

Mayor's Task Force Report on the **Prevention of Flooding in Bloomingdale and LeDroit Park**

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MAYOR'S TASK FORCE REPORT ON THE PREVENTION OF FLOODING IN BLOOMINGDALE AND LeDROIT PARK

December 2012

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Executive Summary

Introduction

On July 10, 18, 19, and September 2, 2012, intense rainfall events caused stormwater and combined sewage to flood the residential neighborhoods of Bloomingdale and LeDroit Park in Wards 5 and 1, respectively, of Washington, DC. During the severe storms, residents reported flooding of their basements which occurred from either sewer backups, overland flow, or both.

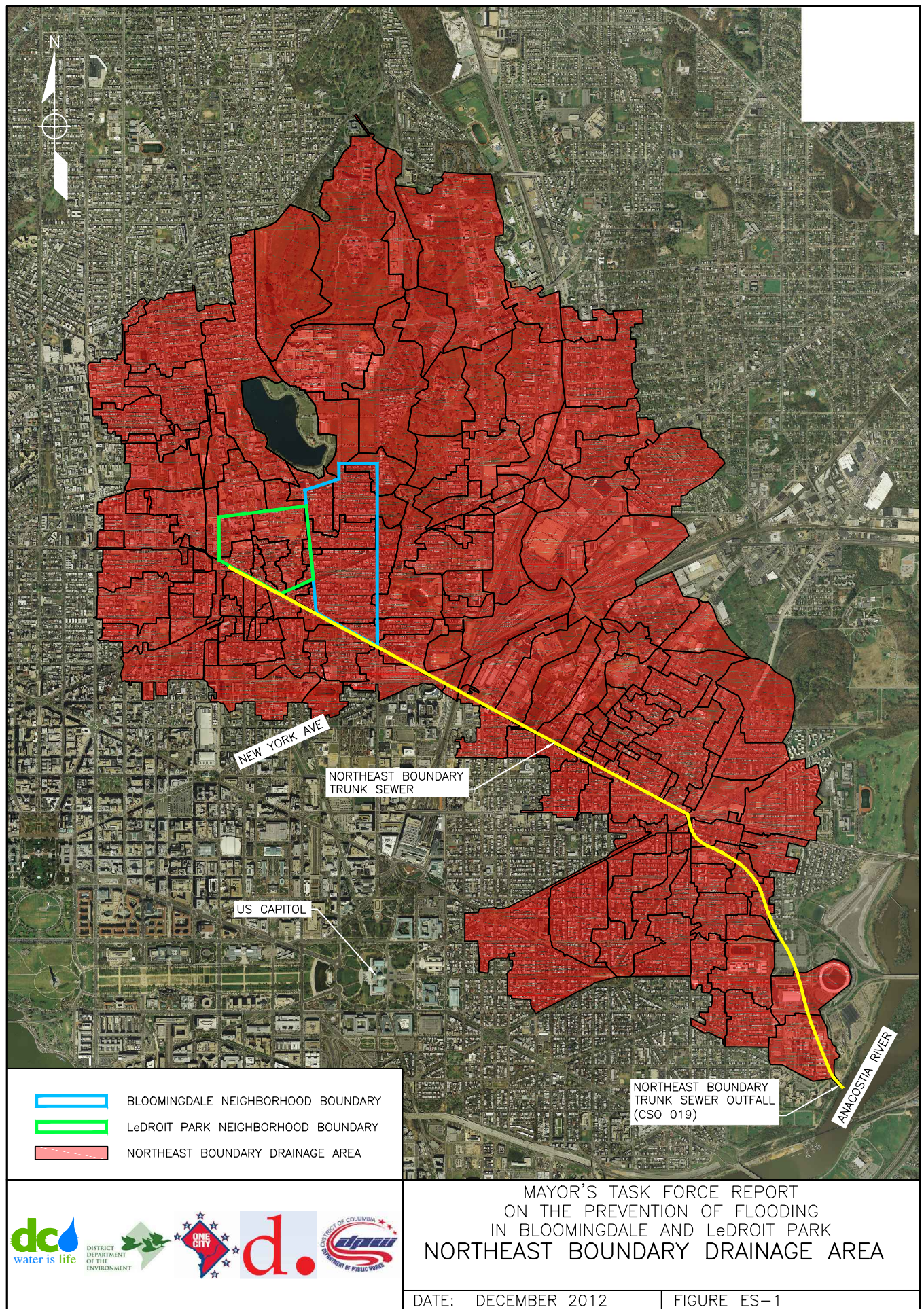
On August 21, 2012, Mayor Vincent C. Gray established the *Mayor's Task Force on the Prevention of Flooding in Bloomingdale and LeDroit Park*. As mandated by Mayor Gray, this report identifies the causes of surface flooding and sewer backups that occurred in Bloomingdale and LeDroit Park, provides recommendations on short, medium, and long term mitigation measures, including the methodology which led to those recommendations, and summarizes these issues within a regulatory, economic, and social context.

Existing Conditions

The sewer system that serves the Bloomingdale and LeDroit Park neighborhoods is the Northeast Boundary drainage area and was constructed by the United States Federal Government in the late 1800's. As with many communities in the 19th Century, the sewer system serves the dual purposes of collecting wastewater from homes and business and stormwater runoff from streets and properties. Referred to as combined sewers, these systems continued to serve the District of Columbia as the region's population grew at an exponential rate. Figure ES-1 shows the Northeast Boundary Drainage Area.

In meeting the growing population's needs, the District experienced development that transformed previously low-density rural areas into new communities. Impervious area, which contributes to stormwater runoff, and population have increased drastically since the late 1800's when the sewer system was constructed. Most of the sewer pipes in the Northeast Boundary drainage areas were constructed prior to 1910, well before the District's 15-year storm design standard was established. Consequently, the existing Northeast Boundary Trunk Sewer (NEBTS) and many of its trunk sewers, including many of those in Bloomingdale and LeDroit Park, do not have the capacity to convey storms with return frequencies beyond the 2-year storm without flooding.

Capacity limitations with the NEBTS were reported as early as the late 19th Century, and further development of the City has exacerbated this problem. Many studies of these areas conducted during the latter half of the 20th Century proposed sewer system capacity improvements, but recognized that the large scale of necessary improvements were extremely challenging from both a cost and constructability standpoint. The \$2.6 billion DC Clean Rivers Project is required to be completed in 2025 by a Federal Consent Decree signed by the U.S. Government, the District and DC Water. The DC Clean Rivers project includes construction of a large \$600 million tunnel system that is approximately five miles in length. The tunnel will serve the Northeast Boundary drainage area, including Bloomingdale and LeDroit Park, to mitigate flooding during large storm events. The project is being funded by District rate payers through the DC Water Clean Rivers Impervious Area Charge (IAC).



In historical terms, basement renovations are a relatively recent phenomenon for Bloomingdale and LeDroit Park, and basement units have not historically functioned as livable space. Basement conversions have coincided with a large influx of new property owners who are expanding livable space for personal use or for rental income. A significant number of property owners have lowered the foundations of their properties by one to two feet in order to maximize space at the basement level. These renovations have rendered properties more susceptible to flooding and have increased the value of potential damages from sewer backups.

2012 Flood Events

Rainfall data collected from DC Water's rain gage at the Bryant Street Pump Station, and later confirmed by a radar rainfall analysis, revealed that Bloomingdale and LeDroit Park experienced the most intense rainfall and largest storm volumes in the region during the July 10, 18, 19, and September 2, 2012 storms. The storms have been characterized as having a return frequency of between five and ten years (see Table ES-1 below). In other words, on average, storms of this intensity and total rainfall should be expected only once every five or ten years. However, history has shown that the return frequency exceeds the average during particularly wet periods. Multiple storms with a higher return period have occurred in the same year on a number of occasions since 1948, when rainfall record-keeping began at National Airport.

Table ES-1: Rainfall Summary for Major 2012 Storms

Date	Duration	Rainfall (inches)*	NOAA Point Precipitation Frequency (Nearly)
7/10/2012	1-hour	1.96	10 year storm
7/18/2012	30-minute	1.35	5 year storm
7/19/2012	15-min	0.94	5 year storm
9/2/2012	2-hour	2.78	10 year storm
* Recorded by DC Water's Bryant Street Rain Gage			

During the four major 2012 storms, the trunk sewers were observed to surcharge and overflow through manholes and catch basins at numerous locations. Many homes and businesses whose sewer laterals connect to the sewer collection system in close proximity to these surcharged sewers (sewers that are flowing full) were subject to sewer backflow conditions (sewer backups) that introduced sewage into basements through floor drains and plumbing fixtures. Surface flooding in the streets occurred at First Street NW and Rhode Island Avenue, where ponding levels topped two feet, and at other locations on or near Florida Avenue, Flagler Place, and First Street NW.

More than 200 property owners reported flooding. More than 100 of these owners were impacted by sewer



Figure ES-2: Flooding at the intersection of First St NW and

backups, with a much lower number reporting incidences of surface flooding. Reported costs associated with flood clean-up and repair range from \$3,000 to \$18,000 per household. Other reported damages included loss of personal property and family heirlooms, lost time from work, lost tenants and rental income, reduced resale value of homes, and the physical and emotional toll of repeated clean-up and mitigation efforts.

District agencies responded during the storms and in the days and weeks following the storms. DC Water increased catch basin cleaning, began a rigorous sewer inspection program, began a public outreach initiative, coordinated with the Department of Public Works to distribute sandbags in advance of predicted storm events, and initiated the backflow preventer rebate program. The District Department of Transportation deployed variable message boards to flood areas, detoured traffic, and responded to roadway emergencies. After the September 2nd storm, the Department of Health surveyed the neighborhood for health hazards and began an outreach campaign to educate residents about flood clean-up, water and food safety, mold prevention, and other health topics.

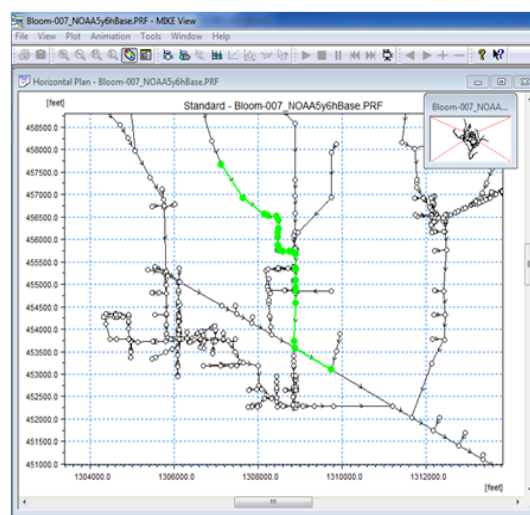
Causes Of Flooding And Sewer Backups

Investigation of the Bloomingdale sewer system utilizing closed-circuit television (CCTV) began on July 23, 2012. DC Water recently completed the inspection program for all critical sewer lines in the affected region. As indicated by the condition assessment results for sewer pipes surveyed to date, no pipes were identified to be collapsed or near collapse. Additionally, no large-diameter pipes were identified to have blockages that would inhibit flow to the degree that could cause manhole overflows, basement back up, and street flooding, as were seen in Bloomingdale and LeDroit Park during the July floods.

Flooding in the Bloomingdale and LeDroit Park area during the July, 2012 and September, 2012 storms stems from rainfall that exceeds the capacity of the sewer system. Trunk sewers serving these neighborhoods have capacity to convey a rainfall event with a magnitude and intensity that is smaller than that which occurred. Under heavy rainfall conditions, the sewers become surcharged (the pipe is full) and sewer laterals that serve adjacent homes and businesses backup. In addition to the trunk sewers having capacity less than that required to convey the necessary flows, the stormwater inlets (or catch basins) in some parts of the area are either too small or are not located for optimal performance. This prevents surface runoff from ever entering the system and contributes to surface ponding. Other possible causes of flooding have been investigated, but have not been found to play a role.

Model Development

To understand how the sewer system performed during the 2012 flooding, and to evaluate a range of measures to mitigate flooding, a detailed hydraulic computer model of the terrain and the sewer system was developed. The particular model used in this study built upon the GIS-



Collection System Model for the NEBTS and Bloomingdale and LeDroit Park areas

based model already being used by DC Water for its capital planning activities. Surface and subsurface pipe models of the combined and sanitary sewer systems were developed to evaluate the mechanics of flooding in Bloomingdale. The surface model analyzed the overland surface flow in the drainage area. The subsurface pipe model analyzed the hydraulic capacity of the sewer system. The model was then used to predict ponding levels and volumes of flow that would occur in the Bloomingdale area for various storm frequencies and with various flood control alternatives.

Engineering Alternatives Evaluated

The Task Force identified and evaluated many short, medium and long term measures to mitigate flooding. The measures evaluated are summarized in Table ES-2.

Table ES-2: Remedial Measures Evaluated

Short Term	Medium Term	Long Term
<ul style="list-style-type: none"> • Backwater Valves • Engineering Consultations • Removable Barriers • Rain Barrels • Green Infrastructure • Catch Basin • Detention Vaults 	<ul style="list-style-type: none"> • Storage at McMillan • Storage at McMillan with Flagler Place Pump Station • Storage at McMillan with First Street Tunnel • Local Separation • Conveyance to Tiber Creek • Rain Barrels • Green Infrastructure • Catch Basin Inlet Restrictors • Inflatable Flood Walls 	<ul style="list-style-type: none"> • DC Clean Rivers Project (Northeast Boundary Tunnel)

The long term remedial measure for flooding and sewer backups in Bloomingdale, LeDroit Park, and other known chronic flood areas in this part of the City is the DC Clean Rivers Project. Over \$600 million will be spent by DC Water to construct the tunnel system and sewer diversion facilities that will provide flood relief. Since this project has been identified and budgeted and scheduled, it was the sole remedial measure considered for the long term.

Alternatives for short and medium term remedial measures were evaluated using the following criteria:

- Reduces Sewer Backups
- Reduces Impacts of Surface Flooding
- Protects Downstream Properties
- Magnitude of Benefit
- Practicality
- Cost
- Schedule

Regulatory

The Task Force also evaluated a number of regulatory and insurance topics, with specific consideration given to backwater valves, basement conversions, insurance options offered through Federal Emergency Management Agency (FEMA), legislative proposals to address flooding, historic preservation guidelines, and the water and sewer permitting process. Broadly speaking, the regulatory options that were explored for this report were focused on reducing the risk and impact of sewer backups in the future, strengthening regulatory enforcement over occupancy requirements, and improving homeowner knowledge of insurance options.

Table ES-3 provides an overview of the regulatory topics explored in this report.

Table ES-3: Overview of Regulatory Topics

Topic	Overview
Backwater Valves	Existing requirements for backwater valve installation for renovation and new development, summary of the permit review process and post-permit inspections, options to reduce the burden associated with backwater valve installation, advantages of grinder pumps or sewage ejectors over backwater valves, cases where rain leader disconnections may apply, and the Construction Codes amendment process
Basement Conversions	Requirements for renting out basement space with and without a kitchen, overview of the Department of Consumer and Regulatory Affairs inspection and enforcement authority and potential amendments to the Plumbing and Construction Codes for stairway drain connections and basement thresholds
FEMA Insurance Options	Overview of the National Flood Insurance Program (NFIP), NFIP policy types and general coverage, coverage options specific to basement dwellings, explanation of mandatory versus supplemental insurance, NFIP's flood insurance discount program, sewer backup insurance, and regulatory options for increasing sewer backup insurance for homeowners
Legislative Proposals to Address Flooding	Overview of proposed legislation: Bloomingdale and LeDroit Park Backflow Preventer and Sandbag Act of 2012, District of Columbia Flood Assistance Fund Amendment Act of 2012, and District of Columbia Fire and Casualty Amendment Act of 2012; potential home inspection and home seller disclosure requirements
Historic Preservation Guidelines	General guidelines for construction on private property and public rights-of-way in historic districts, special stipulations for DC sponsored projects, and State Historic Preservation Office review of proposed construction on the McMillan Reservoir Site

Water and Sewer Permitting Process	Review process for new construction and renovations that would modify the public water and sewer system, definition of available capacity, general standards for determining available water system capacity, sewage treatment capacity, combined sewer capacity, and sanitary sewer capacity
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Storm Preparedness and Response

The Task Force also investigated storm response actions that would prepare residents and operational agencies to better respond to future flood events. These actions focused on increasing citizen preparedness for all stages of a storm (e.g., before, during, and after), providing residents and businesses with a compendium of government and local resources, coordinating community outreach and communication efforts, inter-agency response, informing voluntary home inspections for hazards, and managing mental stress associated with disaster situations. Table ES-4 summarizes the storm preparation and response activities detailed in Section 7.

Table ES-4: Storm Preparation and Response Activities

Topic	Overview
Citizen Storm/Flood Preparedness	Guidance on formulating a Family Emergency Plan, protecting personal property, monitoring weather-related and public announcements, and flood clean-up and disinfection
Flood Protection & Homeowner Toolkit	Flood resource information and contacts for agencies involved in pre-, during, and post-disaster assistance
Community Outreach & Communication	Discussion of the major communication components needed to inform residents on emergency preparedness
Agency Coordination of Storm Response	Identification of key agencies, organizational control, and emergency management operations for each agency
Voluntary Home Inspections for Environmental and Health Hazards	Overview of agency-specific assistance available to residents who are interested in performing voluntary home inspections
Managing Stress During Emergency Situations	Information on recognizing changes in stress level, symptoms that may warrant mental health referral, and services provided by the District Department of Mental Health Resources

Together with the regulatory and insurance options, this information was used to inform the Task Force's recommendations on legislative policy that will reinforce the requirements for proposed development, and the operations and maintenance activities of the agencies that serve property owners before, during, and immediately following storm events.

Recommendations

The causes of the flooding problem in Bloomingdale are the result of decisions made in the late 1800's about the size and configuration of the sewer system, combined with the conversion of farmland to the densely developed urban landscape that exists today. The sewer system built in the late 1800's is simply too small to accommodate the storm water runoff for the area that was developed after the sewer's construction. This has resulted in a problem that will be extremely difficult, costly and time consuming to correct. Given these challenges, the Task Force developed a range of recommendations that should be implemented over the short, medium and long term to mitigate flooding. The recommendations are divided into the following major categories:

- Engineering Components
- Regulatory Components
- Code Revision Components
- Operation and Maintenance Components

Table ES-5 lists the components, while Figures ES-3 and ES-4 show the location of the principal elements. The recommendations are described in detail after the table.

Table ES-5: Summary of Recommendations

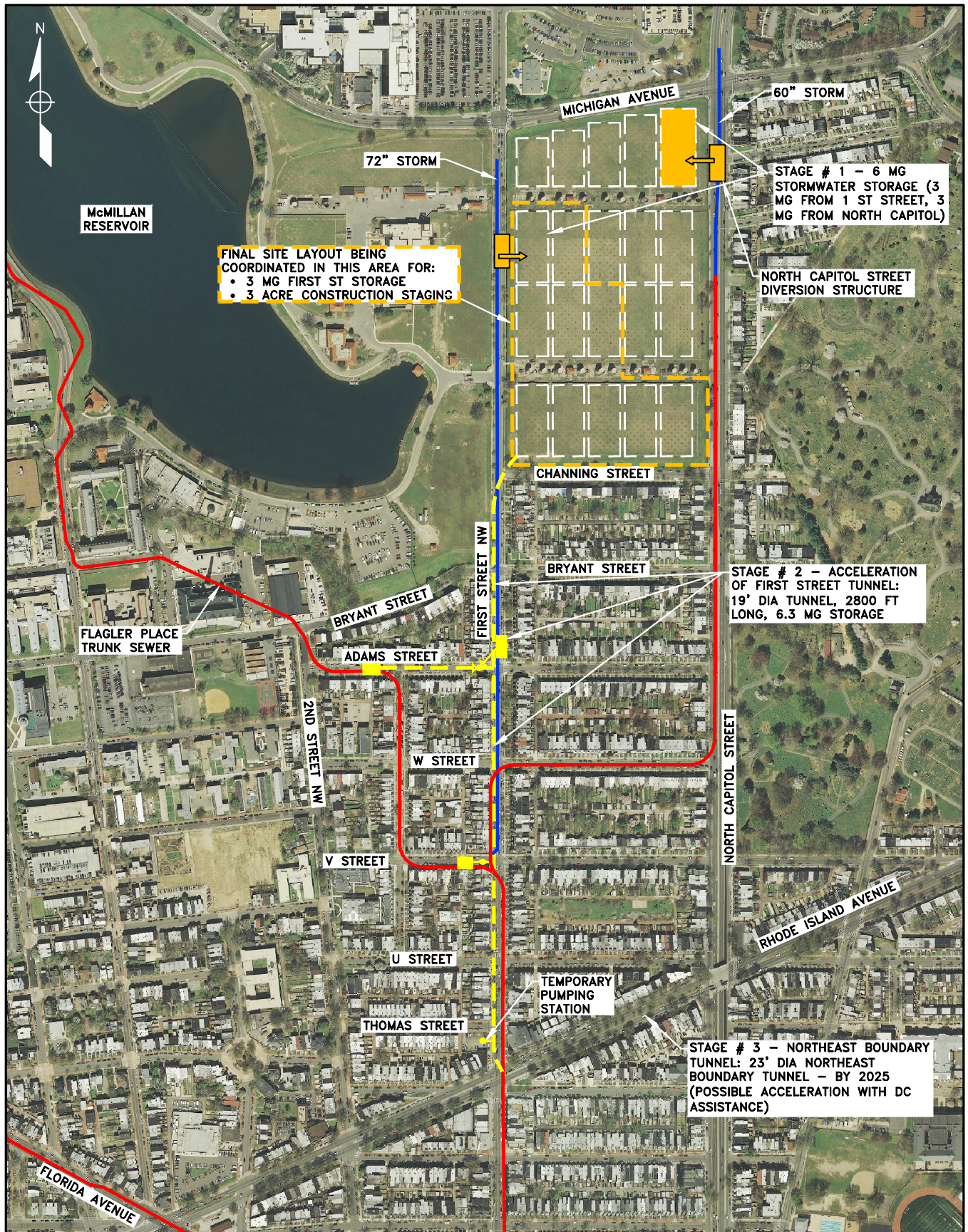
No.	Recommendation	Est. Capital Cost 2012 \$	Schedule	Responsibility	
				Admin	Fiscal
Engineering - Short Term					
1.	Backwater Valve (BWV) Program <ul style="list-style-type: none">For approx. 200 homes with reported backups in summer 2012<ul style="list-style-type: none">Mandatory programDC Gov to install backwater valvesHomeowner maintains & signs waiver for future floodingAdditional homes that experience backups in future<ul style="list-style-type: none">Roll into program aboveRefine Bloomingdale/LeDroit Park Eligibility Area<ul style="list-style-type: none">Public outreach to encourage BWV installationRebate 90% up to \$5000, homeowner arranges for installationContinue with current program approx. 1,000 homes and continue until tunnel is complete.	\$1-\$6 M	Implement until Northeast Boundary Tunnel constructed (10+/- years)	DC Water/ DGS/ DCRA	DC Water / District (3)
2.	Rain Barrel Program <ul style="list-style-type: none">Current funding up to 250 barrels; program in place	\$0.25 M	Underway	DDOE	DC Water
3.	Green Infrastructure (GI) Program - DC Water will fund GI construction at Rhode island and First Street, to be constructed by DDOT, in accordance with MOU	\$1.1 M	1 year	DDOT	DC Water
Engineering - Medium Term					
4.	Construct Temporary Stormwater Storage at McMillan – approx. 6 mg	\$12 M	Place in service by Spring 2014 ⁽¹⁾	DC Water	DC Water / District (2)
5.	Construct First St NW Tunnel <ul style="list-style-type: none">Construct approx. 6 million gallon, 2800’ long, 19’ inside diameter storage tunnel from Rhode Island and First St NW to southwest corner of McMillan site	\$132 M	Place in service by Spring 2016 ⁽¹⁾	DC Water	DC Water / District (2)
6.	Rain Barrel Program <ul style="list-style-type: none">Increase number of barrels available to public from 250 to 1,250 (increase of 1000) through rebate of rain barrel only (no installation services provided)	\$0.3 M	Next 3 years	DDOE	DDOE
7.	Green Infrastructure <ul style="list-style-type: none">GI in Bloomingdale & LeDroit Park drainage areas on public space	\$10 M	5 years	DDOT	DDOT
8.	Engineering Consultations and Flood Proofing <ul style="list-style-type: none">Provide free engineering consultationsProvide rebate of 90% up to \$3,000 for improvements made in accordance with engineering consultation	\$0.375 M	Next 3 years	DGS/ DCRA	DC Water / District (3)
Engineering - Long Term					
9.	Advance construction of the Northeast Boundary Tunnel	\$500-600 M	By 2022 ⁽¹⁾	DC Water	DC Water

No.	Recommendation Description	Justification	Responsibility	
			Admin	Fiscal
Regulatory				
10.	DCRA should be more proactive in investigating illegal basement apartments based on tips/complaints.	Illegal basement conversions increase the risk of sewer backups (Report Section 6.2.4)	DCRA	N/A
11.	Future development in Bloomingdale/LeDroit Park sewershed (properties more than 1 acre) <ul style="list-style-type: none">Allow sanitary discharges for future developmentOn private and public property (new streets in new development) – require that stormwater peak discharge for post development be limited to predevelopment conditions for 25-year 24-hour storm. Return to standard DDOE stormwater regulations once Northeast Boundary Tunnel is in place.	Prevent increase in sewer backups & surface flooding (Report Section 6.6)	DCRA/ DMPED Office of Plan’g/ DDOE/ DDOT/ DC Water	N/A
12.	Insurance <ul style="list-style-type: none">Require homeowners to provide proof that sewer backup rider has been purchased prior to reimbursing for backwater valve rebateRequire real estate disclosure form when buying house acknowledging being offered or informed about sewer backup rider on insuranceRequire insurance companies to provide statement of additional optional coverage available for sewer backups, including for homeowner and rental insurance	Encourage residents to purchase maximum available insurance protection (Report Section 6.3)	DISB/ DCRA/ DGS	N/A
13.	Require licensing for home inspectors, which would include procedure for inspecting backwater valve/grinder pump/sewage ejector	Encourage awareness of sewer backups (Report Section 6.4.4)	DCRA	N/A
14.	Explore the need or benefit to reinstating the District of Columbia Soil and Water Conservation District.	Dedicated group focused on impacts of stormwater runoff from new construction/development (Report Section 9.2.5)	DDOE	N/A
Code Changes				
15.	For new construction or where renovation costs exceed 50% of assessed value, require grinder pump or sewage ejector system with battery backup if lowest floor elevation is lower than manhole rim.	Grinder pump more reliable than BWVs (Report Section 6.1.5)	DCRA/ DC Water	N/A
16.	Require real estate disclosures when selling property if: <ul style="list-style-type: none">Backwater valve or grinder pump system is present/not present and stated risksAmend existing disclosure form to include known sewer backup or surface flooding occurrences	Encourage awareness of sewer backups (Report Section 6.4.5)	DCRA/ DGS	N/A
17.	Allow backwater valve to be installed on one lateral that serves properties with multiple floors (two laterals not required). Rain leaders must be disconnected.	Reduce burden of BWV installation	DCRA/ DC Water	N/A
18.	Threshold must be min 12” above curb elevation for basement entrances on new construction/renovations.	Add protection from surface flooding (Report Section 6.2.6)	DCRA	N/A
19.	Connect stairway drains to sump pump, grinder pump, or sewage ejector system for new construction / renovations.	Reduce protection for sewer backups	DCRA/ DC Water	N/A

No.	Recommendation Description	Est. Capital Cost 2012 \$	Schedule	Responsibility	
				Admin	Fiscal
Operation & Maintenance Components					
20.	Increase catch basin cleaning frequency in Bloomingdale/LeDroit Park to quarterly	\$20k/yr	Ongoing	DC Water	DC Water
21.	Distribute sandbags to residents for advance preparation, not only in response to storm forecast.	\$55k	Ongoing	DPW	DPW
Public Outreach Components					
22.	Establish regular program of door-to-door flier distribution with emergency response information	N/A		DPW	N/A
23.	Install and operate permanent automated flood warning signage on RI Ave to issue flood warning and emergency response information	\$100k	1 year	DDOT	DDOT
24.	Organize roundtable with residents to discuss anxiety/stress/fear.	N/A		DOH/DMH	N/A
25.	Educate homeowners about Backwater Valve installation and separate lateral requirements, including the possibility of waiver by code officials to allow single lateral connection. (Related to Recommendation 16)	N/A		DC Water	N/A

Notes: 1. Schedules contingent upon District support as follows:

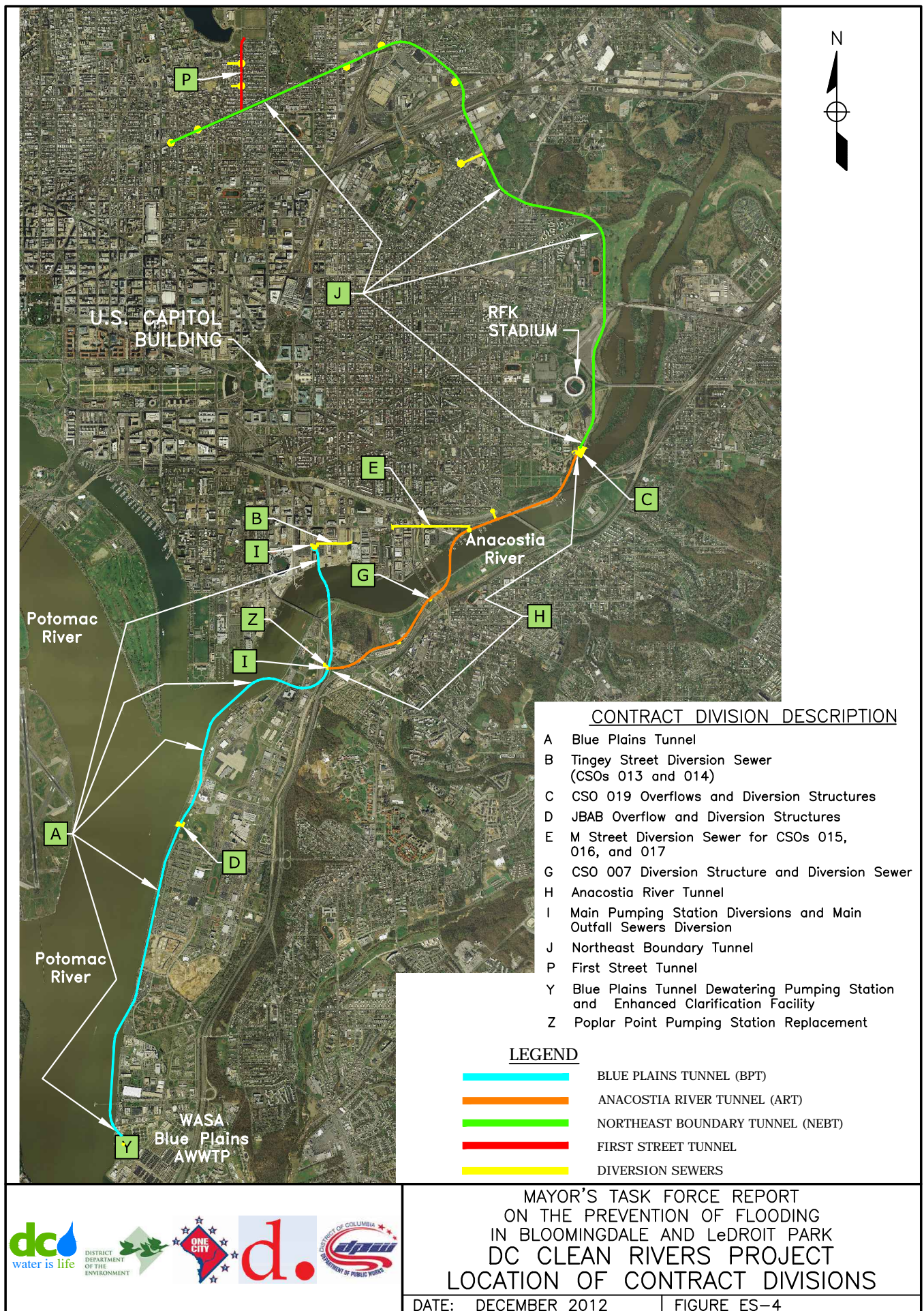
- a. City Administrator appoints champion, heading a task force that is empowered to direct agencies
 - b. District dedicates agency staff authorized to make decisions located with DC Water project team
 - c. DC Water obtains power of Eminent Domain and District exercises power of Eminent Domain as necessary
 - d. District grants all necessary easements to DC Water
 - e. District grants necessary District property to DC Water for permanent facilities and for construction
 - f. District provides expedited permits with dedicated staff
 - g. District allows necessary street closures, work hours, etc. for construction operations.
 - h. Permit fees are waived
2. Approximately \$40 million in additional funding required for the McMillan Stormwater Storage and an enhanced tunnel at First Street will be funded through one of the following:
 - a. Debt issuance by DC Water, with debt service payments made through transfers from the District's annual operating budget in the amount needed to pay the additional infrastructure financing
 - b. Debt issuance by DC Water with increased rates from District ratepayers for the term of the project financing
 3. Costs identified as the fiscal responsibility of the District of Columbia government have been recognized and will be included within the Mayor's Fiscal Year 2014 operating or capital budget submission. However, where funding is not currently identified, actual implementation of recommendations will be dependent upon funding and budget approvals.



MAYOR'S TASK FORCE REPORT
ON THE PREVENTION OF FLOODING
IN BLOOMINGDALE AND LeDROIT PARK
**McMILLAN STORAGE & FIRST STREET
TUNNEL OPTION (RECOMMENDED)**

DATE: DECEMBER 2012

FIGURE ES-3



Critical Items Needed For Success

The medium and long-term engineering initiatives include the following major construction projects with extremely aggressive schedules:

- Temporary Stormwater Storage at McMillan – by Spring 2014
- First Street NW branch Tunnel – by Spring 2016
- Northeast Boundary Tunnel – by 2022

These are major projects with an estimated cost of more than \$700 M that will be constructed in a dense urban area. Identifying the right of way for the tunnel and surface facilities, obtaining the necessary property and easements, and obtaining construction staging areas and permits for construction are critical to being able to construct the project in accordance with the schedules shown.

These projects cannot be constructed according to the schedules shown without the strong commitment from District agencies to act as project stakeholders by providing the following:

- City Administrator appoints a champion. The champion assembles and leads a Task Force of key officials from District agencies, and is empowered to direct agencies on project related issues.
- District agencies dedicate staff to support the project, and who are authorized to make decisions on behalf of the agency. The agency representatives may be located with the project design team to facilitate close coordination.
- DC Water obtains power of Eminent Domain and District exercises power of Eminent Domain as necessary to obtain land for the project.
- District grants all necessary easements to DC Water.
- District grants necessary District property to DC Water for permanent facilities and for construction.
- District provides expedited permits with dedicated staff.
- District allows necessary street closures, work hours, etc. for construction operations.
- Permit fees are waived.
- District allows street closures, reasonable work hour restrictions, and other coordination for construction operations.
- District facilitates parking mitigation in construction zones.
- District provides financial assistance, including waiving permit fees and helping to secure Federal funding to limit water and sewer rate increases.



Predicted Benefits

The flooding problem in Bloomingdale is a problem that has developed since the 1880's. This has resulted in a problem that will be extremely difficult, costly and time consuming to correct. Prior engineering studies and this Task Force have determined that the Northeast Boundary Tunnel is the

most practical and cost effective solution for bringing the carrying capacity of the sewer system up to the current design standard adopted by DC Water.

Table ES-6 shows the predicted ponding level (depth of water in the street) and the predicted water surface elevation in the major trunk sewers in Bloomingdale. The table shows that even during a 5-year storm, significant ponding and basement backups are predicted.

Implementation of the improvements is predicted to provide a steady, incremental improvement in flood mitigation, culminating in placing the Northeast Boundary Tunnel on line in 2022. Implementation of the short-term improvements is not predicted to affect the ponding level or possibility of basement backups. However, residences that have installed BWVs and performed flood proofing would be protected from these conditions.

Implementation of the medium-term improvements is predicted to mitigate much of the surface ponding and basement backups during a 5-year storm. During larger storms, surface ponding and basement backups will be reduced, but are not predicted to be eliminated by the medium-term improvements.

Implementation of the Northeast Boundary Tunnel is predicted to relieve surface ponding and basement backups up to the 15-year design storm, which is the design standard for the system.

After construction of the Northeast Boundary Tunnel, the majority of storms will be contained within the tunnel system. However, low spots in the area may still flood if storms occur above the design capacity of the system, although the severity of flooding will be greatly reduced. This is illustrated in Figure ES-5. Homes and businesses that are susceptible to flooding should consider retaining backflow preventers, grinder pumps, and building floodproofing even after construction of the Northeast Boundary Tunnel.

Figure ES-5: Northeast Boundary Tunnel System Capacity

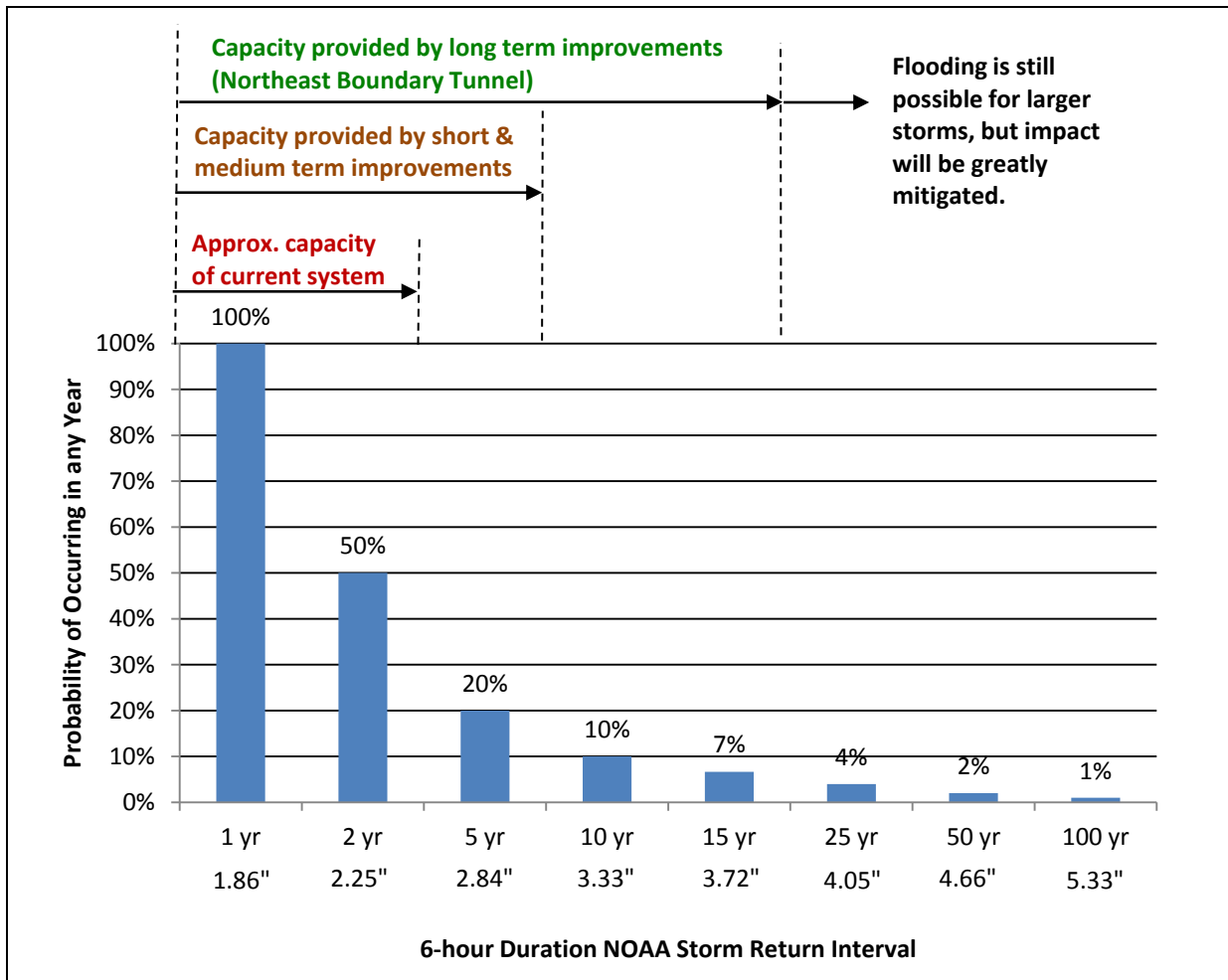


Table ES-6: Predicted Benefits of Recommendations

Condition	Design Storm (6-hour duration)	Major Components	Average Ponding Depth (inches)			HGL Depth Above(+) or Below(-) Grade (feet)			Mitigates Sewer Backups	Mitigates Surface Flooding
			RI Ave Bet 1 st & 2 nd	Flagler Place & V St	U St & 1 st St	RI Ave & 1 st St	Flagler Place & V St	U St & 1 st St		
Existing Conditions	5-year	Existing Conditions	22"	8"	4"	-2.4'	3.2'	-1.2'	No	No
Short-Term Improvements	5-year	<ul style="list-style-type: none"> BWV Program Rain Barrel Program Green Infrastructure Program 	Some improvement, difficult to quantify			Some improvement, difficult to quantify			Yes, for properties with BWV	Yes, for properties with flood-proofing
Medium-Term Improvements	5-year	Short Term Improvements Plus: <ul style="list-style-type: none"> 6 million gallons storm water storage at McMillan Sand Filter Site First Street NW Storage /Conveyance Tunnel Rain Barrel Program Green Infrastructure Program Floodproofing Program 	<2"	2"	3"	-6.4'	-7.7'	-9.2'	Yes	Yes
Long-Term Improvements	15- Year Storm	Short and Medium Term Improvements Plus: <ul style="list-style-type: none"> Northeast Boundary Tunnel 	< 2"			Runoff and combined sewage contained within sewers			Yes	Yes

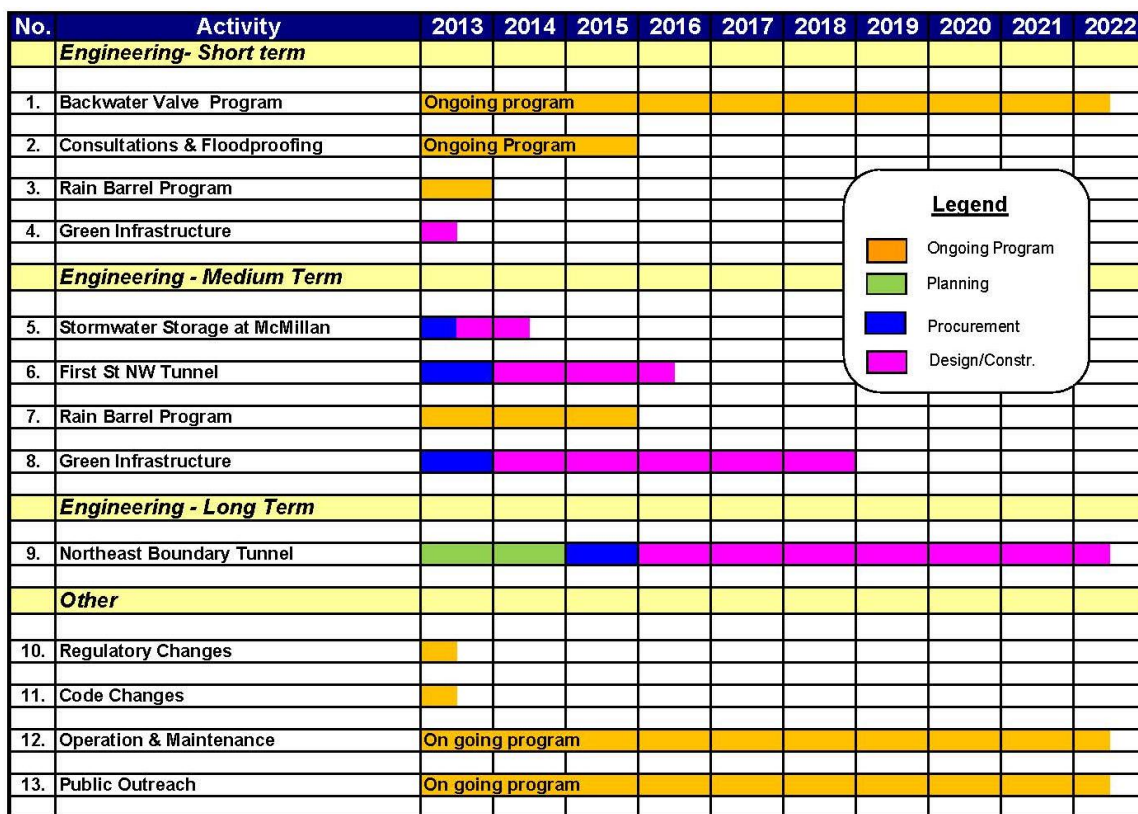
Schedule

The recommended plan has been developed at this stage to a conceptual level. Basic capacities have been established for the facilities, general locations have been selected and appurtenant and support facilities have been identified. Also, the general hydraulic operation of the system has been formulated, interfaces with existing facilities have been considered and potential construction sequencing has been reviewed.

Time requirements in the implementation schedule have been based on information compiled during the planning process, experience with similar projects and estimates of future and field conditions. There are a number of uncertainties associated with the time requirements included in the implementation plan and schedules. As the implementation process moves forward, it will be necessary to identify and resolve such uncertainties and to adjust time requirements.

Figure ES-6 shows the proposed schedule for the recommended plan.

Figure ES-6: Recommended Plan Schedule



1 Introduction

On July 10, 18, 19, and September 2, 2012, intense rainfall events caused stormwater and combined sewage to flood the residential neighborhoods of Bloomingdale and LeDroit Park in Wards 5 and 1, respectively, of Washington, DC. During the severe storms, residents reported flooding of their basements which occurred from either sewer backups, overland flow, or both. Overland flow entered basements over low door sills, window wells and other openings. Combined sewage backups occurred through toilets, tubs, sinks and floor drains. The extreme nature of the flooding, the damage to private property, and the health risks associated with exposure to sanitary sewage led to a multi-agency response and community calls for answers and action.



Inside Cleanup of Flooded Basement

On August 21, 2012, Mayor Vincent Gray established the *Mayor's Task Force on the Prevention of Flooding in Bloomingdale and LeDroit Park*. As mandated by Mayor Gray, this reports seeks to identify the causes of surface flooding and sewer backups that occurred in Bloomingdale and LeDroit Park, provide recommendations on short, medium, and long-term mitigation measures, including the methodology which led to those recommendations, and to summarize these issues within a regulatory, economic, and social context.

1.1 Background

The sewer system that serves the Bloomingdale and LeDroit Park neighborhoods, known as the Northeast Boundary Trunk Sewer (NEBTS), was constructed by the federal government beginning in 1879 and continuing through the late 1800's. As with many communities in the 19th Century, the sewer system served the dual purpose of collecting wastewater from homes and business and stormwater runoff from streets and properties. Referred to as combined sewers, these systems continued to serve the District of Columbia as the region's population grew at an exponential rate. In meeting the growing population's needs, the District experienced development that transformed previously low-density rural areas into new communities. All of these changes have contributed to a vastly different built environment than that which was present in the late 1800's when the sewer system was constructed. Roughly one-third of the District, including Bloomingdale and LeDroit Park, continues to be served by combined sewer systems.



Capacity limitations with the NEBTS were reported as early as the late 19th Century, and further development of the City has exacerbated this problem. Many studies conducted during the latter half of the 20th Century proposed sewer system capacity improvements, but recognized the scale of necessary improvements were extremely challenging from both a cost and constructability standpoint. In 2005, DC Water began implementation of the DC Clean Rivers Project, an endeavor designed to achieve three main objectives:

- Control combined sewer overflows to the Anacostia River, Potomac River, and Rock Creek to achieve water quality objectives

- Mitigate flooding at chronic flood areas in the Northeast Boundary Drainage area, including Bloomingdale and LeDroit Park up to the 15-year design storm
- Provide storage of combined flows during wet weather events to reduce peak flows to the Blue Plains Wastewater Treatment Plant to allow practical enhanced nutrient removal to meet the goals of the Chesapeake Bay Program.



The \$2.6 billion DC Clean Rivers Project is required to be completed by 2025 by a Federal Consent Decree signed by the U.S.

Government, the District and DC Water. The project includes construction of a \$600 million tunnel system, approximately five miles in length, which will serve the Northeast Boundary drainage area to mitigate flooding during large storm events.

The importance of flooding mitigation became evident this summer, when Bloomingdale and LeDroit Park experienced intense storm events that resulted in

neighborhood flooding. All of these storms were short-duration, high intensity events that caused the NEBTS to become overwhelmed. This heavy influx of rain led to overland flooding and sewer backups in numerous residential and commercial basements. As a result, Bloomingdale and LeDroit Park residents faced costly damages to their homes and businesses. The large number of residents affected by the storms, the costly damages associated with flooding and sewer backups, and concerns about the health risks associated with exposure to bacteria known to be present in raw sewage has prompted action by multiple City agencies and community groups.

1.2 Mayor's Directive

On August 21, 2012, Mayor Gray acknowledged the need for government agencies and partners to work collaboratively towards mitigating the effects of flooding and sewer backups. The *Mayor's Task Force on the Prevention of Flooding in Bloomingdale and LeDroit Park* (Task Force) was assembled, and includes residents from the affected communities, government officials, and DC Water representatives. The Mayor's order establishing the Task Force is provided in Appendix 3. The Task Force has been charged with advising the Mayor on the causes of and potential actions to prevent flooding in Bloomingdale and LeDroit Park.

The Task Force was directed to:

- Investigate the causes of flooding in the Bloomingdale and LeDroit Park area.
- Investigate potential short term, medium term, and long-term actions that may be taken by DC Water, other District agencies, and residents to reduce the likelihood or severity of flooding and its associated consequences, and to prevent or reduce the damage caused by such flooding (collectively, "remedial measures").
- Estimate the costs to implement the remedial measures and the time periods within which the remedial measures may be implemented.

- Transmit to the Mayor no later than December 31, 2012, a written report setting forth the findings and recommendations of the Task Force regarding the causes of flooding in the Bloomingdale and LeDroit Park neighborhoods and potential remedial measures.

1.3 Task Force Organization

The Task Force, co-chaired by DC Water General Manager George Hawkins and City Administrator Allen Lew, includes:

- Kenyan McDuffie, Ward 5 Councilmember
- Jim Graham, Ward 1 Councilmember
- Terry Bellamy, District Department of Transportation, Director
- Keith Anderson, District Department of the Environment, Interim Director
- William Howland, Department of Public Works, Director
- Chris Geldart, D.C. Homeland Security & Emergency Management Agency, Director
- Nicholas Majett, Department of Consumer & Regulatory Affairs, Director
- Dr. Saul Levin, D.C. Department of Health, Director
- William White, Department of Insurance, Securities & Banking, Director
- Eric Goulet, Office of Budget and Finance, Budget Director
- Serita Sanders, Bloomingdale neighborhood representative
- Teri Quinn, Bloomingdale neighborhood representative
- Myla Moss, LeDroit Park neighborhood representative

The Task Force has been organized into committees as follows.

1.3.1 Technical Committee

The Technical Committee is composed of representatives from the following entities: DC Water (lead organization), District Department of Public Works, District Department of the Environment, District Department of Transportation, Resident Representatives, Office of the City Administrator. Additional engineering support and sewer hydraulic modeling was provided by engineering consultants Greeley & Hansen, ARCADIS/Malcolm Pirnie, and LimnoTech (LTI).

The Technical Committee is responsible for the following actions:

- Determining the viability (costs/benefits) of an independent engineering assessment that examines neighborhood conditions, identifies weak and/or damaged sewers susceptible to blockage; and examining the impact of new development.
- Defining implementation processes and timeline for priority medium-term engineering solutions such as temporary storage of stormwater upstream of Bloomingdale/LeDroit Park, installation of stormwater retention features, and connection of additional storm drains.
- Developing green technology/green management strategies to help control property damage, including expansion of the RiverSmart program.
- Investigating options for inflatable or movable flood walls, and other solutions for Rhode Island Avenue.
- Assessing the impact of new construction in adjacent neighborhoods (e.g., NOMA, McMillan, Eckington) on drainage and sewer control in Bloomingdale and LeDroit Park.

1.3.2 Finance Committee

The Finance Committee is composed of representatives from the following entities: Office of Budget and Finance (lead organization), DC Water, District Department of Consumer and Regulatory Affairs, District Department of Transportation, Resident Representative, Office of the City Administrator.

The Finance Committee is responsible for the following actions:

- Estimating the costs of various flood prevention options, with an emphasis on short term and interim solutions in coordination with the Technical Committee.
- Identifying financing and /or subsidy resources to help homeowners with the procurement and installation of equipment or surface improvements to prevent flooding.
- Examining opportunities to extend flood insurance coverage, including designation as flood protection zone via FEMA and legislative mandates through DC Council.
- Developing preliminary program specs (e.g., eligibility, inspection, funding source) for an “emergency relief fund” to provide short term assistance to residents.
- Identifying federal financial assistance options for short and medium term remedies.
- Estimating the costs to implement remedial measures and the implementation timeframe.

1.3.3 Emergency Response Committee

The Emergency Response Committee is composed of representatives from the following entities: Department of Public Works (lead organization), District Department of Transportation, Homeland Security and Emergency Management Agency, District Department of Health, District Department of Insurance, Securities, and Banking, Resident Representative, Office of the City Administrator.

The Emergency Response Committee is responsible for the following actions:

- Preparing a storm/flood response plan to guide emergency activities and ensure coordination between District agencies, DC Water, and community information services— define control, command, and coordination in operational action plans.
- Developing public awareness materials with guidance on citizen storm preparation and emergency preparedness activities, including safety tips and after flood precautions (e.g., flood and water hazards, interior and exterior clean-up, and structural damage) to help facilitate the recovery process.
- Improving strategic communication and coordination between DPW, DC Water, DDOT, and HSEMA (including weather alerts, emergency preparedness, traffic control changes).
- Preparing guidelines for treating flood damaged homes that include after flood clean-up, waste removal, and vector control actions.
- Developing a strategy for voluntary home inspection of environmental and health hazards associated with severe flooding and sewer overflow.
- Evaluating the need for mental health services and identifying mental health resources.

1.3.4 Planning and Research Committee

The Planning and Research Committee is composed of the representatives from following entities: District Department of the Environment (lead organization), District Department of Transportation,

DC Water, District Department of Public Works, Homeland Security and Emergency Management Agency, Resident Representative, Office of the City Administrator.

The Planning and Research Committee is responsible for the following actions:

- Reviewing and summarizing experiences and remedial strategies from neighborhoods in other jurisdictions with similar flooding conditions to highlight best management practices.
- Examining the response capacity of DC Water, DPW, HSEMA, and other key service-providers to identify gaps and recommend improvements, in consideration of common standards, as applicable.
- Researching “affordable” flood prevention/flood damage repair financial assistance services including grants, matching funds, low interest loans, rebates, and tax benefit solutions.
- Identifying and packaging available resources from DC agencies (and other credible organizations) into a flood protection toolkit encompassing property damage reconditioning, food safety, clean-up and sanitation, and health and environmental safety.
- Identify infrastructure improvement plans that offer coordination opportunities with short term and medium term flood relief strategies.
- Summarizing flood prevention, protection, and mitigation best practices with a focus on diminishing impact or severity, ensuring preparedness and readiness within the community, implementing immediate response actions, and supporting community recovery – to help strengthen the District’s flood response operations.

1.3.5 Legislative and Government Affairs Committee

The Legislative and Government Affairs Committee is composed of representatives from the following entities: Office of the City Administrator (lead organization), Councilmember McDuffie, Councilmember Graham, Homeland Security and Emergency Management Agency, District Department of Insurance, Securities and Banking, District Department of Consumer and Regulatory Affairs, Resident Representative.

The Legislative and Government Affairs Committee is responsible for the following actions:

- Identifying gaps in plumbing and building code regulations, and developing recommendations to improve guidance on front/rear entrance and basement renovation (in low-lying areas), strengthen installation and inspection services, enforce compliance with flood hazard rules, and foster greater contractor and homeowner accountability.
- Determining the legislative and regulatory changes needed to implement short term flood prevention strategies or to improve storm response.
- Drafting specific provisions where appropriate.
- Coordinating with other government agencies, where needed.
- Examining options for legislative action to authorize “emergency relief funding”.

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