanitary areas is included in the watershed model.
- The total length of sewer pipes in the model is 235,683 ft. (44.6 miles) distributed over 1,020 individual pipe elements with diameters between 12 inches and 120 inches.
- The model represents all currently active CSO outfalls (29) plus the WWTP outfall used to discharge treated effluent.
- The model represents the Shockoe Retention Basin as well as the Hampton – McCloy Storage Tunnel.

2.3.3 Receiving Water Quality Model

The James River receiving water quality model extends from South Gaskins Road upstream of the Richmond city boundary, to Osborne Park downstream of the Richmond city boundary. The upstream limit of the model was chosen to be just upstream of Richmond's city limits. The downstream limit was chosen to be downstream of Cornelius Creek and near a frequently sampled water quality station. Twenty three miles of the James River are represented in the model with average grid cell dimensions of 140 feet wide and 340 feet long. Each grid cell spans the average depth of the river within their cell boundary. Six cells typically span the width of the river. Key features represented in the model include upstream James River flows; low head dams; the James River Falls near downtown Richmond, runoff; base flow, and *E.coli* loads from tributaries and MS4 areas; the City wastewater treatment plant, CSO discharges and *E.coli* loads; and tidal conditions in the Lower James River. Several of these features are shown in Figure 2-4.



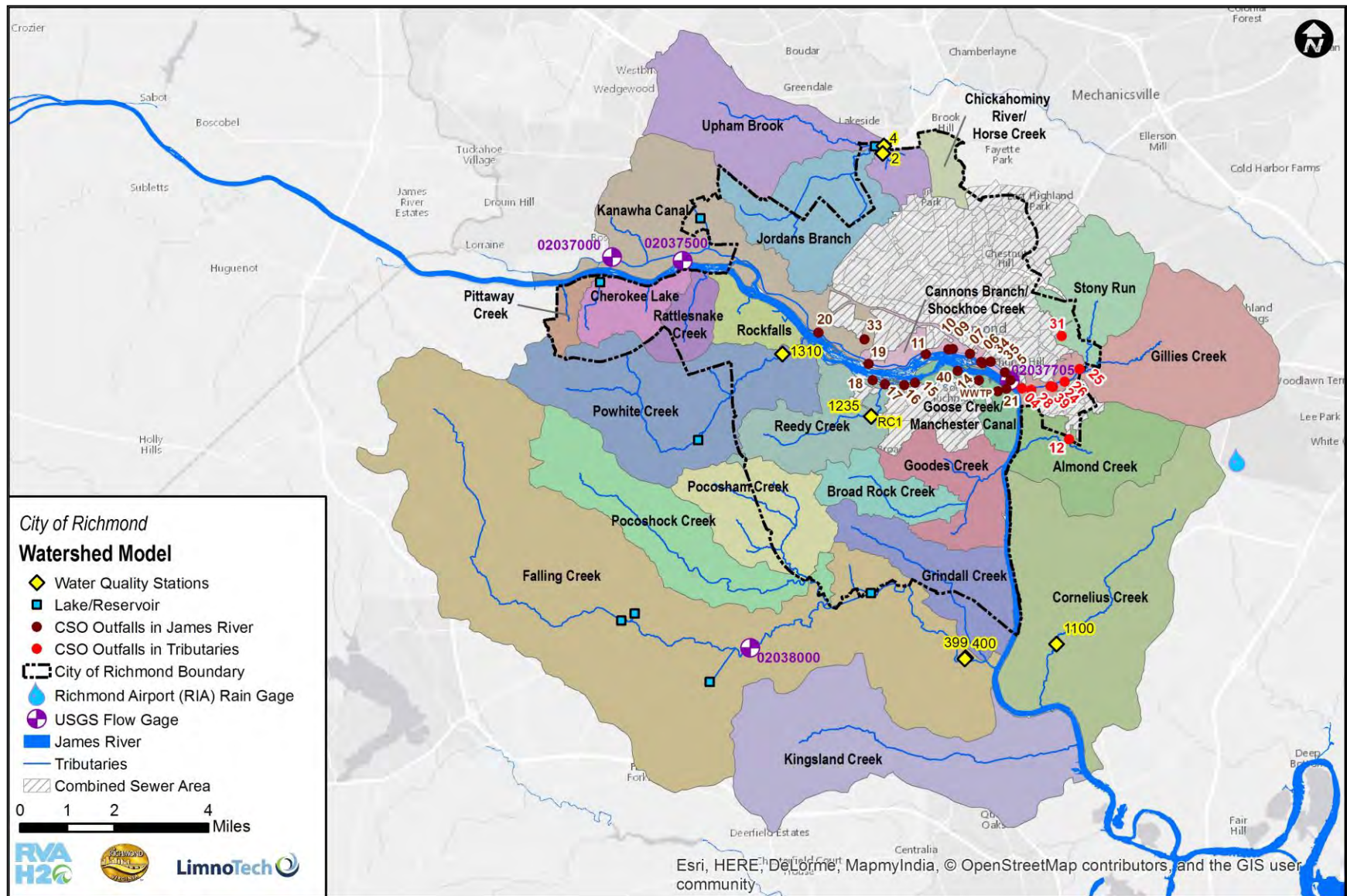


Figure 2-2: Extent and Key Features of the Watershed Model

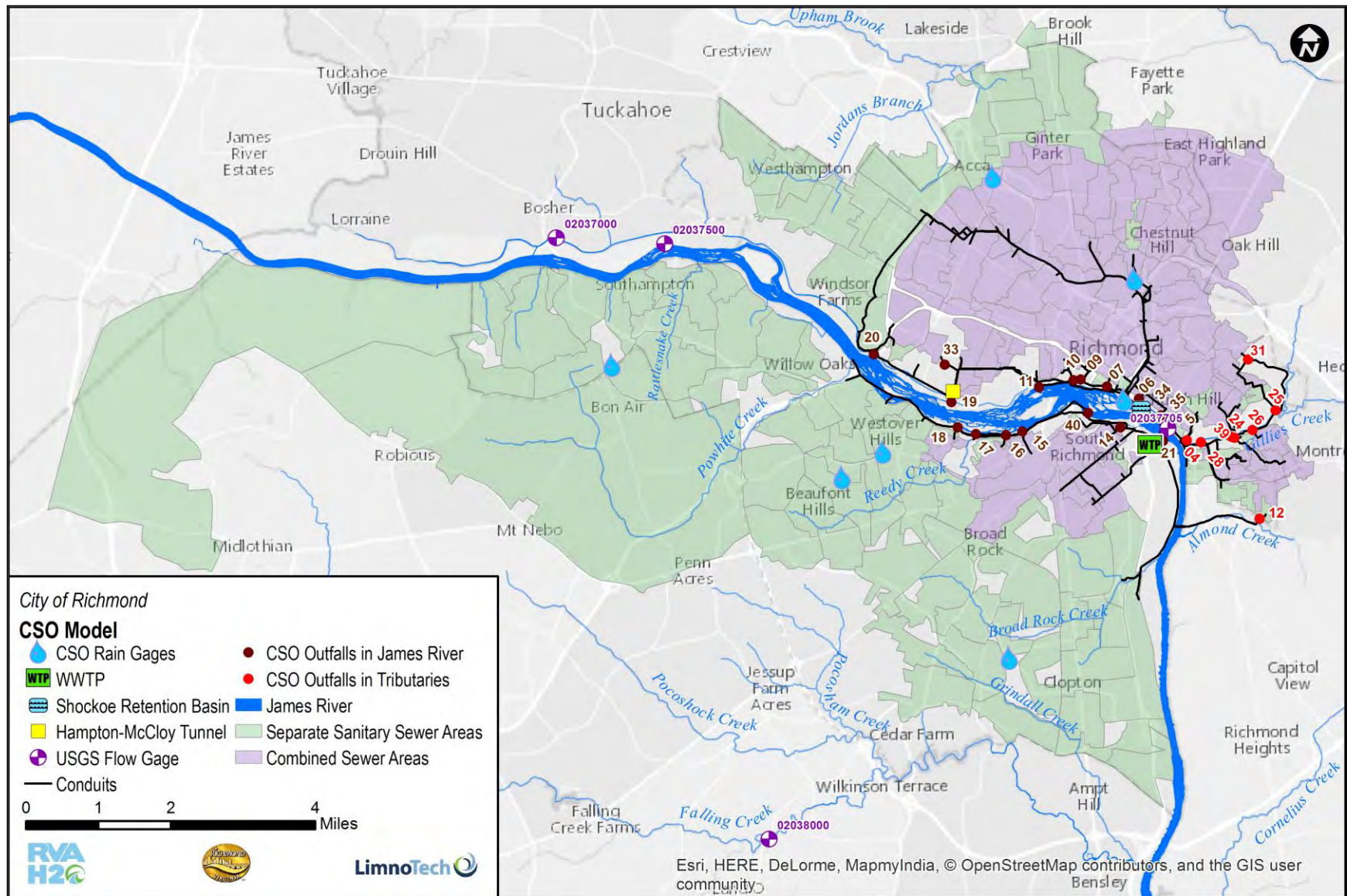


Figure 2-3: Extent and Key Features of the Richmond CSS Model

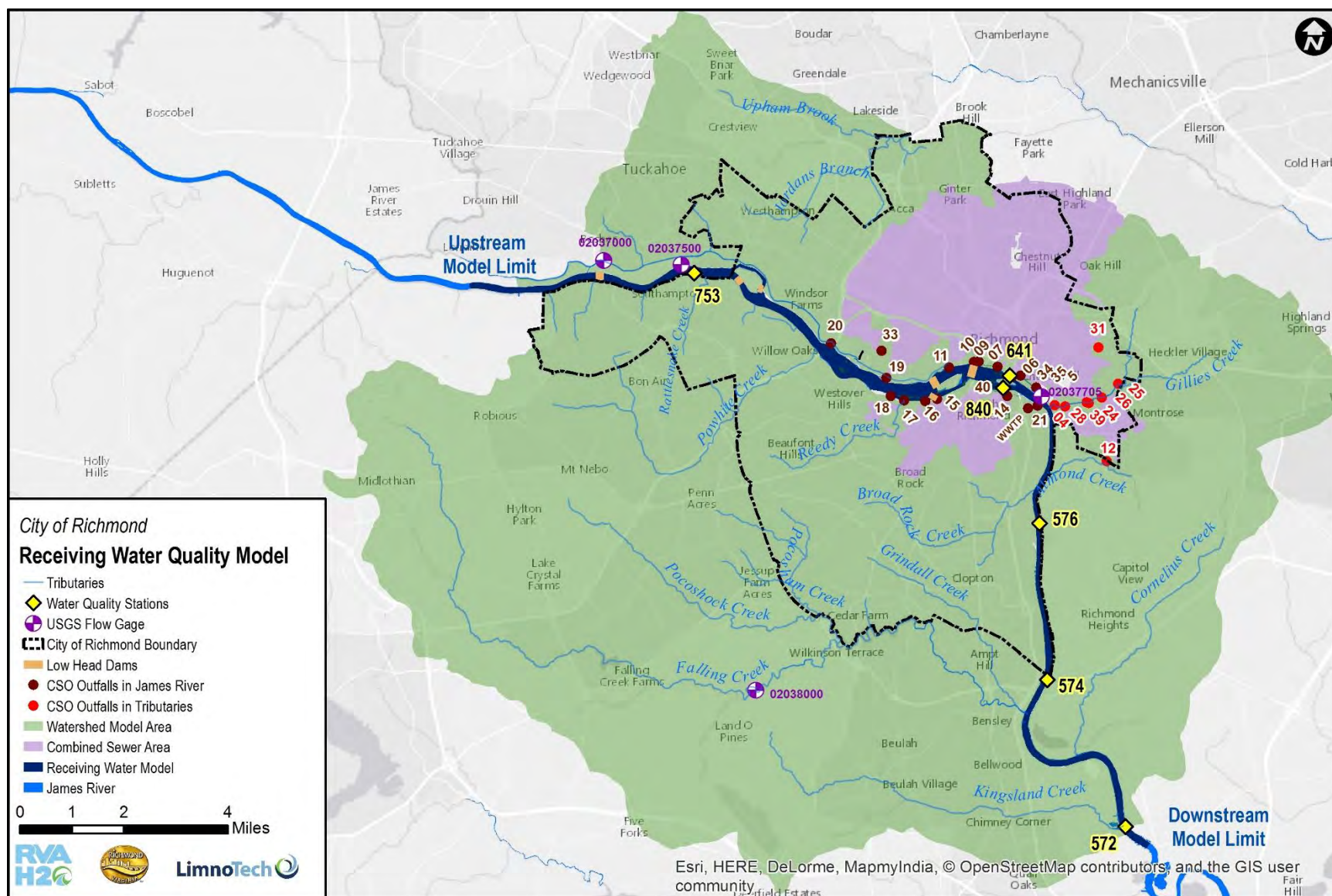


Figure 2-4: Extent and Key Features of the Receiving Water Quality Model

3 Model Development

Model development is the process of configuring a model to represent certain conditions of interest (e.g. combined sewer overflows, or bacteria concentrations) at a particular site. The model development process for the James River water quality modeling framework included definition of 1) important physical and chemical processes, 2) model inputs and assumptions influencing the modeled processes, 3) the spatial extent of model calculations, and 4) the time span of model calculations. This process is described below for each of the three components of the modeling framework.

3.1 Watershed Model

The Richmond watershed model consists of a set of subcatchments (representing the hydrology of the system) that are connected to a network of streams and impoundments (representing the hydraulics of the system). During wet weather events, runoff and associated pollutants are transported from the subcatchments to the stream network, and ultimately discharge to the James River (representing water quality in the system). To set up the watershed model in SWMM, processes influencing the system's hydrology, hydraulics, and pollutant transport must first be characterized. Several different types of data are needed to properly develop a SWMM model. These data characterize the properties that affect the hydrology and hydraulics of a SWMM model. The processes that were modeled and the relevant data that were collected and analyzed for the purpose of setting up the Richmond watershed model are described below.

3.1.1 Process Model Selection

The first step in model development is determining what hydraulic and water quality processes should be included. SWMM is capable of modeling six processes: rainfall/runoff, infiltration, snow melt, groundwater, flow routing, and water quality. To meet the objectives of this model four of these processes were used: rainfall/runoff, infiltration, flow routing, and water quality. It was assumed that snow melt typically does not generate significant runoff in the Richmond area. The contribution of groundwater to stream flow was approximated using a baseflow time pattern for select model nodes, so explicitly modeling groundwater was unnecessary.

3.1.2 Hydrology

3.1.2.a Subcatchments

The 23 tributary watersheds (Figure 2-2) were divided into smaller subcatchments through interpretation of a digital elevation model (DEM), political boundaries, and consideration of culverts, major roads, and water quality stations.

For several watersheds, delineated subcatchments existed from previous modeling efforts by Greeley and Hansen for the Richmond Stormwater Master Watershed Plans (Greeley and Hansen, 2012-2014). For these watersheds, the Greeley and Hansen delineations were re-evaluated using the above considerations, and the subcatchment boundaries were adjusted to meet the needs of this modeling effort. In total, the watershed model is comprised of 427 subcatchments.



To simplify model characterization, some subcatchments located outside of the Richmond city limits were replaced with inflow time series when data was available. Four subcatchments in the upstream portion of the Kanawha Canal watershed were replaced with data from USGS gage #02037000, which had an instantaneous flow time series available from 2007-2015.

3.1.2.b Meteorology

SWMM requires two meteorological inputs: a precipitation time series to generate runoff, and temperature data to calculate evaporation. Complete time series for precipitation (hourly and daily), daily minimum temperatures, and maximum temperatures were available at Richmond International Airport (RIA) from 1949 through current condition. All meteorological data at RIA were obtained from the National Centers for Environmental Information¹ (NCEI) which is operated by the National Oceanic and Atmospheric Administration (NOAA).

3.1.2.c Baseflow

Baseflow comprises the majority of stream flow during extended periods of dry weather, and can be estimated from measured flow data time series. The only gaged tributary within the model extent is in the upper portion of the Falling Creek watershed (USGS 02038000, Figure 2-2), so the flow record from this gage was used to approximate baseflow for all tributaries within the model. Using 30 years of flow data (1965-1994), monthly 7Q10 flows were calculated using methods from Risley et al (2008). These values were then normalized to watershed area (in mi²) and applied to subcatchments that contribute to the streams and creeks that are included in the watershed model (Figure 3-1).

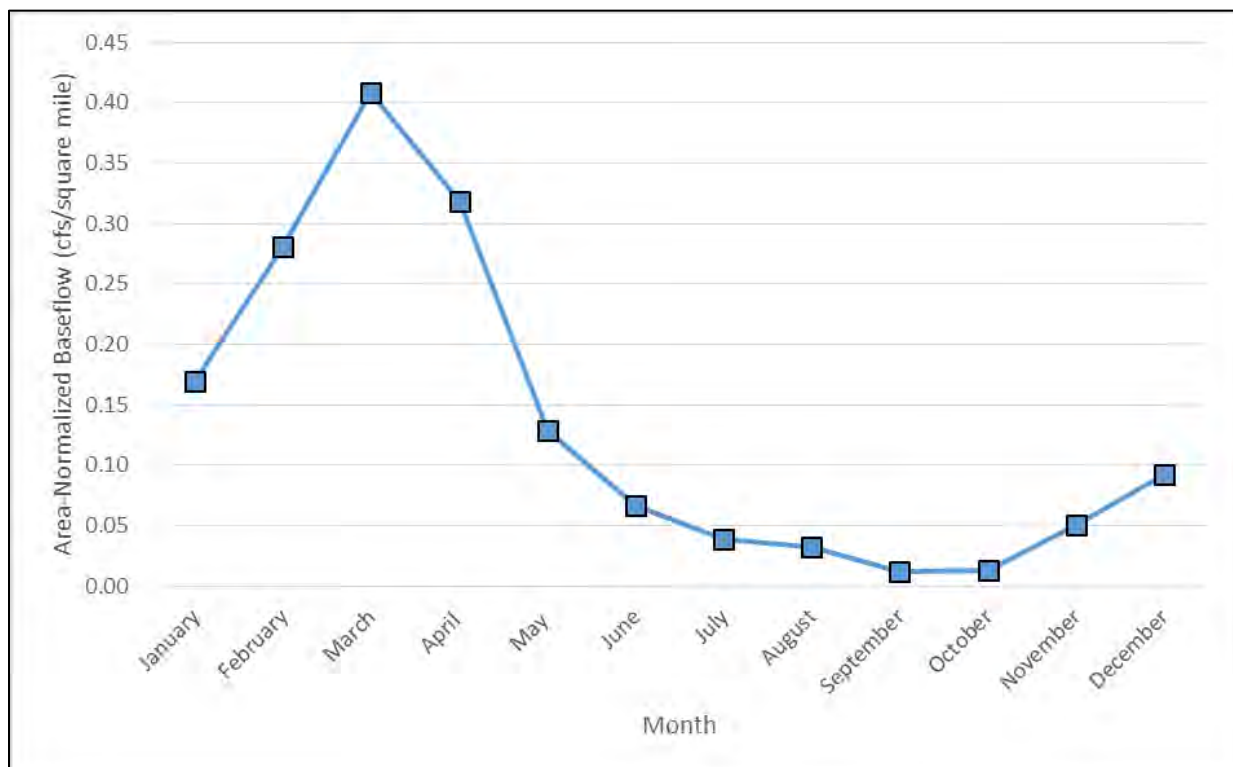


Figure 3-1: Monthly Baseflow Values Used in the Watershed Model

¹ Formerly the National Climatic Data Center (NCDC). In 2015 NCDC merged with the National Geophysical Data Center (NGDC) and the National Oceanic Data Center (NODC).

3.1.2.d Soil infiltration

SWMM offers several methods for soil infiltration (listed in order of increasing complexity): Curve Number, Horton's, and Green-Ampt. The Green-Ampt method requires site-specific knowledge to characterize infiltration parameters, which were not readily available for this project. Therefore, the Horton method was selected for the watershed model. Horton's method uses a set of parameters that defines the maximum infiltration rate, the minimum infiltration rate, the decay rate for changing from maximum to minimum infiltration rates, a recovery rate for changing from minimum to maximum infiltration rates, and an overall maximum infiltration volume. These parameters are determined based on the hydrologic soil groups that are present in the watershed model extent.

The hydrologic properties of soils influence the how quickly and how much precipitation is converted to runoff. In general, soils can be classified by hydrologic soil group (HSG). There are four basic HSGs, called HSG A, HSG B, HSG C, and HSG D. Soils in group A have the lowest runoff potential, while soils in group D have the greatest runoff potential (Mockus et al., 2004). These four basic classifications can then be broken down into dual classifications such as A/D or B/D. Dual classifications represent soils that are classified as group D because of a high water table, making them behave as though they have a high runoff potential. However, if the water table were lowered, these soils would have a lower runoff potential (such as group A or B).

To characterize the soils within the model extent, data were downloaded from the Soil Survey Geographic (SSURGO) database provided by the National Resources Conservation Service (NRCS). A wide range of HSGs are represented within the SWMM model extent (Table 3-1). In addition to the four standard categories (HSG A through D), several dual classifications are also represented. These dual classifications were assumed to be undrained, and were therefore assigned the same soil properties as HSG D. There were also nine soil types with no official hydrologic soil group classification (Table 3-2). Based on the descriptions provided by NRCS, it was assumed that most of these unclassified soils were poorly drained and would have a high potential for runoff (Mockus et al., 2004). Therefore, they were assigned the same soil properties as HSG D.

The soil infiltration parameters associated with each HSG were estimated from tables provided in the *User's Guide to SWMM 5* (James et al., 2010). An average minimum and average maximum value from the suggested range was used for the infiltration rate. In the absence of detailed soil data, the decay constant and drying time were assumed to be the same for all soil types within the model extent, and a maximum infiltration volume was not specified.

Table 3-1: Description of hydrologic soil groups within watershed model extent			
Hydrologic Soil Group	Description	Area (mi ²)	% Total
A	Soils with low runoff potential	17.9	9.1%
A/D	Soils with high runoff potential unless drained. Otherwise classified as HSG A.	0.4	0.2%
B	Soils with moderately low runoff potential	75.8	38.7%
B/D	Soils with high runoff potential unless drained. Otherwise classified as HSG B.	20.0	10.2%
C	Soils with moderately high runoff potential	30.3	15.5%
C/D	Soils with high runoff potential unless drained. Otherwise classified as HSG C.	10.9	5.6%
D	Soils with high runoff potential	5.5	2.8%



Table 3-1: Description of hydrologic soil groups within watershed model extent

Hydrologic Soil Group	Description	Area (mi ²)	% Total
Unknown	See Table 3-2	33.0	16.8%
Water	N/A	2.2	1.1%
	TOTAL	196.0	100.0%

Table 3-2: Description of the “Unknown” Hydrologic Soil Group within watershed model extent

Hydrologic Soil Group	Soil Type	Area (mi ²)	% Total
Unknown	Urban land	20.1	10.2%
Unknown	Udorthents-Dumps complex, pits	6.7	3.4%
Unknown	Udorthents, loamy, borrow pits	0.2	0.1%
Unknown	Udorthents, loamy	1.4	0.7%
Unknown	Gravel pit	2.2	1.1%
Unknown	Udorthents, clayey	0.001	0.0%
Unknown	Borrow pit	0.004	0.0%
Unknown	Orthents-Udults-Mine pits complex	0.4	0.2%
Unknown	Made land	2.0	1.0%
	TOTAL	33.0	16.8%

3.1.2.e Impervious Area and Slope

Percent impervious area and percent slope strongly influence the amount of precipitation that becomes stormwater runoff. Large amounts of impervious area and/or high slopes can lead to high-volume and “flashy” runoff. To estimate median percent impervious area for each subcatchment, a percent impervious area raster was downloaded from National Land Cover Database (NLCD) (Xian et al., 2011). Percent slope for each subcatchment was estimated using the National Elevation Dataset (NED) (Gesch et al., 2002).

3.1.2.f Additional Subcatchment Parameters

In addition to the major subcatchment parameters listed in the sections above, there are five additional parameters that were characterized for each subcatchment: Manning’s n coefficient for overland flow over pervious and impervious areas, depression storage for pervious and impervious areas, and percent of impervious area with zero depression storage. These parameters can be used to adjust the shape and the timing of the hydrograph. For simplicity, these parameters were set to constant values for all subcatchments. The values were selected based on literature values from the SWMM5 manual (James et al., 2010)

Table 3-3: Additional SWMM Subcatchment Parameters

Parameter	Value	Description	Source
Manning's n for overland flow over impervious area	0.018	Average value	Mc Cuen et al. (1996)
Manning's n for overland flow over pervious area	0.25	Dense grass	Mc Cuen et al. (1996)
Depression storage for impervious area	0.075	Average value for impervious surfaces	ASCE (1992)
Depression storage for pervious areas	0.15	Average value for lawns	ASCE (1992)
Percent of impervious area with no depression storage	25%	Default value in SWMM	

3.1.3 Hydraulics and Routing

SWMM offers three methods for routing water through the stream network (listed in order of increasing complexity): steady flow, kinematic wave, and dynamic wave. Dynamic wave was selected for the routing portion of the model. The dynamic wave model can account for channel storage, backwater, entrance/exit losses, flow reversal, and pressurized flow. The dynamic wave model allows for more complex flow conditions than the other routing methods, but requires the use of smaller computational time steps, so choosing this method generally increases the model run times. Theoretically, it produces more accurate results.

3.1.3.a Stream network

Modeling efforts focused on tributaries within the watershed model extent that are currently impaired for bacteria or have active or planned stream restoration projects. Some of these streams originate outside of the city of Richmond, but flow through the city. Two types of small, intermittent streams were not explicitly modeled: unimpaired tributaries within the City of Richmond and unimpaired tributary streams outside the City of Richmond. Unimpaired small tributaries within the city limits were omitted largely because there were no data on stream geometry or characteristics. Upon visual inspection of aerial photography, it was noted that most of these waterbodies were ditches. The small, intermittent streams outside the city were omitted because they are not within Richmond's service area.

The network of streams modeled was developed using two sources. Hydrography data were acquired from the National Hydrography Dataset (NHD Plus), which is developed by USEPA Office of Water and the US Geological Survey (USGS) (USEPA, 2005). This dataset includes nationwide spatial information about a variety of waterbodies, including streams, rivers, lakes, and ponds. NHD Plus was modified using a digital elevation model developed from LiDAR mass points. Modifications of the NHD Plus flow lines were made to align with the lowest nearby digital elevation model (DEM) elevation and with aerial photographs.

The DEM was also used to characterize irregular transects for each section of the stream channel. Using the DEM, one transect was drawn for each subcatchment in the model. Each transect was drawn at a location that was considered to be most representative of the stream channel within a subcatchment.

3.1.3.b Infrastructure

The modeling of culverts was limited to structures that were located on modeled tributaries. Culvert data were provided by the City of Richmond for portions of the watersheds within the city limits. Culvert locations and geometry were estimated for culverts located outside of the city. An initial estimate of culvert geometry was based on aerial photos from Bing maps and the DEM. Initial estimates were then adjusted during calibration under the assumption that culverts were designed to avoid flooding roadways.



The hydrology calibration process revealed that lakes and reservoirs significantly influence the timing of peak flows and their magnitudes. Nine lakes and impoundments were identified through the NHD dataset and subsequently modeled within the model extent, including Cherokee Lake, Cornelius Creek Lake, Falling Creek Reservoir, Gregory's Pond, Lower Beaver Pond, Lower Young's Pond, Rock Creek Park Lake, Upper Lake Bexley, Upper Young's Pond, and Westhampton Lake. When possible, data for these impoundments, associated weirs, and spillways were obtained from the US Army Corps of Engineers (USACE, 1979-1981). Otherwise, impoundment, weir, and spillway characteristics were estimated from aerial photographs, 2-ft contours created from Light Detection and Radar (LiDAR) data, and the DEM. Two conditions constrained the hydraulic behavior of impoundments in the model. First, impoundments were assumed to have a minimum constant water depth that was equal to the primary spillway elevation. Second, it was assumed that lakes and impoundments did not regularly overflow their banks. This seemed like a reasonable assumption because several of the impoundments are surrounded by buildings. If an impoundment regularly flooded in the model, the depth of the storage node was increased and the stage-storage curve was linearly extrapolated.

3.1.4 Water Quality

3.1.4.a Land use/land cover

For water quality modeling in SWMM, land uses must be defined in order to assign pollutant loading. To characterize land use within the model extent, land use data were acquired from the National Land Cover Database (NLCD). The data are generated by the Multi-Resolution Land Characteristics (MRLC) consortium and provided in a raster data format with a spatial resolution of 30 meters (MRLC 2016). NLCD 2011, the most recent version of this dataset, was used to characterize land use in the SWMM model (Homer et al., 2011).

The NLCD also provides data on percent impervious area (Xian et al., 2011), and this dataset was modified and used to estimate the median percent impervious area for each subcatchment. The modification of these data was necessary because the initial model runs during the hydrology calibration process underestimated gaged flows. This discrepancy was discovered through a watershed-scale analysis comparing NLCD impervious cover and a planimetric impervious layer provided by the City of Richmond. It revealed that the NLCD impervious layer underestimated the median percent impervious area, especially in less urban areas. A linear regression was used to develop a relationship between the two datasets and to adjust the NLCD impervious area to better match the planimetric data from the City. After the initial adjustment, the percent impervious area for each subcatchment was adjusted downward by 15%, in order to account for impervious areas that are not directly connected to a waterway or storm sewer. This is standard practice in watershed modeling because runoff from unconnected impervious areas typically first flow onto pervious areas where infiltration can occur, and any excess is then routed to the stream or storm sewer. Because the amount of directly connected impervious area is not known, this adjustment factor was used as a calibration parameter.

3.1.4.b Pollutant loading

In the watershed model, pollutants enter the tributaries in three ways: runoff from the tributary watersheds, baseflow, and CSO overflows. Build-up of pollutants on the watershed and their subsequent wash-off during runoff events are the dominant mechanisms for pollutant loading into tributaries. Pollutant concentrations in baseflow is effectively a calibration parameter that is set for consistency with dry weather pollutant data in the streams. CSO overflows to the tributaries are estimated using combined sewer model output and event mean concentrations (as described below in Section 3.3).

During dry weather periods, pollutants accumulate on subcatchments through a process called build-up. The two parameters that govern build up are the build-up rate, which is the rate at which pollutant



accumulates on a subcatchment (expressed in units of cfu/acre/day), and the maximum buildup, which is the maximum amount of pollutant that can accumulate on a subcatchment (expressed in units of cfu/acre). Both of these parameters are represented in the model as a function of land use. To assign reasonable build-up rates and maximum build up to each land use, a review of literature values from across the country was conducted (see tables below). Literature values were not available for all land uses in the model, so in the absence of available data, the build-up parameters for the most similar land use were assigned. Initial model runs used the median build-up rate and the median of maximum build-up for each land use. These parameters were then fine-tuned during calibration, using the 25th and 75th percentiles as reasonable limits on the range of potential values.

Table 3-4: Land Use Build-Up Rates (cfu/acre/day) Used in the Watershed Model				
Land Use	Count	Q1	Median	Q3
Developed - High Intensity	21	6.24E+07	1.27E+09	2.12E+09
Developed - Low Intensity	12	8.13E+07	1.65E+09	2.60E+09
Developed - Medium Intensity	14	9.09E+07	1.50E+09	2.60E+09
Developed - Open Space	8	2.31E+08	1.57E+09	7.81E+09
Undeveloped	32	1.09E+08	1.43E+09	9.62E+09
Forest	9	5.07E+06	8.52E+06	1.41E+08

Table 3-5: Maximum Build-Up Rates Used in the Watershed Model				
Land Use	Count	Q1	Median	Q3
Developed - High Intensity	7	9.57E+09	1.06E+10	1.41E+10
Developed - Low Intensity	4	1.06E+10	1.14E+10	3.44E+11
Developed - Medium Intensity	5	5.33E+09	1.02E+10	2.33E+11
Developed - Open Space	4	1.03E+10	1.40E+10	1.75E+11
Undeveloped	9	1.53E+09	2.95E+10	8.51E+10
Forest	5	1.53E+09	1.53E+09	1.67E+09

During wet weather periods, pollutants are depleted from subcatchments and delivered to streams through a process called wash-off. Similar to build-up, the amount of pollutant that washes off during a runoff event is dictated by land use-specific wash-off rate called the event mean concentration (EMC). EMCs for each land use were informed by a literature review. Runoff will continue to generate pollutant load until the available source of pollutant build-up has been exhausted. Literature values were not available for all land uses in the model, so in the absence of available data, the build-up parameters for the most similar land use were assigned. Initial model runs used the median EMC for each land use, and were then fine-tuned during calibration, using the 25th and 75th percentiles as reasonable limits.

Table 3-6: Landuse Based E.Coli EMC Values Used in the Watershed Model			
NLCD 2011	E.coli (CFU/100 mL)		
Cultivated Crops	1,945	8,440	26,567
Pasture/Hay	2,682	3,989	28,102
Forest	380	504	565
Wetlands (Woody/Herbaceous)	565	10,339	10,756



Table 3-6: Landuse Based E.Coli EMC Values Used in the Watershed Model

NLCD 2011	<i>E.coli</i> (CFU/100 mL)		
Developed - Open	2,479	2,479	25,856
Developed - Low Intensity	3,157	15,294	29,723
Developed - Medium Intensity	4,480	5,620	15,527
Developed - High Intensity	884	3,700	11,000

An *E.coli* baseflow concentration was assigned at each model location where baseflow was added. A literature review of urban TMDLs was conducted to determine a reasonable range of values. Initial model runs used the median *E.coli* concentration of 50 CFU/100 mL, which was then fine-tuned during calibration, using the 25th (28 CFU/100 mL) and 75th (599 CFU/100 mL) percentiles as reasonable limits. The assigned baseflow *E.coli* concentration is the same for each tributary, and is a constant value over time.

CSO flows from the CSS model and *E.coli* concentrations were added to more accurately reflect water quality within CSO-impacted tributaries. There are eight CSOs that overflow into two tributaries in the model: Gillies Creek and Almond Creek. Inflow time series for these eight CSOs were generated by the CSS model. EMCs were assumed for the CSO discharges and were based on previous work on typical fecal coliform concentrations for CSOs in Richmond. The fecal coliform values were then adjusted to represent *E.coli* concentrations using the VADEQ translator (Lawson, 2003). An *E.coli* EMC of 205,000 CFU/100 mL was used for seven of eight CSOs in Gillies Creek. An EMC of 215,000 CFU/100 mL was used for the remaining Gillies Creek CSO and the one CSO in Almond Creek. Further information on the values selected for the CSO EMCs can be found in Section 4.1.

3.1.4.c In-Stream Decay Rate

In-stream bacteria fate and transport processes include die-off, settling to and resuspension from the streambed. The net effect of these processes are represented in the model through the use of a first-order decay rate. Typically, all of the streams in a modeled system will have the same decay rate, with the resulting losses of bacteria in each waterbody varying as a function of travel time through the stream network. An initial in-stream decay rate was set to 1.0/d based on the initial decay rate estimated in the 2010 James River TMDL (MapTech, 2010). This parameter was then adjusted during calibration. The decay rate was varied incrementally between 0.5/d and 2.0/d during the calibration phase.

3.2 CSS Model

The combined sewer system (CSS) model used for this study is based on the Wet Weather Combined Sewer (WWCS) model developed to support Richmond's Long-Term Control Plan Re-Evaluation (Greeley and Hansen, 2002). This CSS model was recalibrated and revised by Greeley and Hansen (GH) between 2010 and 2015 as part of the Wastewater Collection System Master Plan (Greeley and Hansen, 2015). This version of the CSS model is currently used by the city to produce the Combined Sewer System Annual Reports. This CSS model relies on boundary forcings (operating rules, observed flow time series and control decisions) that makes it unsuitable for hindcasting extended time periods and modeling CSS operational alternatives.

The primary SWMM processes and parameters used in the CSS model are similar to the ones described in Section 3.1 above with the exception that the CSS model does account for evapotranspiration as part of the rainfall - runoff process and does not include any internal system pollutant loading (pollutant EMC are assigned to the outfall discharge only). During the CSS model calibration process, 7 local rain gages were



used while the NCDC gage at Richmond Airport was used for the IRWMP, due to limited data availability and reliability of the 7 local rain gages.

To prepare the CSS model for use in this study, it was reviewed and modified by Brown and Caldwell, as described in the “CSO Model Review and Advancement Strategy” technical memorandum by Brown and Caldwell (Brown and Caldwell, 2016). As part of this work, the following major changes and modifications were done:

- Reduction of the number of pipe elements to focus on the main interceptor network and improve model stability. This reduced the number of model pipes from 2,357 to 1,019.
- Definition of standard operating procedures for the WWTP by replacing the flow boundary condition, which required an observed plant influent time series with a simple outflow pipe limited to the plant capacity (e.g. 75 MGD for the model calibration)
- Definition of standard operating rules to control the major facilities like the Shockoe Retention Basin and eliminating the need of an external time series forcing for flow boundary condition at this location.
- Elimination of various inactive control rules
- Reduction of the number of subcatchments (and receiving nodes) by deleting those that flow to the neighboring county collection system
- Reduction of the number of unit hydrographs describing the baseflow I & I conditions

These changes were necessary in order to be able to run the model in hindcast mode for a long-term continuous period, and in order to operate the model for evaluating CSS alternatives.

3.3 Receiving Water Quality Model

Site specific data supported the development of both the hydrodynamic and water quality components of the EFDC receiving water model. Bathymetric data from the current FEMA Flood Insurance Study (FEMA, 2014) and from a USACE survey of the estuarine reach (USACE, 2013) were averaged over the model grid. In the upper, riverine reach, a cross-sectional average bed elevation was computed for each row of grid cells. In the lower, estuarine reach, a DEM was computed from the detailed USACE elevation data and averaged over the model grid. The modeled James River bed elevation profile is illustrated in the figure below.



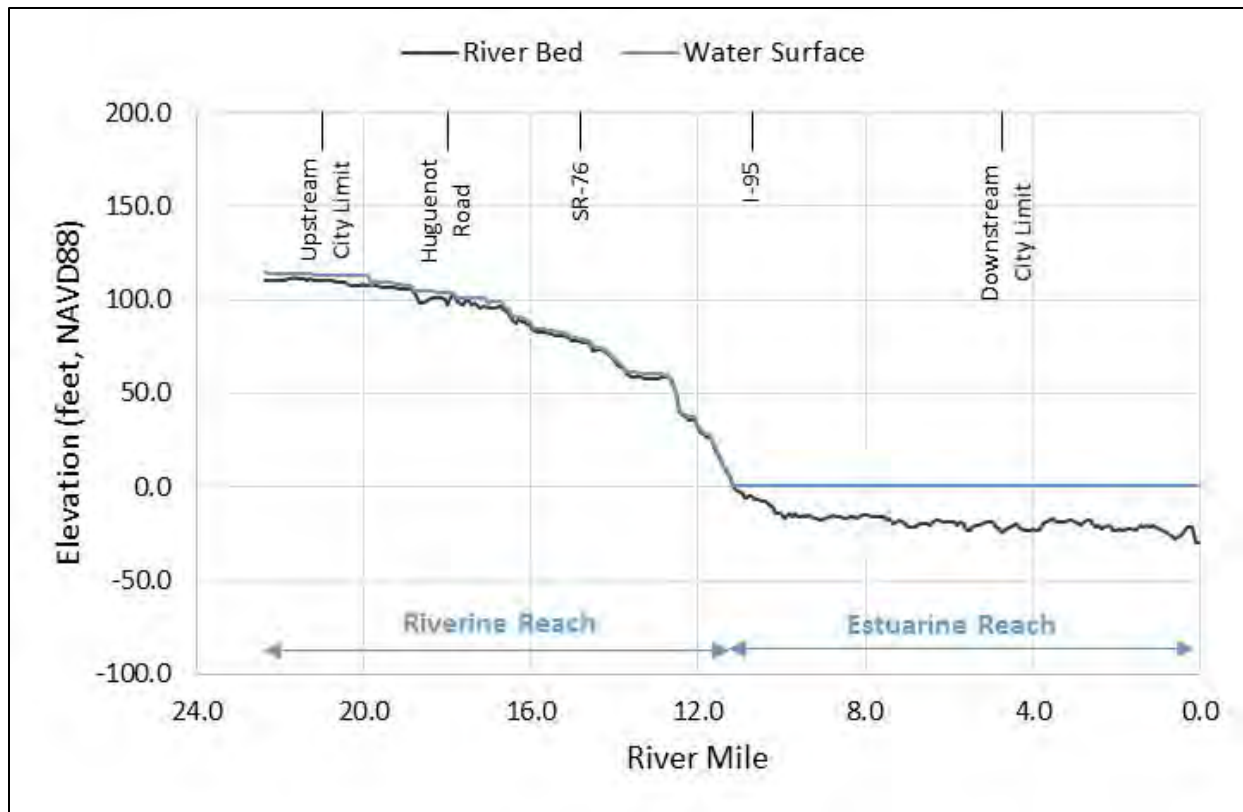


Figure 3-2: James River Elevation Profile

Tidal water levels from USGS Station #02037705 (James River at City Locks at Richmond, VA) were applied at the downstream boundary and the model was calibrated to adjust for the change in water levels between the gauging station and the downstream model boundary. This calibration, which is described in Section 4, accounts for differences in timing (phasing) of the tides between the two locations, and differences in non-tidal water levels associated with river flows.

Upstream James River flows from USGS Station 02037500 (James River near Richmond, VA) were directly applied at the upstream model boundary. For days when *E.coli* were sampled near the upstream boundary, these data were directly inputted to the model. For days when *E.coli* data were unavailable, upstream James River *E.coli* concentrations were estimated based on sampling data from a station at Huguenot Bridge. 112 samples at this location collected between 2011 and 2013 were used to develop a regression of flow and *E.coli* using the USGS LOADEST software package.

LOADEST is a program for “estimating constituent loads in streams and rivers” (USGS, 2017). The figure below illustrates the predicted relationship between James River flow and *E.coli* concentrations upstream of Richmond. The regression equation is as follows:

$$a_0 + a_1 * \ln Q + a_2 * \ln Q^2 + a_3 * \sin(2\pi * dtime) + a_4 * \cos(2\pi * dtime)$$

Where:

- a_0 , a_1 , a_2 , a_3 , and a_4 are constants equal to 3.17, 1.27, 0.41, -0.79, and -0.04 respectively,
- Q is streamflow (cubic feet per second), and,
- $dtime$ is time relative to the center time (days)

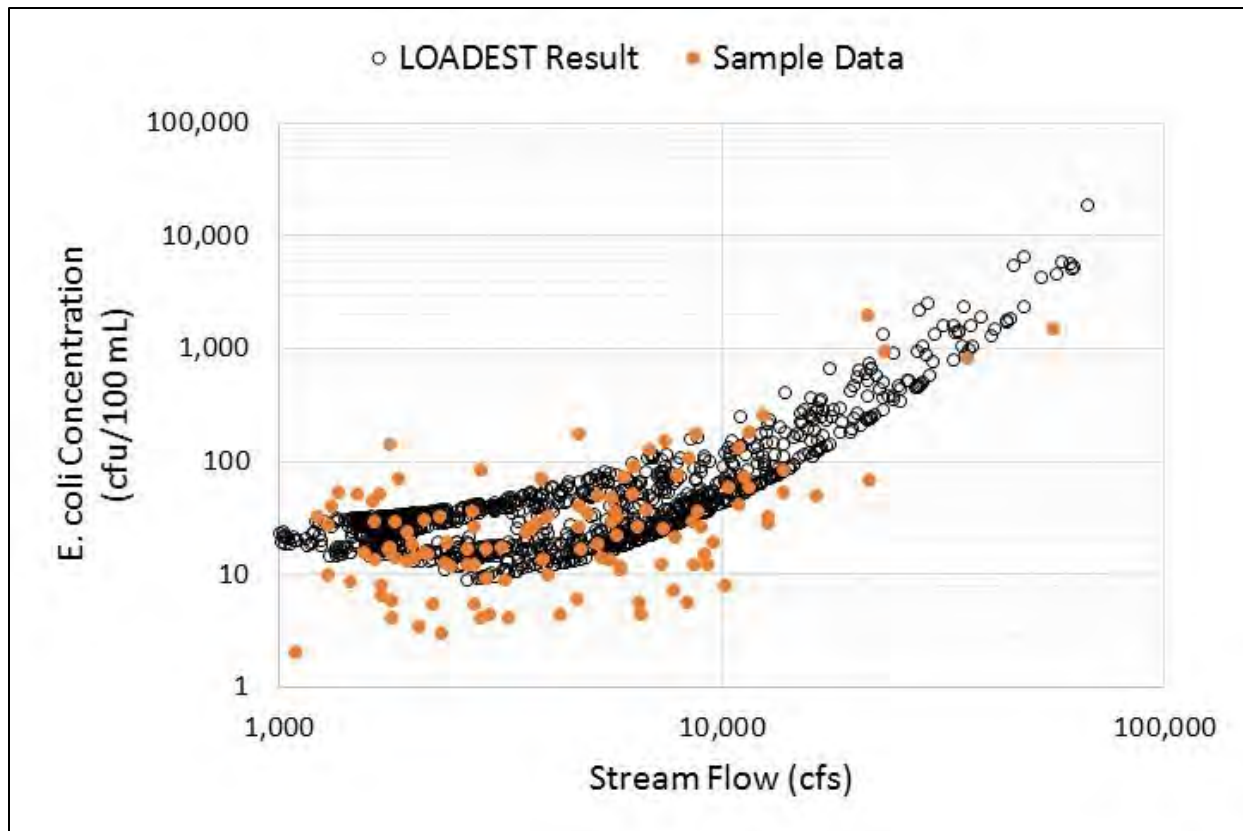


Figure 3-3: Regression of James River flow and *E.coli* concentration

Flows and *E.coli* concentrations associated with MS4 and watershed areas, and CSO discharges were computed from the watershed and CSS models, respectively. Flows and concentrations from the watershed model were input to EFDC at an hourly interval. Flows from the CSS model were input to EFDC at a five-minute interval due to the faster response time of the combined sewer system to rainfall relative to the watershed.

Fecal coliform event mean concentrations (EMCs) were previously calculated (and accepted by VADEQ) for the CSO discharges during the development of the Long Term Control Plan. These EMCs were calculated based on CSO outfall monitoring at several CSOs (Greeley and Hansen, personal communication, 11/15/2016). For this modeling effort, fecal coliform EMC concentrations were converted to *E.coli* concentrations using the VADEQ translator (Lawson, 2003). Table 3-7 summarizes the original fecal coliform EMCs and the translated *E.coli* values.

Consistent with the Long Term Control Plan, all influent to the WWTP was assumed to have an *E.coli* concentration of 235,000 CFU/100mL. It was assumed that influent receiving full treatment would result in an effluent concentration of 126 CFU/100 mL, consistent with the effluent concentration guidelines in the VAPDES permit (#VA0063177). For model application scenarios in which WWTP wet weather flow upgrades are proposed, effluent discharge concentrations were estimated based on the methods described in Section 5.

Table 3-7: Summary of fecal coliform and *E.coli* CSO EMCs

CSO Districts	CSO Drainage Areas			
	Outfall Serial No.	Outfall Location	Fecal Coliforms (#/100 mL)	<i>E.coli</i> (#/100 mL)
South Side James River Park	018	42nd Street	986,775	318,000
	017	Reedy Creek	986,775	318,000
	016	Woodland Heights	986,775	318,000
	015	Canoe Run	986,775	318,000
	040	CSO-1 OUT/SSJRP	986,775	318,000
North Side James River Park	011	Park Hydro	437,343	150,000
	010	Gambles Hill	437,343	150,000
	009	Seventh Street	437,343	150,000
	(008) ^a	(Sixth Street) ^a	437,343	150,000
	007	Byrd Street	437,343	150,000
	(036) ^b	(Virginia Street) ^b	437,343	150,000
Manchester Area (WWTP Area)	014	Stockton Street	86,266 ^d	34,000
	013	Maury Street	86,266 ^d	34,000
	021	Gordon Avenue	86,266 ^d	34,000
Gillies Creek	005	Peach Street	612,230	205,000
	002	Orleans Street	612,230	205,000
	004	Bloody Run	612,230	205,000
	003	Nicholson Street	612,230	205,000
	(023) ^c	(Old Fulton Street Bridge) ^c	612,230	205,000
	024	White and Varina Streets	612,230	205,000
	025	Briel Street and Gilles Creek	612,230	205,000
	026	1250 feet east of Government Road	612,230	205,000
	(027) ^c	(Williamsburg Road and Gillies Creek) ^c	612,230	205,000
	028	800' North of Nicholson Street	612,230	205,000
	035	25th and Dock Streets	612,230	205,000
	039	550 feet Downstream from Government Road	612,230	205,000
Shockoe Creek	006	Shockoe Creek	315,369 ^d	111,000
	034	19th and Dock Street	315,369 ^d	111,000
Remote Locations	020	McCloy Street	647,000	215,000
	019	Hampton Street	647,000	215,000
	033	Shields Lake	647,000	215,000
	012	Hilton Street	647,000	215,000
	031	Oakwood Cemetery	647,000	215,000



4 Model Calibration

Model calibration is the process of adjusting model parameters and assumptions within defensible ranges to achieve reasonable agreement between modeled and observed conditions. Model parameters and assumptions are set to the extent possible based on site specific data. However, in some cases, calibration is necessary because site specific data are either limited or unavailable. The calibration process fine-tunes these parameters, within reasonable bounds, to improve model calculations.

4.1 Calibration Data

The calibration process relies heavily on site-specific data to guide the tuning of model inputs. Site specific data support identification of important spatial patterns or time trends in environmental conditions. These patterns often lend insights into the processes or sources most strongly influencing environmental conditions. In this way, the model calibration process involves interpreting site data to understand and bring the model into agreement with important conditions. Site data vary in their capacity to support such an interpretation depending largely on their quantity and locations. The following sections describe the site specific data available for calibration of the modeling framework and also describe the interpretation of these data.

4.1.1 Watershed Model

4.1.1.a Hydrology

The hydrology calibration for the watershed model relied on data from Falling Creek (USGS #02038000), which was the only continuous flow and water depth gage within the modeled area (

Figure 2-2). Daily average flow data was available from 1955-1994. It was assumed that calibrated parameters related to in-channel roughness, overbank roughness, and impervious area would be similar between Falling Creek and the remainder of the watershed. This assumption seems reasonable based on a comparison of key watershed characteristics that influence runoff, including impervious area, slope, and soil infiltration, in Falling Creek versus the other model subcatchments. This comparison is shown in the table below.

Table 4-1: Median value of key runoff parameters in Falling Creek compared to the rest of the model subcatchments

Key Runoff Parameter	Median Value in Model Subcatchments	Median Value in the Falling Creek Subcatchment
% impervious area	26%	22%
% slope	5%	7%
Min infiltration	2.5	2.7
Max infiltration	0.161	0.178



4.1.1.b Water quality

The selected water quality calibration period was calendar years 2011 through 2013. This time period had the greatest quantity of sampling data available and the greatest range of *E.coli* results, including high values that would be indicative of wet weather source impacts. Seven stations on five different tributaries were chosen to evaluate the water quality calibration (Table 4-2). Station selection was based on the quantity of available data during the calibration period, the proximity of the station to the mouth of the stream, distribution of stations in the model extent, and the size of the tributary. Stations near stream mouths were selected because they more accurately reflect the total *E.coli* load delivered to the James River for each tributary. Stations representing a varied spatial distribution and a variety of sizes were selected to evaluate the robustness of the calibrated parameters.

Table 4-2: Water quality monitoring stations used for watershed model calibration		
Tributary	Station ID	<i>E.coli</i> Data (#)
Falling Creek	399/400	30
Cornelius Creek	1310	15
Powwhite Creek	1100	12
Upham Brook	4	14
Upham Brook	2	7
Reedy Creek	1235/RC1	6

Similar to the hydrology calibration, the water quality calibration was limited by the available data. Because of the data limitations, the water quality calibration was viewed not so much as a definitive calibration, but as a reasonable estimate of tributary loads and their timing so that calibration of the James River receiving water quality model could move forward. If necessary, the watershed model calibration would be revisited if the results from the receiving water quality model indicated it was necessary. The final calibration of the watershed model would be considered complete once the water quality calibration of the James River model was complete. After initial tuning of the watershed model water quality parameters, tributary *E.coli* loads were passed forward to the James River receiving water model. The effect of these tributary loads on James River water quality was assessed through calibration of the James River model which is further described in 4.4.

Water quality data in the tributaries were limited in their capacity to describe wet weather conditions. Most of the data collected appeared to be sampled during dry weather periods, a time when *E.coli* concentrations are expected to be low. Additionally, for almost all stations, samples were collected once per day, and therefore do not capture the temporal variability of bacteria (also known as the “pollutograph”) that is expected during a rainfall event.

4.1.2 CSS Model

The CSS model was calibrated by Greeley and Hansen in 2015 during the initial model development as described in the CSS model documentation of the Waste Water Collection System Master Plan (Greeley and Hansen, 2015). The calibration was done using monitoring data from 16 flow meters, 7 rain gauges, and one river level sensor near outfall CSO 06 (Figure 2-3). The monitoring period lasted 11 months, from July 2012 to June 2013. Several issues related to the metering were identified in the report, and not all data collected was suitable to be used for model calibration. Ten (10) wet weather events were selected from the monitoring period to perform the wet weather calibration.



4.1.3 Receiving Water Quality Model

The hydrodynamic calibration period for the James River receiving water quality model was calendar years 2011 through 2013. This is the same period used for the water quality calibration, and includes a wide range of James River flow conditions. Data from two USGS stations supported the hydrodynamic model calibration: one in the riverine reach (Station 02037500 at Huguenot Bridge) and one in the estuarine reach (Station 02037705 at the City Locks). Data from the riverine USGS station quantify the change in stream depth and velocity with river flow. Data from the estuarine USGS station quantify the amplitude and phasing of tidal water levels.

The water quality calibration period for the James River receiving water model was calendar years 2011 through 2013. As shown in Figure 4-1, this period contains nearly the greatest density of sampling data in the James River. It also represents a typical range of flow and precipitation conditions. While calendar year 2010 had the highest sample count, several of the samples resulted in non-detected *E.coli* concentrations so they were less informative for the model calibration.

Data from the six locations with the greatest quantity of samples with detectable *E.coli* concentrations guided the calibration. Three of these locations occur in the riverine reach and three occur in the estuarine reach. One station (#753) is upstream of all Richmond sources, two are near downtown Richmond and are influenced by CSOs (#641 and #840), and the remaining three are downstream of CSOs and beyond Richmond (#576, #574, and #572). These stations are shown in Figure 2-4.

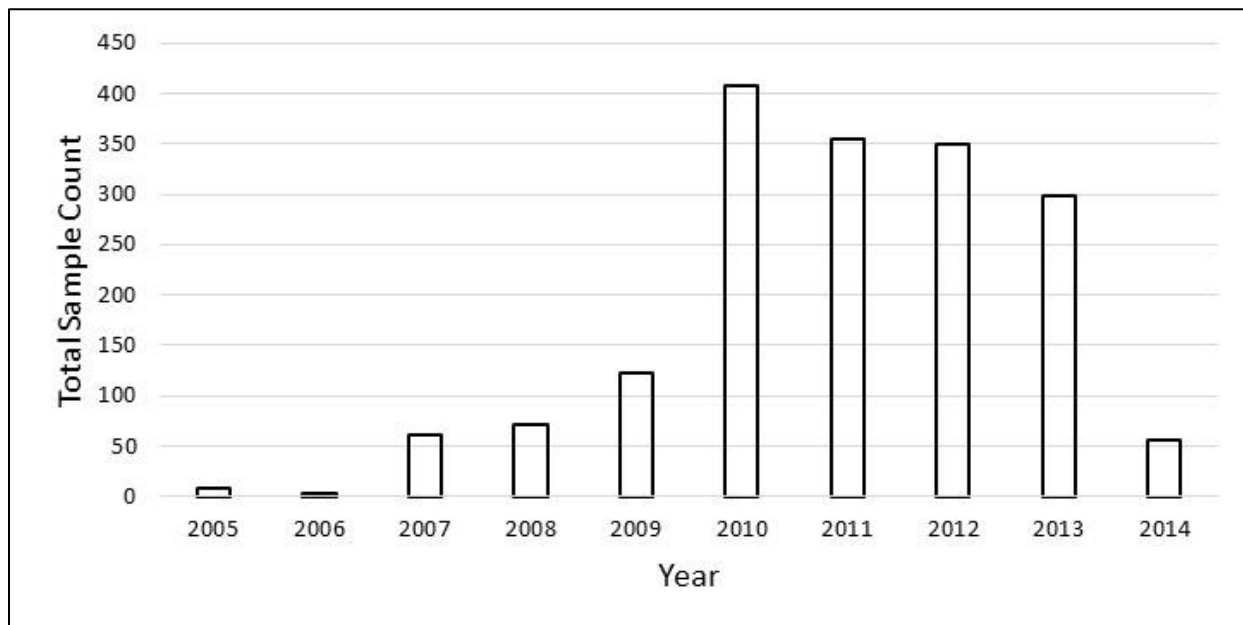


Figure 4-1: James River *E.coli* Water Quality Sample Count by Year

The calibration data were analyzed to identify patterns in water quality along the James River that would guide model calibration. Three significant observations were made. First, dry weather *E.coli* concentrations increase significantly moving from the upstream most station at Huguenot Bridge (station

753) to the downtown area (station 840).

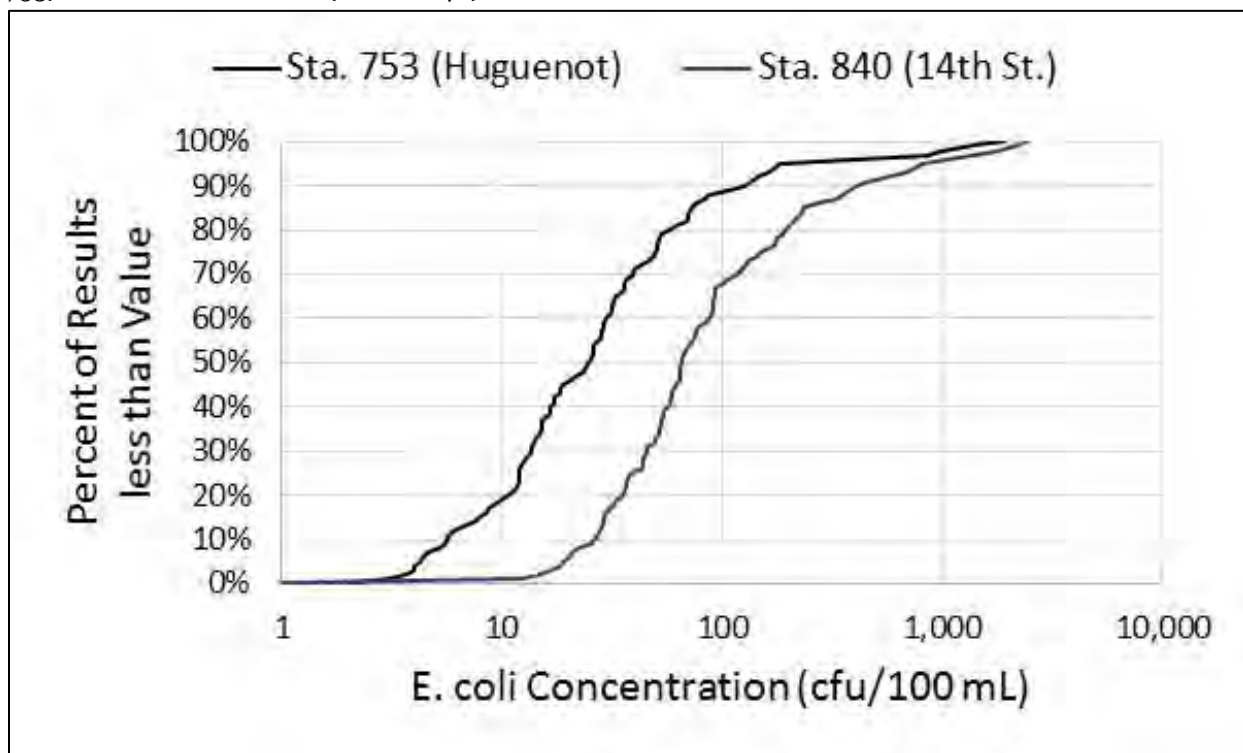


Figure 4-2 compares cumulative frequency distributions (CFDs) at the upstream station and a station near downtown. Median (50th percentile) *E.coli* concentrations increase from 25 to 66 CFU/100 mL, indicating a significant persistent source of *E.coli* to the river between these locations.

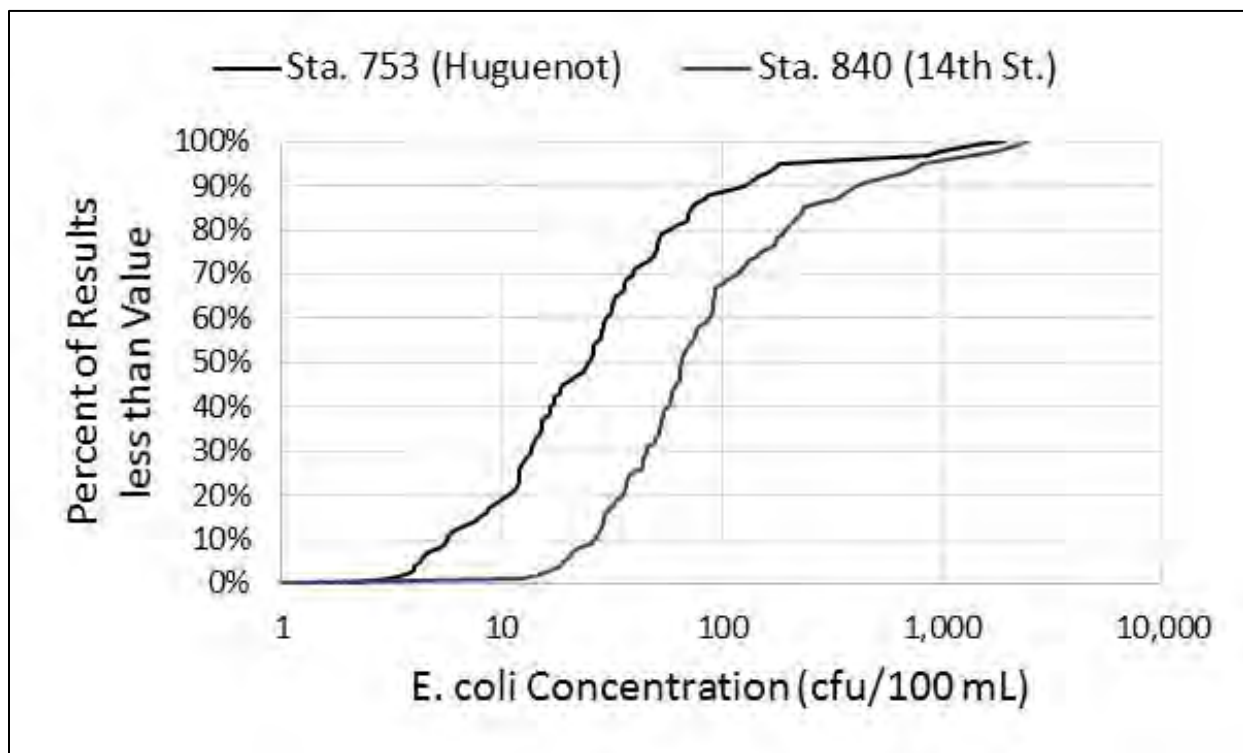


Figure 4-2: Increase in *E.coli* Concentrations from Huguenot Bridge to 14th St. Bridge

Second, *E.coli* concentrations are similar among station 840 on the south side of Mayo Island at 14th Street and stations 576, 574, and 572 which occur farther downstream in the estuarine reach.

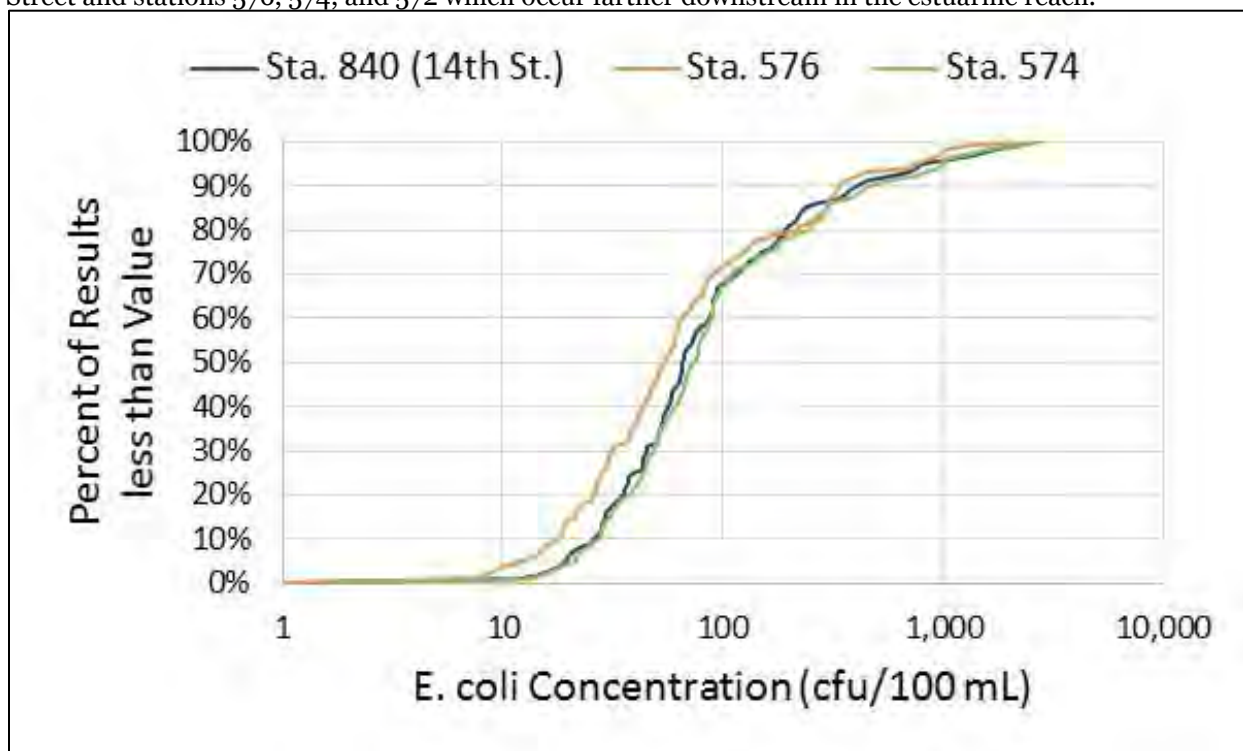


Figure 4-3 compares the cumulative frequency distributions (CFDs) among these stations. Similarities in the *E.coli* concentrations among these stations indicate that, most of the time, additional pollutant loads downstream of station 840 and on the north side of Mayo Island are small relative to the upstream *E.coli* load. Similarity in *E.coli* concentrations at these three locations also indicates that in-stream losses of bacteria are minor between stations 840, 576, and 574. Median (50th percentile) *E.coli* concentrations at stations 840, 576, and 574 are 66, 74, and 55 CFU/100 mL respectively.

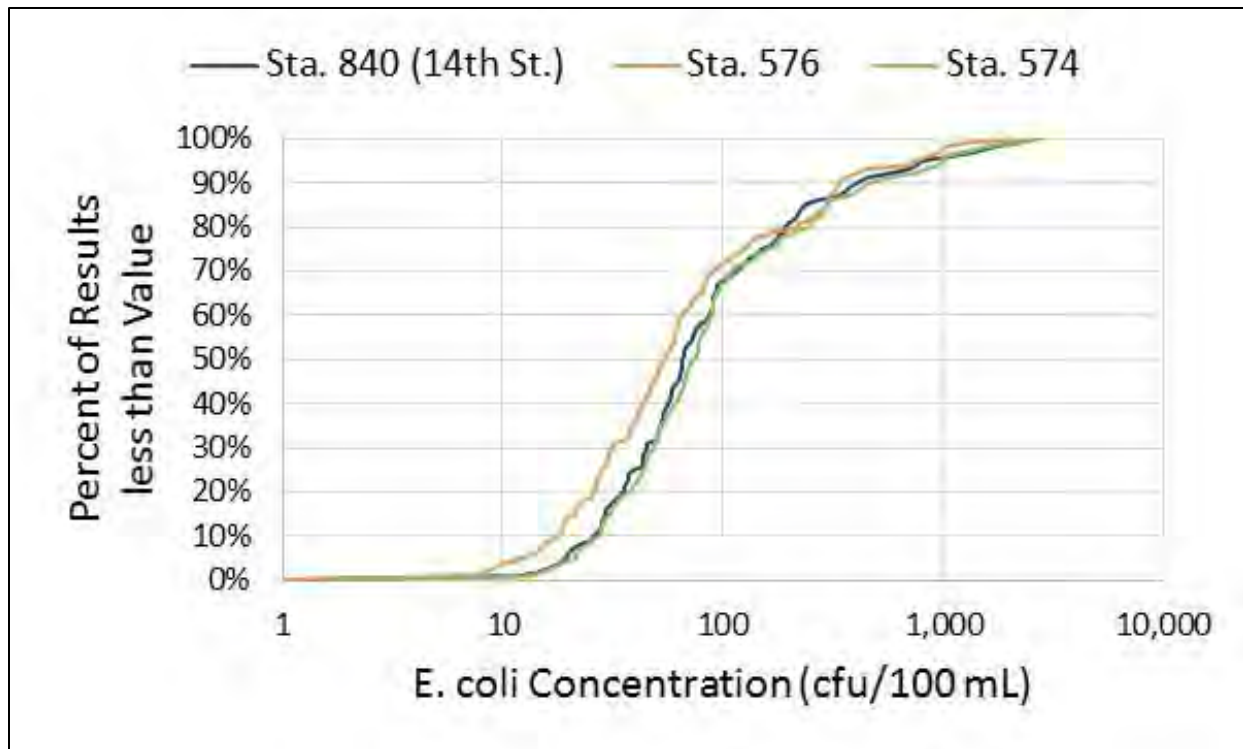


Figure 4-3: Similarity in *E.coli* Concentrations among Stations 840, 576, and 574

Third, *E.coli* concentrations at station 641 are significantly higher than at stations 840, 576, 574, and 572 and are assumed to be unrepresentative of ambient conditions on the north side of the island. If these data were representative of the total flow north of the island, then *E.coli* concentrations at downstream stations would be higher than data at station 841 on the south side of the island. Given the similarity in concentrations between stations 841, 576, and 574, it is assumed that samples at station 640 are not representative of the broader river flow north of the island. Samples at this location were taken within a protected embayment that receives discharge from CSO o6 (Shockoe Retention Basin discharge). The protected embayment may have flow properties different from the main section of James River (e.g. sheltered location, stagnant water, little flushing from the James River, direct CSO discharge) that may

relate to the unrepresentatively high *E.coli* concentrations observed there.

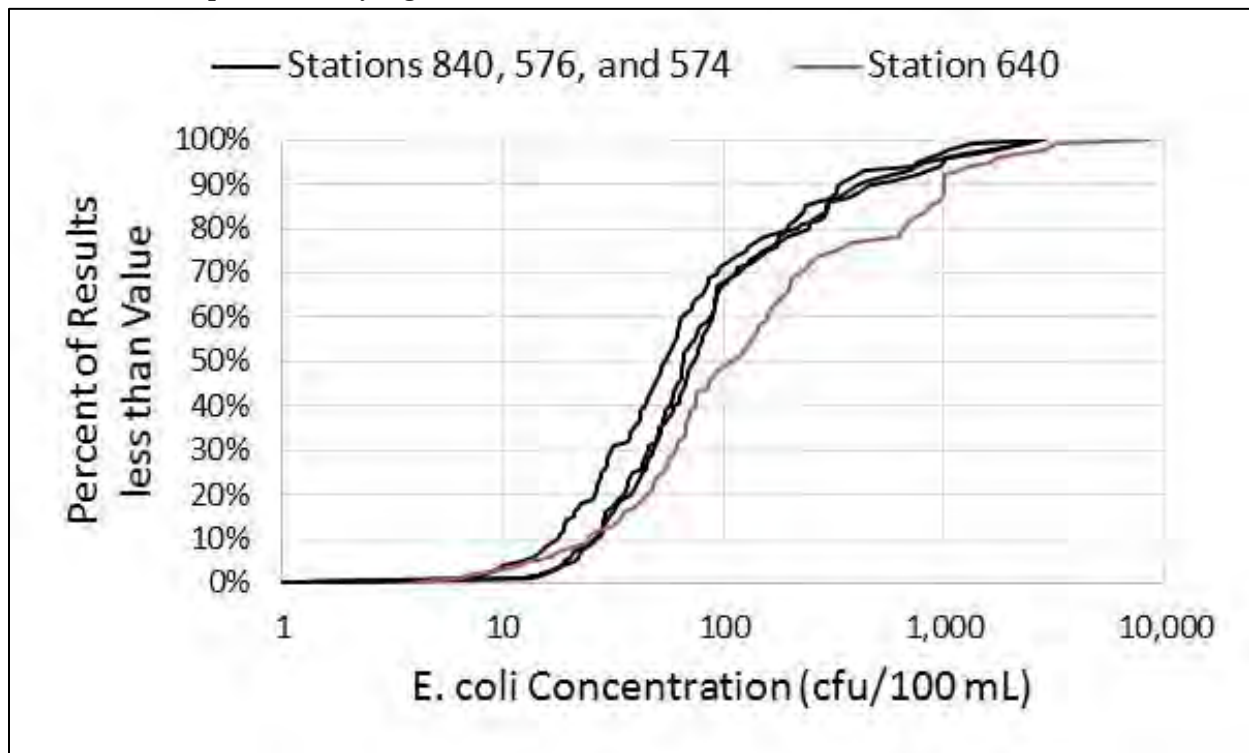


Figure 4-4 illustrates differences between *E.coli* concentrations at station 640 and the surrounding stations.

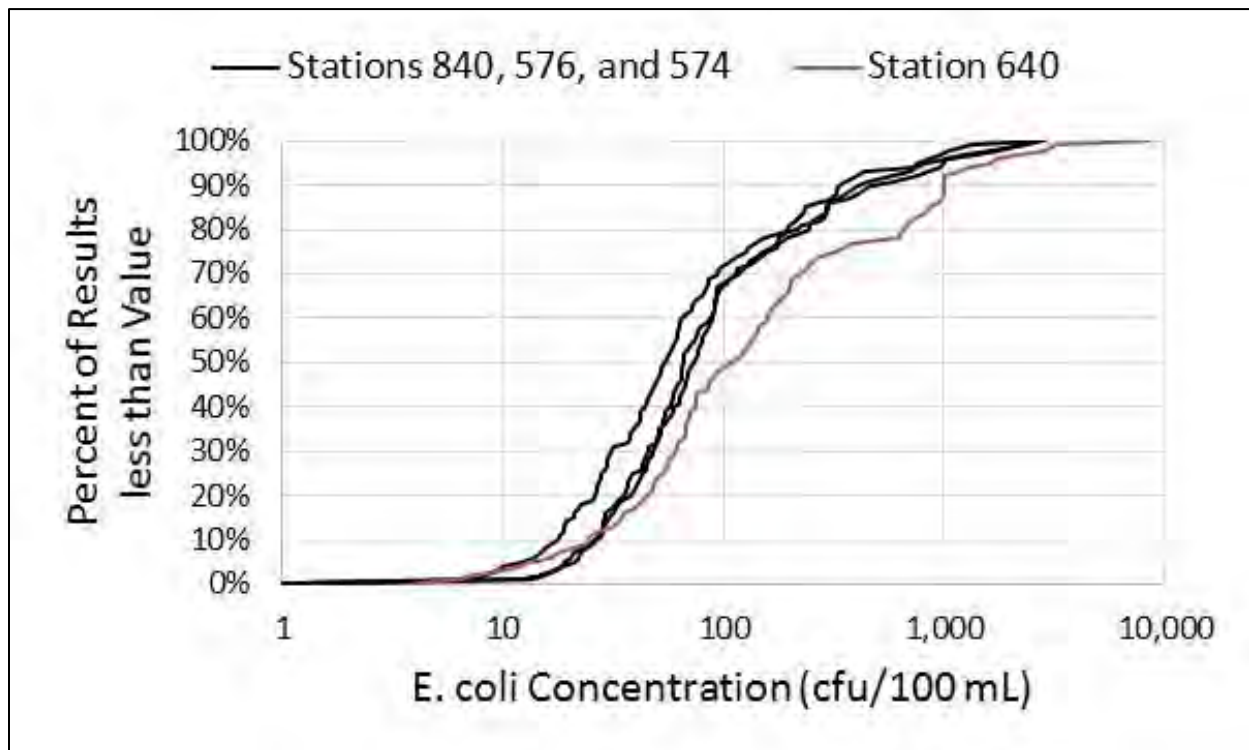


Figure 4-4: Differences in *E.coli* Concentrations between station 640 and other surrounding stations

These observations from the data represent the understanding of water quality patterns that guided James River water quality model calibration decisions, which are further described in the sections below.

4.2 Model Evaluation and Performance Criteria

Model evaluation and performance criteria are principles and standards for evaluating the success of a model calibration. In some cases, statistical evaluations of model output are useful in that they can be related to industry standards. In other cases, reliable statistical standards are unavailable and model calibration is guided primarily by visual evaluation of graphics comparing model and data. Considerations that guided the model calibration process are described for each model below.

4.2.1 Watershed Model

The evaluation of the hydrology calibration involved statistical and visual comparisons between the modeled flows at the outlet of the upstream portion of the Falling Creek watershed and observed flows at the Falling Creek USGS gage. Annual and cumulative modeled flow volume were evaluated. Comparisons were also made between model results and gaged flows for 18 individual storm events. For each event, model results were qualitatively and statistically evaluated based on the shape of the hydrograph, total event volume, and event peak flows.

The evaluation of the water quality calibration relied upon graphical summaries of model results. These summaries included boxplots, cumulative frequency distributions, and one-to-one plots of model results versus observed data. The primary calibration parameters were pollutant build-up and wash-off, baseflow concentration of *E.coli*, and in-stream *E.coli* decay rate. Due to the lack of available water quality data, the final calibration of the watershed model was completed as part of the water quality calibration for the James River EFDC model.

4.2.2 CSS Model

The performance evaluation of the original Wet Weather Combined Sewer (WWCS) model was conducted by Greeley and Hansen and included visual comparisons of flow hydrographs for individual wet weather events at the metering locations as well as 1:1 plots for comparisons of wet weather event flow volume and peak flows. The model evaluation is described in the Collection System Hydraulic model report of the Wastewater Collection System Master Plan by GH (Greeley and Hansen, 2012).

Brown and Caldwell evaluated the adjusted Clean Water Plan version of the CSS model (described in Section 3.2) against available flow observations as well as the underlying WWCS model by GH and the comparison described in detail in the IP Model Development documentation (Brown and Caldwell, 2016). This includes flow comparisons for individual wet weather events at meter locations (against observations) as well as volumetric comparisons at CSO locations on an event and annual basis against the WWCS model.

4.2.3 Receiving Water Quality Model

Evaluation of the hydrodynamic model performance relied on graphical summaries of model output. In the riverine reach, modeled depths and velocities were plotted against modeled discharge and compared against observed depths and velocities plotted against observed discharge. These relationships of depth and velocity versus discharge are strongly influenced by the hydraulic characteristics of the James River including bed slope, width, and channel roughness. In the estuarine reach, the model was evaluated using two other graphic types: time series and one-to-one plots. These tools were used to assess the phasing and amplitude of the modeled tides and the effect of river flows on water levels in the estuarine reach.



Evaluation of the water quality model performance also relied on graphical summaries of model output, including time series plots and cumulative frequency distributions (CFDs). Emphasis was placed on evaluating the model's consistency with elevated *E.coli* concentrations which would most significantly influence compliance with water quality standards.

4.3 Hydrology and Hydrodynamics Calibration Results

Hydrology and hydrodynamics describe the quantities and rates of water moving through a system. In the James River water quality modeling framework, this includes movement of storm runoff from the watershed into and through tributaries and storm water sewers, movement of water and wastewater into and through the combined sewer system and through the wastewater treatment plant and combined sewer overflows, and movement of water into and through the James River. Calibration of hydrology and hydrodynamics is important in that it strongly influences the concentrations and persistence of pollutants in an environmental system.

4.3.1 Watershed Model

The purpose of the hydrology calibration was to: 1) reasonably approximate the volume and timing of observed flows in Falling Creek and 2) develop hydrologic parameters that could be used for all subcatchments and stream channels in the watershed model extent. In the absence of robust site-specific data, it was assumed that all subcatchments and stream channels in the model would have similar hydrologic properties. This assumption was considered reasonable because median values are similar for subcatchment parameters, such as impervious area, percent slope, and soil properties between the gaged portion of the Falling Creek watershed and the other watersheds included in the model extent. The model was run for calendar years 1985 to 1994, and modeled cumulative flows and storm event hydrographs were compared to observed flows at the USGS gage. Subcatchment percent impervious area and stream channel roughness values were adjusted to bring the modeled results into alignment with observed values.

On a cumulative basis, the model results reasonably match observed flows for all years until spring of 1993 and spring of 1994 (Figure 4-5).



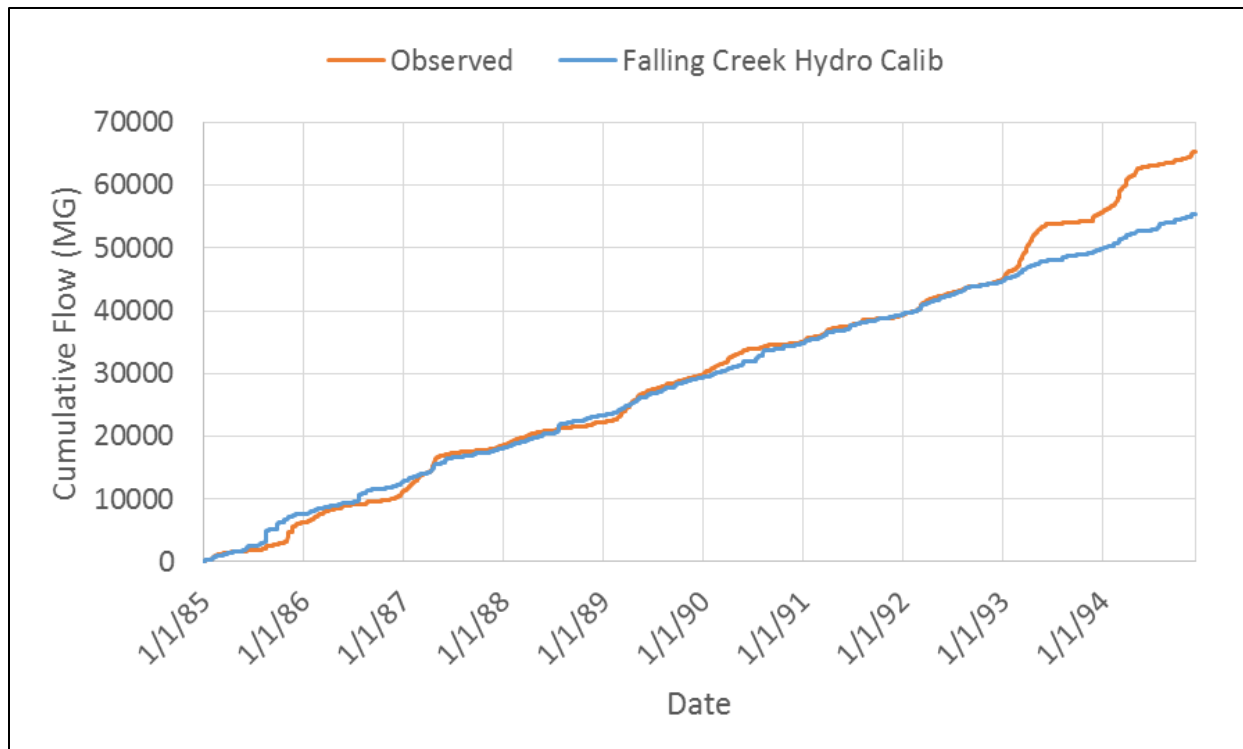


Figure 4-5: Observed and Modeled Cumulative Flow Volume at the Falling Creek Gage

For the period 1985 to 1994, the model underpredicted observed flows by approximately 15%. However, when the flows from 1993 and 1994 were excluded, the difference in cumulative volume between modeled and observed flows decreased to -0.5% (Table 4-3). The cause for the 1993 and 1994 increases in observed flows are unknown, but similar increases were observed in four other USGS gages in the region: Totopotomoy Creek near Studley, VA (USGS 01673550); James River near Richmond, VA (USGS 02037500); Appomattox River at Mattoax, VA (USGS 02040000); and Chickahominy River near Providence Forge, VA (USGS 02042500), indicating that this is not merely an instrumental problem at a single gage (Figure 4-6). Variations could be attributable to differences in rainfall in the Falling Creek watershed and at the Richmond Airport, which are approximately 11.7 miles apart as the crow flies.

Table 4-3: Observed and Modeled Annual Flow Volumes at the Falling Creek Gage

Year	Observed Total Annual Flow (MG)	Modeled Total Annual Flow (MG)	Percent Difference Between Modeled and Observed
1994	9,614	5,584	-41.9%
1993	10,740	5,181	-51.8%
1992	5,678	5,209	-8.3%
1991	4,214	4,609	9.4%
1990	5,253	5,521	5.1%
1989	7,566	6,110	-19.2%
1988	3,677	5,143	39.9%
1987	7,435	5,417	-27.1%
1986	4,875	5,066	3.9%

Table 4-3: Observed and Modeled Annual Flow Volumes at the Falling Creek Gage

Year	Observed Total Annual Flow (MG)	Modeled Total Annual Flow (MG)	Percent Difference Between Modeled and Observed
1985	6,262	7,639	22.0%
OVERALL	65,313	55,477	-15.1%
OVERALL (excl. '93-'94)	44,959	44,712	-0.5%

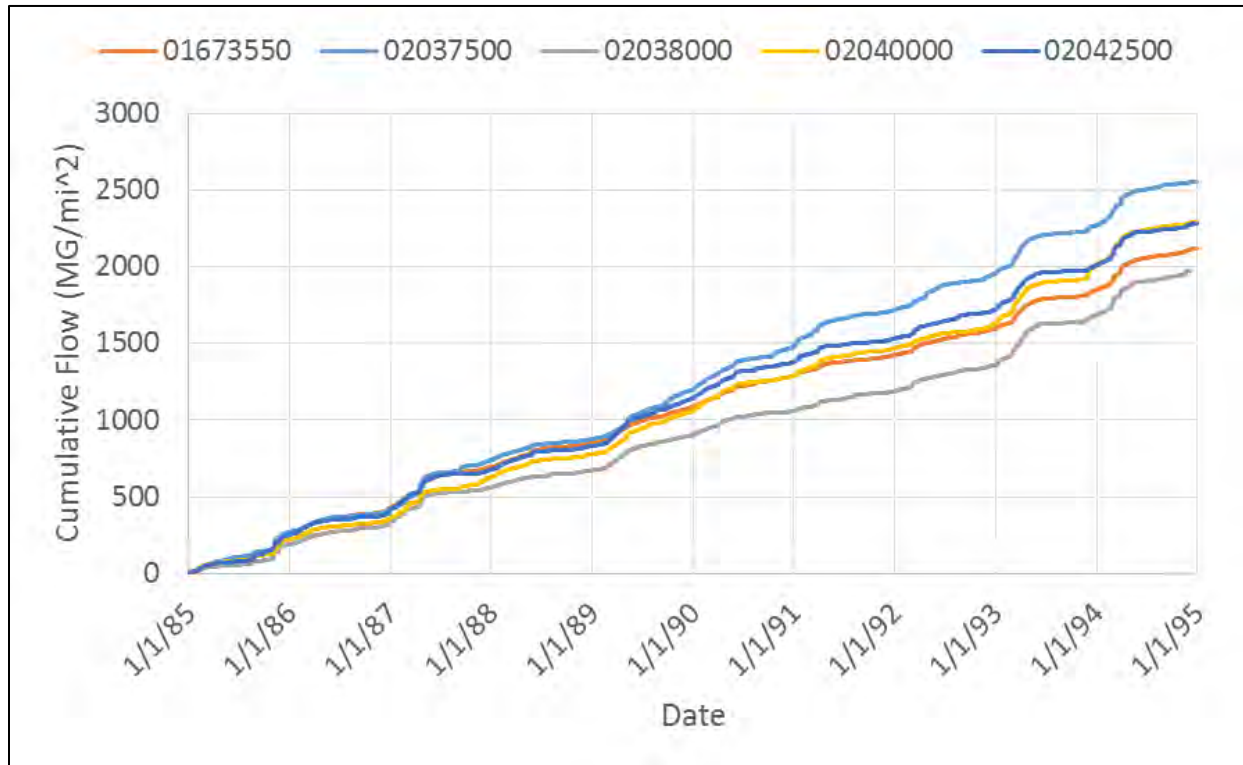


Figure 4-6: Area Normalized Cumulative Flow Volume for USGS Gages in the Richmond Region

On an event basis, model results tend to over predict event volumes and peak flows (Figure 4-7 and Figure 4-8), but the general shape of the hydrographs tend to match (Figure 4-9). The model currently only uses precipitation from one gage at Richmond International Airport (RIA). Variations on an event basis could be attributable to differences in rainfall in the Falling Creek watershed and at the Richmond Airport, which are approximately 11.7 miles apart as the crow flies.

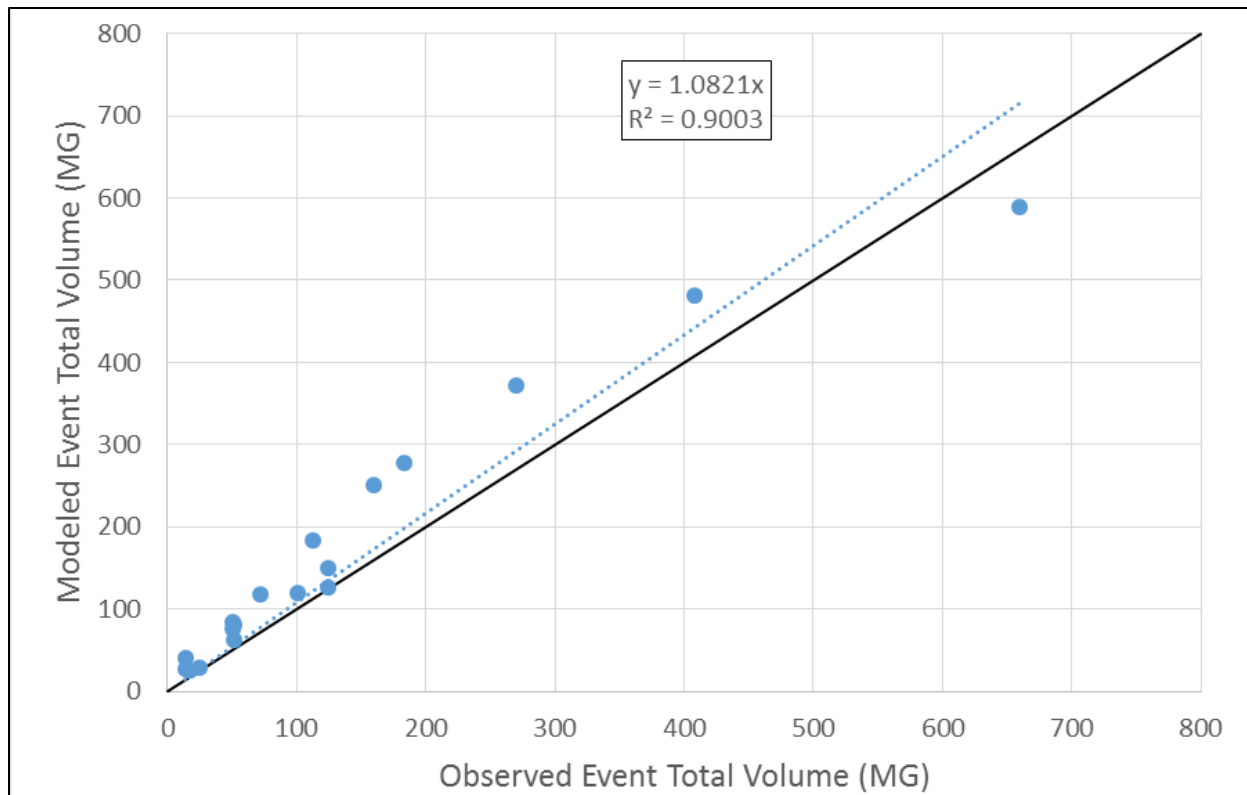


Figure 4-7: Modeled vs Observed Event Volume

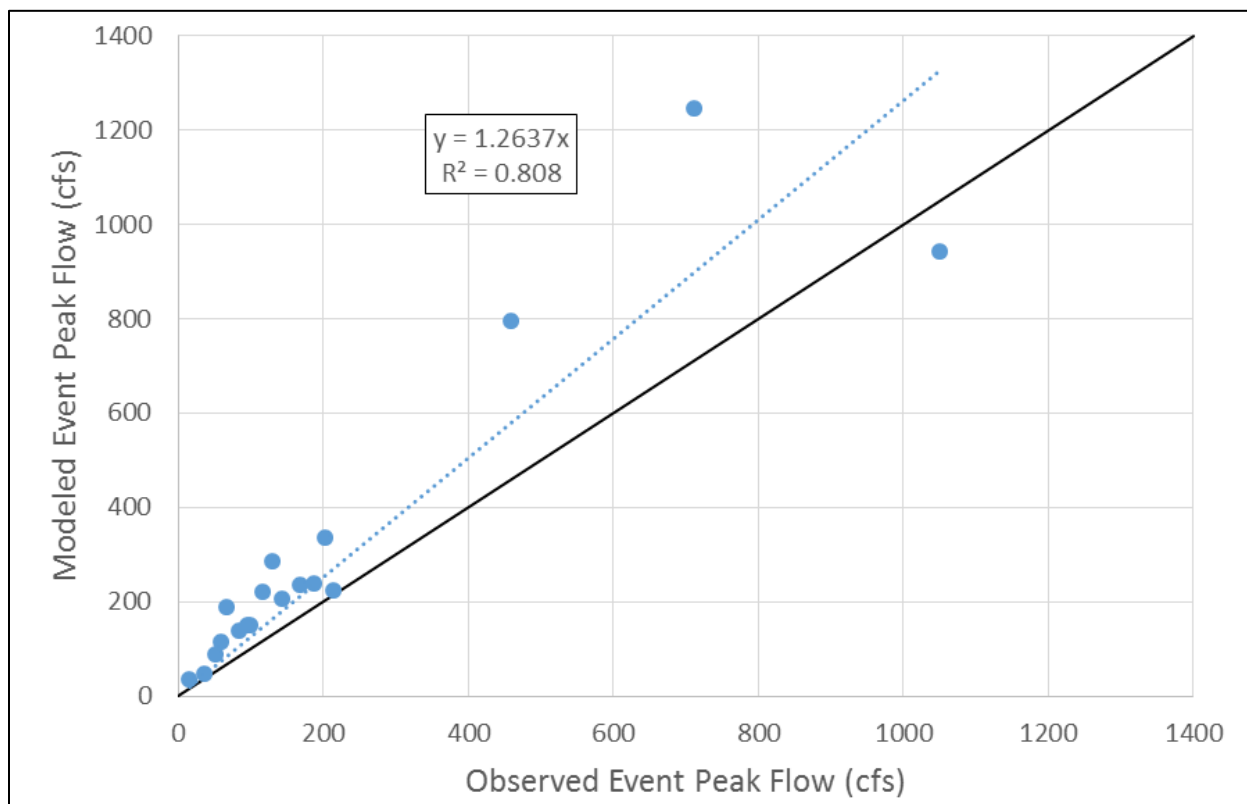


Figure 4-8: Modeled vs. Observed Event Peak Flow Rate

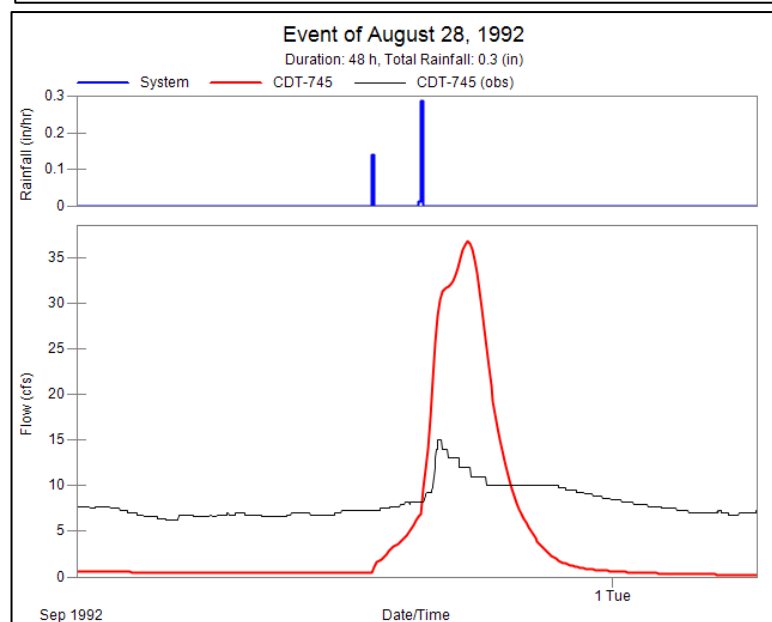
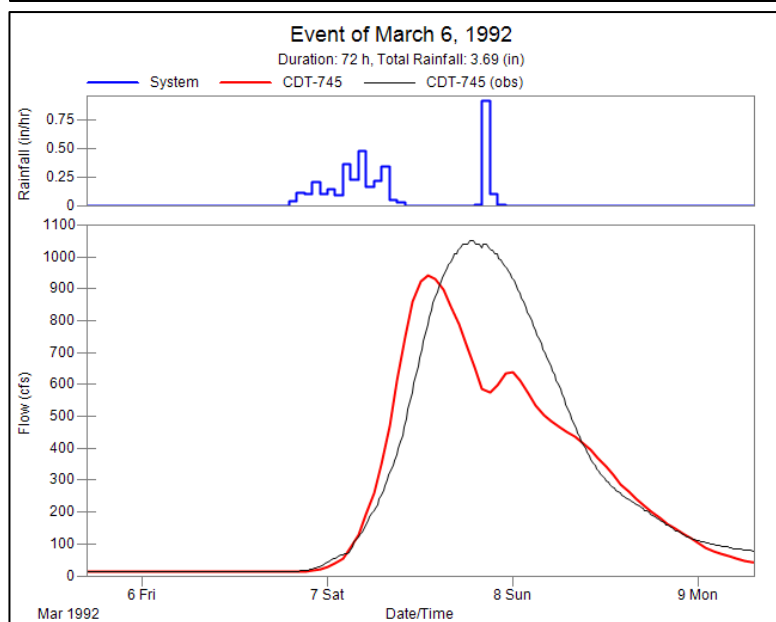
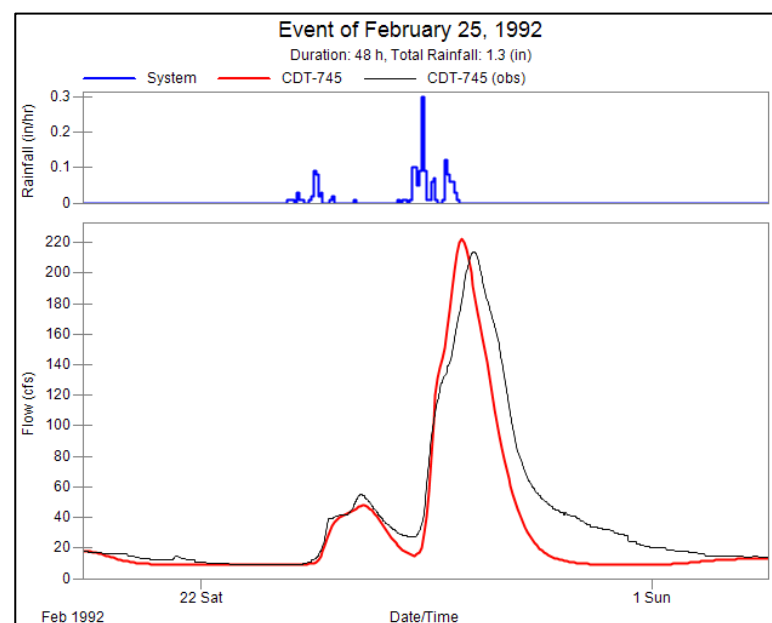
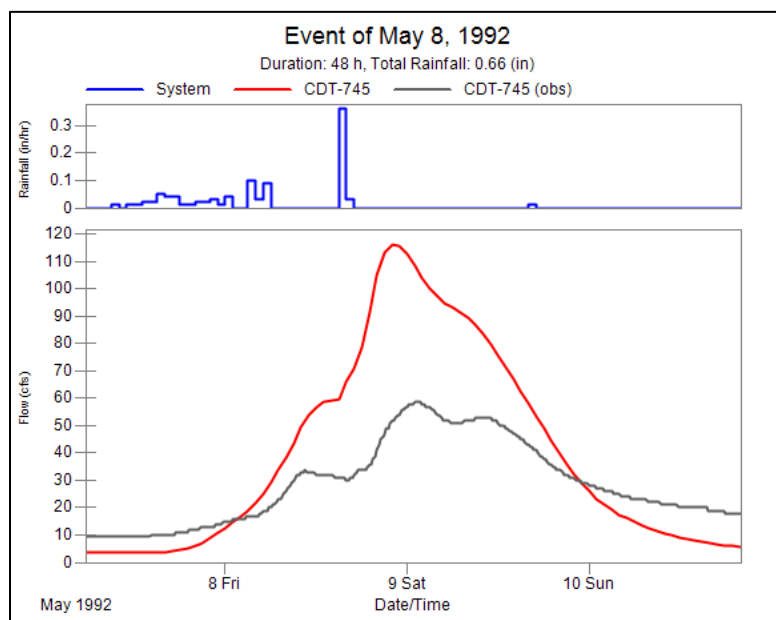


Figure 4-9: Modeled vs Observed hydrographs for four events at Falling Creek Gage

Three calibration parameters were used to adjust cumulative volumes, event volumes, and event peak flows: percent impervious area, Manning's N for in-channel roughness, and Manning's N for overbank roughness. Adjustments to modeled cumulative volume were made by adjusting the percent impervious area. Adjustments to event peak flows and the timing of peak flows were made by adjusting in-channel and overbank Manning's values. Manning's N for in-channel roughness was varied between 0.035 and 0.05 for a main channel that was assumed to be clean, winding and have some pools and shoals. Manning's N for overbank roughness was varied between 0.04 and 0.08 for overbanks that were assumed to have light brush and trees (Chow, 1959).

Impervious area is not typically a calibrated parameter, but initial model runs underestimated observed cumulative flows (dotted green line in Figure 4-10). To determine the cause of the underestimated flows, NLCD impervious cover data were compared to a planimetric impervious layer provided by the City of Richmond. The analysis revealed that the NLCD impervious layer underestimated the median percent impervious area, especially in less urban areas. To correct the underestimation of impervious area a linear regression was used to adjust the NLCD impervious area upwards for consistency with the planimetric data (dotted blue line in figure below). Finally, because the amount of directly connected impervious area is not known, the percent impervious area for each subcatchment was adjusted downward to account for impervious areas that are not directly connected to a waterway (solid blue line in figure below). Results from each run are summarized in Figure 4-10.

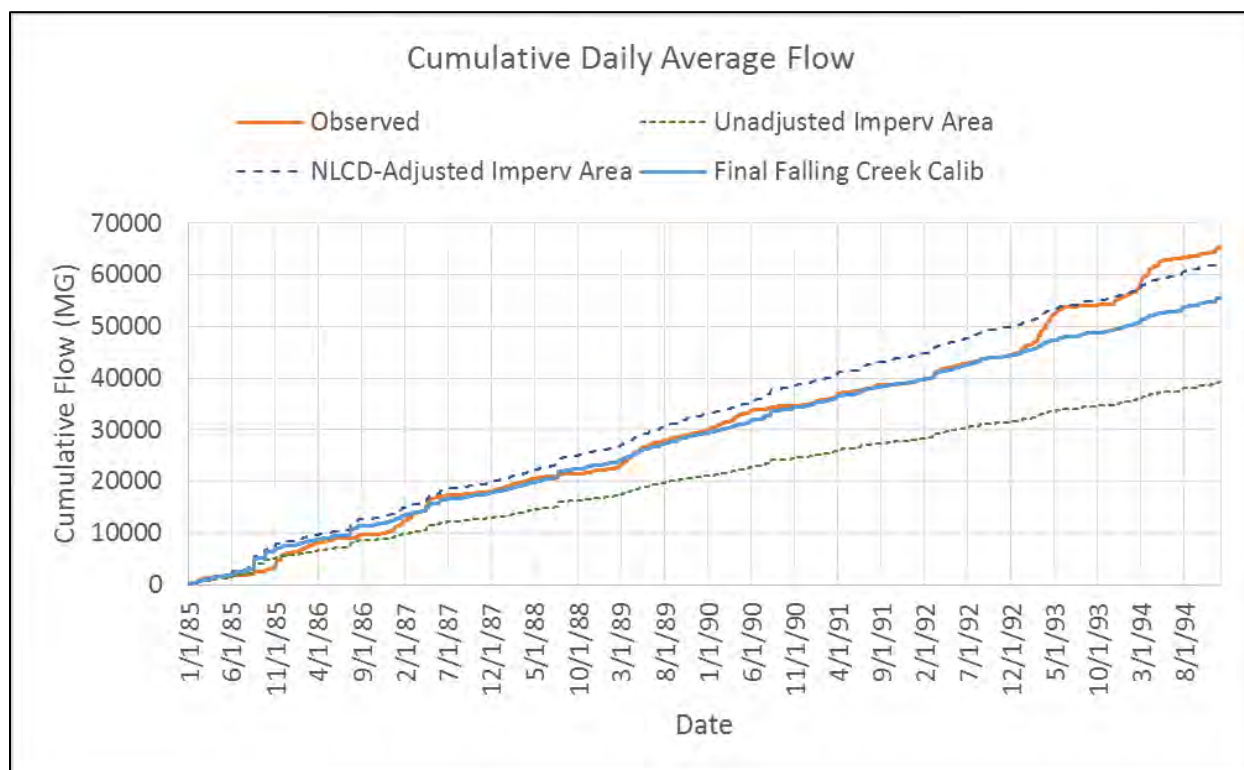


Figure 4-10: Model calibration results (impervious area)

4.3.2 CSS Model

The CSS calibration of the original Wet Weather Combined Sewer (WWCS) model focused both on achieving the appropriate volume and peak flows within the sewer system and on characterizing the discharge at the combined sewer outfalls, specifically at CSO 06 (Shockoe Retention Basin). While calibration within the sewer system was deemed acceptable and representative of conditions at that time,

calibration at the Shockoe Retention Basin was more difficult to achieve due to the complex hydraulic situation in this area as well as to the manual overflow operations that occur at this location (Greeley and Hansen, 2015).

The original WWCS model was modified and adapted so that it could be used in hindcast mode for a long-term continuous period, and in order to operate the model for evaluating CSS alternatives. After the modifications, the performance of the resulting CSS IP model was checked against monitoring data as well as against the results from the underlying original WWCS model. A discussion of the results is included in the CSS model review memorandum (Brown and Caldwell, 2016). Overall, the CSS IP model predicts lower overall CSS volume discharges and events compared to the results documented in the 2002 LTCP re-evaluation report, as well as compared to the CSS Annual Reports. These differences can be attributed to two main reasons:

- Numerous changes to the CSS model were performed since the 2002 LTCP re-evaluation, and the CSS model was re-calibrated on a few different occasion. This results in the CSO discharge volumes and number of CSO events to be different from those reported in the 2002 LTCP re-evaluation. These differences are deemed justified based on the additional monitoring data that was used to conduct the re-calibration, and on the CSS model revisions, including operational and physical changes to the combined sewer system and waste water treatment plant system that were implemented since the 2002 Long Term Control Plan Re-Evaluation.
- The CSS IP model uses standard operating rules to model the CSO operations at the Shockoe Retention Basin, causing the CSO discharges modeled at this location to be different from those reported in the CSS Annual Report, where the CSO discharges are calculated by using the real-time operator logs and which are interweaved with the results from the CSS model.

4.3.3 Receiving Water Quality Model

The purpose of the hydrodynamic model calibration was to adjust model parameters within defensible ranges to achieve reasonable agreement between modeled and observed water levels and velocities. The model was run for calendar years 2011 through 2013, and the modeled relationships between river discharge and water level, as well as river discharge and velocity were compared to the observed relationships in the riverine reach. Modeled roughness heights, which represent both grain roughness associated with substrate and larger scale bed forms, were adjusted within bounds consistent with Manning's N roughness values cited in the FEMA Flood Insurance Study (FEMA, 2014). These adjustments were made to bring the modeled water levels and velocities in closer agreement with the observed data.

Figure 4-11 and Figure 4-12 illustrate the riverine model calibration and show sensitivity of the model results to varying roughness height inputs. The calibrated bed roughness heights varied from 5 to 50 millimeters corresponding to Mannings N values from 0.03 to 0.045. Roughness heights were halved in the sensitivity test named "Lower Roughness Test," and they were doubled in the sensitivity test named "Higher Roughness Test." Increases in bed roughness caused increases in modeled water surface elevations and decreases in current velocities. The calibrated roughness inputs provided a balance of accurately simulating both water surface elevations and current velocities.



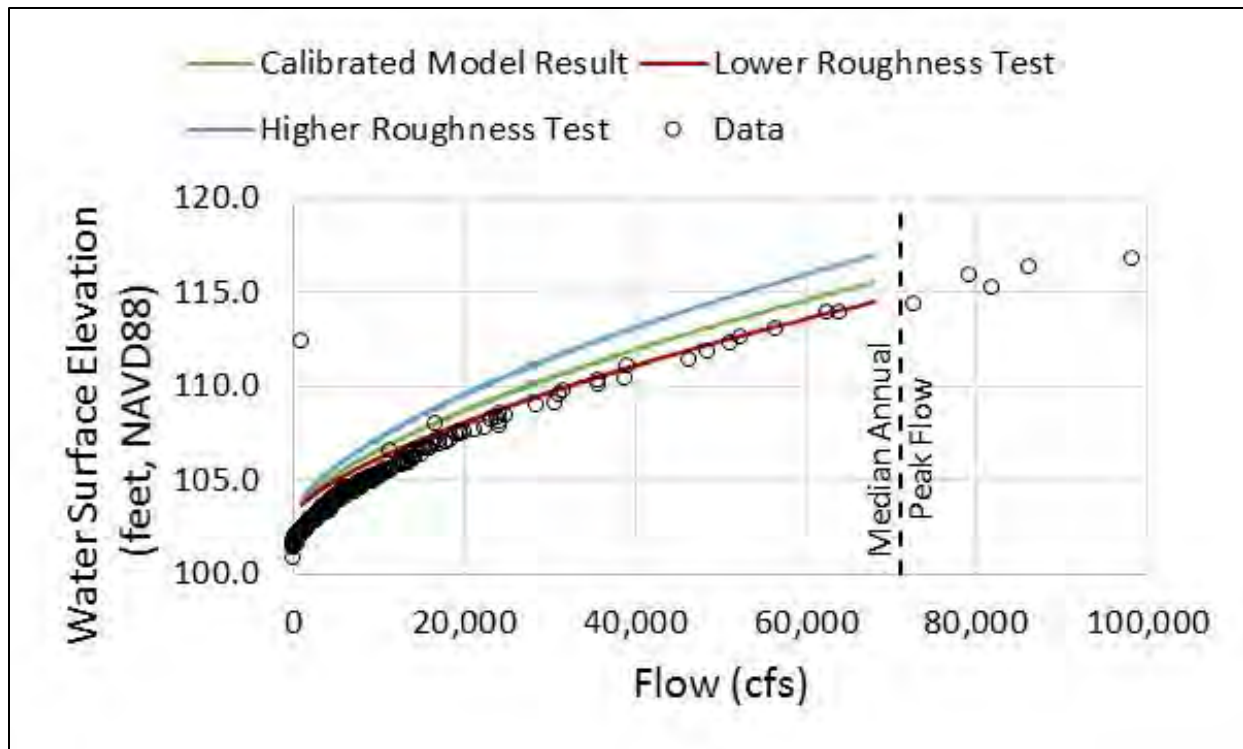


Figure 4-11: Comparison of Modeled and Observed Water Levels at upstream USGS gage

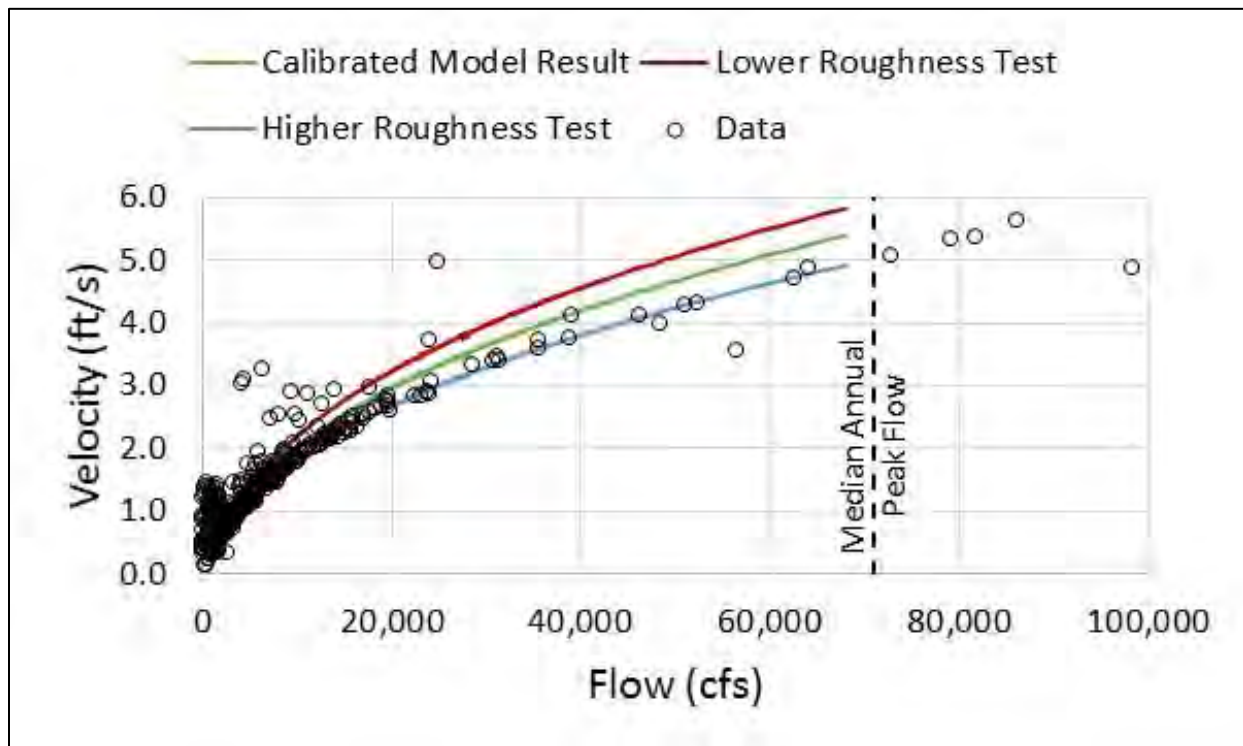


Figure 4-12: Comparison of Modeled and Observed Velocities at upstream USGS gage

Calibration to USGS water level data in the estuarine reach was achieved by adjusting the water level at the boundary to account for the effect of river flow on water levels. Water levels at the boundary were reduced relative to the gaged water levels to account for changes in water level between the gage and the model boundary. The data were adjusted according to the expression:

$$Z_{boundary} = Z_{Gage} - C * Q^n$$

Where:

- $Z_{boundary}$ is the estimated water level at the downstream boundary in feet
- Z_{gage} is the observed water surface elevation at the USGS gage (#02037705) in feet,
- C and n are constants which were determined via calibration to be $4.4e-7$ and 1.5 ; and,
- Q is the James River flow rate in cubic feet per second

The data were also shifted by approximately three minutes backward in time to account for propagation of the tides from the model boundary to the gage location.

Figure 4-13 and Figure 4-14 illustrate the estuarine model calibration and Figure 4-15 shows how the model performed in the absence of this flow-based water level adjustment at the downstream boundary. Without this flow-based adjustment to water levels, modeled water levels are biased four feet high relative to the data during the highest flow conditions.

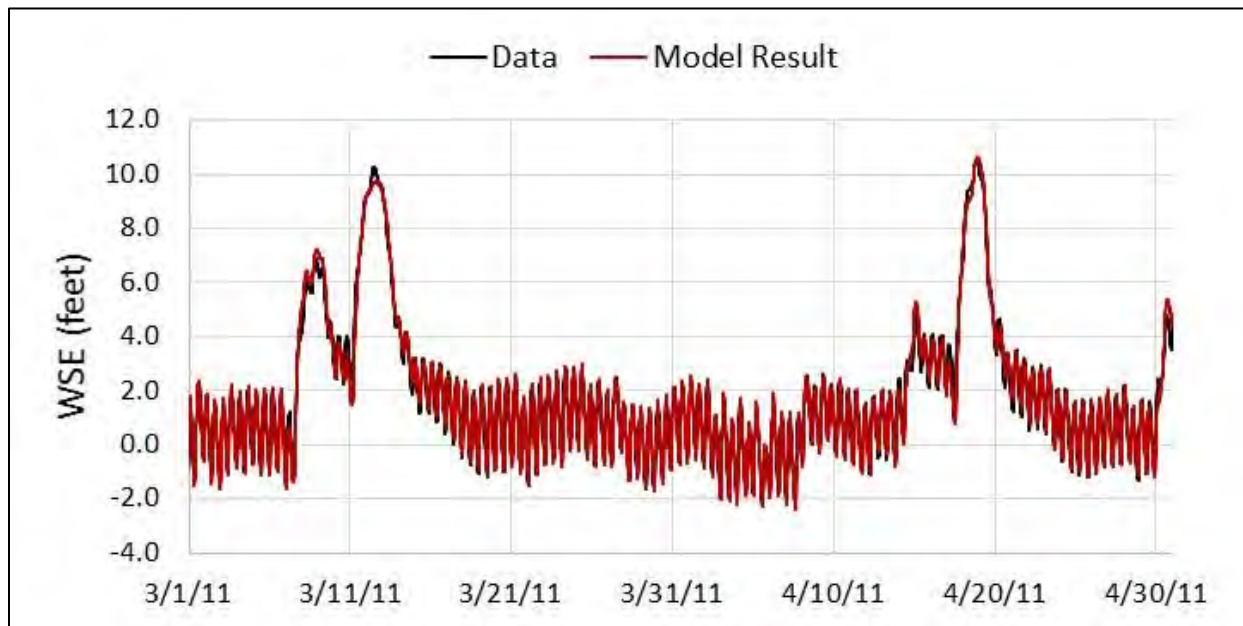


Figure 4-13: Time Series Comparison of Modeled and Observed Water Levels at downstream USGS gage

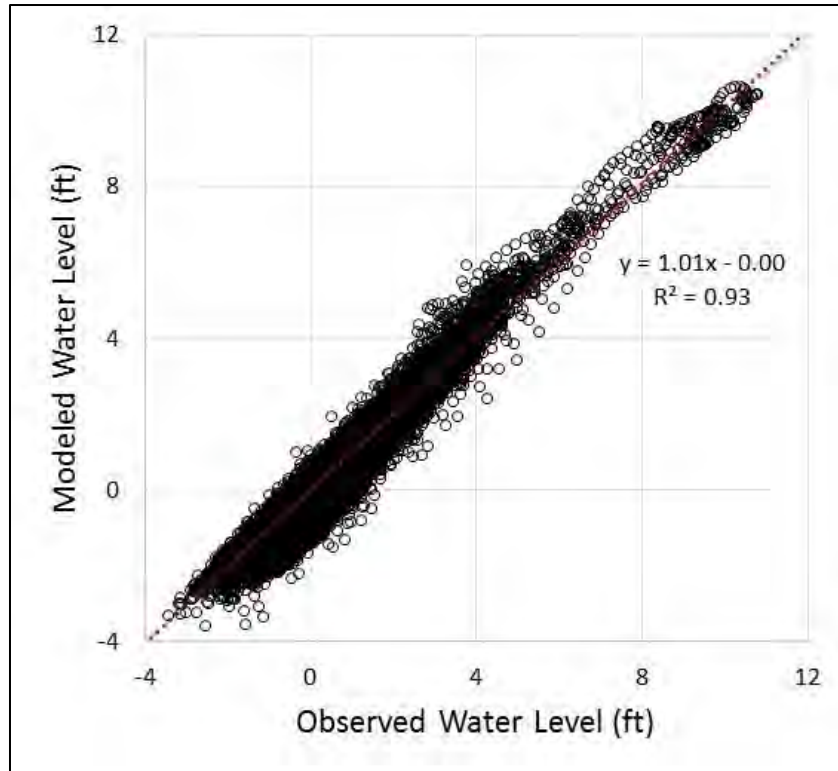


Figure 4-14: One-to-one Comparison of Modeled and Observed Water Levels at downstream USGS gage

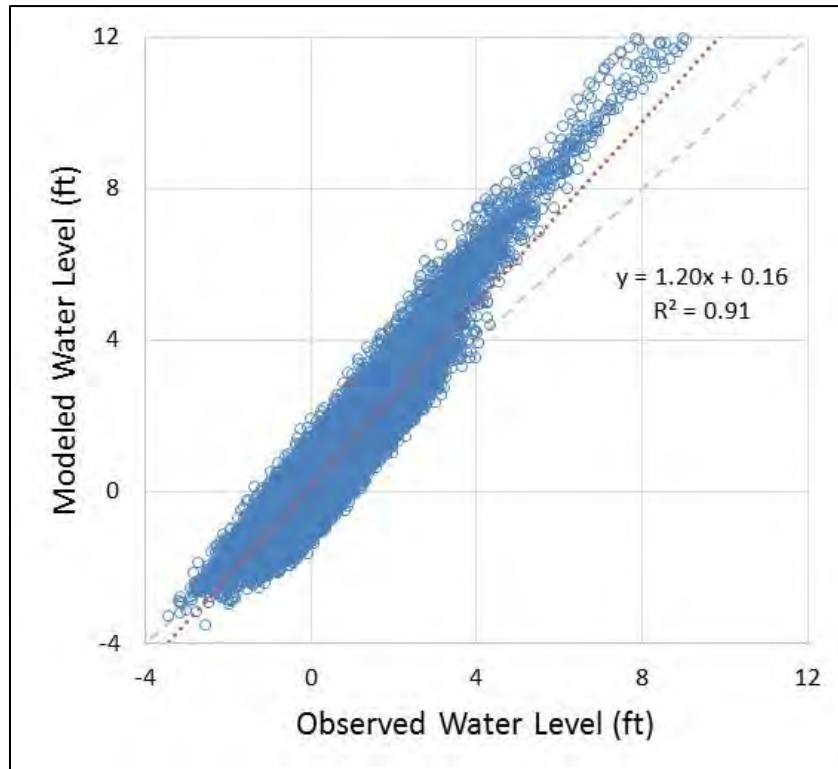


Figure 4-15: One-to-one Comparison of Modeled and Observed Water Levels at downstream USGS gage without calibration of water levels at the boundary

4.4 Water Quality Calibration Results

Calibration of water quality conditions involved adjusting inputs that influence the quantity, timing, and locations of *E.coli* delivered to the receiving waters and adjusting inputs that influence the survival of *E.coli* in the streams. *E.coli* sources in the water quality modeling framework include *E.coli* washoff from the watershed, persistent background sources of *E.coli* (e.g.: wildlife), *E.coli* in combined sewer overflows and treatment plant effluent, and *E.coli* originating from upstream locations in the James River watershed.

4.4.1 Watershed Model

The main objectives of the watershed water quality calibration were to estimate *E.coli* loading to the receiving water quality model and the approximate timing of these loads. To evaluate the first objective, the distribution of modeled *E.coli* concentrations was compared to observed data using boxplots. To evaluate the second objective, model results were compared to observed data using one-to-one plots, where the observed data is compared to the modeled data for a given model time step.

Data from the Falling Creek location were primarily used to calibrate the watershed model for two reasons: First, Falling Creek stations 399/400 have the greatest quantity of observed data. Second, since Falling Creek is the only tributary in the watershed model with a USGS flow gage, the modeled flows are likely to be the most accurately represented. Therefore, accurately modeling observed concentrations in Falling Creek would result in the best estimation of *E.coli* loads delivered to the receiving water quality model. Since there is a limited amount of data available in the tributaries, the initial calibration was considered complete and satisfactory once the modeled results from Falling Creek and the majority of the other five tributaries matched observed values within reason.

The model was run for the calendar years 2011 to 2013 and modeled *E.coli* concentrations were compared to observed results for six tributaries. Figure 4-16 and Figure 4-17 illustrate the watershed model water quality calibration. Model results at Falling Creek reasonably approximate the median observed concentration and the distribution of observed values. Modeled median values for four out of the other five tributaries also appear to be reasonable, with the modeled medians within one order of magnitude of the observed medians. Maximum modeled *E.coli* concentrations are generally greater than the observed data, which is assumed to be due to the lack of wet weather data collected in the tributaries. One-to-one plots were evaluated in light of the fact that in-stream *E.coli* concentrations can vary greatly in time and space (USEPA, 2010). To account for the natural variability that can occur when sampling *E.coli*, two additional sets of lines were added to the 1-to-1 plot: the first set of dashed lines represent a two-times (2x) confidence interval representing the variability in monitoring data results associated with field-collection efforts. The second set of dotted lines represents a ten-time (10x) confidence interval which represents the possible variability in monitoring data results associated with both the field collection efforts and the laboratory methods. The majority of points on the one-to-one plots fall within the 10x confidence interval for all stations.



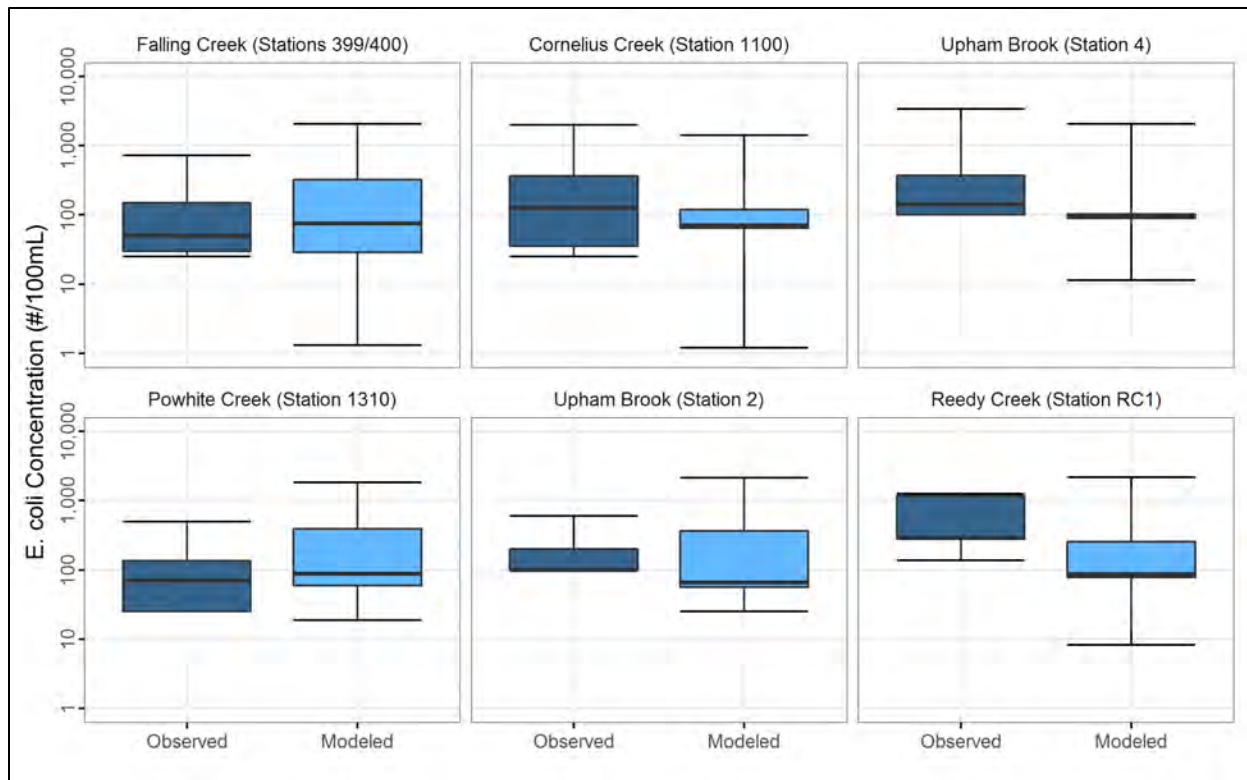


Figure 4-16: Boxplots of Modeled vs. Observed E.coli Concentrations in Select Richmond Tributaries

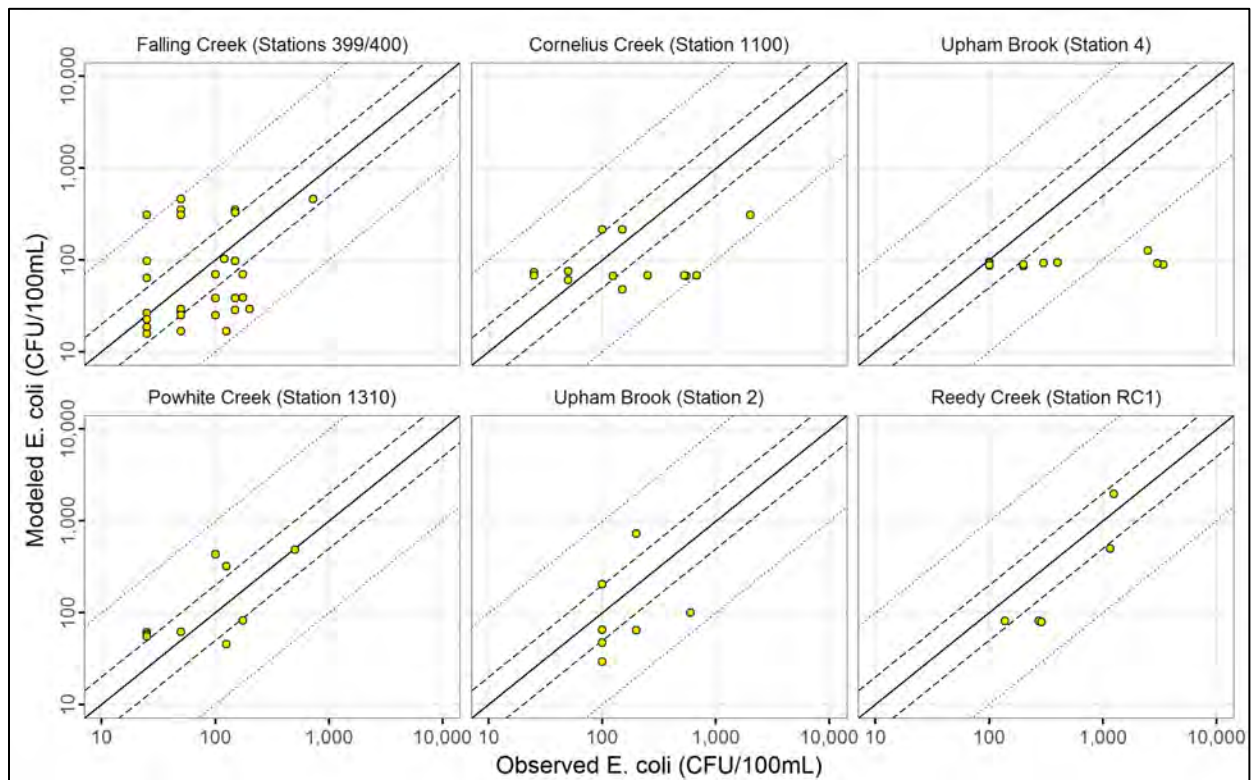


Figure 4-17: One-to-One Plots of Modeled vs Observed E.coli Concentrations in Select Richmond Tributaries

Calibration of the watershed model to better represent the *E.coli* concentrations was achieved by adjusting the values of four main parameters: pollutant build-up rate, pollutant wash-off rate, baseflow *E.coli* concentration, and in-stream decay rate. Pollutant build-up and wash-off had the greatest influence on wet weather in-stream concentrations, while baseflow *E.coli* concentration had the greatest influence on dry weather concentrations. Of the six stations evaluated, *E.coli* decay rate was found to have the greatest influence on Falling Creek, the largest tributary in the model extent. The impact of in-stream decay rate for the other five stations was nominal because travel times in these tributaries was generally shorter.

4.4.2 CSS Model

Explicit water quality calibration of the CSS model was not conducted. Rather, the CSO discharges were assigned bacteria concentrations based on monitoring results conducted for the development of the original LTCP. Additionally, the WWTP discharges were assigned bacteria concentrations based on the current bacteria water quality standards. Section 3.3 and 5.2 discusses the pollutant concentrations assigned to the various CSS outfalls and the WWTP discharge streams in more detail.

4.4.3 Receiving Water Quality Model

The primary objectives of the James River water quality model calibration were to: 1) evaluate the reasonableness of modeled *E.coli* loadings by source type and 2) evaluate the completeness of modeled *E.coli* sources. These objectives were achieved by evaluating consistency between modeled and observed *E.coli* concentrations and identifying and resolving any significant biases. The water quality model calibration is controlled in large part by estimates of *E.coli* concentrations from upstream of the study area and by estimates of *E.coli* loads from the watershed model and CSO model. Because of this, the water quality model calibration is a consistency check between the load estimates and sampling data in the James River.

The model was run for calendar years 2011 through 2013 and modeled *E.coli* concentrations were compared to observed concentrations at six stations. Figure 4-18 and Figure 4-19 illustrate the James River water quality model calibration. Median modeled *E.coli* concentrations are within 15% of median observed *E.coli* concentrations except at Station 641 where, as described in Section 4.1.3, the sampling data are anomalously high and not suitable for model calibration. Maximum modeled *E.coli* concentrations are all higher than observed *E.coli* concentrations. This is because model results are computed for every hour of the three year period, while samples were only taken occasionally, making it unlikely that the samples would capture the highest *E.coli* concentrations that actually occur in the river.



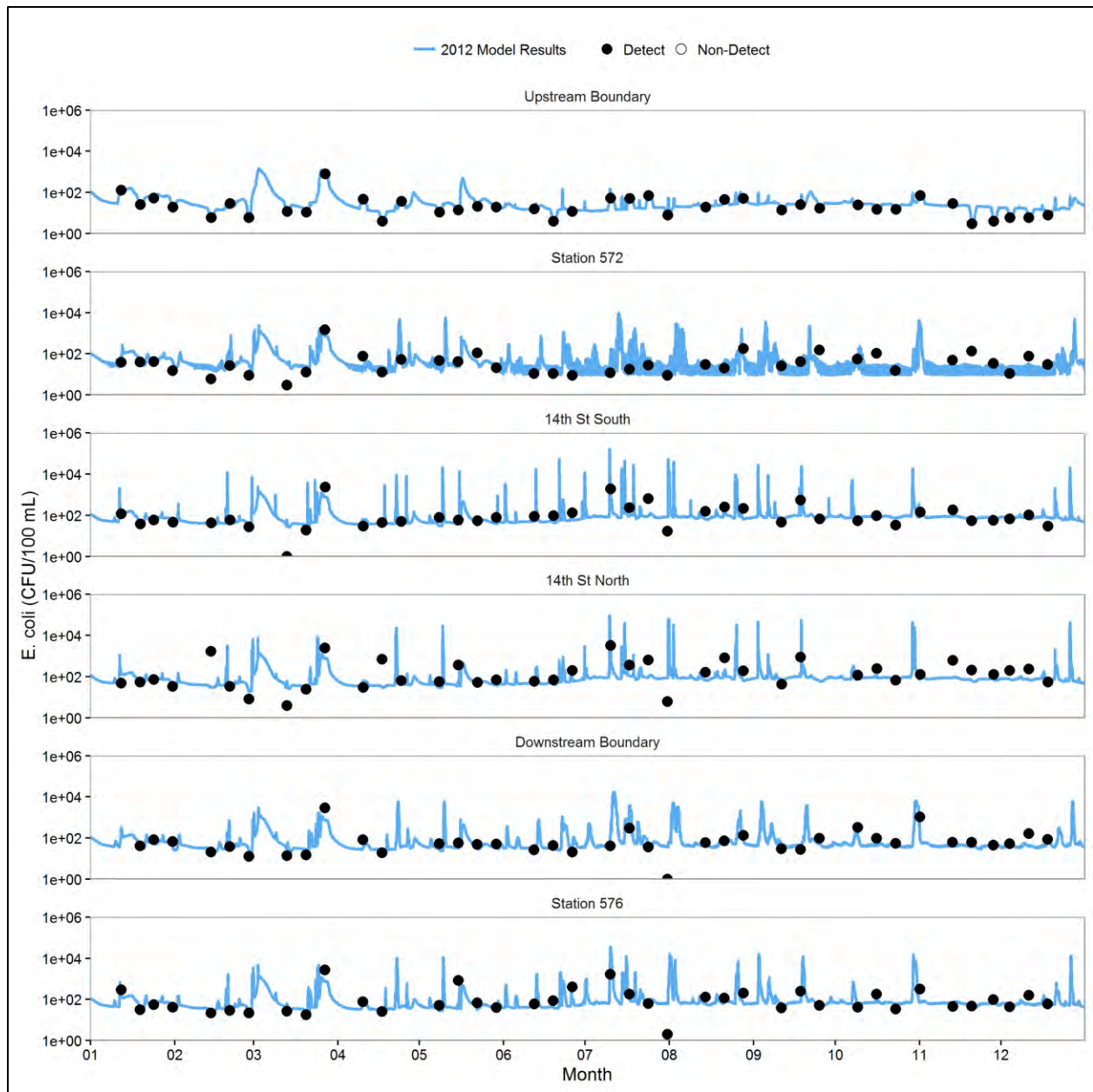


Figure 4-18: Time Series Comparison of Modeled and Observed *E.coli*

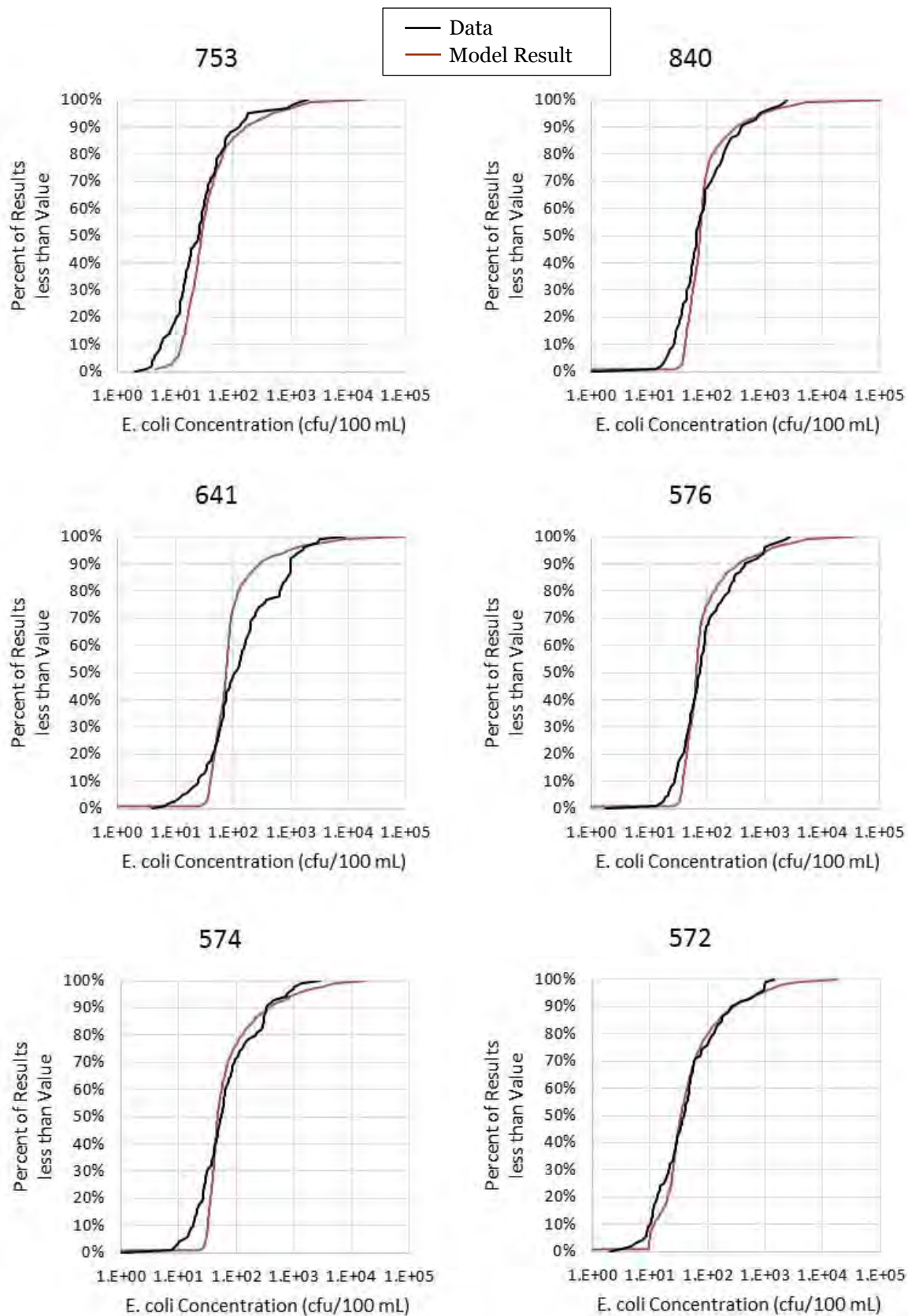


Figure 4-19: Cumulative Frequency Distribution Comparisons of Modeled and Observed *E.coli*

Calibration of the water quality model required the introduction of a significant unknown source between the Huguenot Bridge and the 14th Street Bridge (Figure 4-20). It is assumed that this source represents bacteria contributions from common background sources such as wildlife and failing septic systems. This source was introduced to the model at a constant rate of 3.2E+12 CFU/day just downstream of the Poney Pasture Park. This assumed loading rate is of the same order of magnitude as the loading rate estimated for failing septic systems and wildlife in the James River Richmond Bacteria TMDL (MapTech, 2010). Increases to instream *E.coli* concentrations due to the background source are generally between 30 and 40 CFU/100 mL. The decision to input this load near the park is not meant to indicate that the source(s) necessarily originates there. Additional sampling data would be required to identify the spatial distribution of this source(s) between the Huguenot Bridge and the 14th Street Bridge.

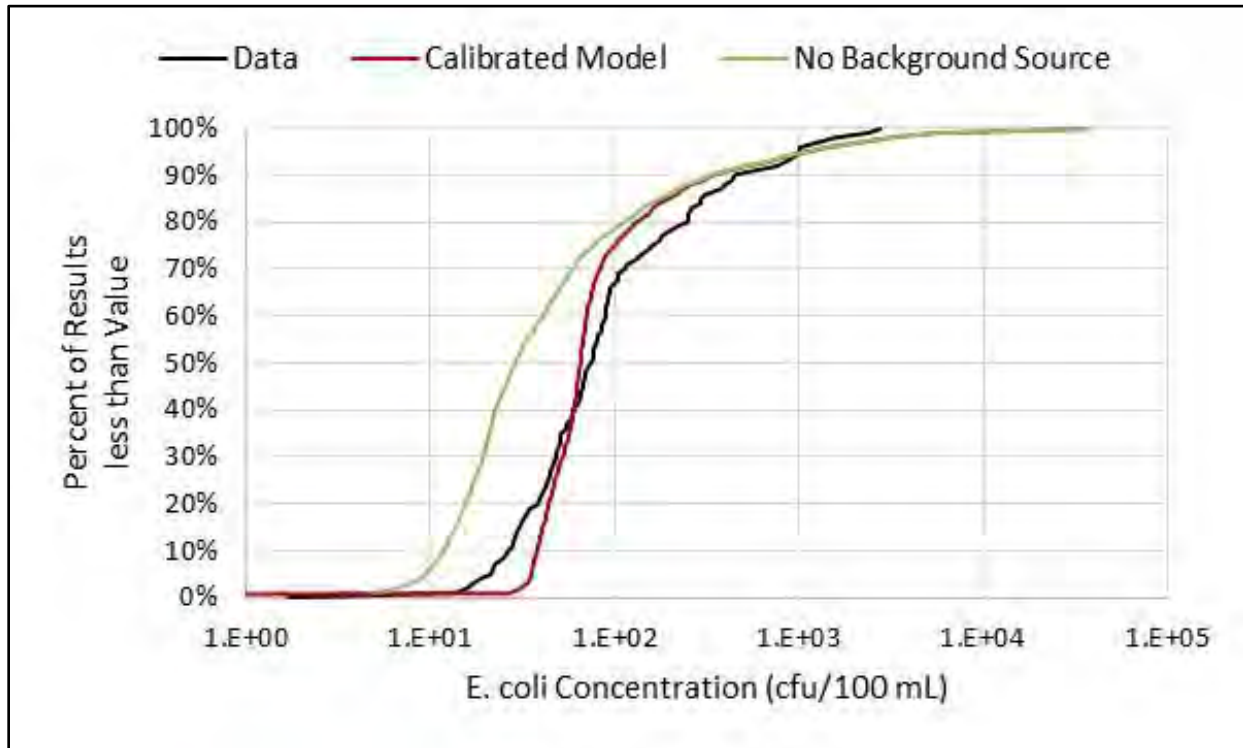


Figure 4-20: Sensitivity of Model Calibration to the Background Source

Figure 4-21 and Figure 4-22 illustrate sensitivity of the model results to adjustments of all major *E.coli* loading assumptions. In each plot, the source type of interest was reduced by 50% to evaluate its influence on modeled *E.coli* concentrations. Model results at the downstream city limit are shown. In these figures, the green dashed line represents the difference between the calibrated model result and the source reduction sensitivity test result. Reductions in persistent sources such as the James River upstream of Richmond and the background source always have some influence on *E.coli* concentrations. However, wet weather sources only reduce *E.coli* concentrations when precipitation has occurred. As a result, CSOs, for instance, only reduce concentrations thirty-five percent of the time (i.e. for the 65th to 100th percentile on the plots).

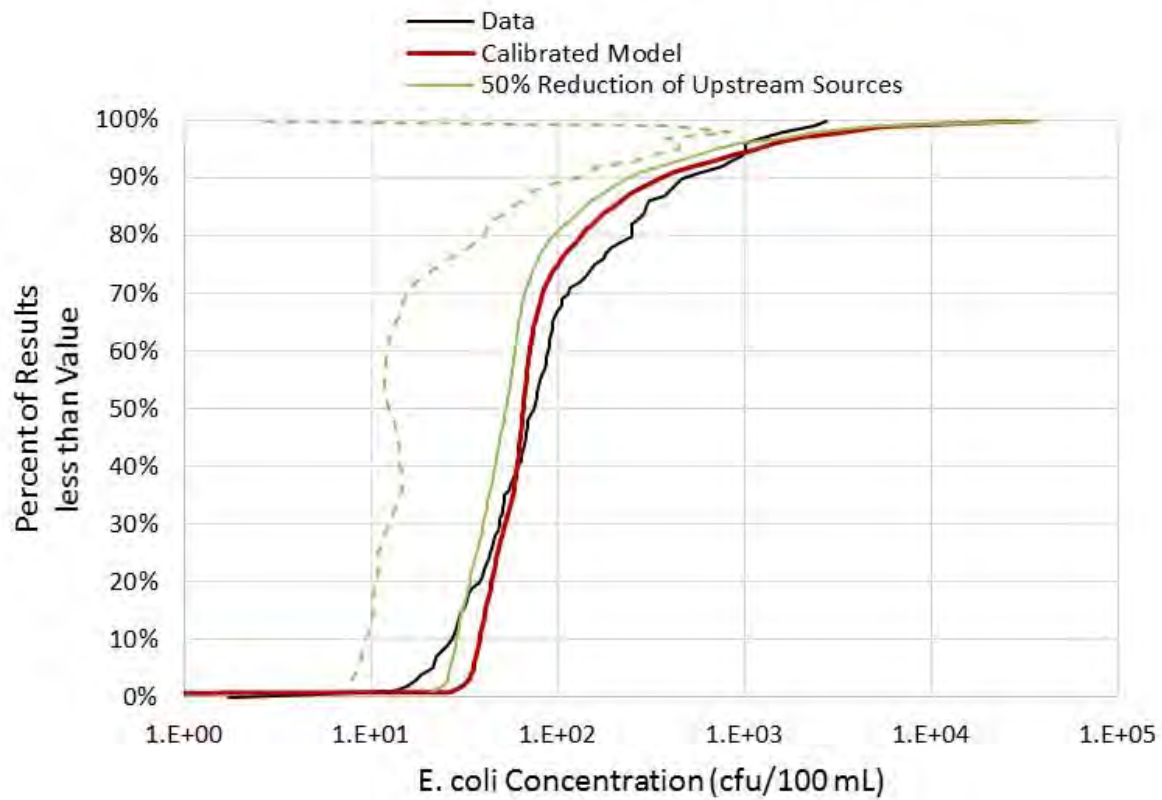
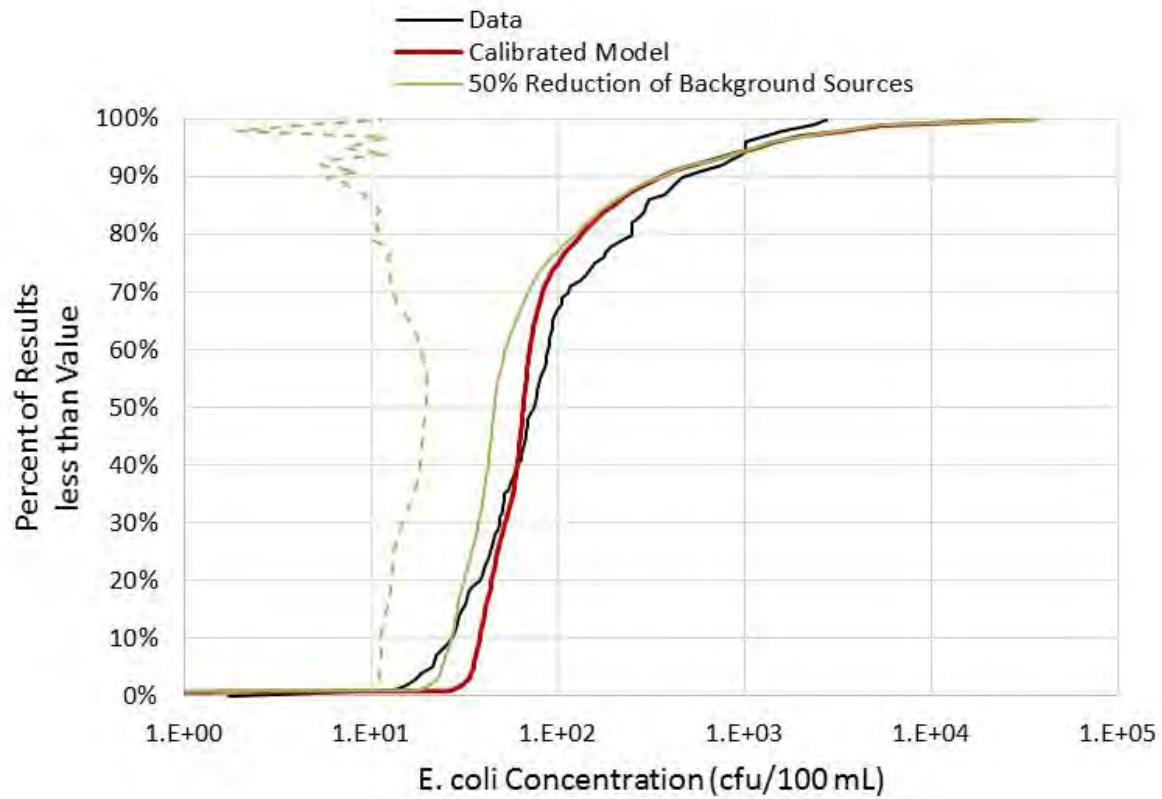


Figure 4-21: Sensitivity of Model Results to 50% Reduction of Persistent Sources

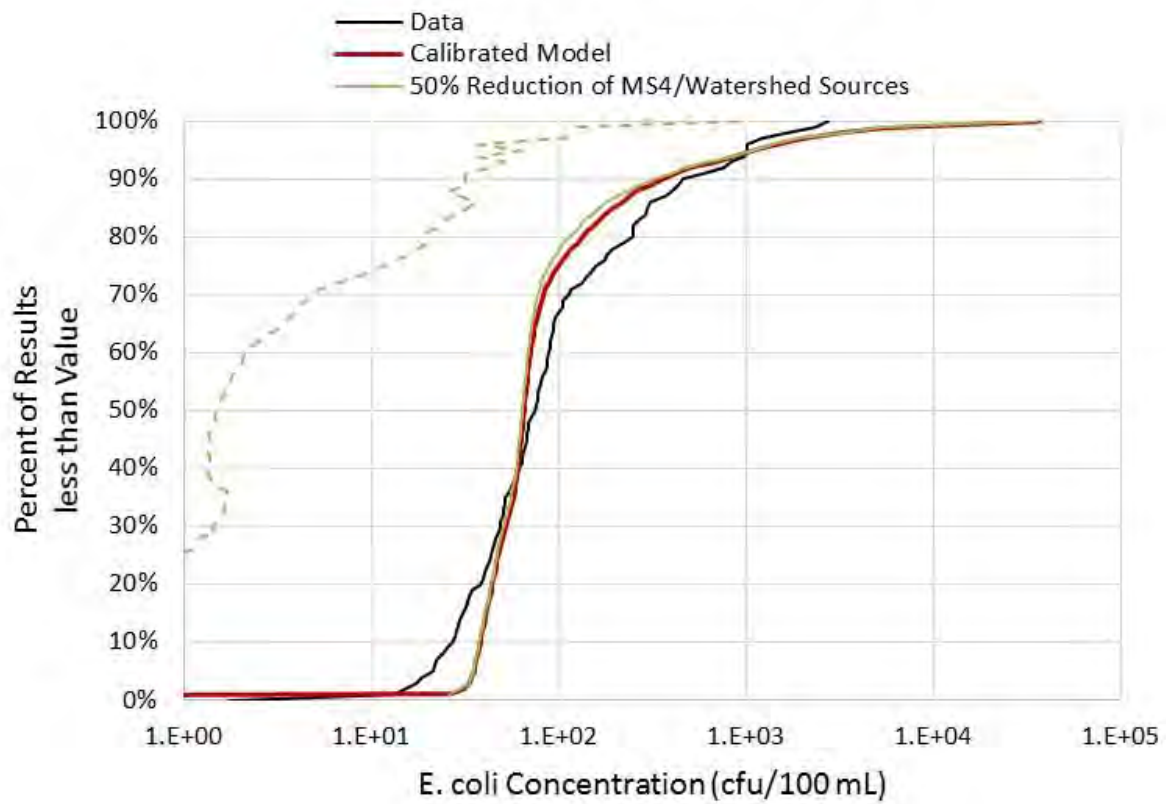
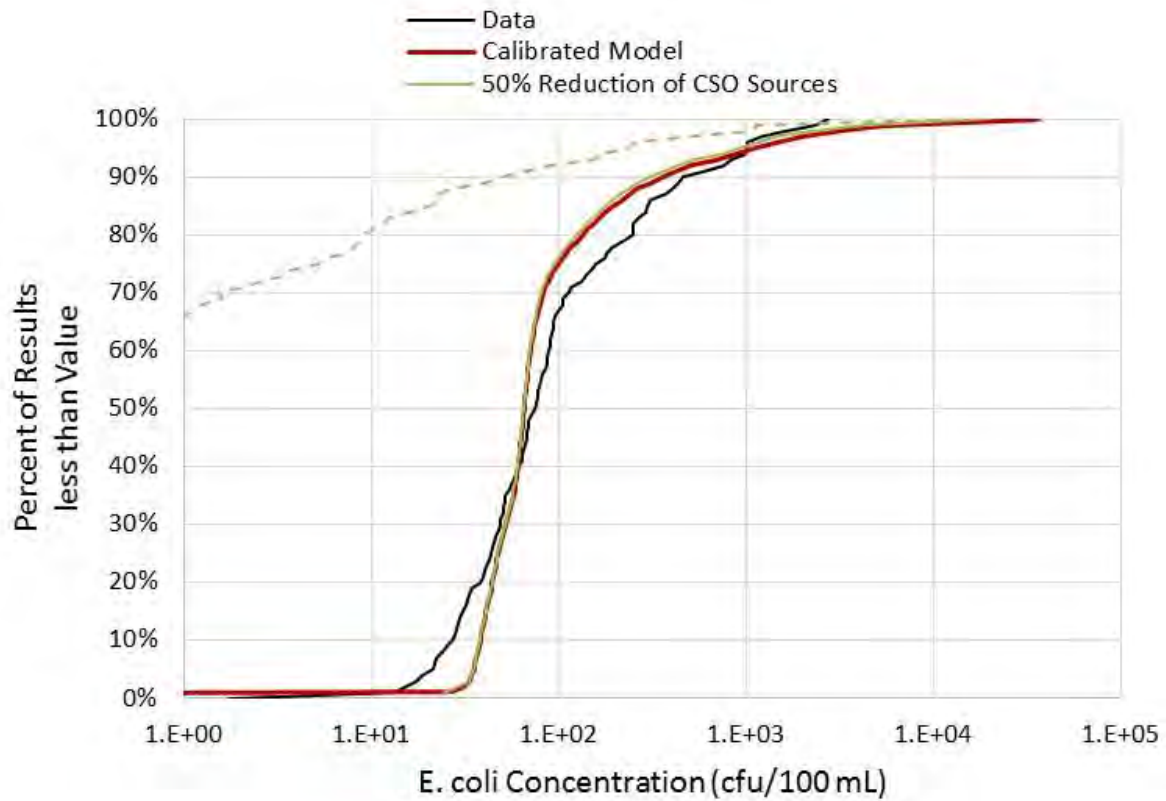


Figure 4-22: Sensitivity of Model Results to 50% Reduction of Wet Weather Sources

5 Model Application and Results

5.1 Overview

To date, the model has been applied to evaluate the following:

- **Current conditions:** Best representation of current conditions, and includes all the Phase I and Phase II CSO improvements from the LTCP.
- **Baseline Conditions:** represents the current condition, plus all the currently funded Phase III collection system improvement projects from the LTCP.
- **Green Infrastructure in the MS4 Area Strategy:** represents the baseline conditions, plus the implementation of 104 acres of green infrastructure on city-owned area in the MS4.
- **Green Infrastructure in CSO Area Strategy:** represents the baseline conditions, plus the implementation of 18 acres of green infrastructure on city-owned area in the CSS area.
- **CSS Infrastructure Improvements Strategy:** represents the baseline conditions, plus all the remaining unfunded Phase III collection system improvement projects from the LTCP.

The sequencing of the modeling applications is shown in the figure below.

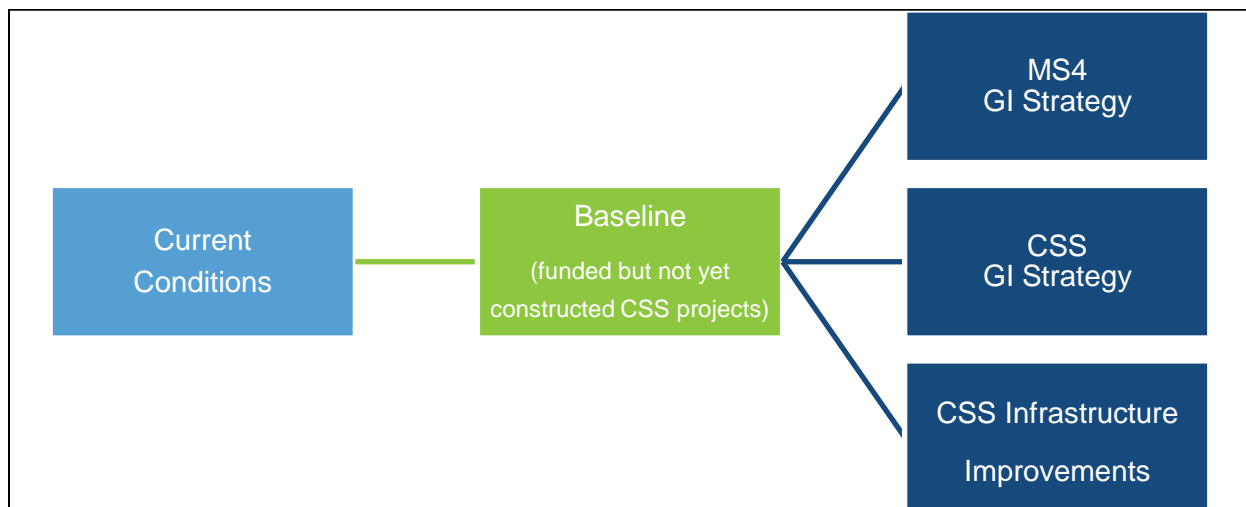


Figure 5-1: Sequencing of Model Applications

These conditions and strategies were evaluated using several metrics related to bacteria reduction, including:

- Bacteria load reduction from combined sewer and tributary discharges, expressed as Billion CFU
- Overall average percent improvement in monthly geomean water quality standard compliance at the downstream city limit
- Reduction in number of CSO events

- Reduction in CSO volume (Million gallons)

These four metrics are used in the Strategy Calculator, a spreadsheet tool that is used to evaluate and score the different management strategies across a wide range of goals and objectives (LimnoTech, 2017).

The model is further used to evaluate water quality benefits relative to the monthly geometric mean standard and the statistical threshold value (STV) standard, on a monthly basis. The geometric mean standard states that the monthly geometric mean *E.coli* concentration must fall below 126 cfu/100 mL to be in compliance. The VDEQ statistical threshold value standard states that no more than 10% of *E.coli* concentrations in a month may exceed 235 cfu/100 mL to be in compliance.

5.2 Methodology for Model Application and for Evaluating Model Results

The three-year period of 2011 through 2013 was selected as the application period because it represents a continuous time period that includes typical wet, dry, and average precipitation conditions, with corresponding responses in James River flow conditions. This is shown in Figure 5-2.

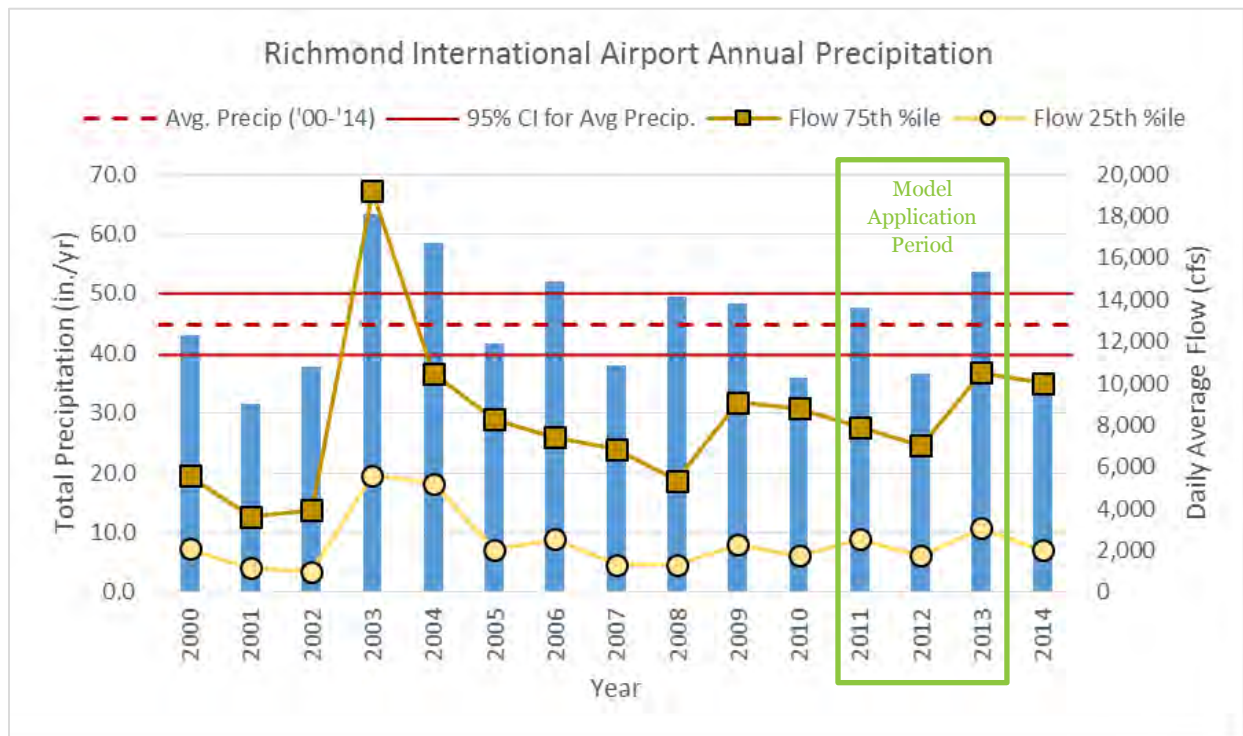


Figure 5-2: Precipitation and Daily Average Flow at Richmond International Airport

The following process was followed when applying the water quality model components to evaluate the various strategies:

1. Simulate any improvements to the combined sewer system or treatment plan with the CSS model;
2. Relay model results from potential CSS improvements in the Gillies or Almond Creek tributaries to the watershed model;
3. Simulate any MS4 strategies or CSS improvements in the Gillies or Almond Creek improvements with the watershed model;

4. Simulate the impact of improvements in the James River by relaying CSS model results (i.e. time series of overflow discharge and bacteria load) and watershed model results (i.e. time series of tributary flows and bacteria loads) to the James River Receiving Water Quality Model.
5. Summarize the results of the model runs using the metrics described in the previous section.

After running the water quality modeling framework through the process described above, water quality compliance was evaluated at the downstream boundary of the city, Richmond's National Pollutant Discharge Elimination System (NPDES) compliance point. *E.coli* concentrations at this point were compared to the monthly geometric mean of 126 CFU/100 mL and the STV of <10% of all samples exceeding 235 CFU/100mL. For each month that violated the water quality standard, a detailed component analysis was completed. The component analysis tracks the relative contribution of each *E.coli* source (upstream, CSOs, watershed/MS4, background, and WWTP) to the modeled concentration in the James River. This type of analysis is useful to evaluate which sources of bacteria have the greatest impact on water quality conditions in the James River for a given point in time or location in the river.

Additionally, model results were summarized to determine the overall bacteria load reduction, CSO volume reduction, reduction in number of CSO overflow events, and to evaluate the percent improvement towards monthly geomean water quality standard compliance at the downstream city limit. The “percent improvement towards monthly geometric mean compliance”, also dubbed “percent improvement” for convenience, ranges from 0% to 100%, with 0% corresponding to the existing state of compliance and 100% corresponding to full compliance with the monthly geomean water quality standard. The “percent improvement” is computed as follows:

$$I_p = \frac{\sum_1^n V_{n,scenario} - \sum_1^n V_{n,current}}{\sum_1^n V_{n,current}}$$

Where:

- “ I_p ” is Percent Improvement,
- “ V ” is the compliance metric value for a given month, (e.g. the geometric mean value for December 2011),
- “ n ” is an index for the month, and
- the subscripts “scenario” and “current” correspond to a scenario of interest and the current condition, respectively.

Graphically, each summation term in this equation is the total bar height above the water quality standard as shown in Figure 5-3. If, under a particular scenario, the total bar height above the standard is small compared to the current conditions, then the “percent improvement” will be nearly 100% and the system will be near full compliance. If the total bar height under a particular scenario is similar to that of the current condition, then the “percent improvement” will be nearly 0%.



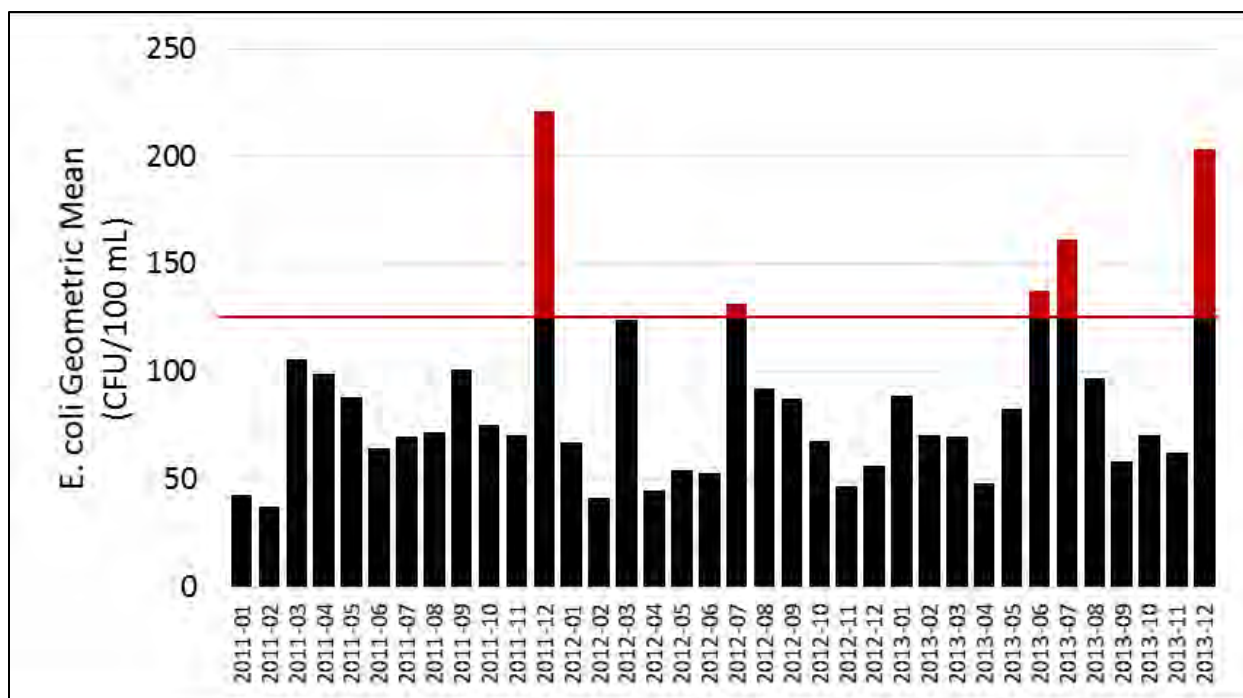


Figure 5-3: Graphical Depiction of the “Percent Improvement” Metric

5.3 Overview of Model Scenarios

Each strategy that was evaluated by the water quality model required unique changes to the model inputs, as further described in the sections below.

5.3.1 Current Conditions

Because the model calibration period and model application period are the same, no further changes were implemented to assess the current conditions.

5.3.2 Baseline Conditions

The baseline conditions represents the current conditions plus the addition of all the currently funded Phase III collection system improvement projects from the LTCP. These projects include the sewer separation of CSO 028A and CSO 028E, replacement of the CSO 04 regulator, and increasing the wet weather treatment capacity of the treatment plant to 140 MGD. These three projects were modeled in the CSS model, and results were passed down to the watershed model and the receiving water quality model. Because these projects are already funded and included in the City’s planning documents, this condition was considered to be the baseline condition against which other additional strategies would be compared for the purpose of evaluating the metrics used in the Strategy Calculator.

Additional discussion of the projects included in the baseline conditions is presented in Section 5.3.5

5.3.3 Green Infrastructure in the MS4 Area Strategy

The “green infrastructure in the MS4 area” strategy proposed to implement green infrastructure to treat 104 acres of impervious area owned by the Department of Public Utilities (DPU) or Department of Parks & Recreation (DPR), in addition to all the currently funded phase III collection system improvement projects included in the baseline conditions. The acreage of green infrastructure was determined by

identifying the total area of land that is owned by either DPU or DPR, using ArcGIS. Additional information such as topography and soil type was then superimposed over the DPU and DPR properties. Through this visual analysis, it was determined that roughly 50% of the DPU/DPR land would likely not be conducive to the implementation of green infrastructure without significant engineered modifications such as land leveling or soil amendments. Therefore the total available land for this strategy was reduced by half. The remaining area was summarized by subwatershed so that it could be simulated in the watershed model.

All area available for green infrastructure implementation within a subwatershed was modeled as one representative green infrastructure practice since the specific types of green infrastructure are unknown at this planning stage. The generic practices were modeled using SWMM storage nodes with an assumed effective depth of 1.5 feet and sized in area to capture a 1.2 inch storm (90th percentile storm on an average annual basis). The modeled generic green infrastructure practices account for evaporation and bottom infiltration into the native soil. It was assumed that all green infrastructure is being drained within 48 hours to provide storage volume for back-to-back rainfall events. This was simulated by using an appropriately sized orifice to simulate practice underdrains. Potential flows exceeding the green-infrastructure capacity in the model were handled by a weir simulating practice overflow or flow rejection. Water quality routines were applied to the water volumes stored in the practices.

5.3.4 Green Infrastructure in the CSS Area Strategy

The “green infrastructure in the CSS area” strategy proposed to implement green infrastructure to treat 18 acres of impervious area owned by the Department of Public Utilities (DPU) or Department of Parks & Recreation, in addition to all the currently funded phase III collection system improvement projects included in the baseline conditions. The acreage of green infrastructure included in this strategy was determined through the same process as described in the previous section. Additionally, green infrastructure in the CSS model was simulated in the same way as is done in the MS4 area, as described in the previous section.

5.3.5 CSS Infrastructure Improvements Strategy

The “*CSS Infrastructure Improvements*” strategy² includes ten projects that are included in the Phase III collection system upgrades described in the LTCP (Greeley and Hansen, 2002):

1. CSO 14 regulator upgrade
2. CSO 028A & 028E sewer separation
3. CSO 04 & CSO 05 regulator replacement
4. Lower Gillies sewer conveyance
5. WWTP wet weather treatment to 140 MGD
6. WWTP wet weather treatment to 300 MGD
7. CSO 21 replacement
8. CSO 21 additional 2 MG storage
9. Shockoe Retention Basin (SRB) expansion
10. SRB disinfection

² Alternative LTCP projects are currently being evaluated by Brown and Caldwell but results are not yet available to be included as of March 2017.



Of those ten projects, #1-#3 and #5 are included in the Baseline Conditions, since these projects are currently funded by the City of Richmond. Implementation of all ten projects represents the obligations under the LTCP, and is commonly referred to as the “full LTCP” scenario.

The unfunded projects were modeled in isolation to determine individual impact on CSO volume discharge, bacteria load reduction, and impact on the receiving water quality. These CSS “scenarios” are summarized in Table 5-1 and Table 5-2.

Table 5-1: Description of CSS Projects Evaluated by the Water Quality Model

CSS Scenario	CSS Project Name	CSS Project Description
Current	Current Conditions	Current sewer conditions, including all LTCP Phase I and Phase II projects.
14-3	Baseline Conditions	Includes the currently funded projects: -- CSO 04, 014, and 05 regulator upgrades -- CSO 028A & 028E disconnection -- WWTP wet weather treatment up to 140 MGD
14-2	Gillies Conveyance	Lower Gillies Wet Weather Conveyance Interceptor to convey more flow to the WWTP
15-4	300 MGD Wet Weather Treatment	WWTP wet weather treatment up to 300 MGD
15-5	CSO 21 Replacement	Replacement of the CSO 21 regulator and additional 2MG storage
18-4	SRB Expansion	Shockoe retention basin (SRB) expansion to 15MG
18-5	SRB Expansion and Disinfection	SRB Expansion to 15MG and chlorine disinfection of the SRB discharge at CSO 06
19-3A	Full LTCP	All 10 Phase III projects, Full Long-term Control Plan (LTCP) achieved.

Table 5-2: CSS Water Quality Model Matrix

CSS Project	CSS Scenario						
	Baseline (14-3)	14-2	15-4	15-5	18-4	18-5	Full LTCP (19-3A)
CSO 14 regulator upgrade	X	X	X	X	X	X	X
CSO 028A & 028E separation	X	X	X	X	X	X	X
CSO 04 & CSO 05 replacement	X	X	X	X	X	X	X
Lower Gillies Conveyance		X					X
WWTP wet weather treatment to 140 MGD	X	X		X	X	X	
WWTP wet weather treatment to 300 MGD			X				X
CSO 21 replacement and additional 2MG storage				X			X
SRB expansion					X	X	X
SRB disinfection						X	X



In addition to making changes to the CSS model elements and configuration to represent the individual CSS improvements, the *E.coli* concentrations associated with the WWTP were also modified depending on the CSS project. Under current conditions, the WWTP treats inflows up to 75 MGD, with no supplemental treatment during wet weather flows. Several CSS scenarios simulate wet weather treatment up to 140 MGD, and yet others simulate wet weather treatment up to 300 MGD. The WWTP treatment scheme for each scenario is summarized in Table 5-3.

Table 5-3: WWTP Treatment for Each CSS Scenario

CSS Scenario	Full Treatment (MGD)	Primary Treatment (MGD)	Preliminary Treatment (MGD)	Total Treatment (MGD)
Current	75	--	--	75
14-3	75	65	--	140
14-2	75	65	--	140
15-4	85	55	160	300
15-5	75	65	--	140
18-4	85	55	--	140
18-5	85	55	160	140
19-3A	85	55	160	300

E.coli concentrations associated with each treatment pathway were estimated based on previous modeling, and a flow-weighted average *E.coli* concentration was calculated to estimate the total *E.coli* contribution from the WWTP. All influent to the WWTP was assumed to have an *E.coli* concentration of 235,000 CFU/100mL. It was assumed that influent receiving full treatment would result in an effluent concentration of 126 CFU/100 mL, consistent with the effluent concentration guidelines in the VAPDES permit (#VA0063177). Effluent concentrations from primary and preliminary treatment facilities were calculated according to the following formula:

$$\text{Effluent } E. coli \text{ concentration} = \frac{\text{influent concentration}}{\text{reduction factor}}$$

The effluent reduction factors for primary and preliminary treatment were calculated using formulas that were developed as part of ongoing modeling efforts by Greeley and Hansen (Greeley and Hansen, personal communication, 11/15/2016).). The primary treatment reduction factor is governed by the following equation:

$$\text{Log reduction factor} = 0.76 * 10^{2.57904 - 1.2563 * \log(Q)}$$

Where: Q is the inflow in MGD

The preliminary treatment reduction is governed by the following equation:

$$\text{Log reduction factor} = 0.76 * 10^{2.77053 - 1.2563 * \log(Q)}$$

Where: Q is the inflow in MGD

For both treatment pathways, the reduction factor is large when flows are small due to increased contact time with the UV disinfection system. Therefore, a treatment floor of 126 cfu/100 mL was set because it was assumed that the treatment capacity of the primary and preliminary pathways could not exceed full treatment.



Post-processing was also required to simulate disinfection at SRB. All influent to SRB was assumed to have an *E.coli* concentration of 111,000 CFU/100 mL, consistent with *E.coli* EMC for CSO o6. The effluent reduction factor for SRB was calculated using a formula that was developed as part of ongoing modeling efforts by Greeley and Hansen (Greeley and Hansen, personal communication, 11/15/2016.)

$$\text{Log reduction factor} = 11.8102 - 3.1211 * \log(Q)$$

Where: Q is the flow rate in MGD

Similar to the WWTP alternative treatment pathways, the SRB reduction factor is large when flows are small due to increased contact time with the chlorine disinfection system. Therefore, a treatment floor of 126 cfu/100 mL was set because it was assumed that the SRB treatment capacity could not exceed full treatment at the WWTP.

5.4 Results

The James River water quality model was configured to compute *E.coli* concentrations at an hourly interval for the three year typical period. These results were compared against the monthly water quality standards and summarized at key locations of interest along the river. Additionally, results were also summarized to show the overall bacteria load reduction, CSO volume reduction, and reduction in number of CSO events.

5.4.1 Current Conditions

Figure 5-4 show the modeled monthly geomean concentrations and the percent exceedance of the STV standards at the downstream boundary of the city. For each month that violated the water quality standard, a detailed component analysis was completed. The component analysis tracks the relative contribution of each *E.coli* source (upstream, CSOs, watershed/MS4, background, and WWTP) to the modeled concentration in the James River. This type of analysis is useful to evaluate which sources of bacteria have the greatest impact on water quality conditions in the James River for a given point in time or location in the river.

Under current conditions, the geometric mean water quality standard is violated at the downstream city limit (the compliance evaluation point) for 4 months of the 36 month typical period. Significant contributors to non-compliance are upstream sources, the background sources, and CSOs. Non-compliance tends to occur when James River flows and upstream James River concentrations are high or when James River flows are low and significant precipitation events cause combined sewer discharges.

The statistical threshold value standard is more frequently violated, with 16 of 36 months exceeding the standard at the downstream City limit. Significant contributors to non-compliance of the STV standards are mainly CSOs and upstream sources, and to a lesser extent, the MS4/Watershed source. The CSOs are a more frequent and greater contributor to water quality violations using the STV standard than using the monthly geometric mean standard.

These results illustrate that:

- The James River is in violation of both the geometric mean and the statistical threshold value water quality standards for some months out of the three year simulation period.
- The primary cause of a water quality standard violation can sometimes be linked to Richmond combined sewer overflows, while at other times it is due to upstream sources. Background and MS4/Watershed sources play a smaller overall role in the bacteria water quality violations. The WWTP does not contribute significantly to bacteria water quality violations.



Figure 5-5 illustrates the E.coli monthly geometric mean in the James River, from a few miles upstream of the city limits to a few miles past the downstream city limits. During some months, for example in April 2012 (orange line), the James River is compliant upstream of the city and local *E.coli* sources are small enough that the James River is also compliant downstream of the city. During other months, like in June of 2013 (blue line), the James River is compliant upstream of the city but because of the contributions from background, watershed, and CSO sources, the James River exceeds the water quality standards at the downstream city limit. Finally during some months, like December 2011 (dark green line), the river is non-compliant with the water quality standards upstream of the city and remains non-compliant downstream of the city.

Table 5-4 shows the E.coli load, CSO volume, and number of CSO events under the existing conditions.

Table 5-4: Existing Condition: E.coli Load, CSO Volume, and Number CSO Events	
Metric	Value
Average yearly E.coli load (billion cfu)	9,651,987
Average annual number of CSO events	53
Average yearly CSO volume discharged (million gallons)	1,670



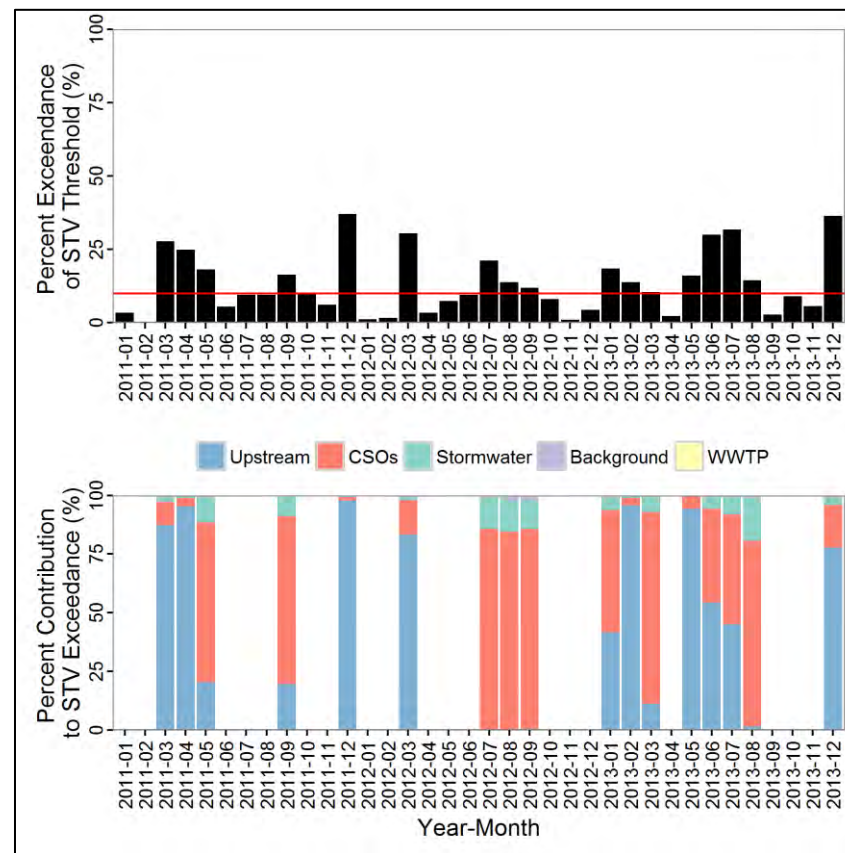
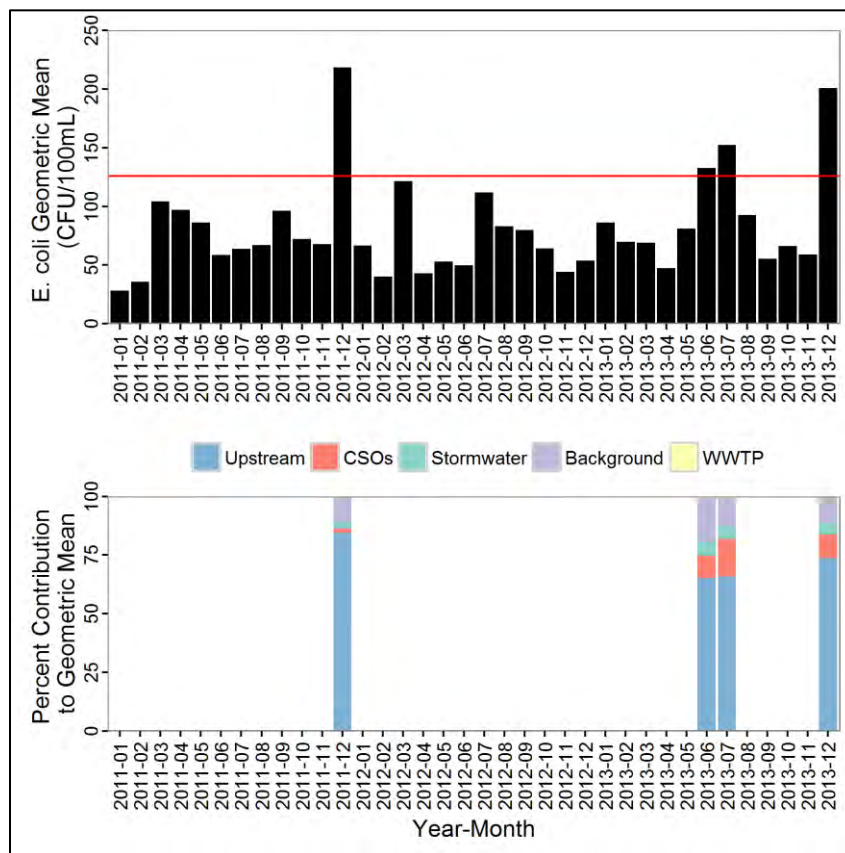


Figure 5-4: Existing Condition: Monthly Geometric Mean and STV Standard Model Results

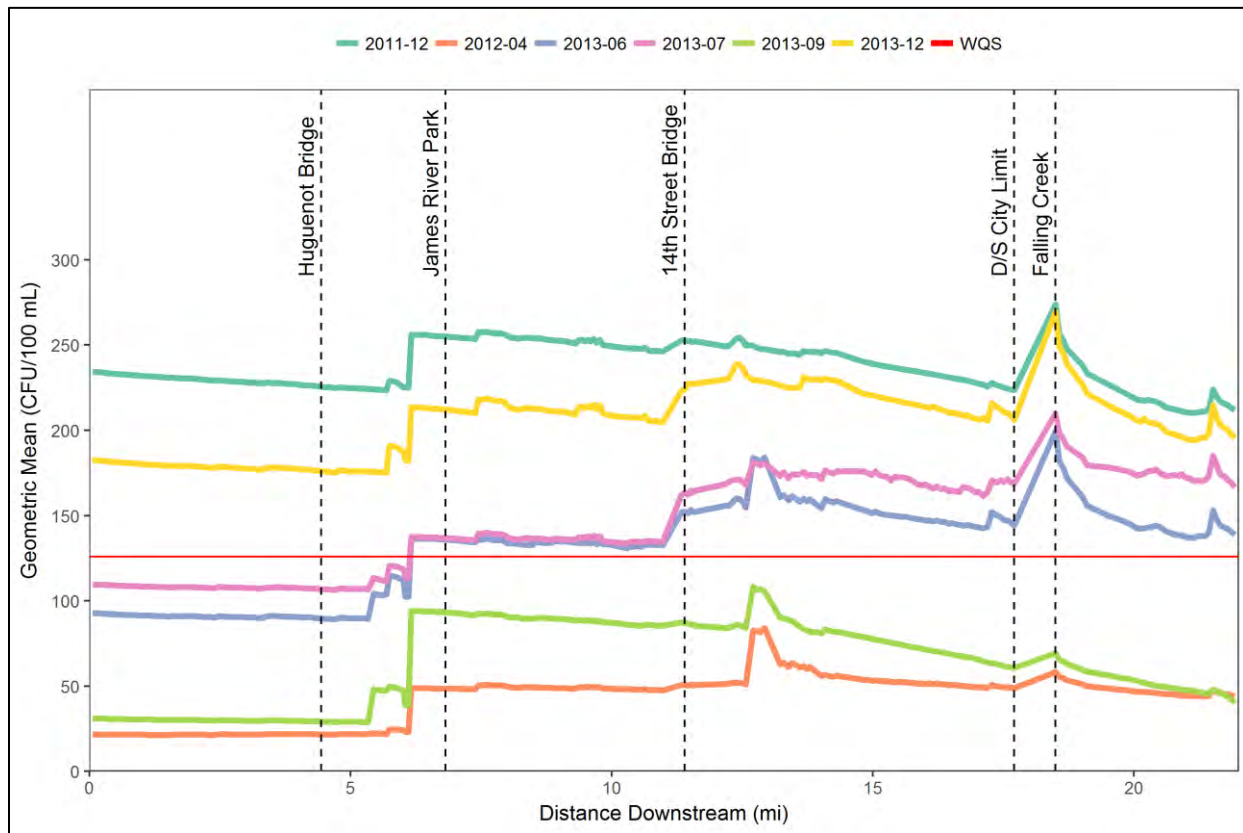


Figure 5-5: Lateral and temporal variability in E.coli concentration in the James River

5.4.2 Baseline Conditions

Figure 5-6 shows the modeled monthly geomean concentrations and the percent exceedance of the STV standards at the downstream boundary of the city for the baseline condition. For each month that violated the water quality standard, a detailed component analysis was completed. Similar to current conditions, under baseline conditions, the geometric mean water quality standard is violated at the downstream city limit (the compliance evaluation point) for 4 months of the 36 month typical period. Significant contributors to non-compliance are upstream sources, the “background” or “unknown” source, and CSOs. Non-compliance tends to occur when James River flows and upstream James River concentrations are high or when James River flows are low and significant precipitation events cause combined sewer discharges.

The statistical threshold value standard is more frequently violated, with 16 of 36 months exceeding the standard at the downstream City limit. Significant contributors to non-compliance of the STV standards are mainly CSOs and upstream sources, and to a lesser extent, the MS4/Watershed source. Though the baseline projects significantly reduce CSOs, these projects alone are not sufficient to bring the James River into compliance with water quality standards.

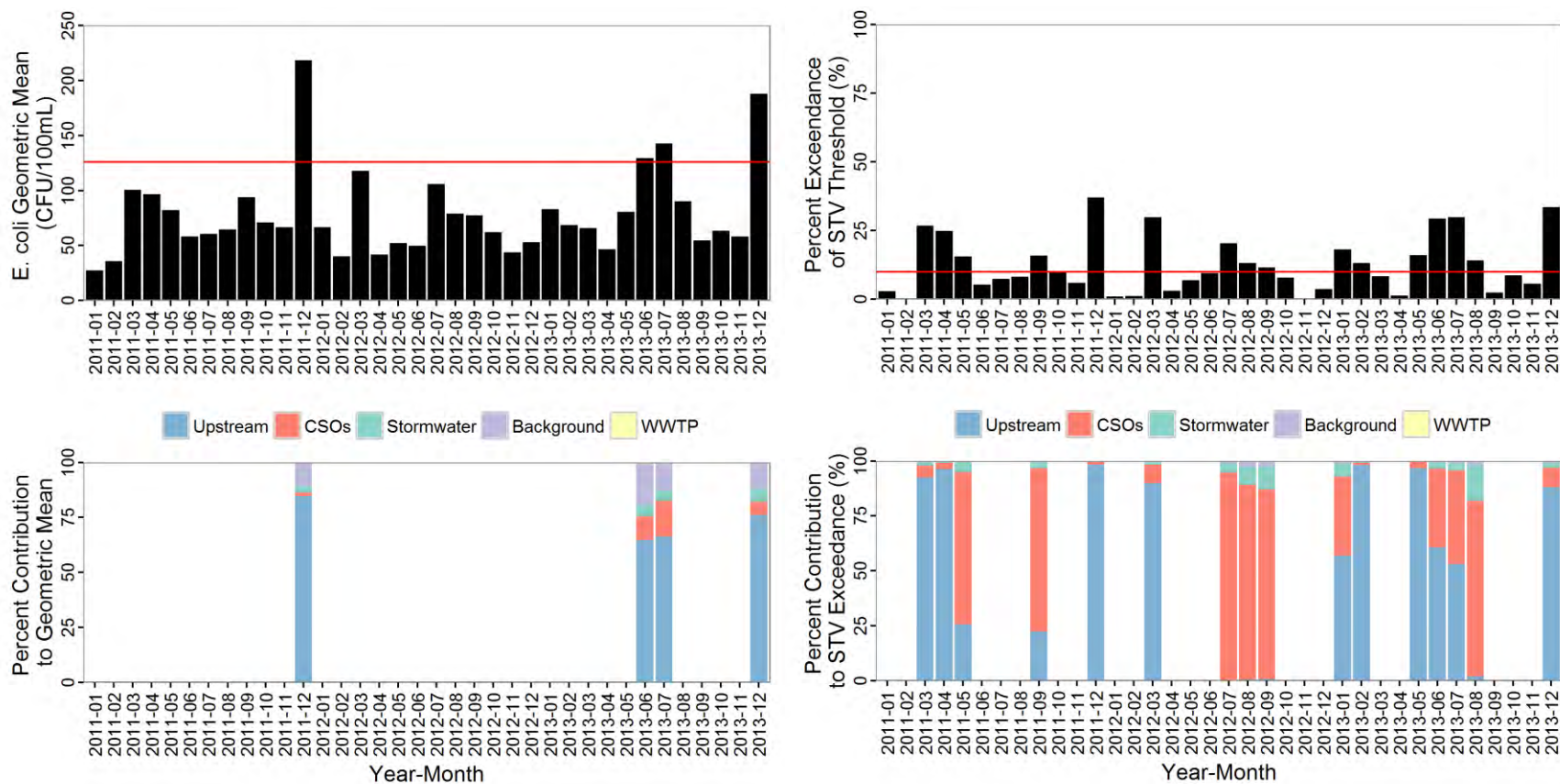


Figure 5-6: Baseline Condition: Monthly Geometric Mean and STV Standard Model Results

Table 5-5 shows the E.coli load, CSO volume, and number of CSO events under the existing conditions. The baseline conditions represent the improvements due to the implementation of several CSO improvement projects. Compared to the existing conditions, these projects collectively reduce the E.coli loads by approximately 18%, reduce the number of overflows by 2 events, and reduce the yearly CSO volume discharged by approximately 29%.

Table 5-5: Baseline Condition: E.coli Load, CSO Volume, and Number CSO Events	
Metric	Value
Average yearly E.coli load (billion cfu)	7,958,183
Average annual number of CSO events	51
Average yearly CSO volume discharged (million gallons)	1,190
Percent improvement compared to current conditions (%)	12.8

5.4.3 Green Infrastructure in the MS4 Area Strategy

The “*green infrastructure in the MS4 area*” strategy proposed to implement green infrastructure to treat 104 acres of impervious area owned by the Department of Public Utilities (DPU) or Department of Parks & Recreation, in addition to all the currently funded phase III collection system improvement projects included in the baseline conditions. Table 5-6 shows the E.coli load, CSO volume, and number of CSO events under the “Green Infrastructure in the MS4 Area” strategy. This strategy reduces the E.coli load entering the James River only slightly compared to the baseline conditions (<0.6% reduction). This strategy only targets Richmond’s MS4 area, so the number of CSO events and the yearly CSO volume are not affected compared to the baseline scenario.

Table 5-6: Green Infrastructure in MS4 Strategy: E.coli Load, CSO Volume, and Number CSO Events	
Metric	Value
Average yearly E.coli load (billion cfu)	7,954,132
Average annual number of CSO events	51
Average yearly CSO volume discharged (million gallons)	1,190
Percent improvement compared to current conditions (%)	13.0

5.4.4 Green Infrastructure in the CSS Area Strategy

The “*green infrastructure in the CSS area*” strategy proposed to implement green infrastructure to treat 18 acres of impervious area owned by the Department of Public Utilities (DPU) or Department of Parks & Recreation, in addition to all the currently funded phase III collection system improvement projects included in the baseline conditions. Table 5-7 shows the E.coli load, CSO volume, and number of CSO events under the “Green Infrastructure in the CSS Area” strategy. This strategy reduces the E.coli load entering the James River only slightly compared to the baseline conditions (<0.6% reduction). This strategy specifically targets the CSS area. The area of GI implementation (18 acres) is not significant enough to reduce the number of CSO events, but it does reduce the annual CSO volume discharged slightly compared to the baseline scenario.



Table 5-7: Green Infrastructure in CSS Strategy: E.coli Load, CSO Volume, and Number CSO Events

Metric	Value
Average yearly E.coli load (billion cfu)	7,905,833
Average annual number of CSO events	51
Average yearly CSO volume discharged (million gallons)	1,180
Percent improvement compared to current conditions (%)	12.9

5.4.5 CSS Infrastructure Improvement Strategy

Table 5-6 shows the E.coli load, CSO volume, and number of CSO events under the “CSS Infrastructure Improvement” strategy. This strategy includes numerous projects intended to reduce the number of CSO events and CSO volume discharged.

Table 5-8: CSS Infrastructure Improvement Strategy: E.coli Load, CSO Volume, and Number CSO Events

Metric	Value	Reduction Compared to Baseline Conditions	Reduction Compared to Existing Conditions
Average yearly E.coli load (billion cfu)	4,407,072	45%	54%
Average annual number of CSO events	50	2%	5%
Average yearly CSO volume discharged (million gallons)	228	81%	86%
Percent improvement compared to current conditions (%)	21.3%	-	-



Figure 5-7 illustrates water quality compliance at the downstream City limit for the CSS Infrastructure Improvement strategy. Under this strategy, the geometric mean water quality standard is violated at the downstream city limit (the compliance evaluation point) for 3 months of the 36 month typical period. Non-compliance occurs because the upstream sources contribute significant flow and high bacteria loads.

The statistical threshold value standard is more frequently violated, with 16 of 36 months exceeding the standard at the downstream City limit. Significant contributors to non-compliance of the STV standards are mainly CSOs and upstream sources, and to a much lesser extent, the MS4/Watershed source. The CSOs continue to contribute to non-compliance under the STV standards, especially during the summer months. The CSOs are a more frequent and greater contributor to water quality violations using the STV standard than using the monthly geometric mean standard.

These results illustrate that:

- Controlling City of Richmond bacteria sources alone would not achieve compliance with water quality standards.
- Reducing combined sewer overflows via the CSS Infrastructure Improvement strategies would significantly reduce the average yearly CSO volume discharged (81% reduction compared to the baseline conditions). It would also improve compliance with water quality standards, especially during times when upstream sources are not significantly contributing to water quality violations.



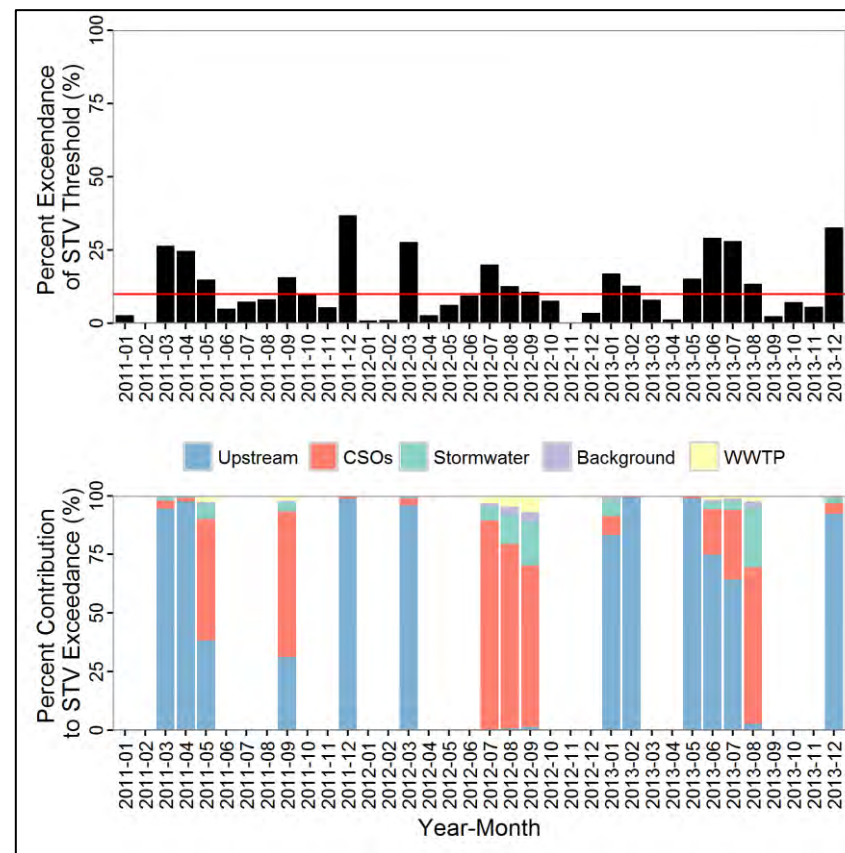
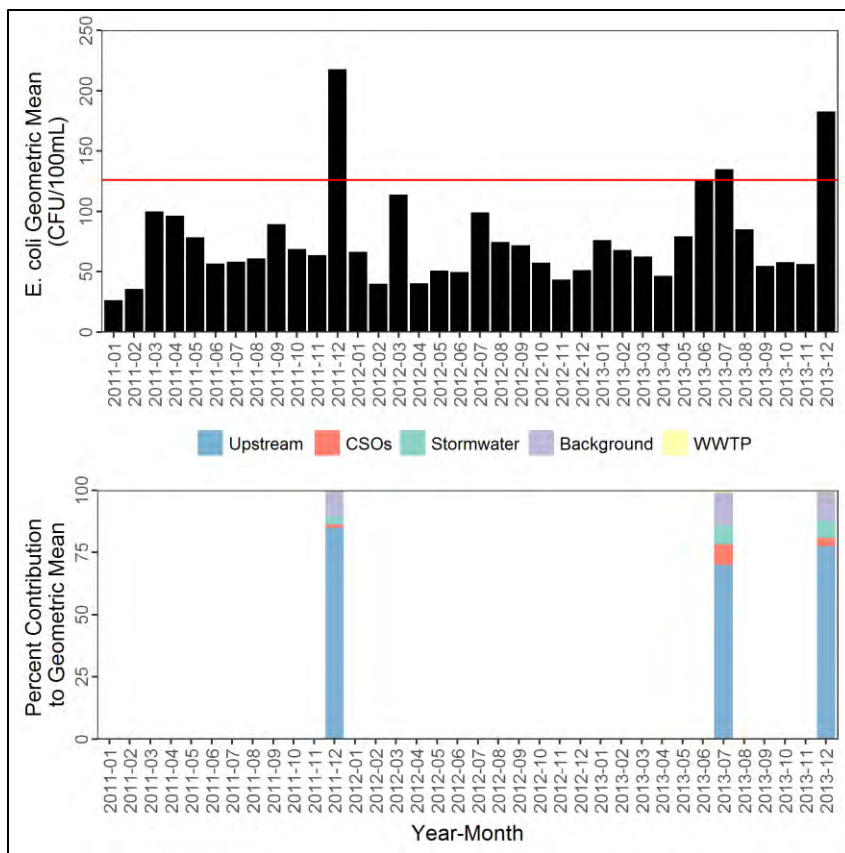


Figure 5-7: CSS Improvement Infrastructure Strategy: Monthly Geometric Mean and STV Standard Model Results

5.4.5.a CSS Infrastructure Improvement Strategy with Upstream Load Reductions

The James River Bacteria TMDL (MapTech, 2010) details the *E.coli* load reductions that would be necessary to achieve water quality compliance upstream of the City. These reductions, which were based on an independent analysis of water quality, were generally greater than 50%. Based on this information, the Water Quality model was applied for the CSS Infrastructure Strategy, whereby upstream load reductions were incrementally reduced until the downstream water quality criteria would be achieved under the monthly geomean standard. If all other sources remain the same, and with the CSS Infrastructure improvements in place, upstream sources would need to be reduced by 50% in order to meet the monthly geomean standard. These results are shown in

Figure 5-8.

5.4.5.b Evaluating Individual CSS Infrastructure Improvement Projects

The CSS Infrastructure Improvement Strategy consists of several different projects as outlined in the LTCP, and shown in Table 5-1 and Table 5-2. Each project was evaluated in isolation to determine individual project impact on bacteria load reduction and on the percent improvement towards meeting the monthly *E.coli* geometric mean water quality standard. Figure 5-9 summarizes the *E.coli* load reductions and Table 5-9 shows the “percent improvement” for each project scenario. Even though the individual scenarios can achieve significant *E.coli* load reductions (22%-67% reductions), the “percent improvement” shows smaller gains that vary between 13% and 21%. This is because *E.coli* loads from the CSS system make up only a fraction of the total *E.coli* load in the James River.

5.4.5.c Evaluating Alternative CSS Improvement Projects

It is anticipated that the modeling framework will be applied during the summer and fall of 2017 to evaluate alternative CSS reduction projects that may provide similar benefits to the LTCP projects, but at a reduced cost. These alternatives will be evaluated against the existing LTCP projects, and results will be presented as they become available.



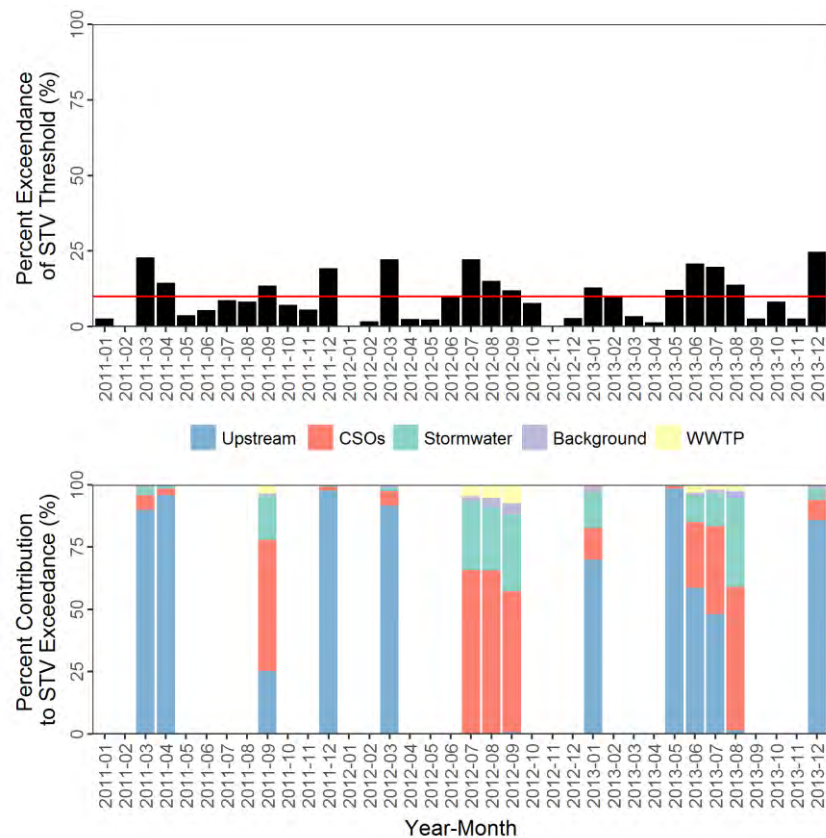
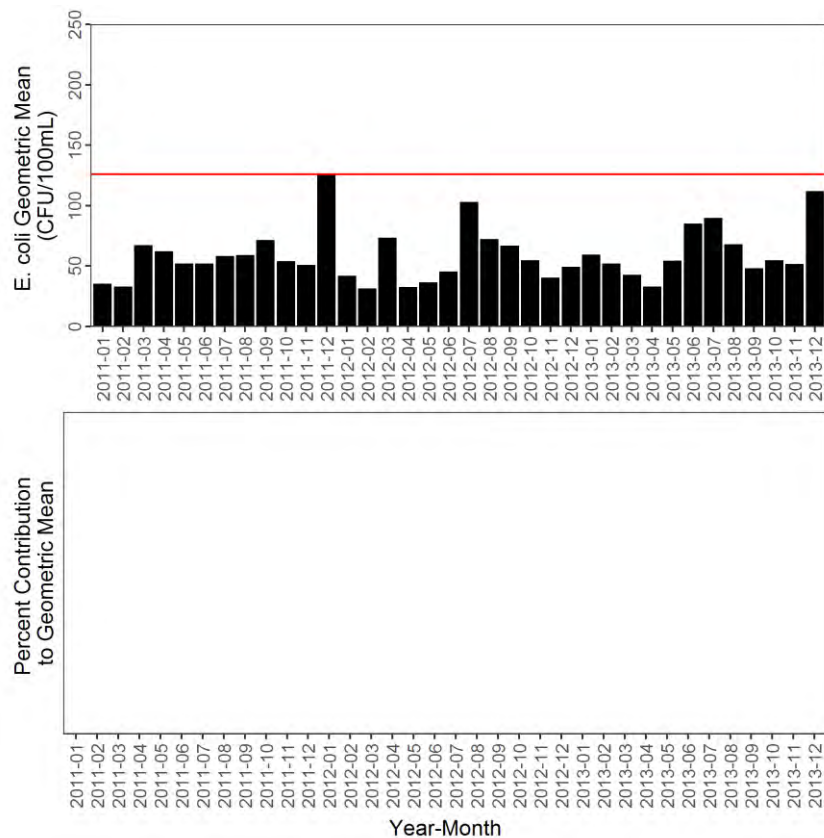


Figure 5-8: Modeled Water Quality Concentration with CSS Improvement Infrastructure Strategy and a 50 Percent Reduction in Upstream Loads



Figure 5-9: E.coli Load Reduction for Each CSS Infrastructure Improvement Project

Table 5-9: Percent Improvement Over Current Conditions for each CSS Infrastructure Improvement Project

CSS Scenario	Project	3-year Aggregate CSO Event Reduction (#)	3-year Aggregate CSO Volume Reduction (MG)	3-year Aggregate Exceedance of Geomean Standard (CFU/100ml)	Percent Improvement Over Current Conditions
Current	Current Conditions	--	--	200	--
14-3	Baseline Conditions	5	1,439	174	12.8%
14-2	Gillies Conveyance	5	1,468	174	13.2%
15-4	300 MGD Wet Weather Treatment	5	2,488	167	16.6%
15-5	CSO 21 Replacement	6	1,634	175	12.5%
18-4	SRB Expansion	1	1,950	168	16.1%
18-5	SRB Expansion and Disinfection	5	3,993	158	21.0%
19-3A	CSS Infrastructure Improvement Strategy (Full LTCP)	8	4,325	157	21.3%

5.4.6 Summary of Results for the Strategy Calculator

The strategies were evaluated using several metrics related to bacteria reduction, including:

- Bacteria load reduction from combined sewer and tributary discharges, expressed as Billion CFU
- Percent improvement in monthly geomean water quality standard compliance at the downstream city limit
- Reduction in number of CSO events
- Reduction in CSO volume (Million gallons)

These four metrics are used in the Strategy Calculator, a spreadsheet tool that is used to evaluate and score the different management strategies across a wide range of goals and objectives (LimnoTech, 2017). The results for the Strategy Calculator are summarized in Table 5-10.

Table 5-10: Strategy metric results used in the Strategy Calculator			
Metric	GI in MS4	GI in CSS	CSS Infrastructure
Average yearly E.coli load reduction compared to the baseline (billion cfu)	4,051	52,350	3,551,112
Average reduction in annual number of CSO events compared to the baseline conditions	0	0	1
Average reduction in annual CSO volume discharged compared to the baseline conditions (million gallons)	0	9	962
Percent improvement compared to baseline conditions (%)	0.1	0.1	10



6 References

American Society of Civil Engineers (ASCE). 1992. Design & Construction of Urban Stormwater Management Systems, New York, NY.

Brown and Caldwell. 2016. Draft Technical Memorandum: CSO Model Review and Advancement Strategy: Model Review. May 10, 2016.

Chow, V.T., 1959, Open-channel hydraulics: New York, McGraw-Hill, 680 p.

Federal Emergency Management Agency (FEMA). 2014. Flood Insurance Study: City of Richmond, Virginia. Revised July 16, 2014.

Gesch, D., Oimoen, M., Greenlee, S., Nelson, C., Steuck, M., & Tyler, D. 2002. The National Elevation Dataset. Photogrammetric engineering and remote sensing, 68(1), 5-32.

Greeley and Hansen. 2002. Combined Sewer Overflow (CSO) Study; Long-Term CSO Control Plan Re-Evaluation. January, 2002.

Greeley and Hansen. 2012-2014:

- Broad Rock Creek Watershed Plan. Final Report. November 2012.
- Cherokee Lake Watershed Plan. Final Report, November 2012.
- Falling Creek Watershed Plan. Final Report, February 2014.
- Gillies Creek Watershed Plan. Final Report, November 2012.
- Goodes Creek Watershed Plan. Final Report, November 2012.
- Grindall Creek Watershed Plan. Final Report, November 2012.
- Jordan's Branch Watershed Plan. Final Report, November 2012.
- Manchester Watershed Plan. Final Report, November 2012.
- Pocosham Creek Watershed Plan. Final Report, February 2014.
- Reedy Creek Watershed Plan. Final Report, November 2012.
- Riverfront Watershed Plan. Final Report, January 2014.
- Willow Oaks Watershed Plan. Final Report, January 2014.

Greeley and Hansen. 2015. Wastewater Collection System Master Plan: Collection System Hydraulic Model. November 2015.

James, W., Rossman, L. A., & James, W. R. C. 2010. User's guide to SWMM 5: [based on original USEPA SWMM documentation]. CHI.

Lawson, 2003. HSPF Model Calibration and Verification for Bacteria TMDLS: Guidance Memo No. 03-2012. Commonwealth of Virginia. Department of Environmental Quality. Water Division.



LimnoTech. 2008. Richmond CSO and James River receiving water model – Model description & Modeling procedure.

LimnoTech, 2017. Calculator Webinar, January 2017. Accessible through: <http://www.rvah2o.org/file-upload-form/> or through <https://player.vimeo.com/video/199872947>

MapTech, 2010. Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond. November 2010. McCuen, R. et al. 1996. Hydrology, FHWA-SA-96-067, Federal Highway Administration, Washington, DC

Risley, J. C., Stonewall, A., & Haluska, T. L. 2008. Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon (No. FHWA-OR-RD-09-03). US Department of the Interior, US Geological Survey.

USACE, 2013. Richmond Deepwater Terminal to Hopewell After Dredging. Survey of September 2011 to January 2012. James River, Virginia. 1/23/2013.

USACE, 1979-1980. National Dam Safety Program. Norfolk District Corps of Engineers. Reports available through the Defense Technical Information Center: <http://www.dtic.mil/dtic/>

USEPA, 2010. Sampling and Consideration of Variability (Temporal and Spatial) For Monitoring of Recreational Waters (EPA Publication No. EPA-823-R-10-005).

USGS, 2017. Load Estimator (LOADEST): A Program for Estimating Constituent Loads in Streams and River. Website accessed 2/13/2017. Page last modified: 12/12/2016.



7 Glossary

CSO: Combined sewer overflow
CSS: Combined sewer system
CWA: Clean Water Act
DCIA: Directly connected impervious area
DEM: Digital elevation model
EFDC: Environmental Fluid Dynamic Code
EMC: Event mean concentration
HSG: Hydrologic soil group
LiDAR: Light detection and ranging
MRLC: Multi-Resolution Land Characteristics
MS4: Municipal separate storm sewer system
NCDC: National Climatic Data Center
NLCD: National Land Cover Database
NRCS: National Resources Conservation Service
NOAA: National Oceanic and Atmospheric Administration
NRCS: National Resources Conservation Service
RIA: Richmond International Airport
SSO: Sanitary sewer overflow
SSURGO: Soil Survey Geographic database
SWMM: Storm Water Management Model
USGS: United States Geological Survey



Appendix 2. Strategy Fact Sheets

STRATEGY: RIPARIAN AREAS

Replace or restore 10 acres of riparian buffers according to state guidance. This may include:

- Implementing in the MS4 and / or the CSS areas of the City
- Replacing grassed buffers and impervious surfaces with a forested buffer
- Evaluating opportunities for inclusion of access points to waterbody for recreational activities

Riparian areas within urban environments often face numerous pressures from encroachment to increased pollutant impacts. The Riparian Area strategy includes the identification of areas within a 100 foot riparian buffer that have been compromised by insufficient vegetation to perform its function. This can stem from factors such as the removal of trees, lack of an understory, or presence of impervious surfaces.

A GIS analysis of the City's streams and the land cover surrounding these streams identified locations where these stream buffer deficiencies exist. The intent of the Riparian Area strategy is to replace or restore these deficient buffers. Several assumptions were made in association with this strategy including:

- Removal of two acres of impervious surfaces
- Restoration of eight acres of grassed areas to forest buffer
- Planting 125 trees per acre

Additionally, because one objective is to facilitate recreational access to the streams, this strategy will also incorporate four access points within these 10 acres of restored riparian area (1 access point per 1,000 feet of buffers replaced/restored).

This strategy also makes the assumption that there will be an investigation of the possibility to increase the width of riparian buffers within the City to 200 feet. If determined feasible, riparian buffers will be expanded upon where possible.

While this strategy is not traditionally considered "green infrastructure," it was characterized as such for the scoring of the strategies due to elements of the strategy, such as removal of impervious surfaces and tree planting.

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, the Riparian Area strategy was included in **TIER 1** of priorities for implementation.



METRICS

The table below shows the metrics that were addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the GI in the MS4 strategy

METRIC	METRIC	METRIC
✓ TN reduction	✓ Riparian buffers restored/increased	✓ Area treated by GI
✓ TP reduction	✓ Habitat protected or restored	Streams restored
✓ TSS reduction	✓ Habitat connected by green corridor	✓ Stormwater volume reduction
✓ Bacteria reduction	✓ Impervious surface reduced or treated	✓ Stream access points added
Reduction in no. of CSO events	✓ Trees planted	✓ Streams buffers added
Reduction in CSO volume	Potable water consumption reduced	Conservation easements added
✓ PCB, metals, and toxics reduction	Rain or storm water used for irrigation	Trash reduction
Amount of water conserved	Percent increase in WQS compliance at James River compliance point	✓ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness was evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) and expressed as cost per unit pollutant removed.

Pollutant Removal		Cost Effectiveness	
Average yearly TN load reduction (lbs/yr)	19	Cost per pound TN removed	\$58,902
Average yearly TP load reduction (lbs/yr)	4	Cost per pound TP removed	\$292,553
Average yearly TSS load reduction (lbs/yr)	1,081	Cost per pound TSS removed	\$1,017
Average yearly E.coli load reduction (billion cfu/yr)	83	Cost per billion cfu E.coli removed	\$13,190

STRATEGY: GREEN INFRASTRUCTURE IN THE MS4

Install or retrofit green infrastructure (GI) draining 104 acres of city-owned impervious surfaces (50% of all city-owned impervious area) through efforts such as:

- Installing GI on DPU property, specifically targeting city-owned vacant properties for stormwater management
- Installing a mix of GI, including bioengineered tree boxes (like Filtera-type practices)
- Installing GI on Parks department property (e.g.: playgrounds, parks, cemetery roadways, vacant properties, etc.)
- Retrofitting four DPU stormwater BMPs (e.g., dry ponds to more efficient BMPs); draining at least 6 acres of impervious surface

This green infrastructure (GI) strategy is intended to represent a general mix of practices typically included in GI implementation efforts. As part of the development of this high-level strategy, the IWRM Planning Team made a variety of assumptions and decisions with regard to the GI types included, area treated, and load reductions efficiencies, and other benefits provided by the GI practices. These assumptions and decisions were necessary so that this strategy could be modeled at a high level in order to calculate expected load and stormwater volume reductions, and provide metric scores to assess how well the strategy meets the goals and objectives of the IWRM.

The mix of GI types included and shown below is based on some of the more common GI types that are routinely implemented in the region. The practices assumed for this strategy are not meant to be exclusive or all-encompassing; other practices such as constructed wetlands, impervious surface disconnection, or nutrient management, could also be included under this strategy. The “final” list of GI practices will be determined through the Framework Planning process, as the City and stakeholders move closer to evaluating projects for implementation (see Chapter 7 of the City’s Integrated Water Resources Management Plan for additional discussion on Framework Planning).

The Mix of GI and Associated Acres Assumed for GI in the MS4

Green Infrastructure Practice	Area Treated (acres)
Engineered tree boxes	17
Stormwater pond retrofit (dry pond to wet pond)	6
Green roofs	1
Rainbarrels	16
Permeable pavement - A/B soils, underdrain	10
Permeable pavement - C/D soils, underdrain	10
Bioretention/raingardens - A/B soils, underdrain	21
Bioretention/raingardens - C/D soils, underdrain	23
Total Area Treated by Green Infrastructure in the MS4 area	104

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, GI in the MS4 was included in **TIER 1** of priorities for implementation.



METRICS

The table below shows the metrics that were addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the GI in the MS4 strategy

METRIC	METRIC	METRIC
✓ TN reduction	Riparian buffers restored/increased	✓ Area treated by GI
✓ TP reduction	✓ Habitat protected or restored	Streams restored
✓ TSS reduction	Habitat connected by green corridor	✓ Stormwater volume reduction
✓ Bacteria reduction	✓ Impervious surface reduced or treated	Stream access points added
Reduction in no. of CSO events	✓ Trees planted	Streams buffers added
Reduction in CSO volume	Potable water consumption reduced	Conservation easements added
✓ PCB, metals, and toxics reduction	✓ Rain or storm water used for irrigation	Trash reduction
Amount of water conserved	Percent increase in WQS compliance at James River compliance point	✓ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness was evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) and expressed as cost per unit pollutant removed.

Pollutant Removal		Cost Effectiveness	
Average yearly TN load reduction (lbs)	414	Cost per pound TN removed	\$30,181
Average yearly TP load reduction (lbs)	90	Cost per pound TP removed	\$138,687
Average yearly TSS load reduction (lbs)	42,397	Cost per pound TSS removed	\$295
Average yearly E.coli load reduction (billion cfu)	3,531	Cost per billion cfu E.coli removed	\$3,540

STRATEGY: GREEN INFRASTRUCTURE IN THE COMBINED SEWER SYSTEM (CSS)

Install or retrofit green infrastructure (GI) draining 18 acres of city-owned impervious surfaces through efforts such as:

- Installing GI on DPU property, specifically targeting city-owned vacant properties for stormwater management
- Installing a mix of GI, including bioengineered tree boxes (like Filtera-type practices)
- Installing GI on Parks department property (e.g.: playgrounds, parks, cemetery roadways, vacant properties, etc.)

This green infrastructure (GI) strategy is intended to represent a general mix of practices typically included in GI implementation efforts. As part of the development of this high-level strategy, the IWRM Planning Team made a variety of assumptions and decisions with regard to the GI types included, area treated, and load reductions efficiencies, and other benefits provided by the GI practices. These assumptions and decisions were necessary so that this strategy could be modeled at a high level in order to calculate expected load and stormwater volume reductions, and provide metric scores to assess how well the strategy meets the goals and objectives of the IWRM.

The mix of GI types included and shown here is based on some of the more common GI types that are routinely implemented in the region. The practices assumed for this strategy are not meant to be exclusive or all-encompassing; other practices such as constructed wetlands, impervious surface disconnection, or nutrient management, could also be included under this strategy. The “final” list of GI practices will be determined through the Framework Planning process, as the City and stakeholders move closer to evaluating projects for implementation (see Chapter 7 of the City’s Integrated Water Resources Management Plan for additional discussion on Framework Planning).

The Mix of GI and Associated Acres Assumed for GI in the CSS

Green Infrastructure Practice	Area Treated (acres)
Engineered tree boxes	2.9
Green roofs	0.2
Rainbarrels	2.7
Permeable pavement - A/B soils, underdrain	1.8
Permeable pavement - C/D soils, underdrain	1.8
Bioretention/raingardens - A/B soils, underdrain	4.1
Bioretention/raingardens - C/D soils, underdrain	4.5
Total Area Treated by Green Infrastructure in the MS4 area	18

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, GI in the CSS was included in **TIER 1** of priorities for implementation.



METRICS

The table below shows the metrics that were addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the GI in the MS4 strategy

METRIC	METRIC	METRIC
✓ TN reduction	Riparian buffers restored/increased	✓ Area treated by GI
✓ TP reduction	✓ Habitat protected or restored	Streams restored
✓ TSS reduction	Habitat connected by green corridor	✓ Stormwater volume reduction
✓ Bacteria reduction	✓ Impervious surface reduced or treated	Stream access points added
Reduction in no. of CSO events	✓ Trees planted	Streams buffers added
✓ Reduction in CSO volume	Potable water consumption reduced	Conservation easements added
✓ PCB, metals, and toxics reduction	✓ Rain or storm water used for irrigation	✓ Trash reduction
Amount of water conserved	Percent increase in WQS compliance at James River compliance point	✓ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness was evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) and expressed as cost per unit pollutant removed.

Pollutant Removal		Cost Effectiveness	
Average yearly TN load reduction (lbs)	74	Cost per pound TN removed	\$45,270
Average yearly TP load reduction (lbs)	16	Cost per pound TP removed	\$209,375
Average yearly TSS load reduction (lbs)	7,393	Cost per pound TSS removed	\$453
Average yearly E.coli load reduction (billion cfu)	40,642	Cost per billion cfu E.coli removed	\$82

STRATEGY: STREAM RESTORATION

This strategy includes the rehabilitation of 2,500 linear feet of stream, including activities such as removal of concrete channels and repair of incised banks. These streams can be located within the MS4 or the CSS areas of the City. This strategy also includes the evaluation of opportunities for inclusion of access points to a waterbody for recreational activities.

The 2,500 linear feet selected for this Stream Restoration Strategy was based upon a similar expanse included within the City's Chesapeake Bay TMDL Action Plan. Several assumptions were made in the development of this strategy including the following:

- The EPA CBP-approved pollutant reduction for this practice considers the ecoregion within which the stream restoration takes place. Because Richmond is split approximately in half between the Coastal Plain and the Piedmont ecoregions, it was assumed that 50% of the stream rehabilitation efforts would occur in each.
- Stream restoration projects will include a riparian buffer of 100 feet, but, where possible, the buffer will be increased to 200 feet.
- The average width of the streams restored was assumed to be 50 feet.
- This 100-foot buffer along the 2,500 linear feet of stream restoration results in almost 6 acres of riparian buffer restored or increased.
 - This is separate from what is included in the Riparian Area Strategy.
- Trees would be planted at a density of 125 trees per acre with over 700 trees planted.
 - This is separate from what is included in the Tree Strategy.
- Because improving waterfront access for recreation is an objective for the IWRM Plan, an access point for residents was assumed to be included for every 1,000 feet of stream restored. Two access points are therefore assumed for this 2,500 linear feet of stream restoration.

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, the Stream Rehabilitation strategy was included in **TIER 1** of priorities for implementation.



METRICS

The table below shows the metrics that are addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the GI in the MS4 strategy

METRIC	METRIC	METRIC
✓ TN reduction	✓ Riparian buffers restored/increased	✓ Area treated by GI
✓ TP reduction	✓ Habitat protected or restored	✓ Streams restored
✓ TSS reduction	✓ Habitat connected by green corridor	Stormwater volume reduction
Bacteria reduction	Impervious surface reduced or treated	✓ Stream access points added
Reduction in number of CSO events	✓ Trees planted	Stream buffers added
Reduction in CSO volume	Potable water consumption reduced	Conservation easements added
PCB, metals, and toxics reduction	Rain or storm water used for irrigation	Trash reduction
Amount of water conserved	Percent increase in WQS compliance at James River compliance point	

✓ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness was evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) and expressed as cost per unit pollutant removed.

Pollutant Removal	
Average yearly TN load reduction (lbs/yr)	188
Average yearly TP load reduction (lbs/yr)	170
Average yearly TSS load reduction (lbs/yr)	75,013
Average yearly E.coli load reduction (billion cfu/yr)	--

Cost Effectiveness	
Cost per pound TN removed	\$15,467
Cost per pound TP removed	\$17,059
Cost per pound TSS removed	\$39
Cost per billion cfu E.coli removed	--

STRATEGY: TREE PLANTING

Increase natural land cover by focusing on tree planting, including:

- Increasing tree canopy on City property by 5%
- Protecting existing tree canopy by following maintenance addressed in the Tree Planting Master Plan

The tree planting strategy is intended to protect as well as increase the amount of tree canopy that covers Richmond. As part of the development of this high-level strategy, the IWRM Planning Team made a variety of assumptions and decisions with regard to the number and density of trees planted, area treated, load reduction efficiencies, and other benefits provided by tree planting. These assumptions and decisions were necessary so that this strategy could be modeled at a high level in order to calculate expected load and stormwater volume reductions, and provide metric scores to assess how well the strategy meets the goals and objectives of the IWRM. For example, it was assumed that 2,000 trees per year would be planted at a density of 125 trees/acre and that a single tree could reduce up to 466 gallons of storm water per year.

In addition to reducing target pollutant loads and stormwater volume, increasing the tree canopy also provides additional benefits to the public and to wildlife. As part of the tree planting strategy, trees planted in 50% of targeted areas are intended to increase or protect existing habitat, and 25% of the areas targeted for tree planting will be part of green corridors.

Acres Assumed for Tree Planting in the MS4

Tree Planting Practice	Area (acres)
Total area targeted for tree planting	80
Effective tree canopy area	33
Tree canopy area over impervious area	7
Tree canopy area over pervious areas	26
Habitat protected/restored	17
Habitat protected by green corridor	8

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, the Tree Planting strategy was included in **TIER 2** of priorities for implementation.



METRICS

The table below shows the metrics that were addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the GI in the MS4 strategy

METRIC	METRIC	METRIC
✓ TN reduction	Riparian buffers restored/increased	✓ Area treated by GI
✓ TP reduction	✓ Habitat protected or restored	Streams restored
✓ TSS reduction	✓ Habitat connected by green corridor	✓ Stormwater volume reduction
Bacteria reduction	✓ Impervious surface reduced or treated	Stream access points added
Reduction in no. of CSO events	✓ Trees planted	Streams buffers added
Reduction in CSO volume	Potable water consumption reduced	Conservation easements added
✓ PCB, metals, and toxics reduction	Rain or storm water used for irrigation	Trash reduction
Amount of water conserved	Percent increase in WQS compliance at James River compliance point	✓ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness was evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) and expressed as cost per unit pollutant removed.

Pollutant Removal		Cost Effectiveness	
Average yearly TN load reduction (lbs/yr)	30	Cost per pound TN removed	\$72,158
Average yearly TP load reduction (lbs/yr)	4	Cost per pound TP removed	\$520,833
Average yearly TSS load reduction (lbs/yr)	447	Cost per pound TSS removed	\$4,925
Average yearly E.coli load reduction (billion cfu/yr)	--	Cost per billion cfu E.coli removed	--

STRATEGY: NATIVE PLANT RESTORATION/INVASIVE PLANT REMOVAL

Increase the number and variety of native plants in the City of Richmond by:

- Using 80% native plants in new landscaping at public facilities by 2023
- Removing 5% of invasive plant species on DPU and park properties and replace with native species

The native plant restoration/invasive plant removal strategy focuses on populating new landscaping projects with plant species native to Richmond, actively removing invasive plant species and replacing them with native, and promoting public awareness of invasive plants. As part of the development of this high-level strategy, the IWRM Planning Team made a variety of assumptions and decisions with regard to the area treated, load reductions efficiencies, and other benefits provided by the native plant restoration/invasive plant removal. These assumptions and decisions were necessary so that this strategy could be modeled at a high level in order to calculate expected load and stormwater volume reductions, and provide metric scores to assess how well the strategy meets the goals and objectives of the IWRM.

There are two main components of the native restoration/invasive removal. The first component focuses on native plant restoration and invasive plant removal on City property. The native plant restoration/invasive plant removal strategy will also take several other factors into account such as biodiversity and the suitability of a species for a given location. Plantings of native species will focus on a wide variety of plants that are commonly found in the Coastal Plain/Piedmont region. In areas of the city that are not expected to receive supplemental watering, only drought-tolerant, native species will be considered. The second component of this strategy will be to develop a “do not plant” list of invasive species to raise awareness of problem species and to help guide local gardeners.

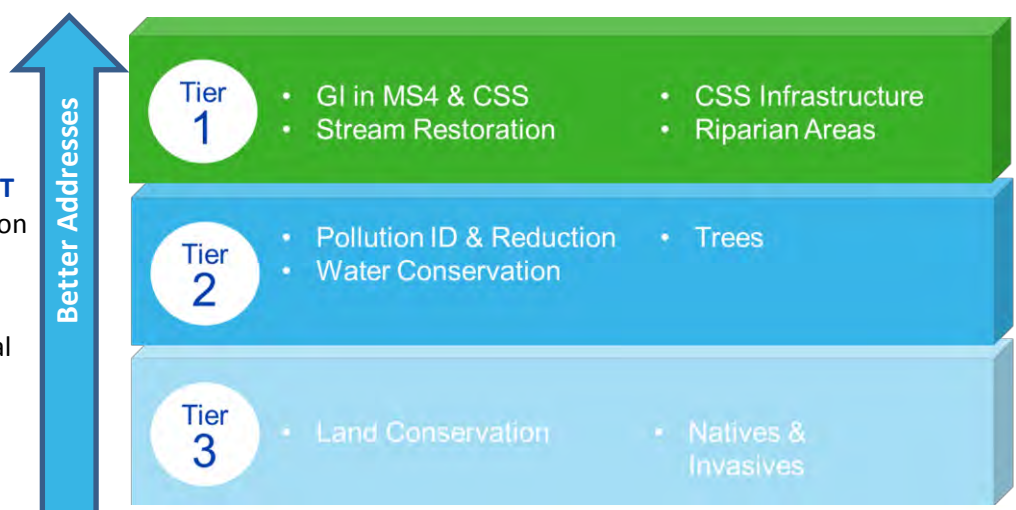
Strategy Elements	
20	Acres of native planting and/or invasive removal
2,000	Trees planted

While this Strategy does not offer significant reductions in target pollutants, they do provide a number of other benefits for the public, the city, and local wildlife, including: increased recreational space, plant biodiversity that will support a wider range of wildlife, and decreased watering costs associated with maintaining appropriately placed native plant species.

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, the Native Plant Restoration/Invasive Plant Removal strategy was included in **TIER 3** of priorities for implementation.



METRICS

The table below shows the metrics that were addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the GI in the MS4 strategy

METRIC	METRIC	METRIC
TN reduction	Riparian buffers restored/increased	Area treated by GI
TP reduction	√ Habitat protected or restored	Streams restored
TSS reduction	√ Habitat connected by green corridor	Stormwater volume reduction
Bacteria reduction	Impervious surface reduced or treated	Stream access points added
Reduction in no. of CSO events	√ Trees planted	Streams buffers added
Reduction in CSO volume	Potable water consumption reduced	Conservation easements added
PCB, metals, and toxics reduction	Rain or storm water used for irrigation	Trash reduction
Amount of water conserved	Percent increase in WQS compliance at James River compliance point	

√ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness for various strategies is evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) only. Because this strategy doesn't result in reduction of these pollutants, cost effectiveness could not be calculated.

Pollutant Removal		Cost Effectiveness	
Average yearly TN load reduction (lbs/yr)	--	Cost per pound TN removed	--
Average yearly TP load reduction (lbs/yr)	--	Cost per pound TP removed	--
Average yearly TSS load reduction (lbs/yr)	--	Cost per pound TSS removed	--
Average yearly E.coli load reduction (billion cfu/yr)	--	Cost per billion cfu E.coli removed	--

STRATEGY: WATER CONSERVATION

Reduce water consumption by 10% (from 2009-2014 baseline) through efforts such as:

- Installing water efficient fixtures as a policy by 2023 in all new public facility construction
- Implementing incentive programs that provide retrofits for low income households
- Encouraging water conservation on City properties
- Installing conservation landscaping on city-owned properties

This water conservation strategy is intended to represent a general mix of practices typically included in water conservation implementation efforts. As part of the development of this high-level strategy, the IWRM Planning Team made a variety of assumptions and decisions with regard to the conservation measures included, gallons of water conserved, load reductions efficiencies, and other benefits provided by the conservation practices. These assumptions and decisions were necessary so that this strategy could be modeled at a high level in order to calculate expected load and stormwater volume reductions, and provide metric scores to assess how well the strategy meets the goals and objectives of the IWRM.

The mix of conservation activities included and shown here is based on incorporation of common water conservation practices, such as rain barrels and encouraging water conservation by City staff. An incentive program is also planned

that will include retrofits of low flush toilets and other fixtures. The “final” list of water conservation practices will be determined through the Framework Planning process, as the City and stakeholders move closer to evaluating projects for implementation (see Chapter 7 of the City’s Integrated Water Resources Management Plan for additional discussion on Framework Planning).

The Mix of Conservation Practices and Associated Gallons Conserved Assumed for Water Conservation

Water Conservation Practice	Water Conserved (million gallons)
1,000 New rain barrels	0.52
Conservation incentives	250
Improvements in the water distribution system	250
Total Water Conserved by Water Conservation Practices (over five years)	500.52

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, the Water Conservation strategy was included in **TIER 2** of priorities for implementation.



METRICS

The table below shows the metrics that were addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the Water Conservation strategy

METRIC	METRIC	METRIC
✓ TN reduction	Riparian buffers restored/increased	✓ Area treated by GI
✓ TP reduction	Habitat protected or restored	Streams restored
✓ TSS reduction	Habitat connected by green corridor	✓ Stormwater volume reduction
Bacteria reduction	✓ Impervious surface reduced or treated	Stream access points added
Reduction in no. of CSO events	Trees planted	Streams buffers added
Reduction in CSO volume	✓ Potable water consumption reduced	Conservation easements added
PCB, metals, and toxics reduction	✓ Rain or storm water used for irrigation	Trash reduction
✓ Amount of water conserved	Percent increase in WQS compliance at James River compliance point	

✓ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness was evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) and expressed as cost per unit pollutant removed.

Pollutant Removal	
Average yearly TN load reduction (lbs/yr)	11
Average yearly TP load reduction (lbs/yr)	1
Average yearly TSS load reduction (lbs/yr)	422
Average yearly E.coli load reduction (billion cfu/yr)	--

Cost Effectiveness	
Cost per pound TN removed	\$24,092
Cost per pound TP removed	\$195,744
Cost per pound TSS removed	\$639
Cost per billion cfu E.coli removed	--

STRATEGY: LAND CONSERVATION

Place an additional 10 acres of city-owned land under conservation easement. When selecting acreage to include in the easement consideration will be given to the following factors:

- Prioritizing the conservation of land that creates connected green corridors
- Evaluating opportunities for inclusion of access points to waterbodies for recreational activities

The land conservation strategy focuses on placing an additional 10 acres of City-owned land under conservation easement. As part of the development of this high-level strategy, the IWRM Planning Team made a variety of assumptions and decisions with regard to implementation. It was assumed that 50% of the land included in the conservation easement would create connected green corridors. Green corridors are areas of open space that connect fragmented green spaces together allowing for the improved movement of people and wildlife.

While the land conservation strategy does not offer significant reductions in target pollutants, they do provide a number of other benefits for both local wildlife and the public, including: habitat protection, habitat restoration, increased recreational space, and an increased number of access points to waterbodies within the City.

Because there are no regulatory requirements driving land conservation in the City, this strategy also helps the City address the IWRM Plan objective to exceed regulatory requirements, when possible.

Land Conservation Benefits

Conservation/restoration of habitat

Improved connectivity between habitats

Increased public open space

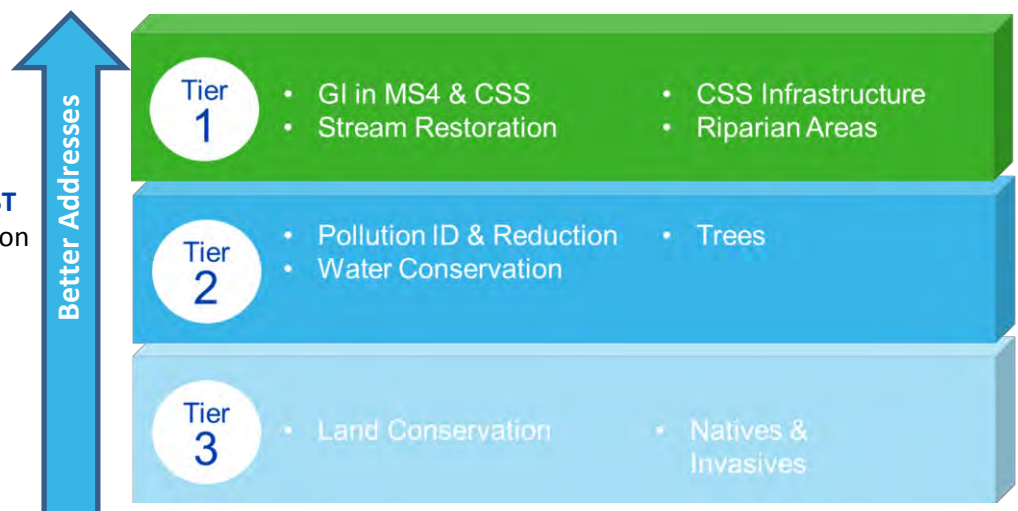
Increased mobility for wildlife

Increased access to recreational opportunities

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, the Land Conservation strategy was included in **TIER 3** of priorities for implementation.



METRICS

The table below shows the metrics that were addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the GI in the MS4 strategy

METRIC	METRIC	METRIC
TN reduction	Riparian buffers restored/increased	Area treated by GI
TP reduction	√ Habitat protected or restored	Streams restored
TSS reduction	√ Habitat connected by green corridor	Stormwater volume reduction
Bacteria reduction	Impervious surface reduced or treated	√ Stream access points added
Reduction in no. of CSO events	Trees planted	Streams buffers added
Reduction in CSO volume	Potable water consumption reduced	√ Conservation easements added
PCB, metals, and toxics reduction	Rain or storm water used for irrigation	Trash reduction
Amount of water conserved	Percent increase in WQS compliance at James River compliance point	√ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness for various strategies is evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) only. Because this strategy doesn't result in reduction of these pollutants, cost effectiveness could not be calculated.

Pollutant Removal		Cost Effectiveness	
Average yearly TN load reduction (lbs/yr)	--	Cost per pound TN removed	--
Average yearly TP load reduction (lbs/yr)	--	Cost per pound TP removed	--
Average yearly TSS load reduction (lbs/yr)	--	Cost per pound TSS removed	--
Average yearly E.coli load reduction (billion cfu/yr)	--	Cost per billion cfu E.coli removed	--

STRATEGY: POLLUTANT IDENTIFICATION AND REDUCTION

Reduce the contribution of pollutants to the municipal separate stormwater sewer system (MS4) area by:

- Conducting at least one special study per year in hot spot areas to identify illicit discharges/connections
- Collecting data associated with non-structural BMPs to facilitate quantification of pollutant reduction

The first part of this strategy involves identifying and eliminating illicit discharges within the MS4 area. Illicit discharges are sources of pollutants collected to storm drains that contribute contaminants to the system during periods of dry weather. This strategy will find and eliminate illicit discharges by conducting at least one special study each year in an area that has been deemed a “hot spot” for pollutant loading. By targeting “hot spots” the city can effectively and efficiently target relatively large sources of pollutants by eliminating the source of the discharge or by implementing a best management practice (BMP) to reduce the pollutant loading. Over five years, at least 3 of these studies will be used to meet pollutant reductions required by the Chesapeake Bay TMDL.

The second part of this strategy involves data collection for non-structural best management practices (BMPs). Currently, the assumptions associated with implementing non-structural BMPs such as catch basin clean outs and street sweeping are based on region-specific literature reviews. Because there is not an approved or commonly used methodology in place to account for pollutant reductions associated with pet waste removal, this practice was not accounted for quantitatively in the strategy calculator. By collecting site-specific data on pollution reduction practices, the City will be able to refine the pollutant removal rates associated with these projects and to better quantify their impact on the James River. As additional data and research substantiate the quantification of additional pollutant removal practices, these will also be taken into consideration.

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, the Pollutant Identification and Reduction strategy was included in **TIER 2** of priorities for implementation.



METRICS

The table below shows the metrics that were addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the GI in the MS4 strategy

METRIC	METRIC	METRIC
√ TN reduction	Riparian buffers restored/increased	Area treated by GI
√ TP reduction	Habitat protected or restored	Streams restored
√ TSS reduction	Habitat connected by green corridor	Stormwater volume reduction
Bacteria reduction	Impervious surface reduced or treated	Stream access points added
Reduction in no. of CSO events	Trees planted	Streams buffers added
Reduction in CSO volume	Potable water consumption reduced	Conservation easements added
√ PCB, metals, and toxics reduction	Rain or storm water used for irrigation	√ Trash reduction
Amount of water conserved	Percent increase in WQS compliance at James River compliance point	

√ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness was evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) and expressed as cost per unit pollutant removed.

Pollutant Removal	
Average yearly TN load reduction (lbs/yr)	448
Average yearly TP load reduction (lbs/yr)	162
Average yearly TSS load reduction (lbs/yr)	57,893
Average yearly E.coli load reduction (billion cfu/yr)	--

Cost Effectiveness	
Cost per pound TN removed	\$36,597
Cost per pound TP removed	\$100,882
Cost per pound TSS removed	\$284
Cost per billion cfu E.coli removed	--

STRATEGY: IMPLEMENT CSS INFRASTRUCTURE PROJECTS

Implement projects outlined in Richmond’s combined sewer overflow long-term control plan (CSO LTCP), including:

- Installing wet weather interceptor in Lower Gillies Creek to convey more flow to the WWTP
- Increasing wet weather treatment to 300 MGD at the WWTP
- Expanding Shockoe Retention Basin by 15 MG to capture more combined sewer overflow
- Adding disinfection at the Shockoe outfall to reduce bacteria in combined sewer overflow
- Expanding secondary treatment at the WWTP to 85 MGD

Implementation of Richmond’s combined sewer overflow long-term control plan (CSO LTCP) is required under a consent order from the State Water Control Board.

The consent order was issued in 2005 and includes an implementation schedule and a description of LTCP projects that will be implemented. Projects that are part of this strategy are aimed at decreasing the volume of CSOs by rerouting flows from the combined sewer outfalls to the Richmond waste water treatment plan (WWTP) and Shockoe retention basin (SRB), where those flows can then receive some level of treatment before being released into the James River. Increasing the treatment capacity of the WWTP and SRB, will result in smaller pollutant loads entering the James River, thereby improving water quality.

Strategy Elements

Expanding wet weather treatment at the waste water treatment plant

Improving wet weather conveyance in Lower Gillies Creek to the waste water treatment plant

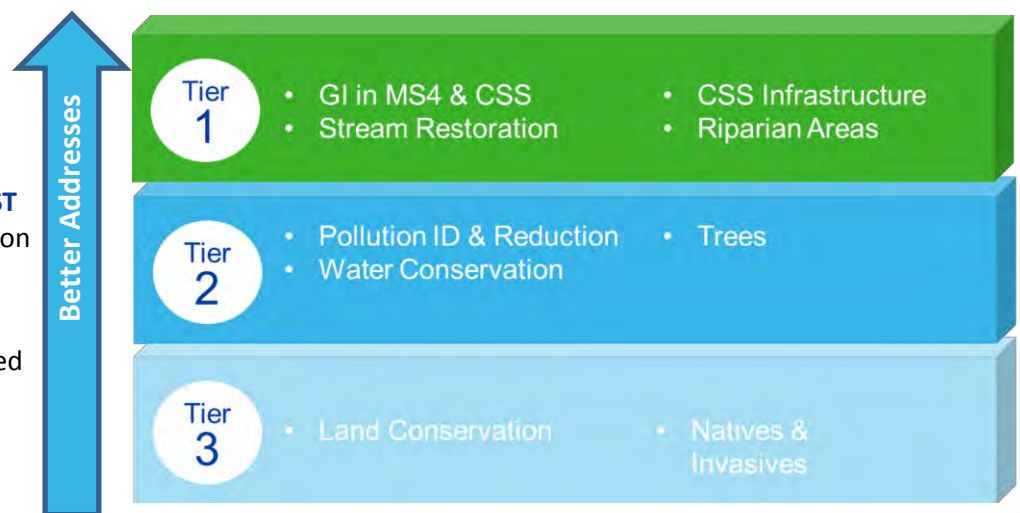
Expanding the Shockoe Retention Basin and disinfecting combined sewer overflows at SRB

Expanding secondary treatment at the waste water treatment plant

STRATEGY TIERS

Priorities for implementation are based on how well the strategy addresses selected **METRICS**, **POLLUTANT REDUCTION**, and **COST EFFECTIVENESS**. Each is discussed on the following page.

Overall, the Implement CSS Infrastructure Strategy was included in **TIER 1** of priorities for implementation.



METRICS

The table below shows the metrics that were addressed by this strategy. Additional details regarding information and assumptions related to this strategy and the numeric metric results can be found in the IWRM Planning Spreadsheet Calculator Tool, located at RVAH2O.org.

Metrics evaluated for the GI in the MS4 strategy

METRIC	METRIC	METRIC
√ TN reduction	Riparian buffers restored/increased	Area treated by GI
√ TP reduction	Habitat protected or restored	Streams restored
√ TSS reduction	Habitat connected by green corridor	Stormwater volume reduction
√ Bacteria reduction	Impervious surface reduced or treated	Stream access points added
√ Reduction in no. of CSO events	Trees planted	Streams buffers added
√ Reduction in CSO volume	Potable water consumption reduced	Conservation easements added
√ PCB, metals, and toxics reduction	Rain or storm water used for irrigation	√ Trash reduction
Amount of water conserved	√ Percent increase in WQS compliance at James River compliance point	√ = metric was addressed by the strategy

POLLUTANT REDUCTION & COST EFFECTIVENESS

Cost effectiveness was evaluated for the permit-driven metrics (TN, TP, TSS, bacteria) and expressed as cost per unit pollutant removed.

Pollutant Removal		Cost Effectiveness	
Average yearly TN load reduction (lbs/yr)	7,066	Cost per pound TN removed	\$55,507
Average yearly TP load reduction (lbs/yr)	903	Cost per pound TP removed	\$434,293
Average yearly TSS load reduction (lbs/yr)	116,843	Cost per pound TSS removed	\$3,357
Average yearly E.coli load reduction (billion cfu/yr)	3,551,112	Cost per billion cfu E.coli removed	\$110

SUPPORTING ACTIONS TO MAIN STRATEGIES

While strategies have been defined as “activities, actions, or items that will help meet goals and objectives” of the Integrated Water Resources Management (IWRM) Plan, a number of additional actions have been identified to support or facilitate the implementation of these strategies. These supporting actions to the main strategies include efforts that may broaden the main strategy, additional specificity on how a strategy could be implemented, or identify additional resources and data needs to fully implement the main strategy. These supporting actions are not necessarily quantifiable in and of themselves and may be components of multiple main strategies. They may also involve efforts on non-City property and rely on resources that are outside the DPU’s authority.

The development of strategies that meet the goals and objectives of the IWRM Plan resulted in a number of supporting actions related to:

- Partnerships
- Maintenance
- Monitoring, assessment & planning
- Incentives & credits
- Regulations, ordinances & codes
- Outreach

A summary of each of the supporting actions is discussed below and specific examples of these actions are included in the following tables.

The following table identifies which of these supporting actions are included in each strategy. For instance, the Riparian Area, Green Infrastructure (GI) in the municipal separate storm sewer system (MS4), and Tree Strategies address each of the six supporting actions. Alternatively the Pollution Identification (ID), Combined Sewer System (CSS) Infrastructure, and Land Conservation Strategies address only two supporting actions.

	Riparian Area	GI in MS4	GI in CSS	Stream Restor.	Natives/ Invasives	Trees	Land Cons.	Water Cons.	Pollution ID	CSS Infrast.
Partnerships	√	√	√	√	√	√	√	√		
Maintenance	√	√	√	√	√	√				
Monitoring	√	√	√	√	√	√			√	√
Incentives	√	√			√	√		√		
Regulations	√	√	√			√		√		
Outreach	√	√	√	√	√	√	√	√	√	√

Partnerships

The purpose of establishing partnerships is to facilitate a greater level of future implementation. This could be as the result of partnerships within the City, such as with Department of Planning or the Parks, Recreation, and Community Facilities. Partnerships may also include non-City agencies, such as watershed groups or neighborhood associations that can help facilitate implementation of strategies on private property. Non-DPU City departments, watershed groups, or neighborhood associations could work collectively with DPU to cost share implementation of strategies through shared staff and resources or through collaboration of actions. Additional specificity related to partnerships (along with other supporting actions) are expected to be refined over time as additional discussions and agreements are made with potential partners.

Maintenance

Many of the selected strategies require maintenance to ensure the strategy is performing as it should and will continue to meet its intended objectives. Part of this supporting action includes ensuring that sufficient funding is available and is part of each applicable strategy.

Monitoring, Assessment & Planning

The intent of this supporting action is to gather data and information and use these results to help inform and guide future implementation. This can include monitoring of specific practices, such as pre- and post-construction monitoring of a stream restoration project. It could also include the inventory and mapping of areas associated with the various strategies, such as riparian buffers or invasive species. Monitoring also includes the continuation of the James River and tributary sampling that is being used to evaluate the status and trends that are seen in the City's water quality and aquatic biological communities. As DPU is just one of the organizations that is conducting monitoring, another supporting action could include the initiation of a workgroup to improve coordination of data collection efforts.

Incentives & Credits

These supporting actions are intended to further evaluate, develop, and implement mechanisms to incentivize new initiatives or higher levels of future implementation. Specific actions can relate to expansion of the stormwater credit program to include reference to additional strategies, such as restoration of riparian buffers or removal of invasive and planting of native species on private land.

Regulations, Ordinances & Codes

This includes analyzing and modifying, if necessary, the framework within which implementation will occur. For instance, the Riparian Area Strategy is based on implementation within a 100 foot stream buffer. This supporting action could include evaluating expansion of this buffer to a 200 foot buffer. Additionally, City zoning and planning-related ordinances could be reevaluated to include language related to impervious area or to protect existing trees on developed property.

Outreach

Each of the 10 main strategies includes opportunities for education and outreach. This can include identifying ways to potentially expand upon future implementation by conveying information on resources available or ways for partners and the public support implementation of a strategy. As the implementation portion of the IWRM Plan is developed in more detail, specific activities will be identified and opportunities to implement these activities will be discussed with partner organizations.

COSTS

Costs were evaluated for each of the Supporting Actions. This information is summarized in the table below and detailed further in Appendix 5 (Strategy Cost Estimation) of the IWRM Plan.

Supporting Action	Estimated Cost
Partnerships	\$655,000
Maintenance	Cost was included in association with the individual strategies
Monitoring	\$1,208,000
Incentives/ Credits	\$500,000
Regulations	Assumed to be part of City staff's normal job duties
Outreach	\$500,000

	Riparian Areas	Green Infrastructure (in MS4)	Green Infrastructure (in CSS)	Stream Restoration	Native/ Invasives	Trees	Land Conservation	Water Conservation	Pollution Identification	CSS Infrastructure
Supporting Actions										
Partnerships	20 acres of riparian buffers on private properties: * Through purchase of land * Partnerships with residents: Promote program for buffers on private properties (include tiers of level of involvement - (1) maintenance agreement with city, (2) conservation agreement/ easement.)) * Partner with Master Naturalists to enlist their support to assist with riparian restoration	* 5 acres on DPW property (rights of way, roadways, green alleys) Implement 10 acres of GI on private property: * Adopt a rain garden program - coordinate with residents, non-profits, commercial entities * Partner with City's community garden program to identify 3 acres of area for additional GI implementation * Partner with Public Works to ensure City greenways include GI (5 acres of GI)	* 5 acres on DPW property (rights of way, roadways, green alleys) Implement 10 acres of GI on private property. : * Adopt a rain garden program - coordinate with residents, non-profits, commercial entities * Partner with City's community garden program to identify 1 acres of area for additional GI implementation * Partner with Public Works to ensure City greenways include GI (2 acres of GI)	Promote requests for stream restoration by private landowners. Streamline the process by which these requests are addressed.	* Develop a program to encourage the use of native plants in private landscaping - sign up 20 private landscapers. * Initiate an adopt-a-lot program (10 lots with invasive species removed, replanted, and maintained) * Partner with organizations, such as the James River Park System Invasive Plant Task Force, to better determine areas with significant invasive species issues and resources to deal with the problem.	* Partner with the public and other stakeholders, such as the Richmond Tree Stewards, to plant and maintain trees on public properties.	Partner with the public and other stakeholders to identify land to put in conservation easements. Include an additional 100 acres of non-City property in conservation easements.	* Partner with Richmond Redevelopment and Housing Authority to identify homes/properties that are eligible for upgrades to water efficient fixtures. * Partner with upstream localities and Virginia Department of Health to update/maintain Source Water Protection Plan		
Hire DPU staff or assign 1 FTE to coordinate volunteers from corporate entities, watershed/environmental groups, and public with partnership opportunities associated with the IP effort. Staff to enlist/maintain 6 of partnerships per year										
Hold 3 stakeholder meetings per year to continue communication with partners/stakeholders and add purpose to the IP effort.										
Evaluate partnership network in 5 years (at the end of the permit cycle) to assess gaps and identify new public/private partners.										
Maintenance	Include funding to support maintenance of newly replanted / restored riparian buffers (to ensure success of plantings, prevention of establishment of invasive species, etc.)	Include funding to support maintenance of green infrastructure practices based on findings of the inspection program to ensure continued pollutant reduction credit.		Include funding to support maintenance of restored streams.	Include funding to support maintenance of newly planted native plants as well as to maintain newly established plantings where invasives have been removed from the landscape	Provide funding to support maintenance of trees on city property to ensure their survival and health.				
Monitoring, Assessments & Planning	Inventory and map riparian areas to better understand loss or growth of riparian buffers	Evaluate potential for conducting pre and post construction monitoring of key stormwater BMPs.		Conduct pre and post restoration monitoring per Chesapeake Bay Program requirements	Monitor growth/expansion of invasive species.	Inventory and map locations of trees and tree boxes to better understand loss or growth of tree coverage.			Implement IDDE-related monitoring to support this effort - supported by a desktop analysis of high risk dischargers	Continue monitoring effort associated with the CSO and WWTP discharge programs.
	Continue monitoring of 8 locations across the city for macroinvertebrate, habitat, and instream water quality. Continue monitoring at two locations for flow. Evaluate opportunities to expand the flow monitoring network across the City.									
	Evaluate the development of a monitoring data portal to facilitate sharing of data collected within the City with stakeholders and the public.									

	Riparian Areas	Green Infrastructure (in MS4)	Green Infrastructure (in CSS)	Stream Restoration	Native/ Invasives	Trees	Land Conservation	Water Conservation	Pollution Identification	CSS Infrastructure
	Initiate monitoring workgroup in year one made up of technical stakeholders and other key groups/individuals to evaluate current monitoring efforts and identify potential efficiencies and additional monitoring needs moving forward.									
	Conduct assessments of 4 stream segments across the four watershed groupings to support the development of watershed restoration plans to address pollutant sources and watershed stressors.									
Incentives/ Credits	Reevaluate the stormwater credit program to determine potential to include practices such as replacing or restoring riparian buffers.	* Reevaluate the stormwater credit program (through updates to the credit manual) to include additional practices including tree planting, green roofs, etc. Reevaluation of the credit program will also include increases of funding available for these credits to incentivize implementation on private property. * Provide credits for residential and non-residential properties to reduce stormwater fees based on implementation of "green practices".			Evaluate incentives/credits for purchasing / planting native species (such as Montgomery County, MD).	* Reevaluate the stormwater credit program to determine potential to include practices such as planting trees on private property. * Provide 500 trees for planting on private property or equivalent incentives to purchase native trees.		* Offer grants to replace 20 % of inefficient fixtures in moderate to low-income units. * Evaluate expansion of incentive program to cover washing machines and dishwashers		
Regs/ Ordinance/ Code	Evaluate expanding the regulatory buffer from 100ft to 200ft	Evaluate inclusion of language in City zoning and planning-related ordinances to limit impervious area on developed property.				Evaluate inclusion of language in City zoning and planning-related ordinances to protect existing trees and add new trees on developed property.		Adopt permitting standards for water efficient appliances/fixtures in city code		
Outreach		Conduct outreach to advertise the resources, requirements, and services available through city related to green infrastructure for private property owners				Conduct outreach to advertise the resources, requirements, and services available through city related to tree planting and maintenance.		* Promote ability to use grey water for toilet flushing. Promote as way to achieve higher LEED standards. * Encourage and incentivize water capture and reuse for landscaping * Promote water conservation for commercial, industrial, and residential customers through efforts such as "Fix a Leak Week" and the City's Every Drop Counts initiative.	Conduct targeted outreach to high-risk industries, particularly in areas of the city identified as hot spots.	
	Conduct outreach to educate the general public about the goals and objectives of RVAH2O, and the resources and services available through the city.									

Appendix 3. RVA Clean Water Plan Goals, Objectives & Metrics

RVAH2O WATERSHED METRICS

GOAL	OBJECTIVES	METRICS
Manage wastewater and stormwater to improve the water quality and water quantity of ground water and surface water.	Develop one stormwater management plan to cover the City's four watershed groupings based on the City's watershed characterization report.	Plan produced (yes=1, no=0)
	Reduce nitrogen, phosphorus and sediment in discharges to achieve VPDES permit requirements (Chesapeake Bay TMDL).	<ul style="list-style-type: none">N reduction (lbs.)P reduction (lbs.)TSS reduction (lbs.)
	Reduce bacteria levels to achieve VPDES permit requirements (local TMDL and water quality standards).	<ul style="list-style-type: none">Percent increase in monthly geomean WQS complianceAverage yearly E. coli load reduction (billion cfu)Average yearly reduction in CSO events (number)Average yearly reduction in CSO volume discharged (million gallons)
	Reduce toxics (e.g., mercury, PAHs, PCBs), trash and other pollutants and address TMDLs for these pollutants.	<ul style="list-style-type: none">PCB, metals and toxics reduction (yes=1, no=0)Trash reduction (lbs.)
	Develop green infrastructure, including riparian buffers and removal of impervious surfaces on development, existing development and redevelopment.	<ul style="list-style-type: none">Area treated by GI (acres)Impervious surface reduced or treated (acres)
Protect and restore aquatic and terrestrial habitats to support balanced indigenous communities.	Restore streams to improve, restore and enhance native ecological communities.	<ul style="list-style-type: none">Streams restored (miles of streams)Reduce stormwater volume discharging to streams (gallons)Riparian buffers restored and/or increased (acres)
	Identify, protect and restore critical habitats.	Critical habitat protected or restored (acres)
	Enhance aquatic and terrestrial habitat connectivity.	Habitat connected by green corridor (acres)
	Investigate and, where feasible, promote actions that might surpass regulatory requirements.	Exceeds regulatory requirements (yes=1, no=0)
Engage and educate the public to share responsibility and take action on achieving healthy watersheds.	Engage and efficiently educate the public about standards, processes and actions associated with watershed health and public health.	Residents reached by effort (# of people)
	Assist in the education of citizens about overall water quality issues and benefits of improved water quality.	Residents reached by effort (# of people)
	Support and encourage local action to improve water quality.	<ul style="list-style-type: none">NGOs/community groups provided support by City (# of groups)Money available for incentives (dollars)
	Provide quicker public notifications of spills or pollution from regulators or other "river watchers."	Time to notify (days)
Implement land conservation and restoration and incorporate these into planning practices to improve water quality.	Protect, restore and increase riparian buffers.	Riparian buffers restored and/or increased (acres)
	Reduce impervious surfaces.	Impervious surface reduced or treated (acres)
	Increase natural land cover with a focus on preserving, maintaining and increasing tree canopy.	Trees planted (acres)
	Incorporate green infrastructure in new development and redevelopment.	Area treated by GI (acres)
	Conserve lands where possible and consistent with Richmond's Comprehensive Plan.	Conservation easements added (acres)
Create partnerships across the watersheds internal and external to the City of Richmond to maximize benefits and minimize impacts to all stakeholders.	Develop and implement a source water prevention plan/strategy.	Plan produced (yes=1, no=0)
	Establish public-private partnerships to secure funding, implement strategies and projects, and achieve plan goals.	Partnerships implemented (# of)
	Maintain and expand the RVAH2O group.	Meetings held (# of)
Maximize water availability through efficient management of potable water, stormwater and wastewater.	Reduce use of potable water for industry and irrigation.	<ul style="list-style-type: none">Potable water consumption reduced (gallons)Rainwater and stormwater used for irrigation (gallons)
	Achieve water conservation by improving the existing water conveyance system.	Amount of water conserved (gallons)
	Achieve water conservation by incentivizing upgrades to end-user water fixtures where appropriate.	Money available for incentives (dollars)
Provide safe, accessible, ecologically sustainable water-related recreational opportunities for all.	Improve water quality to promote safe recreation consistent with the City's Riverfront Plan.	<ul style="list-style-type: none">Percent increase in monthly geomean WQS complianceAverage yearly E. coli load reduction (billion cfu)Average yearly reduction in CSO events (number)Average yearly reduction in CSO volume discharged (million gallons)
	Promote ecologically sustainable management of riverfront and riparian areas.	Streams with buffers (length of streams with 100-foot buffer added)
	Improve river and waterfront access for recreation.	Access points (yes=1, no=0)
Work collaboratively to gather consistent high-quality data to characterize the status and trends of water resources and to gauge the effectiveness of restoration efforts.	Conduct water quality and biological monitoring.	Stations monitored (# of stations)
	Provide timely water quality information.	Time necessary for monitoring results (days)
	Collaborate with citizens and local/state agencies for coordinated monitoring.	Citizen groups/agencies coordinated with (# of)
	Utilize results to target restoration efforts and convey progress.	Project with monitoring component (yes=1, no=0)

Appendix 4. Calculator Spreadsheet Tool

See attached Excel document.

Appendix 5. Strategy Cost Estimation

See attached Excel document.