Appendix B

Summary of Public Involvement

Public Involvement Summary

2005-2013 Major Public Meetings

Table G-1: Major Public Meetings 2005-2013

Date	Meeting
Summer 2005	St. Paul's Plan Analysis Phase
Summer 2006	Initial Tidewater Gardens survey
November 1, 2006	Tidewater Gardens Resident Meeting
November 2, 2006	Community Meeting
Summer 2007	St. Paul's Plan Vision Phase
October 5-6, 2007	St. Paul's Plan Community Charrette
May 21, 2009	Public Vision Workshop
Summer 2009	Draft St. Paul's Plan
July 2009–June 2011	St. Paul's Plan Area Advisory Committee Meetings
June 2011	St. Paul's Plan Area Advisory Board
June 2011	HUD CNI Site Visit
June 2011–August 2012	CNI Committees
August 2, 2011	Tidewater Gardens Fun Days – CNI informational booth and surveys
September 2011–Present	Monthly CNI Status Meetings with Tidewater Gardens Resident Council
September 15, 2011	Huntersville Community Meeting
October 6, 2011	People Planning Community Meeting
October 12, 2011	St. Paul's Plan NRHA Board Presentation
October 12, 2011	Corporate leaders (NRHA CEO, the City Manager, Superintendent of NPS and, CEO of United Way) visit to Harlem Children Zone organized by United Way
November 17, 2011	Sister Project Visit – Washington DC Capital River Front w/CNI Grant Manager, CNI advisor TCG, NRHA Staff
December 12, 2011	St. Paul's Plan Tidewater Gardens Resident Meeting
January 18-20th, 2012	Norfolk CNI Group attend Harlem Children Zone
February 6, 2012	St. Paul's Plan Community Presentation
March 7, 2012	Huntersville Survey Event
April 1, 2012	St. Paul's Bus Transfer Meeting
April 24, 2012	Presentation to City Council Health, Education and Families Committee
July 27, 2012	Tidewater Gardens Fun Days – CNI informational booth and surveys
September 12, 2012	CNI presentation to NRHA Board
October 16, 2012	Joint City Council and NRHA Board workshop
October 22-23, 2012	Collective Impact Workshop with HUD at Young Terrace
October 1, 2012	Council Action on Bus Transfer
November 1, 2012	Council and Board Joint Meeting on St. Paul's

Date	Meeting
May 8, 2013	NRHA Board CNI presentation
May 8, 2013	Appointment of NRHA Board CNI Subcommittee
May 8, 3013	NRHA Board Meeting on First Choice Neighborhood Plan-Acceptance
May 29, 2013–August 22, 2013	NRHA Board Subcommittee Meetings
July 25, 2013	Planning Commission Public Hearing on St. Paul's Plan

2015–2018 Major Public Meetings

Table G-2: List of Public Meetings 2015-2018

Date	Event	Participating Groups	Meeting Location
June 19, 2015 – June 23, 2015	National Disaster Resilience Competition (NDRC)	Community Stakeholders, Residents, City and NRHA Staff	Slover Library
October 12, 2015	Meeting with Tidewater Residents on NDRC	Tidewater Residents	Hunton YMCA
October 8, 2015	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
November 17, 2015	Meetings with the Resident Advisory Board: Annual Plan Direction to demolish Tidewater Gardens	Public Housing Residents	Oakmont Community Center
December 10, 2015	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
February 11, 2016	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
May 12, 2016	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
October 13, 2016	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
January 12, 2017	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
January 24, 2017	Meetings with the Resident Advisory Board: Annual Plan Direction to demolish Tidewater Gardens	Public Housing Residents	Grandy Village Learning Center
March 9, 2017	NRHA Board of Commissioners-Annual Plan Public Hearing	Board members, Stakeholders, General public	Ruffner Middle School

Date	Event	Participating Groups	Meeting Location
June 27, 2017	Briefing of the TMC Presidents Tidewater Gardens and Calvert Square	Public Housing Residents	Calvert Square Family Investment Center
July 13, 2017	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
July 19, 2017	City Council Meetings-St. Paul's Presentations and Discussion	City Council, General public	City Council
August 8, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Tidewater Gardens	Residents, stakeholders, faith community, businesses	St. Mary's Basilica
August 12, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Young Terrace	Residents, stakeholders, faith community, businesses	Young Terrace Community Center
August 15, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Huntersville Community	Residents, stakeholders, faith community, businesses	United House of Prayer
August 19, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Tidewater Gardens	Residents, stakeholders, faith community, businesses	St. Mary's Basilica
August 24, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Young Terrace	Residents, stakeholders, faith community, businesses	Young Terrace Community Center
September 9, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Calvert Square Community	Residents, stakeholders, faith community, businesses	Calvert Square Family Investment Center
September 10, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Tenant Management Councils	Residents, stakeholders, faith community, businesses	Calvert Square Family Investment Center
September 14, 2017	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
September 17, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Business Community	Residents, stakeholders, faith community, businesses	Attucks Theater
September 21, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Pastor's Roundtable	Residents, stakeholders, faith community, businesses	First Baptist
October 21, 2017	St. Paul's Community Meetings-Mayor's Community Conversations: Resident Forum	Residents, stakeholders, faith community, businesses	Ruffner Middle School
November 14, 2017	City Council Meetings-St. Paul's Presentations and Discussion	City Council, General public	City Council

Date	Event	Participating Groups	Meeting Location
January 23, 2018	City Council Meetings-St. Paul's Presentations and Discussion	City Council, General public	City Council
February 26, 2018	Community Meeting on St. Paul's Choice Neighborhoods Initiative and Tidewater demolition	Residents, Stakeholders and Faith Community	St. Mary's Basilica
March 8, 2018	NRHA Board of Commissioners-Annual Plan Public Hearing	Board members, Stakeholders, General public	Ruffner Middle School
April 12, 2018	Mayor's St. Paul's Task Force	Residents, stakeholders, faith community, businesses	Attucks Theater
April 12, 2018	NRHA Board of Commissioners-Annual Plan Approval	Board members, General public	NRHA
April 26, 2018	St. Paul's Project Q&A-Public Forum	Community Stakeholders, Residents, Faith Community	Booker T Washington High School
May 17, 2018	Mayor's St. Paul's Task Force	Residents, stakeholders, faith community, businesses	Attucks Theater
June 19, 2018	Mayor's St. Paul's Task Force	Residents, stakeholders, faith community, businesses	Attucks Theater
June 20, 2018	Community Meeting on St. Paul's Choice Neighborhoods Initiative and Tidewater demolition	Residents, Stakeholders and Faith Community	St. Mary's Basilica
July 12, 2018	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
July 16, 2018	Community Meeting on St. Paul's Choice Neighborhoods Initiative and Tidewater demolition	Residents, Stakeholders and Faith Community	St. Mary's Basilica
July 17, 2018	Community Meeting on St. Paul's Choice Neighborhoods Initiative and Tidewater demolition	Residents, Stakeholders and Faith Community	St. Mary's Basilica
July 17, 2018	Mayor's St. Paul's Task Force	Residents, stakeholders, faith community, businesses	St. Mary's Basilica
July 18, 2018	Community Meeting on St. Paul's Choice Neighborhoods Initiative and Tidewater demolition	Residents, Stakeholders and Faith Community	St. Mary's Basilica
July 24, 2018	City Council Meetings-St. Paul's Presentations and Discussion	City Council, General public	City Council
August 9, 2018	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
August 21, 2018	Mayor's St. Paul's Task Force	Residents, stakeholders, faith community, businesses	St. Mary's Basilica

Date	Event	Participating Groups	Meeting Location
August 22, 2018	Community Meeting on St. Paul's and Tidewater demolition	Residents, Stakeholders and Faith Community	St. Mary's Basilica
September 7, 2018	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
September 13, 2018	Presentations to the NRHA Board of Commissioners	Board members, General public	NRHA
September 18, 2018	Mayor's St. Paul's Task Force	Residents, stakeholders, faith community, businesses	St. Mary's Basilica
October 9, 2018	Presentation to Olde Huntersville Civic League-CNI plan and Tidewater Gardens demolition	Huntersville Community Residents	Olde Huntersville Neighborhood Center
October 16, 2018	Mayor's St. Paul's Task Force	Residents, stakeholders, faith community, businesses	St. Mary's Basilica
December 6, 2018	Mayor's St. Paul's Task Force	Residents, stakeholders, faith community, businesses	St. Mary's Basilica

2019–2020 Major Public Meetings

Table G-3: Major Public Meetings 2019-2020

Date	Item	Time and Location
2019		
6/13	NRHA Board meeting: Resolution to approve CNI Grant	555 E. Main Street: 9 AM
6/18	St. Paul's Advisory Committee: USI meet and greet	St. Mary's Basilica: 6-7:30 PM
6/19	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
6/25	Tidewater Gardens Property Management Meeting: Discussion of voluntary vouchers/relocation availability for phase 1	Hunton YMCA: 6 PM
6/26	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
7/3	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
7/8	USI - Resident Introduction meeting	Hunton YMCA: 5-6 PM
7/9	Tidewater Gardens Financial Budgeting Simulation	Hunton YMCA: 6-8 PM

Date	Item	Time and Location
7/10	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
7/10	Tidewater Gardens Bank On Graduation	Hunton YMCA: 6-8 PM
7/11	NRHA Board meeting: USI Presentation	555 E. Main Street: 9 AM
7/16	St. Paul's Advisory Committee meeting	St. Mary's Basilica: 6-7:30 PM
7/16	Financial Education Summer Series: Dealing with Debt	Hunton YMCA: 6-8 PM
7/17	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
7/20	Community Partners briefing	
7/23	Tidewater Gardens Property Management Meeting	Hunton YMCA: 6 PM
7/23	Financial Education Summer Series: Tracking Income and Benefits	Hunton YMCA: 6-8 PM
8/7	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
8/8	Financial Education Summer Series: Dealing with Debt	Hunton YMCA: 6-8 PM
8/13	Development Team Meeting: Replacement housing analysis, site specific review, collaboration with USI and St. Mary's	555 East Main Street, 16th Floor Conference Room: 10 AM-5 PM
8/14	HUD Section 3 Conference for businesses to kickoff CNI activities	Downing-Gross Cultural Arts Center: 2410 Wickham Ave. Newport News, 8:30 AM – 12 PM
8/14	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
8/14	Inclusionary Housing Committee Meeting	Food Bank: 3-4 PM
8/15	NRHA Board meeting: CNI Update and 120 Notice	555 E. Main Street: 9 AM
8/15	Financial Education Summer Series: Tracking Income and Benefits	Hunton YMCA: 6-8 PM
8/19	VHDA Meeting: LIHTC deals required for CNI	City Hall 10th Floor: 2-4 PM
8/20	Meeting with Congressman Scott: St. Paul's Updates and Introduction to USI and Brinshore	City Hall 10th Floor: 10 AM-12 PM
8/20	St. Paul's Advisory Committee meeting: Technical plan review (joint public meeting)	Ruffner Academy: 6-7:30 PM
8/21	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
8/21	People Implementation Plan meeting/ budget discussion with USI	Resilience Office: 1-4 PM
8/22	Financial Education Summer Series: Understanding Credit Reports and Scores	Hunton YMCA: 6-8 PM

Date	Item	Time and Location
8/27	Tidewater Gardens Property Management Meeting	Hunton YMCA: 6 PM
8/27	Financial Education Summer Series: Keep it Safe (identity protection and record keeping)	Hunton YMCA: 6-8 PM
8/28	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
8/29	USI and NPS introduction/planning meeting	Resilience Office: 10-11 AM
9/4	Weekly People First team meeting	People First Office- 447 Walke Street: 1 PM
9/11	Weekly People First team meeting	People First Office- 447 Walke Street; 1 PM
9/12	NRHA Board meeting	555 E. Main Street: 9 AM
9/17	St. Paul's Advisory Committee meeting	St. Mary's Basilica: 6-7:30 PM
9/18	HUD Section 3 Conference for residents	Hunton YMCA: 10 AM-2 PM
9/18	Weekly People First team meeting	People First Office- 447 Walke Street; 1 PM
9/24	Tidewater Gardens Property Management Meeting	Hunton YMCA: 6 PM
9/25	Weekly People First team meeting	People First Office- 447 Walke Street; 1 PM
10/1	Collaborative Infrastructure Meeting	City Hall 7th Floor Conference Room: 1:30-3:30 PM
10/1	Joint City Council Meeting with the Norfolk Public School Board	4-7 PM
10/2	Architectural Review Board (ARB) Subcommittee: Block 20 discussion	City Hall 5th Floor: 3-5 PM
10/3	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3-4 PM
10/4	Meeting with HRT regarding Blocks 19 & 20	Hampton Roads Transit- 509 E. 18th Street: 1:30-2:30 PM
10/9	Blueway/ Greenway Landscape Architect firm interviews	2233 McKann Avenue: 12-5 PM
10/10	NRHA Board Meeting	555 E. Main Street: 9 AM
10/10	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3-4 PM
10/14-10/16	Purpose Built Communities Conference	Atlanta, GA
10/17	Development Team Monthly Visit	NRHA 16th Floor Board Room 9 AM – 3 PM
10/17	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3-4 PM

Date	Item	Time and Location
10/21	Architecture Review Board (ARB)- Block 20 final review	City Hall 10th Floor Conference Room: 4 PM
10/21-10/31	Willis Building site visit by Green Coast and E. Smith Legacy	TBD
10/22	Tidewater Gardens Property Management Meeting*	Hunton YMCA: 6 PM
10/24	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3-4 PM
10/28	People First Partners Meeting Partners who committed CNI leverage Information for RFQ Respondents	TBD
10/29	People First Partners Meeting: Education Partners	TBD
10/30	People First Partners Meeting: Community and Organizational Partners	TBD
10/30	Community Conversation Planning Meeting	NRHA 16th Floor: 2-3:30 PM
10/31	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3-4 PM
11/7	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3-4 PM
11/7	Architecture Review Board (ARB)	City Hall 10th Floor Conference Room: 4 PM
11/14	NRHA Board Meeting	555 E. Main Street: 9 AM
11/14	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3-4 PM
11/14	Planning Commission Public Hearing – Block 20	City Hall 11th Floor Conference Room: 2:30 PM
11/19	St. Paul's Advisory Committee meeting*	St. Mary's Basilica: 6-7:30 PM
11/20	Development Team Monthly Visit	Norfolk-TBD
11/26	Tidewater Gardens Property Management Meeting*	Hunton YMCA: 6 PM
12/18	Development Team Monthly Visit	Norfolk- TBD
12/3	Utility Coordination Meeting	City Hall 5th Floor Planning Conference Room: 1 - 3 PM
12/5	GNC Meeting: John Majors speaking	Slover Library: 8 - 9:30 AM
12/5	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 2 - 4 PM
12/6	City-NRHA Coordination Meeting	NRHA: 12 – 1:30 PM

Date	Item	Time and Location
12/9	Architectural Review Board: Block 20 review	City Hall 10th Floor Conference Room: 4 PM
12/11	Opportunity Zone Day Part III	Attucks Theater 8:30 AM – 7:30 PM
12/12	NRHA Board Meeting	555 E. Main Street: 9 AM
12/12	Planning Commission Block 20 Public Hearing	City Hall 10th Floor Conference Room: 1 – 3 PM
12/12	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3 - 4 PM
12/16	NRHA Annual Resident Forum	Hunton YMCA: 5:30 – 7 PM
12/17-12/19	Development Team Monthly Visit	TBD
12/17	People First Partner Engagement Meetings (Education)	Jordan-Newby Library 9 AM – 5 PM
12/17	St. Paul's Advisory Committee meeting*	Attucks Theater: 6 - 8 PM
12/18	People First Partner Engagement Meetings (Health and Economic Mobility)	Jordan-Newby Library 9 AM – 3 PM
12/18	Commercial and Community Space Planning Work Session	Slover Library: 1 – 4 PM
12/19	Tree Decision Meeting	Slover Library 9:30 – 10:30 AM
12/19	Collaborative Infrastructure Meeting	Slover Library 10:30 AM – 12:30 PM
12/19	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
12/26	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3 - 4 PM
2020		
1/2	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
1/9	NRHA Board Meeting	555 E. Main Street: 9 AM
1/9	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3 - 4 PM
1/15	Development Team Monthly Visit	Norfolk- TBD
1/16	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
1/21	St. Paul's Advisory Committee meeting*	St. Mary's Basilica: 6 – 7:30 PM

Date	Item	Time and Location
1/28	Tidewater Gardens Monthly Property Management Meeting	Hunton Y 6 PM
1/30	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
2/13	NRHA Board Meeting	555 E. Main Street: 9 AM
2/13	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
2/18	St. Paul's Advisory Committee meeting*	St. Mary's Basilica 6 – 7:30 PM
2/19	Development Team Monthly Visit	Norfolk- TBD
2/25	Tidewater Gardens Monthly Property Management Meeting	Hunton Y 6 PM
2/27	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
1/27	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
1/28	Streetscape Work Session	SPT/Resilience Office 10 AM–4 PM
1/29	Virginia Arts Conference	Richmond 9 AM – 5 PM
1/30	Meeting with Neighborhood Development: Engagement Plan	500 E. Main Street 9th Floor 1 – 2:30 PM
1/30	Christians United for Social Change presentation	First Lutheran Church 1301 Colley Avenue: 6:30 PM
1/30	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
1/31	Eviction Workshop	Hampton 10 AM – 12 PM
2/3	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
2/4	CNI City-NRHA Coordination Meeting	TBD 11 AM – 12 PM
2/6	Mayor's Commission on Aging presentation	Norfolk Fitness and Wellness Center 7300 Newport Ave. 9 – 10 AM
2/6	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3 - 4 PM
2/10	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
2/11	Section 3 Contractor Event	Calvert Envision Center 7241 Oakmont Drive: 9 AM – 2 PM
2/12	United for Children Executive Committee Meeting	Dominion Enterprises 150 Granby Street: 8 – 10 AM

Date	Item	Time and Location
2/13	NRHA Board Meeting	NRHA 16th Floor 9 AM – 11:30 AM
2/13	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
2/17	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
2/18	Resource Fair Meeting with Sheriff's Office	NRHA 16th Floor 10 – 11 AM
2/18	CNI City-NRHA Coordination Meeting	TBD 2:30 – 3:30 PM
2/18	'St. Paul's 10' Engagement Meeting	St. Mary's Basilica 4:30 – 5:30 PM
2/18	St. Paul's Advisory Committee Meeting	St. Mary's Basilica 6 – 7:30 PM
2/19	Development Team Monthly Visit	TBD
2/20	Collaborative Infrastructure Meeting	Slover Library 10 AM – 12 PM
2/20	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3 - 4 PM
2/24	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
2/27	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
3/2	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
3/5	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3 - 4 PM
3/9	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
3/10	Tidewater Gardens Public Meeting	William A. Hunton YMCA
3/12	NRHA Board Meeting	NRHA 16th Floor 9 AM – 11:30 AM
3/12	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
3/16	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
3/17	St. Paul's Advisory Committee Meeting	St. Mary's Basilica 6 – 7:30 PM
3/18	Development Team Monthly Visit	TBD
3/19	Collaborative Infrastructure Meeting	Slover Library 10 AM – 12 PM
3/23	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM

Date	Item	Time and Location
3/26	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
3/30	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
4/2	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3 - 4 PM
4/6	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
4/9	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
4/13	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
4/15	Development Team Monthly Visit	TBD
4/16	NRHA Board Meeting	NRHA 16th Floor 9 AM – 11:30 AM
4/16	Collaborative Infrastructure Meeting	Slover Library 10 AM – 12 PM
4/16	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3 - 4 PM
4/20	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
4/21	St. Paul's Advisory Committee Meeting	St. Mary's Basilica 6 – 7:30 PM
4/23	St. Paul's biweekly meeting with the City Manager	City Hall 11th Floor Conference Room: 3 - 4 PM
4/27	People First Coordination Meeting	SPT/Resilience Office: 1 -2 PM
4/30	St. Paul's biweekly meeting with Councilwoman Graves	City Hall 11th Floor Conference Room: 3 - 4 PM

St. Paul's Advisory Committee

St. Paul's Advisory Committee Members

Table G-4: St. Paul's Advisory Committee Members

Name	Affiliation
Ursula Banks	Tidewater Gardens Tenant Management Council
Michelle Cook	Tidewater Gardens Tenant Management Council
Emma Morgan	Tidewater Gardens Resident
Terri Dorey	Tidewater Gardens Resident
Jenelle Williams	Tidewater Gardens Resident
Rev. Dr. Robert Murray	First Baptist Church
Rev. Dr. Glenn Porter, Sr.	Queen Street Baptist Church
Earl P. Fraley, Jr.	Saint Mary's Catholic Church
Rev. John Burton	St. John's AME Church
Ronald Brown	Christ Pentecostal Church
Rev. Moses L. Davis, Sr.	Christ Pentecostal Church
John Mayer	McDonalds
Jason Cook	Norfolk Wholesale Floral Corporation
Donnell Brown	Norfolk Redevelopment and Housing Authority
John Hazelette	Norfolk Public Schools
Frank Duke	City of Norfolk

St. Paul's Advisory Committee Meetings

- July 30, 2009
- September 3, 2009
- October 1, 2009
- November 5, 2009
- December 3, 2009
- January 7, 2010
- February 4, 2010
- June 9, 2011
- June 27, 2011

Collective Impact – United for Children

People Planning Component facilitated the development of a group of critical partnerships (i.e., Norfolk Public School, City of Norfolk, United Way, and NRHA) for the expressed purpose of addressing barriers that impede economic independency and self---sufficiency. The October 2012 Collective Impact Work Session facilitated by Len Clay, from HUD led to the creation of the United for Children (UFC) Collaborative. Two committees, an Executive Committee and a Leadership Committee have been created to oversee the formation, collaboration and the implementation of UFC effort.

Executive Committee

An Executive Committee, made up of senior executives of the partners, as well as CEO---level community leaders, has set the vision and directed their staffs to execute, with a goal that all children in our targeted, high-poverty populations graduate on time from high school, ready for a productive, self-sufficient life. This group meets four times a year and staffs a working committee.

Table G-5: Executive Committee

Name	Organization	Title
Sarah Bishop	United Way	Director, Education Initiatives
Joan Brock	Women's Leadership Council	Community Leader
Susan Colpitts	Signature Financial, Women's Leadership Council	Chief Financial Officer
Dr. Deborah DiCroce	Hampton Roads Community Foundation	President/CEO
Richard Homan, MD	Eastern Virginia Medical School	President
Dr. Kirk Houston	Norfolk Public Schools	Board Chair for NPS
Dr. Linda Irwin-Devitis	Old Dominion University, School of Education	Professor
Marcus Jones	City of Norfolk	City Manager
Dr. Samuel King	Norfolk Public Schools	Superintendent
Carol McCormack	United Way	President/CEO
Shurl Montgomery	Norfolk Redevelopment & Housing Authority	CEO
Wick Moorman	Norfolk Southern	CEO
James Squires	Norfolk Southern	President
Dr. Linda Rice	Hampton Roads Community Foundation	Vice President for Initiatives
Lewis Webb	Kaufman and Canoles	Esq. Chair

Leadership Committee

The Leadership Committee is made up of leaders from each of the stakeholder organizations. They are charged with keeping the initiative on target, coordinating work across various subcommittees and working through barriers. They have commissioned 7 subcommittees.

Table G-6: Leadership Committee

Name	Organization	Title
Wynter Benda	City of Norfolk	Assistant City Manager
Sarah Bishop	United Way	Director, Education Initiatives
Susan Colpitts	Signature Financial, Women's Leadership Council	Chief Financial Officer
C.W. Gowen Jr., MD	Eastern Virginia Medical School	Chair of Pediatrics
Darrell Hill	City of Norfolk	Assistant City Manager

Name	Organization	Title
Dr. Linda Irwin-Devitis	Old Dominion University	Professor, Literacy Education
Claudia Keenan	Eastern Virginia Medical School	Senior Vice President, External Relations
John Kownack	Norfolk Redevelopment & Housing Authority	Chief Development Officer
Karen Remley, MD	Eastern Virginia Medical School	Founding Director, M. Foscue Brock Institute of Community and Global Health
Dr. Linda Sevigny	Norfolk Public Schools	Deputy Superintendent of Teaching & Learning
Dr. L'Tanya Simmons	Norfolk Public Schools	Deputy Superintendent of Operations
Pam Smith-Rodden	United Way	Vice President, Communications & Marketing
Judith Taylor-Fishwick	Eastern Virginia Medical School	Assistant Professor, Department of Pediatrics
Lewis Webb	Kaufman & Canoles	Chair of the Executive & Leadership Committees

NRHA Communication for St. Paul's Project

1. Annual Reports- 2017 & 2018

- Posts on Facebook
- Posts to NRHA website
- Dissemination in local business journal "Inside Business"

2. Families First Newsletter

- Direct mailer to all residents- Spring/Summer 2017 issue
- Direct mailer to all residents- Fall/Winter 2017
- Direct mailer to all residents- Spring/Summer 2018
- Direct mailer to all residents- Fall/Winter 2018

3. St. Paul's area Newsletters

- Direct mailer to all St. Paul residents- January 2018
- Direct mailer to all St. Paul residents- July 2018
- Direct mailer to all St. Paul residents- December 2018
- Direct mailer to all St. Paul residents- June 2019
- Direct mailer to all St. Paul residents- November 2019

4. "Bank On" Financial Literacy event series- January/February 2019

- Direct mailer to all St. Paul residents

- Flyers for communicate dissemination
- Post to NRHA website
- Event on Facebook
- Post on Facebook

5. St. Paul's Workshop Series (charrettes) - July 16-18, 2018

- Post to NRHA website
- Event on Facebook
- Post on Facebook
- Flyers for communicate dissemination
- Direct mailer to all St. Paul residents

6. St. Paul's Housing and Relocation Meeting for Tidewater Gardens- August 22, 2018

- Post to NRHA website
- Event on Facebook
- Post on Facebook
- Flyers for communicate dissemination
- Direct mailer to all Tidewater Gardens Residents

7. "Let's Get Ready" (Relocation Benefits/ HCV Prep) Meeting- March 2019

- Direct mailer to all Tidewater Gardens Residents
- Post to NRHA website
- Post on Facebook

8. Tidewater Gardens Community Meeting (Property Management Meeting immediately following CNI grant award) - May 23, 2019

- Direct mailer to all Tidewater Gardens Residents
- Post on Facebook
- Post to NRHA website

9. People Fist Block Party- May 11, 2019

- Post to NRHA website
- Event on Facebook
- Post on Facebook
- Flyers for communicate dissemination
- Yard signs in front of event venue

10. St. Paul's Advisory Council meeting- August 2019

- Direct mailer to all St. Paul residents
- Post on Facebook

11. Fit Finances Workshop- July 2019

- Direct mailer to all St. Paul residents
- Post to NRHA website
- Post on Facebook

12. Bottom Line Budgeting Workshop- July 9, 2019

- Direct mailer to all St. Paul residents
- Post to NRHA website
- Post on Facebook

13. Self-Care September event- September 2019

- Post to NRHA website
- Post on Facebook
- Flyers for communicate dissemination

14. GED Classes- September 2019

- Post to NRHA website
- Post on Facebook
- Flyers for communicate dissemination

15. Budget Public Hearings- June 14, 2018 & June 13, 2019

- Ad in Virginia Pilot Compass and New Journal & Guide
- Post to NRHA website
- Post on Facebook

16. Annual Plan Public Hearings- March 8, 2018 & March 14, 2019

- Ad in Virginia Pilot Compass and New Journal & Guide
- Post to NRHA website
- Event on Facebook
- Post on Facebook
- Flyers for communicate dissemination
- Posters in property management offices

17. Annual Plan Amendment Public Hearings- November 8, 2018 & November 14, 2019

- Ad in Virginia Pilot Compass and New Journal & Guide
- Post to NRHA website
- Post on Facebook

18. City Funding Applications- October 11, 2018 and October 10, 2019

- Ad in compass
- Post to NRHA website
- Post on Facebook

19. Annual Resident Forums (all communities) 2018 & 2019

- Direct mailer to all St. Paul residents
- Flyers for communicate dissemination
- Post to NRHA website
- Event on Facebook
- Post on Facebook
- Flyers disseminated in “food bags” distributed by Hunton YMCA to all communities

20. Tidewater Gardens Message Board Posters (including but not limited to the following)

- Relocation sequence map- August 2018
- Updated relocation sequence map- August 2019
- Personal Points of Contact (PPC) contact information (prior to People First)- August 2018

21. “Seize the Moment” Employment Fair- September 18, 2019

- Post to NRHA website
- Event on Facebook
- Post on Facebook
- Flyers for communicate dissemination
- Direct mailer to all St. Paul residents
- Ad in New Journal & Guide
- Banner posted outside of Hunton YMCA
- Flyers disseminated in “food bags” distributed by Hunton YMCA to all communities

22. Resident Employment Fair- November 7, 2019

- Post to NRHA website
- Event on Facebook
- Post on Facebook
- Flyers for communicate dissemination
- Direct mailer to all St. Paul residents
- Ad in New Journal & Guide
- Banner posted outside of Hunton YMCA

23. Other Marketing Collateral

- Relocation FAQ- November 2018
- Relocation brochure- November 2018
- St. Paul’s Q& A- January 2018
- CNI packet to City Council- September 2018
- CNI presentation to the Downtown Norfolk Council- November 2018
- CNI packet and presentation to Urban Land Institute- October 2018
- Guiding Principles graphic- August 2018
- Community Meeting Presentation- March 19, 2019

24. Press Releases

- Annual Plan for Assisted-Rental and Housing Choice Voucher Programs Now Available Public Hearing Scheduled- February 16, 2018
- NRHA Board Approves Annual Plan- April 12, 2018
- NRHA Board of Commissioner to Conduct CNI Workshop- September 5, 2018
- NRHA holds Public Hearing for FY 2020 Funding Application Summary- September 28, 2018
- Proposed Amendment to Assisted-Rental Programs Annual Plan- Public Hearing scheduled for November 8, 2018- October 10, 2018
- Norfolk Selected as a Finalist for FY2018 Choice Neighborhoods Initiative Grant – February 1, 2019
- Annual Plan Public Hearing- February 7, 2019
- People First Team Offices Open in Tidewater Gardens- March 20, 2019
- Norfolk Awarded $30M Choice Neighborhood Initiative Implementation Grant- May 13, 2019
- NRHA Sets Public Hearing for FY2020 Proposed Budget- June 14, 2019
- NRHA holds Public Hearing for FY 2021 Funding Application Summary- October 2, 2019
- Proposed Amendment to Assisted-Rental Programs Annual Plan- Public Hearing scheduled for November 14, 2019- Oct. 28, 2019
- NRHA Sets Public Hearing for FY2020 Proposed Budget- June 4, 2019

25. Board of Commissioners Meeting Announcements

- Post to NRHA website
- Event on Facebook
- Post on Facebook
- Post on Twitter

Appendix C

Coastal Zone Consistency Review

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 1111 East Main Street, Suite 1400, Richmond, VA 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

March 16, 2020

Vanasse Hangen Brustlin, Inc.
Attn: Kimberly S. Blossom
351 McLaws Circle, Suite 3
Williamsburg, VA 23185-6316
Via Email: kblossom@vhb.com

RE: Federal Consistency Review, St. Paul's Area/Tidewater Gardens Choice Neighborhood Implementation Grant, City of Norfolk, DEQ #4146

Dear Ms. Blossom:

On behalf of the Commonwealth of Virginia, the Department of Environmental Quality (DEQ) is responsible for reviewing and responding to federal consistency documentation submitted in accordance with the Intergovernmental Review of Federal Programs (E.O. 12372) and federal consistency regulations for the review of federal financial assistance to state and local governments (15 CFR, Subpart F, §930.90 *et seq.).* Pursuant to the Coastal Zone Management Act of 1972, as amended, because this project will be federally funded, it must be constructed and operated in a manner that is consistent with the Virginia Coastal Zone Management (CZM) Program.

PROJECT DESCRIPTION

According to the submission dated and received March 2, 2020, the Norfolk Redevelopment Housing Authority (NHRA), in partnership with the City of Norfolk, proposes to secure a Choice Neighborhood Implementation (CNI) Grant from the Department of Housing and Urban Development (HUD) to demolish, dispose of, and redevelop the Tidewater Gardens public housing community and nearby City of Norfolk owned properties in the St. Paul's area. Tidewater Gardens, located at 450 Walke Street, was constructed in 1953 and consists of 618 dwelling units located within 78 two-story apartment buildings covering approximately 44 acres. It has been determined that the structures are in poor physical condition, and demolition was recommended over renovation. Funds from this grant will also partially support the St. Paul's Area Transformation Plan, a mixed-income development initiative.

This project consists of the following:

- Demolition and disposition of Tidewater Gardens
- Disposition for infrastructure to support redevelopment (including roadways/ROW, open space, stormwater retention, pump station, and pathways
- Disposition for redevelopment of mixed-income apartment buildings, multi-story, mixed-use buildings, single-family residences, duplexes, and row houses
- Disposition for Future Commercial Development
- Redevelopment of the Snyder Lot (in northern downtown Norfolk), the Red Carpet Site/former Police Station (located north of Tidewater Gardens), and the Transit site surrounding the Downtown Norfolk Transit Area
- Potential renovation of the Willis Building

New development will include 730-1,000 residential units and 15,000 to 47,000 square feet of non-residential space.

FEDERAL CONSISTENCY

This project is consistent with the Virginia Coastal Zone Management Program (CZM), provided all applicable permits or approvals listed under "Enforceable Policies of Virginia's Coastal Zone Management Program" (enforceable policies) are received prior to implementation of the project. Accordingly, if any of the enforceable policies apply, please contact the relevant agencies to obtain applicable permits or approvals. DEQ's Tidewater Regional Office (DEQ TRO, 757-518-2000) administers the enforceable policies listed under DEQ's jurisdiction. Please contact that office for assistance in meeting the requirements of applicable programs.

The following discussion is provided as a guide to the enforceable policies administered by DEQ and other agencies of the Commonwealth which could apply to the project. In addition, DEQ encourages the applicant to consider potential project impacts to the advisory policies of the Virginia CZM Program. Final determination concerning potential impacts on these programs rests with DEQ TRO or the appropriate state agency. It is the applicant's responsibility to coordinate development with appropriate state agencies.

1. Non-point Source Pollution Control.

1(a) Erosion and Sediment Control and Stormwater Management. A project specific erosion and sediment control (ESC) plan must be submitted to the locality for review and approval pursuant to the local ESC requirements for land-disturbing activities equal to or greater than 10,000 square feet (2,500 square feet in a Chesapeake Bay Preservation Area). Depending on local requirements, the area of land disturbance requiring an ESC plan may be less. The ESC plan must be approved by the locality prior to any land disturbing activity at the project site. All regulated land-disturbing activities associated with the project, including on- and off-site access roads, staging areas, borrow areas, stockpiles, and soil intentionally transported from the project must be covered by the project-specific ESC plan. Depending on local requirements, a Stormwater Management (SWM) plan may be required. Local ESC and SWM program

requirements may be requested through the appropriate locality office. [References: Virginia Erosion and Sediment Control Law, Virginia Code §62. 1-44. 15:51 et seq.; Virginia Erosion and Sediment Control Regulations, 9 VAC 25-840-10 et seq.; Virginia Stormwater Management Act, Virginia Code §62. 1. 44. 15:51 et seq.; Virginia Stormwater Management Program Permit Regulations, 9 VAC 25-880-1 et seq.]

Additional guidance may be obtained from DEQ's Office of Stormwater Management, Larry Gavan at (804) 698-4040 or Larry.Gavan@deq.virginia.gov.

1(b) Virginia Stormwater Management Program General Permit for Stormwater Discharges from Construction Activities. DEQ is responsible for the issuance, denial, revocation, termination, and enforcement of the Virginia Stormwater Management Program (VSMP) General Permit for Stormwater Discharges from Construction Activities related to municipal separate storm sewer systems (MS4s) and construction activities for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program.

The operator or owner of a construction project involving land-disturbing activities equal to or greater than one acre is required to register for coverage under the General Permit for Discharges of Stormwater from Construction Activities and develop a project-specific stormwater pollution prevention plan (SWPPP). The SWPPP must be prepared prior to submission of the registration statement for coverage under the general permit, and it must address water quality and quantity in accordance with the VSMP Permit Regulations. General information and registration forms for the General Permit are available on DEQ's website at http://www.deq.virginia.gov./Programs/Water/StormwaterManagementWSMPPermits/ConstructionGeneralPermit.aspx. [References: Virginia Stormwater Management Act, Virginia Code sections 62. 1. 44. 15:24 et seq.; VSMP Permit Regulations, 9 VAC 25-870-10 et seq.] Additional assistance may be obtained by contacting DEQ's Office of Stormwater Management, Holly Sepety at (804) 698-4039 or Holly.Sepety@deq.virginia.gov.

2. Coastal Lands Management. Under the Chesapeake Bay Preservation Act (Bay Act), localities within the state's coastal zone have enacted programs designed to improve water quality in the Chesapeake Bay through mitigation of the impacts of development and redevelopment on sensitive environmental features such as streams, wetlands, floodplains, highly erodible soils, and highly permeable soils. Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) have been designated in each locality; these areas consist of groupings of sensitive environmental features. RPA features (tidal wetlands, certain non-tidal wetlands, tidal shores, and buffer areas) are the most sensitive; in general, only water-dependent uses may be constructed in an RPA. RMA features (highly erodible soils, highly permeable soils, and certain non-tidal wetlands) are less sensitive than RPA features, but no less important. Development in an RMA requires that activities meet certain performance criteria designed to mitigate negative environmental impacts. To ensure compliance with the Bay Act, please contact the appropriate locality office. Additional guidance may be

obtained from DEQ's Office of Local Government Programs, Daniel Moore at (804) 698-4520 or Daniel.Moore@deq.virginia.gov.

3. Air Pollution Control. DEQ recommends that precautionary measures be employed during construction to reduce ground-level ozone concentrations, especially during ozone alert days. This can be done by minimizing the generation of ozone precursors such as volatile organic compounds and nitrogen oxides during operation of construction equipment and vehicles. Any access roads, parking lots/garage, ingress/egress, or interchanges/ intersections should be designed and constructed so as to avoid or minimize traffic congestion and/or unnecessary localized vehicular idling.

Although no adverse impacts to air quality are anticipated from the proposed project, during construction fugitive dust must be kept to a minimum. This requires, but is not limited to, measures such as application of water to suppress dust and washing down construction vehicles and paved roadways immediately adjacent to the construction site. The following sections of the Regulations for the Control and Abatement of Air Pollution, which appear in the Virginia Administrative Code (VAC), may be applicable:

- 9 VAC 5-50-60 et seq. governs the abatement of visible emissions and fugitive dust emissions
- 9 VAC 5-45-760 et seq. addresses asphalt paving operations
- 9 VAC 5-130-1 0 et seq. addresses open burning.

For additional information, contact DEQ-TRO, Laura Corl at 757-518-2178, or Laura.Corl@deq.virginia.gov.

ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

In addition to the enforceable policies of the Virginia CZM Program, the project must comply with all other applicable federal, state and local laws and regulations. In general, to the extent practicable, development must incorporate features that prevent significant adverse impacts on ambient air quality, water quality, wetlands, historic structures, fish and wildlife, and species of plants, animals, or insects listed by state agencies as rare, threatened, or endangered.

The following discussion is provided as a guideline of programs administered by DEQ and other agencies of the commonwealth, which could be applicable. Final determinations concerning potential impacts on these programs rest with the DEQ TRO (757-518-2000) and the appropriate agency administering each program. It is the responsibility of the applicant (i.e., the NHRA) to coordinate with these agencies.

1. Solid and Hazardous Wastes, and Hazardous Substances. DEQ administers the *Virginia Solid Waste Management Regulations* (9 VAC 20-81) and the *Virginia Hazardous Waste Management Regulations* (9 VAC 20-60). The NHRA may contact DEQ's Tidewater Regional Office (Melinda Woodruff, telephone (757) 518-2174 or e-

mail Melinda.Woodruff@deq.virginia.gov) concerning the location and availability of waste management facilities in the project area.

1(a) Agency Recommendations. DEQ encourages all projects and facilities to implement pollution prevention principles, including:

- the reduction, reuse and recycling of all solid wastes generated; and
- the minimization and proper handling of generated hazardous wastes.

1(b) Requirements.

(i) Contaminated Waste. Any wastes that are generated must be tested and disposed of in accordance with applicable federal, state, and local laws and regulations.

(ii) Asbestos-Containing Materials and Lead-Based Paint. All structures being renovated must be checked for asbestos-containing materials (ACM) and lead-based paint (LBP) prior to demolition. If ACM or LBP are found, in addition to federal waste-related regulations, state regulations 9 VAC 20-80-620 for ACM and 9 VAC 20-60-261 for LBP must be followed.

2. Pollution Prevention. DEQ advocates that principles of pollution prevention and sustainability be used in all construction projects as well as in facility operations. Effective siting, planning, and on-site Best Management Practices (BMPs) will help to ensure that environmental impacts are minimized. However, pollution prevention and sustainability techniques also include decisions related to construction materials, design, and operational procedures that will facilitate the reduction of wastes at the source. We have several pollution prevention recommendations that may be helpful for this project:

- Consider environmental attributes when purchasing materials. For example, the extent of recycled material content, toxicity level, and amount of packaging should be considered and can be specified in purchasing contracts.
- Consider energy efficiency when choosing materials and products, like insulation, fixtures, and HVAC systems.
- Consider contractors' commitment to the environment when choosing contractors. Specifications regarding raw materials and construction practices can be included in contract documents and requests for proposals.
- Choose sustainable materials and practices for infrastructure and building construction and design. These could include asphalt and concrete containing recycled materials, and integrated pest management in landscaping, among other things.
- Integrate pollution prevention techniques into property construction and maintenance.

DEQ's Office of Pollution Prevention provides information and technical assistance relating to pollution prevention techniques. For more information, contact DEQ's Office of Pollution Prevention (Meghann Quinn, (804-698-4021).

3. Pesticides and Herbicides. DEQ recommends that the use of herbicides or pesticides for construction or landscape maintenance should be in accordance with the principles of integrated pest management. The least toxic pesticides that are effective in controlling the target species should be used. Please contact the Department of Agriculture and Consumer Services at (804) 786-3501 for more information.

4. Natural Heritage Resources. The Department of Conservation and Recreation's Division of Natural Heritage (DNH) maintains a Biotics Data System (Biotics) for occurrences of natural heritage resources in identified project areas. Natural heritage resources are defined as the habitat of rare, threatened, or endangered animal and plant species, unique or exemplary natural communities, and significant geologic communities. Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Department of Conservation and Recreation (DCR), DCR has the authority to report for VDACS on state-listed plant and insect species. Contact DCR-DNH, Rene Hypes at (804) 371-2708, to secure information on natural heritage resources.

5. Historic and Archaeological Resources. Section 106 of the National Historic and Preservation Act of 1966, as amended, requires that proponents of activities that receive federal funding must consider effects to properties that are listed, or eligible for listing, on the National Register of Historic Places. The Department of Historic Resources (DHR) conducts reviews of projects to determine their effect on historic structures or cultural resources.

Your letter indicates that the existing structures date from 1953. Please note that under historic preservation rules, structures over 50 years old may (by virtue of age and other characteristics) be eligible for listing on the National Register. Accordingly, we recommend that the NHRA or its agents contact DHR (Roger Kirchen, telephone (804) 482-6091) before proceeding with the rehabilitation work to ask two questions: (1) whether National Register (or Virginia Landmarks Register) eligibility is the case, and, if so, (2) whether it warrants any precautions relative to the scope of work that is contemplated for the property.

The NHRA or its contractor may encounter archaeological resources while undertaking or preparing for the project. If archaeological resources are encountered, contact DHR, Roger Kirchen at (804) 482-6091 or Roger.Kirchen@dhr.virginia.gov.

6. Energy Conservation. The redeveloped structure should be planned and designed to comply with state and federal guidelines and industry standards for energy conservation and efficiency. For example, the energy efficiency of the house can be enhanced by maximizing the use of the following:

- thermally-efficient building shell components (roof, wall, floor, windows and insulation).
- facility siting and orientation with consideration towards natural lighting and solar loads.
- high efficiency heating, ventilation, air conditioning systems.
- high efficiency lighting systems and daylighting techniques.

Please contact the Department of Mines, Minerals and Energy (David Spears at (434) 951-6350) for assistance in meeting this challenge.

7. Wildlife Resources. The Department of Game and Inland Fisheries (DGIF), as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over wildlife and freshwater fish, including state or federally listed endangered or threatened species, but excluding listed insects *(Virginia Code* Title 29.1). DGIF is a consulting agency under the U.S. Fish and Wildlife Coordination Act (16 U.S.C. sections 661 *et seq.),* and provides environmental analysis of projects or permit applications coordinated through DEQ and several other state and federal agencies. DGIF determines likely impacts upon fish and wildlife resources and habitat, and recommends appropriate measures to avoid, reduce, or compensate for those impacts. For more information, contact Amy Ewing at (804) 367-2211.

Thank you for the opportunity to review this proposal. If you have questions, please feel free to call me at (804) 698-4299.

Sincerely,

Janine Howard, EIR Coordinator
Office of Environmental Impact Review

Ec: Kerry Johnson, HUD

Appendix D

Natural Heritage Resources

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Date:

Self-Certification Letter

Project Name:

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Virginia Ecological Services online project review process. By printing this letter in conjunction with your project review package, you are certifying that you have completed the online project review process for the project named above in accordance with all instructions provided, using the best available information to reach your conclusions. This letter, and the enclosed project review package, completes the review of your project in accordance with the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA). This letter also provides information for your project review under the National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C. 4321-4347, 83 Stat. 852), as amended. A copy of this letter and the project review package must be submitted to this office for this certification to be valid. This letter and the project review package will be maintained in our records.

The species conclusions table in the enclosed project review package summarizes your ESA conclusions. These conclusions resulted in:

- "no effect" determinations for proposed/listed species and/or proposed/designated critical habitat; and/or
- Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR § 17.40(o) [as determined through the Information, Planning, and Consultation System (IPaC) northern long-eared bat assisted determination key]; and/or
- "may affect, not likely to adversely affect" determinations for proposed/listed species and/or proposed/designated critical habitat.

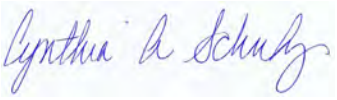
We certify that use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with the determinations described above for proposed and listed species and proposed and designated critical habitat. Additional coordination with this office is not needed.

Candidate species are not legally protected pursuant to the ESA. However, the Service encourages consideration of these species by avoiding adverse impacts to them. Please contact this office for additional coordination if your project action area contains candidate species.

Should project plans change or if additional information on the distribution of proposed or listed species, proposed or designated critical habitat becomes available, this determination may be reconsidered. This certification letter is valid for 1 year.

Information about the online project review process including instructions and use, species information, and other information regarding project reviews within Virginia is available at our website http://www.fws.gov/northeast/virginiafield/endspecies/project_reviews.html. If you have any questions, please contact Troy Andersen of this office at (804) 824-2428.

Sincerely,



Cindy Schulz
Field Supervisor
Virginia Ecological Services

Enclosures - project review package

VaFWIS Initial Project Assessment Report Compiled on 1/20/2020, 1:58:28 PM

Known or likely to occur within a **3 mile radius around point 36,50,53.7 -76,16,47.4** in **550 Chesapeake City, 710 Norfolk City, 740 Portsmouth City, 810 Virginia Beach City, VA**

View Map of Site Location

669 Known or Likely Species ordered by Status Concern for Conservation
(displaying first 45) (45 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
010031	FESE	Ia	Sturgeon, shortnose	Acipenser brevirostrum		BOVA
030074	FESE	Ia	Turtle, Kemp's ridley sea	Lepidochelys kempii		BOVA
010032	FESE	Ib	Sturgeon, Atlantic	Acipenser oxyrinchus		BOVA
030075	FESE	Ic	Turtle, leatherback sea	Dermochelys coriacea		BOVA
030073	FESE		Turtle, hawksbill sea	Eretmochelys imbricata		BOVA
040183	FESE		Tern, roseate	Sterna dougallii dougallii		BOVA
030071	FTST	Ia	Turtle, loggerhead sea	Caretta caretta		BOVA
040144	FTST	Ia	Knot, red	Calidris canutus rufa		BOVA
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
030072	FTST	Ib	Turtle, green sea	Chelonia mydas		BOVA
040120	FTST	IIa	Plover, piping	Charadrius melodus		BOVA
120030	FTSE	IVb	Manatee, West Indian	Trichechus manatus		BOVA
030064	SE	Ia	Turtle, eastern chicken	Deirochelys reticularia reticularia		BOVA
040118	SE	Ia	Plover, Wilson's	Charadrius wilsonia		BOVA
040110	FPSE	Ia	Rail, eastern black	Laterallus jamaicensis jamaicensis		BOVA
050034	SE	Ia	Bat, Rafinesque's eastern big-eared	Corynorhinus rafinesquii macrotis		BOVA
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
030013	SE	IIa	Rattlesnake, canebrake	Crotalus horridus		BOVA,Habitat
040096	ST	Ia	Falcon, peregrine	Falco peregrinus	Yes	BOVA,SppObs
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
040379	ST	Ia	Sparrow, Henslow's	Centronyx henslowii		BOVA
040179	ST	Ia	Tern, gull-billed	Gelochelidon nilotica		BOVA
020002	ST	IIa	Treefrog, barking	Hyla gratiosa		BOVA
030010	ST	IIa	Lizard, eastern glass	Ophisaurus ventralis		BOVA
040403	ST		Falcon, Arctic peregrine	Falco peregrinus tundrius		BOVA
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030067	CC	IIa	Terrapin, northern diamond-backed	Malaclemys terrapin terrapin	Yes	BOVA,Habitat,SppObs
030063	CC	IIIa	Turtle, spotted	Clemmys guttata		BOVA
030031	CC	IIIc	Kingsnake, scarlet	Lampropeltis elapsoides		BOVA
040092		Ia	Eagle, golden	Aquila chrysaetos		BOVA
040040		Ia	Ibis, glossy	Plegadis falcinellus		BOVA
040213		Ic	Owl, northern saw-whet	Aegolius acadicus		BOVA

020063		IIa	Toad, oak	Anaxyrus quercicus		BOVA
040052		IIa	Duck, American black	Anas rubripes		BOVA
040033		IIa	Egret, snowy	Egretta thula		BOVA
040029		IIa	Heron, little blue	Egretta caerulea caerulea		BOVA
040036		IIa	Night-heron, yellow-crowned	Nyctanassa violacea violacea	Yes	BOVA,CWB
040114		IIa	Oystercatcher, American	Haematopus palliatus		BOVA
040192		IIa	Skimmer, black	Rynchops niger		BOVA
040181		IIa	Tern, common	Sterna hirundo		BOVA
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA
040140		IIa	Woodcock, American	Scolopax minor		BOVA
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus		BOVA
040105		IIb	Rail, king	Rallus elegans		BOVA,Habitat
040304		IIc	Warbler, Swainson's	Limnothlypis swainsonii		BOVA

To view **All 669 species** View 669

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier
Virginia Widlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.; b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;
c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams (1 records)

View Map of All Anadromous Fish Use Streams

Stream ID	Stream Name	Reach Status	Anadromous Fish Species			View Map
			Different Species	Highest TE*	Highest Tier**	
C20	Elizabeth river	Confirmed	3		IV	Yes

Impediments to Fish Passage

N/A

Colonial Water Bird Survey (11 records)

View Map of All Query Results
Colonial Water Bird Survey

Colony_Name	N Obs	Latest Date	N Species			View Map
			Different Species	Highest TE*	Highest Tier**	
Urban, Norfolk South, Portsmouth	2	Jun 18 2013	2		II	Yes
Urban, Kempsville, Norfolk	2	Jun 14 2013	2		II	Yes
Urban, Norfolk South, Norfolk	2	Jun 14 2013	2		II	Yes
Ingleside	3	May 18 2008	3		II	Yes
Shea Terrace	2	May 18 2008	2		II	Yes
Tanglewood	3	May 18 2008	3		II	Yes
Campostella Heights	1	Jul 10 2003	1		II	Yes
Ghent	1	Jul 9 2003	1		II	Yes
West Ghent	1	Jun 1 1993	2		II	Yes
Campostella Jr. High	1	Jul 5 2008	1			Yes
Campostella Jr High	1	Jul 10 2003	1			Yes

Displayed 11 Colonial Water Bird Survey

Threatened and Endangered Waters

N/A

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests

N/A

Habitat Predicted for Aquatic WAP Tier I & II Species

N/A

Habitat Predicted for Terrestrial WAP Tier I & II Species (4 Species)

View Map of Combined Terrestrial Habitat Predicted for 4 WAP Tier I & II Species Listed Below

ordered by Status Concern for Conservation

BOVA Code	Status*	Tier**	Common Name	Scientific Name	View Map
030013	SE	IIa	Rattlesnake, canebrake	Crotalus horridus	Yes
030067	CC	IIa	Terrapin, northern diamond-backed	Malaclemys terrapin terrapin	Yes
040105		IIb	Rail, king	Rallus elegans	Yes
040186		IIIa	Tern, least	Sternula antillarum	Yes

Public Holdings: (3 names)

Name	Agency	Level
Fort Norfolk	Dept. of the Army	Federal
Norfolk Naval Shipyard	Dept. of the Navy	Federal
Portsmouth Naval Medical Center	Dept. of the Navy	Federal

Compiled on 1/20/2020, 1:58:28 PM I1011777.0 report=IPA searchType= R dist= 4828.032 poi= 36,50,53.7 -76,16,47.4
PixelSize=64; Anadromous=0.046468; BECAR=0.025928; Bats=0.025434; Buffer=0.213257; County=0.116263; Impediments=0.026133; Init=0.276682; PublicLands=0.052342; SppObs=0.339457; TEWaters=0.042227; TierReaches=0.079055; TierTerrestrial=0.317686; Total=1.620807; Tracking_BOVA=0.22981; Trout=0.036519

Site Location

36,50,53.7 -76,16,47.4
is **the Search Point**

Show Position Rings
(•) Yes ( ) No
1 mile and 1/4 mile at the **Search Point**

Show Search Area
(•) Yes ( ) No
3 Search distance miles radius

Search Point is at map center

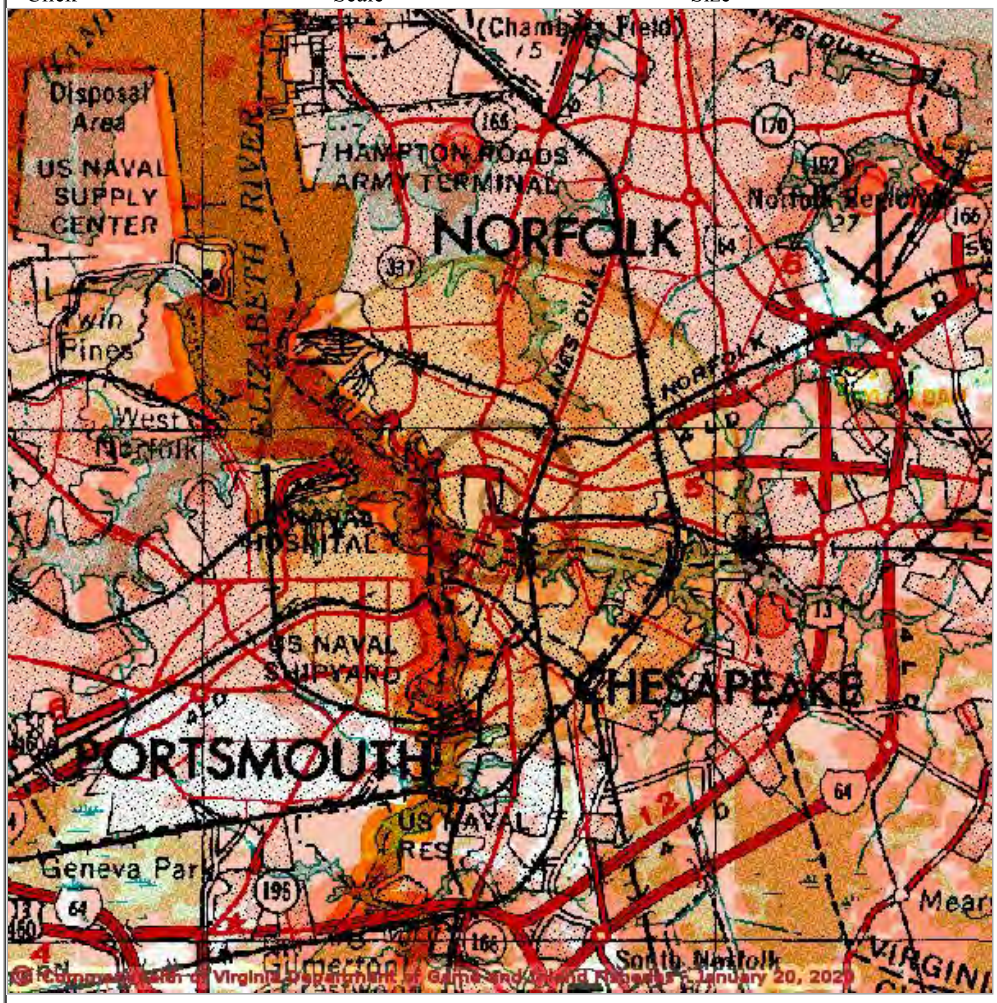
Base Map Choices
Topography ▼

Map Overlay Choices
Current List: Position, Search, BECAR, BAEANests, TEWaters, TierII, Habitat, Trout, Anadromous

Map Overlay Legend

Refresh Browser Page

Map Click Pan Id M Map Scale In Zoom Out Screen Size Small Size Big Help



Point of Search 36,50,53.7 -76,16,47.4
Map Location 36,50,53.7 -76,16,47.4

Select **Coordinate System:**
(•) Degrees,Minutes,Seconds Latitude - Longitude
( ) Decimal Degrees Latitude - Longitude
( ) Meters UTM NAD83 East North Zone
( ) Meters UTM NAD27 East North Zone

Base Map source: USGS 1:250,000 topographic maps (see Microsoft terraserver-usa.com for details)

Map projection is UTM Zone 18 NAD 1983 with left 376299 and top 4088403. Pixel size is 32 meters . Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixles. The map display represents 19200 meters east to west by 19200 meters north to south for a total of 368.6 square kilometers.

T & E Waters

Federal

State

Predicted Habitat WAP Tier I & II

Aquatic

Terrestrial

Trout Waters

Class I - IV

Class V - VI

Anadromous Fish Reach

Confirmed

Potential

Impediment

Position Rings 1 mile and 1/4 mile at the Search Point

3 mile radius Search Area

Bald Eagle Concentration Areas and Roosts

The map display represents 63002 feet east to west by 63002 feet north to south for a total of 142.3 square miles.

Topographic maps and Black and white aerial photography for year 1990+- are from the United States Department of the Interior, United States Geological Survey.
Color aerial photography aquired 2002 is from Virginia Base Mapping Program, Virginia Geographic Information Network.
Shaded topographic maps are from TOPO! ©2006 National Geographic http://www.national.geographic.com/topo
All other map products are from the Commonwealth of Virginia Department of Game and Inland Fisheries.

map assembled 2020-01-20 13:58:43 (qa/qc March 21, 2016 12:20 - tn=1011777.0 dist=4828.032 I)
$poi=36.8482500 -76.2798333

Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL & RECREATIONAL RESOURCES

Web Project ID: WEB0000012256

Client Project Number:

PROJECT INFORMATION

TITLE: Choice Neighborhoods Initiative (CNI) - Tidewater Gardens

DESCRIPTION: HUD Redevelopment Project

EXISTING SITE CONDITIONS: Existing HUD residential area

QUADRANGLES: Norfolk South

COUNTIES: City of Norfolk

Latitude/Longitude (DMS): 36° 51' 4.3061" N / 76° 16' 49.2555" W

Acreage: 278 acres

Comments:

REQUESTOR INFORMATION

Priority: N

Tier Level: Tier II

Tax ID: 04-2931679

Contact Name: Tim Davis

Company Name: VHB, Inc.

Address: 351 McLaws Circle, Suite 3

City: Williamsburg

State: VA

Zip: 23185

Phone: 757-220-0500

Fax: 757-903-2794

Email: tdavis@vhb.com

Conservation Site	Site Type	Brank	Acreage	Listed Species Presence
Natural Heritage Screening Features Intersecting Project Boundary				

Site Name	Group Name	Common Name	Scientific Name	GRANK	SRANK	Fed Status	Species of Concern	State Status	EO Rank	Last Obs Date	Precision
Natural Heritage Resources Intersecting Project Boundary											

Intersecting Predictive Models
Predictive Model Results

Choice Neighborhoods Initiative (CNI) - Tidewater Gardens

Project Boundary

Buffered Project Boundary

1:13,306

0 0.1 0.2 0.4 mi

0 0.175 0.35 0.7 km

Quads: Norfolk South

Counties: City of Norfolk

Company: VHB, Inc.

Lat/Long: 365104 / -761649

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

The project mapped as part of this report has been searched against the Department of Conservation and Recreation's Biotics Data System for occurrences of natural heritage resources in the vicinity of the area indicated for this project. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

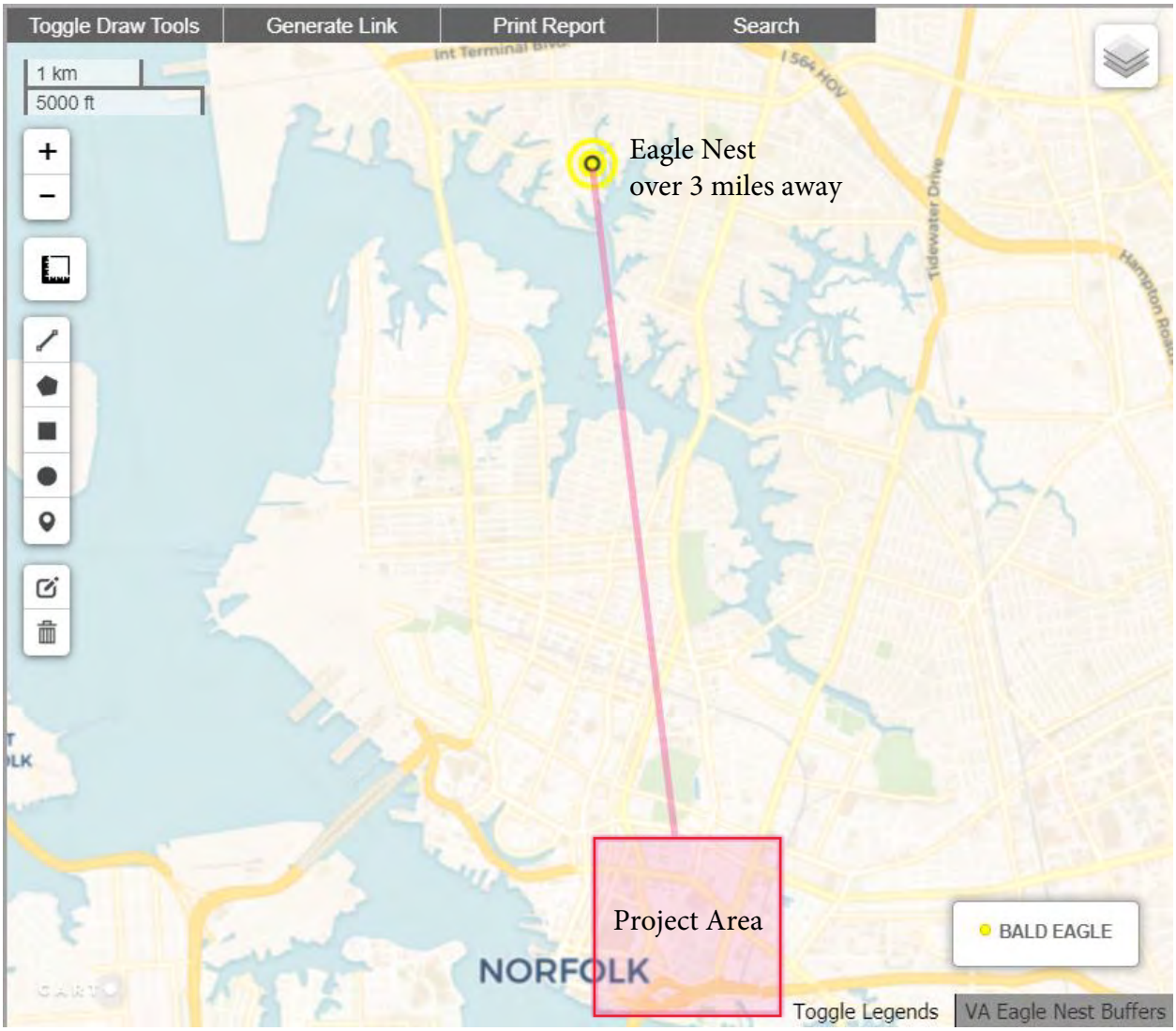
According to the information currently in Biotics, natural heritage resources have not been documented within the submitted project boundary including a 100 foot buffer. In addition, the project area does not intersect any of the predictive models identifying potential habitat for natural heritage resources.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Virginia Department of Conservation and Recreation (DCR), DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

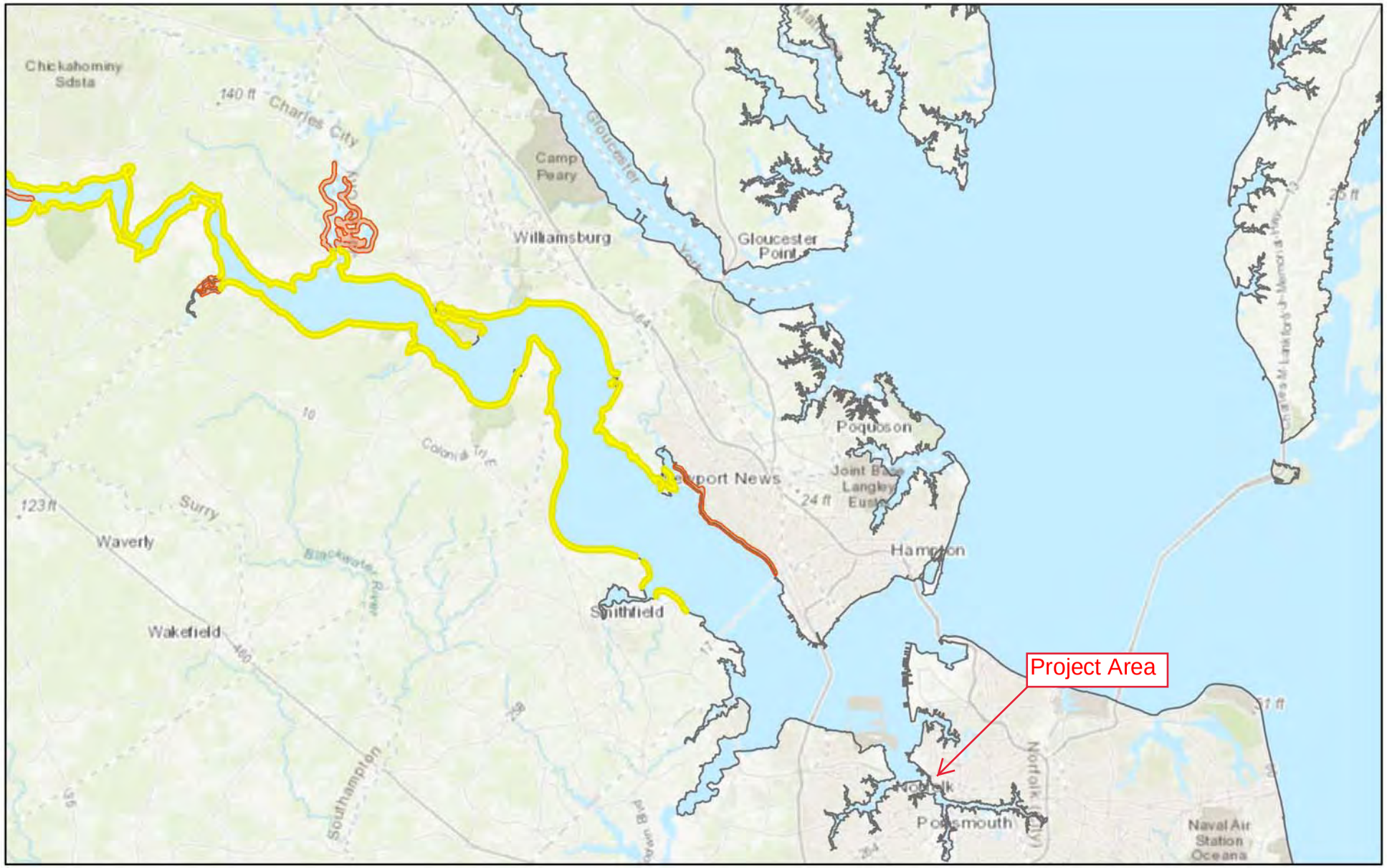
Any absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks additional natural heritage resources. New and updated information is continually added to Biotics. Please revisit this website or contact DCR for an update on this natural heritage information if a significant amount of time passes (DCR recommends no more than six months) before it is utilized.

The Virginia Department of Game and Inland Fisheries maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters, that may contain information not documented in the Natural Heritage Data Explorer. Their database may be accessed from http://vafwis.org/fwis/ or contact Ernie Aschenbach (804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov).

Thank you for submitting your project to the Virginia Department of Conservation and Recreation's Natural Heritage Data Explorer Web Service. Should you have any questions or concerns about this report, the Data Explorer, or other Virginia Natural Heritage Program services, please contact the Natural Heritage Project Review Unit at 804-371-2708.


Toggle Draw Tools
Generate Link
Print Report
Search
1 km
5000 ft
Eagle Nest
over 3 miles away
Project Area
NORFOLK
BALD EAGLE
Toggle Legends
VA Eagle Nest Buffers

Tidewater Gardens



January 20, 2020

1:577,791

0 4 8 16 mi

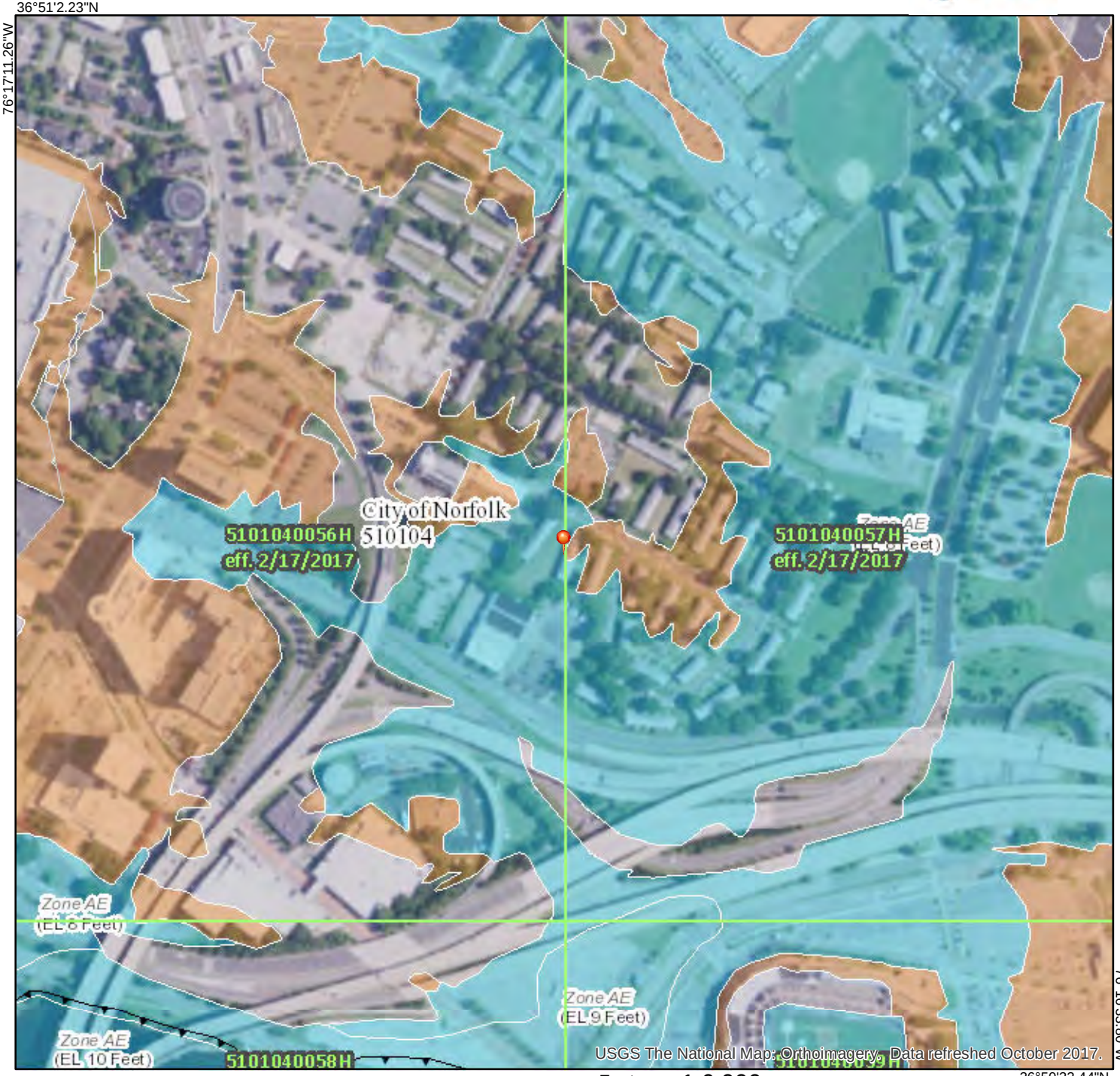
0 5 10 20 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS,

Appendix E

Additional Project Coordination & Compliance

National Flood Hazard Layer FIRMette



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/30/2018 at 9:04:23 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

SECTION 18 DEMOLITION DISPOSITION
PHYSICAL CONDITION ASSESSMENT (PCA)

TIDEWATER GARDENS -
NORFOLK REDEVELOPMENT HOUSING AUTHORITY
450 WALKE STREET, NORFOLK, VIRGINIA 23504

D3G PROJECT NUMBER:

2018-1258

REPORT ISSUE DATE:

SEPTEMBER 12, 2018

Marc Butler
Construction Inspector — Signature

Shawn Hughes
Senior Project Manager — Signature

Mike Ferguson, P.E.
Vice President of Technical Services — Signature

EXECUTIVE PROPERTY DESCRIPTION

Property: Tidewater Gardens –
Norfolk Redevelopment Housing Authority
450 Walke Street
Norfolk, Virginia 23504

Site Description: Tidewater Gardens, located at 450 Walke Street, Norfolk, Virginia consists of six-hundred eighteen (618) dwelling units located within seventy-eight (78) 2-story apartment buildings. According to D3G estimates and provided information, the property features a combined gross area of 543,402 square feet, is situated on 44.0 acres, and the structures were constructed circa 1953.

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

1.1 General Description

Project Name:	Tidewater Gardens - Norfolk Redevelopment Housing Authority
Address:	450 Walke Street Norfolk, Virginia 23504
Property Type:	Multi-Family Apartments; Affordable
Dates of Construction:	Circa 1953
Building Size/Type:	Seventy Eight (78) Residential Buildings / Total Gross area = 543,402 SF
Number/Type of Units:	Six-hundred Eighteen (618) dwelling units

1.2 General Physical Condition and Summary

This Physical Condition Assessment (PCA) identified that the circa 1953 structures are in poor physical condition and require significant rehabilitation and retrofit to render the structures viable for on-going safe and sanitary housing. Demolition is recommended as opposed to renovation. Our PCA concluded that the level of repairs and/or obsolescence observed at the property warrant consideration of Section 18 of the Housing Act of 1937, specifically:

a. Demolition Review Criteria for Obsolescence
Pursuant to 24 CFR 970 and Notice PIH 2012-7, in our professional opinion the Subject Property qualifies for *Functional Obsolescence*, based upon a multitude of factors concerning the 1950 masonry-constructed 2-story structures. Functional Obsolescence items are detailed in Section 3.1 of this report.

b. Demolition Review Criteria for Cost Ineffectiveness
Pursuant to 24 CFR 970 and Notice PIH 2012-7, in our professional opinion the Subject Property qualifies for *Cost Ineffectiveness*, based upon an analysis of the rehabilitation costs to correct deficiencies and aged systems within the 1950 masonry-constructed structures. A comparison of the Total Development Cost (TDC) to the estimated 16-Division construction/rehabilitation cost resulted in a ratio of 73.62%. Cost Ineffectiveness items are detailed in Section 3.2 of this report.

2.0 PURPOSE AND SCOPE

2.1 Purpose

D3G was retained by The Communities Group (the Client), on behalf of the Norfolk Redevelopment Housing Authority to conduct this Physical Condition Assessment (PCA) investigation in order to provide an objective, independent, professional opinion of the potential repair, rehabilitation and deferred maintenance associated with the subject property for an application pursuant to Notice PIH 2018-04 (HA), issued March 22, 2018. The demolition and disposition of public housing is authorized under Section 18 of the Housing Act of 1937, as amended. For the demolition of an entire development, the development must be determined to be obsolete as to physical condition, location, or other factors, making it unsuitable for housing purposes, and no reasonable program of modifications is cost-effective to return the public housing project or portion of the project to its useful life.

2.2 Scope

This PCA has been performed in accordance with ASTM E-2018-08 *Standard Guide for Property Condition Assessments: Baseline Property Condition Assessment Process*. This CNA is intended to provide an independent and detailed report of the current physical condition and future capital requirements for the subject property. This report includes a description of the overall condition of the building components and systems and conditions that may limit the Expected Useful Life (EUL) of the property and its systems. This report includes a discussion regarding functional obsolescence, significant deficiencies, deferred maintenance items, and material code violations at the subject property. The conclusions within this report are based upon a visual survey of the building and grounds, research of readily available documents, and conversations with people who have knowledge of the property. The assessment is based on interviews with management and local agencies, a review of available documents, and a visual examination of the property. The physical examination included a review of buildings, foundations, roofs, exterior/interior walls, mechanical systems, doors and windows, interior elements, and utilities.

This report is intended to provide information to assist with US Department of Housing and Urban Development (HUD) definitions for: (a) Demolition Review Criteria for Obsolescence; and, (b) Demolition Review Criteria for Cost Ineffectiveness. If a PHA proposes demolition/disposition under 24 CFR section 970.15, the SAC application is to provide a detailed description of the project's physical obsolescence, including a description of rehabilitation and details of the project's obsolescence (e.g. other factors that have seriously affected the marketability, usefulness or management of the project), and/or supporting documentation that rehabilitation of the public housing is cost prohibitive. Deliverables for this study, to assist with an evaluation of the Subject Property, include:

- The performance of a field inspection of the Subject Property conducted by individuals trained in building engineering and construction practices and licensed by the Building Performance Institute (BPI).

- Access to residential units was attempted, to include all vacant and down units. All exterior areas and common/mechanical areas of each building are accessed.

- The interviewing of tenants and staff regarding the condition of the apartment complex, common areas, and known physical/equipment deficiencies.

- Interviews with local officials regarding zoning and code compliance at the property, and receipt of zoning/building code certification.

- The preparation and submittal of a written report containing information specific to: observations, obsolescence, interpretations, and estimated costs of repairs.

- Discussion of items of Obsolescence; and basis for findings of Obsolescence.

- Completion of a rehabilitation estimate using CSI 16 Division format. The rehabilitation cost-estimate includes only work-items necessary to address the project's immediate needs (up to three years). Rehabilitation cost-estimate includes only work-items necessary to return the project to an average quality. Rehabilitation cost-estimate includes only necessary repair costs (e.g., with the exception of air conditioners, no new items such as on-site improvements other than those required by local ordinances, washer/dryer hook-ups, garbage disposals, porches). Cost estimation was performed using 2018 2nd quarter R.S. Means data.

- Evaluation of cost-effectiveness of rehabilitation in comparison to the project's total development cost (TDC) on form HUD-52860-B. HUD generally considers modifications not to be cost-effective if costs exceed 62.5% for elevator structures and 57.14% for other types of structures.

- The reporting of findings in a format acceptable by the Client.

3.0 SYSTEM DESCRIPTION AND OBSERVATIONS

3.1 Overall General Description

Project Name:	Tidewater Gardens -
	Norfolk Redevelopment Housing Authority
Address:	450 Walke Street
	Norfolk, Virginia 23504
Property Type:	Multi-Family Apartments; Affordable
Dates of Construction:	Circa 1953
Building Size/Type:	78 Residential Buildings / Total Gross area = 543,402 SF
Number/Type of Units:	Six-hundred eighteen (618) dwelling units

Unit Types	Rentable Area (ft2)	Number of Units	Total Rentable Area (ft2)
1 BR / 1 BA	490	98	48,020
2 BR / 1 BA	706	281	198,386
3 BR / 1 BA	925	174	160,950
4 BR / 1 BA	1,028	64	65,792
5 BR / 1.5 BA	1,414	1	1,414
	Total:	**618**	**474,562**

3.1.1 Remaining Useful Life (RUL)

The buildings at the subject property were constructed circa 1953. Marshall and Swift valuation service provides a published Economic Life of masonry constructed buildings at 50 years; whereas, technically the structures have outlived their economic life and require substantial rehabilitation and modernization.

3.1.2 Observations of Obsolescence

Pursuant to 24 CFR 970 and Notice PIH 2012-7, in our professional opinion the Subject Property qualifies for Functional Obsolescence and Cost Ineffectiveness, based upon a multitude of factors concerning the circa 1953 masonry constructed structures.

3.1.2.1 Building Code Obsolescence

The buildings at the subject property were constructed circa 1953, and future significant rehabilitation will require compliance with the following modern building codes:

- 2012 Virginia Rehabilitation Code
- 2012 International Building Code (IBC)

- 2012 International Mechanical Code (IMC)
- 2012 International Plumbing Code
- 2012 Life Safety Code (NFPA-101)
- 2011 National Electric Code (NFPA-70)
- 2012 International Energy Conservation Code (IECC)
- 2012 International Existing Building Code
- 2012 International Fuel Gas Code
- 2012 International Fire Code (IFC)
- Standard Installation of Sprinkler Systems in in Low-Rise Residential Occupancies (NFPA-13R)
- Standard Installation of Sprinkler Systems (NFPA-13)
- National Fire Alarm Code (NFPA-72)
- 2017 Virginia Housing Development Authority Minimum Design and Construction Requirements – (if LIHTC tax credits are utilized)

3.1.2.2 Structure / Original Design Obsolescence

The existing masonry construction presents significant issues with rehabilitation. The following conditions warrant discussion, relative to functional obsolescence:

Structural Deficiencies:

1. The property features select dwelling units with only partial accessibility features and do not feature universal design characteristics.
2. The dwelling units do not feature any insulation and would require the installation of wall cavities further reducing the amount of livable/leasable space within the units.
3. The sanitary waste lines are reported to be original cast iron and clay piping that has exceeded its life expectancy and complete replacement is required.
4. The current domestic water supply system has exceeded its life expectancy and complete replacement is required.
5. The electrical system is beyond its EUL with aging electrical breaker panels and deteriorating exterior meter banks. Circuit breakers serving outlets in the dwelling units would need to be changed to 'Arc Fault' type in order to meet the latest codes. 'Tamper Resistant' type receptacles are also now required throughout the units to meet the latest code. Additionally, smoke detectors in units are extremely old and are not interconnected. Light fixtures are outdated and inefficient.
6. The circa 1953 constructed buildings are not in compliance with modern fire codes to include interior fire-ratings of walls and ceilings, alarm systems, and fire suppression systems.
7. Required replacement of the existing heating system would likely precipitate the requirement for new building (ground to roof) chases, which would entail a reduction of unit sizes in the location of future vertical chase for construction of modern mechanical infrastructure.

8. Due to the nature of original construction, all electrical raceways and plumbing piping is exposed surface-mounted. Future modifications would require the same, whereas, appropriate construction would include either furring-out interior walls and construction of bulk-heads/enclosures around exposed piping.
9. Rehabilitation of the circa 1953 structures would include environmental remediation requirements relative to hazardous building materials (asbestos, lead and mold).
10. Rehabilitation and retrofit of the existing structures would result in a reduction of unit count and/or a reduction in the bedroom ratio; as well as a reduction in the net leasable square footage of the units.
11. The dwelling units currently feature small electrical panels that will not permit upgrade to current code or the installation of air conditioning within the units. Upgrade and replacement of the existing dwelling unit electrical panels would require an incoming electrical service upgrade to the buildings.
12. Select dwelling units feature un-grounded electrical outlets which are currently not code complaint.
13. The installation of split systems with air conditioning and ductwork throughout would be required to improve indoor air quality.
14. The 3, 4, and 5-bedroom dwelling units currently only feature one full bathroom. Appropriate, modern construction standards would include the construction of additional bathrooms for the larger dwelling units.

Design Deficiencies:

1. Rehabilitation of the property would require 100% vacancy/relocation. Due to requirements for major mechanical, electrical, and plumbing system and piping replacements, occupied rehabilitation would be unmanageable.
2. Rehabilitation of the structures would include environmental remediation requirements relative to hazardous building materials (asbestos, lead and mold).
3. The dwelling units are undersized compared to current standards.
4. Due to the nature of original construction, all electrical raceways and plumbing piping is exposed surface-mounted. Future modifications would require the same, whereas, appropriate construction would include either furring-out interior walls and construction of bulk-heads/enclosures around exposed piping.
5. A minimum of 1 ½ bathrooms (one full bathroom and one-half bathroom) in all two-bedroom units and a minimum of 2 full bathrooms in all three or more-bedroom units is recommended.
6. Lack of defensible space related to building layout / orientation: Large old growth trees, vast swaths of open space between buildings, lack of frontage on public streets, steep topography contribute to blind corners, expanses of indefensible space, and dark vegetated edges at the perimeter.
7. Inaccessibility for people with disabilities: While select units have been modified for people with disabilities, the units are not up to current standards and many areas of the site are not accessible. Site grading and walkways do not provide accessible routes to all site amenities including playgrounds.

8. Concrete that is cracked, crumbling, spalling, heaving or settling, or may be a safety issue is to be repaired or replaced.
9. The exterior entry doors are not insulated. The replacement of exterior doors is recommended.
10. The dwelling units do not feature central air conditioning. Additionally, the condensate from the window-mounted units runs down the outside of the buildings staining and deteriorating the brick exterior.
11. The dwelling unit bedroom and closet sizes are small in comparison with modern-day construction. Many closets are not enclosed with doors. Increasing the size of the rooms is not feasible due to the type of construction and overall size of the dwelling units.
12. The dwelling unit bathrooms sizes are small in comparison with modern-day construction and do not provide reasonable maneuvering space due to the placement of fixtures within the small spaces. Increasing the size of the bathrooms is not feasibly due to the type of construction and overall size of the dwelling units.

3.1.2.3 Cost Obsolescence

An analysis of the rehabilitation costs to correct deficiencies, deterioration, and aged systems within the circa 1953 masonry-constructed structures determined that demolition is recommended. Please note, the estimated construction costs do not include such things as additional bathrooms in the 3, 4, and 5-bedroom units or increased marketability by adding site improvements. A comparison of the Total Development Cost (TDC) to the estimated 16-Division construction/rehabilitation cost resulted in a ratio of 65.41%.

3.2 Site Improvements

3.2.1 Topography

The topography of the property varies slightly. The site has been graded to provide as much positive drainage away from the structures as possible. Storm water drainage consists of surface percolation from limited landscaped areas, and via sheet (water) flow over impervious surfaces to the municipal storm sewer.

3.2.2 Storm Water Drainage

Ponding of water, splash back at the base of the exterior walls and foundations, and negative drainage towards the structures was observed and reported throughout the property. Storm water drainage consists of surface percolation from limited landscaped areas, and via sheet (water) flow over impervious surfaces to the municipal storm sewer. Additionally, significant areas of bare soil and erosion were observed surrounding the buildings. The storm drainage system was reported and observed in poor physical condition with damaged inlets, many of which were observed clogged with debris. Significant flooding has been noted at the corner of Mariner Street and the service lane, and along Charlotte Street from Fenchurch Streets to

Walke Street. Regrading to provide positive drainage away from the buildings is recommended and has been included in the proposed rehabilitation cost estimate.

The residential buildings feature hip style roofs with gutters and downspouts that were observed in poor physical condition. The replacement of the gutters and downspouts is recommended and has been included in the proposed rehabilitation cost estimate.

3.2.3 Ingress, Egress and Community Connectivity

The property features multiple points of vehicular ingress and egress, consisting of asphalt drive lanes maintained by the local municipality. Pedestrian ingress and egress to the site is provided via sidewalks connecting each building throughout the property. The sidewalks throughout the site are connected to the municipal streets where public sidewalks are present.

3.2.4 Paving, Curbing and Parking

The property features asphalt driveways and a parking area at the management building. Additionally, the property features street parking for resident use. The asphalt paving at the parking area was observed in poor physical condition; requiring milling, paving, and restriping; however, is not included in the proposed rehabilitation scope of work cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.2.5 Flatwork

The site features concrete walkways, which vary in width from approximately thirty inches (32") to thirty-six inches (36") wide that were observed in generally poor physical condition. Replacement of the of concrete walkways is recommended but is not included proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.2.6 Landscaping and Appurtenances

3.2.6.1 Signage

Signage identifying the property was not observed. The property features building-mounted signage at each building identifying the units contained within. The dwelling units feature small plaques identifying the unit numbers.

3.2.6.2 Fencing

The subject property features a mix of chain link and wrought iron fencing in select areas that that was observed in generally poor physical condition. Replacement of the fencing is recommended but is not included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.2.6.3 Retaining Walls

The subject property features retaining walls in select areas throughout the property that were observed in poor to fair physical condition. Removal or replacement of the retaining walls is recommended but is not included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.2.6.4 Refuse Collection

The dwelling units are provided roll-out refuse containers for curb side pickup. The installation of refuse dumpsters within enclosures throughout the property is recommended but is not included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.2.6.5 Site Lighting

Exterior lighting at the property is provided via pole-mounted lighting fixtures maintained by the local electric utility, and building-mounted HID fixtures that were observed in poor physical condition. Replacement of the building-mounted HID fixtures is recommended to improve site safety and security and is included in the proposed rehabilitation cost estimate.

3.2.6.6 Landscaping, Lawn, and Irrigation

Landscaping consists of trees, shrubs, and grasses situated throughout the site and surrounding the apartment buildings. The existing landscaping was observed in generally poor condition, with overhanging trees that require trimming, and large areas of bare soil and erosion surrounding the majority of the residential buildings. Tree trimming, re-grading, the addition of top soil and re-seeding is recommended but is not included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.2.7 Recreational Facilities

The property features children's playgrounds, a basketball court, and community center/auditorium that were observed in poor to fair physical condition; however, repair or replacement of the recreational facilities is not included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.2.8 Utilities

3.2.8.1 Water

Service	Utility Provider	Responsible Party
Water Provider	City of Norfolk	Dwelling Unit: Owner
		Common Area: Owner

3.2.8.2 Electricity

Service	Utility Provider	Responsible Party
Electricity Provider	Dominion Energy	Dwelling Unit: Tenant
		Common Area: Owner

3.2.8.3 Natural Gas

Service	Utility Provider	Responsible Party
Natural Gas Provider	Virginia Natural Gas	Dwelling Unit: Tenant
		Common Area: Owner

3.2.8.4 Sanitary Sewer

Service	Utility Provider	Responsible Party
Sanitary Sewer Provider	City of Norfolk	Dwelling Unit: Owner
		Common Area: Owner

3.2.8.5 Special Utility Systems

3.2.8.5.1 Site Security Systems

The subject property does not feature any site security systems. The installation of a video surveillance system and perimeter fencing is recommended to control site access but is not included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.2.8.5.2 Other Utility Systems

The subject property features a central heating plant that provides domestic hot water (DHW) and heating water to the entire property. The systems within the heating plant were generally observed in fair to good physical condition but are expensive to maintain and operate. It should also be noted that the underground piping throughout the property was reported and observed in poor physical condition. D3G recommends elimination of the central heating plant, and installation of individual DHW and split heating systems in the dwelling units for improved comfort and efficiency.

3.3 Structural Frame and Building Envelope

3.3.1 Foundation

The foundation construction of the buildings consists of concrete grade beams and footings with 40-foot long wood piles, poured in place concrete slab on grade assemblies. It should be noted that according to the original construction drawings, building type X feature precast slab assemblies. The existing building foundations were observed in fair physical condition. Evaluation by a licensed structural engineer is recommended; however, evaluation and repair, if required, are not included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.3.2 Building Frame

The above ground load bearing wall assemblies are constructed of CMU. The floors are constructed of poured-in-place concrete. The roofs are hip truss roof systems constructed of wood members surfaced with wood sheathing, and asphalt shingle roofing. The hip roof truss assemblies were observed in fair physical condition.

Additionally, severe mold and moisture issues were observed throughout the units caused by exterior water infiltration and window-mounted AC units. Remediation of mold and mildew from the building frame, as well as replacement of any moisture damaged framing at the time of rehabilitation is recommended.

3.3.3 Building Envelope and Facade

3.3.3.1 Sidewall Systems (Exterior Walls, Fascia, Soffit and Trim)

The exterior wall assemblies are constructed of concrete masonry units surfaced with solid brick masonry. The exterior brick masonry was observed in generally poor physical condition, with deterioration of the brick and mortar joints observed. Replacement of approximately 25% of the brick masonry, raking and re-pointing of all mortar joints, and sealing of the brick masonry facade is recommended and has been included in the proposed rehabilitation cost estimate.

The buildings feature aluminum or vinyl wrapped wood fascia, and aluminum soffits that were observed in poor physical condition. Replacement of all aluminum or vinyl wrapped wood fascia, and aluminum soffits is recommended and has been included in the proposed rehabilitation cost estimate.

3.3.3.2 Fenestration System - Windows

The buildings feature aluminum framed, insulated window assemblies that are reportedly approximately 10 years old and were observed in poor to good physical condition. Replacement of approximately 50% of all windows, and replacement of all window screens is recommended and has been included in the proposed rehabilitation cost estimate.

3.3.3.3 Fenestration System - Doors

The dwelling unit entry doors consist of hollow-metal assemblies doors that were observed in generally poor to fair physical condition. Additionally, the dwelling unit entries feature aluminum storm doors that were also observed in generally poor to fair physical condition. Replacement of the exterior entry and storm doors is recommended and has been included in the proposed rehabilitation cost estimate.

3.3.3.4 Insulation

Thermal barrier insulation is identified to be insufficient per modern energy efficiency building standards. The brick and CMU masonry exterior walls provide thermal mass; however, likely do not feature any other insulation. Full compliance with current energy codes will be difficult to achieve based upon the thermal mass of the structures; however, installation of energy-code compliant insulation upon rehabilitation is recommended and has been included in the proposed rehabilitation cost estimate.

3.3.4 Roofing

The residential buildings feature asphalt shingle roofing was reportedly installed in 2002 and was observed in fair physical condition. Replacement of the existing asphalt shingles and sheathing within the next 3-years is not anticipated.

The dwelling units feature covered porches at the front entrances. The canopies are constructed of wood framing surfaced with corrugated metal panels. The canopies were observed in poor to fair physical condition with select canopies observed sagging, and damaged or deteriorated trim and soffits. Removal and replacement of all canopies is recommended and has been included in the rehabilitation cost estimate.

3.4 Mechanical and Electrical Systems

3.4.1 Plumbing Systems

3.4.1.1 Supply and Waste Piping

The main water supply to the buildings originates at water meter vaults located near the front of each building. Visually accessible domestic water piping is constructed of a mix of galvanized and copper piping, fittings, couplings, and joints. Where visible, domestic water piping is not insulated. The original plumbing piping was primarily surface-mounted and was observed to be in poor physical condition. Replacement of all domestic water supply piping and water meters is recommended and has been included in the proposed rehabilitation cost estimate.

Sewer connections at the property consist of a mix of cast iron and clay tile mains and branch lines connected to the municipal sewer system. Based upon observations, reported site conditions, and age of the system, replacement of the sewer lines, vents, stacks, and connections is recommended and has been included in the proposed rehabilitation cost estimate.

3.4.1.2 Domestic Hot Water (DHW) System

Domestic hot water (DHW) is supplied via natural gas-fired water heaters located in the central heating plant. The majority of the hot water piping is not insulated within the individual dwelling unit living spaces and may contribute to significant energy losses. Hot water piping failure modes reportedly include circumferential breaks, longitudinal splitting, and corrosion through holes. Replacement of all hot water piping and installation of individual hot water heaters is recommended and has been included in the proposed rehabilitation cost estimate.

3.4.1.3 Fixtures

Kitchen fixtures include stainless steel sinks and chrome faucets. The bathrooms feature wall-mounted sinks, floor-mounted water closets, and steel tubs with ceramic tile surrounds that were observed in generally poor physical condition. Replacement of the wall-mounted sinks and faucets, steel tubs, tub controls, floor-mounted water closets, and ceramic tile surrounds. Is recommended and has been included in the proposed rehabilitation cost estimate.

3.4.2 Heating Systems

The dwelling units are supplied heating exclusively via a central heating plant containing all dual-fuel boilers, pumps, condensing-type hot water heaters, expansion tanks, and gas/oil/heating water/domestic hot water piping. A centrally networked Energy Management System controls equipment installed at the Central Heating Plant. The systems within the heating plant were generally observed in fair to good physical condition but are expensive to maintain and operate. It should also be noted that reportedly the existing gas

infrastructure was installed in 1958 and will need significant repairs. Water has been noted in the gas line during heavy rains and the system appears to have low pressure during peak demands such as the holiday season.

Heating water is pumped to hot water radiant floor convectors in each unit. The manual shut-off valves reportedly do not work in most instances. Because of the inability to reduce the flow of hot water through the radiators, reportedly many tenants open their windows during the heating season to relieve the warm air. The hot water radiators are mostly original and are expected to fail due to rusted, dust-clogged, and/or cracked fins, as well as the integrity of the gaskets between fins becoming compromised over time. The majority of the heating water piping is not insulated within the individual dwelling unit living spaces and may contribute to significant energy losses. D3G recommends elimination of the central heating plant, and installation of individual DHW and split heating systems in the dwelling units for improved comfort and efficiency. Costs associated with the installation of individual hot water and heating systems is included in the proposed rehabilitation cost estimate.

3.4.3 Air Conditioning and Ventilation

3.4.3.1 Cooling Systems

The dwelling units are not provided conditioned air. Installation of high-efficiency split systems consisting of electric air handler units (AHU's) and pad-mounted condensing units is recommended to improve indoor air quality and has been included in the proposed rehabilitation cost estimate.

3.4.3.2 Ventilation Systems

The dwelling unit bathrooms feature operable windows; however, do not feature ceiling-mounted exhaust fans. Select dwelling units feature exterior vented range hoods, but most of the dwelling unit kitchens feature recirculating range hoods. Installation of exterior venting range hoods in the dwelling unit kitchens, and installation of exterior venting exhaust fans in the dwelling unit bathrooms to prevent mold and mildew is recommended and has been included in the proposed rehabilitation cost estimate.

3.4.4 Electrical Systems

3.4.4.1 Electrical Service and Metering

The property receives primary electrical power from Dominion Energy, which is then redistributed by NRHA owned overhead distribution system with pole-mounted transformers. The overhead electrical distribution system is subject to failure due to age, weather, overloading, and deferred maintenance. Reportedly the system is not of adequate size to support the addition of central air conditioning or other upgrades that will be required at the time of rehabilitation. Evaluation by a licensed electrical engineer is required, however, evaluation, and repair or replacement as deemed necessary by the engineer, are not

included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.4.4.2 Electrical Distribution

Each dwelling unit features a small surface-mounted electrical breaker panel located in the kitchen. Electrical service to each dwelling unit consists of 120/240V, 3 wire service with 50 - 150 amps provided. It is reported by the property management, and from limited visual access, that the electrical branch wiring at the complex is copper. Aluminum branch wiring was not observed. The majority of kitchens and bathrooms were observed without proper Ground Fault Circuit Interrupt (GFCI) protection. Replacement of the electrical panels to accommodate the required upgrades at the time of rehabilitation, and installation of code-compliant GFCI protected outlets in the kitchens and bathrooms is required and has been included in the proposed rehabilitation cost estimate.

3.4.4.3 Lighting Systems

Interior lighting throughout the dwelling units is provided via incandescent and fluorescent lighting fixtures. It could not be determined if lighting was sufficient, as the inspection was performed during the day; however, based upon the number of fixtures at the property and tenant and management interviews, lighting is presumed to be adequate. Replacement and upgrade of all dwelling unit lighting fixtures with high efficiency fixtures and bulbs is recommended and has been included in the proposed rehabilitation cost estimate.

3.4.4.4 Emergency Power Provisions

The subject property does not feature any emergency power provisions.

3.5 Vertical Transportation

3.5.1 Conveyance Systems

The subject property does not feature any mechanical conveyance systems.

3.5.2 Stairways

The 2-story townhouse dwelling units feature interior staircase assemblies. The staircase assemblies are constructed of steel stringers and treads, with a mix of wood and metal handrails. Overall, the interior stairways were observed in fair physical condition. Replacement of the treads and handrails is recommended and has been included in the proposed rehabilitation cost estimate.

3.6 NFPA – Life Safety Systems

3.6.1 Sprinklers and Standpipes

Due to the age of the buildings, D3G cannot confirm the existence of fire-rated construction (vertically and horizontally) between each unit at the property. Additionally, the buildings do not feature sprinklers and standpipes. Construction of code-compliant fire-rated assemblies (vertically) between each unit in the attic space, is recommended and has been included in the proposed rehabilitation cost estimate.

3.6.2 Alarm Systems

The dwelling units contain hard-wired smoke detectors located within the immediate vicinity of the sleeping areas; however, were observed without smoke detectors in the bedrooms of the units. Per HUD MAP Guidelines; according to Life Safety Code (NFPA 101), paragraph 31.3.4.5.1, smoke alarms must be installed outside every sleeping area in the immediate vicinity of the bedrooms and on all levels of the dwelling unit, including basements. In addition to the NFPA requirements, the regulation in 24 CFR 200.76 requires that smoke detectors must also be installed inside each sleeping area; therefore, the installation of compliant smoke detectors within all bedrooms is required and has been included in the proposed rehabilitation cost estimate. The smoke detectors can be either hard wired or battery powered. Battery powered smoke detectors must have the following features, according to the HUD MAP Guidelines: the cell must be tamper-resistant; the cells cannot be used in any other toy or appliance; the cells must have a ten-year life; the smoke detector may have a manual silencing device to clear unwanted alarms such as cooking smoke. For the purpose of this report we have budgeted battery powered smoke detectors, allowable by the HUD MAP Guidelines. It is recommended to contact the local municipality to determine if battery-operated smoke detectors are allowable. If further clarification is needed regarding smoke detector compliance, please contact the local reviewing HUD office. Select dwelling units feature visual devices (strobes) that are inter-connected to the facilities fire alarm system.

3.6.3 Other Life Safety/Emergency Systems

The subject property does not feature any other Life Safety/Emergency Systems.

3.7 Interior Elements

3.7.1 Interior Dwelling Units

3.7.1.1 Interior Finishes (Walls, Floors, and Soft Surfaces)

Interior finishes were observed in generally poor physical condition. Interior walls and ceilings of the dwelling units consist primarily of painted concrete masonry units (CMU). Interior ceilings consist of painted concrete on the ground level, and painted plaster on the second floor. Floor coverings within the dwelling units consist of VCT flooring. Removal and replacement of

all plaster, flooring, and all hazardous material content is recommended. Additionally, the installation of furring strips and gypsum wallboard on all CMU walls is recommended to conceal the new mechanical, electrical, and plumbing systems and has been included in the proposed rehabilitation cost estimate.

It should be noted that evidence of pests including insects and rodents were observed throughout the property. Upon completion of the proposed rehabilitation, it is presumed that a majority of the pest and rodent concerns should be alleviated; however, monthly inspection and treatment of the property by a licensed pest contractor is recommended to mitigate the possibility of repeat infestation.

3.7.1.2 Appliances

The dwelling unit kitchens feature electric ranges and refrigerators. The appliances were observed in generally poor physical condition. Replacement of all dwelling unit appliances at the time of rehabilitation is recommended but is not included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

3.7.1.3 Casework and Cabinets

Kitchen cabinets consist of wood-framed base and suspended wall cabinets that are of various ages. The base cabinets are surfaced with plastic laminate countertops. Visually inspected cabinets, hardware and countertops were observed in poor physical condition. Replacement of all kitchen cabinets and countertops is recommended and has been included in the proposed rehabilitation cost estimate.

3.7.1.4 Other Interior Elements

Interior and closet doors consist of wood door assemblies. Doors at the property were observed in generally poor physical condition. The replacement of all interior doors is recommended and has been included in the proposed rehabilitation cost estimate.

3.7.2 Common Areas

3.7.2.1 Hallways

The apartment buildings do not feature any common hallways.

3.7.2.2 Common Amenity Space

The residential apartment buildings do not feature any common amenity spaces.

3.7.2.3 Storage Areas

The property does not feature dedicated storage areas available for the residents outside of the dwelling units. The property features a maintenance building for the storage of maintenance items and equipment.

3.7.2.4 Office / Management Areas

Tidewater Gardens features a management building that contains the leasing and administrative offices. The finishes in the management building were observed in fair to good physical condition. Refurbishment of the management building is not included in the proposed rehabilitation cost estimate in accordance with the Section 18 Demolition/Disposition guidelines.

4.0 ADDITIONAL CONSIDERATIONS

4.1 Code and Regulatory Compliance

The site and all public areas were screened for compliance with the following applicable codes and regulations.

State Code: The current building code for the state of Virginia is the Virginia Rehabilitation Code (2012).

Energy Code: The current energy code for the state of Virginia is the 2012 International Energy Conservation Code (IECC).

Multifamily Related: The following multifamily housing related codes and standards apply to the property:

- Americans with Disability Act (ADA Code of 1991)
- Life Safety Code, National Fire Protection Association (NFPA)
- Uniform Federal Accessibility Standards (UFAS)
- Minimum Property Standards (MPS), HUD Handbook 4910.1
- 2017 Virginia Housing Development Authority Minimum Design and Construction Requirements – (if LIHTC tax credits are utilized)

4.1.1 Building Codes

4.1.1.1 NFPA – Life Safety Codes

Due to the age of the buildings, D3G cannot confirm the existence of fire-rated construction (vertically and horizontally) between each unit at the property. Additionally, the buildings do not feature sprinklers and standpipes. Construction of code-compliant fire-rated assemblies (vertically and horizontally) between each unit, is recommended and has been included in the proposed rehabilitation scope of work.

4.1.1.2 Local / State Building Code

The current building code for the state of Virginia is the Virginia Rehabilitation Code (2012).

4.1.2 Accessibility Regulations

4.1.2.1 Americans with Disabilities Act (ADA)

The public areas at the property were screened for compliance with the ADA Code of 1990, Title III, Public Accommodations and Commercial Facilities. The provisions of Title III provide that persons with disabilities should have accommodations and access to public and commercial facilities which are equal to, or similar to, those available to the general public. The final rules implementing Title III were published on July 26, 1991 and required compliance by January 26, 1992.

The residential buildings included within this report were constructed circa 1953 and consist of seventy-eight (78) apartment buildings that do not contain other public spaces. Therefore, the residential buildings are not subject to the requirements of the Americans with Disabilities Act (ADA).

4.1.2.2 Fair Housing Act (FHA)

The buildings were constructed circa 1953 and are not subject to the requirements of the Fair Housing Act, which requires residential buildings constructed after March 13, 1991, or permitted after June 15, 1990, be designed and constructed in compliance with the Act.

4.1.2.3 Section 504 / Uniform Federal Accessibility Standards (UFAS)

The UFAS was published in the Federal Register on August 7, 1984 (49 FR 31528). HUD adopted the UFAS in 24 CFR (Code of Federal Regulations) part 40, effective October 4, 1984. Effective as of July 11, 1988, the design, construction, or alteration of buildings in conformance with sections 3-8 of the UFAS shall be deemed to comply with the requirements of 24 C.F.R. Sections 8.21, 8.22, 8.23, and 8.25. If the design of a facility was commenced before July 11,

1988, the provisions shall be followed to the maximum extent practicable, as determined by the Department.

Tidewater Gardens was originally constructed circa 1953 and features project-based assistance. Therefore, the buildings and units included in this report are subject to the requirements of Section 504 of the Rehabilitation Act of 1973. The property currently features select dwelling units that are designated handicapped accessible with partial UFAS compliant features. Reconfiguration of 5% or thirty-one (31) dwelling units to be fully UFAS compliant, and the installation of audio/visual alarm notification for the hearing and visually impaired in 2% or thirteen (13) dwelling units is required at the time of rehabilitation is required and has been included in the proposed rehabilitation cost estimate.

4.1.3 Seismic Design Considerations

According to available information, the subject property is situated within a designated Seismic Zone 1, an area of low seismic activity. Consistent with the seismic requirements outlined in Standard and Poor's "Property Condition Assessment Criteria for Multifamily Buildings," additional evaluation is only necessary for structures, which are within a Zone 3 or 4; therefore, no additional evaluation is required regarding seismic activity at the subject property.

4.2 Environmental Considerations

4.2.1 Fuel Storage Tanks

The subject property features two (2) 10,000-gallon underground storage tanks (UST's) containing heating oil adjacent to the central heating plant. The heating oil is used to supplement the duel-fuel boilers that. No issues regarding the UST's was reported or observed.

4.2.2 Lead Based Paint (LBP)

The subject property was constructed circa 1953, prior to the 1978 ban on lead-based paint (LBP); therefore, LBP is suspected to be present at the property. Per 24 CFR 35 – Subpart G 35.630 and HUD MAP 9.5.A.5, conversions and major rehabilitation projects require full abatement of lead-based paint. Complete removal of all Lead Based Paint is recommended and has been included in the proposed rehabilitation scope of work. Abatement activities may include chemical stripping of lead-based paints, enclosure of lead-based paints (i.e. covering existing LBP walls with sheetrock), paint stabilization with an ASTM/EPA approved encapsulate paint and/or selective demolition and disposal. Any remaining LBP should be managed under a site-specific Operations and Maintenance (O&M) Program. Components identified as containing lead in any concentration are required be handled in accordance with 29 CFR 1926.62, the OSHA "Lead Exposure in Construction" Standard (OSHA does not define LBP). All generated debris containing lead-based paint is to be appropriately disposed of in accordance with applicable EPA RCRA requirements. All renovation and maintenance workers are required to have a one-day EPA renovator class when working in residential

facilities constructed prior to 1978 that contain LBP and any impacts to LBP must be conducted in accordance with applicable EPA and state regulations. Complete removal and disposal of all LBP is required at the time of rehabilitation and has been included in the proposed rehabilitation cost estimate.

4.2.3 Asbestos-Containing Material (ACM)

The subject properties were constructed circa 1953, at a time when the use of asbestos containing materials (ACMs) were prevalent in construction practices; therefore, presumed ACMs are suspected to be present at the subject property. ACMs which are to be impacted by the renovation activities should be removed from the facility. Removal activities should be conducted by a licensed asbestos abatement contractor in accordance with applicable local, state and federal guidelines. In addition, any remaining identified ACMs and/or PACMs should be managed in place under a site-specific Operations and Maintenance (O&M) Program. Complete removal and disposal of all ACM's is required at the time of rehabilitation and has been included in the proposed rehabilitation cost estimate.

4.2.4 Mold and Mildew

Mold and mildew was reported and observed in the majority of dwelling units throughout the property. Upon completion of the proposed rehabilitation scope of work, any mold/mildew will have been remediated and removed. Additionally, the installation of additional mechanical ventilation and replacement of the windows should mitigate any additional mold/mildew growth. Complete removal and remediation of all mold is required at the time of rehabilitation and has been included in the proposed rehabilitation cost estimate.

Additionally, the installation of additional mechanical ventilation, waterproofing of the exterior façade, and the replacement of the windows at the time of rehabilitation should mitigate any additional mold/mildew growth.

4.2.5 FEMA Flood Plains and Hazards

According to FEMA Flood Insurance Rate Maps (FIRM's) #5101D-040056H and #5101D-040057H dated February 17, 2017, the majority of the property is located in Zone AE, designated as a zone that has a 1% probability of flooding every year (also known as the "100-year floodplain"), and where predicted flood water elevations above mean sea level have been established. Properties in Zone AE are considered to be at high risk of flooding under the National Flood Insurance Program (NFIP) and mandatory flood insurance is required.

4.2.6 Other Environmental Conditions

The subject property was constructed circa 1953. The antiquated building envelope and infrastructure present limitations to achieving typical modern resident amenities, including second bathrooms in 3, 4, and 5-bedroom dwelling units, larger closets, and addition of dishwashers and disposals. Besides general functional and design obsolescence, the dwelling units were observed in very poor physical condition with advanced capital needs, including systemic mold and moisture damage presenting health and safety risks.

5.0 DOCUMENT REVIEWS AND INTERVIEWS

5.1 Document Review

The investigation of the subject property required that select documents be reviewed to obtained site specific information. As part of the audit desk review, the following documentation was obtained and reviewed:

a. Site specific information provided for review:
    i. Property Questionnaire
    ii. Various Property Provided Documentation
    iii. Construction Drawings
    iv. REAC report

5.2 Site Interviews and Questionnaires

The scope of a Physical Condition Assessment requires that persons familiar with the property be interviewed, including a minimum of one of the following: property manager, maintenance director/staff, owner/owner representative, and other designated stakeholders as determined by the project team. In addition, D3G has standardized a Property Questionnaire and Utility Data form and is required to be completed by the owner or owner representative. The following is a Record of Communication log with stakeholders of this project:

Person	Title	Dates	Discussion
Angela Higgins	Property Manager	August 7 & 8, 2018	Discussed operations and maintenance
Stephen Firth	Maintenance Supervisor	August 7 & 8, 2018	Provided tour of facility, discussed operations and maintenance

Please be advised, D3G makes an effort to discuss housing concerns and comfort levels with building tenants; however, as a respect to privacy, resident and occupant names are not recorded. Interviews during the inspection process with representative tenants which identify any adverse conditions or occupant comfort concerns are addressed within the recommended repairs and rehabilitations.

6.0 QUALIFICATIONS

Dominion Due Diligence Group (D3G) was established in 1994 and has grown to a national full-service Environmental and Engineering real estate due diligence firm featuring over 125 employees. D3G focuses on affordable housing, elderly care facilities and historical rehabilitations, with our 3rd party reporting used for HUD-FHA, USDA-RD, Fannie Mae, Freddie Mac, and LIHTC transactions. D3G has worked with every HUD office in the country and is a premier provider of Green Capital Needs Assessments (GPCA and GRPCA) to the Office of Affordable Housing Preservation (OAHP) at HUD, under both the M2M program and the ARRA stimulus bill. A staff resume of the Needs Assessor performing this evaluation has been provided in Appendix H. D3G's senior staff are trained, accredited and licensed in the following fields of building science investigations:

- Engineering (Professional Engineer)
- Architectural (Licensed Architect, ICC Plans Examiner)
- Sustainability (LEED-AP, RESNET, BPI-Multifamily)
- Environmental (CSP, EP, CHMM, CEI)

7.0 LIMITING CONDITIONS

This report has been prepared for and can be relied upon by the Client and the United States Department of Housing and Urban Development (HUD). This report was prepared in accordance with generally accepted industry standards of practice for building inspection services, as detailed in Section 2.2 Scope. No other warranty, either expressed or implied, is made. This report is not to be reproduced, either in whole or in part, without written consent from the preparer. The statements in this report are professional opinions about the present condition of the subject property. They are based upon visual evidence available during the inspection of reasonably accessible areas at the subject property. We did not remove any surface materials, perform any destructive testing, or move any furnishings. The study is not an exhaustive technical evaluation. Such an evaluation would entail a significantly larger scope of work than was determined for this project. Accordingly, we cannot comment on the condition of systems that we could not see, such as buried structures and utilities, nor are we responsible for conditions that could not be seen or were not within the scope of our services at the time of inspection. We did not undertake activities that would completely assess the stability of the building or the underlying foundation soil since this effort would require excavation and destructive testing. Likewise, this is not a seismic assessment, nor do we make any conclusions or comments regarding wood destroying organisms/insects. Our on-site observations pertain only to specific locations at specific times on specific dates. Our observations and conclusions do not reflect variations in conditions that may exist, in unexplored areas of the site, or at times other than those represented by our observations.

8.0 CERTIFICATION

The Needs Assessor certifies that the data presented in this report is representative of site conditions observed during our inspection. We understand that this report will be used by The Client to document to the U.S. Department of Housing and Urban Development the current physical condition and needs of the property. The Needs Assessor certifies that the review was in accordance with the HUD requirements applicable on the date of the Review and that we have no financial interest or family relationship with the officers, directors, stockholders or partners of the Borrower, the general contractor, any subcontractors, the buyer or seller of the proposed property or engage in any business that might present a conflict of interest.

Marc Butler
Construction Inspector — Signature

Shawn Hughes
Senior Project Manager — Signature

Mike Ferguson, P.E.
Vice President of Technical Services — Signature

Warning: Title 18 U.S.C. 1001, provides in part that whoever knowingly and willfully makes or uses a document containing any false, fictitious, or fraudulent statement or entry, in any manner in the jurisdiction of any department of agency of the United States, shall be fined not more than $ 10,000 or imprisoned for not more than five years or both.

9.0 APPENDICIES

Appendix A: HUD Form 52860-B, Total Development Cost Addendum

Appendix B: Rehabilitation Cost Estimate / Year 1 Immediate Needs

Appendix C: Color Site Photographs

Appendix D: Site Maps

Appendix E: Site Specific Information

Appendix F: Staff Resumes and Certifications

APPENDIX A:

Total Development Cost Worksheet

Total Development Cost
(TDC) Addendum

U.S. Department of Housing
and Urban Development
Office of Public and Indian Housing

OMB Approval No. 2577-0075
(exp. 10/31/2010)

Public reporting burden for this collection of information is estimated to average 2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. HUD may not collect this information, and you are not required to complete this form, unless it displays a currently valid OMB control number.

This information is required to as a supplement to the HUD-52860 for all inventory removal actions that involve a demolition action or a disposition action justified by obsolescence based on requirements of Section 18 of the United States housing Act of 1937 as amended ("Act") and 24 CFR Part 970. HUD will use this information to determine whether, and under what circumstances, to permit PHAs to remove from their inventories all or a portion of a public housing development, as well as to track removals for other record keeping requirements. Responses to this collection of information are statutory and regulatory to obtain a benefit. Please refer to the instructions for each section for additional guidance on how to complete this application. HUD approval of the proposed removal from inventory action in this application does not constitute HUD approval for funding of the proposed action. All capitalized terms not defined in this form have the meanings as defined in the Act and the HUD Regulations. The information requested does not lend itself to confidentiality.

1. Inventory Removal Application Number DDA_____
Development Name & Number __Tidewater Gardens - NRHA_____

2. Total Development cost calculation

Based on HUD Notice _____ For Locality ____Norfolk, VA_____

If Justification is based upon obsolescence of the units/buildings, complete the applicable calculation below for the unit proposed for demolition for each project

Size - Type	Number of units	Times	TDC Per Unit	= TDC
0 - Bdr Detached and Semi detached		X	$ -	$ -
0 - Bdr Row Dwelling		X	$ -	$ -
0 - Bdr Walk-Up		X	$ -	$ -
0 - Bdr elevator		X	$ -	$ -
1 - Bdr Detached and Semi detached		X	$ -	$ -
1 - Bdr Row Dwelling		X	$ -	$ -
1 - Bdr Walk-Up		X	$ -	$ -
1 - Bdr elevator		X	$ -	$ -
2 - Bdr Detached and Semi detached		X	$ -	$ -
2 - Bdr Row Dwelling		X	$ -	$ -
2 - Bdr Walk-Up	618	X	$ 205,444.00	$ 126,964,392.00
2 - Bdr elevator		X	$ -	$ -
3 - Bdr Detached and Semi detached		X	$ -	$ -
3 - Bdr Row Dwelling		X	$ -	$ -
3 - Bdr Walk-Up		X	$ -	$ -
3 - Bdr Elevator		X	$ -	$ -
4 - Bdr Detached and Semi detached		X	$ -	$ -
4 - Bdr Row Dwelling		X	$ -	$ -
4 - Bdr Walk-Up		X	$ -	$ -
4 - Bdr Elevator		X	$ -	$ -
5 - Bdr Detached and Semi detached		X	$ -	$ -
5 - Bdr Row Dwelling		X	$ -	$ -
5 - Bdr Walk-Up		X	$ -	$ -
5 - Bdr Elevator		X	$ -	$ -
6 - Bdr Detached and Semi detached		X	$ -	$ -
6 - Bdr Row Dwelling		X	$ -	$ -
6 - Bdr Walk-Up		X	$ -	$ -
6 - Bdr Elevator		X	$ -	$ -
TOTAL				$ 126,964,392.00

3. Estimated Cost of Rehabilitation $ 93,440,792.39

Provide an attachment showing cost breakdown and reference it as Addendum to 52860-B – Rehabilitation Cost Breakdown

4. Rehabilitation Cost % (estimated cost of Rehabilitation/Total TDC) x 100 = **73.60%**

Provide attachments as needed.
All attachments must reference the Section and line number to which they apply. Previous versions obsolete.

APPENDIX B:

Rehabilitation Cost Estimate / Year 1 Immediate Needs

Rehabilitation Cost Estimate – Year 1 Immediate Needs

Date:	09/12/2018	Gross Square Feet:	543,402
Project:	Tidewater Gardens	Number of Units:	618
Address:	250 Walke Street	R.S. Means Location Factor (Building):	0.866
City, State:	Norfolk, Virginia 23504	DBWR Type (Residential or Commercial):	Residential
		Construction Cost Adjustment Factor:	1.0000

Line	Div.	Trade Item	Total Cost	Total Cost Adjusted for Location
1	3	Concrete	$ 5,167,408.84	$ 4,474,976.06
2	4	Masonry	$ 6,242,971.00	$ 5,406,412.89
3	5	Metals	$ 1,346,347.00	$ 1,165,936.50
4	6	Rough Carpentry	$ 2,271,409.35	$ 1,984,779.22
5	6	Finish Carpentry	$ 1,803,436.95	$ 1,561,776.40
6	7	Waterproofing	$ 655,697.02	$ 567,833.62
7	7	Insulation	$ 1,427,863.95	$ 1,236,530.18
8	7	Roofing	$0.00	$0.00
9	7	Roof Accessories	$0.00	$0.00
9	7	Sheet Metal	$275,780.65	$238,826.04
10	8	Doors	$ 3,890,537.25	$ 3,369,205.26
11	8	Windows	$ 2,065,186.56	$ 1,788,451.56
12	8	Glass	$0.00	$0.00
13	9	Lath and Plaster	$ 297,258.00	$ 257,425.43
14	9	Drywall	$ 3,050,282.87	$ 2,909,384.17
15	9	Ceramic Tile	$ 631,966.80	$ 547,283.25
16	9	Acoustical	$0.00	$0.00
18	9	Resilient Flooring	$ 5,359,703.62	$ 4,641,503.33
19	9	Painting	$ 2,529,372.10	$ 2,194,441.18
20	10	Specialties	$ 605,979.90	$ 524,778.59
21	10	Special Equipment	$0.00	$35,000.00
22	11	Cabinets	$ 4,896,820.50	$ 4,240,646.55
23	11	Appliances	$0.00	$0.00
24	12	Blinds and Shades, Artwork	$0.00	$0.00
25	12	Carpets	$0.00	$0.00
26	13	Special Construction	$ 16,570,950.12	$ 14,350,442.80
27	14	Elevators	$0.00	$0.00
28	15	Plumbing and Hot Water	$ 11,312,852.46	$ 10,680,810.73
29	15	Heat and Ventilation	$ 1,736,972.70	$ 1,504,218.36
30	15	Air Conditioning	$ 1,806,341.34	$ 1,564,291.60
31	16	Electrical	$ 10,374,290.65	$ 8,984,135.70
32		Subtotal (Structures)	$ 84,319,429.63	$ 74,229,089.43
33	0	Accessory Structures	$0.00	$0.00
34	0	Total (Lines 32 and 33)	$ 84,319,429.63	$ 74,229,089.43
35	31	Earthwork	$301,650.00	$261,228.90
36		Site Utilities	$1,257,499.30	$1,088,994.39
37		Roads & Walks	$163,000.00	$141,158.00
38	32	Site Improvements	$0.00	$0.00
39	32	Lawns and Plantings	$0.00	$0.00
40		Unusual Site Conditions	$0.00	$0.00
41		Total Land Improvements	$1,722,149.30	$1,491,381.29

Rehabilitation Cost Estimate – Year 1 Immediate Needs

Date:	09/12/2018	Gross Square Feet:	543,402
Project:	Tidewater Gardens	Number of Units:	618
Address:	250 Walke Street	R.S. Means Location Factor (Building):	0.866
City, State:	Norfolk, Virginia 23504	DBWR Type (Residential or Commercial):	Residential
		Construction Cost Adjustment Factor:	1.0000

Line	Div.	Trade Item		Total Cost	Total Cost Adjusted for Location
		Combined Structure and Land Improvement Cost		**$86,041,578.93**	**$75,720,470.72**
		Contingency (7.5%)		**$8,604,157.89**	**$5,679,035.30**
		Soft Costs and Fees			**$12,041,286.36**
		General Conditions	**5.00%**		**$4,069,975.30**
		Builder's Profit (Elevator, Electrical, HVAC, and Plumbing only)	**10.00%**		**$2,273,345.64**
		Architectural Design Fees	**5.00%**		**$4,069,975.30**
		PHA Administration Fee	**2.00%**		**$1,627,990.12**
		TOTAL REHABILITATION / RETROFIT CONSTRUCTION COST BUDGET:			**$93,440,792.39**
		TOTAL DEVELOPMENT COST			**$ 126,964,392.00**
		Rehabilitation Cost % (estimated cost of Rehabilitation/Total TDC) x 100 =			**73.60%**
		Rehabilitation Cost Per Unit (Estimated Cost of Rehabilitation/Number of			**$ 151,198.69**

APPENDIX C:

Color Site Photographs

PHOTO #1

Typical building exterior front elevation

PHOTO #2

Typical building exterior rear elevation

PHOTO #3

Typical building exterior end elevation

PHOTO #4

Typical dwelling unit porch and entry

PHOTO #5

Bare soil and erosion

PHOTO #6

Typical apartment building courtyard

PHOTO #7

Typical deteriorated brick masonry

PHOTO #8

Typical deteriorated and stained brick masonry

PHOTO #9

Typical deteriorated steel lintels

PHOTO #10

Typical deteriorated steel lintels

PHOTO #11

Overhead electrical lines within close proximity of the windows

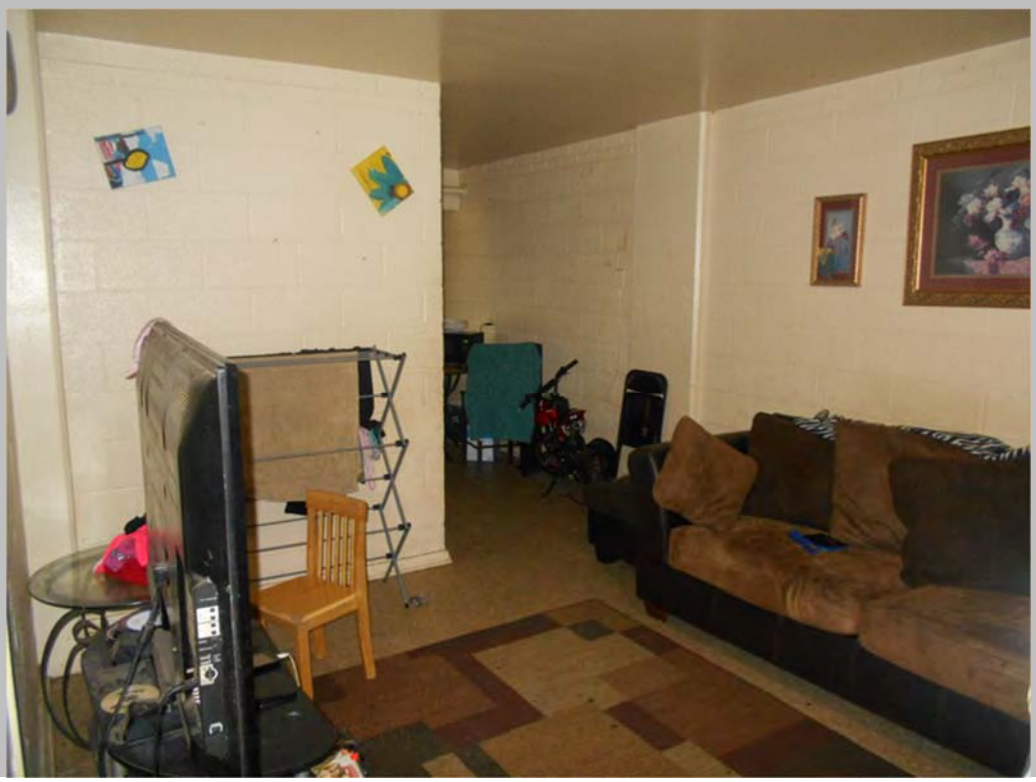
PHOTO #12

Typical deteriorated soffits

PHOTO #13

Typical handicapped street parking

PHOTO #14



Typical dwelling unit living room

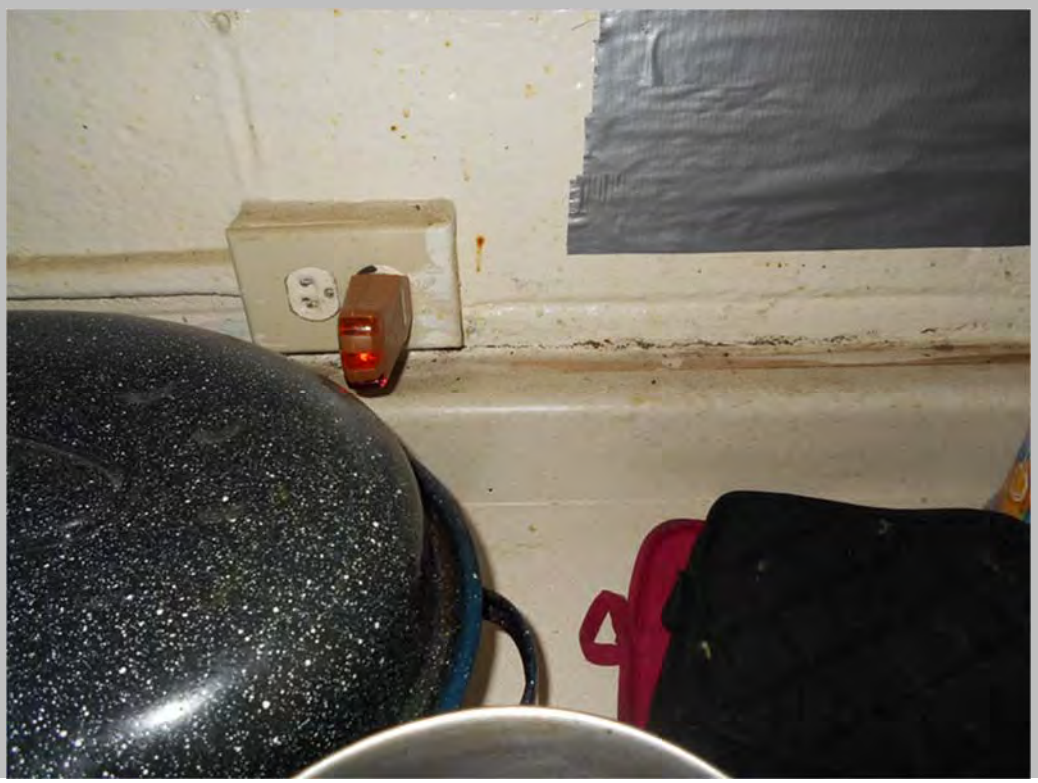
PHOTO #15

Typical dwelling unit kitchen

PHOTO #16

Typical down dwelling unit

PHOTO #17

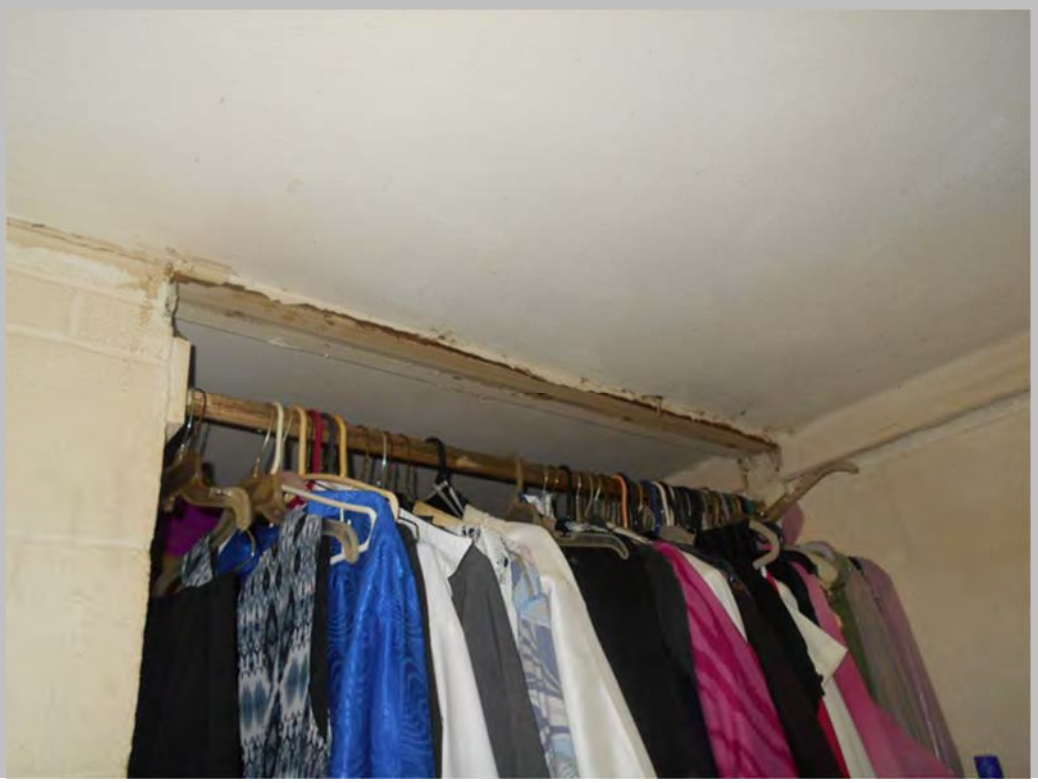


Typical kitchen outlet without GFCI protection

PHOTO #18

Typical dwelling unit bedroom

PHOTO #19



Typical dwelling unit bedroom closet without doors

PHOTO #20

Typical dwelling unit bathroom

PHOTO #21

Typical dwelling unit bathroom sink and toilet

PHOTO #22

Typical dwelling unit bath tub and ceramic tile surround

PHOTO #23

Typical dwelling unit light fixture

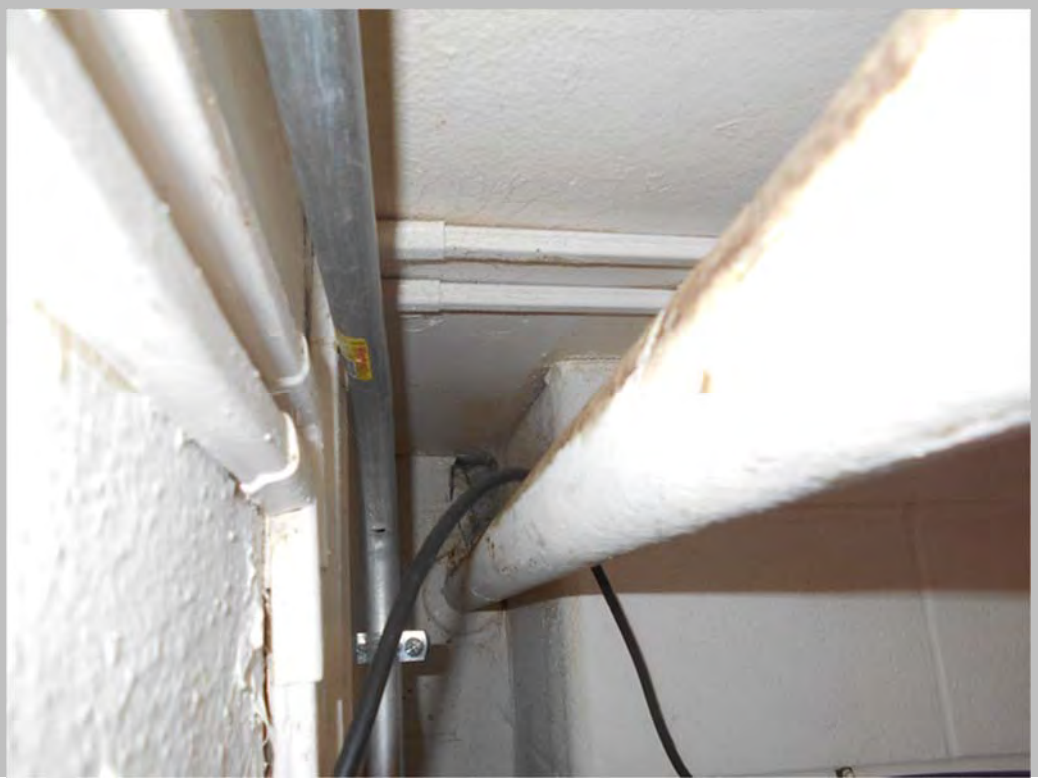
PHOTO #24

Surface-mounted piping typical in all dwelling units

PHOTO #25

Surface-mounted piping and raceways typical in all dwelling units

PHOTO #26



Surface-mounted piping and raceways typical in all dwelling units

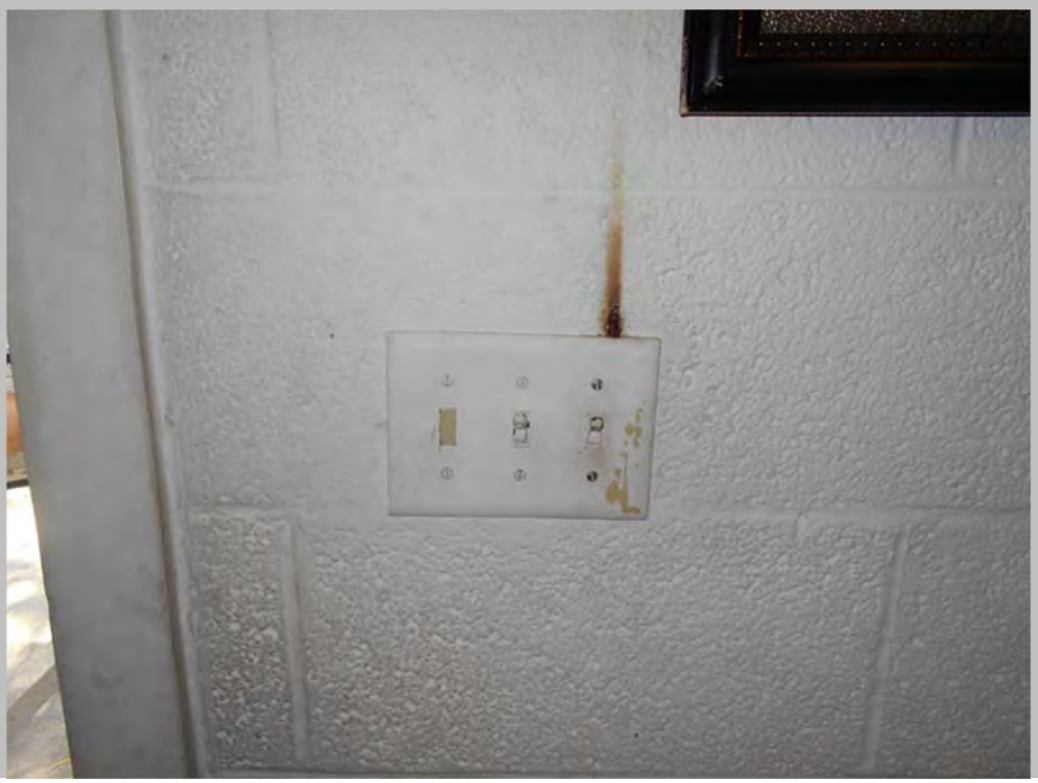
PHOTO #27

Surface-mounted piping and raceways typical in all dwelling units

PHOTO #28

Typical small dwelling unit electrical panel

PHOTO #29



Typical electrical system issues

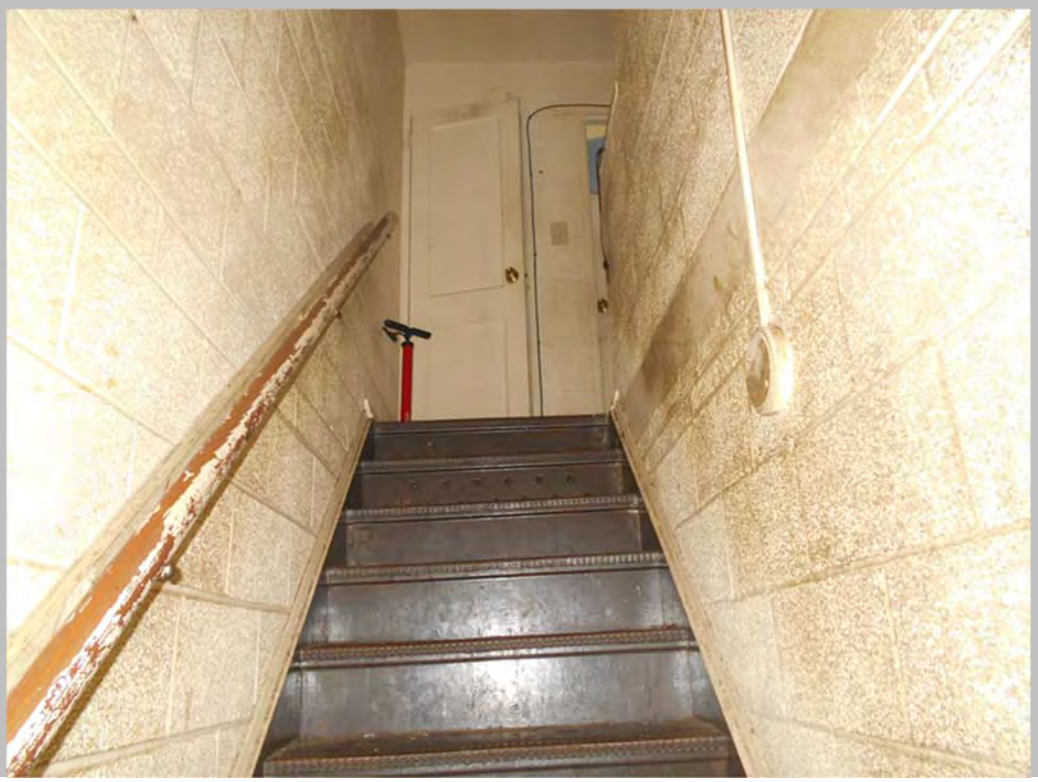
PHOTO #30

Typical dwelling unit hydronic radiator

PHOTO #31

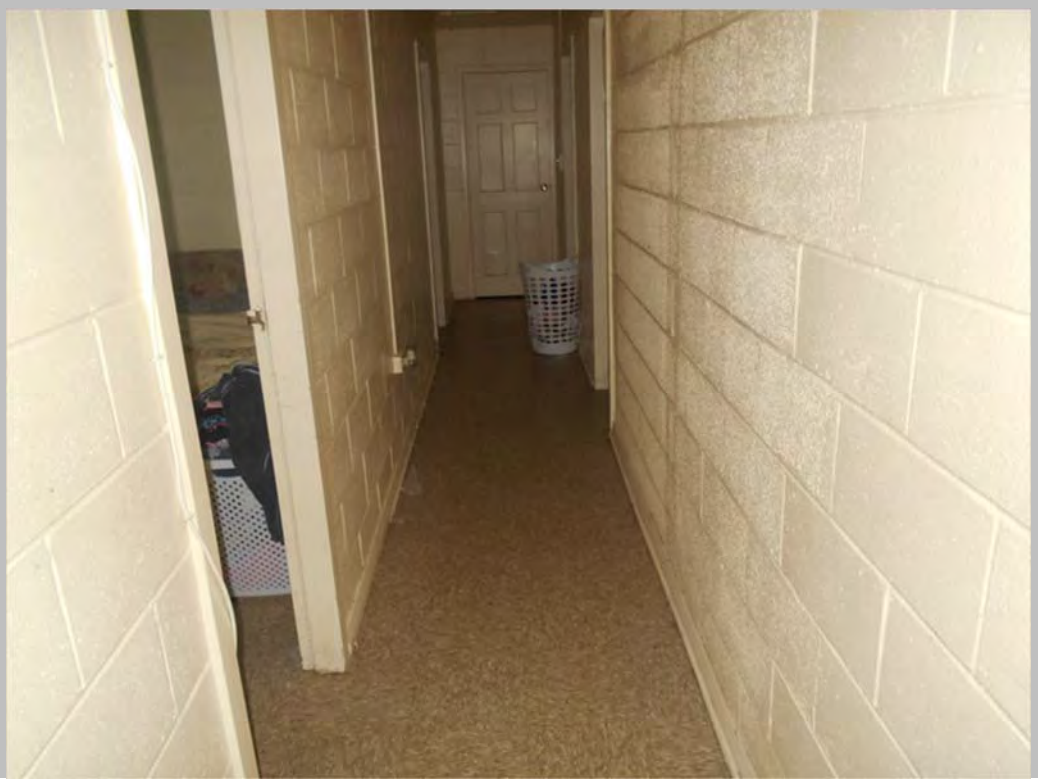
Galvanized piping

PHOTO #32



Typical dwelling unit interior stairwell

PHOTO #33



Typical concrete masonry unit interior wall construction

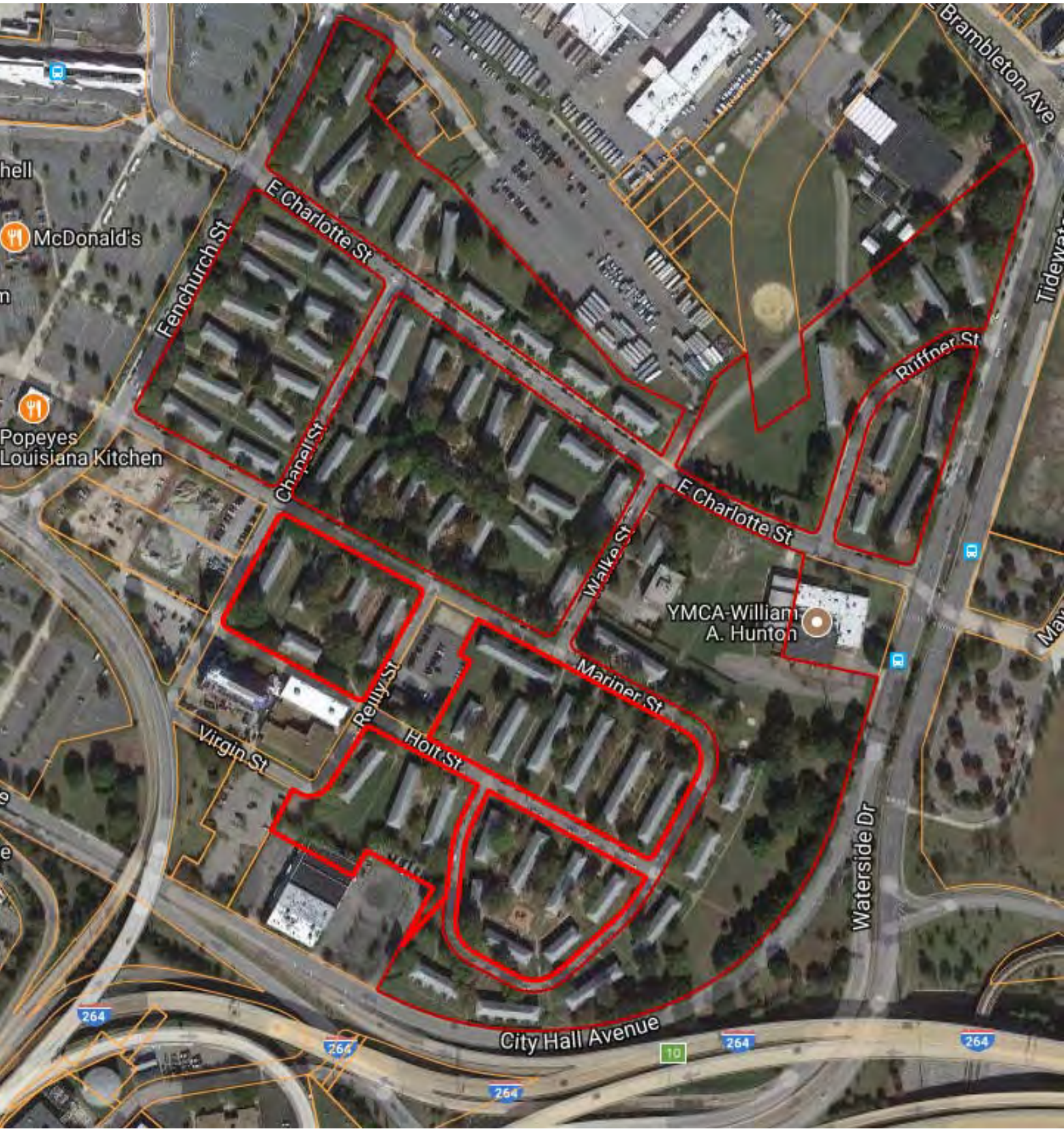
PHOTO #34

Typical dwelling unit windows – damaged and poorly installed


STOP
Google Earth
© 2018 Google

APPENDIX D:

Site Maps


Brambleton Ave
E Charlotte St
Fenchurch St
McDonald's
Popeyes
Louisiana Kitchen
Chapel St
Riffner St
Tidewa
E Charlotte St
Walke St
YMCA-William
A. Hunton
Mariner St
Reilly St
Holt St
Virgin St
Waterside Dr
City Hall Avenue
264
264
264
264
10

APPENDIX E:

Site Specific Information

OMB Approval No. 2577-0269
(exp. 4/30/2018)

CHOICE NEIGHBORHOODS – CERTIFICATION OF SEVERE PHYSICAL DISTRESS

I hereby certify that:

1. I am a licensed engineer ☒ architect ☐ (check one).

2. I am not an employee of the Lead Applicant, Co-Applicant (if any), Principal Team Member (if any), Planning Coordinator (if any) or unit of local government in which the housing project identified below is located.

3. The public and/or assisted housing development listed below meets (in the manner described in either subparagraph A or B below) the following definition of severe physical distress:

Requires major redesign, reconstruction or redevelopment, or partial or total demolition, to correct serious deficiencies in the original design (including inappropriately high population density), deferred maintenance, physical deterioration or obsolescence of major systems, and other deficiencies in the physical plant of the project.

Check one:

A. ☒ The development currently meets the above definition of severe physical distress;

Or

B. ☐ The development has been legally demolished and HUD has not yet provided replacement housing assistance, other than tenant-based assistance, for the demolished units. However, the development satisfied the definition of severe physical distress (as defined above) as of the day the demolition was approved by HUD.

Name: Michael Ferguson

Signature: _____ Date: 08/23/2018

License number: 0402040110 State of Registration: Virginia

Lead Applicant: _____

Name of Targeted Public and/or Assisted Housing Site(s):

Tidewater Gardens – Norfolk Redevelopment Housing Authority

Warning: HUD will prosecute false claims and statements. Conviction may result in the imposition of criminal and civil penalties. (18 U.S.C. 1001, 1010, 1012, 31 U.S.C. 3729, 3802)

APPENDIX F:

Staff Resumes and Certifications

SHAWN HUGHES, BPI MFBA

CONSTRUCTION INSPECTOR

EDUCATION
Spotsylvania Technical Education Center
ECPI of Richmond – Computer Electronics
Germanna Community College – Business and Economics
Virginia Army National Guard

CERTIFICATIONS/REGISTRATIONS/TRAINING
Building Performance Institute (BPI) Certified Multifamily Building Analyst Professional
HUD Multi-Family Accelerated Processing (MAP) Training (Cleveland, OH)
Master Electrician License (VA License # 2710016117)
Environmental Site Assessment (D3G Internal Training)
Fair Housing Act Accessibility Training (D3G Internal Training)
OSHA 10 and 30-hour Construction Safety
Integrated Pest Management in Multifamily Housing Course - National Healthy Homes Training Center
Basics of Elevator Inspections given by Sanjay Kamani, QEI, KP Property Advisors LLC
VHDA Universal Design Course

SUMMARY OF EXPERIENCE
Shawn is an AEC Project Manager for Dominion Due Diligence Group. He is directly responsible for overseeing architectural and cost reviews for 223(f) "heavy f" projects and the LIHTC Pilot Program. He is also responsible for property inspection and preparation of Section Demolition/Disposition reports to prove functional and design obsolescence, as well as ineffectiveness. He has extensive experience with regards to commercial and residential construction and design issues, as well as state and federal contracts with more than 25 years' experience in the construction and electrical field. Prior to joining Dominion Due Diligence Group, he was a General Superintendent for Gilbane Building Company. During his former employment he was responsible for design and planning, managing, training, inspecting, ordering materials, organizing and completing multiple projects throughout the State of Virginia. Shawn has attended specialized building and electrical code classes and has in depth understanding regarding building construction and electrical concerns. The following sites are examples of multi-family and healthcare facility inspections in which he has participated:

Section 18 Demolition/Disposition
- Parker-Riddick Village - Suffolk, VA
- Joseph Floyd Manor - Charleston, SC
- Whitcomb Court - Richmond, VA
- Mosby Court - Richmond, VA
- Creighton Court - Richmond, VA
- Southtown Court - Birmingham, AL
- 3513 Mayo Street, 3529-3533 Mayo Street and 331 Lapier Street 3513 Mayo Street, 3529-3533 Mayo Street and 331 Lapier Street - Toledo, OH
- Eastview Homes (Cedar Valley and Rockdale) and Scattered Sites- Cedartown, GA
- Loveman Village - Birmingham, AL
- Lucas County SAC Assessment- Toledo, OH
- Twin Park West Site 1 & 2 - Bronx, NY
- Highbridge Rehabs (Nelson Avenue) - Bronx, NY
- Bushwick II (Group A & C) - Brooklyn, NY
- Bushwick II CDA (Group E) - Brooklyn, NY
- Betances III, 13 - Bronx, NY
- Betances II, 9A - Bronx, NY
- Lincoln Park Apartments- Portsmouth, VA
- Willow House - North Little Rock, AR
- Heritage House - North Little Rock, AR

SHAWN HUGHES, BPI MFBA

CONSTRUCTION INSPECTOR

- Campus Towers - North Little Rock, AR
- Woodland Park Phase II & III - Gainesville, FL
- Woodland Park Phase I - Gainesville, FL
- Oak Hill Apartments - Common Buildings (Management Office), Townhomes, Garden Buildings, and 475 Garner Court - Pittsburgh, PA
- Lucas Metropolitan Housing Authority - Toledo, OH
- Comstock Court; Charles Lumley Homes; Dr. E. A. Robinson Towers - Asbury, NJ

LIHTC

- Handy Homes and Carver Heights – Florence, AL
- Carver Heights – Florence, AL
- Newman Court Apartments – Pontiac, MI
- Texarkana RAD Portfolio - Pinehurst Village, Carver Courts, Hacota I, II & III, Bramble Courts, Highpoint Homes, & Union Village Plaza – Texarkana, AR
- Pine Bluff Arkansas Housing Authority – Pine Bluff, AR
- South Central Village of Clarksville – Clarksville, TN
- Haynes Garden Apartments – Nashville, TN
- Robinson Towers – Asbury Park, NJ
- Comstock Court – Asbury Park, NJ
- Charles Lumley Homes Asbury – Park, NJ
- Leeds Alabama HA - Dorrough, Capital & Charles Barkley, Florida & Morton, Porch – Leeds, AL
- Raymond Watkins Apartments – Saratoga, NY
- John Guy Prindle Apartments – Ilion, NY
- The Pomeroy aka Pomeroy Gardens – Washington, DC
- Country Place Apartments – Columbia, KY

MODIFIED AEC REVIEW

- Grace West Manor
- Grace West Manor
- Haynes Garden Apartments
- Lakeview at Victoria Park
- Oak Woods Apartments
- McKendree Manor
- Frederick House
- Palouse Trace Apartments
- Dino Papavero Senior Center
- Logan Heights
- Mission Towers Apartments
- Oceanside Estates
- Cedar Park Apartments
- AHEPA 58 Apartments
- Lakewood Apartments
- Golden Spike Apartments

CONSTRUCTION MONITORING

- Riverway Apartments – Brooklyn, NY
- Kingsport Apartments – Port Chester, NY
- Oakmeade Apartments – Highland Springs, VA
- The Plaza at Centennial Hill – Montgomery, AL
- Peterborough Apartments – St. Petersburg, FL
- Claremont Courts – Greensboro, NC
- Churchill Senior Living – Phase II – Germantown, MD
- Southside Village – Lexington, NC

MARC BUTLER

ENGINEERING PROJECT MANAGER

EDUCATION
College of William & Mary, Williamsburg, Virginia-BA Economics 1986

CERTIFICATIONS/REGISTRATIONS/TRAINING
EarthCraft Certified Builder
HUD Multi-Family Accelerated Processing (MAP) Training (D3G Internal Training)
Fair Housing Act Accessibility Training (D3G Internal Training)
Uniform Federal Accessibility Standards Training (D3G Internal Training)
Americans with Disabilities Act Training (D3G Internal Training)

SUMMARY OF EXPERIENCE
Marc Butler is an Engineering Project Manager for Dominion Due Diligence Group. Mr. Butler is directly responsible for Project Capital Needs Assessments performed throughout the United States. Prior to joining Dominion Due Diligence Group, Mr. Butler had previously worked for over 25 years as a Class-A General Contractor in Virginia. During that time Mr. Butler managed single family and light commercial projects. Mr. Butler started in the construction business as a carpenter's helper and finished as owner of his own company. As an owner, Mr. Butler was responsible for all aspects of the projects including bidding, plans and specifications, permitting, building, and inspections. His experience has given him an in-depth understanding of multiple phases of construction and repair as well as cost estimation.

The following sites are examples of multi-family inspections in which Mr. Butler has participated:

HUD MAP 223(f)
- Parkview at Taylor-Baltimore, MD
- Parkview at Woodlawn-Baltimore, MD

RAD
- Lakeview Associates - Buffalo, NY
- Lakeview Family - Buffalo, NY
- West Village - New Haven, CT
- Townes 1 & 2 – Richmond, VA

MIKE T. FERGUSON, PE, BPI BA

DIRECTOR OF ENGINEERING SERVICES

EDUCATION
Averett University, VA, USA, M.B.A.
University of Toronto, ON, Canada, M.Eng. in Civil Engineering
Ryerson Polytechnic University, ON, Canada, B.Eng. in Civil Engineering

CERTIFICATIONS/REGISTRATIONS/TRAINING
Licensed Professional Engineer, Virginia, Indiana
HUD Multi-Family Accelerated Processing (MAP) Cost/A&E Seminar – New York City
Multifamily Property Inspection Training – Mortgage Bankers Association (CampusMBA)
AHERA Asbestos Accreditation
Principles of Environmental Site Assessments – ASTM E 1527-05
Fair Housing Act Accessibility Workshop (2 day workshop)
U.S. Green Building Council – LEED 101: Green Building Basics
Building Performance Institute (BPI) Certified Building Analyst Professional
FEMA Emergency certificates
Basics of Elevator Inspections given by Sanjay Kamani, QEI, KP Property Advisors LLC
Integrated Pest Management in Multifamily Housing Course - National Healthy Homes Training Center
Fair Housing Act Training – Design and Construction Requirements
Reserve Specialist

SUMMARY OF EXPERIENCE
Mr. Ferguson has extensive training and experience with regards to commercial and residential construction and design issues. Mr. Ferguson has 10 years experience in the construction industry as a structural engineer, commercial and residential contractor, having worked with Tectonic Engineering Consultants, Davroc and Associates, and various independent contractors prior to joining Dominion Due Diligence Group as Director of Engineering Services. In his former employment he was responsible for managing construction projects, structural design and analysis, construction specification preparation, construction documentation control, construction inspections, and building investigations throughout the United States and eastern Canada for commercial, municipal and governmental agencies. He has an in-depth understanding of all phases of construction, from planning and design, to structural requirements and site development. In his current position with Dominion Due Diligence Group, Mr. Ferguson is responsible for managing Dominion's staff of Needs Assessors/Construction Inspectors, scheduling projects, providing technical support as well as quality control and assurance measures, and training of staff. The following sites are examples of multi-family and health care facilities, which Mr. Ferguson has inspected and reported upon:

HUD MAP 223(f)
- Chippington Towers II - Nashville, TN
- Gilman Square Apts. - Somerville, MA
- Hearthstone Apartments - McAllen, TX
- Jaycee Village Apartments - Uhrichsville, OH
- Lakeshore Apartments - Miami, FL
- Laurens Villa Apartments - Laurens, SC
- Mountain Shadow Apts. - Palmdale, CA
- Pendleton Place Apartments - Indianapolis, IN
- Riverview Cooperative - Riverview, MI
- St. Augustine Apartments - Miami, FL
- Stratford and Watergate Apts. - Indianapolis, IN Summer Breeze Apartments - North Hills, CA
- Sunset Ridge Apartments - Reno, NV

MIKE T. FERGUSON, PE, BPI BA

DIRECTOR OF ENGINEERING SERVICES

HUD MAP 232/223(f)

- Anberry Rehabilitation Hospital - Atwater, CA
- Saint Andrew's Healthcare - Los Angeles, CA
- Beechwood Continuing Care - Getzville, NY
- Bickford Cottage - Omaha, NE
- Kenwell Adult Home - Kenmore, NY
- Levering Regional Health Care - Hannibal, MO
- Livingston Convalescent Center - Livingston, TX
- Manor Hills Adult Home – Wellsville, NY
- Worcester Skilled Nursing Center - Worcester, MA
- Zionsville Meadows - Zionsville, IN
- Silsbee Convalescent Center - Silsbee, TX
- Susguehanna Nursing Home - Johnson City, NY
- Tri-State Manor - Harrogate, TN
- United Helpers Nursing Home - Ogdensburg, NY

HUD MAP 202/223(f)

- Cooper Square Apartments - New York, NY
- Essex Cooperative - Essex, MD
- Evelyn & Louis Green Residence - Far Rockaway, NY Julianna Apartments - Buffalo, NY
- Oak Forest Apartments - Franklin, NC
- Scheuer House of Brighton Beach - Brooklyn, NY
- Spring Valley Apartments -Caspian, MI
- Ukrainian Village - Warren, MI

OTHER

- Beacon Pointe Nursing Center - Sunrise, FL – PCNA for ASTM
- Chippington Towers -Madison, TN – PNA per HUD and Fannie Mae protocols
- ITT Technical Institute Building – Richmond, VA – PCR per ASTM protocols
- Knoxville Pointe West - Dunlap, IL - PCNA for Freddie Mac
- Oakland Village Townhomes – Richmond, VA – PNA for ASTM
- Rosegate Commons, Indianapolis, IN – PCR for Freddie Mac
- Scheuer House of Coney Island – Brooklyn, NY – PCNA per HUD protocols
- Scheuer House of Manhattan Beach – Brooklyn, NY – PCNA per HUD protocols
- Vantage 78 Apartments – Charlotte, NC – PCNA per HUD protocols

Appendix F

Historic/Cultural Resources

COMMONWEALTH of VIRGINIA

Matt Strickler
Secretary of Natural Resources

Department of Historic Resources
2801 Kensington Avenue, Richmond, Virginia 23221

Julie V. Langan
Director

Tel: (804) 367-2323
Fax: (804) 367-2391
www.dhr.virginia.gov

June 11, 2020

Kimberly Blossom
VHB
351 McLaws Circle, Suite 3
Williamsburg, VA 23185

Re: St. Paul's Tidewater Gardens Choice Neighborhoods Implementation (CNI) Grant
450 Walke Street, 645 Church Street, and 434 St. Paul's Street, Norfolk, VA
DHR File No. 2020-3393

Dear Ms. Blossom:

The Department of Historic Resources (DHR) has received your request for review of the project referenced above pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended. U.S Department of Housing and Urban Development (HUD) funds will be utilized for this project. The project, as presented, consists of the redevelopment of the St. Paul's neighborhood. Comprising over fifty-eight (58) acres, this CNI project includes the phased construction of mixed-income residential properties, commercial space, open green space, a community hub, and the realignment of roads.

Based on our review of the information provided, DHR concurs with your recommendation that the scope of work will have *no adverse effect* on historic resources. Implementation of the undertaking in accordance with the finding of *no adverse effect* as documented fulfills the Federal agency's responsibilities under Section 106 of the National Historic Preservation Act. If for any reason the undertaking is not or cannot be conducted as proposed in the finding, consultation under Section 106 must be reopened.

Thank you again for notifying our office of this project. If you have any questions regarding these comments, please do not hesitate to contact me at 804-482-8097 or email Laura.Lavernia@dhr.virginia.gov

Sincerely,

Laura Lavernia, Architectural Historian
Review and Compliance Division

C: Roger Kirchen, DHR, Review and Compliance; Kerry Johnson, HUD.

Western Region Office
962 Kime Lane
Salem, VA 24153
Tel: (540) 387-5443
Fax: (540) 387-5446

Northern Region Office
5357 Main Street
PO Box 519
Stephens City, VA 22655
Tel: (540) 868-7029
Fax: (540) 868-7033

Eastern Region Office
2801 Kensington Avenue
Richmond, VA 23221
Tel: (804) 367-2323
Fax: (804) 367-2391

Appendix G

VDOT Noise Screening Analysis Technical Memorandum

To: Kimberly Blossom

Date: April 22, 2020
Project #: 34402.06

Memorandum

From: Jason Ross P.E., Director of Noise and Vibration
Eric Illich, Noise & Air Quality Analyst

Re: Tidewater Gardens Choice Neighborhood Implementation (CNI) VDOT Noise Screening Analysis

Executive Summary

VHB has conducted a noise screening in accordance with Virginia Department of Transportation (VDOT) traffic noise policy for the Tidewater Gardens Choice Neighborhood Implementation Project. This traffic noise screening is warranted since the project is a Type I project in accordance with Federal Highway Administration (FHWA) regulations due to the realignment of existing roadways and introduction of new roadways. The proposed project would include the realignment of Church Street south of Bute Street and the introduction of new roadways including Freemason Avenue (an east-west connection between Church Street and St. Paul's Boulevard) and other local roadways within the Tidewater Gardens Community.

The noise screening includes noise from highway and roadway traffic as well as rail, and transit sources in the study area including the Norfolk Downtown Transit Center, freight trains on the Northeast Corridor, and Tide light rail trains. Noise levels were assessed at 88 receptor locations including existing receptors and receptors that would be permitted after the Finding of No Significant Impact (FONSI) is issued for the United States Housing and Urban Development (HUD) Environmental Assessment (EA). Noises level typically range in the mid 50's to lower 60's dBA (Leq) and range from 45 to 73 dBA (Leq) at all receptors in the study area. Noise levels would exceed the FHWA Noise Abatement Criteria (NAC) at three receptors at the St. Paul's Apartments (R68, R69 and R70) and the Queen Street Baptist Church (R84).

Since noise levels approach or exceed the NAC at these receptors, noise abatement such as; noise barriers, traffic management measures such as traffic control devices, prohibiting certain vehicle types such as trucks, nighttime truck restrictions, modifying speed limits, or designating lanes for certain use, altering roadway alignments, and/or acquiring property to serve as a buffer zone for noise. A noise barrier to in these locations would need to have substantial gaps for pedestrian and vehicular access to not reduce visibility. Gaps in a noise wall significantly reduce the barrier performance by not completely blocking the noise path between the noise source and the receiver and would not be acoustically effective. The roadway designs already incorporate features to reduce traffic speeds and to control traffic with traffic control devices. Therefore, additional traffic management measures would not be warranted and would not substantially reduce traffic noise levels. Therefore, noise abatement would not be feasible and would not be recommended for further evaluation.

Construction of the proposed project has the potential to cause short-term noise effects depending on the phase of construction. There are no standard federal construction noise criteria applicable to the proposed project. Noise from construction activities is exempt from Norfolk noise ordinance under Section 26-3 and HUD does not regulate construction noise.

351 McLaws Circle
Suite 3
Williamsburg, VA 23185-5797
P 757.220.0500

Introduction

This technical memorandum includes background information on the methodology used to conduct the VDOT noise screening, the noise abatement criteria (NAC) use to assess whether noise mitigation such as barriers or traffic management measures are warranted, the results of the noise screening analysis, and information on construction noise.

Methodology

A VDOT noise screening analysis is completed for projects where noise impact may be anticipated, however noise abatement is clearly not feasible. Since the predominant sources of noise in the Tidewater Gardens area include highway, major roadways, buses, freight trains, and light rail trains which would not be affected by the project, noise barriers or traffic management measures would not feasible and reasonable. Therefore, a VDOT detailed noise analysis is not warranted.

The noise screening analysis is a simple procedure used to predict traffic noise levels and make a reasonable determination of noise impacts. VHB has consulted with VDOT Noise Abatement Staff to determine a reasonable approach for the screening analysis. The approach includes identifying existing and future receptors in the study area and categorizing them according to FHWA Activity Categories, developing an FHWA Traffic Noise Model (TNM) of the project area including roadways and highways surrounding the Tidewater Gardens project area and using the Federal Transit Administration (FTA) guidelines for general noise assessment to predict noise from buses, freight, and light rail sources, and evaluating whether noise abatement is warranted, feasible, and reasonable according to VDOT policies.

Noise Regulations and Guidelines

This noise analysis was prepared in accordance with ***Title 23, Code of Federal Regulations*** (C.F.R.), ***Part 772: Procedures for Abatement of Highway Traffic Noise and Construction Noise*** (July 13, 2010), and VDOT's ***Highway Traffic Noise Impact Analysis Guidance Manual*** (February 20, 2018). The noise analysis also adheres to FHWA traffic noise analysis guidelines contained in Report FHWA-HEP-10-025, ***Highway Traffic Noise: Analysis and Abatement Guidance***, revised December 2011.

Noise Abatement Criteria

FHWA has established NAC to help protect public health, welfare and livability from excessive vehicle traffic noise. The NAC are considered the upper limit of acceptable highway traffic noise for different types of land use Activity Categories. The NAC focus on levels where highway traffic noise could potentially interfere with speech communication in exterior areas and are used to evaluate whether noise abatement is needed for exterior areas of frequent human use.

Table 1 shows the FHWA Activity Categories, the description of the type of land use within the category, and the NAC based on loudest-hour Leq noise levels. These abatement criteria typically apply to design-year noise conditions for a proposed Project regardless of whether the proposed Project would increase or decrease noise conditions compared to the existing or No Action condition. However, the Tidewater Gardens project would not increase freight or light rail train movements, bus operations or traffic volumes of the predominant sources of traffic noise such as Interstate 264, St. Paul's Boulevard, Market Street, and Tidewater Drive. The proposed project would include realignment and

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P 757.220.0500

redesigns to roadways including Church Street, St. Paul's Boulevard, and local roads within the proposed development that would tend to slow traffic conditions, but these are not the predominant sources of sound in the study area. Therefore, existing traffic, rail, and transit volumes are representative of the loudest-noise conditions and have been used for the noise screening analysis

TABLE 1: FHWA Noise Abatement Criteria (NAC)

Activity Category	Loudest-Hour Noise Level (Leq)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purposes.
B	67 (Exterior)	Residential.
C	67 (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in Categories A-D or F.
F	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	Undeveloped lands that are not permitted.

Source: 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise.

VDOT implements the NAC by defining that "approaching the NAC" means noise levels are 1 dBA below the NAC criteria. For example, if noise levels would be 66 dBA (Leq) at a residential receptor, that would approach the NAC of 67 dBA (Leq) and noise abatement must be considered. VDOT also defined a decibel rounding convention such that modeled decibel levels are presented to the whole decibel. For example, if design-year noise levels would be 65.5 dBA (Leq) at a residential receptor, the sound level would be rounded to 66 dBA (Leq) and would approach the NAC. VDOT also defines a "substantial increase" in noise as an increase of 10 dBA or more between design-year noise levels and existing levels. A substantial increase does not depend on whether the design-year noise levels approach or exceed the absolute NAC. Noise abatement must be considered for properties that will be impacted by the project (approach the NAC in the future build scenario and/or experience a substantial increase in the future build scenario over existing levels).

351 McLaws Circle
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P 757.220.0500

For the proposed Project, existing noise-sensitive receptors include multi-family residential (Activity Category B) apartments, Activity Category C uses including places of worship and outdoor recreation areas, and Activity Category F uses including industrial and commercial properties. There are no Activity Category A, D, or E receptors in the study area. In accordance with FHWA regulations, noise is evaluated at existing sensitive uses and locations already permitted for sensitive use. Undeveloped lands are deemed to be permitted when there is a definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of at least one building permit. Because the proposed developments have not been permitted for sensitive use, receptors are assessed as Activity Category G and are not eligible for potential noise mitigation.

Traffic Data

Major roadways in the Tidewater Gardens noise study area include East Brambleton Avenue, Tidewater Drive, St. Paul's Boulevard, Market Street, East City Hall Drive, I-264 East and I-264 West. Based on 2018 VDOT traffic volume data, the average daily traffic (ADT) range from approximately 11,000 to 101,000 vehicles on these roadways, with the percentage of medium trucks ranging from 0.9 to 4.9% and the percentage of heavy trucks ranging from 0.5 to 4.6%. The peak hour factor (K-factor) ranges from 7.69 to 12.93%. The number of automobiles, medium trucks, and heavy trucks and their associated travel speeds for each modeled roadway segment were input into the model. Traffic inputs in the model are assumed as free flow and are modeled at their posted speed limit. The proposed project is not anticipated to significantly increase traffic volumes in the study area; therefore the existing traffic volumes were used as shown in **Table 2**.

Table 2: Traffic Data

Street Name	AAWDT	K%	Peak Hour Volume (Veh/hour)			
			Total	Auto	Medium Trucks	Heavy Trucks
E Brambleton Ave (St. Paul's Blvd to Church Street)	22000	7.69	1692	1618	43	31
E Brambleton Ave (Church Street to Tidewater Dr)	24000	7.93	1903	1831	35	38
Church Street (Monticello Ave to E Brambleton Ave)	18000	8.09	1456	1415	25	16
Tidewater Dr (E Virginia Beach Blvd to E Brambleton Ave)	38000	8.20	3116	3044	31	41
E Brambleton Ave (Tidewater Dr to Park Dr)	39000	8.23	3210	3088	58	63
Tidewater Dr (E Brambleton Ave to I-264 Interchange)	28000	9.09	2545	2445	24	76
Church Street/Fenchurch St (E Brambleton Ave to Market St)	7000	8.39	587	577	6	4
E Charlotte St (Fenchurch St to Tidewater Dr)	2100	8.15	171	167	3	1
E Charlotte St (St. Paul's Blvd to Fenchurch St)	910	8.74	80	78	1	1
St. Paul's Blvd (E Brambleton Ave to Market St)	46000	8.11	3731	3663	34	34
E Charlotte St (St. Paul's Blvd to Monticello Ave)	3300	11.53	380	371	7	3
Market St (St. Paul's Blvd to I-264 Interchange)	29000	8.43	2445	2401	22	22
St. Paul's Blvd (Market St to Waterside Dr)	11000	12.93	1422	1398	15	9
E City Hall Dr (St. Paul's Blvd to Market St)	27000	10.45	2822	2751	51	20

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P 757.220.0500

Street Name	AAWDT	K%	Peak Hour Volume (Veh/hour)			
			Total	Auto	Medium Trucks	Heavy Trucks
E City Hall Dr (St. Paul's Blvd to Monticello Ave)	9400	10.90	1025	999	18	7
E Plume St (St. Paul's Blvd to Boush St)	2900	11.98	347	337	7	3
E Main St (St. Paul's Blvd to Boush St)	2500	12.86	322	312	7	3
I-264E & W (Interchange to Berkeley Bridge)	101000	8.58	8666	8102	161	402
I-264W (I-464 to Tidewater Dr)	48000	9.09	4363	4192	42	129
I-264E (ALT US460 to SR 337)	51000	8.48	4325	4094	210	20

Source: VHB, 2020.

VDOT Noise Screening Results

This section presents the results of the VDOT noise screening analysis. According to VDOT noise policy, all sources of sound must be included in the analysis. Noise sources included in the analysis included traffic noise and rail and transit sources. Rail and transit sources include bus operations at the Norfolk Downtown Transit Center, freight trains on the Northeast Corridor, and Tide light rail trains.

Noise sources were predicted using the FHWA TNM version 2.5, which considers the attenuating effects of distance building rows, topography, ground surface conditions and atmospheric absorption. Existing elevation data was based on Lidar survey data collected in 2013. Future roadway alignments were based on conceptual design plans

Noise levels have been predicted based on existing traffic conditions, train movements, and bus transit operations. The proposed project would not increase freight or light rail train movements, bus operations or traffic volumes of the predominant sources of traffic noise such as Interstate 264, St. Paul's Boulevard, Market Street, and Tidewater Drive. The proposed project would include realignment and redesigns to roadways including Church Street, St. Paul's Boulevard, and local roads within the proposed development that would tend to slow traffic conditions. Therefore, existing traffic, rail, and transit volumes are representative of the loudest-noise conditions.

Transit and rail sources were predicted using FTA Impact Assessment Spreadsheet (version 1/29/2019). Transit operations at the Norfolk Downtown Transit Center were determined based on posted schedules. Based on a peak activity of 62 busses per hour, noise from operations of the transit center ranged from 52 to 65 dBA (Leq) for nearby receptors including the Norfolk Fire Department and portions of proposed Blocks 17, 18, 19, and 20. The Northeast Corridor is a north-south freight line running east of the study area. Peak-hour freight operations were modeled as two trains, each with locomotives and 40 rail cars. Noise levels from freight operations are approximately 54 dBA for nearby receptors including the YMCA playground and portions of proposed Blocks 3A, 3B, 4 and 11. The Tide light rail runs south of the study area adjacent to proposed development Block 1. Tide operations were modeled as two train cars with five-minute headways bi-directionally, equaling approximately 24 events per hour and resulting in a noise level of 62 dBA (Leq) for adjacent receptors at Block 1.

As shown in **Table 3**, noise was predicted at 88 receptor locations including existing receptors and receptors introduced by the proposed project (See Figure 1). Traffic noise is the predominant source for most receptors except those near the Norfolk Downtown Transit Center where bus transit noise is the predominant source. Noise levels are typically in the mid 50's to lower 60's dBA (Leq) and range from 45 to 73 dBA (Leq) at all receptors in the study area.

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P 757.220.0500

Noise levels at the proposed mixed-use development at Block 18 (R44) would be 73 dBA. Noise levels approach or exceed the NAC at three receptors at the St Paul's Apartments (R68, R69, and R70) and the Queen Street Baptist Church (R84) located along Saint Paul's Boulevard and East Brambleton Avenue.

Table 3: Noise Screening Analysis Results

Receptor	Activity Category	Label	Noise Level (dBA, Leq)
Development Block 1	G	R1, R2, R3, R4	55 to 68
Development Block 2	G	R10, R11, R12, R13	54 to 63
Development Block 3A	G	R14, R15, R16, R17	58 to 65
Development Block 3B	G	R18, R19, R20, R21	56 to 61
Development Block 4	G	R22, R23, R24, R25	53 to 57
Development Block 5	G	R26, R27, R28	50 to 54
Development Block 6	G	R29	59
Development Block 9	G	R30, R31, R32, R33	51 to 62
Development Block 10	G	R34, R35, R36, R37	51 to 52
Development Block 11	G	R38, R39, R40, R41	50 to 58
Development Block 17	G	R49, R50, R51, R52	50 to 56
Development Block 18	G	R43, R44, R45, R46, R47, R48	58 to 73
Development Block 19	G	R57, R58, R59, R60	48 to 59
Development Block 20	G	R53, R54, R55, R56	51 to 56
St. Mary's Church	C	R5, R6, R7, R8, R9	51 to 65
YMCA Playground	C	R42	58
St Paul's Apartments	B	R62, R63, R64, R65, R66, R67, **R68, R69, R70**, R71, R72, R73, R74, R75, R76, R77, R78, R79	48 to 70
First Baptist Church Annex	C	R81	45
Ready Academy Playground	C	R82	46
First Baptist Church	C	R83	52
Queen St Baptist Church	C	**R84**	**66**
Norfolk Wholesale Flower	F	R85	65
Willis Building	F	R86	69
Post Office	F	R87	60
Tidewater Park Elementary Playground	C	R88	61

Source: VHB, 2020.
Values in bold approach or exceed the NAC.

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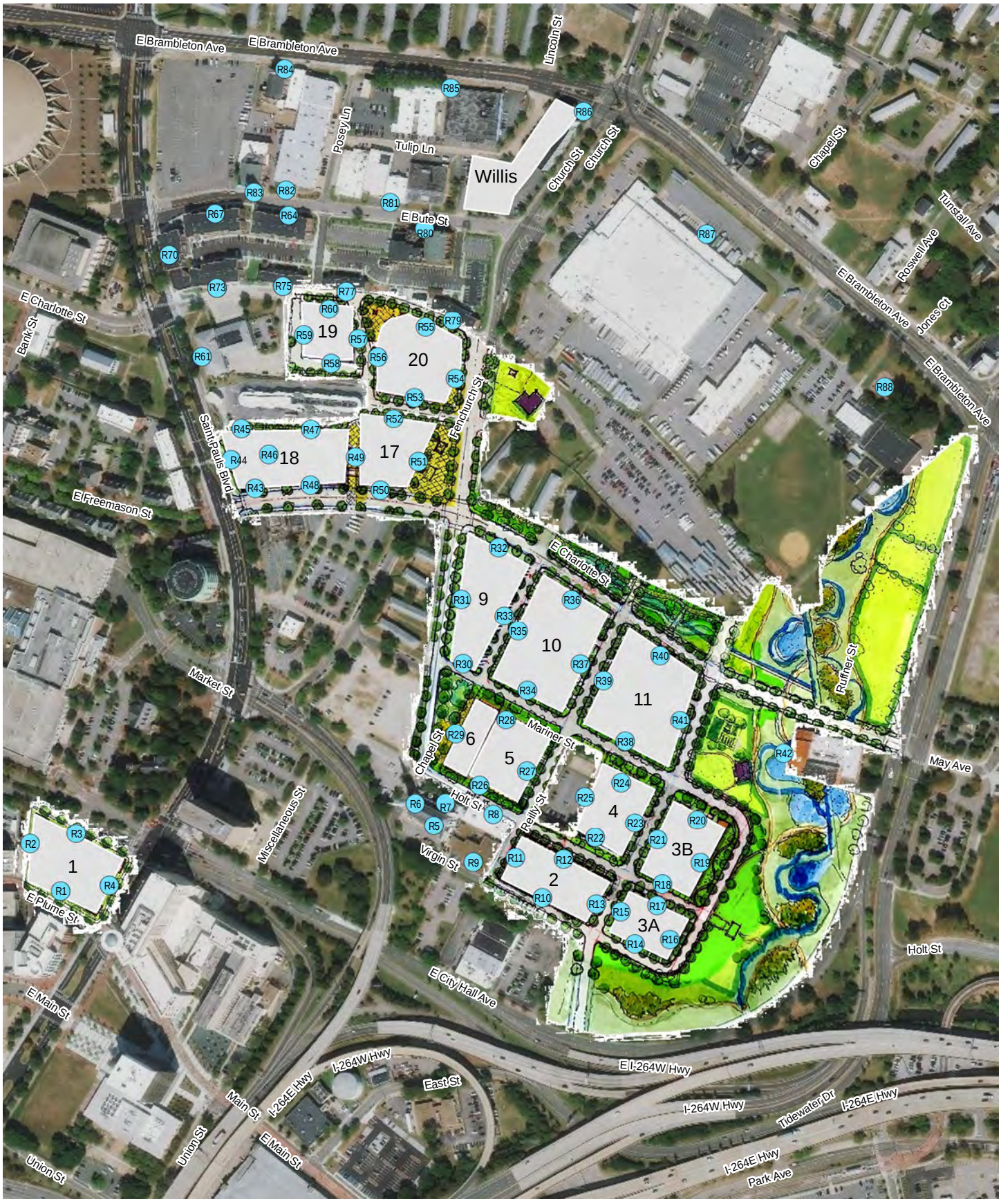

0 140 280 560 Feet

Tidewater Gardens CNI | Norfolk, VA

Receptor Location

Development Blocks

Figure 1
Noise Receptor Locations

Noise Abatement Alternatives

Potential noise abatement measures must be considered for areas where noise levels approach or exceed the NAC and/or will constitute a substantial increase over existing noise level. The following sections describe the general methods used to evaluate each abatement approach.

Traffic Management

Traffic management measures that can reduce noise include traffic control devices, vehicle-type restrictions (such as truck restrictions), nighttime-use restrictions, reducing speed limits, or designating lane uses. Many of these traffic management approaches to reducing noise can conflict with the purpose or need of the project to improve mobility and accessibility, so traffic management measures are not often recommended.

Alignment Modifications

The horizontal distance between roadways and receptors is an important factor for noise levels. A general rule of thumb is that doubling the distance between a road and a receptor will reduce noise levels by approximately 4 to 5 dBA. The vertical alignment of roadways can affect noise levels depending on whether there is a line-of-sight from the roadway surface to the receptors. Modifications to the vertical alignment that change the line-of-sight condition can affect noise levels by several decibels depending on the specific changes. However, it is typically not practical to realign existing roadways substantially farther from receptors or change the vertical alignment to effectively reduce noise. Because the proposed project only involves the realignment of Church Street and noise is produced by traffic throughout the study area, alignment modifications would not be a feasible noise mitigation measure.

Buffer Zones

Buffer zones are undeveloped, open spaces which border a highway. Buffer zones could be created by purchasing land or development rights, in addition to the normal right-of-way, so that future dwellings cannot be constructed close to the highway. This prevents the possibility of constructing dwellings that would otherwise have an excessive noise level from nearby highway traffic. An additional benefit of buffer zones is that they often improve the roadside appearance. The proposed project includes open green space on the east side of the development that would act as a buffer zone. Creating additional buffer zones is not possible due to the substantial amount of land that must be purchases and because in many cases dwellings already border the existing road.

Noise Barriers

Noise barriers and berms are effective at reducing highway noise when they block the line-of-sight between the sources of noise (tires, engine, exhaust) and receptors. Noise barriers are recommended for construction when they are warranted, feasible and reasonable. The feasibility of noise barriers depends on several factors including whether the barrier would be safe, constructible, accessible, maintainable, does not conflict with utilities, does not adversely affect drainage, and how much noise is reduced by the barrier. Reasonableness of noise barriers depends on the cost-effectiveness of constructing the noise barriers relative to how much noise reduction it would provide receptors, its ability to achieve the VDOT noise reduction design goal, and what the viewpoints are of the property owners and residents that would benefit from the barrier.

351 McLaws Circle
Suite 3
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P 757.220.0500

Noise Abatement Assessment

Based on the results of the noise screening, noise levels at the proposed mixed-use development (Activity Category G) at Block 18 (R44) would be 73 dBA (Leq), but noise abatement is not considered for Activity Category G. Noise levels would approach or exceed the NAC at three Activity Category B receptors at the St Paul's Apartments (R68, R69, and R70) and the Activity Category C Queen Street Baptist Church (R84) located along Saint Paul's Boulevard and East Brambleton Avenue. Since noise levels approach or exceed the NAC at these receptors, noise abatement must be assessed.

A noise barrier to in these locations would need to have substantial gaps for pedestrian and vehicular access to not reduce visibility. Gaps in a noise wall significantly reduce the barrier performance by not completely blocking the noise path between the noise source and the receiver and would not be acoustically effective. The roadway designs already incorporate features to reduce traffic speeds and to control traffic with traffic control devices. Therefore, additional traffic management measures would not be warranted and would not substantially reduce traffic noise levels. Therefore, noise abatement would not be feasible and would not be recommended for further evaluation.

Construction Noise Assessment

Construction of the proposed project has the potential to cause short-term noise effects depending on the phase of construction. Typically, the loudest phase of construction involves earthwork which may include sheet pile driving, excavators, and heavy trucks. Other sources of construction noise, such as backhoes or bulldozers, generate 80 to 85 dBA at 50 feet. **Table 4** presents the maximum noise levels of typical construction equipment used during roadway improvement projects. Construction activity is primarily expected to occur during the day.

TABLE 4: Noise Levels of Typical Highway Construction Equipment

Equipment	Maximum Noise Level at 50 feet (dBA)
Backhoe	80
Blasting	94
Compactor	80
Air Compressor	80
Dozer	85
Dump Truck	84
Excavator	85
Hoe Ram	90
Paver	85
Rock Drill	85
Scraper	85

Source: Federal Highway Administration, Roadway Construction Noise Model, 2006.

There are no standard federal construction noise criteria applicable to the proposed project. Noise from construction activities is exempt from Norfolk noise ordinance under Section 26-3 and HUD does not regulate construction noise. For roadway construction, VDOT requires contractors to meet construction noise provisions in their standard road and

351 McLaws Circle
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P 757.220.0500

bridge construction specification. These specifications include limiting noise to 80 dBA at the closest adjoining property of noise-sensitive use, potentially restricting construction activities between 10:00 P.M. and 6:00 A.M., assuring that construction equipment does not generate unnecessary noise, and utilizing truck routes that minimizes truck activity in residential areas. Construction activities would be conducted in accordance with applicable local, state, and federal noise requirements and there would be no significant adverse noise impact.

Noise-Compatible Land Use Planning

The prevention of future impacts is one of the most important aspects of noise control. Local development and highways can co-exist, but local government officials need to know what noise levels to expect from a highway and what type of development will be compatible with it. One of the most effective means to prevent future traffic noise impacts is to promote noise-compatible land use planning for new developments. The compatibility of highways and neighboring local areas is essential for continued growth and can be achieved if local governments and developers require and practice noise-sensitive land-use planning.

VDOT's intention is to communicate with local officials and provide resources on noise-compatible planning measures for undeveloped lands. Although regulation of land use is not within the purview of VDOT, some widely accepted techniques for noise-sensitive land use planning in the vicinity of existing and proposed highway facilities include:

- Locating commercial retail, industrial, manufacturing, warehousing and other noise-compatible land-uses adjacent to highways
- Incorporating effective traffic noise mitigating features, such as earth berms and solid-mass noise walls, as part of residential developments
- Utilization of noise-sensitive architectural design and site planning, such as the orientation of quiet spaces away from roadways
- Use of sound insulating building materials and construction methods

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P 757.220.0500

Appendix H

St. Paul's Blue/Greenway Functional Concept Development

St. Paul's Blue/Greenway
Functional Concept Development

Final Report, January 9, 2020

Prepared by:

moffatt & nichol

WAGGONNER & BALL

Table of Contents

List of Tables

List of Figures

Abbreviations and Acronyms

AEP	Annual Exceedance Probability
B/G Way	Blue/Greenway
BMP	Best Management Practice
CF	Cubic Feet
CNI	Choice Neighborhoods Initiative
CY	Cubic Yard(s)
EL	Elevation
DCR	Department of Conservation and Recreation
DEQ	Department of Environmental Quality
ft	Feet
GIS	Geographical Information System
HGL	Hydraulic Grade Line
MHHW	Mean Higher High Water
MSL	Mean Sea Level
NAVD88	North American Vertical Datum of 1988
NOAA	National Oceanographic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NRHA	Norfolk Redevelopment and Housing Authority
RPOS	Recreation Parks and Open Space
SWMM	Storm Water Management Model
TMDL	Total Maximum Daily Load
TP	Total Phosphorous
USACE	U.S. Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VNG	Virginia Natural Gas

Executive Summary

The St. Paul's Blue/Greenway is the redevelopment of approximately 26 acres of public housing and other properties into an aesthetic open space designed to treat and store stormwater runoff in the face of long-term outlooks on storm events and sea level rise. The project is being developed concurrently and in coordination with the broader upland Choice Neighborhoods Initiative redevelopment of the St. Paul's area.

This report documents the development of a functional concept that:

- quantifies the recommended footprints for the hydraulic and water quality elements
- quantifies the expected benefits these elements will provide
- describes a range of other considerations for transforming the functional concept into design alternatives

Table ES-1 summarizes a functional concept that consists of two main elements, which are further illustrated as a preliminary concept in **Figure ES-1**:

- A **primary conveyance channel** to replace the function of the existing underground culvert and substantially expand the capacity to store stormwater during high tide events when discharge to the Elizabeth River is limited.
- **Three water quality features** such as wet ponds or constructed wetlands to remove phosphorous from the upland redevelopment area to comply with the City's stormwater management requirements.

Table ES-1: Functional concept elements

Water Quality Elements				
WQ Basin	**Volume** *(ft^3)*			**Est. Footprint**
	Min. Treatment Volume	Concept Storage (> El +1.3ft)	Total Volume	*Acres*
A	66,640	245,000	505,000	1.80
B	52,392	165,000	320,000	1.25
C	24,384	165,000	320,000	1.25
			Total WQ Feature Footprint	*3.30*
Channel/Storage Elements				
Stage Elevation	**Function**		**Volume**	**Est. Footprint**
ft, NAVD88			*ft^3*	*Acres*
-3 to +1.3	Primary channel		345,000	3.80
+1.3 to +5.0	Extended storage capacity		1,056,000	4.20
			Total Channel/Storage Footprint	*8.00*
+1.3 to +5.0	Additional BMP Storage		575,000[A]	*3.30*
			Total Hydraulic Element Footprint	**11.30**

[A] Total Concept Storage Volume of BMPs A, B, and C above elevation +1.3 ft NAVD88

Figure ES-1: St. Paul's Blue/Greenway early concept

Project Benefits

Constructing the blue/greenway to conform to the functional requirements is anticipated to provide the following resilience benefits and opportunities:

- Removes existing residential dwellings and commercial activities from the flood plain
- Provides over 1.6 million cubic feet of upland runoff storage
- Reduces the extent of flooding in areas upstream of the redevelopment area
- Removes pollutants from stormwater runoff prior to discharge into the Elizabeth River:
    - Provides for the required treatment of the upland redeveloped areas (33.06 lbs/yr TP removal
    - Provides excess removal capacity for possible offsite treatment credit toward other redevelopment projects (12.46 lbs/yr TP credit)
    - Provides additional treatment opportunities within the main storage areas for up to 140 lbs/yr TP removal depending on channel configuration.
- Significant preservation of existing mature trees

The analyses also show that future tide conditions due to sea level rise will limit the effectiveness of the site to mitigate flooding unless elements are added to mitigate the effects. Initially, the site will benefit from a tide gate at its downstream end to limit backflow into the system. As sea level continues to rise, the site will increasingly benefit from a pump station to limit floodwater elevation in the upland areas.

Order of Magnitude Probable Cost

Order of magnitude probable costs for the project were developed as a range to reflect the spectrum of development possibilities, in particular regarding the degree of hardscaping envisioned and whether a pump station is included. As such, the anticipated program cost is projected to be from $12.3 million to $23.2 million.

1. General

1.1. Project Description

The St. Paul's Blue/Greenway is the redevelopment of approximately 26 acres of public housing and other properties into an aesthetic open space designed to treat and store stormwater runoff, as well as support recreational activities. The project is being developed concurrently and in coordination with the broader upland redevelopment of the St. Paul's district.

1.2. Purpose and Need

In January 2018, the City undertook preparation of a revitalization plan for the St. Paul's area as part of the U.S. Department of Housing and Urban Development's Choice Neighborhoods Initiative (CNI) and developed a visionary master plan to improve, through redevelopment: flood resiliency, safety, housing, availability and diversity. The blue/greenway serves in the aspect of flood resiliency in that it aims to significantly reduce the effects of flooding for the residents of this area while providing a green space for recreation. With these issues addressed, the space has the opportunity to become an essential part of a large transformational improvement of this neighborhood adjacent to Norfolk's downtown business district.

Figure 1-1: Conceptual sketch of the redeveloped St. Paul's area (Source: 2018 Vision Plan, Torti Gallas + Partners w/ Depiction, LLC)

1.3.Location

This project is located just east of downtown Norfolk in the Tidewater Gardens neighborhood (**Figure 1-2**). The broader area is a mix of institutional, commercial, and multi-family dwellings, much of which was developed in mid-1900s, that forms a low-to medium density urban environment. Several major connector roads surround the area, and the neighborhood has good access to public transportation such as the Hampton Roads Transit (HRT) bus stops and The TIDE light rail. The existing road network disconnected Tidewater Gardens from the larger city street grid with only a single east-west connection (Charlotte Street) between City Hall Avenue and Tidewater Drive.

Hydrologically, the site represents the downstream half of an urban drainage basin that extends a little over a quarter of a mile further north to Virginia Beach Boulevard (See Section 2 for additional discussion).

Context Map

Figure 1-2: St. Paul's Blue/Greenway within the City of Norfolk

1.4.Functional Concept Development Objectives and Scope

The functional concept development effort was undertaken to support planning of the blue/greenway concurrent with the planning and design of the larger St. Paul's redevelopment. The particular focus is on establishing the needed footprint of the blue/greenway and quantifying the project benefits.

The primary function of the blue/greenway is to create space for stormwater to manage water quality, as well as tidal and stormwater flooding. Management in this context consists of slowing, storing, and discharging surface water, as illustrated in **Figure 1-3**.

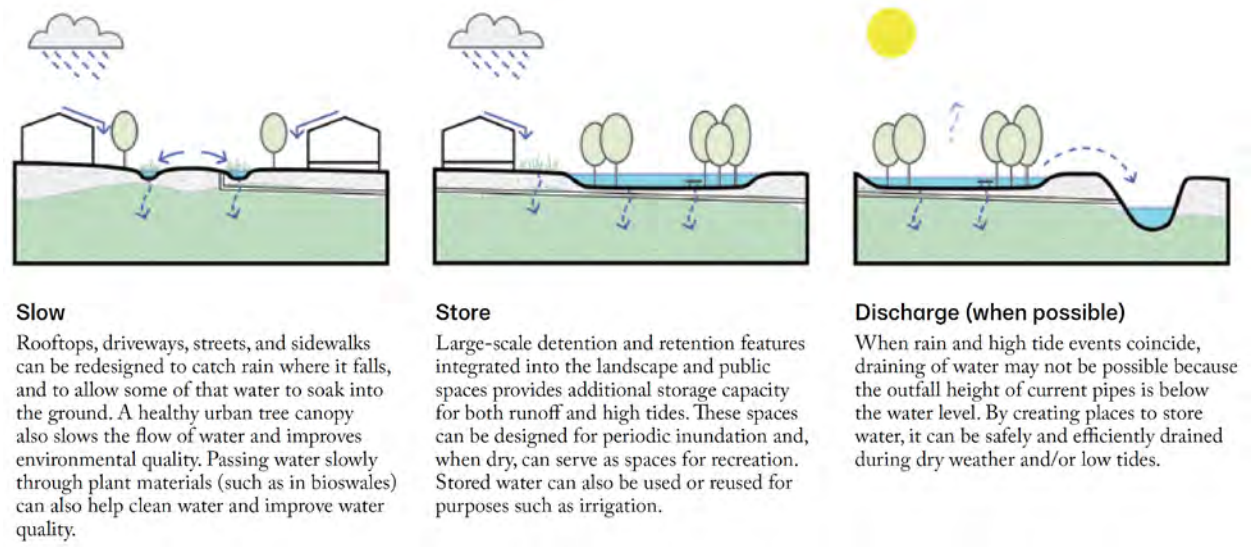


Figure 1-3: Blue/greenway water management functions

The hydraulic functions were further considered in context to potential future conditions that include significant long-term sea level rise and a trend toward more frequent heavy rainfall events. Specifically considered design conditions included:

- The 25-year return period (4% annual exceedance probability, AEP), 24-hour rainfall event, as provided in NOAA's Atlas 14. From recent analysis of historical rainfall data by City of Virginia Beach and their consultants, the Atlas 14 total for this event appears to more closely approximate a 10-year return period (10% AEP) frequency.
- Elizabeth River water levels of +4.9 ft NAVD88 and +6.4 ft NAVD88 tide conditions reflecting a 1-year return period river level with 1.5 ft and 3.0 ft sea level rise, respectively.

Under these conditions, the primary objectives for the functional concept development effort were to:

- Quantify potential benefits (e.g. reduction in severity, frequency, etc.) to area flooding as a result of developing the blue/greenway.
- Quantify potential benefits to stormwater quality, including compliance with City of Norfolk stormwater management regulations.
- Identify the footprint needed to support these benefits.
- Identify the expanded footprint needed to support recreational and aesthetic purposes.
- Provide an order-of-magnitude opinion of probable cost for the concept.
- Refine the project scope for future design and permitting efforts.

To accomplish these objectives, the following scope of work includes:

- **Hydrologic and Hydraulic Analysis** to evaluate the runoff storage, conveyance needs, and flooding effects.
- **Stormwater Quality Analysis** to determine the necessary space allocations for treatment facilities and to quantify the expected treatment performance.
- **Functional Concept Design** to incorporate the hydraulic and treatment features, as well as other desired elements, into a preliminary concept that establishes the limits of the blue/greenway and serves as a starting point for subsequent design efforts.

The products of this scope of work are documented by this report.

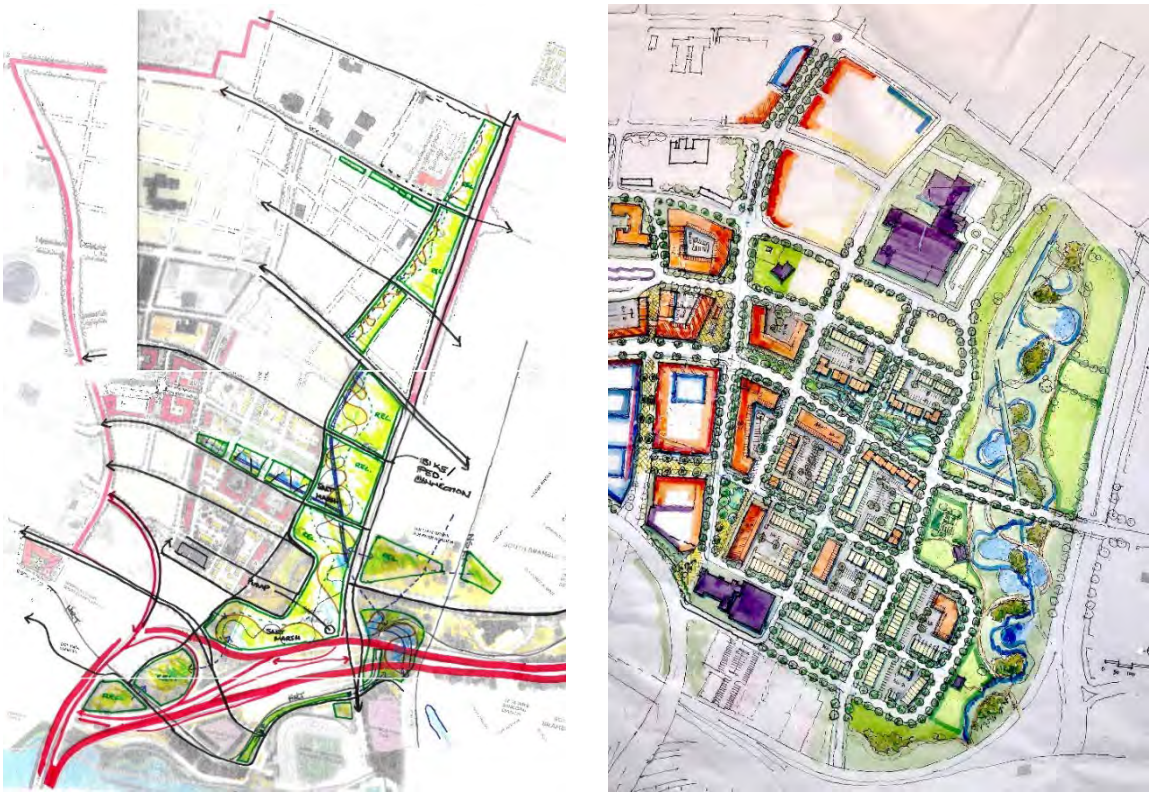


Figure 1-4: Visions for the blue/greenway developed during the CNI Kickoff Workshop, June 2019

2. Hydrologic and Hydraulic Analysis

2.1. Objectives

The objective of the hydrologic/hydraulic analyses within the functional concept development effort is to:

- Quantify stage-storage needs to prevent or minimize upland flooding in the contributing drainage basins.
- Illustrate and quantify post-redevelopment effects on upland flooding.
- Develop preliminary geometries to support the needed conveyance capacity.
- Understand the interaction between water quality treatment features and the broader hydraulic elements of the blue/greenway.

2.2. Assumptions

The hydrologic and hydraulic analysis for the functional concept relies on several high-level assumptions that will need to be reviewed as both the blue/greenway design and the larger redevelopment planning continues to progress. Key assumptions made in the present hydrologic and hydraulic analyses include:

- Existing offsite conditions and hydraulic performance reflected in a PCSWMM model of the storm drain system, provided by others,[1] are accurate. The model has not been calibrated or verified due to a lack of historical water level and discharge observations in the study area, and it will continue to be developed and refined through later stages of redevelopment and blue/greenway design.
- The design rainfall event for conveyance sizing is the NOAA Atlas 14 Type II 24-hour, 25-year return period rainfall for Norfolk (7.0 inches total rainfall)[2].
- New storm drains for the redevelopment area have been schematized based on the conceptual road grid prepared by Timmons Group following the June 2019 design charette and in conjunction with defining the water quality treatment basins (See Section 3.3 for further information).
- Groundwater and tidal effects generate a permanent pool elevation of +1.3 ft NAVD88 in all ponds and channels with invert elevations deeper than that elevation.

[1] Arcadis US developed this initial PCSWMM model under separate contract to the city of Norfolk.

[2] The 25-year return period rainfall in NOAA Atlas 14 was selected as the design basis storm to reflect more recent analysis of precipitation (Dewberry, 2018) that indicates this magnitude of rainfall is expected to more closely approximate a 10-year return period. The 10-year return period 24-hour rainfall is the current City of Norfolk Standard for the design of local drainage systems.

- Runoff reduction resulting from onsite storage of rainfall, as specified by the City of Norfolk Zoning Ordinance for areas within the Coastal Resilience Overlay, is excluded from the hydrographic/hydraulic analysis model.
- For the purpose of evaluating the performance of the blue/greenway system in future higher tailwater scenarios, it is assumed that future flood walls or similar coastal flood mitigation measured would prevent overland flow from the Elizabeth River into the blue/greenway.

2.3.Methodology

The design hydrologic and hydraulic conditions were modelled using Computational Hydraulics International's (CHI) PCSWMM modeling software, which is based on the United States Environmental Protection Agency (USEPA) Stormwater Management Model (SWMM) version 5.1.013. Within the model, design rainfall events are applied to the user-defined collection of subcatchment areas to generate runoff based on each subcatchment area's surface (pervious and impervious) and soil characteristics.

The model then simulates the calculated runoff flow over land and into open channels, pipe networks, storage features (e.g. ponds), and other treatment facilities. Model outputs allow the user to understand the flow rates, volumes, velocities, hydraulic grade lines, and other characteristics of runoff. This data is then used to design the stormwater management features, which can also be tested with the model to assess their effectiveness.

The base model for this functional concept development was a PCSWMM model developed by Arcadis US and provided in July 2019 for the project area (inclusive of upstream subcatchment areas outside of the redevelopment footprint).

That model was modified by Moffatt & Nichol for use in the analysis described below.

2.3.1. Storm Events

NRCS Type II rainfall distributions (**Figure 2-1**) using NOAA Atlas 14 point precipitation frequency estimates for a 24-hour duration in Norfolk, Virginia (summarized on **Table 2-1**) were used as the design storm events for evaluating the hydraulic performance of the concept system and as the basis for the functional requirements.

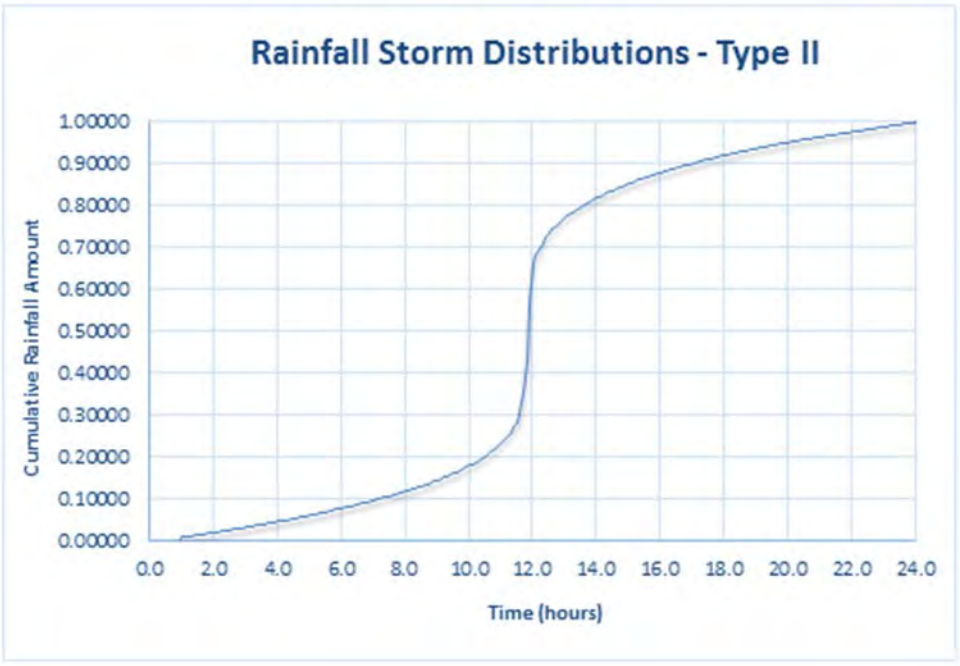


Figure 2-1: NRCS Type II rainfall distribution

Table 2-1: NOAA Atlas 14 24-hr precipitation amounts

Return Period	24-hr Precipitation (inches)
1-yr	2.95
2-yr	3.59
5-yr	4.64
10-yr	5.53
25-yr	7.00[3]
50-yr	7.97
100-yr	9.23

As indicated previously, a study of more recent rainfall patterns indicates the 25-year return period listed in NOAA Atlas 14 more closely approximates a present day 10-year return period.

2.3.2. Existing Conditions Outside the Redevelopment Area

The existing St. Paul's area drainage system extends beyond the redevelopment area limits, both to the north of Brambleton Avenue, and to the east of Tidewater Drive, as illustrated in **Figure 2-2**. Estimated runoff from these areas into the proposed blue/greenway footprint is based on the

[3] NOAA Atlas 14 reports 6.85 inches for Norfolk for the 25-yr return period storm; This value was revised for the Arcadis model to further reflect anticipated future conditions.

provided PCSWMM model. **Table 2-2** summarizes the area and peak flow conditions estimated for the offsite basins.

Table 2-2: Offsite basin characteristics

Basin	Imp. Area	Perv. Area	Total Area	Peak Flows					
				1-yr	2-yr	5-yr	10-yr	25-yr	100-yr
Units	*Acres*	*Acres*	*Acres*	*CFS*	*CFS*	*CFS*	*CFS*	*CFS*	*CFS*
Offsite North	114.24	112.91	227.15	87.0	90.5	94.2	97.2	103.3	119
Offsite East	2.57	3.62	6.19	10.0	12.4	15.9	17.0	16.7	24

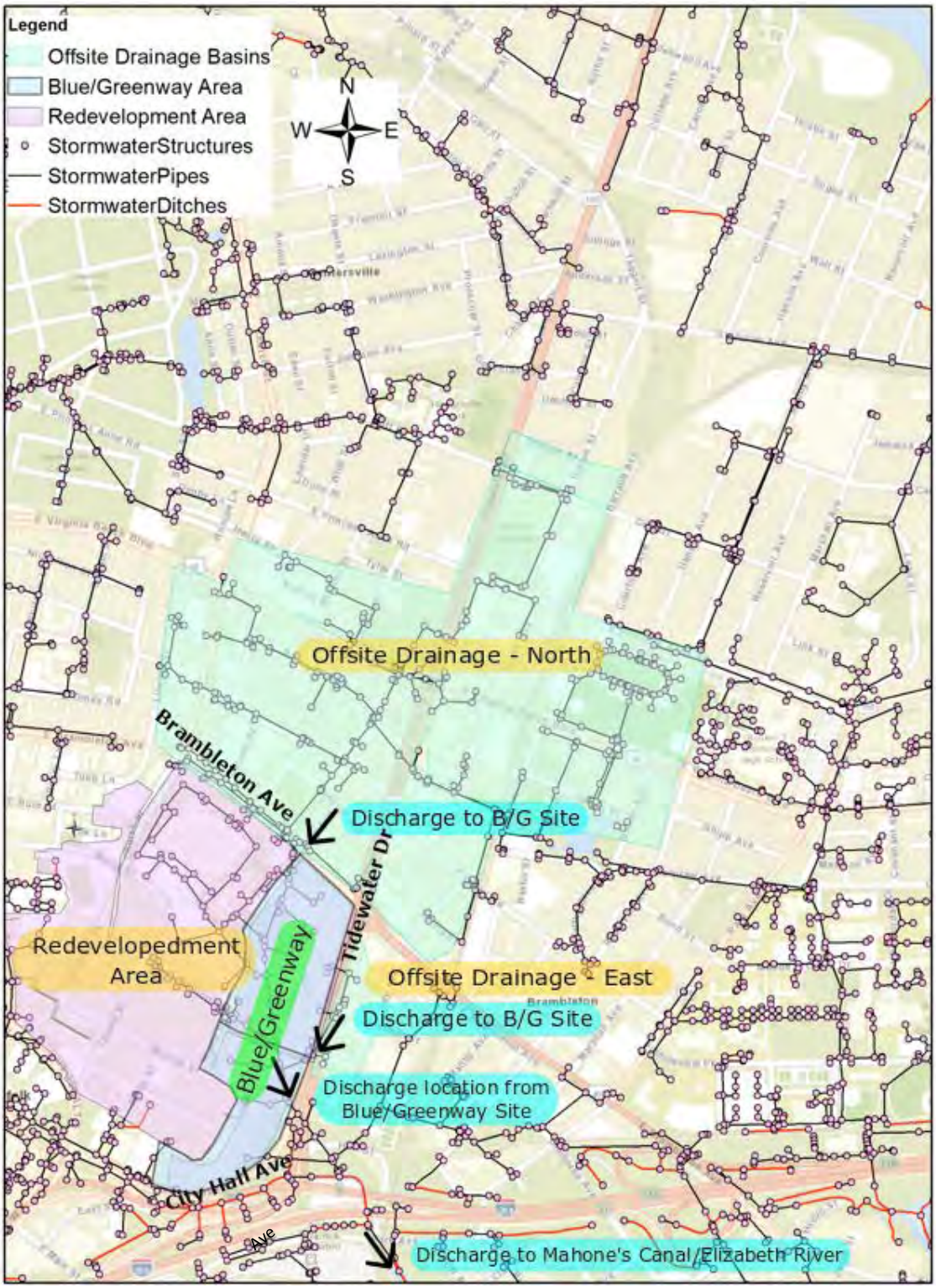


Figure 2-2: Existing drainage basins and storm drain system

2.3.3. Concept Drainage within the Redevelopment Area

A conceptual drainage system for the upland redeveloped area was modeled in PCSWMM to estimate the runoff rates and volumes that will be discharging into the blue/greenway. The conceptual system is based on the concept redeveloped road grid and an assumed prevailing redeveloped upland ground elevation of +8.0 ft NAVD88. The upland redevelopment area is conceptually divided into four drainage basins and drainage systems (coinciding with the Water Quality Basins described in Section 3), each of which conveys runoff from the area eastward to the blue/greenway for discharge into the water quality features and/or main channel (**Figure 2-3**).

The concept drains are further sized and profiled within the model to provide unconstrained flow for the NOAA Atlas 14 25-year return period storm. As design (by others) of the upland drainage system progresses, the feasibility of establishing the assumed conveyance and associated profiles should be periodically re-confirmed. Concept outfalls from the redevelopment area into the blue/greenway, as a point of coordination between the two efforts, are summarized in **Table 2-3.**

Table 2-3: Concept redevelopment drainage outfalls

Basin	Concept Pipe Dimensions	Invert Elevation at Outfall (ft, NAVD88)
WQ Basin A	Circular, 5 ft dia.	-2.25
WQ Basin B	Box, 4 ft x 4 ft	-1.00
WQ Basin C	Circular, 4 ft dia.	-1.00
WQ Basin D	Circular, 4 ft dia.	-1.00

Basins characteristics and resultant peak flows are summarized in **Table 2-4.**

Table 2-4: Concept redevelopment area characteristics

Basin	Imp. Area	Perv. Area	Total Area	Peak Flows						
				1-yr	2-yr	5-yr	10-yr	25-yr	100-yr	100-yr Design Storm*
Units	*Acres*	*Acres*	*Acres*	*CFS*	*CFS*	*CFS*	*CFS*	*CFS*	*CFS*	*CFS*
WQ Basin A	16.98	10.41	27.39	81.9	105.9	146.2	187.6	245.2	311	103
WQ Basin B	13.07	9.08	22.15	55.4	72.6	97.9	126.0	161.0	207	69
WQ Basin C	6.43	2.75	9.18	34.6	43.3	56.8	68.3	87.0	123	n/a
WQ Basin D	11.47	3.42	14.89	44.0	54.7	70.5	83.3	103.8	150	95

*100-yr Design Storm peak flows refer to the peak flow **into the blue/greenway primary channel** and reflect runoff being detained by the proposed water quality facilities.

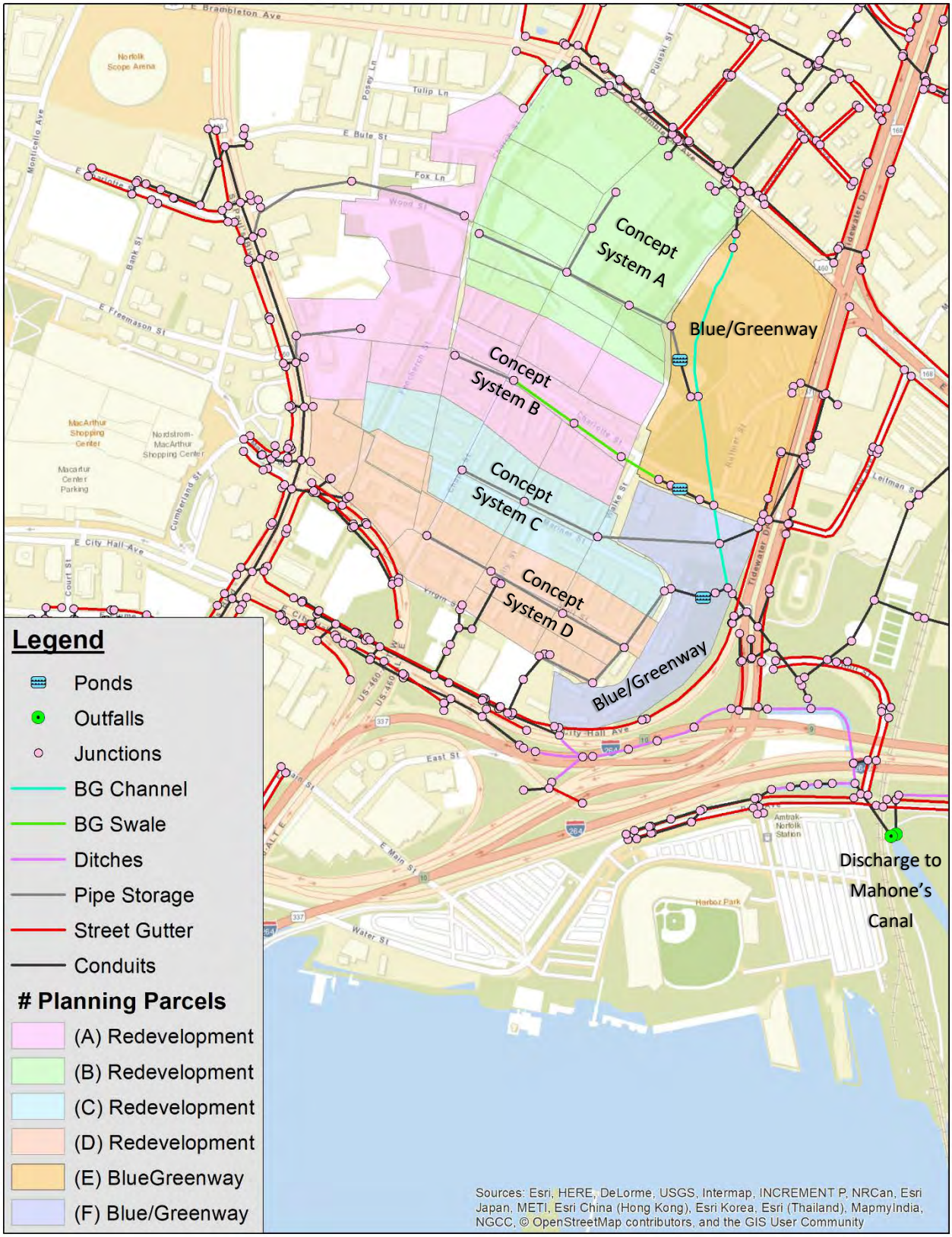


Figure 2-3: Concept drainage within the redevelopment area.

Basin B, which is centered on the redeveloped Freemason Street is further planned to include a linear blue/greenway element, including a channelized area for conveyance of stormwater upstream of its discharge into the main blue/greenway site. Within PCSWMM, this element was modeled as an open channel with a bottom elevation of approximately +3.0 ft NAVD88 and is illustrated in **Figure 2-4**.

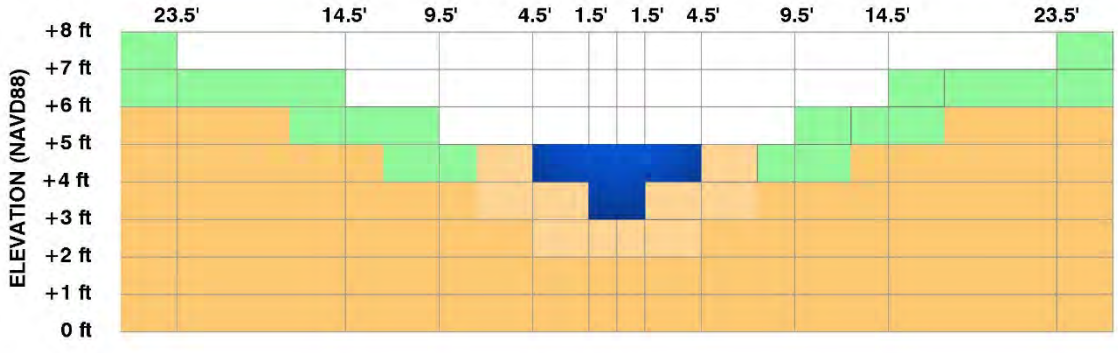


Figure 2-4: Concept hydraulic section of Freemason Street swale

2.3.4. Treatment Components

Runoff from the upland redevelopment areas may discharge into engineered treatment facilities such as wet ponds or stormwater wetlands as the runoff enters the blue/greenway (See Section 3 for further discussion).

Treated runoff from these facilities is then envisioned to discharge into the primary channel located within the blue/greenway for subsequent storage, conveyance, and ultimate discharge into the Elizabeth River Eastern Branch.

2.3.5. Blue/Greenway Channel

The functional concept of drainage within the blue/greenway is the interconnected treatment facilities mentioned above and a primary channel that receives the runoff from the upland redevelopment area as well as the existing basin areas to the north and east of the blue/greenway.

The primary channel will convey runoff into an existing culvert under Tidewater Drive. From there, the runoff flows from a series of ditches and other existing culverts to ultimately discharge into Mahone's Canal[4] and on into the Elizabeth River Eastern Branch.

[4] Referenced on a March 1921 Norfolk and Vicinity Map prepared by the Norfolk City Planning Commission (G3884.N6 1921 .N61 MLC)

The primary channel is envisioned to consist of a perpetually-wet bottom channel with a deliberate broader channel section designed for higher flows and significant water storage during high tailwater conditions that may constrain or prevent discharge. The intent of the functional concept is to quantify approximate water storage needed at various elevations. During preliminary design efforts, it is expected that these areas will be used to develop a concept channel that considers other design elements such as stable side slopes, public safety, and localized space constraints.

The functional concept channel section and associated storage volumes are illustrated in **Figure 2-5**. The concept section was developed through successive model runs to identify a reasonable set of storage volume objectives and planning elevations.

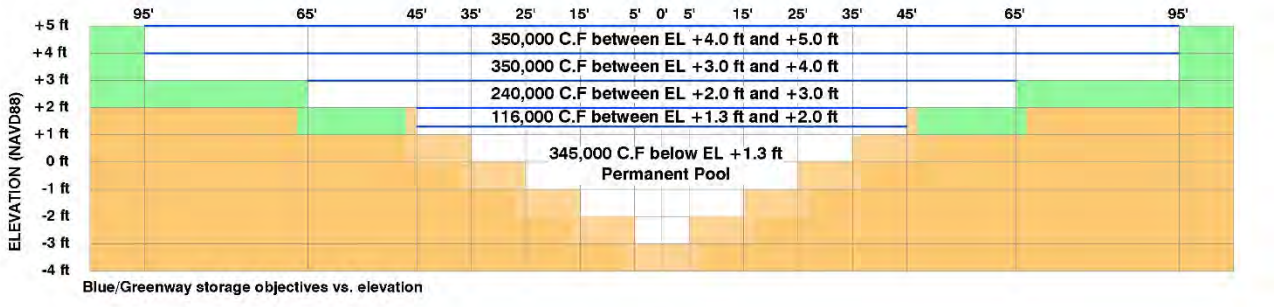


Figure 2-5: Functional concept storage objectives vs. elevation

The storage volume below elevation +1.3 ft NAVD88 is generally only effective for alternatives that provide pre-storm pumping, and therefore the anticipated passive performance for the blue/greenway does not rely on it. As the functional concept is applied to the site to develop a preliminary design, this storage may be reduced or re-located outside of the blue/greenway.

2.3.6. Tailwater Conditions

System operation under various tailwater conditions was simulated in PCSWMM to evaluate the potential effects of the blue/greenway on upland flooding.

- Static +1.6 ft NAVD88 to reflect a typical high tide condition (MHHW)
- Static +3.4 ft NAVD88 to reflect a probable maximum annual high tide condition[5]/Approximate MHHW with 1.5 ft of future sea level rise
- Static +4.9 ft NAVD88 for probable maximum high tide plus 1.5 ft of future sea level rise
- Static +6.4 ft NAVD88 for probable maximum high tide plus 3.0 ft of future sea level rise

[5] +2.96 ft NAVD88 (2018 NOAA estimate for the 99% Annual Exceedance Probability Level for the Sewell's Point Tidal Station) plus 0.4 ft local tide adjustment (Fugro Atlantic, 2010) for the project location compared to Sewell's Point.

- November 2009 Nor'easter tidal elevation time-series
- November 2009 Nor'easter tidal elevation time series plus 1.5 ft of future sea level rise
- Typical receding (ebbing) tide time-series (rate at which a high tailwater condition recedes)
- Typical receding (ebbing) tide time series plus 1.5 ft of future sea level rise

Sea level rise increments are the planning increments presently being used for Hampton Roads area sea level rise, flooding, and stormwater studies.

Static tailwater conditions were used to conservatively assess the runoff volumes, peak flows, and hydraulic grade lines the blue/greenway would need to manage. Additionally, to help further define the requirements of the functional concept and quantify its potential benefits, scenarios with dynamic tides were also generated.

The 2009 Nor'easter was used as an approximation of a severe weather event to assess potential opportunities to either reduce the storage needs or maximize the storage benefits upstream of the tide gate by considering that there may be periods during a storm event where discharge is plausible. These scenarios were just an initial assessment and did not seek to capture the full range of controlling conditions.

A typical ebbing tide time series (i.e. how fast does the tailwater recede) was also used in selected scenarios to evaluate the blue/greenway's effect on the duration of upland flooding in context to when the tailwater begins to recede (See Section 2.4.2 for additional information).

2.3.7. Tide Gate

A tide gate was assumed to be installed where the outflow from the blue/greenway will pass under Tidewater Drive to limit backflow into the site, particularly given the design tailwater elevations associated with sea level rise. Tide gates (such as the one shown in **Figure 2-6**) act as a check valve to prevent downstream water from flowing back into the system during high tides.

Figure 2-6: Example of a tide gate (downstream side). As water level rises, buoyancy forces act on the orange floats to shut the door.

Due to large portions of the upland area being at or below an elevation of +5.0 ft NAVD88, storm event runoff becomes effectively sequestered within the blue/greenway and other storage areas for tailwaters of +4.9 ft NAVD88 or higher, as it will be unable to establish the gradient necessary to discharge through the tide gate and into the Eastern Branch of the Elizabeth River.

The specific location of the tide gate may change as the design progresses, as there may be opportunities for its function to support other storm drain systems that discharge into Mahone's Canal.

2.3.8. Freemason Street Culvert

The conceptual street grid for the redevelopment area includes a realigned Freemason Street crossing the blue/greenway to connect to Tidewater Drive. For the functional concept, a culvert is envisioned over the main blue/greenway channel. While the main channel section is fairly wide, its geometry is primarily based on providing storage capacity. The calculated peak flow rate for the 100-year return period storm (a typical design condition for major structures) during a low tailwater condition is approximately 207 cfs[6].

[6] Under the redevelopment concept, a significant amount of runoff is detained by the water quality BMPs which helps reduce the overall peak flow at the culvert compared to the peak flows being discharged from each basin.

An 80 ft long (assumed based on the concept road section) single barrel box or arch culvert measuring 16 ft wide with a crown elevation of +4.0 ft NAVD88 (+3.5 ft NAVD88 peak hydraulic grade line) should provide sufficient conveyance capacity for the 100-year return period peak flow rate.

2.4.Functional Concept Hydraulic Performance

The PCSWMM model was used to estimate the future hydraulic conditions resulting from the redevelopment of the St. Paul's area and construction of the blue/greenway under various storm events. Key model outputs used to support the functional concept development were:

Peak hydraulic grade line within the blue/greenway to understand the expected conditions within the blue/greenway.

Runoff volume of the subcatchment areas to understand storage needs, with the subcatchments further grouped into major areas: off-site drainage north of Brambleton Avenue, off-site drainage east of Tidewater Drive, the four redevelopment area basins, and the blue/greenway itself.

Flood recession time to understand how quickly the system will recover once the tailwater elevation begins to recede.

2.4.1. Peak Water Elevations

Peak water elevations within the blue/greenway (i.e. the maximum simulated hydraulic grade line within the site) were calculated for a range of storm events and static tailwater elevations and are summarized in **Table 2-5**. Note that initial water elevations within the blue/greenway are lower than the tailwater elevation due to the assumption of a tide gate to prevent backflow into the system.

As the tailwater elevations increase with rising sea level, the opportunity for the blue/greenway to discharge during the storm event is progressively reduced. The runoff accumulating within the blue/greenway will be increasingly impounded and unable to discharge by gravity. Eventually, the system's storage volume becomes exceeded and flooding will occur.

Table 2-6 further summarizes analysis results for scenarios where the City prepares for a forecasted storm by lowering the water elevation upstream of the tide gate, which may be feasible using a modestly sized pump station (compared to a pump station designed to reliably meet or exceed the peak flow rates discharging into the blue/greenway during a storm event). Dynamic, albeit severe, tailwater conditions based on the 2009 Nor'easter tide levels were also modelled to assess the possible sensitivity of the calculated hydraulic grade line to the variation in tailwater level that might be encountered during such an event.

Table 2-5: Summary of results, static tailwater scenarios

Storm Event	24-hr NOAA Atlas 14 Rainfall	Starting Water Elevation	Tailwater Elevation	Total Inflow Volume	Peak HGL Elevation	Interpretation of Model Outputs
Units	*Inches*	*ft, NAVD88*	*ft, NAVD88*	*ft³*	*ft, NAVD88*	
Scenario 1 - Existing MHHW						
1-yr	2.95	+1.30	+1.60	1,930,000	+2.05	The blue/greenway would be able to discharge through the tide gate almost immediately and continue throughout the storm event, including during peak runoff periods. This performance limits the hydraulic grade line to less than +2.7 ft NAVD88, which is still below the majority of the system's inlets (and therefore flooding due to the system's capacity is not anticipated; localized flooding due to overland flow and inlet capacity constraints may still occur).
2-yr	3.59	+1.30	+1.60	2,410,000	+2.26	
5-yr	4.64	+1.30	+1.60	3,215,000	+2.61	
10-yr	5.53	+1.30	+1.60	3,895,000	+2.88	
25-yr	7.00	+1.30	+1.60	4,995,000	+3.30	
Scenario 2 - Existing annual maximum high tide / Approximate future MHHW for 1.5 ft sea level rise						
1-yr	2.95	+1.30	+3.40	1,640,000	+3.45	Should the design storm event coincide with an existing annual maximum high tide elevation (or a typical high tide condition following 1.5 ft sea level rise), the model indicates the concept blue/greenway would effectively manage runoff as discharge is still expected to occur when the stored water elevation reaches higher stages within the blue/greenway. However, more upland locations would experience flooding where existing inlets are fairly low.
2-yr	3.59	+1.30	+3.40	2,080,000	+3.50	
5-yr	4.64	+1.30	+3.40	2,835,000	+3.64	
10-yr	5.53	+1.30	+3.40	3,490,000	+3.9	
25-yr	7.00	+1.30	+3.40	4,525,000	+4.34	
Scenario 3 - Projected annual maximum high tide plus 1.5 ft sea level rise						
1-yr	2.95	+1.30	+4.90	1,525,000	+3.71	Beginning with this scenario, tailwater elevations are at or exceed the elevation of many areas within the overall drainage basin, thus resulting in complete impoundment of stormwater runoff unless pumping systems are installed. Typical storms (1-yr and 2-yr return periods) are expected to generally be contained by the concept blue/greenway with some upland flooding in low-lying areas. Major storms (5-yr+) will result in widespread flooding[7].
2-yr	3.59	+1.30	+4.90	1,830,000	+4.01	
5-yr	4.64	+1.30	+4.90	2,360,000	+4.44	
10-yr	5.53	+1.30	+4.90	2,850,000	+4.72	
25-yr	7.00	+1.30	+4.90	3,580,000	+4.95	
Scenario 4 - Projected annual maximum high tide plus 3.0 ft sea level rise						
1-yr	2.95	+1.30	+6.40	1,525,000	+3.71	Similar to Scenario 3; runoff is impounded by the blue/greenway and tide gate until the tidal elevation recedes.
2-yr	3.59	+1.30	+6.40	1,830,000	+4.01	
5-yr	4.64	+1.30	+6.40	2,360,000	+4.44	
10-yr	5.53	+1.30	+6.40	2,850,000	+4.72	
25-yr	7.00	+1.30	+6.40	3,555,000	+5.01	

[7] Accurate evaluation of these scenarios becomes limited as the modeled conditions reach the practical limits of the stormwater model. When the hydraulic grade line exceeds upland inlet elevations, the model relies on broad assumptions regarding the extent of ponding and "above inlet" storage. These assumptions support this evaluation of blue/greenway concept performance but are not suitable for fully assessing the impact of surface flooding.

Table 2-6: Summary of results, other scenarios

Storm Event	24-hr NOAA Atlas 14 Rainfall	Starting Water Elevation	Tailwater Elevation	Total Inflow Volume	Peak HGL Elevation	Interpretation of Model Outputs
Units	*Inches*	*ft, NAVD88*	*ft, NAVD88*	*ft^3*	*ft, NAVD88*	
Scenario 5 – Approximate future MHHW for 1.5 ft sea level rise with 1 ft pre-storm pump down						
1-yr	2.95	+0.30	+3.40	1,675,000	+3.41	Compared to the no pre-storm pump down scenario (Scenario 2), very minor improvements are observed during major events due to more blue/greenway storage being available to receive peak discharges into the blue/greenway.
2-yr	3.59	+0.30	+3.40	2,080,000	+3.45	
5-yr	4.64	+0.30	+3.40	2,860,000	+3.53	
10-yr	5.53	+0.30	+3.40	3,520,000	+3.65	
25-yr	7.00	+0.30	+3.40	4,615,000	+4.07	
Scenario 6 – Projected annual maximum high tide plus 1.5 ft sea level rise with 1 ft pre-storm pump down						
1-yr	2.95	+0.30	+4.90	1,685,000	+3.54	As with Scenario 5, the minor pre-storm pump downs appear to convey very minor reductions in peak hydraulic grade lines.
2-yr	3.59	+0.30	+4.90	1,945,000	+3.78	
5-yr	4.64	+0.30	+4.90	2,480,000	+4.26	
10-yr	5.53	+0.30	+4.90	2,940,000	+4.58	
25-yr	7.00	+0.30	+4.90	3,705,000	+4.93	
Scenario 7 – Projected annual maximum high tide plus 1.5 ft sea level rise with 3.3 ft pre-storm pump down						
1-yr	2.95	-2.00	+4.90	1,870,000	+2.87	Extensive pre-storm pumping to significantly lower water levels and make additional storage volume available within the blue/greenway is predicted to provide modest reductions to the peak hydraulic grade line, though the 25-year storm event's runoff volume is still substantial compared to the incremental storage volume increase and some upland flooding is still expected to occur.
2-yr	3.59	-2.00	+4.90	2,295,000	+3.33	
5-yr	4.64	-2.00	+4.90	2,930,000	+3.73	
10-yr	5.53	-2.00	+4.90	3,325,000	+4.15	
25-yr	7.00	-2.00	+4.90	4,060,000	+4.65	
Scenario 8 Projected annual maximum high tide plus 3.0 ft sea level rise plus two package pumps operating before and during storm event						
1-yr	2.95	+1.30	+6.40	n/a	+2.34	This scenario indicates that with the blue/greenway storage volumes, modest pump stations can help mitigate peak hydraulic grade lines during major storm events.
2-yr	3.59	+1.30	+6.40	n/a	+2.80	
5-yr	4.64	+1.30	+6.40	n/a	+3.35	
10-yr	5.53	+1.30	+6.40	n/a	+3.72	
25-yr	7.00	+1.30	+6.40	n/a	+4.35	
Scenario 9 – 2009 Nor'easter dynamic tailwater conditions plus 1.5 ft sea level rise						
1-yr	2.95	+1.30	2009 NE + 1.5	n/a	+3.70	The resultant peak hydraulic grade lines for scenarios using the 2009 Nor'easter tidal conditions to represent more realistic tailwater conditions indicates the use of static tailwater conditions do not result in excessively conservative predictions. Despite the pattern of rising and lowering tailwaters, discharge from the blue/greenway remained very limited and the resultant peak hydraulic grade lines were similar to Scenario 3.
2-yr	3.59	+1.30	2009 NE + 1.5	n/a	+4.00	
5-yr	4.64	+1.30	2009 NE + 1.5	n/a	+4.41	
10-yr	5.53	+1.30	2009 NE + 1.5	n/a	+4.68	
25-yr	7.00	+1.30	2009 NE + 1.5	n/a	+5.04	

Total runoff volume flowing into the blue/greenway was also documented to help provide insight into the magnitude of storage needed. The calculated volume reaching the blue/greenway decreases due to the effects of upstream, offsite surface flooding as the tailwater elevations increase.

Figures 2-7 through 2-10 illustrate the water levels compared to a functional concept cross-section of the main blue/greenway channel. Figures 2-7 and 2-8 illustrate a range of inundation within the blue/greenway that may occur in present day. As sea level progresses towards 1.5 ft above current benchmarks, the latter scenario (Figure 2-8) will be experienced more frequently unless pumping measures are implemented.

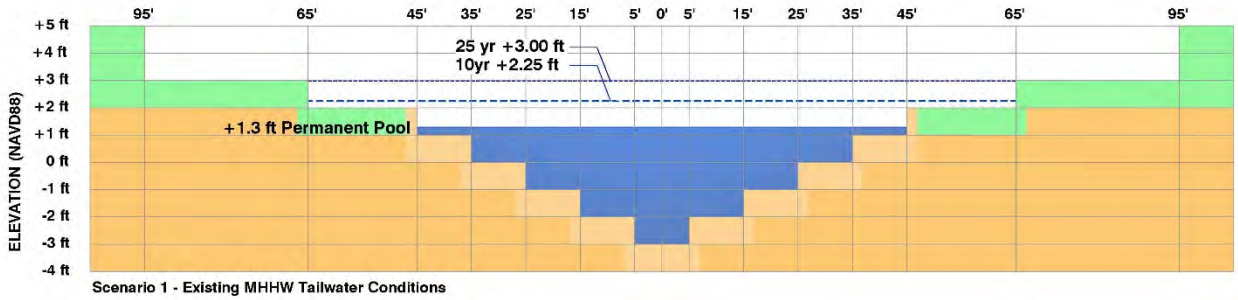


Figure 2-7: Peak water levels for existing MHHW tailwaterwater conditions

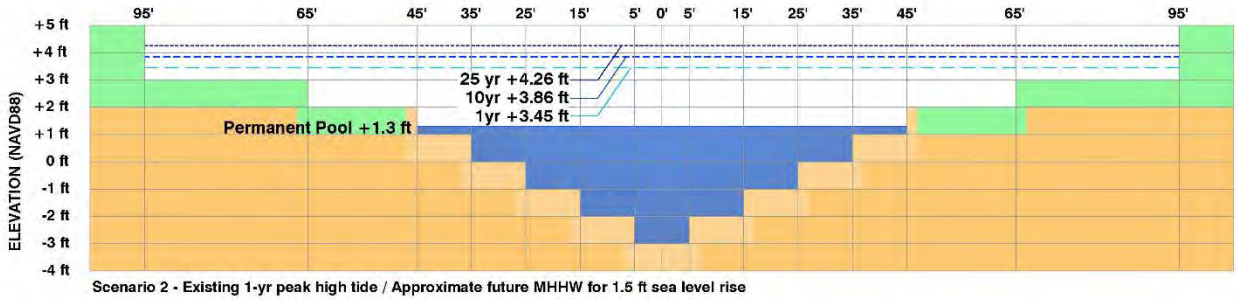


Figure 2-8: Peak water levels for existing annual maximum high tide / approximate future MHHW for 1.5 ft sea level rise

Where river conditions result in tailwater elevations exceeding +4.9 ft NAVD88, runoff within the blue/greenway will be impounded for the duration of the high tide (Figure 2-9). One measure that can help mitigate such events would be to lower the water level within the blue/greenway ahead of a forecasted rain event (Figure 2-10). As this is a proactive effort, it may be accomplished with smaller pumping facilities than one designed to convey the peak flows generated by a major storm event.

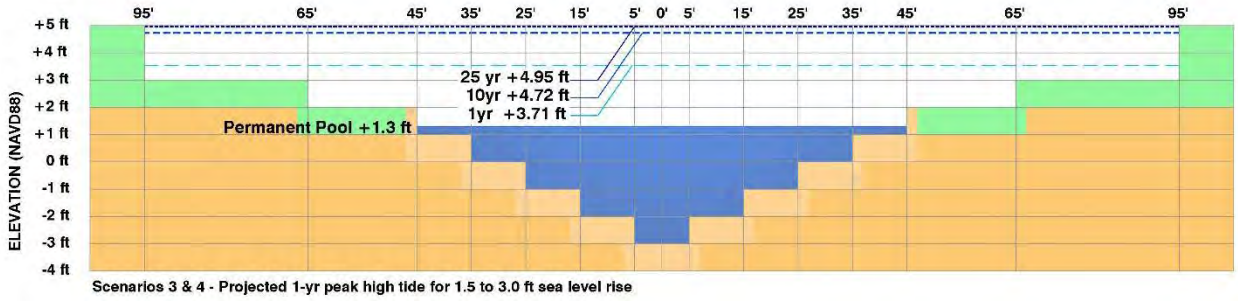


Figure 2-9: Peak water levels for projected annual maximum high tide with 1.5 ft or more sea level rise

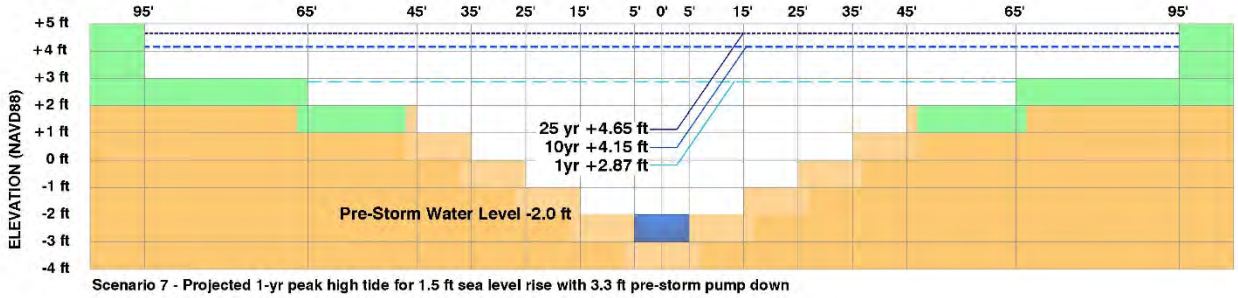


Figure 2-10: Peak water levels for projected annual maximum high tide with 1.5 ft or more sea level rise and pre-storm pump down.

Continuing pumping throughout the storm, even with modest pumps, provides additional improvements (Scenario 8 on Table 2-5). As illustrated by the sequence shown in **Figure 2-11**, a pair of pumps each conveying up to 30 cfs throughout the storm would reduce the peak water elevation within the blue/greenway, and then expeditiously lower the stored water level following the storm's peak.

Overall, the model indicates concept blue/greenway will function passively in the near-term but will require pumping features to provide a consistent level of protection as sea level rises.

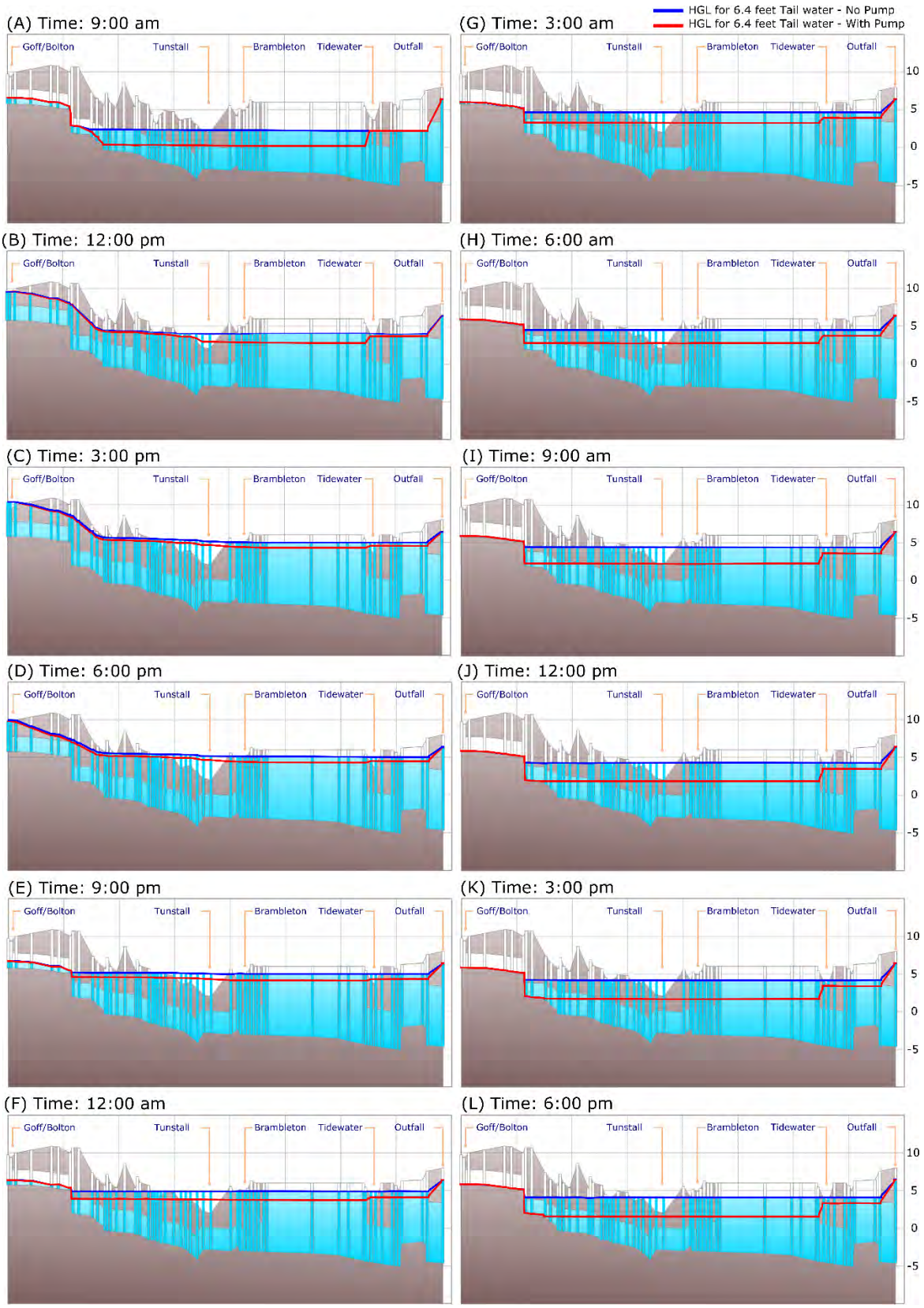


Figure 2-11: Comparison of peak water elevation time series with and without pumps, 25-yr storm w/ 3 ft sea level rise

2.4.2. Upland Flooding and Recovery

The storage provided by the blue/greenway will mitigate flooding presently experienced in areas further upstream. Still, as indicated in the previous section, low-lying areas within the project's drainage basin will increasingly experience flooding as sea level rises unless additional measures such as pumping and construction of flood barriers are provided.

2.4.2.1. Predicted Flood Extents

Hydraulic grade line elevations calculated by the model were applied to the rim elevations of the stormwater structures documented in the available GIS data to identify which nodes experience flooding during design storm events as a means of demonstrating that the project will reduce or otherwise not adversely affect the likelihood and/or magnitude of flooding experienced by the overall system.

Figures 2-12 through **2-15** provide side-by-side comparisons of the existing system and post-project system nodes (See Appendix A for enlarged figures). The model shows that the storage provided by the blue/greenway will generally lower the peak hydraulic grade lines of the upland areas at each node, reducing the frequency and depth of surface flooding.

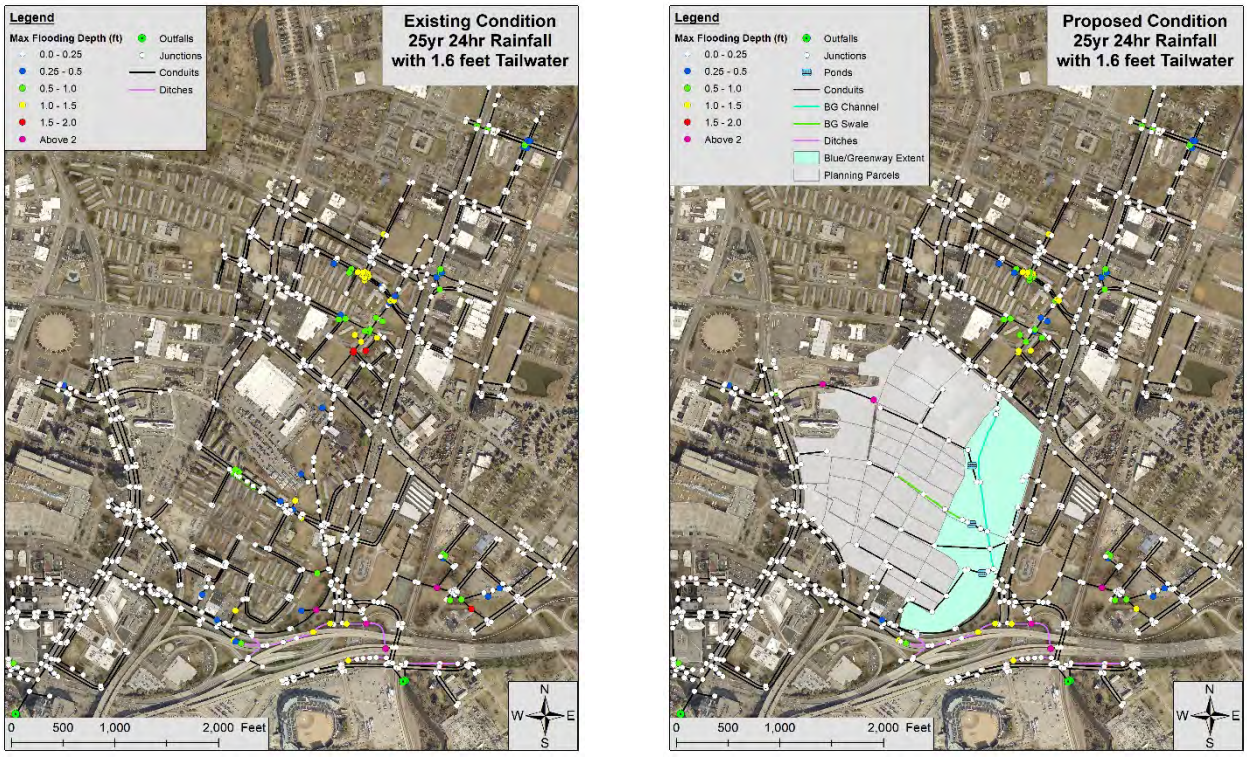
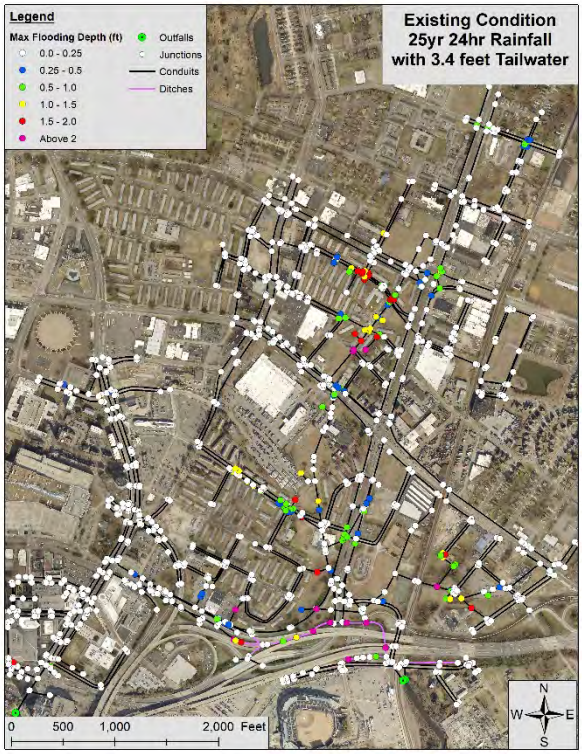


Figure 2-12: Pre- and Post-project flooded nodes for 25-yr storm with +1.6 ft NAVD88 tailwater



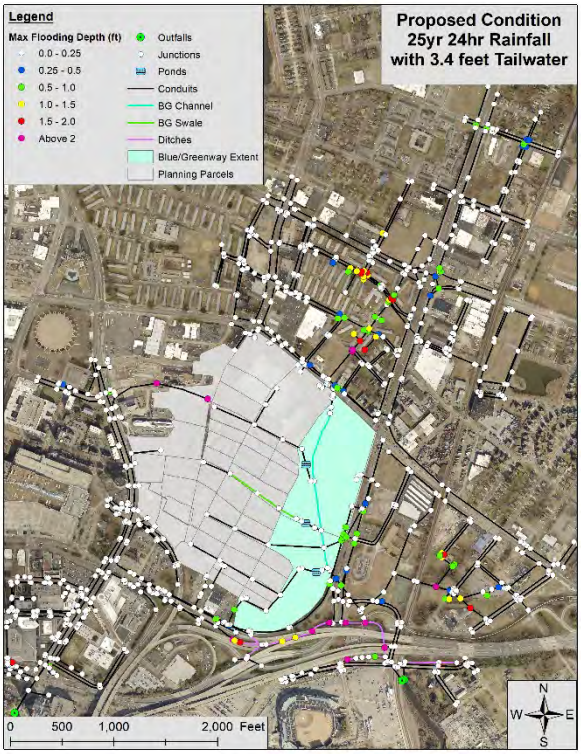
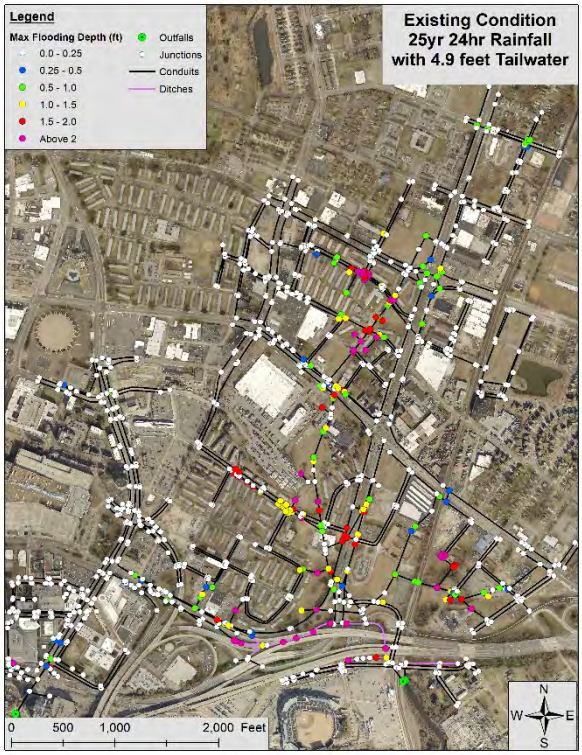


Figure 2-13: Pre- and Post-project flooded nodes for 25-yr storm with +3.4 ft NAVD88 tailwater



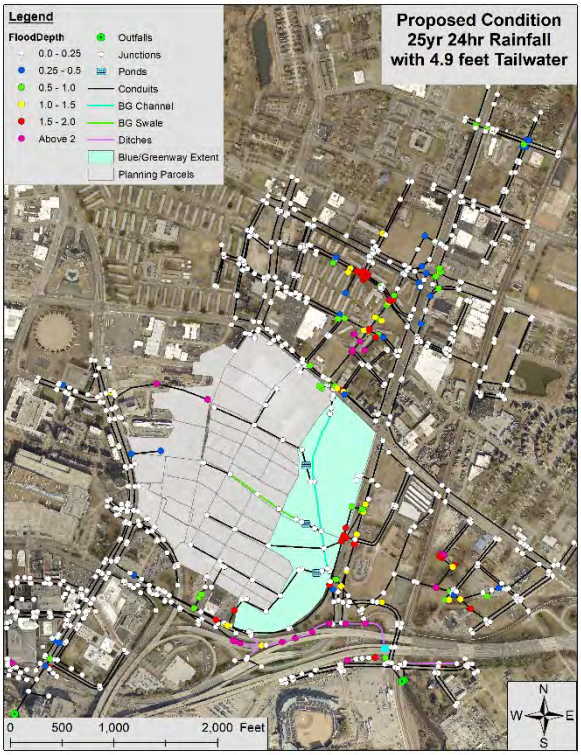


Figure 2-14: Pre- and Post-project flooded nodes for 25-yr storm with +4.9 ft NAVD88 tailwater

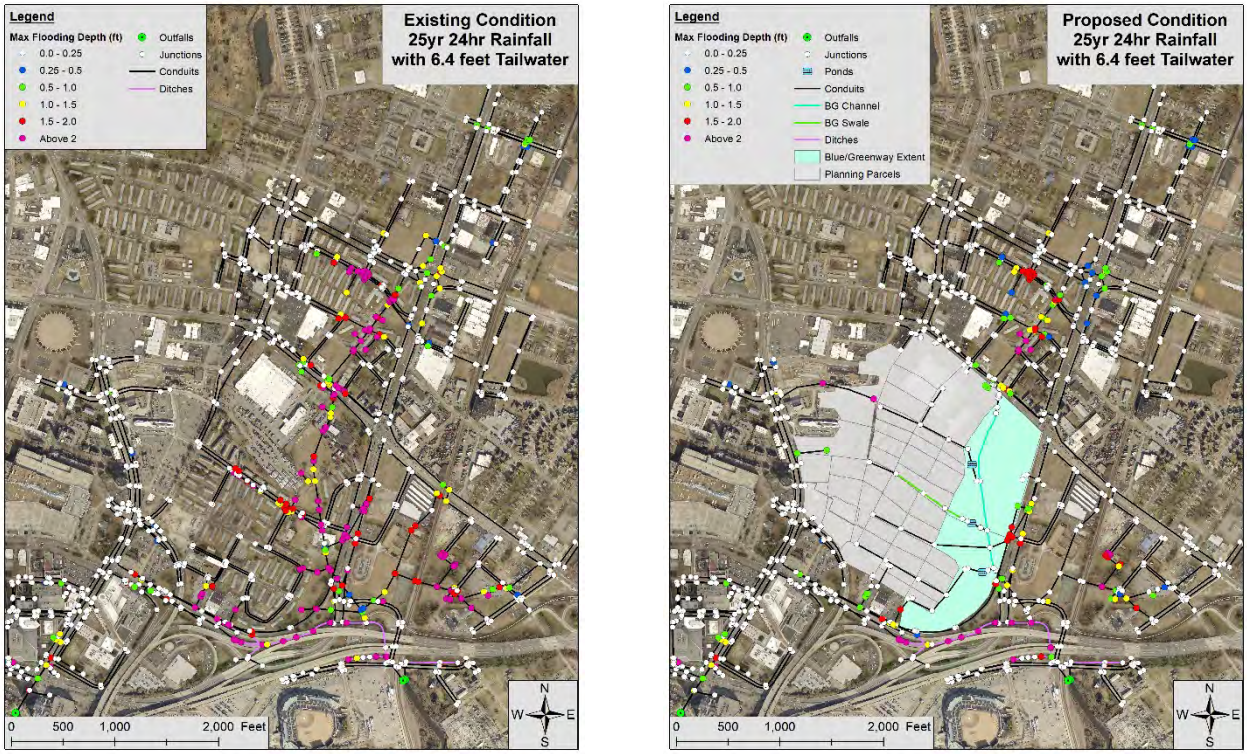


Figure 2-15: Pre- and Post-project flooded nodes for 25-yr storm with +6.4 ft NAVD88 tailwater

2.4.2.2. Flood Recovery

Major storm events may result in extended periods of high tailwater conditions that limit discharge from the site. To evaluate the blue/greenway's effect on flood recovery once the tide begins to recede, selected storm events with high tailwater conditions were modelled with a receding tailwater to mimic a typical ebb tide (**Figure 2-16**) following the storm to determine the how long the calculated hydraulic grade line takes to fall below all stormwater structure rims. As runoff is able to discharge from the blue/greenway, the hydraulic grade line becomes progressively lower until it is below the upland inlets, indicating the probable recovery from flooding (absent overland flow obstructions and inlet capacity constraints). **Figures 2-17** and **2-18** illustrate the "flooded" and "recovered" profiles.

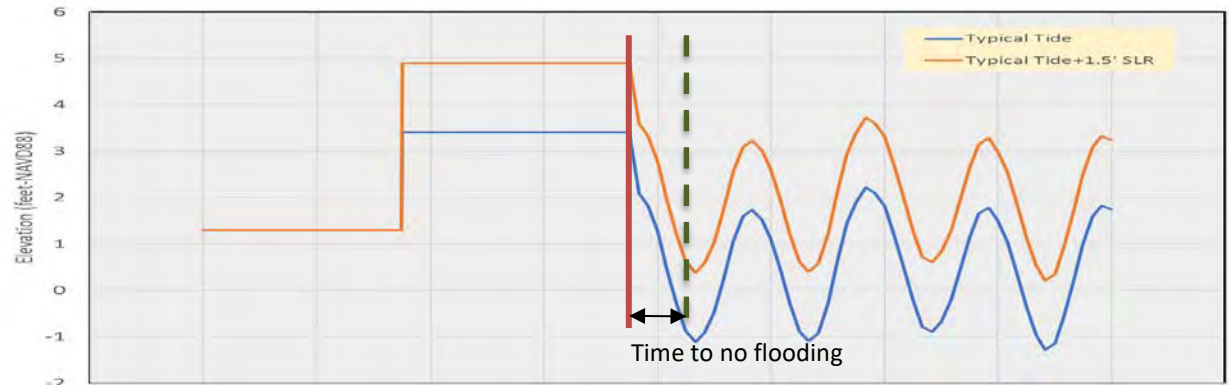


Figure 2-16: Tailwater over time for flood recovery evaluation

Table 2-7 summarizes the results of this analysis, which was performed for the +3.4 ft and +4.9 ft NAVD88 tailwater scenarios where flooding is predicted to occur. As indicated, the blue/greenway will not adversely affect flood recovery and may provide minor improvements for higher tailwater conditions.

Table 2-7: Summary of flood recovery times

Storm Event	Starting Water Elevation	Starting Tailwater Elevation	Existing System	Proposed System
			Time to Recovery	Time to Recovery
Units	*ft, NAVD88*	*ft, NAVD88*	*hours*	*hours*
10-yr	+1.3	+3.4	1.8	1.8
25-yr	+1.3	+3.4	1.8	1.8
2-yr	+1.3	+4.9	4.7	4.3
5-yr	+1.3	+4.9	4.7	4.5
10-yr	+1.3	+4.9	4.7	4.5
25-yr	+1.3	+4.9	4.7	4.5

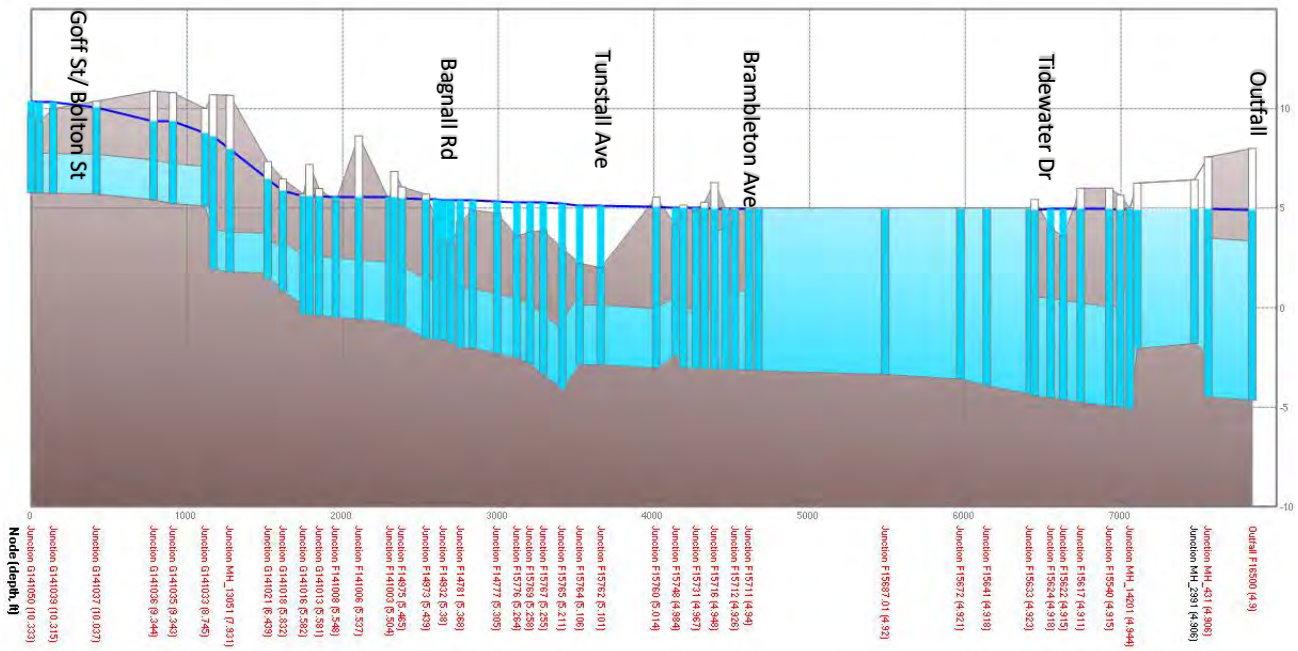


Figure 2-17: Calculated "Flooded" profile for 25-yr storm with +4.9 ft NAVD88 tailwater

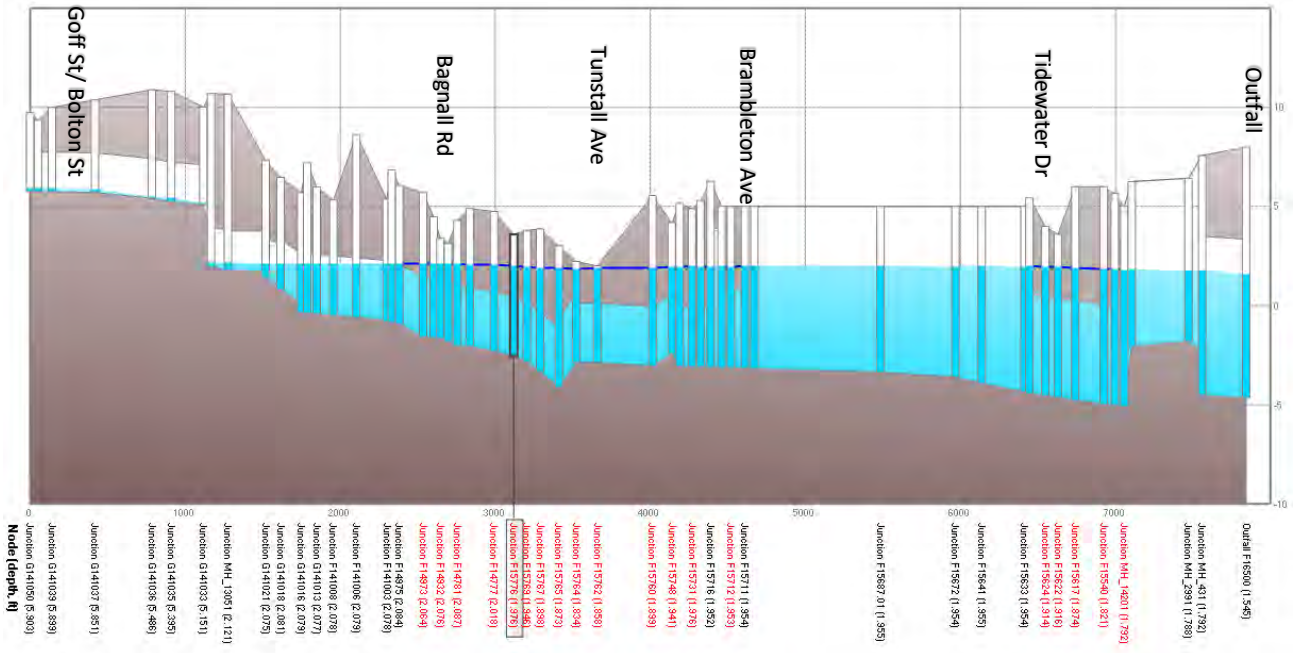


Figure 2-18: Calculated "recovered" profile (approximately 4.5 hours following start of ebb tide)

3. Stormwater Quality

3.1. Objectives

The objective of the stormwater quality evaluation within the functional concept development is to identify and document:

- anticipated water quality improvements needed by the overall redevelopment effort to comply with the City of Norfolk's stormwater requirements;
- estimated footprints of the stormwater best management practices (BMPs) to provide the target treatment;
- opportunity to gain Chesapeake Bay Program Total Maximum Daily Load (TMDL) credits; and
- other potential water quality-related opportunities.

3.2. Assumptions

The water quality analysis for the functional concept is reliant on several high-level assumptions that will need to be confirmed as the larger redevelopment planning continues to progress toward final plans and construction. Key assumptions include:

- Concept water quality drainage basins (shown as Basins A – D on **Figure 3-1**) have been developed based on the conceptual road grid prepared by Timmons Group following the June 2019 design charette. The blue/greenway footprint is represented by an additional two water quality basins (Basins E and F).
- Each redevelopment basin will be fully redeveloped:
    - The redeveloped upland basins are assumed to have an additional 10% impervious area over existing conditions.
    - The blue/greenway footprint is assumed to have a maximum 5.6 acres of impervious surface.[8] The actual impervious surface created within the blue/greenway is likely to be less than this value.
- BMPs within the blue/greenway will need to provide all required water quality improvements for the redevelopment project nominally bounded by Brambleton Avenue, Tidewater Drive, St. Paul's Boulevard, and City Hall Avenue.
- Potential water quality benefits of future onsite stormwater management features of the redeveloped parcels have not been factored into the calculations.

[8] Based on the Runoff Reduction Method worksheet, reducing the blue/greenway basins from approximately 9.3 acres of existing impervious to no more than 5.6 acres under redeveloped conditions will achieve the required TP reduction without the need for a treatment BMP.

- Water quality benefits that may be generated by the extension of the blue/greenway along Freemason Street are not reflected in the water quality calculations.

Analysis of interim water quality conditions during individual redevelopment phases was excluded from the present calculations because the primary objective of this functional concept development stage is to support definition of the end goal. A future stage of the blue/greenway design would be able to consider additional details on interim functionality and construction phasing.

3.3.Methodology

Determination of the specific water quality objectives (i.e. Total Phosphorus removal) was based on the calculations using the *DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet Version 3.0*. BMP effectiveness calculations were based on the Virginia Department of Conservation and Recreation (DCR) 2013 BMP Standards and Specifications[9].

As indicated in the previous section, the water quality calculations are for concept water quality drainage basins based on the redevelopment footprint and concept road grid. Four basins were defined for the redeveloped area, plus two additional basins for the blue/greenway footprint, as shown in **Figure 3-1**. **Table 3-1** summarizes the characteristics for each area (based on the Arcadis stormwater model and reflecting a 10% increase in impervious area over existing conditions to reflect the redeveloped conditions).

[9] These BMPs are now administered under the Virginia Department of Environmental Quality (DEQ)

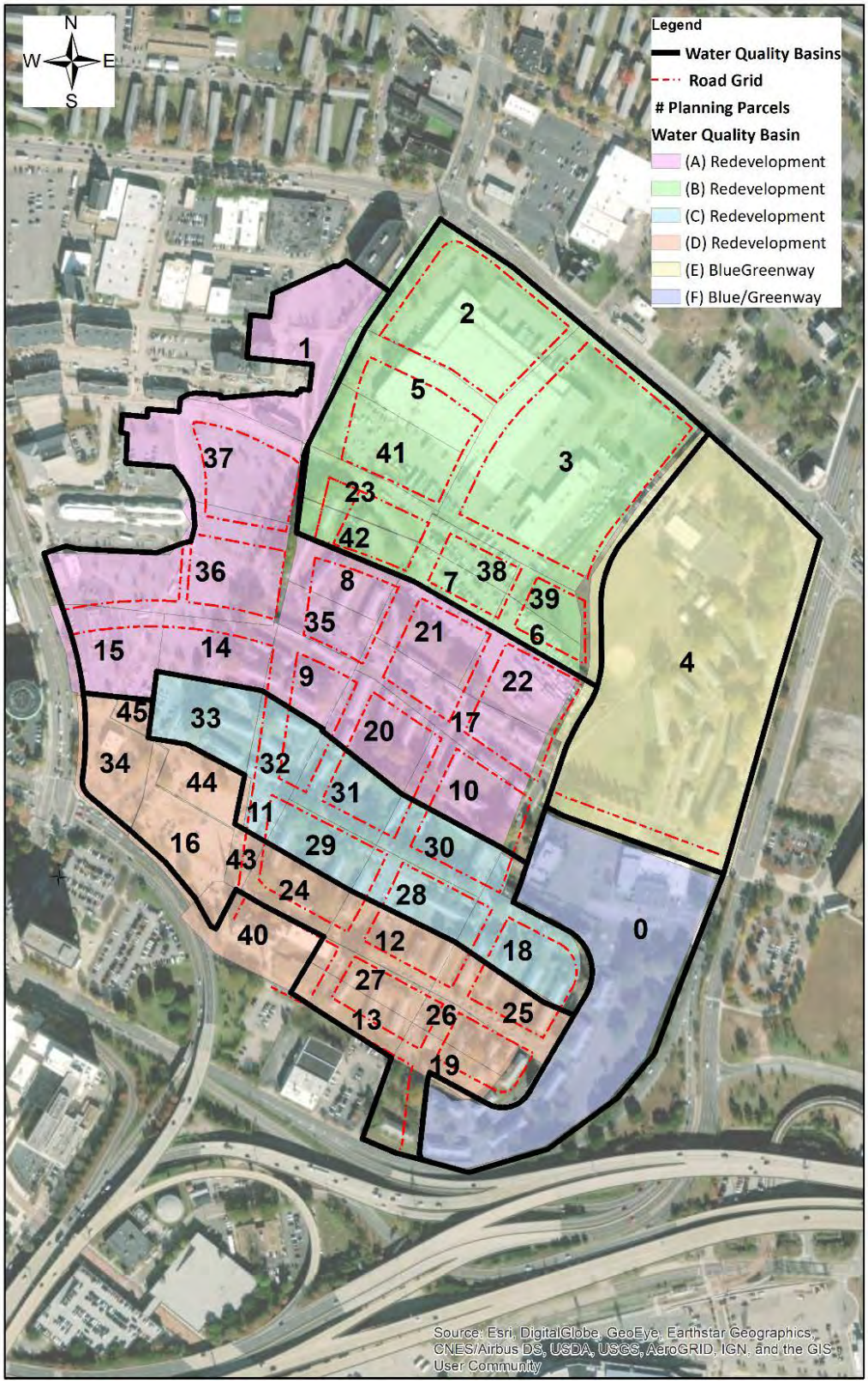


Figure 3-1: Concept water quality drainage basins

Table 3-1: Summary of estimated post-development basin characteristics used in the water quality calculations

Parcel	Area (Acres)	Land use Before	Land use After	Impervious Percent	Soil Type	WQ Basin
0	10.77	Open space	Blue/greenway	19.0	B/C	F
1	4.42	Institutional	Church	36.1	C	A
2	4.66	Institutional	Post office	71.8	C	B
3	8.11	Institutional	School	38.7	C	B
4	15.19	Open space	Blue/greenway	23.7	B/C	E
5	2.13	Institutional	Assumed	82.5	C	B
6	0.66	Institutional	Assumed	49.6	C	B
7	0.79	Institutional	Assumed	86.4	C	B
8	1.13	Mixed use	Market District	41.5	C	A
9	1.24	Mixed use	Market District	52.0	C	A
10	1.61	Mixed use	Residential	68.7	C	A
11	0.78	Open space	TBD	55.0	C	D
12	1.41	Mixed use	Residential	90.3	C	D
13	1.00	Residential	Townhouses	94.2	C	D
14	1.69	Mixed used	Market district	65.7	C	A
15	2.04	Mixed use	Market district	76.8	C	A
16	2.95	Institutional	Church	78.9	C	D
17	2.09	Open space	Freemason swales	10.0	C	A
18	1.22	Mixed use	Residential	73.5	C	C
19	0.84	Residential	Townhouses	59.4	C	D
20	1.61	Mixed use	Residential	72.2	C	A
21	1.54	Mixed use	Residential	68.7	C	A
22	1.55	Mixed use	Residential	74.8	C	A
23	1.35	Institutional	Assumed	50.3	C	B
24	1.18	Mixed use	Residential	66.1	C	D
25	1.21	Mixed use	Residential	73.5	C	D
26	0.84	Residential	Townhouses	59.4	C	D
27	0.85	Residential	Townhouses	94.2	C	D
28	1.29	Mixed use	Residential	90.3	C	C
29	1.07	Mixed use	Residential	66.1	C	C
30	1.42	Mixed use	Residential	68.7	C	C
31	1.45	Mixed use	Residential	72.2	C	C
32	1.06	Mixed use	Market District	52.0	C	C
33	1.66	Mixed used	Market district	65.7	C	C
34	2.02	Mixed use	Market district	76.8	C	D
35	0.90	Mixed use	Market District	41.5	C	A
36	4.81	Institutional	Fire station/McDonalds	85.0	C	A
37	2.75	Institutional	Fire station/McDonalds	85.0	C	A
38	0.73	Institutional	Assumed	86.4	C	B
39	0.65	Institutional	Assumed	49.6	C	B
40	1.82	Institutional	Church	78.9	C	D
41	2.11	Institutional	Assumed	82.5	C	B
42	0.95	Institutional	Assumed	50.3	C	B

Basin characteristics were input into the Runoff Reduction Method spreadsheet using the assumptions previously identified to calculate the water quality objectives and treatment volumes. For re-development projects, the objective is a 20% reduction in Total Phosphorus.

100% of the water quality runoff (1-inch rainfall event) for each basin was used to calculate the BMP footprints based on the premise that that treatment BMPs will effectively be located remotely from their respective redevelopment basins. Subdivision of flow from each basin is not anticipated to occur, and each BMP must therefore be sized for the entire basin that it serves.

While the target Total Phosphorus reduction for a re-development is 20%, removal rates for typical downstream facilities being considered may range from 40% to 75%. This provides opportunities within the concept to establish BMPs for only some of the basins, or to generate a surplus of treatment that could be coupled with other redevelopment efforts.

For purposes of quantifying BMP footprints within the functional concept, the design criteria for BMP type Wet Pond #1 in a Coastal Plain environment was used. **Figure 3-2** illustrates the typical basis of the pond design[10].

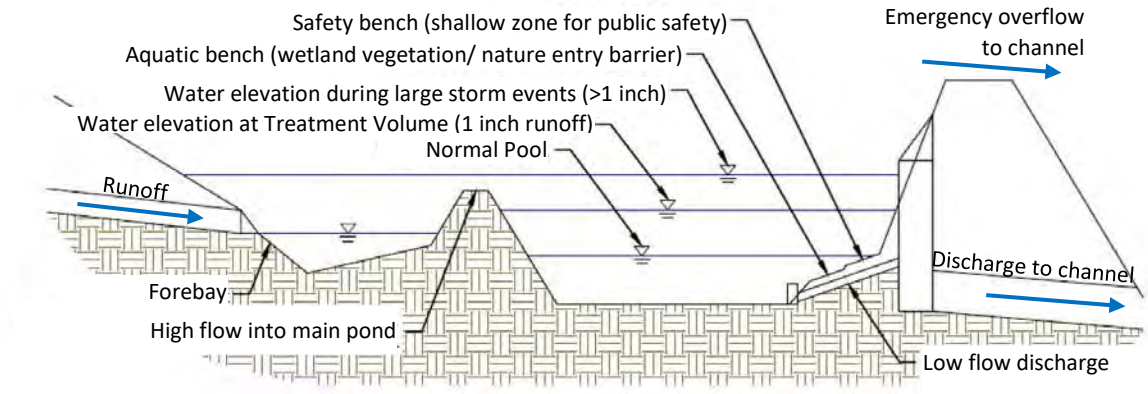


Figure 3-2: Functional section of wet pond

Treatment potential for BMP type Constructed Wetlands #1 were also calculated. These BMPs can typically be adapted to the pipe profile conditions anticipated to be developed for the redevelopment, are compatible with the planned purpose of the blue/greenway and can reliably provide the needed conveyance capacity during storm events. When designed in conformance with published criteria, they provide Total Phosphorus removal rates of 45% and 50%, respectively.

[10] The footprints needed to achieve the redevelopment's water quality objectives reflect the minimum requirements; the functional concept subsequently identifies larger ponds based on maximizing water storage for flood mitigation.

While these BMPs are discussed as separate entities, there will be opportunities to combine them together and/or combine them with the primary channel to integrate the functional concept with site conditions and to support other design objectives (e.g. upland recreational areas).

3.4.Water Quality BMP Performance

Table 3-2 summarizes the water quality-related output from the Runoff Reduction Method spreadsheets, describing the potential Total Phosphorous removal for the concept BMPs.

Table 3-2: Summary of WQ basin treatment objectives and opportunities

WQ Basin	Acres	Post-Redev % Imp	Total Phosphorous (TP) generated	Treatment Volume (T_v)	TP Removal Objective	TP Removal Opportunity (Wet Pond #1, 45% removal)	TP Removal Opportunity (Wetland #1, 50% removal)
	Acres		*lbs/yr*	*ft^3*	*lbs/yr*	*lbs/yr*	*lbs/yr*
A (Redev)	27.39	62%	41.87	66,640	11.87	18.82	20.91
B (Redev)	22.15	59%	32.92	52,392	9.33	14.80	16.44
C (Redev)	9.18	70%	15.32	24,384	4.34	6.89	7.65
D (Redev)	14.89	77%	26.48	42,153	7.52	11.90	13.23
E (B/G Way)	15.19	24%	13.65	21,725	0.00	6.14	6.82
F (B/G Way)	10.77	19%	8.80	14,001	0.00	3.95	4.39
Total	**99.57**	**51%**	**137.54**	**218,938**	**33.06**	**62.50**	**69.44**

As indicated in the summary, the opportunity for Total Phosphorous removal is greater than the redevelopment's Total Phosphorous removal requirement of 33.06 lbs/year. This indicates there is flexibility to accommodate different configurations of BMPs and/or support other offsite area water quality requirements within the blue/greenway footprint, such as redevelopment efforts planned north of Brambleton Avenue.

Table 3-3 summarizes the combinations of treated Water Quality Basins considered. For the functional concept stage, the proposed combination of treated water quality basins is based on achieving the required Total Phosphorous removal objective. A combination of 3 water quality BMPs (ABC or ABD) can be accommodated within the blue/greenway, which should provide a surplus of treatment capacity for the upland redevelopment. Providing BMPs for all 4 water quality basins may be feasible but could reduce the area available for other functions within the blue/greenway. Wet ponds were assumed for this exercise, as they have the lower removal rate.

Table 3-3: Treated water quality basin combinations considered

Treated WQ Basins Combinations	TP Removal (Wet Pond) (lbs/yr)	Surplus TP Removal[A] (lbs/yr)
AB	33.62	+0.56
ABC	40.51	+7.45
ABD	45.52	+12.46
ACD	37.61	+4.55
BCD	33.59	+0.53
ABCD	52.41	+19.35

[A] Based on 33.06 lbs/year removal objective

3.5.Offsite Area Treatment

3.5.1. Aesthetic Treatment

Untreated stormwater runoff may have high turbidity or convey floating debris such as leaves and litter, which will negatively impact the intended use of the blue/greenway as a public area. As the runoff from offsite areas enters the blue/greenway, elements should be provided to reduce sediments and debris before it disperses across the blue/greenway.

The large area covered by the north offsite area (i.e. potential for high peak flows) and deep invert elevations will limit opportunities for using hydrodynamic separator systems to reduce sediment. However, gross solids removal devices (i.e. trash screens and racks) can still be integrated into the upstream end of the blue/greenway to minimize introduction of floating debris to the daylighted creek.

3.5.2. Water Quality Treatment

The primary channel's function to provide storage during high tailwater conditions also provides an opportunity to detain and treat offsite runoff from north of Brambleton Avenue or east of Tidewater Drive.

The approximately 227 acres of offsite area that ultimately discharge to the blue/greenway results in a total treatment volume of approximately 500,000 ft^3. Based on anticipated geographic constraints, the primary channel may be able to accommodate between 300,000 ft^3 and 415,000 ft^3 of treatment volume while still providing sufficient upland area for fair weather activities.

Applying guidance from the Chesapeake Bay TMDL program for BMP retrofits, this treatment volume represents between 0.70 inches and 0.98 inches of impervious area runoff, which in turn can be credited as removing between 40% to 44% of the Total Phosphorous[11].

Thus, based on the initial pollutant loads for the offsite areas calculated by the Runoff Reduction Method, the primary channel could provide removal rates of approximately 127 lbs/yr to 140 lbs/yr TP removed.

[11] Chesapeake Bay TMDL guidance assumes all storage BMPs can provide up to 55% TP removal for 1 inch of runoff from impervious areas. The calculated removal rate is then applied to the calculated runoff from both pervious and impervious areas. Since Virginia DEQ and the City of Norfolk have established a 45% removal rate for coastal plain wet ponds, the estimated removal rate calculated using TMDL guidance has been adjusted to not exceed the 45% removal rate.

4. Site Considerations

Development of the blue/greenway site will need to consider a range of elements beyond just the hydraulic and water quality functions. As part of developing the functional concept, several other site conditions were reviewed and documented:

- Site topography
- Existing trees
- Existing infrastructure
- Recreational elements

Together, these considerations will shape how the blue/greenway elements are sized and located within the site limits.

4.1. History and Topography

The site of St. Paul's Blue/Greenway was historically a waterway connected to the Eastern Branch of the Elizabeth River formed through tidal action and a natural creek later named Newton's Creek. As Norfolk continued to grow and urbanize, the area was progressively filled in; surface drainage was routed into an underground storm drain (**Figure 4-1**). The natural forces that shaped this feature are still present, and development of a concept analogous to and compatible with its pre-developed state should enjoy improved function and stability.

Figure 4-1: Progressive infill of Newton's Creek (1873 on left, 1892 on right)

Although now filled and long forgotten, it is possible to hypothesize the historic character of the creek based upon nearby precedents. **Figure 4-2** pairs an aerial photo of Broad Creek in Norfolk with a topographic map from the 1880s, at the same scale. As with Newton's Creek, the tidal Broad Creek meanders through salt marshes, low banks lined with shrubs and trees, and urban development built to the edge of the wetlands, or on fill. Local precedents can inform the design of

the new St. Paul's Blue/Greenway, with similar landscape and ecological typologies, combined with recreational and urban uses.

Figure 4-3 illustrates the conditions documented in the 1880s with the CNI redevelopment street grid as an overlay. It shows the morphology of the creek and marshes, land elevation contours and the extent of the street network. Mapping the historic high ground and boundaries of the creek and marshes can help inform the design of the new buildings, roads and blue/greenway. The filled waterway and wetlands area is prone to flooding, and it has unstable, subsiding, organic soils coupled with groundwater challenges.

The current land surface elevation still reflects much of the pre-development condition (**Figure 4-4**) and confirms that the proposed blue/greenway is generally sited to work well with the natural conditions.

Figure 4-2: 1880 Map of Newton's Creek (left) paired with Broad Creek (right)

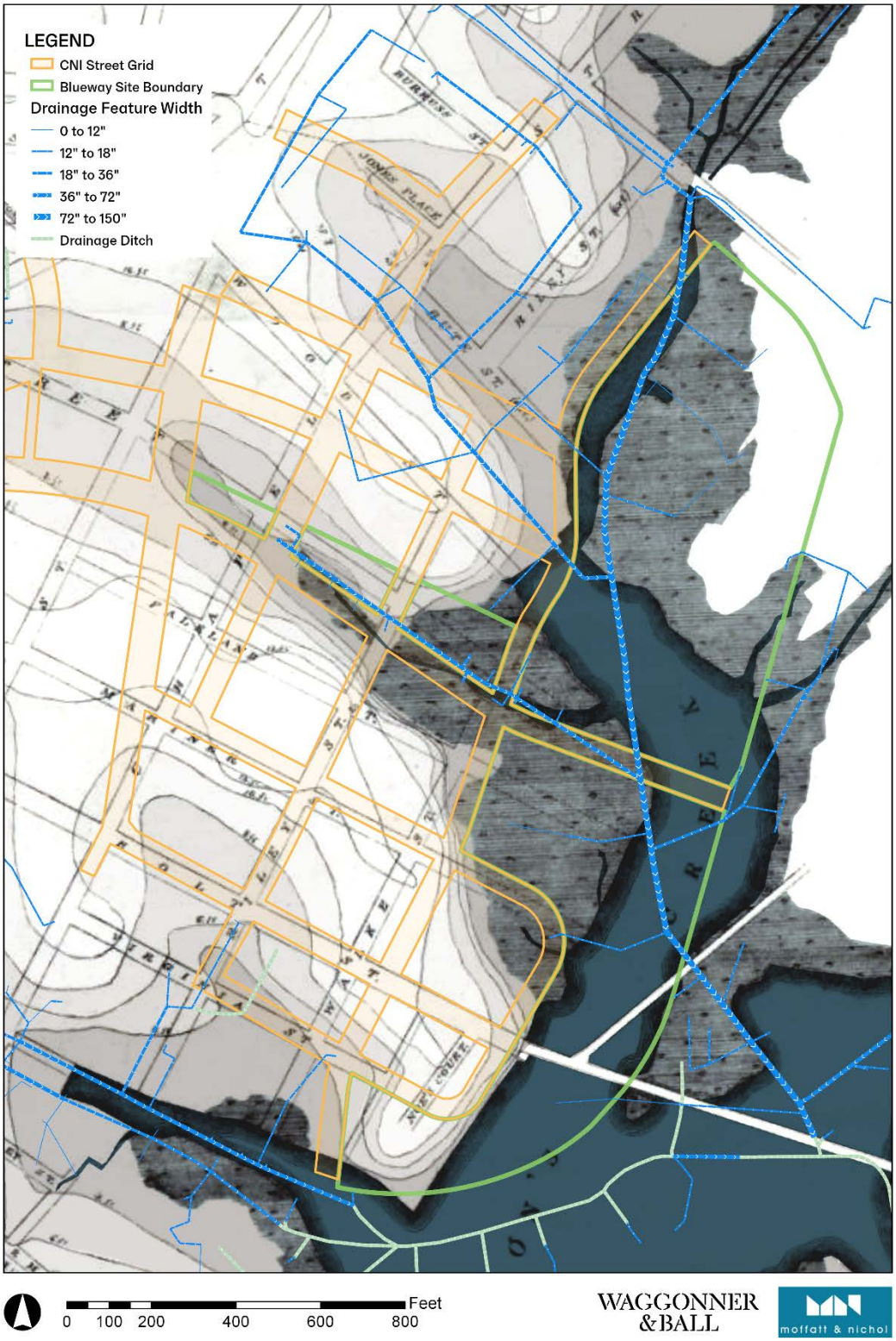


Figure 4-3: Circa 1880 site conditions overlaid with concept redevelopment grid

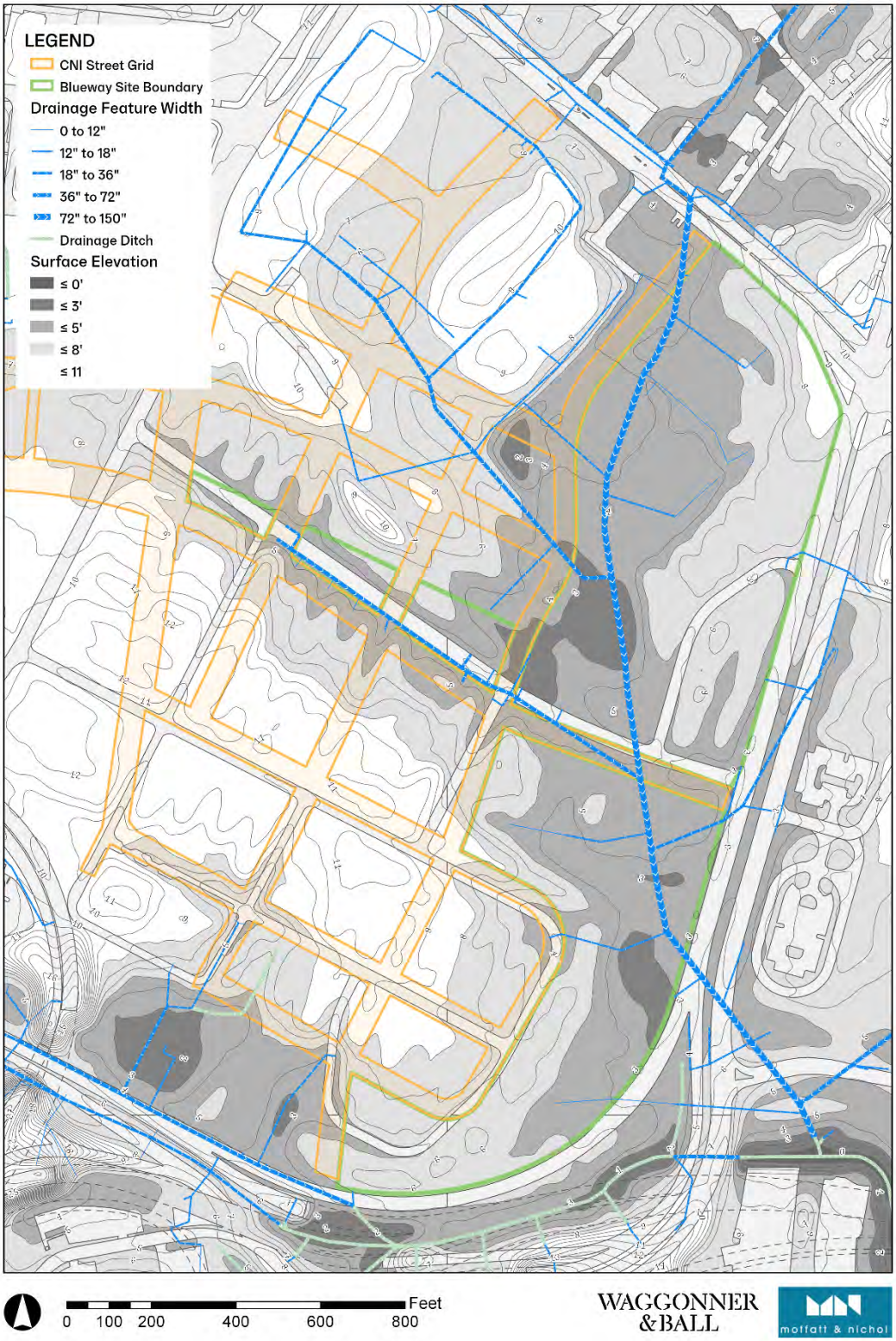


Figure 4-4: Existing site topography (2013 LiDAR survey) and storm drains with concept street grid

Figure 4-5: Mid-Century aerial photo of Tidewater Gardens area prior to demolition with colors added to illustrate the extent of greenspace where the creek was filled, high streets (yellow) and the low Charlotte Street alignment. (NRHA)

Wood, Faulkner, Mariner and Holt Streets were historically the high east/west streets, and the most densely developed **(Figure 4-5)**. Charlotte Street was at the lowest elevation, built on a finger of the creek. The former creek is evident in the elevation map as low lying land. When the tide is high and the rains are intense, the area is inundated with water. Photos from October 23, 1953 illustrate that tidal flooding issues are not a new phenomenon **(Figures 4-6 and 4-7)**. The proposed CNI housing redevelopment builds upon the high ground and reestablishes the historic street and block pattern. The new streets will be elevated above 8 feet NAVD88, creating a rim around the west side of the blue/greenway that is significantly higher than existing grade, presenting opportunities for significant water storage in the former Charlotte Street right of way (now proposed as Freemason Street). As the functional concept evolves to a preliminary design, the historical topography should further be considered as the channels and runoff storage areas are defined.

Figure 4-6: Tidal flooding on October 23, 1953, near Charlotte and Walke (NRHA)

Figure 4-7: Walke at Charlotte Street, Mid 20th Century and 2019 (NRHA, Google)

4.2.Trees

While much of the effort is focused on returning the blue/greenway site to more closely reflect the pre-developed Newton's Creek, there are numerous mature trees that should be preserved to the extent practical. These large trees provide significant hydrologic, ecological, and aesthetic value, along with creating a unique sense of place in the neighborhood.

Figure 4-8: 1970s era photo of Tidewater Gardens and St. Mary's Basilica. Note the oak trees along Mariner and Holt Streets and within the development blocks. (NRHA)

Figure 4-9: Oak trees along Mariner Street, left. Orange circles indicate trees that could potentially be preserved with slight rotation and realignment of the proposed street grid (light orange), right.

Figure 4-10: Aerial view of the Tidewater Gardens. Note the significant trees along Mariner, throughout the NRHA housing development and within the Blue/Greenway area.

The proposed CNI housing and street block layout will impact approximately 575 trees. The proposed surface elevation of the new streets is above 8 feet and the new housing will be above 11 feet NAVD88, requiring significant fill in many locations. As previously indicated, and illustrated on **Figures 4-9 and 4-10**, the existing Mariner and Holt streets are already on high ground and should not require fill to achieve the design elevation for the majority of their length. These two streets have allées of mature oak trees, with significant aesthetic, ecological and cultural value. Slightly shifting the proposed roadway centerlines could maintain the existing street grid alignment and preserve these invaluable, natural assets.

Appreciating the hydrological, ecological and aesthetic benefits of mature trees, their preservation is an ambition of the Blue/Greenway design team. **Figure 4-11** is a preliminary study of the trees potentially impacted by the CNI redevelopment blocks and streets along the edge of the site (orange and yellow) and those that are likely to be impacted by excavation for the water management feature (teal blue). Trees not as likely to be impacted by site disturbance are indicated in dark green. A buffer was generated around the drip line of the trees to be preserved; the remaining site is available for locating Blue/Greenway features (light teal). The health and value of the existing trees (**Figure 4-12**) should be confirmed by the city arborist and parks department.

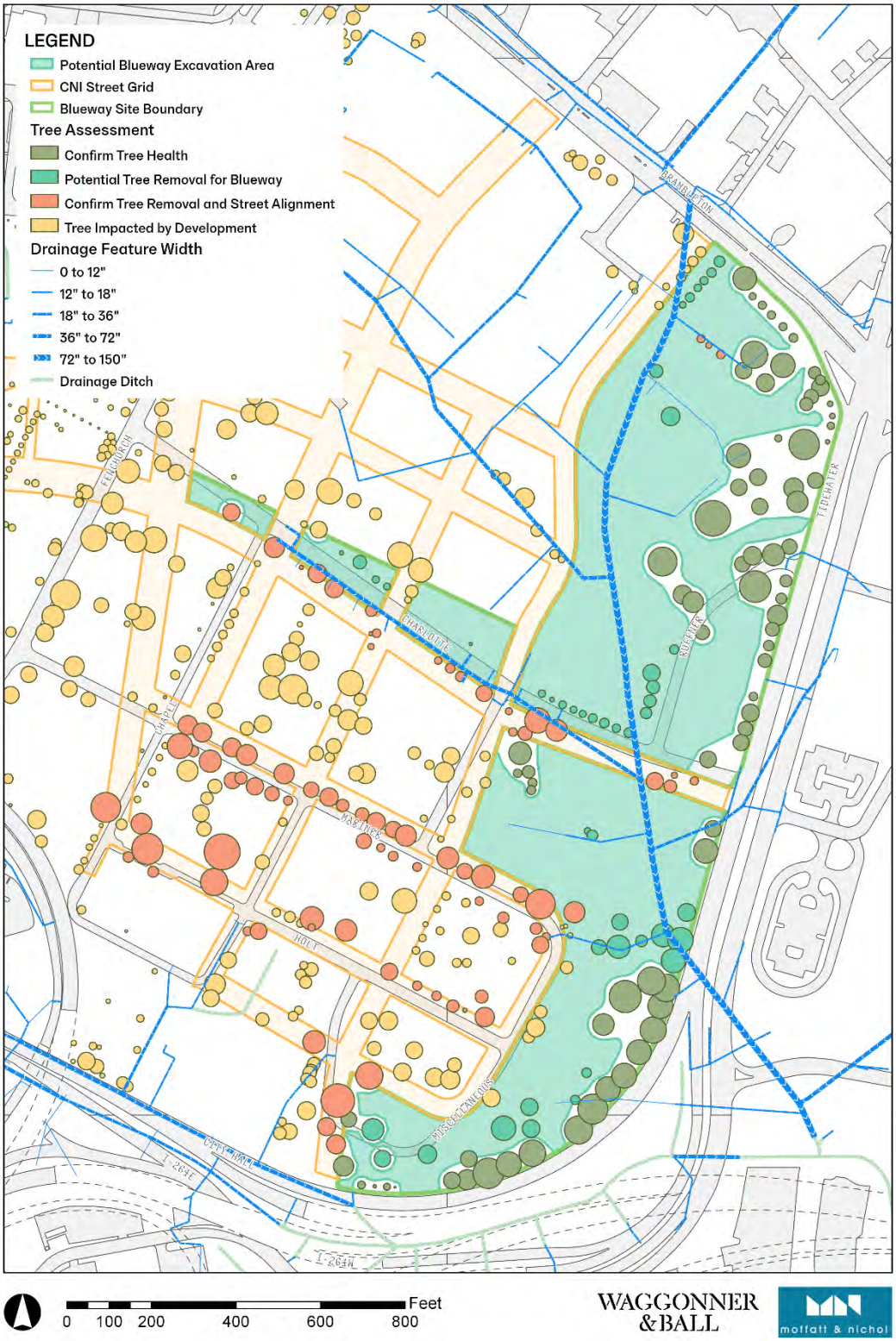


Figure 4-11: Preliminary study of tree impacts

Figure 4-12: Mature oak trees within the blue/greenway footprint

4.3.Existing Infrastructure

The St. Paul's Redevelopment is comprehensive in its scope and while some phasing will need to be considered as the concept develops, the blue/greenway has fewer constraints associated with incremental development compared to many other urban redevelopment efforts. **Figure 4-14** illustrates the extent of existing structures that will be removed prior to site development of the blue/greenway.

Analysis of available GIS data indicates the blue/greenway does not have major subsurface infrastructure networks within the majority of its footprint, other than the drainage culverts (**Figure 4-15**). A major gas pipeline runs north/south along Tidewater Drive, and a water main parallels City Hall Avenue. Both will need to be studied further where the proposed drainage improvements cross them. A small utility building on Charlotte Street (**Figure 4-13**) appears to be related to the Virginia Natural Gas (VNG) service to the Tidewater Gardens public housing development, indicating that there may be more subsurface utilities than are currently mapped. It is assumed that all the existing infrastructure will be replaced in the redevelopment, including the central plant, likely serviced by gas, water, sewer and power. Power poles and lines that serve the former housing would preferably be removed and service to the new development coordinated with the blue/greenway design. Survey work should confirm the locations of all utilities, which may or may not be documented in GIS. A drainage conveyance through the blue/greenway to support site, offsite, and redevelopment areas will need to be maintained throughout site development, however. During early phases portions of the blue/greenway may also need to serve as temporary sedimentation areas for construction stormwater management.

Figure 4-13: Virginia Natural Gas pipeline utility shed

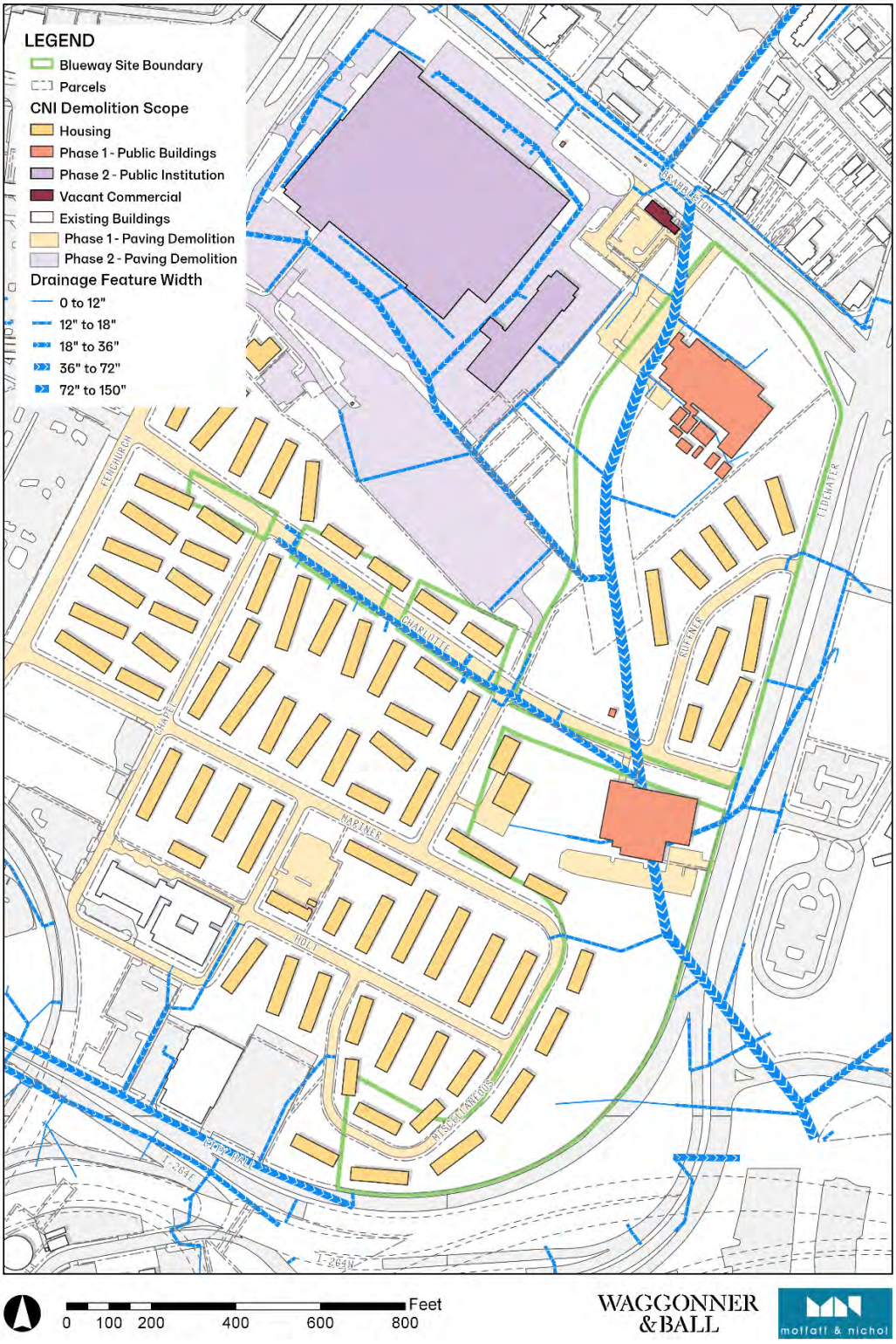


Figure 4-14: Redevelopment demolition scope

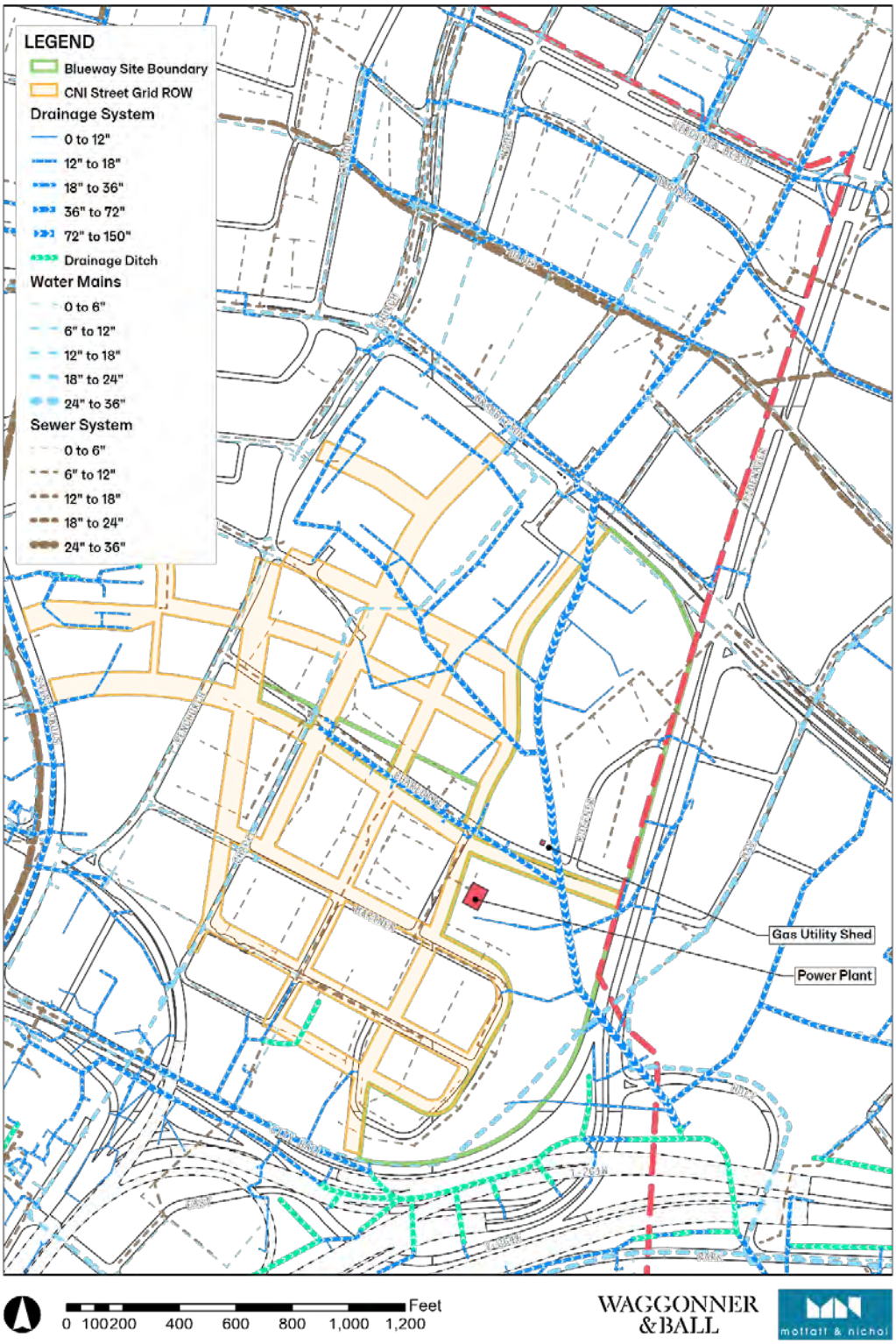


Figure 4-15: Existing subsurface utilities

4.4.Community Assets and Connections

Existing recreational and educational assets will be impacted by the redevelopment of the Tidewater Gardens neighborhood (**Figure 4-16**). Both the William A. Hunton YMCA and Tidewater Park Elementary School structures are slated for demolition. It is assumed these facilities will not be replaced in the Blue/Greenway site boundary. Within the the site, there are five playgrounds, two of which are significant structures that could be maintained or relocated. There is a softball field and four basketball courts with lighting located adjacent to the school.

The playing field, playground and basketball courts associated with the school are not currently maintained by City of Norfolk Department of Recreation, Parks, and Open Space (RPOS). RPOS has indicated that there is no need to replace these in kind. Given the large stormwater storage and conveyance needs, the recreational program will not include large fields for organized play. Hard courts and playgrounds can be incorporated throughout the park, and open areas can be used for informal play, picnics, etc. Walking and biking paths, gathering spaces and contemplative spaces will be incorporated into the park.

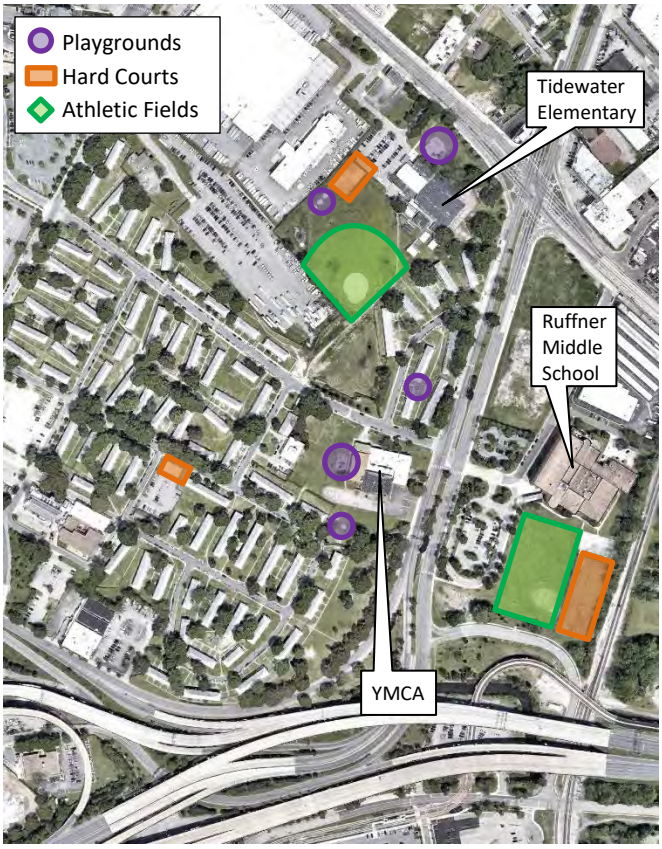


Figure 4-16: School softball field and playground at the YMCA, map of recreational and educational assets

There are currently two bus stops that service the future blue/greenway area, one on E. Brambleton Avenue at Roswell Street, and one on Tidewater Drive at Charlotte Street. The new HRT transit hub is located nearby at St. Paul's Boulevard. Additionally, there is a TIDE Light Rail stop at Harbor Park, on the other side of Interstate 64 (**Figure 4-17**). Future path networks and park entries could link to these transit nodes. A shared use path is envisioned within the Blue/Greenway park, linking Tidewater Gardens to the city's growing bicycle network. The shared use paths will be designed to meet VDOT guidelines for shared use, including both bicycle and pedestrian requirements for safety. Primary paths shall be designed to provide safe access when Blue/Greenway is full of stormwater, while secondary paths may be designed to be inundated. Off-street parking for the parkway in not anticipated as there will be ample on-street parking available along the west side of the park. If parking is necessitated, it will be designed to minimize heat island effect and maximize stormwater runoff management.

4.5.Integrated Site Footprint

Figure 4-18 integrates the assumed extent of demolition of public housing, institutional buildings, and other existing infrastructure with desired tree preservation buffer zones to describe the target limits for significant land disturbance supporting development of the water management and upland recreation elements.

While future concept development can consider expanding this footprint, the associated trade-offs should be considered.

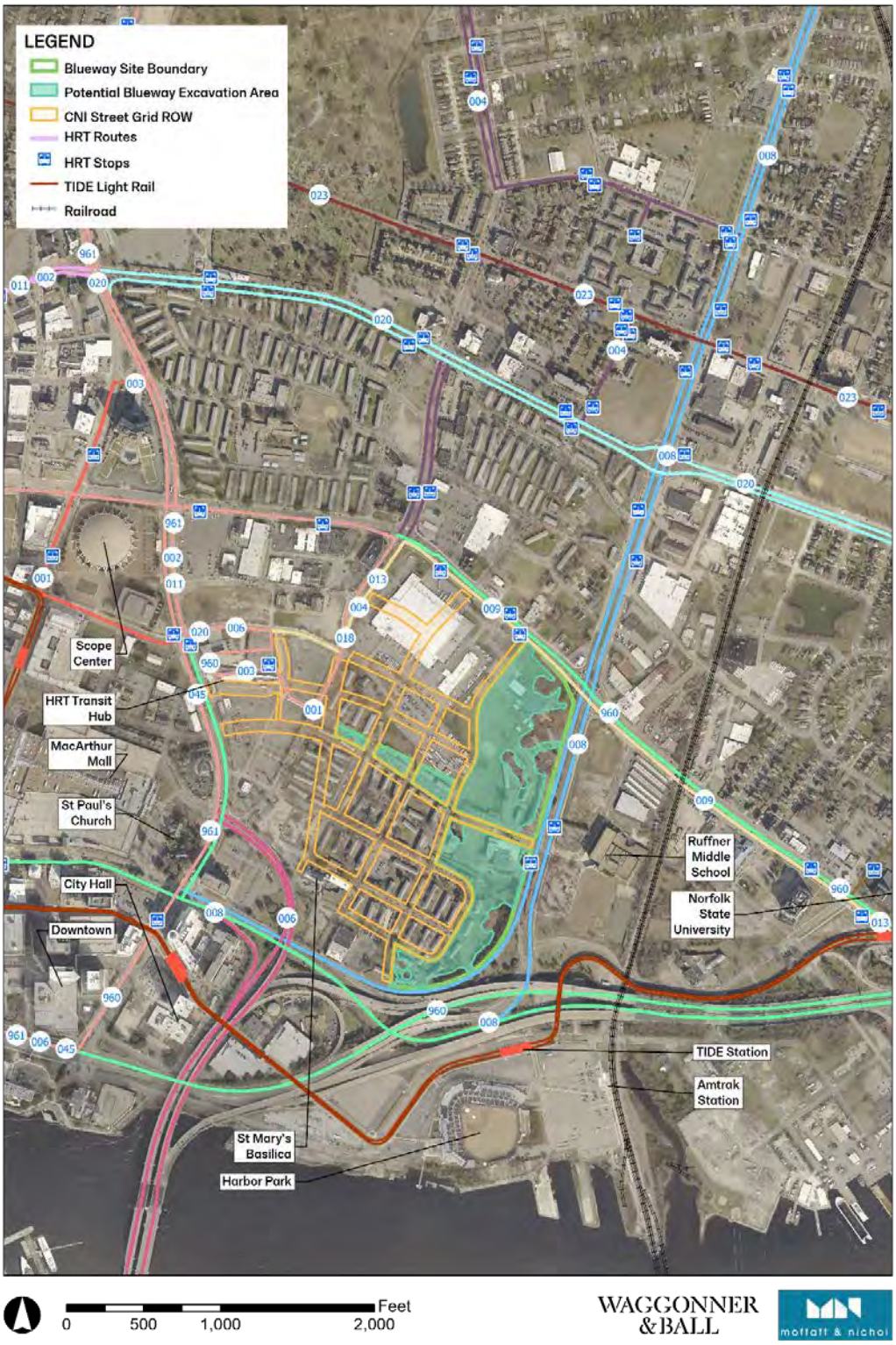


Figure 4-17: Transit connections and community assets

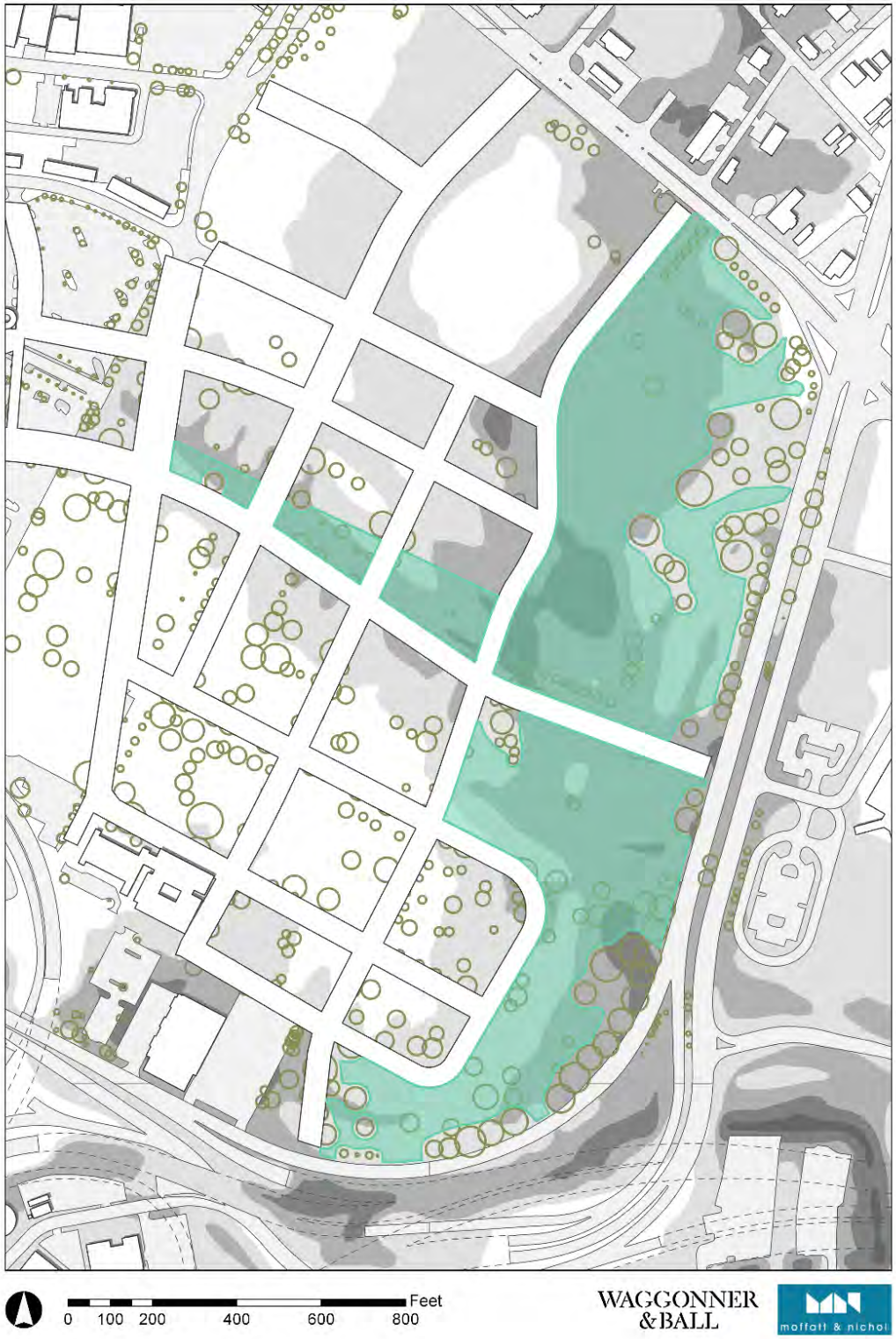


Figure 4-18: Effective development area

5. Description of the Blue/Greenway Functional Concept

5.1. Functional Footprints

The hydraulic and stormwater quality analyses were used to establish target footprints for stormwater features within the blue/greenway, summarized on **Table 5-1** and illustrated in a simplified format on **Figure 5-1**.

Table 5-1: Functional concept stormwater management elements

Channel/Storage Elements				
Stage Elevation	**Volume**			**Est. Footprint**[A]
ft, NAVD88	*ft³*			*Acres*
-3 to +1.3	345,000			3.8
+1.3 to +2.0	116,000			3.8
+2.0 to +3.0	240,000			5.5
+3.0 to +4.0	350,000			8.0
+4.0 to +5.0	350,000			8.0
Water Quality Elements				
WQ Basin	**Volume** *(ft³)*[B]			**Est. Footprint**[C]
	Min. Treatment Volume	Concept Storage (> El +1.3ft)	Total Volume	*Acres*
A	66,640	245,000	505,000	1.80
B	52,392	165,000	320,000	1.25
C	24,384	165,000	320,000	1.25

[A] Estimated footprints are based on the simplified channel section and are not additive (for example, an 8 acre area could also provide the 5.5 and 3.8 acre storage stages as well)

[B] As indicated earlier, concept storage needs exceed the treatment volume needs. Concept storage reflects available storage between the estimated permanent pool elevation (+1.3 ft NAVD88) and top of pond (+5.0 ft NAVD88). Total volume is the entire volume of the pond from the assumed bottom (-5.5 ft NAVD88) to the top of pond.

[C] Estimated footprint reflects a trapazoidal prism sized to contain the total volume with 1V:5H slopes plus a 10 ft aquatic bench at 1V:10H

As indicated in the previous section, topography and tree preservation should be considered as the concept evolves. For the simplified concept illustrated, water storage areas, both for the primary channel and the water quality BMPs, were generally placed in open areas or within the footprints of the existing buildings that will be removed as part of the redevelopment. More detailed concepts developed in subsequent design stages can consider combining water quality features and/or the primary channel to further maximize utilization of the space.

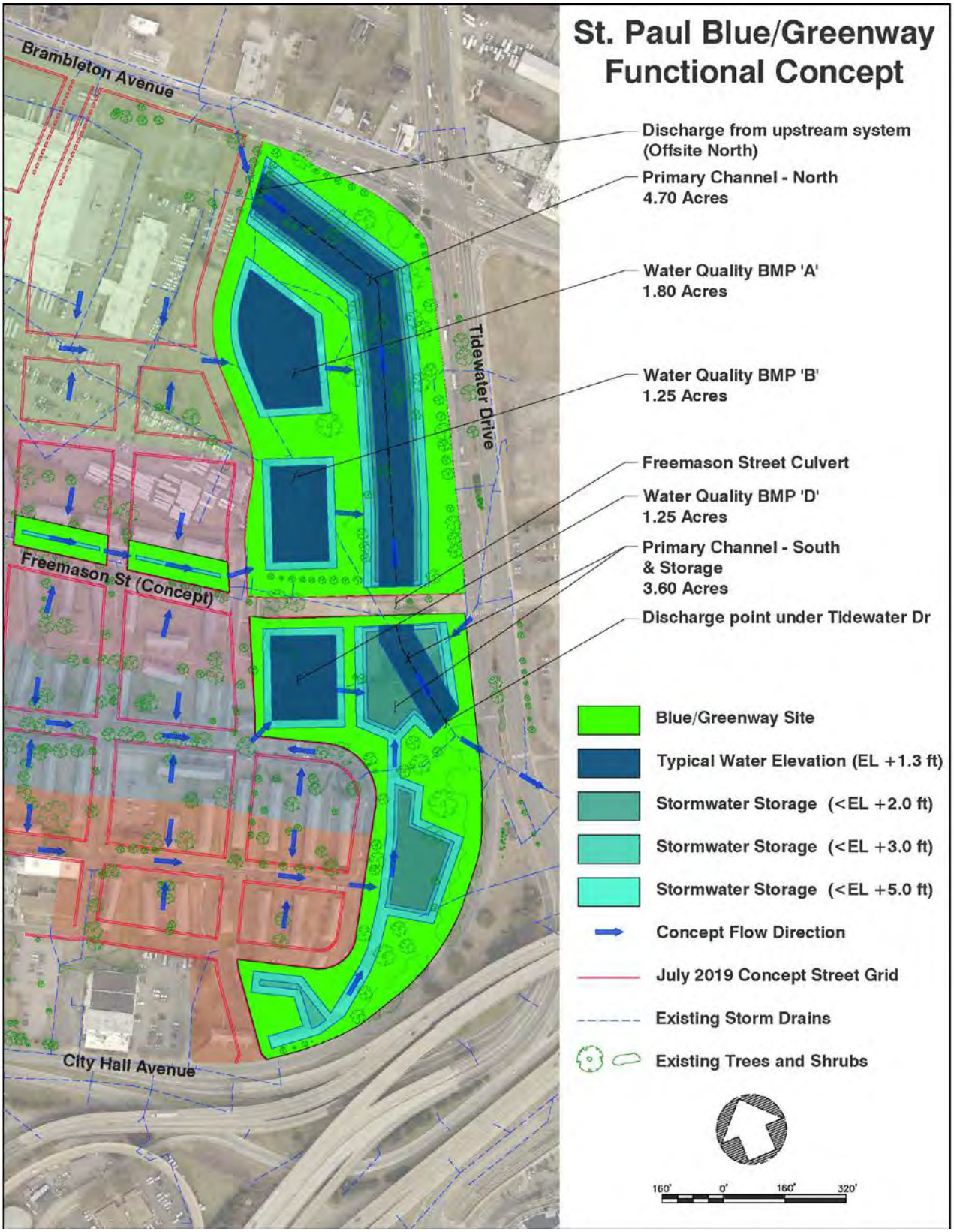


Figure 5-1: St. Paul's Blue/Greenway Functional Concept (simplified)

5.2.Early Concept of Blue/Greenway Features

The functional requirements and integrated site footprint were used to demonstrate an early concept of features comprising the blue/greenway.

Figures 5-2 and 5-3 are preliminary concept landscape plan and sectional studies, a test fit of the engineering functional design concepts shown in **Figure 5-1**. The engineered profiles of the main channel and ponds are combined with existing land surface elevations derived from the 2013 LIDAR DEM, with buffers for tree preservation, access paths, and transitions to new grades along the CNI development area.

As described in the hydrologic and hydraulic design section of this report, the main channel of the daylit Newton's Creek is conceived as a stepped profile (**Figure 5-4**). Land higher than elevation 4 ft NAVD88 in elevation will generally remain above the water storage volumes and will be suitable for mowed lawns and recreational fields, formal and community gardens, and forested areas. Below elevation 4 ft NAVD88, the shoreline will consist of littoral shelves at varying elevations that will that provide wetland habitat, nutrient filtration and reduction, and aesthetic value. At the lowest part of the channel, a permanent watercourse will vary in elevation and width, changing with the tides and rain flooding. In further development of the concept design, the widths and elevations of the shelves and watercourse can be varied. Meanders, anabranches and marsh areas, with their expected ecological, water quality and aesthetic benefits, can be incorporated.

Along the main channel, a series of wet ponds or dry detention areas will provide both additional storage capacity and water quality benefits (**Figure 5-5**). Wet ponds will incorporate fringing wetlands with native plantings. They can be separated from the main channel entirely, or be incorporated into the profile. A contemporary example of wet bottom detention basins being incorported into public recreational space can be found along Halls Bayou in Houston. Keith Weiss park in the Aldine neighborhood of Houston features three wet bottom detention basins that can store up to 900 acre feet of water in a storm event. The basins connected by riparian corridors with naturalized edges to improve stormwater quality. Keith Weiss Park is a central piece of flood mitigation along Halls Bayou. **Figures 5-6 and 5-7** illustrate how the basins are incorporated into the park. Dry detention basins could potentially be used for recreation or simply planted with meadow grasses with minimal maintenance requirements.

Figure 5-2: Concept landscape plan with section cut locations

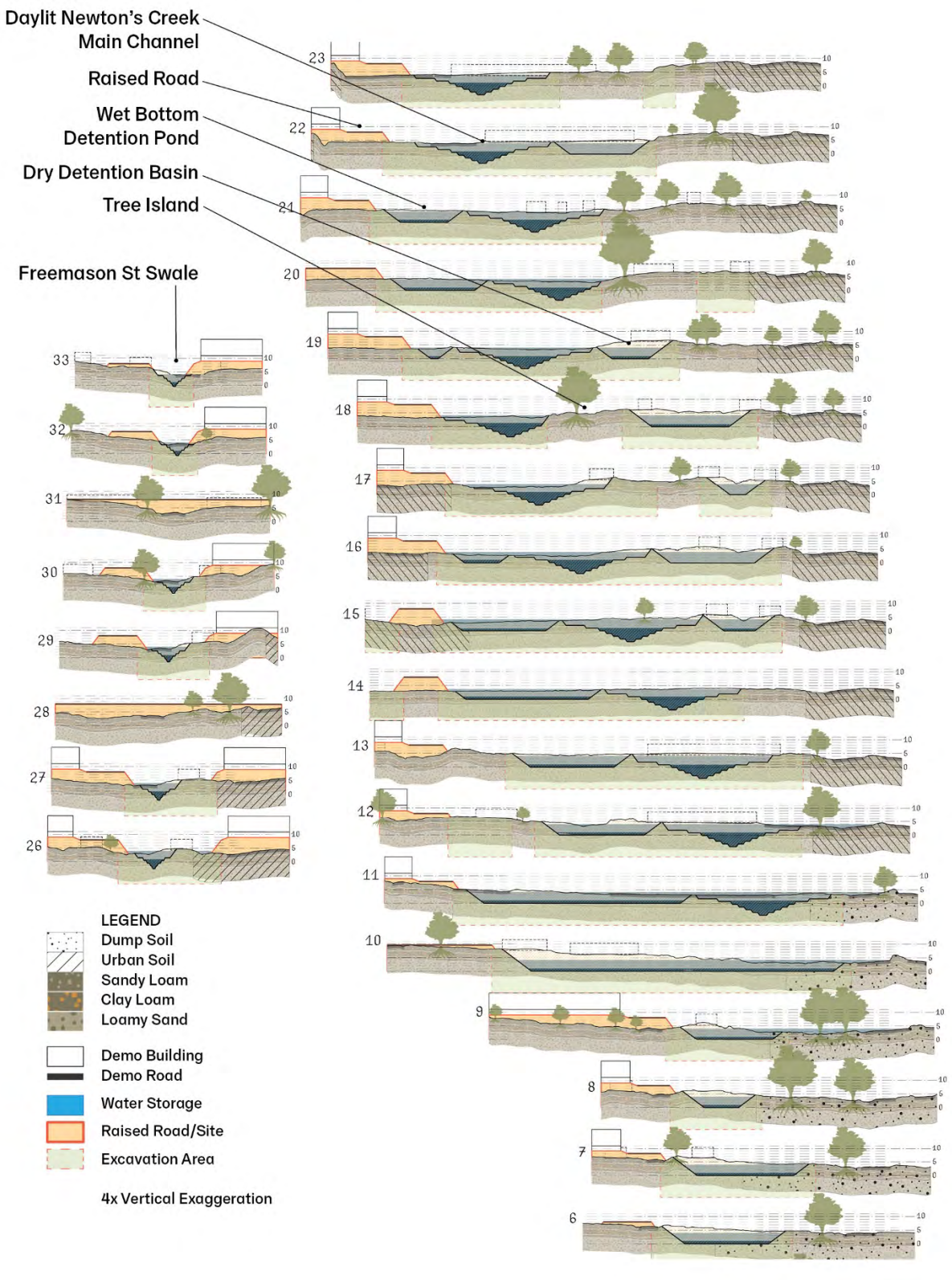


Figure 5-3: Concept landscape sections, 4x vertical exaggeration

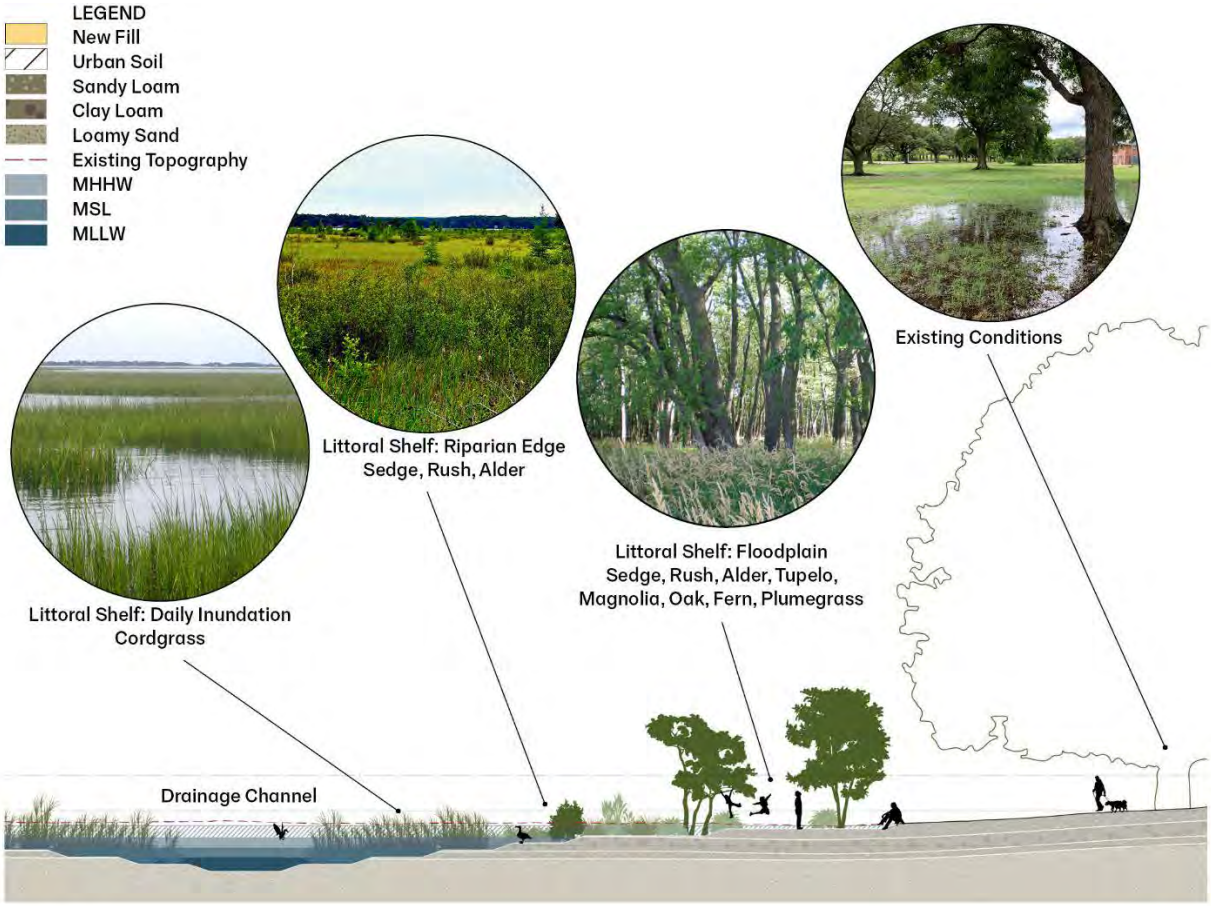


Figure 5-4: Typical section profile through the daylit Newton's Creek drainage channel

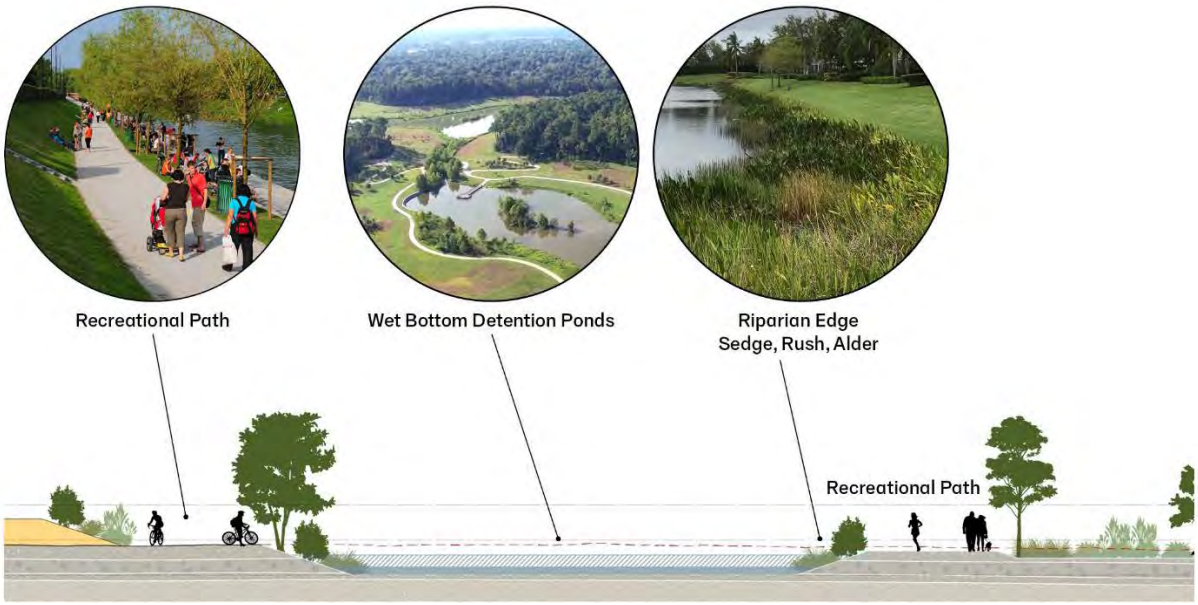


Figure 5-5: Typical section profile through the wet bottom detention ponds

Figure 5-6: One of three wet bottom detention basins in Keith Weiss Park

Figure 5-7: Basins connected by riparian corridors and have planted edges to improve water quality

The branch of the blue/greenway along Freemason Street can have a different function and character from the primary north/south park space (**Figure 5-8**). The existing grade is already at a low elevation because of its history as a branch of Newton's Creek referred to as Plume's Cove. Inherently, there will be a large storage potential in the basins created by new streets and residential blocks. Each crossing street can act as a weir structure, holding water at a different elevation than the daylit Newton's Creek.

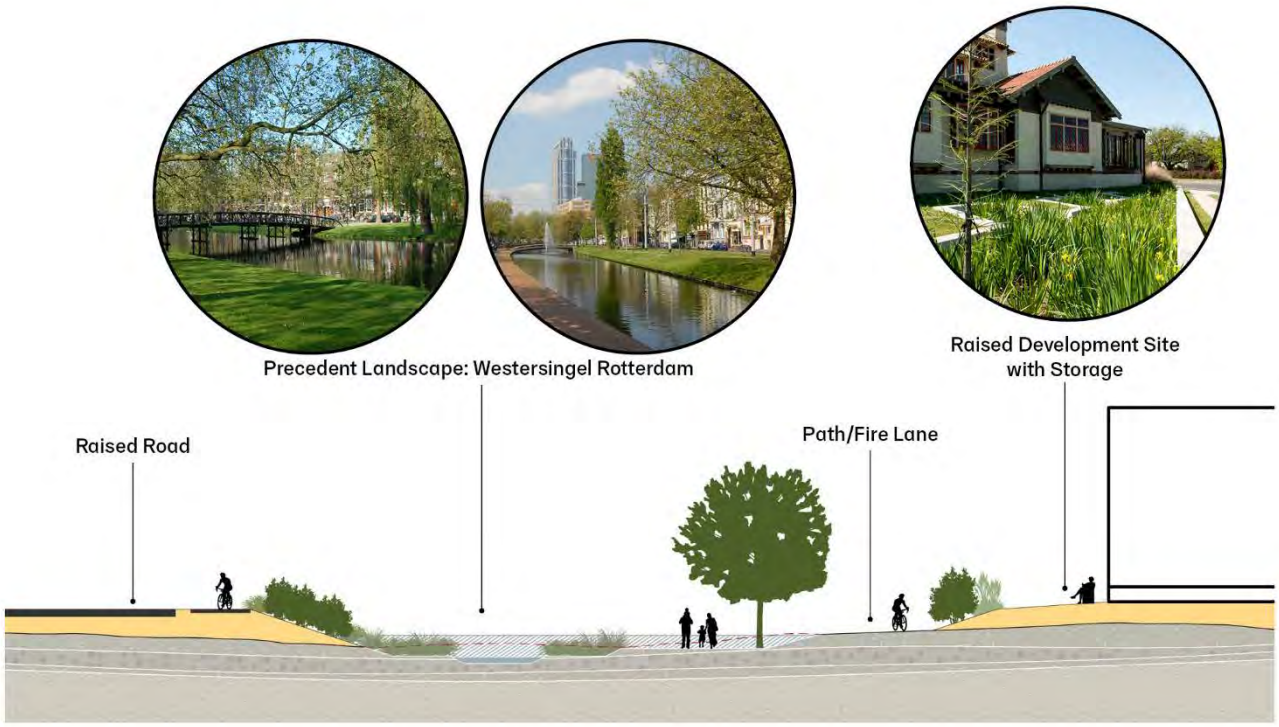


Figure 5-8: Typical section profile through the Freemason Street Swale

5.3. Order of Magnitude Probable Cost

A preliminary order of magnitude for the probable cost based on the early concept and high-level unit costs is projected to be between $12.3 million to $23.2 million, with the major contributing elements summarized on **Table 5-2**. Actual costs will be significantly affected by inclusion of a pump station, the extent of project phasing required, and the extent of "hardscaping" such as retaining walls paths and other structures, ultimately proposed.

Table 5-2: Preliminary order of magnitude probable cost

Element	Quantity	Low Cost	High Cost
Mobilization	LS	$ 360,000	$ 680,000
Site preparation	23 acres	$ 180,000	$ 350,000
Demolition, Excavation, Grading	23 acres	$ 4,100,000	$ 5,500,000
Landscaping and Plantings	13 acres	$ 860,000	$ 1,320,000
Stormwater Management Structures	LS	$ 1,700,000	$ 5,800,000
Site amenities, trails, lighting	LS	$ 440,000	$ 720,000
Subtotal		$ 7,650,000	$14,380,000
Contingency	40%	$ 3,060,000	$ 5,752,000
Construction Subtotal		$10,710,000	$20,132,000
Engineering, Construction Mgt, and other services	15%	$ 1,605,000	$ 3,020,000
Total Order of Magnitude Program Cost		**$12,315,000**	**$23,152,000**

This projected cost excludes construction of the realigned Freemason Street through the site and its associated culvert.

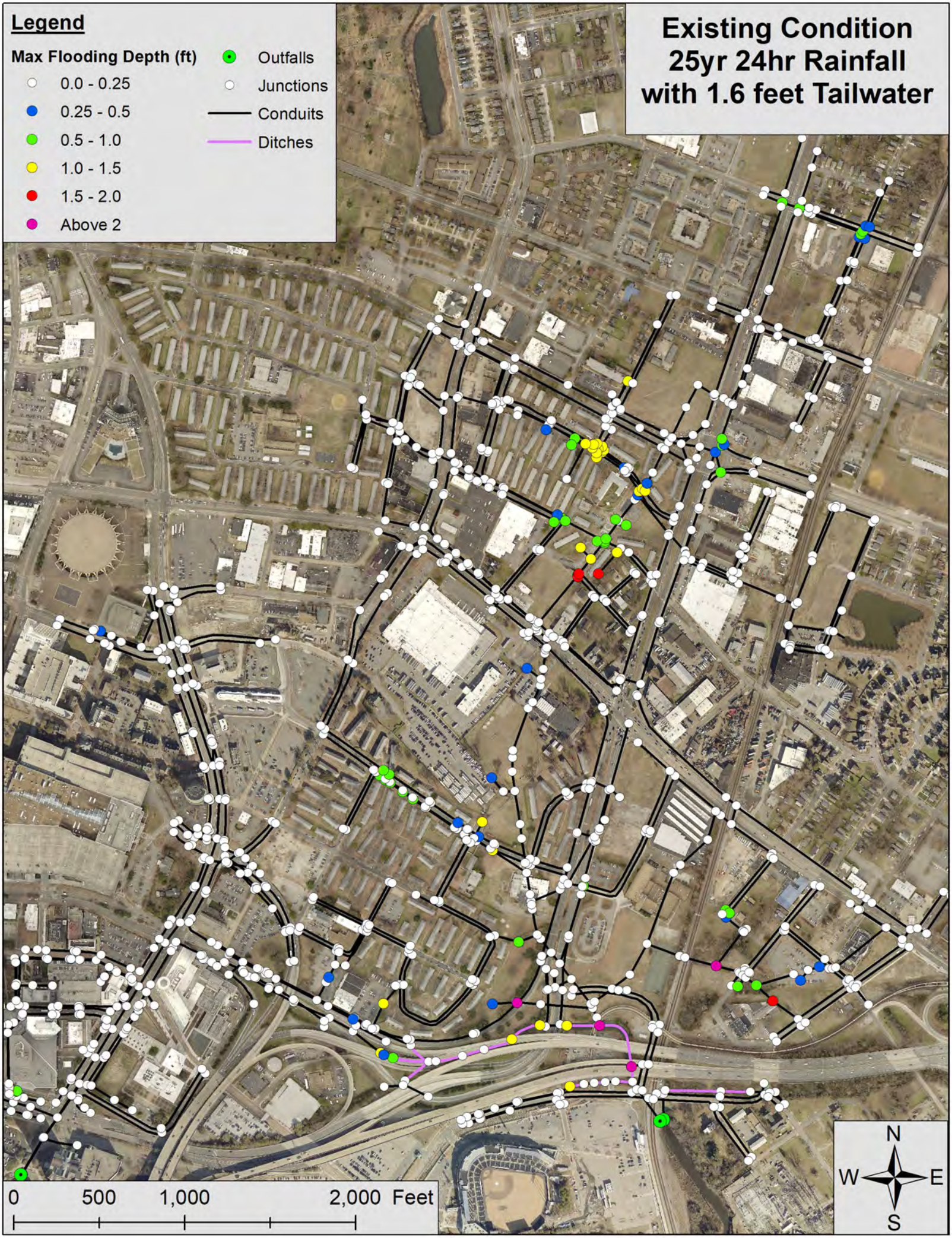
6. Next Steps

This functional concept should be used as an initial basis of design for further design development of the blue/greenway and evaluation of alternatives. It should further be used to guide the necessary field investigations of the site to better understand the geotechnical conditions and verify the extent of underground utilities.

Specific tasks to consider for the next phase of development include the following, which positions the project to move into preliminary and final design stages.

- Gap analysis of missing data
- Base mapping, including wetland delineations, topographic surveys, and underground utility surveys where data is needed.
- Phase 1 environmental site assessment to identify potential areas of concern
- Concept development and alternatives analysis
- Updates to the hydraulic and hydrologic analyses as needed
- Pre-permitting coordination

Appendix A: Enlarged Upland Flooding Figures


Legend
Max Flooding Depth (ft)
0.0 - 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
Above 2
Outfalls
Junctions
Conduits
Ditches
Existing Condition
25yr 24hr Rainfall
with 1.6 feet Tailwater
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1,000
2,000 Feet
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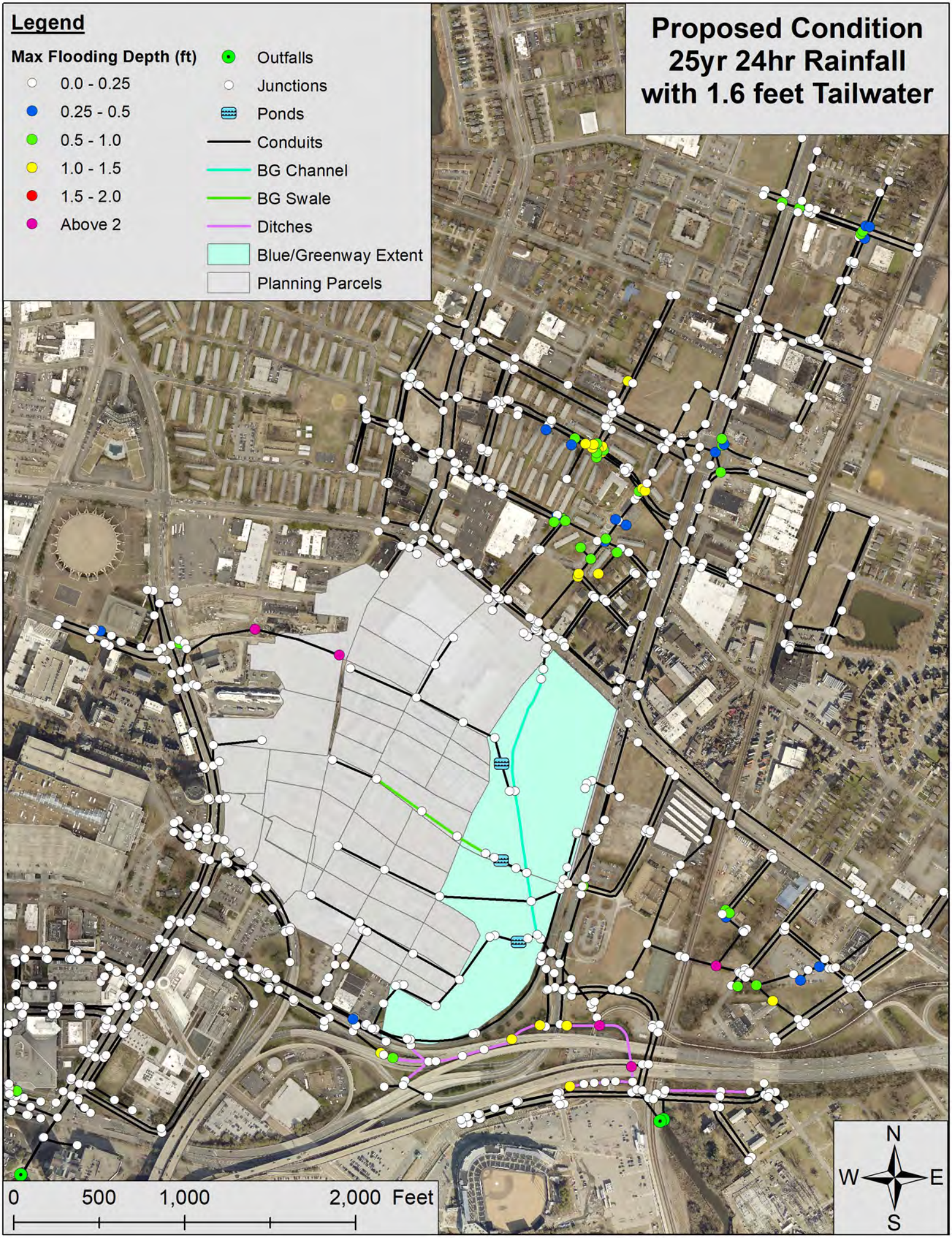
Legend
Max Flooding Depth (ft)
0.0 - 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
Above 2
Outfalls
Junctions
Ponds
Conduits
BG Channel
BG Swale
Ditches
Blue/Greenway Extent
Planning Parcels
Proposed Condition
25yr 24hr Rainfall
with 1.6 feet Tailwater
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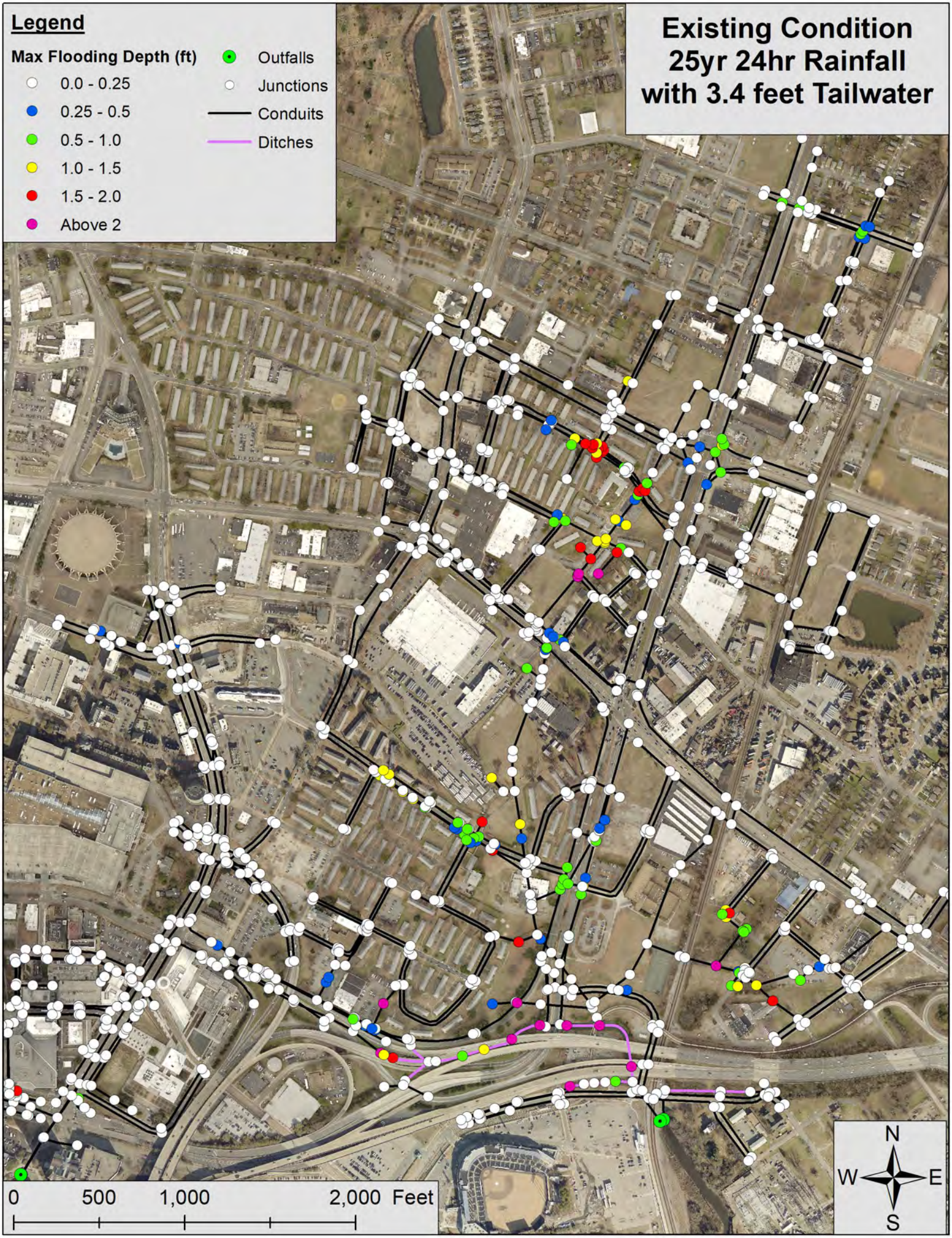
Legend
Max Flooding Depth (ft)
0.0 - 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
Above 2
Outfalls
Junctions
Conduits
Ditches
Existing Condition
25yr 24hr Rainfall
with 3.4 feet Tailwater
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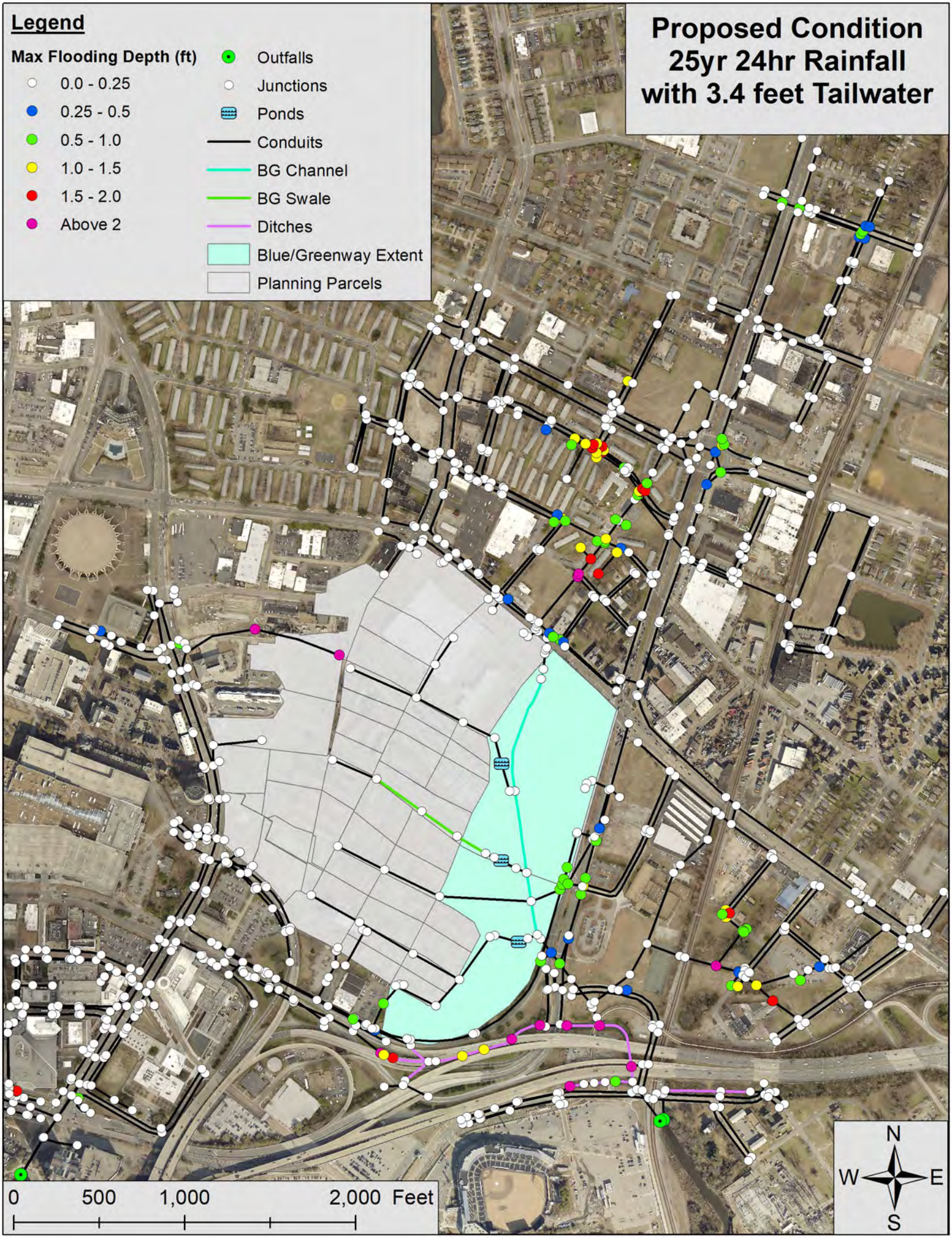
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Max Flooding Depth (ft)
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0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
Above 2
Outfalls
Junctions
Ponds
Conduits
BG Channel
BG Swale
Ditches
Blue/Greenway Extent
Planning Parcels
Proposed Condition
25yr 24hr Rainfall
with 3.4 feet Tailwater
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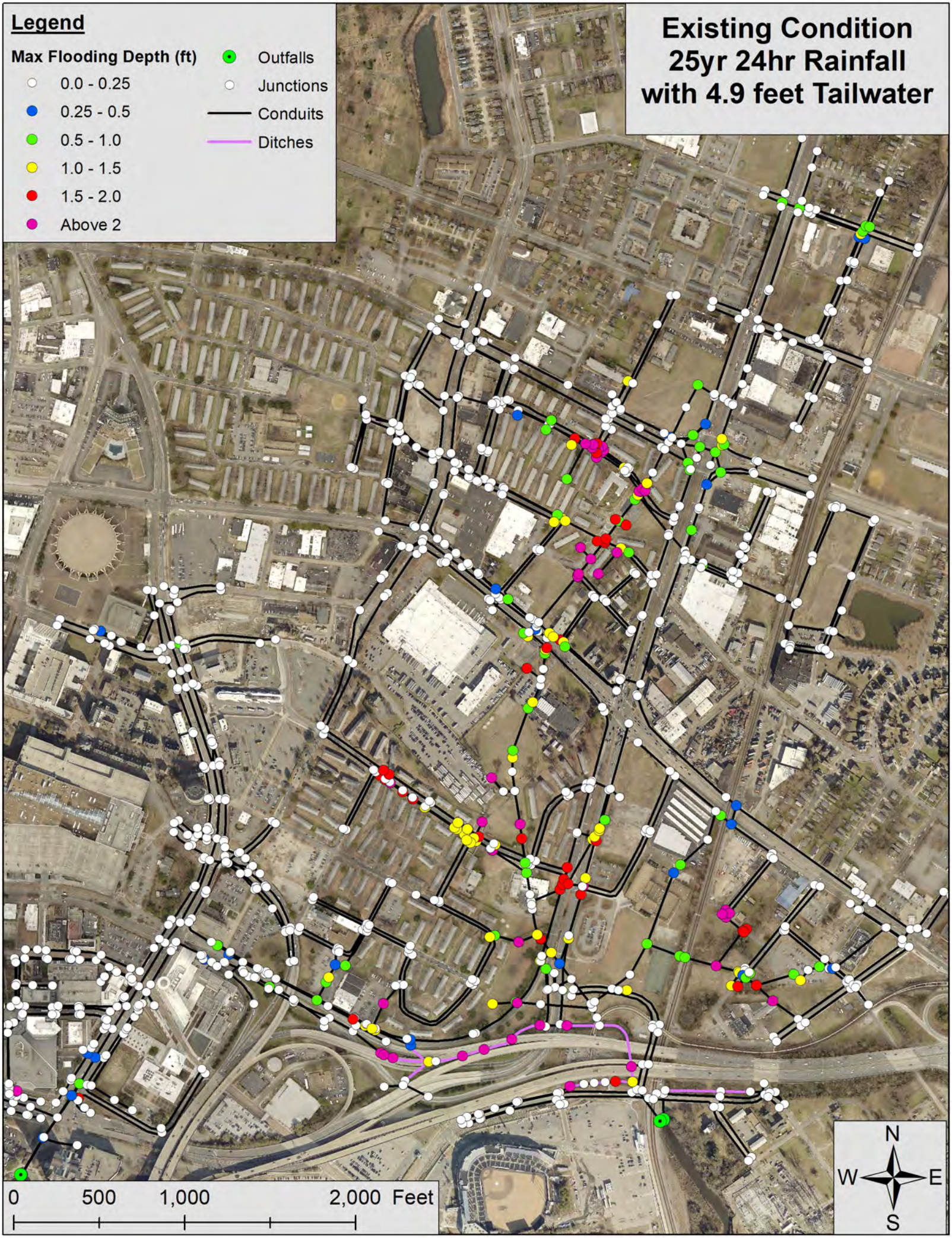
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Max Flooding Depth (ft)
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0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
Above 2
Outfalls
Junctions
Conduits
Ditches
Existing Condition
25yr 24hr Rainfall
with 4.9 feet Tailwater
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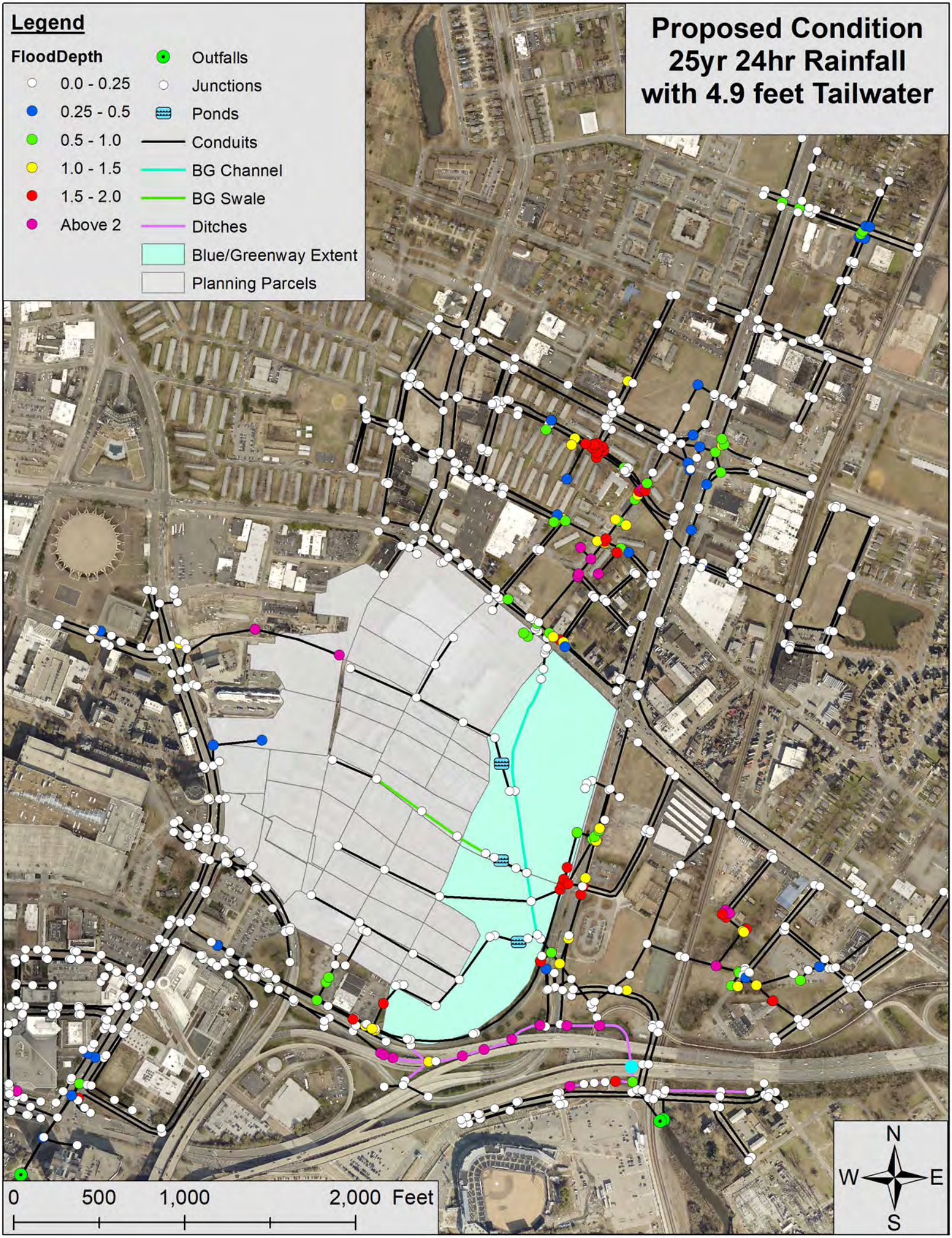
Legend
FloodDepth
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0.25 - 0.5
0.5 - 1.0
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1.5 - 2.0
Above 2
Outfalls
Junctions
Ponds
Conduits
BG Channel
BG Swale
Ditches
Blue/Greenway Extent
Planning Parcels
Proposed Condition
25yr 24hr Rainfall
with 4.9 feet Tailwater
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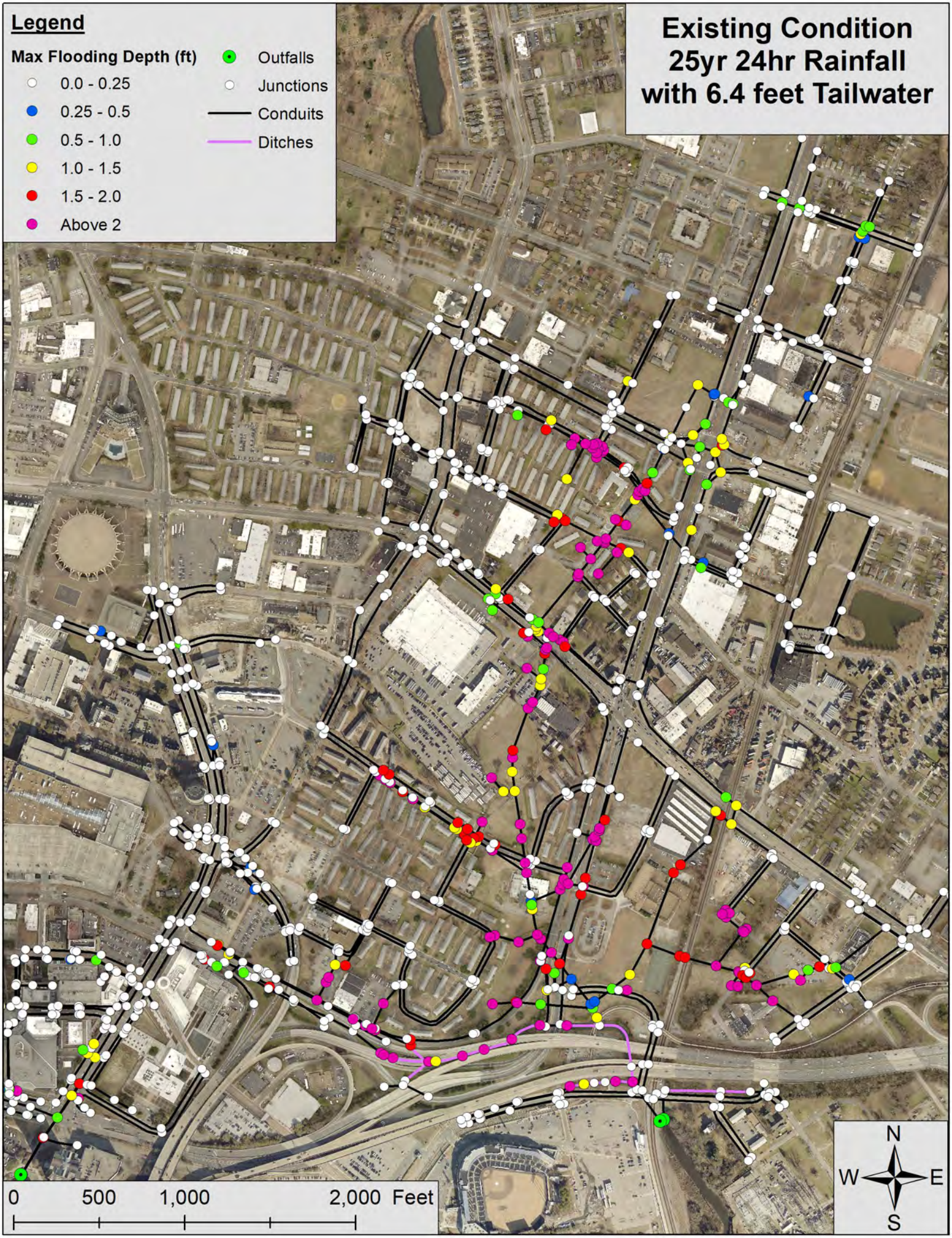
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Max Flooding Depth (ft)
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0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
Above 2
Outfalls
Junctions
Conduits
Ditches
Existing Condition
25yr 24hr Rainfall
with 6.4 feet Tailwater
0
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2,000 Feet
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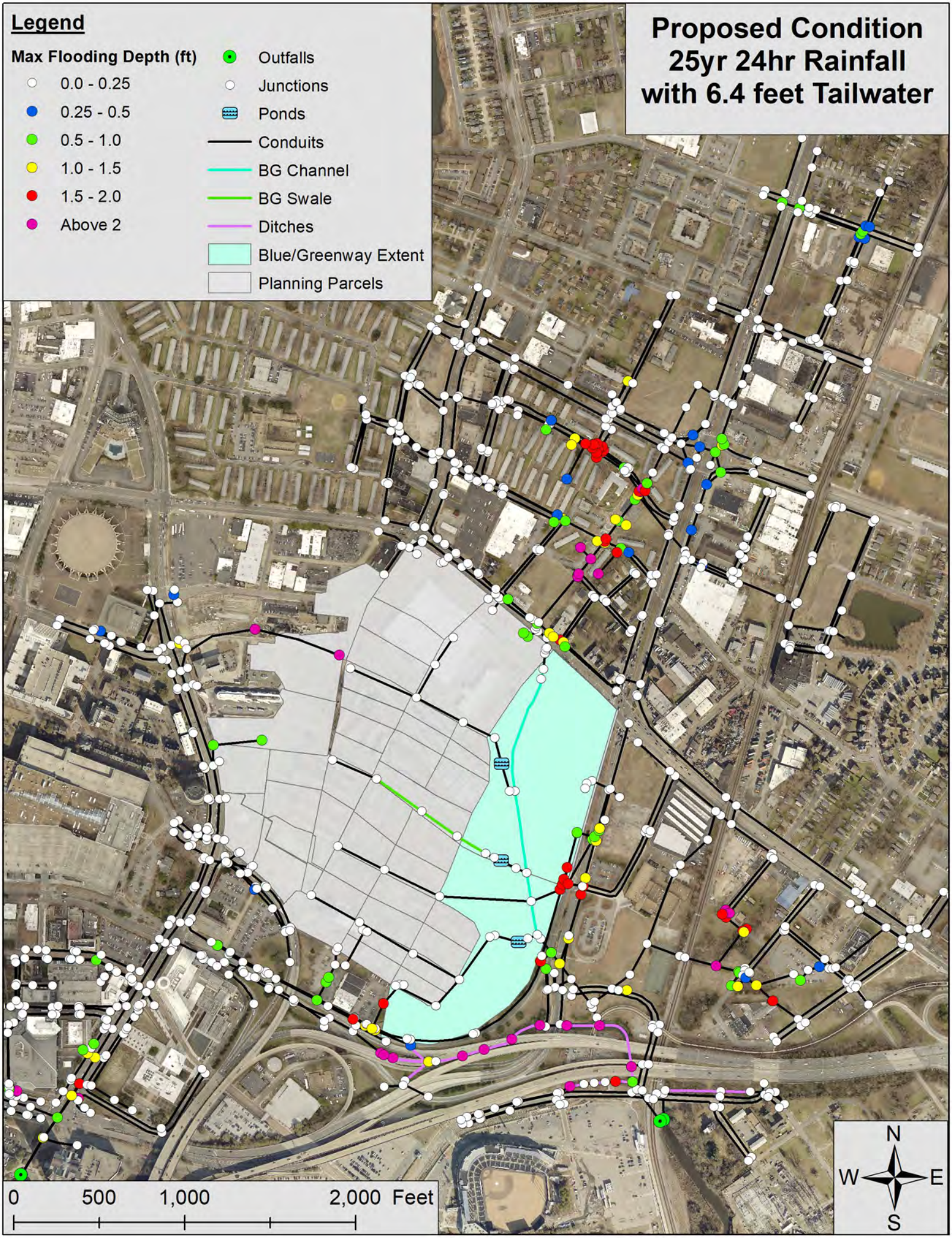
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Max Flooding Depth (ft)
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0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
Above 2
Outfalls
Junctions
Ponds
Conduits
BG Channel
BG Swale
Ditches
Blue/Greenway Extent
Planning Parcels
Proposed Condition
25yr 24hr Rainfall
with 6.4 feet Tailwater
0
500
1,000
2,000 Feet
N
W
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S

Appendix B: Runoff Reduction Method Spreadsheets

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

☐ 2011 BMP Standards and Specifications ☑ 2013 Draft BMP Standards and Specifications

Project Name:	St Pauls BlueGreenway
Date:	
Linear Development Project?	No

CLEAR ALL

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* → 73.61

Check:

BMP Design Specifications List: 2013 Draft Stds & Specs

Maximum reduction required: 20%
Linear project? No

The site's net increase in impervious cover (acres) is: 7.361
Land cover areas entered correctly? ✓

Post-Development TP Load Reduction for Site (lb/yr): 33.06
Total disturbed area entered? ✓

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed forest/open space	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	4.10	26.12	2.90	33.12
Impervious Cover (acres)	0.00	5.00	29.39	6.10	40.49
					73.61

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	3.19	20.57	2.00	25.76
Impervious Cover (acres)	0.00	5.91	34.94	7.00	47.85
Area Check	OK.	OK.	OK.	OK.	73.61

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre		
Pre-ReDevelopment	**Listed**	**Adjusted[1]**
Forest/Open Space Cover (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
% Forest	0%	0%
Managed Turf Cover (acres)	33.12	25.76

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final)	
Post ReDev. & New Impervious	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	25.76

Land Cover Summary-Post	
Post-ReDevelopment	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	25.76

Land Cover Summary-Post
Post-Development New Impervious

WQ Basins A - D, Wet Pond #1 Coastal Plain BMP

Weighted Rv(turf)	0.22	0.22		Weighted Rv (turf)	0.22		Weighted Rv (turf)	0.22			
% Managed Turf	45%	39%		% Managed Turf	35%		% Managed Turf	39%			
Impervious Cover (acres)	40.49	40.49		Impervious Cover (acres)	47.85		ReDev. Impervious Cover (acres)	40.49		New Impervious Cover (acres)	7.36
Rv(impervious)	0.95	0.95		Rv(impervious)	0.95		Rv(impervious)	0.95		Rv(impervious)	0.95
% Impervious	55%	61%		% Impervious	65%		% Impervious	61%			
Total Site Area (acres)	**73.61**	**66.25**		**Final Site Area (acres)**	**73.61**		**Total ReDev. Site Area (acres)**	**66.25**			
Site Rv	**0.62**	**0.67**		**Final Post Dev Site Rv**	**0.69**		**ReDev Site Rv**	**0.67**			
Treatment Volume and Nutrient Load							**Treatment Volume and Nutrient Load**				
Pre-ReDevelopment Treatment Volume (acre-ft)	3.8130	3.6773		**Final Post-Development Treatment Volume (acre-ft)**	4.2601		**Post-ReDevelopment Treatment Volume (acre-ft)**	3.6773		**Post-Development Treatment Volume (acre-ft)**	0.5827
Pre-ReDevelopment Treatment Volume (cubic feet)	166,095	160,184		**Final Post-Development Treatment Volume (cubic feet)**	185,569		**Post-ReDevelopment Treatment Volume (cubic feet)**	160,184		**Post-Development Treatment Volume (cubic feet)**	25,384
Pre-ReDevelopment TP Load (lb/yr)	**104.36**	**100.64**		**Final Post-Development TP Load (lb/yr)**	**116.59**		**Post-ReDevelopment Load (TP) (lb/yr)***	**100.64**		**Post-Development TP Load (lb/yr)**	**15.95**
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	1.42	1.52		Final Post-Development TP Load per acre **(lb/acre/yr)**	1.58		Post-ReDevelopment TP Load per acre **(lb/acre/yr)**	1.52			
Baseline TP Load (lb/yr) **(0.41 lbs/acre/yr** applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*27.16*					**Max. Reduction Required (Below Pre-ReDevelopment Load)**	**20%**			
							TP Load Reduction Required for Redeveloped Area (lb/yr)	**20.13**		**TP Load Reduction Required for New Impervious Area (lb/yr)**	**12.93**

[1] *Adjusted Land Cover Summary:*
Pre ReDevelopment land cover minus pervious land cover (forest/open space or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requriement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	**33.06**

Nitrogen Loads (Informational Purposes Only)

Pre-ReDevelopment TN Load (lb/yr)	746.55		Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr)	834.08

WQ Basins A - D, Wet Pond #1 Coastal Plain BMP

Drainage Area A

Drainage Area A Land Cover (acres)

CLEAR BMP AREAS

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	2.51	6.00	2.00	10.51	0.22
Impervious Cover (acres)	0.00	3.82	11.06	2.00	16.88	0.95
				Total	27.39	

Total Phosphorus Available for Removal in D.A. A (lb/yr)	41.87
Post Development Treatment Volume in D.A. A (ft^3)	66,640

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	

6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	AREA CHECK:	OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	AREA CHECK:	OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	0		
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	41.87		
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00		
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	41.87		

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0	10.51	16.88	0	0	66,640	66,640	45	0.00	41.82	18.82	23.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	

13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	16.88	AREA CHECK:	OK.
TOTAL MANAGED TURF AREA TREATED (ac)	10.51	AREA CHECK:	OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	33.06
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	41.87
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	18.82
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	18.82
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	23.05

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	59.84
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	59.84

Drainage Area B

Drainage Area A Land Cover (acres)

CLEAR BMP AREAS

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.51	8.53	0.00	9.04	0.22
Impervious Cover (acres)	0.00	0.09	9.02	4.00	13.11	0.95
				Total	22.15	

Total Phosphorus Available for Removal in D.A. B (lb/yr)	32.92
Post Development Treatment Volume in D.A. B (ft^3)	52,392

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	

WQ Basins A - D, Wet Pond #1 Coastal Plain BMP

6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL TURF AREA TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL RUNOFF REDUCTION IN D.A. B (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	32.92	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	32.92	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0	9.04	13.11	0	0	52,392	52,392	45	0.00	32.88	14.80	18.08	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	13.11	AREA CHECK:	OK.
TOTAL MANAGED TURF AREA TREATED (ac)	9.04	AREA CHECK:	OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	33.06
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	32.92
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	14.80
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. B (lb/yr)	14.80
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. B (lb/yr)	18.12

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	47.04
TOTAL NITROGEN REMOVED IN D.A. B (lb/yr)	47.04

Drainage Area C

Drainage Area A Land Cover (acres)

CLEAR BMP AREAS

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.17	2.57	0.00	2.74	0.22
Impervious Cover (acres)	0.00	2.00	4.44	0.00	6.44	0.95
				Total	9.18	

Total Phosphorus Available for Removal in D.A. C (lb/yr)	15.32
Post Development Treatment Volume in D.A. C (ft^3)	24,384

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	

WQ Basins A - D, Wet Pond #1 Coastal Plain BMP

6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	**AREA CHECK:** OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	**AREA CHECK:** OK.
TOTAL RUNOFF REDUCTION IN D.A. C (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. C (lb/yr)	15.32	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	15.32	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0	2.74	6.44	0	0	24,384	24,384	45	0.00	15.30	6.89	8.42	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	6.44	AREA CHECK:	OK.
TOTAL MANAGED TURF AREA TREATED (ac)	2.74	AREA CHECK:	OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	33.06
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. C (lb/yr)	15.32
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	6.89
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. C (lb/yr)	6.89
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. C (lb/yr)	8.43

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	21.90
TOTAL NITROGEN REMOVED IN D.A. C (lb/yr)	21.90

Drainage Area D

Drainage Area A Land Cover (acres)

CLEAR BMP AREAS

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.00	3.47	0.00	3.47	0.22
Impervious Cover (acres)	0.00	0.00	10.42	1.00	11.42	0.95
				Total	14.89	

Total Phosphorus Available for Removal in D.A. D (lb/yr)	26.48
Post Development Treatment Volume in D.A. D (ft^3)	42,153

Stormwater Best Management Practices (RR = Runoff Reduction) --Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	

6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	**AREA CHECK:** OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	**AREA CHECK:** OK.
TOTAL RUNOFF REDUCTION IN D.A. D (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. D (lb/yr)	26.48	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	26.48	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0	3.47	11.42	0	0	42,153	42,153	45	0.00	26.45	11.90	14.55	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	11.42	AREA CHECK:	OK.
TOTAL MANAGED TURF AREA TREATED (ac)	3.47	AREA CHECK:	OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	33.06
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. D (lb/yr)	26.48
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	11.90
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. D (lb/yr)	11.90
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. D (lb/yr)	14.58

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	37.85
TOTAL NITROGEN REMOVED IN D.A. D (lb/yr)	37.85

Site Results (Water Quality Compliance)

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	16.88	13.11	6.44	11.42	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	16.88	13.11	6.44	11.42	0.00	OK.
MANAGED TURF AREA (ac)	10.51	9.04	2.74	3.47	0.00	OK.
MANAGED TURF AREA TREATED (ac)	10.51	9.04	2.74	3.47	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3)	185,569

Runoff Reduction Volume and TP By Drainage Area	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft^3)	0	0	0	0	0	0
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	41.87	32.92	15.32	26.48	0.00	116.59
TP LOAD REDUCTION ACHIEVED (lb/yr)	18.82	14.80	6.89	11.90	0.00	52.41
TP LOAD REMAINING (lb/yr)	23.05	18.12	8.43	14.58	0.00	64.19
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	59.84	47.04	21.90	37.85	0.00	166.63

Total Phosphorus		
FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	116.59	
TP LOAD REDUCTION REQUIRED (lb/yr)	33.06	
TP LOAD REDUCTION ACHIEVED (lb/yr)	52.41	
TP LOAD REMAINING (lb/yr):	64.19	
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	0.00	**
** TARGET TP REDUCTION EXCEEDED BY 19.35 LB/YEAR **		

Total Nitrogen (For Information Purposes)	
POST-DEVELOPMENT LOAD (lb/yr)	834.08
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	166.63
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	667.46

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

BMP Design Specifications List: **2013 Draft Stds & Specs**

Site Summary

Project Title: St Pauls BlueGreenway

Date: NA

Total Rainfall (in):	**43**
Total Disturbed Acreage:	**73.61**

Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	4.10	26.12	2.90	33.12	45
Impervious Cover (acres)	0.00	5.00	29.39	6.10	40.49	55
					73.61	100

Post-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	3.19	20.57	2.00	25.76	35
Impervious Cover (acres)	0.00	5.91	34.94	7.00	47.85	65
					73.61	100

Site Tv and Land Cover Nutrient Loads

	Final Post-Development (Post-ReDevelopment & New Impervious)	Post-ReDevelopment	Post-Development (New Impervious)	Adjusted Pre-ReDevelopment	Pre-ReDevelopment TP Load per acre (lb/acre/yr)	Final Post-Development TP Load per acre (lb/acre/yr)	Post-ReDevelopment TP Load per acre (lb/acre/yr)
Site Rv	0.69	0.67	0.95	0.67	**1.52**	**1.58**	**1.52**
Treatment Volume (ft^3)	185,569	160,184	25,384	160,184			
TP Load (lb/yr)	116.59	100.64	15.95	100.64			
Total TP Load Reduction Required (lb/yr)	**33.06**	20.13	12.93				

	Final Post-Development Load (Post-ReDevelopment & New Impervious)	Pre-ReDevelopment
TN Load (lb/yr)	834.08	746.55

Site Compliance Summary

Maximum % Reduction Required Below Pre-ReDevelopment Load	20%

WQ Basins A - D, Wet Pond #1 Coastal Plain BMP

Total Runoff Volume Reduction (ft^3)	0
Total TP Load Reduction Achieved (lb/yr)	52.41
Total TN Load Reduction Achieved (lb/yr)	166.63
Remaining Post Development TP Load (lb/yr)	64.19
Remaining TP Load Reduction (lb/yr) Required	**0.00**

**** TARGET TP REDUCTION EXCEEDED BY 19.35 LB/YEAR ****

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	10.51	9.04	2.74	3.47	0.00	25.76
Impervious Cover (acres)	16.88	13.11	6.44	11.42	0.00	47.85
Total Area (acres)	**27.39**	**22.15**	**9.18**	**14.89**	**0.00**	**73.61**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	18.82	14.80	6.89	11.90	0.00	52.41
TN Load Reduced (lb/yr)	59.84	47.04	21.90	37.85	0.00	166.63

Runoff Volume and CN Calculations

	1-year storm	2-year storm	10-year storm
Target Rainfall Event (in)	2.96	3.60	5.53

Drainage Areas	RV & CN	Drainage Area A	Drainage Area B	Drainage Area C	Drainage Area D	Drainage Area E
CN		88	88	91	92	0

	RR (ft^3)		0	0	0	0	0			
	1-year return period	**RV wo RR (ws-in)**	1.78	1.78	2.03	2.12	0.00			
		RV w RR (ws-in)	1.78	1.78	2.03	2.12	0.00			
		CN adjusted	88	88	91	92	0			
	2-year return period	**RV wo RR (ws-in)**	2.36	2.36	2.64	2.73	0.00			
		RV w RR (ws-in)	2.36	2.36	2.64	2.73	0.00			
		CN adjusted	88	88	91	92	0			
	10-year return period	**RV wo RR (ws-in)**	4.17	4.17	4.50	4.61	0.00			
		RV w RR (ws-in)	4.17	4.17	4.50	4.61	0.00			
		CN adjusted	88	88	91	92	0			

					Enter Total Disturbed Area *(acres)* →	73.61		***Check:***				
								BMP Design Specifications List:	**2013 Draft Stds & Specs**			
					Maximum reduction required:	***20%***		***Linear project?***	**No**			
					The site's net increase in impervious cover (acres) is:	***7.361***		***Land cover areas entered correctly?***	✓			
					Post-Development TP Load Reduction for Site (lb/yr):	***33.06***		***Total disturbed area entered?***	✓			

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed forest/open space	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	4.10	26.12	2.90	33.12
Impervious Cover (acres)	0.00	5.00	29.39	6.10	40.49
					73.61

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	3.19	20.57	2.00	25.76
Impervious Cover (acres)	0.00	5.91	34.94	7.00	47.85
Area Check	**OK.**	**OK.**	**OK.**	**OK.**	73.61

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre		
Pre-ReDevelopment	**Listed**	**Adjusted[1]**
Forest/Open Space Cover (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
% Forest	0%	0%
Managed Turf Cover (acres)	33.12	25.76
Weighted Rv(turf)	0.22	0.22
% Managed Turf	45%	39%
Impervious Cover (acres)	40.49	40.49
Rv(impervious)	0.95	0.95
% Impervious	55%	61%
Total Site Area (acres)	**73.61**	**66.25**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final)	
Post ReDev. & New Impervious	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	25.76
Weighted Rv (turf)	0.22
% Managed Turf	35%
Impervious Cover (acres)	47.85
Rv(impervious)	0.95
% Impervious	65%
Final Site Area (acres)	**73.61**

Land Cover Summary-Post	
Post-ReDevelopment	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	25.76
Weighted Rv (turf)	0.22
% Managed Turf	39%
ReDev. Impervious Cover (acres)	40.49
Rv(impervious)	0.95
% Impervious	61%
Total ReDev. Site Area (acres)	**66.25**

Land Cover Summary-Post	
Post-Development New Impervious	
New Impervious Cover (acres)	7.36
Rv(impervious)	0.95

WQ Basins A - D Constructed Wetland #1 BMP

Site Rv	0.62	0.67		Final Post Dev Site Rv	0.69		ReDev Site Rv	0.67			
Treatment Volume and Nutrient Load							**Treatment Volume and Nutrient Load**				
Pre-ReDevelopment Treatment Volume (acre-ft)	3.8130	3.6773		**Final Post-Development Treatment Volume (acre-ft)**	4.2601		**Post-ReDevelopment Treatment Volume (acre-ft)**	3.6773		**Post-Development Treatment Volume (acre-ft)**	0.5827
Pre-ReDevelopment Treatment Volume (cubic feet)	166,095	160,184		**Final Post-Development Treatment Volume (cubic feet)**	185,569		**Post-ReDevelopment Treatment Volume (cubic feet)**	160,184		**Post-Development Treatment Volume (cubic feet)**	25,384
Pre-ReDevelopment TP Load (lb/yr)	**104.36**	**100.64**		**Final Post-Development TP Load (lb/yr)**	**116.59**		**Post-ReDevelopment Load (TP) (lb/yr)***	**100.64**		**Post-Development TP Load (lb/yr)**	**15.95**
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	1.42	1.52		Final Post-Development TP Load per acre **(lb/acre/yr)**	1.58		Post-ReDevelopment TP Load per acre **(lb/acre/yr)**	1.52			
Baseline TP Load (lb/yr) (**0.41 lbs/acre/yr** applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*27.16*					**Max. Reduction Required (Below Pre-ReDevelopment Load)**	**20%**			
							TP Load Reduction Required for Redeveloped Area (lb/yr)	**20.13**		**TP Load Reduction Required for New Impervious Area (lb/yr)**	**12.93**

[1] *Adjusted Land Cover Summary:*
Pre ReDevelopment land cover minus pervious land cover (forest/open space or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requriement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	33.06

Nitrogen Loads (Informational Purposes Only)

Pre-ReDevelopment TN Load (lb/yr)	746.55	Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr)	834.08

WQ Basins A - D Constructed Wetland #1 BMP

Drainage Area A

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	2.51	6.00	2.00	10.51	0.22
Impervious Cover (acres)	0.00	3.82	11.06	2.00	16.88	0.95
				Total	27.39	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. A (lb/yr)	41.87
Post Development Treatment Volume in D.A. A (ft^3)	66,640

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	

WQ Basins A - D Constructed Wetland #1 BMP

6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	0	

TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	41.87
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	41.87

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0	10.51	16.88	0	0	66,640	66,640	50	0.00	41.82	20.91	20.91	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	

WQ Basins A - D Constructed Wetland #1 BMP

13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	16.88	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	10.51	AREA CHECK: OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	33.06
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	41.87
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	20.91
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	20.91
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	20.96

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	74.80
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	74.80

WQ Basins A - D Constructed Wetland #1 BMP

Drainage Area B

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.51	8.53	0.00	9.04	0.22
Impervious Cover (acres)	0.00	0.09	9.02	4.00	13.11	0.95
				Total	22.15	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. B (lb/yr)	32.92
Post Development Treatment Volume in D.A. B (ft^3)	52,392

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	

WQ Basins A - D Constructed Wetland #1 BMP

6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL TURF AREA TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL RUNOFF REDUCTION IN D.A. B (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	32.92	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	32.92	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0	9.04	13.11	0	0	52,392	52,392	50	0.00	32.88	16.44	16.44	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													

WQ Basins A - D Constructed Wetland #1 BMP

13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	13.11	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	9.04	AREA CHECK: OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	33.06
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	32.92
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	16.44
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. B (lb/yr)	16.44
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. B (lb/yr)	16.48

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	58.81
TOTAL NITROGEN REMOVED IN D.A. B (lb/yr)	58.81

WQ Basins A - D Constructed Wetland #1 BMP

Drainage Area C

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.17	2.57	0.00	2.74	0.22
Impervious Cover (acres)	0.00	2.00	4.44	0.00	6.44	0.95
				Total	9.18	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. C (lb/yr)	15.32
Post Development Treatment Volume in D.A. C (ft^3)	24,384

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	

WQ Basins A - D Constructed Wetland #1 BMP

6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL RUNOFF REDUCTION IN D.A. C (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. C (lb/yr)	15.32	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	15.32	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0	2.74	6.44	0	0	24,384	24,384	50	0.00	15.30	7.65	7.65	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													

WQ Basins A - D Constructed Wetland #1 BMP

13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	6.44	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	2.74	AREA CHECK: OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	33.06
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. C (lb/yr)	15.32
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	7.65
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. C (lb/yr)	7.65
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. C (lb/yr)	7.67

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	27.37
TOTAL NITROGEN REMOVED IN D.A. C (lb/yr)	27.37

WQ Basins A - D Constructed Wetland #1 BMP

Drainage Area D

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.00	3.47	0.00	3.47	0.22
Impervious Cover (acres)	0.00	0.00	10.42	1.00	11.42	0.95
				Total	14.89	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. D (lb/yr)	26.48
Post Development Treatment Volume in D.A. D (ft^3)	42,153

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	

WQ Basins A - D Constructed Wetland #1 BMP

6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL RUNOFF REDUCTION IN D.A. D (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. D (lb/yr)	26.48	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	26.48	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0	3.47	11.42	0	0	42,153	42,153	50	0.00	26.45	13.23	13.23	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													

WQ Basins A - D Constructed Wetland #1 BMP

13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	11.42	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	3.47	AREA CHECK: OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	33.06
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. D (lb/yr)	26.48
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	13.23
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. D (lb/yr)	13.23
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. D (lb/yr)	13.26

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr)	47.31
TOTAL NITROGEN REMOVED IN D.A. D (lb/yr)	47.31

WQ Basins A - D Constructed Wetland #1 BMP

Site Results (Water Quality Compliance)

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	16.88	13.11	6.44	11.42	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	16.88	13.11	6.44	11.42	0.00	OK.
MANAGED TURF AREA (ac)	10.51	9.04	2.74	3.47	0.00	OK.
MANAGED TURF AREA TREATED (ac)	10.51	9.04	2.74	3.47	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3)	185,569

Runoff Reduction Volume and TP By Drainage Area	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft^3)	0	0	0	0	0	0
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	41.87	32.92	15.32	26.48	0.00	116.59
TP LOAD REDUCTION ACHIEVED (lb/yr)	20.91	16.44	7.65	13.23	0.00	58.23
TP LOAD REMAINING (lb/yr)	20.96	16.48	7.67	13.26	0.00	58.36
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	74.80	58.81	27.37	47.31	0.00	208.29

Total Phosphorus		
FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	116.59	
TP LOAD REDUCTION REQUIRED (lb/yr)	33.06	
TP LOAD REDUCTION ACHIEVED (lb/yr)	58.23	
TP LOAD REMAINING (lb/yr):	58.36	
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	0.00	**

** TARGET TP REDUCTION EXCEEDED BY 25.17 LB/YEAR **

Total Nitrogen (For Information Purposes)	
POST-DEVELOPMENT LOAD (lb/yr)	834.08
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	208.29
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	625.80

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

BMP Design Specifications List: **2013 Draft Stds & Specs**

Site Summary

Project Title: St Pauls BlueGreenway
Date: NA

Total Rainfall (in):	**43**
Total Disturbed Acreage:	**73.61**

Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	4.10	26.12	2.90	33.12	45
Impervious Cover (acres)	0.00	5.00	29.39	6.10	40.49	55
					73.61	100

Post-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	3.19	20.57	2.00	25.76	35
Impervious Cover (acres)	0.00	5.91	34.94	7.00	47.85	65
					73.61	100

Site Tv and Land Cover Nutrient Loads

	Final Post-Development (Post-ReDevelopment & New Impervious)	Post-ReDevelopment	Post-Development (New Impervious)	Adjusted Pre-ReDevelopment
Site Rv	0.69	0.67	0.95	0.67
Treatment Volume (ft^3)	185,569	160,184	25,384	160,184
TP Load (lb/yr)	116.59	100.64	15.95	100.64

Pre-ReDevelopment TP Load per acre (lb/acre/yr)	Final Post-Development TP Load per acre (lb/acre/yr)	Post-ReDevelopment TP Load per acre (lb/acre/yr)
1.52	**1.58**	**1.52**

Total TP Load Reduction Required (lb/yr)	**33.06**	20.13	12.93

	Final Post-Development Load (Post-ReDevelopment & New Impervious)	Pre-ReDevelopment
TN Load (lb/yr)	834.08	746.55

Site Compliance Summary

Maximum % Reduction Required Below Pre-ReDevelopment Load	20%

Total Runoff Volume Reduction (ft^3)	0

WQ Basins A - D Constructed Wetland #1 BMP

Total TP Load Reduction Achieved (lb/yr)	58.23
Total TN Load Reduction Achieved (lb/yr)	208.29
Remaining Post Development TP Load (lb/yr)	58.36
Remaining TP Load Reduction (lb/yr) Required	**0.00**

**** TARGET TP REDUCTION EXCEEDED BY 25.17 LB/YEAR ****

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	10.51	9.04	2.74	3.47	0.00	25.76
Impervious Cover (acres)	16.88	13.11	6.44	11.42	0.00	47.85
Total Area (acres)	**27.39**	**22.15**	**9.18**	**14.89**	**0.00**	**73.61**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	20.91	16.44	7.65	13.23	0.00	58.23
TN Load Reduced (lb/yr)	74.80	58.81	27.37	47.31	0.00	208.29

Runoff Volume and CN Calculations

	1-year storm	2-year storm	10-year storm
Target Rainfall Event (in)	2.96	3.60	5.53

Drainage Areas	RV & CN	Drainage Area A	Drainage Area B	Drainage Area C	Drainage Area D	Drainage Area E
CN		88	88	91	92	0
RR (ft^3)		0	0	0	0	0
1-year return period	**RV wo RR (ws-in)**	1.78	1.78	2.03	2.12	0.00
	RV w RR (ws-in)	1.78	1.78	2.03	2.12	0.00
	CN adjusted	88	88	91	92	0
2-year return period	**RV wo RR (ws-in)**	2.36	2.36	2.64	2.73	0.00
	RV w RR (ws-in)	2.36	2.36	2.64	2.73	0.00

WQ Basins A - D Constructed Wetland #1 BMP

	CN adjusted	88	88	91	92	0
10-year return period	**RV wo RR (ws-in)**	4.17	4.17	4.50	4.61	0.00
	RV w RR (ws-in)	4.17	4.17	4.50	4.61	0.00
	CN adjusted	88	88	91	92	0

WQ Basins A - D Constructed Wetland #1 BMP

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - **Version 3.0**

☐ 2011 BMP Standards and Specifications ☑ 2013 Draft BMP Standards and Specifications

Project Name:	St Pauls BlueGreenway
Date:	
Linear Development Project?	No

CLEAR ALL

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* → 29.60

Check:

BMP Design Specifications List: 2013 Draft Stds & Specs

Maximum reduction required: 20%
Linear project? No

The site's net increase in impervious cover (acres) is: 0
Land cover areas entered correctly? ✓

Post-Development TP Load Reduction for Site (lb/yr): 0.00
Total disturbed area entered? ✓

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed forest/open space	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	0.00	20.30	0.00	20.30
Impervious Cover (acres)	0.00	1.50	6.30	1.50	9.30
					29.60

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	0.45	23.00	0.50	23.95
Impervious Cover (acres)	0.00	1.05	3.60	1.00	5.65
Area Check	OK.	OK.	OK.	OK.	29.60

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre		
Pre-ReDevelopment	**Listed**	**Adjusted[1]**
Forest/Open Space Cover (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
% Forest	0%	0%
Managed Turf Cover (acres)	20.30	20.30

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final)	
Post ReDev. & New Impervious	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	23.95

Land Cover Summary-Post	
Post-ReDevelopment	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	23.95

Land Cover Summary-Post
Post-Development New Impervious

B/G Way Basins

Weighted Rv(turf)	0.22	0.22		Weighted Rv (turf)	0.22		Weighted Rv (turf)	0.22			
% Managed Turf	69%	69%		% Managed Turf	81%		% Managed Turf	81%			
Impervious Cover (acres)	9.30	9.30		Impervious Cover (acres)	5.65		ReDev. Impervious Cover (acres)	5.65		New Impervious Cover (acres)	0.00
Rv(impervious)	0.95	0.95		Rv(impervious)	0.95		Rv(impervious)	0.95		Rv(impervious)	--
% Impervious	31%	31%		% Impervious	19%		% Impervious	19%			
Total Site Area (acres)	**29.60**	**29.60**		**Final Site Area (acres)**	**29.60**		**Total ReDev. Site Area (acres)**	**29.60**			
Site Rv	**0.45**	**0.45**		**Final Post Dev Site Rv**	**0.36**		**ReDev Site Rv**	**0.36**			
Treatment Volume and Nutrient Load				**Treatment Volume and Nutrient Load**							
Pre-ReDevelopment Treatment Volume (acre-ft)	1.1084	1.1084		**Final Post-Development Treatment Volume (acre-ft)**	0.8869		**Post-ReDevelopment Treatment Volume (acre-ft)**	0.8869		**Post-Development Treatment Volume (acre-ft)**	--
Pre-ReDevelopment Treatment Volume (cubic feet)	48,283	48,283		**Final Post-Development Treatment Volume (cubic feet)**	38,632		**Post-ReDevelopment Treatment Volume (cubic feet)**	38,632		**Post-Development Treatment Volume (cubic feet)**	--
Pre-ReDevelopment TP Load (lb/yr)	**30.34**	**30.34**		**Final Post-Development TP Load (lb/yr)**	**24.27**		**Post-ReDevelopment Load (TP) (lb/yr)***	**24.27**		**Post-Development TP Load (lb/yr)**	--
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	1.02	1.02		Final Post-Development TP Load per acre **(lb/acre/yr)**	0.82		Post-ReDevelopment TP Load per acre **(lb/acre/yr)**	0.82			
Baseline TP Load (lb/yr) **(0.41 lbs/acre/yr** applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*12.14*					**Max. Reduction Required (Below Pre-ReDevelopment Load)**	**20%**			
[1] Adjusted Land Cover Summary: Pre ReDevelopment land cover minus pervious land cover (forest/open space or managed turf) acreage proposed for new impervious cover.							**TP Load Reduction Required for Redeveloped Area (lb/yr)**	**0.00**		**TP Load Reduction Required for New Impervious Area (lb/yr)**	**0**
Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).											
Column I shows load reduction requriement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).											
Post-Development Requirement for Site Area											
			TP Load Reduction Required (lb/yr)		**0.00**		**	*TP LOAD REDUCTION NOT REQUIRED*			
Nitrogen Loads (Informational Purposes Only)											
	Pre-ReDevelopment TN Load (lb/yr)	217.02					Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr)	173.64			

B/G Way Basins

Drainage Area A

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.45	8.27	0.00	8.72	0.22
Impervious Cover (acres)	0.00	1.05	1.00	0.00	2.05	0.95
				Total	10.77	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. A (lb/yr)	8.80
Post Development Treatment Volume in D.A. A (ft^3)	14,001

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	

B/G Way Basins

6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	8.80	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	8.80	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0	8.72	2.05	0	0	14,001	14,001	45	0.00	8.79	3.95	4.83	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	

B/G Way Basins

13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	2.05	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	8.72	AREA CHECK: OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	0.00
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	8.80
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	3.95
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	3.95
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	4.84

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	12.57
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	12.57

B/G Way Basins

Drainage Area B

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.00	11.09	0.50	11.59	0.22
Impervious Cover (acres)	0.00	0.00	2.60	1.00	3.60	0.95
				Total	15.19	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. B (lb/yr)	13.65
Post Development Treatment Volume in D.A. B (ft^3)	21,725

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	

B/G Way Basins

6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	
9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL TURF AREA TREATED (ac)	0.00	**AREA CHECK: OK.**
TOTAL RUNOFF REDUCTION IN D.A. B (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	13.65	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	13.65	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	
11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0	11.59	3.60	0	0	21,725	21,725	50	0.00	13.63	6.82	6.82	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13. Wet Ponds (no RR)													

B/G Way Basins

13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	3.60	**AREA CHECK: OK.**
TOTAL MANAGED TURF AREA TREATED (ac)	11.59	**AREA CHECK: OK.**

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	0.00
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	13.65
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	6.82
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. B (lb/yr)	6.82
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. B (lb/yr)	6.83

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	24.38
TOTAL NITROGEN REMOVED IN D.A. B (lb/yr)	24.38

B/G Way Basins

Site Results (Water Quality Compliance)

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	2.05	3.60	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	2.05	3.60	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	8.72	11.59	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	8.72	11.59	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3)	38,632

Runoff Reduction Volume and TP By Drainage Area	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft^3)	0	0	0	0	0	0
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	8.80	13.65	0.00	0.00	0.00	22.45
TP LOAD REDUCTION ACHIEVED (lb/yr)	3.95	6.82	0.00	0.00	0.00	10.77
TP LOAD REMAINING (lb/yr)	4.84	6.83	0.00	0.00	0.00	11.68
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	12.57	24.38	0.00	0.00	0.00	36.96

Total Phosphorus		
FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	24.27	
TP LOAD REDUCTION REQUIRED (lb/yr)	0.00	
TP LOAD REDUCTION ACHIEVED (lb/yr)	10.77	
TP LOAD REMAINING (lb/yr):	13.50	
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	0.00	**

** TARGET TP REDUCTION EXCEEDED BY 10.77 LB/YEAR **

Total Nitrogen (For Information Purposes)	
POST-DEVELOPMENT LOAD (lb/yr)	173.64
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	36.96
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	136.69

B/G Way Basins

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

BMP Design Specifications List: **2013 Draft Stds & Specs**

Site Summary

Project Title: St Pauls BlueGreenway
Date: NA

Total Rainfall (in):	**43**
Total Disturbed Acreage:	**29.60**

Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	20.30	0.00	20.30	69
Impervious Cover (acres)	0.00	1.50	6.30	1.50	9.30	31
					29.60	100

Post-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.45	23.00	0.50	23.95	81
Impervious Cover (acres)	0.00	1.05	3.60	1.00	5.65	19
					29.60	100

Site Tv and Land Cover Nutrient Loads

	Final Post-Development (Post-ReDevelopment & New Impervious)	Post-ReDevelopment	Post-Development (New Impervious)	Adjusted Pre-ReDevelopment
Site Rv	0.36	0.36	--	0.45
Treatment Volume (ft^3)	38,632	38,632	--	48,283
TP Load (lb/yr)	24.27	24.27	--	30.34

Pre-ReDevelopment TP Load per acre (lb/acre/yr)	Final Post-Development TP Load per acre (lb/acre/yr)	Post-ReDevelopment TP Load per acre (lb/acre/yr)
1.02	**0.82**	**0.82**

Total TP Load Reduction Required (lb/yr)	**0.00**	0.00	0

	Final Post-Development Load (Post-ReDevelopment & New Impervious)	Pre-ReDevelopment
TN Load (lb/yr)	173.64	217.02

Site Compliance Summary

Maximum % Reduction Required Below Pre-ReDevelopment Load	20%

Total Runoff Volume Reduction (ft^3)	0

B/G Way Basins

Total TP Load Reduction Achieved (lb/yr)	10.77
Total TN Load Reduction Achieved (lb/yr)	36.96
Remaining Post Development TP Load (lb/yr)	13.50
Remaining TP Load Reduction (lb/yr) Required	**0.00**

**** TARGET TP REDUCTION EXCEEDED BY 10.77 LB/YEAR ****

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	8.72	11.59	0.00	0.00	0.00	20.31
Impervious Cover (acres)	2.05	3.60	0.00	0.00	0.00	5.65
Total Area (acres)	**10.77**	**15.19**	**0.00**	**0.00**	**0.00**	**25.96**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	3.95	6.82	0.00	0.00	0.00	10.77
TN Load Reduced (lb/yr)	12.57	24.38	0.00	0.00	0.00	36.96

Runoff Volume and CN Calculations

	1-year storm	2-year storm	10-year storm
Target Rainfall Event (in)	2.96	3.60	5.53

Drainage Areas	RV & CN	Drainage Area A	Drainage Area B	Drainage Area C	Drainage Area D	Drainage Area E
CN		78	80	0	0	0
RR (ft^3)		0	0	0	0	0
1-year return period	**RV wo RR (ws-in)**	1.10	1.22	0.00	0.00	0.00
	RV w RR (ws-in)	1.10	1.22	0.00	0.00	0.00
	CN adjusted	78	80	0	0	0
2-year return period	**RV wo RR (ws-in)**	1.57	1.72	0.00	0.00	0.00
	RV w RR (ws-in)	1.57	1.72	0.00	0.00	0.00

B/G Way Basins

	CN adjusted	78	80	0	0	0
10-year return period	**RV wo RR (ws-in)**	3.17	3.36	0.00	0.00	0.00
	RV w RR (ws-in)	3.17	3.36	0.00	0.00	0.00
	CN adjusted	78	80	0	0	0

B/G Way Basins

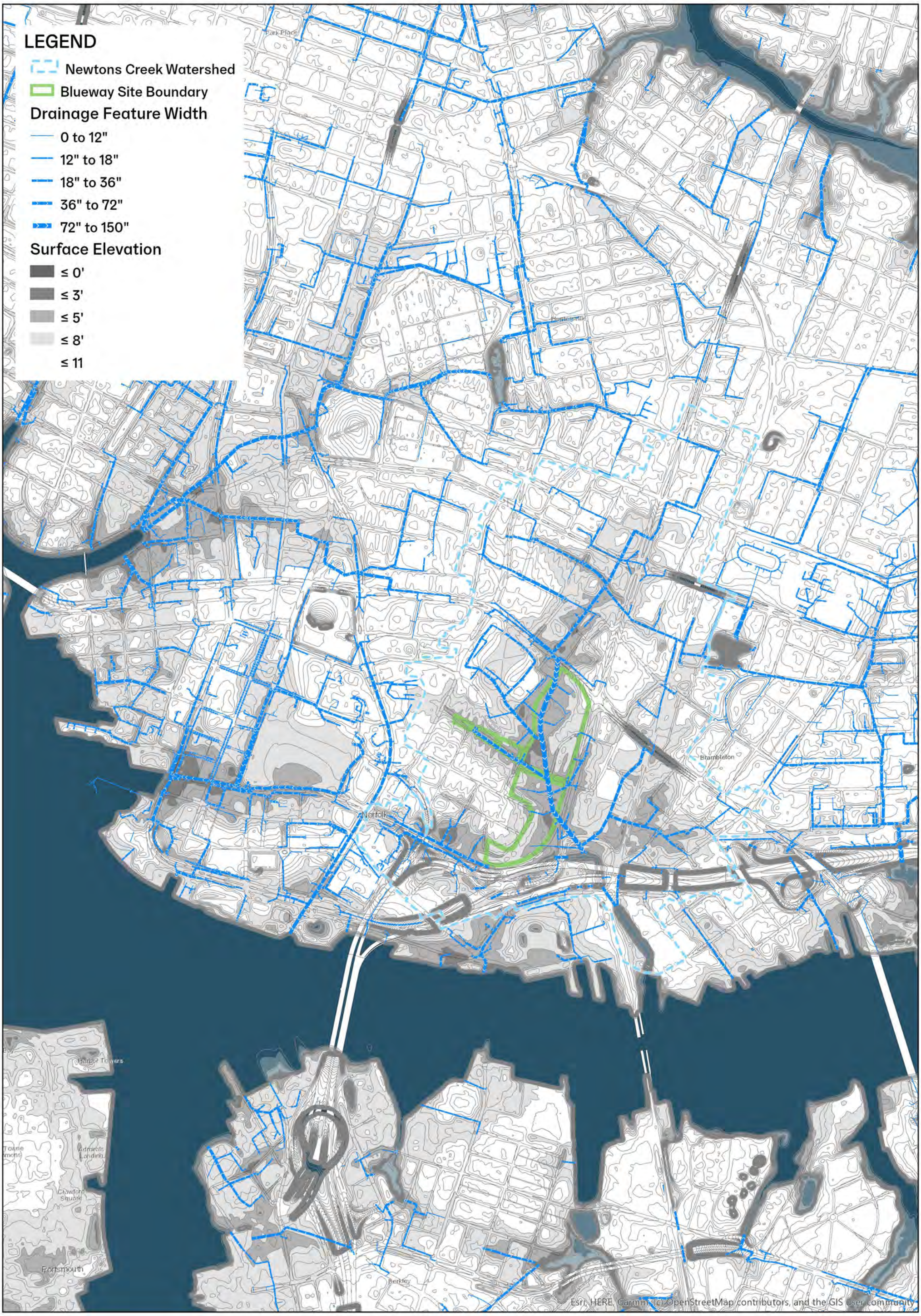
Appendix C: Enlarged Maps

Context Map

WAGGONNER & BALL

moffatt & nichol

2013 Digital Elevation Model

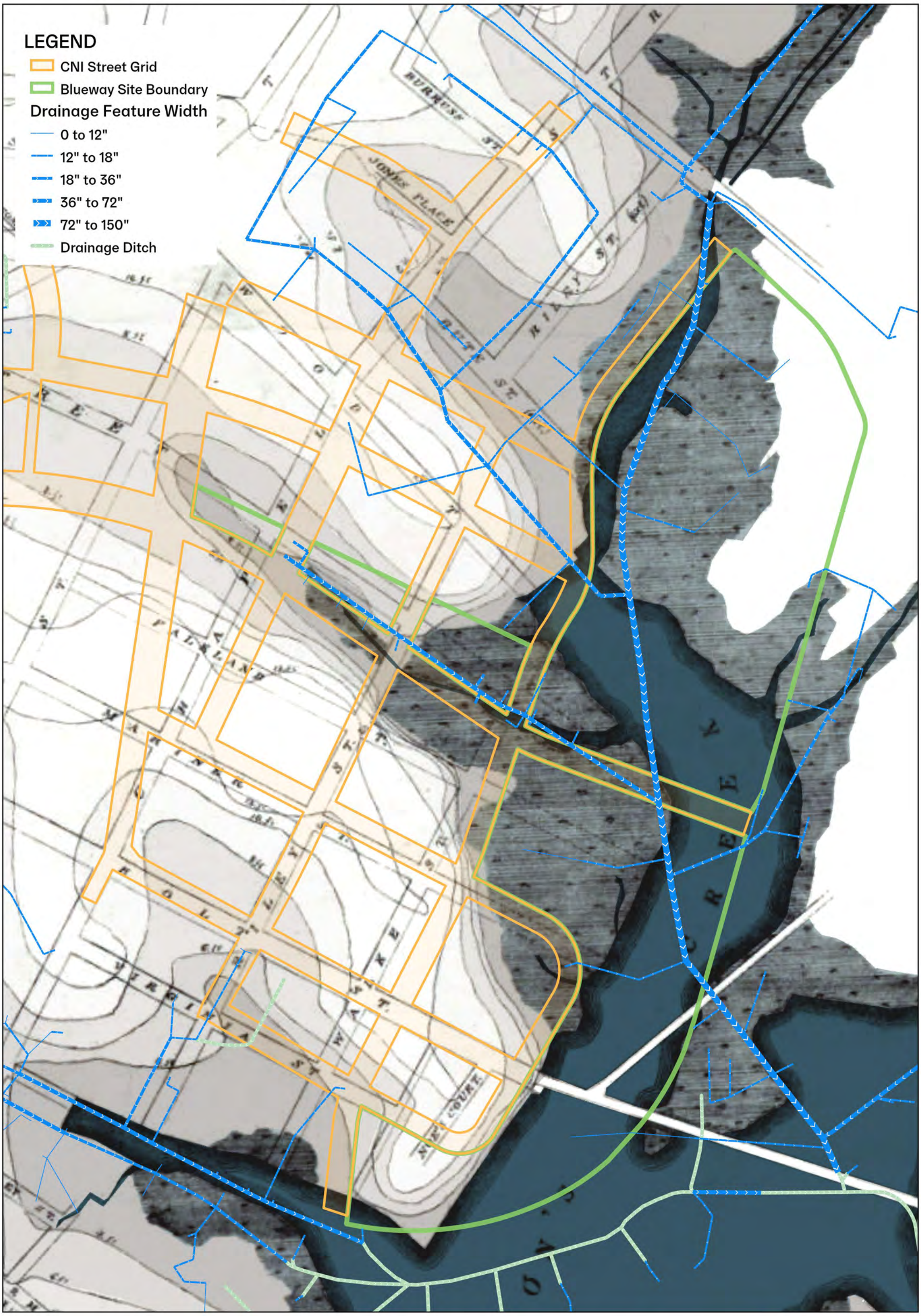


0 0.5 1 Miles

WAGGONNER & BALL

moffatt & nichol

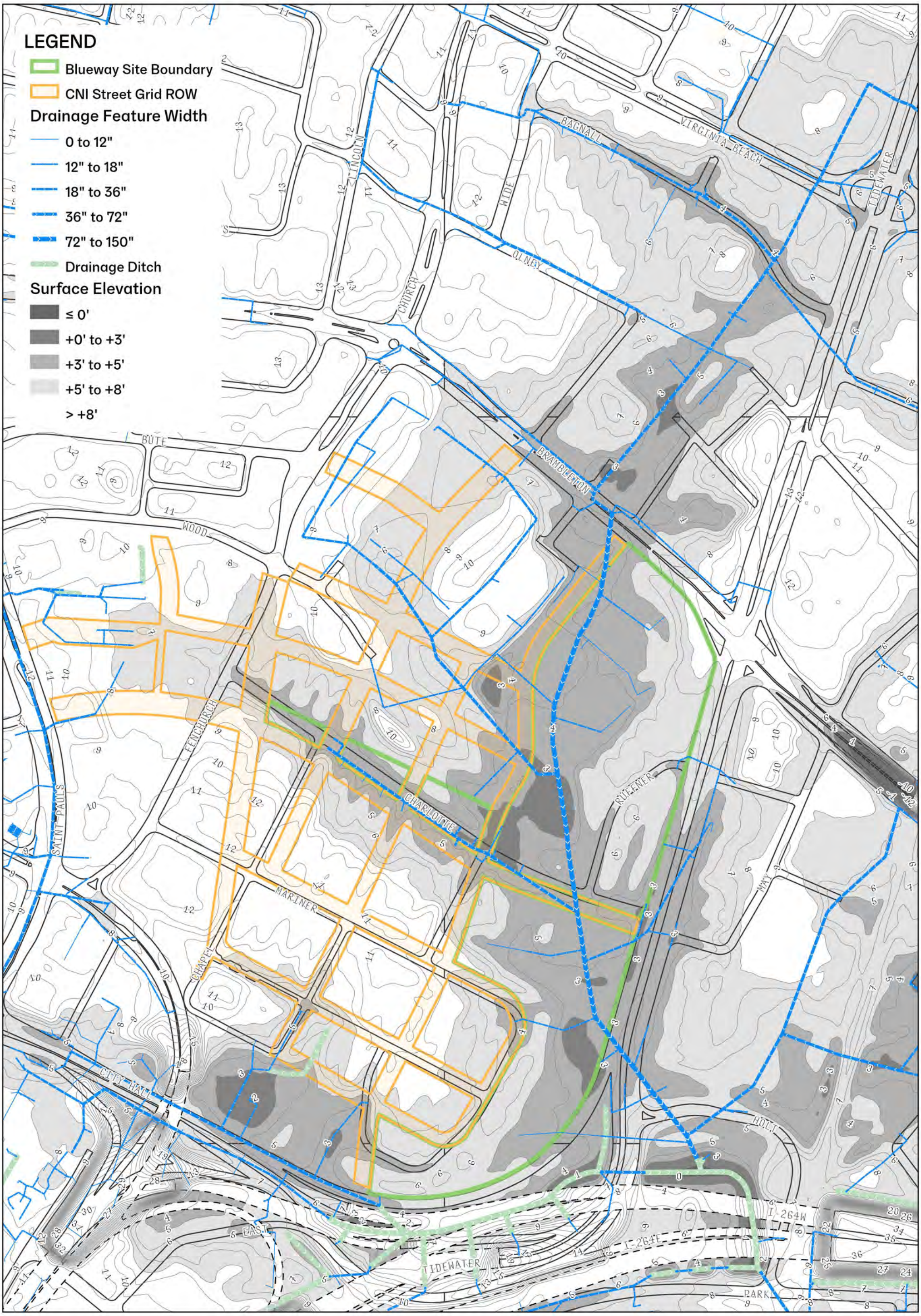
1880's Topographic Survey



WAGGONNER & BALL

moffatt & nichol

2013 Digital Elevation Model

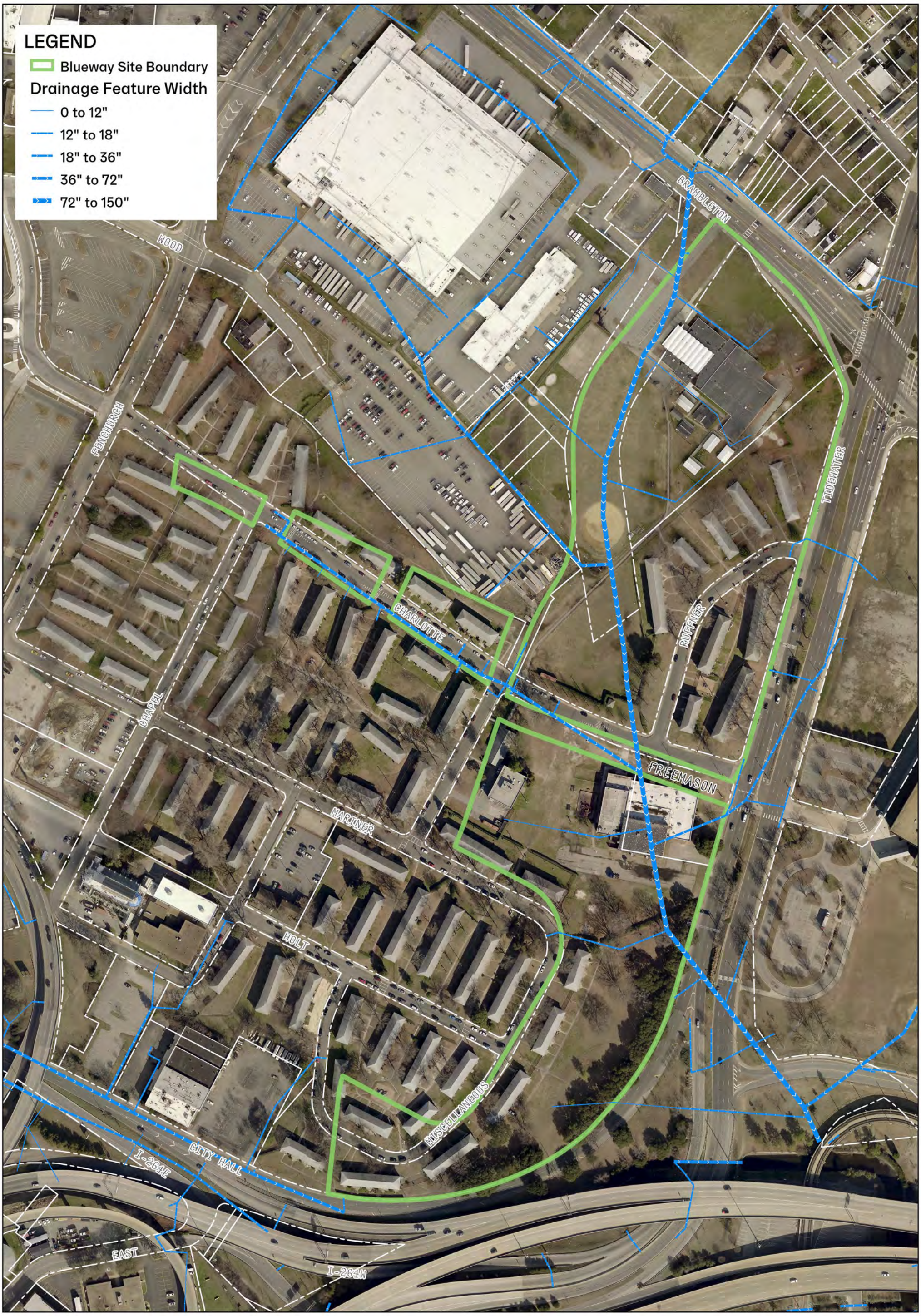


Feet
0 100200 400 600 800 1,000 1,200

WAGGONNER & BALL

moffatt & nichol

2017 Aerial



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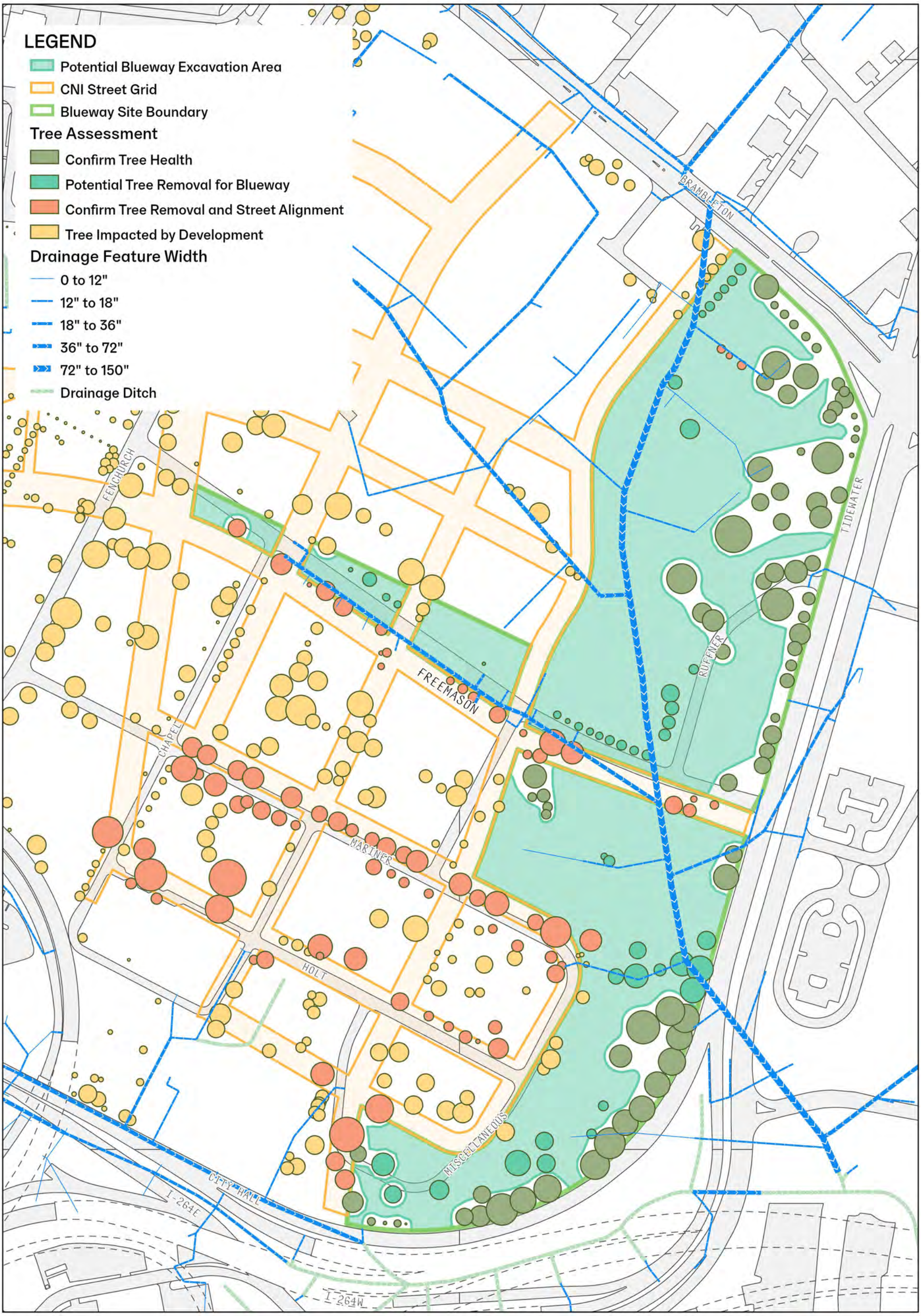
WAGGONNER & BALL

moffatt & nichol

Trees and Open Space



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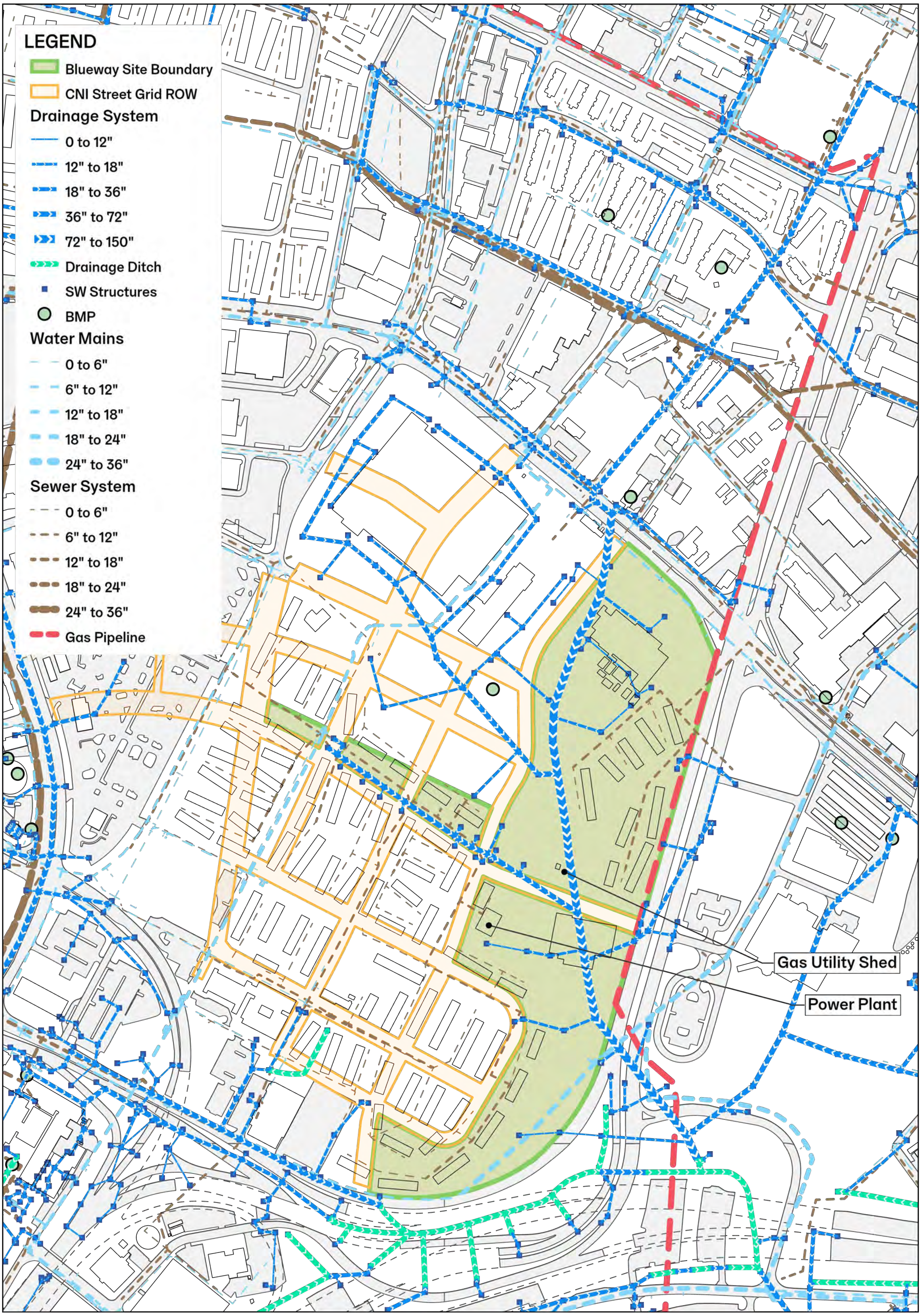
WAGGONNER & BALL

moffatt & nichol

Subsurface Utilities



0 500 1,000 Feet

WAGGONNER & BALL

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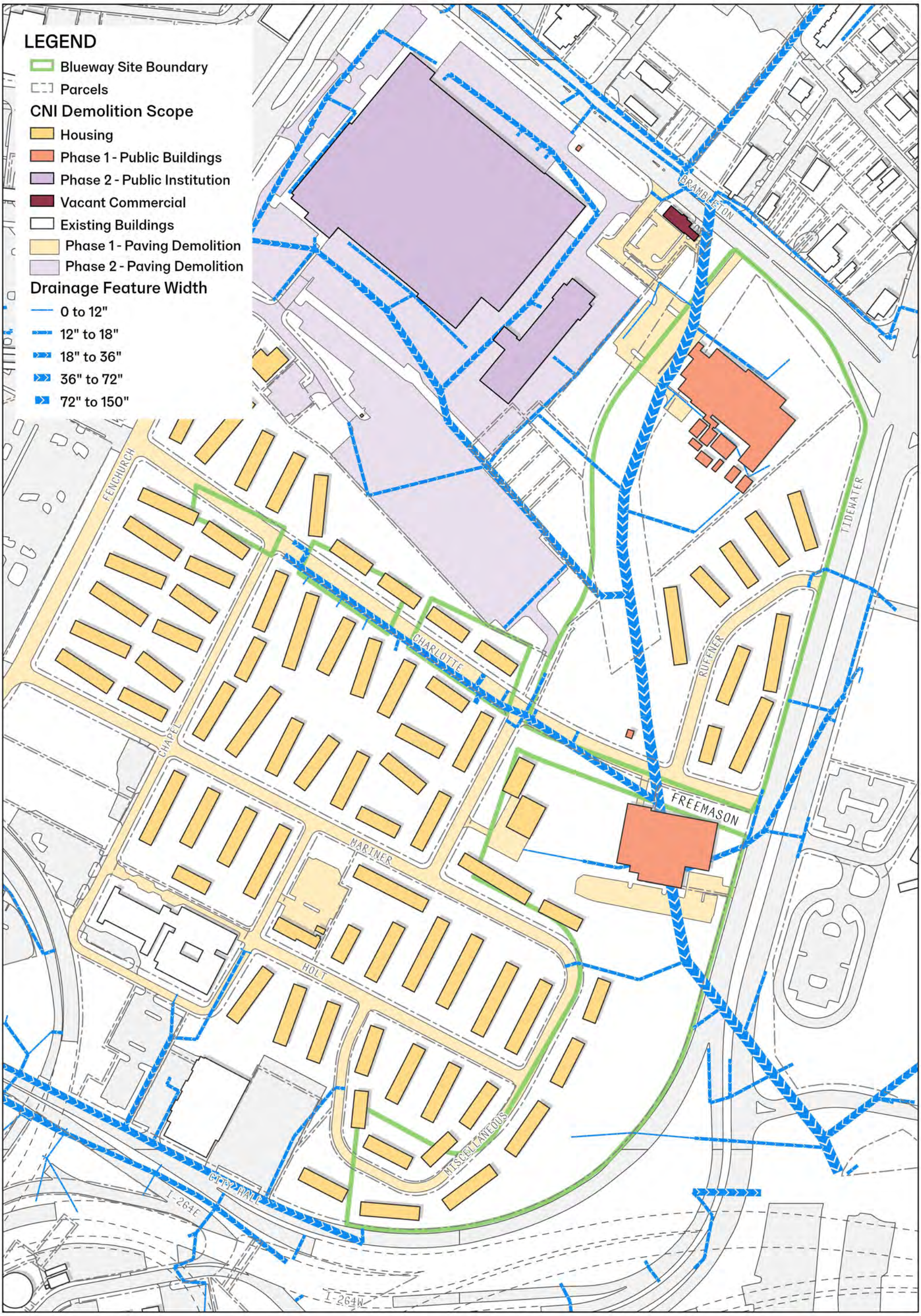
Assumed Demolition Scope



0 100 200 400 600 800 Feet

WAGGONNER & BALL

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Blue/Greenway Site

0 500 1,000 Feet

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Assets and Connections

0 500 1,000 2,000 Feet

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Serial Sections Plan

WAGGONNER & BALL

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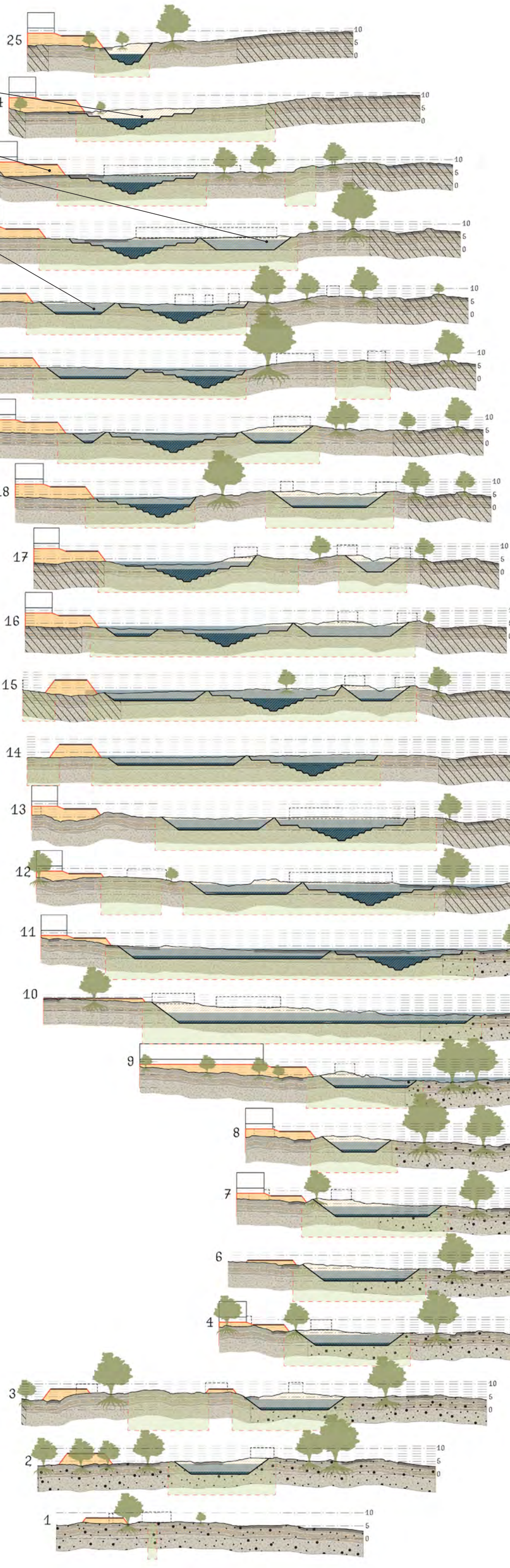
Serial Sections

Daylit Newton's Creek Main Channel

Raised Road

Dry Detention Basin

Wet Bottom Detention Pond

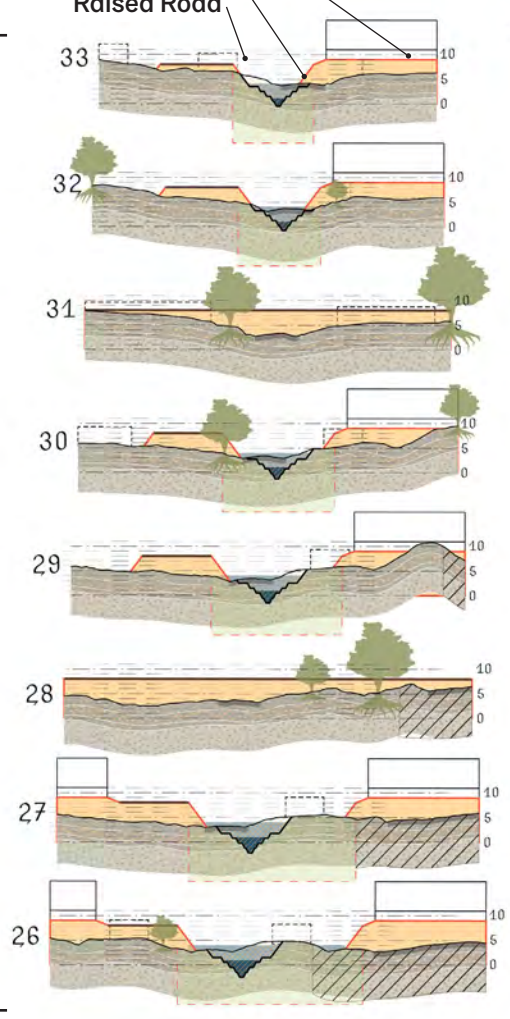


Serial Sections F

Raised Development Site

Freemason St Swale

Raised Road



Serial Sections A

Serial Sections B

Serial Sections C

Serial Sections D

Serial Sections E

LEGEND

- Dump Soil
- Urban Soil
- Sandy Loam
- Clay Loam
- Loamy Sand
- Demo Building
- Demo Road
- Water
- Flood Stage
- Raised Road/Site
- Excavation Area

4x Vertical Exaggeration

WAGGONNER & BALL

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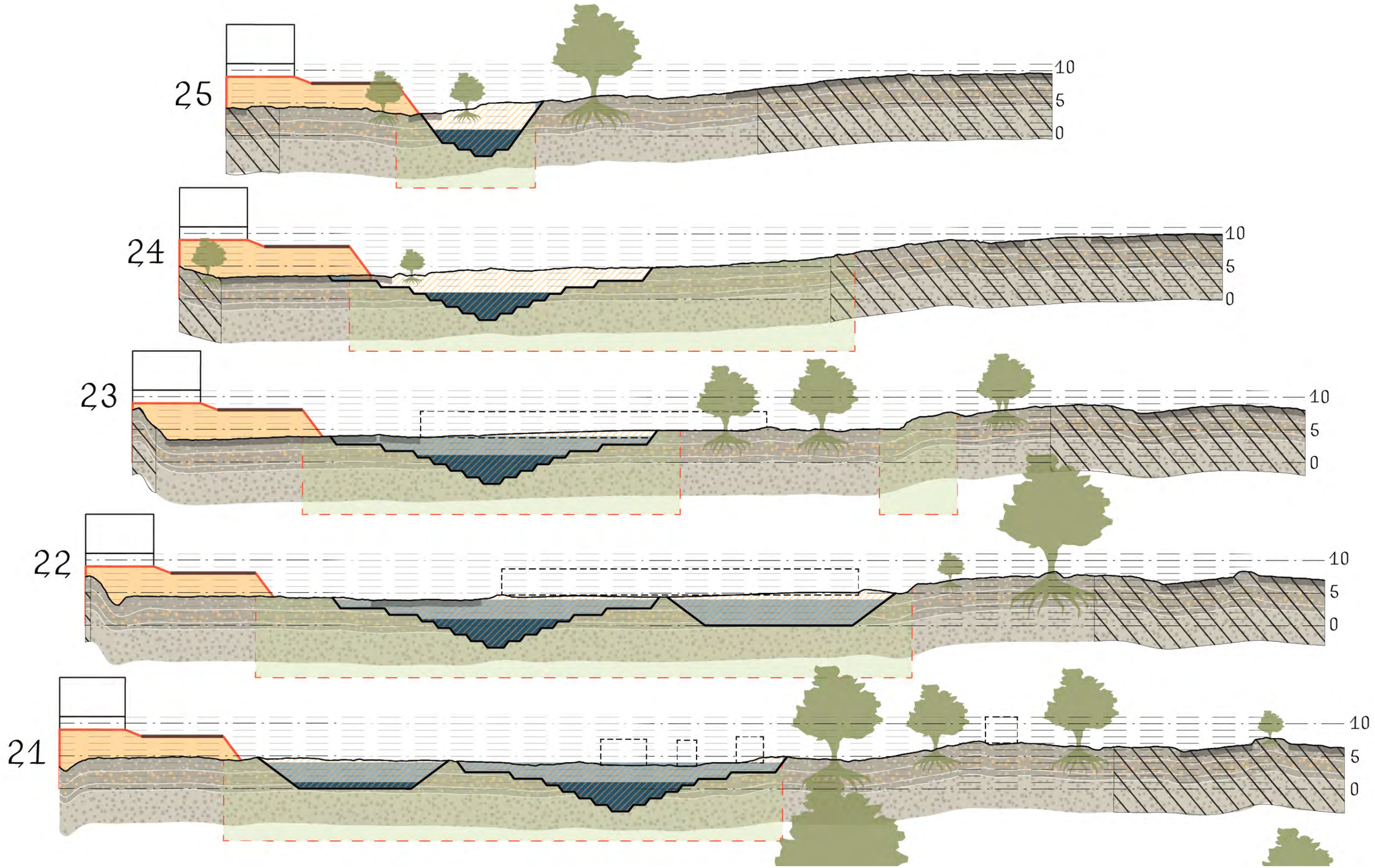
Serial Sections A



6'12' 24' 48' 1" = 24'
Vertical Exaggeration 4x

WAGGONNER &BALL

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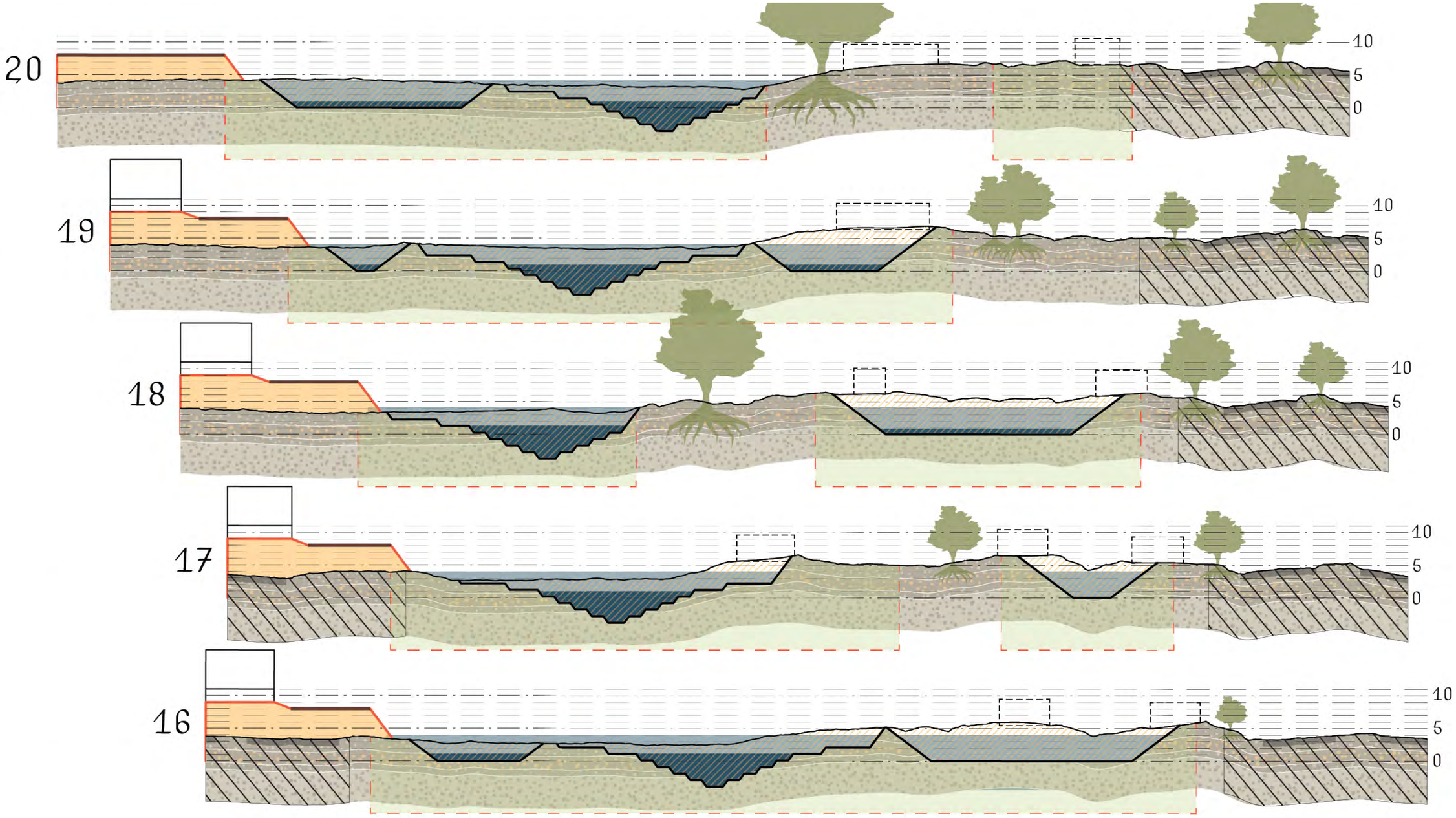
Serial Sections B



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Vertical Exaggeration 4x

WAGGONNER & BALL

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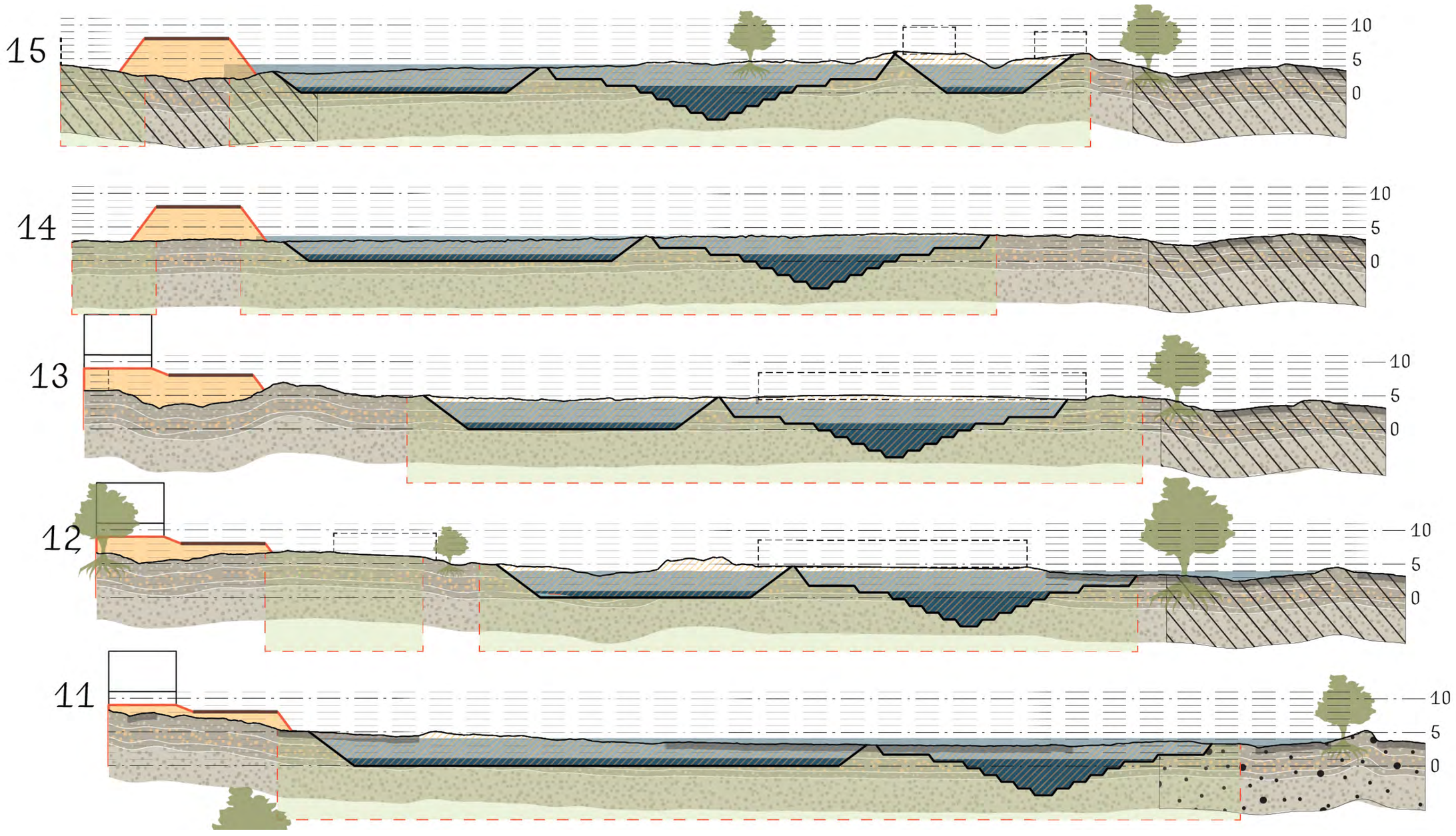
Serial Sections C



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Vertical Exaggeration 4x

WAGGONNER &BALL

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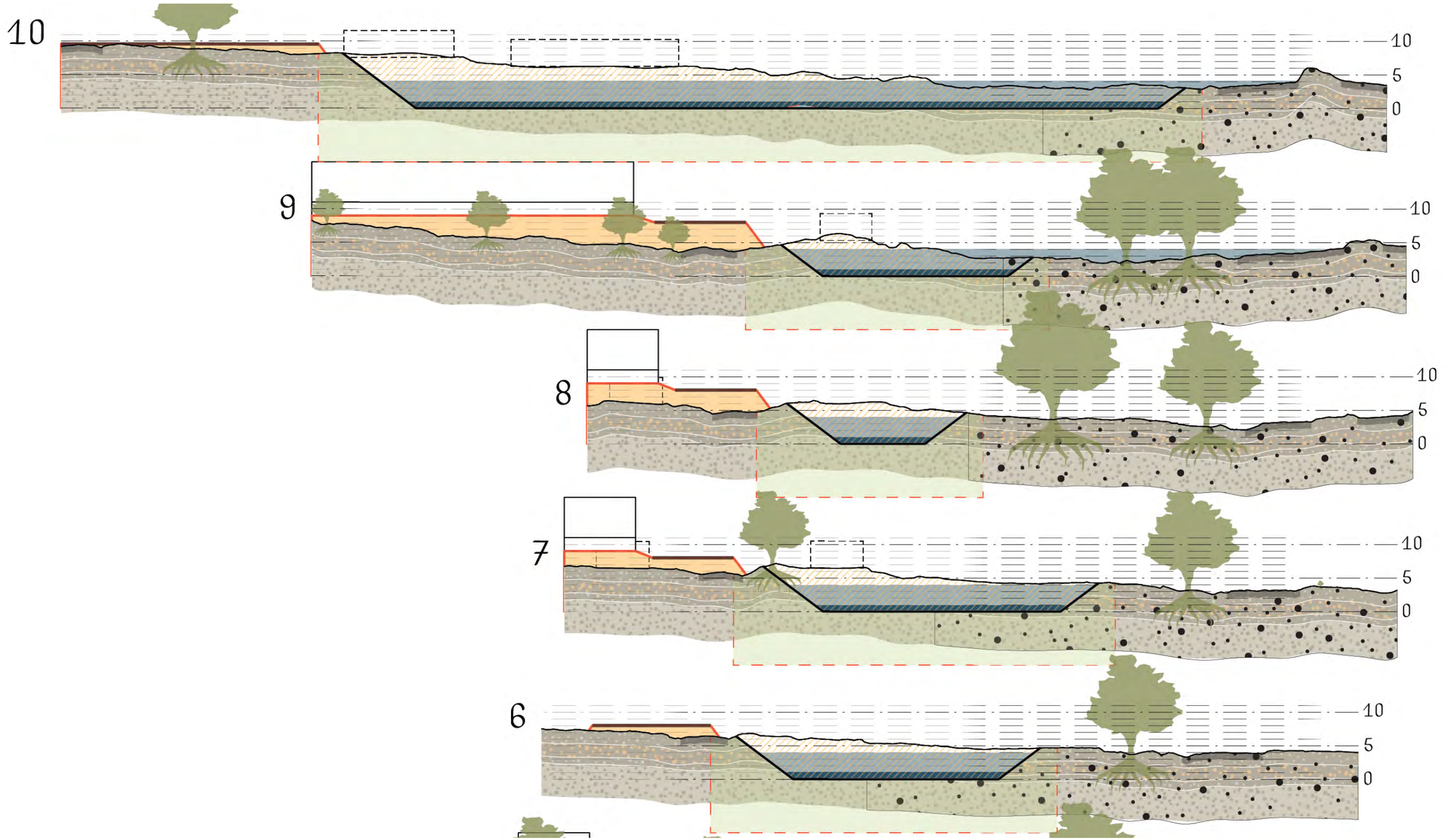
Serial Sections D

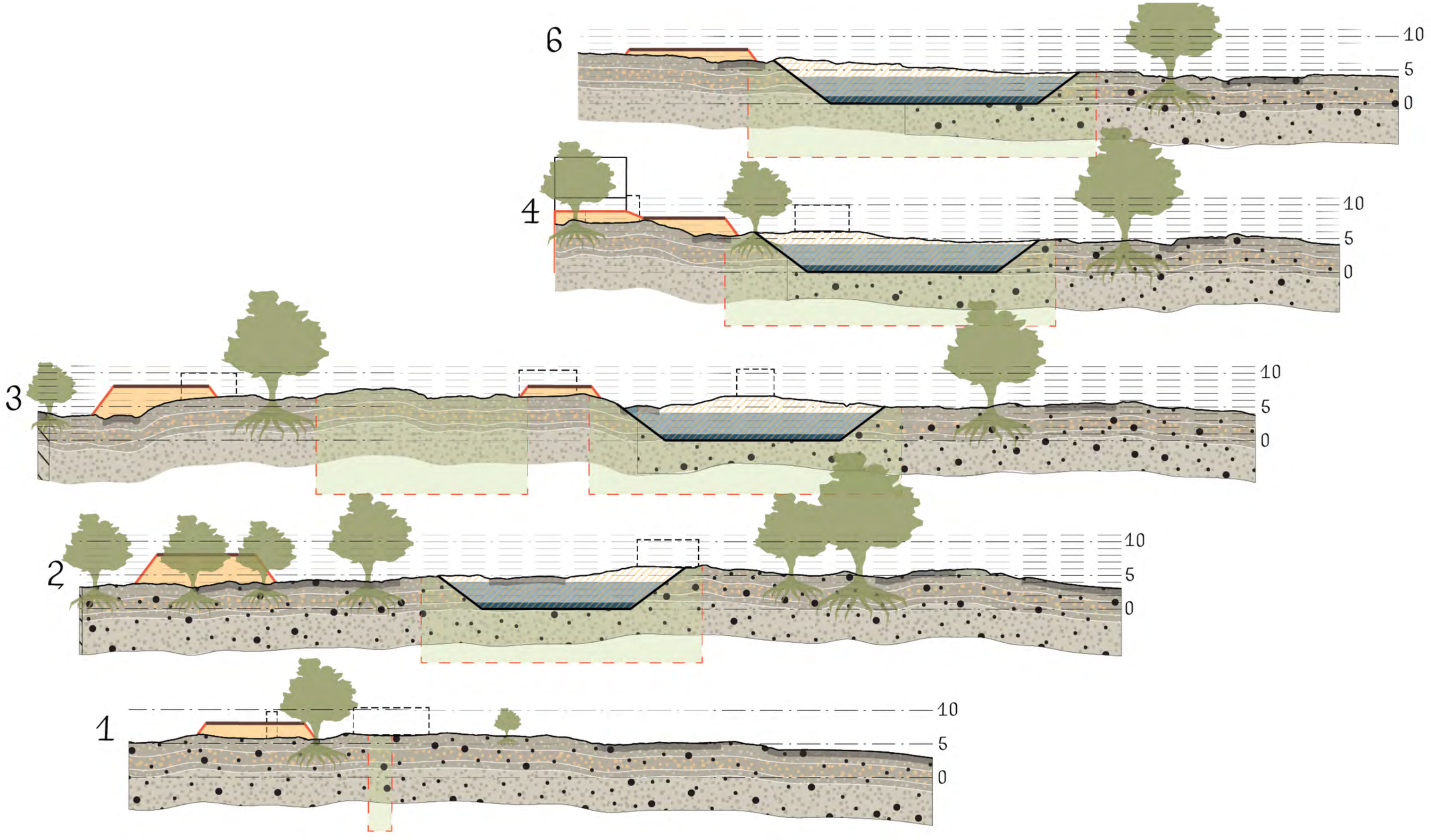


6'12' 24' 48' 1" = 24'
Vertical Exaggeration 4x

WAGGONNER &BALL

moffatt & nichol

Serial Sections E

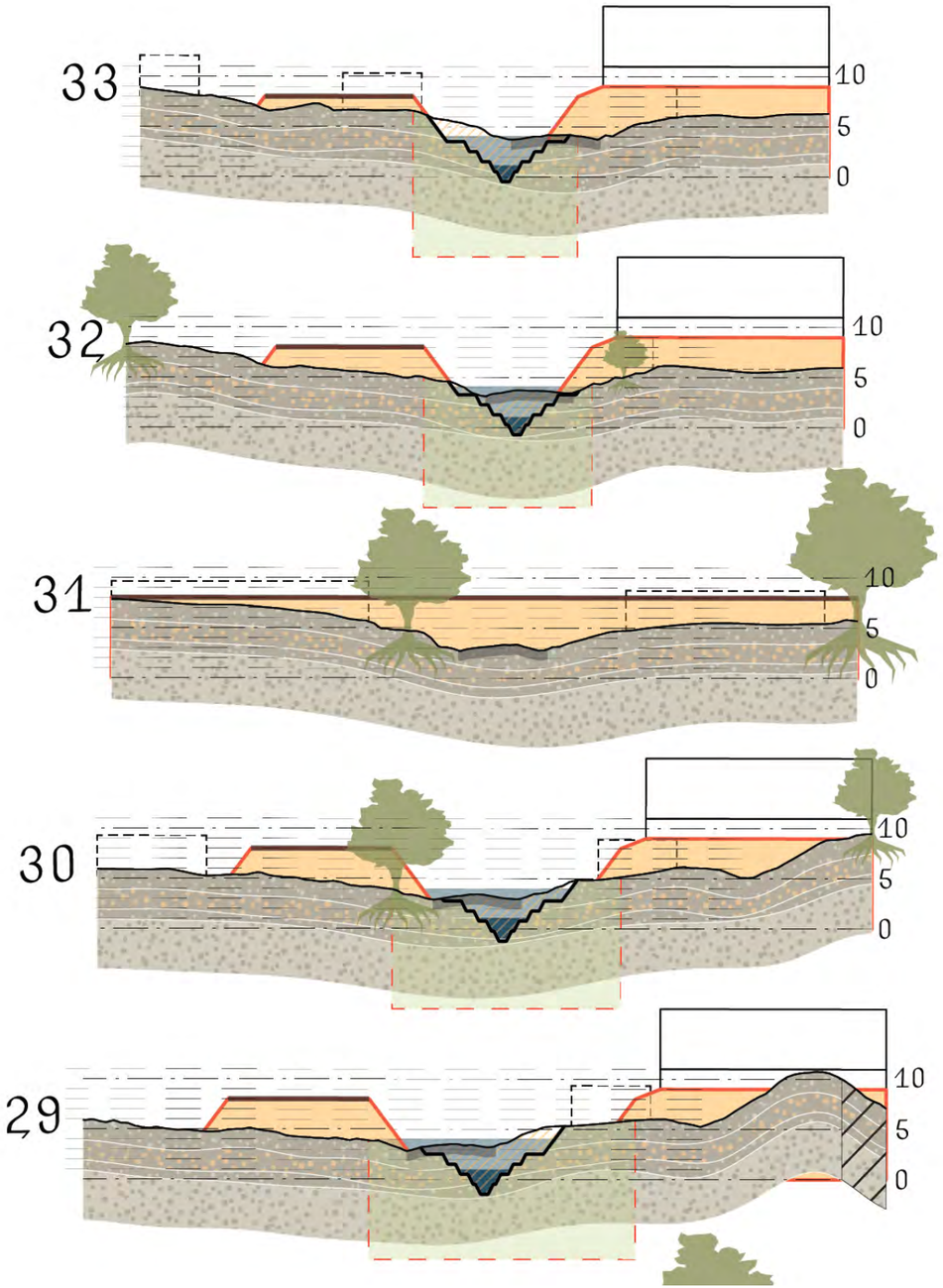


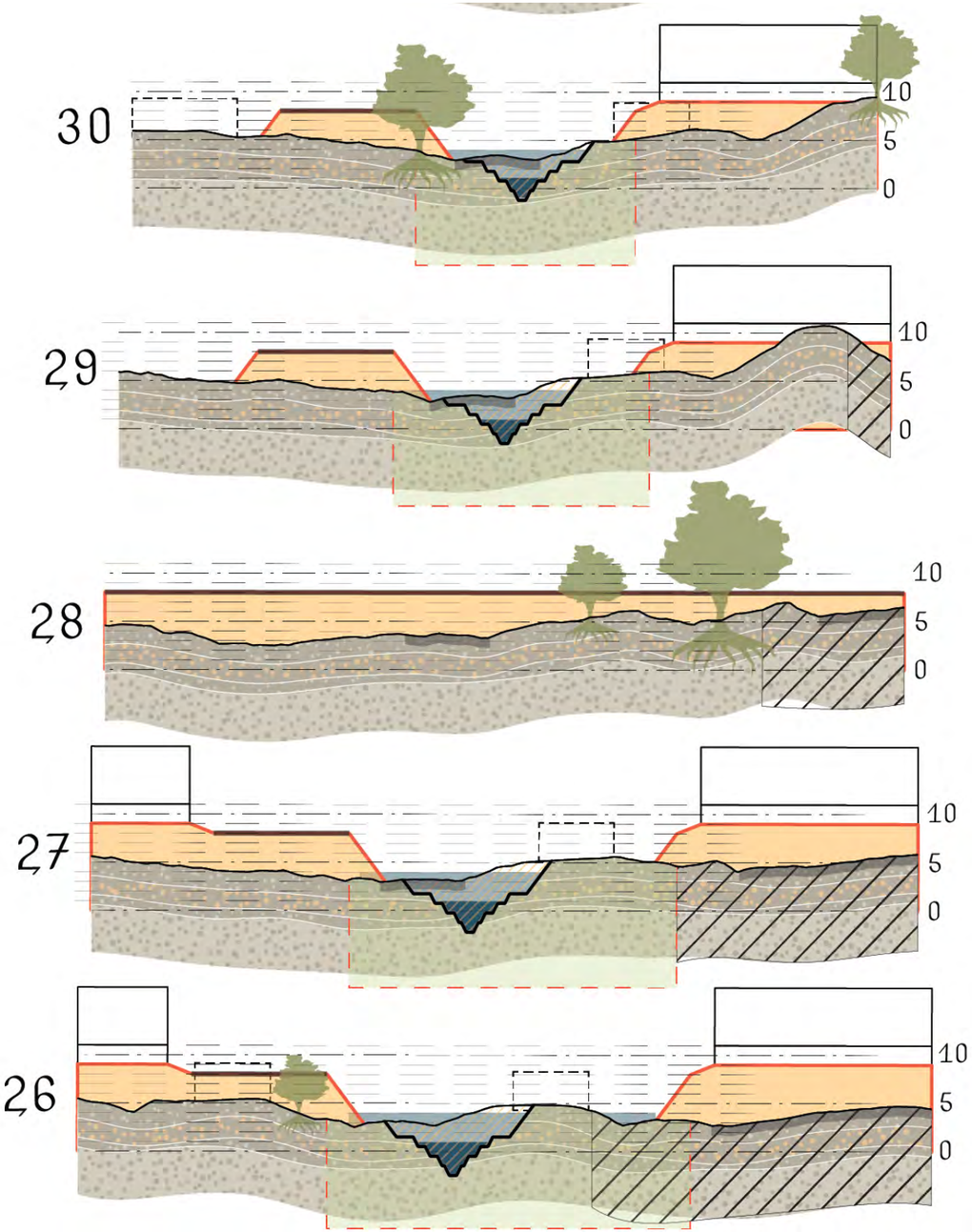
6'12' 24' 48' 1" = 24'
Vertical Exaggeration 4x

WAGGONNER &BALL

moffatt & nichol

Serial Sections F





6'12' 24' 48' 1" = 24'
Vertical Exaggeration 4x

WAGGONNER &BALL

moffatt & nichol

Appendix I

Section 4(f) Evaluation

St. Paul's Area/Tidewater Gardens Choice Neighborhood Implementation (CNI)

Section 4(f) Evaluation

PREPARED FOR

Norfolk Redevelopment & Housing Authority
910 Ballentine Boulevard
Norfolk, Virginia 23501

PREPARED BY

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Williamsburg, VA 23185
757.279.2828

May 2020

Table of Contents

1

Introduction

1.1 Background

This Section 4(f) Evaluation describes the presence of and the Proposed Action's potential impact on Section 4(f) properties. Section 4(f) of the U.S. Department of Transportation Act of 1966 (DOT Act) requires DOT agencies to protect certain properties when making transportation improvements. These properties, collectively referred to as Section 4(f) properties, include publicly-owned parks, recreation areas, wildlife or waterfowl refuges, and publicly- and privately-owned historic sites of national, state, or local significance. If a feasible and prudent alternative exists that avoids Section 4(f) properties and meets the project purpose and need, federal agencies may not select an alternative that uses a Section 4(f) resource. According to 23 CFR 774.17, "a feasible and prudent avoidance alternative is one that avoids using Section 4(f) property and does not cause other severe problems of a magnitude that substantially outweighs the importance of protecting the Section 4(f) property."

The Proposed Action for this Section 4(f) evaluation is the redevelopment of the Tidewater Gardens community in Norfolk, Virginia, under the U.S. Department of Housing and Urban Development (HUD) Choice Neighborhood Implementation program. The City of Norfolk, acting through the Norfolk Redevelopment and Housing Authority (NRHA), is preparing National Environmental Policy Act (NEPA) documentation for the project in accordance with the Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities (24 CFR Part 58). The Proposed Action is not sponsored or funded by, and does not currently require authorizations from, any DOT agency; hence, it is not currently subject to Section 4(f). However, the City anticipates that it may request funding from the

Federal Highway Administration (FHWA) via the Virginia Department of Transportation (VDOT) for the realignment and improvement of existing roads to enhance circulation within Tidewater Gardens and improve connections to the larger community. Should such funding be received, it is anticipated that FHWA could adopt the NEPA documentation prepared by the City and NHRA, including this Section 4(f) evaluation, to satisfy its own NEPA requirements.

This appendix includes documentation to support a *de minimis* impact determination with respect to historic properties within the Proposed Action's Area of Potential Effects (APE). This *de minimis* impact determination has been made after considering measures to minimize harm, and determining that the project would not adversely affect the activities, features, or attributes qualifying these properties for protection under Section 4(f). FHWA, as the agency responsible for Section 4(f) compliance, must concur with this finding.

1.2 Project Overview

NRHA, together with the City and other major partners, have developed a plan to address the impacts of poverty and implement real change within the extended St. Paul's area of the City. As the largest redevelopment and housing authority in Virginia, NRHA's mission is to provide quality housing opportunities that promote sustainable mixed-income communities. The first component of the St. Paul's project is the redevelopment of Tidewater Gardens plus the addition of nearby City-owned properties known as the Snyder Lot, the Transit Area, and the proposed renovation of the Willis Building. The project location consists of approximately 58 acres (Figure 1), which include the following properties:

- Tidewater Gardens, located at 450 Walke Street, is a NRHA-owned public housing community situated on approximately 44 acres. The community is located west of Tidewater Drive, north of City Hall Avenue, east of Fenchurch Street, and south of Brambleton Avenue.
- The Snyder Lot is located in the southwest quadrant of the four-way intersection created by East City Hall Avenue and St. Paul's Boulevard. This site is proposed for redevelopment as a mixed-use area with both market-rate residential and commercial units.
- The Transit Area is located immediately north and south of East Charlotte Street between the intersections with Fenchurch Street and St. Paul's Boulevard. This area is proposed for mixed-use redevelopment with commercial retail space and multi-family residential units.
- The Willis Building, constructed in 1988, is a 60,000-square-foot commercial space occupied by multiple tenants. It is located north of Tidewater Gardens on the southwest corner of Church Street and E. Brambleton Avenue.

1.3 Project Purpose and Need

The Proposed Action is the first step in a long-term strategy for the redevelopment of aging public housing and the deconcentration of poverty. The existing concentrated low-income

housing design has failed to achieve the program's goal of serving as a steppingstone for its residents to escape high crime and poverty-stricken areas. The concentration of poverty in Tidewater Gardens has not aided upward mobility of its residents out of poverty; instead, generations of residents have remained in the community.

Built circa 1953 using low-cost materials, the housing units in Tidewater Gardens have obsolesced and are now in poor physical condition. Over half of the 618 distressed housing units, located within 78 buildings, are within the 100-year floodplain. The extent of deficiencies in the structures, building systems, and overall infrastructure is such that major modernization is not recommended. Due to the general state of disrepair, the isolation resulting from the existing site layout, and the obsolete unit sizes and amenities, demolition and subsequent redevelopment is the most practical approach.

The Tidewater Gardens community was built on fill material in what was previously Newton Creek. The community experiences regular flooding from storm events and, when these events coincide with high tides, tidal flooding as well. Roads often become impassable even during regular rainfall events. The effects of tidal flooding are expected to worsen given anticipated sea level rise of approximately 2.5 feet in the Norfolk area by the year 2065 (based on the National Oceanic and Atmospheric Administration intermediate rate for sea level rise forecast).

Planning efforts to transform the area began in 2005 and include goals such as improving the quality of life for residents of the community through better housing, reduced crime, and better access to the greater community. The purpose of and need for the project were further refined through the 2015 development of a Choice Neighborhoods Initiative Transformation Plan to include:

- Transformation from a community with the largest concentration of poverty in the region to a mixed-income, sustainable neighborhood;
- Transformation from a community experiencing extensive flooding, to one that has a system of parks, open space and streets that both manage stormwater and flooding for its watershed and provide the neighborhood with recreational, cultural and educational amenities;
- Transformation from a community with multiple unaccredited schools, to one with a laboratory school that will innovate to provide the Commonwealth of Virginia with solutions to equitable education and student achievement;
- Transformation from a community that is segregated and isolated from the opportunities immediately around it, to one that is connected physically, socially and psychologically to the richest collection of educational, cultural and educational assets in the region;
    - Transformation from three distressed public housing communities with a super-block pattern of streets, to a desirable community with a grid pattern of neighborly streets that enable residents to build social capital;
    - Transformation from a community of barracks-style buildings, to one with a wide range of housing types similar to the best loved neighborhoods in the City; and
    - Transformation from a community without convenient retail and community services to one with a lively community street lined with shops, medical, cultural, and social

services, including an innovative "HUB" facility for bringing together new and existing organizations in an accessible facility.

1.4 Description of the Proposed Action

The Proposed Action includes phased demolition of 78 housing buildings and the phased redevelopment of the site with mixed-income residential properties, commercial space, associated infrastructure, and open green space (Figure 2). Specific activities included in the Proposed Action are summarized below and described in further detail in the Environmental Assessment.

- **Demolition and Relocation:** Demolition of all existing buildings at Tidewater Gardens would occur in four phases over the course of two years. NRHA-owned utilities and existing roads would also be demolished; all hazardous material would be appropriately abated. NRHA would provide relocation assistance to residents through a choice of housing options that include either permanent relocation outside of Tidewater Gardens or temporary relocation until the proposed new housing units are completed.

- **Housing Redevelopment:** In coordination with the phased demolition, a phased redevelopment of the site would be undertaken. Portions of the land would be transferred from NRHA ownership to the City for roadways, rights-of-way, and other infrastructure. Other portions of the site would be transferred to a developer, who would build a total of 710 residential units that would include replacements for the existing units as well as affordable and market-rate units. The majority of redevelopment within the Tidewater Gardens neighborhood footprint would occur primarily in areas outside of the 100-year floodplain.

- **Community Hub:** The 60,000-square-foot Willis Building, located north of Tidewater Gardens on the southwest corner of Church Street and E. Brambleton Avenue, would be renovated to serve as a community hub. The multi-story building would serve as a combined social, commercial, and community facility, providing the physical and programmatic infrastructure to help residents build wealth and bring in people from outside the community.

- **Road Realignment and Improvements:** Roads within the project area would be realigned to create a connected pattern of neighborhood streets and blocks, replacing the existing super-blocks. Freemason Street would be extended to connect from St. Paul's Boulevard to Tidewater Drive and provide enhanced crossing options. New neighborhood streets would be of an appropriate width to accommodate parking needs. In addition, Church Street would be realigned in a more north-south orientation to lead from the existing Martin Luther King, Jr. Memorial to the steeple of the Basilica of St. Mary's. This realignment would reconnect area churches that had been disconnected by roadways and redevelopment over time. Buildings along Church Street would be mixed-use with ground-level retail or community-service offices. The realignment would be at a pedestrian scale to focus on the neighborhood's walkability. It would reconnect the area

to other neighborhoods to the north and would attract new neighborhood services such as pharmacies, banks, and convenience stores.

- **Stormwater Management and St. Paul's Blue/Greenway:** On the southeastern edge of the project area, an aesthetic open space would be created within the 100-year floodplain to treat and store stormwater runoff. The major element of this area, the St. Paul's Blue/Greenway, would be the daylighting and restoration of Newton Creek. The blue/greenway would include detention ponds, dry detention basins, swales, and mature trees to treat and store stormwater in the most flood-prone area of Tidewater Gardens. It would also provide a new recreational parkland, as well as a trail connecting to the adjacent downtown, waterfront, and area amenities. Extending from the blue/greenway would be green streetscapes to absorb rainwater and connect residents to the Downtown Norfolk Transit Center via green walkways. "Pocket parks" (small green spaces) would be created to preserve existing mature trees throughout the neighborhood.

1.5 No Action Alternative

As required by NEPA, the EA evaluates an alternative in which the Proposed Action would not take place. This alternative is referred to as No Action. Under this alternative, the existing buildings and infrastructure would remain and would continue to be repaired and maintained as time and funding allowed; however, it is expected that the costs for maintenance and repair would continue to increase as these older buildings continue to deteriorate.

2

Section 4(f) Resources

2.1 Introduction

The Study Area for Section 4(f) resources was defined as the indirect Area of Potential Effects (APE) for Section 106 historic and archaeological resources. The indirect APE encompasses all areas in which a potential use of the identified Section 4(f) properties could occur. The study area contains one publicly accessible playground and five historic properties listed on the National Register of Historic Places (NRHP). These properties are protected under Section 4(f) and are evaluated in this report.

2.2 Regulatory Context

2.2.1 Section 4(f) of the Department of Transportation Act of 1966

Congress' intent to preserve publicly owned parks and recreation lands, wildlife and waterfowl refuges of national, state, or local significance, or historical sites that are eligible for the NRHP is outlined in the DOT Act. This memorandum refers to 49 USC 303(c) as "Section 4(f)". The statute, and subsequent Federal Highway Administration (FHWA) guidance, identify a number of ways in which projects may affect Section 4(f) properties, as defined below:

- **Use**. Except as set forth in 23 CFR 774.11 and 774.13, a "use" of Section 4(f) property occurs: (1) When land is permanently incorporated into a transportation facility; (2)

When there is a temporary occupancy of land that is adverse in terms of the statute's preservation purpose as determined by the criteria in 23 CFR 774.13(d); or (3) When there is a constructive use of a Section 4(f) property as determined by the criteria in 23 CFR 774.15.

- **Constructive use determinations.** (a) A constructive use occurs when the transportation project does not incorporate land from a Section 4(f) property, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only when the protected activities, features, or attributes of the property are substantially diminished.
- ***De minimis* impact.** (1) For historic sites, *de minimis* impact means that the FHWA has determined, in accordance with 36 CFR 800, that no historic property is affected by the project or that the project will have "no adverse effect" on the historic property in question. (2) For parks, recreation areas, and wildlife and waterfowl refuges, a *de minimis* impact is one that will not adversely affect the features, attributes, or activities qualifying the property for protection under Section 4(f).
- **Temporary occupancy.** A temporary occupancy occurs when land from a Section 4(f) property is used for short-term construction purposes, such as to provide staging or access areas. Temporary occupancies may be considered a Section 4(f) use if the land is subject to temporary or permanent adverse changes. Temporary occupancy is not a Section 4(f) use if the work is minor; occupancy is less than the time needed for project construction; there is no change in ownership; there are no adverse changes to the property's activities, features, or attributes; and the land is restored to its original condition.

2.2.2 Section 106 of the National Historic Preservation Act

Section 4(f) resources that are eligible for listing on the NRHP are also protected by Section 106 of the National Historic Preservation Act (NHPA). Section 106 is the primary federal regulation governing the protection of historic resources. It requires federal agencies to consider the effects of their undertakings on historic properties and to give the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. The implementing regulations for this process are found at 36 CFR 800. For this undertaking, the APE was identified in consultation with the Virginia Department of Historic Resources (DHR).

National Register Bulletin 15 provides additional clarification on the process of assessing cultural resource eligibility for the NRHP. Cultural resources, defined as districts, sites, buildings, objects, or structures, are evaluated based on criteria specified by the Department of Interior Regulations (36 CFR Part 60: National Register of Historic Places) and National Register Bulletin 15 to determine eligibility for listing on the NRHP. Resources listed on or considered eligible for the NRHP are those that are 50 years or older, that "possess integrity of location, design, setting, materials, workmanship, feeling, and association," and

A. that are associated with events that have made a significant contribution to the broad patterns of our history; or

B. that are associated with the lives of persons significant in our past; or

C. that embody the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that components may lack individual distinction; or

D. that have yielded, or may be likely to yield, information important in prehistory or history.

DHR has review authority over projects requiring state or federal funding, licensing, permitting, and/or approvals, in order to evaluate potential direct or indirect impacts to properties listed or eligible for listing in the National Register of Historic Places, in compliance with the standards and guidelines established by Section 106 of the NHPA, the Secretary of the Interior's Standards and Guidelines for Identification (1983), and National Register Bulletin 24, *Guidelines for Local Surveys: A Basis for Preservation Planning* (1977, revised 1985).

2.3 Existing Conditions

2.3.1 Parks and Recreation Areas

There are no public parks within a one-quarter-mile radius (approximately 1300 feet) of the Tidewater Gardens site. The closest parks, MacArthur Park and MacArthur Square, are approximately 0.4 mile to the west and are outside of the study area.

Tidewater Park Elementary School, located just north of the project area, has play structures and sports courts that are accessible to the public. Because these facilities are the only publicly accessible recreational features within the study area, they are considered to be a Section 4(f) resource for purposes of this analysis. The William A. Hunton YMCA, located immediately east of the project site, has a gymnasium that is open only to members, and therefore is not a Section 4(f) resource.

2.3.2 Historic Properties

The APE for the Proposed Action was delineated based on where historic resources may be affected, both directly and indirectly. For direct effects, the APE is considered the entire project area where demolition and construction for redevelopment would take place. For indirect effects, the APE includes the project area plus adjacent properties from where the redevelopment would be visible. This indirect APE takes into account the potential changes to views from historic properties into the redevelopment area. The direct and indirect APEs are shown on Figure 3.

Tidewater Gardens was originally developed circa 1953 and is associated with the Tidewater Gardens South Public Housing Historic District (DHR ID #122-5416). A Phase I Cultural Resource Survey performed for the historic district in 2009 determined that although the neighborhood is an example of early public housing in Norfolk, the buildings do not possess any unique characteristics that would separate them from other public housing facilities in

Norfolk or the Tidewater region. DHR concurred with the Phase I report and recommended that the resource was not eligible for listing in the NRHP in a letter dated June 12, 2009. Therefore, Tidewater Gardens is not considered a historic resource and is excluded from this analysis. An archives search performed using the DHR database did not identify any historic resources within the APE for direct effects.

Five architectural resources were identified within the indirect APE. These resources include the following:

- DHR ID #122-0024, Basilica of Saint Mary of the Immaculate Conception, ca. 1857
- DHR ID #122-0025, St. Paul's Episcopal Church, ca. 1739
- DHR ID #122-0211, St. John's African Methodist Episcopal Church, ca. 1887
- DHR ID #122-0776, Colonial Revival House, ca. 1915
- DHR ID #122-0033, Willoughby-Baylor House, ca. 1794

The Basilica of Saint Mary of the Immaculate Conception, known as St. Mary's Church, is located immediately adjacent to the project area to the southeast. St. Mary's Church is a circa 1857 Gothic Revival Catholic church that is listed in the NRHP and Virginia Landmarks Register. The church is significant for its association with the proliferation of Roman Catholicism in 19th-century Tidewater Virginia, for its association with an African American congregation in the mid-20th century, and as an excellent example of Gothic Revival architecture (DHR 2017).

St. Paul's Episcopal Church is located to the southwest of Tidewater Gardens and to the northeast of the Snyder Lot. St. Paul's is a 1739 brick church designed in a Colonial Ecclesiastic style in a Latin cross form. It is listed in both the NRHP and the Virginia Landmarks Register. The church is significant for its association with the early development of Norfolk and as an excellent example of Colonial Ecclesiastic architecture (DHR 1971).

St. John's African Methodist Episcopal Church is located north of the Transit Area site and southeast of the Willis Building. It is a circa 1887 church in the Romanesque Revival/Richardsonian style. It is listed in the NRHP and the Virginia Landmarks Register (DHR 1986).

Immediately adjacent to St. John's is the Colonial Revival House. This house was constructed circa 1915 and is one of the very few surviving Colonial Revival residences in this area of Norfolk, which has been largely redeveloped (DHR 1994).

The Willoughby-Baylor House is located east of Tidewater Gardens and southeast of the Transit Area Site. It is a circa 1794 Federal/Adamesque style residence. It is listed in the NRHP and the Virginia Landmarks Register and is significant for its distinctive characteristics of architecture and construction (DHR 1980).

Other resources were identified within the indirect APE that were either determined by DHR to be not eligible for listing in the National Register or are no longer extant. Therefore, these resources were excluded from the analysis.

2.3.1 Archaeological Resources

Although the DHR database search identified several archaeological resources within the indirect APE, these resources are outside of the project footprint for demolition and/or construction. There is no potential for impacts on archaeological resources outside of the project footprint; therefore, these resources were excluded from this analysis.

3

Impacts on Section 4(f) Properties

3.1 Proposed Action

This section describes how the Proposed Action would affect Section 4(f) resources within the Study Area, and whether those effects would constitute a use of the Section 4(f) resources as described in Section 2.2.1 above.

3.1.1 Parks and Recreation Areas

The Proposed Action would not require the acquisition of any property from the Tidewater Park Elementary School playground and would not affect access to or use of the playground. Therefore, no Section 4(f) use of this property would occur. In addition, the Proposed Action would provide new recreational opportunities for residents of Tidewater Gardens and the surrounding area through the development of the St. Paul's Blue/Greenway.

3.1.2 Historic Properties

Under the Proposed Action, there would be no direct impacts on historic resources within the project area. The demolition and subsequent redevelopment of the Tidewater Gardens neighborhood and additional lots would, however, result in indirect impacts on historic architectural resources within the APE, as described below.

St, Mary's Church

St. Mary's Church is located immediately adjacent to Tidewater Gardens on its northeast and southeast boundaries. Demolition and redevelopment of the neighborhood would alter the immediate setting of St. Mary's Church. However, the integrity of setting has been compromised through decades of development, including the original construction of Tidewater Gardens in the 1950s (DHR 2017). The design of the redevelopment would be subject to a site plan review by the City of Norfolk for consistency with applicable city design and building standards. This would include review and approval by the city's Architectural Review Board to ensure that new construction is compatible with the architectural character of the area. Therefore, any potential adverse effects on the setting due to the redevelopment would be minimized during design of the new buildings. Depending on the final design, the setting of St. Mary's may be improved by the construction of buildings more compatible with the overall architectural character of the area.

Although no physical changes would occur to St. Mary's Church, Church Street would be realigned, with its terminus at the front of St. Mary's Church. This realignment would alter the existing spatial relationships between the church and other areas of the Tidewater Gardens neighborhood. Church Street would become one of the major roads through the neighborhood for both vehicle and pedestrian circulation. Being located at the southern terminus of this main road would make St. Mary's Church a focal point of the community and improve its spatial relationship with the neighborhood. The church would also gain a more direct connection with the broader neighborhood, including with the Christ Pentecostal Church and St. John's African Methodist Episcopal Church, which would be located close to the realigned Church Street.

Currently, St. Mary's Church has a somewhat diminished integrity of feeling due to an intrusive raised highway exit ramp southwest of the property (DHR 2017). Realigning Church Street to extend northward from the front of the church would also provide a visual focus away from the intrusive highway exit ramp and toward the new connection to the rest of the neighborhood. This would restore some of the church's integrity of feeling that has been lost through decades of development. No adverse effect, as defined under Section 106 of the NHPA, is expected to occur as a result of the Proposed Action. Therefore, no Section 4(f) use of this historic property would occur.

Other Historic Resources

For the remaining historic resources within the indirect APE (St. Paul's Church, St. John's Church, the Willoughby-Baylor House, and the Colonial Revival House), the redevelopment of Tidewater Gardens and additional lots would result in indirect impacts of lesser intensity than those on St. Mary's Church. The proposed redevelopment would be visible from the historic resources, which would change existing views of the area from these resources. New buildings that are larger or more vertical in scale than the existing buildings may dominate the viewshed more than the existing two-story buildings. The proposed redevelopment of the Snyder Lot would be visible across City Hall Avenue from St. Paul's Church; however, existing vegetation on the St. Paul's property would screen some of the redevelopment from view and lessen the visual impact. The redeveloped Transit Area Site, which would be

partially visible from St. John's Church and the Willoughby-Baylor House, would also be somewhat screened from view by existing development, lessening the visual impact. Existing development, including St. John's Church itself, would also screen the redevelopment from view from the Colonial Revival House.

As described above for St, Mary's Church, the design of the redevelopment would be subject to a site plan review by the City, including review and approval by the city's Architectural Review Board to ensure that new construction is compatible with the architectural character of the area. This would minimize any adverse impacts on the viewshed due to the redevelopment. Additionally, the setting of the affected historic resources within the urban environment has been altered many times through ongoing development of the city, and views have not been identified as character-defining features of these historic resources that qualify them for listing in the NRHP. Therefore, the alteration of the existing views would not diminish the historic integrity of historic resources within the indirect APE. No adverse effect on historic resources and no Section 4(f) use of these historic properties would occur as a result of the proposed project.

3.1.3 Archaeological Resources

As described above, there are no identified archaeological resources within the area that would be disturbed for demolition and redevelopment of Tidewater Gardens under the Proposed Action. As a result, no Section 4(f) use of archaeological resources would occur.

3.2 No Action Alternative

Under the No Action Alternative, there would be no changes to the project area; therefore, there would be no impacts to recreational, historic architectural, or archaeological resources.

3.3 Conclusion

As described in Section 2.2.1 above, Section 4(f) provides for a finding of *de minimis* impact. A *de minimis* impact involves a use of Section 4(f) property that is generally minor in nature and, after taking into account avoidance, minimization, mitigation, and enhancement measures, results in no adverse effect to the activities, features, or attributes qualifying a park, recreation area, or wildlife or waterfowl refuge for protection under Section 4(f). As described in Section 3.1.1, the Proposed Action would not require a Section 4(f) use of the Tidewater Park Elementary School playground, *de minimis* or otherwise.

For historic sites, *de minimis* impact means that the FHWA has determined, in accordance with 36 CFR 800, that no historic property is affected by the project or that the project will have "no adverse effect" on the historic property in question, as defined by Section 106 of the NHPA. Because the indirect effects of the Proposed Action on historic properties, as described above, are not considered severe enough to constitute an adverse effect under Section 106, a *de minimis* finding is recommended for these properties. This finding is contingent on a Section 106 finding of no adverse effect by DHR, and will need to be reviewed and confirmed by FHWA as the agency responsible for administering Section 4(f).

3.4 Consultation and Coordination

3.4.1 Agency Coordination

According to FHWA's Section 4(f) guidance, a determination of *de minimis* impact on a historic site may be made when all three of the following criteria are satisfied:

- The process required by Section 106 of the National Historic Preservation Act (NHPA) results in the determination of "no adverse effect" or "no historic properties affected" with the concurrence of the State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO), and Advisory Council on Historic Preservation (ACHP), if the ACHP is participating in the Section 106 consultation;
- The SHPO and/or THPO, and ACHP, if the ACHP is participating in the Section 106 consultation, is informed of U.S. DOT's intent to make a *de minimis* impact determination based on their written concurrence in the Section 106 determination; and
- U.S. DOT has considered the views of any consulting parties participating in the Section 106 consultation.

NRHA and the City of Norfolk are currently coordinating with DHR to request concurrence on a finding of no adverse effect under Section 106 for the historic resources within the Tidewater Gardens APE. Coordination with the Tribal Historic Preservation Officers (THPOs) of Native American tribes with cultural resource interests in the APE is also taking place. Correspondence with DHR and the THPOs is included in Appendix D of the Environmental Assessment. Once concurrence has been obtained on the Section 106 effect determination, this evaluation will be updated accordingly, and DHR and the THPOs will be notified of the intent to make a *de minimis* impact determination under Section 4(f).

3.4.2 Public Involvement

Planning efforts for the Tidewater Gardens redevelopment began in May 2013. Public meetings on the project began in June 2015 and remain ongoing, with over 50 public meetings held to date. The intent of the meetings was to introduce the community to the project team, describe the goals for the public housing community, receive comments from the public, and answer questions. Discussion topics include site constraints, conceptual design, coastal resiliency, funding, and schedules. Chapter 4 of the EA includes additional information on public involvement for the project, including a full list of meetings.

Attachment A
Figures

St. Paul's Area / Tidewater Gardens
Choice Neighborhoods Implementation

FIGURE 1
Project Location Map (Aerial Base)

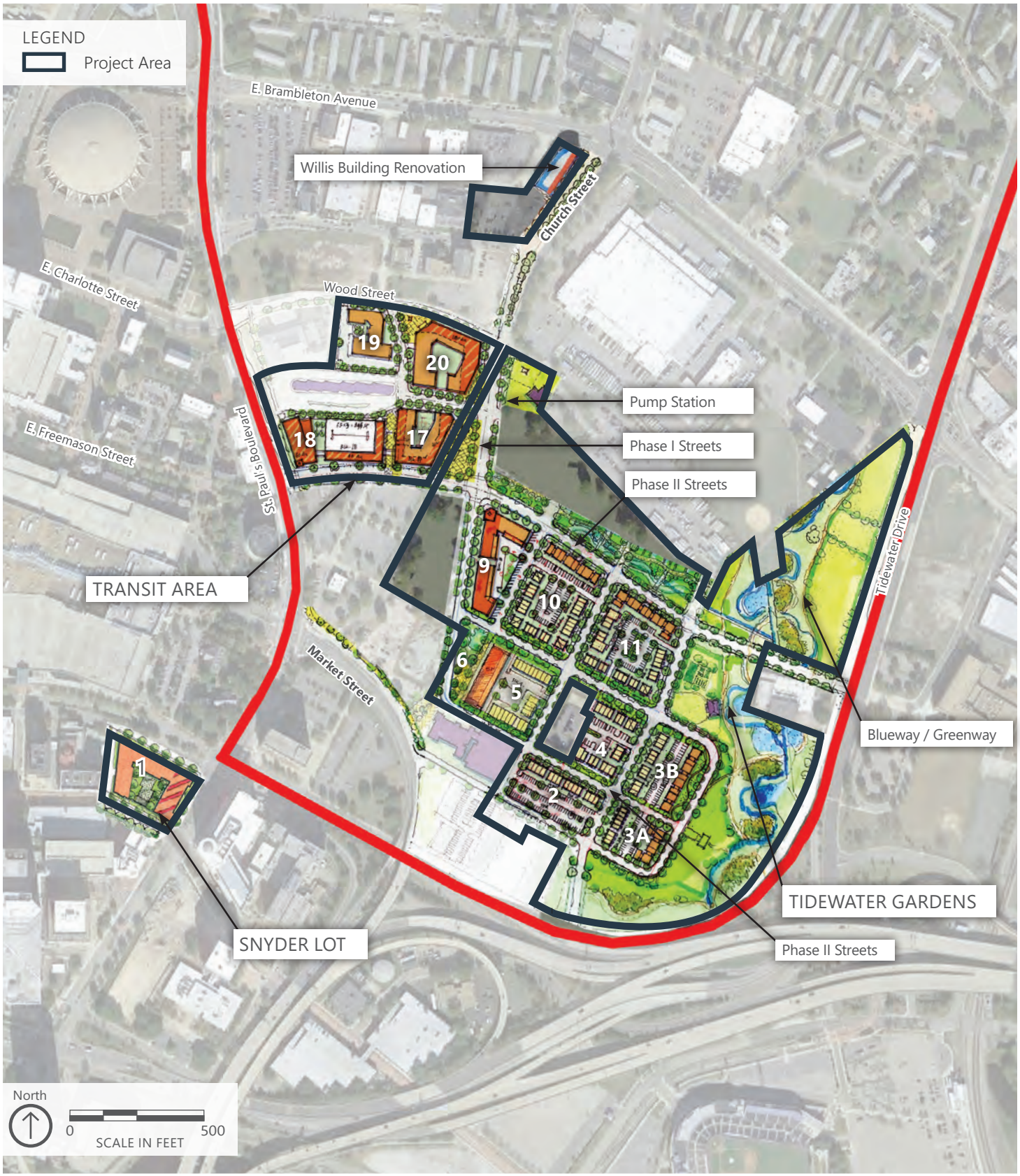

FIGURE 2

Proposed Redevelopment Plan

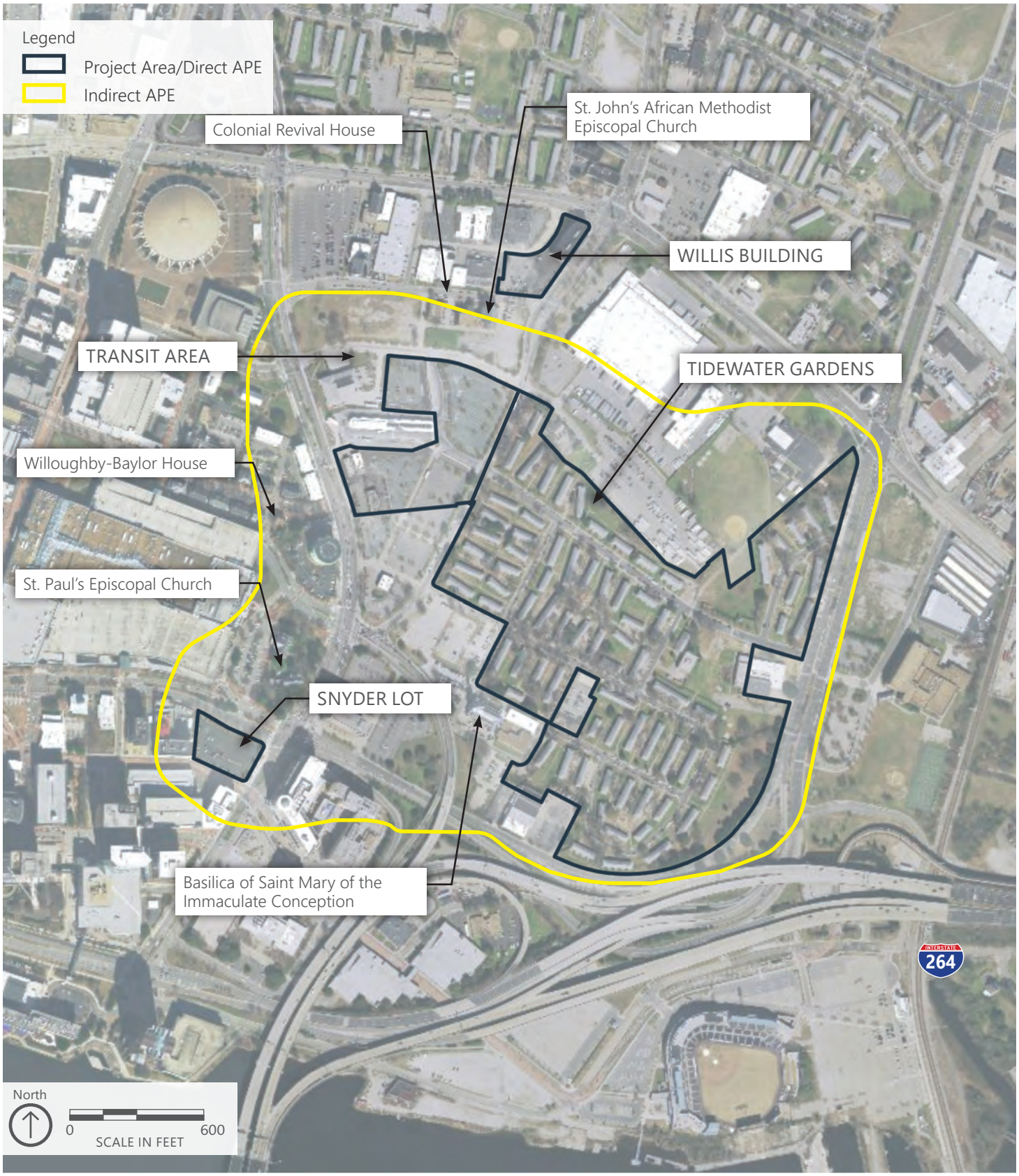

FIGURE 3
Area of Potential Effects