DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

DC CLEAN RIVERS PROJECT
GREEN INFRASTRUCTURE PROGRAM

# PRACTICABILITY ASSESSMENT FOR POTOMAC RIVER GREEN INFRASTRUCTURE

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Prepared for:

Prepared by:

Program Consultants Organization
Blue Plains Advanced Wastewater Treatment Plant
5000 Overlook Avenue, SW
Washington, DC 20032

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# Executive Summary

## ES.1 Introduction

The District of Columbia Water and Sewer Authority (DC Water) is implementing a Long Term Control Plan (LTCP), also referred to as the DC Clean Rivers Project (DCCR), to control combined sewer overflows (CSOs) to the District of Columbia's (District) waterways. DCCR is comprised of a variety of projects to control CSOs, including pumping station rehabilitations, green infrastructure (GI), and a system of underground storage/conveyance tunnels. DCCR is being implemented in accordance with a first amendment to the Consent Decree (Amended Consent Decree), entered on January 14, 2016, which amends and supersedes the 2005 Consent Decree (Consent Decree) and incorporates GI, in a combination of gray and green solutions to control CSOs and improve the quality of life in the District.

**GI can provide environmental, social, and economic benefits not offered by traditional gray infrastructure**

GI uses plants, trees, engineered soil mixes, aggregate storage and other measures to mimic natural processes to control stormwater, resulting in cleaned, cooled, and slowed stormwater runoff. These systems promote stormwater detention and infiltration into the soil and include techniques such as pervious pavements, bioretention (rain gardens), rain barrels and downspout disconnections, as well as other technologies. Through integrating natural processes into the urban environment and its unique characteristics, GI provides not only stormwater management, but also supports additional benefits such as local job creation, improved air quality, a cooler city, greener public and private spaces, added bird and pollinator habitat, increased property values, and greenhouse gas mitigation.

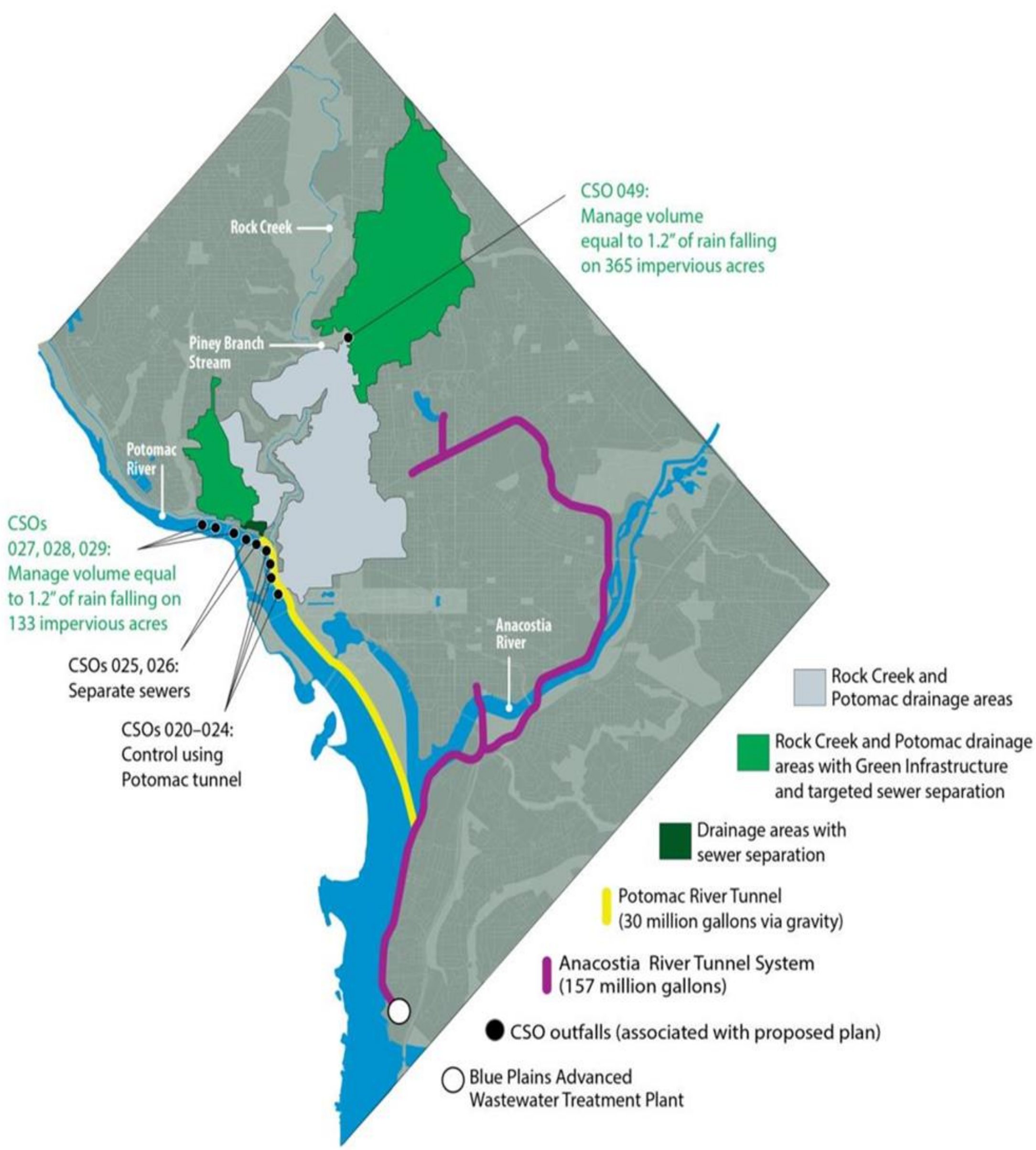
## ES.2 Amended Consent Decree Requirements

The Amended Consent Decree specifies the projects that must be implemented in the Anacostia River, Potomac River, and Rock Creek sewersheds and stipulates deadlines for placing those projects in operation. Figure ES-1 shows the projects required under the Amended Consent Decree.

When the Consent Decree was amended, it was recognized that GI had not been implemented previously on a large scale in DC or in an ultra-urban area similar to DC to provide a high degree of CSO control. As a result, its effectiveness, cost, and practicality were unknown. The Amended Consent Decree therefore provided for DC Water to construct demonstration projects in the Potomac and Rock Creek sewersheds and to evaluate their cost, performance, and other characteristics. Based on that evaluation, the Amended Consent Decree requires DC Water to determine the practicability of GI. If DC Water determines that GI is practicable, then the remaining GI projects would be implemented to control the specified CSOs. If DC Water determines that GI is not practicable, then DC Water would revert to the gray controls. Both the Rock Creek and Potomac sewersheds are required to be evaluated, and separate determinations may made regarding the practicability of continuing with a full-scale green application within the respective sewershed. This document presents the results of the practicability assessment for GI in the Potomac River sewershed.

**Because GI had not been implemented on a large scale in an urban setting, the Amended Consent Decree provides for a testing and evaluation process**

**Figure ES-1. Clean Rivers Project**



## ES.3 DC Water's Investments to Evaluate Green Infrastructure

**DC Water has invested more than $80M and several hundred thousand person-hours advancing GI**

DC Water has made major investments to advance the state of GI and to make the evaluation regarding practicability. This includes going above and beyond the minimum requirements of the Amended Consent Decree. Figure ES-2 illustrates the projects and initiatives undertaken that inform and support elements of the practicability assessment. In total these efforts comprise an investment of more than $80M, with several hundred-thousand person hours of effort.

GI projects constructed within both the Rock Creek sewershed and Potomac River sewershed provide the basis for assessing the practicability of future GI implementation in the Potomac River sewershed to achieve the requirements of the Amended Consent Decree.

Most of the GI control measures planned and implemented by DC Water were constructed in public rights of way (ROW), specifically planter strips, alleys, and roadways. These include bioretention in the planter strip between the curb and the sidewalk, bioretention as curb extensions, subsurface storage, and permeable pavement in alleys and parking lanes. A select number of controls were implemented in small public parks. Additional GI controls were implemented on private properties, specifically downspout disconnections.

While DC Water's experience in the GI arena is vast, not all these projects can be counted towards the requirements of the Consent Decree. They do however contribute to the depth of institutional knowledge that has informed the conclusions of this Practicability Assessment. Table ES-1 summarizes the GI practices constructed for both Rock Creek Project No. 1 and Potomac River Project No. 1, followed by the number of impervious acres managed in each.

**Table ES-1. Summary of GI Projects for CSO Control**

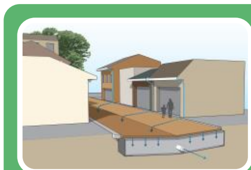
| Sewershed | Project | Impervious Acres Managed | | | | |
|---|---|---|---|---|---|---|
| | | Bioretention | Permeable Pavement | Targeted Sewer Separation | Downspout Disconnect | Total |
| Rock Creek Project 1 | RC-A | 3.9 | 14.9 | | | 18.8 |
| | Kennedy Street | 1.2 | 1.5 | | | 2.7 |
| | Challenge Parks | 1.9 | | | | 1.9 |
| | AlleyPalooza | | 3.0 | | | 3.0 |
| | Downspout Disconnect | | | | 1.0 | 1.0 |
| | **Subtotal Rock Creek** | **7.0** | **19.4** | **0.0** | **1.0** | **27.4** |
| Potomac River Project 1 | PR-A | 0.3 | 7.5 | 67.5 | | 75.3 |
| | AlleyPalooza | | 0.1 | | | 0.1 |
| | Downspout Disconnect | | | | 0.2 | 0.2 |
| | **Subtotal Potomac River** | **0.3** | **7.6** | **67.5** | **0.2** | **75.6** |
| **Grand Total** | | **7.3** | **27.0** | **67.5** | **1.2** | **103.0** |

## Potomac River Project A

- First large scale GI project for CSO control in Potomac River sewershed
- Manages 75.3 impervious acres
- Consists of a combination of GI in public right-of-way and targeted sewer separation

## Rock Creek Project A

- First large scale GI project for CSO control in the Rock Creek sewershed
- Manages 18.8 impervious acres
- Consists primarily of bioretention, porous pavement in the parking lanes and permeable alleys



## AlleyPalooza Partnership with DDOT

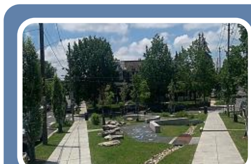
- Constructed under a DDOT contract, consists of 7 permeable alleys in Rock Creek and Potomac River sewersheds managing 3.1 impervious acres
- Utilized inovative standard design details and specifications in combination with a DOEE blanket permit to streamline implementation while lowering costs


## Downspout Disconnection

- Program for District residents to disconnect their homes' downspouts from the combined sewer and redirect flow onto landscaped areas
- Manages 1.2 impervious acres in the Rock Creek and Potomac sewersheds
- Over 280 homes have participated to date

## GI Challenge - Kennedy Street GI Streetscape

- Showcase GI streetscape located on the 100 block of Kennedy Street, NW
- Manages 2.7 impervious acres
- Consists of inovative GI in public right-of-way, utilizing GI as an amenity through revealed stormwater management and public art elements



## GI Challenge - GI Parks Project

- Showcase 2 GI parks projects located along Kansas Avenue NW
- Manages 1.9 impervious acres
- Utilizes GI as an amenity through revealed stormwater management with functional and aesthetic improvements to the parks

## DC Water GI Utility Protection Guidelines

- Establishes protocols and protective measures for the design and construction of GI near traditional DC Water sewer and water infrastructure
- Utilized by DC Water, other District agencies and utilities, as well as developers and others engaging in construction of GI in the public right-of-way

## DC Water GI Design Standards

- Development of GI Details and Specifications for CSO control.
- Utilized on Rock Creek Project A and as the basis for work that followed
- Consists of details and specifications for permeable pavement, bioretention, and other common elements of GI

**Figure ES-2. Investments in Support of GI**

National Green Infrastructure Certification Program

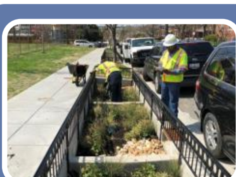
- DC Water partnered with the Water Environment Federation to launch the National Green Infrastructure Certification Program (NGICP) for entry level GI professionals
- Provided nearly $1M in seed capital, recruited 14 other municipalities to join at $50K each

NGICP Training and Workforce Development

- Working with the University of the District of Columbia (UDC), DC Water has funded NGICP training for District residents since 2016
- Program has trained over 150 District residents
- Consists of hands-on training, class time, field work, and job placement assistance

Blanket Permit with District Department of Energy and Environment

- In coordination with DDOT and DOEE, utilized a blanket permit approach for implementing standardized permeable alleys in the District
- Approach streamlines the siting, approval, and construction process for permeable alleys



Standardized Designs for Permeable Pavement

- Building from DC Water GI Design Standards, established standardized designs for alley permeable pavement and planter bioretention.
- Approach helped drive down costs and streamline approvals and construction processes

Partner With Local Schools and Universities

- Developed concept plans incorporating GI in the redesign of Georgetown University's Healy Lawn
- Drafted concept plans for GI educational spaces at Washington Latin Public Charter School and Paul Public Charter School

**Figure ES-2. Investments in Support of GI (Continued)**

## ES.4 Results of Our Assessments

The Consent Decree provides for assessing the practicability of GI considering constructability, operability, efficacy, public acceptability, and cost per impervious acre treated. Table ES-2 summarizes the results of the assessment and the section below explains the rationale.

**Table ES-2. Results of Potomac River Practicability Assessment**

| Criteria | Assessment | Basis |
|---|---|---|
| Constructability | Negative | • Limited space in Georgetown area<br>• GI not constructible in CSO 027 and 028 |
| Public Acceptance | Negative | • Objections in Historic District, significant opposition from Commission of Fine Arts, Old Georgetown Board, National Capital Planning Commission, DC State Historic Preservation Office, Advisory Neighborhood Commission and residents |
| Efficacy | Good | • Can be designed and constructed to perform as predicted |
| Operability | Moderate | • Maintenance is simple, but is essential to assure performance<br>• If not maintained adequately, performance can suffer |
| Cost Effectiveness | Negative | • Extremely high costs to construct green infrastructure in historic district |
| Other – Triple Bottom Line and Economic Benefits | Negative | • Due to lack of space, most GI would be porous pavement (not green) with little triple bottom line benefit |
| Other – Protection of future infrastructure (GI MOU) | Moderate | • Agreement with District not reached on GI MOU |

- ***Constructability***
  DC Water was able to construct GI in public space within the Burleith and Glover Park neighborhoods in CSO 029 for Potomac River Project No. 1. The projects were constructible by conventional construction methods and contractors were available to perform the work. However, due to the limited space, tight conditions, and historic conditions within the Historic Georgetown area, GI is significantly more difficult to construct in CSOs 027 and 028. From a constructability standpoint, GI is not practicable within these sewersheds.

- ***Operability***
  While the DC Water-constructed GI practices do not require active operation, regular maintenance is required to assure adequate performance. Maintenance techniques and equipment are relatively straightforward and can be performed by conventional crews that can be trained on the specifics within reasonable times. From an operability standpoint, GI is practicable.

- ***Efficacy***
  Approximately one year of pre- and post-construction monitoring was conducted and the collection system model was then run for the average year (1988-1990) to make predictions regarding wet weather flow (WWF) volume reduction. WWF volumes are defined as occurring when predicted flows in the sewer exceed two times average dry weather flow rate. The reduction in WWF volumes was calculated by taking the difference between pre- and post-construction WWF volumes and dividing by the number of impervious acres treated at 1.2" to determine the WWF reduction in million gallons per average year per impervious acres treated at 1.2". Table ES-3 summarizes the results.

**Table ES-3. Average Year Predictions Based on Post-Construction Monitoring**

| Sewershed | Imp. Acres Treated by GI (% of Total) | WWF Volume (MG) | | Volume Reduction Normalized per Imp Acre Treated (%) | |
|---|---|---|---|---|---|
| | | Pre-Construction | Post-Construction | Actual | Predicted |
| PR-A | 9.1 | 77.73 | 72.56 | 6.65 | 6.65 |

The Potomac monitoring and modeling demonstrate that incorporation of appropriate lessons learned from other DC Water projects, allows GI to be constructed and to perform as predicted. Knowledge was gained through this process which provides a template for the design of subsequent projects to meet performance objectives. Based on the performance of PR-A and the lessons learned from PR-A and other projects, the efficacy of GI is practicable.

- ***Public Acceptability***
  Due to significant opposition to construct Project No. 1 in the Georgetown Historic District from the US Commission of Fine Arts, the National Capital Planning Commission, the Old Georgetown Board, Civic Associations, Advisory Neighborhood Commissions and other parties, DC Water modified the original project extents and agreed to construct Potomac Project No. 1 in the CSO 029 area only. Potomac River Project A (CSO 029) received a majority of positive feedback from survived residents. The Georgetown Historic District is primarily located in the CSO 027 and 028 sewershed, where 35 impervious acres are required to be managed by GI under the Consent Decree. DC Water has been unable to garner support from

these various groups and review agencies to construct the required GI acres in CSOs 027 and 028. Due to this fact of significant opposition, GI is not practicable from a public acceptability standpoint.

- ***Cost Effectiveness***
  The cost to implement GI covers a spectrum from low to high cost. Examples of lower cost GI include open space bioretention and adding GI to an existing capital project. Examples of higher cost GI include those requiring utility relocation, small projects with limited space and small drainage areas, projects requiring significant surface restoration, and projects adjacent to historic structures and materials. DC Water's analyses indicate that to manage 133 impervious acres, there are inadequate low-cost GI opportunities in the sewershed, and that significant amounts of high cost GI would be required, specifically in the area corresponding to CSOs 027 and 028. Since DC Water was unable to attain approval to construct GI in the Historic Georgetown area, actual costs are unknown. However, given the tight conditions, historic area considerations, and lack of open space, a full GI build out in these sewersheds would be far more expensive than any other GI constructed by DC Water to date. Given these considerations, GI in the Potomac Sewershed is not practicable due to cost.

## ES.5 Determination

Given the significant and insurmountable public and approval agency opposition to GI implementation in the Historic District of Georgetown, the challenging constructability conditions, significantly higher costs associated with GI and the low triple bottom line co-benefits, DC Water has determined that it is not practicable to control at least 133 acres to the 1.2" retention standard in the CSO 027, 028 and 029 sewersheds. Per the terms of the Consent Decree, DC Water will instead plan, design, and construct the Potomac River Storage/Conveyance Tunnel with a total storage volume of not less than 40 million gallons.

# 1 Introduction

## 1.1 Purpose

The District of Columbia Water and Sewer Authority (DC Water) is implementing a Long Term Control Plan (LTCP), also referred to as the DC Clean Rivers Project (DCCR), to control combined sewer overflows (CSOs) to the District of Columbia's (District) waterways. DCCR is comprised of a variety of projects to control CSOs, including pumping station rehabilitation, targeted sewer separation, green infrastructure (GI), and a system of underground storage/conveyance tunnels. DCCR is being implemented in accordance with a first amendment to the Consent Decree (Amended Consent Decree), entered on January 14, 2016, which amends and supersedes the 2005 Consent Decree (Consent Decree) and incorporates GI, in a combination of gray and green solutions to control CSOs while improving the quality of life in the District. The Amended Consent Decree requirements are outlined in Section 1.2. The Amended Consent Decree is provided in Appendix A.

The purpose of this document is to comply with the Amended Consent Decree requirement to submit the results of the Potomac River GI Practicability Assessment. Additionally, the Post Construction Report No. 1 for Potomac River GI, also required by the Amended Consent Decree, can be found in Appendix B of this report.

## 1.2 Amended Consent Decree Requirements

The Amended Consent Decree specifies the necessary requirements for projects that DCCR must implement in all three sewersheds (Anacostia River, Potomac River, and Rock Creek) and deadlines for the implementation of these projects. Figure 1-1 shows the projects required under the Amended Consent Decree. In the event DC Water determines that it is not practicable to control the required acres through the use of GI in the Rock Creek or Potomac sewersheds, the Amended Consent Decree currently requires DC Water to construct an all gray alternative. Both the Rock Creek and Potomac sewersheds shall be evaluated, and separate determinations will be made regarding the practicability of continuing with an all green application within the respective sewershed. The Practicability Assessment for GI in the Potomac River sewershed is made within the body of this report, while the Practicability Assessment for GI in the Rock Creek sewershed was submitted to EPA in June 2020. The requirements and deadlines of the Amended Consent Decree specific to GI implementation in the Rock Creek and Potomac River sewersheds are described in the following subsections.

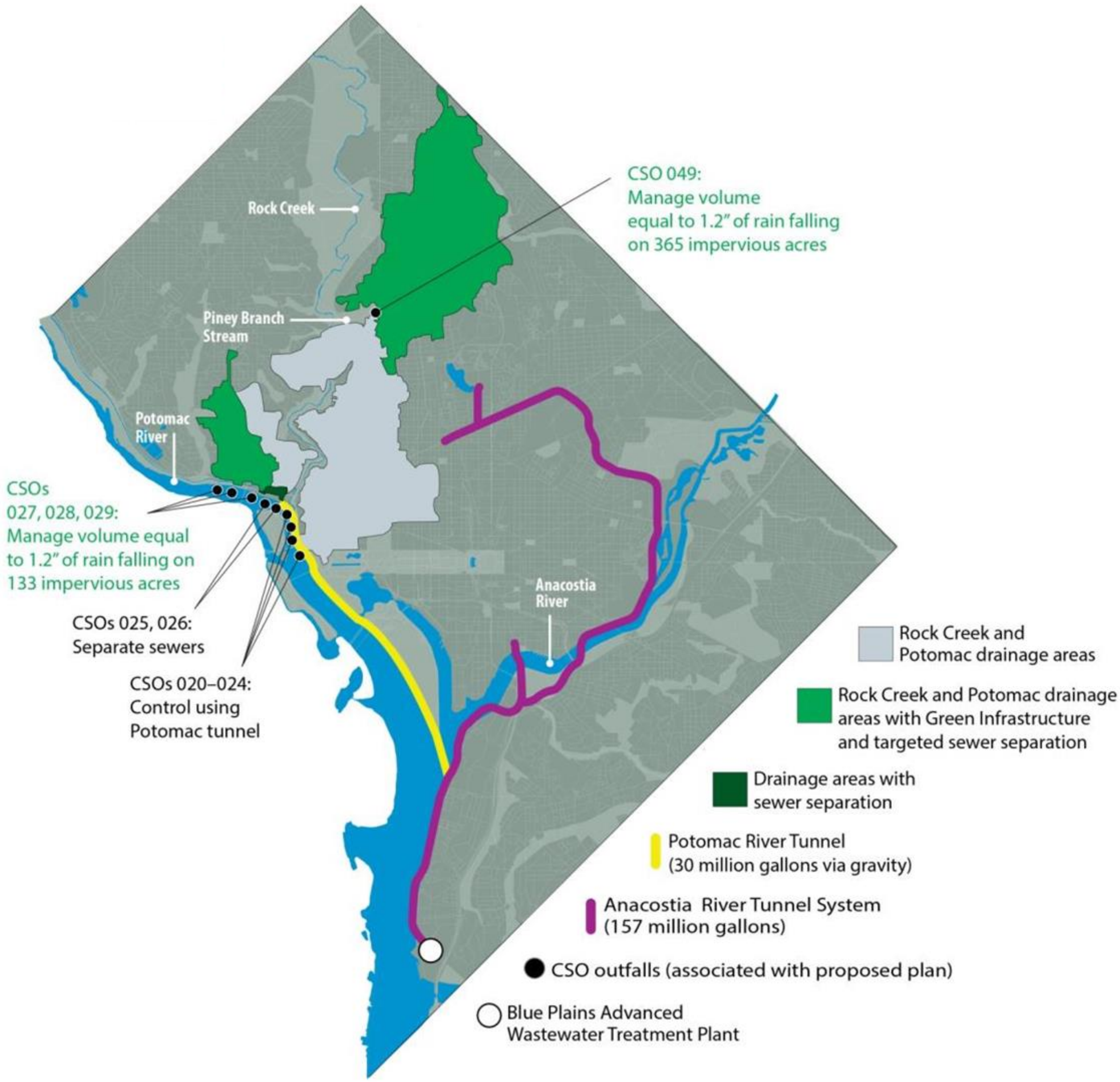



**Figure 1-1. Amended Consent Decree Requirements**

### 1.2.1 Potomac River Sewershed GI Projects

The Amended Consent Decree requires that GI be constructed in the drainage areas for CSOs 027, 028, and 029 within the Potomac River sewershed to manage the volume of runoff produced by 1.2" of rain falling on 133 impervious acres in the sewershed. The number of impervious acres is equivalent to 30% of total impervious acres in the CSOs 027 and 028 sewersheds, and 60% of total impervious acres in the CSO 029 sewershed. Table 1-1 lists the three Potomac River sewershed projects required to achieve the 133 impervious acres and each project's associated schedule that are part of the Amended Consent Decree.

**Table 1-1. Potomac River Sewershed Projects in Amended Consent Decree**

| Project No | Impervious Acres to Control to 1.2" Retention Standard | Date to Award Contract for Construction | Date to Place in Operation |
|---|---|---|---|
| 1 | 44 | June 23, 2017 | June 23, 2019 |
| 2 | 46 | June 23, 2022 | June 23, 2024 |
| 3 | 43 | June 23, 2025 | June 23, 2027 |

Appendix F, Section II.C.5 requires that:

> "No later than 15 months following the Place in Operation date for Project 1 above, DC Water shall submit to EPA and the District Post Construction Monitoring Report No.1 for the Potomac River Sewershed Projects (Potomac Report No. 1). In addition to the information required in Subsection II.B above [sic], the report shall contain DC Water's determination of the practicability of controlling at least 133 acres to the 1.2" Retention Standard in the CSO 027, 028, and 029 sewersheds by the Place in Operation deadline for Project No. 3 above based on its experience with implementing Project No. 1. Such determination shall consider the constructability, operability, efficacy, public acceptability and cost per impervious acre treated of the controls."

In addition to the Practicability Assessment, Appendix F, Section II.B, states:

> "Six months following the completion of the project's post construction monitoring program, DC Water shall submit a Post Construction Report for EPA review and comment. The Post Construction Report shall contain:
>
> 1. A comparison of planned projects under the Project Description and actual implemented projects:
>    a. Costs
>    b. Acreage treated to 1.2" retention standard
>    c. Estimate of run-off control
> 2. Identification of barriers to implementation of projects and steps taken by DC Water and the District to address any identified barriers for this and future projects
> 3. Post Construction Monitoring and Modeling Program results assessing the efficiency of the controls implemented
> 4. Changes proposed for future projects"

### 1.2.2 Rock Creek Sewershed GI Projects

The Amended Consent Decree requires that GI be constructed in the Piney Branch drainage area (CSO 049) within the Rock Creek sewershed to manage the volume of runoff produced by 1.2" of rain falling on 365 impervious acres (30% of the total impervious acres) in the sewershed. Table 1-2 lists the five Rock Creek sewershed projects required to achieve the 365 impervious acres and each project's associated schedule that are part of the Amended Consent Decree.

**Table 1-2. Rock Creek Sewershed Projects in Amended Consent Decree**

| Project No: | Impervious Acres to Control to 1.2" Retention Standard | Date to Award Contract for Construction | Date to Place in Operation |
|---|---|---|---|
| 1 | 20 | March 30, 2017 | March 30, 2019 |
| 2 | 75 | January 23, 2022 | January 23, 2024 |
| 3 | 90 | March 23, 2025 | March 23, 2027 |
| 4 | 90 | September 30, 2027 | September 30, 2029 |
| 5 | 90 | March 23, 2028 | March 23, 2030 |

As with Potomac River, Appendix F, Section II.D.7 requires submittal of a Practicability Assessment within 15 months of the place in operation date for Rock Creek Project 1 and a Post Construction Monitoring Report within 6 months after completion of post construction monitoring for Rock Creek Project No. 1.

The Practicability Assessment and Post Construction Report No. 1 for Rock Creek Green Infrastructure were submitted in June 2020.

### 1.2.3 Definition of 1.2" Retention Standard

As defined in the Amended Consent Decree, Section IV, Page 12, the "1.2" Retention Standard" is "the volume of water runoff produced by 1.2 inches of rain falling on an impervious surface." To achieve the Amended Consent Decree requirements, GI control measures are to be designed and constructed to collectively manage the required number of impervious acres to the 1.2" Retention Standard. The volume managed by individual GI control measures will be maximized within site constraints. The 1.2" Retention Standard for any particular project will be achieved by managing 1.2" over the project drainage area. Table 1-3 presents the treated impervious area requirements for each sewershed.

**Table 1-3. Impervious Area Treated Requirements**

| Sewershed | Impervious Area Treated (Acres) |
|---|---|
| CSO 049 | 365 |
| CSO 027 | 31 |
| CSO 028 | 4 |
| CSO 029 | 98 |
| **Total** | **498** |

# 2 Basis for Evaluation

This Section provides a summary of the various GI projects constructed within both the Rock Creek sewershed (Rock Creek Project No. 1) and Potomac River sewershed (Potomac River No. 1) under the Amended Consent Decree. DC Water's experience implementing these projects provides the basis for assessing the practicability of future GI implementation in the Potomac River sewershed to achieve the requirements of the Amended Consent Decree. Assessment of practicability will be discussed in Section 3. Review of the following data is included in the Basis for Evaluation Section:

- Scope of Constructed Projects
- Project Delivery Method
- Basis for Design and Construction Details
- Performance Acceptance Testing
- Improvements After Construction
- Maintenance
- Monitoring and Modeling Program
- Cost
- Public Acceptance
- Other Efforts in Support of GI
- Acres Pursuant to District's Stormwater Regulations

## 2.1 Scope of Constructed Projects

Most of the GI control measures planned and implemented by DC Water in the District were constructed in public rights of way (ROW), specifically planter strips, alleys, and roadways. These include bioretention in the planter strip between the curb and the sidewalk, bioretention as curb extensions, subsurface storage, and permeable pavement in alleys and parking lanes. A select number of controls were implemented in small public parks. Additional GI controls were implemented on private properties, specifically downspout disconnections.

Rock Creek Project No. 1 included the following: Rock Creek Project A (RC-A), Kennedy Street – GI Streetscape, GI Challenge Parks, Green Alley Partnership (AlleyPalooza), and Downspout Disconnections. Potomac River Project No. 1 included the following: Potomac River Project A (PR-A), Targeted Sewer Separation, Green Alley Partnership (AlleyPalooza), and Downspout Disconnections. A synopsis of each of these projects within Rock Creek Project No. 1 and Potomac River Project No. 1 is listed below. Table 2-2 at the end of this subsection summarizes the number of GI practices (including sewer separation) constructed for both Rock Creek Project No. 1 and Potomac River Project No. 1, followed by the number of impervious acres managed in each.

### 2.1.1 Rock Creek Project A (RC-A)

Rock Creek Project A (RC-A) was the first large scale GI project constructed in the Rock Creek sewershed by DC Water. The project area is mostly residential in nature, mainly comprised of 55 city blocks of row houses predominantly within the Brightwood Park and Manor Park neighborhoods of northwest Washington, DC. The project area is bounded by Oglethorpe Street NW and Gallatin Street NW to the north and south, respectively, and 1st Street NE and 3rd Place NW to the east and west, respectively. Refer to the Rock Creek GI Project A area as shown in Figure 2-1.

An extensive planning effort was undertaken in 2016 to identify and determine the extents of GI opportunities within the RC-A area. This planning effort was summarized in the July 2016 GI Program Plan submitted to EPA. Every block within the CSO 049 sewershed was categorized for GI feasibility using geographic information system (GIS) data and visualization. Opportunities for GI siting as well as constraints were identified. Opportunities included open space in the planting strips for bioretention siting, alleyways that were classified as being in poor to fair condition by DDOT, and locations that would receive sufficient stormwater flow to capture 1.2" of rainfall from the contributing drainage area. Constraints included large trees, density of existing utilities, width of planting strips, steep slopes, and other site conditions that would preclude or drive up the cost of GI implementation. Ultimately, average or typical block conditions were identified, and GI was conceptually sited across the entire CSO 049 sewershed to understand what density was required on a block-by-block level to confirm and understand what a full 365 acres managed by GI build-out would look like. The boundary of RC-A was ultimately delineated as the characteristics of the neighborhood closely matched the typical characteristics that were expected to be encountered through a full program build-out, as well as the density and concentration of GI placement that would ultimately achieve 365 acres managed, again in the full build-out scenario.

Other drivers for determining the extents of the RC-A project area included the location of three sites where GI implementation was already in development through the Green Infrastructure Challenge; the GI Challenge Parks located at Kansas Avenue and 3rd Street NW and Kansas Avenue and 2nd Street NW, respectively, and the Kennedy Street GI Challenge Streetscape, located on the 100 block of Kennedy Street NW. Finally, the subsurface sewer network was overlaid, and a series of distinct monitoring locations were identified so that much of the rainfall within the project boundary could be measured at select points within the sewer network.

As shown in Figure 2-2, the RC-A project consisted of the design and construction of thirty-six (36) planter bioretentions, two (2) curb extension bioretentions, eight (8) parking lane permeable pavements and thirty-one (31) alley permeable pavements implemented through a design-build process. The installed green infrastructure followed DC Water and District design standards, which were customized for site-specific sizing considerations, as well as standardized designs for a portion of the alley facilities (utilizing standard depths and check dam spacing).

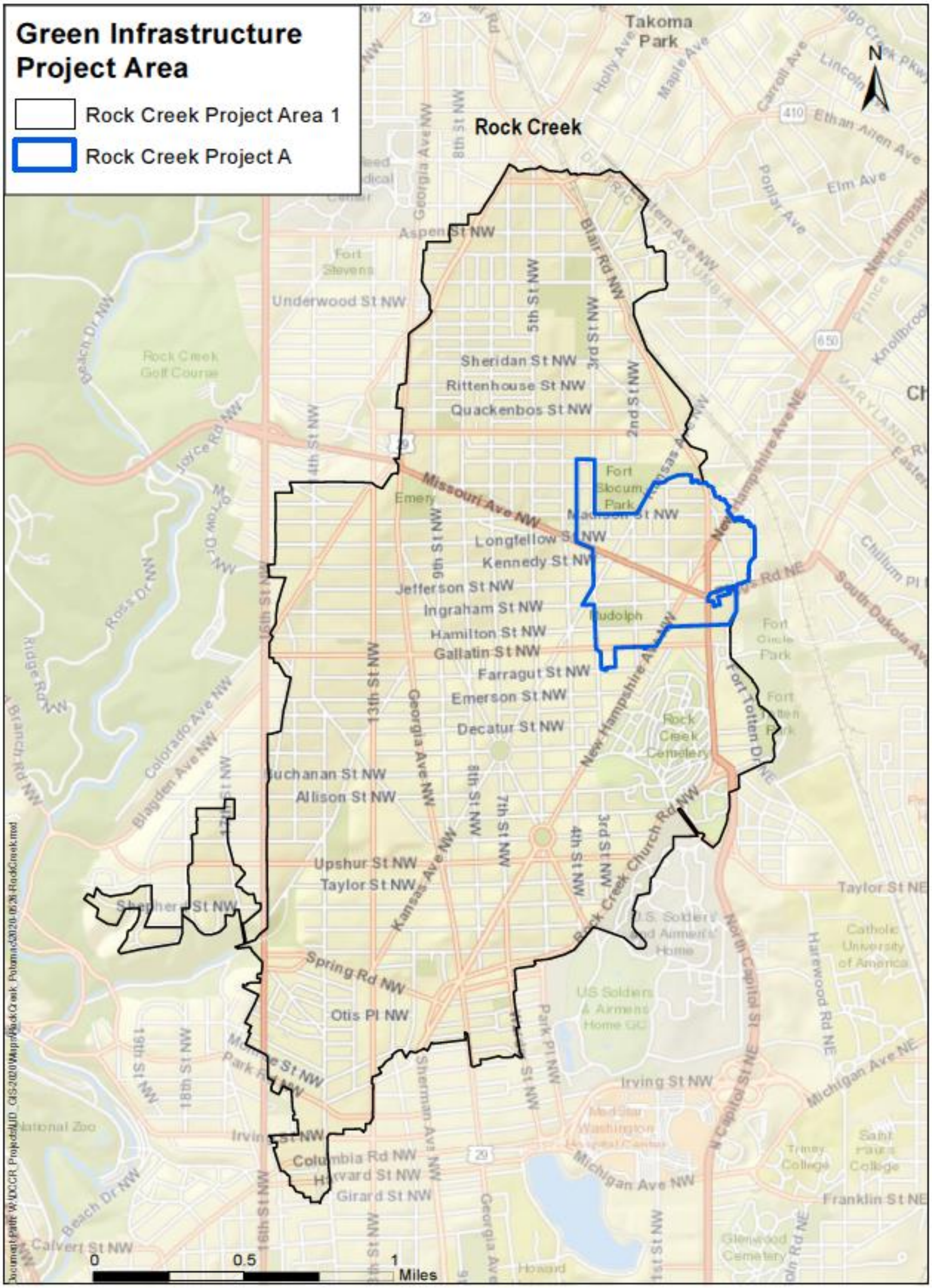



**Figure 2-1. Rock Creek Project No. 1 and Rock Creek GI Project A Areas**

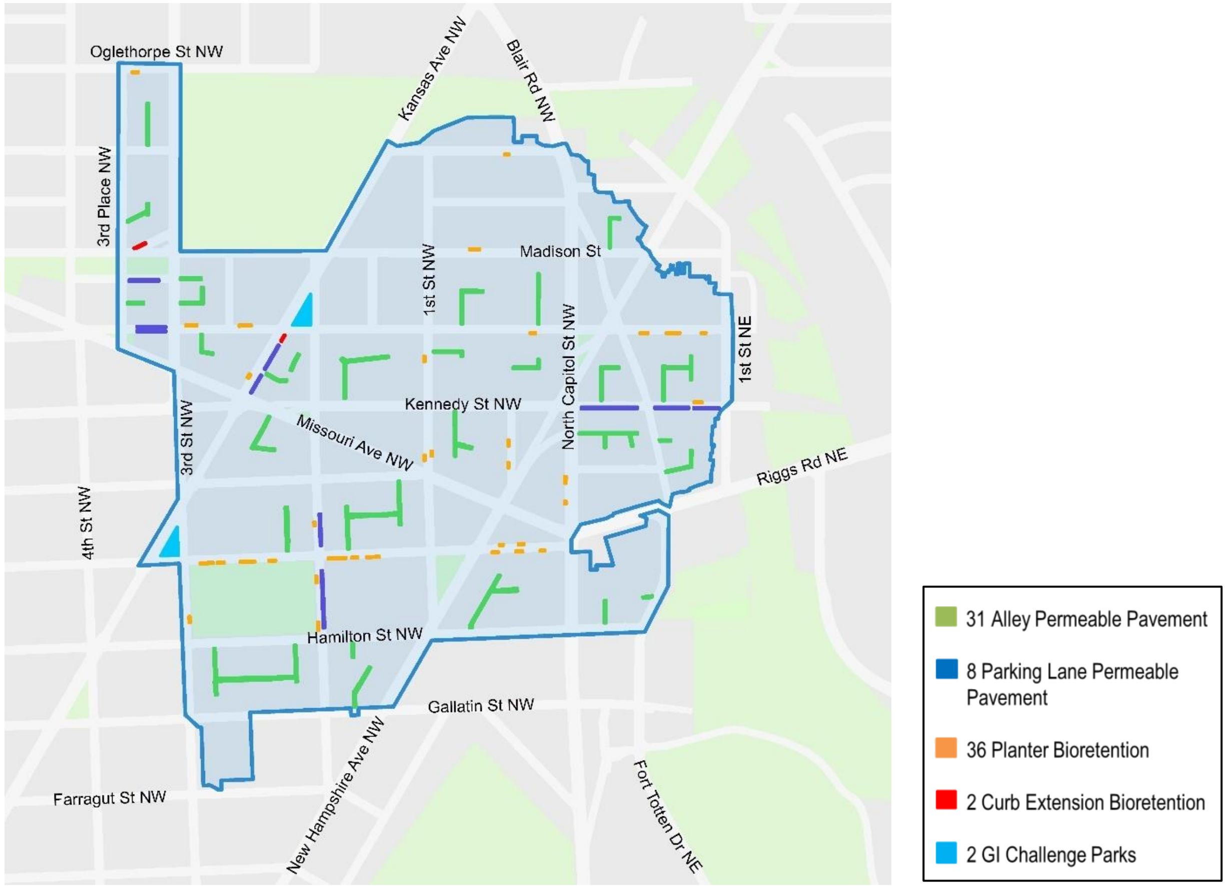



**Figure 2-2. Rock Creek Project A (RC-A) GI Practice Locations**

### 2.1.2 Kennedy Street – GI Streetscape (Rock Creek Sewershed)

In April 2013, DC Water launched the GI Challenge Streetscape Project, engaging firms to design innovative, cost effective, replicable, and high performing green infrastructure practices to be implemented on the 100 block of Kennedy Street NW, in the heart of the RC-A project area. Highlights of the design challenge are presented in Appendix C. This project was ultimately made part of the larger Kennedy Street Revitalization Project, a partnership between DC Water, the District of Columbia Mayor's Office, and the District Department of Transportation (DDOT). The GI practices implemented through this project included bioretention (rain gardens), permeable parking lanes, permeable sidewalk pavers, and landscape infiltration gaps. New street trees, traffic calming measures, and stormwater-related educational art were also included in the project. Kennedy Street was implemented utilizing a design-bid-build project delivery method and followed District GI design standards that were customized for site conditions and innovative applications of GI. The Kennedy Street GI Streetscape Project is also referred to as Rock Creek Project B (RC-B) within this report. This showcase project is a frequent stop for groups interested in learning more about DC Water’s GI program, as well as a location utilized for in-field training for local residents participating in the National Green Infrastructure Certification Program

(NGICP) training that DC Water runs in partnership with the University of the District of Columbia (Figure 2-3).


**Figure 2-3. Kennedy Street Streetscape Project Tour Stop - Bioretention**

### 2.1.3 GI Challenge Parks (Rock Creek Sewershed)

An additional aspect to the Green Infrastructure Challenge was the GI Challenge Parks Project, with highlights presented in Appendix C. The GI Challenge Parks project incorporated the same goals of the Streetscape Challenge of engaging firms to design innovative, cost effective, replicable, and high performing green infrastructure practices, but in this instance focused on implementation of GI in two triangle parks located at Kansas Avenue and 2nd Street NW and Kansas Avenue and 3rd Street NW. The two GI parks were completed in the fall of 2018 under the RC-A contract and showcase a variety of revealed stormwater management practices including bioretention facilities, porous flexible pavement, stone lined swales, as well as natural boulders for creative play, painted paths and steppingstones, pedestrian bridges, and new trees. Figure 2-2 shows the location of the two challenge parks within the Rock Creek sewershed while Figure 2-4 provides a photo of the finished park at 2nd Street NW and Kansas Avenue. Both parks were implemented utilizing a design-bid-build project delivery method and followed District GI design standards that were customized for site conditions and innovative applications of GI.

**Figure 2-4. Typical GI Park (photo)**

### 2.1.4 Potomac River Project A (PR-A) (Potomac River Sewershed)

Potomac River Project A (PR-A) was the first large scale GI project constructed in the Potomac River sewershed by DC Water. The project area includes a significant area of the Glover Park and Burleith neighborhoods and is mostly residential in nature, mainly comprised of row houses and some detached homes, with commercial areas along Wisconsin Avenue NW. The southern portion of the Potomac GI area includes Georgetown University and the Georgetown Historic District. Refer to the Potomac River Project A area as shown in Figure 2-5.

A parallel planning effort was conducted (as described above in the RC-A section) for the Potomac sewersheds 027, 028, and 029. This planning effort was summarized in the July 2016 GI Program Plan submitted to EPA. The project extents and block locations for the GI sited in PR-A within the Burleith and Glover Park neighborhoods are generally representative of typical blocks to be encountered in CSOs 028 and 029. CSO 027 corresponds with the Georgetown Historic District and contains conditions unique to that neighborhood. Initially the PR-A project area included a portion of CSO 027, however due to significant pushback from review agencies and representatives of the Historic District, the PR-A project area was reduced to focus on the Glover Park and Burleith neighborhoods in order to meet the required Amended Consent Decree schedule.

As shown in Figure 2-6, this project consisted of the design and construction of five (5) planter bioretentions (Figure 2-7), fifteen (15) parking lane permeable pavements and twenty-three (23) alley permeable pavements through a design-bid-build process. The installed green infrastructure utilized standardized designs for all the bioretention and alley facilities (utilizing standard depths, check dam spacing, etc.).

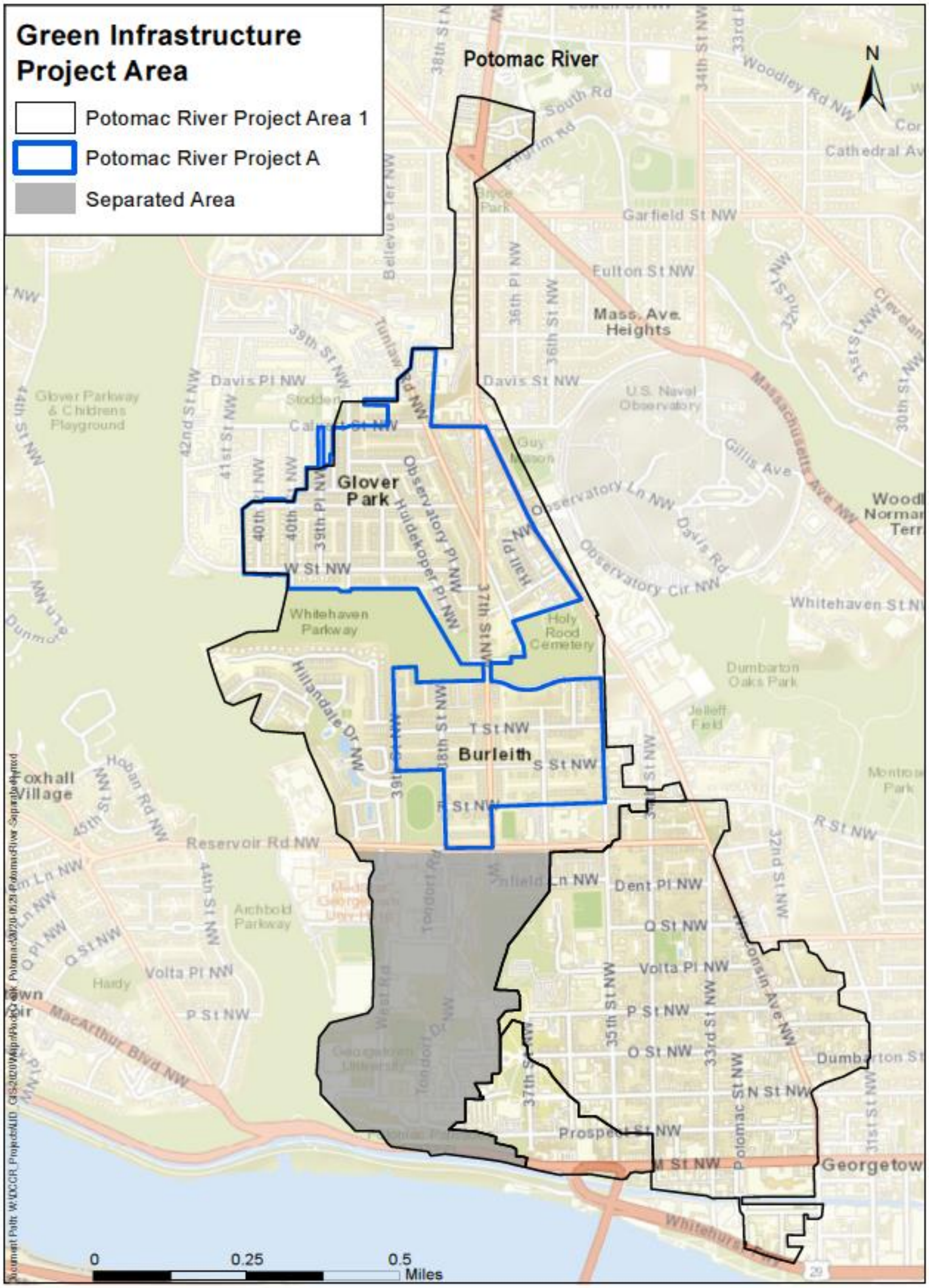



**Figure 2-5. Potomac River Project No. 1 Area and Potomac River Project A**

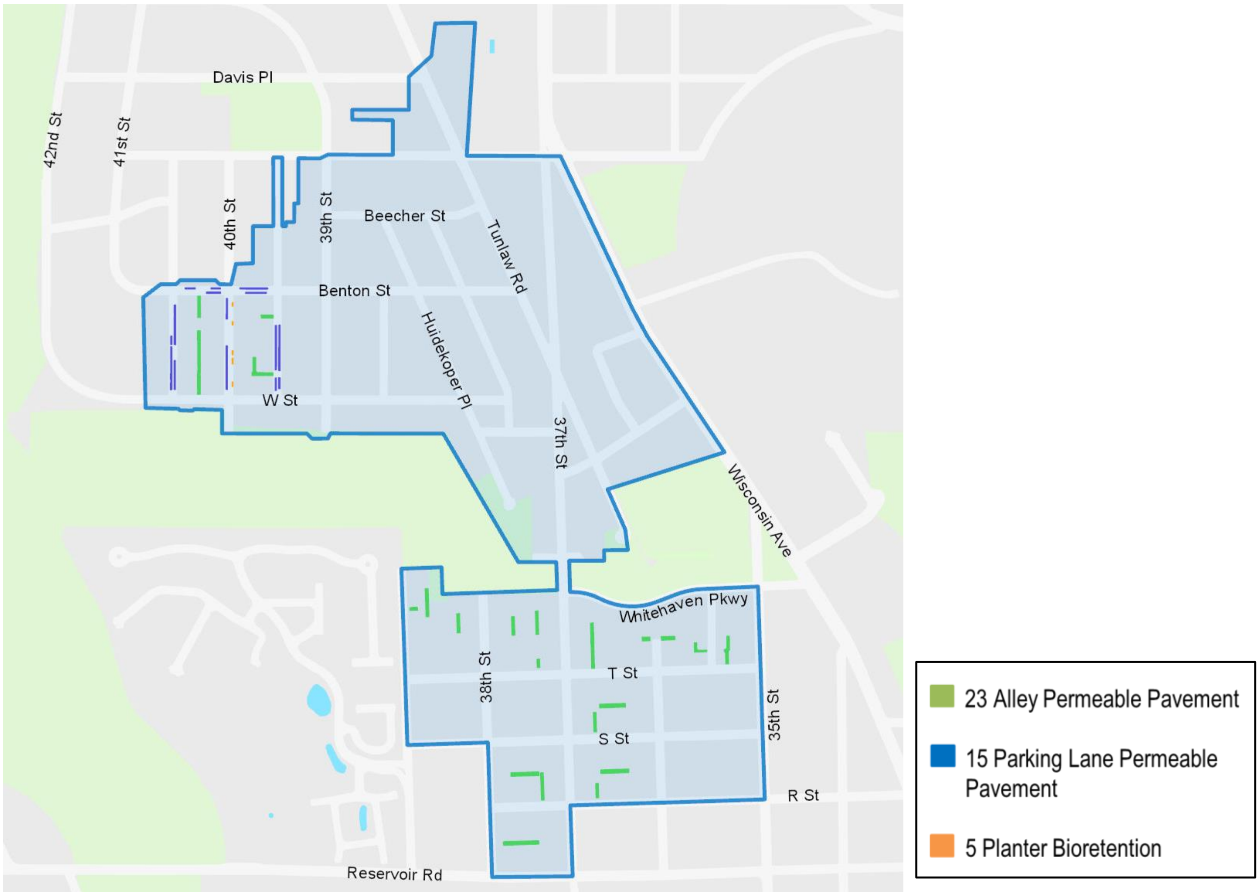



**Figure 2-6. Potomac River Project A (PR-A) GI Practice Locations**

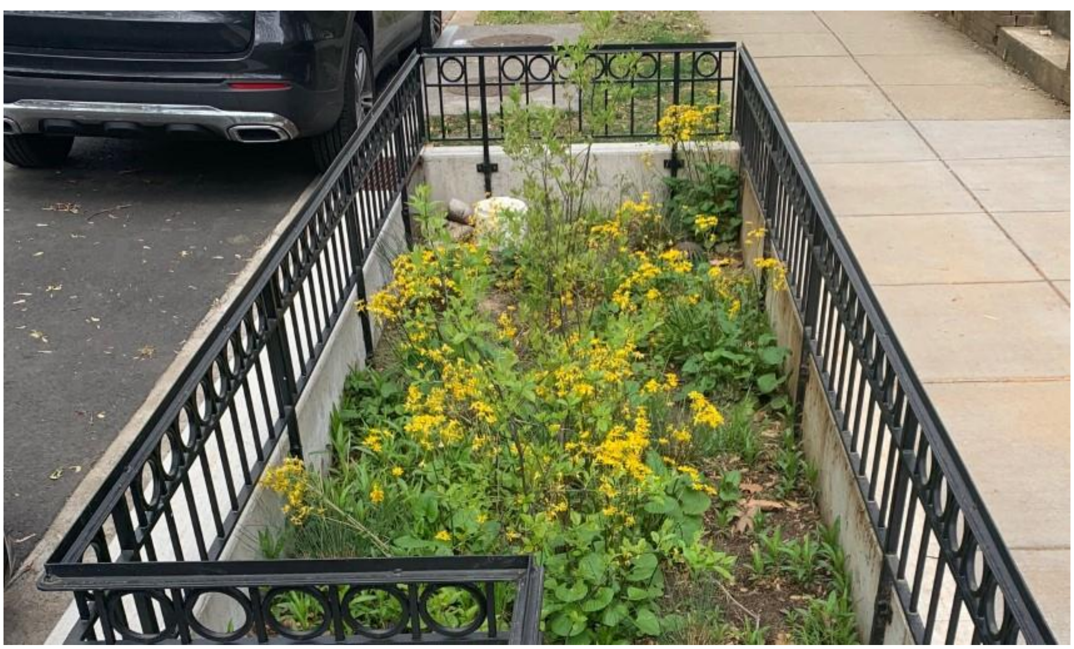


**Figure 2-7. Typical Bioretention in Potomac Sewershed (photo)**

### 2.1.5 Targeted Sewer Separation (Potomac River Sewershed)

Targeted sewer separation was planned and implemented on Georgetown University property within the Potomac River CSO 029 sewershed shown in the blue and green shaded areas in Figure 2-8. Preliminary investigations indicated that sewer separation was feasible and appeared to have been partially completed already in small areas throughout the sizable campus. Work was completed in 2018 to formally complete the separation and has eliminated combined sewers from the Georgetown University property.

The Hillandale neighborhood was redeveloped in 1980s. As part of that redevelopment, infrastructure was constructed to serve that development. However, it was unclear on the extent to which the separate sanitary and storm sewers were constructed in public and private space. Hence this area was assumed to be combined as part of CSO model development in 1999. The recent investigations which included flow monitoring and bacteria sampling were performed to ascertain the configuration of the sewers in this area.

These separated areas within the Potomac River CSO 029 sewershed, shown in Figure 2-8, manage a total of 67.5 equivalent impervious acres as tabulated in Table 2-1 below. Additional documentation on these sewer separation projects can be found in Appendix D.

**Table 2-1. Approximate Acreage in Separated Areas**

| Area | Total Acres[1] | Impervious Acres | Pervious Acres | Total Equivalent Impervious Acres[2] |
|---|---|---|---|---|
| Georgetown | 74.10 | 41.77 | 32.33 | 47.76 |
| Hillandale | 37.60 | 14.79 | 22.81 | 19.75 |
| **Total** | **111.70** | **56.56** | **55.14** | **67.5** |

[1] Total Acres = Impervious Acres + Pervious Acres

[2] Total Equivalent Impervious Acres = Impervious Acres*0.95 + Pervious Acres*0.25. 0.95 and 0.25 are the DCCR program-wide runoff coefficients for impervious and pervious areas, respectively.

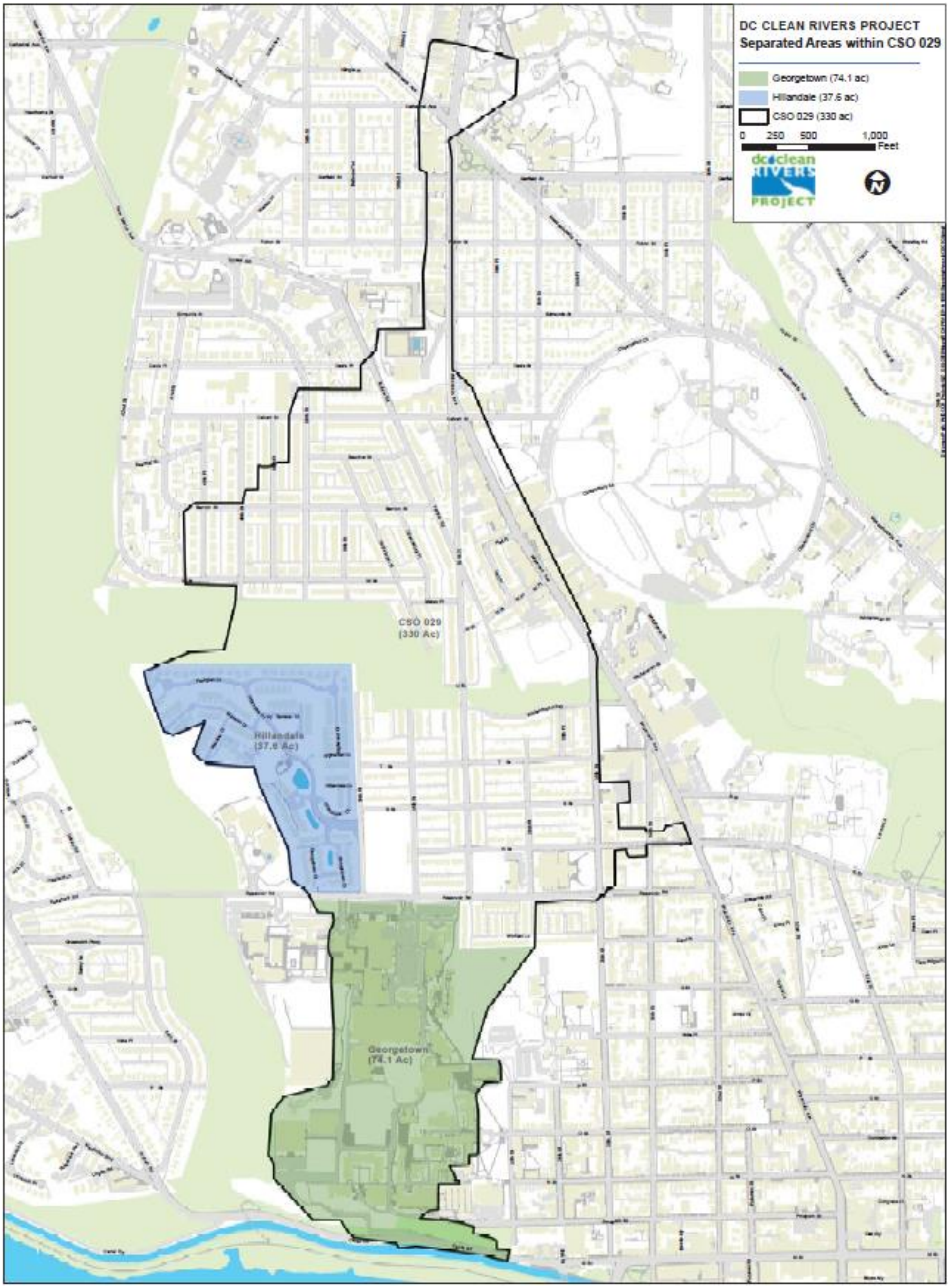



Figure 2-8. CSO 029 - Separated Areas

### 2.1.6 Green Alley Partnership (AlleyPalooza) (Rock Creek and Potomac River Sewersheds)

The AlleyPalooza Campaign is a District initiative to focus on alley replacement within the District. DC Water partnered with DDOT to construct permeable pavement alleys within the CSO areas. Figure 2-9 shows a typical alley replacement. The Green Alley Partnership constructed permeable pavement in six (6) alleys within the Rock Creek sewershed and one (1) alley within the Potomac River sewershed. DC Water utilized standard designs for all the permeable alleys (standard depths, check dam spacing, etc.) as well as a blanket permit with the District that lowered cost and expedited implementation.

**Figure 2-9. Typical Green Alley Partnership Installation (photo)**

### 2.1.7 Downspout Disconnection (Rock Creek and Potomac Sewersheds)

The first GI project boundaries in both the Rock Creek and Potomac River sewersheds (shown in the Pilot Program Areas in Figure 2-10 and Figure 2-11) contain approximately 4,436 downspouts that were observed during initial project development. Of these downspouts, approximately 36% were already disconnected from the combined sewer system, flowing across grassed or other areas rather than direct piping to the combined sewer and thereby reducing flows. Another 47% of downspouts could not be feasibly disconnected given the downspout configuration and/or site topography. The remaining downspouts could potentially be disconnected. To date, approximately 13,200 downspouts have been observed in the areas shown in Pilot Program, and 2018 and 2019 Project Areas in Figure 2-10 and Figure 2-11. Of these downspouts, approximately 58% were already disconnected from the combined sewer system. Another 27% of downspouts could not be feasibly disconnected given the downspout configuration and/or site topography. The goal was to disconnect as many downspouts as possible through public outreach with private property owners in order to increase runoff infiltration at the individual residential property, as well as increase the travel time to the nearest combined sewer inlet for any runoff that didn’t infiltrate on the resident’s property.

The downspout disconnection program is ongoing and is free to participating residents within the CSO GI areas. In addition to disconnecting downspouts, residents may also receive a rain barrel to collect rainwater for irrigating their garden or landscaping. Runoff reduction is achieved by directing rooftop flow into vegetated areas, where a portion of that flow can infiltrate into the ground. Other flow may be directed into a nearby GI practice, or eventually make it into the combined sewer system, albeit at a slower rate and reduced volume than when previously connected directly via the homeowner’s downspout and sewer connection. This program has been implemented under contract with Rock Creek Conservancy, a local non-profit. Figure 2-10 and Figure 2-11 show the project areas for both the Rock Creek and Potomac River areas, respectively.

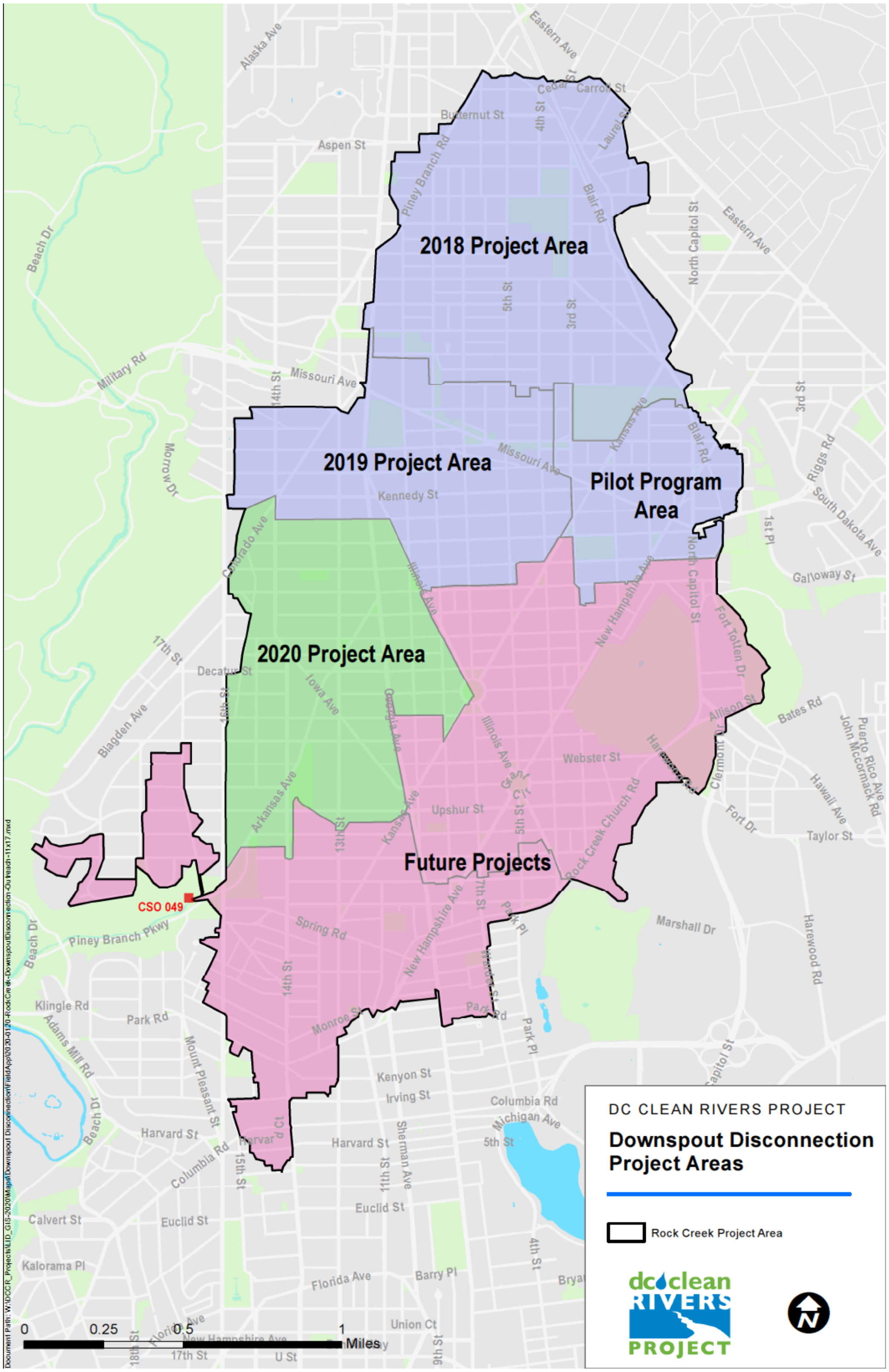



**Figure 2-10. Rock Creek Downspout Disconnect Program Locations**

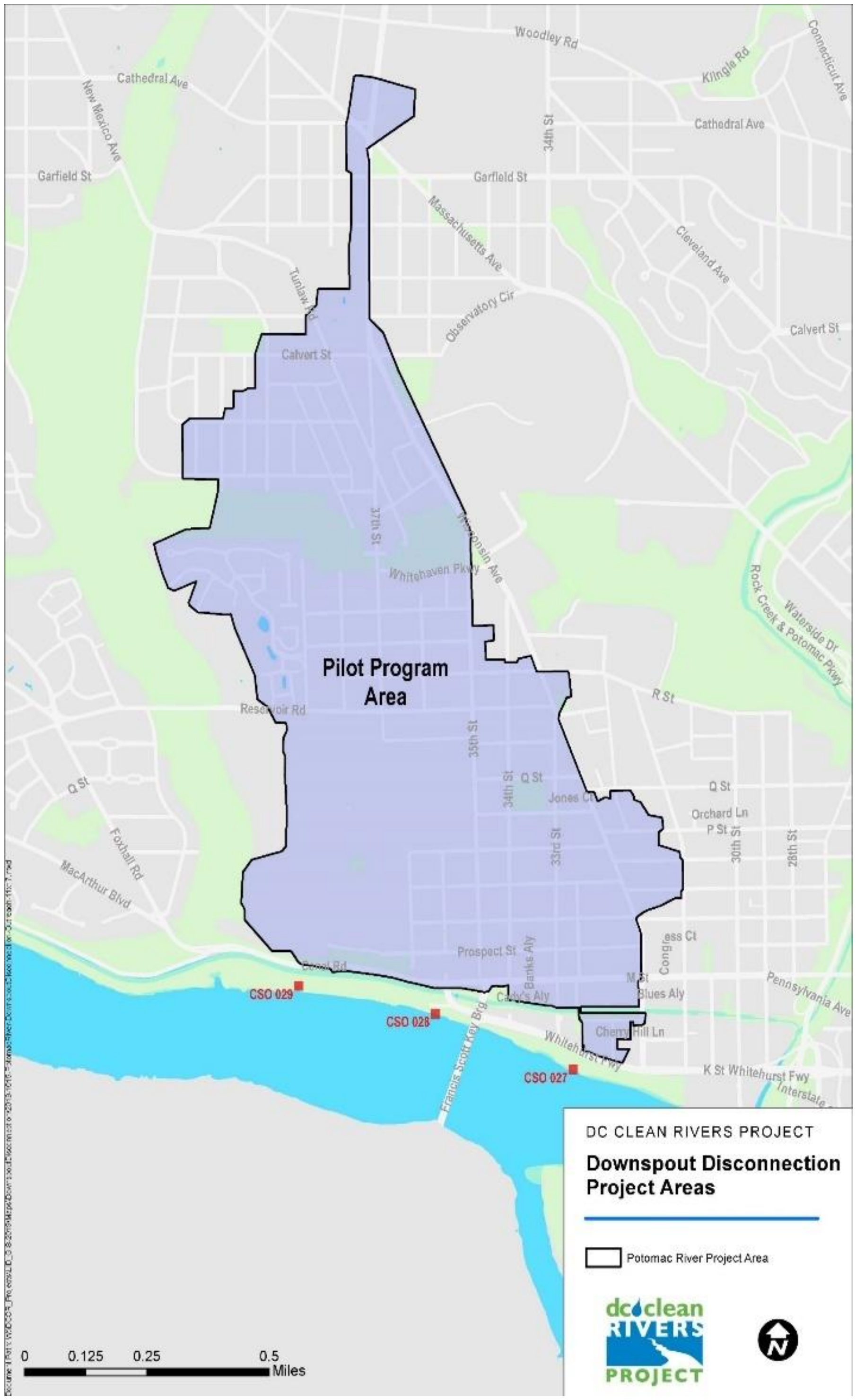



**Figure 2-11. Potomac River Downspout Disconnect Program Locations**

Table 2-2 below summarizes the number of GI practices (including sewer separation) constructed for both Rock Creek Project No. 1 and Potomac River Project No. 1, followed by the number of impervious acres managed in each.

**Table 2-2. GI Practices Constructed and Impervious Acres Managed by Project**

| Sewershed | Project | Bioretention | Permeable Pavement | Targeted Sewer Separation | Downspout Disconnect | Total |
|---|---|---|---|---|---|---|
| **Number of Projects** | | | | | | |
| Rock Creek Project 1 | RC-A | 38 | 39 | | | 77 |
| | Kennedy Street | 21 | 12 | | | 33 |
| | Challenge Parks | 2 | | | | 2 |
| | AlleyPalooza | | 6 | | | 6 |
| | Downspout Disconnect | | | | 304[1] | 304 |
| | **Subtotal Rock Creek** | **61** | **57** | **0** | **304** | **422** |
| Potomac River Project 1 | PR-A | 5 | 38 | | | 43 |
| | AlleyPalooza | | 1 | | | 1 |
| | Downspout Disconnect | | | | 58[1] | 58 |
| | **Subtotal Potomac River** | **5** | **39** | **0** | **58** | **102** |
| | **Grand Total** | **66** | **96** | **0** | **362** | **524** |
| **Impervious Acres Managed** | | | | | | |
| Rock Creek Project 1 | RC-A | 3.9 | 14.9 | | | 18.8 |
| | Kennedy Street | 1.2 | 1.5 | | | 2.7 |
| | Challenge Parks | 1.9 | | | | 1.9 |
| | AlleyPalooza | | 3.0 | | | 3.0 |
| | Downspout Disconnect | | | | 1.0 | 1.0 |
| | **Subtotal Rock Creek** | **7.0** | **19.4** | **0.0** | **1.0** | **27.4** |
| Potomac River Project 1 | PR-A | 0.3 | 7.5 | 67.5 | | 75.3 |
| | AlleyPalooza | | 0.1 | | | 0.1 |
| | Downspout Disconnect | | | | 0.2 | 0.2 |
| | **Subtotal Potomac River** | **0.3** | **7.6** | **67.5** | **0.2** | **75.6** |
| **Grand Total** | | **7.3** | **27.0** | **67.5** | **1.2** | **103.0** |

[1] Represents the number of individual downspouts disconnected

## 2.2 Project Delivery Method

As a point of comparison, DC Water utilized different project delivery methods common to the construction of GI. Table 2-3 below shows the progression of projects and the delivery method utilized for each.

**Table 2-3. Project Timeframe and Delivery Method**

| Project | Timeframe | Delivery Method |
|---|---|---|
| Rock Creek Project A (RC-A) | 2016 | Design-Build |
| AlleyPalooza | 2017 | IDIQ |
| Kennedy Street | 2016 | Design-Bid-Build |
| Challenge Parks | 2016 | Design-Bid-Build |
| Potomac River Project A (PR-A) | 2018 | Design-Bid-Build |

The Rock Creek Project A used a Design-Build approach. This method allowed DC Water to capitalize on the time saving benefits for this approach. Since a single procurement process was utilized, construction could begin on GI practices as designs were completed. To take advantage of the Design-Build process, the design was split into three construction packages, allowing each to be released for construction at varying times. The Design-Build team utilized custom designs for all the bioretention and parking lane permeable pavement facilities, and initially as well for the alley permeable pavement facilities. Alleys shifted to a standard design as DC Water worked with DDOT and the District Department of Energy and Environment (DOEE) to standardize alley permeable pavement facilities, which were utilized beginning in 2017 for RC-A.

For Kennedy Street, Challenge Parks and Potomac River Project A, DC Water utilized the more traditional Design-Bid-Build process. This provided a greater opportunity for DC Water input and review of the projects. While Kennedy Street and the Challenge Parks utilized a customized design approach, PR-A used standardized designs for all the GI practices.

Since the Green Alley Partnership (AlleyPalooza) was administered by DDOT, DC Water provided funding to DDOT to build permeable pavement alleys within the CSO area. DDOT utilized an indefinite delivery/indefinite quantity (IDIQ) contract that enabled DC Water to know the cost of the GI practice broken down on a unit price basis. This provided a high level of cost detail to DC Water that continued to inform and drive cost reduction strategies for the program.

## 2.3 Basis for Design and Construction Details

In preparation for program implementation, DCCR began a process of creating GI design standards during the fall of 2014 specifically tailored for CSO control. The DCCR GI Design Standards were first published in 2015 to supplement the current District standards for GI and build upon DC Water's existing GI Utility Protection Guidelines that were released in 2013. District standards, developed by DDOT and DOEE, provided comprehensive guidance for siting, designing, constructing, and maintaining all types of GI, including bioretention, permeable pavement, and impervious surface removal and disconnection. However, these standards were not designed specifically for CSO control, so refinements to the guidelines were necessary to address CSO volume considerations and optimize performance accordingly. Table 2-4 represents DC Water's GI Design parameters used both in RC-A and PR-A designs. A description of how GI practices were optimized for storage and CSO reduction follows the table.

**Table 2-4. GI Design Parameters**

| Description | | Rock Creek Project A | Potomac River Project A |
|---|---|---|---|
| **Design Guidelines** | | | |
| ***Runoff Volume*** | Minimum | 0.8" | 0.8" |
| | Maximum | 1.7" | 1.7" |
| ***Contributing Drainage Area (CDA)*** | Bioretentions | No. min | 10% |
| | Permeable Pavements | 3:1 | 10:1 |
| ***Underdrains*** | All Facility Types | As required | Yes |
| **Planter Bioretention** | | | |
| ***Facility Length (ft.)*** | Minimum | 10 ft. | 10 ft. |
| | Maximum | 35 ft. | No maximum |
| | Increments | 1 ft | 1 ft |
| ***Facility Width (ft.)*** | Minimum | 2.5 ft | 2.5 ft |
| | Maximum | Not to exceed existing | Not to exceed existing |
| **Curb Extension Bioretention** | | | |
| ***Facility Length (ft.)*** | Minimum | 20 ft. | 10 ft. |
| | Maximum | Limited to replace 1 parking space (20 feet) per street within block. | No impacts to parking |
| | Increments | 1.0 ft. | 0.5 ft |
| ***Facility Width in roadway (ft.)*** | Minimum | 4 ft.; intervals of 1 ft. | 4 ft.; intervals of 1 ft. |
| | Maximum | 8 ft. | 8 ft. |
| **Sidewalk Storage (Planter/Curb Extension)** | | | |
| ***Facility Length (ft.)*** | Criteria | Based on adjacent facility and site constraints | Based on adjacent facility and site constraints |
| ***Facility Width (ft.)*** | Minimum | 1.25 ft. | 1.25 ft. |
| | Maximum | Based on site constraints | Based on site constraints |
| **Alley Permeable Pavement** | | | |
| ***Facility Length (ft.)*** | Minimum | 40 ft. | No minimum |
| | Maximum | Based on site constraints | Based on site constraints |
| ***Facility Width (ft.)*** | Minimum | 3 ft. | 3 ft. |
| | Maximum | Match existing alley | Match existing alley |
| **Parking Lane Permeable Pavement** | | | |
| ***Facility Length (ft.)*** | Minimum | 40 ft. | No minimum |
| | Maximum | Based on site constraints | Based on site constraints |
| ***Facility Width (ft.)*** | Minimum | No minimum | No minimum |
| | Maximum | Match existing parking lane | Match existing parking lane |

### 2.3.1 Standard Design Elements

The primary GI control measures that were made part of the DC Water GI Program include the following:

- **Bioretention facilities** are depressed, landscaped basins that allow stormwater to collect and infiltrate through soils to an aggregate storage layer for temporary storage. These control measures may allow infiltration of water into the surrounding soil. In cases where full infiltration is not feasible within a reasonable timeframe, underdrains can slowly release flow back into the sewer system.

- **Permeable pavement facilities** replace impervious, traditional paving surfaces with materials that provide the necessary structural support for vehicles and pedestrians while allowing rainfall to infiltrate into the underlying aggregate storage layer for temporary storage. Like bioretention, these control measures may allow groundwater recharge through infiltration but where full infiltration is not feasible within a reasonable timeframe, underdrains can slowly release flow back into the sewer system.

Standard design elements for each of these facility types were developed to provide uniformity across the GI practices, allowing for a more streamlined design and construction process. Some of these elements included underdrain configuration, check dam spacing, and storage layer depth as shown in Figure 2-12 and Figure 2-13 on the following page.

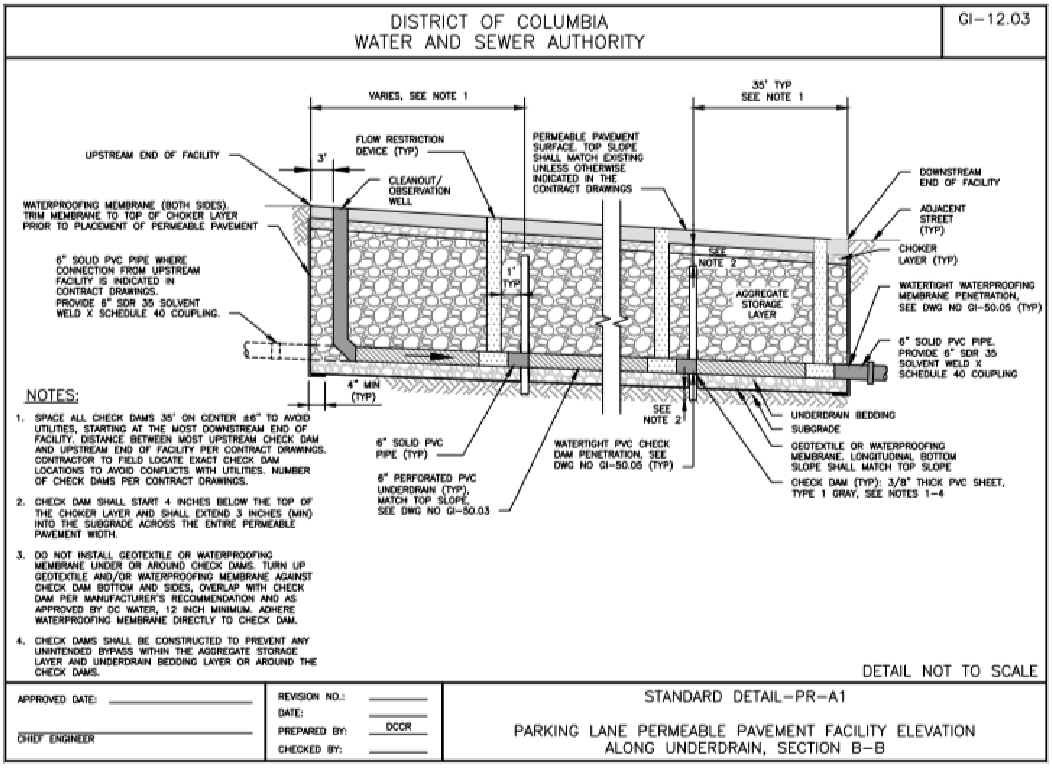



**Figure 2-12. Typical Permeable Pavement Section**

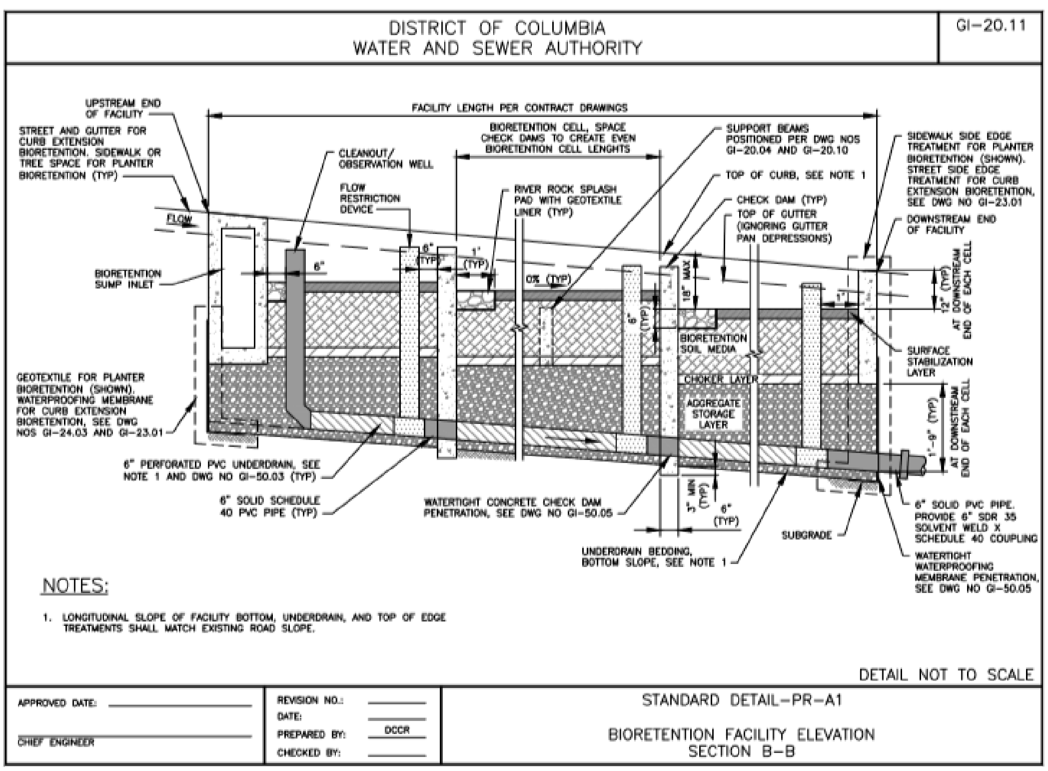



**Figure 2-13. Typical Bioretention Section**

### 2.3.2 CSO Volume Control Design Elements

Key criteria for the development of the DCCR GI standards included optimized volume capture, cost effectiveness, delivery of triple bottom line benefits, long-term performance, and ease of maintenance. Most specifically, two key elements were included in the DCCR standard GI details to maximize CSO volume control. These were the addition of Enhanced Infiltration Risers (EIR) within bioretention facilities and Flow Restriction Devices (FRD) in all GI practices.

Enhanced Infiltration Risers were designed to deliver stormwater directly to the storage layer of the bioretention when the rate of water entering the GI practice was greater than the soil media could infiltrate. Since stormwater volume capture is the main driver in DC Water's GI program to reduce CSOs, the EIRs were installed just above the ponding elevation to increase the volume of water captured both at the surface to promote treatment, and within each cell of the facility by providing an alternative means of water reaching open storage capacity in the aggregate layer.  The addition of the EIR also reduces the bypassing of flows during larger storm events, helping to maximize the bioretention's performance. A detail of the EIR is shown in Figure 2-14.

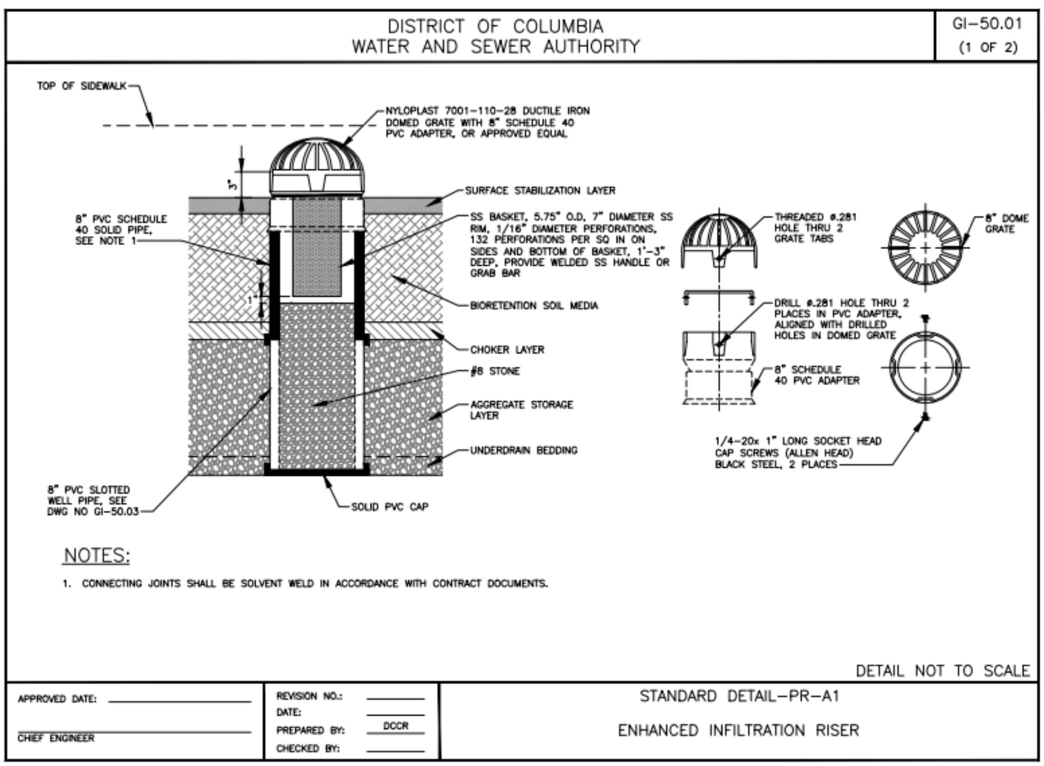



**Figure 2-14. Enhanced Infiltration Riser Standard Detail**

Flow Restriction Devices were designed to restrict flow between cells separated by a check dam within a facility and/or through the GI practice underdrain system before stormwater reenters the Combined Sewer System (CSS) and to better utilize more of the GI storage volume during a typical storm. The FRD utilized a flapper style gate (shown in Figure 2-15) fitted with an orifice sized to retain water within the GI practice with a target of 48-hours per the design guidance. For bioretention facilities, the FRD access riser sits above the ponding elevation and is fitted with a solid PVC cap. In permeable pavement facilities, the FRD access riser sits below the finished surface and is protected with a solid cast iron cover. A detail of an FRD found in a bioretention is shown in Figure 2-16. A full copy of the DCCR GI design details is provided in Appendix E.

**Figure 2-15. Flow Restriction Device – Flapper Style**

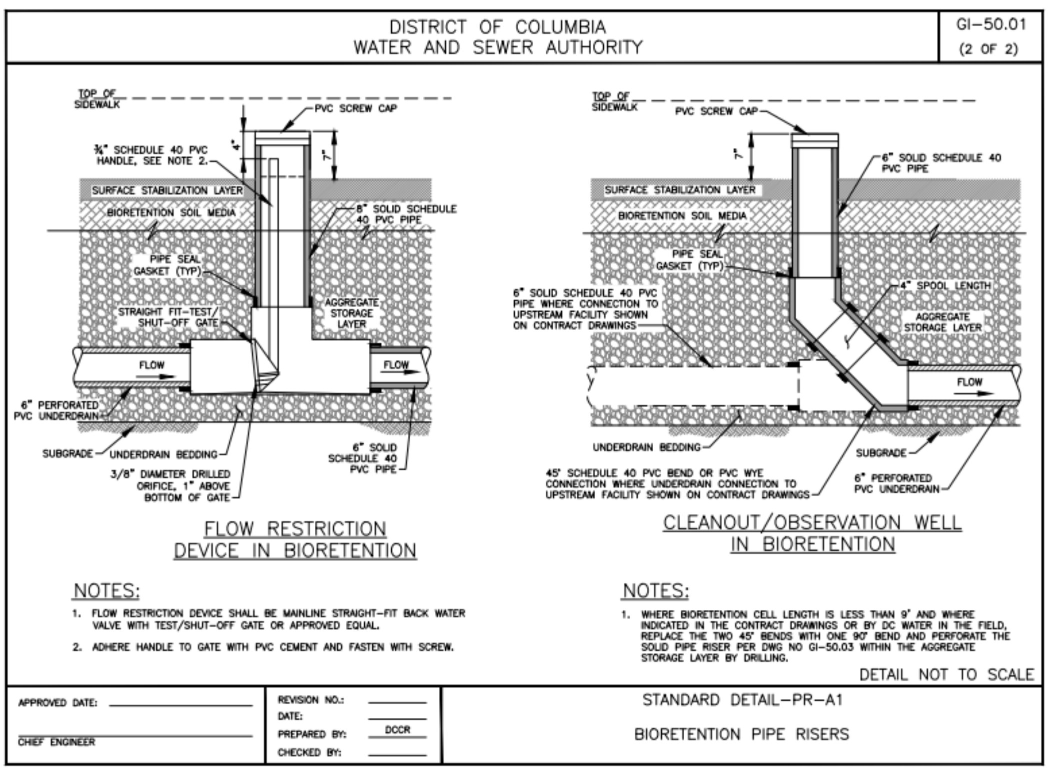



**Figure 2-16. Flow Restriction Device Standard Detail**

## 2.4 Performance Acceptance Testing

As part of the construction contracts, GI practices were tested to determine if the requirements of the design specifications were met. Each facility underwent two specific tests to determine compliance prior to acceptance by DC Water.

The first test was to verify the surface infiltration rate. For bioretention facilities, an infiltration rate of no less than 1" per hour (in/hr) was required through the soil media. The bioretention surface was flooded up to the enhanced infiltration riser elevation. Water levels were recorded every fifteen (15) minutes until the water level within the bioretention ponding layer reached zero (the surface of the bioretention). The infiltration rate of the facility was then calculated using the following formula.

$$\boldsymbol{Infiltration\ Rate}\ \left(\frac{\boldsymbol{in}}{\boldsymbol{hr}}\right) = \frac{\boldsymbol{Total\ Water\ Elevation\ Change}\ (\boldsymbol{in})}{\boldsymbol{Total\ Drawdown\ Time}\ (\boldsymbol{hr})}$$

For permeable pavement facilities (both parking lane and alley) a minimum surface infiltration rate of sixty (60") inches per hour was required. A ring test following ASTM C1701 standards was conducted to determine the infiltration rate. The surface infiltration rate of the facility was calculated using the following formula.

$$\boldsymbol{Infiltration\ Rate}\ \left(\frac{\boldsymbol{in}}{\boldsymbol{hr}}\right) = \frac{\boldsymbol{K}(\boldsymbol{constant}) * \boldsymbol{M}(\boldsymbol{mass\ of\ water})}{\boldsymbol{D}^{2}(\boldsymbol{in}) * \boldsymbol{t}(\boldsymbol{sec})}$$

The second test was to verify that the facilities held water while also draining in no more than 48 hours through a flood test. Each facility was filled and monitored over a 48-hour period to ensure the water retained in the facility either infiltrated into the subsurface soils or was released back into the CSS via the underdrain system.

Prior to final acceptance by DC Water, each facility was required to pass these performance tests.

## 2.5 Improvements Made After Construction (Retrofits)

To improve the stormwater capture of the GI practices, DC Water made several retrofits to each facility shortly after completion of the RC-A, PR-A, and Green Alley Partnership (AlleyPalooza) projects. Within a few months of operation, it was observed, as well as detected in the metering data, that GI practices were releasing water back into the CSS at a higher rate than what was noted during the performance testing and specified in the design. The seal on the flapper style gates (Figure 2-15 above) began to fail, allowing higher volumes of water to be released faster than the target drawdown rate of 48-hours. To correct this issue, the FRD flapper gates in all GI practices were replaced with either a mechanical plug (Figure 2-17) or a straight fit gate (Figure 2-18), both with orifices. Mechanical plugs were installed in the most downstream end of the facility, while the straight fit gates were installed in all the upstream cells. This permits maintenance crews to easily remove the gates when flushing the underdrain systems, where the most downstream cell is used as a sump to collect the sediment to be pumped out. This retrofit allows water to be retained longer within the facility to reach the target drawdown time of 48-hours per the design guidance.

**Figure 2-17. Flow Restriction Device - Mechanical Plug**

**Figure 2-18. Flow Restriction Device - Straight Fit Gate**

In addition, during high intensity storm events, stormwater runoff was observed to be flowing down the center of the permeable pavement alley and out of the drainage area when adequate storage was still available in the subsurface. To increase the volume of water entering each cell of the facility, FRD access solid cast iron lid covers within Alley Permeable Pavement facilities of the RC-A, PR-A, and AlleyPalooza projects were replaced with slotted cast iron grate covers, and a stainless-steel filter basket inserted into the riser pipe to protect the facility from sedimentation and debris. This modification has increased the volume of water reaching the aggregate storage, similar to the EIRs in the bioretention practices, and thereby reduced the bypassing of flows during larger storm events.

## 2.6 Maintenance

DC Water is responsible for maintaining the GI control measures in accordance with DC Water's National Pollutant Discharge Elimination System (NPDES) Permit. For GI control measures in the public ROW, access for inspection, maintenance and monitoring is included in the annual blanket permit from DDOT for maintenance and access to water and sewer lines and manholes. Maintenance of GI control measures in the public ROW is coordinated among DDOT, Department of Public Works (DPW) and DC Water, but ultimately falls on DC Water to perform.

DC Water's established maintenance goals related to the performance, safety and aesthetics of the GI measures are as follows:

- Ensure GI function and performance to meet DC Water's water quality goals and Amended Consent Decree requirements;
- Ensure public and maintenance crew safety;
- Ensure original GI project aesthetic goal(s); and
- Ensure public use of the ROW, preservation of public infrastructure, protection of public and private properties, and minimization of nuisance conditions.

### 2.6.1 Maintenance Activities and Frequency

In Table 2-5 on the following page, a selection of typical maintenance activities is summarized for each of the project's bioretention and permeable pavement practices. Maintenance crews submit monthly reports indicating work performed, and if corrective actions are necessary. Verification inspections are performed monthly by DC Water asset management staff to confirm maintenance activities required that period were performed to the degree and frequency necessary to achieve the CSO control performance objectives. Inspection and maintenance measures and frequencies continue to be adjusted through an adaptive management approach based on ongoing experience observing and maintaining the GI practices.

**Table 2-5. Typical Maintenance Activities for Permeable Pavement and Bioretention**

| Project/Facility Type | Frequency | Maintenance Activities |
|---|---|---|
| Kennedy Street - Streetscape Bioretentions | Monthly | Trash, weed, leaves, debris, and dead plant removal. Inspect for erosion. Check for missing signs. Remove sediment. Inspect cleanout, underdrains, and dry well grate inlets and note any standing water. |
| Kennedy Street - Streetscape Pervious Pavement | Monthly | Removal of trash, leaves, sediment, and debris. Inspect, remove by hand, vacuum, and sweep between pavers. Replace void filler aggregate as needed. |
| | Annually | Inspect the surface and underdrain system by flushing to verify flow and exfiltration. Repair any damaged or displaced pavers. |
| Rock Creek Project A (RCA) Bioretentions | Monthly | Trash, weed, leaves, debris, and dead plant removal. Inspect for erosion. Check for missing signs. Remove sediment. Inspect cleanout, underdrains, and dry well grate inlets and note any standing water. |
| | Quarterly | Inspection of system for hydraulic function, mitigation of clogging. Replace gravel or river rock in eroded areas. |
| | Annually | Trim grasses and perennials, prune shrubs. |
| Rock Creek Project A (RCA) Pervious Pavement | Monthly | Vacuum sweeping and remove debris from enhanced infiltration baskets. Inspection and removal of trash, leaves, sediment, and weeds. |
| | Quarterly | Inspect structures for blockages and sediment and inspection and correction of settlement or heaving. |
| | Annually | Inspect the surface and underdrain system by flushing to verify flow and exfiltration. Repair any damaged or displaced pavers. |
| GI Challenge Parks | Monthly | Trash, weed, leaves, debris, and dead plant removal. Inspect and remove debris and sediment from all structures. Treat vegetation for any disease and pest problems. Turf area mowing and watering vegetation frequency is variable. |
| | Quarterly | Inspect and replace mulch or river rock in eroded areas. |
| | Bi-Annually | Inspection of system for hydraulic function, mitigation of clogging. |
| | Annuallly | Trim grasses and perennials, prune shrubs. |
| Green Alley Partnership (AlleyPalooza) Pervious Pavement | Monthly | Removal of trash, leaves, sediment, and debris. Inspect, remove by hand, vacuum, and sweep between pavers. Replace void filler aggregate as needed. |
| | Quarterly | Inspection of system for water flow and removal of any clogging. Inspect cleanouts, observation wells, and underdrains for blockages. Inspection and corrrection of settlement and heaving. |
| | Bi-Annually | Inspection and removal of leaves and weeds. |
| | Annually | Inspection and cleanout of system piping. |

**Table 2-5. Typical Maintenance Activities for Permeable Pavement and Bioretention (Cont.)**

| Project/Facility Type | Frequency | Maintenance Activities |
|---|---|---|
| Potomac River Project A-1 (PRA-1) Bioretentions | Monthly | Inspect flow restriction devices, enhanced infiltration baskets, cleanouts, and ponding areas for standing water. Removal of trash, leaves, weeds, debris, dead plants, and sediment. Inspect and remove all sediment and blockages from inlet/outlet structures. |
| | Quarterly | Inspection of system for hydraulic function, mitigation of clogging. Replace gravel or river rock in eroded areas. |
| | Annually | Trim grasses and perennials, prune shrubs. |
| Potomac River Project A-1 (PRA-1) Pervious Pavement | Monthly | Inspect flow restriction devices, cleanouts, and enhanced infiltration baskets. Vacuum sweep pavement and inspect system for flow for any heaving or settlement in pavement. |
| | Quarterly | Inspection of system for water flow and removal of any clogging. Inspect cleanouts, observation wells, and underdrains for blockages. Inspection and corrrection of settlement and heaving. |
| | Bi-Annually | Inspection and removal of leaves and weeds. |
| | Annually | Inspection and cleanout of system piping. |

### 2.6.2 Initial Warranty and Maintenance Periods

As part of the construction contracts, the contractor was obligated to maintain completed facilities through the duration of the contract until the facilities were turned over to DC Water at contract Final Completion. For the RC-A project only, the contractor was responsible for a contractually obligated 1-year initial maintenance period after substantial completion. For all other GI projects, DC Water took over maintenance responsibilities following final acceptance and completion. Currently all GI maintenance is being performed under contract.

DC Water continues to evaluate potential changes to the maintenance program such as optimizing contract requirements and maintenance frequencies based on accumulated field observations and experience. In addition, DC Water is considering the option of self-performing GI maintenance with internal DC Water maintenance crews. Considerations such as costs, availability of necessary labor and experience, job creation, public outreach, and legal requirements will be carefully reviewed prior to any substantial changes to the current approach.

## 2.7 Monitoring and Modeling Program

This Section describes the monitoring and modeling programs for various project areas constructed by DC Water to evaluate the effectiveness of GI in the District. A brief modeling background and terminology is explained here for informational purpose.

A storm water management model (SWMM) developed by integrating DC Water's InfoWorks model elements was used for modeling the green infrastructure (GI). The model represents GI practices by combining all practices of a given practice type (alley permeable pavement, parking lane permeable pavement, bioretention practices) into one single practice per type per model subshed. A schematic of this "lumped practice" modeling approach is shown in Figure 2-19. The red block in the figure represents lumped GI.

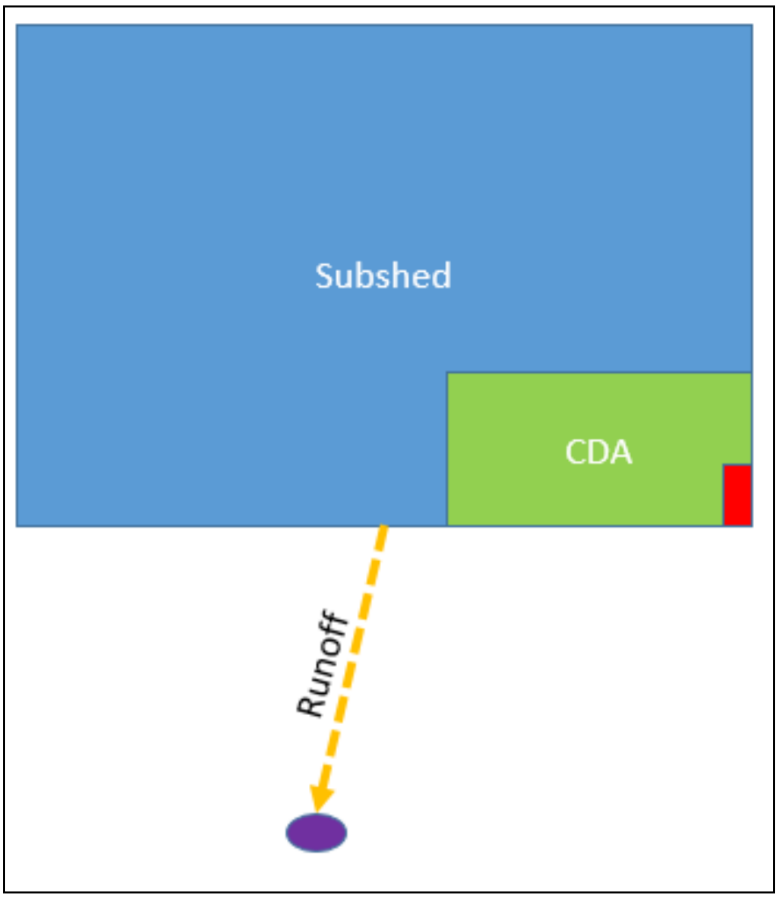



**Figure 2-19. Lumped Practice Modeling Approach**

A model calibration is an iterative process to adjust the model parameters until a reasonable match is achieved in the wet weather volume and peaks between model predictions and observed metered data. In a 1-to-1 plot between model prediction and metered data under an ideal scenario, the model predictions will perfectly match the metered data and all events would line up along the 1- l line with the R-squared value 1.00.

### 2.7.1 PR-A Monitoring and Modeling Program

This section provides an overview of the PR-A monitoring program. A detailed model documentation report along with the calibration plots are provided as Appendix F.

Table 2-6 provides an overview of all monitoring and modeling timeframes for pre- and post-construction monitoring efforts.

**Table 2-6. PR-A Monitoring Schedule**

| Monitoring Type | Timeframe | Model Description | Total Rainfall (in) |
|---|---|---|---|
| Rainfall Monitoring | 2/5/16 – 4/23/20 | For Pre-Construction Period: 2/5/16 – 2/4/17<br>For Post-Construction Period: 4/16/19 – 4/23/20 | |
| Pre-Construction Monitoring - Sewershed | 2/5/16 – 2/4/17 | Entire monitoring period served as calibration period | 28.3 |
| Post-Construction Monitoring – Sewershed | 4/16/19 – 4/23/20 | Entire monitoring period served as calibration period | 43.08 |
| Post-Construction Monitoring – GI Practice | 11/14/19 – 4/23/20 | Comparison of modeled WLs with practice-specific WL data. | 16.88 |

The sewershed monitoring locations are tabulated in Table 2-7 and shown in Figure 2-20. There are two outlets from PR-A, with interconnections between them, that were monitored by meters 029-5 and 029-6 during both pre- and post-construction periods. Those two meters' flows were summed for model calibration. There are also two upstream meters with interconnections, 029-1 and 029-2, which were also summed for calibration.

The combined 029-1 and 029-2 area covers 33 acres and is 50% impervious. The combined 029-5 and 029-6 area (overall PR-A area) consists of 190 acres and is 46% impervious. The installed green infrastructure practices consist mostly of pervious pavers, with only a few bioretention cells. About 40% of the GI practices are concentrated in the 029-1- and 029-2-meter sheds, with the remainder in the 029-5 and 029-6 meter sheds.

**Table 2-7. PR-A Flow Meters**

| Meter | Purpose / Usage | Drainage Area (ac) | Pre-Construction | Post-Construction |
|---|---|---|---|---|
| PR-A 029-1 | Quantify runoff from a specific group of GI practices | 33.4 | YES | YES |
| PR-A 029-2 | Quantify runoff from a specific group of GI practices | | YES | YES |
| PR-A 029-3 | Quantify runoff from a specific area[1, 2] | 22.7 | YES | YES |

| Meter | Purpose / Usage | Drainage Area (ac) | Pre-Construction | Post-Construction |
|---|---|---|---|---|
| PR-A 029-4 | Quantify runoff from a specific area[1, 2] | 40.5 | YES | YES |
| PR-A 029-5 | Quantify total flows in PR-A area | 190.0 | YES | YES |
| PR-A 029-6 | Quantify total flows in PR-A area | | YES | YES |

[1]Internal Meter, not used for this study due to inconsistencies in flows from pre- to post-construction periods, as well as absence of GI practices within these meter sheds

[2]Meter not used for this study due to overlapping drainage area size or data quality issues

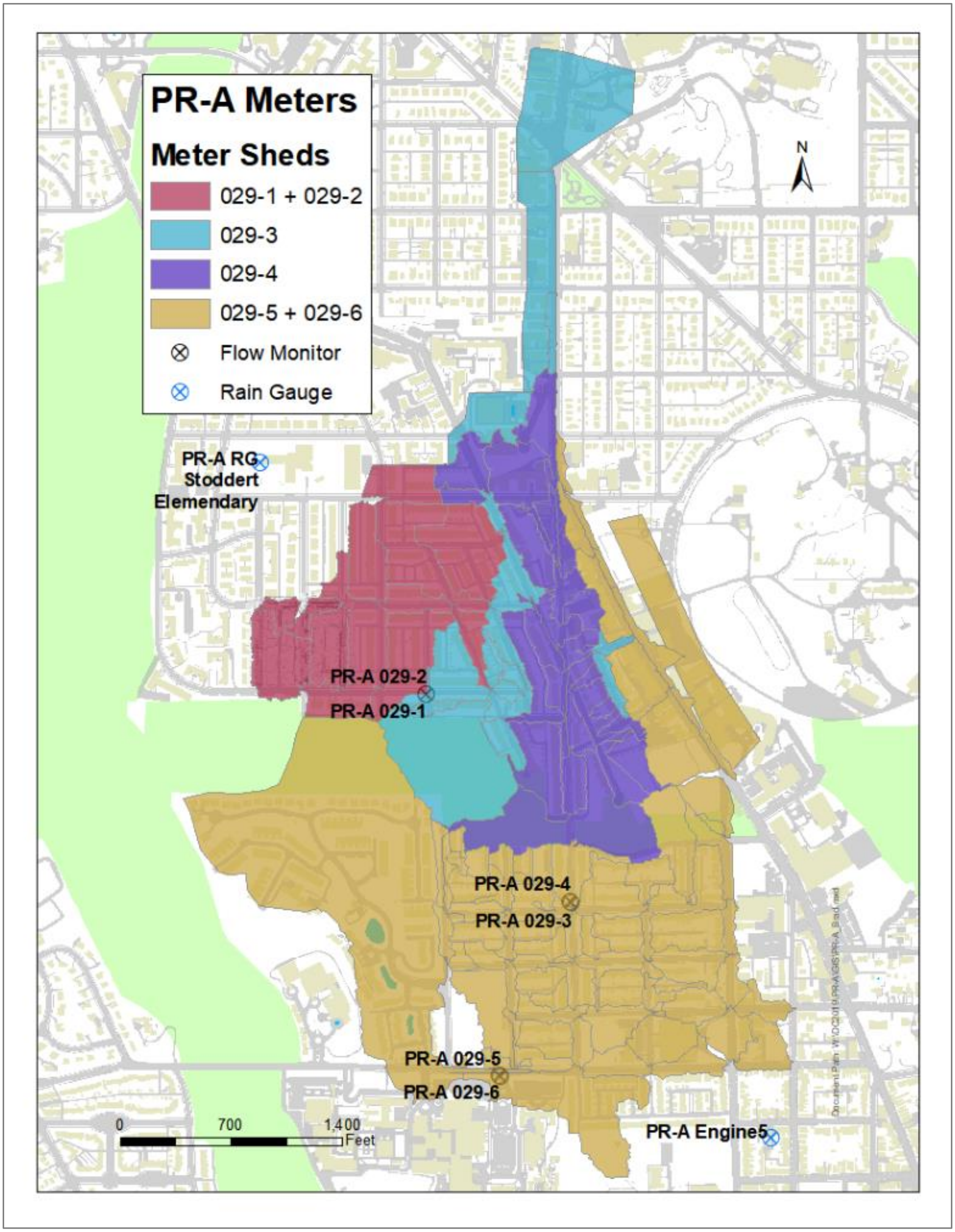



**Figure 2-20. PR-A Monitoring Locations**

## 2.8 Cost Data

Table 2-8 below presents the cost data for each of the projects described above. It should be noted that the cost listed in Table 2-8 for Green Alley Partnership (AlleyPalooza) and Downspout Disconnect projects represent the combined total for GI practices built in both the Rock Creek and Potomac River sewersheds.

**Table 2-8. Project Cost Data**

| Project | Construction Cost (M) | Capital Cost (M) | Acres Managed | Construction Cost per Acre Managed | Capital Cost per Acre Managed |
|---|---|---|---|---|---|
| Rock Creek Project A (RC-A) | $ 16.85 | $ 21.91 | 18.8 | $ 896,300 | $ 1,165,200 |
| AlleyPalooza | $ 1.67 | $ 2.00 | 3.1 | $ 538,700 | $ 646,500 |
| Kennedy Street | $ 2.15 | $ 2.79 | 2.7 | $ 794,800 | $ 1,033,300 |
| Challenge Parks | $ 1.58 | $ 2.06 | 1.9 | $ 833,500 | $ 1,083,500 |
| Potomac River Project A-1 (PRA-1) | $ 5.22 | $ 6.79 | 7.9[1] | $ 660,800 | $ 859,000 |
| Downspout Disconnect | $ 0.57 | $ 0.68 | 1.2 | $ 475,000 | $ 570,000 |

[1] Target Sewer Separation excluded

Through implementation of each project and lessons learned, DC Water has been able to realize cost savings from one project to another. As described above, some of the cost saving measures implemented between projects included design standardization and contract methodology.

For the maintenance contract described in Section 2.6, DC Water received multiple bids to conduct the work required. The cost per acre per year for the maintenance of the PR-A GI practices are shown in Table 2-9.

**Table 2-9. PR-A Maintenance Costs ($/ac/yr)**

| | Bidder 1 | Bidder 2 | Bidder 3 |
|---|---|---|---|
| Potomac River Project A (PR-A) | $14,576.15 | $9,980.77 | $15,735.38 |

## 2.9 Public Comments and Acceptance

### 2.9.1 Potomac River GI Planning

During the planning stages of GI in the CSO 027, 028 and 029 sewershed, DC Water received concerns from various stakeholder about the implementation of GI in the Georgetown Historic District. The Georgetown Historic District is primarily located in the CSO 027 and 028 sewershed, where 35 impervious acres to control to the 1.2” retention standard are required to be managed by GI as shown in Table 2-10.

**Table 2-10. Impervious Acres Required to be Managed by CSO**

| CSO | Impervious Acres to Control to 1.2” Retention Standard |
|---|---|
| 027 | 31 |
| 028 | 4 |
| 029 | 98 |
| **Total** | **133** |

In May 2015, DC Water, EPA, DOJ, and the District reached agreement on the consent decree modification to include GI. DC Water then began planning and design of the initial projects in the Potomac. The original plan was to construct the Potomac River Project No 1. in the CSO 027 and 028 sewersheds since these were most representative of typical sewershed characteristics. DC Water’s efforts included reaching out to stakeholders, preparing alternative design concepts, conducting site walks with stakeholders and other efforts to secure acceptance of the initial demonstration project. Between October 2015 and July 2016, DC Water encountered increasing opposition to constructing Project No. 1 in CSOs 027 and 028 from the US Commission of Fine Arts (CFA), National Capital Planning Commission (NCPC), DC State Historic Planning Office (SHPO), Old Georgetown Board (OGB), Citizens Association of Georgetown (CAG), Advisory Neighborhood Commissions (ANCs), and other parties. The parties opposed to Project No. 1 engaged in a multitude of efforts to prevent the demonstration project from being constructed, including:

- Writing letters opposing the project
- Scheduling meetings with DC Water opposing the effort
- Alleging that CSOs were not occurring to the extent predicted in Georgetown, therefore obviating the need for GI
- Alleging there was unused capacity in the sewer system that could be used to control these CSOs, eliminating the need for GI
- Alleging procedural deficiencies in the Consent Decree Modification process which could be legally challenged to prevent GI from being constructed
- Referring alleged procedural deficiencies to the Advisory Council on Historic Preservation for a ruling intended to stop construction of GI in the historic district
- Passing ANC resolutions advocating for the above items
- The Potomac River Tunnel (PRT) National Environmental Policy Act (NEPA) documentation was being prepared during this period. The parties used opportunities during that process to register opposition to GI in Georgetown.

The parties opposed to GI construction in the historic district also engaged the political leadership in the District. A meeting was held with District Councilmember Jack Evans, constituents and parties opposed to the GI project, and DC Water’s General Manager George Hawkins along with DC Water staff on July 15, 2016. The Councilmember and the constituents opposed the GI project and asked DC Water not to construct it. Based on opposition to the project from constituents, their Council representative, and the likely inability to obtain the permits and approval from CFA, OGB, NCPC and the DC SHPO necessary to construct the project, DC Water agreed not to construct Potomac Project No 1 in

CSO 027/028. Instead, DC Water agreed to construct Potomac Project No. 1 in CSO 029, outside of the historic District. As a result, the size of the GI project was reduced, and targeted sewer separation in CSO 029 was performed to meet the consent decree requirements for Potomac Project No 1.

After July 2016, DC Water designed, permitted, and procured Potomac Project No 1 in the CSO 029 sewershed, including targeted sewer separation. The GI project construction contract was awarded April 28, 2018 and placed in operation on May 17, 2019. Post construction monitoring was then performed.

Since construction of Potomac Project No 1 in the CSO 029, opposition to GI in CSO 027 and 028 has not changed.

Figure 2-21 provides a timeline between 2015 and 2020 identifying DC Water's efforts to construct Potomac GI Project 1 in the Georgetown historic district. Below the timeline, summaries of each entry in the timeline are provided. Detailed documentation is provided in Appendix G.

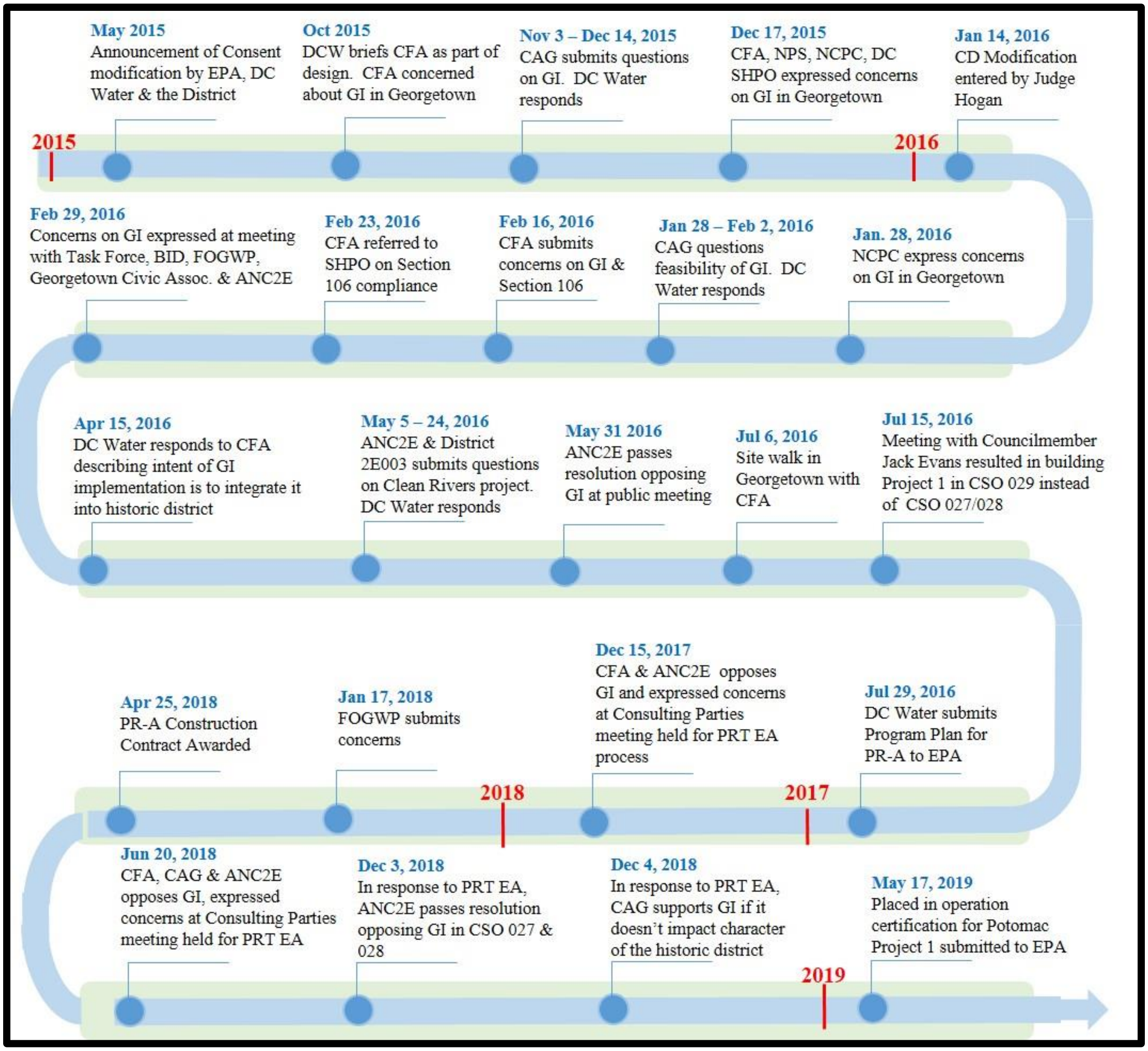



**Figure 2-21. Potomac River Timeline for GI Opposition**

- May 2015
  DC Water, EPA and the District jointly agree on consent decree modification and announce plan to modify consent decree to include GI.

- October 5, 2015
  As part of initial design process, Clean Rivers briefs CFA on project. CFA expresses concern about GI in Georgetown, especially historic district.

- November 3, 2015 - December 14, 2015
  Citizens Association of Georgetown submits questions regarding occurrence of CSOs, existing sewer system, feasibility of GI, the need for the Clean Rivers Project and the planned controls. DC Water responds in writing on December 14, 2014.

- December 17, 2015
  Clean Rivers briefs CFA, NPS, NCPC, DC SHPO on project. Parties express concern about GI in Georgetown.

- January 14, 2016
  CD Modification entered by Judge Hogan.

- January 28, 2016
  Clean Rivers briefs NCPC on project. NCPC expresses concern about GI in Georgetown.

- February 16, 2016
  CFA sends letter to DC Water, expressing the following:
    - Questions whether Section 106 has been followed for consent decree modification. Indicates it will refer matter to Advisory Council on Historic Preservation to determine if there has been a procedural deficiency
    - Alleges DC Water failed to consult with CFA staff prior to Consent Decree modification. Such consultation would have allowed CFA to express its concerns.
    - The plan for GI creates multiple impacts in the historic district. The previous plan (the tunnel) had much less impacts and involved only one landowner.
    - The undertaking of GI will have a tremendous negative impact on the historic district.
    - GI is inappropriate for Georgetown given its historic streets laid out before the L'Enfant Plan and the narrow streets and confines.
    - Of the strategies allowed by the CD modification:
        - Sewer separation is least objectionable
        - Permeable alleys are less desirable
        - Advise against tree box restoration, parking lane permeable pavement and crosswalk storage
        - Advise most strongly against sidewalk storage

  On February 23, 2016, CFA referred the matter of Section 106 compliance to Advisory Council on Historic Preservation.

  On April 15, 2016, DC Water responded in writing to CFA indicating its desire to design and implement GI in a manger that minimizes impacts, maximizes effectiveness, and preserves the historic character. DC Water also proposed a series of site walks with CFA to identify what would be feasible in these CSO drainage areas.

- January 28 to February 2, 2016
  Citizens Association of Georgetown submits questions regarding occurrence of CSOs, existing sewer system, feasibility of GI, the need for the Clean Rivers Project and the planned controls. DC Water responds in writing on February 2, 2016.

- February 29, 2016
  DC Water meets with Georgetown Task Force, including Georgetown Business Improvement District (BID), Friends of Georgetown Waterfront Park (FOGWP), Georgetown Civic

Association and ANC2E. Concerns were expressed over CSO controls and disruption of GI impacts on historic District.

- May 5 to 24, 2016
  ANC2E Chairman Ron Lewis and Single Member District 2E003 Commissioner Jeffrey Jones submit questions to DC Water on May 5 and May 24, 2016, respectively. The intent of the questions is to cast doubt on the occurrence of CSOs, the need for the Clean Rivers Project and the planned controls. DC Water responds in writing on May 24, 2016.

- May 31, 2016
  At ANC2E public meeting, ANC2E opposed construction of GI. ANC2E passes resolution questioning DC Water's assumptions used to justify extension of GI into Georgetown.

- July 6, 2016
  Site walks in Georgetown drainage areas conducted by DC Water and CFA. Purpose of site walks was to identify opportunity for GI and to obtain feedback on design approach to integrate GI into historic district.

- July 15, 2016
  Meeting at Councilmember Jack Evans office organized by constituents, including ANC2E. Constituents advocate for not building GI and for reconsidering entire approach. Jack Evans pushed DC Water General Manager not to construct GI in Georgetown. DC Water General Manager agreed to not build project #1 in CSO 027/028 and instead to build it in CSO 029. Final determination regarding GI would determine how DC Water moved ahead.

- July 29, 2016
  In accordance with Consent Decree deadlines, DC Water submits Program Plan and Project Description for Potomac Project No 1 in CSO 029 drainage area to EPA.

- December 15, 2017
  As part of Potomac Tunnel EA process, DC Water held a Consulting Parties Meeting.
    - CFA expressed opposition to GI.
    - ANC2E opposed GI in Georgetown due to disruption to character of historic district and disruption.
    - Substantial discussion about impacts of GI on historic district, the desire of CFA and DC SHPO to include GI in FONSI or programmatic agreement for the Potomac Tunnel.
    - On Jan 17, 2018, Friends of Georgetown Waterfront Park wrote letter to DC Water as part of consulting parties process for Potomac Tunnel EA. The group questions whether GI is needed and whether overflows of the magnitude predicted are really occurring.

- April 25, 2018
  PR-A Construction Contract awarded

- June 20, 2018
  As part of Potomac consulting parties meeting for Potomac River Tunnel:
  - CFA expressed opposition to GI and the need to have complex discussions to site multiple GI facilities.
  - Citizens Association of Georgetown expressed concern about using open space and green space for GI. These sides are needed for other purpose and are too valuable in Georgetown.
  - ANC2E expressed opposition GI and concern about maintenance.

- December 2018
  As part of comments on Potomac Tunnel EA:
  - ANC2E passes resolution on December 3, 2018 opposing GI in CSO 027 and 028.
  - Citizens Association of Georgetown submit comments on Potomac Tunnel EA on December 4, 2018. CAG identified alterative CSO control plans and expressed support for GI provided it did not disrupt the character of the historic district.
  - As part of comments on Potomac Tunnel EA, Friends of Georgetown Waterfront Park submitted comments in December 2018, opposing tunnel construction in park and indicating DC Water must do everything in its power to be successful with GI to avoid constructing tunnel.

- May 17, 2019
  DC Water certifies to EPA that Potomac Project 1 has been placed in operation.

### 2.9.2 Potomac River GI Construction (CSO 029)

Below is a summary of the community's concerns, positive feedback, and survey responses (Appendix H) received from residents regarding DC Water's GI Program, including GI in CSO 029.

DC Water's GI Program constructed over 150 GI practices throughout multiple neighborhoods in the District. Approximately 2,000 homes are located near GI practices constructed by DC Water as part of Rock Creek Project A, Potomac River Project A, Kennedy Street, GI Challenge Parks, and the Green Alley Partnership. During these projects, DC Water received a total of 187 inquiries from the community. Table 2-11 summarizes the inquiries received regarding the construction of GI in resident neighborhoods and does not include comments received based on the post-construction survey described in Section 2.9.6 below.

**Table 2-11. Community Inquiries on GI through Construction**

| Category | Number of Residents | % of Project Area (2,029 Homes) |
|---|---|---|
| General/Schedule | 40 | 2.0% |
| Access | 11 | 0.5% |
| Trash Collection | 25 | 1.2% |
| Parking | 60 | 3.0% |
| Noise/Debris | 9 | 0.4% |
| Construction of GI/Lack of GI | 6 | 0.3% |
| Damage Claims | 36 | 1.8% |
| **Total** | **187** | **9.2%** |

DC Water received inquiries from 9% of the homes located near GI sites; highlighting the fact that the outreach efforts surrounding the GI program were successful in communicating the project as well as mitigating construction impacts to the community. Concerns (general inquiries and schedule, access, and trash collection) made up 41% of the received inquiries while complaints (loss of parking, noise/debris, either not wanting the GI constructed near their home or not having GI constructed near their home, and damage claims) made up 59% of the inquiries received. The following sections provides further details on the concerns and complaints expressed as well as the resolutions DC Water completed.

### 2.9.3 Construction Concerns

The concerns that were received were categorized in the following categories: general inquiries and schedule, access, and trash collection.

Residents had many questions about the construction schedule or more details on the project such as the aesthetics of the permeable pavers and types of plants for the bioretention facilities. One resident was planning to repave her driveway and wanted to know if the bioretention facility would impact her renovation. Residents wanted to understand how long construction would occur near their homes. The DC Water team would call, email, or meet with residents to answer their questions, explain the extents of the work, and remind residents that all the work was occurring in the public space.

Many residents had concerns about access when they received the notice about upcoming construction, with handicap access and access for elderly as the top concerns. Other residents needed access for deliveries, other contractors, and movers. DC Water worked with everyone to determine the best solution which included setting up temporary disability parking spots, providing disability parking permits, moving equipment and materials to allow access, and even helped with carrying in groceries.

For many residents in the project area, trash is collected from the alleys. When alleys were closed for GI construction, trash was collected from the front of homes. Some residents expressed concern over the ability to move the bins as well as concern that their trash collection would be missed. DC Water assisted in moving bins for residents. DC Water also worked closely with the District's Department of Public Works (DPW) to redeploy trash crews when a pick-up was missed. In certain instances, the construction crews would remove and haul away trash themselves to prevent residents from having to wait for DPW to return. The construction crews also temporarily labeled bins to ensure the correct bin was returned to its owner.

### 2.9.4 Construction Complaints

The complaints that were received were categorized in the following categories: loss of parking, noise/debris, not wanting the GI constructed near their home and damage claims.

Most complaints occurred during active construction and revolved around a lack of parking and access to parking within alleys. DC Water understood the inconvenience of alley closures, preventing parking and access to the back of homes during construction, and helped mitigate concerns by assisting residents with obtaining temporary street parking permits while their alley was closed. DC Water also coordinated with a local grocery store to provide free resident access to parking spaces in the store's garage. In total, DC Water assisted over 50 residents with obtaining alternative parking solutions. Additionally, DC Water worked closely with the contractor to phase the work to minimize the amount and duration of parking impacts. The contractor opened access to completed alley sections as soon as possible to provide access to back-of-home parking. To ensure better communication regarding alley closures, additional notification flyers were developed to:

- Let residents know more precisely when construction would start in the back of their individual home,
- Let residents know when the work behind their individual home was complete so they could start parking again in the back of their home,
- Let residents know when trash collection would resume in the back of their home.

DC Water experienced a few cases where residents returned home from a long work trip or vacation away to discover that their vehicle was stuck in the back of their home within a closed alley. DC Water worked with these residents and the construction crews to identify how to access their vehicles as quickly as possible. In some instances, the construction crews would build a temporary bridge over the excavations to allow for the cars to be moved.

In general, complaints and issues encountered were typical of any infrastructure construction activities that occur in the proximity of residential housing. For example, there were a few instances when residents complained about noise, specifically that the construction began before the permitted 7AM construction start hour. In these cases, the construction management team immediately informed the contractor to stop work and discussed the importance of adhering to the permitted construction work hours. Annoyance vibration was noted by a few residents, in response DC Water worked with the contractor to modify their means and methods to reduce annoyance vibrations during demolition and construction. A few complaints regarding construction debris were also received. For example, one resident notified the team that trash from a GI construction site blew into her yard during a storm. A staff member was deployed to remove the trash. Similarly, another resident alerted the team that construction materials were left in the neighborhood. The construction crews were sent to retrieve the materials.

Many residents inquired as to the reasons GI was or was not constructed near their home. Some residents did not want GI due to the inconvenience of construction or distrust of public works projects, while others were disappointed to not have GI constructed on their block. To help residents understand why their neighborhood may have or may have not received GI, the outreach coordinator would explain the general selection criteria which includes:

- Ability to meet the stormwater management requirements (cost effectiveness, slope, amount of stormwater reaching the facility)
- Utility conflicts
- Condition of pavement
- Coordination with other construction projects

Damage claims were also received. These ranged from concern over potential damage that could occur, perceived damage, and damage determined to be caused by GI construction. Damage claims included minor damage to retaining walls, driveways, and flooding. DC Water offered a claims process if a property owner believed that construction activities undertaken by the project damaged their property. The resident could call the 24/7 project telephone hotline or DC Water to initiate the claims process. A brief description of that process follows:

- A member of the contractor team would first visit the property and confirm the details, but not determine liability.
- Following the site visit, the claim would be handed over to DC Water's insurance company. Communication with the property owner would then continue between the resident and DC Water's insurance carrier and assigned adjuster.
- The claim would receive a claim number and an adjuster would visit the property to observe the alleged damage.
- The project team would follow the claim so that DC Water and the homeowner would be aware of the status and outcome of each claim.

A total of 36 damage claims were received related to the GI construction. Of these damage claims, 25 were repaired by the contractor or payments were made to the homeowner by DC Water's insurance company. Nine of the damage claims were determined to be false claims or conditions that existed prior to construction. With over 2,000 homes located near GI practices constructed by DC Water as part of Rock Creek Project A, Potomac River Project A1, and the Green Alley Partnership; the percentage of actual damage at 1% is low given the scope and extents of the project.

As described above, in most cases, DC Water was able to respond to and resolve complaints.

### 2.9.5 Positive Feedback

Although many residents were initially concerned about the disruptions caused by construction, the GI projects received many positive comments from the community.

Residents complimented the aesthetics of the finished product and how helpful and responsive the outreach team was in answering questions and providing assistance. Several noted that their experience communicating with DC Water's GI team was far better than their experience with other local utilities. Below are a few examples of the feedback provided by residents located near DC Water GI practices.

- *"I would complement them on how nice the finished alleys look and how helpful the supervisors were. Amanda Zander has been very responsive to my queries and has helped me write two web posts explaining the work. She and a colleague also tabled at two BCA picnics."*

  *~Ann Carper, resident, Potomac River sewershed, August 2019*

- *"You guys did the best job! I'm very impressed and I love the alley. The Clean Rivers project did a great job! The Public Outreach Coordinator and Project Manager came by my house to review the project with me beforehand. During the project, I needed help and they were responsive and helpful. I was definitely impressed. Thank you!"*

  *~Stacey Proctor, resident, Potomac River sewershed, February 2019*

- *"I am writing to commend Ms. Amanda Zander for her excellence in coordinating and distributing much-needed parking permits to our household with the commencement of significant work to be done in the alley behind our home. The attached letter reiterates the message in this email for your and her records.*

  *We would have been in dire straits without them, and although Ms. Zander is responsible for a number of high priority items, she nonetheless also prioritized minimizing headaches in the community where the work is currently still underway. She responded immediately to our desperation with calm foresight, a simple plan of action, and expedient response.*

  *Her professionalism represented DC Water with distinction and quality service to DC residents. I am thankful and impressed. I believe Ms. Zander's skillful management of a potentially stressful set of interactions qualify her for a promotion and pay raise, and hope you will agree.*

  *Thank you Ms. Zander, from all of us at 37th Street!"*

  *~Jee Kim, resident, Potomac River sewershed, January 2019*

### 2.9.6 Survey

To gather additional post-construction input from the community, DC Water developed a GI Survey. This survey was mailed to each of the 2,029 homes located near GI practices constructed by DC Water as part of RC-A, PR-A, and AlleyPalooza. Surveys were completed and returned via mail, email, or online through Survey Monkey.

Two-hundred and six (206) residents responded to the survey. Most of the survey responses provided appreciation for GI and support for future GI construction. Specifically:

- 68% would like a significant amount or quite a bit more of GI in their neighborhood
- 79% would like a significant amount or quite a bit more of GI in the District
- Green alleys rated highest in types of GI preferred (only slightly higher, residents chose a mix of all technologies including bioretention, green parks, green roofs, rain barrels, and green streetscapes)
- 82% felt GI brought a benefit to their neighborhood
- Cleaner rivers/better water quality was rated the most important benefit of GI, with improved infrastructure such as repaved alleys rated the next most important benefit
- 85% agreed or slightly agreed that the benefit of GI outweighed the disruption of construction

The survey helped to gauge the ways in which residents prefer to be informed of construction projects. Mailers and door flyers were the most preferred methods over other methods such as meetings, websites, word-of-mouth, and listservs and social media forums such as NextDoor. Although outreach for GI included a variety of methods, the preferred methods correlated well with DC Water's actual outreach efforts, which relied heavily on mailers and door flyers to provide information about the GI projects.

## 2.10 Other Efforts in Support of GI

### 2.10.1 GI Utility Protection Guidelines

The DC Water Green Infrastructure Utility Protection Guidelines (Guidelines) provide guidance on the design and construction of GI adjacent or connected to DC Water utilities. The Guidelines are intended to provide reasonable protections for traditional DC Water sewer and water assets, and provide siting and design guidance for the following types of GI practices: street tree planting, tree and tree box filters; bioretention and bioswales; permeable pavements and pavers; alleys with bioretention; and underdrains adjacent to catch basins. DC Water utilities adjacent to, crossing, or connected to these GI practices include water mains, sewers, water services, sewer laterals, water meters, shutoff valves and valve boxes, cleanouts, hydrants, and other structures.

The development of these Guidelines included consultation with other agencies including DDOT, analysis of similar guidelines in other localities and a review of local regulations (including District of Columbia Municipal Separate Storm Sewer System permit) The specific requirements were developed and published in July 2013 with a copy included in Appendix I, and reflect the due diligence performed as part of the development process. The Guidelines are used by designers working in public space for various District agencies, other utilities, and by private developers and property owners implementing GI in and around public space.

### 2.10.2 Coordination with DDOT's Green Book

The Sustainable DC Plan (http://www.sustainabledc.org/) adopted in 2013, sets long-range goals for making the District the greenest city in the nation. The plan calls for increasing green infrastructure in the public right of way (ROW) and taking actions to improve the health of the city's waterways.

The District stormwater regulations require stormwater volume retention on all major construction projects. Both public and private projects constructing in the ROW are required to retain stormwater to the maximum extent practicable. Designers must examine all uses of public space and place stormwater management where space and use allow.

DDOT is installing green infrastructure as part of construction projects and in retrofit projects to reduce stormwater runoff in more areas of the city. Green Street and Green Alley projects utilize GI techniques and may be constructed where watershed and infrastructure improvements are prioritized.

Some of the DDOT green infrastructure practices for streets include bioretention, street trees, landscape areas, permeable pavement, and removing unnecessary paving. When implemented, GI creates living green streets that capture, store, and infiltrate stormwater to treat it as a resource and improve the urban environment.

In 2014, DDOT released the GI Standards which included technical drawings, specifications, design manual, plant list, and maintenance schedules, and can be found here: https://ddot.dc.gov/publication/ddot-green-infrastructure-standards-2014

During the development of the DDOT GI standards, DC Water provided extensive comments on multiple iterations of the Standards that considered the (then) future construction of DC Water's GI program. The feedback from DC Water focused on making sure that the Standards would not conflict with DC Water's goals and could instead complement and support them as DC Water moved forward with its GI program for CSO control.

### 2.10.3 National Green Infrastructure Certification Program (NGICP)

DC Water recognized early on that green infrastructure not only helps to beautify neighborhoods, support natural habitats, enhance public space, and clean District rivers, GI also helps create and sustain long-term local green jobs. Not only has DC Water committed with the District of Columbia to have 51% of new jobs created through the Green Infrastructure Program be filled by District residents, but in 2016, through a partnership with the Water Environment Federation (WEF) and 14 cities and towns across the country, DC Water lead the creation of the National Green Infrastructure Certification Program (NGICP). (https://ngicp.org/)

DC Water and WEF in concert with the other NGICP partners set a national standard for GI entry level construction, inspection, and maintenance workers. A curriculum was developed to train individuals and provide the necessary skills for the creation of a proficient green workforce and establish a career path for skilled green infrastructure workers. Since inception in 2016, a total of 605 individuals have become NGICP certified.

Since 2016, DC Water has been working in partnership with the University of the District of Columbia (UDC) to fund NGICP training and workforce development in the District. The program has included a blend of soft skills, technical studies focused on the NGICP curriculum, and a variety of field and hands on learning experiences. One hundred fifty (150) District residents have completed the training, with 66 District residents passing the exam and receiving the NGICP credential. As part of the workforce development component, DC Water staff through DC WaterWorks, has assisted in placing graduates in jobs on DC Water GI projects, and other organizations and firms working within the GI arena. Job placement numbers have fluctuated over time, but at its high point over the course of the program to-date, over 30 individuals were working in GI related jobs including many on DC Water projects.

As the use of green infrastructure for stormwater management grows nationwide, holding this certification will provide a unique opportunity for the participants to pursue a successful career path here in the District and beyond. Additional information on the NGICP program is provided in Appendix J.

### 2.10.4 Standard Alley Design and Blanket Permit

As mentioned above, in 2013, the District of Columbia adopted the Sustainable DC Plan which set long-range goals for making the District the greenest city in the nation and to take actions to improve the water quality in Rock Creek, and the Potomac and Anacostia Rivers. To relieve pressure on the stormwater infrastructure, the plan calls for DC to increase the use of GI along the District’s public rights-of-way and build 25 miles of green alleys by 2032.

In coordination with the Mayor’s Office, DDOT initiated a six-year, $175 million program called AlleyPalooza in 2014. The program’s goal is to provide targeted and expedited alley maintenance and restoration services for the residents of the District.  Due to the extensive need for alley repairs across the District, DDOT prioritizes alley improvement projects based on the number of resident service requests and an alley condition rating.  Each year DDOT uses the alley prioritization process to select eight alley rehabilitation projects in each of the District’s eight wards for a total of 64 AlleyPalooza projects per year.

In addition to AlleyPalooza, DDOT is installing GI as part of construction projects and in retrofit projects to reduce the quantity and improve the quality of stormwater within the District. DDOT’s green alley projects are constructed where watershed improvements and infrastructure rehabilitation are prioritized in the District’s right of way.  Because DCCR’s and DDOT’s programs have a significant focus on alley work, there existed an opportunity to utilize a standard approach to green alley permitting, design, and construction to achieve common goals while reducing total cost to District residents and ratepayers.

In 2017, DC Water developed standard alley permeable pavement (APP) details and specifications. The standard APP design details were developed based on DDOT’s Standard GI Details with sufficient updates to specify dimensions and elements of the design that were not otherwise provided in DDOT's green book details. The specifications and standard APP details are provided as part of Appendix E. As part of the implementation, a blanket permit was negotiated with DOEE and DDOT referencing and allowing the standardized approach and associated standardized details and specifications. This approach significantly streamlined the siting, design, permitting, and construction processes. Instead of an alley taking months to site, design, permit, and begin construction, this highly efficient method allowed DC Water to identify a permeable alley and be mobilized and starting construction in a matter of weeks. This efficiency throughout the process helped to drive down costs significantly.

### 2.10.5 Partnerships with Schools

Throughout the course of the GI program, DC Clean Rivers staff worked with several schools on conceptual plans for GI, provided tours to various school groups, and supported other school initiatives such as "family fun day" types of public events. Examples of design and conceptual planning work follow in this section.

#### 2.10.5.1 Washington Latin Public Charter School

DC Clean Rivers staff began working with Washington Latin Public Charter School in 2013, as part of the planning and groundwork for the future of the GI program and the first large-scale Rock Creek project. Initially the school was envisioned as part of a "hub and spoke" approach that identified locations for GI that provided multiple functions (improving parks, school grounds, recreation centers and the like) that would serve as "hubs" with GI in the public right of way serving as "green corridor spokes." At the time, Washington Latin had an underutilized bioretention site, and an opportunity for a school garden that was a prime candidate for irrigation derived from rainwater harvesting from the school's rooftop. Through multiple meetings and conversations with the school, concept plans were developed (see Figure 2-22), which included a cistern, terraced vegetable gardens, and enhancements to the bioretention area including additional plantings and outdoor classroom space. Ultimately due to funding and timing DC Water did not advance the conceptual designs to final designs, however the school went on to implement many of the elements contained in the plans.

**Figure 2-22. Washington Latin PCS Concept Design**

### 2.10.5.2 Paul Public Charter School

Located in Northwest DC, Paul Public Charter School was also envisioned to function as a green infrastructure "hub." In 2013 as-built plans for the school were obtained, and every corner of the school property studied for GI implementation. Multiple sites on the property were considered, but here again, timing was not ideal as the school shortly thereafter began a process for a major renovation/addition that expanded across many of the ideal GI locations. Ultimately concept plans were developed that identified and disconnected interior roof drains at the front of the school and directed that flow into a pair of bioretention facilities flanking the school entrance stairs (see Figure 2-23). This location was initially considered to be included in Rock Creek Project A, but ultimately was identified as a location for consideration under a later project as it fell outside of the contiguous RC-A project area.

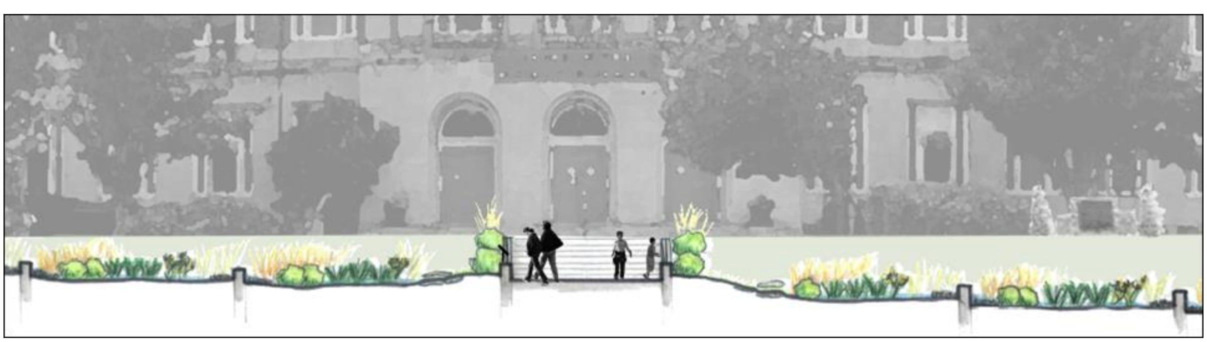


**Figure 2-23. Paul PCS Concept Rendering**

### 2.10.5.3 Georgetown University

DC Clean Rivers staff worked with non-technical Georgetown University students and staff to mentor and provide technical guidance for their 2014 submission to EPA for the “Campus Rainworks Challenge” (Figure 2-24). For 2014 there were sixty-four submissions for the Rainworks Challenge, including multiple submissions with technical teams of engineering and landscape architecture students. Two entries were awarded first place, two were awarded second place, and two received an honorable mention (one of which was the submission from the non-technical Georgetown University team).

From EPA’s website:

> *The design focuses on retrofitting areas around Lauinger Library, an iconic building on the university’s main quadrangle that receives an estimated 1 million visitors per year. The site comprises a significant portion of the sewershed and currently contains underutilized space, impermeable surfaces, and inefficient drainage. To mitigate stormwater runoff draining into the combined sewer, the team identified three mini-sites around the library to implement green infrastructure practices. The sites together have the potential to manage 22,050 gallons of rainwater during a 1.2” storm. The team’s design also improves community space on campus and provides opportunities for public education about sustainable stormwater infrastructure.*
>
> (https://www.epa.gov/green-infrastructure/2014-campus-rainworks-challenge-winners#georgetown)

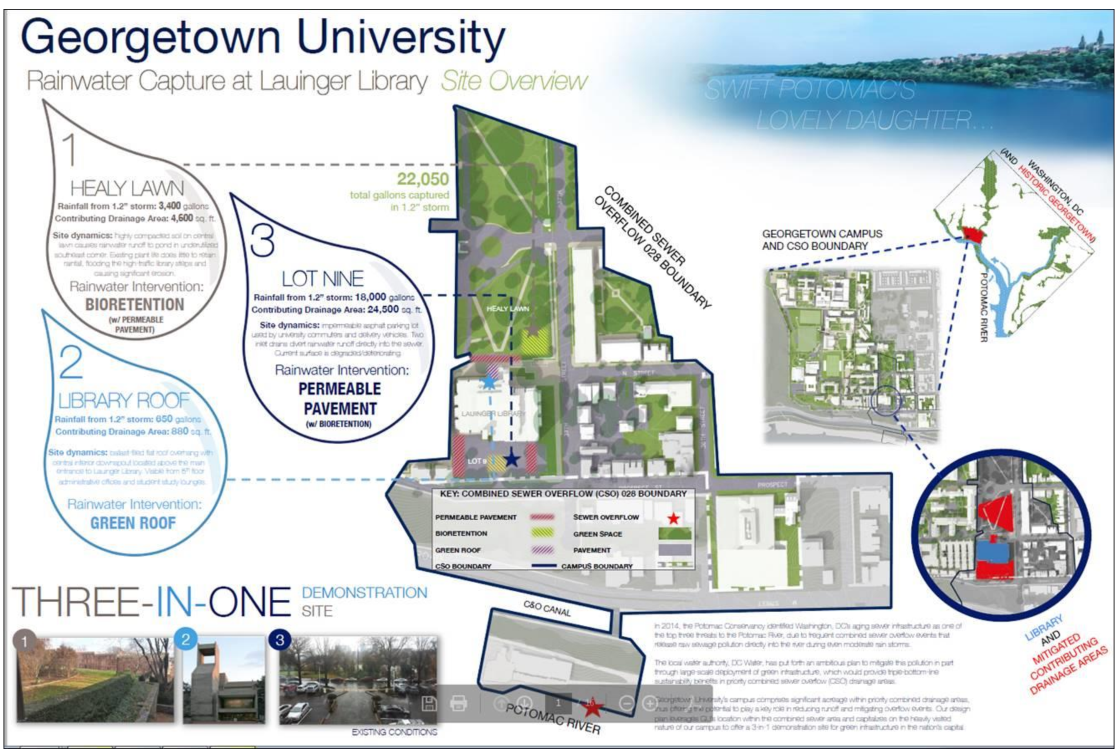



**Figure 2-24. Georgetown University Rainwater Capture Site Overview**

This initial work with Georgetown University led to additional conversations and technical investigations for GI retrofit of Healy Lawn, the iconic open space on the eastern side of campus, as well as the parking lot behind Lauinger Library. The University was in the process of updating its master plan, and several areas of Healy Lawn needed redesign that also offered opportunities for GI retrofit. The parking lot behind Lauinger Library had poor circulation and drainage issues that also represented an opportunity for GI. Ultimately given timing, the scope of work involved, and long-term campus development considerations, the work did not progress beyond the early concept stage.

## 2.11 Acres Pursuant to District's Stormwater Regulations

Appendix F, Section II.E of the Amended Consent Decree allows DC Water to take credit for other controlled acres. The decree states that within the GI areas, "Controlled acres from the implementation of the District's MS4 Permit and Stormwater Regulations will be credited against DC Water's obligations to control acres." These are stormwater measures that have been implemented due to redevelopment within the sewershed, and paid for by District business owners, residents and taxpayers. These measures contribute to the overall volume managed in the sewershed, and collectively help to reduce stormwater runoff that contributes to combined sewer overflows at CSOs 027, 028 and 029. The following criteria must be met to allow these acres to be credited towards the acres noted in Table 1-1 :

"1. They are located in the CSO areas targeted for GI implementation by DC Water; and
2. The design of the control measures and their level of control has been verified by DC Water to achieve the 1.2" retention standard or any portion thereof. Where green infrastructure installation by any party do not meet the full 1.2" design criterion and are counted towards meeting the requirements of this consent decree, DC Water may proportionally credit the control achieved; and
3. DC Water, the District or a private party has assumed operation and maintenance responsibilities in a legally binding document of as part of its statutory or regulatory authority."

### 2.11.1 DOEE MS4 Database

DOEE has responsibility for administering the District's stormwater program and activities required in the District's National Pollutant Discharge Elimination System (NPDES) Permit – more commonly referred to as a Municipal Separate Storm Sewer System (or MS4) Permit. DOEE created a stormwater database, giving them the ability to track, evaluate, and report on details of GI installations throughout the District, including those in the Combined Sewer Areas where they also apply the MS4 requirements. The database contains such information as Best Management Practice (BMP) type, installation date, contributing drainage area, and storage and retention volumes. In addition, the database indicates if the BMP is regulated under the MS4 permit or not. Regulated BMPs are listed as a "Yes" in the database under the "Major Regulated Activity" field.

### 2.11.2 DOEE Requirements

To ensure compliance with the stormwater requirements of the District, DOEE mandated that stormwater facilities installed after approximately 1999 have a legally binding covenant, which is filed with the record of deeds of the property, requiring the stormwater practices to exist and to be maintained. Facilities regulated under this provision are listed in the database as such under the "Major Regulated Activity" field. This indicates that a covenant is on file with DOEE which conveys with the property anytime it is bought or sold. In addition, DOEE inspects each facility approximately every three years to confirm the property owner is maintaining the facilities.

### 2.11.3 MS4 Credit

DC Water reviewed the stormwater practices in DOEE's database and used the following criteria to identify practices to credit:

- Practices must be in the Potomac River sewershed. DC Water overlaid the latitude/longitude coordinates for the practices in DOEE's database on the GIS sewershed boundaries to identify practices within the sewershed. Figure 2-25 shows the location of the practices.
- Only practices constructed after 2002 were eligible. Since the monitoring for the LTCP occurred in 2002 to determine the volume to be managed at CSO 027, 028 and 029, BMPs installed prior to that period would already have been accounted for in the monitoring data. Therefore, only BMPs listed in the DOEE database after 2002 were considered eligible for inclusion.
- Only practices identified as constructed pursuant to a "Major Regulated Activity" were eligible. This is because Major Regulated Activities are required to have covenants that convey with the property.
- Only practices that had a quantified storage volume in the database were eligible. Practices with no storage volume such as trees and Bayscaping were considered ineligible to be conservative in the accounting.
- Fifty-four eligible practices were identified as constructed between 2003 and 2012.
- Practices constructed in the separated area of CSO 029 will be considered ineligible to be counted.
- DC Water reviewed the sizing of practices in the database. The volume of practices that exceeded the predicted runoff from the drainage area tributary to the practice for a 3.5" rainfall was excluded. This is because a 3.5" rainfall is the largest storm in the average year period (1988, 1989 and 1990) used as the basis for CSO planning.

Table 2-12 summarize the practices while Figure 2-25 depicts their location.

**Table 2-12. Major Regulated Activity BMPs**

| After 2002 (after LTCP monitoring) | CSO 027 | CSO 028 | CSO 029 Combined | CSO 029 Separated |
|---|---|---|---|---|
| # Practices | 9 | 0 | 15 | 30 |
| Storage Vol. (MG) | 0.1 | 0.0 | 0.1 | 0.5 |

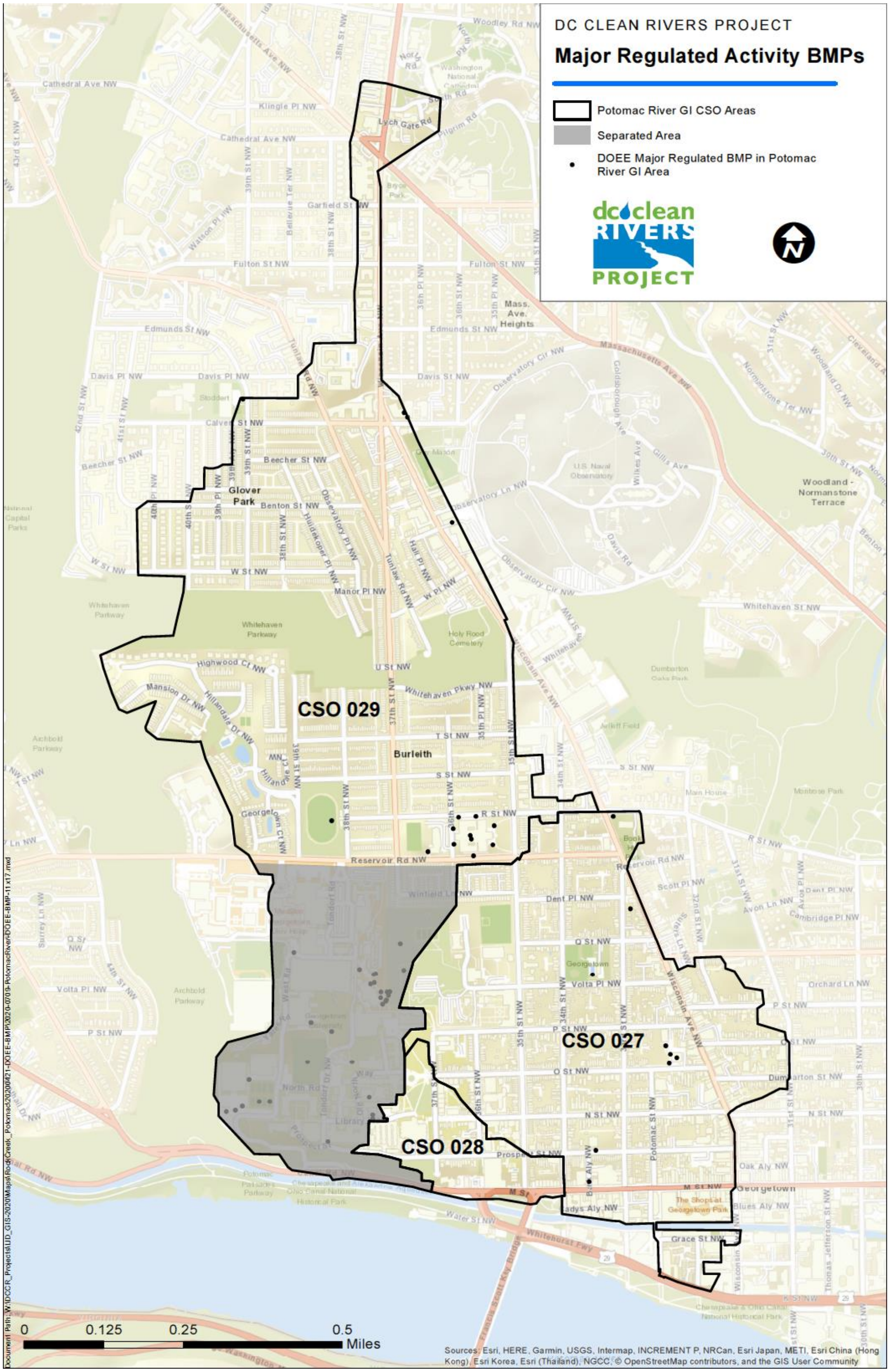



**Figure 2-25. Major Regulated MS4s in Potomac River GI Area**

# 3 Assessment

In accordance with the Amended Consent Decree, this section provides a practicability assessment of the first GI project in the CSO 027, 028 and 029 sewersheds. In performing the assessment, DC Water considered the lessons learned for all the GI constructed in the Rock Creek and Potomac sewersheds. The following items were considered in the assessment:

- Constructability
- Efficacy
- Cost Effectiveness
- Operability
- Public Acceptability

## 3.1 Constructability

The first Potomac River GI project is located within CSO 029 of the Potomac River GI Area, and includes approximately 330 acres as shown in Figure 2-5. This project boundary was selected for the following reasons:

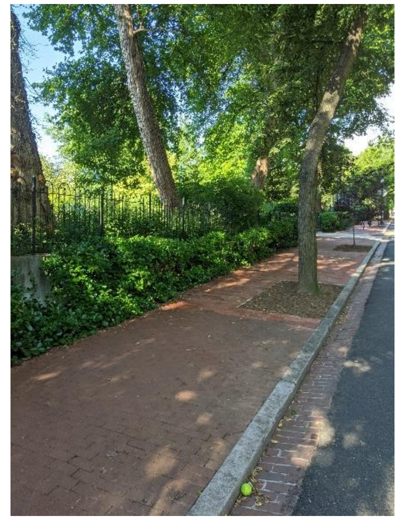
- Public and approval agency opposition prevented constructing the project in the CSO 027/208 sewershed
- The project boundary was outside the historic district, therefore allowing feasible design and construction
- Availability and feasibility of monitoring locations

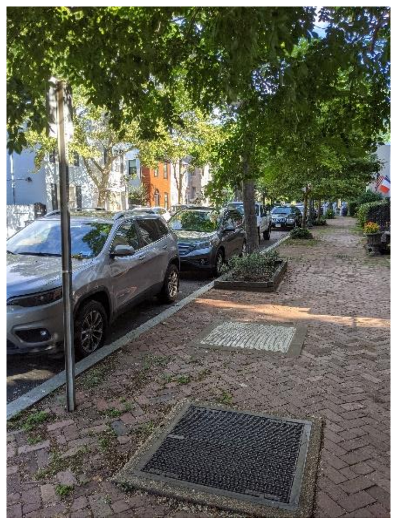
The GI practices implemented within the project boundary were sited based on existing condition constraints, such as utilities, structures, topography, land use, and vegetation. DC Water was able to site, permit and construct the appropriate number of GI practices along with targeted sewer separations to exceed the number of acres required to be managed under Project No. 1 listed in the Consent Decree as shown in Table 1-1.

As noted in Section 2.9.1, the ability to site GI in the historic areas of CSO 027 and 028 was the largest barrier for implementing GI in the Potomac River CSO area. Although DC Water was able to exceed the number of acres required for Project No. 1 due to the sewer separation project, the number of acres achieved through GI was eight (8) and only located in the CSO 029 sewershed.

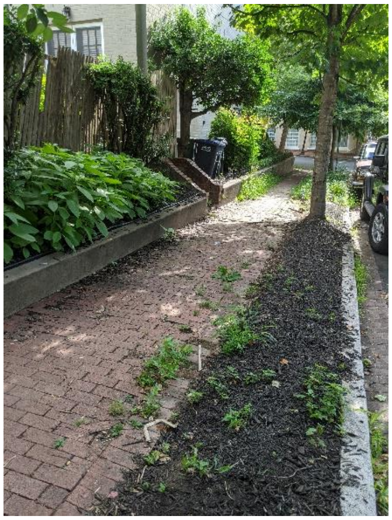
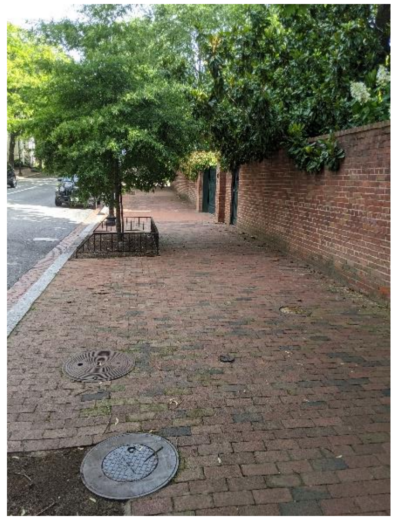
While DC Water was able to construct GI practices in public space within the Burleith and Glover Park neighborhoods for Potomac River Project No. 1, and while the projects were constructible by conventional construction methods and contractors were available to perform the work, due to the limited space, tight conditions, utility conflicts and historic conditions within the Historic Georgetown area (as shown in the following photos), GI is significantly more difficult to site and construct in CSOs 027 and 028. From a constructability standpoint, GI is not practicable within these sewersheds.







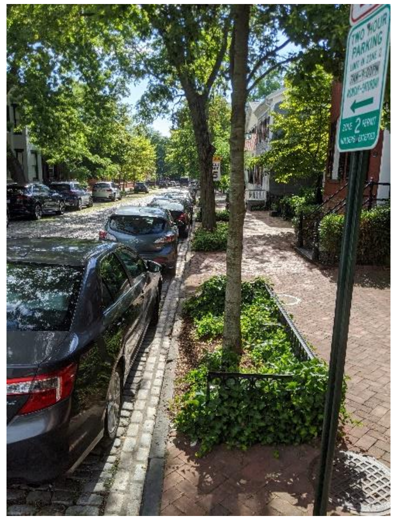
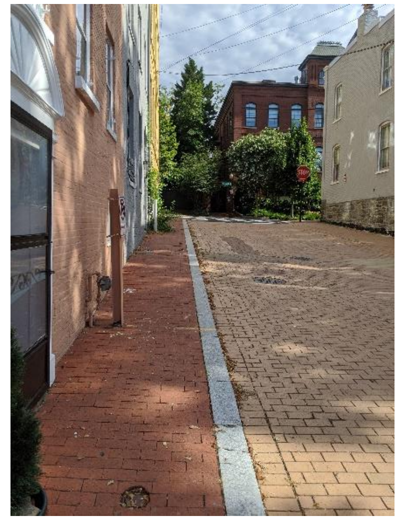


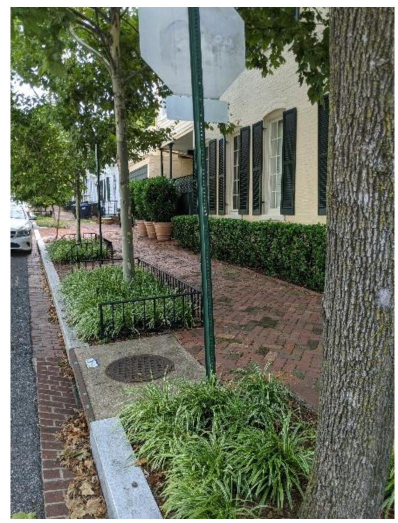
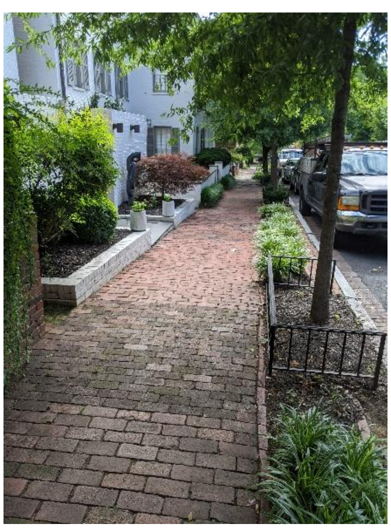



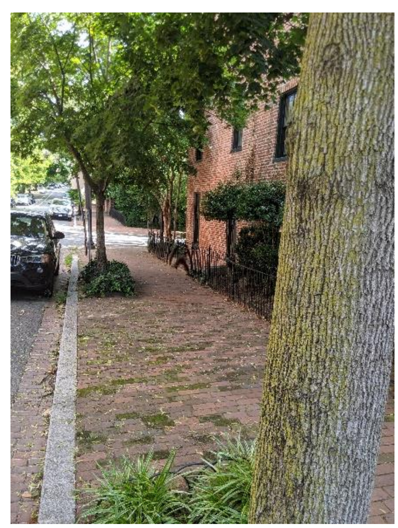








## 3.2 Operability

Effective operation and maintenance are essential to the success of GI. DC Water maintains the inventory of GI practices it owns, including those GI practices brought on during Potomac River Project No. 1.

While the DC Water-constructed GI practices do not require an active operator, ongoing and extensive GI maintenance is conducted on a monthly and quarterly basis to maximize performance of each of the GI practices. Monthly maintenance for all bioretention facilities involves weed, sediment, and debris removal, inspection of cleanout and underdrain structures, and inspection for erosion. Monthly maintenance for all pervious pavement facilities involves vacuuming with regenerative air sweepers, inspections of flow restriction devices and observation wells for standing water, clogging and blockages.

Additional quarterly maintenance of bioretentions includes removal of weeds, trash, and debris and inspection of all structures and vegetation and includes the flushing of underdrains if required. Quarterly maintenance for the pervious pavement involves inspection of the system for clogging, blockages, debris and sediment, intensive joint cleaning using compressed air, and inspection of the collection of settlement or heaving as well as the flushing of underdrains if required.

Reporting and photo logging for each maintenance visit is performed and reported back to DC Water's Asset Management group. As the inventory of GI practices owned and operated by DC Water grows, DC Water will have a significant annual resource demand beyond what is currently allocated.

From an operability standpoint, GI is practicable in the Potomac River Sewershed.

## 3.3 Efficacy

To determine the efficacy of GI, DC Water monitored and modeled the sewershed both pre- and post-construction to see if there was a reduction in wet weather flow (WWF), and if that reduction matched the predicted reduction based on the number of impervious acres treated by GI. The WWF volumes presented in this Section are defined as occurring when predicted flows in the sewer are exceeding two times average dry weather flow rate. The reduction in WWF volumes per average year was calculated by taking the difference between pre- and post-construction volumes divided by the number of impervious acres treated at 1.2" to determine the WWF reduction in million gallons per average year per impervious acres treated at 1.2".

### 3.3.1 PR-A Pre-Construction Monitoring - Sewershed

A complete set of event hydrographs, monthly plots and rainfall events tabulations is included in the modeling report prepared for PR-A, provided as Appendix F. The calibration and monitoring results are explained as follows.

Figure 3-1 through Figure 3-4 are 1-to-1 volume and peak flow plots for the combined 029-1 + 029-2 meter locations and 029-5 + 029-6 meter locations, comparing metered flows versus modeled predictions. Modeled predictions match event volumes well for both 029-1 + 029-2 and 029-5 + 029-6 locations. Peak flow response is more variable, with the model generally predicting somewhat higher peak flows, but with significant variability from event to event.

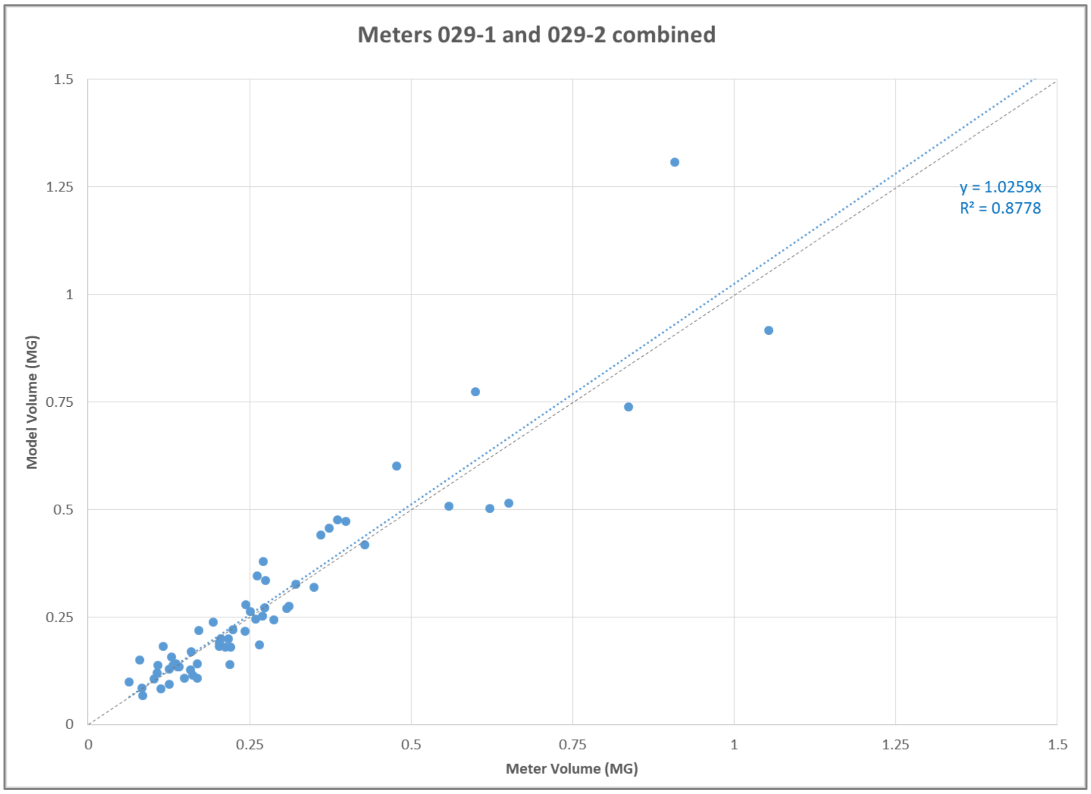



**Figure 3-1. PR-A Pre-Construction Event Volumes, 029-1 + 029-2**

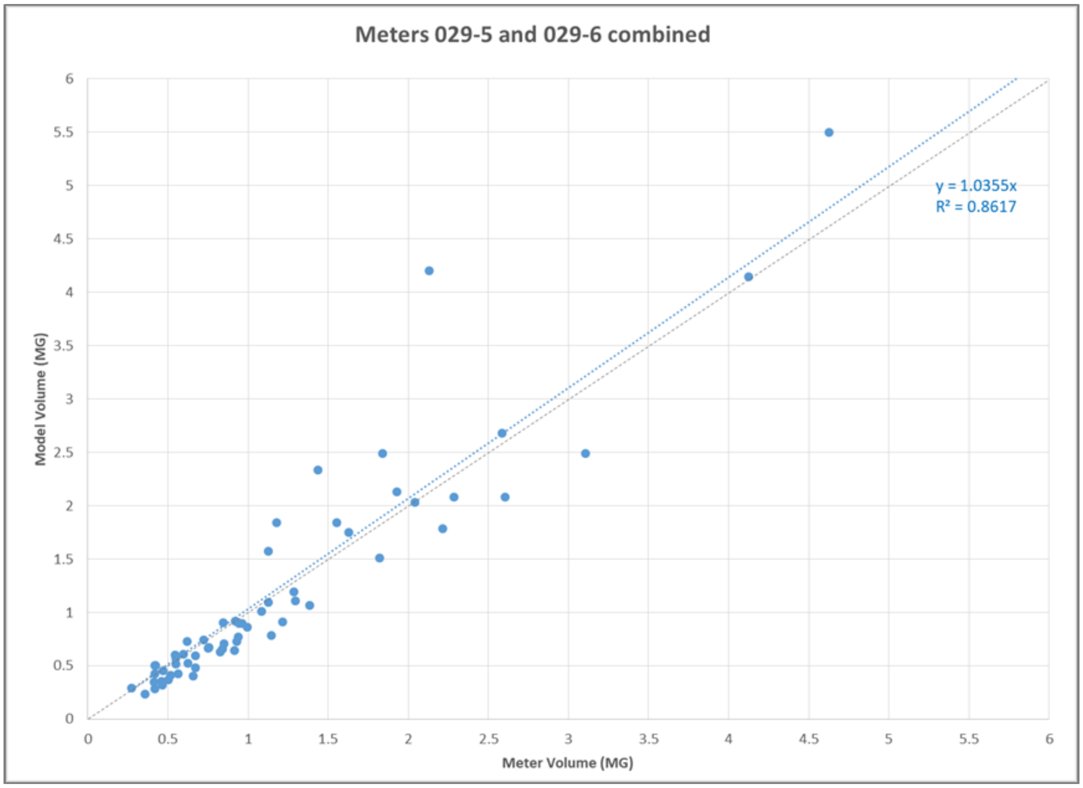



**Figure 3-2. PR-A Pre-Construction Event Volumes, 029-5 + 029-6**

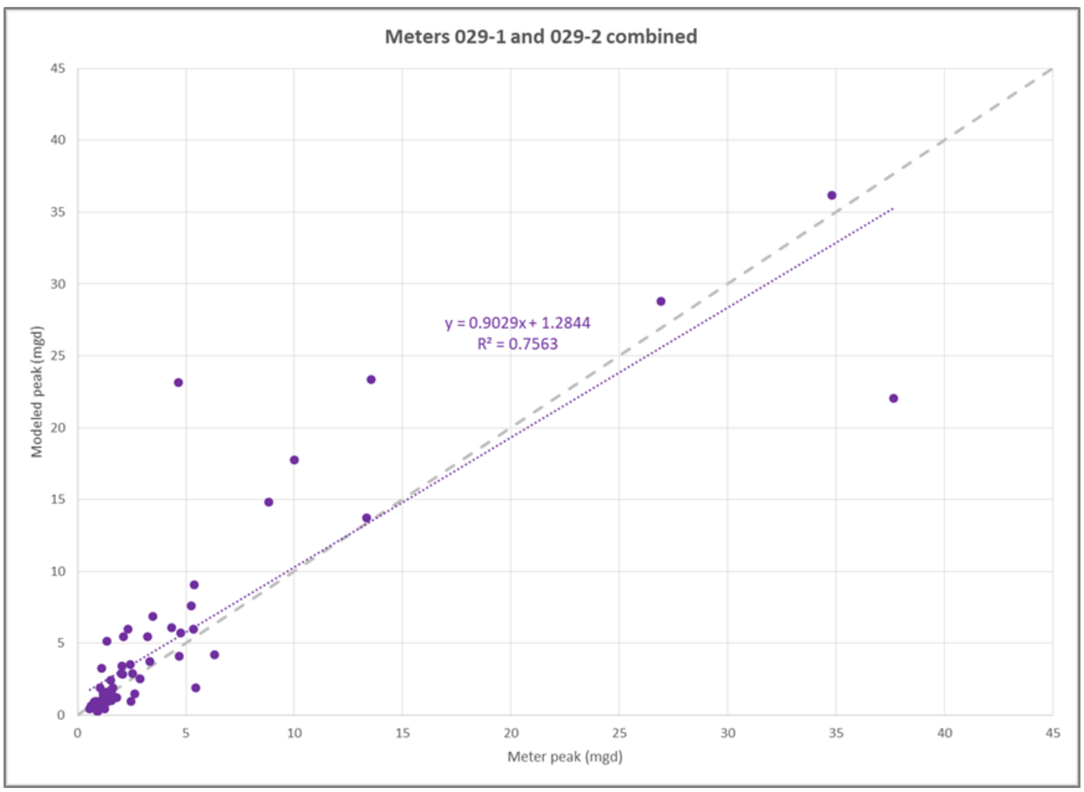



**Figure 3-3. PR-A Pre-Construction Event Peak Flows, 029-1 + 029-2**

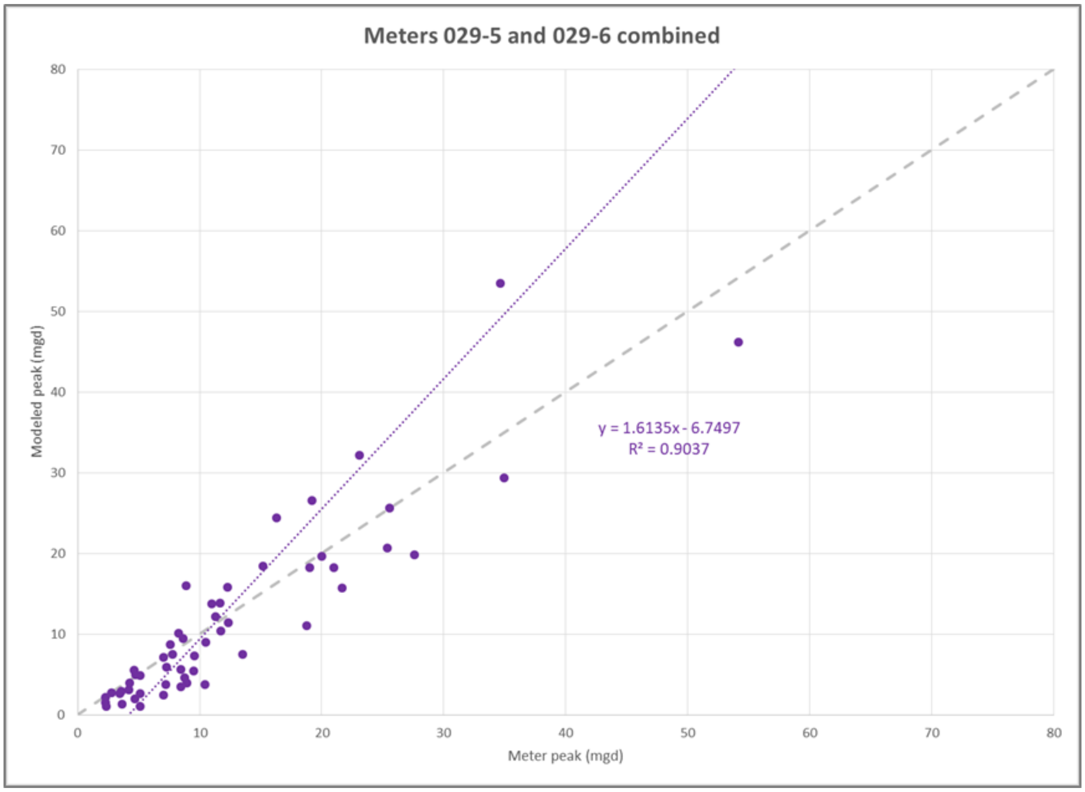



**Figure 3-4. PR-A Pre-Construction Event Peak Flows, 029-5 + 029-6**

### 3.3.2 PR-A Post-Construction Monitoring - Sewershed

Figure 3-5 through Figure 3-8 are 1-to-1 volume and peak flow plots for the combined 029-1 + 029-2 meter locations and 029-5 + 029-6 meter locations, comparing metered flows versus modeled predictions.

For 029-1 + 029-2, over the entire calibration period, the model under-predicts volumes by 4%. For 029-5 + 029-6, there is an overall over-prediction of volumes by 17%. In consideration that (a) the pre-construction model matches event volumes well for those downstream meters, and (b) the volume match is very good for the post-construction model at the upstream 029-1 + 029-2 meters where about half of the GI is concentrated, it was decided not to undertake additional model calibration.

As with the pre-construction model, peak flow response was more variable; the predicted peak flows were generally lower than metered flow peaks at 029-1 +029-2, and higher than metered flow peaks at 029-5 + 029-6.

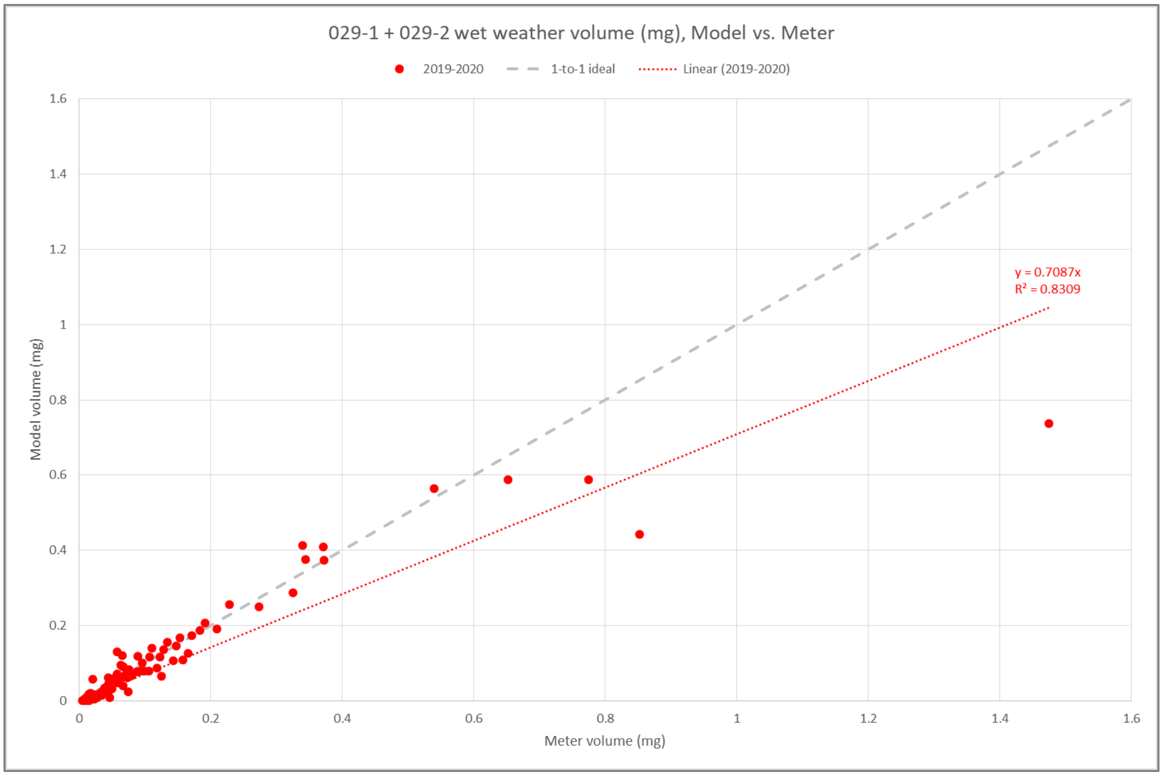



**Figure 3-5. PR-A Post-Construction Event Volumes, 029-1 + 029-2**

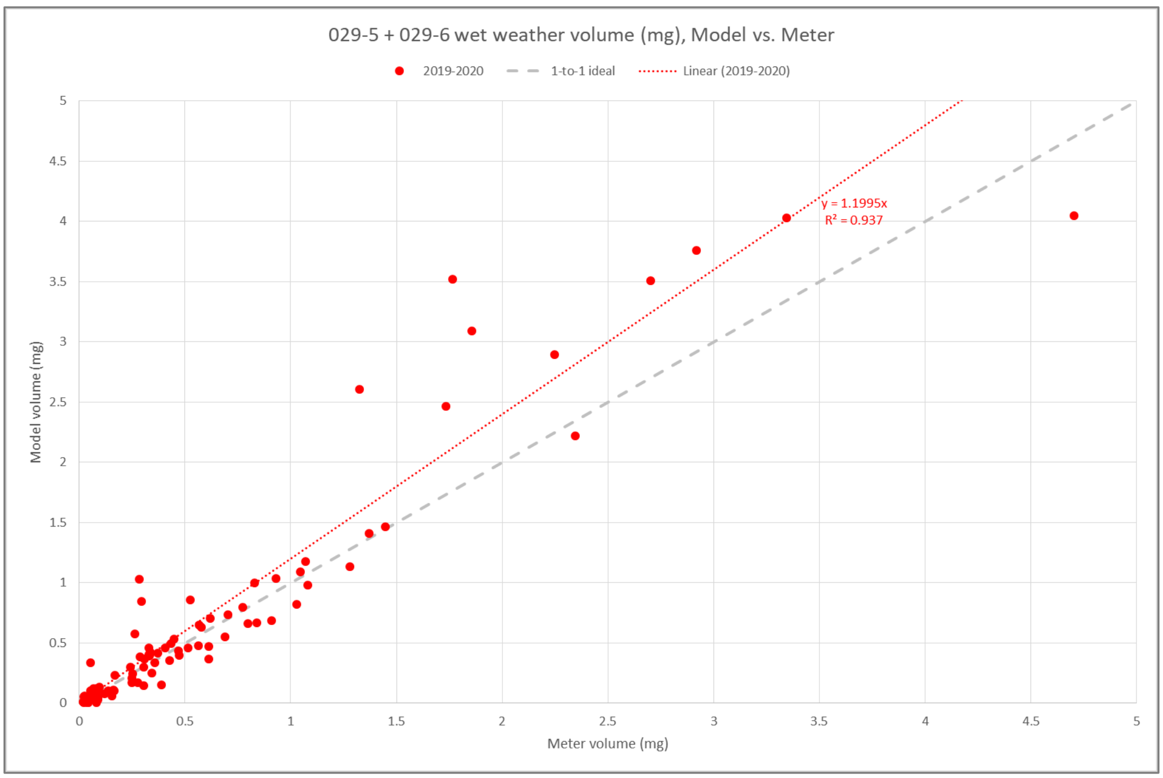



**Figure 3-6. PR-A Post-Construction Event Volumes, 029-5 + 029-6**

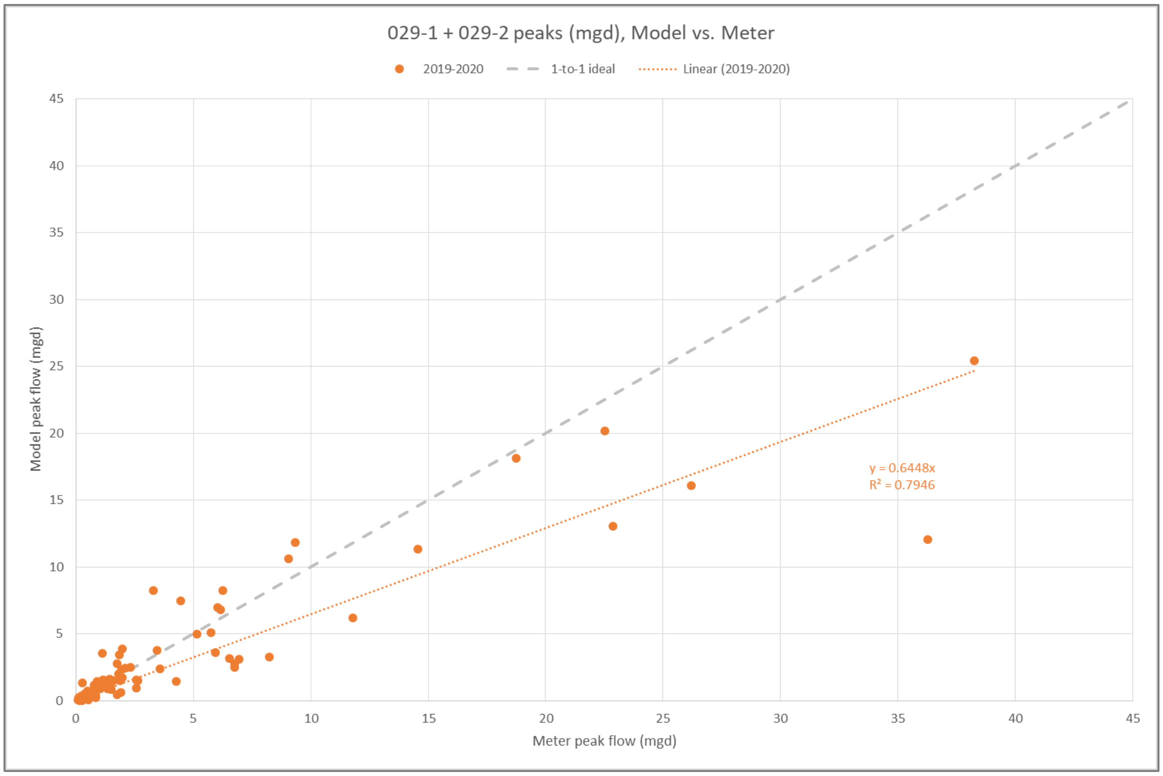



**Figure 3-7. PR-A Post-Construction Event Peak Flows, 092-1 + 029-2**

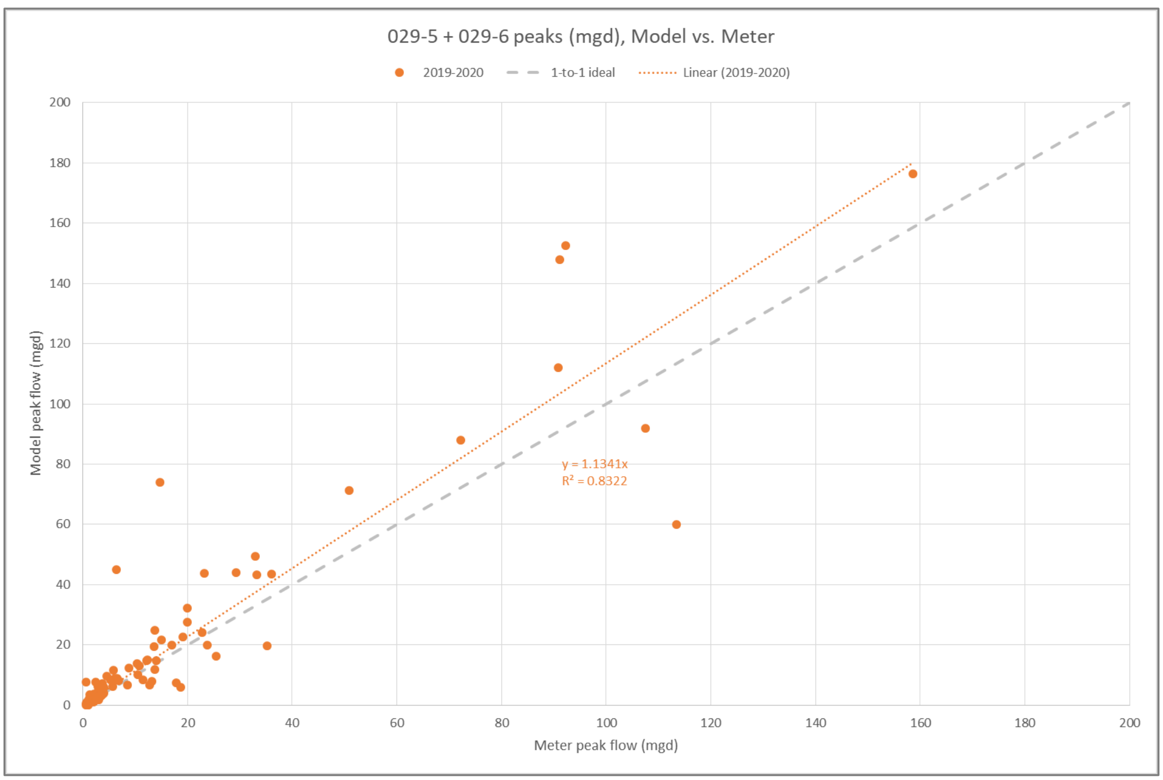



**Figure 3-8. PR-A Post-Construction Event Peak Flows, 029-5 + 029-6**

### 3.3.3 Post-Construction Model Results Summary

Results from the post-construction model calibration and the LTCP forecast period of 1988-1990 are presented in Table 3-1 below. Wet weather flow (WWF) volumes are defined as occurring when predicted flows in the sewer are exceeding two times the average dry weather flow rate. The reduction in WWF volumes per average year was calculated by taking the difference between pre- and post-construction WWF volumes and dividing by the number of impervious acres treated at 1.2” to determine the WWF reduction in million gallons per average year per impervious acres treated at 1.2”.

As the predictions from post-construction model using as-built GI matched the observed meter data to an acceptable degree without further adjustment of GI model parameters, it is assumed that actual modeled volume reduction and expected volume reduction are the same for the period 1988-1990.

**Table 3-1. Post-Construction Monitoring Results**

| Sewershed | Impervious Acres treated by GI (% of Total) | WWF Volume – Pre-Construction (MG) | WWF Volume – Post Construction (MG) | Predicted Volume Reduction Using Monitoring Data, Normalized to Impervious Acres Treated (%) | Predicted Volume Reduction Before Construction, Normalized to Impervious Acres Treated (%) |
|---|---|---|---|---|---|
| **2019 -2020 Rainfall Conditions** | | | | | |
| PR-A (2019 -2020 Rainfall) | 9.1 | 92.67 | 87.62 | 5.45 | N/A |
| **Average Year Rainfall Conditions (1988, 1989, 1990)** | | | | | |
| PR-A | 9.1 | 77.73 | 72.56 | 6.65 | 6.65 |

Based on the performance of PR-A, the efficacy of GI in the Potomac River Sewershed is practicable.

## 3.4 Public Acceptability

There was significant opposition to GI construction in the Georgetown Historic District in CSO 027 and 028. Opposition arose from the US Commission of Fine Arts, the National Capital Planning Commission, the Old Georgetown Board, Civic Associations, Advisory Neighborhood Commissions, and others. As a result of this opposition, DC Water was unable to construct Potomac Project No. 1 in CSO 027/028 and constructed only in CSO 029.

The opposition to GI in CSO 027/028 has not changed. As a result, GI is not practicable from a public acceptability point of view in the Potomac sewershed.

## 3.5 Cost Effectiveness

As DC Water's Green Infrastructure program matures, cost saving strategies have been able to be implemented from project to project. As shown in Table 3-2, the Rock Creek Project A cost was approximately 36% higher per acre managed than the Potomac River Project A, while the AlleyPalooza project shows additional cost reductions. Some of the cost saving measures implemented between projects included design standardization (Section 2.3.1) and contract methodology (Section 2.2).

**Table 3-2. RC-A, PR-A and AlleyPalooza Cost Comparison**

| Project | Acres Managed | Construction Cost per Acre Managed | Capital Cost per Acre Managed |
|---|---|---|---|
| Rock Creek Project A (RC-A) | 18.8 | $ 896,300 | $ 1,165,200 |
| Potomac River Project A (PR-A) | 7.9[1] | $ 660,800 | $ 859,000 |
| AlleyPalooza | 3.1 | $ 538,700 | $ 646,500 |

[1] Targeted Sewer Separation excluded

Since DC Water was unable to construct GI in the Georgetown Historic District as part of Potomac River Project No. 1, the cost related requirements to construct GI in the CSO 027/028 areas are unknown. Additionally, since DC Water does not have actual costs to construct GI in the Historic District, estimating the cost is difficult to determine. Based on the comments received during the planning stages, DC Water can assume that costs within the Historic District would be far higher than what was seen in other locations of the District. Therefore, despite the cost saving measures that have been achieved from project to project, a full 133-acre buildout within the Potomac River Sewershed has been determined to be cost prohibitive.

From a cost effectiveness standpoint, GI is not practicable in the Potomac River sewershed.

## 3.6 Economic Impact Analysis (EIA)

Corona Environmental Consulting (Corona) conducted a sensitivity analysis to evaluate the economic impact benefits for varying levels of green infrastructure (GI) projects. This section summarizes their findings, and a memorandum outlining their analysis can be found in Appendix K. Three scenarios were analyzed based on managing 10 acres of impervious area using a mix of bioretention and permeable pavement as described below:

- Scenario 1: 50% of impervious acres are managed through permeable pavement, 50% managed through bioretention.
- Scenario 2: 70% of impervious acres are managed through permeable pavement, 30% managed through bioretention.
- Scenario 3: 90% of impervious acres are managed through permeable pavement, 10% managed through bioretention.

For the purposes of this exercise, a comparison of the impacts of alternative GI scenarios to those associated with spending on an equivalent level of gray infrastructure was conducted. The impacts per million dollars spent under the GI scenarios compared to the gray infrastructure impacts per million dollars spent from the Rock Creek analysis was analyzed.

All spending on infrastructure creates economic impacts. It is therefore worthwhile to compare economic impacts of different alternatives to a baseline (i.e., gray infrastructure) scenario. Table 3-3 compares the economic impacts of the three GI scenarios to the economic impacts associated with gray infrastructure (per million dollars spent), based on results from the analysis of CSO control alternatives in the Rock Creek watershed. Table 3-3 results are based on impacts associated with the same level of spending for gray and green infrastructure.

**Table 3-3. Total Economic Impacts per Million Dollars Spent, 2019 USD**

| Impact Type | Scenario 1 – 50% BR / 50% PP | | Scenario 2 – 30% BR / 70% PP | | Scenario 3 – 10% BR / 90% PP | |
|---|---|---|---|---|---|---|
| | Impact/$M | % Increase from Gray | Impact/$M | % Increase from Gray | Impact/$M | % Increase from Gray |
| Employment (Jobs) | 10.77 | **21%** | 10.2 | **14%** | 9.63 | **8%** |
| Labor Income | 807,621 | **9%** | 833,414 | **13%** | 859,207 | **16%** |
| Total Value Added | 881,136 | **38%** | 866,596 | **36%** | 852,056 | **34%** |
| Economic Output | 1,394,813 | **8%** | 1,398,441 | **8%** | 1,402,069 | **8%** |

## 3.7 Triple Bottom Line Assessment of GI Co-Benefits

In addition, Corona evaluated the triple bottom line (TBL) co-benefits associated with green infrastructure (GI) implementation scenarios described in Section 3.6. Table 3-4 shows the total present value of the monetized co-benefit estimates for each scenario through 2060, using a 3 percent discount rate. The table includes the monetary gains estimated for each co-benefit category. Apart from the Energy Savings and Air Emissions Reductions categories, the scenario with the most bioretention (50%) brings the highest level of co-benefits across the co-benefit categories. That said, given the tight conditions and lack of open space in Historic Georgetown, and minimal open space conditions in the rest of the sewershed, it would be likely that a full build-out of GI in the Potomac area would result in a program consisting mainly of permeable paving (90% or more), minimizing the potential overall co-benefits that could be realized in the Potomac sewershed.

**Table 3-4. Present Value of Co-Benefits by Category and Scenario, through 2060, (2019 USD)**

| Benefit Categories | 50/50 Scenario | 30/70 Scenario | 10/90 Scenario |
|---|---|---|---|
| Energy Savings WW Treatment | $ 72,146 | $ 72,146 | $ 72,146 |
| Air Emissions Reduction | $ 426,547 | $ 426,547 | $ 426,547 |
| Property Value Increase [a] | $ 3,361,031 | $ 2,016,618 | $ 672,206 |
| Heat Stress Reduction | $ 19,354 | $ 11,612 | $ 3,871 |
| Carbon Emissions Reduction | $ 224,953 | $ 221,427 | $ 217,901 |
| Ecosystem Value | $ 5,164 | $ 3,098 | $ 1,033 |
| Recreation Value [b] | $ 918,385 | $ - | $ - |
| Value of Green Jobs - Construction | $ 231,068 | $ 223,646 | $ 216,247 |
| Value of Green Jobs - O&M | $ 208,328 | $ 182,069 | $ 162,566 |
| **Total** | **$ 5,466,974** | **$ 3,157,162** | **$ 1,772,516** |

# 4 Practicability Determination and Recommendation

## 4.1 Conclusion and Recommendation

Given the significant and insurmountable public and approval agency opposition to GI implementation in the Historic District of Georgetown, the challenging constructability conditions, significantly higher costs associated with GI and the low triple bottom line co-benefits, DC Water has determined that it is not practicable to control at least 133 acres to the 1.2” Retention Standard in the CSO 027, 028 and 029 sewersheds. Per the terms of the Consent Decree, DC Water will instead plan, design, and construct the Potomac River Storage/Conveyance Tunnel with a total storage volume of not less than 40 million gallons.

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# Appendix A

# Amended Consent Decree

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**UNITED STATES DISTRICT COURT**
**FOR THE DISTRICT OF COLUMBIA**

| | |
|---|---|
| **ANACOSTIA WATERSHED SOCIETY, et al., Plaintiffs,**<br><br>**v.**<br><br>**DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY, and THE DISTRICT OF COLUMBIA, Defendants,**<br><br>**and**<br><br>**THE UNITED STATES OF AMERICA, Plaintiff,**<br><br>**v.**<br><br>**DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY, et al., and THE DISTRICT OF COLUMBIA, Defendants.** | **Consolidated Civil Action No. 1:00CV00183TFH** |

# FIRST AMENDMENT TO CONSENT DECREE

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WHEREAS, on February 2, 2000, the Plaintiffs, Anacostia Watershed Society, Kingman Park Civic Association, American Canoe Association, Friends of the Earth, Sierra Club, and Mary Stuart Bick Ferguson ("Citizen Plaintiffs") filed an action, Civil Action No. 1:00CV00183TFH, against the District of Columbia Water and Sewer Authority (hereinafter "DC Water") and its then General Manager, Jerry Johnson, pursuant to Sections 309(b) and (d) and 505 of the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 and the Water Quality Act of 1987 ("Clean Water Act" or "the Act"), 33 U.S.C. §§1319(b) and (d), and 1365;

WHEREAS, on December 20, 2002, Plaintiff, the United States of America, on behalf of the United States Environmental Protection Agency ("EPA"), filed a Complaint against DC Water and the District of Columbia ("District"), which case was consolidated with the pending matter against DC Water for the alleged violations of the Clean Water Act;

WHEREAS, the Complaints alleged that DC Water violated the Clean Water Act, 33 U.S.C. §§1251 et seq., by failing to comply with the District of Columbia Water Quality Standards, effluent limitations and other conditions established in the National Pollutant Discharge Elimination System ("NPDES") Permit No. DC0021199 issued to DC Water by EPA under Section 402 of the Act, 33 U.S.C. §1342, and by failing to properly manage, operate and maintain all collection, pumping facilities, treatment and/or combined sewer overflow ("CSO") control facilities or combined sewer systems ("CSS") owned and/or operated by DC Water;

WHEREAS, the United States further asserted, inter alia, a claim against the District of Columbia pursuant to Section 309(e) of the Act, 33 U.S.C. §1319(e), and Fed. R. Civ. P. 19(a);

WHEREAS, the United States, the Citizen Plaintiffs, and DC Water have resolved the claims for alleged violations of the Nine Minimum Controls and for the performance of certain projects in a partial consent decree, entered by the Court on October 10, 2003 ("Partial Consent Decree");

WHEREAS, in that Partial Consent Decree, DC Water agreed to pay a civil penalty and to perform Supplemental Environmental Projects and a Citizen Community Project;

WHEREAS, on April 26, 2004, Plaintiffs and Defendants entered into a stipulation which provided in essence that Defendants would not contest their liability for certain claims; that Plaintiff United States waived its claims for any additional civil penalties and dismissed with prejudice its claims under Count Three of its Complaint; and that Citizen Plaintiffs also waived their claims for civil penalties;

WHEREAS, DC Water submitted a draft Long Term Control Plan to EPA in June, 2001. Thereafter, DC Water finalized the Long Term Control Plan in July 2002 ("LTCP") and submitted it to EPA in August, 2002;

WHEREAS, DC Water provided for public participation in development of the Long Term Control Plan through public hearings at various locations throughout the District of Columbia, stakeholder meetings, and other means;

WHEREAS, the recommended control plan in Section 13 of the LTCP provides for, inter alia, three or more underground storage tunnels to hold up to 193 million gallons of the combined wastewater and stormwater during wet weather and to thereby reduce CSOs significantly;

WHEREAS, the Parties and the Citizen Plaintiffs stipulated and agreed and on September 22, 2004, the Court ordered, that issues pertaining to the scope of Section 402(q) of the Clean Water Act, 33 U.S.C. § 1342(q), including whether the measures proposed in DC Water's August, 2002 LTCP conform to the water quality standards of the District of Columbia, would not be addressed in this consolidated action, but rather EPA agreed to address such issues outside the context of this lawsuit in, inter alia, the modification of DC Water's NPDES permit that was pending at that time;

WHEREAS, EPA is the permitting agency and noticed an NPDES Permit containing Phase II conditions for public comment on March 18, 2004. EPA issued the final version of the Permit on December 14, 2004. The Fact Sheet to the final permit states that EPA has determined that, "based upon current information, including but not limited to documentation in the LTCP and the District of Columbia Department of Health's analysis and interpretation of its water quality standards, DC Water has demonstrated, pursuant to Section II.C.4.b of the 1994 CSO Policy, that the CSO control program will not preclude the attainment of water quality standards or the receiving waters' designated uses or contribute to their impairment." The Fact Sheet further provides that this determination is subject to post-construction monitoring adequate to verify compliance with water quality standards, in accordance with Section II.C.4.b and II.C.9 of the 1994 CSO Policy;

WHEREAS, because DC Water is unable to comply with the water quality based CSO effluent limits in the Phase II conditions of its NPDES Permit until such time as it has completed implementation of the CSO controls in its LTCP, the Parties entered into a consent decree, entered by the Court on March 23, 2005 ("2005 Consent Decree"), to establish a judicially enforceable schedule for implementation of the CSO controls in the LTCP;

WHEREAS, in a March 19, 2008 ruling on a permit appeal, the EPA Environmental Appeals Board ruled that District of Columbia water quality standards required that any compliance schedules for attainment of effluent limits for total nitrogen ("Total Nitrogen Limit") and phosphorus must be included in DC Water's NPDES Permit;

WHEREAS, on August 31, 2010, EPA re-issued DC Water's NPDES permit. The re-issued permit requires DC Water to design, construct and Place in Operation (as defined below) the facilities needed for DC Water to attain the Total Nitrogen Limit in the re-issued NPDES permit, and sets forth a schedule for DC Water to place such facilities into operation and to attain compliance with the Total Nitrogen Limit;

WHEREAS, in 2008, DC Water prepared a first revision to its LTCP which is called "DC Water's Total Nitrogen Removal/Wet Weather Plan" ("TN/Wet Weather Plan"). The TN/Wet Weather Plan sets forth DC Water's proposal and schedule to attain the Nitrogen Limit and related limits for phosphorus in its NPDES Permit, to satisfy its wet weather treatment obligations, and to optimize operations at Blue Plains (as defined below). On September 23, 2008, DC Water submitted to EPA the Anacostia River Facility Plan summary report and detailed implementation schedule ("Summary Report"). The Summary Report, which was approved by EPA on July 27, 2010, provides plans for implementing the wet weather aspects of the TN/Wet Weather Plan. The Summary Report is attached as **Appendix D** to this First Amendment to Consent Decree ("Consent Decree");

WHEREAS, the plans for reconfiguring and enlarging the Anacostia River tunnels and related facilities have been expanded upon by DC Water in accordance with the Summary Report, and these facilities are now under design and construction;

WHEREAS, DC Water has also completed a number of additional CSO control projects since the Partial Consent Decree was entered, including, but not limited to, projects to separate combined sewers in the Anacostia and the Rock Creek sewersheds, rehabilitate the Main & O, East Side, and Poplar Point Pumping Stations, improve regulators, eliminate outfalls, and install Green Infrastructure at multiple sites throughout the District;

WHEREAS, the 2005 Consent Decree calls for DC Water to control CSOs in the Potomac River and Rock Creek sewersheds by implementing Gray CSO Controls, including storage tunnels in each sewershed with combined storage capacities of 67.5 million gallons in the aggregate, rehabilitation of the existing Potomac Pumping Station, constructing a new Potomac Tunnel dewatering pumping station, and CSO outfall diversion, consolidation, and separation;

WHEREAS, in 2013, DC Water prepared and submitted to EPA a second revision to its LTCP which proposed substituting Green/Gray CSO Controls in the Potomac sewershed and Green CSO Controls in the Rock Creek sewershed for the corresponding Gray CSO Controls proposed in the LTCP. The new controls proposed in the second revision to the LTCP are summarized and depicted in **Appendix E** to this Consent Decree. The analyses submitted by DC Water in support of the second revision to the LTCP demonstrated that these Green/Gray CSO Controls and Green CSO Controls are projected to provide a degree of control equivalent to the Gray Controls in the LTCP. Following EPA's response to the second revision to the LTCP, DC Water filed a request to modify the affected CSO controls and deadlines pursuant to Section VII of the 2005 Consent Decree (Modifications to Selected CSO Controls and Schedules).

WHEREAS, as required by Section XXII of the 2005 Consent Decree (Modification), DC Water conducted a public participation process prior to submitting its modification request. The public participation process also included the proposed amendments to incorporate the reconfigured and enlarged Anacostia tunnels and related facilities according to the Summary Report and the more efficient designs for the Anacostia River Selected CSO Controls;

WHEREAS, the Parties have agreed to enter into this Consent Decree to reflect the above-described changes to the Selected CSO Controls and Schedules;

WHEREAS, DC Water contends that, pursuant to Section 202 of its enabling legislation, which provides, with certain exceptions not applicable here, that DC Water is subject to all laws applicable to offices, agencies, departments, and instrumentalities of the District government, DC Water is subject to the requirements of the Anti-Deficiency Act, 31 U.S.C. §§1341 et seq., to the same extent as other agencies of the District of Columbia;

WHEREAS, the Parties agree, without adjudication of facts or law, that settlement of this matter in accordance with the terms of this Consent Decree is in the public interest, and have agreed to entry of this Consent Decree without trial of any issues, and the Parties hereby stipulate that, in order to resolve the claims for alleged violations of water quality standards stated in the Complaint of the United States, and to provide for compliance with the water quality-based effluent CSO limits in DC Water's modified NPDES permit, this Consent Decree should be entered;

WHEREAS, the Court, upon consideration of the judicial record before it and review of this Consent Decree, also finds that settlement of this matter and entry of this Consent Decree is fair and in the public interest and will address the underlying causes of the violations. The Court also finds that it should exercise continuing jurisdiction over this matter to resolve disputes and, should the need arise, to modify the obligations in this Consent Decree;

AND WHEREAS, settlement and entry of this Consent Decree does not constitute an admission of liability by DC Water or the District of Columbia;

NOW THEREFORE, before taking any testimony, and without any adjudication of any fact or law, it is hereby ORDERED, ADJUDGED, and DECREED as follows:

## I. JURISDICTION AND VENUE

1. This Court has jurisdiction over the subject matter of this action, and over the Parties hereto, pursuant to Sections 309 and 505 of the Clean Water Act, 33 U.S.C. §§ 1319, 1365, and 28 U.S.C. §§ 1331, 1345, 1355, and 1367. Venue is proper in the District of Columbia

pursuant to Section 309 of the Clean Water Act, 33 U.S.C. § 1319, and 28 U.S.C. §§ 1391 and 1395(a).

## II. APPLICATION AND SCOPE

2. The provisions of this Consent Decree shall apply to and be binding upon the Parties to this action, and their agents, employees, successors and assigns, as well as to all persons acting under the direction and/or control of DC Water, including but not limited to third party firms, corporations, consultants, and contractors.

3. DC Water shall provide a copy of this Consent Decree to any consultant and contractor selected or retained to perform any activity required by this Consent Decree upon selecting or retaining such consultant or contractor.

4. No later than thirty (30) days prior to transfer of any ownership interest, operation, management, or other control of the CSS (as defined below), DC Water shall give written notice and provide a copy of this Consent Decree to any such transferee or successor in interest. DC Water shall require, as a condition of any such sale or transfer, that the purchaser or transferee agree in writing to be bound by this Consent Decree and submit to the jurisdiction of this Court for its enforcement. DC Water shall also notify, in writing, EPA Region III, the United States Attorney for the District of Columbia, and the United States Department of Justice, in accordance with Section XXI (Form of Notice), of any such planned transfer at least thirty (30) days prior to the transfer.

## III. OBJECTIVES

5. It is the express purpose of the Parties in entering this Consent Decree to further the objectives of the Act, as enunciated at Section 101 of the Act, 33 U.S.C. § 1251. All plans, reports, construction, and other obligations in this Consent Decree or resulting from the activities required by this Consent Decree shall have the objective of achieving full compliance with the

Clean Water Act, all applicable Federal and local regulations, and the terms and conditions of DC Water's NPDES Permit, and to meet the objectives of the 1994 CSO Policy (as defined below).

## IV. DEFINITIONS

6. Unless otherwise defined herein, the terms used in this Consent Decree shall have the meaning given to those terms in the Clean Water Act, 33 U.S.C. §§ 1251 et seq., the regulations promulgated thereunder, and EPA's 1994 CSO Policy.

7. The following terms used in this Consent Decree shall be defined as follows:

"Blue Plains" means the District of Columbia advanced wastewater treatment plant at Blue Plains.

"Collection System" means both the separate sanitary sewer and combined sewer systems within the District of Columbia.

"Combined Sewer Collection System" or "CSS" means the pipelines, pumping stations, treatment facilities and appurtenances in the District of Columbia which are designed to convey wastewaters and stormwater through a single pipe system to combined sewer overflow outfalls and/or treatment works. It includes the CSS and CSO facilities described in the NMC Report (as defined below), as well as any future additions or modifications required by this Consent Decree and the Partial Consent Decree.

"Combined Sewer Overflow" or "CSO" means a discharge from the CSS at a CSO outfall designated in the Permit.

"2005 Consent Decree" means the consent decree entered by the Court in this action on March 23, 2005.

"Consent Decree" or "Decree" means this First Amendment to Consent Decree, which amends and supersedes the 2005 Consent Decree.

"Consolidation" or "Outfall Consolidation" means elimination of a permitted CSO outfall by routing the discharge so that it is joined with one or more other permitted CSO outfall(s), or by connecting it with a storage/conveyance tunnel. Consolidation of outfalls does not reduce the volume of the overflow but does allow its location to be changed.

"Contract Award" or "Award Contract" means the date on which a contract is signed by both DC Water and the other party to the contract.

"Construction" means the act of building a facility.

"1994 CSO Policy" means EPA's April 19, 1994 CSO Control Policy, published at 59 Fed. Reg. 18,688, and incorporated into the Clean Water Act pursuant to the Wet Weather Water Quality Act, Section 402(q) of the Clean Water Act, 33 U.S.C. § 1342(q).

"DC Water" means the District of Columbia Water and Sewer Authority and any successors thereto.

"Detailed Design" means the final stage of preparing contract documents to be used to receive bids for construction of a facility.

"District" means the Government of the District of Columbia.

"Effective Date of the First Amendment to the Consent Decree" means the date on which this First Amendment to Consent Decree is approved and entered by the Court.

"Enhanced Clarification Facility" or "ECF" means those facilities at Blue Plains which are to replace the excess flow treatment facilities at Blue Plains. The ECF includes a combination of process units located on the end of the Blue Plains Tunnel ("BPT"), designed to empty the BPT and distribute flow from the BPT. Flows treated in and distributed from the ECF will be discharged as a CSO Bypass from Outfall 001 and/or Outfall 002 as provided in the NPDES Permit. Disinfection by chlorination will be followed by de-chlorination.

"Facility Plan" or "Facility Planning" means preparing an engineering study to develop additional definition of the Selected CSO Controls as may be necessary for preliminary design. Examples of Facility Planning activities include, but are not limited to, planning level geotechnical investigations, developing proposed alignments for the tunnels, identifying land acquisition and required approvals, establishing bases for design, establishing system hydraulics, siting shafts, regulators and pumping stations, and other elements needed to define the function and interaction of the Selected CSO Controls in the LTCP.

"Final Nitrogen Limit" means a limit on the discharge of total nitrogen from Blue Plains as specified in the NPDES Permit.

"Gray CSO Controls" means structural facilities, including but not limited to combined sewer separation, pumping stations, pipelines and conveyance and treatment facilities to control CSO discharges.

"Green CSO Controls" means the use of Green Infrastructure to control CSO discharges.

"Green/Gray CSO Controls" means the use of combinations of Green Infrastructure and Gray CSO Controls.

"Green Infrastructure" or "GI" means both LID and LIDR.

"Long Term Control Plan" or "LTCP" means the plan for controlling CSOs from DC Water's CSS that was prepared by DC Water pursuant to the 1994 CSO Policy and submitted to EPA as a final report in August, 2002, and all supplements thereto.

"Low Impact Development" or "LID" means design and techniques that store, infiltrate, evaporate and detain runoff, including, but not limited to, practices that mimic predevelopment site hydrology as identified in the District's stormwater management regulations and guidebook and in "Greening CSO Plans: Planning and Modeling Green Infrastructure for Combined Sewer

Overflow (CSO) Control", U.S. Environmental Protection Agency, March 2014, Publication # 832-R-14-001.

"Low Impact Development Retrofit" or "LIDR" means the modification of an existing site to accomplish LID goals. In this Decree, LIDR refers to both LID and LIDR.

"MGD" means million gallons per day.

"NMC Report" means the report entitled District of Columbia Water and Sewer Authority, EPMC III-Sewer System, "Combined Sewer System Nine Minimum Controls Summary Report", Draft, July 1999 (Engineering Program Management Consultant III, Greeley and Hansen, Program Manager).

"NPDES Permit" means National Pollutant Discharge Elimination System ("NPDES") permit number DC0021199 issued to DC Water pursuant to Section 402 of the Clean Water Act, 33 U.S.C. § 1342, and any future, extended, modified or reissued permit.

"Partial Consent Decree" means the Consent Decree in this consolidated action entered by this Court on October 10, 2003, resolving, inter alia, Plaintiffs' claim for failure to implement Nine Minimum Controls.

"Parties" means the United States of America, DC Water and the District of Columbia.

"Person" means an individual, corporation, partnership, association, State, municipality, commission, or political subdivision of a State, or any interstate body.

"Place in Operation" means to achieve steady state operation and to operate consistently in such a way as to accomplish the intended function, even though all construction close-out activities (such as completion of a punchlist and resolution of contract disputes or close-outs) may not yet be completed.

"Required Approvals" means approvals and/or permits required from agencies of the

District of Columbia government (other than DC Water itself), the federal government or any other governmental or private entity or person.

"Selected CSO Controls" or "Selected Controls" means the controls and projects that are comprised by the recommended control plan in Section 13 of the LTCP as subsequently modified and enumerated in Section VI (Selected CSO Controls and Schedules).

"Separation" or "Sewer Separation" means separation of sewers carrying stormwater and sanitary wastes, so that stormwater and sanitary wastewater each are conveyed through a separate system of pipes. For those portions of the CSS that are separated pursuant to this Decree or that were separated pursuant to the 2005 Consent Decree, the permitted CSO outfall may remain as a discharge point but shall discharge only stormwater after its separation. For Sewer Separation, in areas targeted for Green Infrastructure, the area managed by sewer separation may be accounted for as achieving the 1.2" retention standard for that area.

"Settling Defendants" means DC Water and the District of Columbia.

"Summary Report" means the Anacostia River Facility Plan summary report and detailed implementation schedule submitted by DC Water to EPA on September 23, 2008, and approved by EPA on July 27, 2010.

"The 1.2" Retention Standard" means the volume of water runoff produced by 1.2 inches of rain falling on an impervious surface.

## V. OVERVIEW

### A. Selected CSO Controls from the LTCP

8. The LTCP provides for control of CSO discharges to the Anacostia River, the Potomac River, and to Rock Creek and its Piney Branch tributary ("receiving waters"). The Selected CSO Controls comprise a system of underground storage tunnels and pumping stations designed to reduce CSO discharges to the receiving waters and to convey stored combined flow

to Blue Plains for treatment. Other elements of the LTCP include LIDR, Sewer Separation, Outfall Consolidation, CSO monitoring, public notification, intercepting sewers, regulator improvements and improvements to excess flow treatment facilities at Blue Plains.

**B. Total Nitrogen/Wet Weather Plan-Related Changes to the Selected CSO Controls for the Anacostia Sewershed**

9. The Summary Report **(Appendix D)** embodies certain changes to the Selected CSO Controls that implement the wet weather aspects of DC Water's TN/ Wet Weather Plan. Those changes, which are herein memorialized, include the use of enhanced clarification for treatment of certain wet weather flows consistent with the terms and conditions of DC Water's NPDES Permit, design and construction of a tunnel from the Main and O Street Pumping Station site to Blue Plains (the "Blue Plains Tunnel"), a 225 mgd Blue Plains Tunnel Dewatering Pumping Station, a 225 mgd Enhanced Clarification Facility ("ECF") to provide high-rate treatment of certain wet weather flows at Blue Plains, and other modifications to the Selected CSO Controls derived from the facility planning work summarized in the Summary Report.

**C. Green/Gray CSO Control-Related Changes to the Selected CSO Controls and Schedules for the Potomac and Rock Creek Sewershed.**

10. This Consent Decree also incorporates changes to the Selected CSO Controls and related schedules to incorporate substitution of Green/Gray CSO Controls in the Potomac sewershed and Green CSO Controls in the Rock Creek sewersheds as set forth in the second revision to the LTCP and summarized at Appendix E.

11. **Green/Gray CSO Controls for the Potomac Sewershed.** The Green/Gray CSO Controls in the Potomac sewershed are designed to take advantage of and build upon the additional conveyance and treatment capacity provided by the Blue Plains Tunnel, the Blue Plains Tunnel Dewatering Pumping Station, and the ECF. For Outfalls 025, 026, 027, 028 and 029, DC Water will implement a combination of targeted Sewer Separation and Green

Infrastructure for these outfalls. For Outfalls 020, 021, 022 and 024, DC Water will reduce the capacity of the Potomac Tunnel from 58 million gallons to 30 million gallons. Accordingly, the Green/Gray CSO Controls for the Potomac sewershed incorporated in this Consent Decree include substituting a smaller Potomac tunnel for the larger tunnel in the Selected CSO Controls from the LTCP, connecting the Potomac Tunnel to the Blue Plains Tunnel, the Green Infrastructure Program in **Appendix F** to this Decree, and targeted Sewer Separation. Because the Potomac and Anacostia Tunnel Systems will be interconnected, the total system storage available will not be less than 187 million gallons. The analyses submitted by DC Water in support of the second revision to the LTCP demonstrate that these Green/Gray CSO Controls and Green CSO Controls are projected to provide a degree of control equivalent to the Gray Controls in the LTCP.

12. **Green/Gray CSO Controls for the Rock Creek Sewershed.** DC Water will substitute Green Infrastructure for the Piney Branch Storage Tunnel. Accordingly, the Green CSO Controls for the Rock Creek sewershed incorporated in this Consent Decree include substituting the Green Infrastructure Program in **Appendix F** to this Decree for the Piney Branch Storage Tunnel.

## VI. SELECTED CSO CONTROLS AND SCHEDULES

DC Water agrees to and is ordered to implement the following Selected CSO Controls, which shall be operated in accordance with the NPDES Permit and shall have the minimum elements and capacities set forth below. Nothing herein shall be deemed to supersede the NPDES Permit and, in the event of a conflict, the NPDES Permit shall control.

### A. Anacostia River Projects

DC Water shall plan, design, and Place in Operation the following projects to control CSO discharges to the Anacostia River, at any time up to, but no later than, the schedules set forth below, and thereafter operate them.

13. DC Water commenced work required under the Facility Plan for the Anacostia River Projects on April 4, 2005. On September 18, 2008 DC Water submitted the Summary Report to EPA pursuant to Section X of the 2005 Consent Decree (EPA Approval of Plans and Submissions). EPA approved the Summary Report and detailed implementation schedule on July 10, 2010. Except for the milestones in this subsection VI.A (Anacostia River Projects), the deadlines in the detailed implementation schedule approved on July 10, 2010, shall serve to track and report progress, but shall not be enforceable obligations of this Consent Decree.

14. **Rehabilitation of Main, "O" Street, and Eastside Pumping Stations.** DC Water has certified that these projects have been completed pursuant to the requirements of the Partial Consent Decree.

15. **Separate Fort Stanton Drainage Area (Outfall 006).** On April 1, 2010, DC Water certified that it had separated the combined sewer area tributary to CSO Outfall 006 on the east side of the Anacostia River, eliminating it as a CSO outfall.

16. **Storage/Conveyance Tunnel from Blue Plains to CSO 019.** DC Water shall construct a Storage/Conveyance Tunnel from Blue Plains to CSO 019 which shall store and convey combined sewer flow from the Main and O Street Pumping Station site and other CSOs along the Anacostia River in accordance with DC Water's NPDES Permit. This tunnel will be designed and operated to provide CSO storage and conveyance for CSO Outfalls 005, 007, 009, 010, 011, 011a, 012, 013, 014, 015, 016, 017, 018, and 019 on the Anacostia River. The storage capacity of the tunnel shall be at least 105 million gallons. The location of the tunnel shall be finalized during final design but its approximate location is depicted in the Summary Report. After the tunnel and its appurtenances are Placed in Operation, discharges to the Northeast

Boundary Facility may be discontinued and the Facility may be abandoned or demolished in accordance with applicable law. After the tunnel is Placed in Operation, in the event of weather causing the tunnel to be used for storage, DC Water shall dewater the tunnel to the CSS as soon as practicable, but in no event longer than 59 hours from the end of the last rainfall event, and shall convey the contents of the tunnel to Blue Plains for treatment in accordance with its NPDES permit. DC Water shall plan, design, construct, and Place in Operation the tunnel at any time up to, but no later than, the following schedule:

a. Award Contract for Detailed Design: Completed

b. Award Contract for Construction: Completed

c. Place in Operation: March 23, 2018

17. **Poplar Point Pumping Station.** Under the Partial Consent Decree, DC Water is required to make certain interim improvements to the existing Poplar Point Pumping Station. In addition, DC Water shall replace the existing Poplar Point Pumping Station with a new pumping station, which shall have a firm pumping capacity of not less than 45 MGD. DC Water shall design, construct and Place in Operation the new pumping station at any time up to, but no later than, the following schedule:

a. Award Contract for Detailed Design: Completed

b. Award Contract for Construction: Completed

c. Place in Operation: March 23, 2018

18. **Northeast Boundary Storage/Conveyance Tunnels.** DC Water shall construct: (1) a Storage/Conveyance Tunnel generally in the Northeast Boundary area, and (2) a Branch Tunnel from the Storage/Conveyance Tunnel in the area of First Street NW and Rhode Island Avenue. The purpose of these tunnels is to provide additional storage and conveyance for

combined sewer flow and to relieve street and basement flooding in the Northeast Boundary area. The tunnels shall capture and store the combined sewer flow, in accordance with DC Water's NPDES permit. After the tunnels are Placed in Operation, in the event of wet weather causing the tunnels to be used for storage, DC Water shall dewater the tunnels to the CSS as soon as practicable, but in no event longer than 59 hours from the end of the last rainfall event, and shall convey the contents of the tunnels to Blue Plains for treatment in accordance with DC Water's NPDES permit. The sum of the storage capacities of the Storage/Conveyance Tunnel from Blue Plains to CSO 019 and the Northeast Boundary Storage/Conveyance Tunnels shall be at least 157 million gallons. The locations of the tunnels will be finalized during final design but their approximate locations are depicted in the Summary Report. DC Water shall design, construct and Place in Operation the tunnels at any time up to, but no later than, the following schedule:

a. Award Contract for Detailed Design: January 2, 2016

b. Award Contract for Construction: March 23, 2020

c. Place in Operation: March 23, 2025

19. **M Street (CSO 016 and CSO 017) and 018 Diversion Sewers.** DC Water shall consolidate and direct all combined sewer flow from Outfalls 016, 017 and 018 in the vicinity of the Anacostia Marina to the Storage/Conveyance Tunnel from Blue Plains to CSO 019 by way of diversion sewers, thus eliminating Outfalls 016, 017 and 018 except in those rare cases where use of those outfalls is required to isolate the tunnels or their appurtenances for service or repair. DC Water shall consolidate these outfalls at any time up to, but no later than, the following schedule:

a. Award Contract for Detailed Design: Completed

b. Award Contract for Construction: Completed

c. Place in Operation: March 23, 2018

**B. Potomac River Projects**

DC Water shall plan, design, construct, and Place in Operation the following projects on the Potomac River to control CSO discharges to that river, at any time up to, but no later than, the schedules set forth below, and thereafter to operate them.

20. DC Water shall start the Facility Plan for the Potomac Storage Tunnel and the Potomac Tunnel Dewatering Pumping Station no later than January 1, 2017. No later than December 31, 2018, DC Water shall submit to EPA pursuant to Section X (EPA Approval of Plans and Submissions) a summary report and detailed implementation schedule for the Potomac Storage Tunnel. That detailed implementation schedule shall set forth anticipated completion dates for stages of work and shall include appropriate deadlines for filing all applications for all permits that DC Water knows will be necessary, and dates for notices to proceed with work and construction starts. Except for the milestones in this subsection VI.B (Potomac River Projects), the deadlines in the detailed implementation schedule that is submitted no later than December 31, 2018, shall serve to track and report progress and shall not be enforceable obligations of this Consent Decree.

21. **Rehabilitation of the Existing Potomac Pumping Station**. The existing Potomac Pumping Station is being rehabilitated pursuant to the Partial Consent Decree in this consolidated action.

22. **Potomac Storage Tunnel.** DC Water shall construct a Potomac Storage/Conveyance Tunnel which shall store combined sewer flow from CSO Outfalls 020, 021, 022, and 024 in accordance with DC Water's NPDES Permit. The storage capacity of the tunnel will be at least thirty (30) million gallons. The location of the tunnel will be finalized

during facility planning and design but its approximate location is depicted in **Appendix E** to this Decree. The tunnel will be dewatered by gravity to the Blue Plains Tunnel. After the tunnel is Placed in Operation, in the event of wet weather causing the tunnel to be used for storage, DC Water shall dewater the tunnel as soon as practicable, but in no event longer than 59 hours, and will convey the contents of the tunnel to Blue Plains for treatment in accordance with DC Water's NPDES permit. DC Water will design, construct and Place into Operation the tunnel at any time up to, but no later than, the following schedule:

a. Award Contract for Design: July 1, 2021

b. Award Contract for Construction: September 30, 2023

c. Place in Operation: March 23, 2030

23. **CSO Outfall Separation.** DC Water shall separate the CSS tributary to CSO Outfalls 025 and 026 and eliminate them as CSO outfalls at any time up to, but no later than, the following schedule:

a. Award Contract for Detailed Design: March 23, 2019

b. Award Contract for Construction: March 23, 2021

c. Place in Operation: March 23, 2023

24. **Environmental Impact Statement for the Potomac Storage Tunnel.** DC Water has certified that it has awarded a contract for preparation of the Environmental Impact Statement ("EIS") required by the National Park Service for the Potomac Storage Tunnel. DC Water shall proceed to complete preparation of the EIS in accordance with the requirements of the National Environmental Policy Act and applicable National Park Service regulations.

25. **Green Infrastructure Program.** DC Water shall implement the Green Infrastructure Program for the Potomac sewershed in accordance with the requirements and

schedules in **Appendix F** to this Decree.

**C. Rock Creek Projects**

26. **Green Infrastructure Program.** DC Water shall implement the Green Infrastructure Program for the Rock Creek sewershed in accordance with the requirements and schedules in **Appendix F** to this Decree.

27. **CSO Outfall Separation.** DC Water has certified pursuant to the Partial Consent Decree that it has separated the Luzon Valley CSS tributary to CSO Outfall 059. DC Water has also certified that it has separated the combined sewer areas tributary to CSO outfalls 031, 037, 053 and 058, and that the separation has eliminated them as CSO outfalls.

28. **Monitoring at CSO Outfalls 033, 036, 047 and 057.** DC Water represents that it has conducted hydraulic monitoring at CSO Outfalls 033, 036, 047 and 057 to obtain data to further characterize the overflows on Rock Creek, including their frequency and volume. DC Water submitted its monitoring data to EPA on April 15, 2005, and EPA approved the data on November 23, 2005. Subsequently, DC Water submitted its plan for controlling CSOs 033, 036, 047 and 057 on May 19, 2006 in a report titled *Control Plan: Rock Creek CSO Outfall Nos. 033. 036, 047 and 057*, Final, May 2006 ("Control Plan"). EPA approved the Control Plan on October 4, 2007. The Control Plan calls for diversion structure improvements and sewer construction to control CSOs 033, 036, and 057. Based on the monitoring, the Control Plan determined that CSO 047 was not predicted to overflow in the average year and that no additional controls were required. The location, sizing, and extent of improvements were finalized during final design. DC Water shall plan, design, construct, and Place in Operation the measures in the Control Plan at any time up to, but no later than, the following schedule:

a. Award Contract for Detailed Design: Completed

b. Award Contract for Construction: Completed

c. Place in Operation: Completed

29. **Piney Branch Diversion Structure Improvements.** DC Water shall modify diversion Structure No. 70 at Piney Branch to improve diversions to the interceptor system at any time up to, but no later than, the following schedule:

a. Award Contract for Detailed Design: March 23, 2016

b. Award Contract for Construction: March 23, 2018

c. Place in Operation: March 23, 2020

**D. Blue Plains Wastewater Treatment Plant Projects**

DC Water shall plan, design, construct, Place in Operation and operate the following projects at Blue Plains, at any time up to, but no later than, the schedules set forth below.

30. **Blue Plains Tunnel Dewatering Pumping Station ("TDPS") and Enhanced Clarification Facility ("ECF").** The locations of the ECF and TDPS will be finalized during the final design. Their approximate location is depicted in the Summary Report. DC Water shall design, construct, and Place in Operation the TDPS and ECF at Blue Plains at any time up to, but no later than, the following schedule:

a. Award Contract for Detailed Design: Completed

b. Award Contract for Construction: Completed

c. Place in Operation: March 23, 2018

**E. Public Notification**

31. A visual notification system shall be installed as part of the construction of the tunnel storage projects for the Anacostia River, the Potomac River and for Rock Creek. The system shall be installed at a minimum of three locations on each receiving water at public access locations. The system shall be designed to notify the public of the occurrence of overflows based on flow monitoring at representative CSO outfalls on each receiving water. The

system shall comprise a series of colored lights, flags or pendants that shall operate as follows:

a. Color A shall be displayed as long as flow is detected from the representative outfall;

b. Color B shall be displayed for 24 hours after flow is no longer detected from the representative outfall;

c. When operational, the visual notification system shall be described and explained on DC Water's web site.

32. DC Water shall finalize the details of the public notification system (e.g., selection of representative outfalls, locations, warning devices, and colors) during Facility Planning for each receiving water. DC Water shall submit its plan with the final details to EPA for approval pursuant to Section X (EPA Approval of Plans and Submissions).

## VII. MODIFICATIONS TO SELECTED CSO CONTROLS AND SCHEDULES

33. DC Water agrees that the original 20 year implementation schedule and the work set forth in Section VI of the 2005 Consent Decree (Selected CSO Controls and Schedules) remain feasible and equitable, based on current information, assumptions and financial and other projections. Some of the information originally available to DC Water and its original assumptions and projections are set forth in, inter alia, the LTCP appended at **Appendix A**. DC Water's original financial assumptions and projections for the 20 year implementation schedule are set forth in, inter alia, **Appendix B.**

34. The Parties recognize that the information currently available to DC Water as well as DC Water's current assumptions and projections may change during implementation of the Selected CSO Controls. The schedule and/or the Selected CSO Controls in Section VI (Selected CSO Controls and Schedules) may be modified based on a significant change in the information currently available to DC Water, or in DC Water's current assumptions or

projections, whether or not such change is anticipated, that renders the Consent Decree no longer feasible and equitable. Unless the Parties otherwise agree, a request for modification shall not relieve DC Water of its obligations pursuant to Section VI (Selected CSO Controls and Schedules) and DC Water shall continue with implementation of the Selected CSO Controls until the request for modification is either agreed to by the Parties, approved by the Court, or ruled on by the Court under Section XXII (Modification). Any dispute as to whether or not implementation of the Selected CSO Controls should continue during the pendency of the modification request shall not be subject to judicial review or to dispute resolution.

35. The United States on behalf of EPA has accepted the Selected CSO Controls and the 20 year schedule. **Appendices A, B, D and E** are not stipulations, however, and the United States reserves its right to disagree with or to contest particular statements or facts contained therein. In the event that DC Water seeks a modification to extend the schedule based upon a significant increase in costs or other changes in financial circumstances, DC Water shall provide to EPA an update of the information contained in **Appendix B** and, at EPA's request, an update of the key financial variables listed at **Appendix C**.

36. The failure of DC Water and/or the District to seek, approve, or enact timely and adequate rate changes or to obtain bond or other financing to implement the work according to the schedule contained herein based on current information, assumptions and projections shall not constitute a significant change in circumstances under this Section nor shall such failure by itself justify any change in or reassessment of the interim milestones or the 20 year schedule in this Decree.

37. **Grant Funding.** The schedules contained herein assume no federal appropriations, grants, or funding from sources other than DC Water for performance of the

work described in Section VI (Selected CSO Controls and Schedules). In the event that DC Water receives grant funding from federal or other sources for such work, it shall report to EPA in writing the source, amount, and timing of any such grant funding when it learns that it will be appropriated or otherwise received. DC Water has the option but is not required to accelerate the schedule contained in Section VI (Selected CSO Controls and Schedules) based on grant funding.

38. Modifications made pursuant to this Section shall follow the procedures set forth in Section XXII (Modification).

39. In the event that DC Water, after consultation with the District, requests a modification to the schedule or to the Selected CSO Controls, and the United States does not agree to the proposed modification, DC Water and/or the District may invoke the dispute resolution procedures of Section XIV (Dispute Resolution).

40. If DC Water, after consultation with the District, requests a modification because it has decided that it needs to rebid a contract to construct a project, and if DC Water has made best efforts to communicate with the appropriate personnel at EPA Region 3 to obtain a response to a request for modification and has promptly responded to any requests for information from EPA Region 3 related to the requested modification, but EPA does not act on the request for modification within sixty (60) days after receiving the modification request, DC Water may initiate informal dispute resolution and issue a notice of the dispute under the dispute resolution procedures. For all other requests for modification, if DC Water has made best efforts to communicate with the appropriate personnel at EPA Region 3 to obtain a response to a request for modification, and has promptly responded to any requests for information from EPA Region 3 related to the requested modification, but EPA does not act on the request for modification

within one hundred twenty (120) days after receiving the modification request, DC Water may initiate informal dispute resolution and issue a notice of the dispute under the dispute resolution procedures.

41. Compliance with the terms of this Decree is not conditioned upon the receipt of federal or state grant funds and DC Water's failure to comply is not excused by the lack of federal or state grant funds, or by the processing of any applications for the same, subject solely to a force majeure event due to the Anti-Deficiency Act provisions in Section XIII (Force Majeure).

## VIII. CONTROL SYSTEM COMPLIANCE AND POST-CONSTRUCTION MONITORING

### A. Individual Construction Project Certification.

42. Within sixty (60) days of Placing in Operation each project required under Section VI (Selected CSO Controls and Schedules), DC Water shall certify under Section XX (Certification of Submissions) that such project has been designed, constructed and will be operated in accordance with the terms of this Consent Decree and its NPDES permit.

### B. Post-construction monitoring.

43. When the Selected Controls set forth in Section VI (Selected CSO Controls and Schedules) have been Placed in Operation, DC Water shall comply with the post-construction monitoring program set forth in its NPDES permit.

44. Following the Effective Date of the First Amendment to the Consent Decree, DC Water shall include with its next application for NPDES permit renewal proposed revisions to the post-construction monitoring program to reflect the modifications to the Selected CSO Controls for the Potomac River and Rock Creek.

## IX. LOW IMPACT DEVELOPMENT RETROFIT

45. DC Water shall promote LIDR in the District of Columbia by performing projects as set forth in this Section. Such projects shall constitute additional work that DC Water agrees to perform in addition to the injunctive relief set forth in Section VI (Selected CSO Controls and Schedules).

46. As set forth in the LTCP, DC Water shall incorporate LIDR techniques into new construction or reconstruction on DC Water facilities for demonstration projects up to a total expenditure of $3 million and shall maintain the LIDR projects for at least five (5) years after each project is Placed into Operation. DC Water shall monitor such projects to obtain data regarding the effectiveness of LIDR in reducing run-off reaching combined sewers and surface waters. These LIDR projects shall be in addition to those constructed as a Supplemental Environmental Project or financed as a Citizen Environmental Project pursuant to the Partial Consent Decree.

47. DC Water submitted a plan to EPA for approval and a schedule for implementing and monitoring LIDR on its own property, which plan and schedule have been approved by EPA. DC Water Placed in Operation all LIDR projects by March 18, 2014. DC Water shall monitor the LIDR projects for twelve (12) months after Placing in Operation all LIDR facilities.

## X. EPA APPROVAL OF PLANS AND SUBMISSIONS

48. After review of any plan, report, or other item that is required to be submitted pursuant to this Consent Decree (with the exception of requests for modification pursuant to Section VII (Modifications to Selected CSO Controls and Schedules)), EPA shall in writing: (a) approve the submission; (b) approve the submission upon specified conditions; (c) approve part of the submission and disapprove the remainder; or (d) disapprove the submission.

49. If the submission is approved, DC Water shall take all actions required by the plan, report, or other item, as approved. If the submission is conditionally approved or approved

only in part, DC Water shall, upon written direction of EPA, take all actions required by the approved plan, report, or other item that EPA determines are technically severable from any disapproved portions, subject to DC Water's right to dispute only the specified conditions or the disapproved portions, under Section XIV (Dispute Resolution).

50. If the submission is disapproved in whole or in part, DC Water shall, within 45 days or such other time as the Parties agree in writing, correct all deficiencies and resubmit the plan, report, or other item, or disapproved portion thereof, for approval. Any Stipulated Penalties applicable to the original submission, as provided in Section XII (Stipulated Penalties), shall accrue during the 45-day period or other specified period, but shall not be payable unless the resubmission is untimely or is disapproved in whole or in part; provided that, if the original submission was so deficient as to constitute a material breach of DC Water's obligations under this Decree, the Stipulated Penalties applicable to the original submission shall be due and payable notwithstanding any subsequent resubmission.

51. If a resubmitted plan, report, or other item, or portion thereof, is disapproved in whole or in part, EPA may again require DC Water to correct any deficiencies, in accordance with the preceding Paragraphs of this Section, subject to DC Water's right to invoke Dispute Resolution and the right of EPA to seek Stipulated Penalties, as provided in the preceding Paragraphs of this Section.

## XI. REPORTING

52. Progress reports are to be provided at quarterly intervals for all milestone events one year or longer in duration. Each progress report shall summarize the status and progress of work required for completion of the next milestone and the impact of any delays on completion of said milestone, and shall be submitted on the 28th day of the month following each calendar quarter.

53. Beginning with the first CSO Quarterly Report due after the Effective Date of the First Amendment to the Consent Decree, and for every calendar quarter thereafter until this Consent Decree terminates in accordance with Section XXVI (Termination), DC Water shall submit written status reports to U.S. EPA, certified pursuant to Section XX (Certification of Submissions), and post them on the DC Water website. In each report, DC Water shall provide the following:

a. a statement setting forth the deadlines and other terms that DC Water is required by this Consent Decree to meet since the date of the last quarterly statement, whether and to what extent DC Water has met these requirements, and the reasons for any noncompliance;

b. a statement tracking DC Water's progress against the detailed implementation schedules required to be submitted under Section VI (Selected CSO Controls and Schedules) upon the completion of Facility Planning for each receiving water, whether there have been any delays, the reasons for the delays, and the actions DC Water is taking or intends to take to overcome the delays.

c. a general description of the work completed within the three-month period, and a projection of work to be performed pursuant to this Consent Decree during the next three-month period. Notification to U.S. EPA of any anticipated delay shall not, by itself, excuse the delay.

## XII. STIPULATED PENALTIES

54. DC Water shall be liable for stipulated penalties for the failure to satisfactorily achieve any deadline for the start of Facility Planning, submission of a detailed implementation schedule and summary report on Facility Planning, Award of Contract for Detailed Design and the Award of Contract for Construction in Section VI (Selected CSO Controls and Schedules), as

follows:

| Period of Noncompliance | Penalty Per Day Per Violation |
|---|---|
| 1st to 30th Day | $ 500 |
| 31st to 59th Day | $ 1,000 |
| 60th day until submitted | $ 1,500 |

55. DC Water shall be liable for stipulated penalties for the failure to satisfactorily Place in Operation any of the required projects by the final deadline set forth for that project in the schedules in Section VI (Selected CSO Controls and Schedules), as follows:

| Period of Noncompliance | Penalty Per Day Per Violation |
|---|---|
| 1st to 30th Day | $ 1,000 |
| 31st to 59th Day | $ 2,000 |
| After 60 Days | $ 5,000 |

56. DC Water shall be liable for stipulated penalties for each failure to properly perform the CSO monitoring required in its NPDES Permit after the Selected Controls are Placed in Operation, as follows:

| Period of Noncompliance | Penalty Per Day Per Violation |
|---|---|
| 1st to 30th Day | $ 1,000 |
| 31st to 59th Day | $ 2,000 |
| 60th day until submitted | $ 2,500 |

57. DC Water shall be liable for stipulated penalties for failure to timely submit any progress or completion report required in Section XI (Reporting) , as follows:

| Period of Noncompliance | Penalty Per Day Per Violation |
|---|---|
| 1st to 30th Day | $ 500 |
| 31st to 59th Day | $ 1,000 |
| 60th day until submitted | $ 2,000 |

58. Other Violations: If DC Water fails to comply with a requirement or provision of this Decree not expressly listed above, it shall be liable for stipulated penalties as follows:

| Period of Noncompliance | Penalty Per Day Per Violation |
|---|---|
| 1st to 30th Day | $ 500 |
| 31st to 59th Day | $ 1,000 |
| 60th day until submitted | $ 2,000 |

59. General Provisions. Stipulated civil penalties shall automatically begin to accrue on the first day DC Water fails to meet any of the schedules required by this Consent Decree or to satisfy any obligation or requirement of this Consent Decree and shall continue to accrue each day until DC Water achieves compliance with such schedule, obligation or requirement; provided, however, that if DC Water submits an appropriately documented request for modification under Section XXII (Modification) 180 days prior to an affected deadline or compliance date, and EPA does not act on such request for modification prior to the deadline or compliance date, stipulated penalties shall not accrue for DC Water's failure to satisfy the deadline or compliance date until EPA's approval or disapproval. This provision shall not apply if DC Water does not have a reasonable basis to make the request for modification or if the request is made for purposes of delay. In the event EPA approves or disapproves DC Water's request for modification after passage of the affected deadline or compliance date, stipulated penalties shall begin to accrue from the time EPA acts on the request for modification.

60. Failure to Meet Award of Construction Contract Deadlines Due to Rebidding. If DC Water elects to rebid a construction contract for a project described in Section VI (Selected CSO Controls and Schedules), it may request a modification under Section VII (Modifications to Selected CSO Controls and Schedules). In the alternative, DC Water may rebid and elect to have any stipulated penalties for failure to meet the Award of Construction Contract deadline due and owing but to defer their payment. If DC Water meets its deadline for Placing in Operation the specific project for which penalties were deferred, stipulated penalties for failure to meet the deadline for Award of Construction Contract will be excused. If DC Water fails to meet the deadline for Placing in Operation the specific project for which penalties were deferred, stipulated penalties for the failure to meet both the Award of Construction Contract and the

Placing in Operation deadlines will be due and payable on demand by the United States. When DC Water elects a deferral of stipulated penalties for failure to meet an Award of Construction deadline due to rebidding a project, it shall give written notice to EPA that it intends to rebid the project and to defer stipulated penalties. When it awards the contract for construction of that project, DC Water shall so notify EPA and advise it in writing of the amount of stipulated penalties accrued pursuant to Section XII (Stipulated Penalties) that are due and owing but deferred.

61. Stipulated civil penalties shall be paid within thirty (30) days of the date of a demand for payment of stipulated civil penalties for any non-compliance with any of the schedules of performance or requirements set forth in this Consent Decree.

62. In the event that a stipulated penalty is not paid according to the instructions in a written demand from the United States, the stipulated civil penalty shall be payable with interest from the original due date to the date of payment, at the statutory judgment rate set forth at 28 U.S.C. § 1961(a).

63. Stipulated civil penalties shall be paid electronically or by submitting a certified or cashier's check payable to "Treasurer, the United States of America", and tendered to the United States Attorney for the District of Columbia. Simultaneously, DC Water shall send copies of the certified or cashier's check, together with a letter describing the basis for the penalties, to Chief, Environmental Enforcement Section, United States Department of Justice, Post Office Box 7611, Ben Franklin Station, Washington, D.C. 20044, and to Section Chief, Compliance and Enforcement Branch, Water Protection Division, US EPA Region 3, 1650 Arch Street, Philadelphia, PA 19103. The transmittal letter shall reference the caption, the civil action number, and DOJ Number 90-5-1-1-07137.

64. Payment of stipulated civil penalties as set forth above shall be in addition to any other rights or remedies which may be available to the United States or its agencies by reason of DC Water's failure to comply with the requirements of this Consent Decree and all applicable Federal, state or local laws, regulations, wastewater discharge permit(s) and all other applicable permits. Where a violation of this Consent Decree is also a violation of such laws, regulations, or permits, DC Water shall be allowed a credit, in the amount of any Stipulated Penalties paid, as a set-off against any statutory penalties imposed for such violation.

65. If DC Water invokes dispute resolution and the Court resolves the dispute against DC Water, stipulated penalties which have accrued during the pendency of the dispute shall be payable, as set forth herein, upon resolution of the dispute; provided, however, that in the event that the Director of the Water Protection Division requires more than sixty (60) days to issue a final agency decision concerning the dispute, DC Water shall be liable only for sixty (60) days of stipulated penalties for the period from submission of the final Statements of Position or written Reply until issuance of the final agency decision, as set forth in Section XIV (Dispute Resolution). Stipulated penalties shall begin to accrue again upon issuance of the final agency decision.

## XIII. FORCE MAJEURE

66. "Force Majeure" for the purposes of this Consent Decree is defined as an event arising from causes beyond the control of DC Water or the control of any entity controlled by DC Water, including its consultants and contractors, which delays or prevents the performance of any obligation under this Consent Decree. Nothing in this Section is intended to relieve DC Water of its duty to use due diligence to complete the requirements of this Consent Decree in a timely manner or of DC Water's obligation to meet all discharge limitations and other obligations contained in DC Water's NPDES Permit. Unanticipated or increased costs or

changed financial circumstances are not Force Majeure events, except as provided in Paragraph 68 (Anti-Deficiency Act Events) below, although in certain instances they may constitute the basis for a request for modification pursuant to Section VII (Modifications to Selected CSO Controls and Schedules).

67. **Permitting:** Failure to apply for a required permit or approval, or to provide in a timely manner all information required to obtain a permit or approval necessary to meet the requirements of this Consent Decree, are not Force Majeure events. However, failure of a permitting authority to issue a necessary permit in a timely fashion is an event of Force Majeure where the failure of the permitting authority to act is beyond the control of DC Water and DC Water demonstrates that it has taken all steps available to it to obtain the necessary permit, including but not limited to:

a. Promptly providing reasonably known permitting authorities with copies of this Consent Decree, when lodged, as well as briefing each such authority, both orally and with written materials if necessary, on the projects and schedules contained therein in order to coordinate permitting submittals and approvals;

b. submitting a complete permit application within two (2) months of the date identified in the detailed implementation schedule to apply for permits that are known to be required, and in a prompt fashion for those permits not known to be required or previously identified in the schedule;

c. responding to requests for additional information by the permitting authority in a timely fashion;

d. making regular inquiry, approximately every 45 days, both verbally and in writing, with the permitting authority after initial or supplemental permit filings, to determine the status of the permit application;

e. seeking relief from higher management officials within the permitting authority where permit processing delays threaten to cause noncompliance with any deadline in this decree;

f. accepting lawful permit terms and conditions; and

g. prosecuting appeals of any unlawful terms and conditions imposed by the permitting authority in an expeditious fashion.

68. **Anti-Deficiency Act Events**: Nothing in this Decree shall be construed to require an expenditure, obligation or contract in violation of the Anti-Deficiency Act, 31 U.S.C. §§ 1341 et seq. Where an expenditure, obligation or contract is subject to the Anti-Deficiency Act, DC Water's obligations shall be subject to the availability of appropriated funds. In such case, DC Water must identify the portion of its budget related to implementation of this Consent Decree that is comprised of appropriated or other funds, and demonstrate why the unavailability of those appropriated or other funds will delay specific obligations.

69. To the extent made necessary by lack of appropriated funds, DC Water may obtain deferral of compliance with an obligation of this Consent Decree until its next annual budget cycle if, within sixty (60) days after DC Water knew or should have known of the event described in Paragraph 70 below, it provides in writing to EPA Region III a statement which shows the following:

a. That it included in its annual budget, which accompanies the District of Columbia budget submitted to the President for transmission to the Congress pursuant to Section 446 of the District of Columbia Home Rule Act, D.C. Code Sec. 1-204.46 (2001), sufficient money to carry out such objective;

b. That it made diligent efforts to obtain Congressional enactment of that part of the budget act;

c. That it expressly identified in the annual fiscal year adopted budget prepared for Congressional use such obligation (not necessarily to include reference to this Decree as such) together with the amount of money tied to performing such obligation; and

d. That Congress acted expressly to eliminate such amount of money or to reduce it below the level necessary to perform the obligation, or that Congress made an across the board reduction in DC Water's appropriation as shown in DC Water's adopted budget without expressly saving such obligation and the across the board reduction, as applied proportionately to the amount of money shown in the adopted budget for such obligation, left an insufficient amount to carry out that obligation.

70. **General Requirements:** When circumstances are occurring or have occurred which may delay the completion of any requirement of this Consent Decree, whether or not due to a Force Majeure event, DC Water shall so notify EPA, in writing, within fifteen (15) days after DC Water knew, or should have known, of the delay or anticipated delay. The notice shall describe in detail the basis for DC Water's contention that it experienced a Force Majeure delay, the anticipated length of the delay, the precise cause or causes of the delay, the measures taken or to be taken to prevent or minimize the delay, and the timetable by which those measures will be implemented. Failure to so notify the United States shall constitute a waiver of any claim of Force Majeure as to the event in question.

71. If the United States finds that a delay in performance is, or was, caused by a Force Majeure event, it shall extend the time for performance, in writing, for a period to compensate for the delay resulting from such event and stipulated penalties shall not be due for

such period. In proceedings on any dispute regarding a delay in performance, the dispute resolution provisions of Section XIV (Dispute Resolution) shall apply and DC Water shall have the burden of proving that the delay is, or was, caused by a Force Majeure event, and that the amount of additional time requested is necessary to compensate for that event.

72. Compliance with a requirement of this Consent Decree shall not by itself constitute compliance with any other requirement. An extension of one compliance date based on a particular event shall not automatically extend another compliance date or dates. DC Water shall make an individual showing of proof regarding the cause of each delayed incremental step or other requirement for which an extension is sought. DC Water may petition for the extension of more than one compliance date in a single request.

## XIV. DISPUTE RESOLUTION

73. This Court shall retain jurisdiction for the purpose of adjudicating, in the manner provided by this Section, all disputes between DC Water and the United States that may arise under the provisions of this Consent Decree. Unless otherwise expressly provided in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under or with respect to this Consent Decree. However, the procedures set forth in this Section shall not apply to actions by the United States to enforce obligations of DC Water that have not been disputed in accordance with this Section.

74. Permit actions pursuant to 40 C.F.R. Part 124, including issuance, denials, and modifications, shall not be subject to this Consent Decree, but rather shall continue to be handled through the administrative and judicial procedures set forth in those regulations.

75. Any dispute which arises under or with respect to this Consent Decree shall in the first instance be the subject of informal negotiations between DC Water and the United States. Notice of the dispute shall be transmitted no later than fourteen (14) days from the date of

the circumstances giving rise to the dispute. The period for informal negotiations shall not exceed twenty (20) days from the date of receipt of the original notice of the dispute, unless DC Water and the United States otherwise agree in writing to extend that period.

76. If the informal negotiations are unsuccessful, the position of the United States shall control unless, within twenty (20) days after the conclusion of the informal negotiation period, DC Water invokes the formal dispute resolution procedures of this Section by serving on the United States a written Statement of Position on the matter in dispute, which shall set forth the nature of the dispute with a proposal for its resolution as well as any factual data, analysis or opinion supporting that position and any supporting documentation (including the Long Term Control Plan or portions thereof) relied upon.

77. Within thirty (30) days of the receipt of a Statement of Position, pursuant to this Section, the United States may serve on DC Water its own Statement of Position, which may include an alternate proposal for resolution of the dispute as well as any factual data, analysis, or opinion supporting that position and all supporting documentation (including the Long Term Control Plan or portions thereof) relied upon by the United States. Within 15 days after receipt of such Statement, DC Water may serve on the United States a written Reply.

78. <u>Matters Accorded Record Review</u>: With the exception of modification requests pursuant to Section VII (Modifications to Selected CSO Controls and Schedules), this Paragraph shall pertain to disputes subject to the procedures of this Section that concern the adequacy or nature of the work to be performed under Section VI (Selected CSO Controls and Schedules), or other matters that are accorded review on the administrative record under applicable principles of administrative law. For matters subject to this Paragraph, DC Water shall have the burden of showing that the position of the United States is arbitrary and capricious or otherwise not in

accordance with applicable law or this Consent Decree. Plaintiff shall compile an administrative record, which shall consist of the Statements of Position and supporting documentation relied upon (including the LTCP or portions thereof that the parties incorporated into their Statements) and other documents considered and relied upon by EPA in arriving at its final administrative decision. Where appropriate, EPA may allow DC Water, the District of Columbia, Citizen Plaintiffs, and/or other members of the public to make supplemental submissions. The Director of the Water Protection Division shall issue a written final administrative decision resolving the dispute based on the administrative record. Stipulated penalties for the period from submission of the final Statement of Position or written Reply until issuance of the final administrative decision shall accrue for no more than sixty (60) days, even if EPA issues the final administrative decision after more than 60 days. The final administrative decision shall be effective in ten (10) days, unless DC Water moves for judicial review within ten (10) days of its receipt of the final agency decision.

79. Modification Requests: In the case of requests for modification of the Selected CSO Controls and/or schedules pursuant to Section VII (Modifications to Selected CSO Controls and Schedules), DC Water shall bear the burden of demonstrating that the requested modification should be approved in accordance with Section VII (Modifications to Selected CSO Controls and Schedules). EPA's final decision shall be binding on DC Water, unless within twenty (20) days of its receipt DC Water submits a modification request to the Court. If the Director of the Water Protection Division does not issue a final decision on a request for modification within one hundred twenty (120) days from the date that DC Water submits its Reply to the United States' Statement of Position, DC Water may elect to move in Court to modify the Consent Decree.

80. Other Matters: In the case of other matters not subject to Paragraphs 78 and 79

above, DC Water shall have the burden to demonstrate that its actions or positions were taken in accordance with the terms, conditions, requirements and objectives of this Consent Decree and the Clean Water Act. The Director of the Water Protection Division will issue a final decision resolving the dispute which will be binding on DC Water, unless within twenty (20) days of its receipt DC Water serves on the United States a motion for judicial review of the decision setting forth the matter in dispute, the efforts made to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Decree. Stipulated penalties for the period from submission of the final Statement of Position or written Reply until issuance of the final administrative decision shall accrue for no more than sixty (60) days, even if EPA issues the final administrative decision after more than 60 days.

81. Where the dispute arises from DC Water's request for modification of the Selected CSO Controls and/or schedules pursuant to Section VII (Modifications to Selected CSO Controls and Schedules), the matter shall not be subject to the principles of record review in Paragraph 78. For other matters, if DC Water and the United States disagree as to whether the dispute should proceed under the principles of record review or not, DC Water shall follow the procedures determined by EPA to be applicable. Upon appeal, the Court shall determine which procedures are applicable in accordance with the standards set forth in this Section.

82. Submission of any matter to the Court for resolution shall not extend or stay any of the deadlines set forth in this Consent Decree unless the Parties agree to such extension in writing or the Court grants an order extending such deadline(s). Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in this Section. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Consent

Decree. In the event that DC Water does not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XII (Stipulated Penalties).

## XV. RIGHT OF ENTRY

83. Commencing upon the date of lodging of this Consent Decree, U.S. EPA and its representatives, contractors, consultants, and attorneys shall have the right of entry into and upon the premises of DC Water at all reasonable times, upon proper presentation of credentials, for the purposes of:

a. Monitoring the progress of activities required by this Consent Decree;

b. Verifying any data or information required to be submitted pursuant to this Consent Decree;

c. Obtaining samples and, upon request, splits of any samples taken by DC Water or its consultants. Upon request, DC Water will be provided with splits of all samples taken by the United States;

d. Inspecting and evaluating the CSO System;

e. Inspecting and reviewing any record required to be kept under the provisions of this Consent Decree or any NPDES Permit and the Clean Water Act; and

f. Otherwise assessing DC Water's compliance with this Consent Decree.

84. This Section XV (Right of Entry) in no way limits or affects any right of entry and inspection, or any other right otherwise held by the United States, U.S. EPA and any other governmental entity, pursuant to applicable federal or state laws, regulations.

85. DC Water reserves the right to request the laboratory analytical results of samples taken from the CSS by the United States during the term of this Consent Decree, and any non-privileged reports prepared using such results.

## XVI. NOT A PERMIT/COMPLIANCE WITH OTHER STATUTES/REGULATIONS

86. This Consent Decree is not and shall not be interpreted to be a permit or modification of any existing permit issued pursuant to Section 402 of the Act, 33 U.S.C. § 1342. This Consent Decree does not relieve DC Water of any obligation to apply for, obtain and comply with the requirements of any new or existing NPDES permit or to comply with any federal, state or local laws or regulations, including, but not limited to its obligations to obtain a permit for its wastewater treatment and collection system or facilities and to comply with the requirements of any NPDES permit or with any other applicable federal or state law or regulation. Any new permit, or modification of existing permits, must be complied with in accordance with federal and state laws and regulations.

## XVII. FAILURE OF COMPLIANCE

87. The United States does not, by its consent to the entry of this Consent Decree, warrant or aver in any manner that DC Water's complete compliance with this Consent Decree will result in compliance with the provisions of the Clean Water Act, 33 U.S.C. §§ 1251 et seq., or with DC Water's NPDES permit. Notwithstanding EPA's review or approval of any Scope of Work, report, or plans and specifications, pursuant to this Consent Decree, DC Water shall remain solely responsible for any non-compliance with the terms of this Consent Decree, all applicable permits, the Clean Water Act, and regulations promulgated thereunder. The pendency or outcome of any proceeding concerning issuance, reissuance, or modification of any permit shall neither affect nor postpone DC Water's duties and obligations as set forth in this Consent Decree.

## XVIII. EFFECT OF DECREE AND NON-WAIVER PROVISIONS

88. The Parties agree that this Consent Decree resolves the civil claims for violation of water quality standards and for long-term injunctive relief (Claim One) alleged in the Complaint filed by the United States through the date of lodging of this Decree.

89. The Consent Decree in no way affects or relieves Settling Defendants of any responsibility to comply with any federal, state, or local law or regulation.

90. The Parties agree that DC Water is responsible for achieving and maintaining complete compliance with all applicable federal and state laws, regulations, and permits, and that compliance with this Consent Decree shall be no defense to any actions commenced pursuant to said laws, regulations, or permits.

91. The United States reserves the right to file a civil action for statutory penalties or injunctive relief against DC Water for any violations of the Clean Water Act by DC Water which occur after the date of lodging of this Consent Decree and any such violations occurring prior to that date that are not specifically alleged as Claims for Relief in the Complaints.

92. This Consent Decree does not limit or affect the rights of DC Water, the District of Columbia, or the United States as against any third parties which are not parties to this Consent Decree.

93. The Parties reserve any and all legal and equitable remedies available to enforce the provisions of this Consent Decree. This Consent Decree shall not limit any authority of EPA under any applicable statute, including the authority to seek information from DC Water or to seek access to the property of DC Water, nor shall anything in this Consent Decree be construed to limit the authority of the United States to undertake any action against any person, including DC Water, in response to conditions that may present an imminent and substantial endangerment to the environment or the public health or welfare.

94. Obligations of DC Water under the provisions of this Consent Decree to perform duties scheduled to occur after the date of lodging, but prior to the Effective Date of the First Amendment to the Consent Decree, shall be legally enforceable from the date of lodging of this

Consent Decree. Liability for stipulated penalties, if applicable, shall accrue for violation of such obligations as of the date of violation and payment of such stipulated penalties may be demanded by the United States upon or after the Effective Date of the First Amendment to the Consent Decree.

95. The United States reserves the right to file a criminal action for statutory penalties or other criminal relief against DC Water for any violations by DC Water of the Clean Water Act or other applicable federal statutes.

96. It is the intent of the Parties hereto that the clauses hereof are severable, and should any clause(s) be declared by a court of competent jurisdiction to be invalid and unenforceable, the remaining clauses shall remain in full force and effect.

97. The United States reserves all remedies available to it for violations of Federal, State and local law.

## XIX. COSTS OF SUIT

98. The Parties shall bear their own costs and attorney's fees with respect to this action and to matters related to this Consent Decree.

## XX. CERTIFICATION OF SUBMISSIONS

99. DC Water shall maintain copies of any underlying research and data in its possession, custody or control for any and all documents, scope of work, reports, plans and specifications, or permits submitted to EPA pursuant to this Consent Decree for a period of five (5) years, except that DC Water shall not be required to maintain copies of drafts of documents, scope of work, reports, plans and specifications, reports or permits. DC Water shall require any independent contractor implementing this Consent Decree to also retain such materials for a period of five (5) years. DC Water shall submit such supporting documents to EPA upon request. DC Water shall also submit to EPA upon request any other documents that relate to or discuss

the operation, maintenance, repair, or construction of the CSO system (or any portion thereof), or that relate to or discuss the number, frequency, volume, quality or environmental impact of CSO discharges. In all notices, documents or reports submitted to EPA pursuant to this Consent Decree, a senior management official of DC Water shall sign and certify such notices, documents and reports as follows:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

## XXI. FORM OF NOTICE

100. Unless otherwise specified within the terms of this Consent Decree, all reports, notices, or any other written communications required to be submitted under this Consent Decree shall be sent to the respective parties at the following addresses:

As to the United States:

Department of Justice

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
Post Office Box 7611, Ben Franklin Station
Washington, DC 20044
Reference DOJ Case No. 90-5-1-1-07137

United States Attorney
District of Columbia
Judiciary Center
555 Fifth Street NW
Washington, DC 20530

EPA

Director
Water Enforcement Division
Office of Regulatory Enforcement
U.S. Environmental Protection Agency
OECA-ORE-WED
Ariel Rios Building
12th and Pennsylvania Ave, NW
Mail Code 2243A
Washington, DC 20004

Chief
NPDES Branch (3WP42)
Water Protection Division
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103

Yvette Roundtree (3RC20)
Office of Regional Counsel
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103

As to DC Water:

George S. Hawkins or his successor
General Manager
District of Columbia Water and Sewer Authority
5000 Overlook Avenue, SW
Washington, D.C. 20032

Deputy General Manager/Chief Enginner
District of Columbia Water and Sewer Authority
5000 Overlook Avenue, SW
Washington, D.C. 20032

As to the District:

The Attorney General of District of Columbia
One Judiciary Square
441 Fourth Street NW
Suite 600 South
Washington, DC 20001

## XXII. MODIFICATION

101. This Consent Decree contains the entire agreement of the Parties and shall not be modified by any prior oral or written agreement, representation or understanding. Prior drafts of this Consent Decree shall not be used in any action involving the interpretation or enforcement of this Consent Decree.

102. The non-material terms of this Consent Decree may be modified by a subsequent written agreement signed by all the Parties. If all the Parties agree to a material modification in writing, they may apply to the Court for approval thereof. If the Parties do not reach agreement on such material modification, the request for modification shall be subject to the dispute resolution procedures of this Decree. All material modifications shall be in writing and approved by the Court before they will be deemed effective.

103. In the event DC Water requests a material modification to the Selected CSO Controls and/or the schedule set forth in Section VI (Selected CSO Controls and Schedules), DC Water shall arrange for additional public participation prior to submitting the modification request to the United States. DC Water shall initially consult with EPA concerning the modification and the scope of public participation to be obtained by DC Water prior to submission of a formal request for modification from DC Water to EPA.

a. The proposed modification package shall be submitted to EPA and shall contain the following:

i. the basis for the modification and the supporting technical and regulatory justification (including if applicable the LTCP or pertinent portions thereof);

ii. any changes to the Selected CSO Controls and/or to the schedule in Section VI (Selected CSO Controls and Schedules), along with any supporting data;

iii. a demonstration of material compliance with any applicable requirements of the 1994 CSO Policy; and

iv. a demonstration that public participation has occurred.

b. If the United States, after consultation with the District of Columbia, agrees to the modification, the proposed changes to the Selected CSO Controls and/or the schedules shall be executed by appropriate officials on behalf of the United States, the District of Columbia, and DC Water and lodged with the Court for a period of public comment prior to entry. If the United States does not agree to the proposed modification, the matter shall be subject to the procedures of Section XIV (Dispute Resolution).

## XXIII. PUBLIC COMMENT

104. The parties agree and acknowledge that final approval by the United States and entry of this Consent Decree is subject to the requirements of 28 C.F.R. § 50.7, which provides for notice of the lodging of this Consent Decree in the Federal Register, an opportunity for public comment, and consideration by the United States of any comments. This Paragraph does not create any rights exercisable by the Settling Defendants, and Settling Defendants shall not withdraw their consent to this Consent Decree between lodging and entry of this Consent Decree and hereby consents to entry of this Decree without further notice.

105. All information and documents submitted by Settling Defendants to U.S. EPA pursuant to this Consent shall be subject to public inspection, unless identified and supported as confidential by DC Water in accordance with 40 C.F.R. Part 2.

## XXIV. CONTINUING JURISDICTION OF THE COURT

106. The Court shall retain jurisdiction to enforce the terms and conditions of this Consent Decree and to resolve disputes arising hereunder as may be necessary or appropriate for the construction, modification or execution of this Consent Decree.

## XXV. APPENDICES

**Appendix A** is the Long Term Control Plan and its Appendices.

**Appendix B** contains DC Water's financial assumptions and projections that it sets forth as its basis for the 20 year implementation schedule in this Consent Decree.

**Appendix C** contains a list of key financial variables to be updated in the event of a request for modification due to changed financial circumstances pursuant to Section VII of the 2005 Consent Decree (Modifications to Selected CSO Controls and Schedules).

**Appendix D** contains the TN/Wet Weather Plan Summary Report.

**Appendix E** contains the Summary of Gray/Green and Green CSO Controls for the Potomac and Rock Creek Sewersheds.

**Appendix F** contains the Green Infrastructure Program for the Potomac and Rock Creek Sewersheds.

## XXVI. TERMINATION

107. This Consent Decree shall terminate upon motion of the United States to the Court after each of the following has occurred:

a. DC Water has Placed in Operation all of the construction projects required under Section VI (Selected CSO Controls and Schedules);

b. DC Water has demonstrated that it has achieved and maintained compliance with the water quality based CSO numerical effluent limitations and the performance standards requiring that the Selected CSO Controls be implemented, operated and maintained as described in DC Water's NPDES Permit for two years after the Selected CSO Controls are Placed in Operation;

c. DC Water has satisfactorily implemented its LIDR projects and programs as required by Section IX (Low Impact Development Retrofit);

d. DC Water has paid all stipulated penalties and any other monetary obligations due hereunder, and no penalties or other monetary obligations due hereunder are outstanding or owed to the United States; and

e. DC Water has certified completion to the United States, and the United States has not contested DC Water's completion or compliance.

108. The Consent Decree shall not terminate if, within 90 days of certification by DC Water to the United States of compliance pursuant to this Section, the United States asserts in writing that full compliance has not been achieved, or seeks further specific information in order to evaluate DC Water's certification. If the United States disputes DC Water's full compliance, this Consent Decree shall remain in effect pending resolution of the dispute by the parties or the Court.

109. Notwithstanding Paragraph 108 above, if DC Water submits a certification to the United States that it has completed all the requirements in Paragraph 107 above, and the United States does not respond on or before 90 days, DC Water may file a motion to the Court seeking termination of this Consent Decree.

## XXVII. SIGNATORIES

110. The Assistant Attorney General on behalf of the United States and the undersigned representatives of the Settling Defendants certify that they are fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind such party to this document.

Entered this 14th day of January, 2016

Thomas F. Hogan

~~Chief~~ Judge, United States District Court

THE UNDERSIGNED PARTIES enter into this First Amendment to Consent Decree in the matter of *Anacostia Watershed Society, et al., v. District of Columbia Water and Sewer Authority and the District of Columbia; and United States of America v. District of Columbia Water and Sewer Authority and the District of Columbia*

FOR THE UNITED STATES OF AMERICA:

4/22/15

Dated

JOHN C. CRUDEN
Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice

3/27/15

Dated

MARCELLO MOLLO
Senior Attorney
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611, Ben Franklin Station
Washington, D.C. 20044
601 D Street NW
Washington, D.C. 20004

THE UNDERSIGNED PARTIES enter into this First Amendment to Consent Decree in the matter of *Anacostia Watershed Society, et al., v. District of Columbia Water and Sewer Authority and the District of Columbia; and United States of America v. District of Columbia Water and Sewer Authority and the District of Columbia*

[RESERVED]

THE UNDERSIGNED PARTIES enter into this First Amendment to Consent Decree in the matter of *Anacostia Watershed Society, et al., v. District of Columbia Water and Sewer Authority and the District of Columbia; and United States of America v. District of Columbia Water and Sewer Authority and the District of Columbia*

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY:

5/8/15
Dated

SHAWN M. GARVIN
Regional Administrator
U.S. EPA Region III

4/20/15
Dated

MARY COE
Acting Regional Counsel
U.S. EPA Region III

4/21/15
Dated

YVETTE ROUNDTREE
Senior Assistant Regional Counsel
U.S. EPA Region III
1650 Arch Street
Philadelphia, PA 19103

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FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY:

4/7/15
Dated

SUSAN SHINKMAN
Director
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance

4-7-15
Dated

MARK POLLINS
Director, Water Enforcement Division
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance

4.7.15
Dated

SUSHILA NANDA
Senior Attorney Advisor
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

THE UNDERSIGNED PARTIES enter into this First Amendment to Consent Decree in the matter of *Anacostia Watershed Society, et al., v. District of Columbia Water and Sewer Authority and the District of Columbia; and United States of America v. District of Columbia Water and Sewer Authority and the District of Columbia*

FOR THE DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY:

12/18/14
Dated

GEORGE S. HAWKINS
General Manager
District of Columbia Water and Sewer Authority

12/18/14
Dated

RANDY E. HAYMAN
General Counsel
District of Columbia Water and Sewer Authority
5000 Overlook Avenue, S.W.
Washington, D.C. 20032

Dec. 18, 2014
Dated

DAVID E. EVANS
McGuireWoods LLP
One James Center
901 East Cary Street
Richmond, Virginia 23219
*Counsel to District of Columbia Water and Sewer Authority*

THE UNDERSIGNED PARTIES enter into this First Amendment to Consent Decree in the matter of *Anacostia Watershed Society, et al., v. District of Columbia Water and Sewer Authority and the District of Columbia; and United States of America v. District of Columbia Water and Sewer Authority and the District of Columbia*

FOR THE DISTRICT OF COLUMBIA:

3/24/15
Dated

RASHAD M. YOUNG
City Administrator
District of Columbia
John A. Wilson Building
1350 Pennsylvania Avenue, NW
Washington, DC 20004

KARL A. RACINE
Attorney General for the District of Columbia

3/24/15
Dated

By: Ellen A. Efros /TMR
Ellen A. Efros
Deputy Attorney General
Public Interest Division
441 4th Street, NW, Suite 6 South
Washington, DC 20001

# APPENDIX B

## APPENDIX B

Table 1, attached, presents WASA's financial projections for the impact on sewer rates of the 20-year LTCP implementation schedule as specified in the consent decree. Descriptions of the heading columns in Table 1 are presented below:

| Column No. | Heading | Description |
|---|---|---|
| 1 | Year No. | Sequential count of number of years starting in 2004 |
| 2 | Calendar year | Calendar year starting in 2004 |
| 3 | Capital<br>2001 Dollars ($M) | Estimated capital costs for the CSO LTCP expressed in constant year 2001 dollars |
| 4 | Capital<br>Actual Dollars ($M) | The estimated capital costs for the CSO LTCP expressed in the year of expenditure dollars using 3% per year to escalate the 2001 value estimate. |
| 5 | OM<br>2001 Dollars ($M) | Estimated operating and maintenance costs for the CSO LTCP expressed in constant year 2001 dollars. |
| 6 | OM<br>Actual Dollars ($M) | The estimated operating and maintenance costs for the CSO LTCP expressed in the year of expenditure dollars using 3% per year to escalate the 2001 value estimate. |
| 7 | Total<br>2001 Dollars ($M) | The addition of CSO Costs/OM/2001 Dollars ($M) and CSO Costs/Capital/2001 Dollars ($M). |
| 8 | Total<br>Actual Dollars ($M) | The addition of CSO Costs/OM/Actual Dollars ($M) and CSO Costs/Capital/Actual Dollars ($M). |
| 9 | Capital Costs Financed ($M) | The amount of actual capital costs that are debt financed. |
| 10 | Capital Costs PAYGO ($M) | The amount of actual capital costs that are paid from current year revenues on a pay-as-you-go-basis. |
| 11 | Debt Service ($M) | Estimated annual debt service on capital costs that are financed using 30 year term and borrowing costs of 7%. |
| 12 | O&M ($M) | Same as Column 6, OM Actual Dollars ($M) |
| 13 | Total Rate Requirements | The addition of PAYGO, Debt Service, O&M costs. |
| 14 | Other WASA Wastewater Costs Paid by DC Ratepayers | Operating and capital costs for wastewater services that are funded by retail ratepayers before the addition of CSO LTCP costs. |
| 15 | Typical Residential Bill Without CSO LTCP | Estimated annual residential wastewater bill before addition of the CSO LTCP costs. |
| 16 | Bill Increase Without CSO LTCP | Estimated annual change in residential wastewater bill before addition of CSO LTCP costs. |
| 17 | Typical Residential Bill Without CSO LTCP | Estimated annual residential wastewater bill after addition of the CSO LTCP costs. |
| 18 | Bill Increase Without CSO LTCP | Estimated annual change in residential wastewater bill after addition of CSO LTCP costs. |
| 19 | MHI | Estimated median household income (MHI) using 3% annual growth rate |
| 20 | % of MHI | Estimated residential bill as a percent of MHI. |
| 21 | Lower 20% | Household income of the most affluent household of the lower 20th percentile of households in the District. |
| 22 | % of Lower 20% | Estimated residential bill as a percent of the household income for the most affluent household of the lower 20th percentile of households in the District. |

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The financial projections are based on certain assumptions, which include, but are not limited to the following:

1. Billed water use is projected to decrease at 1% per year. Residential bill estimates are based on average consumption of 100 ccf per year.

2. Customers are assessed a charge for water and wastewater services based on water consumption. With the exception of certain federal government customers located outside of the District, all customers pay the same rate, regardless of account class, meter size, or size of service connection. The analysis assumes this practice will continue.

3. The analysis assumes a revenue collection rate of 97.7% of billed amounts.

4. Median Household Income in the District of Columbia is projected to increase at 3% per year. The most affluent of the lower 20th percentile of households in the District have a household income in 2004 dollars of $19,669 and this is projected to increase at the rate of inflation, which is assumed to be 3% per year.

5. Projections take into account discounts to low-income customers under the Authority's customer assistance program. The Authority's program covers 6,000 low-income customers and provides discounts of approximately $500,000 each year. Each eligible participant receives an exemption for water service charges in the amount of 4 ccf per month.

6. The financial analysis assumes an all-in borrowing cost assumption of 7 percent including cost of issuance (including bond insurance premiums, premiums for debt service reserve facility and fees and expenses related to bond issuance; approximately 2% on the Authority's 2003 revenue bond issue). The analysis assumes a debt coverage ratio of 1.40 x Term of Debt. The financial analysis utilizes fixed rate financing with a term of 30 years.

7. CSO operating and maintenance and capital costs are escalated at a rate of 3% per year from 2001 cost estimates to the year of expenditure. Non CSO-related wastewater operating and capital costs are projected to increase at approximately 5 percent per year reflecting impacts of inflation and reinvestment in capital facilities.

**Table 1**
**20-Year LTCP Financial Projections**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CSO Costs | | | | | | CSO LTCP Financing | | | | | Other WASA Wastewater Costs | | | Effect on Users | | | | | |
| | | Capital | | O/M | | Total | | | | | | | | | | | | | | | |
| Year No. | Calendar Year | 2001 Dollars ($M) | Actual Dollars ($M) | 2001 Dollars ($M) | Actual Dollars ($M) | 2001 Dollars ($M) | Actual Dollars ($M) | Capital Costs Financed ($M) | Capital Costs PAYGO ($M) | Debt Service ($M) | O & M ($M) | Total Annual Rate Requirements ($M) | Other WASA WW Costs Paid by DC Ratepayers ($M) | Typical Residential Bill w/o CSO LTCP | Bill Increase without CSO LTCP | Typical Residential Bill with CSO LTCP | Bill Increase with CSO LTCP | MHI | % of MHI | Lower 20% | % of Lower 20% |
| 1 | 2004 | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ 120.47 | $ 297 | | $ 297 | | $ 40,616 | 0.7% | $ 19,669 | 1.5% |
| 2 | 2005 | $ 4.07 | $ 4.58 | $ 0.04 | $ 0.04 | $ 4.11 | $ 4.62 | $ 3.86 | $ 0.15 | $ 0.31 | $ 0.04 | $ 0.50 | $ 126.53 | $ 310 | 5% | $ 311 | 5% | $ 41,834 | 0.7% | $ 20,259 | 1.5% |
| 3 | 2006 | $ 4.46 | $ 5.17 | $ 0.06 | $ 0.09 | $ 4.54 | $ 5.26 | $ 1.86 | $ 0.29 | $ 0.46 | $ 0.09 | $ 0.84 | $ 132.60 | $ 323 | 4% | $ 325 | 4% | $ 43,069 | 0.8% | $ 20,867 | 1.6% |
| 4 | 2007 | $ 12.61 | $ 15.06 | $ 0.19 | $ 0.22 | $ 12.80 | $ 15.28 | $ 7.63 | $ 0.67 | $ 1.09 | $ 0.22 | $ 1.99 | $ 139.87 | $ 344 | 6% | $ 348 | 7% | $ 44,382 | 0.8% | $ 21,493 | 1.6% |
| 5 | 2008 | $ 13.45 | $ 16.54 | $ 0.31 | $ 0.37 | $ 13.76 | $ 16.92 | $ 5.36 | $ 0.97 | $ 1.53 | $ 0.37 | $ 2.87 | $ 149.23 | $ 369 | 8% | $ 376 | 8% | $ 45,713 | 0.8% | $ 22,136 | 1.7% |
| 6 | 2009 | $ 15.23 | $ 19.29 | $ 0.45 | $ 0.56 | $ 15.68 | $ 19.85 | $ 14.74 | $ 1.23 | $ 2.71 | $ 0.56 | $ 4.50 | $ 158.08 | $ 397 | 8% | $ 408 | 8% | $ 47,065 | 0.9% | $ 22,802 | 1.8% |
| 7 | 2010 | $ 12.67 | $ 16.52 | $ 0.57 | $ 0.72 | $ 13.23 | $ 17.24 | $ 14.91 | $ 1.62 | $ 3.92 | $ 0.72 | $ 6.26 | $ 166.47 | $ 424 | 7% | $ 439 | 8% | $ 48,497 | 0.9% | $ 23,486 | 1.9% |
| 8 | 2011 | $ 55.90 | $ 76.12 | $ 1.07 | $ 1.40 | $ 56.97 | $ 78.52 | $ 71.13 | $ 3.99 | $ 8.65 | $ 1.40 | $ 15.04 | $ 173.07 | $ 440 | 4% | $ 477 | 8% | $ 49,952 | 1.0% | $ 24,190 | 2.0% |
| 9 | 2012 | $ 60.19 | $ 83.32 | $ 1.62 | $ 2.16 | $ 61.81 | $ 85.49 | $ 76.77 | $ 6.54 | $ 16.83 | $ 2.16 | $ 24.55 | $ 179.02 | $ 459 | 4% | $ 520 | 9% | $ 51,461 | 1.0% | $ 24,916 | 2.1% |
| 10 | 2013 | $ 60.96 | $ 86.91 | $ 2.17 | $ 3.01 | $ 63.13 | $ 89.92 | $ 77.76 | $ 9.14 | $ 22.10 | $ 3.01 | $ 34.24 | $ 177.46 | $ 460 | 0% | $ 545 | 5% | $ 52,994 | 1.0% | $ 25,664 | 2.1% |
| 11 | 2014 | $ 53.55 | $ 78.64 | $ 2.66 | $ 3.79 | $ 56.21 | $ 82.43 | $ 67.26 | $ 11.36 | $ 27.52 | $ 3.79 | $ 42.69 | $ 184.34 | $ 482 | 5% | $ 589 | 8% | $ 54,584 | 1.1% | $ 26,434 | 2.2% |
| 12 | 2015 | $ 57.05 | $ 86.29 | $ 3.17 | $ 4.66 | $ 60.22 | $ 90.96 | $ 72.60 | $ 13.79 | $ 33.37 | $ 4.66 | $ 51.82 | $ 191.51 | $ 505 | 5% | $ 637 | 8% | $ 56,221 | 1.1% | $ 27,227 | 2.3% |
| 13 | 2016 | $ 61.13 | $ 95.24 | $ 3.73 | $ 5.64 | $ 64.86 | $ 100.88 | $ 76.82 | $ 16.42 | $ 39.72 | $ 5.64 | $ 61.77 | $ 198.96 | $ 530 | 5% | $ 688 | 8% | $ 57,908 | 1.2% | $ 28,049 | 2.5% |
| 14 | 2017 | $ 63.43 | $ 101.79 | $ 4.30 | $ 6.71 | $ 67.73 | $ 108.49 | $ 82.82 | $ 19.17 | $ 46.36 | $ 6.71 | $ 72.25 | $ 206.69 | $ 556 | 5% | $ 743 | 8% | $ 59,645 | 1.2% | $ 28,885 | 2.6% |
| 15 | 2018 | $ 69.02 | $ 114.07 | $ 4.93 | $ 7.91 | $ 73.95 | $ 121.98 | $ 91.84 | $ 22.23 | $ 53.78 | $ 7.91 | $ 83.92 | $ 214.73 | $ 582 | 5% | $ 802 | 8% | $ 61,435 | 1.3% | $ 29,751 | 2.7% |
| 16 | 2019 | $ 66.99 | $ 114.04 | $ 5.54 | $ 9.15 | $ 72.52 | $ 123.19 | $ 88.85 | $ 25.19 | $ 60.94 | $ 9.15 | $ 95.28 | $ 223.09 | $ 611 | 5% | $ 863 | 8% | $ 63,278 | 1.4% | $ 30,644 | 2.8% |
| 17 | 2020 | $ 70.36 | $ 123.37 | $ 6.18 | $ 10.51 | $ 76.53 | $ 133.88 | $ 95.02 | $ 28.36 | $ 68.59 | $ 10.51 | $ 107.46 | $ 231.78 | $ 640 | 5% | $ 928 | 8% | $ 65,176 | 1.4% | $ 31,563 | 2.9% |
| 18 | 2021 | $ 116.31 | $ 210.07 | $ 7.23 | $ 12.68 | $ 123.54 | $ 222.75 | $ 176.86 | $ 34.21 | $ 82.77 | $ 12.68 | $ 129.65 | $ 240.78 | $ 671 | 5% | $ 1,021 | 10% | $ 67,131 | 1.5% | $ 32,510 | 3.1% |
| 19 | 2022 | $ 125.00 | $ 232.54 | $ 8.36 | $ 15.11 | $ 133.37 | $ 247.65 | $ 191.94 | $ 40.60 | $ 98.23 | $ 15.11 | $ 153.94 | $ 260.14 | $ 704 | 5% | $ 1,124 | 10% | $ 69,145 | 1.6% | $ 33,485 | 3.4% |
| 20 | 2023 | $ 107.76 | $ 206.48 | $ 9.34 | $ 17.38 | $ 117.10 | $ 223.86 | $ 160.63 | $ 45.95 | $ 111.17 | $ 17.38 | $ 174.50 | $ 269.88 | $ 738 | 5% | $ 1,219 | 8% | $ 71,220 | 1.7% | $ 34,490 | 3.5% |
| 21 | 2024 | $ 108.12 | $ 213.39 | $ 10.32 | $ 19.78 | $ 118.44 | $ 233.17 | $ 162.04 | $ 51.35 | $ 124.23 | $ 19.78 | $ 195.35 | $ 269.99 | $ 774 | 5% | $ 1,318 | 8% | $ 73,356 | 1.8% | $ 35,525 | 3.7% |
| 22 | 2025 | $ - | $ - | $ 10.32 | $ 20.37 | $ 10.32 | $ 20.37 | $ - | $ - | $ 124.23 | $ 20.37 | $ 144.60 | $ 280.50 | $ 812 | 5% | $ 1,218 | -8% | $ 75,557 | 1.6% | $ 36,590 | 3.3% |
| 23 | 2026 | $ - | $ - | $ 10.32 | $ 20.98 | $ 10.32 | $ 20.98 | $ - | $ - | $ 124.23 | $ 20.98 | $ 145.21 | $ 291.42 | $ 851 | 5% | $ 1,264 | 4% | $ 77,824 | 1.6% | $ 37,688 | 3.4% |
| 24 | 2027 | $ - | $ - | $ 10.32 | $ 21.61 | $ 10.32 | $ 21.61 | $ - | $ - | $ 124.23 | $ 21.61 | $ 145.84 | $ 302.77 | $ 893 | 5% | $ 1,311 | 4% | $ 80,158 | 1.6% | $ 38,819 | 3.4% |
| 25 | 2028 | $ - | $ - | $ 10.32 | $ 22.26 | $ 10.32 | $ 22.26 | $ - | $ - | $ 124.23 | $ 22.26 | $ 146.49 | $ 314.56 | $ 936 | 5% | $ 1,361 | 4% | $ 82,563 | 1.6% | $ 39,983 | 3.4% |
| 26 | 2029 | $ - | $ - | $ 10.32 | $ 22.93 | $ 10.32 | $ 22.93 | $ - | $ - | $ 124.23 | $ 22.93 | $ 147.16 | $ 326.61 | $ 982 | 5% | $ 1,413 | 4% | $ 85,040 | 1.7% | $ 41,183 | 3.4% |
| 27 | 2030 | $ - | $ - | $ 10.32 | $ 23.61 | $ 10.32 | $ 23.61 | $ - | $ - | $ 124.23 | $ 23.61 | $ 147.84 | $ 339.53 | $ 1,030 | 5% | $ 1,467 | 4% | $ 87,591 | 1.7% | $ 42,418 | 3.5% |
| 28 | 2031 | $ - | $ - | $ 10.32 | $ 24.32 | $ 10.32 | $ 24.32 | $ - | $ - | $ 124.23 | $ 24.32 | $ 148.55 | $ 352.78 | $ 1,080 | 5% | $ 1,524 | 4% | $ 90,219 | 1.7% | $ 43,691 | 3.5% |
| 29 | 2032 | $ - | $ - | $ 10.32 | $ 25.05 | $ 10.32 | $ 25.05 | $ - | $ - | $ 124.23 | $ 25.05 | $ 149.28 | $ 366.50 | $ 1,133 | 5% | $ 1,583 | 4% | $ 92,925 | 1.7% | $ 45,001 | 3.5% |
| 30 | 2033 | $ - | $ - | $ 10.32 | $ 25.80 | $ 10.32 | $ 25.80 | $ - | $ - | $ 124.23 | $ 25.80 | $ 150.03 | $ 380.78 | $ 1,188 | 5% | $ 1,645 | 4% | $ 95,713 | 1.7% | $ 46,351 | 3.5% |
| 31 | 2034 | $ - | $ - | $ 10.32 | $ 26.58 | $ 10.32 | $ 26.58 | $ - | $ - | $ 124.23 | $ 26.58 | $ 150.81 | $ 395.62 | $ 1,246 | 5% | $ 1,710 | 4% | $ 98,585 | 1.7% | $ 47,742 | 3.6% |
| 32 | 2035 | $ - | $ - | $ 10.32 | $ 27.37 | $ 10.32 | $ 27.37 | $ - | $ - | $ 123.92 | $ 27.37 | $ 151.29 | $ 411.04 | $ 1,307 | 5% | $ 1,777 | 4% | $ 101,542 | 1.8% | $ 49,174 | 3.6% |
| 33 | 2036 | $ - | $ - | $ 10.32 | $ 28.20 | $ 10.32 | $ 28.20 | $ - | $ - | $ 123.77 | $ 28.20 | $ 151.96 | $ 427.06 | $ 1,371 | 5% | $ 1,848 | 4% | $ 104,588 | 1.8% | $ 50,650 | 3.6% |
| 34 | 2037 | $ - | $ - | $ 10.32 | $ 29.04 | $ 10.32 | $ 29.04 | $ - | $ - | $ 123.13 | $ 29.04 | $ 152.18 | $ 443.70 | $ 1,438 | 5% | $ 1,921 | 4% | $ 107,726 | 1.8% | $ 52,169 | 3.7% |
| 35 | 2038 | $ - | $ - | $ 10.32 | $ 29.91 | $ 10.32 | $ 29.91 | $ - | $ - | $ 122.70 | $ 29.91 | $ 152.62 | $ 461.00 | $ 1,509 | 5% | $ 1,997 | 4% | $ 110,958 | 1.8% | $ 53,734 | 3.7% |
| | Total | $ 1,138.24 | $ 1,898.43 | $ 216.78 | $ 468.93 | $ 1,356.60 | $ 2,355.36 | $ 1,641.56 | $ 333.22 | $ 2,540.89 | $ 468.93 | $ 3,343.24 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

J:\1162\Litigation\Financial Impacts\[20 YR CSO LTCP Case V10292004 scenario 1.xls]Vertical Table

# APPENDIX C

**APPENDIX C**
Certain Financial Information to Perform Financial Analysis
Pursuant to Section VII

In the event that WASA seeks a modification of the Schedule pursuant to Section VII of the Consent Decree due to cost overruns or changed financial circumstances, WASA shall update its financial information. Information that may be relevant includes the following list or categories of information, and WASA agrees to provide such information in the event the United States requests it. Nothing in this Appendix in any way limits or narrows the United States' right to obtain or request other information in order to review and respond to WASA's request for a modification.

1. DC population, current and projected

2. Number of households, current and projected
   - Single-family residence
   - Multi-family buildings

3. Median household income

4. Wastewater billings and volume billed for past three years, broken out for all user classes

5. Wastewater revenues and expenditures for past three years.

6. WASA financial statements for past three years.

7. Prospectuses issued within the past three years.

8. Rate studies prepared within the past three years related to wastewater or stormwater programs.

9. Per household wastewater metering fee and ROW fee

10. Average per household volume billed for
    - Single-family residence
    - Multi-family residence

11. Current baseline revenues and expenditures.

12. LTCP costs
    - Capital costs incurred to date
    - Capital costs projected by year
    - Additional operations and maintenance costs projected by year
    - Costs to date financed with grants (amount and interest rate by year)
    - Costs to date financed with low interest, non-market loans (amount and interest rate by

year)

13. Projected costs other than those required by this consent decree that should be considered in addition to baseline costs. Identify and project by year.
- Costs necessary to comply with regulations or other legal requirements.
- Projected sewer system assessment and rehabilitation costs
- Other increases that would cause total annual expenditures to rise at a rate greater than inflation

14. Debt coverage ratio

15. Bond interest rate and term

16. Rate of inflation

17. PAYGO assumption

18. Current wastewater rate per ccf for single-family residential customers.

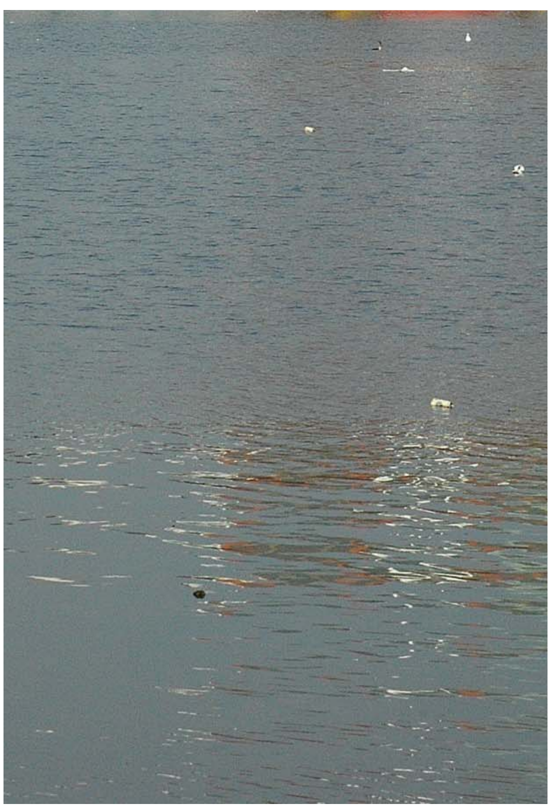
19. History of rate adjustments or rate recovery approach during the past five years. Identify the current basis for recovery of LTCP costs and any expected changes in the basis for the recovery of these costs. If rates are recovered through other than the wastewater rate, identify the mechanism, and the amount of costs born by each user class.

20. Projection over twenty years estimating per household impact of LTCP.

21. Current programs to provide relief to low-income residents.

22. Other documentation or analysis that EPA and/or WASA deems relevant for the particular circumstances.

# APPENDIX D



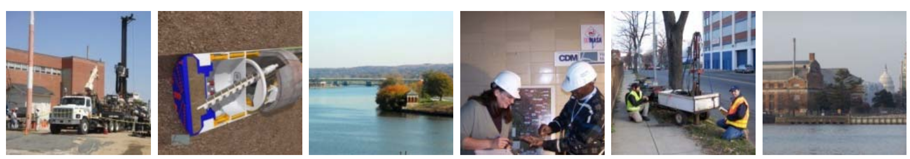
DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY

LONG TERM CSO CONTROL PLAN

**ANACOSTIA RIVER PROJECTS**

# DOCUMENT II-3:5-FI

# FACILITY PLAN



## SUMMARY REPORT AND DETAILED IMPLEMENTATION SCHEDULE

SEPTEMBER 23, 2008

CDM/HMM, A JOINT VENTURE – FACILITY PLAN, DCFA #399-WSA

GREELEY AND HANSEN LLC - OPERATIONAL PLAN, EPMC-III

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**Section** **Summary Report and Detailed Implementation Schedule**



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# Summary Report and Detailed Implementation Schedule

This report is a summary of findings and recommendations based on the Facility Plan developed for the District of Columbia Water and Sewer Authority's (Authority or WASA) Anacostia River Projects which are part of WASA's Long Term Control Plan for Combined Sewer Overflows. It has been prepared to satisfy the requirement for the Authority to submit to the United States Environmental Protection Agency (EPA), no later than September 23, 2008, a summary report and detailed implementation schedule for the Anacostia River Projects as described at Section VI, paragraph A.9. of the Consent Decree entered into by the Authority, the United States and the District of Columbia, effective March 23, 2005. Detailed information regarding the Facility Plan for the Anacostia River Projects, is provided in Document II-3:4 FD, Facility Plan, which includes a main document volume and four Appendix volumes of supporting and reference information.

When completed, the Anacostia River Projects are expected to reduce the average year volume of combined sewer overflows to the Anacostia River by 98 percent, and number of overflows from 82 to 2 in the average year.

## 1. Background and Introduction

Communities with combined sewer systems are required to prepare long term plans for control of combined sewer overflows (CSOs) in accordance with the CSO Policy at Section 402 (q) of the Clean Water Act. The Authority, after extensive stakeholder and public participation, completed its Long Term Control Plan (LTCP) for the District's combined sewer system in July 2002. The LTCP provides for control of CSOs to the Anacostia River, Rock Creek and Potomac River and was submitted for approval to the District Department of Health (DOH) and EPA.

The LTCP was approved by DOH on August 28, 2003, and on December 16, 2004 EPA reissued the Authority's National Pollutant Discharge Elimination System (NPDES) permit to include the CSO control provisions of the DOH approved LTCP. Subsequently, the Authority, the District of Columbia and the United States entered into a Consent Decree to implement the LTCP. The Consent Decree includes the schedule for the facilities included in the LTCP and was entered by the Federal Court on March 23, 2005.

Projects to control CSOs to the Anacostia River are at the top of the court ordered schedule, and the Authority is required to prepare a Facility Plan for these projects. The Facility Plan for the Anacostia River CSOs comprises engineering studies to advance the LTCP conceptual plan to a level sufficient to proceed into detailed design and construction.

The Consent Decree schedule for the Anacostia River Projects, including milestone dates, is summarized in Table 1.

**Table 1**
**Anacostia River Projects**
**Consent Decree Milestone Dates**
**(not later than dates)**

| Project | Award Contract for Design | Award Contract for Construction | Place in Operation |
|---|---|---|---|
| Anacostia River Projects Facility Plan | Sep 23, 2005 | n/a | Sep 23, 2008 (1) |
| Storage/Conveyance Tunnel From Poplar Point to Northeast Boundary | Mar 23, 2009 | Mar 23, 2012 | Mar 23, 2018 |
| Anacostia Outfall Consolidation | Mar 23, 2013 | Mar 23, 2016 | Mar 23, 2018 |
| Storage/Conveyance Tunnel Parallel to Northeast Boundary Sewer | Mar 23, 2015 | Mar 23, 2018 | Mar 23, 2025 |
| Northeast Boundary Side Tunnels | Mar 23, 2019 | Mar 23, 2022 | Mar 23, 2025 |
| Poplar Point Pumping Station | Mar 23, 2012 | Mar 23, 2015 | Mar 23, 2018 |
| Separate Fort Stanton Drainage Area (Outfall 006) | Mar 23, 2006 | Mar 23, 2008 | Mar 23, 2010 |
| Fort Stanton Interceptor | Mar 23, 2013 | Mar 23, 2016 | Mar 23, 2018 |

(1) Requires WASA to submit a summary report and detailed implementation schedule to EPA.

There are fourteen existing CSO outfalls along the Anacostia River as shown on Figure 1. Under the LTCP, the area tributary to Outfall 006 is being separated. That project is under construction and scheduled to be placed in operation by March 23, 2010. The remainder of the CSOs, shown on Figure 1, are included in the facilities that comprise the Facility Plan for the Anacostia River Projects (ARP) program. The ARP program comprises a tunnels system together with diversion and overflow facilities to capture, store and convey combined sewer flow. In addition to providing CSO control, the tunnels system is designed to control chronic surface flooding on the combined sewer system in the Northeast Boundary Area. The chronic surface flooding is the result of a lack of adequate capacity in the existing Northeast Boundary Trunk Sewer. The tunnels system, CSO locations and the Northeast Boundary areas prone to surface flooding are shown on Figure 2.


**Figure 1: Locations of Combined Sewer Overflows along the Anacostia River**

As shown on Figure 2, the tunnels system extends from the Authority's Blue Plains Advanced Wastewater Treatment Plant (Blue Plains or BPAWWTP), along the Potomac and Anacostia Rivers and into the Northeast Boundary Area. Existing CSOs will be conveyed into the tunnels system through a system of diversion sewers and drop shafts. Similar diversion facilities will be used to provide relief for the existing Northeast Boundary Trunk Sewer. Flow captured in the tunnels will be treated at Blue Plains. Flows in excess of the tunnels storage capacity and Blue Plains treatment capacity will overflow to the Potomac and Anacostia Rivers at locations shown on Figure 2.


**Figure 2: Location of Tunnels System Relative to CSOs and Flooding Areas**

The tunnels system shown on Figure 2, is a result of the following:

- The LTCP approved by DOH on August 28, 2003, which provided for the tunnel's system to terminate at its south end on Poplar Point and;
- Supplement No.1 to the LTCP, which comprises the Blue Plains Total Nitrogen Removal/Wet Weather Plan submitted to EPA on October 12, 2007. This plan provides for modifying the LTCP Consent Decree to blend the new nitrogen limit for Blue Plains and wet weather treatment. The principal provisions of the plan include the addition of enhanced nitrogen removal (ENR) at Blue Plains and extension of the tunnels system from Poplar Point to Blue Plains, including tunnel dewatering and enhanced clarification facilities at the tunnels system terminus.

## 2. Project Scope & Description of Facilities

Principal facilities included in the Anacostia River Projects are shown on Figure 3 and include approximately 12.9 miles of tunnels, 17 shafts for conveyance of flows into the tunnels system, overflow structures, air venting and management, and maintenance and inspection access. In addition to the underground works, diversion chambers and sewers will be constructed to capture and divert flows from the existing combined sewer system into drop shafts that will convey the flows to the tunnels system. The tunnels will be constructed using pressurized-face soft ground tunnel boring machines (TBMs). The tunnels and shafts will be constructed at depths to invert between 70 and 200 below existing ground elevation.

The principal elements that comprise the ARP are described briefly as follows:

- Blue Plains Tunnel (BPT) –The BPT follows an alignment that starts at Blue Plains, traverses west of Interstate 295 along the Potomac River through Bolling Air Force Base (BAFB) and the Anacostia Naval Annex, then crosses under the Anacostia River north of the existing WASA Main Outfall Sewers (which extend from WASA's Main Pumping Station to Poplar Point), and terminates in the north yard area of WASA's Main Pumping Station. The BPT will have an inside diameter of 23 feet and a permanent lining of precast concrete segments connected by bolts and gaskets. This lining system will be used for all tunnel reaches on the ARP for bored tunnels. Shafts located along the BPT include a dewatering pumping station shaft at Blue Plains; a tunnel overflow shaft within BAFB downstream of a new connection to the Potomac Outfall Sewers; a combination drop and junction shaft with the Anacostia River Tunnel near Poplar Point; and a drop shaft at WASA's Main Pumping Station.
- Anacostia River Tunnel (ART) – The ART begins at the junction shaft with the BPT at a location approximately 750 feet south of the existing Poplar Point Pumping Station. It then traverses under the Washington Metropolitan Area Transit Authority (WMATA) Green Line at Poplar Point, follows Anacostia Park to a point east of the 11th Street Bridges where it crosses the Anacostia River, and then follows the north (west) shore of the river from Water Street to an interface with the Northeast Boundary Tunnel immediately north of the planned CSO 019 facilities. The ART is planned to be constructed from the CSO 019 area southward to the junction shaft with the BPT, with all

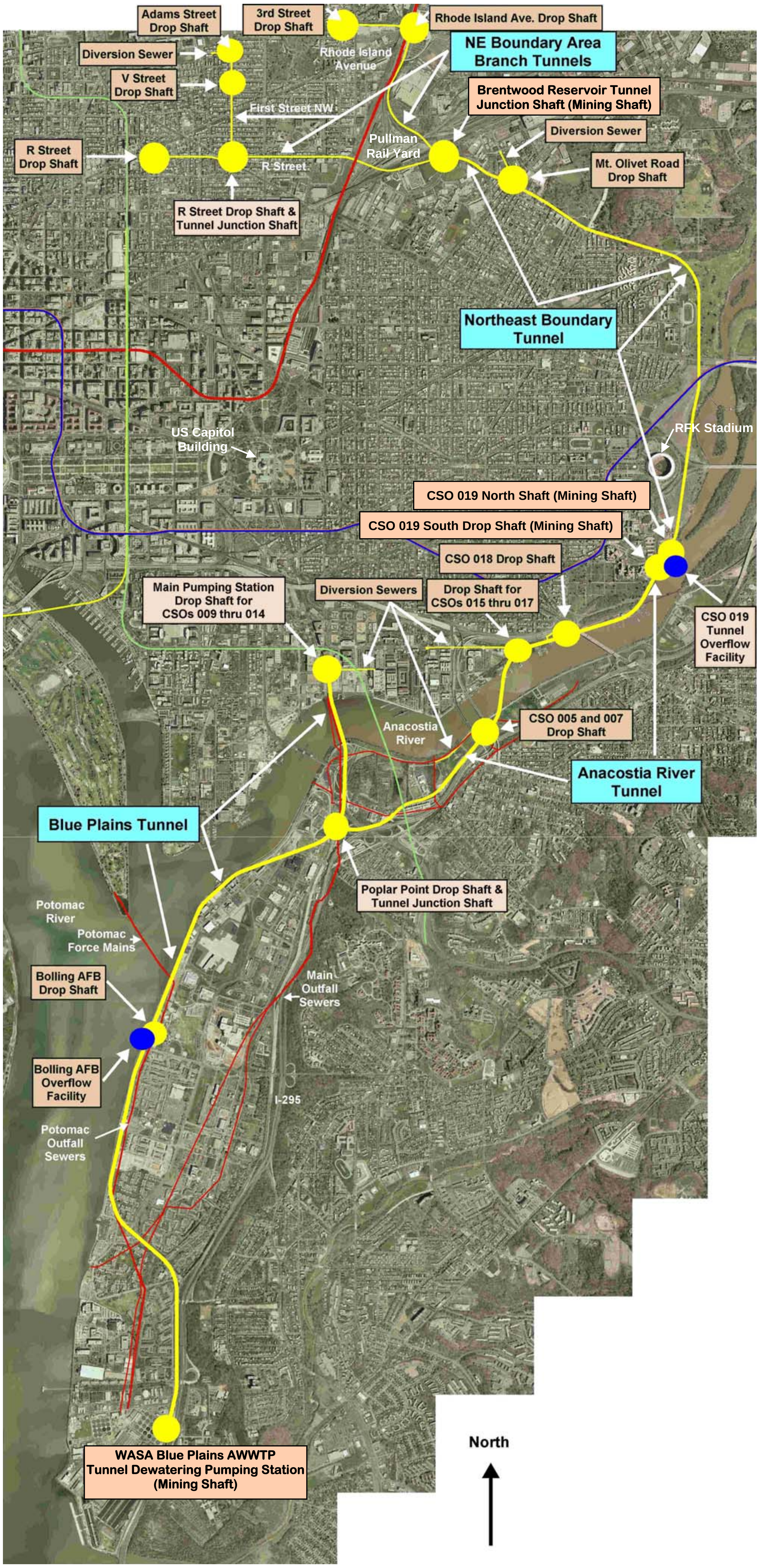



**Figure 3: Principal Anacostia River Projects Facilities**

tunnel construction staging from the south parking lot area of RFK Stadium. Flows from CSOs 005 and 007 on the south side of the river will be captured in a new diversion sewer and conveyed into the tunnel at a drop shaft located between the approach roadways for the 11th Street Bridges. Flows from CSOs 015, 016 and 017 on the north (west) side of the river also will be captured in a new diversion sewer and conveyed to a drop shaft located at the intersection of Water Street SE and M Street SE. Flows from CSO 018 on the north (west) side of the river will be conveyed to a drop shaft somewhat to the east along M Street near Barney Circle. At the CSO 019 area, a drop shaft will accept flows from the existing Northeast Boundary Trunk Sewer above CSO 019. In addition, the drop shaft will serve as a tunnel overflow shaft, and a second tunnel overflow shaft will also be constructed. The CSO 019 area is the limit of the first phase of facilities construction and facilities system operation. The Consent Decree requires the new ARP facilities from Blue Plains to the CSO 019 area to be placed in operation by March 23, 2018.

- Northeast Boundary Tunnel (NEBT) – The NEBT will be excavated north from the CSO 019 area under the RFK Stadium parking lots along the Anacostia River, Langston Golf Course and under the National Arboretum. It will then continue west along Mount Olivet Road NE and terminate at WASA's Brentwood Reservoir site adjacent to New York Avenue. Since the ART will be operating while the NEBT is under construction, a temporary isolation plug or physical separation (bulkhead) between the ART and NEBT tunnels must be in place to provide for the safety of the workers constructing the NEBT. This separating plug or bulkhead will be constructed by the ART construction contractor. Along the NEBT there will be a drop shaft near the intersection of Mount Olivet Road NE and West Virginia Avenue NE to receive flows from this flooding area. The tunnel terminus at the Brentwood Reservoir will be at a shaft for extraction of the TBM. This shaft will also serve as a junction shaft for connecting the Northeast Boundary Area branch tunnels to the NEBT, and as the mining shaft for the R Street and Rhode Island Avenue branch tunnels.

- Northeast Boundary Area Branch Tunnels – Three branch tunnels will convey flows from flooding areas west of the Pullman Rail Yard: the R Street Branch Tunnel (RSBT), the Rhode Island Avenue Branch Tunnel (RIBT), and the First Street NW Branch Tunnel (FSNWBT). These tunnels have been planned with inside diameters of 12 feet. Drop shafts are planned at the upstream ends of the respective tunnels. The RSBT and FSNWBT will join at an intermediate, combination drop and junction shaft. As for other drop shafts, these will connect to the existing combined sewer system via diversion chambers and sewers.

  Diversion Chambers and Sewers – In order to capture and convey flows from the existing combined sewer system to the respective drop shaft facilities, diversion chambers will be constructed at the points of diversion, and diversion sewers will be constructed from those points to the nearest drop shafts. These will involve surface construction at the diversion points and potentially at intermediate locations along the diversion sewer alignments, depending on the construction technology applied. Microtunneling and pipe-jacking applications are being considered for construction of diversion sewers, depending on the feasibility of the respective technologies with respect to the site conditions. The most significant diversion sewer alignments include:

- Tingey Street SE, connecting to drop shaft facilities at the Main Pumping Station
- M Street SE and Water Street SE areas, connecting to drop shaft facilities along Water Street SE and M Street SE
- Mount Olivet Road neighborhood area diversions
- Northeast Boundary Area diversions connecting to the branch tunnels described above

## 3. Project Setting

Facilities to be constructed and operated will be located in a variety of settings ranging from open space and public lands to well developed residential and commercial neighborhoods. Several areas are also being planned to undergo substantial development and infrastructure improvements prior to and during construction of the ARP facilities. Therefore, the siting of facilities and planning for construction and facilities operations has involved a substantial degree of coordination and collaboration with numerous government agencies, citizen groups and neighborhoods, military commands, railroad entities, utility companies and other interested parties. Planning has been designed to minimize disturbance to neighborhoods as well as physical and construction staging interfaces with planned property development and major infrastructure projects.

The storage and conveyance tunnels are predominantly located in soil strata, and therefore soft ground tunneling technologies will be employed. Tunnel construction will be performed by Tunnel Boring Machines (TBMs) that will be driven from mining shafts at locations shown on Figure 3. The majority of tunnel construction activities will be concentrated at the mining shaft locations. Consequently, the mining shaft areas require substantial staging areas for material handling, construction logistics, and utility support. The recommended plan is based on the use of two sites for the majority of tunnel construction: WASA's Blue Plains site for construction of the BPT to Main Pumping Station and the southern parking lot area of RFK Stadium for construction of the ART to its junction with the BPT; and the NEBT to its terminal shaft at Brentwood Reservoir in the vicinity of New York Avenue NE. The Brentwood Reservoir site will also be a construction work site for mining and construction of approximately 2.6 miles of the branch tunnels.

Improvements in tunneling technology during the past couple of decades will result in fewer impacts on the surrounding neighborhoods and environment than in the past and provides the ability to construct tunnels within more variable and difficult ground conditions than in the past. However, the minimization of risks associated with the ARP tunnels program is a key consideration as for any other underground construction program. Such risks could involve, but are not limited to:

- Ability to perform the work under varying or adverse geological conditions
- Protection of structures and utilities from settlement or other adverse impacts
- Encountering unknown subsurface obstructions that impede tunnel advance

- Major mechanical failures of the TBM that may require construction of an unplanned access from the surface or extensive ground improvement to rescue and repair the TBM

These risks are particularly important considerations for the design and construction of soft ground tunnels compared to tunnels constructed in intact rock, as has been the case for many CSO tunnels that have been constructed prior to the introduction of modern soft-ground tunneling technology.

In consideration of the risks above, as well as in the interest of minimizing the need to acquire private property or easements, the tunnel alignments have been located to be predominantly in open land within public space and to not pass directly below existing surface structures. These public lands include D.C. streets and properties occupied by WASA, development land, park land, BAFB, the Anacostia Naval Annex, the RFK Stadium site, and the National Arboretum. Rights are required for construction and operation of the tunnels underneath private properties, including CSX and WMATA properties at five locations and several small privately owned parcels for subsurface easements along the tunnels alignments. Easements for small privately owned parcels along sections of the alignments are required because of the minimum turning radii needed for the TBMs to facilitate excavation and construction of the pre-cast concrete tunnel lining.

To avoid subsurface obstructions and to protect structures and utilities from settlement-induced damage, the Facility Plan development included a limited subsurface geotechnical exploration program to investigate geological conditions along the planned tunnel alignments and research of the major infrastructure and structures in proximity to the alignments. The alignment of the ART is greatly influenced by avoidance of past, present, and future bridge piers and piles while maintaining a minimum radius of curvature for tunnel construction. Protection and avoidance of damage to WMATA transit structures is also a consideration. The tunnel alignments cross under the subsurface Green Line just west of Anacostia Station, the aerial section of the Blue Line in the northern parking area of RFK Stadium, and the surface Red Line track south and north of the Rhode Island Avenue Station. Additionally, the Tingey Street Diversion Sewer will cross above the WMATA Green Line. Traversal of the Bolling AFB and Anacostia Naval Annex also include consideration of not only protection of existing structures and infrastructure, but also security considerations during construction and systems operations.

For the branch tunnels west and north of the NEBT terminus shaft, the local area along the tunnel alignments is predominantly residential with some commercial properties and small public parks. Tunnels in this area will be primarily to provide conveyance of storm flows rather than provide storage during a storm event. Consequently, they are planned to be smaller than the main storage / conveyance tunnels, which lessens the potential for surface or structural settlement. At the currently planned diameters, these tunnels will be constructed using the same methodology as the main storage / conveyance tunnels. If it is determined, as the design proceeds, that these can be smaller tunnels, alternative tunnel construction technologies may be applied, such as pipe jacking or micro-tunneling. The determination of the appropriate technology will likely occur during the design phase of the program based on a more extensive site characterization and geotechnical investigation program.

Coordination with other planned development and infrastructure projects also had a significant influence on the siting of the facilities. The Principal projects include those shown on Figure 4 and are:

- The planned development of residential and commercial properties and public lands at Poplar Point and the planned replacement of the South Capitol Street Bridge with associated modifications to the I-295 interchange in this area.
- The planned development of Diamond Teague Park, currently under construction, located along the north bank of the Anacostia River immediately to the south and east of Nationals Stadium and to the south and west of WASA's O Street Pumping Station.


**Figure 4: Principal Planned Development and Infrastructure Projects in ARP Area**

- On the north (west) shore of the Anacostia River, planned property development at the Southeast Federal Center near WASA's Main Pumping Station, Maritime Plaza and Boathouse Row developments near Water Street, and the Hill East development project near CSO 019 have to be considered relative to the siting of facilities.
- Another major infrastructure project that impacts the design and construction of facilities on both sides of the Anacostia River is the replacement of the 11th Street Bridges by the District Department of Transportation (DDOT). Coordination is required for diversion chambers and sewers as well as the drop shaft facility for CSO 005 and CSO 007.
- In the Northeast Boundary Area, extensive development has been accomplished near New York and Florida Avenues, with more planned to be completed over the next 20+ years while the ARP is under design and construction. Much of this development will be accomplished under the District's NoMA project (North of Massachusetts Avenue).

# 4. Investigation and Evaluation of Alternatives

During development of the recommended plan, a number of alternatives and variations of alternatives for the configuration of facilities were investigated and evaluated in an organized and systematic manner. The major alternative alignment corridors which were investigated are presented on Figure 5. These alternatives were evaluated relative to their ability to achieve the required system hydraulic operational performance, as well as their respective programmatic profiles (e.g., estimated cost, schedule, risks, real estate needs, permitting, and degree of required coordination with other agencies and projects and community impacts, if any).

Overall, 12 alternative tunnel horizontal alignments, with some associated variations for localized conditions, were investigated for the tunnels between Poplar Point and the Northeast Boundary Area. For the BPT, three alternative alignments were investigated to varying degrees.

Alternative configurations were also investigated for construction and operation of deaeration facilities and drop shafts. Where such facilities have been constructed in rock as part of CSO storage and conveyance systems in major cities such as Milwaukee and Atlanta, deaeration facilities were constructed in horizontal chambers at the terminus of tunnel segments or adjacent to the tunnel with a small-diameter connecting tunnel or adit between the drop shaft and the tunnel. In those cases, the deaeration chambers were also typically of similar or larger cross-section than the tunnel. For the soil conditions anticipated for the ARP, construction of that same type of configuration could prove difficult and risky. Accordingly, an alternative configuration for locating the deaeration facility within a construction shaft in line with the tunnel has been developed for the ARP program. For this configuration, flows will enter the drop shaft through a tangential approach ramp and vortex generator, which is typical for many CSO facilities. However, at the base of the drop shaft the flow would transition to a circular channel to allow deaeration of the flow before the flow enters the tunnels system.

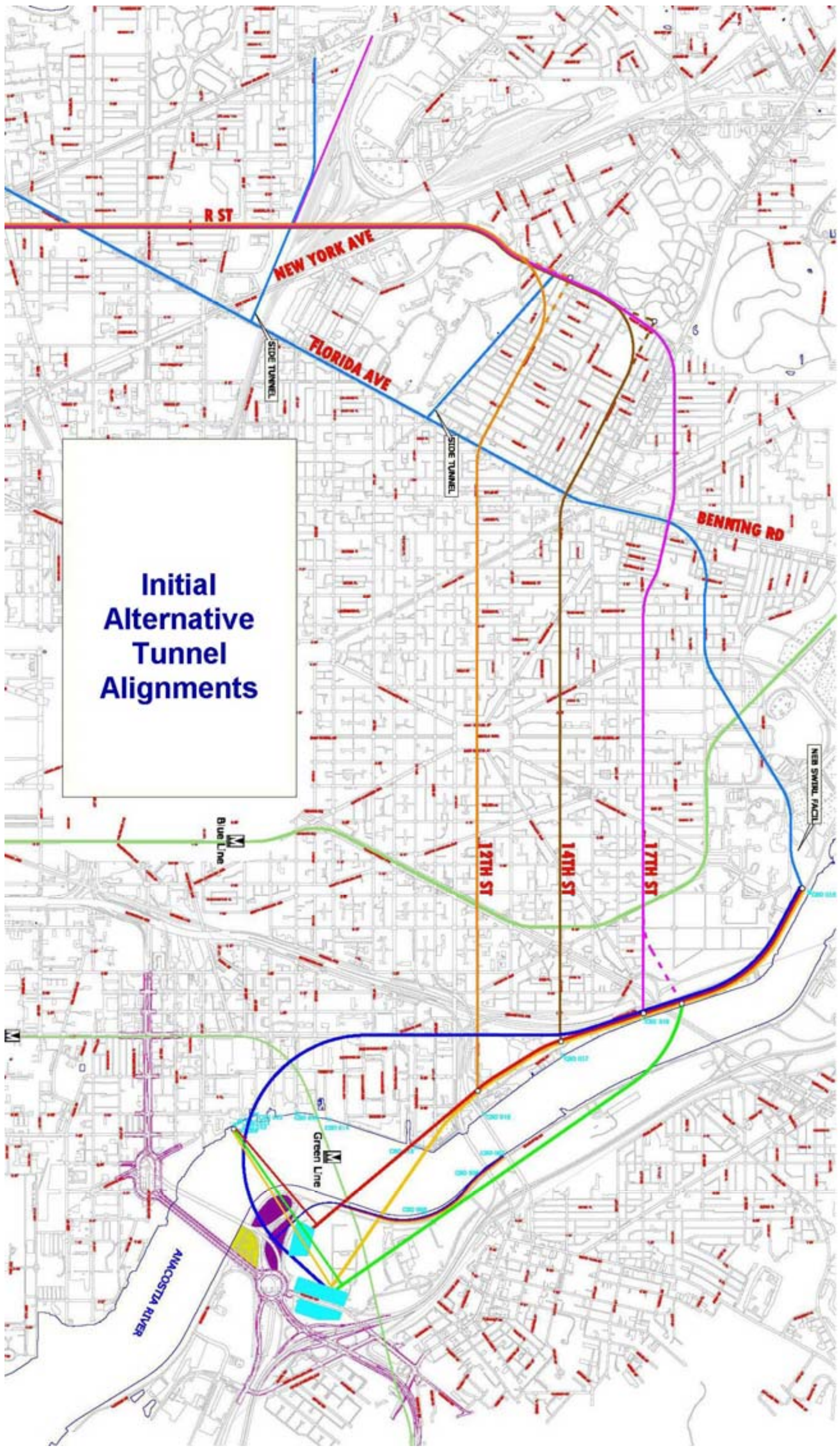



**Figure 5: Alternative Tunnel Alignment Corridors**

# 5. Recommended Implementation Schedule for Anacostia River Projects

The Facility Plan documents provide an expanded description of the facilities to be designed, constructed and placed in operation for the Anacostia River Projects, together with an associated schedule, estimated costs and other program related activities and issues.

The implementation schedule for the ARP has been developed to provide for construction through a number of individual contracts or contract divisions based on principal consideration as follows:

- Limit the value of construction contracts to the availability of bonding capacity and contractor resources in the tunneling industry.
- Separate work by degree of risk, contractor specialty and availability of local resources. Basically, this means separating the deep tunnel work from the near surface work such as diversion structures and sewers.
- Sequencing and interfacing requirements for the individual contract divisions
- Ability to meet and exceed goals for MBE/WBE participation.
- Timeframes required for the various construction activities such as time for procurement and delivery of the large tunnel boring machines and anticipated tunnel mining rates.

Construction contract divisions developed for implementation of the ARP are summarized in Table 2 and shown on Figure 6.

A comparison between the projects developed in the Facility Plan and those in the Consent Decree is summarized in Table 3. This comparison relates compliance dates for the Consent Decree projects to the Facility Plan Contract Divisions.

A detailed implementation schedule for the Facility Plan Contract Divisions is shown on Figure 7. Also shown on Figure 7 are the proposed projects and milestone dates for a modification of the Consent Decree that reflects facility planning. Additionally, the schedule shows permitting timeframes related to the proposed construction. The modified Consent Decree projects milestones match the milestones for the projects in the existing Consent Decree.

Principal features included in the detailed implementation schedule shown on Figure 7 are summarized as follows:

- An 18-month period from award of construction contract, for manufacture, delivery, assembly and start-up of a TBM. This means that actual tunnel mining starts 18 months after construction contract award.
- Tunnels shafts construction starts upon award of construction contract.
- Tunnels mining derived from the available geotechnical information and other experience has been based on an average rate of 40 feet per day.

- Contract Divisions C, E, F and G, which interface with Contract Division H, the Anacostia River Tunnel, will be completed to a "Ready to be Placed in Operation" stage before the Division H contract is awarded.
- The construction contract award date for Contract Division K, the Northeast Boundary Branch Tunnels, occurs on the "Place in Operation" date for Contract Division H, the Anacostia River Tunnel.
- The construction contract award date for Contract Division J, the Northeast Boundary Tunnel occurs at a point when there should be sufficient time for Contract Division K to vacate the Brentwood shaft site, which is the recovery shaft for Contract Division J.
- Contract Division H, Anacostia River Tunnel has the responsibility for activating connections, constructed under other contracts, to place the system between Blue Plains and CSO 019 in operation.
- Contract Division J, Northeast Boundary Tunnel has the responsibility for activating connections, constructed under other contracts, to place the system between CSO 019 and the Northeast Boundary area in operation.

**Table 2**
**Construction Contract Divisions for Anacostia River Projects**

| CONTRACT DIVISION | DESCRIPTION |
|---|---|
| A | Blue Plains Tunnel and Main Outfall Sewers Diversion |
| B | Tingey Street Diversion Sewer for CSOs 013 and 014 |
| C | CSO 019 Overflows and Diversion Structures |
| D | Bolling AFB Overflow and Potomac Outfall Sewer Diversion |
| E | M Street Diversion Sewer for CSOs 015, 016, and 017 |
| F | CSO 018 Diversion Sewer |
| G | CSO 005 and 007 Diversion Sewer |
| H | Anacostia River Tunnel |
| I | Main Pumping Station Diversions |
| J | Northeast Boundary Tunnel |
| K | Northeast Boundary Branch Tunnels |
| L | Northeast Boundary Diversions |
| M | Mt. Olivet Road Diversions |
| Y | Blue Plains Tunnel Dewatering Pumping Station and Enhanced Clarification Facility |
| Z | Poplar Point Pumping Station Replacement |

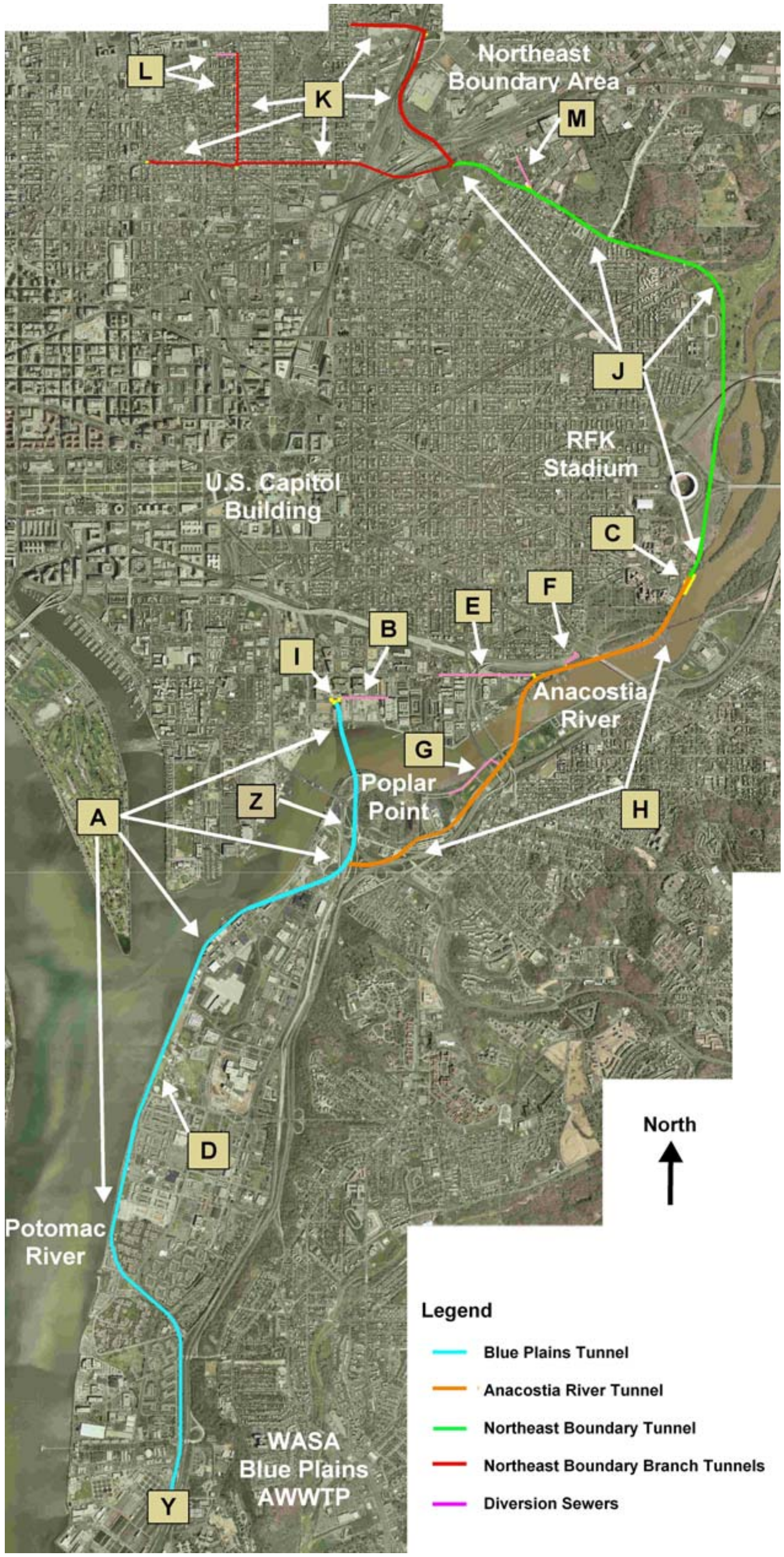


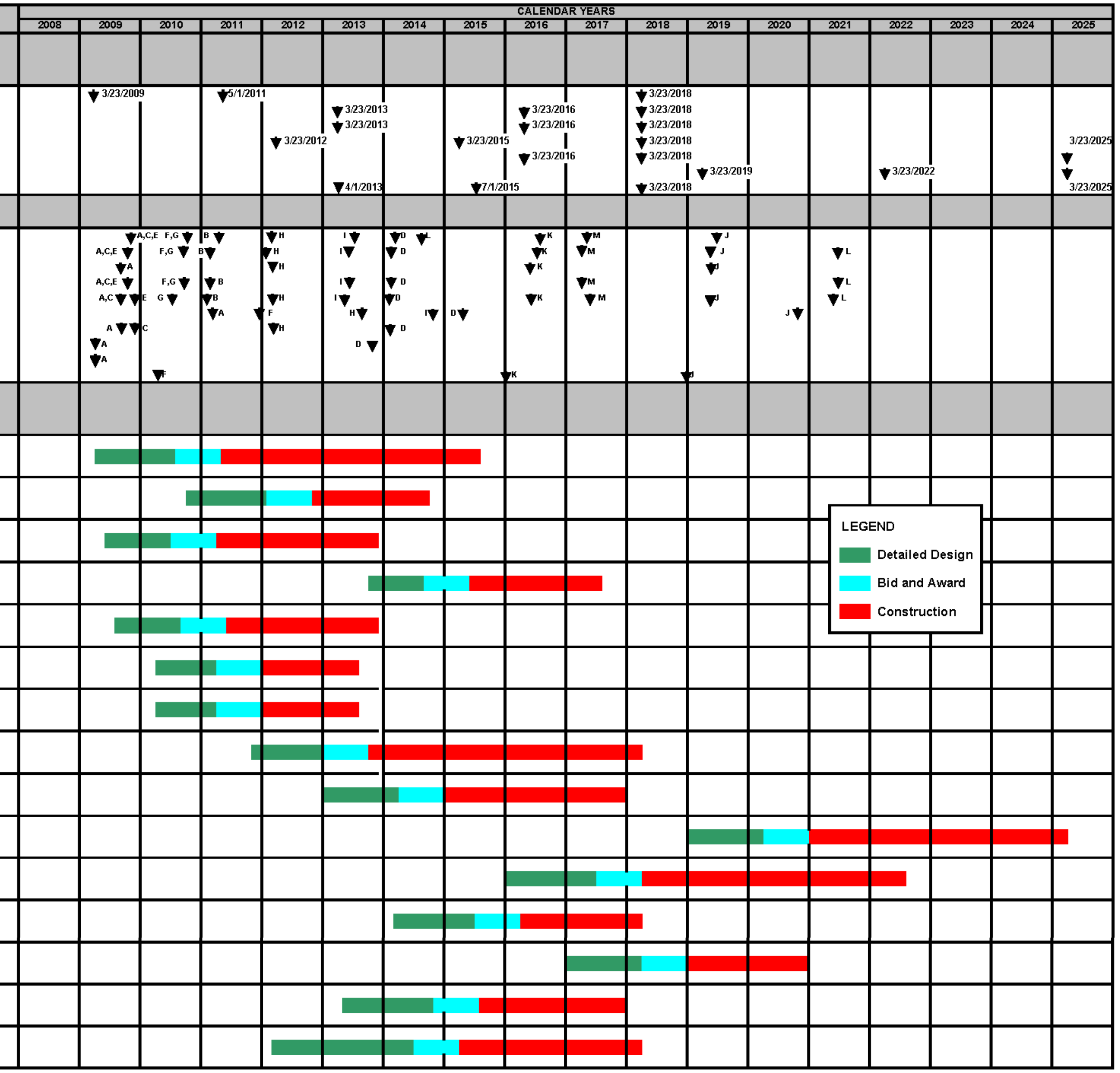

**Figure 6: Locations of Contract Divisions**

**Table 3**
**Anacostia River Projects**
**Comparison of Facility Plan and Consent Decree Projects**

| FACILITY PLAN CONTRACT DIVISION | FACILITY PLAN PROJECT | MATCHING CONSENT DECREE PROJECT | CONSENT DECREE COMPLIANCE DATES RELATED TO FACILITY PLAN PROJECT |
|---|---|---|---|
| A | Blue Plains Tunnel and Main Outfall Sewers Diversion | Storage/Conveyance Tunnel from Poplar Point to Northeast Boundary | Contract Division A award dates for detailed design and contract for construction to be used to determine compliance for Consent Decree project dates |
| E<br><br>F | M Street Diversion Sewer for CSOs 015, 016, and 017<br><br>CSO 018 Diversion Sewer | Anacostia Outfall Consolidation | Contract Divisions E and F award dates for detailed design and contract for construction to be used to determine compliance for Consent Decree project dates |
| H | Anacostia River Tunnel | Storage/Conveyance Tunnel from Poplar Point to Northeast Boundary | Contract Division H Place in Operation Date to be used to determine compliance for Consent Decree project date |
| G | CSO 005 and 007 Diversion Sewer | Fort Stanton Interceptor | Contract Division G replaces function of Consent Decree project; Fort Stanton Interceptor to be deleted. |
| Z | Poplar Point Pumping Station Replacement | Poplar Point Pumping Station | Contract Division Z has same compliance dates as Consent Decree project |
| J | Northeast Boundary Tunnel | Storage/Conveyance Tunnel Parallel to Northeast Boundary Sewer | Contract Division J Place in Operation date to be used to determine compliance for Consent Decree projects date |
| K | Northeast Boundary Branch Tunnels | Storage/Conveyance Tunnel Parallel to Northeast Boundary Sewer | Contract Division K award dates for detailed design and contract for construction to be used to determine compliance for Consent Decree project dates |
| K | Northeast Boundary Branch Tunnels | Northeast Boundary Side Tunnels | Contract Division K award dates for detailed design and contract for construction and Place in Operation date to be used to determine compliance for Consent Decree project dates |
| Y | Blue Plains Tunnel Dewatering Pumping Station and Enhanced Clarification Facility (ECF) | Poplar Point Pumping Station and Excess Flow Improvements | Contract Division Y Place in Operation date to be used to determine compliance for Consent Decree project date; ECF replaces Excess Flow Improvements |

| | FACILITY PLAN PROJECTS RELATED TO MODIFIED CONSENT DECREE PROJECTS AND ASSOCIATED MODIFIED CONSENT DECREE MILESTONES (1) | Award Contract for Detailed Design | Award Contract for Construction | Place in Operation | |
|---|---|---|---|---|---|
| | *Storage/Conveyance Tunnel from Blue Plains to CSO 019* | *March 23, 2009* | *May 1, 2011* | *March 23, 2018* | |
| | *M Street Diversion Sewer and CSO 018 Diversion Sewer* | *March 23, 2013* | *March 23, 2016* | *March 23, 2018* | |
| | *CSO 005 and 007 Diversion Sewer* | *March 23, 2013* | *March 23, 2016* | *March 23, 2018* | |
| | *Poplar Point Pumping Station Replacement* | *March 23, 2012* | *March 23, 2015* | *March 23, 2018* | |
| | *Northeast Boundary Storage/Conveyance Tunnel* | *March 23, 2016* | *March 23, 2018* | *March 23, 2025* | |
| | *Northeast Boundary Branch Tunnels* | *March 23, 2019* | *March 23, 2022* | *March 23, 2025* | |
| | *Blue Plains Tunnel Dewatering Pumping Station and Enhanced Clarification Facilities* | *April 1, 2013* | *July 1, 2014* | *March 23, 2018* | |
| | GENERAL TIME FRAMES FOR PERMIT APPLICATIONS BY CONTRACT DIVISION | | | | |
| | *DC Water and Sewer Authority* | *2 months prior to 60% design* | | | |
| | *Department of Consumer & Regulatory Affairs* | *3 months prior to 60% design* | | | |
| | *Department of Health, DC Fire & Emergency Medical Services* | *30% design* | | | |
| | *DC Department of Environment* | *3 months prior to 60% design* | | | |
| | *DC Department of Public Works* | *30% design* | | | |
| | *DC Department of Parks & Recreation* | *2 months prior to Construction NTP* | | | |
| | *US Army Corps of Engineers* | *30% design* | | | |
| | *Bolling AFB (DOD), Department of the Air Force* | *Design NTP* | | | |
| | *US Navy* | *Design NTP* | | | |
| | *CSX Corporation* | *Design NTP* | | | |

| CONTRACT DIVISION | DESCRIPTION | AWARD CONTRACT FOR DETAILED DESIGN | AWARD CONTRACT FOR CONSTRUCTION | READY TO BE PLACED IN OPERATION (2) | PLACE IN OPERATION |
|---|---|---|---|---|---|
| A | *Blue Plains Tunnel and Main Outfall Sewers Diversion* | *March 23, 2009* | *May 1, 2011* | *July 1, 2015* | *(3)* |
| B | *Tingey Street Diversion Sewer for CSOs 013 and 014* | *October 1, 2010* | *October 1, 2012* | *October 1, 2014* | *(3)* |
| C | *CSO 019 Overflows and Diversion Structure* | *June 1, 2009* | *March 1, 2011* | *November 1, 2013* | *(3)* |
| D | *Bolling AFB Overflow and Potomac Outfall Sewer Diversion* | *October 1, 2013* | *July 1, 2015* | *July 1, 2017* | *(3)* |
| E | *M Street Diversion Sewer for CSOs 015, 016, and 017* | *August 1, 2009* | *May 1, 2011* | *November 1, 2013* | *(3)* |
| F | *CSO 018 Diversion Sewer* | *April 1, 2010* | *January 2, 2012* | *July 1, 2013* | *(3)* |
| G | *CSO 005 and 007 Diversion Sewer* | *April 1, 2010* | *January 2, 2012* | *July 1, 2013* | *(3)* |
| H | *Anacostia River Tunnel* | *November 1, 2011* | *November 1, 2013* | *March 23, 2018* | *March 23, 2018* |
| I | *Main Pumping Station Diversions* | *January 2, 2013* | *January 2, 2015* | *December 31, 2017* | *(3)* |
| J | *Northeast Boundary Tunnel* | *January 2, 2019* | *January 2, 2021* | *March 23, 2025* | *March 23, 2025* |
| K | *Northeast Boundary Branch Tunnels* | *January 2, 2016* | *March 23, 2018* | *July 1, 2022* | *(4)* |
| L | *Northeast Boundary Diversions* | *March 23, 2014* | *March 23, 2016* | *March 23, 2018* | *(4)* |
| M | *Mt. Olivet Road Diversions* | *January 2, 2017* | *January 2, 2019* | *December 31, 2020* | *(4)* |
| Y | *Blue Plains Tunnel Dewatering Pumping Station and Enhanced Clarification Facility (ECF)* | *April 1, 2013* | *July 1, 2015* | *December 31, 2017* | *(3)* |
| Z | *Poplar Point Pumping Station Replacement* | *March 23, 2012* | *March 23, 2015* | *March 23, 2018* | *March 23, 2018* |




Note:
1 See Table 3 for comparison of Facility Plan and Consent Decree Projects
2 Means that facilities included in contract can be placed in operation when a subsequent contract is placed in operation.
3 Will be placed in operation when Contract Division H is placed in operation.
4 Will be placed in operation when Contract Division J is placed in operation.

**Figure 7: Anacostia River Projects Detailed Facility Plan Contract Divisions Implementation Schedule**

# 6. Program Implementation

The Authority and its consultants have developed the Facility Plan and implementation schedule. This work has been frequently reviewed by the Authority's Project Review Board (PRB). The PRB is comprised of nine individuals with a high level of experience and expertise in planning, engineering, construction and management of projects of similar type and scope to those in the ARP program. The Project Review Board has endorsed the Facility Plan and contributed suggestions and recommendations for its implementation.

The following subsections describe findings to-date regarding issues and other factors associated with the implementation of the Anacostia River Projects together with discussion of various aspects that are pertinent to its successful and timely completion.

## Operational Plan and Hydraulic Design

The following criteria were selected by WASA for the operational plan and hydraulic design of the Anacostia River Projects.

- Comply with the LTCP Consent Decree, as modified to accommodate the Total Nitrogen Removal / Wet Weather (TN/WW) Plan.
- Reduce CSO overflows on the Anacostia River to the level identified in the approved LTCP: two CSO overflows and 54 million gallons (mg) of overflow per average year.
- Provide flood relief to the Northeast Boundary (NEB) Drainage Area up to a 6-hour 15-year design storm.
- Provide solids and floatables control for remaining overflows.
- Consolidate CSO's 016, 017 and 018 in the Anacostia Marina area such that all overflows are either stored in the tunnel or conveyed by the tunnel for overflow at another location.
- Configure the system to operate passively by gravity, without use of active operation gates or other such controls.
- Configure the system to prevent flooding of basements and flooding to grade. Where existing conditions in the collection system cause these conditions, arrange the tunnel system to improve hydraulic performance to the extent practicable.

The hydraulic design of the tunnels system was performed using the model prepared to develop the LTCP: the Danish Hydraulic Institute's MOUSE Model. The model was updated to reflect changes to the collection system since the development of the LTCP. The following summarizes key elements of the hydraulic design and operational plan:

- <u>System operation:</u> The tunnels system is designed to fill by gravity. If storms produce volumes that exceed the capacity of the system, the tunnels system has been configured to overflow to the receiving waters by gravity. The only facility that requires active operation during storms is the tunnel dewatering pumping station. The facilities that control diversions into and overflows from the tunnel typically comprise weirs, orifices and other static hydraulic controls.

- Extent of Northeast Boundary Flooding Protection: The tunnels system is designed to provide flooding protection to the Northeast Boundary area up to a 15-year, 6-hour design storm. It has been determined that most existing trunk and local street sewers in the drainage area do not have adequate capacity to convey the design storm. This is not unexpected since the sewers were constructed prior to the adoption of the 15-year storm as the bases for design. Since most of the existing sewers in the Northeast Boundary area do not have the capacity to convey the design storm, evaluations were made to determine the extent of flooding relief that would be provided by the ARP. These evaluations showed that it was cost prohibitive to bring all sewers in the Northeast Boundary area up to the 15-year design standard. Instead, the following design criteria were adopted for the program:
  - Provide flooding relief for the Northeast Boundary Trunk Sewer from it's outlet at CSO 019 to 1st Street NW
  - Provide relief to the following chronic flood areas and to the trunk sewers serving the areas listed below that are located between the Northeast Boundary Trunk Sewer and the flood areas:
    - Area 1 - Rhode Island Avenue N.E. between 4th and 6th Streets
    - Area 2 - West Virginia Avenue N.E. near Mt. Olivet Road
    - Area 3 - P Street and 1st Street N.W.
    - Area 5 - Rhode Island Avenue N.W., near 6th and R Streets
    - Area 6 – Thomas and Flagler Streets, NW
  - Size the tunnel and its appurtenances so they are large enough to accommodate future relief in the Northeast Boundary Area.

  These criteria will provide relief for the identified flooding in the drainage area up to the design storm. In addition, the tunnel is sized large enough to allow future relief of other sub-sewer sheds in the Northeast Boundary area if relief is required in other areas in the future.

- Storage Volume: The tunnels system is designed to provide 157 million gallons of storage at a tunnel fill elevation of -24.0 (DC DPW Datum).

- Tunnel Overflow Facilities: Tunnel overflow facilities have been sited at Bolling Air Force Base (BAFB) and at CSO 019 which serves the Northeast Boundary area. After the tunnel is full, the BAFB overflow facility will typically convey flow from CSOs 005, 007, 009, and 011 through 018, while the overflow facility at CS0 019 will provide relief for the Northeast Boundary area combined sewer flow and relief flow for the flood prone locations in the Northeast Boundary area.

- Tunnel Dewatering Pumping Station – In accordance with the TN/WW Plan, the facility will have an installed firm capacity of 225 mgd. To provide for future expansion, the facility will be designed to be expandable.

- Other Aspects: Analyses have been conducted during the facility planning regarding odor control, venting, hydraulic transients, access, isolation of the tunnel, monitoring and keeping the tunnel clean. These are described in detail in the Facility Plan document.

## Risk Management and Construction Planning

Underground construction for shafts and tunnels is a highly specialized field with inherent risks. Design and construction efforts and activities should, therefore, progress in concert with an appropriate risk management program. Section 8 of the Facility Plan discusses the risk management efforts accomplished to date and outlines a risk management program considered as part of facility planning efforts. Figure 8 below illustrates the relationship between the implementation elements of the projects and the risk management program as suggested in the Facility Plan.

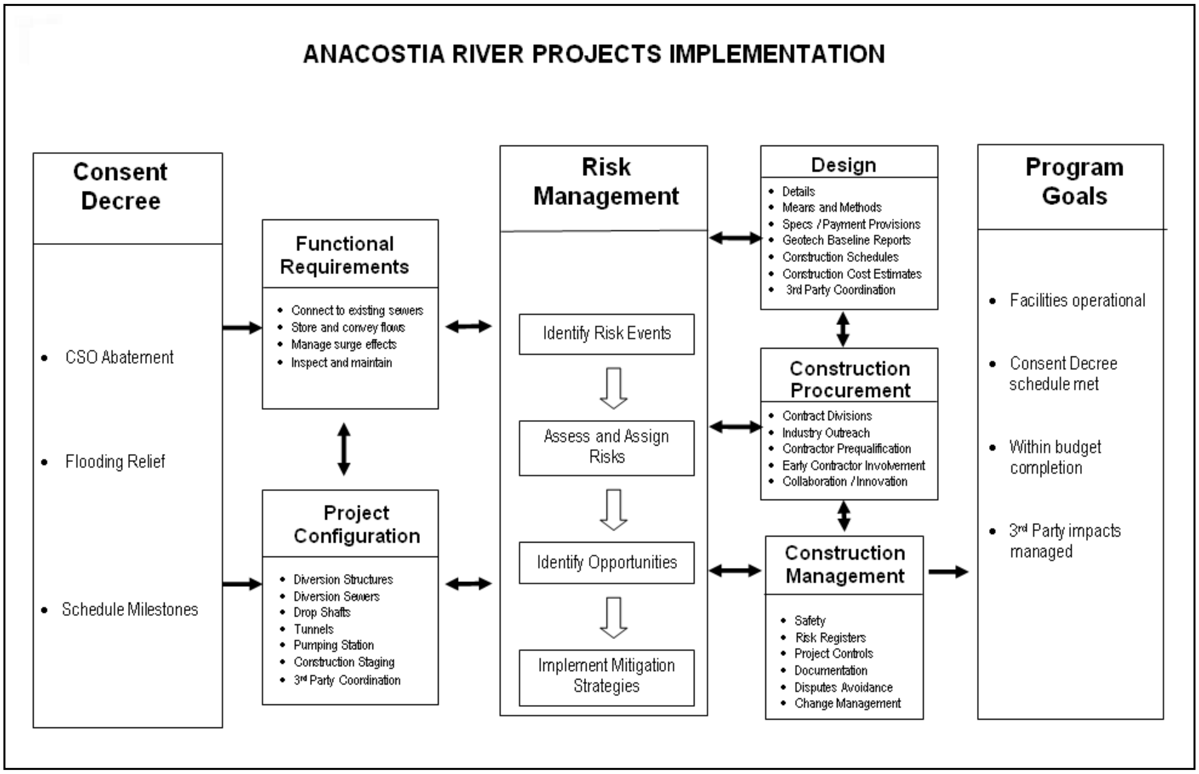



**Figure 8: Program Implementation and Risk Management**

The general risk management considerations diagrammed in Figure 8 will be evaluated further to develop a comprehensive approach in the future phases of the ARP implantation.

Additionally, the risk management program will need to include provisions to mitigate construction impacts on areas and neighborhoods during construction. Such provisions include by may not be limited to impacts to residences and businesses, traffic routes, noise, dust, utilities and other public concerns. The design and construction phases of the ARP program will, therefore, include outreach elements to accommodate public and institutional needs

## Geotechnical Investigations

Planning level geotechnical investigations have been made for the development of the Facility Plan. Most of these investigations have been completed, but some will continue through the end of 2008. Data from the latter investigations will be included in subsequent phases of project implementation. The geotechnical investigations have included research of existing information; geophysical surveys; borings by conventional rotary and sonic drilling methods; field instrumentation and testing programs; laboratory testing of recovered soil and rock samples; and groundwater monitoring. The Facility Plan includes a Preliminary Geotechnical Data Report as Appendix Volume III.

Figure 9 shows the locations of borings and geophysical surveys performed as part of the Facility Plan development. Figure 10 presents a general composite of the geological profile of the currently anticipated ground conditions along the tunnels alignments. Geotechnical investigations during design will provide more detailed information regarding the conditions which may be expected at specific shaft and structure locations as well as along the diversion sewers and tunnels alignments.

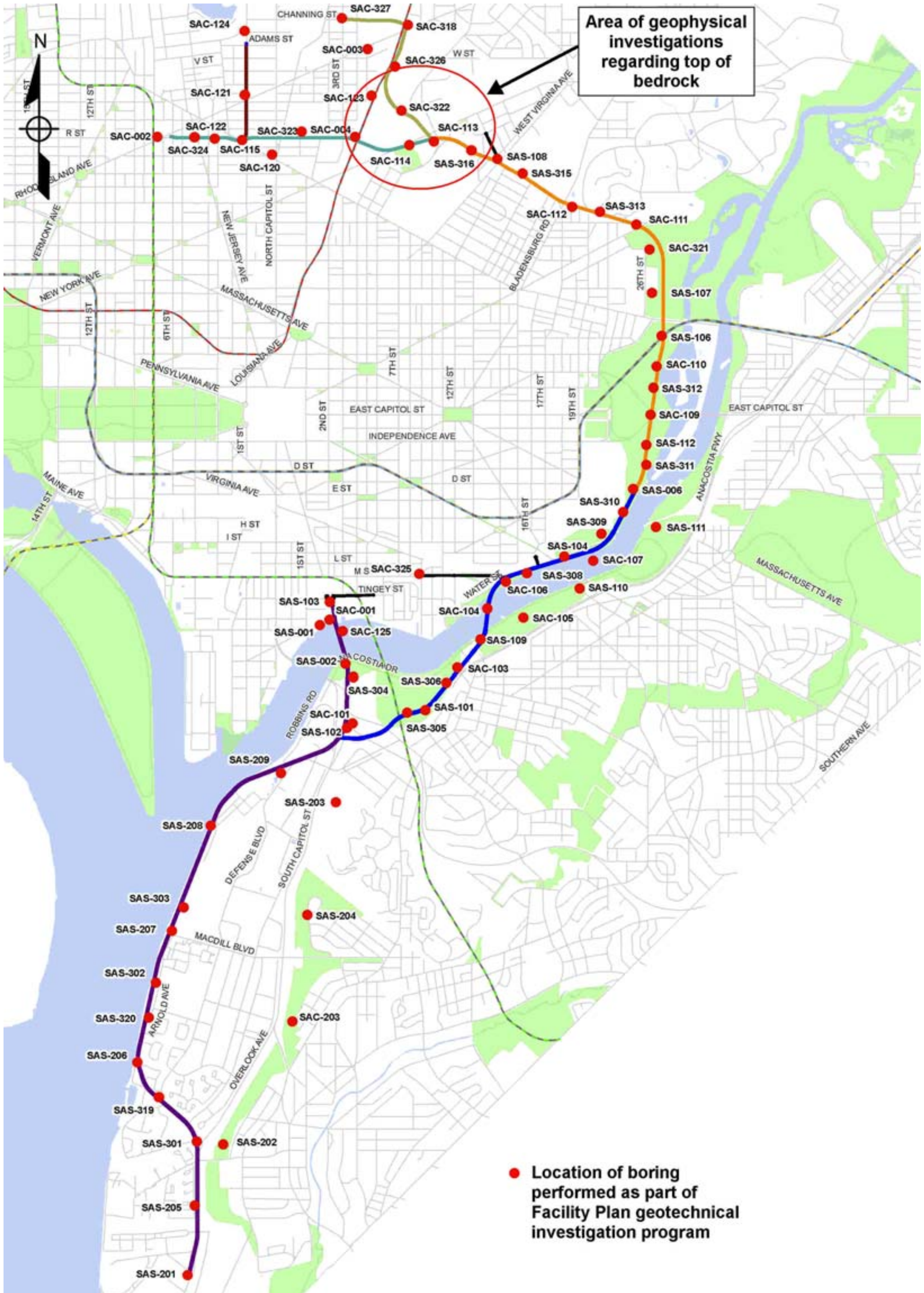
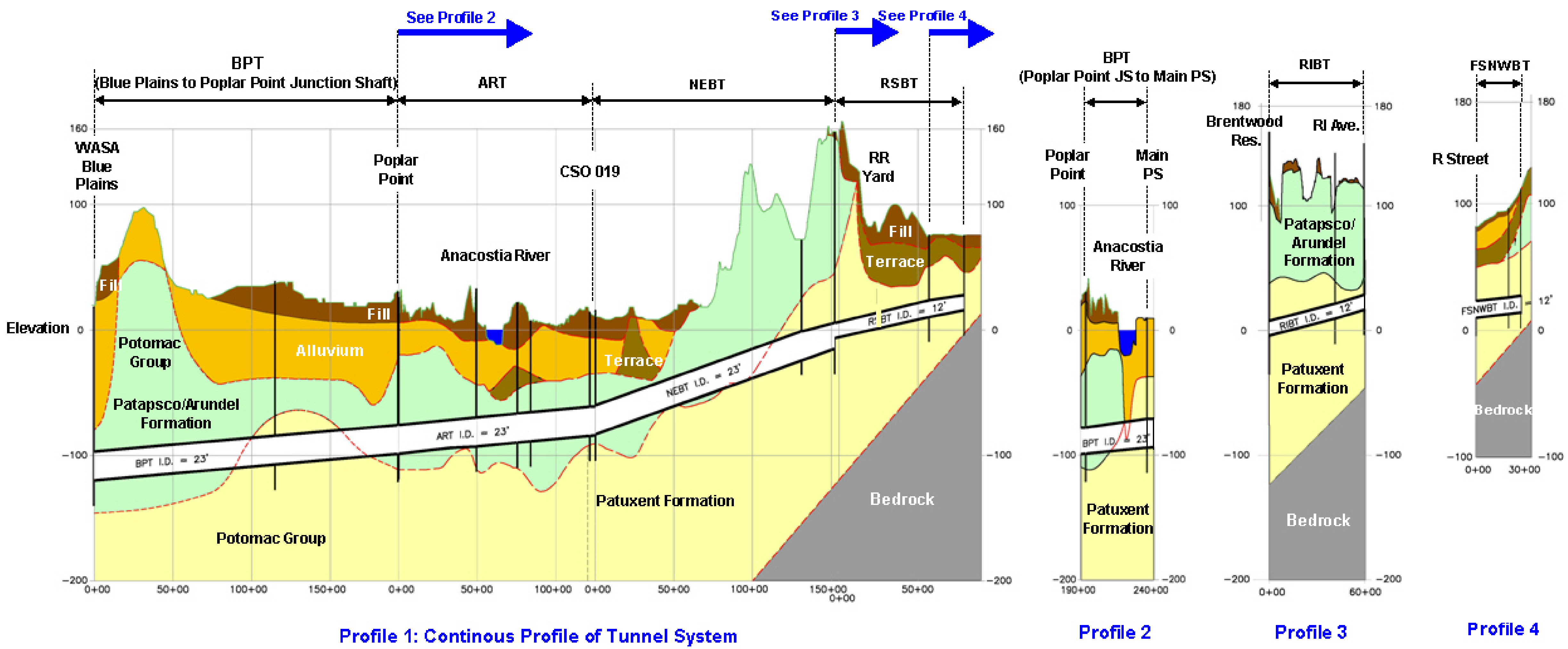



**Figure 9: Locations of Borings and Geophysical Survey**




**TUNNELS:**

BPT = Blue Plains Tunnel
ART = Anacostia River Tunnel
NEBT = Northeast Boundary Tunnel
RSBT = R Street Branch Tunnel
RIBT = Rhode Island Branch Tunnel
FSNWBT = First Street NW Branch Tunnel

**Figure 10: Summary Geologic Profiles**

## Project Permitting

The Consent Decree includes requirements relative to acquisition of permits and approvals associated with the ARP. These requirements include identification of the permits required for the ARP as well as the timing for submittals applications. Table 4 identifies the agencies and organizations that will require some type of permit or approval for construction of the facilities defined for the project. The detailed implementation schedule shown on Figure 7 also includes a graphical summary of the permits process timeline.

The permitting agencies and organizations presented in Table 4 have been divided into the following categories:

- Utility agencies
- District of Columbia (D.C.) agencies
- Regional agencies
- Federal agencies, including applicable military commands
- Private organizations/property owners

The permit requirements vary among the different agencies. Section 11 of the Facility Plan identifies, to the extent identified as being applicable, all of the agencies that will have jurisdiction over the planned alignments, and appurtenant facilities sites, and it outlines the requirements and procedures for obtaining a permit from each respective agency. Section 14 of the Facility Plan provides additional information relative to those agencies and other entities that will require on-going coordination beyond the formal permitting process throughout the design and construction periods.

## Land Acquisition and Approvals

Section 12 of the Facility Plan provides a detailed listing of the property acquisitions, easements and agreements required for the project. The scope of the respective property acquisitions relative to the planned facilities and tunnels alignments are also shown on several figures included within Section 12. The evaluations of alternative tunnel alignments were based on locations that would minimize impacts on private property owners and establish the locations of tunnels corridors in public owned areas. Approximately 10 percent of the tunnels alignments and facilities defined in the Facility Plan are located on privately owned locations.

A summary of property owners identified on Figures 12-1 through 12-23 of the Facility Plan is presented in Table 5. More than 90 percent of the tunnels length is located below land owned by the United States Government and controlled by the military (Bolling Air Force Base and Anacostia Naval Annex) or the National Park Service, or below the public right-of-way. Various railroad companies, including CSX Railroad and WMATA own or control the land above approximately 6 percent of the tunnels length and private entities own the land above approximately 3 percent of the tunnels length.

**Table 4, Sheet 1 of 3**
**Project Permitting and Submittal Deadline Requirements**
**Based on Information Available During Facility Planning**

| Contract Division Designation and Major Components | Agency/Organization | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Utilities | | | | | DC Agencies | | | | | | | | | | Federal Agencies | | | | | | | | | Other Agencies/Private | | | |
| | Potomac Electric Power Company | | Washington Gas Company | Telephone (Comcast/Verizon) | DC Water and Sewer Authority | District Department of Transportation | DC Office of Planning | Department of Consumer & Regulatory Affairs | Department of Health / D.C. Fire & Emergency Medical Services | District Department of Environment | Navy Research Laboratory | Deputy Mayor for Planning and Economic Development | Various Advisory Neighborhood Commissions | DC Department of Public Works | DC Department of Parks & Recreation | National Mall and Memorial Parks | U.S. Army Corps of Engineers | Department of the Interior (Marinas) | National Park Service - East | Bolling AFB (DoD) or Department of the Air Force | U.S. Navy | National Arboretum | National Capitol Planning Commission | U.S. Coast Guard (Sector Baltimore) | Washington Metropolitan Area Transit Authority | CSX Corporation | Private Property Owners | U.S. Postal Service |
| | Request for New Service | Utility Relocation Review | Utility Relocation Request | Utility Relocation Request | Construction Site Permit | Maintenance of Traffic Schemes | Document Review | Public Space Application/PSMA-WOSE/Others | Tunnel Ventilation/Other Permit Approvals through DCRA & DDOT | ESC/SMP/NPDES | Property Access | Site Acquisition | Letter Notification | Site Layout Permit | Tree Protection Permit | RFK Stadium Access | 404 Permit (s) | Document Review | Site Acquisition /Document Review | Document Review/Site Access Permit | Document Review/Site Access Permit | Document Review | Document Review | River Crossing | Real Estate Application | Document Review/Right of Entry Permit | Letter of Notification | Document Review |
| A<br>BPT, BPTDS, BAFB-DS, PP-JS (excavation & support), MPS-DS, MOS-DC, and approach channel | At 30% design | At 30% design | — | — | 2 mo. prior to 60% design | At 60% design | At NTP design | 3 mo. prior to 60% design | At 30% design | 3 mo. prior to 60% design | At NTP for design | At NTP for design | At 30% design | At 30% design | — | — | 2 mo. Prior to 30% | — | 2 mo. prior to 30% design | At NTP design | At NTP design | — | 3 mo. prior to 60% design | At NTP design | — | — | — | — |
| B<br>CSO 013-DC, CSO 014-DC and microtunnel | At 60% design | At 30% design | 2 mo. prior to 60% design | At 30% design | 2 mo. prior to 60% design | At 60% design | At NTP design | 3 mo. prior to 60% design | — | 3 mo. prior to 60% design | — | At NTP for design | At 30% design | At 30% design | — | — | — | — | — | — | — | — | 3 mo. prior to 60% design | — | — | — | — | — |
| C<br>CSO 019-S, CSO 019-N, CSO 019-JC-2 and approach channel | At 60% design | At 30% design | 2 mo. prior to 60% design | — | 2 mo. prior to 60% design | At 60% design | At NTP design | 3 mo. prior to 60% design | — | 3 mo. prior to 60% design | — | At NTP for design | At 30% design | At 30% design | 2 mo. prior to const. NTP | At 30% design | — | — | 2 mo. prior to 30% design | — | — | — | 3 mo. prior to 60% design | — | — | — | — | — |
| D<br>BAFB-OF, BPOS-DC and approach channel | At 60% design | At 30% design | 2 mo. prior to 60% design | At 30% design | 30% design | At 60% design | At NTP design | 3 mo. prior to 60% design | — | 3 mo. prior to 60% design | — | — | At 30% design | At 30% design | 2 mo. prior to const. NTP | — | At 30% design | — | 2 mo. prior to 30% design | At NTP design | — | — | 3 mo. prior to 60% design | At NTP design | — | — | — | — |
| E<br>CSO 015-DC, CSO 016-DC, CSO 017-DC, microtunnel and approach channel | At 60% design | At 30% design | 2 mo. prior to 60% design | At 30% design | 2 mo. prior to 60% design | At 60% design | At NTP design | 3 mo. prior to 60% design | — | 3 mo. prior to 60% design | — | At NTP for design | At 30% design | At 30% design | 2 mo. prior to const. NTP | — | — | At 30% design | — | — | — | — | 3 mo. prior to 60% design | — | — | — | — | — |

**Table 4, Sheet 2 of 3**
**Project Permitting and Submittal Deadline Requirements**
**Based on Information Available During Facility Planning**

| Contract Division Designation and Major Components | Agency/Organization: Utilities | | | | | DC Agencies | | | | | | | | | | Federal Agencies | | | | | | | | | Other Agencies/Private | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Potomac Electric Power Company | | Washington Gas Company | Telephone (Comcast/Verizon) | DC Water and Sewer Authority | District Department of Transportation | DC Office of Planning | Department of Consumer & Regulatory Affairs | Department of Health / D.C. Fire & Emergency Medical Services | District Department of Environment | Navy Research Laboratory | Deputy Mayor for Planning and Economic Development | Various Advisory Neighborhood Commissions | DC Department of Public Works | DC Department of Parks & Recreation | National Mall and Memorial Parks | U.S. Army Corps of Engineers | Department of the Interior (Marinas) | National Park Service - East | Bolling AFB (DoD) or Department of the Air Force | U.S. Navy | National Arboretum | National Capital Planning Commission | U.S. Coast Guard (Sector Baltimore) | Washington Metropolitan Area Transit Authority | CSX Corporation | Private Property Owners | U.S. Postal Service |
| | Request for New Service | Utility Relocation Review | Utility Relocation Request | Utility Relocation Request | Construction Site Permit | Maintenance of Traffic Schemes | Document Review | Public Space Application/PSMA-WOSE/Others | Tunnel Ventilation/Other Permit Approvals through DCRA & DDOT | ESC/SMP/NPDES | Property Access | Site Acquisition | Letter Notification | Site Layout Permit | Tree Protection Permit | RFK Stadium Access | 404 Permit (s) | Document Review | Site Acquisition /Document Review | Document Review/Site Access Permit | Document Review/Site Access Permit | Document Review | Document Review | River Crossing | Real Estate Application | Document Review/Right of Entry Permit | Letter of Notification | Document Review |
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| D<br>BAFB-OF, BPOS-DC and approach channel | At 60% design | At 30% design | 2 mo. prior to 60% design | At 30% design | 30% design | At 60% design | At NTP design | 3 mo. prior to 60% design | — | 3 mo. prior to 60% design | — | — | At 30% design | At 30% design | 2 mo. prior to const. NTP | — | At 30% design | — | 2 mo. prior to 30% design | At NTP design | — | — | 3 mo. prior to 60% design | At NTP design | — | — | — | — |
| E<br>CSO 015-DC, CSO 016-DC, CSO 017-DC, microtunnel and approach channel | At 60% design | At 30% design | 2 mo. prior to 60% design | At 30% design | 2 mo. prior to 60% design | At 60% design | At NTP design | 3 mo. prior to 60% design | — | 3 mo. prior to 60% design | — | At NTP for design | At 30% design | At 30% design | 2 mo. prior to const. NTP | — | — | At 30% design | — | — | — | — | 3 mo. prior to 60% design | — | — | — | — | — |

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| Contract Division Designation and Major Components | Agency/Organization | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Utilities | | | | | DC Agencies | | | | | | | | | | Federal Agencies | | | | | | | | | Other Agencies/Private | | | |
| | Potomac Electric Power Company | | Washington Gas Company | Telephone (Comcast/Verizon) | DC Water and Sewer Authority | District Department of Transportation | DC Office of Planning | Department of Consumer & Regulatory Affairs | Department of Health / D.C. Fire & Emergency Medical Services | District Department of Environment | Navy Research Laboratory | Deputy Mayor for Planning and Economic Development | Various Advisory Neighborhood Commissions | DC Department of Public Works | DC Department of Parks & Recreation | National Mall and Memorial Parks | U.S. Army Corps of Engineers | Department of the Interior (Marinas) | National Park Service - East | Bolling AFB (DoD) or Department of the Air Force | U.S. Navy | National Arboretum | National Capitol Planning Commission | U.S. Coast Guard (Sector Baltimore) | Washington Metropolitan Area Transit Authority | CSX Corporation | Private Property Owners | U.S. Postal Service |
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| D<br>BAFB-OF, BPOS-DC and approach channel | At 60% design | At 30% design | 2 mo. prior to 60% design | At 30% design | 30% design | At 60% design | At NTP design | 3 mo. prior to 60% design | — | 3 mo. prior to 60% design | — | — | At 30% design | At 30% design | 2 mo. prior to const. NTP | — | At 30% design | — | 2 mo. prior to 30% design | At NTP design | — | — | 3 mo. prior to 60% design | At NTP design | — | — | — | — |
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**Table 5**
**Summary of Property Owners along the Proposed Tunnels System Alignments**

| **Property Owners** | **Approximate Length of Tunnel (Ft)** | **% of Total Length** |
|---|---|---|
| Public Right-of-Way | 20,775 | 32.9% |
| National Park Service (USA) | 18,260 | 28.9% |
| Military (BAFB and Navy) | 15,390 | 24.4% |
| Railroad Entities | 4,025 | 6.4% |
| US Army Corps of Engineers (USA) | 2,300 | 3.6% |
| Private Property | 1,915 | 3.0% |
| USA (other) | 1,725 | 2.7% |
| National Arboretum (USDA) | 1,660 | 2.6% |
| District of Columbia | 1,370 | 2.2% |
| WASA controlled (owned by DC and/or USA) | 510 | 0.8% |
| PEPCO | 105 | 0.2% |
| **Total** | **68,035** | **100%** |

# Public Notification

A visual CSO notification system has been installed and is in operation on the Anacostia River as shown on Figure 11. Under the Consent Decree, at least three additional systems are required. Because extensive redevelopment planning and new bridge construction planning is underway all along the Anacostia River in the area of all the CSO outfalls, it is not practicable, at this time, to finalize the details of the public notification system. For example, some of the redevelopment plans are considering new public access to the river, but the locations and other details are only conceptual. In view of the circumstance associated with the redevelopment and bridge construction, the Authority proposes to include the visual notification systems under Contract Division H, Anacostia River Tunnel, which is scheduled for award of design by November 1, 2011.

**Figure 11: CSO Warning Lights on Anacostia River**

## Other ARP Implementation Factors

The ARP have been developed at this stage to a level sufficient to proceed to detailed design and construction. However, uncertainties remain, and these uncertainties could impact the design and schedule of the facilities included in the Facility Plan. In addition to uncertainties discussed under project setting, risk management and construction planning, geotechnical information, permitting and land acquisition, there are those criteria, standards, regulations, laws, guidelines and assumptions upon which the ARP and schedule are based. The following list includes, but may not be limited to, factors for which changes from the bases upon which the Facility Plan has been prepared, could require changes to the ARP and the implementation schedule:

- Those items listed in subsection 13.7 of the LTCP, Final Report, July 2002
- EPA's approval and approval conditions of the Authority's Blue Plains Total Nitrogen Removal/Wet Weather Plan, LTCP Supplement No. 1, Final, October 2007
- The terms and conditions related to nitrogen removal and the combined sewer system in the proposed and final reissued NPDES permit for Blue Plains
- The terms and conditions in a modified Consent Decree necessary to incorporate LTCP Supplement No. 1 and the Facility Plan
- Actions, decision, conditions and delays created, caused or contributed by third parties that impact the design and schedule bases of the ARP included in the Facility Plan. Third parties include, but may not be limited to, the parties to the Consent Decree, other than the Authority, and all their branches, departments and agencies; utility agencies, transportation agencies, the affected public, special interest groups, suppliers, and contractors.

# APPENDIX E

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

DC CLEAN RIVERS PROJECT

# APPENDIX E

# SUMMARY OF GREEN/GRAY AND GREEN CONTROLS FOR THE POTOMAC AND ROCK CREEK SEWERSHEDS

December 2014

Prepared for:

Prepared by:

Program Consultants Organization
Blue Plains Advanced Wastewater Treatment Plant
5000 Overlook Avenue, SW
Washington, DC 20032

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# 1 Introduction

## 1.1 Purpose

The District of Columbia Water and Sewer Authority (DC Water) is implementing a Long Term Control Plan (LTCP or DC Clean Rivers Project, DCCR) to control combined sewer overflows (CSOs) to the District's waterways. The DCCR is comprised of a variety of projects including pumping station rehabilitations, targeted sewer separation, green infrastructure (GI) at DC Water facilities and a system of underground storage/conveyance tunnels to control CSOs. The DCCR is being implemented in accordance with a Consent Decree (LTCP Decree) signed by DC Water, the District, and the U.S Government, that specifies the schedule for implementation. Projects on the Anacostia River are first in the schedule and DC Water is implementing those projects in accordance with the Decree.

Unlike single-purpose gray infrastructure which uses tanks, tunnels and pipes to store and convey CSO, GI uses vegetation and soil to manage stormwater where it falls. GI has the ability to reduce stormwater and CSOs, and provide multiple environmental, social and economic benefits. Examples of these benefits include improved air quality, reduced heat island effects, improved property values and creation of local jobs. In addition, GI consists of many small projects which can be brought on line as soon as individual projects are completed. In contrast, gray CSO projects can typically only be brought on line when all the elements are completed. Because of this, GI projects can provide earlier CSO reduction than all-gray projects.

Based on an assessment of the sewersheds, DC Water is proposing hybrid CSO controls for the Potomac and Rock Creek as follows:

- In Rock Creek, construct GI instead of the Piney Branch tunnel to control the Piney Branch CSO
- On the Potomac, construct a hybrid green and gray control system for the Potomac River CSOs

This document provides a summary of the green/gray and green controls for the Potomac and Rock Creek sewersheds.

DC Water has public noticed a detailed summary of the analysis supporting the green and green/gray controls in the following document: *Long Term Control Plan Modification for Green Infrastructure*, January 2014, DC Water.

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# 2 Collection System Modeling

This section describes the use of DC Water's hydrologic and hydraulic model to predict sewer system response to the proposed green and green/gray CSO controls. This section presents a brief background on the models employed followed by discussions of the model development and the model application.

## 2.1 Background

Hydrologic and hydraulic models are computer simulation tools used by planners and engineers to evaluate rainfall and runoff relationships in urban areas. The hydrologic model simulates the major components of the hydrologic cycle; that is, the physical processes of rainfall, evapotranspiration, storage, and runoff. The response of urban neighborhoods to rainfall is determined by the relative degree of imperviousness of surface features (e.g., rooftops, parking lots, roads, etc.) and the infiltration capabilities of the soils. The hydraulic model simulates the movement of runoff and sewer flows through the below-ground network of pipes and other infrastructure that make up the sewer system. Flow through the sewer system is determined by the capacity of pipes, pumps, and other hydraulic control structures, and by backwater conditions.

Hydrologic and hydraulic models are calibrated based on observed rainfall and flow data. The model parameters (e.g., infiltration rate, slope, roughness coefficient, etc.) are adjusted in calibration to an optimal point where the ability of the model to simulate the volume and timing of runoff events is maximized. Independent validation of models is done by gauging the ability of the model to simulate a separate group of rainfall/runoff events without adjustment of the model parameters. Model calibration and validation provide confidence in the ability of the models to "predict" the response of the system under a variety of conditions. This is particularly true when the calibration and validation data sets include a wide variety of rainfall and flow conditions.

Identifying a dataset that represents average rainfall conditions for use in the hydrologic model is a fundamental first step in model development. As part of the evaluation of the original LTCP, DC Water analyzed over 50 years of hourly rainfall data at Ronald Reagan National Airport to identify an average rainfall period. The years from 1988 to 1990 were selected as the average rainfall period. This period was chosen because annual precipitation from these three years represent dryer conditions, wetter conditions, and average conditions compared to the long term average for the District. Table 2-1 compares the rainfall for these three years to the long term average.

**Table 2-1. Annual Average Rainfall Conditions in the District**

| Statistic | 1988 | 1989 | 1990 | 1988-1990 Avg | Long Term Avg[1] |
|---|---|---|---|---|---|
| Annual Rainfall (inches) | 31.74 | 50.32 | 40.84 | 40.97 | 38.95 |
| No. Events > 0.05 inches[2] | 61 | 79 | 74 | 71 | 74 |
| Average Storm Duration (hours)[2] | 9.6 | 11.2 | 9.6 | 10.1 | 9.9 |
| Average Maximum Intensity (in/hr) | 0.15 | 0.18 | 0.15 | 0.16 | 0.15 |
| Maximum Intensity (in/hr) | 1.32 | 1.31 | 1.25 | 1.29 | 1.30 |
| Percentile[3] | 14th | 90th | 68th | 68$^{th}$ | -- |

Notes: 1. Ronald Reagan National Airport hourly data, 1949-1998

2. Individual events separated by a minimum of 6 hours with no rain.

3. Percentile is based on total annual rainfall.

DC Water has used the MIKE URBAN Model and its predecessor (the MOUSE Model) for all of its hydrologic and hydraulic analyses dating back to 1998. Both models are products of DHI, formerly the Danish Hydraulic Institute (www.dhigroup.com).The models were applied to support a wide range of projects and studies including development of the original LTCP for the combined sewer system (CSS). The MOUSE Model incorporating both hydrologic and hydraulic modeling capabilities was selected by DC Water in 1998 to support development of the LTCP. MOUSE was chosen at the time because it had the capability to directly simulate Real Time Control (RTC) operations, a feature that was not then available in the widely-used Storm Water Management Model (SWMM).

During model development, sewersheds for both the CSS and the municipal separate storm sewer system (MS4) in the District were delineated based on sewer maps and topography. Hydrology parameters in the hydrologic model (e.g., pervious vs. impervious, infiltration, etc.) were based on available soil, land use, and zoning maps. Hydraulic controls (e.g., regulators, pump stations, outfalls, inflatable dams, etc.) were based on drawings, pump curves, operations documents, and other studies.

Model calibration and validation was based on rainfall and flow records in the CSS collected during 1999-2000. This included 24 rainfall events for model calibration and another 20 rainfall events for model validation. Several rain gages in the District and observed rainfall at DC National Airport were used to drive the hydrologic model. The hydrologic model was calibrated ahead of the hydraulic model. Overall, the emphasis of calibration and validation was placed on developing a mass balance of flow at Blue Plains, and a reasonable representation of the frequency and volume of CSO discharges.

Since the original model was developed to support the LTCP, a number of software upgrades and model improvements have been made. DHI upgraded the MOUSE model engine to the current incarnation of MIKE URBAN in 2003. The upgrade to MIKE URBAN improved the model application in several ways. It was able to be applied in a continuous simulation mode, a very important consideration where long multiple year simulations are required. MIKE URBAN also included GIS-based software. This made it easier to use GIS data sets for impervious surfaces (e.g., roads, sidewalks, parking lots, etc.) and soils more spatially and directly. In addition, DC Water had its sewer maps (i.e., counter maps) digitized and developed as a geodatabase that could be directly linked to MIKE URBAN. The result of this update was a much improved representation of surface conditions across the CSS in the hydrologic model. In addition, the pipe network in the hydraulic model was based on better information on pipe slopes, diameters, roughness, and other relevant characteristics. New and more robust flow data from suburban jurisdictions and from the District's separate sewer system were also integrated into the model boundary conditions. Figures 2-1 and 2-2 provide a visual representation of the model elements and the land cover for Potomac and Piney Branch sewersheds, respectively.

MIKE URBAN was recalibrated during the period 2005-2006 based on metered flow data for the collection system and Blue Plains. This flow data was supplemented with point rainfall data at National Airport and other District of Columbia stations, with radar rainfall estimates on a square kilometer basis available for some key rainfall events.

Since this recalibration, the MIKE URBAN model has continued to be employed in a number of capacities for DC Water. The model has been used for emergency operations planning, Inter Municipal Agreement (IMA) negotiations, multi-jurisdictional use facilities planning and cost allocation, the Anacostia Facilities Plan, the updated LTCP/Total Nitrogen-Wet Weather Plan, the Federal Triangle and other flood studies, and quarterly NPDES reporting of CSO estimates.

For DC Water's analysis of green infrastructure potential, a suite of modeling software packages (including MIKE URBAN and SWMM5) was evaluated to identify the best modeling tool to utilize. The results of this evaluation are presented in Technical Memorandum No. 2, Approach to Hydrologic and Hydraulic Modeling. This evaluation resulted in the selection of EPA's SWMM5 runoff application to perform the hydrologic evaluation and paired with the existing MIKE URBAN hydraulic model. EPA SWMM5 features options for explicit characterization and simulation of specific GI practices that the MIKE URBAN hydrologic model does not.

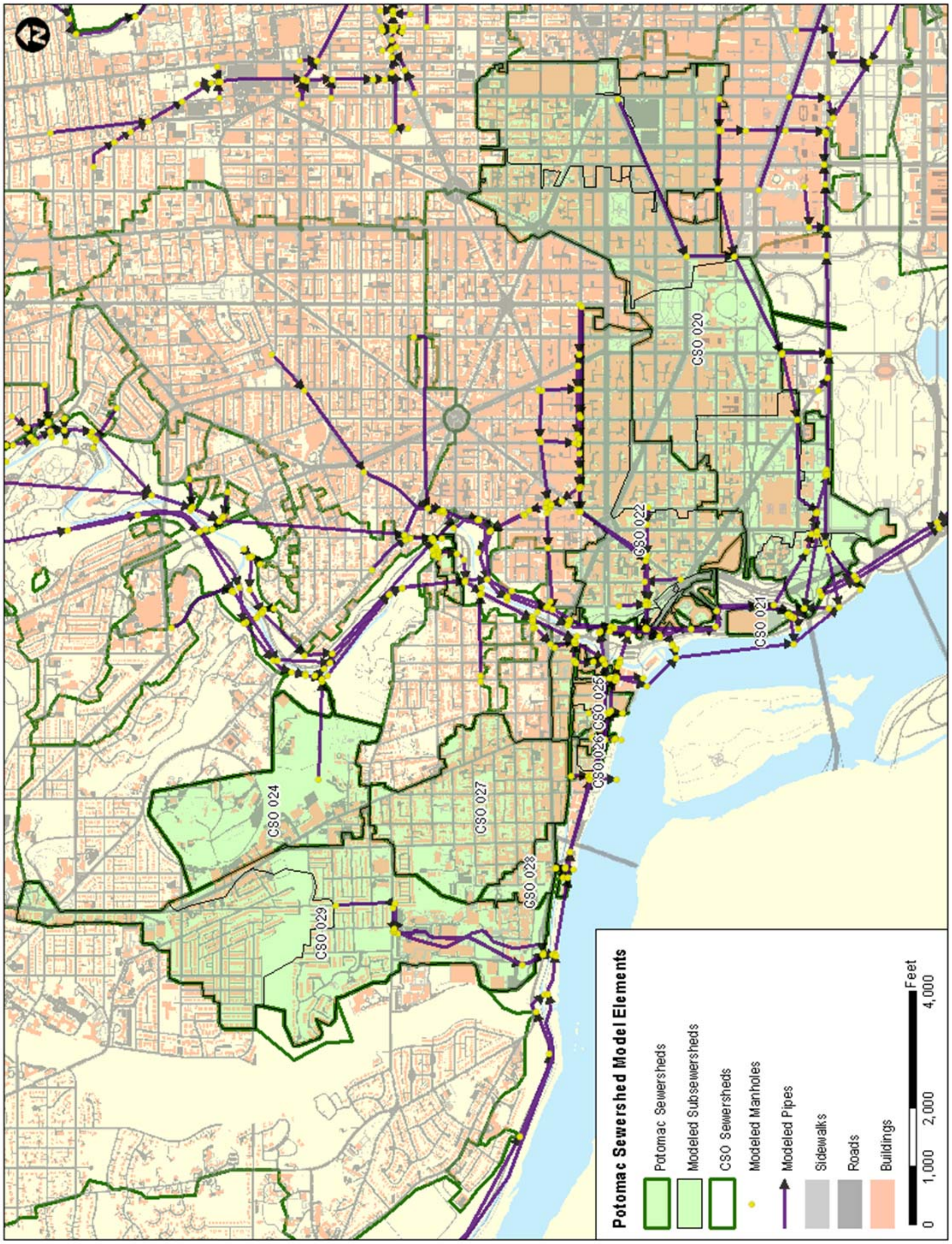


**Figure 2-1. Potomac Sewershed Model Elements**

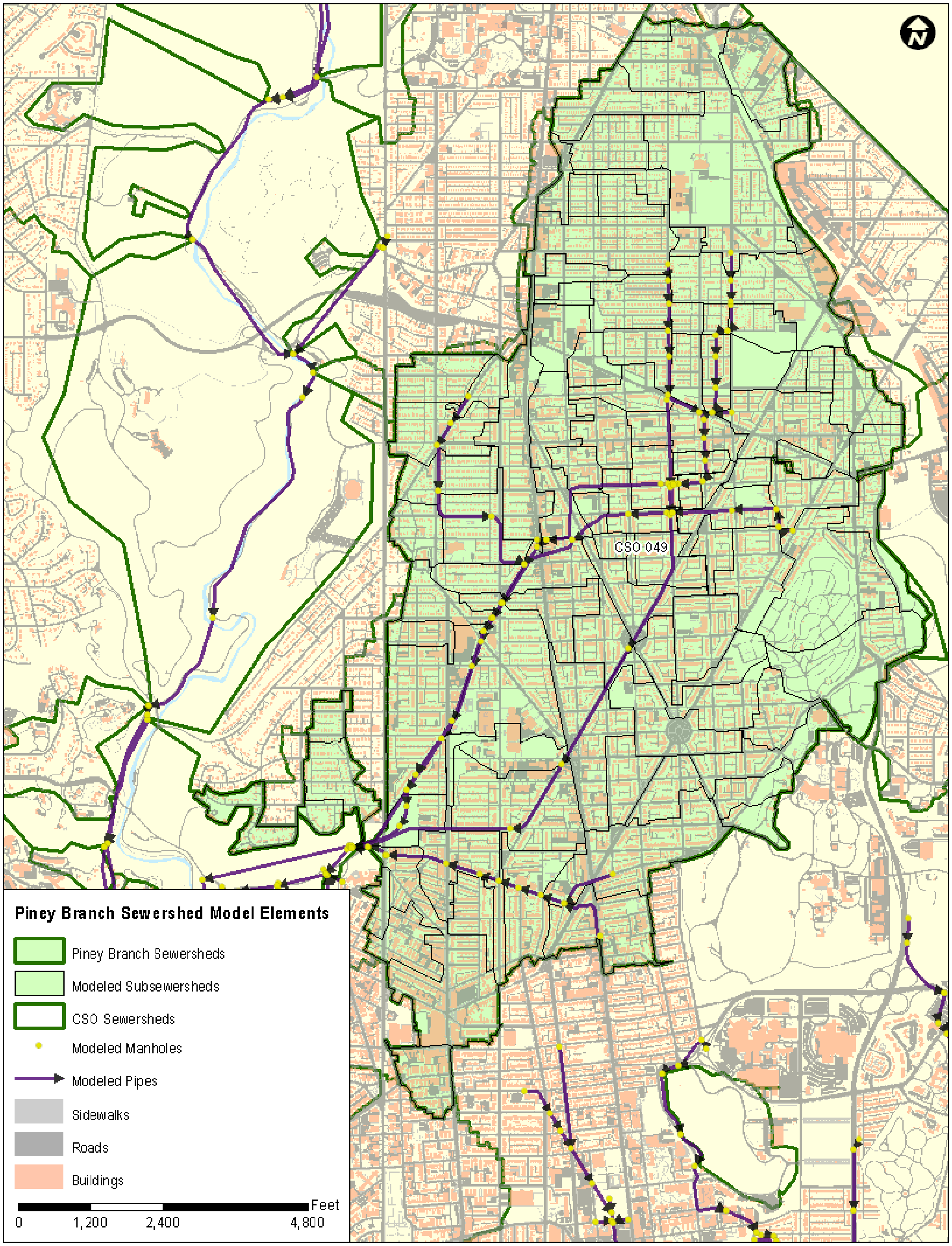


**Figure 2-2. Piney Branch Sewershed Model Elements**

## 2.2 Model Development

For this GI screening analysis, the SWMM5 hydrologic model was used for runoff simulation and the existing hydraulic portion of the MIKE URBAN model was used to model flow through the collection system. The SWMM5 runoff model was developed based on the runoff portion of the MIKE URBAN model as described below, and results were compared to the MIKE URBAN model to ensure consistency with previous model runs.

Historically, the purpose of the MIKE URBAN model was to predict combined sewer volumes and overflows entering receiving waters from the DC Water combined sewer service area. Developing a model for GI simulation requires finer subsewershed, pipe, and manhole resolution than previously existed in the MIKE URBAN runoff model. To accommodate this, the Piney Branch sewershed was redelineated to a higher resolution of 101 geographically separate model subsewersheds. Potomac model subsewersheds were deemed to be of sufficient resolution that finer delineations were unnecessary. There are 138 modeled subsewersheds throughout the Piney Branch and Potomac sewersheds with a median area of 19 acres. Ninety percent (90%) of the modeled subsewersheds are less than 140 acres.

Existing runoff parameters from MIKE URBAN were converted to SWMM5 runoff parameters. Parameters were copied when the exact analog to the MIKE URBAN parameter existed in SWMM5. Other parameters were converted to match as closely to the parameters in MIKE URBAN and then checked for consistency. Horton infiltration parameters were updated based on NRCS SSURGO soil data for the model area.

In order to effectively model water loss within GI practices, evapotranspiration (ET) was refined so that it could be applied to GI practices and the model in general. In MIKE URBAN, ET was applied only to water in storage, which was a representation of green infrastructure practice storage. SWMM5 does not have an option to apply ET solely to a practice; instead it is applied to the model as a whole. ET for SWMM5 was based on daily temperatures and climate at the Ronald Reagan Washington National Airport using a modified Thornwaite approach. Of the several accepted methods that could be used to approximate ET, this approach provided results most similar to the MIKE URBAN runoff model.

The models were run for the 1988-1990 period for validation. Time series output from both SWMM5 and MIKE URBAN runoff models was used as an input to the MIKE URBAN hydraulic model. Several metrics were used to compare the two models and insure the SWMM5 model was consistent with the MIKE URBAN runoff model including runoff volume, overflow volume, and frequency of CSO overflows.

## 2.3 Model Application

GI practices are represented in SWMM5 as "LID controls" (Low Impact Development). LID controls were used in the model for the Piney Branch and Potomac River areas of the combined sewer area. SWMM5 is a lumped parameter model that assumes uniformity across a single modeled sewershed. This means that LID controls were designed to represent the total of all GI practices contained within the modeled sewershed instead of representing each GI practice separately. This is common practice in a lumped parameter model.

GI practices are grouped into the four following LID control categories based on their general design and purpose:

- Rain Barrels
- Cisterns
- Bioretention
- Porous Pavement

Each type of LID control treats runoff from a specific area and drainage areas do not overlap. In SWMM5, each of the contributing areas to the four types of LID control is simulated as a separate subcatchment. Each type of impervious cover exists throughout the Potomac and Rock Creek sewersheds leading to a generally uniform distribution of LID controls. The modeling analysis focused on aggregate area of each impervious cover type without regard to public or private ownership. For scenarios that examine a high level of GI control, it is possible that opportunities for private GI implementation could be limited. In these cases, it is assumed that opportunities exist on public-owned property to compensate for the lack of opportunity on private property, and runoff passes through public property before entering the collection system.

In SWMM5, runoff from the surface to be treated by an LID control is routed to the control before entering the hydraulic model (MIKE URBAN). For example, if the scenario calls for 30% GI treatment, 30% of the contributing area from the variety of types of impervious surfaces is routed to LID controls identified for the specific type of impervious surface. Runoff not entering a LID control flows directly to the hydraulic model. Figure 2-3 shows the modeling framework used by SWMM5 to route flow to LID controls.

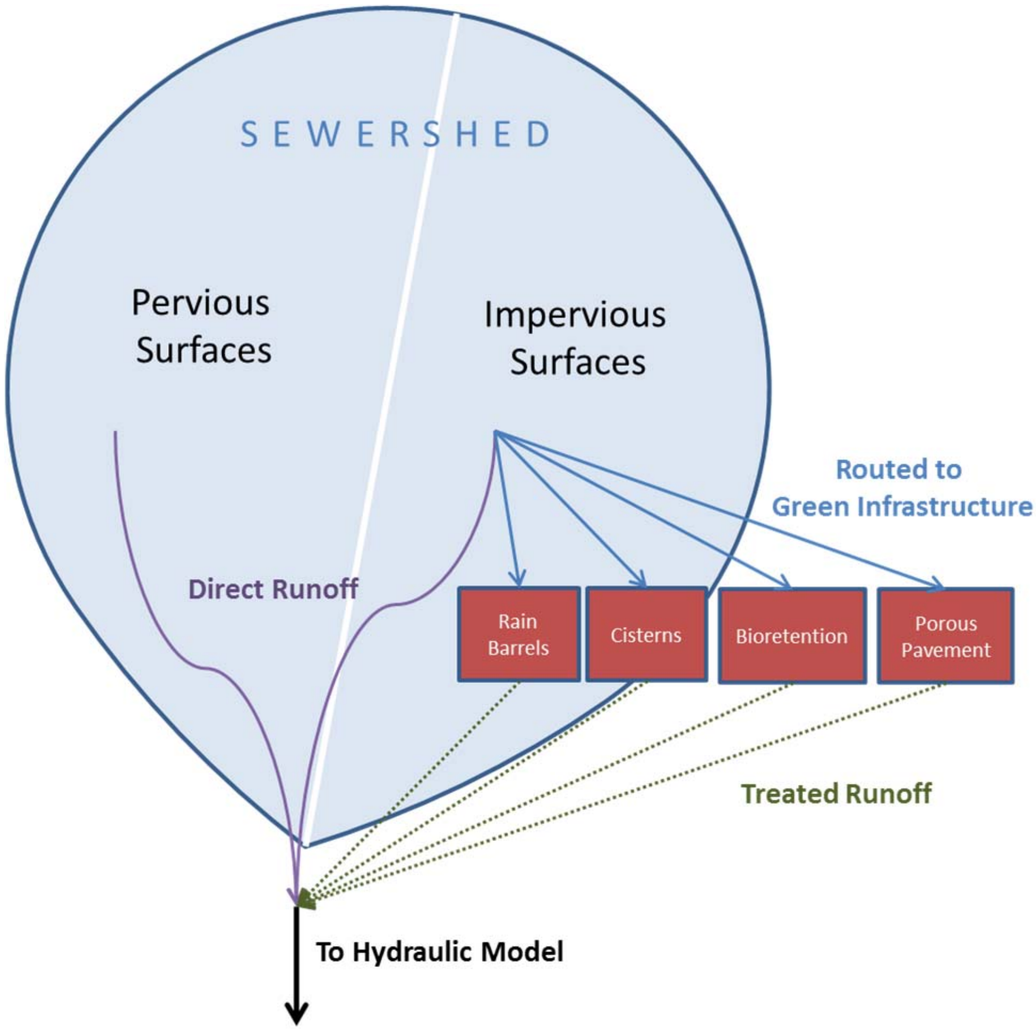


**Figure 2-3: SWMM5 LID Control Routing**

SWMM5 represents LID controls as shown in Figure 2-4. All LID controls use the same framework, with runoff entering the LID through the surface layer and passing to other layers or out of the LID practice through ET, overflow, underdrain, or infiltration based on parameters defined for each LID practice.

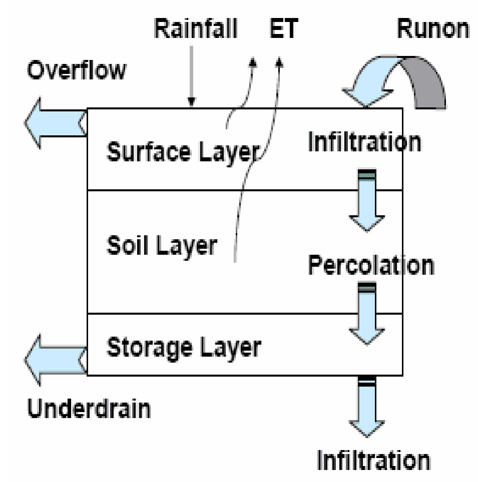


**Figure 2-4. SWMM5 LID Control Representation**

Each LID control is sized to completely contain the runoff volume produced from a 1.2 inch storm over the area treated. Other LID control parameters are determined based on accepted literature values for the types of LID controls and design guidelines used in the Concept Plan (see Technical Memorandum No. 3). Table 2-2 shows the LID control parameters used in the SWMM5 runoff model. Bioretention cell and porous pavement parameters for infiltration and underdrains varied due to site-specific soil conditions and infiltration potential across the modeled area.

Infiltration from each of the LID controls into the underlying soil is assumed to occur at a rate equal to the Horton method minimum infiltration rate for the subsewershed within which it is contained. This is a conservative assumption and accounts for probable soil compaction under the LID control.

Each LID control has a simulated underdrain. The underdrain diameter and height from the bottom of the control are optimized to allow the control to drain or infiltrate within 48 hours of the end of the storm and allow the water surface elevation in the control to remain below the surface of the practice. Rain barrels and cisterns do not have infiltration and the underdrains are simulated at the bottom of the control. Underdrain outflow from rain barrels is assumed to drain to the surface of the subshed where the rain barrel is located. Underdrain outflow from the other practices is assumed to flow directly into the collection system.

**Table 2-2. SWMM5 LID Practice Parameters**

| Parameter | Units | Rain Barrel | Cistern | Bioretention Cell | Porous Pavement |
|---|---|---|---|---|---|
| **Surface** | | | | | |
| **Storage depth** | in | | | 6 | 0.1 |
| **Surface slope** | % | | | 0 | 1.9 |
| **Soil/Pavement** | | | | | |
| **Thickness** | in | | | 24 | 6 |
| **Porosity** | frac | | | 0.3 | 0.2 |
| **Field Capacity** | frac | | | 0.105 | 0.105 |
| **Wilting Point** | frac | | | 0.047 | 0.047 |
| **Conductivity** | in/hr | | | 1.18 | 100 |
| **Conductivity Slope** | | | | 7 | 7 |
| **Suction Head** | in | | | 1.4 | 1.4 |
| **Storage** | | | | | |
| **Height** | in | 36 | 36 | 18 | 36 |
| **Void Ratio** | | | | 0.67 | 0.67 |
| **Infiltration** | in/hr | | | Varies | Varies |
| **Clogging Factor** | | | | 0 | 0 |
| **Drain** | | | | | |
| **Drain Coef.** | in/hr | 0.25 | 0.25 | Varies | Varies |
| **Drain Exponent** | | 0.5 | 0.5 | 0.5 | 0.5 |
| **Drain Offset** | in | 0 | 0 | Varies | Varies |
| **Drain Delay** | hr | 0 | 0 | | |

Various implementation scenarios were simulated to evaluate the expected runoff reduction and resulting tunnel size resulting from implementing various distributions of LID practices described above. The specific scenarios, the modeling approach, and the modeling results are presented in Section 5.

# 3 Green and Green/Gray Controls for Piney Branch and Potomac River

DC Water is proposing to modify its LTCP to change the CSO control plan for Piney Branch and the Potomac River. The proposed control plan includes green and green/gray controls. Each control technology will be used where it is the most appropriate. The hybrid green/gray controls are predicted to provide a degree of CSO control equivalent to the gray controls in the LTCP. The hybrid approach will have a higher socio economic benefit to the District, especially in the communities served by GI. Figure 3-1 at the end of this section summarizes the proposed controls as compared to the LTCP.

## 3.1 Green Controls for Piney Branch

### 3.1.1 Scope

**Piney Branch**
**30% GI Implementation**
Total Sewershed area = 2,329 acres
Impervious area = 1,215 acres
GI @ 30% of Impervious Area = 365 acres

GI will treat approximately 30% (or 365 acres) of the impervious area in the Piney Branch drainage area, providing control for CSO 049. GI will be sized to provide a retention capacity equivalent to 1.2" of rain falling on an impervious surface. GI projects may include bioretention practices (bioretention cells, bioswales, vegetated filter strips, and tree box filters), rooftop collection practices (green roofs, blue roofs, downspout disconnection, rain barrels, and cisterns), permeable pavement, and large-volume underground storage. These facilities will be constructed in both public and privately-owned spaces. In addition to GI, targeted sewer separation may be utilized to offload storm water from the combined sewer system.

In addition to GI, the weir height of the existing diversion structure serving CSO 049 will be raised to increase the capture of combined sewage. The resulting captured sewage will be diverted to the existing East Rock Creek Diversion Sewer for conveyance to Blue Plains for treatment This control structure modification is not predicted to increase overflow frequency or volume at other downstream CSOs in the Rock Creek sewershed.

### 3.1.2 Predicted Performance

Hydraulic modeling predictions indicate that GI implementation and modifications to Structure 70 will eliminate the need to construct 9.5 MG of tunnel storage included in the LTCP. The GI program is predicted to provide a degree of CSO control equivalent to the gray controls in the LTCP, as summarized in Table 3-1.

Predicted water quality is summarized in Table 3-2 and the GI controls are predicted to provide a degree of water quality performance in the receiving water equivalent to the gray controls in the LTCP.

# Green and Green/Gray Controls

**Table 3-1**
**Piney Branch Predicted CSO Overflows in Average Year**

| Parameter | Before LTCP[1] | LTCP | Green Controls[2] |
|---|---|---|---|
| No. of Overflows (#/avg yr) | 25 | 1 | 1 |
| Overflow Volume (mg/avg yr) | 39.73 | 1.41 | <1 |
| % reduction from Before LTCP | -- | 96% | 96% or greater |

**Table 3-2**
**Predicted Water Quality in**
**Rock Creek after Piney Branch (Segment 17) in Average Year**

| Parameter | Before LTCP[1] | LTCP | Green Controls[2] |
|---|---|---|---|
| # Months Fecal Geomean>200 (all loads) | 12 | 12 | 12 |
| # Months Fecal Geomean>200 (CSO only) | 0 | 0 | 0 |
| | | | |
| # Days Fecal>200 (all loads) | 335 | 335 | 335 |
| # Days Fecal>200 (CSO Only) | 24 | 1 | 1 |
| | | | |
| # Days Fecal>200 (all loads) May - Sept | 135 | 135 | 135 |
| # Days Fecal>200 (CSO Only) May - Sept | 15 | 1 | 1 |
| | | | |
| # Months E. Coli Geomean>126 (all loads) | 12 | 12 | 12 |
| # Months E. Coli Geomean>126 (CSO only) | 0 | 0 | 0 |
| | | | |
| # Days E. Coli>126 (all loads) | 365 | 365 | 365 |
| # Days E. Coli>126 (CSO Only) | 24 | 1 | 1 |
| | | | |
| # Days E. Coli>126 (all loads) May - Sept | 153 | 153 | 153 |
| # Days E. Coli>126 (CSO Only) May - Sept | 15 | 1 | 0 |
| | | | |
| # Days D.O.< 5 mg/L (all loads) | 0 | 0 | 0 |
| # Days D.O.< 5 mg/L (CSO Only) | 0 | 0 | 0 |

Notes for Tables 3-1 and 3-2:

1. Results shown for Before LTCP are without Phase1 Controls in place (i.e. without inflatable dams, pumping station rehabilitations and Northeast Boundary Swirl Facility in operation).
2. At the low levels of CSO overflows projected herein, model accuracy is highly dependent on many variables such as the accuracy of rainfall data, information on the drainage area and other factors. Further, additional overflows will occur for rain events which exceed or are not represented in the average year. The model predictions contained herein do not change the level of CSO control determined to be adequate to meet water quality standards which was included by DC Water in its LTCP, and subsequently approved by EPA and the D.C. Department of the Environment.

## 3.2 Green/Gray Controls for Potomac River

### 3.2.1 Scope

DC Water will construct the following controls for the Potomac River CSOs:

- **Potomac Tunnel (CSOs 020 – 024)**
  The Potomac Storage Tunnel will capture CSOs 020 through 024. These outfalls serve the major interceptors draining Rock Creek and the large downtown areas in the Potomac sewershed. Given the large overflow volume produced by these outfalls and the highly urbanized nature of the sewershed, DC Water will construct gray infrastructure to control these CSOs. The tunnel in the LTCP was a 58 million gallon (mg) facility with a tunnel dewatering pumping station at the low end. After rain events, the pumping station would bleed captured flow via the existing system to Blue Plains for treatment. The large size of the tunnel was driven, in part, by the inability to completely dewatering the tunnel during back-to-back rain events.

  As part of this modification, DC Water is proposing to construct a gravity tunnel from CSO 024 all the way to interconnect with the Blue Plains Tunnel on the Anacostia System. The total volume of the Potomac Tunnel will be 30 mg and the tunnel will be emptied by gravity. This configuration will create one interconnected tunnel system. The advantages of this system include:

  - The Potomac and Anacostia Tunnel Systems will be interconnected, with a total system storage volume of 187 mg (30 mg for the Potomac + 157 mg for the Anacostia River Tunnel System). Since rainfall has both geographic and temporal variability, the interconnection of the tunnel system improves the ability of the system to provide CSO control. As an example, intense rain events in one part of the District can utilize the tunnel system volume as needed to control overflows. This, combined with the sewer separation and GI, allows the 30 mg Potomac Tunnel to provide a degree of control equivalent to the gray controls in the LTCP.

  - The gravity tunnel does not require construction of a new pumping station in the National Mall area. This preserves space for other higher value use. In addition, it reduces the need operation and maintenance associated with a complex mechanical system. Elimination of the pumping station also improves reliability and redundancy since the gravity tunnel does not require electrical power or other mechanical equipment to function.

  - The gravity tunnel improves the reliability and operability of the existing sewer system. The system will be configured such that if Potomac Pumping Station loses power, then normal sanitary flows in the system will drop into the tunnel by gravity for conveyance to Blue Plains thereby preventing a dry weather overflow. Further, if Potomac Pumping Station or the Potomac Force Mains experience equipment failures or need to be worked on for repair or maintenance, the gravity tunnel can be used as a backup to convey flows to Blue Plains for treatment.

  - The gravity Potomac Tunnel is more environmentally responsible because it eliminates the need for an energy intensive pumping station.

- **Separation of Combined Sewers (CSOs 025 – 026)**
  The drainage areas for CSO 025 (17 acres) and CSO 026 (3 acres) are very small and, therefore, it is practical to separate the tributary combined sewers. Separation will result in the elimination of combined sewer overflows from these sewersheds.

- **Green Infrastructure (CSOs 027 – 029)**
  GI will provide CSO control in these outlying sewersheds. GI will treat 30% of impervious areas in the CSO 027 and 028 sewersheds, and 60% of impervious areas in the CSO 029 sewershed, for a total of 133 impervious acres. GI will be sized to provide capture equivalent to 1.2” of rain falling on an impervious surface. GI projects may include bioretention practices (bioretention cells, bioswales, vegetated filter strips, and tree box filters), rooftop collection practices (green roofs, blue roofs, downspout disconnection, rain barrels, and cisterns), permeable pavement, and large-volume underground storage. In addition to GI, targeted sewer separation may be utilized to offload storm water from the combined sewer system. Diversion structures within the CSO 027, 028, and 029 sewersheds will be modified to increase diversion capacities. The diversion structure improvements coupled with the GI are predicted to provide a degree of CSO control comparable to the LTCP.

**CSO 025 Separation**
Sewershed = 17 acres

**CSO 026 Separation**
Sewershed = 3 acres

**CSO 027 30% GI Implementation**
Sewershed = 164 acres
Impervious = 104 acres
30% GI = 31 acres

**CSO 028 30% GI Implementation**
Sewershed = 21 acres
Impervious = 13 acres
30% GI = 4 acres

**CSO 029 60% GI Implementation**
Sewershed = 330 acres
Impervious = 164 acres
60% GI = 98 acres

### 3.2.2 Predicted Performance

Hydraulic modeling predictions indicate that the hybrid green/gray controls are predicted to provide a degree of CSO control equivalent to the gray controls in the LTCP. Predicted CSOs are summarized in Table 3-3. Predicted water quality is summarized in Table 3-4 and the data show that the GI controls are predicted to provide a degree of water quality performance in the receiving water equivalent to the gray controls in the LTCP.

# Green and Green/Gray Controls

**Table 3-3**
**Potomac River Predicted CSO Overflows (Average Year)**

| Parameter | Before LTCP[1] | LTCP | Green/Gray Controls[2] |
|---|---|---|---|
| No. of Overflows (#/avg yr) | 74 | 4 | 4 |
| Overflow Volume (mg/avg yr) | 953 | 79 | 59 |
| % reduction from Before LTCP | -- | 92% | 92% or greater |

**Table 3-4**
**Potomac River Predicted Water Quality**
**Memorial Bridge (Segment 6) in Average Year**

| Parameter | Before LTCP[1] | LTCP | Green/Gray Controls[2] |
|---|---|---|---|
| # Months Fecal Geomean>200 (all loads) | 3 | 1 | 1 |
| # Months Fecal Geomean>200 (CSO only) | 0 | 0 | 0 |
| | | | |
| # Days Fecal>200 (all loads) | 142 | 109 | 109 |
| # Days Fecal>200 (CSO Only) | 57 | 6 | 3 |
| | | | |
| # Days Fecal>200 (all loads) May - Sept | 64 | 44 | 44 |
| # Days Fecal>200 (CSO Only) May - Sept | 33 | 4 | 1 |
| | | | |
| # Months E. Coli Geomean>126 (all loads) | 2 | 0 | 0 |
| # Months E. Coli Geomean>126 (CSO only) | 0 | 0 | 0 |
| | | | |
| # Days E. Coli>126 (all loads) | 118 | 77 | 74 |
| # Days E. Coli>126 (CSO Only) | 60 | 6 | 3 |
| | | | |
| # Days E. Coli>126 (all loads) May - Sept | 57 | 36 | 30 |
| # Days E. Coli>126 (CSO Only) May - Sept | 35 | 5 | 1 |
| | | | |
| # days D.O.< 5 mg/L (all loads) | 0 | 0 | 0 |
| # days D.O.< 5 mg/L (CSO Only) | 0 | 0 | 0 |

Notes for Tables 3-3 and 3-4:

1. Results shown for Before LTCP are without Phase1 Controls in place (i.e. without inflatable dams, pumping station rehabilitations and Northeast Boundary Swirl Facility in operation).
2. At the low levels of CSO overflows projected herein, model accuracy is highly dependent on many variables such as the accuracy of rainfall data, information on the drainage area and other factors. Further, additional overflows will occur for rain events which exceed or are not represented in the average year. The model predictions contained herein do not change the level of CSO control determined to be adequate to meet water quality standards which was included by DC Water in its LTCP, and subsequently approved by EPA and the D.C. Department of the Environment.

## Green and Green/Gray Controls

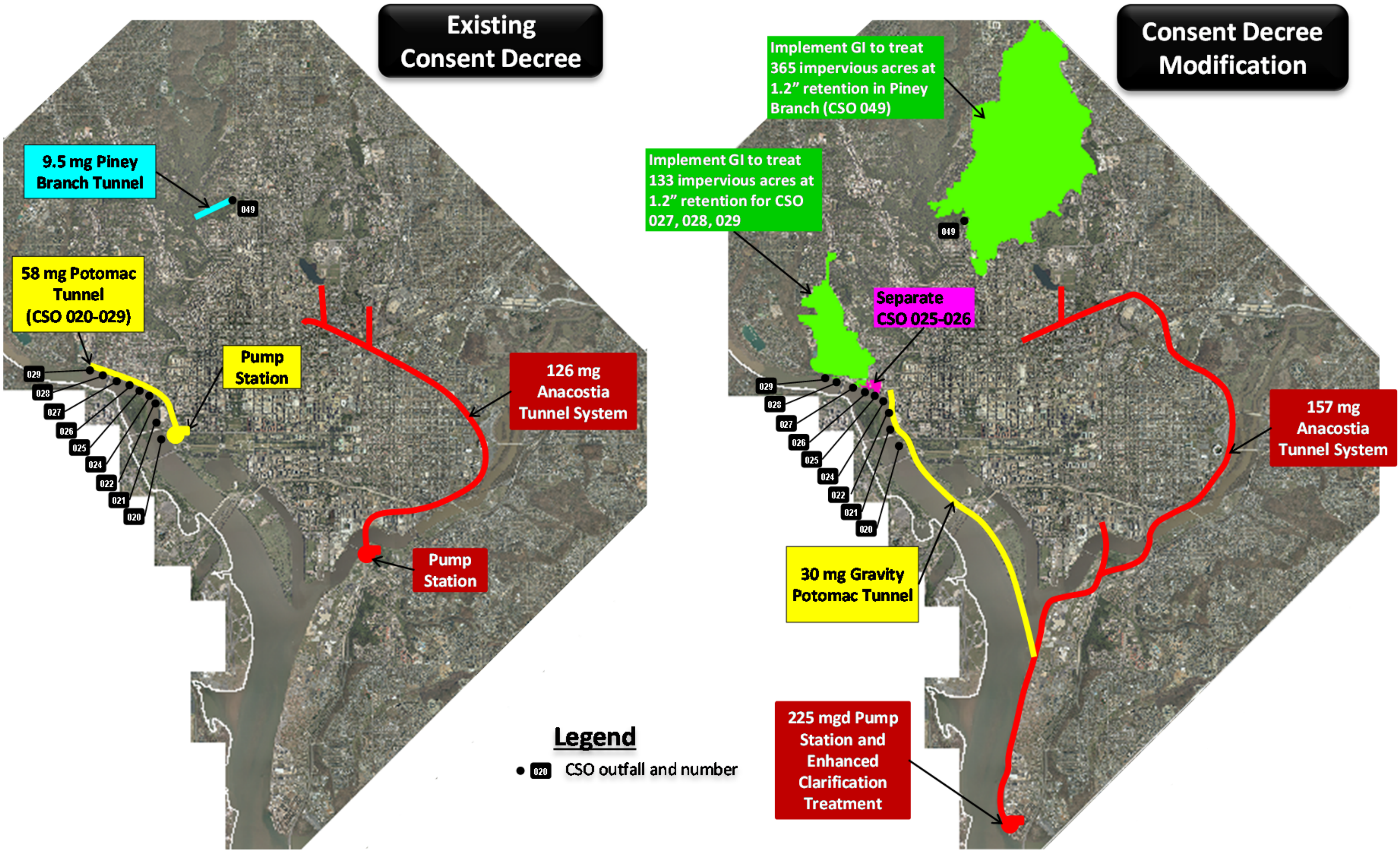


**Figure 3-1: Green and Green/Gray Controls**

# APPENDIX F

**APPENDIX F**
**GREEN INFRASTRUCTURE PROGRAM FOR THE POTOMAC AND ROCK CREEK SEWERSHEDS**

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## I. Green Infrastructure Program Plan

Within 12 months after the Effective Date of the First Amendment to the Consent Decree, DC Water shall submit to EPA for approval pursuant to Section X (EPA Approval of Plans and Submissions) of this Consent Decree a Green Infrastructure Program Plan (the "GI Program Plan"). The GI Program Plan shall include the information described in subsections A, B, and C below:

A. **Green Infrastructure Control Measures**.

1. Identification and description of the GI control measures (including any targeted sewer separation projects) that DC Water intends to install (or have the District or other entities install on its behalf), the approximate locations of the sites for the measures, and the estimated cost to implement the measures.

2. The conceptual project location identifications and descriptions, and cost estimates for the measures that DC Water intends to install (or have the District or other entities install on its behalf), which shall correspond to the individual GI Projects set forth in the schedule in Section II of this Appendix F.

3. An estimate of the number of acres of land projected to be effectively retrofitted with GI in the Potomac and Rock Creek sewersheds prior to 2030 pursuant to the District's MS4 permit and storm water regulations.

B. **Preservation and Maintenance of Constructed Green Infrastructure Projects**. A plan to (1) preserve and maintain the GI control measures installed pursuant to the GI Program Plan and (2) ensure that future site or land use changes do not result in the loss of the runoff reduction benefits of the GI control measures installed pursuant to the GI Program Plan, unless that loss is compensated for by other controls in the same CSO drainage area.

C. **Public Outreach**. A plan to engage property owners in the Potomac and Rock Creek sewersheds and interested stakeholders to promote and facilitate installation of GI on private property and to ensure public input into the site selection process and concept design for the control measures that DC Water proposes to install as part of the GI Program Plan.

## II. DC Water Implementation Schedule

DC Water shall construct and Place in Operation the GI control measures assigned to it and set forth in the GI Program Plan developed pursuant to Section I of this Appendix F in accordance with the following schedule.

**A.** Six months prior to the award contract for construction for each of the projects listed in this section, DC Water shall submit a Project Description to EPA for review and comment. The Project Description shall contain:

1. An identification of the CSO areas where the projects are to be implemented

2. The types of GI control that are to be employed and the rational for their use

3. The approximate location of the controls

4. The estimated acreage that will be controlled to a 1.2” retention standard

5. A schedule for implementation of the controls

6. The estimated cost for each type of control to be employed

7. The total cost for the Project

8. Post Construction Monitoring and Modeling Program for this project to demonstrate the capture efficiency of the controls to be implemented

**B.** Six months following the completion of a project’s post construction monitoring program, DC Water shall submit a Post Construction report for EPA review and comment. The Post Construction Report shall contain:

1. A comparison of planned projects under the Project Description and actual implemented projects:

   (a) Costs

   (b) Acreage treated to 1.2” retention standard

   (c) Estimate of run-off control.

2. Identification of barriers to implementation of projects and steps taken by DC Water and the District to address any identified barriers for this and future projects

3. Post Construction Monitoring and Modeling Program results assessing the efficiency of the controls implemented

4. Changes proposed for future projects

**C. Potomac Sewershed Projects: In accordance with the following schedule, construct GI, including targeted sewer separation, in the CSO 027, 028 and 029 sewersheds designed to:**

1. Project No. 1: Control 44 acres to the 1.2” Retention Standard

    (a) Award Contract for Construction: June 23, 2017

    (b) Place in Operation: June 23, 2019

2. Project No. 2: Control 46 acres to the 1.2” Retention Standard

    (a) Award Contract for Construction: June 23, 2022

    (b) Place in Operation: June 23, 2024

3. Project No. 3: Control 43 acres to the 1.2” Retention Standard

    (a) Award Contract for Construction: June 23, 2025

    (b) Place in Operation: June 23, 2027

4. Controlled acres placed in operation in excess of those specified for a given project in this paragraph II.C may be credited against the acres required to be controlled on subsequent projects.

5. No later than 15 months following the Place in Operation date for Project No. 1 above, DC Water shall submit to EPA and the District Post Construction Monitoring Report No. 1 for the Potomac Sewershed Projects (Potomac Report No. 1). In addition to the information required in Subsection II.B above, the report shall contain DC Water’s determination of the practicability of controlling at least 133 acres to the 1.2” Retention Standard in the CSO 027, 028 and 029 sewersheds by the Place in Operation deadline for Project No. 3 above based on its experience with implementing Project No. 1. Such determination shall consider the constructability, operability, efficacy, public acceptability and cost per impervious acre treated of the controls.

6. EPA shall either approve or disapprove of the determination required by Paragraph 5 above. If EPA fails to either approve or disapprove the determination within 180-days following receipt of Potomac Report No. 1, any subsequent deadline that is dependent upon such approval or disapproval shall be extended by the number of calendar days beyond the 180-day period that EPA uses to approve or disapprove the determination.

The process for approving or disapproving the determination shall be governed by Paragraph 39 of the Consent Decree.

7. In the event DC Water determines that it is not practicable to control at least 133 acres to the 1.2” Retention Standard in the CSO 027, 028 and 029 sewersheds by the Place in Operation deadline for Project No. 3 above and such determination is approved by EPA, DC Water shall:

(a) Plan, design, and construct the Potomac River Storage/Conveyance Tunnel with a total storage volume of not less than 40 million gallons, at any time up to, but no later than the following schedule

(i) Award Contract for Detailed Design: Three (3) months after EPA approval

(ii) Award Contract for Construction: Two (2) years and six (6) months after EPA approval

(iii) Place in Operation: Nine (9) years after EPA approval

(b) Be relieved of its obligation to implement Project Nos. 2 and 3 above; and

(c) Operate and maintain the GI constructed in Project No. 1 in accordance with its NPDES Permit.

**D. Rock Creek Sewershed Projects: In accordance with the following schedule, construct GI, including targeted sewer separation, in the CSO 049 (Piney Branch) sewershed designed to:**

1. Project No. 1: Control 20 acres to the 1.2” Retention Standard

(a) Award Contract for Construction: March 30, 2017

(b) Place in Operation: March 30, 2019

2. Project No. 2: Control 75 acres to the 1.2” Retention Standard

(a) Award Contract for Construction: January 23, 2022

(b) Place in Operation: January 23, 2024

3. Project No. 3: Control 90 acres to the 1.2” Retention Standard

(a) Award Contract for Construction: March 23, 2025

(b) Place in Operation: March 23, 2027

4. Project No. 4: Control 90 acres to the 1.2” Retention Standard

   (a) Award Contract for Construction: September 30, 2027

   (b) Place in Operation: September 30, 2029

5. Project No. 5: Control 90 acres to the 1.2” Retention Standard

   (a) Award Contract for Construction: March 23, 2028

   (b) Place in Operation: March 23, 2030

6. Controlled acres placed in operation in excess of those specified for a given project in this paragraph II.D. may be credited against the acres required to be controlled on subsequent projects.

7. No later than 15 months following the Place in Operation date for Project No. 1 above, DC Water shall submit to EPA and the District Post Construction Monitoring Report No. 1 for the Rock Creek Sewershed Projects (Rock Creek Report No. 1). In addition to the information required in Subsection II.B above, the report shall contain DC Water’s determination of the practicability of controlling at least 365 acres to the 1.2” Retention Standard in the CSO 049 sewershed by the Place in Operation deadline for Project No. 5 above based on its experience with implementing Project No. 1. Such determination shall consider the constructability, operability, efficacy, public acceptability and cost per impervious acre treated of the controls.

8. EPA shall either approve or disapprove of the determination required by Paragraph 7 above. If EPA fails to either approve or disapprove the determination within 180-days following receipt of Rock Creek Report No. 1, any subsequent deadline that is dependent upon such approval or disapproval shall be extended by the number of calendar days beyond the 180-day period that EPA uses to approve or disapprove the determination. The process for approving or disapproving the determination shall be governed by Paragraph 39 of the Consent Decree.

9. In the event DC Water determines that it is not practicable to control at least 365 acres to the 1.2” Retention Standard in the CSO 049 sewershed by the Place in Operation deadline for Project No. 5 above and such determination is approved by EPA, DC Water shall:

   (a) Construct a Rock Creek Storage Facility the (Facility), which shall store combined sewer flow from the Piney Branch Outfall, CSO 049, in accordance with DC Water’s NPES Permit. The storage capacity of the Facility will be at least nine and one-half (9.5) million gallons. After the Facility is Placed in Operation, in the event of wet weather causing the facility to be used for storage, DC Water shall dewater the Facility to the CSS as soon as practicable, but in no event longer than 59 hours, and shall convey the contents of the Facility to Blue Plains for treatment in accordance with DC Water's NPDES permit. The location of the Facility will be finalized during Facility Planning and design, but it will be between CSO 049 and Rock Creek and its approximate location is depicted in Page ES-9 of Appendix A to this Decree;

(b) Plan, design, construct and Place in Operation the Facility at any time up to, but no later than the following schedule:

(i) Award Contract for Detailed Design: Three (3) years six (6) months after EPA approval

(ii) Award Contract for Construction: Five (5) years six (6) months after EPA approval

(iii) Place in Operation: Nine (9) years after EPA Approval

(c) Be relieved of its obligation to implement Project Nos. 2, 3, 4 and 5 above; and

(d) Operate and maintain the GI constructed in Project No. 1 in accordance with its NPDES Permit.

**E.** **Credit for Other Controlled Acres**. Controlled acres from the implementation of the District's MS4 Permit and Stormwater Regulations will be credited against DC Water's obligations to control acres in paragraphs II.C. and II.D. if:

1. They are located in the CSO areas targeted for GI implementation by DC Water; and

2. The design of the control measures and their level of control has been verified by DC Water to achieve the 1.2" retention standard or any portion thereof. Where green infrastructure installations by any party do not meet the full 1.2" design criterion and are counted towards meeting the requirements of this consent decree, DC Water may proportionally credit the control achieved; and

3. DC Water, the District or a private party has assumed operation and maintenance responsibilities in a legally binding document or as part of its statutory or regulatory authority.

**F.** **DC Water Commitments to Coordinate with the District.** The commitments of DC Water in coordinating with the District are:

1. DC Water shall consult with the District's Program Coordinator and relevant District agencies in selecting planned GI projects proposed for District property or rights of way to ensure coordination with District infrastructure policies and priorities;

2. DC Water shall submit draft GI construction staging packages identifying facilities to be constructed, including preliminary engineering plans and specifications, staging areas, estimated construction durations, work hours and traffic management plans for review by the District and shall do so sufficiently in advance of construction of the various GI contract divisions in order to allow adequate time for the District to review the packages, for the District and DC Water to resolve any issues, and for the District to issue the permits before the expected start date of construction;

3. DC Water shall prepare 30%, 60%, 90% and 100% documents each for RFP and design for District review and comment prepared in accordance with terms agreed to by the District and DC Water;

4. DC Water shall submit a maintenance and monitoring plan, including the funding methodology, for each GI Project to the District agencies having jurisdiction.

5. DC Water shall submit applications for public space, construction, and any other necessary permits for each project or facility;

6. DC Water shall submit the documents required by this section sufficiently in advance of construction in order to allow adequate time for the District to review the document, for the District and DC Water to resolve any issues, and for the District to issue the permits or other legal authority before the expected start date of construction of the project.

7. DC Water shall work with the District to coordinate and align capital projects and expenditures, where feasible and practical, to allow implementation of the GI projects in a manner that enables the efficient use of resources and minimizes costs to the taxpayers and rate-payers.

8. DC Water shall assure that GI credited towards meeting DC Water's obligations to control acres in paragraphs II.C. and II.D is inspected no less than once every three years and that any deficiencies are corrected.

## III. District of Columbia Government Commitments

**A.** The commitments of the District in support of the GI Projects are:

1. The District agrees to provide the public space necessary for DC Water to construct GI to control 365 acres to the 1.2" Retention Standard in the CSO 049 sewershed and 133 acres to the 1.2" Retention Standard in the

CSO 027, 028 and 029 sewersheds, less any acres controlled from implementation of the District's MS4 Permit and Stormwater Regulation. The District and DC Water will establish procedures for identifying GI locations, technologies, and issuance of permits for construction, operation and maintenance and other matters in a Memorandum of Understanding. The Memorandum of Understanding will be executed within 24 months of the Effective Date of the First Amendment to Consent Decree.

2. The District will appoint an executive-level District official as the District's Program Coordinator within 6 months of Effective Date of the First Amendment to the Consent Decree. The Coordinator will be charged with coordinating and expediting the work of the relevant District offices, departments and agencies;

3. After submission by DC Water of each construction staging package, the District shall review the proposed construction staging areas, construction durations, maintenance of traffic, parking mitigation, work hours and facilities to be constructed, and work with DC Water to resolve any concerns and issue approval letters identifying the conditions that must be met in order to obtain permits for construction;

4. The District shall issue permits for construction within thirty (30) business days of submittal of a complete application package prepared in accordance with an approval letter;

5. After submission and review of the maintenance and monitoring plan for a GI Project submitted by DC Water, the District shall issue permits or other legal authority to DC Water in advance of the completion of construction of the GI Projects allowing access for the maintenance and monitoring of the project; unless, as part of the maintenance and monitoring plan submitted by DC Water and approved by the District, the District or private party will be responsible for the maintenance and monitoring of the project.

6. The District shall revise its storm water policies regarding in-lieu fees to include the following:

   (a) In-lieu fees paid by regulated projects in the CSO 027, 028, 029 and 049 sewersheds will be used to fund construction of GI in those sewersheds; and

   (b) In-lieu fees paid by regulated projects in combined sewersheds will not be used to fund projects in combined sewersheds controlled by the Gray CSO Controls required by this Consent Decree.

7. The District shall submit a report to EPA for review and comment no later than March 1, 2016 identifying impediments to implementation of the GI Projects and identifying proposed changes to the regulations, codes, standards, guidelines and policies by reviewing the following items at a minimum:

   (a) Storm water regulations and policies; including a review of the practicability of incentivizing storm water retention credits (SRCs) to maximize water quality benefits;

   (b) District Department of Transportation ("DDOT") Design and Engineering Manual;

   (c) Zoning regulations;

   (d) Plumbing and Building Codes;

   (e) DDOT Urban Forestry Guidelines;

   (f) DDOT Green Infrastructure Standards; and

   (g) DC Water Utility Protection Guidelines.

8. The District shall take the following actions with respect to the proposed amendments to the regulations, codes, standards and guidelines included in the reports described in paragraphs above:

   (a) For statutory amendments, the District shall submit to the Council by no later than March 1, 2017, proposed legislation to enact the statutory amendments;

   (b) For regulatory amendments that require Council approval, the District shall publish a notice of proposed rulemaking by March 1, 2017, and shall submit to the Council by no later than January 1, 2018, a proposed resolution to approve the final rules;

   (c) For regulatory amendments that require Zoning Commission approval, the District shall submit proposed zoning language to the Zoning Commission for its approval by no later than March 1, 2017;

   (d) For regulatory amendments that do not require Council or Zoning Commission approval, the District shall issue a notice of proposed rulemaking by March 1, 2017;

   (e) For statutory amendments and for regulatory amendments that require Council approval, the District shall take such actions as are necessary to obtain the Council's approval of the proposed legislation by March 1, 2018;

(f) For regulatory amendments that require Zoning Commission approval, the District shall take such actions as are necessary to obtain the Zoning Commission's adoption of the regulatory amendments by March 1, 2018; and

(g) For regulatory amendments that do not require Council or Zoning Commission approval, the District shall issue a notice of final rulemaking no later than March 1, 2018.

**B. Anti-Deficiency Act Events:** Nothing in this Decree shall be construed to require an expenditure, obligation or contract in violation of the Anti-Deficiency Act, 31 U.S.C. §§ 1341 et seq. Where an expenditure, obligation or contract is subject to the Anti-Deficiency Act, the District's obligations shall be subject to the availability of appropriated funds.

## IV. Additional Coordination between DC Water and District

DC Water and the District will work together to coordinate and align capital projects and expenditures, where feasible and practical, to allow implementation of the GI Projects in a manner that enables the efficient use of resources and minimizes costs to the taxpayers and rate-payers. As part of this process, the District and DC Water will identify capital projects in the sewersheds for CSO 027, 028, 029 and 049 that are projected to be completed during the subsequent three (3) years and that provide an opportunity to include more than $200,000 of green infrastructure in excess of that required by District law. DC Water may request the District to incorporate in one or more of these projects GI in excess of that required by District law. The District agrees to grant such requests if DC Water agrees to fund the incremental design, construction, monitoring and maintenance costs of GI implemented by the District in excess of GI required by District law, the amount of such funding is agreed to by the District and DC Water, and the proposed GI is consistent with the District's current and potential future program for the project. Such excess GI will be credited to the acres required to be controlled in Subsections II.C and II.D of this Appendix F.

## V. Reporting

A. Following EPA's approval of the GI Program Plan, DC Water shall report on the status of implementation of the GI Program Plan in each Quarterly Report required by Section XI (Reporting) of this Decree. The reports shall describe the status (i.e., in design, in procurement, under construction, or completed) of the control measure projects identified in the Plan. As part of the First Quarterly Report of each calendar year, DC Water shall include the following information for the prior calendar year:

1. Total acres of impervious area treated by GI installed and by sewer separation since the Effective Date of the First Amendment to the Consent Decree in the sewersheds for CSO 027, 028, 029 in the Potomac and CSO 049 (Piney Branch);

2. Acres of impervious area treated by GI pursuant to the District's MS4 permit and Stormwater Regulations installed since the Effective Date of the First Amendment to the Consent Decree in the sewersheds for CSO 027, 028, 029 in the Potomac and CSO 049 (Piney Branch); and the numbers of such acres credited in accordance with Section II.C of this Appendix F;

3. The activities the District and DC Water have taken to coordinate and align capital projects to minimize costs associated with implementation of the GI Projects by DC Water.

# Appendix B

# Potomac River GI Project No. 1: Post Construction Report

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DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

DC CLEAN RIVERS PROJECT
GREEN INFRASTRUCTURE PROGRAM

# POTOMAC RIVER GI PROJECT NO. 1 POST CONSTRUCTION REPORT

July 2020

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# Table of Contents

## List of Tables



## List of Figures



## Appendices

# 1 Introduction

## 1.1 Purpose

The District of Columbia Water and Sewer Authority (DC Water) is implementing a Long Term Control Plan (LTCP), also referred to as the DC Clean Rivers Project (DCCR), to control combined sewer overflows (CSOs) to the District of Columbia's (District) waterways. DCCR is comprised of a variety of projects to control CSOs, including pumping station rehabilitations, green infrastructure (GI), and a system of underground storage/conveyance tunnels. DCCR is being implemented in accordance with a first amendment to the Consent Decree (Amended Consent Decree), entered on January 14, 2016, which amends and supersedes the 2005 Consent Decree (Consent Decree) and incorporates GI, in a combination of gray and green solutions to control CSOs while improving the quality of life in the District.

The purpose of this document is to demonstrate compliance with the Amended Consent Decree requirement as stated in the Amended Consent Decree's Appendix F, Section II.B which states, "Six months following the completion of the project's post construction monitoring program, DC Water shall submit a Post Construction Report for EPA review and comment."

This Post Construction Report for the first project in the Potomac River sewershed, Potomac River GI Project No. 1, includes the following, as required by Appendix F of the Amended Consent Decree:

1. A comparison of planned projects under the Project Description and actual implemented projects:
    a. Costs
    b. Acreage treated to 1.2" retention standard
    c. Estimate of run-off control.
2. Identification of barriers to implementation of projects and steps taken by DC Water and the District to address any identified barriers for this and future projects
3. Post Construction Monitoring and Modeling Program results assessing the efficiency of the controls implemented
4. Changes proposed for future projects

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# 2 Post Construction Report for Potomac River Project No. 1

The Amended Consent Decree's Appendix F, Section II.B, states: "Six months following the completion of the project's post construction monitoring program, DC Water shall submit a Post Construction Report for EPA review and comment. The Post Construction Report shall contain:

1. A comparison of planned projects under the Project Description and actual implemented projects:
    a. Costs
    b. Acreage treated to 1.2" retention standard
    c. Estimate of run-off control.
2. Identification of barriers to implementation of projects and steps taken by DC Water and the District to address any identified barriers for this and future projects
3. Post construction Monitoring and Modeling Program results assessing the efficiency of the controls implemented
4. Changes proposed for future projects"

This Section addresses this requirement of the Amended Consent Decree.

## 2.1 Comparison of Costs – Planned vs. Actual

Table 2-1 compares the total project cost for Potomac River Project No. 1 as estimated in the Project Description (2016) to the actual project cost after construction.

**Table 2-1. Cost Comparison Planned vs. Implemented**

| Potomac River Project No. 1 | Cost |
|---|---|
| Planned Project Cost (in 2015 Capital Costs) | \$15 - \$25 Million |
| Implemented Project Costs (Actual) | \$5.22 Million[1] |
| | \$42 Thousand[2] |
| | \$80 Thousand[3] |
| **Total Implemented Project Costs** | **\$5.34 Million** |

[1]Potomac River Project A (PR-A)
[2]Sewer Separation
[3]Downspout Disconnect

Actual project costs were substantially lower than planned because DC Water was able to take advantage of previous sewer separation that had occurred because of redevelopment on Georgetown University and Hillendale. The extent of this separation was unknown during original planning and not accounted for in original project planning and development. These are one-time occurrences and are not likely to occur in other portions of the combined sewer area.

## 2.2 Comparison of Acreage Treated to 1.2" Retention Standard and Estimate of Run-off Control

The first Potomac River GI project under the Amended Consent Decree was required to manage 1.2" of stormwater runoff from at least 44 impervious acres. Under Potomac River Project No. 1, 75.6 acres were managed. Projects that make up Potomac River Project No. 1 include PR-A with Targeted Sewer Separation, Green Alley Partnership (AlleyPalooza), and Downspout Disconnect. Table 2-2 shows the breakdown of acres per project.

**Table 2-2. Practices Constructed and Impervious Acres Managed by Project**

| Sewershed | Project | Bioretention | Permeable Pavement | Targeted Sewer Separation | Downspout Disconnect | Total |
|---|---|---|---|---|---|---|
| **Number of Projects** | | | | | | |
| Potomac River Project 1 | PR-A | 5 | 38 | | | 43 |
| | AlleyPalooza | | 1 | | | 1 |
| | Downspout Disconnect | | | | 58[1] | 58 |
| | **Grand Total** | **5** | **39** | **0** | **58** | **102** |
| **Impervious Acres Managed** | | | | | | |
| Potomac River Project 1 | PR-A | 0.3 | 7.5 | 67.5 | | 75.3 |
| | AlleyPalooza | | 0.1 | | | 0.1 |
| | Downspout Disconnect | | | | 0.2 | 0.2 |
| | **Grand Total** | **0.3** | **7.6** | **67.5** | **0.2** | **75.6** |

[1] Represents the number of individual downspouts disconnected

## 2.3 Barriers to Implementation

Opposition to construct Project No. 1 in the Georgetown Historic District from the Commission on Fine Arts, the National Capital Planning Commission, the Old Georgetown Board, the Citizens Association of Georgetown, Advisory Neighborhood Commissions, and other parties prevented DC Water from installing GI in CSO 027/028 area. DC Water was able to construct Potomac Project No. 1 in the CSO 029 area only.

## 2.4 Pre-Construction Monitoring - Sewershed

A complete set of event hydrographs, monthly plots and rainfall events tabulations is included in the modeling report prepared for PR-A, provided as Appendix A. The calibration and monitoring results are explained as follows.

Figure 2-1 through Figure 2-6 are 1-to-1 volume and peak flow plots and select individual event hydrographs for the combined 029-1 + 029-2 meter locations and 029-5 + 029-6 meter locations, comparing metered flows versus modeled predictions.

Modeled predictions match event volumes well for both 029-1 + 029-2 and 029-5 + 029-6 locations. Peak flow response is more variable, with the model generally predicting somewhat higher peak flows, but with significant variability from event to event.

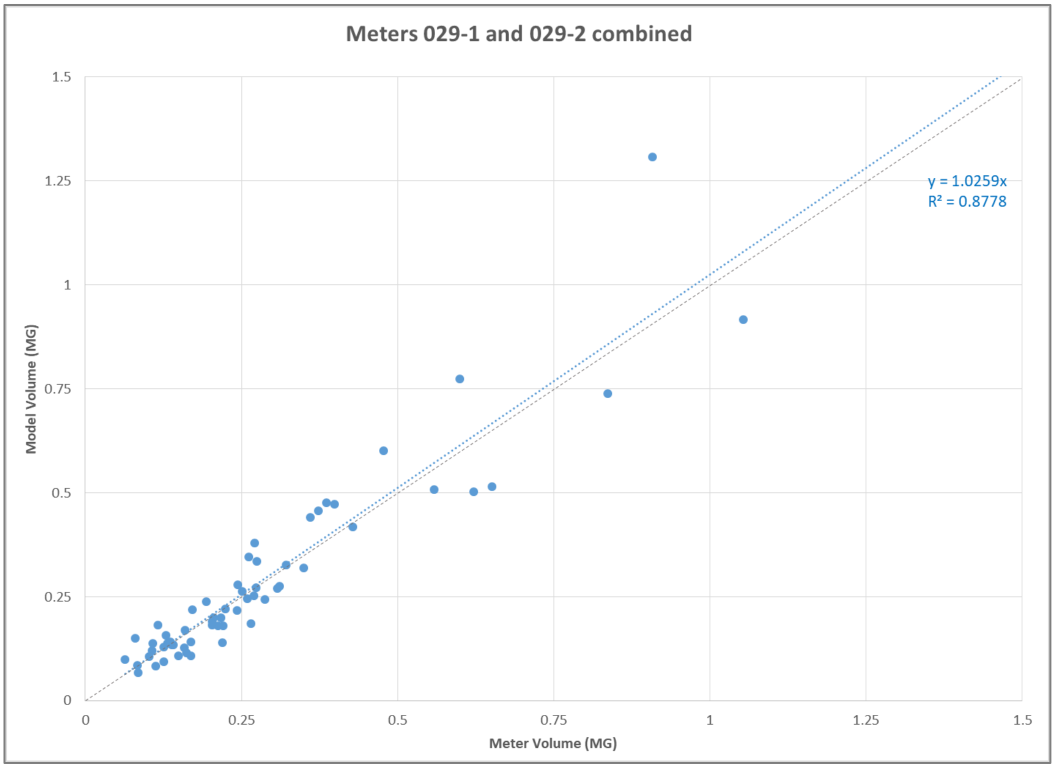


**Figure 2-1. PR-A Pre-Construction Event Volumes, 029-1 + 029-2**

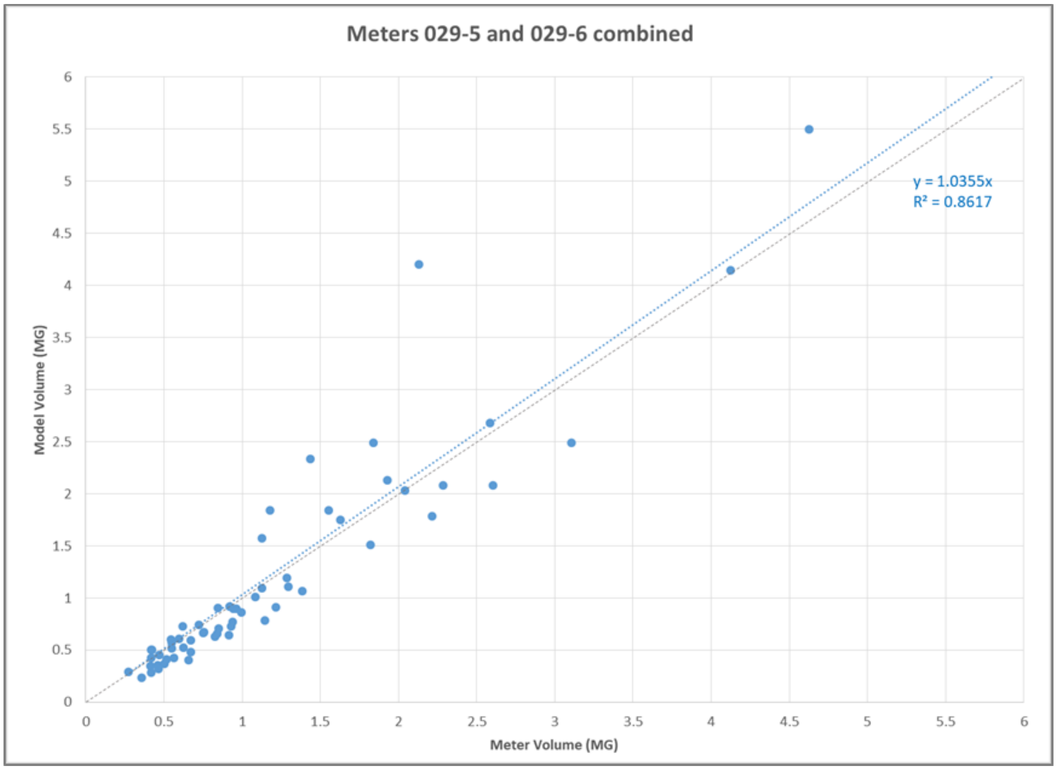


Figure 2-2. PR-A Pre-Construction Event Volumes, 029-5 + 029-6

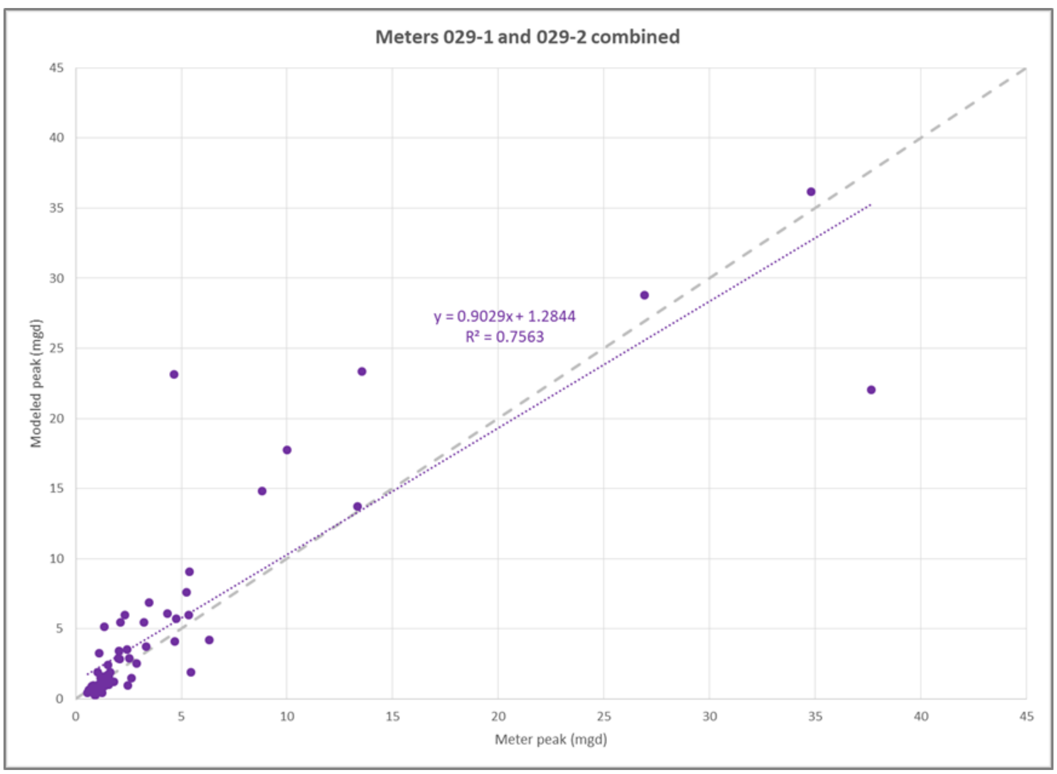


Figure 2-3. PR-A Pre-Construction Event Peak Flows, 029-1 + 029-2

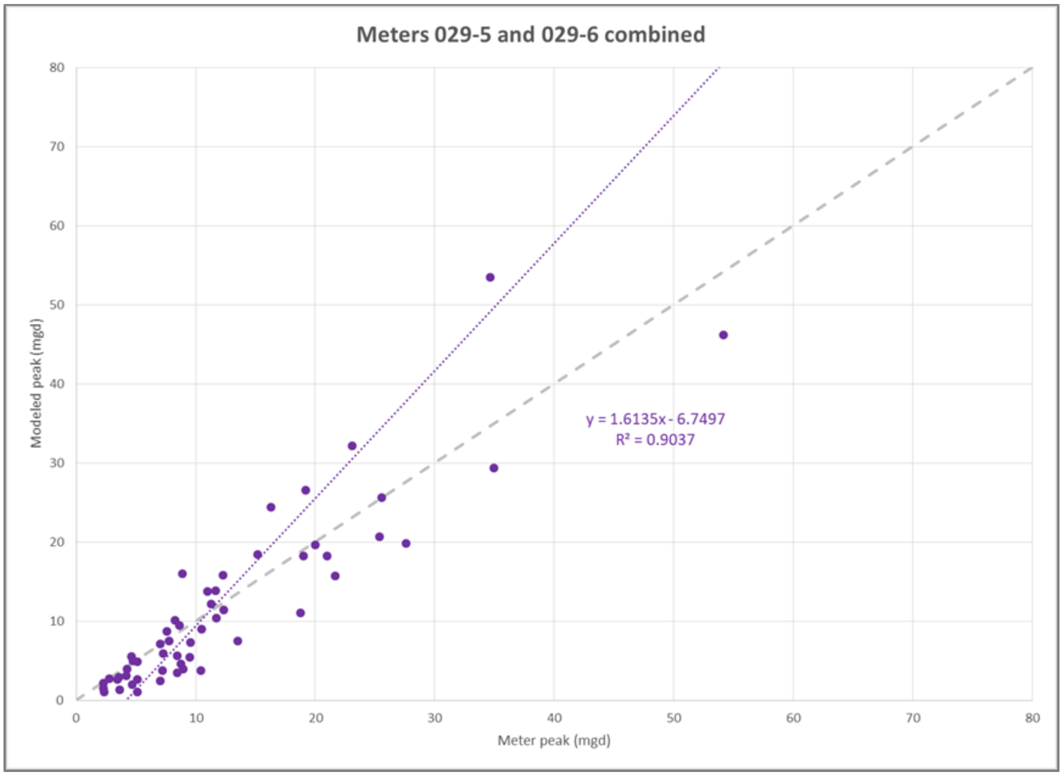


Figure 2-4. PR-A Pre-Construction Event Peak Flows, 029-5 + 029-6

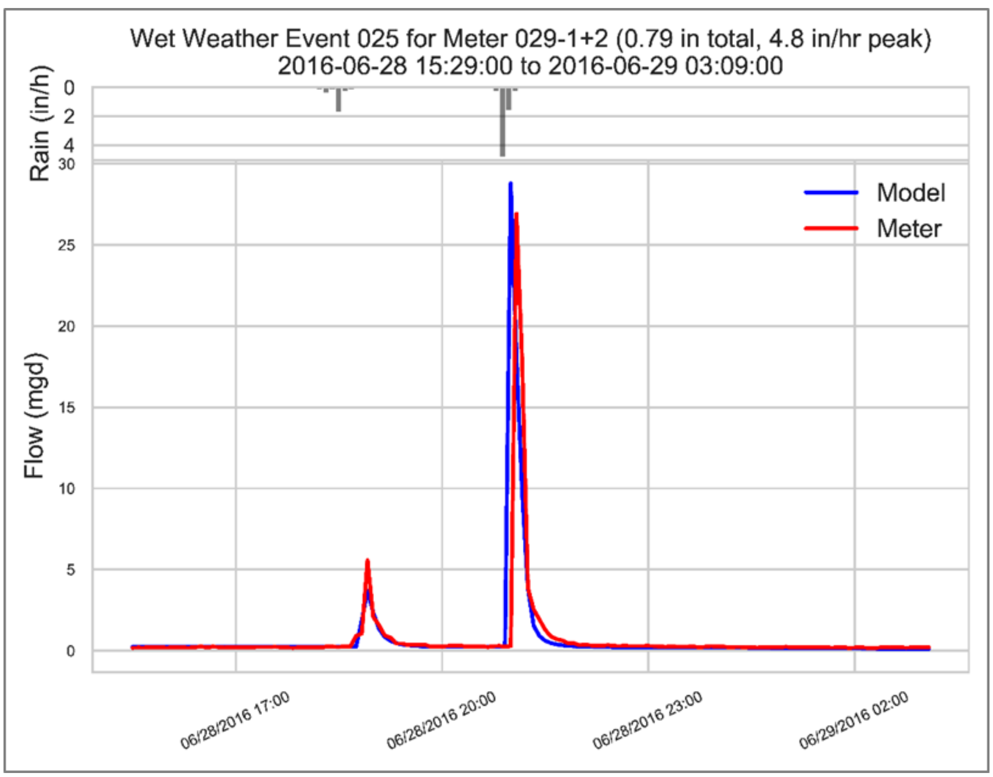


Figure 2-5. PR-A Pre-Construction Event Hydrograph, 029-1 + 029-2

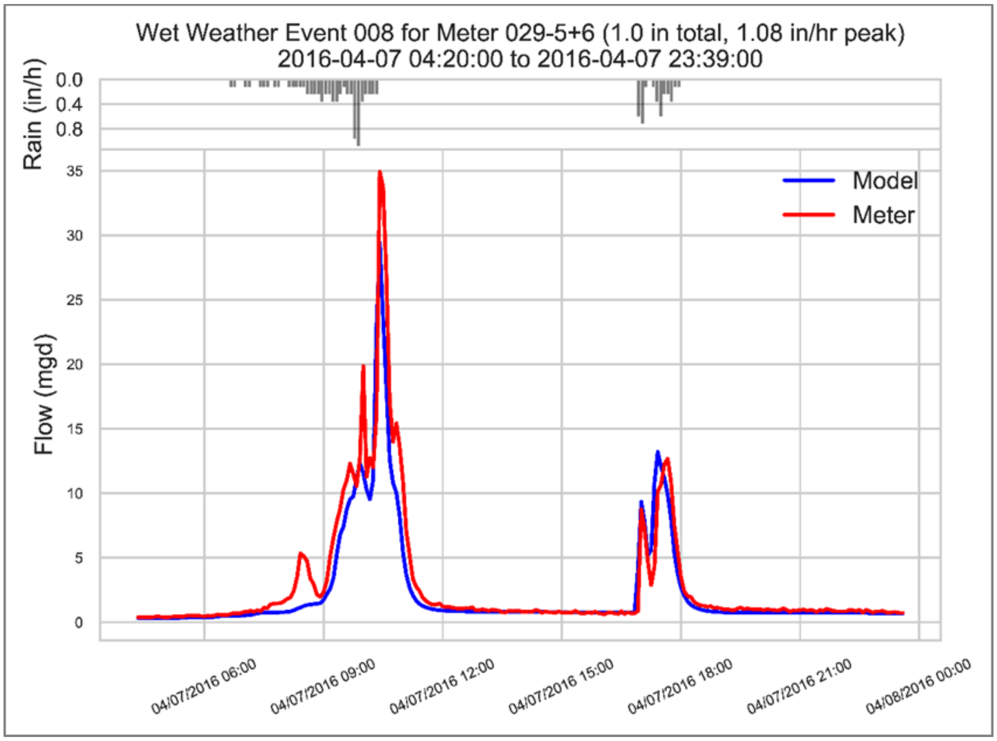


**Figure 2-6. PR-A Pre-Construction Event Hydrograph, 029-5 + 029-6**

## 2.5 Post-Construction Monitoring – Sewershed

A complete set of event hydrographs, monthly plots and rainfall events tabulations is included in the modeling report prepared for PR-A, provided as Appendix A. The calibration and monitoring results are explained as follows.

For post-construction monitoring using sewershed flow monitoring data, Figure 2-7 though Figure 2-10 show 1-to-1 volume and peak flow plots and Figure 2-11 and Figure 2-12 show select individual event hydrographs for the combined 029-1 + 029-2 meter locations and 029-5 + 029-6 meter locations, comparing metered flows versus modeled predictions.

For 029-1 + 029-2, over the entire calibration period, the model under-predicts volumes by 4%. For 029-5 + 029-6, there is an overall over-prediction of volumes by 17%. In consideration that (a) the pre-construction model matches event volumes well for those downstream meters, and (b) the volume match is very good for the post-construction model at the upstream 029-1 + 029-2 meters where about half of the GI is concentrated, it was decided not to undertake additional model calibration.

As with the pre-construction model, peak flow response was more variable; the predicted peak flows were generally lower than metered flow peaks at 029-1 +029-2, and higher than metered flow peaks at 029-5 + 029-6.

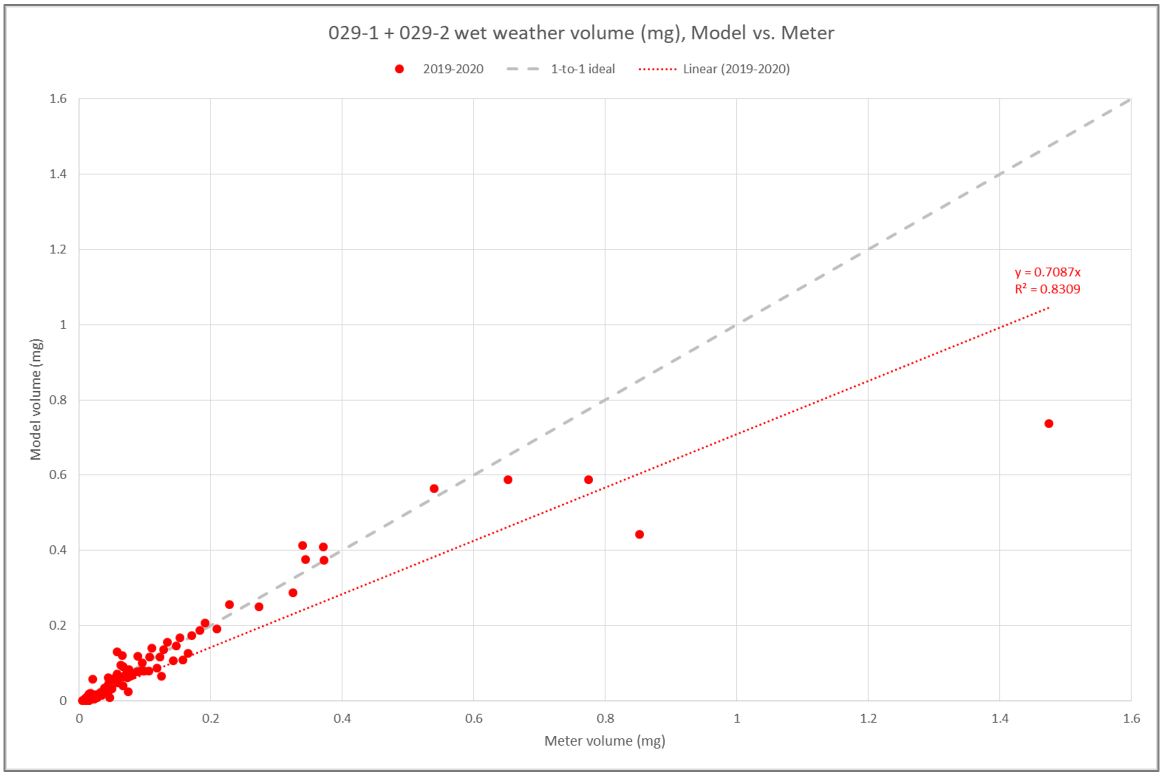


**Figure 2-7. PR-A Post-Construction Event Volumes, 029-1 + 029-2**

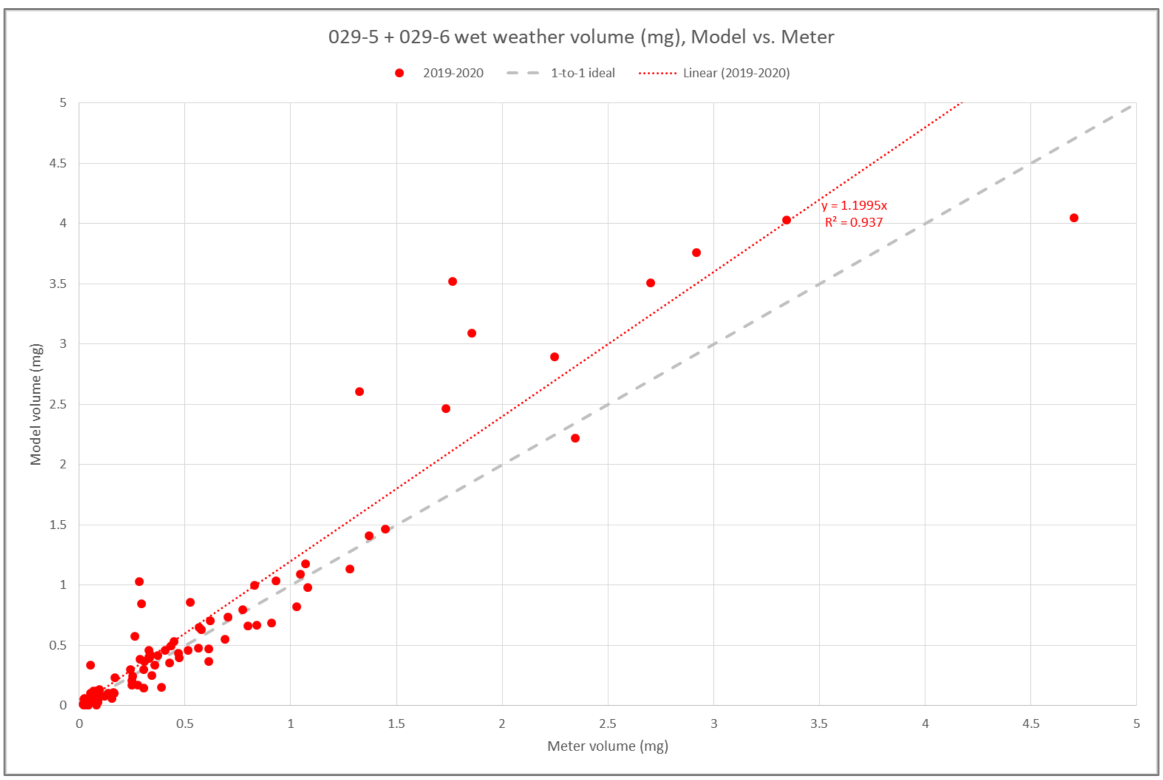


**Figure 2-8. PR-A Post-Construction Event Volumes, 029-5 + 029-6**

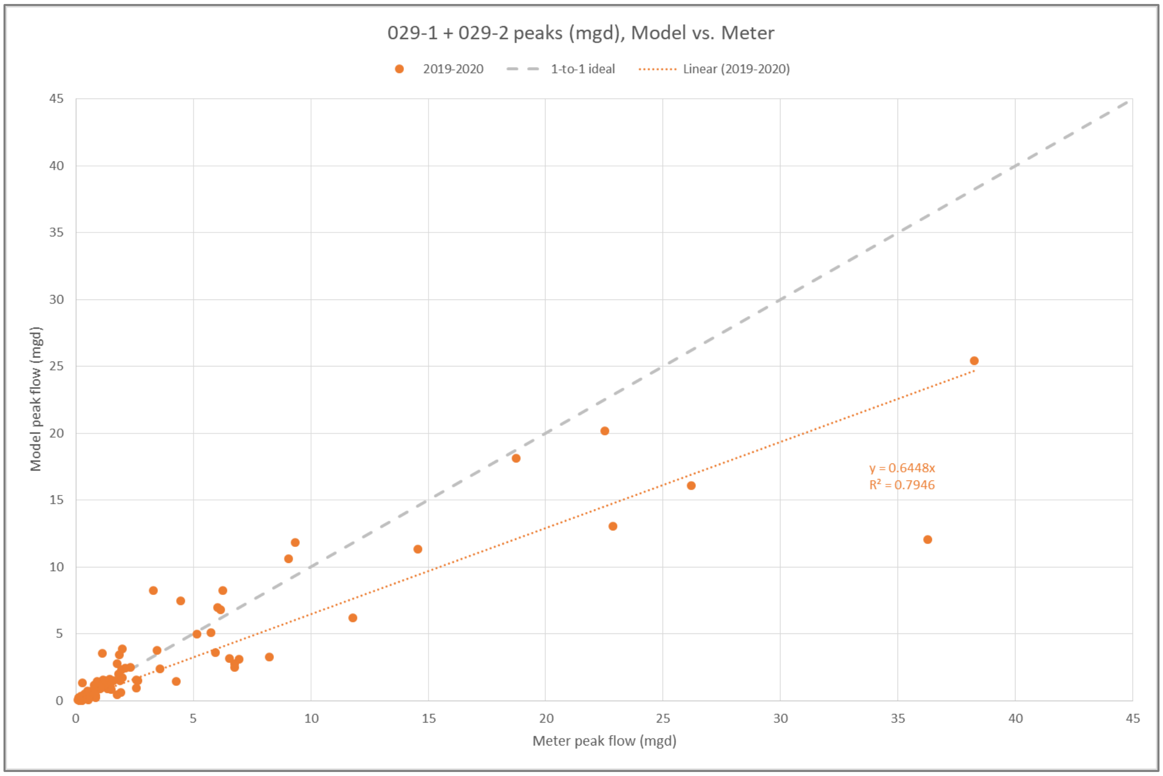


**Figure 2-9. PR-A Post-Construction Event Peak Flows, 092-1 + 029-2**

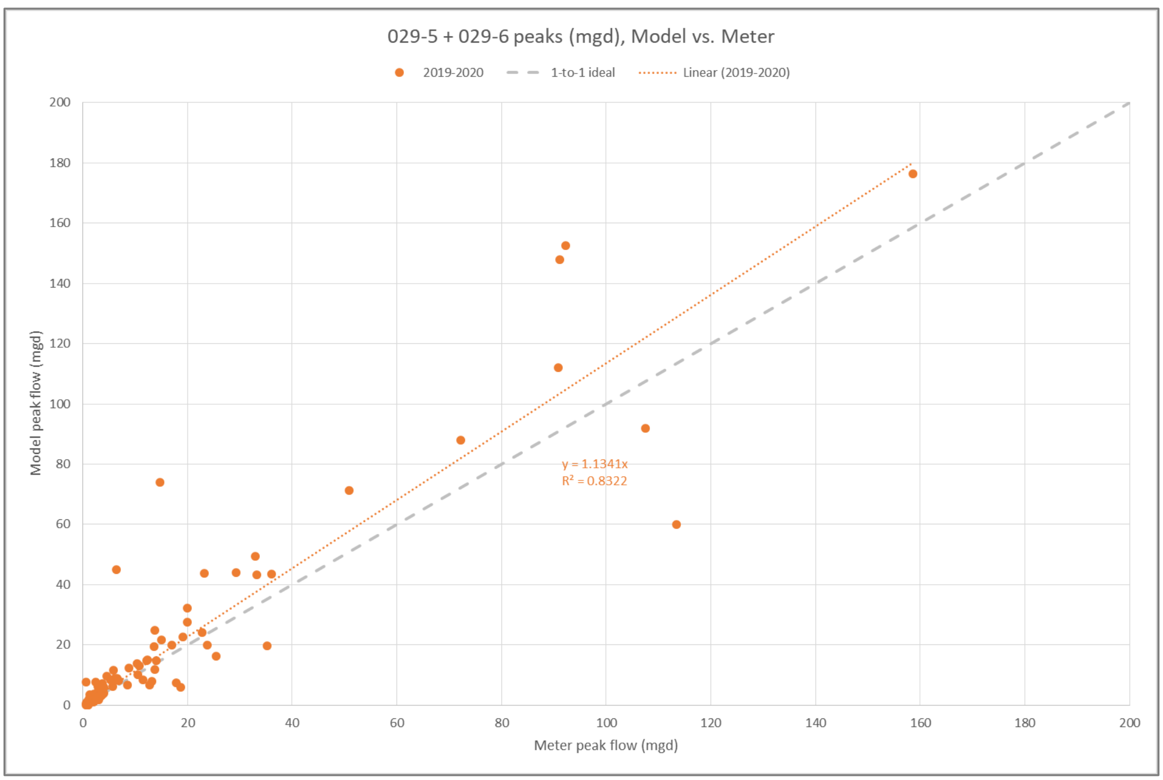


**Figure 2-10. PR-A Post-Construction Event Peak Flows, 029-5 + 029-6**

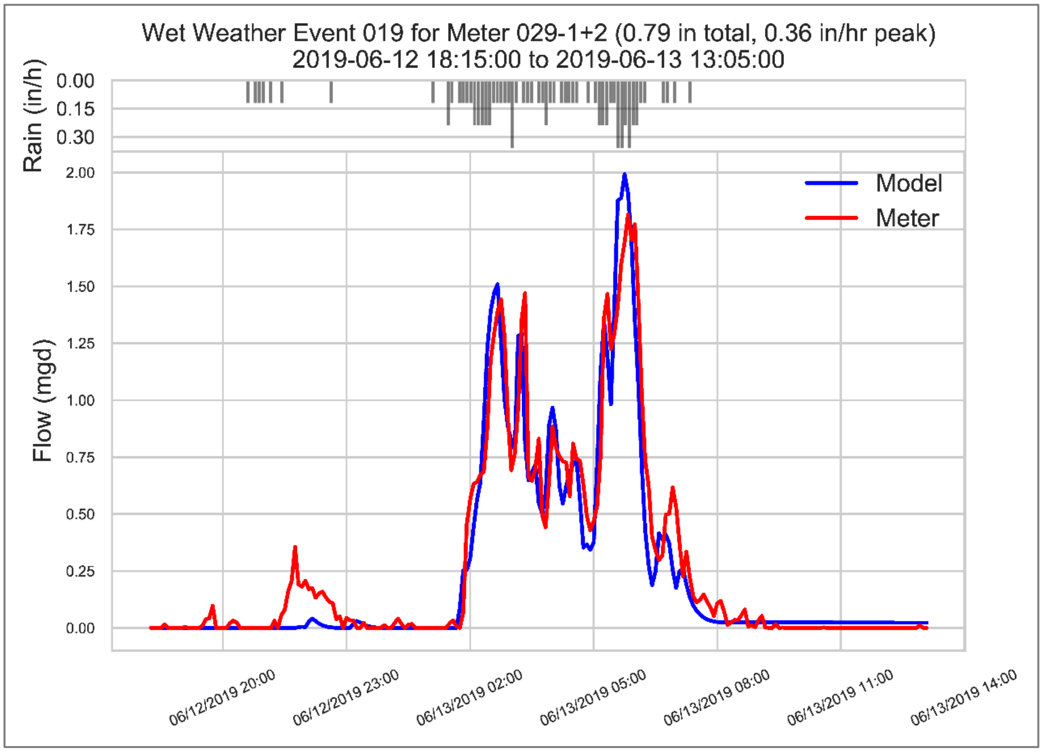


**Figure 2-11. PR-A Post-Construction Event Hydrograph, 029-1 + 029-2**

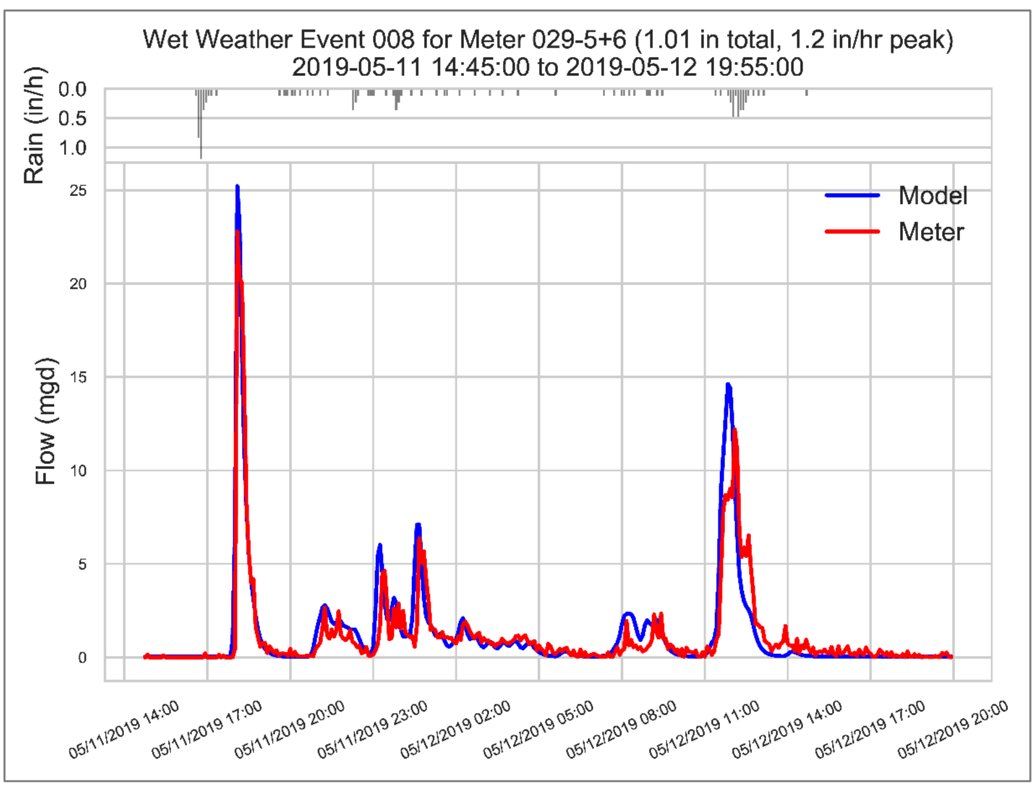


**Figure 2-12. PR-A Post-Construction Event Hydrograph, 029-5 + 029-6**

Results from the post construction model calibration and the LTCP forecast period of 1988-1990 are presented in Table 2-3 below.

To determine the efficacy of GI, DC Water monitored and modeled the sewershed both pre- and post-construction to see if there was a reduction in wet weather flow (WWF), and if that reduction matched the predicted reduction based on the number of impervious acres treated by GI. The WWF volumes presented in this Section are defined as occurring when predicted flows in the sewer are exceeding two times the average dry weather flow rate.

The reduction in WWF volumes per average year was calculated by taking the difference between pre- and post-construction volumes divided by the number of impervious acres treated at 1.2” to determine the WWF reduction in million gallons per average year per impervious acres treated at 1.2”.

As the predictions from the post-construction model using as-built GI matched the observed meter data to an acceptable degree without further adjustment of GI model parameters, it is assumed that actual modeled volume reduction and expected volume reduction are the same for the period 1988-1990.

**Table 2-3. PR-A Wet Weather Performance, Predicted Results**

| Simulated Time Period | Impervious Acres treated by GI (% of Total) | WWF Volume: Pre-Construction | WWF Volume: Post Construction | Predicted Volume Reduction Using Monitoring Data, Normalized to Impervious Acres Treated (%) | Predicted Volume Reduction Before Construction, Normalized to Impervious Acres Treated (%) |
|---|---|---|---|---|---|
| PR-A Model, 2019-2020 Rainfall Conditions | 9.1 % | 92.67 | 87.62 | 5.45% | N/A |
| 1988-1990 Average-Year LTCP Forecast Period | 9.1 % | 77.73 | 72.56 | 6.65% | 6.65% |

## 2.6 Changes for Future Projects

Since a determination of practicability for controlling at least 133 acres to the 1.2” Retention Standard in the CSO 027, 028 and 029 sewersheds by the place-in-operation deadline for Project No. 3 (June 23, 2027) is being undertaken concurrently, please refer to the Practicability Assessment for Potomac River Green Infrastructure Report dated August 2020 for changes in future projects in this sewershed.. .

# Appendix A

# Model Documentation:
# Green Infrastructure Modeling for PR-A Area

(this appendix will be made part of the
Potomac River Practicability Report dated August 2020)

# Appendix C

# GI Challenge Projects

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# PUBLIC MEETING

## Green Infrastructure Challenge

### Thursday, July 9, 6 - 8 pm

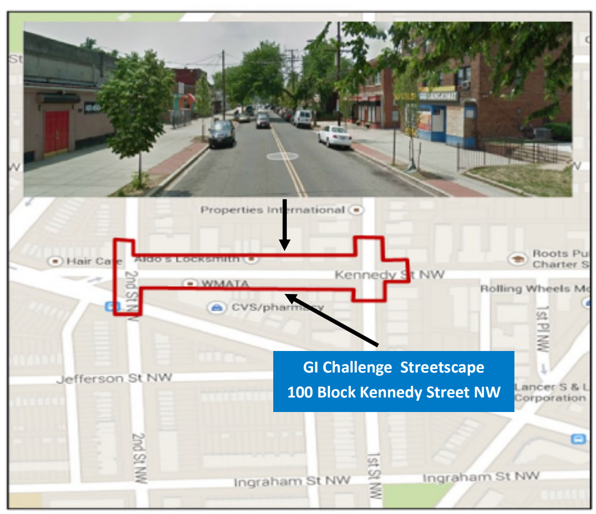
**(Open house format)**
**Roots Public Charter School, Multi-Purpose Room**
**15 Kennedy Street NW, Washington DC, 20011**

DC Water will hold a public meeting to present the final concept plans of two upcoming Green Infrastructure projects to be constructed as par t of the DC Clean Rivers Project:

**Kansas Avenue Green Infrastructure Parks**


Kansas Avenue and 3rd Street NW
&
Kansas Avenue and 2nd Street NW

**Kennedy Street Green Infrastructure**




100 Block of Kennedy Street NW

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For more information, please contact Lilia Ledezma at (202) 787-4496
by email at lilia.ledezma@dcwater.com
Or visit the project website at dcwater.com/greenchallenge

District of Columbia Water and Sewer Authority
George S. Hawkins, General Manager

*Briefing on:*

# *Green Infrastructure Challenge Projects*

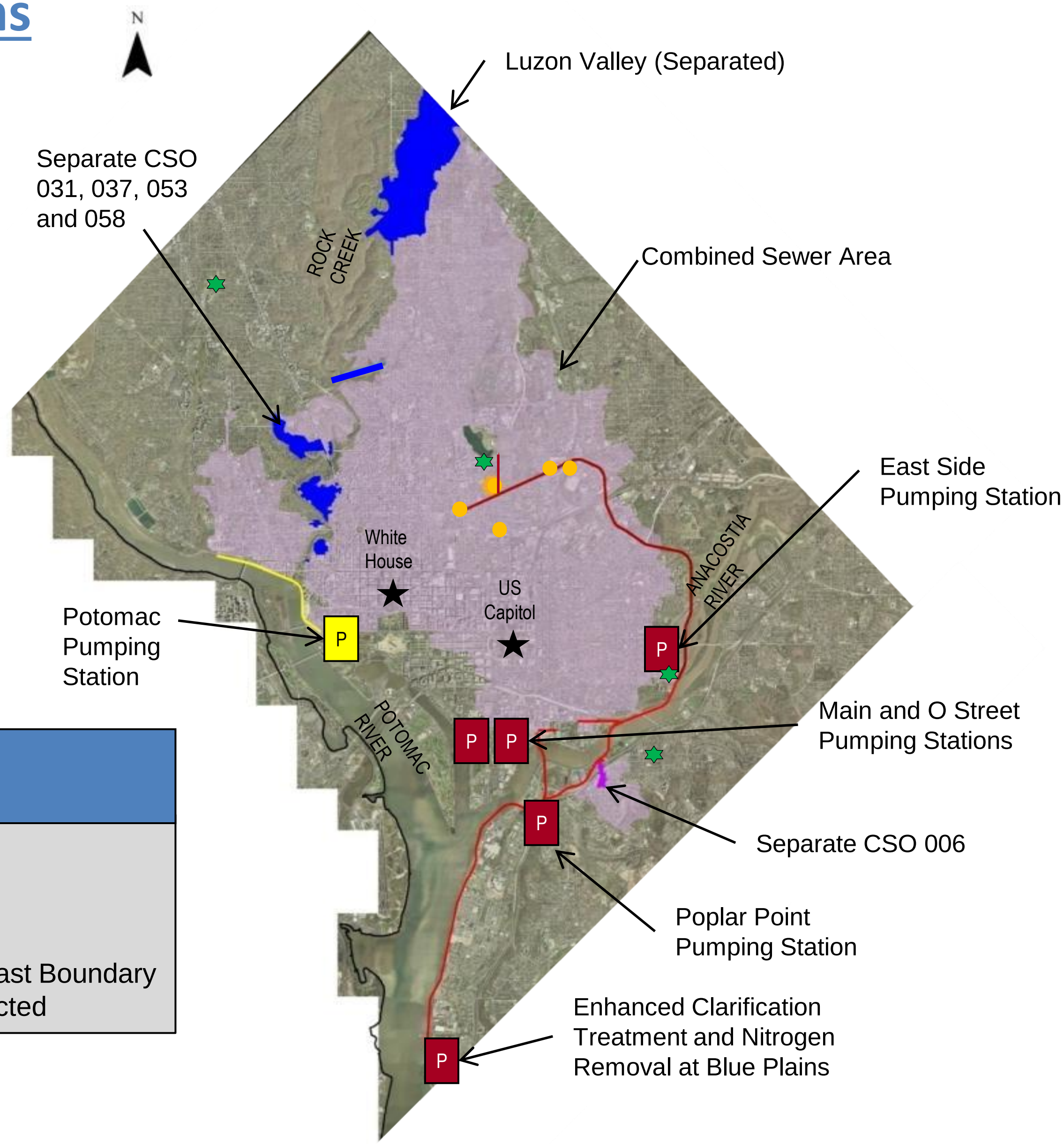
*Briefing for:*

## *ANC 4D*

**May 19, 2015**

DCWATER.COM

# DC Clean Rivers Project and Nitrogen Removal Programs – Prior to Modification



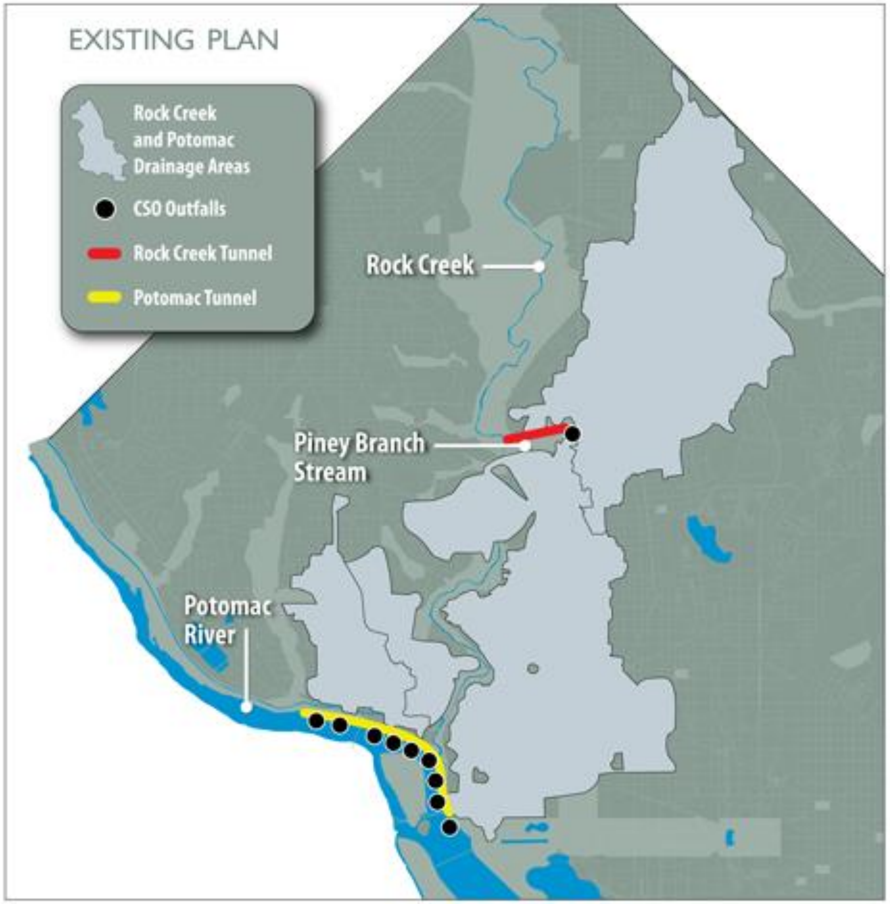

LEGEND

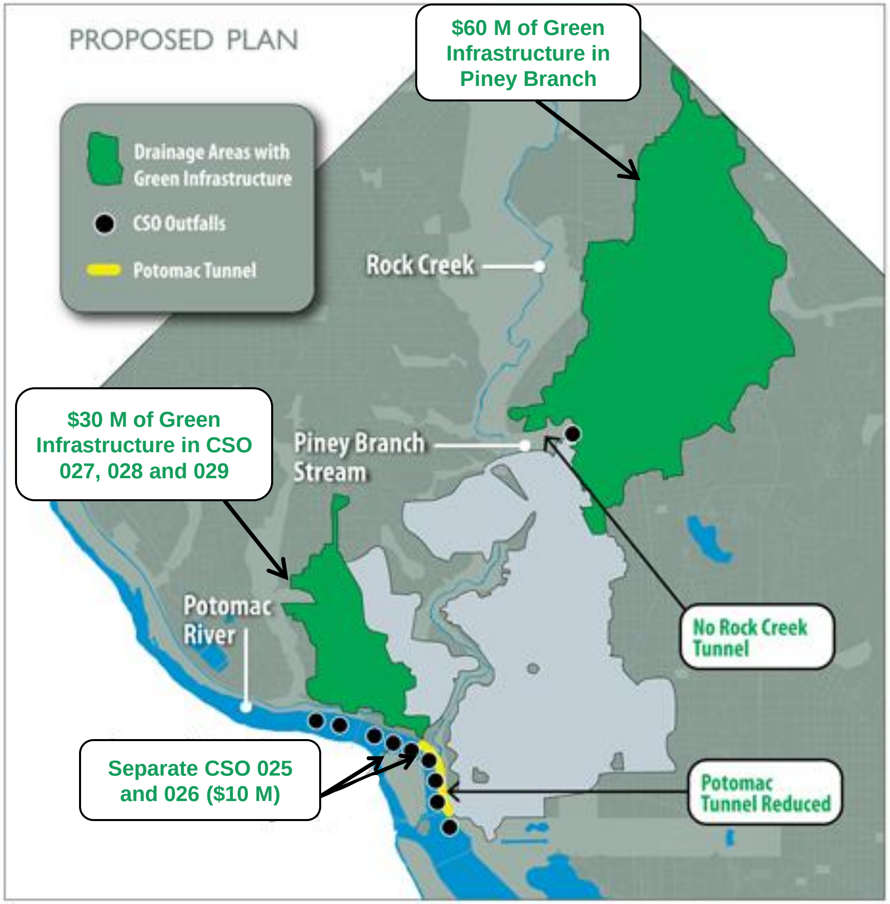
- Anacostia River Tunnel System
- Potomac River Tunnel
- Piney Branch Tunnel
- P Pumping Station Rehabilitation
- Known Flood Area
- Green Infrastructure (by DC Water)

**DC CLEAN RIVERS PROJECT AND NITROGEN REMOVAL PROGRAMS**

- DC Clean Rivers Project: $2.6 Billion
- Nitrogen Removal: $950 Million
- Total > $ 3.5 Billion
- 20 yr implementation (2005 – 2025)
- 96% reduction in CSOs & flood relief in Northeast Boundary
- Approx 1 million lbs/yr nitrogen reduction predicted

# Background: DC Clean Rivers Proposed Green Infrastructure Plan

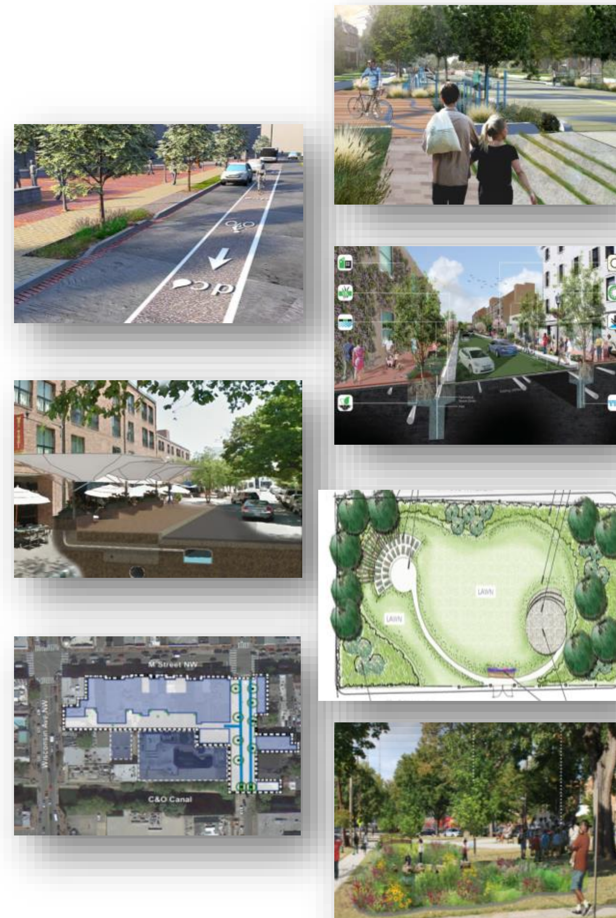



dc clean RIVERS PROJECT

# GI Challenge
# Goals

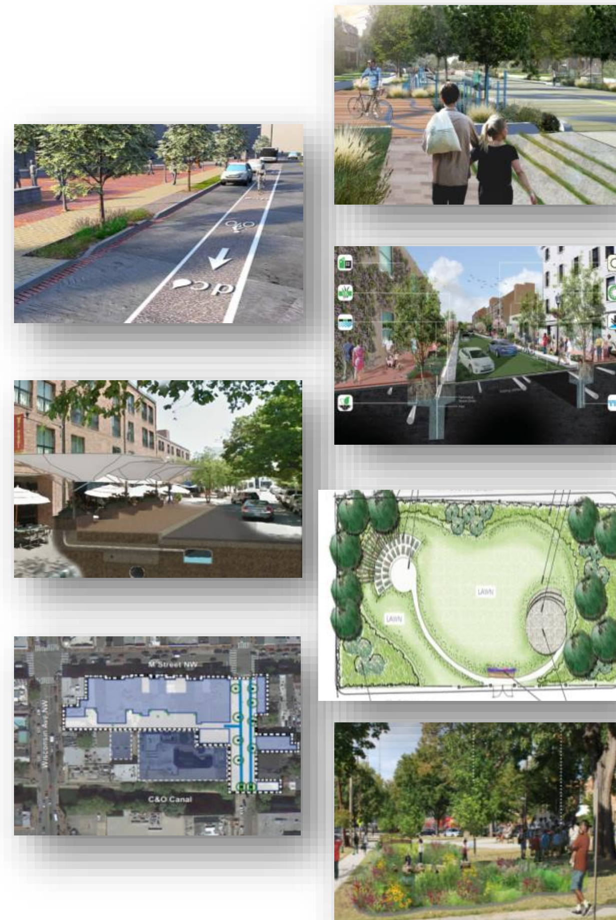
- Challenge Goals
  - Proposing practical and implementable solutions that can be constructed
  - Demonstrating performance in capturing stormwater runoff volume
  - Retrofitting the urban environment and utilizing stormwater as a site amenity
  - Advancing innovative technologies
  - Demonstrating cost effective solutions



dc clean RIVERS PROJECT

# GI Challenge Design Phase Summary

- Two Planning Phase Winning Designs Selected for Final Design
- Categories for this Phase Include:
  - **Kansas Avenue Green Infrastructure Parks Project**
    - Designs for 2 GI Parks
    - Selected Team: CH2M
  - **Kennedy Street Green Infrastructure Streetscape Project**
    - Design for 1 GI Streetscape
    - Selected Team: Nitsch Engineering
- Streetscape project to be bid and constructed with DDOT Kennedy Street Project



dc clean RIVERS PROJECT

# GI Challenge Design Phase
# GI Parks Project Description

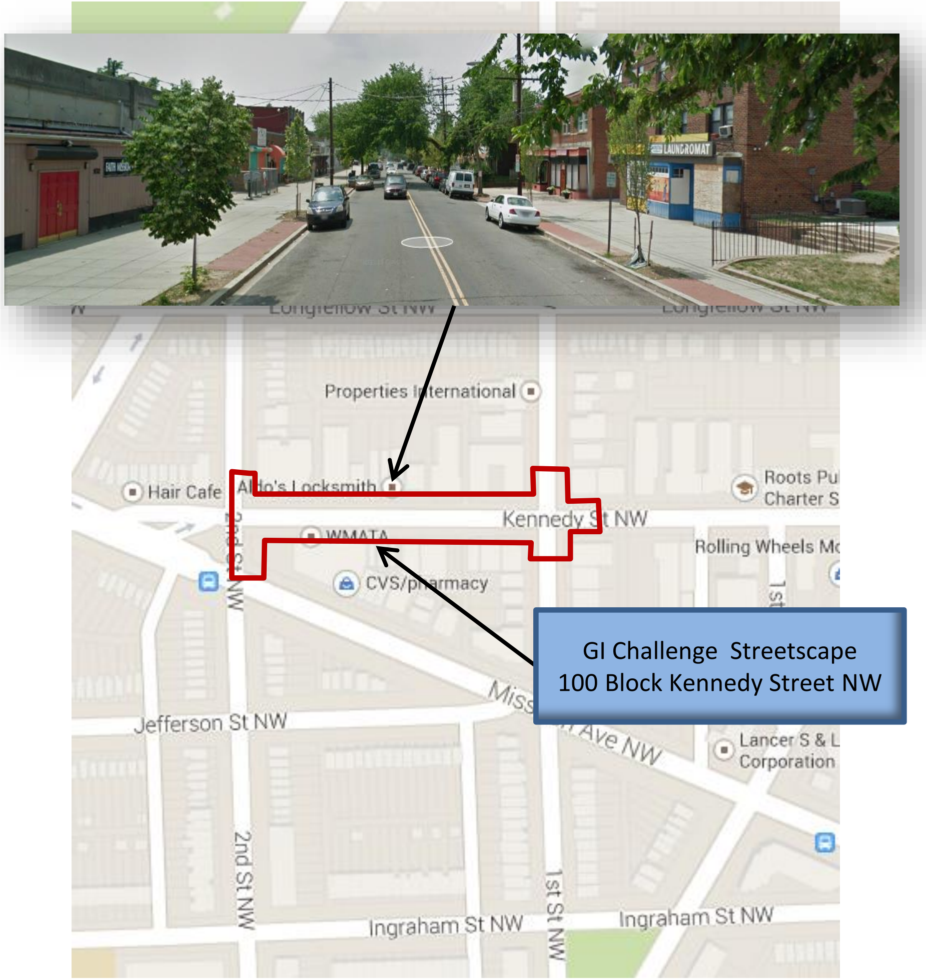
## Kansas Avenue NW Green Infrastructure Parks Project:

- Park 1:
  - Approx 150’ L x 90’ W. Bounded by Ingraham Street NW, Kansas Avenue NW, and 3rd Street NW
  - Brightwood Park Neighborhood
  - Existing Site Conditions:
    - Mix of shade and ornamental trees
    - Sidewalks on all sides
    - Adjacent to Washington Latin PCS
    - Surrounded by row houses
- Park 2:
  - Approx 170’ L x 90’ W. Bounded By Longfellow Street NW, Kansas Avenue NW, and 2nd Street NW
  - Brightwood Park Neighborhood
  - Existing Site Conditions:
    - Small, recently planted trees and turf
    - Sidewalks on all sides
    - Adjacent to Fort Slocum Park
    - Surrounded by row houses

# GI Challenge Design Phase
## GI Streetscape Description

**Kennedy Street Green Infrastructure Streetscape Project:**

- Bounded by 1st Street NW and Missouri Avenue NW
  - Approximately 800’ long with a right-of-way width of 60’
  - Primarily commercial site
  - Brightwood Park neighborhood
  - Characterized by broad sidewalks, a mix of recently planted trees and mature trees, and underutilized commercial properties
  - Design to be closely coordinated with DDOT work on Kennedy Street.



# GI Challenge Design Phase
## Anticipated Schedule

| Task | Date – GI Parks | Date – GI Streetscape |
|---|---|---|
| 1. Public Outreach Meeting # 1 | May 28, 2015 | May 28, 2015 |
| 2. Public Outreach Meeting # 2 | July 2015 (TBD) | July 2015 (TBD) |
| 5. Public Outreach Meeting #3 (~ 90% Design) | December 2015 | N/A |
| 7. Construction | TBD (pending LTCP Modification) | w/ DDOT Kennedy Street Project October 2015 – Spring 2016 (Anticipated) |

# GI Challenge Design Phase
## Next Steps

**Next Steps:**

- First Public Outreach Meeting May 28, 2015 from 6:00 pm – 8:00 pm
  - Roots PCS, 15 Kennedy Street, NW Washington, DC 20011
  - Goal: Solicit and incorporate feedback from the public in design process
- Second Public Outreach Meeting July, 2015
  - Date/Location TBD







dc clean RIVERS PROJECT

# QUESTIONS AND ANSWERS

# *Kennedy Street Green Infrastructure Streetscape Briefing for DDOT*

**May 14, 2015**

# Project Team

***Project Team:***

*DC Clean Rivers*

*Nitsch Engineering (PM, Lead Engineer)*

*Urban Rain | Design (Lead Landscape Architect)*

*Warner Larson Landscape Architects (Landscape Architect)*

*EBA Engineering (Survey, Geotech, Estimating)*

*McKissack & McKissack (Permitting)*

*Stacy Levy (Environmental Artist)*

*Tina Boyd & Associates (Public Outreach)*

# BACKGROUND

dc clean RIVERS PROJECT

# GI Challenge Design Phase
## Goals

- Challenge Goals
  - Proposing practical and implementable solutions that can be constructed
  - Demonstrating performance in capturing stormwater runoff volume
  - Retrofitting the urban environment and utilizing stormwater as a site amenity
  - Advancing innovative technologies
  - Demonstrating cost effective solutions






# GI Challenge Design Phase Summary

- Two Planning Phase Winning Designs Selected for Final Design and Construction
- Categories for this Phase Include:
  - **Kansas Avenue Green Infrastructure Parks Project :**
    - Designs for 2 GI Parks
    - Selected Team: CH2M HILL
  - **Kennedy Street Green Infrastructure Streetscape Project :**
    - Design for 1 GI Streetscape
    - Selected Teams: Nitsch Engineering
- Park Project Anticipated to be Executed Under a Design-Bid-Build Project Delivery or Similar
- Streetscape Project to be bid and constructed with DDOT Kennedy Street Project







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# Evaluation Panel

- Evaluation Panel consisted of members from
  - DC Water
  - District Department of the Environment
  - District Department of Transportation
  - District Office of Planning
  - District Department of Public Works
  - Other industry experts







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# GI Challenge Design Phase
# GI Parks Project Description

## Kansas Avenue NW Green Infrastructure Parks Project:

- Park 1:
  - Approx 150’ L x 90’ W. Bounded by Ingraham Street NW, Kansas Avenue NW, and 3rd Street NW
  - Brightwood Park Neighborhood
  - Existing Site Conditions:
    - Mix of shade and ornamental trees
    - Sidewalks on all sides
    - Adjacent to Washington Latin PCS
    - Surrounded by row houses
- Park 2:
  - Approx 170’ L x 90’ W. Bounded By Longfellow Street NW, Kansas Avenue NW, and 2nd Street NW
  - Brightwood Park Neighborhood
  - Existing Site Conditions:
    - Small, recently planted trees and turf
    - Sidewalks on all sides
    - Adjacent to Fort Slocum Park
    - Surrounded by row houses


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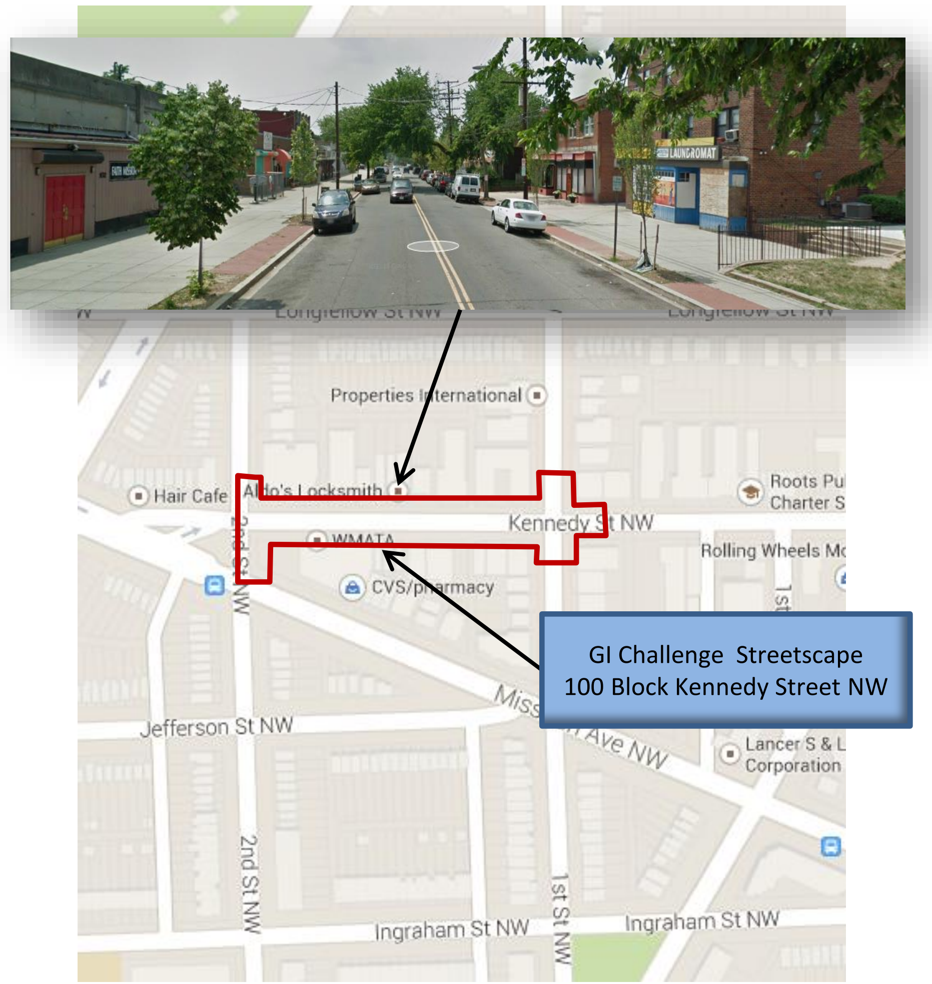
# GI Challenge Design Phase
## GI Streetscape Description

**Kennedy Street Green Infrastructure Streetscape Project:**

- Bounded by First Street NW and Missouri Avenue NW
  - Approximately 800' long with a right-of-way width of 60'
  - Primarily commercial site
  - Brightwood Park neighborhood
  - Characterized by broad sidewalks, a mix of recently planted trees and mature trees, and underutilized commercial properties
  - Design and construction to be closely coordinated with DDOT work on Kennedy Street.



# GI Challenge Design Phase
## Designer’s Scope of Work

### Designer’s Scope of Work:

- Assisting DC Water with public engagement and design refinement.
- Integrating revealed stormwater management processes that facilitate public engagement and education.
- Organizing, managing and otherwise providing the engineering, landscape architecture, and other design services necessary to prepare contract documents, suitable for obtaining bids for the construction of the project.
- Obtaining necessary permits and approvals.
- Engineering services during bidding.
- Services during construction, including responses to requests for information, review of shop drawings, etc.







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# GI Challenge Design Phase Anticipated Schedule

## Kansas Avenue Green Infrastructure Parks Project:

| Task | Date |
|---|---|
| 1. Public Outreach Meeting # 1 | May 28, 2015 |
| 2. Public Outreach Meeting # 2 | July, 2015 |
| 3. 50% Design Complete | August 2015 |
| 4. 90% Design Complete | December 2015 |
| 5. Public Outreach Meeting #3 (Review 90% Design) | December 2015 |
| 6. 100% Design | March 2016 |
| 7. Begin Construction | TBD – per CD Mod |
| 8. Complete Construction | TBD – per CD Mod |

## Kennedy Street Green Infrastructure Streetscape Project:

| Task | Date |
|---|---|
| 1. Public Outreach Meeting # 1 | May 28, 2015 |
| 2. DDOT Bid Submission | June 15, 2015 |
| 3. Public Outreach Meeting # 2 | July, 2015 |
| 5. 50% Design Complete | July 2015 |
| 6. 90% Design Complete | August 2015 |
| 7. Public Outreach Meeting #3 (Review 90% Design) | August 2015 |
| 8. 100% Design | September 2015 |
| 9. Begin Construction (Under DDOT Streetscape work) | October 2015 |
| 10. Complete Construction | Spring 2016 |

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# EXISTING CONDITIONS

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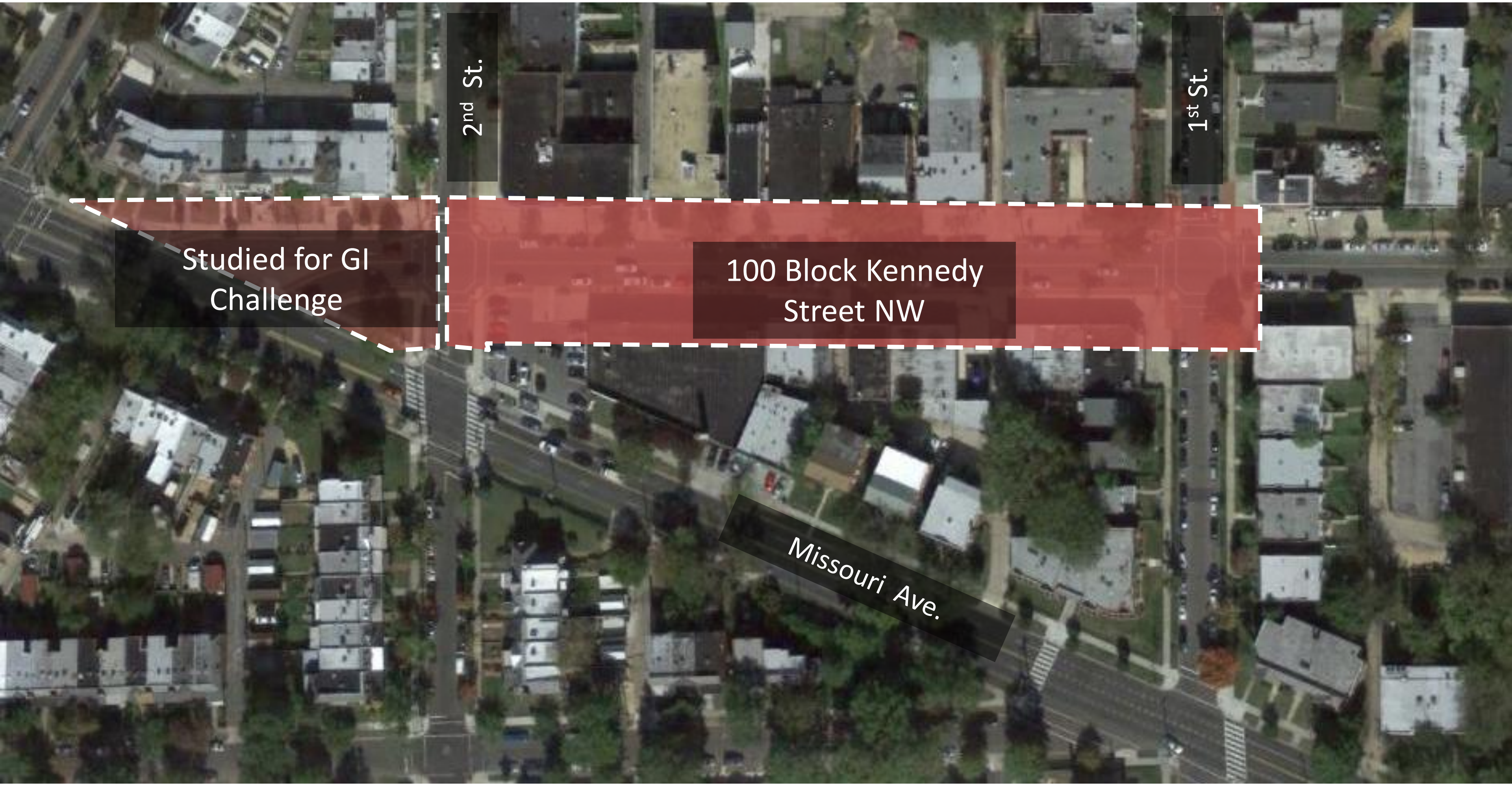
# Project Site



# Project Site

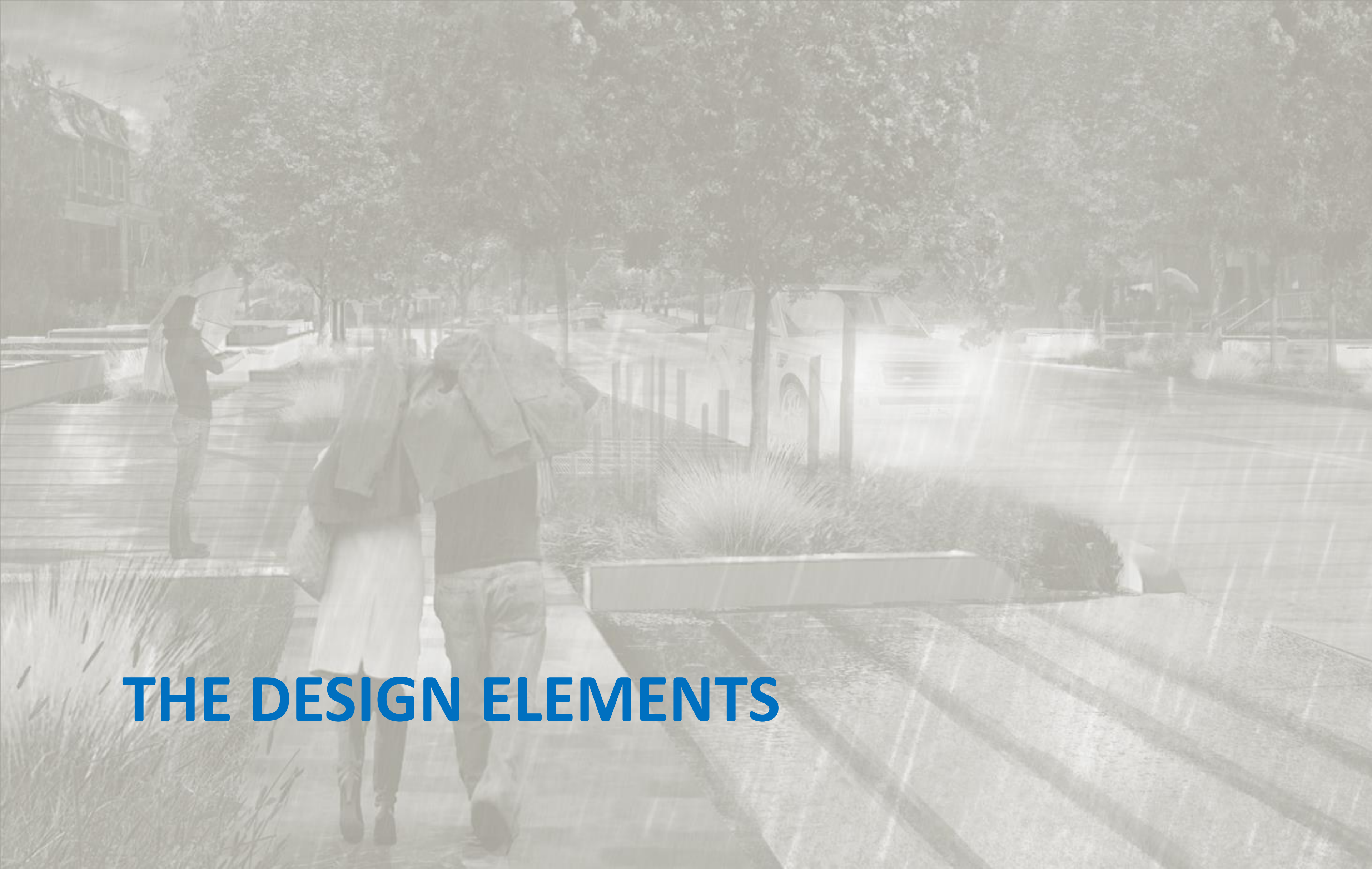

**Vegetation**
Thin, Inconsistent
Tree Canopy


Wide Sidewalks
Lack of Programming,
Street Furniture, and Other
Pedestrian Amenities


Function
Streetscape Does Not Inspire, Educate, or Improve Health of Community
Lack of Street Identity


Mobility
Street is dominated
by vehicular use and speed
Lack of people use and
gathering space


Public R.O.W
Private Sidewalk



# THE DESIGN ELEMENTS





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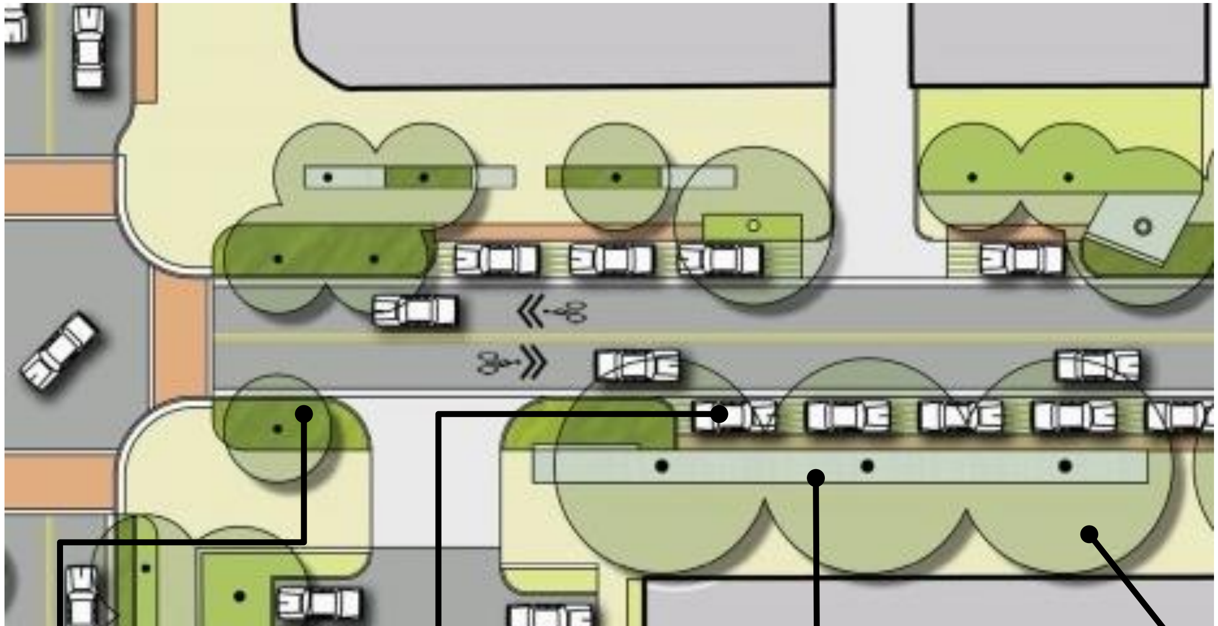
# Multi-Layer Design Approach



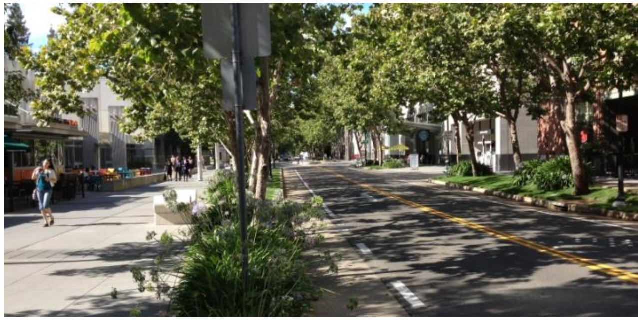
Bioretention Curb Extensions

Permeable Parking Lane

Walkable Recessed Landscapes

Enhanced Tree Canopy

# Street Tree Canopy

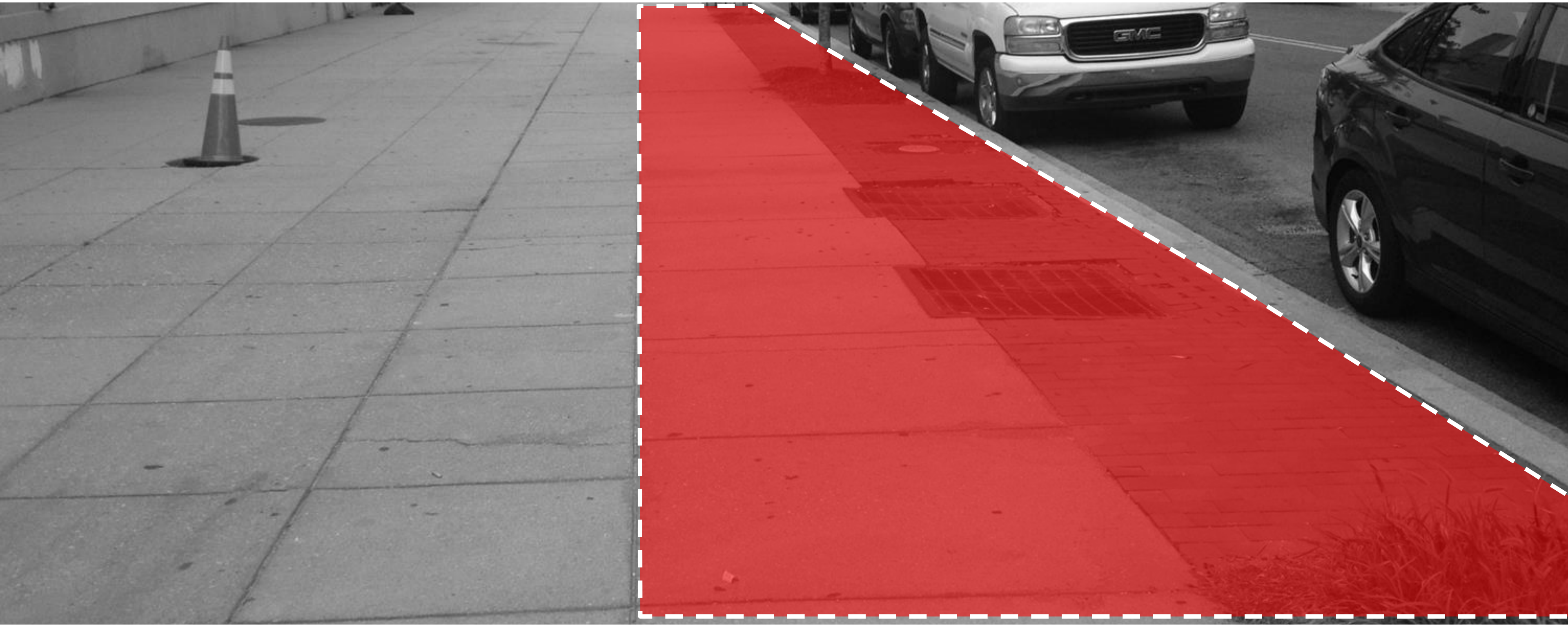



# Permeable Parking Lane

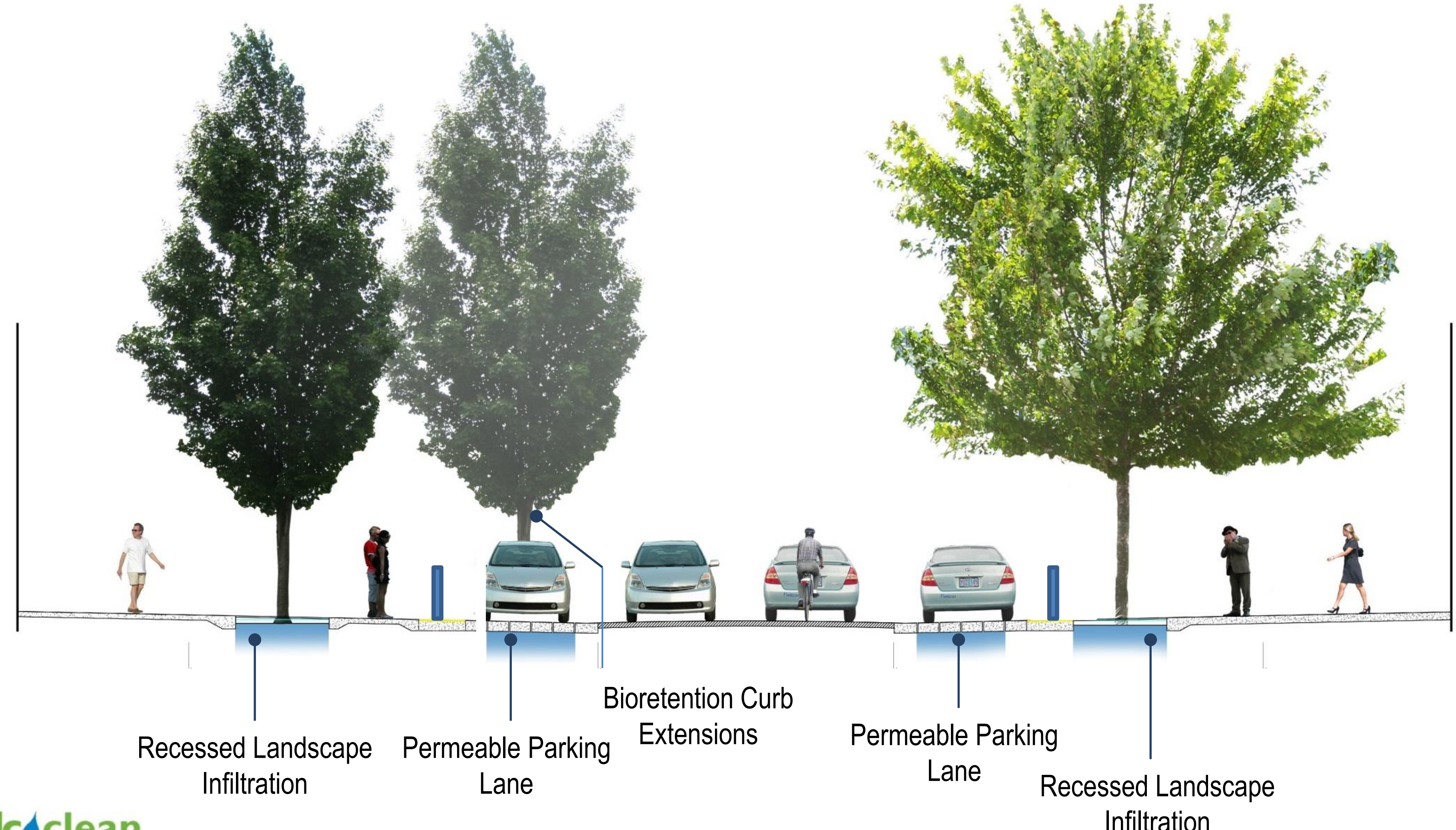

# Bioretention Curb Extensions



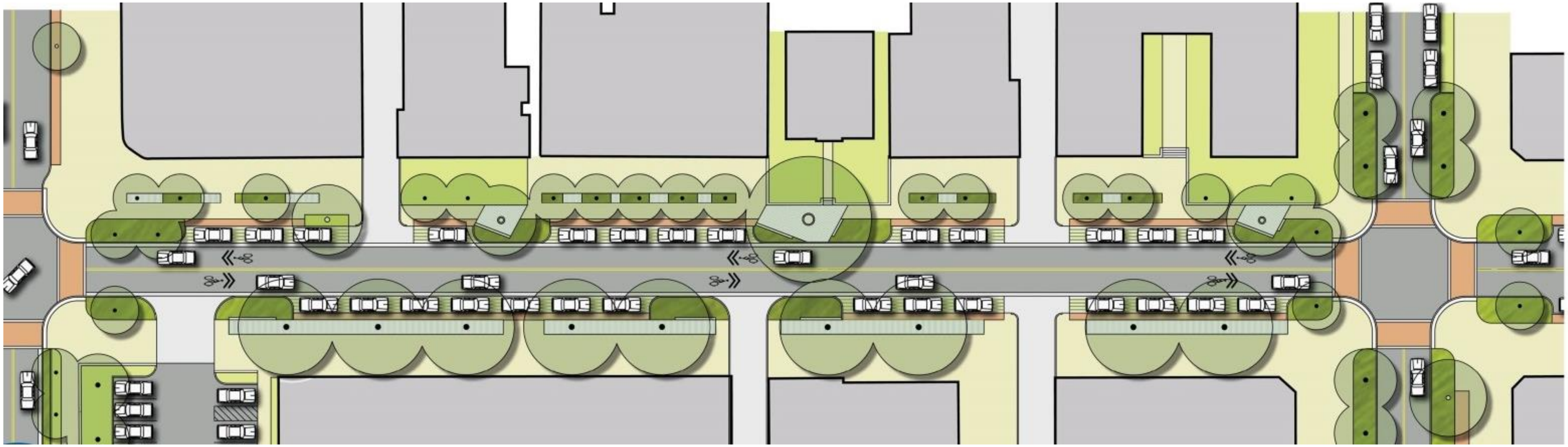
# Walkable Recessed Landscape




# Cross Section



# High Performance Stormwater Management



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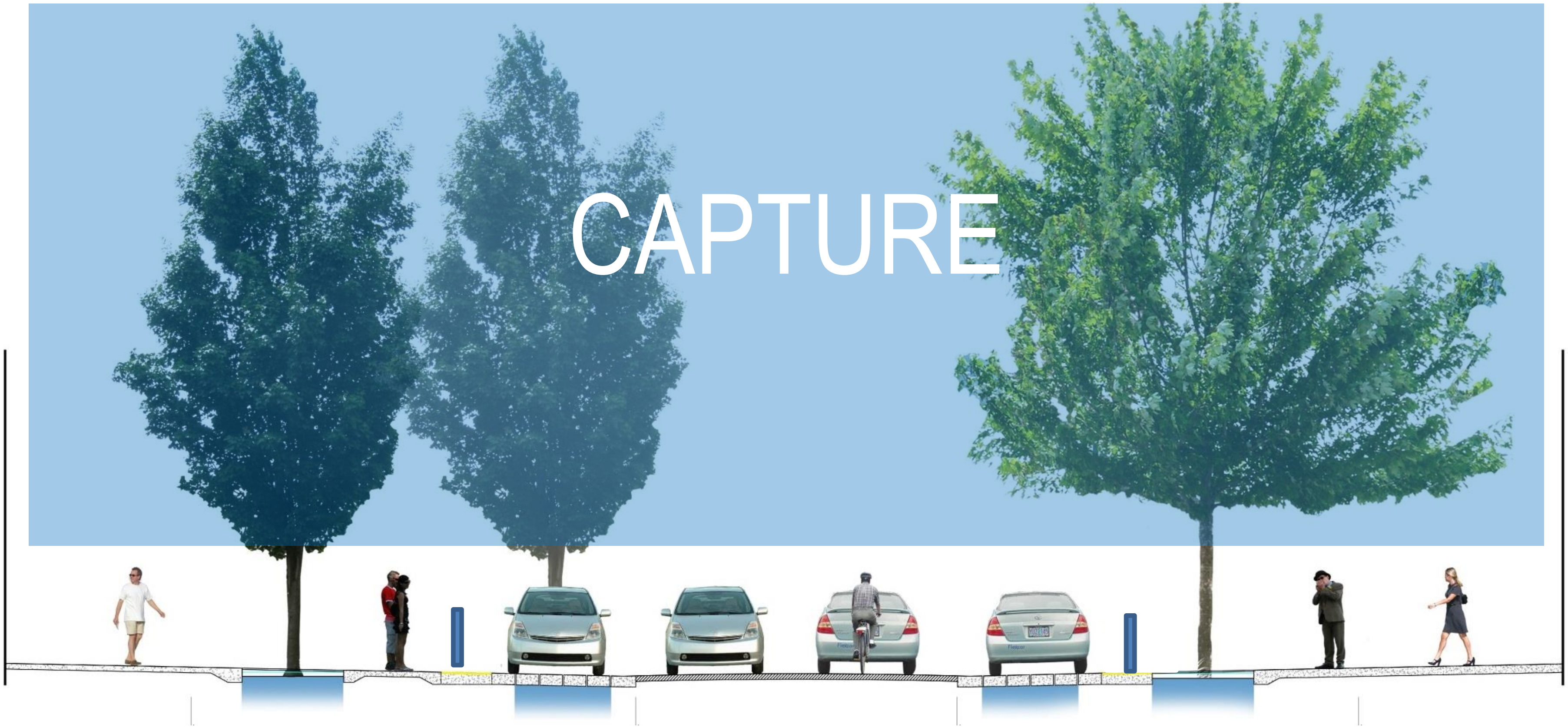
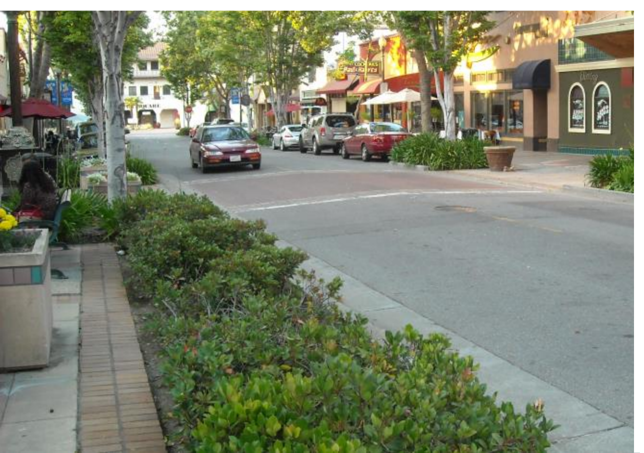
# Vertical Capture

# CAPTURE



# Ground Surface Absorption



# VOLUME & TIME

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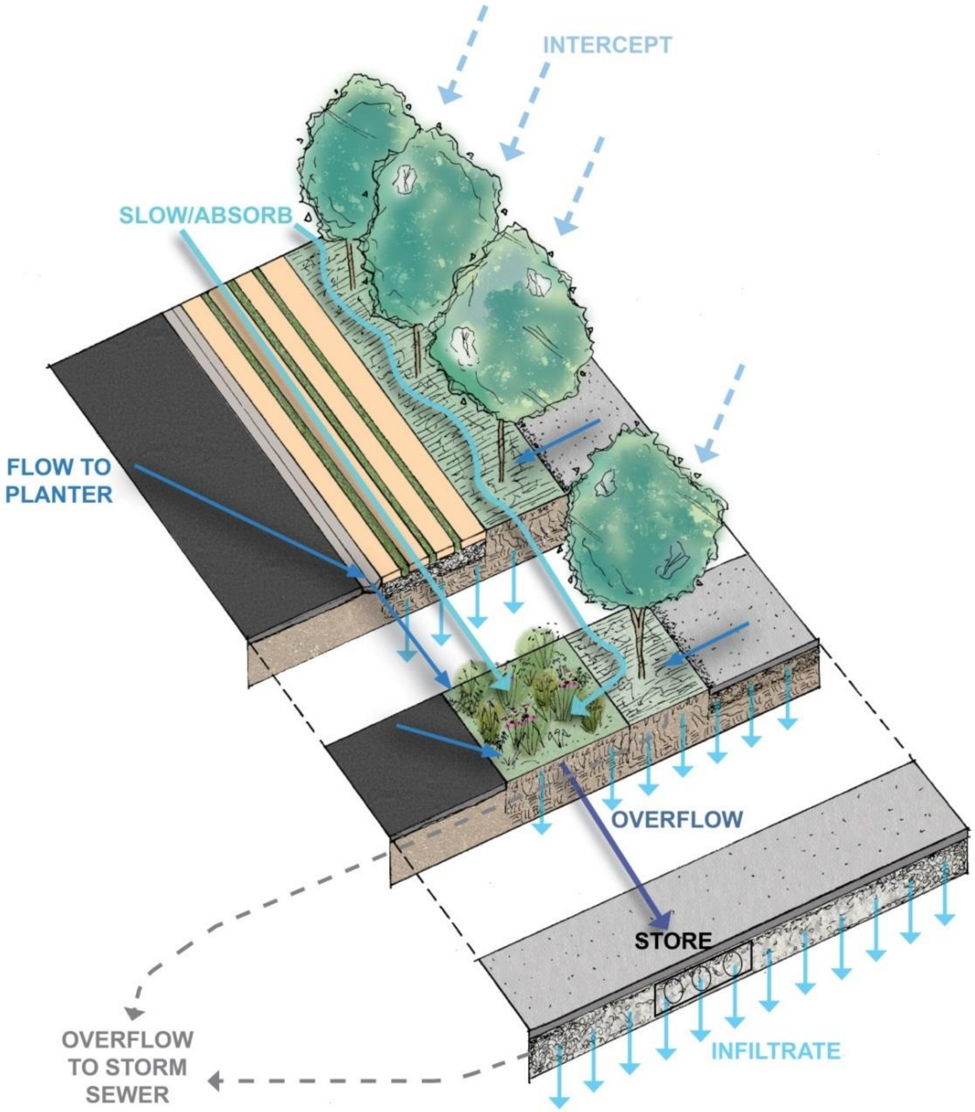
# An Integrated Treatment Train

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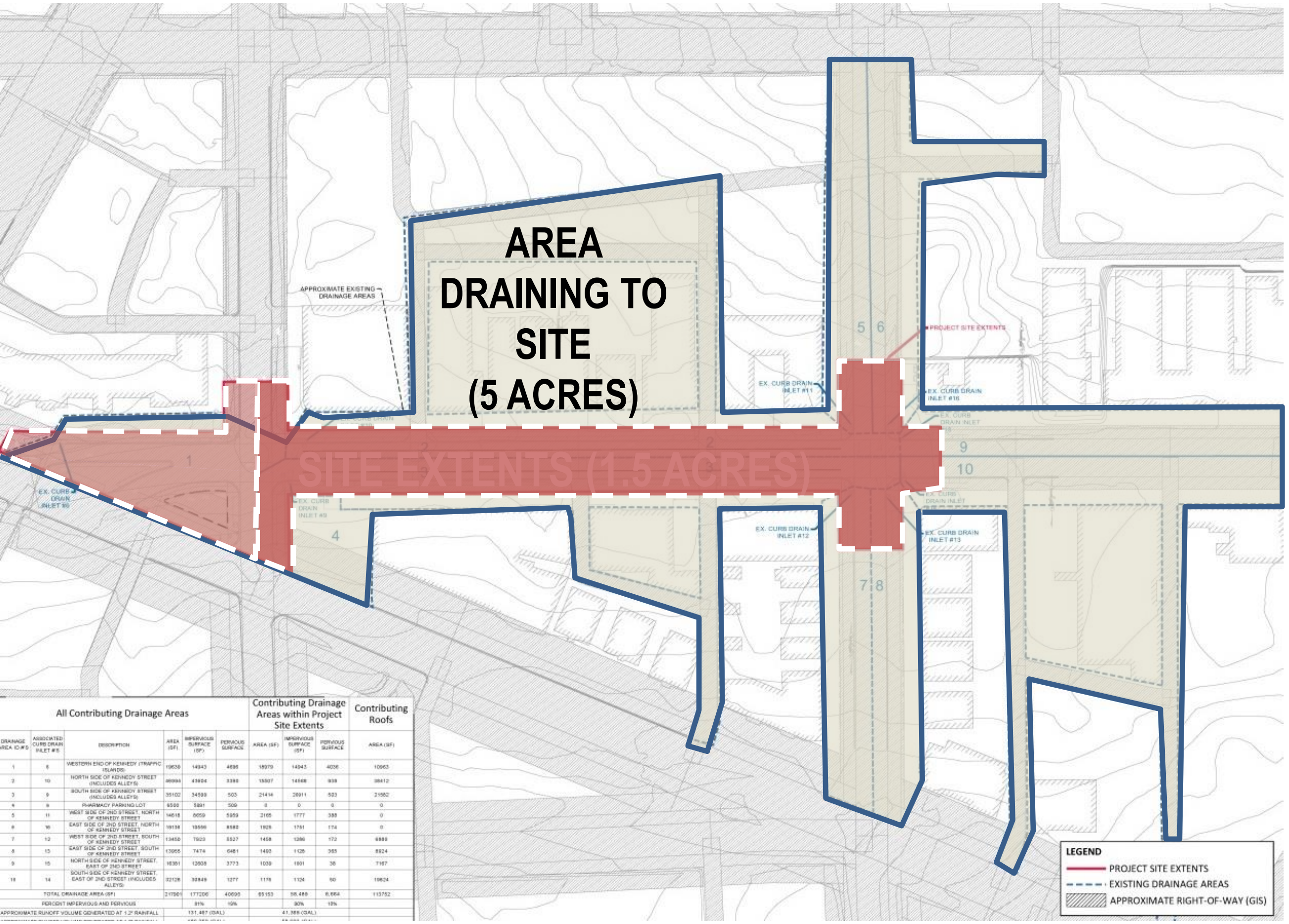
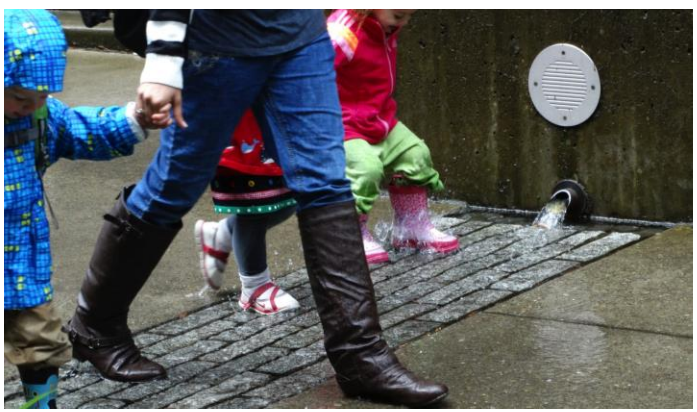
PROJECT

# Beyond the Project Boundary



# Sidewalk Placemaking

# Interpretive Public Art




NO
1 HOUR

# Green Catalyst


# DISCUSSION

# Topics of concern we've heard so far…

- Accessibility and Safety
  - ADA
  - Bicycle, pedestrian, and vehicular zones
- Curbless, "w" cross section
  - Safety (vehicles entering pedestrian zone)
  - Flooding/Conveyance (15-year storm)
- R.O.W vs. Private Sidewalk
  - Location of GI (within ROW)
  - Location of public art (sidewalks, crosswalks)
  - Sidewalk minimum width (8')
- Walkable Grates
  - Gap width (1/2" max.)
  - Accessibility
  - Safety
  - Performance
  - Access and Maintenance
- LIG (landscape infiltration gaps)
  - Parking lane (not suitable)
  - Planting strip and pedestrian zone
- Street Trees
  - Protection of existing trees
  - Removal of unhealthy trees
  - Enhancement of canopy
  - Emphasis on soil volume
- Decking over existing 36" Elm root zone
  - Accessibility
  - Alternate application
- Bioretention curb extensions
  - Turning radii
  - Curb ramps
  - Unprotected drops and tripping hazards

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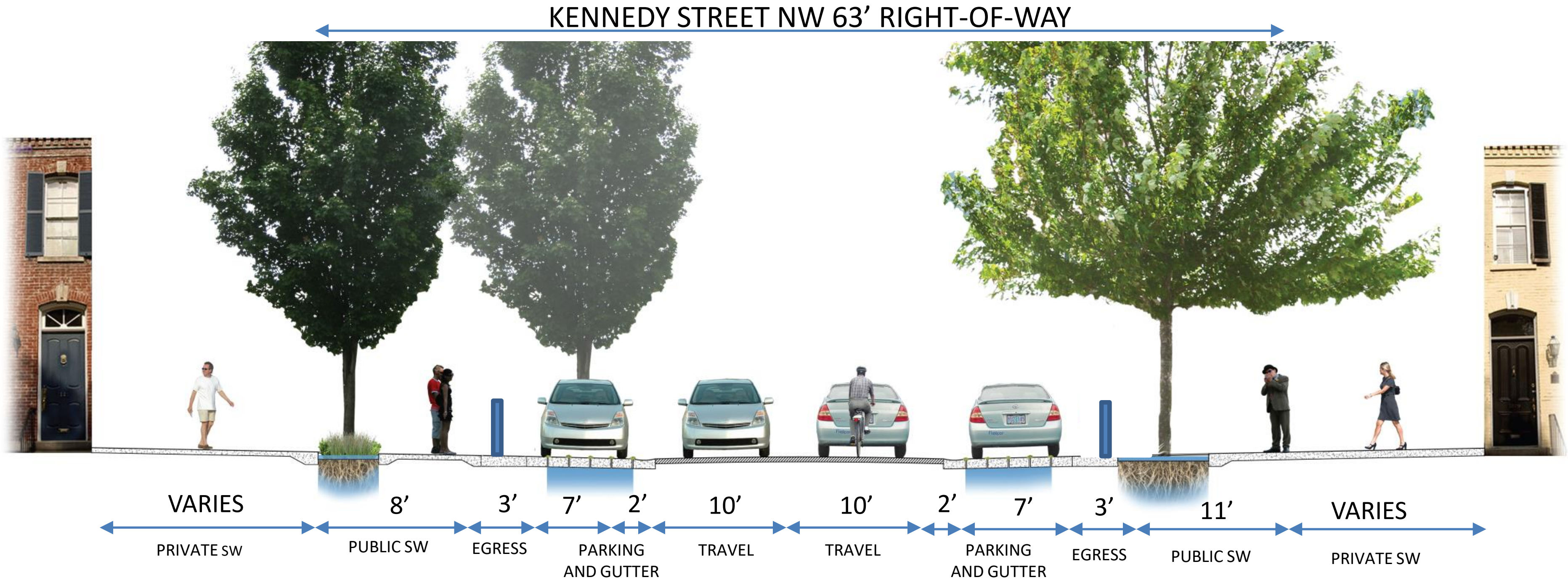
# Curbless "w" Cross Section




**Notes:**

Existing vehicular zone (curb to curb) is 36'

Proposed vehicular zone is 38' (aligns with DDOT guidelines)

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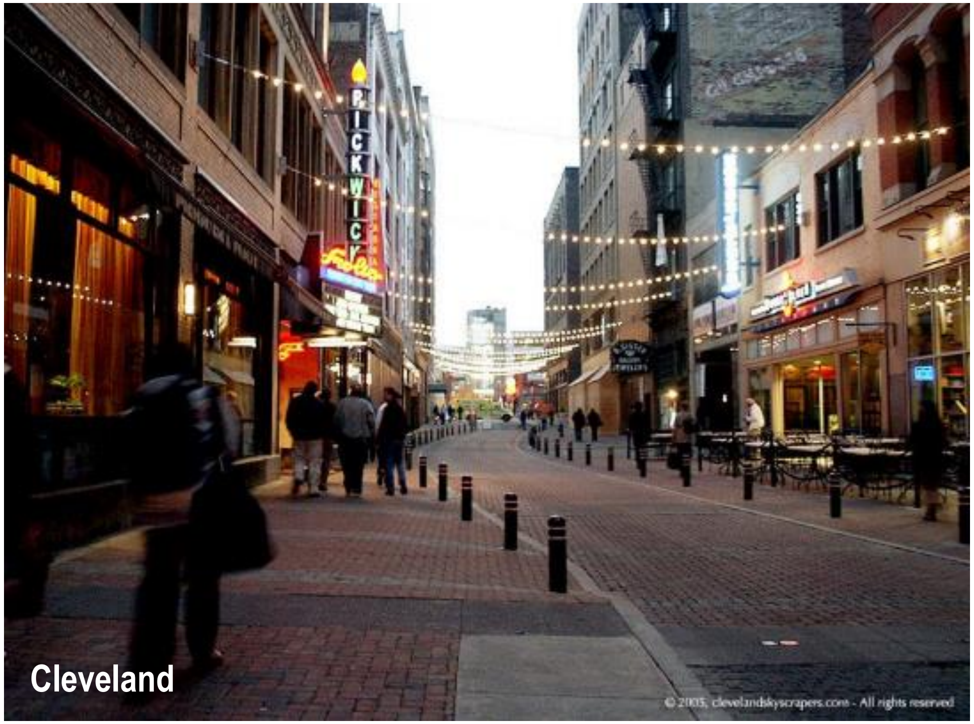
# Curbless “w” Cross Section, Drainage

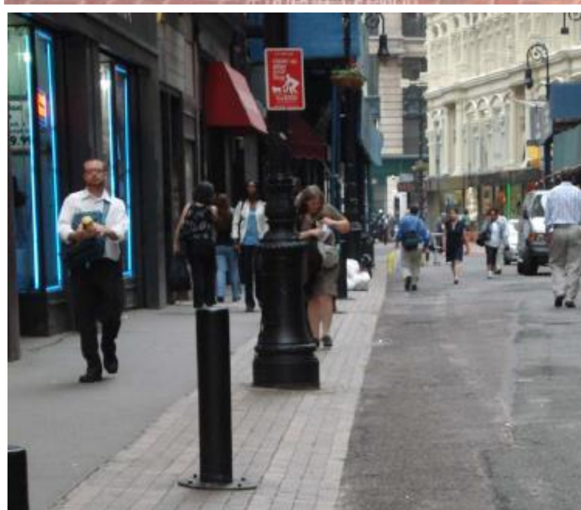


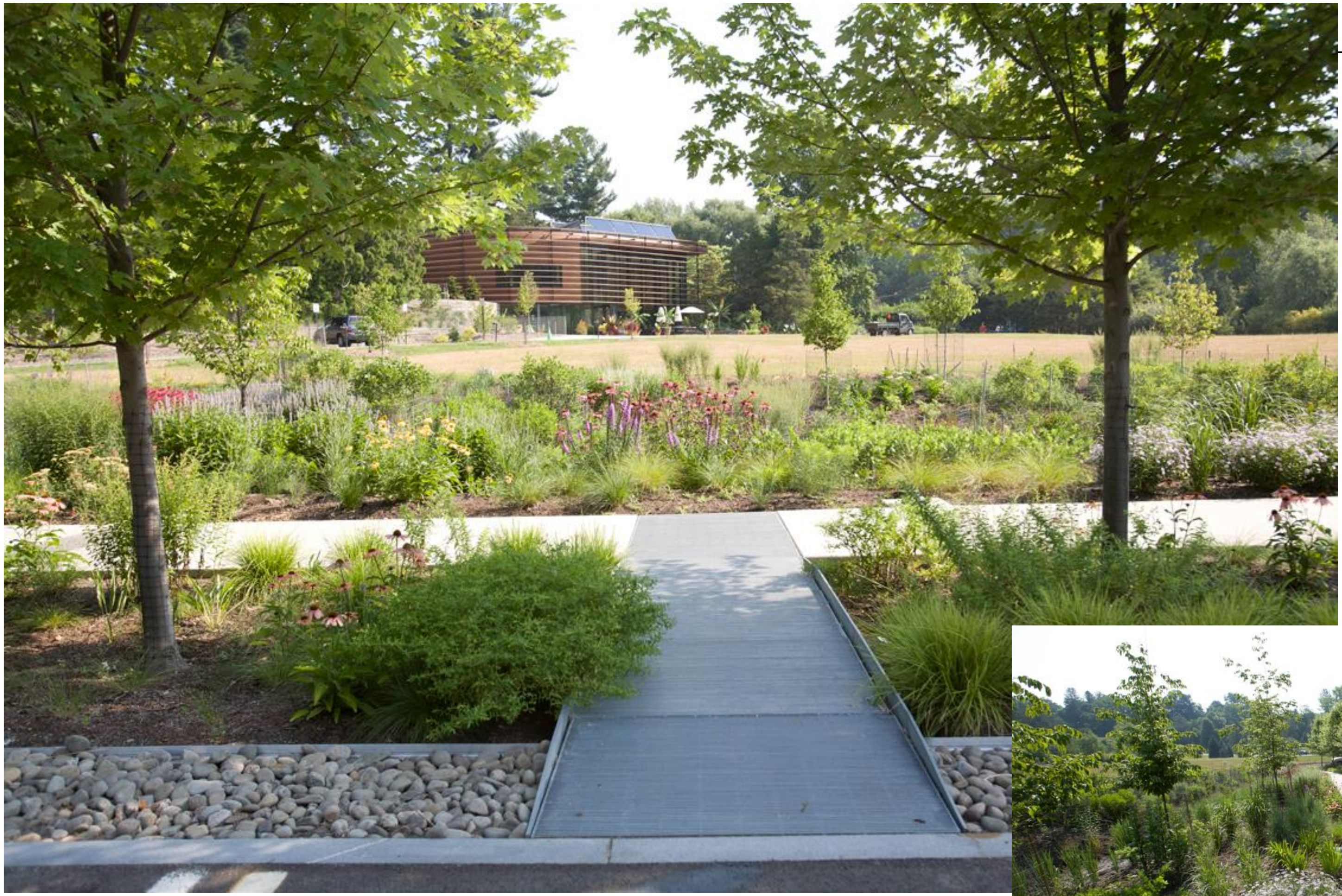
# Shared Space, Safety

Eugene, OR


NYC/Other



# Walkable Landscapes (Accessible Grates)



Cornell University Plantations

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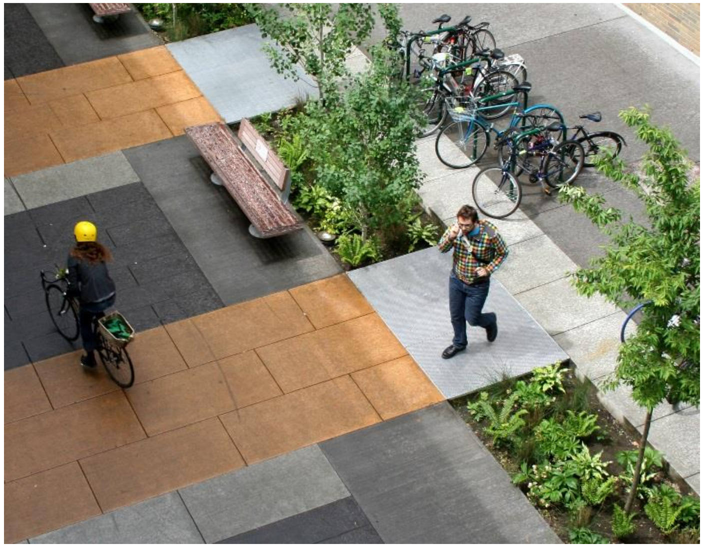
# Walkable Landscapes (Accessible Grates)

Columbus, OH

Portland, OR



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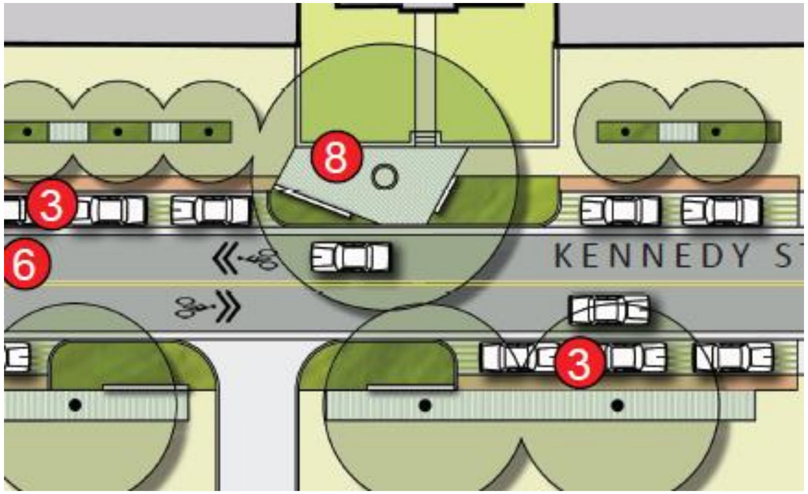
# Decking at Existing Elm Tree




# Landscape Infiltration Gaps (LIGs)

### Alternate Permeable Parking Lane Materials

### Applications in Pedestrian Zone

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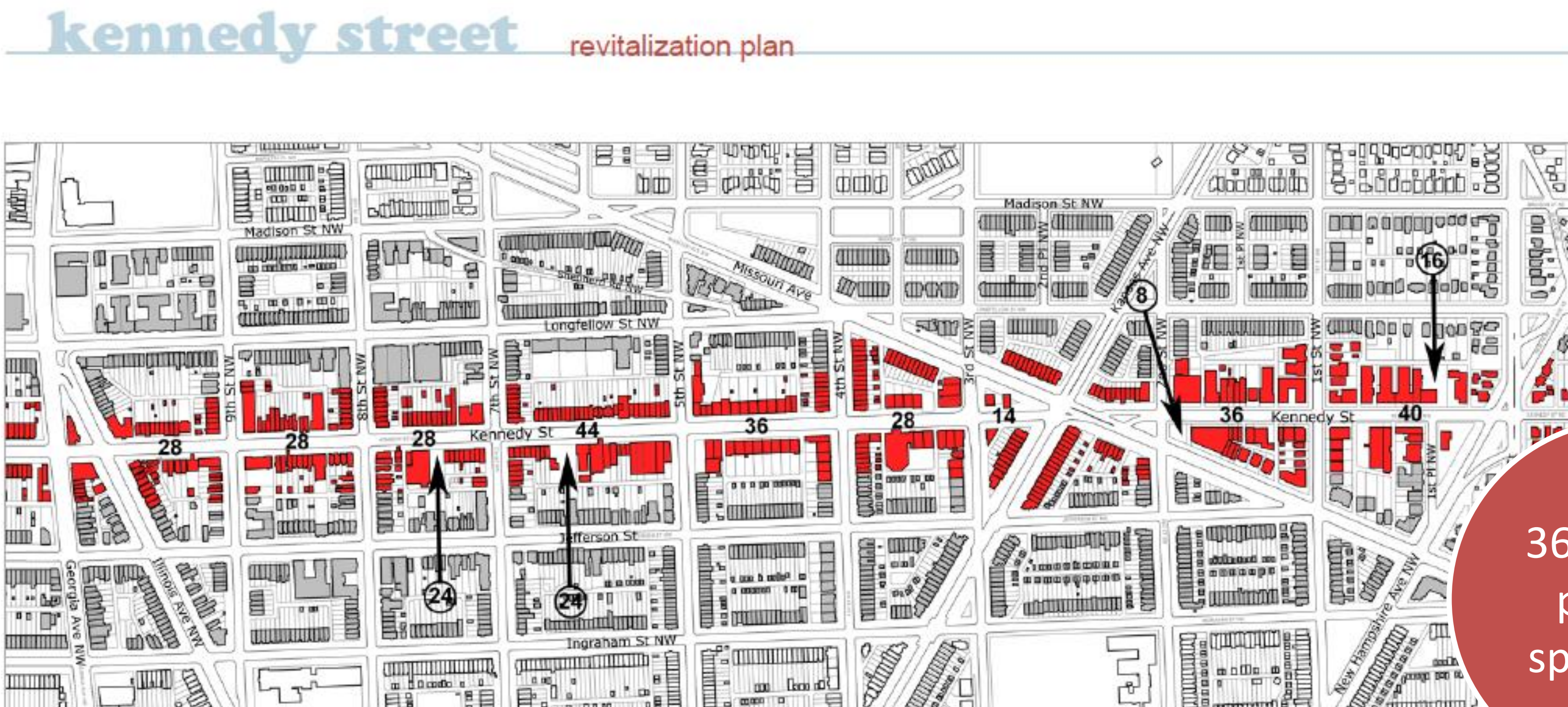
# Parking

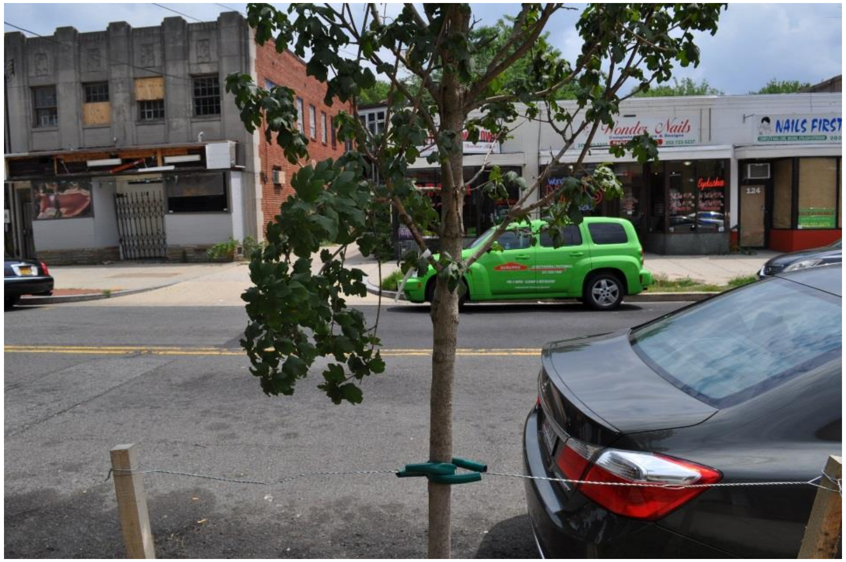



36 existing parking spaces (est.)

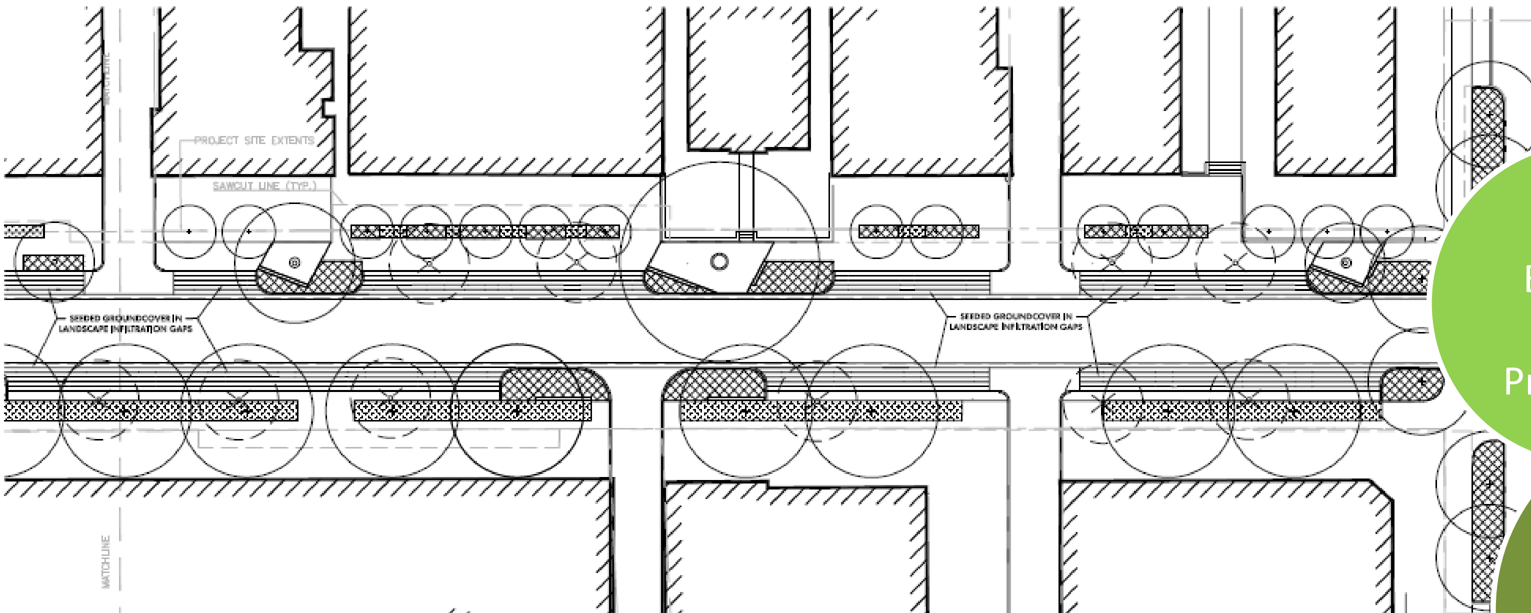
27 proposed parking spaces (DDOT Standard)

# Existing Street Trees





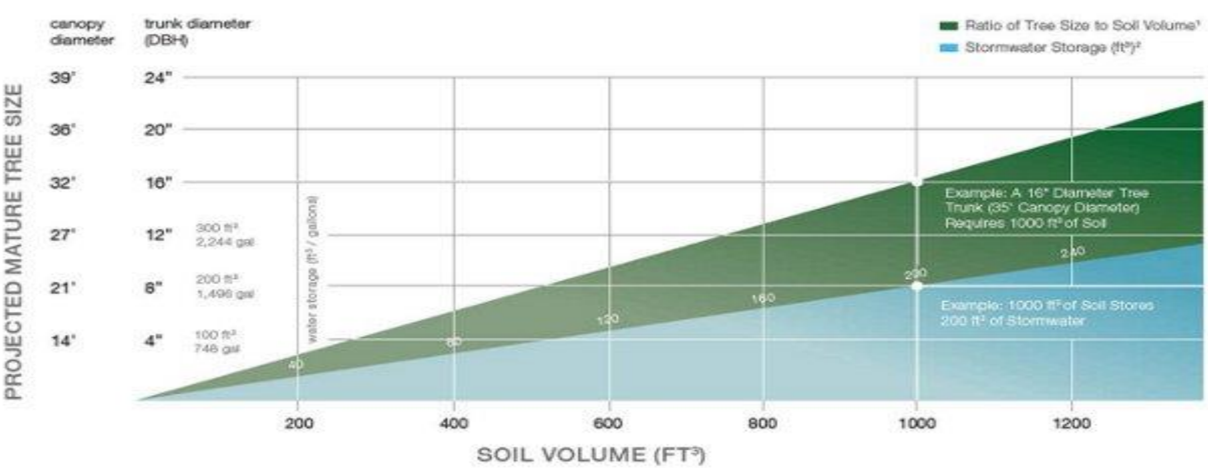

# Street Trees and Soil Volumes




15 Existing Street Trees

4 Existing Trees Preserved

42 New Street Trees



# June 15, 2015 Concept Design Submittal

- Preliminary List of Drawings
  - Title Sheet
  - General Notes, Standard Symbols, Abbreviations
  - Summary of Quantities
  - Demolition Plan
  - Typical Sections
  - Layout Plan
  - Landscape and Materials Plan
  - Landscape Details
  - Planting Plan
  - Grading and Drainage Plan
  - Civil Site Details
- Specifications for GI Elements

*Format of deliverables and other coordination items to be discussed*

District of Columbia Water and Sewer Authority
Henderson J. Brown IV, General Manager

*Briefing on:*

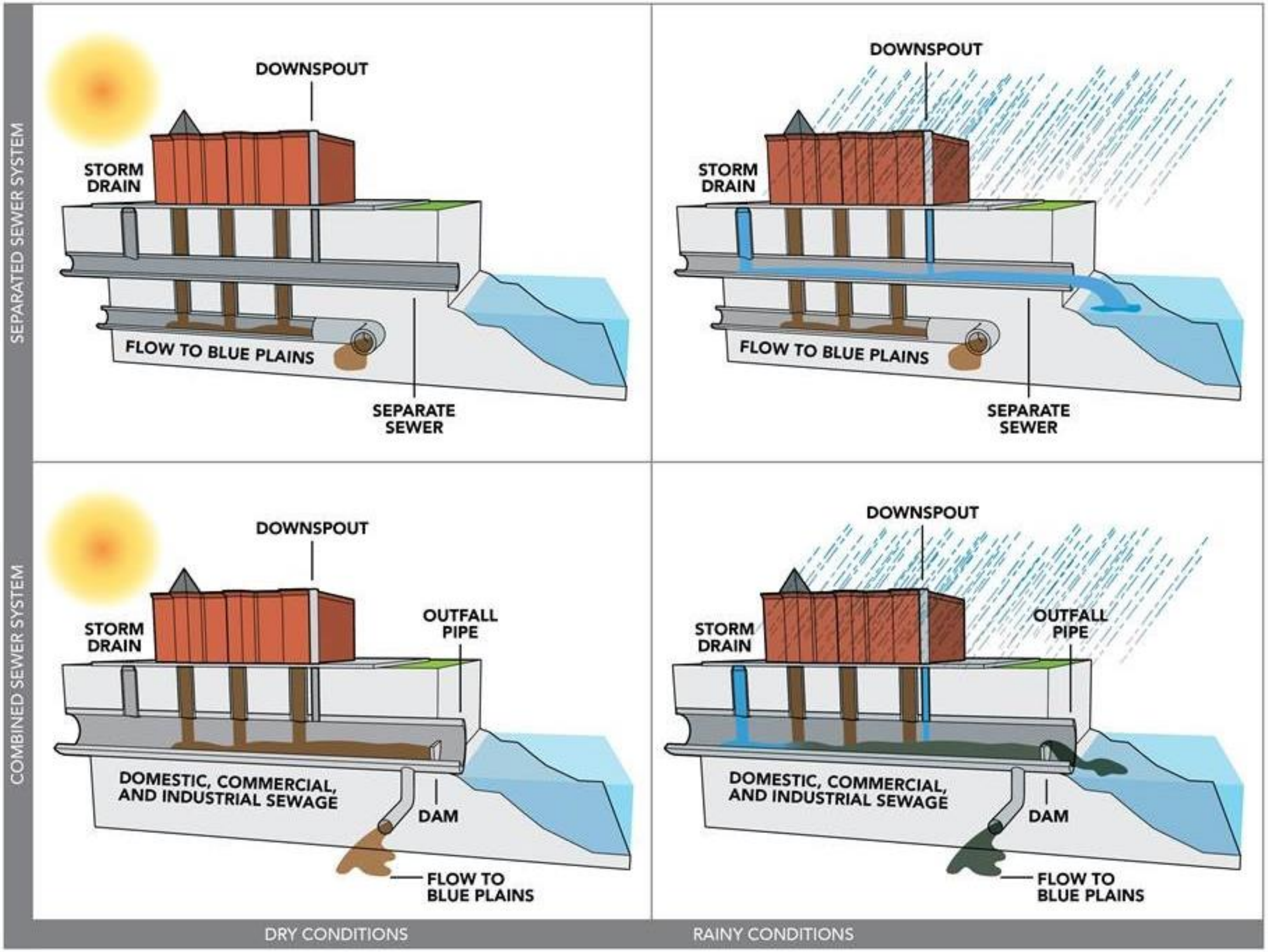
# *DC Clean Rivers Project*
# *Kansas Avenue Green Infrastructure Parks*

*Briefing for:*

## *NPC18*

**April 2018**

# DC Clean Rivers Project Overview:
## Sewer Systems in DC






*Discharge occurs when pipe’s capacity is exceeded

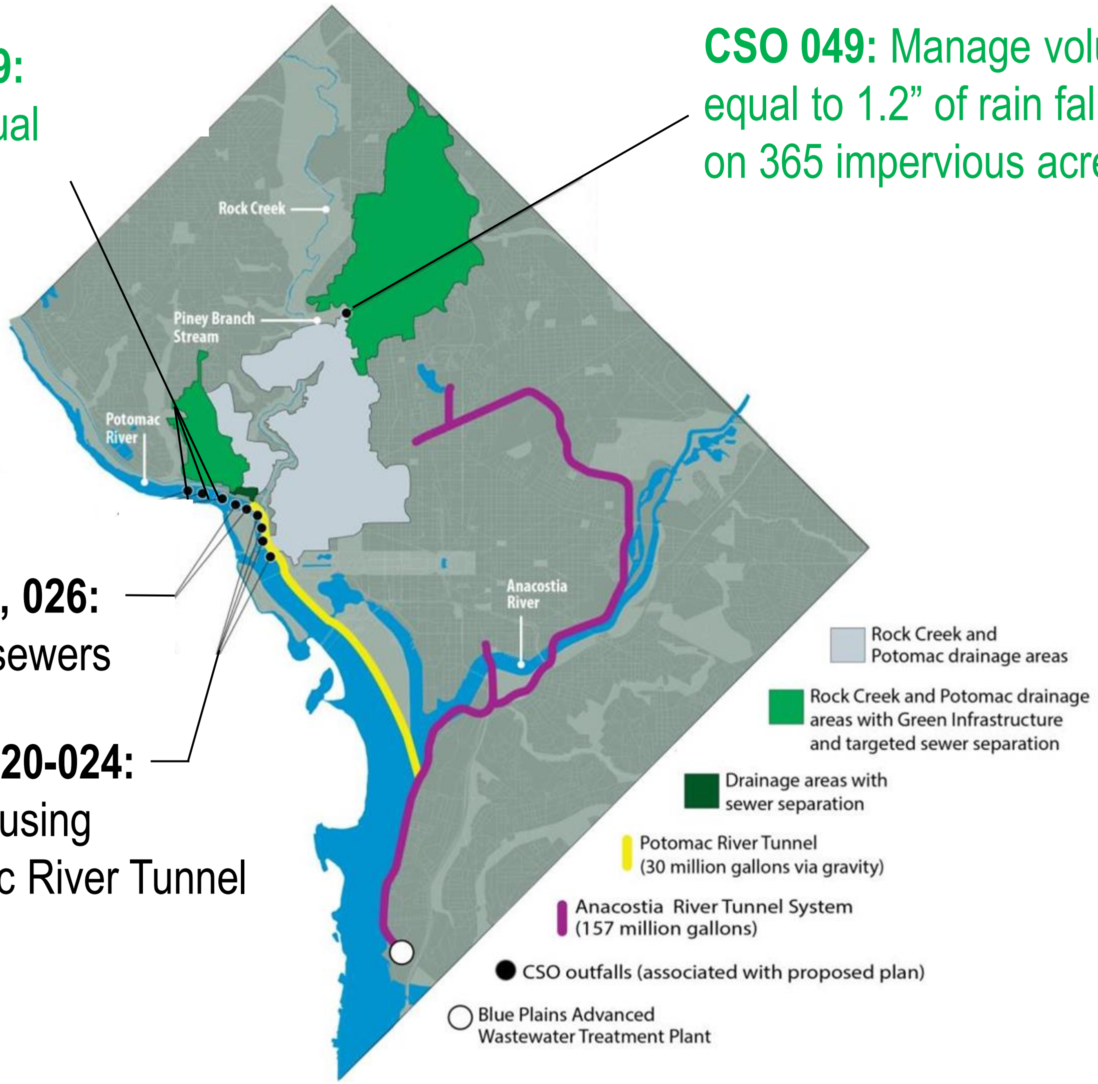
# DC Clean Rivers Project Overview:
## Amended Consent Decree

**CSOs 027, 028, 029:** Manage volume equal to 1.2” of rain falling on 133 impervious acres

**CSO 049:** Manage volume equal to 1.2” of rain falling on 365 impervious acres

**CSOs 025, 026:** Separate sewers

**CSOs 020-024:** Control using Potomac River Tunnel

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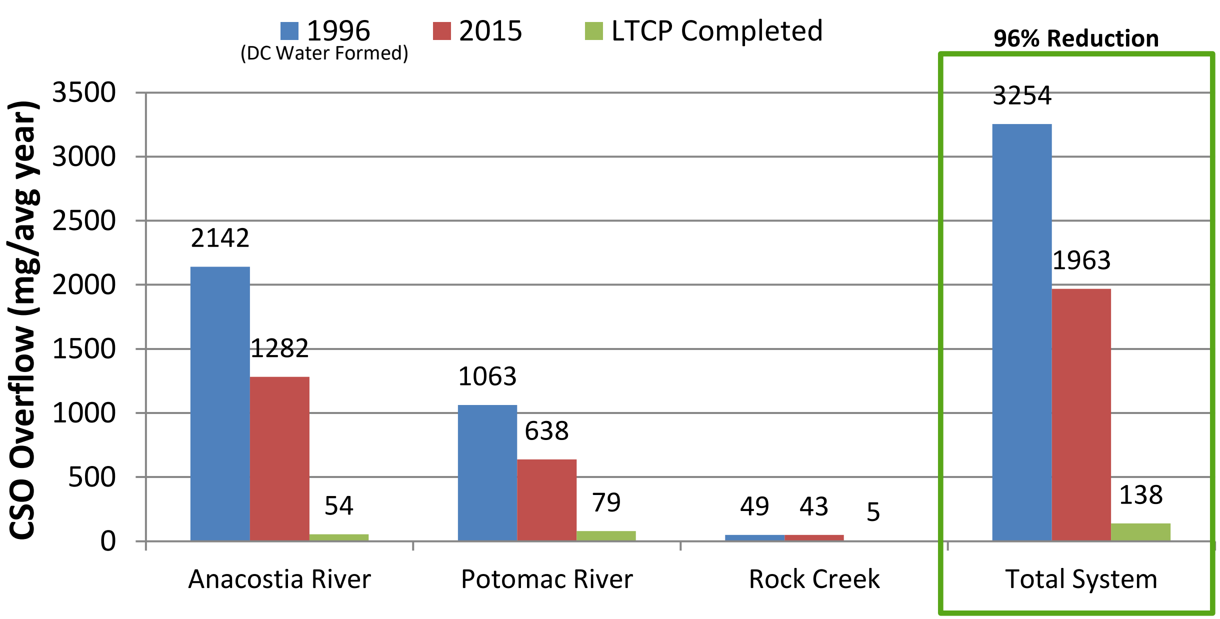
# DC Clean Rivers Project:
## Reducing Combined Sewer Overflows (CSOs)




**Predicted Progress in Controlling CSOs**

# DC Clean Rivers Project:
## Why Green Infrastructure?

- CSO benefits begin sooner for CSOs:
  - 049: Rock Creek
  - 027, 028, 029: Potomac River
- Triple Bottom Line benefits are provided beyond CSO control:
  - Social
  - Economic
  - Environmental

Pilot Green Roof Maintenance Training Program

- Green jobs are available with Green Infrastructure (GI):
  - DC Water and District MOU establishes goal of 51% of new hires to be District residents
  - GI training and certification for GI construction, maintenance and inspection
  - Opportunities for Certified Business Enterprises

# Background:
## Green Infrastructure Challenge Goals

- Launched in 2013
- Challenge Goals
  - Proposing practical and implementable solutions that can be constructed
  - Demonstrating performance in capturing stormwater runoff volume
  - Retrofitting the urban environment and utilizing stormwater as a site amenity
  - Advancing innovative technologies
  - Demonstrating cost effective solutions



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# Background:
# Green Infrastructure Challenge Summary

- Seven Teams Shortlisted
- CH2M HILL Selected for Final Design and Construction
- Project Area:
  - **Kansas Avenue Green Infrastructure Parks Project :**
    - Designs for 2 GI Parks
    - Convert grassed traffic medians into multi-benefit parks
- Parks Project to be built under the Rock Creek Project A contract, the first GI contract in the Rock Creek Sewershed

The Green Infrastructure Design Challenge resulted in the Kansas Avenue Green Infrastructure Parks Project

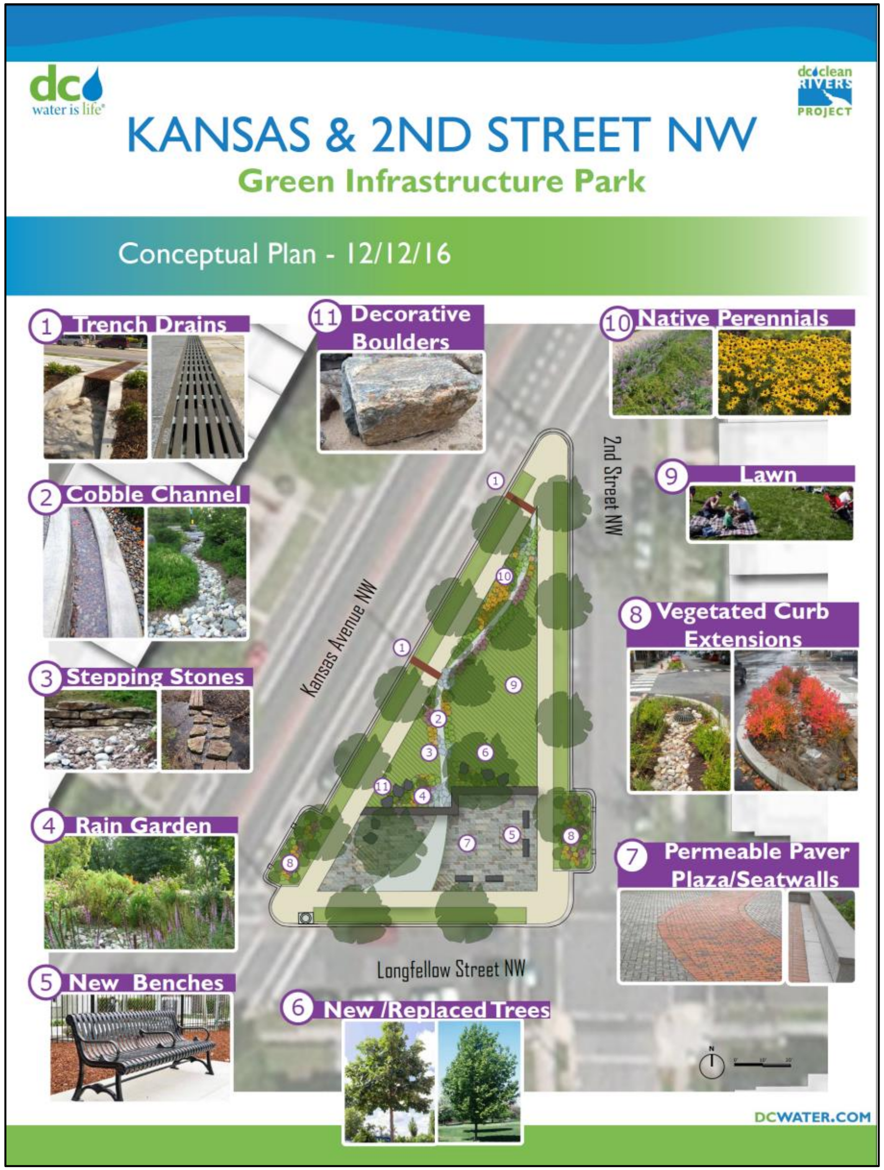

# Background:
## Kansas Avenue Green Infrastructure Parks Project

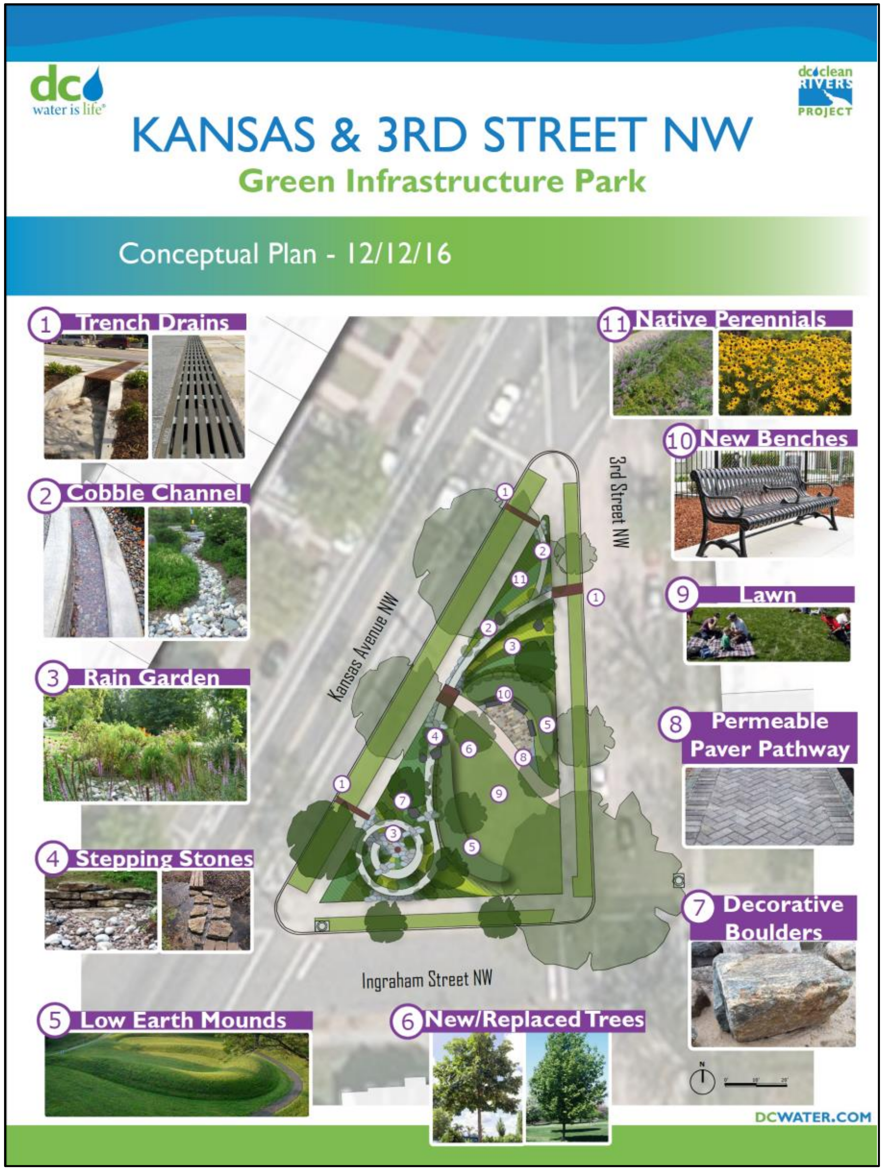
**Kansas Avenue Green Infrastructure Parks Project:**

- Kansas and 2nd Park:
  - Approx 150’ L x 90’ W. Bounded by Ingraham Street NW, Kansas Avenue NW, and 3rd Street NW
  - Brightwood Park Neighborhood
  - Existing Site Conditions:
    - Mix of shade and ornamental trees
    - Sidewalks on all sides
    - Adjacent to Washington Latin Public Charter School
    - Surrounded by row houses
- Kansas and 3rd Park:
  - Approx 170’ L x 90’ W. Bounded By Longfellow Street NW, Kansas Avenue NW, and 2nd Street NW
  - Brightwood Park Neighborhood
  - Existing Site Conditions:
    - Small, recently planted trees and turf
    - Sidewalks on all sides
    - Adjacent to Fort Slocum Park
    - Surrounded by row houses


Note: The Kansas Avenue Green Infrastructure Parks Project will serve as a pilot for potential future GI parks application throughout the Rock Creek Sewershed. No GI parks are planned for the Potomac River Sewershed at this time.

# Initial Concept Plans



# Final Concept Plans

# Final Concept Plans

KANSAS AVENUE GREEN INFRASTRUCTURE PARKS PROJECT

**KANSAS AND SECOND STREET N.W.**

EXISTING

PROPOSED

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# Final Concept Plans

# Final Concept Plans

KANSAS AVENUE GREEN INFRASTRUCTURE PARKS PROJECT

**KANSAS AND THIRD STREET N.W.**

EXISTING

PROPOSED

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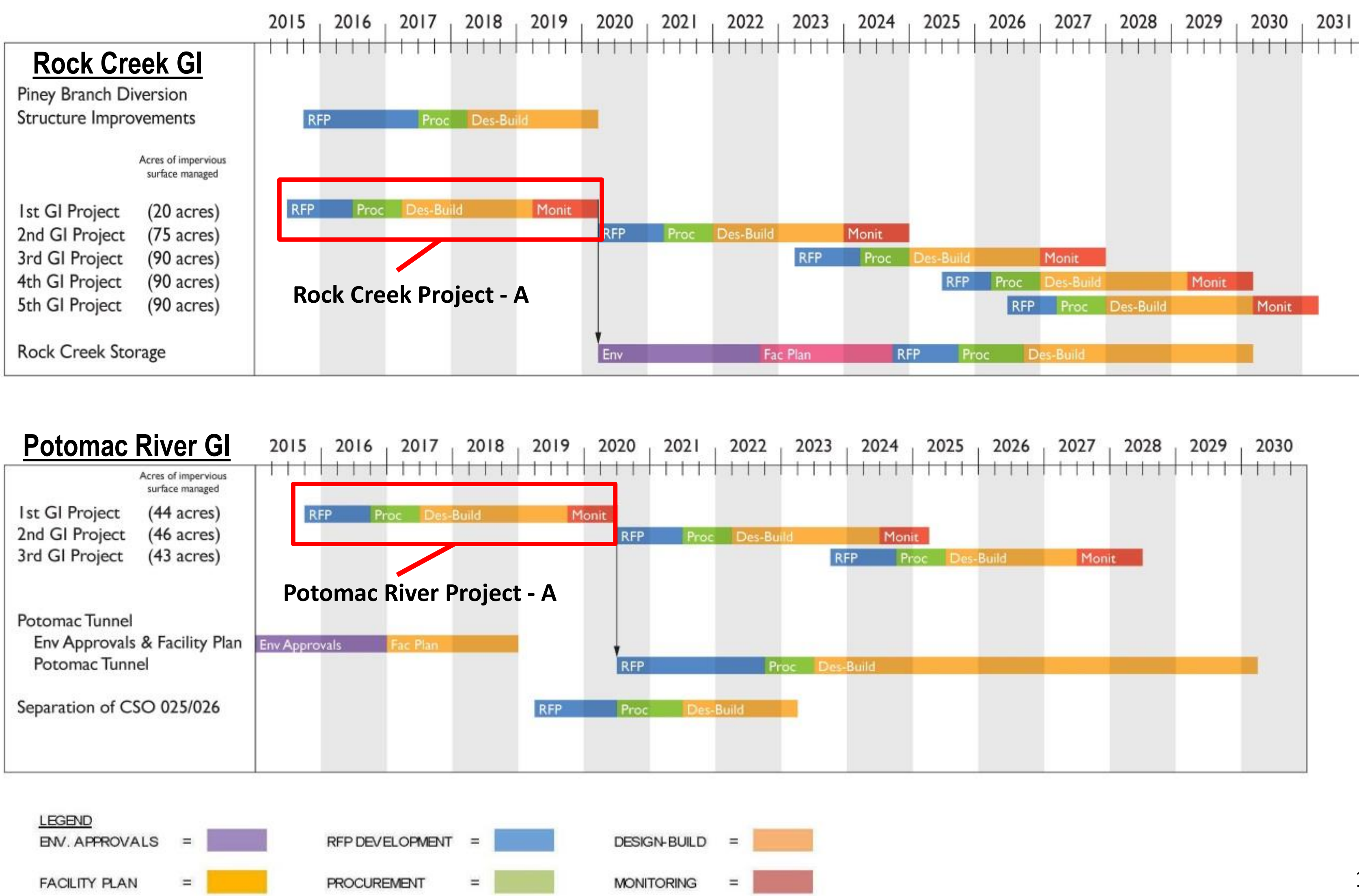
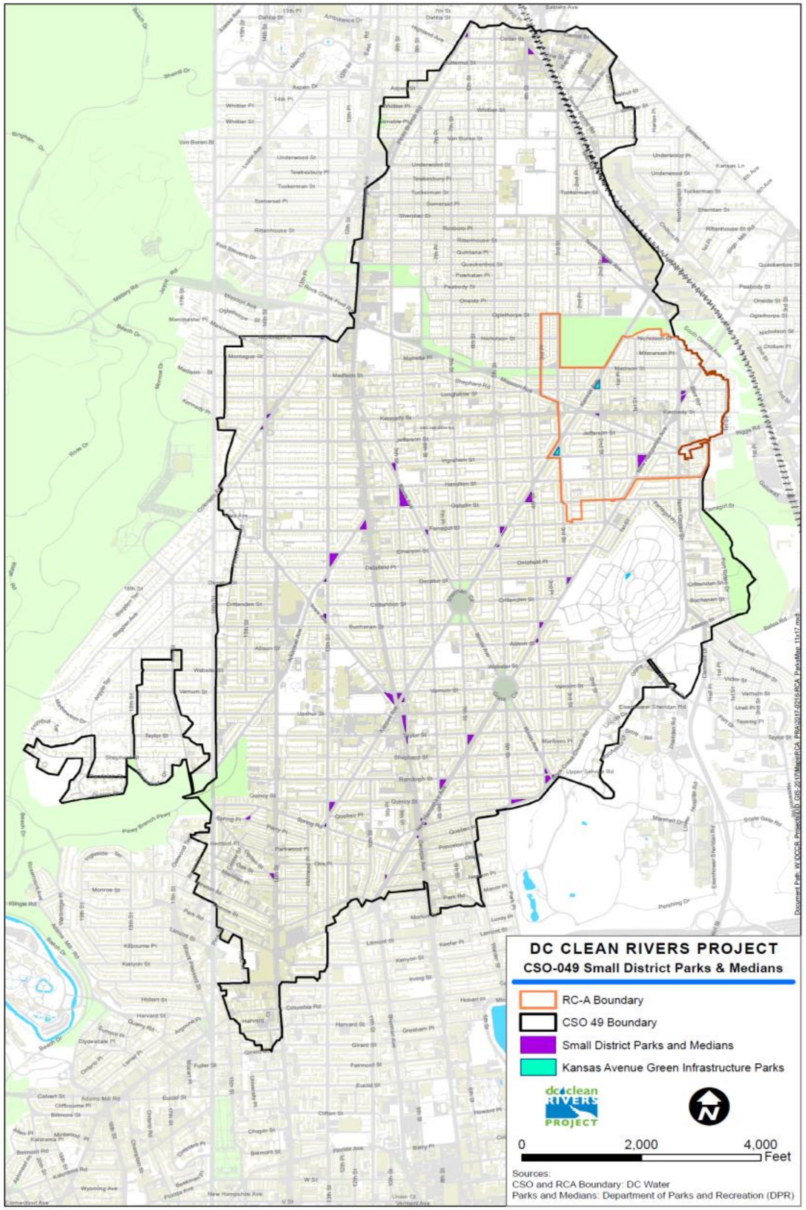
# DC Clean Rivers Project:
## Green Infrastructure Implementation Schedule



# Next Steps:

**<u>Future Rock Creek Green Infrastructure Park Opportunities:</u>**

- Approximately 45 additional small parks and medians in the Rock Creek Sewershed with GI potential.
- The current submittal to the U.S. Commission of Fine Arts introduces the option for a Master Plan approach.
- DC Water is considering various procurement mechanisms for Park implementation under future phases of the Program.



# Questions?

**Seth Charde, PLA, LEED AP**
Program Manager – Green Infrastructure Construction
DC Water
Seth.Charde@dcwater.com

http://www.dcwater.com/Green


# Appendix D

# Sewer Separation in the CSO 029 Sewershed within the Hillandale Neighborhood and Georgetown University Campus

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# MEMORANDUM

May 7, 2020

**TO:** Carlton Ray
Vice President, Clean Rivers

**CC:** Seth Charde
Senior Advisor, Green Infrastructure

**FROM:** John Cassidy, Program Consultant Organization
Ramakrishna Jeedigunta, Program Consultant Organization

**SUBJECT:** Documentation of Sewer Separation in the CSO 029 Sewershed within the Hillandale Neighborhood and Georgetown University Campus

Background and Purpose

In 2016, the Long Term Control Plan Consent Decree was modified to allow for evaluation of Green Infrastructure (GI) as a control measure in lieu of the tunnels (gray infrastructure) for CSOs 027, 028 and 029 on the Potomac River, and CSO 049 on Rock Creek. The Consent Decree required the implementation of the first GI projects in the Potomac River and Rock Creek sewersheds as demonstration projects, followed by post construction monitoring to evaluate the efficacy, constructability, operability, public acceptability, and cost of GI. If GI were determined to be practicable, DC Water would continue to implement the remainder of the GI in those sewersheds to control CSOs. If GI were determined to be impracticable, DC Water would construct gray infrastructure to control those CSOs. DC Water is required to make the practicability determination and it is subject to EPA approval.

By 2019, per the Consent Decree, DC Water must have completed design and construction of the first two green infrastructure projects. The first project in the Potomac River sewershed must manage a total of 44 equivalent impervious acres. The Decree allows the use of GI, including targeted sewer separation. DC Water has used a combination of the following projects to meet this requirement:

- A series of sewer separation projects, completed on the Georgetown University (GU) Campus between 1960 and the early 2000s, divert stormwater to a 96-inch combined sewer overflow pipe built through campus (96-inch GU overflow sewer) and discharge to the Potomac River via CSO 029. All sanitary flows were routed to a new 21-inch sanitary sewer line on campus (21-inch GU sanitary sewer), which flows into the Upper Potomac Interceptor Relief Sewer (UPIRS).

These sewer separation projects divert stormwater to the Potomac River from approximately 41.8 acres of impervious surface and 32.3 acres of pervious surface, or an equivalent impervious area of 47.8 acres.

- Demolition of the masonry dam and elimination of the dry weather diversion pipe at Structure 46 located near Canal Road NW has been completed, allowing stormwater from the 72-inch College Pond sewer to discharge to the Potomac River via CSO 029 outfall. As part of the sewer separation projects on the GU campus, the 72-inch College Pond sewer has been abandoned, which used to act as the main combined sewer for the Georgetown campus and surrounding area to the north.
- The Hillandale neighborhood was redeveloped in 1980s. As part of that redevelopment, infrastructure was constructed to serve that development. However, it was unclear on the extent to which the separate sanitary and storm sewers were constructed in public and private space. Hence this area was assumed to be combined as part of CSO model development in 1999. The recent investigations which included flow monitoring and bacteria sampling were performed to ascertain the configuration of the sewers in this area. These investigations resulted in determining that stormwater from this neighborhood is routed through several stormwater ponds on site and through separated storm sewers before exiting the Hillandale complex at 39th St. NW and Reservoir Rd. NW via a 33-inch storm sewer. The 33-inch storm sewer then connects to a 48-inch storm sewer along Reservoir Rd. NW, which then connects to the 96-inch GU overflow sewer near Structure 47, allowing for direct discharge of Hillandale stormwater to the Potomac River via CSO 029. All Hillandale sanitary flows exit the neighborhood via an 18-inch sanitary sewer which connects to the 21-inch GU sanitary sewer, ensuring all sanitary flows from Hillandale are sent to the Blue Plains Advanced Wastewater Treatment Plant (BPAWWTP). This project manages stormwater from approximately 14.8 impervious acres and 22.8 pervious acres, or an equivalent impervious area of 19.8 acres.

In total, these projects manage 67.5 equivalent impervious acres (Table 1).

**Table 1: Approximate Acreage in Separated Areas**

| Area | Total Acres[1] | Impervious Acres | Pervious Acres | Total Equivalent Impervious Acres[2] |
|---|---|---|---|---|
| Georgetown | 74.10 | 41.77 | 32.33 | 47.76 |
| Hillandale | 37.60 | 14.79 | 22.81 | 19.75 |
| **Total** | **111.70** | **56.56** | **55.14** | **67.5** |

[1] Total Acres = Impervious Acres + Pervious Acres

[2] Total Equivalent Impervious Acres = Impervious Acres*0.95 + Pervious Acres*0.25. 0.95 and 0.25 are the DCCR program-wide runoff coefficients for impervious and pervious areas respectively.

During development of the baseline CSO model in 1999, both the Hillandale and Georgetown University areas were assumed to be combined sewer areas which contributed to CSOs at CSO 029. DC Water has performed a robust array of investigations to verify that these areas are in fact separated. The purpose of this memorandum is to document the methodology, results and conclusions of these investigations. Attachment A shows a map of the separated areas in Hillandale and Georgetown, Sewer

Structures 46 and 47, CSO 029, the main trunk sewers on Georgetown's campus (the abandoned 72-inch College Pond sewer, the 96-inch GU overflow sewer and the 21-inch GU sanitary sewer), and the sampling/monitoring locations from this investigation. All the sewers identified above can be seen in Figure 1.

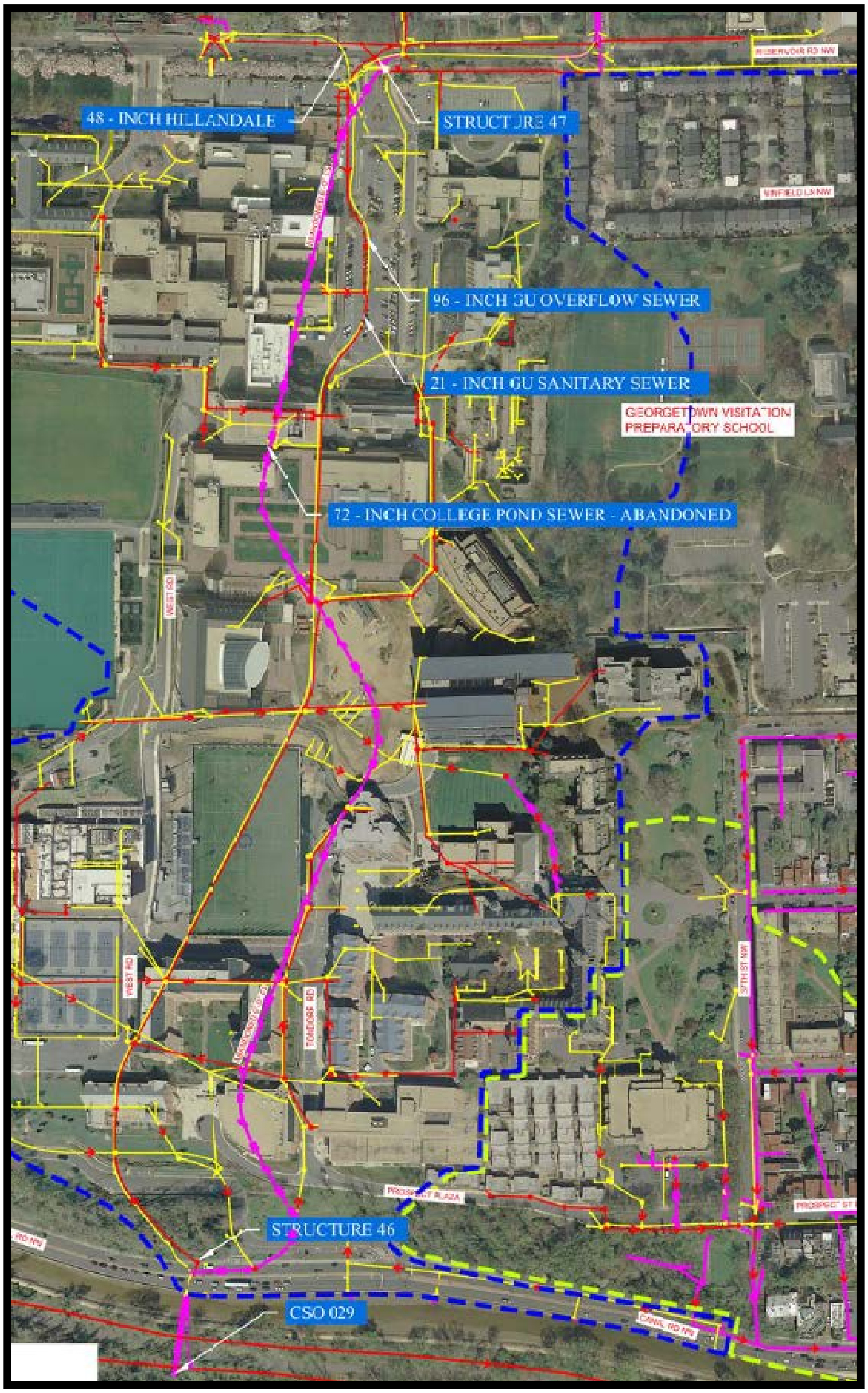



**Figure 1: Georgetown University - Sewers**

Methodology and Results

1. GU Campus Sewer Separation

A letter dated February 13, 2013 from Georgetown University Office of Planning and Facilities Management indicated that the GU campus was separated in early 2000 (included in Attachment B).

- Georgetown Records Review

  To confirm the sewer separation, a review of the record drawings dating back to the 1900s was performed. The maps and documents show a transition on Georgetown's campus from combined sewer system to a separated sewer system. Earlier maps show plans and construction of the 72-inch College Pond combined sewer which runs through the campus and discharged to the Potomac River. Transition to a separated sewer system began in the 1960s. The 72-inch College Pond sewer was first slated for abandonment in 1963, when bulkheads were constructed at the northern end of the sewer pipe to disconnect it from the public sewer system at Sewer Structure 47 near Reservoir Road NW. In lieu of the 72-inch College Pond combined sewer, a separate storm and sewer system was proposed and constructed. The 96-inch GU overflow sewer and adjacent 21-inch GU sanitary sewer were first planned and constructed in the 1960s. Since then, Georgetown University has conducted several projects to reconnect buildings and the drainage system to these new sewers, while systematically disconnecting buildings from the much older 72-inch College Pond sewer. Upon sewer separation on the campus, the 96-inch GU overflow sewer discharges directly to the Potomac River via CSO 029 outfall. All sanitary flow in the 21-inch GU sanitary sewer is conveyed to UPIRS near Sewer Structure 46, ultimately leading to the BPAWWTP.

  During the final stages of the sewer separation on the GU campus, dye testing of the building connections was conducted in 2000. The dye tests were conducted by dropping dye in sanitary sewers leading from the buildings and observing the 72-inch College Pond sewer for traces.

  Review of the 96-inch GU overflow sewer CCTV inspections was also performed. Dry weather flows were observed in various portions of the sewer which suggested a need for further investigations such as flow monitoring and sampling activities.

- Georgetown Flow Monitoring

  Flow monitors were installed at Structure 47 and Structure 46 to verify the functionality of the 96-inch GU overflow sewer, the 21-inch GU sanitary sewer and the abandoned 72-inch College Pond Sewer.

  The 96-inch GU overflow sewer was monitored from December 2014 to November 2015. Meter M-25-US was located upstream of the bottom slot located at Sewer Structure 47, while meter M-25-DS was located downstream of the diversion weir. The flow data collected at M-25-US showed dry weather flow and major spikes during wet weather indicating that the 96-inch GU overflow sewer is a combined sewer. The flow data collected at M-25-DS showed flow only during wet weather indicating that all dry weather flow was diverted to the 21-inch GU sewer at

Sewer Structure 47 as designed, and that the 96-inch GU overflow sewer does act as an overflow sewer during wet weather events.

Meter M-24 was installed on the 21-inch GU sanitary sewer near Structure 46 to verify that this sewer carries sanitary flows only. Flow data collected from December 2014 to November 2015 showed clear diurnal patterns with minor spikes during rain events indicating that this sewer is mostly sanitary with minor intrusion of stormwater inflows. The relatively minor and consistent spikes during rain events point to stormwater infiltration rather than direct storm connections.

Lastly, to verify that the 72-inch College Pond sewer was abandoned, meter M-31 was installed on the 72-inch College Pond sewer just upstream of the diversion weir located at Sewer Structure 46. Monitoring occurred from April 8, 2015 to June 30, 2015. No flow was detected by the meter during dry weather; however, flow was detected during wet weather, supporting the idea that the line does not contain sanitary inflows but does experience stormwater inflows. Those stormwater inflows were typically minimal, peaking at about 13.5 cfs in during one storm in May 2015, leading DC Water to believe the stormwater inflows were a result of infiltration due to the sewer age rather than direct storm connections.

Overall, the flow monitoring in Georgetown suggest the 72-inch College Pond sewer is effectively abandoned, that the 21-inch GU sewer is sanitary, and the 96-inch GU sewer is a combined overflow sewer.

- Georgetown Water Quality Sampling

  Dry weather grab samples from the locations in Table 2 were analyzed for bacteria (*E. coli*).

**Table 2: Georgetown Water Quality Sampling Results**

| Area | Location | Date | *E. coli* Count (MPN/100ml) |
|---|---|---|---|
| 84-inch GU Overflow Sewer (upstream of this test site, the diameter is 96-inch) | Canal Rd. NW, upstream of Sewer Structure 46 | 7/2/14 | 146 |
| 72-inch College Pond Sewer | Canal Rd. NW upstream of Sewer Structure 46. Discharge pipe with small amount of dry weather flow. | 7/7/15 | <2 |

While *E. coli* counts range for different wastewater and stormwater sources, a 2009 study by WERF showed a mean *E. coli* concentration of $3.04x10^5$ MPN/100ml in raw wastewater. A 2007 Washington State Department of Ecology report showed stormwater from residential areas having an average *E. coli* concentration of $1.78x10^3$ MPN/100ml. Similarly, the National Stormwater Quality Database indicates a median stormwater concentration of $1.75x10^3$ MPN/100ml.

Based on these results, it is evident that the 96-inch GU overflow sewer carries combined sewage only during wet weather and any dry weather flow observed in the CCTV videos of this sewer is due to infiltration. The bacteria results confirm that the 72-inch College Pond sewer carries only stormwater resulting from infiltration.

The documentation related to flow monitoring (meter location maps, flow data and hydrographs) and sampling (sampling locations, lab results and chain of custody forms) are included in Attachment C.

2. Georgetown CSO 028 and 029 Drainage Study

A drainage study was conducted on the Georgetown University campus to better define the boundary between CSO 028 and CSO 029, allowing for a more accurate measurement of the number of pervious and impervious acres managed by the separated sewer system within CSO 029.

The drainage study included:

- A field visit on November 7, 2014 to verify the presence of inlets and drainage patterns near Ryan Hall and Village A and to visually inspect the topography in the open space between Copley Hall and 37th St NW,
- Analysis of a 2-foot contour map to generate a CSO 028 drainage map, and
- A drawing analysis to evaluate the drainage infrastructure near Ryan Hall, Maguire Hall, and Village A.

A drainage boundary map depicting the CSO 028 and CSO 029 drainage areas is included in Attachment D**.**

3. Hillandale Sewer Separation

- Hillandale Records Review

  Review of the record drawings was performed. Stormwater ponds and sewers on site date back to approximately 1980. A review of DC Water sewer maps confirms the 33-inch storm sewer connects to the 96-inch GU overflow sewer via a 48-inch storm sewer along Reservoir Rd. NW. The 18-inch sanitary line from the Hillandale complex connects to the 21-inch GU sanitary sewer near Sewer Structure 47. The 48-inch storm sewer connects downstream of the Structure 47 Diversion Structure. All the sewers identified here can be seen in Figure 2.

- Hillandale Flow Monitoring and Dye Testing

  Flow monitors were installed from April 8, 2015 to May 31, 2015 to verify the sewer separation. The flow meter M-32 was installed at Reservoir Rd. NW and 39th St. NW in the 33-inch Hillandale storm sewer.

Continuous flow was observed at this meter, with significant peaks during storm events and some volume spikes and dips during dry weather. No diurnal patterns typical of sanitary flow were observed. To further investigate the dry weather flow, dye testing and a visual field inspection were conducted on May 19, 2015 in the storm system. Dye was introduced at a sanitary manhole upstream in Hillandale, and downstream sanitary and storm sewers were observed for traces. Dye traces were found at the downstream sanitary observation point, however, no dye or other signs of sanitary discharges were found in the storm sewers. It was therefore concluded that the baseline flow is likely due to subsurface infiltration and potential leakage or overflows from Hillandale's stormwater ponds. This, combined with the fact that monitored storm sewer flow patterns matched rainfall patterns, indicated that all sewers upstream of the monitoring location were strictly storm sewers in the Hillandale area.

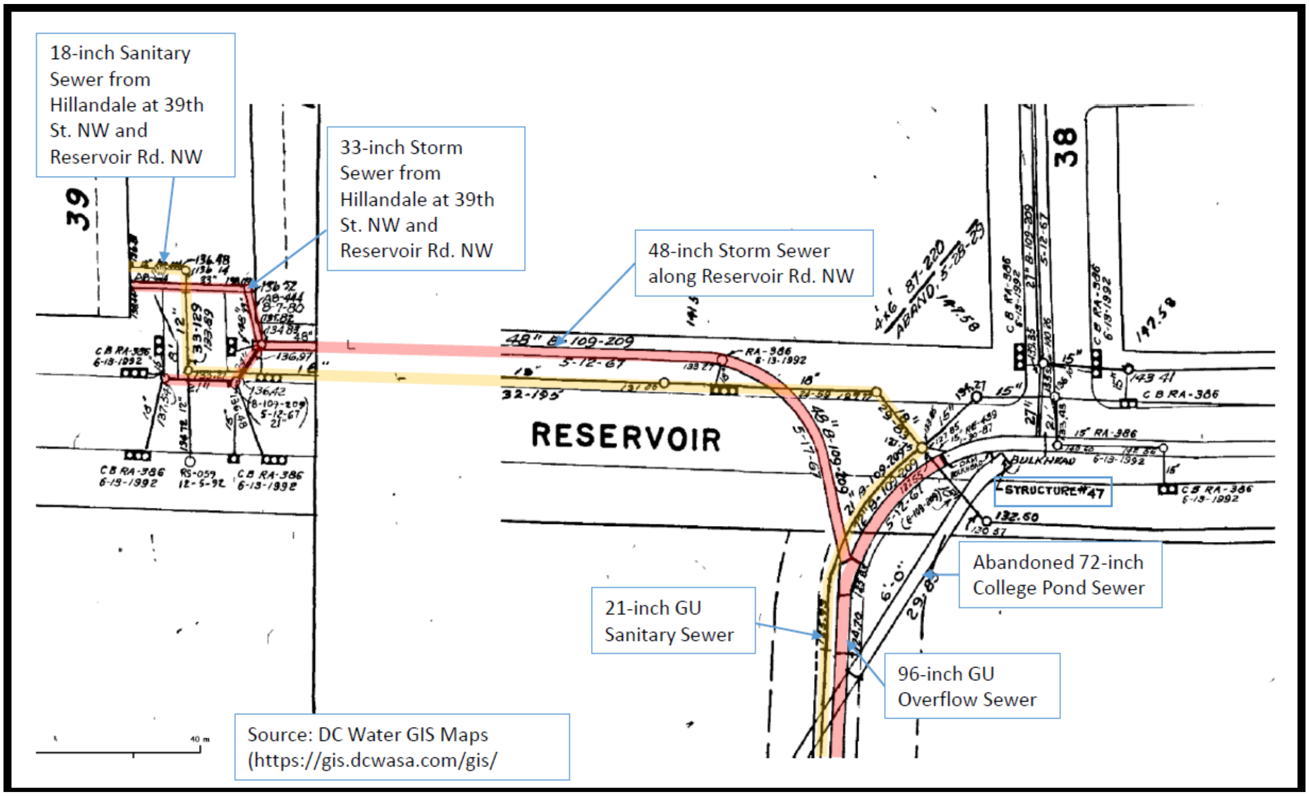



**Figure 2: Hillandale - Sewers**

- Hillandale Water Quality Sampling

  Dry weather grab samples were collected from 33-inch and 48-inch storm sewers downstream of the Hillandale complex and analyzed for bacteria (*E. coli*). Table 3 lists the results of these tests.

**Table 3: Hillandale Water Quality Sampling Results**

| Area | Location | Date | *E. coli* Count (MPN/100ml) |
|---|---|---|---|
| 33-inch Storm Sewer | 39th St and Reservoir Rd. NW | 6/18/15 | 7,900 |
| 48-inch Storm Sewer | 38th St and Reservoir Rd. NW | 7/2/14 | 2,420 |

Per the typical *E. coli* limits stated in Section 1 of Methodology and Results, the bacteria results tabulated above confirm that the 33-inch and 48-inch storm sewers from Hillandale only convey stormwater.

The documentation related to flow monitoring (location maps, flow data, hydrographs), dye testing location map and sampling (locations, test results and chain of custody forms) are included in Attachment E.

Conclusions

All records review, flow monitoring analysis and bacteria testing performed during the investigations detailed in this memo support that both the Hillandale and Georgetown University areas are separately sewered. With the modification to the sewer structure 46 located near Canal Road and the work done to confirm the separation in Hillandale, the number of impervious acres discharging to the combined sewer system and contributing to CSOs at CSO 029 will have been reduced by 67.5 acres which exceeds the Consent Decree requirement to manage 44 equivalent impervious acres in the Potomac River sewershed.

References

Maestre, Alex and Robert Pitt. "The National Stormwater Quality Database, Version 1.1: A Compilation and Analysis of NPDES Stormwater Monitoring Information." Department of Civil and Environmental Engineering, University of Alabama. Sept 2005. Table 3. http://rpitt.eng.ua.edu/Publications/Stormwater%20Characteristics/NSQD%20EPA.pdf

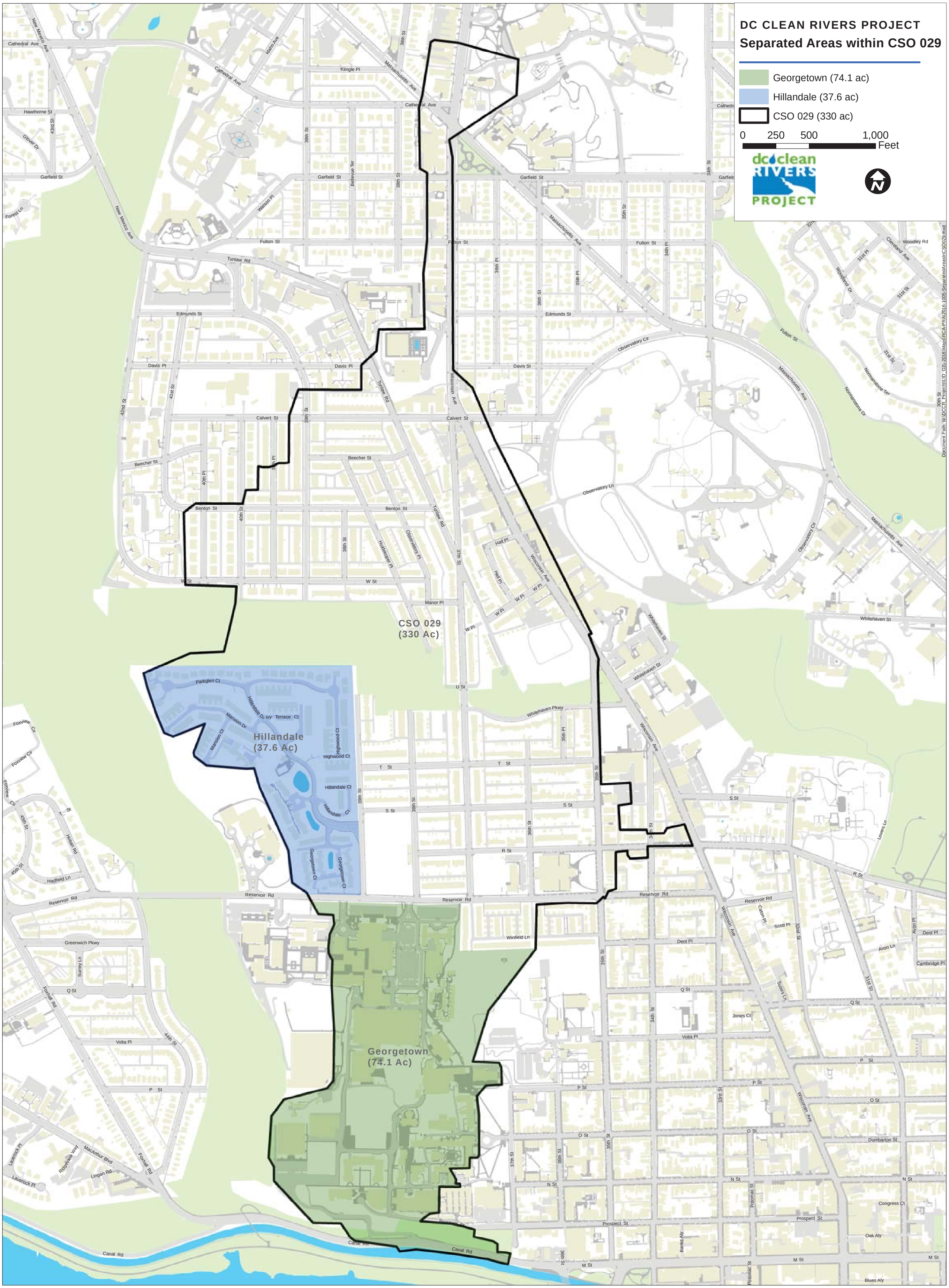
Water Environment Research Foundation. "Influent Constituent Characteristics of the Modern Water Stream from Single Sources." 2009. http://www.ndwrcdp.org/documents/04-DEC-1/04DEC01web.pdf

Enclosures:

Attachment A – CSO 029 Sewer Separation Map
Attachment B – Georgetown University Letter Confirming Separation on GU Campus
Attachment C – Georgetown University – Flow Metering and Water Quality Sampling Documentation
Attachment D – CSO 028 & 029 Drainage Boundary
Attachment E – Hillandale: Flow Monitoring, Dye Testing & Water Quality Sampling Documentation

# Attachment A

## CSO 029 Sewer Separation Map


DC CLEAN RIVERS PROJECT
Separated Areas within CSO 029
Georgetown (74.1 ac)
Hillandale (37.6 ac)
CSO 029 (330 ac)
0 250 500 1,000
Feet
dc clean RIVERS PROJECT
CSO 029
(330 Ac)
Hillandale
(37.6 Ac)
Georgetown
(74.1 Ac)

# Attachment B

## Georgetown University Letter Confirming Separation in GU Campus

*Georgetown University*

*Vice President for Planning and Facilities Management*

February 13, 2013

Ray Hyland
DC Clean Rivers Project
District of Columbia Water and Sewer Authority
5000 Overlook Avenue, SW
Washington, DC 20032
(202) 787-4259

Subject: Information Request

Dear Mr. Hyland,

Thank you for your interest in working with Georgetown University regarding sustainable storm water management in the District of Columbia. We recognize and support the importance of this topic to our local region and look forward to exploring how the University might help support these goals.

In response to your recent request for information regarding sewer trunk lines within the University boundaries, I offer the information below:

Our records indicate that the 72" combined sanitary and storm sewer (CSS) you referenced in your email is not currently in use. Instead, our records show that two separated lines – including one 96" storm sewer and one 21" sanitary sewer – are the only active trunk lines within the campus boundaries at this time.

The now-abandoned, 72" CSS you referenced was capped at the north side of campus in the early 2000s. University records indicate prior connections from individual campus buildings and storm drains to the 72" CSS line that existed around the early 2000s were also identified and rerouted, now feeding into the separate storm and sanitary sewer trunks.

Should you have additional questions or if we may be of any further assistance, please don't hesitate to contact my Sustainability Officer, Audrey Stewart (ams399@georgetown.edu) or Facilities Management Director, Richard Payant (payantr@georgetown.edu) who can assist in providing access to physical on campus.

Thank you again. We look forward to meeting with you soon.

Sincerely,

Robin Morey
Vice President for Planning
and Facilities Management, Georgetown University

CC: Richard Payant, Director for Facilities Management
Audrey Stewart, Sustainability Coordinator
Regina Bleck, Assist Vice President, Planning and Project Management
Glenda Sizer, Interim Director for Safety and Environmental Management

# Attachment C

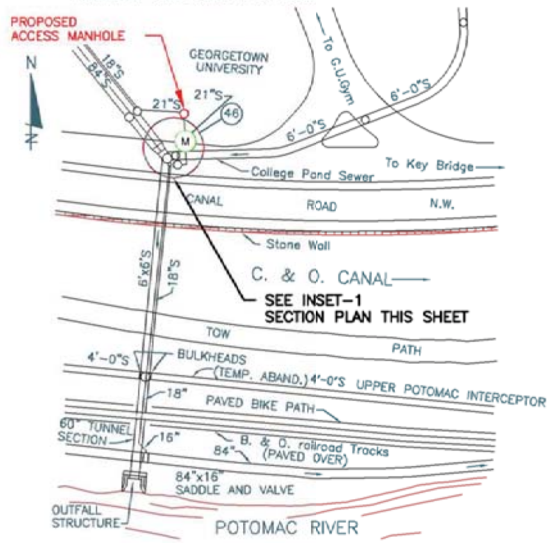
## Georgetown University – Flow Monitoring & Water Quality Sampling Documentation

1 – FLOW METER


STRUCTURE NO. 46, College Pond Sewer, Canal Road about 1,000 ft. East of Foxhall Road, N.W. This structure has a slot-type regulator. The Storm Overflow is formed by a depressed slot and a masonry dam. A 6-ft. Combined Sewer enters the Diversion Chamber, and there is a slot in the invert which collects the Dry-Weather Flow into a sump-like structure, and the flow is then conveyed through an 18-in. intercepting connection to the Upper Potomac Interceptor Relief Sewer. The Upper Potomac Interceptor is temporarily abandoned.

The 6-ft. by 6-ft. Overflow line discharges to the Potomac River.

There is an Outlet Structure and Gate at the outlet.




FLOW METER LOCATION PLAN

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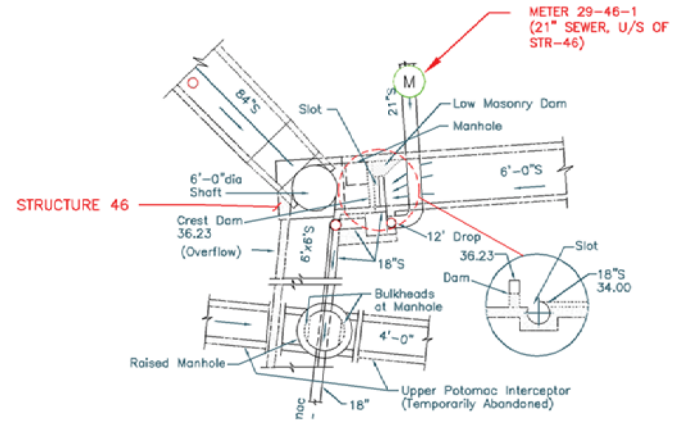
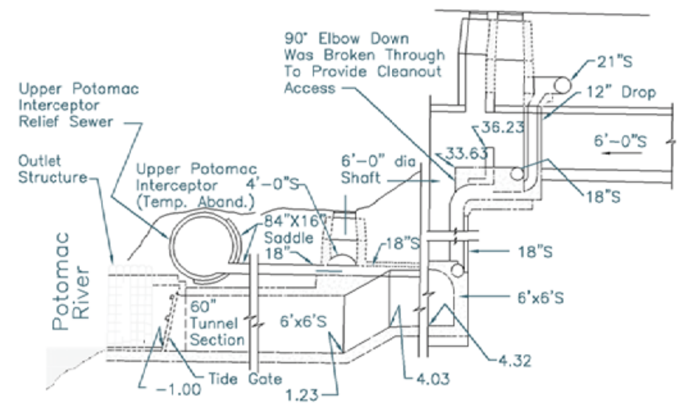



INSET-1 SECTION PLAN

SCALE NTS




CROSS SECTION A-A (PROFILE)

SCALE NTS

LEGEND

M FLOW METER LOCATION

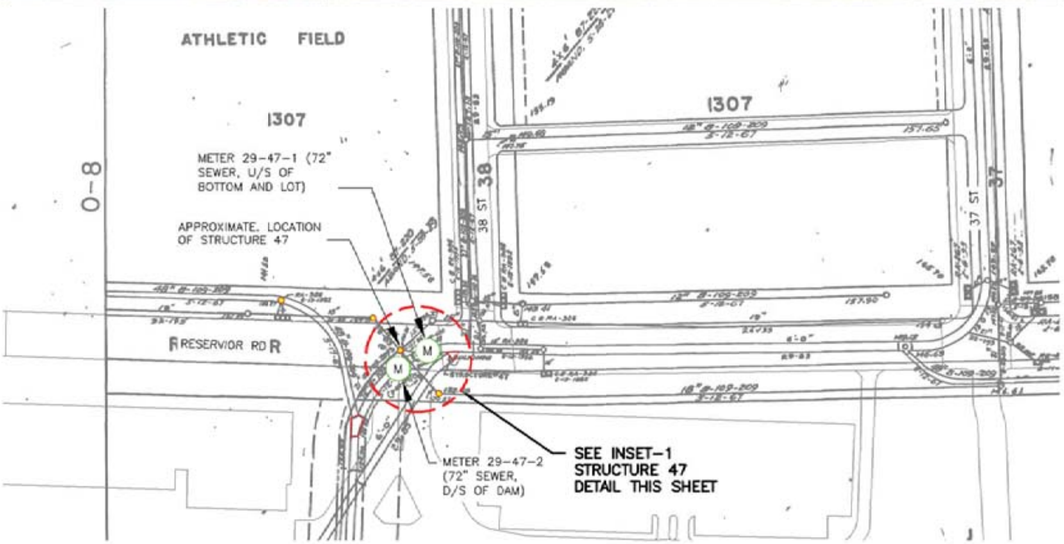
NATIONAL PARK SERVICE AREA


dc clean RIVERS PROJECT
DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY
5000 OVERLOOK AVENUE, SW
WASHINGTON, DC 20032
PHONE: 202-787-4460
FAX: 202-787-4478


DC CLEAN RIVERS PROJECT
POST CONSTRUCTION MONITORING
FLOW MONITORING MAPS
29-46-1
METER LOCATION AND TYPICAL CROSS SECTION

DATE: OCTOBER 2014 | SITE 24

2 – FLOW METERS


FLOW METER LOCATION PLAN

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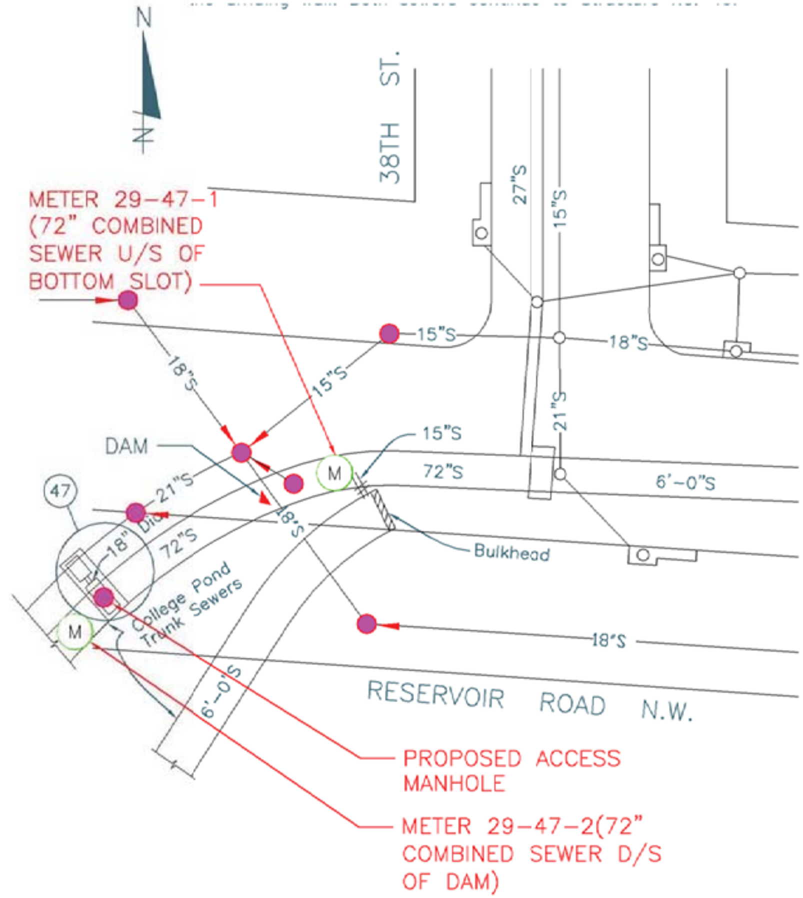



INSET-1 STRUCTURE 47 DETAIL

SCALE NTS

LEGEND

M FLOW METER LOCATION


dc clean RIVERS PROJECT

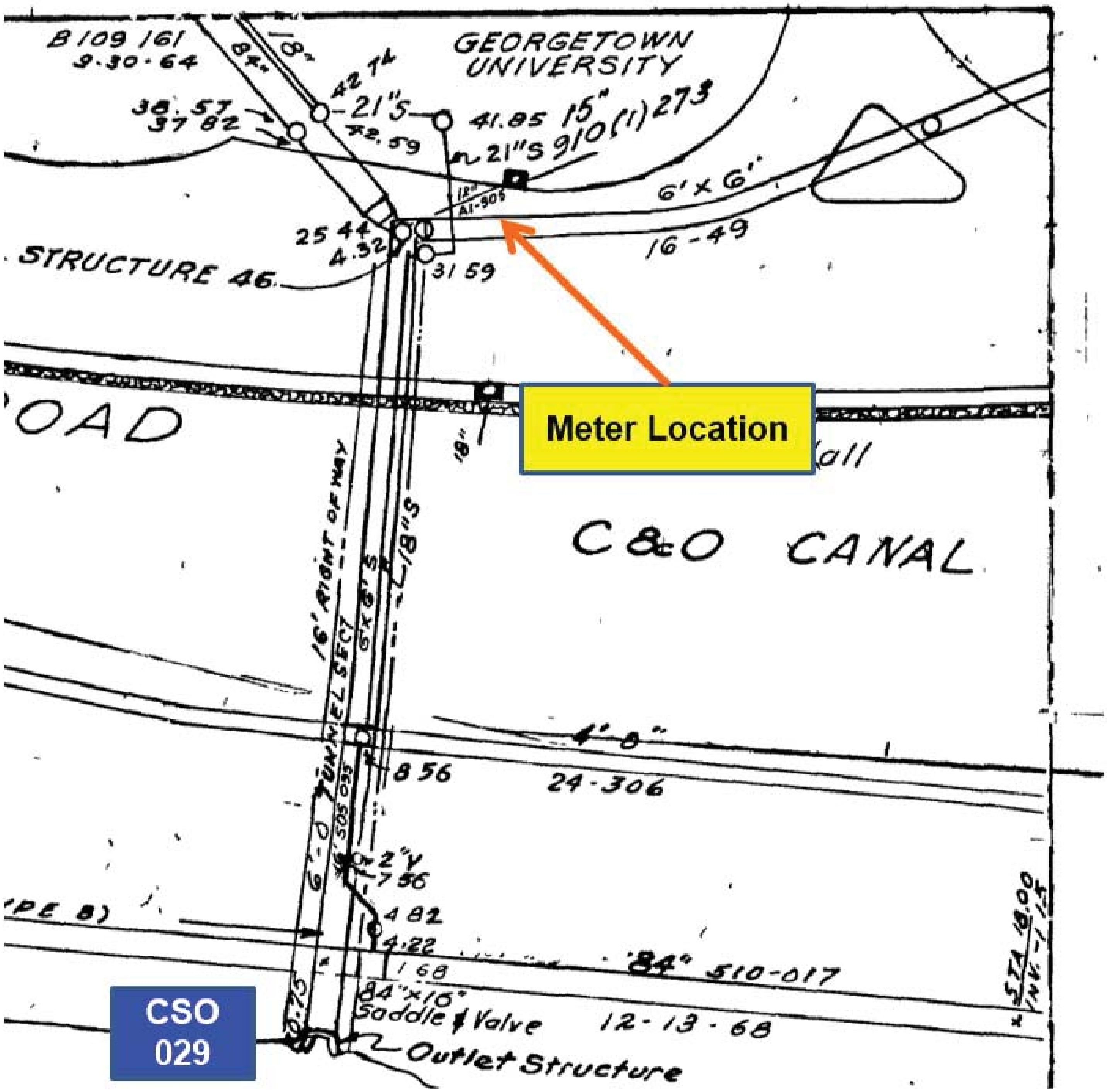
DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY
5000 OVERLOOK AVENUE, SW
WASHINGTON, DC 20032
PHONE: 202-787-4460
FAX: 202-787-4478

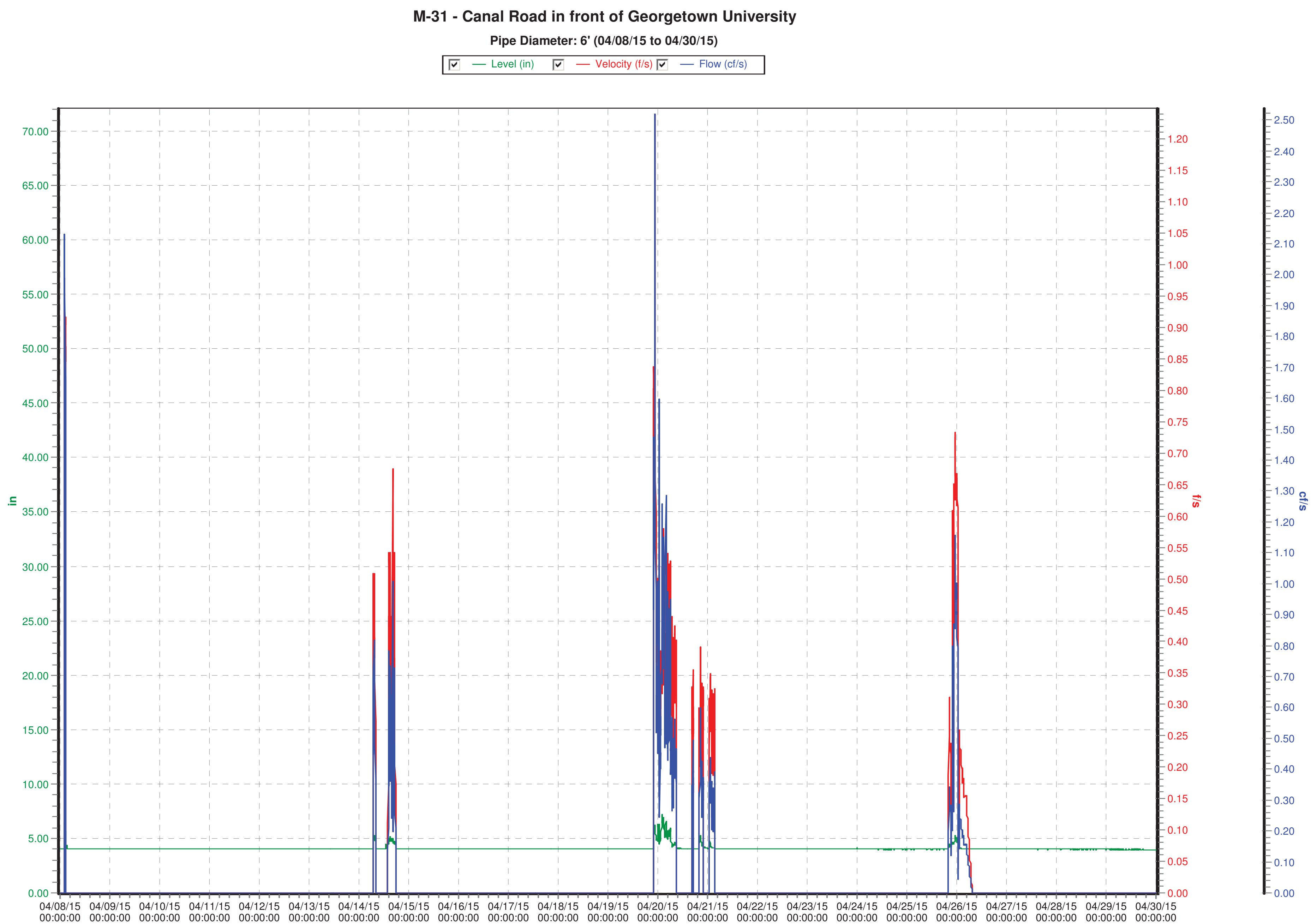

DC CLEAN RIVERS PROJECT
POST CONSTRUCTION MONITORING
FLOW MONITORING MAPS
29-47-1_2
METER LOCATION AND TYPICAL CROSS SECTION

DATE: OCTOBER 2014 | SITE 25

LAST SAVED BY: CONSTANT A. NORTEY DATE: 10/20/2014 3:10:01 PM
DRAWING ID: L:\LTCP\PCM\FLOW METER - EXHIBITS-FIGURES\25_29-47-1_2_3.DWG

# Meter-31 on College Pond Sewer (Upstream of Sewer Structure 46)





M-31 - Canal Road in front of Georgetown University
Pipe Diameter: 6' (04/08/15 to 04/30/15)
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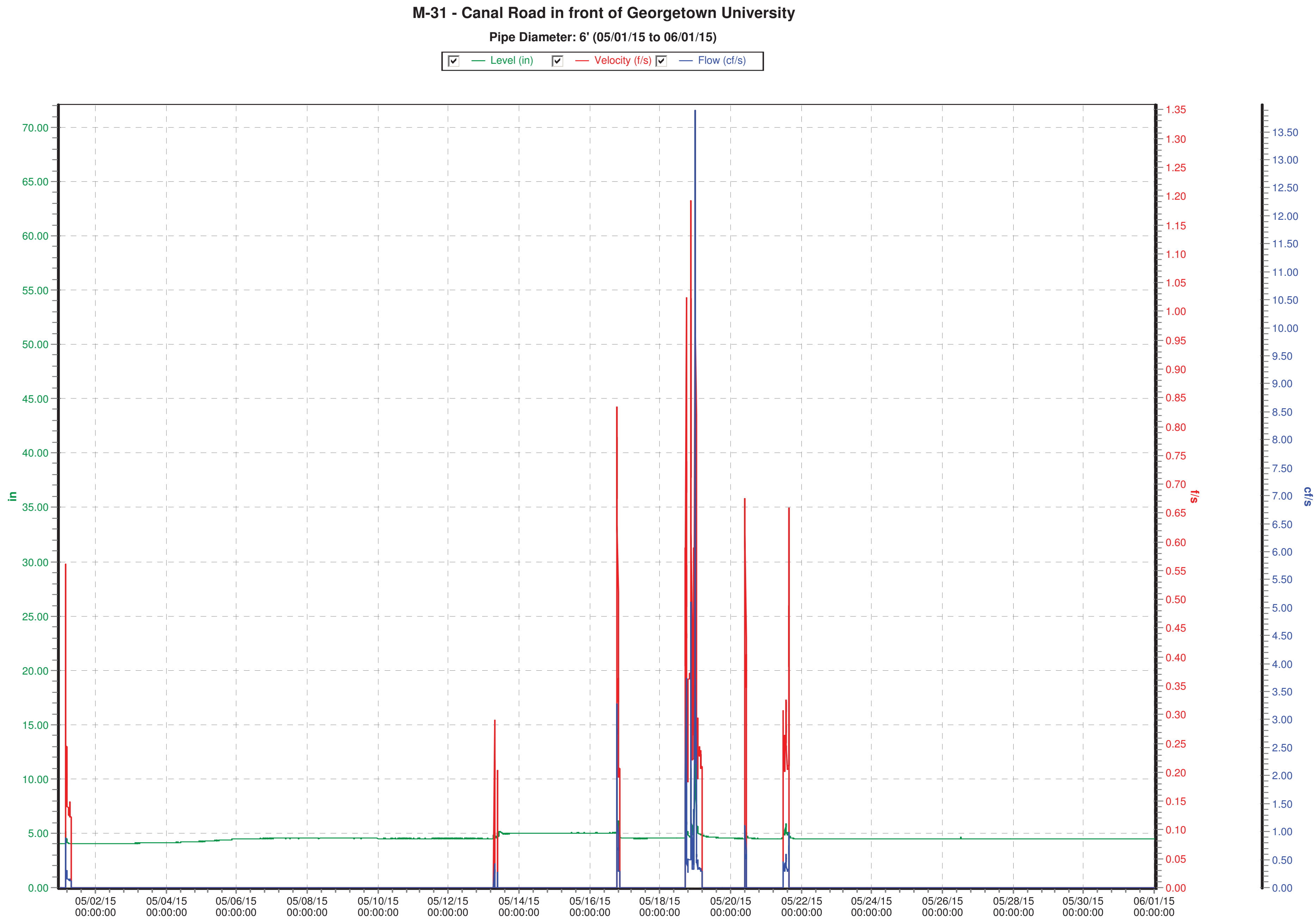
M-31 - Canal Road in front of Georgetown University
Pipe Diameter: 6' (05/01/15 to 06/01/15)
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Flow (cf/s)
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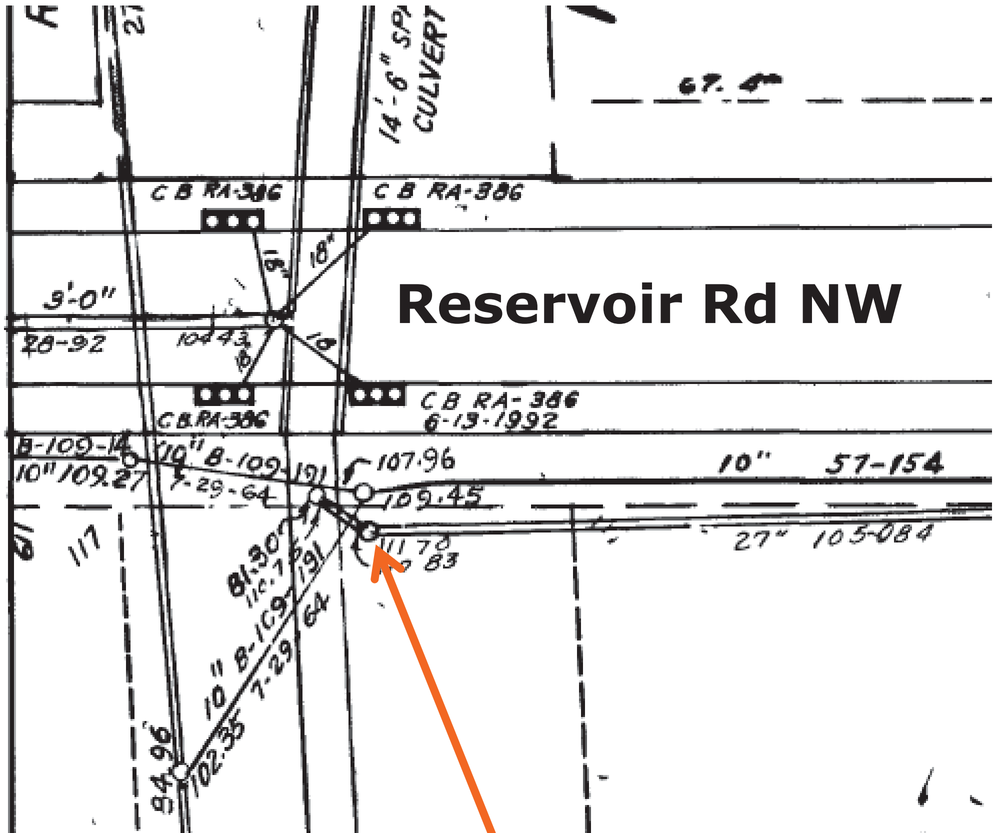
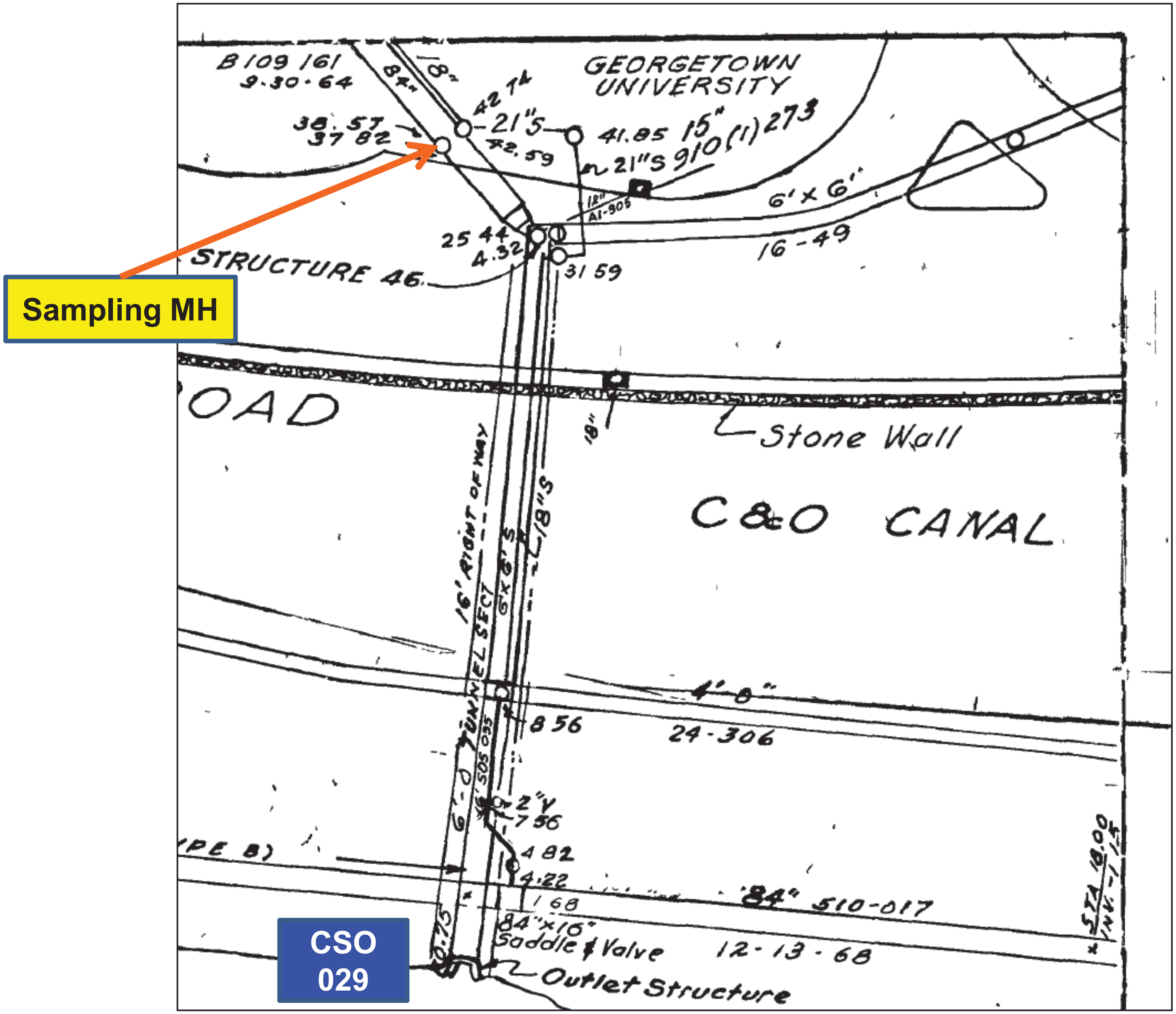
06/01/15 00:00:00

# 07/02/14 Water Quality Sample Location – Reservoir Road east of 44th St




Sampling MH

# 07/02/14 Water Quality Sample Location – Canal Road Upstream of Sewer Structure 46



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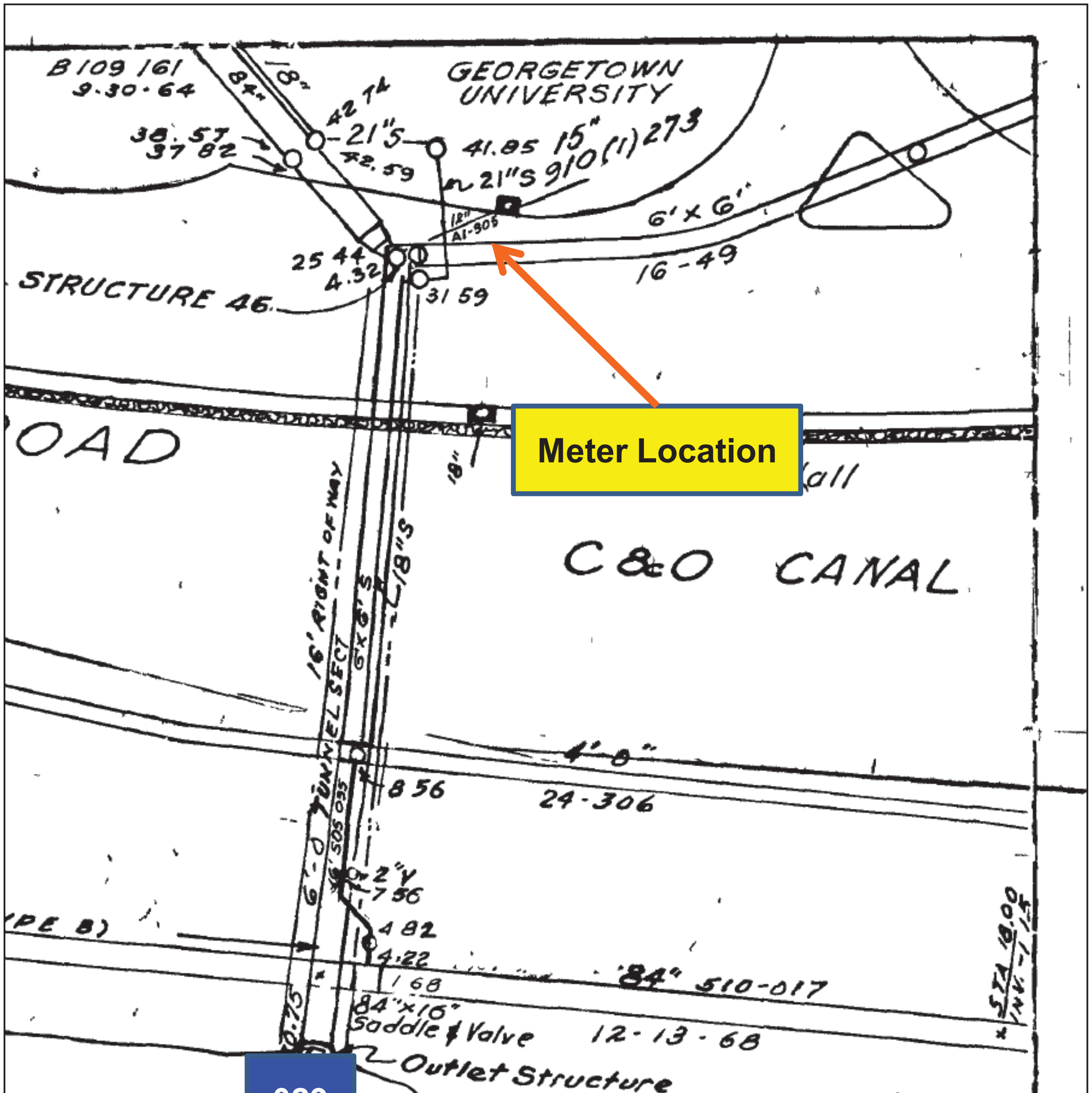
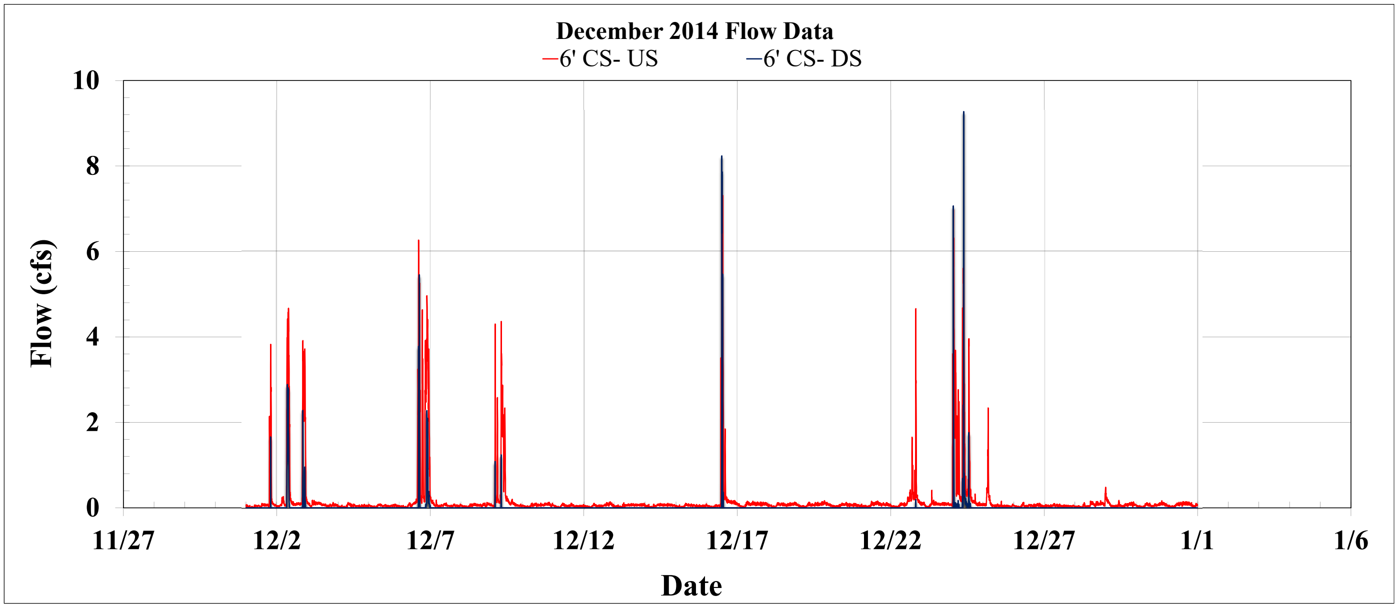
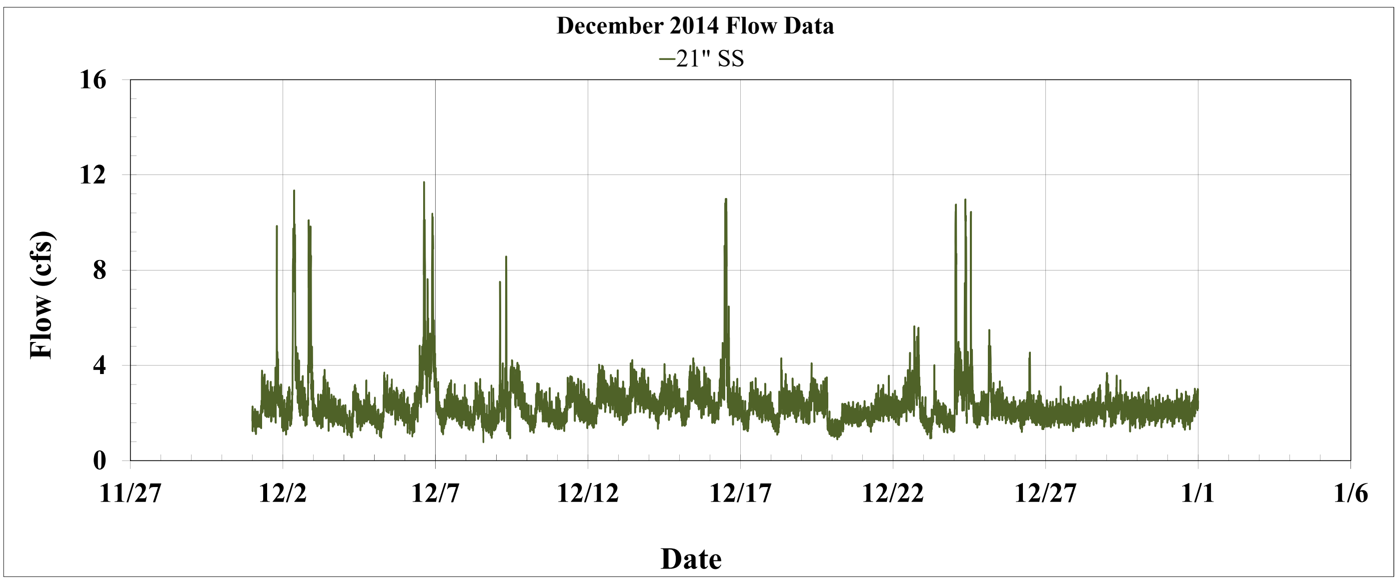


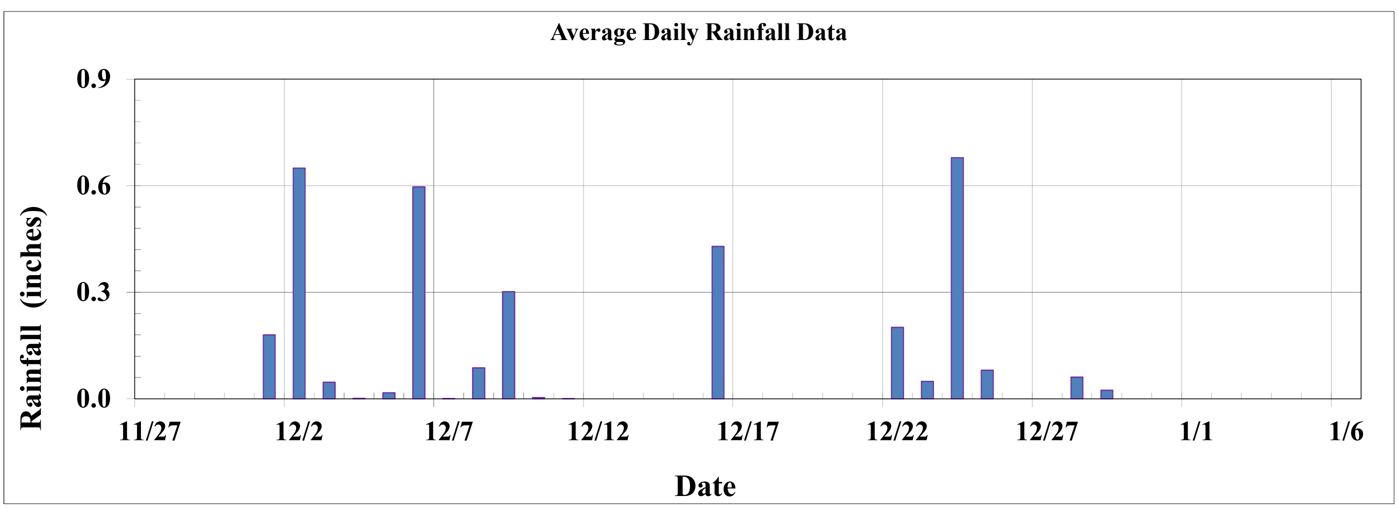



dc clean RIVERS PROJECT

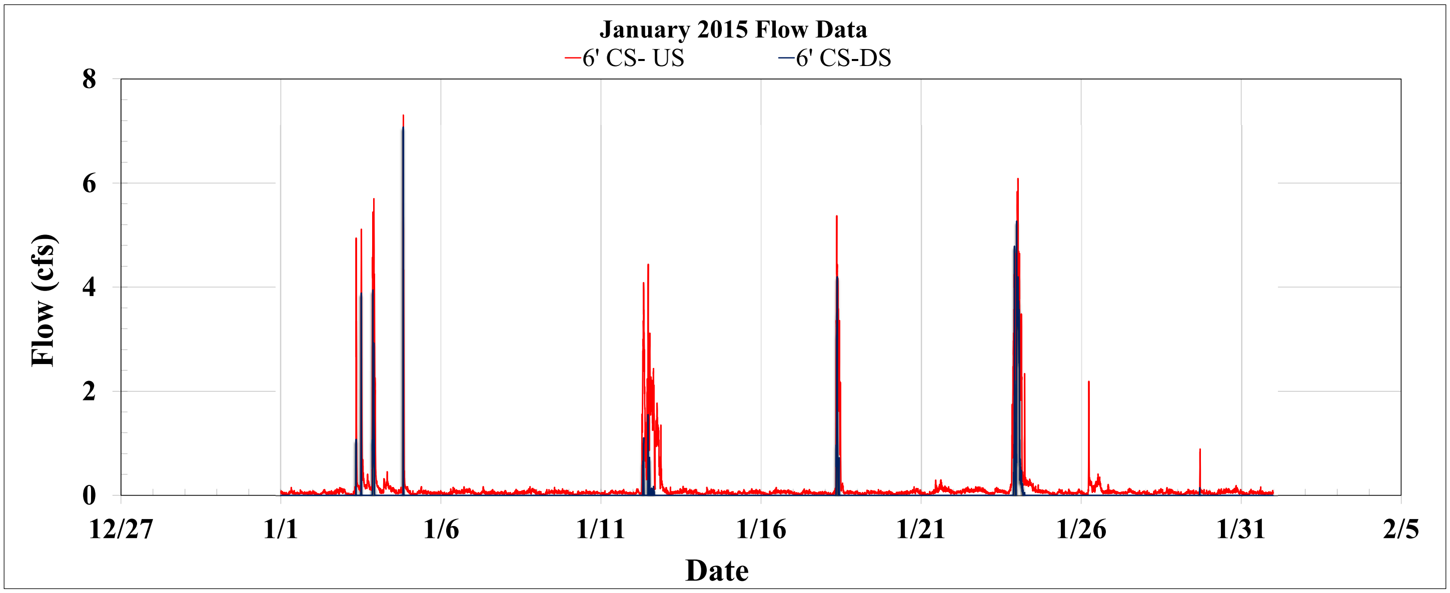
# College Pond Sewer Flow Data

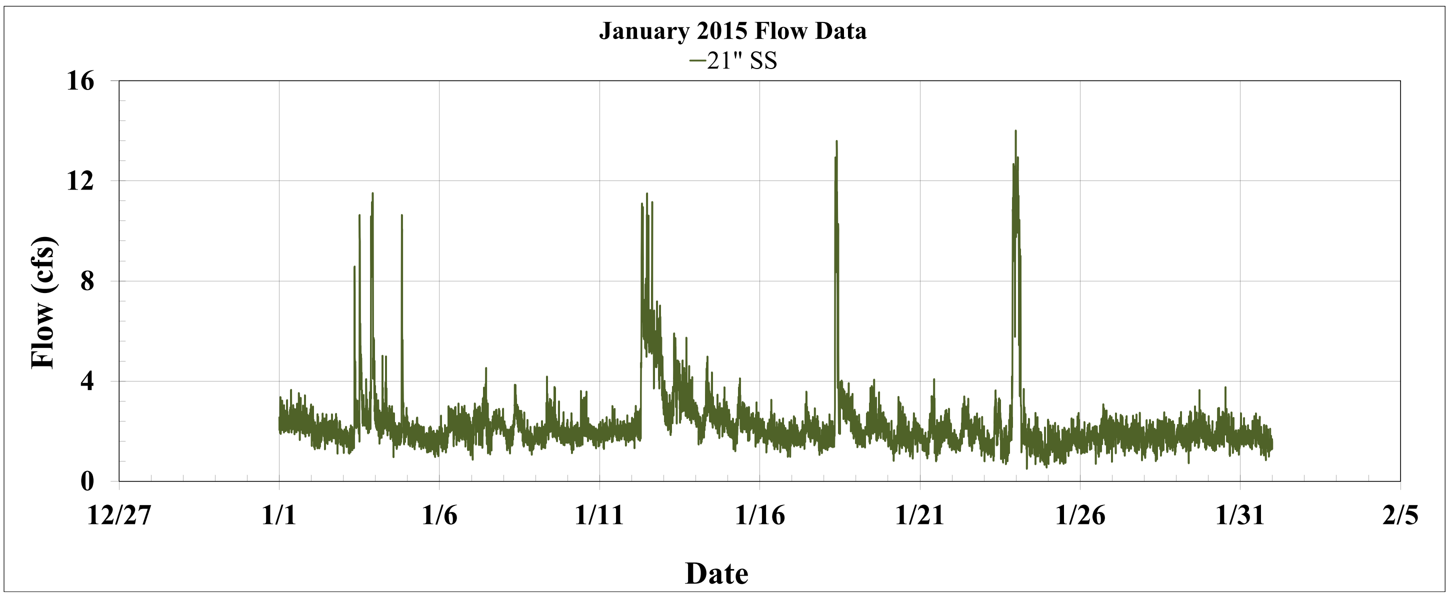


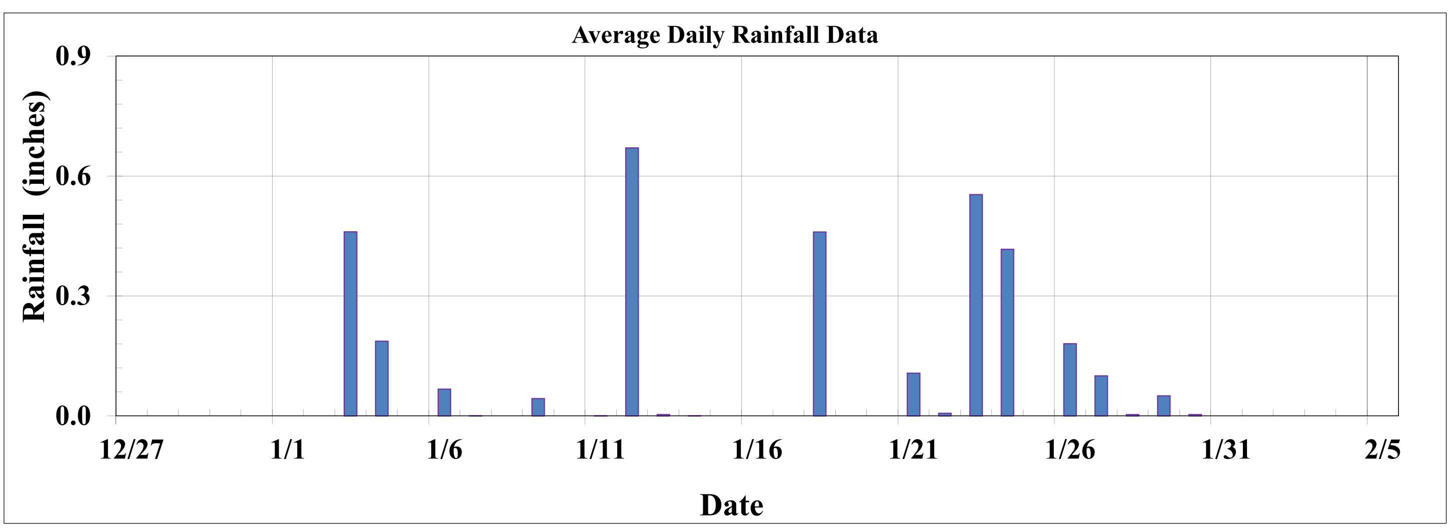



# College Pond Sewer Flow Data



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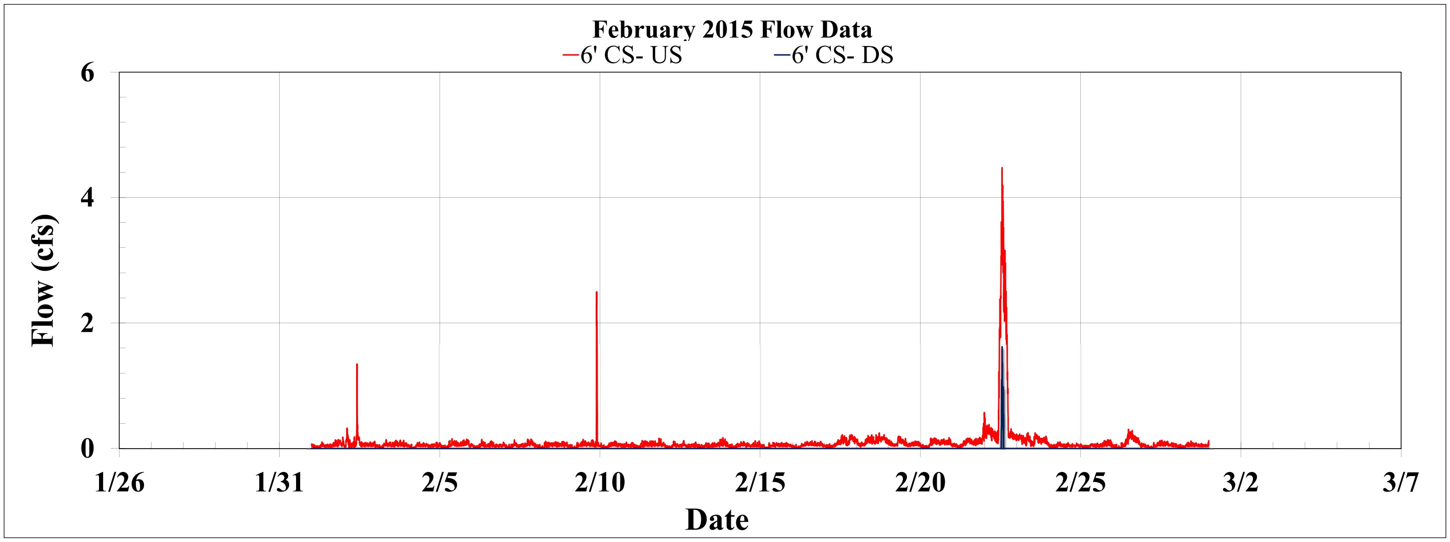
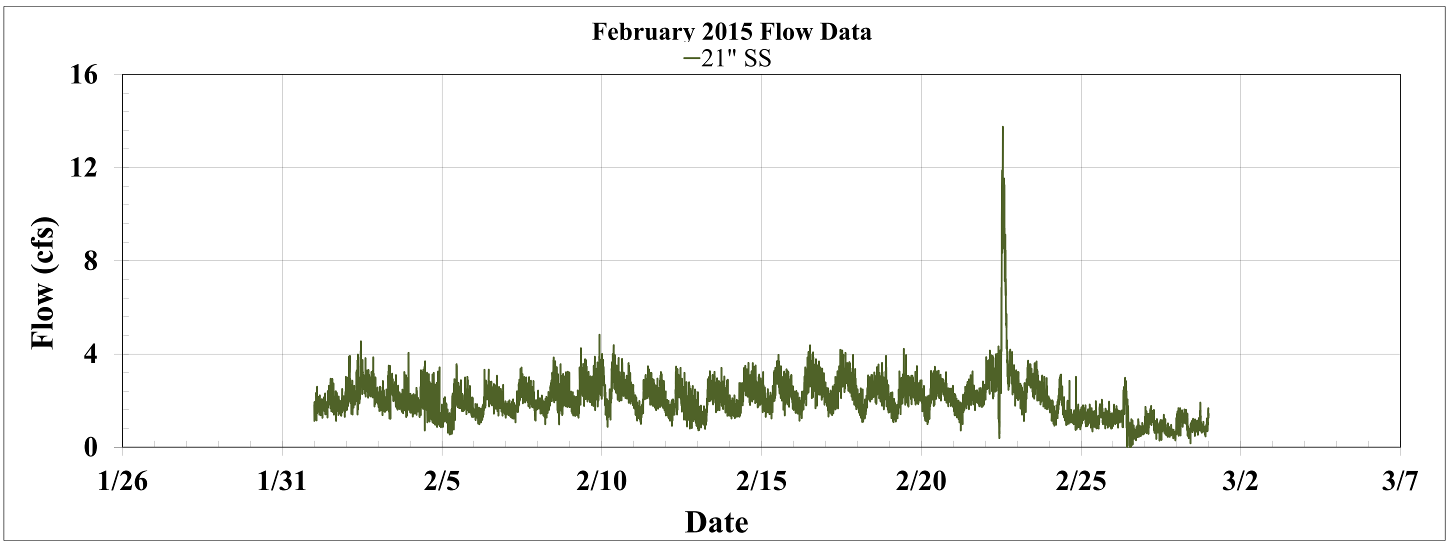
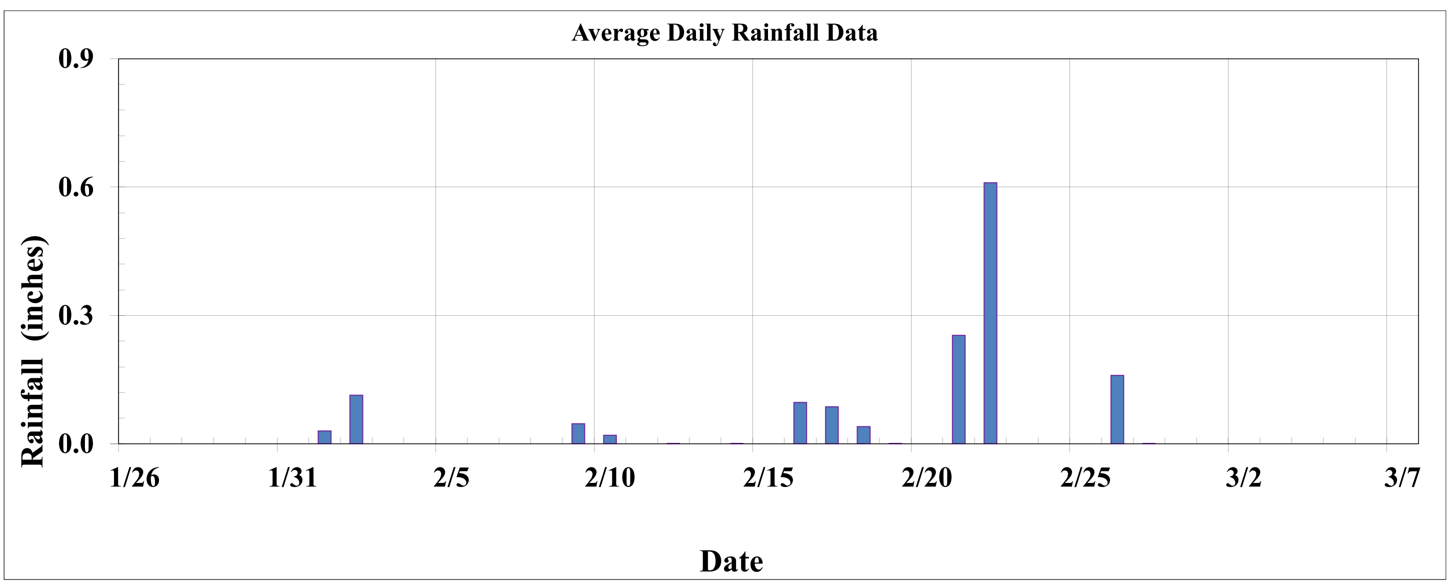
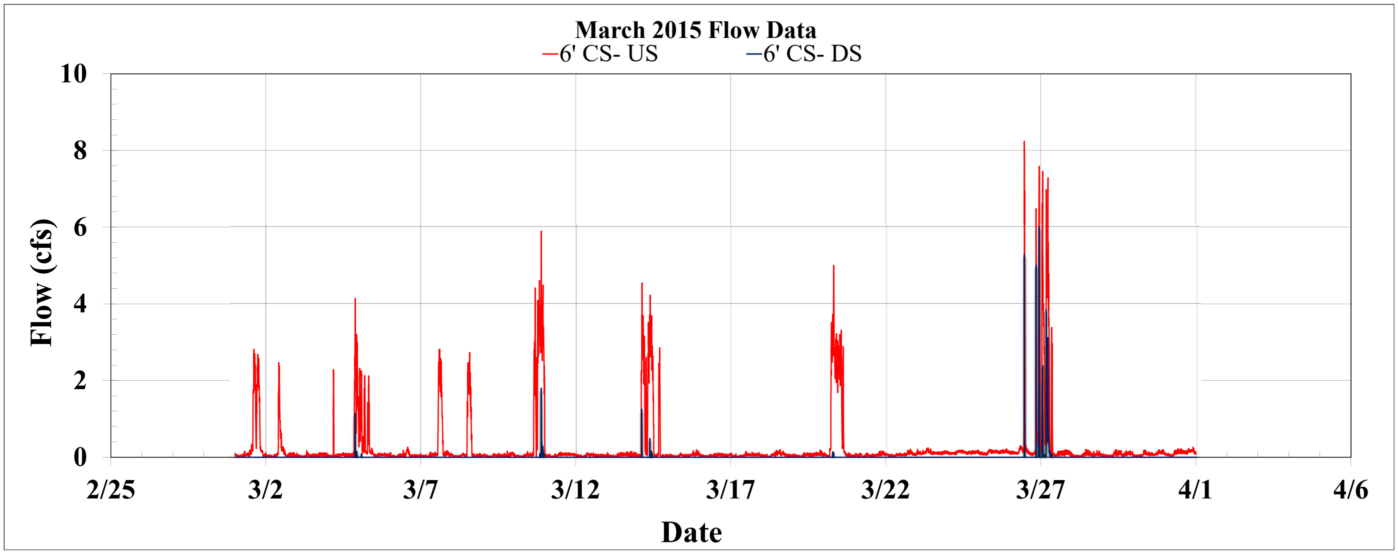
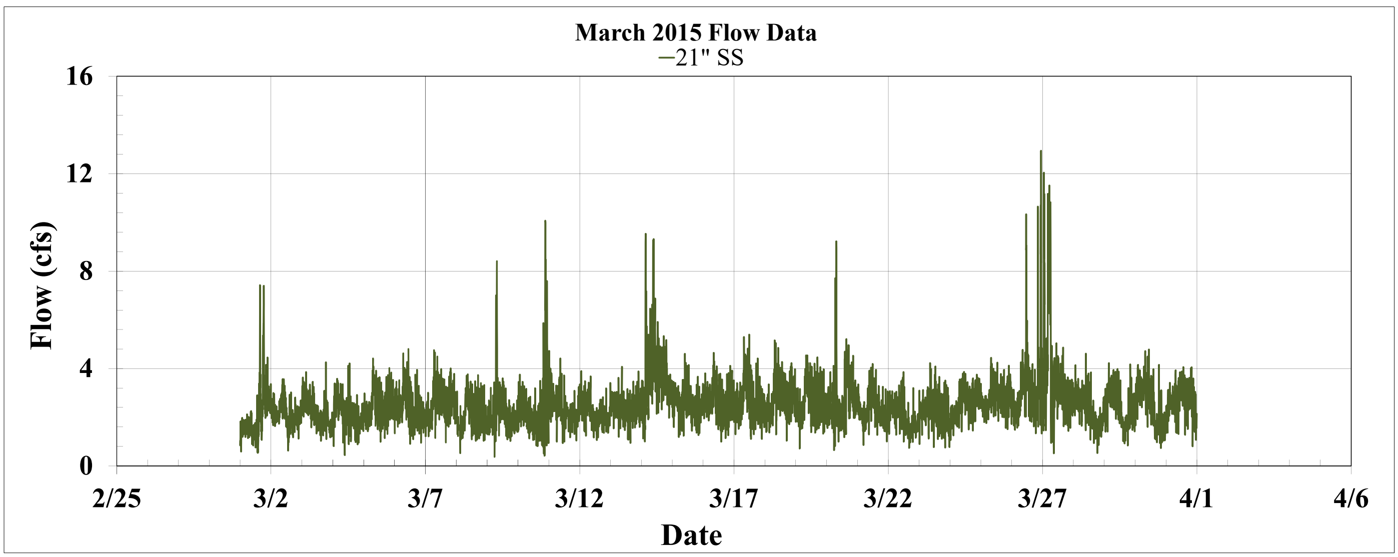


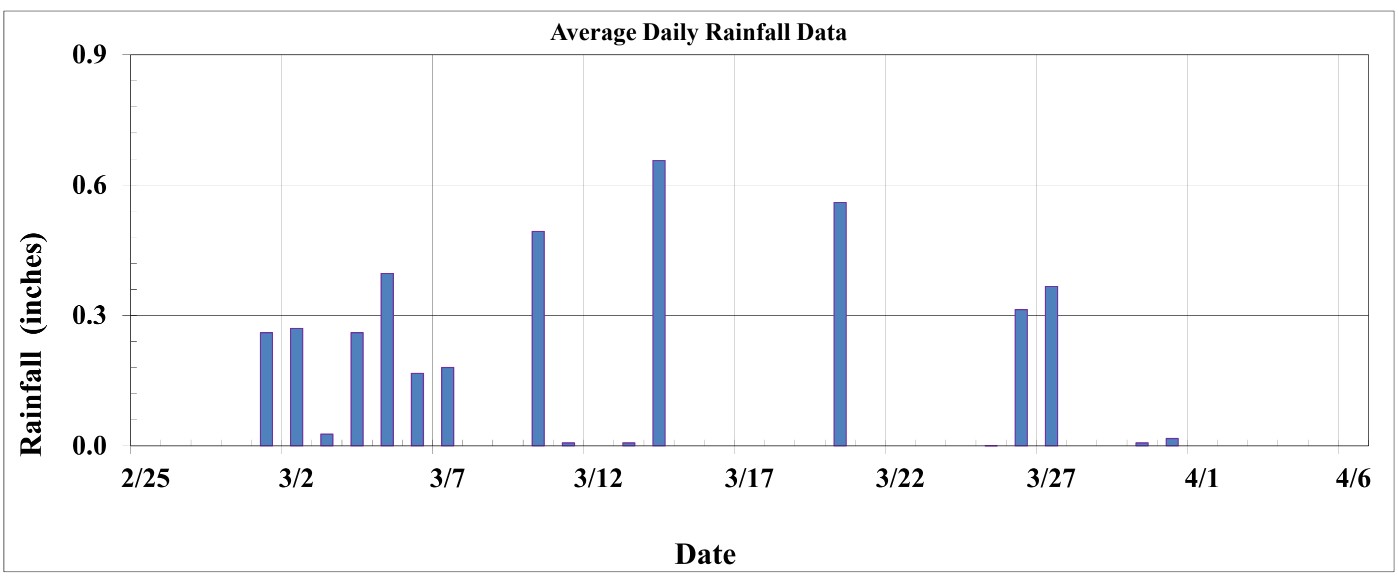



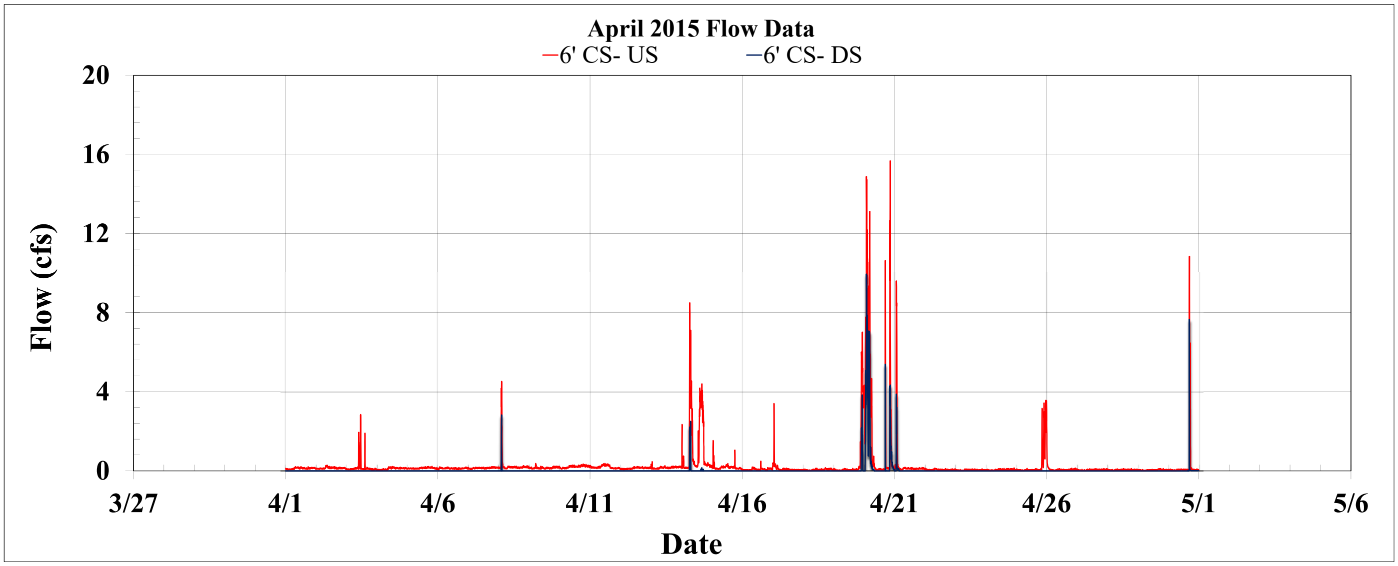
# College Pond Sewer Flow Data

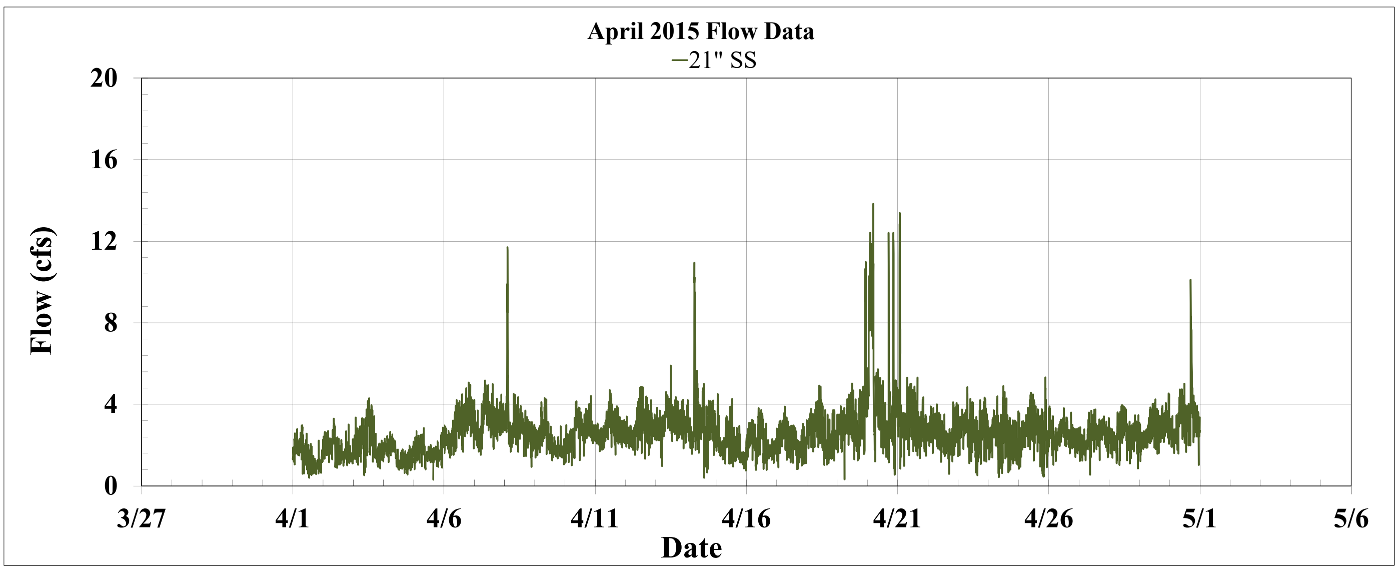


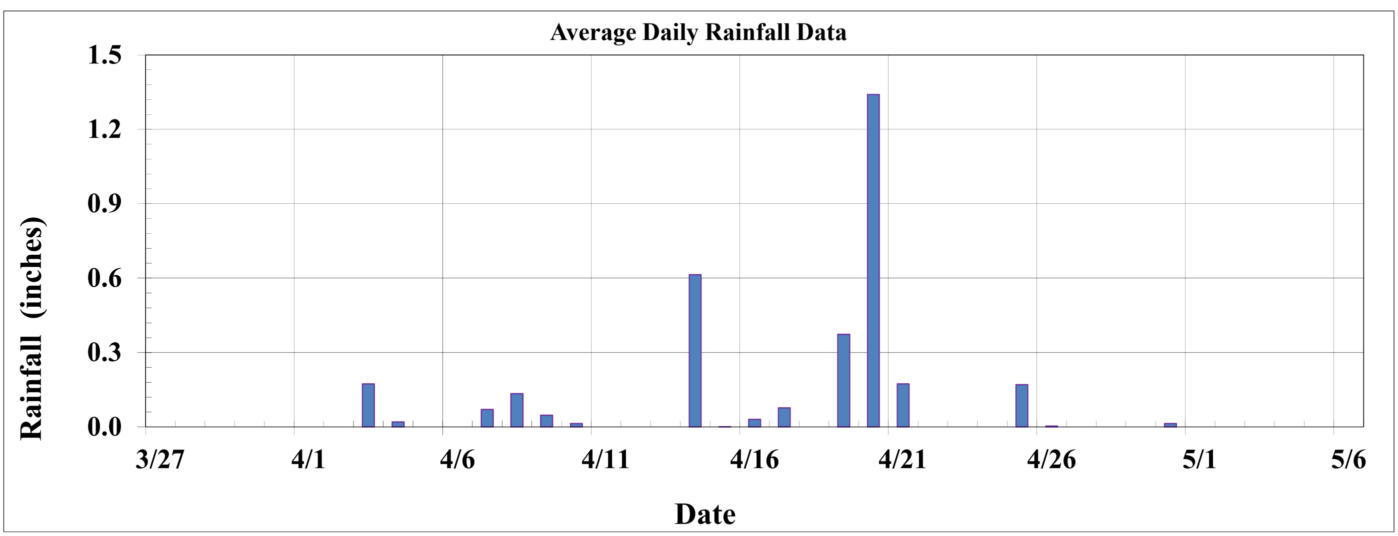



# College Pond Sewer Flow Data



# MARTEL

**Greeley and Hansen**
5000 Overlook Ave. SW

Washington, DC 20032
**Attention: Ram Jeedigunta**

Monday, July 7, 2014

**FINAL**
***Certificate of Analysis***

*Report for Lab No: 16086.*
*Sampled by Martel.*
*P.O. Number:*
*Project Identification: Gerogetown University Sampling - 7/2/14*

MARTEL NO. 16086 000001 — CLIENT SAMPLE IDENTIFICATION: 00-27-1, Near 44th St & Reservoir Rd NW — Sample Date/Time: 07/02/2014 10:35

| Compound | Test Value | Test Unit | Method | Detection Limit | Analysis Date/Time/Initial |
|---|---|---|---|---|---|
| Escherichia Coli, Quantitray | 14 | mpn/100ml | SM 9223 B-04 | 1 | 07/02/2014 14:33 MA |

MARTEL NO. 16086 000002 — CLIENT SAMPLE IDENTIFICATION: 29-48-1, Near 38th St & Reservoir Rd NW — Sample Date/Time: 07/02/2014 10:45

| Compound | Test Value | Test Unit | Method | Detection Limit | Analysis Date/Time/Initial |
|---|---|---|---|---|---|
| Escherichia Coli, Quantitray | 2420 | mpn/100ml | SM 9223 B-04 | 1 | 07/02/2014 14:33 MA |

MARTEL NO. 16086 000003 — CLIENT SAMPLE IDENTIFICATION: 29-72-1, Near 38th St & Reservoir Rd NW — Sample Date/Time: 07/02/2014 10:52

| Compound | Test Value | Test Unit | Method | Detection Limit | Analysis Date/Time/Initial |
|---|---|---|---|---|---|
| Escherichia Coli, Quantitray | >=2420 | mpn/100ml | SM 9223 B-04 | 1 | 07/02/2014 14:33 MA |

MARTEL NO. 16086 000004 — CLIENT SAMPLE IDENTIFICATION: 29-84-1, Near Canal Rd NW — Sample Date/Time: 07/02/2014 11:15

| Compound | Test Value | Test Unit | Method | Detection Limit | Analysis Date/Time/Initial |
|---|---|---|---|---|---|
| Escherichia Coli, Quantitray | 146 | mpn/100ml | SM 9223 B-04 | 1 | 07/02/2014 14:33 MA |

MARTEL

**Certificate of Analysis**

**Martel Laboratories $_{JDS}$ Inc.**

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
PH 410-825-7790 FAX 410-821-1054 EMAIL: martel@martellabs.com



**Notes and references:**

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.

Thomas Merusoff

Project Manager

16086 # CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Sampler(s) Ram Jeedigunta, Gaylon Moomaw, Nikos Apsilidis Dcwasa

Client Name/Phone/FAX Greeley and Hansen

Client Address 5000 Overlook Ave SW Washington, DC 20032

Invoice Address same as above

Project Manager Jeff Thomas

Project Name/# Georgetown University Sampling

Contract/P.O Number

Sample Turnaround Time Normal (2 - 3 weeks)

| Station No./ Sample ID | Station Location | Matrix | Container Description/ Preservation Status | Potentially Hazardous? | # of Containers | Date | Time | Analyses Required/Comments |
|---|---|---|---|---|---|---|---|---|
| 00-27-1 | Near 44th St & Reservoir Rd NW | grab-unfiltered | mL plastic sodium thiosulfate | NO | 1 | 7/2/2014 | 10:35 | E. coli |
| 2 29-48-1 | Near 38th St & Reservoir Rd NW | grab-unfiltered | mL plastic sodium thiosulfate | NO | 1 | 7/2/2014 | 10:45 | E. coli |
| 3 29-72-1 | Near 38th St & Reservoir Rd NW | grab-unfiltered | mL plastic sodium thiosulfate | NO | 2 | 7/2/2014 | 10:52 | E. coli |
| 4 29-84-1 | Near Canal Rd NW | grab-unfiltered | mL plastic sodium thiosulfate | NO | 2 | 7/2/2014 | 11:15 | E. coli |
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| Transferred by: [signature] | Received by: [signature] | Date 7/2/14 | Time 1410 |
| Transferred by: | Received by: | Date | Time |
| Transferred by: | Received by: | Date | Time |

Cooler Receipt Information

Sufficient ice? - Yes/No If No, temp.= 11.0°

Sample containers pres'd? - Yes/No If No, explain

Custody Seal present/intact? - Yes/No NA

Initials: [initials] Date: 7/2/14

**D.C. Water and Sewer**
Laboratory Pretreatment
5000 Overlook Ave. SW
Washington, DC 200325394

**Attention: Gayle Moomaw**

*Report for Lab No: 22011.*
*Sampled by Martel.*
*P.O. Number: LTCP-420-2015-2*
*Project Identification: College Pond- Georgetown, 7/7/15.*

Monday, July 13, 2015

***Certificate of Analysis***

**FINAL**

| MARTEL NO. | | CLIENT SAMPLE IDENTIFICATION | | | | Sample Date/Time |
|---|---|---|---|---|---|---|
| 22011 | 000001 | ECOLI- George - College -1 | | | | 07/07/2015 03:50 |
| Compound | Test Value | Test Unit | Method | Detection Limit | | Analysis Date/Time/Initial |
| Escherichia coli | <2 | mpn/100ml | SM 9221F | 2 | | 07/07/2015 10:51 MA |

| MARTEL NO. | | CLIENT SAMPLE IDENTIFICATION | | | | Sample Date/Time |
|---|---|---|---|---|---|---|
| 22011 | 000002 | ECOLI- George - College -2 | | | | 07/07/2015 03:55 |
| Compound | Test Value | Test Unit | Method | Detection Limit | | Analysis Date/Time/Initial |
| Escherichia coli | <2 | mpn/100ml | SM 9221F | 2 | | 07/07/2015 10:51 MA |

**Martel Laboratories$_{JDS}$ Inc.**
1025 Cromwell Bridge Road - Baltimore, Maryland 21286
PH 410-825-7790 FAX 410-821-1054 EMAIL: martel@martellabs.com

SMPLOG03

DCDPW



07/13/2015

stddl.frx

**Notes and references:**

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.

Project Manager

# MARTEL *CHAIN OF CUSTODY / SAMPLE INFORMATION FORM*

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 Email: vk@martellabs.com

**MARTEL** Log # 22011 Client Code

Client Name/Phone/FAX DC WATER / LAYLE MOOMAW

Client Address 5000 OVERLOOK AVE SW WASHINGTON DC

Invoice Address SAME AS ABOVE

Sampler LAYLE MOOMAW

Project Name/# COLLEGE POND GEORGETOWN SR

Contract/P.O Number ICP-420-2015-2

Sample Turnaround Time

| Station No./ Sample ID | Station Location | Matrix | Container Description/ Preservation Status | Potentially Hazardous? | # of Containers | Date | Time | Analyses Required/Comments |
|---|---|---|---|---|---|---|---|---|
| 1 | ECOLI-LEORGE-COLLEGE | STORM 1 | POP TOP/SOD. THIO | | 1 | 7/7/15 | 0350 AM | ECOLI 9221 F (EC MUG) |
| 2 | ECOLI-LEORGE-COLLEGE | STORM 2 | POP TOP/SOD. THIO | | 1 | 7/7/15 | 0355 AM | ECOLI 9221 F (EC MUG) |
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| Transferred by: | Received by: | Date | Time |
|---|---|---|---|
| Transferred by: [signature] | Received by: [signature] | Date 7/7/15 | Time 8:00 |
| Transferred by: [signature] | Received by: [signature] | Date 7-7 | Time 9:30 |
| Transferred by: | Received by: | Date | Time |

Cooler Receipt Information **(LAB USE ONLY)**

Sufficient ice? - Yes/No If No, temp.= 8.5

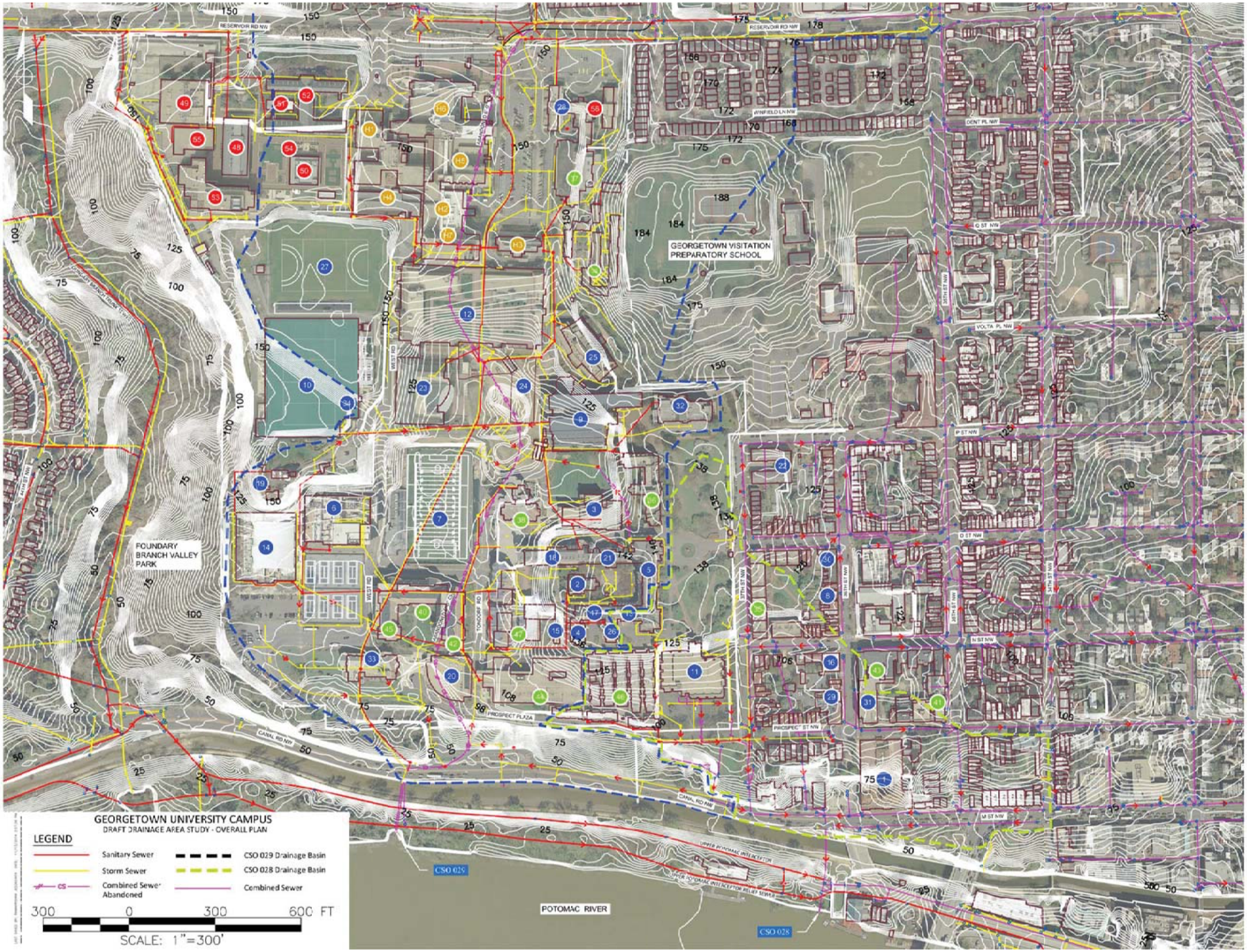
Sample containers pres'd? - Yes/No If No, explain

Custody Seal present/intact? - Yes/No NA

Initials: VB Date: 7/7/15

# Attachment D

## CSO 028 & 029 Drainage Boundary




Academic/Administrative Buildings

1 - Car Barn
2 - Dahlgren Chapel
3 - Davis Performing Arts Center
4 - Gervase Building
5 - Healy Hall
Gaston Hall
Riggs Library
6 - Heating and Cooling Plant
7 - Hoya Field
8 - Institute for the Study of Diplomacy
9 - Intercultural Center (ICC)
ICC Auditorium
10 - Kehoe Field
11 - Lauinger Library
12 - Leavey Center
Hotel and Conference Center
Sellinger Lounge
University Bookstore
13 - Maguire Hall
14 - McDonough Arena
15 - McSherry Building
16 - Mortara Building
17 - Mulledy Building
18 - New North
19 - Observatory and Ecology Lab
20 - O'Donovan Dining Hall
21 - Old North
22 - Poulton Hall
23 - Rafik B. Hariri Building
McDonough School of Business
Lohrfink Auditorium
24 - Regents Hall
25 - Reiss Science Building
26 - Ryan Hall
27 - Shaw Field (North Kehoe Field)
28 - St. Mary's Hall
29 - University Safety Services
30 - Wagner Alumni House
31 - Walsh Building
32 - White-Gravenor Hall
Undergraduate Admissions
33 - Wolfington Hall
Jesuit Residence
34 - Yates Field House

Residential Buildings

35 - Alumni Square
36 - Copley Hall
Copley Formal Lounge
37 - Darnall Hall
38 - Harbin Hall
39 - Henle Village
40 - Kennedy Hall
41 - LXR Hall
42 - McCarthy Hall
McShain Lounge
43 - Nevils Hall
44 - New South Hall
45 - Reynolds Hall
46 - Village A
47 - Village C

Medical Center Buildings

48 - Basic Science Building
49 - Building D
**Warwick Evans Conference Room**
50 - Dahlgren Medical Library
51 - Med-Dent Annex
52 - Med-Dent Building
**W. Proctor Harvey Clinical Teaching Amphitheater**
53 - New Research Building
**NRB Auditorium**
54 - PreClinical Science Building
55 - Research Resource Facility (RRF)
56 - St. Mary's Hall

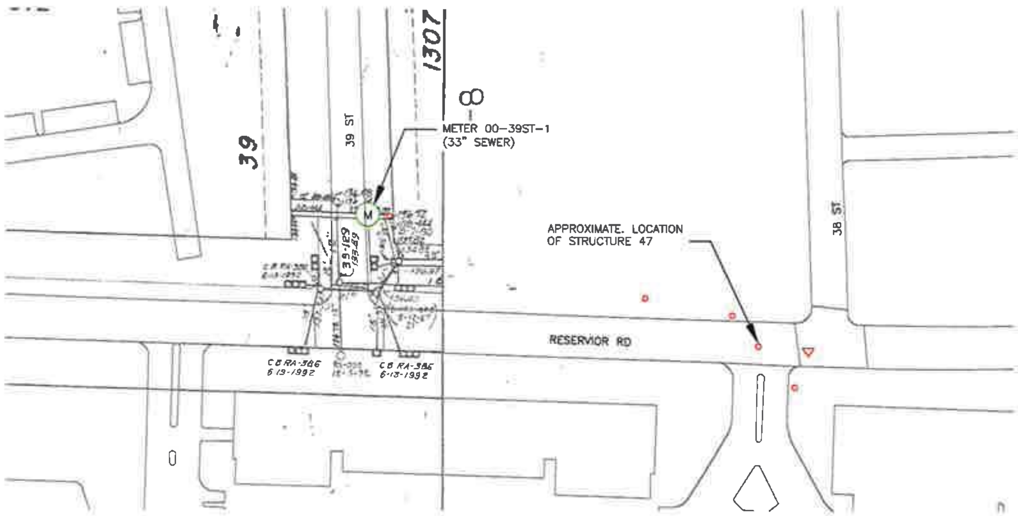
Hospital Buildings

H1 - Concentrated Care Center (CCC)
H2 - Gorman Building
H3 - Kober-Cogan Building
H4 - Lombardi Cancer Center
H5 - Marcus Bles Building
H6 - MedStar Georgetown University Hospital
H7 - Pasquerilla Healthcare Center (PHC)

# Attachment E

## Hillandale: Flow Monitoring Dye Testing & Water Quality Sampling Documentation

1 – FLOW METER


**FLOW METER LOCATION PLAN**

SCALE: NTS

**LEGEND**

(M) FLOW METER LOCATION

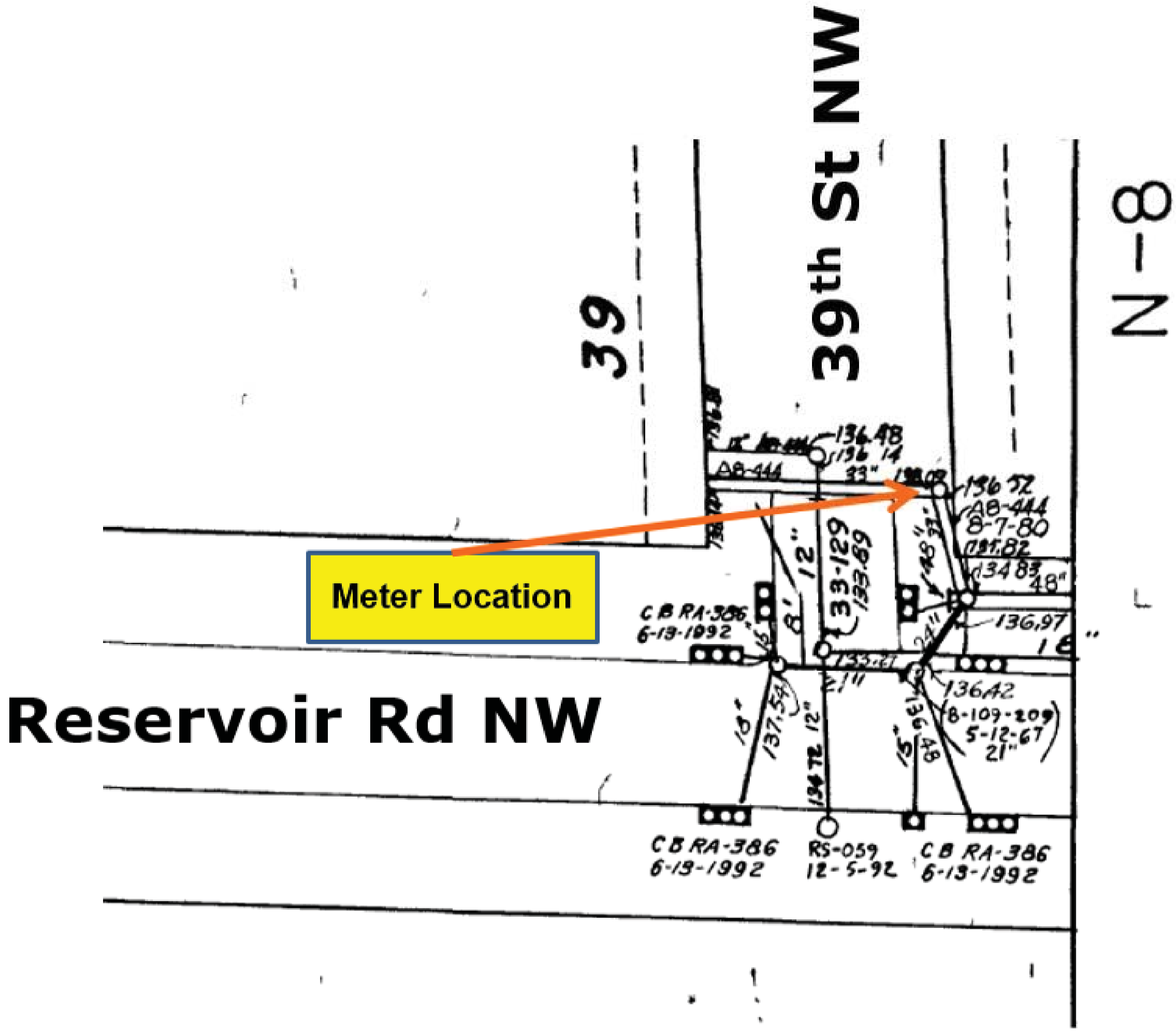
dc clean RIVERS PROJECT


DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY
5000 OVERLOOK AVENUE, SW
WASHINGTON, DC 20032
PHONE: 202-787-4460
FAX: 202-787-4478

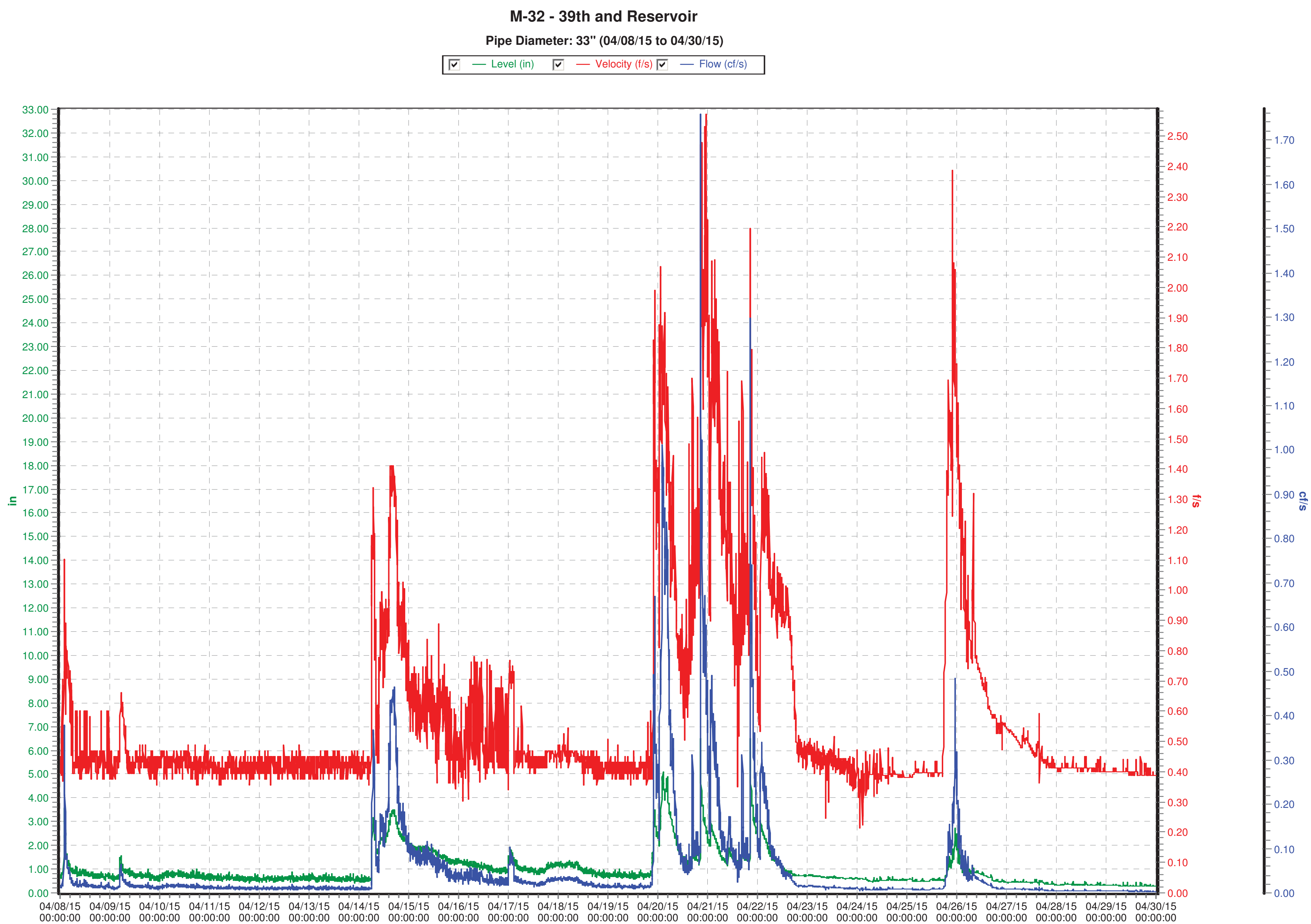

DC CLEAN RIVERS PROJECT
POST CONSTRUCTION MONITORING
FLOW MONITORING MAPS
00–39ST–1
METER LOCATION AND TYPICAL CROSS SECTION

DATE: MARCH 2015 | SITE 32

# Meter-32 on 33" Storm Sewer from Hillandale




dc clean RIVERS


M-32 - 39th and Reservoir
Pipe Diameter: 33" (04/08/15 to 04/30/15)
Level (in)
Velocity (f/s)
Flow (cf/s)
in
f/s
cf/s
04/08/15 00:00:00
04/09/15 00:00:00
04/10/15 00:00:00
04/11/15 00:00:00
04/12/15 00:00:00
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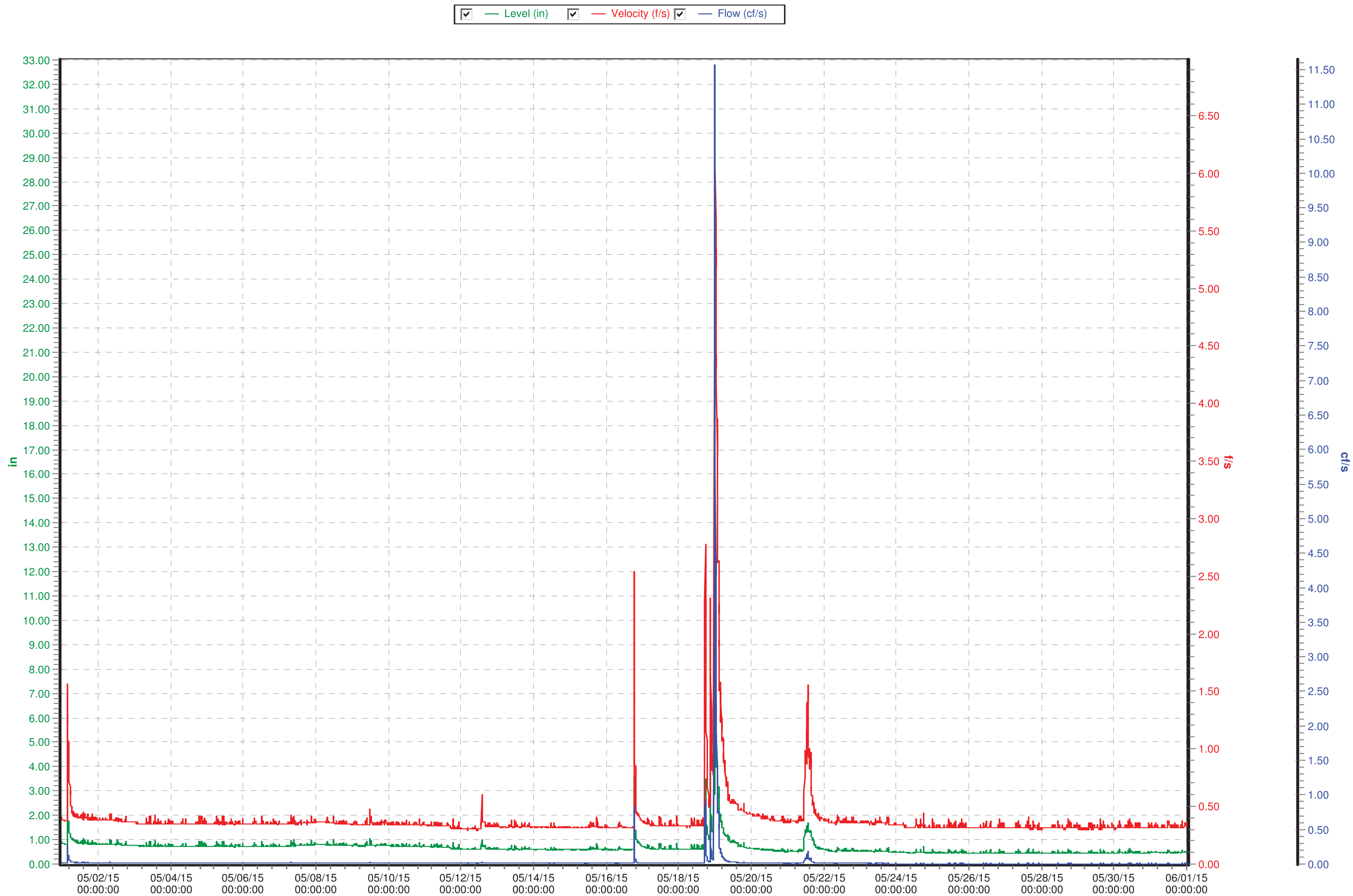
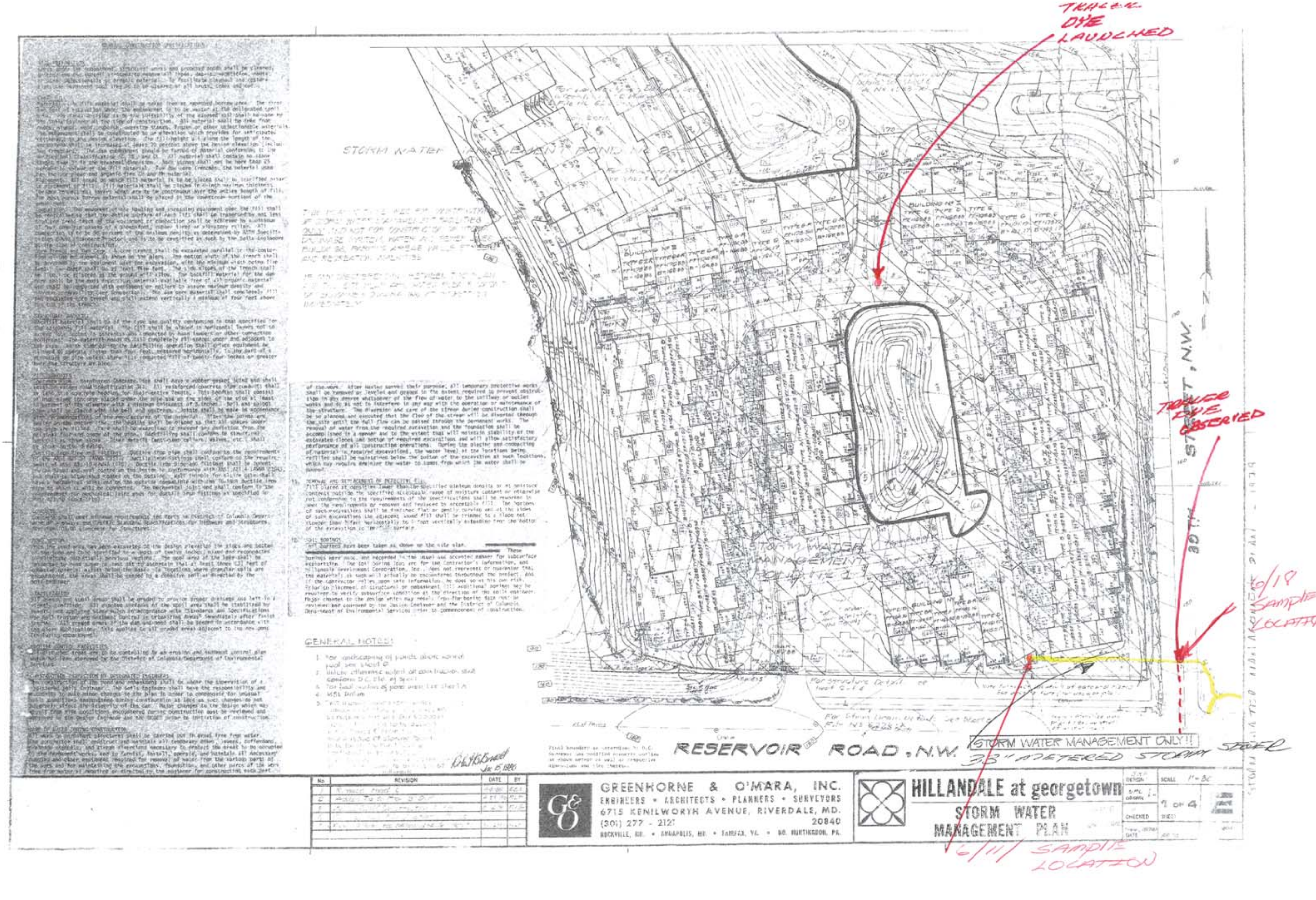
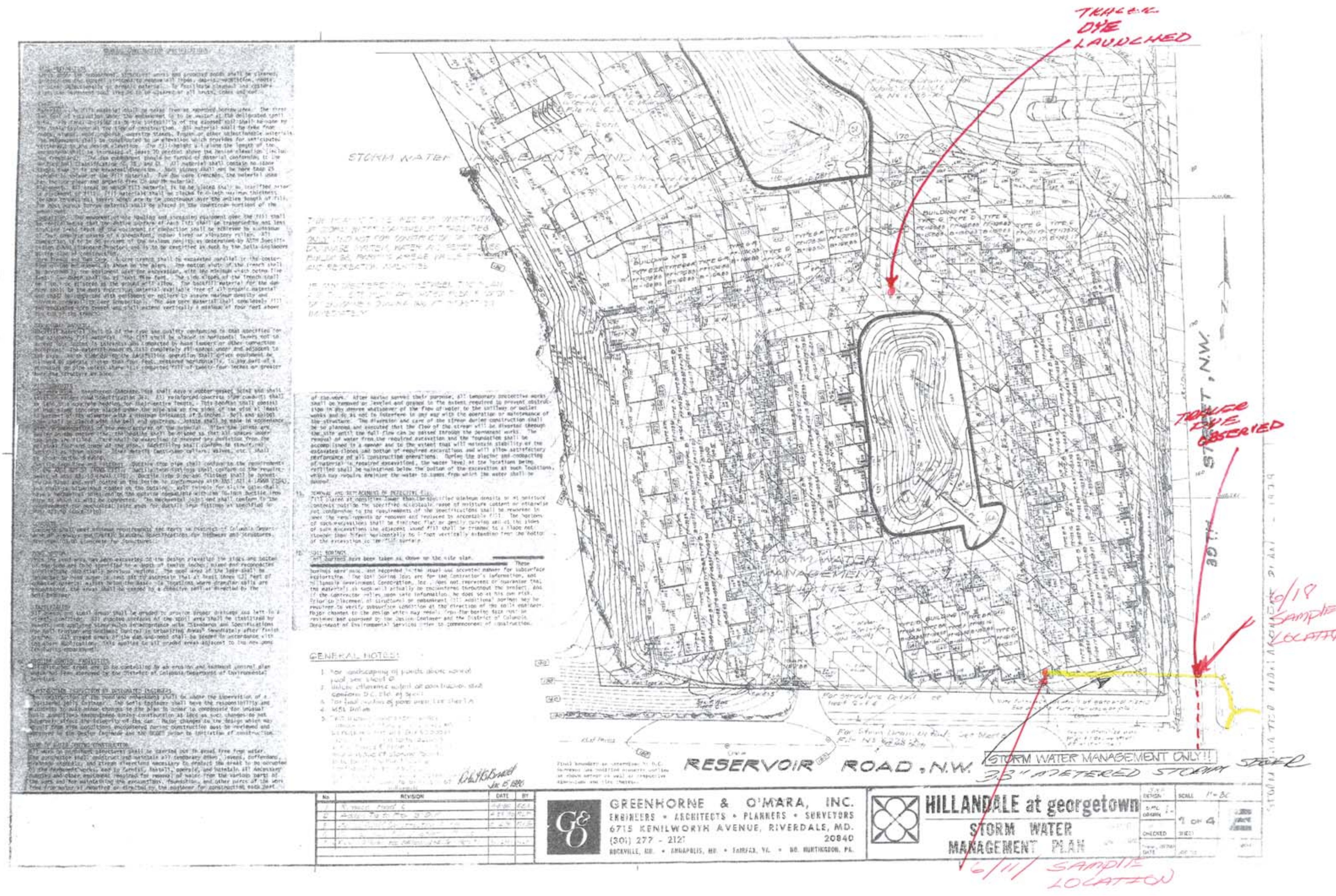
04/28/15 00:00:00
04/29/15 00:00:00
04/30/15 00:00:00

# M-32 - 39th and Reservoir

**Pipe Diameter: 33" (05/01/15 to 06/01/15)**




TRACER DYE LAUNCHED
STORM WATER MANAGEMENT POND
GENERAL NOTES:
TRACER DYE OBSERVED
30TH STREET, N.W.
STORM WATER MANAGEMENT POND
6/18 SAMPLE LOCATION
RESERVOIR ROAD, N.W.
STORM WATER MANAGEMENT ONLY!!
33" METERED STORM SEWER
No. REVISION DATE BY
GREENHORNE & O'MARA, INC.
ENGINEERS • ARCHITECTS • PLANNERS • SURVEYORS
6715 KENILWORTH AVENUE, RIVERDALE, MD.
(301) 277 - 2121 20840
ROCKVILLE, MD. • ANNAPOLIS, MD. • FAIRFAX, VA. • NO. HUNTINGDON, PA.
HILLANDALE at georgetown
STORM WATER MANAGEMENT PLAN
DESIGN
DRAWN
CHECKED
SCALE 1" = 30'
SHEET 1 OF 4
6/11 SAMPLE LOCATION



TRACER DYE LAUNCHED
TRACER DYE OBSERVED
6/18 SAMPLE LOCATION
6/11/ SAMPLE LOCATION
STORM WATER
STORM WATER MANAGEMENT
GENERAL NOTES:
RESERVOIR ROAD, N.W.
30TH STREET, N.W.
STORM WATER MANAGEMENT ONLY!!
33" METERED STORM SEWER
REVISION
DATE
BY
GREENHORNE & O'MARA, INC.
ENGINEERS • ARCHITECTS • PLANNERS • SURVEYORS
6715 KENILWORTH AVENUE, RIVERDALE, MD.
(301) 277-2121 20840
ROCKVILLE, MD. • ANNAPOLIS, MD. • FAIRFAX, VA. • NO. HUNTINGDON, PA.
HILLANDALE at georgetown
STORM WATER MANAGEMENT PLAN
SCALE 1"=30'
1 OF 4
CHECKED

MARTEL

**Greeley and Hansen**
5301 Shawnee Rd.
Ste 400
Alexandria, VA 22312
**Attention: Ram Jeedigunta**

Tuesday, June 23, 2015

## *Certificate of Analysis*

**FINAL**

*Report for Lab No: 21719.*
*Samples picked up by Martel.*
*Project Identification: Georgetown- Hillandale Sewer Sampling, 6/18/15.*

MARTEL NO. 21719 000001 — CLIENT SAMPLE IDENTIFICATION: Reservoir 39th — Sample Date/Time: 06/18/2015 10:15

| Compound | Test Value | Test Unit | Method | Detection Limit | Analysis Date/Time/Initial |
|---|---|---|---|---|---|
| Escherichia coli | 7900 | mpn/100ml | SM 9221F | 1 | 06/18/2015 14:47 MA |

MARTEL NO. 21719 00001D — CLIENT SAMPLE IDENTIFICATION: Reservoir 39th- Duplicate — Sample Date/Time: 06/18/2015 10:15

| Compound | Test Value | Test Unit | Method | Detection Limit | Analysis Date/Time/Initial |
|---|---|---|---|---|---|
| Escherichia coli | 2300 | mpn/100ml | SM 9221F | 1 | 06/18/2015 14:47 MA |

**Martel Laboratories$_{JDS}$ Inc.**

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
PH 410-825-7790 FAX 410-821-1054 EMAIL: martel@martellabs.com



**Notes and references:**

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.

Project Manager

# MARTEL *CHAIN OF CUSTODY / SAMPLE INFORMATION FORM*

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 • martel@martellabs.com

MARTEL Log # 21719 Client Code

Sampler LAYLE MOOMAW

Client Name/Phone/FAX GREELEY AND HANSON

Project Name/#

Client Address

Contract/P.O Number

E-mail Address

Sample Turnaround Time

| Sample No. | Sample Location | Matrix | Container Description/Preservation Status | # of Containers | Date | Time | Analyses Required/Comments |
|---|---|---|---|---|---|---|---|
| 001 | RESERVOIR 39TH | STORM WATER | 120 ML THIO | 1 | 6/18 | 10:15 | |
| 002 | DUPLICATE | " | " | 1 | 6/18 | 10:15 | |
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| Transferred by | Received by | Date | Time |
|---|---|---|---|
| Transferred by: [signature] | Received by: [signature] | 6/18 | 1030 |
| Transferred by: [signature] | Received by: [signature] | 6-18 | 13:50 |
| Transferred by: | Received by: | Date | Time |

Cooler Receipt Information **(LAB USE ONLY)**

Sufficient ice/blue ice? - Yes/No IR temp = 12.0

Sample containers pres'd? - Yes/No If No, explain

Custody Seal present/intact? - Yes/No NA

Initials: TB Date: 6/18/15

# Appendix E

# DC Water GI Construction Standard Details

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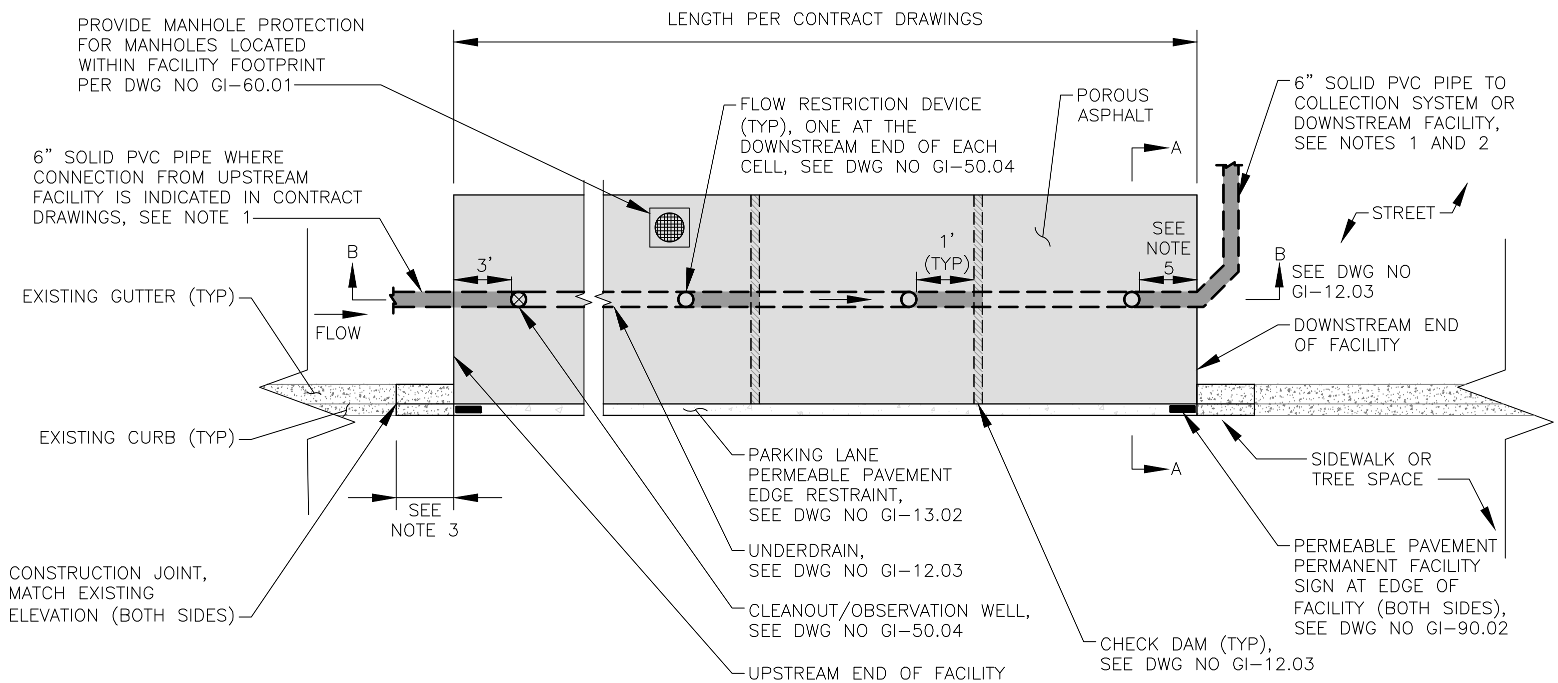
DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

GI–11.01
(1 OF 2)




## NOTES:

1. COLLECTION SYSTEM TIE IN LOCATION INDICATED ON CONTRACT DRAWINGS. ELEVATION OF CONNECTION TO COLLECTION SYSTEM AS INDICATED IN CONTRACT DRAWINGS. UNDERDRAIN PIPE SHALL TRANSITION FROM PVC SCHEDULE 40 TO PVC SDR–35 OUTSIDE THE FACILITY, WITHIN 3 LF OF THE UNDERDRAIN PENETRATION THOUGH THE WATERPROOFING MEMBRANE, AS MEASURED ALONG THE CENTERLINE OF THE UNDERDRAIN PIPE. FOR CONNECTION TO MANHOLES OR CATCH BASINS, SEE DWG NO GI–100.02. FOR CONNECTION TO SEWERS, SEE DWG NO GI–100.01. FOR CONNECTION TO DOWNSTREAM PERMEABLE PAVEMENT FACILITY, SEE DWG NO GI–50.04.

2. SEE DC WATER STANDARD DETAIL S–15.01 FOR TRENCH EXCAVATION AND FILL. BACKFILL ABOVE THE BEDDING, FOURTH COURSE, SHALL BE COMPACTED FILL MEETING DC WATER STANDARDS.

3. CONTRACTOR SHALL RESTORE CURB AND GUTTER PER DDOT STANDARDS 1' BEYOND FACILITY EXCEPT WHERE:
   - CATCH BASIN OR ALLEY APRON IS WITHIN 0–4' OF EDGE OF FACILITY, REPLACE CURB AND GUTTER TO EDGE OF CATCH BASIN OR ALLEY APRON.
   - NEXT CURB CONSTRUCTION JOINT IS WITHIN 1–4' OF EDGE OF FACILITY, REPLACE TO THAT CONSTRUCTION JOINT.
   - OTHERWISE SPECIFIED IN THE CONTRACT DRAWINGS OR BY DC WATER'S REPRESENTATIVE.

   CONTRACTOR SHALL MATCH EXISTING SURFACE FINISH.

4. FOR CURB AND GUTTER AND PARKING LANE PERMEABLE PAVEMENT EDGE RESTRAINT JOINTS, SEE DDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND STRUCTURES, SECTION 606.01.

5. 4' WHERE UNDERDRAIN TIES TO SEWER WITHIN FACILITY FOOTPRINT. OTHERWISE, 1', OR PER CONTRACT DRAWINGS.

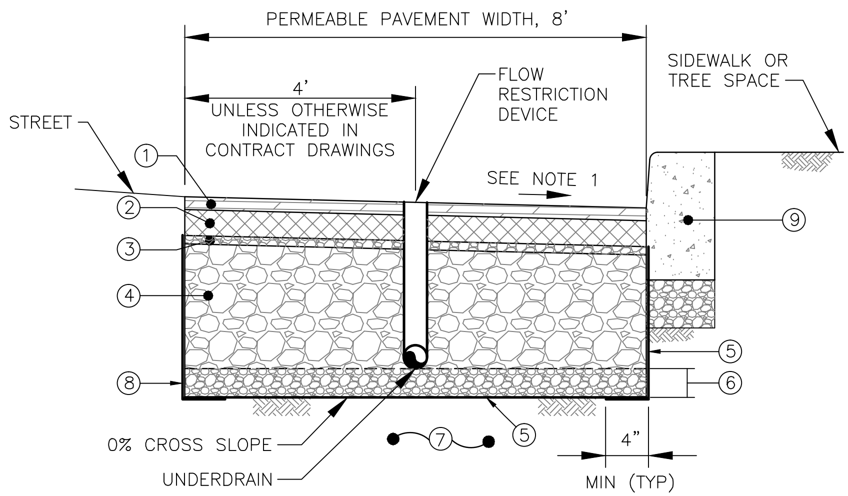
6. CONTRACTOR SHALL PROVIDE, FURNISH, AND INSTALL THREE (3) PARKING LANE PERMEABLE PAVEMENT VACUUMING SIGNS PER SIDE OF STREET BETWEEN INTERSECTIONS WITH PROPOSED PARKING LANE PERMEABLE PAVEMENT. FINAL SIGN LOCATIONS SHALL BE FIELD LOCATED BY THE CONTRACTOR IN THE TREE SPACE AND APPROVED BY DC WATER.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ____________ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | PARKING LANE PERMEABLE PAVEMENT FACILITY PLAN |
| | CHECKED BY: ______ | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

GI–11.01
(2 OF 2)




## LEGEND:

1. POROUS ASPHALT SURFACE COURSE, 1.5" THICKNESS
2. POROUS ASPHALT BASE COURSE, 3" THICKNESS
3. CHOKER LAYER, 2" THICKNESS, AASHTO #57 STONE OR APPROVED EQUIVALENT
4. AGGREGATE STORAGE LAYER, 26" THICKNESS AT PERMEABLE PAVEMENT CONCRETE CURB, AASHTO #2 OR #3 STONE OR APPROVED EQUIVALENT
5. GEOTEXTILE, SEE NOTE 2
6. UNDERDRAIN BEDDING, 3" THICKNESS, AASHTO #57 STONE OR APPROVED EQUIVALENT
7. SUBGRADE. PREPARE SUBGRADE IN ACCORDANCE WITH DDOT GREEN INFRASTRUCTURE STANDARDS, SECTION 621.01(D)
8. WATERPROOFING MEMBRANE. AT INTERFACE WITH STREET, TRIM MEMBRANE TO TOP OF CHOKER LAYER PRIOR TO PLACEMENT OF POROUS ASPHALT BASE COURSE.
9. PARKING LANE PERMEABLE PAVEMENT EDGE RESTRAINT, SEE DWG NO GI–13.02.

## NOTES:

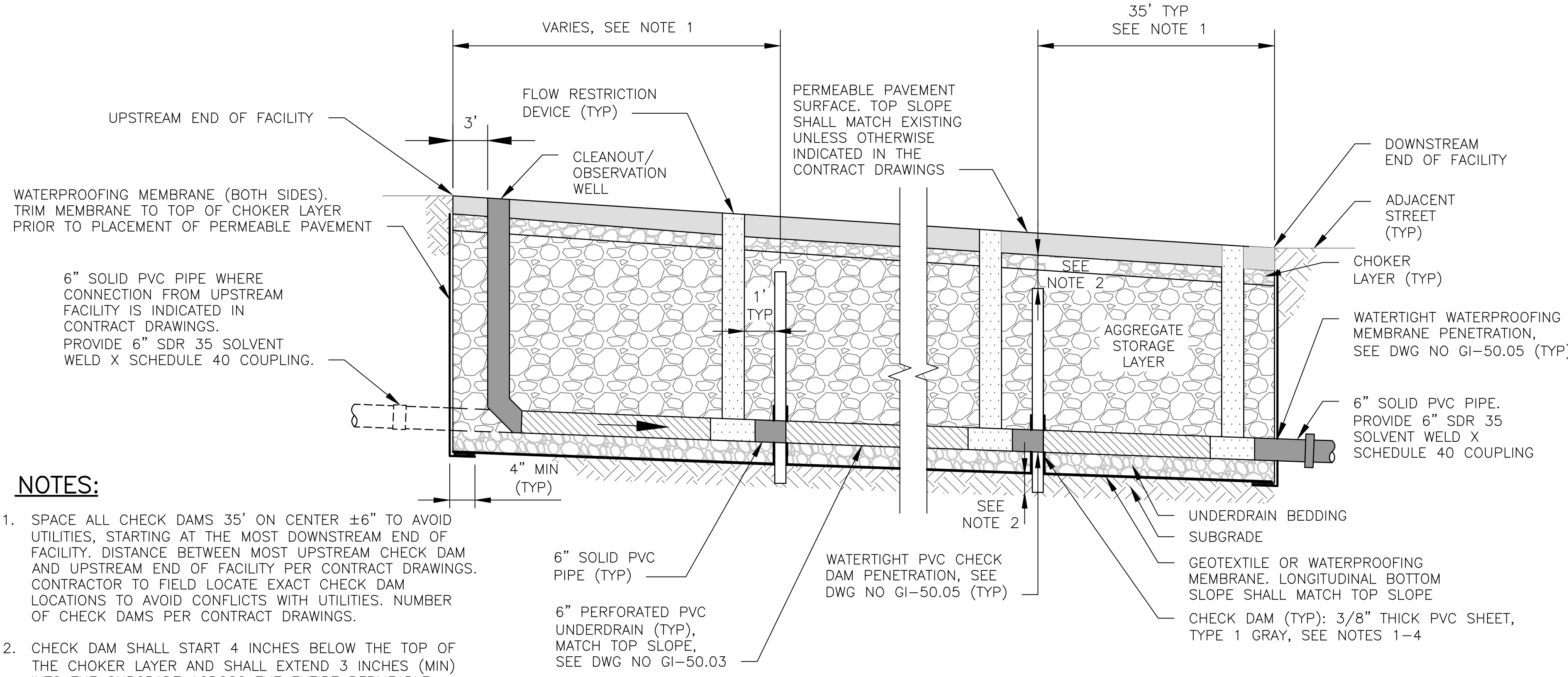
1. MATCH EXISTING SURFACE CROSS SLOPES UNLESS OTHERWISE INDICATED IN CONTRACT DRAWINGS.
2. WATERPROOFING MEMBRANE SHALL BE USED IN LIEU OF GEOTEXTILE WHERE INDICATED IN CONTRACT DRAWINGS.
3. EXCAVATION AND ALL SUPPORT OF EXCAVATION, INCLUDING SLOPES, SHALL BE A MINIMUM OF 2 FEET FROM ALL STRUCTURES, EXCLUDING MANHOLES, UTILITY RISERS AND CATCH BASINS. TEMPORARILY SUPPORT MANHOLES, POLES, AND OTHER EXISTING STRUCTURES DURING CONSTRUCTION TO PREVENT MOVEMENT DUE TO REMOVAL OF SOIL AND UNBALANCED LOADING.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| ______ CHIEF ENGINEER | PREPARED BY: DCCR | PARKING LANE PERMEABLE PAVEMENT FACILITY SECTION A–A |
| | CHECKED BY: ______ | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

GI–12.03




## NOTES:

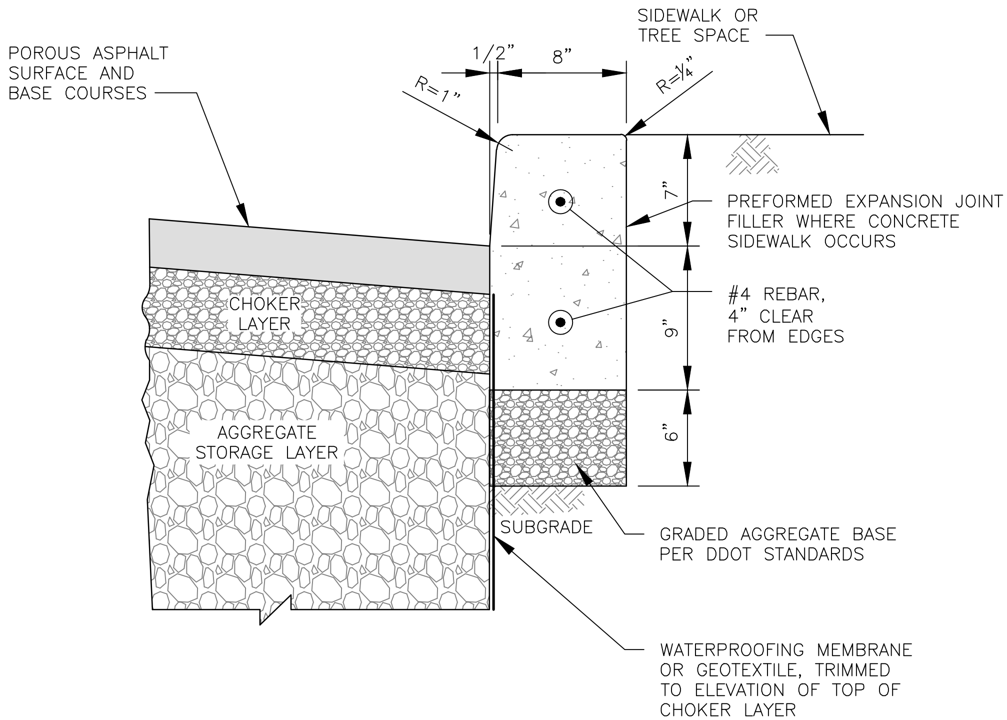
1. SPACE ALL CHECK DAMS 35' ON CENTER ±6" TO AVOID UTILITIES, STARTING AT THE MOST DOWNSTREAM END OF FACILITY. DISTANCE BETWEEN MOST UPSTREAM CHECK DAM AND UPSTREAM END OF FACILITY PER CONTRACT DRAWINGS. CONTRACTOR TO FIELD LOCATE EXACT CHECK DAM LOCATIONS TO AVOID CONFLICTS WITH UTILITIES. NUMBER OF CHECK DAMS PER CONTRACT DRAWINGS.
2. CHECK DAM SHALL START 4 INCHES BELOW THE TOP OF THE CHOKER LAYER AND SHALL EXTEND 3 INCHES (MIN) INTO THE SUBGRADE ACROSS THE ENTIRE PERMEABLE PAVEMENT WIDTH.
3. DO NOT INSTALL GEOTEXTILE OR WATERPROOFING MEMBRANE UNDER OR AROUND CHECK DAMS. TURN UP GEOTEXTILE AND/OR WATERPROOFING MEMBRANE AGAINST CHECK DAM BOTTOM AND SIDES, OVERLAP WITH CHECK DAM PER MANUFACTURER'S RECOMMENDATION AND AS APPROVED BY DC WATER, 12 INCH MINIMUM. ADHERE WATERPROOFING MEMBRANE DIRECTLY TO CHECK DAM.
4. CHECK DAMS SHALL BE CONSTRUCTED TO PREVENT ANY UNINTENDED BYPASS WITHIN THE AGGREGATE STORAGE LAYER AND UNDERDRAIN BEDDING LAYER OR AROUND THE CHECK DAMS.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| ______ | PREPARED BY: DCCR | PARKING LANE PERMEABLE PAVEMENT FACILITY ELEVATION ALONG UNDERDRAIN, SECTION B–B |
| CHIEF ENGINEER | CHECKED BY: ______ | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

GI–13.02




## NOTES:

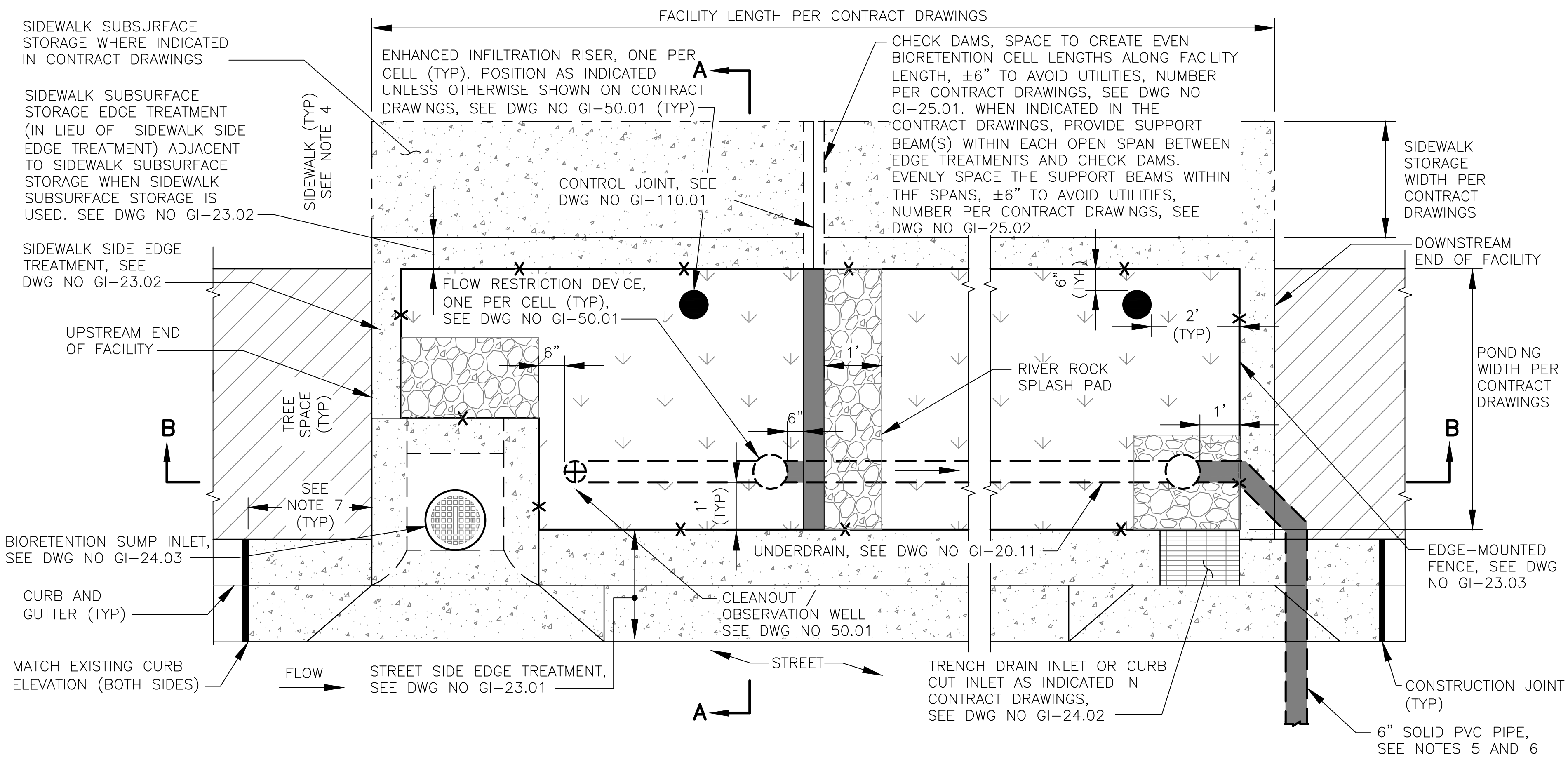
1. WHERE TREE ROOTS BUTTRESS OVER EXISTING CURB, EXISTING CURB SHALL REMAIN IN PLACE ADJACENT TO TREE, IN ACCORDANCE WITH CONTRACT DOCUMENTS.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ____________ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| ____________ CHIEF ENGINEER | PREPARED BY: DCCR | |
| | CHECKED BY: ______ | PARKING LANE PERMEABLE PAVEMENT EDGE RESTRAINT |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY






DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| CHIEF ENGINEER | DATE: ______ | PLANTER BIORETENTION FACILITY PLAN |
| | PREPARED BY: DCCR | |
| | CHECKED BY: ______ | |

## NOTES:

1. IF CONTRACT DRAWINGS INDICATE A NEW TREE WITHIN OR DIRECTLY ADJACENT TO A FACILITY, SEE DWG NO GI–70.01. PLANTINGS SHALL BE INSTALLED IN ACCORDANCE WITH DWG NOS GI–70.02 AND GI–70.03.
2. SEE CONTRACT DRAWINGS FOR INLET CONFIGURATIONS AND SIZES. PROVIDE ADDITIONAL INLETS WHERE INDICATED IN CONTRACT DRAWINGS.
3. EXISTING PEDESTRIAN PATHS LOCATED WITHIN PROPOSED FACILITY FOOTPRINT SHALL BE REMOVED.
4. REPLACE IMPACTED SIDEWALK SLABS ADJACENT TO FACILITY.
5. COLLECTION SYSTEM TIE IN LOCATION INDICATED ON CONTRACT DOCUMENTS. ELEVATION OF CONNECTION TO COLLECTION SYSTEM PER CONTRACT DRAWINGS. UNDERDRAIN PIPE SHALL TRANSITION FROM PVC SCHEDULE 40 TO PVC SDR–35 OUTSIDE THE FACILITY, WITHIN 3 LF OF THE UNDERDRAIN PENETRATION THOUGH THE WATERPROOFING MEMBRANE OR GEOTEXTILE, AS MEASURED ALONG THE CENTERLINE OF THE UNDERDRAIN PIPE. FOR CONNECTION TO MANHOLES OR CATCH BASINS, SEE DWG NO GI–100.02. FOR CONNECTION TO SEWERS, SEE DWG NO GI–100.01. FOR CONNECTION TO DOWNSTREAM PERMEABLE PAVEMENT FACILITY, SEE DWG NO GI–50.04.
6. SEE DC WATER STANDARD DETAIL S–15.01 FOR TRENCH EXCAVATION AND FILL. BACKFILL ABOVE THE BEDDING, FOURTH COURSE, SHALL BE COMPACTED FILL MEETING DC WATER STANDARDS.
7. CONTRACTOR SHALL RESTORE CURB AND GUTTER PER DDOT STANDARDS 1' BEYOND FACILITY EXCEPT WHERE:
   - CATCH BASIN OR ALLEY APRON IS WITHIN 0–4' OF EDGE OF FACILITY, REPLACE CURB AND GUTTER TO EDGE OF CATCH BASIN OR ALLEY APRON.
   - NEXT CURB CONSTRUCTION JOINT IS WITHIN 1–4' OF EDGE OF FACILITY, REPLACE TO THAT CONSTRUCTION JOINT.
   - OTHERWISE SPECIFIED IN THE CONTRACT DRAWINGS OR BY DC WATER'S REPRESENTATIVE.

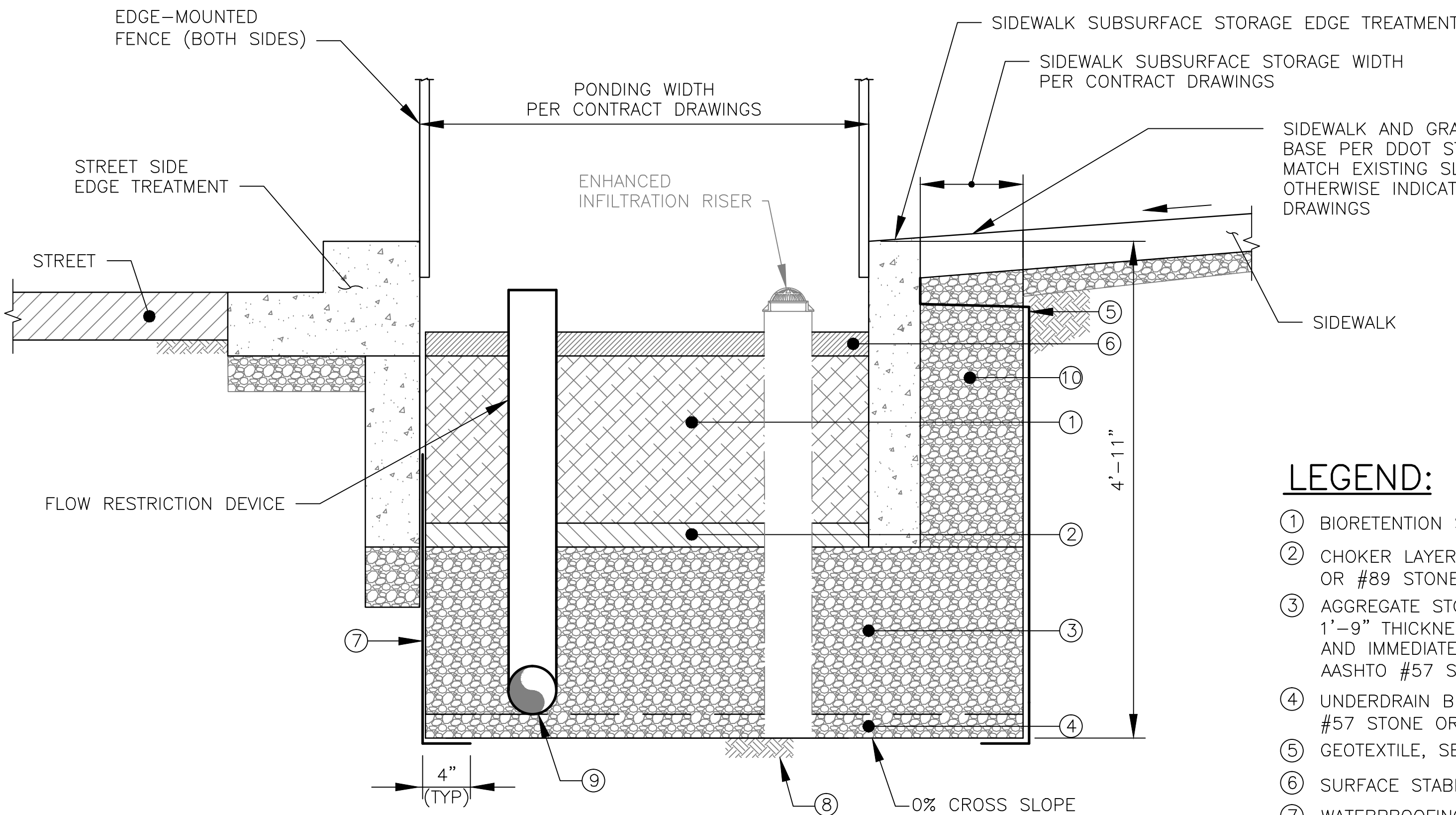
   CONTRACTOR SHALL MATCH EXISTING SURFACE FINISH.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| ______ CHIEF ENGINEER | PREPARED BY: DCCR | PLANTER BIORETENTION FACILITY PLAN |
| | CHECKED BY: ______ | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY






## LEGEND:

1. BIORETENTION SOIL MEDIA, 1'–6" THICKNESS
2. CHOKER LAYER, 3" THICKNESS, AASHTO #8 OR #89 STONE OR APPROVED EQUIVALENT
3. AGGREGATE STORAGE LAYER, THICKNESS VARIES, 1'–9" THICKNESS AT DOWNSTREAM END OF FACILITY AND IMMEDIATELY UPSTREAM OF CHECK DAMS, AASHTO #57 STONE OR APPROVED EQUIVALENT
4. UNDERDRAIN BEDDING, 3" THICKNESS, AASHTO #57 STONE OR APPROVED EQUIVALENT
5. GEOTEXTILE, SEE NOTE 2
6. SURFACE STABILIZATION LAYER, 2" THICKNESS
7. WATERPROOFING MEMBRANE
8. SUBGRADE, SEE NOTE 1
9. UNDERDRAIN
10. SIDEWALK SUBSURFACE STORAGE

## NOTES:

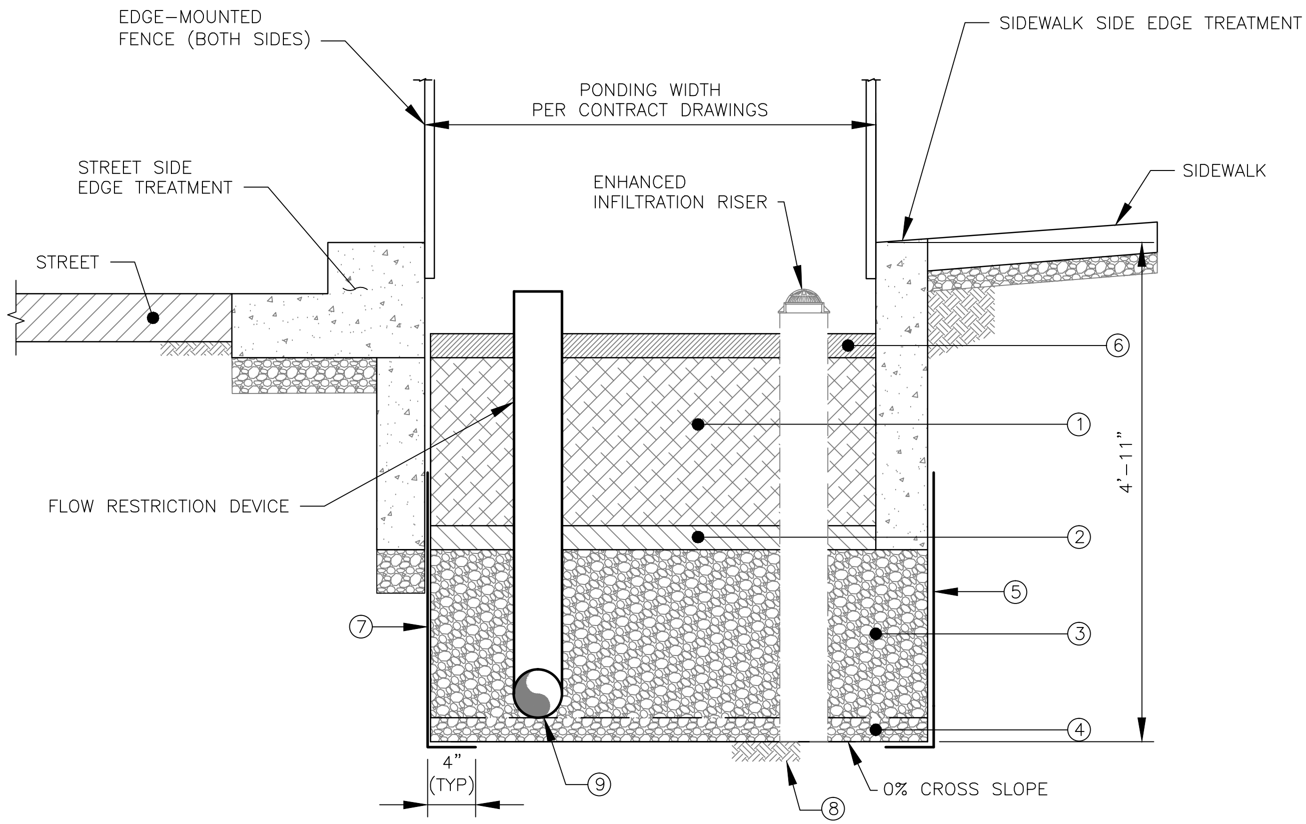
1. SCARIFY SUBGRADE 3" MIN BEFORE INSTALLATION.
2. WATERPROOFING MEMBRANE SHALL BE USED IN LIEU OF GEOTEXTILE WHERE INDICATED IN CONTRACT DRAWINGS.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______<br><br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL–PR–A1<br>PLANTER BIORETENTION FACILITY<br>WITH SIDEWALK SUBSURFACE STORAGE,<br>SECTION A–A |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY






## NOTES:

1. SCARIFY SUBGRADE 3" MIN BEFORE INSTALLATION.
2. WATERPROOFING MEMBRANE SHALL BE USED IN LIEU OF GEOTEXTILE WHERE INDICATED IN CONTRACT DRAWINGS.

## LEGEND:

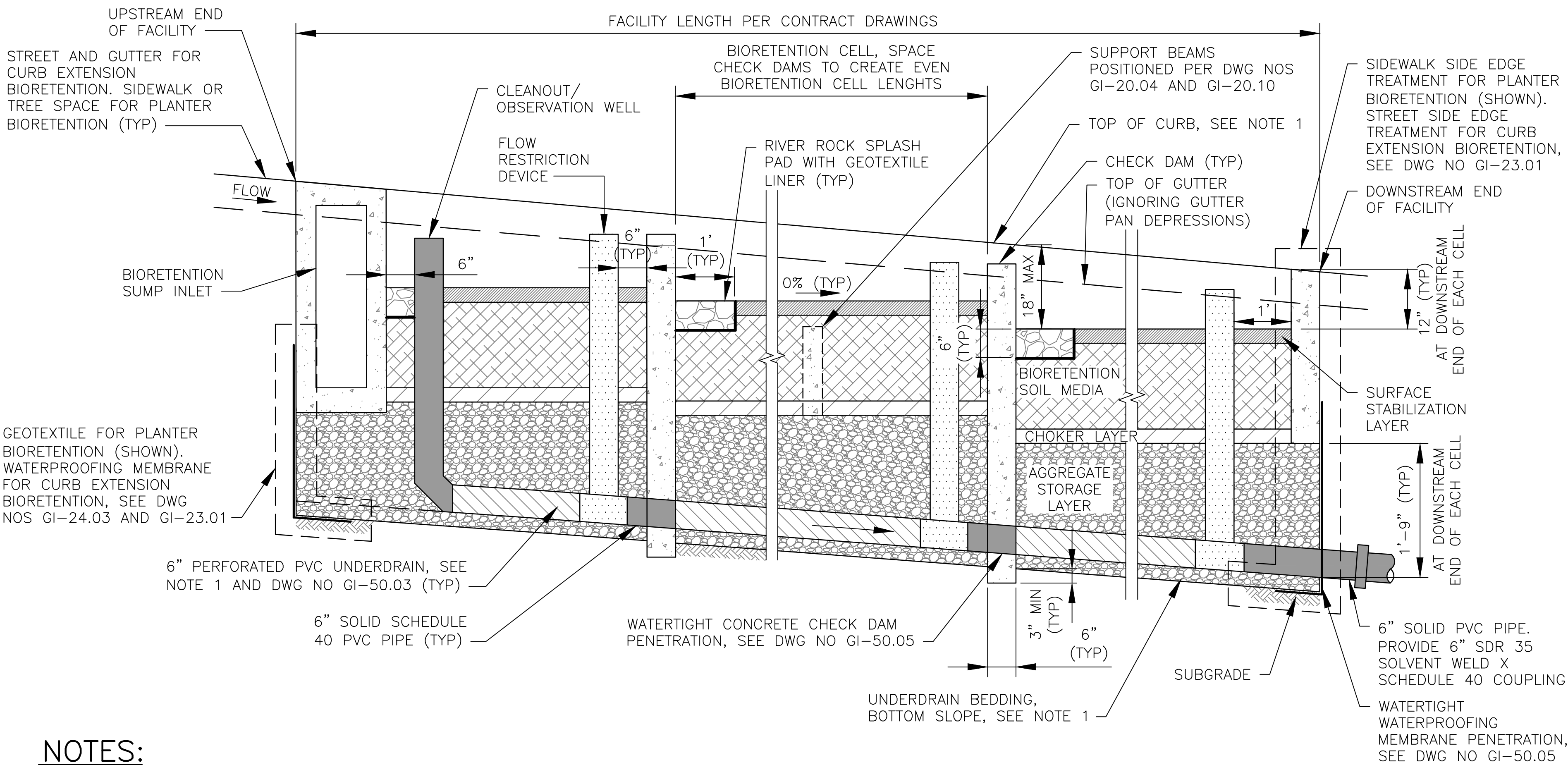
1. BIORETENTION SOIL MEDIA, 1'–6" THICKNESS
2. CHOKER LAYER, 3" THICKNESS, AASHTO #8 OR #89 STONE OR APPROVED EQUIVALENT
3. AGGREGATE STORAGE LAYER, THICKNESS VARIES, 1'–9" THICKNESS AT DOWNSTREAM END OF FACILITY AND IMMEDIATELY UPSTREAM OF CHECK DAMS, AASHTO #57 STONE OR APPROVED EQUIVALENT
4. UNDERDRAIN BEDDING, 3" THICKNESS, AASHTO #57 STONE OR APPROVED EQUIVALENT
5. GEOTEXTILE, SEE NOTE 2
6. SURFACE STABILIZATION LAYER, 2" THICKNESS
7. WATERPROOFING MEMBRANE
8. SUBGRADE, SEE NOTE 1
9. UNDERDRAIN

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______<br><br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL–PR–A1<br>PLANTER BIORETENTION FACILITY<br>WITHOUT SIDEWALK SUBSURFACE<br>STORAGE, SECTION A–A |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY

GI–20.11




## NOTES:

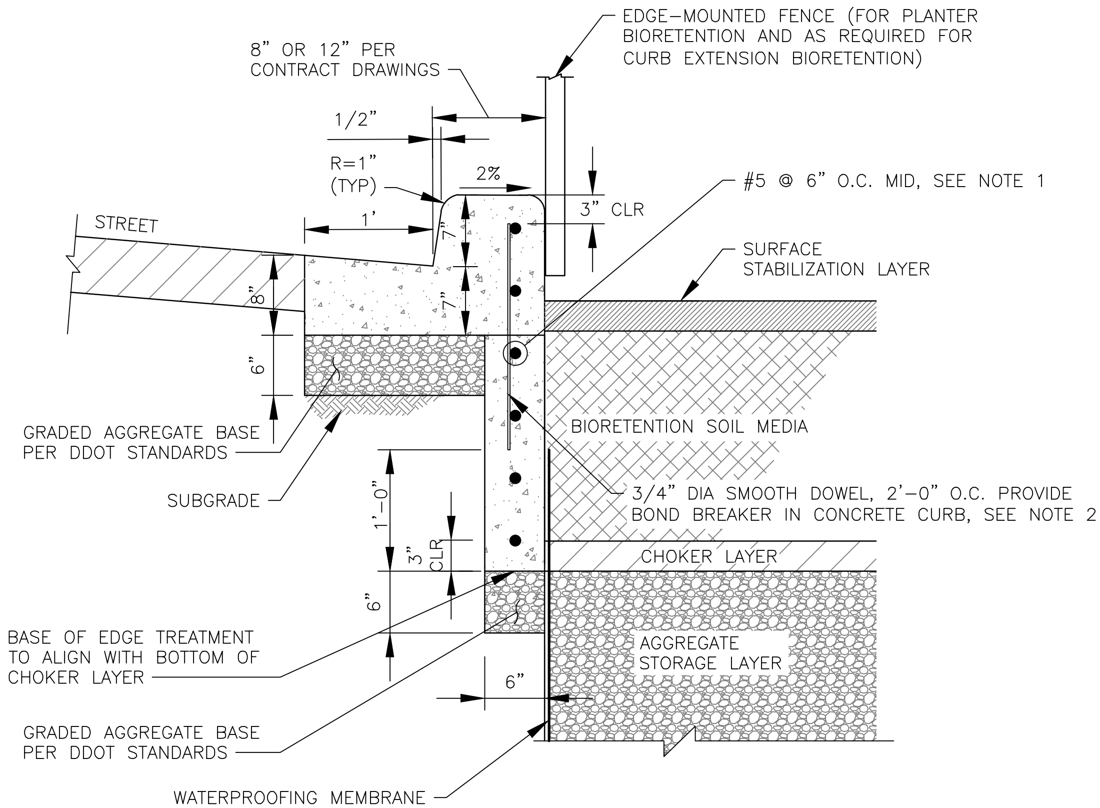
1. LONGITUDINAL SLOPE OF FACILITY BOTTOM, UNDERDRAIN, AND TOP OF EDGE TREATMENTS SHALL MATCH EXISTING ROAD SLOPE.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______<br><br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL–PR–A1<br><br>BIORETENTION FACILITY ELEVATION<br>SECTION B–B |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

GI-23.01




## NOTES:

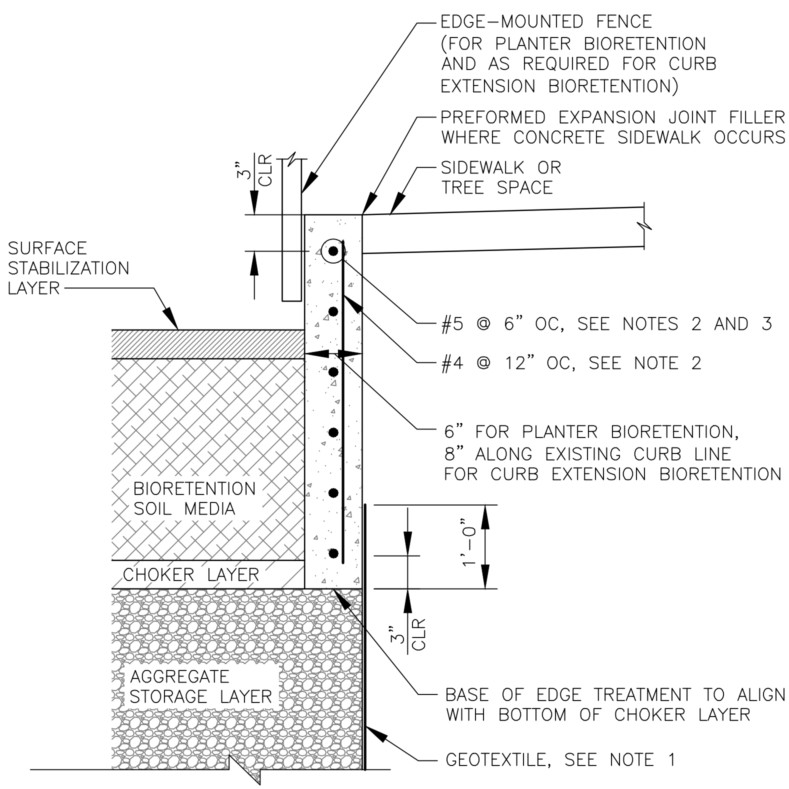
1. PROVIDE CORNER BARS AT CORNERS PER DWG NO GI-110.01. DOWEL INTO BIORETENTION SUMP INLETS WHERE THEY OCCUR, TO DEVELOP BAR.
2. DOWEL BAR: ASTM A615, GR 60, SMOOTH
   BOND BREAKER: VALVOLINE TECTYL 506, OR APPROVED EQUAL

DETAIL NOT TO SCALE

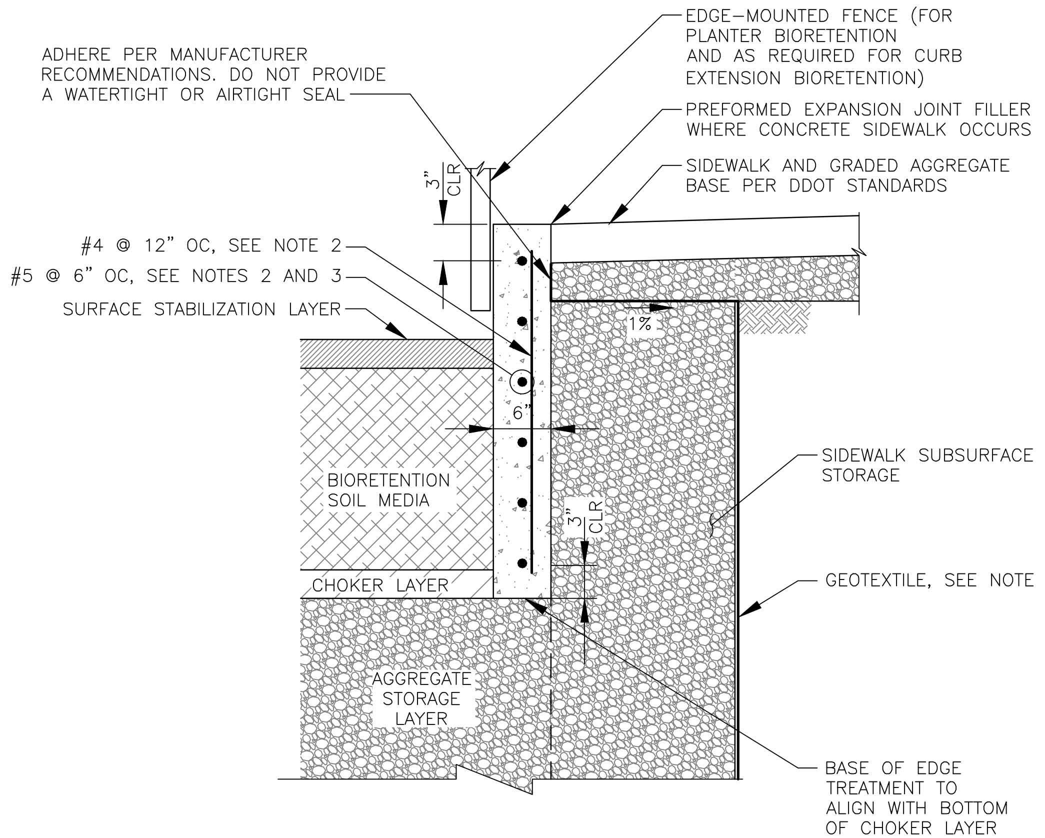
| | | |
|---|---|---|
| APPROVED DATE: ______<br><br>______<br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL-PR-A1<br><br>STREET SIDE EDGE TREATMENT |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY

GI–23.02




SIDEWALK SIDE EDGE TREATMENT




SIDEWALK SUBSURFACE STORAGE EDGE TREATMENT

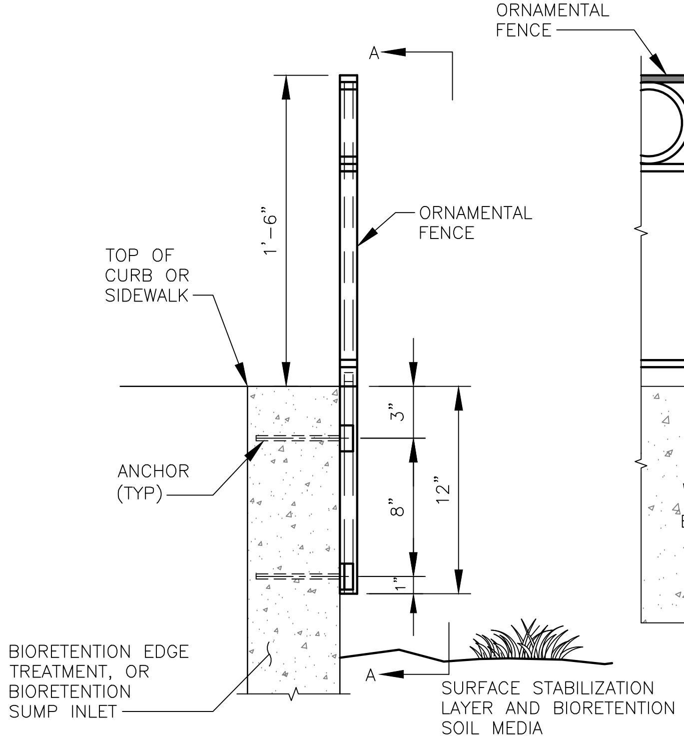
## NOTES:

1. WATERPROOFING MEMBRANE SHALL BE USED IN LIEU OF GEOTEXTILE WHERE INDICATED IN THE CONTRACT DRAWINGS.
2. CENTER REINFORCEMENT IN EDGE TREATMENT.
3. PROVIDE CORNER BARS AT CORNERS PER DWG NO GI–110.01. DOWEL INTO BIORETENTION SUMP INLETS WHERE THEY OCCUR, TO DEVELOP BAR.

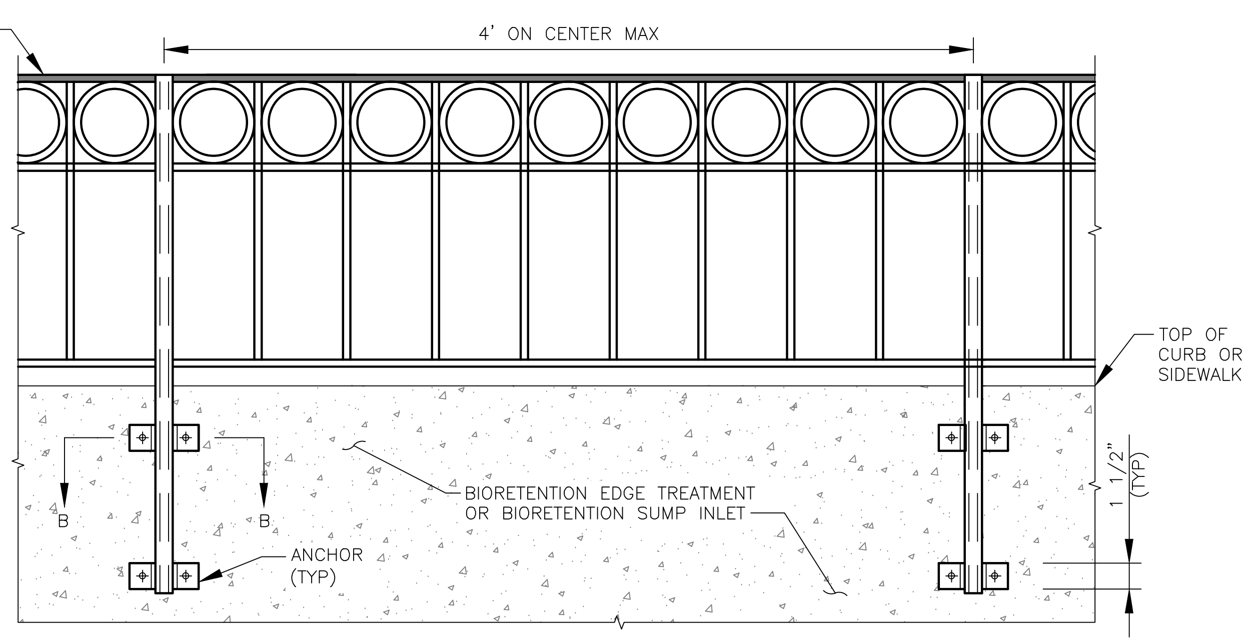
DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| | PREPARED BY: DCCR | BIORETENTION EDGE TREATMENTS – SIDEWALK SIDE |
| CHIEF ENGINEER | CHECKED BY: ______ | |

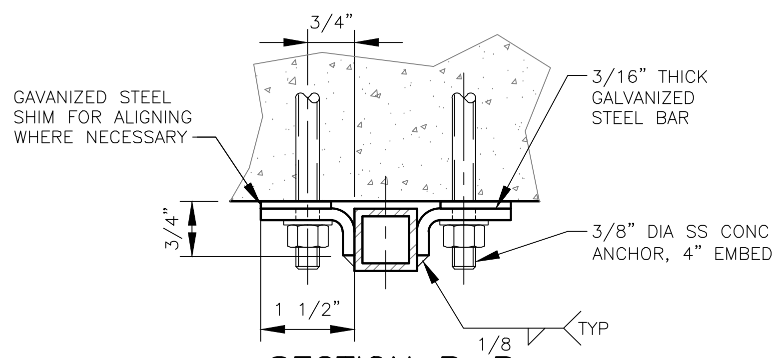
# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY




## ELEVATION




## SECTION A–A




## SECTION B–B

## NOTES:

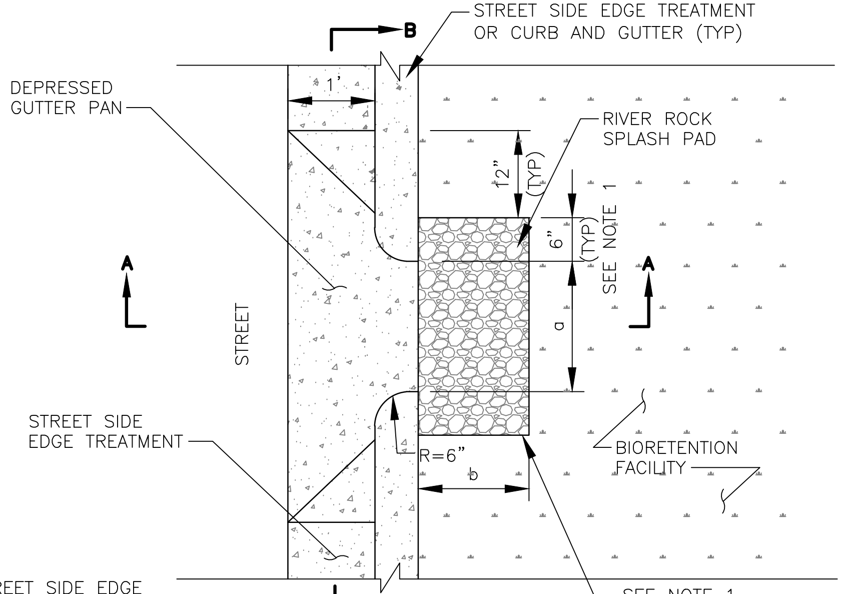
1. ANCHORS SHALL NOT BE USED ON THE SIDE OF THE BIORETENTION SUMP INLET WITH THE OPENING.
2. CORNERS OF FENCE SHALL NOT BE WELDED EXCEPT WHERE NEEDED TO SUPPORT UNANCHORED PERPENDICULAR FENCE.
3. LOCATE END POST WITHIN 1'–0" OF CORNERS.

DETAIL NOT TO SCALE

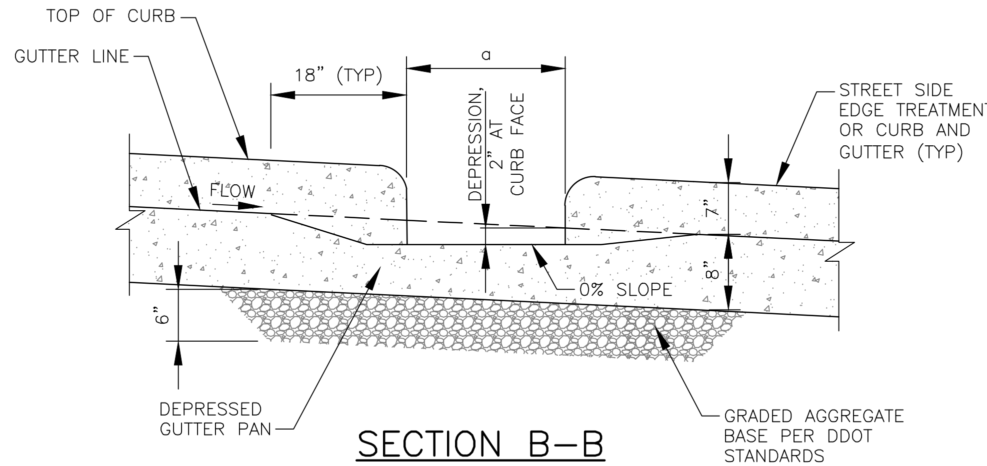
| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | EDGE–MOUNTED FENCE |
| | CHECKED BY: ______ | |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY

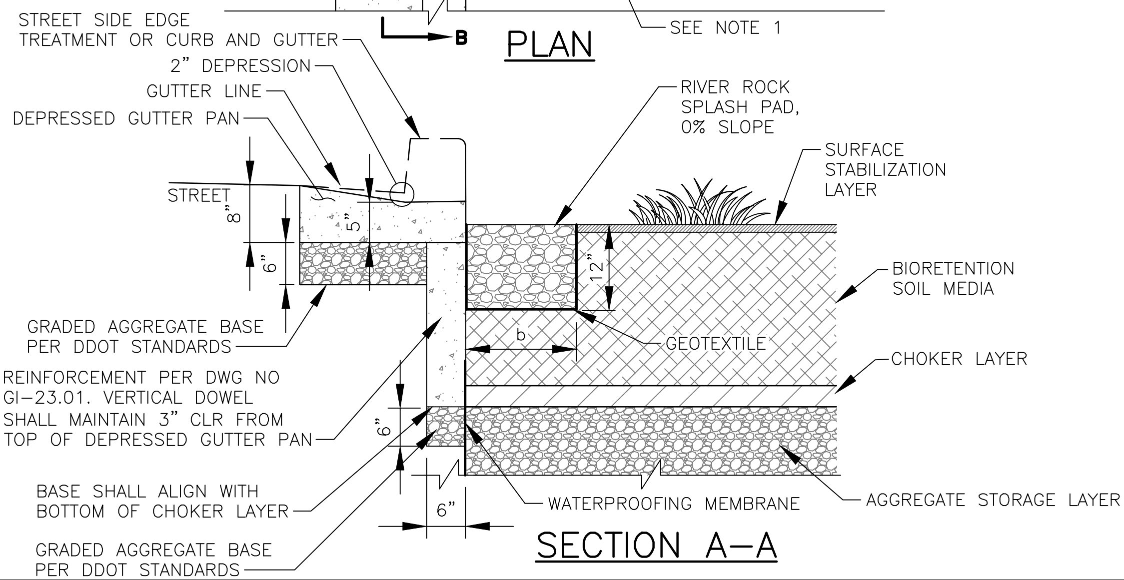





PLAN




SECTION B–B




SECTION A–A

## NOTES:

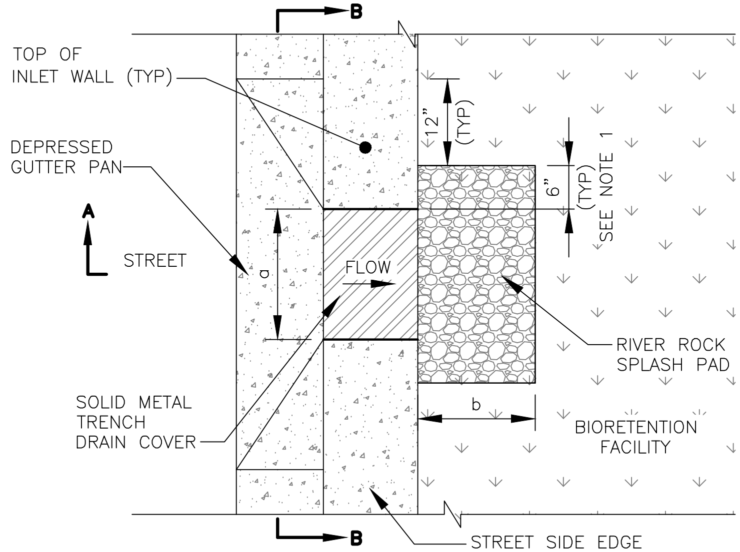
1. ELIMINATE WING OF RIVER ROCK SPLASH PAD WHERE INLET OPENING ABUTS CHECK DAM OR EDGE TREATMENT.
2. SEE CONTRACT DRAWINGS FOR DIMENSIONS a AND b.

DETAIL NOT TO SCALE

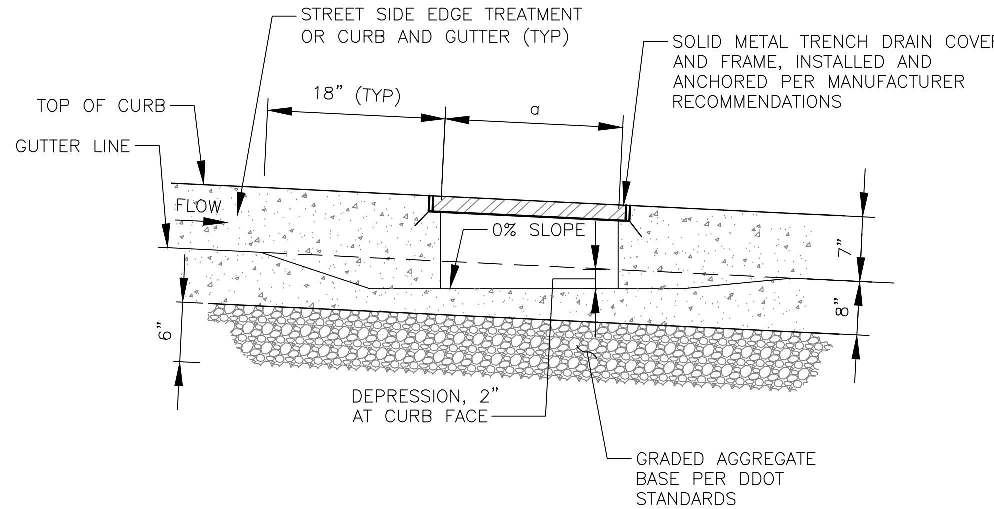
| | | |
|---|---|---|
| APPROVED DATE: ______<br><br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL–PR–A1<br><br>CURB CUT INLET |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY

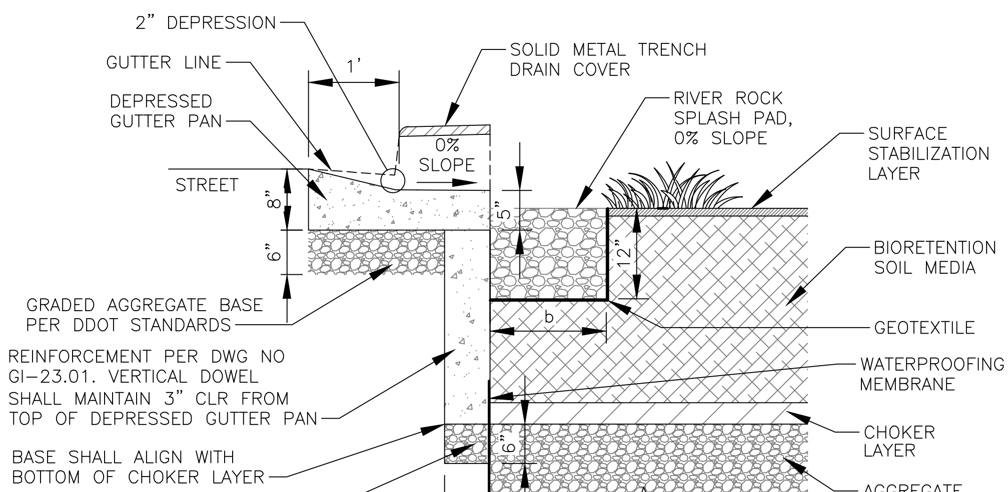
GI–24.02




PLAN




SECTION B–B



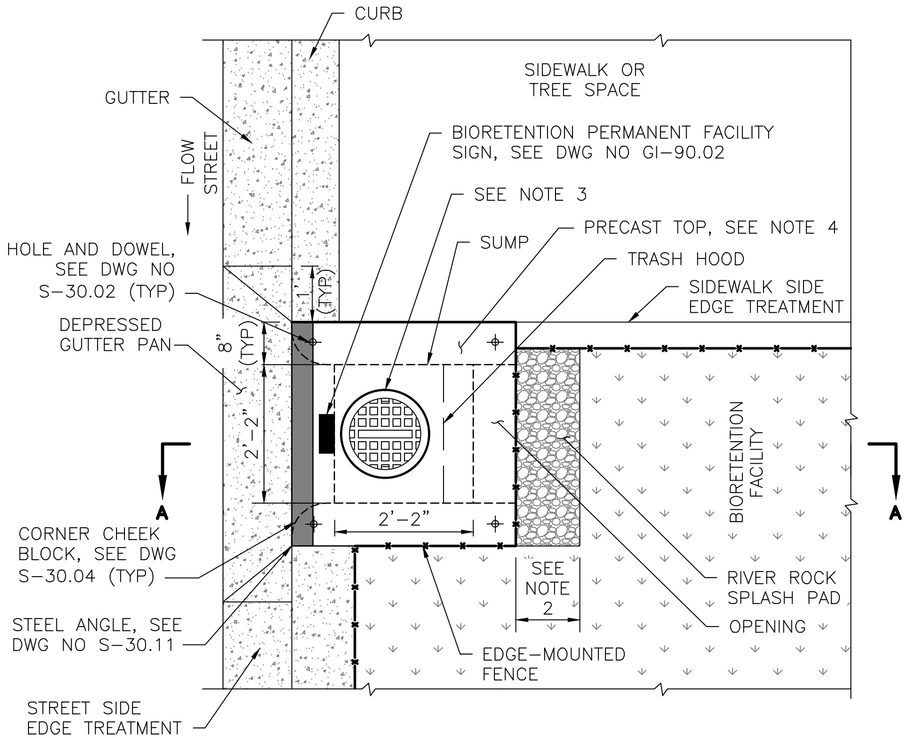

SECTION A–A

## NOTES:

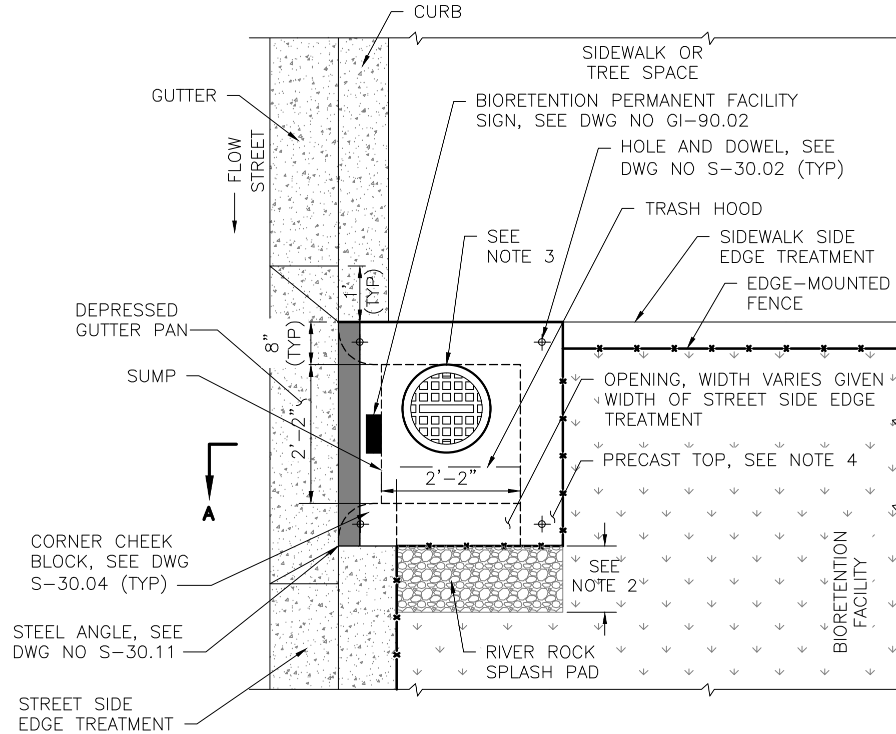
1. ELIMINATE WING OF RIVER ROCK SPLASH PAD WHERE INLET OPENING ABUTS CHECK DAM OR EDGE TREATMENT.
2. SEE CONTRACT DRAWINGS FOR DIMENSIONS a AND b.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| CHIEF ENGINEER | DATE: ______ | SOLID TRENCH DRAIN INLET |
| | PREPARED BY: DCCR | |
| | CHECKED BY: ______ | |




PLAN VIEW – TYPE A



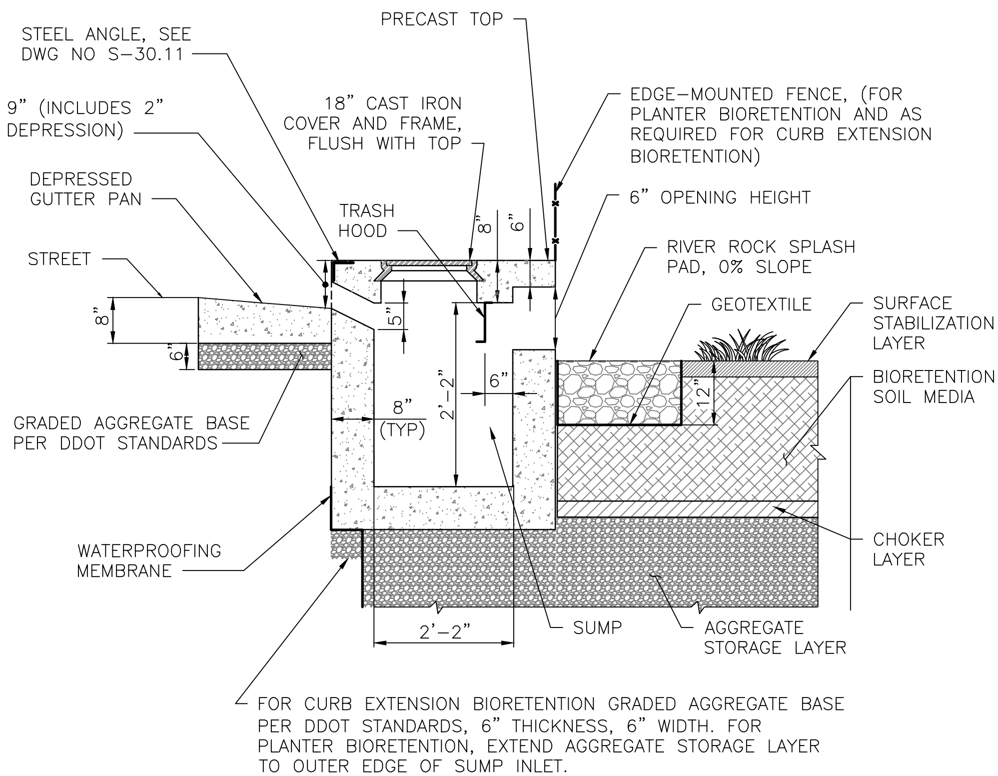

PLAN VIEW – TYPE B

## NOTES:

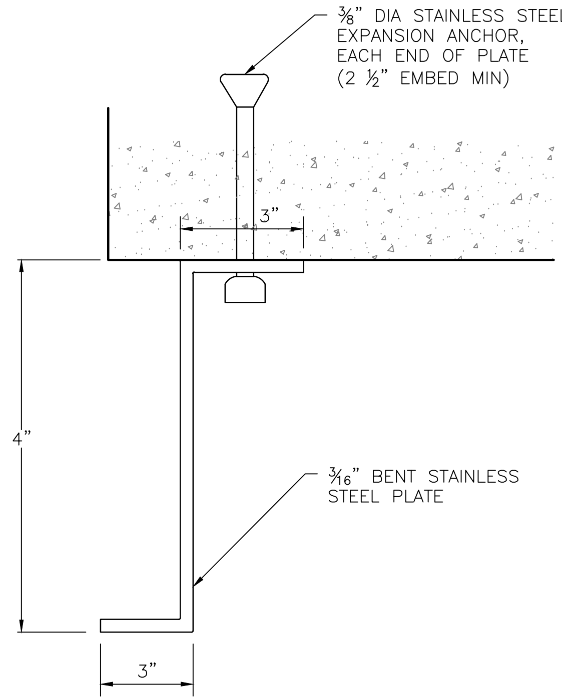
1. EXPANSION JOINT REQUIRED AROUND SUMP INLET AT CONCRETE INTERFACES.
2. 1'–6" UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DRAWINGS.
3. 18" CAST IRON COVER AND FRAME, FLUSH WITH TOP. NEENAH R–1791–E OR APPROVED EQUIVALENT.
4. PROVIDE REINFORCING STEEL ANCHORS, AND CONCRETE PER DWG NOS S–30.02 AND S–30.11.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | BIORETENTION SUMP INLET FOR PLANTER BIORETENTION |
| | CHECKED BY: ______ | |




SECTION A–A




TRASH HOOD

## NOTE:

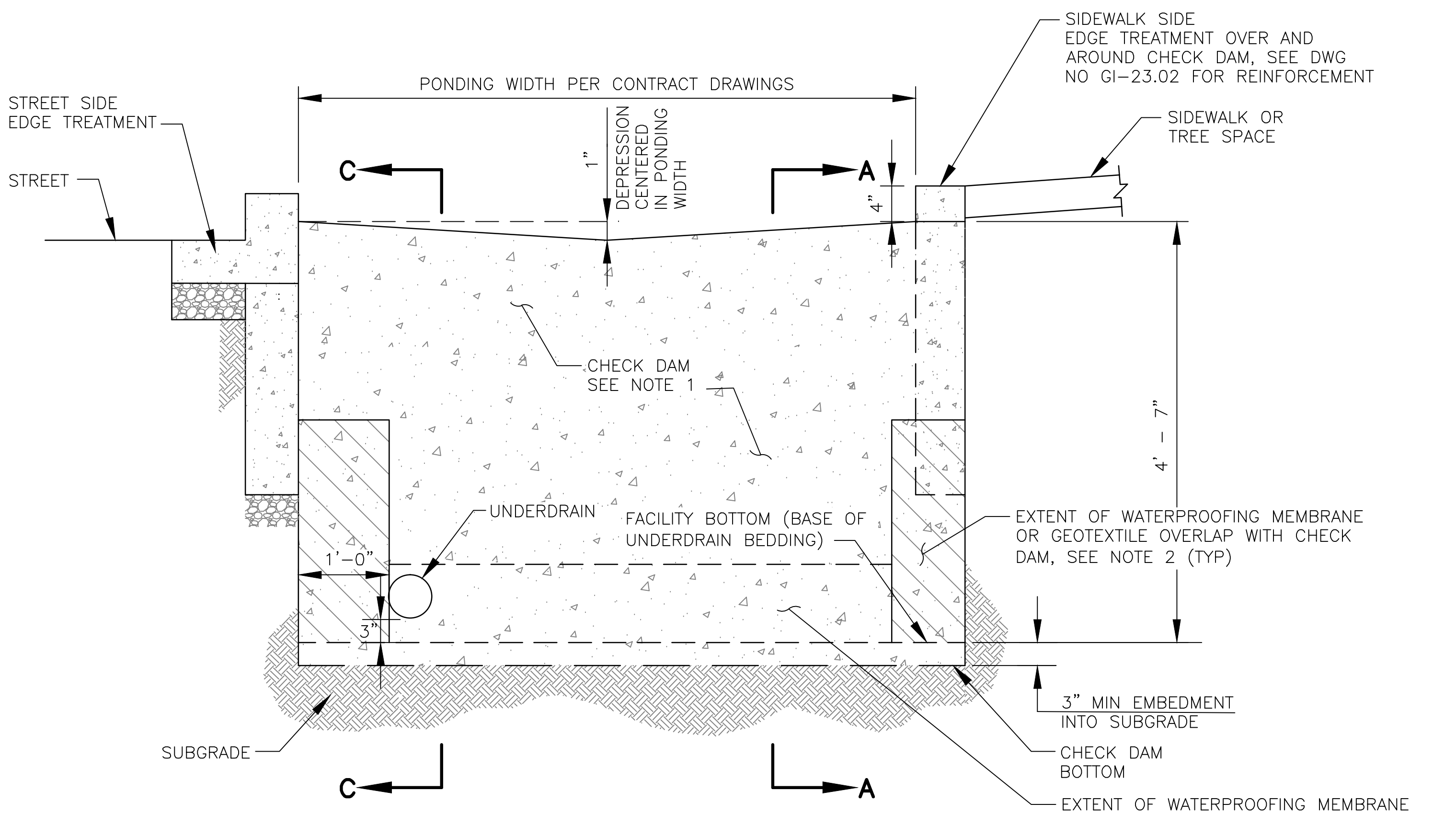
1. PROVIDE REINFORCING STEEL ANCHORS AND CONCRETE PER DWG NOs S–30.02 AND S–30.11.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: | REVISION NO.: | STANDARD DETAIL–PR–A1 |
| | DATE: | |
| | PREPARED BY: DCCR | BIORETENTION SUMP INLET, SECTION A–A |
| CHIEF ENGINEER | CHECKED BY: | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY






## NOTES:

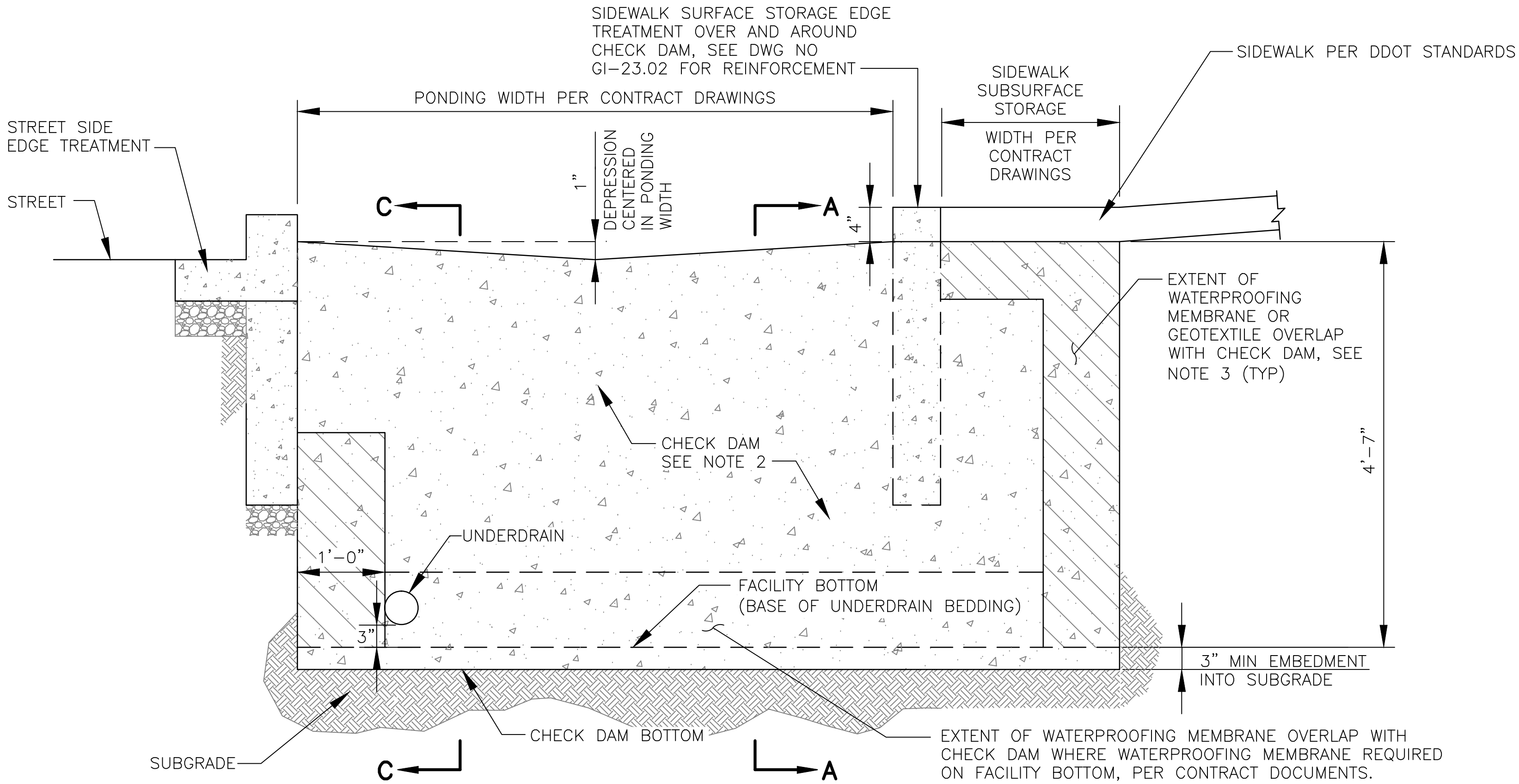
1. SEE SECTION A–A FOR REINFORCEMENT
2. DO NOT INSTALL GEOTEXTILE OR WATERPROOFING MEMBRANE UNDER OR AROUND CHECK DAMS. TURN UP GEOTEXTILE AND/OR WATERPROOFING MEMBRANE AGAINST CHECK DAM, OVERLAP WITH CHECK DAM PER MANUFACTURER'S RECOMMENDATION AND AS APPROVED BY DC WATER, 12 INCH MINIMUM. ADHERE WATERPROOFING MEMBRANE DIRECTLY TO CHECK DAM TO CREATE WATERTIGHT SEAL EXCEPT WHERE OTHERWISE INDICATED.
3. CHECK DAMS SHALL BE CONSTRUCTED TO PREVENT ANY UNINTENDED BYPASS WITHIN THE AGGREGATE STORAGE LAYER AND UNDERDRAIN BEDDING LAYER OR AROUND THE CHECK DAMS.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | BIORETENTION CHECK DAM WITHOUT SIDEWALK SUBSURFACE STORAGE |
| | CHECKED BY: ______ | |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY

GI–25.01
(2 OF 4)

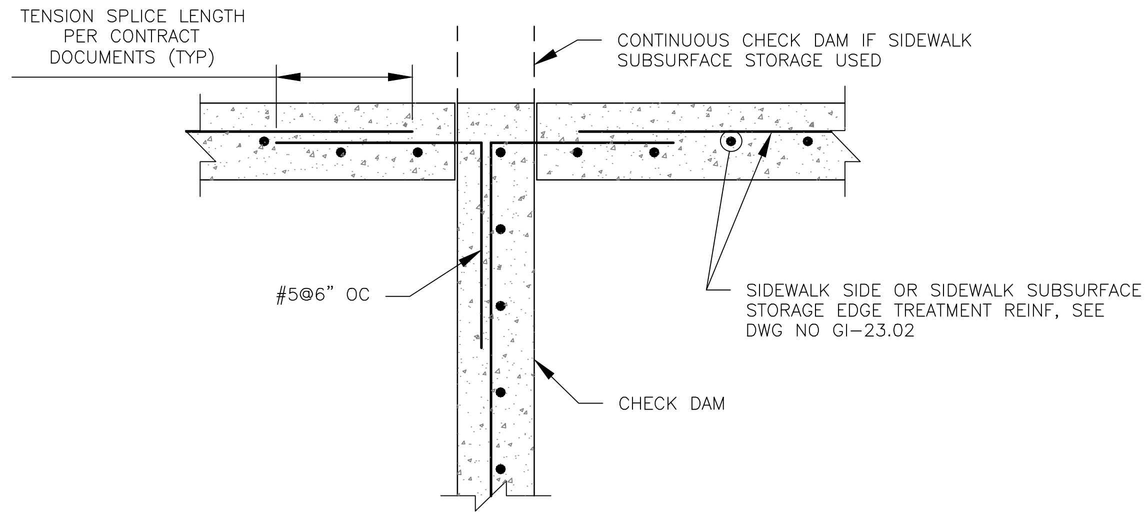



## NOTES:

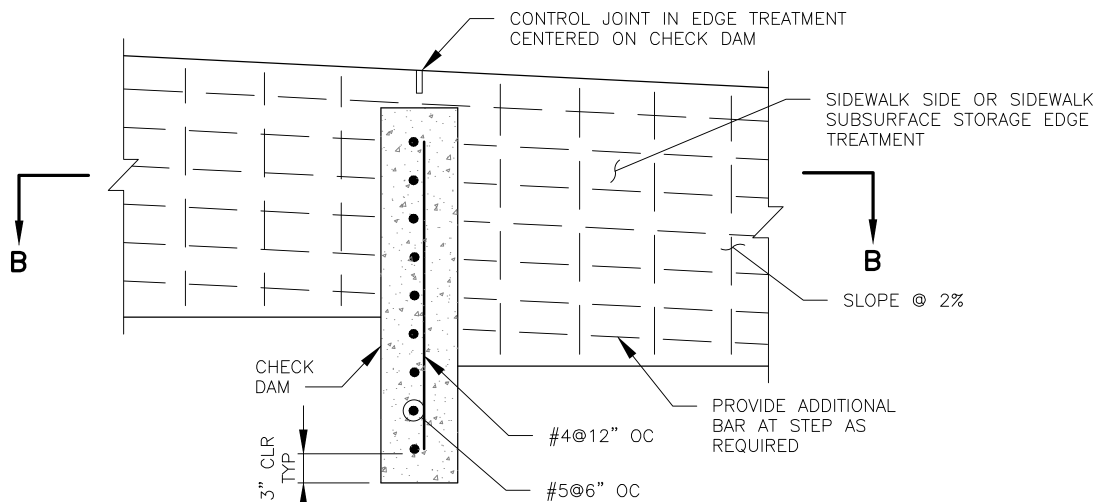
1. CHECK DAMS SHALL EXTEND THROUGH SIDEWALK SUBSURFACE STORAGE AGGREGATE. TOP OF CHECK DAM IN SIDEWALK SHALL MATCH TOP OF CHECK DAM IN BIORETENTION PONDING AREA.
2. SEE SECTION A–A FOR REINFORCEMENT.
3. DO NOT INSTALL GEOTEXTILE OR WATERPROOFING MEMBRANE UNDER OR AROUND CHECK DAMS. TURN UP GEOTEXTILE AND/OR WATERPROOFING MEMBRANE AGAINST CHECK DAM BOTTOM AND SIDES, OVERLAP WITH CHECK DAM PER MANUFACTURER'S RECOMMENDATION AND AS APPROVED BY DC WATER, 12 INCH MINIMUM. ADHERE WATERPROOFING MEMBRANE DIRECTLY TO CHECK DAM TO CREATE WATERTIGHT SEAL EXCPET WHERE OTHERWISE INDICATED.
4. CHECK DAMS SHALL BE CONSTRUCTED TO PREVENT ANY UNINTENDED BYPASS WITHIN THE AGGREGATE STORAGE LAYER AND UNDERDRAIN BEDDING LAYER OR AROUND THE CHECK DAMS.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ____________ | REVISION NO.: ________ | STANDARD DETAIL–PR–A1 |
| | DATE: ________ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | BIORETENTION CHECK DAM WITH SIDEWALK SUBSURFACE STORAGE |
| | CHECKED BY: ________ | |




SECTION B–B




SECTION A–A

NOTES:

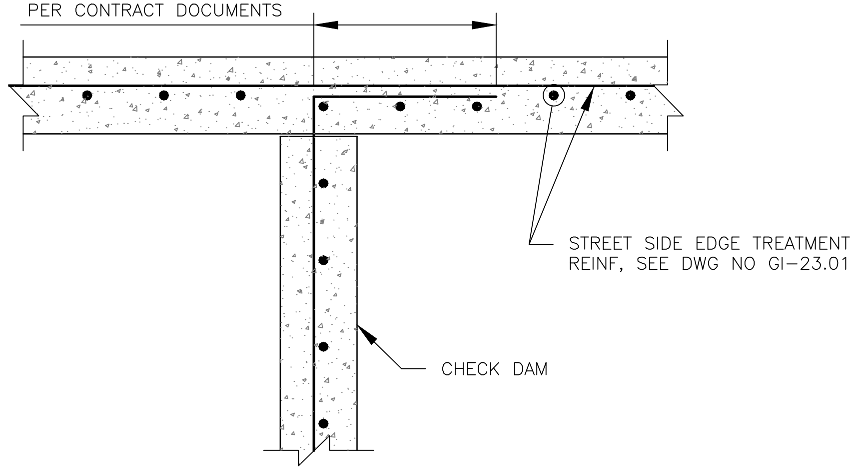
1. CENTER REINFORCEMENT IN CHECK DAM.

DETAIL NOT TO SCALE

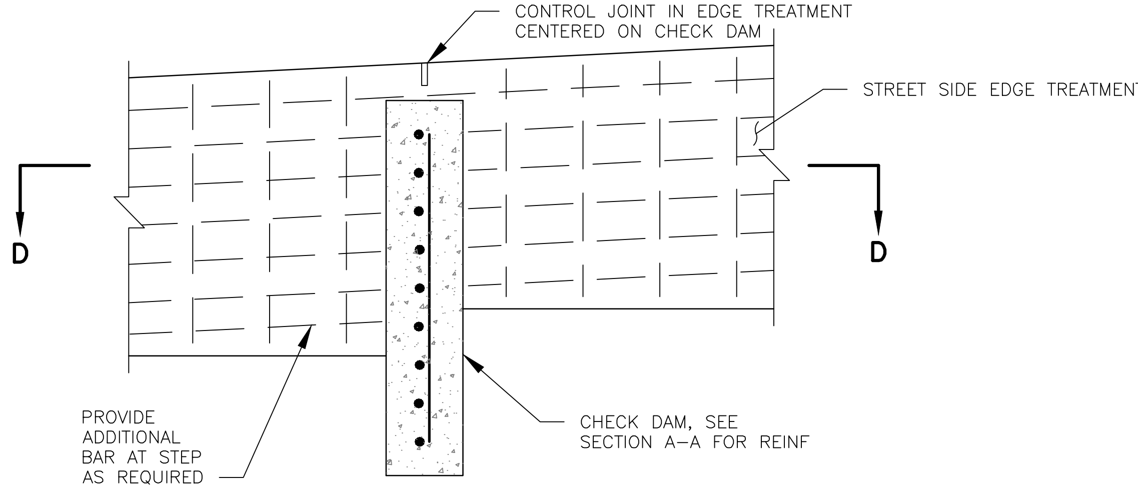
| | | |
|---|---|---|
| APPROVED DATE: ________ | REVISION NO.: ________ | STANDARD DETAIL–PR–A1 |
| | DATE: ________ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | CHECK DAM REINFORCEMENT – SIDEWALK SIDE |
| | CHECKED BY: ________ | SECTION A–A |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY





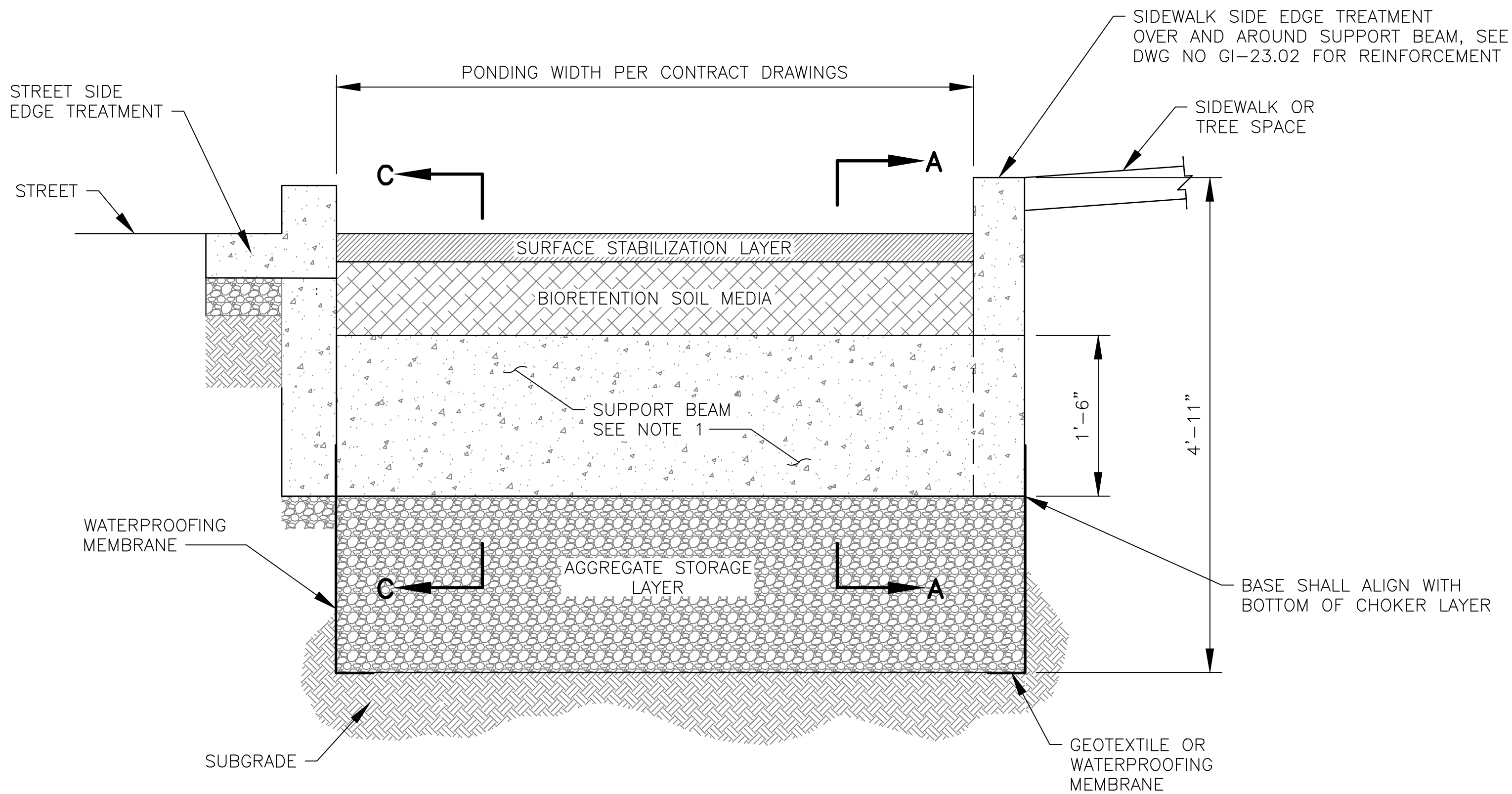

SECTION D–D




SECTION C–C

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ____ | REVISION NO.: ____ | STANDARD DETAIL–PR–A1 |
| | DATE: ____ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | CHECK DAM REINFORCEMENT – STREET SIDE<br>SECTION C–C |
| | CHECKED BY: ____ | |

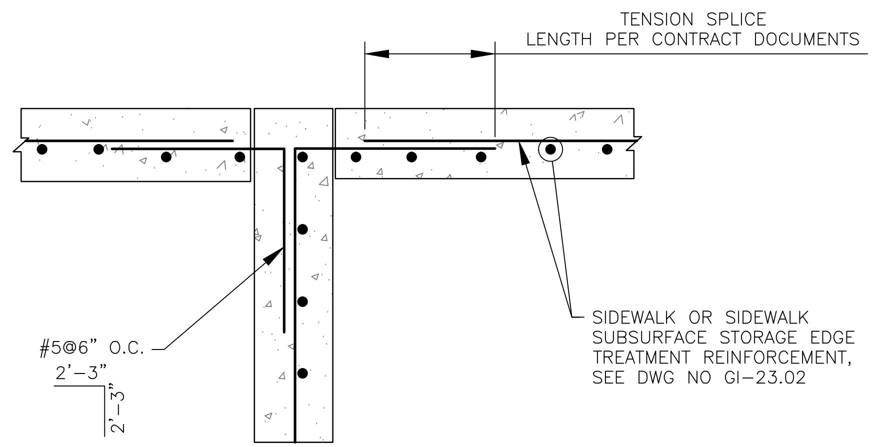



## NOTES:

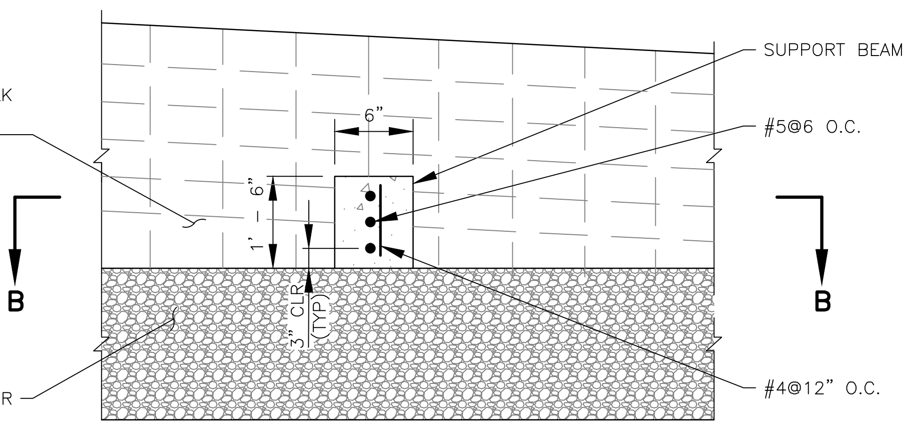
1. SEE SECTION A–A FOR REINFORCEMENT.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ____________ | REVISION NO.: ____ | STANDARD DETAIL–PR–A1 |
| CHIEF ENGINEER | DATE: ____ | SUPPORT BEAM |
| | PREPARED BY: DCCR | |
| | CHECKED BY: ____ | |




**SECTION B–B**




## NOTES:

1. CENTER REINFORCEMENT IN SUPPORT BEAM.

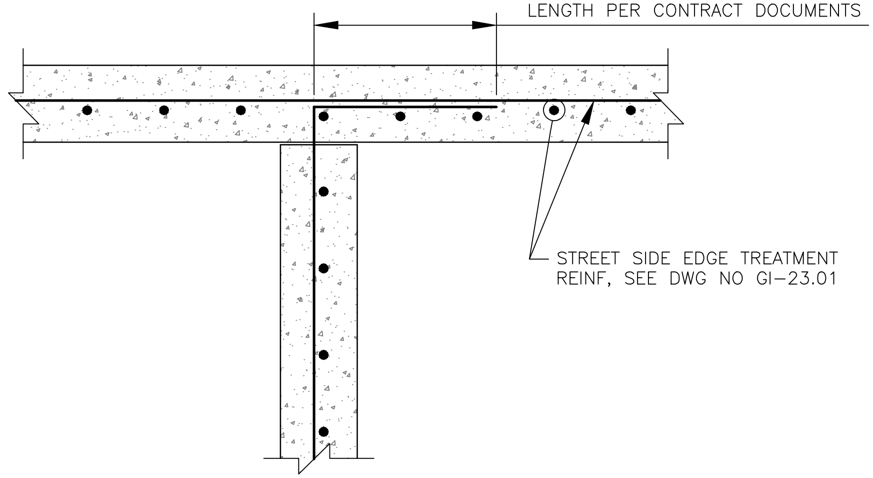
**SECTION A–A**

DETAIL NOT TO SCALE

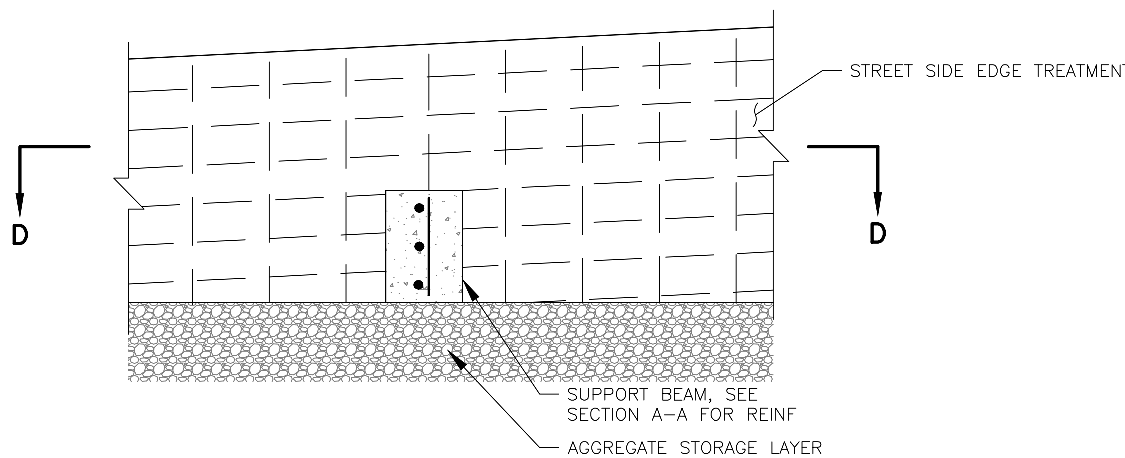
| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | SUPPORT BEAM REINFORCEMENT – SIDEWALK SIDE SECTION A–A |
| | CHECKED BY: ______ | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

GI–25.02
(3 OF 3)




SECTION D–D



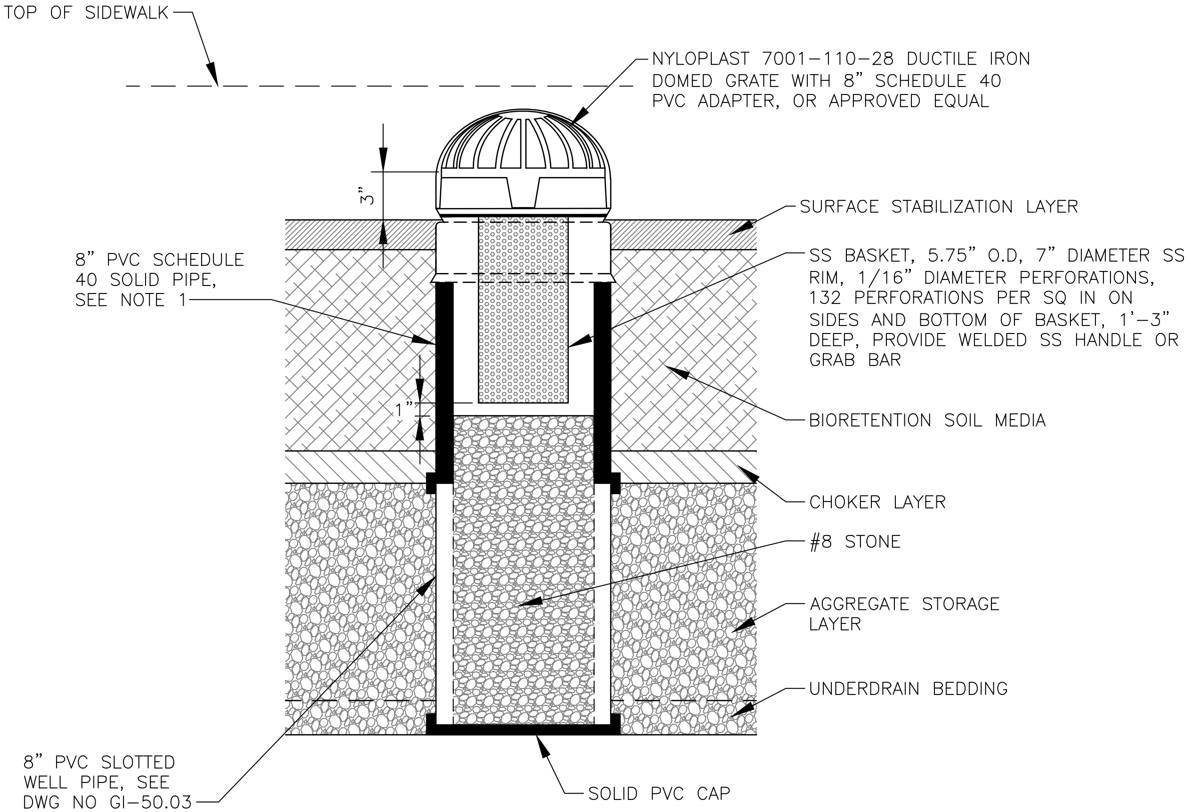

SECTION C–C

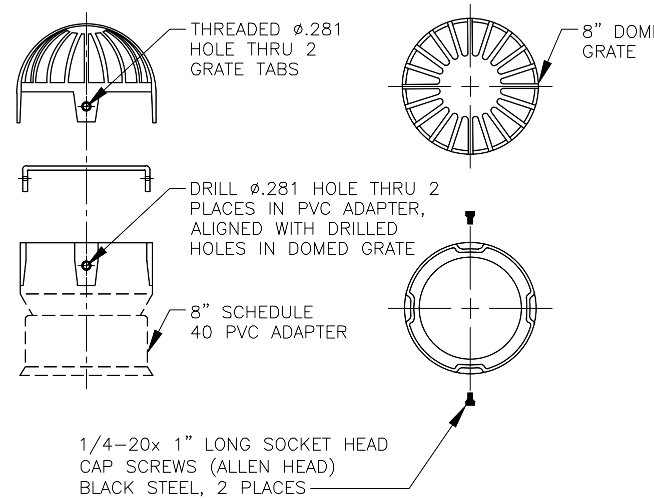
DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ____ <br> ____ CHIEF ENGINEER | REVISION NO.: ____ <br> DATE: ____ <br> PREPARED BY: DCCR <br> CHECKED BY: ____ | STANDARD DETAIL–PR–A1 <br> SUPPORT BEAM REINFORCEMENT – STREET SIDE SECTION C–C |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY






## NOTES:

1. CONNECTING JOINTS SHALL BE SOLVENT WELD IN ACCORDANCE WITH CONTRACT DOCUMENTS.

DETAIL NOT TO SCALE

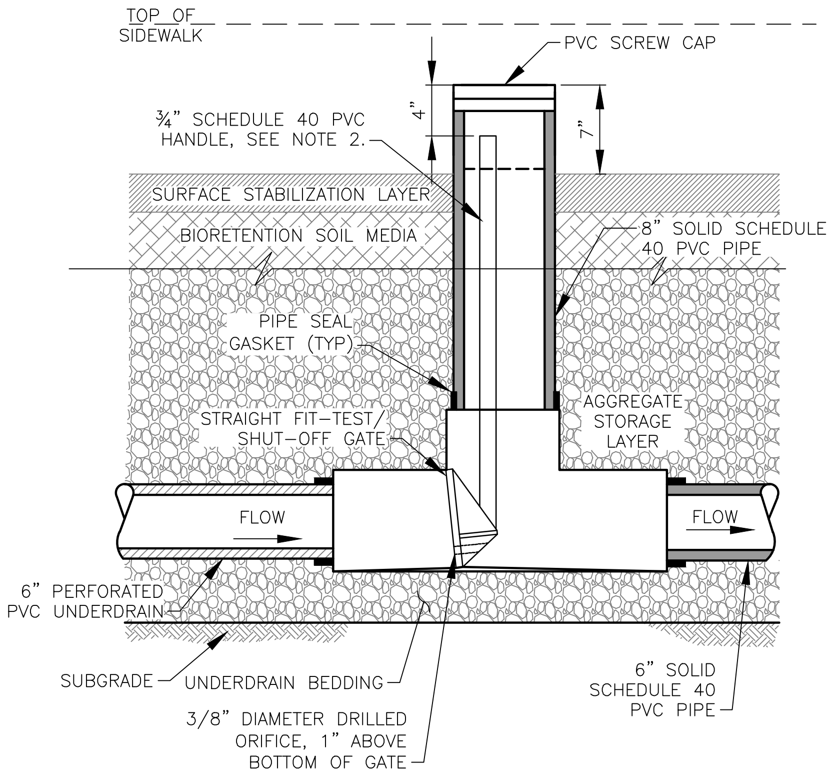
APPROVED DATE: ____________

____________
CHIEF ENGINEER

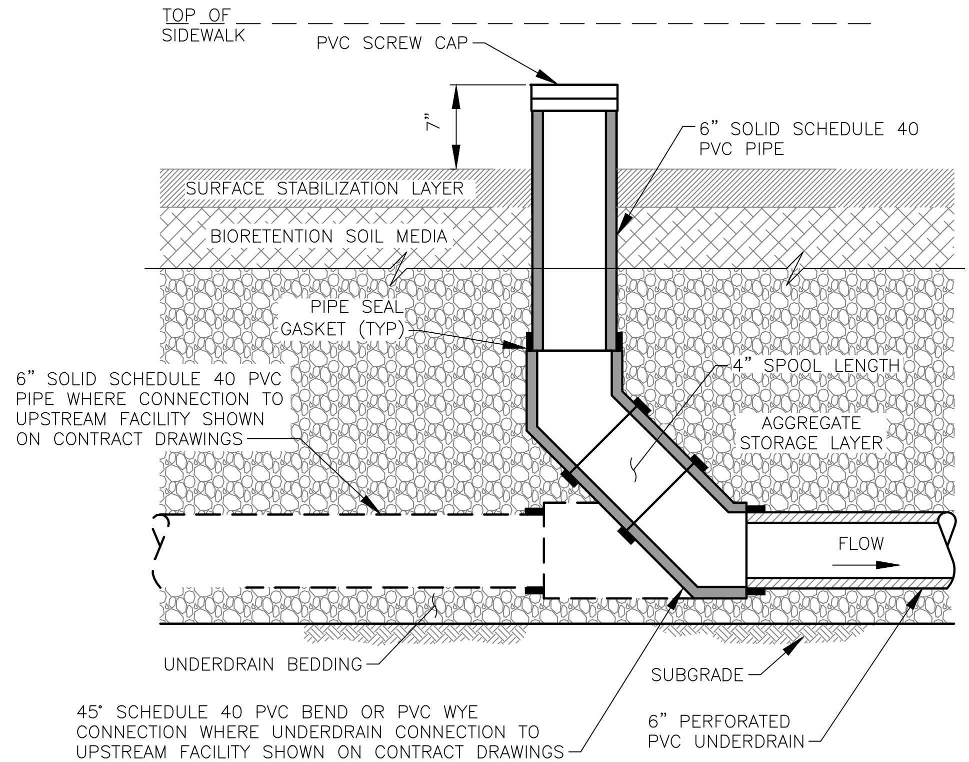
REVISION NO.: ________
DATE: ________
PREPARED BY: DCCR
CHECKED BY: ________

STANDARD DETAIL–PR–A1

ENHANCED INFILTRATION RISER




## FLOW RESTRICTION DEVICE IN BIORETENTION




## CLEANOUT/OBSERVATION WELL IN BIORETENTION

## NOTES:

1. FLOW RESTRICTION DEVICE SHALL BE MAINLINE STRAIGHT–FIT BACK WATER VALVE WITH TEST/SHUT–OFF GATE OR APPROVED EQUAL.
2. ADHERE HANDLE TO GATE WITH PVC CEMENT AND FASTEN WITH SCREW.

## NOTES:

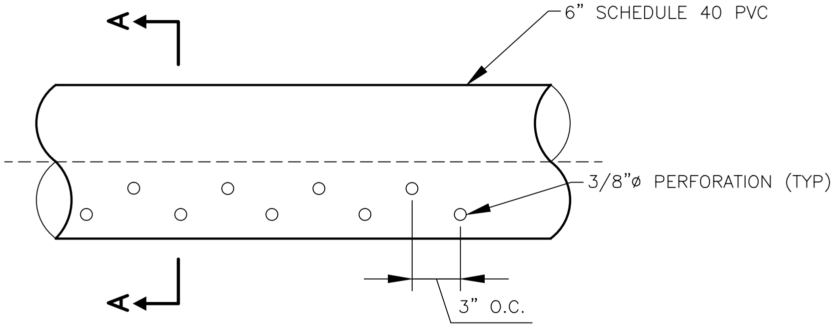
1. WHERE BIORETENTION CELL LENGTH IS LESS THAN 9' AND WHERE INDICATED IN THE CONTRACT DRAWINGS OR BY DC WATER IN THE FIELD, REPLACE THE TWO 45° BENDS WITH ONE 90° BEND AND PERFORATE THE SOLID PIPE RISER PER DWG NO GI–50.03 WITHIN THE AGGREGATE STORAGE LAYER BY DRILLING.

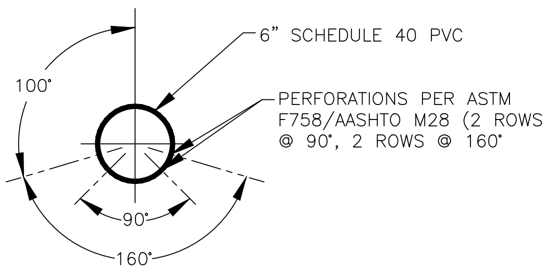
DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ____________ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | BIORETENTION PIPE RISERS |
| | CHECKED BY: ______ | |

GI–50.03

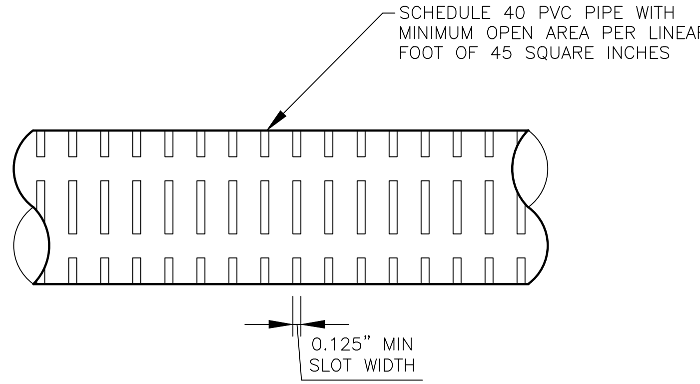
DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY




SECTION A–A

6" PERFORATED PVC UNDERDRAIN



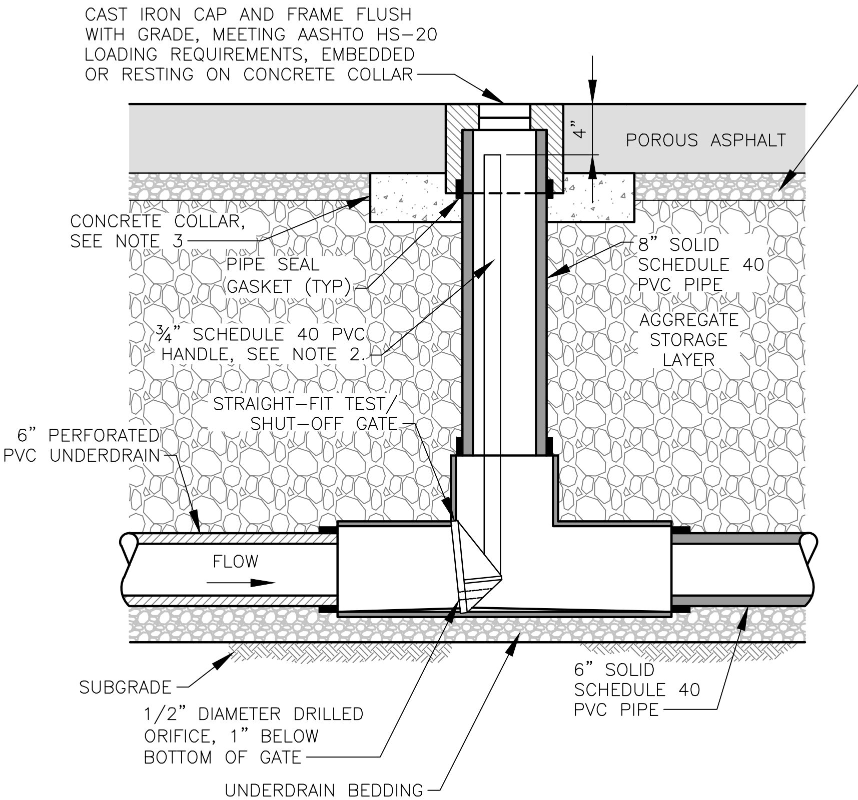

8" PVC SLOTTED WELL PIPE

DETAIL NOT TO SCALE

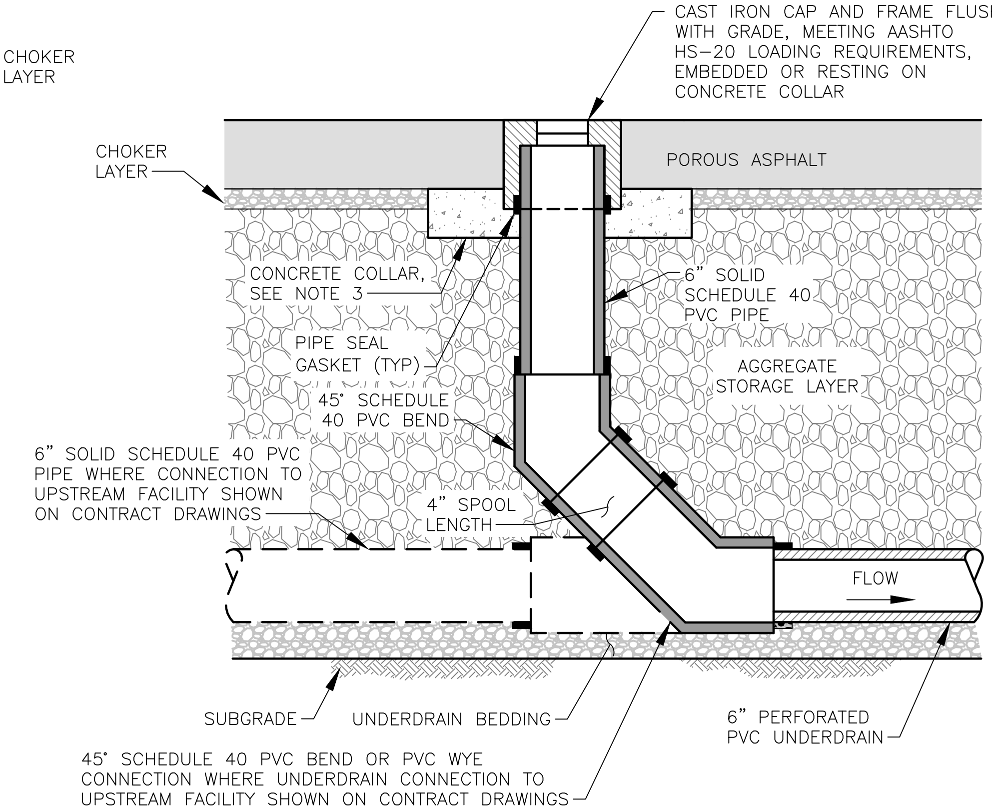
| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | GREEN INFRASTRUCTURE PIPING |
| | CHECKED BY: ______ | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

GI–50.04




FLOW RESTRICTION DEVICE IN PARKING LANE PERMEABLE PAVEMENT




CLEANOUT/OBSERVATION WELL IN PARKING LANE PERMEABLE PAVEMENT

NOTES:

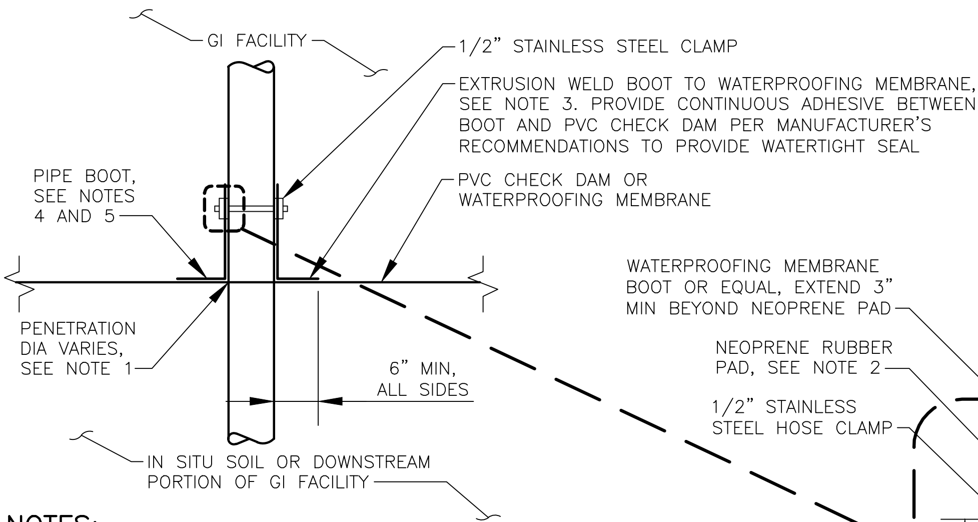
1. FLOW RESTRICTION DEVICE SHALL BE MAINLINE STRAIGHT–FIT BACK WATER VALVE WITH TEST/SHUT–OFF GATE OR APPROVED EQUAL.
2. ADHERE HANDLE TO GATE WITH PVC CEMENT AND FASTEN WITH SCREW.
3. WRAP PIPE WITH TWO LAYERS OF BUILDING PAPER BEFORE PLACING CONCRETE. CONCRETE COLLAR SHALL BE 6" BELOW CAST IRON FRAME AND BE 1'–6" LONG AND WIDE. INSTALL TWO #4 REBAR ON ALL 4 SIDES AT MID–DEPTH. BUILDING PAPER SHALL CONFORM TO ASTM D–4869 AND BE PLAIN 15LB ASPHALT TYPE 1.

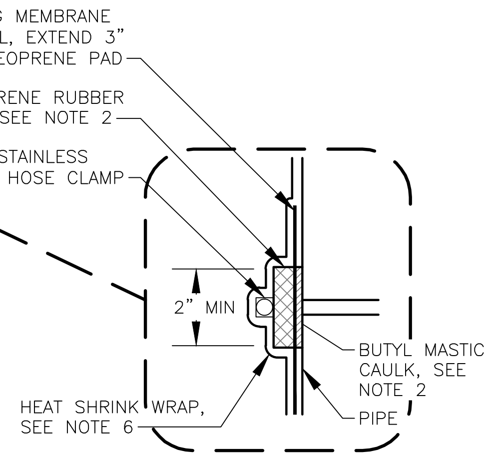
DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| ______ CHIEF ENGINEER | PREPARED BY: DCCR | PARKING LANE PERMEABLE PAVEMENT PIPE RISERS |
| | CHECKED BY: ______ | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

GI–50.05

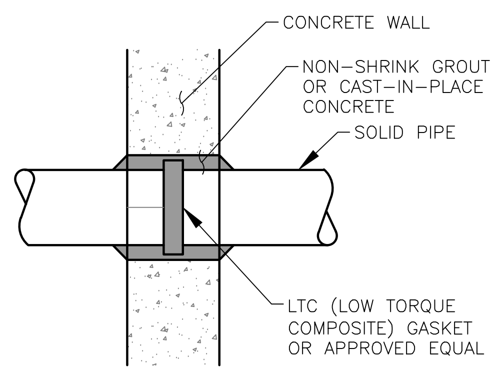



## NOTES:

1. CUT OPENING IN WATERPROOFING MEMBRANE OR PVC CHECK DAM TO WITHIN 1/2" OF PIPE OUTSIDE DIAMETER.
2. APPLY BUTYL MASTIC CAULK AND NEOPRENE RUBBER PAD CONTINUOUSLY AROUND PIPE.
3. PROVIDE CONTINUOUS EXTRUSION WELD AT BOOT/WATERPROOFING MEMBRANE INTERFACE.
4. FORM BOOT WITH SUFFICIENT MATERIAL TO PREVENT OVERSTRESSING DURING BACKFILLING, BUT WITHOUT FOLDS OR WRINKLES.
5. CONSTRUCT BOOT FROM SAME MATERIAL AS THE WATERPROOFING MEMBRANE.
6. SEAL CLAMP AND END OF BOOT WITH HEAT SHRINK WRAP. EXTEND HEAT SHRINK WRAP ONE PIPE DIAMETER (MINIMUM) BEYOND CLAMP.
7. CONTRACTOR MAY USE PRE FABRICATED PIPE BOOTS IN LIEU OF FIELD–FABRICATED BOOTS. CONNECT PREFABRICATED BOOT TO PIPE WATERPROOFING MEMBRANE AND PVC CHECK DAM PER MANUFACTURER'S RECOMMENDATIONS.

WATERTIGHT PVC CHECK DAM OR
WATERPROOFING MEMBRANE PENETRATION



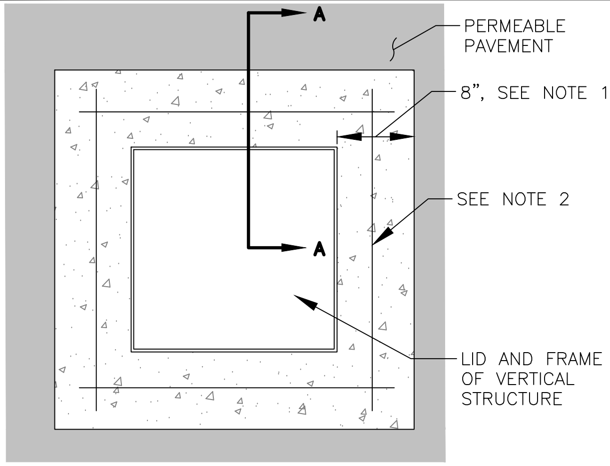

WATERTIGHT CONCRETE CHECK DAM OR
EDGE TREATMENT PENETRATION

DETAIL NOT TO SCALE

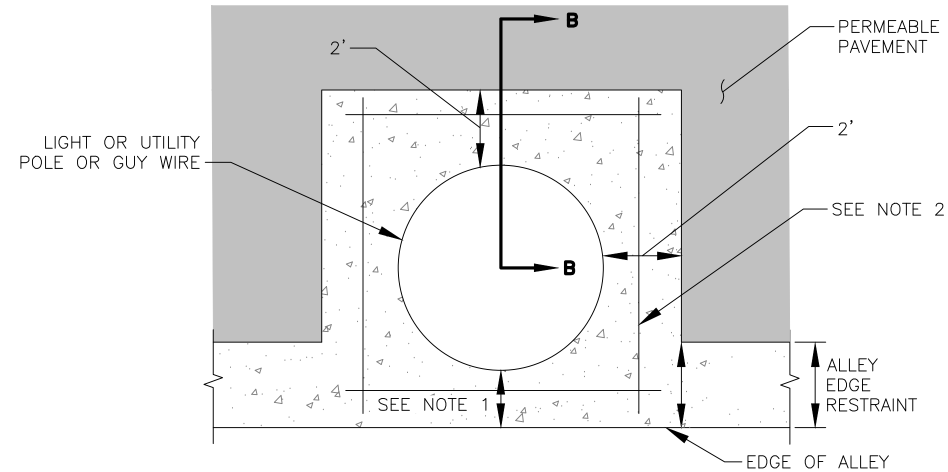
| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | GI FACILITY PIPE PENETRATIONS |
| | CHECKED BY: ______ | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

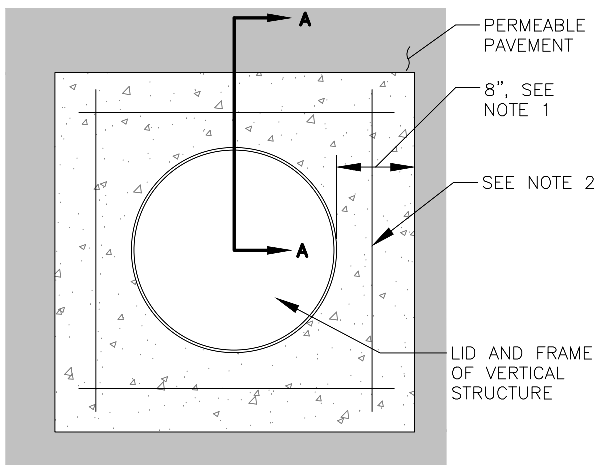
GI–60.01
(1 OF 2)



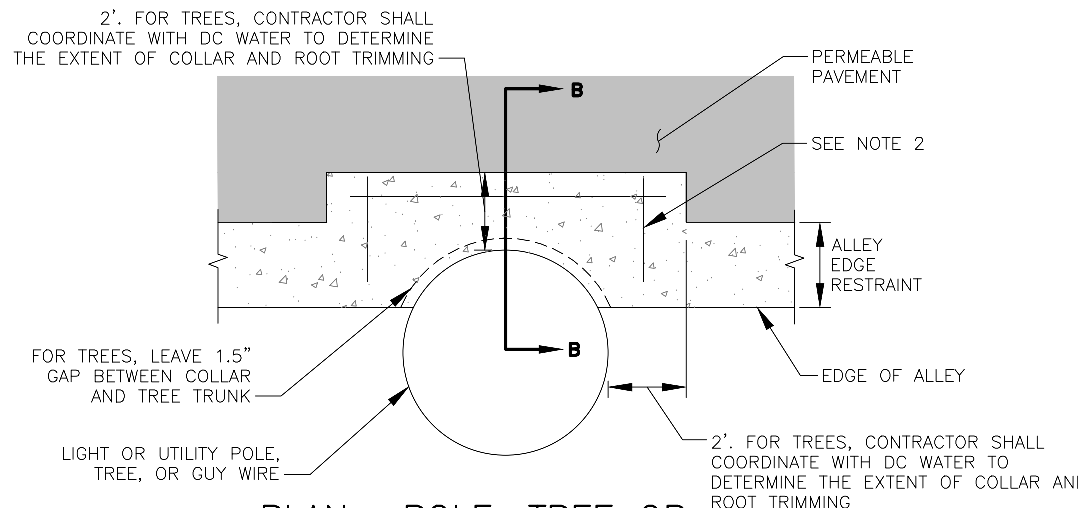

PLAN – MANHOLE
W/ SQUARE FRAME




PLAN– POLE OR GUY
WIRE WITHIN ALLEY




PLAN – MANHOLE
W/ ROUND FRAME



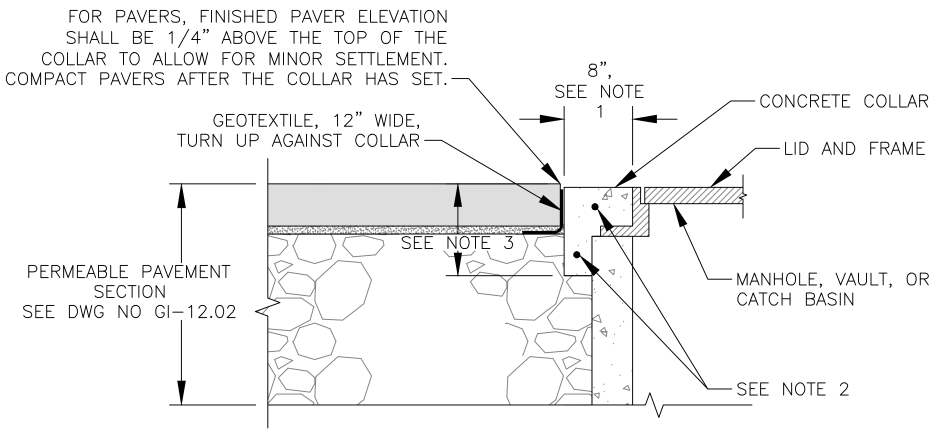

PLAN– POLE, TREE OR
GUY WIRE ALONG ALLEY

DETAIL NOT TO SCALE

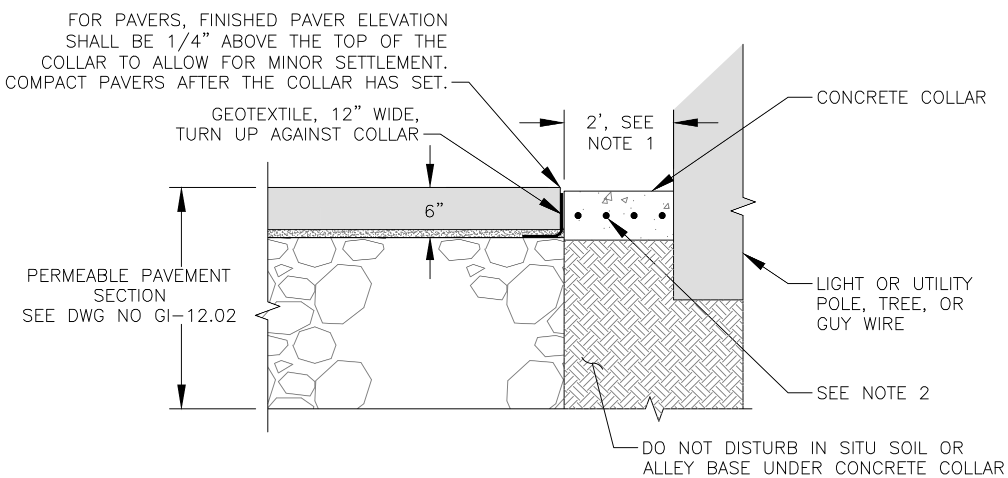
| | | |
|---|---|---|
| APPROVED DATE: ____________<br><br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL–PR–A1<br><br>PROTECTION OF POLES, MANHOLES, GUY WIRES, AND TREES IN PERMEABLE PAVEMENT FACILITIES |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY






## SECTION A




## SECTION B

## NOTES:

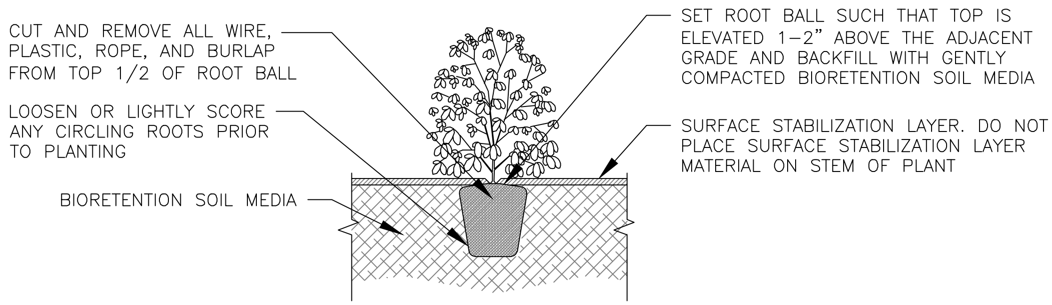
1. CONCRETE COLLAR SHALL RESIDE SOLELY WITHIN EXISTING ALLEY OR PARKING LANE EXTENTS. DO NOT COMPLETE SECTIONS OF COLLAR OUTSIDE EXTENTS.
2. ONE #4 REBAR FOR EACH 6" WIDTH AND DEPTH OF CONCRETE.
3. CONCRETE: DDOT SPECIFICATION 817, CLASS B OR CLASS C.
4. FOR POLES IN ALLEYS WITH GUY WIRES, CONNECT THE CONCRETE COLLARS AROUND THE POLE AND GUY WIRE. PROVIDE WELDED WIRE FABRIC PER DDOT STANDARDS FOR PCC ALLEYS IN THE EXTENDED COLLAR.

DETAIL NOT TO SCALE

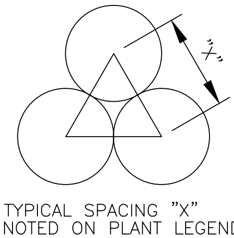
| | | |
|---|---|---|
| APPROVED DATE: ____ | REVISION NO.: ____ | STANDARD DETAIL–PR–A1 |
| | DATE: ____ | |
| ____ CHIEF ENGINEER | PREPARED BY: DCCR | PROTECTION OF POLES, MANHOLES, GUYWIRES AND TREES IN PERMEABLE PAVEMENT FACILITIES |
| | CHECKED BY: ____ | |

GI–70.03

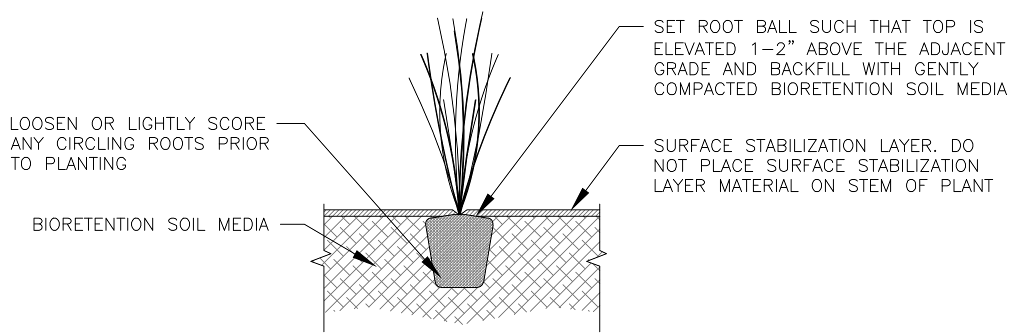
# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY




## BIORETENTION SHRUB PLANTING




## TYPICAL SPACING DIAGRAM




## BIORETENTION HERBACEOUS PLANTING

## NOTES:

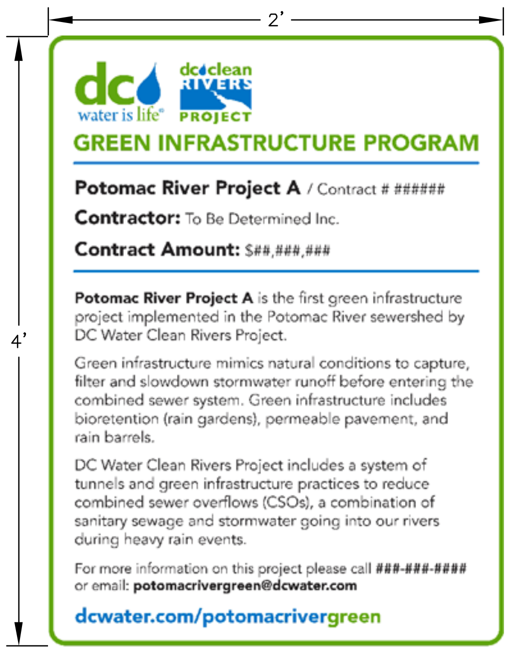
1. PLANT SPECIES, QUANTITES, AND LAYOUTS AS INDICATED IN THE CONTRACT DRAWINGS.

DETAIL NOT TO SCALE

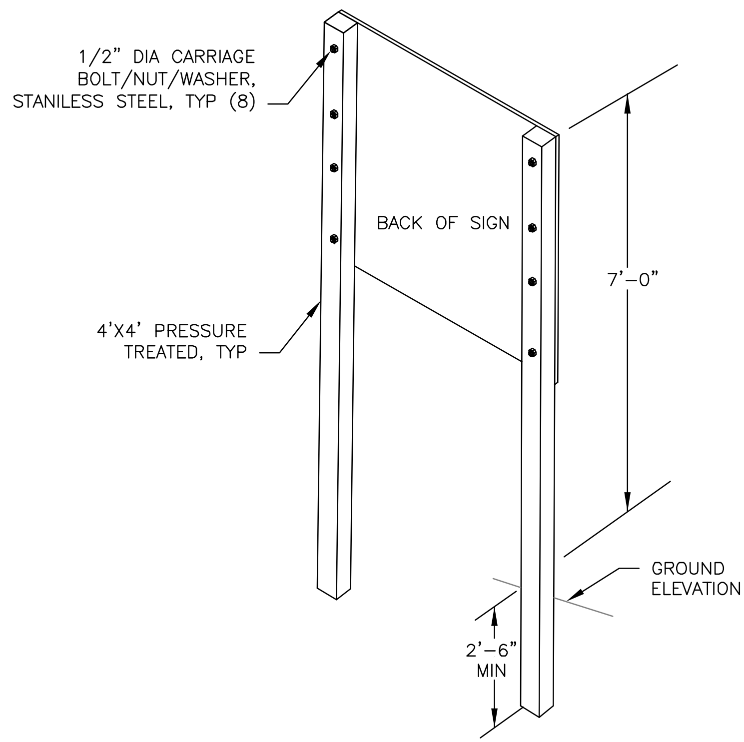
| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | SHRUB AND HERBACEOUS PLANTING DETAILS |
| | CHECKED BY: ______ | |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY

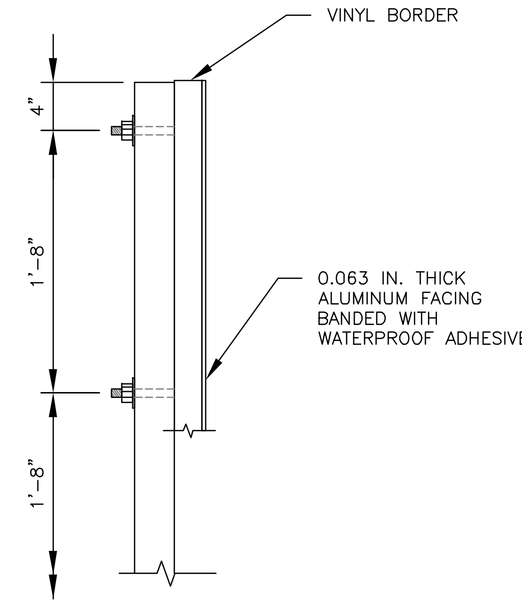
GI–90.01




CONSTRUCTION PROJECT SIGN
FRONT ELEVATION




ISOMETRIC VIEW OF SIGN SUPPORT




TYPICAL FRAME SECTION

NOTES:

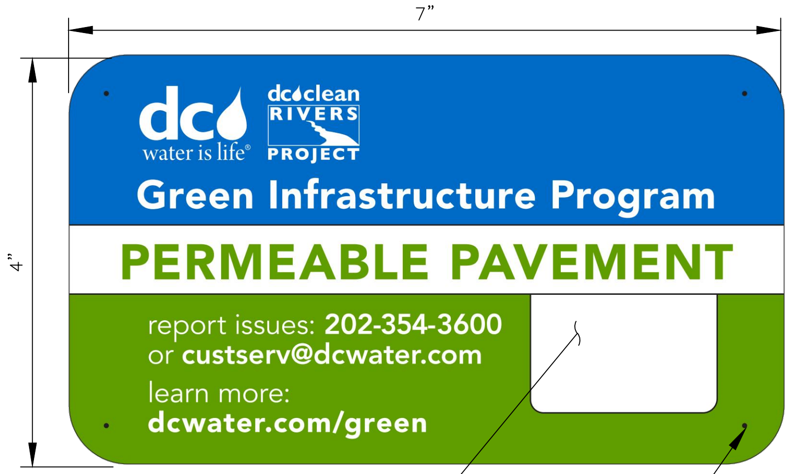
1. CONTRACTOR SHALL PROVIDE, FURNISH, AND INSTALL CONSTRUCTION PROJECT SIGNS WHERE INDICATED IN THE CONTRACT DOCUMENTS.
2. SIGN SHALL HAVE A UV PROTECTIVE COAT WHICH CAN EASILY BE CLEANED.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ____________ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| CHIEF ENGINEER | DATE: ______ | CONSTRUCTION PROJECT SIGN |
| | PREPARED BY: DCCR | |
| | CHECKED BY: ______ | |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

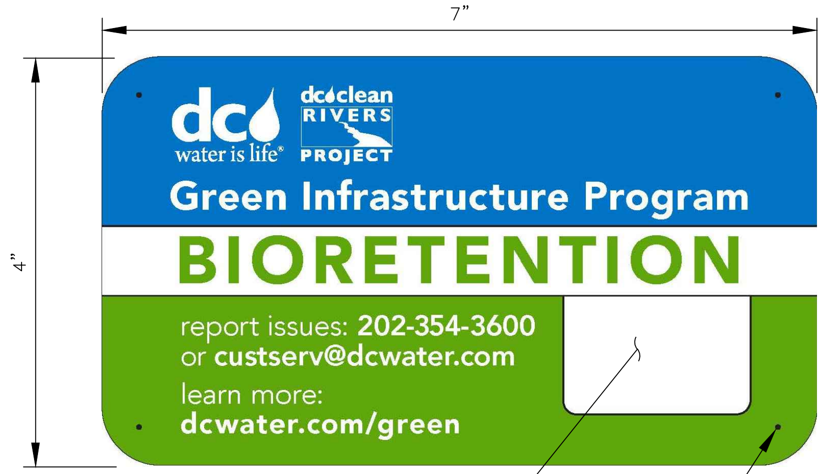
GI–90.02




CONTRACTOR TO PROVIDE AND INSTALL FACILITY IDENTIFICATION STICKERS IN BLANK AREA SHOWN

HOLES FOR MECHANICAL FASTENERS (TYP)

PERMEABLE PAVEMENT PERMANENT FACILITY SIGN
FRONT ELEVATION




CONTRACTOR TO PROVIDE AND INSTALL FACILITY IDENTIFICATION STICKERS IN BLANK AREA SHOWN

HOLES FOR MECHANICAL FASTENERS (TYP)

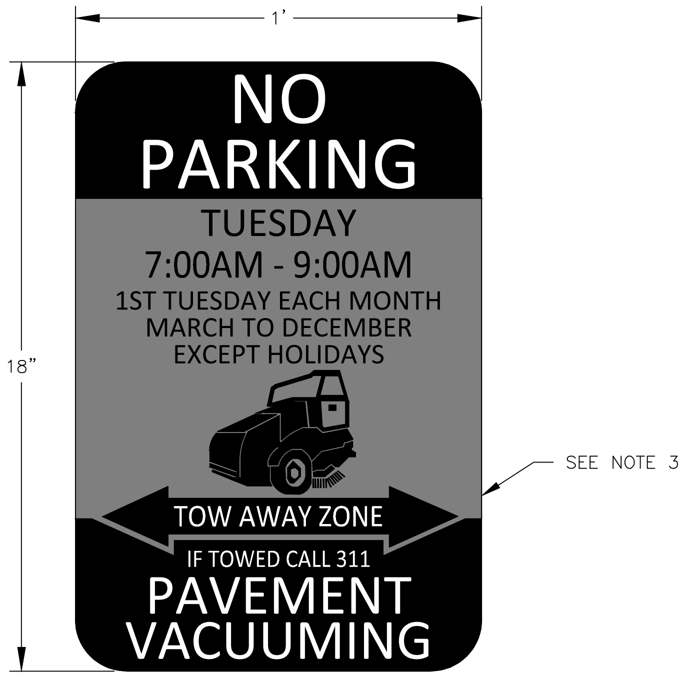
BIORETENTION PERMANENT FACILITY SIGN
FRONT ELEVATION

## NOTES:

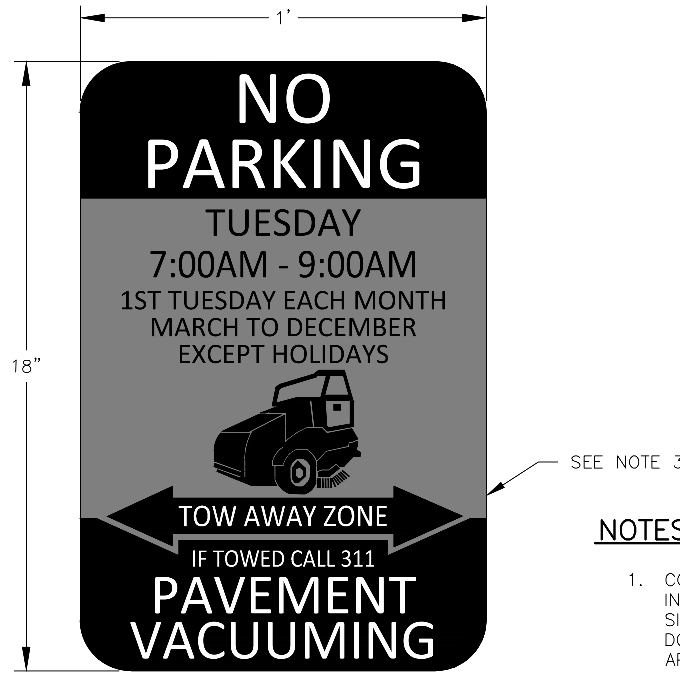
1. CONTRACTOR SHALL COORDINATE WITH DC WATER FOR FINAL SIGN AND STICKER IMAGES. CONTRACTOR SHALL SUBMIT ONE FACILITY SIGN AND ONE STICKER FOR APPROVAL BY DC WATER PRIOR TO PRODUCTION.
2. CONTRACTOR SHALL FURNISH THE FOLLOWING SIGNS OR APPROVED ALTERNATE WITH EQUAL OR BETTER DURABILITY AND FINISH: SIGNS SHALL BE STAINLESS STEEL CONSTRUCTION, PRINTED IN COLOR USING AN UV PROTECTED ENAMEL PAINT, AND INSTALLED WITH BOTH ADHESIVE AND MECHANICAL FASTENERS.
3. FOR ALLEY PERMEABLE PAVEMENT FACILITIES, CONTRACTOR SHALL INSTALL EACH SIGN ON THE TOP FACE OF THE ALLEY EDGE RESTRAINT PER THE LOCATIONS SPECIFIED IN THE CONTRACT DOCUMENTS. FOR PARKING LANE PERMEABLE PAVEMENT FACILITIES, INSTALL EACH SIGN CENTERED ON THE TOP OF THE PERMEABLE PAVEMENT CURB IN THE LOCATIONS SPECIFIED IN THE CONTRACT DOCUMENTS. FOR BIORETENTION FACILITIES, LOCATE SIGNS PER DWG NO GI–24.03.
4. CONTRACTOR SHALL ENSURE EDGES OF SIGN ARE FLUSH WITH OR MINIMALLY DEPRESSED INTO CONCRETE.
5. SIGNS SHALL BE ORIENTED TO BE LEGIBLE FROM STREET OR ALLEY.
6. STICKERS SHALL BE VINYL DECALS APPROPRIATE FOR OUTDOOR USE WITH MATTE LAMINATION, BLACK ON WHITE, 3M SCOTCHCAL SERIES 50 OR APPROVED EQUAL. EACH STICKER SHALL BE PRINTED WITH A UNIQUE IDENTIFIER PROVIDED BY DC WATER.

DETAIL NOT TO SCALE

| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | PERMANENT FACILITY IDENTIFICATION SIGN |
| | CHECKED BY: ______ | |




PARKING LANE PERMEABLE PAVEMENT
VACUUMING SIGN
FRONT ELEVATION




ALLEY PERMEABLE PAVEMENT
VACUUMING SIGN
FRONT ELEVATION

## NOTES:

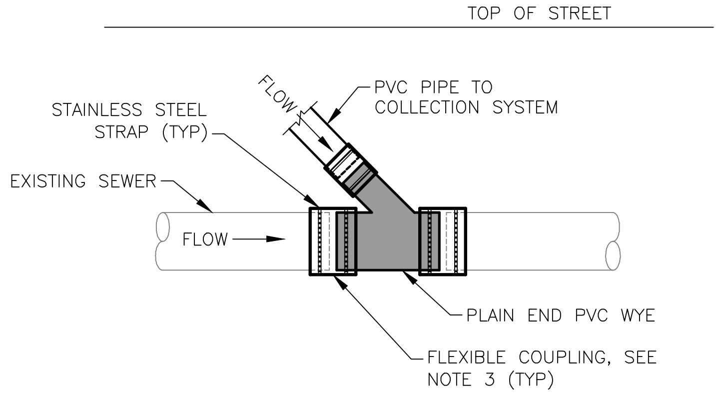
1. CONTRACTOR SHALL PROVIDE, FURNISH, AND INSTALL PERMEABLE PAVEMENT VACUUMING SIGNS WHERE INDICATED IN THE CONTRACT DOCUMENTS. FINAL LOCATIONS SHALL BE APPROVED BY DC WATER.
2. SIGN PANELS SHALL MEET THE MATERIAL AND CONSTRUCTION REQUIREMENTS SPECIFIED IN THE 2013 DDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND STRUCTURES, SECTION 616.03.
3. CONTRACTOR SHALL COORDINATE WITH DC WATER TO OBTAIN FINAL SIGN IMAGES PRIOR TO FUNCTIONAL TESTING.
4. SIGNS SHALL BE INSTALLED AND MOUNTED PER DDOT STANDARD DWG 616.10. ALLEY PERMEABLE PAVEMENT SIGN SHALL BE INSTALLED IN THE ALLEY EDGE RESTRAINT. CORE DRILL INTO THE ALLEY EDGE RESTRAINT AND PATCH WITH CLASS C OR CLASS E CONCRETE. DO NOT EMBED SIGN POST DURING FORMATION OF ALLEY EDGE RESTRAINT.

DETAIL NOT TO SCALE

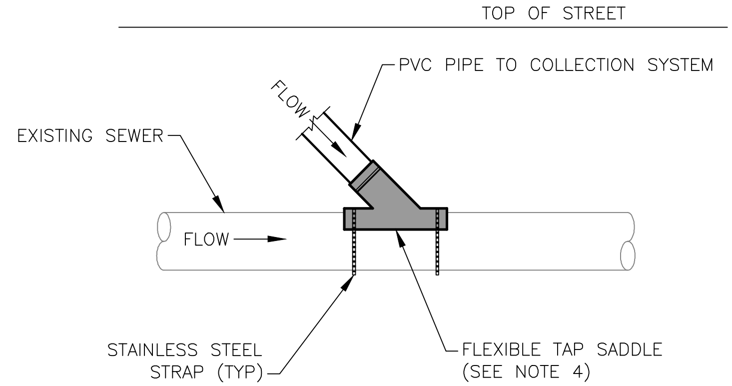
| | | |
|---|---|---|
| APPROVED DATE: ______<br><br>______<br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL–PR–A1<br><br>PERMEABLE PAVEMENT VACUUMING SIGN |

# DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY

GI–100.01




CONNECTION TO SEWERS LESS THAN OR EQUAL TO 12"




CONNECTION TO SEWERS GREATER THAN 12" AND LESS THAN OR EQUAL TO 36"

PLAN

NOTES:

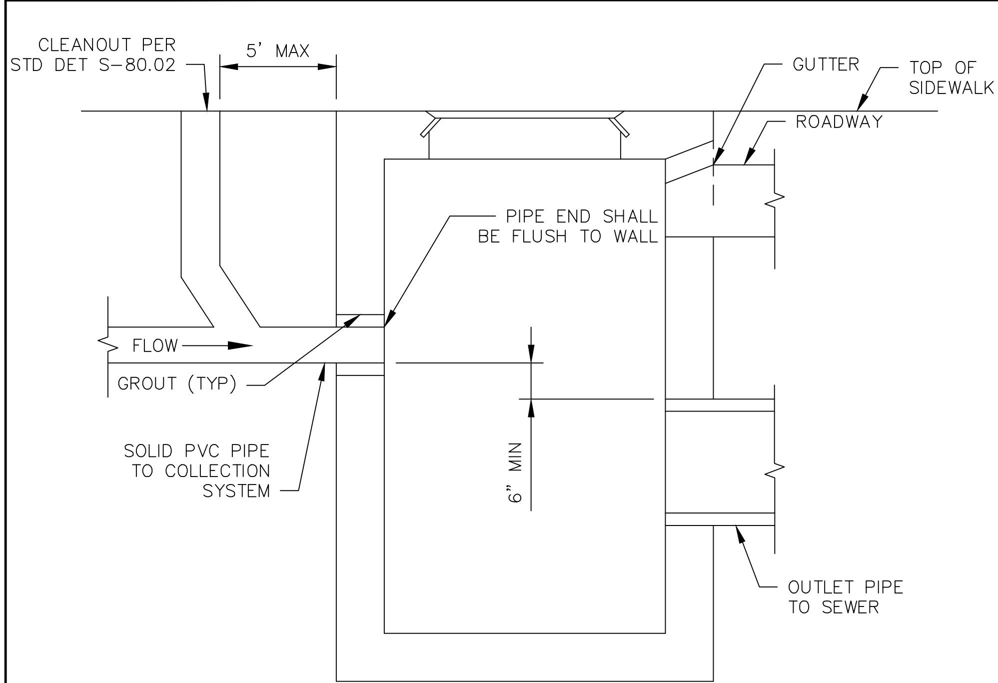
1. MATERIALS AND WORKMANSHIP ASSOCIATED WITH THE WYE BRANCH AND PVC PIPE TO COLLECTION SYSTEM SHALL BE IN ACCORDANCE WITH D.C. PLUMBING CODE.
2. VERTICAL BENDS FOR GRADE (NOT SHOWN) MAY BE REQUIRED ON PVC PIPE TO COLLECTION SYSTEM.
3. FLEXIBLE COUPLINGS SHALL MEET THE REQUIREMENTS OF ASTM C1173, BE SPECIFICALLY DESIGNED FOR THE PIPE MATERIALS TO BE JOINED, AND ALIGN THE INSIDE WALLS OF THE PIPE INVERT. ECCENTRIC COUPLINGS SHALL BE USED WHERE NECESSARY. COUPLINGS SHALL BE FERNCO, INC. OR APPROVED EQUAL.
4. FLEXIBLE TAP SADDLES SHALL CONSIST OF A PVC WYE SECURED TO THE EXISTING SEWER USING STAINLESS STEEL STRAPS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. A WATERTIGHT SEAL SHALL BE PROVIDED BETWEEN THE SADDLE AND THE EXISTING PIPE. FLEXIBLE TAP SADDLES SHALL BE FERNCO, INC. OR APPROVED EQUAL.

DETAIL NOT TO SCALE

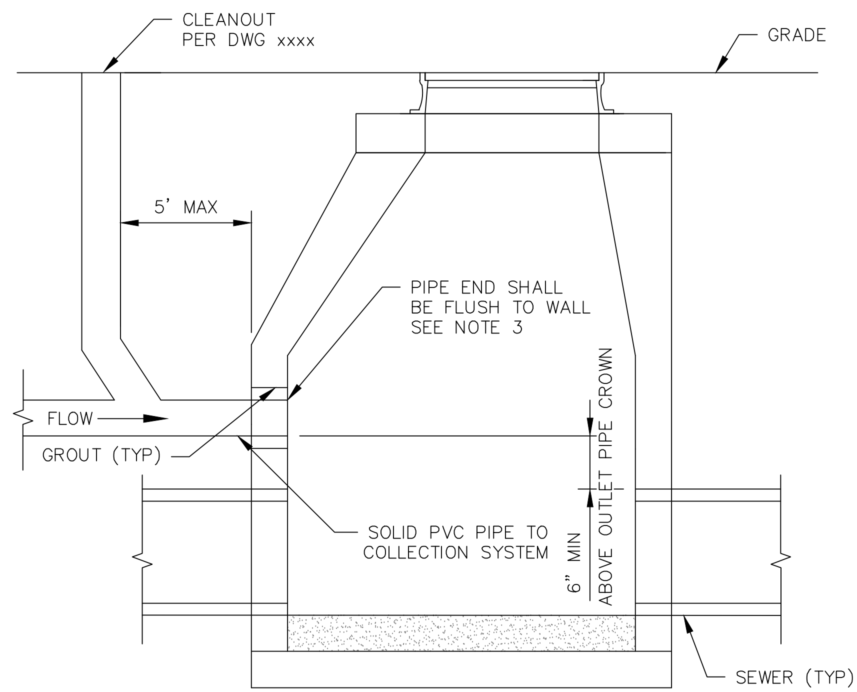
| | | |
|---|---|---|
| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | ≤6" DIAMETER PVC PIPE CONNECTION TO SEWER |
| | CHECKED BY: ______ | |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY

GI–100.02




CATCH BASIN SECTION




MANHOLE SECTION

NOTES:

1. CLAY DAMS OR OTHER APPROVED WATERSTOPS SHALL BE PROVIDED AT 100' INTERVALS (MINIMUM ONE) ALONG THE LENGTH OF THE SOLID PVC PIPE TO COLLECTION SYSTEM TO PREVENT MIGRATION OF WATER ALONG THE LENGTH OF THE PIPE.
2. CLEANOUTS SHALL BE PLACED AT 100 FOOT INTERVALS (MINIMUM ONE SHALL BE LOCATED AT A MAX OF 5' FROM THE CATCH BASIN OR MANHOLE).
3. FOR TIE IN TO A MANHOLE, FIELD CUTS IN CONCRETE SECTIONS OF MANHOLES SHALL BE ACCOMPLISHED WITH PROPER TOOLS. UNLESS OTHERWISE APPROVED, THE OUTLINE OF THE PROPOSED HOLE SHALL BE CLEARLY MARKED AND SHALL BE LINE DRILLED NOT MORE THAN FIVE INCHES APART. THE HOLE SHALL BE MADE SMOOTH TO RECEIVE THE PIPE ENTRY SEAL AND THE PIPE. PIPE ENTRY SEALS SHALL BE USED WHEN CONNECTING A PROPOSED SANITARY OR COMBINED SEWER OF TWENTY–FOUR (24) INCHES AND SMALLER DIAMETER TO AN EXISTING MANHOLE. NONSHRINK GROUT SHALL BE USED TO FILL VOID BETWEEN ENTRY SEAL AND PIPE. FOR STORM SEWER CONNECTIONS MADE IN THE FIELD, THE ANNULAR SPACE AROUND THE CONNECTION PIPE SHALL BE FILLED WITH NONSHRINK MORTAR. FIELD CUT ENTRY HOLES WILL NOT BE PERMITTED IN PROPOSED MANHOLES UNLESS APPROVED BY DC WATER'S REPRESENTATIVE.

   PIPE ENTRY HOLES IN BRICK SECTIONS OF EXISTING MANHOLES SHALL BE MADE BY CAREFULLY REMOVING SECTION OF BRICKWORK. MANHOLE PIPE ENTRY SEALS SHALL BE EQUIVALENT TO "PRESS WEDGE II" GASKETS MANUFACTURED BY PRESS–SEAL GASKETS CORP., FORT WAYNE, IN: "A–LOK" GASKETS MANUFACTURED BY A–LOK PRODUCTS CORP., TRENTON, NJ; OR "KOR–N–SEAL", MANUFACTURED BY NATIONAL POLLUTION CONTROL SYSTEMS, INC., NASHUA, NH.

DETAIL NOT TO SCALE

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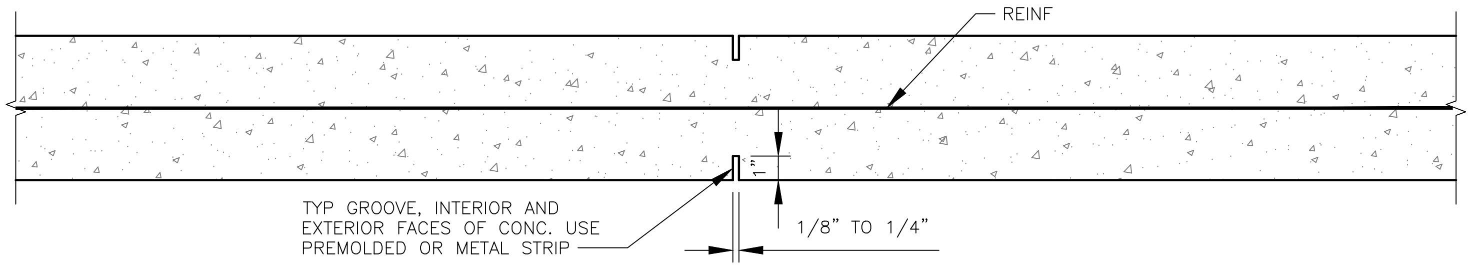
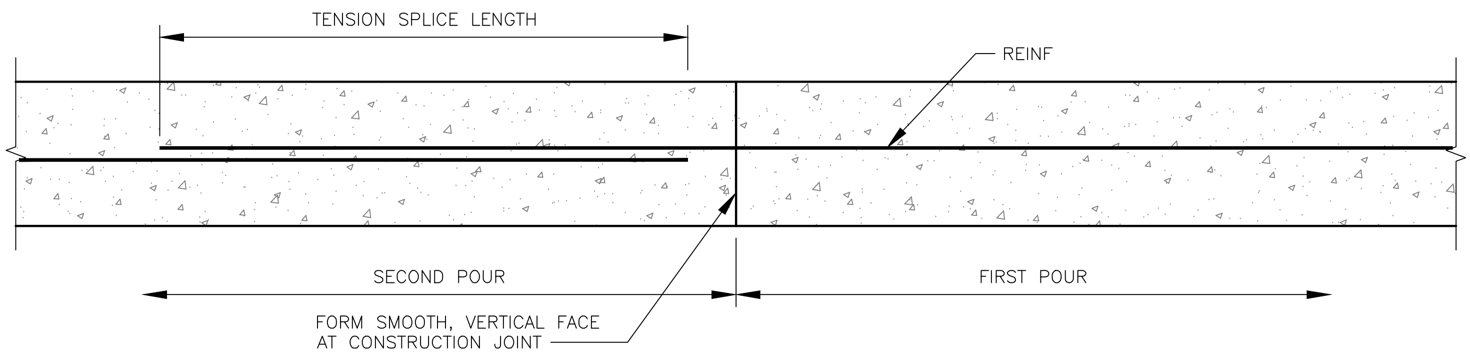
| APPROVED DATE: ______<br><br>______<br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL–PR–A1<br><br>PVC PIPE CONNECTION TO<br>CATCH BASINS AND MANHOLES |

# DISTRICT OF COLUMBIA
# WATER AND SEWER AUTHORITY






CONTROL JOINT–PLAN




CONSTRUCTION JOINT–PLAN

## NOTES:

1. PROVIDE CONTROL JOINTS 10 FT O.C. MAX CONSTRUCTION JOINTS MAY BE SUBSTITUTED FOR CONTROL JOINTS.

DETAIL NOT TO SCALE

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| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL–PR–A1 |
| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | BIORETENTION EDGE TREATMENT JOINTS |
| | CHECKED BY: ______ | |

| DISTRICT OF COLUMBIA<br>WATER AND SEWER AUTHORITY | GI–110.01<br>(2 OF 2) |
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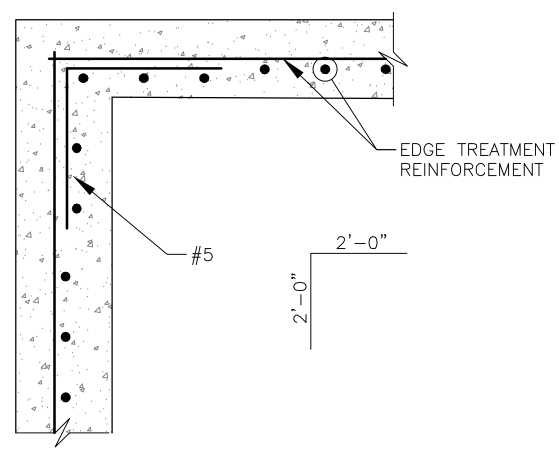


TYPICAL CORNER REINFORCEMENT

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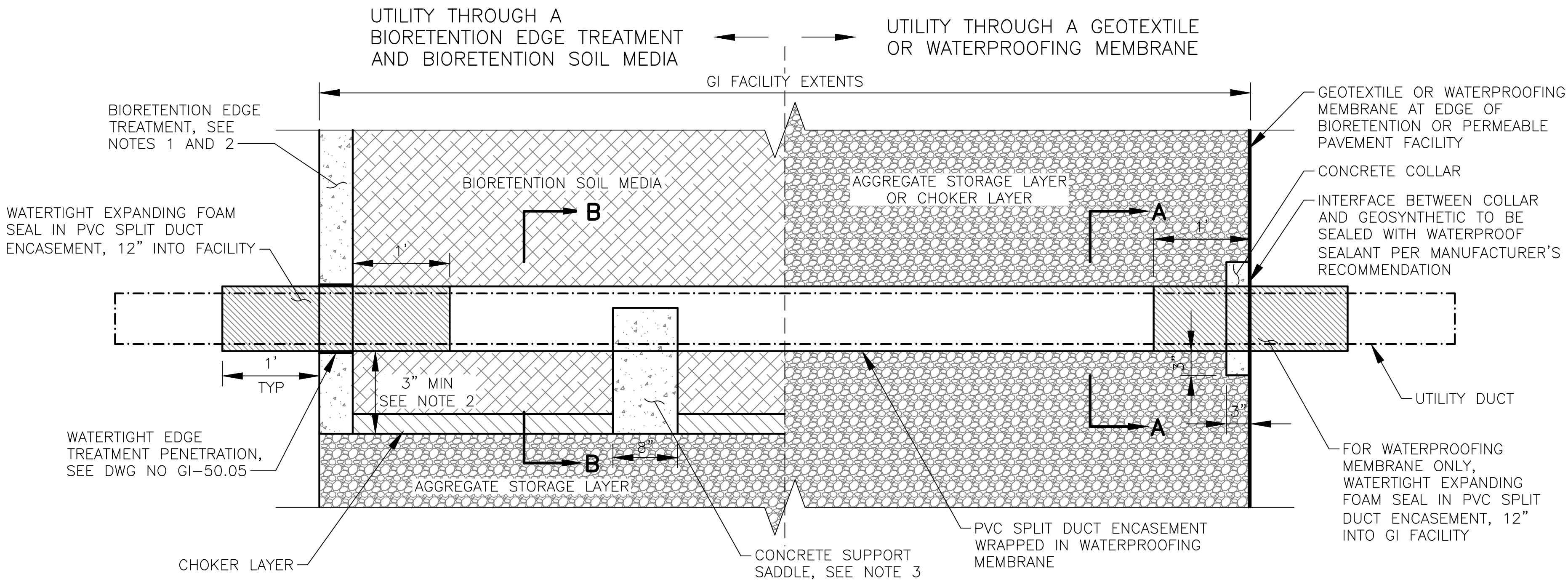
| APPROVED DATE: ______<br><br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL–PR–A1<br><br>BIORETENTION EDGE TREATMENT JOINTS |




ELEVATION

## NOTES:

1. CONTRACTOR TO CONSTRUCT REINFORCEMENT IN BIORETENTION EDGE TREATMENT AROUND SPLIT DUCT ENCASEMENT WHERE CONFLICTS ARISE.
2. EXTEND DEPTH OF EDGE TREATMENT AS NEEDED IN AREA AROUND UTILITY TO PROVIDE 3" MIN CONCRETE ON ALL SIDES OF SPLIT DUCT ENCASEMENT.
3. WHERE SPLIT DUCT ENCASEMENT RESTS ON BIORETENTION SOIL MEDIA, PROVIDE A CONCRETE CRADLE EVERY 5' (MIN) ALONG SPANS BETWEEN CHECK DAMS, SUPPORT BEAMS, AND EDGE TREATMENTS.

DETAIL NOT TO SCALE

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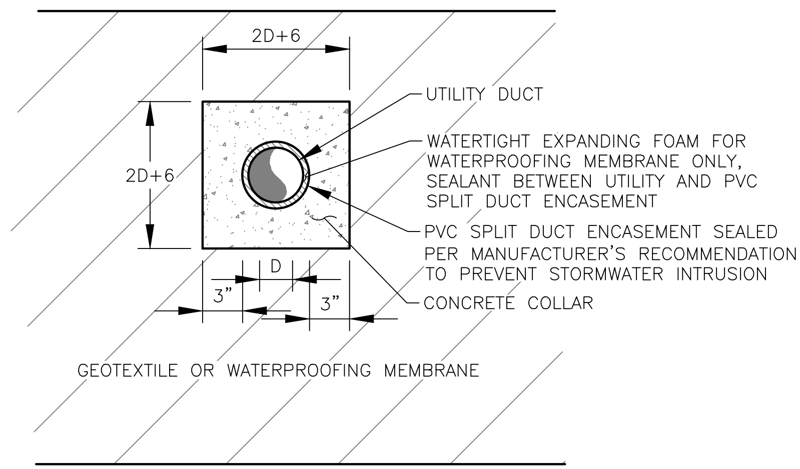
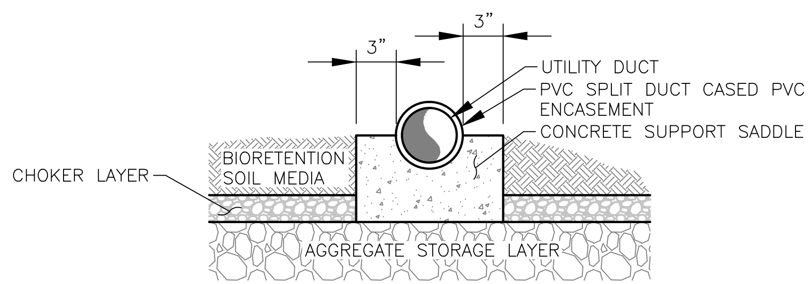
| APPROVED DATE: ______ <br> CHIEF ENGINEER | REVISION NO.: ______ <br> DATE: ______ <br> PREPARED BY: DCCR <br> CHECKED BY: ______ | STANDARD DETAIL–PR–A1 <br> PVC SLEEVE UTILITY PROTECTION |

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

GI–300.01
(2 OF 2)




CROSS SECTION A–A




CROSS SECTION B–B

DETAIL NOT TO SCALE

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| | DATE: ______ | |
| CHIEF ENGINEER | PREPARED BY: DCCR | PVC SLEEVE UTILITY PROTECTION |
| | CHECKED BY: ______ | |

GI DETAILS SPECIFIC TO APP

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# DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY AND DISTRICT DEPARTMENT OF TRANSPORTATION

S–1

## PROJECT SPECIFICATIONS:

1. SPECIFICATIONS: THE FOLLOWING STANDARDS AND SPECIFICATIONS SHOULD BE INCLUDED IN THIS CONTRACT IN ADDITION TO THE SPECIFICATIONS CONTAINED HEREIN:
   a) DDOT GREEN INFRASTRUCTURE (GI) STANDARDS 2014
   b) DC WATER SPECIFICATION 30 01 31 CLEANING OF SEWERS
   c) DC WATER SPECIFICATION 33 01 32 CLEANING AND CCTV INSPECTION OF BUILDING SEWERS
   d) DDOT STANDARD SPECIFICATIONS FOR HIGHWAY STRUCTURES – 2013

2. DEFINITIONS:
   a) GI FACILITY: A GI FACILITY MAY ENCOMPASS THE ENTIRE ALLEY OR A PORTION THEREOF AND IS DEFINED BY A UNIQUE NUMERICAL IDENTIFIER.
   b) CELL: THE EXTENT OF THE GI FACILITY INCLUDING ALL LAYERS ABOVE CHECK DAM HEIGHT BETWEEN TWO CHECK DAMS OR BETWEEN EDGE OF FACILITY AND CHECK DAM.

3. SUBMITTAL OF FINAL RECORD DOCUMENTS: WITHIN TEN (10) DAYS OF THE SUBSTANTIAL COMPLETION INSPECTION, CONTRACTOR SHALL SUBMIT A DRAWING DETAILING THE FOLLOWING: EXTENT OF PERMEABLE PAVEMENT, CHECK DAM LOCATIONS, UNDERDRAIN LAYOUT, AND UNDERDRAIN TIE–IN TO SEWER. RECORD DOCUMENTS MUST BE APPROVED BY OWNER PRIOR TO ACCEPTANCE OF THE IMPROVEMENTS AND PRIOR TO FINAL PAYMENT.

4. WARRANTY: MATERIALS AND WORKMANSHIP SHALL BE GUARANTEED FOR TWELVE (12) MONTHS BEGINNING ON THE DATE OF SUBSTANTIAL COMPLETION.
   a) WHEN CORRECTING FAILED OR DAMAGED WARRANTED CONSTRUCTION, CONTRACTOR SHALL REMOVE AND REPLACE CONSTRUCTION THAT HAS BEEN DAMAGED AS A RESULT OF SUCH FAILURE OR MUST BE REMOVED AND REPLACED TO PROVIDE ACCESS FOR CORRECTION OF WARRANTED CONSTRUCTION.
   b) WHEN WORK COVERED BY A WARRANTY HAS FAILED AND BEEN CORRECTED BY REPLACEMENT OR REBUILDING, CONTRACTOR SHALL REINSTATE THE WARRANTY BY WRITTEN ENDORSEMENT. THE REINSTATED WARRANTY SHALL BE EQUAL TO THE ORIGINAL WARRANTY.

5. PROTECTION OF GI SURFACES: CONSTRUCTION SEQUENCE OF GI FACILITIES AND ADJACENT WORK SHALL BE FROM UPSTREAM TO DOWNSTREAM. GI FACILITIES SHALL BE PROTECTED FROM DAMAGE INCLUDING DAMAGE FROM SEDIMENT AND COMPACTION THROUGHOUT THE WORK. INLETS AND SURFACES TO GI FACILITIES SHALL NOT BE OPENED TO FLOW UNTIL ALL UPSTREAM FACILITIES ARE COMPLETED, THE CONTRIBUTING DRAINAGE AREA (CDA) IS STABILIZED, AND THERE ARE NO EVIDENT AREAS SUSCEPTIBLE TO EROSION WITHIN THE CDA (AS DETERMINED BY THE OWNER).

6. IMPERVIOUS CONCRETE & REBAR: CONCRETE SHALL MEET DDOT SPECIFICATION 817, CLASS B OR C. ALL REBAR SHALL BE #4 AND GRADE 60 PER DDOT STANDARD 812.02.

7. PERVIOUS CONCRETE MIX: PERVIOUS CONCRETE MIX PROPORTIONS SHALL BE AS FOLLOWS:
   a) COARSE AGGREGATE: 2,000 TO 2,500 LB/YD3
   b) CEMENTITIOUS MATERIALS: 450 TO 700 LB/YD3
   c) WATER–TO–CEMENTITIOUS RATIO: 0.27 TO 0.34
   d) AGGREGATE–TO–CEMENTITIOUS RATIO (BY MASS): 4 TO 4.5:1

8. PERVIOUS CONCRETE DESIGN PARAMETERS:
   a) TRANSVERSE JOINT SPACING: 15 FEET
   b) DESIGN FLEXURAL STRENGTH: 350 PCI
   c) COMPRESSIVE STRENGTH: 2,500 PSI

9. GI PIPING MATERIALS:
   a) ALL PIPES AND FITTINGS SHALL BE SCHEDULE 40 PVC WITH SOLVENT WELDED JOINTS AND FITTINGS AND SHALL BE A MINIMUM OF SIX (6) INCHES IN DIAMETER. WHERE PERFORATIONS ARE REQUIRED THEY SHALL BE ONE HALF (0.5) INCH IN DIAMETER.
   b) MAX ALLOWABLE ANGLE FOR ANY PIPE SEGMENT CHANGE IN DIRECTION SHALL NOT EXCEED FORTY–FIVE (45) DEGREES UNLESS CHANGE OCCURS WITHIN A MANHOLE.
   c) PROVIDE AT LEAST ONE (1) OBSERVATION WELL PER GI FACILITY.

10. GEOTEXTILE CLASS 1 SHALL BE MIRAFI 140N, PROPEX 4508, GEOTEX 451, OR APPROVED EQUAL.

11. WATERPROOFING MEMBRANE SHALL CONFORM TO PGI–1104, HAVE A MINIMUM THICKNESS OF THIRTY (30) MIL, AND BE PLASTIFLEX IG PVC OR EQUAL.

12. UTILITY PROTECTION: SHALL BE IN ACCORDANCE WITH DDOT GREEN INFRASTRUCTURE STANDARDS 33.14.6, DC WATER'S UTILITY PROTECTION DETAILS AND THE NOTES ON DRAWING NO. GI 12–02.

13. MAINTENANCE OF FLOW: THE CONTRACTOR IS FOREWARNED THAT FLOWS VARY IN THE EXISTING SEWER WIDELY AND RAPIDLY. WORK SHALL NOT BE PERFORMED DURING WET WEATHER. MAINTAIN FLOW IN EXISTING SEWERS AT ALL TIMES UNLESS OTHERWISE APPROVED BY DC WATER. DISCHARGES OF WASTEWATER ARE PROHIBITED.

14. QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC). QA/QC SHALL BE IN ACCORDANCE WITH DDOT STANDARD SPECIFICATIONS DIVISIONS 105 AND 106 AND THE FOLLOWING:
   a) TESTING LABORATORIES AND REPORTS, MANUFACTURER'S FIELD INSTALLATION SERVICES AND REPORTS, AND TEST SAMPLES SHALL BE IN CONFORMANCE WITH DDOT GI STANDARD SPECIFICATIONS 621.01, 621.02, AND 621.04.
   b) THE OWNER MAY ESTABLISH AN INDEPENDENT VERIFICATION AND ASSURANCE INSPECTION AND TESTING PROGRAM TO VALIDATE THE CONTRACTOR'S QA/QC SAMPLING AND TESTING PROGRAM. THE OWNER'S INSPECTIONS AND TESTS ARE FOR THE SOLE BENEFIT OF THE OWNER AND WILL NOT RELIEVE ANY RESPONSIBILITY OF THE CONTRACTOR FOR PROVIDING ADEQUATE QA/QC MEASURES.

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| APPROVED DATE: ____________<br><br>____________<br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL<br><br>SUPPLEMENTAL SPECIFICATIONS |

## SPECIFICATIONS CONTINUED:

c) THE CONTRACTOR SHALL PROVIDE TWENTY-FOUR (24) HOURS' NOTICE TO THE OWNER SO THAT THE OWNER MAY WITNESS ON-SITE INSPECTIONS AND TESTS. OWNER OR DESIGNATED REPRESENTATIVES WITNESSING INSPECTIONS AND TESTS DOES NOT RELIEVE THE CONTRACTOR'S OBLIGATION TO COMPLY WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. THE THREE HOLD/NOTIFICATION POINTS ARE AS FOLLOWS:

i. UNDERDRAIN LAYOUT, CHECK DAM, AND FLOW CONTROL DEVICE INSTALLATION/ ARRANGEMENT PRIOR TO BACKFILL.

ii. UNDERDRAIN TIE-IN TO SEWER OR MANHOLE.

e) AT FINAL COMPLETION AND PRIOR TO RELEASE OF RETAINAGE, SUBMIT TO OWNER ALL COMPLETED QA/QC DOCUMENTATION INCLUDING THE ORIGINAL INSPECTION AND TEST RECORDS DEMONSTRATING THAT THE WORK HAS BEEN SATISFACTORILY PERFORMED AND TESTED.

15. <u>TRENCH EXCAVATION AND BACKFILL:</u> SHALL BE IN ACCORDANCE WITH DC WATER SPECIFICATION 31 23 10 AND DC WATER STANDARD DETAIL S-15.01 POLYVINYL CHLORIDE (PVC) PIPE SEWER TRENCH LAYING CONDITION. SEWER AND WATER MAIN TRENCH OPERATIONS SHALL BE COORDINATED WITH OTHER UTILITY WORK AND SCHEDULED TO MEET MAINTENANCE OF TRAFFIC PROVISIONS.

16. <u>FUNCTIONAL TESTING:</u> TESTING SHALL BE PERFORMED FOR EACH GI FACILITY TO CONFIRM PERMEABILITY AND THAT CONSTRUCTION MEETS THE REQUIREMENTS OF THE CONTRACT. THE CONTRACTOR SHALL PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, TOOLS, ETC. REQUIRED TO PERFORM THE FUNCTIONAL TESTING FOR ALL GI FACILITIES. THE CONTRACTOR SHALL COOPERATE WITH THE DECISIONS AND GUIDANCE PROVIDED BY THE OWNER AND ANY MANUFACTURER OR MANUFACTURER'S REPRESENTATIVE AND SHALL PERFORM TESTING ON A WEEKDAY IN THE PRESENCE OF THE OWNER. AT A MINIMUM TESTING SHALL INCLUDE:

b) FLOODING OF ONE CELL (I.E., THE AREA IN BETWEEN TWO CHECK DAMS) FOR EVERY 100 FT OF GI FACILITY LENGTH. FOR GI FACILITIES LESS THAN 100 FT IN LENGTH A MINIMUM OF TWO CELLS SHALL BE FLOODED. FLOW FROM THE TEST WATER SOURCE SHALL BE EQUALLY DISTRIBUTED OVER THE PERMEABLE SURFACE ABOVE THE CELL AND APPLIED IN A DIRECTION PARALLEL TO THE FACILITY UNDERDRAIN. TESTING FOR EACH CELL WILL BE CONSIDERED SUCCESSFUL AFTER A CONTINUOUS FLOW OF WATER HAS BEEN OBSERVED IN THE UNDERDRAIN AT THE DOWNSTREAM MOST OBSERVATION WELL/VERTICAL RISER OF THE FLOW RESTRICTION DEVICE FOR A MINIMUM OF 15 MINUTES.

17. <u>FUNCTIONAL TESTING LOGS:</u> SUBMIT TESTING LOGS TO THE OWNER THROUGHOUT FUNCTIONAL TESTING ACTIVITIES SHOWING COMPLIANCE, NON-COMPLIANCE, PARTIAL COMPLIANCE OF ALL SYSTEMS TESTED WITH SPECIFICATIONS AND PERFORMANCE CRITERIA, OR INDICATION OF DEFICIENT AREAS REQUIRING REMEDIATION. ALL MAINTENANCE AND SERVICING DURING FUNCTIONAL TESTING SHALL BE NOTED IN THE FUNCTIONAL TESTING LOGS. INSPECTION REPORTS SHALL BE PROVIDED TO THE OWNER.

a) FUNCTIONAL TESTING LOGS SHALL INCLUDE, AT A MINIMUM: DATE OF TEST; NAME OF CONTRACTOR'S REPRESENTATIVE OVERSEEING TEST; ALLEY SEGMENT IDENTIFIER; CELL LOCATION; WATER APPLICATION METHOD; START TIME AND END TIME OF WATER APPLICATION; PICTURE OF TEST LOCATION; AND PICTURE OF FLOW WITHIN UNDERDRAIN. IF TEST IS UNSUCCESSFUL, TEST LOG SHOULD INDICATE FAILURE AND REASON FOR FAILURE.

17. <u>ACCEPTANCE OF WORK:</u>

a) IF, DURING THE FUNCTIONAL TESTING, ANY PART OF THE WORK FAILS TO FULLY CONFORM TO THE REQUIREMENTS OF THE CONTRACT, THE FUNCTIONAL TESTING SHALL BE CONSIDERED TO HAVE FAILED, AND THE WORK SHALL NOT BE CONSIDERED TO BE ACCEPTABLE, AND THE OWNER SHALL SO NOTIFY THE CONTRACTOR IN WRITING. NO PAYMENT SHALL BE MADE FOR A FAILED TEST.

b) UPON FAILURE OF THE FUNCTIONAL TESTING, THE CONTRACTOR SHALL PROMPTLY REMEDY ANY DEFECTS IN THE WORK AND SHALL PROMPTLY RESCHEDULE AND RE-START THE COMPLETE FUNCTIONAL TESTING.

c) THE SUCCESSFUL COMPLETION OF THE FUNCTIONAL TESTING SHALL BE DEFINED BY SUCCESSFUL COMPLETION OF FUNCTIONAL TESTING FOR ALL SYSTEMS AND AFTER SUBMITTAL OF THE FUNCTIONAL TESTING LOGS; THE OWNER WILL APPROVE FUNCTIONAL TESTING FOR EACH GI FACILITY.

d) AT FINAL COMPLETION AND PRIOR TO RELEASE OF RETAINAGE, SUBMIT TO OWNER ALL COMPLETED QA/QC DOCUMENTATION INCLUDING THE ORIGINAL INSPECTION AND TEST RECORDS DEMONSTRATING THAT THE WORK HAS BEEN SATISFACTORILY PERFORMED AND TESTED.

19. <u>PHOTOGRAPHS AND VIDEO</u> SHALL BE IN ACCORDANCE WITH THE EXISTING CONTRACT WITH THE FOLLOWING ADDITION: BEFORE THE START OF WORK, THE CONTRACTOR SHALL VIDEOTAPE THE ENTIRE ALLEY SEGMENT SURFACE AREA AND PORTIONS OF THE CDA WITHIN A FIFTEEN (15) FOOT BUFFER OF THE ALLEY USING A DIGITAL CAMERA.

20. <u>GROUNDWATER:</u> GROUNDWATER LEVELS SHALL NOT BE WITHIN TWO (2) FEET OF THE GI FACILITY BOTTOM.

a) PRIOR TO EXCAVATION OF EACH ALLEY SEGMENT, THE CONTRACTOR SHALL PERFORM ONE (1) TEST PIT AT THE DOWNSTREAM END OF THE ALLEY AT A LOCATION APPROVED BY THE OWNER TO A DEPTH TWO (2) FEET BELOW THE FACILITY BOTTOM TO DETERMINE IF GROUNDWATER IS WITHIN TWO (2) FEET OF THE FACILITY BOTTOM. IF GROUNDWATER IS ENCOUNTERED WITHIN POTHOLE, FACILITY SHALL NOT BE CONSTRUCTED.

b) CONTRACTOR SHALL HALT ANY ACTIVITIES UPON DISCOVERY OF SHALLOW GROUNDWATER WITHIN THE GI FACILITY'S EXCAVATION.

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| APPROVED DATE: ______ | REVISION NO.: ______ | STANDARD DETAIL |
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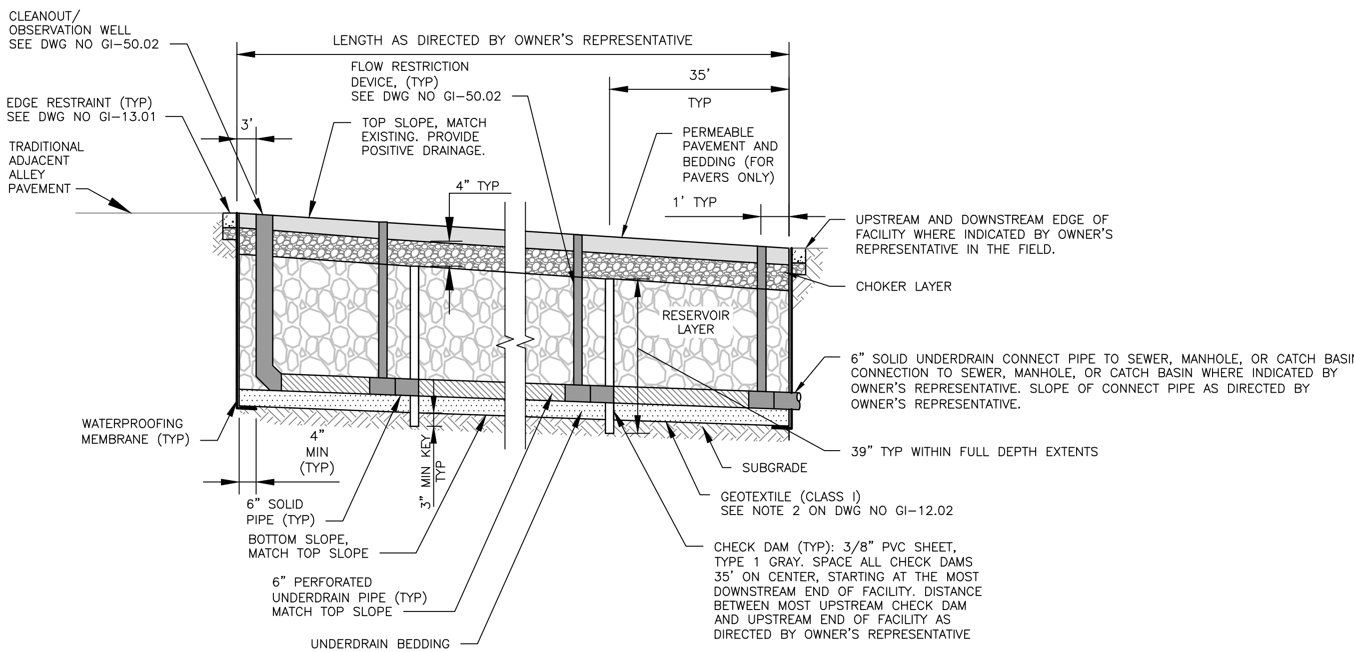
| | PREPARED BY: DCCR | |
| | CHECKED BY: ______ | |

# DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY AND DISTRICT DEPARTMENT OF TRANSPORTATION

GI–12.01

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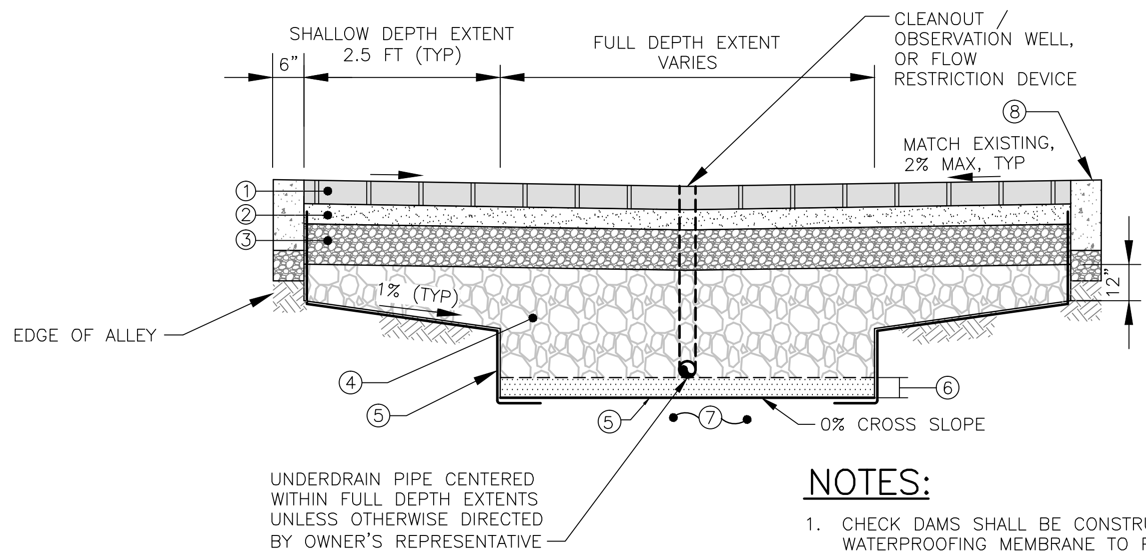
# DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY AND DISTRICT DEPARTMENT OF TRANSPORTATION

GI–12.02




## LEGEND:

1. PAVEMENT SURFACE MAY VARY BY PROJECT LOCATION AND SHALL BE SPECIFIED BY THE OWNER (PAVER OPTION SHOWN ABOVE). FOR PERMEABLE INTERLOCKING PAVERS OR CLAY BRICK PAVERS THICKNESS SHALL BE 3–1/8" MIN AND 2–5/8" THICKNESS RESPECTIVELY. PROVIDE JOINTS BETWEEN PAVERS AS RECOMMENDED BY MANUFACTURER AND MEETING ADA REQUIREMENTS. FILL JOINTS WITH AASHTO #8. FOR PERVIOUS CONCRETE THICKNESS SHALL BE 6".
2. BEDDING LAYER (FOR PAVERS ONLY), AASHTO #8 OR APPROVED EQUIVALENT, 2" THICKNESS.
3. CHOKER LAYER, 4" THICKNESS, AASHTO #57 OR APPROVED EQUIVALENT.
4. RESERVOIR LAYER, 33" THICKNESS AT CENTER, AASHTO #2, #3, OR APPROVED EQUIVALENT.
5. GEOTEXTILE, SEE NOTE 2
6. UNDERDRAIN BEDDING, 3" THICKNESS, SAME REQUIREMENTS AS RESERVOIR LAYER.
7. SUBGRADE. PREPARE SUBGRADE IN ACCORDANCE WITH DDOT GREEN INFRASTRUCTURE STANDARDS, SECTION 621.01 (D).
8. EDGE RESTRAINT, SEE DWG NO GI–13.01.

## NOTES:

1. CHECK DAMS SHALL BE CONSTRUCTED AND SEAMED WITH GEOTEXTILE AND WATERPROOFING MEMBRANE TO PREVENT ANY BYPASS WITHIN THE RESERVOIR LAYER AND UNDERDRAIN BEDDING LAYER. CHECK DAM SHALL NOT EXTEND ABOVE RESERVOIR LAYER AND SHALL EXTEND 3 INCH MINIMUM INTO SUBGRADE IN BOTH SHALLOW AND FULL DEPTH EXTENTS. DO NOT INSTALL GEOTEXTILE OR WATERPROOFING MEMBRANE UNDER OR AROUND CHECK DAMS. TURN UP GEOTEXTILE AND WATERPROOFING MEMBRANE AGAINST CHECK DAM, OVERLAP PER MANUFACTURER'S RECOMMENDATION AND AS APPROVED BY OWNER'S REPRESENTATIVE, 12 INCH MINIMUM. ADHERE WATERPROOFING MEMBRANE TO CHECK DAM, NOT GEOTEXTILE.
2. WATERPROOFING MEMBRANE SHALL BE USED IN LIEU OF GEOTEXTILE FOR PORTION OF FACILITY LOCATED WITHIN A HOTSPOT, ADJACENT TO TRADITIONAL PAVEMENT OR WITHIN 10 FEET (HORIZONTALLY) OF A BUILDING OR UTILITY (LIGHT POLE, COMMUNICATION, GAS, OR ELECTRIC LINE). SEE DC WATER'S UTILITY PROTECTION GUIDELINES FOR WATERPROOFING REQUIREMENTS FOR SEWER AND WATER LINES.
3. FULL DEPTH EXCAVATION AND ALL SUPPORT OF EXCAVATION, INCLUDING SLOPES, SHALL BE A MINIMUM OF 3 FEET FROM ALL STRUCTURES, EXCLUDING MANHOLES AND UTILITY RISERS WHERE INDICATED BY OWNER'S REPRESENTATIVE.
4. FOR MANHOLES WITHIN A PERMEABLE PAVEMENT FACILITY, PROVIDE TYPICAL EDGE RESTRAINT ABUTTING MANHOLE WITH WATERPROOFING LINER UP SIDES. FOR UTILITY AND LIGHT POLES, DO NOT EXCAVATE WITHIN 3 FT HORIZONTALLY OF POLE. EDGE RESTRAINT TO BE OFFSET 3 FT FROM POLE. SHALLOW RESURFACING TO OCCUR WITHIN 3 FT OFFSET OF POLE AS DIRECTED BY OWNER'S REPRESENTATIVE.

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| | DATE: ______ | |
| | PREPARED BY: DCCR | ALLEY PERMEABLE PAVEMENT SECTION |
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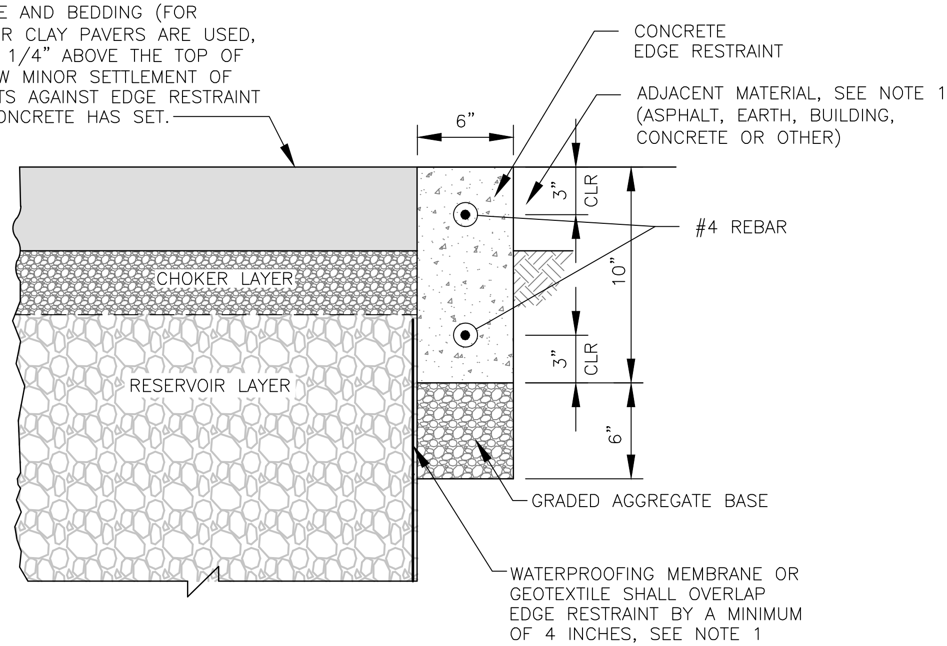
DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY
AND DISTRICT DEPARTMENT OF TRANSPORTATION

GI–13.01




ALLEY EDGE RESTRAINT

NOTES:

1. CONCRETE EDGE RESTRAINT SHALL BE OMITTED WHERE PERMEABLE PAVEMENT FACILITY ABUTS CONCRETE APRON OR ANOTHER PERMEABLE PAVEMENT FACILITY. WHERE FACILITY ABUTS A CONCRETE APRON, EXTEND WATERPROOFING MEMBRANE TO SURFACE. TRIM LINER 1" BELOW SURFACE PRIOR TO PLACEMENT OF PERMEABLE PAVEMENT WEARING COURSE. WHERE FACILITY ABUTS ANOTHER FACILITY, INSTALL TYPICAL CHECK DAM AND TYPICAL WATERPROOFING MEMBRANE OR GEOTEXTILE IN LIEU OF EDGE TREATMENT PER DWG NO GI–12.01 AND GI–12.02.

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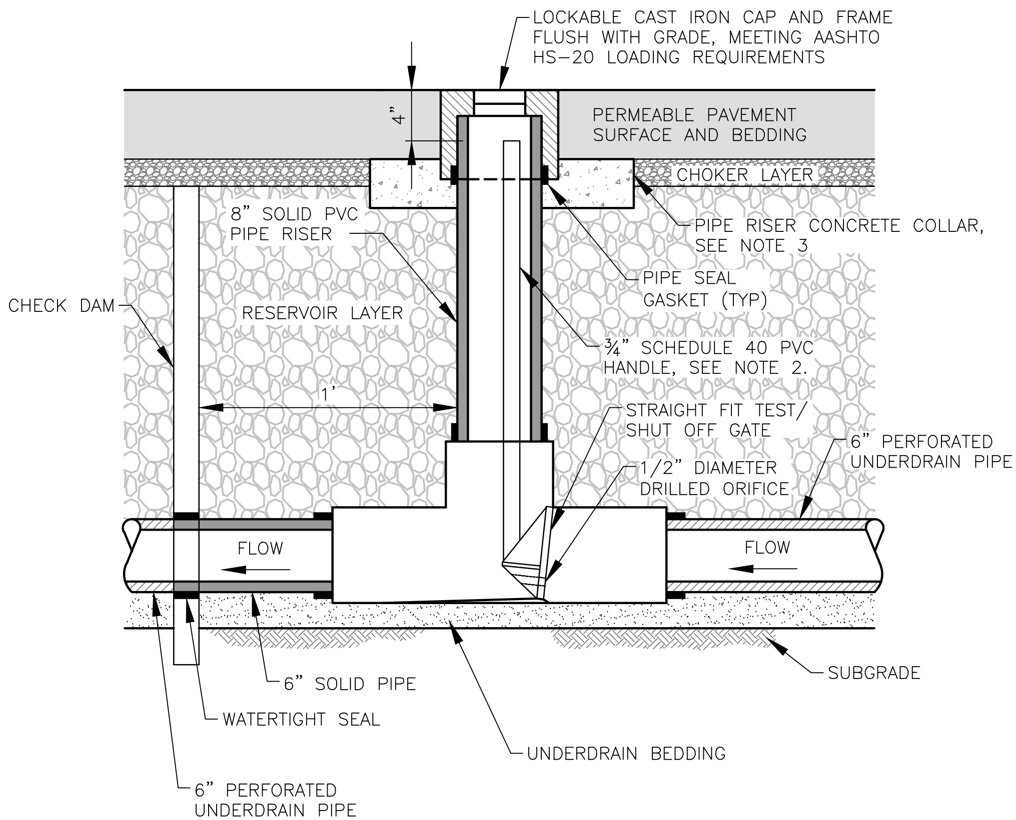
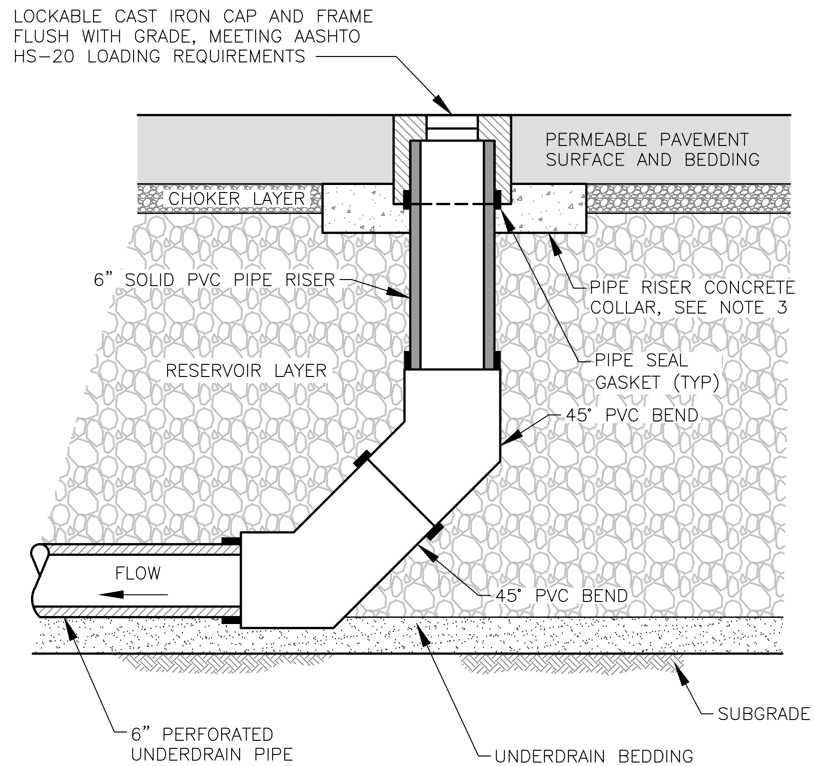
| APPROVED DATE: ______<br>______<br>CHIEF ENGINEER | REVISION NO.: ______<br>DATE: ______<br>PREPARED BY: DCCR<br>CHECKED BY: ______ | STANDARD DETAIL<br>ALLEY<br>EDGE RESTRAINT |

# DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY AND DISTRICT DEPARTMENT OF TRANSPORTATION

GI–50.02




## FLOW RESTRICTION DEVICE




## CLEANOUT/OBSERVATION WELL IN PERMEABLE PAVEMENT

## NOTES:

1. FLOW RESTRICTION DEVICE SHALL BE MAINLINE STRAIGHT-FIT BACK WATER VALVE OR APPROVED EQUAL. VERTICAL ACCESS PIPE OF FLOW RESTRICTION DEVICE SHALL SERVE AS AN ADDITIONAL CLEANOUT/ OBSERVATION WELL.
2. ADHERE HANDLE TO GATE WITH PVC CEMENT AND FASTEN WITH SCREW.
3. WRAP PIPE WITH TWO LAYERS OF BUILDING PAPER BEFORE PLACING CONCRETE. CONCRETE COLLAR SHALL BE 6" THICK AND 1.5 FT LONG AND WIDE. INSTALL TWO #4 REBAR ON ALL 4 SIDES AT MID-DEPTH. BUILDING PAPER SHALL CONFORM TO ASTM D-4869 AND BE PLAIN 15LB ASPHALT TYPE 1.

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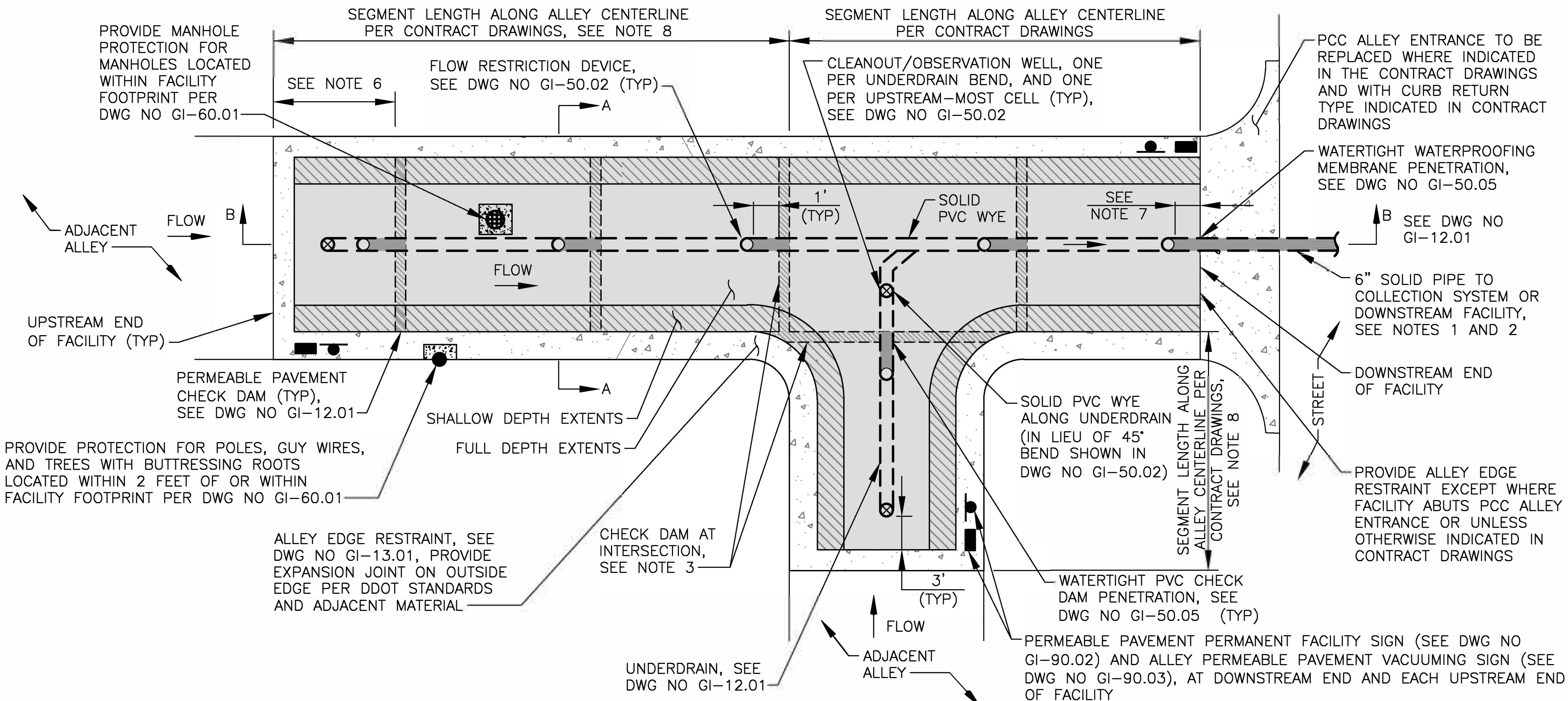
| ______ | PREPARED BY: DCCR | PIPE RISERS |
| CHIEF ENGINEER | CHECKED BY: ______ | |




## NOTES:

1. COLLECTION SYSTEM TIE IN LOCATION INDICATED ON CONTRACT DRAWINGS. ELEVATION OF CONNECTION TO COLLECTION SYSTEM PIPE AS INDICATED IN CONTRACT DRAWINGS. UNDERDRAIN PIPE SHALL TRANSITION FROM PVC SCHEDULE 40 TO PVC SDR-35 OUTSIDE THE FACILITY, WITHIN 3 LF OF THE UNDERDRAIN PENETRATION THOUGH THE WATERPROOFING MEMBRANE, AS MEASURED ALONG THE CENTERLINE OF THE UNDERDRAIN PIPE. FOR CONNECTION TO MANHOLES OR CATCH BASINS, SEE DWG NO GI-100.02. FOR CONNECTION TO SEWERS, SEE DWG NO GI-100.01. FOR CONNECTION TO DOWNSTREAM PERMEABLE PAVEMENT FACILITY, SEE DWG NO GI-50.04.
2. SEE DC WATER STANDARD DETAIL 5-15.01 FOR TRENCH EXCAVATION AND FILL. BACKFILL ABOVE THE BEDDING, FOURTH COURSE, SHALL BE COMPACTED FILL MEETING DC WATER STANDARDS.
3. PROVIDE AN ADDITIONAL CHECK DAM AT THE INTERFACE OF ABUTTING ALLEY PERMEABLE PAVEMENT SEGMENTS.
4. FOR POROUS CONCRETE ALLEY JOINT LAYOUT, SEE DDOT DWG NO 503.01. FOR ALLEY EDGE RESTRAINT JOINTS, SEE DDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND STRUCTURES, SECTION 606.01. AT CORNERS, PROVIDE CORNER BARS WITH TENSION LAP SPLICE LENGTH BOTH LEGS.
5. TEMPORARILY SUPPORT MANHOLES, POLES, AND OTHER EXISTING STRUCTURES DURING CONSTRUCTION TO PREVENT MOVEMENT DUE TO REMOVAL OF SOIL AND UNBALANCED LOADING.
6. DISTANCE BETWEEN MOST UPSTREAM CHECK DAM AND UPSTREAM END OF FACILITY OR SEGMENT PER CONTRACT DRAWINGS.
7. 6' WHERE CATCH BASIN ABUTS DOWNSTREAM END OF FACILITY. OTHERWISE, 1' OR PER CONTRACT DRAWINGS.
8. WHERE PROPOSED APP FACILITY'S UPSTREAM END TERMINATES WITHIN 2' DOWNSTREAM OF AN ALLEY JOINT, EXTEND THE APP FACILITY LENGTH TO THE ALLEY JOINT UNLESS OTHERWISE DIRECTED BY DC WATER OR THE CONTRACT DOCUMENTS. FACILITY LENGTHS SHALL ALSO BE ADJUSTED TO LIMIT CUTTING OF PERMEABLE PAVERS AND BRICKS, AS APPROVED BY DC WATER.

DETAIL NOT TO SCALE

# ALLEY PERMEABLE PAVEMENT FACILITY PLAN

# Appendix F

# Model Documentation:
# Green Infrastructure Modeling for PR-A Area

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DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY

DC CLEAN RIVERS PROJECT

# Model Documentation: Green Infrastructure Modeling for PR-A Area

July 2020

Prepared for:

Prepared by:

Program Consultants Organization
Blue Plains Advanced Wastewater Treatment Plant
5000 Overlook Avenue, SW
Washington, DC 20032

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# Table of Contents

# Tables



# List of Figures



# Appendices

# 1 Introduction

## 1.1 Background

The development and calibration of the combined sewer model used for the LTCP is documented in *Study Memorandum LTCP 5-4: CSS Model Documentation* that was published with the LTCP in 2001. The modeling conducted to evaluate green infrastructure in the PR-A area uses refined sub-models of the metered PR-A area that were developed independently of the system-wide LTCP model.

## 1.2 Model Documentation

This is an update to the PRA model documentation included in the RCA Practicability Report (Refer to Appendix F) published in June 2020. This update covers the entire Post Construction Monitoring period for PR-A from April 16, 2019 to April 23, 2020.

The PR-A SWMM runoff model is an application of the EPA SWMM5 model. SWMM5 is the current version of the most widely applied urban stormwater model across the world include for specific GI applications. EPA's long-term support to the development and application of SWMM5 and earlier SWMM models underscores its acceptance in applications to support regulatory programs. SWMM5 is the model used for the range of GI-related modeling for the DCCR. The model included subcatchments representing runoff in the PR-A project area, the sewer network conveying the flow to the outlets of the PR-A project area and the GI practices planned for PR-A. GI practices are represented in the model by combining all practices of a given practice type (alley permeable pavement, parking lane permeable pavement, bioretention practices) into one single practice per type per model subshed. A schematic of this "lumped practice" modeling approach is shown in Figure 1-1.

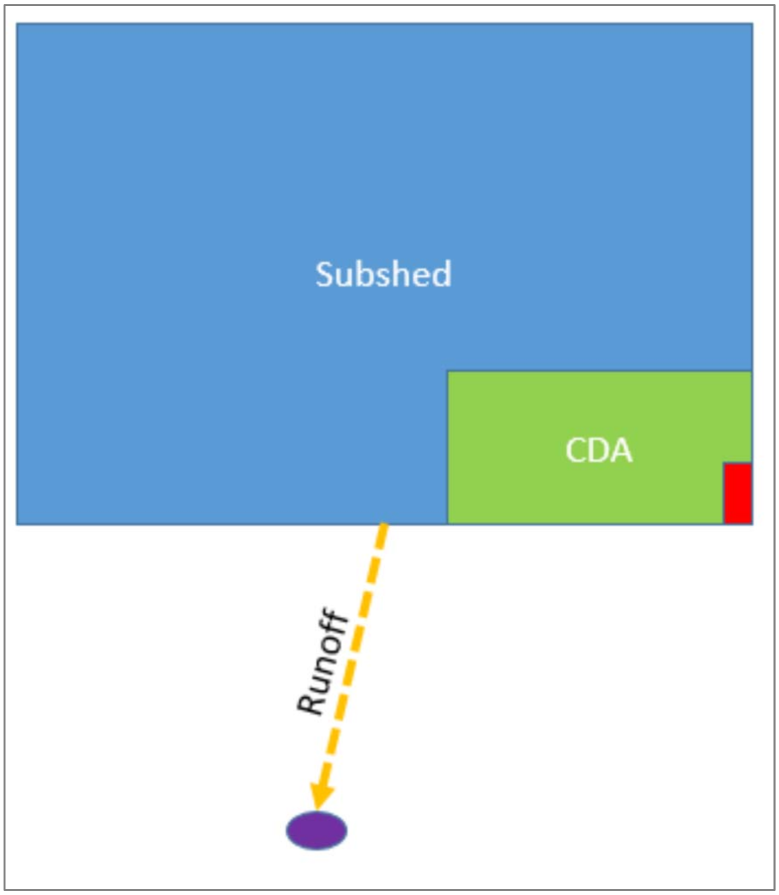


**Figure 1-1. Lumped Practice Modeling Approach**

## 1.3 Scope and Modeling Objectives

The development, calibration, and application of the PR-A SWMM model followed a similar effort for the RC-A Green Infrastructure project. The model was developed to reflect conditions prior to GI installation, followed by calibration to the pre-construction monitoring period. A post-construction model was then developed to reflect the installation of GI; this model was calibrated to the post-construction data. The calibrated post-construction model was then applied to predict overall wet weather reductions for the LTCP average year period of 1988-1990.

- The pre-construction model was calibrated for a time period of February 5, 2016 to February 4, 2017.
- Installed GI practices were added to the model and the model was calibrated using post-construction sewer monitoring data using data from April 16, 2019 to March 26, 2020. Model adjustments during this calibration were limited to the GI parameters only, although model adjustments were minor and did not deviate from the GI design/as-built parameters. Model parameters unrelated to GI were unchanged from the pre- to post-construction models.
- The calibrated post-construction model was used to simulate the LTCP forecast period of 1988-1990.
- Additional comparisons were made between model-predicted GI practice performance and practice-specific water level data. Practice-specfic data for six practices for the period of

November 14, 2019 to April 23, 2020 were compared with modeled water levels for lumped practices on the subshed level. Table 1-1 provides an overview of all modeling timeframes.

**Table 1-1. PR-A Modeling Timeframes**

| Modeling Purpose | Timeframe | Model Description |
|---|---|---|
| Rainfall Monitoring | 2/5/16 – 4/23/20 | For Pre Construction Period: 2/5/16 – 2/4/17<br>For Post Construction Period: 4/16/19 – 4/23/20 |
| Pre-Construction Monitoring – Sewershed | 2/5/16 – 2/4/17 | Entire monitoring period served as calibration period |
| Post-Construction Monitoring – Sewershed | 4/16/19 – 4/23/20 | Entire monitoring period served as calibration period |
| Post-Construction Monitoring – GI Practices | 11/14/19 – 4/23/20 | Comparison of modeled WLs with practice-specific WL data. |

# 2 Description of System

## 2.1 PR-A Area

The PR-A study area consists of 190 acres, and is approximately 46% impervious. Table 2-1. Constructed and Metered GI Facilities summarizes all GI practices installed within and outside of the study area. "Acres Managed" are based on the impervious portion of the GI CDA. Figure 2-1. Installed PR-A GI Practices
 shows the PR-A GI facility locations.

**Table 2-1. Constructed and Metered GI Facilities**

| | Constructed & Modeled (Project Area) | |
|---|---|---|
| **Practice Type** | **Number of Practices** | **Acres Managed (% of Total Impervious Acres Managed)** |
| Planter Bioretention (PBR) | 5 | 0.3 (3.5%) |
| Alley Permeable Pavement (APP) | 23 | 5.69 (71.5%) |
| Parking Lane Permeable Pavement (PPP) | 15 | 1.99 (25.0%) |
| **Total** | **43** | **7.95 (100%)** |

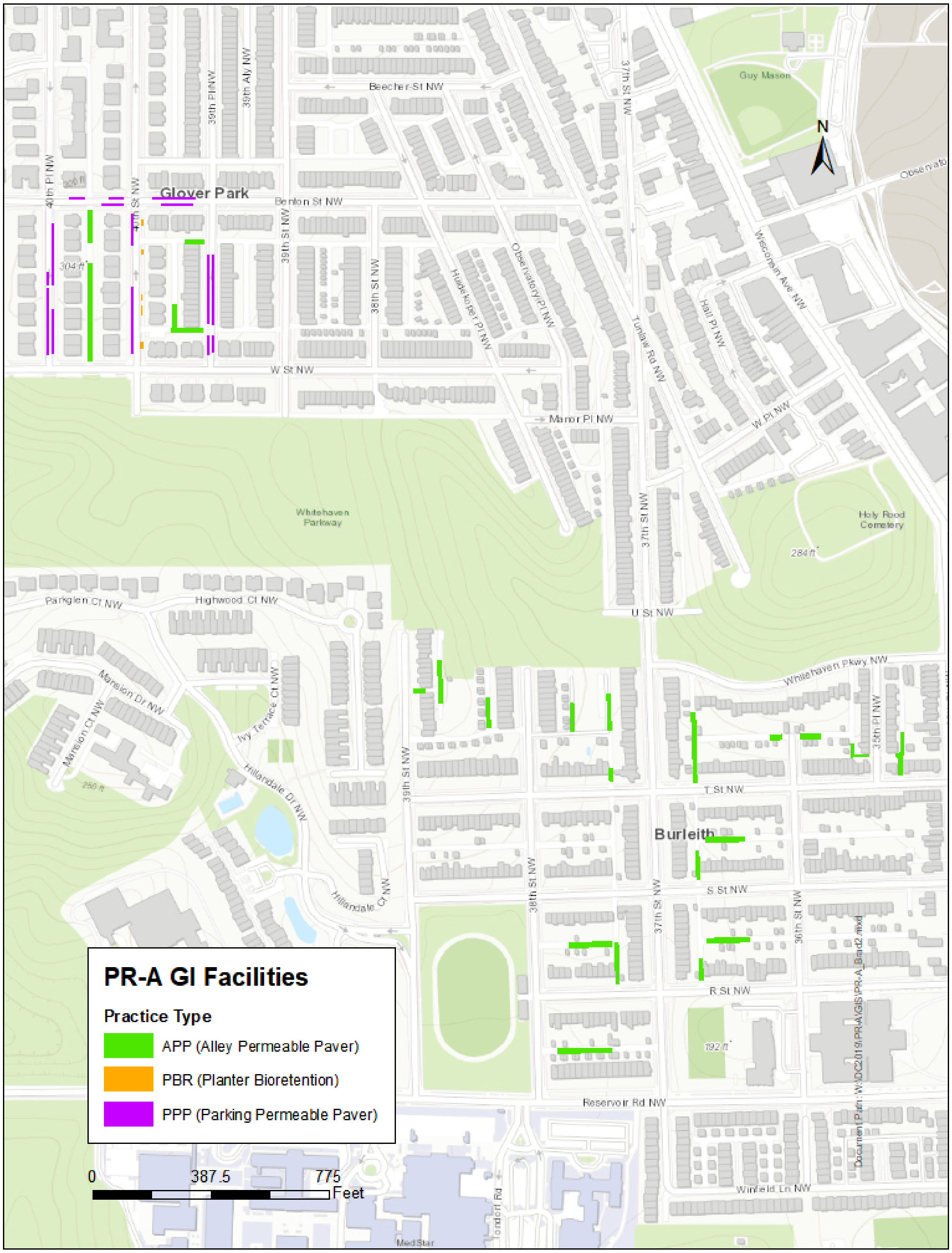


Figure 2-1. Installed PR-A GI Practices

## 2.2 Monitoring Locations and Data

There are two outlets from PR-A, with interconnections between them, that were monitored by meters 029-5 and 029-6 during both pre- and post-construction periods. Those two meters' flows were summed for model calibration. There are also two upstream meters with interconnections, 029-1 and 029-2, which were also summed for calibration. The combined 029-1 and 029-2 area covers 33 acres, and is 50% impervious. The installed green infrastructure practices consist mostly of pervious pavers, with only a few bioretention cells. About 40% of the GI practices are concentrated in the 029-1 and 029-2 meter sheds, with the remainder in the 029-5 and 029-6 meter sheds. Overall, the PR-A study area consists of 190 acres, and is 46% impervious. Table 2-2. PR-A Flow Meters summarizes the PR-A meter areas.

**Table 2-2. PR-A Flow Meters**

| Meter | Purpose / Usage | Drainage Area (ac) | Pre-Construction | Post-Construction |
|---|---|---|---|---|
| PR-A 029-1 | Quantify runoff from a specific group of GI practices | 33.4 | YES | YES |
| PR-A 029-2 | Quantify runoff from a specific group of GI practices | | YES | YES |
| PR-A 029-3 | Quantify runoff from a specific area[1,2] | 22.7 | YES | YES |
| PR-A 029-4 | Quantify runoff from a specific area[1,2] | 40.5 | YES | YES |
| PR-A 029-5 | Quantify total flows in PR-A area | 190.0 | YES | YES |
| PR-A 029-6 | Quantify total flows in PR-A area | | YES | YES |

[1] Internal Meter not used for this study due to inconsistencies in flows from pre- to post-construction periods, as well as absence of GI practices within these meter sheds
[2]Meter not used for this study due to overlapping drainage area size or data quality issues

Figure 2-2**Error! Reference source not found.** shows the locations of the meters and rain gauge, as well as the drainage areas for the sewer meters and meter groupings.

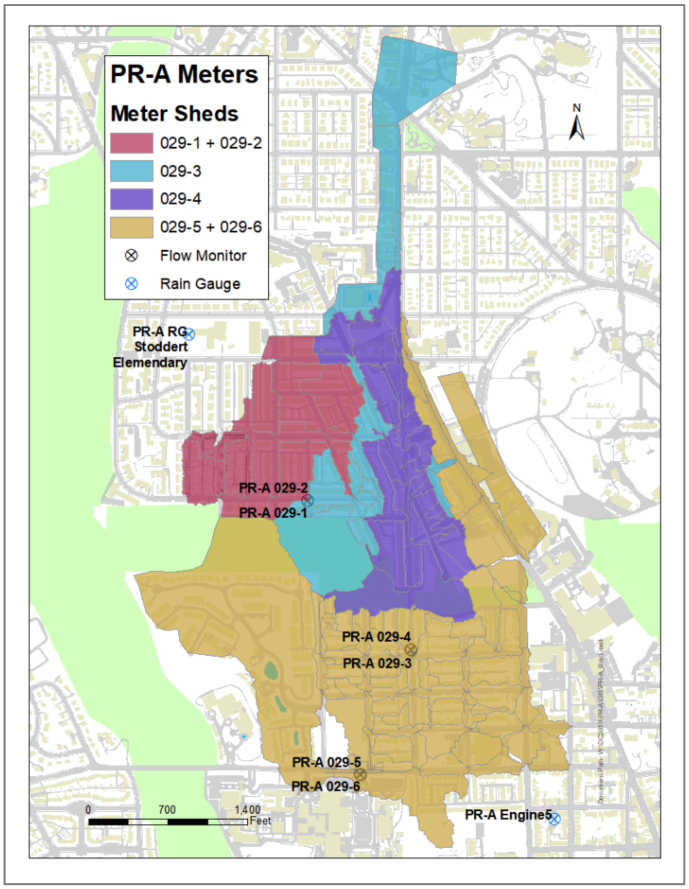

Figure 2-2. PR-A Monitoring Locations and Sheds

## 2.3 Rainfall Monitoring

A rain gauge with a five-minute reporting interval was installed at the Stoddert Elementary and was active for both the pre-construction and post-construction periods. For the purposes of modeling and analysis, events were excluded from analysis if there were any suspected winter weather influences, if there was an extreme disconnect between sewer metering data and rain data, or if there was substantial disagreement between the rain gauge and other DC Water rain gauges. There were no events excluded from the pre-construction period, and two events excluded from the post-construction period. Table 2-3. Total Rainfall During Pre- and Post-Construction Periods summarizes the rainfall event totals for the pre- and post-construction periods.

**Table 2-3. Total Rainfall During Pre- and Post-Construction Periods**

| Period | Total Rainfall (inches) | Number of Events |
|---|---|---|
| 2016-2017 Pre-Construction | 28.33 | 60 |
| 2019-2020 Post-Construction | 43.08 | 91 |
| Calibration Events | 39.24 | 89 |

## 2.4 GI Practice Water Level Monitoring

Sensors in six GI practices (APP-0707, APP-0905, PBR-0902, PBR-0903, PBR-0904, PPP-0901) began recording water levels in November 2019 to monitor the filling and drawdown rates of GI on a individual practice basis. For these six practices, one water level sensor was installed in each individual cell of each practice. The sensors are located in the practices' underdrain cleanouts at a level of 3" above practice bottom. Water levels in the practice that are below 3" cannot be measured. The GI model represents one type of practice within each model subshed, therefore a comparison of modeled GI practices with the individually-monitored PR-A practices is not possible.

Table 2-4. Maximum Observed Practice Water Levels summarizes the maximum water levels observed in each of the practice-level monitoring wells. In all cases, the "A01" cell is the most upstream practice cell.

**Table 2-4. Maximum Observed Practice Water Levels**

| Practice ID | Type | Maximum Water Level (in) |
|---|---|---|
| 0707-A01 | APP | 1.24 |
| 0707-A02 | APP | 5.30 |
| 0905-A01 | APP | 27.37 |
| 0905-A02 | APP | 31.49 |
| 0905-A03 | APP | 19.37 |
| 0905-A04 | APP | 27.84 |
| 0905-A05 | APP | 33.05 |
| 0902-A01 | PBR | 20.87 |
| 0902-A02 | PBR | 14.86 |
| 0902-A03 | PBR | 11.84 |
| 0903-A01 | PBR | 5.92 |
| 0903-A02 | PBR | 8.86 |
| 0903-A03 | PBR | 4.73 |
| 0903-A04 | PBR | 15.73 |
| 0904-A01 | PBR | 3.00 |
| 0904-A02 | PBR | 5.66 |
| 0901-A01 | PPP | 3.68 |
| 0901-A02 | PPP | 0.64 |
| 0901-A03 | PPP | 4.88 |
| 0901-A04 | PPP | 32.55 |
| 0901-A05 | PPP | 34.31 |
| 0901-A06 | PPP | 37.04 |

# 3 Model Calibration

The pre-construction model calibration consisted of adjustments to impervious percentages and infiltration rates in the runoff model, and adjustments to flow splits and regulator parameters in the hydraulic model. The calibrated pre-construction model then served as the basis for the post-construction modeling.

The post-construction modeling with GI practices used the lumped practice approach that was consistent with the approach taken for the RC-A modeling work. In the lumped practice approach, GI practices of similar type are represented as one element within a SWMM subcatchment.

The GI practice parameters were populated based on the calculated wet-weather-volume-treated capacities of each practice. All pervious pavers were characterized as having no bottom infiltration because these practices are all lined. A ¼” orifice was assumed for the underdrains. No adjustments were needed to the GI parameters during calibration. The model setup and major calibration parameters are shown in the Table 3-1. PR-A Model Parameters.

**Table 3-1. PR-A Model Parameters**

| Model Parameter | PR-A Model |
|---|---|
| Model inventory | 132 subcatchments, 190 acres<br>61,646 feet of conduit |
| % impervious cover | 46% impervious |
| Saturated infiltration | Varies by subcatchment; 0.165 - 0.5 in/hr, 0.36 in/hr average |
| GI settings (for post-construction model) | • As-built CDAs<br>• Porosity/void-ratio values based on volume-managed calculations<br>• 0.25” orifices in 6” underdrain pipes<br>• Lined pervious paver practices |

## 3.1 Pre-Construction Model Results

A complete set of event hydrographs, monthly plots and rainfall events tabulations is included in the Appendices A and B for pre-construction monitoring. The calibration and monitoring results are explained as follows.

Figure 3-1. PR-A Pre-Construction Event Volumes, 029-1 + 029-2 through Figure 3-6 are 1-to-1 volume and peak flow plots and select individual event hydrographs for the combined 029-1 + 029-2 meter locations and 029-5 + 029-6 meter locations, comparing metered flows versus modeled predictions.

Modeled predictions match event volumes well for both 029-1 + 029-2 and 029-5 + 029-6 locations. Peak flow response is more variable, with the model generally predicting somewhat higher peak flows, but with significant variability from event to event.

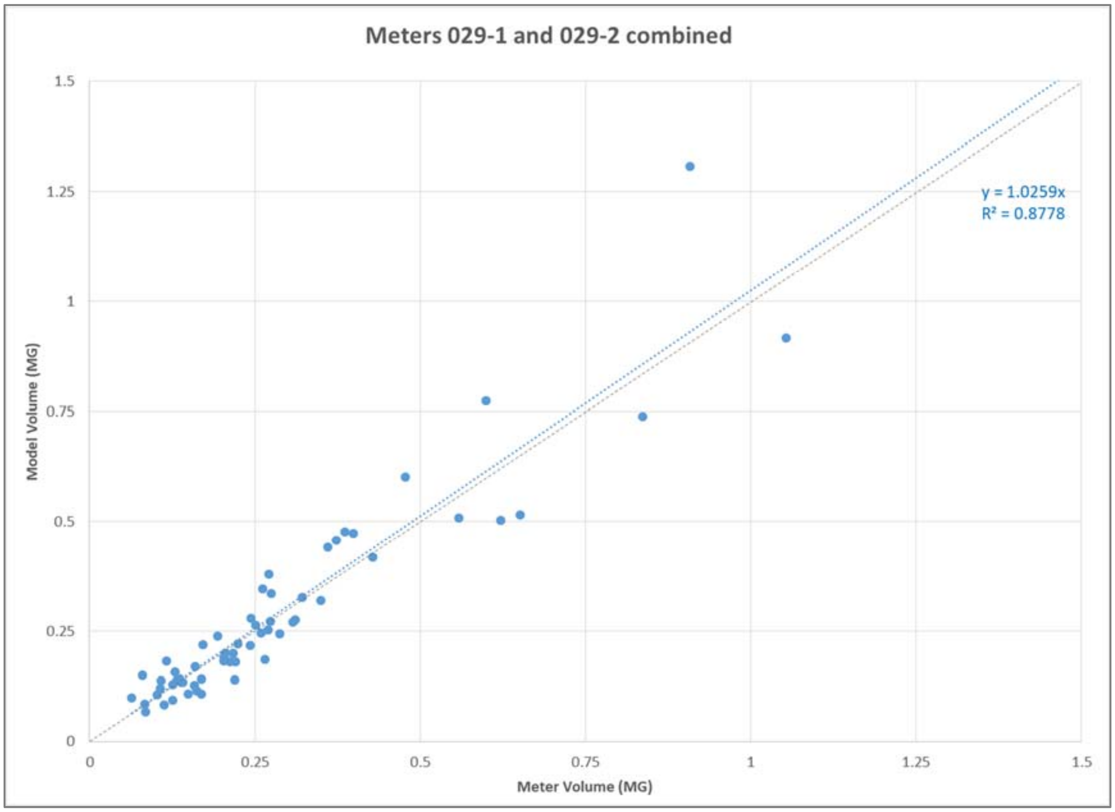


**Figure 3-1. PR-A Pre-Construction Event Volumes, 029-1 + 029-2**

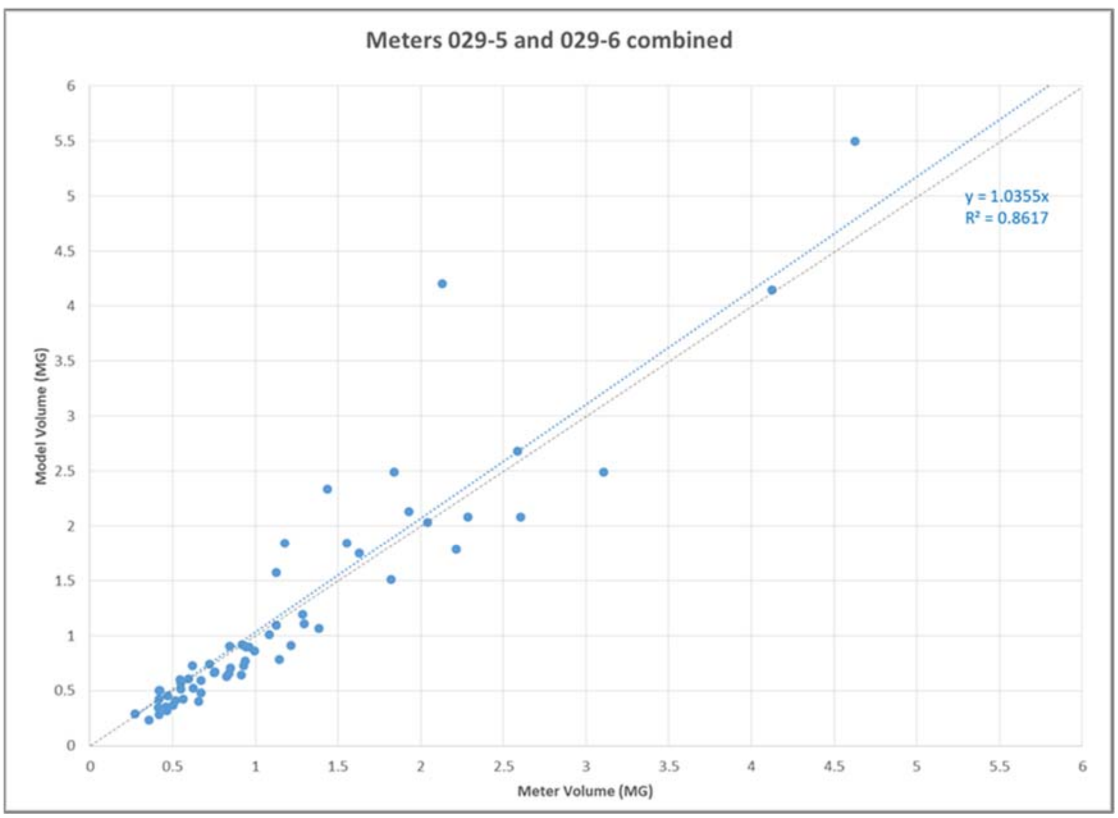


**Figure 3-2. PR-A Pre-Construction Event Volumes, 029-5 + 029-6**

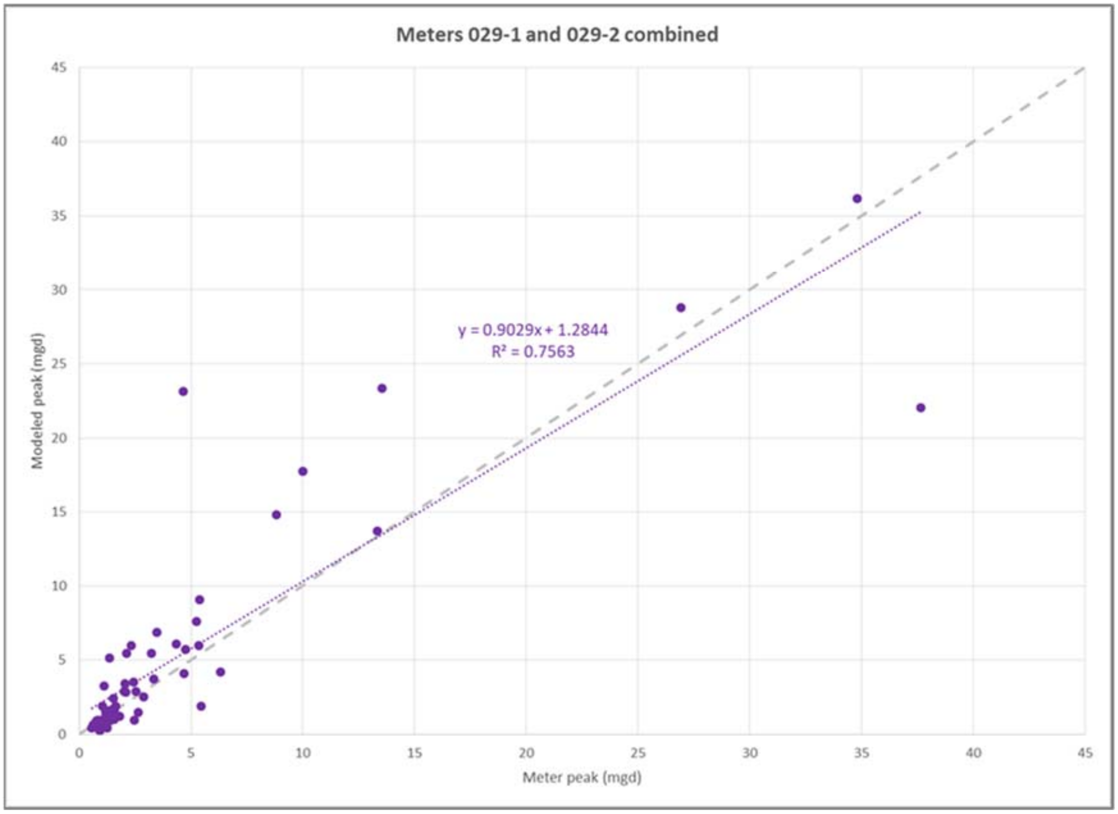


**Figure 3-3. PR-A Pre-Construction Event Peak Flows, 029-1 + 029-2**

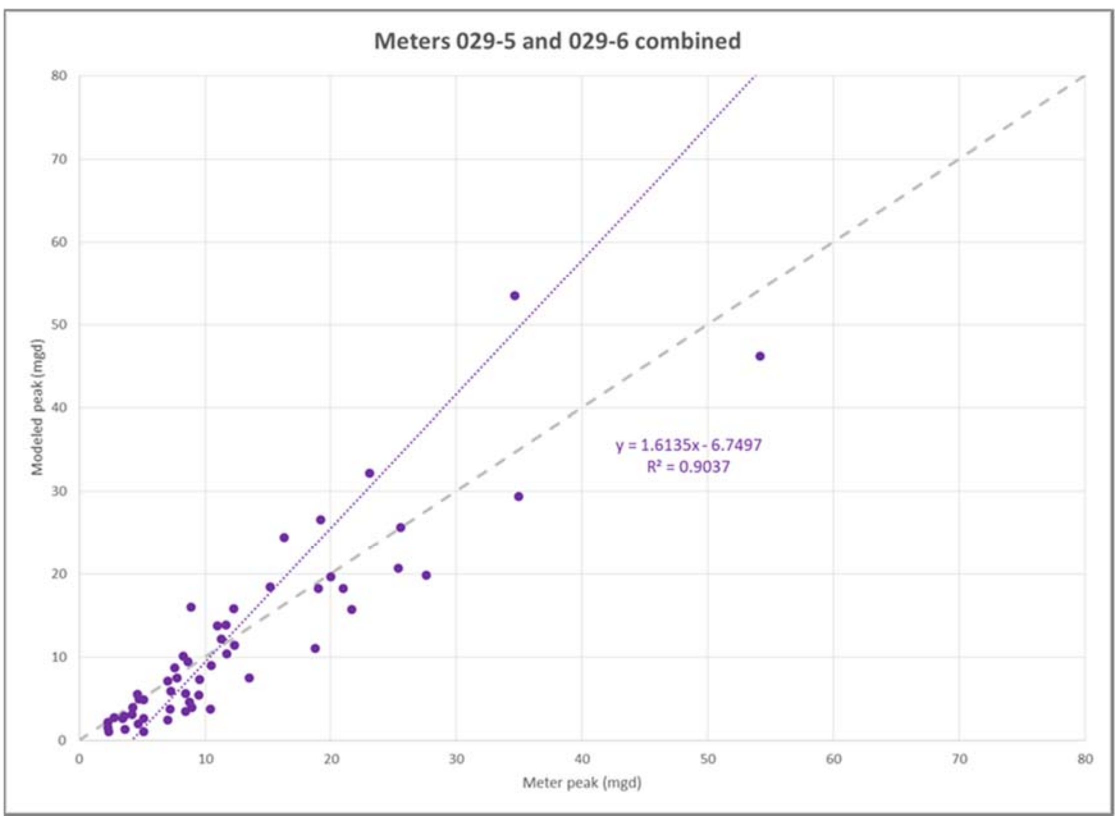


**Figure 3-4. PR-A Pre-Construction Event Peak Flows , 029-5 + 029-6**

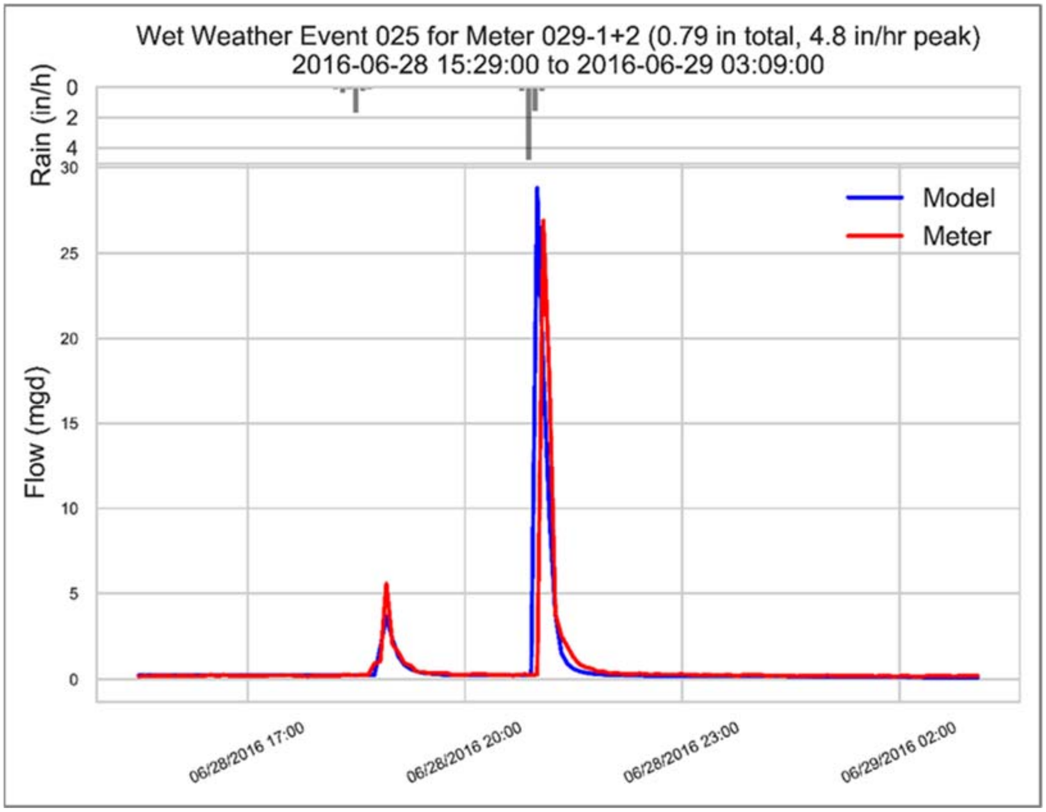


**Figure 3-5. PR-A Pre-Construction Event Hydrograph, 029-1 + 029-2**

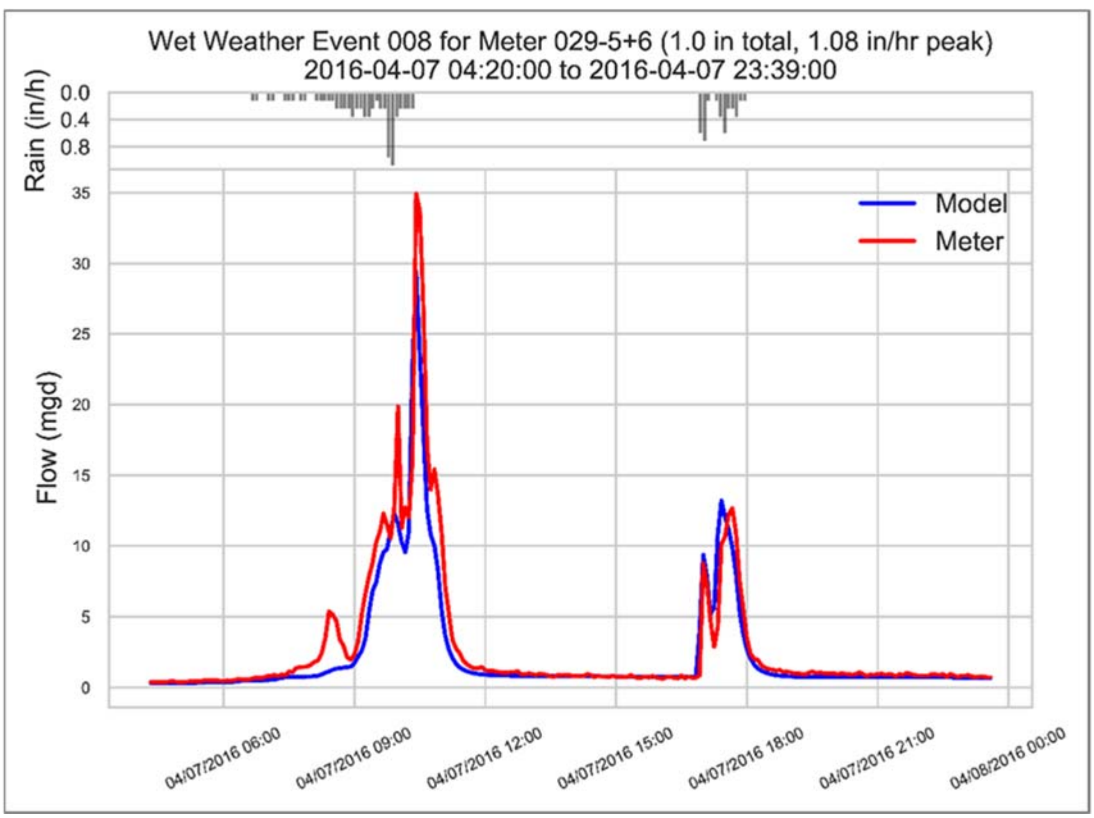


**Figure 3-6. PR-A Pre-Construction Event Hydrograph, 029-5 + 029-6**

## 3.2 Post-Construction Model Results

A complete set of event hydrographs, monthly plots and rainfall events tabulations is included in the Appendices C and D for post-construction monitoring. The calibration and monitoring results are explained as follows.

Following figures, Figure 3-7 through Figure 3-12 are 1-to-1 volume and peak flow plots and select individual event hydrographs for the combined 029-1 + 029-2 meter locations and 029-5 + 029-6 meter locations, comparing metered flows versus modeled predictions.

For 029-1 + 029-2, over the entire calibration period, the model under-predicts volumes by 4%. For 029-5 + 029-6, there is an overall over-prediction of volumes by 17%. In consideration that (a) the pre-construction model matches event volumes well for those downstream meters, and (b) the volume match is very good for the post-construction model at the upstream 029-1 + 029-2 meters where about half of the GI is concentrated, it was decided not to undertake additional model calibration.

As with the pre-construction model, peak flow response was more variable; the predicted peak flows were generally lower than metered flow peaks at 029-1 +029-2, and higher than metered flow peaks at 029-5 + 029-6.

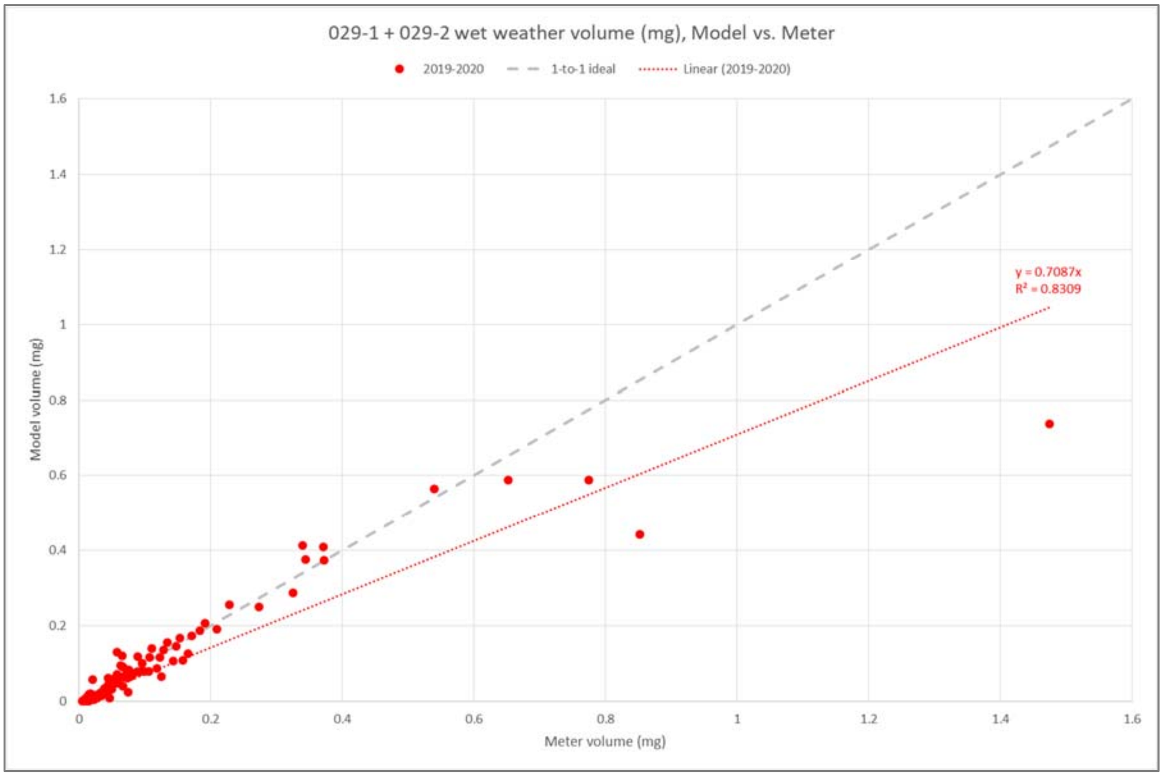


**Figure 3-7. PR-A Post-Construction Event Volumes, 029-1 + 029-2**

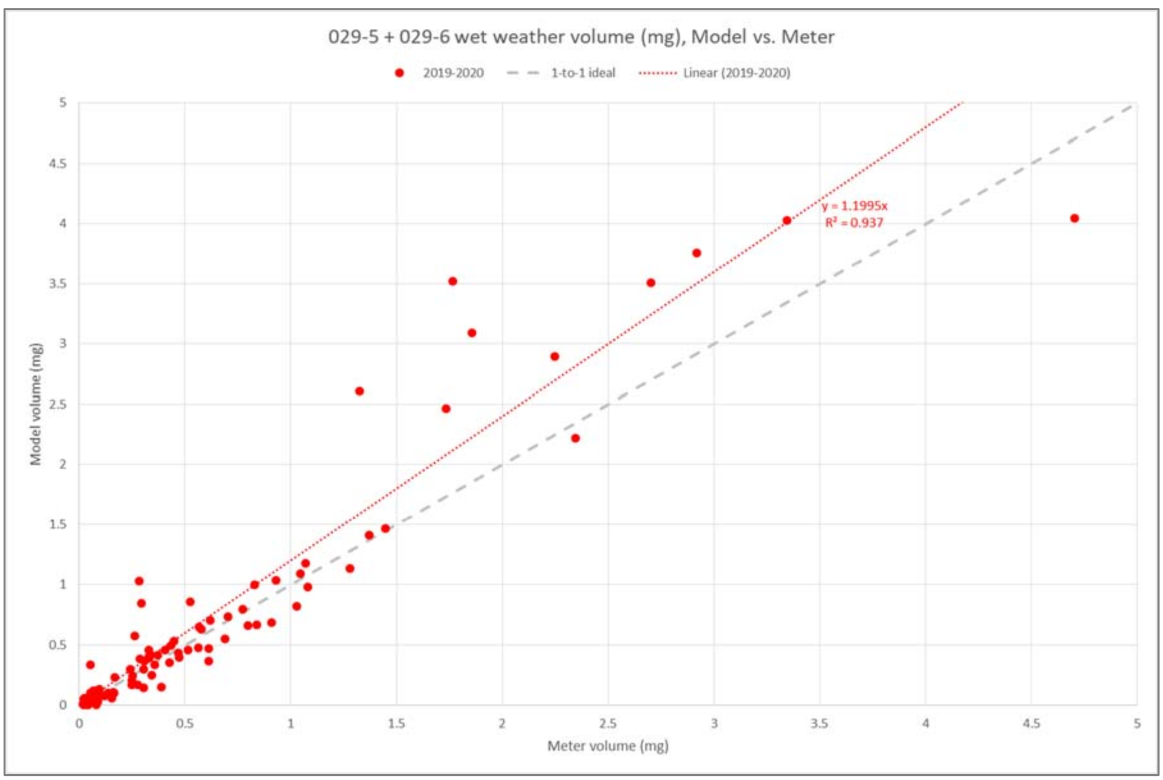


**Figure 3-8. PR-A Post-Construction Event Volumes, 029-5 + 029-6**

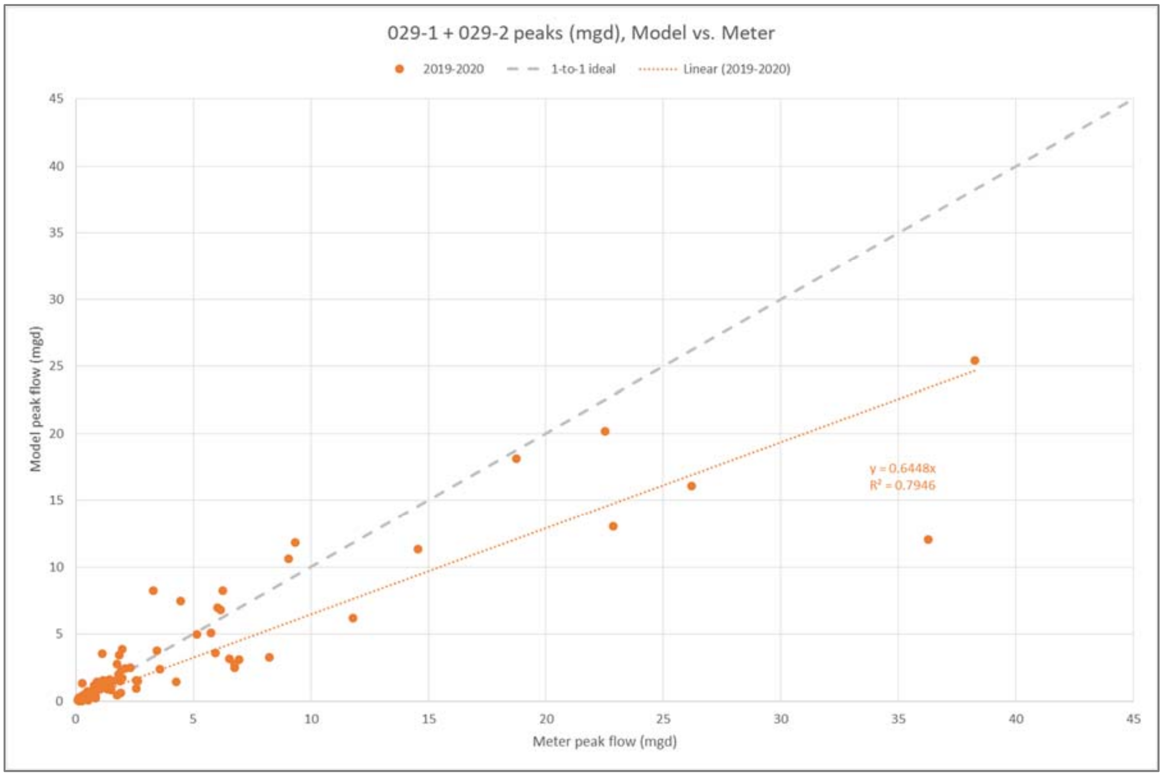


**Figure 3-9. PR-A Post-Construction Event Peak Flows, 029-1 + 029-2**

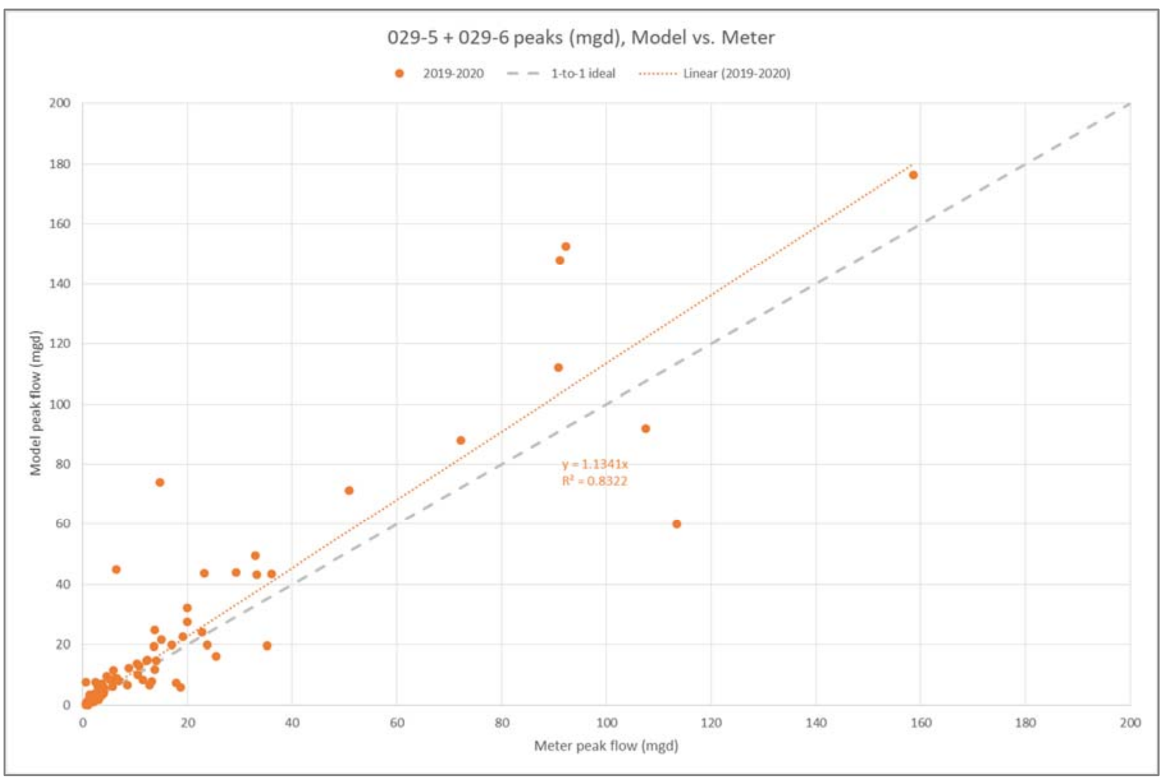


**Figure 3-10. PR-A Post-Construction Event Peak Flows, 029-5 + 029-6**

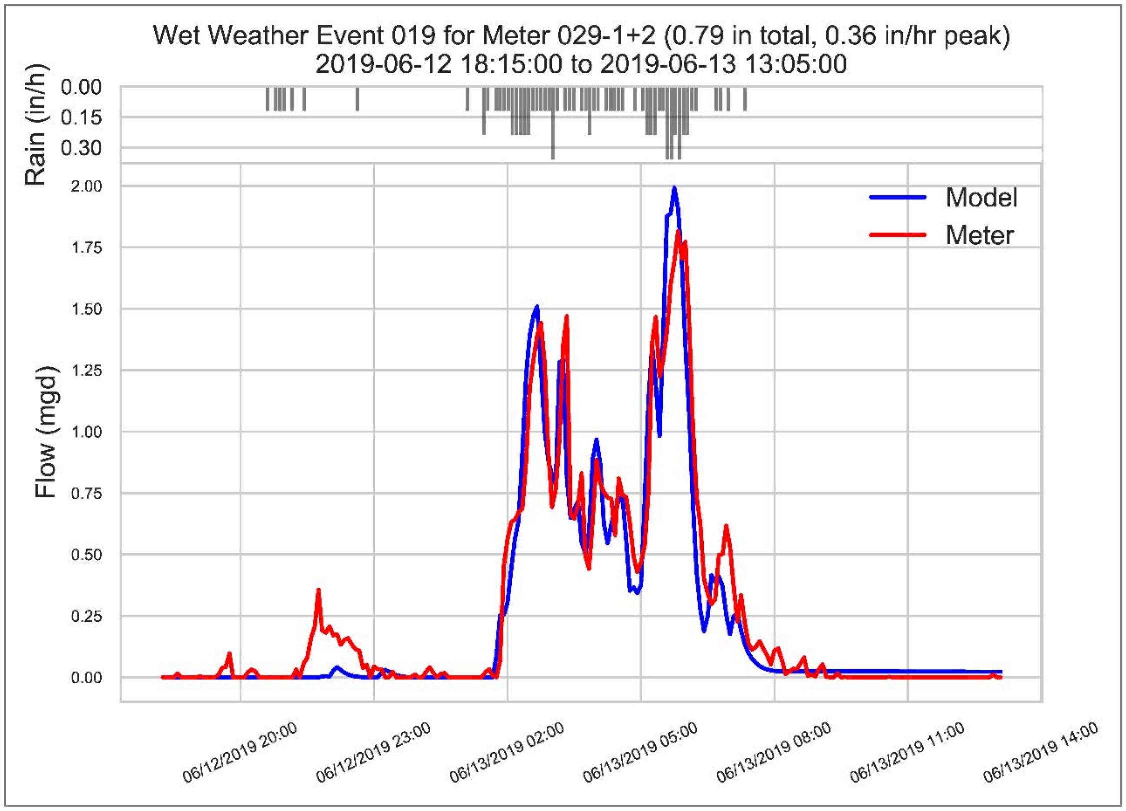


**Figure 3-11. PR-A Post-Construction Event Hydrograph, 029-1 + 029-2**

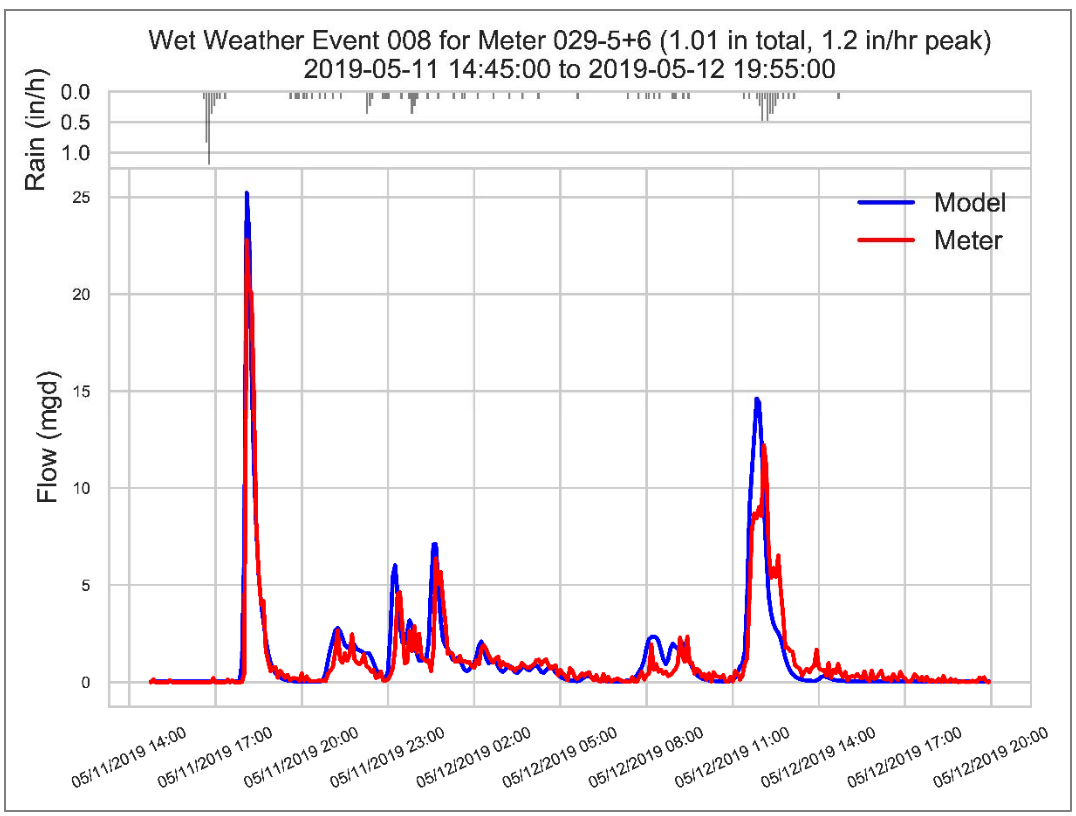


**Figure 3-12. PR-A Post-Construction Event Hydrograph, 029-5 + 029-6**

# 4 Results

Results from the post construction model calibration and the LTCP forecast period of 1988-1990 are presented in Table 3-1. PR-A Model Parameters below.

To determine the efficacy of GI, DC Water monitored and modeled the sewershed both pre- and post-construction to see if there was a reduction in wet weather flow (WWF), and if that reduction matched the predicted reduction based on the number of impervious acres treated by GI. The WWF volumes presented in this Section are defined as occurring when predicted flows in the sewer are exceeding two times the average dry weather flow rate. This methodology was selected because it is the original basis of design for the complete treatment capacity of the Blue Plains Advanced Wastewater Treatment Plant in the Blue Plains Feasibility Study (Final Report, 1984, Greeley and Hansen). Using this metric, it is possible that some residual wet weather flow in the underdrain could occur beneath this threshold. In the context of CSO control, GI would still effectively eliminate this wet weather volume, since existing CSO regulators would divert this residual flow.

The reduction in WWF volumes per average year was calculated by taking the difference between pre- and post-construction volumes divided by the number of impervious acres treated at 1.2” to determine the WWF reduction in million gallons per average year per impervious acres treated at 1.2”. The normalization factor (ratio of planned and managed impervious acres) used in the results calculation is one, since the planned and managed acres for PR-A is equal (8 acres).

As the predictions from the post-construction model using as-built GI matched the observed meter data to an acceptable degree without further adjustment of GI model parameters, it is assumed that actual modeled volume reduction and expected volume reduction are the same for the period 1988-1990.

**Table 4-1. PR-A Wet Weather Performance, Predicted Results**

| Simulated Time Period | Impervious Acres treated by GI (% of Total) | WWF Volume – Pre-Construction (MG) | WWF Volume – Post Construction (MG) | Predicted Volume Reduction Using Monitoring Data, Normalized to Impervious Acres Treated (%) | Predicted Volume Reduction Before Construction, Normalized to Impervious Acres Treated (%) |
|---|---|---|---|---|---|
| PR-A Model, 2019-2020 Rainfall Conditions | 9.1 % | 92.67 | 87.62 | 5.45% | N/A |
| 1988-1990 Average Year LTCP Forecast Period | 9.1 % | 77.73 | 72.56 | 6.65% | 6.65% |

# Appendix A

# Pre-Construction Event Hydrographs

(Note: The y-axis varies in scale between the individual plots)

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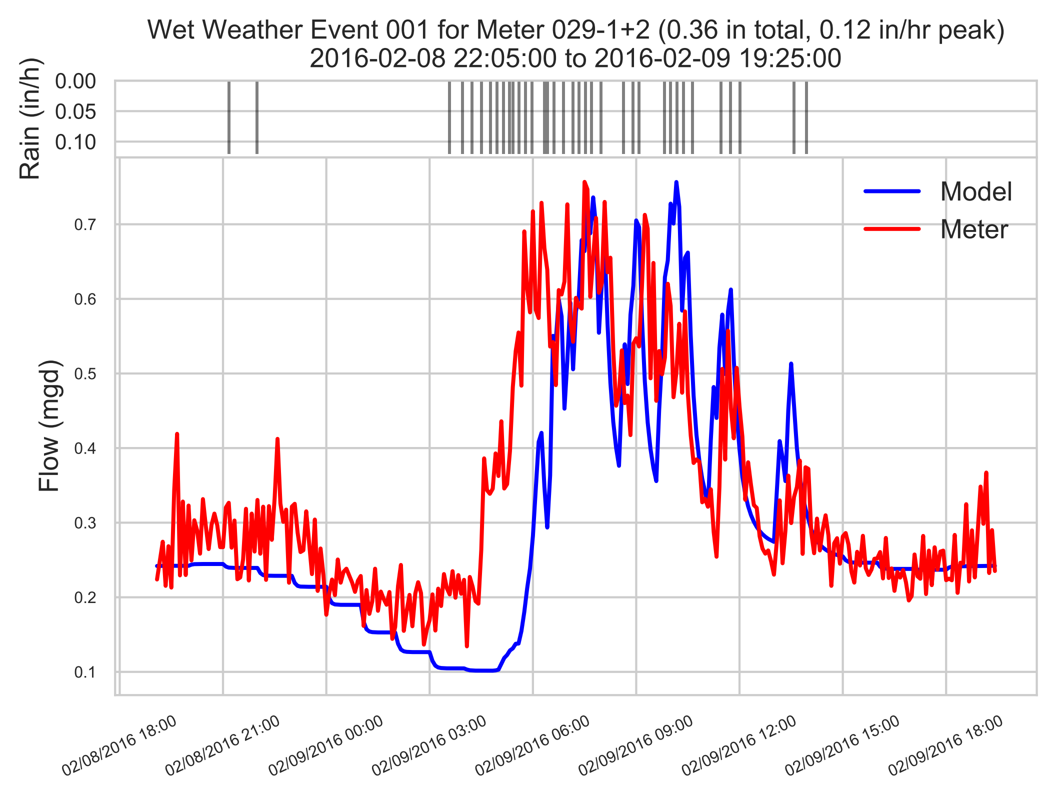
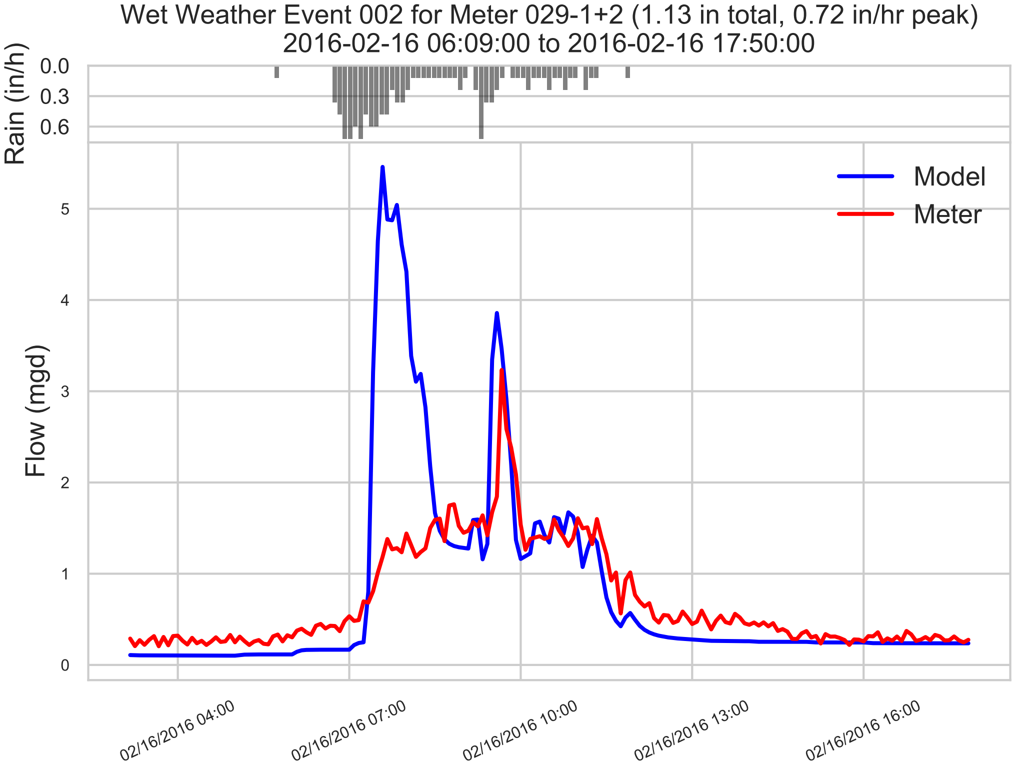
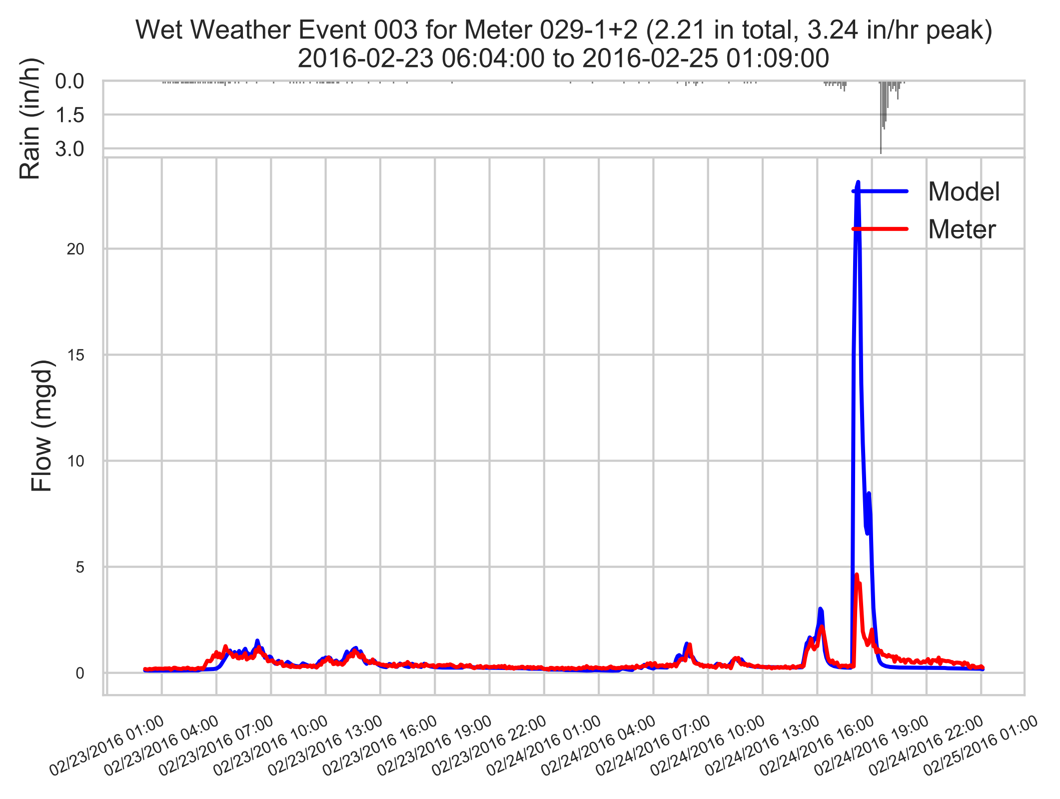

Wet Weather Event 001 for Meter 029-1+2 (0.36 in total, 0.12 in/hr peak)
2016-02-08 22:05:00 to 2016-02-09 19:25:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Model
Meter
02/08/2016 18:00
02/08/2016 21:00
02/09/2016 00:00
02/09/2016 03:00
02/09/2016 06:00
02/09/2016 09:00
02/09/2016 12:00
02/09/2016 15:00
02/09/2016 18:00



Wet Weather Event 002 for Meter 029-1+2 (1.13 in total, 0.72 in/hr peak)
2016-02-16 06:09:00 to 2016-02-16 17:50:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
0
1
2
3
4
5
Model
Meter
02/16/2016 04:00
02/16/2016 07:00
02/16/2016 10:00
02/16/2016 13:00
02/16/2016 16:00



Wet Weather Event 003 for Meter 029-1+2 (2.21 in total, 3.24 in/hr peak)
2016-02-23 06:04:00 to 2016-02-25 01:09:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
0
5
10
15
20
Model
Meter
02/23/2016 01:00
02/23/2016 04:00
02/23/2016 07:00
02/23/2016 10:00
02/23/2016 13:00
02/23/2016 16:00
02/23/2016 19:00
02/23/2016 22:00
02/24/2016 01:00
02/24/2016 04:00
02/24/2016 07:00
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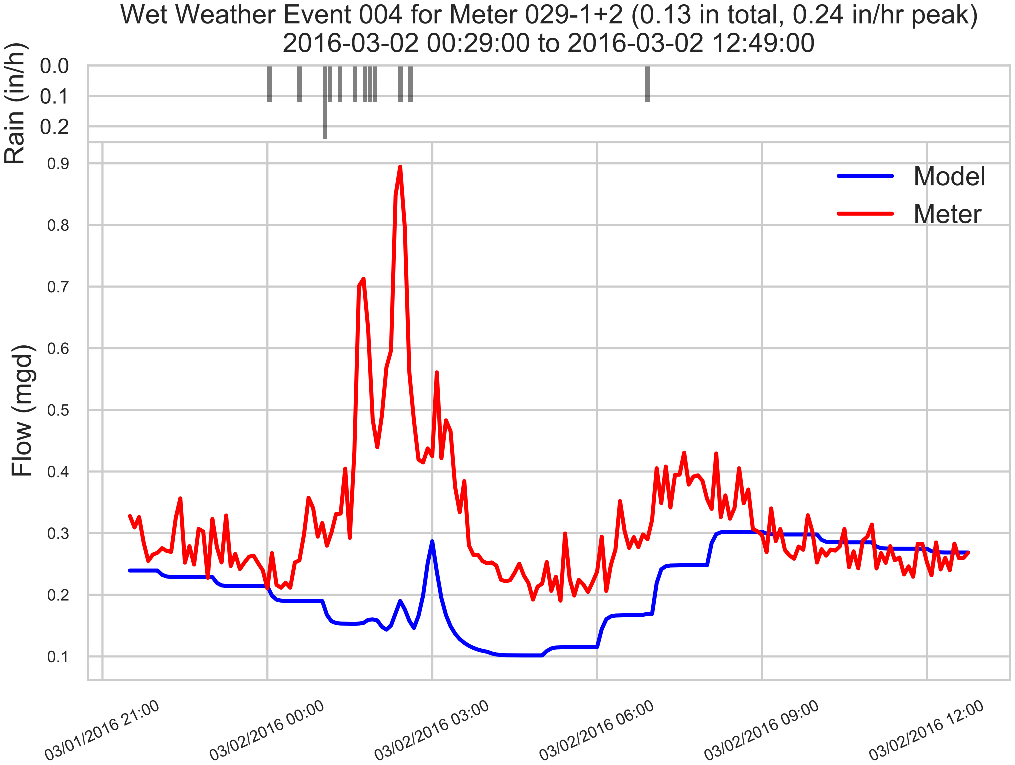
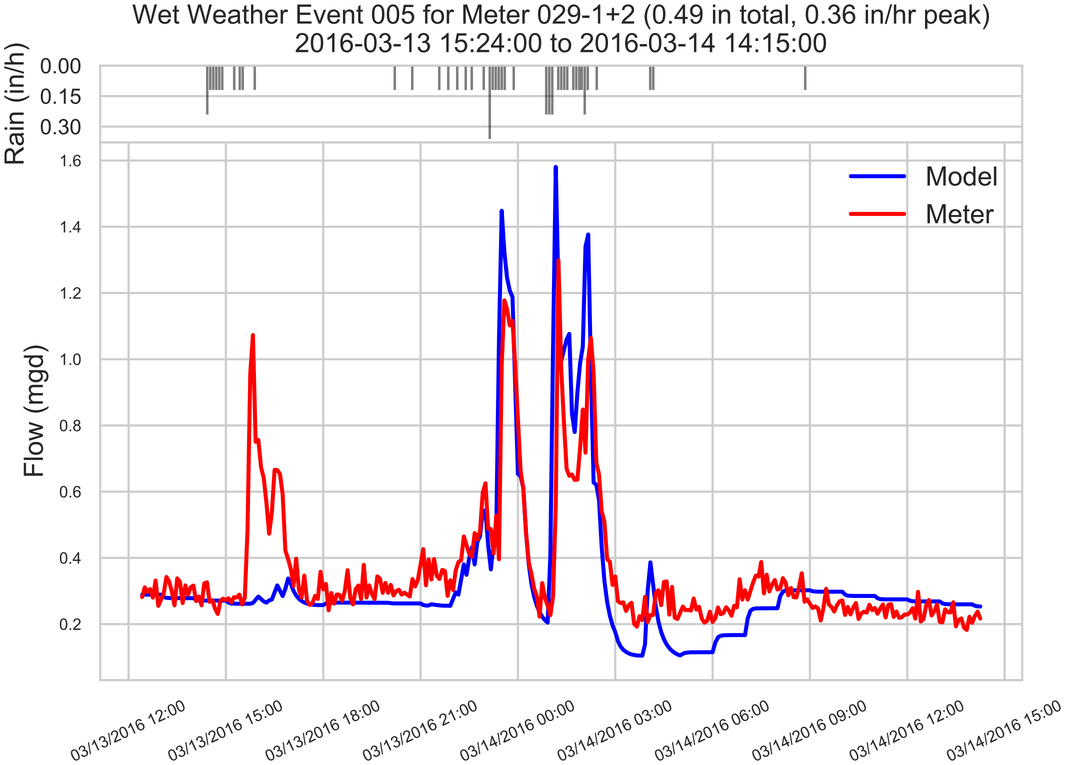
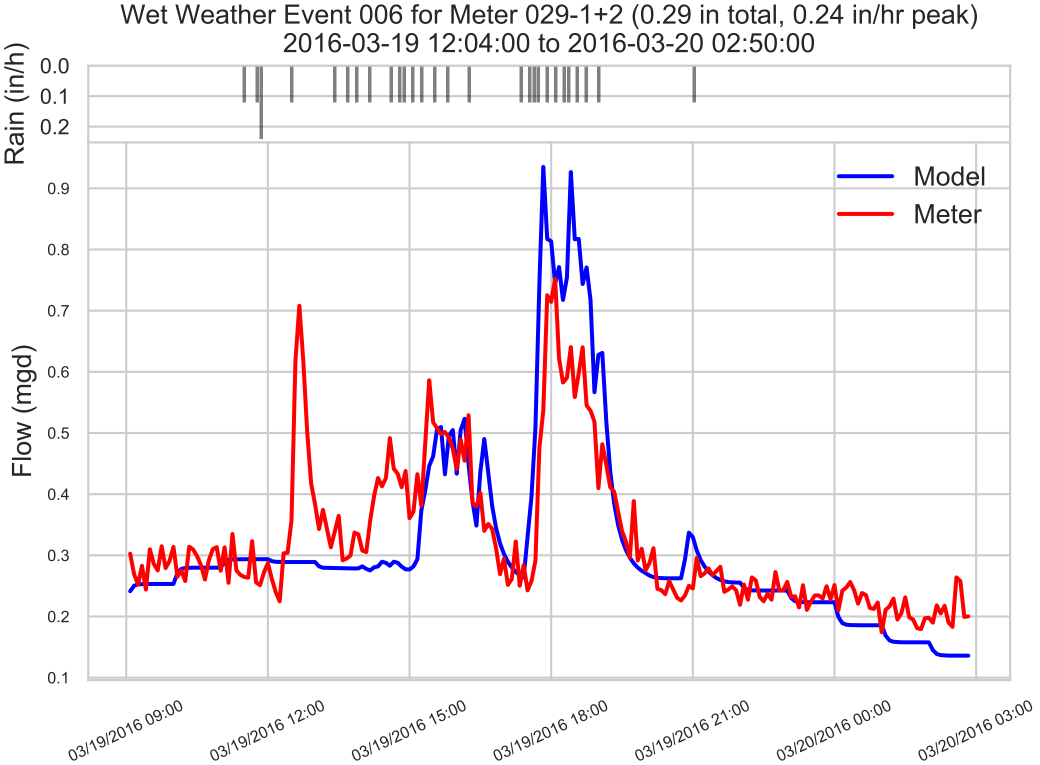
02/25/2016 01:00



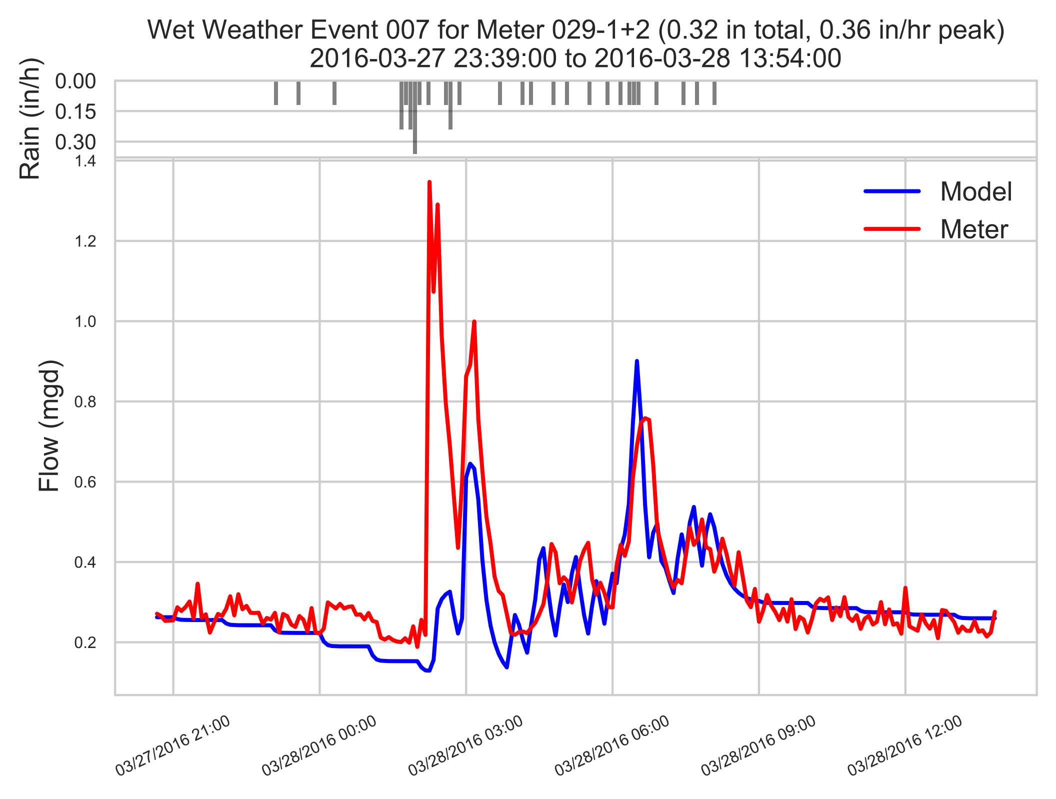
Wet Weather Event 004 for Meter 029-1+2 (0.13 in total, 0.24 in/hr peak)
2016-03-02 00:29:00 to 2016-03-02 12:49:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Model
Meter
03/01/2016 21:00
03/02/2016 00:00
03/02/2016 03:00
03/02/2016 06:00
03/02/2016 09:00
03/02/2016 12:00



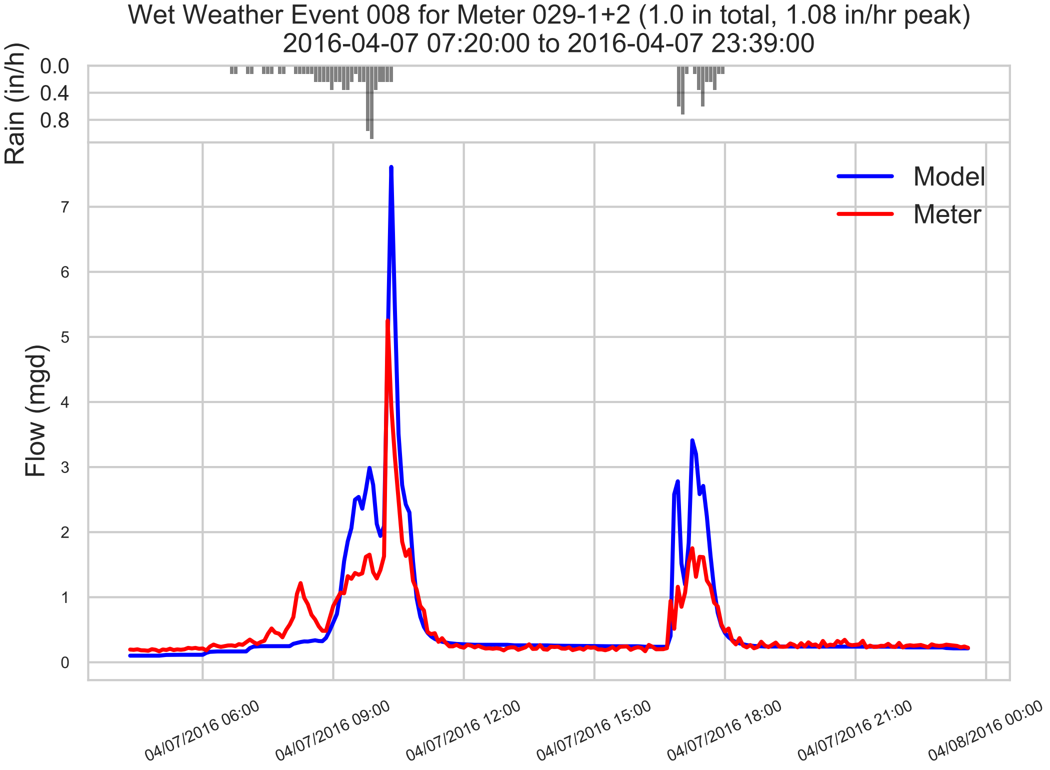
Wet Weather Event 005 for Meter 029-1+2 (0.49 in total, 0.36 in/hr peak)
2016-03-13 15:24:00 to 2016-03-14 14:15:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
03/13/2016 12:00
03/13/2016 15:00
03/13/2016 18:00
03/13/2016 21:00
03/14/2016 00:00
03/14/2016 03:00
03/14/2016 06:00
03/14/2016 09:00
03/14/2016 12:00
03/14/2016 15:00



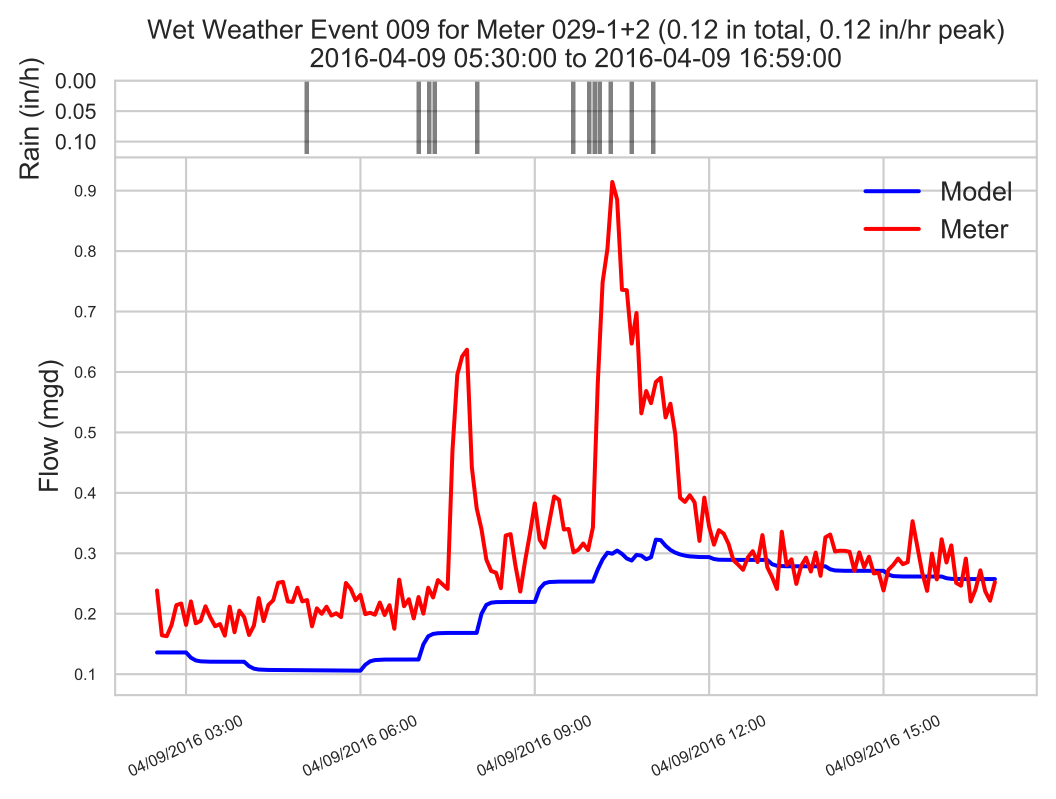
Wet Weather Event 006 for Meter 029-1+2 (0.29 in total, 0.24 in/hr peak)
2016-03-19 12:04:00 to 2016-03-20 02:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Model
Meter
03/19/2016 09:00
03/19/2016 12:00
03/19/2016 15:00
03/19/2016 18:00
03/19/2016 21:00
03/20/2016 00:00
03/20/2016 03:00



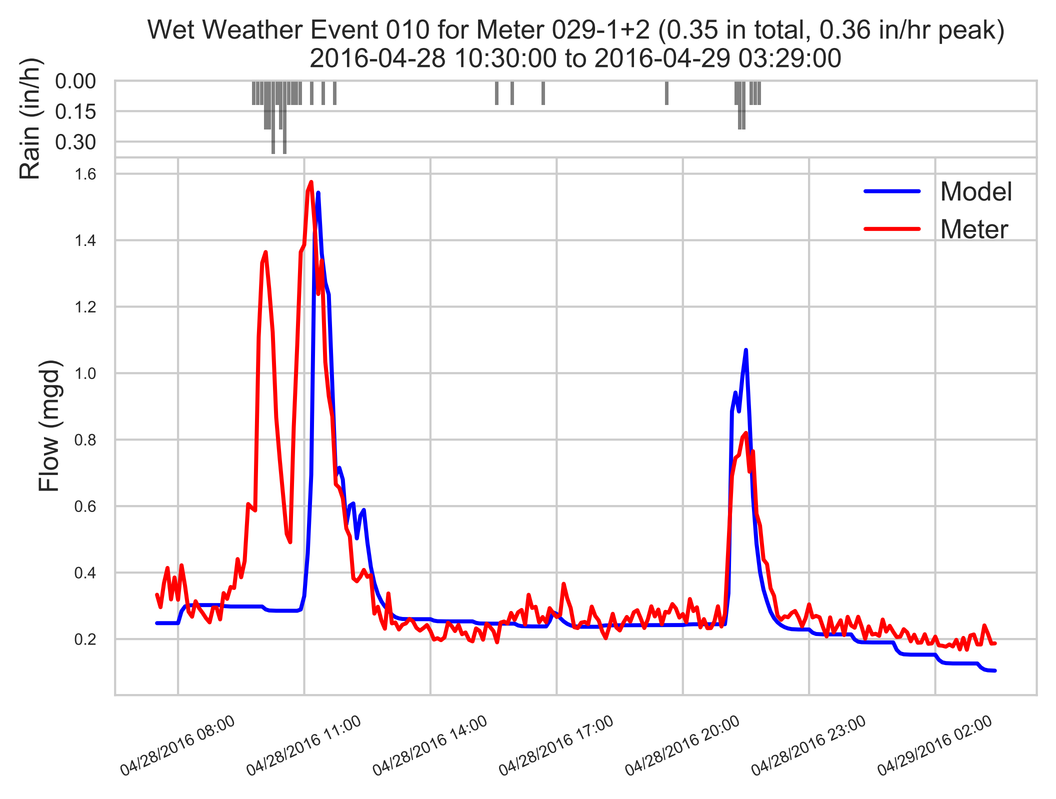
Wet Weather Event 007 for Meter 029-1+2 (0.32 in total, 0.36 in/hr peak)
2016-03-27 23:39:00 to 2016-03-28 13:54:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
03/27/2016 21:00
03/28/2016 00:00
03/28/2016 03:00
03/28/2016 06:00
03/28/2016 09:00
03/28/2016 12:00



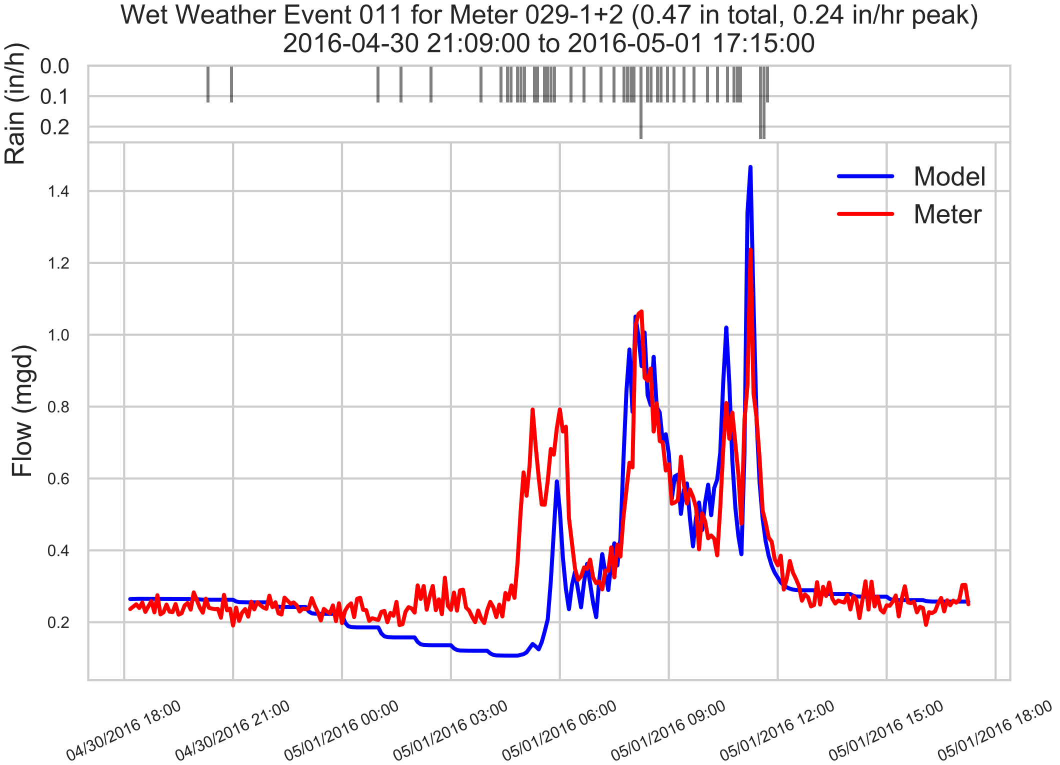
Wet Weather Event 008 for Meter 029-1+2 (1.0 in total, 1.08 in/hr peak)
2016-04-07 07:20:00 to 2016-04-07 23:39:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
0
1
2
3
4
5
6
7
Model
Meter
04/07/2016 06:00
04/07/2016 09:00
04/07/2016 12:00
04/07/2016 15:00
04/07/2016 18:00
04/07/2016 21:00
04/08/2016 00:00

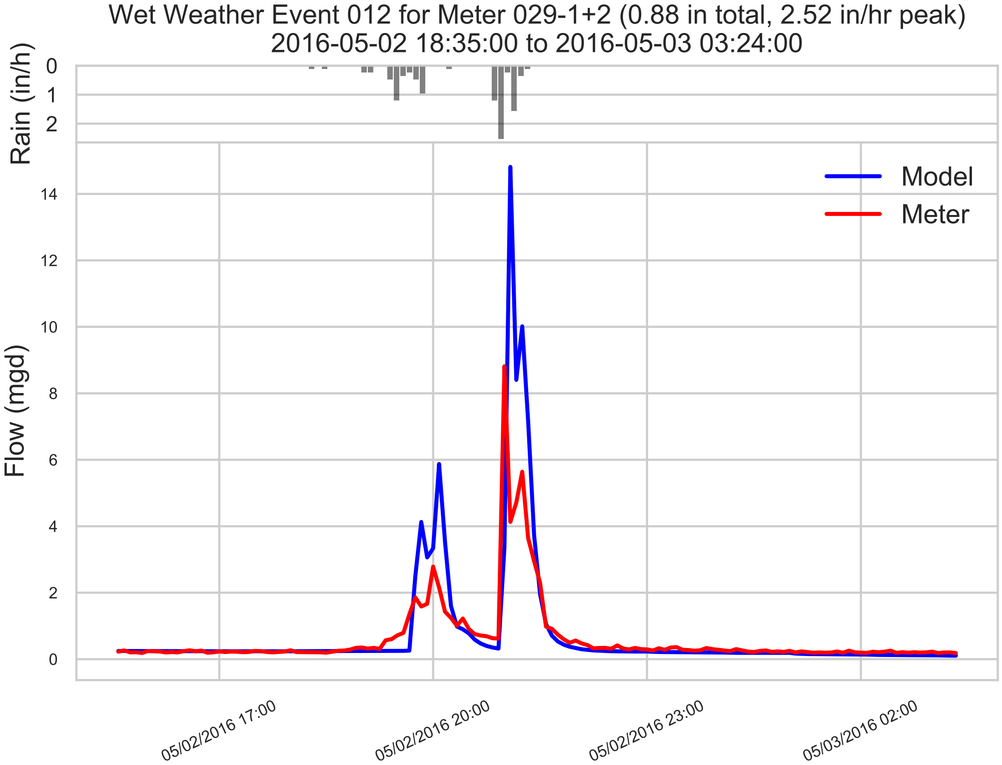


Wet Weather Event 009 for Meter 029-1+2 (0.12 in total, 0.12 in/hr peak)
2016-04-09 05:30:00 to 2016-04-09 16:59:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Model
Meter
04/09/2016 03:00
04/09/2016 06:00
04/09/2016 09:00
04/09/2016 12:00
04/09/2016 15:00

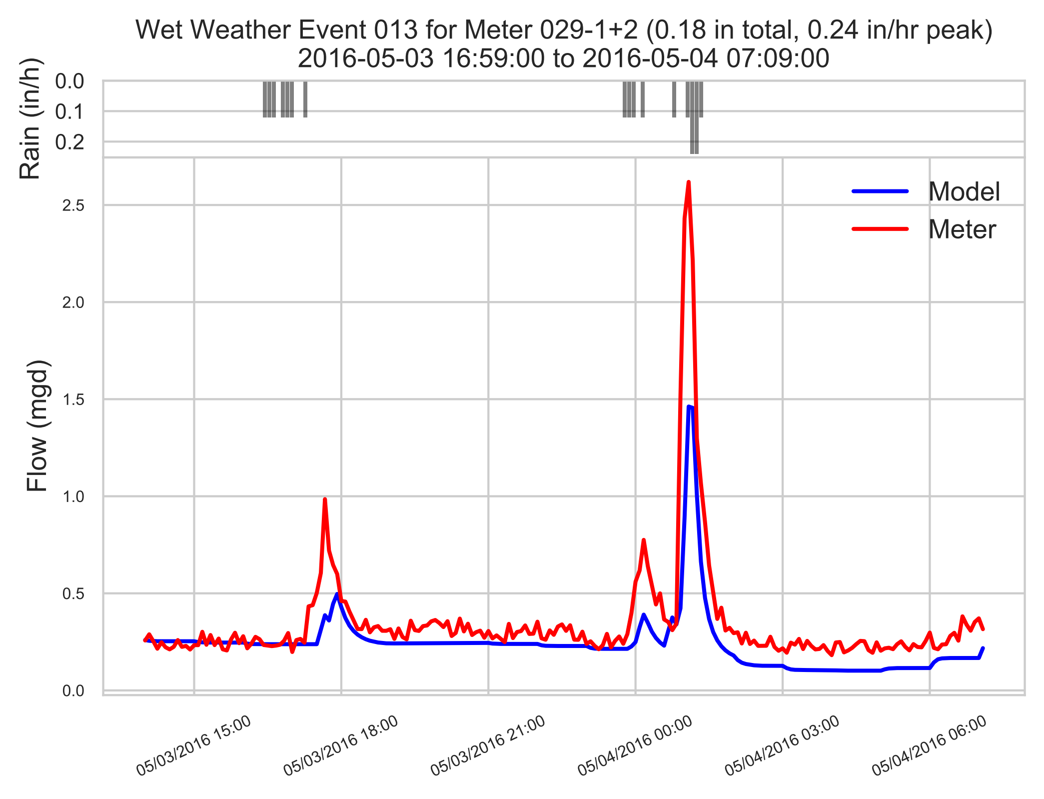


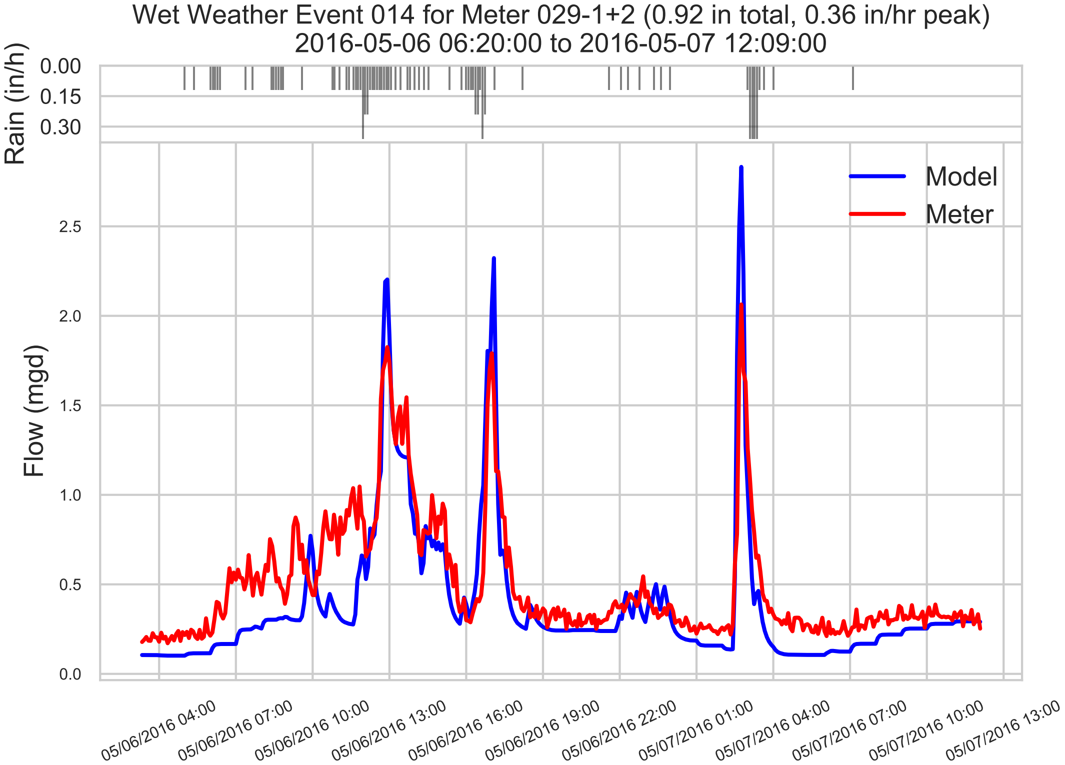
Wet Weather Event 010 for Meter 029-1+2 (0.35 in total, 0.36 in/hr peak)
2016-04-28 10:30:00 to 2016-04-29 03:29:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
04/28/2016 08:00
04/28/2016 11:00
04/28/2016 14:00
04/28/2016 17:00
04/28/2016 20:00
04/28/2016 23:00
04/29/2016 02:00

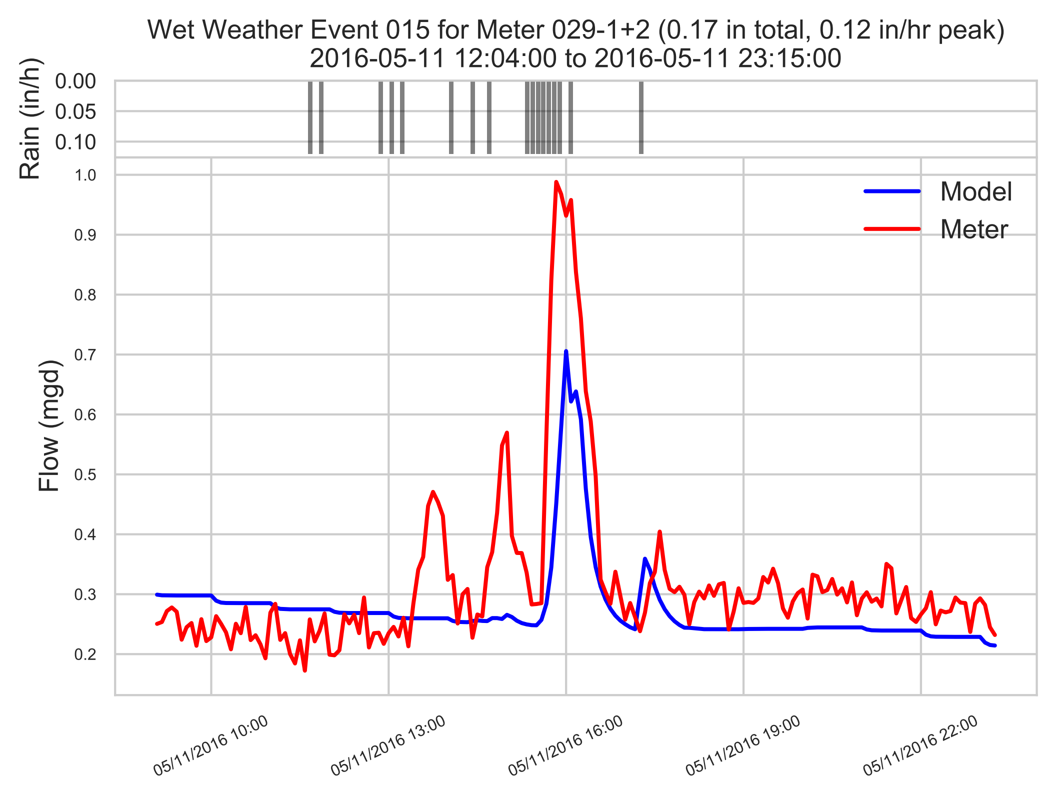

Wet Weather Event 011 for Meter 029-1+2 (0.47 in total, 0.24 in/hr peak)
2016-04-30 21:09:00 to 2016-05-01 17:15:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
04/30/2016 18:00
04/30/2016 21:00
05/01/2016 00:00
05/01/2016 03:00
05/01/2016 06:00
05/01/2016 09:00
05/01/2016 12:00
05/01/2016 15:00
05/01/2016 18:00



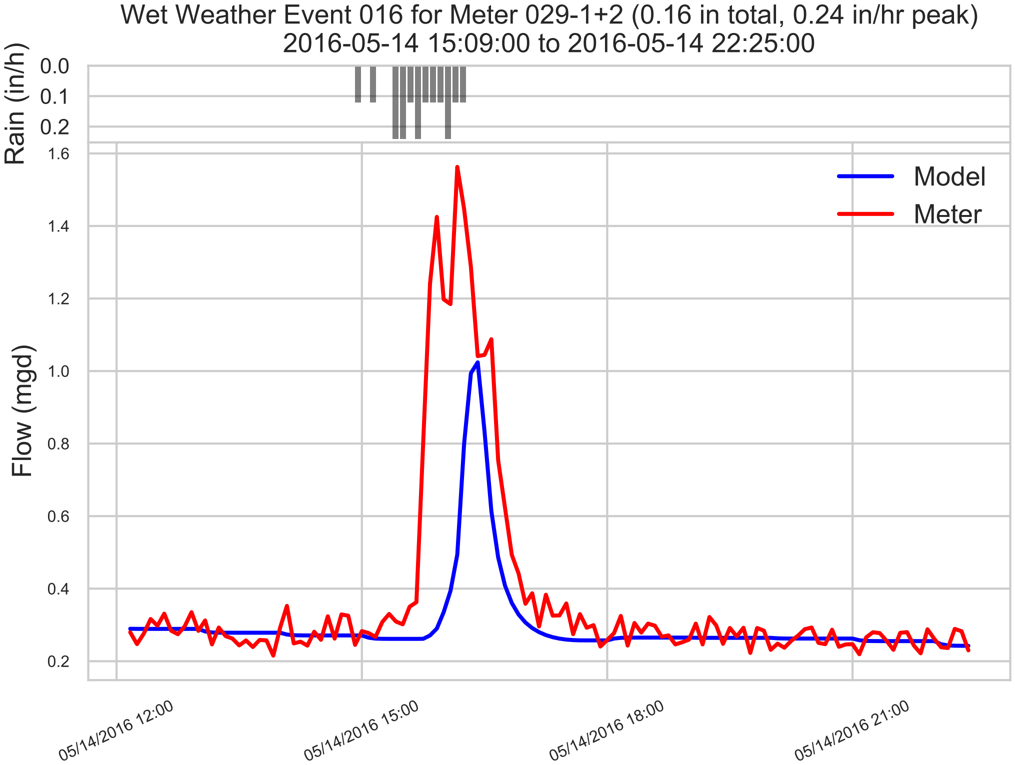
Wet Weather Event 012 for Meter 029-1+2 (0.88 in total, 2.52 in/hr peak)
2016-05-02 18:35:00 to 2016-05-03 03:24:00
Rain (in/h)
0
1
2
Flow (mgd)
0
2
4
6
8
10
12
14
Model
Meter
05/02/2016 17:00
05/02/2016 20:00
05/02/2016 23:00
05/03/2016 02:00


Wet Weather Event 013 for Meter 029-1+2 (0.18 in total, 0.24 in/hr peak)
2016-05-03 16:59:00 to 2016-05-04 07:09:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
05/03/2016 15:00
05/03/2016 18:00
05/03/2016 21:00
05/04/2016 00:00
05/04/2016 03:00
05/04/2016 06:00

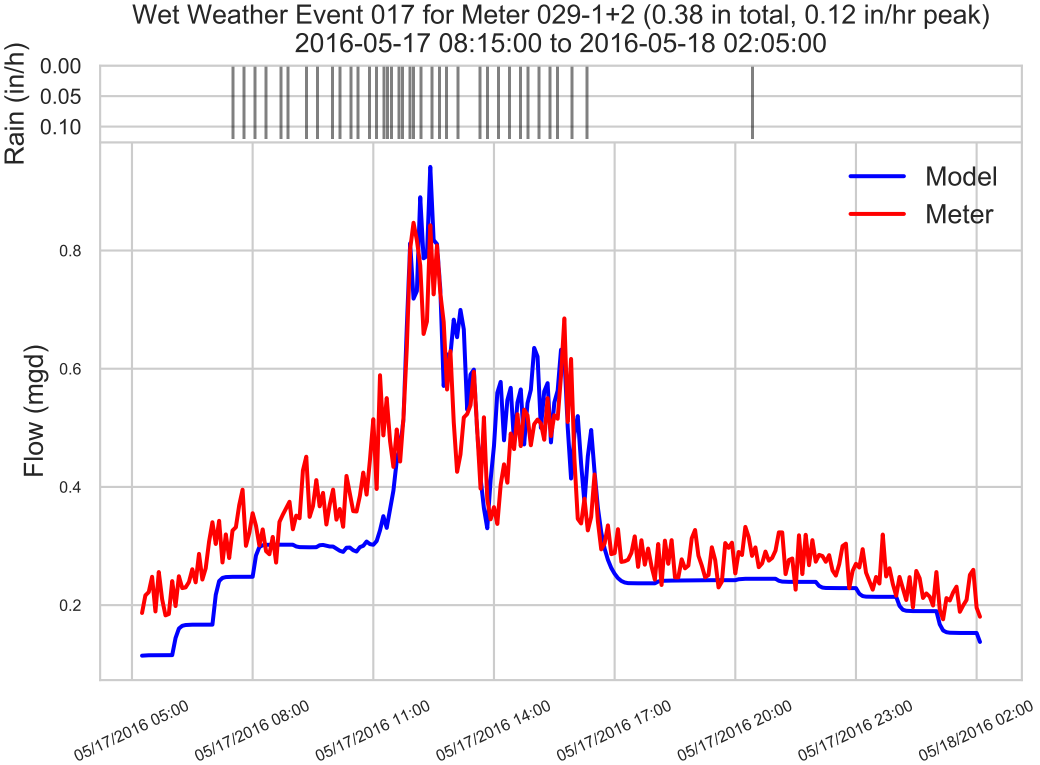

Wet Weather Event 014 for Meter 029-1+2 (0.92 in total, 0.36 in/hr peak)
2016-05-06 06:20:00 to 2016-05-07 12:09:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0.0
0.5
1.0
1.5
2.0
2.5
Model
Meter
05/06/2016 04:00
05/06/2016 07:00
05/06/2016 10:00
05/06/2016 13:00
05/06/2016 16:00
05/06/2016 19:00
05/06/2016 22:00
05/07/2016 01:00
05/07/2016 04:00
05/07/2016 07:00
05/07/2016 10:00
05/07/2016 13:00



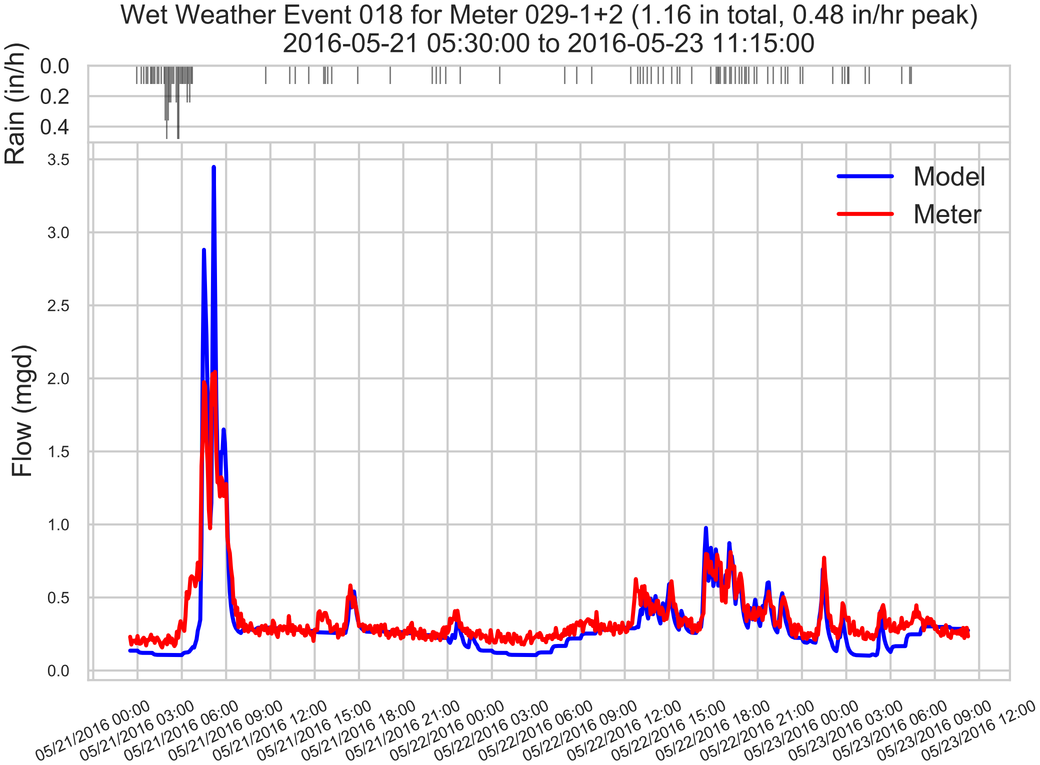
Wet Weather Event 015 for Meter 029-1+2 (0.17 in total, 0.12 in/hr peak)
2016-05-11 12:04:00 to 2016-05-11 23:15:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
Model
Meter
05/11/2016 10:00
05/11/2016 13:00
05/11/2016 16:00
05/11/2016 19:00
05/11/2016 22:00



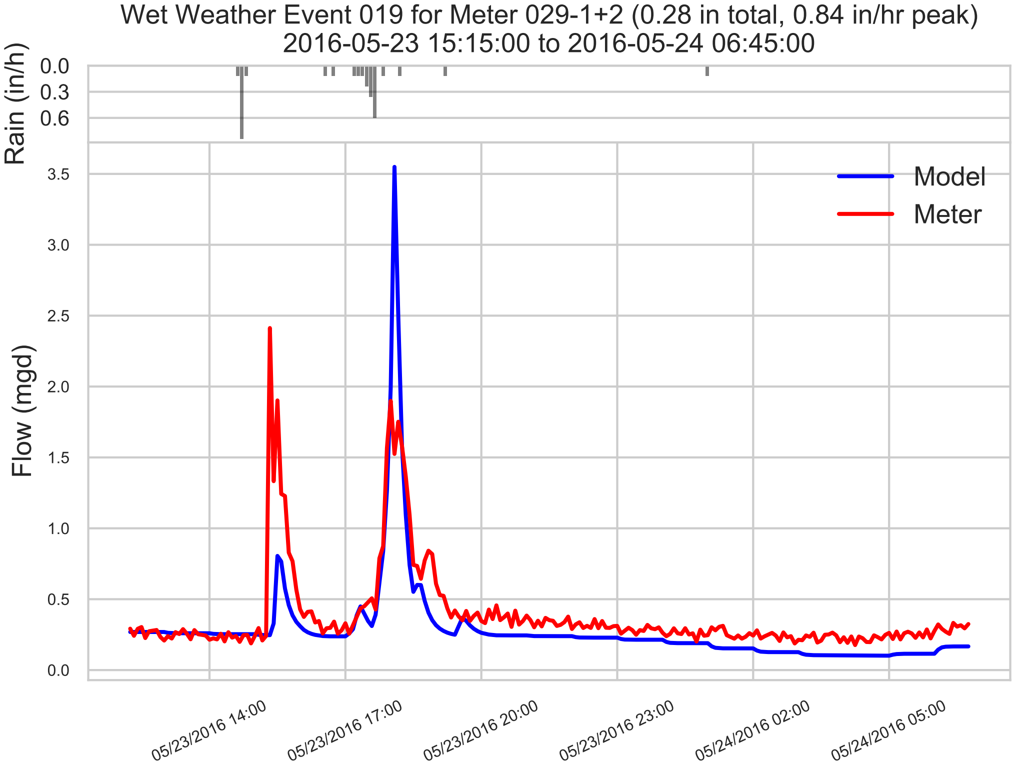
Wet Weather Event 016 for Meter 029-1+2 (0.16 in total, 0.24 in/hr peak)
2016-05-14 15:09:00 to 2016-05-14 22:25:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
05/14/2016 12:00
05/14/2016 15:00
05/14/2016 18:00
05/14/2016 21:00

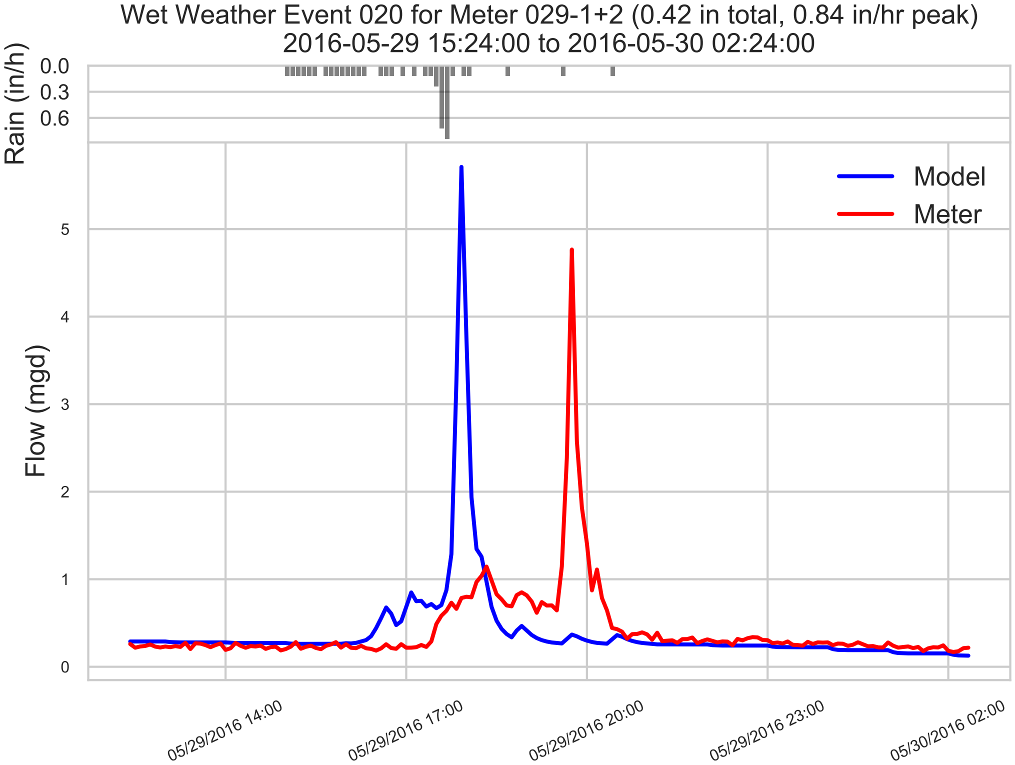


Wet Weather Event 017 for Meter 029-1+2 (0.38 in total, 0.12 in/hr peak)
2016-05-17 08:15:00 to 2016-05-18 02:05:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.8
0.6
0.4
0.2
Model
Meter
05/17/2016 05:00
05/17/2016 08:00
05/17/2016 11:00
05/17/2016 14:00
05/17/2016 17:00
05/17/2016 20:00
05/17/2016 23:00
05/18/2016 02:00

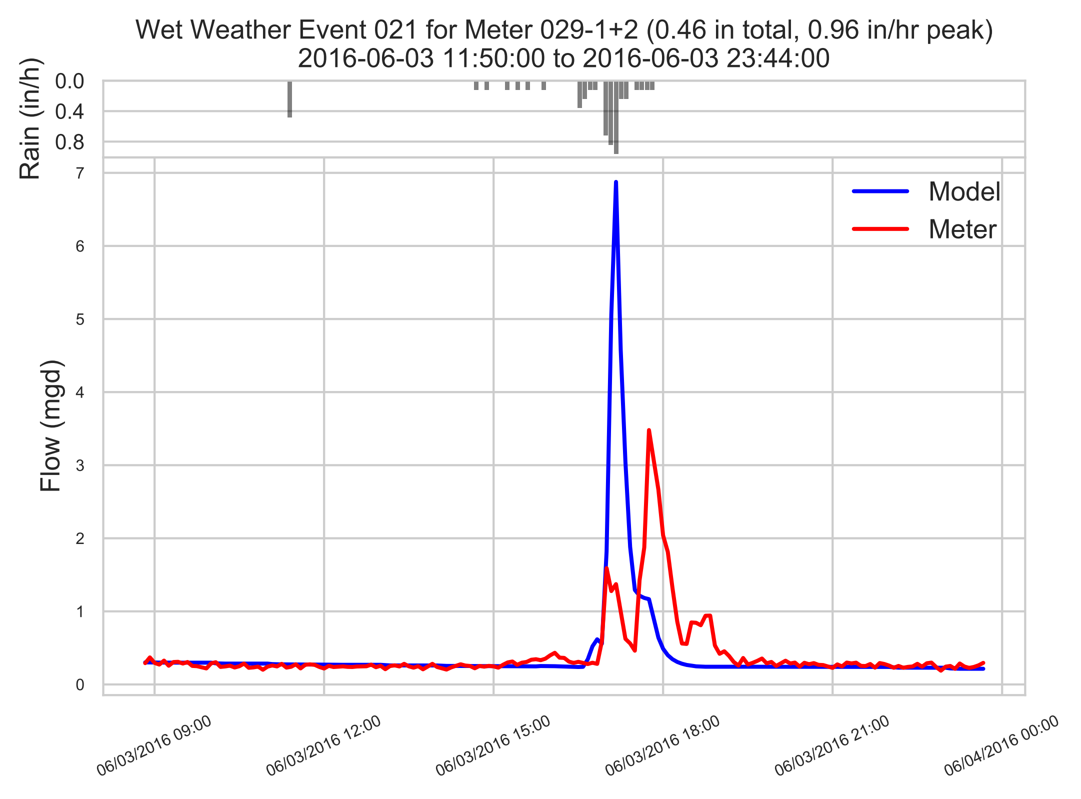


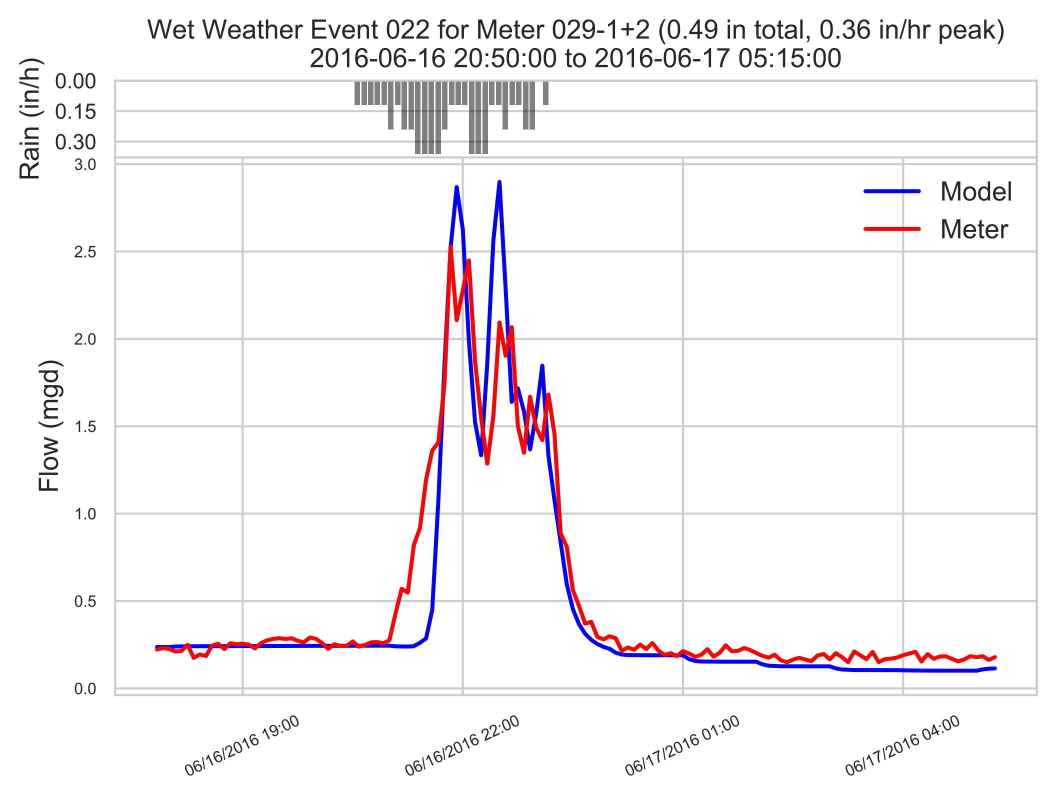
Wet Weather Event 018 for Meter 029-1+2 (1.16 in total, 0.48 in/hr peak)
2016-05-21 05:30:00 to 2016-05-23 11:15:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
05/21/2016 00:00
05/21/2016 03:00
05/21/2016 06:00
05/21/2016 09:00
05/21/2016 12:00
05/21/2016 15:00
05/21/2016 18:00
05/21/2016 21:00
05/22/2016 00:00
05/22/2016 03:00
05/22/2016 06:00
05/22/2016 09:00
05/22/2016 12:00
05/22/2016 15:00
05/22/2016 18:00
05/22/2016 21:00
05/23/2016 00:00
05/23/2016 03:00
05/23/2016 06:00
05/23/2016 09:00
05/23/2016 12:00


Wet Weather Event 019 for Meter 029-1+2 (0.28 in total, 0.84 in/hr peak)
2016-05-23 15:15:00 to 2016-05-24 06:45:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
05/23/2016 14:00
05/23/2016 17:00
05/23/2016 20:00
05/23/2016 23:00
05/24/2016 02:00
05/24/2016 05:00

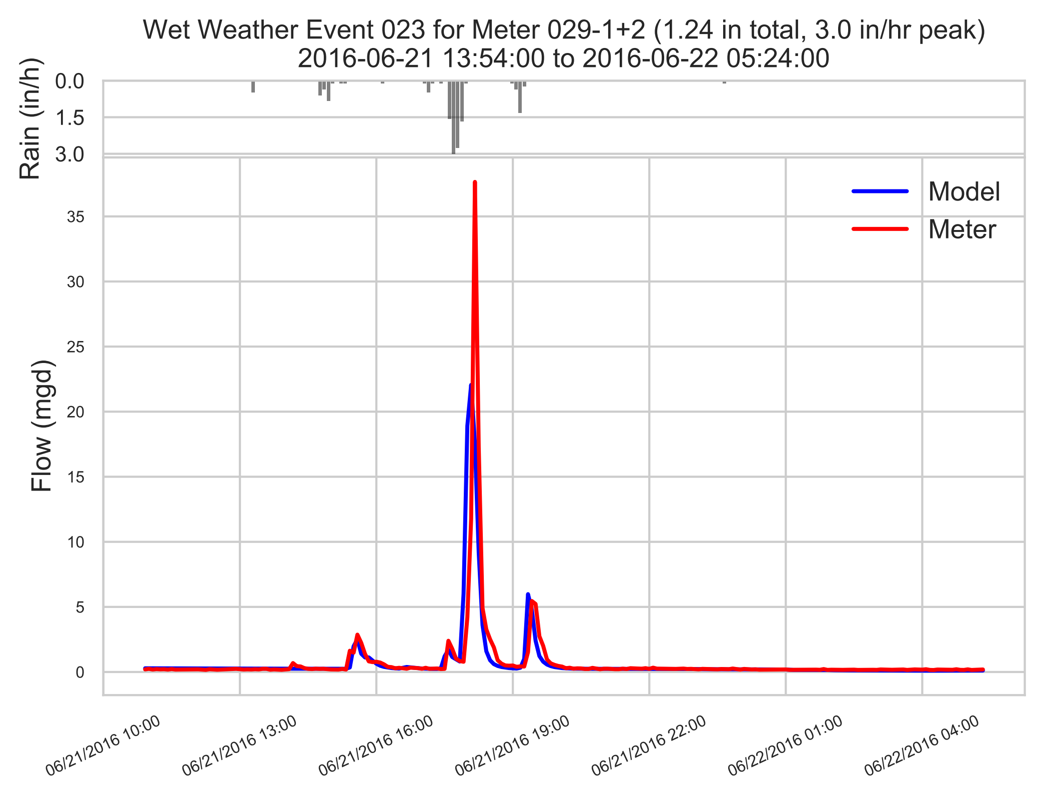


Wet Weather Event 020 for Meter 029-1+2 (0.42 in total, 0.84 in/hr peak)
2016-05-29 15:24:00 to 2016-05-30 02:24:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
0
1
2
3
4
5
Model
Meter
05/29/2016 14:00
05/29/2016 17:00
05/29/2016 20:00
05/29/2016 23:00
05/30/2016 02:00

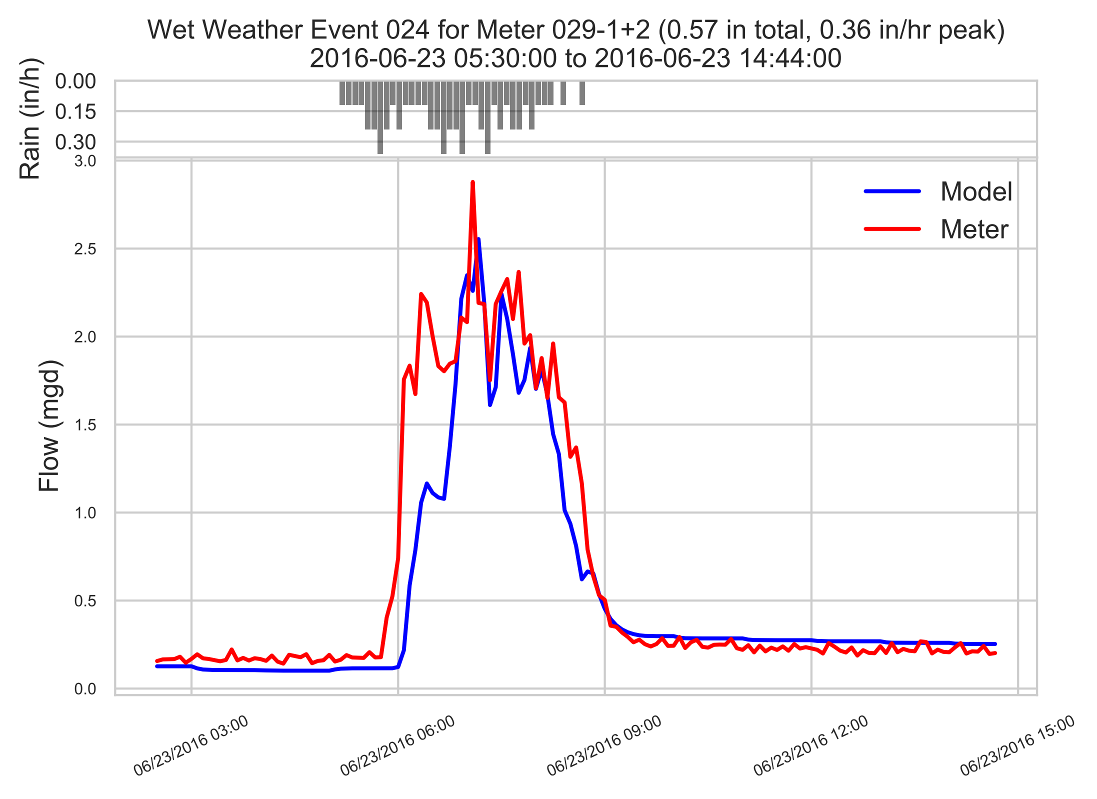

Wet Weather Event 021 for Meter 029-1+2 (0.46 in total, 0.96 in/hr peak)
2016-06-03 11:50:00 to 2016-06-03 23:44:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
0
1
2
3
4
5
6
7
Model
Meter
06/03/2016 09:00
06/03/2016 12:00
06/03/2016 15:00
06/03/2016 18:00
06/03/2016 21:00
06/04/2016 00:00



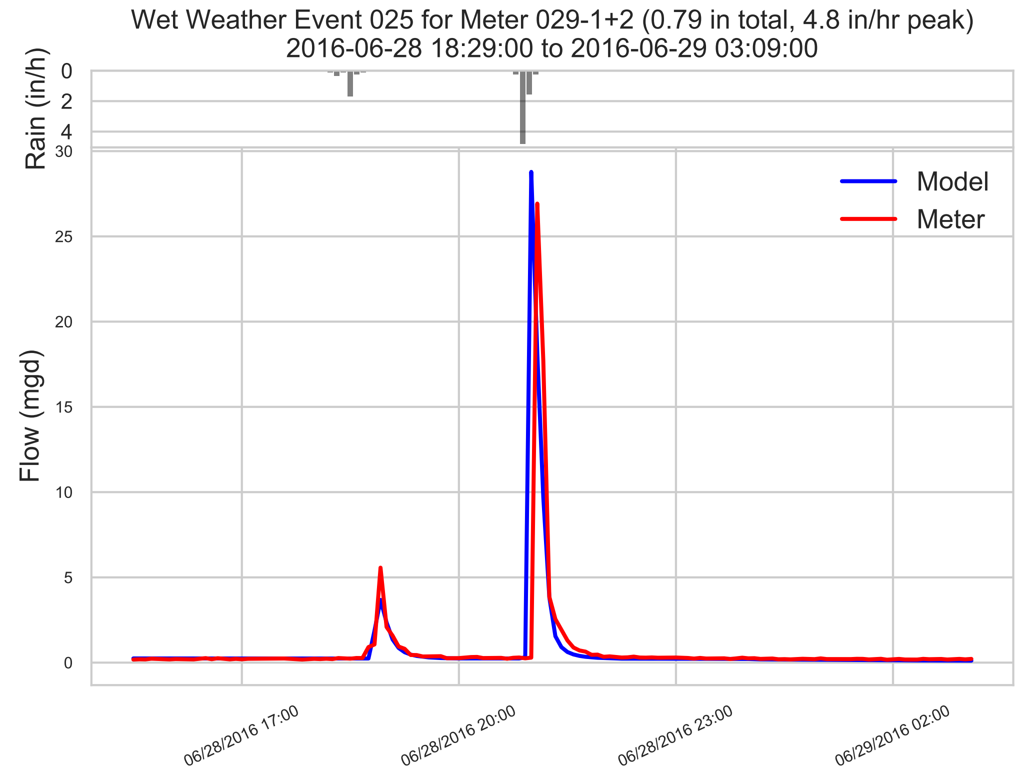
Wet Weather Event 022 for Meter 029-1+2 (0.49 in total, 0.36 in/hr peak)
2016-06-16 20:50:00 to 2016-06-17 05:15:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
06/16/2016 19:00
06/16/2016 22:00
06/17/2016 01:00
06/17/2016 04:00



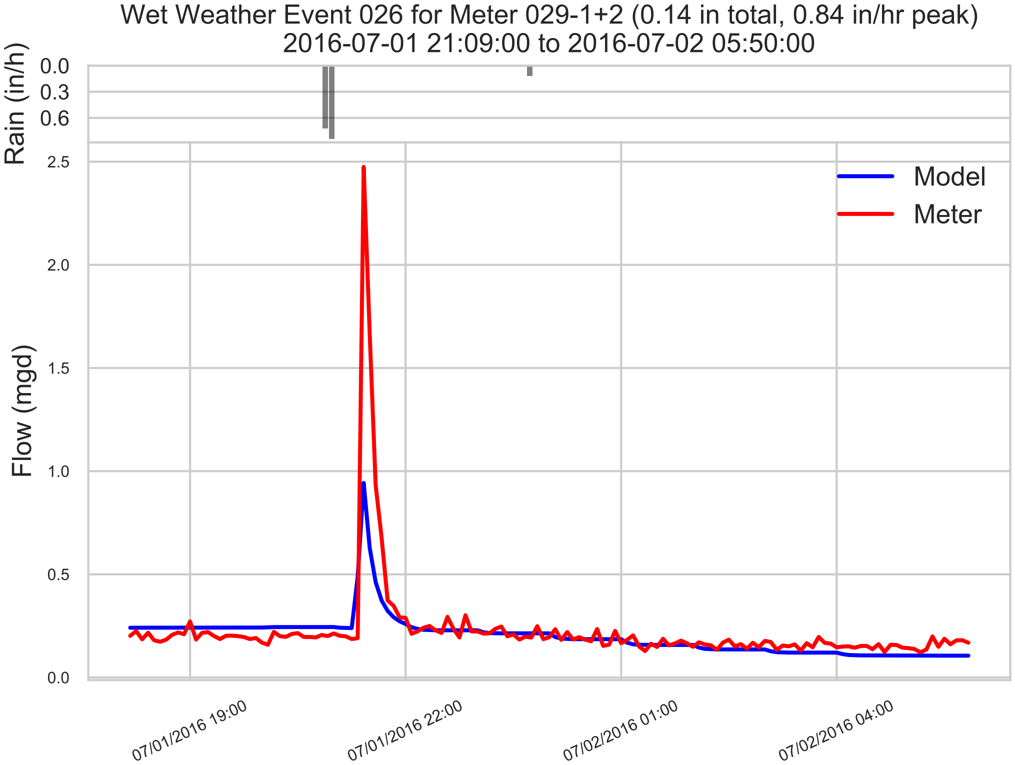
Wet Weather Event 023 for Meter 029-1+2 (1.24 in total, 3.0 in/hr peak)
2016-06-21 13:54:00 to 2016-06-22 05:24:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
0
5
10
15
20
25
30
35
Model
Meter
06/21/2016 10:00
06/21/2016 13:00
06/21/2016 16:00
06/21/2016 19:00
06/21/2016 22:00
06/22/2016 01:00
06/22/2016 04:00



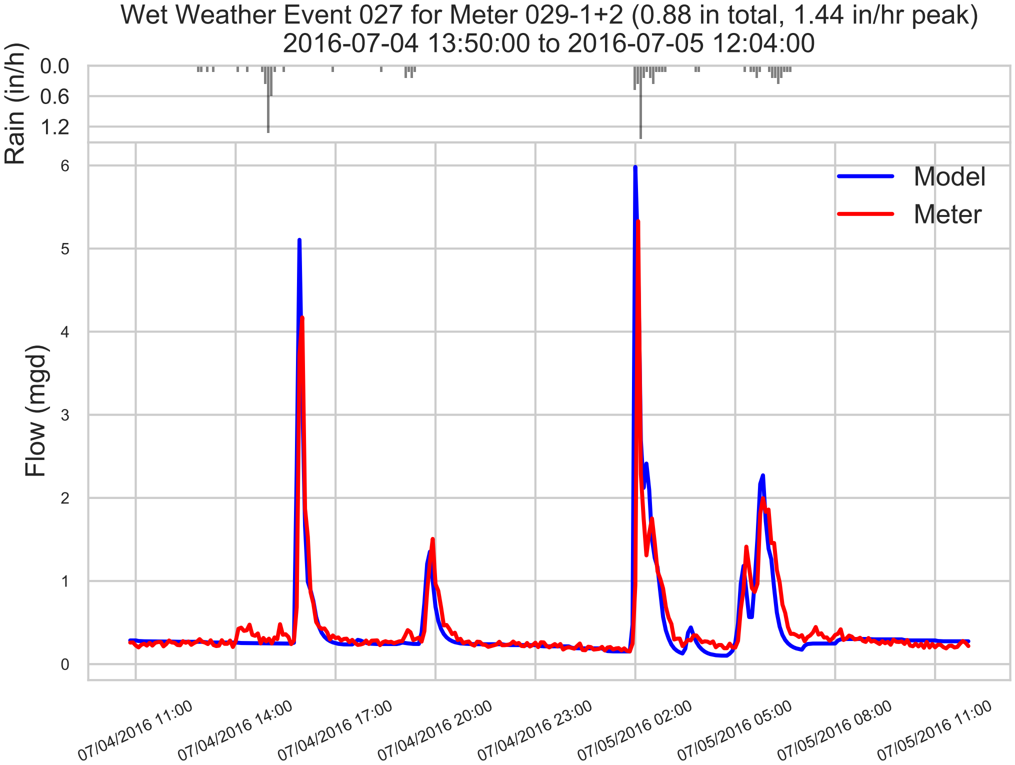
Wet Weather Event 024 for Meter 029-1+2 (0.57 in total, 0.36 in/hr peak)
2016-06-23 05:30:00 to 2016-06-23 14:44:00
Rain (in/h)
0.00
0.15
0.30
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Flow (mgd)
Model
Meter
06/23/2016 03:00
06/23/2016 06:00
06/23/2016 09:00
06/23/2016 12:00
06/23/2016 15:00



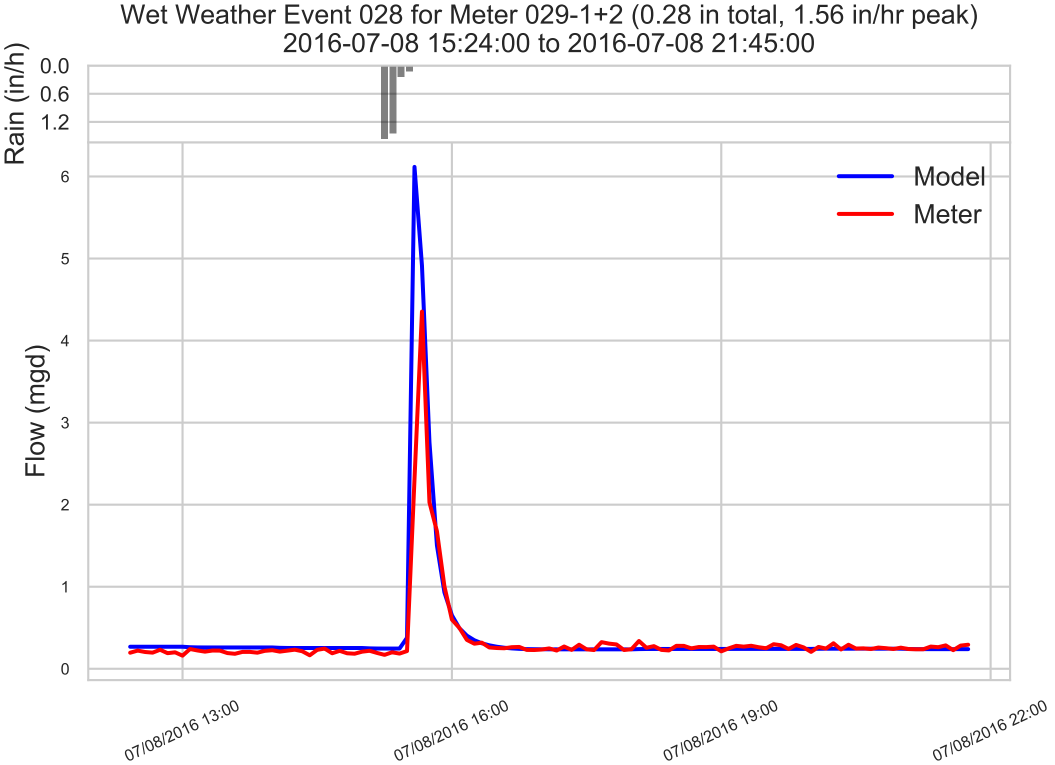
Wet Weather Event 025 for Meter 029-1+2 (0.79 in total, 4.8 in/hr peak)
2016-06-28 18:29:00 to 2016-06-29 03:09:00
Rain (in/h)
0
2
4
30
25
20
15
10
5
0
Flow (mgd)
Model
Meter
06/28/2016 17:00
06/28/2016 20:00
06/28/2016 23:00
06/29/2016 02:00



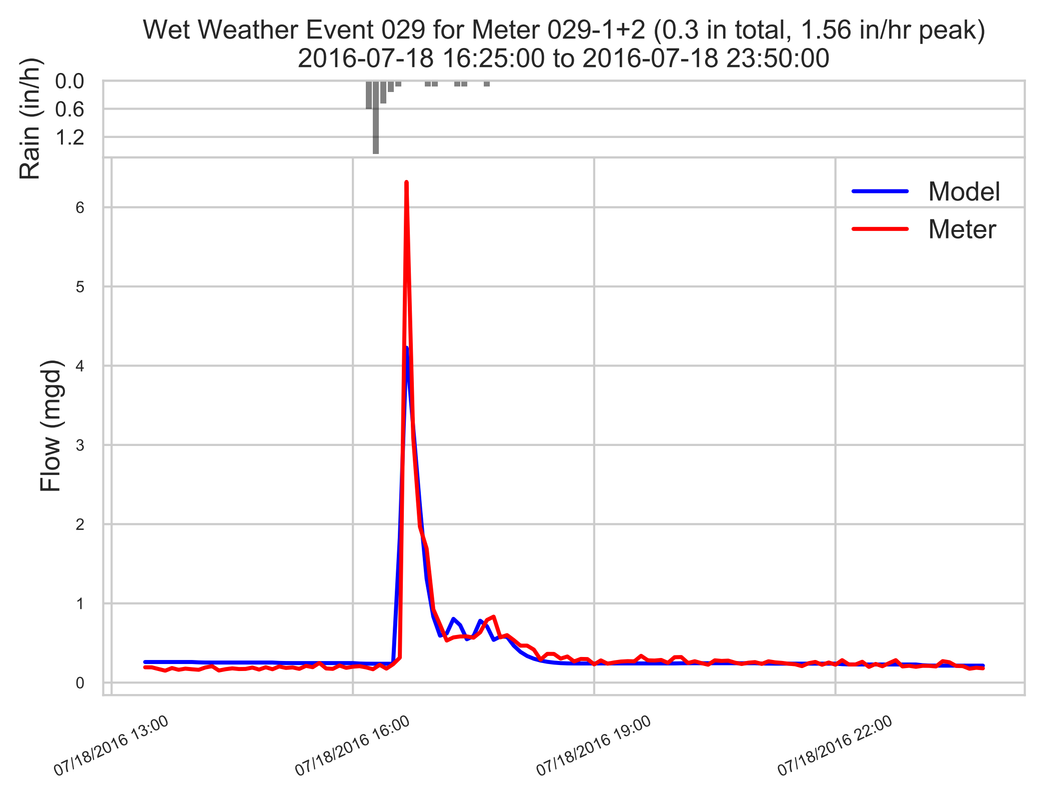
Wet Weather Event 026 for Meter 029-1+2 (0.14 in total, 0.84 in/hr peak)
2016-07-01 21:09:00 to 2016-07-02 05:50:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
07/01/2016 19:00
07/01/2016 22:00
07/02/2016 01:00
07/02/2016 04:00

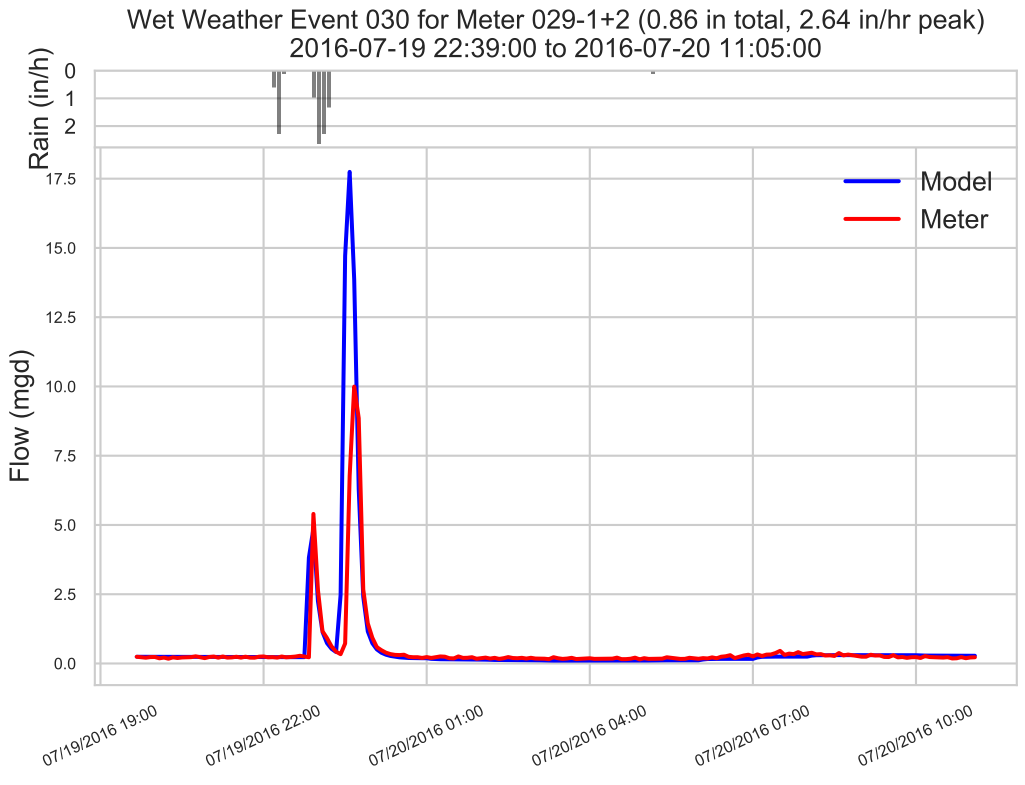


Wet Weather Event 027 for Meter 029-1+2 (0.88 in total, 1.44 in/hr peak)
2016-07-04 13:50:00 to 2016-07-05 12:04:00
Rain (in/h)
0.0
0.6
1.2
Flow (mgd)
6
5
4
3
2
1
0
Model
Meter
07/04/2016 11:00
07/04/2016 14:00
07/04/2016 17:00
07/04/2016 20:00
07/04/2016 23:00
07/05/2016 02:00
07/05/2016 05:00
07/05/2016 08:00
07/05/2016 11:00

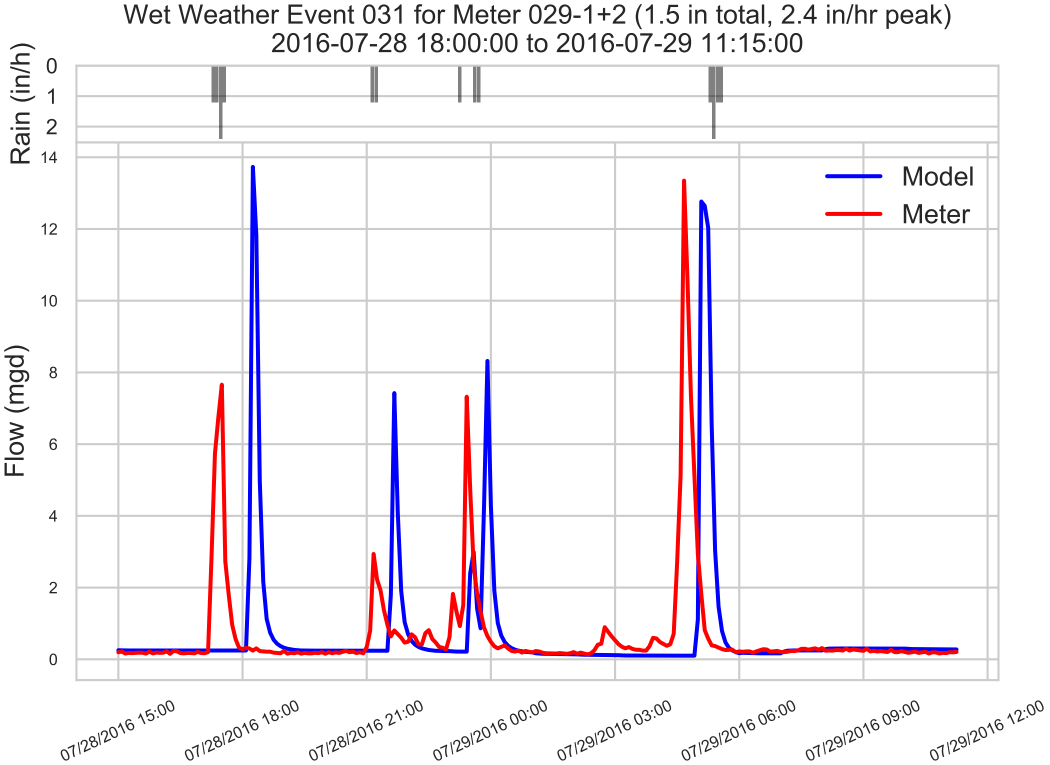


Wet Weather Event 028 for Meter 029-1+2 (0.28 in total, 1.56 in/hr peak)
2016-07-08 15:24:00 to 2016-07-08 21:45:00
Rain (in/h)
0.0
0.6
1.2
Flow (mgd)
0
1
2
3
4
5
6
Model
Meter
07/08/2016 13:00
07/08/2016 16:00
07/08/2016 19:00
07/08/2016 22:00

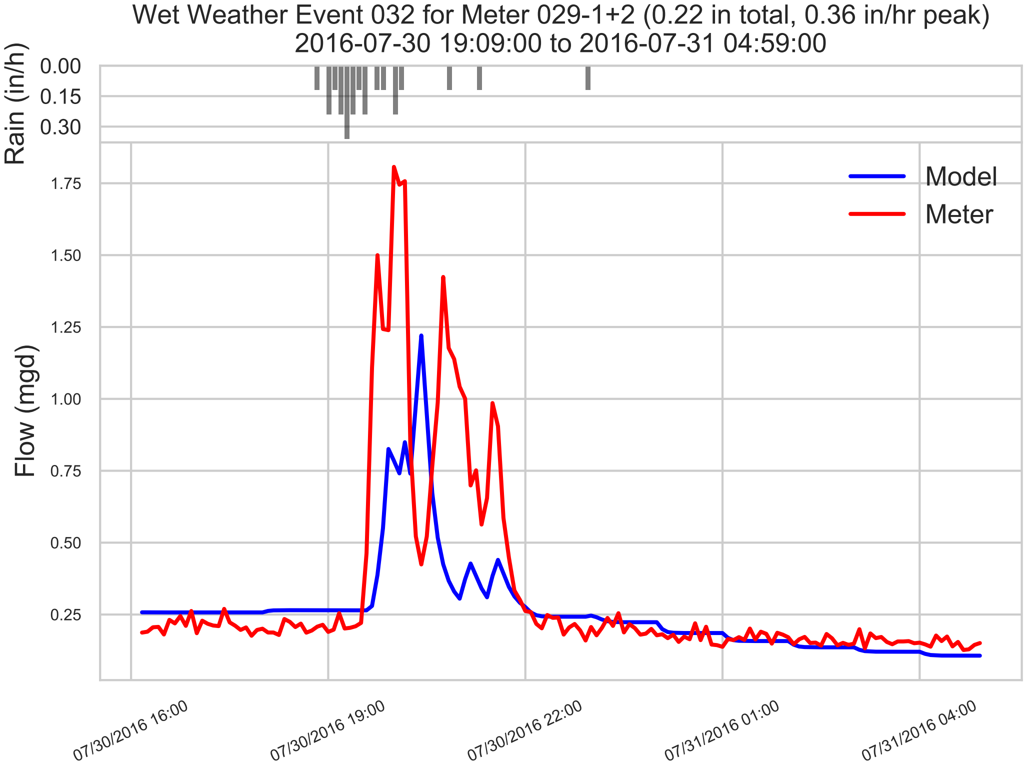

Wet Weather Event 029 for Meter 029-1+2 (0.3 in total, 1.56 in/hr peak)
2016-07-18 16:25:00 to 2016-07-18 23:50:00
Rain (in/h)
0.0
0.6
1.2
Flow (mgd)
0
1
2
3
4
5
6
Model
Meter
07/18/2016 13:00
07/18/2016 16:00
07/18/2016 19:00
07/18/2016 22:00



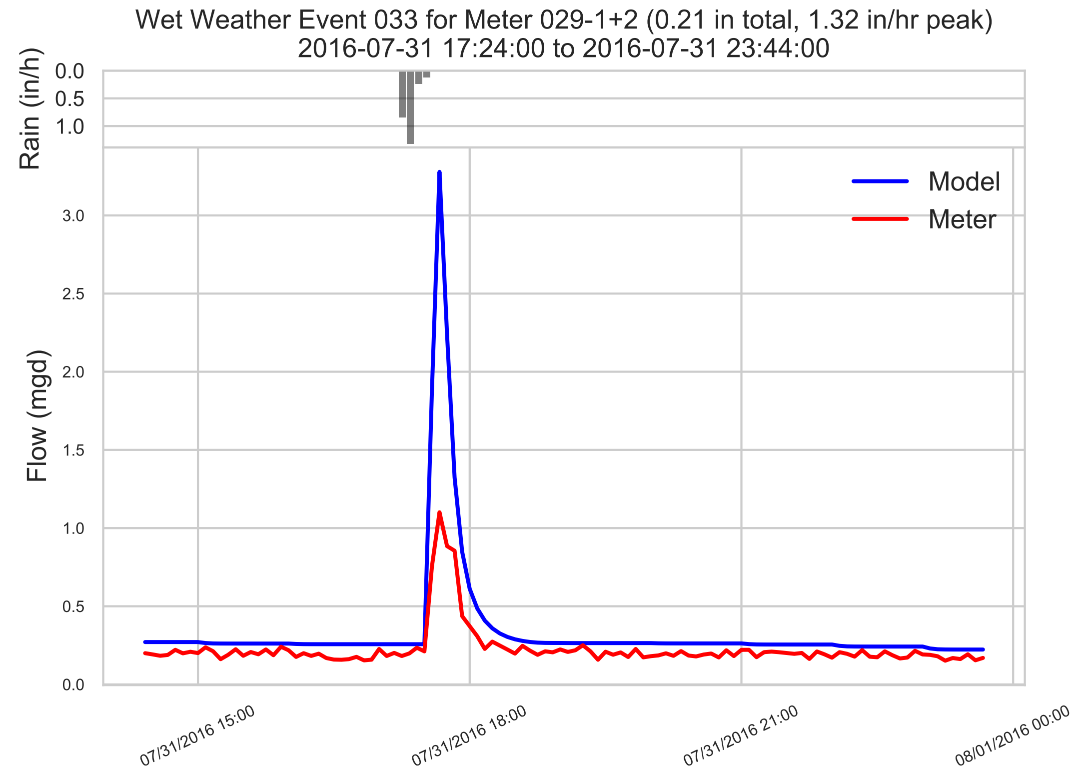
Wet Weather Event 030 for Meter 029-1+2 (0.86 in total, 2.64 in/hr peak)
2016-07-19 22:39:00 to 2016-07-20 11:05:00
Rain (in/h)
0
1
2
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
07/19/2016 19:00
07/19/2016 22:00
07/20/2016 01:00
07/20/2016 04:00
07/20/2016 07:00
07/20/2016 10:00

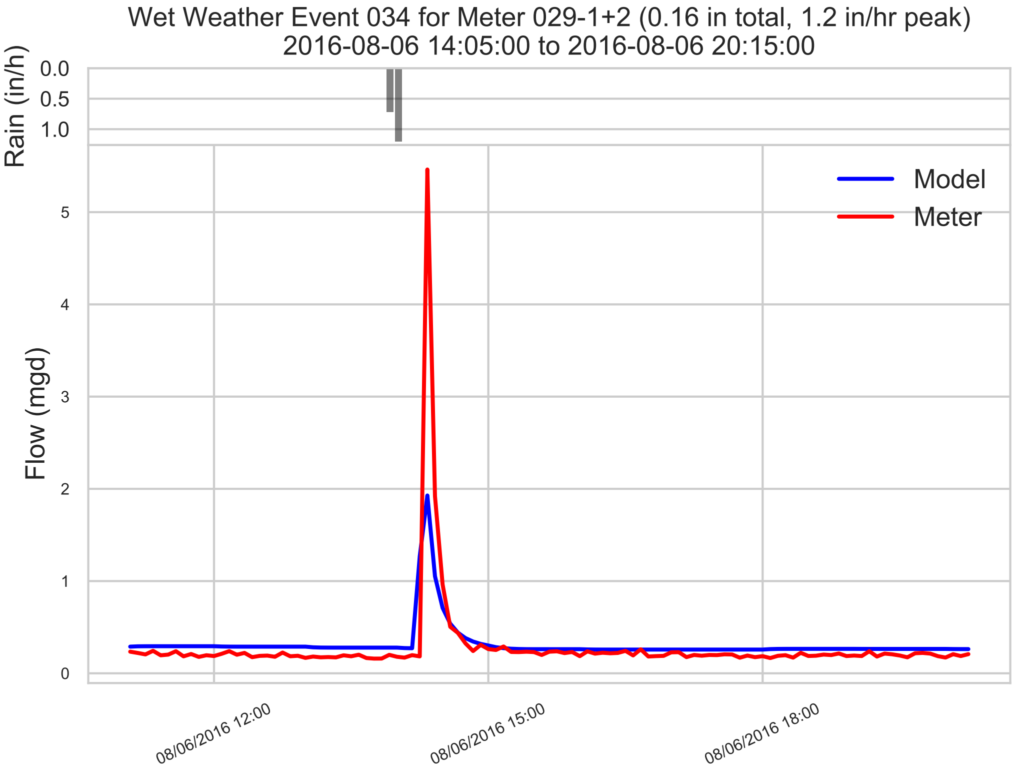


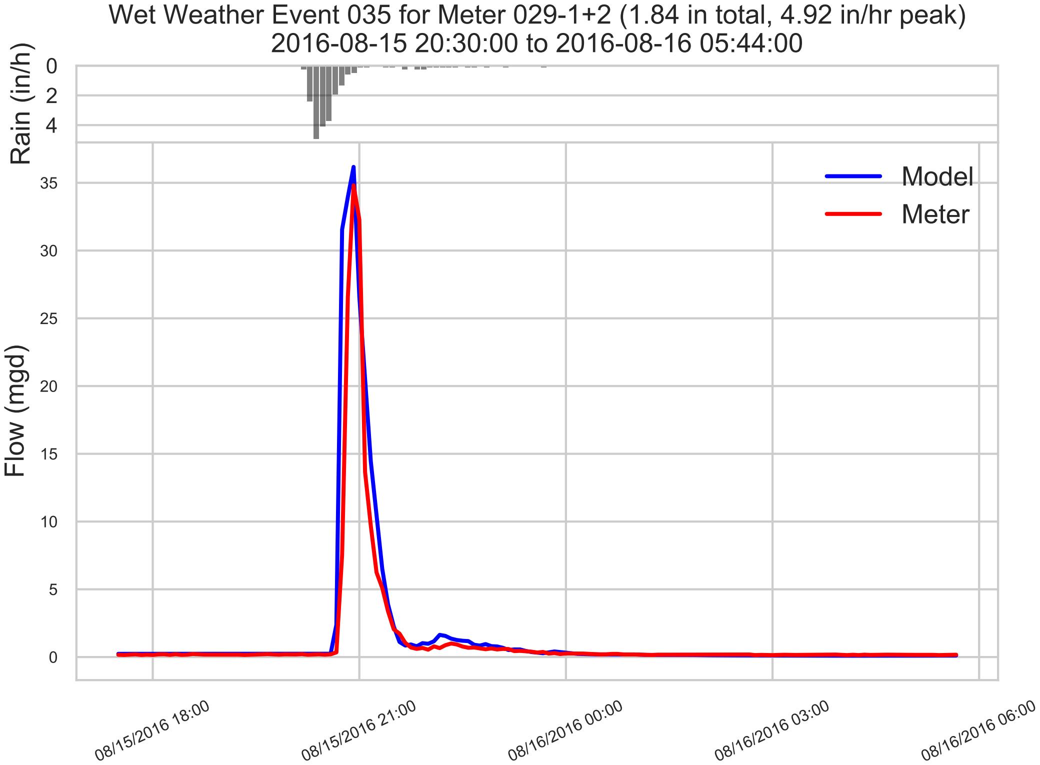
Wet Weather Event 031 for Meter 029-1+2 (1.5 in total, 2.4 in/hr peak)
2016-07-28 18:00:00 to 2016-07-29 11:15:00
Rain (in/h)
0
1
2
Flow (mgd)
0
2
4
6
8
10
12
14
Model
Meter
07/28/2016 15:00
07/28/2016 18:00
07/28/2016 21:00
07/29/2016 00:00
07/29/2016 03:00
07/29/2016 06:00
07/29/2016 09:00
07/29/2016 12:00

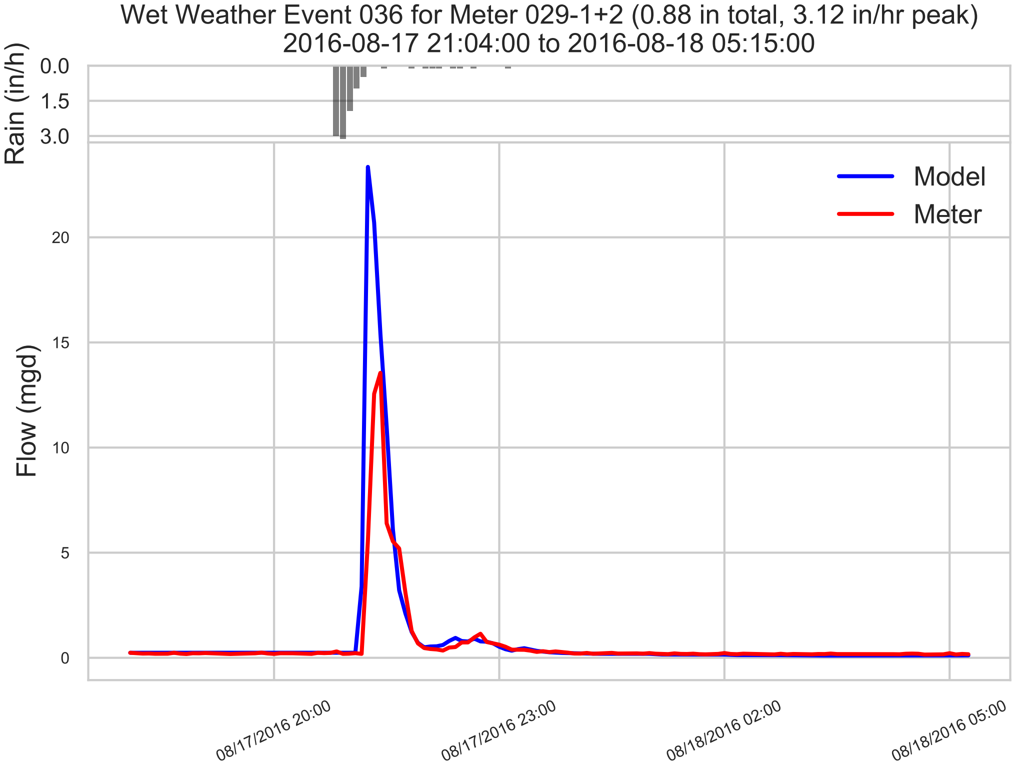


Wet Weather Event 032 for Meter 029-1+2 (0.22 in total, 0.36 in/hr peak)
2016-07-30 19:09:00 to 2016-07-31 04:59:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
Model
Meter
07/30/2016 16:00
07/30/2016 19:00
07/30/2016 22:00
07/31/2016 01:00
07/31/2016 04:00

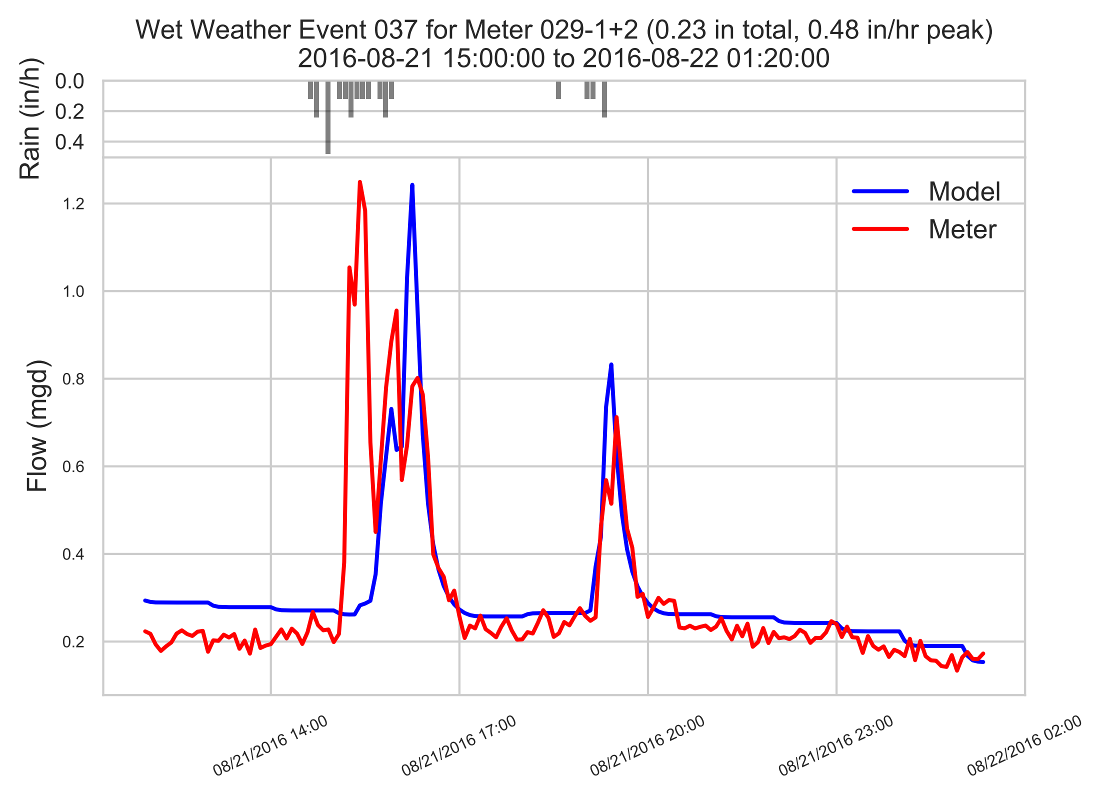

Wet Weather Event 033 for Meter 029-1+2 (0.21 in total, 1.32 in/hr peak)
2016-07-31 17:24:00 to 2016-07-31 23:44:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Model
Meter
07/31/2016 15:00
07/31/2016 18:00
07/31/2016 21:00
08/01/2016 00:00

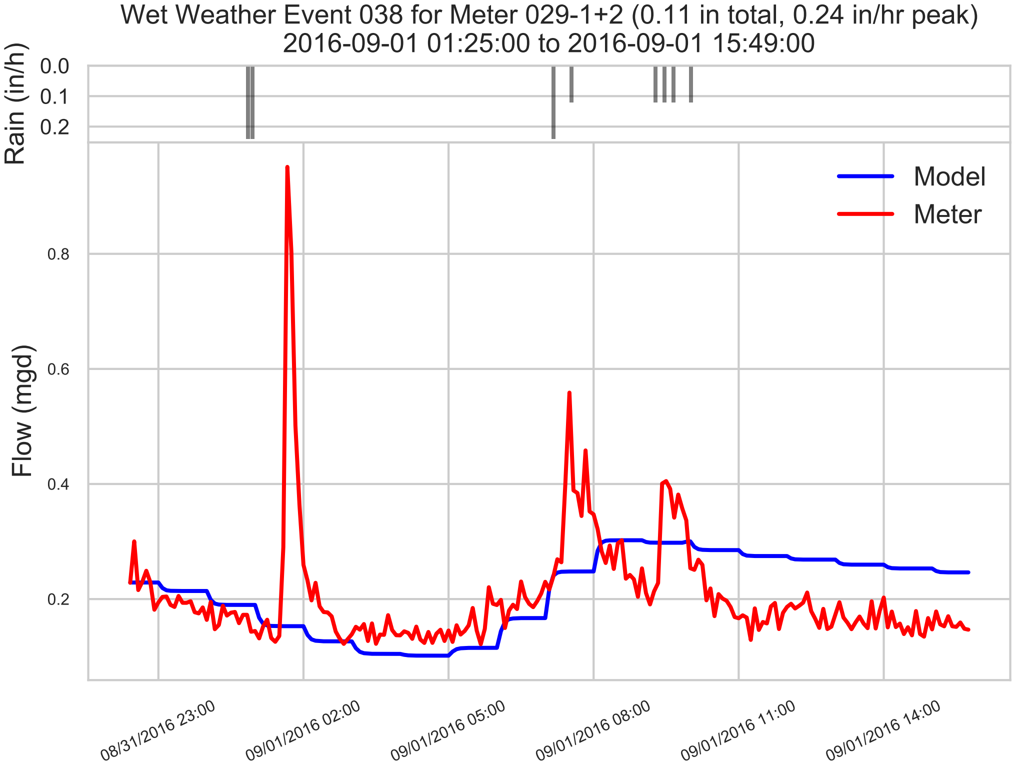

Wet Weather Event 034 for Meter 029-1+2 (0.16 in total, 1.2 in/hr peak)
2016-08-06 14:05:00 to 2016-08-06 20:15:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
0
1
2
3
4
5
Model
Meter
08/06/2016 12:00
08/06/2016 15:00
08/06/2016 18:00


Wet Weather Event 035 for Meter 029-1+2 (1.84 in total, 4.92 in/hr peak)
2016-08-15 20:30:00 to 2016-08-16 05:44:00
Rain (in/h)
0
2
4
Flow (mgd)
35
30
25
20
15
10
5
0
Model
Meter
08/15/2016 18:00
08/15/2016 21:00
08/16/2016 00:00
08/16/2016 03:00
08/16/2016 06:00

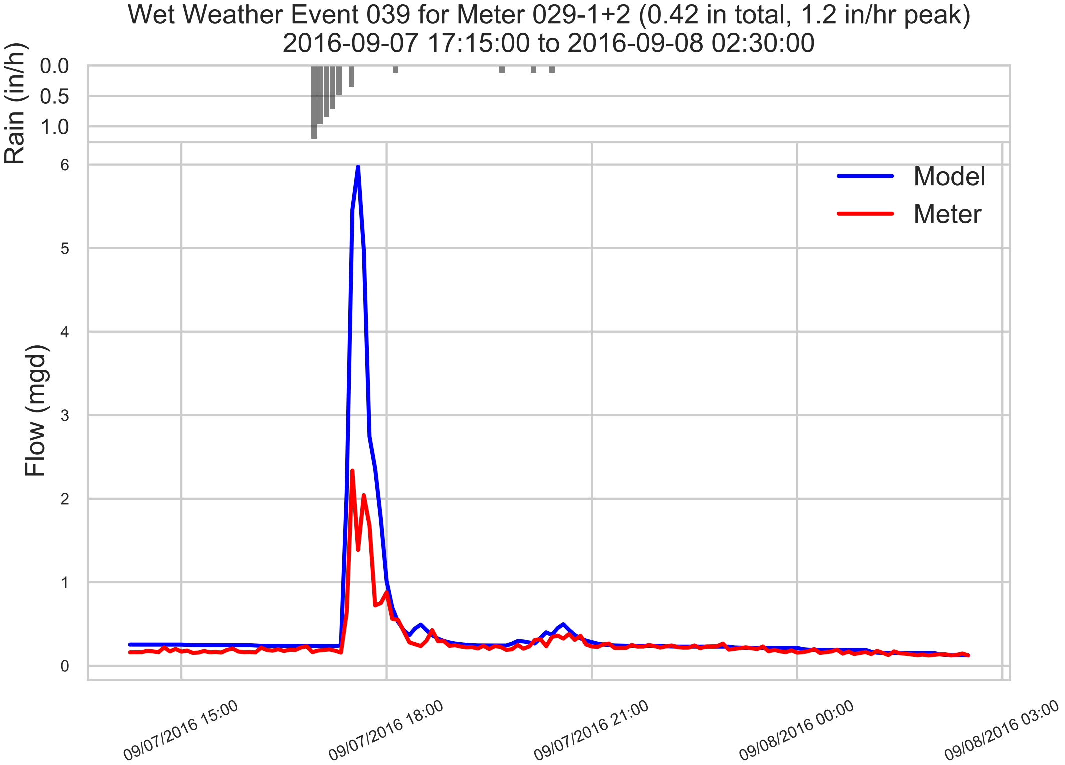


Wet Weather Event 036 for Meter 029-1+2 (0.88 in total, 3.12 in/hr peak)
2016-08-17 21:04:00 to 2016-08-18 05:15:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
20
15
10
5
0
Model
Meter
08/17/2016 20:00
08/17/2016 23:00
08/18/2016 02:00
08/18/2016 05:00

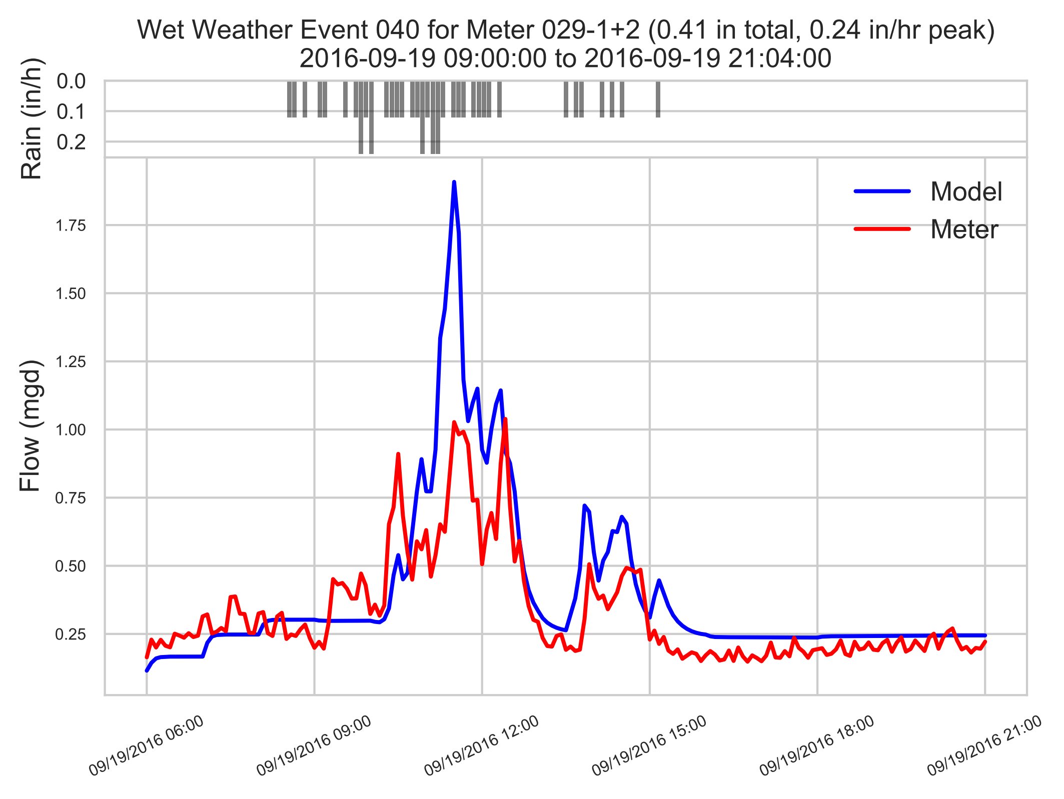

Wet Weather Event 037 for Meter 029-1+2 (0.23 in total, 0.48 in/hr peak)
2016-08-21 15:00:00 to 2016-08-22 01:20:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
08/21/2016 14:00
08/21/2016 17:00
08/21/2016 20:00
08/21/2016 23:00
08/22/2016 02:00



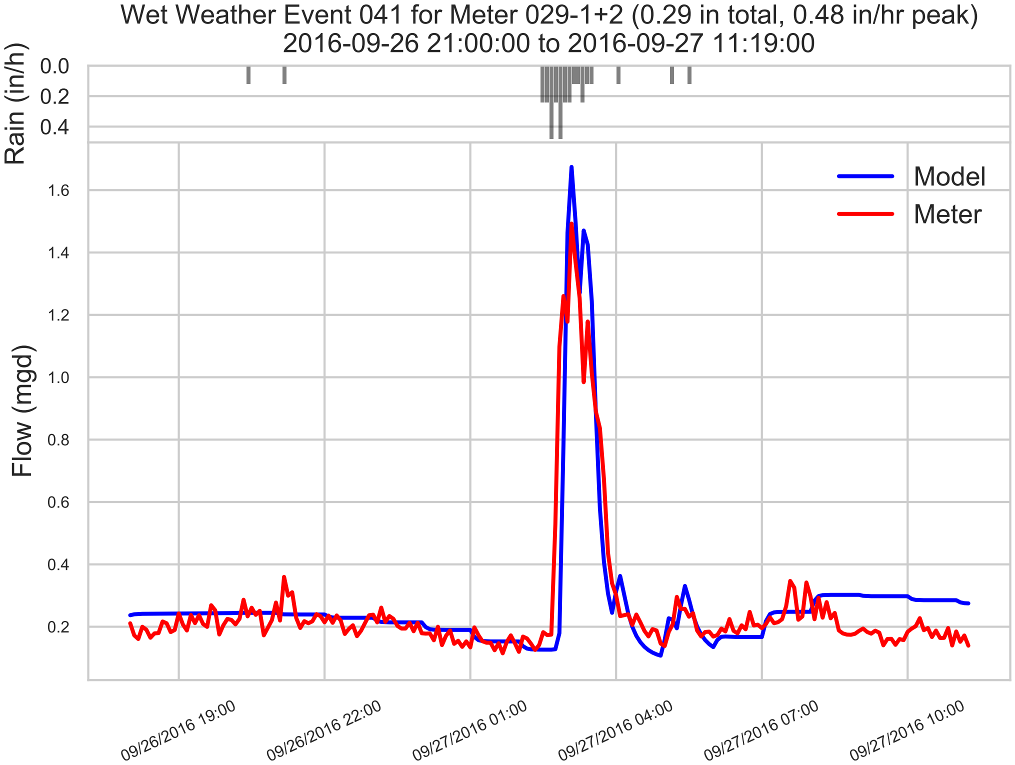
Wet Weather Event 038 for Meter 029-1+2 (0.11 in total, 0.24 in/hr peak)
2016-09-01 01:25:00 to 2016-09-01 15:49:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.8
0.6
0.4
0.2
Model
Meter
08/31/2016 23:00
09/01/2016 02:00
09/01/2016 05:00
09/01/2016 08:00
09/01/2016 11:00
09/01/2016 14:00

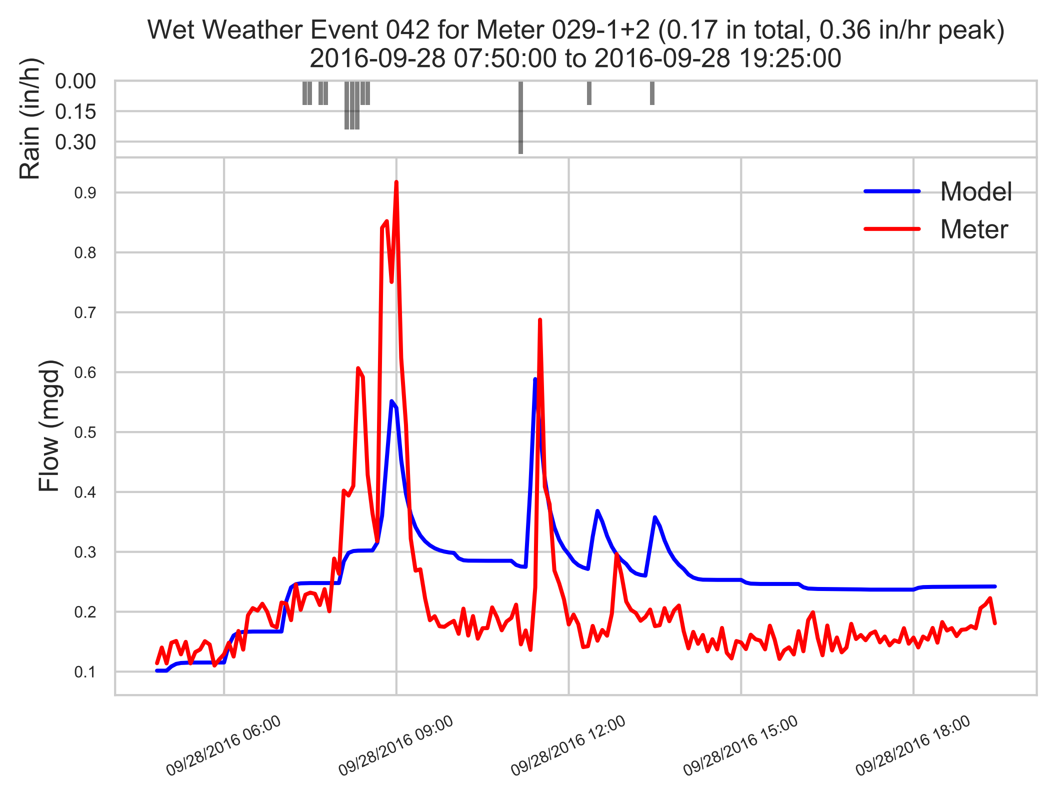


Wet Weather Event 039 for Meter 029-1+2 (0.42 in total, 1.2 in/hr peak)
2016-09-07 17:15:00 to 2016-09-08 02:30:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
0
1
2
3
4
5
6
Model
Meter
09/07/2016 15:00
09/07/2016 18:00
09/07/2016 21:00
09/08/2016 00:00
09/08/2016 03:00

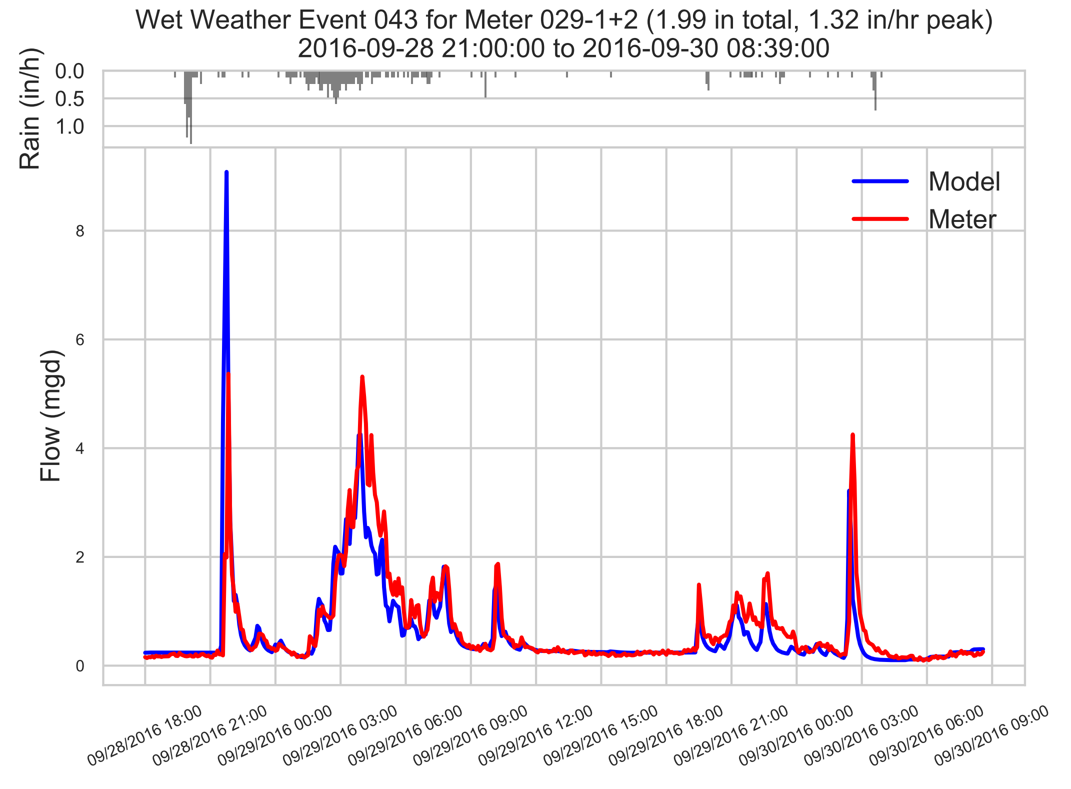


Wet Weather Event 040 for Meter 029-1+2 (0.41 in total, 0.24 in/hr peak)
2016-09-19 09:00:00 to 2016-09-19 21:04:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
Model
Meter
09/19/2016 06:00
09/19/2016 09:00
09/19/2016 12:00
09/19/2016 15:00
09/19/2016 18:00
09/19/2016 21:00

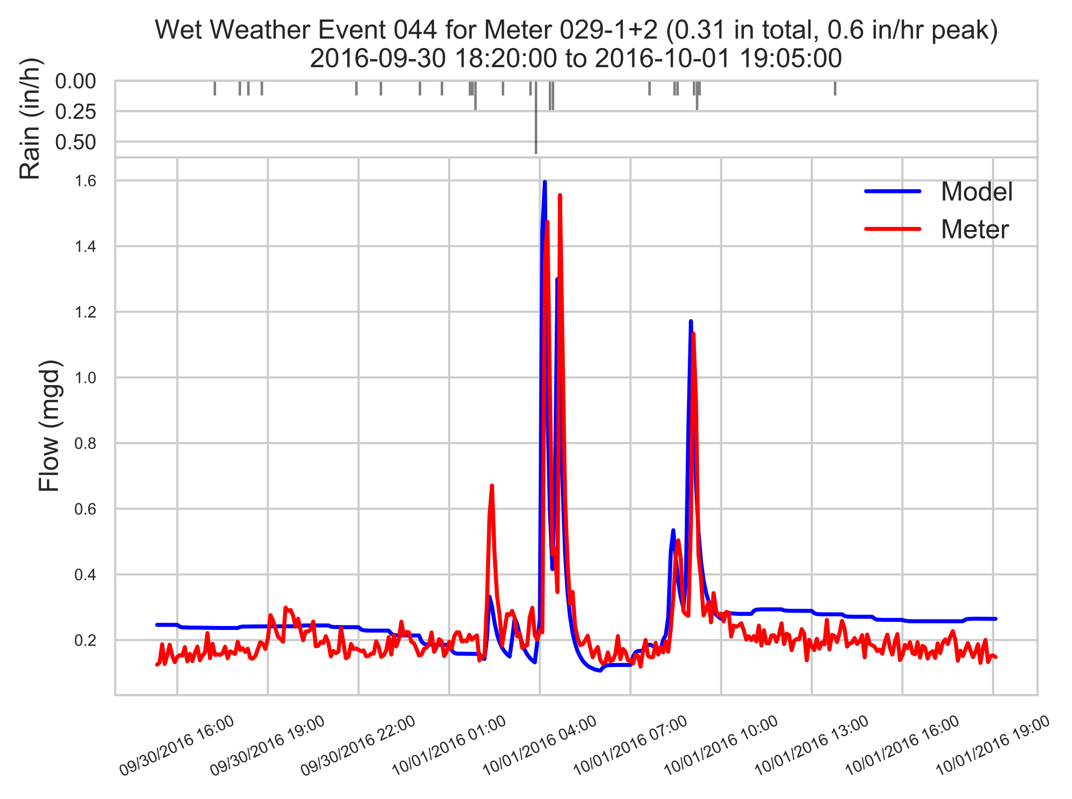

Wet Weather Event 041 for Meter 029-1+2 (0.29 in total, 0.48 in/hr peak)
2016-09-26 21:00:00 to 2016-09-27 11:19:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
09/26/2016 19:00
09/26/2016 22:00
09/27/2016 01:00
09/27/2016 04:00
09/27/2016 07:00
09/27/2016 10:00



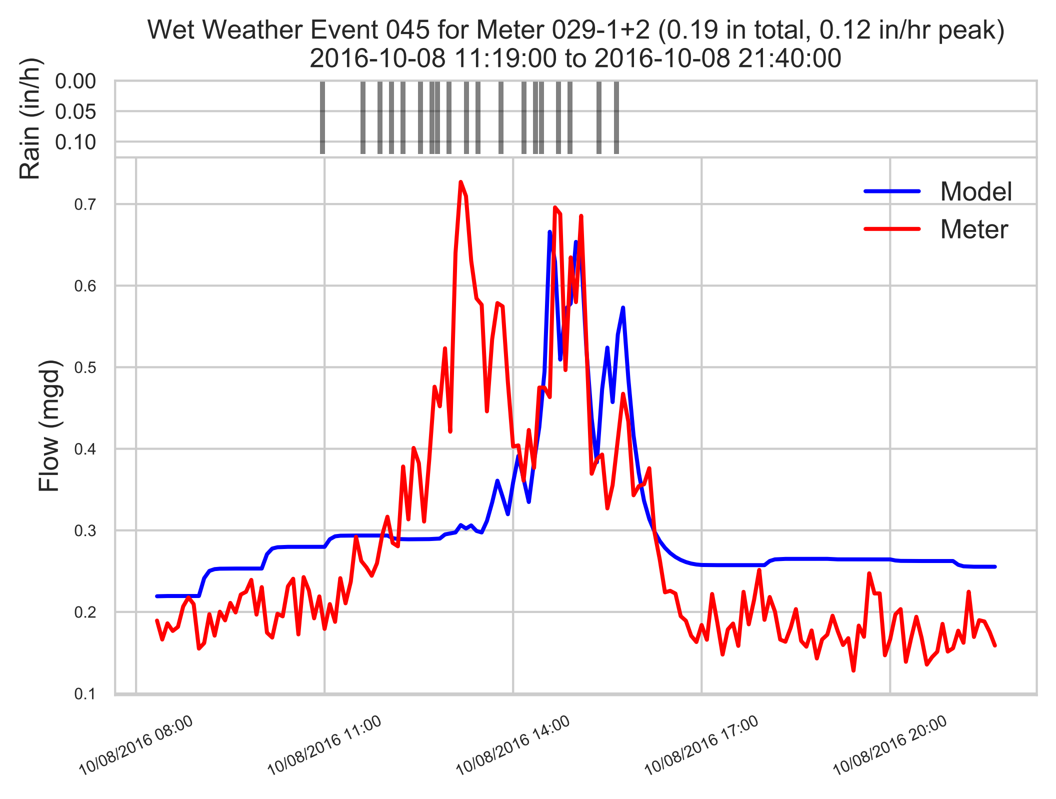
Wet Weather Event 042 for Meter 029-1+2 (0.17 in total, 0.36 in/hr peak)
2016-09-28 07:50:00 to 2016-09-28 19:25:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Model
Meter
09/28/2016 06:00
09/28/2016 09:00
09/28/2016 12:00
09/28/2016 15:00
09/28/2016 18:00



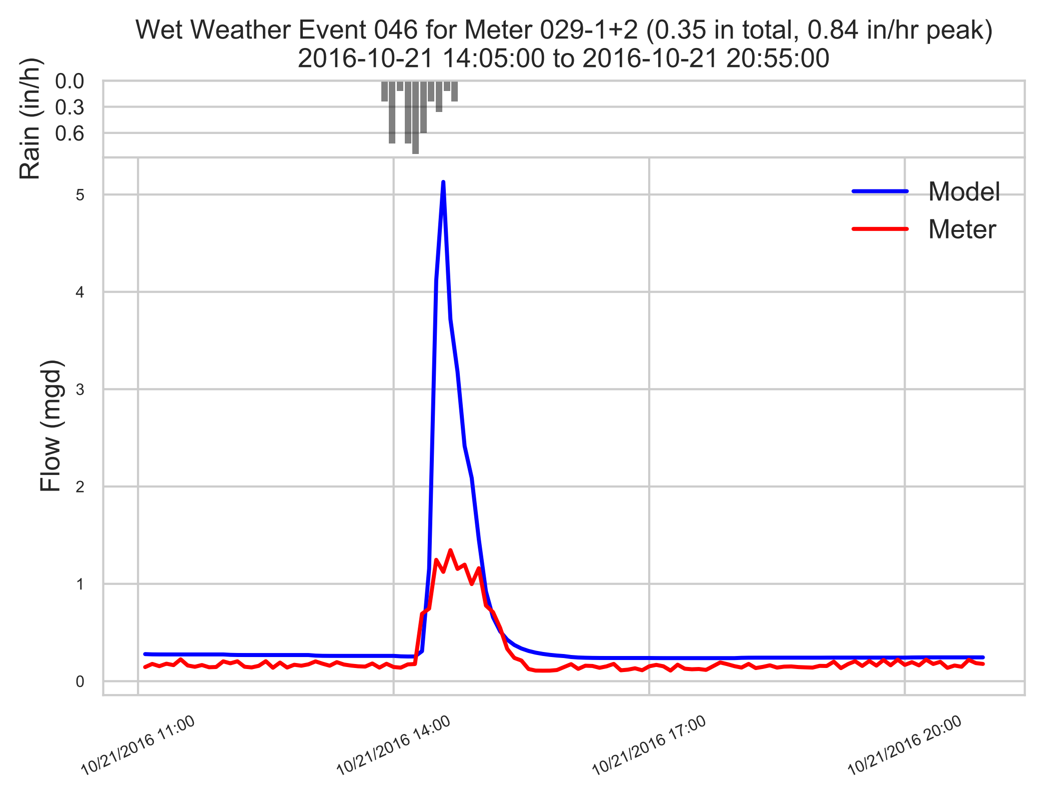
Wet Weather Event 043 for Meter 029-1+2 (1.99 in total, 1.32 in/hr peak)
2016-09-28 21:00:00 to 2016-09-30 08:39:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
0
2
4
6
8
Model
Meter
09/28/2016 18:00
09/28/2016 21:00
09/29/2016 00:00
09/29/2016 03:00
09/29/2016 06:00
09/29/2016 09:00
09/29/2016 12:00
09/29/2016 15:00
09/29/2016 18:00
09/29/2016 21:00
09/30/2016 00:00
09/30/2016 03:00
09/30/2016 06:00
09/30/2016 09:00



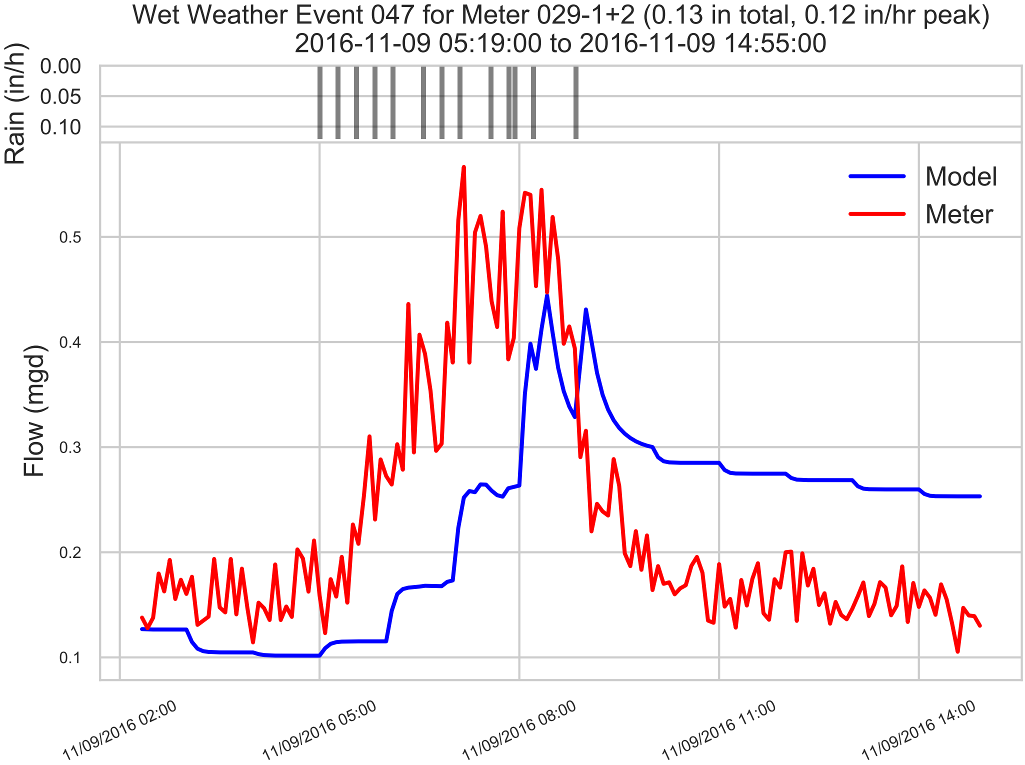
Wet Weather Event 044 for Meter 029-1+2 (0.31 in total, 0.6 in/hr peak)
2016-09-30 18:20:00 to 2016-10-01 19:05:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
09/30/2016 16:00
09/30/2016 19:00
09/30/2016 22:00
10/01/2016 01:00
10/01/2016 04:00
10/01/2016 07:00
10/01/2016 10:00
10/01/2016 13:00
10/01/2016 16:00
10/01/2016 19:00



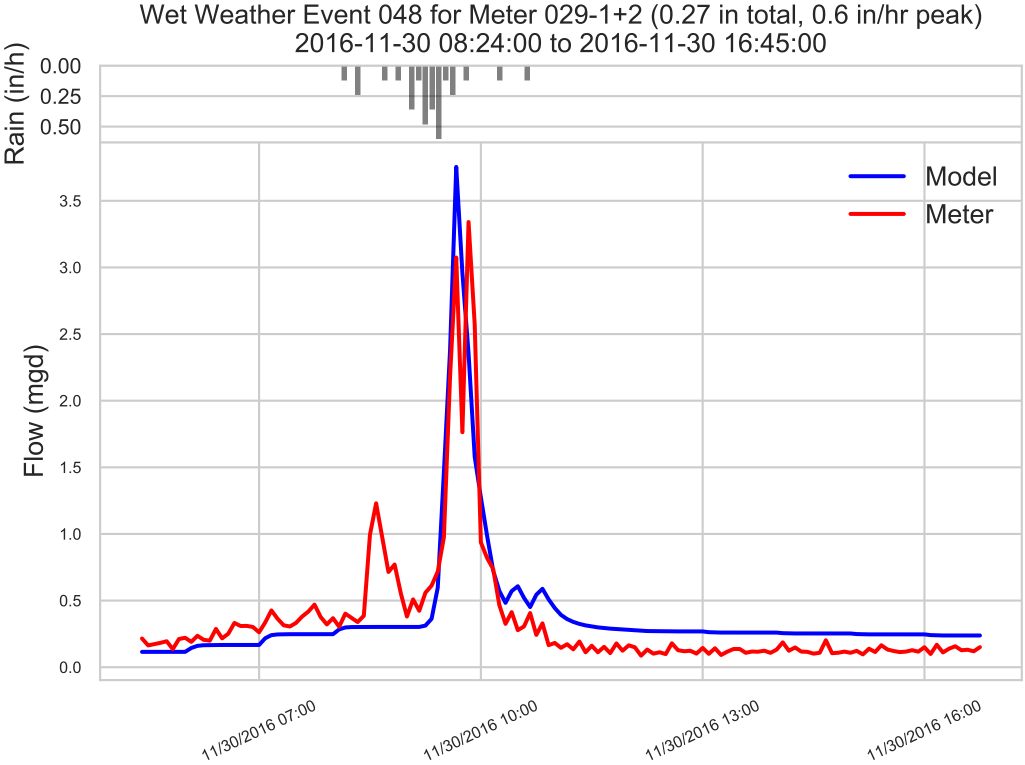
Wet Weather Event 045 for Meter 029-1+2 (0.19 in total, 0.12 in/hr peak)
2016-10-08 11:19:00 to 2016-10-08 21:40:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Model
Meter
10/08/2016 08:00
10/08/2016 11:00
10/08/2016 14:00
10/08/2016 17:00
10/08/2016 20:00

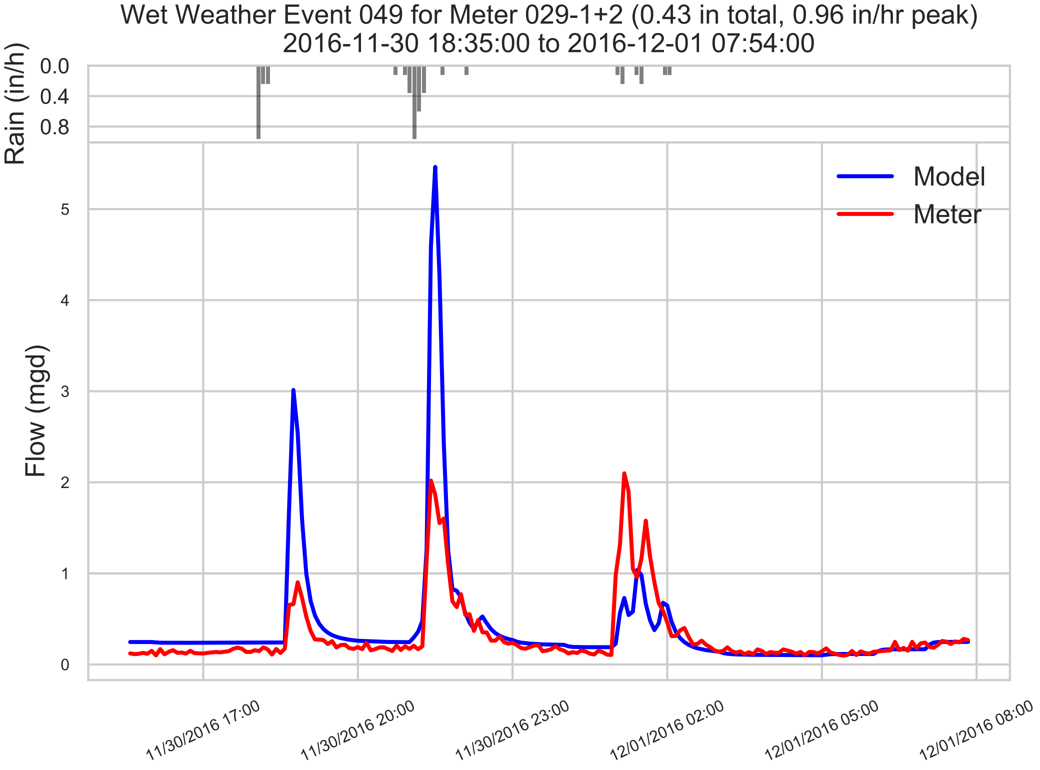


Wet Weather Event 046 for Meter 029-1+2 (0.35 in total, 0.84 in/hr peak)
2016-10-21 14:05:00 to 2016-10-21 20:55:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
5
4
3
2
1
0
Model
Meter
10/21/2016 11:00
10/21/2016 14:00
10/21/2016 17:00
10/21/2016 20:00

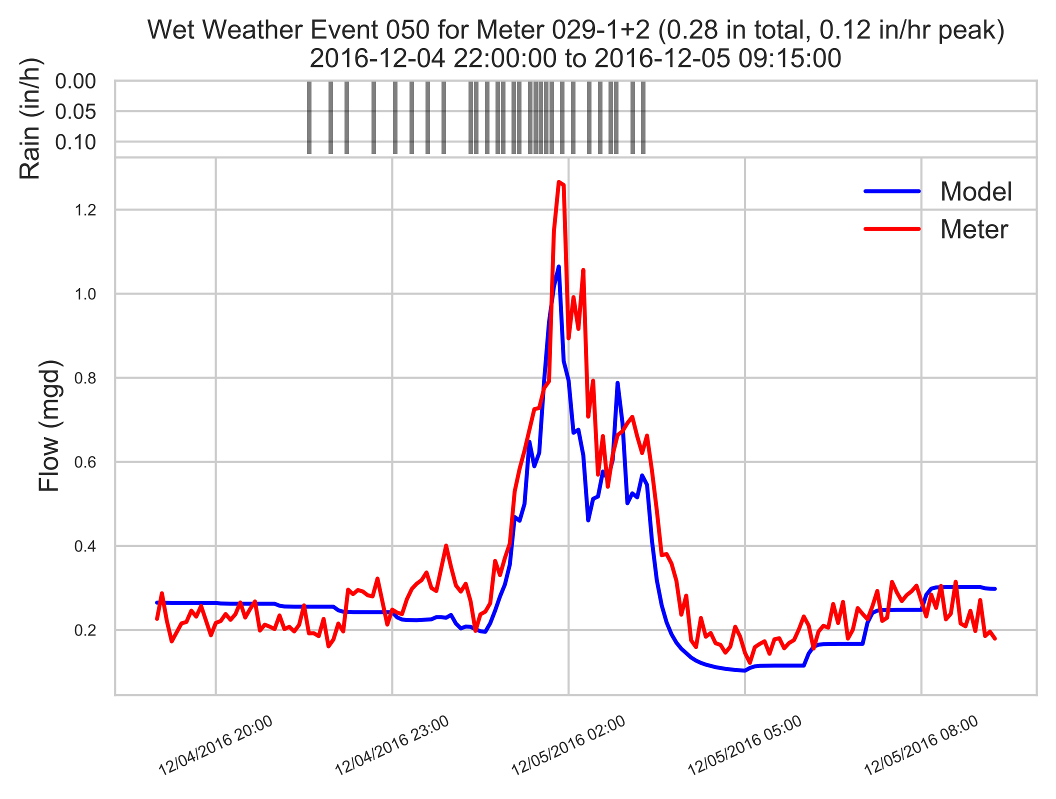


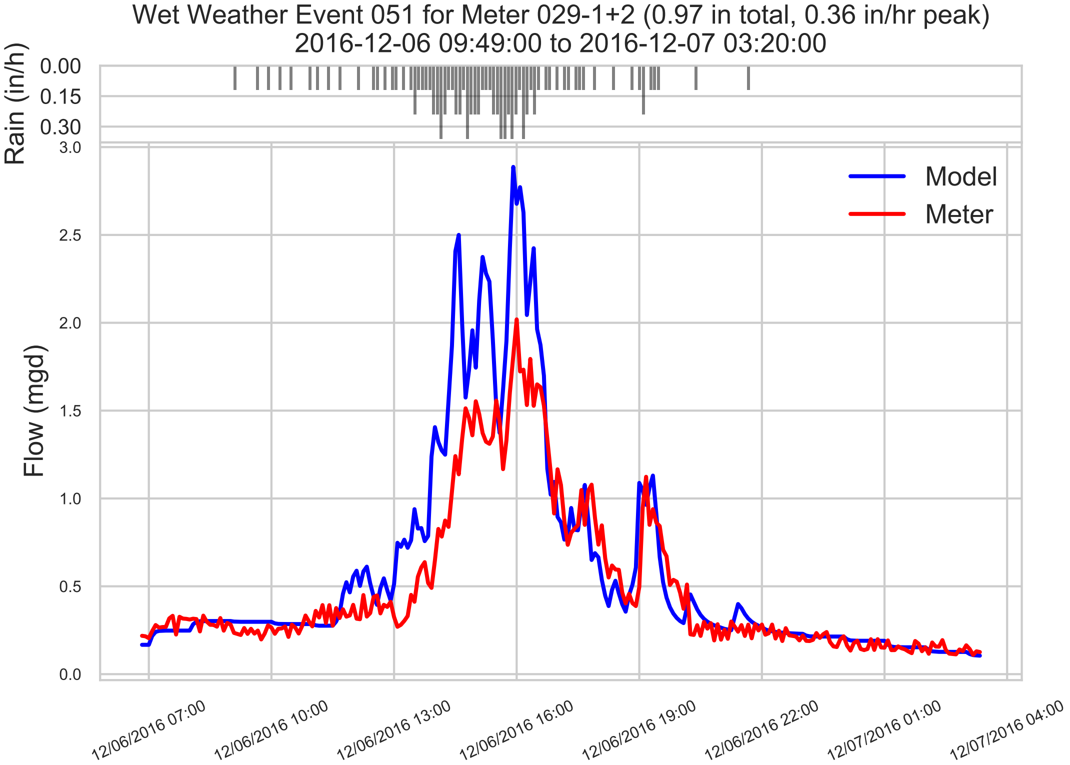
Wet Weather Event 047 for Meter 029-1+2 (0.13 in total, 0.12 in/hr peak)
2016-11-09 05:19:00 to 2016-11-09 14:55:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.5
0.4
0.3
0.2
0.1
Model
Meter
11/09/2016 02:00
11/09/2016 05:00
11/09/2016 08:00
11/09/2016 11:00
11/09/2016 14:00

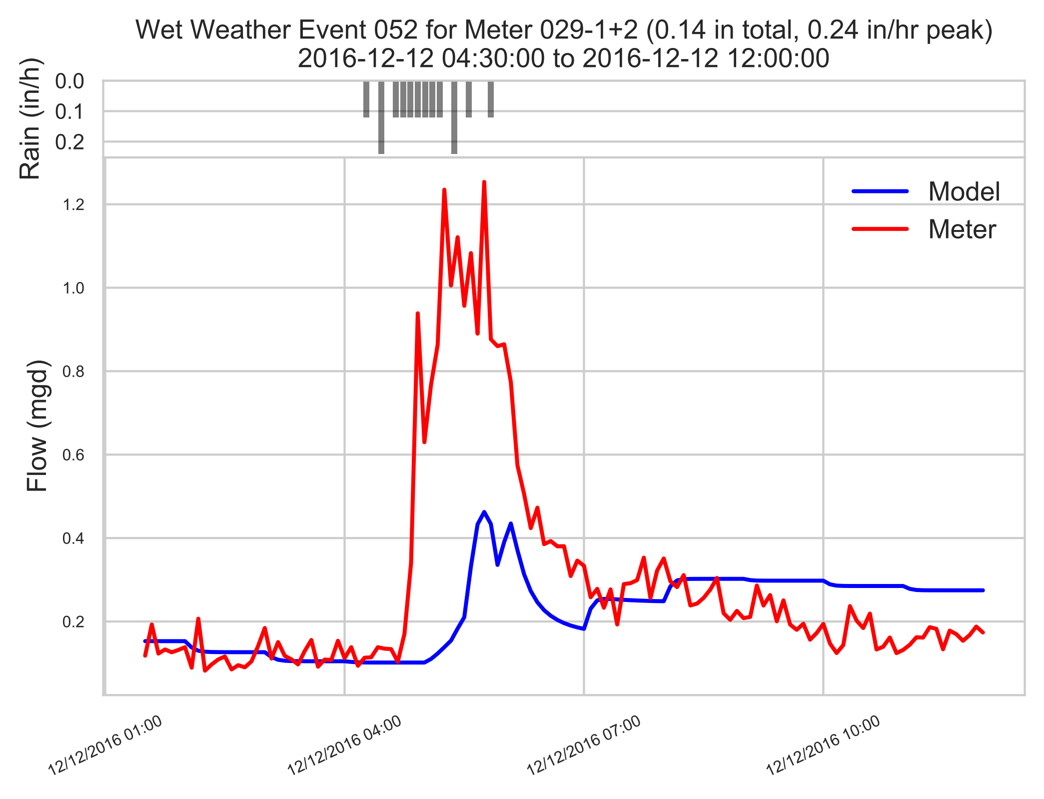

Wet Weather Event 048 for Meter 029-1+2 (0.27 in total, 0.6 in/hr peak)
2016-11-30 08:24:00 to 2016-11-30 16:45:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Model
Meter
11/30/2016 07:00
11/30/2016 10:00
11/30/2016 13:00
11/30/2016 16:00

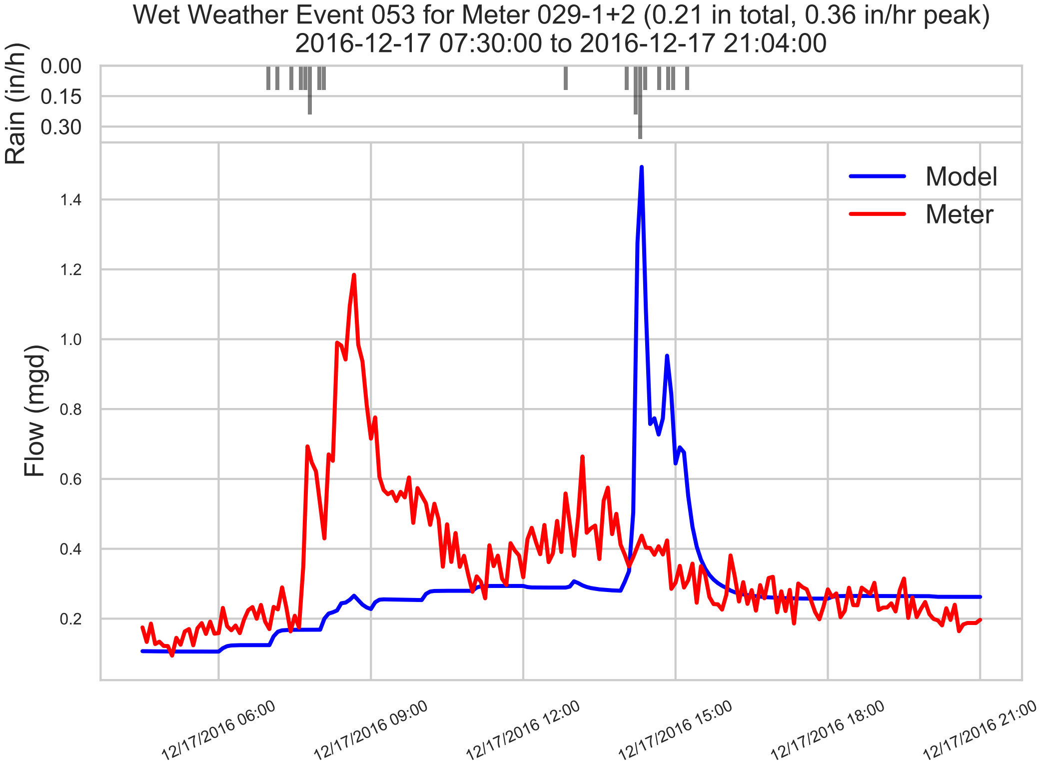


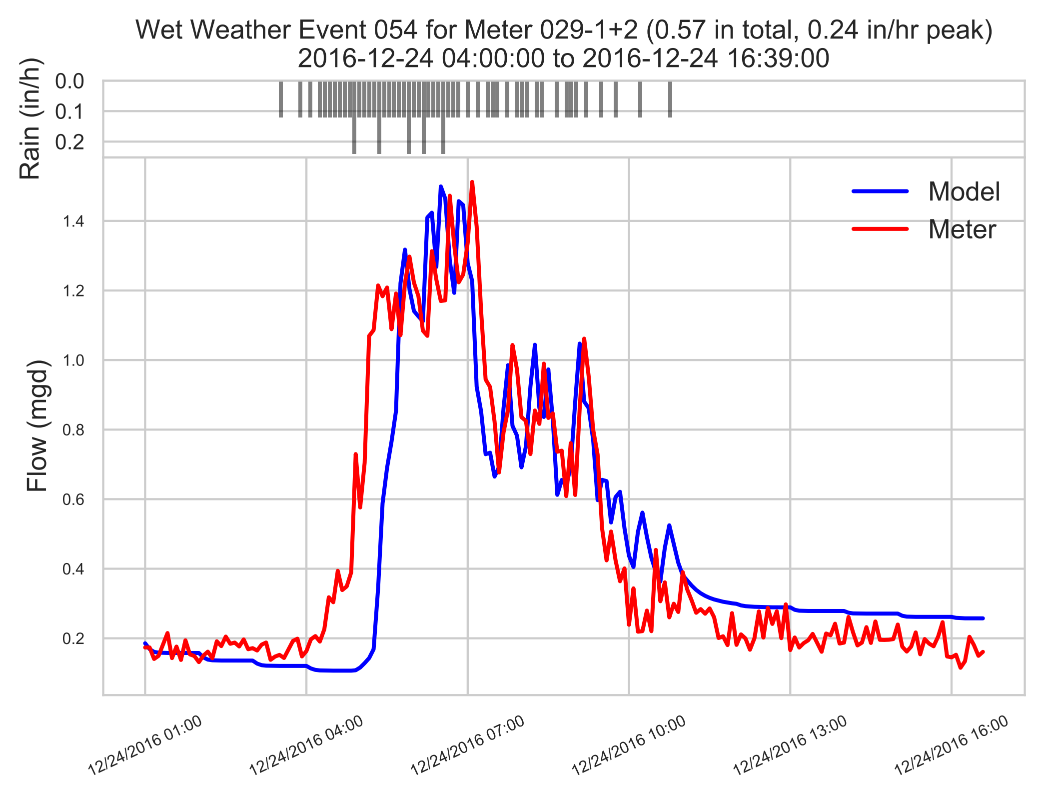
Wet Weather Event 049 for Meter 029-1+2 (0.43 in total, 0.96 in/hr peak)
2016-11-30 18:35:00 to 2016-12-01 07:54:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
0
1
2
3
4
5
Model
Meter
11/30/2016 17:00
11/30/2016 20:00
11/30/2016 23:00
12/01/2016 02:00
12/01/2016 05:00
12/01/2016 08:00


Wet Weather Event 050 for Meter 029-1+2 (0.28 in total, 0.12 in/hr peak)
2016-12-04 22:00:00 to 2016-12-05 09:15:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.2
0.4
0.6
0.8
1.0
1.2
Model
Meter
12/04/2016 20:00
12/04/2016 23:00
12/05/2016 02:00
12/05/2016 05:00
12/05/2016 08:00

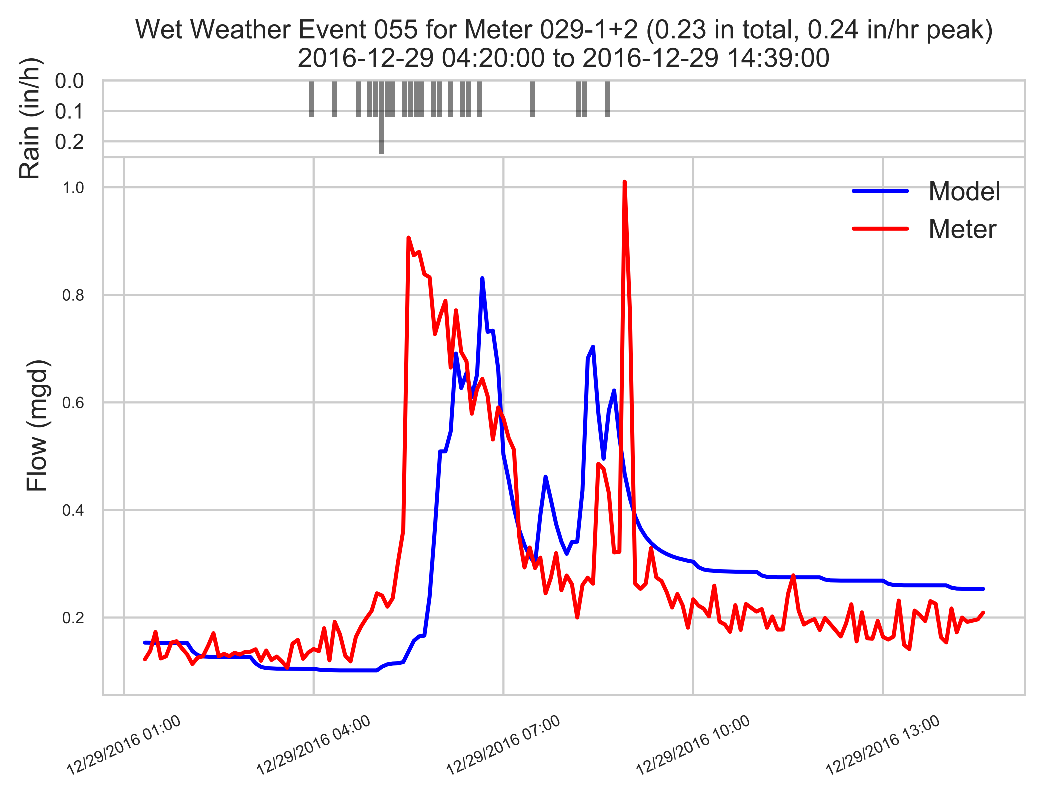

Wet Weather Event 051 for Meter 029-1+2 (0.97 in total, 0.36 in/hr peak)
2016-12-06 09:49:00 to 2016-12-07 03:20:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
12/06/2016 07:00
12/06/2016 10:00
12/06/2016 13:00
12/06/2016 16:00
12/06/2016 19:00
12/06/2016 22:00
12/07/2016 01:00
12/07/2016 04:00

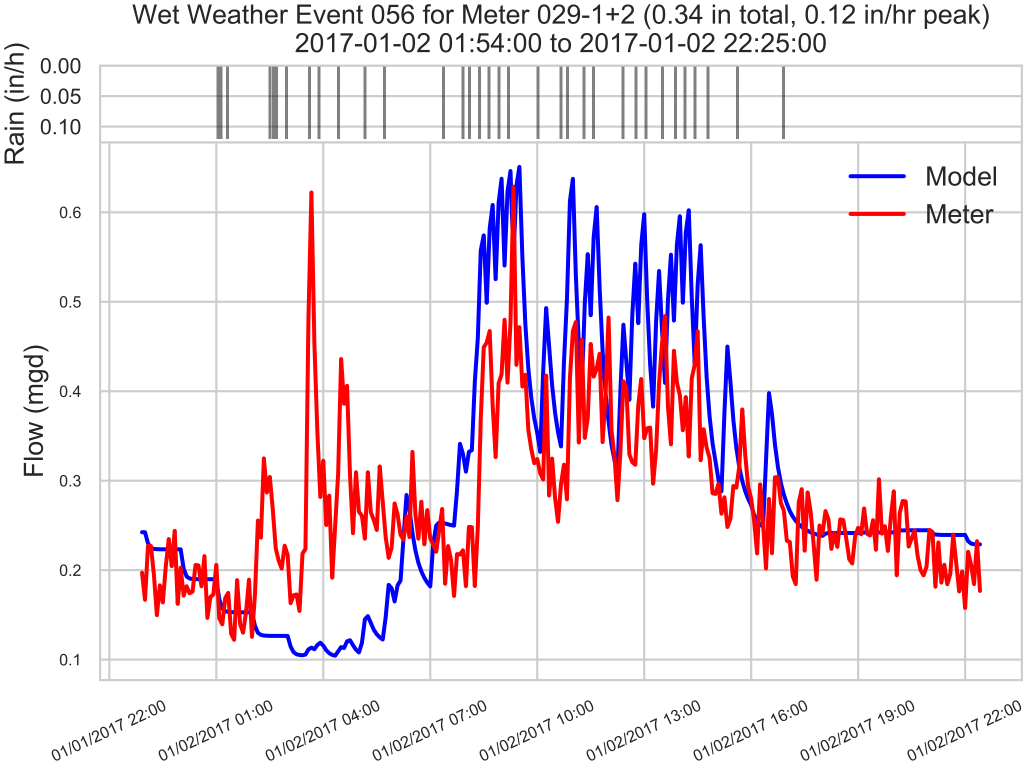

Wet Weather Event 052 for Meter 029-1+2 (0.14 in total, 0.24 in/hr peak)
2016-12-12 04:30:00 to 2016-12-12 12:00:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
12/12/2016 01:00
12/12/2016 04:00
12/12/2016 07:00
12/12/2016 10:00


Wet Weather Event 053 for Meter 029-1+2 (0.21 in total, 0.36 in/hr peak)
2016-12-17 07:30:00 to 2016-12-17 21:04:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
12/17/2016 06:00
12/17/2016 09:00
12/17/2016 12:00
12/17/2016 15:00
12/17/2016 18:00
12/17/2016 21:00

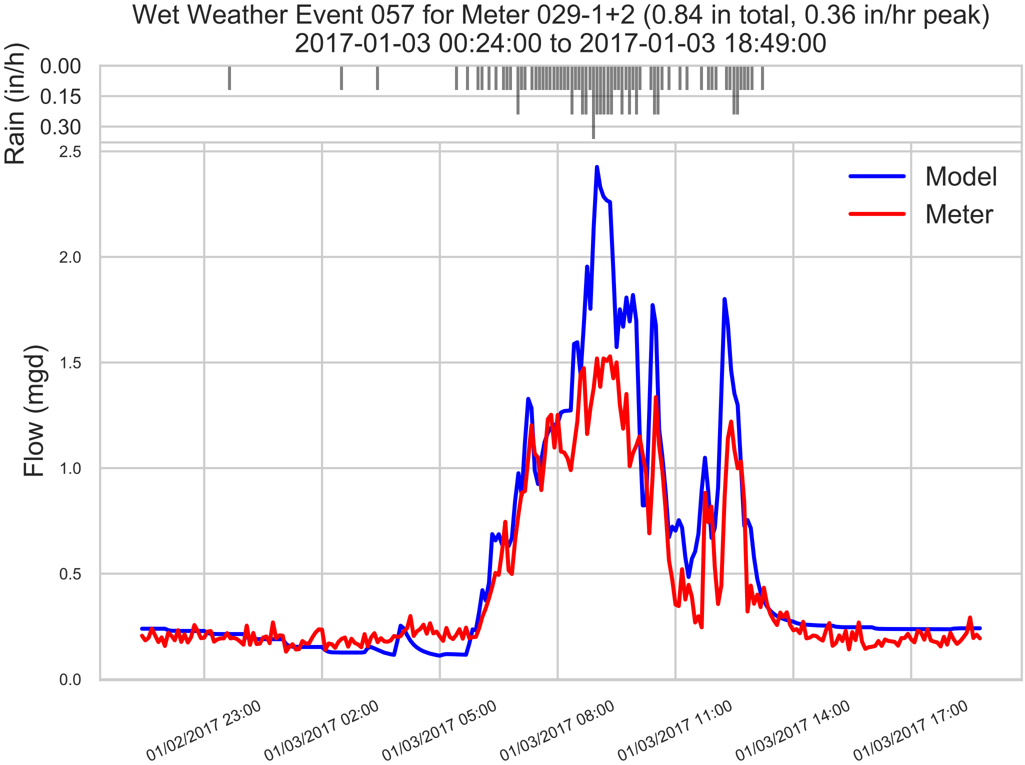


Wet Weather Event 054 for Meter 029-1+2 (0.57 in total, 0.24 in/hr peak)
2016-12-24 04:00:00 to 2016-12-24 16:39:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Model
Meter
12/24/2016 01:00
12/24/2016 04:00
12/24/2016 07:00
12/24/2016 10:00
12/24/2016 13:00
12/24/2016 16:00

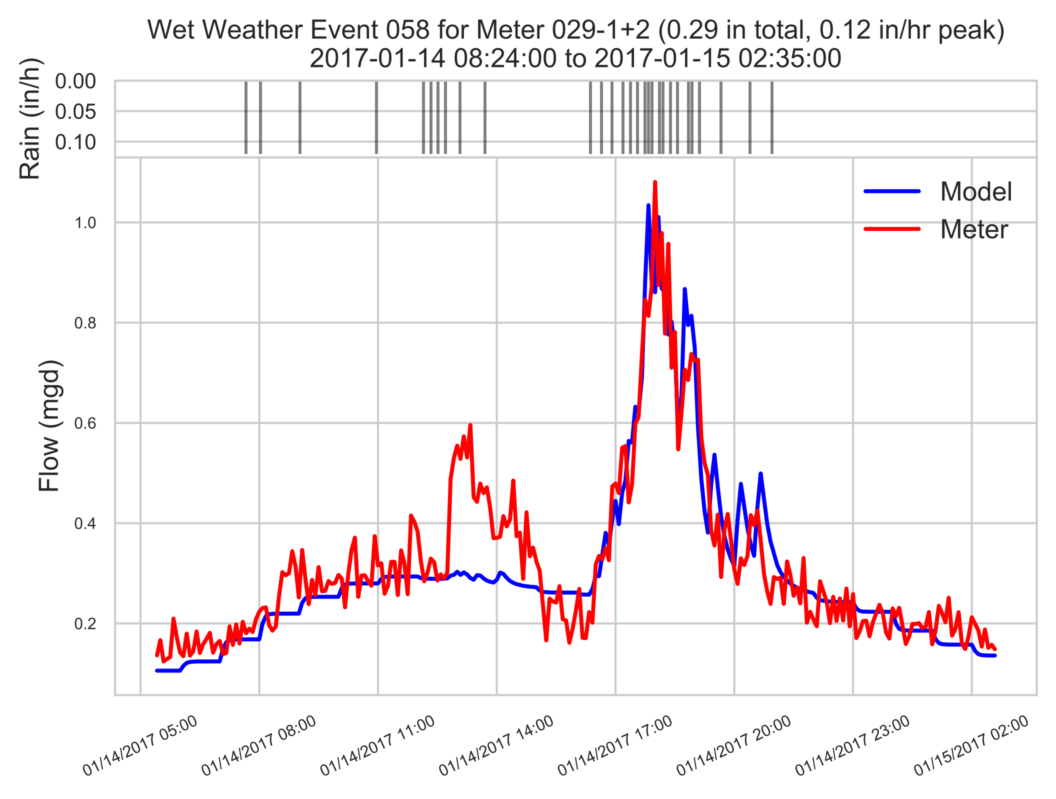

Wet Weather Event 055 for Meter 029-1+2 (0.23 in total, 0.24 in/hr peak)
2016-12-29 04:20:00 to 2016-12-29 14:39:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
Model
Meter
12/29/2016 01:00
12/29/2016 04:00
12/29/2016 07:00
12/29/2016 10:00
12/29/2016 13:00

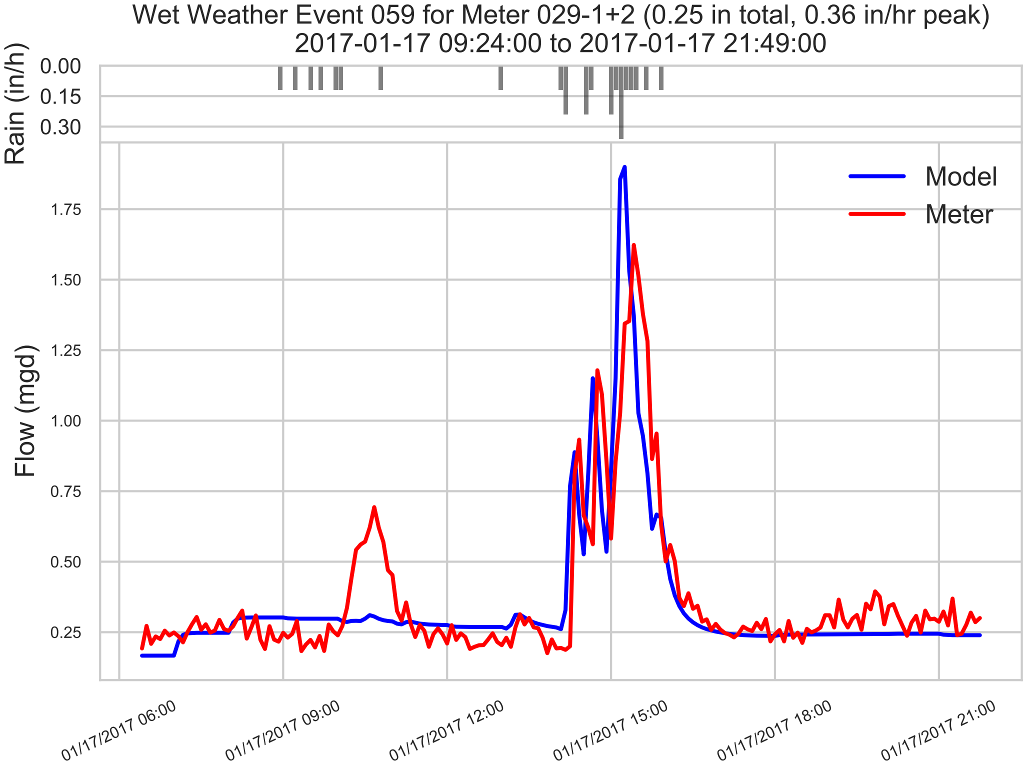


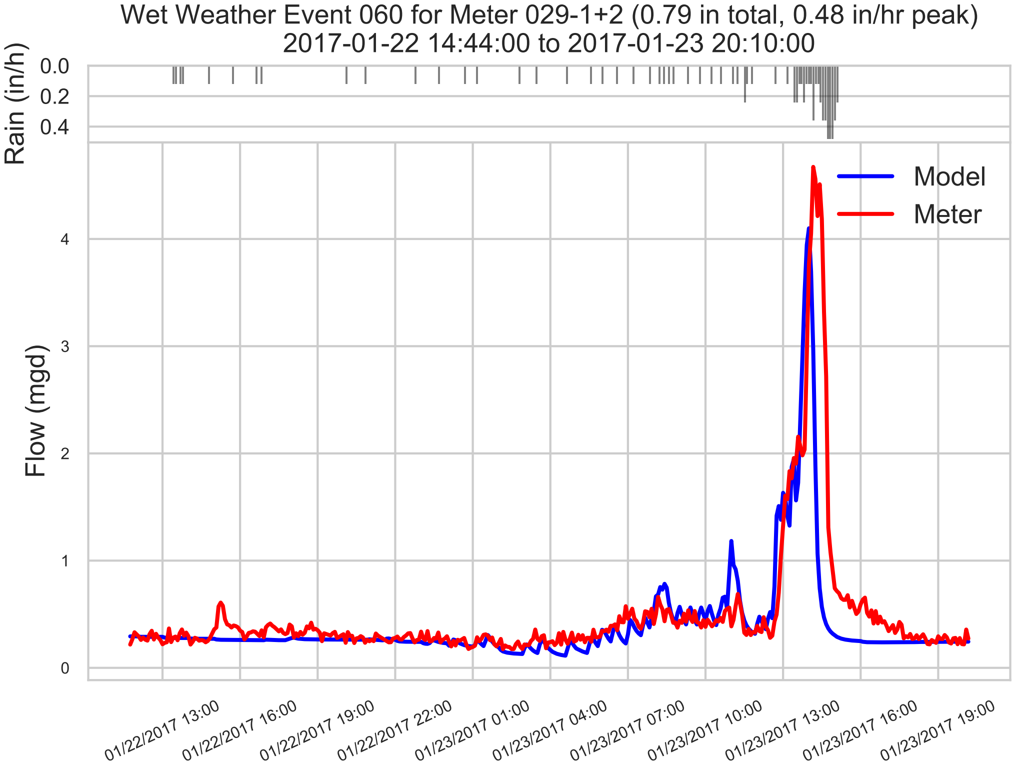
Wet Weather Event 056 for Meter 029-1+2 (0.34 in total, 0.12 in/hr peak)
2017-01-02 01:54:00 to 2017-01-02 22:25:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.1
0.2
0.3
0.4
0.5
0.6
Model
Meter
01/01/2017 22:00
01/02/2017 01:00
01/02/2017 04:00
01/02/2017 07:00
01/02/2017 10:00
01/02/2017 13:00
01/02/2017 16:00
01/02/2017 19:00
01/02/2017 22:00

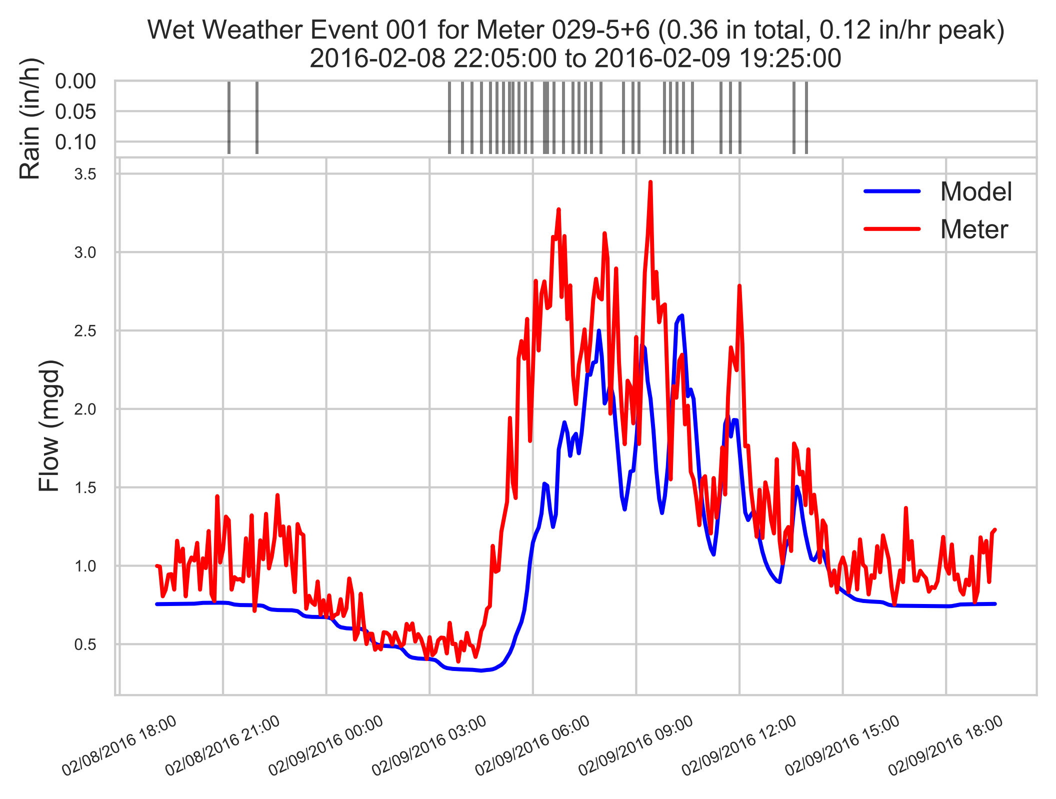


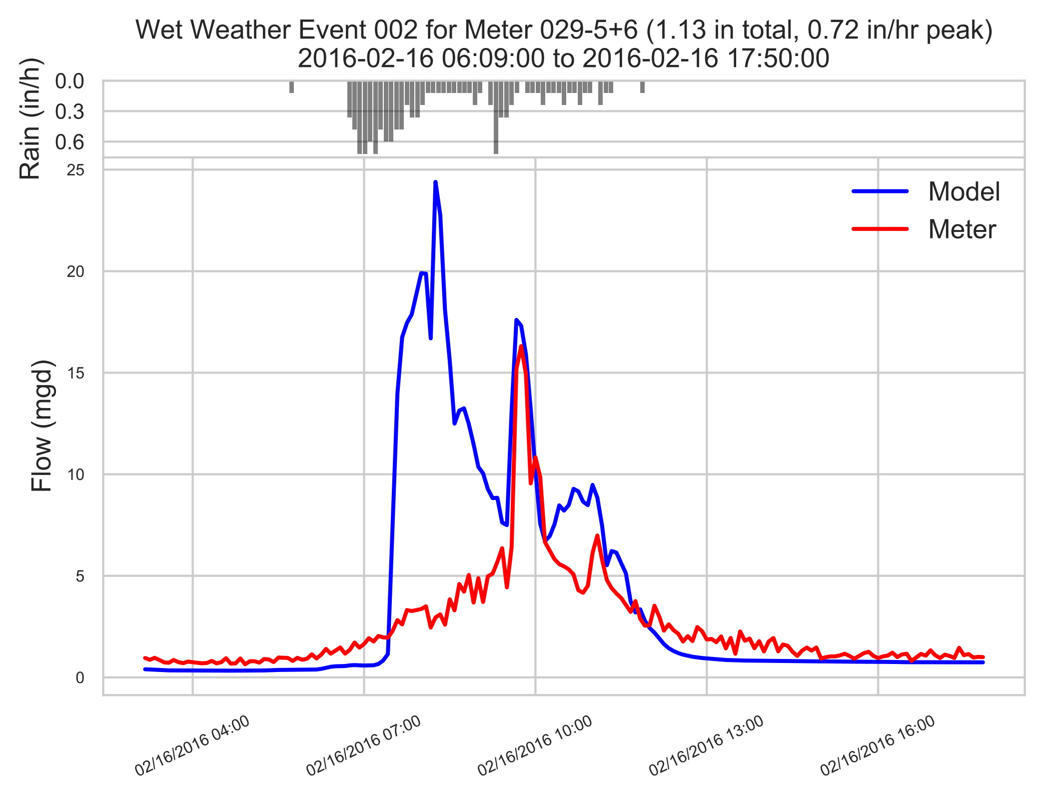
Wet Weather Event 057 for Meter 029-1+2 (0.84 in total, 0.36 in/hr peak)
2017-01-03 00:24:00 to 2017-01-03 18:49:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
01/02/2017 23:00
01/03/2017 02:00
01/03/2017 05:00
01/03/2017 08:00
01/03/2017 11:00
01/03/2017 14:00
01/03/2017 17:00


Wet Weather Event 058 for Meter 029-1+2 (0.29 in total, 0.12 in/hr peak)
2017-01-14 08:24:00 to 2017-01-15 02:35:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
Model
Meter
01/14/2017 05:00
01/14/2017 08:00
01/14/2017 11:00
01/14/2017 14:00
01/14/2017 17:00
01/14/2017 20:00
01/14/2017 23:00
01/15/2017 02:00

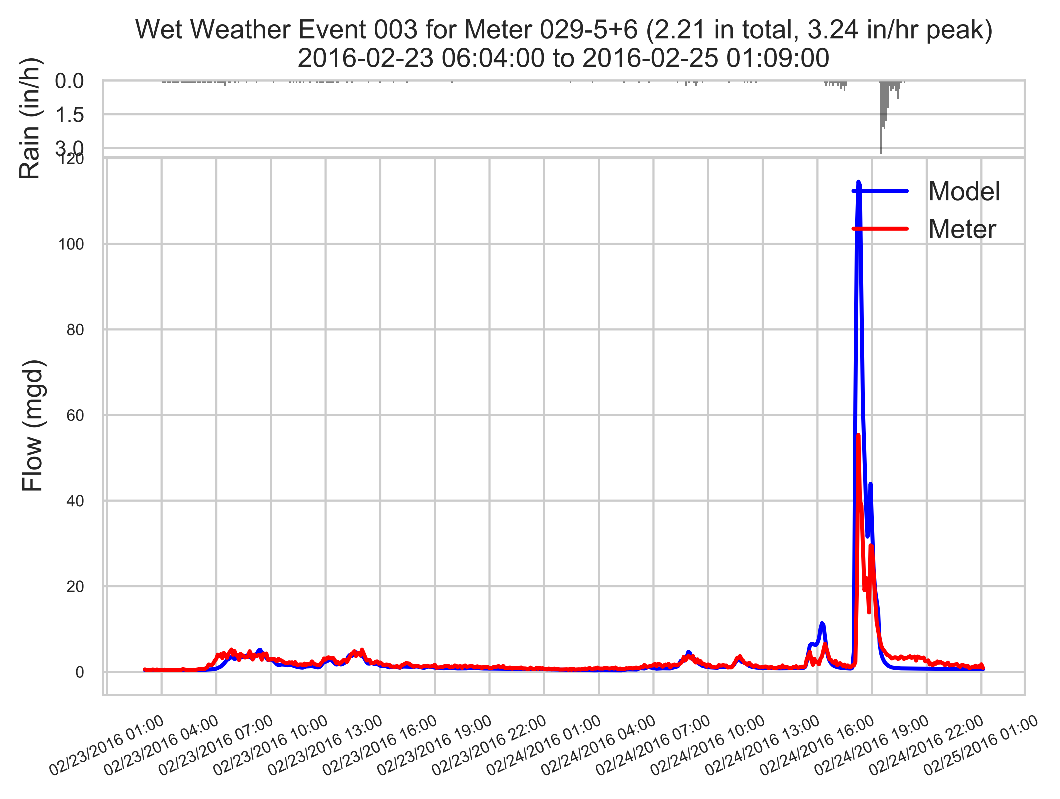

Wet Weather Event 059 for Meter 029-1+2 (0.25 in total, 0.36 in/hr peak)
2017-01-17 09:24:00 to 2017-01-17 21:49:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
Model
Meter
01/17/2017 06:00
01/17/2017 09:00
01/17/2017 12:00
01/17/2017 15:00
01/17/2017 18:00
01/17/2017 21:00

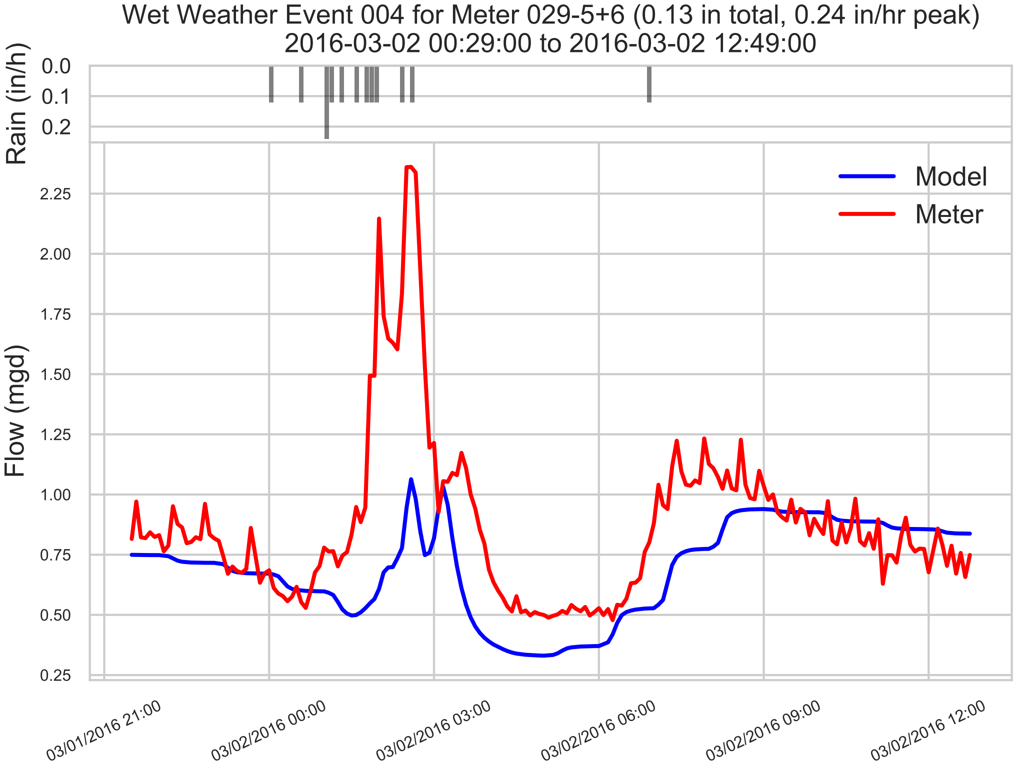

Wet Weather Event 060 for Meter 029-1+2 (0.79 in total, 0.48 in/hr peak)
2017-01-22 14:44:00 to 2017-01-23 20:10:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
1
2
3
4
Model
Meter
01/22/2017 13:00
01/22/2017 16:00
01/22/2017 19:00
01/22/2017 22:00
01/23/2017 01:00
01/23/2017 04:00
01/23/2017 07:00
01/23/2017 10:00
01/23/2017 13:00
01/23/2017 16:00
01/23/2017 19:00


Wet Weather Event 001 for Meter 029-5+6 (0.36 in total, 0.12 in/hr peak)
2016-02-08 22:05:00 to 2016-02-09 19:25:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
Model
Meter
02/08/2016 18:00
02/08/2016 21:00
02/09/2016 00:00
02/09/2016 03:00
02/09/2016 06:00
02/09/2016 09:00
02/09/2016 12:00
02/09/2016 15:00
02/09/2016 18:00

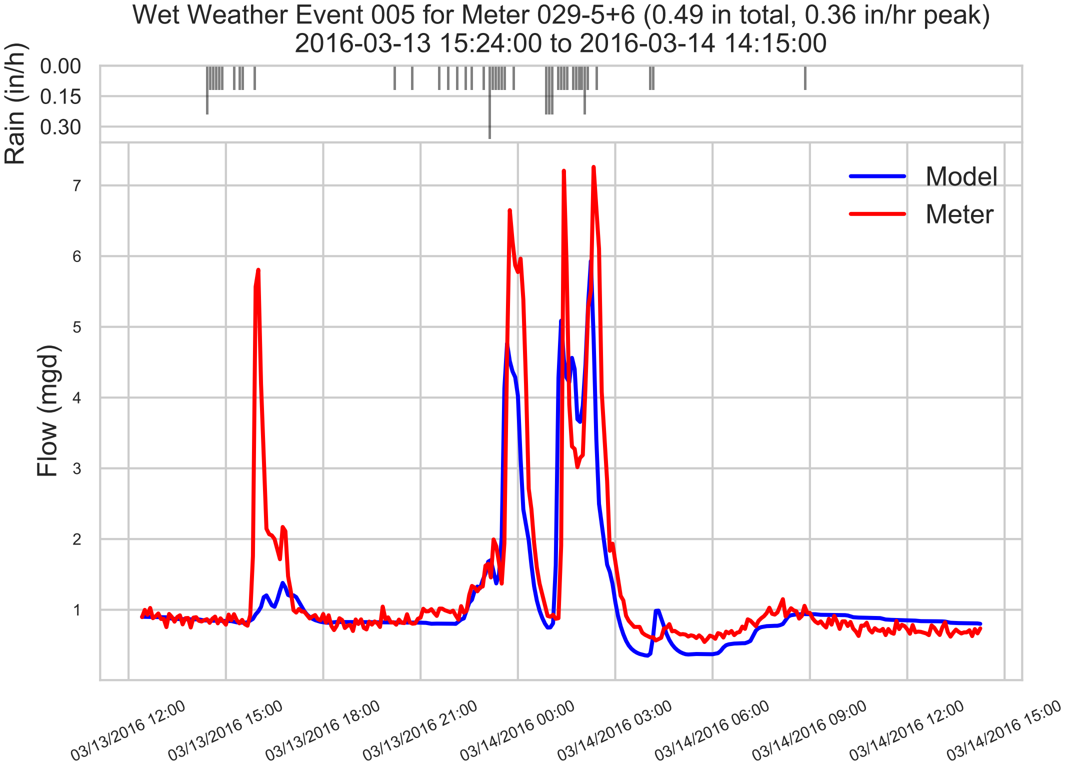


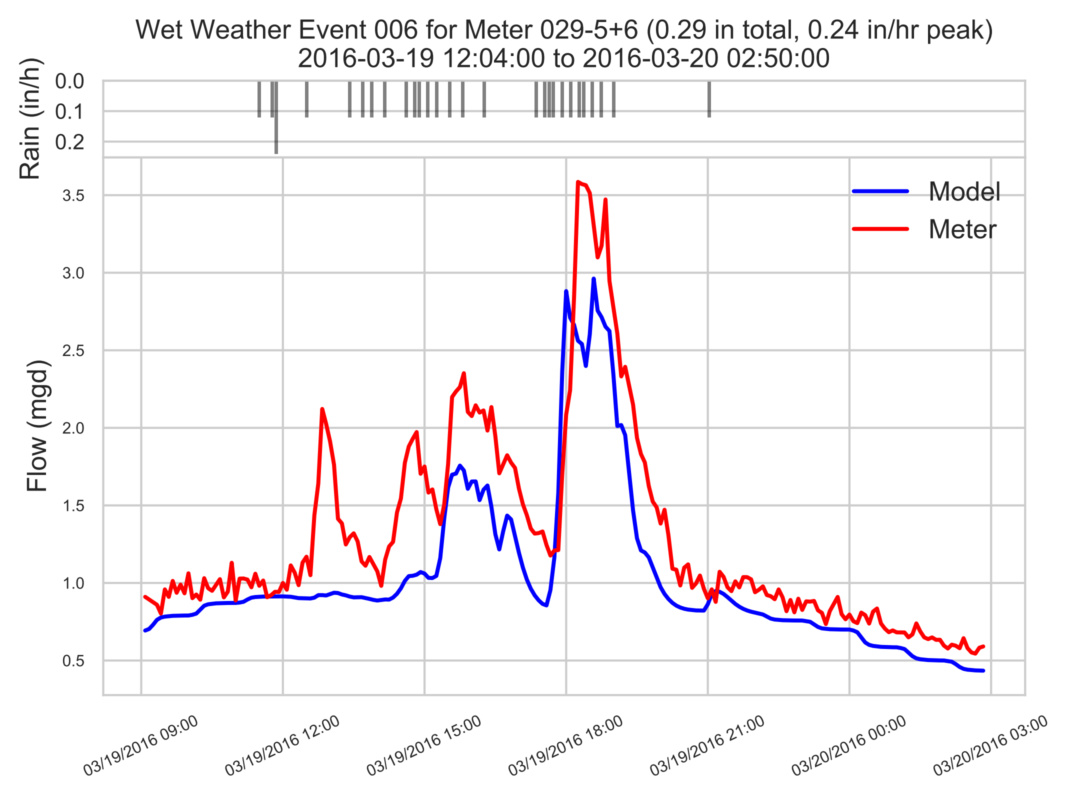
Wet Weather Event 002 for Meter 029-5+6 (1.13 in total, 0.72 in/hr peak)
2016-02-16 06:09:00 to 2016-02-16 17:50:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
25
20
15
10
5
0
Model
Meter
02/16/2016 04:00
02/16/2016 07:00
02/16/2016 10:00
02/16/2016 13:00
02/16/2016 16:00


Wet Weather Event 003 for Meter 029-5+6 (2.21 in total, 3.24 in/hr peak)
2016-02-23 06:04:00 to 2016-02-25 01:09:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
120
100
80
60
40
20
0
Model
Meter
02/23/2016 01:00
02/23/2016 04:00
02/23/2016 07:00
02/23/2016 10:00
02/23/2016 13:00
02/23/2016 16:00
02/23/2016 19:00
02/23/2016 22:00
02/24/2016 01:00
02/24/2016 04:00
02/24/2016 07:00
02/24/2016 10:00
02/24/2016 13:00
02/24/2016 16:00
02/24/2016 19:00
02/24/2016 22:00
02/25/2016 01:00

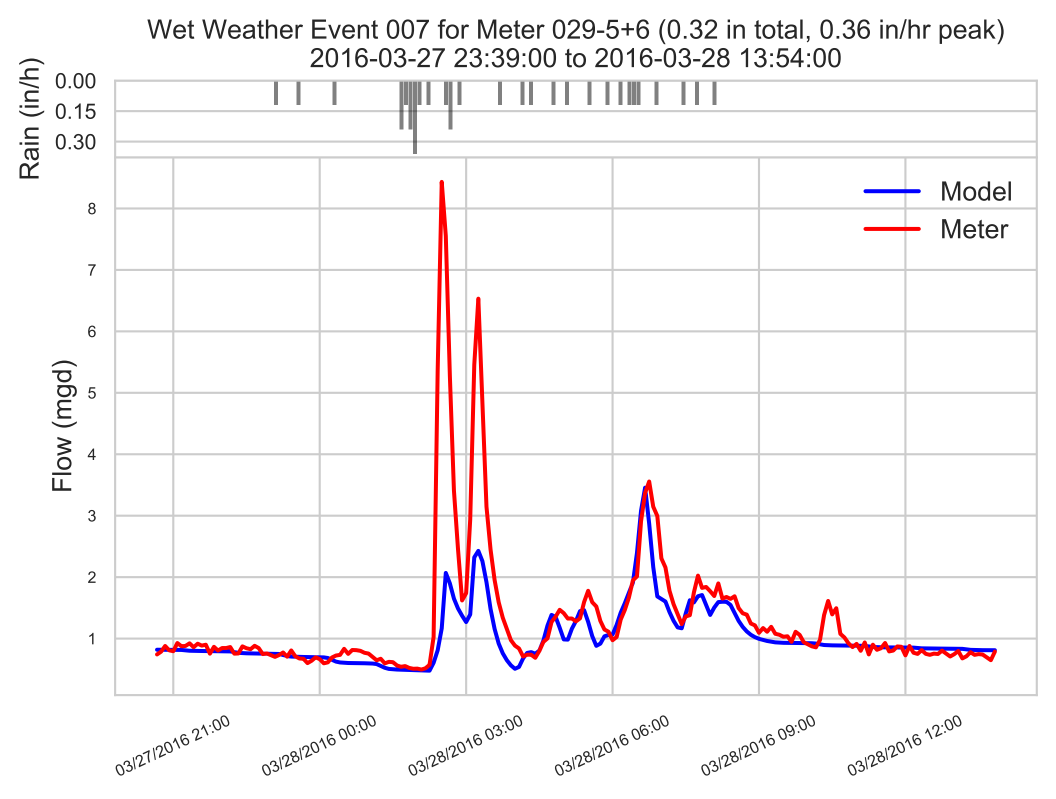


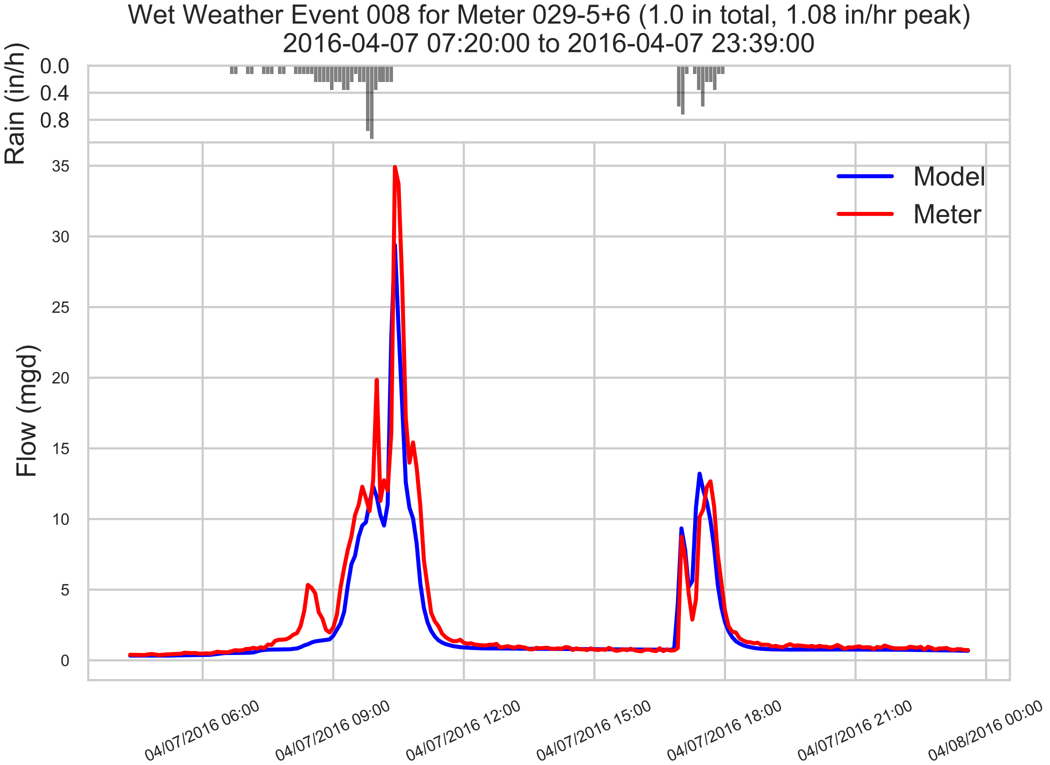
Wet Weather Event 004 for Meter 029-5+6 (0.13 in total, 0.24 in/hr peak)
2016-03-02 00:29:00 to 2016-03-02 12:49:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
Model
Meter
03/01/2016 21:00
03/02/2016 00:00
03/02/2016 03:00
03/02/2016 06:00
03/02/2016 09:00
03/02/2016 12:00


Wet Weather Event 005 for Meter 029-5+6 (0.49 in total, 0.36 in/hr peak)
2016-03-13 15:24:00 to 2016-03-14 14:15:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
7
6
5
4
3
2
1
Model
Meter
03/13/2016 12:00
03/13/2016 15:00
03/13/2016 18:00
03/13/2016 21:00
03/14/2016 00:00
03/14/2016 03:00
03/14/2016 06:00
03/14/2016 09:00
03/14/2016 12:00
03/14/2016 15:00

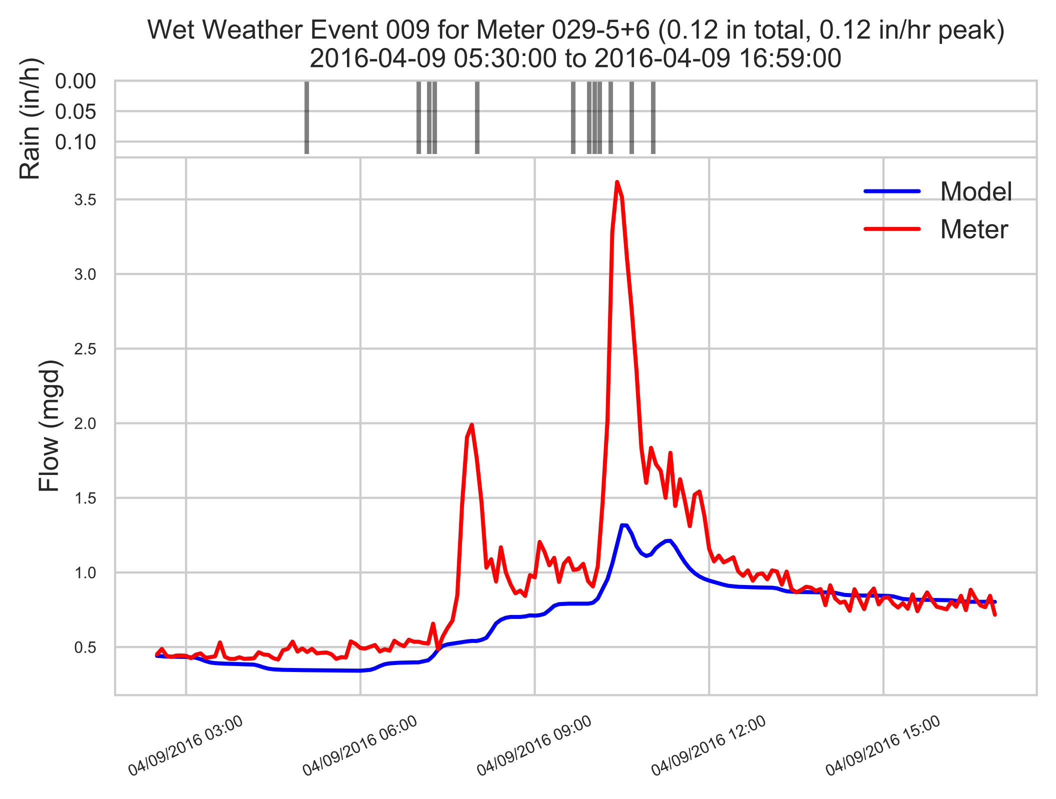


Wet Weather Event 006 for Meter 029-5+6 (0.29 in total, 0.24 in/hr peak)
2016-03-19 12:04:00 to 2016-03-20 02:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
Model
Meter
03/19/2016 09:00
03/19/2016 12:00
03/19/2016 15:00
03/19/2016 18:00
03/19/2016 21:00
03/20/2016 00:00
03/20/2016 03:00

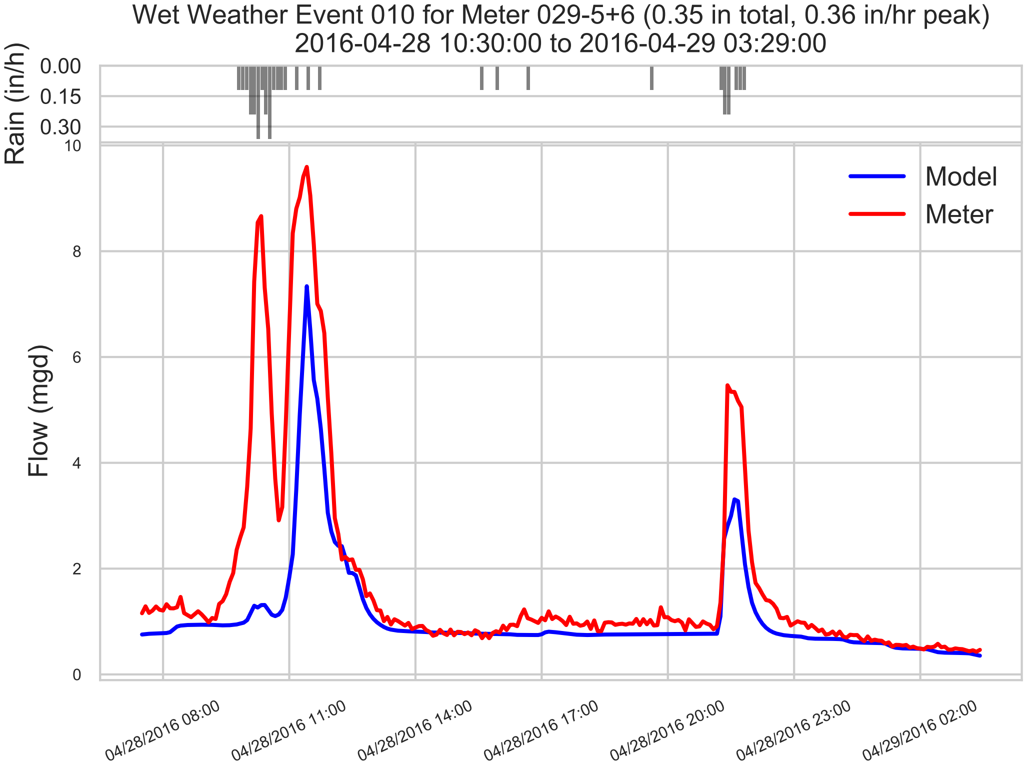

Wet Weather Event 007 for Meter 029-5+6 (0.32 in total, 0.36 in/hr peak)
2016-03-27 23:39:00 to 2016-03-28 13:54:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
1
2
3
4
5
6
7
8
Model
Meter
03/27/2016 21:00
03/28/2016 00:00
03/28/2016 03:00
03/28/2016 06:00
03/28/2016 09:00
03/28/2016 12:00



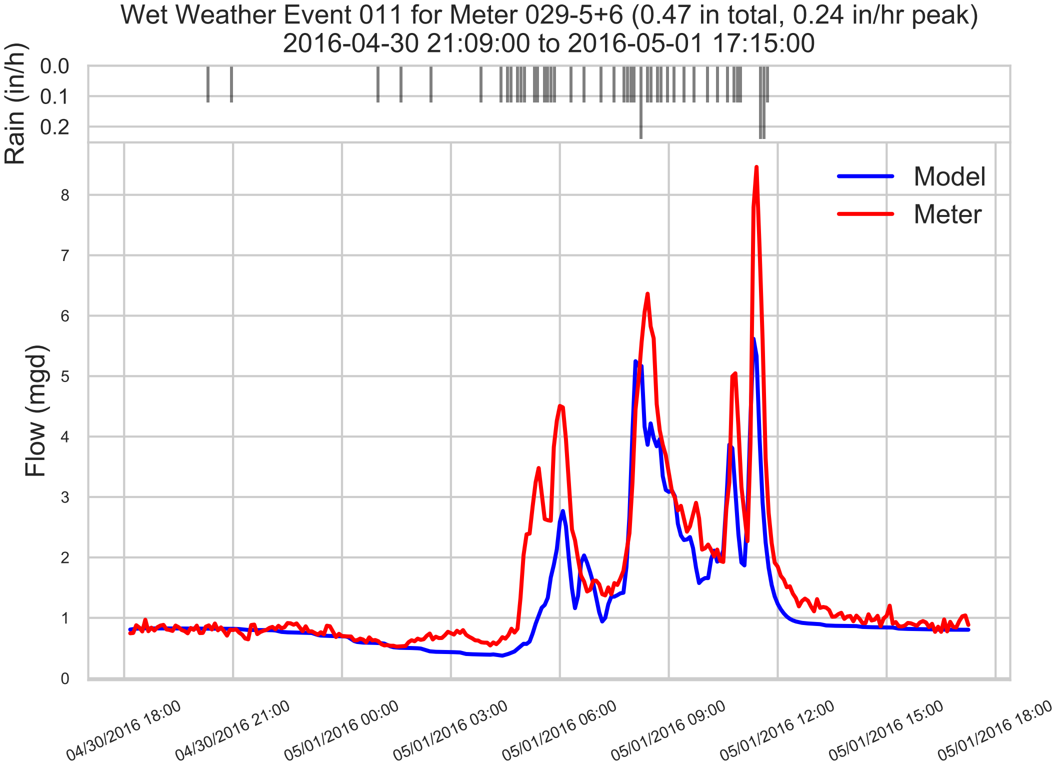
Wet Weather Event 008 for Meter 029-5+6 (1.0 in total, 1.08 in/hr peak)
2016-04-07 07:20:00 to 2016-04-07 23:39:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
35
30
25
20
15
10
5
0
Model
Meter
04/07/2016 06:00
04/07/2016 09:00
04/07/2016 12:00
04/07/2016 15:00
04/07/2016 18:00
04/07/2016 21:00
04/08/2016 00:00

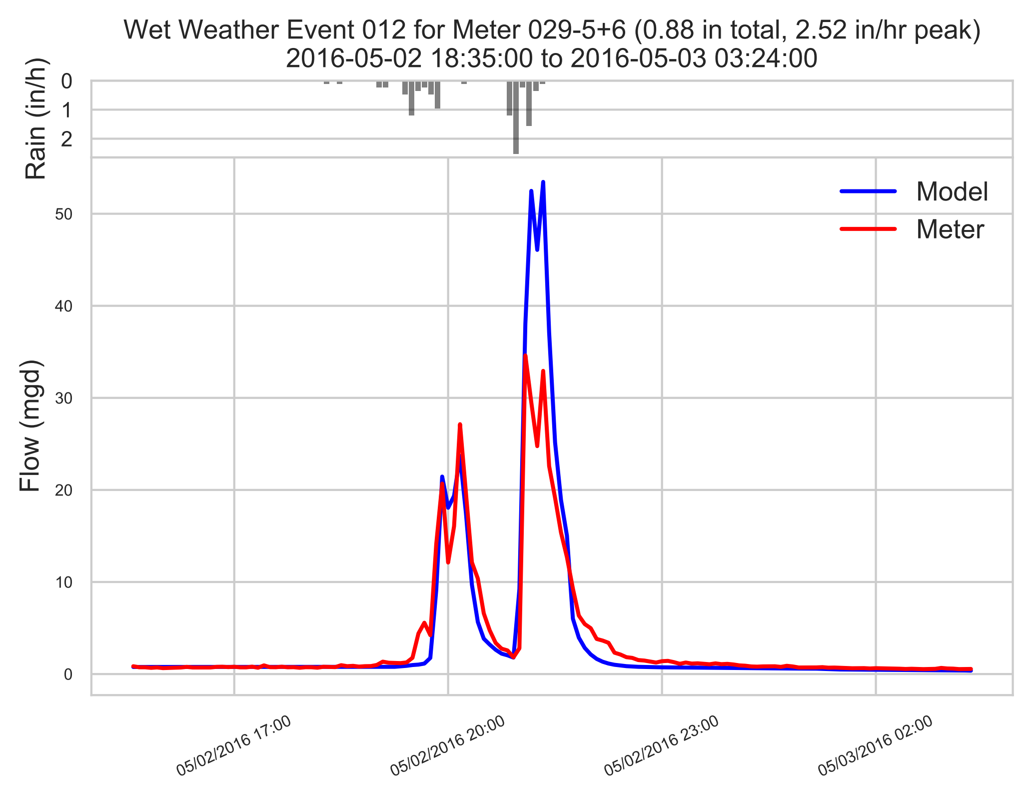


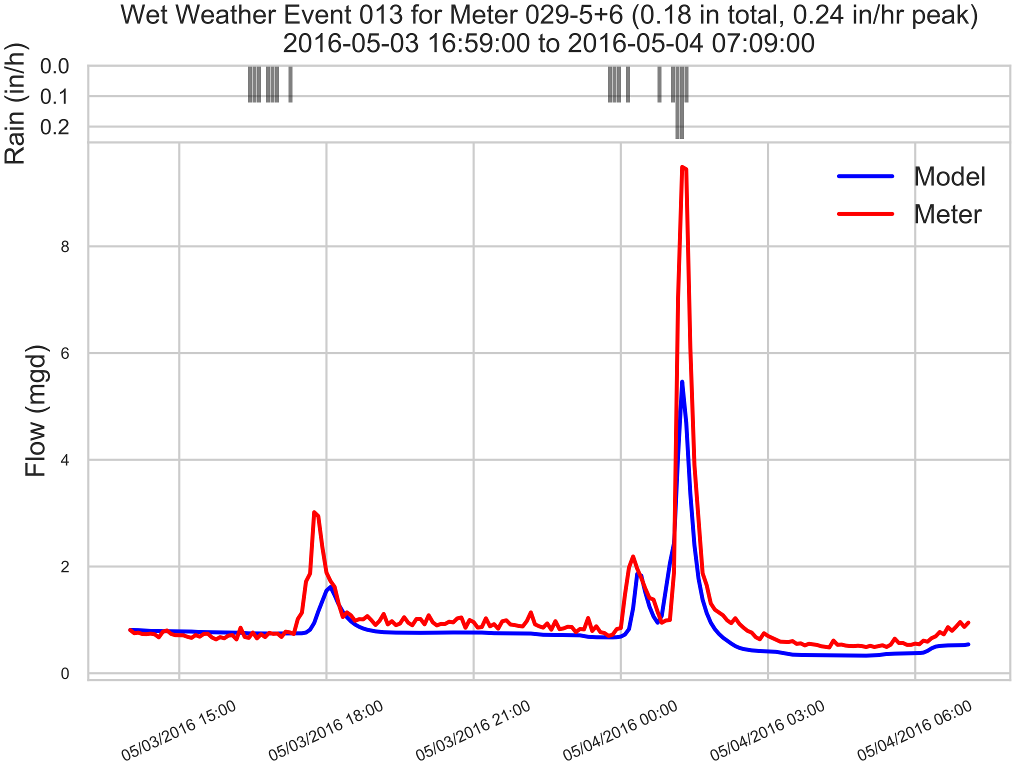
Wet Weather Event 009 for Meter 029-5+6 (0.12 in total, 0.12 in/hr peak)
2016-04-09 05:30:00 to 2016-04-09 16:59:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
Model
Meter
04/09/2016 03:00
04/09/2016 06:00
04/09/2016 09:00
04/09/2016 12:00
04/09/2016 15:00



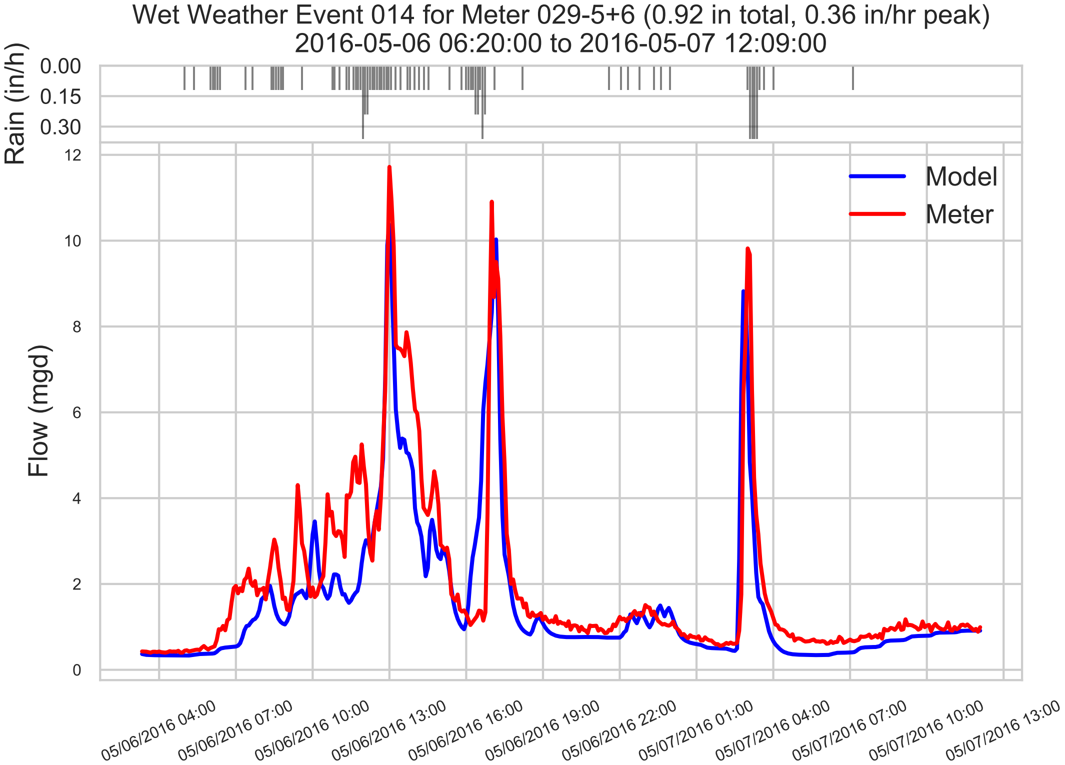
Wet Weather Event 010 for Meter 029-5+6 (0.35 in total, 0.36 in/hr peak)
2016-04-28 10:30:00 to 2016-04-29 03:29:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
10
8
6
4
2
0
Model
Meter
04/28/2016 08:00
04/28/2016 11:00
04/28/2016 14:00
04/28/2016 17:00
04/28/2016 20:00
04/28/2016 23:00
04/29/2016 02:00


Wet Weather Event 011 for Meter 029-5+6 (0.47 in total, 0.24 in/hr peak)
2016-04-30 21:09:00 to 2016-05-01 17:15:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
5
6
7
8
Model
Meter
04/30/2016 18:00
04/30/2016 21:00
05/01/2016 00:00
05/01/2016 03:00
05/01/2016 06:00
05/01/2016 09:00
05/01/2016 12:00
05/01/2016 15:00
05/01/2016 18:00

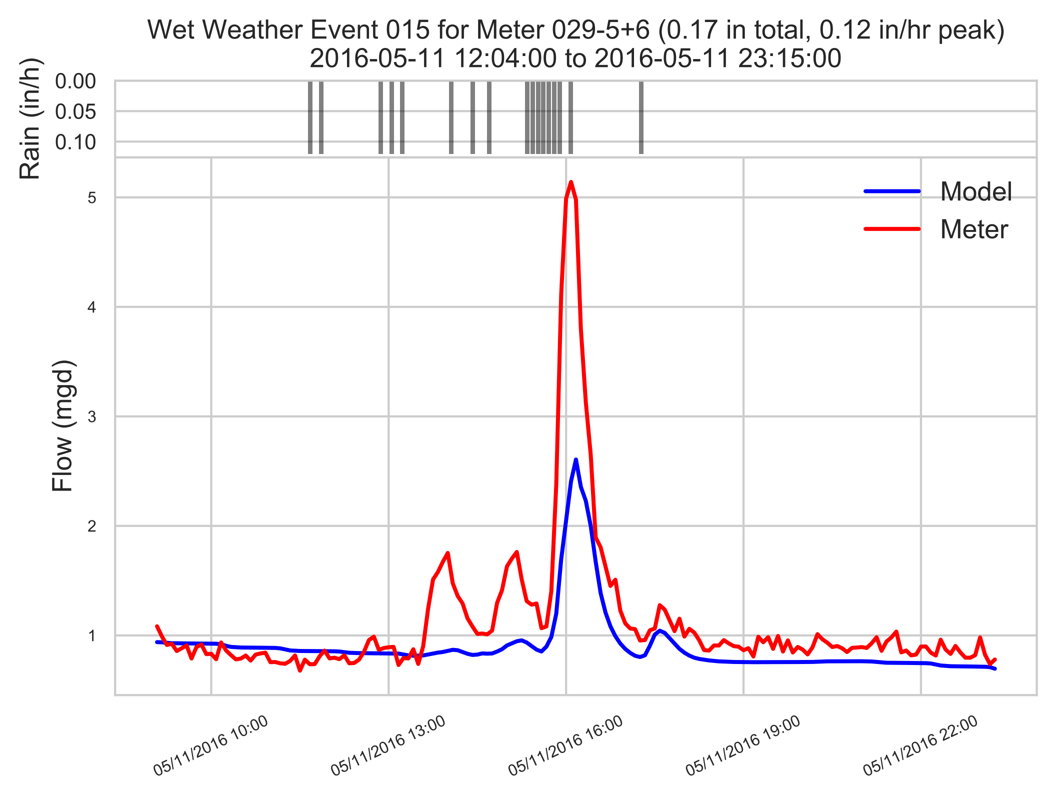

Wet Weather Event 012 for Meter 029-5+6 (0.88 in total, 2.52 in/hr peak)
2016-05-02 18:35:00 to 2016-05-03 03:24:00
Rain (in/h)
0
1
2
Flow (mgd)
0
10
20
30
40
50
Model
Meter
05/02/2016 17:00
05/02/2016 20:00
05/02/2016 23:00
05/03/2016 02:00

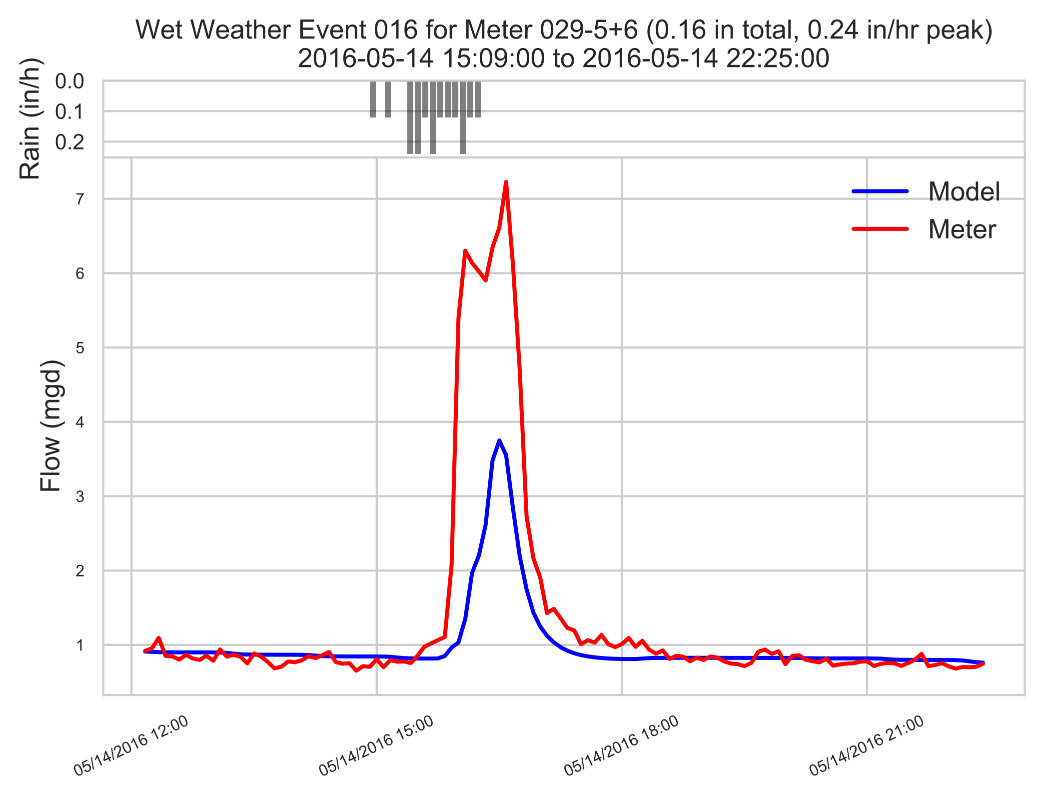


Wet Weather Event 013 for Meter 029-5+6 (0.18 in total, 0.24 in/hr peak)
2016-05-03 16:59:00 to 2016-05-04 07:09:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
2
4
6
8
Model
Meter
05/03/2016 15:00
05/03/2016 18:00
05/03/2016 21:00
05/04/2016 00:00
05/04/2016 03:00
05/04/2016 06:00

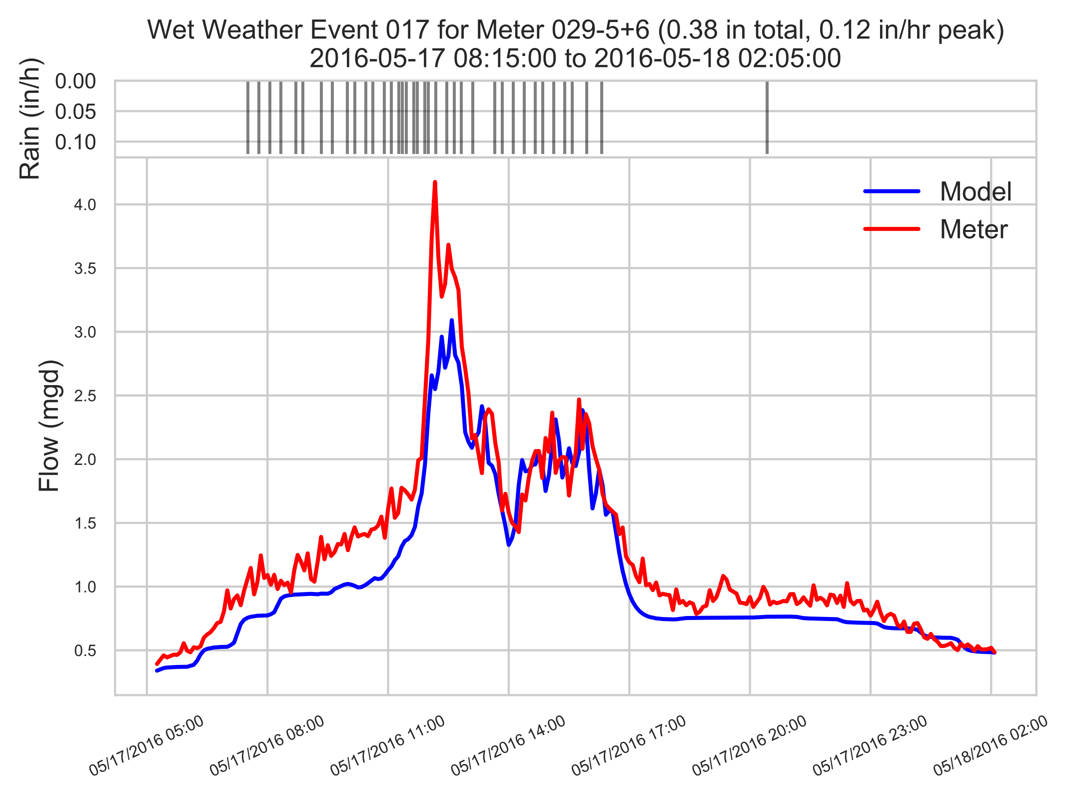


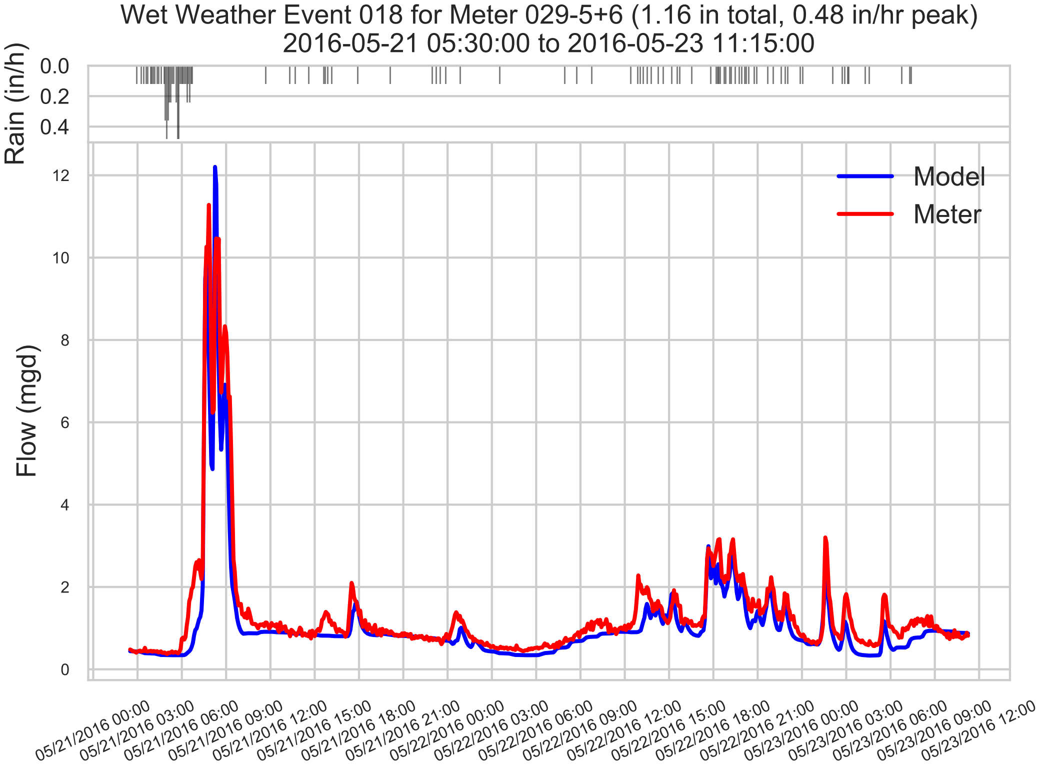
Wet Weather Event 014 for Meter 029-5+6 (0.92 in total, 0.36 in/hr peak)
2016-05-06 06:20:00 to 2016-05-07 12:09:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0
2
4
6
8
10
12
Model
Meter
05/06/2016 04:00
05/06/2016 07:00
05/06/2016 10:00
05/06/2016 13:00
05/06/2016 16:00
05/06/2016 19:00
05/06/2016 22:00
05/07/2016 01:00
05/07/2016 04:00
05/07/2016 07:00
05/07/2016 10:00
05/07/2016 13:00

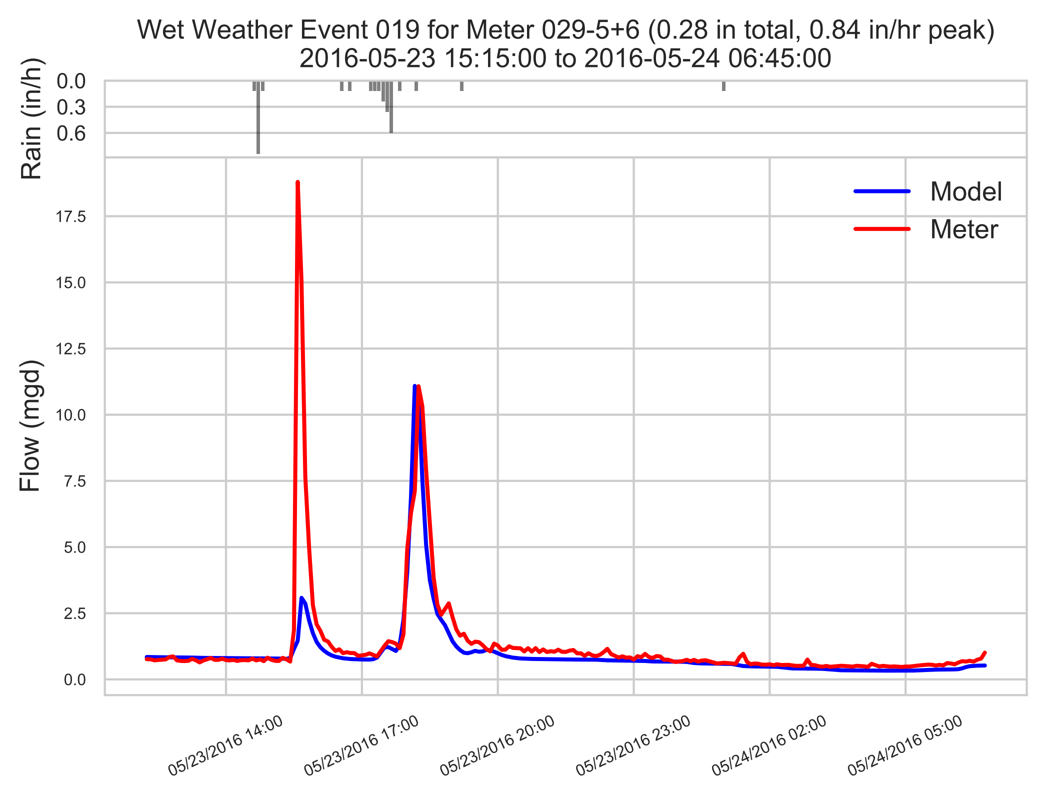

Wet Weather Event 015 for Meter 029-5+6 (0.17 in total, 0.12 in/hr peak)
2016-05-11 12:04:00 to 2016-05-11 23:15:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
5
4
3
2
1
Model
Meter
05/11/2016 10:00
05/11/2016 13:00
05/11/2016 16:00
05/11/2016 19:00
05/11/2016 22:00

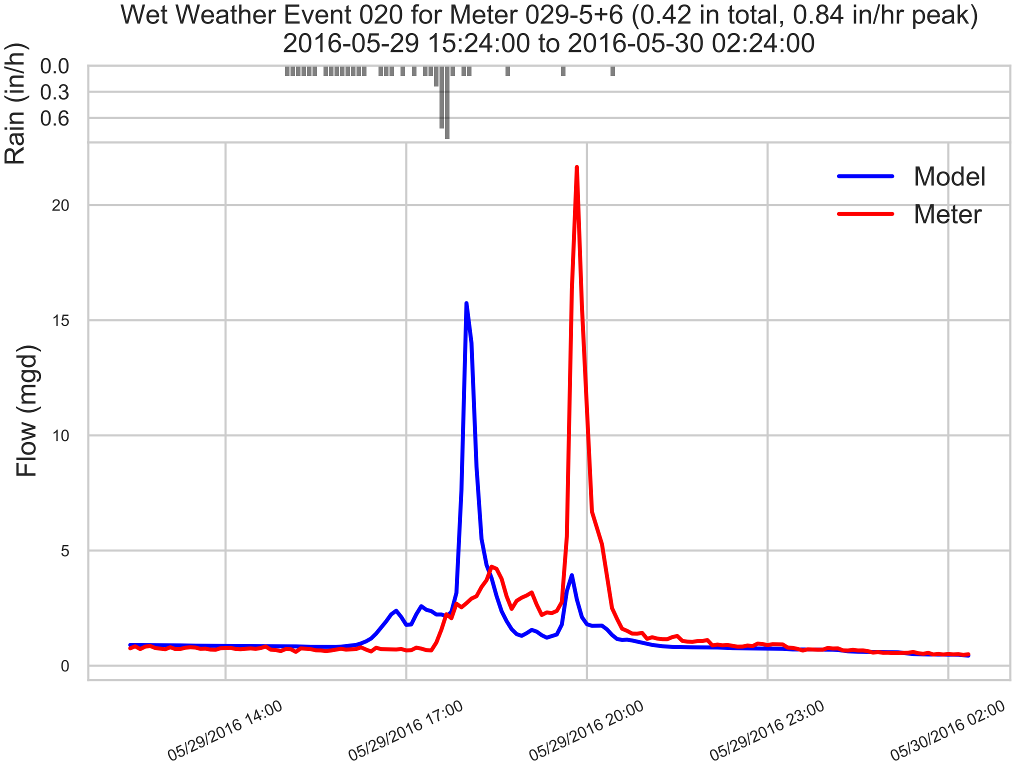


Wet Weather Event 016 for Meter 029-5+6 (0.16 in total, 0.24 in/hr peak)
2016-05-14 15:09:00 to 2016-05-14 22:25:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1
2
3
4
5
6
7
Model
Meter
05/14/2016 12:00
05/14/2016 15:00
05/14/2016 18:00
05/14/2016 21:00

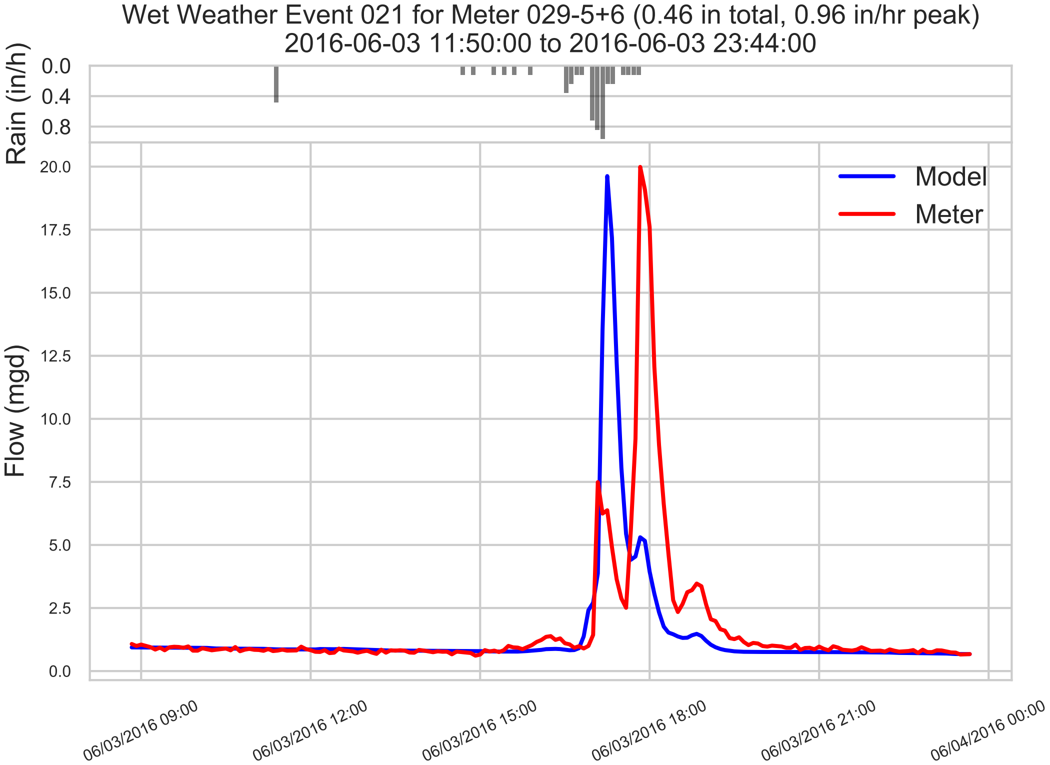

Wet Weather Event 017 for Meter 029-5+6 (0.38 in total, 0.12 in/hr peak)
2016-05-17 08:15:00 to 2016-05-18 02:05:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
Model
Meter
05/17/2016 05:00
05/17/2016 08:00
05/17/2016 11:00
05/17/2016 14:00
05/17/2016 17:00
05/17/2016 20:00
05/17/2016 23:00
05/18/2016 02:00


Wet Weather Event 018 for Meter 029-5+6 (1.16 in total, 0.48 in/hr peak)
2016-05-21 05:30:00 to 2016-05-23 11:15:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
2
4
6
8
10
12
Model
Meter
05/21/2016 00:00
05/21/2016 03:00
05/21/2016 06:00
05/21/2016 09:00
05/21/2016 12:00
05/21/2016 15:00
05/21/2016 18:00
05/21/2016 21:00
05/22/2016 00:00
05/22/2016 03:00
05/22/2016 06:00
05/22/2016 09:00
05/22/2016 12:00
05/22/2016 15:00
05/22/2016 18:00
05/22/2016 21:00
05/23/2016 00:00
05/23/2016 03:00
05/23/2016 06:00
05/23/2016 09:00
05/23/2016 12:00

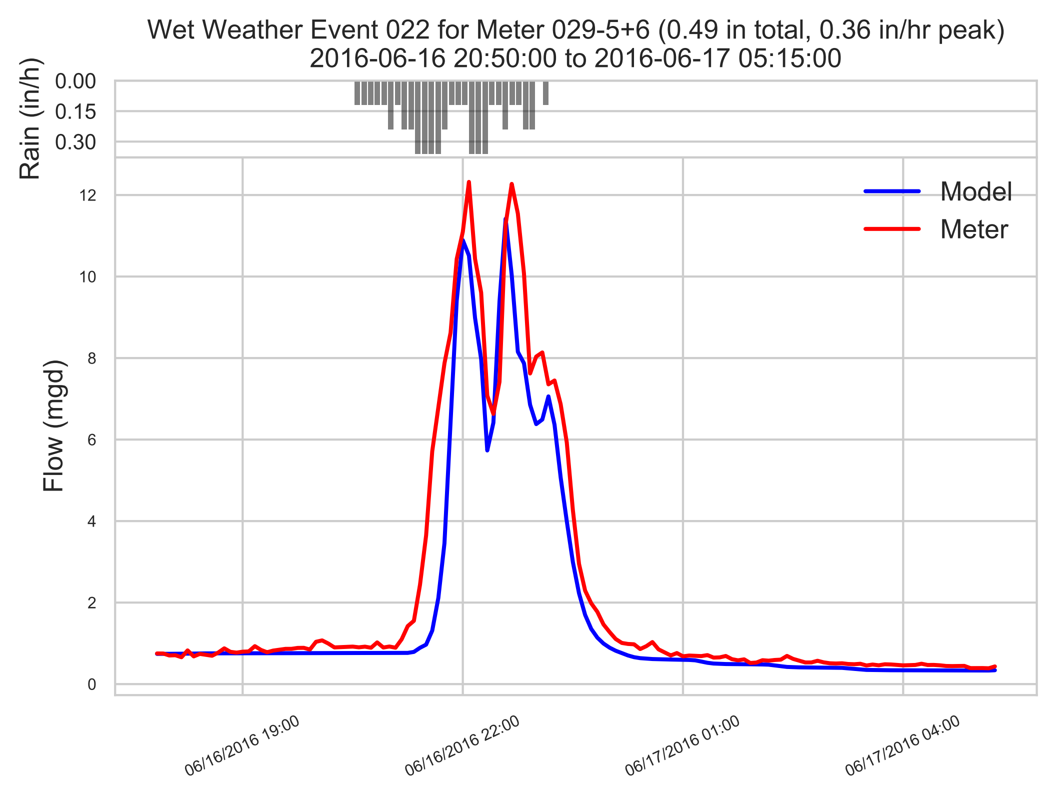

Wet Weather Event 019 for Meter 029-5+6 (0.28 in total, 0.84 in/hr peak)
2016-05-23 15:15:00 to 2016-05-24 06:45:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
05/23/2016 14:00
05/23/2016 17:00
05/23/2016 20:00
05/23/2016 23:00
05/24/2016 02:00
05/24/2016 05:00



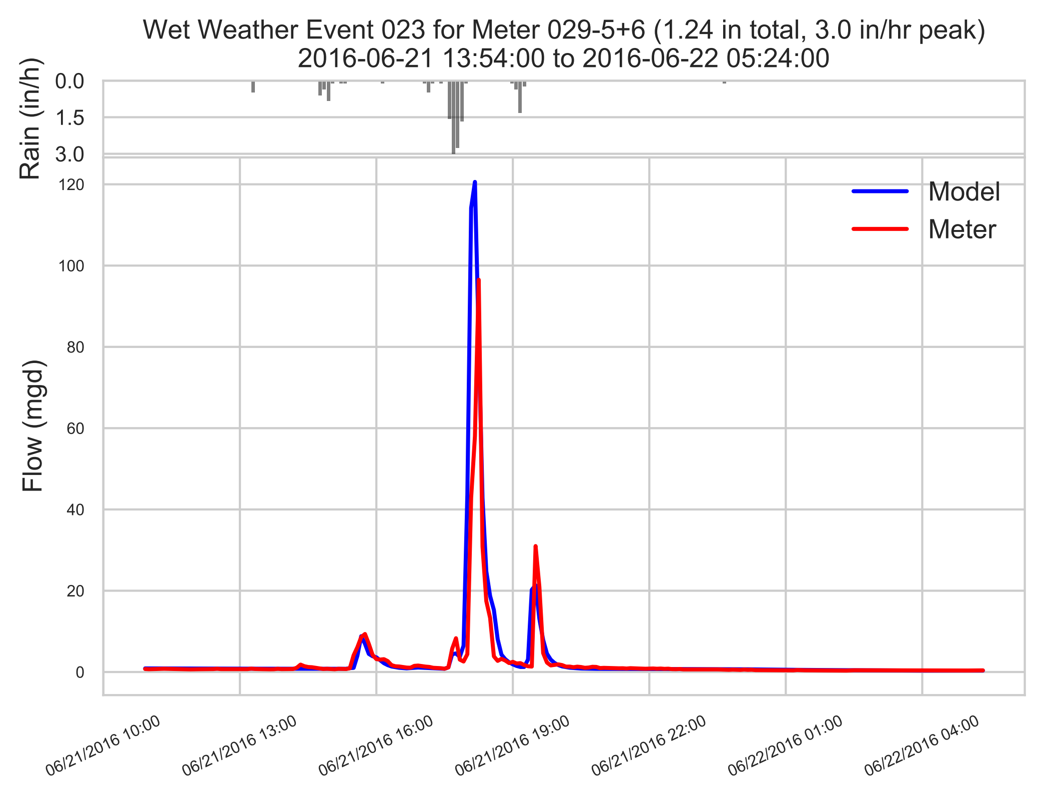
Wet Weather Event 020 for Meter 029-5+6 (0.42 in total, 0.84 in/hr peak)
2016-05-29 15:24:00 to 2016-05-30 02:24:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
0
5
10
15
20
Model
Meter
05/29/2016 14:00
05/29/2016 17:00
05/29/2016 20:00
05/29/2016 23:00
05/30/2016 02:00



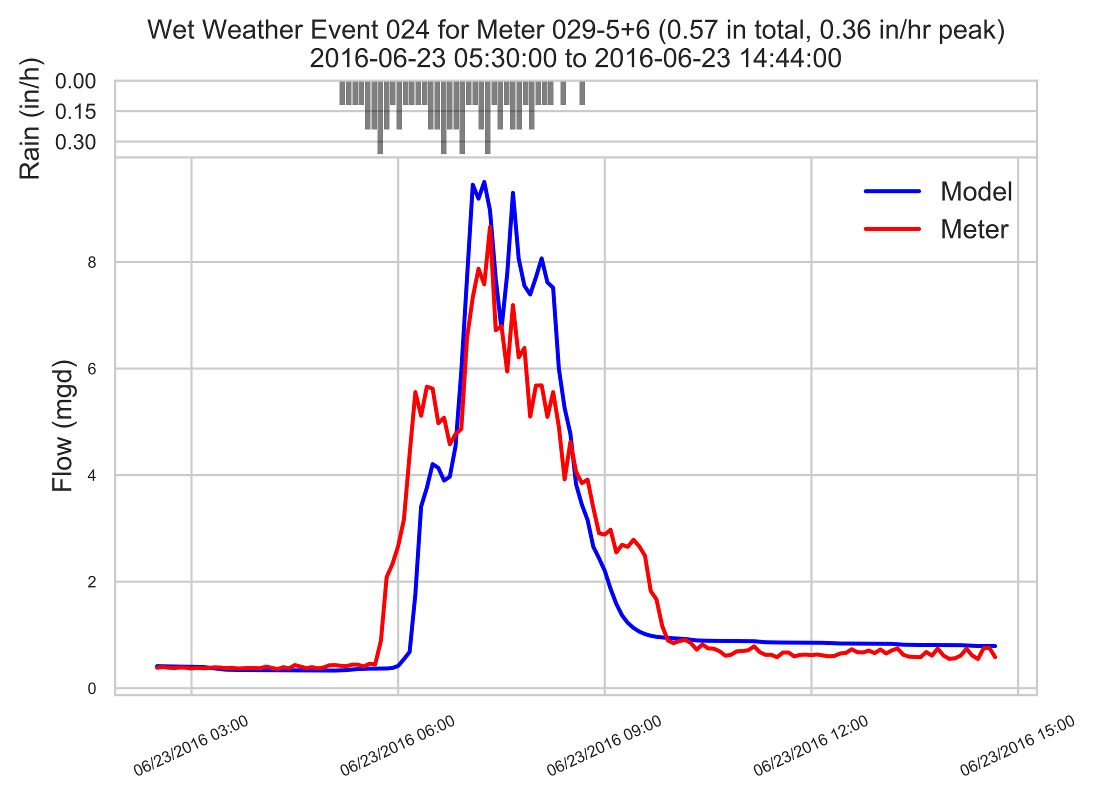
Wet Weather Event 021 for Meter 029-5+6 (0.46 in total, 0.96 in/hr peak)
2016-06-03 11:50:00 to 2016-06-03 23:44:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
06/03/2016 09:00
06/03/2016 12:00
06/03/2016 15:00
06/03/2016 18:00
06/03/2016 21:00
06/04/2016 00:00



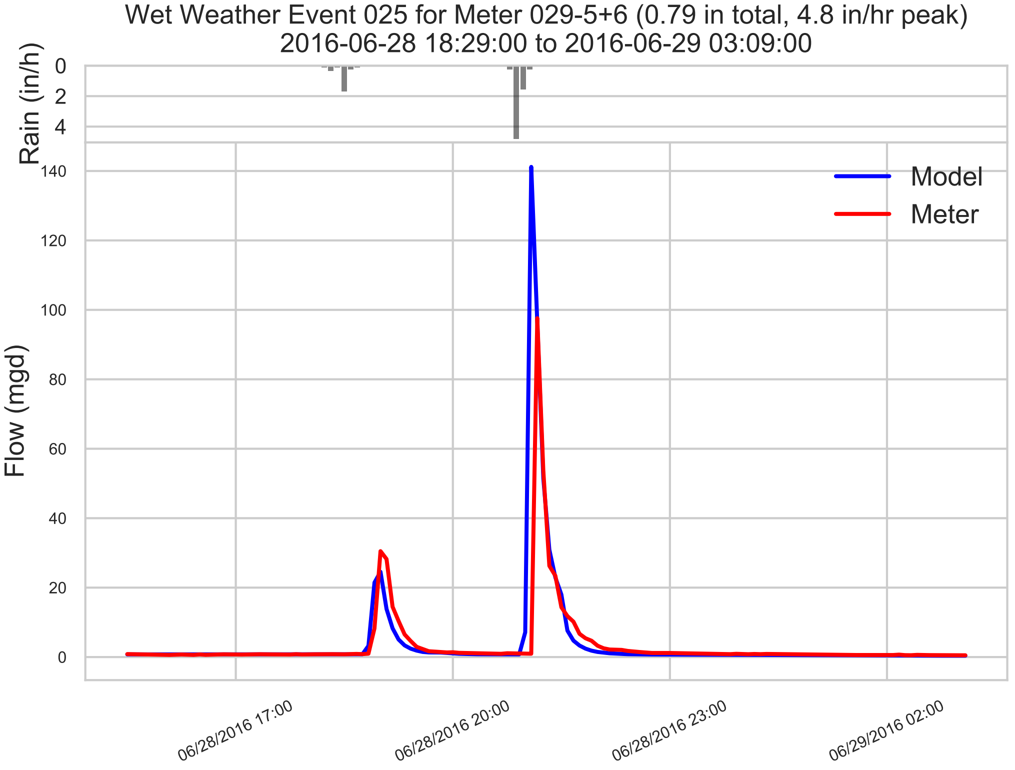
Wet Weather Event 022 for Meter 029-5+6 (0.49 in total, 0.36 in/hr peak)
2016-06-16 20:50:00 to 2016-06-17 05:15:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0
2
4
6
8
10
12
Model
Meter
06/16/2016 19:00
06/16/2016 22:00
06/17/2016 01:00
06/17/2016 04:00



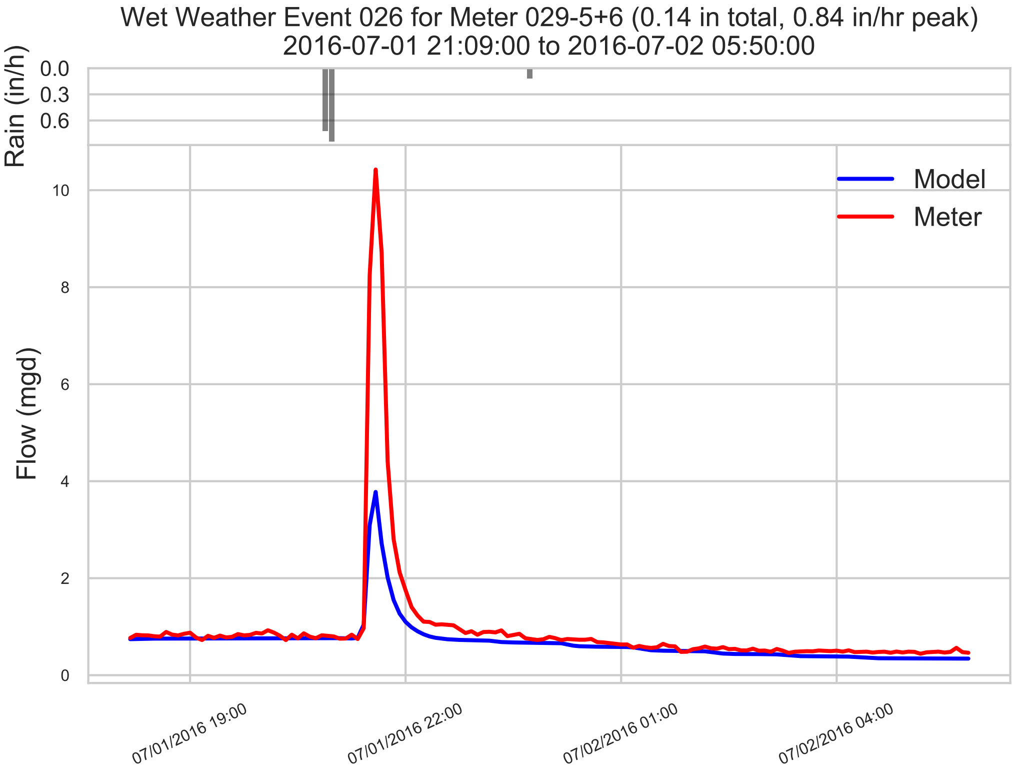
Wet Weather Event 023 for Meter 029-5+6 (1.24 in total, 3.0 in/hr peak)
2016-06-21 13:54:00 to 2016-06-22 05:24:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
120
100
80
60
40
20
0
Model
Meter
06/21/2016 10:00
06/21/2016 13:00
06/21/2016 16:00
06/21/2016 19:00
06/21/2016 22:00
06/22/2016 01:00
06/22/2016 04:00



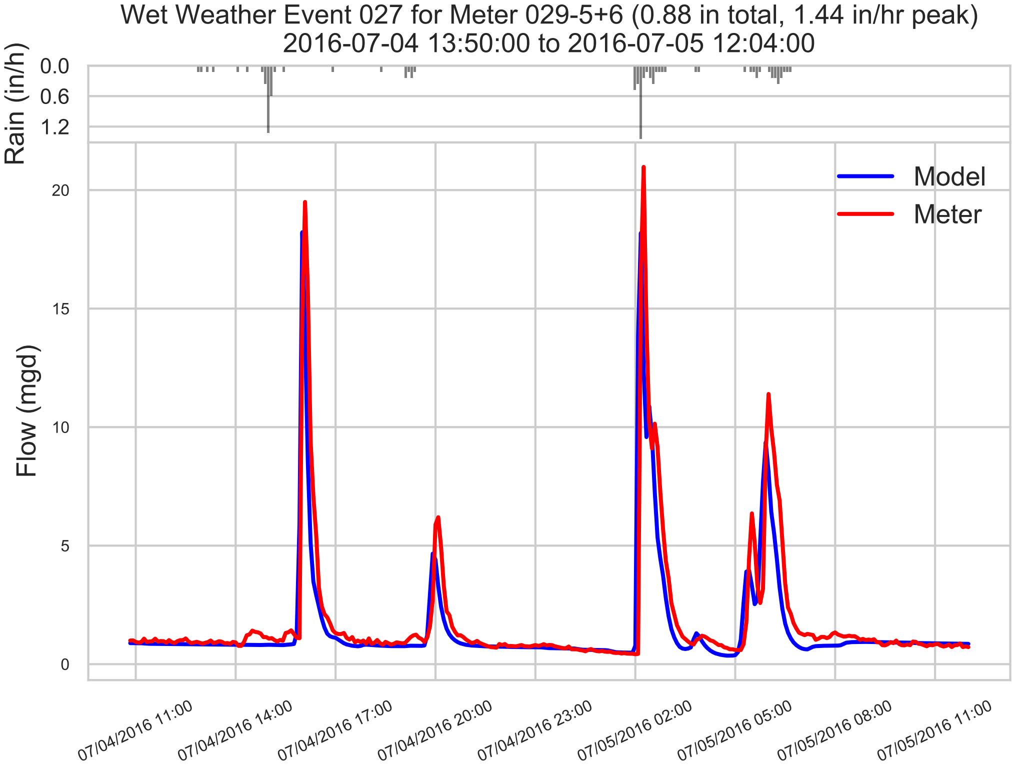
Wet Weather Event 024 for Meter 029-5+6 (0.57 in total, 0.36 in/hr peak)
2016-06-23 05:30:00 to 2016-06-23 14:44:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0
2
4
6
8
Model
Meter
06/23/2016 03:00
06/23/2016 06:00
06/23/2016 09:00
06/23/2016 12:00
06/23/2016 15:00



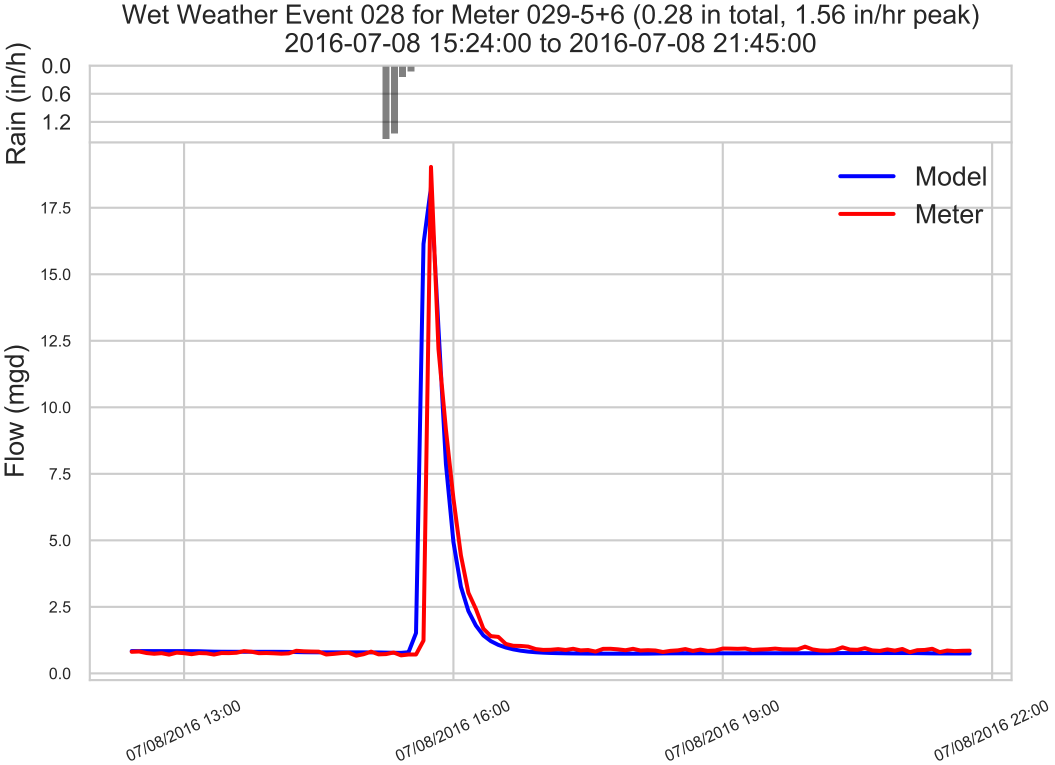
Wet Weather Event 025 for Meter 029-5+6 (0.79 in total, 4.8 in/hr peak)
2016-06-28 18:29:00 to 2016-06-29 03:09:00
Rain (in/h)
0
2
4
Flow (mgd)
140
120
100
80
60
40
20
0
Model
Meter
06/28/2016 17:00
06/28/2016 20:00
06/28/2016 23:00
06/29/2016 02:00



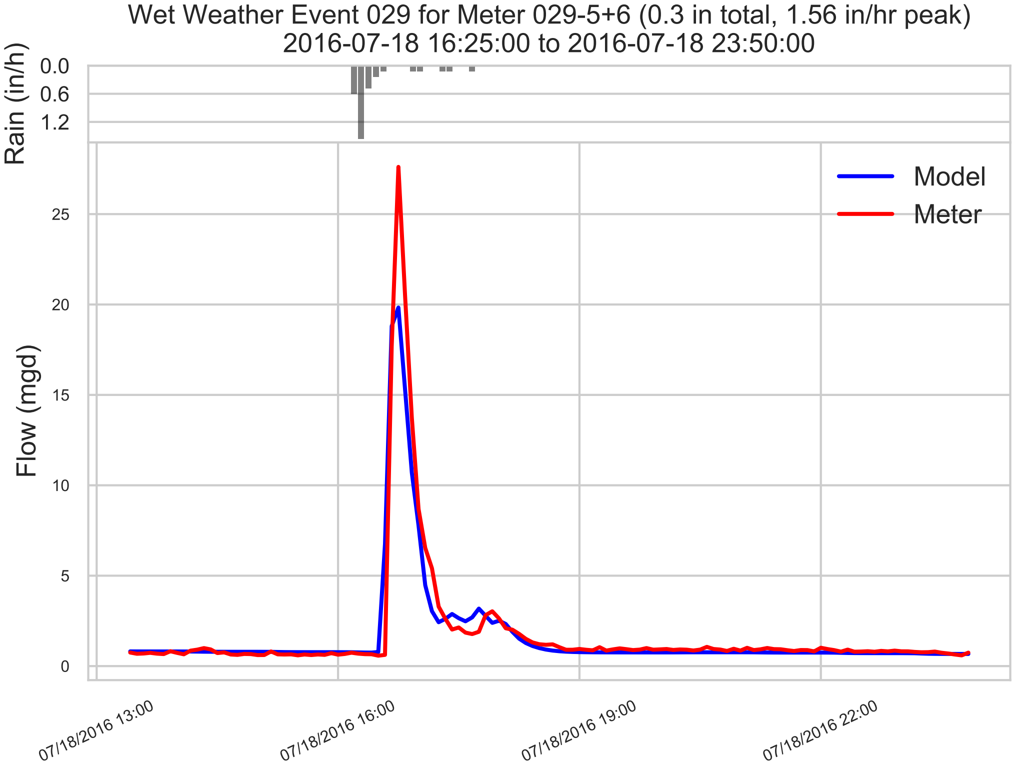
Wet Weather Event 026 for Meter 029-5+6 (0.14 in total, 0.84 in/hr peak)
2016-07-01 21:09:00 to 2016-07-02 05:50:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
10
8
6
4
2
0
Model
Meter
07/01/2016 19:00
07/01/2016 22:00
07/02/2016 01:00
07/02/2016 04:00



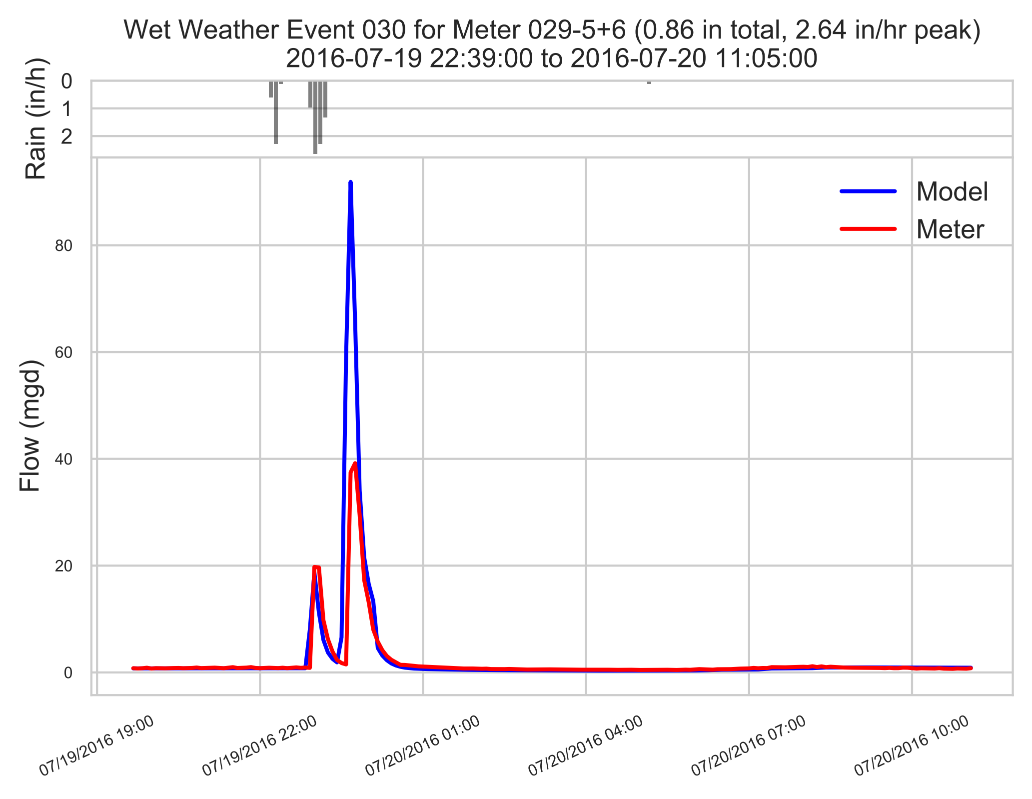
Wet Weather Event 027 for Meter 029-5+6 (0.88 in total, 1.44 in/hr peak)
2016-07-04 13:50:00 to 2016-07-05 12:04:00
Rain (in/h)
0.0
0.6
1.2
Flow (mgd)
20
15
10
5
0
Model
Meter
07/04/2016 11:00
07/04/2016 14:00
07/04/2016 17:00
07/04/2016 20:00
07/04/2016 23:00
07/05/2016 02:00
07/05/2016 05:00
07/05/2016 08:00
07/05/2016 11:00

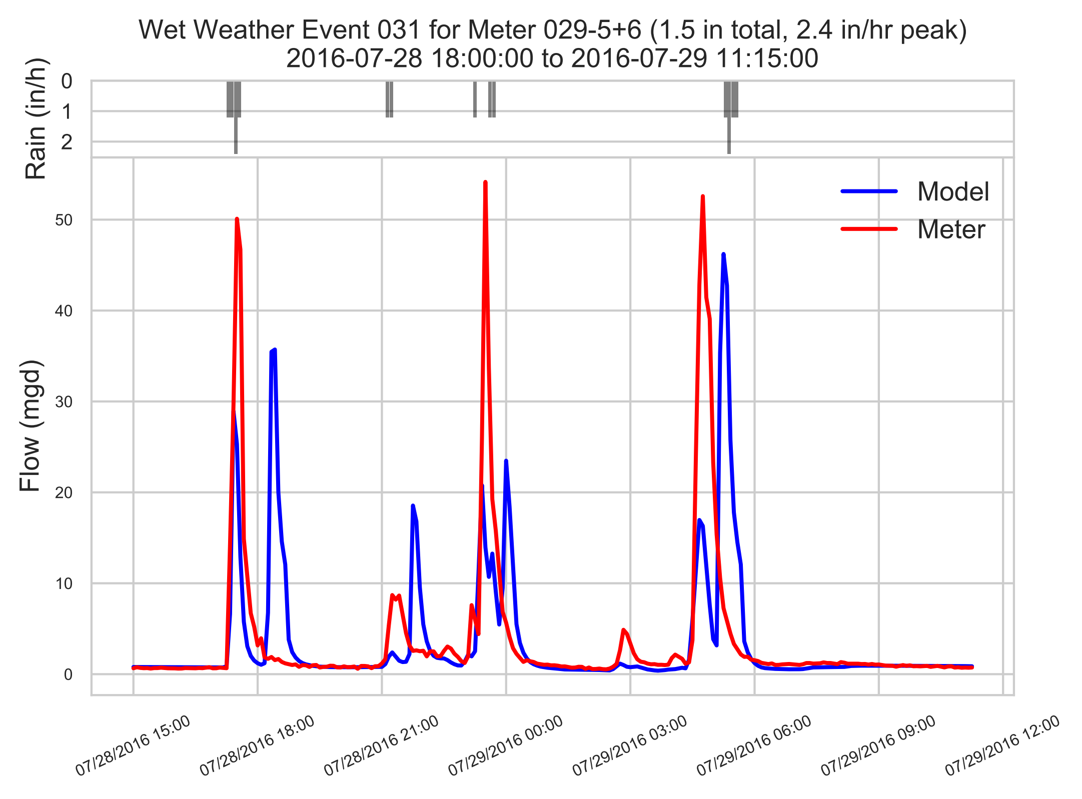


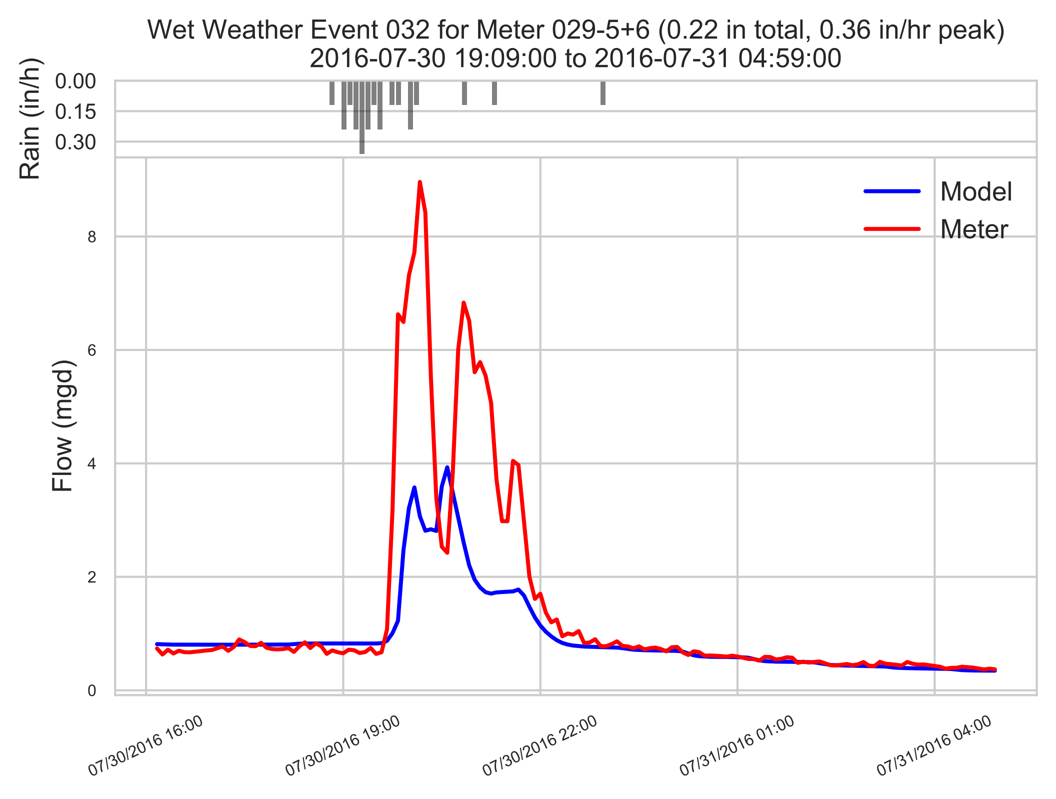
Wet Weather Event 028 for Meter 029-5+6 (0.28 in total, 1.56 in/hr peak)
2016-07-08 15:24:00 to 2016-07-08 21:45:00
Rain (in/h)
0.0
0.6
1.2
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
07/08/2016 13:00
07/08/2016 16:00
07/08/2016 19:00
07/08/2016 22:00



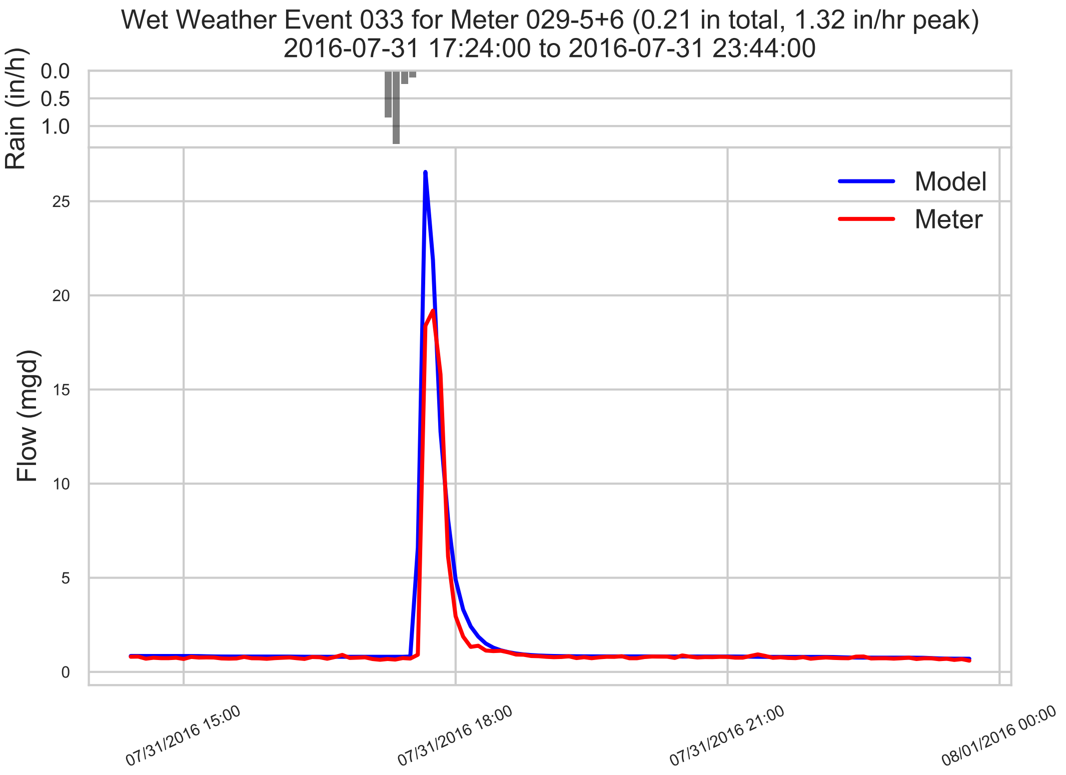
Wet Weather Event 029 for Meter 029-5+6 (0.3 in total, 1.56 in/hr peak)
2016-07-18 16:25:00 to 2016-07-18 23:50:00
Rain (in/h)
0.0
0.6
1.2
Flow (mgd)
0
5
10
15
20
25
Model
Meter
07/18/2016 13:00
07/18/2016 16:00
07/18/2016 19:00
07/18/2016 22:00


Wet Weather Event 030 for Meter 029-5+6 (0.86 in total, 2.64 in/hr peak)
2016-07-19 22:39:00 to 2016-07-20 11:05:00
Rain (in/h)
0
1
2
Flow (mgd)
0
20
40
60
80
Model
Meter
07/19/2016 19:00
07/19/2016 22:00
07/20/2016 01:00
07/20/2016 04:00
07/20/2016 07:00
07/20/2016 10:00

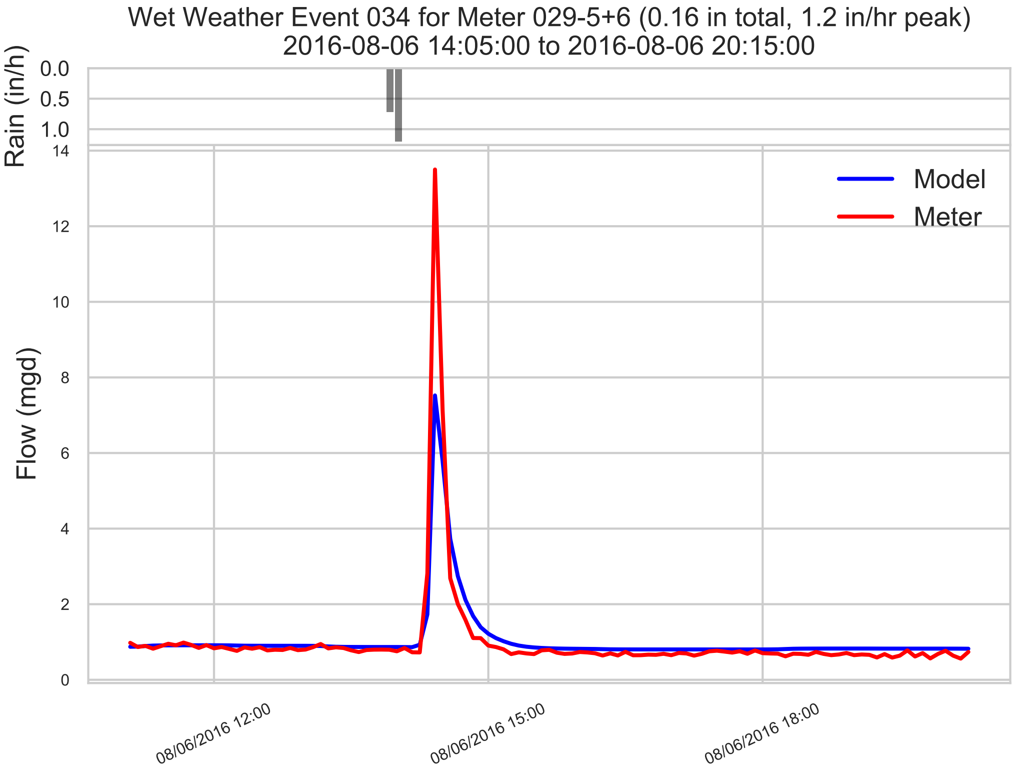

Wet Weather Event 031 for Meter 029-5+6 (1.5 in total, 2.4 in/hr peak)
2016-07-28 18:00:00 to 2016-07-29 11:15:00
Rain (in/h)
0
1
2
Flow (mgd)
0
10
20
30
40
50
Model
Meter
07/28/2016 15:00
07/28/2016 18:00
07/28/2016 21:00
07/29/2016 00:00
07/29/2016 03:00
07/29/2016 06:00
07/29/2016 09:00
07/29/2016 12:00

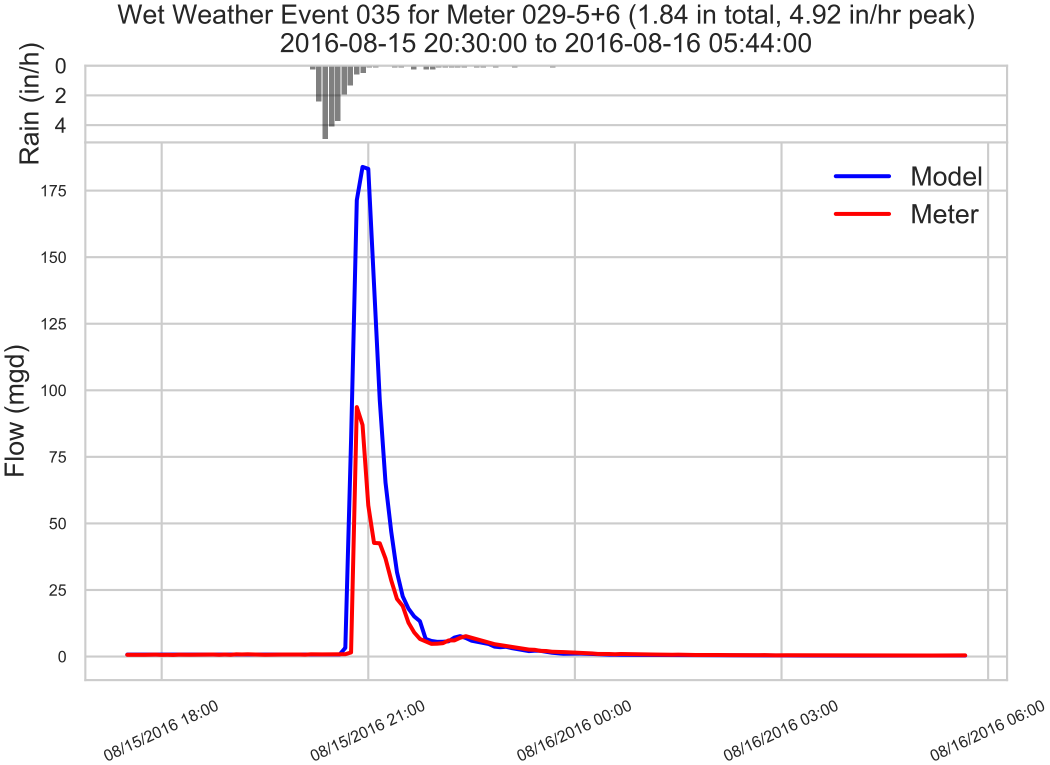


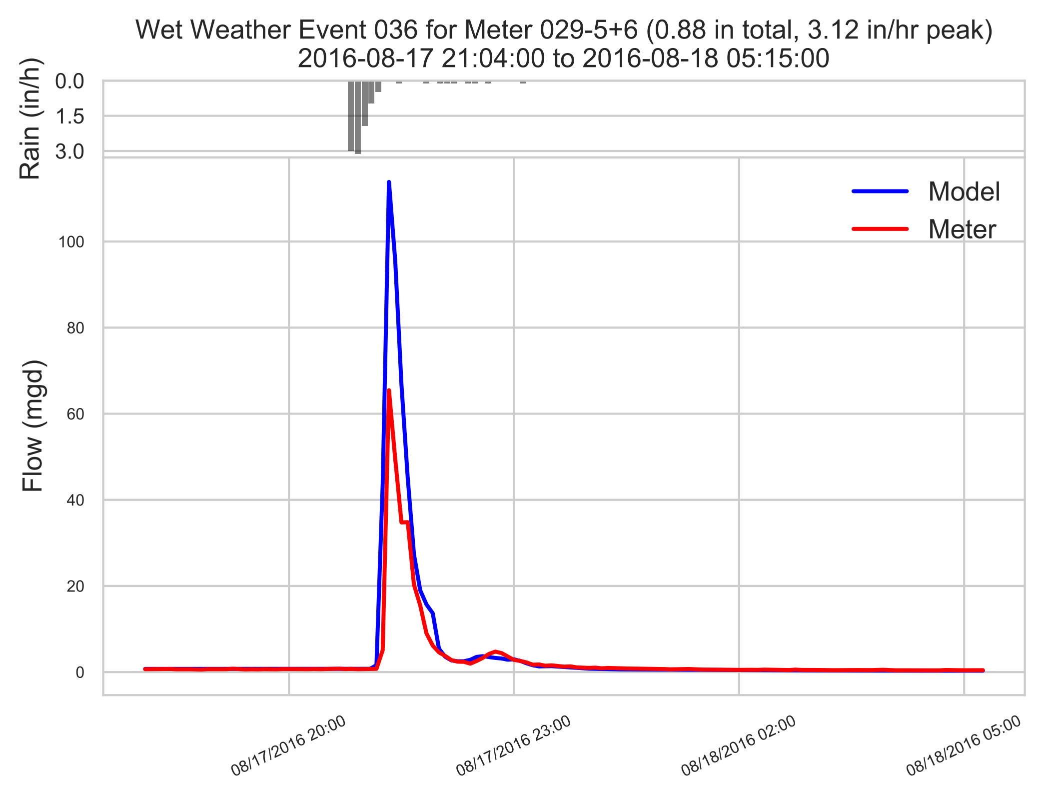
Wet Weather Event 032 for Meter 029-5+6 (0.22 in total, 0.36 in/hr peak)
2016-07-30 19:09:00 to 2016-07-31 04:59:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0
2
4
6
8
Model
Meter
07/30/2016 16:00
07/30/2016 19:00
07/30/2016 22:00
07/31/2016 01:00
07/31/2016 04:00



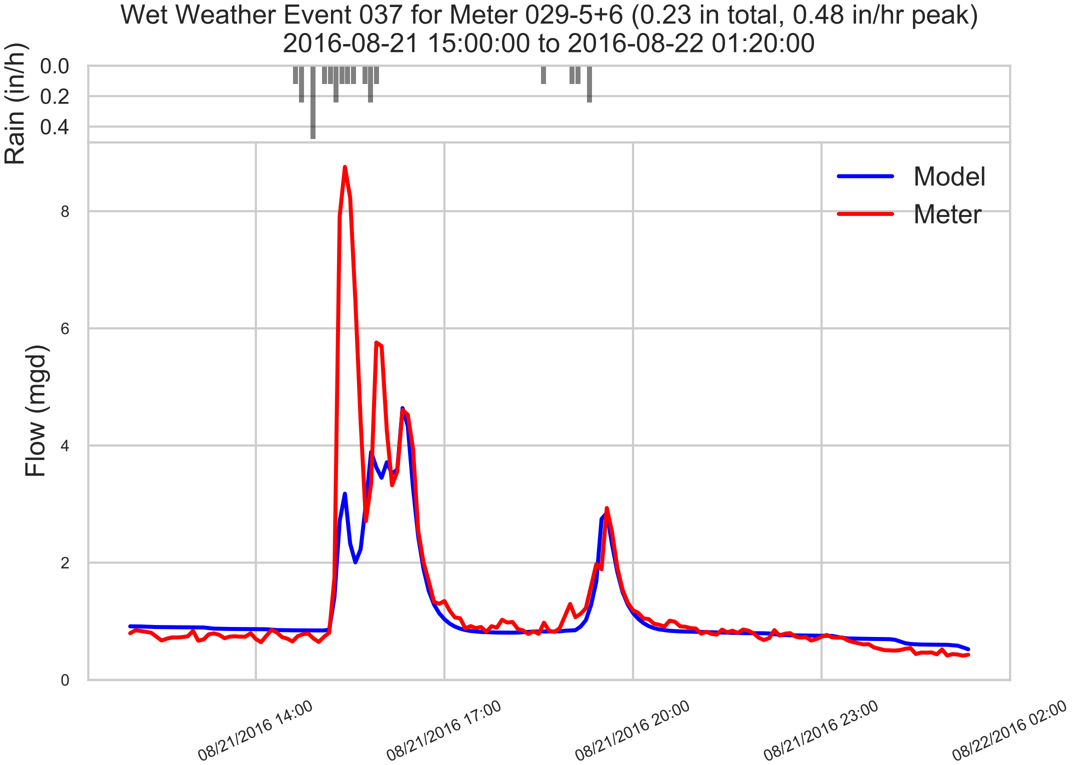
Wet Weather Event 033 for Meter 029-5+6 (0.21 in total, 1.32 in/hr peak)
2016-07-31 17:24:00 to 2016-07-31 23:44:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
25
20
15
10
5
0
Model
Meter
07/31/2016 15:00
07/31/2016 18:00
07/31/2016 21:00
08/01/2016 00:00

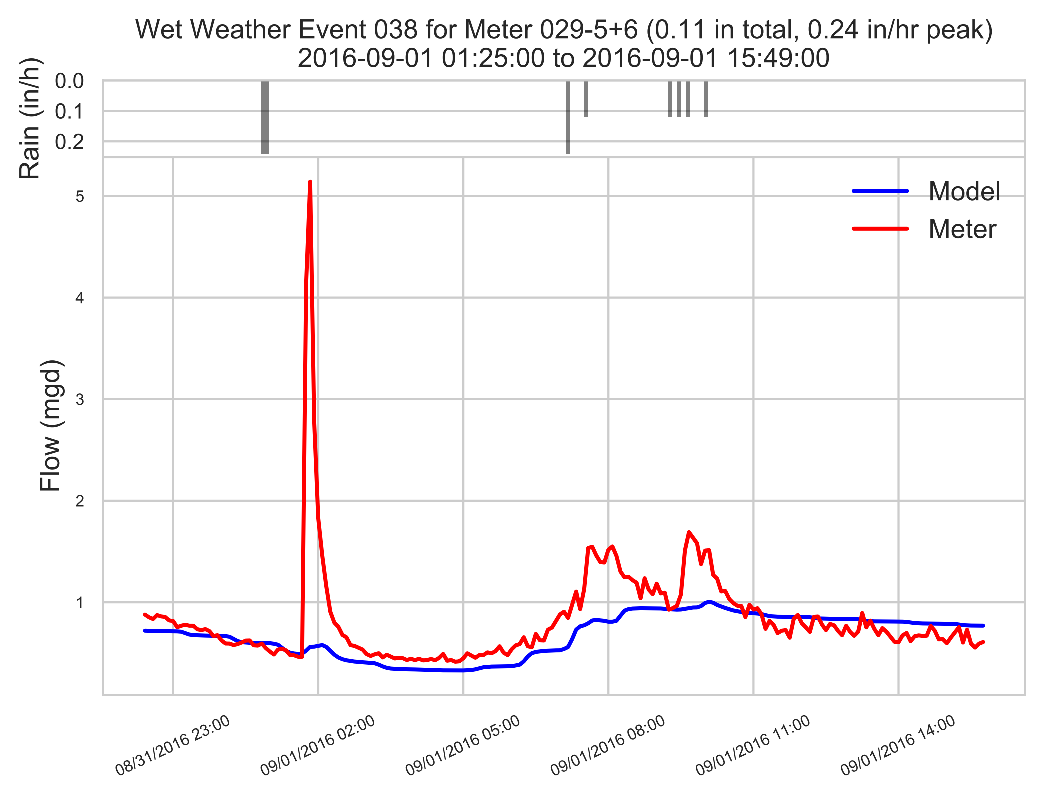

Wet Weather Event 034 for Meter 029-5+6 (0.16 in total, 1.2 in/hr peak)
2016-08-06 14:05:00 to 2016-08-06 20:15:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
14
12
10
8
6
4
2
0
Model
Meter
08/06/2016 12:00
08/06/2016 15:00
08/06/2016 18:00


Wet Weather Event 035 for Meter 029-5+6 (1.84 in total, 4.92 in/hr peak)
2016-08-15 20:30:00 to 2016-08-16 05:44:00
Rain (in/h)
0
2
4
Flow (mgd)
175
150
125
100
75
50
25
0
Model
Meter
08/15/2016 18:00
08/15/2016 21:00
08/16/2016 00:00
08/16/2016 03:00
08/16/2016 06:00

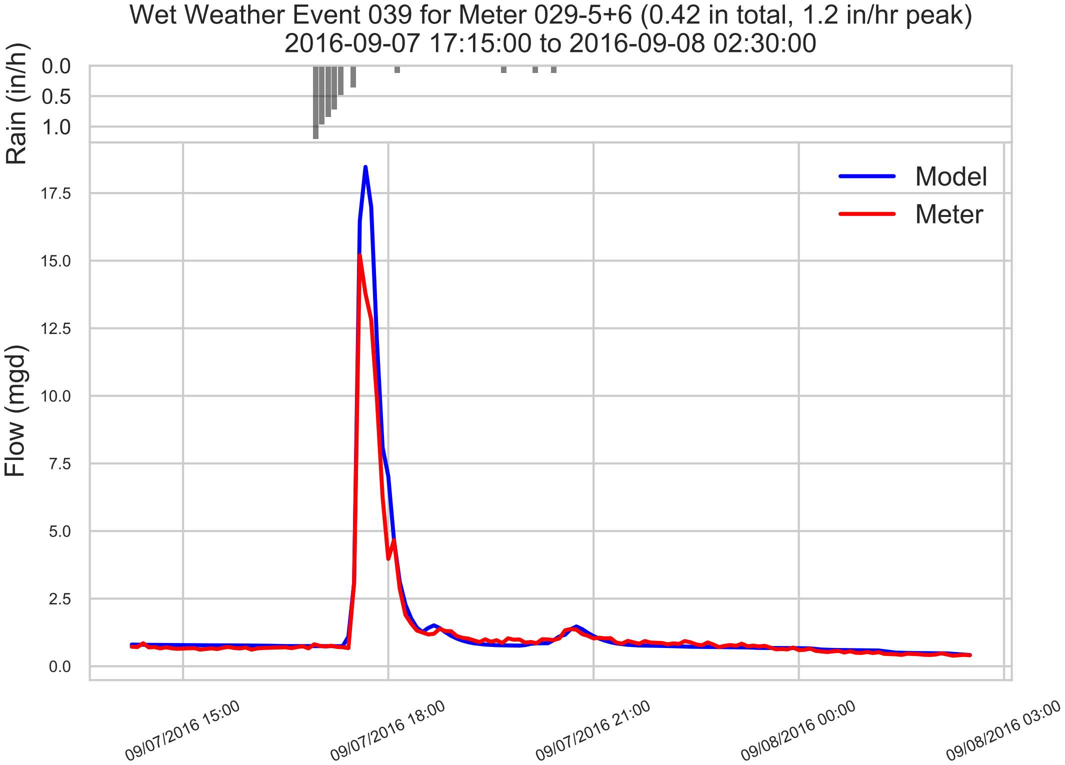


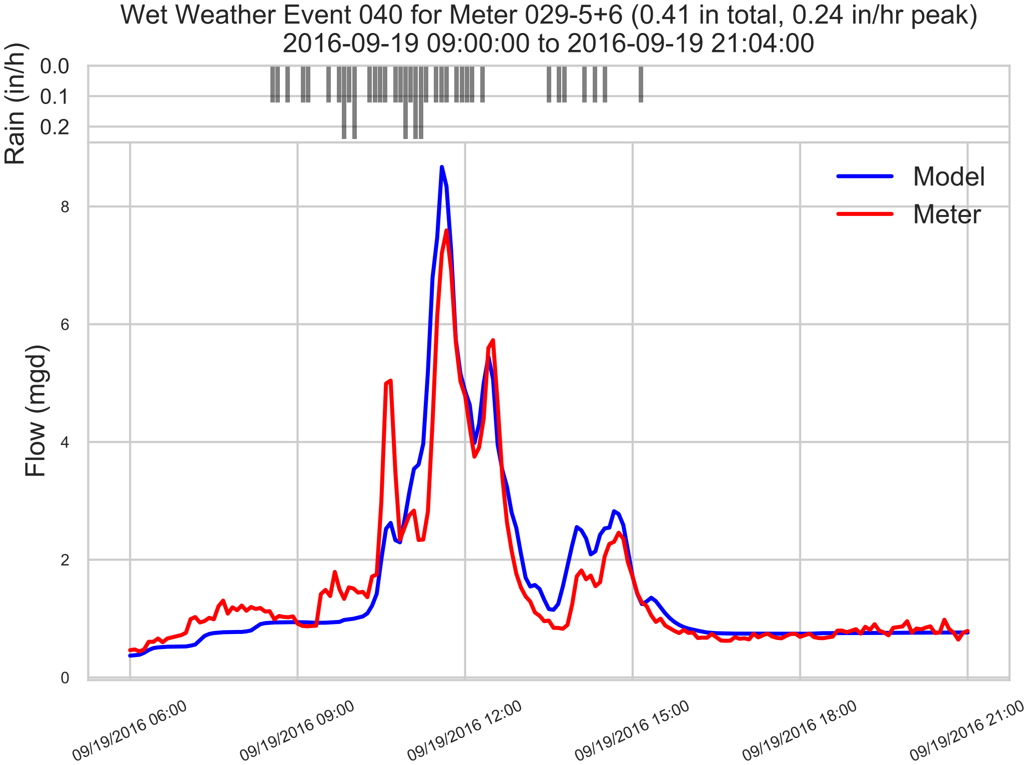
Wet Weather Event 036 for Meter 029-5+6 (0.88 in total, 3.12 in/hr peak)
2016-08-17 21:04:00 to 2016-08-18 05:15:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
0
20
40
60
80
100
Model
Meter
08/17/2016 20:00
08/17/2016 23:00
08/18/2016 02:00
08/18/2016 05:00

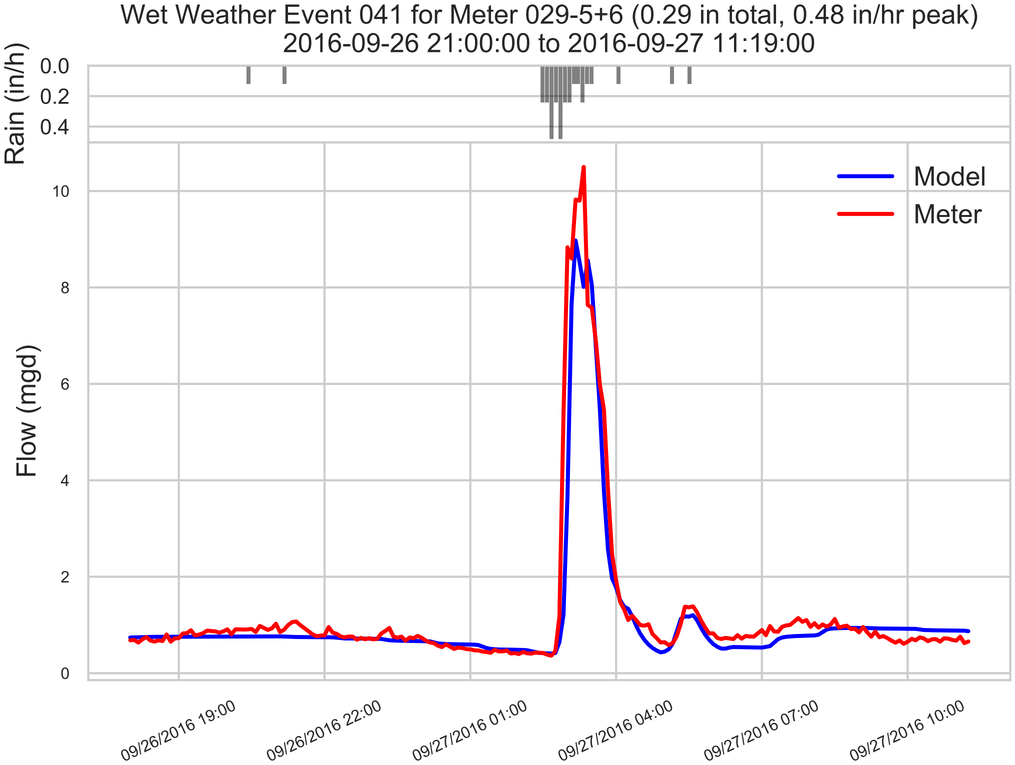

Wet Weather Event 037 for Meter 029-5+6 (0.23 in total, 0.48 in/hr peak)
2016-08-21 15:00:00 to 2016-08-22 01:20:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
2
4
6
8
Model
Meter
08/21/2016 14:00
08/21/2016 17:00
08/21/2016 20:00
08/21/2016 23:00
08/22/2016 02:00



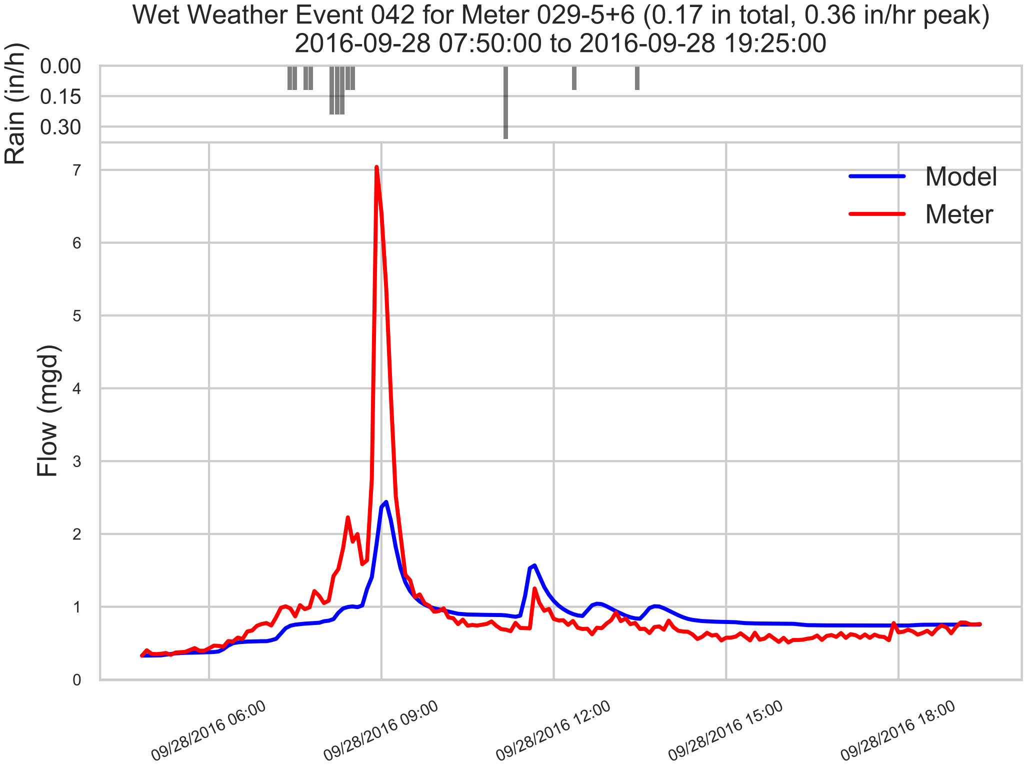
Wet Weather Event 038 for Meter 029-5+6 (0.11 in total, 0.24 in/hr peak)
2016-09-01 01:25:00 to 2016-09-01 15:49:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
5
4
3
2
1
Model
Meter
08/31/2016 23:00
09/01/2016 02:00
09/01/2016 05:00
09/01/2016 08:00
09/01/2016 11:00
09/01/2016 14:00


Wet Weather Event 039 for Meter 029-5+6 (0.42 in total, 1.2 in/hr peak)
2016-09-07 17:15:00 to 2016-09-08 02:30:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
09/07/2016 15:00
09/07/2016 18:00
09/07/2016 21:00
09/08/2016 00:00
09/08/2016 03:00

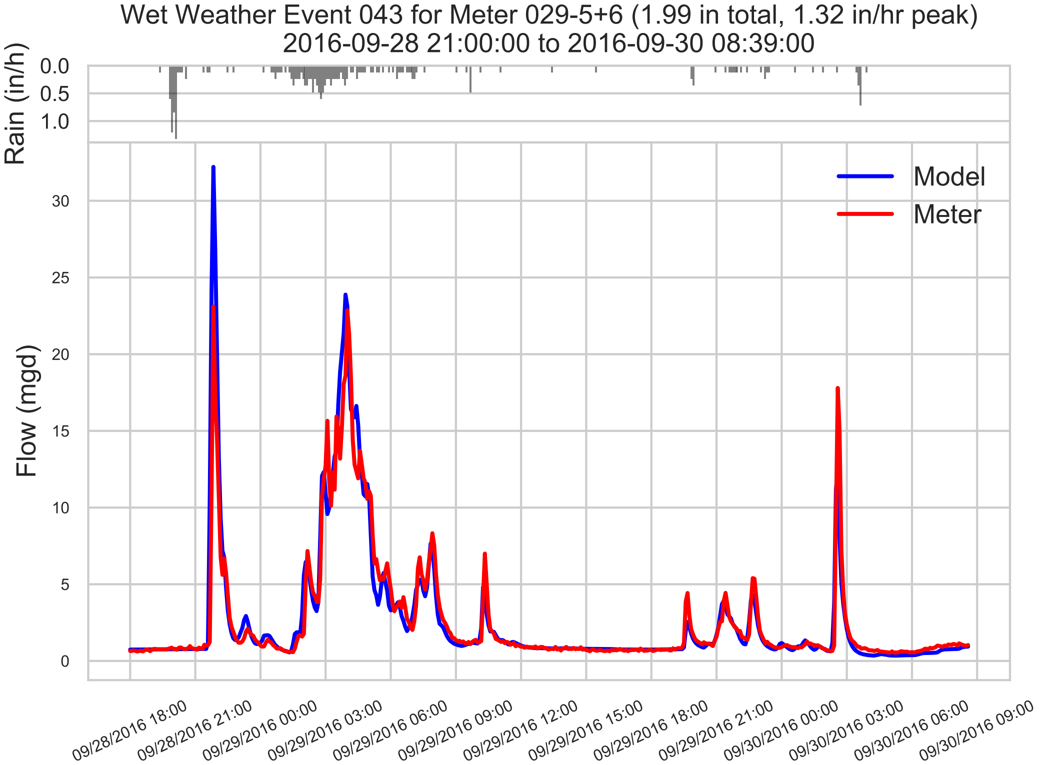

Wet Weather Event 040 for Meter 029-5+6 (0.41 in total, 0.24 in/hr peak)
2016-09-19 09:00:00 to 2016-09-19 21:04:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
2
4
6
8
Model
Meter
09/19/2016 06:00
09/19/2016 09:00
09/19/2016 12:00
09/19/2016 15:00
09/19/2016 18:00
09/19/2016 21:00



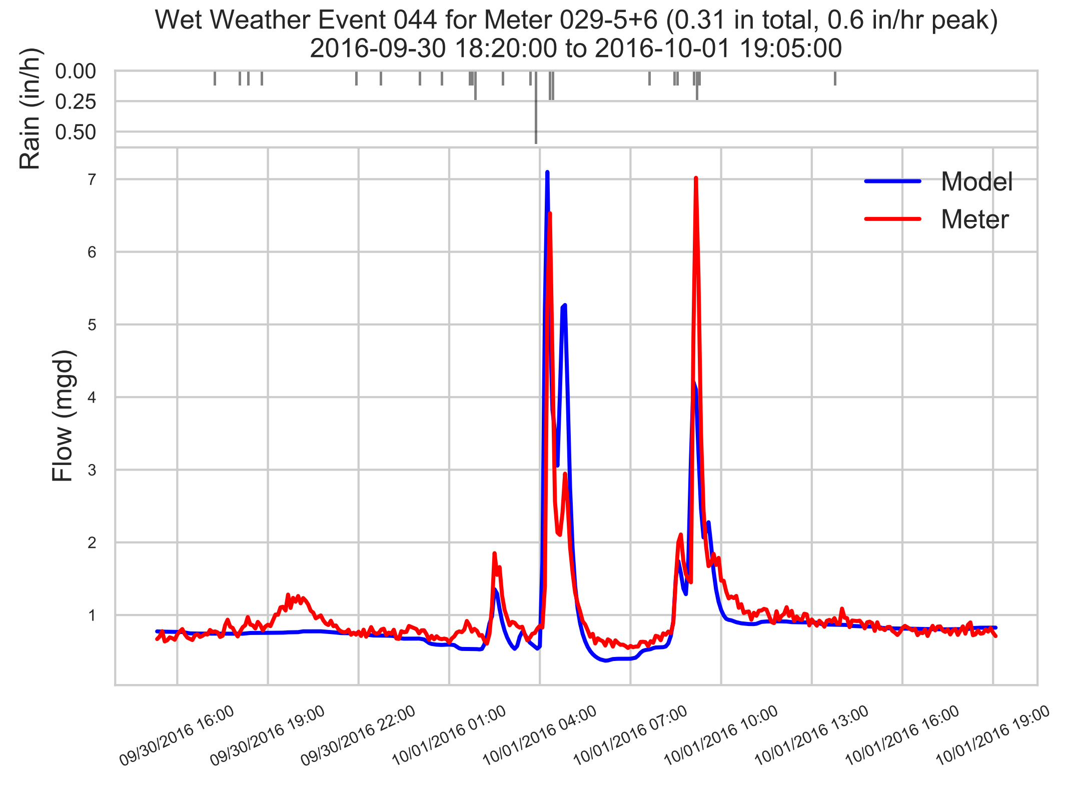
Wet Weather Event 041 for Meter 029-5+6 (0.29 in total, 0.48 in/hr peak)
2016-09-26 21:00:00 to 2016-09-27 11:19:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
2
4
6
8
10
Model
Meter
09/26/2016 19:00
09/26/2016 22:00
09/27/2016 01:00
09/27/2016 04:00
09/27/2016 07:00
09/27/2016 10:00

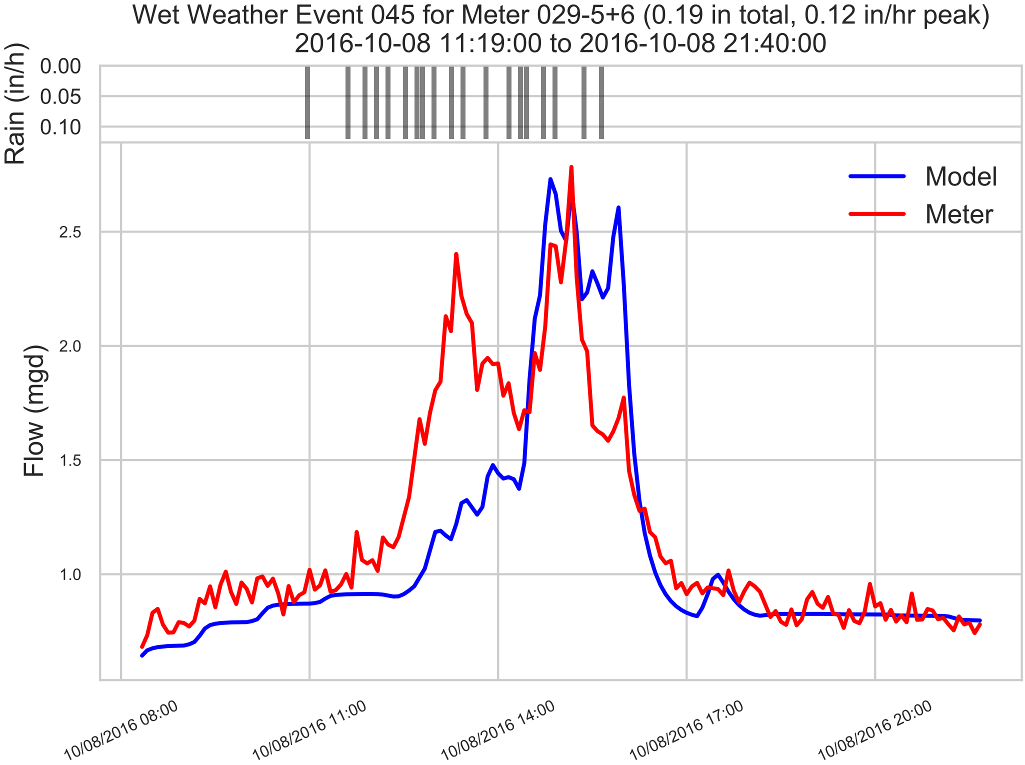


Wet Weather Event 042 for Meter 029-5+6 (0.17 in total, 0.36 in/hr peak)
2016-09-28 07:50:00 to 2016-09-28 19:25:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0
1
2
3
4
5
6
7
Model
Meter
09/28/2016 06:00
09/28/2016 09:00
09/28/2016 12:00
09/28/2016 15:00
09/28/2016 18:00

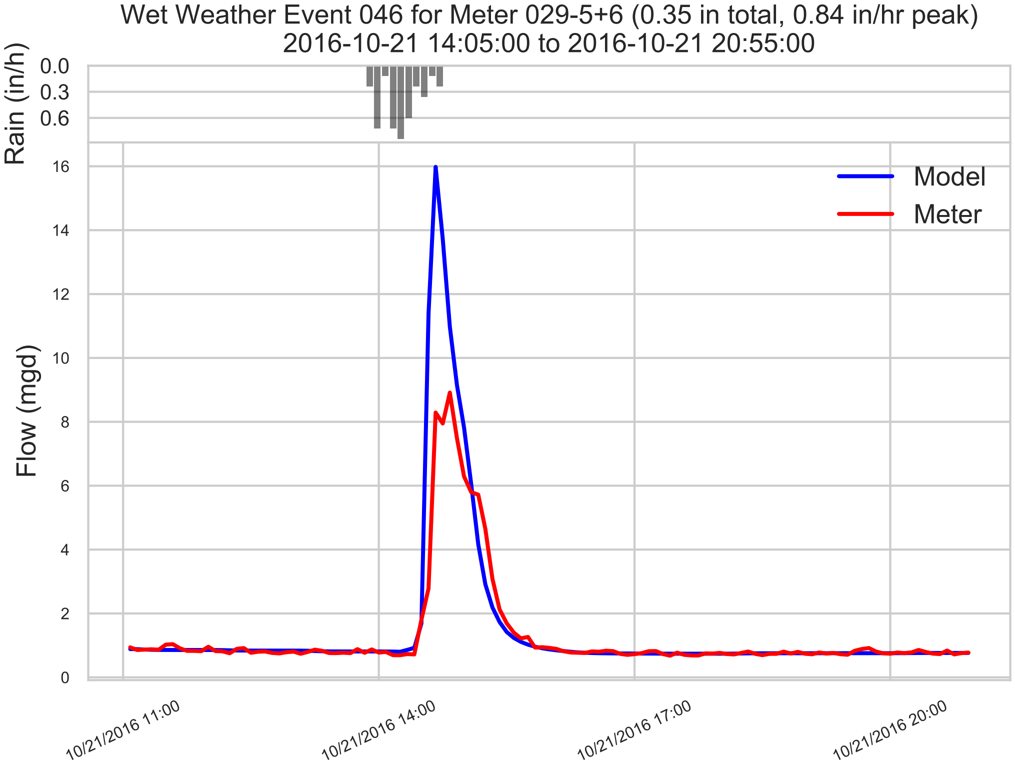


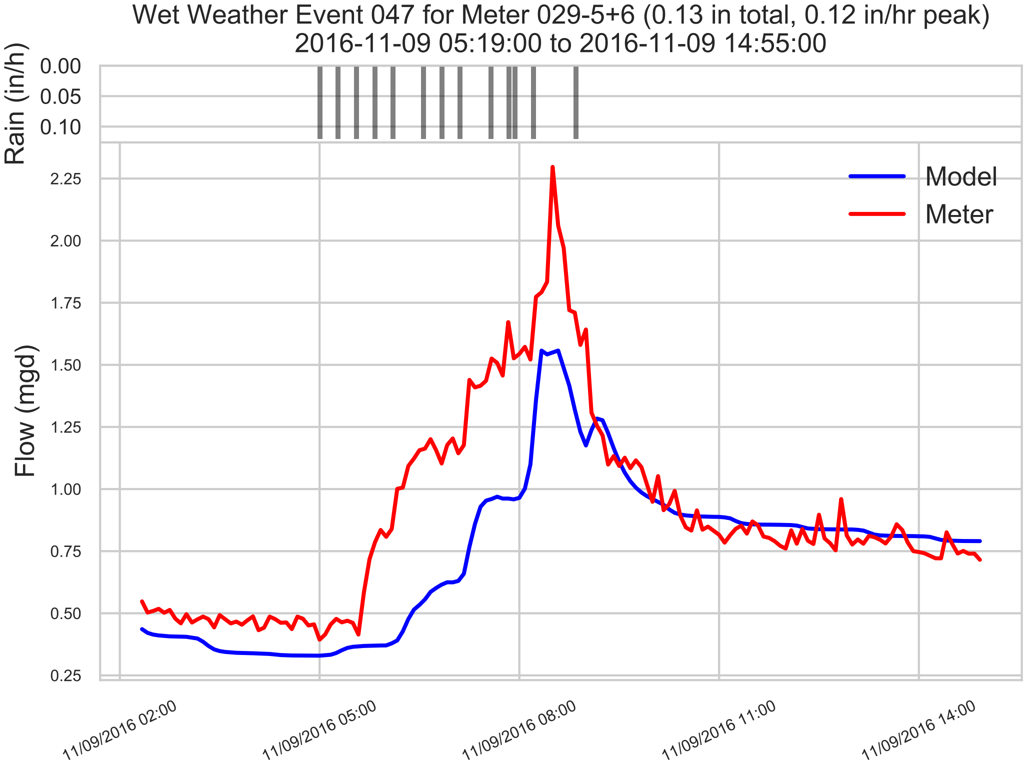
Wet Weather Event 043 for Meter 029-5+6 (1.99 in total, 1.32 in/hr peak)
2016-09-28 21:00:00 to 2016-09-30 08:39:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
0
5
10
15
20
25
30
Model
Meter
09/28/2016 18:00
09/28/2016 21:00
09/29/2016 00:00
09/29/2016 03:00
09/29/2016 06:00
09/29/2016 09:00
09/29/2016 12:00
09/29/2016 15:00
09/29/2016 18:00
09/29/2016 21:00
09/30/2016 00:00
09/30/2016 03:00
09/30/2016 06:00
09/30/2016 09:00

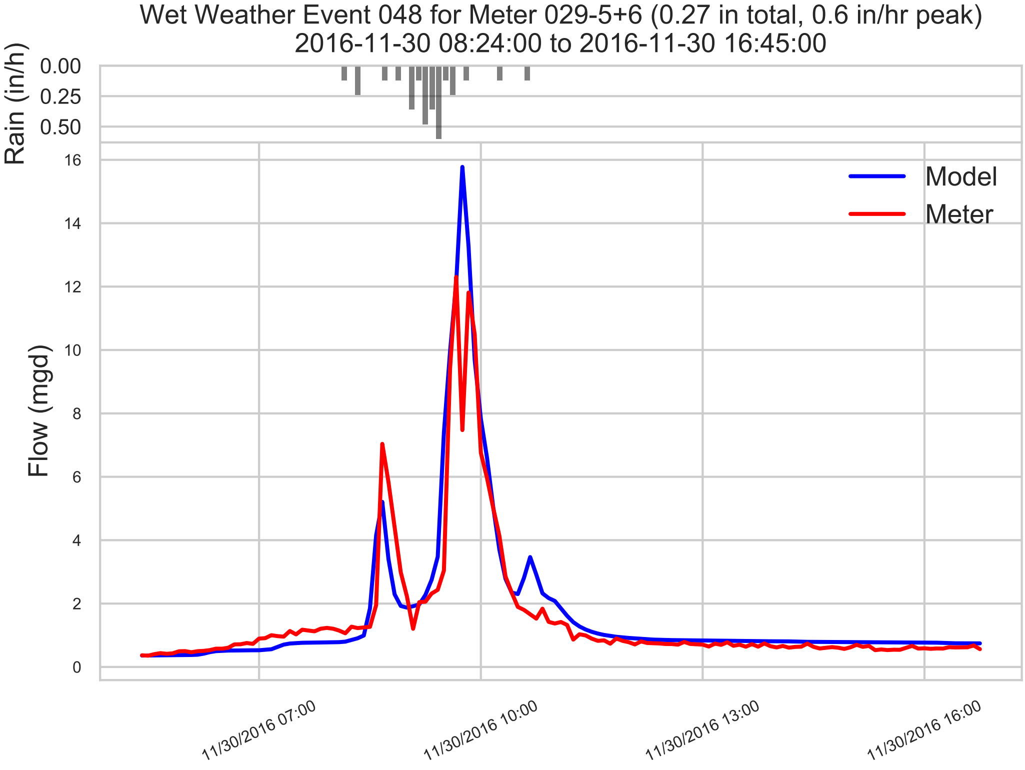

Wet Weather Event 044 for Meter 029-5+6 (0.31 in total, 0.6 in/hr peak)
2016-09-30 18:20:00 to 2016-10-01 19:05:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
1
2
3
4
5
6
7
Model
Meter
09/30/2016 16:00
09/30/2016 19:00
09/30/2016 22:00
10/01/2016 01:00
10/01/2016 04:00
10/01/2016 07:00
10/01/2016 10:00
10/01/2016 13:00
10/01/2016 16:00
10/01/2016 19:00

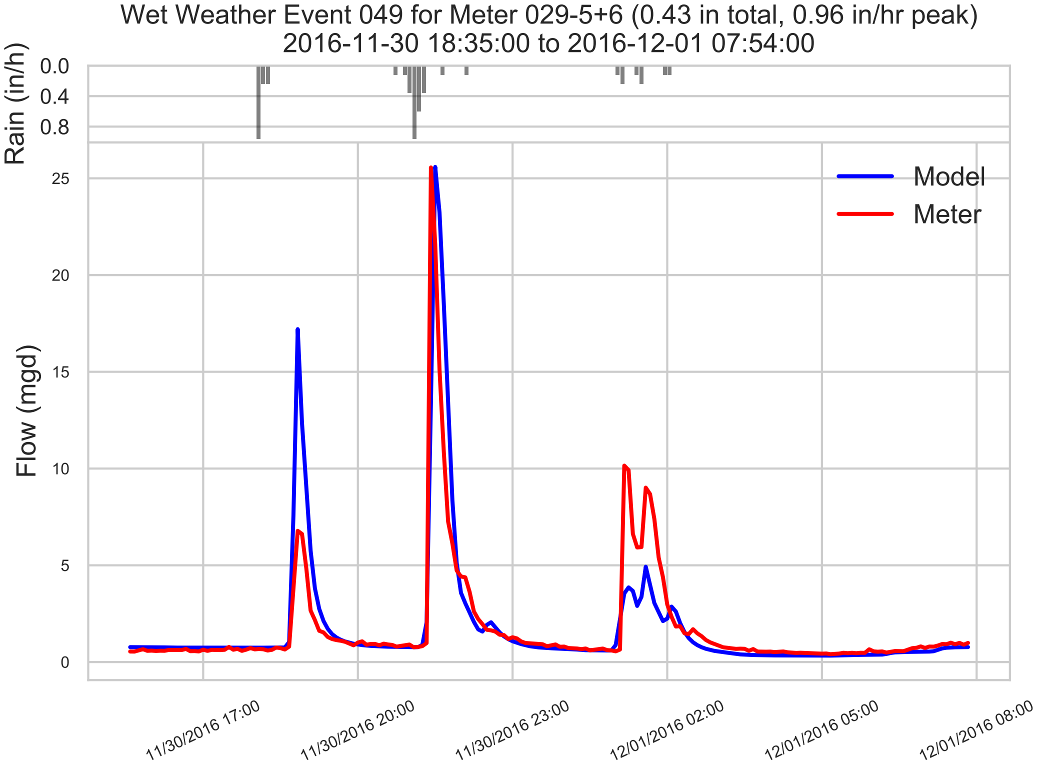


Wet Weather Event 045 for Meter 029-5+6 (0.19 in total, 0.12 in/hr peak)
2016-10-08 11:19:00 to 2016-10-08 21:40:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
2.5
2.0
1.5
1.0
Model
Meter
10/08/2016 08:00
10/08/2016 11:00
10/08/2016 14:00
10/08/2016 17:00
10/08/2016 20:00

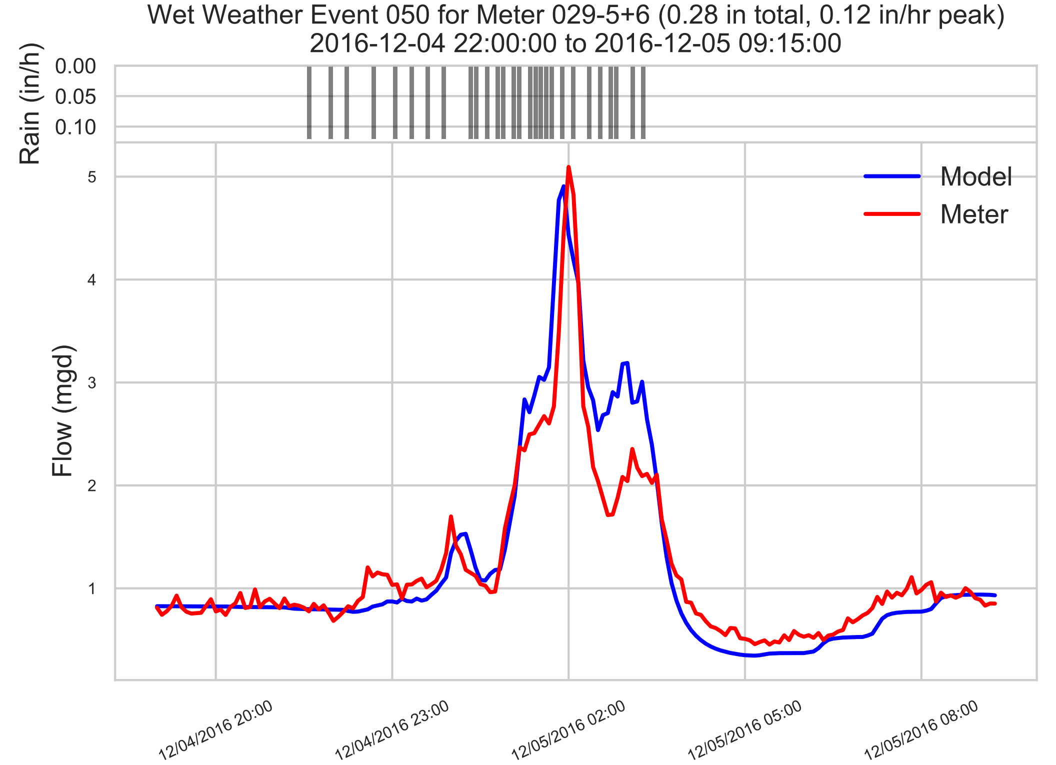

Wet Weather Event 046 for Meter 029-5+6 (0.35 in total, 0.84 in/hr peak)
2016-10-21 14:05:00 to 2016-10-21 20:55:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
16
14
12
10
8
6
4
2
0
Model
Meter
10/21/2016 11:00
10/21/2016 14:00
10/21/2016 17:00
10/21/2016 20:00


Wet Weather Event 047 for Meter 029-5+6 (0.13 in total, 0.12 in/hr peak)
2016-11-09 05:19:00 to 2016-11-09 14:55:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
Model
Meter
11/09/2016 02:00
11/09/2016 05:00
11/09/2016 08:00
11/09/2016 11:00
11/09/2016 14:00

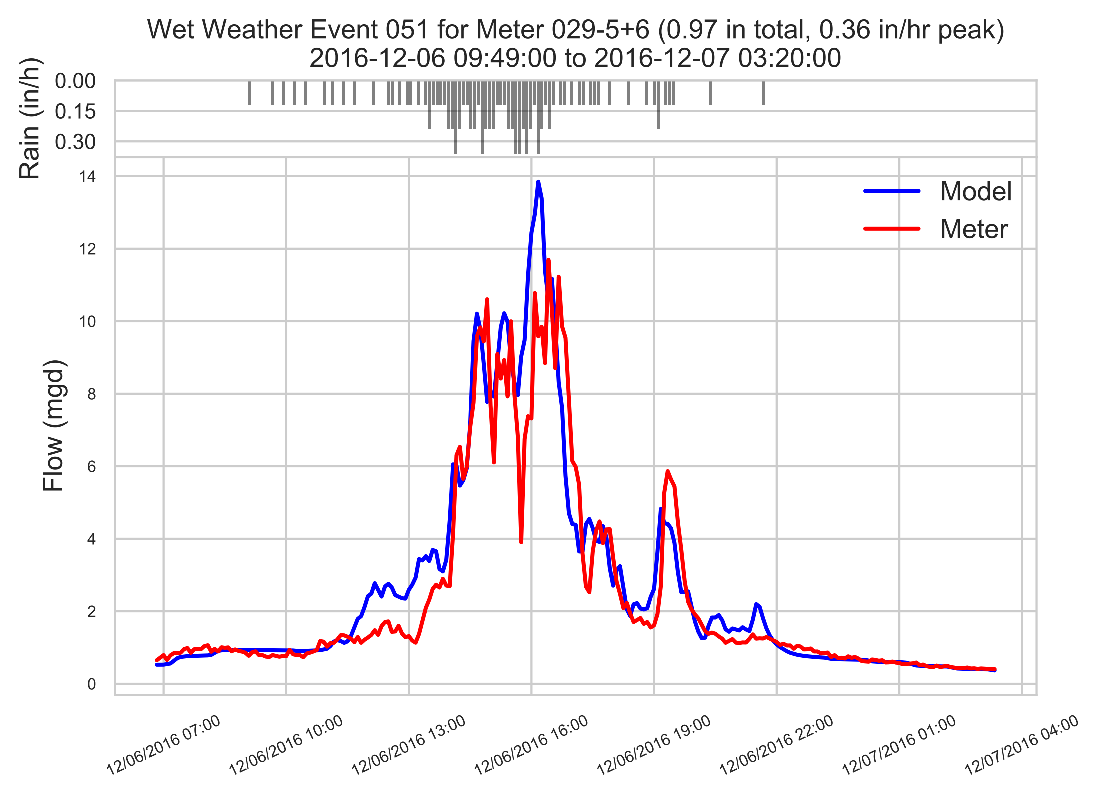

Wet Weather Event 048 for Meter 029-5+6 (0.27 in total, 0.6 in/hr peak)
2016-11-30 08:24:00 to 2016-11-30 16:45:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
16
14
12
10
8
6
4
2
0
Model
Meter
11/30/2016 07:00
11/30/2016 10:00
11/30/2016 13:00
11/30/2016 16:00



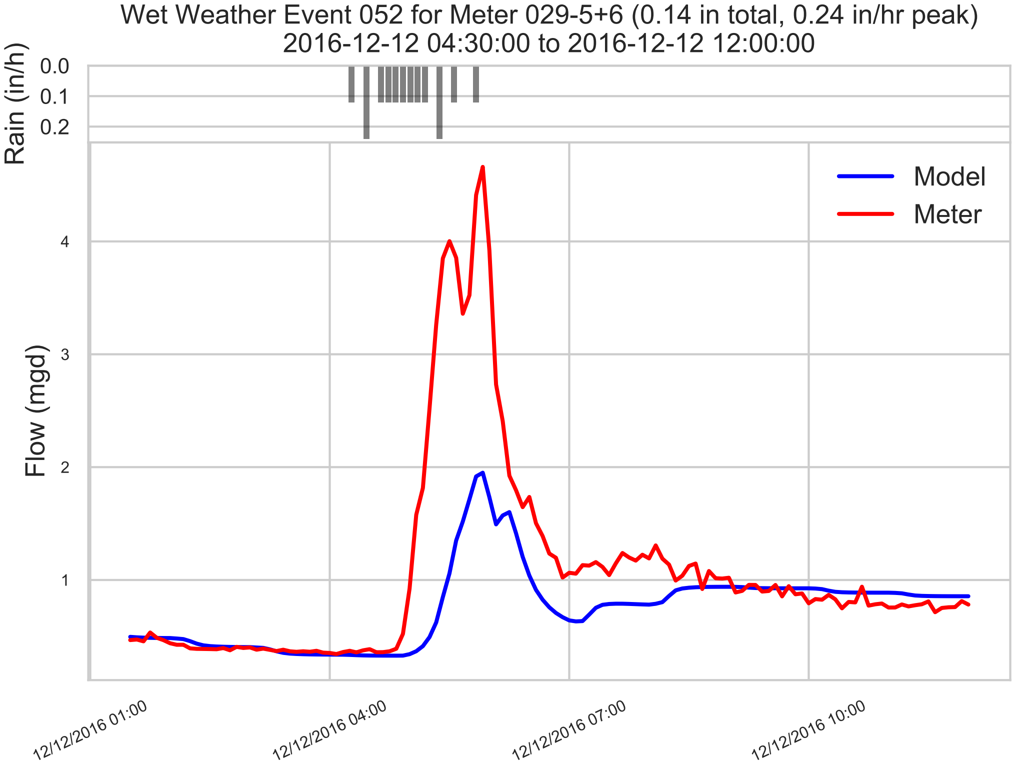
Wet Weather Event 049 for Meter 029-5+6 (0.43 in total, 0.96 in/hr peak)
2016-11-30 18:35:00 to 2016-12-01 07:54:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
25
20
15
10
5
0
Model
Meter
11/30/2016 17:00
11/30/2016 20:00
11/30/2016 23:00
12/01/2016 02:00
12/01/2016 05:00
12/01/2016 08:00



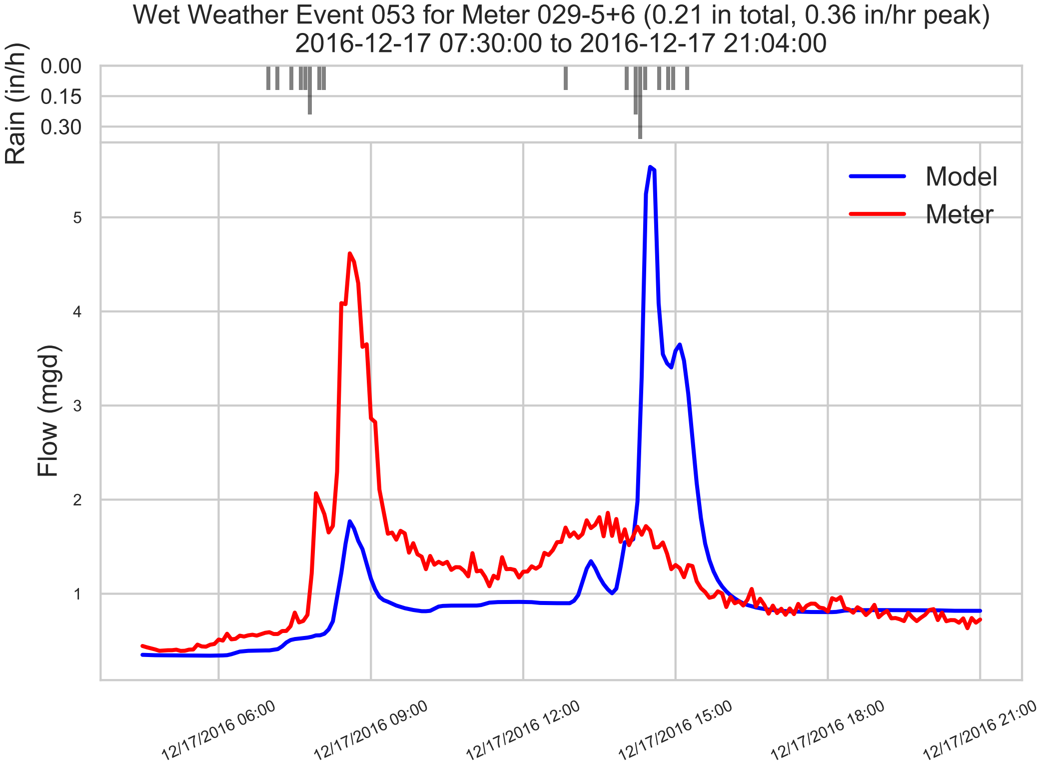
Wet Weather Event 050 for Meter 029-5+6 (0.28 in total, 0.12 in/hr peak)
2016-12-04 22:00:00 to 2016-12-05 09:15:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
1
2
3
4
5
Model
Meter
12/04/2016 20:00
12/04/2016 23:00
12/05/2016 02:00
12/05/2016 05:00
12/05/2016 08:00



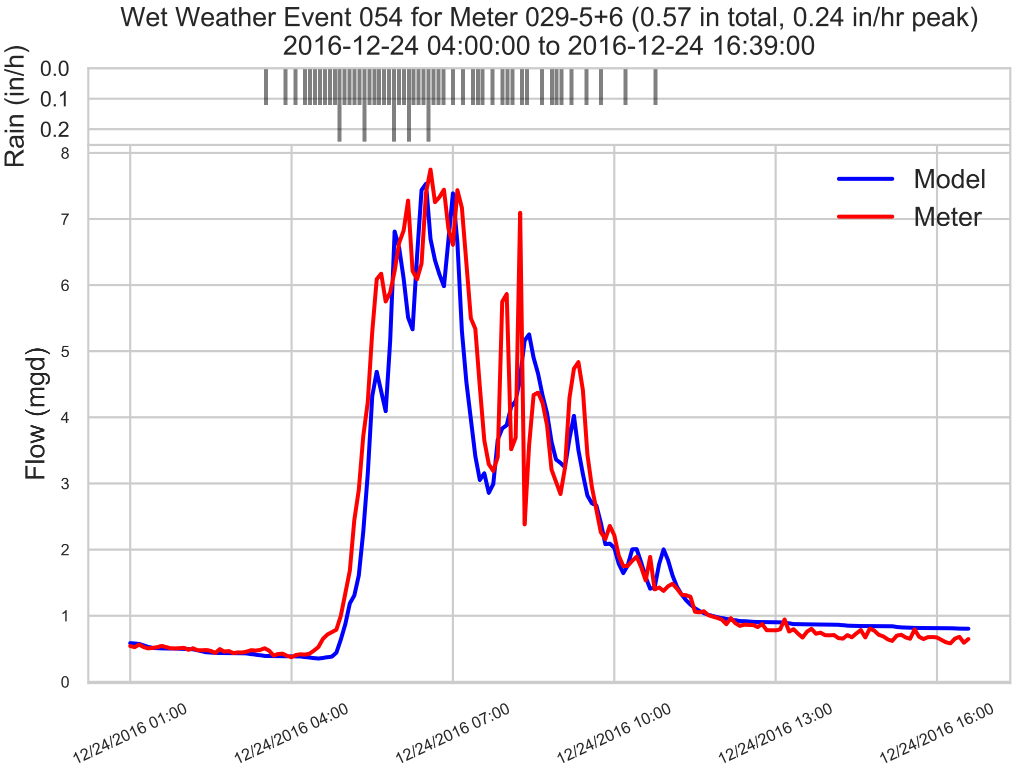
Wet Weather Event 051 for Meter 029-5+6 (0.97 in total, 0.36 in/hr peak)
2016-12-06 09:49:00 to 2016-12-07 03:20:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0
2
4
6
8
10
12
14
Model
Meter
12/06/2016 07:00
12/06/2016 10:00
12/06/2016 13:00
12/06/2016 16:00
12/06/2016 19:00
12/06/2016 22:00
12/07/2016 01:00
12/07/2016 04:00



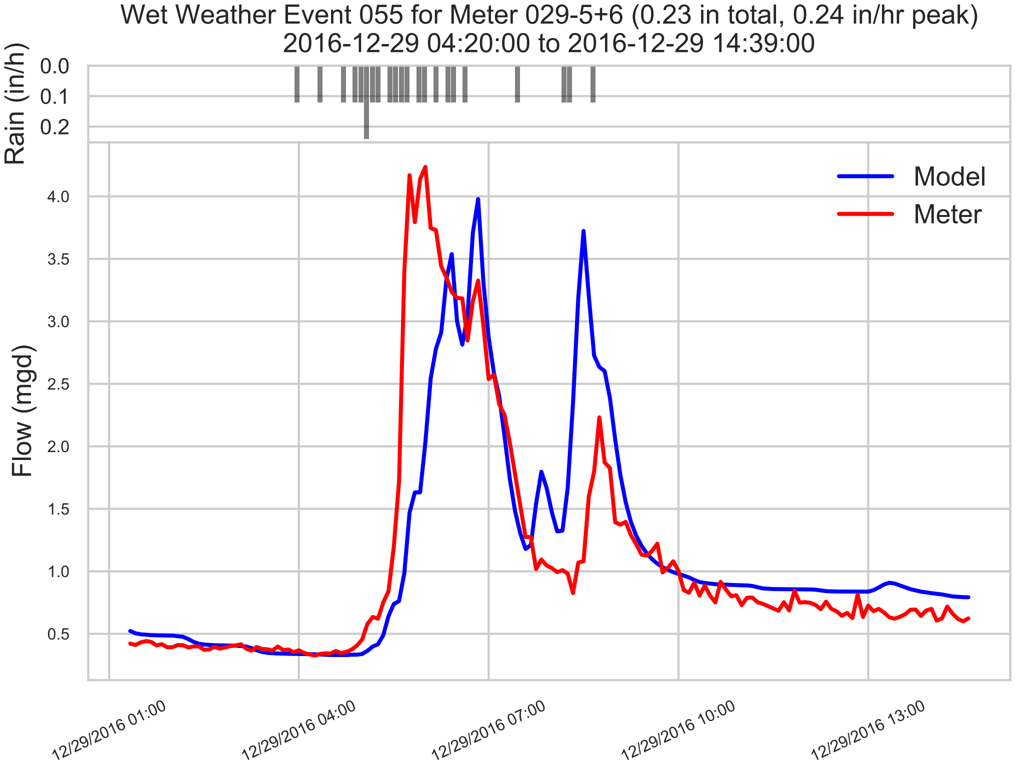
Wet Weather Event 052 for Meter 029-5+6 (0.14 in total, 0.24 in/hr peak)
2016-12-12 04:30:00 to 2016-12-12 12:00:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1
2
3
4
Model
Meter
12/12/2016 01:00
12/12/2016 04:00
12/12/2016 07:00
12/12/2016 10:00



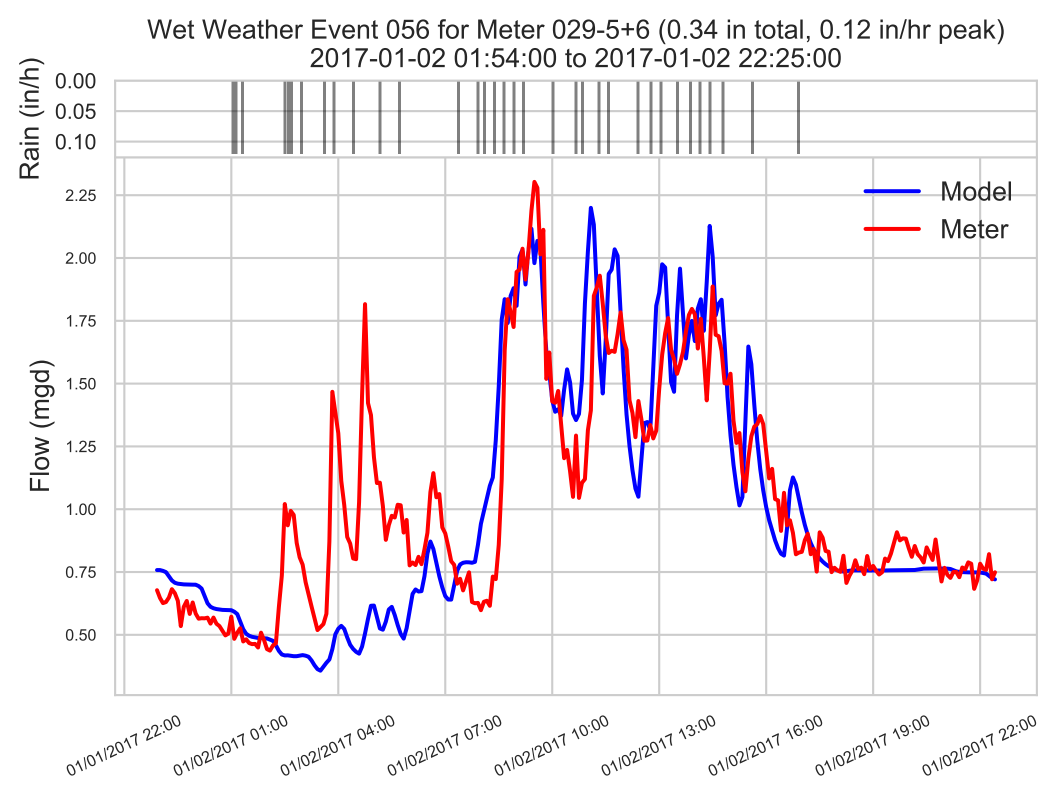
Wet Weather Event 053 for Meter 029-5+6 (0.21 in total, 0.36 in/hr peak)
2016-12-17 07:30:00 to 2016-12-17 21:04:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
1
2
3
4
5
Model
Meter
12/17/2016 06:00
12/17/2016 09:00
12/17/2016 12:00
12/17/2016 15:00
12/17/2016 18:00
12/17/2016 21:00



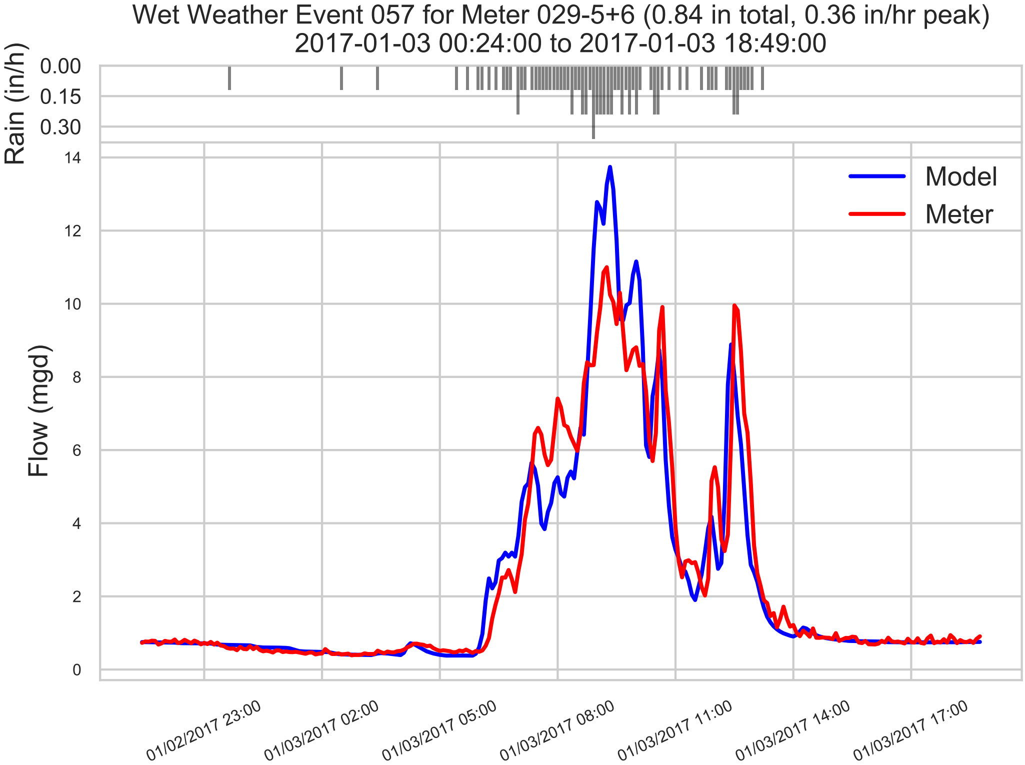
Wet Weather Event 054 for Meter 029-5+6 (0.57 in total, 0.24 in/hr peak)
2016-12-24 04:00:00 to 2016-12-24 16:39:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
5
6
7
8
Model
Meter
12/24/2016 01:00
12/24/2016 04:00
12/24/2016 07:00
12/24/2016 10:00
12/24/2016 13:00
12/24/2016 16:00



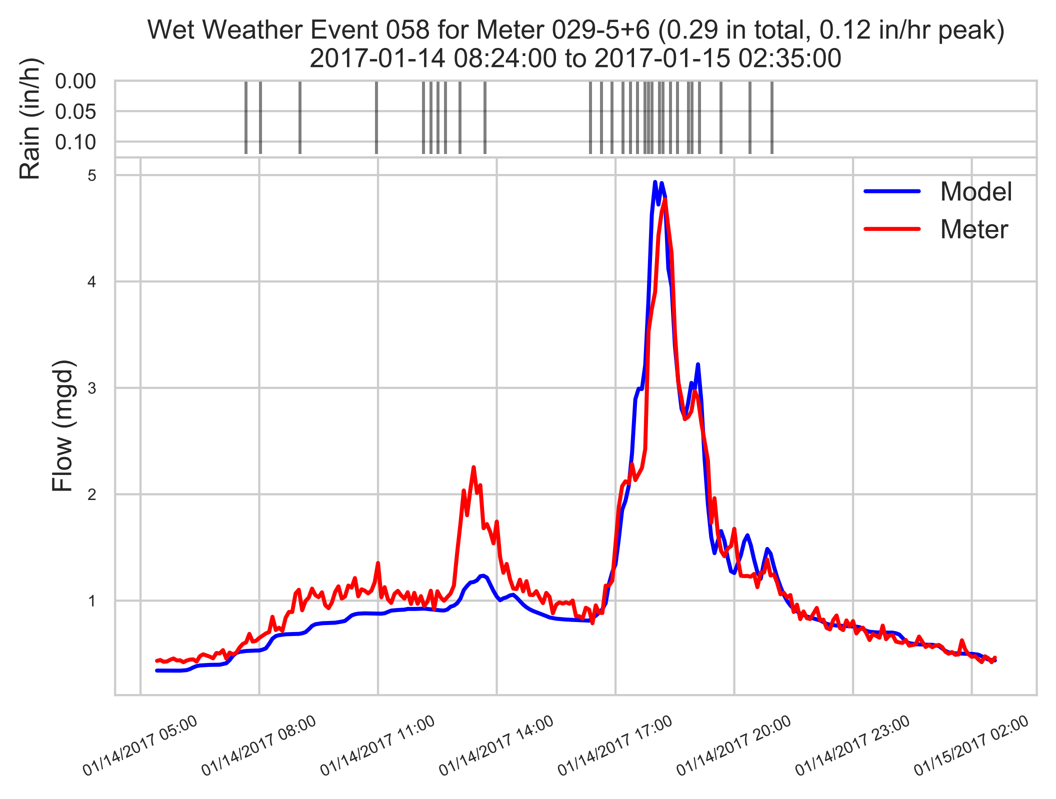
Wet Weather Event 055 for Meter 029-5+6 (0.23 in total, 0.24 in/hr peak)
2016-12-29 04:20:00 to 2016-12-29 14:39:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
Model
Meter
12/29/2016 01:00
12/29/2016 04:00
12/29/2016 07:00
12/29/2016 10:00
12/29/2016 13:00

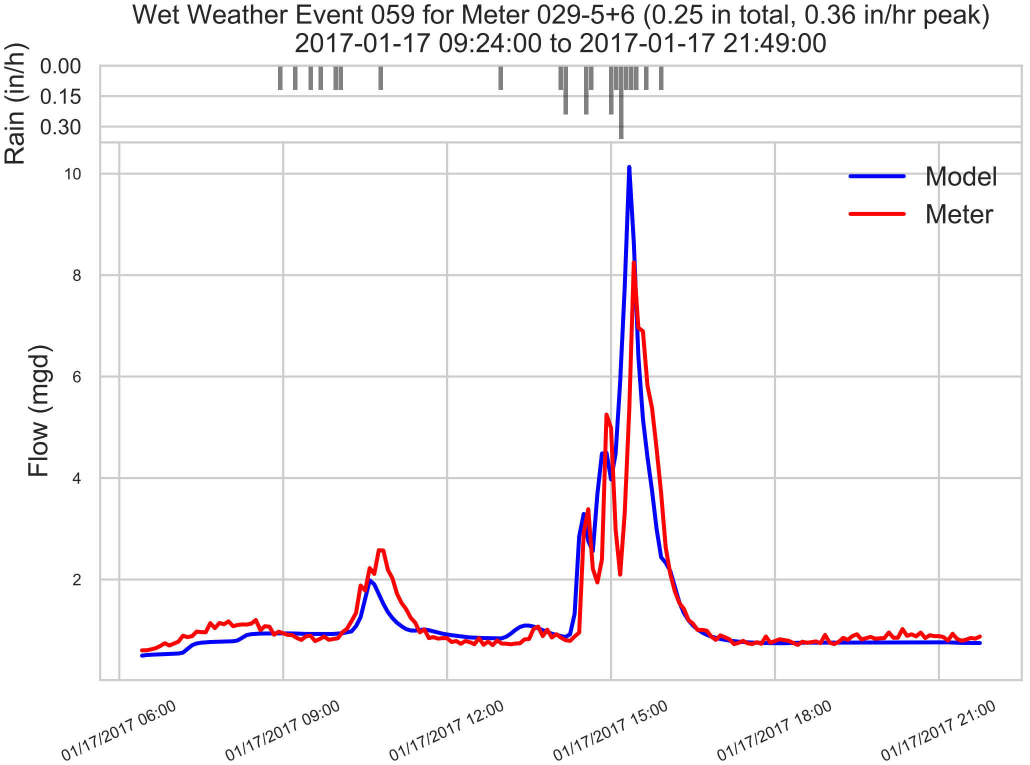


Wet Weather Event 056 for Meter 029-5+6 (0.34 in total, 0.12 in/hr peak)
2017-01-02 01:54:00 to 2017-01-02 22:25:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
Model
Meter
01/01/2017 22:00
01/02/2017 01:00
01/02/2017 04:00
01/02/2017 07:00
01/02/2017 10:00
01/02/2017 13:00
01/02/2017 16:00
01/02/2017 19:00
01/02/2017 22:00

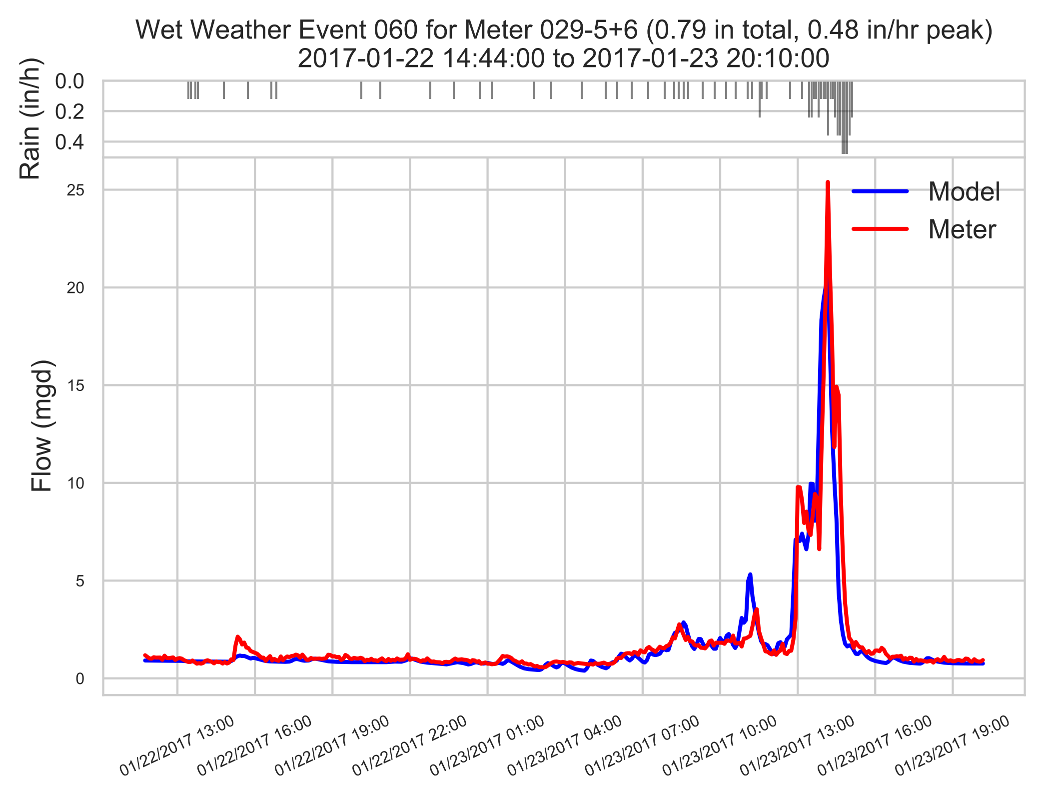


Wet Weather Event 057 for Meter 029-5+6 (0.84 in total, 0.36 in/hr peak)
2017-01-03 00:24:00 to 2017-01-03 18:49:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0
2
4
6
8
10
12
14
Model
Meter
01/02/2017 23:00
01/03/2017 02:00
01/03/2017 05:00
01/03/2017 08:00
01/03/2017 11:00
01/03/2017 14:00
01/03/2017 17:00


Wet Weather Event 058 for Meter 029-5+6 (0.29 in total, 0.12 in/hr peak)
2017-01-14 08:24:00 to 2017-01-15 02:35:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
5
4
3
2
1
Model
Meter
01/14/2017 05:00
01/14/2017 08:00
01/14/2017 11:00
01/14/2017 14:00
01/14/2017 17:00
01/14/2017 20:00
01/14/2017 23:00
01/15/2017 02:00



Wet Weather Event 059 for Meter 029-5+6 (0.25 in total, 0.36 in/hr peak)
2017-01-17 09:24:00 to 2017-01-17 21:49:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
10
8
6
4
2
Model
Meter
01/17/2017 06:00
01/17/2017 09:00
01/17/2017 12:00
01/17/2017 15:00
01/17/2017 18:00
01/17/2017 21:00


Wet Weather Event 060 for Meter 029-5+6 (0.79 in total, 0.48 in/hr peak)
2017-01-22 14:44:00 to 2017-01-23 20:10:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
25
20
15
10
5
0
Model
Meter
01/22/2017 13:00
01/22/2017 16:00
01/22/2017 19:00
01/22/2017 22:00
01/23/2017 01:00
01/23/2017 04:00
01/23/2017 07:00
01/23/2017 10:00
01/23/2017 13:00
01/23/2017 16:00
01/23/2017 19:00

# Appendix B

# Monitoring Timeseries for Entire Pre-Construction Metering Time Period

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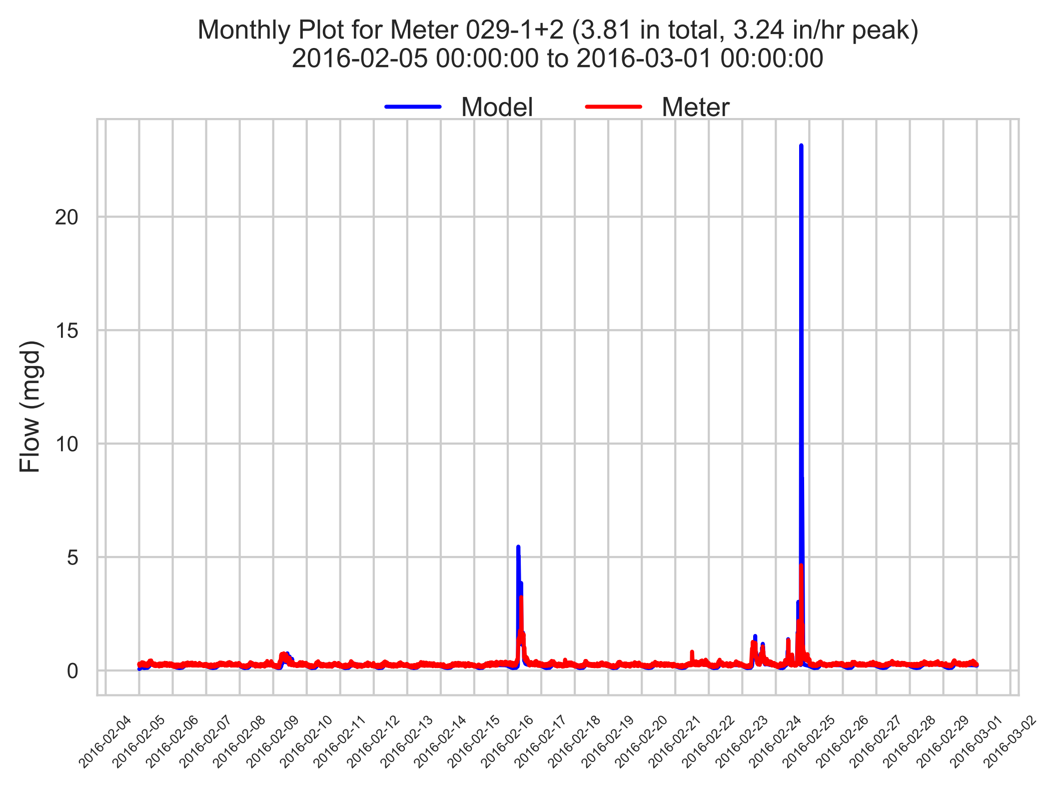
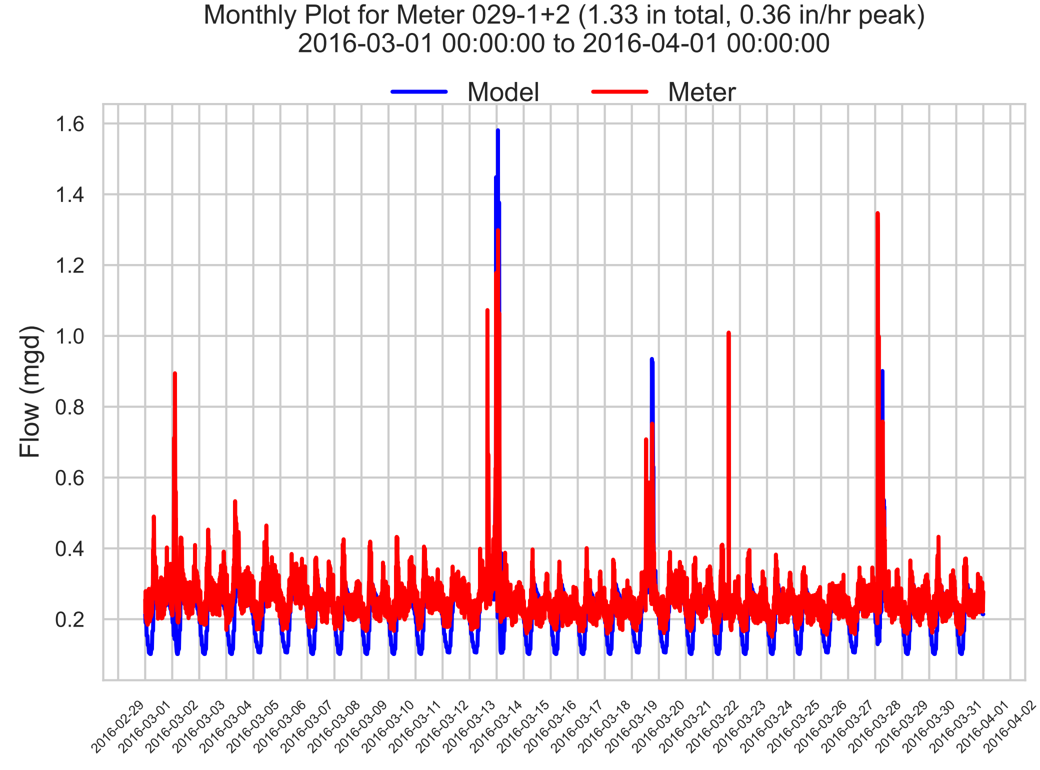


Monthly Plot for Meter 029-1+2 (3.81 in total, 3.24 in/hr peak)
2016-02-05 00:00:00 to 2016-03-01 00:00:00
Model
Meter
Flow (mgd)
0
5
10
15
20
2016-02-04
2016-02-05
2016-02-06
2016-02-07
2016-02-08
2016-02-09
2016-02-10
2016-02-11
2016-02-12
2016-02-13
2016-02-14
2016-02-15
2016-02-16
2016-02-17
2016-02-18
2016-02-19
2016-02-20
2016-02-21
2016-02-22
2016-02-23
2016-02-24
2016-02-25
2016-02-26
2016-02-27
2016-02-28
2016-02-29
2016-03-01
2016-03-02


Monthly Plot for Meter 029-1+2 (1.33 in total, 0.36 in/hr peak)
2016-03-01 00:00:00 to 2016-04-01 00:00:00
Model
Meter
Flow (mgd)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
2016-02-29
2016-03-01
2016-03-02
2016-03-03
2016-03-04
2016-03-05
2016-03-06
2016-03-07
2016-03-08
2016-03-09
2016-03-10
2016-03-11
2016-03-12
2016-03-13
2016-03-14
2016-03-15
2016-03-16
2016-03-17
2016-03-18
2016-03-19
2016-03-20
2016-03-21
2016-03-22
2016-03-23
2016-03-24
2016-03-25
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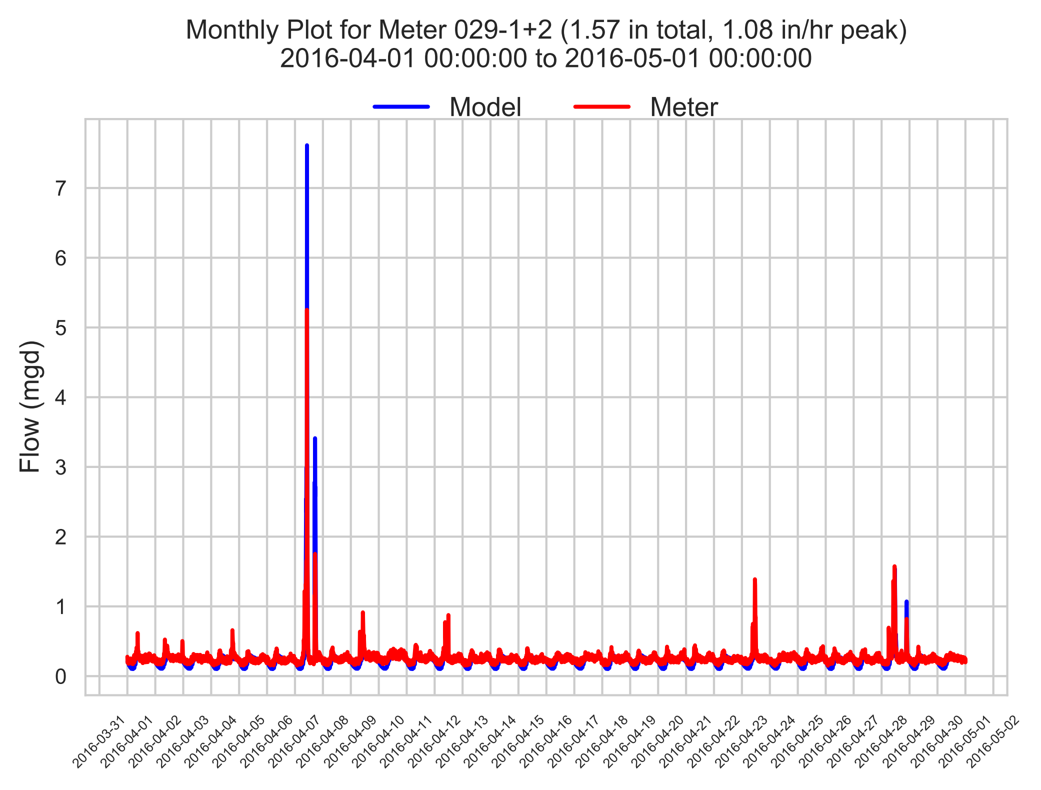
2016-03-28
2016-03-29
2016-03-30
2016-03-31
2016-04-01
2016-04-02



Monthly Plot for Meter 029-1+2 (1.57 in total, 1.08 in/hr peak)
2016-04-01 00:00:00 to 2016-05-01 00:00:00
Model
Meter
Flow (mgd)
0
1
2
3
4
5
6
7
2016-03-31
2016-04-01
2016-04-02
2016-04-03
2016-04-04
2016-04-05
2016-04-06
2016-04-07
2016-04-08
2016-04-09
2016-04-10
2016-04-11
2016-04-12
2016-04-13
2016-04-14
2016-04-15
2016-04-16
2016-04-17
2016-04-18
2016-04-19
2016-04-20
2016-04-21
2016-04-22
2016-04-23
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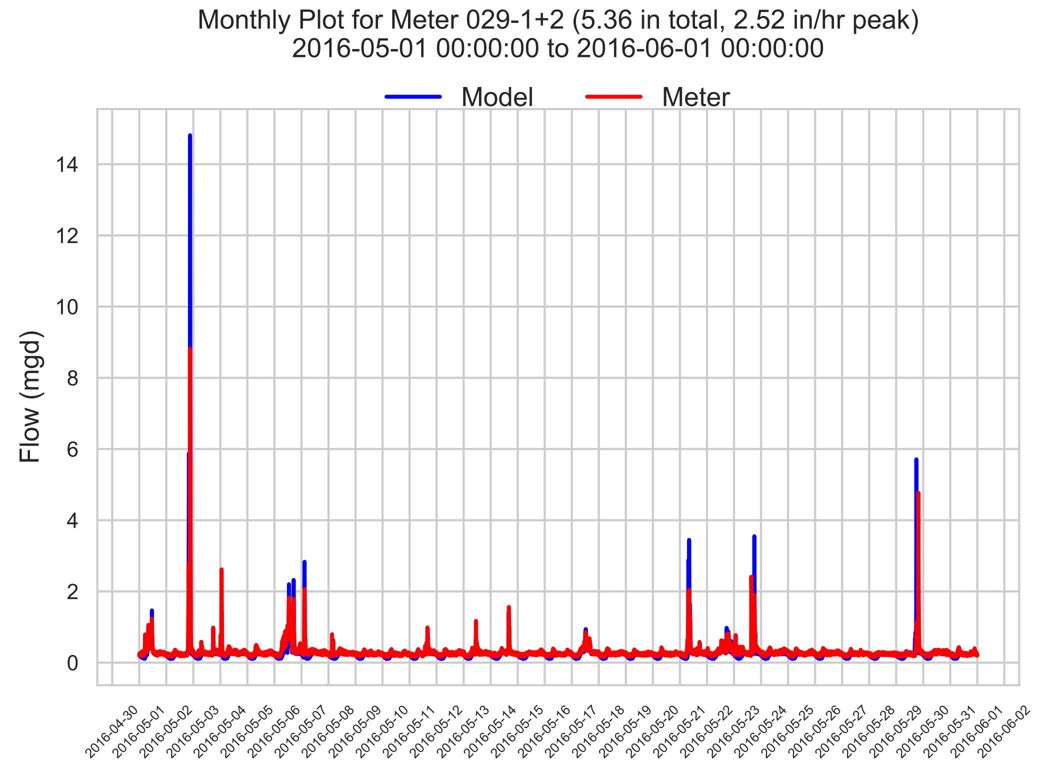
2016-04-29
2016-04-30
2016-05-01
2016-05-02



Monthly Plot for Meter 029-1+2 (5.36 in total, 2.52 in/hr peak)
2016-05-01 00:00:00 to 2016-06-01 00:00:00
Model
Meter
Flow (mgd)
0
2
4
6
8
10
12
14
2016-04-30
2016-05-01
2016-05-02
2016-05-03
2016-05-04
2016-05-05
2016-05-06
2016-05-07
2016-05-08
2016-05-09
2016-05-10
2016-05-11
2016-05-12
2016-05-13
2016-05-14
2016-05-15
2016-05-16
2016-05-17
2016-05-18
2016-05-19
2016-05-20
2016-05-21
2016-05-22
2016-05-23
2016-05-24
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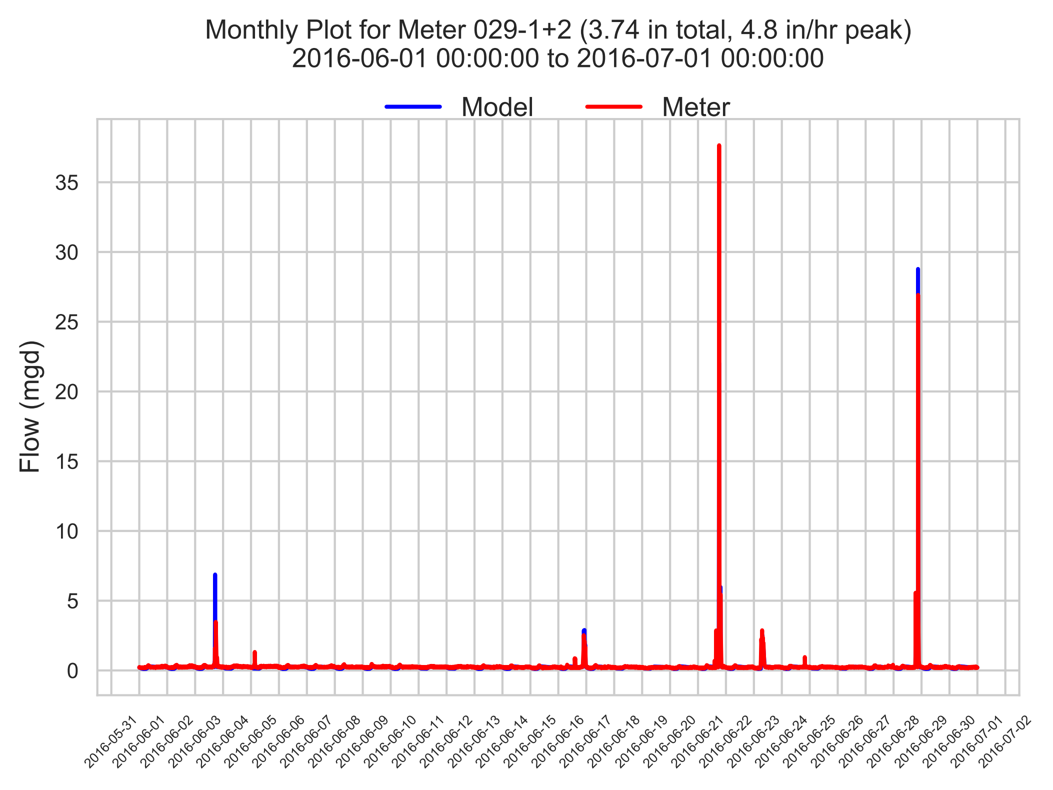
2016-06-01
2016-06-02



Monthly Plot for Meter 029-1+2 (3.74 in total, 4.8 in/hr peak)
2016-06-01 00:00:00 to 2016-07-01 00:00:00
Model
Meter
Flow (mgd)
0
5
10
15
20
25
30
35
2016-05-31
2016-06-01
2016-06-02
2016-06-03
2016-06-04
2016-06-05
2016-06-06
2016-06-07
2016-06-08
2016-06-09
2016-06-10
2016-06-11
2016-06-12
2016-06-13
2016-06-14
2016-06-15
2016-06-16
2016-06-17
2016-06-18
2016-06-19
2016-06-20
2016-06-21
2016-06-22
2016-06-23
2016-06-24
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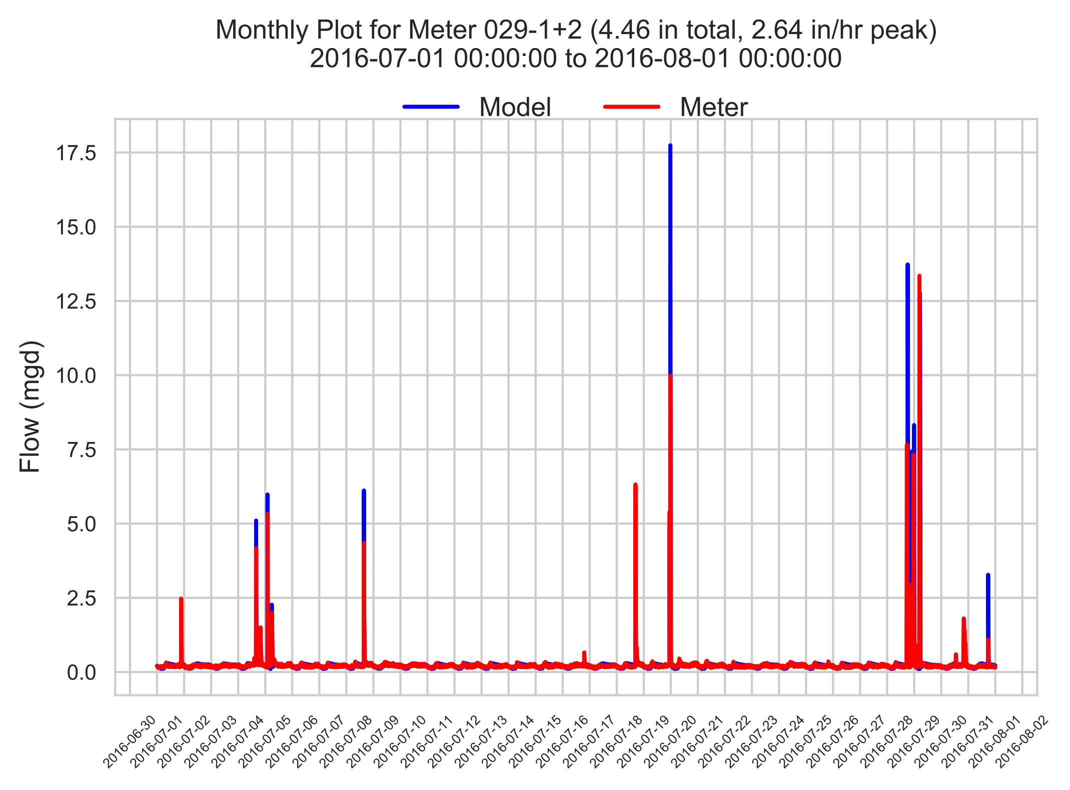
2016-06-28
2016-06-29
2016-06-30
2016-07-01
2016-07-02



Monthly Plot for Meter 029-1+2 (4.46 in total, 2.64 in/hr peak)
2016-07-01 00:00:00 to 2016-08-01 00:00:00
Model
Meter
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
2016-06-30
2016-07-01
2016-07-02
2016-07-03
2016-07-04
2016-07-05
2016-07-06
2016-07-07
2016-07-08
2016-07-09
2016-07-10
2016-07-11
2016-07-12
2016-07-13
2016-07-14
2016-07-15
2016-07-16
2016-07-17
2016-07-18
2016-07-19
2016-07-20
2016-07-21
2016-07-22
2016-07-23
2016-07-24
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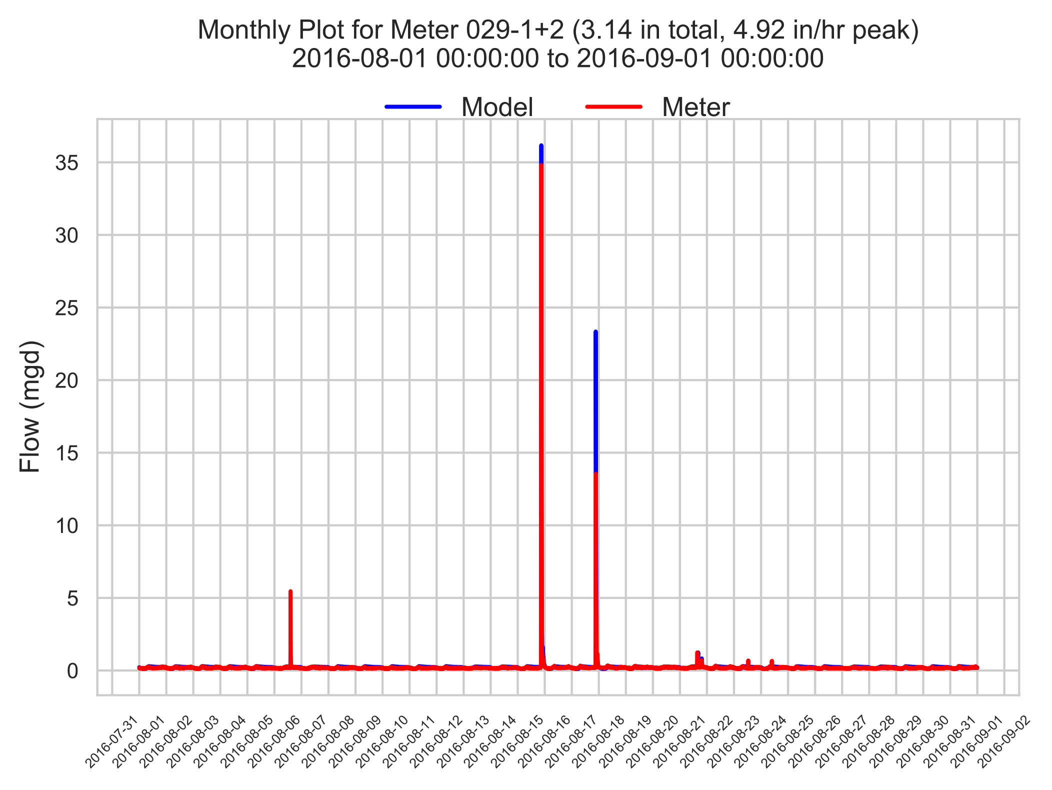
2016-07-30
2016-07-31
2016-08-01
2016-08-02



Monthly Plot for Meter 029-1+2 (3.14 in total, 4.92 in/hr peak)
2016-08-01 00:00:00 to 2016-09-01 00:00:00
Model
Meter
Flow (mgd)
0
5
10
15
20
25
30
35
2016-07-31
2016-08-01
2016-08-02
2016-08-03
2016-08-04
2016-08-05
2016-08-06
2016-08-07
2016-08-08
2016-08-09
2016-08-10
2016-08-11
2016-08-12
2016-08-13
2016-08-14
2016-08-15
2016-08-16
2016-08-17
2016-08-18
2016-08-19
2016-08-20
2016-08-21
2016-08-22
2016-08-23
2016-08-24
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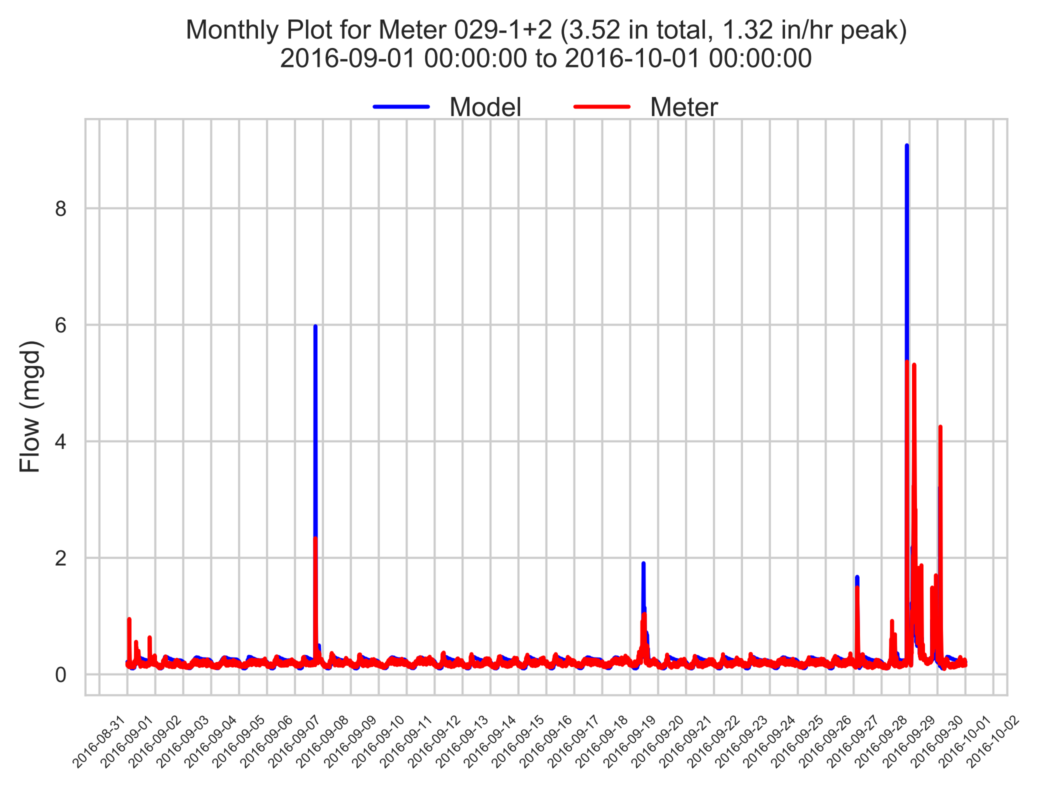
2016-08-31
2016-09-01
2016-09-02



Monthly Plot for Meter 029-1+2 (3.52 in total, 1.32 in/hr peak)
2016-09-01 00:00:00 to 2016-10-01 00:00:00
Model
Meter
Flow (mgd)
0
2
4
6
8
2016-08-31
2016-09-01
2016-09-02
2016-09-03
2016-09-04
2016-09-05
2016-09-06
2016-09-07
2016-09-08
2016-09-09
2016-09-10
2016-09-11
2016-09-12
2016-09-13
2016-09-14
2016-09-15
2016-09-16
2016-09-17
2016-09-18
2016-09-19
2016-09-20
2016-09-21
2016-09-22
2016-09-23
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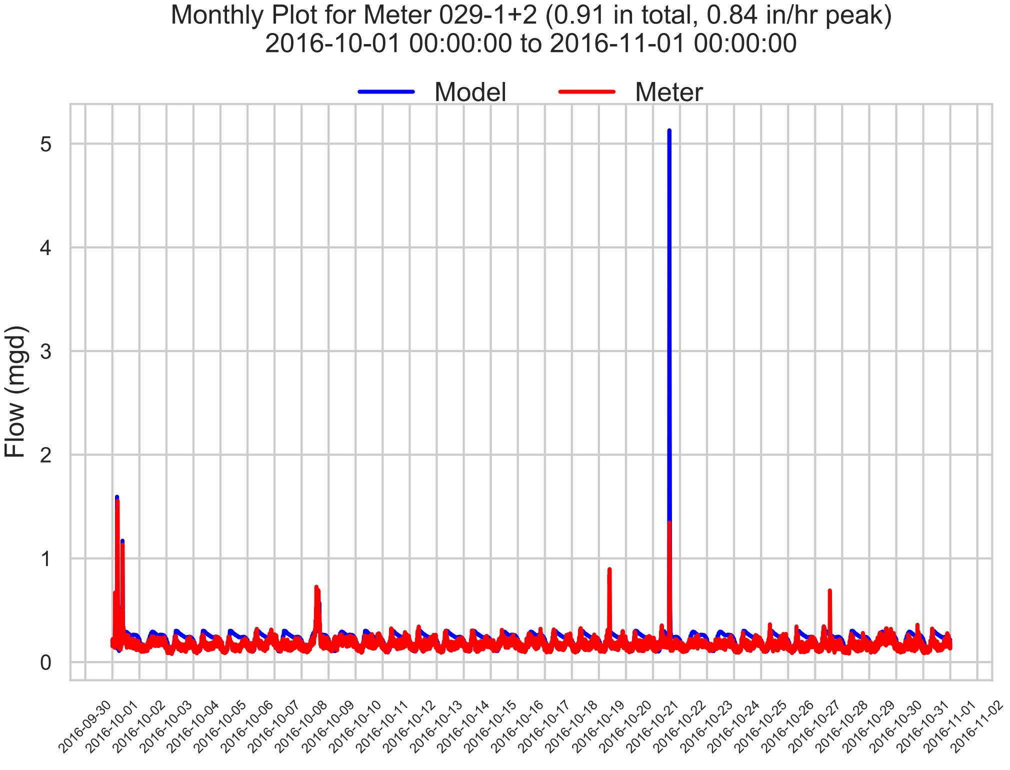
2016-09-28
2016-09-29
2016-09-30
2016-10-01
2016-10-02



Monthly Plot for Meter 029-1+2 (0.91 in total, 0.84 in/hr peak)
2016-10-01 00:00:00 to 2016-11-01 00:00:00
Model
Meter
Flow (mgd)
0
1
2
3
4
5
2016-09-30
2016-10-01
2016-10-02
2016-10-03
2016-10-04
2016-10-05
2016-10-06
2016-10-07
2016-10-08
2016-10-09
2016-10-10
2016-10-11
2016-10-12
2016-10-13
2016-10-14
2016-10-15
2016-10-16
2016-10-17
2016-10-18
2016-10-19
2016-10-20
2016-10-21
2016-10-22
2016-10-23
2016-10-24
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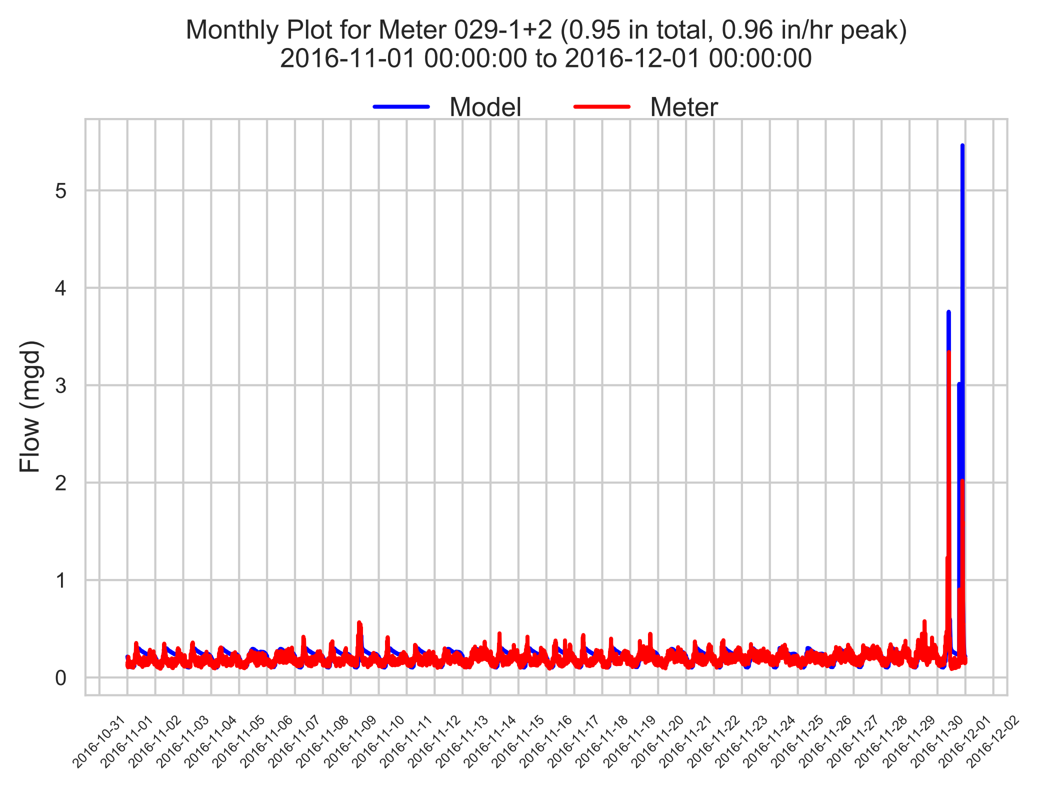
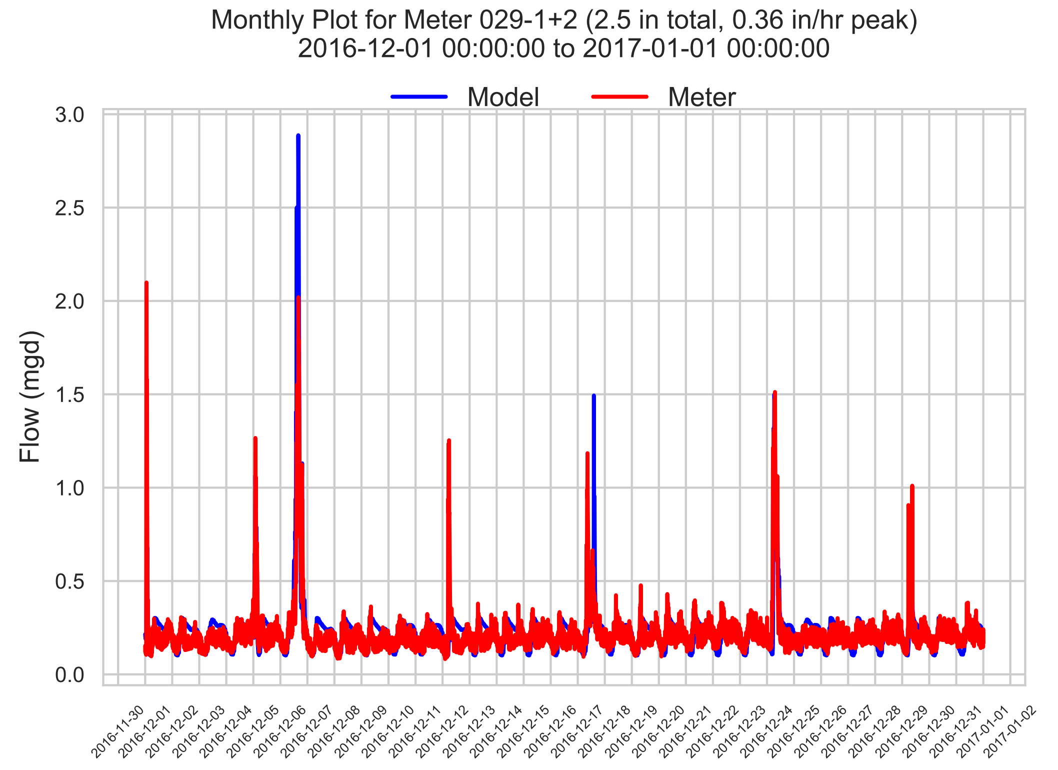
2016-10-30
2016-10-31
2016-11-01
2016-11-02



Monthly Plot for Meter 029-1+2 (0.95 in total, 0.96 in/hr peak)
2016-11-01 00:00:00 to 2016-12-01 00:00:00
Model
Meter
Flow (mgd)
0
1
2
3
4
5
2016-10-31
2016-11-01
2016-11-02
2016-11-03
2016-11-04
2016-11-05
2016-11-06
2016-11-07
2016-11-08
2016-11-09
2016-11-10
2016-11-11
2016-11-12
2016-11-13
2016-11-14
2016-11-15
2016-11-16
2016-11-17
2016-11-18
2016-11-19
2016-11-20
2016-11-21
2016-11-22
2016-11-23
2016-11-24
2016-11-25
2016-11-26
2016-11-27
2016-11-28
2016-11-29
2016-11-30
2016-12-01
2016-12-02



Monthly Plot for Meter 029-1+2 (2.5 in total, 0.36 in/hr peak)
2016-12-01 00:00:00 to 2017-01-01 00:00:00
Model
Meter
Flow (mgd)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2016-11-30
2016-12-01
2016-12-02
2016-12-03
2016-12-04
2016-12-05
2016-12-06
2016-12-07
2016-12-08
2016-12-09
2016-12-10
2016-12-11
2016-12-12
2016-12-13
2016-12-14
2016-12-15
2016-12-16
2016-12-17
2016-12-18
2016-12-19
2016-12-20
2016-12-21
2016-12-22
2016-12-23
2016-12-24
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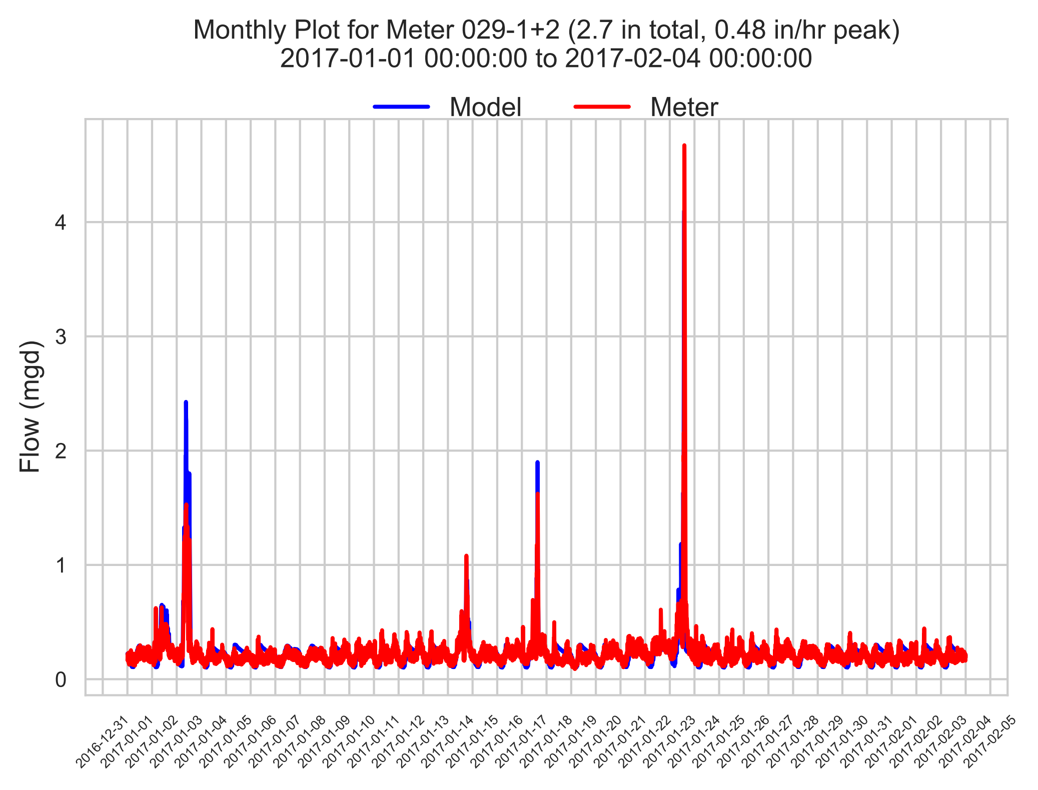
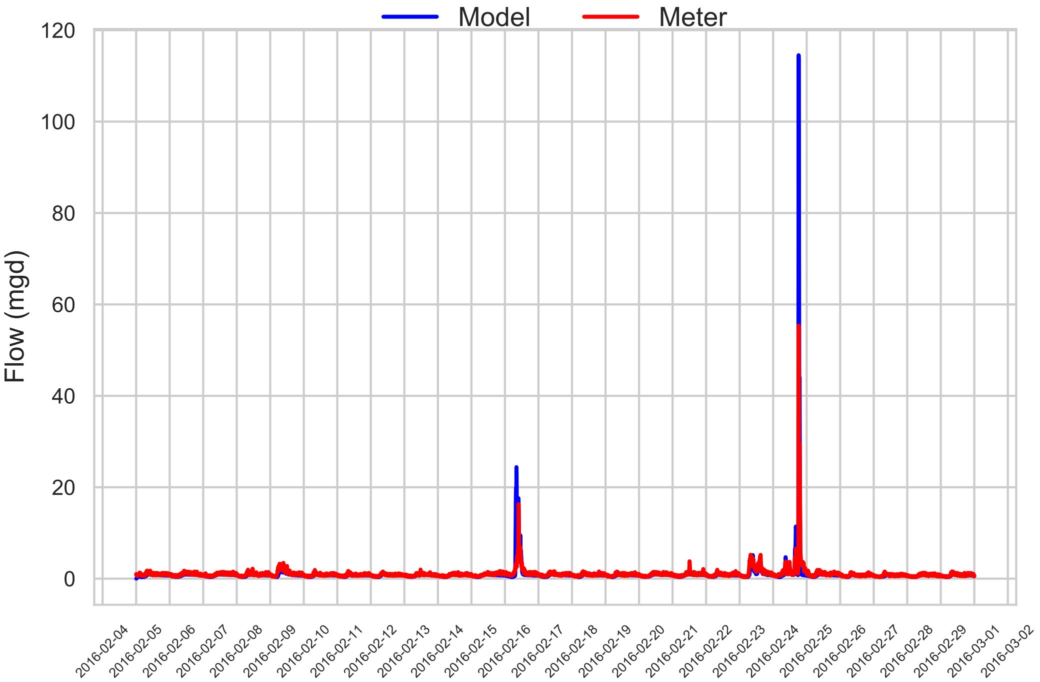
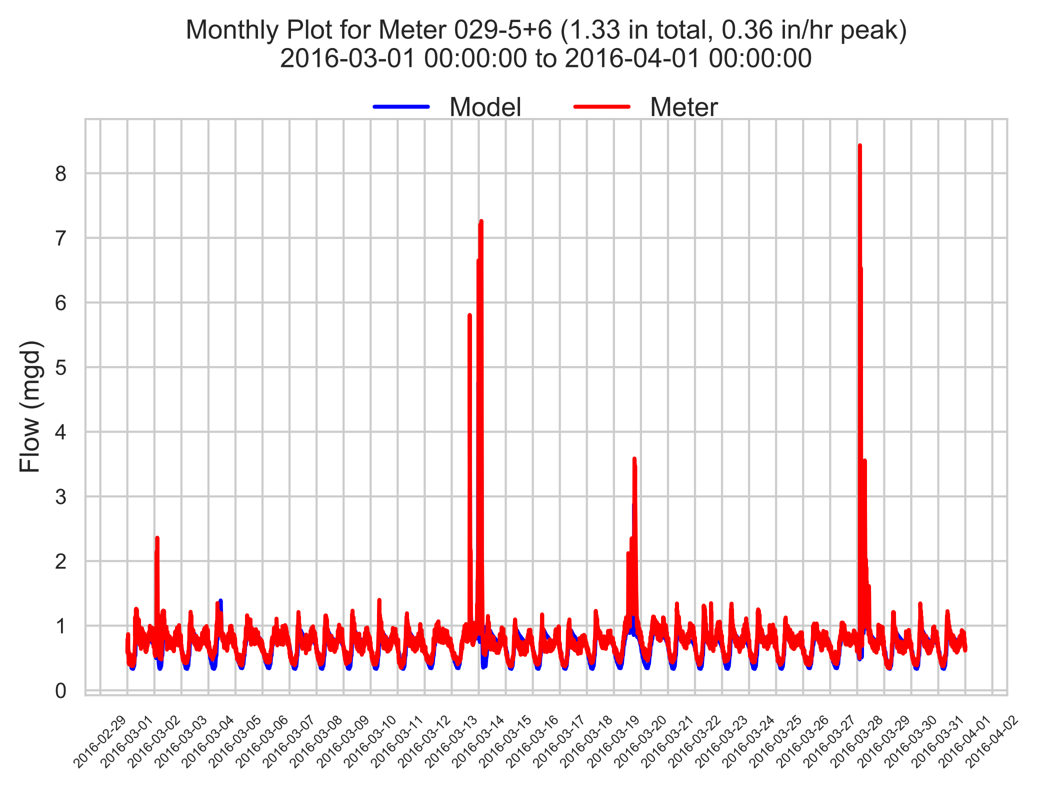
2016-12-31
2017-01-01
2017-01-02



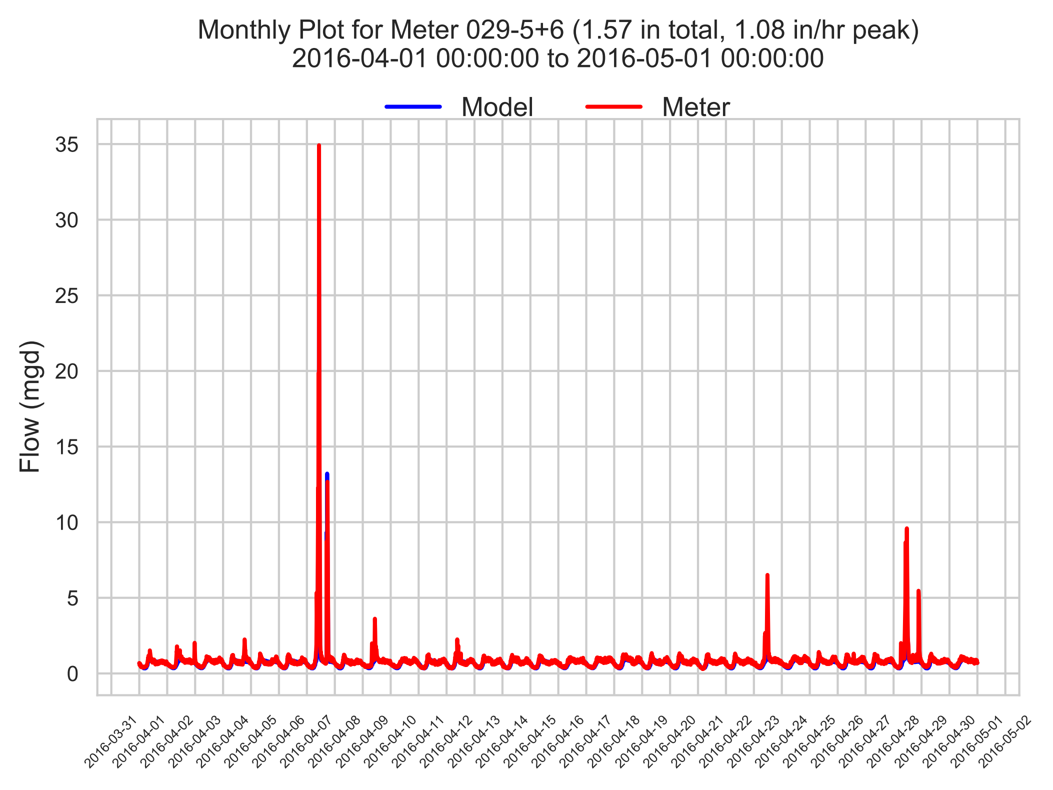
Monthly Plot for Meter 029-1+2 (2.7 in total, 0.48 in/hr peak)
2017-01-01 00:00:00 to 2017-02-04 00:00:00
Model
Meter
Flow (mgd)
0
1
2
3
4
2016-12-31
2017-01-01
2017-01-02
2017-01-03
2017-01-04
2017-01-05
2017-01-06
2017-01-07
2017-01-08
2017-01-09
2017-01-10
2017-01-11
2017-01-12
2017-01-13
2017-01-14
2017-01-15
2017-01-16
2017-01-17
2017-01-18
2017-01-19
2017-01-20
2017-01-21
2017-01-22
2017-01-23
2017-01-24
2017-01-25
2017-01-26
2017-01-27
2017-01-28
2017-01-29
2017-01-30
2017-01-31
2017-02-01
2017-02-02
2017-02-03
2017-02-04
2017-02-05

Monthly Plot for Meter 029-5+6 (3.81 in total, 3.24 in/hr peak)
2016-02-05 00:00:00 to 2016-03-01 00:00:00





Monthly Plot for Meter 029-5+6 (1.33 in total, 0.36 in/hr peak)
2016-03-01 00:00:00 to 2016-04-01 00:00:00
Model
Meter
Flow (mgd)
0
1
2
3
4
5
6
7
8
2016-02-29
2016-03-01
2016-03-02
2016-03-03
2016-03-04
2016-03-05
2016-03-06
2016-03-07
2016-03-08
2016-03-09
2016-03-10
2016-03-11
2016-03-12
2016-03-13
2016-03-14
2016-03-15
2016-03-16
2016-03-17
2016-03-18
2016-03-19
2016-03-20
2016-03-21
2016-03-22
2016-03-23
2016-03-24
2016-03-25
2016-03-26
2016-03-27
2016-03-28
2016-03-29
2016-03-30
2016-03-31
2016-04-01
2016-04-02



Monthly Plot for Meter 029-5+6 (1.57 in total, 1.08 in/hr peak)
2016-04-01 00:00:00 to 2016-05-01 00:00:00
Model
Meter
Flow (mgd)
35
30
25
20
15
10
5
0
2016-03-31
2016-04-01
2016-04-02
2016-04-03
2016-04-04
2016-04-05
2016-04-06
2016-04-07
2016-04-08
2016-04-09
2016-04-10
2016-04-11
2016-04-12
2016-04-13
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2016-04-20
2016-04-21
2016-04-22
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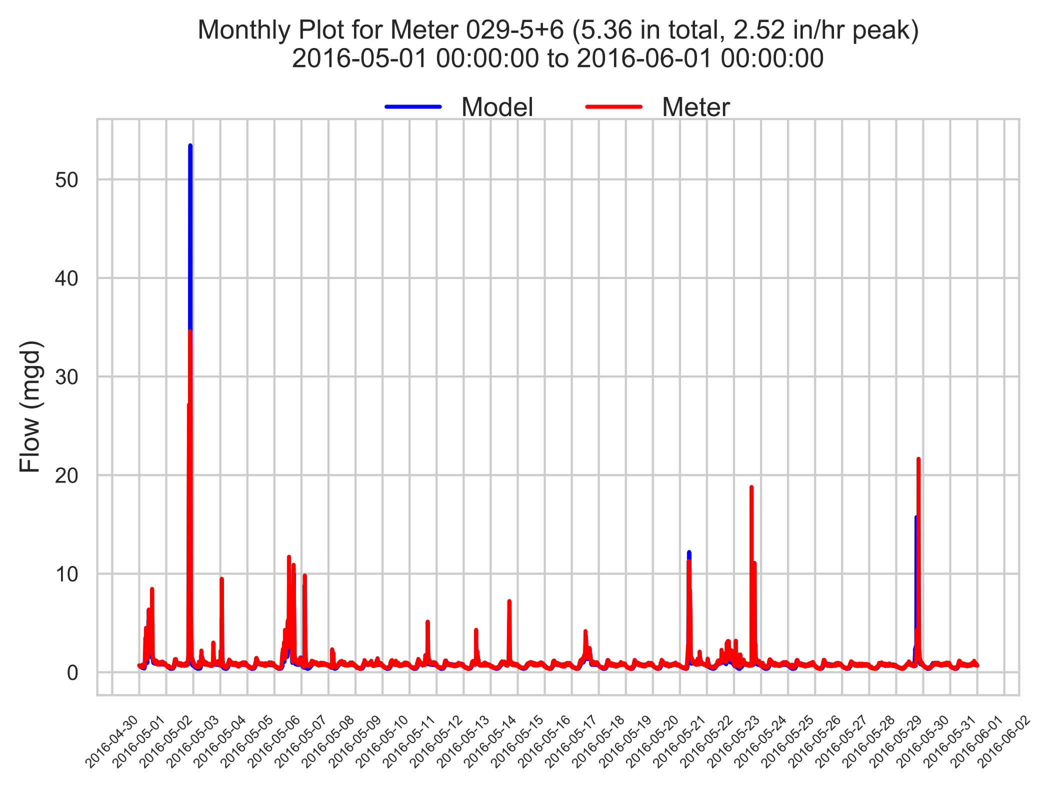
2016-05-01
2016-05-02


Monthly Plot for Meter 029-5+6 (5.36 in total, 2.52 in/hr peak)
2016-05-01 00:00:00 to 2016-06-01 00:00:00
Model
Meter
Flow (mgd)
0
10
20
30
40
50
2016-04-30
2016-05-01
2016-05-02
2016-05-03
2016-05-04
2016-05-05
2016-05-06
2016-05-07
2016-05-08
2016-05-09
2016-05-10
2016-05-11
2016-05-12
2016-05-13
2016-05-14
2016-05-15
2016-05-16
2016-05-17
2016-05-18
2016-05-19
2016-05-20
2016-05-21
2016-05-22
2016-05-23
2016-05-24
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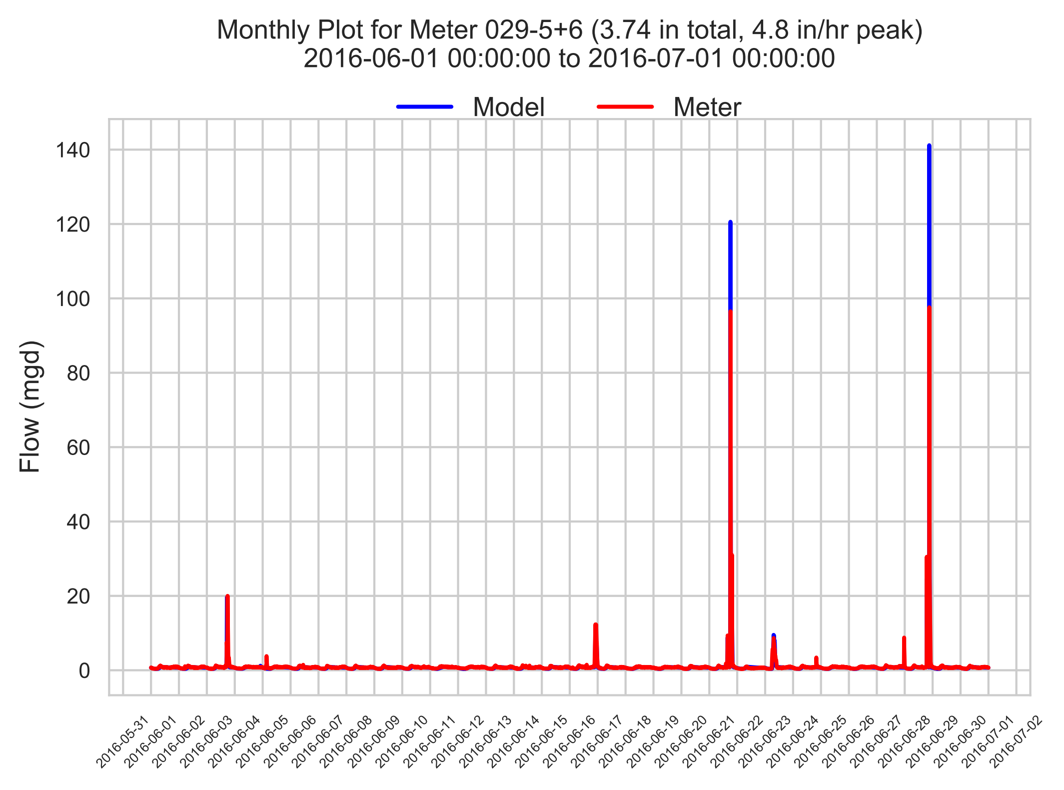
2016-05-29
2016-05-30
2016-05-31
2016-06-01
2016-06-02



Monthly Plot for Meter 029-5+6 (3.74 in total, 4.8 in/hr peak)
2016-06-01 00:00:00 to 2016-07-01 00:00:00
Model
Meter
Flow (mgd)
140
120
100
80
60
40
20
0
2016-05-31
2016-06-01
2016-06-02
2016-06-03
2016-06-04
2016-06-05
2016-06-06
2016-06-07
2016-06-08
2016-06-09
2016-06-10
2016-06-11
2016-06-12
2016-06-13
2016-06-14
2016-06-15
2016-06-16
2016-06-17
2016-06-18
2016-06-19
2016-06-20
2016-06-21
2016-06-22
2016-06-23
2016-06-24
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2016-06-26
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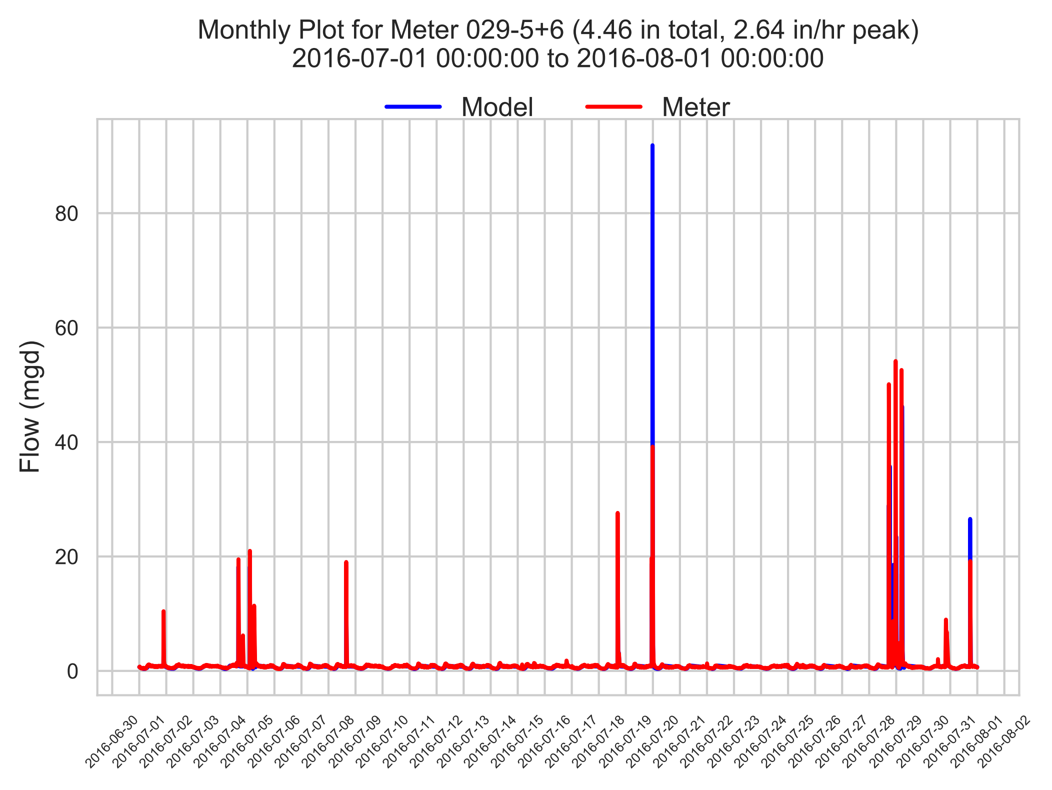
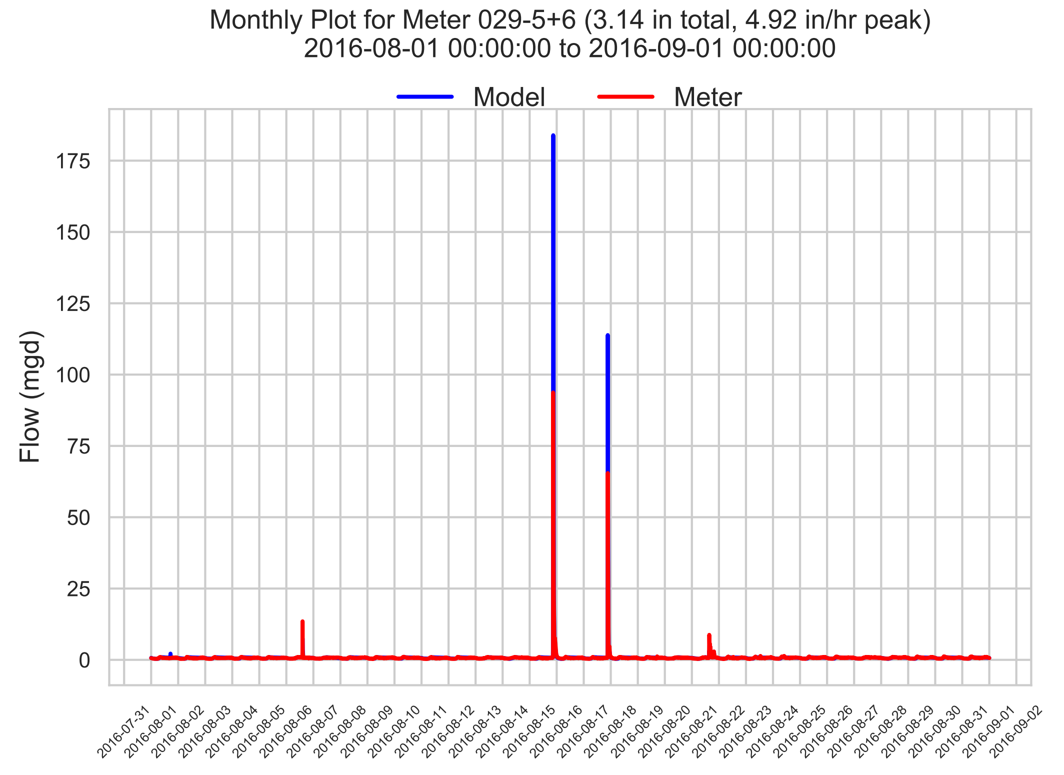
2016-06-28
2016-06-29
2016-06-30
2016-07-01
2016-07-02


Monthly Plot for Meter 029-5+6 (4.46 in total, 2.64 in/hr peak)
2016-07-01 00:00:00 to 2016-08-01 00:00:00
Model
Meter
Flow (mgd)
0
20
40
60
80
2016-06-30
2016-07-01
2016-07-02
2016-07-03
2016-07-04
2016-07-05
2016-07-06
2016-07-07
2016-07-08
2016-07-09
2016-07-10
2016-07-11
2016-07-12
2016-07-13
2016-07-14
2016-07-15
2016-07-16
2016-07-17
2016-07-18
2016-07-19
2016-07-20
2016-07-21
2016-07-22
2016-07-23
2016-07-24
2016-07-25
2016-07-26
2016-07-27
2016-07-28
2016-07-29
2016-07-30
2016-07-31
2016-08-01
2016-08-02



Monthly Plot for Meter 029-5+6 (3.14 in total, 4.92 in/hr peak)
2016-08-01 00:00:00 to 2016-09-01 00:00:00
Model
Meter
Flow (mgd)
0
25
50
75
100
125
150
175
2016-07-31
2016-08-01
2016-08-02
2016-08-03
2016-08-04
2016-08-05
2016-08-06
2016-08-07
2016-08-08
2016-08-09
2016-08-10
2016-08-11
2016-08-12
2016-08-13
2016-08-14
2016-08-15
2016-08-16
2016-08-17
2016-08-18
2016-08-19
2016-08-20
2016-08-21
2016-08-22
2016-08-23
2016-08-24
2016-08-25
2016-08-26
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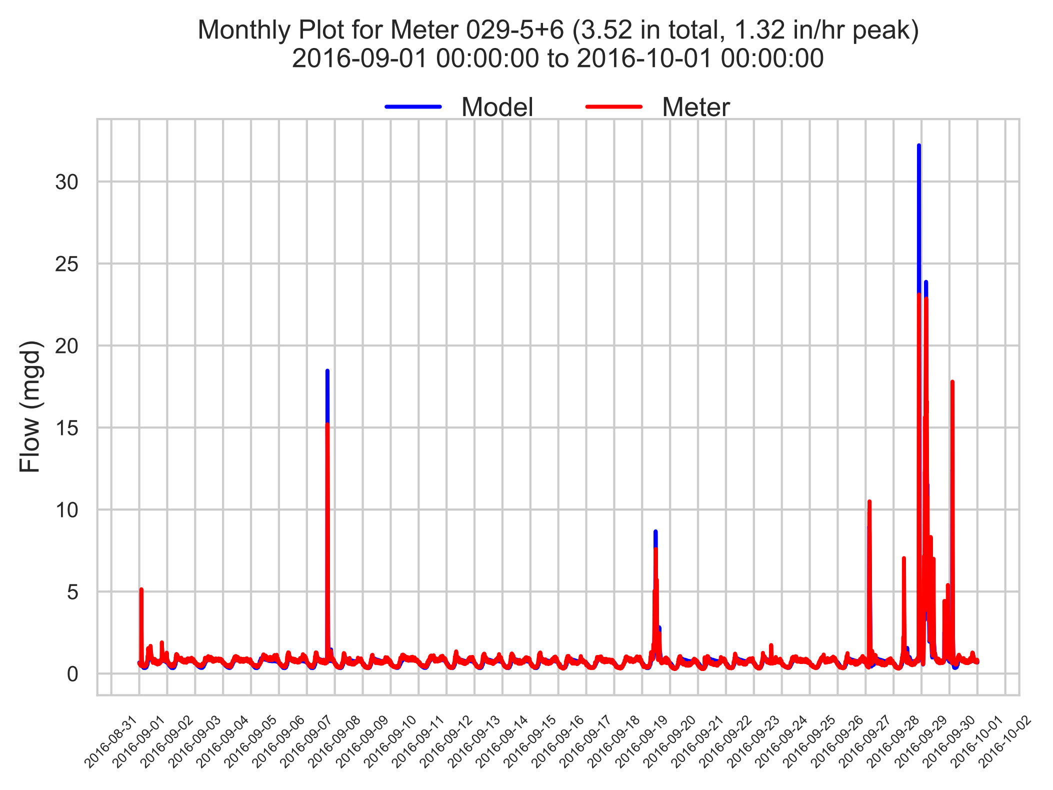
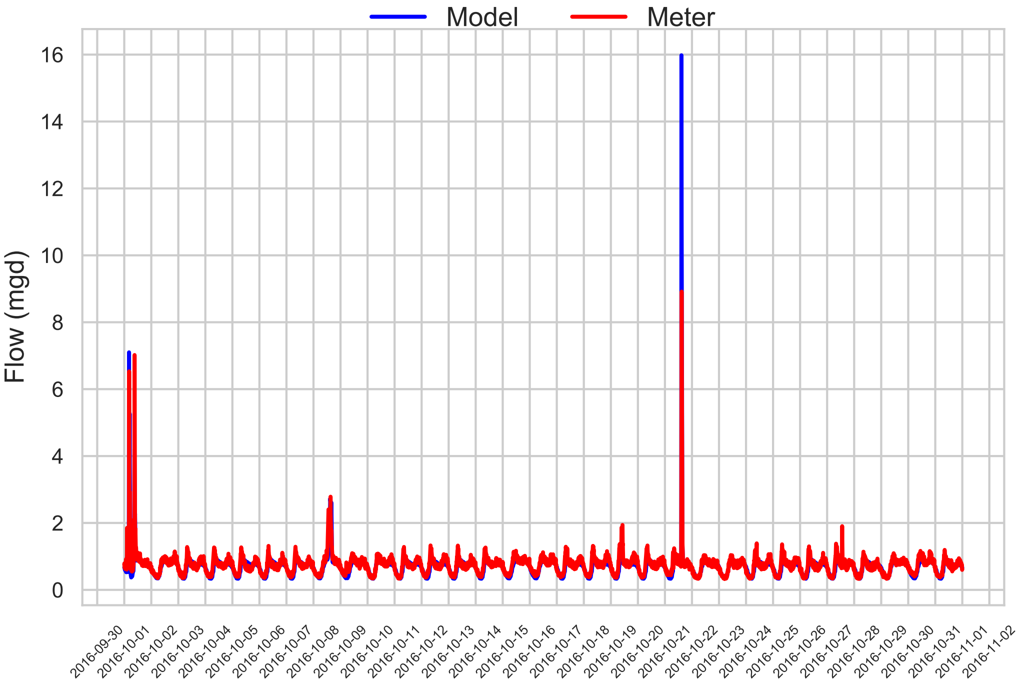
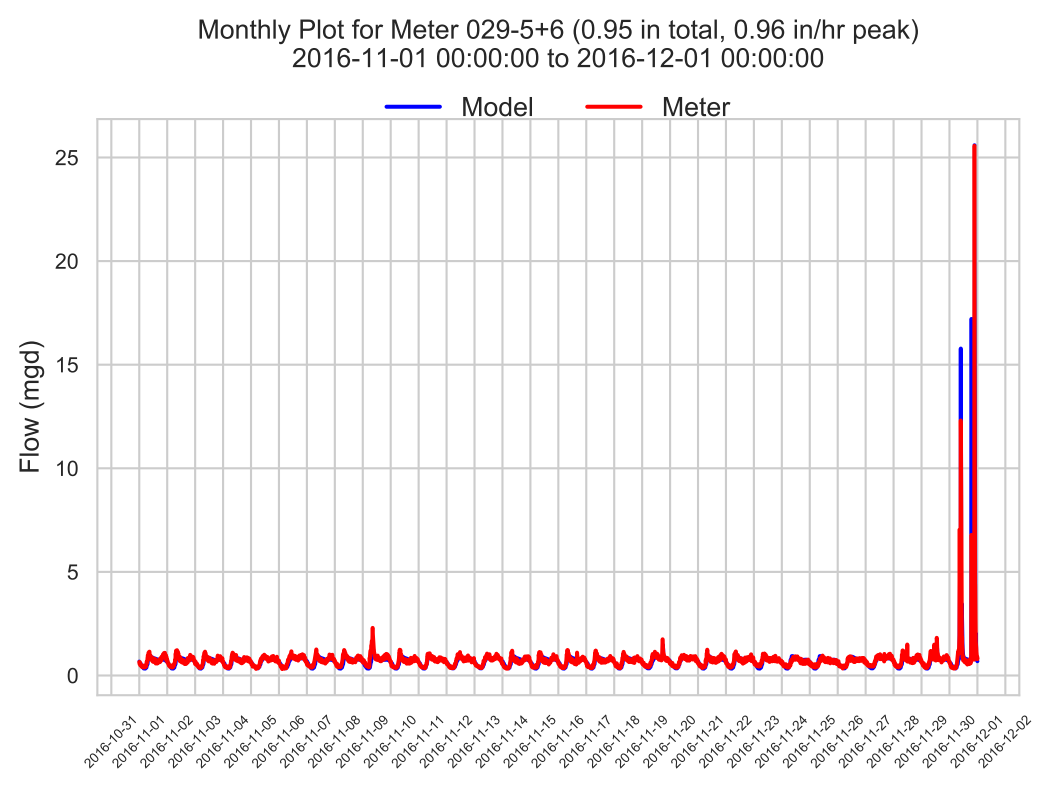
2016-08-29
2016-08-30
2016-08-31
2016-09-01
2016-09-02



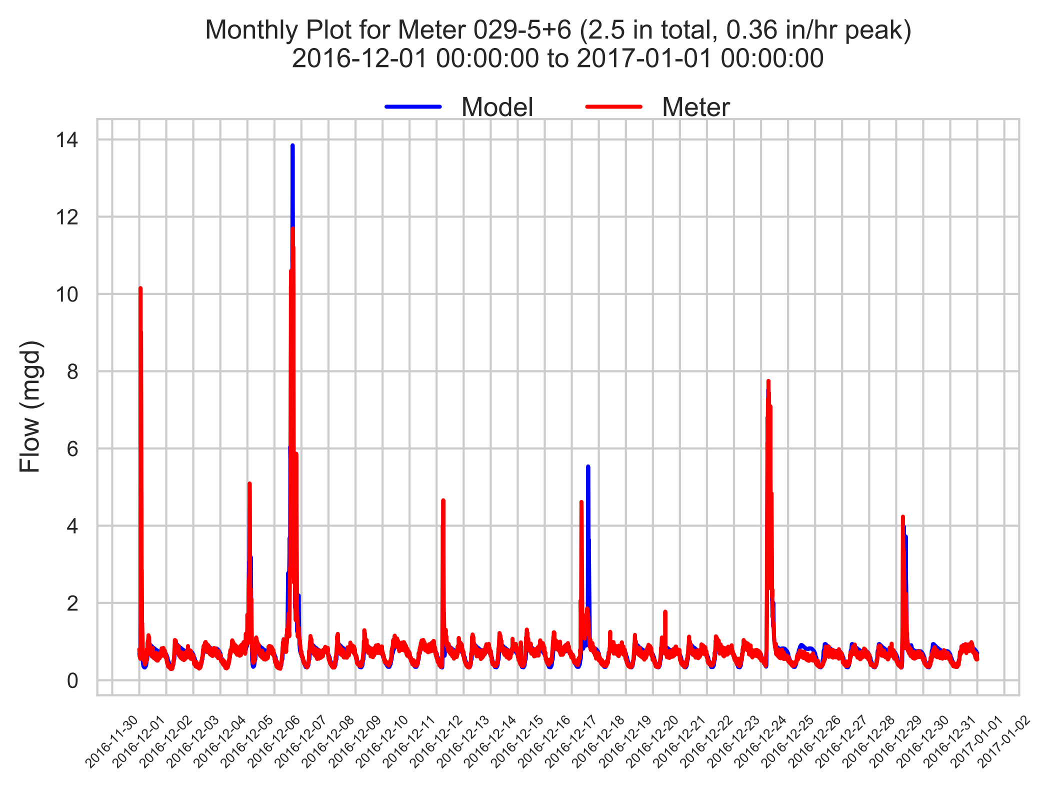
Monthly Plot for Meter 029-5+6 (3.52 in total, 1.32 in/hr peak)
2016-09-01 00:00:00 to 2016-10-01 00:00:00
Model
Meter
Flow (mgd)
0
5
10
15
20
25
30
2016-08-31
2016-09-01
2016-09-02
2016-09-03
2016-09-04
2016-09-05
2016-09-06
2016-09-07
2016-09-08
2016-09-09
2016-09-10
2016-09-11
2016-09-12
2016-09-13
2016-09-14
2016-09-15
2016-09-16
2016-09-17
2016-09-18
2016-09-19
2016-09-20
2016-09-21
2016-09-22
2016-09-23
2016-09-24
2016-09-25
2016-09-26
2016-09-27
2016-09-28
2016-09-29
2016-09-30
2016-10-01
2016-10-02

Monthly Plot for Meter 029-5+6 (0.91 in total, 0.84 in/hr peak)
2016-10-01 00:00:00 to 2016-11-01 00:00:00





Monthly Plot for Meter 029-5+6 (0.95 in total, 0.96 in/hr peak)
2016-11-01 00:00:00 to 2016-12-01 00:00:00
Model
Meter
Flow (mgd)
0
5
10
15
20
25
2016-10-31
2016-11-01
2016-11-02
2016-11-03
2016-11-04
2016-11-05
2016-11-06
2016-11-07
2016-11-08
2016-11-09
2016-11-10
2016-11-11
2016-11-12
2016-11-13
2016-11-14
2016-11-15
2016-11-16
2016-11-17
2016-11-18
2016-11-19
2016-11-20
2016-11-21
2016-11-22
2016-11-23
2016-11-24
2016-11-25
2016-11-26
2016-11-27
2016-11-28
2016-11-29
2016-11-30
2016-12-01
2016-12-02



Monthly Plot for Meter 029-5+6 (2.5 in total, 0.36 in/hr peak)
2016-12-01 00:00:00 to 2017-01-01 00:00:00
Model
Meter
Flow (mgd)
0
2
4
6
8
10
12
14
2016-11-30
2016-12-01
2016-12-02
2016-12-03
2016-12-04
2016-12-05
2016-12-06
2016-12-07
2016-12-08
2016-12-09
2016-12-10
2016-12-11
2016-12-12
2016-12-13
2016-12-14
2016-12-15
2016-12-16
2016-12-17
2016-12-18
2016-12-19
2016-12-20
2016-12-21
2016-12-22
2016-12-23
2016-12-24
2016-12-25
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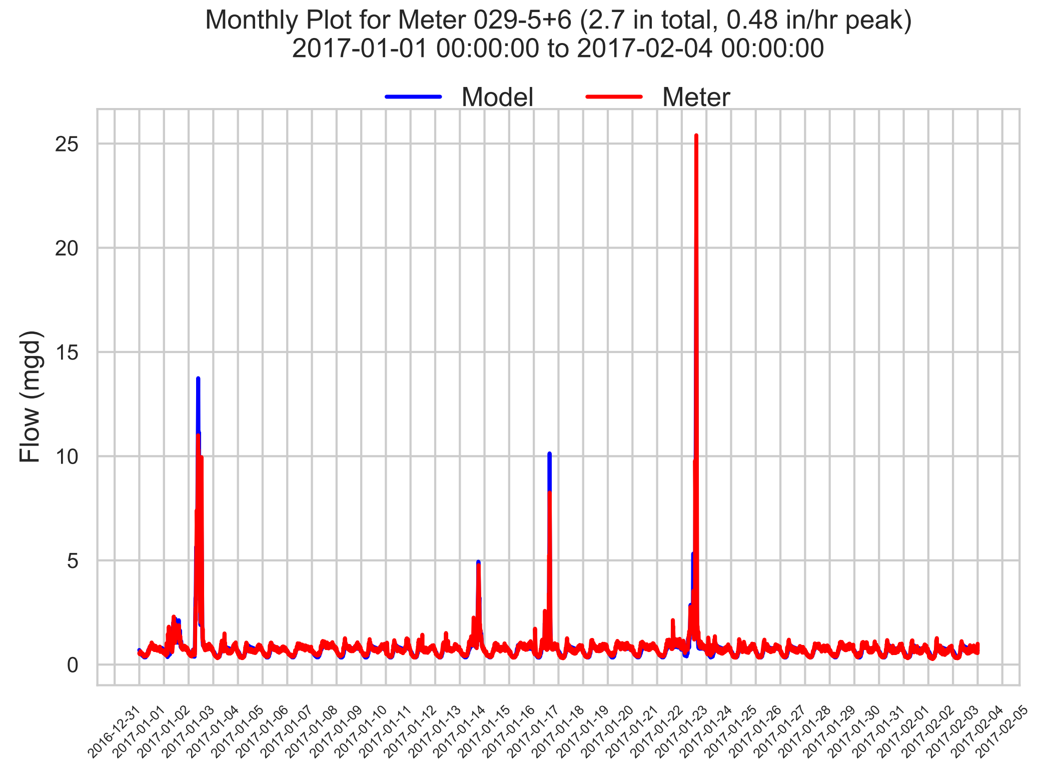
2016-12-29
2016-12-30
2016-12-31
2017-01-01
2017-01-02



Monthly Plot for Meter 029-5+6 (2.7 in total, 0.48 in/hr peak)
2017-01-01 00:00:00 to 2017-02-04 00:00:00
Model
Meter
Flow (mgd)
0
5
10
15
20
25
2016-12-31
2017-01-01
2017-01-02
2017-01-03
2017-01-04
2017-01-05
2017-01-06
2017-01-07
2017-01-08
2017-01-09
2017-01-10
2017-01-11
2017-01-12
2017-01-13
2017-01-14
2017-01-15
2017-01-16
2017-01-17
2017-01-18
2017-01-19
2017-01-20
2017-01-21
2017-01-22
2017-01-23
2017-01-24
2017-01-25
2017-01-26
2017-01-27
2017-01-28
2017-01-29
2017-01-30
2017-01-31
2017-02-01
2017-02-02
2017-02-03
2017-02-04
2017-02-05

# Appendix C

# Post-Construction Event Hydrographs

(Note: The y-axis varies in scale between the individual plots)

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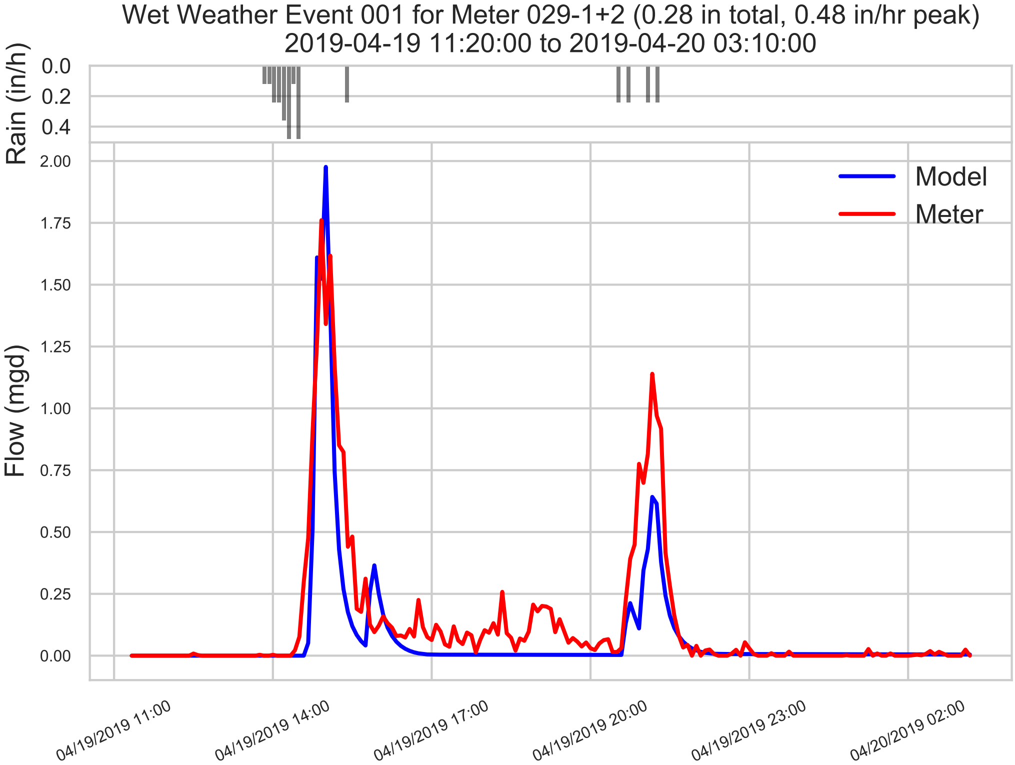
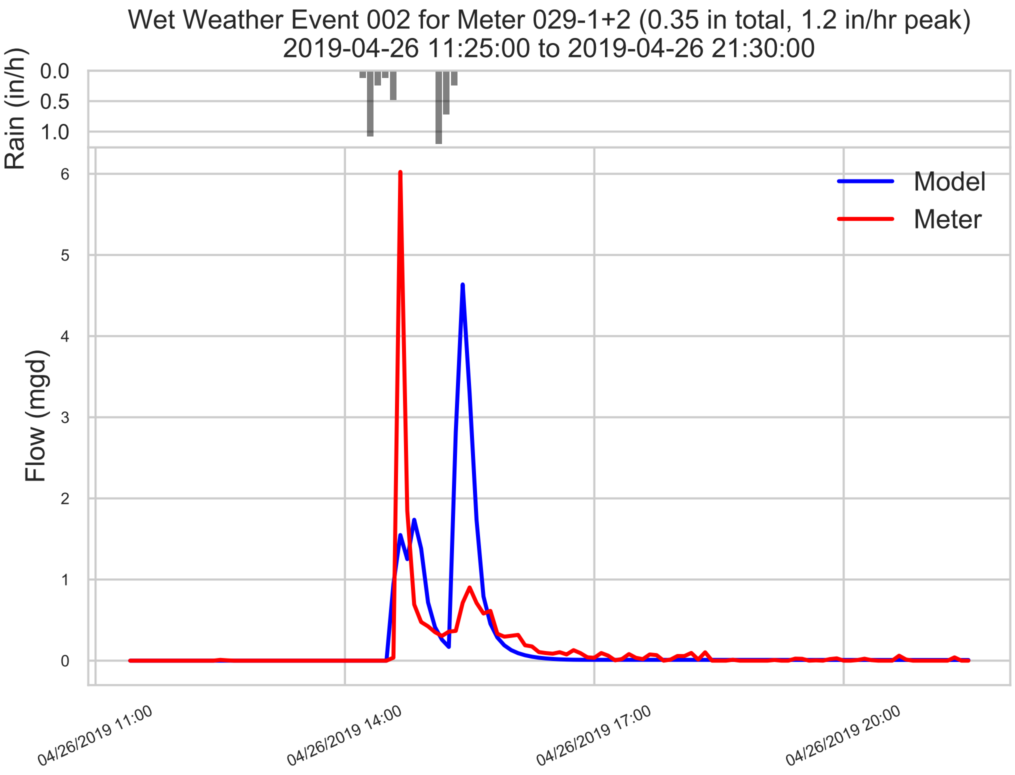
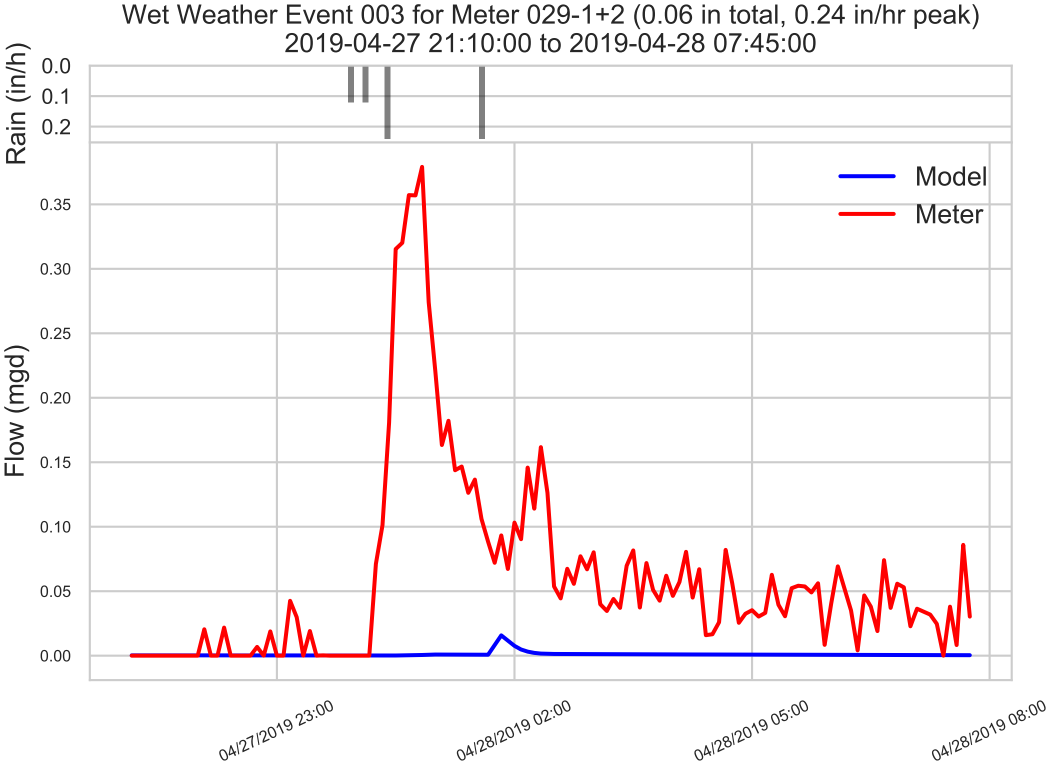
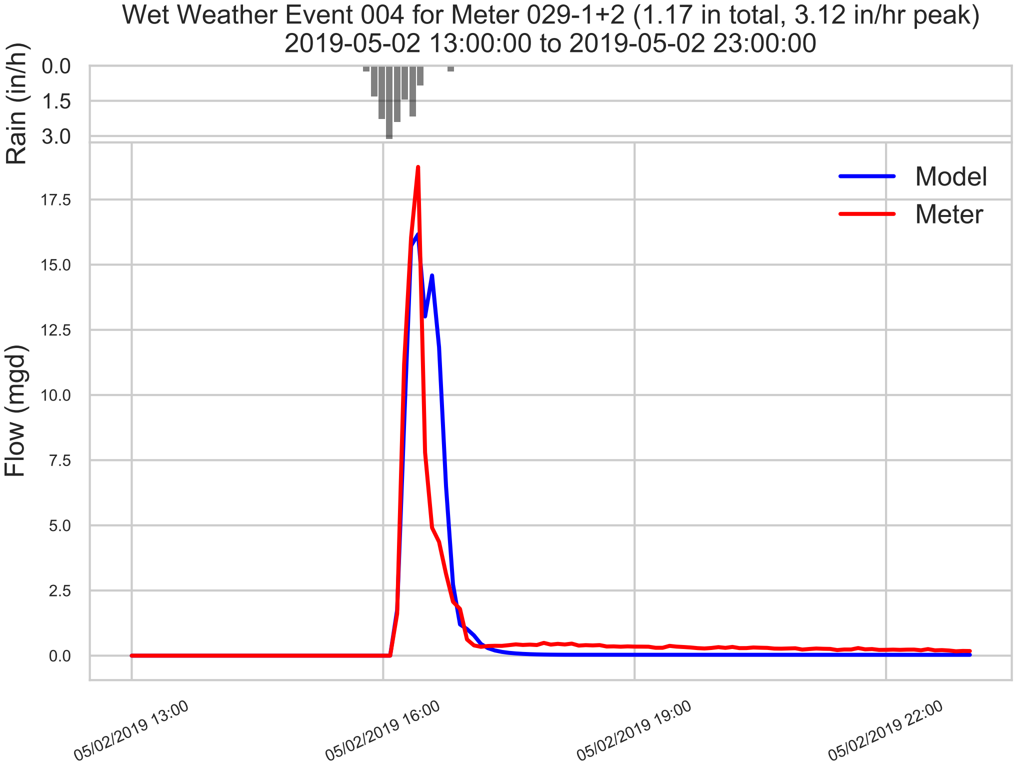
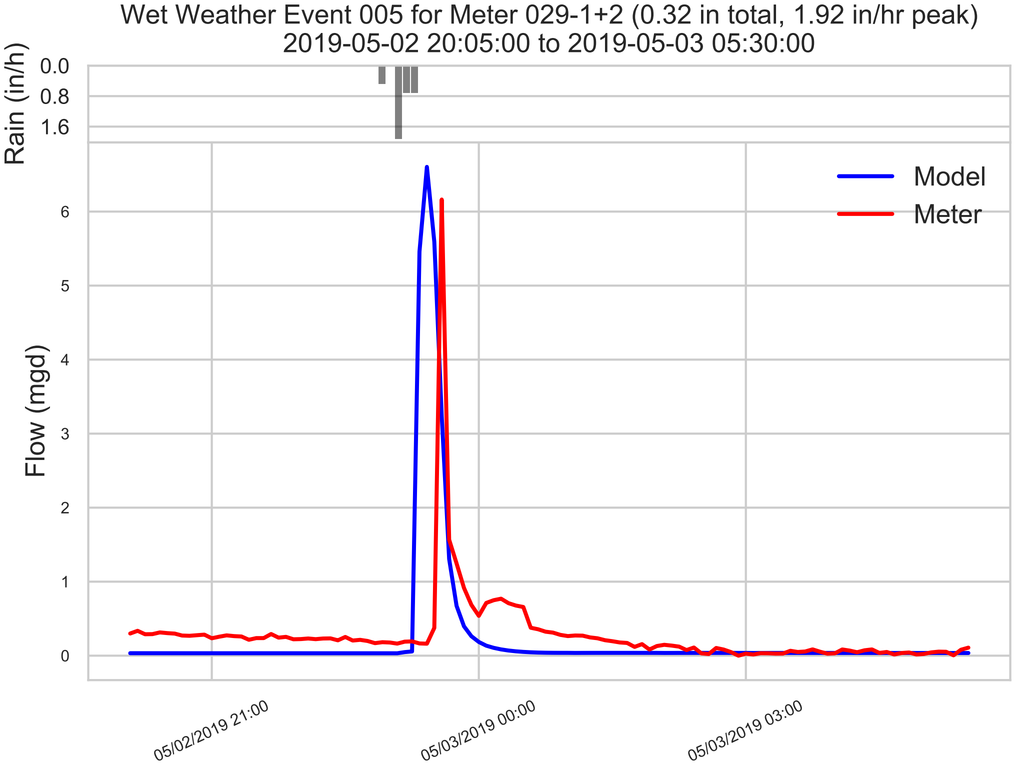

Wet Weather Event 001 for Meter 029-1+2 (0.28 in total, 0.48 in/hr peak)
2019-04-19 11:20:00 to 2019-04-20 03:10:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Model
Meter
04/19/2019 11:00
04/19/2019 14:00
04/19/2019 17:00
04/19/2019 20:00
04/19/2019 23:00
04/20/2019 02:00


Wet Weather Event 002 for Meter 029-1+2 (0.35 in total, 1.2 in/hr peak)
2019-04-26 11:25:00 to 2019-04-26 21:30:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
6
5
4
3
2
1
0
Model
Meter
04/26/2019 11:00
04/26/2019 14:00
04/26/2019 17:00
04/26/2019 20:00

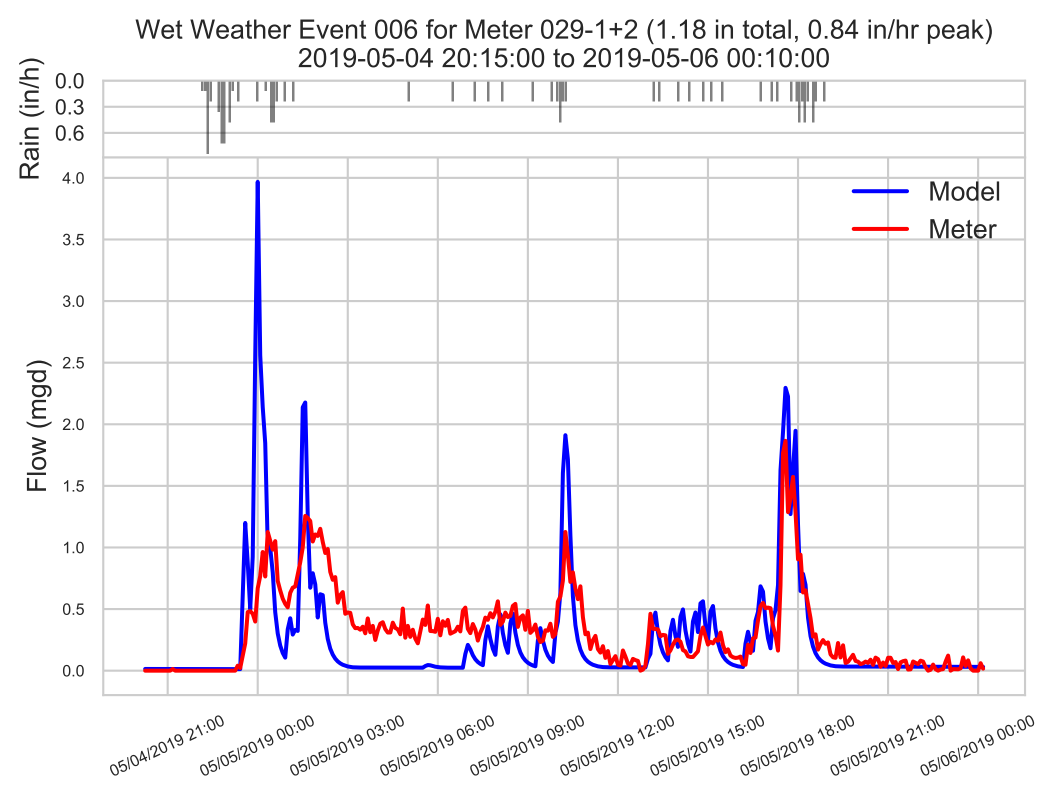


Wet Weather Event 003 for Meter 029-1+2 (0.06 in total, 0.24 in/hr peak)
2019-04-27 21:10:00 to 2019-04-28 07:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Model
Meter
04/27/2019 23:00
04/28/2019 02:00
04/28/2019 05:00
04/28/2019 08:00

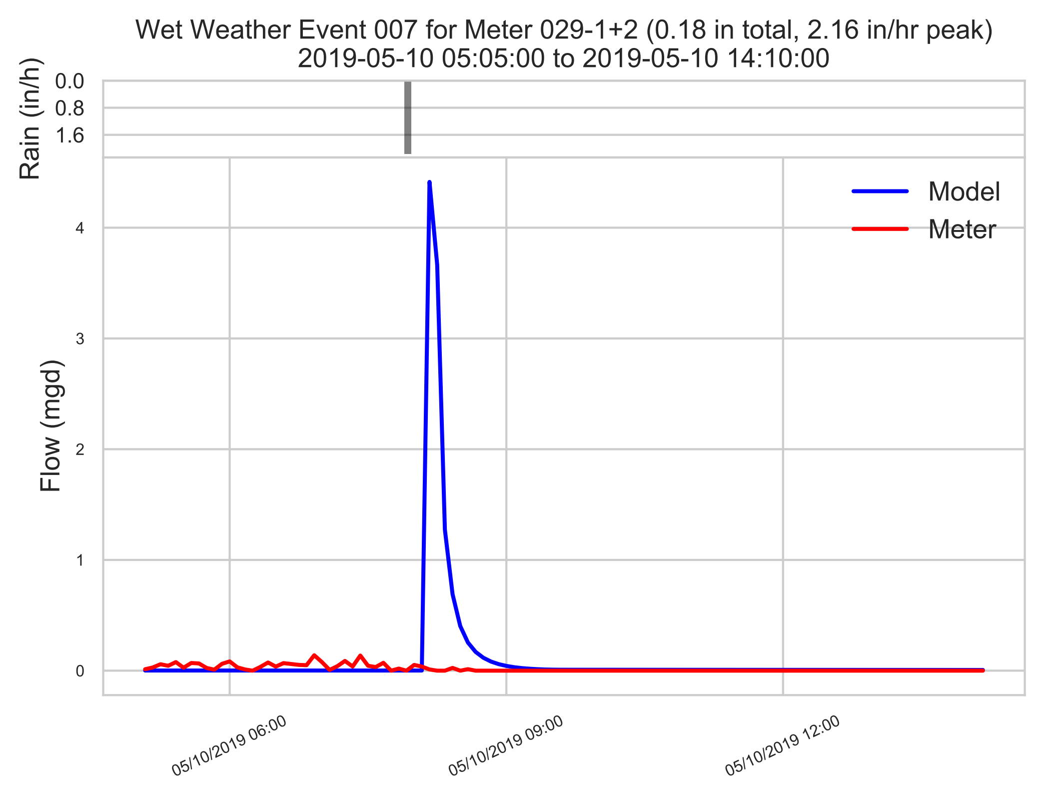

Wet Weather Event 004 for Meter 029-1+2 (1.17 in total, 3.12 in/hr peak)
2019-05-02 13:00:00 to 2019-05-02 23:00:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
05/02/2019 13:00
05/02/2019 16:00
05/02/2019 19:00
05/02/2019 22:00



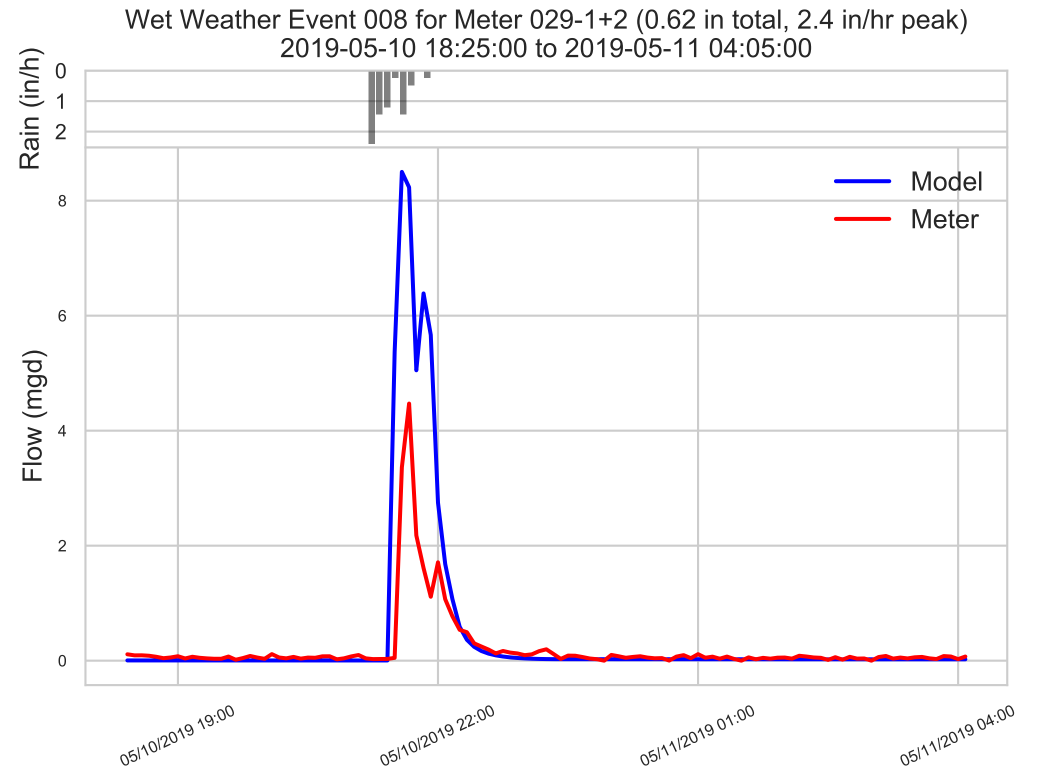
Wet Weather Event 005 for Meter 029-1+2 (0.32 in total, 1.92 in/hr peak)
2019-05-02 20:05:00 to 2019-05-03 05:30:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
0
1
2
3
4
5
6
Model
Meter
05/02/2019 21:00
05/03/2019 00:00
05/03/2019 03:00



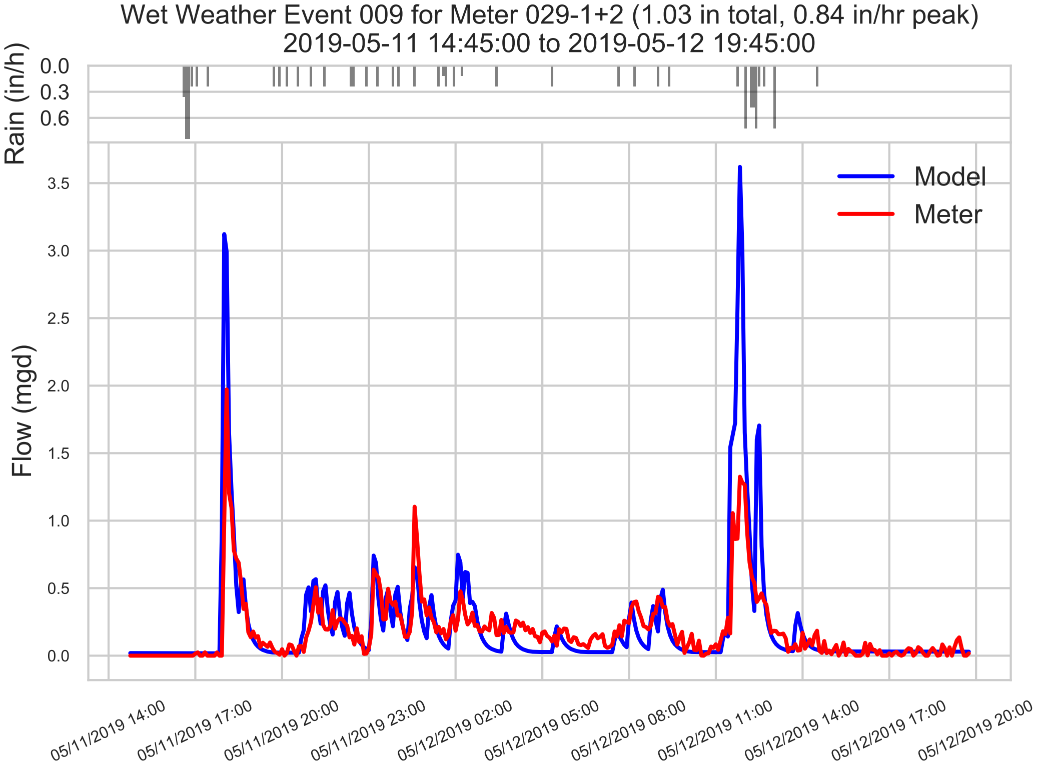
Wet Weather Event 006 for Meter 029-1+2 (1.18 in total, 0.84 in/hr peak)
2019-05-04 20:15:00 to 2019-05-06 00:10:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
05/04/2019 21:00
05/05/2019 00:00
05/05/2019 03:00
05/05/2019 06:00
05/05/2019 09:00
05/05/2019 12:00
05/05/2019 15:00
05/05/2019 18:00
05/05/2019 21:00
05/06/2019 00:00

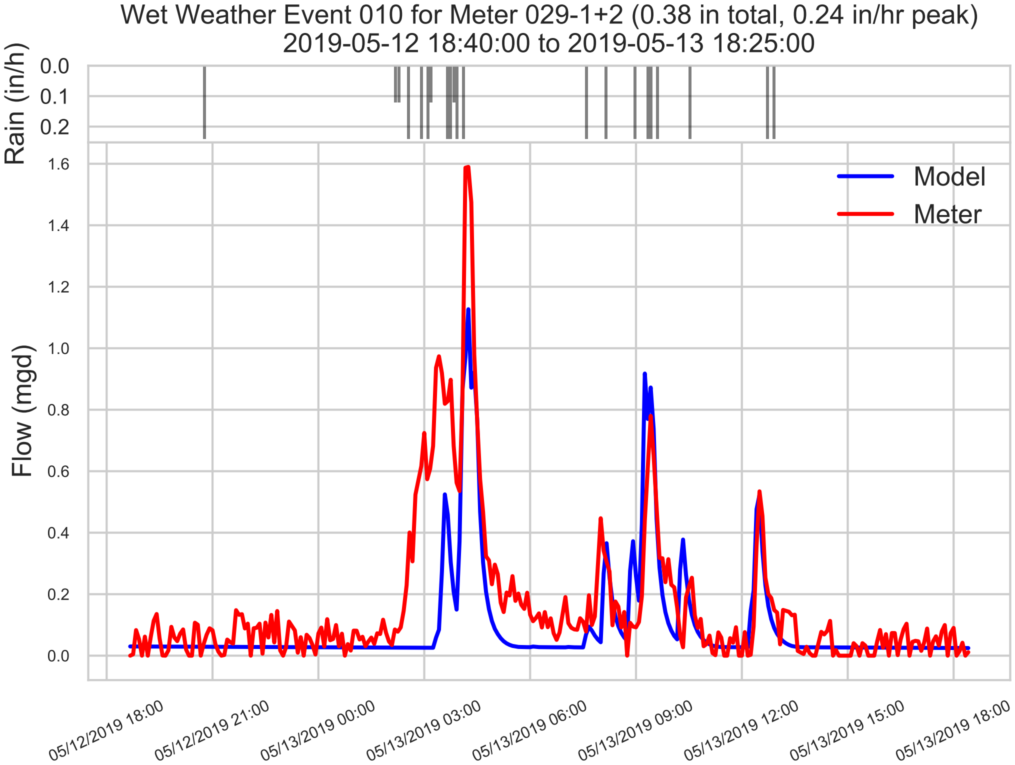


Wet Weather Event 007 for Meter 029-1+2 (0.18 in total, 2.16 in/hr peak)
2019-05-10 05:05:00 to 2019-05-10 14:10:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
0
1
2
3
4
Model
Meter
05/10/2019 06:00
05/10/2019 09:00
05/10/2019 12:00

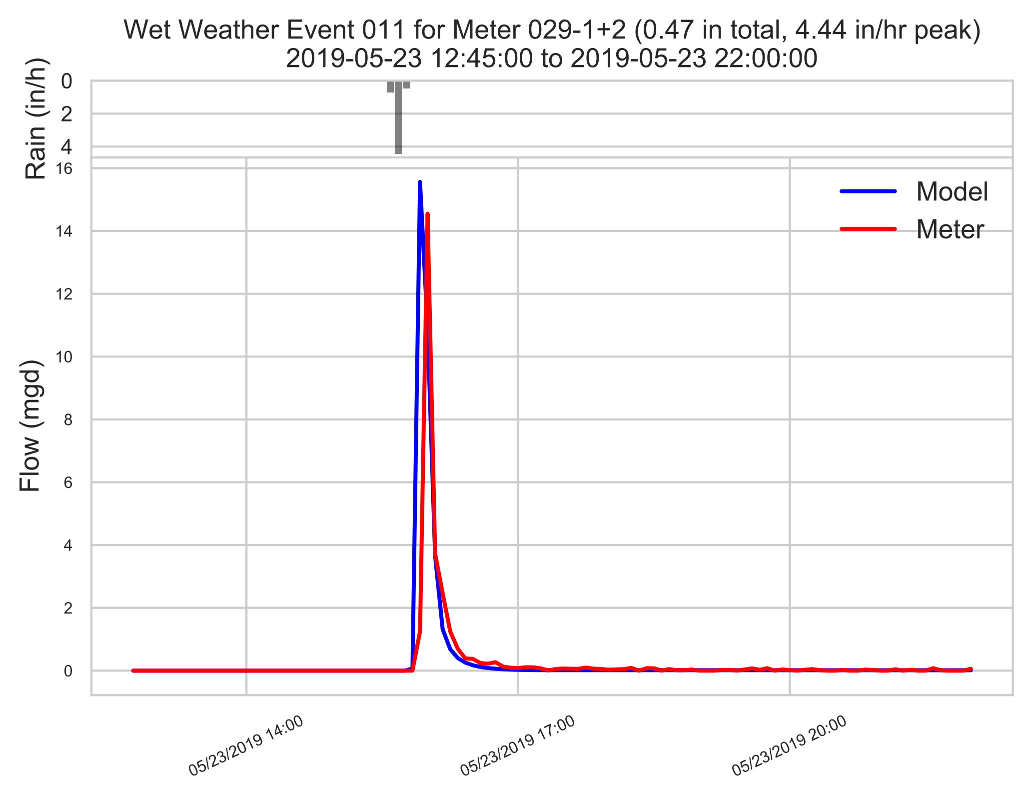


Wet Weather Event 008 for Meter 029-1+2 (0.62 in total, 2.4 in/hr peak)
2019-05-10 18:25:00 to 2019-05-11 04:05:00
Rain (in/h)
0
1
2
Flow (mgd)
8
6
4
2
0
Model
Meter
05/10/2019 19:00
05/10/2019 22:00
05/11/2019 01:00
05/11/2019 04:00

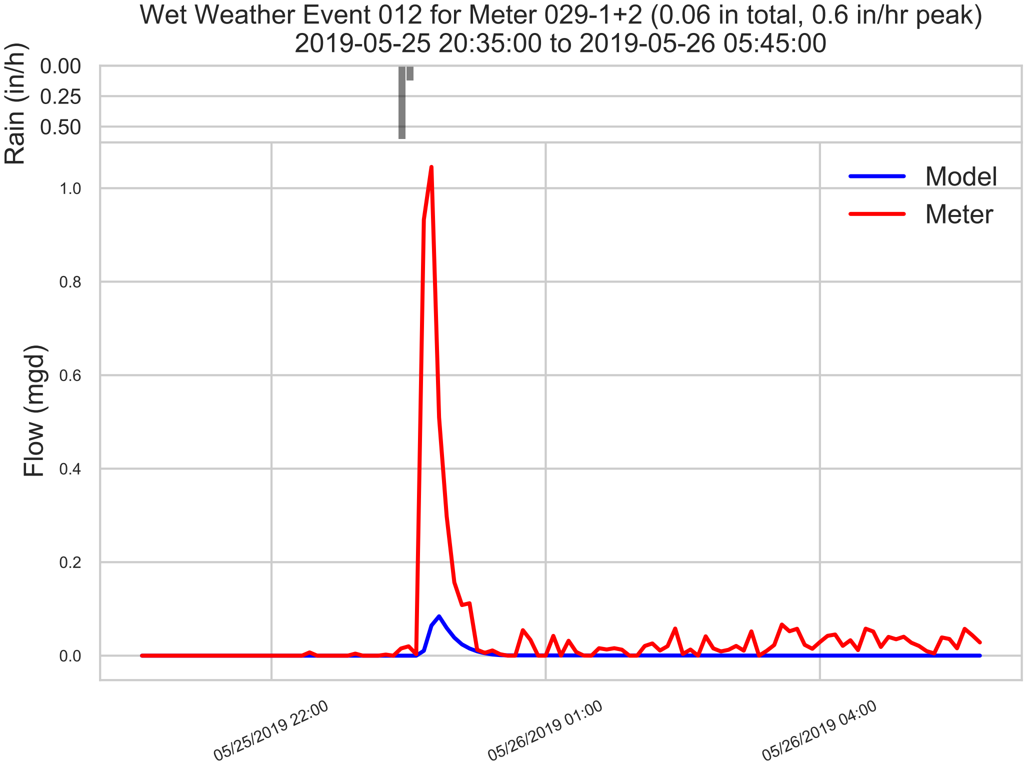

Wet Weather Event 009 for Meter 029-1+2 (1.03 in total, 0.84 in/hr peak)
2019-05-11 14:45:00 to 2019-05-12 19:45:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
05/11/2019 14:00
05/11/2019 17:00
05/11/2019 20:00
05/11/2019 23:00
05/12/2019 02:00
05/12/2019 05:00
05/12/2019 08:00
05/12/2019 11:00
05/12/2019 14:00
05/12/2019 17:00
05/12/2019 20:00

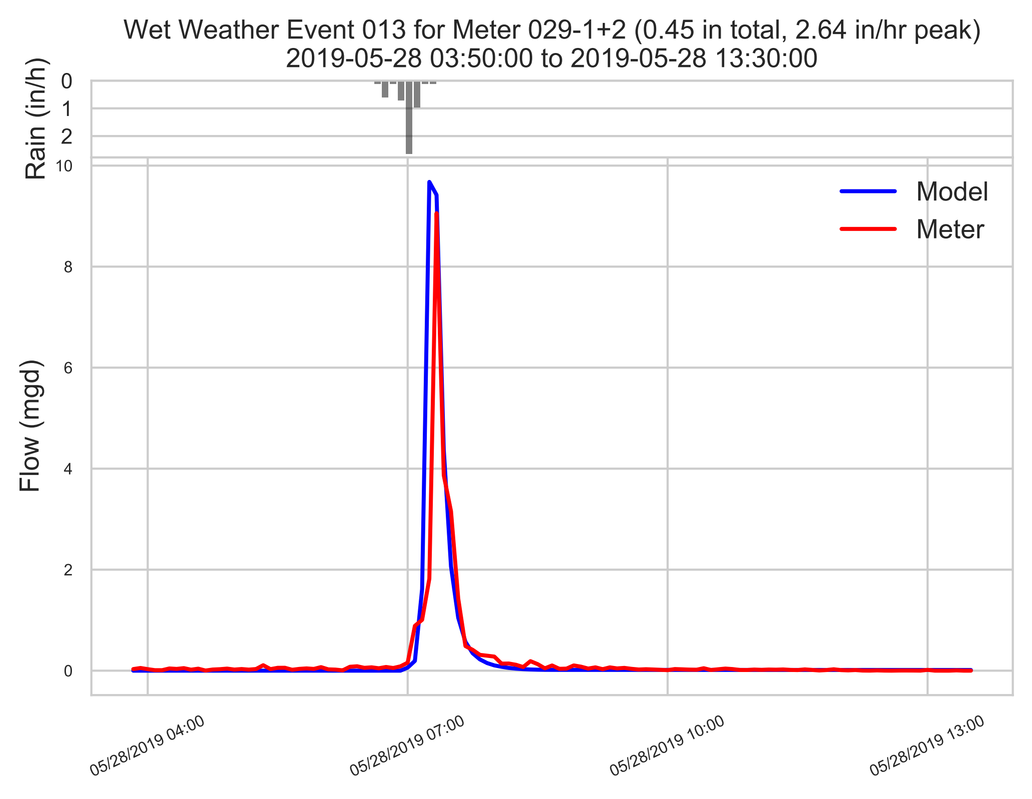


Wet Weather Event 010 for Meter 029-1+2 (0.38 in total, 0.24 in/hr peak)
2019-05-12 18:40:00 to 2019-05-13 18:25:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
05/12/2019 18:00
05/12/2019 21:00
05/13/2019 00:00
05/13/2019 03:00
05/13/2019 06:00
05/13/2019 09:00
05/13/2019 12:00
05/13/2019 15:00
05/13/2019 18:00

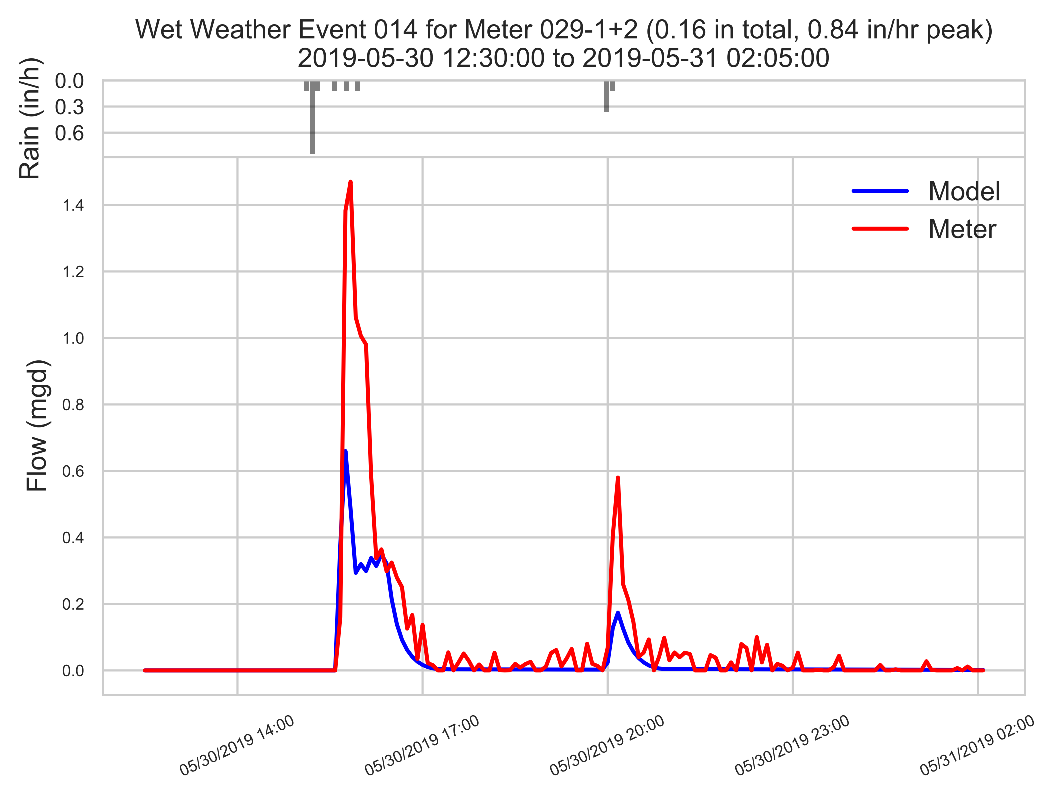


Wet Weather Event 011 for Meter 029-1+2 (0.47 in total, 4.44 in/hr peak)
2019-05-23 12:45:00 to 2019-05-23 22:00:00
Rain (in/h)
0
2
4
Flow (mgd)
16
14
12
10
8
6
4
2
0
Model
Meter
05/23/2019 14:00
05/23/2019 17:00
05/23/2019 20:00

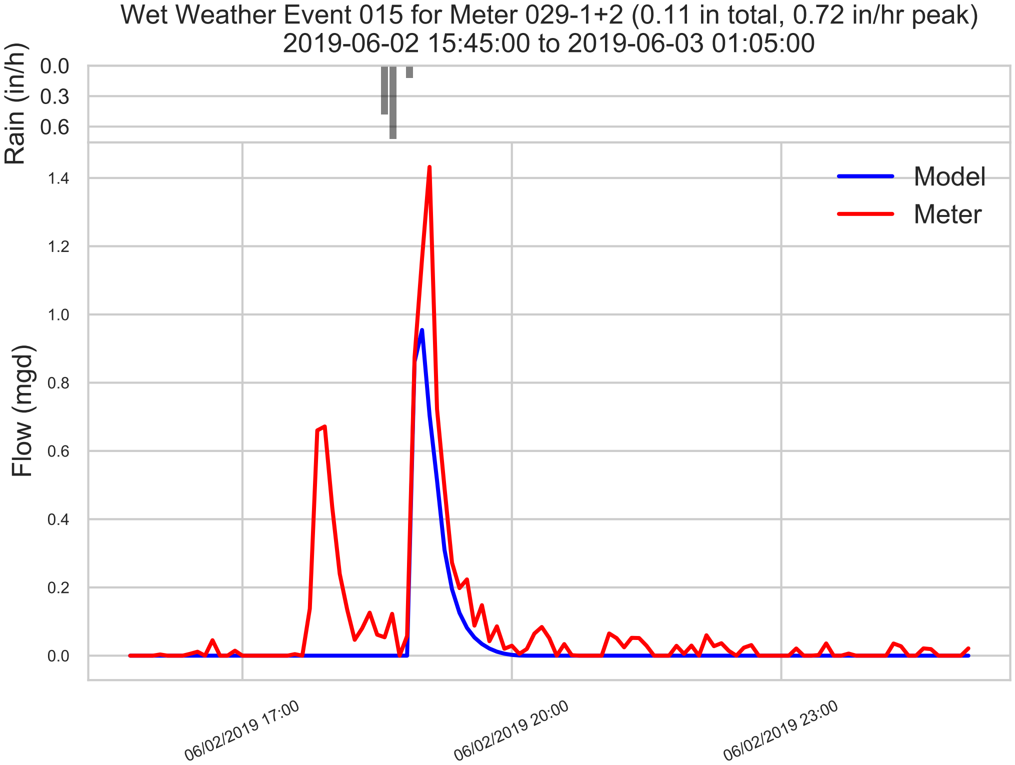

Wet Weather Event 012 for Meter 029-1+2 (0.06 in total, 0.6 in/hr peak)
2019-05-25 20:35:00 to 2019-05-26 05:45:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
05/25/2019 22:00
05/26/2019 01:00
05/26/2019 04:00

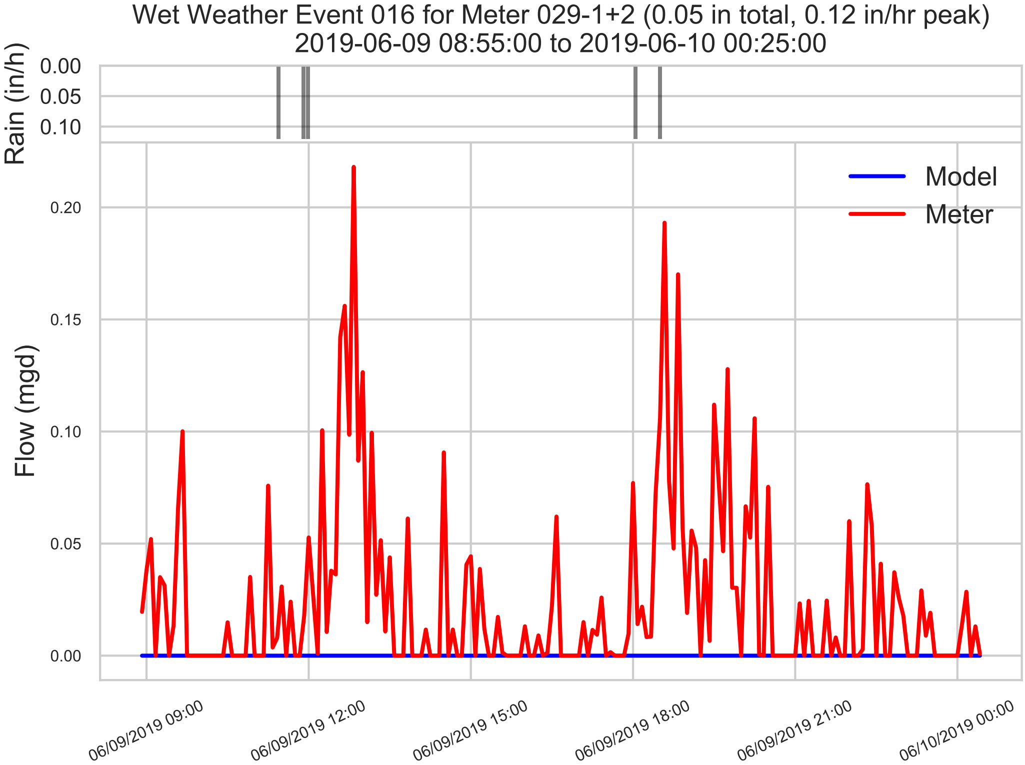


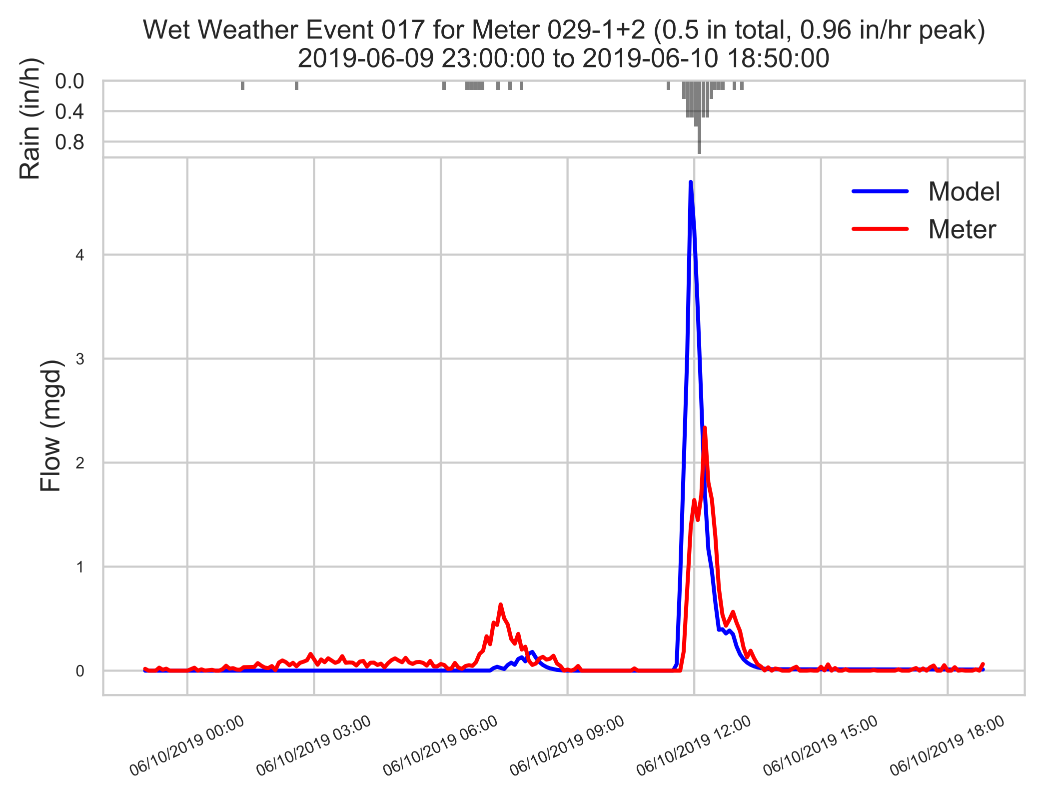
Wet Weather Event 013 for Meter 029-1+2 (0.45 in total, 2.64 in/hr peak)
2019-05-28 03:50:00 to 2019-05-28 13:30:00
Rain (in/h)
0
1
2
10
8
6
4
2
0
Flow (mgd)
Model
Meter
05/28/2019 04:00
05/28/2019 07:00
05/28/2019 10:00
05/28/2019 13:00



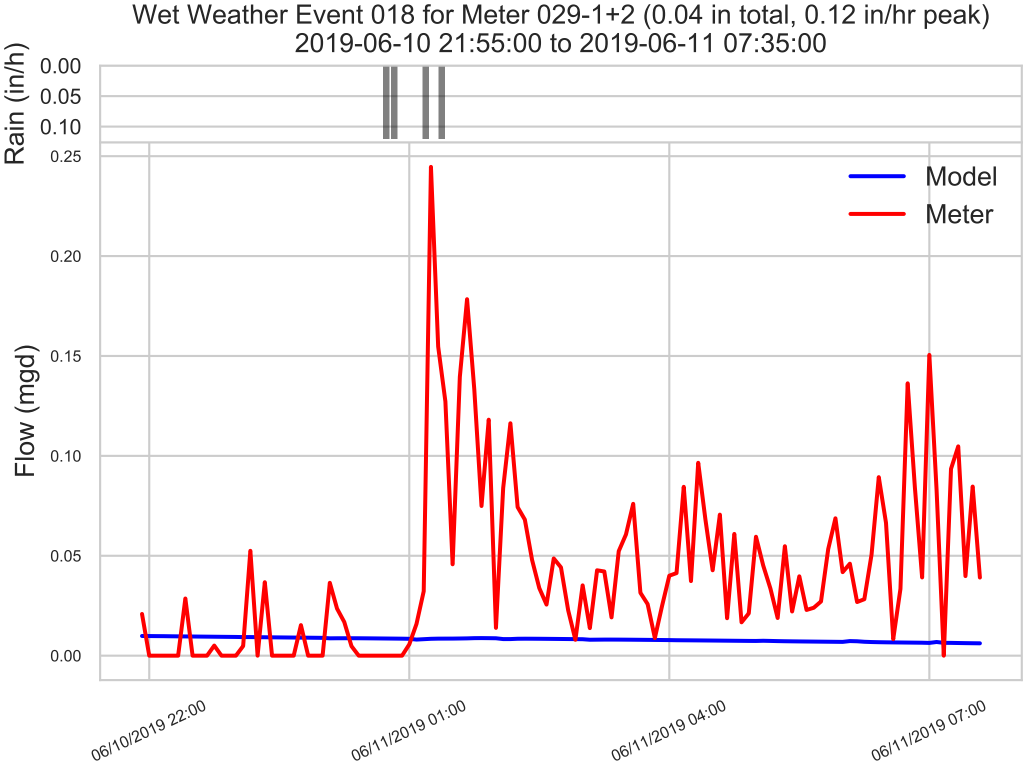
Wet Weather Event 014 for Meter 029-1+2 (0.16 in total, 0.84 in/hr peak)
2019-05-30 12:30:00 to 2019-05-31 02:05:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
05/30/2019 14:00
05/30/2019 17:00
05/30/2019 20:00
05/30/2019 23:00
05/31/2019 02:00


Wet Weather Event 015 for Meter 029-1+2 (0.11 in total, 0.72 in/hr peak)
2019-06-02 15:45:00 to 2019-06-03 01:05:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
06/02/2019 17:00
06/02/2019 20:00
06/02/2019 23:00

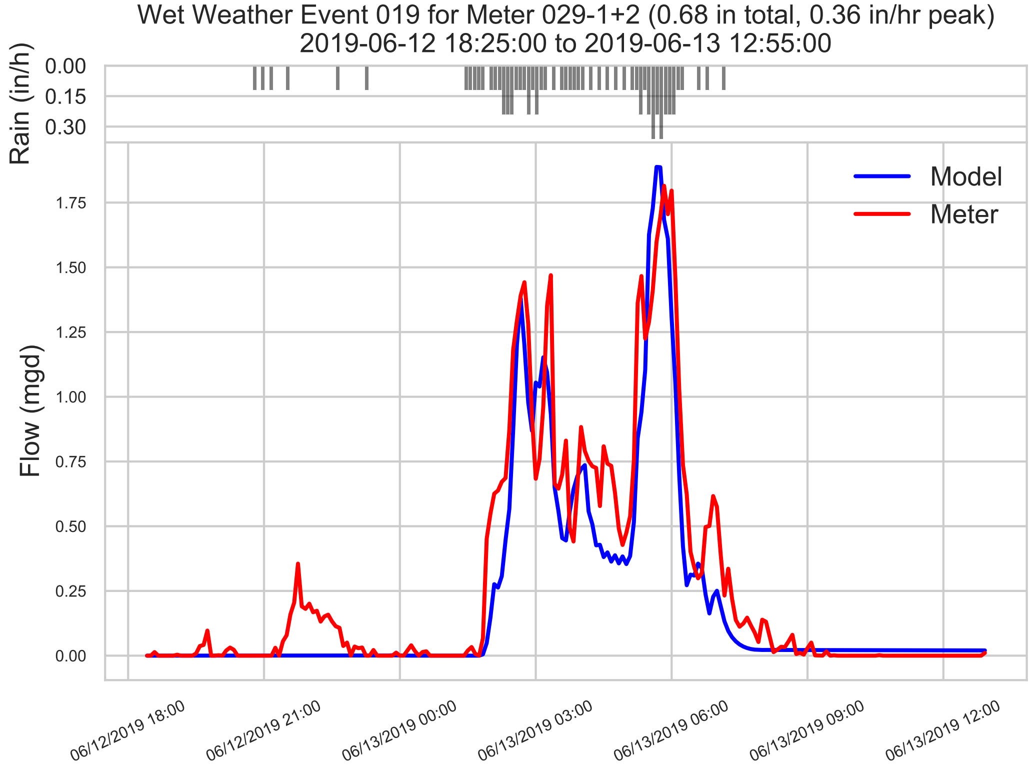

Wet Weather Event 016 for Meter 029-1+2 (0.05 in total, 0.12 in/hr peak)
2019-06-09 08:55:00 to 2019-06-10 00:25:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.20
0.15
0.10
0.05
0.00
Model
Meter
06/09/2019 09:00
06/09/2019 12:00
06/09/2019 15:00
06/09/2019 18:00
06/09/2019 21:00
06/10/2019 00:00



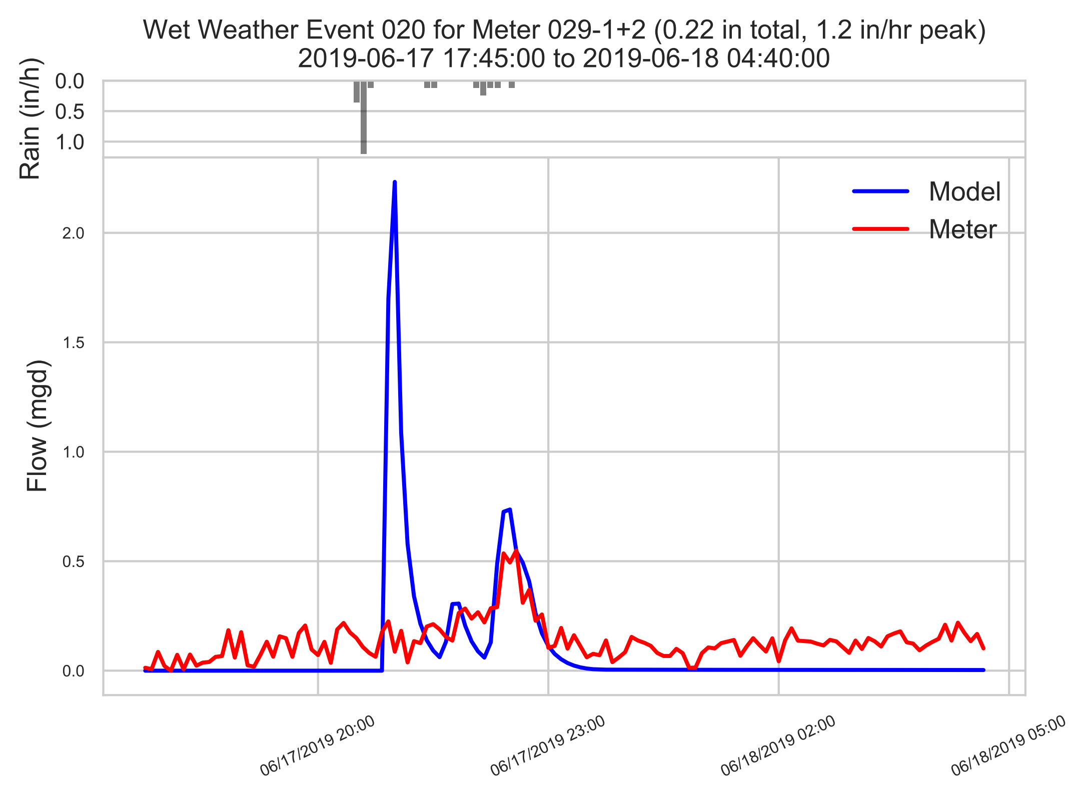
Wet Weather Event 017 for Meter 029-1+2 (0.5 in total, 0.96 in/hr peak)
2019-06-09 23:00:00 to 2019-06-10 18:50:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
0
1
2
3
4
Model
Meter
06/10/2019 00:00
06/10/2019 03:00
06/10/2019 06:00
06/10/2019 09:00
06/10/2019 12:00
06/10/2019 15:00
06/10/2019 18:00

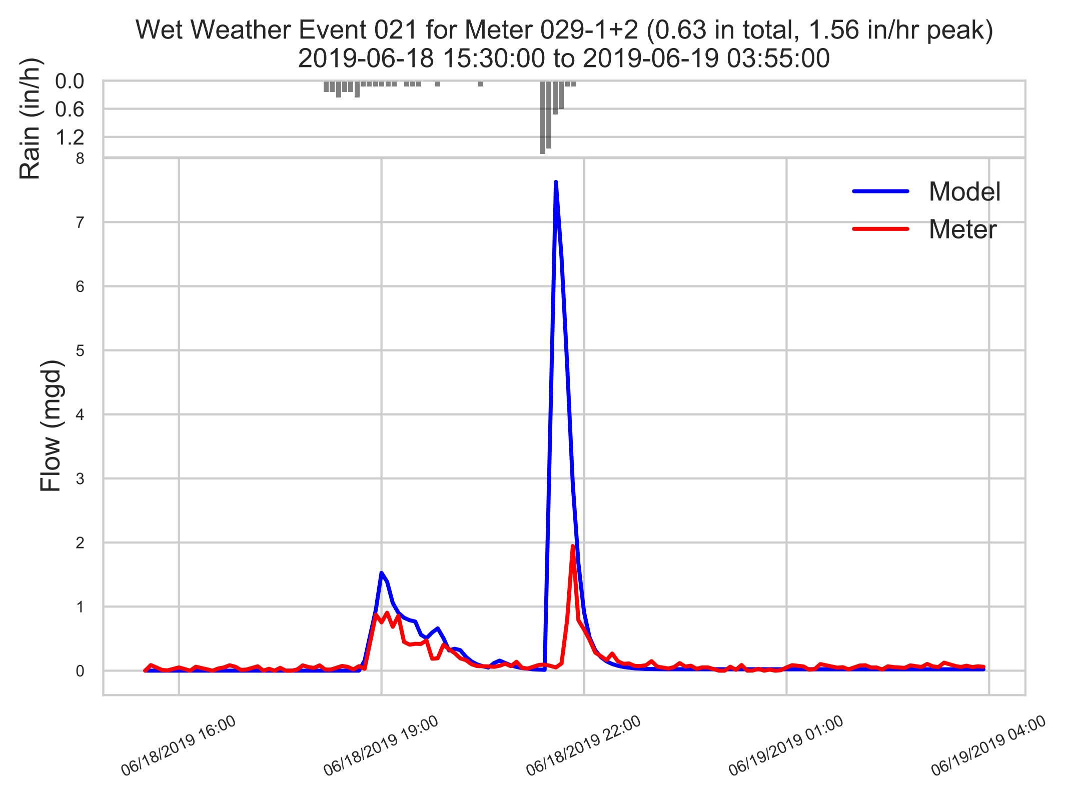


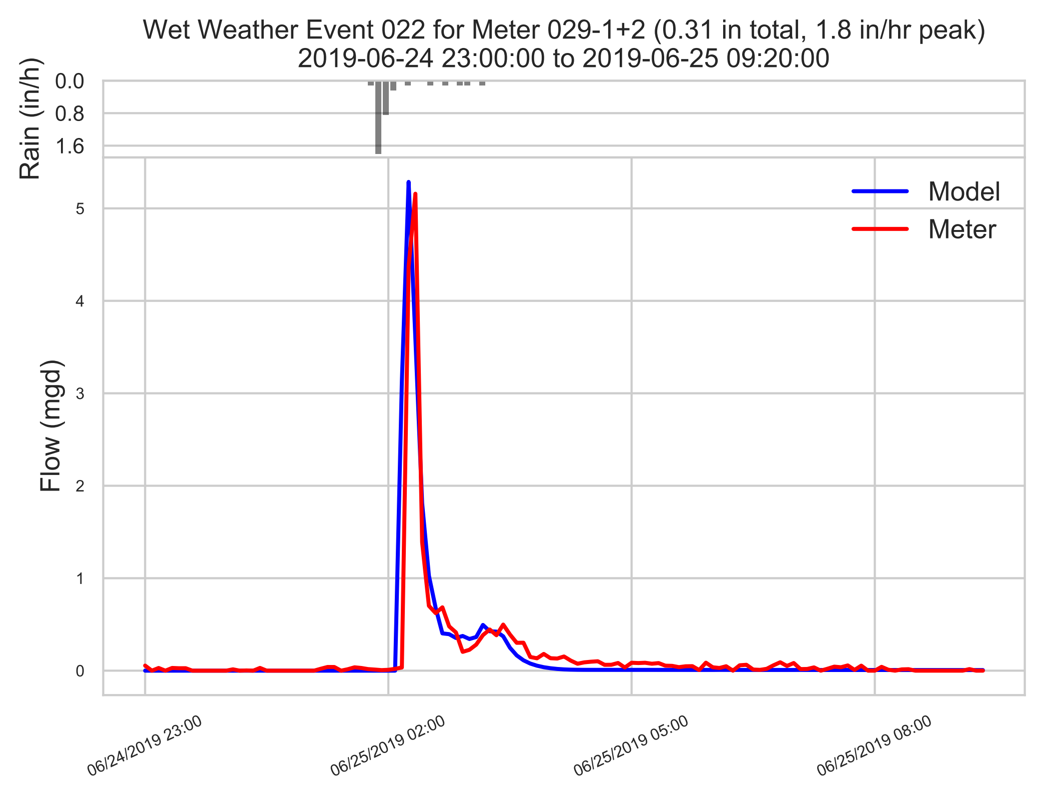
Wet Weather Event 018 for Meter 029-1+2 (0.04 in total, 0.12 in/hr peak)
2019-06-10 21:55:00 to 2019-06-11 07:35:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.25
0.20
0.15
0.10
0.05
0.00
Model
Meter
06/10/2019 22:00
06/11/2019 01:00
06/11/2019 04:00
06/11/2019 07:00



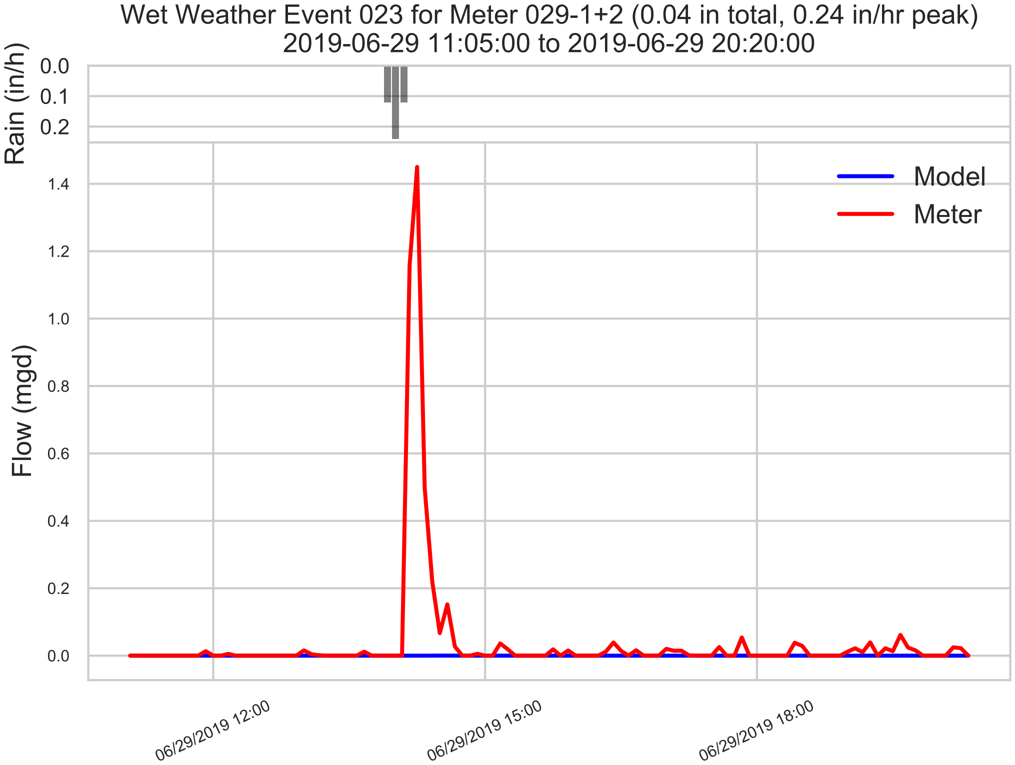
Wet Weather Event 019 for Meter 029-1+2 (0.68 in total, 0.36 in/hr peak)
2019-06-12 18:25:00 to 2019-06-13 12:55:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Model
Meter
06/12/2019 18:00
06/12/2019 21:00
06/13/2019 00:00
06/13/2019 03:00
06/13/2019 06:00
06/13/2019 09:00
06/13/2019 12:00


Wet Weather Event 020 for Meter 029-1+2 (0.22 in total, 1.2 in/hr peak)
2019-06-17 17:45:00 to 2019-06-18 04:40:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
2.0
1.5
1.0
0.5
0.0
Model
Meter
06/17/2019 20:00
06/17/2019 23:00
06/18/2019 02:00
06/18/2019 05:00

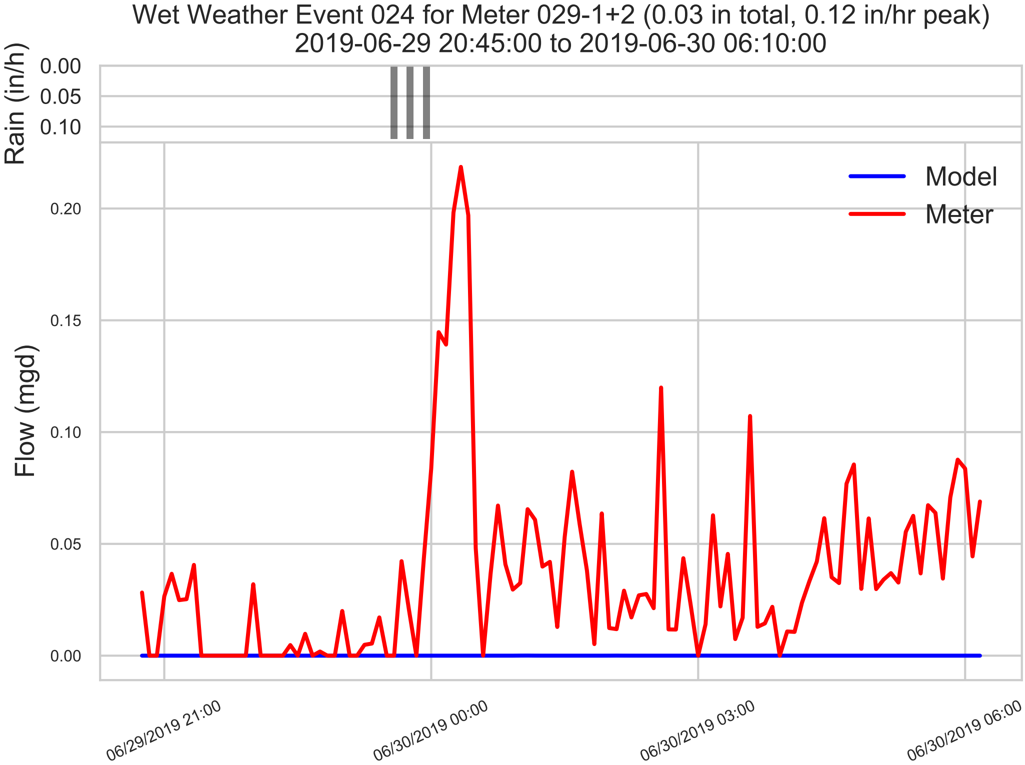

Wet Weather Event 021 for Meter 029-1+2 (0.63 in total, 1.56 in/hr peak)
2019-06-18 15:30:00 to 2019-06-19 03:55:00
Rain (in/h)
0.0
0.6
1.2
Flow (mgd)
0
1
2
3
4
5
6
7
8
Model
Meter
06/18/2019 16:00
06/18/2019 19:00
06/18/2019 22:00
06/19/2019 01:00
06/19/2019 04:00



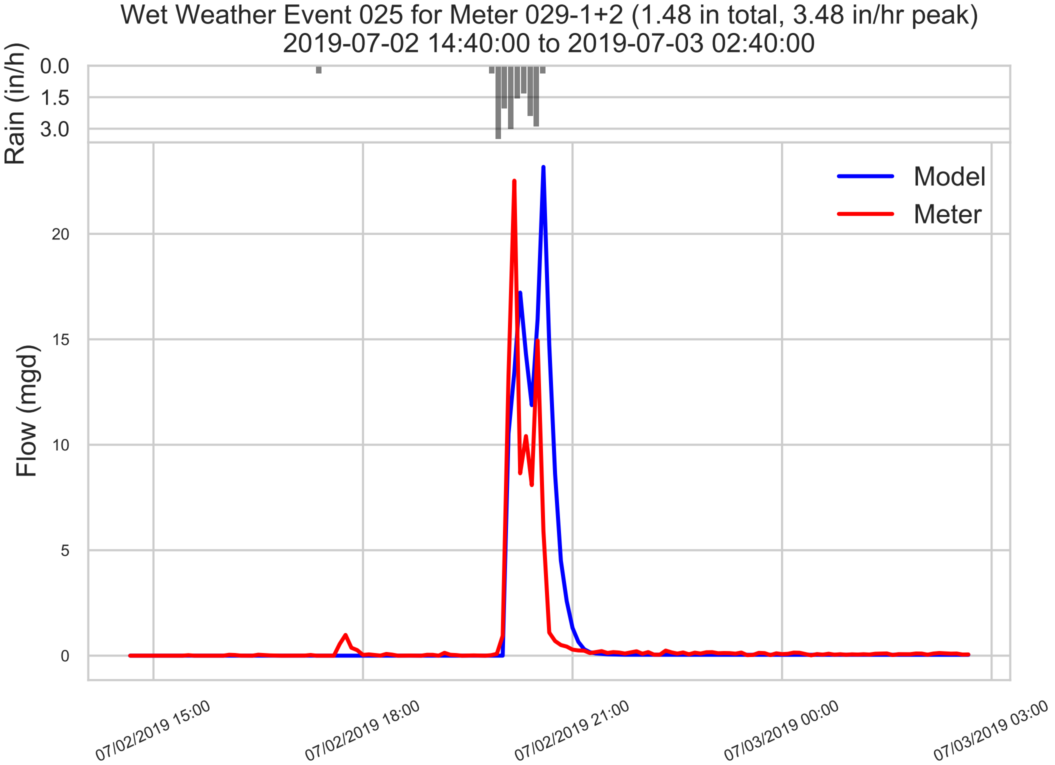
Wet Weather Event 022 for Meter 029-1+2 (0.31 in total, 1.8 in/hr peak)
2019-06-24 23:00:00 to 2019-06-25 09:20:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
0
1
2
3
4
5
Model
Meter
06/24/2019 23:00
06/25/2019 02:00
06/25/2019 05:00
06/25/2019 08:00



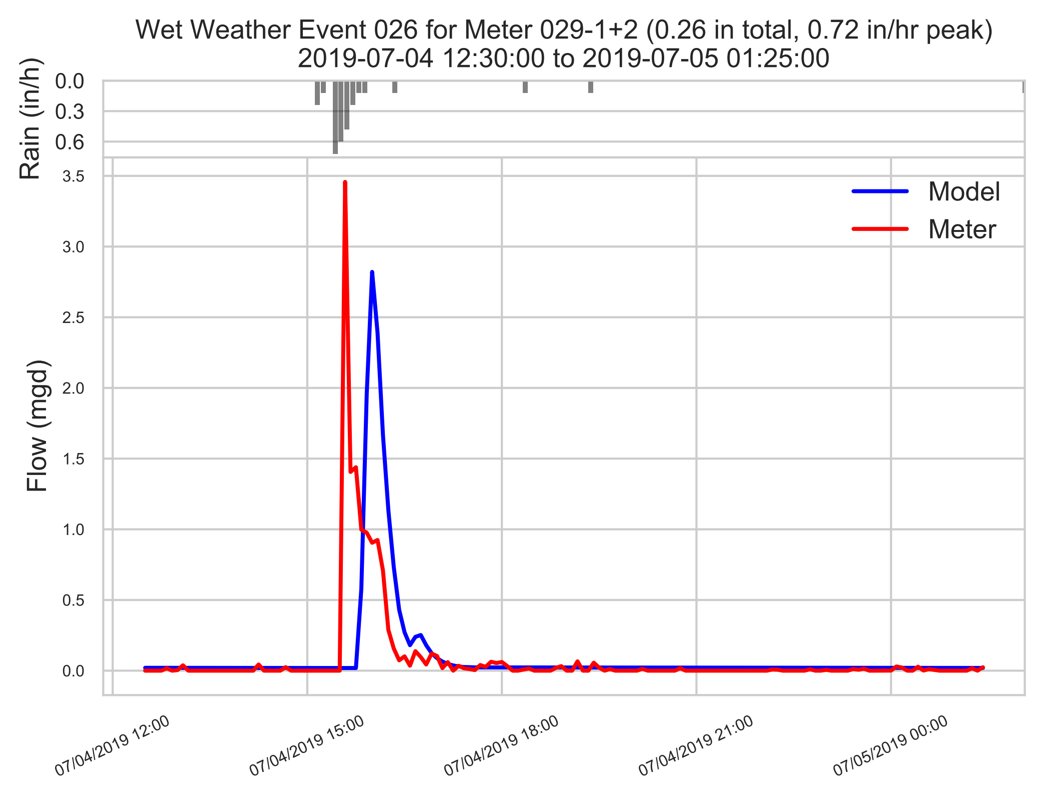
Wet Weather Event 023 for Meter 029-1+2 (0.04 in total, 0.24 in/hr peak)
2019-06-29 11:05:00 to 2019-06-29 20:20:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
06/29/2019 12:00
06/29/2019 15:00
06/29/2019 18:00



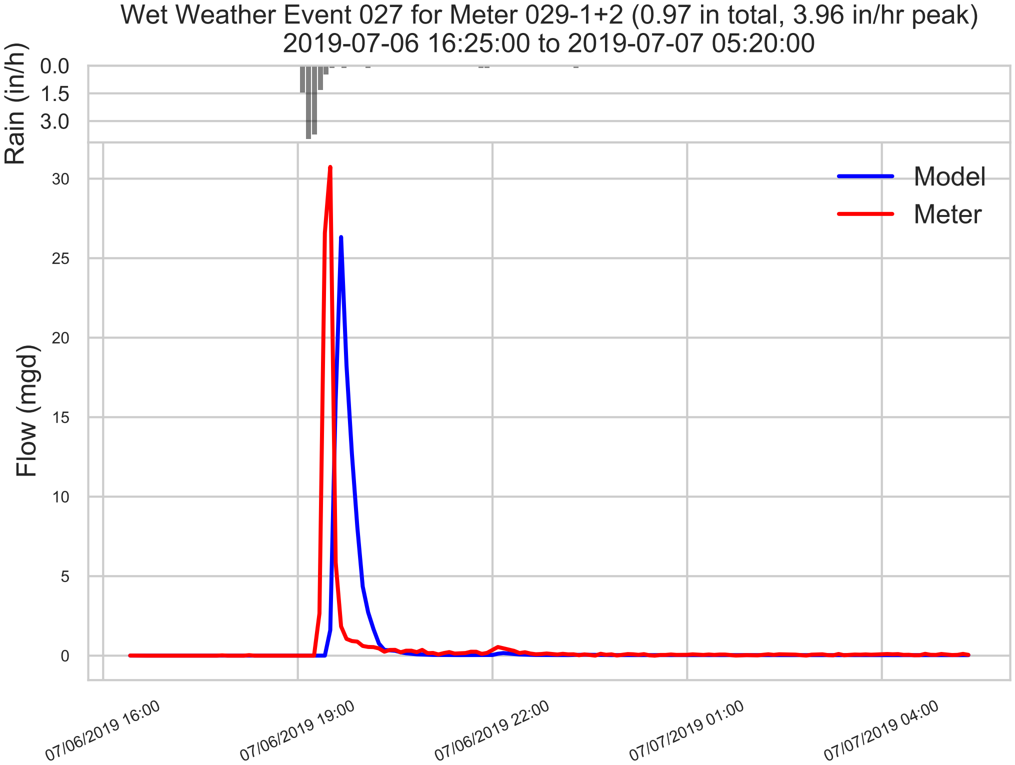
Wet Weather Event 024 for Meter 029-1+2 (0.03 in total, 0.12 in/hr peak)
2019-06-29 20:45:00 to 2019-06-30 06:10:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.20
0.15
0.10
0.05
0.00
Model
Meter
06/29/2019 21:00
06/30/2019 00:00
06/30/2019 03:00
06/30/2019 06:00



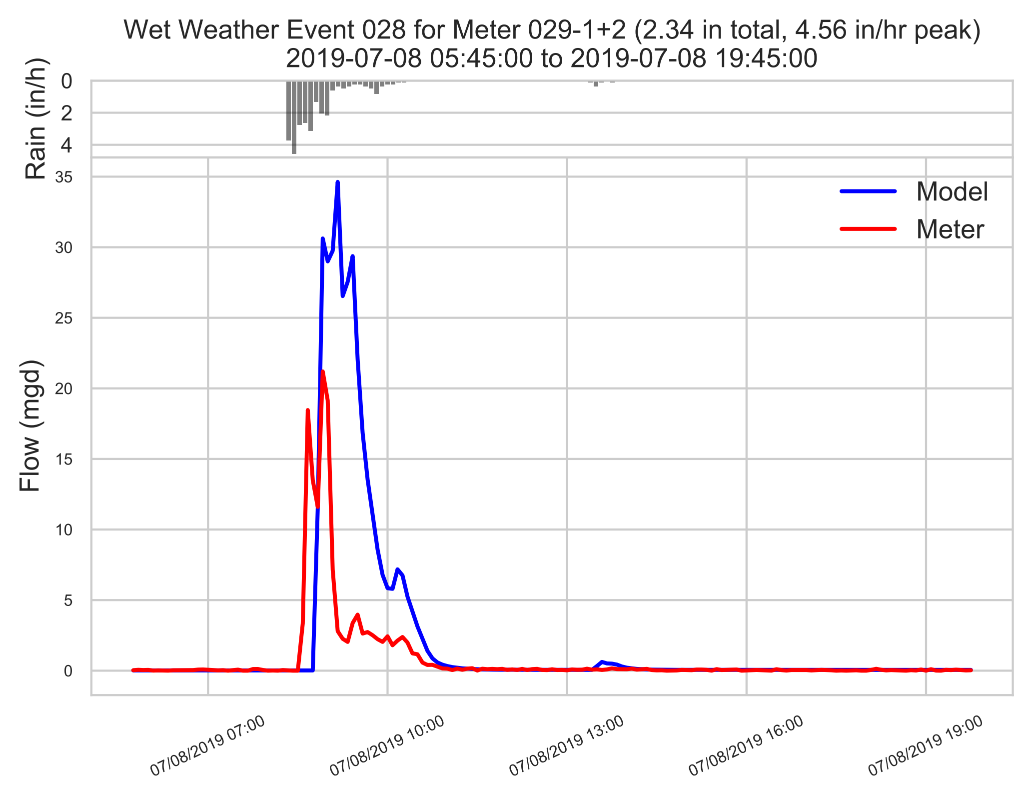
Wet Weather Event 025 for Meter 029-1+2 (1.48 in total, 3.48 in/hr peak)
2019-07-02 14:40:00 to 2019-07-03 02:40:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
0
5
10
15
20
Model
Meter
07/02/2019 15:00
07/02/2019 18:00
07/02/2019 21:00
07/03/2019 00:00
07/03/2019 03:00

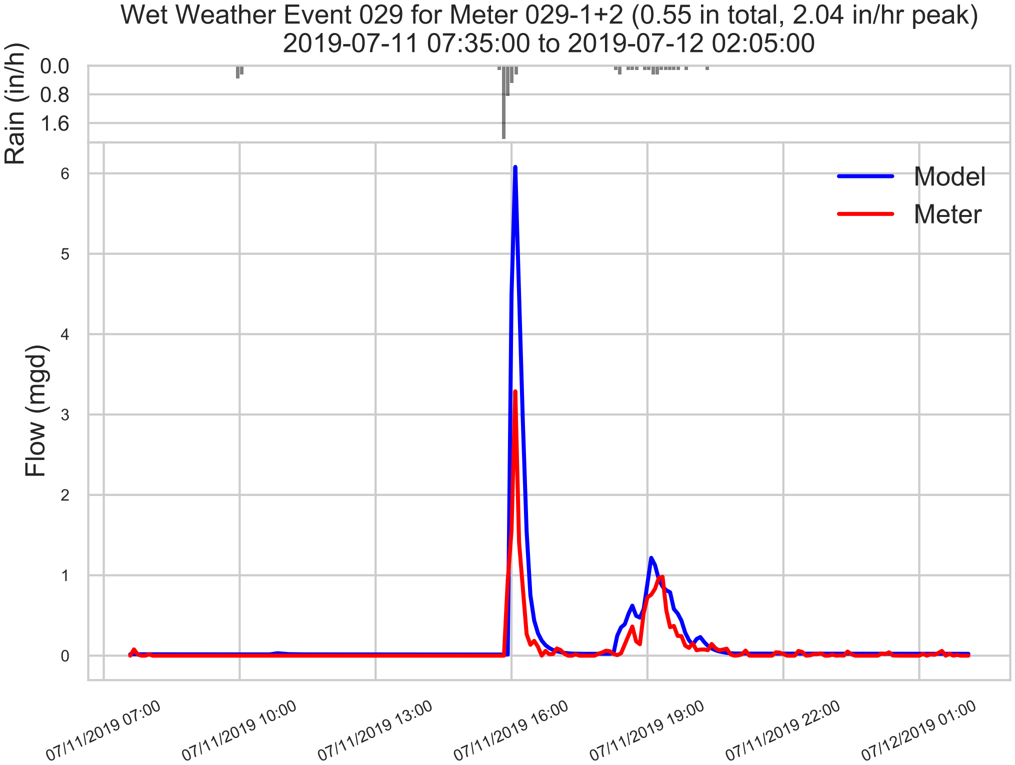


Wet Weather Event 026 for Meter 029-1+2 (0.26 in total, 0.72 in/hr peak)
2019-07-04 12:30:00 to 2019-07-05 01:25:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
07/04/2019 12:00
07/04/2019 15:00
07/04/2019 18:00
07/04/2019 21:00
07/05/2019 00:00

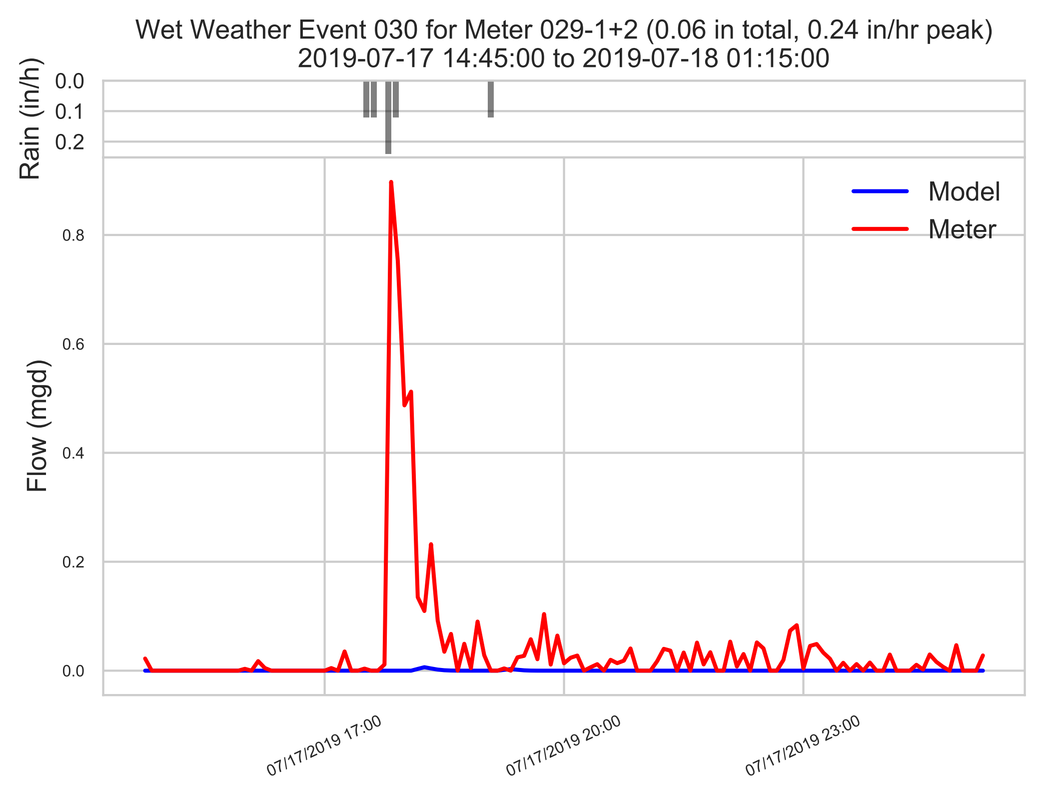


Wet Weather Event 027 for Meter 029-1+2 (0.97 in total, 3.96 in/hr peak)
2019-07-06 16:25:00 to 2019-07-07 05:20:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
30
25
20
15
10
5
0
Model
Meter
07/06/2019 16:00
07/06/2019 19:00
07/06/2019 22:00
07/07/2019 01:00
07/07/2019 04:00

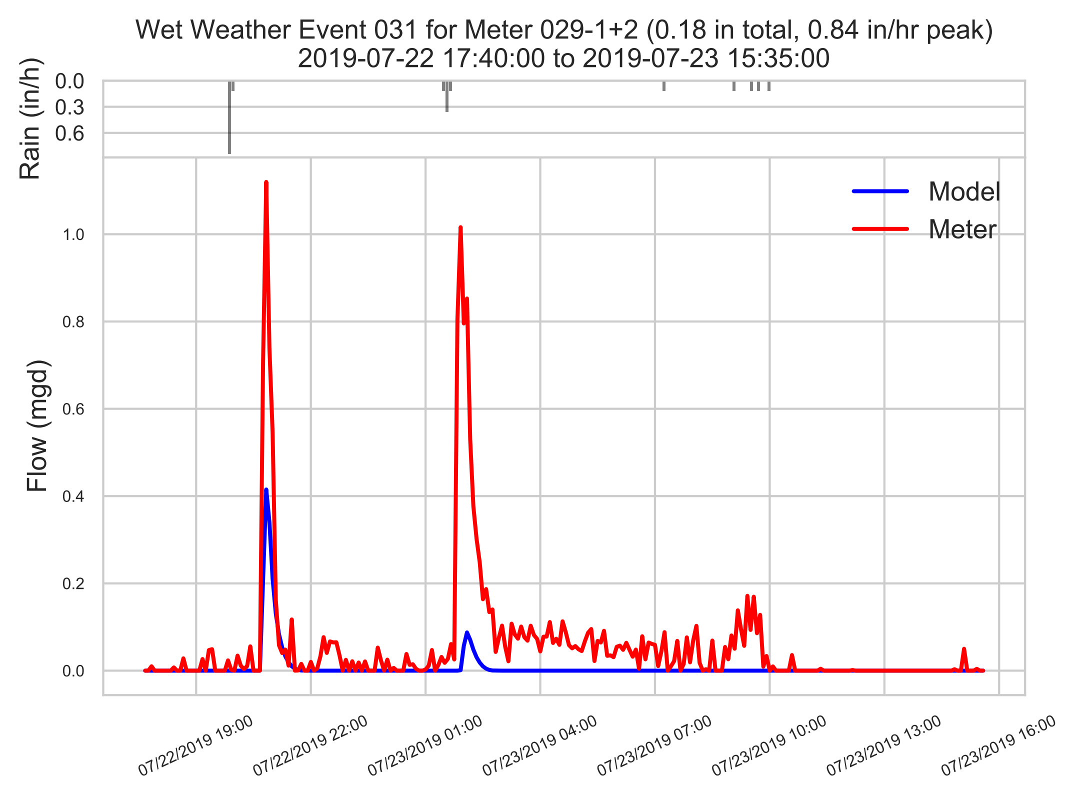

Wet Weather Event 028 for Meter 029-1+2 (2.34 in total, 4.56 in/hr peak)
2019-07-08 05:45:00 to 2019-07-08 19:45:00
Rain (in/h)
0
2
4
Flow (mgd)
35
30
25
20
15
10
5
0
Model
Meter
07/08/2019 07:00
07/08/2019 10:00
07/08/2019 13:00
07/08/2019 16:00
07/08/2019 19:00

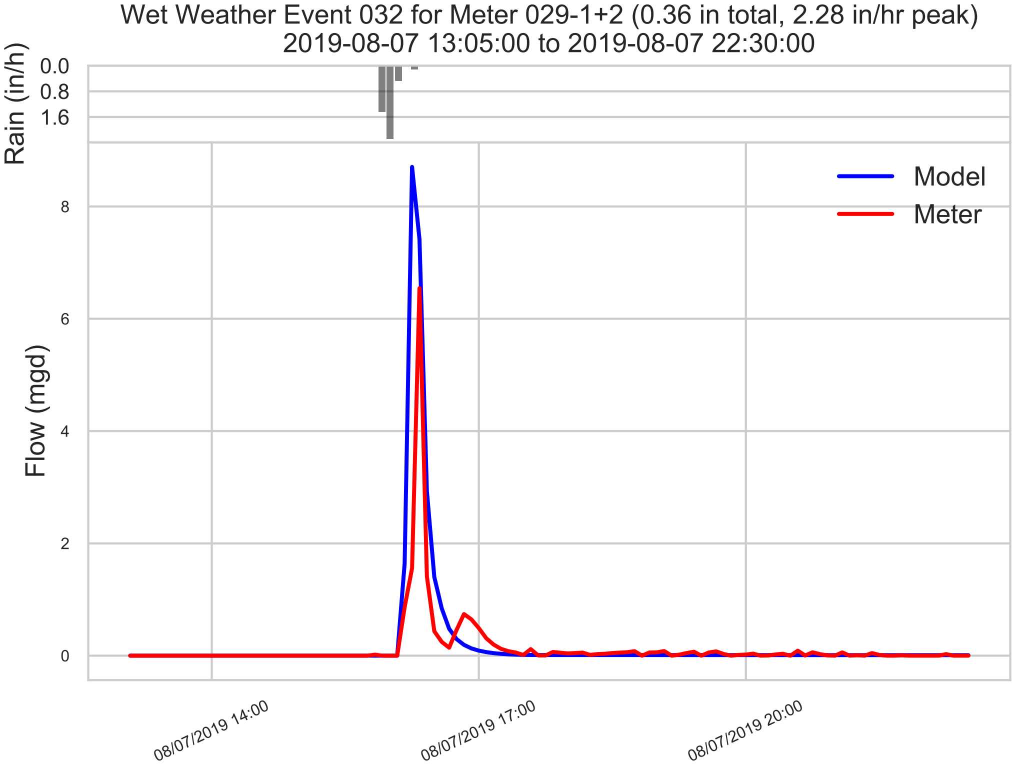


Wet Weather Event 029 for Meter 029-1+2 (0.55 in total, 2.04 in/hr peak)
2019-07-11 07:35:00 to 2019-07-12 02:05:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
0
1
2
3
4
5
6
Model
Meter
07/11/2019 07:00
07/11/2019 10:00
07/11/2019 13:00
07/11/2019 16:00
07/11/2019 19:00
07/11/2019 22:00
07/12/2019 01:00

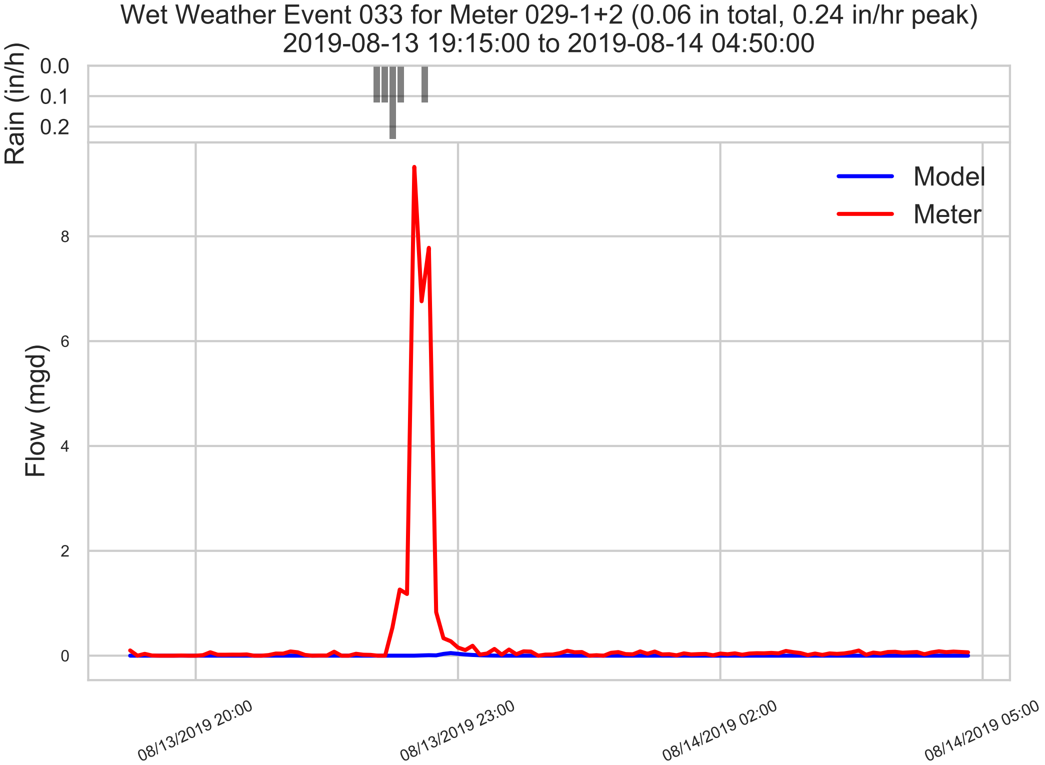


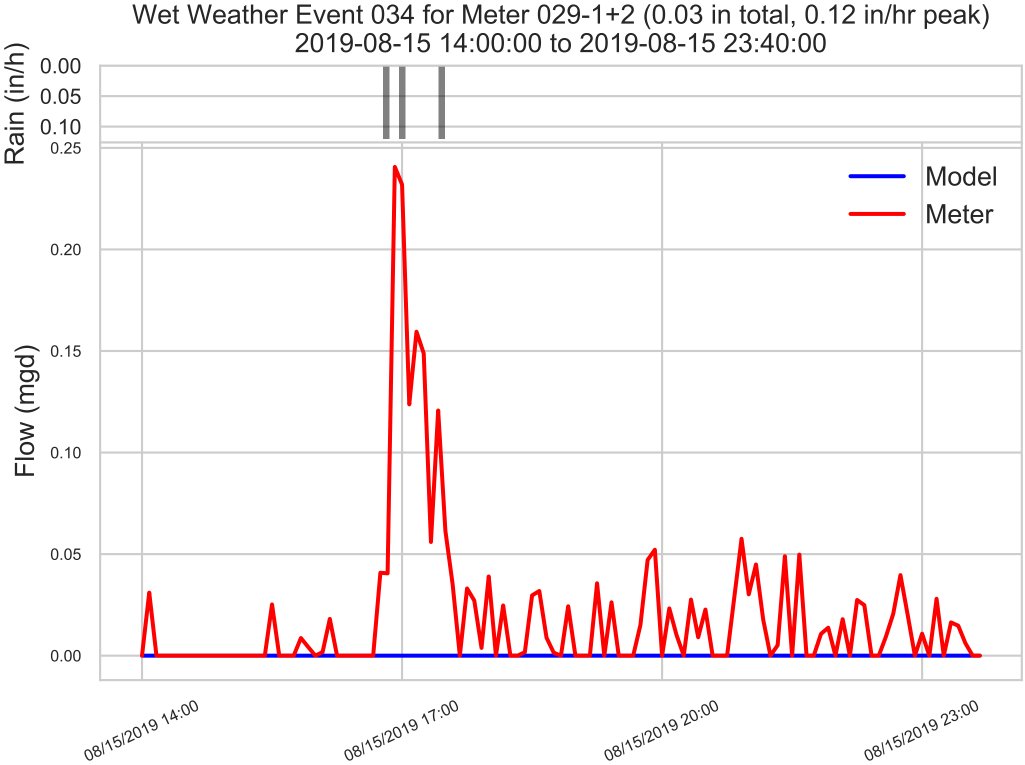
Wet Weather Event 030 for Meter 029-1+2 (0.06 in total, 0.24 in/hr peak)
2019-07-17 14:45:00 to 2019-07-18 01:15:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.8
0.6
0.4
0.2
0.0
Model
Meter
07/17/2019 17:00
07/17/2019 20:00
07/17/2019 23:00

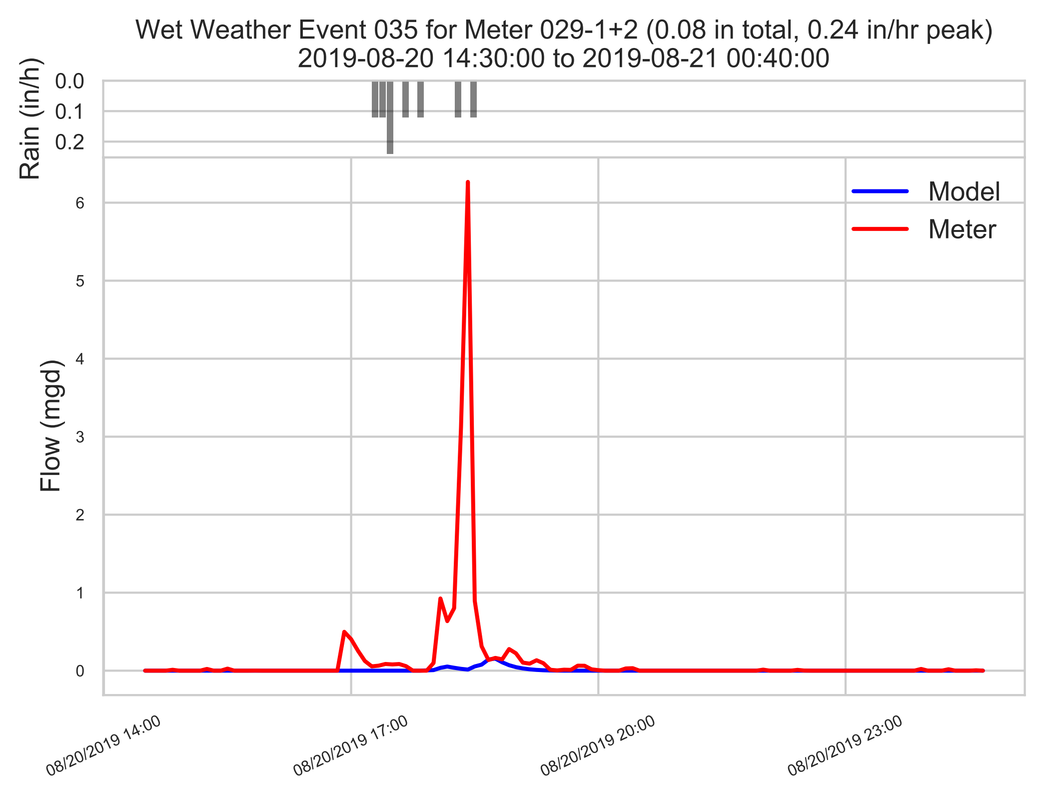

Wet Weather Event 031 for Meter 029-1+2 (0.18 in total, 0.84 in/hr peak)
2019-07-22 17:40:00 to 2019-07-23 15:35:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
07/22/2019 19:00
07/22/2019 22:00
07/23/2019 01:00
07/23/2019 04:00
07/23/2019 07:00
07/23/2019 10:00
07/23/2019 13:00
07/23/2019 16:00



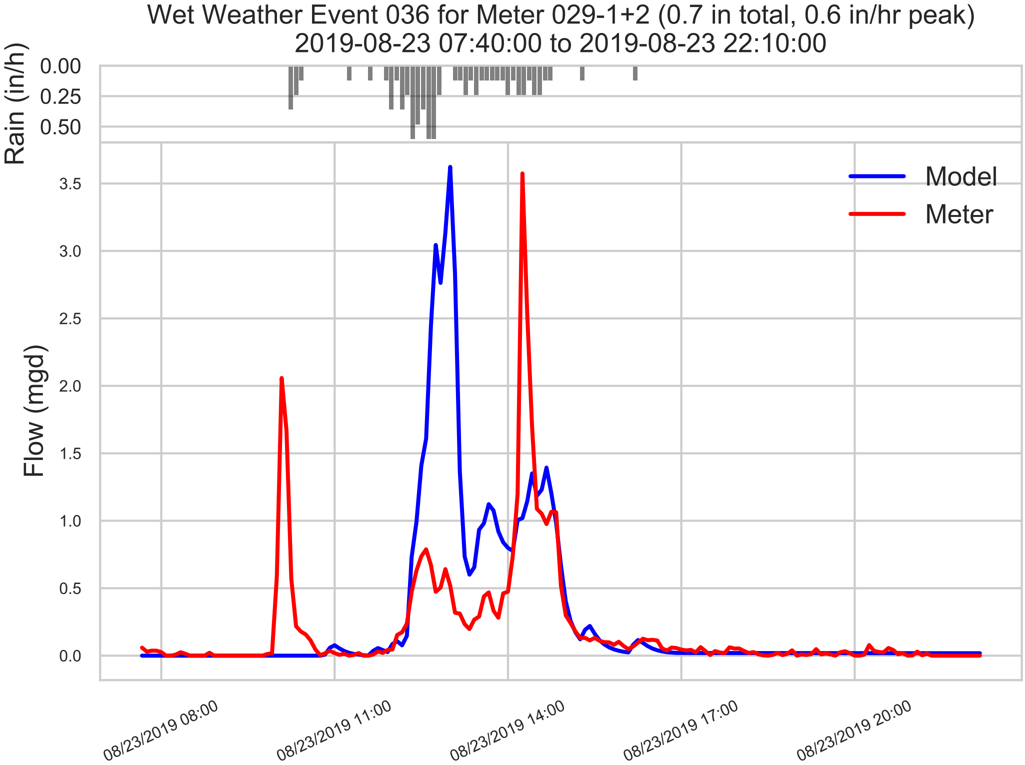
Wet Weather Event 032 for Meter 029-1+2 (0.36 in total, 2.28 in/hr peak)
2019-08-07 13:05:00 to 2019-08-07 22:30:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
0
2
4
6
8
Model
Meter
08/07/2019 14:00
08/07/2019 17:00
08/07/2019 20:00


Wet Weather Event 033 for Meter 029-1+2 (0.06 in total, 0.24 in/hr peak)
2019-08-13 19:15:00 to 2019-08-14 04:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
2
4
6
8
Model
Meter
08/13/2019 20:00
08/13/2019 23:00
08/14/2019 02:00
08/14/2019 05:00

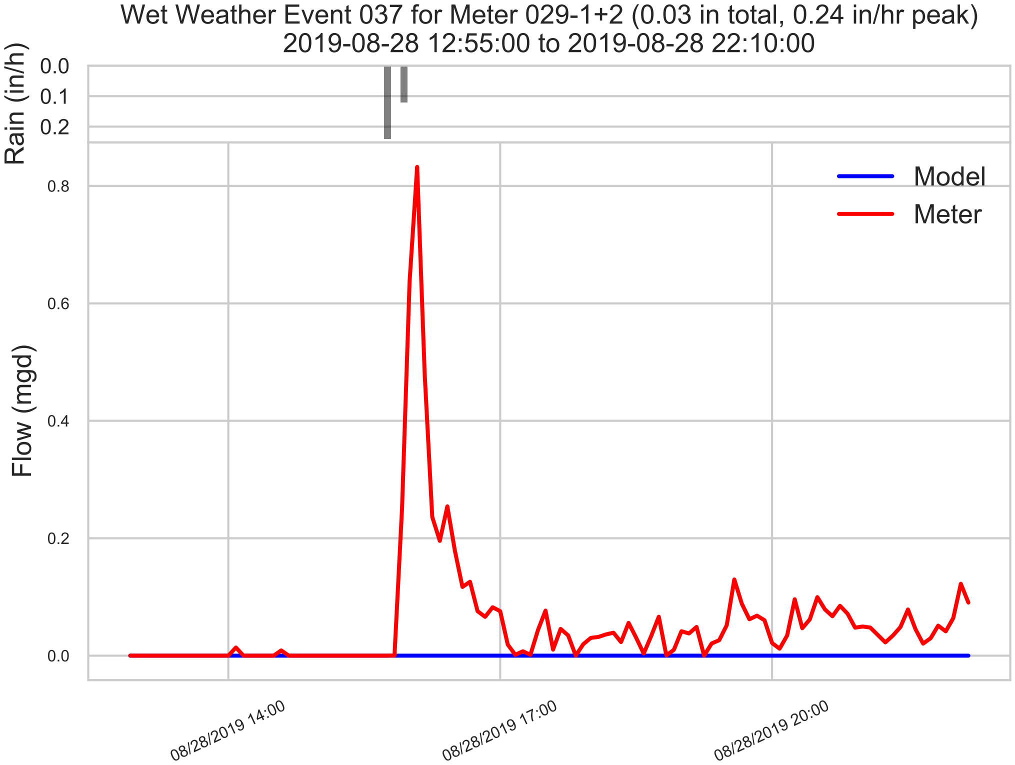

Wet Weather Event 034 for Meter 029-1+2 (0.03 in total, 0.12 in/hr peak)
2019-08-15 14:00:00 to 2019-08-15 23:40:00
Rain (in/h)
0.00
0.05
0.10
0.25
0.20
0.15
0.10
0.05
0.00
Flow (mgd)
Model
Meter
08/15/2019 14:00
08/15/2019 17:00
08/15/2019 20:00
08/15/2019 23:00

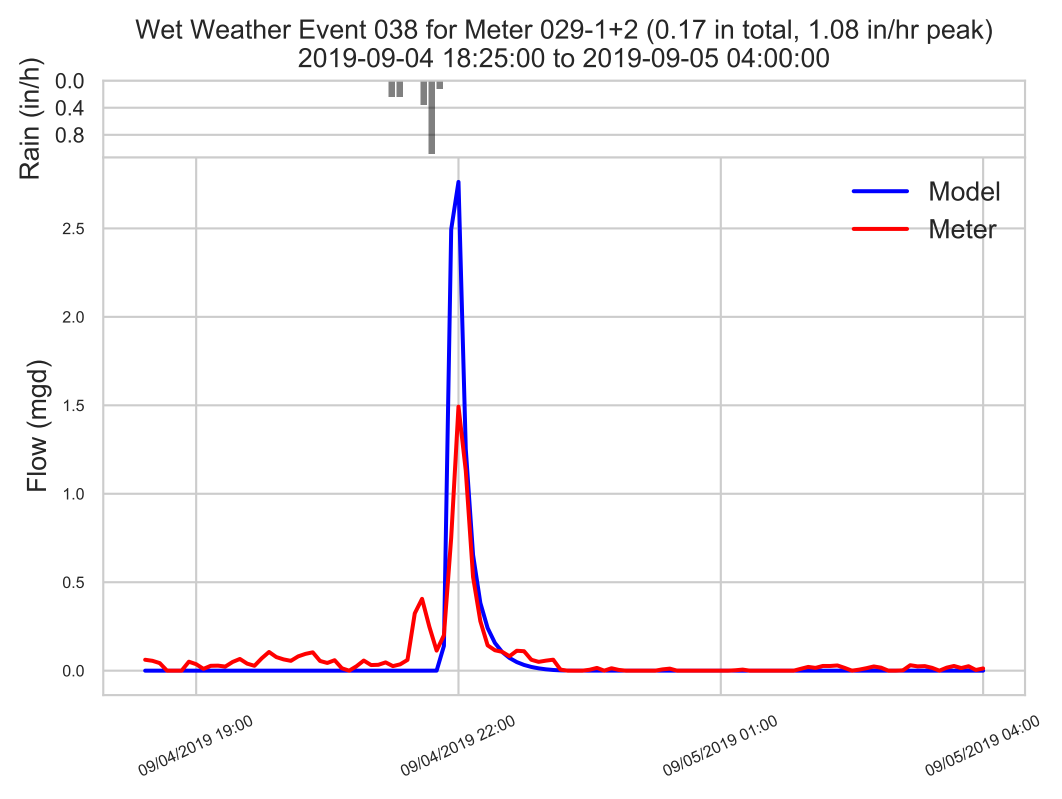


Wet Weather Event 035 for Meter 029-1+2 (0.08 in total, 0.24 in/hr peak)
2019-08-20 14:30:00 to 2019-08-21 00:40:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
5
6
Model
Meter
08/20/2019 14:00
08/20/2019 17:00
08/20/2019 20:00
08/20/2019 23:00

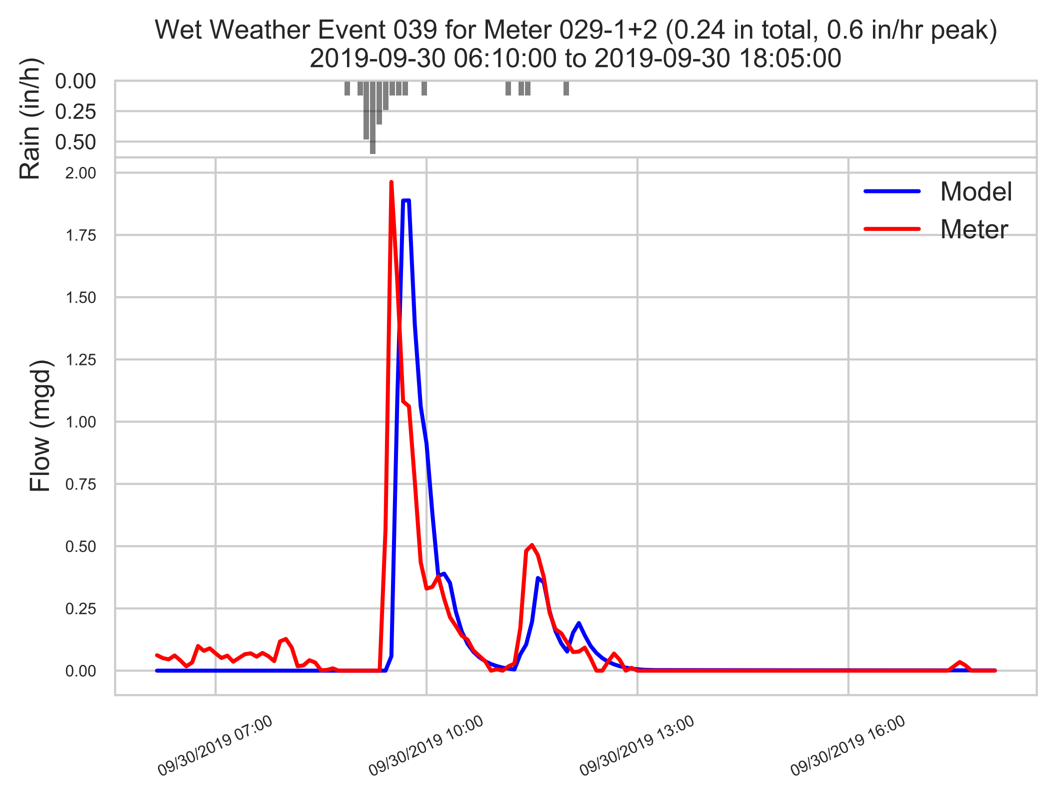


Wet Weather Event 036 for Meter 029-1+2 (0.7 in total, 0.6 in/hr peak)
2019-08-23 07:40:00 to 2019-08-23 22:10:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
08/23/2019 08:00
08/23/2019 11:00
08/23/2019 14:00
08/23/2019 17:00
08/23/2019 20:00

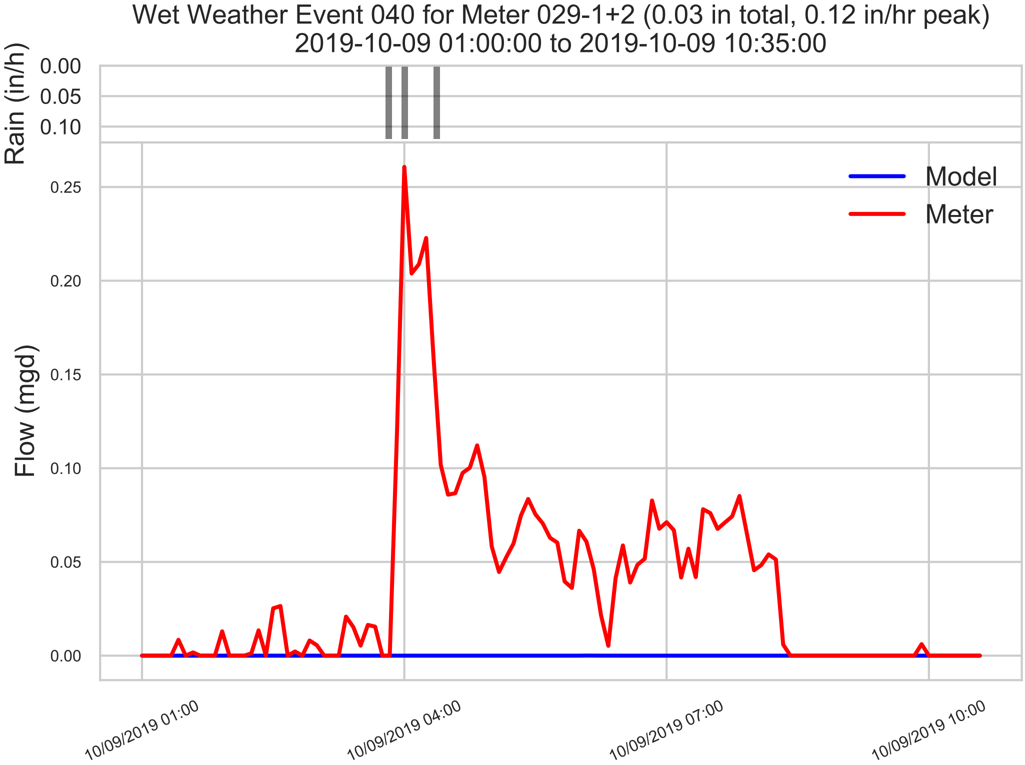

Wet Weather Event 037 for Meter 029-1+2 (0.03 in total, 0.24 in/hr peak)
2019-08-28 12:55:00 to 2019-08-28 22:10:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.8
0.6
0.4
0.2
0.0
Model
Meter
08/28/2019 14:00
08/28/2019 17:00
08/28/2019 20:00



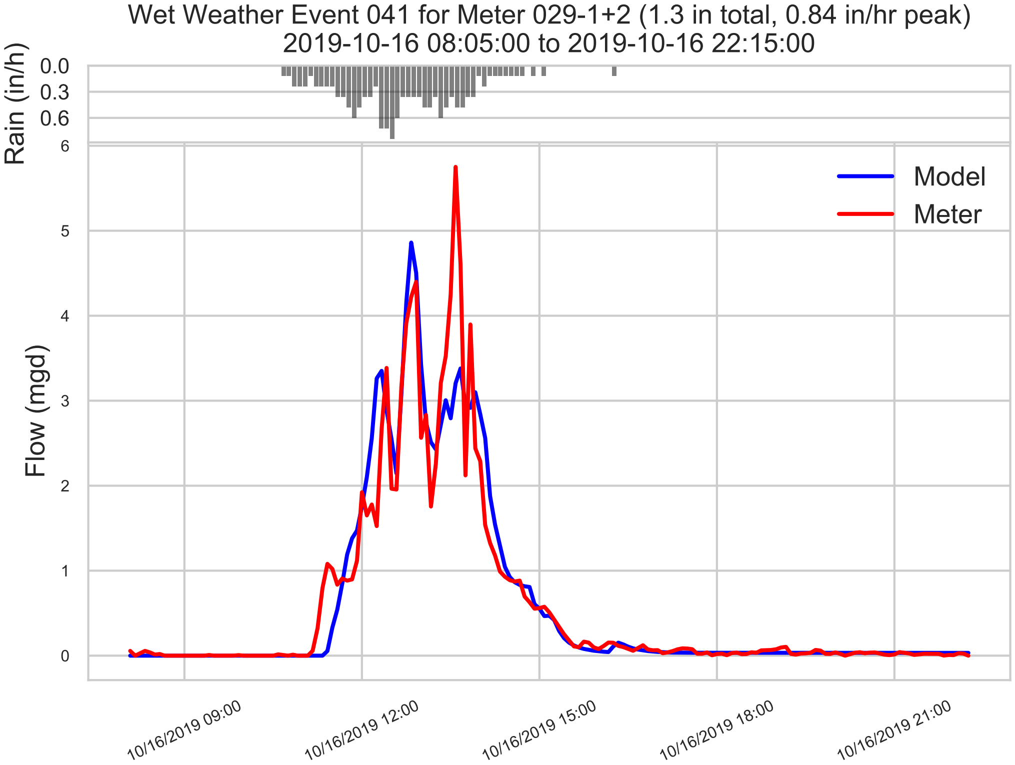
Wet Weather Event 038 for Meter 029-1+2 (0.17 in total, 1.08 in/hr peak)
2019-09-04 18:25:00 to 2019-09-05 04:00:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
0.0
0.5
1.0
1.5
2.0
2.5
Model
Meter
09/04/2019 19:00
09/04/2019 22:00
09/05/2019 01:00
09/05/2019 04:00



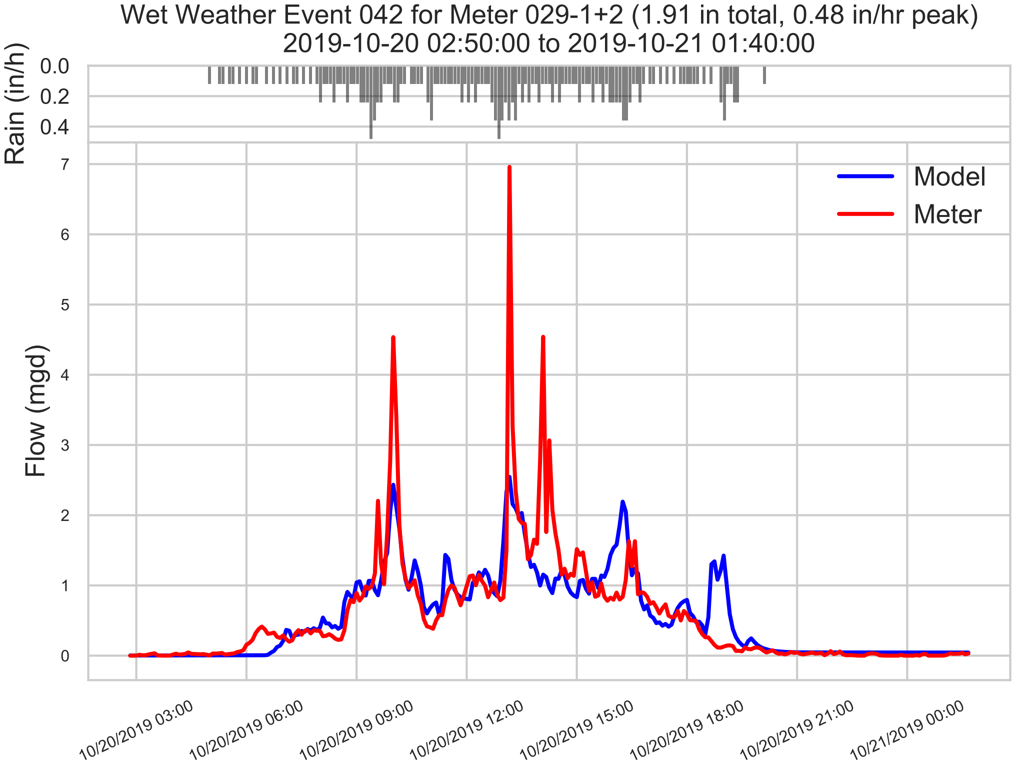
Wet Weather Event 039 for Meter 029-1+2 (0.24 in total, 0.6 in/hr peak)
2019-09-30 06:10:00 to 2019-09-30 18:05:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Model
Meter
09/30/2019 07:00
09/30/2019 10:00
09/30/2019 13:00
09/30/2019 16:00



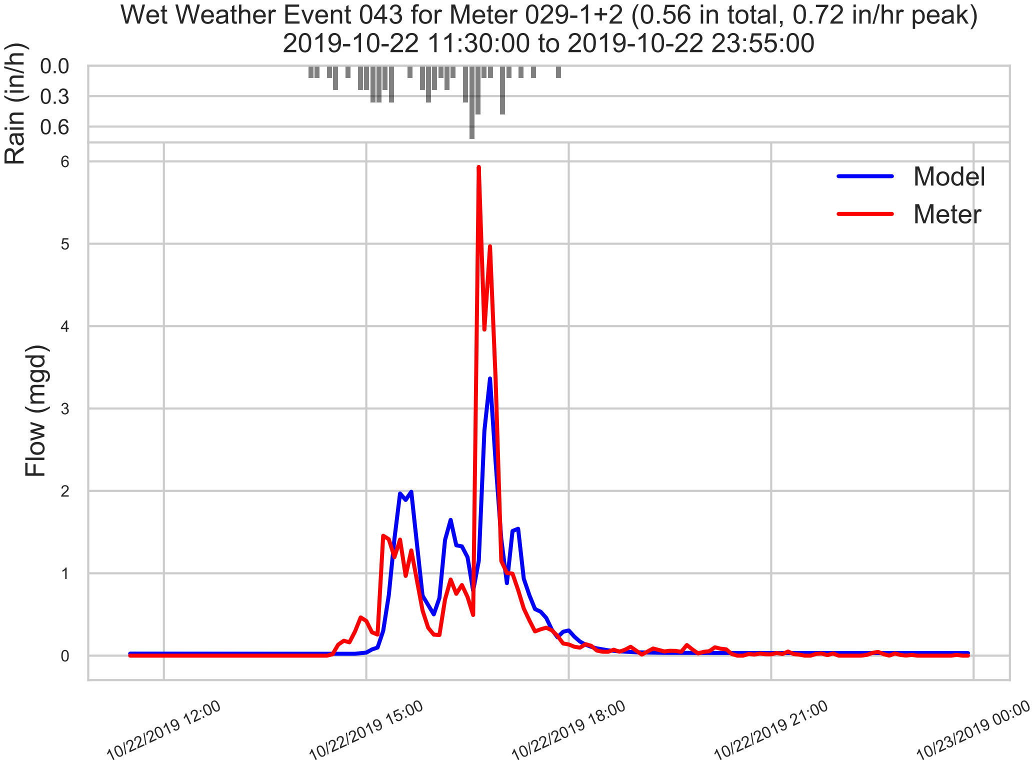
Wet Weather Event 040 for Meter 029-1+2 (0.03 in total, 0.12 in/hr peak)
2019-10-09 01:00:00 to 2019-10-09 10:35:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.25
0.20
0.15
0.10
0.05
0.00
Model
Meter
10/09/2019 01:00
10/09/2019 04:00
10/09/2019 07:00
10/09/2019 10:00

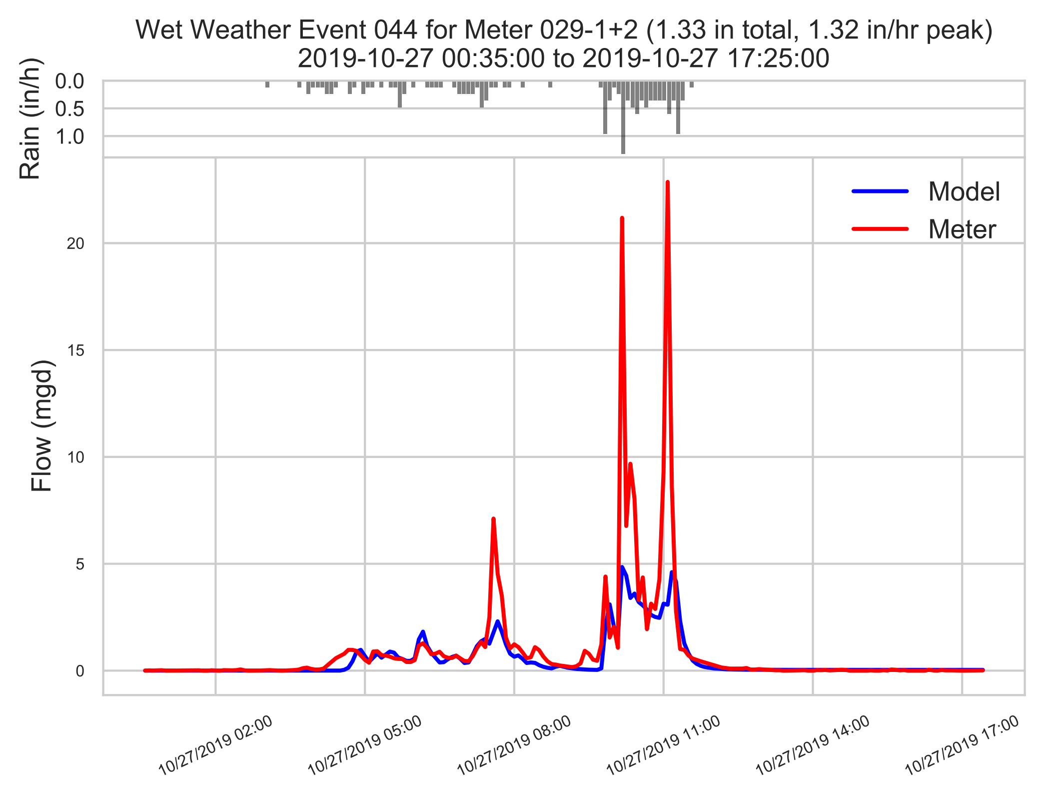


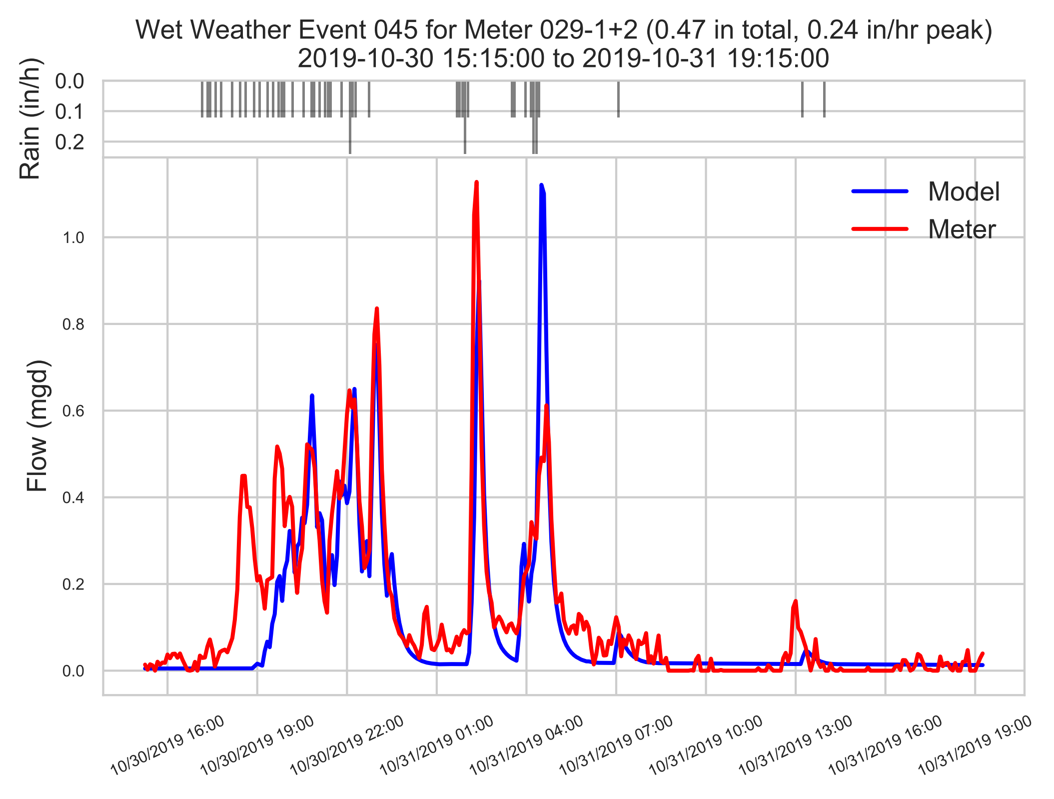
Wet Weather Event 041 for Meter 029-1+2 (1.3 in total, 0.84 in/hr peak)
2019-10-16 08:05:00 to 2019-10-16 22:15:00
Rain (in/h)
0.0
0.3
0.6
6
5
4
3
2
1
0
Flow (mgd)
Model
Meter
10/16/2019 09:00
10/16/2019 12:00
10/16/2019 15:00
10/16/2019 18:00
10/16/2019 21:00



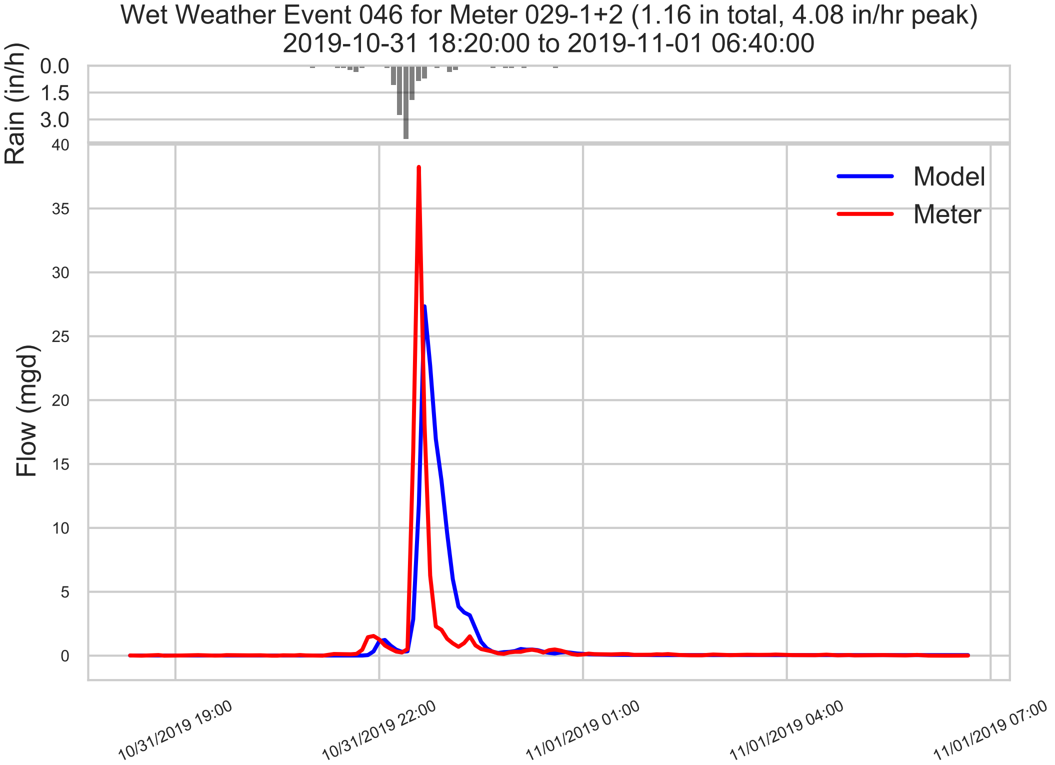
Wet Weather Event 042 for Meter 029-1+2 (1.91 in total, 0.48 in/hr peak)
2019-10-20 02:50:00 to 2019-10-21 01:40:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
1
2
3
4
5
6
7
Model
Meter
10/20/2019 03:00
10/20/2019 06:00
10/20/2019 09:00
10/20/2019 12:00
10/20/2019 15:00
10/20/2019 18:00
10/20/2019 21:00
10/21/2019 00:00


Wet Weather Event 043 for Meter 029-1+2 (0.56 in total, 0.72 in/hr peak)
2019-10-22 11:30:00 to 2019-10-22 23:55:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
0
1
2
3
4
5
6
Model
Meter
10/22/2019 12:00
10/22/2019 15:00
10/22/2019 18:00
10/22/2019 21:00
10/23/2019 00:00

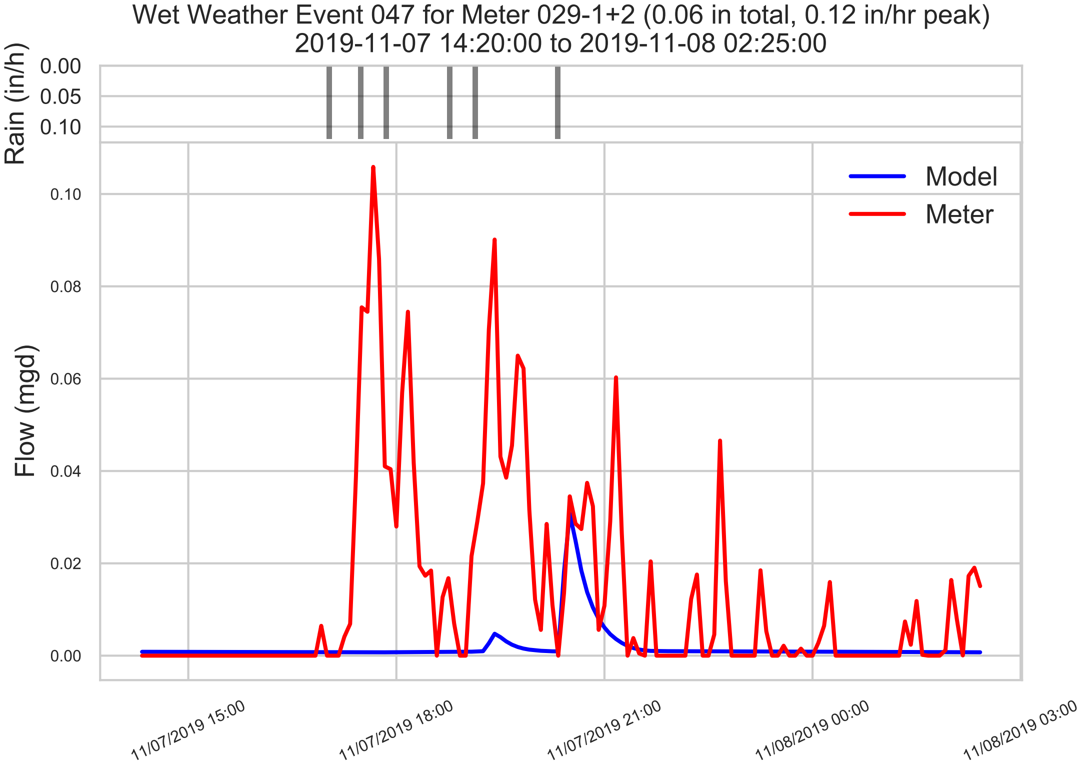

Wet Weather Event 044 for Meter 029-1+2 (1.33 in total, 1.32 in/hr peak)
2019-10-27 00:35:00 to 2019-10-27 17:25:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
20
15
10
5
0
Model
Meter
10/27/2019 02:00
10/27/2019 05:00
10/27/2019 08:00
10/27/2019 11:00
10/27/2019 14:00
10/27/2019 17:00



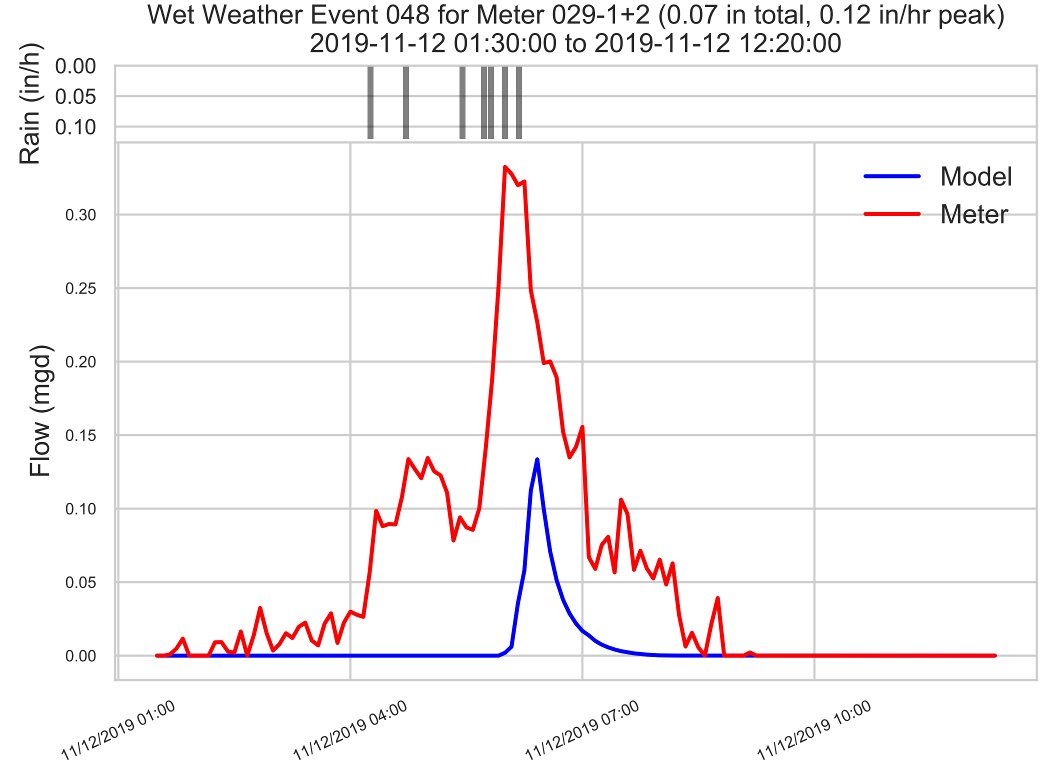
Wet Weather Event 045 for Meter 029-1+2 (0.47 in total, 0.24 in/hr peak)
2019-10-30 15:15:00 to 2019-10-31 19:15:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.0
0.2
0.4
0.6
0.8
1.0
Model
Meter
10/30/2019 16:00
10/30/2019 19:00
10/30/2019 22:00
10/31/2019 01:00
10/31/2019 04:00
10/31/2019 07:00
10/31/2019 10:00
10/31/2019 13:00
10/31/2019 16:00
10/31/2019 19:00



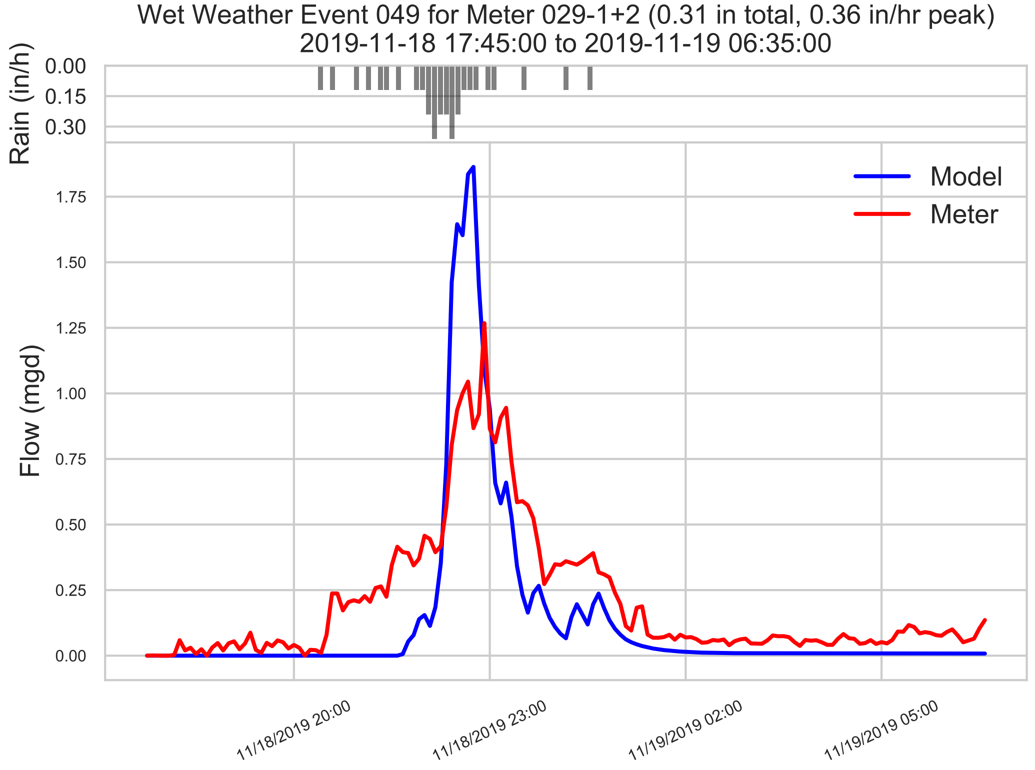
Wet Weather Event 046 for Meter 029-1+2 (1.16 in total, 4.08 in/hr peak)
2019-10-31 18:20:00 to 2019-11-01 06:40:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
40
35
30
25
20
15
10
5
0
Model
Meter
10/31/2019 19:00
10/31/2019 22:00
11/01/2019 01:00
11/01/2019 04:00
11/01/2019 07:00



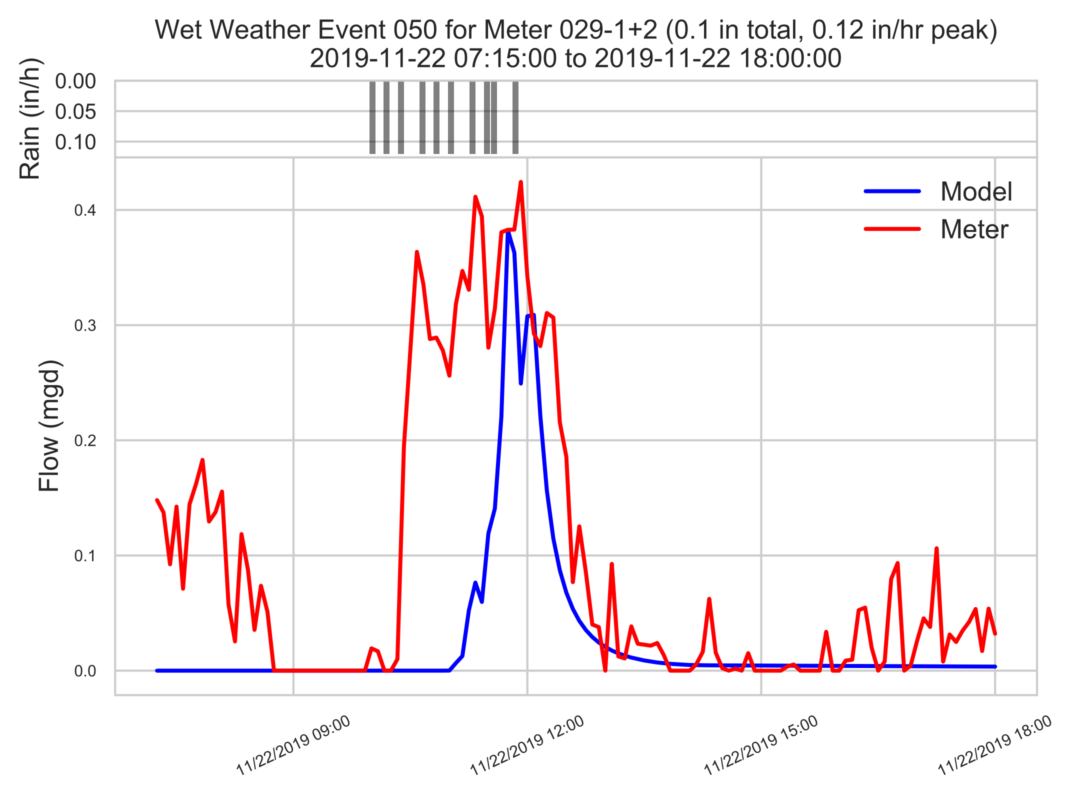
Wet Weather Event 047 for Meter 029-1+2 (0.06 in total, 0.12 in/hr peak)
2019-11-07 14:20:00 to 2019-11-08 02:25:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.10
0.08
0.06
0.04
0.02
0.00
Model
Meter
11/07/2019 15:00
11/07/2019 18:00
11/07/2019 21:00
11/08/2019 00:00
11/08/2019 03:00

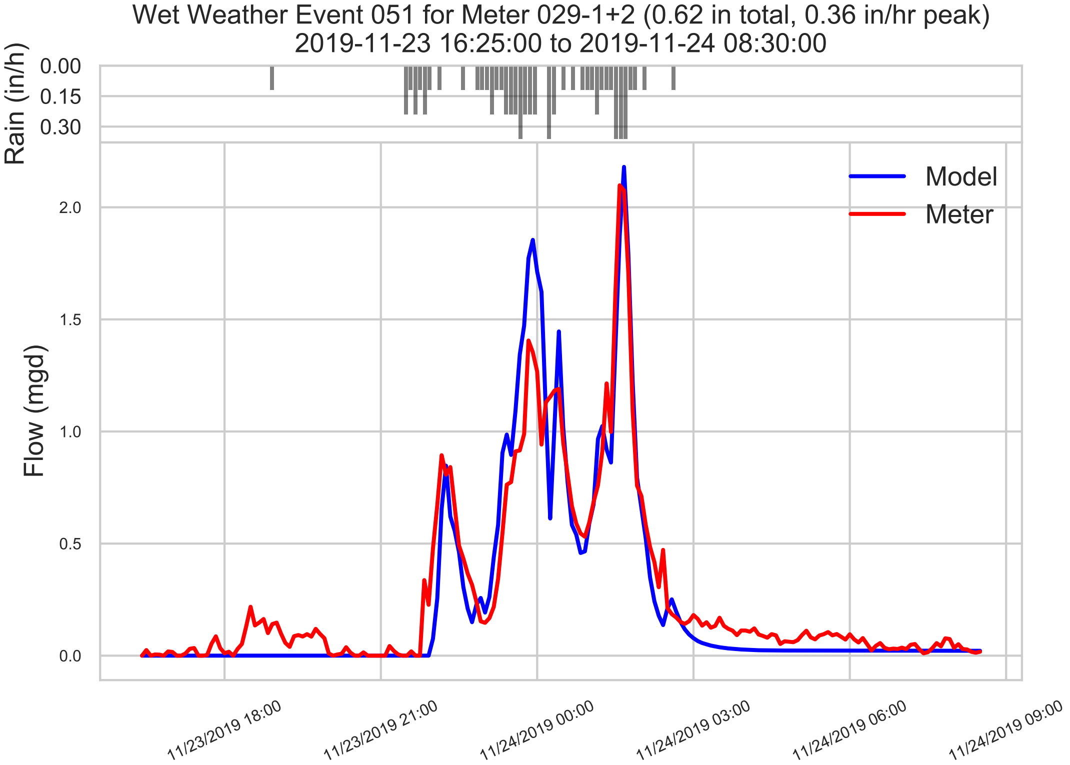


Wet Weather Event 048 for Meter 029-1+2 (0.07 in total, 0.12 in/hr peak)
2019-11-12 01:30:00 to 2019-11-12 12:20:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Model
Meter
11/12/2019 01:00
11/12/2019 04:00
11/12/2019 07:00
11/12/2019 10:00

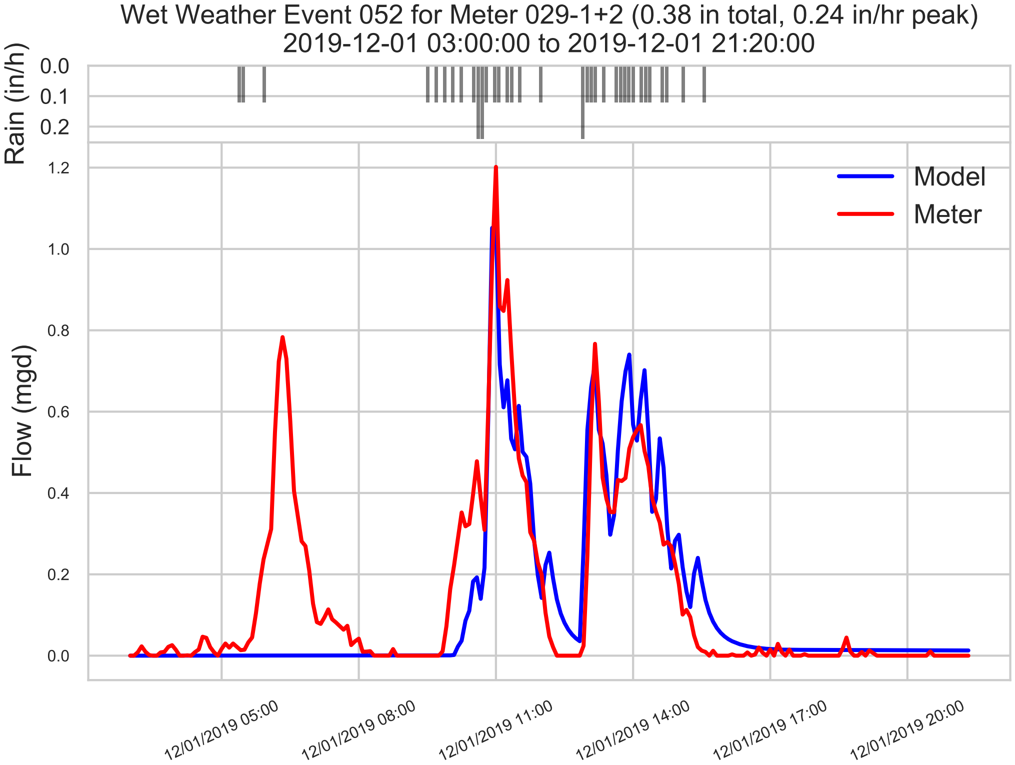


Wet Weather Event 049 for Meter 029-1+2 (0.31 in total, 0.36 in/hr peak)
2019-11-18 17:45:00 to 2019-11-19 06:35:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
Model
Meter
11/18/2019 20:00
11/18/2019 23:00
11/19/2019 02:00
11/19/2019 05:00

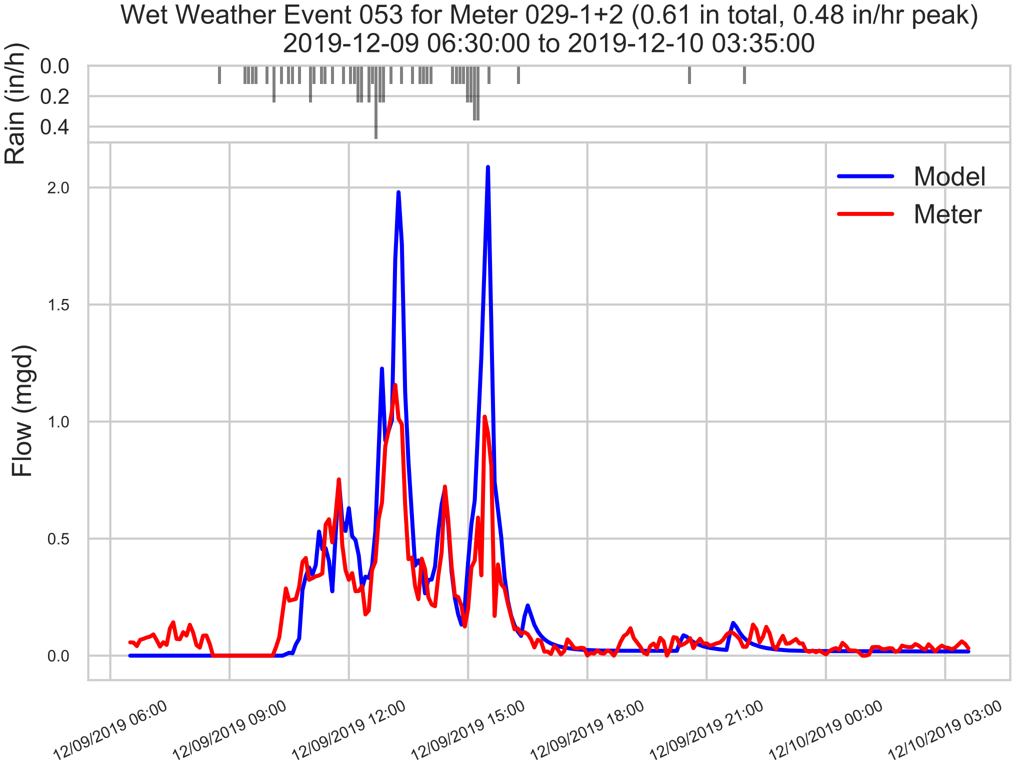

Wet Weather Event 050 for Meter 029-1+2 (0.1 in total, 0.12 in/hr peak)
2019-11-22 07:15:00 to 2019-11-22 18:00:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.4
0.3
0.2
0.1
0.0
Model
Meter
11/22/2019 09:00
11/22/2019 12:00
11/22/2019 15:00
11/22/2019 18:00



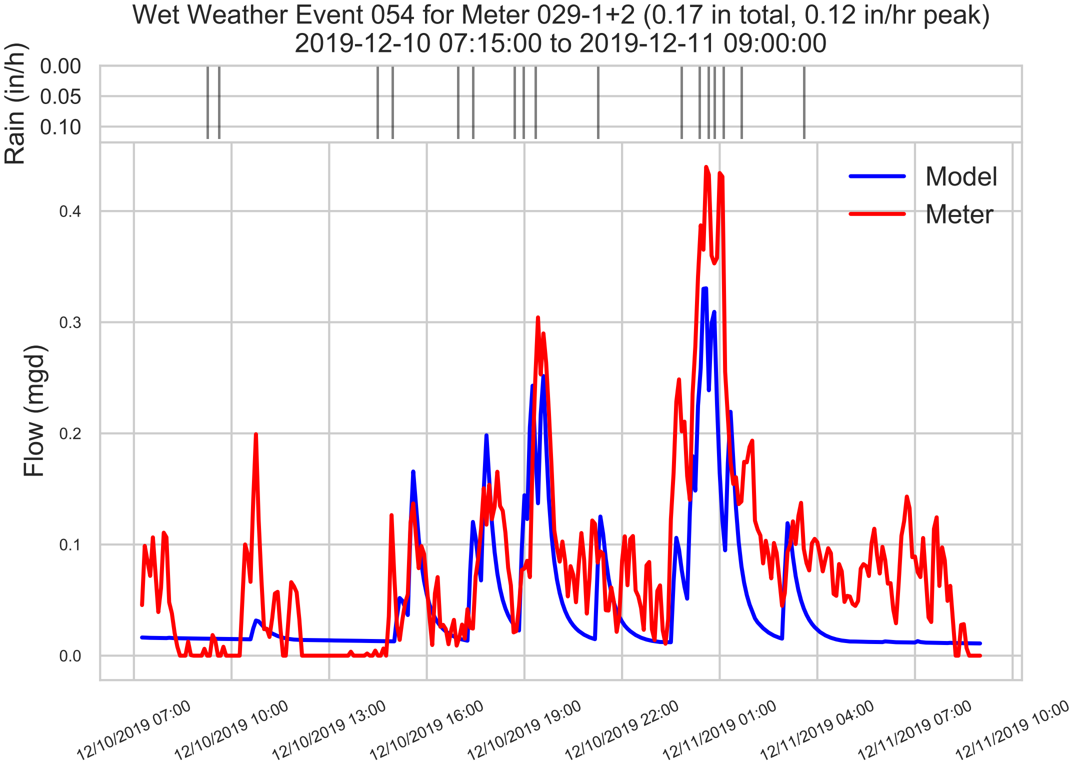
Wet Weather Event 051 for Meter 029-1+2 (0.62 in total, 0.36 in/hr peak)
2019-11-23 16:25:00 to 2019-11-24 08:30:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
2.0
1.5
1.0
0.5
0.0
Model
Meter
11/23/2019 18:00
11/23/2019 21:00
11/24/2019 00:00
11/24/2019 03:00
11/24/2019 06:00
11/24/2019 09:00



Wet Weather Event 052 for Meter 029-1+2 (0.38 in total, 0.24 in/hr peak)
2019-12-01 03:00:00 to 2019-12-01 21:20:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
12/01/2019 05:00
12/01/2019 08:00
12/01/2019 11:00
12/01/2019 14:00
12/01/2019 17:00
12/01/2019 20:00

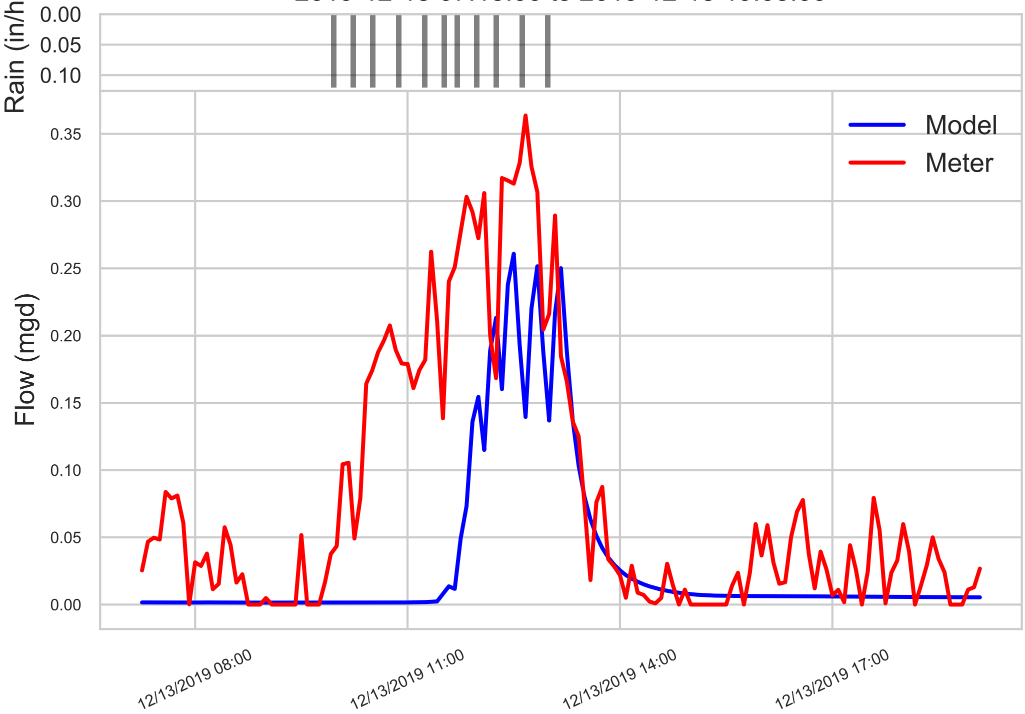


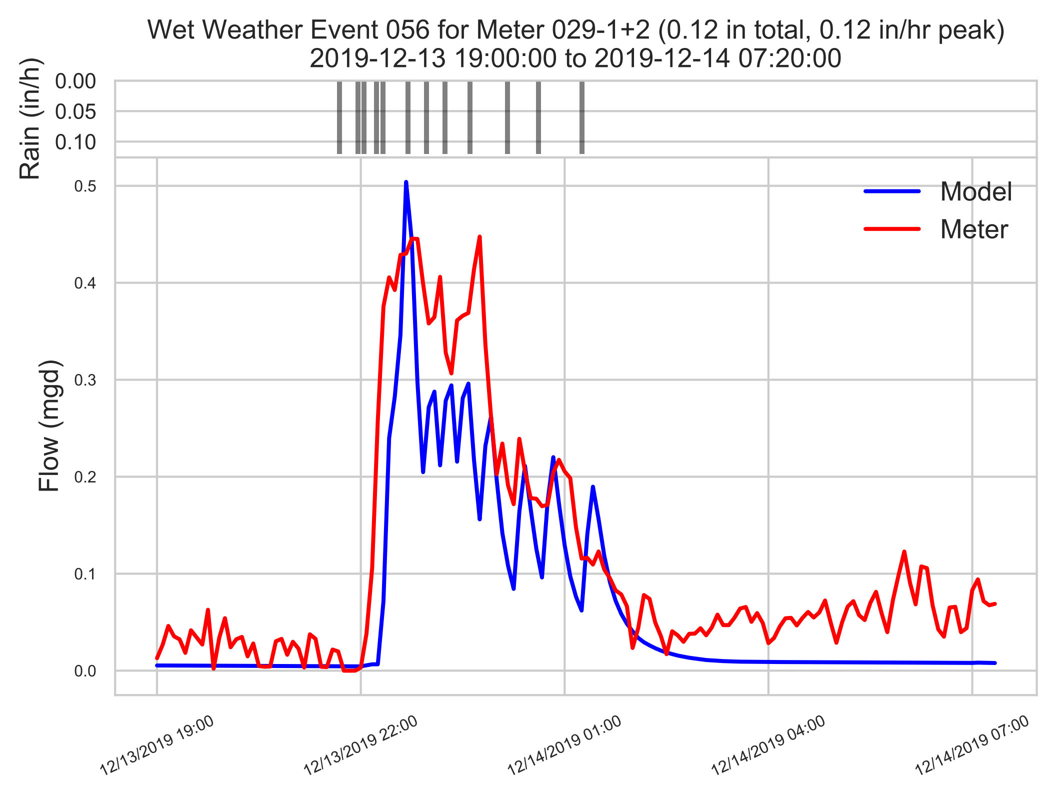
Wet Weather Event 053 for Meter 029-1+2 (0.61 in total, 0.48 in/hr peak)
2019-12-09 06:30:00 to 2019-12-10 03:35:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0.0
0.5
1.0
1.5
2.0
Model
Meter
12/09/2019 06:00
12/09/2019 09:00
12/09/2019 12:00
12/09/2019 15:00
12/09/2019 18:00
12/09/2019 21:00
12/10/2019 00:00
12/10/2019 03:00



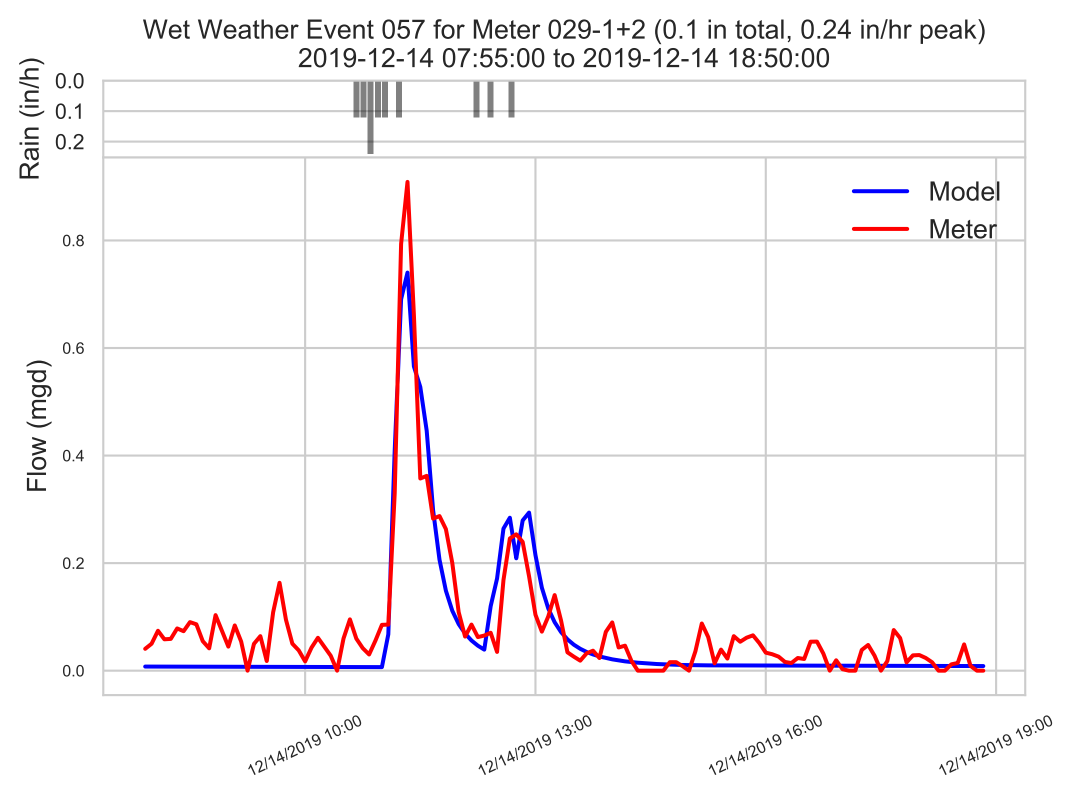
Wet Weather Event 054 for Meter 029-1+2 (0.17 in total, 0.12 in/hr peak)
2019-12-10 07:15:00 to 2019-12-11 09:00:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.0
0.1
0.2
0.3
0.4
Model
Meter
12/10/2019 07:00
12/10/2019 10:00
12/10/2019 13:00
12/10/2019 16:00
12/10/2019 19:00
12/10/2019 22:00
12/11/2019 01:00
12/11/2019 04:00
12/11/2019 07:00
12/11/2019 10:00

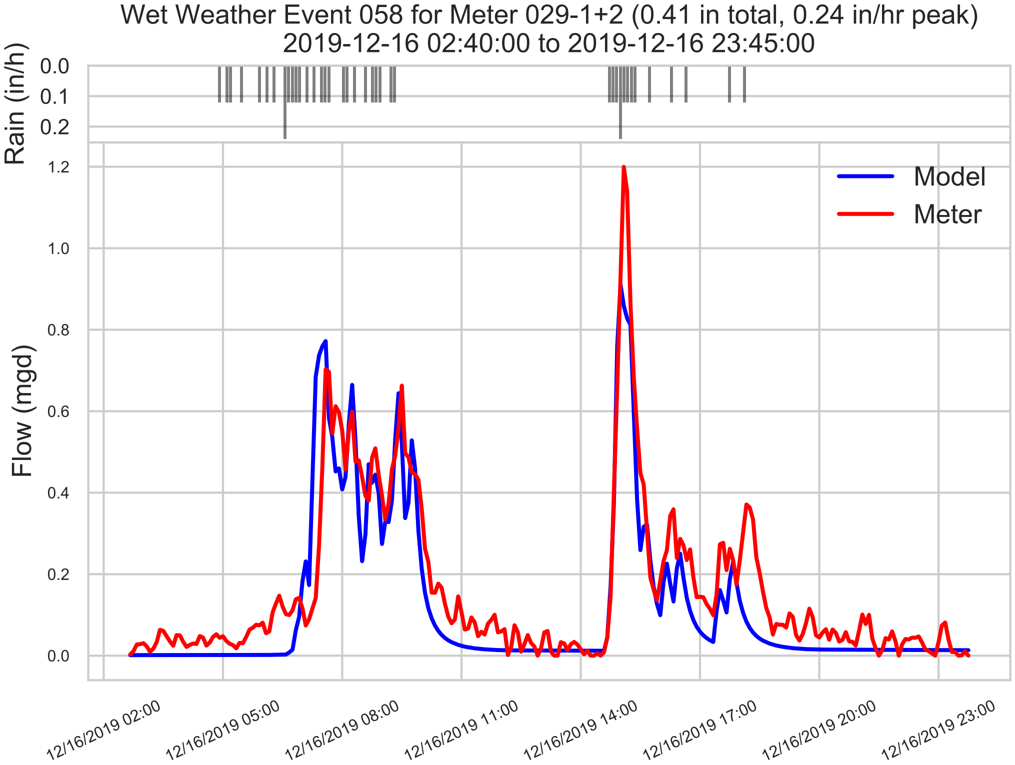
Wet Weather Event 055 for Meter 029-1+2 (0.11 in total, 0.12 in/hr peak)
2019-12-13 07:15:00 to 2019-12-13 19:05:00



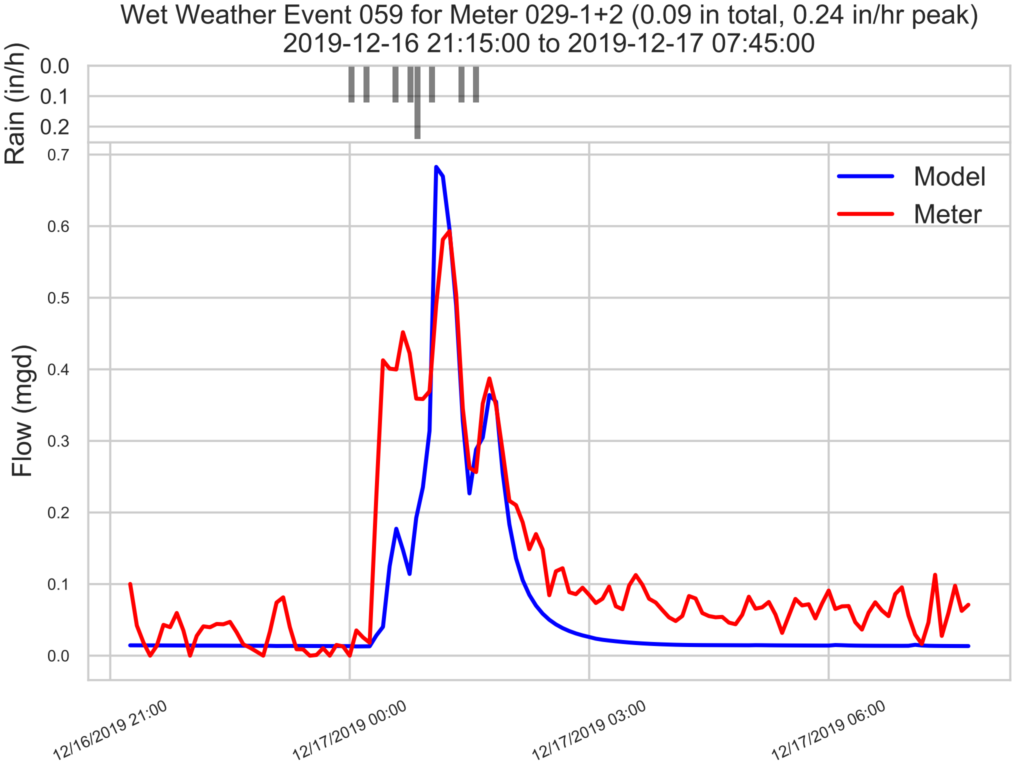


Wet Weather Event 056 for Meter 029-1+2 (0.12 in total, 0.12 in/hr peak)
2019-12-13 19:00:00 to 2019-12-14 07:20:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.0
0.1
0.2
0.3
0.4
0.5
Model
Meter
12/13/2019 19:00
12/13/2019 22:00
12/14/2019 01:00
12/14/2019 04:00
12/14/2019 07:00

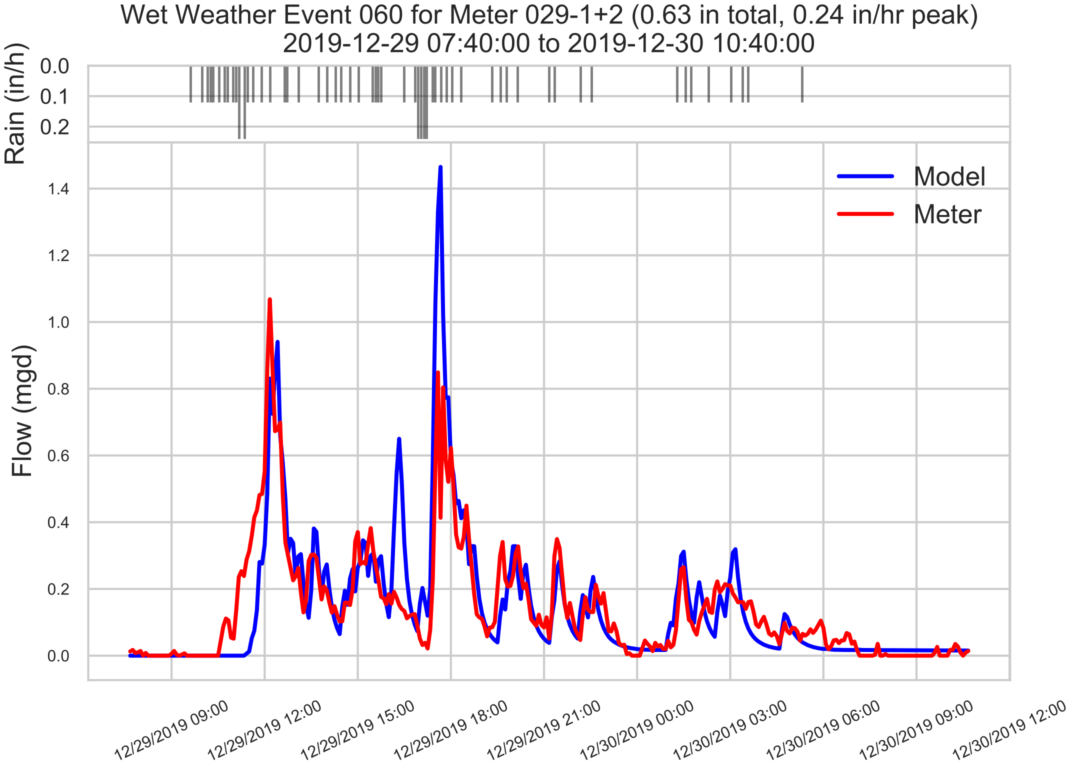

Wet Weather Event 057 for Meter 029-1+2 (0.1 in total, 0.24 in/hr peak)
2019-12-14 07:55:00 to 2019-12-14 18:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.8
0.6
0.4
0.2
0.0
Model
Meter
12/14/2019 10:00
12/14/2019 13:00
12/14/2019 16:00
12/14/2019 19:00

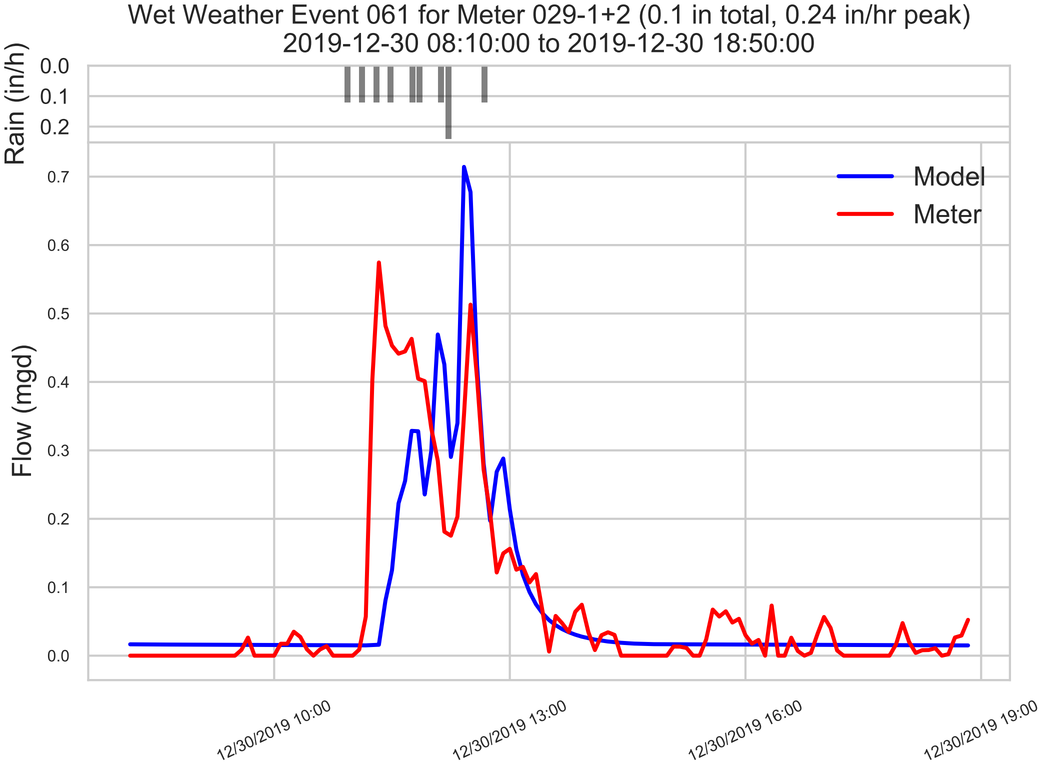


Wet Weather Event 058 for Meter 029-1+2 (0.41 in total, 0.24 in/hr peak)
2019-12-16 02:40:00 to 2019-12-16 23:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
12/16/2019 02:00
12/16/2019 05:00
12/16/2019 08:00
12/16/2019 11:00
12/16/2019 14:00
12/16/2019 17:00
12/16/2019 20:00
12/16/2019 23:00

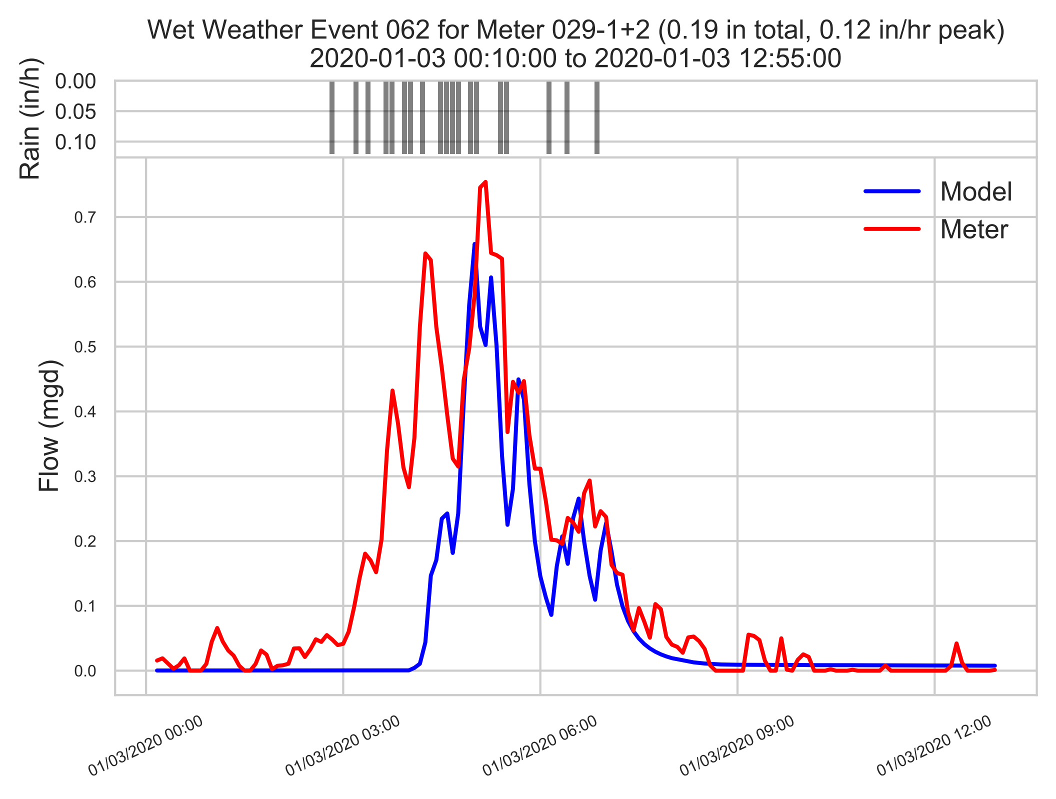


Wet Weather Event 059 for Meter 029-1+2 (0.09 in total, 0.24 in/hr peak)
2019-12-16 21:15:00 to 2019-12-17 07:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Model
Meter
12/16/2019 21:00
12/17/2019 00:00
12/17/2019 03:00
12/17/2019 06:00

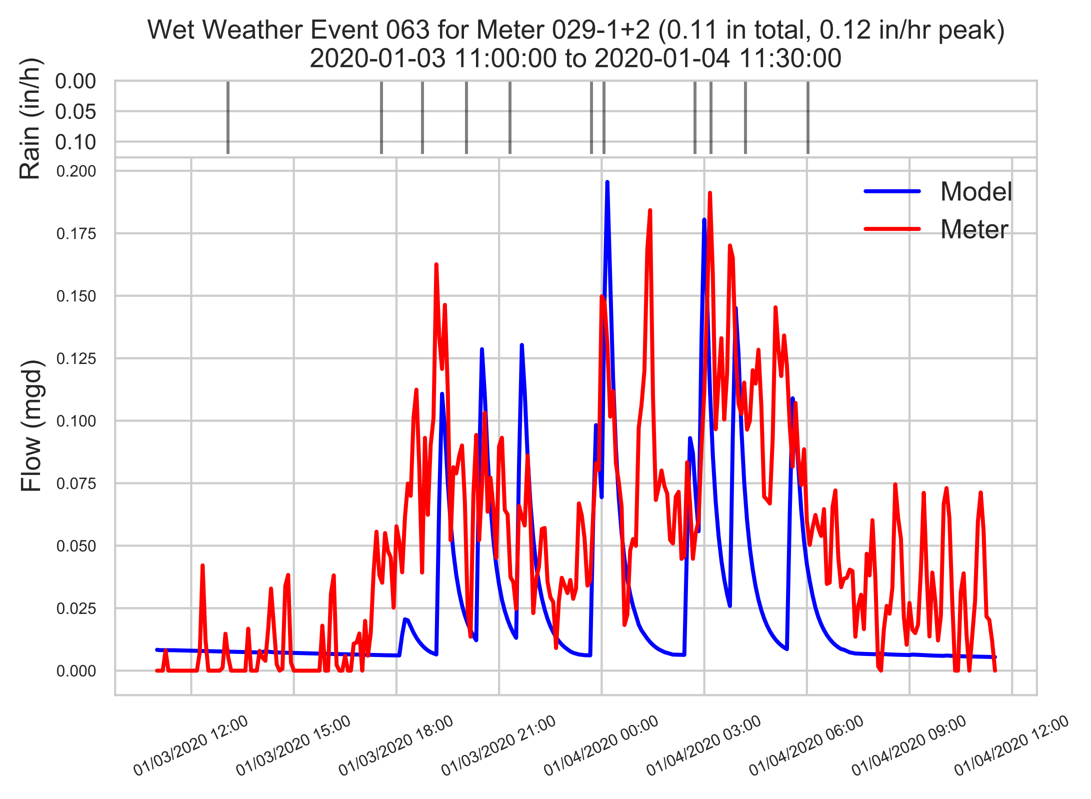

Wet Weather Event 060 for Meter 029-1+2 (0.63 in total, 0.24 in/hr peak)
2019-12-29 07:40:00 to 2019-12-30 10:40:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
12/29/2019 09:00
12/29/2019 12:00
12/29/2019 15:00
12/29/2019 18:00
12/29/2019 21:00
12/30/2019 00:00
12/30/2019 03:00
12/30/2019 06:00
12/30/2019 09:00
12/30/2019 12:00



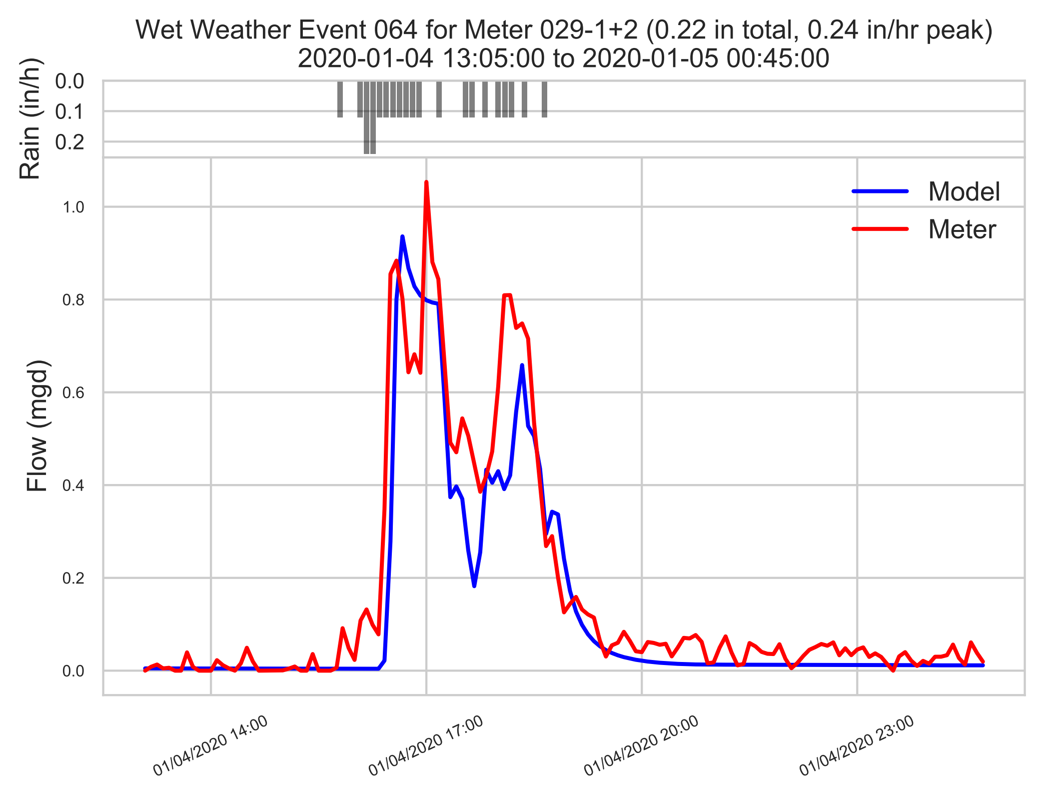
Wet Weather Event 061 for Meter 029-1+2 (0.1 in total, 0.24 in/hr peak)
2019-12-30 08:10:00 to 2019-12-30 18:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Model
Meter
12/30/2019 10:00
12/30/2019 13:00
12/30/2019 16:00
12/30/2019 19:00



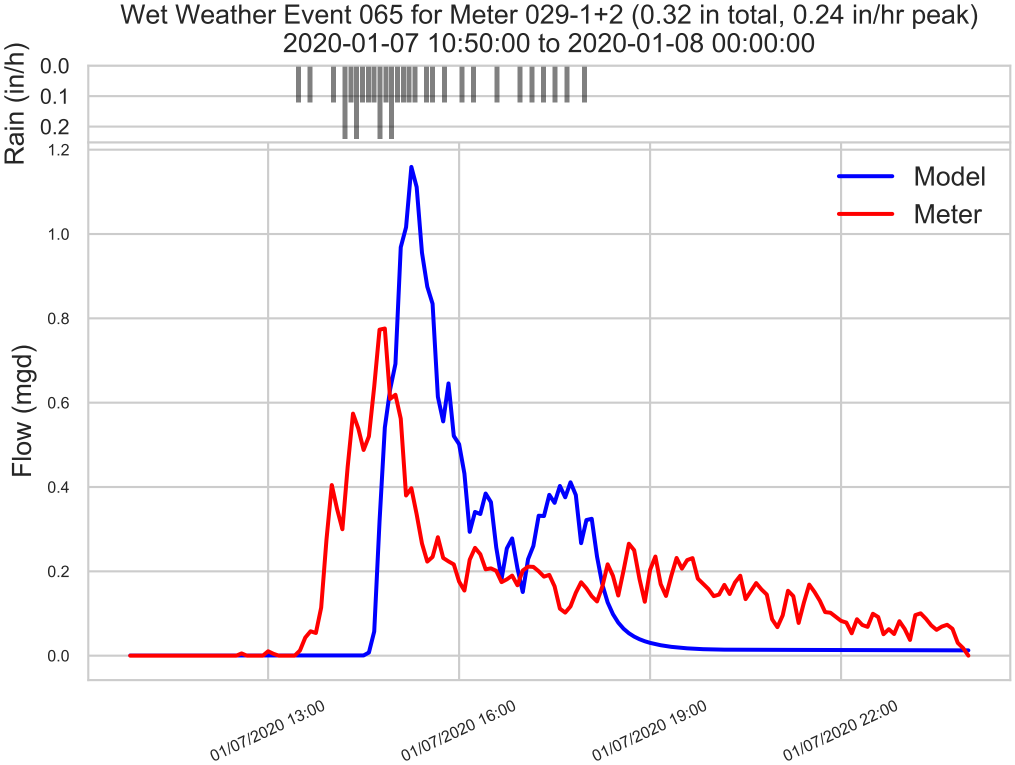
Wet Weather Event 062 for Meter 029-1+2 (0.19 in total, 0.12 in/hr peak)
2020-01-03 00:10:00 to 2020-01-03 12:55:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Model
Meter
01/03/2020 00:00
01/03/2020 03:00
01/03/2020 06:00
01/03/2020 09:00
01/03/2020 12:00



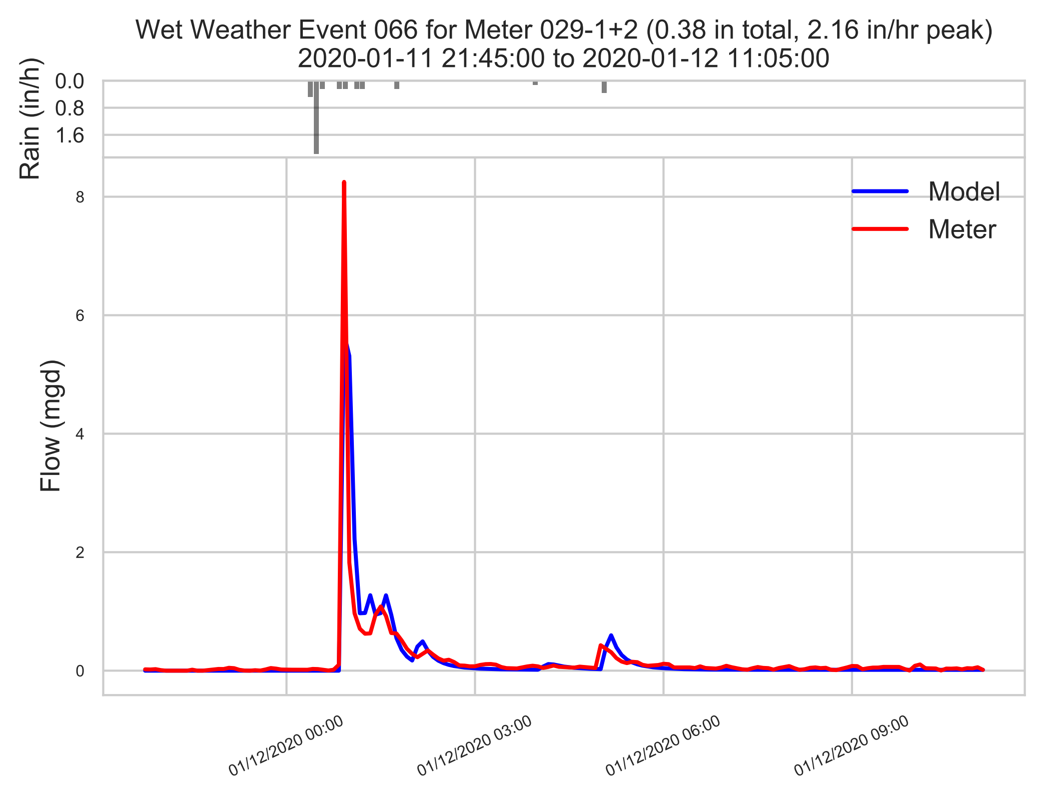
Wet Weather Event 063 for Meter 029-1+2 (0.11 in total, 0.12 in/hr peak)
2020-01-03 11:00:00 to 2020-01-04 11:30:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
Model
Meter
01/03/2020 12:00
01/03/2020 15:00
01/03/2020 18:00
01/03/2020 21:00
01/04/2020 00:00
01/04/2020 03:00
01/04/2020 06:00
01/04/2020 09:00
01/04/2020 12:00

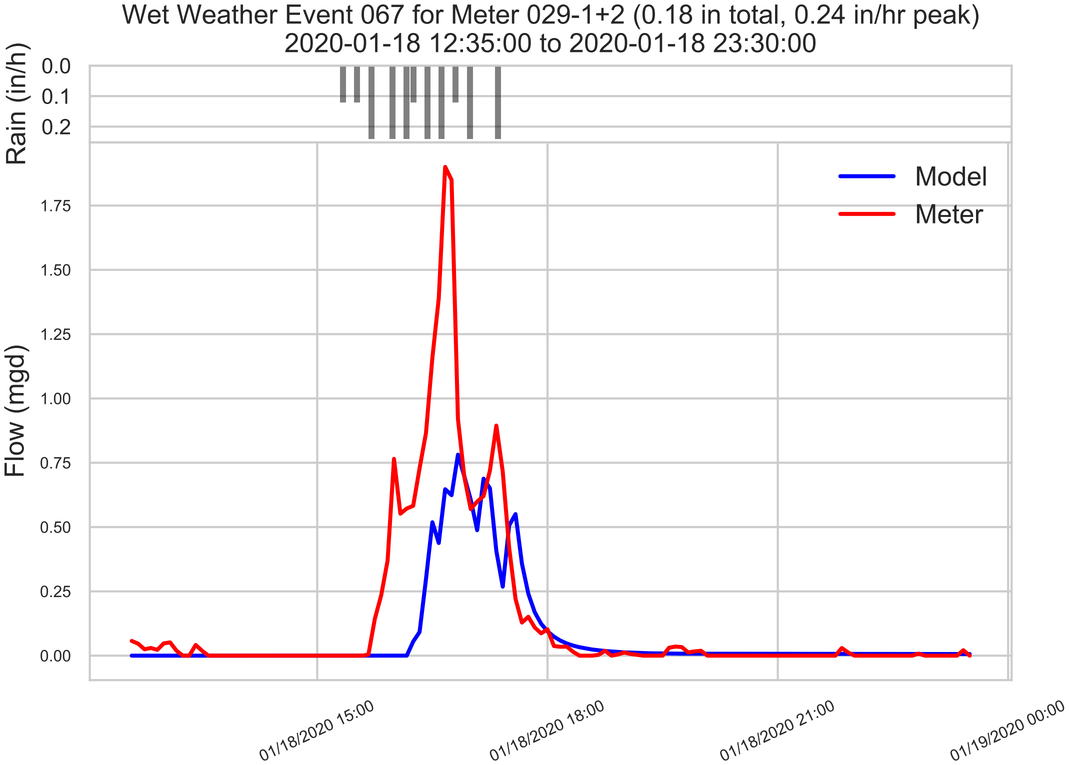


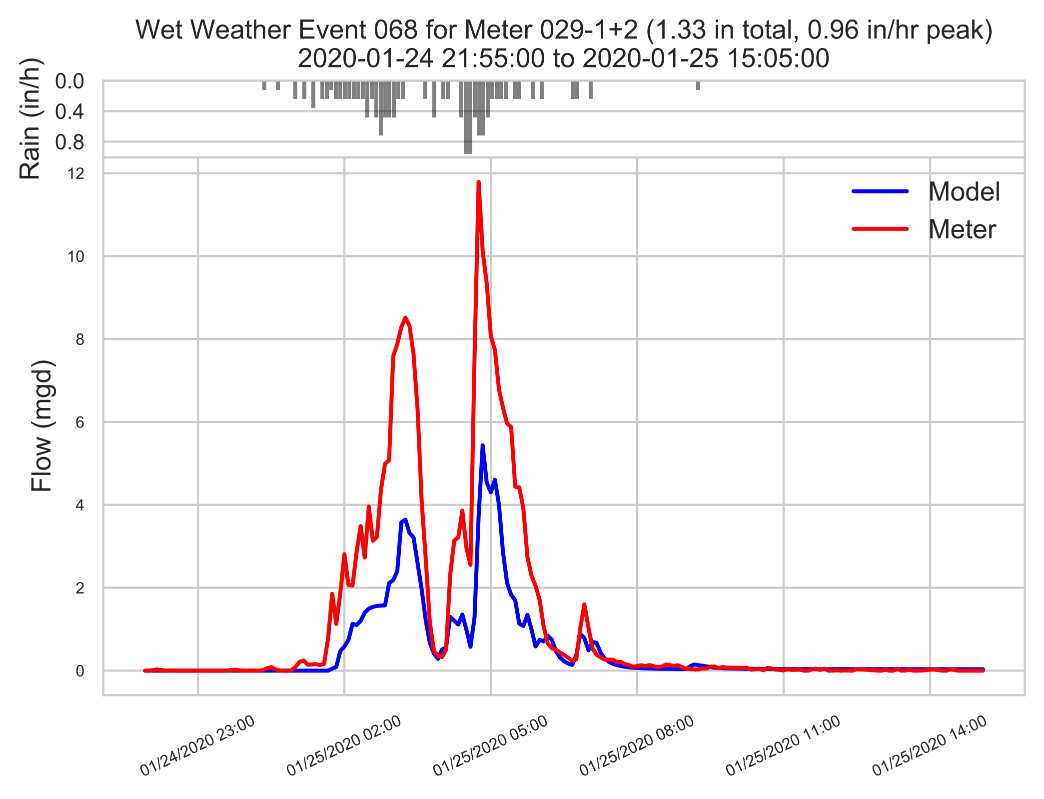
Wet Weather Event 064 for Meter 029-1+2 (0.22 in total, 0.24 in/hr peak)
2020-01-04 13:05:00 to 2020-01-05 00:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
01/04/2020 14:00
01/04/2020 17:00
01/04/2020 20:00
01/04/2020 23:00

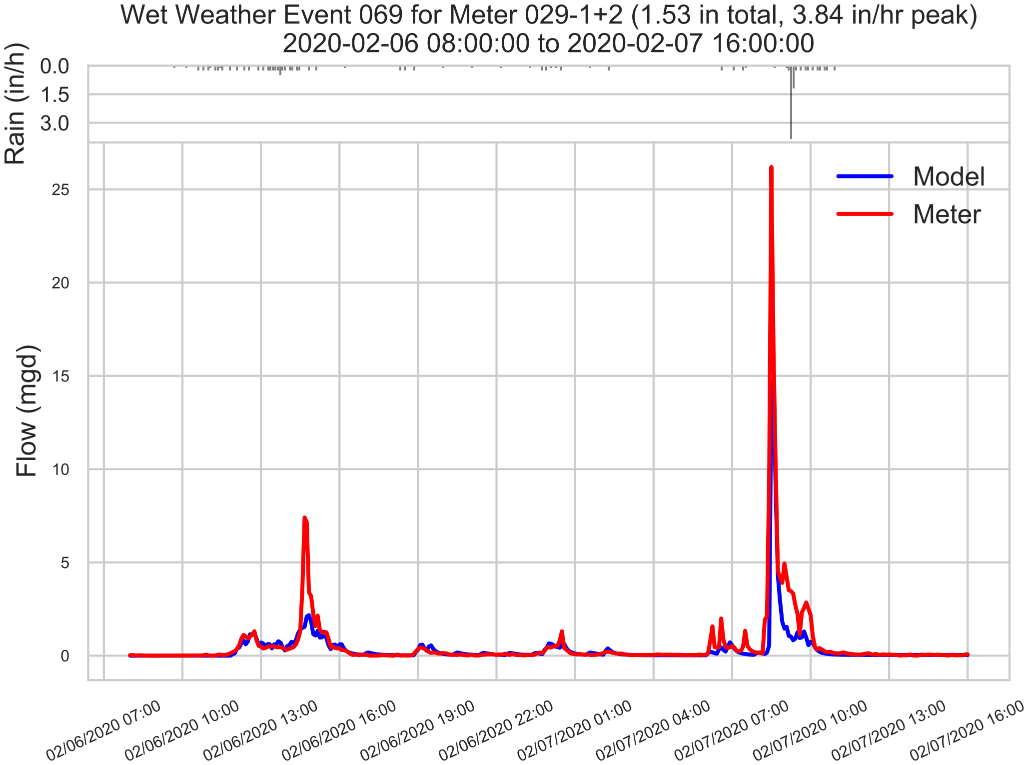


Wet Weather Event 065 for Meter 029-1+2 (0.32 in total, 0.24 in/hr peak)
2020-01-07 10:50:00 to 2020-01-08 00:00:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
01/07/2020 13:00
01/07/2020 16:00
01/07/2020 19:00
01/07/2020 22:00

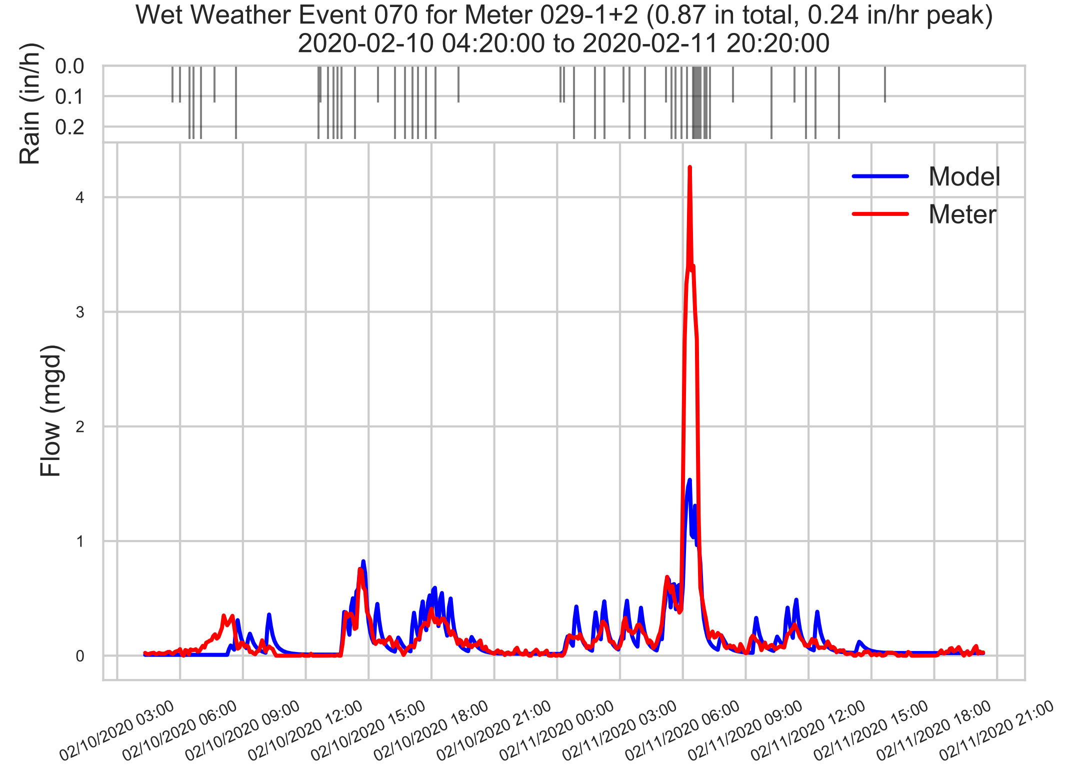

Wet Weather Event 066 for Meter 029-1+2 (0.38 in total, 2.16 in/hr peak)
2020-01-11 21:45:00 to 2020-01-12 11:05:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
8
6
4
2
0
Model
Meter
01/12/2020 00:00
01/12/2020 03:00
01/12/2020 06:00
01/12/2020 09:00

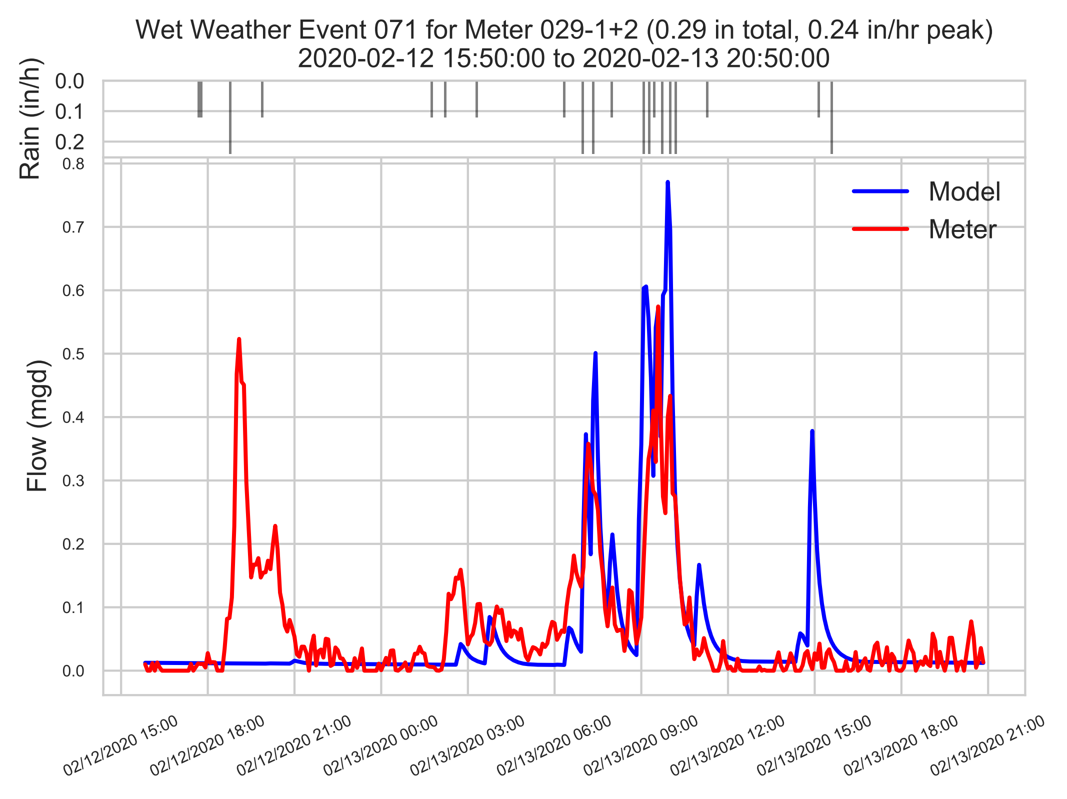

Wet Weather Event 067 for Meter 029-1+2 (0.18 in total, 0.24 in/hr peak)
2020-01-18 12:35:00 to 2020-01-18 23:30:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Model
Meter
01/18/2020 15:00
01/18/2020 18:00
01/18/2020 21:00
01/19/2020 00:00

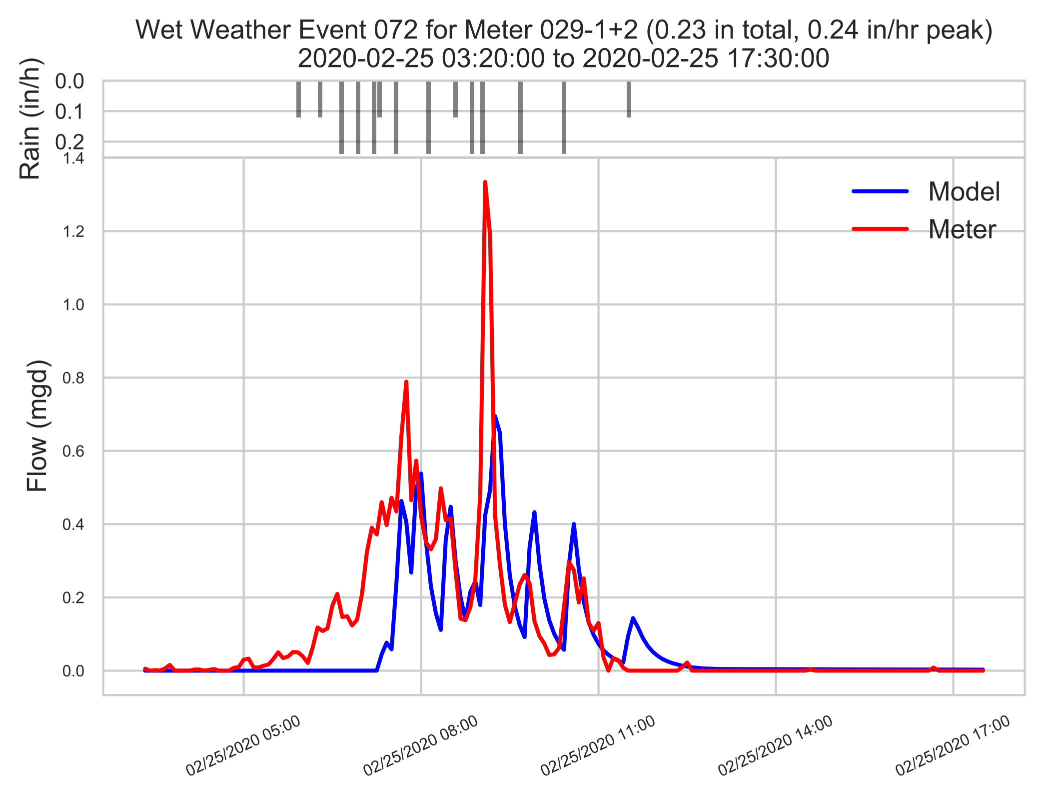

Wet Weather Event 068 for Meter 029-1+2 (1.33 in total, 0.96 in/hr peak)
2020-01-24 21:55:00 to 2020-01-25 15:05:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
12
10
8
6
4
2
0
Model
Meter
01/24/2020 23:00
01/25/2020 02:00
01/25/2020 05:00
01/25/2020 08:00
01/25/2020 11:00
01/25/2020 14:00



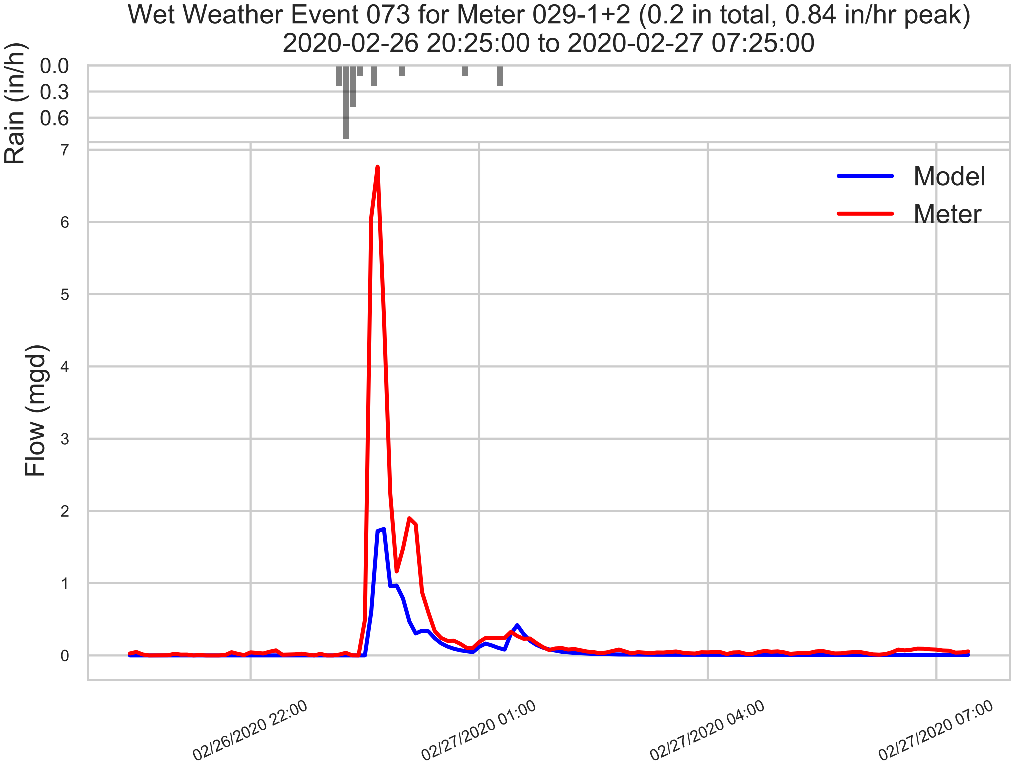
Wet Weather Event 069 for Meter 029-1+2 (1.53 in total, 3.84 in/hr peak)
2020-02-06 08:00:00 to 2020-02-07 16:00:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
0
5
10
15
20
25
Model
Meter
02/06/2020 07:00
02/06/2020 10:00
02/06/2020 13:00
02/06/2020 16:00
02/06/2020 19:00
02/06/2020 22:00
02/07/2020 01:00
02/07/2020 04:00
02/07/2020 07:00
02/07/2020 10:00
02/07/2020 13:00
02/07/2020 16:00

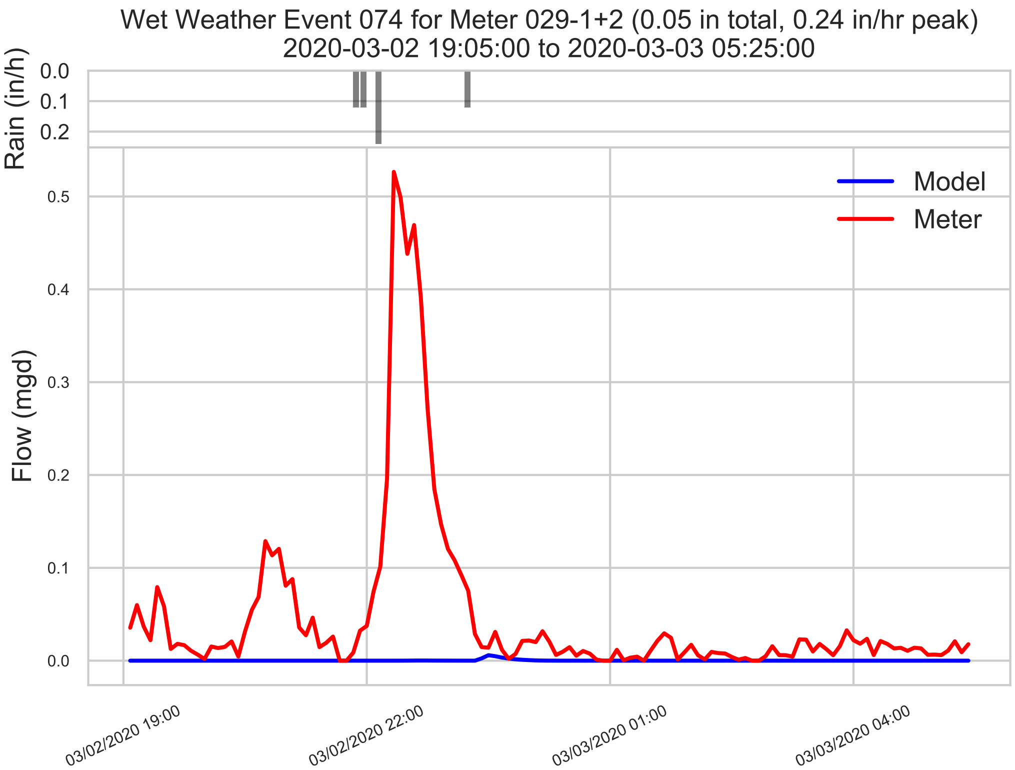

Wet Weather Event 070 for Meter 029-1+2 (0.87 in total, 0.24 in/hr peak)
2020-02-10 04:20:00 to 2020-02-11 20:20:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
4
3
2
1
0
Model
Meter
02/10/2020 03:00
02/10/2020 06:00
02/10/2020 09:00
02/10/2020 12:00
02/10/2020 15:00
02/10/2020 18:00
02/10/2020 21:00
02/11/2020 00:00
02/11/2020 03:00
02/11/2020 06:00
02/11/2020 09:00
02/11/2020 12:00
02/11/2020 15:00
02/11/2020 18:00
02/11/2020 21:00

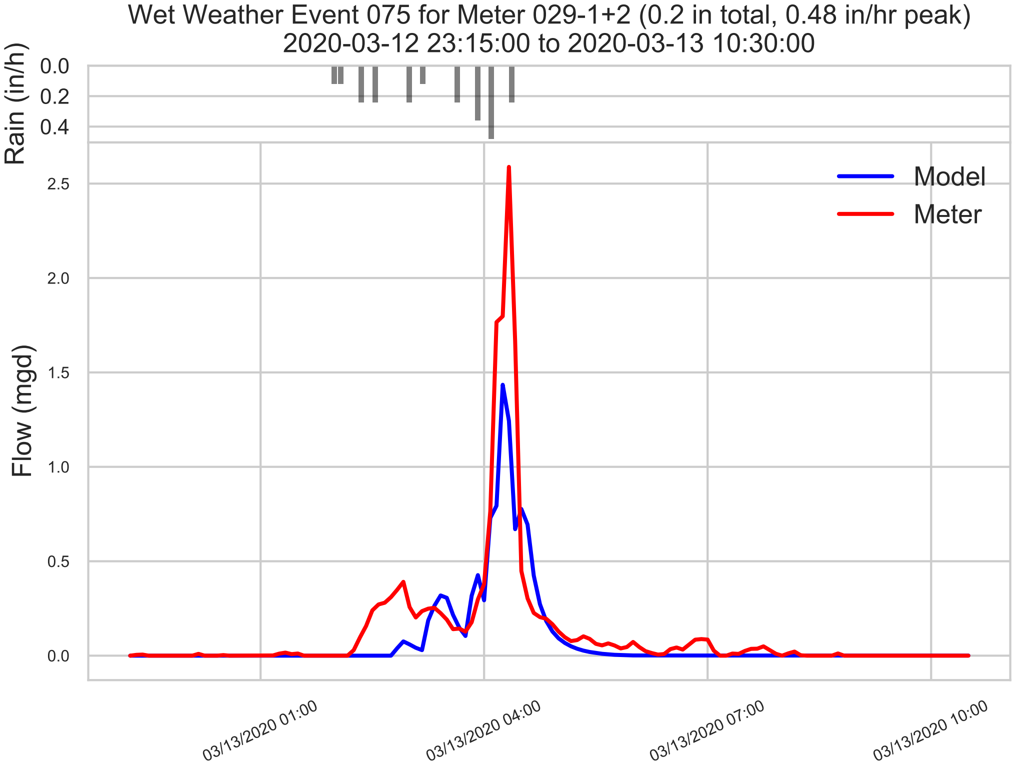

Wet Weather Event 071 for Meter 029-1+2 (0.29 in total, 0.24 in/hr peak)
2020-02-12 15:50:00 to 2020-02-13 20:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Model
Meter
02/12/2020 15:00
02/12/2020 18:00
02/12/2020 21:00
02/13/2020 00:00
02/13/2020 03:00
02/13/2020 06:00
02/13/2020 09:00
02/13/2020 12:00
02/13/2020 15:00
02/13/2020 18:00
02/13/2020 21:00



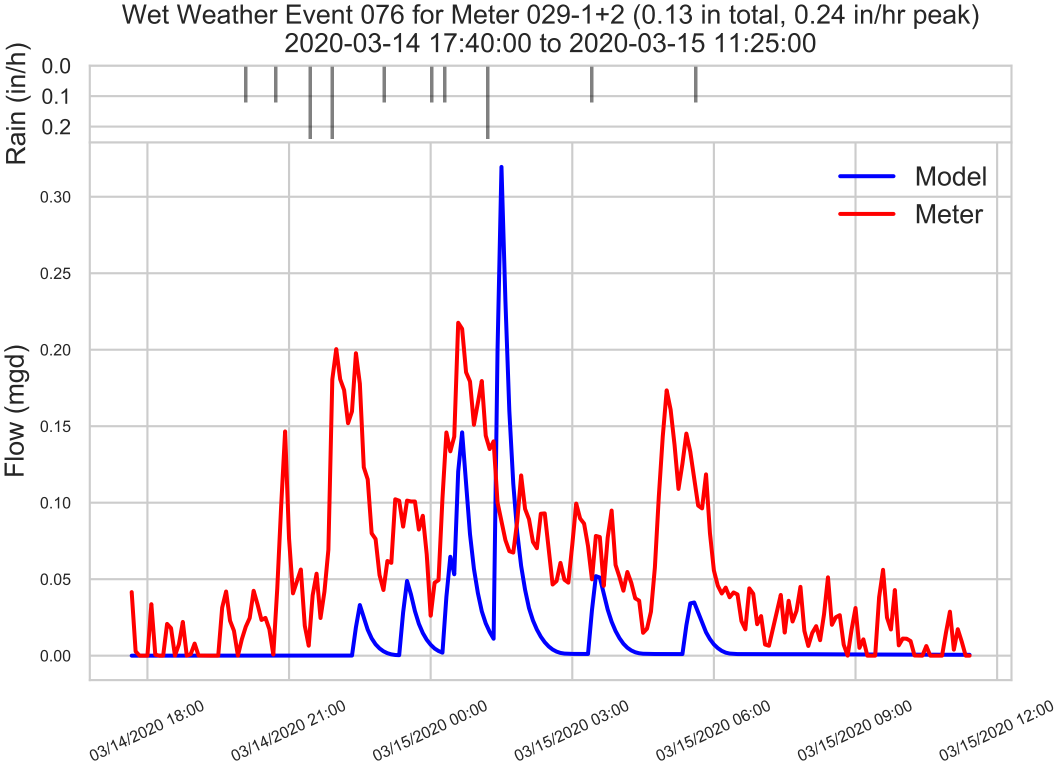
Wet Weather Event 072 for Meter 029-1+2 (0.23 in total, 0.24 in/hr peak)
2020-02-25 03:20:00 to 2020-02-25 17:30:00
Rain (in/h)
0.0
0.1
0.2
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Flow (mgd)
Model
Meter
02/25/2020 05:00
02/25/2020 08:00
02/25/2020 11:00
02/25/2020 14:00
02/25/2020 17:00

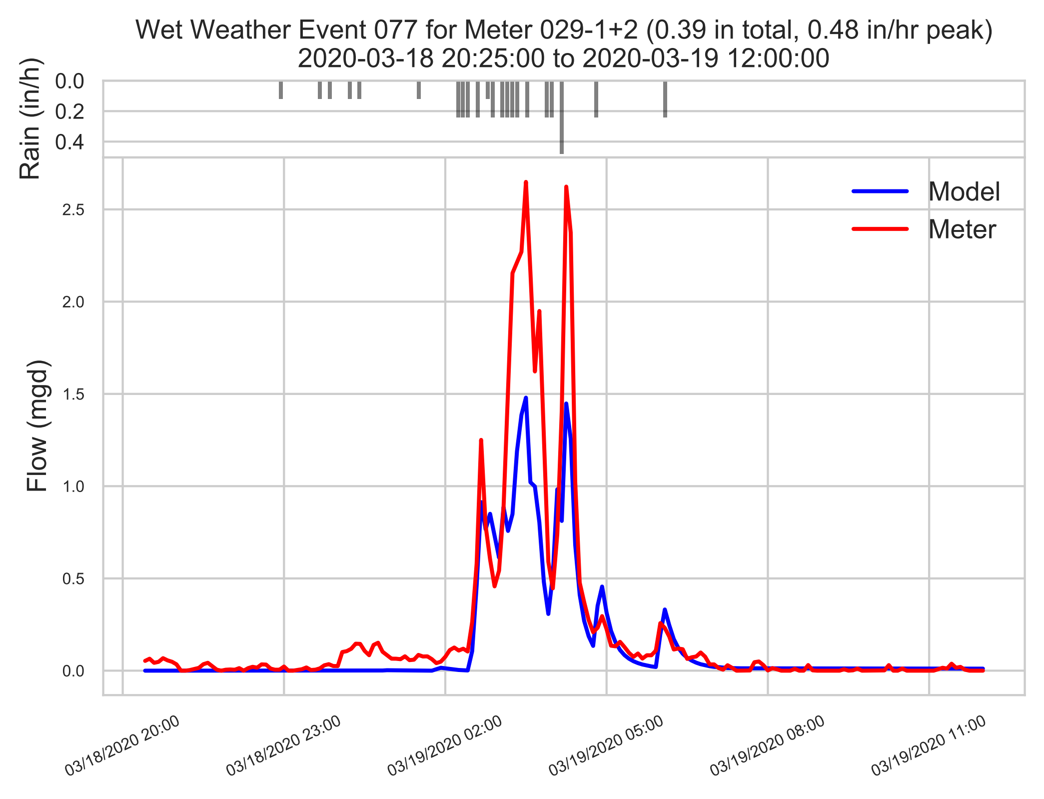

Wet Weather Event 073 for Meter 029-1+2 (0.2 in total, 0.84 in/hr peak)
2020-02-26 20:25:00 to 2020-02-27 07:25:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
0
1
2
3
4
5
6
7
Model
Meter
02/26/2020 22:00
02/27/2020 01:00
02/27/2020 04:00
02/27/2020 07:00


Wet Weather Event 074 for Meter 029-1+2 (0.05 in total, 0.24 in/hr peak)
2020-03-02 19:05:00 to 2020-03-03 05:25:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.5
0.4
0.3
0.2
0.1
0.0
Model
Meter
03/02/2020 19:00
03/02/2020 22:00
03/03/2020 01:00
03/03/2020 04:00

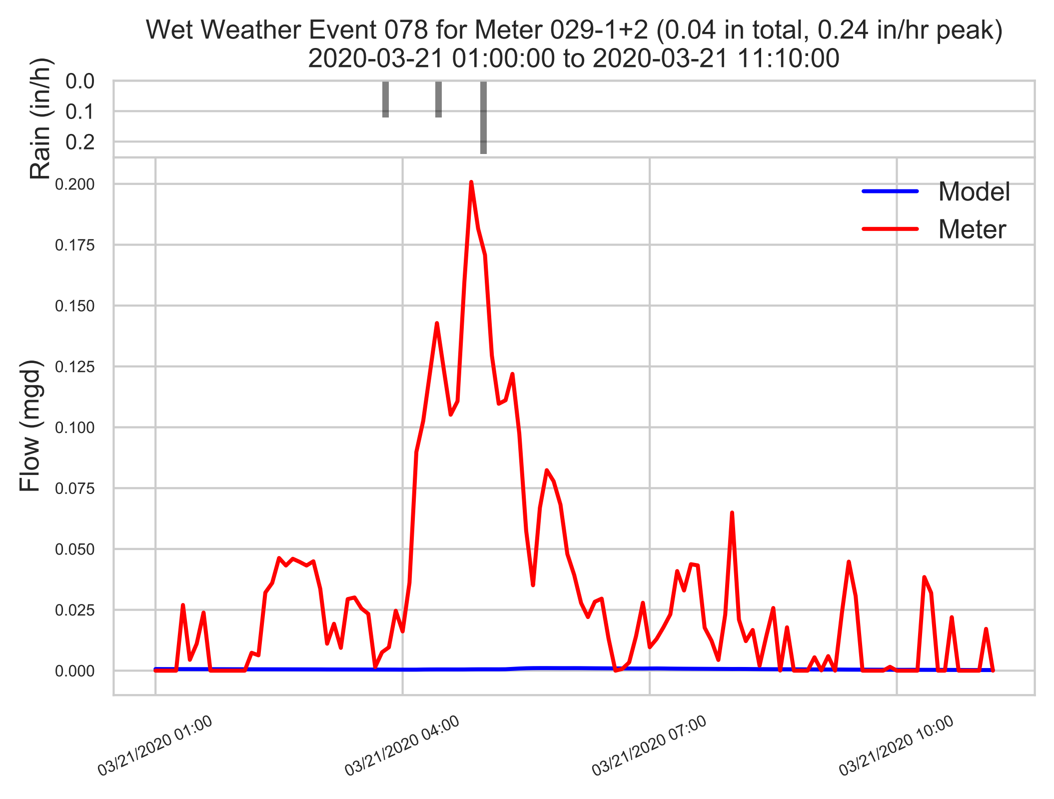


Wet Weather Event 075 for Meter 029-1+2 (0.2 in total, 0.48 in/hr peak)
2020-03-12 23:15:00 to 2020-03-13 10:30:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
03/13/2020 01:00
03/13/2020 04:00
03/13/2020 07:00
03/13/2020 10:00

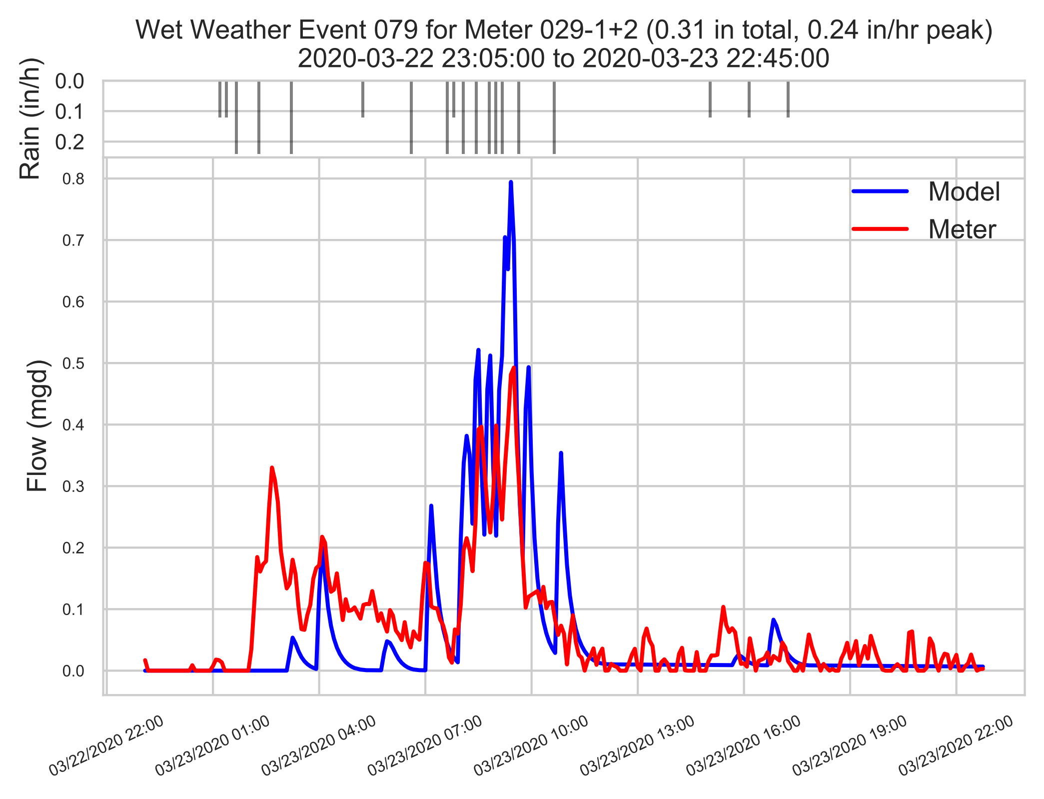

Wet Weather Event 076 for Meter 029-1+2 (0.13 in total, 0.24 in/hr peak)
2020-03-14 17:40:00 to 2020-03-15 11:25:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Model
Meter
03/14/2020 18:00
03/14/2020 21:00
03/15/2020 00:00
03/15/2020 03:00
03/15/2020 06:00
03/15/2020 09:00
03/15/2020 12:00



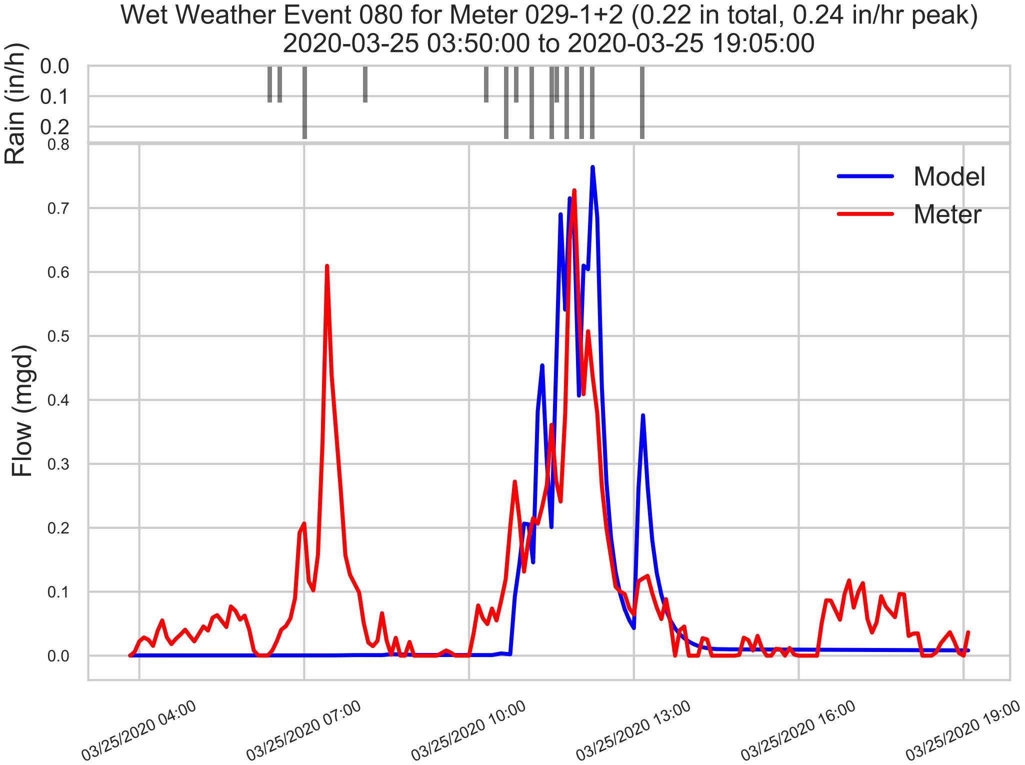
Wet Weather Event 077 for Meter 029-1+2 (0.39 in total, 0.48 in/hr peak)
2020-03-18 20:25:00 to 2020-03-19 12:00:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
03/18/2020 20:00
03/18/2020 23:00
03/19/2020 02:00
03/19/2020 05:00
03/19/2020 08:00
03/19/2020 11:00



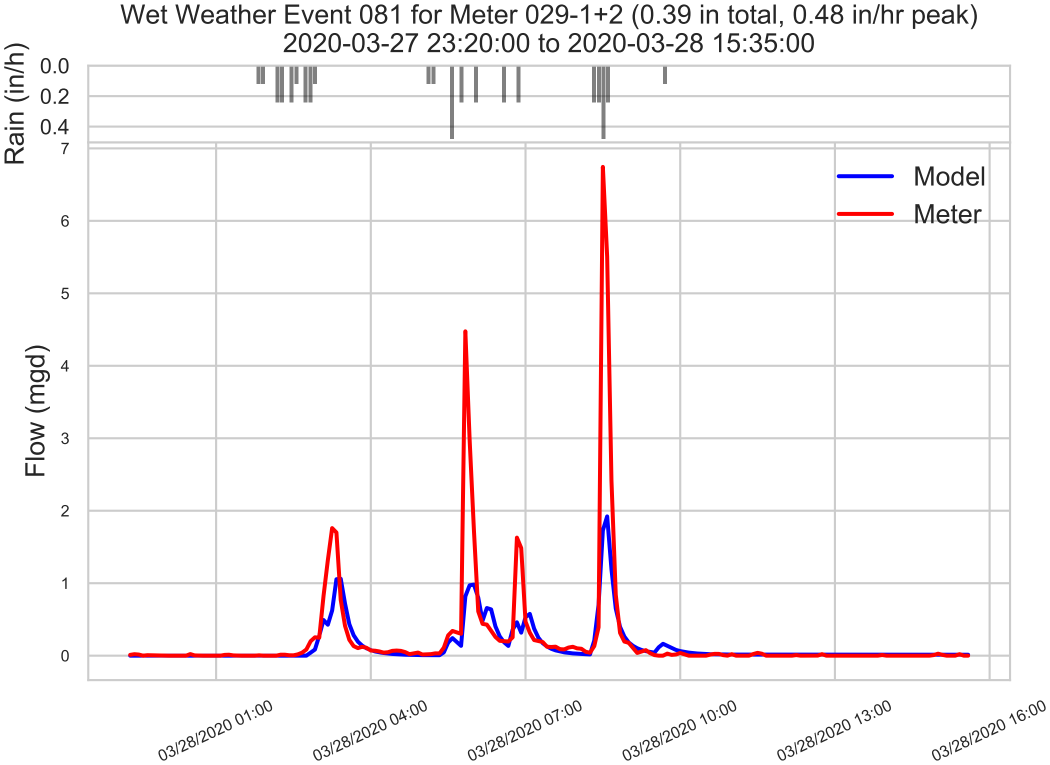
Wet Weather Event 078 for Meter 029-1+2 (0.04 in total, 0.24 in/hr peak)
2020-03-21 01:00:00 to 2020-03-21 11:10:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
Model
Meter
03/21/2020 01:00
03/21/2020 04:00
03/21/2020 07:00
03/21/2020 10:00

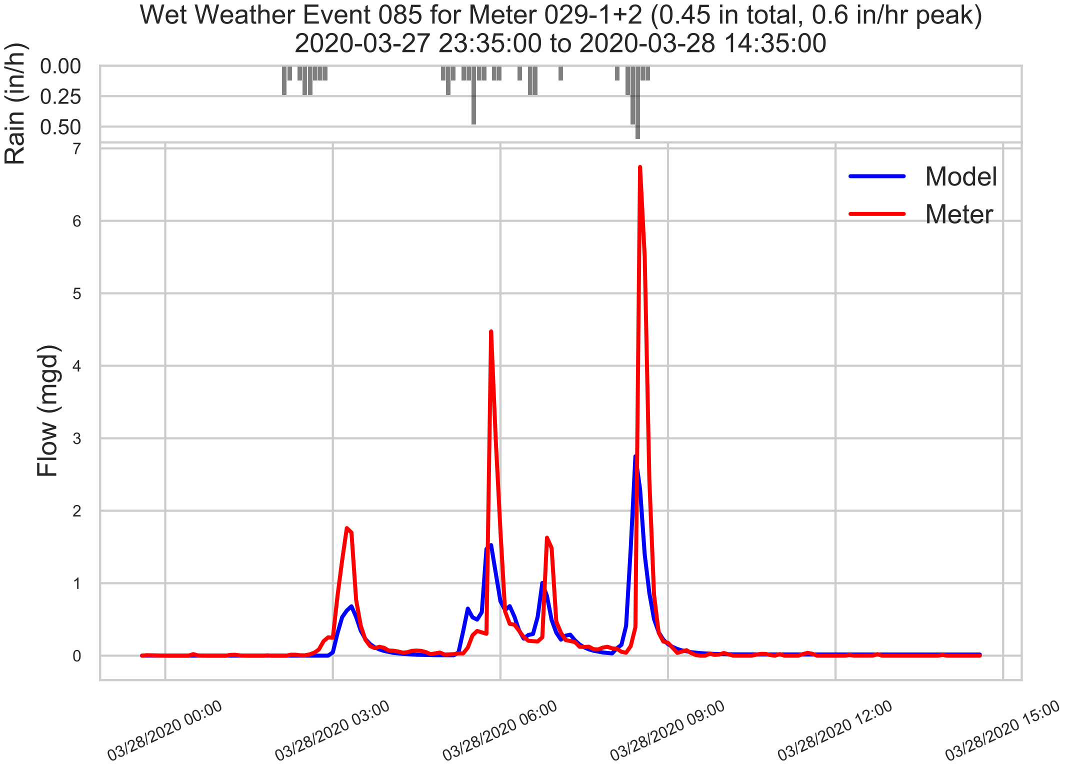


Wet Weather Event 079 for Meter 029-1+2 (0.31 in total, 0.24 in/hr peak)
2020-03-22 23:05:00 to 2020-03-23 22:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Model
Meter
03/22/2020 22:00
03/23/2020 01:00
03/23/2020 04:00
03/23/2020 07:00
03/23/2020 10:00
03/23/2020 13:00
03/23/2020 16:00
03/23/2020 19:00
03/23/2020 22:00

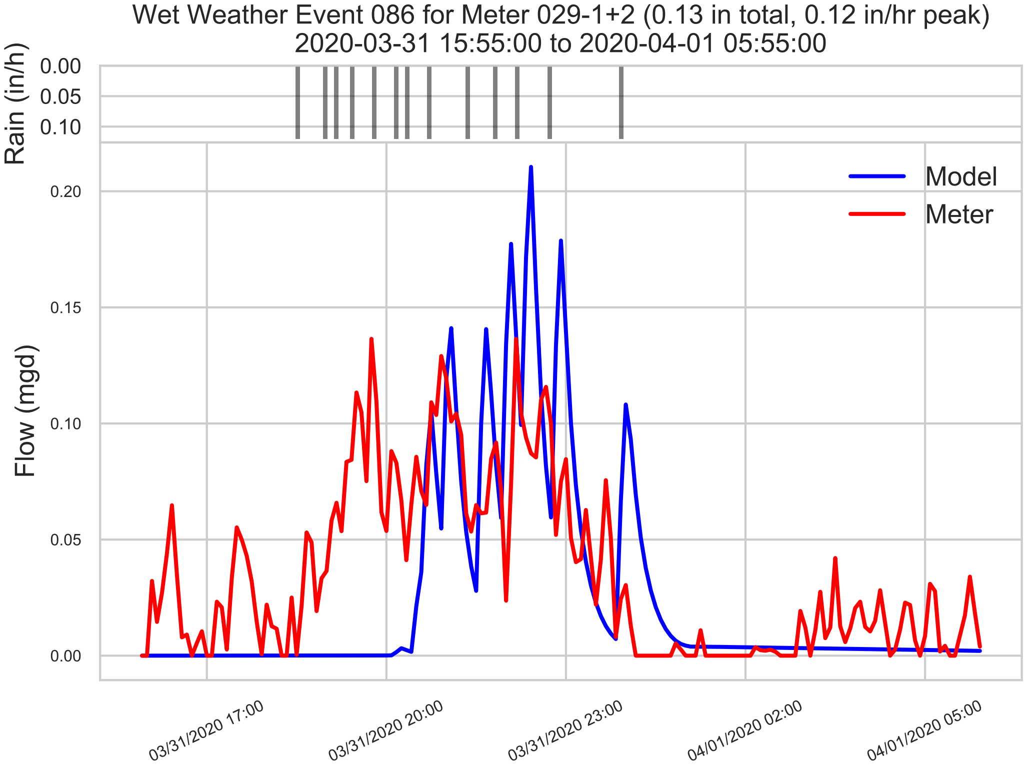


Wet Weather Event 080 for Meter 029-1+2 (0.22 in total, 0.24 in/hr peak)
2020-03-25 03:50:00 to 2020-03-25 19:05:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Model
Meter
03/25/2020 04:00
03/25/2020 07:00
03/25/2020 10:00
03/25/2020 13:00
03/25/2020 16:00
03/25/2020 19:00

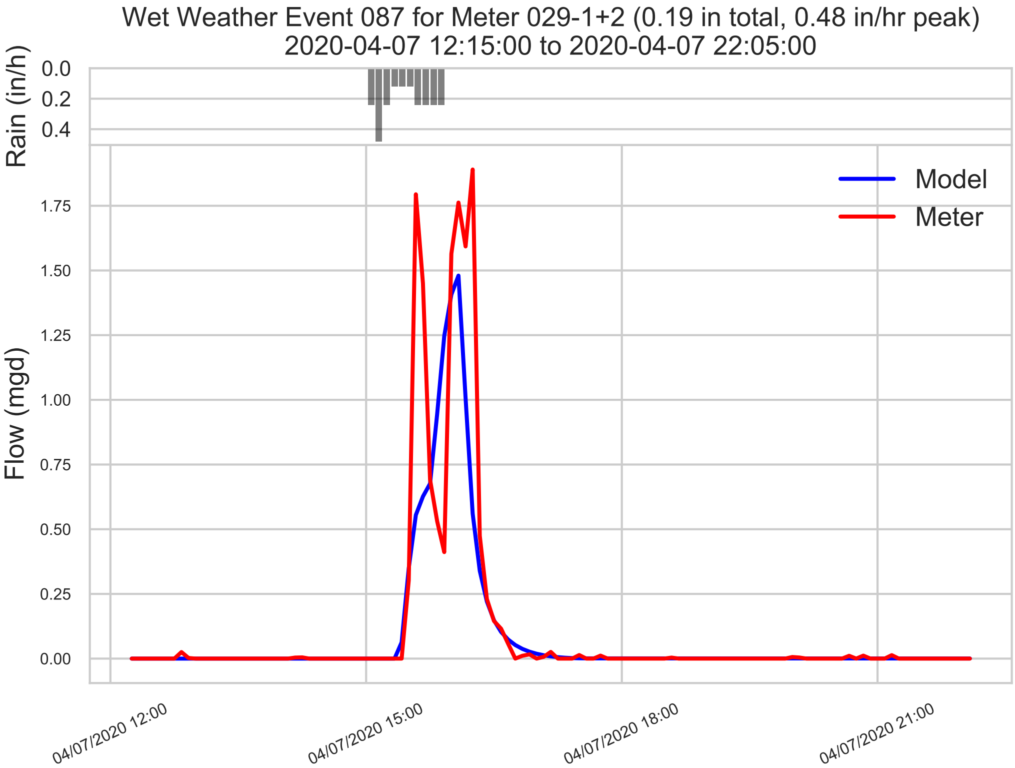

Wet Weather Event 081 for Meter 029-1+2 (0.39 in total, 0.48 in/hr peak)
2020-03-27 23:20:00 to 2020-03-28 15:35:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
1
2
3
4
5
6
7
Model
Meter
03/28/2020 01:00
03/28/2020 04:00
03/28/2020 07:00
03/28/2020 10:00
03/28/2020 13:00
03/28/2020 16:00



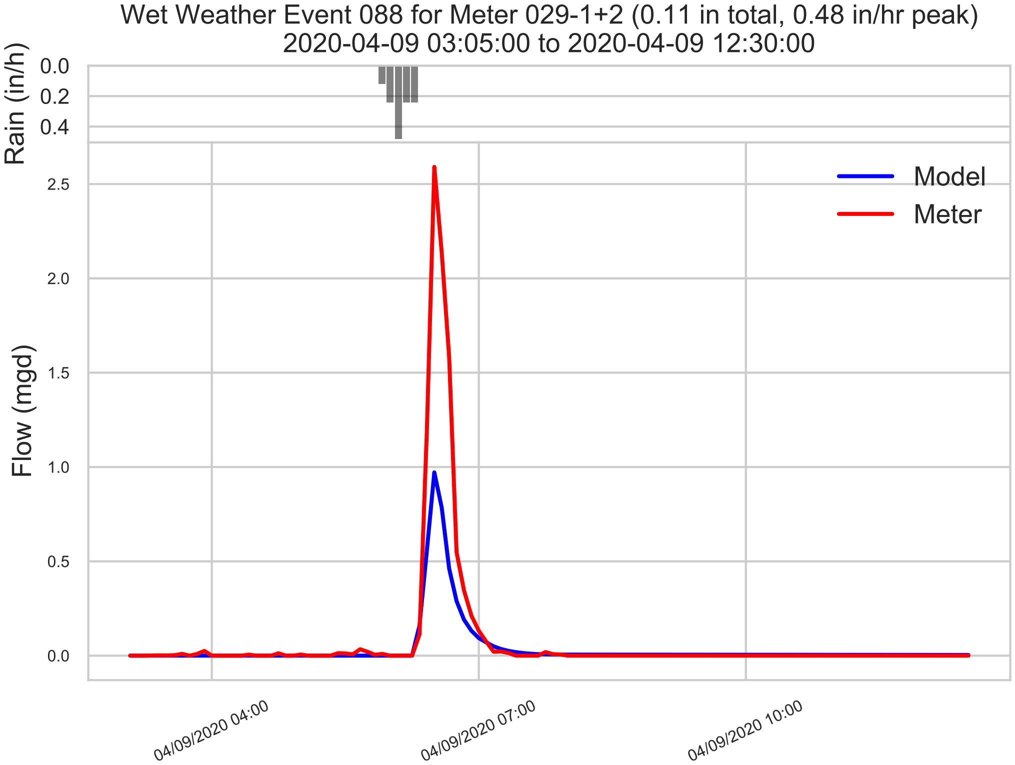
Wet Weather Event 085 for Meter 029-1+2 (0.45 in total, 0.6 in/hr peak)
2020-03-27 23:35:00 to 2020-03-28 14:35:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
0
1
2
3
4
5
6
7
Model
Meter
03/28/2020 00:00
03/28/2020 03:00
03/28/2020 06:00
03/28/2020 09:00
03/28/2020 12:00
03/28/2020 15:00

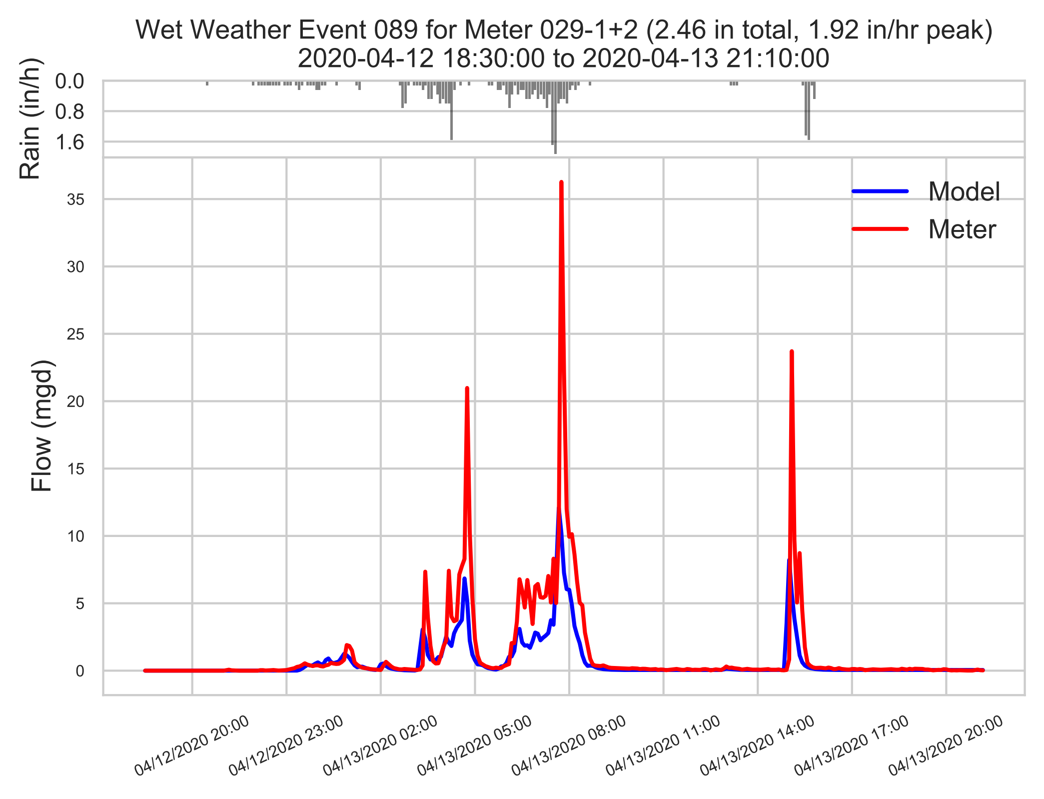


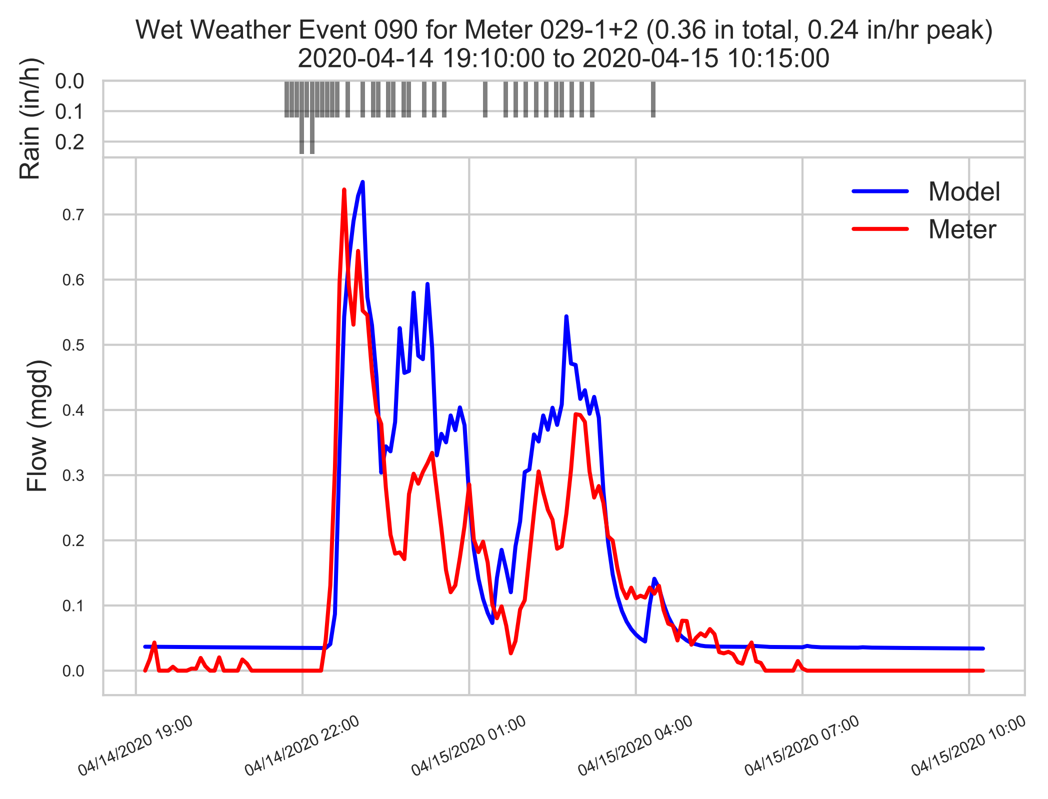
Wet Weather Event 086 for Meter 029-1+2 (0.13 in total, 0.12 in/hr peak)
2020-03-31 15:55:00 to 2020-04-01 05:55:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.20
0.15
0.10
0.05
0.00
Model
Meter
03/31/2020 17:00
03/31/2020 20:00
03/31/2020 23:00
04/01/2020 02:00
04/01/2020 05:00

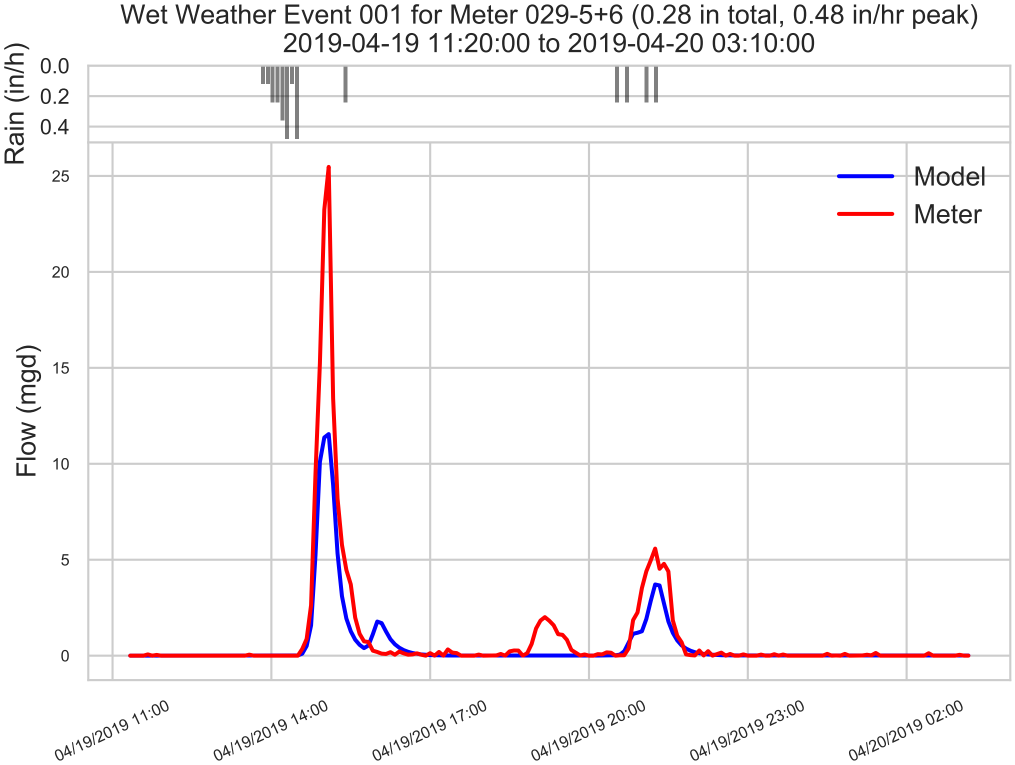


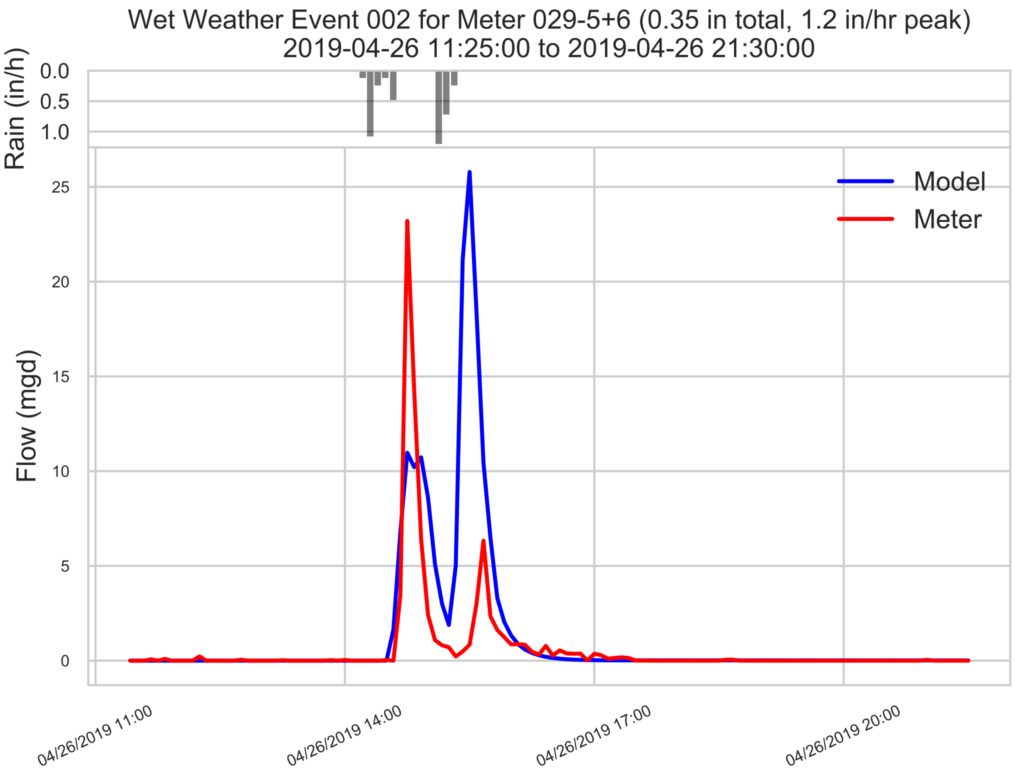
Wet Weather Event 087 for Meter 029-1+2 (0.19 in total, 0.48 in/hr peak)
2020-04-07 12:15:00 to 2020-04-07 22:05:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Model
Meter
04/07/2020 12:00
04/07/2020 15:00
04/07/2020 18:00
04/07/2020 21:00


Wet Weather Event 088 for Meter 029-1+2 (0.11 in total, 0.48 in/hr peak)
2020-04-09 03:05:00 to 2020-04-09 12:30:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
04/09/2020 04:00
04/09/2020 07:00
04/09/2020 10:00

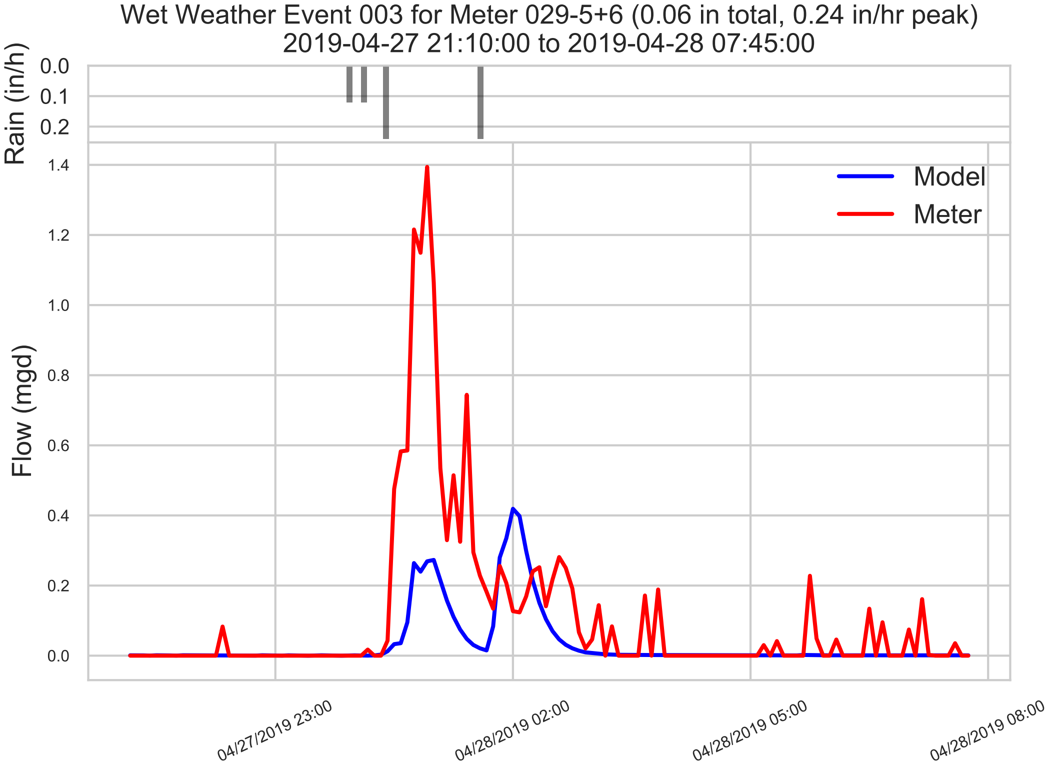

Wet Weather Event 089 for Meter 029-1+2 (2.46 in total, 1.92 in/hr peak)
2020-04-12 18:30:00 to 2020-04-13 21:10:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
0
5
10
15
20
25
30
35
Model
Meter
04/12/2020 20:00
04/12/2020 23:00
04/13/2020 02:00
04/13/2020 05:00
04/13/2020 08:00
04/13/2020 11:00
04/13/2020 14:00
04/13/2020 17:00
04/13/2020 20:00


Wet Weather Event 090 for Meter 029-1+2 (0.36 in total, 0.24 in/hr peak)
2020-04-14 19:10:00 to 2020-04-15 10:15:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Model
Meter
04/14/2020 19:00
04/14/2020 22:00
04/15/2020 01:00
04/15/2020 04:00
04/15/2020 07:00
04/15/2020 10:00

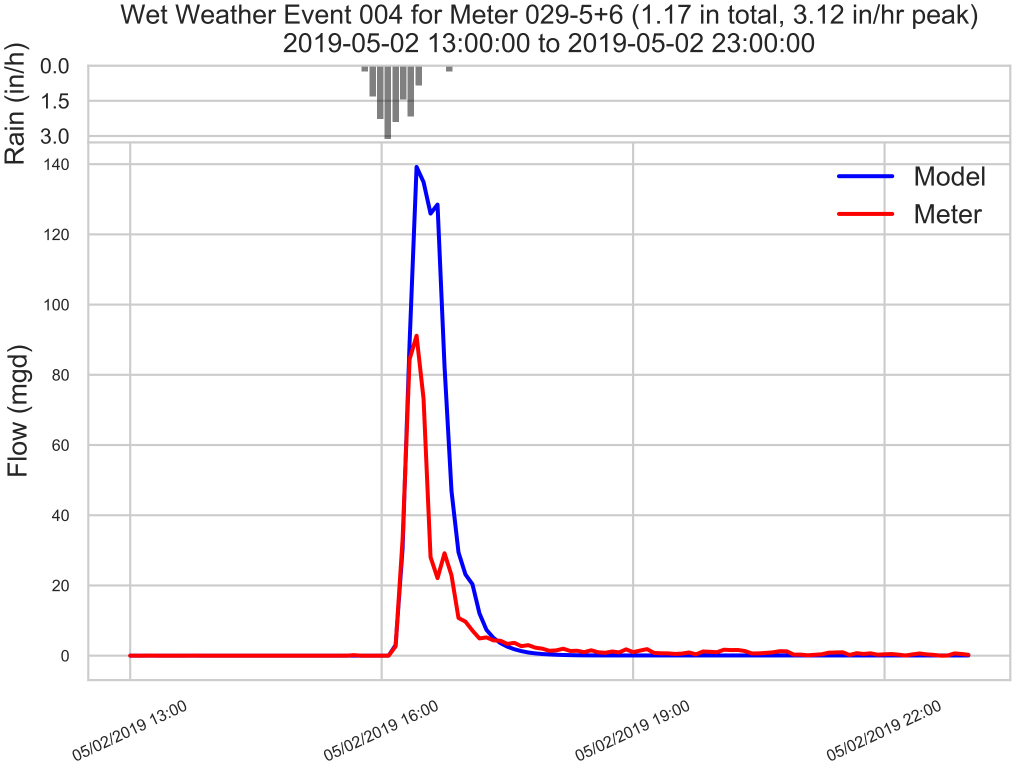

Wet Weather Event 001 for Meter 029-5+6 (0.28 in total, 0.48 in/hr peak)
2019-04-19 11:20:00 to 2019-04-20 03:10:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
25
20
15
10
5
0
Model
Meter
04/19/2019 11:00
04/19/2019 14:00
04/19/2019 17:00
04/19/2019 20:00
04/19/2019 23:00
04/20/2019 02:00



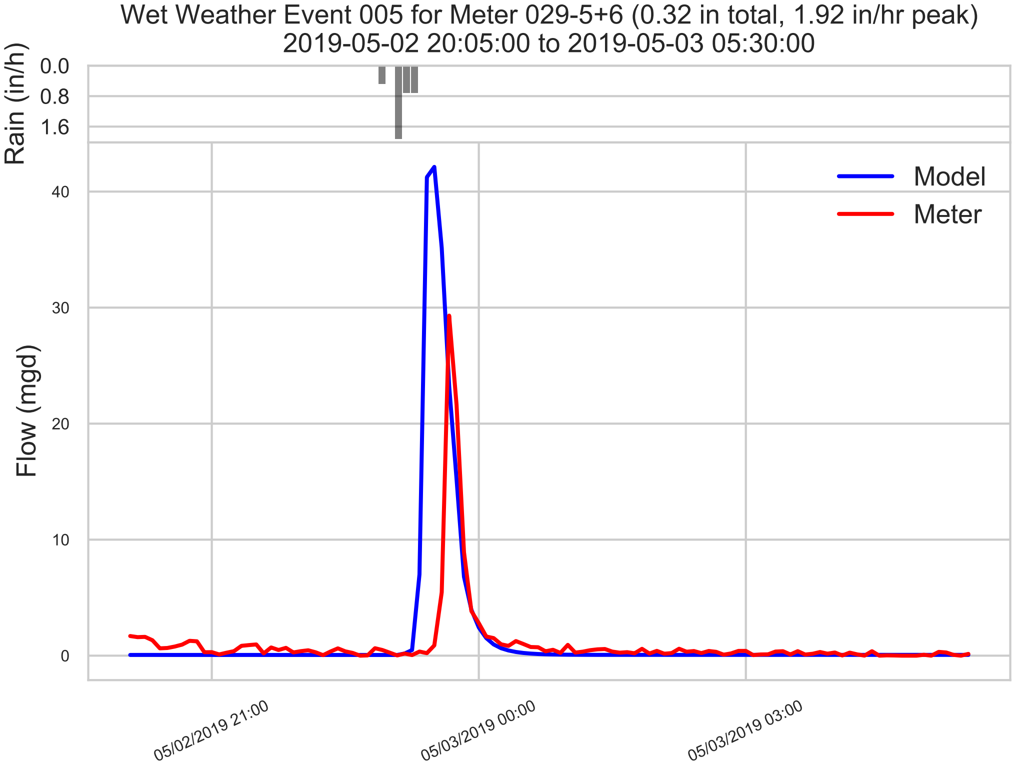
Wet Weather Event 002 for Meter 029-5+6 (0.35 in total, 1.2 in/hr peak)
2019-04-26 11:25:00 to 2019-04-26 21:30:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
25
20
15
10
5
0
Model
Meter
04/26/2019 11:00
04/26/2019 14:00
04/26/2019 17:00
04/26/2019 20:00

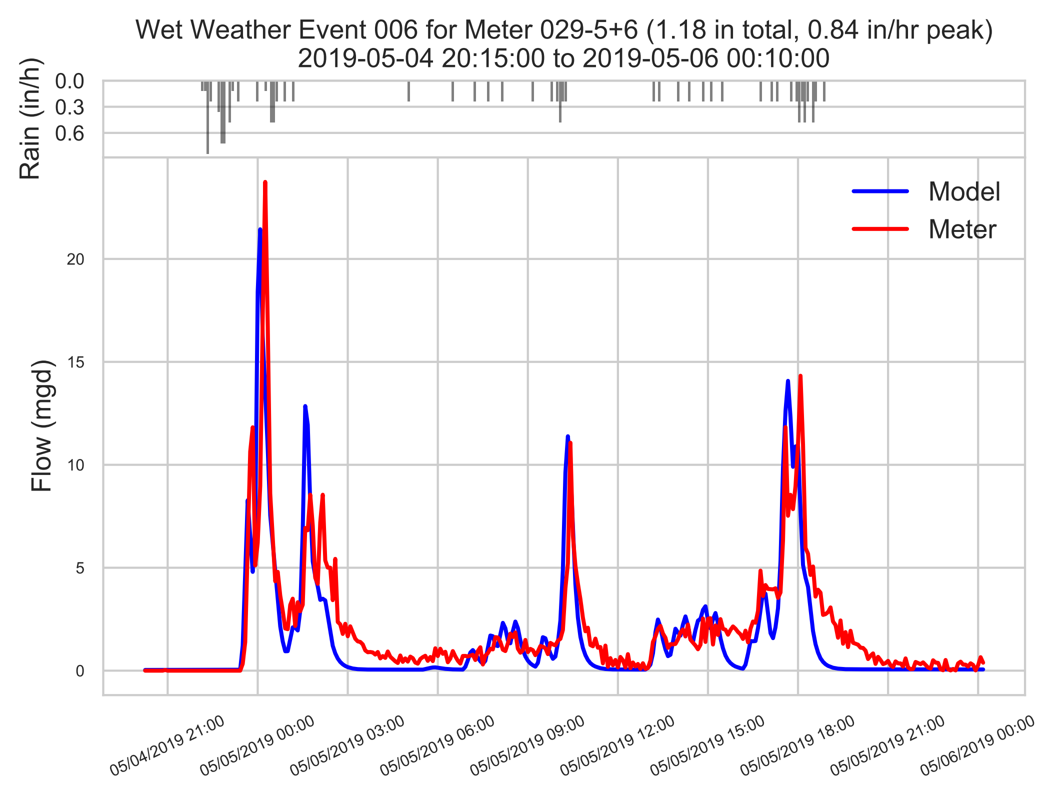


Wet Weather Event 003 for Meter 029-5+6 (0.06 in total, 0.24 in/hr peak)
2019-04-27 21:10:00 to 2019-04-28 07:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
04/27/2019 23:00
04/28/2019 02:00
04/28/2019 05:00
04/28/2019 08:00

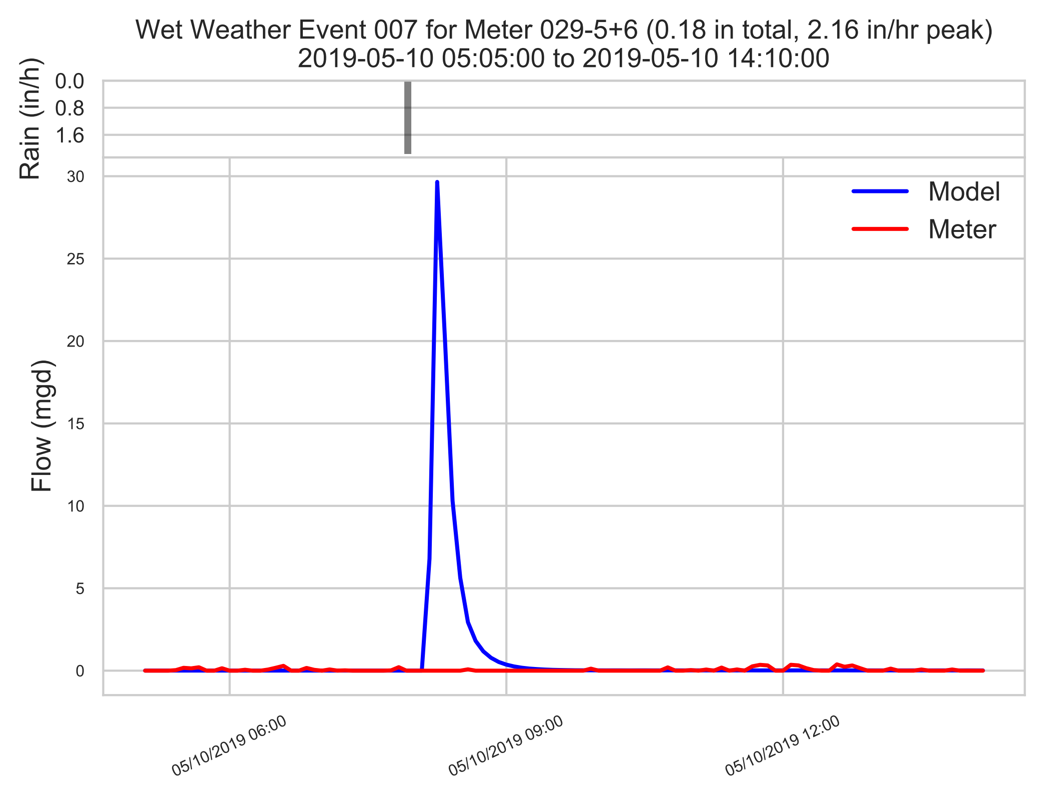


Wet Weather Event 004 for Meter 029-5+6 (1.17 in total, 3.12 in/hr peak)
2019-05-02 13:00:00 to 2019-05-02 23:00:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
140
120
100
80
60
40
20
0
Model
Meter
05/02/2019 13:00
05/02/2019 16:00
05/02/2019 19:00
05/02/2019 22:00

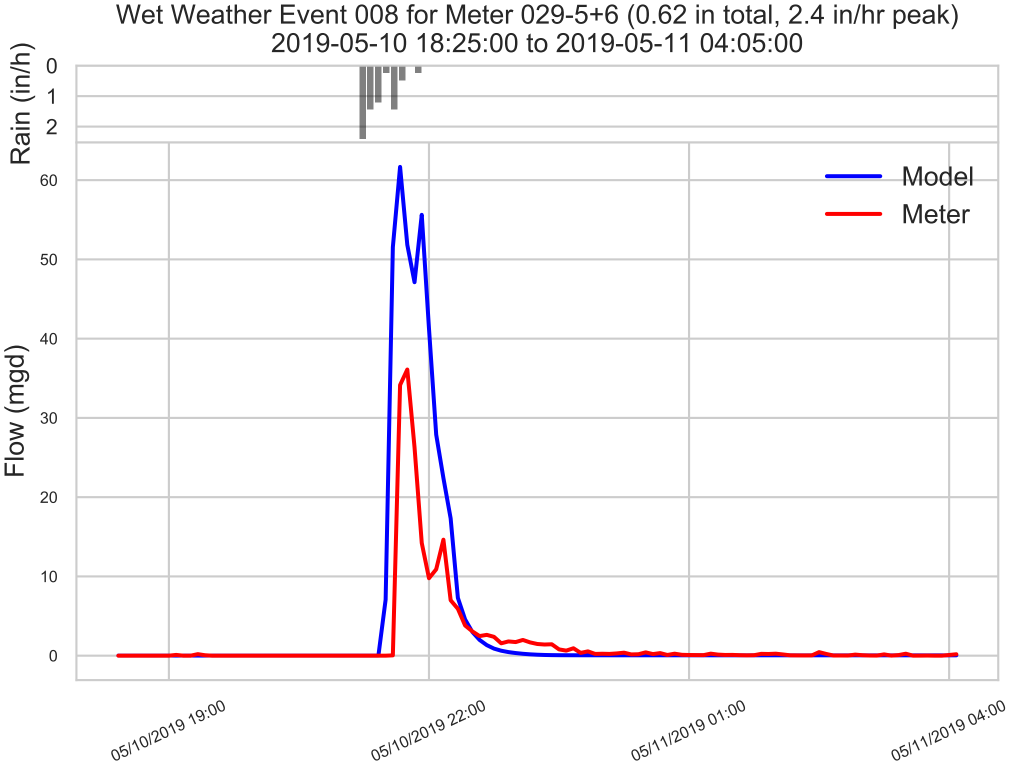

Wet Weather Event 005 for Meter 029-5+6 (0.32 in total, 1.92 in/hr peak)
2019-05-02 20:05:00 to 2019-05-03 05:30:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
40
30
20
10
0
Model
Meter
05/02/2019 21:00
05/03/2019 00:00
05/03/2019 03:00



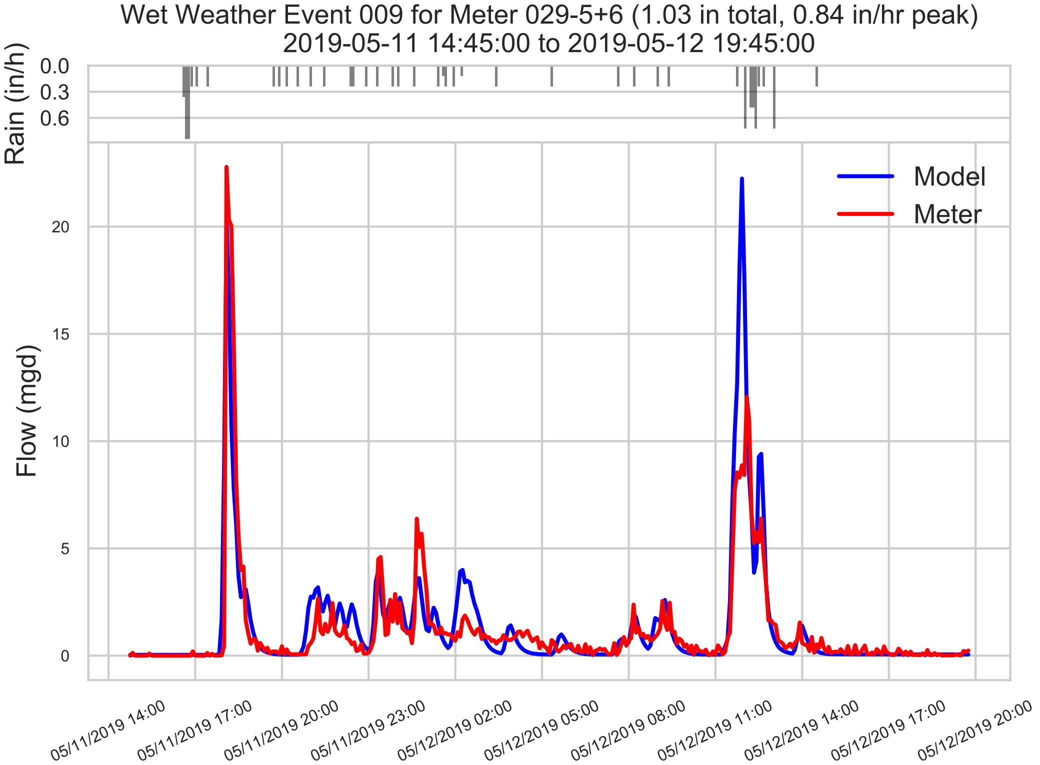
Wet Weather Event 006 for Meter 029-5+6 (1.18 in total, 0.84 in/hr peak)
2019-05-04 20:15:00 to 2019-05-06 00:10:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
0
5
10
15
20
Model
Meter
05/04/2019 21:00
05/05/2019 00:00
05/05/2019 03:00
05/05/2019 06:00
05/05/2019 09:00
05/05/2019 12:00
05/05/2019 15:00
05/05/2019 18:00
05/05/2019 21:00
05/06/2019 00:00



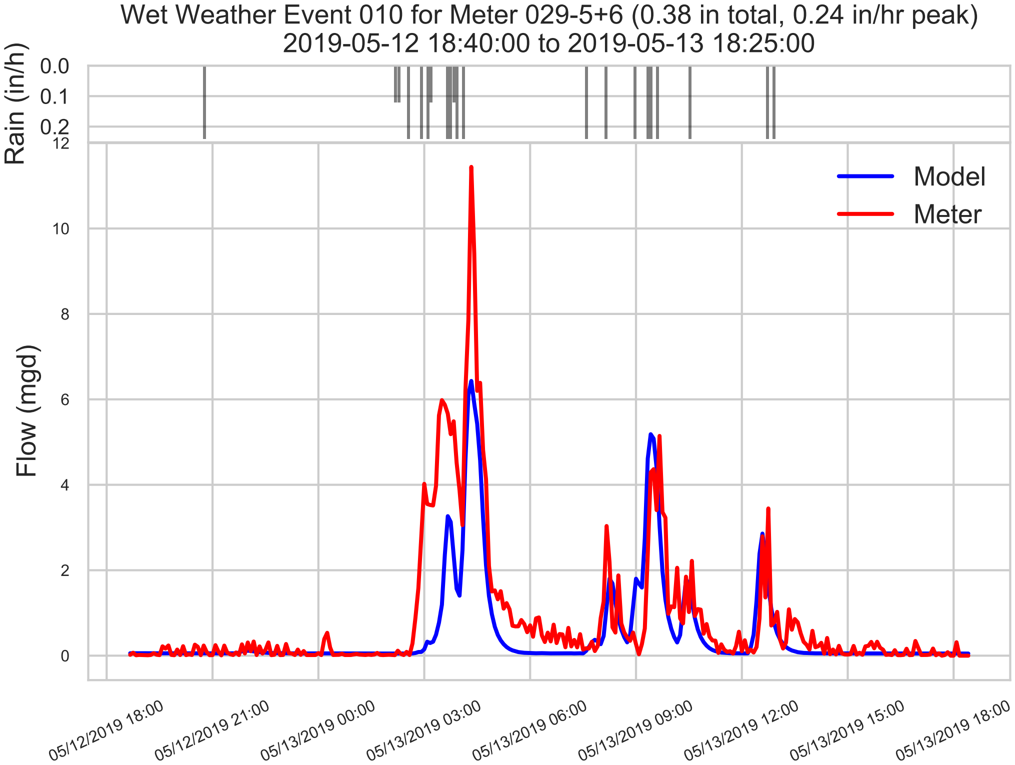
Wet Weather Event 007 for Meter 029-5+6 (0.18 in total, 2.16 in/hr peak)
2019-05-10 05:05:00 to 2019-05-10 14:10:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
30
25
20
15
10
5
0
Model
Meter
05/10/2019 06:00
05/10/2019 09:00
05/10/2019 12:00

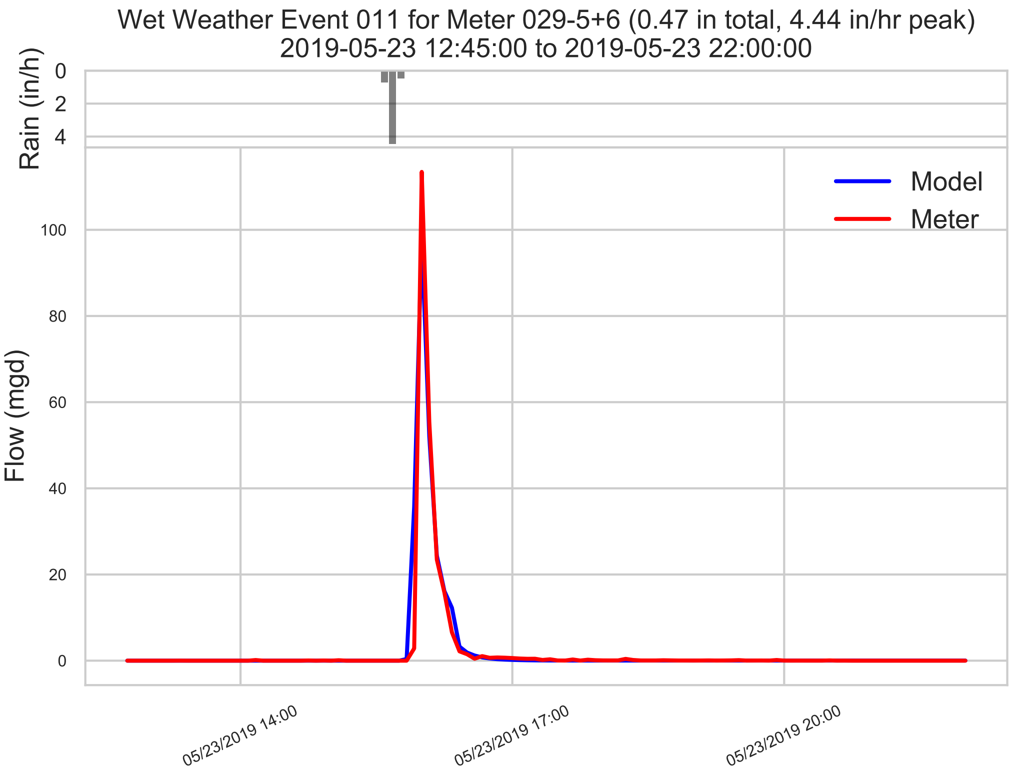


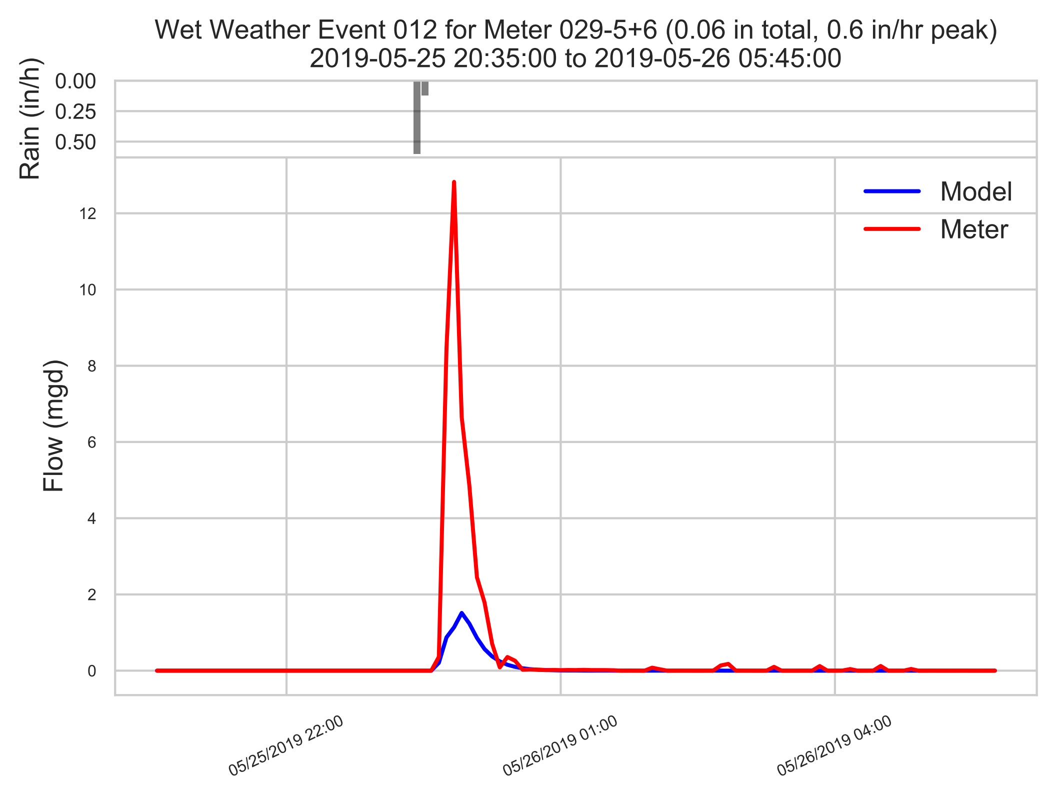
Wet Weather Event 008 for Meter 029-5+6 (0.62 in total, 2.4 in/hr peak)
2019-05-10 18:25:00 to 2019-05-11 04:05:00
Rain (in/h)
0
1
2
Flow (mgd)
60
50
40
30
20
10
0
Model
Meter
05/10/2019 19:00
05/10/2019 22:00
05/11/2019 01:00
05/11/2019 04:00



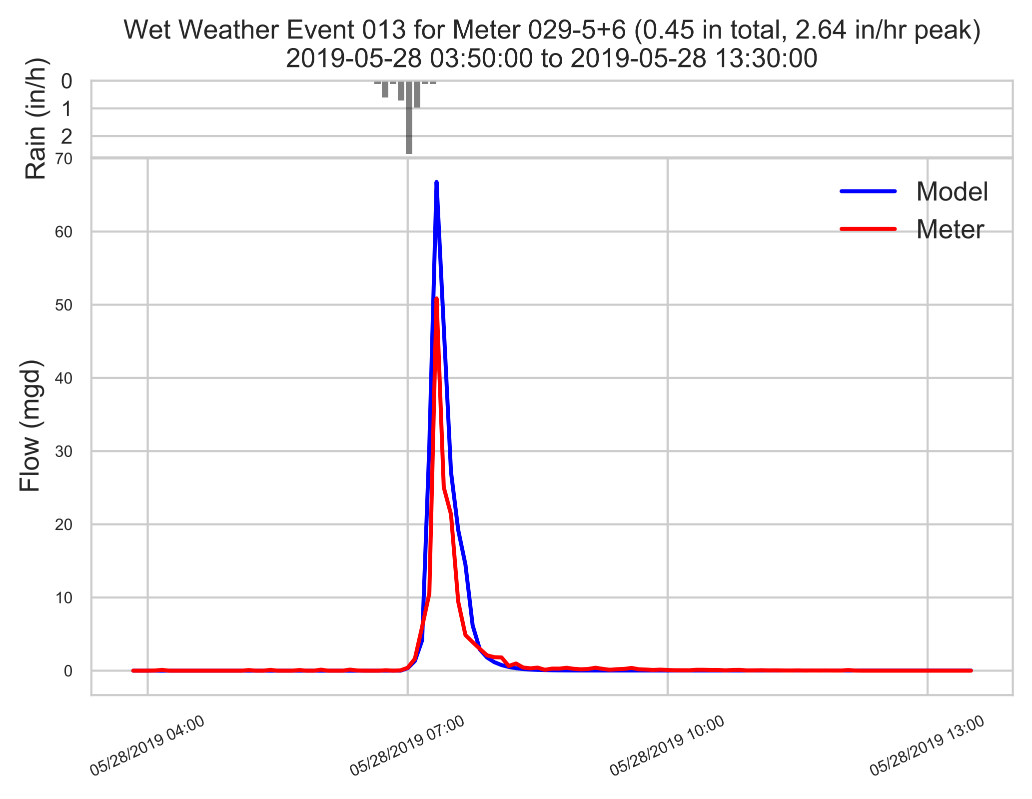
Wet Weather Event 009 for Meter 029-5+6 (1.03 in total, 0.84 in/hr peak)
2019-05-11 14:45:00 to 2019-05-12 19:45:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
0
5
10
15
20
Model
Meter
05/11/2019 14:00
05/11/2019 17:00
05/11/2019 20:00
05/11/2019 23:00
05/12/2019 02:00
05/12/2019 05:00
05/12/2019 08:00
05/12/2019 11:00
05/12/2019 14:00
05/12/2019 17:00
05/12/2019 20:00


Wet Weather Event 010 for Meter 029-5+6 (0.38 in total, 0.24 in/hr peak)
2019-05-12 18:40:00 to 2019-05-13 18:25:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
12
10
8
6
4
2
0
Model
Meter
05/12/2019 18:00
05/12/2019 21:00
05/13/2019 00:00
05/13/2019 03:00
05/13/2019 06:00
05/13/2019 09:00
05/13/2019 12:00
05/13/2019 15:00
05/13/2019 18:00

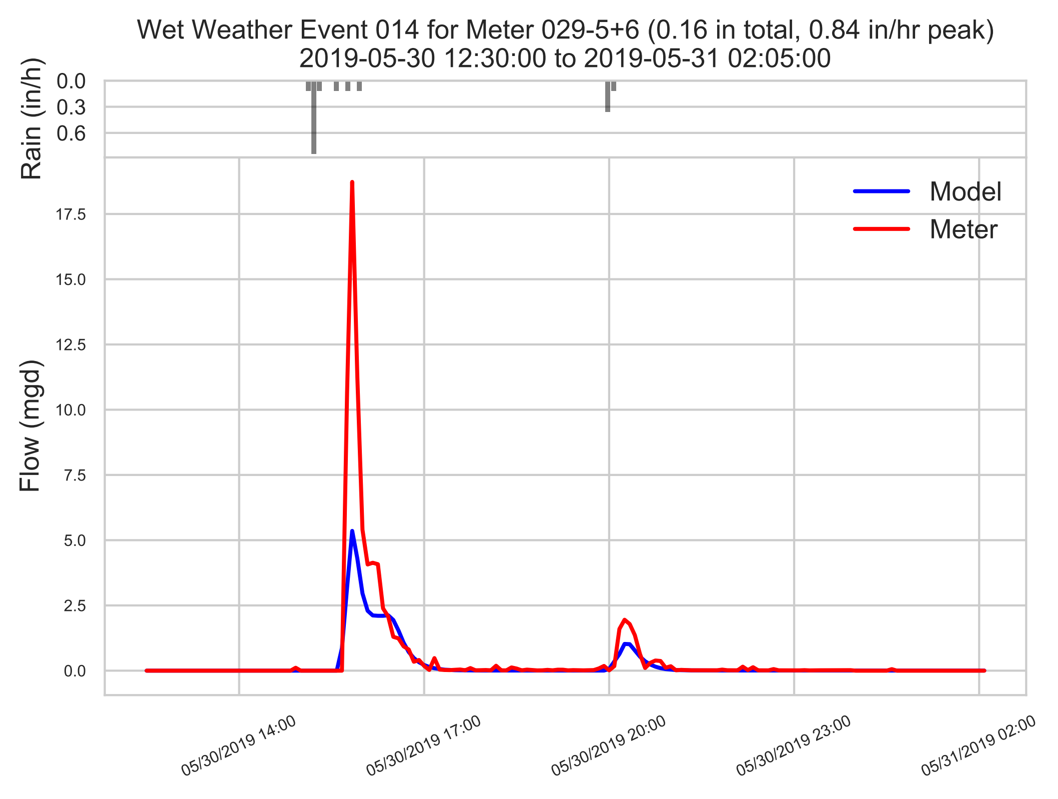

Wet Weather Event 011 for Meter 029-5+6 (0.47 in total, 4.44 in/hr peak)
2019-05-23 12:45:00 to 2019-05-23 22:00:00
Rain (in/h)
0
2
4
Flow (mgd)
0
20
40
60
80
100
Model
Meter
05/23/2019 14:00
05/23/2019 17:00
05/23/2019 20:00



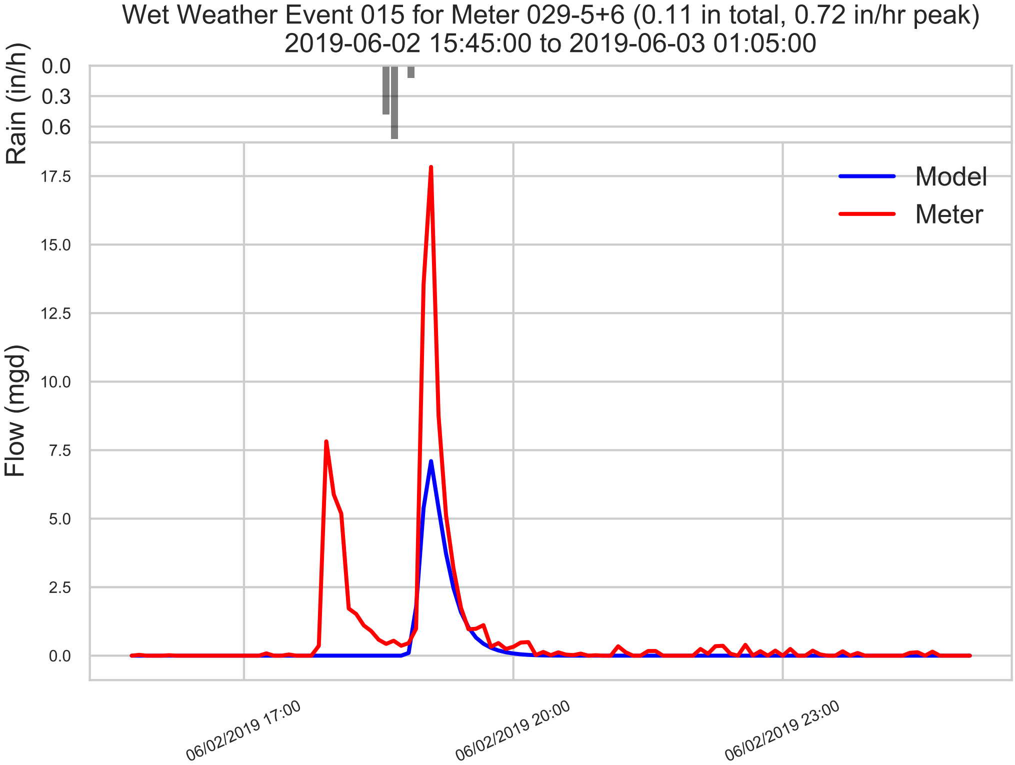
Wet Weather Event 012 for Meter 029-5+6 (0.06 in total, 0.6 in/hr peak)
2019-05-25 20:35:00 to 2019-05-26 05:45:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
0
2
4
6
8
10
12
Model
Meter
05/25/2019 22:00
05/26/2019 01:00
05/26/2019 04:00



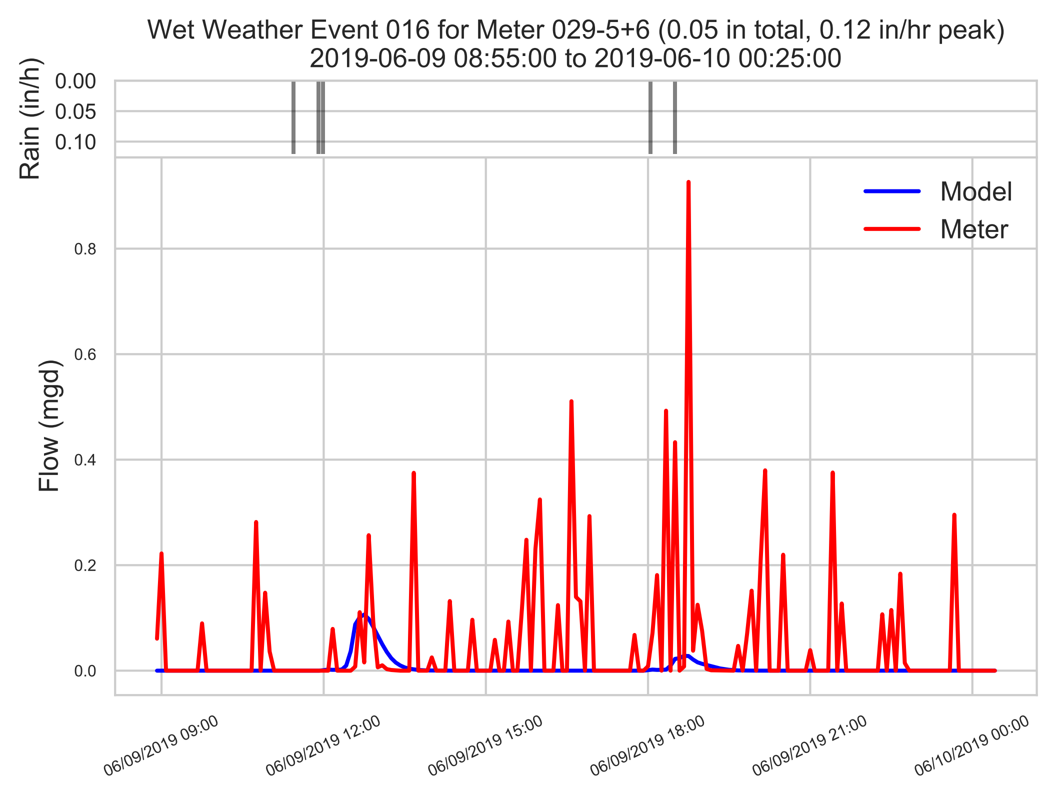
Wet Weather Event 013 for Meter 029-5+6 (0.45 in total, 2.64 in/hr peak)
2019-05-28 03:50:00 to 2019-05-28 13:30:00
Rain (in/h)
0
1
2
70
60
50
40
30
20
10
0
Flow (mgd)
Model
Meter
05/28/2019 04:00
05/28/2019 07:00
05/28/2019 10:00
05/28/2019 13:00

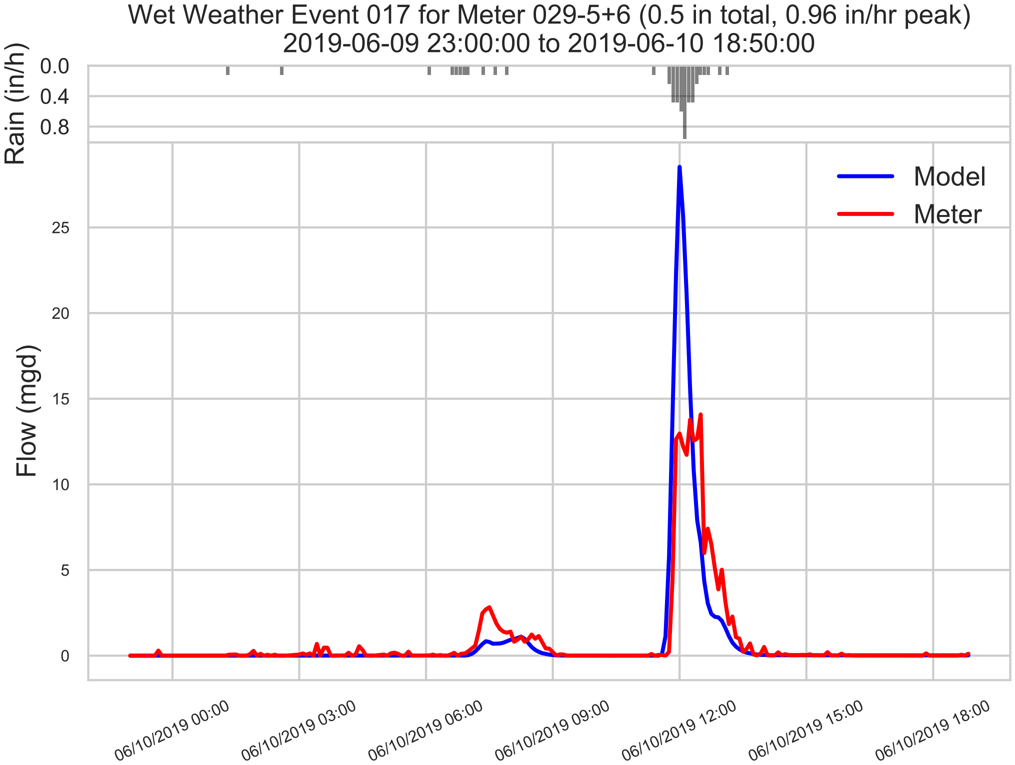


Wet Weather Event 014 for Meter 029-5+6 (0.16 in total, 0.84 in/hr peak)
2019-05-30 12:30:00 to 2019-05-31 02:05:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
05/30/2019 14:00
05/30/2019 17:00
05/30/2019 20:00
05/30/2019 23:00
05/31/2019 02:00

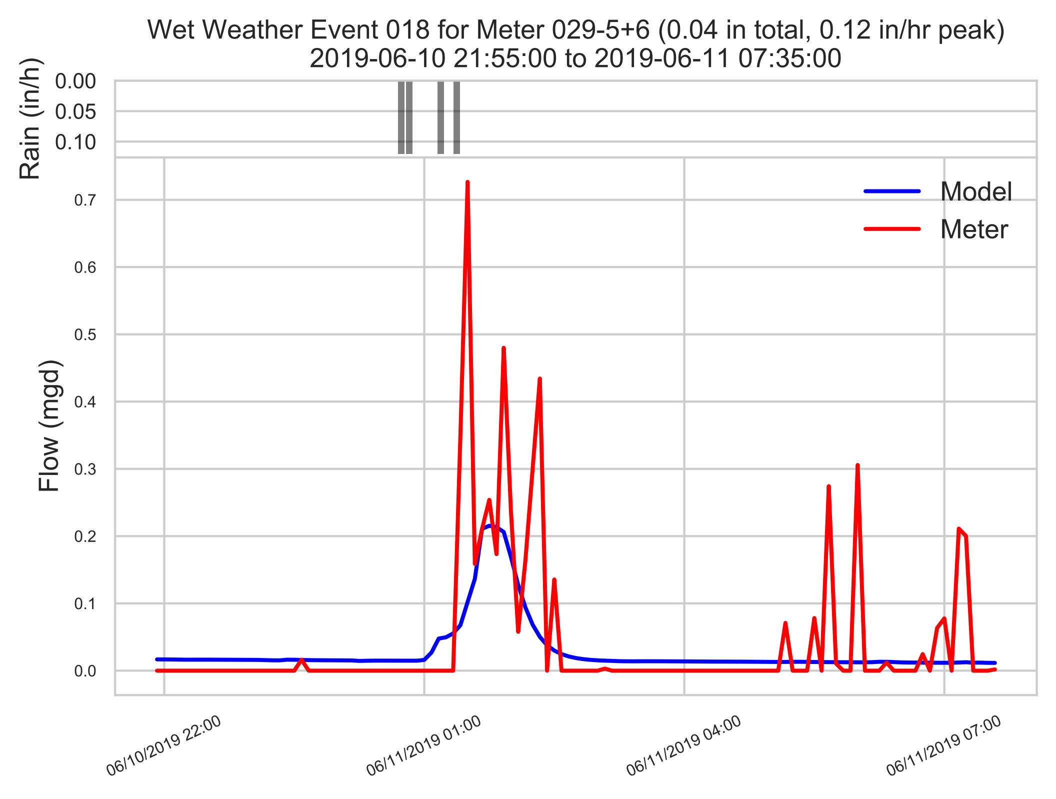


Wet Weather Event 015 for Meter 029-5+6 (0.11 in total, 0.72 in/hr peak)
2019-06-02 15:45:00 to 2019-06-03 01:05:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
06/02/2019 17:00
06/02/2019 20:00
06/02/2019 23:00

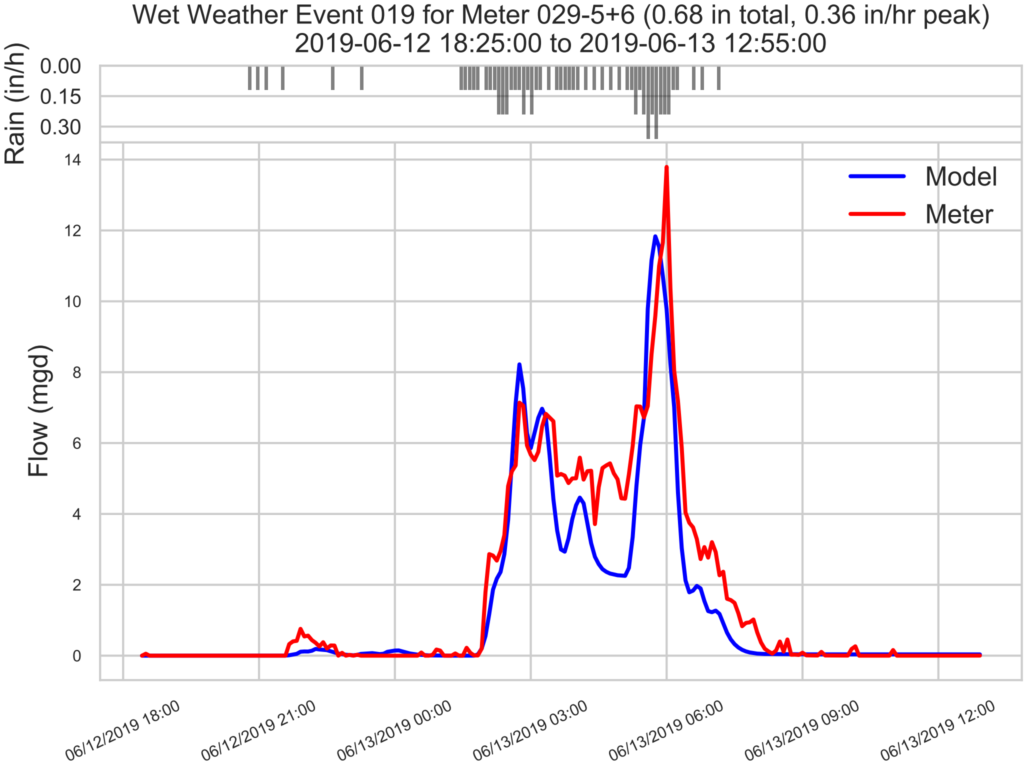

Wet Weather Event 016 for Meter 029-5+6 (0.05 in total, 0.12 in/hr peak)
2019-06-09 08:55:00 to 2019-06-10 00:25:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.0
0.2
0.4
0.6
0.8
Model
Meter
06/09/2019 09:00
06/09/2019 12:00
06/09/2019 15:00
06/09/2019 18:00
06/09/2019 21:00
06/10/2019 00:00



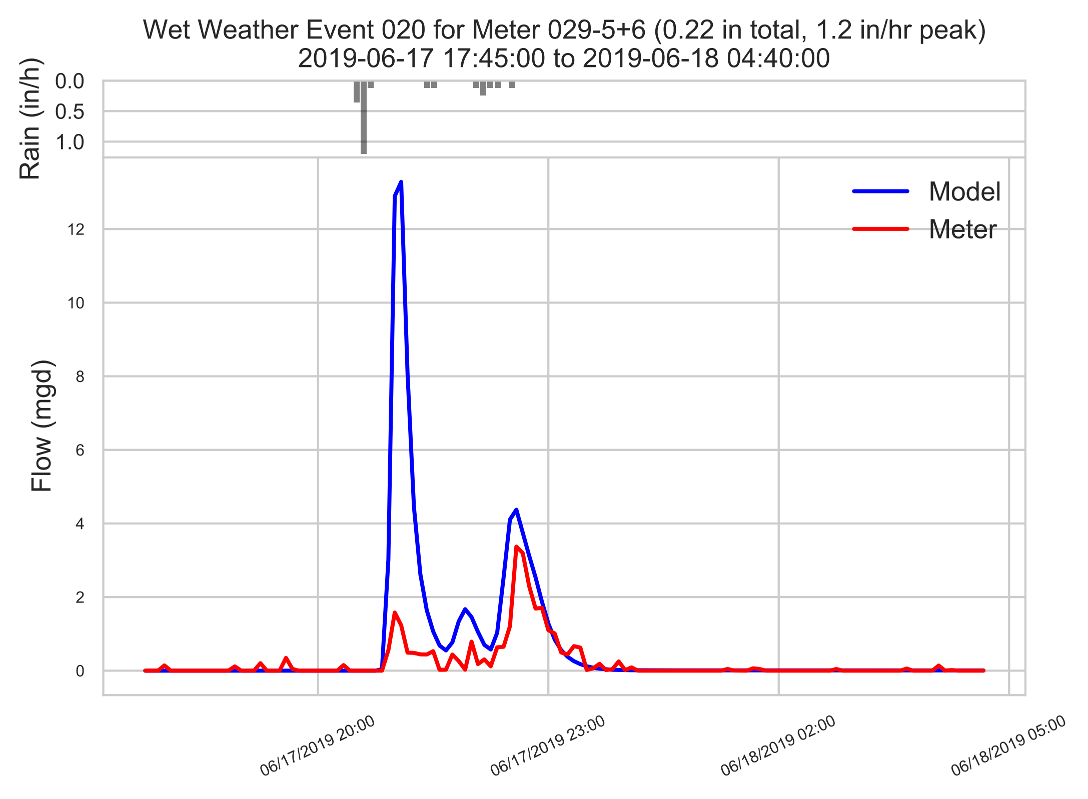
Wet Weather Event 017 for Meter 029-5+6 (0.5 in total, 0.96 in/hr peak)
2019-06-09 23:00:00 to 2019-06-10 18:50:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
0
5
10
15
20
25
Model
Meter
06/10/2019 00:00
06/10/2019 03:00
06/10/2019 06:00
06/10/2019 09:00
06/10/2019 12:00
06/10/2019 15:00
06/10/2019 18:00



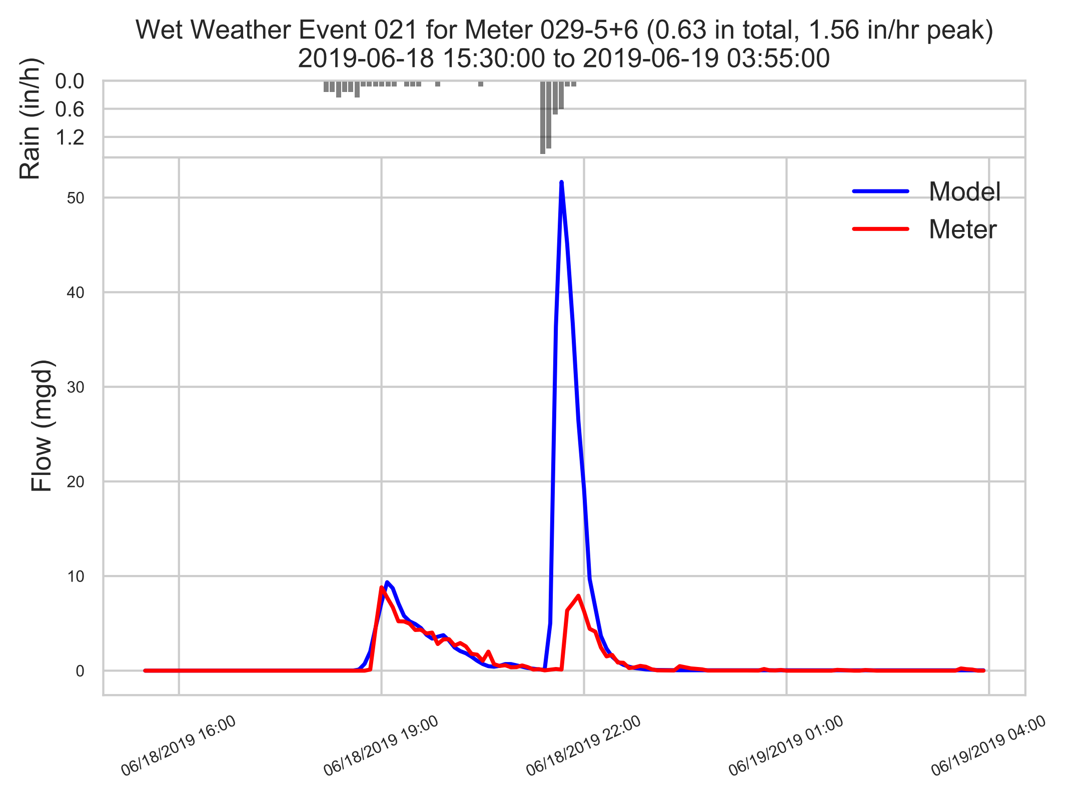
Wet Weather Event 018 for Meter 029-5+6 (0.04 in total, 0.12 in/hr peak)
2019-06-10 21:55:00 to 2019-06-11 07:35:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Model
Meter
06/10/2019 22:00
06/11/2019 01:00
06/11/2019 04:00
06/11/2019 07:00



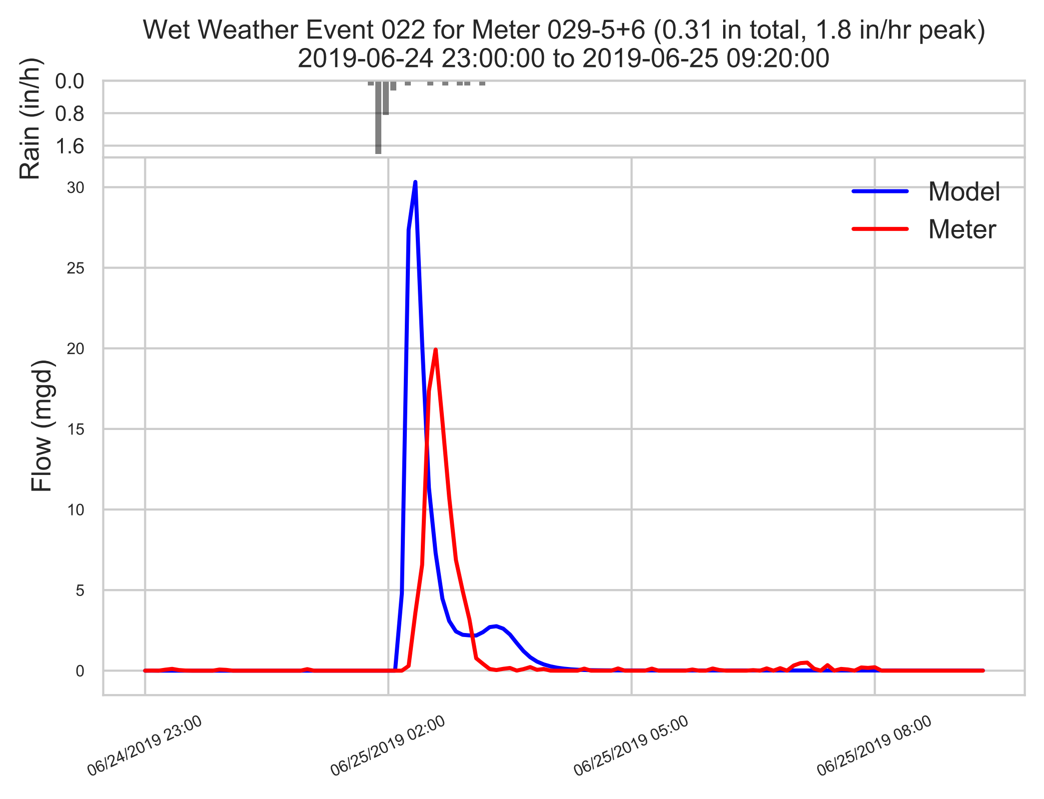
Wet Weather Event 019 for Meter 029-5+6 (0.68 in total, 0.36 in/hr peak)
2019-06-12 18:25:00 to 2019-06-13 12:55:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0
2
4
6
8
10
12
14
Model
Meter
06/12/2019 18:00
06/12/2019 21:00
06/13/2019 00:00
06/13/2019 03:00
06/13/2019 06:00
06/13/2019 09:00
06/13/2019 12:00



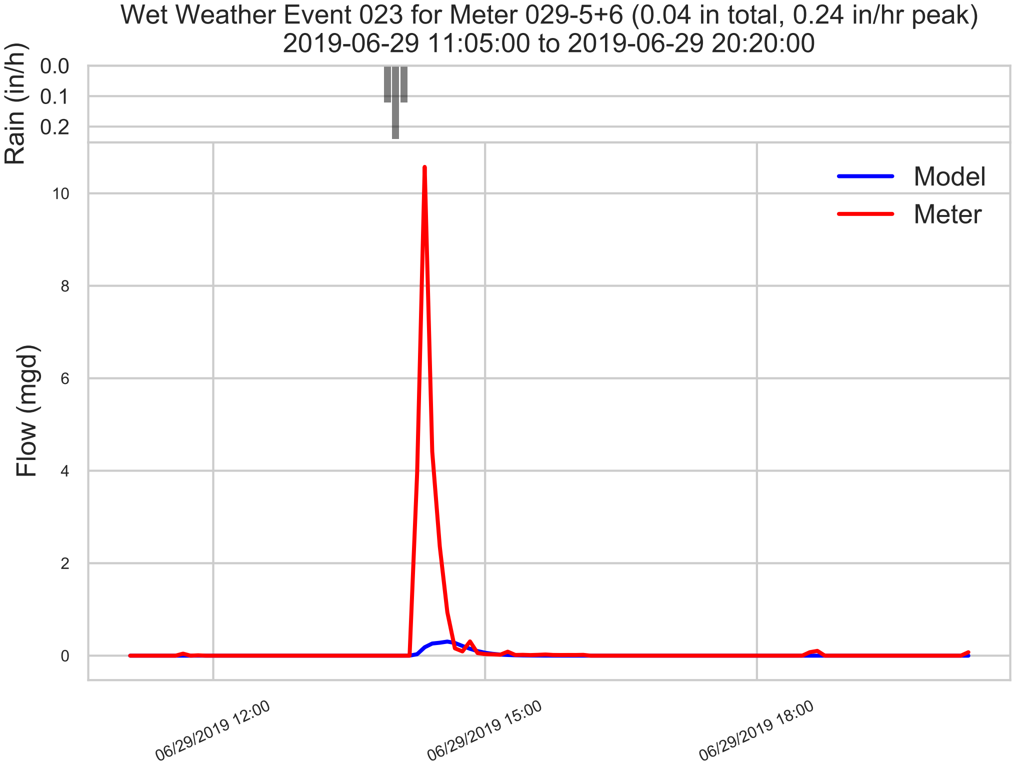
Wet Weather Event 020 for Meter 029-5+6 (0.22 in total, 1.2 in/hr peak)
2019-06-17 17:45:00 to 2019-06-18 04:40:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
0
2
4
6
8
10
12
Model
Meter
06/17/2019 20:00
06/17/2019 23:00
06/18/2019 02:00
06/18/2019 05:00



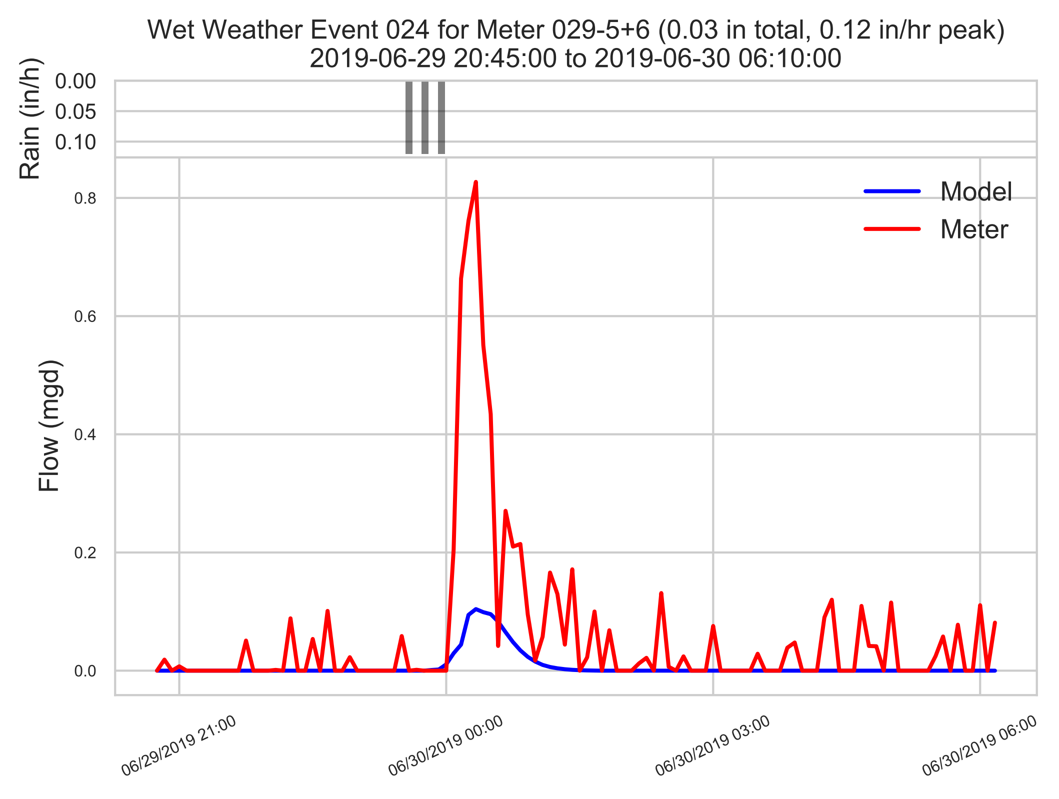
Wet Weather Event 021 for Meter 029-5+6 (0.63 in total, 1.56 in/hr peak)
2019-06-18 15:30:00 to 2019-06-19 03:55:00
Rain (in/h)
0.0
0.6
1.2
Flow (mgd)
50
40
30
20
10
0
Model
Meter
06/18/2019 16:00
06/18/2019 19:00
06/18/2019 22:00
06/19/2019 01:00
06/19/2019 04:00



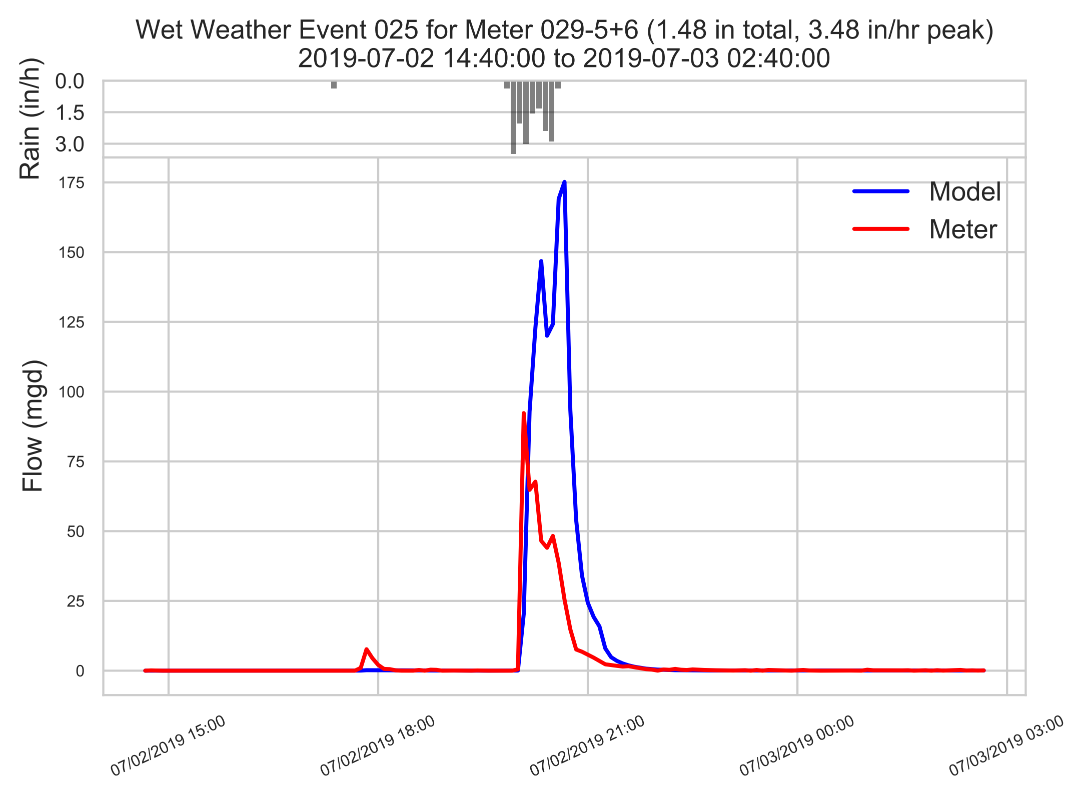
Wet Weather Event 022 for Meter 029-5+6 (0.31 in total, 1.8 in/hr peak)
2019-06-24 23:00:00 to 2019-06-25 09:20:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
0
5
10
15
20
25
30
Model
Meter
06/24/2019 23:00
06/25/2019 02:00
06/25/2019 05:00
06/25/2019 08:00



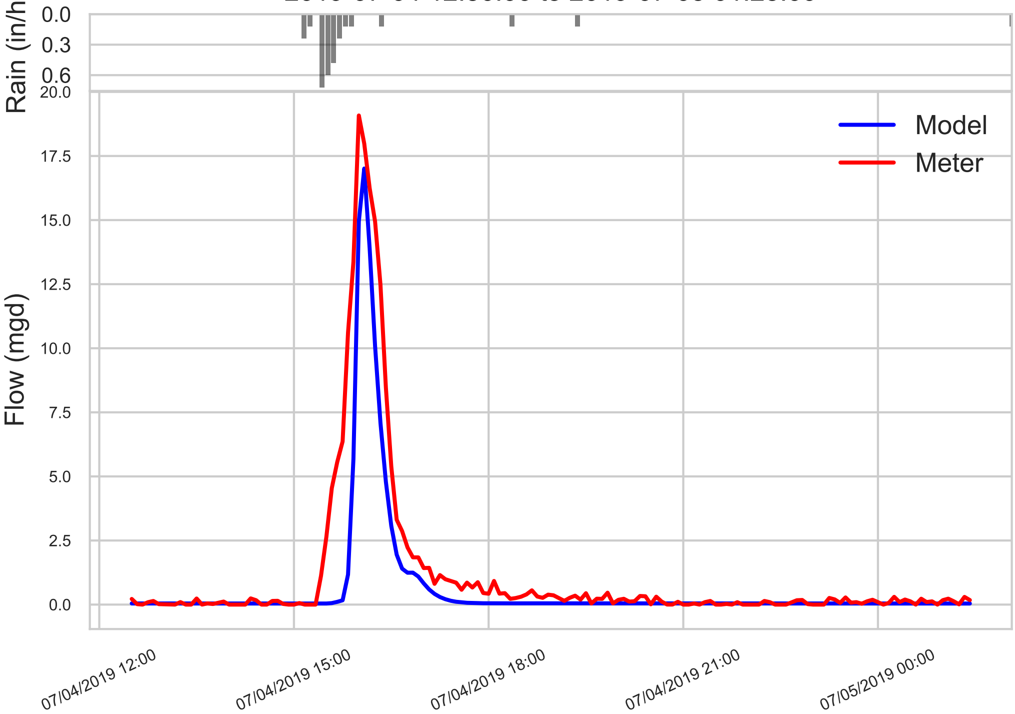
Wet Weather Event 023 for Meter 029-5+6 (0.04 in total, 0.24 in/hr peak)
2019-06-29 11:05:00 to 2019-06-29 20:20:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
10
8
6
4
2
0
Model
Meter
06/29/2019 12:00
06/29/2019 15:00
06/29/2019 18:00

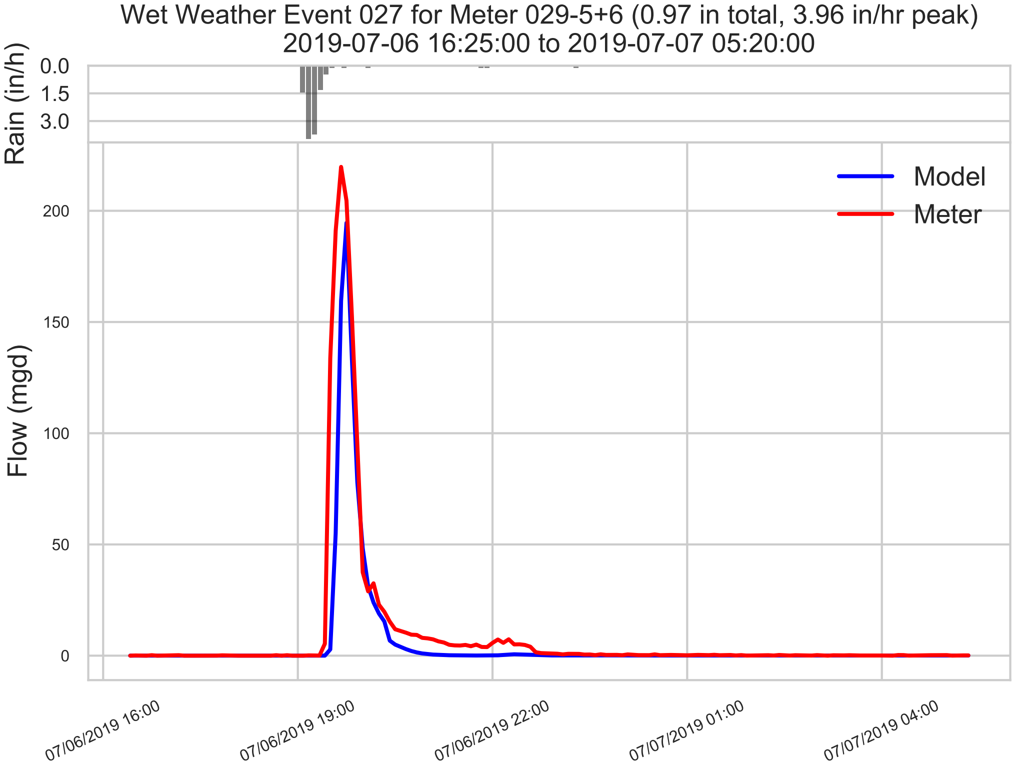


Wet Weather Event 024 for Meter 029-5+6 (0.03 in total, 0.12 in/hr peak)
2019-06-29 20:45:00 to 2019-06-30 06:10:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.8
0.6
0.4
0.2
0.0
Model
Meter
06/29/2019 21:00
06/30/2019 00:00
06/30/2019 03:00
06/30/2019 06:00

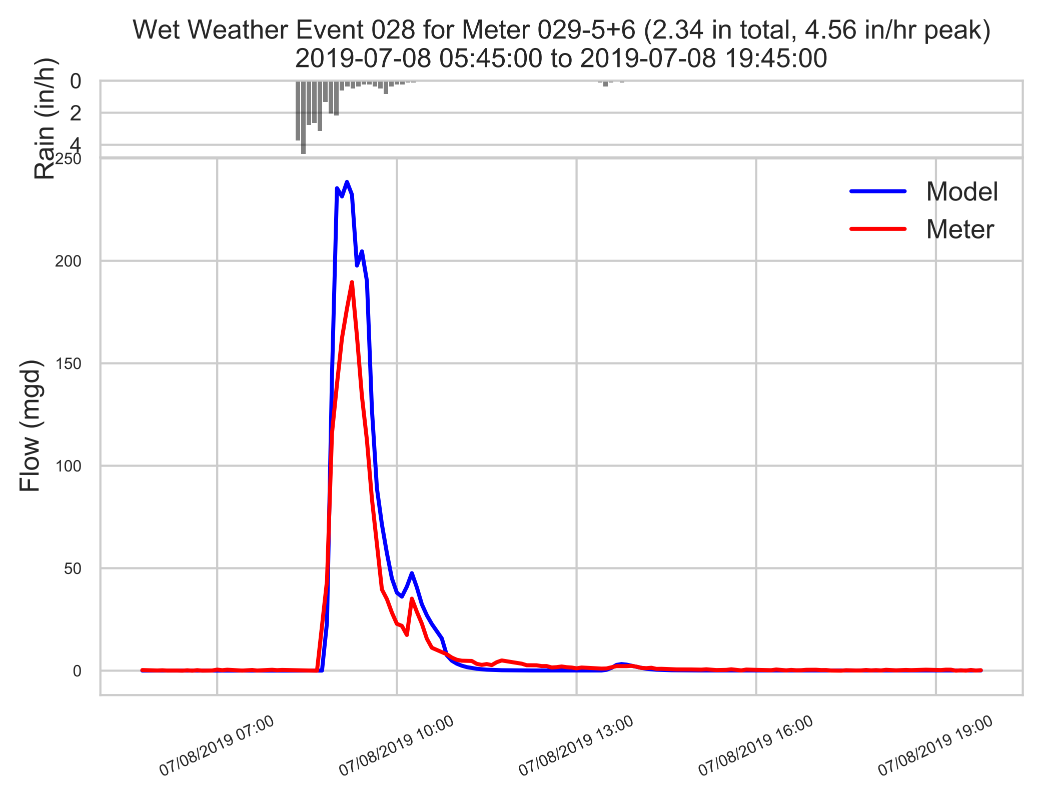

Wet Weather Event 025 for Meter 029-5+6 (1.48 in total, 3.48 in/hr peak)
2019-07-02 14:40:00 to 2019-07-03 02:40:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
175
150
125
100
75
50
25
0
Model
Meter
07/02/2019 15:00
07/02/2019 18:00
07/02/2019 21:00
07/03/2019 00:00
07/03/2019 03:00

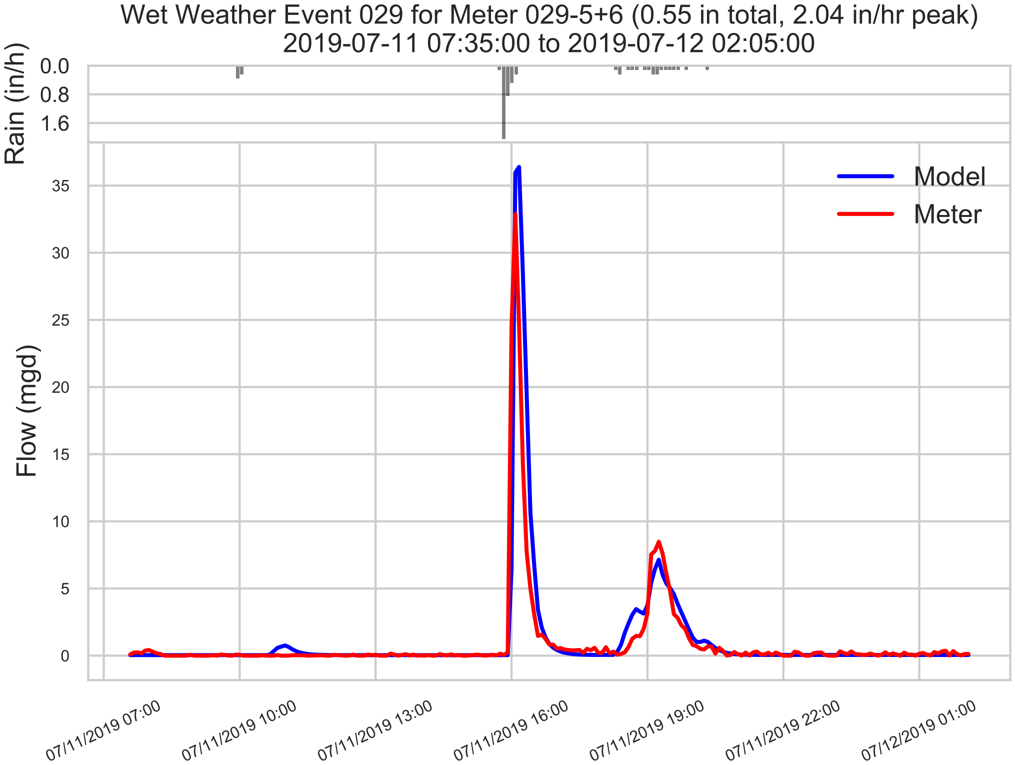
Wet Weather Event 026 for Meter 029-5+6 (0.26 in total, 0.72 in/hr peak)
2019-07-04 12:30:00 to 2019-07-05 01:25:00



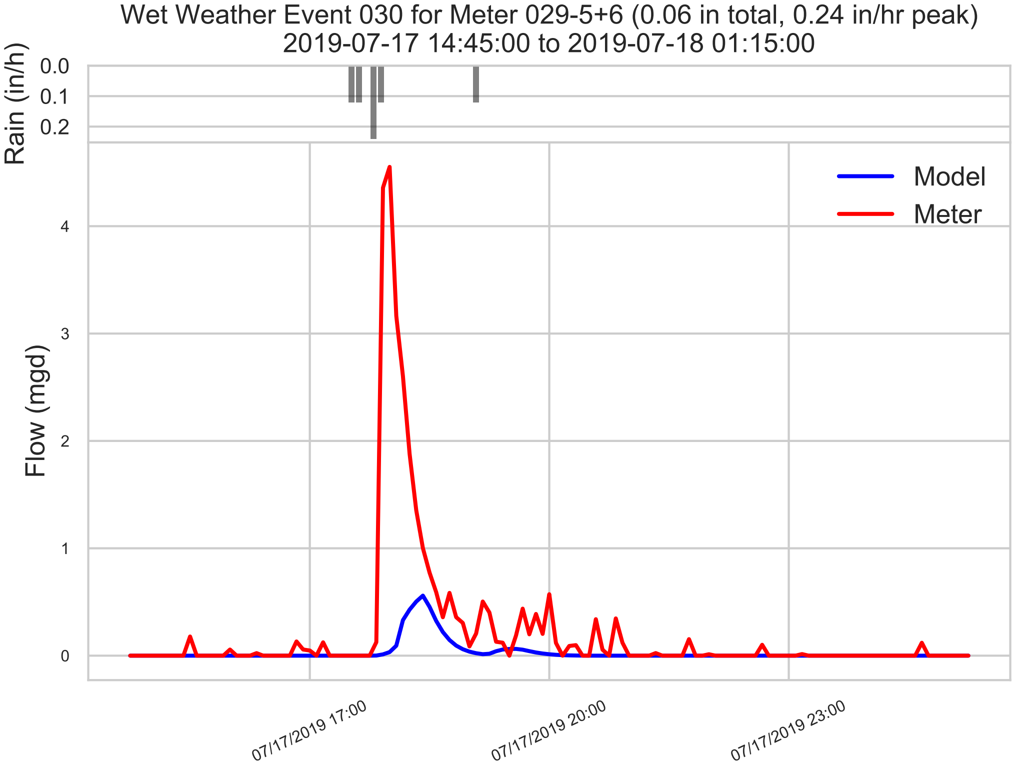


Wet Weather Event 027 for Meter 029-5+6 (0.97 in total, 3.96 in/hr peak)
2019-07-06 16:25:00 to 2019-07-07 05:20:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
200
150
100
50
0
Model
Meter
07/06/2019 16:00
07/06/2019 19:00
07/06/2019 22:00
07/07/2019 01:00
07/07/2019 04:00

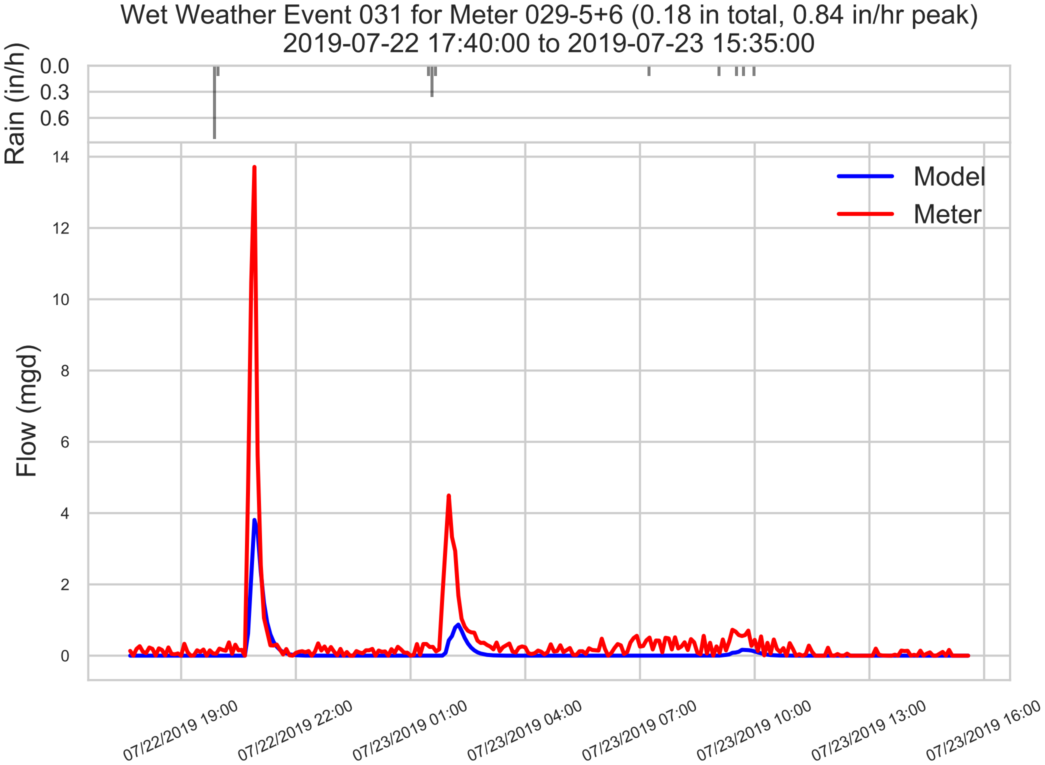

Wet Weather Event 028 for Meter 029-5+6 (2.34 in total, 4.56 in/hr peak)
2019-07-08 05:45:00 to 2019-07-08 19:45:00
Rain (in/h)
0
2
4
250
200
150
100
50
0
Flow (mgd)
Model
Meter
07/08/2019 07:00
07/08/2019 10:00
07/08/2019 13:00
07/08/2019 16:00
07/08/2019 19:00

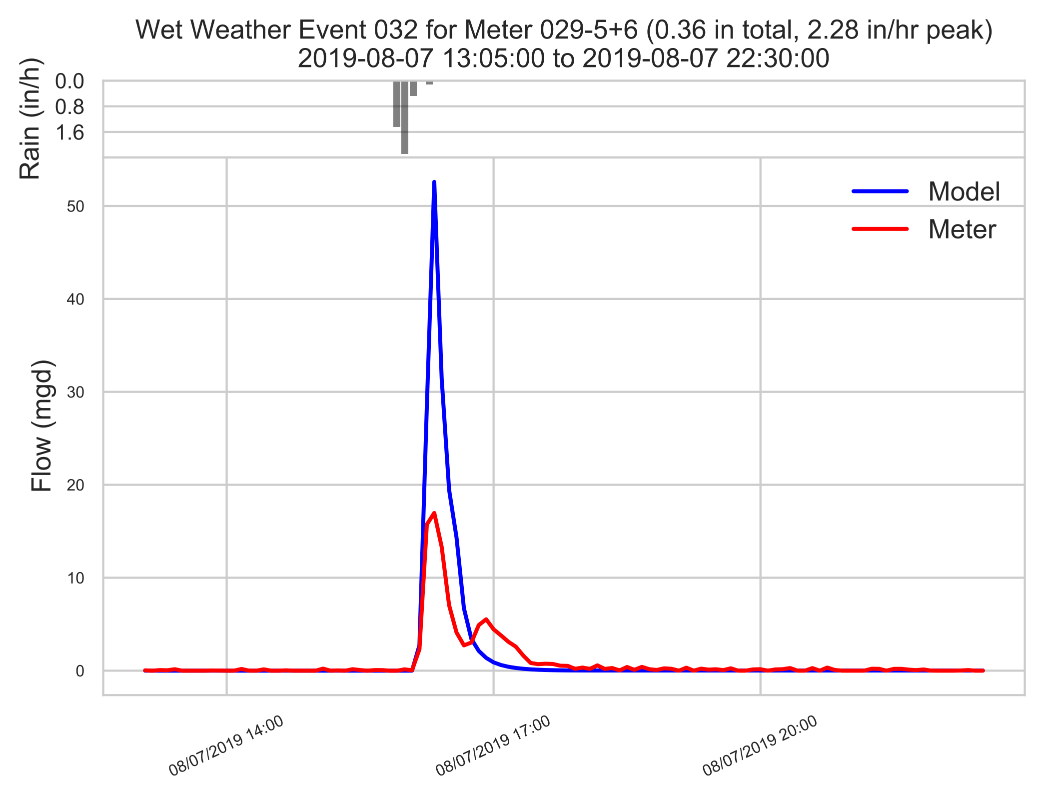


Wet Weather Event 029 for Meter 029-5+6 (0.55 in total, 2.04 in/hr peak)
2019-07-11 07:35:00 to 2019-07-12 02:05:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
35
30
25
20
15
10
5
0
Model
Meter
07/11/2019 07:00
07/11/2019 10:00
07/11/2019 13:00
07/11/2019 16:00
07/11/2019 19:00
07/11/2019 22:00
07/12/2019 01:00

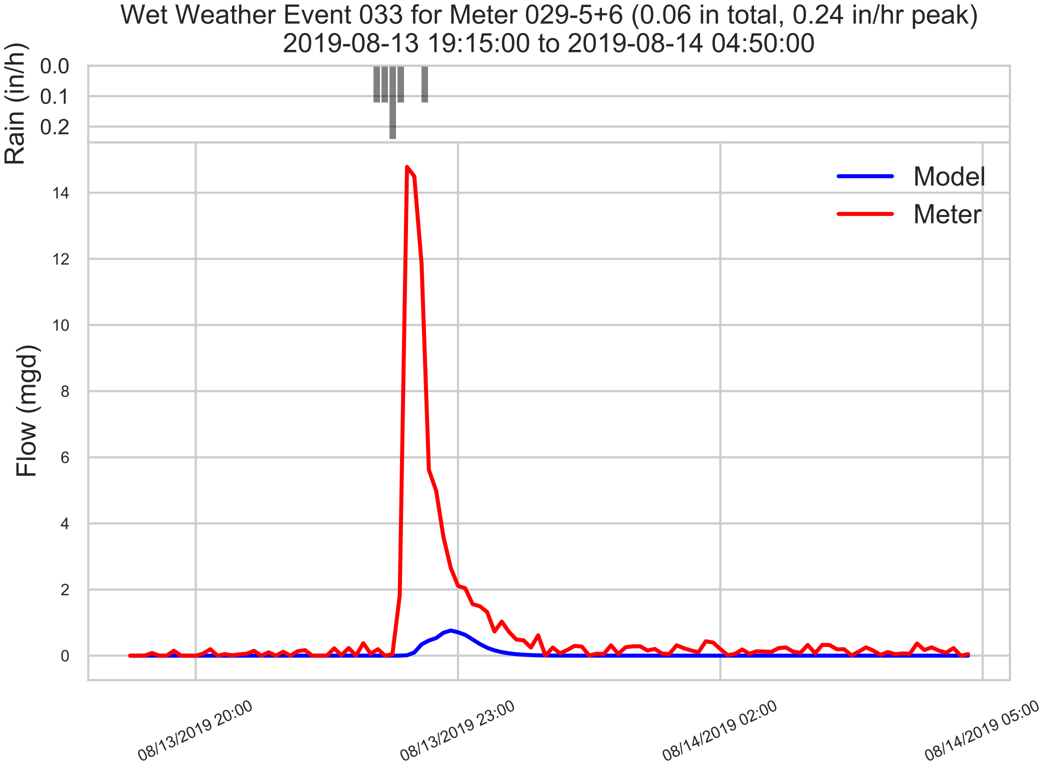


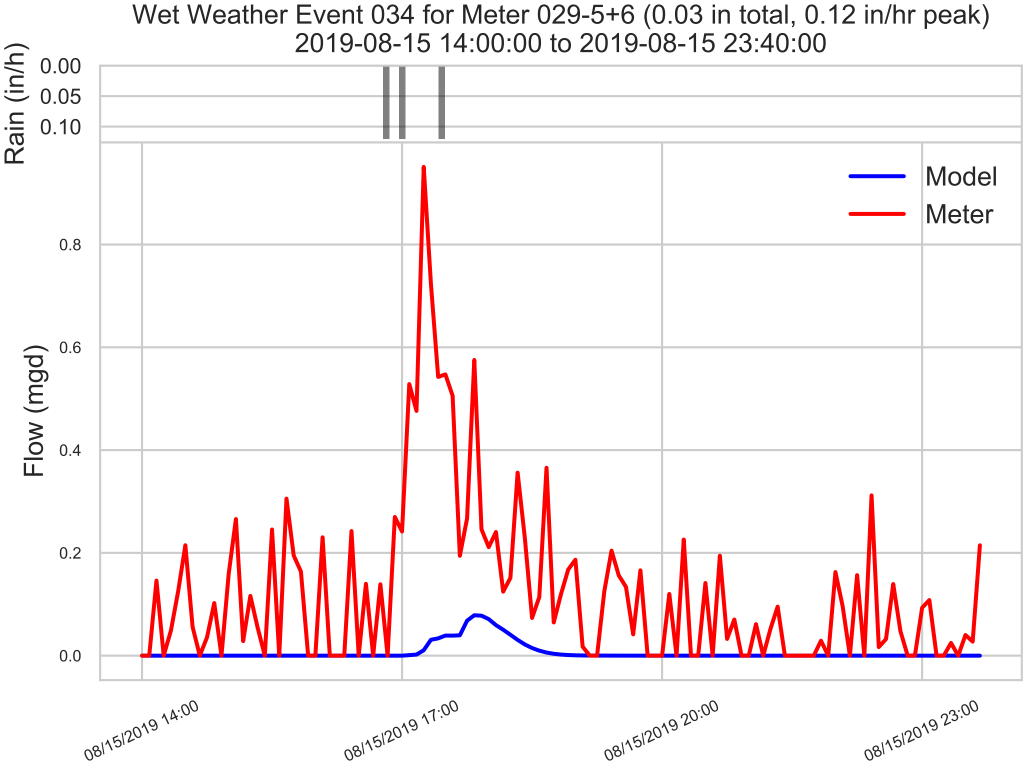
Wet Weather Event 030 for Meter 029-5+6 (0.06 in total, 0.24 in/hr peak)
2019-07-17 14:45:00 to 2019-07-18 01:15:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
Model
Meter
07/17/2019 17:00
07/17/2019 20:00
07/17/2019 23:00

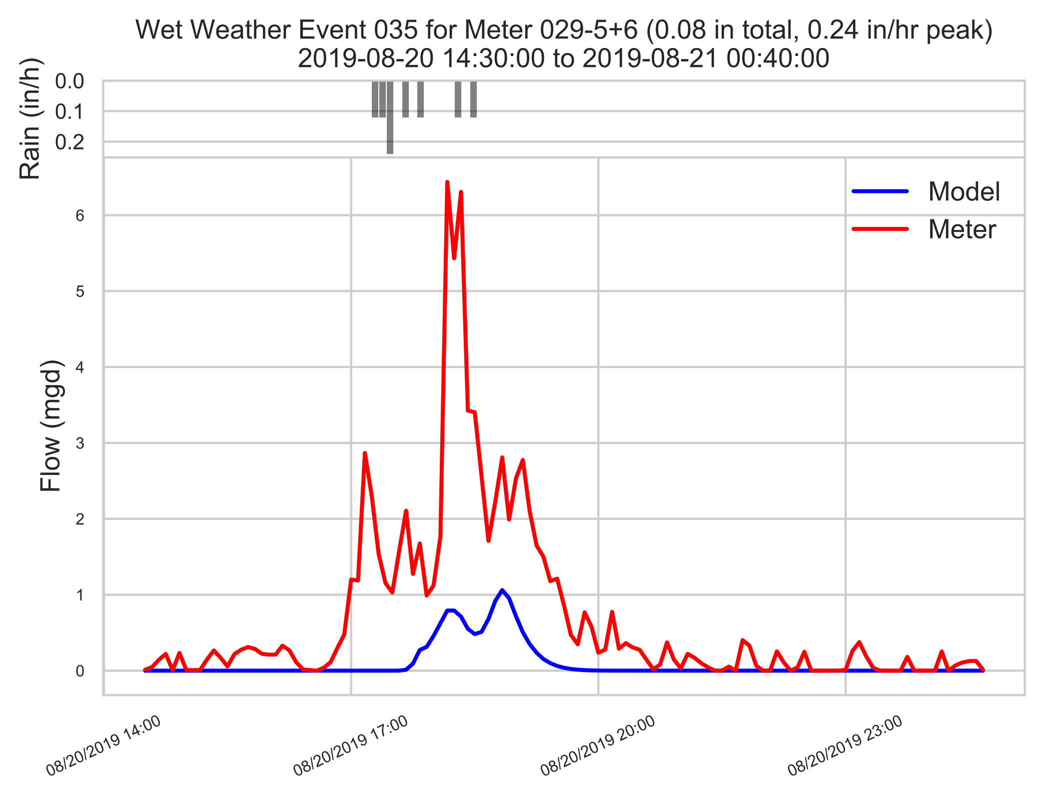

Wet Weather Event 031 for Meter 029-5+6 (0.18 in total, 0.84 in/hr peak)
2019-07-22 17:40:00 to 2019-07-23 15:35:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
14
12
10
8
6
4
2
0
Model
Meter
07/22/2019 19:00
07/22/2019 22:00
07/23/2019 01:00
07/23/2019 04:00
07/23/2019 07:00
07/23/2019 10:00
07/23/2019 13:00
07/23/2019 16:00



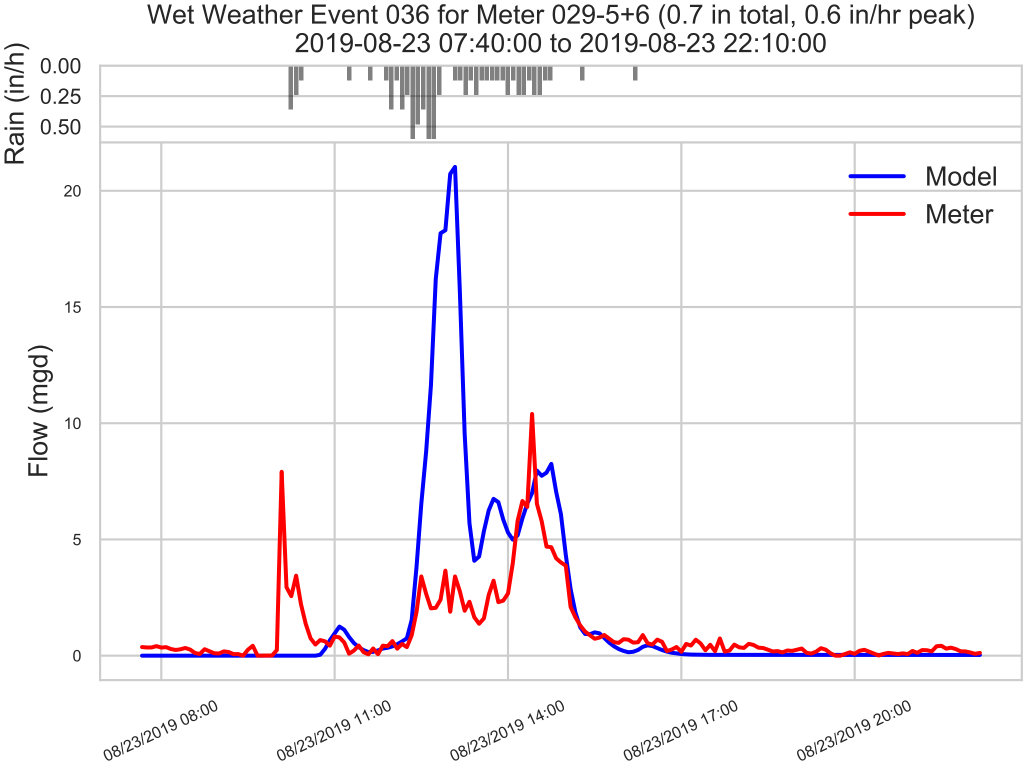
Wet Weather Event 032 for Meter 029-5+6 (0.36 in total, 2.28 in/hr peak)
2019-08-07 13:05:00 to 2019-08-07 22:30:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
50
40
30
20
10
0
Model
Meter
08/07/2019 14:00
08/07/2019 17:00
08/07/2019 20:00


Wet Weather Event 033 for Meter 029-5+6 (0.06 in total, 0.24 in/hr peak)
2019-08-13 19:15:00 to 2019-08-14 04:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
14
12
10
8
6
4
2
0
Model
Meter
08/13/2019 20:00
08/13/2019 23:00
08/14/2019 02:00
08/14/2019 05:00

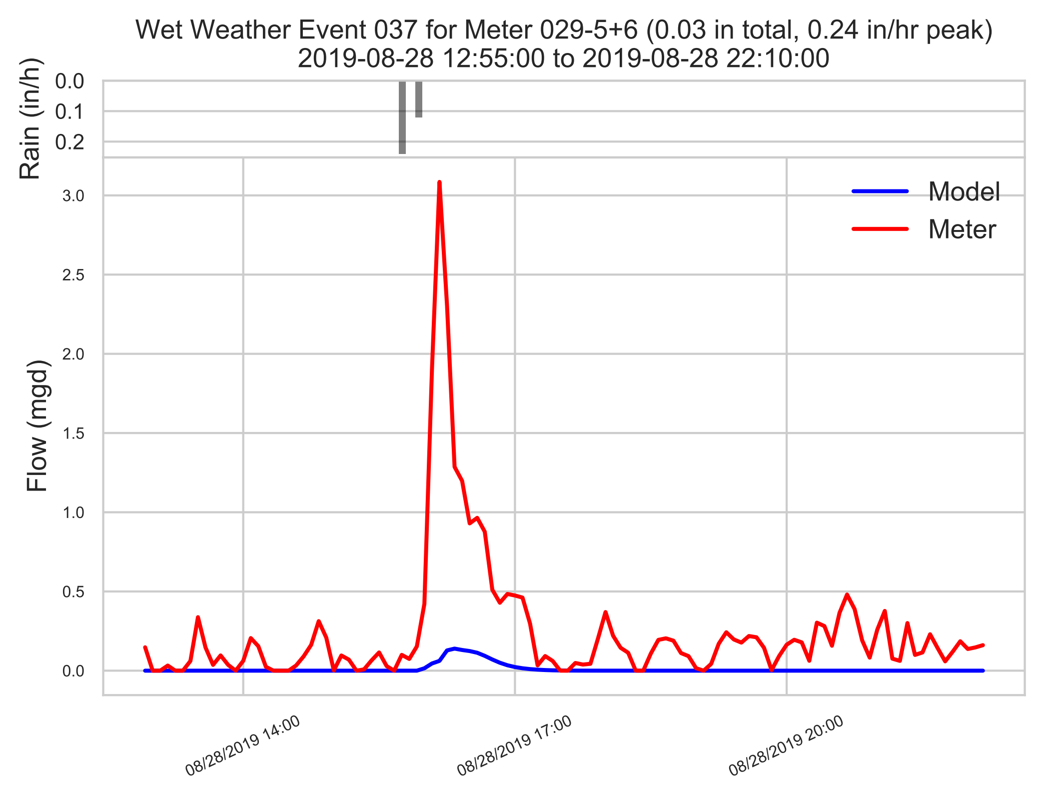

Wet Weather Event 034 for Meter 029-5+6 (0.03 in total, 0.12 in/hr peak)
2019-08-15 14:00:00 to 2019-08-15 23:40:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.0
0.2
0.4
0.6
0.8
Model
Meter
08/15/2019 14:00
08/15/2019 17:00
08/15/2019 20:00
08/15/2019 23:00

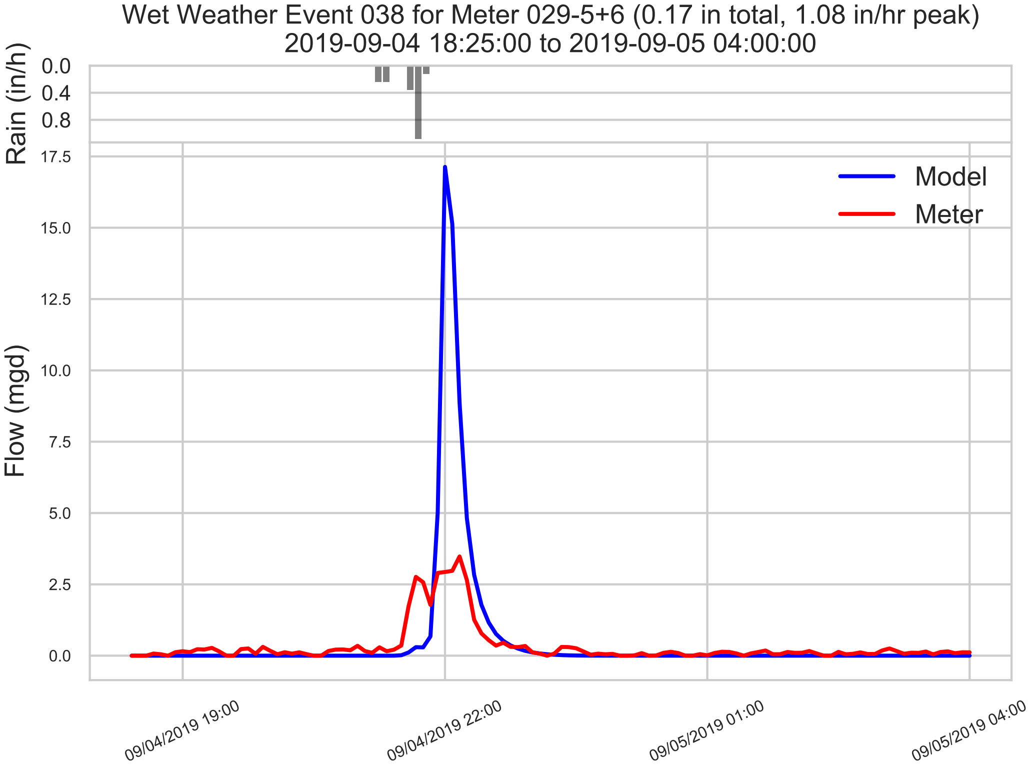


Wet Weather Event 035 for Meter 029-5+6 (0.08 in total, 0.24 in/hr peak)
2019-08-20 14:30:00 to 2019-08-21 00:40:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
5
6
Model
Meter
08/20/2019 14:00
08/20/2019 17:00
08/20/2019 20:00
08/20/2019 23:00

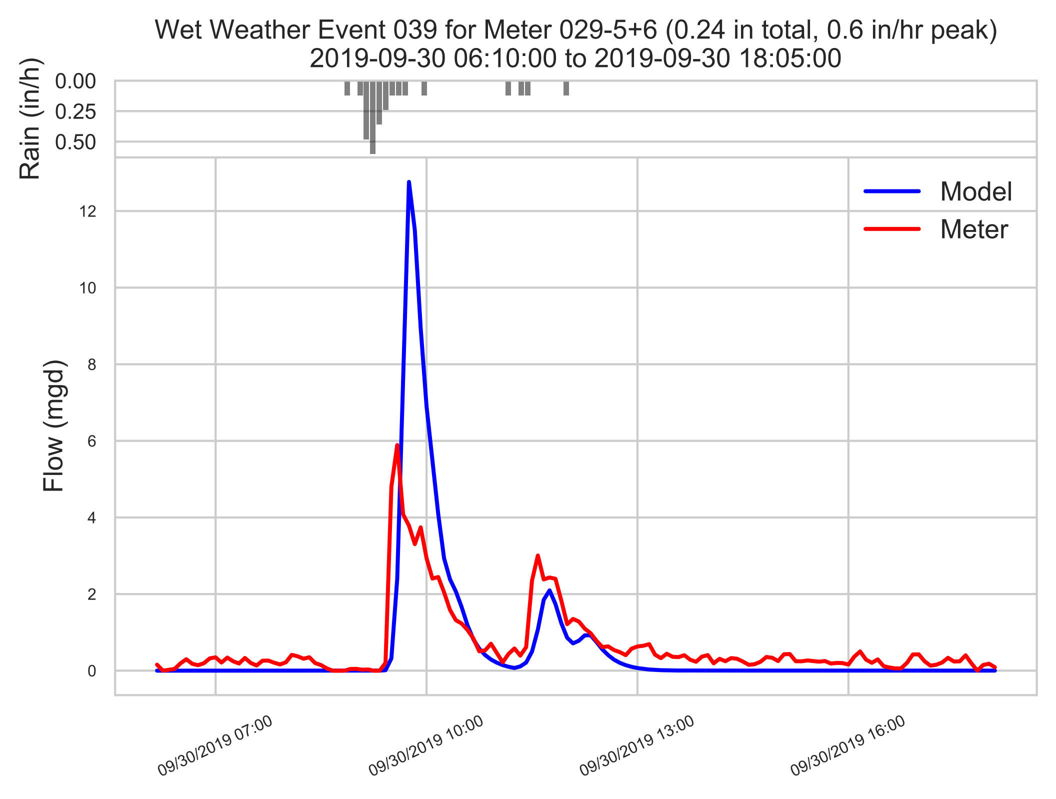


Wet Weather Event 036 for Meter 029-5+6 (0.7 in total, 0.6 in/hr peak)
2019-08-23 07:40:00 to 2019-08-23 22:10:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
0
5
10
15
20
Model
Meter
08/23/2019 08:00
08/23/2019 11:00
08/23/2019 14:00
08/23/2019 17:00
08/23/2019 20:00

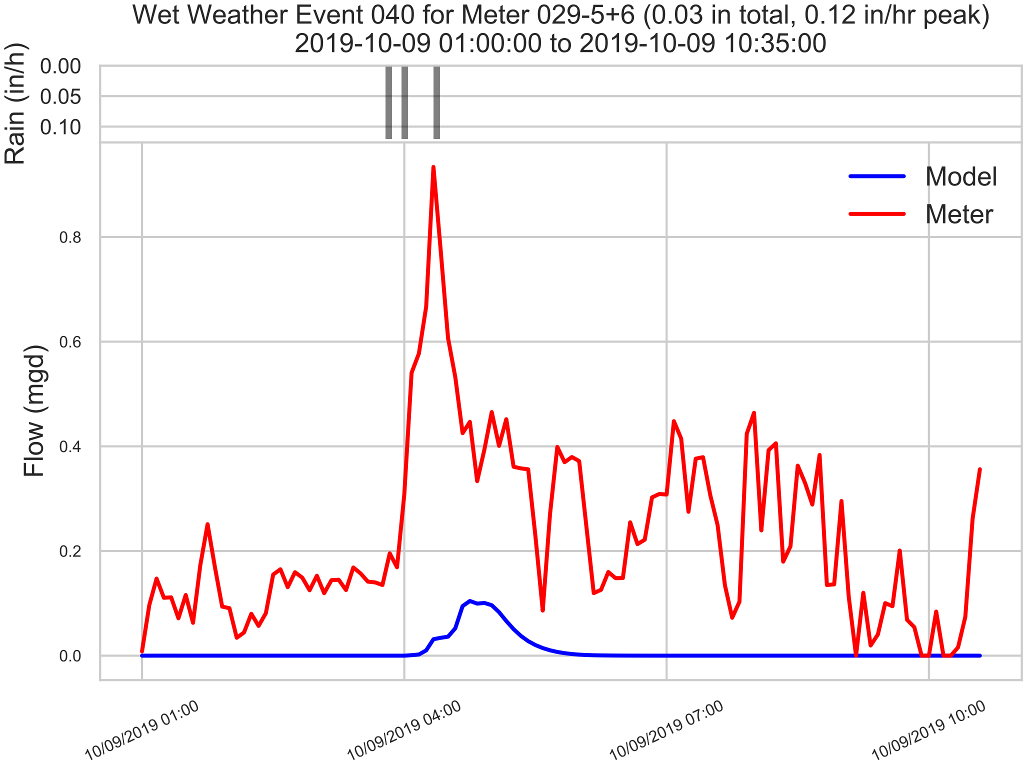

Wet Weather Event 037 for Meter 029-5+6 (0.03 in total, 0.24 in/hr peak)
2019-08-28 12:55:00 to 2019-08-28 22:10:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
08/28/2019 14:00
08/28/2019 17:00
08/28/2019 20:00



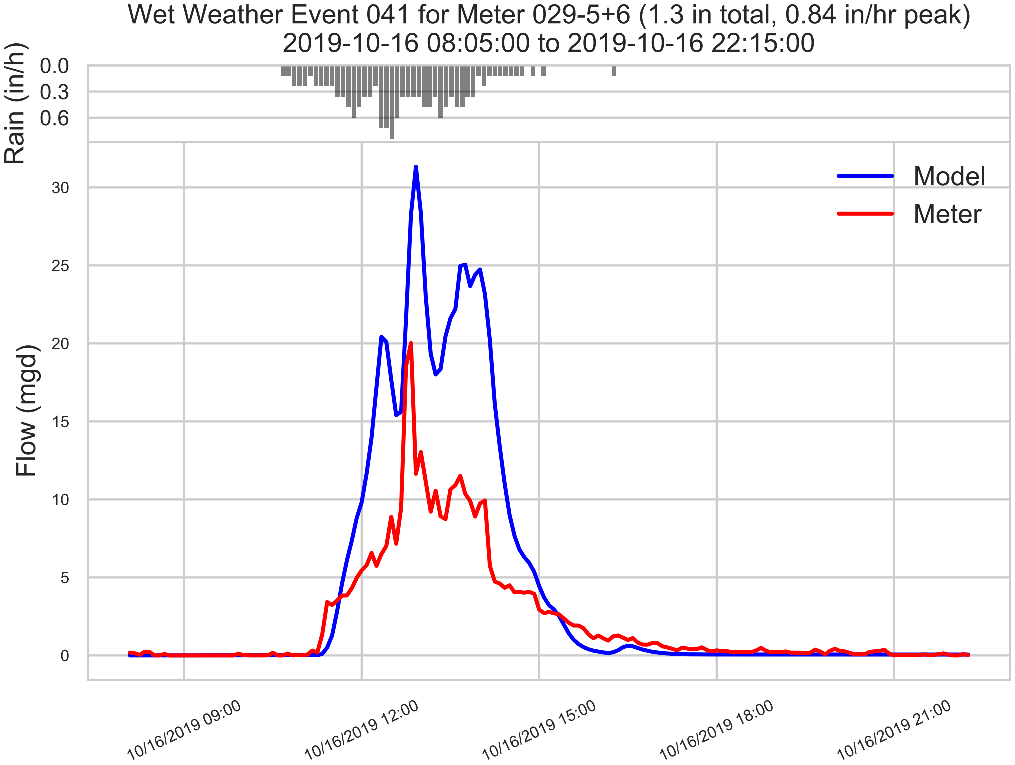
Wet Weather Event 038 for Meter 029-5+6 (0.17 in total, 1.08 in/hr peak)
2019-09-04 18:25:00 to 2019-09-05 04:00:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
09/04/2019 19:00
09/04/2019 22:00
09/05/2019 01:00
09/05/2019 04:00

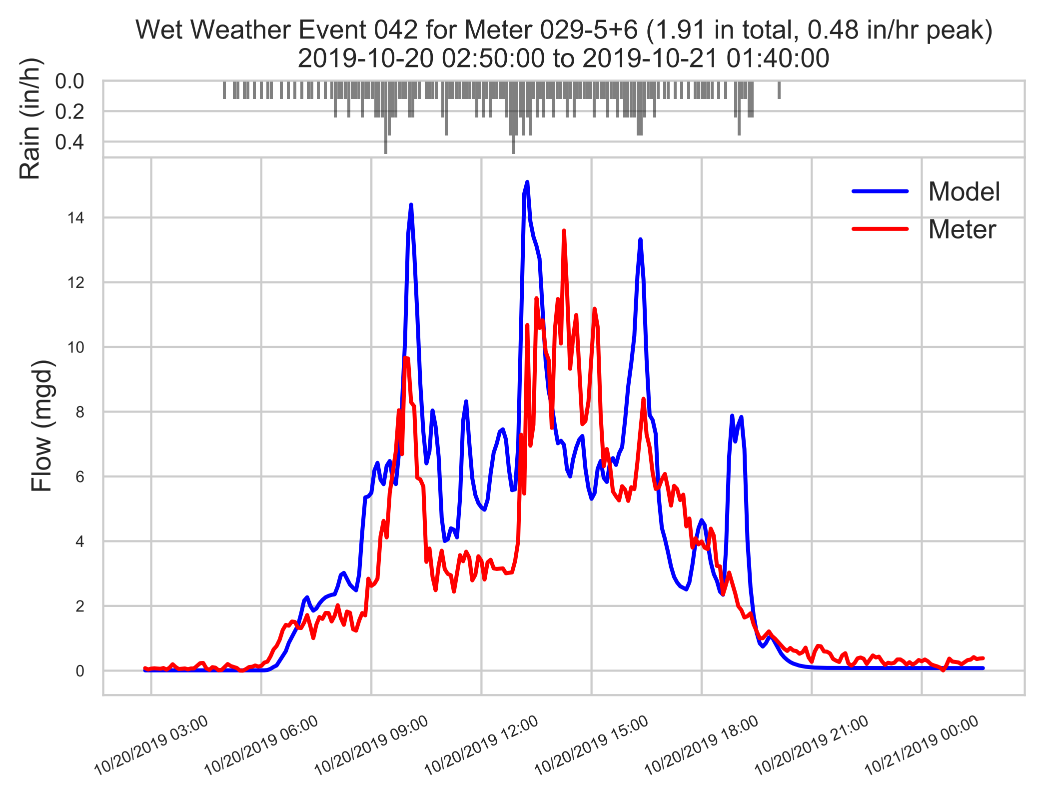


Wet Weather Event 039 for Meter 029-5+6 (0.24 in total, 0.6 in/hr peak)
2019-09-30 06:10:00 to 2019-09-30 18:05:00
Rain (in/h)
0.00
0.25
0.50
Flow (mgd)
0
2
4
6
8
10
12
Model
Meter
09/30/2019 07:00
09/30/2019 10:00
09/30/2019 13:00
09/30/2019 16:00

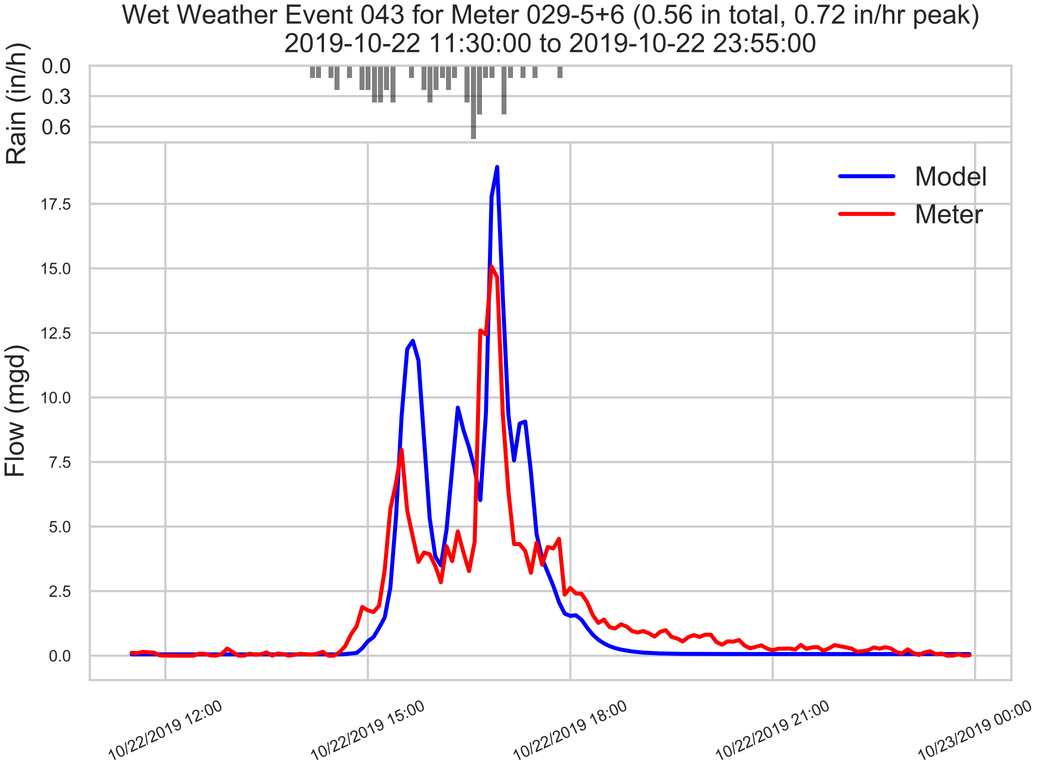


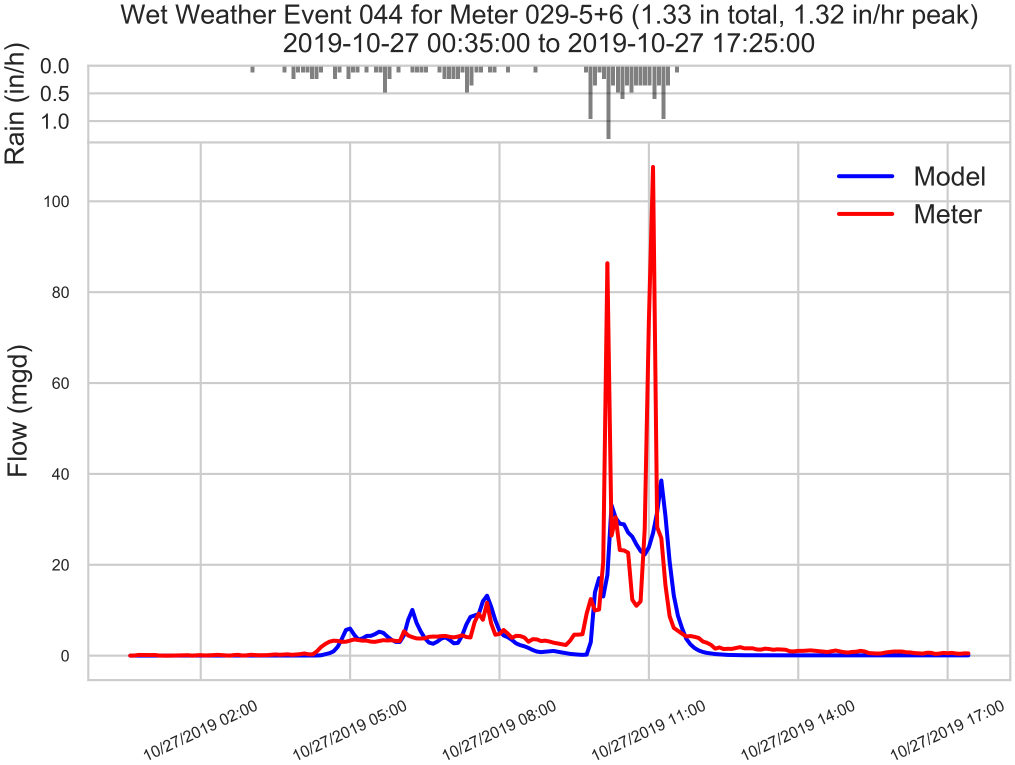
Wet Weather Event 040 for Meter 029-5+6 (0.03 in total, 0.12 in/hr peak)
2019-10-09 01:00:00 to 2019-10-09 10:35:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.8
0.6
0.4
0.2
0.0
Model
Meter
10/09/2019 01:00
10/09/2019 04:00
10/09/2019 07:00
10/09/2019 10:00

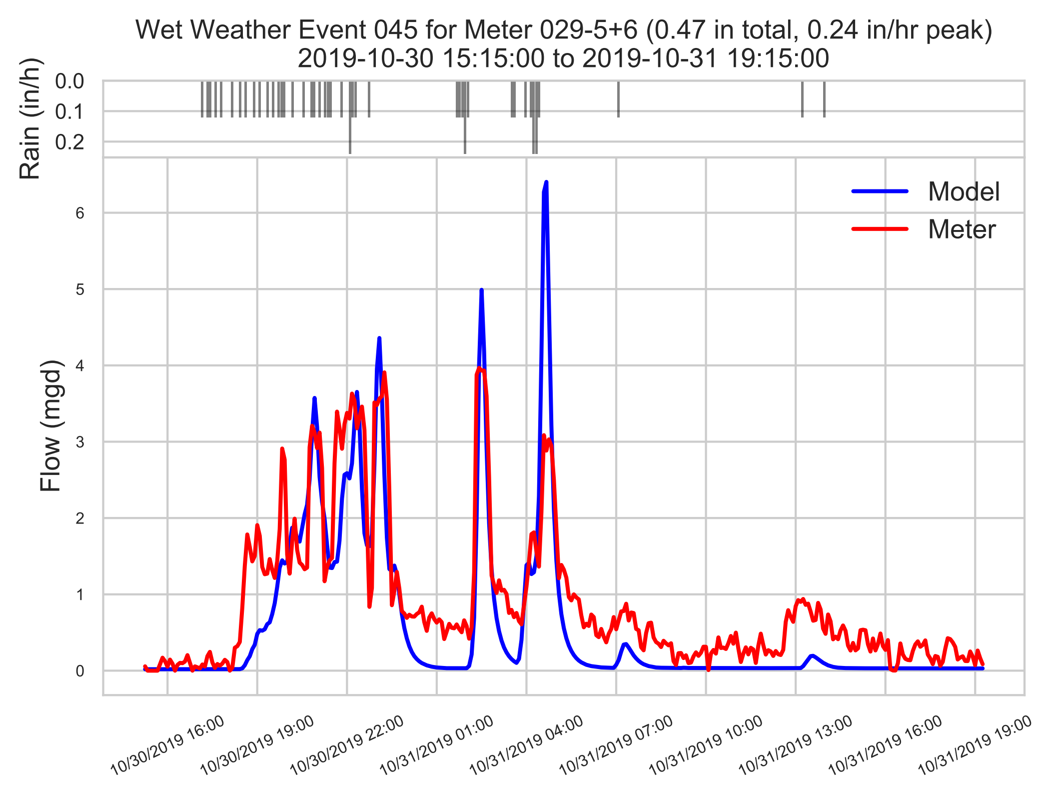

Wet Weather Event 041 for Meter 029-5+6 (1.3 in total, 0.84 in/hr peak)
2019-10-16 08:05:00 to 2019-10-16 22:15:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
0
5
10
15
20
25
30
Model
Meter
10/16/2019 09:00
10/16/2019 12:00
10/16/2019 15:00
10/16/2019 18:00
10/16/2019 21:00



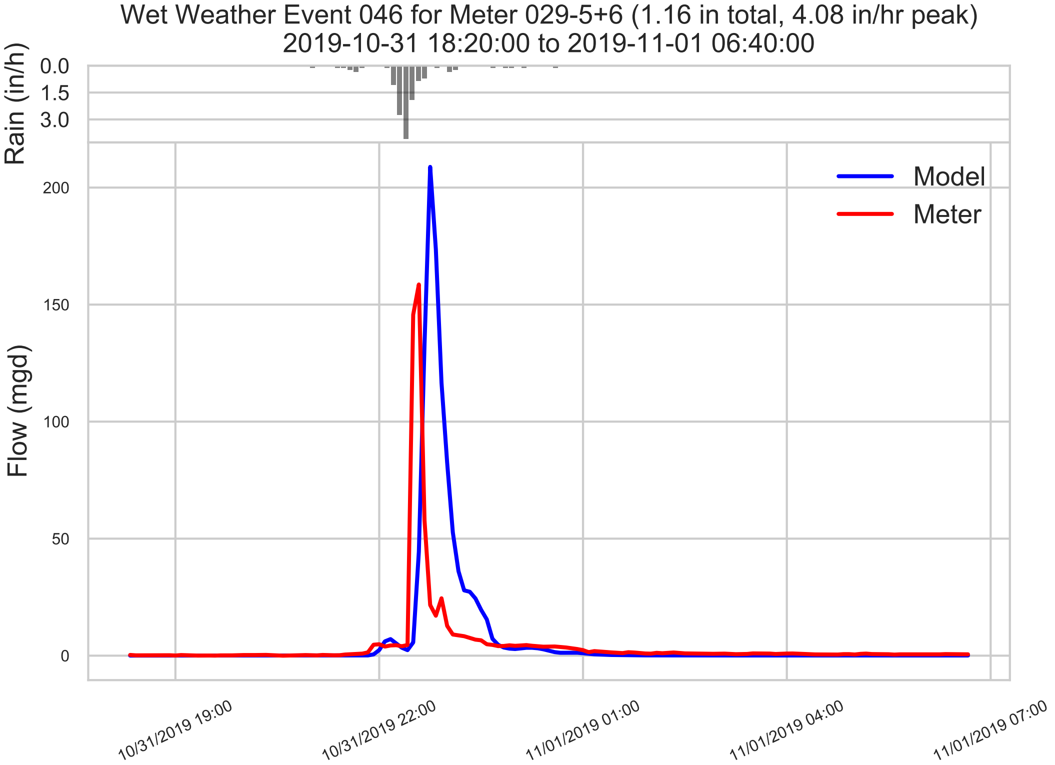
Wet Weather Event 042 for Meter 029-5+6 (1.91 in total, 0.48 in/hr peak)
2019-10-20 02:50:00 to 2019-10-21 01:40:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
2
4
6
8
10
12
14
Model
Meter
10/20/2019 03:00
10/20/2019 06:00
10/20/2019 09:00
10/20/2019 12:00
10/20/2019 15:00
10/20/2019 18:00
10/20/2019 21:00
10/21/2019 00:00


Wet Weather Event 043 for Meter 029-5+6 (0.56 in total, 0.72 in/hr peak)
2019-10-22 11:30:00 to 2019-10-22 23:55:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Model
Meter
10/22/2019 12:00
10/22/2019 15:00
10/22/2019 18:00
10/22/2019 21:00
10/23/2019 00:00

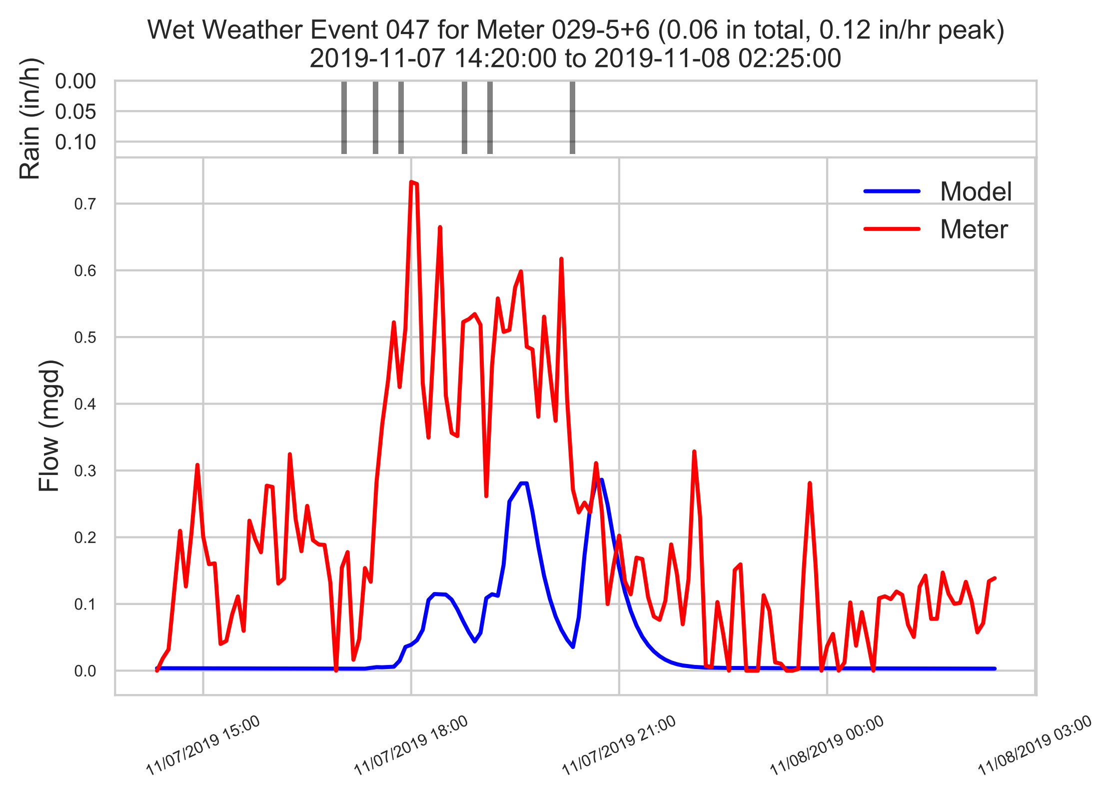

Wet Weather Event 044 for Meter 029-5+6 (1.33 in total, 1.32 in/hr peak)
2019-10-27 00:35:00 to 2019-10-27 17:25:00
Rain (in/h)
0.0
0.5
1.0
Flow (mgd)
0
20
40
60
80
100
Model
Meter
10/27/2019 02:00
10/27/2019 05:00
10/27/2019 08:00
10/27/2019 11:00
10/27/2019 14:00
10/27/2019 17:00

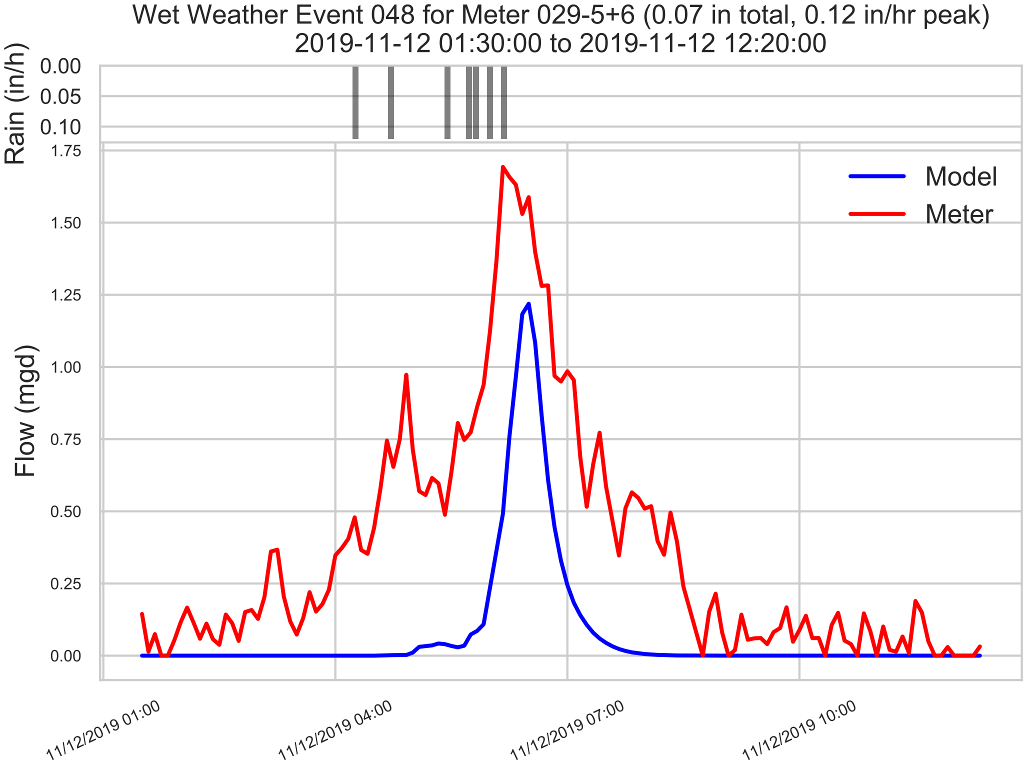


Wet Weather Event 045 for Meter 029-5+6 (0.47 in total, 0.24 in/hr peak)
2019-10-30 15:15:00 to 2019-10-31 19:15:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
5
6
Model
Meter
10/30/2019 16:00
10/30/2019 19:00
10/30/2019 22:00
10/31/2019 01:00
10/31/2019 04:00
10/31/2019 07:00
10/31/2019 10:00
10/31/2019 13:00
10/31/2019 16:00
10/31/2019 19:00

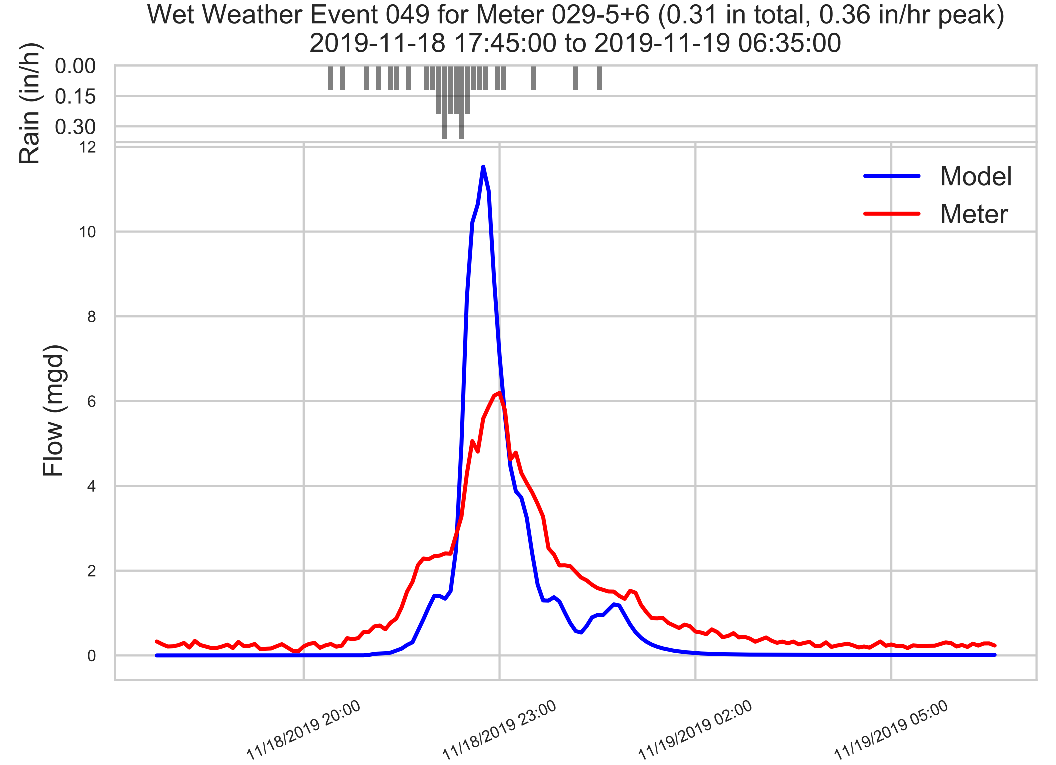


Wet Weather Event 046 for Meter 029-5+6 (1.16 in total, 4.08 in/hr peak)
2019-10-31 18:20:00 to 2019-11-01 06:40:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
200
150
100
50
0
Model
Meter
10/31/2019 19:00
10/31/2019 22:00
11/01/2019 01:00
11/01/2019 04:00
11/01/2019 07:00

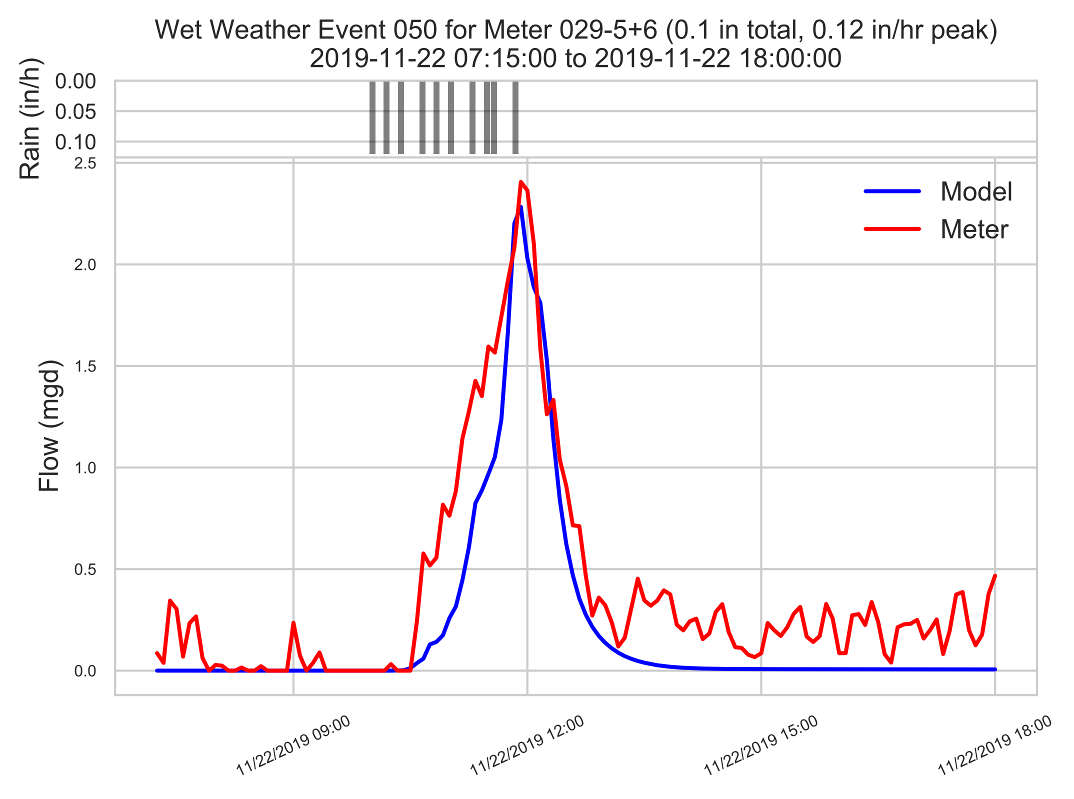

Wet Weather Event 047 for Meter 029-5+6 (0.06 in total, 0.12 in/hr peak)
2019-11-07 14:20:00 to 2019-11-08 02:25:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Model
Meter
11/07/2019 15:00
11/07/2019 18:00
11/07/2019 21:00
11/08/2019 00:00
11/08/2019 03:00

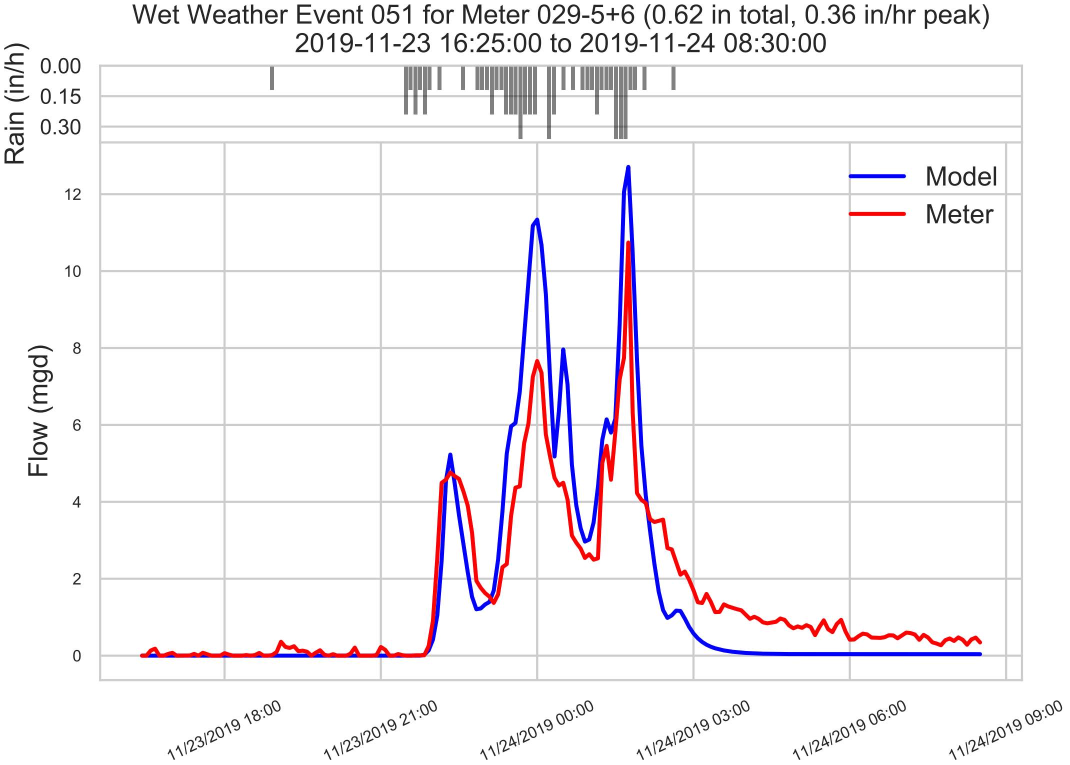


Wet Weather Event 048 for Meter 029-5+6 (0.07 in total, 0.12 in/hr peak)
2019-11-12 01:30:00 to 2019-11-12 12:20:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Model
Meter
11/12/2019 01:00
11/12/2019 04:00
11/12/2019 07:00
11/12/2019 10:00

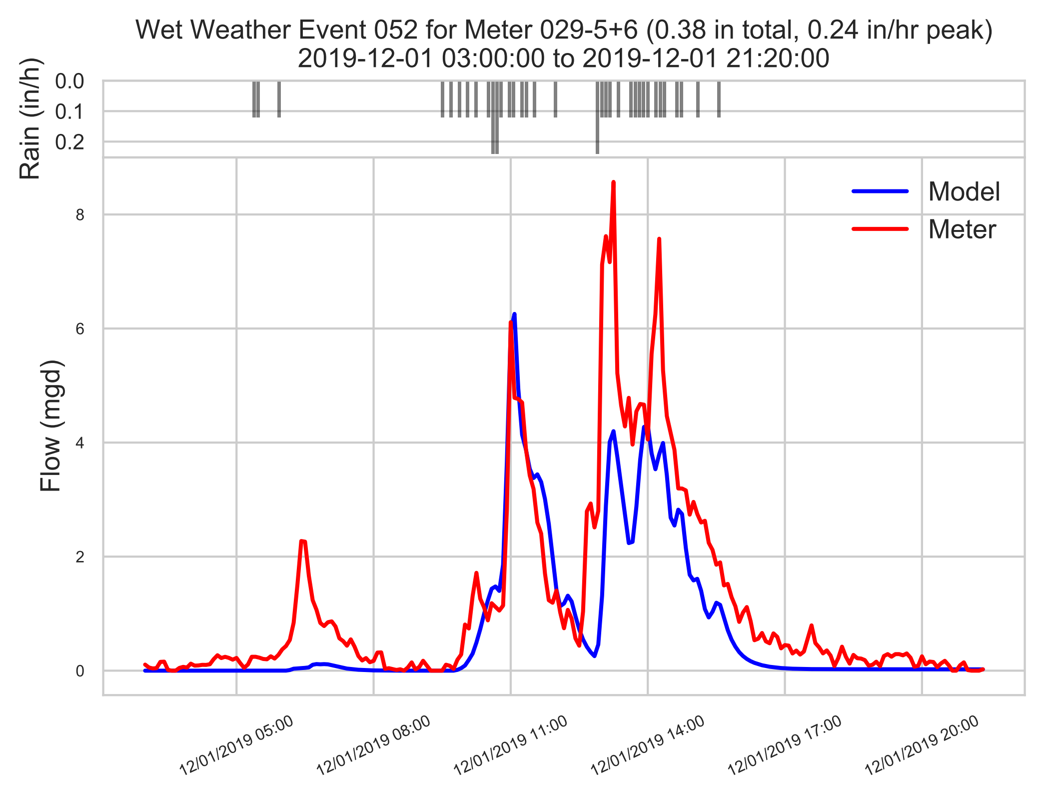


Wet Weather Event 049 for Meter 029-5+6 (0.31 in total, 0.36 in/hr peak)
2019-11-18 17:45:00 to 2019-11-19 06:35:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
12
10
8
6
4
2
0
Model
Meter
11/18/2019 20:00
11/18/2019 23:00
11/19/2019 02:00
11/19/2019 05:00

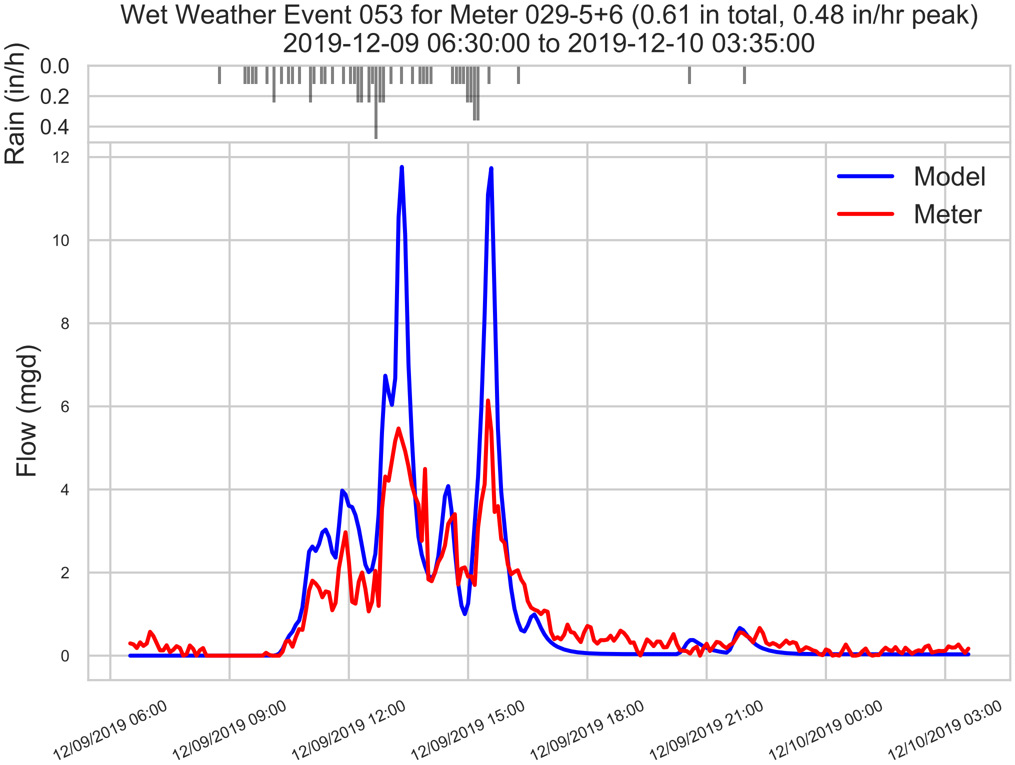

Wet Weather Event 050 for Meter 029-5+6 (0.1 in total, 0.12 in/hr peak)
2019-11-22 07:15:00 to 2019-11-22 18:00:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
11/22/2019 09:00
11/22/2019 12:00
11/22/2019 15:00
11/22/2019 18:00



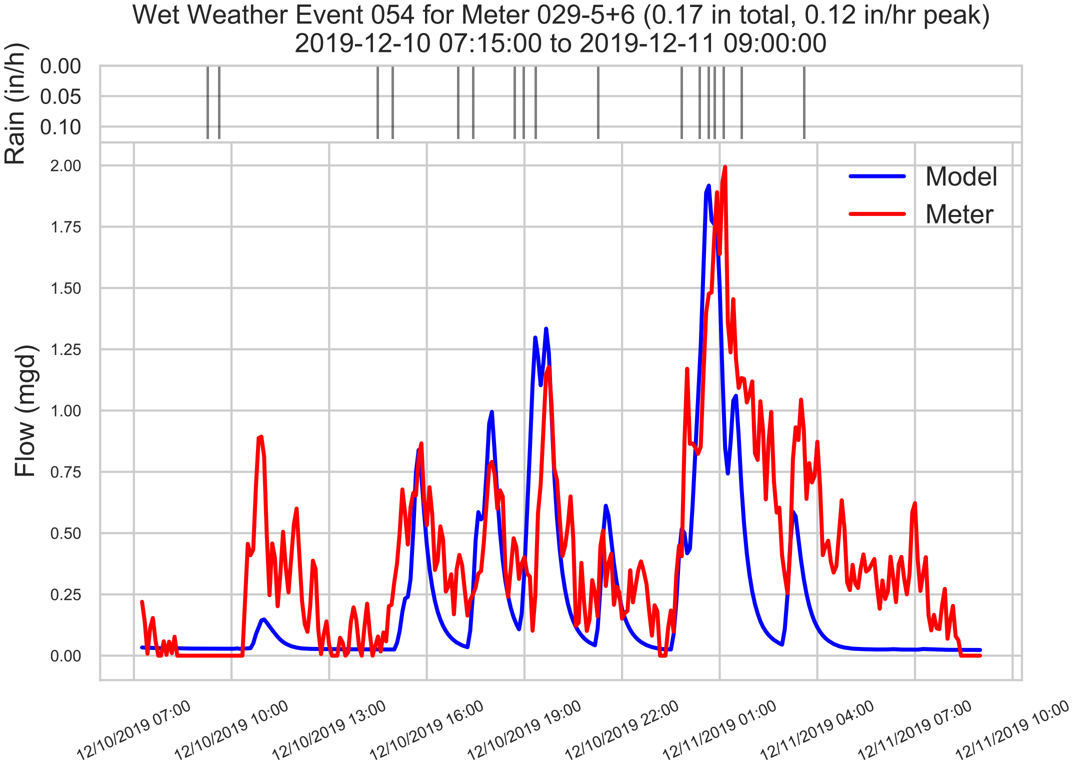
Wet Weather Event 051 for Meter 029-5+6 (0.62 in total, 0.36 in/hr peak)
2019-11-23 16:25:00 to 2019-11-24 08:30:00
Rain (in/h)
0.00
0.15
0.30
Flow (mgd)
0
2
4
6
8
10
12
Model
Meter
11/23/2019 18:00
11/23/2019 21:00
11/24/2019 00:00
11/24/2019 03:00
11/24/2019 06:00
11/24/2019 09:00



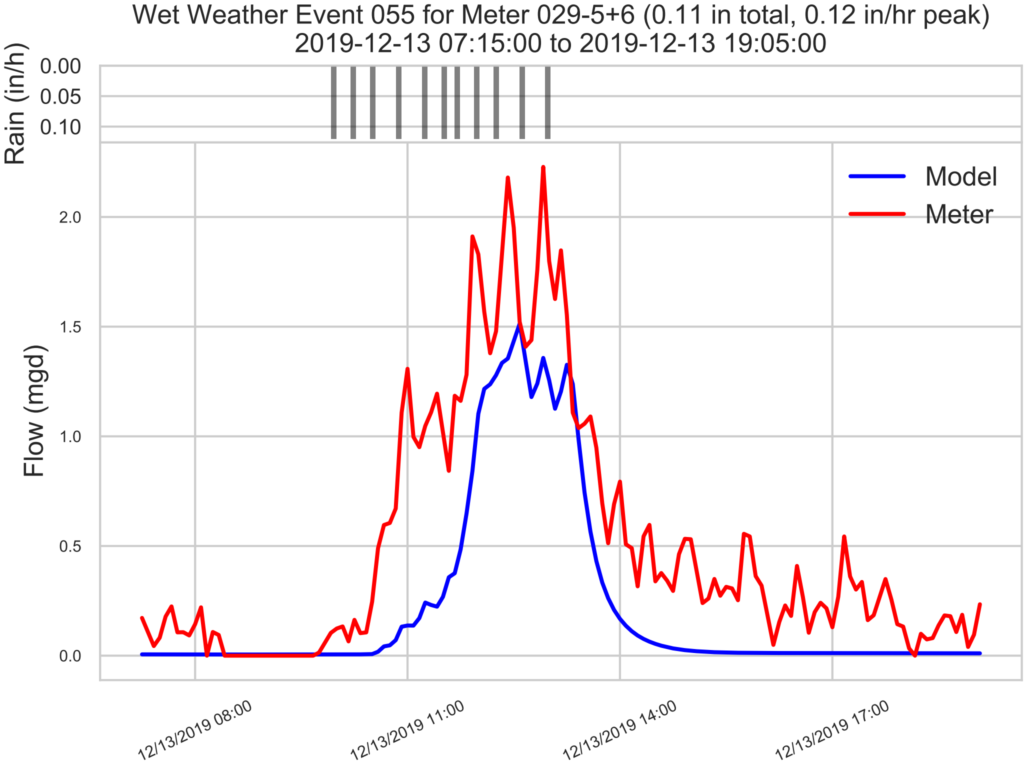
Wet Weather Event 052 for Meter 029-5+6 (0.38 in total, 0.24 in/hr peak)
2019-12-01 03:00:00 to 2019-12-01 21:20:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
2
4
6
8
Model
Meter
12/01/2019 05:00
12/01/2019 08:00
12/01/2019 11:00
12/01/2019 14:00
12/01/2019 17:00
12/01/2019 20:00



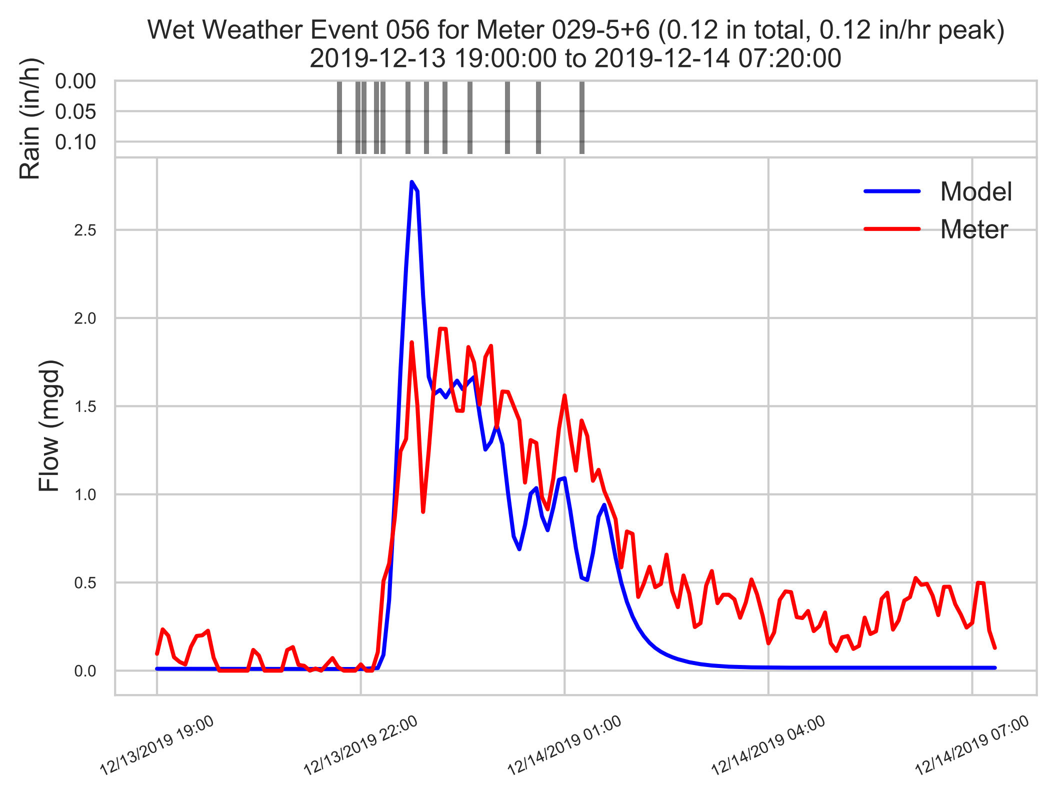
Wet Weather Event 053 for Meter 029-5+6 (0.61 in total, 0.48 in/hr peak)
2019-12-09 06:30:00 to 2019-12-10 03:35:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
12
10
8
6
4
2
0
Model
Meter
12/09/2019 06:00
12/09/2019 09:00
12/09/2019 12:00
12/09/2019 15:00
12/09/2019 18:00
12/09/2019 21:00
12/10/2019 00:00
12/10/2019 03:00



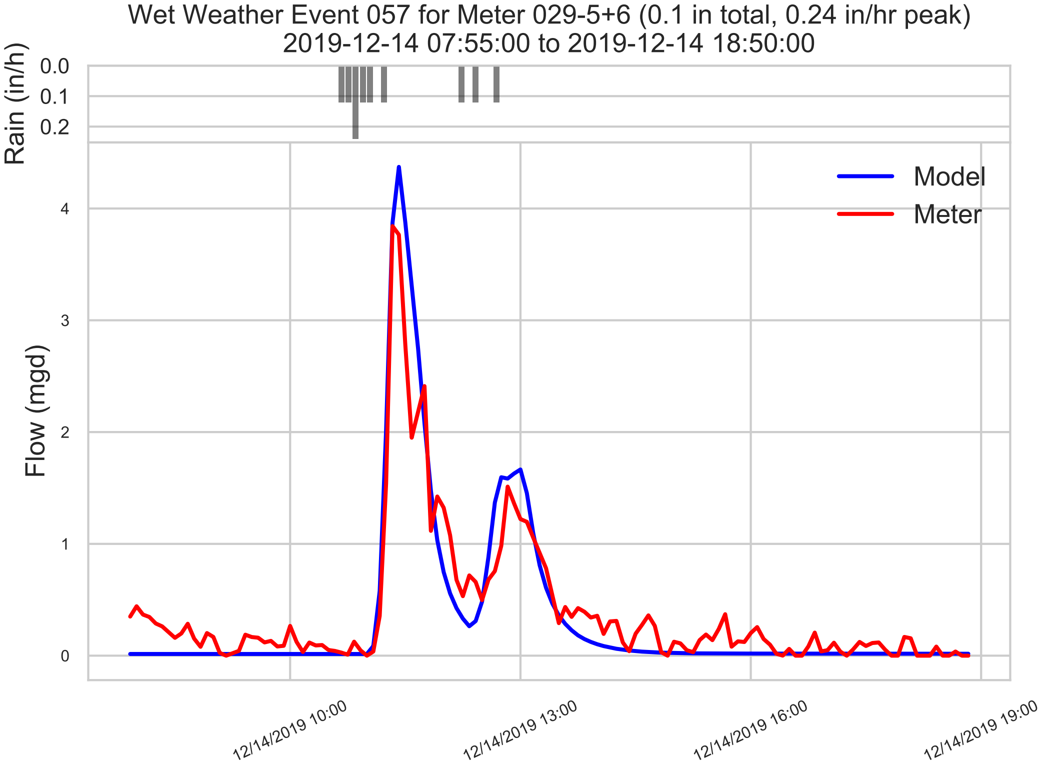
Wet Weather Event 054 for Meter 029-5+6 (0.17 in total, 0.12 in/hr peak)
2019-12-10 07:15:00 to 2019-12-11 09:00:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Model
Meter
12/10/2019 07:00
12/10/2019 10:00
12/10/2019 13:00
12/10/2019 16:00
12/10/2019 19:00
12/10/2019 22:00
12/11/2019 01:00
12/11/2019 04:00
12/11/2019 07:00
12/11/2019 10:00



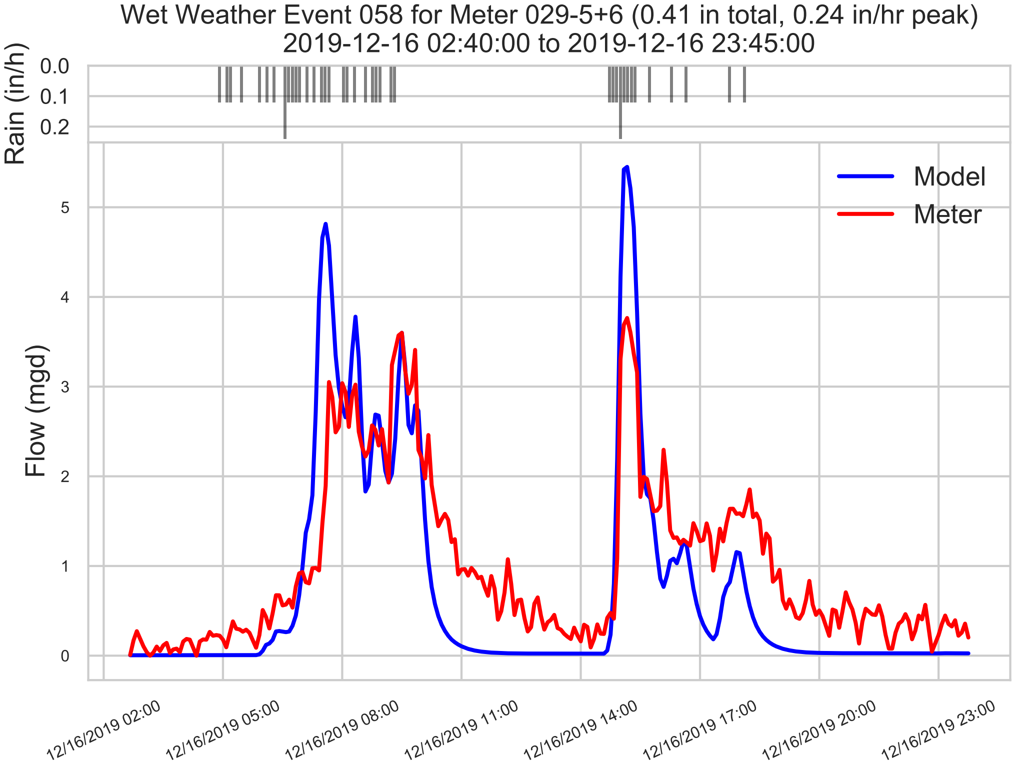
Wet Weather Event 055 for Meter 029-5+6 (0.11 in total, 0.12 in/hr peak)
2019-12-13 07:15:00 to 2019-12-13 19:05:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
2.0
1.5
1.0
0.5
0.0
Model
Meter
12/13/2019 08:00
12/13/2019 11:00
12/13/2019 14:00
12/13/2019 17:00



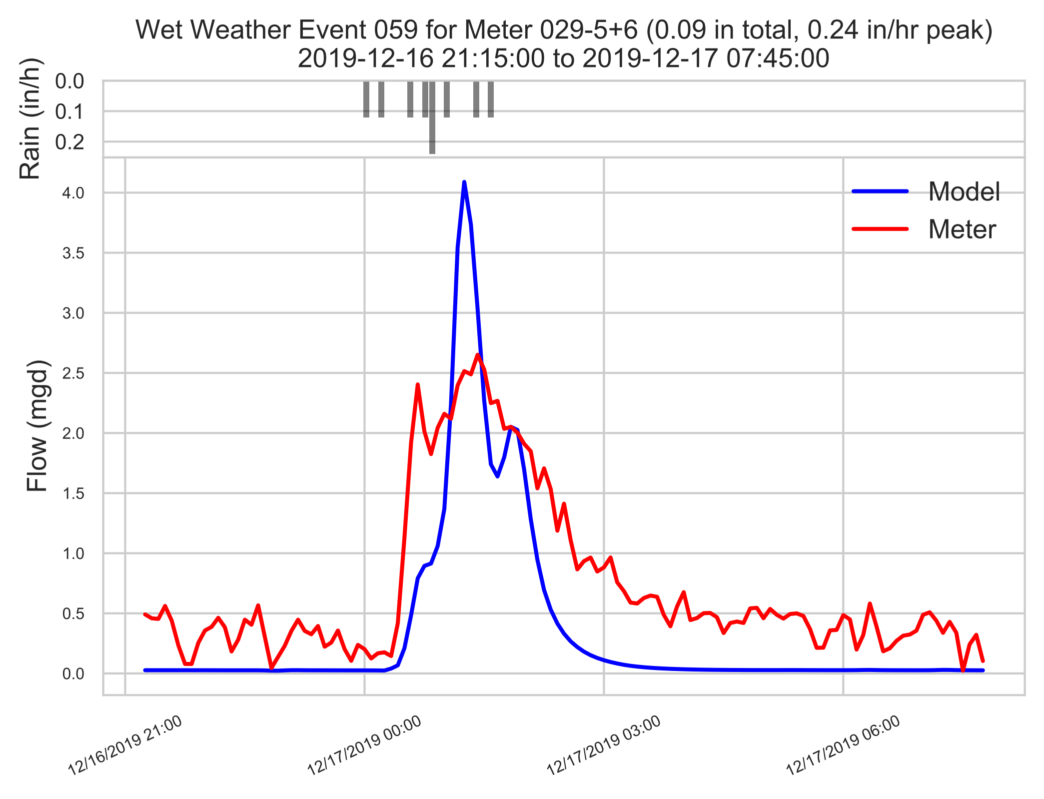
Wet Weather Event 056 for Meter 029-5+6 (0.12 in total, 0.12 in/hr peak)
2019-12-13 19:00:00 to 2019-12-14 07:20:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.0
0.5
1.0
1.5
2.0
2.5
Model
Meter
12/13/2019 19:00
12/13/2019 22:00
12/14/2019 01:00
12/14/2019 04:00
12/14/2019 07:00

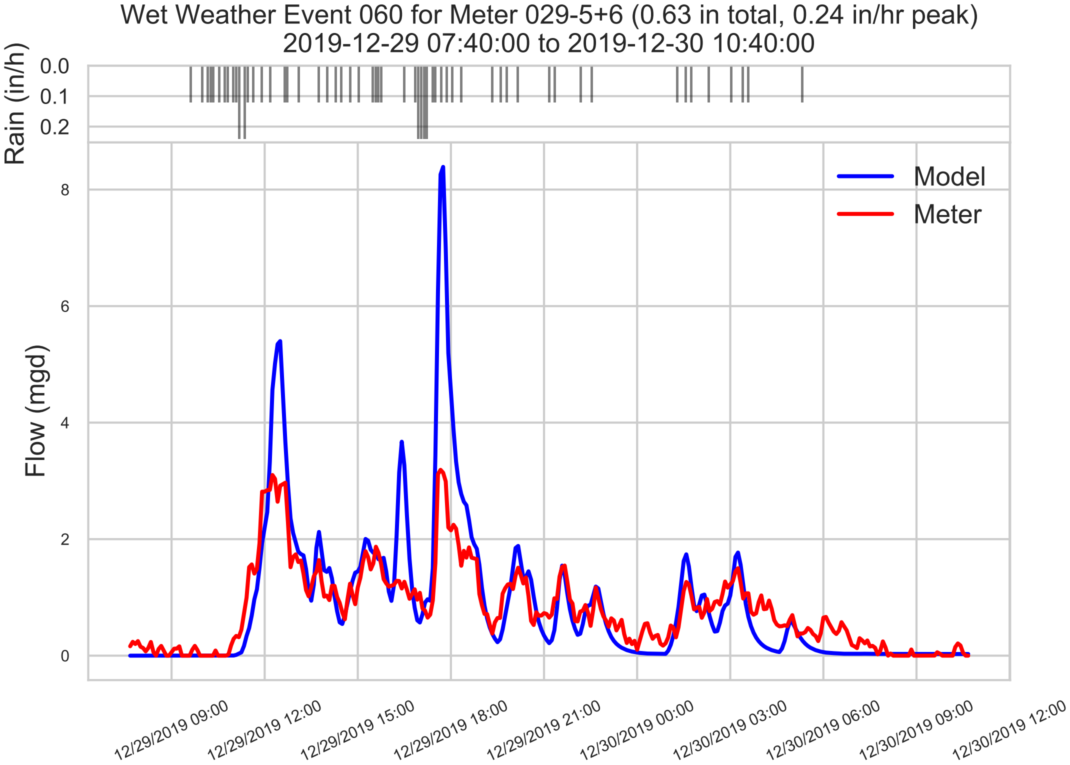


Wet Weather Event 057 for Meter 029-5+6 (0.1 in total, 0.24 in/hr peak)
2019-12-14 07:55:00 to 2019-12-14 18:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
Model
Meter
12/14/2019 10:00
12/14/2019 13:00
12/14/2019 16:00
12/14/2019 19:00

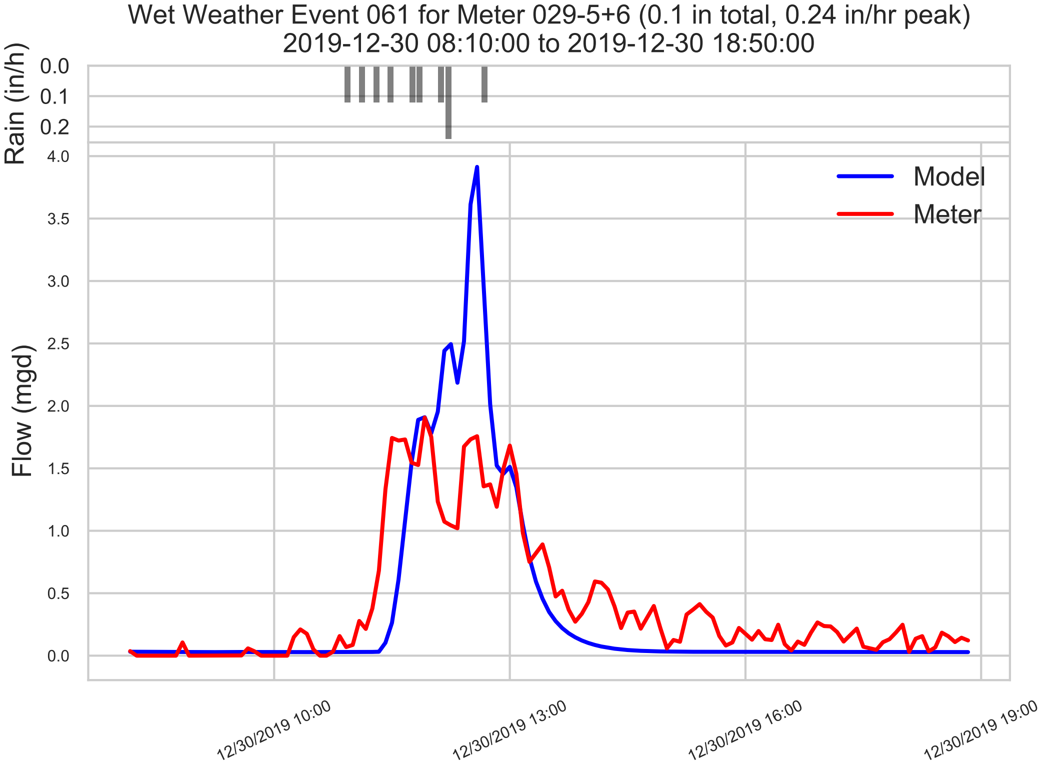


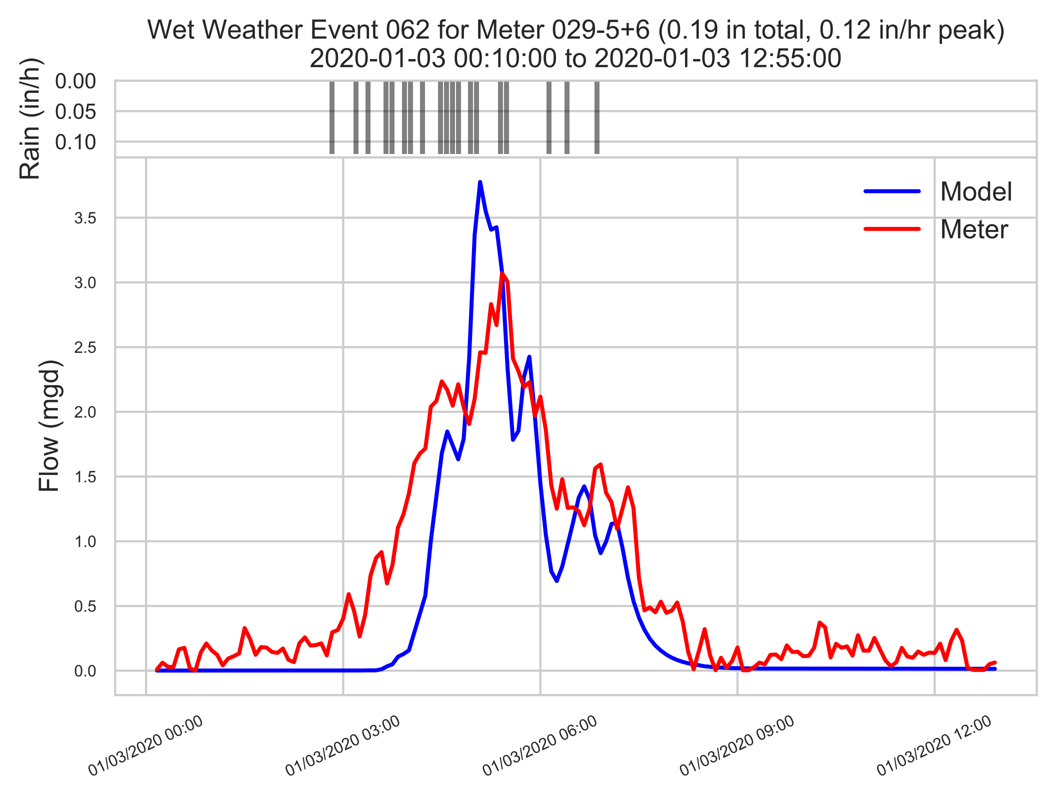
Wet Weather Event 058 for Meter 029-5+6 (0.41 in total, 0.24 in/hr peak)
2019-12-16 02:40:00 to 2019-12-16 23:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
5
Model
Meter
12/16/2019 02:00
12/16/2019 05:00
12/16/2019 08:00
12/16/2019 11:00
12/16/2019 14:00
12/16/2019 17:00
12/16/2019 20:00
12/16/2019 23:00


Wet Weather Event 059 for Meter 029-5+6 (0.09 in total, 0.24 in/hr peak)
2019-12-16 21:15:00 to 2019-12-17 07:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
12/16/2019 21:00
12/17/2019 00:00
12/17/2019 03:00
12/17/2019 06:00

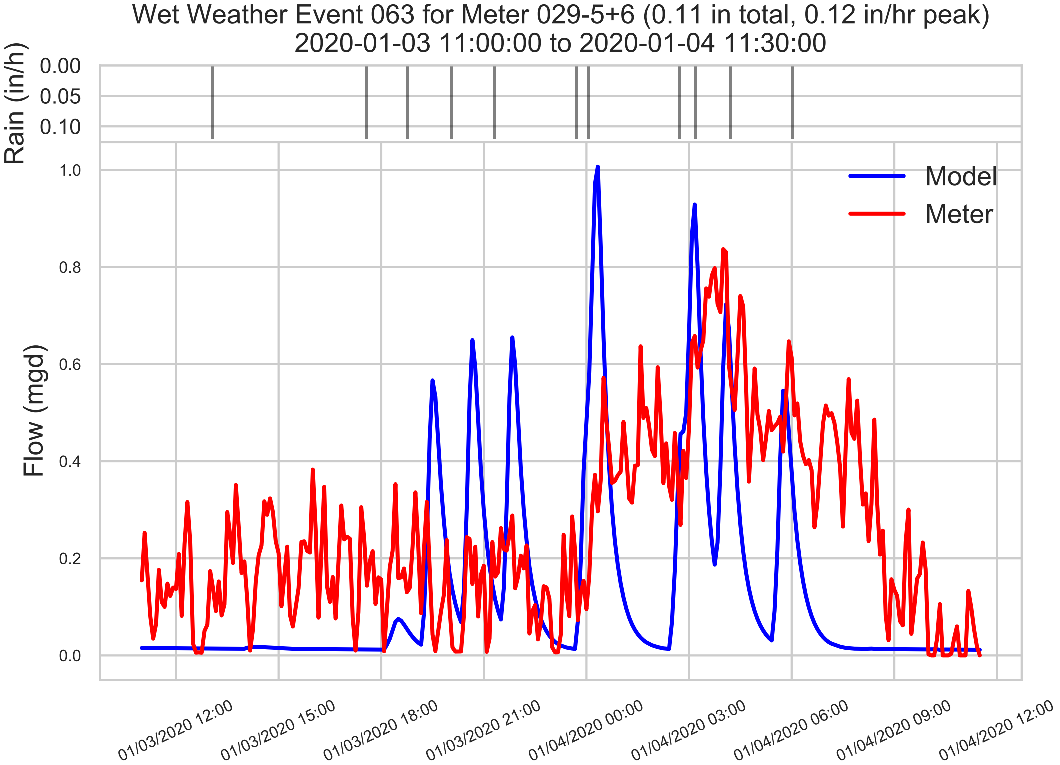


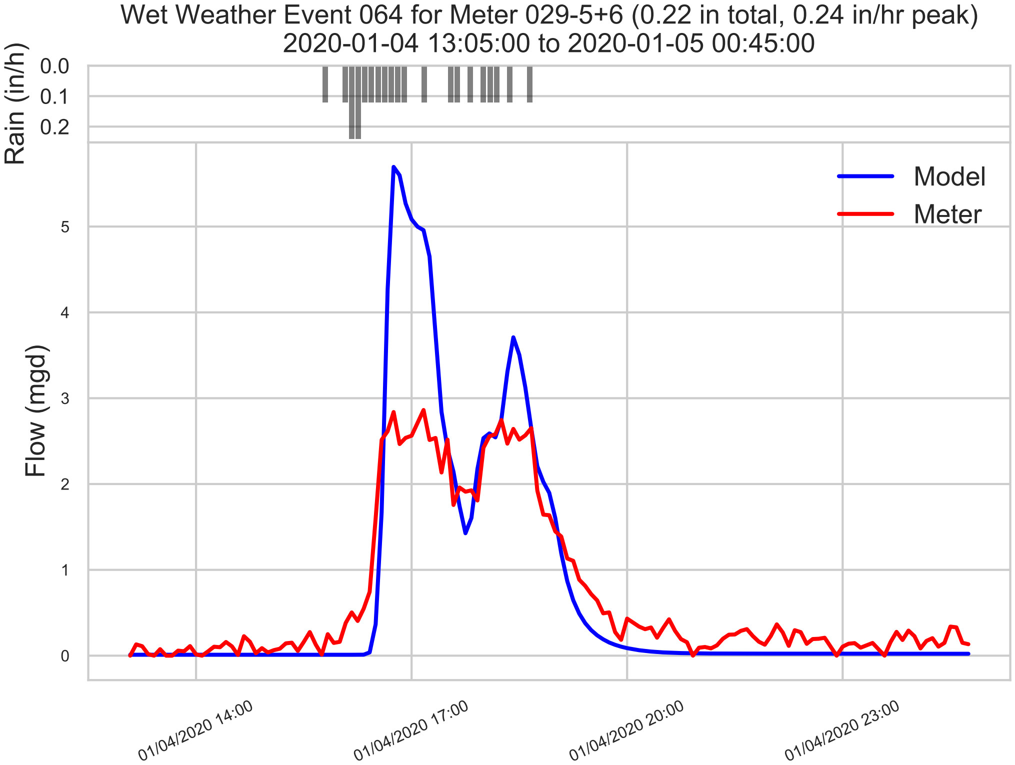
Wet Weather Event 060 for Meter 029-5+6 (0.63 in total, 0.24 in/hr peak)
2019-12-29 07:40:00 to 2019-12-30 10:40:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
8
6
4
2
0
Model
Meter
12/29/2019 09:00
12/29/2019 12:00
12/29/2019 15:00
12/29/2019 18:00
12/29/2019 21:00
12/30/2019 00:00
12/30/2019 03:00
12/30/2019 06:00
12/30/2019 09:00
12/30/2019 12:00


Wet Weather Event 061 for Meter 029-5+6 (0.1 in total, 0.24 in/hr peak)
2019-12-30 08:10:00 to 2019-12-30 18:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
12/30/2019 10:00
12/30/2019 13:00
12/30/2019 16:00
12/30/2019 19:00

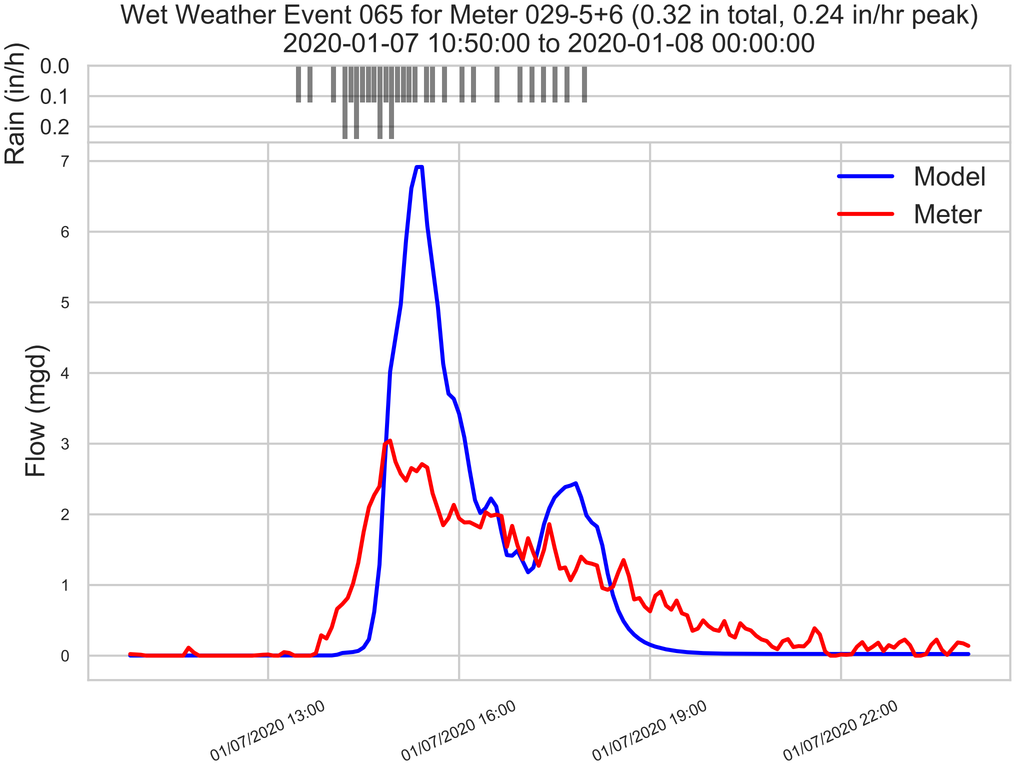


Wet Weather Event 062 for Meter 029-5+6 (0.19 in total, 0.12 in/hr peak)
2020-01-03 00:10:00 to 2020-01-03 12:55:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Model
Meter
01/03/2020 00:00
01/03/2020 03:00
01/03/2020 06:00
01/03/2020 09:00
01/03/2020 12:00

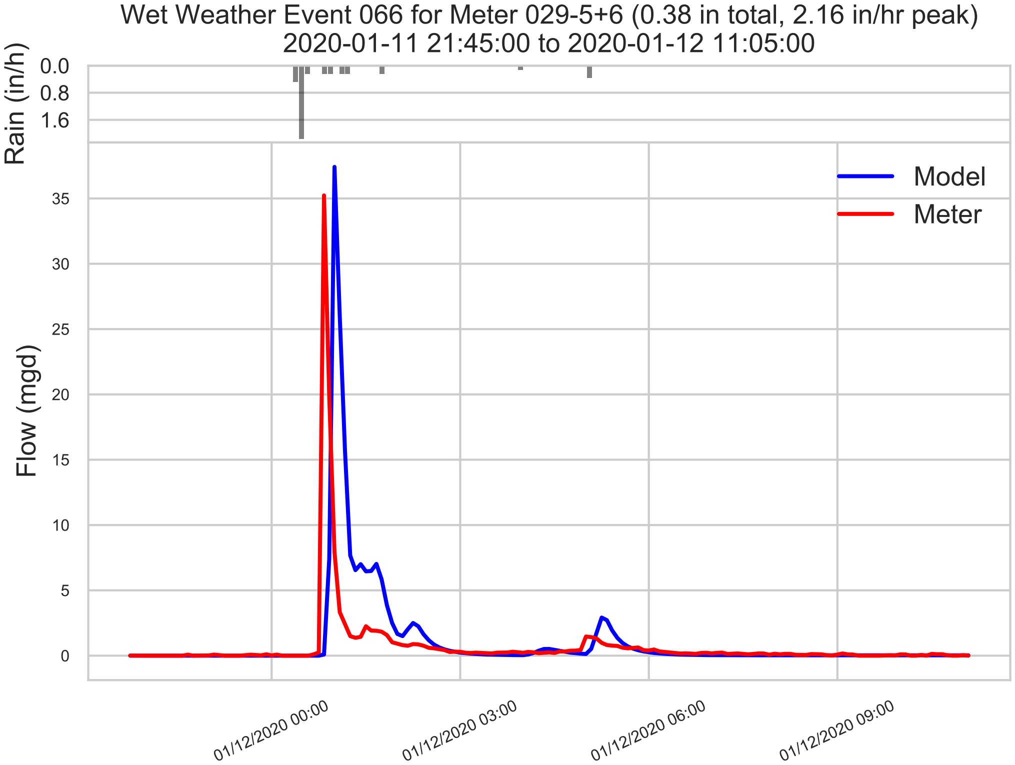

Wet Weather Event 063 for Meter 029-5+6 (0.11 in total, 0.12 in/hr peak)
2020-01-03 11:00:00 to 2020-01-04 11:30:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
01/03/2020 12:00
01/03/2020 15:00
01/03/2020 18:00
01/03/2020 21:00
01/04/2020 00:00
01/04/2020 03:00
01/04/2020 06:00
01/04/2020 09:00
01/04/2020 12:00



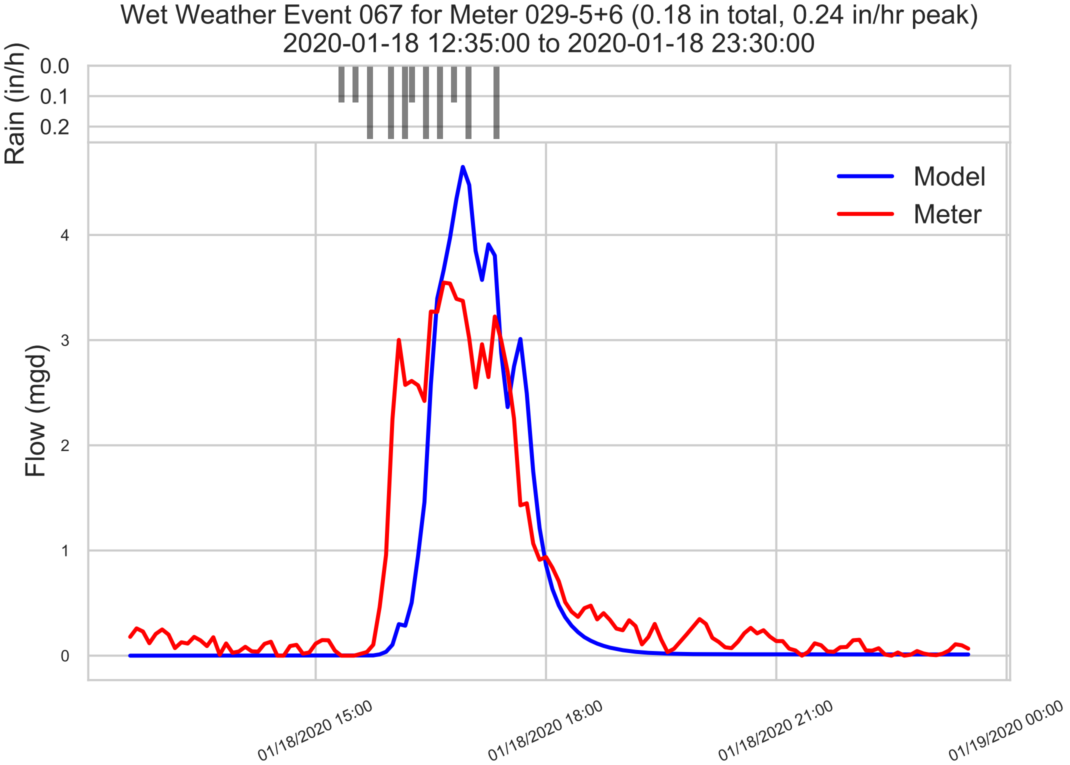
Wet Weather Event 064 for Meter 029-5+6 (0.22 in total, 0.24 in/hr peak)
2020-01-04 13:05:00 to 2020-01-05 00:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
5
Model
Meter
01/04/2020 14:00
01/04/2020 17:00
01/04/2020 20:00
01/04/2020 23:00

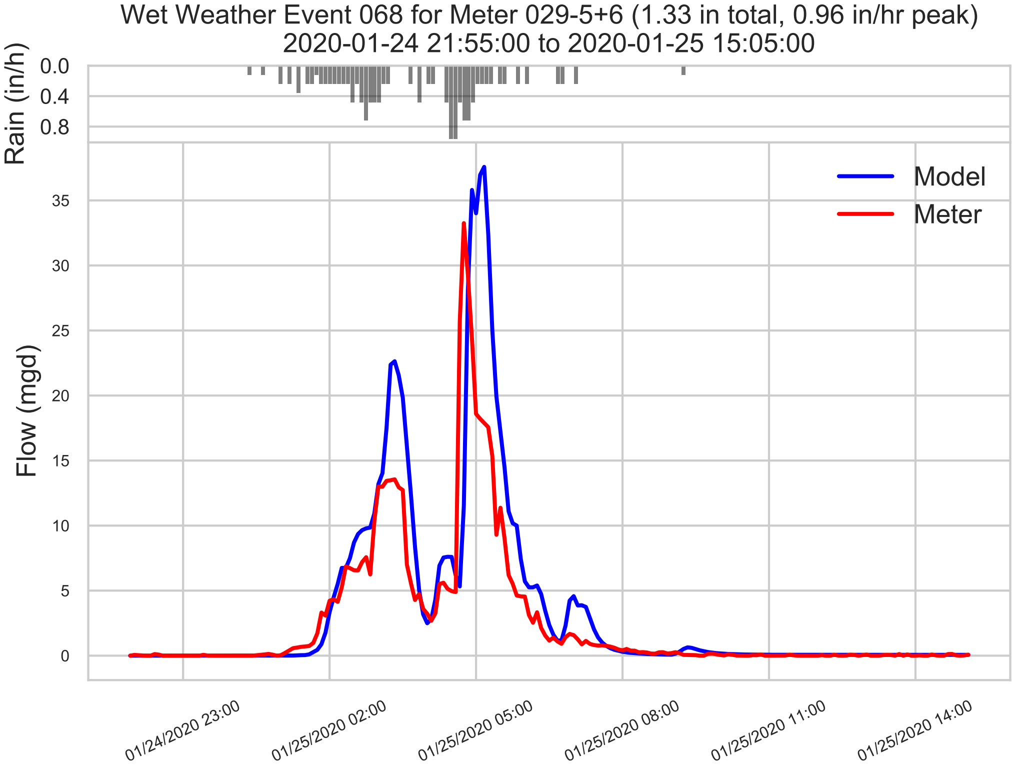


Wet Weather Event 065 for Meter 029-5+6 (0.32 in total, 0.24 in/hr peak)
2020-01-07 10:50:00 to 2020-01-08 00:00:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
5
6
7
Model
Meter
01/07/2020 13:00
01/07/2020 16:00
01/07/2020 19:00
01/07/2020 22:00

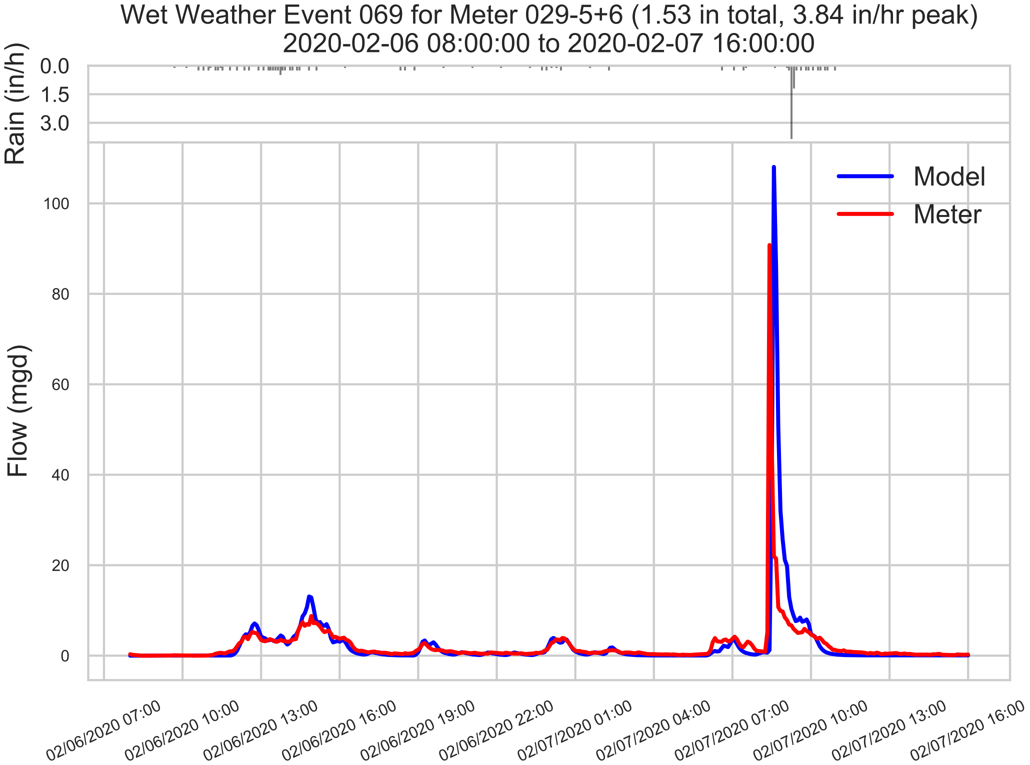


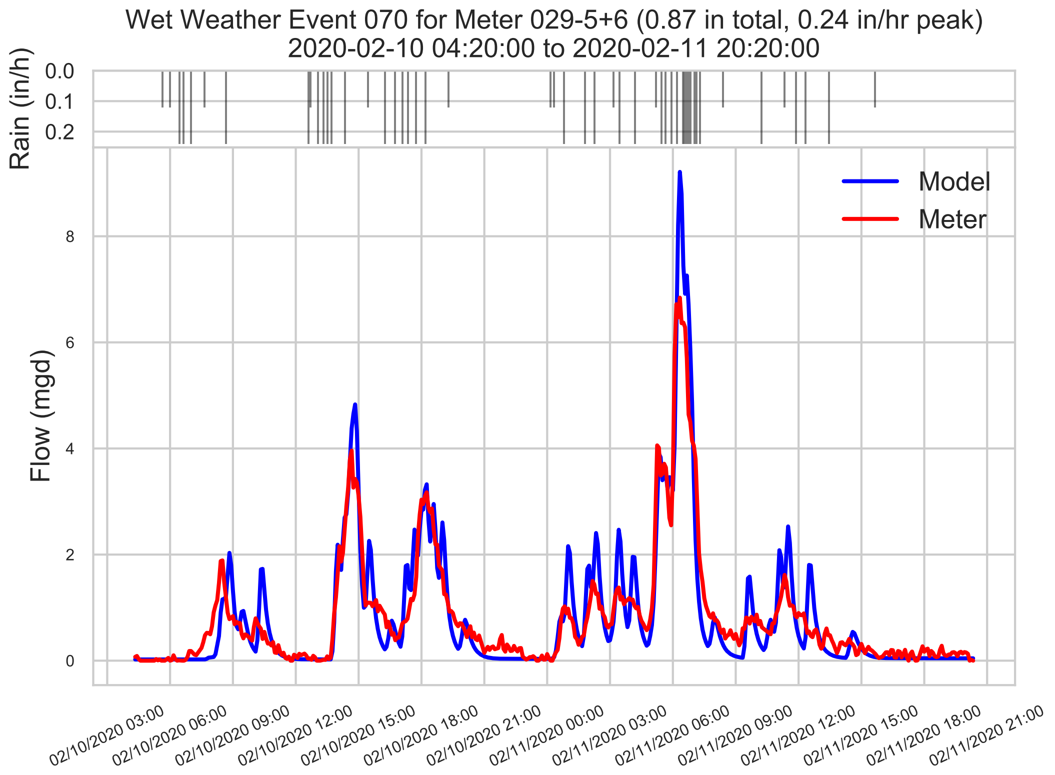
Wet Weather Event 066 for Meter 029-5+6 (0.38 in total, 2.16 in/hr peak)
2020-01-11 21:45:00 to 2020-01-12 11:05:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
0
5
10
15
20
25
30
35
Model
Meter
01/12/2020 00:00
01/12/2020 03:00
01/12/2020 06:00
01/12/2020 09:00

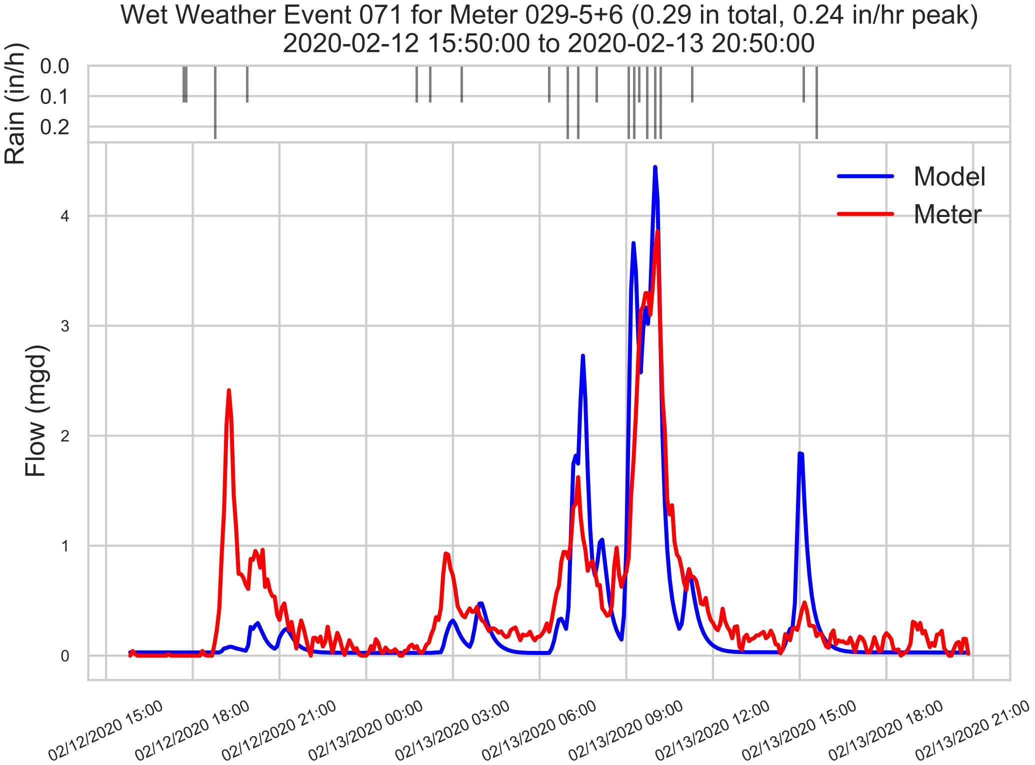

Wet Weather Event 067 for Meter 029-5+6 (0.18 in total, 0.24 in/hr peak)
2020-01-18 12:35:00 to 2020-01-18 23:30:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
Model
Meter
01/18/2020 15:00
01/18/2020 18:00
01/18/2020 21:00
01/19/2020 00:00



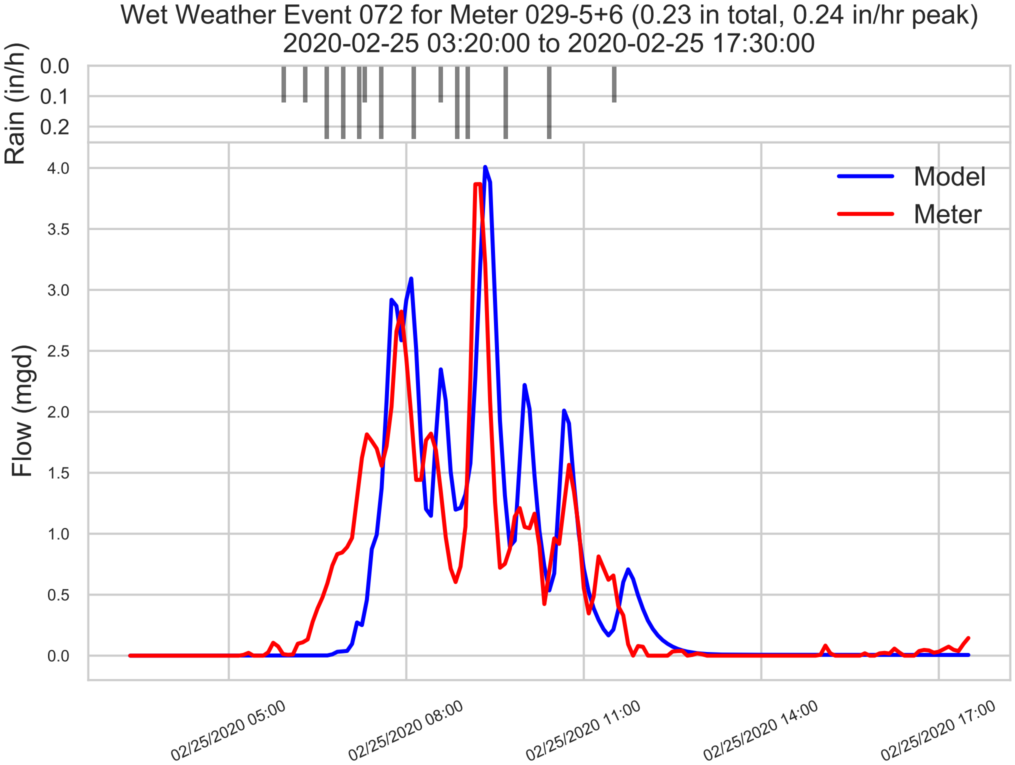
Wet Weather Event 068 for Meter 029-5+6 (1.33 in total, 0.96 in/hr peak)
2020-01-24 21:55:00 to 2020-01-25 15:05:00
Rain (in/h)
0.0
0.4
0.8
Flow (mgd)
35
30
25
20
15
10
5
0
Model
Meter
01/24/2020 23:00
01/25/2020 02:00
01/25/2020 05:00
01/25/2020 08:00
01/25/2020 11:00
01/25/2020 14:00


Wet Weather Event 069 for Meter 029-5+6 (1.53 in total, 3.84 in/hr peak)
2020-02-06 08:00:00 to 2020-02-07 16:00:00
Rain (in/h)
0.0
1.5
3.0
Flow (mgd)
0
20
40
60
80
100
Model
Meter
02/06/2020 07:00
02/06/2020 10:00
02/06/2020 13:00
02/06/2020 16:00
02/06/2020 19:00
02/06/2020 22:00
02/07/2020 01:00
02/07/2020 04:00
02/07/2020 07:00
02/07/2020 10:00
02/07/2020 13:00
02/07/2020 16:00

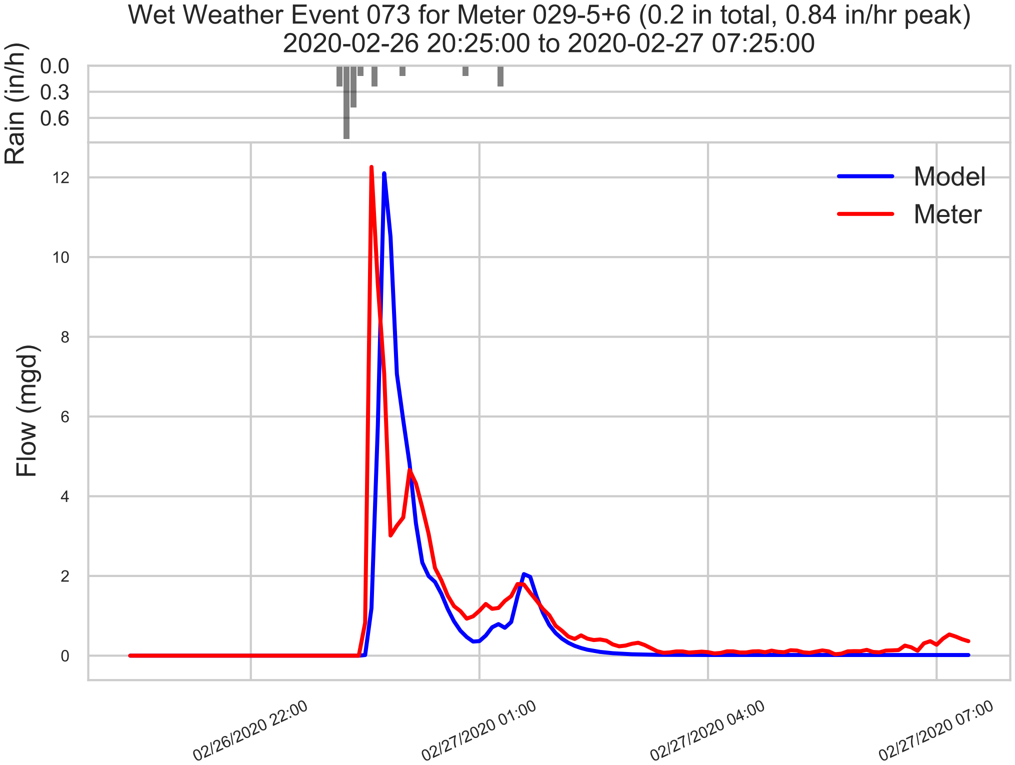

Wet Weather Event 070 for Meter 029-5+6 (0.87 in total, 0.24 in/hr peak)
2020-02-10 04:20:00 to 2020-02-11 20:20:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
2
4
6
8
Model
Meter
02/10/2020 03:00
02/10/2020 06:00
02/10/2020 09:00
02/10/2020 12:00
02/10/2020 15:00
02/10/2020 18:00
02/10/2020 21:00
02/11/2020 00:00
02/11/2020 03:00
02/11/2020 06:00
02/11/2020 09:00
02/11/2020 12:00
02/11/2020 15:00
02/11/2020 18:00
02/11/2020 21:00

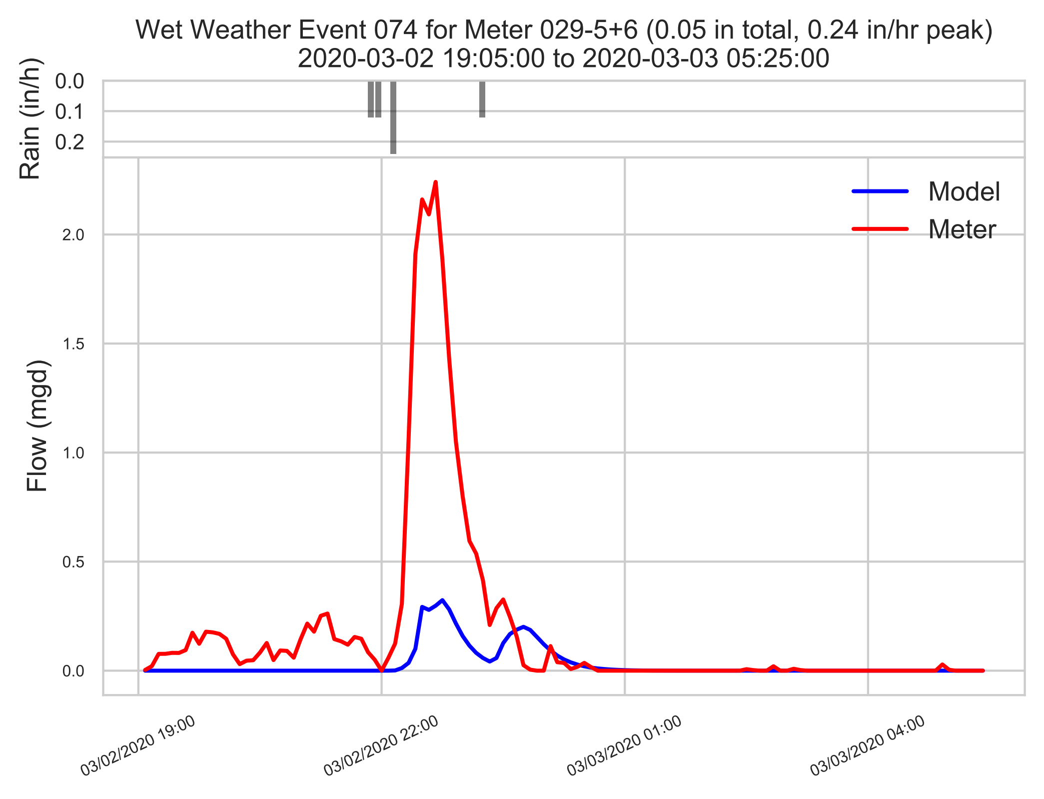


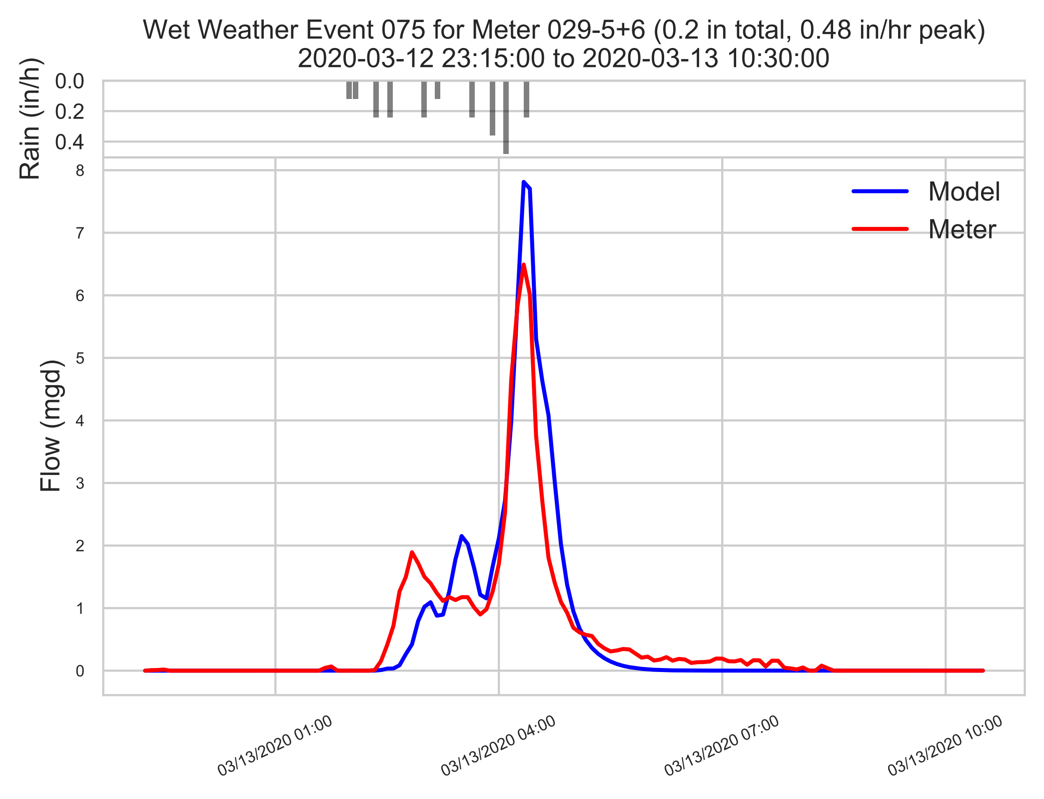
Wet Weather Event 071 for Meter 029-5+6 (0.29 in total, 0.24 in/hr peak)
2020-02-12 15:50:00 to 2020-02-13 20:50:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
Model
Meter
02/12/2020 15:00
02/12/2020 18:00
02/12/2020 21:00
02/13/2020 00:00
02/13/2020 03:00
02/13/2020 06:00
02/13/2020 09:00
02/13/2020 12:00
02/13/2020 15:00
02/13/2020 18:00
02/13/2020 21:00

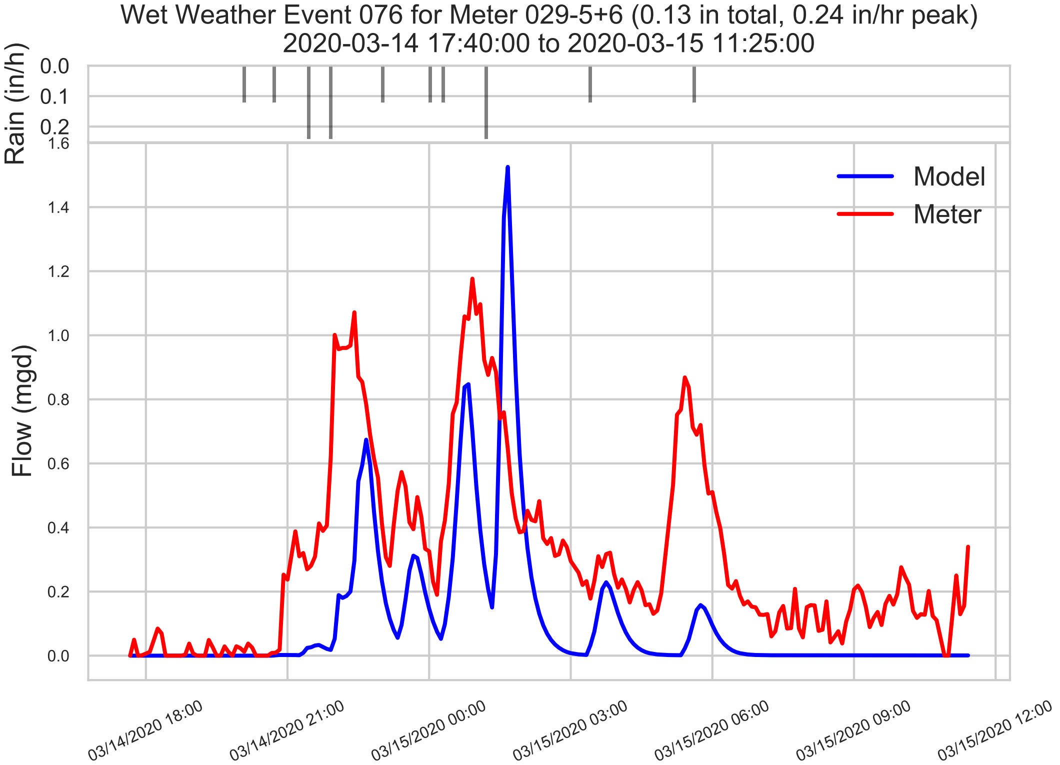


Wet Weather Event 072 for Meter 029-5+6 (0.23 in total, 0.24 in/hr peak)
2020-02-25 03:20:00 to 2020-02-25 17:30:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Model
Meter
02/25/2020 05:00
02/25/2020 08:00
02/25/2020 11:00
02/25/2020 14:00
02/25/2020 17:00

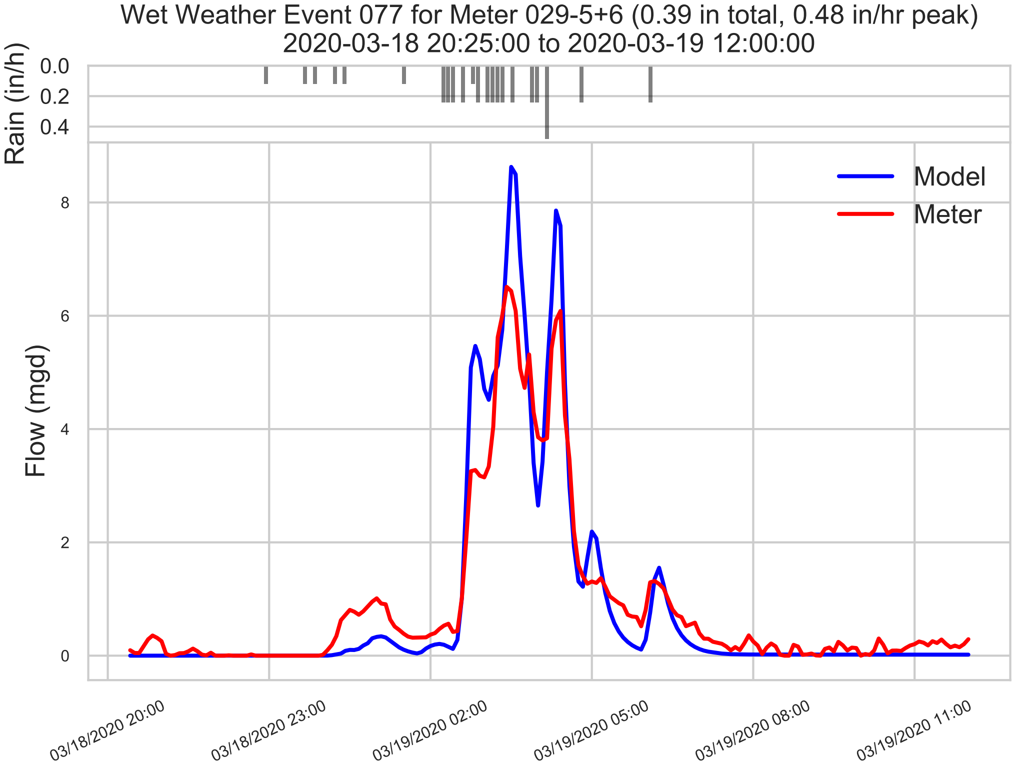

Wet Weather Event 073 for Meter 029-5+6 (0.2 in total, 0.84 in/hr peak)
2020-02-26 20:25:00 to 2020-02-27 07:25:00
Rain (in/h)
0.0
0.3
0.6
Flow (mgd)
0
2
4
6
8
10
12
Model
Meter
02/26/2020 22:00
02/27/2020 01:00
02/27/2020 04:00
02/27/2020 07:00


Wet Weather Event 074 for Meter 029-5+6 (0.05 in total, 0.24 in/hr peak)
2020-03-02 19:05:00 to 2020-03-03 05:25:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
2.0
1.5
1.0
0.5
0.0
Model
Meter
03/02/2020 19:00
03/02/2020 22:00
03/03/2020 01:00
03/03/2020 04:00

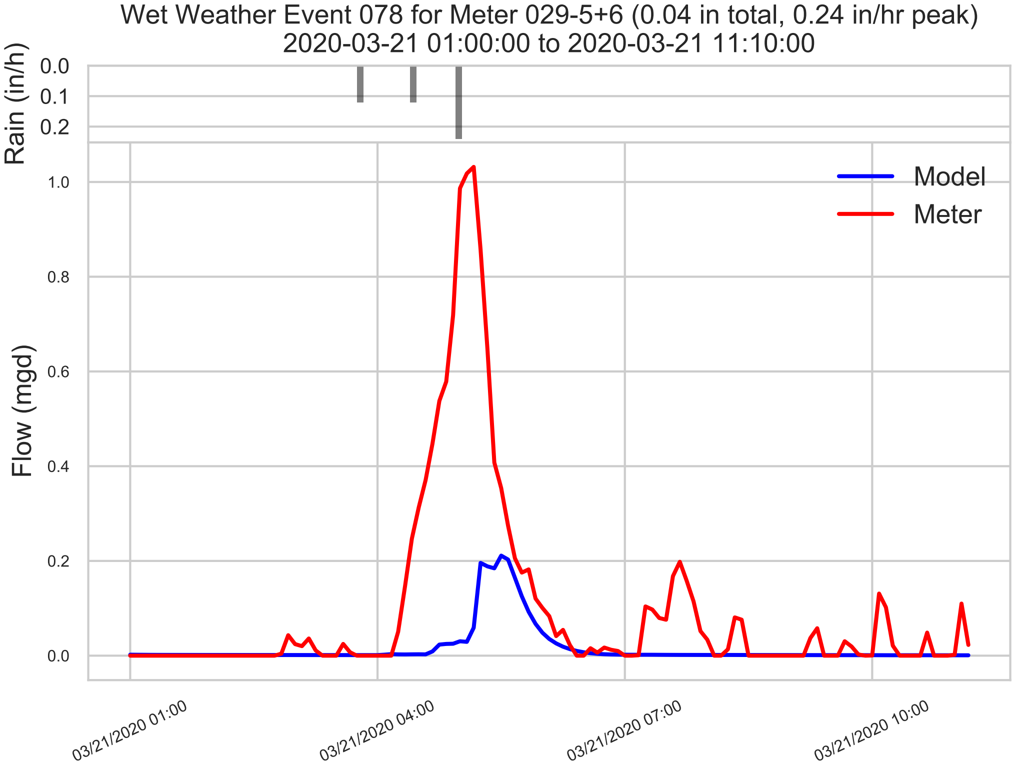

Wet Weather Event 075 for Meter 029-5+6 (0.2 in total, 0.48 in/hr peak)
2020-03-12 23:15:00 to 2020-03-13 10:30:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
1
2
3
4
5
6
7
8
Model
Meter
03/13/2020 01:00
03/13/2020 04:00
03/13/2020 07:00
03/13/2020 10:00



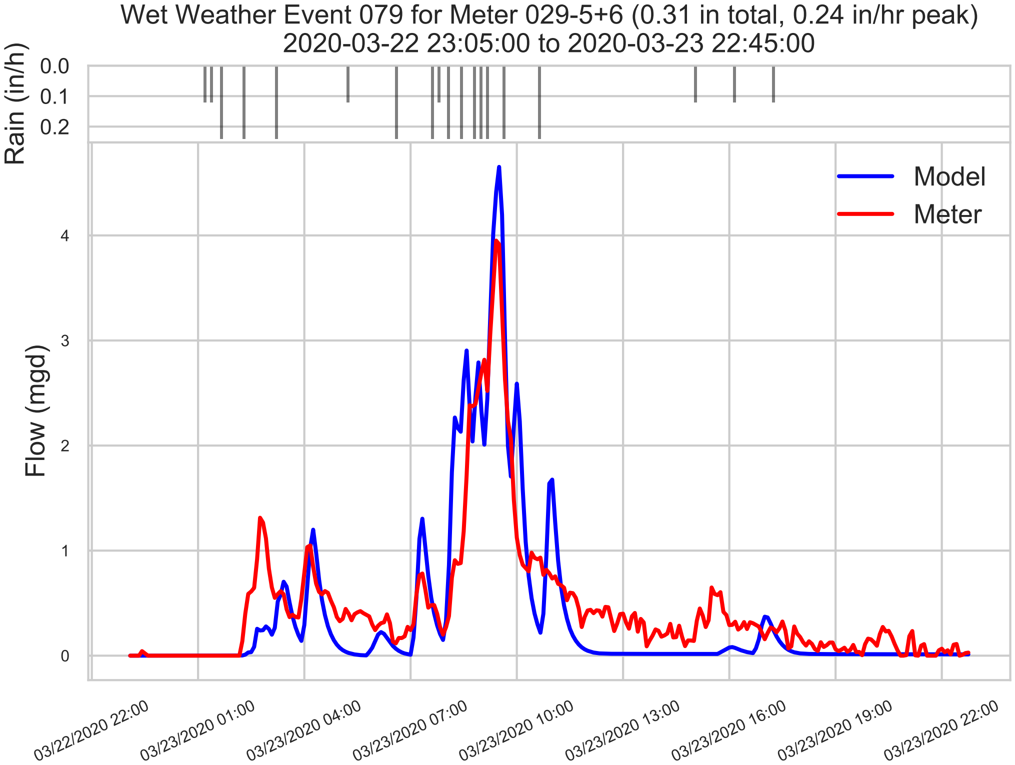
Wet Weather Event 076 for Meter 029-5+6 (0.13 in total, 0.24 in/hr peak)
2020-03-14 17:40:00 to 2020-03-15 11:25:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
03/14/2020 18:00
03/14/2020 21:00
03/15/2020 00:00
03/15/2020 03:00
03/15/2020 06:00
03/15/2020 09:00
03/15/2020 12:00



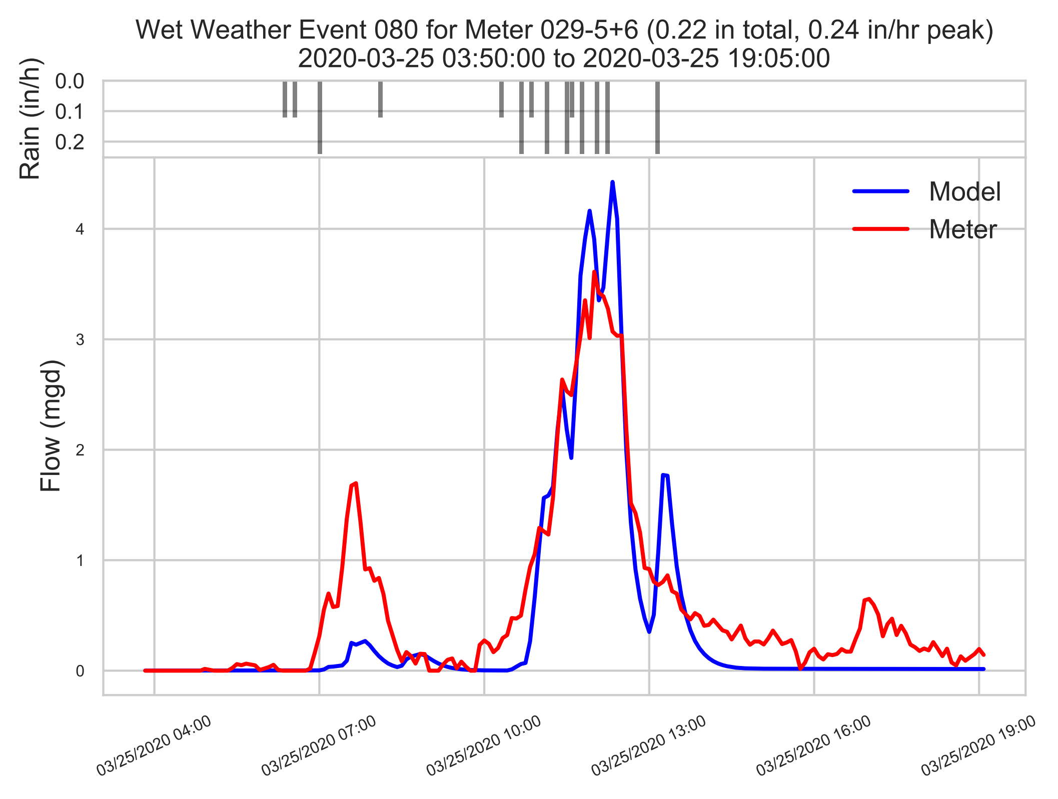
Wet Weather Event 077 for Meter 029-5+6 (0.39 in total, 0.48 in/hr peak)
2020-03-18 20:25:00 to 2020-03-19 12:00:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
8
6
4
2
0
Model
Meter
03/18/2020 20:00
03/18/2020 23:00
03/19/2020 02:00
03/19/2020 05:00
03/19/2020 08:00
03/19/2020 11:00

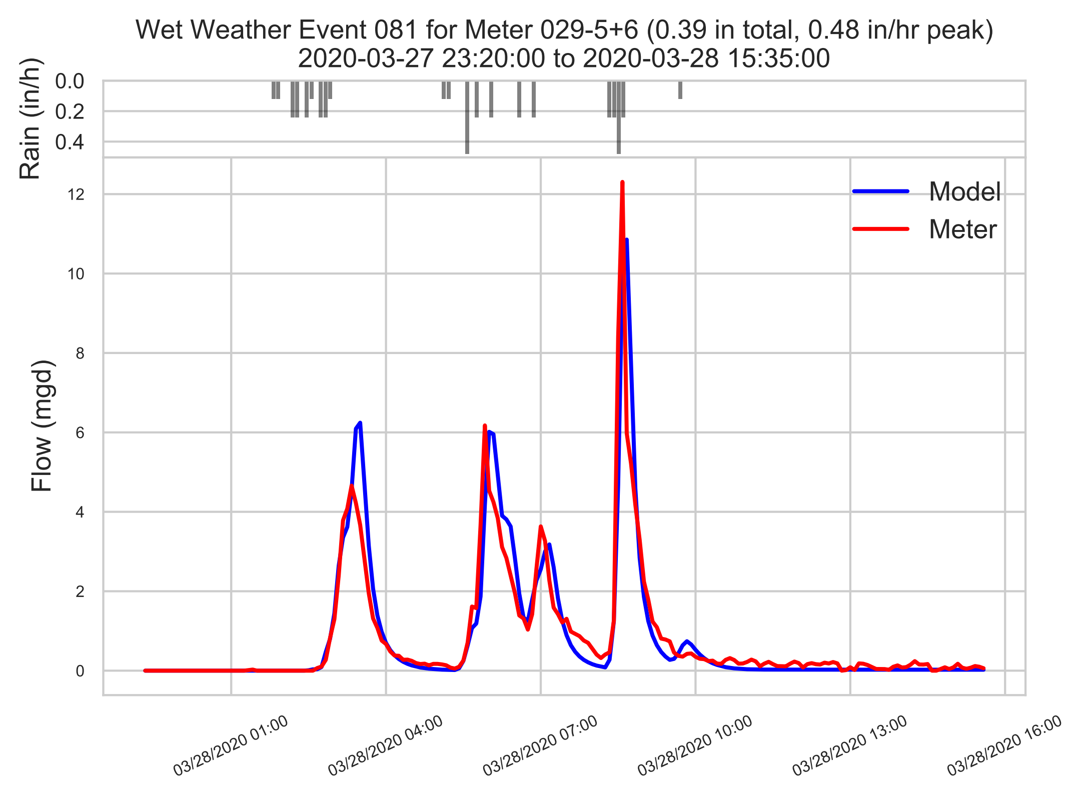


Wet Weather Event 078 for Meter 029-5+6 (0.04 in total, 0.24 in/hr peak)
2020-03-21 01:00:00 to 2020-03-21 11:10:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
03/21/2020 01:00
03/21/2020 04:00
03/21/2020 07:00
03/21/2020 10:00



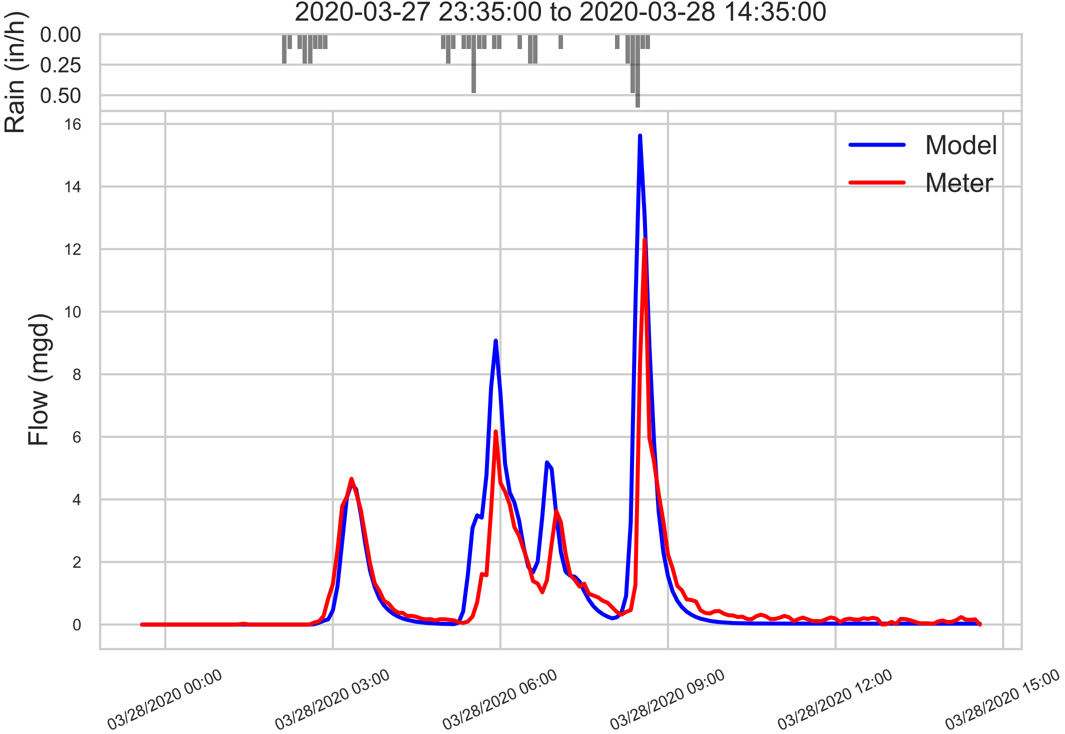
Wet Weather Event 079 for Meter 029-5+6 (0.31 in total, 0.24 in/hr peak)
2020-03-22 23:05:00 to 2020-03-23 22:45:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
Model
Meter
03/22/2020 22:00
03/23/2020 01:00
03/23/2020 04:00
03/23/2020 07:00
03/23/2020 10:00
03/23/2020 13:00
03/23/2020 16:00
03/23/2020 19:00
03/23/2020 22:00

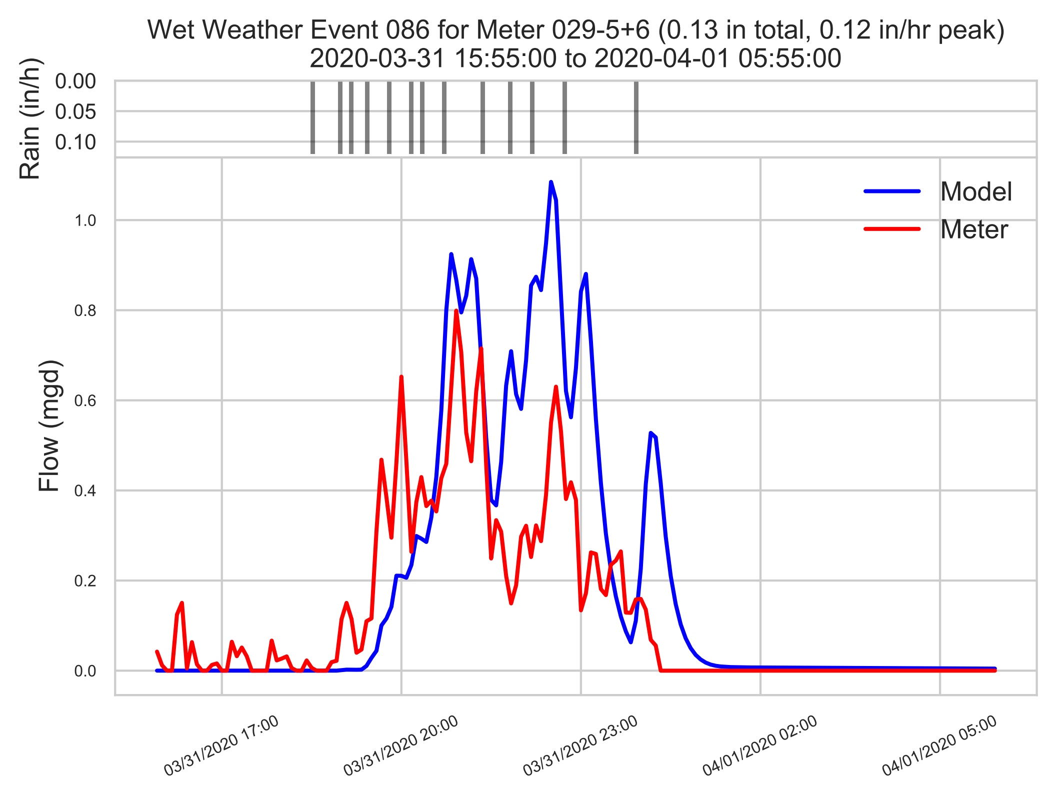

Wet Weather Event 080 for Meter 029-5+6 (0.22 in total, 0.24 in/hr peak)
2020-03-25 03:50:00 to 2020-03-25 19:05:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
Model
Meter
03/25/2020 04:00
03/25/2020 07:00
03/25/2020 10:00
03/25/2020 13:00
03/25/2020 16:00
03/25/2020 19:00



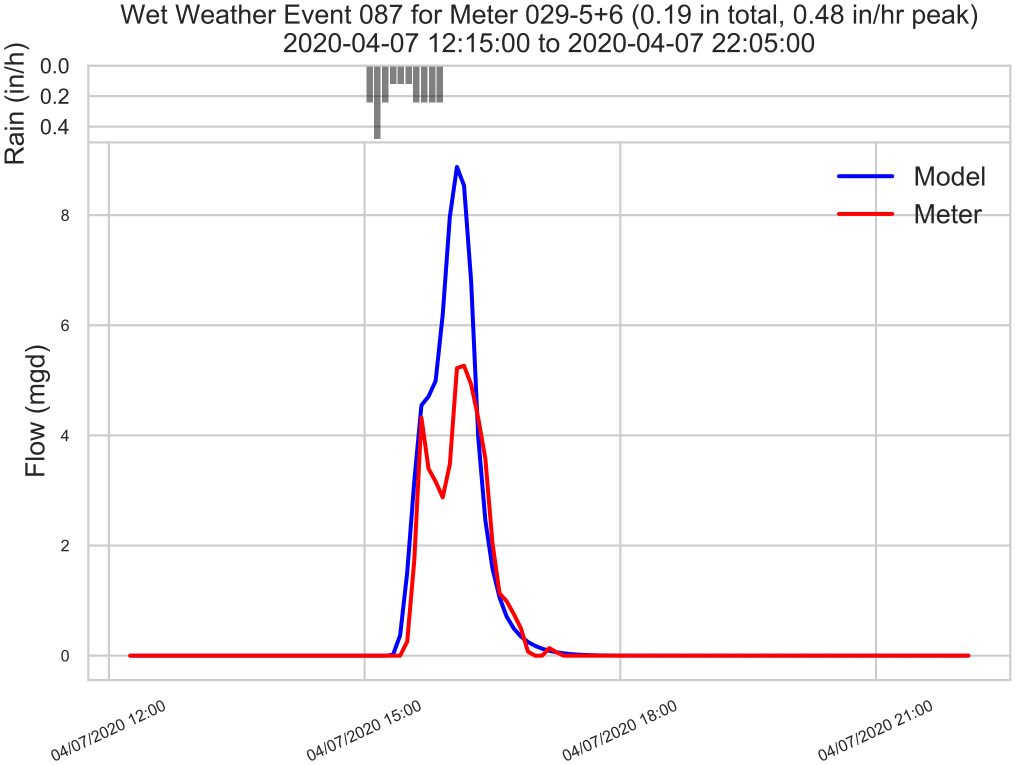
Wet Weather Event 081 for Meter 029-5+6 (0.39 in total, 0.48 in/hr peak)
2020-03-27 23:20:00 to 2020-03-28 15:35:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
2
4
6
8
10
12
Model
Meter
03/28/2020 01:00
03/28/2020 04:00
03/28/2020 07:00
03/28/2020 10:00
03/28/2020 13:00
03/28/2020 16:00

Wet Weather Event 085 for Meter 029-5+6 (0.45 in total, 0.6 in/hr peak)
2020-03-27 23:35:00 to 2020-03-28 14:35:00



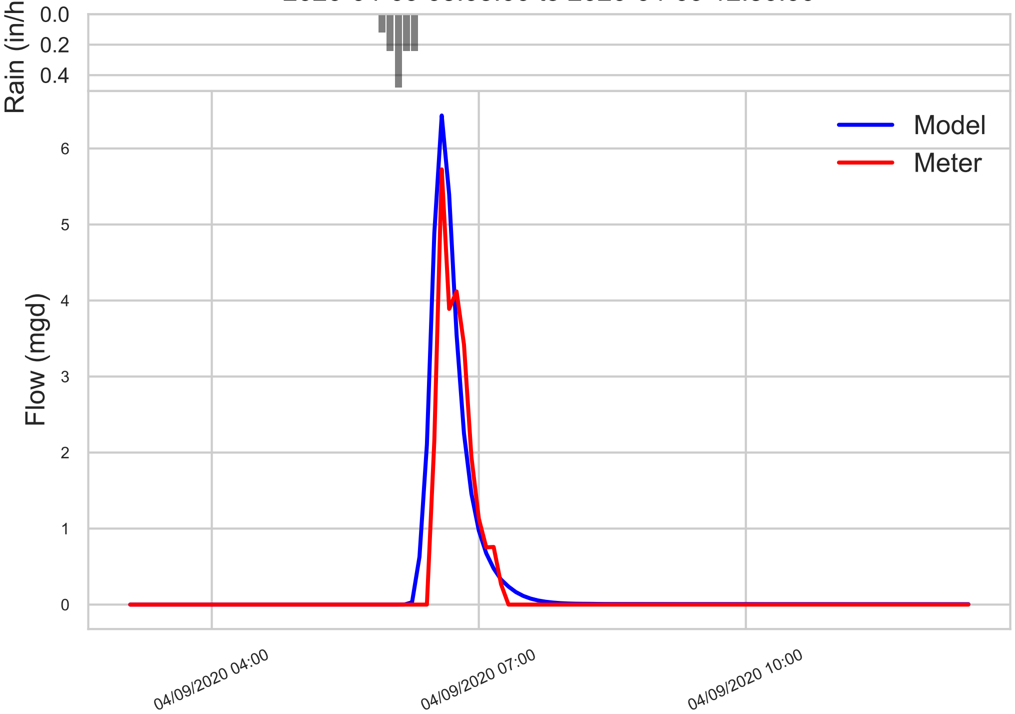


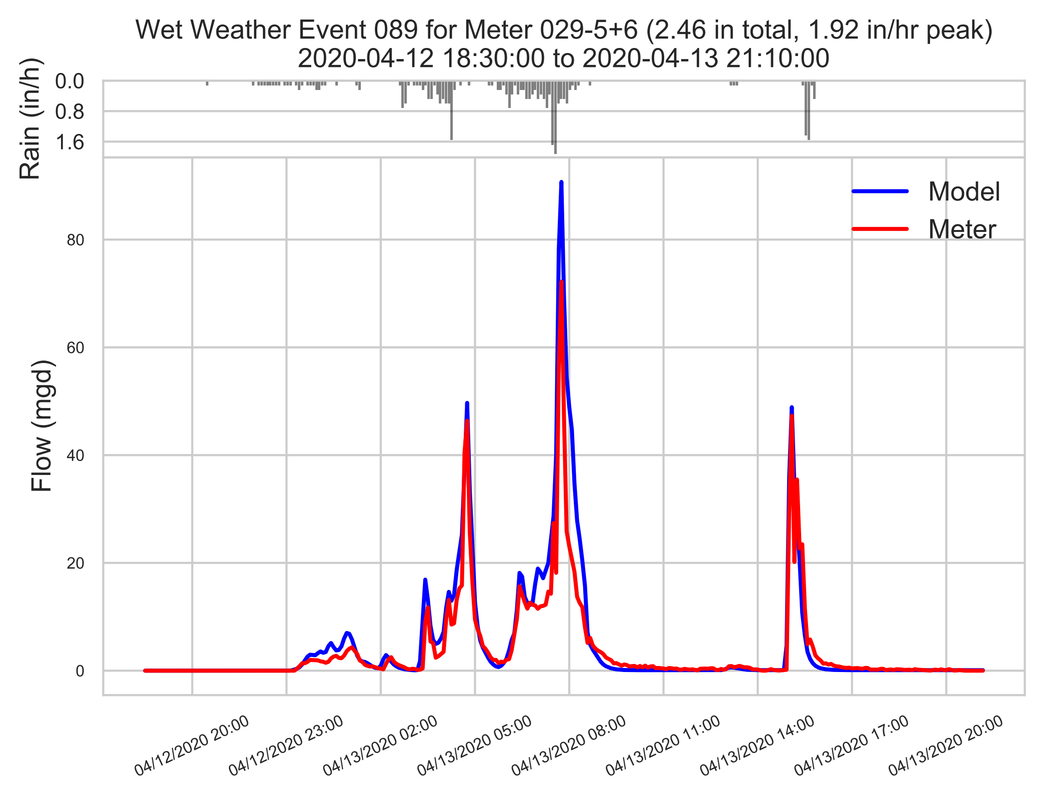
Wet Weather Event 086 for Meter 029-5+6 (0.13 in total, 0.12 in/hr peak)
2020-03-31 15:55:00 to 2020-04-01 05:55:00
Rain (in/h)
0.00
0.05
0.10
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
0.0
Model
Meter
03/31/2020 17:00
03/31/2020 20:00
03/31/2020 23:00
04/01/2020 02:00
04/01/2020 05:00



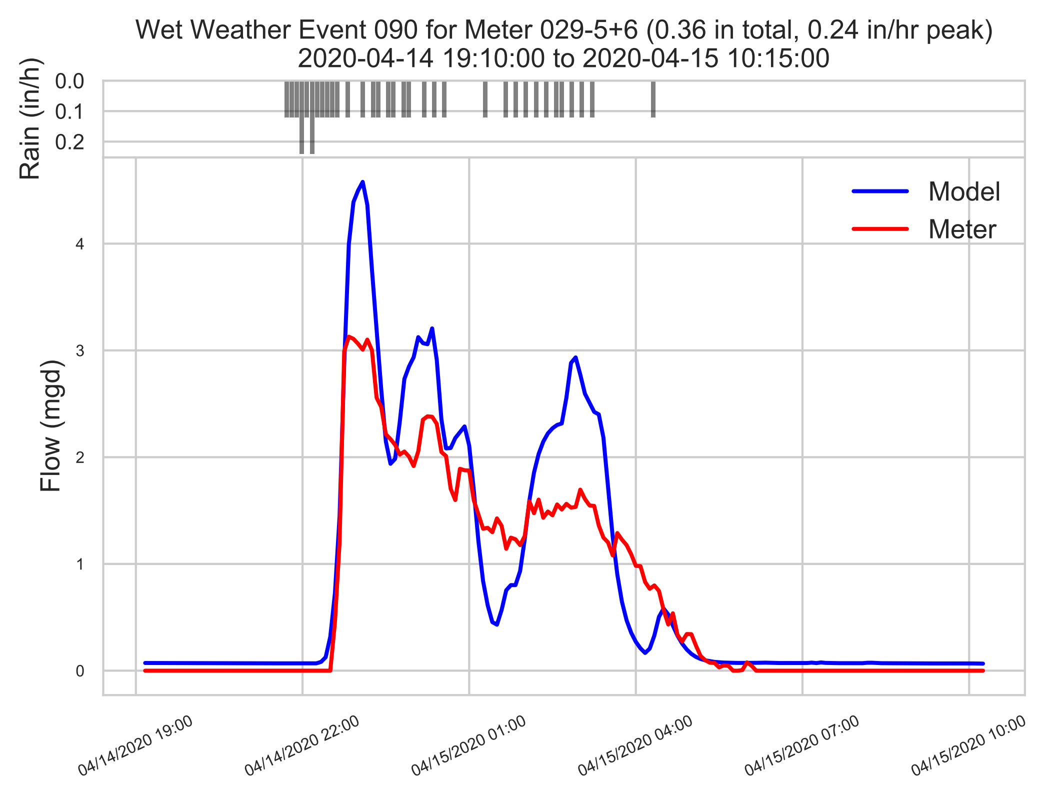
Wet Weather Event 087 for Meter 029-5+6 (0.19 in total, 0.48 in/hr peak)
2020-04-07 12:15:00 to 2020-04-07 22:05:00
Rain (in/h)
0.0
0.2
0.4
Flow (mgd)
0
2
4
6
8
Model
Meter
04/07/2020 12:00
04/07/2020 15:00
04/07/2020 18:00
04/07/2020 21:00

Wet Weather Event 088 for Meter 029-5+6 (0.11 in total, 0.48 in/hr peak)
2020-04-09 03:05:00 to 2020-04-09 12:30:00





Wet Weather Event 089 for Meter 029-5+6 (2.46 in total, 1.92 in/hr peak)
2020-04-12 18:30:00 to 2020-04-13 21:10:00
Rain (in/h)
0.0
0.8
1.6
Flow (mgd)
0
20
40
60
80
Model
Meter
04/12/2020 20:00
04/12/2020 23:00
04/13/2020 02:00
04/13/2020 05:00
04/13/2020 08:00
04/13/2020 11:00
04/13/2020 14:00
04/13/2020 17:00
04/13/2020 20:00



Wet Weather Event 090 for Meter 029-5+6 (0.36 in total, 0.24 in/hr peak)
2020-04-14 19:10:00 to 2020-04-15 10:15:00
Rain (in/h)
0.0
0.1
0.2
Flow (mgd)
0
1
2
3
4
Model
Meter
04/14/2020 19:00
04/14/2020 22:00
04/15/2020 01:00
04/15/2020 04:00
04/15/2020 07:00
04/15/2020 10:00

# Appendix D

# Monitoring Timeseries for Entire Post-Construction Metering Time Period

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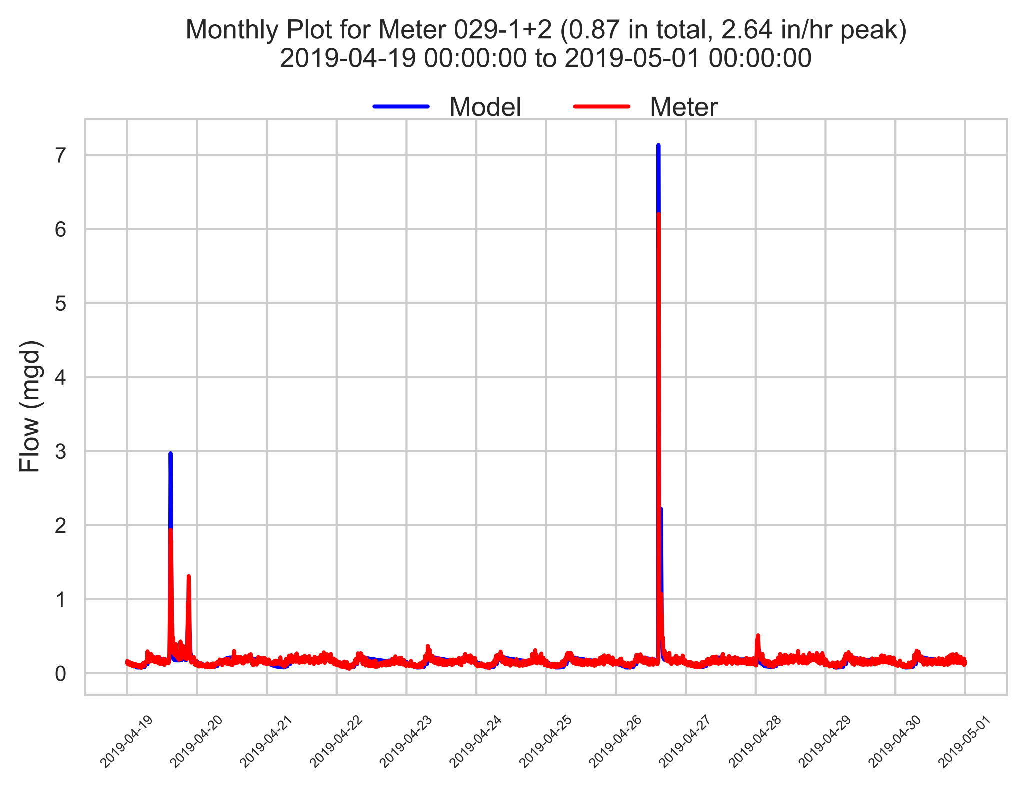
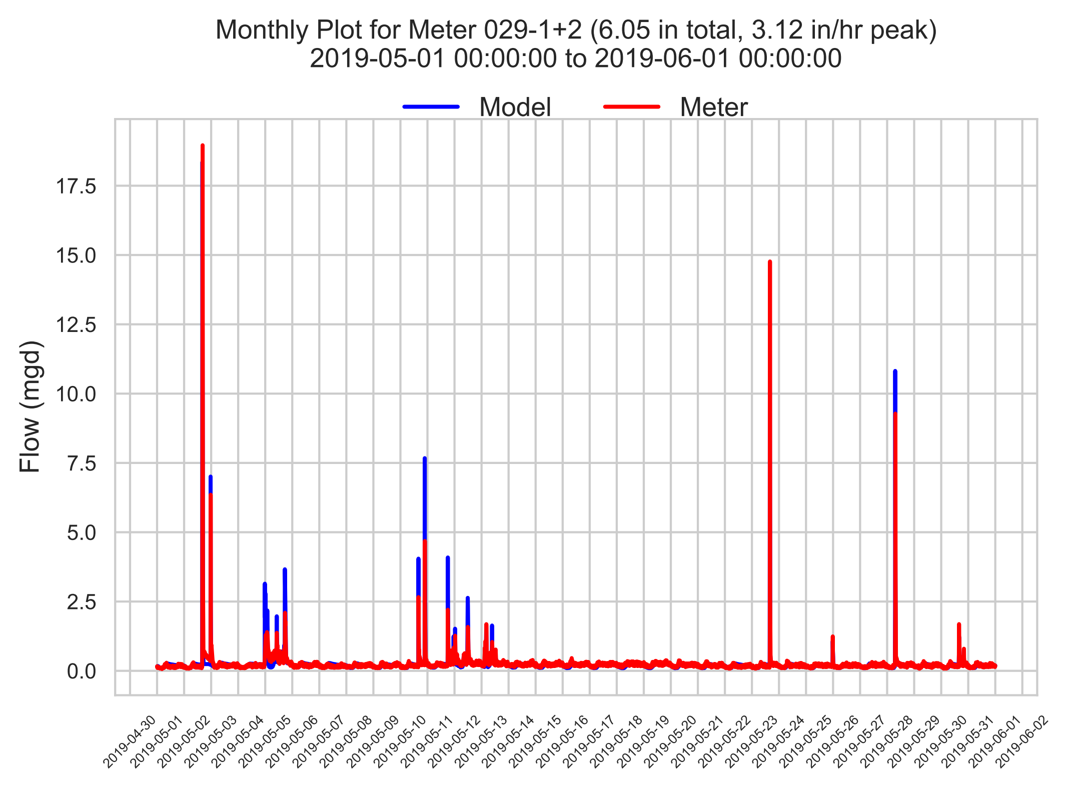
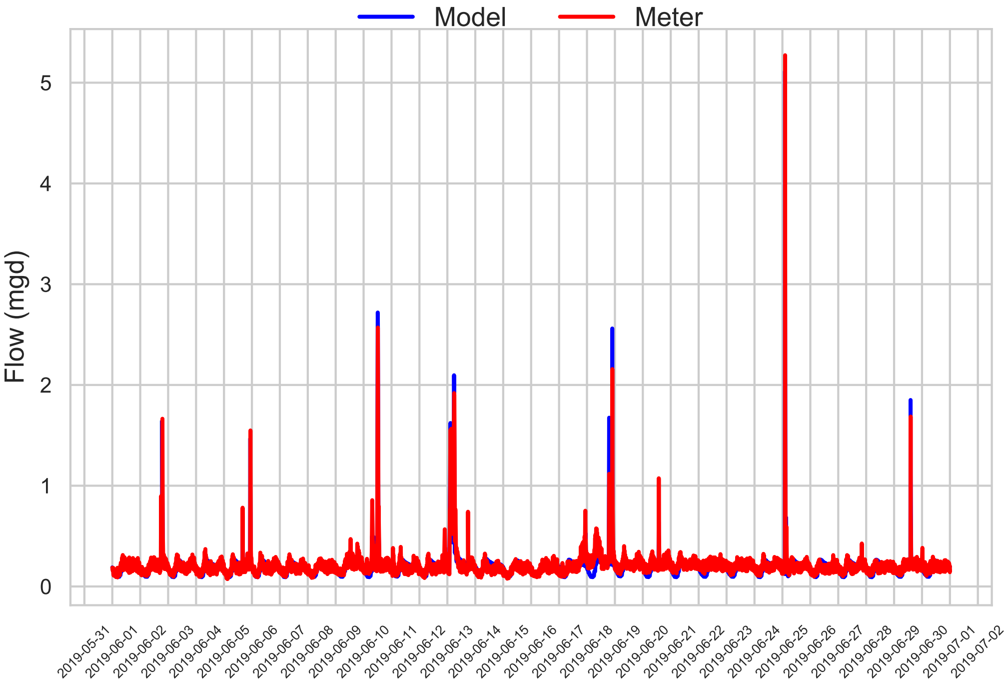
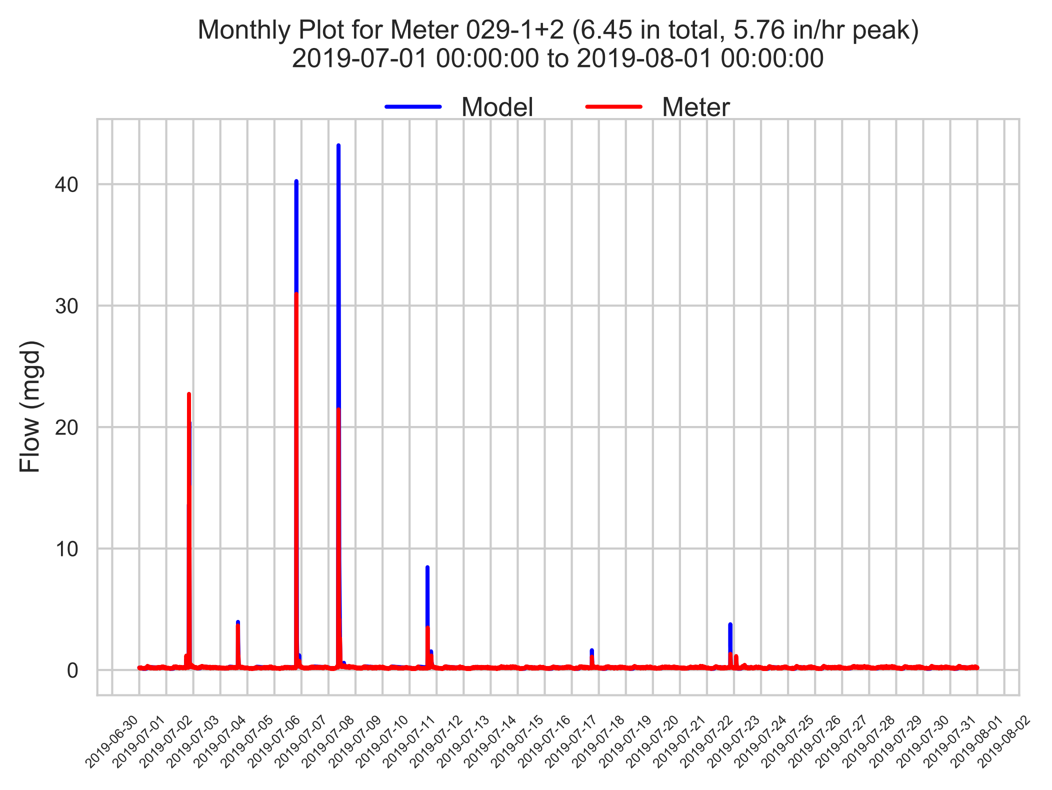

Monthly Plot for Meter 029-1+2 (0.87 in total, 2.64 in/hr peak)
2019-04-19 00:00:00 to 2019-05-01 00:00:00
Model
Meter
Flow (mgd)
0
1
2
3
4
5
6
7
2019-04-19
2019-04-20
2019-04-21
2019-04-22
2019-04-23
2019-04-24
2019-04-25
2019-04-26
2019-04-27
2019-04-28
2019-04-29
2019-04-30
2019-05-01


Monthly Plot for Meter 029-1+2 (6.05 in total, 3.12 in/hr peak)
2019-05-01 00:00:00 to 2019-06-01 00:00:00
Model
Meter
Flow (mgd)
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
2019-04-30
2019-05-01
2019-05-02
2019-05-03
2019-05-04
2019-05-05
2019-05-06
2019-05-07
2019-05-08
2019-05-09
2019-05-10
2019-05-11
2019-05-12
2019-05-13
2019-05-14
2019-05-15
2019-05-16
2019-05-17
2019-05-18
2019-05-19
2019-05-20
2019-05-21
2019-05-22
2019-05-23
2019-05-24
2019-05-25
2019-05-26
2019-05-27
2019-05-28
2019-05-29
2019-05-30
2019-05-31
2019-06-01
2019-06-02

Monthly Plot for Meter 029-1+2 (2.78 in total, 1.92 in/hr peak)
2019-06-01 00:00:00 to 2019-07-01 00:00:00





Monthly Plot for Meter 029-1+2 (6.45 in total, 5.76 in/hr peak)
2019-07-01 00:00:00 to 2019-08-01 00:00:00
Model
Meter
Flow (mgd)
0
10
20
30
40
2019-06-30
2019-07-01
2019-07-02
2019-07-03
2019-07-04
2019-07-05
2019-07-06
2019-07-07
2019-07-08
2019-07-09
2019-07-10
2019-07-11
2019-07-12
2019-07-13
2019-07-14
2019-07-15
2019-07-16
2019-07-17
2019-07-18
2019-07-19
2019-07-20
2019-07-21
2019-07-22
2019-07-23
2019-07-24
2019-07-25
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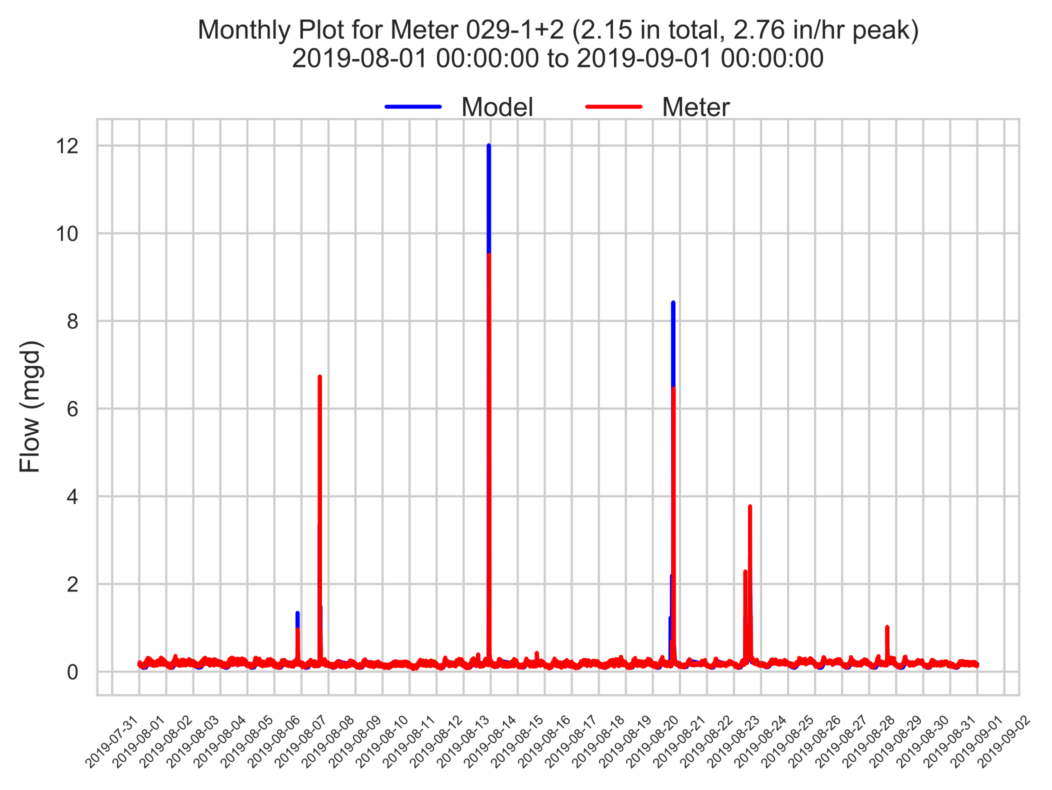
2019-07-27
2019-07-28
2019-07-29
2019-07-30
2019-07-31
2019-08-01
2019-08-02



Monthly Plot for Meter 029-1+2 (2.15 in total, 2.76 in/hr peak)
2019-08-01 00:00:00 to 2019-09-01 00:00:00
Model
Meter
Flow (mgd)
0
2
4
6
8
10
12
2019-07-31
2019-08-01
2019-08-02
2019-08-03
2019-08-04
2019-08-05
2019-08-06
2019-08-07
2019-08-08
2019-08-09
2019-08-10
2019-08-11
2019-08-12
2019-08-13
2019-08-14
2019-08-15
2019-08-16
2019-08-17
2019-08-18
2019-08-19
2019-08-20
2019-08-21
2019-08-22
2019-08-23
2019-08-24
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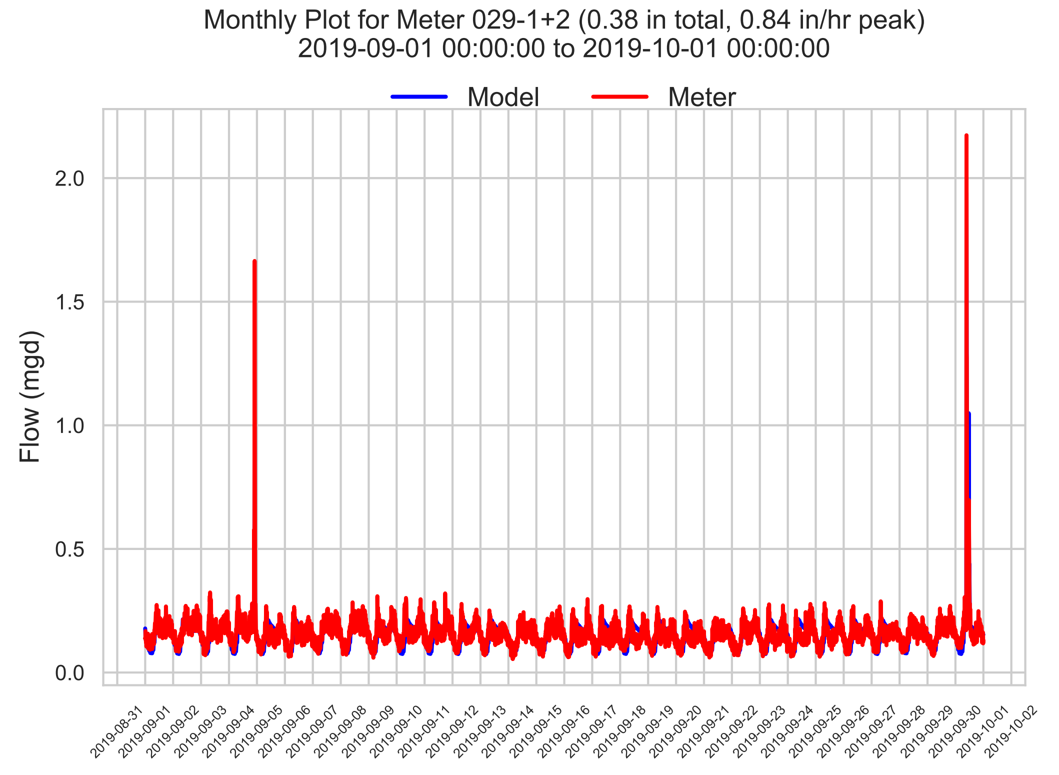
2019-08-30
2019-08-31
2019-09-01
2019-09-02



Monthly Plot for Meter 029-1+2 (0.38 in total, 0.84 in/hr peak)
2019-09-01 00:00:00 to 2019-10-01 00:00:00
Model
Meter
Flow (mgd)
0.0
0.5
1.0
1.5
2.0
2019-08-31
2019-09-01
2019-09-02
2019-09-03
2019-09-04
2019-09-05
2019-09-06
2019-09-07
2019-09-08
2019-09-09
2019-09-10
2019-09-11
2019-09-12
2019-09-13
2019-09-14
2019-09-15
2019-09-16
2019-09-17
2019-09-18
2019-09-19
2019-09-20
2019-09-21
2019-09-22
2019-09-23
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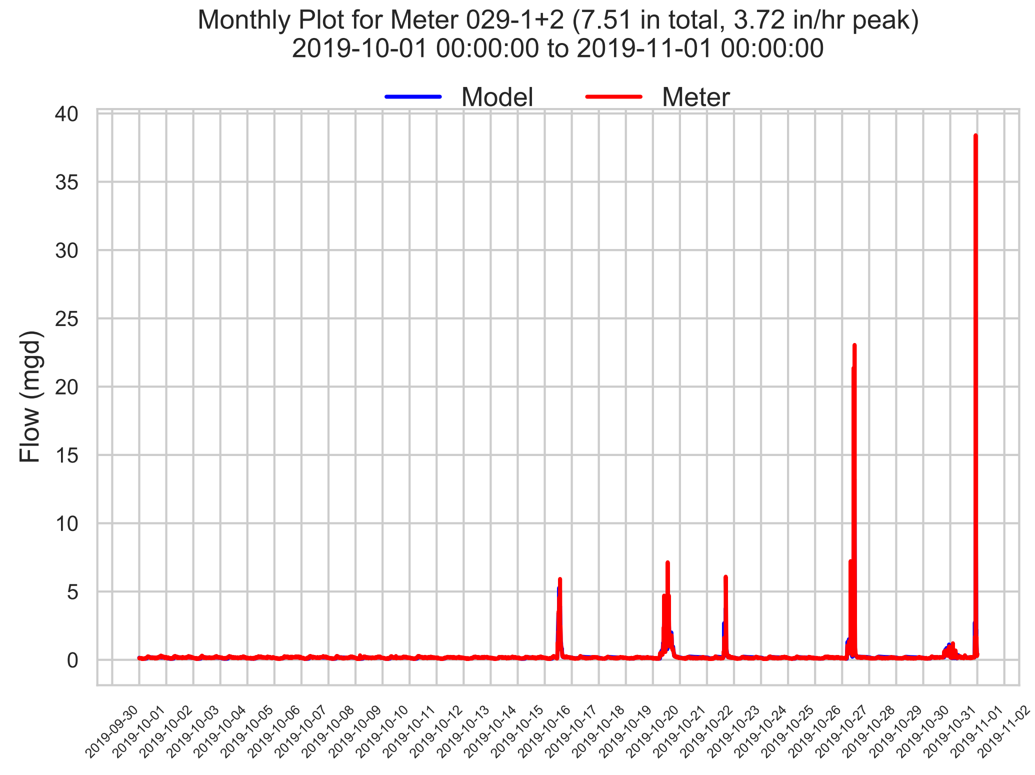
2019-09-28
2019-09-29
2019-09-30
2019-10-01
2019-10-02



Monthly Plot for Meter 029-1+2 (7.51 in total, 3.72 in/hr peak)
2019-10-01 00:00:00 to 2019-11-01 00:00:00
Model
Meter
Flow (mgd)
0
5
10
15
20
25
30
35
40
2019-09-30
2019-10-01
2019-10-02
2019-10-03
2019-10-04
2019-10-05
2019-10-06
2019-10-07
2019-10-08
2019-10-09
2019-10-10
2019-10-11
2019-10-12
2019-10-13
2019-10-14
2019-10-15
2019-10-16
2019-10-17
2019-10-18
2019-10-19
2019-10-20
2019-10-21
2019-10-22
2019-10-23
2019-10-24
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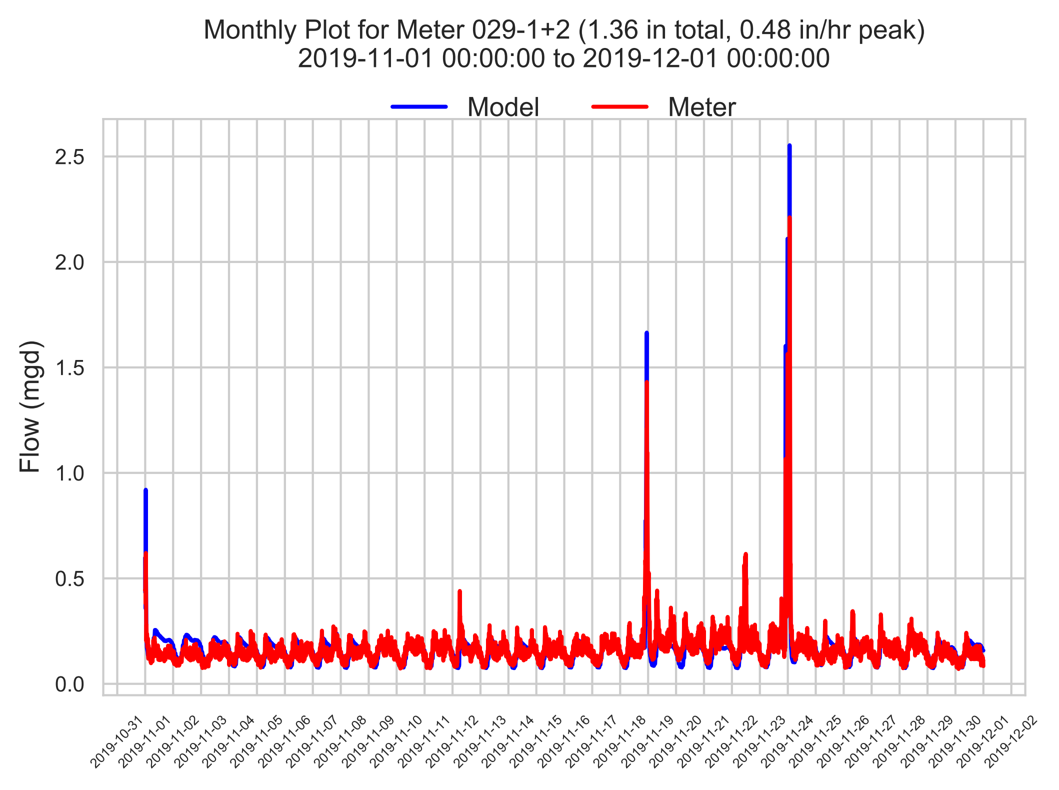
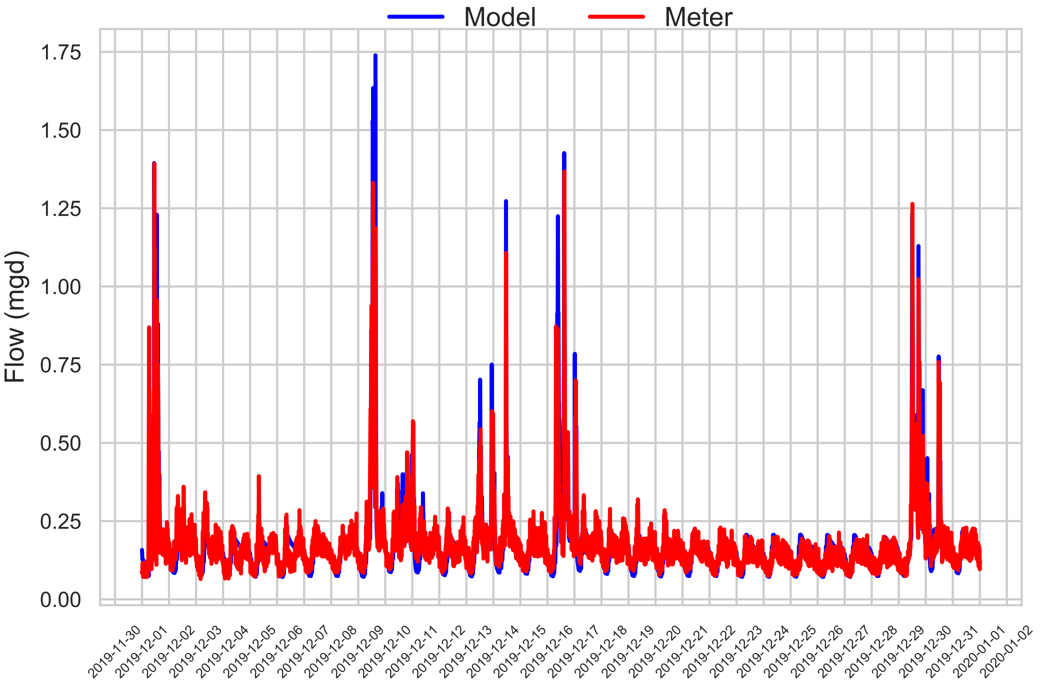
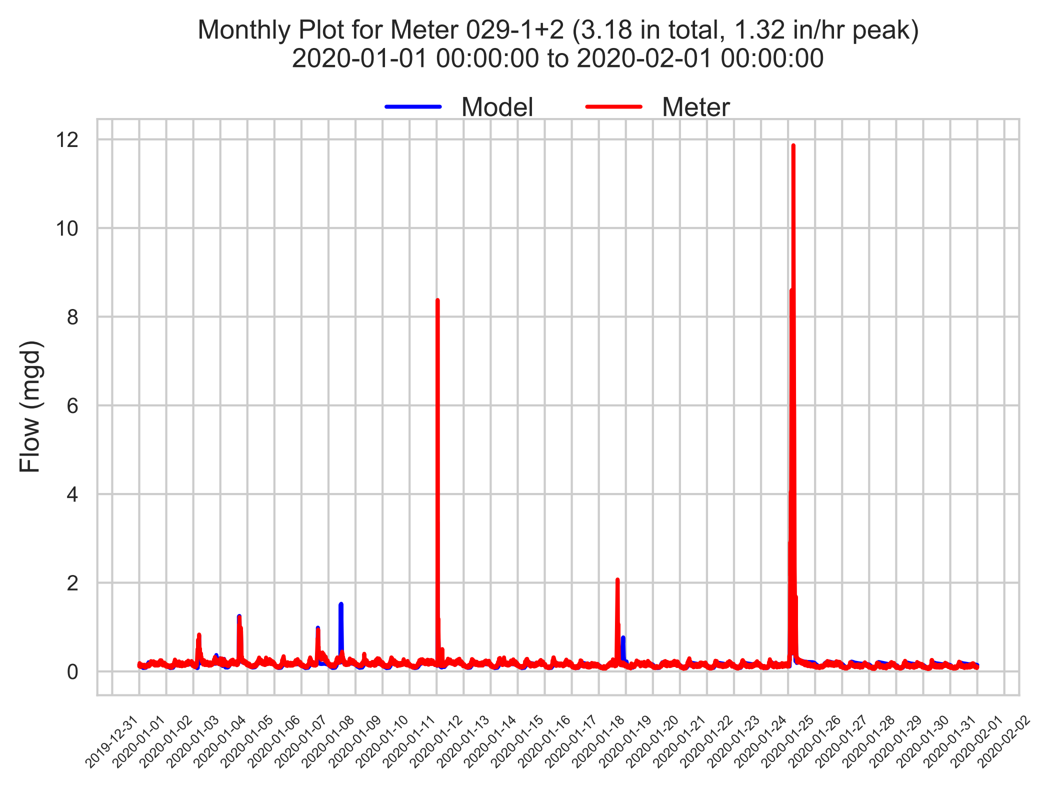
2019-10-28
2019-10-29
2019-10-30
2019-10-31
2019-11-01
2019-11-02



Monthly Plot for Meter 029-1+2 (1.36 in total, 0.48 in/hr peak)
2019-11-01 00:00:00 to 2019-12-01 00:00:00
Model
Meter
Flow (mgd)
0.0
0.5
1.0
1.5
2.0
2.5
2019-10-31
2019-11-01
2019-11-02
2019-11-03
2019-11-04
2019-11-05
2019-11-06
2019-11-07
2019-11-08
2019-11-09
2019-11-10
2019-11-11
2019-11-12
2019-11-13
2019-11-14
2019-11-15
2019-11-16
2019-11-17
2019-11-18
2019-11-19
2019-11-20
2019-11-21
2019-11-22
2019-11-23
2019-11-24
2019-11-25
2019-11-26
2019-11-27
2019-11-28
2019-11-29
2019-11-30
2019-12-01
2019-12-02

Monthly Plot for Meter 029-1+2 (3.19 in total, 0.48 in/hr peak)
2019-12-01 00:00:00 to 2020-01-01 00:00:00





Monthly Plot for Meter 029-1+2 (3.18 in total, 1.32 in/hr peak)
2020-01-01 00:00:00 to 2020-02-01 00:00:00
Model
Meter
Flow (mgd)
0
2
4
6
8
10
12
2019-12-31
2020-01-01
2020-01-02
2020-01-03
2020-01-04
2020-01-05
2020-01-06
2020-01-07
2020-01-08
2020-01-09
2020-01-10
2020-01-11
2020-01-12
2020-01-13
2020-01-14
2020-01-15
2020-01-16
2020-01-17
2020-01-18
2020-01-19
2020-01-20
2020-01-21
2020-01-22
2020-01-23
2020-01-24
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2020-01-28
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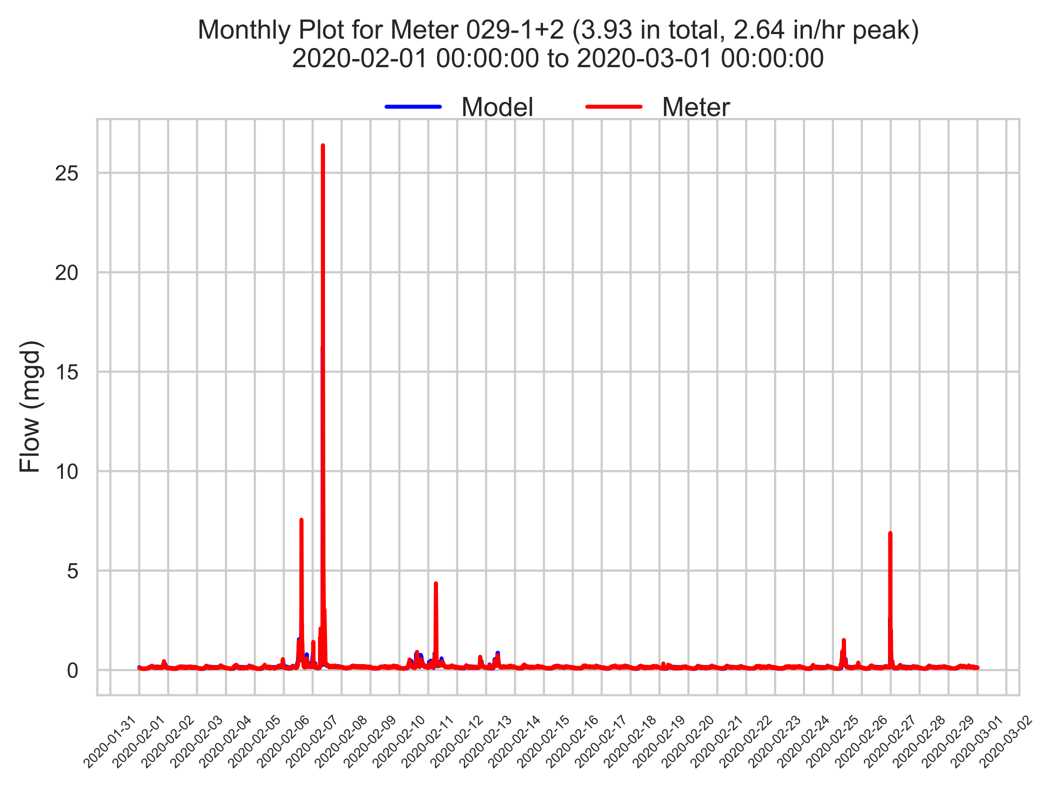
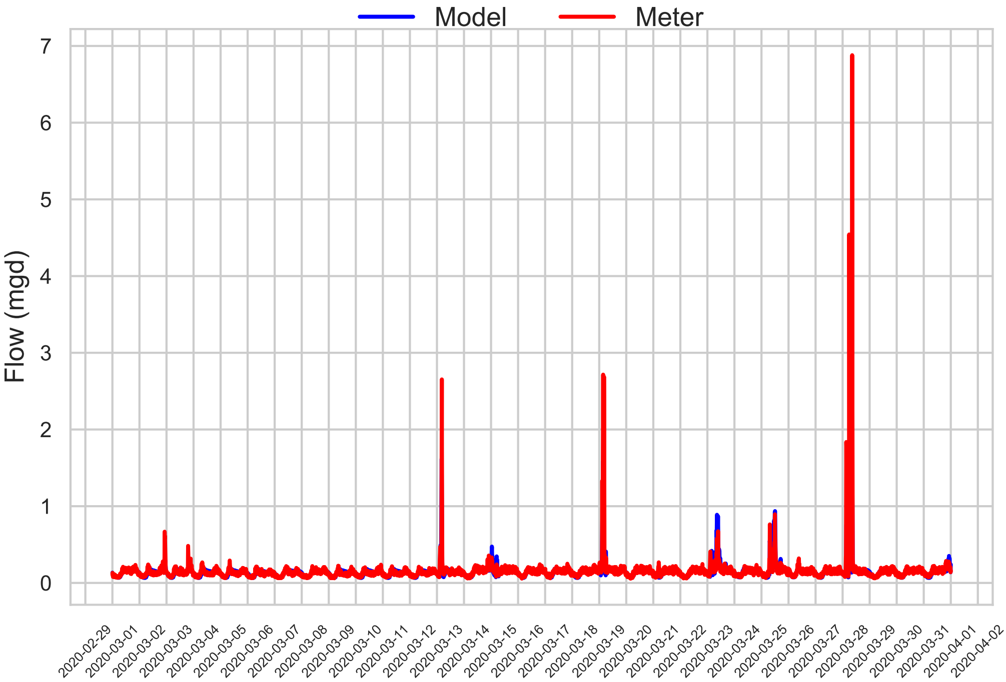
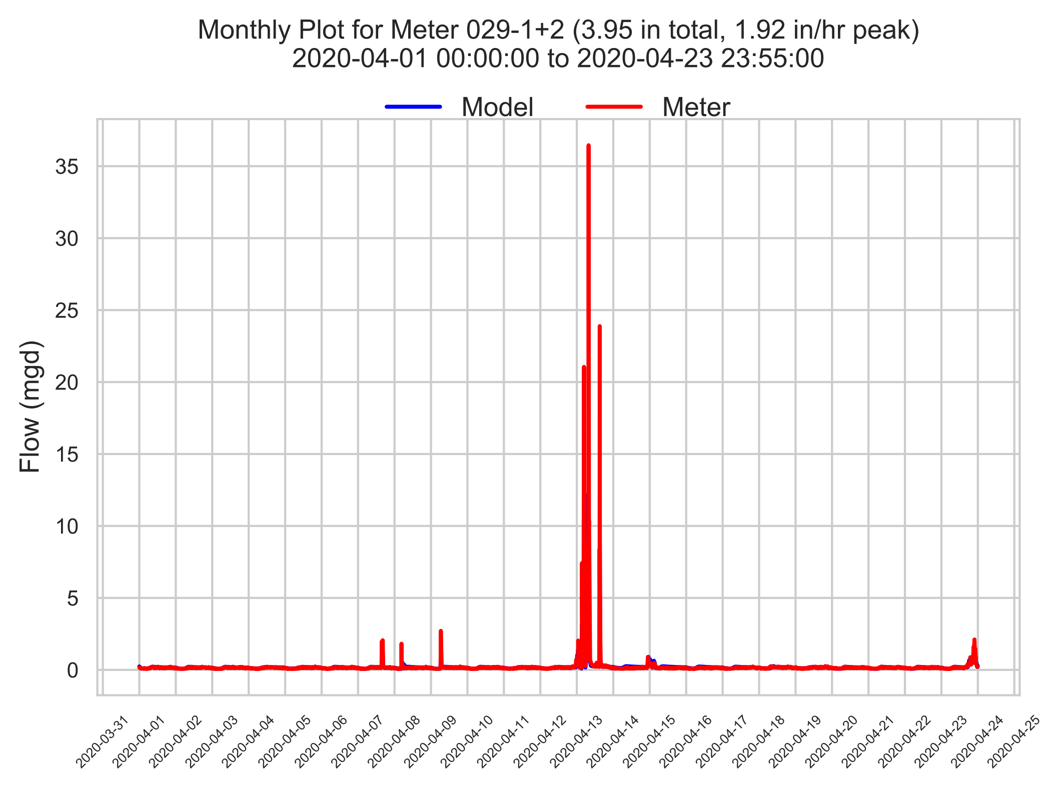
2020-01-30
2020-01-31
2020-02-01
2020-02-02



Monthly Plot for Meter 029-1+2 (3.93 in total, 2.64 in/hr peak)
2020-02-01 00:00:00 to 2020-03-01 00:00:00
Model
Meter
Flow (mgd)
0
5
10
15
20
25
2020-01-31
2020-02-01
2020-02-02
2020-02-03
2020-02-04
2020-02-05
2020-02-06
2020-02-07
2020-02-08
2020-02-09
2020-02-10
2020-02-11
2020-02-12
2020-02-13
2020-02-14
2020-02-15
2020-02-16
2020-02-17
2020-02-18
2020-02-19
2020-02-20
2020-02-21
2020-02-22
2020-02-23
2020-02-24
2020-02-25
2020-02-26
2020-02-27
2020-02-28
2020-02-29
2020-03-01
2020-03-02

Monthly Plot for Meter 029-1+2 (2.46 in total, 0.6 in/hr peak)
2020-03-01 00:00:00 to 2020-04-01 00:00:00





Monthly Plot for Meter 029-1+2 (3.95 in total, 1.92 in/hr peak)
2020-04-01 00:00:00 to 2020-04-23 23:55:00
Model
Meter
Flow (mgd)
0
5
10
15
20
25
30
35
2020-03-31
2020-04-01
2020-04-02
2020-04-03
2020-04-04
2020-04-05
2020-04-06
2020-04-07
2020-04-08
2020-04-09
2020-04-10
2020-04-11
2020-04-12
2020-04-13
2020-04-14
2020-04-15
2020-04-16
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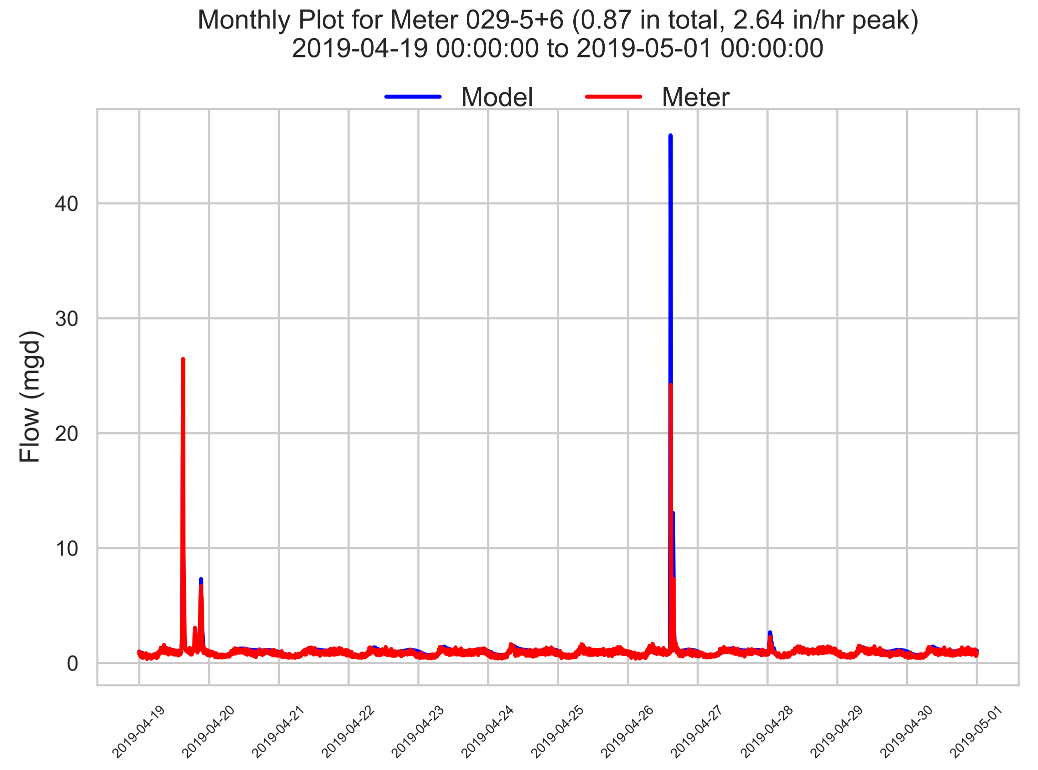
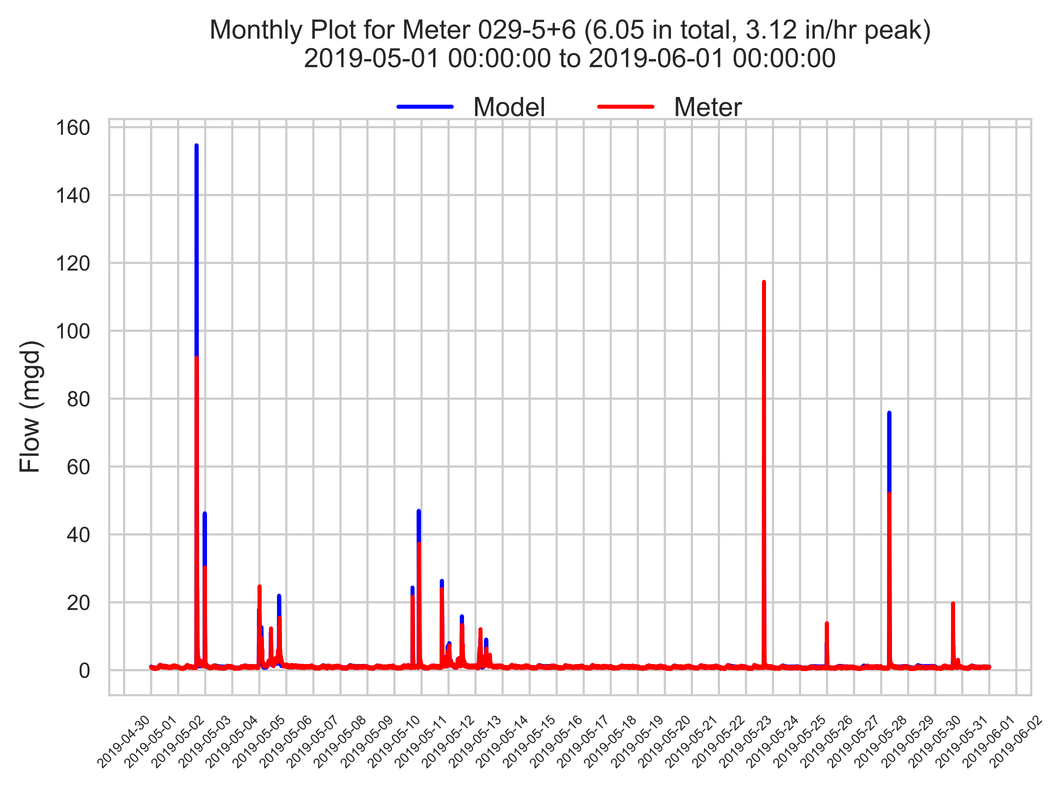
2020-04-24
2020-04-25


Monthly Plot for Meter 029-5+6 (0.87 in total, 2.64 in/hr peak)
2019-04-19 00:00:00 to 2019-05-01 00:00:00
Model
Meter
Flow (mgd)
0
10
20
30
40
2019-04-19
2019-04-20
2019-04-21
2019-04-22
2019-04-23
2019-04-24
2019-04-25
2019-04-26
2019-04-27
2019-04-28
2019-04-29
2019-04-30
2019-05-01


Monthly Plot for Meter 029-5+6 (6.05 in total, 3.12 in/hr peak)
2019-05-01 00:00:00 to 2019-06-01 00:00:00
Model
Meter
Flow (mgd)
0
20
40
60
80
100
120
140
160
2019-04-30
2019-05-01
2019-05-02
2019-05-03
2019-05-04
2019-05-05
2019-05-06
2019-05-07
2019-05-08
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2019-05-14
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2019-05-16
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2019-05-18
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2019-05-20
2019-05-21
2019-05-22
2019-05-23
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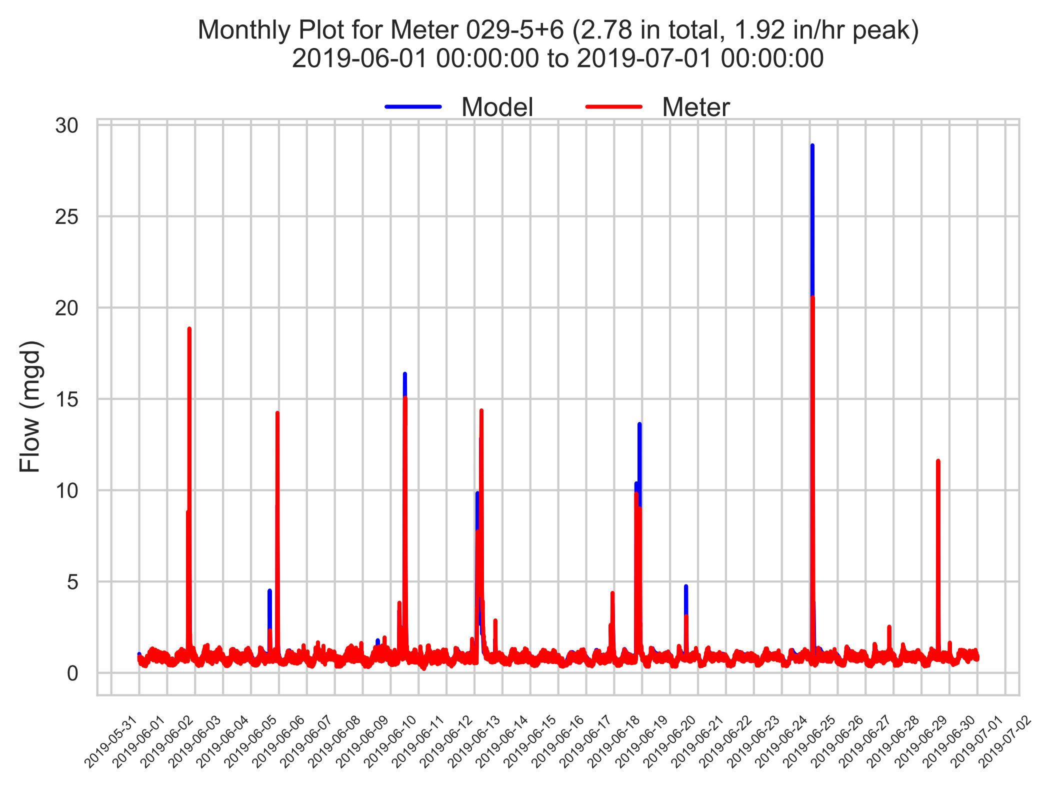
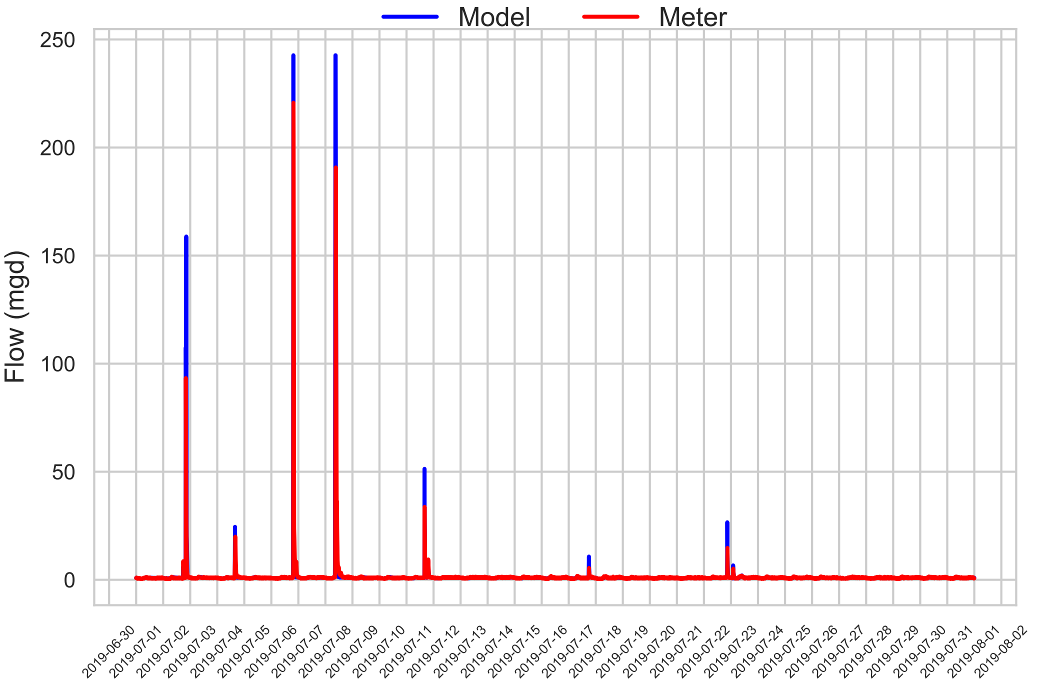
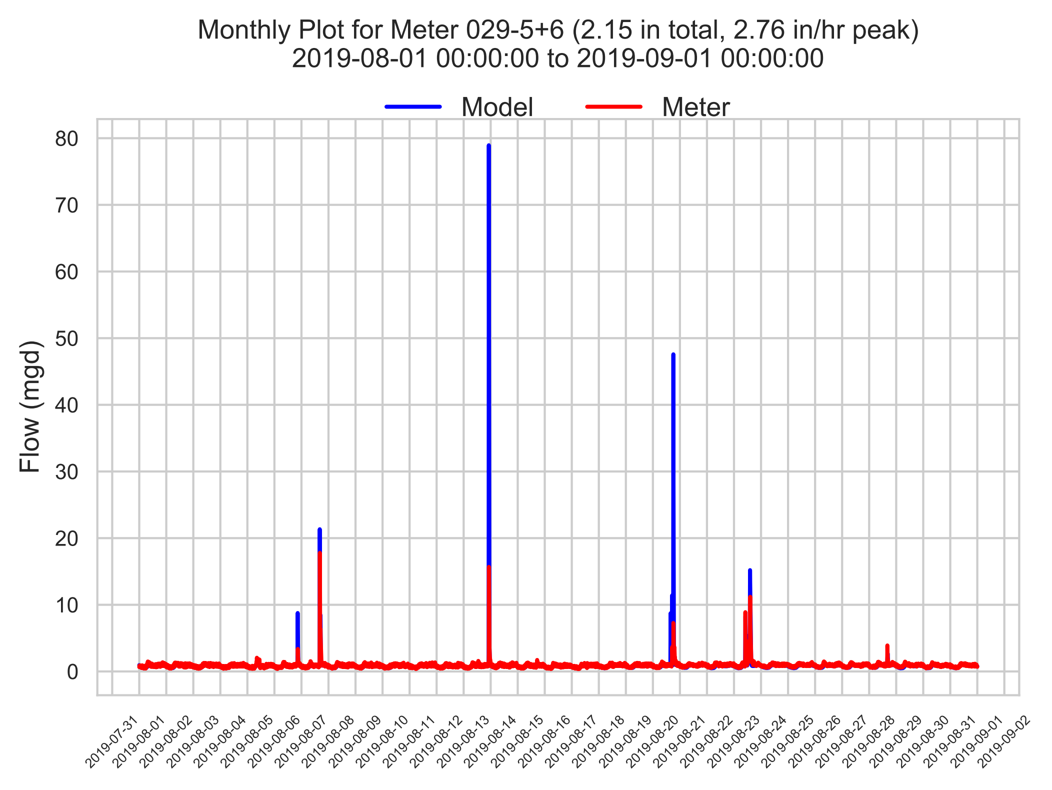
2019-05-31
2019-06-01
2019-06-02


Monthly Plot for Meter 029-5+6 (2.78 in total, 1.92 in/hr peak)
2019-06-01 00:00:00 to 2019-07-01 00:00:00
Model
Meter
Flow (mgd)
0
5
10
15
20
25
30
2019-05-31
2019-06-01
2019-06-02
2019-06-03
2019-06-04
2019-06-05
2019-06-06
2019-06-07
2019-06-08
2019-06-09
2019-06-10
2019-06-11
2019-06-12
2019-06-13
2019-06-14
2019-06-15
2019-06-16
2019-06-17
2019-06-18
2019-06-19
2019-06-20
2019-06-21
2019-06-22
2019-06-23
2019-06-24
2019-06-25
2019-06-26
2019-06-27
2019-06-28
2019-06-29
2019-06-30
2019-07-01
2019-07-02

Monthly Plot for Meter 029-5+6 (6.45 in total, 5.76 in/hr peak)
2019-07-01 00:00:00 to 2019-08-01 00:00:00





Monthly Plot for Meter 029-5+6 (2.15 in total, 2.76 in/hr peak)
2019-08-01 00:00:00 to 2019-09-01 00:00:00
Model
Meter
Flow (mgd)
0
10
20
30
40
50
60
70
80
2019-07-31
2019-08-01
2019-08-02
2019-08-03
2019-08-04
2019-08-05
2019-08-06
2019-08-07
2019-08-08
2019-08-09
2019-08-10
2019-08-11
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2019-08-14
2019-08-15
2019-08-16
2019-08-17
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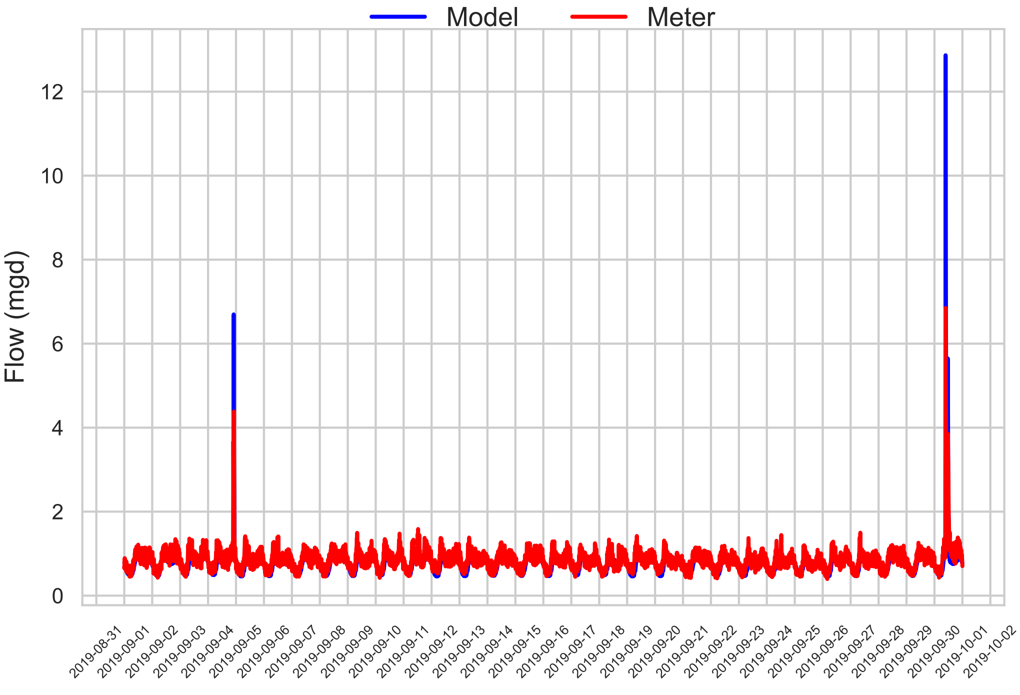
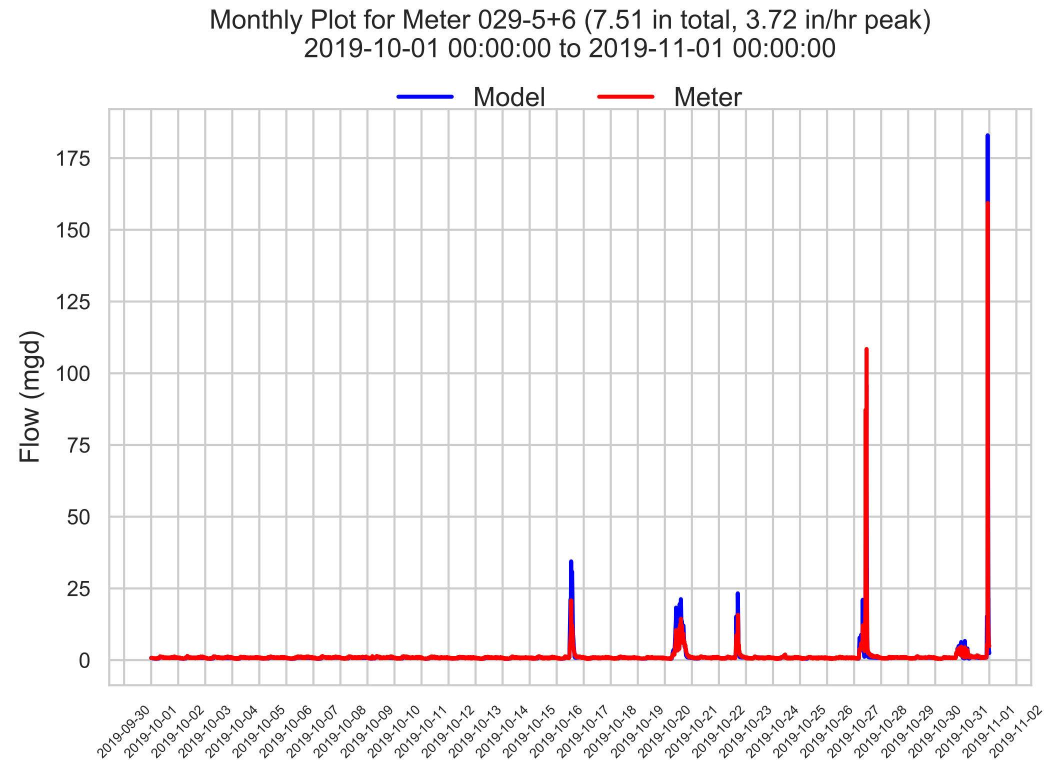
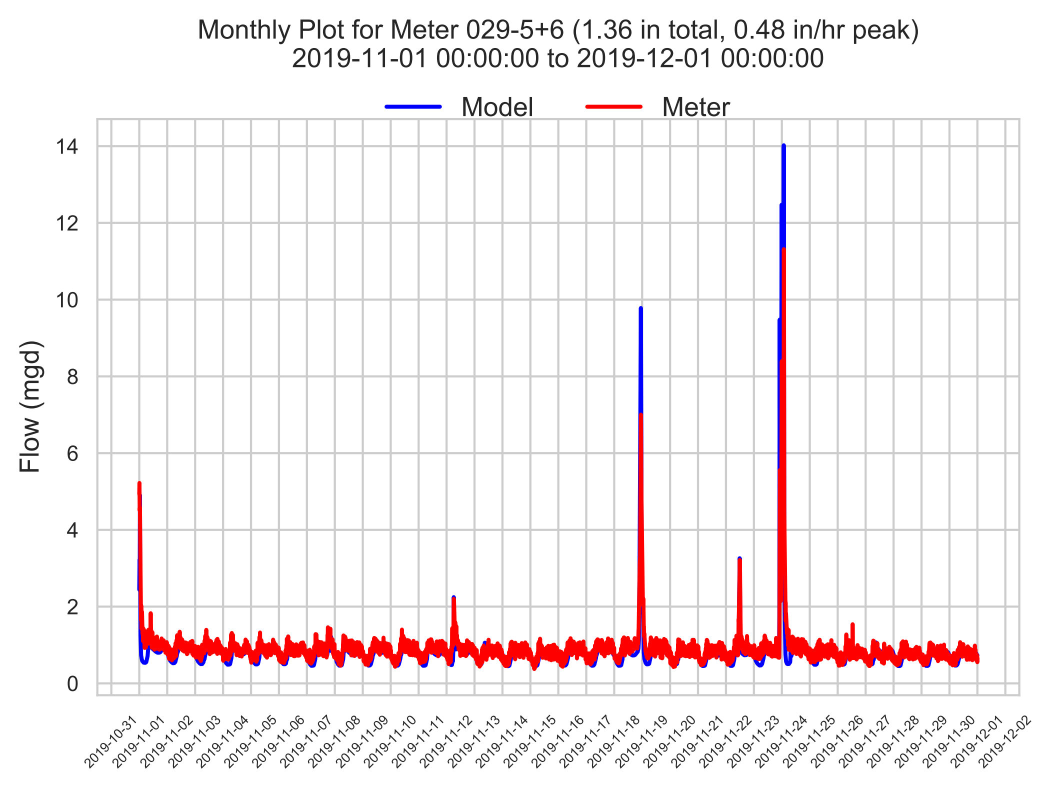
2019-08-19
2019-08-20
2019-08-21
2019-08-22
2019-08-23
2019-08-24
2019-08-25
2019-08-26
2019-08-27
2019-08-28
2019-08-29
2019-08-30
2019-08-31
2019-09-01
2019-09-02

Monthly Plot for Meter 029-5+6 (0.38 in total, 0.84 in/hr peak)
2019-09-01 00:00:00 to 2019-10-01 00:00:00



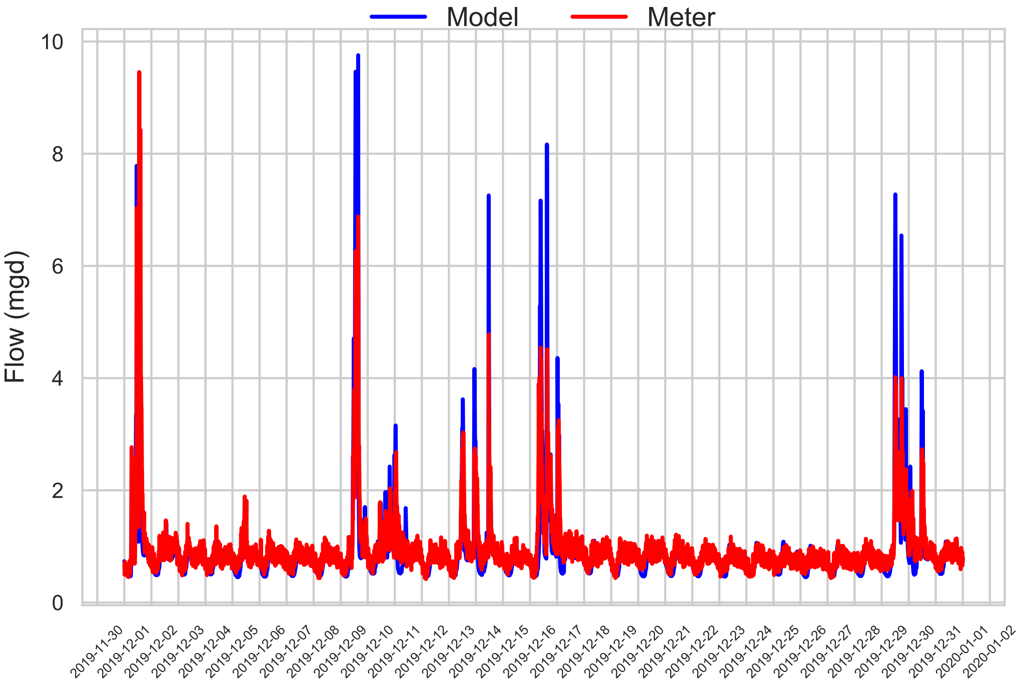


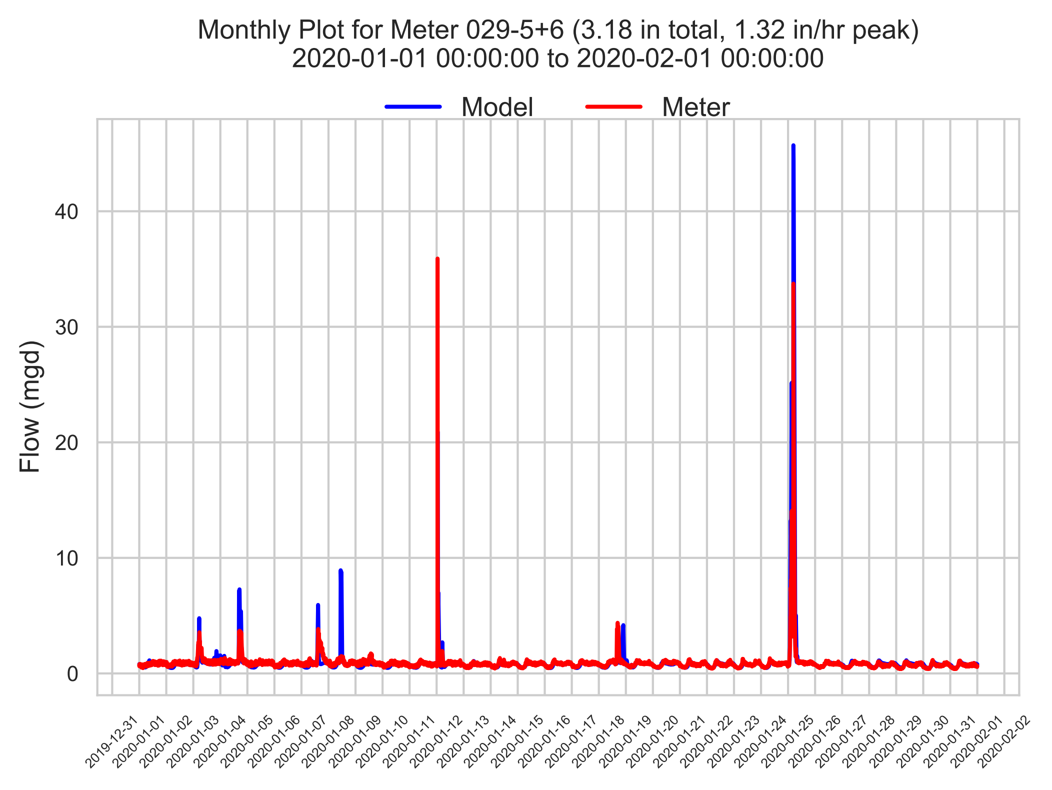
Monthly Plot for Meter 029-5+6 (7.51 in total, 3.72 in/hr peak)
2019-10-01 00:00:00 to 2019-11-01 00:00:00
Model
Meter
Flow (mgd)
0
25
50
75
100
125
150
175
2019-09-30
2019-10-01
2019-10-02
2019-10-03
2019-10-04
2019-10-05
2019-10-06
2019-10-07
2019-10-08
2019-10-09
2019-10-10
2019-10-11
2019-10-12
2019-10-13
2019-10-14
2019-10-15
2019-10-16
2019-10-17
2019-10-18
2019-10-19
2019-10-20
2019-10-21
2019-10-22
2019-10-23
2019-10-24
2019-10-25
2019-10-26
2019-10-27
2019-10-28
2019-10-29
2019-10-30
2019-10-31
2019-11-01
2019-11-02



Monthly Plot for Meter 029-5+6 (1.36 in total, 0.48 in/hr peak)
2019-11-01 00:00:00 to 2019-12-01 00:00:00
Model
Meter
Flow (mgd)
0
2
4
6
8
10
12
14
2019-10-31
2019-11-01
2019-11-02
2019-11-03
2019-11-04
2019-11-05
2019-11-06
2019-11-07
2019-11-08
2019-11-09
2019-11-10
2019-11-11
2019-11-12
2019-11-13
2019-11-14
2019-11-15
2019-11-16
2019-11-17
2019-11-18
2019-11-19
2019-11-20
2019-11-21
2019-11-22
2019-11-23
2019-11-24
2019-11-25
2019-11-26
2019-11-27
2019-11-28
2019-11-29
2019-11-30
2019-12-01
2019-12-02

Monthly Plot for Meter 029-5+6 (3.19 in total, 0.48 in/hr peak)
2019-12-01 00:00:00 to 2020-01-01 00:00:00





Monthly Plot for Meter 029-5+6 (3.18 in total, 1.32 in/hr peak)
2020-01-01 00:00:00 to 2020-02-01 00:00:00
Model
Meter
Flow (mgd)
0
10
20
30
40
2019-12-31
2020-01-01
2020-01-02
2020-01-03
2020-01-04
2020-01-05
2020-01-06
2020-01-07
2020-01-08
2020-01-09
2020-01-10
2020-01-11
2020-01-12
2020-01-13
2020-01-14
2020-01-15
2020-01-16
2020-01-17
2020-01-18
2020-01-19
2020-01-20
2020-01-21
2020-01-22
2020-01-23
2020-01-24
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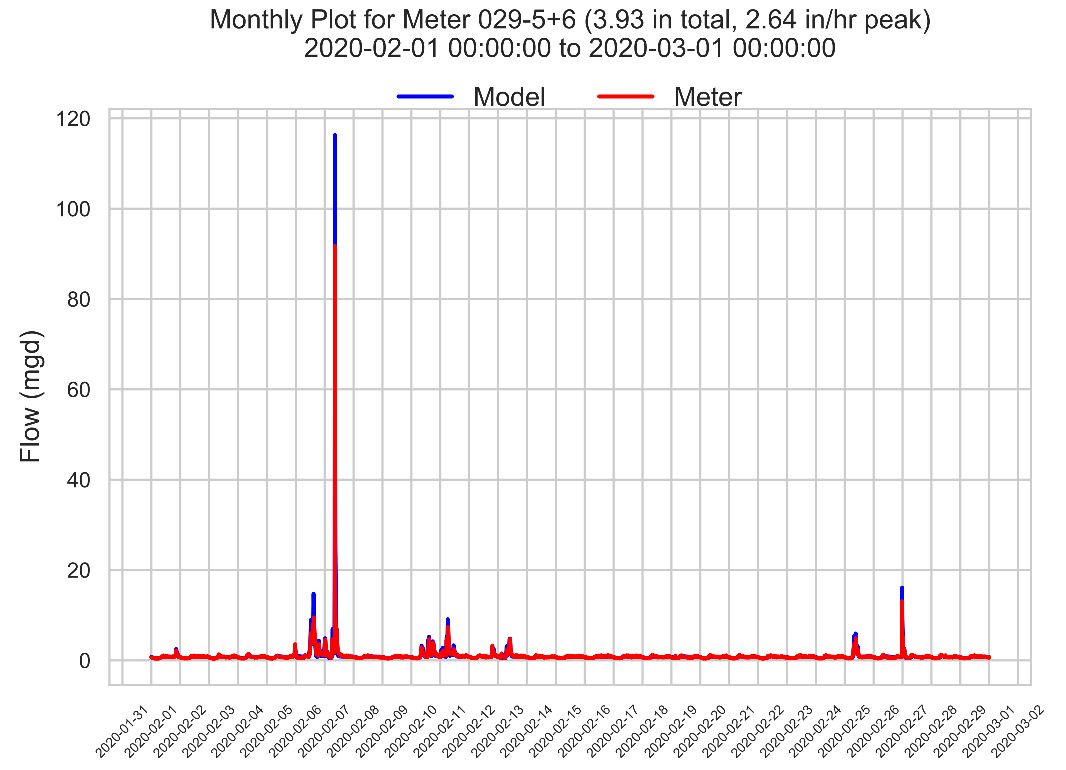
2020-02-01
2020-02-02


Monthly Plot for Meter 029-5+6 (3.93 in total, 2.64 in/hr peak)
2020-02-01 00:00:00 to 2020-03-01 00:00:00
Model
Meter
Flow (mgd)
0
20
40
60
80
100
120
2020-01-31
2020-02-01
2020-02-02
2020-02-03
2020-02-04
2020-02-05
2020-02-06
2020-02-07
2020-02-08
2020-02-09
2020-02-10
2020-02-11
2020-02-12
2020-02-13
2020-02-14
2020-02-15
2020-02-16
2020-02-17
2020-02-18
2020-02-19
2020-02-20
2020-02-21
2020-02-22
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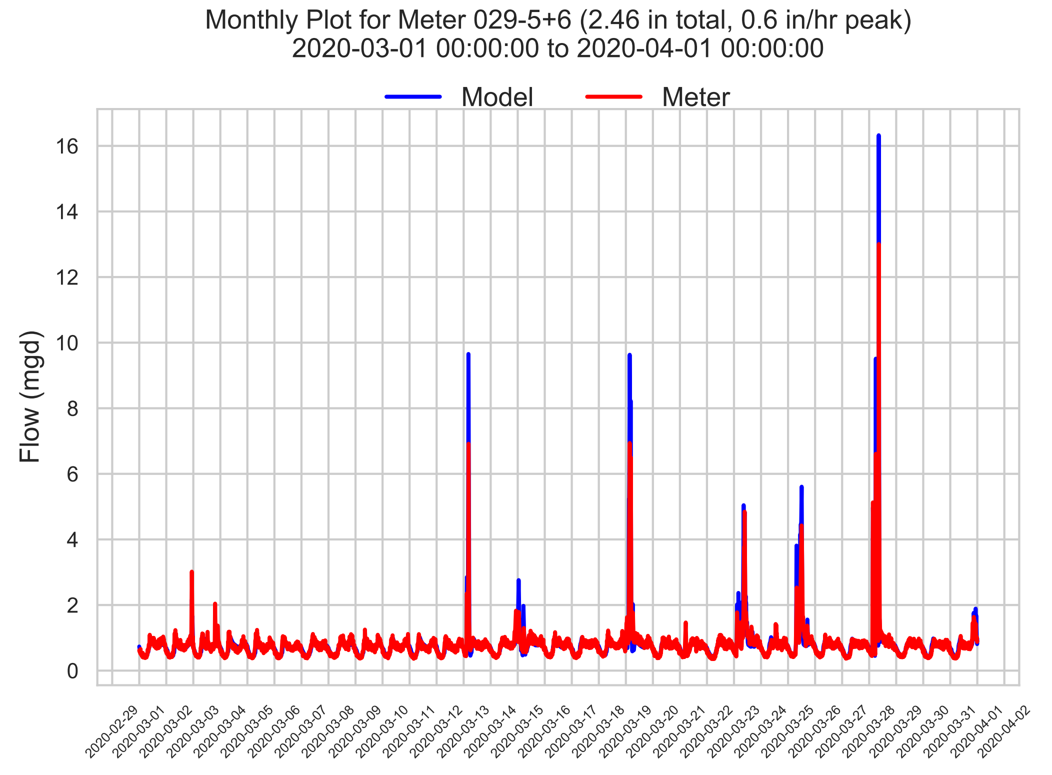
2020-03-01
2020-03-02



Monthly Plot for Meter 029-5+6 (2.46 in total, 0.6 in/hr peak)
2020-03-01 00:00:00 to 2020-04-01 00:00:00
Model
Meter
Flow (mgd)
0
2
4
6
8
10
12
14
16
2020-02-29
2020-03-01
2020-03-02
2020-03-03
2020-03-04
2020-03-05
2020-03-06
2020-03-07
2020-03-08
2020-03-09
2020-03-10
2020-03-11
2020-03-12
2020-03-13
2020-03-14
2020-03-15
2020-03-16
2020-03-17
2020-03-18
2020-03-19
2020-03-20
2020-03-21
2020-03-22
2020-03-23
2020-03-24
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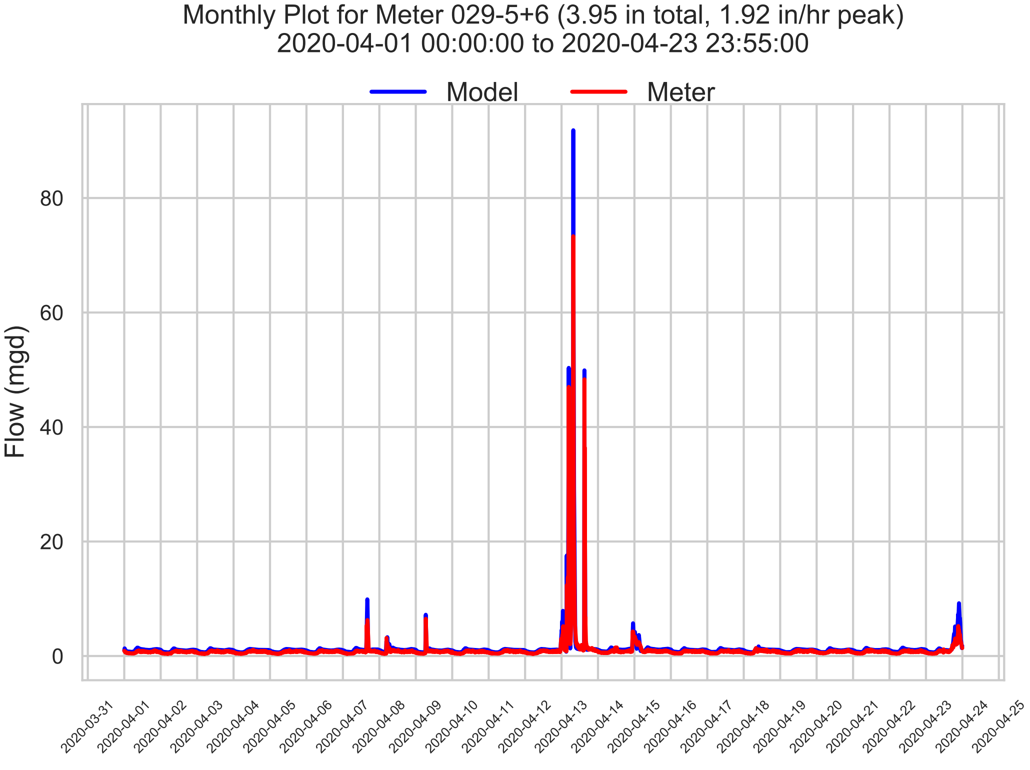
2020-04-01
2020-04-02



Monthly Plot for Meter 029-5+6 (3.95 in total, 1.92 in/hr peak)
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Model
Meter
Flow (mgd)
0
20
40
60
80
2020-03-31
2020-04-01
2020-04-02
2020-04-03
2020-04-04
2020-04-05
2020-04-06
2020-04-07
2020-04-08
2020-04-09
2020-04-10
2020-04-11
2020-04-12
2020-04-13
2020-04-14
2020-04-15
2020-04-16
2020-04-17
2020-04-18
2020-04-19
2020-04-20
2020-04-21
2020-04-22
2020-04-23
2020-04-24
2020-04-25

# Appendix G

# Potomac River Project Planning Comments

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## District of Columbia Water and Sewer Authority
## Index of Public Comments Related to Green Infrastructure

| First Name | Last Name | Comment No. | Affiliation | Date | Document Reference |
|---|---|---|---|---|---|
| Marchant | Wentworth | 1 | Wentworth Green Strategies | 8/18/2014 | PRT EIS Public Scoping |
| Marchant | Wentworth | 2 | Wentworth Green Strategies | 8/18/2014 | PRT EIS Public Scoping |
| Marchant | Wentworth | 3 | Wentworth Green Strategies | 8/18/2014 | PRT EIS Public Scoping |
| Joseph | Sternlieb | 4 | Georgetown Business Improvement District | 8/29/2014 | PRT EIS Public Scoping |
| Joseph | Sternlieb | 5 | Georgetown Business Improvement District | 8/29/2014 | PRT EIS Public Scoping |
| Joseph | Sternlieb | 6 | Georgetown Business Improvement District | 8/29/2014 | PRT EIS Public Scoping |
| Joseph | Sternlieb | 7 | Georgetown Business Improvement District | 8/29/2014 | PRT EIS Public Scoping |
| Walter | Groszyk | 8 | Citizens Association of Georgetown | 1/29/2015 | PRT Consulting Parties Meeting/ Section 106 |
| | | 9 | | 1/29/2015 | PRT Consulting Parties Meeting/ Section 106 |
| Pamla<br>Robert | Moore<br>Eigen | 10 | Citizens Association of Georgetown/ Friends of Georgetown Waterfront Park | 1/29/2015 | Commented on presentation material distributed on January 29 2015 Meeting/ Section 106 |
| Pamla<br>Robert | Moore<br>Eigen | 11 | Citizens Association of Georgetown/ Friends of Georgetown Waterfront Park | 2/23/2015 | Commented on presentation material distributed on January 29 2015 Meeting/ Section 106 |
| Joseph | Sternlieb | 12 | Georgetown Business Improvement District | 3/5/2015 | Commented on presentation material distributed on January 29 2015 Meeting/ Section 106 |
| Pamla | Moore | 13 | Citizens Association of Georgetown | 4/6/2015 | PRT EIS Public Scoping |
| Pamla | Moore | 14 | Citizens Association of Georgetown | 4/6/2015 | PRT EIS Public Scoping |
| Pamla | Moore | 15 | Citizens Association of Georgetown | 4/6/2015 | PRT EIS Public Scoping |
| Pamla | Moore | 16 | Citizens Association of Georgetown | 4/6/2015 | PRT EIS Public Scoping |
| Pamla | Moore | 17 | Citizens Association of Georgetown | 4/6/2015 | PRT EIS Public Scoping |
| Pamla | Moore | 18 | Citizens Association of Georgetown | 4/6/2015 | PRT EIS Public Scoping |
| Pamla | Moore | 19 | Citizens Association of Georgetown | 4/6/2015 | PRT EIS Public Scoping |
| Pamla | Moore | 20 | Citizens Association of Georgetown | 4/6/2015 | PRT EIS Public Scoping |
| Amber | Jones | 21 | Defenders of Potomac River Parkland | 4/6/2015 | PRT EIS Public Scoping |
| Dward | Moore | 22 | C&O Canal Association | 4/6/2015 | PRT EIS Public Scoping |
| Edmund | Preston | 23 | | 4/6/2015 | PRT EIS Public Scoping |
| Gretchen | Ellsworth | 24 | | 4/6/2015 | PRT EIS Public Scoping |
| Ted | Nevius | 25 | | 4/6/2015 | PRT EIS Public Scoping |

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|---|---|---|---|---|---|
| Gretchen | Ellsworth | 26 | | 4/6/2015 | PRT EIS Public Scoping |
| Amber | Jones | 27 | Defenders of Potomac River Parkland | 4/6/2015 | PRT EIS Public Scoping |
| Dward | Moore | 28 | C&O Canal Association | 4/6/2015 | PRT EIS Public Scoping |
| | | 29 | Citizens Association of Georgetown | 11/3/2015 | Questions on GI |
| | | 30 | Citizens Association of Georgetown | 11/3/2015 | Questions on GI |
| | | 31 | Citizens Association of Georgetown | 11/3/2015 | Questions on GI |
| | | 32 | Citizens Association of Georgetown | 11/3/2015 | Questions on GI |
| | | 33 | Citizens Association of Georgetown | 11/3/2015 | Questions on GI |
| Thomas | Luebke | 34 | Commission of Fine Arts | 2/16/2016 | Letter on GI Installations in Old Georgetown Historic District |
| Thomas | Luebke | 35 | Commission of Fine Arts | 2/16/2016 | Letter on GI Installations in Old Georgetown Historic District |
| Thomas | Luebke | 36 | Commission of Fine Arts | 2/16/2016 | Letter on GI Installations in Old Georgetown Historic District |
| Thomas | Luebke | 37 | Commission of Fine Arts | 2/16/2016 | Letter on GI Installations in Old Georgetown Historic District |
| Thomas | Luebke | 38 | Commission of Fine Arts | 2/16/2016 | Letter on GI Installations in Old Georgetown Historic District |
| Thomas | Luebke | 39 | Commission of Fine Arts | 2/23/2016 | CFA Letter to SHPO |
| | | 40 | | 2/29/2016 | Addendums to Task Force Comments |
| | | 41 | Agencies Participated Include: ANC 2E, Citizens Association of Georgetown, Georgetown Business District | 2/29/2016 | Addendums to Task Force Comments |
| Ron | Lewis | 42 | ANC 2E | 5/31/2016 | Letter |
| Thomas | Luebke | 43 | Commission of Fine Arts | 7/6/2016 | Meeting Minutes from Sitewalk with CFA in Georgetown |
| Jack | Evans | 44 | ANC 2E | 7/15/2016 | Potomac River CSO Issues in Georgetown: Protecting Historic Character, Finding Appropriate Solutions |
| Thomas | Luebke | 45 | Commission of Fine Arts | 12/15/2017 | PRT Consulting Parties Meeting/ Section 106 |
| | | 46 | SHPO | 12/15/2017 | NHPA Section 106 Consulting Parties Meeting, held on 12/15/2017/ Section 106 |
| Robert | Vom Eigen | 47 | Citizens Association of Georgetown | 1/17/2018 | Letter/ Section 106 |
| | | 48 | Georgetown Business Improvement District | 1/18/2018 | PRT Consulting Parties Meeting/ Section 106 |
| Lisa | Palmer | 49 | ANC 2E | 6/20/2018 | PRT Consulting Parties Meeting/ Section 106 |
| Elsa | Santoyo | 50 | DDOT | 6/20/2018 | PRT Consulting Parties Meeting/ Section 106 |

# District of Columbia Water and Sewer Authority
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| First Name | Last Name | Comment No. | Affiliation | Date | Document Reference |
|---|---|---|---|---|---|
| Elsa | Santoyo | 51 | DDOT | 6/20/2018 | PRT Consulting Parties Meeting/ Section 106 |
| Lisa | Palmer | 52 | ANC 2E | 6/20/2018 | PRT Consulting Parties Meeting/ Section 106 |
| Joe | Gibbons | 53 | ANC 2E | 6/20/2018 | PRT Consulting Parties Meeting/ Section 106 |
| Thomas | Luebke | 54 | Commission of Fine Arts | 6/20/2018 | PRT Consulting Parties Meeting/ Section 106 |
| Lisa | Palmer | 55 | ANC 2E | 6/20/2018 | PRT Consulting Parties Meeting/ Section 106 |
| Stephen | Crimmins | 56 | Friends of Georgetown Waterfront Park | 7/17/2018 | PRT Consulting Parties Meeting/ Section 106 |
| Lisa | Palmer | 57 | ANC 2E | 11/14/2018 | PEPC-50548 |
| Ridgway | Hall | 58 | | 11/19/2018 | Letter |
| Joe | Gibbons | 59 | ANC 2E | 12/4/2018 | Letter |
| Joshua | Lindsay | 60 | | 12/5/2018 | PEPC-50548 |
| Marchant | Wentworth | 61 | Wentworth Green Strategies | 12/5/2018 | PEPC-50548 |
| William | Holdsworth | 62 | C&O Canal Association | 12/5/2018 | PEPC-50548 |
| Stephen | Crimmins | 63 | Friends of Georgetown Waterfront Park | 12/5/2018 | PEPC-50548 |
| Yaniv | Franco | 64 | | 12/5/2018 | PEPC-50548 |
| Kim | Paul | 65 | | 12/5/2018 | PEPC-50548 |
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| Deborah | Lutterbeck | 67 | | 12/5/2018 | PEPC-50548 |
| Pamla | Moore | 68 | Citizens Association of Georgetown | 12/5/2018 | PEPC-50548 |
| Christopher | Murphy | 69 | Georgetown University | 12/5/2018 | PEPC-50548 |
| Joseph | Sternlieb | 70 | Georgetown Business Improvement District | 12/5/2018 | PEPC-50548 |

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 13
## Author Information

| | | |
|---|---|---|
| Keep Private: | No | |
| Name: | Marchant Wentworth | |
| Organization: | Wentworth Green Strategies | Official Rep. |
| Organization Type: | I - Unaffiliated Individual | |
| Address: | 903 Hamlin Street NE<br>Washington, DC 20017<br>USA | |
| E-mail: | marchant_wentworth@msn.com | |

## Correspondence Information

| | |
|---|---|
| Status: Reviewed | Park Correspondence Log: |
| Date Sent: 08/18/2014 | Date Received: 08/20/2014 |
| Number of Signatures: 1 | Form Letter: No |
| Contains Request(s): Yes | Type: Letter |
| Notes: | |

## Correspondence Text

DC Clean Rivers Project Team:
Wentworth Green Strategies is pleased to submit these comments on the scoping of the Environmental Impact Statement (EIS) for the Potomac River Tunnel.

Introduction

DC Water has proposed a modification to the consent decree that has set out goals and deadlines for reducing combined sewer overflows. They have proposed a five-year delay for meeting the goals for the Potomac River Tunnel and a seven-year delay in meeting the deadline for the Piney Branch Combined Sewer Overflow (CSO). They would substitute an ambitious program of "green infrastructure" (GI) for one proposed combined sewer tunnel on Piney Branch and shorten another proposed tunnel along the Potomac.
I. The Environmental Impact Statement should evaluate near term projects to protect public health and the environment particularly around areas of known public contact such as the boathouses along the Potomac River and the Georgetown Waterfront.
II. The Environmental Impact Statement should evaluate the impact on ratepayers by building a shortened Potomac tunnel that would reduce capital costs.
III. The Environmental Impact Statement should evaluate programs to relieve capacity in the Potomac Interceptor, institute aggressive water conservation projects throughout the region tributary to the Interceptor, provide support for DDOT and DDOE to implement the stormwater regulations and reduce runoff, and renegotiate the InterMunicipal Agreement and the charges for the Potomac Interceptor to more fairly allocate the costs of the CSO controls to the entire region that will benefit by a cleaner Potomac.

Discussion

Considering Georgetown, the disruption caused by the reconstruction of M Street in Georgetown in 2002 is a fresh memory for many Georgetown businesses and residents . At least two of the CSOs that discharge overflows upstream of the waterfront and the boat houses, CSO 027 and CSO 029, have sewersheds with narrow streets, and relatively few alleys. DC water has envisioned GI to be the primary treatment option. However, GI projects in these sewersheds might arouse citizen opposition and contribute in delays and increased costs. Navigating the historical designations in Georgetown as well as mitigating threats to Georgetown Park along the waterfront could pose additional delays and increased costs. Finally, recent DC legislation mandating the undergrounding of certain electric wires may also contribute to delays and increase the cost per acre. For these reasons, the EIS should evaluate whether the shortened Potomac River Tunnel proposed by DC Water minimizes the disruption to Georgetown residents, businesses, and the Historic District.
II. The Environmental Impact Statement should evaluate the benefits of prioritizing near term projects to protect public health and the environment particularly around areas of known public contact such as the boathouses along the Potomac River and the Georgetown Waterfront.
We believe that there are viable projects that DC Water might move forward in the near term to gain some reduction of overflows. The EIS should evaluate the public health and environmental benefits to implementing these projects as soon as possible.

Separate CSO 025 and 026

Under DC Water's modification proposal, the separation of CSO 025 and 26 is not slated to be completed until after the Potomac tunnel is completed in 2032. We urge that the EIS evaluate the benefits of having this separation begin as soon as possible and not wait until the Potomac tunnel is completed. Modeling data from DC Water indicates that even in the wettest quarters, these sewersheds generate relatively little flow. Indeed, CSO 025 comprises only 17 acres of sewershed. The data indicate that CSO 026 has virtually zero flow. However, CSO 025 flows are immediately upstream from Thompson's Boat Center and reducing flows here may afford that high recreational use area some benefit.

Divert some flows from CSO 027 to the Upper Potomac Relief Sewer

The Environmental Impact Statement should evaluate whether GI alone may not be enough to reduce flows from this overflow to meet LTCP goals and whether it might be possible to divert some of these flows to the Upper Potomac Relief Sewer after the Potomac Tunnel is completed. However, we urge that the Environmental Impact Statement evaluate reducing the flows before the Tunnel is completed in order to afford greater protection from overflows to the Thompson's Boat Center and Georgetown Waterfront downstream.
Separating O25 and 026 early and diverting flows from CSO 027 have consequences elsewhere in the sewer system.

The Environmental Impact Statement should evaluate whether in some storm conditions the net effect of these diversions may be to create corresponding overflows at CSO21 due to capacity limitations of certain sections of the Potomac Interceptor between the Rock Creek Interceptor and the Potomac Pumping Station. The EIS should balance the impact of these overflows at CSO 021 with water quality benefits of reducing discharges upstream of high use public areas such as the Georgetown waterfront and the Thompson's Boat Center. We urge the EIS to investigate other actions that might free up some capacity in this section of the Potomac Interceptor'prior to the construction of the Potomac Tunnel'including reducing flows in the Rock Creek Interceptor and other areas to the tributary to the Potomac Pumping Station.

The Environmental Impact Statement should evaluate the water quality benefits and public health protection that would result from prioritizing GI treatment of Potomac sewersheds that discharge upstream of the boat houses and the Georgetown waterfront first.

Using CSO data derived from Quarterly Reports filed under the Nine Minimum Controls reporting requirement, we analyzed volume discharges from the various CSOs along the Potomac in the wettest quarter (second quarter, 2008)'presumably the highest volume quarter between 2005 and 2013. The graph in Appendix A indicates that the cluster of CSOs that would be served by the Potomac tunnel'CSO 020 through CSO024'contribute 89 percent of the total volume of stormwater and overflows from CSOs along the Potomac. The five remaining CSOs upstream of Thompson's Boat Center'025 through CSO029'discharge 39 million gallons. Of these five, DC Water has suggested that CSOs 025 and 026 be separated. The DC Water proposal has suggested that some portion of the discharge of CSO 027 might be directed into the Upper Potomac Relief Sewer.

While some amount of control appears to be available to three of the five upstream CSOs, we urge the Environmental Impact Statement to evaluate the benefit of prioritizing GI activities in the sewersheds of CSO 028 and 029. For example, the CSO 028 sewershed is 21 acres, of which 13 acres are impervious surface. It appears to be comprised of roughly nine blocks of Georgetown, at least three of which appear to be green space associated with the eastern section of Georgetown University campus as well as a section of the waterfront that includes a canoe rental facility. Controlling these areas with a variety of GI technologies might be undertaken with minimum disruption. Indeed, DC Water has proposed to treat 30 percent of the impervious surface in the sewershed amounting to only 4 acres. In contrast, controlling CSO 029 appears to present more challenges. The 330 acre sewershed has 164 acres of impervious surface'the largest of the Potomac sewersheds. DC Water has indicated that they could achieve a 60 percent treatment rate of impervious surface based on earlier work on separation. Because of the location of this CSO immediately upstream from the Potomac Boat Club, we recommend that this area be given top priority for GI treatment.

Using the above measure to control CSO discharges upstream of Thompson's Boat Center means that a shortened Potomac Tunnel is adequate and will save ratepayers money. We support the shortened Potomac Tunnel and the 5 year extension'coupled with strict performance criteria. Using data derived from the CSO Quarterly Reports submitted by DC Water under the Nine Minimum Controls, we confirmed that the shortened Potomac Tunnel is vitally needed to control the worse of the Potomac CSOs. Because of the volumes and durations of the discharges, we believe that GI alone is not adequate to reduce the overflows enough to achieve the LTCP goal.

We analyzed the wettest quarter between 2005 and 2013 and compared them to the overflows for the Potomac CSOs in the same period. The analysis indicated that in the second quarter of 2008, collectively the CSOs on the Potomac discharged 328.3 million gallons of untreated overflow and stormwater. Seventy-one percent of that total'231.2 million gallons'came from a single location, CSO 021, just upstream from the Theodore Roosevelt Bridge. Over 53 million gallons of overflow came from CSOs upstream of Thompsons Boat Center or adjacent to the Georgetown waterfront'both popular recreational areas. (See Appendix A for the graph of these overflows)

We believe that the EIS is an important requirement and will provide the opportunity to consider many of the issues raised in these comments. We support the need for this document. We suggest that the scope of the EIS be limited to the impacts on US Park Service land along the Potomac and expanded to consider the impacts on the sewersheds tributary to the Potomac Tunnel including CSOs 20, 21 and 22 and evaluate the impact of the Tunnel on the operation and maintenance of the Potomac Pumping Station. In addition, we urge the EIS to consider the impact of reported stormwater and groundwater pumping to the sewer system and the effect that may have on the capacity of the Tummel.

The EIS should evaluate the benefits for low-income ratepayers by constructing the shortened Potomac Tunnel. It is important to note that DC residents will likely experience significant increases in utility bills due to a variety of factors including fuel costs and the additional costs of undergrouding utility lines. To use these increases in the LTCP as the reason for delays disguises the real problem. Shaving the peaks o capital costs, as this proposal attempts to do, is merely a short-term fix to a larger problem'the cost of DC Water's Capital Improvement Program (CIP). The real need for these rate increases results from the legacy of decades of underfunding of our sewer and water infrastructure stemming from a dysfunctional relationship with the DC government. Ratepayer dollars were continually sucked out of the Sewer and Water Fund and used to cover politically motivated contracts. The result was a cash-starved Department of Sanitary Engineering that could only respond to emergencies, much less longer term water quality issues.

We urge the EIS to evaluate ways that DC Water mitigate rate impacts on low income ratepayers including:
• renegotiating the InterMunicipal Agreement (IMA) to increase user charges for the use of the Potomac Interceptor Sewer to better reflect the true cost of those flows;
• reevaluating the present rate structure to assess whether charges for the commercial and other sewer users including WMATA and the federal government truly reflect costs;
• expanding DC Water's program of rate relief for low income ratepayers; and continuing to pursue federal funding.

V. The EIS should evaluate programs to relieve capacity in the Potomac Interceptor, institute aggressive water conservation projects throughout the region tributary to the Potomac Interceptor, provide support for DDOT and DDOE to implement the stormwater regulations and reduce runoff, and renegotiated the InterMunicpal Agreement and the charges for the use of the Potomac Interceptor to more fairly allocate the costs of CSO controls to the various suburban jurisdictions.

The EIS should evaluate efforts to institute an aggressive water conservation campaign for all sewersheds tributary to the Potomac interceptor. We recognize that great gains have been made to produce declining flows to Blue Plains despite an increasing population. However, more should be done. Reducing flows will produce great benefits in reducing electricity consumption and sludge production at the plant. Even relatively small reductions can produce savings.

The EIS should focus on relieving capacity in the Potomac Interceptor and the Potomac Pump Station. Indications are that, even with the construction of the Potomac Tunnel, the capacity of the Potomac Interceptor and the Potomac Pump Station may be exceeded in severe rain events. This may play a major role in creating overflows at CSO021. The EIS should investigate all possible measures that might result in offloading water from that system. For example, the LTCP details that the Washington Metropolitan Area Transit Authority (WMATA) may be pumping as much as 5.3 million gallons of ground water into the combined sewer system tributary to the Potomac Pump Station. These flows are easily handled during dry weather conditions, but in severe rain events, these flows might contribute to overflows.

There could be other measures that might be taken to reduce flows to the Interceptor. For example, the EIS could evaluate measure such as enhanced GI in the sewersheds tributary to the Potomac Interceptor in the District such as CSOs 020 and 022. The EIS should evaluate the value of requiring new development in these sewersheds to undertake the latest water conservation and storm water management systems

Thank you for your consideration of these comments.

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 11
## Author Information


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|---|---|
| Keep Private: | No |
| Name: | Joseph Sternlieb |
| Organization: | Georgetown Business Improvement District |
| Organization Type: | I - Unaffiliated Individual |
| Address: | 1000 Potomac Street NW<br>Suite 122<br>Washington , DC 20007<br>USA |
| E-mail: | jsternlieb@georgetowndc.com |


## Correspondence Information

| | |
|---|---|
| Status: Reviewed | Park Correspondence Log: |
| Date Sent: 08/29/2014 | Date Received: 08/29/2014 |
| Number of Signatures: 1 | Form Letter: No |
| Contains Request(s): Yes | Type: Web Form |
| Notes: | |

## Correspondence Text

August 29, 2014

Lisa Mendelson-Lelmini
Acting Regional Director
National Capital Region
National Park Service
1100 Ohio Drive SW
Washington, DC 20242

Subject: Comments on the Scope of the Environmental Impact Statement for the Proposed Potomac River Tunnel Project

Dear Ms. Mendelson-Lelmini,

The Georgetown Business Improvement District submits the following comments in response to the National Park Services (NPS) Notice of Intent to prepare an Environmental Impact Statement (EIS) on the proposed Potomac River Tunnel Project.

The Georgetown Business Improvement District (GBID) is a publicly chartered, private non-profit organization that manages elements of the public environment, and provides services to the Georgetown commercial district to sustain and improve the local economy. Our borders include all the area between the Potomac River and the north side of M Street NW, and between Rock Creek Park and the intersection of the Whitehurst Freeway and Canal Road; as well as Wisconsin Avenue south of Reservoir Road and the commercial portion of all east-west running streets intersecting Wisconsin Avenue. Our members include approximately 500 commercial property owners and over 1,500 commercial tenants.

We are submitting these comments to identify issues of interest to our members including the problems associated with CSOs as well as those that will be caused by mitigation efforts and the planned Potomac River Tunnel construction. The notice of intent invited us to provide comments on the purpose, need, objectives, alternatives, and any associated issues with the proposed project and the EIS. We hope that these comments are addressed in the final scoping of the EIS.

First, we want to endorse the extensive comments provided by the Citizens Association of Georgetown and the Friends of Georgetown Waterfront Park. We strongly support efforts to eliminate or, at least, greatly reduce, combined sewer overflow events. We also agree, in principal, with their conclusions that green infrastructure is preferable to construction of the section of storm water retention tunnel that was originally planned between Rock Creek and Key Bridge. However, we are skeptical of the ability of green infrastructure projects west of Rock Creek to eliminate CSO events, and request that the EIS fully describe and evaluate all aspects of the green infrastructure that would be necessary to achieve the desired goal, and that the EIS further evaluate alternative hard infrastructure interventions that are less disruptive than tunneling west of Rock Creek, and would achieve the desired goals.
The Georgetown BID is sympathetic to the problems that DC Water has managing sewer and storm water systems that were built in an era that predated modern sewage control standards. The current system was also built to accommodate needs of a smaller and less impactful population and uses. Similarly, the Georgetown portion of the sewer system exists below a fully built-out historic district comprised of many structures that exceed 150 years in age. Thus, every effort to design and build a system that reduces or eliminates CSO events in Georgetown will disrupt the physical environment and impact buildings, businesses, access, mobility, and recreation. We expect that any mitigation efforts will temporarily harm the local economy by limiting access to businesses, slowing traffic, disrupting public transit, and limiting recreation uses.

Knowing that our members will be impacted, our goal is to have the CSO mitigation projects completed:
1. as quickly as possible
2. with as little disruption to any particular building, business, or sector of the workforce, as possible;
3. without major disruption to public transit or commuter or visitor traffic
4. to be maximally effective in limiting CSO events
5. to minimize impact to Georgetown’s parks and recreation facilities
6. to minimize impact on historic commercial buildings
7. to minimize impact on the long-term look and feel of the commercial district, including mature street trees and brick sidewalks
8. to be a permanent solution - so that future generations do not have to readdress this issue

Specific issues that the EIS should address include:
Whether DC Waters requested modification to shorten the tunnel and replace the section addressing CSOs 026 through 029 with green infrastructure is workable. In the absence of a specific green infrastructure plan, we wonder how realistic the generic green infrastructure interventions will be when applied to the Georgetown Historic District. DC Water has presented six green infrastructure interventions that might be used in Georgetown in order to reduce the size of the Potomac River Tunnel. These include: Bioretention Rain Gardens, Permeable Pavement, Cisterns and Rain Barrels, Vegetated Swales, Native Landscaping, and Green Roofs.

The EIS should present a storm water retention goal for each CSO outfall (gallons of water that must be retained or diverted from the storm system to prevent a CSO from occurring) and then present a realistic plan for each outfall catchment area that includes the exact location, cost, and management plan for each of the proposed green infrastructure interventions. Each should account for the historic, physical, geotechnical, and political hurdles that will have to be overcome to do the installation. The EIS must evaluate:

a. how much storm water each of the major green infrastructure tactics could realistically capture/divert in Georgetown's environment given existing and future development.
b. how much roof space can realistically host green roof material and how much water would that capture?
c. where and how impervious paving materials would be replaced by pervious materials and how much water would be captured?
d. where and how would bio swales, rain gardens, and rain capturing plant species be employed and how much water would they divert and process?
e. given that a standard 66 gallon rain barrel can capture only 12% o the runoff from 1 rain event on a typical 900 square foot roof, how many barrels and cisterns would need to be employed, where would they be installed, how would they be managed, and what would be their impact?

We request this level of detail because, although we prefer green infrastructure solutions in principle, no evidence has been presented that they can be practically employed in Georgetown.

While the CAG and FOGWP letter states that the EIS must include an alternative that avoids construction, or the placement of any tunnel-related structure or shaft, within or immediately adjacent to the Waterfront Park, we further believe that alternatives should include hard infrastructure other than the proposed tunnel, such as the use of the C&O Canal right of way in exchange of improvements to the canal structure, in the event that green infrastructure is not a viable alternative.

Thanks you for this opportunity to address the EIS scoping. We look forward to working with your agency and DC Water in the coming months and years to address this very important issue.

Sincerely yours,

Joseph Sternlieb
CEO

Comments # 8, 9, 11

District of Columbia Water and Sewer Authority
DC Clean Rivers Project

# Potomac River Tunnel Project
# Consulting Parties Meeting Comment Form

If you have any comments, questions, and/or concerns regarding the Potomac River Tunnel project, we'd like to hear from you. Please fill out this form and write your comments, questions, and/or concerns in the space below marked 'Comments'. You may give the completed form to a DC Water or NPS representative; comment online at http://parkplanning.nps.gov/PotomacRiverTunnel (preferred method); or mail to DC Clean Rivers Project, DC Water and Sewer Authority, 5000 Overlook Avenue SW, Washington, DC 20032. All submissions from organizations or businesses, and from individuals identifying themselves as representatives of organizations or businesses, will be made available for public inspection in their entirety.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you may request in your comment that your personal identifying information be withheld from public review, we cannot guarantee that we will be able to do so. Thank you.

I request my personal identifying information be withheld from the record. Yes ☐ No ☒

Date 1/29/15 Phone No. ____

Email whandsfield@georgetowndc.com

Circle One: (Mr.) (Mrs.) (Ms.)

Name *(Please print clearly)* Will (First) Handsfield (Last)

Address 1000 Potomac St. NW suite 108

City Washington State DC Zip 20007

Ward/ANC 2 Affiliation Georgetown BID

Comments: *(Please print clearly)* Please explore the gravity-pipe option further to include extending it along the originally agreed-to, consent decree pipe alignment. Please provide more specific information on green infrastructure planned for Georgetown.

(if you need additional space, please use the back of this form)

FOR DC WATER USE ONLY

DC Water Representative ____ Date ____

Action Taken/Next Steps ____

District of Columbia Water and Sewer Authority
DC Clean Rivers Project

# Potomac River Tunnel Project
# Consulting Parties Meeting Comment Form

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I request my personal identifying information be withheld from the record. Yes ☐ No ☐

Date 1/29/15 Phone No. [redacted]

Email [redacted]

Circle One: (Mr.) (Mrs.) (Ms.)

Name *(Please print clearly)* [redacted]
First Last

Address [redacted]

City [redacted] State DC Zip 20007

Ward/ANC 2 Affiliation Grace Episcopal Church

Comments: *(Please print clearly)* Lots of info, mostly clear. We're a long way from specifics, though.

(if you need additional space, please use the back of this form)

FOR DC WATER USE ONLY

DC Water Representative ______ Date ______

Action Taken/Next Steps ______

District of Columbia Water and Sewer Authority
DC Clean Rivers Project

# Potomac River Tunnel Project
# Consulting Parties Meeting Comment Form

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I request my personal identifying information be withheld from the record. Yes ☐ No ☒

Date 01/29/15 Phone No. ____

Email Presto 77 @ Verizon.Net

Circle One: (Mr.) (Mrs.) (Ms.)

Name *(Please print clearly)* Ned (First) Preston (Last)

Address 6306 Swords Way

City Bethesda State MD Zip 20

Ward/ANC ____ Affiliation C+O Canal assoc

Comments: *(Please print clearly)* List of historic sites should include the Alexandria Aqueduct and C+O Canal berm and towpath.

(if you need additional space, please use the back of this form)

FOR DC WATER USE ONLY

DC Water Representative ____ Date ____

Action Taken/Next Steps ____

dc clean RIVERS PROJECT

District of Columbia Water and Sewer Authority
DC Clean Rivers Project

NATIONAL PARK SERVICE

# Potomac River Tunnel Project
# Consulting Parties Meeting Comment Form

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I request my personal identifying information be withheld from the record. Yes ☐ No ☒

Date 1/30/2015 Phone No. 202-518-0524

Email greg@waba.org

Circle One: (Mr.) (Mrs.) (Ms.)

Name *(Please print clearly)* GREGORY (First) BILLING (Last)

Address 2599 Ontario Rd. NW

City Washington State DC Zip 20009

Ward/ANC 1 Affiliation Washington Area Bicyclist Association

Comments: *(Please print clearly)*

• The Capital Crescent Trail in western Georgetown, the Rock Creek Park Trail and other multi-use paths should be considered during planning for construction. DC law requires access

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FOR DC WATER USE ONLY

DC Water Representative ______ Date ______

Action Taken/Next Steps ______

to be provided to pedestrian and bicyclists during constuction.

- During the planning for green infrastructure, bicycling improvements should be included. This project is a fantastic opportunity to improve bicycle transportation access with protected bike lanes, trails and bike parking.
  DDOT's Move DC outlines all planned bike infrastructure for DC. Please consult this master plan.

dc clean RIVERS PROJECT

District of Columbia Water and Sewer Authority
DC Clean Rivers Project

NATIONAL PARK SERVICE

# Potomac River Tunnel Project
# Consulting Parties Meeting Comment Form

If you have any comments, questions, and/or concerns regarding the Potomac River Tunnel project, we'd like to hear from you. Please fill out this form and write your comments, questions, and/or concerns in the space below marked 'Comments'. You may give the completed form to a DC Water or NPS representative; comment online at http://parkplanning.nps.gov/PotomacRiverTunnel (preferred method); or mail to DC Clean Rivers Project, DC Water and Sewer Authority, 5000 Overlook Avenue SW, Washington, DC 20032. All submissions from organizations or businesses, and from individuals identifying themselves as representatives of organizations or businesses, will be made available for public inspection in their entirety.

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I request my personal identifying information be withheld from the record. Yes ☐ No ☑

Date Jan 29, 2015 Phone No. 703-536-1737

Email rodmackler@yahoo.com

Circle One: (Mr.) (Mrs.) (Ms.)

Name (Please print clearly) Rod (First) Mackler (Last)

Address 944 N. Potomac St

City Arlington State VA Zip 22205

Ward/ANC ________ Affiliation C&O Canal Association

Comments: (Please print clearly) We – The C&O Canal Association – would like to be a consulting party for any aspect that impacts the C&O Canal National Historical Park. If the Green Modification is accepted and the tunnel shortened to eliminate impact of the C&O Canal NHP, then the question is moot, unless (over)

(if you need additional space, please use the back of this form)

FOR DC WATER USE ONLY

DC Water Representative ________ Date ________

Action Taken/Next Steps ________

Some of the green infrastructure is built within the C&O Canal NHP.

Comment #10

CITIZENS ASSOCIATION of GEORGETOWN

February 23, 2015

DC Clean Rivers Project,
c/o Potomac River Tunnel EIS
DC Water and Sewer Authority
5000 Overlook Avenue SW
Washington, DC 20032

**Subject: Comments on the Presentation Materials distributed at the January 29, 2015 meeting of consulting parties for the Potomac River Stormwater Retention Tunnel**

As consulting parties, representatives of the Citizens Association of Georgetown (CAG) and the Friends of Georgetown Waterfront Park (FoGWP) participated in the January 29, 2015 meeting of consulting parties for the proposed Potomac River Stormwater Retention Tunnel.

Before turning to detailed comments, we would like to provide a statement of position:

*CAG and FoGWP seek to protect the historic fabric of Georgetown, and, in principle, endorse the application of Green Infrastructure (GI) solutions for abating the combined sewer overflows from our community. Our endorsement is predicated on the GI solutions substantially reducing or eliminating these overflows, and these solutions not materially distorting or destroying the historic fabric.*

We are mindful that the draft Long Term Control Plan (dated January 2014) calls for GI to be applied to approximately 35 acres of currently impermeable surface area in a section of west Georgetown, largely east of Georgetown University, south of R St NW, and west of Wisconsin Ave. This acreage is approximately 3.5 times the size of the Georgetown Waterfront Park. Given the potential scale of GI applications in this dense urban area, we recognize the challenge in identifying and applying effective strategies that also help maintain and preserve the historic character of our neighborhoods.

Our comments are based on the briefing and material presented at this meeting by DC Water & Sewer Authority (WASA). At the meeting, a sequence of next steps was provided, but without dates. Further, the relationship between the Environmental Impact Statement (EIS) for this project and DC Water's proposed modifications to the consent decree was not clear. The consent decree sets out a set of projects and timelines to abate combined sewer overflows into the Potomac and other rivers




1365 Wisconsin Avenue NW
Suite 200
Washington DC 20007
202.337.7313
Fax: 202.333.1088
cagmail@cagtown.org
www.cagtown.org

and waters in the District of Columbia. As consulting parties, we ask that WASA clarify its schedule for modifying the consent decree. Our expectation is that the terms of the modification will be informed by and therefore be finalized after the EIS has issued and the Section 106 consultations have concluded but we would appreciate confirmation at the next meeting of Consulting Parties.

At the January 29th meeting, a rudimentary sketch of three possible alignments of a Potomac River Stormwater Retention Tunnel was provided. Our understanding is more specific information for the alternative alignments will be developed in forthcoming months. We also understand the EIS will cover related projects in Georgetown, such as Green Infrastructure and sewer separation, which could affect the alignment and capacity of the tunnel.

For the set of comments below, we provide an explanatory basis for the comment.

**1. The Potomac River Stormwater Retention Tunnel.**

WASA should clarify how much of the proposed capacity reduction of the Potomac River Tunnel is attributable to the proposed use of Green Infrastructure for Combined Sewer Overflow (CSO) numbers 27, 28, and 29, located along the north bank of the Potomac River in Georgetown. The sewershed (catchment area) for these CSOs includes Georgetown, generally west of Wisconsin Ave. NW; Georgetown University; Burleith; and slices of neighborhoods north of Burleith to Massachusetts Ave NW.

WASA should describe the potential effect on the tunnel's capacity and alignment if Green Infrastructure applied in these three sewersheds would only achieve a modest reduction in flow.

Basis for comment: Originally planned as having a 58 million gallon capacity, WASA now proposes to reduce the tunnel's capacity to 21 million gallons if a force main and a pumping station proximate to the tunnel is used for de-watering, or 30 million gallons if de-watering is achieved through gravity flow to the Blue Plains treatment plant.

The proposed reduction in tunnel size mainly stems from the construction of a 225 million gallons a day (MGD) enhanced clarification facility and a 225 MGD dewatering pump station, both at Blue Plains. These facilities will allow WASA to empty the tunnel more rapidly before an ensuing rain event. However, if the tunnel sizing and length assumes Green Infrastructure in west Georgetown will eliminate the current overflow particularly at outfalls 27 and 28, we believe an assessment of the effect on tunnel design of a more limited overflow reduction is also needed.

**2. Diversion capacity of conveyance structures and pumping facilities in Georgetown.**

WASA should include updated values for Minimum Diversion Capacity for CSO control, and should provide two sets of values for CSOs 27, 28, and 29: one for an alternative that fully implements GI in these sewersheds; and a second alternative that does not produce, either wholly or in part, the expected results from Green Infrastructure implementation.

Basis for comment:

The diversion capacities in the following table are from p. 42-43 of NPDES permit DC0021190, dated September 30, 2010.

Table 1

| CSO Outfall Number and Location | Minimum Diversion Capacity for CSO Control (In MGD) | Impervious acreage | Approximate impervious acreage to receive Green Infrastructure | Catchmen total area |
|---|---|---|---|---|
| CSO 020, 23rd St. NW, N of Constitution Ave. | 297 | NA | Diverted to tunnel | |
| CSO 21, Northeast of the Roosevelt Bridge | 530 | NA | Diverted to tunnel | |
| CSO 22, near Virginia Ave. NW and the Watergate | 333 | NA | Diverted to tunnel | 200 acres |
| CSO 24, foot of 30th St NW | 66 | NA | Diverted to tunnel | 174 acres |
| CSO 25, foot of 31st St NW | 3 | NA | To be separated | 17 acres |
| CSO 26, foot of Wisconsin. Ave. NW | 0 | NA | To be separated | 2 acres |
| CSO 27, foot of Potomac St. NW | 92 | 104 acres | 31 acres | 164 acres |
| CSO 28, between the ruins of the Aqueduct Bridge and Washington Canoe Club | 9 | 13 acres | 4 acres | 21 acres |
| CSO 29, below the Canal Rd. NW entrance to Georgetown University | 133 | 166 acres | 98 acres | 330 acres |

Notes: The values for Minimum Diversion Capacity for CSO Control were predicated on construction of a 58 million gallon capacity stormwater retention tunnel. Examples of impervious acreage are streets and other paved surfaces, roofs.

**3. Green Infrastructure in the area serviced by CSOs 27, 28, and 29.**
WASA should describe the particular Green Infrastructure technologies that WASA now proposes to use in Georgetown, and indicate the expected effectiveness of these technologies in reducing combined sewer overflows. Updated data similar to that presented in Table 2 below would be helpful in gauging the effectiveness of these technologies.

WASA should also describe the potential construction impact, including duration and areal extent (e.g., how many square feet), associated with application of the proposed Green Infrastructure technologies in Georgetown.

Basis for comment:

Table 2

| CSO Outfall Number and Location | Number of Overflows per year (events) | Volume in Million Gallons per year | Amount of precipitation to cause overflow | Catchment area |
|---|---|---|---|---|
| CSO 24, foot of 30th St NW | 33 | 120.37 | 0.3 inches | 174 acres |
| CSO 25, foot of 31st St NW | 14 | 0.34 | 0.5 inches | 17 acres |
| CSO 26, foot of Wisc. Ave. | 0 | 0 | 0 | 2 acres |
| CSO 27, foot of Potomac St | 73 | 52.56 | 0.1 inch | 164 acres |
| CSO 28, west of Aqueduct Br. | 13 | 0.50 | 0.5 inches | 21 acres |
| CSO 29, below Canal Rd. entrance to Georgetown U. | 56 | 26.79 | 0.3 inches | 330 acres |

Note: The data in the above table are for CSO flows for an average rain year with inflatable dams in place, but without rehabilitation of pumping stations. The data are from 2004. (Pumping stations were subsequently rehabilitated.)

Table 3

| CSO Outfall Number and Location | Catchment Area | Average CSO volume per event | Average CSO volume per event per acre |
|---|---|---|---|
| 27, foot of Potomac St. | 164 acres | 720,000 gallons | 4,400 gallon |
| 28, west of Aqueduct Bridge | 21 acres | 38,000 gallons | 1,800 gallon |
| 29, below the Canal Rd entrance to Georgetown University | 330 acres | 89,000 gallons | 270 gallons |

Note: Average CSO volume per event calculated by dividing total annual overflow volume by the number of annual events.

In the draft Long Term Control Plan (LTCP), WASA proposed to introduce various Green Infrastructure technologies and methods to reduce stormwater runoff into the collection sewers for three combined sewer systems, existing between Wisconsin Ave. and Glover Archbold Park.

For CSO 27 and 28, the technologies proposed to be deployed were 75 gallon rain barrels connected to downspouts collecting runoff from roofs, and installing permeable (pervious) pavement on streets, alleys, and sidewalks.

We now understand that DC Water is considering substituting Green Infrastructure technologies other than rain barrels, and the installation of permeable pavement on sidewalks, alleys, and streets, to reduce runoff flows in west Georgetown.

WASA has indicated that it will focus on using public spaces where a range of GI strategies, such as expanded tree boxes, rain gardens and retention ponds could be employed, and would largely dispense with the rain barrels on private property. The areal extent of west Georgetown (between Wisconsin Ave. and Georgetown University) where Green Infrastructure would be used in CSOs 27 and 28 is approximately 35 acres.

In two previous letters providing detailed comments on the draft Long Term Control Plan and the scoping plan for this EIS, CAG and FoGWP voiced concern about the effects of the initial infrastructure proposals on the historic infrastructure and buildings of Georgetown, a National Historic Landmark district. We also questioned the practicability and effectiveness of these two technologies in Georgetown.

Our comments in those previous letters were formed by statements, such as those below, set out in the draft LTCP:

*"GI has not been used at a large scale in dense urban areas to control CSOs to a high degree.*
*Therefore, there is a need to develop basic information regarding permitting, location of facilities, public outreach and involvement, development of design details and maintenance."*
Source: LTCP Modification for GI 3-3; Draft for Public Comment

*"The conclusion of this study, which was conducted at the time that the draft CSO LTCP was being prepared, was that the use and effectiveness of rain barrels as a long term CSO control was questionable (MWCOG, 2001)."*
Source: Technical Memorandum No. 4: 3-3; District of Columbia's Green Infrastructure Experience

As illustrated in Table 3, the average CSO volumes per acre per event for CSOs 27 and 28 reveal marked differences in overflow volumes per acre from that of the adjacent sewershed, CSO 29. This suggests a need for far more extensive Green Infrastructure in the CSO 27 and 28 sewersheds, and raises questions about the feasibility of applying such extensive infrastructure, and the scale of its impact.

We further note that the draft LTCP anticipated applying Green Infrastructure to 31 acres in the CSO 27 sewershed. This would necessitate achieving a reduction of over 23,000 gallons of overflow per 'treated' acre per event. We question whether a reduction of that magnitude is feasible in a built up urban environment.

**4. CSO numbers 25 and 26**

As the combined sewer overflows for CSO numbers 25 and 26 appear minimal, WASA should include an alternative that retains these sewers as combined sewers, and consolidates their overflow with the overflow for sewers being diverted into the tunnel.

Basis for comment: These combined sewer overflows are located at the foot of 31st St NW and Wisconsin Ave NW respectively, and serve a small catchment area south of the C&O Canal. As indicated in tables 1 and 2, the overflow volume is minimal. The proposed modifications to the consent decree would separate these combined sewers into a sanitary sewer and a storm sewer; flow from the latter discharging into the Potomac, and flow from the sanitary sewer sent to Blue Plains for treatment. Separation would involve extensive construction in the affected neighborhood.

**5. Interceptor Sewers along K and Water streets , and the Potomac Pumping Station**

WASA should clarify whether these two interceptors have sufficient capacity to transport increased overflows from CSO 27 and 28, if Green Infrastructure initiatives being considered for these sewersheds will not reduce overflow volumes to the extent anticipated in the Long Term Control Plan.

If capacity is inadequate, WASA should consider an alternative that constructs a new sewer (and associated diversion structures) between CSO 28 or 29 and 27th and K streets NW, and any necessary increase in the pumping capacity of the Potomac Pumping Station.

Basis for comment:

Preliminary environmental studies for the proposed non-motorized boathouse zone along the Potomac in Georgetown, diagram the path of the Upper Potomac Interceptor Sewer and the Upper Potomac Relief Interceptor Sewer as paralleling the Capitol Crescent Trail from CSO 29 to and under the Aqueduct Bridge.

Technical memoranda attached to the draft LTCP indicate there is sufficient extra capacity within these interceptors to carry overflow from the combined sewers to the retention tunnel. Subsequent oral communications indicates this extra capacity may not exist. Oral communications also indicated that cross-feeds exist between these two interceptors, allowing flow to be diverted from one sewer to the other. The extra capacity would be needed if Green Infrastructure in the CSO 27, 28, and 29 sewersheds did not generate sufficient reduction in overflow volumes.

**6. O and P Streets NW**

These streets should be listed as a historic resource in the historic properties inventory.

Basis for comment: While the sections of these streets in west Georgetown are not listed as a District Landmark or on the National Register of Historic Places, a recent, multi-million dollar reconstruction has restored their appearance to that of the late 19th Century. This reconstruction also restored the streetcar tracks, and the original traction system for the streetcars.

Sincerely,

Pamla Moore

Pamla Moore
President, Citizens Association of Georgetown

Robert P. vom Eigen

Robert vom Eigen
President
Friends of Georgetown Waterfront Park

cc:
Joel Gorder
Regional Environmental Coordinator
National Capital Region
National Park Service
Ohio Drive NW
Washington DC

GEORGETOWN
BUSINESS IMPROVEMENT DISTRICT
GEORGETOWNDC.COM

March 5, 2015

DC Clean Rivers Project,
c/o Potomac River Tunnel EIS
DC Water and Sewer Authority
5000 Overlook Avenue SW,
Washington, DC 20032

Dear General Manager Hawkins and Clean Rivers Project Staff,

The Georgetown BID recently attended the January 29th meeting on the Potomac River Stormwater Retention Tunnel and related plan to modify the existing EPA consent decree with a Green Infrastructure (GI) solution for the CSO areas covering Georgetown (CSOs 24 – 29). We attended this meeting in our capacity as an affected consulting party, and broadly represent business and commercial real estate interests throughout lower Georgetown and along the Wisconsin Avenue corridor.

The Georgetown BID endorses the combined comments from the Citizen's Association of Georgetown (CAG) and the Friends of Georgetown Waterfront Park (FoGWP) on the most recent meeting, and the Green Infrastructure plan in general as presented to us in both public and private meetings. DC Water will have received the CAG / FoGWP comments in a letter dated February 23rd, 2015. Our primary concerns can be distilled down to the following:

- The level of detail presented thus far is insufficient for us, or other consulting parties, to provide specific comments. We look forward to a more detailed plan from DC Water describing precisely the GI measures envisioned, and the location of those interventions. Only then can we deliberate the costs and benefits of the project as proposed, specifically as it affects the commercial, residential, and historical interests of Georgetown.

- The scale of the stormwater overflow problem, particularly in CSO 27, seems to greatly exceed the available non-urbanized land within the catchment area, as described in item 3 and Tables 2 and 3 in the CAG / FoGWP letter. We are left to infer that GI interventions in this area (which covers much of the BID) would either be insufficient to achieve the mandated mitigation, or be so large and disruptive in scale as to have a significant impact on the neighborhood and commercial areas affected.

- The potential for sewer construction and access immediately west of the Aqueduct Bridge on Water Street will affect the long-term plans for development of a boat house at "Site C" under the National Park Service's current EA for the non-motorized boathouse zone.

> A boathouse on this site has long been a priority of the Georgetown community, including the BID, and we would like to do everything possible to preserve its development ability for the anticipated boathouse use.

Lastly, the GBID was encouraged to see some new concepts discussed at the consulting parties meeting, specifically the possibility of a smaller "gravity" diversion tunnel that would tie into the newly constructed tunnel network along the Anacostia and lower Potomac. The possibility that this solution could reliably achieve the required mitigation with fewer construction and long term impacts within Georgetown is very interesting, and we would like to learn more about DC Water's analysis on this and other possible solutions to the combined sewer overflow problem along our section of the Potomac River.

Please know that we remain committed to the Clean Water Act goal of achieving a swimmable, fishable Potomac River, and will work constructively with DC Water to achieve this goal through the Clean Rivers project.

My best regards,

Joe Sternlieb
CEO

cc. Citizen's Association of Georgetown
Friends of Georgetown Waterfront Park
Georgetown Business Association

Comments # 13 thru 28

National Park Service
U.S. Department of the Interior
National Capital Region

DC Water
DC Clean Rivers Project

# Draft
# Public Scoping Comment Analysis Report

Potomac River Tunnel
Environmental Impact Statement

April 6, 2015

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## Appendices

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# 1) INTRODUCTION AND GUIDE

## a) Background

Pursuant to section 101(2)(C) of the National Environmental Policy Act (NEPA) of 1969, as amended, the National Park Service, in cooperation with DC Water, is preparing an Environmental Impact Statement (EIS) for the construction of the Potomac River Tunnel. The National Park Service will also consider the effects of the proposed undertaking on historic properties in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 and its implementing regulations (36 CFR Part 800).

The Potomac River Tunnel is a component of DC Water's Long Term Control Plan (LTCP), also known as the DC Clean Rivers Project, a massive infrastructure program designed to control the discharge of untreated combined sewage during heavy rainfall events. The project will be designed to meet court-ordered CSO control objectives and water quality standards to comply with the requirements of the 2005 Federal Consent Decree entered into by DC Water, the District, the U.S. Department of Justice, and the U.S. Environmental Protection Agency. DC Water is proposing to modify the existing LTCP to include Green Infrastructure (GI). If the modification is approved, the implementation of GI could reduce the scope of the Potomac River Tunnel. The study area is illustrated in Figure 1.

The purpose of the project is to construct a tunnel and supporting infrastructure to control combined sewer overflows (CSOs), which occur when the combined sewer system capacity is exceeded during storm events. The Consent Decree established schedules for construction of the tunnels and related CSO control facilities, including a 2025 deadline to place the tunnels into operation. The project is needed because CSOs contribute to water quality impairment in receiving waters. CSOs impair water quality by increasing water bacteria levels, contributing to low dissolved oxygen in water (increasing the potential for fish stress or fish kills and impacts to other aquatic life), and increasing the amount of trash in waterways.

Project considerations that will need to be evaluated in the EIS include:

- Beneficial impacts to water quality due to the capture and treatment of CSOs;
- Visitation and recreational use may be temporarily interrupted or limited during construction including access to portions of National Park Service lands;
- Construction may cause temporary delays and closures that could increase traffic congestion, cause rerouting of pedestrian and bicycle commuters, and affect access to local businesses;
- Aquatic wildlife including Atlantic sturgeon and shortnose sturgeon, both of which are endangered species, could be affected by construction activities; and
- Construction may impact cultural resources within the study area.


**FIGURE 1: POTOMAC RIVER TUNNEL STUDY AREA**

## b) Public Scoping Process Summary

Public involvement and participation is an essential element of the NEPA process, engaging citizens in decision-making through planning and development. Public outreach is also a required action under Section 106 of the NHPA. As a part of the NEPA process and to comply with the requirements of Section 106 of the NHPA, the National Park Service involved the public in project planning by holding a formal public scoping period in order to give the public a chance to learn about the project and provide feedback. DC Water, in coordination with the National Park Service, published ads in four local papers (*The Washington Post* [July 6, 2014], *The Northwest Current* [July 2, 2014], *The Washington City Paper* [July 4, 2014], and *The Georgetowner* [July 2, 2014]) announcing a public scoping meeting. On July 14, 2014, DC Water, in coordination with the National Park Service, distributed a public scoping newsletter to those individuals and groups within ½ mile of the Potomac River Tunnel study area using GIS/address data from DC Water's customer service database. In addition, the National Park Service posted project information, including the scoping newsletter, to the NPS Planning, Environment and Public Comment (PEPC) website (http://parkplanning.nps.gov/PotomacRiverTunnel). This project information was also posted on DC Water's website at https://www.dcwater.com/workzones/projects/potomac_river_tunnel/default.cfm. Project information will be posted and updated on both of these sites as the project moves forward. On July 17, 2014, DC Water issued an email blast announcing the public scoping meeting to Advisory Neighborhood Commission (ANCs) within the Potomac River Tunnel study area as well as other interested parties. On July 21, 2014 robocalls were made announcing the public scoping meeting to DC Water customers within ½ of the project study area. The newspaper advertisements, PEPC posts, scoping newsletter, email blasts, and robocalls provided a project overview and invited the public to participate in the scoping process. Members of the public were invited to submit comments on the project electronically, through the PEPC website or by mailing written comments to DC Water. These notifications also included information regarding the public scoping period, which was held between July 2, 2014 and August 31, 2014, and provided notice of the public meeting.

The public scoping meeting was held on July 31, 2014 at the Lab School of Washington in Washington, DC. This meeting was held to provide citizens with an opportunity to learn about the Potomac River Tunnel project, to provide input as to their issues and/or concerns about the project, and provide comments or feedback. The scoping meeting began at 6:00 p.m. and continued until 8:00 p.m. Meeting attendees were provided a brief overview of the meeting format as they signed in. The meeting was held in an open house format with a brief welcome and presentation of informational displays by DC Water. The informational displays were arranged at various stations around the meeting room, with NPS, DC Water, and consultant staff on hand throughout the meeting to address questions and listen to the public.

A total of 38 individuals signed in at the public scoping meeting in Washington, DC. Comment forms were available to the public for written comments and a court reporter was available to transcribe oral comments at the meeting. Meeting attendees were encouraged to submit their comments in writing on the PEPC site or by using the comment forms provided. Three written comments were submitted at the meeting.

### c) Nature of Comments Received during Public Scoping

Seventeen (17) pieces of correspondence from two states (Maryland and New Jersey) and the District of Columbia were received during the public scoping period. Individuals living within the vicinity of the project area (Maryland and the District of Columbia) submitted sixteen (approximately 94.1 percent) of those correspondence pieces.

Two (2) local government organizations, Washington Metropolitan Area Transit Authority (WMATA) and ANC 2E, provided comments on the project. WMATA stated that construction in the vicinity of any Metrorail system infrastructure, whether at grade, aerial, or tunnel, must be coordinated to ensure safety and eliminate conflicts. ANC 2E stated that they support the Citizen's Association of Georgetown and the Friends of the Georgetown Waterfront Park's letter commenting on the project and agree with the concerns and requests made in the letter.

Correspondence from area residents and civic organizations made up the balance of comments received. Only one comment was received from outside the Washington Metropolitan Area. Generally, the correspondence was in support of a shortened tunnel with Green Infrastructure (GI) CSO control. Several commenters were concerned with impacts the project might have on historic properties and visitor use and experience. Other commenters stressed the need for additional documentation in the EIS or provided requests that certain topics or resources be evaluated in detail.

A summary of comments received during public scoping follows:

- Seven (7) commenters supported a revised tunnel configuration with GI CSO Control.
- Five (5) commenters expressed concern with the impact of the project on visitor use and experience. Three (3) of these commenters were concerned with detrimental effects on the Capitol Crescent Trail as a result of the proposed action. Other visitor use issues include impacts to local businesses and traffic, the rerouting of bicycle and pedestrian traffic, and the impact of the outfalls' proximities to the non-motorized boathouse zone.
- Four (4) commenters expressed their concern of the potential impacts to historic structures in the area.
- Four (4) commenters suggested the need for additional studies and documentation for the EIS. Suggested items include:
  - Creating additional alternatives to address GI in the EIS.
  - Including a description of the process involved in dewatering the tunnel under each Alternative.
  - Referencing other resource-related studies conducted within the study area.
  - Referencing and documenting other successfully implemented tunnel projects.
  - Expediting the separation of CSO 025 and CSO 026.
  - Evaluating the reduction of flows before the tunnel project is completed.
- Three (3) commenters stated that the impacts of the overflows at CSO 021 be balanced with the water quality benefits of reducing discharge upstream of public areas.
- One (1) commenter suggested that the EIS include improvements to natural flood protection and erosion control.
- One (1) commenter suggested evaluating the impact of stormwater and groundwater pumping on tunnel capacity.
- Three (3) commenters discussed the need for coordination with various local agencies affected by the project.
- Three (3) commenters raised issues with the potential socioeconomic impact of the project. Comments include:
  - The local economy being negatively impacted during construction of the project.
  - A request for more explanation of the comparison between the Hybrid Plan and the tunnel project in regards to cost savings.
  - The impact on ratepayers and potential mitigation of these impacts.
  - The potential minimization of impact to Georgetown residents, business, and the Historic District under the shortened Potomac River Tunnel.
- Three (3) commenters expressed general support for the Potomac River Tunnel.
- Three (3) commenters stated that the EIS should include a discussion of potential mitigation options.
- Three (3) commenters questioned the feasibility of CSO control using GI.
- One (1) commenter noted the detrimental effects of rerouting bicycle and pedestrian traffic to the C&O Canal towpath.
- One (1) commenter suggested that the potential impact of the alternatives on the future streetcar line on K Street be further analyzed.
- One (1) commenter stated that the project should avoid major disruptions to public transit and traffic.

- Three (3) commenters suggested new alternatives for the EIS or additional elements to the existing alternatives. Suggestions include:
    - Evaluating the prioritization of GI activities in the sewersheds of CSO 028 and CSO 029.
    - Evaluating the reduction of flows before the tunnel project is completed.
    - Beginning the separation of CSO 025 and CSO 026 as early as possible.
    - Including hard infrastructure in the alternatives other than the proposed tunnel.
    - Connecting the existing sewer to the proposed tunnel using a pipeline (minimizing required structures).
    - Sizing the tunnel to handle overflows from CSO 027.
    - Creating an alternative tunnel alignment in lower Georgetown.
- Two (2) commenters called for an increase in the EIS study area.
- Two (2) commenters expressed concern for impacts to the parkland and suggested further examination into more conventional types of re-landscaping.
- Two (2) commenters stated the potential impact of the project on the C&O Canal National Historical Park.
- One (1) commenter suggested investigating how the Gravity Tunnel Concept might impact the Capital Crescent Trail.
- One (1) commenter opposed the use of NPS property.
- One (1) commenter concurred with the impact topics and issues analyzed under the EIS.
- One (1) commenter suggested further evaluation of the public health benefits of GI treatments that discharge upstream of the Georgetown waterfront and boathouses.
- One (1) commenter stated that delays and costs may be increased by undergrounding utilities.
- One (1) commenter discussed the presence of several structures on or eligible for listing in the National Register of Historic Places and that a portion of the study area lies within the boundaries of a National Historic Landmark.
- One (1) commenter stated that the EIS should examine the effects of climate change and sea level rise.
- One (1) commenter suggested that near term projects be evaluated for cumulative impacts to public health.
- One (1) commenter stated that past industrial activities in the area could indicate hazardous materials within the study area.

## d) The Comment Analysis Process

Comment analysis is a process used to compile and combine similar public comments into a format that can be used by decision makers and the project team responsible for the Potomac River Tunnel EIS. In the scoping phase, comment analysis helps the project team to refine the topics and issues to be evaluated and considered in the EIS, in accordance with regulations implementing NEPA and Section 106 of the NHPA.

As the NEPA process continues, comment analysis will help the project team for the Potomac River Tunnel EIS organize and clarify technical information, refine the scope of the EIS, define alternatives and issues to be addressed, and effectively evaluate potential impacts associated with the alternatives. The comment analysis process includes five main components:

- developing a coding structure to organize comments by topics
- employing a comment database for comment management

- reading and coding public comments
- interpreting and analyzing the comments to identify issues and themes
- preparing a comment summary

A coding structure was developed to help sort comments into logical groups by topic and issue. The coding structure was derived from an analysis of the range of topics discussed during internal NPS scoping and from comments received from members of the public. The coding structure was designed to capture all comment content rather than to restrict or exclude any ideas.

The PEPC database was used to manage and organize the comments. The database stores the full text of all correspondence and allows each comment to be coded by topic or issue. Outputs from the database, which are provided as tables in Chapter 2: Content Analysis Report, include tallies of the total number of pieces of correspondence and comments received, sorting and reporting of comments by a particular topic or issue, and demographic information about the sources of the comments. Analysis of the public comments in PEPC involves assigning the codes to statements made by the public in letters, emails, web forms, and comments provided at the public meetings. Each comment received during the public scoping comment period was read and analyzed. Although the comment analysis process attempts to capture the full range of public concerns, comment analysis is not a vote-counting process and this report is not intended as a statistical analysis. This report is intended to be a summary of the different concerns, issues, and opinions raised by the comments received. The emphasis is on content of the comments, rather than the number of times a particular comment was received.

### e) Definition of Terms

Primary terms used in the document are defined below:

**Correspondence:** A correspondence is the entire document received from the public – including individuals, organizations, government officials, and agency representatives. It can be in the form of a letter, comment card, or PEPC website comment form. Each piece of correspondence is assigned a unique identification number in the PEPC system.

**Comment:** A comment is a portion of the text within a correspondence that addresses a single subject. It could include such information as an expression of support or opposition to a proposed activity, additional data regarding the existing condition, an opinion questioning a matter of policy, or an opinion regarding the adequacy of an analysis.

**Code:** A grouping centered on a common topic or subject matter with which the public is concerned. The codes were developed during the scoping process and are used to track major subjects throughout the NEPA process.

**Concern:** Concerns are subdivisions of codes. Each code was further separated into several concern statements to provide a better focus on the content of comments.

**Non-Substantive Comment:** A non-substantive comment is a comment that offers opinions or provides information not directly related to issues or impact analyses. Comments in favor of or against the proposed action or alternatives, or comments that only agree or disagree with NPS policy, are non-substantive.

**Substantive Comment:** A substantive comment is a comment that does one or more of the following:

(a) question, with reasonable basis, the accuracy of information in the EIS;
(b) question, with reasonable basis, the adequacy of environmental analysis;
(c) present reasonable alternatives other than those presented in the EIS; and/or
(d) cause changes or revisions in the proposal.

In other words, they raise, debate, or question a point of fact or policy. Comments in favor of or against the proposed action or alternatives or comments that only agree or disagree with NPS policy are not considered substantive (non-substantive).

## f) Guide to This Document

This report is organized as follows:

**Content Analysis Report –** This is the basic report produced from PEPC that provides information on the numbers and types of comments received, organized by code. The first section of the report provides a summary of the number of comments that were coded under each topic. The second section provides general demographic information, such as the states where commenters live, the number of letters received from different categories of organizations, etc.

**Public Comment Summary** – This report summarizes the substantive comments received during public scoping. These comments are organized by codes and further organized into concern statements.

**Correspondence Index of Organizations –** This list identifies the commenters or authors by organization type. If the commenter provides an organization without identifying himself/herself as an official representative of that organization, that correspondence is listed under the Unaffiliated Individuals category by the organization name. Individuals who did not provide their first or last name are represented by N/A.

**Correspondence Index of Individual Commenters –** This lists all individual commenters alphabetically. Individuals who did not provide their first or last name are represented by N/A.

**Index By Organization Type –** This list identifies all of the codes that were assigned to each individual piece of correspondence and is arranged by organization type. Individual commenters are also included in this report and are identified as Unaffiliated Individuals.

**Index by Code –** This lists which commenters or authors (identified by PEPC organization type) commented on which topics, as identified by the codes used in this analysis. The report is organized by code and under each code is a list of the authors and correspondence numbers who submitted comments that fell under that code. Those correspondences identified as N/A represent unaffiliated individuals.

**Correspondences Submitted –** This is a complete listing of all correspondences submitted.

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# 2) CONTENT ANALYSIS REPORT

**TABLE 1: COMMENT DISTRIBUTION BY CODE**

| Code | Description | Total |
|---|---|---|
| AE1100 | Affected Environment: Hazardous Materials | 1 |
| AE14000 | Affected Environment: Historic Structures | 1 |
| AL1100 | Support Shortened Tunnel/GI CSO Control | 7 |
| AL1200 | Support Tunnel (General) | 3 |
| AL1300 | Oppose Use of NPS Property | 1 |
| AL4000 | Alternatives: New Alternatives or Elements | 3 |
| AL5000 | Alternatives: Miscellaneous | 1 |
| CC1000 | Consultation and Coordination: General Comments | 3 |
| CL4000 | Climate Change: Impact of Proposal and Alternatives | 1 |
| CR4000 | Cultural Resources: Impact of Proposal and Alternatives | 4 |
| HS4000 | Health and Safety: Impact of Proposal and Alternatives | 1 |
| HS5000 | Health and Safety: Cumulative | 1 |
| MT1100 | Miscellaneous Topics: General Support of EIS Process | 1 |
| MT2000 | Miscellaneous: Mitigation | 3 |
| MT3000 | Miscellaneous: Study Area | 2 |
| MT4000 | Miscellaneous: Feasibility of Equivalent CSO Control Using GI | 3 |
| MT5000 | Miscellaneous: Additional Studies/Documentation | 4 |
| PA4000 | C&O Canal National Historic Park: Impact of Proposal and Alternatives | 2 |
| SE4000 | Socioeconomics: Impact of Proposal and Alternatives | 3 |
| TR4000 | Traffic and Transportation: Impact of Proposal and Alternatives | 3 |
| UT4000 | Utilities: Impact of Proposal and Alternatives | 1 |
| VR4000 | Vegetation and Riparian: Impact of Proposal and Alternatives | 2 |
| VU4000 | Visitor Use and Experience: Impacts of Proposal and Alternatives | 5 |
| WQ4000 | Water Quality: Impact of Proposal and Alternatives | 3 |

**TABLE 2: CORRESPONDENCE SIGNATURE COUNT BY ORGANIZATION TYPE**

| Organization Type | Number of Correspondence Signatures |
|---|---|
| Civic Groups | 1 |
| Unaffiliated Individual | 16 |
| **TOTAL** | **17** |

**TABLE 3: CORRESPONDENCE DISTRIBUTION BY CORRESPONDENCE TYPE**

| Type | Number of Correspondences | Percentage |
|---|---|---|
| Web Form | 12 | 70.6% |
| Other | 3 | 17.6% |
| Letter | 2 | 11.8% |
| TOTAL | 17 | |

**TABLE 4: CORRESPONDENCE DISTRIBUTION BY STATE**

| State | Number of Correspondences | Percentage |
|---|---|---|
| DC | 13 | 76.4% |
| MD | 3 | 17.7% |
| NJ | 1 | 5.9% |
| **TOTAL** | **17** | |

# 3) PUBLIC COMMENT SUMMARY

## a) Substantive Issues Report

### AE1100 Affected Environment: Hazardous Materials (Substantive)

**Correspondence Id:** 7 **Comment Id:** 402757 **Coder Name:** MIKE_SYBERT

**Comment Text:** After the Civil War, the port of Georgetown increasingly became the site of various industrial enterprises. Along both banks of Rock Creek, near Virginia Avenue NW and the Creek's confluence with the Chesapeake & Ohio Canal, was a large complex of facilities producing and distributing illuminating gas. Toxic contaminants, likely related to these industrial activities, were found in recent years during the course of several construction projects.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

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### AE14000 Affected Environment: Historic Structures (Substantive)

**Correspondence Id:** 7 **Comment Id:** 402738 **Coder Name:** MIKE_SYBERT

**Comment Text:** Two structures within this general area are on the National Register of Historic Places: the Washington Canoe Club, and the Potomac Boat Club.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402754 **Coder Name:** MIKE_SYBERT

**Comment Text:** Part of the study area for the EIS lies within the National Historic Landmark boundaries for Georgetown. Georgetown was designated a National Historic Landmark in 1967. Additionally, as noted above, several structures on the National Register of Historic Places are within the Georgetown study area.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402748 **Coder Name:** MIKE_SYBERT

**Comment Text:** The former GSA West Heating Plant building and site were determined to be eligible for listing on the National Register of Historic Places.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

### AL1100 Support Shortened Tunnel/GI CSO Control (Non-Substantive)

**Correspondence Id:** 3 **Comment Id:** 402725 **Coder Name:** MIKE_SYBERT

**Comment Text:** I fully support the proposal Green Infrastructure proposal of DC Water as a way to accomplish the required clean-water goals along the Potomac River and Rock Creek faster and in a more environmentally friendly way, and urge a comprehensive evaluation in the EIS of the time to completion; financial impact, including construction and long-term impact of operations and maintenance on water and sewer ratepayers; ecological and environmental benefits; legal impacts, including what laws would be required to maintain the long-term integrity of the Green Infrastructure projects (for example, any need to re-zone or restrict construction in adjoining areas to avoid types of developments and materials such as solid concrete that would reverse the benefits); and social benefits, such as increased parkland for recreation, of incorporating this proposal into the overall tunnel plan.

**Organization:** Defenders of Potomac River Parkland

**Commenter:** Amber Jones **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 4 **Comment Id:** 402729 **Coder Name:** MIKE_SYBERT

**Comment Text:** For these reasons, our Association supports modification of the Long Term Control Plan to make it possible to fulfill the aims of the DC Clean Rivers Project without tunnel construction upriver from the Alexandria Aqueduct.

**Organization:** C&O Canal Association

**Commenter:** Dward Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402760 **Coder Name:** MIKE_SYBERT

**Comment Text:** We further support the proposal to shorten the length of the Potomac River Tunnel. Originally envisioned as extending west along the Potomac River and ending near the outfall for CSO 29 (aligned approximately with the 3900 block of Canal Road NW), the truncated tunnel would now extend only to the general area of the confluence of Rock Creek and the Potomac River, ten or more blocks east.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 8 **Comment Id:** 402762 **Coder Name:** MIKE_SYBERT

**Comment Text:** For this reason, I strongly prefer the DC Water proposal that would place the western terminus of the tunnel downriver from Key Bridge.

**Organization:**

**Commenter:** Edmund Preston **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 10 **Comment Id:** 402764 **Coder Name:** MIKE_SYBERT

**Comment Text:** For these reasons, as well as the many reasons to turn to green solutions to as much run-off in this area, I strongly favor the reduction to the smallest possible amount of tunneling and creation of combined sewage outflows in the river.

**Organization:**

**Commenter:** Gretchen Ellsworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402766 **Coder Name:** MIKE_SYBERT

**Comment Text:** We also agree, in principal, with their conclusions that green infrastructure is preferable to construction of the section of storm water retention tunnel that was originally planned between Rock Creek and Key Bridge.

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402788 **Coder Name:** MIKE_SYBERT

**Comment Text:** Using the above measure to control CSO discharges upstream of Thompson's Boat Center means that a shortened Potomac Tunnel is adequate and will save ratepayers money. We support the shortened Potomac Tunnel and the 5 year extension, coupled with strict performance criteria.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

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### AL1200 Support Tunnel (General) (Non-Substantive)

**Correspondence Id:** 7 **Comment Id:** 402759 **Coder Name:** MIKE_SYBERT

**Comment Text:** CAG and FoGWP fully support the goal of ending nearly all the combined sewer outflows into the Potomac and Anacostia rivers. This will greatly benefit residents and visitors of our area, who increasingly are using these waters as a recreational resource.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402765 **Coder Name:** MIKE_SYBERT

**Comment Text:** We strongly support efforts to eliminate or, at least, greatly reduce, combined sewer overflow events.

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 16 **Comment Id:** 402796 **Coder Name:** MIKE_SYBERT

**Comment Text:** The more tunnels the better!

**Organization:**

**Commenter:** Ted Nevius **Page:** **Paragraph:**

**Kept Private:** No

### AL1300 Oppose Use of NPS Property (Non-Substantive)

**Correspondence Id:** 1 **Comment Id:** 402716 **Coder Name:** MIKE_SYBERT

**Comment Text:** don't use nps property for this issue of sewer clean up for this region. the region needs to use its own property for its clean up sewer issues.

**Organization:**

**Commenter:** jean publi **Page:** **Paragraph:**

**Kept Private:** No

### AL4000 Alternatives: New Alternatives Or Elements (Substantive)

**Correspondence Id:** 7 **Comment Id:** 402735 **Coder Name:** MIKE_SYBERT

**Comment Text:** CAG and FoGWP believe actual reduction of overflows, particularly for CSO 27, may require the retention capacity of the Potomac River tunnel to be increased to handle a greater flow volume. For this reason, the EIS study area should be expanded.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402787 **Coder Name:** MIKE_SYBERT

**Comment Text:** While some amount of control appears to be available to three of the five upstream CSOs, we urge the Environmental Impact Statement to evaluate the benefit of prioritizing GI activities in the sewersheds of CSO 028 and 029. For example, the CSO 028 sewershed is 21 acres, of which 13 acres are impervious surface. It appears to be comprised of roughly nine blocks of Georgetown, at least three of which appear to be green space associated with the eastern section of Georgetown University campus as well as a section of the waterfront that includes a canoe rental facility. Controlling these areas with a variety of GI technologies might be undertaken with minimum disruption. Indeed, DC Water has proposed to treat 30 percent of the impervious surface in the sewershed amounting to only 4 acres. In contrast, controlling CSO 029 appears to present more challenges. The 330 acre sewershed has 164 acres of impervious surface, the largest of the Potomac sewersheds. DC Water has indicated that they could achieve a 60 percent treatment rate of impervious surface based on earlier work on separation. Because of the location of this CSO immediately upstream from the Potomac Boat Club, we recommend that this area be given top priority for GI treatment.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402786 **Coder Name:** MIKE_SYBERT

**Comment Text:** The Environmental Impact Statement should evaluate the water quality benefits and public health protection that would result from prioritizing GI treatment of Potomac sewersheds that discharge upstream of the boat houses and the Georgetown waterfront first.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402784 **Coder Name:** MIKE_SYBERT

**Comment Text:** However, we urge that the Environmental Impact Statement evaluate reducing the flows before the Tunnel is completed in order to afford greater protection from overflows to the Thompson's Boat Center and Georgetown Waterfront downstream.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402782 **Coder Name:** MIKE_SYBERT

**Comment Text:** Under DC Water's modification proposal, the separation of CSO 025 and 26 is not slated to be completed until after the Potomac tunnel is completed in 2032. We urge that the EIS evaluate the benefits of having this separation begin as soon as possible and not wait until the Potomac tunnel is completed. Modeling data from DC Water indicates that even in the wettest quarters, these sewersheds generate relatively little flow. Indeed, CSO 025 comprises only 17 acres of sewershed. The data indicate that CSO 026 has virtually zero flow. However, CSO 025 flows are immediately upstream from Thompson's Boat Center and reducing flows here may afford that high recreational use area some benefit.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402773 **Coder Name:** MIKE_SYBERT

**Comment Text:** we further believe that alternatives should include hard infrastructure other than the proposed tunnel, such as the use of the C&O Canal right of way in exchange of improvements to the canal structure, in the event that green infrastructure is not a viable alternative.

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402751 **Coder Name:** MIKE_SYBERT

**Comment Text:** We expect the description of each alternative to describe the time it would take to de-water the tunnel, and the consequent effect on tunnel storage capacity and length.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402749 **Coder Name:** MIKE_SYBERT

**Comment Text:** CAG and FoGWP propose that an alternative in the EIS examine re-aligning the path of this sewer in lower Georgetown. A potential re-alignment would take the sewer from a position just south of Pennsylvania Avenue NW and near the west abutment of the Pennsylvania Avenue Bridge to a position east of Rock Creek near the intersection of K St. NW and 27th St. NW.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402743 **Coder Name:** MIKE_SYBERT

**Comment Text:** Although the overflow from CSO 28 is minimal, we believe that an alternative in the EIS that sizes the stormwater retention tunnel to handle overflows from CSO 27 - if further study determines that overflows from this sewer would not be abated by Green Infrastructure - is warranted.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402741 **Coder Name:** MIKE_SYBERT

**Comment Text:** CAG and FoGWP believe that the EIS must include an alternative that avoids construction, or the placement of any tunnel-related structure or shaft, within or immediately adjacent to the Waterfront Park.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402740 **Coder Name:** MIKE_SYBERT

**Comment Text:** Among the tunnel-related structures potentially to be built in this area are a retrieval shaft, a diversion chamber(s), and a tangential inlet. An alternative that uses a pipeline to connect these two sewers, and reduces the number of required structures should be included in the EIS.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402739 **Coder Name:** MIKE_SYBERT

**Comment Text:** CAG and FoGWP strongly believe the EIS must include an alternative where the sewer and tunnel-related structures have the least permanent effect on future sites for new boathouses, and for access to and recreational use of the river.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

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### AL5000 Alternatives: Miscellaneous (Substantive)

**Correspondence Id:** 12 **Comment Id:** 402776 **Coder Name:** MIKE_SYBERT

**Comment Text:** how the option of the Gravity Tunnel Concept might impact the project upriver from Rock Creek, particularly along the CCT.

**Organization:** Coalition for the Capital Crescent Trail

**Commenter:** N/A **Page:** **Paragraph:**

**Kept Private:** No

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### CC1000 Consultation and Coordination: General Comments (Substantive)

**Correspondence Id:** 2 **Comment Id:** 402723 **Coder Name:** MIKE_SYBERT

**Comment Text:** Construction in the vicinity of any Metrorail system infrastructure, whether at grade, aerial, or tunnel must be coordinated with WMATA to ensure safety and eliminate conflicts. Specifically, any construction within the WMATA Zone of Influence, as defined in our adjacent construction project manual, or any construction that requires the temporary or permanent use of WMATA property, is subject to review and coordination with WMATA.

**Organization:** Washington Metropolitan Area Transit Authority

**Commenter:** Regina A Sullivan **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 15 **Comment Id:** 402794 **Coder Name:** MIKE_SYBERT

**Comment Text:** 3. Is DC Water working in concert with the DC Office of Planning?

**Organization:**

**Commenter:** Alma Gates **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 15 **Comment Id:** 402793 **Coder Name:** MIKE_SYBERT

**Comment Text:** 1. How will this proposed project be coordinated with DDOT's proposed upgrades to Canal Road.

**Organization:**

**Commenter:** Alma Gates **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402755 **Coder Name:** MIKE_SYBERT

**Comment Text:** If the National Park Service intends to reflect and incorporate relevant requirements established by the NHPA in the preparation of the EIS, with respect to both content and process, this should be done in a manner consistent the Handbook. In this regard, we ask to be informed of the opportunities for future consultation and coordination in the preparation of this EIS.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 2 **Comment Id:** 402724 **Coder Name:** MIKE_SYBERT

**Comment Text:** Please be advised that in advance of such effort, the relationship between WMATA and the project sponsor(s) must be reduced to formal agreement. Importantly, that eventual agreement will provide that certain insurance and indemnification requirements will be passed-through to the project sponsor's contractor(s). It will also ensure prompt reimbursement to WMATA for staff time associated with the project.

**Organization:** Washington Metropolitan Area Transit Authority

**Commenter:** Regina A Sullivan **Page:** **Paragraph:**

**Kept Private:** No

### CL4000 Climate Change: Impact of Proposal and Alternatives (Substantive)

**Correspondence Id:** 7 **Comment Id:** 402753 **Coder Name:** MIKE_SYBERT

**Comment Text:** The EIS should address the potential long-term effect of climate change and sea level rise on this project. Among the effects that should be considered are projected changes in the intensity, duration, and frequency of significant rain events. A significant change in the amount of precipitation that falls in future decades in the Mid-Atlantic can impact the size and capacity of the stormwater retention tunnel. A rise in sea level, accompanied by higher storm surges, may lead to increased flooding, with higher flood heights, on the Potomac River. This possibility should be factored in the design and placement of structures associated with this project.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

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### CR4000 Cultural Resources: Impact Of Proposal And Alternatives (Substantive)

**Correspondence Id:** 7 **Comment Id:** 402737 **Coder Name:** MIKE_SYBERT

**Comment Text:** Our concern for this area is the potential for serious detrimental effects from heavy construction equipment and activity on the bottomlands; the Capitol Crescent trail; two major interceptor sewers that parallel the trail, one having had three significant failures in recent years, spilling large amounts of raw sewage; the fragile condition of the century-old Washington Canoe Club boathouse; and the remaining abutment of the Nineteenth Century Aqueduct Bridge that once crossed the Potomac River. (The abutment and a pier near the Virginia shore were preserved as historical markers for this remarkable engineering edifice.)

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402780 **Coder Name:** MIKE_SYBERT

**Comment Text:** DC water has envisioned GI to be the primary treatment option. However, GI projects in these sewersheds might arouse citizen opposition and contribute in delays and increased costs. Navigating the historical designations in Georgetown as well as mitigating threats to Georgetown Park along the waterfront could pose additional delays and increased costs. Finally, recent DC legislation mandating the undergrounding of certain electric wires may also contribute to delays and increase the cost per acre. For these reasons, the EIS should evaluate whether the shortened Potomac River Tunnel proposed by DC Water minimizes the disruption to Georgetown residents, businesses, and the Historic District.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402769 **Coder Name:** MIKE_SYBERT

**Comment Text:** Knowing that our members will be impacted, our goal is to have the CSO mitigation projects completed: 1. as quickly as possible 2. with as little disruption to any particular building, business, or sector of the workforce, as possible; 3. without major disruption to public transit or commuter or visitor traffic 4. to be maximally effective in limiting CSO events 5. to minimize impact to Georgetowns parks and recreation facilities 6. to minimize impact on historic commercial buildings 7. to minimize impact on the long-term look and feel of the commercial district, including mature street trees and brick sidewalks 8. to be a permanent solution - so that future generations do not have to readdress this issue

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 10 **Comment Id:** 402763 **Coder Name:** MIKE_SYBERT

**Comment Text:** I am concerned about the historical structures fronting the Potomac near Key Bridge. In addition, of course, to the C&O Canal, the only two surviving early 20th-century boathouses on the River and the Aqueduct Bridge remains are at risk. These important documents of their eras on the River seem to be directly in the path of harm and very unlikely to survive the impact of digging and the movement of heavy equipment over and over in and out of the constricted access area. The vibrations from digging and truck traffic etc. will, I fear, be too much for the century old boathouses and even older aqueduct bridge remains.

**Organization:**

**Commenter:** Gretchen Ellsworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402744 **Coder Name:** MIKE_SYBERT

**Comment Text:** DC Water has indicated it intends to separate these combined sewers into sanitary sewers and storm sewers. We note that separation will entail construction next to the oldest surviving waterfront building from the port of Georgetown era: the Francis Dodge Warehouse at the corner of Wisconsin Ave. and K St. NW. The Historic American Buildings Survey indicates that the Dodge Warehouse building was erected in the late Eighteenth Century. We expect that the alternatives will ensure that no damage occurs to this building. We also note that, within this part of the study area, the Grace Episcopal Church is on the National Register of Historic Places.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

### HS4000 Health and Safety: Impact of Proposal and Alternatives (Substantive)

**Correspondence Id:** 13 **Comment Id:** 402786 **Coder Name:** MIKE_SYBERT

**Comment Text:** The Environmental Impact Statement should evaluate the water quality benefits and public health protection that would result from prioritizing GI treatment of Potomac sewersheds that discharge upstream of the boat houses and the Georgetown waterfront first.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

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### HS5000 Health and Safety: Cumulative (Substantive)

**Correspondence Id:** 13 **Comment Id:** 402777 **Coder Name:** MIKE_SYBERT

**Comment Text:** I. The Environmental Impact Statement should evaluate near term projects to protect public health and the environment particularly around areas of known public contact such as the boathouses along the Potomac River and the Georgetown Waterfront.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402781 **Coder Name:** MIKE_SYBERT

**Comment Text:** II. The Environmental Impact Statement should evaluate the benefits of prioritizing near term projects to protect public health and the environment particularly around areas of known public contact such as the boathouses along the Potomac River and the Georgetown Waterfront.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

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### MT1100 Miscellaneous Topics: General Support of EIS Process (Substantive)

**Correspondence Id:** 5 **Comment Id:** 402731 **Coder Name:** MIKE_SYBERT

**Comment Text:** During DC Water's public scoping meeting of July 31, 2014, the Defenders were pleased to read in the "Welcome" handout, p.13, that the following issues and impact topics will be analyzed in the EIS for the Potomac River tunnel project: water quality; wetlands; floodplains; wildlife including rare, threatened and endangered species; air quality; noise; historic structures and districts; cultural landscapes; visitor use and experience; human health and safety; park operations and management; and, transportation. We agree that these issues and topics should be included in the EIS for the project because they are critical for the protection of parkland, and we look forward to reviewing the analysis and results of same in the draft EIS when it is released to the public.

**Organization:** Defenders of Potomac River Parkland

**Commenter:** Sally Strain **Page:** **Paragraph:**

**Kept Private:** No

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### MT2000 Miscellaneous: Mitigation (Substantive)

**Correspondence Id:** 3 **Comment Id:** 402726 **Coder Name:** MIKE_SYBERT

**Comment Text:** I also urge NPS and DC Water to consider the pending tunnel construction project, regardless of final size and capacity and whether or not Green Infrastructure is incorporated, as an opportunity to re-landscape as many areas of public parkland as possible (after construction is finished) with indigenous plant species and wetlands resembling historic ones (before roads, buildings, bridges, and railroads).

**Organization:** Defenders of Potomac River Parkland

**Commenter:** Amber Jones **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 6 **Comment Id:** 402732 **Coder Name:** MIKE_SYBERT

**Comment Text:** mitigation measures must also be considered.

**Organization:** The Committee of 100 on the Federal City

**Commenter:** Nancy MacWood **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402750 **Coder Name:** MIKE_SYBERT

**Comment Text:** Four of the six combined sewers in Georgetown (numbers 24, 27, 28, and 29) cross under the Chesapeake and Ohio Canal. Any alternative that proposes construction in or near the canal, or proposes running sewer pipe in the canal bed should describe actions to be taken to mitigate any potential damage to the canal walls, or canal towpath.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402758 **Coder Name:** MIKE_SYBERT

**Comment Text:** The EIS should describe mitigating actions to eliminate the risk to public health and welfare of hazardous substances discovered during construction.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

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### MT3000 Miscellaneous: Study Area (Substantive)

**Correspondence Id:** 7 **Comment Id:** 402733 **Coder Name:** MIKE_SYBERT

**Comment Text:** CAG and FoGWP believe the study area should be expanded to include the catchment areas for CSO 28 and CSO 27 in west Georgetown.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402735 **Coder Name:** MIKE_SYBERT

**Comment Text:** CAG and FoGWP believe actual reduction of overflows, particularly for CSO 27, may require the retention capacity of the Potomac River tunnel to be increased to handle a greater flow volume. For this reason, the EIS study area should be expanded.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402789 **Coder Name:** MIKE_SYBERT

**Comment Text:** We suggest that the scope of the EIS be limited to the impacts on US Park Service land along the Potomac and expanded to consider the impacts on the sewersheds tributary to the Potomac Tunnel including CSOs 20, 21 and 22 and evaluate the impact of the Tunnel on the operation and maintenance of the Potomac Pumping Station.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

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### MT4000 Miscellaneous: Feasibility of Equivalent CSO Control Using GI (Non-Substantive)

**Correspondence Id:** 7 **Comment Id:** 402734 **Coder Name:** MIKE_SYBERT

**Comment Text:** DC Water proposes to reduce overflows from these two sewers through several Green Infrastructure initiatives. The practicability and efficacy of DC Water's proposed initiatives has yet to be demonstrated with respect to these two Georgetown sewers.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402742 **Coder Name:** MIKE_SYBERT

**Comment Text:** CAG and FoGWP are skeptical that the proposed strategies will result in flow reductions on the scale envisioned by the models (which seem to have been run without locational data). Our skepticism is based on the age and deteriorated condition of the sewers serving west Georgetown; sewers which likely reflect the design dictum of the era: 'Dilution is the solution for pollution'.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402767 **Coder Name:** MIKE_SYBERT

**Comment Text:** However, we are skeptical of the ability of green infrastructure projects west of Rock Creek to eliminate CSO events, and request that the EIS fully describe and evaluate all aspects of the green infrastructure that would be necessary to achieve the desired goal, and that the EIS further evaluate alternative hard infrastructure interventions that are less disruptive than tunneling west of Rock Creek, and would achieve the desired goals.

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402770 **Coder Name:** MIKE_SYBERT

**Comment Text:** Specific issues that the EIS should address include: Whether DC Waters requested modification to shorten the tunnel and replace the section addressing CSOs 026 through 029 with green infrastructure is workable. In the absence of a specific green infrastructure plan, we wonder how realistic the generic green infrastructure interventions will be when applied to the Georgetown Historic District.

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402771 **Coder Name:** MIKE_SYBERT

**Comment Text:** The EIS should present a storm water retention goal for each CSO outfall (gallons of water that must be retained or diverted from the storm system to prevent a CSO from occurring) and then present a realistic plan for each outfall catchment area that includes the exact location, cost, and management plan for each of the proposed green infrastructure interventions. Each should account for the historic, physical, geotechnical, and political hurdles that will have to be overcome to do the installation. The EIS must evaluate:

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402783 **Coder Name:** MIKE_SYBERT

**Comment Text:** The Environmental Impact Statement should evaluate whether GI alone may not be enough to reduce flows from this overflow to meet LTCP goals and whether it might be possible to divert some of these flows to the Upper Potomac Relief Sewer after the Potomac Tunnel is completed.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

## MT5000 Miscellaneous: Additional Studies/Documentation (Substantive)

**Correspondence Id:** 7 **Comment Id:** 402743 **Coder Name:** MIKE_SYBERT

**Comment Text:** Although the overflow from CSO 28 is minimal, we believe that an alternative in the EIS that sizes the stormwater retention tunnel to handle overflows from CSO 27 - if further study determines that overflows from this sewer would not be abated by Green Infrastructure - is warranted.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402784 **Coder Name:** MIKE_SYBERT

**Comment Text:** However, we urge that the Environmental Impact Statement evaluate reducing the flows before the Tunnel is completed in order to afford greater protection from overflows to the Thompson's Boat Center and Georgetown Waterfront downstream.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402783 **Coder Name:** MIKE_SYBERT

**Comment Text:** The Environmental Impact Statement should evaluate whether GI alone may not be enough to reduce flows from this overflow to meet LTCP goals and whether it might be possible to divert some of these flows to the Upper Potomac Relief Sewer after the Potomac Tunnel is completed.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402782 **Coder Name:** MIKE_SYBERT

**Comment Text:** Under DC Water's modification proposal, the separation of CSO 025 and 26 is not slated to be completed until after the Potomac tunnel is completed in 2032. We urge that the EIS evaluate the benefits of having this separation begin as soon as possible and not wait until the Potomac tunnel is completed. Modeling data from DC Water indicates that even in the wettest quarters, these sewersheds generate relatively little flow. Indeed, CSO 025 comprises only 17 acres of sewershed. The data indicate that CSO 026 has virtually zero flow. However, CSO 025 flows are immediately upstream from Thompson's Boat Center and reducing flows here may afford that high recreational use area some benefit.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402781 **Coder Name:** MIKE_SYBERT

**Comment Text:** II. The Environmental Impact Statement should evaluate the benefits of prioritizing near term projects to protect public health and the environment particularly around areas of known public contact such as the boathouses along the Potomac River and the Georgetown Waterfront.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402780 **Coder Name:** MIKE_SYBERT

**Comment Text:** DC water has envisioned GI to be the primary treatment option. However, GI projects in these sewersheds might arouse citizen opposition and contribute in delays and increased costs. Navigating the historical designations in Georgetown as well as mitigating threats to Georgetown Park along the waterfront could pose additional delays and increased costs. Finally, recent DC legislation mandating the undergrounding of certain electric wires may also contribute to delays and increase the cost per acre. For these reasons, the EIS should evaluate whether the shortened Potomac River Tunnel proposed by DC Water minimizes the disruption to Georgetown residents, businesses, and the Historic District.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402778 **Coder Name:** MIKE_SYBERT

**Comment Text:** II. The Environmental Impact Statement should evaluate the impact on ratepayers by building a shortened Potomac tunnel that would reduce capital costs.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402777 **Coder Name:** MIKE_SYBERT

**Comment Text:** I. The Environmental Impact Statement should evaluate near term projects to protect public health and the environment particularly around areas of known public contact such as the boathouses along the Potomac River and the Georgetown Waterfront.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 12 **Comment Id:** 402774 **Coder Name:** MIKE_SYBERT

**Comment Text:** We would like to see documentation/references to tunnel projects of this nature being successfully implemented elsewhere in your report.

**Organization:** Coalition for the Capital Crescent Trail

**Commenter:** N/A **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402772 **Coder Name:** MIKE_SYBERT

**Comment Text:** a. how much storm water each of the major green infrastructure tactics could realistically capture/divert in Georgetown's environment given existing and future development. b. how much roof space can realistically host green roof material and how much water would that capture? c. where and how impervious paving materials would be replaced by pervious materials and how much water would be captured? d. where and how would bio swales, rain gardens, and rain capturing plant species be employed and how much water would they divert and process? e. given that a standard 66 gallon rain barrel can capture only 12% o the runoff from 1 rain event on a typical 900 square foot roof, how many barrels and cisterns would need to be employed, where would they be installed, how would they be managed, and what would be their impact?

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402767 **Coder Name:** MIKE_SYBERT

**Comment Text:** However, we are skeptical of the ability of green infrastructure projects west of Rock Creek to eliminate CSO events, and request that the EIS fully describe and evaluate all aspects of the green infrastructure that would be necessary to achieve the desired goal, and that the EIS further evaluate alternative hard infrastructure interventions that are less disruptive than tunneling west of Rock Creek, and would achieve the desired goals.

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402756 **Coder Name:** MIKE_SYBERT

**Comment Text:** The EIS should reference and describe the numerous cultural resource-related studies already completed in the Potomac River Tunnel study area, and identify the need for additional studies in those areas likely to be directly impacted by construction of the tunnel, or by ancillary structures connecting a combined sewer with the tunnel.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402751 **Coder Name:** MIKE_SYBERT

**Comment Text:** We expect the description of each alternative to describe the time it would take to de-water the tunnel, and the consequent effect on tunnel storage capacity and length.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

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### PA4000 C&O Canal National Historic Park: Impact of Proposal and Alternatives (Non-Substantive)

**Correspondence Id:** 4 **Comment Id:** 402730 **Coder Name:** MIKE_SYBERT

**Comment Text:** We urge that planners take all possible steps to protect the C&O Canal NHP

**Organization:** C&O Canal Association

**Commenter:** Dward Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 8 **Comment Id:** 402761 **Coder Name:** MIKE_SYBERT

**Comment Text:** In particular, very significant harm to the C&O Canal National Historical Park would probably result if the tunnel's construction and maintenance took place in the area west of the remaining section of the Alexandria Canal Aqueduct.

**Organization:**

**Commenter:** Edmund Preston **Page:** **Paragraph:**

**Kept Private:** No

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### SE4000 Socioeconomics: Impact Of Proposal And Alternatives (Substantive)

**Correspondence Id:** 11 **Comment Id:** 402768 **Coder Name:** MIKE_SYBERT

**Comment Text:** Thus, every effort to design and build a system that reduces or eliminates CSO events in Georgetown will disrupt the physical environment and impact buildings, businesses, access, mobility, and recreation. We expect that any mitigation efforts will temporarily harm the local economy by limiting access to businesses, slowing traffic, disrupting public transit, and limiting recreation uses.

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402792 **Coder Name:** MIKE_SYBERT

**Comment Text:** We urge the EIS to evaluate ways that DC Water mitigate rate impacts on low income ratepayers including: - renegotiating the InterMunicipal Agreement (IMA) to increase user charges for the use of the Potomac Interceptor Sewer to better reflect the true cost of those flows; - reevaluating the present rate structure to assess whether charges for the commercial and other sewer users including WMATA and the federal government truly reflect costs; - expanding DC Water's program of rate relief for low income ratepayers; and continuing to pursue federal funding.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402791 **Coder Name:** MIKE_SYBERT

**Comment Text:** The EIS should evaluate the benefits for low-income ratepayers by constructing the shortened Potomac Tunnel. It is important to note that DC residents will likely experience significant increases in utility bills due to a variety of factors including fuel costs and the additional costs of undergrounding utility lines. To use these increases in the LTCP as the reason for delays disguises the real problem. Shaving the peaks o capital costs, as this proposal attempts to do, is merely a short-term fix to a larger problem, the cost of DC Water's Capital Improvement Program (CIP). The real need for these rate increases results from the legacy of decades of underfunding of our sewer and water infrastructure stemming from a dysfunctional relationship with the DC government. Ratepayer dollars were continually sucked out of the Sewer and Water Fund and used to cover politically motivated contracts. The result was a cash-starved Department of Sanitary Engineering that could only respond to emergencies, much less longer term water quality issues.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402780 **Coder Name:** MIKE_SYBERT

**Comment Text:** DC water has envisioned GI to be the primary treatment option. However, GI projects in these sewersheds might arouse citizen opposition and contribute in delays and increased costs. Navigating the historical designations in Georgetown as well as mitigating threats to Georgetown Park along the waterfront could pose additional delays and increased costs. Finally, recent DC legislation mandating the undergrounding of certain electric wires may also contribute to delays and increase the cost per acre. For these reasons, the EIS should evaluate whether the shortened Potomac River Tunnel proposed by DC Water minimizes the disruption to Georgetown residents, businesses, and the Historic District.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402778 **Coder Name:** MIKE_SYBERT

**Comment Text:** II. The Environmental Impact Statement should evaluate the impact on ratepayers by building a shortened Potomac tunnel that would reduce capital costs.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 12 **Comment Id:** 402775 **Coder Name:** MIKE_SYBERT

**Comment Text:** at the July meeting DC Water representatives stated that the Hybrid Plan would not actually result in any appreciable cost savings vs a tunnel project under the CCT & C&O Canal upriver from Rock Creek, and we would like further explanation on why that is so.

**Organization:** Coalition for the Capital Crescent Trail

**Commenter:** N/A **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402769 **Coder Name:** MIKE_SYBERT

**Comment Text:** Knowing that our members will be impacted, our goal is to have the CSO mitigation projects completed: 1. as quickly as possible 2. with as little disruption to any particular building, business, or sector of the workforce, as possible; 3. without major disruption to public transit or commuter or visitor traffic 4. to be maximally effective in limiting CSO events 5. to minimize impact to Georgetown's parks and recreation facilities 6. to minimize impact on historic commercial buildings 7. to minimize impact on the long-term look and feel of the commercial district, including mature street trees and brick sidewalks 8. to be a permanent solution - so that future generations do not have to readdress this issue

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

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## TR4000 Traffic and Transportation: Impact of Proposal and Alternatives (Substantive)

**Correspondence Id:** 4 **Comment Id:** 402728 **Coder Name:** MIKE_SYBERT

**Comment Text:** A central mission of our Association is to safeguard the environmental and historical assets of the Chesapeake and Ohio Canal National Historical Park. The EIS study area includes a popular portion of the canal park that extends upriver from the Alexandria Aqueduct. That area would be adversely affected by the longer version of the Potomac River Tunnel originally envisioned under DC Water's Long Term Control Plan. Much of this parkland would likely be closed during the lengthy construction period. It seems probable that pedestrian and bicycle traffic along the much-used Capital Crescent Trail would have to be rerouted along the historic canal towpath. Permanent effects on the canal park might include installation of a tunnel access point and the operation of maintenance vehicles, changes that would be detrimental to this historic and scenic space.

**Organization:** C&O Canal Association

**Commenter:** Dward Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402752 **Coder Name:** MIKE_SYBERT

**Comment Text:** Proposals have been made for a streetcar line to run along K St. NW in Georgetown, and possibly have a terminus there. Alternatives that place structures, such as diversion chambers and tangential inlets, on K St. should address the potential impact of these on a future streetcar line on K Street.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402769 **Coder Name:** MIKE_SYBERT

**Comment Text:** Knowing that our members will be impacted, our goal is to have the CSO mitigation projects completed: 1. as quickly as possible 2. with as little disruption to any particular building, business, or sector of the workforce, as possible; 3. without major disruption to public transit or commuter or visitor traffic 4. to be maximally effective in limiting CSO events 5. to minimize impact to Georgetown’s parks and recreation facilities 6. to minimize impact on historic commercial buildings 7. to minimize impact on the long-term look and feel of the commercial district, including mature street trees and brick sidewalks 8. to be a permanent solution - so that future generations do not have to readdress this issue

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

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### UT4000 Utilities: Impact of Proposal and Alternatives (Substantive)

**Correspondence Id:** 13 **Comment Id:** 402780 **Coder Name:** MIKE_SYBERT

**Comment Text:** DC water has envisioned GI to be the primary treatment option. However, GI projects in these sewersheds might arouse citizen opposition and contribute in delays and increased costs. Navigating the historical designations in Georgetown as well as mitigating threats to Georgetown Park along the waterfront could pose additional delays and increased costs. Finally, recent DC legislation mandating the undergrounding of certain electric wires may also contribute to delays and increase the cost per acre. For these reasons, the EIS should evaluate whether the shortened Potomac River Tunnel proposed by DC Water minimizes the disruption to

Georgetown residents, businesses, and the Historic District.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

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### VR4000 Vegetation And Riparian Areas: Impact Of Proposal And Alternatives (Substantive)

**Correspondence Id:** 3 **Comment Id:** 402727 **Coder Name:** MIKE_SYBERT

**Comment Text:** The EIS should consider this alternative to more conventional types of re-landscaping and evaluate the many benefits that could accrue, including improving natural flood protection and erosion control of the parkland along the Potomac River, Rock Creek, and Anacostia River; discouraging ("crowding-out") invasive species; and attracting indigenous wildlife (such as has occurred as a result of the Kenilworth Marsh restoration project by the Corps of Engineers)

**Organization:** Defenders of Potomac River Parkland

**Commenter:** Amber Jones **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402737 **Coder Name:** MIKE_SYBERT

**Comment Text:** Our concern for this area is the potential for serious detrimental effects from heavy construction equipment and activity on the bottomlands; the Capitol Crescent trail; two major interceptor sewers that parallel the trail, one having had three significant failures in recent years, spilling large amounts of raw sewage; the fragile condition of the century-old Washington Canoe Club boathouse; and the remaining abutment of the Nineteenth Century Aqueduct Bridge that once crossed the Potomac River. (The abutment and a pier near the Virginia shore were preserved as historical markers for this remarkable engineering edifice.)

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

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### VU4000 Visitor Use: Impact Of Proposal And Alternatives (Substantive)

**Correspondence Id:** 4 **Comment Id:** 402728 **Coder Name:** MIKE_SYBERT

**Comment Text:** A central mission of our Association is to safeguard the environmental and historical assets of the Chesapeake and Ohio Canal National Historical Park. The EIS study area includes a popular portion of the canal park that extends upriver from the Alexandria Aqueduct. That area would be adversely affected by the longer version of the Potomac River Tunnel originally envisioned under DC Water's Long Term Control Plan. Much of this parkland would likely be closed during the lengthy construction period. It seems probable that pedestrian and bicycle traffic along the much-used Capital Crescent Trail would have to be rerouted along the historic canal towpath. Permanent effects on the canal park might include installation of a tunnel access point and the operation of maintenance vehicles, changes that would be detrimental to this historic and scenic space.

**Organization:** C&O Canal Association

**Commenter:** Dward Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402736 **Coder Name:** MIKE_SYBERT

**Comment Text:** These outfalls are within or proximate to the non-motorized boathouse zone being advanced by the National Park Service.

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402737 **Coder Name:** MIKE_SYBERT

**Comment Text:** Our concern for this area is the potential for serious detrimental effects from heavy construction equipment and activity on the bottomlands; the Capitol Crescent trail; two major interceptor sewers that parallel the trail, one having had three significant failures in recent years, spilling large amounts of raw sewage; the fragile condition of the century-old Washington Canoe Club boathouse; and the remaining abutment of the Nineteenth Century Aqueduct Bridge that once crossed the Potomac River. (The abutment and a pier near the Virginia shore were preserved as historical markers for this remarkable engineering edifice.)

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 11 **Comment Id:** 402769 **Coder Name:** MIKE_SYBERT

**Comment Text:** Knowing that our members will be impacted, our goal is to have the CSO mitigation projects completed: 1. as quickly as possible 2. with as little disruption to any particular building, business, or sector of the workforce, as possible; 3. without major disruption to public transit or commuter or visitor traffic 4. to be maximally effective in limiting CSO events 5. to minimize impact to Georgetown’s parks and recreation facilities 6. to minimize impact on historic commercial buildings 7. to minimize impact on the long-term look and feel of the commercial district, including mature street trees and brick sidewalks 8. to be a permanent solution - so that future generations do not have to readdress this issue

**Organization:** Georgetown Business Improvement District

**Commenter:** Joseph Sternlieb **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 12 **Comment Id:** 402776 **Coder Name:** MIKE_SYBERT

**Comment Text:** how the option of the Gravity Tunnel Concept might impact the project upriver from Rock

Creek, particularly along the CCT.

**Organization:** Coalition for the Capital Crescent Trail

**Commenter:** N/A **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402782 **Coder Name:** MIKE_SYBERT

**Comment Text:** Under DC Water's modification proposal, the separation of CSO 025 and 26 is not slated to be completed until after the Potomac tunnel is completed in 2032. We urge that the EIS evaluate the benefits of having this separation begin as soon as possible and not wait until the Potomac tunnel is completed. Modeling data from DC Water indicates that even in the wettest quarters, these sewersheds generate relatively little flow. Indeed, CSO 025 comprises only 17 acres of sewershed. The data indicate that CSO 026 has virtually zero flow. However, CSO 025 flows are immediately upstream from Thompson's Boat Center and reducing flows here may afford that high recreational use area some benefit.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

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## WQ4000 Water Resources: Impact Of Proposal And Alternatives (Substantive)

**Correspondence Id:** 3 **Comment Id:** 402727 **Coder Name:** MIKE_SYBERT

**Comment Text:** The EIS should consider this alternative to more conventional types of re-landscaping and evaluate the many benefits that could accrue, including improving natural flood protection and erosion control of the parkland along the Potomac River, Rock Creek, and Anacostia River; discouraging ("crowding-out") invasive species; and attracting indigenous wildlife (such as has occurred as a result of the Kenilworth Marsh restoration project by the Corps of Engineers)

**Organization:** Defenders of Potomac River Parkland

**Commenter:** Amber Jones **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 7 **Comment Id:** 402737 **Coder Name:** MIKE_SYBERT

**Comment Text:** Our concern for this area is the potential for serious detrimental effects from heavy construction equipment and activity on the bottomlands; the Capitol Crescent trail; two major interceptor sewers that parallel the trail, one having had three significant failures in recent years, spilling large amounts of raw sewage; the fragile condition of the century-old Washington Canoe Club boathouse; and the remaining abutment of the Nineteenth Century Aqueduct Bridge that once crossed the Potomac River. (The abutment and a pier near the Virginia shore were preserved as historical markers for this remarkable engineering edifice.)

**Organization:** Citizens Association of Georgetown

**Commenter:** Pamla H Moore **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402785 **Coder Name:** MIKE_SYBERT

**Comment Text:** The Environmental Impact Statement should evaluate whether in some storm conditions the net effect of these diversions may be to create corresponding overflows at CSO21 due to capacity limitations of certain sections of the Potomac Interceptor between the Rock Creek Interceptor and the Potomac Pumping Station. The EIS should balance the impact of these overflows at CSO 021 with water quality benefits of reducing discharges upstream of high use public areas such as the Georgetown waterfront and the Thompson's Boat Center.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402786 **Coder Name:** MIKE_SYBERT

**Comment Text:** The Environmental Impact Statement should evaluate the water quality benefits and public health protection that would result from prioritizing GI treatment of Potomac sewersheds that discharge upstream of the boat houses and the Georgetown waterfront first.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

**Correspondence Id:** 13 **Comment Id:** 402790 **Coder Name:** MIKE_SYBERT

**Comment Text:** In addition, we urge the EIS to consider the impact of reported stormwater and groundwater pumping to the sewer system and the effect that may have on the capacity of the Tummel.

**Organization:** Wentworth Green Strategies

**Commenter:** Marchant Wentworth **Page:** **Paragraph:**

**Kept Private:** No

## b) Concern Statements by Comment Code

***AE1100 - Affected Environment: Hazardous Materials***

***CONCERN STATEMENT:*** (Concern ID: 53047) Commenters suggest the presence of hazardous materials in the study area from past industrial activities.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402757 **Organization Type:** Unaffiliated Individual

**Representative Quote:** After the Civil War, the port of Georgetown increasingly became the site of various industrial enterprises. Along both banks of Rock Creek, near Virginia Avenue NW and the Creek's confluence with the Chesapeake & Ohio Canal, was a large complex of facilities producing and distributing illuminating gas. Toxic contaminants, likely related to these industrial activities, were found in recent years during the course of several construction projects.

***AE14000 - Affected Environment: Historic Structures***

***CONCERN STATEMENT:*** (Concern ID: 53049) Commenters presented several structures on or eligible for the National Register of Historic Places, including the Washington Canoe Club, the Potomac Boat Club, and the former GSA West Heating Plant.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402738 **Organization Type:** Unaffiliated Individual

**Representative Quote:** Two structures within this general area are on the National Register of Historic Places: the Washington Canoe Club, and the Potomac Boat Club.

***CONCERN STATEMENT:*** (Concern ID: 53050) Commenters stated that part of the study area is within the boundary of the Georgetown National Historic Landmark District.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402754 **Organization Type:** Unaffiliated Individual

**Representative Quote:** Part of the study area for the EIS lies within the National Historic Landmark boundaries for Georgetown. Georgetown was designated a National Historic Landmark in 1967. Additionally, as noted above, several structures on the National Register of Historic Places are within the Georgetown study area.

***AL1100 - Support Shortened Tunnel/GI CSO Control***

***AL1200 - Support Tunnel (General)***

***AL1300 - Oppose Use of NPS Property***

***AL4000 - Alternatives: New Alternatives Or Elements***

***CONCERN STATEMENT:*** (Concern ID: 53051) Commenters suggested that the EIS evaluate prioritizing GI activities in the sewershed of CSO 028 and 029.

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402787 **Organization Type:** Unaffiliated Individual

**Representative Quote:** While some amount of control appears to be available to three of the five upstream CSOs, we urge the Environmental Impact Statement to evaluate the benefit of prioritizing GI activities in the sewersheds of CSO 028 and 029. For example, the CSO 028 sewershed is 21 acres, of which 13 acres are impervious surface. It appears to be comprised of roughly nine blocks of Georgetown, at least three of which appear to be green space associated with the eastern section of Georgetown University campus as well as a section of the waterfront that includes a canoe rental facility. Controlling these areas with a variety of GI technologies might be undertaken with minimum disruption. Indeed, DC Water has proposed to treat 30 percent of the impervious surface in the sewershed amounting to only 4 acres. In contrast, controlling CSO 029 appears to present more challenges. The 330 acre sewershed has 164 acres of impervious surface, the largest of the Potomac sewersheds. DC Water has indicated that they could achieve a 60 percent treatment rate of impervious surface based on earlier work on separation. Because of the location of this CSO immediately upstream from the Potomac Boat Club, we recommend that this area be given top priority for GI treatment.

***CONCERN STATEMENT:*** (Concern ID: 53054) Commenters suggest that the EIS evaluate reducing the flows before the Tunnel is completed.

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402784 **Organization Type:** Unaffiliated Individual
**Representative Quote:** However, we urge that the Environmental Impact Statement evaluate reducing the flows before the Tunnel is completed in order to afford greater protection from overflows to the Thompson's Boat Center and Georgetown Waterfront downstream.

***CONCERN STATEMENT:*** (Concern ID: 53056) Commenters said that the CSO 025 and 026 separation should begin as soon as possible.

***Representative Quote(s):***
**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402782 **Organization Type:** Unaffiliated Individual
**Representative Quote:** Under DC Water's modification proposal, the separation of CSO 025 and 26 is not slated to be completed until after the Potomac tunnel is completed in 2032. We urge that the EIS evaluate the benefits of having this separation begin as soon as possible and not wait until the Potomac tunnel is completed. Modeling data from DC Water indicates that even in the wettest quarters, these sewersheds generate relatively little flow. Indeed, CSO 025 comprises only 17 acres of sewershed. The data indicate that CSO 026 has virtually zero flow. However, CSO 025 flows are immediately upstream from Thompson's Boat Center and reducing flows here may afford that high recreational use area some benefit.

***CONCERN STATEMENT:*** (Concern ID: 53060) Commenters recommend that the alternatives include hard infrastructure other than the proposed tunnel.

***Representative Quote(s):***
**Corr. ID:** 11 **Organization:** Georgetown Business Improvement District **Comment ID:** 402773 **Organization Type:** Unaffiliated Individual
**Representative Quote:** we further believe that alternatives should include hard infrastructure other than the proposed tunnel, such as the use of the C&O Canal right of way in exchange of improvements to the canal structure, in the event that green infrastructure is not a viable alternative.

***CONCERN STATEMENT:*** (Concern ID: 53061) Commenters stated that the description of the alternatives should include the time it would take to dewater the tunnel.

***Representative Quote(s):***
**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402751 **Organization Type:** Unaffiliated Individual
**Representative Quote:** We expect the description of each alternative to describe the time it would take to de-water the tunnel, and the consequent effect on tunnel storage capacity and length.

***CONCERN STATEMENT:*** (Concern ID: 53062) Commenters suggested using a pipeline to connect the two sewers.

***Representative Quote(s):***
**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402740 **Organization Type:** Unaffiliated Individual
**Representative Quote:** Among the tunnel-related structures potentially to be built in this area are a retrieval shaft, a diversion chamber(s), and a tangential inlet. An alternative that uses a pipeline to connect these two sewers, and reduces the number of required structures should be included in the EIS.

***CONCERN STATEMENT:*** (Concern ID: 53063) Commenters suggested the tunnel be sized to handle overflows from CSO 27.

***Representative Quote(s):***
**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402743 **Organization Type:**

Unaffiliated Individual
**Representative Quote:** Although the overflow from CSO 28 is minimal, we believe that an alternative in the EIS that sizes the stormwater retention tunnel to handle overflows from CSO 27 - if further study determines that overflows from this sewer would not be abated by Green Infrastructure - is warranted.

***CONCERN STATEMENT:*** (Concern ID: 53064) Commenters suggested that an alternative tunnel alignment be developed in lower Georgetown to avoid the Waterfront Park and that would have the least permanent effect on future sites for new boathouses and for access to and recreational use of the river.

***Representative Quote(s):***
**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402741 **Organization Type:** Unaffiliated Individual
**Representative Quote:** CAG and FoGWP believe that the EIS must include an alternative that avoids construction, or the placement of any tunnel-related structure or shaft, within or immediately adjacent to the Waterfront Park.

### *AL5000 - Alternatives: Miscellaneous*

***CONCERN STATEMENT:*** (Concern ID: 53065) Commenters suggested investigating how the Gravity Tunnel Concept might impact the Capital Crescent Trail.

***Representative Quote(s):***
**Corr. ID:** 12 **Organization:** Coalition for the Capital Crescent Trail **Comment ID:** 402776 **Organization Type:** Unaffiliated Individual
**Representative Quote:** how the option of the Gravity Tunnel Concept might impact the project upriver from Rock Creek, particularly along the CCT.

### *CC1000 - Consultation and Coordination: General Comments*

***CONCERN STATEMENT:*** (Concern ID: 53103) Commenters said that DC Water should coordinate with WMATA, DC Office of Planning, DDOT, and the Citizens Association of Georgetown.

***Representative Quote(s):***
**Corr. ID:** 2 **Organization:** Washington Metropolitan Area Transit Authority **Comment ID:** 402723 **Organization Type:** Unaffiliated Individual
**Representative Quote:** Construction in the vicinity of any Metrorail system infrastructure, whether at grade, aerial, or tunnel must be coordinated with WMATA to ensure safety and eliminate conflicts. Specifically, any construction within the WMATA Zone of Influence, as defined in our adjacent construction project manual, or any construction that requires the temporary or permanent use of WMATA property, is subject to review and coordination with WMATA.

### *CL4000 - Climate Change: Impact of Proposal and Alternatives*

***CONCERN STATEMENT:*** (Concern ID: 53068) Comments stated that the EIS should address the long-term effects of climate change and sea level rise.

***Representative Quote(s):***
**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402753 **Organization Type:** Unaffiliated Individual
**Representative Quote:** The EIS should address the potential long-term effect of climate change and sea level rise on this project. Among the effects that should be considered are projected changes in the intensity, duration, and frequency of significant rain events. A significant change in the amount of precipitation that falls in future decades in the Mid-Atlantic can impact the size and capacity of the stormwater retention tunnel. A rise in sea level, accompanied by higher storm surges, may lead to increased flooding, with higher flood heights, on the Potomac River. This possibility should be factored in the design and placement of structures associated with this project.

### *CR4000 - Cultural Resources: Impact Of Proposal And Alternatives*

***CONCERN STATEMENT:*** (Concern ID: 53069) Commenters expressed concern with potential impacts to historic structures, such as the Washington Canoe Club boathouse, the Aqueduct Bridge, the Dodge Warehouse building, the Grace Episcopal Church, and the C&O Canal.

***Representative Quote(s):***

**Corr. ID:** 10 **Organization:** *Not Specified* **Comment ID:** 402763 **Organization Type:** Unaffiliated Individual

**Representative Quote:** I am concerned about the historical structures fronting the Potomac near Key Bridge. In addition, of course, to the C&O Canal, the only two surviving early 20th-century boathouses on the River and the Aqueduct Bridge remains are at risk. These important documents of their eras on the River seem to be directly in the path of harm and very unlikely to survive the impact of digging and the movement of heavy equipment over and over in and out of the constricted access area. The vibrations from digging and truck traffic etc. will, I fear, be too much for the century old boathouses and even older aqueduct bridge remains.

### *HS4000 - Health and Safety: Impact of Proposal and Alternatives*

***CONCERN STATEMENT:*** (Concern ID: 53070) One comment stated that the EIS should evaluate the public health benefits of GI treatments that discharge upstream of the Georgetown waterfront and boathouses.

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402786 **Organization Type:** Unaffiliated Individual

**Representative Quote:** The Environmental Impact Statement should evaluate the water quality benefits and public health protection that would result from prioritizing GI treatment of Potomac sewersheds that discharge upstream of the boat houses and the Georgetown waterfront first.

### *HS5000 - Health and Safety: Cumulative*

***CONCERN STATEMENT:*** (Concern ID: 53072) Comments stressed that the EIS evaluate other near term projects with regards to cumulative impacts to public health.

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402781 **Organization Type:** Unaffiliated Individual

**Representative Quote:** II. The Environmental Impact Statement should evaluate the benefits of prioritizing near term projects to protect public health and the environment particularly around areas of known public contact such as the boathouses along the Potomac River and the Georgetown Waterfront.

### *MT1100 - Miscellaneous Topics: General Support of EIS Process*

***CONCERN STATEMENT:*** (Concern ID: 53073) One commenter agreed with the issues and impact topics to be analyzed by the EIS.

***Representative Quote(s):***

**Corr. ID:** 5 **Organization:** Defenders of Potomac River Parkland **Comment ID:** 402731 **Organization Type:** Unaffiliated Individual

**Representative Quote:** During DC Water's public scoping meeting of July 31, 2014, the Defenders were pleased to read in the "Welcome" handout, p.13, that the following issues and impact topics will be analyzed in the EIS for the Potomac River tunnel project: water quality; wetlands; floodplains; wildlife including rare, threatened and endangered species; air quality; noise; historic structures and districts; cultural landscapes; visitor use and experience; human health and safety; park operations and management; and, transportation.

We agree that these issues and topics should be included in the EIS for the project because they are critical for the protection of parkland, and we look forward to reviewing the analysis and results of same in the draft EIS when it is released to the public.

***MT2000 - Miscellaneous: Mitigation***

***CONCERN STATEMENT:*** (Concern ID: 53102) Commenters stated that the EIS should include a discussion of potential mitigation actions, specifically with regards to landscaping, hazardous substances, and the C&O Canal.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402758 **Organization Type:** Unaffiliated Individual

**Representative Quote:** The EIS should describe mitigating actions to eliminate the risk to public health and welfare of hazardous substances discovered during construction.

***MT3000 - Miscellaneous: Study Area***

***CONCERN STATEMENT:*** (Concern ID: 53074) Commenters suggested that the study area for the EIS be increased.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402733 **Organization Type:** Unaffiliated Individual

**Representative Quote:** CAG and FoGWP believe the study area should be expanded to include the catchment areas for CSO 28 and CSO 27 in west Georgetown.

***MT4000 - Miscellaneous: Feasibility of Equivalent CSO Control Using GI***

***MT5000 - Miscellaneous: Additional Studies/Documentation***

***CONCERN STATEMENT:*** (Concern ID: 53075) Comments suggested that each alternative describe the time it would take to dewater the tunnel.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402751 **Organization Type:** Unaffiliated Individual

**Representative Quote:** We expect the description of each alternative to describe the time it would take to de-water the tunnel, and the consequent effect on tunnel storage capacity and length.

***CONCERN STATEMENT:*** (Concern ID: 53076) Commenters stated that the EIS should reference other resource-related studies completed in the study area.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402756 **Organization Type:** Unaffiliated Individual

**Representative Quote:** The EIS should reference and describe the numerous cultural resource-related studies already completed in the Potomac River Tunnel study area, and identify the need for additional studies in those areas likely to be directly impacted by construction of the tunnel, or by ancillary structures connecting a combined sewer with the tunnel.

***CONCERN STATEMENT:*** (Concern ID: 53077) Commenters requested documentation or references to other successfully implemented tunnel projects.

***Representative Quote(s):***

**Corr. ID:** 12 **Organization:** Coalition for the Capital Crescent Trail **Comment ID:** 402774 **Organization Type:** Unaffiliated Individual

**Representative Quote:** We would like to see documentation/references to tunnel projects of this nature being successfully implemented elsewhere in your report.

***CONCERN STATEMENT:*** (Concern ID: 53078) Commenters said that the EIS should evaluate the impact on ratepayers by building the tunnel

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402778 **Organization Type:** Unaffiliated Individual

**Representative Quote:** II. The Environmental Impact Statement should evaluate the impact on ratepayers by building a shortened Potomac tunnel that would reduce capital costs.

***CONCERN STATEMENT:*** (Concern ID: 53080) Commenters suggest evaluating the benefits of separating CSO 025 and 026 immediately.

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402782 **Organization Type:** Unaffiliated Individual

**Representative Quote:** Under DC Water's modification proposal, the separation of CSO 025 and 26 is not slated to be completed until after the Potomac tunnel is completed in 2032. We urge that the EIS evaluate the benefits of having this separation begin as soon as possible and not wait until the Potomac tunnel is completed. Modeling data from DC Water indicates that even in the wettest quarters, these sewersheds generate relatively little flow. Indeed, CSO 025 comprises only 17 acres of sewershed. The data indicate that CSO 026 has virtually zero flow. However, CSO 025 flows are immediately upstream from Thompson's Boat Center and reducing flows here may afford that high recreational use area some benefit.

***CONCERN STATEMENT:*** (Concern ID: 53081) Commenters suggested that the EIS evaluate reducing the flows before the tunnel is completed.

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402784 **Organization Type:** Unaffiliated Individual

**Representative Quote:** However, we urge that the Environmental Impact Statement evaluate reducing the flows before the Tunnel is completed in order to afford greater protection from overflows to the Thompson's Boat Center and Georgetown Waterfront downstream.

***CONCERN STATEMENT:*** (Concern ID: 53100) Commenters said further investigation should be done regarding green infrastructure in the EIS, including the possibility of creating additional alternatives.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402743 **Organization Type:** Unaffiliated Individual

**Representative Quote:** Although the overflow from CSO 28 is minimal, we believe that an alternative in the EIS that sizes the stormwater retention tunnel to handle overflows from CSO 27 **-** if further study determines that overflows from this sewer would not be abated by Green Infrastructure **-** is warranted.

***PA4000 - C&O Canal National Historic Park: Impact of Proposal and Alternatives***

***SE4000 - Socioeconomics: Impact Of Proposal And Alternatives***

***CONCERN STATEMENT:*** (Concern ID: 53082) Some commenters expressed concern that mitigation efforts may temporarily harm the local economy.

***Representative Quote(s):***

**Corr. ID:** 11 **Organization:** Georgetown Business Improvement District **Comment ID:** 402768 **Organization Type:** Unaffiliated Individual

**Representative Quote:** Thus, every effort to design and build a system that reduces or eliminates CSO events in Georgetown will disrupt the physical environment and impact buildings, businesses, access, mobility, and recreation. We expect that any mitigation efforts will temporarily harm the local economy by limiting access to businesses, slowing traffic, disrupting public transit, and limiting recreation uses.

***CONCERN STATEMENT:*** (Concern ID: 53083) Commenters requested a further explanation of the lack of cost savings of the Hybrid Plan compared to a tunnel project under the CCT and C&O Canal.

***Representative Quote(s):***

**Corr. ID:** 12 **Organization:** Coalition for the Capital Crescent Trail **Comment ID:** 402775 **Organization Type:** Unaffiliated Individual

**Representative Quote:** at the July meeting DC Water representatives stated that the Hybrid Plan would not actually result in any appreciable cost savings vs a tunnel project under the CCT & C&O Canal upriver from Rock Creek, and we would like further explanation on why that is so.

***CONCERN STATEMENT:*** (Concern ID: 53084) Comments stated that the EIS should evaluate whether the shortened Potomac River Tunnel with GI minimizes the disruption to Georgetown residents, businesses, and the Historic District.

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402780 **Organization Type:** Unaffiliated Individual

**Representative Quote:** DC water has envisioned GI to be the primary treatment option. However, GI projects in these sewersheds might arouse citizen opposition and contribute in delays and increased costs. Navigating the historical designations in Georgetown as well as mitigating threats to Georgetown Park along the waterfront could pose additional delays and increased costs. Finally, recent DC legislation mandating the undergrounding of certain electric wires may also contribute to delays and increase the cost per acre. For these reasons, the EIS should evaluate whether the shortened Potomac River Tunnel proposed by DC Water minimizes the disruption to Georgetown residents, businesses, and the Historic District.

***CONCERN STATEMENT:*** (Concern ID: 53085) Commenters suggested that the EIS evaluate the impact on ratepayers and ways to mitigate rate impacts.

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402792 **Organization Type:** Unaffiliated Individual

**Representative Quote:** We urge the EIS to evaluate ways that DC Water mitigate rate impacts on low income ratepayers including:

- renegotiating the InterMunicipal Agreement (IMA) to increase user charges for the use of the Potomac Interceptor Sewer to better reflect the true cost of those flows;
- reevaluating the present rate structure to assess whether charges for the commercial and other sewer users including WMATA and the federal government truly reflect costs;
- expanding DC Water's program of rate relief for low income ratepayers; and continuing to pursue federal funding.

### *TR4000 - Traffic and Transportation: Impact of Proposal and Alternatives*

***CONCERN STATEMENT:*** (Concern ID: 53086) Commenters stated that bicycle/pedestrian traffic may need to be rerouted to the C&O Canal towpath, which could be detrimental to the resource.

***Representative Quote(s):***

**Corr. ID:** 4 **Organization:** C&O Canal Association **Comment ID:** 402728 **Organization Type:** Unaffiliated Individual

**Representative Quote:** A central mission of our Association is to safeguard the environmental and historical assets of the Chesapeake and Ohio Canal National Historical Park. The EIS study area includes a popular portion of the canal park that extends upriver from the Alexandria Aqueduct. That area would be adversely affected by the longer version of the Potomac River Tunnel originally envisioned under DC Water's Long Term Control Plan. Much of this parkland would likely be closed during the lengthy construction period. It seems probable that pedestrian and bicycle traffic along the much-used Capital Crescent Trail would have to be rerouted along the historic canal towpath. Permanent effects on the canal park might include installation of a tunnel access point and the operation of maintenance vehicles, changes that would be detrimental to this historic and scenic space.

***CONCERN STATEMENT:*** (Concern ID: 53087) Commenters suggested that the alternatives be analyzed to address the potential impact of these on a future streetcar line on K Street.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402752 **Organization Type:** Unaffiliated Individual

**Representative Quote:** Proposals have been made for a streetcar line to run along K St. NW in Georgetown, and possibly have a terminus there. Alternatives that place structures, such as diversion chambers and tangential inlets, on K St. should address the potential impact of these on a future streetcar line on K Street.

***CONCERN STATEMENT:*** (Concern ID: 53088) Commenters stressed that the project avoid major disruptions to public transit or commuter/visitor traffic.

***Representative Quote(s):***

**Corr. ID:** 11 **Organization:** Georgetown Business Improvement District **Comment ID:** 402769 **Organization Type:** Unaffiliated Individual

**Representative Quote:** Knowing that our members will be impacted, our goal is to have the CSO mitigation projects completed:

1. as quickly as possible
2. with as little disruption to any particular building, business, or sector of the workforce, as possible;
3. without major disruption to public transit or commuter or visitor traffic
4. to be maximally effective in limiting CSO events
5. to minimize impact to Georgetown's parks and recreation facilities
6. to minimize impact on historic commercial buildings
7. to minimize impact on the long-term look and feel of the commercial district, including mature street trees and brick sidewalks
8. to be a permanent solution - so that future generations do not have to readdress this issue

### *UT4000 - Utilities: Impact of Proposal and Alternatives*

***CONCERN STATEMENT:*** (Concern ID: 53089) One commenter stated that the undergrounding of electric wires may increase delays and costs.

***Representative Quote(s):***

**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402780 **Organization Type:** Unaffiliated Individual

**Representative Quote:** DC water has envisioned GI to be the primary treatment option. However, GI projects in these sewersheds might arouse citizen opposition and contribute in delays and increased costs. Navigating the historical designations in Georgetown as well as mitigating threats to Georgetown Park along the waterfront could pose additional delays and increased costs. Finally, recent DC legislation mandating the undergrounding of certain electric wires may also contribute to delays and increase the cost per acre. For these reasons, the EIS should evaluate whether the shortened Potomac River Tunnel proposed by DC Water minimizes the disruption to Georgetown residents, businesses, and the Historic District.

***VR4000 - Vegetation And Riparian Areas: Impact Of Proposal And Alternatives***

***CONCERN STATEMENT:*** (Concern ID: 53090) Commenters stated that construction could have detrimental impacts on the parkland and that more conventional types of re-landscaping should be examined.

***Representative Quote(s):***

**Corr. ID:** 3 **Organization:** Defenders of Potomac River Parkland **Comment ID:** 402727 **Organization Type:** Unaffiliated Individual

**Representative Quote:** The EIS should consider this alternative to more conventional types of re-landscaping and evaluate the many benefits that could accrue, including improving natural flood protection and erosion control of the parkland along the Potomac River, Rock Creek, and Anacostia River; discouraging ("crowding-out") invasive species; and attracting indigenous wildlife (such as has occurred as a result of the Kenilworth Marsh restoration project by the Corps of Engineers)

***VU4000 - Visitor Use: Impact Of Proposal And Alternatives***

***CONCERN STATEMENT:*** (Concern ID: 53091) Commenters expressed concern with the potential rerouting of the bicycle and pedestrian traffic.

***Representative Quote(s):***

**Corr. ID:** 4 **Organization:** C&O Canal Association **Comment ID:** 402728 **Organization Type:** Unaffiliated Individual

**Representative Quote:** A central mission of our Association is to safeguard the environmental and historical assets of the Chesapeake and Ohio Canal National Historical Park. The EIS study area includes a popular portion of the canal park that extends upriver from the Alexandria Aqueduct. That area would be adversely affected by the longer version of the Potomac River Tunnel originally envisioned under DC Water's Long Term Control Plan. Much of this parkland would likely be closed during the lengthy construction period. It seems probable that pedestrian and bicycle traffic along the much-used Capital Crescent Trail would have to be rerouted along the historic canal towpath. Permanent effects on the canal park might include installation of a tunnel access point and the operation of maintenance vehicles, changes that would be detrimental to this historic and scenic space.

***CONCERN STATEMENT:*** (Concern ID: 53093) Commenters conveyed concern with outfalls being close to the non-motorized boathouse zone.

***Representative Quote(s):***

**Corr. ID:** 7 **Organization:** Citizens Association of Georgetown **Comment ID:** 402736 **Organization Type:** Unaffiliated Individual

**Representative Quote:** These outfalls are within or proximate to the non-motorized boathouse zone being advanced by the National Park Service.

***CONCERN STATEMENT:*** (Concern ID: 53095) Some comments described the potential detrimental effects of the project on the Capitol Crescent Trail.

***Representative Quote(s):***

**Corr. ID:** 12 **Organization:** Coalition for the Capital Crescent Trail **Comment ID:** 402776 **Organization Type:** Unaffiliated Individual

**Representative Quote:** how the option of the Gravity Tunnel Concept might impact the project upriver from Rock Creek, particularly along the CCT.

***CONCERN STATEMENT:*** (Concern ID: 53096) Commenters asked that the EIS address minimize impacts to Georgetown parks and recreation facilities.

***Representative Quote(s):***

**Corr. ID:** 11 **Organization:** Georgetown Business Improvement District **Comment ID:** 402769 **Organization**

**Type:** Unaffiliated Individual
**Representative Quote:** Knowing that our members will be impacted, our goal is to have the CSO mitigation projects completed:
1. as quickly as possible
2. with as little disruption to any particular building, business, or sector of the workforce, as possible;
3. without major disruption to public transit or commuter or visitor traffic
4. to be maximally effective in limiting CSO events
5. to minimize impact to Georgetown's parks and recreation facilities
6. to minimize impact on historic commercial buildings
7. to minimize impact on the long-term look and feel of the commercial district, including mature street trees and brick sidewalks
8. to be a permanent solution - so that future generations do not have to readdress this issue

***WQ4000 - Water Resources: Impact Of Proposal And Alternatives***

***CONCERN STATEMENT:*** (Concern ID: 53097) Commenters stated that the EIS should include improvements to natural flood protection and erosion control of the parkland along the Potomac River, Rock Creek, and Anacostia River.

***Representative Quote(s):***
**Corr. ID:** 3 **Organization:** Defenders of Potomac River Parkland **Comment ID:** 402727 **Organization Type:** Unaffiliated Individual
**Representative Quote:** The EIS should consider this alternative to more conventional types of re-landscaping and evaluate the many benefits that could accrue, including improving natural flood protection and erosion control of the parkland along the Potomac River, Rock Creek, and Anacostia River; discouraging ("crowding-out") invasive species; and attracting indigenous wildlife (such as has occurred as a result of the Kenilworth Marsh restoration project by the Corps of Engineers)

***CONCERN STATEMENT:*** (Concern ID: 53098) Commenters said that the EIS should balance the impact of these overflows at CSO 021 with water quality benefits of reducing discharges upstream of high use public areas.

***Representative Quote(s):***
**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402785 **Organization Type:** Unaffiliated Individual
**Representative Quote:** The Environmental Impact Statement should evaluate whether in some storm conditions the net effect of these diversions may be to create corresponding overflows at CSO21 due to capacity limitations of certain sections of the Potomac Interceptor between the Rock Creek Interceptor and the Potomac Pumping Station. The EIS should balance the impact of these overflows at CSO 021 with water quality benefits of reducing discharges upstream of high use public areas such as the Georgetown waterfront and the Thompson's Boat Center.

***CONCERN STATEMENT:*** (Concern ID: 53099) Commenters stated that the EIS should evaluate the impact of stormwater and ground water pumping on the capacity of the tunnel.

***Representative Quote(s):***
**Corr. ID:** 13 **Organization:** Wentworth Green Strategies **Comment ID:** 402790 **Organization Type:** Unaffiliated Individual
**Representative Quote:** In addition, we urge the EIS to consider the impact of reported stormwater and groundwater pumping to the sewer system and the effect that may have on the capacity of the Tummel.

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# APPENDIX A:
# CORRESPONDENCE INDEX OF ORGANIZATIONS

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## Appendix A

## Correspondence Index of Organizations (12/04/2014)

*Notes:*

1. *When the commenter provides an organization, but does not identify himself/herself as an official representative of that organization, that correspondence is listed by the organization name, but under the "Unaffiliated Individuals" category.*
2. *N/A represents individuals who did not submit their first or last name.*

| Correspondence ID | Name | Organization | Form Letter |
|---|---|---|---|
| **Civic Groups** | | | |
| 14 | Lewis, Ron | ANC 2E | No |
| **Unaffiliated Individual** | | | |
| 4 | Moore, Dward | C&O Canal Association | No |
| 7 | Moore, Pamla H. | Citizens Association of Georgetown | No |
| 12 | N/A, N/A | Coalition for the Capital Crescent Trail | No |
| 3 | Jones, Amber | Defenders of Potomac River Parkland | No |
| 5 | Strain, Sally | Defenders of Potomac River Parkland | No |
| 9 | Strain, Sally | Defenders of Potomac River Parkland | No |
| 11 | Sternlieb, Joseph | Georgetown Business Improvement District | No |
| 6 | MacWood, Nancy | The Committee of 100 of the Federal City | No |
| 2 | Sullivan, Regina A. | Washington Metropolitan Area Transit Authority | No |
| 13 | Wentworth, Marchant | Wentworth Green Strategies | No |
| 17 | Clark, Martha | | No |
| 10 | Ellsworth, Gretchen | | No |
| 15 | Gates, Alma | | No |
| 16 | Nevius, Ted | | No |
| 8 | Preston, Edmund | | No |
| 1 | Publi, Jean | | No |

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# APPENDIX B:
# CORRESPONDENCE INDEX OF INDIVIDUAL COMMENTERS

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**Appendix B**
**CORRESPONDENCE INDEX OF INDIVIDUAL COMMENTERS**
**(12/04/2014)**

*Note: N/A represents individuals who did not submit their first or last name.*

| Correspondence ID | Form Letter? | Name |
|---|---|---|
| 17 | No | Clark, Martha |
| 10 | No | Ellsworth, Gretchen |
| 15 | No | Gates, Alma |
| 3 | No | Jones, Amber |
| 14 | No | Lewis, Ron |
| 6 | No | MacWood, Nancy |
| 4 | No | Moore, Dward |
| 7 | No | Moore, Pamla H. |
| 12 | No | N/A, N/A |
| 16 | No | Nevius, Ted |
| 8 | No | Preston, Edmund |
| 1 | No | Publi, Jean |
| 11 | No | Sternlieb, Joseph |
| 5 | No | Strain, Sally |
| 9 | No | Strain, Sally |
| 2 | No | Sullivan, Regina A. |
| 13 | No | Wentworth, Marchant |

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# APPENDIX C:
# INDEX BY ORGANIZATION TYPE

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## Index By Organization Type (12/04/2014)

### Unaffiliated Individual

C&O Canal Association - 4; AL1100 - Support Shortened Tunnel/GI CSO Control. PA4000 - C&O Canal National Historic Park: Impact of Proposal and Alternatives. TR4000 - Traffic and Transportation: Impact of Proposal and Alternatives. VU4000 - Visitor Use: Impact Of Proposal And Alternatives.

Citizens Association of Georgetown - 7; AE1100 - Affected Environment: Hazardous Materials. AE14000 - Affected Environment: Historic Structures. AL1100 - Support Shortened Tunnel/GI CSO Control. AL1200 - Support Tunnel (General). AL4000 - Alternatives: New Alternatives Or Elements. CC1000 - Consultation and Coordination: General Comments. CL4000 - Climate Change: Impact of Proposal and Alternatives. CR4000 - Cultural Resources: Impact Of Proposal And Alternatives. MT2000 - Miscellaneous: Mitigation. MT3000 - Miscellaneous: Study Area. MT4000 - Miscellaneous: Feasibility of Equivalent CSO Control Using GI. MT5000 - Miscellaneous: Additional Studies/Documentation. TR4000 - Traffic and Transportation: Impact of Proposal and Alternatives. VR4000 - Vegetation And Riparian Areas: Impact Of Proposal And Alternatives. VU4000 - Visitor Use: Impact Of Proposal And Alternatives. WQ4000 - Water Resources: Impact Of Proposal And Alternatives.

Coalition for the Capital Crescent Trail - 12; AL5000 - Alternatives: Miscellaneous. MT5000 - Miscellaneous: Additional Studies/Documentation. SE4000 - Socioeconomics: Impact Of Proposal And Alternatives. VU4000 - Visitor Use: Impact Of Proposal And Alternatives.

Defenders of Potomac River Parkland - 3; AL1100 - Support Shortened Tunnel/GI CSO Control. MT2000 - Miscellaneous: Mitigation. VR4000 - Vegetation And Riparian Areas: Impact Of Proposal And Alternatives. WQ4000 - Water Resources: Impact Of Proposal And Alternatives. 5; MT1100 - Miscellaneous Topics: General Support of EIS Process.

Georgetown Business Improvement District - 11; AL1100 - Support Shortened Tunnel/GI CSO Control. AL1200 - Support Tunnel (General). AL4000 - Alternatives: New Alternatives Or Elements. CR4000 - Cultural Resources: Impact Of Proposal And Alternatives. MT4000 - Miscellaneous: Feasibility of Equivalent CSO Control Using GI. MT5000 - Miscellaneous: Additional Studies/Documentation. SE4000 - Socioeconomics: Impact Of Proposal And Alternatives. TR4000 - Traffic and Transportation: Impact of Proposal and Alternatives. VU4000 - Visitor Use: Impact Of Proposal And Alternatives.

The Committee of 100 on the Federal City - 6; MT2000 - Miscellaneous: Mitigation.

Washington Metropolitan Area Transit Authority - 2; CC1000 - Consultation and Coordination: General Comments.

Wentworth Green Strategies - 13; AL1100 - Support Shortened Tunnel/GI CSO Control. AL4000 - Alternatives: New Alternatives Or Elements. CR4000 - Cultural Resources: Impact Of Proposal And Alternatives. HS4000 - Health and Safety: Impact of Proposal and Alternatives. HS5000 - Health and Safety: Cumulative. MT3000 - Miscellaneous: Study Area. MT4000 - Miscellaneous: Feasibility of Equivalent CSO Control Using GI. MT5000 - Miscellaneous: Additional Studies/Documentation. SE4000 - Socioeconomics: Impact Of Proposal And Alternatives. UT4000 - Utilities: Impact of Proposal and Alternatives. VU4000 - Visitor Use: Impact Of Proposal And Alternatives. WQ4000 - Water Resources: Impact Of Proposal And Alternatives.

*N/A* - 1; AL1300 - Oppose Use of NPS Property. 8; AL1100 - Support Shortened Tunnel/GI CSO Control. PA4000 - C&O Canal National Historic Park: Impact of Proposal and Alternatives. 10; AL1100 - Support Shortened Tunnel/GI CSO Control. CR4000 - Cultural Resources: Impact Of Proposal And Alternatives. 15; CC1000 - Consultation and Coordination: General Comments. 16; AL1200 - Support Tunnel (General).

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# APPENDIX D:
# INDEX BY CODE

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## Index By Code (12/04/2014)

Georgetown Business Improvement District - 11
Wentworth Green Strategies - 13
*N/A* - 10

**HS4000 - Health and Safety: Impact of Proposal and Alternatives**
Wentworth Green Strategies - 13

**HS5000 - Health and Safety: Cumulative**
Wentworth Green Strategies - 13

**MT1100 - Miscellaneous Topics: General Support of EIS Process**
Defenders of Potomac River Parkland - 5

**MT2000 - Miscellaneous: Mitigation**
Citizens Association of Georgetown - 7
Defenders of Potomac River Parkland - 3
The Committee of 100 on the Federal City - 6

**MT3000 - Miscellaneous: Study Area**
Citizens Association of Georgetown - 7
Wentworth Green Strategies - 13

**MT4000 - Miscellaneous: Feasibility of Equivalent CSO Control Using GI**
Citizens Association of Georgetown - 7
Georgetown Business Improvement District - 11
Wentworth Green Strategies - 13

**MT5000 - Miscellaneous: Additional Studies/Documentation**
Citizens Association of Georgetown - 7
Coalition for the Capital Crescent Trail - 12
Georgetown Business Improvement District - 11
Wentworth Green Strategies - 13

**PA4000 - C&O Canal National Historic Park: Impact of Proposal and Alternatives**
C&O Canal Association - 4
*N/A* - 8

**SE4000 - Socioeconomics: Impact Of Proposal And Alternatives**
Coalition for the Capital Crescent Trail - 12
Georgetown Business Improvement District - 11
Wentworth Green Strategies - 13

**TR4000 - Traffic and Transportation: Impact of Proposal and Alternatives**
C&O Canal Association - 4

Citizens Association of Georgetown - 7
Georgetown Business Improvement District - 11

**UT4000 - Utilities: Impact of Proposal and Alternatives**
Wentworth Green Strategies - 13

**VR4000 - Vegetation And Riparian Areas: Impact Of Proposal And Alternatives**
Citizens Association of Georgetown - 7
Defenders of Potomac River Parkland - 3

**VU4000 - Visitor Use: Impact Of Proposal And Alternatives**
C&O Canal Association - 4
Citizens Association of Georgetown - 7
Coalition for the Capital Crescent Trail - 12
Georgetown Business Improvement District - 11
Wentworth Green Strategies - 13

**WQ4000 - Water Resources: Impact Of Proposal And Alternatives**
Citizens Association of Georgetown - 7
Defenders of Potomac River Parkland - 3
Wentworth Green Strategies – 13

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# APPENDIX E:
# CORRESPONDENCES SUBMITTED

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# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 1
## Author Information

Keep Private: No
Name: jean publi
Organization:
Organization Type: I - Unaffiliated Individual
Address: not available
flemington, NJ 08822
USA
E-mail: jeanpubilc1@yahoo.com

## Correspondence Information

Status: Reviewed
Park Correspondence Log:
Date Sent: 07/02/2014
Date Received: 07/02/2014
Number of Signatures: 1
Form Letter: No
Contains Request(s): Yes
Type: Web Form
Notes:

## Correspondence Text

don't use nps property for this issue of sewer clean up for this region. the region needs to use its own property for its clean up sewer issues. I also think the national taxpayers are being involved through this dubious issue of trigh to make this a national issue, when it is a local onel the local high flywers mostly govt employees who get high salaries compared to the rest of the country have set up a dirty sewer system. make them pay for the clean up. make them use their own property to fix it. don't make this a national issue. also with the issue of sea rise involving the Potomac a tunnel needs very very careful attention when the next sea and hurricane tempest comes roaring through. this site in a national park is not the site for any location for this to be done. is this why the deer were killed at this park site? the uglinesssurrounding this park is only enhanced by this latest deleterious proposal. stop inveigling national taxpayers for a local issue, dirty sewers for th ehigh flyers in corrupt Washington dc. I want to be kept on the mailing list for any further discussion on this. tax the locals for their upgrade to sewers. tha tis the proper thing to do. that happens in every location I have ever heard of.l the locals get their taxes increased.

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 2
## Author Information

| | |
|---|---|
| Keep Private: | No |
| Name: | Regina A. Sullivan |
| Organization: | Washington Metropolitan Area Transit Authority |
| Organization Type: | I - Unaffiliated Individual |
| Address: | Office of Government Relations<br>600 5th Street, NW<br>Washington , DC 20001<br>USA |
| E-mail: | rsullivan@wmata.com |

## Correspondence Information

| | |
|---|---|
| Status: Reviewed | Park Correspondence Log: |
| Date Sent: 08/13/2014 | Date Received: 08/13/2014 |
| Number of Signatures: 1 | Form Letter: No |
| Contains Request(s): Yes | Type: Web Form |
| Notes: | |

## Correspondence Text

August 13, 2014

Mr. Moussa Wone
DC Clean Rivers Project
c/o Potomac River Tunnel EIS
DC Water and Sewer Authority
5000 Overlook Ave., SW
Washington, DC 20032

Mr. Joel Gorder
National Park Service
1100 Ohio Drive, SW
Washington, DC 20242

Re: NPS-NCR-NACA-14983

Dear Mr. Gorder and Mr. Wone:

In response to the subject Notice of Intent to Prepare an Environmental Impact Statement for the Potomac River Tunnel in the National Capital Region (published in the Federal Register on July 2, 2014), the Washington Metropolitan Area Transit

Authority (WMATA) hereby provides initial comments about the proposed action.

About WMATA
WMATA, known locally as "Metro," provides rail, bus and paratransit service to a 1,500-square mile area that includes Washington, DC, and surrounding jurisdictions in Maryland and Virginia. Around 40 percent of rush-hour Metrorail passengers are federal employees, and service is provided to millions of tourists who visit the nation's capital every year. Metro operates the second largest heavy rail transit system, sixth largest bus network and fifth largest paratransit service in the United States:

• Metrorail currently operates 1,092 heavy rail cars serving 91 rail stations over 117 miles of track, providing more than 750,000 trips on a typical weekday;

• Metrobus operates 1525 buses, providing 132 million annual trips on 318 routes serving 11,279 bus stops; and

• MetroAccess provides 2 million annual door-to-door paratransit trips for customers with disabilities who are unable to use Metro's accessible fixed route services for some or all of their trips.

WMATA understands that DC Water is considering construction of an underground storage tunnel that will parallel the Potomac River in the vicinity of Washington, DC. As you may know, the alignment of the Metrorail system includes a tunnel under the Potomac River through which Blue, Orange, and Silver Line trains pass. Running southwesterly from Washington, DC into Virginia, this tunnel connects the Foggy Bottom and Rosslyn Metrorail stations. It then continues generally westward and, in a separate alignment, southeasterly from Rosslyn toward the Court House and Arlington Metrorail stations, respectively. For reference, the situation is analogous to the Metrorail Green Line, which crosses the Anacostia River in the vicinity of the Anacostia Metrorail station. DC Water's Anacostia Regional Tunnel intersects with Metrorail system infrastructure at this location.

Construction in the vicinity of any Metrorail system infrastructure, whether at grade, aerial, or tunnel must be coordinated with WMATA to ensure safety and eliminate conflicts. Specifically, any construction within the WMATA Zone of Influence, as defined in our adjacent construction project manual, or any construction that requires the temporary or permanent use of WMATA property, is subject to review and coordination with WMATA. Please be advised that in advance of such effort, the relationship between WMATA and the project sponsor(s) must be reduced to formal agreement. Importantly, that eventual agreement will provide that certain insurance and indemnification requirements will be passed-through to the project sponsor's contractor(s). It will also ensure prompt reimbursement to WMATA for staff time associated with the project.

More detailed information about the WMATA Zone of Influence, project requirements, and WMATA requirements can be found by reviewing the "Adjacent Construction Project Manual" posted on-line at:
http://www.wmata.com/business/joint_development_opportunities/adjacent_construction_information.cfm

I encourage project officials to contact Mr. Thomas Crone, CCM, Senior Program Manager, Office of Joint Development and Adjacent Construction, to discuss the project and procedures. Mr. Crone may be reached at
(301) 618-1016.

In conclusion, we look forward to working with the National Park Service and the Clean Rivers Project on this important planning effort, and beyond.

Sincerely,

Signed: Regina Sullivan

Managing Director
Office of Government Relations

hard copy delivered by USPS

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 3
## Author Information

Keep Private: No

Name: Amber Jones

Organization: Defenders of Potomac River Parkland

Organization Type: I - Unaffiliated Individual

Address:

Washington, DC 20003
USA

E-mail:

## Correspondence Information

Status: Reviewed

Park Correspondence Log:

Date Sent: 08/14/2014

Date Received: 08/14/2014

Number of Signatures: 1

Form Letter: No

Contains Request(s): Yes

Type: Web Form

Notes:

## Correspondence Text

I fully support the proposal Green Infrastructure proposal of DC Water as a way to accomplish the required clean-water goals along the Potomac River and Rock Creek faster and in a more environmentally friendly way, and urge a comprehensive evaluation in the EIS of the time to completion; financial impact, including construction and long-term impact of operations and maintenance on water and sewer ratepayers; ecological and environmental benefits; legal impacts, including what laws would be required to maintain the long-term integrity of the Green Infrastructure projects (for example, any need to re-zone or restrict construction in adjoining areas to avoid types of developments and materials such as solid concrete that would reverse the benefits); and social benefits, such as increased parkland for recreation, of incorporating this proposal into the overall tunnel plan.

I also urge NPS and DC Water to consider the pending tunnel construction project, regardless of final size and capacity and whether or not Green Infrastructure is incorporated, as an opportunity to re-landscape as many areas of public parkland as possible (after construction is finished) with indigenous plant species and wetlands resembling historic ones (before roads, buildings, bridges, and railroads). The EIS should consider this alternative to more conventional types of re-landscaping and evaluate the many benefits that could accrue, including improving natural flood protection and erosion control of the parkland along the Potomac River, Rock Creek, and Anacostia River; discouraging ("crowding-out") invasive species; and attracting indigenous wildlife (such as has occurred as a result of the Kenilworth Marsh restoration project by the Corps of Engineers)

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 4
## Author Information


Keep Private: No

Name: Dward Moore

Organization: C&O Canal Association

Organization Type: I - Unaffiliated Individual

Address:

Glen Echo, MD 20812
USA

E-mail: president@candocanal.org


## Correspondence Information

Status: Reviewed
Park Correspondence Log:
Date Sent: 08/15/2014
Date Received: 08/15/2014
Number of Signatures: 1
Form Letter: No
Contains Request(s): Yes
Type: Web Form
Notes:

## Correspondence Text

The C&O Canal Association appreciates the opportunity to submit a scoping comment on the preparation of an Environmental Impact Statement (EIS) concerning the Potomac River Tunnel project.

A central mission of our Association is to safeguard the environmental and historical assets of the Chesapeake and Ohio Canal National Historical Park. The EIS study area includes a popular portion of the canal park that extends upriver from the Alexandria Aqueduct. That area would be adversely affected by the longer version of the Potomac River Tunnel originally envisioned under DC Water's Long Term Control Plan. Much of this parkland would likely be closed during the lengthy construction period. It seems probable that pedestrian and bicycle traffic along the much-used Capital Crescent Trail would have to be rerouted along the historic canal towpath. Permanent effects on the canal park might include installation of a tunnel access point and the operation of maintenance vehicles, changes that would be detrimental to this historic and scenic space.

For these reasons, our Association supports modification of the Long Term Control Plan to make it possible to fulfill the aims of the DC Clean Rivers Project without tunnel construction upriver from the Alexandria Aqueduct. We urge that planners take all possible steps to protect the C&O Canal NHP, and request that our Association be a designated a consulting party for this EIS.

Thank you for your consideration of this comment.

Sincerely,
Dward Moore
President

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 5
## Author Information

Keep Private: No
Name: Sally Strain
Organization: Defenders of Potomac River Parkland
Organization Type: I - Unaffiliated Individual
Address:
washington, DC 20016
USA
E-mail: seawalk@starpower.net

## Correspondence Information

Status: Reviewed
Park Correspondence Log:
Date Sent: 08/24/2014
Date Received: 08/24/2014
Number of Signatures: 1
Form Letter: No
Contains Request(s): Yes
Type: Web Form
Notes:

## Correspondence Text

Scoping comments for the Potomac River Tunnel project from Defenders of Potomac River Parkland:

Defenders of Potomac River Parkland, an alliance of more than 20 organizations and many individuals, was formed in 2003 to oppose a very large private development proposal (a Georgetown University boathouse the length of a football field, located inside the C&O Canal National Historical Park, rising above the Canal towpath, and destroying wooded shoreline).

Since then, the Defenders have advocated for the protection of parkland in many public meetings, and in other ways, including submitting scoping comments on January 13, 2008, for an EIS for the above-mentioned boathouse proposal (see www.savethecanal.org/scope.html). The Defenders will continue to advocate for the protection of parkland in the future.

During DCWater's public scoping meeting of July 31, 2014, the Defenders were pleased to read in the "Welcome" handout, p.13, that the following issues and impact topics will be analyzed in the EIS for the Potomac River tunnel project: water quality; wetlands; floodplains; wildlife including rare, threatened and endangered species; air quality; noise; historic structures and districts; cultural landscapes; visitor use and experience; human health and safety; park operations and management; and, transportation.

We agree that these issues and topics should be included in the EIS for the project because they are critical for the protection of parkland, and we look forward to reviewing the analysis and results of same in the draft EIS when it is released to the public.

Thank you.

Sincerely,

Sally Strain, Coordinator, Defenders of Potomac River Parkland www.savethecanal.org

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 6
## Author Information

| | |
|---|---|
| Keep Private: | No |
| Name: | Nancy MacWood |
| Organization: | The Committee of 100 on the Federal City |
| Organization Type: | I - Unaffiliated Individual |
| Address: | 945 G Street, N.W.<br>Washington, DC 20001<br>USA |
| E-mail: | info@Committeeof100.net |

## Correspondence Information

| | |
|---|---|
| Status: Reviewed | Park Correspondence Log: |
| Date Sent: 08/26/2014 | Date Received: 08/26/2014 |
| Number of Signatures: 1 | Form Letter: No |
| Contains Request(s): Yes | Type: Web Form |
| Notes: | |

## Correspondence Text

The Committee of 100 on the Federal City (C100) is pleased to submit the following comments into the record on the proposed Potomac River Tunnel in preparation of a draft Environmental Impact Statement (EIS). A Trustee of C100 attended the July 31 Public Scoping Meeting and we ask to be included as a consulting party to the Section 106 process required under NEPA and NHPA.

Since its founding in 1923, the Committee of 100 has provided responsible oversight in all pertinent aspects of community development. These include parks and conservation, historic preservation, visual planning and architecture, land use regulation and renewal planning, pollution control and environmental protection, and transportation planning.

The C&O Canal National Historic Park and the Potomac Gorge, environmentally sensitive areas of significance to the region and the nation, are included in the study area for the EIS on the Potomac River Tunnel Project. In addition to the land, water, air, structures, living organisms, environmental conditions at the site, as well as social, cultural and economic aspects that will be considered in the preparation of the draft EIS, mitigation measures must also be considered.

Thank you for the opportunity to request Section 106 party status and to submit these comments regarding the Proposed Potomac River Tunnel Project. The C100 looks forward to the future presentation on "Alternatives," which will inform the draft EIS, later this winter.

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 7
## Author Information

| | |
|---|---|
| Keep Private: | No |
| Name: | Pamla H. Moore |
| Organization: | Citizens Association of Georgetown |
| Organization Type: | I - Unaffiliated Individual |
| Address: | 1365 Wisconsin Avenue NW<br>Washington DC 20007<br>Washington , DE 20007<br>USA |
| E-mail: | cag-president@cagtown.org |

## Correspondence Information

| | |
|---|---|
| Status: Reviewed | Park Correspondence Log: |
| Date Sent: 08/26/2014 | Date Received: 08/26/2014 |
| Number of Signatures: 1 | Form Letter: No |
| Contains Request(s): Yes | Type: Web Form |
| Notes: | |

## Correspondence Text

August 26, 2014

Lisa Mendelson-Lelmini
Acting Regional Director
National Capital Region
National Park Service
1100 Ohio Drive SW
Washington, DC 20242

Subject: Comments on the Scope of the Environmental Impact Statement for the Proposed Potomac River Tunnel Project

Dear Ms. Mendelson-Lelmini,

The following comments are in response to the National Park Service's (NPS) Notice of Intent to prepare an Environmental Impact Statement (EIS) on the proposed Potomac River Tunnel Project. This project would be a large volume, stormwater retention tunnel, holding overflows from several combined sewers until these are sent to the Blue Plains Treatment Plant before being discharged into the Potomac River.

The Notice of intent was published in the Federal Register on July 2, 2014, and invited the public to provide comments on the purpose, need, objectives, alternatives [to be presented], and any associated issues with the proposed project and the concomitant EIS.

These comments are provided jointly by the Citizens Association of Georgetown (CAG) and the Friends of Georgetown Waterfront Park (FoGWP). CAG is a non-profit organization whose roots date from 1878. CAG's mission is to preserve the historic character, quality of life and aesthetic values of Georgetown with a particular eye toward protecting the interests of the neighborhood's residents and homeowners. The Friends of Georgetown Waterfront Park is a non-profit corporation created to raise funds to construct and maintain the Waterfront Park and to advocate on behalf of the Park and non-motorized boating facilities and activities along the Potomac riverfront in Georgetown.

Our comments are limited to that part of the project study area encompassing Georgetown and the immediate area of Rock Creek Park

adjacent to Georgetown. Our first comment relates to the proposed boundaries of the study area. Comments 2-5 sequentially cover the combined sewer overflows (CSO) in Georgetown proceeding from west to east. Comments 6-12 are project-wide. Our comments were approved by the governing boards of our respective organizations.

1.) The boundaries of the study area in west Georgetown.
The northern boundary of the study area depicted in the Potomac River Study Area map runs along M St. NW, beginning just east of Rock Creek and extending westward to and along Canal Rd. NW to 37th St. NW. There, the boundary extends north to Prospect St. NW and then west to the Canal Rd. entrance to Georgetown University's campus. CAG and FoGWP believe the study area should be expanded to include the catchment areas for CSO 28 and CSO 27 in west Georgetown.

DC Water proposes to reduce overflows from these two sewers through several Green Infrastructure initiatives. The practicability and efficacy of DC Water's proposed initiatives has yet to be demonstrated with respect to these two Georgetown sewers. CAG and FoGWP believe actual reduction of overflows, particularly for CSO 27, may require the retention capacity of the Potomac River tunnel to be increased to handle a greater flow volume. For this reason, the EIS study area should be expanded.

2.) Combined sewer overflow numbers 29 and 28, and the non-motorized boathouse zone.
Combined sewer overflow outfall numbers 29 and 28 drain sewers serving Georgetown University, Glover Park, and part of Cathedral Heights; and lower west Georgetown, respectively. These outfalls are within or proximate to the non-motorized boathouse zone being advanced by the National Park Service.

Our concern for this area is the potential for serious detrimental effects from heavy construction equipment and activity on the bottomlands; the Capitol Crescent trail; two major interceptor sewers that parallel the trail, one having had three significant failures in recent years, spilling large amounts of raw sewage; the fragile condition of the century-old Washington Canoe Club boathouse; and the remaining abutment of the Nineteenth Century Aqueduct Bridge that once crossed the Potomac River. (The abutment and a pier near the Virginia shore were preserved as historical markers for this remarkable engineering edifice.)

Two structures within this general area are on the National Register of Historic Places: the Washington Canoe Club, and the Potomac Boat Club.

Among the tunnel-related structures potentially to be built in this area are a retrieval shaft, a diversion chamber(s), and a tangential inlet. An alternative that uses a pipeline to connect these two sewers, and reduces the number of required structures should be included in the EIS. CAG and FoGWP strongly believe the EIS must include an alternative where the sewer and tunnel-related structures have the least permanent effect on future sites for new boathouses, and for access to and recreational use of the river.

CAG and FoGWP also hope that data collection and analysis of this area will facilitate NPS' effort to produce an environmental assessment of the non-motorized boathouse zone, which should also include Thompson's Boat Center. The Boat Center is within the Potomac River Tunnel study area.

3.) Combined sewer overflow number 27, and the Georgetown Waterfront Park.
This combined sewer serves most of west Georgetown between Wisconsin Ave. NW and Georgetown University. The outfall for CSO 27 is in the middle of the Georgetown Waterfront Park, at the foot of Potomac St. NW. This sewer, and its smaller counterpart, CSO 28, are shown in maps dating from the early 1880s. DC Water records indicate that CSO 27 is the quickest of the Georgetown sewers to overflow, and overflows occur with minimal precipitation.

CAG and FoGWP believe that the EIS must include an alternative that avoids construction, or the placement of any tunnel-related structure or shaft, within or immediately adjacent to the Waterfront Park.

DC Water is proposing to apply several Green Infrastructure strategies to reduce overflows from this combined sewer, and from CSO 28. CAG and FoGWP are skeptical that the proposed strategies will result in flow reductions on the scale envisioned by the models (which seem to have been run without locational data). Our skepticism is based on the age and deteriorated condition of the sewers serving west Georgetown; sewers which likely reflect the design dictum of the era: 'Dilution is the solution for pollution'. Conveyance to an outfall of sanitary sewage in these sewers was facilitated by allowing infiltration and inflow of groundwater into the sewer pipes. On the basis of DC Water flow data, CAG and FoGWP suspect there is widespread groundwater infiltration and inflow into these sewers, contributing substantially to overflow volume.

Our skepticism is reinforced from our review of several documents prepared by DC Water. In January 2014, DC Water published, for public comment, a draft Long Term Control Plan Modification for Green Infrastructure. Several technical memoranda in the draft Modification plan indicate that installation of Green Infrastructure initiatives in west Georgetown could prove to be impractical and inadequate. On p. 5-7 of Technical Memorandum No. 7, one reads, "Because of the built-up and dense development in CSO 027's sewershed, it is anticipated that GI by itself will not provide the degree of control necessary. As a result, the cost estimates prepared for this alternative include allowances for constructing a diversion to the Upper Potomac Interceptor Relief Sewer to provide the necessary degree of CSO control." In table 4. Appendix C of Technical Memorandum No. 7 (no page number), the design diversion rates to a relief interceptor for CSO 027 and CSO 028 are given as 357 and 70 MGD, respectively.

These two sewer systems will be nearly 150 years old when the Potomac River Tunnel becomes operational. Anecdotally, there currently are recurring reports of blockages and related failures, and backflows into low-lying drains during rain events.

Although the overflow from CSO 28 is minimal, we believe that an alternative in the EIS that sizes the stormwater retention tunnel to handle overflows from CSO 27 - if further study determines that overflows from this sewer would not be abated by Green Infrastructure - is warranted. Conversely, further study by DC Water may lead to a decision to separate this combined sewer, which already is well beyond expected design life. Separation would reduce overflow volumes, and lead to a reduction in size of the retention tunnel.

4.) Combined sewer overflow numbers 26 and 25, and the Georgetown Waterfront Park
The outfalls for these sewers are at the foot of Wisconsin Ave. NW (within the park) and the foot of 31st St NW (just outside the park) respectively. These sewers serve a very small area, south of the canal, near lower Wisconsin Ave NW.

DC Water has indicated it intends to separate these combined sewers into sanitary sewers and storm sewers. We note that separation will entail construction next to the oldest surviving waterfront building from the port of Georgetown era: the Francis Dodge Warehouse at the corner of Wisconsin Ave. and K St. NW. The Historic American Buildings Survey indicates that the Dodge Warehouse building was erected in the late Eighteenth Century. We expect that the alternatives will ensure that no damage occurs to this building. We also note that, within this part of the study area, the Grace Episcopal Church is on the National Register of Historic Places.

5.) Combined sewer overflow number 24, the West Rock Creek Diversion Sewer
This combined sewer has the largest overflow volume of any combined sewer in Georgetown. The largest-size diameter, by far, of Georgetown's combined sewers, it diagonally crosses the canal just west of Lock #1, passes under the former GSA West Heating Plant site, diagonally crosses K St NW between 29th and 30th streets NW, and has an outfall and tide gate at the foot of 30th St NW. The sewer's catchment area is generally along the west bank of Rock Creek, and extends north of the traditional boundaries for Georgetown.

The former GSA West Heating Plant building and site were determined to be eligible for listing on the National Register of Historic Places.

CAG and FoGWP propose that an alternative in the EIS examine re-aligning the path of this sewer in lower Georgetown. A potential re-alignment would take the sewer from a position just south of Pennsylvania Avenue NW and near the west abutment of the Pennsylvania Avenue Bridge to a position east of Rock Creek near the intersection of K St. NW and 27th St. NW. Re-aligning this sewer would remove a long-term threat to the stability of the Chesapeake & Ohio Canal towpath, and the stone walls of Lock #1's basin.

The following comments are project-wide.

6.) Chesapeake and Ohio Canal National Historic Park
Four of the six combined sewers in Georgetown (numbers 24, 27, 28, and 29) cross under the Chesapeake and Ohio Canal. Any alternative that proposes construction in or near the canal, or proposes running sewer pipe in the canal bed should describe actions to be taken to mitigate any potential damage to the canal walls, or canal towpath.

7.) Gravity flow alternative for de-watering the Potomac stormwater retention tunnel.
We understand two alternatives are being considered to de-water (empty) the stormwater retention tunnel, one alternative using pumps and a force main; the other relying on gravity flow to send the tunnel contents to the treatment plant at Blue Plains. A factor in sizing the tunnel is how long it takes to empty it before the next rain event. We expect the description of each alternative to describe the time it would take to de-water the tunnel, and the consequent effect on tunnel storage capacity and length.

8. Transit initiatives on K St NW in Georgetown.
Proposals have been made for a streetcar line to run along K St. NW in Georgetown, and possibly have a terminus there. Alternatives that place structures, such as diversion chambers and tangential inlets, on K St. should address the potential impact of these on a future streetcar line on K Street.

9.) Climate change and rising sea levels
The EIS should address the potential long-term effect of climate change and sea level rise on this project. Among the effects that should be considered are projected changes in the intensity, duration, and frequency of significant rain events. A significant change in the amount of precipitation that falls in future decades in the Mid-Atlantic can impact the size and capacity of the stormwater retention tunnel. A rise in sea level, accompanied by higher storm surges, may lead to increased flooding, with higher flood heights, on the Potomac River. This possibility should be factored in the design and placement of structures associated with this project.

10. The National Historic Preservation Act (NHPA).
Part of the study area for the EIS lies within the National Historic Landmark boundaries for Georgetown. Georgetown was designated a National Historic Landmark in 1967. Additionally, as noted above, several structures on the National Register of Historic Places are within the Georgetown study area.

The NEPA and NHPA A Handbook for Integrating NEPA and Section 106, published March 2013 by the Council of Environmental Quality and the Advisory Council on Historic Preservation (ACHP), sets out guidance for meeting the requirements of these two laws in the preparation of an EIS.

We note two paragraphs from the Handbook:
"The agency should include language in the Notice of Intent (NOI) and any notices of scoping, stating the agency's intent to discuss Section 106 [of NHPA] and utilize scoping to partially fulfill the Section 106 public notification and consultation requirements. Scoping may be an opportunity to identify consulting parties and initiate consultation."

and,

"Substitution under 36 C.F.R. § 800.8(c) permits agencies to use the NEPA review to comply with Section 106 as an alternative to the process set out in 36 C.F.R. §§ 800.3-
800.6. The use of a substitution approach allows agencies to use the procedures and documentation required for the preparation of an EA/FONSI or EIS/ROD to comply
with the Section 106 procedures. To do so, the agency must notify the ACHP and SHPO/THPO in advance that it intends to do so and meet certain specified standards and documentation requirements as set forth in 36 C.F.R. § 800.8(c)(1)."

If the National Park Service intends to reflect and incorporate relevant requirements established by the NHPA in the preparation of the EIS, with respect to both content and process, this should be done in a manner consistent the Handbook. In this regard, we ask to be informed of the opportunities for future consultation and coordination in the preparation of this EIS.

11. Cultural Resource Survey.
A Cultural Resources Survey was prepared as part of the Environmental Assessment for the General Services Administration's proposed disposal of the West Heating Plant on 29th St. NW in Georgetown. This Survey references various archeological and historical studies undertaken in recent decades in or near the Georgetown waterfront.

Of particular note are several limited excavations done near the constructed ramps of the Whitehurst Freeway. These studies identified several sites deemed eligible for listing in the National Register of Historic Places, including a Native American Late Woodland site, and the site of the Thomas Peter house, where George Washington ate his last meal before his death. A subsequent excavation discovered the cremated remains of a Native American woman, buried with numerous funerary items.

The EIS should reference and describe the numerous cultural resource-related studies already completed in the Potomac River Tunnel study area, and identify the need for additional studies in those areas likely to be directly impacted by construction of the tunnel, or by ancillary structures connecting a combined sewer with the tunnel.

12. Presence of hazardous material.
After the Civil War, the port of Georgetown increasingly became the site of various industrial enterprises. Along both banks of Rock Creek, near Virginia Avenue NW and the Creek's confluence with the Chesapeake & Ohio Canal, was a large complex of facilities producing and distributing illuminating gas. Toxic contaminants, likely related to these industrial activities, were found in recent years during the course of several construction projects. The EIS should describe mitigating actions to eliminate the risk to public health and welfare of hazardous substances discovered during construction.

Conclusion:

CAG and FoGWP fully support the goal of ending nearly all the combined sewer outflows into the Potomac and Anacostia rivers. This will greatly benefit residents and visitors of our area, who increasingly are using these waters as a recreational resource.

We further support the proposal to shorten the length of the Potomac River Tunnel. Originally envisioned as extending west along the Potomac River and ending near the outfall for CSO 29 (aligned approximately with the 3900 block of Canal Road NW), the truncated tunnel would now extend only to the general area of the confluence of Rock Creek and the Potomac River, ten or more blocks east. The longer tunnel, with its accompanying structures, prospectively threatened to disrupt and damage the Georgetown Waterfront Park, and Federally-owned land west of the Waterfront Park in a significant way..

Thank you for providing us with the opportunity to comment on the scope of this important Environmental Impact Statement.

If you have any questions on this comment letter, please contact Walter Groszyk at wg@outcomesmatter.com

Sincerely,

Pamla Moore
President, Citizens Association of Georgetown
1365 Wisconsin Avenue NW; Suite 200
Washington DC 20007

Robert P. vom Eigen
President, Friends of Georgetown Waterfront Park
P.O. Box 3653
Washington DC 20027

by email to: http://parkplanning.nps.gov/NCRO

cc: DC Clean Rivers Project
c/o Potomac River Tunnel EIS
DC Water and Sewer Authority
5000 Overlook Ave., SW
Washington, DC 20032

Tara Morrison, Superintendent, Rock Creek Park
Kevin Brandt, Superintendent, C&O Canal National Historic Park
Robert Vogel, Superintendent, National Mall and Memorial Parks
Ron Lewis, Chairman, ANC-2E
Lauralyn Lee, Associate Vice President, Georgetown University
Riyad Said, President, Georgetown Business Association
Joe Sternlieb, CEO, Georgetown Business Improvement District

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 8
## Author Information

| | |
|---|---|
| Keep Private: | No |
| Name: | Edmund Preston |
| Organization: | |
| Organization Type: | I - Unaffiliated Individual |
| Address: | 6306 Swords Way<br>Bethesda, MD 20817<br>USA |
| E-mail: | presto77@verizon.net |

## Correspondence Information

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|---|---|
| Status: Reviewed | Park Correspondence Log: |
| Date Sent: 08/27/2014 | Date Received: 08/27/2014 |
| Number of Signatures: 1 | Form Letter: No |
| Contains Request(s): Yes | Type: Web Form |
| Notes: | |

## Correspondence Text

I appreciate the opportunity to make this personal comment on the scope of the Environmental Impact Statement for the Potomac River Tunnel.

The clean-water objectives of this project are extremely worthwhile, but I urge that the statement give due weight to possible environmental side effects. In particular, very significant harm to the C&O Canal National Historical Park would probably result if the tunnel's construction and maintenance took place in the area west of the remaining section of the Alexandria Canal Aqueduct.

That part of the National Historical Park provides invaluable historic views, open space, wooded shoreline, and a much-used section of the Capital Crescent Trail. For this reason, I strongly prefer the DC Water proposal that would place the western terminus of the tunnel downriver from Key Bridge. Urbanized space exists in that area that would be a more appropriate site for the tunnel's construction and for a permanent access point, if that is required.

Thank you for your consideration.

Sincerely, Edmund Preston

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 9
## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Sally Strain |
| Organization: | Defenders of Potomac River Parkland |
| Organization Type: | I - Unaffiliated Individual |
| Address: | 5712 Sherier Pl., Washington, DC 20016<br>washington, DC 20016<br>USA |
| E-mail: | seawalk@starpower.net |


## Correspondence Information

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|---|---|
| Status: New | Park Correspondence Log: |
| Date Sent: 08/27/2014 | Date Received: 08/27/2014 |
| Number of Signatures: 1 | Form Letter: No |
| Contains Request(s): Yes | Type: Web Form |
| Notes: | |

## Correspondence Text

Resubmitted 8/27/14. Please confirm receipt of these comments:

Scoping comments for the Potomac River Tunnel project from Defenders of Potomac River Parkland:

Defenders of Potomac River Parkland, an alliance of more than 20 organizations and many individuals, was formed in 2003 to oppose a very large private development proposal (a Georgetown University boathouse the length of a football field, located inside the C&O Canal National Historical Park, rising above the Canal towpath, and destroying wooded shoreline).

Since then, the Defenders have advocated for the protection of parkland in many public meetings, and in other ways, including submitting scoping comments on January 13, 2008, for an EIS for the above-mentioned boathouse proposal (see www.savethecanal.org/scope.html). The Defenders will continue to advocate for the protection of parkland in the future.

During DC Water's public scoping meeting of July 31, 2014, the Defenders were pleased to read in the "Welcome" handout, p.13, that the following issues and impact topics will be analyzed in the EIS for the Potomac River tunnel project: water quality; wetlands; floodplains; wildlife including rare, threatened and endangered species; air quality; noise; historic structures and districts; cultural landscapes; visitor use and experience; human health and safety; park operations and management; and, transportation.

We agree that these issues and topics should be included in the EIS for the project because they are critical for the protection of parkland, and we look forward to reviewing the analysis and results of same in the draft EIS when it is released to the public.

Thank you.

Sincerely,

Sally Strain, Coordinator, Defenders of Potomac River Parkland www.savethecanal.org

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 10
## Author Information

| | |
|---|---|
| Keep Private: | No |
| Name: | Gretchen Ellsworth |
| Organization: | |
| Organization Type: | I - Unaffiliated Individual |
| Address: | Washington, DC 20009<br>USA |
| E-mail: | gretchene@mindspring.com |

## Correspondence Information

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|---|---|
| Status: Reviewed | Park Correspondence Log: |
| Date Sent: 08/28/2014 | Date Received: 08/28/2014 |
| Number of Signatures: 1 | Form Letter: No |
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| Notes: | |

## Correspondence Text

I am concerned about the historical structures fronting the Potomac near Key Bridge. In addition, of course, to the C&O Canal, the only two surviving early 20th-century boathouses on the River and the Aqueduct Bridge remains are at risk. These important documents of their eras on the River seem to be directly in the path of harm and very unlikely to survive the impact of digging and the movement of heavy equipment over and over in and out of the constricted access area. The vibrations from digging and truck traffic etc. will, I fear, be too much for the century old boathouses and even older aqueduct bridge remains.

For these reasons, as well as the many reasons to turn to green solutions to as much run-off in this area, I strongly favor the reduction to the smallest possible amount of tunneling and creation of combined sewage outflows in the river.

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 11
## Author Information

Keep Private: No
Name: Joseph Sternlieb
Organization: Georgetown Business Improvement District
Organization Type: I - Unaffiliated Individual
Address: 1000 Potomac Street NW
Suite 122
Washington , DC 20007
USA
E-mail: jsternlieb@georgetowndc.com

## Correspondence Information

Status: Reviewed
Park Correspondence Log:
Date Sent: 08/29/2014
Date Received: 08/29/2014
Number of Signatures: 1
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Contains Request(s): Yes
Type: Web Form
Notes:

## Correspondence Text

August 29, 2014

Lisa Mendelson-Lelmini
Acting Regional Director
National Capital Region
National Park Service
1100 Ohio Drive SW
Washington, DC 20242

Subject: Comments on the Scope of the Environmental Impact Statement for the Proposed Potomac River Tunnel Project

Dear Ms. Mendelson-Lelmini,

The Georgetown Business Improvement District submits the following comments in response to the National Park Services (NPS) Notice of Intent to prepare an Environmental Impact Statement (EIS) on the proposed Potomac River Tunnel Project.

The Georgetown Business Improvement District (GBID) is a publicly chartered, private non-profit organization that manages elements of the public environment, and provides services to the Georgetown commercial district to sustain and improve the local economy. Our borders include all the area between the Potomac River and the north side of M Street NW, and between Rock Creek Park and the intersection of the Whitehurst Freeway and Canal Road; as well as Wisconsin Avenue south of Reservoir Road and the commercial portion of all east-west running streets intersecting Wisconsin Avenue. Our members include approximately 500 commercial property owners and over 1,500 commercial tenants.

We are submitting these comments to identify issues of interest to our members including the problems associated with CSOs as well as those that will be caused by mitigation efforts and the planned Potomac River Tunnel construction. The notice of intent invited us to provide comments on the purpose, need, objectives, alternatives, and any associated issues with the proposed project and the EIS. We hope that these comments are addressed in the final scoping of the EIS.

First, we want to endorse the extensive comments provided by the Citizens Association of Georgetown and the Friends of Georgetown Waterfront Park. We strongly support efforts to eliminate or, at least, greatly reduce, combined sewer overflow events. We also agree, in principal, with their conclusions that green infrastructure is preferable to construction of the section of storm water retention tunnel that was originally planned between Rock Creek and Key Bridge. However, we are skeptical of the ability of green infrastructure projects west of Rock Creek to eliminate CSO events, and request that the EIS fully describe and evaluate all aspects of the green infrastructure that would be necessary to achieve the desired goal, and that the EIS further evaluate alternative hard infrastructure interventions that are less disruptive than tunneling west of Rock Creek, and would achieve the desired goals.
The Georgetown BID is sympathetic to the problems that DC Water has managing sewer and storm water systems that were built in an era that predated modern sewage control standards. The current system was also built to accommodate needs of a smaller and less impactful population and uses. Similarly, the Georgetown portion of the sewer system exists below a fully built-out historic district comprised of many structures that exceed 150 years in age. Thus, every effort to design and build a system that reduces or eliminates CSO events in Georgetown will disrupt the physical environment and impact buildings, businesses, access, mobility, and recreation. We expect that any mitigation efforts will temporarily harm the local economy by limiting access to businesses, slowing traffic, disrupting public transit, and limiting recreation uses.

Knowing that our members will be impacted, our goal is to have the CSO mitigation projects completed:
1. as quickly as possible
2. with as little disruption to any particular building, business, or sector of the workforce, as possible;
3. without major disruption to public transit or commuter or visitor traffic
4. to be maximally effective in limiting CSO events
5. to minimize impact to Georgetown’s parks and recreation facilities
6. to minimize impact on historic commercial buildings
7. to minimize impact on the long-term look and feel of the commercial district, including mature street trees and brick sidewalks
8. to be a permanent solution - so that future generations do not have to readdress this issue

Specific issues that the EIS should address include:
Whether DC Waters requested modification to shorten the tunnel and replace the section addressing CSOs 026 through 029 with green infrastructure is workable. In the absence of a specific green infrastructure plan, we wonder how realistic the generic green infrastructure interventions will be when applied to the Georgetown Historic District. DC Water has presented six green infrastructure interventions that might be used in Georgetown in order to reduce the size of the Potomac River Tunnel. These include: Bioretention Rain Gardens, Permeable Pavement, Cisterns and Rain Barrels, Vegetated Swales, Native Landscaping, and Green Roofs.

The EIS should present a storm water retention goal for each CSO outfall (gallons of water that must be retained or diverted from the storm system to prevent a CSO from occurring) and then present a realistic plan for each outfall catchment area that includes the exact location, cost, and management plan for each of the proposed green infrastructure interventions. Each should account for the historic, physical, geotechnical, and political hurdles that will have to be overcome to do the installation. The EIS must evaluate:

a. how much storm water each of the major green infrastructure tactics could realistically capture/divert in Georgetown's environment given existing and future development.
b. how much roof space can realistically host green roof material and how much water would that capture?
c. where and how impervious paving materials would be replaced by pervious materials and how much water would be captured?
d. where and how would bio swales, rain gardens, and rain capturing plant species be employed and how much water would they divert and process?
e. given that a standard 66 gallon rain barrel can capture only 12% o the runoff from 1 rain event on a typical 900 square foot roof, how many barrels and cisterns would need to be employed, where would they be installed, how would they be managed, and what would be their impact?

We request this level of detail because, although we prefer green infrastructure solutions in principle, no evidence has been presented that they can be practically employed in Georgetown.

While the CAG and FOGWP letter states that the EIS must include an alternative that avoids construction, or the placement of any tunnel-related structure or shaft, within or immediately adjacent to the Waterfront Park, we further believe that alternatives should include hard infrastructure other than the proposed tunnel, such as the use of the C&O Canal right of way in exchange of improvements to the canal structure, in the event that green infrastructure is not a viable alternative.

Thanks you for this opportunity to address the EIS scoping. We look forward to working with your agency and DC Water in the coming months and years to address this very important issue.

Sincerely yours,

Joseph Sternlieb
CEO

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 12
## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | N/A |
| Organization: | Coalition for the Capital Crescent Trail |
| Organization Type: | I - Unaffiliated Individual |
| Address: | P. O. Box 30703, Bethesda, MD 20824<br>Bethesda, MD 20824<br>USA |
| E-mail: | CCCTrail@comcast.net |


## Correspondence Information

| | |
|---|---|
| Status: Reviewed | Park Correspondence Log: |
| Date Sent: 08/31/2014 | Date Received: 08/31/2014 |
| Number of Signatures: 1 | Form Letter: No |
| Contains Request(s): Yes | Type: Web Form |
| Notes: | |

## Correspondence Text

Due to uncertainties in how the project will go forward in the vicinity of the Capital Crescent Trail, due largely to the unresolved proposed Hybrid Plan, the Coalition (CCCT) does not feel that it can be very specific in its comments at this time. Clearly acceptance of DC Water's Hybrid/Green Infrastructure plan by the EPA would have major implications for users of the CCT, so we eagerly await word on that decision. In addition to that uncertainty, some questions did arise from the July 31, 2014 meeting. We would like to see documentation/references to tunnel projects of this nature being successfully implemented elsewhere in your report. Also, at the July meeting DC Water representatives stated that the Hybrid Plan would not actually result in any appreciable cost savings vs a tunnel project under the CCT & C&O Canal upriver from Rock Creek, and we would like further explanation on why that is so. We would also like to see an explanation of how the option of the Gravity Tunnel Concept might impact the project upriver from Rock Creek, particularly along the CCT. Finally, as the incorporated group representing the interests of the Capital Crescent Trail since 1986, the Coalition for the Capital Crescent Trail would appreciate being granted official consulting party status as this project moves forward.

Sincerely,
Ernie Brooks
for the Board of the CCCT

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 13
## Author Information

| | |
|---|---|
| Keep Private: | No |
| Name: | Marchant Wentworth |
| Organization: | Wentworth Green Strategies ☑ Official Rep. |
| Organization Type: | I - Unaffiliated Individual |
| Address: | 903 Hamlin Street NE<br>Washington, DC 20017<br>USA |
| E-mail: | marchant_wentworth@msn.com |

## Correspondence Information

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|---|---|
| Status: Reviewed | Park Correspondence Log: |
| Date Sent: 08/18/2014 | Date Received: 08/20/2014 |
| Number of Signatures: 1 | Form Letter: No |
| Contains Request(s): Yes | Type: Letter |
| Notes: | |

## Correspondence Text

DC Clean Rivers Project Team:
Wentworth Green Strategies is pleased to submit these comments on the scoping of the Environmental Impact Statement (EIS) for the Potomac River Tunnel.

Introduction

DC Water has proposed a modification to the consent decree that has set out goals and deadlines for reducing combined sewer overflows. They have proposed a five-year delay for meeting the goals for the Potomac River Tunnel and a seven-year delay in meeting the deadline for the Piney Branch Combined Sewer Overflow (CSO). They would substitute an ambitious program of "green infrastructure" (GI) for one proposed combined sewer tunnel on Piney Branch and shorten another proposed tunnel along the Potomac.
I. The Environmental Impact Statement should evaluate near term projects to protect public health and the environment particularly around areas of known public contact such as the boathouses along the Potomac River and the Georgetown Waterfront.
II. The Environmental Impact Statement should evaluate the impact on ratepayers by building a shortened Potomac tunnel that would reduce capital costs.
III. The Environmental Impact Statement should evaluate programs to relieve capacity in the Potomac Interceptor, institute aggressive water conservation projects throughout the region tributary to the Interceptor, provide support for DDOT and DDOE to implement the stormwater regulations and reduce runoff, and renegotiate the InterMunicipal Agreement and the charges for the Potomac Interceptor to more fairly allocate the costs of the CSO controls to the entire region that will benefit by a cleaner Potomac.

Discussion

Considering Georgetown, the disruption caused by the reconstruction of M Street in Georgetown in 2002 is a fresh memory for many Georgetown businesses and residents . At least two of the CSOs that discharge overflows upstream of the waterfront and the boat houses, CSO 027 and CSO 029, have sewersheds with narrow streets, and relatively few alleys. DC water has envisioned GI to be the primary treatment option. However, GI projects in these sewersheds might arouse citizen opposition and contribute in delays and increased costs. Navigating the historical designations in Georgetown as well as mitigating threats to Georgetown Park along the waterfront could pose additional delays and increased costs. Finally, recent DC legislation mandating the undergrounding of certain electric wires may also contribute to delays and increase the cost per acre. For these reasons, the EIS should evaluate whether the shortened Potomac River Tunnel proposed by DC Water minimizes the disruption to Georgetown residents, businesses, and the Historic District.
II. The Environmental Impact Statement should evaluate the benefits of prioritizing near term projects to protect public health and the environment particularly around areas of known public contact such as the boathouses along the Potomac River and the Georgetown Waterfront.
We believe that there are viable projects that DC Water might move forward in the near term to gain some reduction of overflows. The EIS should evaluate the public health and environmental benefits to implementing these projects as soon as possible.

Separate CSO 025 and 026

Under DC Water's modification proposal, the separation of CSO 025 and 26 is not slated to be completed until after the Potomac tunnel is completed in 2032. We urge that the EIS evaluate the benefits of having this separation begin as soon as possible and not wait until the Potomac tunnel is completed. Modeling data from DC Water indicates that even in the wettest quarters, these sewersheds generate relatively little flow. Indeed, CSO 025 comprises only 17 acres of sewershed. The data indicate that CSO 026 has virtually zero flow. However, CSO 025 flows are immediately upstream from Thompson's Boat Center and reducing flows here may afford that high recreational use area some benefit.

Divert some flows from CSO 027 to the Upper Potomac Relief Sewer

The Environmental Impact Statement should evaluate whether GI alone may not be enough to reduce flows from this overflow to meet LTCP goals and whether it might be possible to divert some of these flows to the Upper Potomac Relief Sewer after the Potomac Tunnel is completed. However, we urge that the Environmental Impact Statement evaluate reducing the flows before the Tunnel is completed in order to afford greater protection from overflows to the Thompson's Boat Center and Georgetown Waterfront downstream.
Separating O25 and 026 early and diverting flows from CSO 027 have consequences elsewhere in the sewer system.

The Environmental Impact Statement should evaluate whether in some storm conditions the net effect of these diversions may be to create corresponding overflows at CSO21 due to capacity limitations of certain sections of the Potomac Interceptor between the Rock Creek Interceptor and the Potomac Pumping Station. The EIS should balance the impact of these overflows at CSO 021 with water quality benefits of reducing discharges upstream of high use public areas such as the Georgetown waterfront and the Thompson's Boat Center. We urge the EIS to investigate other actions that might free up some capacity in this section of the Potomac Interceptor'prior to the construction of the Potomac Tunnel'including reducing flows in the Rock Creek Interceptor and other areas to the tributary to the Potomac Pumping Station.

The Environmental Impact Statement should evaluate the water quality benefits and public health protection that would result from prioritizing GI treatment of Potomac sewersheds that discharge upstream of the boat houses and the Georgetown waterfront first.

Using CSO data derived from Quarterly Reports filed under the Nine Minimum Controls reporting requirement, we analyzed volume discharges from the various CSOs along the Potomac in the wettest quarter (second quarter, 2008)'presumably the highest volume quarter between 2005 and 2013. The graph in Appendix A indicates that the cluster of CSOs that would be served by the Potomac tunnel'CSO 020 through CSO024'contribute 89 percent of the total volume of stormwater and overflows from CSOs along the Potomac. The five remaining CSOs upstream of Thompson's Boat Center'025 through CSO029'discharge 39 million gallons. Of these five, DC Water has suggested that CSOs 025 and 026 be separated. The DC Water proposal has suggested that some portion of the discharge of CSO 027 might be directed into the Upper Potomac Relief Sewer.

While some amount of control appears to be available to three of the five upstream CSOs, we urge the Environmental Impact Statement to evaluate the benefit of prioritizing GI activities in the sewersheds of CSO 028 and 029. For example, the CSO 028 sewershed is 21 acres, of which 13 acres are impervious surface. It appears to be comprised of roughly nine blocks of Georgetown, at least three of which appear to be green space associated with the eastern section of Georgetown University campus as well as a section of the waterfront that includes a canoe rental facility. Controlling these areas with a variety of GI technologies might be undertaken with minimum disruption. Indeed, DC Water has proposed to treat 30 percent of the impervious surface in the sewershed amounting to only 4 acres. In contrast, controlling CSO 029 appears to present more challenges. The 330 acre sewershed has 164 acres of impervious surface'the largest of the Potomac sewersheds. DC Water has indicated that they could achieve a 60 percent treatment rate of impervious surface based on earlier work on separation. Because of the location of this CSO immediately upstream from the Potomac Boat Club, we recommend that this area be given top priority for GI treatment.

Using the above measure to control CSO discharges upstream of Thompson's Boat Center means that a shortened Potomac Tunnel is adequate and will save ratepayers money. We support the shortened Potomac Tunnel and the 5 year extension'coupled with strict performance criteria. Using data derived from the CSO Quarterly Reports submitted by DC Water under the Nine Minimum Controls, we confirmed that the shortened Potomac Tunnel is vitally needed to control the worse of the Potomac CSOs. Because of the volumes and durations of the discharges, we believe that GI alone is not adequate to reduce the overflows enough to achieve the LTCP goal.

We analyzed the wettest quarter between 2005 and 2013 and compared them to the overflows for the Potomac CSOs in the same period. The analysis indicated that in the second quarter of 2008, collectively the CSOs on the Potomac discharged 328.3 million gallons of untreated overflow and stormwater. Seventy-one percent of that total'231.2 million gallons'came from a single location, CSO 021, just upstream from the Theodore Roosevelt Bridge. Over 53 million gallons of overflow came from CSOs upstream of Thompsons Boat Center or adjacent to the Georgetown waterfront'both popular recreational areas. (See Appendix A for the graph of these overflows)

We believe that the EIS is an important requirement and will provide the opportunity to consider many of the issues raised in these comments. We support the need for this document. We suggest that the scope of the EIS be limited to the impacts on US Park Service land along the Potomac and expanded to consider the impacts on the sewersheds tributary to the Potomac Tunnel including CSOs 20, 21 and 22 and evaluate the impact of the Tunnel on the operation and maintenance of the Potomac Pumping Station. In addition, we urge the EIS to consider the impact of reported stormwater and groundwater pumping to the sewer system and the effect that may have on the capacity of the Tummel.

The EIS should evaluate the benefits for low-income ratepayers by constructing the shortened Potomac Tunnel. It is important to note that DC residents will likely experience significant increases in utility bills due to a variety of factors including fuel costs and the additional costs of undergrouding utility lines. To use these increases in the LTCP as the reason for delays disguises the real problem. Shaving the peaks o capital costs, as this proposal attempts to do, is merely a short-term fix to a larger problem'the cost of DC Water's Capital Improvement Program (CIP). The real need for these rate increases results from the legacy of decades of underfunding of our sewer and water infrastructure stemming from a dysfunctional relationship with the DC government. Ratepayer dollars were continually sucked out of the Sewer and Water Fund and used to cover politically motivated contracts. The result was a cash-starved Department of Sanitary Engineering that could only respond to emergencies, much less longer term water quality issues.

We urge the EIS to evaluate ways that DC Water mitigate rate impacts on low income ratepayers including:
• renegotiating the InterMunicipal Agreement (IMA) to increase user charges for the use of the Potomac Interceptor Sewer to better reflect the true cost of those flows;
• reevaluating the present rate structure to assess whether charges for the commercial and other sewer users including WMATA and the federal government truly reflect costs;
• expanding DC Water's program of rate relief for low income ratepayers; and continuing to pursue federal funding.

V. The EIS should evaluate programs to relieve capacity in the Potomac Interceptor, institute aggressive water conservation projects throughout the region tributary to the Potomac Interceptor, provide support for DDOT and DDOE to implement the stormwater regulations and reduce runoff, and renegotiated the InterMunicpal Agreement and the charges for the use of the Potomac Interceptor to more fairly allocate the costs of CSO controls to the various suburban jurisdictions.

The EIS should evaluate efforts to institute an aggressive water conservation campaign for all sewersheds tributary to the Potomac interceptor. We recognize that great gains have been made to produce declining flows to Blue Plains despite an increasing population. However, more should be done. Reducing flows will produce great benefits in reducing electricity consumption and sludge production at the plant. Even relatively small reductions can produce savings.

The EIS should focus on relieving capacity in the Potomac Interceptor and the Potomac Pump Station. Indications are that, even with the construction of the Potomac Tunnel, the capacity of the Potomac Interceptor and the Potomac Pump Station may be exceeded in severe rain events. This may play a major role in creating overflows at CSO021. The EIS should investigate all possible measures that might result in offloading water from that system. For example, the LTCP details that the Washington Metropolitan Area Transit Authority (WMATA) may be pumping as much as 5.3 million gallons of ground water into the combined sewer system tributary to the Potomac Pump Station. These flows are easily handled during dry weather conditions, but in severe rain events, these flows might contribute to overflows.

There could be other measures that might be taken to reduce flows to the Interceptor. For example, the EIS could evaluate measure such as enhanced GI in the sewersheds tributary to the Potomac Interceptor in the District such as CSOs 020 and 022. The EIS should evaluate the value of requiring new development in these sewersheds to undertake the latest water conservation and storm water management systems

Thank you for your consideration of these comments.

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 14
## Author Information

Keep Private: No
Name: Ron Lewis
Organization: ANC 2E Official Rep.
Organization Type: O - Civic Groups
Address: 3265 S Street NW
Washington, DC 20242
USA
E-mail: anc2e@dc.gov

## Correspondence Information

Status: New
Park Correspondence Log:
Date Sent: 09/05/2014
Date Received: 09/12/2014
Number of Signatures: 1
Form Letter: No
Contains Request(s): Yes
Type: Letter
Notes:

## Correspondence Text

Re: Community comments on the scope of the environmental impact statement for the proposed Potomac River Tunnel Project
On September 2 ANC 2E held its regularly scheduled public meeting, which was properly noticed and attended by all eight commissioners, constituting a quorum. At this meeting the Commission adopted the following position on the scoping of the environmental impact statement for the proposed Potomac River Tunnel Project by the National Park Service:
Whereas, the Citizen's Association of Georgetown and the Friends of the Georgetown Waterfront Park have sent a letter dated August 26, 2014, to the Acting Regional Director of the National Capital Region of the National Park Service (NPS), raising certain concerns and making certain requests regarding the planned NPS Environmental Impact Statement. The Washington Harbour Condominium Owners Association, through its president, Marc Fleischaker, supports this letter. The ANC 2E concurs with the concerns and requests made in the letter. Therefore, it is
RESOLVED that ANC 2E expresses its concurrence with this letter and notes its appreciation of the groups that drafted it.

Sincerely,
Ron Lewis
Chair, ANC 2E

Commissioners:
ED Solomon, District 1 Ron Lewis, District 2 Jeff Jones, District 3 Craig Cassey, Jr., District 4
Bill Starrels, District 5 Tom Birch, District 6 Ellen Steury, District 7 Dennis Quinn, District 8

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 15
## Author Information

Keep Private: No
Name: Alma Gates
Organization:
Organization Type: I - Unaffiliated Individual
Address: 4911 Ashby Street, NW
Washington, DC 20007
USA
E-mail: ahg71139@aol.com

## Correspondence Information

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Park Correspondence Log:
Date Sent: 07/31/2014
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Contains Request(s): Yes
Type: Other
Notes:

## Correspondence Text

1. How will this proposed project be coordinated with DDOT's proposed upgrades to Canal Road.
2. Will there be any effort to incorporate the dewatering taking place at the Washington Aqueduct?
3. Is DC Water working in concert with the DC Office of Planning?
4. Please add me to the list of Consulting Parties.

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 16
## Author Information

Keep Private: No
Name: Ted Nevius
Organization:
Organization Type: I - Unaffiliated Individual
Address: 4851 Reservoir Road NW
Wshington, DC 20007
USA
E-mail: neviust@aol.com

## Correspondence Information

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Park Correspondence Log:
Date Sent: 07/31/2014
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Number of Signatures: 1
Form Letter: No
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Type: Other
Notes:

## Correspondence Text

The more tunnels the better! Incentives for Green investments by the home-owners is/should be "discounted" or paid for by a DC Water Credit on our monthly bills? (24-3b month period) ?

# PEPC Project ID: 50548, DocumentID: 60222
# Correspondence: 17
## Author Information

Keep Private: No
Name: Martha Clark
Organization:
Organization Type: I - Unaffiliated Individual
Address: 3605 T Street NW
Washington, DC 20007
USA
E-mail: clark@starpower.com

## Correspondence Information

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Park Correspondence Log:
Date Sent: 07/31/2014
Date Received: 07/31/2014
Number of Signatures: 1
Form Letter: No
Contains Request(s): Yes
Type: Other
Notes:

## Correspondence Text

See attached to address many water issues before they arrive here, ie Dams that do not cross rivers, proven for 30 years in Africa!! Why reinvent the wheel?
">

Comments #29 thru 33

November 3, 2015
Citizens Association of Georgetown

**Questions Regarding the Abatement and Elimination of Combined Sewer Overflows in Georgetown**

**A. The Potomac River Stormwater Retention Tunnel, the Upper Potomac Interceptor Sewer, and the Upper Potomac Interceptor Relief Sewer**

Terms of Reference

If the initial use of Green Infrastructure (GI) in the drainage areas of Combined Sewer Overflows 027 (west Georgetown), 028 (west Georgetown), and 029 (Georgetown University, Burleith, Cathedral Heights) is determined to be ineffective in abating overflows, DC Water will increase the capacity of the Potomac River Stormwater Retention Tunnel from 30 million gallons to 40 million gallons.

The Upper Potomac Interceptor Sewer runs under the Capitol Crescent Trail, Water St., and K St, crossing under Rock Creek to the Rock Creek Pumping Station at 27th and K Streets NW. The diameter of the sewer in Georgetown is a uniform 48 inches. The six combined sewers (024-029) in Georgetown connect to this interceptor sewer.

The Upper Potomac Interceptor Relief Sewer parallels the Upper Potomac Interceptor Sewer. The diameter of the sewer between 33rd St and the Washington Canoe Club is variously 84 or 96 inches. In the vicinity of 33rd St., there is a 75 foot section with a sewer diameter of 42 inches. Thereafter, the diameter is variously 60 to 100 inches. The Relief Sewer diverts to the southeast near 30th St NW and does not go to the Rock Creek Pumping Station. About 18 million gallons a day (MGD) of peak flow in the Relief Sewer is sent to the Upper Potomac Interceptor Sewer through a short-length, 72 inch diameter intercomection located just west of the Aqueduct Bridge. The peak flow capacity of the Relief Sewer through much of Georgetown is 193 mgd.

The peak flow capacity of the Upper Potomac Interceptor Sewer in Georgetown decreases from 54.3 MGD to 44.0 MGD in the vicinity of 33rd and Water streets. Of the 54.3 MGD flow, 37.8 MGD represents flow from suburban jurisdictions. (Suburban-origin flows from Maryland and Virginia into the Upper Potomac Interceptor and the Relief Sewer are sanitary flows from separated sewers.)

Reference Sources:

*Technical Memorandum No. 1; Multi-Jurisdictional Use Facilities Capital Cost Allocation; DRAFT; April 17, 2013, particularly pages 16, 17, 21, and 22.*

Questions

1.) Does the reduction of 10.3 MGD in peak flow capacity of the Upper Potomac Interceptor near 33rd St NW represent an overflow into the Potomac River?

If so, is this 10.3 MGD overflow the basis for increasing the capacity of the Retention Tunnel by 10 million gallons?

2.) Is it fair to state that approximately 70 percent of the flow (and any overflow) of the Upper Potomac Interceptor at 33rd St. originates from suburban jurisdictions?

3.) If this 10.3 MGD reduction in flow is not the basis for increasing the capacity of the Retention Tunnel, what is the basis for the 10 MGD increase in tunnel capacity?
If the basis is overflows from CSO 027, 028, and 029, how much of the 10 MGD is attributable to each of these three sewers?

4.) Are there significant technical, geologic, hydraulic, and/or cost constraints associated with increasing the diameter of the 42 inch segment of the Relief Sewer in Georgetown to a 60 or 72 inch diameter sewer?

**B. The West Rock Creek Diversion Sewer, Combined Sewers 051, 052, 060, and 024 in East Georgetown. The use and siting of diversion structures.**

Terms of Reference

Combined Sewer 024 is known as the West Rock Creek Diversion Sewer. This is a large diameter sewer, originating at the northern boundary of the Naval Observatory, and flowing generally near the west bank of Rock Creek . In lower Georgetown, this sewer drains a portion of 30th St. south of M St., and the area between Wisconsin Ave and 29th St, and between M St and the C&O Canal.

The sewer runs just east of the Four Seasons hotel, under the former West Heating Plant and coal yard, with an overflow discharge at the foot of 30th St. near the Swedish Embassy.

The following combined sewers service east Georgetown: 051 (Olive St.), 052 (O Street), and 060 (P Street). The former combined sewer 053 (Q St NW) was recently separated into a storm and sanitary sewer. In the past, overflows from these four combined sewers discharged into Rock Creek. Modeling data indicates there are / will be no overflows from combined sewers 051, 052, and 060 into Rock Creek.

Overflows from combined sewer 024 will be diverted into the Potomac River Stormwater Retention Tunnel.

Reference sources:
*Table with CSO Predictions for Average Year. Scenario C-2*
*Table with Combined Sewer System Model Results , Period April-June 2015, Scenario 2015, Q2*

Questions

1.) As the west and east Georgetown neighborhoods are quite homogeneous, why are there no overflows into Rock Creek from combined sewers 051, 052, and 060 in east Georgetown?

2.) Are any potential overflows from these three sewers (051, 052, and 060) being diverted into combined sewer 024?

3.) If there is a diversion into combined sewer 024, is the diversion structure similar to what would be constructed along K and Water streets to reduce/eliminate overflows from the six combined sewers currently overflowing into the Potomac River?

4.) What are the approximate surface dimensions of the space needed to construct and install the diversion chambers for combined sewers 025, 026, 027, and 028? Would any existing diversion structures be retro-fitted?

5.) Can DC Water provide an assurance that diversion chambers for combined sewers 025, 026, 027, and 028 will not be constructed in either the Georgetown Waterfront Park, or on privately-owned land? Can DC Water provide an assurance that no work shafts for a Potomac River Stormwater Retention Tunnel will be constructed in either the Georgetown Waterfront Park, or on privately-owned land along the Georgetown waterfront?

**C. The Application of Green Infrastructure in west Georgetown; the drainage areas for Combined Sewer Overflows 027 and 028. In General**

<u>Terms of Reference</u>

Combined sewers 027 and 028 drain an area generally between Wisconsin Ave and the east boundary of the Georgetown University campus, and between Reservoir Road and Water St. Georgetown University's Healy lawn and the main university library are drained by combined sewer 028. Approximately 50 land parcels on the east side of Wisconsin Ave between N and Q streets, west of 31$^{st}$ St., are drained by combined sewer 027.

Of the 185 acres of total surface area in the drainage areas of CSOs 027 and 028, DC Water has determined that 117 acres represent an impervious surface, meaning stormwater runs off into street gutters, drains and ultimately into the combined sewers.

Of the 117 acres of impervious surface, DC Water proposes to apply GI to 35 acres.

GI will be sized to capture the equivalent of 1.2" of rain falling on an impervious surface.

A 1.2 inch rain falling on 117 impervious acres would generate 3.815 million gallons of stormwater runoff. A 1.2 inch rain falling on 35 impervious acres would generate 1.140 million gallons of runoff. The GI structures/methods to be applied in west Georgetown need to be sized to capture and temporarily retain 1.140 million gallons. For comparison, a 30' x 15' x 5' foot swimming pool holds 16,830 gallons. It would take 68 similarly sized swimming pools to hold 1.140 million gallons of water.

In an average year (one with 41 inches of rain), infiltration inflow of groundwater into the District's sewers amounts to 43 MGD. Infiltration/inflow into the sewers is less during 'dry' years, and higher in 'wet' years. Most of the infiltration and inflow is into combined sewers.

Over 10 percent of the District's sewers were installed before 1893, and nearly four percent were built before 1883. Because of their proximity (and gravity slope) to the Potomac River, the combined sewers in west Georgetown are likely to be among the oldest in the city.

In 2009, consultants recommended that DC Water spend nearly $7 million to rehabilitate the combined sewers of west Georgetown, having determined their condition was among the poorest in the city.

In 2004, DC Water modeled the frequency and volume of combined sewer overflows for every flow in the District. This model is still used to provide quarterly estimates of overflows. Combined sewer 027 had the highest number of annual overflows of District sewers: 73. The model also estimates that an overflow from this combined sewer will occur with as little as 0.1 inch of rain. The annual overflow volume from Combined Sewer 027 is twice that from combined sewer 029, even though the surface area drained by 029 is twice that of 027.

The purpose of GI is to retard the flow of stormwater runoff into the sewers, thus reducing/eliminating overflows from a combined sewer into the Potomac River. The runoff is temporarily retained in a reservoir and slowly released into the sewer after the storm event.

Possible GI projects being considered for west Georgetown include bio-retention practices (bio-retention cells, bioswales, vegetated filter strips, and tree box filters), pervious (permeable, porous) pavement and pavers, rooftop collection practices (downspout disconnection, rain barrels, and cisterns), and large-volume underground storage. For the initial GI project in west Georgetown, DC Water is principally considering pervious pavement, and bio-retention cells.

<u>Reference sources</u>:
*Sewer Systems Facilities Plan, Executive Summary, June 2009*
*Table with CSO Predictions for Average Year. Scenario C-2*

<u>Questions</u>
1.) In DC's model of sewer flow, what values or assumptions are used for the amount of groundwater infiltration / inflow into combined sewers 027 and 028? What percentage of total dry weather flows do these infiltration/inflow values represent?

2.) Has either the dry weather or wet weather flows of combined sewers 027 and 028 ever been metered? If not, are there plans to do so as part of the first GI project?

3.) What are DC Water's plans and schedule to rehabilitate the two combined sewers in west Georgetown?

4.)  Does DC Water have an estimate of how much reduction in total dry weather flow would result from rehabilitating these two combined sewers?

5.)  If GI for west Georgetown is being designed to temporarily store approximately 1.140 million gallons of stormwater runoff to prevent overflows, why must the Retention Tunnel be expanded by 10 million gallons if GI is found not to be effective in eliminating the overflows from combined sewers 027, 028, and 029?

6.)  If combined sewer 027 experiences an overflow from as little as 0.1 inch of rain, how will the application of GI to approximately 30 percent of the impervious surface area drained by this sewer be sufficient to end overflows?

7.)  As overflows from combined sewer 027 occur with as little as 0.1 inch of rain, did DC Water consider increasing the percentage of impervious surface area for which GI would be installed in this sewershed from approximately 30 percent to 60, or even 90 percent?

8.)  Do test borings of west Georgetown indicate that the predominant subsurface geology consists of an upper layer of impervious clay?

9.)  What methods will DC Water use to determine whether Green Infrastructure installations in west Georgetown are effective? Will these methods include metered monitoring of flows before and after the installations?

10.)  If GI in west Georgetown is demonstrated to be ineffective in eliminating overflows, does DC Water plan on de-constructing any bio-retention structures / pervious pavements rather than maintaining them?

**D.) The proposed use of pervious pavement and pavers.**

<u>Terms of Reference</u>

In the drainage area for combined sewers 027 and 028, there are about three acres of alley, about 20 acres of roadway (of which 5.5 acres are intersections).  (By itself, there is not sufficient road and alley acreage available in west Georgetown to meet the need for GI installations on 35 acres of impervious surfaces.)

On roadways, pervious pavement is typically installed on parking lanes, not traffic lanes. Pervious pavement is also not used at intersections.

Pervious pavement has a colder temperature, and snow and ice accumulate faster than on a non-pervious road surface.  Abrasives or other coarse material should not be used on pervious pavement in winter conditions.

The pervious pavement surface must be cleaned periodically, either through sweeping, vacuuming, and/or power-washing. The frequency of such cleaning on an urban street with substantial tree canopy may be up to 12x a year.

The ‘reservoir’ beneath pervious pavement that temporarily holds the stormwater runoff typically consists of loose aggregate stone. The voids between the stone store the runoff. The capacity of the ‘reservoir’ is about 40 percent of the empty volume. (If the swimming pool example cited above were a pervious pavement ‘reservoir’, it could hold about 6,700 gallons of water rather than the nearly 17,000 gallons.)

<u>Reference Sources for sections D and E</u>:
*Long Term Control Plan , Modification for Green Infrastructure, January 2014, Technical Memorandums 4, 5, 6, and 7*

<u>Questions</u>
1.) Has pervious pavement been installed on an urban street in a cold climate city elsewhere in the United States? If so, what has been the experience with the installation?

2.) Has pervious pavement been installed anywhere in the United States in order to meet NPDES conditions for an outfall discharge from a combined sewer? (NPDES is a Federal permit system governing the discharge of pollutants into the navigable waters, including the overflows from combined sewers.)

3.) What is the experience of winter-time freeze-thaw cycles affecting the integrity of pervious pavement?

4.) If liquefied salt must be used to reduce the hazard of snow or ice on a roadway with pervious pavement, what steps will be taken to minimize/prevent damage from the brined snow or ice melt to utility infrastructure and tree/shrub roots proximate to the subsurface ‘reservoir’?

5.) What design steps will be taken to prevent the leaching of subsurface sand or soil (transported by groundwater flow) into the ‘reservoir’, and potentially clogging the subsurface drains that carry off the stored stormwater runoff?

6.) Does the designed retention capacity of pervious pavement include an allowance for reduced efficiency over time? If so, what is the typical allowance?

7.) What is the design life of the permeable pavement surface, and of the complete permeable pavement system (including the ‘reservoir’)?

8.) Will the sweeping, vacuuming, or power-washing of pervious pavement entail widespread no parking restrictions on those roadways with pervious pavement, whenever the roadway is to be cleaned?

9.) Can DC Water provide assurance that pervious pavers will not replace the existing brick sidewalks in west Georgetown?

10.) If DC Water cannot provide such assurance with respect to sidewalks, and the soil beneath the sidewalks in west Georgetown is largely impervious, e.g., clay., would installation of pervious pavers require excavation to a depth similar to that of a pervious street pavement system to remove the impervious soil?

11.) If DC cannot provide such assurance with respect to sidewalks, how would the root system of sidewalk trees be protected from potential damage from any excavation required for the installation of pervious pavers?

12.) Can DC Water provide an assurance that no pervious pavement will be installed on those sections of O and P streets NW that were recently reconstructed and restored to their historical appearance? Has DC Water consulted with the Old Georgetown Board or the Commission on Fine Arts on any design constraints for permeable pavers (particularly for sidewalks) in west Georgetown? If there has been consultation, has either the Board or the Commission indicated whether any use of permeable pavers for sidewalks would be acceptable?

13.) Are there streets, or sections of streets, in west Georgetown for which pervious pavement is impracticable because of the street gradient? If so, please identify these streets.

**E.) The proposed use of bio-retention cells.**

Terms of Reference

The Georgetown historic district is a designated National Historic Landmark (NHL). It is one of three historic districts in DC designated as NHLs, and is by far the largest. Other examples of NHL historic districts of significant size include Beacon Hill NHL Boston with 1300+ contributing buildings; Nantucket NHL encompassing 30,000 acres; Charleston SC NHL with 80+ contributing buildings; and Vieux Carre (New Orleans) NHL comprising 78 square blocks.

The design specifications for bio-retention cells specify a minimum width of three feet. (The cell is excavated below grade for a depth of three feet of more, which allows retention of stormwater in a bottom layer of aggregate stone, below a filtering soil layer for the root systems of vegetation planted in the bio-retention cell.)

Questions

1.) Sidewalks in west Georgetown generally are not sufficiently wide to install a bio-retention cell. For such sidewalks, would some portion of the street be needed for an installation? For areas where an installation can be confined to the sidewalk only, any adjacent parking space may be lost because of impeded access. Will the installation of bio-retention cells in west

Georgetown result in no net loss of parking spaces? If there is a loss of parking spaces, will the number of 'lost' spaces be capped, and at what number?

2.) What entity will be responsible for maintaining the landscape features of the bio-retention cells?

3.) Has any GI method affecting the visual landscape been installed in/at a National Historic Landmark? If so, what design considerations were factored to make the installation compatible with the historic character of the NHL district?

**F.) The proposed separation of Combined Sewers 025 and 026.**

<u>Terms of Reference</u>

Combined sewers 025 and 026 serve an area between K St and the C&O Canal, and between Wisconsin Ave and Thomas Jefferson St. Combined sewer 026 has the smallest drainage area of the six combined sewers with overflow outfalls into the Potomac River at Georgetown.

DC Water is to separate these two combined sewers into a sanitary sewer and a storm sewer, at a multi-million dollar cost.

<u>Questions</u>

1.) Modeled data for combined sewer 026 indicates there are no current or expected overflows from this sewer into the Potomac River. Why is DC Water spending significant sums of money separating a combined sewer that has no overflows?

Comments # 34 thru 38

# U.S. COMMISSION OF FINE ARTS

ESTABLISHED BY CONGRESS 17 MAY 1910

401 F STREET NW SUITE 312 WASHINGTON DC 20001-2728 202-504-2200 FAX 202-504-2195 WWW.CFA.GOV

Date: 16 February 2016

To: Carlton M. Ray, Director, DC Clean Rivers Project
DC Water

From: Thomas Luebke, Secretary
U.S. Commission of Fine Arts

Copies: Javier Marques, Advisory Council for Historic Preservation
David Maloney, D.C. State Historic Preservation Officer
Marcel Acosta, National Capital Planning Commission
Rich Myers, Department of the Interior–Office of the Solicitor

Subject: Green Infrastructure Installations in the Old Georgetown Historic District

The Commission of Fine Arts (CFA) staff has been requested to provide comments regarding the proposed installation of "green infrastructure" elements in various parts of Old Georgetown, a National Historic Landmark historic district administered by the CFA under the authority of the Old Georgetown Act of 1950. This project is associated with the 2015 amendment to the DC Clean Rivers Project, which eliminates a section of the Potomac Tunnel in favor of dispersing water quality and quantity treatment widely across numerous DC neighborhoods (particularly Georgetown and Petworth) with a variety of installations in public space including underground storage tanks associated with tree-boxes or beneath sidewalks and streets, as well as sewer separation.

As a matter of principle and public stewardship, the CFA is highly supportive of the DC Clean Rivers initiative and the public efforts to reduce sewage discharge into the environment. However, the CFA is also obliged to address its specific mandate to protect the historic resources of the Old Georgetown historic district.

The CFA staff has raised the issue of whether Section 106 consultation under the National Historic Preservation Act applies to this project; DC Water has publicly asserted that it does not. With counsel from the Department of the Interior's Office of the Solicitor, we disagree. The entire DC Clean Rivers initiative requires National Pollutant Discharge Elimination System (NPDES) permitting by the Environmental Protection Agency (EPA); this federal undertaking of issuing a permit therefore requires initiation of the Section 106 process. We are not aware that the Section 106 process was ever conducted for the original plan, but the amendment itself constitutes a change to that plan and would therefore require the federal action of issuing a new NPDES permit for the modification entailed in the 2015 consent decree. Therefore, using the criteria set forth in 36 CFR 800, Appendix A, we intend to refer this issue in writing to the Advisory Council on Historic Preservation (ACHP) for its participation in and adjudication of this issue.

The CFA staff has also raised its objections to DC Water's failure to consult with the CFA staff regarding the impact of the proposal on the historic resources of the Old Georgetown historic district prior to obtaining approval of the amended plan by consent decree. While DC Water consulted individually with many other neighborhood and government groups (such as the National Capital Planning Commission), no briefing with the CFA staff was undertaken in which the specific proposal for the green infrastructure initiative was presented for comment. Such consultation could possibly have avoided what may now be procedurally problematic.

More broadly, we raise the following general concerns regarding the impact of the amended plan on many historic resources within the federal historic district:

1) The amended plan creates a multitude of impacts in historic areas, affecting hundreds of properties, whereas the areas of effect created by the original plan affected only one major landowner—the National Park Service—in a few discrete locations whose impacts could likely be managed reasonably through a careful consultation and design process.

2) The original plan concentrated its stormwater retention infrastructure at the Georgetown waterfront in a single element—a tunnel—as is being constructed elsewhere in the city, from the Bloomingdale neighborhood extending for miles southward to Blue Plains, and along West Potomac Park. Because of the poor percolation capacity of the soils underlying the Old Georgetown historic district, the amended plan for green infrastructure elements requires the construction of an unknown number of concrete retention structures with great lengths of associated pipes and linear drain inlets to convey the discharge. The impact of this undertaking is tremendous on the public space of the historic district, including the historic sidewalks, curbs, streets, alleys, and mature street trees.

3) We question why the burden of the green infrastructure strategy—which demonstrably involves so much construction in so many locations—would have been proposed for one of the oldest, densest, and most historically protected areas of the city. As the only major neighborhood of the city whose layout precedes the L'Enfant Plan for Washington, D.C., Georgetown's streets are typically narrower than other neighborhoods, yielding relatively little public space to accommodate the proposed infrastructure.

Because of the 2015 Consent Decree and notwithstanding these procedural and logical objections, we understand that DC Water is obliged to proceed with this plan, and we are providing the following staff comments regarding the various combinations of proposals regarding the installation of green infrastructure elements in the Old Georgetown historic district. In general, if the project were to be implemented, our overall guidance would be to pursue a design that uses that the least visible and most concentrated elements, instead of widespread and extensive changes to the public space. (Again, we note that the original Potomac Tunnel plan was far superior in meeting this goal.)

Specifically, this means we would favor a sewage separation strategy above all others for its relatively limited impact on historic resources. According to the submitted map, there are roughly 16 blocks of Georgetown streets affected, with only two major storage facilities proposed in public space (one at the Volta Park playground, another at 37th Street south of Prospect Street). We would hope that these two structures could be designed to minimize impact on the historic landscape and disruption to existing uses.

Less desirable would be the strategy of permeable alley pavement, which would involve roughly 25 separate repaving projects across the historic district with unknown impacts of drain inlets and associated tree-box storage structures. Due to the complex and layered history of the urban environment in Georgetown, each of these alley installations would require analysis for their historic materials and character, and for which replacement materials could be considered compatible with further study. The greatest latitude of materials can be envisioned here, including the possible use of brick, concrete pavers, or asphalt. (We note that the alley in Square 1272 is documented as in poor condition, although we understand this alley has been recently repaved.)

We advise against the associated "tree box restoration" strategy, which would transform the historic condition of trees in soil flush with the surrounding pavement into deeper pits which are illustrated as being further surrounded by a masonry curb. While some historic tree boxes may need restoration, this proposal would change their character entirely, and should be considered an entirely new element rather than "restoration" of the historic boxes. It is not clear whether this strategy is limited to the alley repaving scenario or others, but it would represent an inappropriate change of character within the very constrained public environment of Georgetown's sidewalks.

We advise against pursuing the strategies that use the surface of the public streets—the parking lane and crosswalks strategies—for their great impact, both in extent and associated intrusions into the design of the historic streetscape. Both strategies constitute roughly one hundred individual installations of one hundred to six hundred feet in length (we estimate this to be something more than *five miles*) within public space, each involving the addition of contrasting pavement, unknown lengths of slot drains or numbers of catch-basin inlet grates, and the construction of underground pipes and inlet structures with each installation. We note that additional grates in the surface of the streets may be problematic for pedestrians; both grates and inlet slot drain covers would create a likely unacceptable impact on the historic streetscape; and we suggest that both types of drain covers would likely create widespread maintenance problems.

Finally, we advise most strongly against the sidewalk storage strategy, as it is the most problematic for its disturbance of many elements in public space, which include the pavement of the sidewalks and curbs, projecting architectural bays and stairs, driveway and alley aprons, tree-boxes, and other street furniture. Again, the complex history of the urban environment in Old Georgetown has resulted in a historic condition of many types of materials with few standard treatments; this historic character would be difficult to replicate on a large scale. Like the interventions considered within the cartway of the streets, this proposal also appears to entail some five miles or more of disruption to the sidewalks of the historic district.

We look forward to consulting with you and other regulatory groups and interested parties in developing the most appropriate design solution for minimizing impacts to the historic resources within the Old Georgetown historic district.

Comment# 39


# U. S. COMMISSION OF FINE ARTS

ESTABLISHED BY CONGRESS 17 MAY 1910

401 F STREET NW SUITE 312 WASHINGTON DC 20001-2728 202-504-2200 FAX 202-504-2195 WWW.CFA.GOV


23 February 2016

Dear Mr. Nelson:

I am writing to request the Advisory Council on Historic Preservation's opinion on whether projects carried out pursuant to the DC Water Clean Rivers initiative would trigger federal agency obligations under Section 106 of the National Historic Preservation Act. We raise this question because DC Water has taken the position that none of such projects could trigger Section 106 obligations. Specifically, DC Water contends that none of those projects will receive federal funding, and that the existence of a court order on the project obviates the need for any Section 106 responsibilities.

As you may know, the DC Clean Rivers initiative is a broad undertaking proceeding from a 2005 Consent Decree between DC Water, the District of Columbia Government, the Environmental Protection Agency (EPA), and the Department of Justice to reduce the discharge of untreated sewage into the Potomac River and its tributaries by 96 percent by 2025. The undertaking entails the construction of approximately 20 miles of underground storage and conveyance tunnels connecting to the Blue Plains treatment facility in Southwest Washington, including the Potomac Tunnel originally proposed from near the Key Bridge in Georgetown and southeastward along West and East Potomac Parks toward Anacostia. We understand that these undertakings require various federal actions, including National Pollutant Discharge Elimination System (NPDES) permitting by the EPA, special use permits by the National Park Service, and possibly others.

The 2015 amendment to the original plan mandated by a new Consent Decree eliminates approximately one mile of the Potomac Tunnel under the Georgetown waterfront; the water treatment for the tributary areas is intended to be addressed through the installation of "green infrastructure" (or GI) elements (such as pervious pavements in streets and alleys, extensive new drains and storage structures along curbs, modified sidewalks and tree boxes) in the Petworth and Georgetown neighborhoods. In the federal National Historic Landmark historic district of Old Georgetown, the impact of these GI projects could be widespread and intrusive, affecting dozens of blocks and hundreds of historic properties and the protected historic character of this neighborhood, one of the oldest and densest parts of the city with the most constrained public space available to accommodate the GI installations.

The Commission of Fine Arts, the federal design review board, is authorized under the 1950 Old Georgetown Act to review proposals for construction in the Georgetown historic district. We raise this question of the applicability of Section 106 of the National Historic Preservation Act to the DC Water Clean Rivers initiative as part of our mandate to protect the historic resources from avoidable impacts created by this undertaking.

Please provide me at your earliest convenience your opinion on whether DC Clean Rivers initiatives projects could trigger Section 106 responsibilities. If you have any questions, please feel free to contact me at (202) 504-2200.

Sincerely,

Thomas Luebke, FAIA
Secretary, U.S. Commission of Fine Arts

Reid Nelson, Director
Office of Federal Agency Programs
Advisory Council on Historic Preservation
401 F Street, NW, Suite 318
Washington, DC 20001-2637

cc: Carlton Ray, DC Water

Comments# 40, 41

## Addendums to Task Force Comments

***A1 Section 106 relevant provisions.**

- Section 106 of the NHPA requires that Federal agencies take into account the potential effect of their undertakings on historic properties. These undertakings include the issuance of a permit or license.

- The Federal EPA administers the NPDES permit program for the District of Columbia. In most states, administration of the permit program has been delegated to the state. Section 106 would likely not apply if the NPDES program was being administered by the District government.

- EPA issues NPDES permits allowing the discharge of combined sewer overflows into the navigable waters of the District. These permits can and do set limits on such discharges, and also can contain conditions prescribing that the discharging party (e.g., the District government) take certain actions to reduce, treat, or eliminate such discharges.

- The CFA asserts that the amended consent decree calls for extensive construction within the National Historic Landmark historic district of Georgetown, with significant potential impact on many history properties within the district. Key provisions of the amended consent decree will be incorporated into an NPDES permit. Thus, Section 106 applies.

- A Section 106 is initiated by a Federal agency; in this instance, the EPA.

- DC Water, EPA, and the NPS neglected to begin timely preparation on of an EIS for the proposed siting and construction of the Potomac River stormwater retention tunnel. The EIS is required because of the prospective impact of the tunnel on Federal lands. That oversight led to schedule delays for certain elements of the Long Term Controlk Plan. The EIS for the tunnel is now being prepared.

***A2 Other proposed alternatives**

- The Georgetown BID and CAG suggested several alternatives to the extended Potomac River tunnel, if Green infrastructure proved to be ineffective in abating the combined sewer overflows.

- CAG suggested a Georgetown relief interceptor sewer be constructed, which would capture the overflows from CSOs 029, 028, and 027, and convey the overflow under Water and K streets to CSO 024, near 30$^{th}$ St. DC Water replied that a sewer pipe nine feet in diameter would be required. Such a pipe is approximately the size of the Upper Potomac Interceptor Relief Sewer, which has a capacity of about 200 million gallons a day, and more than twice the size of the Upper Potomac Interceptor, which carries at least 55 million gallons a day. The overflow volume from the above, three combined sewers is modeled at no more than 5 million gallons a day. DC Water's proposed nine foot diameter pipe suggests the alternative was not seriously considered.

- The BID's proposal was that large storage chambers be constructed in the bed of the C&O Canal, and that these chambers retain the stormwater overflows until flow in the Upper Potomac Interceptor was lower. When the flow was reduced, the chambers would empty and the overflows sent to Blue Plains for treatment. This proposal was dismissed with hyperbole, DC Water positing that disruption and impacts in the area of the canal would be far greater than what would occur from the deep excavation of most residential streets in west Georgetown.

***A3 Archaeological studies**

- A Federal agency, as part of the Section 106 process, is to consider ways to avoid, minimize, or mitigate adverse effects of a proposed undertaking, recognizing the finite and non-renewable nature of listed or eligible archaeological sites, as well as the value these sites.

- A Federal agency may authorize an applicant (e.g., DC Water) for a Federal permit or license to initiate Section 106 consultation. Under such an authorization, however, the Federal agency maintains legal responsibility for all Section 106 findings and determinations, even though the applicant usually produces the documents and studies (including archaeological survey and testing reports) on which these decisions are based.

***A4 Lack of data**

- Upper Potomac Interceptor: Flow is not measured between the DC Maryland line and the Rock Creek Pumping Station at 27th and K Streets.

- Flow is not measured on any of the combined sewers in Georgetown.

- Little Falls Trunk Sewer flow is apparently not measured..

**Upper Potomac Interceptor Sewer**

| Location | Peak Flow |
|---|---|
| @ DC / MD line (measured) | 23.3 MGD |
| Little Falls Trunk Sewer Adds | + 29.5 MGD |
| Subtotal | 52.8 MGD |
| Interconnection from UPI to UPIRS | -19.1 MGD |
| Subtotal | 33.7 MGD |
| Interconnection from UPIRS to UPI near Aqueduct Bridge Adds | +18.1 MGD |
| UPI @Aqueduct Bridge | 51.8 MGD |
| UPI @ Rock Creek Pumping Station (measured?) | 56.4 MGD |
| | |

Rated capacity of the Rock Creek Pumping Station (RCPS) with largest pump out of service is 50 MGD. The pump(s) at the RCPS act as siphons, increasing flow through the Upper Potomac interceptor. Rated capacity of the RCPS with largest pump in service, not given.

Where flow is not measured, it is modeled. Flows in non-calibrated models can have large errors. A 15 percent error in the flow calculation of the Little Falls Trunk Sewer would be about 4.5 MGD.

- Not good practice to rely on uncalibrated model predictions when designing projects. Two years ago (January 2014) DC Water distributed a draft of the proposed Green Infrastructure plan for Georgetown. Between that point and now, DC Water should have measured flows in the Little Falls Trunk Sewer, and in five of the six combined sewers serving Georgetown. Instead, DC Water will now be measuring flows concurrent with design and siting.

***A5 Poor data.**

- DC Water basically conceded, without directly saying so, that the MIKE URBAN model considers all sidewalks in residential, west Georgetown to be 100 percent impervious. Model has no default values for brick sidewalks land on a pervious bed of sand.

- Similarly, the MIKE URBAN model considers all roofs in west Georgetown to be either connected directly to a drain leading to a sewer, or draining to an impervious surface that eventually drains to a sewer.

- Thus, the MIKE URBAN model likely overestimates the amount of stormwater runoff from rain falling on these two types of surfaces in west Georgetown. This can lead to over-estimation of overflow volumes. Alternatively, if the total overflow is correct, the model would have failed to identify and/or correctly calculate the volume(s) from other contributing sources, e.g., groundwater infiltration / inflow into a sewer pipe.

- Not good practice to proceed with model calculations with known errors in input values. "Garbage in, Garbage Out".

***A6 The 'yuck factor'.**

- The 'yuck factor' appears when floatables in the sewer flow appear on the surface of a river/ lake near a sewer outfall. There is no mistaking that the floatables came from a sewer.

- DC Water's model predicts that CSO 027 (which overflows in the middle of the Waterfront Park) overflows about once every five days, from as little as 0.1 inch of rain. According to the model, CSO 029 overflows less frequently.

- Given the predicted frequency and volume of overflows from CSO 027 and 029, one would expect recurring complaints from users of the canoe and boat clubs downstream of CSO 029, and from visitors to the Waterfront Park, where CSO 027's outfall is located. The 'yuck factor' would discourage users and visitors from enjoying the river.

- When the Upper Potomac Interceptor Sewer twice failed in recent years west of the Washington Canoe Club, the 'yuck factor' was clearly evident along the Capital Crescent trail.

- DC Water stated there are no screens in use as part of the diversion chambers for the combined sewers in Georgetown. Screens minimize the appearance of floatables at the overflow outfall.

- This suggests that the overflows from CSO 027 and 029 may not be as frequent or as great as modeled.

## A7* Impervious Acreage

**Table 2-2. CSO Sewershed Impervious Acreage**

| CSO Sewershed | Total Acres | Impervious Acres | % Impervious | Public (Acres) | | | | | | | Private (Acres) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alley | Buildings | Parking Lot | Paved Drives | Roads | Intersections* | Sidewalks | Buildings - Commercial, High Density Residential | Buildings - Mixed Use | Buildings - Low and Low-Med. Density Res. | Parking Lot | Paved Drives |
| CSO 020 | 595 | 450 | 76% | 11.4 | 76.2 | 15.6 | 7.6 | 105.4 | 34.2 | 83.7 | 97.0 | 0.1 | 5.7 | 9.1 | 3.9 |
| CSO 021 | 24 | 19 | 81% | 0.0 | 6.3 | 0.2 | 0.5 | 0.7 | 4.1 | 3.4 | 0.1 | 3.5 | 0.0 | 0.0 | 0.5 |
| CSO 022 | 199 | 158 | 79% | 4.5 | 16.6 | 1.2 | 1.5 | 38.9 | 13.5 | 25.9 | 38.5 | 3.4 | 4.0 | 6.5 | 3.6 |
| CSO 023 | 0 | 0 | N/A | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CSO 024 | 175 | 62 | 36% | 1.0 | 7.7 | 5.0 | 5.1 | 7.6 | 2.0 | 7.4 | 14.4 | 0.0 | 1.8 | 7.5 | 2.6 |
| CSO 025 | 15 | 12 | 79% | 0.2 | 0.5 | 0.1 | 0.1 | 2.0 | 0.1 | 1.7 | 4.2 | 2.1 | 0.0 | 0.2 | 0.7 |
| CSO 026 | 3 | 3 | 86% | 0.1 | 0.0 | 0.0 | 0.0 | 1.1 | 0.0 | 0.3 | 1.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| CSO 027 | 164 | 104 | 64% | 3.1 | 10.1 | 2.4 | 0.7 | 19.4 | 5.5 | 17.5 | 14.6 | 0.3 | 25.6 | 3.5 | 1.4 |
| CSO 028 | 21 | 13 | 61% | 0.0 | 1.6 | 0.7 | 0.7 | 3.1 | 0.7 | 2.6 | 1.8 | 0.0 | 0.9 | 0.6 | 0.1 |
| CSO 029 | 330 | 164 | 50% | 8.4 | 24.8 | 6.3 | 6.3 | 32.7 | 12.0 | 21.0 | 3.9 | 0.0 | 40.3 | 4.7 | 3.8 |

From Technical Memorandum 7, draft LTCP, and referenced in other sources.

## A8* Storage reservoirs in parking lanes.

- The storage reservoirs proposed to be installed beneath parking lanes in west Georgetown are basically a concrete box, with a perforated pipe underdrain at the bottom of the box. The underdrain is needed because subsurface soils in west Georgetown are impervious. The underdrain slowly drains the stormwater temporarily stored in the reservoir into the combined sewer. Stormwater enters the reservoir through a set of inlets.

- The storage reservoir is similar to that which would be used under pervious (permeable) pavement. The difference between the two types of installations is how water enters the reservoir: either seeping through the pervious pavement, or flowing in from an inlet cut into the curb.

- Most installations of storage reservoirs elsewhere are constructed where the subsurface soil is pervious, and thus no need for an underdrain. Typically, they are designed to reduce stormwater flows into a storm sewer. Often, the storage reservoir is used to filter and reduce contamination from pollutants in the stormwater flow. (This is not the case for Georgetown.)

- Very likely that storage reservoir installations elsewhere were at sites where there were no underground utilities in place; e.g., electricity and telephone service was overhead from poles. Technical documentation of the demonstration projects would not have addressed the presence of underground utilities.

- Thus, DC Water did not anticipate having to relocate or protect an extensive network of underground utilities in west Georgetown. Nor did it factor in the cost of doing so, or who would pay for the cost.

- Relocation would entail digging up sidewalks, even though the storage reservoir is under the street. It is unclear how utilities would carry out repairs of utilities located in or under a storage reservoir, nor is the potential effect of in situ reservoirs on the installation of new connections described.

- When asked how sediments, sand, other fine particles in the stormwater flow would be kept from eventually clogging the ports in the perforated pipe underdrain, DC Water replied that inlets would have grates similar to those used in gutter drains. However, the openings in such grates screens only large debris, and are not designed for screening sediment or sand being carried in the flow. There is no method for unclogging the underdrain ports, other than re-excavation.

- Over time, a clogged storage reservoir loses its effectiveness in reducing overflows.

***A9 Rain barrels and downspout disconnects.**

- Basically, DC Water said use of these GI methods would be voluntary, though DC Water would periodically inspect. DC Water will not receive credit from the U.S. E. P. A. for use of these methods; i.e., DC Water will size GI in west Georgetown as if there were no rain barrels or disconnects in place.

**Task Force Comment Summary with Recommendations**
**Meeting with DC Water February 29th 2016**
(see *Addendums for further details)

These comments were prepared because of concerns about the prospective impact of Green Infrastructure (GI) installations in the Georgetown National Historic Landmark historic district. The magnitude of these impacts raises uncertainty over whether GI goals for Georgetown can be achieved.

Introduction

There are 133 impervious acres within the sewersheds for combined sewers numbered CSO 027, 028, and 029, for which DC Water proposes to install GI to reduce/retard stormwater flows. Ninety eight (98) acres, or 74 percent, of the total are in CSO 0 29; 35 acres (26 percent) are in CSOs 027 and 028.

CSOs 027 and 028 generally serve that part of Georgetown, west of Wisconsin Ave. CSO 029 generally serves Burleith and a portion of Cathedral Heights. The Georgetown historic district lies within CSO 027 and 028, and a small part of CSO 029.

The GI installations would occur in three phases (projects), of approximately 44 acres each. Design/construction of the first phase GI installations would begin in the third quarters of 2017. The first phase would be complete by July 2019.

If the first phase of GI installations proves to be ineffective in abating combined sewer overflows, DC Water would immediately proceed with design and construction of a Potomac River stormwater retention tunnel. Because of the ineffective GI, the tunnel's capacity is increased from 30 million gallons to 40 million gallons.

DC Water's 'least impact option' would install GI for 22 impervious acres in CSOs 027 and 028 during the first phase. This represents 63 percent of the 35 impervious acres of GI installations in these two sewersheds. In effect, DC Water is frontloading GI installations in west Georgetown, while deferring much of the planned GI installations in CSO 029 to a subsequent phase.

During the first phase, DC Water also proposes to install GI for nine (9) impervious acres in CSO 029, which are within the boundaries of ANC2E. Total GI installations in ANC2E during the first phase would be 31 acres.

The 'least impact option' would complete all planned GI installations in CSO 028 during the first phase.

Comments

**1. The Commission of Fine Arts, supported by the Dept. of the Interior, asserts there was a failure to comply with Section 106 of the National Historic Preservation Act (NHPA), and, by inference, Section 102 (Environmental Impact Statement) of the National Environmental Policy Act. We support the Commission of Fine Arts' position.**

To meet future National Pollutant Discharge Elimination System ( NPDES) permit limits on discharges from combined sewers serving Georgetown, DC Water proposes to install an extensive amount of GI within the boundaries of a National Historic Landmark district, potentially affecting hundreds of properties. The potential impacts of GI should be subject to Section 106 consultation, and possibly the preparation of an EIS (by EPA). *A1

In an EIS, the alternatives section could study proposals such as construction of a small-diameter Georgetown interceptor relief sewer under K and Water streets; the placement of large-sized, stormwater storage chambers in the bed of the C&O Canal; and separation of combined sewers into a sanitary sewer and a storm sewer in limited locations. *A2

2. Several proposed GI installations would entail large scale excavation of public ways in Georgetown. Some of these ways date to Eighteenth Century, and Georgetown's founding. We believe provisions of the NHPA with respect to protection of archaeological resources may apply. We note the following provision in the Advisory Committee on Historic Preservation's guidelines: "Undertakings with the potential for extensive ground disturbance generally will require a more involved effort [of investigations and surveys] to identify archaeological properties than those with less ground disturbance." *A3

3. We request that DC Water limit the first phase of GI implementation to CSO 029. Installation of GI or other hybrid gray/green solutions in Georgetown, CSOs 027 and 028, would thus occur in phases two and three, post 2020. If the GI installation in CSO 029 was demonstrated to be effective, there could then be consideration of whether GI or other compliance methods would be applied in west Georgetown. The Section 106 process described above may necessitate delay in certain types of GI projects within the Georgetown historic district.

4. Measurement of flows in Georgetown's combined sewers is only now starting. Modeled predictions of stormwater flows in the combined sewer were based on erroneous input. Without accurate flow information, we cannot determine whether the scale and type of proposed GI is appropriate or necessary. *A4, *A5, *A6

5. We recommend that DC Water test the extent that the existing brick sidewalks of residential west Georgetown are pervious surfaces. The results of these tests could significantly reduce the amount of impervious surfaces in Georgetown, and could reduce the amount of Green Infrastructure that is proposed. (The model input is that there are 20.1 acres of impervious surface sidewalks in CSOs 027 and 028.) *A7

6. We recommend that DC Water survey roof leaders in west Georgetown, to determine the extent that these drain directly into a sewer, or indirectly by flowing onto a sidewalk, alley, or street. The results of this survey could indicate that a significant amount of roof area should not be counted as impervious as it flows onto a pervious area. Any reduction in impervious

roof area could reduce the amount of Green Infrastructure that is proposed. (The model input is that there are 54 acres of impervious surface building roofs in CSOs 027 and 028.) *A7

7. We doubt the street-level screening proposed for the inlets to the parking lane storage reservoirs will prevent sediment and sand from eventually clogging ports in the underdrain, rendering these GI installations ineffective over time. This clogging also may not be apparent during an evaluation period. *A8

8. To date, DC Water's coordination with gas, electrical, and telecommunications utilities has been limited. Several types of GI could greatly impact these utilities, which are underground services in Georgetown. DC Water has provided no information on how potential Impacts, such as access for repairs or new connections, would be addressed. Nor has DC Water indicated who will pay for protecting and/or relocating utility lines.

9. We request further clarification and information on the proposed initiative to disconnect downspouts, and temporarily store stormwater runoff from roofs in rain barrels. We understand that a property owner's participation in this program is "voluntary". Is it correct to state that no easement or other encumbrance affecting the property title will be created by virtue of the owner's participation? Is it correct that an owner can freely end participation at any time? Our other questions generally center on responsibility for maintenance and service; e.g., as rain barrels will not be used during winter months, who is responsible for disconnecting and reconnecting the downspout and barrel? *A9

will believe this could be more effective on commercial ave.

10. Permeable pavement/pavers in the alleys of west Georgetown could be acceptable, provided their design and appearance is acceptable to the Commission of Fine Arts/Old Georgetown Board.

11. We are concerned about the potential impact of permeable pavement or pavers in intersections. We request additional information on the durability of such installations in urban settings, and potential torsion effects on the installation from large, heavy vehicles. Further, we anticipate there could be a substantial utility infrastructure impact issue with any installation in an intersection which involves underground storage reservoirs under the intersection.

12. Separation of a combined sewer into a sanitary sewer and a storm sewer might be considered depending on location, but we also have significant concerns. Our concerns center on the potential community disruption that could result from extended periods of construction in particular locations.

13. We understand that modifications to existing diversion chambers will be necessary to comply with future limits on the number of combined sewer overflows. We request more detailed information on the impact of any such construction on the community, and plans to mitigate these impacts.

**DC Clean Rivers Project**

**Green Infrastructure Program**

**Georgetown Task Force - Follow up From January 12, 2016**

**Monday, February 29, 2016**

| # | NAME | ADDRESS | PHONE | EMAIL | Affiliation |
|---|---|---|---|---|---|
| 1 | James Wilcox | 2800 P St NW | 2023091111 | james.wilcox.jr@gmail | GRA |
| 2 | Rick Murphy | 3136 P Street, NW | (202) 383-0635 | rick.murphy@sutherland.com | ANC 2E |
| 3 | WALTER GROSZYK | 1023 30th St NW | 202 669 4054 | wg@outcomesmatter.com | CAG |
| 4 | Robert vom Eigen | 1611 35th St NW | 202 672 5367 | rvomeigen@foley.com | CAG |
| 5 | Will Handsfield | 1000 Potomac St. Suite 122 | 202 400-3786 | whandsfield@georgetowndc.com | BID |
| 6 | John Wiebenson | 1000 Potomac St Ste 122 | 202-298-9222 | Jwiebenson@georgetowndc | BID |
| 7 | John Cassidy | DC Clean Rivers | 202-787-4418 | jcassidy@dcwater.com | Clean Rivers |
| 8 | BETHANY BEZAK | " | " " 4446 | BETHANY.BEZAK@DCWATER.COM | " |
| 9 | CAITLIN FEEHAN | " " | 202-787-4784 | CAITLIN.FEEHAN@DCWATER.COM | " " |
| 10 | Lilia Ledezma | DCCR | 202-787-4496 | lilia.ledezma@dcwater.com | DCCR |
| 11 | JOANNA SCHMICKEL | 2909 M St NW | 202-965-7070 | JSCHMICKEL@CASARCHITECTS.COM | GBA |
| 12 | Ron Lewis | | 202-253-5969 | ron.lewis@anc.dc.gov | ANC 2E |
| 13 | Francine Steininger | 3813 T Street, NW | 202-425-3698 | francineSteininger@gmail.com | BCA Board |
| 14 | Joe Sternlieb | Georgetown BID 1000 Potomac St | 202-400-3761 | jsternlieb@georgetowndc.com | BID |
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Comment# 42

GOVERNMENT OF THE DISTRICT OF COLUMBIA

# Advisory Neighborhood Commission 2E

**Representing the communities of Burleith, Georgetown and Hillandale**

3265 S Street, NW • Washington, DC 20007

(202) 724-7098 • anc2e@dc.gov

June 6, 2016

George Hawkins
CEO and General Manager
District of Columbia Water and Sewer Authority
5000 Overlook Avenue SW
Washington, DC 20032

**Re: Questions about DC Water's Assumptions Used to Justify Extensive "Green Infrastructure" in Georgetown**

Dear Mr. Hawkins,

On May 31, 2016 Advisory Neighborhood Commission 2E held its regularly scheduled public meeting, which was properly noticed and attended by six of seven commissioners, constituting a quorum. At this meeting the Commission unanimously adopted the following resolution:

> After examining the reasoning used by DC Water for proposing extensive construction in Georgetown for "green infrastructure" ("GI") to address combined sewer overflows, ANC 2E has grave doubts about DC Water's assumptions, analysis and conclusions.
>
> - DC Water proposes to undertake extensive GI construction in Georgetown to address supposed overflows into the Potomac - without basing the proposal on any real-world testing to determine the actual extent of overflows.
> - Instead, DC Water is relying on theoretical modeling to determine theoretical overflows.
> - Based on the theoretical overflows, DC Water is proposing that some 30 acres of public streets and alleys in Georgetown be subjected to extensive, expensive and disruptive reconstruction, risking installation of GI that may be both inconsistent with the historic character of the neighborhood and of questionable durability.
> - Only now, however, when pressed for better information, has DC Water admitted that in fact it has tested overflows in Georgetown and that for the key Georgetown

location, known as CSO 027, actual overflow is some five times less than what DC Water's model predicted. The model predicted nearly 42 million gallons per year, but the actual overflow was far less, at 8 million gallons per year.

DC Water cannot responsibly go forward with widespread, disruptive and wasteful work based on assumptions that have been shown to be so wrong.

We call upon DC Water to halt its efforts to impose unjustified construction work and historic-preservation impacts on Georgetown based on grossly false assumptions. We will welcome a collegial effort with DC Water to consider all of the options based on the actual facts.

We look forward to meeting with you about this.

Sincerely,

Ron Lewis

Ron Lewis
Chair, ANC 2E

cc: Jack Evans
ANC 2E Office

DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY | 5000 OVERLOOK AVENUE, SW | WASHINGTON, DC 20032

# Meeting Minutes
# DC Water Clean Rivers Project
# Georgetown Site Walk for Green Infrastructure (GI) Implementation

| Meeting Information | | Document Information | |
|---|---|---|---|
| Topic | Georgetown Site Walk | Edition | 1 |
| Date | July 6, 2016 | Revision Date | |
| Est. Start | 9:00am | | |
| Est. Finish | 10:15am | | |
| Location | N St. and 34th St. | Recorded By | C. Feehan |

Invited/Attended:

| DC Water | | CFA | | | |
|---|---|---|---|---|---|
| Bethany Bezak | BB | Thomas Luebke | TL | | |
| Caitlin Feehan | CF | Eve Barsoum | EB | | |

Additional Distribution of Final Edition of Minutes and Attachments:
- Carlton Ray, Director, DCCR

Attachments:
- Powerpoint presented at meeting on December 17, 2015 – file named "2015-1217 Joint Meeting.ppt"
- Maps presented at meeting on December 17, 2015 – files named:
  - "2015-1123-PRASouth-GISiting-PermeableAlley.pdf"
  - "2015-1123-PRASouth-GISiting-SewerSeparation.pdf"
  - "2015-1123-PRASouth-GISiting-SidewalkStorage.pdf"
  - "2015-1123-PRASouth-GISiting-ParkingLaneStorage.pdf"
  - "2015-1123-PRASouth-GISiting-PermeableParkingCross.pdf"

Meeting Purpose:
The meeting purpose was to walk potential sites for green infrastructure implementation in Georgetown to discuss guidance in pursuing designs that meet CFA's stated goals of low visibility and limited impacts on historic resources.

| Item | Description | By | Party and Action Required | Date Required |
|---|---|---|---|---|
| 1 | Parking Lane Storage – Gutters<br>• The brick gutters do not have a historic status. They are likely a public space design element.<br>• Because the actual bricks currently in the gutter are not historic, they would not have to be numbered and returned to the same location. | TL/ EB | If DC Water proposes parking lane storage, DC Water will provide CFA with proposed impact to bricks in gutter, if any, for evaluation. | |

| Item | Description | By | Party and Action Required | Date Required |
|---|---|---|---|---|
| 2 | Parking Lane Storage – Curbs<br>• | TL/ EB | | |
| 3 | Parking Lane Storage – Inlets (Slot drains, grates, and catch basins)<br>• CFA's preference is for the use of catch basins as the inlets as they have a localized impact. | TL/ EB | If DC Water proposes parking lane storage or sidewalk storage, DC Water will provide CFA with proposed inlet for evaluation. | |
| 4 | Any GI Facility – Concrete<br>• Any concrete should be tinted and the aggregate should be selected to achieve the CFA-desired aesthetic. | TL/ EB | For any concrete DC Water proposes to use, DC Water will provide CFA with proposed mix for evaluation. | |
| 5 | Sidewalk Storage<br>• When restoring the surface, it is important to capture the randomness of the sidewalk's pattern.<br>• If the sidewalks will be restored with exact bricks and pattern as existing conditions, CFA does not foresee an issue with the specific technology, provided that trees are protected during construction. | TL/ EB | If DC Water proposes sidewalk storage, DC Water will provide CFA with proposed tree protection measures for evaluation. | |
| 6 | Permeable Alleys<br>• CFA suggested the use of a permeable asphalt brick, if it exists for alleys. | TL/ EB | If DC Water proposes permeable pavement in the alleys, DC Water will provide CFA with recommended surface materials for evaluation. | |
| 7 | Tree fences<br>• Because the streets are narrower in Georgetown than other streets in D.C., the scale of the tree fence is of greater concern than the pattern. Fences should have | TL/ EB | If DC Water proposes to install any tree fences, DC Water will provide CFA with proposed tree fence design for evaluation. | |
| 8 | Crosswalk Storage<br>• CFA suggested that the surface of the crosswalk | TL/ EB | | |
| 9 | All GI Facilities<br>• Document existing conditions on a block by block basis and provide to CFA. | TL/ EB | DC Water will document all existing conditions in locations for proposed GI facilities and provide documentation to CFA for use in evaluation of proposed GI facilities. | |

# Potomac River CSO Issues in Georgetown:
# Protecting Historic Character, Finding Appropriate Solutions

## The Georgetown historic district – recognition of the National Landmark designation

The historic streetscape in Georgetown is subject to special protections that need to be honored, including the Section 106 process that requires examining and considering alternative approaches

## Measuring the extent of the issue at CSO 27

Analysis to date has not been based on the best and most accurate information

Actual, measured overflow is far less than the theoretical model has projected

## Georgetown should not have the burden of constructing and living with GI to handle overflow from other sources – suburban and western DC

## Developing appropriate solutions together

### Defer any decision about GI in Georgetown - leave Georgetown out of Phase I

The case has not been made for GI in Georgetown, both in terms of need – extent and causes of the issue; available alternative approaches – and visually

The soil in Georgetown is so impermeable that anything called "green infrastructure" would not really operate as significant GI in any event

Downstream solutions and options should be considered seriously, particularly for overflow attributable to upstream (e.g., suburban) flow through the Upper Potomac Interceptor

Comments# 45, 48, 49 thru 56

DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY | 5000 OVERLOOK AVENUE, SW | WASHINGTON, DC 20032

**Meeting Minutes**
**DC Water Clean Rivers Project**
**Potomac River Tunnel Consulting Parties Meeting**

| Meeting Information | | Document Information | |
|---|---|---|---|
| Topic | Potomac River Tunnel | Edition | 1st |
| Date | June 20, 2018 | Revision Date | |
| Est. Start | 1:00 pm | | |
| Est. Finish | 3:30 pm | | |
| Location | DCRA Room E200 | Recorded By | Stantec |

Presenters
CR – Carlton Ray, DC Water
KD - Kim Daileader, EHT Traceries
BF - Brandon Flora, DC Water
JC - John Cassidy, DC Water
JG - Joan Glynn, Stantec
AM - Amanda Morgan, DC Water
PK – Paul Kreisa, Stantec

Consulting Party Comments
CP – Consulting Party not individually identified
AL – Andrew Lewis, DC HPO
TL – Tom Luebke, Commission of Fine Arts
DF – Dan Fox, Commission of Fine Arts
MF – Matthew Flis, National Capital Planning Commission (NCPC)
SP – Steve Plano (DC Department of Transportation)
RT – Dr. Ruth Troccoli, DC HPO
ES – Elsa Santoyo, Citizens Association of Georgetown
AS – Ann Satterthwaite, Friends of Georgetown Waterfront Park
LP – Lisa Palmer, ANC 2E Commissioner 2E05
JG2 – Joe Gibbons, ANC 2E, Chair, Commissioner 2E02
WH – Will Handsfield, Georgetown BID
TS – Tammy Stidham, NPS, National Capital Region
WG – Walter Groszyk, CAG

Meeting Purpose
The purpose of the meeting was to present consulting parties the findings of the Assessment of Effects on Historic Properties Report for the Potomac River Tunnel project. This is the third consulting parties meeting in the Potomac River Tunnel Section 106 process. The following is a summary of the comments and questions received from meeting attendees.

Slide 1: Presentation Overview

None.

Slides 2 and 3: Meeting Purpose and Goals

None.

Slides 4 and 5: Section 106 of the NHPA

None.

Slides 6, 7, 8, and 9: Project Background

None.

Slides 10 and 11: Assessment of Effects, Adverse Effects

None.

Slides 12, 13, and 14: Component 1 – Tunnel Corridor

LP – Asked what determined the placement of the dotted line demarcating the limits of the tunnel portion of the APE and where it falls in relation to Georgetown.

KD – Responded that the demarcation was expanded north of the C&O Canal based on comments from the ANC following the previous consulting parties meeting.

CP – Asked if explosives would be needed to construct the tunnel and/or diversions due to shallow depth of bedrock and if the blasting would be disruptive.

AM – Stated that blasting would be needed to construct the diversions but would be approximately 60 feet below the ground surface and should not be noticeable. DC Water would comply with DCRA limits and guidelines for noise associated with this type of construction activity. Noise from blasting would be monitored closely at the surface. During blasting conducted recently at the Kennedy Center for construction of the CSO 021 diversion, adjacent properties stated that they did not realize that blasting had occurred.

Slides 15, 16, and 17: Component 2 – Mining Site

DF – Asked if there was flexibility with the design of the mining shaft and diversion structures to integrate at- and above-ground infrastructure into the landscape.

BF – Stated that it would depend on the structure, as some of the them, such as the mining shaft, would need to be placed overtop the tunnel. But there is a lot of flexibility with placement of the other structures. The project team will work with relevant stakeholders on the placement and design of at- and above-ground structures.

TL – Asked how large the access points would be and if the structures would be above grade.

BF – Said that access points would include typical 3-foot manholes and an approximately 12-foot x 12-foot opening with removable concrete slabs for maintenance access. They would not necessarily be above grade because they could be designed to be sealed. The access points would be much smaller than the actual structure.

Slides 18, 19, 20, 21, and 22: Component 3 – Emergency Overflow Structure

AL – Asked if any of the trees along Independence Avenue SW would be impacted.

BF – Stated that for maintenance of traffic, DC Water is proposing an option to reroute Ohio Drive to a temporary intersection at Independence Avenue SW at Daniel French Drive SW. If this occurs, several trees along Independence Avenue SW would need to be removed but would be replaced following construction.
AL – Asked if this would create a new intersection.
BF – Responded that the connection point is already signalized.

CP – Asked if water flowing from the structure would be visible from the Potomac River.
BF – Responded that the overflow openings would be partially visible depending on the tide level. Due to the shallow water at the site, the structure cannot be fully submerged because it needs to be constructed out of the riverbed.

AL – Asked if trees could be planted on top of the overflow structure once it has been built.
JC – Responded that small trees could be planted on top of the structure like at CSO 019.
TL – Asked if these trees would be understory trees, which was confirmed. Suggested that trees the exist at the site are large mature trees so this would change the look and feel of the area.
LP – Suggested that the project team consider the application of roof gardens and tree wells like those used overtop underground parking garages.
BF – Responded that the project team would consider this.

RT – Stated that three ship hulls were discovered recently in Old Town Alexandria that were used as bulkheads to stabilize the land and asked if there is any potential for that at the CSO 022 location.
PK – Responded that there has been nothing in the research to indicate this has occurred at the CSO 022 location. If similar remains are discovered at this site it would be incidental. Additionally, the Programmatic Agreement (PA) will include an unanticipated discoveries clause to cover this type of discovery.

CP – Asked what would be constructed above ground and how large would the structures be for the overflow at CSO 022.
BF – Responded that most of the overflow is below ground; Above-ground structures would be elevated between 3 feet and 5 feet to get them above the floodplain. The dimensions of the above-ground infrastructure would be about 10 feet by 50 feet to maintain ventilation and provide protection for the ventilation equipment during floods.

AL – Asked if only one emergency overflow structure will be constructed.
BF – Stated that only one will be constructed.

CP – Suggested that future presentations and maps show the location of metro stations and tunnels.

LP – Asked if the yellow portions depicted on the map were all underground aside from the ventilation vault, which was confirmed.

CP – Asked how long construction would last at CSO 022.
BF – Stated that construction would take approximately 2 years.

CP – Asked when will the preferred option be decided and what will be the basis for the decision.
BF – Responded that the decision will be made through the NEPA and Section 106 compliance processes.

MF – Stated the Emergency Overflow Structure option at CSO 022 appears bigger than the others at West Potomac Park and asked if that was for a particular reason.
BF – Stated that the dimensions of the overflow are dependent primarily on hydraulics and the amount of space available. The West Potomac Park options were conceptually designed to integrate access openings into Ohio Drive to minimize visual impacts. The structure at CSO 022 is more confined due to the limitations of available land area.
TL – Asked if the seawalls at West Potomac Park and CSO 022 are different heights.
KD – Confirmed that the water is much deeper at CSO 022 and the seawall is higher in elevation than the seawall at West Potomac Park.
TL – Stated that perhaps there is an opportunity to construct the overflow at CSO 022 to bury it deeper, which would allow larger trees to be planted.

WH – Stated that there is a C&O Canal Plan under development that involves work along the canal from Mile Marker 0 to 1 in Georgetown. Asked if the project team was aware of it and if it is consistent with the design.
TS – Confirmed the project is consistent with the C&O Canal Plan.

CP – Asked what the quality of water will be that discharges from the overflow structure.
KD – Responded that the water quality will be improved from existing conditions.
JC – Added that the new tunnel will hold 200 million gallons of storage and would require large storm events to produce an overflow, which would in turn be largely diluted in comparison to current conditions.
RT – Asked how often an overflow could be expected.
BF – Stated that there would be an anticipated four overflow events in an average year.

CP – Asked what the timeframe is for the decision on the overflow structure location.
BF – Responded that a decision is expected by the end of the year.

Slides 23 and 24: Component 4 – Ventilation Control Facility and UPIRS Diversion
WG – Asked why a diversion is needed for the UPIRS.
BF – Responded that the diversion would allow connect the UPIRS to the Potomac River Tunnel to serve as a redundancy in the event the Potomac Pump Station goes offline. Flows in the UPIRS could be temporarily diverted to the tunnel until the pump station is brought back online.
LP – Stated an architectural firm should be contracted to design the above-ground portion of the ventilation control facility.
RT – Asked what the circular structure is south of the construction area.
KD – Responded that it is a ventilation shaft for the WMATA tunnel.

WG – Asked if a Native American burial ground is located within this site. Also, asked if the Peter House archaeological site is located at this location.

PK – Stated that a burial site had been identified further north of the site on the other side of the Whitehurst Freeway ramp to I-66. The Peter House is also in the area north of the ramp. Both are outside the limits of the construction area. However, the construction area does include registered archaeological site 51NW120, a limekiln that was identified during investigations conducted for the construction of the freeway ramp. Also, due to the long history of occupation of the area, there is potential for Native American sites to be present.

CP – Asked if any studies have been conducted to determine the extent of contamination in the area from the Washington Gas Light Company. Kennedy Center spent millions on remediation as a part of their expansion project. Suggested that a contamination survey be conducted for the area.
AM – Stated that DC Water is aware of contamination in the area and has initiated studies to determine the extent of the contamination.

WH – Suggested coordination with DDOT, since a 2003 DDOT study had been conducted to connect Rock Creek and Potomac Parkway to I-66 in the area.
BF – Said that the project team is in coordination with DDOT.
JG2 – Added that the project team should coordinate with Will Smith, the Chairman of Foggy Bottom.

Slides 25, 26, and 27: Component 5 – CSO 020 Control
TL – Stated that the CSO 020 Control option north of the Lincoln Memorial is a proposed location for a memorial.
AL – Stated that the CSO 020 Control option located at the Lincoln Memorial volleyball courts is preferable because it eliminates any conflicts with future siting of a memorial at the other location, and also avoids adverse effects to a potentially realigned Constitution Avenue reconnecting the Belvedere with Constitution Avenue.
AL – Asking about the potential removal of elm trees along Constitution Avenue.
KD – Responded that the construction area would not extend far enough north to require removal of the elm trees.

Slides 28 and 29: Component 6 – CSO 021 Control
TL – Asked what of the items depicted on the map have already been built and what is proposed.
BF – Stated that the structures depicted in green are the existing sewers and Potomac Pump Station, which was built in the 1960s, and the diversion structure and ventilation vault constructed in conjunction with the Kennedy Center expansion project. The blue area is the new eco-grove, which has not yet been built, and the orange structures depict the pavilions that are currently being built as part of the Kennedy Center expansion. For this project, DC Water would construct an underground connection, or “adit” between the tunnel and the drop shaft from the diversion structure. At the ground surface, DC Water would occupy the site temporarily to commission the structures.

Slides 30, 31, and 32: Component 7 – CSO 022 Control
None.

Slides 33 and 34: Component 8 – CSO 024 Control and UPI Diversion

CP – Asked if any of the structures would be constructed above grade.
BF – Responded that the floodplain boundary generally follows along the buildings on the north side of K Street. The ventilation vault would need to be elevated a few feet above grade to set the top of the structure above the floodplain.
ES – Asked if it would be possible to place the ventilation vault north of the site in the area owned by DDOT.
BF – Stated that the proposed vault location is within the DDOT area.
TL – Stated that the graphic was difficult to understand.
BF – Explained that the proposed structures would be within K Street and 30th Street under the Whitehurst Freeway.
WH – Stated that DDOT is currently in the planning process for a potential streetcar along K Street and the site proposed for the ventilation vault is a potential site of a maintenance area. Also, stated that the Georgetown Gateway Project from Georgetown BID is planned for this area and may require coordination. There is a lot of interest in developing this area.
LP – Suggested that a hardscape design may be suitable for the site.
BF – Responded that a hardscape design could be a possibility and included that DC Water would coordinate with the various property owners on how the site is developed.

CP – Asked if the ventilation vault could be located further south within 30th Street NW.
KD – Said that the above-ground structures would need to be elevated even higher because the closer to the river the lower the site would be located within the floodplain.

CP – Suggested moving the structure to the northeast near the West Heating Plant property and the Four Seasons Hotel.
BF – Responded that moving the diversion to the north would mean that not all wet weather flows would be controlled, as several sewers connect to CSO 024 downstream of this area.
JC – Added that the placement of the CSO 024 Control was selected to meet water quality standards, as it is the only location where enough wet weather flows would be captured to meet the consent decree obligations and to minimize the amount of disturbance in the area.

CP – Asked if construction could be phased to minimize traffic during construction.
BF – Responded that a phased approach to construction would absolutely be implemented to allow for portions of K Street to remain open for through traffic.

RT – Asked if the yellow depicted on the map was cut and cover from the ground surface, which was confirmed.
DF – Added that the structures that would be visible above-ground should be identified for future presentations to help avoid confusion and understand the extent of these structures.

WG – Stated that the building at 30th Street and K Street houses the Saudi Armed Forces Office and suggested coordinating with them.

<u>Slides 35, 36, and 37: Component 9 – CSO 027 Control</u>
RT – Asked what depth is required to construct the drop shaft.

BF – Responded that the depth will be approximately be 20 feet to 30 feet.

LP – Asked the project team to study the possibility of moving the diversion structure onto Potomac Street NW to minimize impacts to K Street and/or Georgetown Waterfront Park.
BF – Responded that DC Water has investigated this possibility, but the road is too narrow to accommodate construction of the structure.
LP – Stated that Potomac Street NW is seldom used and urged the project team to consider it as a potential location for the structure by making it longer versus wider.
BF – Said that the structure will still need to connect with the river.
LP – Stated that a narrow trench could be dug to install the pipe to minimize impacts.

AS – Asked if the diversion structure and drop shaft would be above ground.
BF – Responded that the structure would be below grade except for the access area which would be above grade.
AS – Asked if the access would be large.
BF – Stated that the access would be elevated approximately 3 feet to 5 feet but there is flexibility in where it will be located and its dimensions.
TJ – Asked what the access is used for in general.
BF - Responded that the access is used for maintenance equipment access.

TL – Asked why the Georgetown Waterfront Park option includes a 30-foot shaft but the K Street option does not. Also, asked what drives the size of the shaft.
BF – The need for a shaft and its size are primarily determined by the movement of air and water at the particular location within the tunnel, but also to be large enough to allow for maintenance equipment access.

JG2 – Asked if the design changes, how would the consulting parties be notified and how would their input be considered.
KD – Responded that the design review process will be outlined in the Programmatic Agreement, which will be adhered to through construction completion.

LP – Stated that Green Infrastructure on the west side of Wisconsin Avenue will have a huge adverse effect on the National Historic Landmark District as a whole because the NHLD has a consistent appearance.
TL – Stated that for the diversion, these discussions are only needed for one site. For GI, imagine having these discussions 50 or 60 times for each site-specific GI measure.
ES – Added that using only green space in Georgetown for GI is highly objectionable and that a lot of people would be greatly affected.
CP – Stated that phased construction could address this issue.

RT – Stated that the CSO 027 sites will be a challenge from an archaeological standpoint, equivalent to when NPS planned the Poplar Point Pumping Station. The challenge is that investigations would require digging deep down to the soil layers where resources may be present.

PK – Added that investigations would require digging somewhere between 3 feet and 5 feet to reach these layers.
RT – Added that this could be an award wining project.

CP – Asked how much disruption is caused by an archaeological investigation.
PK – Responded that at CSO 027, 3 to 5 feet of fill would be removed by excavating trenches within the construction area at the structure locations where archaeological resources have been identified.
CP – Asked how much would need to be sampled.
PK – Stated that that will need to be discussed, but the idea is to limit the amount of machine trenching. These determinations will be made in consultation with DC SHPO and NPS.
ES – Asked if the archaeological investigations would occur before construction and if so, how long will the park be unusable.
PK – Stated that that has yet to be determined, but the investigations would occur within the construction area and trenches would be fenced for safety and then restored afterward. The trenches would be placed to avoid the hardscape, such as walkways. The investigation will require a trench that is 3 to 4 feet wide and 5 to 10 feet long. The trench will be fenced and will take multiple days.
ES – Asked if the trench will then be filled in before the actual work for the project begins, which was confirmed.
LP – Asked if the results of the archaeological investigation could be incorporated into an interpretive experience at the site if anything of interest is found.
PK – Stated that interpretation could certainly be considered as a mitigation measure.

CP – Asked if the project team has the funding to refurbish the park after the archaeological investigation.
CR – Responded that the project team does not have funds yet; no work would begin until funding is received.

WH – Asked if upgrading the existing pumping station would eliminate the need for the tunnel.
JC – Responded that the existing pipe sewers are not big enough to carry the amount of flow that needs to be captured. Also, existing capacity of the pumping station is also not large enough to handle the flow. These ideas were investigated in 1999 and were determined to be costlier and would cause a cascading effect that would be much more impactful.

<u>Slides 38 and 39: Component 10 – CSO 028 Control</u>
WG – Asked if the tunnel would end at the aqueduct bridge.
BF – Stated that it would be dependent on the GI practicability determination.
CP – Asked if DC Water is taking an all or none approach to implementing GI.
BF – Responded not necessarily.

CP – Asked how the timeline would be affected if archaeological investigations yield eligible resources.
PK – Said that all archaeological investigations would occur prior to construction. DC Water currently has a 5-year window for completing the investigations.
CP – Asked if it is possible to get the work done in the allotted time.

PK – Stated that the only potential complication is if the resources are located deep beneath the surface, in which case it would make sense to time the investigation with the construction work.

<u>Slides 40 and 41: Component 11 – CSO 029 Control</u>

CP – Asked what will happen to the tunnel boring machine once construction of the tunnel has been completed.

BF – Responded that it would depend on the final configuration, but the tunnel boring machine could either be pulled up and out of the mining shaft at CSO 029, which is currently designed to be big enough to accomplish or pulled back out through the tunnel to the mine shaft.

<u>Slides 42 and 43: Component 12 – Tunnel Connection to Existing Shaft at JBAB</u>

None.

<u>Slides 44 and 45: Green Infrastructure</u>

ES – Asked if the project team will assess effects to the Georgetown streetscapes, as they are character-defining features of the Georgetown NHLD.

KD – Responded that we cannot finalize adverse effects because the type, number, and location of structures for GI has not been determined yet.

LP – Stated that whether there are 5 structures or 100 structures, implementing would affect the uniformity of the streetscape, including paving, tree boxes, blue stone curbs, etc., that would have adverse effects on the NHLD as a whole.

JG2 – Stated that DDOT has plans to install new lighting within Georgetown which may limit the placement of potential GI and asked if DC Water was aware of the project.

BF – Said that this would be addressed as part of the constructability assessment during the GI practicability determination.

TL – Asked how the practicability of GI can be determined if the location, type, and number of structures is not known. Stated that you need to know what you are doing before you can make a decision. Continued that it cannot be done programmatically, and that DC Water is trying to separate the analysis from the undertaking.

JC – Said that, as per the consent decree, two projects in the Rock Creek and Potomac River sewersheds have been undertaken that will be used to determine practicability. These projects will undergo post-construction monitoring and a document will be prepared to determine if they are practicable. As part of the practicability determination, public acceptability, among others, is considered.

TL – Stated that this is not just a public acceptability issue but also a regulatory issue.

LP – Stated that practicability is not the only issue. What if DC Water cannot identify sufficient mitigation within the NHLD. Also, asked who would maintain the GI facilities, such as rain gardens, if they were implemented. Various community groups maintain rain gardens in other areas of the District that are not kept up by DDOT.

WH – Suggested the use of roof/rain water capturing technology as an alternative to the GI measures proposed and encouraged DC Water to touch base.

RT – Asked if GI is not practicable, then the tunnel would be constructed to CSO 029.
BF – Responded that is correct and stated that the NEPA EA for the project analyzes the full-build scenario for the tunnel so that all bases are covered in the event GI does not move forward.

Slides 46, 47, and 48: Next Steps/Schedule/Questions
RT – Asked if the project will be design/build.
BF – Responded that it has not been determined.

RT – Asked if MOAs could be spawned from the PA.
JG – Responded that this could potentially be possible.
PK – Said that site-specific undertakings typically require an MOA.

AS – Asked what divisions of NPS are involved.
JG – Responded that C&O Canal NHP, Rock Creek Park, National Mall, and the National Capital Region have been involved.

Comment # 46

**DC Water** presented Project Alternatives and draft Areas of Potential Effect (APE's) to be considered in **the Environmental Assessment (EA) for the DC Clean Rivers Project Potomac River Tunnel undertaking, at the *NHPA Section 106 Consulting Parties Meeting, held on Dec. 15 2017.***

In response to comments requested from the Consulting Parties, we offer the following focus on historic preservation concerns about the proposed work. They focus on Georgetown, in the area that is bounded - from west – by the Aqueduct Bridge Abutment and 37Th St NW - to east – the eastern shore of Rock Creek; and from north - Reservoir and R Streets - to south, the southern shore of the Potomac River.

## HP CONCERNS ABOUT SPECIFIC PROJECT COMPONENTS:

THE TUNNEL CORRIDOR

The presentation indicated that the Tunnel would be constructed 100 ft. below grade with trenchless construction. Information about the locations where vertical excavation is required to provide access for trenchless excavation was not provided.

Concerns:

- **Effect on subsurface archeological resources** by the use of heavy machinery or equipment, or construction methods that could possibly destroy, or damage, landscape features and archeological resources at- and below-grade.
- **Effect by construction on site features which are important in defining the APE's overall historic character.** These include: hardscape such as paths, scenic overlooks, amphitheater steps; vegetation, such as trees, shrubs, grass, and gardens; landforms, such as seawalls, terracing, swales and berms; furnishings and fixtures, such as shade structures, light posts and benches; and water features, including the Georgetown Waterfront Park's irrigation systems.

GROUND LEVEL CONSTRUCTION - DIVERSION STRUCTURES CSO 024, 027, 028, 029

The Tunnel's associated diversion structures are planned to be largely below grade, with minimal at-grade appearance – "***except where the diversion structure is located in a flood plain***".

<u>CSO 024</u>: proposed at intersection of K Street NW of 30th Street NW, and K Street NW near 29th Street NW. *Its Components:* At-Grade – Ventilation Vault, air exhaust access points and grating; and Below-grade - sewer, shaft, diversion chambers.

- <u>**Effect of components at- and above grade that will be visible** on:</u> Georgetown Historic District (NHL) looking south from 30th and K Streets, NW and looking west from 29th Street NW near the West Heating Plant (NR, DC).

<u>CSO 027</u>: The presentation materials identified CSO 027 Option 1 to be located in the flood plain, and notes it will have the following components:

*<u>Option 1</u> - Georgetown Waterfront Park between 33rd and Potomac Streets NW*
*Components:*

– At Grade - Emergency Relief pipe outfall, air exhaust access points and grating.
– Above Grade - electrical cabinets and ventilation vault

*<u>Option 2</u> - K Street NW intersection of Potomac Street NW:*
*Components* at Grade - Emergency Relief pipe outfall, air exhaust access points and grating.

- **Effect on appearance of shoreline by outfall** looking north from the Potomac Gorge (DC) to the Georgetown Waterfront Park shore.
- **Effect of electrical cabinets and ventilation vault on site features including relationships between buildings and landscape, views to, from, and within the historic districts and sites** within Georgetown Waterfront Park as seen from from Francis Scott Key Bridge and from the C&O Canal at Potomac and at 33rd Streets NW.
- **Effect on subsurface archeological resources:** Use of heavy machinery or equipment, and construction methods that could possibly destroy - or damage archeological resources at- and below-grade.

<u>CSO 028</u>: C&O Canal - Capital City Trail
*Components At-Grade* - Emergency Relief pipe outfall, air exhaust access points and grating; and *Below-grade* - sewer, shaft, and diversion chambers.
*and*
<u>CSO 029</u>
*<u>Option 1 – Canal Road</u> at Georgetown University Entrance*
*Components:* At-Grade - air exhaust access points and grating, and *Below-grade* – diversion sewer, ventilation vault, diversion chambers.

- **Effect on subsurface archeological resources:** Use of heavy machinery or equipment, and construction methods that could possibly destroy - or damage archeological resources at- and below-grade.

GREEN INFRASTRUCTURE - No actions were described for this component. Nevertheless comments are provided assuming a combination of typical green infrastructure components would be implemented.

- **Effect on setting for the historic district:**
  – Altering the existing relationship between buildings and landscape features by widening /lengthening tree boxes to create rain gardens, changing green- and hard-scape materials, sidewalks and paved streets.
  – Substantially changing streetscape features and relationships so that the historic character of Georgetown NHL District is diminished.
  – Destroying the integrity of the historic setting of Georgetown if implementing green infrastructure west of Wisconsin Avenue results in a different streetscape east and west of Wisconsin Avenue NW.
- **Effect on features which are important in defining the APE and resource's overall historic character** including: machine molded brick sidewalks and bluestone curbs, vegetation, such as trees, and gardens; and light posts.

HP OVERARCHING CONCERNS :

The Secretary of the Interior's Standards for Preservation and Rehabilitation applicable to this project include:

*2. The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces and spatial relationships that characterize a property will be avoided.*

*5. Distinctive materials, features, finishes and construction techniques or examples of craftsmanship that characterize a property will be preserved.*

*8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.*

*9. New construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work will be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.*

***Will the EA include the list of applicable HP Standards, stating that work will be guided by these?***

***Will the EA address in narratives with plans, diagrams, sketches, and 3-D Model viewshed studies***:

- Massing, footprint, and location of above grade diversion structures components to minimize effect on view shed relationships between historic districts and sites?

- Approach to architectural features, height, appearance, color, and texture of the materials of above grade structures that will used to ensure they are sympathetic to the APEs?

- How all necessary investigation will occur using professional archeologists and methods - before ground disturbance work begins?

- How instrumentation during construction (settlement and vibration) will be monitored at all locations within the Historic District?

- How Green Infrastructure will be designed so that the character of the setting of the NHL district will not be altered, and so the integrity of its setting - which is cohesive east and west of Wisconsin Avenue NW - will remain?

- How will features significant of the historic setting be protected and - if disturbed – how they will be restored?

Comment # 47

January 17, 2018

Mr. Brett Schrader
Stantec Consulting Services Inc.
brett.schrader@stantec.com

Dear Mr. Schrader

Thank you for convening the December 15, 2017 meeting of the consulting parties, and for the presentation on the proposed Potomac River Stormwater Retention Tunnel (the Tunnel). The presentation was informative and helpful.

The following comments are submitted by the Citizens Association of Georgetown (CAG), a consulting party under the Section 106 process for the Tunnel project.

The comments are provided for consideration in preparing the Environment Assessment (EA), and for DC Water's study of alternative sites for various structures associated with the Tunnel. These comments are limited to the area of Georgetown

Information to be provided in an Environmental Assessment. The content of this EA is governed by the National Park Service's *NEPA Handbook*, issued in 2015. For this project, provisions of [National P:ark Service] Director's Order #77-2: Floodplain Management, may also apply. We remind you of this, because the December 15th presentation was woefully short in providing basic information, particularly with regard to current conditions. Schematics of existing sewer structures, where provided, were very general. Information on current, measured flows and overflows from the sewers within the proposed scope of work was omitted. The routing of sewers, and an identification of existing geological and other constraints that might also affect future routing was missing. There were no floodplain maps, nor a listing of major floods and their height. (Flood waters were six feet deep on Water St. in the St. Patrick's Day flood of 1936.) An EA is not intended to be an *a posteriori* ratification of a pre-determined schema.

The diversion structure for CSO 027. CAG is concerned that locating this structure with its 100-foot-deep drop shaft in the middle of the Georgetown Waterfront Park, a Federal park, would have a major construction impact. The impact would be most acute in the area between the labyrinth and the Potomac St. allee. Given the narrowness of the park, the construction likely would temporarily sever the park in two for many months. This would greatly disrupt use of the park by pedestrians and cyclists.

The presentation indicated that the diversion structures associated with the Tunnel would be below grade, and that the at-grade appearance would be minimal. Except where the diversion structure is in a flood plain. In the discussion of the diversion structure for CSO 028, mention was made that this structure would be elevated above the flood plain, but its height would not obstruct views from the towpath. As the candidate site in the Waterfront Park is in a flood plain, CAG is opposed to any part of a diversion structure being above grade in the Park.

The issue of a diversion structure being located in a flood plain also applies to the alternate site for the CSO 027 diversion structure, which is on Water St., near Potomac St. Attachment 1 is a view looking east on Water St from Key Bridge in the flood of October 1942, a flood of similar height to the 1936 flood.

On page 13 of the presentation, there is a photograph of the outfall for CSO 027. The outfall appears to be an arched structure, nine or ten feet wide, and it appears that the outfall conduit is similarly sized between the river and Water St. There are no tidal gates for this outfall (or for CSO 028). Does the scope of work potentially envision reconstructing this conduit, and installing tidal gates? If so, the EA should address the construction, and post-construction, impact of this work on the Waterfront Park.

CSO 024. Construction of a diversion structure and a 100-foot-deep drop shaft in the 2900 block of K St NW, the candidate site for this large combined sewer, would adversely affect traffic in lower Georgetown. It is not exaggeration to state that the economic and transportation impact would be very profound. The EA must address this potential impact in detail, and outline steps that would be taken to mitigate it. The candidate site is also the location of major utilities infrastructure, some of which originate in Virginia and proceeds up the 1000 block of 29th St NW. The potential impact on this utility infrastructure should be addressed in the EA.

The candidate site is directly adjacent to an important and highly sensitive embassy facility of a foreign country. CAG strongly recommends that you contact the Office of Foreign Missions in the Department of State, and request that the Office become a consulting party representing the interests of the foreign country.

Attachment 2 is a photograph of the October 1942 flood, looking west from the middle of the 2900 block of K St. NW.

CSO 025 and CSO 026. These two combined sewers service a small, highly impervious area in lower Georgetown. Under the consent decree, these are to be separated into storm and sanitary sewers. The storm sewers would utilize the current outfalls for overflows from the combined sewers, and which are located in the Waterfront Park.

As these sewers are within the study area for the EA, they should be included. There are several historic buildings in the service area of these sewers, including the Dodge Warehouse, the only surviving Federal era warehouse in Georgetown; and Grace Church, on the National Register.

Both modeled and measured overflows from these two combined sewers are de minimus, even from storm events exceeding 1.2 inches. The Long Term Control Plan's estimated cost for sewer separation is $10 million. The EA should provide information on any modification to the diversion chambers and outfall structures that may occur either as a result of sewer separation or their remaining as combined sewers.

<u>Performance objectives for Green Infrastructure (GI)</u> In *Technical Memorandum No. 7: Green Infrastructure Screening Analysis for the Potomac River and Rock Creek*, dated July 11, 2012, the GI goals for CSO 027 and 028 are to be achieved by installing GI on 31 impervious acres in CSO 027 and 4+ acres in CSO 028. The installations would cover 30 percent of the impervious acres in these two sewersheds. (See Table ES-4, Scenario 2A, on page ES-6.) In CY 2015, the measured overflow volumes from CSO 027 and 028 were substantially less than the overflow volumes predicted by the MIKE-URBAN model. The EA should assess whether this greatly diminished overflow volume means that the necessary reductions set out in the GI goals for west Georgetown are already being realized.

<u>Climate Change</u>. The EA should address the potential effect of rising sea levels within the tidal Potomac on the location of Tunnel-related structures and their design.

<u>Alternatives</u>. CAG suggests that DC Water consider an alternative site for the diversion structure and dropshaft for CSO 024. This site would avoid the severe construction-related impact of the candidate site. The alternate site is astride the West Rock Creek Diversion Sewer (CSO 024). Most of the site is above the floodplain.


Alternate site is the area generally bounded by the ramp from southbound Rock Creek Parkway up to eastbound Pennsylvania Ave. NW.

CAG also propose an alternative for the proposed diversion structure and drop shaft for CSO 028, the candidate site for which is just west of the Aqueduct Bridge, on the Capital Crescent Trail. If the Tunnel were to be extended this far west, our alternative would be to construct a diversion chanber for the Upper Potomac interceptor (UPI) sewer, rather than for CSO 028. The chamber would divert several million gallons of peak flow directly to the Tunnel. This would free up capacity in the UPI along Water St. so that flows and overflows from CSO 027 and CSO 028 would be directed to the UPI. The need for a sizeable diversion struction and deep drop shaft for CSO 027 would be avoided. Overflows from CSO 028 would be accommodated within the UPI. The flows from the UPI into the Tunnel would go directly to Blue Plains, bypassing the Rock Creek and Potomac pumping stations.

Sincerely,

Robert P. vom Eigen
President

cc: Mr. Peter May, Associate Regional Director for Lands and Planning, National Park Service
Mr. Thomas Luebke, Secretary, U.S. Commission of Fine Arts

Attachment 1

Water St. looking east during the October 1942 flood. The cement silos for the Lone Star Cement company are slightly east of 34$^{th}$ and Water streets.

Attachment 2

K Street looking west during the October 1942 flood. The end of the fence on the right marks $30^{th}$ St. NW

Comment# 57

# PEPC Project ID: 50548, DocumentID: 91568 Correspondence: 3

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Lisa Palmer |
| Organization: | ANC 2E05 |
| Organization Type: | T - Town or City Government |
| Address: | 3150 South St., NW<br>Washington, DC 20007<br>USA |
| E-mail: | 2E05@anc.dc.gov |


## Correspondence Information

| | |
|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 14, 2018 | Date Received: Nov 14, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Place shaft for CSO 024 in public ROW north of House of Sweden and utilize gravel lot at 30th (?) street as much as possible.

Also regarding CSO 27
Please consider placing the ventilation vault either 1) w/ in the bushes lining the Water St sidewalk OR 2) replacing a parking spot on the street itself.

Comment # 58

Ridgway M. Hall, Jr.
Attorney at Law
3500 Ordway Street, NW
Washington, DC 20016
Tel: 202-744-8229
Email: ridgehall@gmail.com

November 19, 2018

ATTN: Potomac River Tunnel EA
DC Clean Rivers Project
Blue Plains Advanced Wastewater Treatment Plant
5000 Overlook Avenue, SW
Washington, DC 20032

Re: DC Clean Rivers Project, Potomac River Tunnel: Environmental Assessment (Oct. 2018)

Dear Sir or Madam:

I am writing to express my strong support for the conclusions reached in your Environmental Assessment for the Potomac River Tunnel dated October, 2018 (EA), and, for the reasons set forth below, I urge you to go forward with construction of that tunnel consistent with Alternative B, which is your "Proposed Action".

By way of introduction, my wife and I have resided in the District of Columbia for over 40 years. We are ratepyers to DC Water for drinking water and sanitary waste disposal services, including the assessments for the DC Clean Rivers Project. We are happy to pay those assessments because of the important benefits to water quality and the quality of life in the greater DC area which are resulting, and will continue to result, from implementation of the Clean Rivers Project so as to elimainate the significant pollution and adverse effects resulting from the discharges of untreated sewage from the combined sewage overflows (CSOs). In addition, we regularly recreate on the Potomac River, ncluding kayaking, rowing,and occasionaly sailing. Thus we have a substantial interest in this matter.

I have been an environmentsal lawyer for over 40 years, and have been committed to the protection of our environment for as long as I can remember. For 30 of these years I was a partner in a Washington, D.C., law firm, where I started that firm's environmental practice. In addition, I am a former Associate General Counsel for Water at EPA, a former officer of the Environmental Law Institute, a life member of the American Law Institute, and a former Regent in the American College of Environmental Lawyers. I am currently Vice Chair of the Chesapeake Legal Alliance, Inc. However, these comments are submitted solely on my own behalf, and not on behalf of any of those or any other organizations.

Your EA does an excellent job of identifying the important water quality benefits that will result from construction of the proposed tunnel. The "no action" alternative (Alternative A) would allow continuation of the annual CSO discharges of approximately 654 million gallons of untreated sewage a to the Potomac River (EA p. 43), causing continued violations of water quality standards, total maximum daily loads (TMDLs), DC Water's NPDES permit, and the federal consent decree which requires the elimination of these CSO discharges. The existing discharges include *E.coli*, suspended solids (sediment), nutrients, organic pollutants, toxic metals and other contaminants, all of which adversely affect aquatic life and human health, and cause violations of existing water quality standards (WQS) and TMDLs.

These CSO discharges also contribute to violations of the Chesapeake Bay TMDL and its restrictions on discharges of sediment (suspended solids) and nutrients – specifically nitrogen and phosphorus. The Blue Plains WWTP has done an excellent job of installing and operating state-of-the-art wastewater retreatment technology to remove these pollutants. Completion by DC Water of the Anacostia River Tunnel as described in the EA has also contributed to the reduction of these pollutants. Construction of the Potomac River Tunnel is a major and essential part of the overall strategy to significantly improve water quality in the Potomac River and the Chesapeake Bay.

In contrast to the "no action" alternative, the proposed action (Alternative B) would eliminate 93% of these discharges. This would provide major and essential water quality benefits, including benefits to the aquatic and adjacent habitats and the entire ecosystem. The resulting improvements in water quality would provide important recreational benefits for the thousands of people who use the Potomac River, and whose numbers will likely increase significantly when the CSOs are eliminated. This includes human health benefits resulting from reduced levels of pollutants to which recreational users would be exposed. Finally this alternative will result in compliance with important legal requirements identified above and described in the EA, including major progress towards achievement of TMDLs and related water quality standards and use requirements.

Your EA has described the short term adverse impacts likely to occur during the construction phase, and has identified mitigation measures to minimize these impacts. Those mitigation measures all appear to be both adequate and essential. In particular I urge you to ensure maximum feasible protection for water quality, submerged aquatic vegetation, wetlands and habitat for wildlife and fish and other aquatic organisms that may be affected. The EA's commitment to replace any damaged trees, shrubs and aquatic vegetation is an essential component of this project.

Section 2.0 of the EA states that green infrastructure (GI) may be used to eliminate discharges at CSOs 027, 028 and 029, provided that the use of GI complies with the federal consent decree. Any use of GI must not only comply with the consent decree but should also provide water quality benefits and protections equal to or greater than those that would be provided by use of the tunnel.

In conclusion, the construction of the Potomac River Tunnel in a manner consistent with the EA's Alternative B proposal will achieve significant benefits to water quality and to the fish and other aquatic organisms that live in the river, the adjacent habitat and the many humans who enjoy and recreate on or near the river. It will also comply with applicable legal requirements, I therefor strongly support for this proposed project. My wife, Anne, joins in these comments. Thank you for the opportunity to submit these comments. I would be happy to discuss any aspect of them.

Sincerely yours,

Ridgway M. Hall, Jr.

Cc: Tommy Wells, Chairman of the Board, DC Water, and Director, DC Department of Energy and Environment (electronically)

Katherine Antos, Branch Chief for Partnering and Environmental Conservation, DC Department of Energy and Environment (electronically)

Comment # 59

GOVERNMENT OF THE DISTRICT OF COLUMBIA

# Advisory Neighborhood Commission 2E

**Representing the communities of Burleith, Georgetown, and Hillandale**
3265 S Street, NW • Washington, DC 20007
(202) 724-7098 • anc2e@dc.gov

December 4, 2018

Ms. Lisa Mendelson-Ielmini
Acting Regional Director, National Capital Region
National Park Service
1100 Ohio Drive SW
Washington, DC 20242
Lisa_Mendelson-lelmini@nps.gov

Mr. David Gadis
CEO and President
DC Water
5000 Overlook Avenue SW
Washington, DC 20032
dccleanrivers@dcwater.com

**RE: The Potomac River Tunnel Environmental Assessment Prepared by the National Park Service in Cooperation with DC Water**

Dear Ms. Mendelson-Ielmini and Mr. Gadis,

On December 3, 2018 ANC 2E held its regularly scheduled public meeting, which was properly noticed and attended by seven commissioners, constituting a quorum. At this meeting the Commission adopted the following resolution by a vote of (6-0-1) with regard to the above-referenced matter:

> ANC 2E has reviewed the DC Clean Rivers Project Potomac River Tunnel Environmental Assessment dated October 2018 (the "EA"), which was prepared by the National Park Service in cooperation with the District of Columbia Water and Sewer Authority ("DC Water").
>
> ANC 2E notes that the EA reflects DC Water's plan to install so-called Green Infrastructure ("GI") to control combined sewer overflows from three sewersheds in ANC 2E (CSOs 27, 28, and 29) if DC Water determines that use of GI for this purpose is "practicable."
>
> The EA describes the proposed GI measures in very cursory fashion and says only that, "[d]etailed facility siting and design have not been performed for the level of GI implementation required . . . should GI be determined practicable."
>
> The EA fails to disclose what, if any, objective criteria DC Water would use to determine whether the installation of GI in the identified sewersheds would be practicable.
>
> ANC 2E notes, however, that the Amended Consent Decree mandates that DC Water consider, among other things, the public acceptability of GI when determining the practicability of the use of GI in the sewersheds connected to CSOs 27, 28, and 29.

Subject to comments from Georgetown University and a determination of the constructability, operability, efficacy, and cost per impervious acre of the GI proposed for CSO 29, ANC 2E does not object to further consideration of the use of GI in the sewershed that flows into CSO 29.

The sewershed connected to CSO 28 is relatively small. ANC 2E opposes the installation of GI in this sewershed and requests that DC Water consider other alternatives for controlling overflows from CSO 28, including sending overflows to the Upper Potomac Interceptor sewer.

The EA indicates that if GI is determined to be practicable, DC Water proposes to use GI to abate storm water runoff from 31 acres of impervious acres in the sewershed connected to CSO 27. As previously noted, the EA does not disclose exactly what facilities would be constructed and where those facilities would be sited, but it is indisputable that the installation of GI in the CSO 27 sewershed would, among other things, have a severely negative impact on the Georgetown National Historic Landmark District.

ANC 2E firmly opposes the use of so-called Green Infrastructure to control overflows in the CSO 27 sewershed and notes again that public acceptability is a critical factor in the practicability analysis mandated by the Amended Consent Decree.

According to the EA, the only alternative approach to addressing overflows in CSO 27 would be connecting CSO 27 to an extended Potomac River Tunnel, which would require construction of "gray infrastructure" facilities in or near the Georgetown Waterfront Park and along Water Street NW. ANC 2E applauds DC Water's efforts to reduce the intrusiveness of the proposed facilities, and supports the preferred construction options described in the EA. To be clear, however, ANC 2E opposes the construction of any "gray infrastructure" facilities on park land and would oppose any construction plan that contemplates the closing of Water Street and does not adequately address the impact that major construction would have on the residents of the area of Georgetown south of the C&O Canal and west of Wisconsin Avenue NW.

ANC 2E requests that DC Water consider alternatives that would eliminate the need for the construction of any structures in the park or along Water Street NW. In that connection, ANC 2E supports the location of the proposed Emergency Surge Relief Pipe west of the Aqueduct Bridge and asks DC Water to consider alternatives to the "gray infrastructure" facilities described in the EA. In particular, ANC 2E requests that DC Water give serious consideration to the possibility of sewer separation in the areas of the CSO 27 sewershed that lie south of M Street NW. Separating sewers in this area could render it unnecessary to connect the CSO 27 sewershed to the Potomac River Tunnel.

ANC 2E requests DC Water to give consideration to other alternative measures proposed by the Citizens Association of Georgetown, the Friends of Georgetown Waterfront Park, and the Georgetown Business Improvement District with the goal of eliminating the need for either GI in the CSO 27 and CSO 28 sewersheds or permanent structures in or near the waterfront park.

ANC 2E contends that the discussion in the EA of DC Water's plans for the siting and construction of structures associated with CSO 24 is woefully inadequate in light of the fact that any construction in or near K Street east of 30th Street NW would have a profoundly negative impact on the entire Georgetown community. As has been suggested by the Citizens Association of Georgetown, the EA should include a discussion that is glaringly absent: a thorough assessment of the potential impact on traffic flows in lower Georgetown if major construction in this area were to be undertaken.

To summarize, ANC 2E is firmly opposed to the installation of Green Infrastructure in CSOs 27 and 28, and is equally opposed to construction in K Street and Water Street NW as currently described in the EA. Therefore, ANC 2E requests that DC Water rethink the plans for major construction in lower Georgetown to identify ways to minimize impacts on the Georgetown Waterfront Park and the entire historic district, its businesses, and its residents.

Commissioners Rick Murphy (2E03@anc.dc.gov) and Joe Gibbons (2E02@anc.dc.gov) are the Commission's representatives in this matter.

Respectfully submitted,

Joe Gibbons
Chair, ANC 2E

Comment # 60

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 1

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Joshua Lindsay |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1010 Paper Mill Ct NW<br>Washington, DC 20007<br>USA |
| E-mail: | joshua.m.lindsay@gmail.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 14, 2018 | Date Received: Nov 14, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Disruption of Georgetown Waterfront Park is unacceptable and needs to be reconsidered. Specifically, both Options 1 and 2 for Component 9 / CSO 27 would require construction that would displace mature trees and other plantings, consume widely used public space, and effectively render at least 1/3 of Georgetown Waterfront Park unusable during the construction period and (depending on the option selected) unsuitable as park space once the project is complete. Above grade vents (especially sewer vents) are both unsightly and disrupt the use of open green space that makes a park attractive to visitors.

Georgetown Waterfront Park is not a typical neighborhood park. It attracts thousands of visitors from DC, Virginia, Maryland and beyond. In turn, the Park has vitalized the surrounding business district, with circa 20 new businesses opening in the adjacent blocks south of M Street since the Park opened. The spaces designated for disruption are in the middle of the Park, which would make the Park very unattractive during the duration of construction (likely 18 months), during which time the surrounding businesses would suffer. In the longterm, the proposed structures would likely have a similar effect, again to the detriment of the surrounding businesses and community.

Additionally, this project proposes to undo millions of dollars of private and public investment that have made this Park among the nicest public spaces in the District. It can be expected that government funds alone would not be sufficient to restore the Park to its current state, and replacement of mature plantings would take a decade to recover- -even if funds could be allocated to replace them.

There must be another alternative. The C&O Canal seems like an obvious choice. It currently is undergoing maintenance and is slated for major renovations. Moreover, it empties into the Potomac. Could not this pipe be routed under the canal? Because the canal also is above the 100-year flood plain, vents could be level with grade.

Please do not destroy one of the District's most valuable gems, Georgetown Waterfront Park. The community, including surrounding businesses, would suffer immensely if this project goes forward.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 7

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Marchant Wentworth |
| Organization: | Wentworth Green Strategies |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 903 Hamlin St NE<br>Washington, DC, DC 20017-3421<br>USA |
| E-mail: | marchant_wentworth@msn.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 18, 2018 | Date Received: Nov 18, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Comments on the Environmental Assessment October, 2018 on the Potomac River Tunnel submitted on behalf of Wentworth Green Strategies.

Thank you for the opportunity to present our comments on the Potomac River Tunnel. We have long been involved in the effort to implement the Long Term Control Plan and was a member of the Stakeholders Group that helped formulate the original plan in 2001. The Plan for the Potomac River Tunnel we have before us is the product of a modification and subsequent Amended Consent Decree was entered by the DC District Court in January, 2016. Among other changes, the Amended Consent called for the possible substitution of green infrastructure for controlling CSOs 49, and 27-29.

Key Elements Of This Proposal Will Improve Water Quality in the Potomac River

The key elements of this proposal - a gravity-fed tunnel to the treatment plant coupled with sewer separation of two small sewer sheds and possible controls on the remaining Potomac River CSOs with either green infrastructure (GI) or direct connect to the Potomac River Tunnel, will result in a dramatic improvement in water quality for an area of the Potomac that is heavily used by recreational boaters. It will reduce the public health threats that have been posed by these CSOs for over hundred years.

Green Infrastructure May Not Always be the best choice

GI Work in the Piney Branch water shed (CSO 49), one of the largest sewer sheds in the system, is almost complete. That sewershed is largely composed of single family houses with yards and alleys - areas that could easily accommodate widespread installation of GI in alleys and relatively wide residential streets. For residents, this meant a new alley - a popular move. In contrast, the sewersheds of CSOs 27-29 tend to be relatively small row and townhouses with small alleys. Prior experience with sewer replacement along M Street indicates that any sewer work in Georgetown is likely to be complex, expensive, time consuming and contentious. GI typically requires some maintenance and oversight adding to the cost. For these and other reasons, we strongly favor the grey infrastructure alternative to control these CSOs. First, the tunnel is likely to capture more overflow than is GI. Secondly, the use of the tunnel will minimize the impact on the historical and cultural resources in this largely historical district.

We are aware that the use of GI will be determined after the outcome of Green Infrastructure Project I is assessed and evaluated. We ask that the public be involved in this process.

Proposals that would substitute sewer separation for grey infrastructure for CSOs 25 and 26 make good sense because of the small acreage in each of these sewersheds. It may also result in improved drainage for houses in these sewersheds.

The Preferred Options Make Sense - But Should Be Sequenced

By any measure this work is among the largest public works projects ever undertaken in the District. Managing those impacts will be a herculean task. The NPS, working with DC Water should prepare a timeline to attempt to eliminate all the impacts to traffic, view sheds, impact on recreational facilities, etc. from happening all at once. Of particular importance would be to minimize impacts during the flood of visitors during the Cherry Blossom Festival and the 4th of July Celebration.

Tree Replacement

We urge you to consult with Casey Trees and other professionals evaluate the best species appropriate to the particular area. For example, the elms might not be ideal replacements for elms that have to be taken.

END

Comments # 62 thru 70

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 1

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Joshua Lindsay |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1010 Paper Mill Ct NW<br>Washington, DC 20007<br>USA |
| E-mail: | joshua.m.lindsay@gmail.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 14, 2018 | Date Received: Nov 14, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Disruption of Georgetown Waterfront Park is unacceptable and needs to be reconsidered. Specifically, both Options 1 and 2 for Component 9 / CSO 27 would require construction that would displace mature trees and other plantings, consume widely used public space, and effectively render at least 1/3 of Georgetown Waterfront Park unusable during the construction period and (depending on the option selected) unsuitable as park space once the project is complete. Above grade vents (especially sewer vents) are both unsightly and disrupt the use of open green space that makes a park attractive to visitors.

Georgetown Waterfront Park is not a typical neighborhood park. It attracts thousands of visitors from DC, Virginia, Maryland and beyond. In turn, the Park has vitalized the surrounding business district, with circa 20 new businesses opening in the adjacent blocks south of M Street since the Park opened. The spaces designated for disruption are in the middle of the Park, which would make the Park very unattractive during the duration of construction (likely 18 months), during which time the surrounding businesses would suffer. In the longterm, the proposed structures would likely have a similar effect, again to the detriment of the surrounding businesses and community.

Additionally, this project proposes to undo millions of dollars of private and public investment that have made this Park among the nicest public spaces in the District. It can be expected that government funds alone would not be sufficient to restore the Park to its current state, and replacement of mature plantings would take a decade to recover- -even if funds could be allocated to replace them.

There must be another alternative. The C&O Canal seems like an obvious choice. It currently is undergoing maintenance and is slated for major renovations. Moreover, it empties into the Potomac. Could not this pipe be routed under the canal? Because the canal also is above the 100-year flood plain, vents could be level with grade.

Please do not destroy one of the District's most valuable gems, Georgetown Waterfront Park. The community, including surrounding businesses, would suffer immensely if this project goes forward.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 2

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | N/A N/A |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | |
| | Washinton, DC 20016<br>USA |
| E-mail: | |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 14, 2018 | Date Received: Nov 14, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

I oppose the Potomac River tunnel. There are many green and grey infrastructure ideas and areas that could greatly reduce the current issues with a reworking of some of the infrastructure already in place. Let's not push our problems underground.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 3

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Lisa Palmer |
| Organization: | ANC 2E05 |
| Organization Type: | T - Town or City Government |
| Address: | 3150 South St., NW<br>Washington, DC 20007<br>USA |
| E-mail: | 2E05@anc.dc.gov |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 14, 2018 | Date Received: Nov 14, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Place shaft for CSO 024 in public ROW north of House of Sweden and utilize gravel lot at 30th (?) street as much as possible.

Also regarding CSO 27
Please consider placing the ventilation vault either 1) w/ in the bushes lining the Water St sidewalk OR 2) replacing a parking spot on the street itself.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 4

## Author Information


| | |
|---|---|
| Keep Private: | Yes |
| Name: | Roland Halstead |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 7116 Maple Ave<br>Takoma Park, MD 20912<br>USA |
| E-mail: | |


## Correspondence Information

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|---|---|
| Status: New | Park Correspondence Log: |
| Date Sent: Nov 14, 2018 | Date Received: Nov 14, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Thank you for considering both Rock Creek + Capital Crescent Trails work around options.

Thank you, also, for addressing the sewage overflow problem. Maybe even plastics will be prevented.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 5

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Brett Young |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 4573 MacArthur Blvd Apt #303<br>Washington, DC 20007<br>USA |
| E-mail: | jojopuppyfish@yahoo.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 15, 2018 | Date Received: Nov 15, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

I am currently working to restore the Foundry Branch Bridge which is a historic trolley bridge in Glover Archbold Park.
I think its important to coordinate this with the current owner, WMATA and DDOT (which is the potential new owner of the bridge as they are currently studying the feasibility of taking it over)
Please make sure to coordinate this project so that it does not disrupt any competing projects in the Glover Archbold area

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 6

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | bart raguso |
| Organization: | Society for the Possiblity of Human Intelligence |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 42649 waxpool rd.<br>Ashburn, VA 20148<br>USA |
| E-mail: | bartoli842@gmail.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 15, 2018 | Date Received: Nov 15, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

I am just a plain human, uninformed, untutored, unadorned, and unattached to any governmental body. I belong only to the body of man and to the spirit of God. I applaud any effort to improve the condition of our miracle water. It is our life-blood. It is what we depend on for survival, mental health (recreation), spiritual health (seeing the holiness of our Earth), and the stability of our world. Anything which can be done to keep it as pure as possible should be at the top of everyone's agenda, whether they see the water as holy and precious, and a special gift of the Creator, or whether they merely want to be able to motor or to sail upon it without a layer a scum attaching itself to the hull of their vessel.

When our European forebearers came to North America, you could drink from any of it's waters. Let's seek that as our goal.

Think of your Children and Grand-children for once instead of your own narrow interests. Do we not have an obligation to pass on to them, something better or at least as good as what we ourselves have had? If you do not believe in God, at least use your best wisdom to help leave the world a little better than you found it. If you can imagine that we all exist on a miracle Earth, with the miracle of water making all life possible, maybe you can imagine that
we all share an obligation to not piss on God's face and call it rain...

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 7

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Marchant Wentworth |
| Organization: | Wentworth Green Strategies |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 903 Hamlin St NE<br>Washington, DC, DC 20017-3421<br>USA |
| E-mail: | marchant_wentworth@msn.com |


## Correspondence Information

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| Status:New | Park Correspondence Log: |
| Date Sent: Nov 18, 2018 | Date Received: Nov 18, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

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Comments on the Environmental Assessment October, 2018 on the Potomac River Tunnel submitted on behalf of Wentworth Green Strategies.

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Key Elements Of This Proposal Will Improve Water Quality in the Potomac River

The key elements of this proposal - a gravity-fed tunnel to the treatment plant coupled with sewer separation of two small sewer sheds and possible controls on the remaining Potomac River CSOs with either green infrastructure (GI) or direct connect to the Potomac River Tunnel, will result in a dramatic improvement in water quality for an area of the Potomac that is heavily used by recreational boaters. It will reduce the public health threats that have been posed by these CSOs for over hundred years.

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Tree Replacement

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END

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 8

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Amanda R Hartman |
| Organization: | HACC |
| Organization Type: | I-Unaffiliated Individual |
| Address: | York, PA 17404<br>USA |
| E-mail: | |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 26, 2018 | Date Received: Nov 26, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

I am happy to hear all the plans regarding the Potomac River Tunnel. It appears that you have put a lot of thought into this project and have come up with a great plan!

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 9

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Amanda N/A |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | |
| | York, PA 17404<br>USA |
| E-mail: | |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 26, 2018 | Date Received: Nov 26, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

I feel that this project is completely important to the welfare of our environment and I am pleased to read the steps that are being taken to complete this project. Completing the steps of which you have outlined seem to be extremely important to the protection of the Potomac River and other connecting water sources.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 10

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Ridgway M Hall, Jr. |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 3500 Ordway Street, NW<br>Washington, DC 20016<br>USA |
| E-mail: | ridgehall@gmail.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 19, 2018 | Date Received: Nov 28, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Re: DC Clean Rivers Project, Potomac River Tunnel: Environmental Assessment (Oct. 2018)

Dear Sir or Madam:

I am writing to express my strong support for the conclusions reached in your Environmental Assessment for the Potomac River Tunnel dated October, 2018 (EA), and, for the reasons set forth below, I urge you to go forward with construction of that tunnel consistent with Alternative B, which is your "Proposed Action".

By way of introduction, my wife and I have resided in the District of Columbia for over 40 years. We are ratepyers to DC Water for drinking water and sanitary waste disposal services, including the assessments for the DC Clean Rivers Project. We are happy to pay those asessments because of the important benefits to water quality and the quality of life in the greater DC area which are resulting, and will continue to result, from implementation of the Clean Rivers Project so as to elimainate the significant pollution and adverse effects resulting from the discharges of untreated sewage from the combined sewage overflows (CSOs). In addition, we regularly recreate on the Potomac River, ncluding kayaking, rowing, and occasionaly sailing. Thus we have a substantial interest in this matter.

I have been an environmentsal lawyer for over 40 years, and have been committed to the protection of our environment for as long as I can remember. For 30 of these years I was a partner in a Washington, D.C., law firm, where I started that firm's environmental practice. In addition, I am a former Associate General Counsel for Water at EPA, a former officer of the Environmental Law Institute, a life member of the American Law Institute, and a former Regent in the American College of Environmental Lawyers. I am currently Vice Chair of the Chesapeake Legal Alliance, Inc. However, these comments are submitted solely on my own behalf, and not on behalf of any of those or any other organizations.

Your EA does an excellent job of identifying the important water quality benefits that will result from construction of the proposed tunnel. The "no action" alternative (Alternative A) would allow continuation of the annual CSO discharges of approximately 654 million gallons of untreated sewage a to the Potomac River (EA p. 43), causing continued violations of water quality standards, total maximum daily loads (TMDLs), DC Water's NPDES permit, and the federal consent decree which requires the elimination of these CSO discharges. The existing discharges include E. coli, suspended solids (sediment), nutrients, organic pollutants, toxic metals and other contaminants, all of which adversely affect aquatic life and human health, and cause violations of existing water quality standards (WQS) and TMDLs.

These CSO discharges also contribute to violations of the Chesapeake Bay TMDL and its restrictions on discharges of sediment (suspended solids) and nutrients - specifically nitrogen and phosphorus. The Blue Plains WWTP has done an excellent job of installing and operating state-of-the-art wastewater retreatment technology to remove these pollutants. Completion by DC Water of the Anacostia River Tunnel as described in the EA has also contributed to the reduction of these pollutants. Construction of the Potomac River Tunnel is a major and essential part of the overall strategy to significantly improve water quality in the Potomac River and the Chesapeake Bay.

In contrast to the "no action" alternative, the proposed action (Alternative B) would eliminate 93% of these discharges. This would provide major and essential water quality benefits, including benefits to the aquatic and adjacent habitats and the entire ecosystem. The resulting improvements in water quality would provide important recreational benefits for the thousands of people who use the Potomac River, and whose numbers will likely increase significantly when the CSOs are eliminated. This includes human health benefits resulting from reduced levels of pollutants to which recreational users would be exposed. Finally this alternative will result in compliance with important legal requirements identified above and described in the EA, including major progress towards achievement of TMDLs and related water quality standards and use requirements.

Your EA has described the short term adverse impacts likely to occur during the construction phase, and has identified mitigation measures to minimize these impacts. Those mitigation measures all appear to be both adequate and essential. In particular I urge you to ensure maximum feasible protection for water quality, submerged aquatic vegetation, wetlands and habitat for wildlife and fish and other aquatic organisms that may be affected. The EA's commitment to replace any damaged trees, shrubs and aquatic vegetation is an essential component of this project.

Section 2.0 of the EA states that green infrastructure (GI) may be used to eliminate discharges at CSOs 027, 028 and 029, provided that the use of GI complies with the federal consent decree. Any use of GI must not only comply with the consent decree but should also provide water quality benefits and protections equal to or greater than those that would be provided by use of the tunnel.

In conclusion, the construction of the Potomac River Tunnel in a manner consistent with the EA's Alternative B proposal will achieve significant benefits to water quality and to the fish and other aquatic organisms that live in the river, the adjacent habitat and the many humans who enjoy and recreate on or near the river. It will also comply with applicable legal requirements, I therefor strongly support for this proposed project. My wife, Anne, joins in these comments. Thank you for the opportunity to submit these comments. I would be happy to discuss any aspect of them.

Sincerely yours,
Ridgway M. Hall, Jr.

Cc: Tommy Wells, Chairman of the Board, DC Water, and Director, DC Department of Energy and

Environment (electronically)

Katherine Antos, Branch Chief for Partnering and Environmental Conservation, DC Department of Energy and Environment (electronically).

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 11

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | William Holdsworth |
| Organization: | C&O Canal Association |
| Organization Type: | I-Unaffiliated Individual |
| Address: | P.O Box 366<br>Glen Echo, MD 20812-0366<br>USA |
| E-mail: | president@candocanal.org |


## Correspondence Information

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| Status:New | Park Correspondence Log: |
| Date Sent: Nov 28, 2018 | Date Received: Nov 28, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

We appreciate the opportunity to comment on the Environmental Assessment for DC Waters Proposed Potomac River Tunnel. We focus on the C&O Canal National Historical Park, although the project will also impact Rock Creek Park and the National Mall and Memorial Parks.

The objective of the tunnel project is unexceptionable - to reduce the amount of raw sewage dumped into the Potomac River by the District of Columbias combined sanitary and storm sewers. DC Water wants to reduce the amount of sewage 93% by volume, and to reduce the average number of dumps from 74 times a year (an average of over six times a month!) to four times a year.

Ideally, the Green Infrastructure Alternative will be successful, and the tunnel will end below Key Bridge and, thus, below the C&O Canal National Historical Park. If that is not feasible, our concern is the disruption anticipated during a six-year construction phase.

We are gratified that, since the Environmental Impact Statement was published in July 2014, improvements in the project design have eliminated the need for a diversion structure and large diameter shaft for Combined Sewer Overflow (CSO) 029A, alongside the Capital Crescent Trail in the C&O Canal NHP.

Nonetheless, we are concerned about the extensive work required for the new control structure at CSO 028. The fragile Upper Potomac Interceptor sewer that runs under this site has already failed twice in recent memory, necessitating a lengthy closure of the Capital Crescent Trail in each case. The work here would require yet another detour from the bike trail to the C&O Canal towpath, which walkers and joggers usually have to themselves. Construction on CSO 028, between the Alexandria Aqueduct and the Washington Canoe Club, could cause damage to these two significant historic structures in the C&O Canal NHP. We also have concern for damage to the plants in the water (loss of riverine wetlands) and to the archeological sites on the bank of the river, both of which the authors of the EA seem to dismiss too easily.

We note that CSO 028 is designated as the preferred site of an emergency surge relief pipe, rather than CSO 027 downriver from Key Bridge. This greatly increases the scope of the proposed work at CSO 028, enlarging the footprint of the Control structure from about 300 to about 700 square feet. The new pipe would be somewhat larger than the existing outfall pipe and would run parallel to it into the river, crossing an area of historical significance that has been proposed for future recreational enhancement. Construction time would necessarily be lengthened, increasing the period during which detours would be necessary for users of the canal park and Capital Crescent Trail. By comparison, the effects of placing the emergency relief pipe at CSO 027 seem less disruptive, and we therefore request that it be reconsidered as the preferred site.

The C&O Canal Association is an all-volunteer citizens organization established in 1954 to help conserve the natural and historical environment of the C&O Canal and the Potomac River Basin.

We look forward to the successful implementation of this project, protecting the natural and historic resources during construction, and to the end result - a cleaner and more healthful Potomac River. Thank you again for the opportunity to comment.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 12

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Stephen J Crimmins |
| Organization: | Friends of Georgetown Waterfront Park |
| Organization Type: | O - Civic Groups |
| Address: | 1077 30th Street NW<br>Washington, DC 20007<br>USA |
| E-mail: | SCrimmins@mmlawus.com |


## Correspondence Information

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| Status:New | Park Correspondence Log: |
| Date Sent: Nov 28, 2018 | Date Received: Nov 29, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

COMMENTS BY FRIENDS OF GEORGETOWN WATERFRONT PARK

Friends of Georgetown Waterfront Park (FOGWP) submits the following comments in response to the October 2018 Potomac River Tunnel Environmental Assessment prepared by DC Water and the National Park Service. FOGWP can be contacted through its board member Stephen J. Crimmins at the address below.

I. FOGWP's Interest in the Environmental Assessment

The Georgetown Waterfront Park is widely celebrated as a crown jewel in one of the nation's premier historic districts. It is an open and welcoming green space spanning ten acres along a wide river. It offers a respite from urban pressures and intensity, particularly on the neighborhood's crowded weekends. It restores the link between town and river, long lost over decades of industrial development and then decay. It is both beautiful and therapeutic for a large and diverse group of urbanites and visitors. This is not just any park. It is very important to Georgetown and Washington.

The Waterfront Park is also a key driver of the local economy. Hundreds of thousands of visitors from the city, the region and around the world visit the Waterfront Park each year. And as Georgetown's most visited park it serves as a magnet both for the historic district and for Georgetown's many shops, hotels and restaurants. The Waterfront Park thus has a substantial positive impact on the Georgetown economy as well as on District tax revenues.

FOGWP is a §501(c)(3) nonprofit organization established to support the Waterfront Park. FOGWP is an all-volunteer organization, with a board of directors and advisory board, and with no paid staff and minimal administrative costs. Its goal is to devote virtually all of the substantial funds it raises to park maintenance and enhancement. Formed in 2005 as a successor to earlier groups, FOGWP teamed with Georgetown residents and businesses, members of Congress, the District government and the National

Park Service to raise the $23 million in public and private funds needed to begin constructing Phase 1 of the Waterfront Park in 2006, and to finish Phase 2 in 2011. This effort brought to fruition the design for the Park by the nationally respected landscape architectural firm of Wallace, Roberts and Todd (now known as WRT, LLC), based in Philadelphia and San Francisco.

FOGWP continues to raise funds to supplement NPS maintenance, including money to replace and add trees, shrubs, grasses, perennials and other features. Most recently, FOGWP teamed with NPS and the District government to raise $400,000 in private and public funds for extensive repairs next spring to the Waterfront Park's iconic fountain at the foot of Wisconsin Avenue, which appears prominently in tourist guides for Washington distributed around the world, and which is located just a block or so east of the proposed sewer excavation and construction. Again, the Georgetown Waterfront Park's international visibility and renown underscores its role not simply in providing a green refuge for urbanites, but as a key contributor to drawing visitors from near and far to Georgetown and Washington.

II. Green Infrastructure MUST Be Made to Succeed

A. The Consent Decree's Green Infrastructure Requirements. Over two years ago, on 1/15/2016, Judge Thomas Hogan of U.S. District Court in Washington amended the consent decree in the Potomac River cleanup case, Anacostia Watershed Society v. DC Water and Sewer Authority, 00-CV-183-TPH (DDC) (Dkt. #124), which remains pending on the court's active docket. Judge Hogan acted with the agreement of all of the parties appearing before him. The case, naming both DC Water and the District, consolidates complaints filed by public interest groups and by the Justice Department on behalf of the EPA.

For Georgetown, the 2016 amended consent decree directs the use of so-called "green infrastructure" (referred to as "GI" in the amended decree), which uses sound environmental approaches to manage stormwater runoff. (The decree requires reduction in the volume of stormwater entering the sewers to let them do their job of carrying away wastewater without overflowing into the river.) Examples of green infrastructure provided to Judge Hogan as he considered amending the consent decree included "bioretention practices (bioretention cells, bioswales, vegetated filter strips, and tree box filters), rooftop collection practices (green roofs, blue roofs, downspout disconnection, rain barrels, and cisterns), permeable pavement, and large-volume underground storage," as well as modification of existing diversion structures "to increase diversion capacities." (Consent Decree, Appendix E, Dkt. #124-5, §3.2.1) These techniques were presented to the judge as examples, not all are required, some may be used on only a very limited basis, and some may be entirely inappropriate.

Based on both environmental and historic concerns in Georgetown, the consent decree prioritizes green infrastructure over so-called "gray infrastructure." Gray infrastructure is exemplified by the kind of concrete-based sewer structures described in the Environmental Assessment. Green infrastructure would achieve the goal of diverting stormwater away from Georgetown's sewers so they can effectively carry away wastewater, while at the same time protecting our historic district from the kind of heavy construction allowed elsewhere.

The amended consent decree, which was the result of detailed and principled discussions by both sides in the case, wisely includes the following green infrastructure requirements:

• Green infrastructure for Georgetown is formally adopted as a Court mandate. "DC Water shall implement the Green Infrastructure Program for the Potomac sewershed in accordance with the requirements and schedules in Appendix F to this Decree," which covers the CSO 27, 28 and 29 sewersheds in Georgetown. (Decree, ¶25, pp. 19-20) "The Court shall retain jurisdiction to enforce the terms and conditions of this Consent Decree...." (Decree, ¶106, p. 47)

• DC Water and the District must work together do everything needed to make green infrastructure work for Georgetown. Appendix F to the Decree (Dkt. #124-6) obliges the District "to provide the public space necessary for DC Water to construct GI to control ... 133 acres ... in the CSO 027, 028 and 029 sewersheds," lower Georgetown. "The District and DC Water will establish procedures for identifying GI locations, technologies, and issuance of permits for construction, operation and maintenance and other matters in a" memorandum to be executed by 1/15/2018. (Appendix F, §III.A.1, pp. 7-8)

• DC Water has to actually construct green infrastructure for 44 of the 133 sewershed acres in Georgetown before claiming it won't work for the remaining 89 acres. DC Water must "award contract" for construction of green infrastructure for 44 of the 133 acres by 6/23/2017. After constructing and placing in operation green infrastructure for those 44 acres (and no later than 11/23/2020), DC Water may submit a "post-construction" report to the EPA commenting on the practicability of using green infrastructure for the remaining 89 of the 133 Georgetown acres. Only if EPA approves, and subject to continuing court oversight, DC Water may thereafter adopt a tunnel alternative. (Appendix F, §II.C, pp. 3-4)

• DC Water bears the burden of proving green infrastructure won't work, after allowing the public to be heard and Judge Hogan ultimately to make the determination. "In the case of requests for modification of the Selected CSO Controls and/or schedules..., DC Water shall bear the burden of demonstrating that the requested modification should be approved...." (Decree, ¶79, p. 38) The Selected CSO Controls are defined to include the green infrastructure requirements for Georgetown in ¶25 of the Decree. "In the event DC Water requests a material modification to the Selected CSO Controls ... DC Water shall arrange for additional public participation prior to submitting the modification request to" federal authorities, and if approved, any modification must be "lodged with the Court for a period of public comment prior to entry." (Decree, ¶103. pp. 46-47)

DC Water and the District were among the parties who collectively petitioned Judge Hogan to impose these green infrastructure directives for Georgetown in his 2016 amended consent decree. FOGWP much appreciates this principled step taken by DC Water and the other parties, and it is confident of DC Water's commitment and ability to make green infrastructure succeed in Georgetown.

B. DC Water's Efforts to Date to Deploy Green Infrastructure. At an open-house format community meeting on 11/14/2018 at the West End Library, representatives of DC Water described its current and ongoing work to implement the green infrastructure required by the court in its 2016 amended consent decree. Based on the description provided by DC Water at the meeting, FOGWP understands that DC Water is presently installing green infrastructure in about a third of the affected Georgetown sewershed area (mostly in Burleith). This consists largely of installing permeable pavement in alleys and some parking strips, as well as maximizing green space where possible.

FOGWP understands that, after completing this work, DC Water will then spend a full year measuring the efficacy of the green infrastructure it installs to determine whether it should be extended to the rest of our sewershed. If green infrastructure is deemed to work, DC Water will then not have to tear up the Waterfront Park or disrupt the K Street traffic so critical to Georgetown merchants and offices, as well as residents and visitors. A key point during this one-year evaluation process is that there be careful measuring of the success of green infrastructure as actually installed.

Based on what was presented to the court in 2016, it appears that green infrastructure is likely to succeed in Georgetown. Appendix E to the amended consent decree provided DC Water's detailed modeling that supported the concept of a green infrastructure approach for Georgetown. The analysis concluded that "the data show that the green infrastructure controls are predicted to provide a degree of water quality performance in the receiving water equivalent in the gray controls" used elsewhere. (Appendix E, §3.2.2, and Tables 3-3 and 3-4, emphasis added) FOGWP believes that evaluation of the actually installed green infrastructure in the Georgetown sewershed will show that DC Water's modeling in the 2016 amendment to the consent decree was accurate.

C. Green Infrastructure Proven Effective. By way of context, it cannot be stressed enough that green infrastructure is a viable reality that has a successful track record. The U.S. Environmental Protection Agency squarely endorses green infrastructure. EPA notes on its website that "green infrastructure practices provide important environmental, social, and economic benefits." It further notes that "the water quality benefits of green infrastructure are most dramatic when green solutions are integrated throughout a watershed," as the amended consent decree provides for Georgetown. (https://www.epa.gov/green-infrastructure)

The Georgetown Climate Center, part of Georgetown Law School, has published a "Green Infrastructure Toolkit" that "identifies the best green infrastructure practices from cities across the country" designed to "retain and treat stormwater where it falls instead of relying on traditional, concrete-based systems largely underground." The Georgetown Climate Center may be a resource that could lend its expertise to assist in deployment of green infrastructure here in Georgetown. (https://www.georgetownclimate.org/adaptation/toolkits/green-infrastructure-toolkit/introduction.html). By way of illustration, the San Francisco Public Utilities Commission is presently implementing a Sewer System Improvement Program to "construct, monitor and evaluate eight green infrastructure projects to manage stormwater before it enters our combined sewer system in each of San Francisco's eight urban watersheds." Its Chinatown Spofford Alley project was completed in Summer 2018 and is already using green infrastructure to "capture, treat and absorb" stormwater runoff. (https://sfwater.org/index.aspx?page=614)

Green infrastructure is also widely supported internationally. For example, a 6/5/2013 official communication from the European Commission to the European Parliament on "Green Infrastructure (GI) - Enhancing Europe's Natural Capital" called for green infrastructure as a "successfully tested tool for providing ecological, economic and social benefits through natural solutions" (https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52013DC0249). And a follow-on 2014 publication by the European Environment Agency, "Spatial Analysis of Green Infrastructure in Europe" (EEA Technical Report No. 2/2014), commented (page 24) on the "benefits" of green infrastructure for water flow regulation, specifically use of pervious green spaces and plantings to "capture water flow runoff from impervious cover before it reaches overburdened sewer systems."

Much closer to home, the Georgetown Waterfront Park is itself an example of successful green infrastructure. Throughout the Park are rain gardens and stretches of bio-engineering revetments that were installed as green infrastructure measures. Overall, nearly 80% of former impervious paving originally found within the Park's 10 acres was replaced by pervious greenery. Green infrastructure is the future, and all of Georgetown will profit from its expanded deployment in our neighborhood.

D. Making Green Infrastructure a Reality. Based on its wide acceptance by EPA, other American cities and authorities internationally, there should be no question that green infrastructure can succeed in Georgetown. The only question is whether it will be pushed hard enough to make it succeed. This is very important, and a serious effort is called for, not a half-hearted approach. Consistent with

Georgetown's character and history, all available green infrastructure techniques that are appropriate should be deployed. FOGWP understands that this is what DC Water wants, and FOGWP appreciates its efforts.

The Environmental Assessment describes some of the green infrastructure techniques that can be deployed here to assure success. Among other things, these techniques include permeable paving in Georgetown's alleys and parking spaces, with this porous paving set on top of gravel beds that act as natural stormwater runoff storage areas. Likewise, Georgetown's red brick sidewalks are already required for historic reasons to be set without cement, meaning that if all neighborhood sidewalks were brought into compliance with this requirement, the spaces between the bricks would make all of our sidewalks permeable. This stormwater absorption capability of our uncemented brick sidewalks can be enhanced by resetting them above finely crushed gravel (that serve as stormwater runoff storage beds) wherever possible, similar to the approach to be used under permeable paving in the alleys. While our sidewalk bricks already sit on a thin bed of sand or gravel, resetting them on deeper gravel beds will enhance their ability to hold stormwater runoff as it evaporates or seeps into the aquifer below. Similarly, the "large-volume underground storage" described to Judge Hogan can, where appropriate, be deployed to hold stormwater while it disperses.

Many other techniques are available in the green infrastructure "toolkit." For example, additional planted areas set above gravel storage beds to retain water runoff can be installed, most obviously by extending the existing curbside tree boxes from just a few in many blocks to much longer continuous strips wherever feasible, with the strips filled with trees, flowers and native grasses. Also where feasible and appropriate, curb extension beds for flowers again atop gravel storage beds can be deployed. This expansion of sidewalk edge flowers, trees and other greenery would materially enhance Georgetown's appearance.

The Environmental Assessment makes plain that DC Water can and will respect the historic and cultural aspects of Georgetown as part the green infrastructure process, and that it will regularly consult with and accommodate stakeholders. Thus, for example, the historic cobblestone pavers and streetcar tracks along O and P Streets will not be touched. Nor will other historic fixtures throughout the neighborhood. Green infrastructure will be installed around these features and not in their place. Nor will government agents invade private property to dig bioswales or force residents to accept unwanted rainwater collection barrels. As noted above, there are many different forms of green infrastructure, and if particular forms cause problems or are unduly disruptive, resort will be had to other forms. The Environmental Assessment explains how DC Water will install green infrastructure in Georgetown in a sensitive way (page 50):

"[D]ue to the small scale of the individual GI [green infrastructure] facilities that would be implemented, construction durations would be relatively short, and equipment needed to construct the facilities would be small and similar to equipment used for neighborhood utility work, which would minimize the impact. DC Water would ensure that safe pedestrian detours are provided around GI construction areas to ensure accessibility to residences, retail, entertainment, and other destinations within the neighborhood. To minimize long-term impacts from the implementation of GI, sites would be identified, and GI technologies selected, taking into consideration the historic character of Georgetown. DC Water would coordinate closely with project stakeholders to ensure that context-sensitive designs are developed to minimize impacts on character-defining features that contribute to the neighborhood's significance as a Historic District and a National Historic Landmark."

Overall, these construction steps would be localized for brief period in particular blocks, and would thus be less disruptive to Georgetown than the alternative massive "gray" construction project that would clog K and M Streets for two years. And construction of green infrastructure would be less expensive than the gray project. If at the end of the day green infrastructure were not deemed effective, then DC Water would proceed with the lower Georgetown sewer construction described in its recent Environmental Assessment. As discussed below, such "gray" construction would wield a serious blow to the Waterfront Park and to all of Georgetown.

For these reasons, green infrastructure MUST be made to succeed through vigorous deployment followed by a fair evaluation process. FOGWP urges all involved in the evaluation to remember that green infrastructure involves many alternatives, and that if particular techniques prove less effective, others are available. FOGWP urges flexibility in adding alternative approaches where needed as part of and during the course of the evaluation process.

In particular, green infrastructure will not pass the evaluation test if only a few green techniques are deployed, in just limited areas of Burleith, and then measured in a binary thumbs-up-thumbs-down fashion. To succeed, green infrastructure must be deployed using a variety of appropriate solutions, in a variety of Georgetown locations, and using an iterative process. If something works, go with it. If not, try something else. This is how to make green infrastructure succeed, and not simply measure its failure. Based on its support for switching from gray to green infrastructure for Georgetown when parties were petitioning Judge Hogan to amend the consent decree in 2016, FOGWP knows that DC Water is committed to this process, and that NPS shares this view.1

III. Minimize Any Construction in the Waterfront Park

A. Construction Impact. If ultimately adopted, the "gray infrastructure" approach described in the Environmental Assessment would disrupt - for a construction period that would realistically extend for years - the use and enjoyment of the Georgetown Waterfront Park by the hundreds of thousands of Waterfront Park visitors each year. During this extended period, children will not play nor families relax anywhere near a large sewer dig and installation in progress in the middle of the park. The proposal would impact not just the appropriated construction zone, but additionally surrounding areas of the Waterfront Park will be, in varying degrees, effectively pulled out of public service as collateral damage during the construction.

Gray infrastructure construction would also destroy mature plantings in appropriated areas, and when construction is finally done years later, it would take a decade for their replacements to grow to the present magnificent state of the existing plantings. Saplings and small bushes are pale shadows of the lush foliage that has filled out the Waterfront Park over the last decade. The ensuing decade needed to regrow this flora will be a decade missed as children grow up and adults move on without the full civic and natural pleasures they now enjoy in the affected areas of the Park.

B. DC Water's Mitigation Efforts. At the 11/14/2018 community meeting at the West End Library, DC Water representatives advised us that they had revised their construction plans based on earlier FOGWP comments that were submitted during the National Historic Preservation Act "Section 106 process" in July 2018. In what is now its "preferred" Option 1 in the Environmental Assessment, DC Water is proposing to substantially reduce the total area of the Waterfront Park it would physically occupy during the construction period. FOGWP sincerely appreciates this responsiveness to its concerns in this regard by DC Water.

Essentially, DC Water has taken FOGWP's suggestion to move much of the construction out of the Park and instead to build on and under K Street (also known as Water Street in those blocks). This mimics the approach proposed for K and 30th Streets, where much of the

1 The Georgetowner has reported that the District is beginning to repave certain alleys and streets in Georgetown. Before this effort proceeds much further, it would make sense to build green infrastructure into whatever is done. The paving in alleys and in the parking strips along streets should be permeable. All for a greener Georgetown.

construction is similarly to be on and under K Street. In both locations traffic would be diverted principally by shifting lanes. The Environmental Assessment (p. 19) describes the new approach for construction at the Waterfront Park as follows:

"CSO Control Option 1 would be located at the intersection of K Street NW and Potomac Street NW.... This reduces the amount of construction within Georgetown Waterfront Park by locating structures within K Street NW (beneath Whitehurst Freeway). A diversion chamber, approach channel, and drop shaft would be constructed within public space at the intersection. Temporary lane and sidewalk closures would be required within K Street NW and Potomac Street NW, maintenance of traffic controls would be provided to maintain vehicular and pedestrian circulation to the extent practicable. ..." (emphasis added)

This preferred Option 1 is depicted in Figure 2-15 (p. 20) of the Environmental Assessment. This photo-overlay diagram shows that the proposed construction area will be largely in the K Street area, with just a narrow strip of parkland being taken along the edge of K Street. Importantly, limiting construction as described in Option 1 would preserve untouched most of the adjacent lawn, an area much used by Park visitors for picnics and lounging, between the occupied construction strip along K Street out to the river.

Even more importantly, Option 1 would preserve intact both of the Park's "pollinator" gardens. These gardens, packed end-to-end with native flowers in warmer months, are sited on the strips running across the Park from Potomac Street to the river and from 33rd Street to the river. Not only are the massed flowering plant beds in these two strip gardens a magnet and support for endangered bees, but they also are a magnet for visitors who linger there to watch the many bees at work and who use the flowers as a backdrop for their photos. FOGWP raised private funding for both of these pollinator gardens, and it views their uninterrupted preservation for Park users as critical. This further underscores the need to adhere to Option 1 if any gray infrastructure construction is undertaken.

The original construction plan is reflected in what is now called Option 2, which FOGWP appreciates is not the option preferred by DC Water. Under Option 2, as noted in the Environmental Assessment (p. 19), the "diversion chamber, approach channel, and drop shaft would be constructed within the park" (emphasis added). The diagram for Option 2 (Figure 2-17, p. 21) shows that it would take a large portion of parkland by entirely destroying both of the pollinator gardens, and by taking virtually all of the parkland between the two pollinator gardens from K Street all the way out to the river. Needless to say, this would be an environmental disaster and seriously harm park users. FOGWP is very pleased that DC Water has made it clear to all that this is not its preferred option.

A separate issue that must be considered is what will be the location of "an emergency surge relief pipe required to protect the low-lying area between CSO 024 [at K and 30th Streets] and 028 [just west of the Aqueduct Bridge at 36th Street] from flooding due to transient flows within the tunnel system during extreme filling events." The Environmental Assessment (p. 19) goes on to note that this emergency surge pipe "may also be constructed as part of the CSO 028 Control," immediately west of the Aqueduct Bridge along the river. If the emergency surge pipe is located at CSO 027 (the Waterfront Park), this would "require construction through Georgetown Waterfront Park to connect to the Potomac

River." As shown in Figure 2-16 (p. 20), this additional construction would destroy one of the two pollinator gardens, destroy almost the entire lawn between Potomac and 33rd Streets, and run the construction zone right out to the river. For obvious reasons, FOGWP strongly opposes locating the emergency surge pipe in the Waterfront Park and, if it must be constructed, urges that it be located in the vacant lot out by the Aqueduct Bridge. FOGWP is very pleased that DC Water prefers locating the emergency surge pipe west of the Aqueduct Bridge at CSO 028, and not in the Waterfront Park at CSO 027.

NPS has also expressed its preference for the Option 1 favored by DC Water. Additionally, NPS has expressed its preference for not locating the emergency surge relief pipe at CSO 027 in the Waterfront Park. NPS's views are set forth in the Environmental Assessment (pp. 26-27, and Table 2-4). FOGWP likewise appreciates NPS's preferences on these points.

C. Considering Alternatives. Again as just noted, FOGWP much appreciates the progress made so far thanks to DC Water's mitigation efforts described above, and thanks to the well-considered preferences expressed by both DC Water and NPS. That said, FOGWP asks all concerned to continue to keep an open mind to exploring alternatives.

Among other things, FOGWP requests that DC Water reconsider one of the alternatives presently rejected in the Environmental Assessment (p. 29). That alternative would not disturb the Waterfront Park at all, and would instead move all of the construction out of K Street and instead relocate it under Potomac Street. This approach is rejected because of the relatively narrow width of Potomac Street, as well as perceived difficulties in managing traffic, building access and utilities during the construction process.

FOGWP understands these concerns, but suggests they could be overcome by simply locating the actual excavation for the Potomac Street location not in the middle of Potomac Street itself, but instead in the adjacent Fishmarket Square open space, just a few feet north, at the point where Potomac Street bends east into Grace Street. Fishmarket Square would offer immediate access to the Potomac Street location with wide and ample room for construction. The collateral benefit would be that the area's "restoration" funds could then be used not to replicate the present dull brick plaza, but instead to construct the proposed redesign for Fishmarket Square offered by Georgetown Heritage and its C&O Canal Park design consultants at James Corner Field Operations (designers of New York's much acclaimed High Line park).

Still another alternative worth examining is the role the C&O Canal itself can play. As the Georgetown Business Improvement District noted in its 7/19/2018 comments to DC Water, "bio-filtered (or other passive treatment) surface rainwater might be directed into the canal before it enters CSO 27 and adds to the volume problem during high-volume rain events. There is already the precedent of unfiltered roadway water from Canal Road, and unfiltered rooftop water from adjacent properties entering the canal. We believe that there is a deal to be made that provides a passive, environmentally neutral method of handling a large volume of stormwater that would be cost effective for DC Water ratepayers, and provide long term support for canal maintenance." Alternatively, water runoff could be carried away in a below-ground tunnel dug using the less expensive open-pit method under the center of the canal bed, which descends naturally to the east. Again, the "restoration" funding for any canal-based effort could be used to fund Georgetown Heritage's excellent plans, actively supported by NPS and FOGWP, for reviving the Georgetown segment of the C&O Canal Park.

IV. Leave No Permanent Structures in the Waterfront Park

Apart from the construction impact discussed above, FOGWP's other major concern is what, if anything, will be permanently installed in the Waterfront Park as visible structures after the construction is completed. The Environmental Assessment (p. 19) appears to identify only one such structure to be left permanently in the Park: "Because the site is below the 100-year floodplain elevation, tunnel ventilation grating and access points to the ventilation control vault would be extended above-grade by approximately 3 to 5 feet to protect the tunnel system and ventilation equipment." In terms of dimensions, the Environmental Assessment states that "the above-grade portion(s) of the ventilation vault would be approximately 150 square feet."

At the 11/14/2018 West End Library community meeting, DC Water's representatives agreed that a structure 150 square feet (say 10 feet by 15 feet) that is 5 feet high, such as is proposed here, would be roughly the dimensions of a full-sized SUV (like the black Chevy Suburbans that the protective services use to escort officials around DC). So the structure would be about the size of one large full-sized vehicle occupying the overall footprint of a single parking space. Presently the Environmental Assessment (Figure 2-15, p. 20) shows this structure as being located on the Park lawn between Potomac and 33rd Streets.

At the West End Library meeting, FOGWP expressed its serious concern that locating this sewer exhaust fan structure in a lawn area in the Park would inevitably cause collateral damage to the entire surrounding lawn area around the shaft, not just to the structure's 150 square foot space. Nobody is realistically going to want to picnic, lounge or play anywhere near a big 5-foot high sewer vent structure. For this reason, FOGWP strongly requested at the meeting, and repeats its strong request here, that this SUV-sized sewer vent structure be relocated off of the Park lawn and over to a single parking space on K Street.

Specifically, instead of putting this SUV-sized structure on the Park's lawn, FOGWP requests that this SUV-sized structure be placed in a single parking space (or two if needed) in the strip of parking spaces that have recently been established between (i) the new two-way cycle track along the south curb of K Street, and (ii) the eastbound traffic lane on K Street. Locating the SUV-sized structure in a parking space would actually be much safer than parallel parking a real SUV in the space, as the same-sized sewer structure will not have passenger doors flying open and passengers egressing.

Alternatively, the SUV-sized structure could instead be located immediately along the K Street south curb in what is presently the cycle track itself, with the track then briefly swerving into a short detour through an appropriated former parking space or two. Again alternatively, the SUV-sized structure could instead be located on the sidewalk adjoining the K Street south curb, as there is a parallel Park path just 3 or 4 feet in from the sidewalk, and pedestrians could thus be easily diverted around the structure by using the Park path, as presently configured or as modestly reconfigured.

The important point is that, whichever alternative is chosen, the SUV-sized structure should not be located on the Park lawn where it will cause serious collateral damage for a much larger surrounding Park area. This is a simple and direct fix. Commenting unofficially, a DC Water representative at the West End Library meeting expressed the preliminary and personal view that our proposal to relocate the structure - by only a very short distance - is technically feasible, urged us to include it in our comments to the Environmental Assessment, and promised to give it serious consideration.

Finally, the Environmental Assessment makes general references to electrical cabinets and access doors. It does not appear that any of these are proposed to be located on the Waterfront Park's lawn or other parkland. However, if any such additional structures (even at-grade structures) are planned to be sited on parkland, FOGWP asks that they also be relocated to the K Street south sidewalk or road areas for the reasons stated above.

In sum, FOGWP strongly requests that its proposal for moving the SUV-sized structure (and any other permanent structures, even at-grade structures) off the Park lawn be adopted. This is consistent with the promise in the Environmental Assessment (p. 27) to deploy "mitigation" measures "wherever feasible," including to protect "visitor experience in the parks." In particular, the Environmental Assessment (p. 28) indicates that "design of at- or above-grade structures would be developed in coordination with the NPS and DC SHPO to minimize visual impacts of the facilities."

V. Comments on Other Impacted Areas of Georgetown

FOGWP's principal concern is obviously the threat that a "gray" infrastructure approach poses to the Georgetown Waterfront Park. As discussed above, this is a threat that can plainly be eliminated by effective deployment of "green" infrastructure across the Georgetown sewershed. However FOGWP also has concerns about the Environmental Assessment's preproposals for other parts of lower Georgetown.

Just a few months ago, the 5/2/2018 issue of the Georgetowner described the BID's "Georgetown Gateways" project, designed by the noted Beyer Blinder Belle architecture firm. For the Gateway at K and 29th Streets, probably "the first to be constructed" according to the Georgetowner, "a series of girders will be illuminated to mark a pathway of frames along the waterfront," along with "crosswalks for pedestrians and bicyclists ... clearly distinguished using unique and contrasting paving materials for safety and visibility," and possibly additional "pocket parks and gardens" and other "architectural features." In particular, FOGWP supports creation of such parks and gardens in this area of Georgetown that is now dominated by cars.

Instead, the Environmental Assessment is proposing to give us years of heavy sewer construction at this "Gateway" location. Apart from killing this civic improvement for the foreseeable future, the proposal fails to take account of a variety of physical and logistical obstacles to its plans for construction at that location. For example: (i) There may be no block in the District with so much utility infrastructure in such a small area as the 2900 block of K Street NW. (ii) This block is the main route for vehicles and cyclists entering and leaving lower Georgetown, and there is no alternative routing that can reasonably accommodate traffic detoured from the 2900 block of K Street. (iii) The Saudi Defense Ministry owns and occupies the building at the northeast corner of 30th and K Streets, and the Georgetown Suites Hotel (south building) accommodates tourists and business travelers at the northwest corner of 29th and K Streets, so both are immediately adjacent to the construction site and literally within feet of the sewer dig. (iv) Major construction is planned at the former West Heating Plant, including its tank farm (to be reconstructed as a public park) immediately adjacent to the sewer construction at the northeast corner 29th and K Streets, and if sewer construction overlapped this would magnify the disruption for those nearby and for traffic.

FOGWP wonders if the construction and facilities planned for the 2900 block of K Street could be shifted about 50 to 100 yards east where there are multiple and ample areas of unused open space wedged between highway ramps. A big dig there would not require traffic diversion, would largely go unnoticed except by speeding motorists, and could leave above-ground structures behind that would not be objectionable. The sewer excavation and construction on the open land found at that point would move construction entirely off K Street, and thus not create the hardship for Georgetown merchants and offices that sewer construction would inevitably cause if located in the 2900 block of K Street, a principal Georgetown gateway.

Alternatively, sewer work moved slightly east could also be combined with the longtime vision to "fix" the intersection of K Street, 27th Street, Rock Creek Parkway, and Virginia Avenue, a 70-year old relic of plans to blanket the District with freeways that fortunately did not progress very far. What remains is an inefficient and confusing interchange that impedes traffic flow and is presently a vast wasteland of highways, ramps to nowhere, and stalled traffic. Replacing all this with two or three at-grade intersections, controlled with lights and turn lanes, would considerably simplify and ease traffic management at a critical juncture. Plus, what is now a large amount of inaccessible and unused open space wedged between highways would be freed up as additional parkland for Rock Creek Park and the Foggy Bottom neighborhood.

At the other end of lower Georgetown, the Environmental Assessment proposes sewer construction that would carve up the land near Potomac Boat Club and Washington Canoe Club that has been targeted for a "boathouse row" to serve college and high school rowers across the region. This expanded "non-motorized boathouse zone," already the focus of considerable study and public interest, would have a broader positive impact for the entire area, like the urban boathouses that presently grace the Schuylkill, Harlem and Charles Rivers. Such plans for the Potomac, now long delayed, would only be further delayed by years of sewer construction. Disruption at this presently vacant location (CSO 028) is obviously far preferable to tearing up the Waterfront Park (CSO 027). But as this would impact proposed park-related uses very close to the Waterfront Park, it is also of some concern for FOGWP.

VI. Conclusion

FOGWP shares the goal of the amended consent decree to improve the Potomac's water quality, particularly as the river is such a large presence and focal point in the Georgetown Waterfront Park. Among other things, we all long for the day when the river will again be safe for swimmers and wildlife. But FOGWP urges all concerned that it would be very shortsighted to achieve the important environmental goal of a clean river by sacrificing other important environmental goals like open and green parklands. Alternatives exist to give us both.

FOGWP thanks all involved for the opportunity to submit these comments and otherwise make its views known, and it requests the opportunity to participate in further discussions on these issues. FOGWP looks forward to working productively with all interested stakeholders to achieve an overall resolution that is in the public interest.

November 28, 2018

FRIENDS OF GEORGETOWN WATERFRONT PARK
by: Stephen J. Crimmins (FOGWP board member)
1077 30th Street NW, Washington DC 20007
SCrimmins@mmlawus.com / 202.317.0037

Copies furnished to interested parties:
Jack Evans, DC City Councilmember, Ward 2
Schannette Grant, Chief of Staff, Office of Councilmember Evans
Ruth Werner, Committee Director, Office of Councilmember Evans
Sherri Kimbel, Director of Constituent Services, Office of Councilmember Evans
Joe Florio, Director of Communications, Office of Councilmember Evans
Joe Gibbons, Advisory Neighborhood Commission Chair, ANC2E
Monica Roache, Vice Chair, ANC2E
Lisa Palmer, ANC Representative, ANC2E-05 (Lower Georgetown)

Peter Sacco, Executive Director, ANC2E
Julia Washburn, Superintendent, Rock Creek Park, National Park Service
Nick Bartolomeo, Rock Creek Park, National Park Service
Joseph Sternlieb, CEO and President, Georgetown Business Improvement District
Nancy Miyahira, VP and Marketing Director, Georgetown BID
John Wiebenson, Operations Director, Georgetown BID
Will Handsfield, Transportation Director, Georgetown BID
Lauren Boston, Communications Director, Georgetown BID
Jamie Scott, Director of Planning and Economic Development, Georgetown BID
Pamla Moore, President, Citizens Association of Georgetown
Richard deC. Hinds, General Counsel, CAG
Walter Groszyk, Infrastructure Committee Chair, CAG
Elsa Santoyo, Historic Preservation & Zoning Chair, CAG
Leslie Maysak, Executive Director, CAG
Jennifer Romm, Chair, Georgetown Heritage
Richard Levy, Vice Chair, Georgetown Heritage
Maggie Downing, Director of Public Programs & Partnerships, Georgetown Heritage
Scott Walzak, Georgetown Canal Plan Project Manager, Georgetown Heritage
Ann Satterthwaite, Chair, Friends of Georgetown Waterfront Park
Board Members, Friends of Georgetown Waterfront Park

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 13

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Yaniv S Franco |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1013 Paper Mill CT NW<br>Washington, DC 20007<br>USA |
| E-mail: | francoy13@gmail.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 30, 2018 | Date Received: Nov 30, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

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Alternatives to these plans must be considered. First, green infrastructure solutions are plentiful and should be thoroughly vetted before any gray infrastructure options are considered. A combination of

green rooftops, expanded tree planter boxes, permeable pavement, and numerous other green solutions would both beautify the community and avoid the need for heavy construction.

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Improving the Potomac River's water quality is a shared goal, but it would be shortsighted to achieve the environmental goal of a clean river by sacrificing the environmental, community, and business benefits of Georgetown Waterfront Park. Alternatives exist that give us both, and these alternatives should be pursued.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 14

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | N/A N/A |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | |
| | Washington, DC 20007<br>USA |
| E-mail: | |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 30, 2018 | Date Received: Nov 30, 2018 |
| Number of Signatures: 1 | Form Letter: No |
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# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 15

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Kim Paul |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1041 Paper Mill Court, NW<br>Washington, DC 20007<br>USA |
| E-mail: | kim.paul@4kast.net |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 30, 2018 | Date Received: Nov 30, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

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# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 16

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Chantal M COUTURIER |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 2700 Virginia Ave NW<br>Apt 811<br>Washington, DC 20037<br>USA |
| E-mail: | couturier.chantal@gmail.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 30, 2018 | Date Received: Nov 30, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

The location seems totally inappropriate for this type of project. The park attracts many tourists and locals and is relatively small, this is the type of project which should be outside of Georgetown, more towards the West for example.
Not talking about the smell either.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 17

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Patricia D Kellogg |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 2700 Virginia Ave, apt 1002<br>Washington, DC 20037<br>USA |
| E-mail: | patkellogg@mac.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 30, 2018 | Date Received: Nov 30, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

I am enclosing comments from others with which I fervently agree. An alternate solution must be found.

DC Water's construction of the Potomac River Tunnel and its related infrastructure must minimize any temporary and permanent impacts to the Georgetown Waterfront Park (the "Park"). Green infrastructure solutions are readily available and must be considered first. To the extent that any concrete-based sewer structures or other "gray infrastructure" is necessary (and only if a green alternative is not viable), construction work should avoid the Park to the greatest extent possible, and any permanent structures should be located outside of the Park.

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Improving the Potomac River's water quality is a shared goal, but it would be shortsighted to achieve the environmental goal of a clean river by sacrificing the environmental, community, and business benefits of Georgetown Waterfront Park. Alternatives exist that give us both, and these alternatives should be pursued.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 18

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Robin R Clarke |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 2700 Virginia Avenue NW<br>apt. 1202<br>Washington, DC 20037<br>USA |
| E-mail: | robin.clarke39@gmail.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Nov 30, 2018 | Date Received: Nov 30, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

I cannot imagine a more disastrous idea to ruin the wonderful and enormously successful Waterfront Park.
Whenever I go there I hear many different languages spoken and see happy people enjoying the waterfront.
For goodness' sake let's leave it as it is for the enjoyment of everyone from the neighborhood and fro the world at large.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 19

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Margaret E Hardon |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1011 Papermill Court NW<br>Washington, DC 20007<br>USA |
| E-mail: | Megh3@verizon.net |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Dec 2, 2018 | Date Received: Dec 2, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Dear NPS,
I am a 30 year resident of lower Georgetown and have had the good fortune to observe the hard work and funds that transformed our waterfront neighborhood from its industrial past to a ribbon of natural life, and the role that the waterfront park plays in our community. The park is clean, it is open space, it connects us to the river and wildlife. It makes our community more livable in an evermore crowded city. To disrupt the serenity and beauty of this park with concrete structures to emit sewage emissions is misguided approach to solving excessive rainwater runoff. I urge you not to allow the disruption of the park.

Additionally, l urge DC Water not consider adding such infrastructure to our roadway. Having lived adjacent to the Whitehurst Freeway for 30 years, I know well how all sounds and smells on Water Street are amplified by the Whitehurst and directed up our small streets. Sewage emissions would all be blown up into our residences. Might these structures also create more rat habitats?

I understand that green infrastructure in upper Georgetown is an alternative solution and I urge NPS and DC Water to take that option. There are hundreds of homes and thousands of residents in lower Georgetown, there are thousands of workers and shoppers in our neighborhood, and vast numbers of tourists too. Why give a permanent black eye to the park and its surrounding neighborhood?

Sincerely,
Meg Hardon
Papermill Court NW

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 20

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Deborah Lutterbeck |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1031 Cecil Place NW<br>Washington, DC 20007<br>USA |
| E-mail: | deborahdlutterbeck@gmail.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Dec 2, 2018 | Date Received: Dec 2, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

It took decades to deliver Georgetown Waterfront Park. A combination of public and private funding has transformed what was once a parking lot and a place for the city to store salt into magnificent park that attracts thousands of visitors from the city, the region, and around the world.
I have lived near the park for two decades I have had a first hand experience in seeing how it has transformed not only the Georgetown neighborhood - - but has served as a grace note in the nation's Capitol. It also represents a considerable financial investment - - $23 million investment of private and public fund.
DC Water's proposed plans for the Potomac River Tunnel would undermine all of this. Both Options 1 and 2 would require construction that would displace mature trees and take up widely used public space. There are alternatives.
There are plenty of green infrastructure solutions that should be thoroughly vetted before any gray infrastructure options are considered. This could include a combination of green rooftops, expanded tree planter boxes, permeable pavement, and numerous other green solutions would both beautify the community and avoid the need for heavy construction.
Second, and only to the extent that green solutions are studied and found not viable, any gray infrastructure should avoid construction in the Park and locate all permanent structures outside the Park. As others have noted, one option would be to move the construction work out of the Park and to build on and under K Street / Water Street, leaving any permanent above-grade structures in the existing paved parking spaces along K Street. Alternatively, the work could be installed in Fishmarket Square or even under the C&O Canal bed, where the higher elevation would avoid the need for permanent above-grade structures. There would seem to be ample alternatives that can satisfy the Potomac River Tunnel's objectives without sacrificing the many benefits offered by Georgetown Waterfront Park.
As others have said, improving the Potomac River's water quality is a shared goal, but it would be shortsighted to achieve the environmental goal of a clean river by sacrificing the environmental, community, and business benefits of Georgetown Waterfront Park. Alternatives exist and these alternatives should be pursued.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 21

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | N/A N/A |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | |
| | Washington, DC 20007<br>USA |
| E-mail: | |


## Correspondence Information

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| Status:New | Park Correspondence Log: |
| Date Sent: Dec 2, 2018 | Date Received: Dec 2, 2018 |
| Number of Signatures: 1 | Form Letter: No |
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# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 22

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | N/A N/A |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | |
| | Washington, DC 20007<br>USA |
| E-mail: | |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Dec 3, 2018 | Date Received: Dec 3, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

I would like to join my neighbors in suggesting other options like green infrastructure in upper Georgetown (permeable sidewalks and tree boxes for example) would be a far better solution than digging up the park.

DC Water's construction of the Potomac River Tunnel and its related infrastructure must minimize any temporary and permanent impacts to the Georgetown Waterfront Park (the "Park"). Green infrastructure solutions are readily available and must be considered first. To the extent that any concrete-based sewer structures or other "gray infrastructure" is necessary (and only if a green alternative is not viable), construction work should avoid the Park to the greatest extent possible, and any permanent structures should be located outside of the Park.
I hope,you take into consideration the suggestions from concerned neighbors who only want what is best for the park and the impact that this work will have on us.
Thank you

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 23

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Rachel Scarr |
| Organization: | Harbourside |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 740 15th Street, NW, Suite 200<br>Washington, DC 20005<br>Washington, DC 20007<br>USA |
| E-mail: | rachel.scarr@streamrealty.com |


## Correspondence Information

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|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Dec 3, 2018 | Date Received: Dec 3, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

We have reviewed the documents regarding the Potomac River project, Potomac_River_Tunnel_EA_508_2018_10_25.pdf, specifically how it affects our managed property, Harbourside, 2900 K Street, NW on pages 17 and 18. Our only concern is if there is a need for electrical connections for the diversion chamber on 30th Street and the connections equipment is above grade we request that the above ground electrical connections could be put on the opposite side of the street from our building. Additionally, we ask that plans for the traffic flow during the work be provided ahead of time for comment as the street is heavily utilized.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 24

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Patrick Reed |
| Organization: | DDOT ; Member |
| Organization Type: | T - Town or City Government |
| Address: | 55 M Street SE<br>Suite 500<br>Washington, DC 20003<br>USA |
| E-mail: | |


## Correspondence Information

| | |
|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Dec 3, 2018 | Date Received: Dec 3, 2018 |
| Number of Signatures: 4 | Form Letter: No |

Notes: Four authors: Patrick Reed, Haley Peckett, Michael Alvino, Katie Kowalczyk

## Correspondence Text

DC CLEAN RIVERS PROJECT - POTOMAC RIVER TUNNEL
DDOT Assessment of Effects Comments

DDOT Reviewers: Patrick Reed (PR) - Public Space/Planning; Haley Peckett (HP) - DC Streetcar/Planning; Michael Alvino (MA) - Trails/Planning; Katie Kowalczyk (KK) - Green Infrastructure/IPMD

* indicates comments related to Section 106

Comment # Reviewer Page Section Comment Resolution

1 HP, MA N/A General

DDOT Projects within the Potomac River Tunnel project area (in addition to those listed in below comments):
- In the K Street ROW west of 29th Street, DDOT recently installed an on-street bike lane (barriers forthcoming) that should be considered in any CSO or green infrastructure design.
- Also in the same ROW, DDOT is planning to commence an EA with NPS to study a long-term, off-road bike path on NPS land between Water Street and the Potomac. This study would begin in Fall 2018 at the earliest.
- USGT Streetcar EA is currently under review by the lead federal agencies. Anticipated public release date is TBD.
- The EFL/NPS Rehabilitation of the Rock Creek Trail near the Kennedy Center (concept plans attached). This overlaps with Component 3.
- The proposed widening of Rock Creek Parkway at Virginia Avenue (concept plan attached). May conflict with Component 5.

- The Foundry Bridge/Trolley Trail feasibility study. This covers the same area as Component 11.

2* HP 13 Historic Properties
As part of the USGT Section 106 process, DDOT identified historic properties that do not appear to be captured on Slide 13. See Historic Properties attachment.

3 PR 12 Component 1
Page 12 of the supplied presentation notes that the tunnel alignment is "presented as a corridor to maintain flexibility." DDOT Planning & Sustainability Division (PSD) recognizes that some access/tunnel related infrastructure will need to be at the surface level. Per DC public space regulations manholes, hand holes, access hatches, cabinets, ventilation are not permitted in public space absent a compelling need. For all surface infrastructure, justification should be provided that alternatives have been exhausted.

4 PR 14 Component 1
In order to assess the public space impacts associated with the larger project, DDOT needs to see the actual proposed path or potential paths of alignment. It appears that the much of the tunnel, as conceptually proposed, falls on federal property rather than in DDOT's public space; however, the project team should provide a plan calling out the locations where tunnel boring under District of Columbia property is anticipated.

5 PR 14 Component 1
A traffic impact analysis may be necessary to assess impacts during construction if significant rerouting is proposed. If any stop controls, such as signals or beacons, are proposed in relation to Rock Creek Park trail rerouting, these may require a traffic impact analysis depending on the magnitude of impact. More information is needed for DDOT's review.

6 PR 16 Component 2
While the transportation network within the vicinity does not belong to the District of Columbia, DDOT PSD notes that there appear to be pedestrian and vehicular impacts associated with the construction staging for the northern option. As such, it would be DDOT's preference to select West Potomac Park South for the location of the mining site.

7 PR 18 Component 3
Both Component 3 options require closure and rerouting of Ohio Drive SW. The southern option falls south of West Basin Drive, which help rerouting SB traffic around the Tidal Basin and onto Maine during construction.

8 PR 19 Component 3
If the northern option is pursued, confirm whether or not Ohio Drive and Independence Ave will be closed simultaneously. What would be the duration of either street's closure?

9 PR 19-22 Component 3
Related to component 3, provide more information about the temporary Rock Creek Park Trail rerouting. What temporary paths are proposed? Will users be required to cross onto the other side of Rock Creek Parkway, and if so will this require temporary signals/beacons/other stop controls to accommodate pedestrians and cyclists?

10 HP 24, 31-32 Components 4, 7
DDOT is commencing a study (and potential NEPA document) studying multiple traffic options at the

K Street/I-66/Rock Creek Parkway/Virginia Avenue interchange. Proposed treatments include new access ramps. While there is no direct conflict at this time, the study will identify options for new vehicular and bicycle/pedestrian access in the area where Component 4 and 7 construction is proposed. This should be closely coordinated in terms of construction schedule.

11 PR 23 Component 4
It appears that underground structures (the drop shaft and diversion chamber) are shown within a DDOT ROW stub off of 27th Street NW (just south of the Whitehurst Parkway off-ramp). Above grade fixtures associated with the tunnel within DDOT public space will require a public space permit. Near this location, the tunnel appears to shift out from under federal property (Rock Creek) and under Virginia Avenue NW, prior to shifting back to Rock Creek Parkway. As previously noted, DDOT does not permit surface fixtures (vaults, hand holes, vent shafts, etc.) in public space without specific justification explaining how all options have been exhausted.

12 PR 24 Component 4
The notes in the matrix associated with Component 4 suggest that mature trees will need to be removed. Identify if any of the trees that will need to be removed fall within DDOT ROW. Tree removal from DDOT ROW will require a public space permit. DDOT cannot permit the removal of mature trees unless all other options have been exhausted.

13 PR 25-27 Component 5
Both proposed locations fall on federal property and are not subject to public space review. DDOT prefers that the project minimize impacts to the Rock Creek Park Trail. Location option two (Lincoln Memorial Volleyball Courts) requires temporary trail rerouting. Please provide diagrams of temporary paths.

14 PR 28 Component 6
It appears that CSO 021 is being constructed concurrently with the Kennedy Center, however, the adit shown on the plan under the Rock Creek Parkway is not yet constructed, and above ground closure impacts, including extent and duration, should be provided (if any).

15 HP 31 Component 7
DDOT's proposed loop ramp associated with USGT Streetcar (from WB K Street to SB 27th Street) should also be coordinated with new 27th Street tunnel. This loop ramp will also be included in the above mentioned study for possible implementation independent of streetcar.

16* HP 31-32 Component 7
DDOT would be interested to review Phase I and II archeology reports for Component 7. DDOT has identified archeological resources in the K Street/Rock Creek Parkway area and is including a Phase 1A archeology report in the USGT EA. This report can be shared once the EA is ready for public comment.

17 HP 31-32 Component 7
The K Street/Rock Creek Parkway area may also serve as temporary construction staging for USGT streetcar or improvements listed above. Coordinate with DDOT on timing for construction of sewer, if needed.

18 PR 31-32 Component 7
It appears that excavation will occur under a portion of Virginia Avenue at the location of the control for CSO 022. Surface fixtures, vaults, handholes, vent shafts, etc. within DDOT ROW will require a public space permit. As previously noted, DDOT does not permit surface fixtures in public space

without specific justification explaining how all options have been exhausted.

19 PR 31 Component 7
The waterfront outfall appears to have impacts to the Rock Creek Park Trail. Provide more details about rerouting proposals and duration of closure. Will cyclists and pedestrians need to cross Rock Creek Parkway? If so, are stop controls to assist these movements proposed? Note that some stop controls will require study.

20 PR 31-32 Component 7
For the closures related to the construction/maintenance of CSO 022 Control, how will the partial closures operate? Have these been studied? Please provide details about the extent and duration.

21 HP 33-41 Components 8-11
CSO locations 024, 027, 208, and 029 are beneath K Street/Water Street in Georgetown, along the alignment of the Union Station to Georgetown (USGT) Streetcar. Streetcar will include a streetscape reconstruction of the entire right-of-way, including utility relocation.

22 HP 33-34 Component 8
Component 8 likely to directly conflict with streetcar tracks, depending on depth of new infrastructure. Design should be coordinated. Please contact Haley Peckett (haley.peckett@dc.gov) for USGT conceptual designs.

23 PR 34 Component 8
For the closures related to the construction/maintenance of CSO 024 Control and UPI diversion, how will the partial closures of K Street/Whitehurst Freeway operate? Have these been studied? Please provide details about the extent and duration.

24 PR 34 Component 8
It appears portions of 30th Street NW will also need to be closed during construction, but these are not detailed in the matrix. Confirm whether or not there will be impacts to 30th Street NW.

25 PR 34 Component 8
Because there is infrastructure proposed in DDOT ROW at this location, any surface fixtures (manholes, access hatches, ventilation grading) will require a public space permit. As previously noted, DDOT does not permit surface fixtures in public space without specific justification explaining how all options have been exhausted.

26 MA 36 Component 9
Closure of K Street will add impacts to the cycle track described in Comment #1

27 PR 36 Component 9
For closures related to the construction/maintenance of CSO 027 Control, how will the partial closures of K Street/Whitehurst Freeway operate? Have these been studied? Please provide details about the extent and duration.

28 MA 39 Component 10
Component 10 described rerouting the Capital Crescent Trail. It is not obvious whether that is even possible given the limited space available and grade changes.

29 PR 39 Component 10

At this location the Capital Crescent Trail is on NPS property; however, DDOT would appreciate more information about trail rerouting. What is the extent and duration? What alternative paths are proposed?

30 PR 41 Component 11
It appears Component 11 falls within federal property, DC Government property, and Georgetown University property. The DC Government portion of the property is not ROW and as such is not subject to public space regulation. DDOT notes that visible at-grade features are proposed for at this location. Has the project team obtained the necessary approval from the necessary District Government agency?

31 KK 45 Green Infrastructure
We would like to know the estimated SW requirements at a minimum.

1 MA 15 2.2.5.2
If CSO 020 Option 2 is selected, ensure that Rock Creek Trail is maintained and detoured during construction and restored.

2 MA 17 2.2.7.2
CSO 022 Option 2 would need to be coordinated with DDOT planning study for I-66 Bypass/Reconfiguration of Virginia Ave/Rock Creek Parkway Entrance

3 MA 18 2.2.8
CSO 024 underground elements are shown below the proposed multi-use trail extending from Georgetown Waterfront Park to the Rock Creek Trail. Restoration of above grade elements should be coordinated with DDOT to ensure that conflicts are avoided.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 25

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Stefana Scinta |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1043 Paper Mill Ct. NW<br>Washington, DC 20007<br>USA |
| E-mail: | stefanascinta@gmail.com |


## Correspondence Information

| | |
|---|---|
| Status:New | Park Correspondence Log: |
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| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

DC Water's construction of the Potomac River Tunnel and its related infrastructure must minimize any temporary and permanent impacts to the Georgetown Waterfront Park (the "Park"). Green infrastructure solutions are readily available and must be considered first. To the extent that any concrete-based sewer structures or other "gray infrastructure" is necessary (and only if a green alternative is not viable), construction work should avoid the Park to the greatest extent possible, and any permanent structures should be located outside of the Park.

Georgetown Waterfront Park is not a typical neighborhood park. It attracts thousands of visitors from the city, the region, and around the world, and the Park is included among the many landmarks that make DC a popular tourist destination. As a magnet for visitors to Georgetown, the Park has vitalized the surrounding business district, with many new businesses opening in the adjacent blocks south of M Street since the Park opened. The Park has a substantial positive impact on the Georgetown economy and District tax revenues. Likewise, the well manicured Park reflects a $23 million investment of private and public funds used to develop the Park, as well as substantial ongoing capital investments to maintain and improve the Park.

DC Water's proposed plans for the Potomac River Tunnel threaten to undermine this investment and negate the Park's positive impact on the community. Plans include consideration of two "gray infrastructure" options, either of which would unacceptably disrupt the Park. Specifically, both Options 1 and 2 for Component 9 / CSO 27 would require construction that would displace mature trees and other plantings, consume widely used public space, and effectively render at least 1/3 of the Park unusable during the construction period and (depending on the option selected) unsuitable as park space once the project is complete. The proposed "SUV-sized" above grade sewer vent is both unsightly and would disrupt the use of open green space that makes a park attractive to visitors.

Alternatives to these plans must be considered. First, green infrastructure solutions are plentiful and should be thoroughly vetted before any gray infrastructure options are considered. A combination of

green rooftops, expanded tree planter boxes, permeable pavement, and numerous other green solutions would both beautify the community and avoid the need for heavy construction.

Second, and only to the extent that green solutions are studied and found not viable, any gray infrastructure should avoid construction in the Park and locate all permanent structures outside the Park. One option would be to move the construction work out of the Park and to build on and under K Street / Water Street, leaving any permanent above-grade structures in the existing paved parking spaces along K Street. Alternatively, the work could be installed in Fishmarket Square or even under the C&O Canal bed, where the higher elevation would avoid the need for permanent above-grade structures. There would seem to be ample alternatives that can satisfy the Potomac River Tunnel's objectives without sacrificing the many benefits offered by Georgetown Waterfront Park.

Improving the Potomac River's water quality is a shared goal, but it would be shortsighted to achieve the environmental goal of a clean river by sacrificing the environmental, community, and business benefits of Georgetown Waterfront Park. Alternatives exist that give us both, and these alternatives should be pursued.
Attachments area

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 26

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Sherri Green |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 3225 Grace St NW<br>Washington, DC 20007<br>USA |
| E-mail: | sherriagreen@outlook.com |


## Correspondence Information

| | |
|---|---|
| Status:New | Park Correspondence Log: |
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green rooftops, expanded tree planter boxes, permeable pavement, and numerous other green solutions would both beautify the community and avoid the need for heavy construction.

Second, and only to the extent that green solutions are studied and found not viable, any gray infrastructure should avoid construction in the Park and locate all permanent structures outside the Park. One option would be to move the construction work out of the Park and to build on and under K Street / Water Street, leaving any permanent above-grade structures in the existing paved parking spaces along K Street. Alternatively, the work could be installed in Fishmarket Square or even under the C&O Canal bed, where the higher elevation would avoid the need for permanent above-grade structures. There would seem to be ample alternatives that can satisfy the Potomac River Tunnel's objectives without sacrificing the many benefits offered by Georgetown Waterfront Park.

Improving the Potomac River's water quality is a shared goal, but it would be shortsighted to achieve the environmental goal of a clean river by sacrificing the environmental, community, and business benefits of Georgetown Waterfront Park. Alternatives exist that give us both, and these alternatives should be pursued.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 27

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Leonard Ellen |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1029 Cecil Place NW<br>WASHINGTON, DC 20007<br>USA |
| E-mail: | leonard1965@hotmail.com |


## Correspondence Information

| | |
|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Dec 4, 2018 | Date Received: Dec 4, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Dear National Park Service,

I feel we should find other option before proceeding with this in the park. The ascetics will be lasting and possibly damaging to the overall look/feel of the park. Please reconsider!

Sincerely,

Leonard Ellen

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 28

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | N/A N/A |
| Organization: | Citizens Association of Georgetown |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1365 Wisconsin Ave NW<br>Suite 200<br>Washington, DC 20007<br>USA |
| E-mail: | mandihoward@cagtown.org |


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| Notes: | |

## Correspondence Text

December 4, 2018

Lisa Mendelson-Ielmini, Acting Regional Director
National Capital Region
National Park Service
1100 Ohio Drive, SW
Washington, DC 20242

Dear Director Mendelson- Ielmini,

Attached are the comments of the Citizens Association of Georgetown (CAG) on the Environmental Assessment for the Potomac River Tunnel. The Environmental Assessment was open for public comment on October 24, 2018.

As an organization with over 1200 members, CAG has worked for over fifty years to preserve the historic character, quality of life, and aesthetic values of historic Georgetown. CAG is currently a Section 106 consulting party pm the Potomac River Tunnel, and, for the past seven years, has participated in reviews of DC Water's iterative, proposed plans for abating combined sewer overflows into the Potomac River at Georgetown.

The outfalls for all six of Georgetown's combined sewers discharging overflows into the Potomac River are on National Park Service property. All but one of the outfalls is very close to a major recreation point along the river, including boat houses, watercraft rental sites, a canoe club, overlooks, and a boardwalk. Thousands of visitors and recreational users can frequent these recreation points in agreeable weather. A healthy Potomac River is a valuable resource, for both our community and the region at large.

CAG strongly supports a program that will greatly reduce the polluting of the Potomac River at Georgetown. The improvements in water quality and the reduced health risks will enhance the experience of those who visit our waterfront and recreate on the water.

The attached comments were approved, without objection, by CAG's Board at its monthly meeting on November 27, 2018.

Sincerely,

Pamla Moore
President

Attachment

cc:
Honorable Jack Evans, Councilmember, Ward 2
Joe Gibbons, Chairperson, ANC2E
Dr. William Kennedy Smith, Chairperson, ANC2A
Thomas Luebke, Secretary, U. S. Commission on Fine Arts
Kevin Brandt, Superintendent, Chesapeake & Ohio Canal National Historic Park, National Park Service
Julia Washburn, Superintendent, Rock Creek Park, National Park Service
Christopher Murphy, Vice President for Government Relations and Community Engagement, Georgetown University
Jennifer Romm, Chair, Georgetown Heritage
Ann Satterthwaite, Chair, Friends of Georgetown Waterfront Park
Hope Solomon, President, Georgetown Business Association
Joe Sternlieb, Chief Executive Officer, Georgetown Business Improvement District

Attachment
Comments of the Citizen Association of Georgetown (CAG) on the National Park Service's October 2018 Environmental Assessment for the Potomac River Tunnel

CAG's comments focus on the National Park Service's (NPS) preferred overflow control alternatives for abating combined sewer overflows into the Potomac River at Georgetown. (Combined sewers convey both sanitary wastewater and stormwater runoff.) The NPS preferences are set out in Table 2-2 (p. 26) of the EA, and indicate a preference for either 'gray' infrastructure or Green Infrastructure (GI). Sewers with gray infrastructure controls would connect with a Georgetown segment of the planned Potomac River Tunnel (Potomac tunnel). If built, the Georgetown tunnel segment between Rock Creek and the Canal Road entrance to Georgetown University would have a storage capacity of ten million gallons. Wastewater flows stored in the tunnel would be pumped out at Blue Plains at a rate of about one million gallons an hour.

The CAG comments are organized by the combined sewer overflow number, e.g., Combined Sewer Overflow (CSO) 029, and progress from west to east along the discharge points into the river. There are six combined sewers in Georgetown with overflows into the Potomac River.

Matrix of Infrastructure Controls

| Outcome | CSO 024 | CSO 027 | CSO 028 | CSO 029 |
|---|---|---|---|---|
| A | Gray | Green | Green | Green |
| B | Gray | Gray | Green | Green |
| C | Gray | Gray | Gray | Green |
| D | Gray | Gray | Gray | Gray |

The National Park Service's preferred infrastructure alternatives are those in Outcome B.

1. CSO 029

Profile of this sewer. Servicing an area of 330 acres, this sewer has the largest sewershed of the six sewers. The Georgetown University and MedStar Hospital campuses, the neighborhood of Burleith, and a tapered sliver of land extending north of Burleith to Massachusetts Ave. NW in Cathedral Heights, comprises most of the service area. CSO 029 connects to the Upper Potomac Interceptor Relief Sewer (UPIRS), the only one of the six sewers to do so. Connecting to the UPIRS means that controlling overflows from CSO 029 would not affect schemes for controlling overflows from the other five sewers.

The outfall for this sewer, where overflows are discharged into the Potomac River, is south of the Canal Road entrance to Georgetown University. For all of 2015, the measured overflows into the Potomac River from CSO 029 totaled 10 million gallons.

DC Water proposes to control overflows from CSO 029 through the installation of Green Infrastructure. This installation would prevent stormwater runoff from being discharged into the Potomac River from any storm where up to 1.2 inches of rain fell in a 24 hour period (the 1.2 inch standard). The First Amendment to the Consent Decree (First Amendment) allows overflows to be discharged into the river if more than 1.2 inches of rain were to fall in a 24 hour period. This is a major change from the original consent decree, where no overflows into the river were allowed. DC Water estimates an annual average of four overflow events with a discharge into the Potomac River.

There are 164 acres of impervious surfaces (streets and alleys, sidewalks, roofs, etc). in the CSO 029 sewershed. DC Water's original proposal was to have GI installations abate runoff from 98 of the impervious acres.

The NPS preferred control alternative is Green Infrastructure.

CAG Comments

1.1 CAG supports the Green Infrastructure control alternative for this combined sewer. Successful implementation of this alternative obviates the need for the Georgetown segment of the Potomac tunnel to extend west of Key Bridge.

1.2 The EA should explain the reduced scale of GI installation in this sewershed. Presently, GI installation is underway to abate runoff from eight impervious acres. (Source: Potomac River Project A Factsheet) The EA states that runoff from an additional 25 impervious acres will be controlled through future installations of GI. This total of 33 acres is a third of the impervious area that DC Water indicated (in the First Amendment) would be controlled.

2. CSO 028
Profile of this sewer. This sewer primarily services a triangle-shaped area of 21 acres, generally north of M St. (west of Key Bridge), the 3500 and 3600 blocks of Prospect St., the 3600 block on N St., and Lauinger Library and the Healy and Copley lawn areas on the east side of the Georgetown University campus. CSO 028 connects to the Upper Potomac Interceptor sewer,

The outfall for this sewer is just west of the Aqueduct Bridge. For all of 2015, the measured overflows into the Potomac River from CSO 028 totaled three million gallons from 50 rain events, an average of 60,000 gallons per event. (DC Water did not provide ANC2E with data on the measured overflows per event.)

There are 13 acres of impervious surfaces in the CSO 028 sewershed, and DC Water proposed installing GI to abate stormwater runoff from four of these acres. Applying the 1.2 inch standard, the stormwater overflow volume from four impervious acres is 136,000 gallons per storm event.

The NPS preferred control alternative is Green Infrastructure.

CAG comments:
2.1 Extending the Potomac tunnel west to the Aqueduct Bridge simply to capture the small volume of overflows from CSO 028 fails a cost-benefit analysis. The EA should include an alternative that sends all overflows up to the 1.2 inch standard to the Upper Potomac Interceptor sewer. (See comments 2.3 and 3.3 for a further description of this alternative.)

The Emergency Surge Relief Pipe (ESRP)
Profile of this proposed structure. This profile is based on conversations with DC Water representatives at the November 14, 2018 open house on the Potomac tunnel, as the EA has a minimal description of this project.

The purpose of the Emergency Surge Relief Pipe is to divert surge inflows into the Upper Potomac Interceptor sewer to the Potomac River. These surge flows would occur when an extraordinarily large volume of stormwater-related flows enters the UPI. The volume of entering flows would exceed the hydraulic capacity of the UPI and/or the pumping capacity of the Rock Creek Pumping Station. (The Rock Creek Pumping Station routes the wastewater in the UPI toward Blue Plains.) Without the relief pipe, the flow of sewage and stormwater in a filled-to-capacity UPI could back up, and potentially outflow onto streets and into basements.

An above-ground ventilation and access shaft for the ESRP would be constructed next to the Capital Crescent Trail, just west of the Aqueduct Bridge. This would be sited on flat ground at the foot and just south of the earthen embankment for the C&O Canal towpath. The elevation of the ventilation structure would be above the 100 year floodplain, but not above the elevation of the towpath. The large relief pipe(s) would run below the surface from near the ventilation structure to an outfall on the riverbank.

The ESRP is not required by the First Amendment to the Consent Decree..

An alternative site for the ESRP is within the Waterfront Park. The NPS preferred site is the site described above, just west of the Aqueduct Bridge.

CAG comments:

2.2 CAG supports the preferred site of the ESRP near the Aqueduct Bridge. CAG strongly objects to the ESRP being constructed in the Georgetown Waterfront Park. Construction of this relief pipe would be disruptive and destructive of a significant part of the Park.

2.3 The EA should include an alternative that allows stormwater overflows up to the 1.2 inch standard for CSOs 024, 027, and 028 to be collected in the UPI sewer, and routed to Blue Plains via the Rock Creek Pumping Station. If these overflows exceed the capacity of the UPI, the excess overflows would be diverted directly to the river through the ESRP. This alternative would obviate the need for overflows from these three sewers being diverted to the Potomac tunnel, and greatly minimize construction-related impacts in lower Georgetown.

2.4 As the NPS preferred alternatives for abating overflows from CSO 028 is Green Infrastructure, the Potomac tunnel would not extend westward to the preferred location of the ESRP. This precludes having the ESRP divert overflows to the tunnel, rather than into the river.

2. 5 The EA should describe any potential impact of the ESRP at the preferred site west of the Aqueduct Bridge on the planned development of the Georgetown Non-motorized Boathouse Zone . This location is identified as a future recreational boating use site. See: https://parkplanning.nps.gov/projectHome.cfm?projectID=54903

2.6 The EA should describe construction-related impacts on access and use of the Washington Canoe Club facilities, and actions taken to mitigate any impacts.

2.7 As the outfall for the ESRP is proximate to the Potomac Boat Club, the Washington Canoe Club, and canoe and watercraft rental sites, an alert system notifying users of these facilities of an ESRP discharge is critical.

2.8 Appendix C, Wetland Statement of Findings, does not include the ESRP.

3. CSO 027
Profile of this sewer. This service area for this sewer is irregularly shaped but generally covers an area west of Wisconsin Ave., south of R St, to the C&O Canal, and a small area south of the Canal. The west boundary of this sewer aligns with the east boundaries of CSOs 028 and 029. CSO 027 connects to the Upper Potomac Interceptor sewer,

The outfall for this sewer is in the Waterfront Park, south of the intersection of Potomac St and Water St. In lower Georgetown, this sewer is greatly outsized, as 'black liquor' or 'brown liquor' was discharged into this sewer from the pulp mill located at the corner of Potomac St. and Grace St. The pulp mill was owned by the District of Columbia Paper Manufacturing Co. Pulp mills use enormous quantities of water, and water for the pulp mill flowed directly from the C&O Canal through a sluice gate. About seven tons of 'black liquor', a noxious pollutant,
is generated in the course of producing one ton of pulp.

For all of 2015, the measured overflows into the Potomac River from CSO 027 totaled eight million gallons. The computer modeled overflows over the same year were 41.79 million gallons. The measured volume was 19 percent of the volume predicted by the model. In 2015, there were five rain events when rainfall exceeded the 1.2 inch standard. The eight million gallons that was measured included some stormwater-related overflow that the First Amendment would allow to be discharged into the Potomac.

There are 104 acres of impervious surfaces in the CSO 027 sewershed, and DC Water proposed having GI installations abate stormwater runoff from 31 of the impervious acres. Applying the 1.2 inch standard, the volume of stormwater overflows to be abated from 31 acres is about 1,050,000 gallons for a storm event with 1.2 inches of rainfall. This volume would be less for storms with less rainfall; if rainfall were to exceed 1.2 inches, the 'excess' volume would be diverted and discharged into the Potomac River.

The NPS preferred control alternative is gray infrastructure. The NPS preferred site for the diversion structure and a dropshaft to the Potomac tunnel is on Water St., near Potomac St. An above-grade ventilation structure and access point would be constructed just inside the Waterfront Park boundary on Water St. A second alternative would build the diversion structure and dropshaft inside the Park.

The preferred site on Water St. is the locus of an underground complex consisting of a natural gas pipeline, high voltage electrical transmission lines, and telecommunications lines. This infrastructure is squeezed into a narrow pathway under the street. As re-routing these lines is impractical, costs of a diversion structure and dropshaft will increase substantially, and also result in a protracted construction timeline. See CSO 024 for additional discussion of this utilities infrastructure.

Green Infrastructure
Following discussions at the November 14, 2018 'open house' on the EA, CAG's understanding is that the NPS preferred alternative of gray infrastructure does not encompass the installation of Green Infrastructure in this sewershed.

In 2015, CAG, as a consulting party reviewing modifications to the planned Potomac tunnel, provided DC Water with the following statement of position with respect to Green Infrastructure:

CAG seeks to protect the historic fabric of Georgetown, and, in principle, endorses the application of Green Infrastructure (GI) solutions for abating the combined sewer overflows from our community. Our endorsement is predicated on the GI solutions substantially reducing or eliminating these overflows, and these solutions not materially distorting or destroying the historic fabric.

Sewer flows in the Upper Potomac Interceptor sewer. The 48 inch diameter UPI sewer was constructed about a century ago. The UPI conveys sanitary sewage flows from Montgomery County and western neighborhoods of DC to the Rock Creek Pumping Station. Most, if not all, the sewer systems in these areas are separated systems, with the UPI collecting only flows from the sanitary sewer. Five combined sewers in Georgetown connect to the UPI, beginning with CSO 028.

Average Daily Flow in the Upper Potomac Interceptor
as measured at the Rock Creek Pumping Station

Month Average Daily Pumpage in
Millions of gallons a day
(MGD) Monthly rainfall total measured at Rock Creek Pumping Station
Jan 2017 4.05 7. 53
Feb 2017 3.81 0.67
Mar 2017 4.53 2.80
Jul 2017 7.24 8.53
Aug 2017 7.57 5.49
Sep 2017 7.00 1.68
The above values are for three winter months and three summer months. The daily pumpage rate appears to correlate more to the season of the year than monthly precipitation totals.

DC Water has set a daily pumpage limit of 43 million gallons for the Rock Creek Pumping Station, and consequently, this represents the flow capacity of the UPI in Georgetown.

CAG Comments:
3.1 CAG believes other gray infrastructure alternatives should be studied besides the gray infrastructure alternative presented in the EA, i.e., connecting CSO 027 to the planned Potomac tunnel. Of the two alternatives for this connection set out in the EA, CAG strongly objects to the alternative that would construct this diversion facility inside the Waterfront Park (Control option 2).

3.2 For Control option 1, the ventilation vault should be built outside the Waterfront Park. CAG supports building this 150 square foot vault on one or two parking spaces on the south side of Water St., next to the Park. This avoids using any NPS property in the Waterfront Park for Control option 1.

3.3 Extending the Potomac tunnel westward from Rock Creek to the intersection of Potomac and Water streets - a distance of 2000 or more feet - - to capture the relatively small volume of overflows from CSO 027 will likely fail a cost-benefit analysis.

The EA should include an alternative that sends CSO 027 overflows, up to the required 1.2 inch standard, to the UPI sewer. Given the average daily pumpage of the Rock Creek Pumping Station, there appears to be more than sufficient existing capacity in the UPI to convey these CSO 027 overflows to this pumping station. This alternative is adapted from the abatement strategy of the original Consent Decree, in which all overflows from CSO 024 - CSO 028 were collected in a riverfront sewer and then sent to the Potomac tunnel.

This alternative would obviate the need for extending the Potomac tunnel west of 30th St. This would greatly reduce the severe construction impacts on residents, businesses, and recreational users of the river, who rely on Water St. as the only accessible street to properties west of Potomac St.

The 2015 measured overflow volume of eight million gallons for the entire year for CSO 027 also supports an alternative that diverts this sewer's overflows to the UPI.

If overflows were to surge into the UPI, straining the capacity of that interceptor, the proposed Emergency Surge Relief Pipe near the Aqueduct Bridge would shunt the flow volume exceeding the sewer's capacity to the river.

3.4 If the alternative outlined in 3.3 is not feasible, the EA should include an alternative that provides sewer separation in a relatively small area of the CSO 027 sewershed. This separation would help achieve the same reduction in flow volume that would be realized through the application of Green

Infrastructure on 31 impervious acres. Separating the combined sewer in an area south of the C&O Canal, perhaps 5-6 impervious acres, and that part between the south side of M St and the Canal, and between Wisconsin Ave and 34th St, perhaps ten impervious acres, would divert about 500,000 gallons of stormwater flow from the UPI. The separated stormwater flow would be discharged directly into the Potomac. An additional 500,000 gallons of diverted stormwater flow could be achieved by the planned separation of CSO 025 and CSO 026. This total of one million gallons of diverted flow corresponds to the flow volume abated through Green Infrastructure in the CSO 027 sewershed for a storm with up to 1.2 inches of rain falling in a 24 hour period.

As noted on p. 3-4 of Appendix E to the First Amendment, "In addition to GI, targeted sewer separation may be utilized to offload storm water from the combined sewer system."

3.5 If DC Water intends to install tidal gates for CSO 027, the construction and post-construction impact of this installation should be described in the EA.

3.6 The EA should discuss abandonment of the diversion chamber for the UPI at Potomac and Water streets. This chamber diverts overflows in the UPI itself to the Potomac River using the outfall for overflows from CSO 027. The Emergency Surge Relief Pipe would eliminate the need for this diversion chamber.

4. CSO 025 and CSO 026

Profile of these sewers. Both sewers service an area south of the C&O Canal, and both connect to the Upper Potomac Interceptor sewer. The sewershed for CSO 026 is three acres, on the west side of Wisconsin Ave with a small stretch extending west on Grace St. All three acres are categorized as impermeable. The outfall for this sewer is in the Waterfront Park, south of the arching fountain at the park entrance..

CSO 025 serves a somewhat larger area, with a sewershed generally between Thomas Jefferson St and the east side of Wisconsin Ave. This area is 17 acres, 12 of which are impervious. The outfall for this sewer is at the far southeast corner of the Waterfront Park, at the western end of the Washington Harbour boardwalk.

In 2015, the total measured overflows for the entire year were one million gallons for CSO 025, and 10,000 gallons for CSO 026.

Neither sewer is covered in the EA; the First Amendment specifies that these combined sewers are to be separated into a sanitary sewer and a storm sewer.

CAG Comments:

4.1 In previous comments to the Department of Justice on the proposed First Amendment to the Consent Decree, CAG suggested that separation of these two sewers was unnecessary, given their de minimis overflow volumes per storm event.

4.2 If DC Water still proceeds with sewer separation, credit should be given for increasing the UPI flow capacity by about 500,000 gallons from a 1.2 inch rain event as stormwater-related flows from 15 impervious acres are diverted from this interceptor sewer.

5. CSO 024

Profile of this sewer. This sewer is named the West Rock Creek Diversion sewer. Its service area is divided: the upper area includes about 2/3rds of the U. S. Naval Observatory grounds, its northernmost extent; the remaining northern bounds are Calvert St and Whitehaven St. The western boundary is the east side of Wisconsin Ave; the southern boundary is S and R streets, and Dumbarton Oaks. The eastern boundary is the west side of Montrose Park.

The lower service area lies between the south side of M St. and the C&O Canal, and between the east side of Wisconsin Ave, and west of 28th St (extended) at the ramp from the Rock Creek Parkway to Pennsylvania Ave. The lower section also includes a small finger-shaped area running down 30th St from the Canal to K St.

This sewer services a total of 175 acres, with 62 of the acres classified as impervious surfaces. DC Water's May 24, 2016 response to ANC2E on the measured overflows described the "drainage" area for CSO 024 as 44 acres. Figure2.1 on page 8 of the EA lists the service area as 42 acres.

The outfall for this sewer is at the foot of 30th St., near the Embassy of Sweden. In 2015, the measured overflows into the Potomac River from CSO 027 totaled 48 million gallons. The computer modeled overflows for the same year were 37.40 million gallons.

In or near the 2900 block of K St. DC Water proposes to construct a diversion structure for the Rock Creek Pumping Station, a diversion structure for CSO 024, a dropshaft to the Potomac tunnel, and a ventilation vault. New piping would link all four structures, which are over a hundred feet apart in both their east-west and north-south alignments. All but the ventilation vault would be constructed on public streets.

The NPS preferred alternative is gray infrastructure. (Green Infrastructure or sewer separation was never proposed for this combined sewer.)

The proposed siting of this complex of 'gray infrastructure' in this particular block is fraught with complexity, which can only add substantially to the cost of construction, and the duration of construction. Much of proposed construction site lies beneath the overhead Whitehurst Freeway, which may limit the types of construction equipment that can be used.

The three main complications - environmental contamination, traffic, and utilities - are described below.

Environmental contamination near the 2900 block of K St. NW

A. Contamination of the former West Heating Plant (WHP) property, 1000 block of 29th St NW.
In 2013, the General Services Administration (GSA) sold this property to a privately-owned development group. Concerned about the extensive contamination found on this property, GSA encumbered the property title with a CERCLA covenant. The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) is a Federal law governing the cleanup of sites contaminated with hazardous substances and pollutants. This CERCLA covenant cautions the owner(s) of the WHP property that if hazardous substances are released through any construction or other activity, the owner(s), not the government, will be responsible for the cleanup. In short, a warning not to go digging in the former coal yard of the West Heating Plant.

GSA then reinforced the CRECLA covenant by taking the remarkable step of retaining government ownership of the groundwater under the WHP site. The effect of such ownership is to forestall any attempt at de-watering the site.

Prior to the property sale, GSA contracted with several environmental consulting firms to assess the extent of the environmental contamination. The last of the consulting firms, Analytical Services Inc. and Chesapeake Geosciences Inc. described the subsurface characteristics:

"The Site is located near the border between the Piedmont Physiographic Province and the Atlantic Coastal Plain Physiographic Province. Undifferentiated mafic igneous rocks, associated with the Piedmont Physiographic Province, are mapped as underlying the Site (USGS, 1964). Sequences of various combinations of sands, silts, and clays were observed in the well and soil borings advanced at the Site during the Phase II ESA [Environmental Site Assessment]. These borings were terminated at depths ranging from 17 to 22 feet BGS [below ground surface] prior to reaching bedrock. The depth to groundwater recorded during the Phase II ESA ranged from approximately 8 to 20 feet BGS." (Human Health Risk Assessment, Analytical Services Inc. and Chesapeake Geosciences Inc. October 28, 2011)

The consultants stated it was impossible to determine precisely the groundwater level, as the level rose and fell with the tide. The consultants drilled several bore holes around the periphery of the WHP site; these were outside the plant and the stone perimeter wall that closes off the property. A bore hole was drilled at the extreme southwest part of the property, at a point where the southbound exit from Rock Creek Parkway intersects with 29th St. This bore hole became monitoring well #6.

Monitoring well #6 recorded the highest concentration of arsenic, barium, chromium, lead, and mercury in the groundwater, and the highest concentrations of chromium and phenanthrene in the soil, of any of the wells. These contaminants, other than phenanthrene, are found in coal. Phenanthrene is a main constituent of coal tar. (See below on possible contamination of this area from an illuminating gas pipeline.)

The ESA Phase II report quoted from an earlier consultant's report that "Prior to GSA's ownership of the property [circa 1940], the immediate site area was reported to have had a history of heavy industrial use".
Phase I Environmental Site Assessment - West Heating Plant Facility, Cetrom Consulting and Engineering, Advanced Technology Division, March 2000.

(A third consulting firm tested the soil and groundwater in 2003, Brook Environmental & Engineering Corporation. Soil and Groundwater Testing-General Services Administration Central Heating and Refrigeration Plant, West Heating Plant.)

B. The site of the demolished Coal and Ash House, south side of the 2900 block of K St. NW
GSA's concerns about what lies beneath the former West Heating Plant property may have partly stemmed from what was found, about 12 years ago, during construction of an underground parking garage on the site of the demolished Coal and Ash House. The Coal and Ash House, on the south side of the 2900 block of K St., was an integral part of the West Heating Plant. After sale of this property, GSA retained an access easement to the bottom of this garage, where a connection to the conveyor tunnel between the plant and the Coal and Ash House remained in place. Reportedly, and undoubtedly said with hyperbole, the parking garage, for its size, became the most expensive garage ever built. The expense arose from unearthing subsurface contamination, possibly resulting from the heavy metals present in the WHP's coal ash. The general contractor was the Armada Hoffler Construction Co., with headquarters in Virginia Beach, VA.

C. The site of William King & Son, coal merchant; north side of the 2900 block of K St. NW
William King & Son was established in 1835, and apparently continued operations at this location until circa 1960. This was a large coal yard directly across the street from monitoring well #6. William King

& Son apparently supplied coal to industrial enterprises and large commercial buildings; they were proud of not having to advertise.

The coal stored at the King coal yard was bituminous coal from northern Appalachia, coal which contains a high concentration of mercury. For many decades, this coal was unwashed (coal washing became a common practice about 100 years after William King was established). Current coal washing technology will remove about 20 percent of the mercury contamination in bituminous coals. The contamination that remains after washing is either vaporized during combustion, or remains in the ash residue. Some 'washing' of unwashed coal probably occurs naturally from rain and snow falling on coal piles on open ground.

Liquid mercury is largely insoluble, and much heavier than water. If washed onto the ground, it will slowly migrate down until it reaches an impervious layer of soil or rock. Several decades ago, the EPA and the state of New York attempted to remediate the Superfund site of a small mercury recycling plant west of Albany. The site was excavated, then excavated some more, and excavated yet more again without reaching the bottom of the mercury contamination. The site was filled with clean dirt, and the state imposed a covenant on the property title, prohibiting any future building on the site.

D. Contamination from the illuminating gas works, south side of the 2900 block of M St.
In the late 19th Century, the Washington Gas Light Co. erected two tanks in the middle of the property square between the C&O Canal and M St. (The property was also the site of WGL's stables and offices). These tanks were used to store and distribute illuminating gas to Georgetown. The illuminating gas was likely piped up the west side of 29th St from the illuminating gas manufacturing plants near the 2700 block of Virginia Ave NW.

After reconstruction of the 30th St. Bridge over the C&O Canal was completed in 2010, an environmental clean-up team labored for several weeks de-contaminating the basin for the Canal's lock #2. Contamination with phenols (?) or other toxic organic compounds had been discovered prior to the reconstruction. The contaminated bedrock was directly beneath a cemented-over yard drain for the illuminating gas tanks, which had discharged runoff into the Canal. It was said the clean-up cost about $1,000 a square foot.

With the detection of phenanthrene by GSA's environmental consultants, toxic oils and tars from the illuminating gas pipeline may have leaked along its path on 29th St., and remain there still.

Utilities in the 2900 block of K St. NW.
There may be no block in the District with so much utility infrastructure in such a small area as the 2900 block of K St. NW. These utilities include:
• three very large sewers, two of which convey sewage from the Northwest neighborhoods of the District, and from large areas of Montgomery, Fairfax, and Loudon counties to the Potomac Pumping Station, and thence to Blue Plains.
• two high-pressure natural gas pipelines
• high-voltage electrical transmission lines from the Georgetown substation. At the lower end of the 1000 block 30th St., just above K St., PEPCO recently installed new 12.5 kV vaults with transformers to improve the reliability and capacity of their distribution lines. These vaults are very close to the proposed location of the Adit pipe and the dropshaft.
• major telecommunication lines to/from Virginia for several carriers
• an abandoned conveyor tunnel that connected the demolished Coal and Ash house with the former West Heating Plant on 29th St.

The natural gas pipelines run across the proposed site for the ventilation vault.

DC Water should already be familiar with the infrastructure complexity in this small area, as a hereto-unidentified party has bisected the Upper Potomac Interceptor sewer with a smaller pipe. This smaller pipe, akin to puncturing a drinking straw with a toothpick, undoubtedly perturbs the hydrodynamic flow within this large interceptor and likely affects its capacity.
Figure 2-14 in the EA helps identify a possible culprit: a predecessor agency to DC Water. The bisecting pipe roughly aligns with a small trunk sewer line running down the west side of 30th St.

Traffic.
The 2900 block of K St is the main route for vehicles and cyclists entering and leaving lower Georgetown. There is no alternative routing that can reasonably accommodate traffic detoured from the 2900 block of K St. Earlier this decade, GSA did extensive traffic studies on the intersection of 29th and K Streets prior to the auction and sale of the West Heating Plant (GSA and Louis Berger Group, Inc., 2012). These studies recorded 775 vehicles headed westbound during the peak weekday hours, and over 600 vehicles headed eastbound during peak weekday hours.

Traffic would be further impeded as the proposed site lacks sufficient space for construction staging of materials and equipment.

CAG Comments:
5.1 The value for the measured overflows from CSO 024 in 2015 appears highly anomalous: a total of 48 million gallons from 62 impervious acres total contrasted to CSO 029's measured 10 million gallons from 164 impervious acres. (It is even more anomalous if DC Water's reported 44 acres or 42 acres as comprising the "drainage" area is correct. See page 8, supra.)

The schematic (Figure 2.1 of the EA) shows two regulators for this sewer, both located between K St and the C&O Canal. Was the overflow measured at one or both of these regulators? CSO 024 is a tidal sewer as it crosses under the C&O Canal at the basin for Lock #1. As evidence of this, storm-related flows in Rock Creek - - sometimes in conjunction with high tides - - rise above the footing for Lock #1 and flood its basin. In 2014, the new owners of the West Heating Plant commissioned a video survey of CSO 024 between K St. and P St. (The sewer runs north south under the heating plant and the coal yard.) The survey was performed by Langan Engineering and Environmental Services, Inc., with world-wide headquarters in Parsippany NJ. The sewer was reported to be in good condition. The sewer was so dry that a technician had to hand-carry the video camera rather than float it on water flowing in the sewer.

CAG believes further measurement of the stormwater overflow in CSO 024 should be done before determining the best means for abating these overflows. This measurement should determine whether tidal flux or even possible inflows from the C&O Canal into the sewer affected the measurement.

Of note is that in the mid 18th Century, Rock Creek was tidal up to at least P St. Vessels sailed up Rock Creek to load or offload cargo at the P St. dock, and avoided the turbulent flow of the Potomac.

5.2 The EA should include an alternative that sends CSO 024 overflows, up to the required 1.2 inch standard, to the UPI sewer. Given the average daily pumpage of the Rock Creek Pumping Station, there should be more than sufficient existing capacity in the UPI to convey these CSO 024 overflows to this pumping station. (See also comment 3.3.)

If overflows were to surge into the UPI, straining the capacity of that interceptor, the proposed

Emergency Surge Relief Pipe near the Aqueduct Bridge would shunt the flow volume exceeding the sewer's capacity to the river.

This alternative would greatly reduce the very severe construction impacts on residents, businesses, and visitors in lower Georgetown. The alternative would also avoid the potential costly remediation of environmental contaminants that may be present at the planned construction site.

If the location of the proposed diversion structure for the Rock Creek Pumping station can be shifted, this alternative would obviate the need for extending the Potomac tunnel west of Rock Creek.

5.3 If the alternative outlined in 5.2 is not practicable, the EA should include an alternative that locates the diversion structure and drop shaft to a location outside of the floodplain and tidal zone.

A suggested site is within the oval formed by the southbound exit ramp from Rock Creek Parkway to eastbound Pennsylvania Ave NW, next to the Four Seasons hotel. This is within the alignment of CSO 024. The Potomac tunnel would be extended northward to this point, rather than curving west near K St. Manholes leading to the West Rock Creek Diversion Sewer already exist within the area marked by the fuchsia ellipse.

5,4 If the alternatives outlined in 5.2 and 5.3 are not practicable, DC Water should again consider installing inflatable dams between M St and P St, to temporarily store stormwater-related flows until such can be released to the UPI. CSO 024 is a very large diameter sewer with substantial capacity to store these flows.

5.5 If the proposed site for the diversion structure and dropshaft in the 2900 block of K St. is retained, the EA should detail the process DC Water will use to remediate any environmental contamination found at this location.

5.6 The EA should include a thorough assessment of the potential impact on traffic flows in lower Georgetown if major construction in this area were undertaken. The assessment should include the expected duration of this construction, including allowances for utilities relocation and remediation of any environmental contamination. The assessment should identify strategies for minimizing and mitigating the construction impact on traffic flow.

5.7 A foreign government owns and occupies the building at the northeast corner of the intersection of 30th and K Streets. This foreign government plans on expanding the building in the near future to create a new entrance pavilion. This pavilion would be right next to the drop shaft DC Water would construct on lower 30th St. The EA should incorporate a commitment to co-ordinate with the United States Secret Service in the Department of Homeland Security, the State Department, and the foreign government before finalizing any plan to locate the dropshaft at this location. (CAG identified the foreign government and provided additional detail in its Section 106 consulting party comments provided to the EA consultant on July 19, 2018.)

Diversion Chamber for the Rock Creek Pumping Station
Profile of this proposed structure. This profile is based, in part, on conversations with DC Water representatives at the November 14, 2018 open house on the Potomac tunnel, as the EA has a minimal description of this project.

The EA states that "A separate diversion structure would be constructed on the Upper Potomac Interceptor (UPI), allowing the tunnel to be utilized as backup for the Rock Creek Pumping Station in the event of a power failure or other temporary shutdown." The diversion structure is proposed to be built in the center of the intersection of 30th and K streets. No additional description or justification for this significant structure is provided in the EA.

This diversion structure is newly introduced in the EA, is not covered by the First Amendment to the Consent Decree, and is unrelated to combined sewer overflows in Georgetown.

Rehabilitated earlier this decade, the Rock Creek Pumping Station, at 27th and K streets, has three pumps with three separate suction wells with a combined pump capacity of 64.8 million gallons a day (MGD). The rehabilitated pumping station has a firm capacity of 50 MGD (somewhat below the maximum combined pump capacity and the design capacity (60 MGD)). Hydraulic constrictions presently limit the pumping station to 43 MGD. (Source: CCJM, the prime consultant for rehabilitating the Rock Creek, Upper Anacostia and Earl Place Pumping Stations in Washington, DC.) The pumping station has a standby generator in the event of an electrical failure.
The average daily pumpage for this pumping station is well below the present limit of 43 MGD, - - at least three times lower. This suggests there is abundant unused capacity in the UPI to handle stormwater related overflows from CSOs 024-028 in Georgetown.

Month Daily average pumpage
In million gallons a day Total Monthly Rainfall at the
Rock Creek Pumping Station
Apr 2018 7.03 MGD 3.84 inches
May 2018 12.79 MGD 8.70 inches
Jun 2018 6.86 MGD 4.13 inches

Even in May 2018, a very wet month, average daily pumpage was about 30 percent of the pumping station's capacity.

The diversion structure is primarily intended to enhance working conditions at the pumping station during repairs or a major rehabilitation. Repair work is done in a confined space, and this can be detrimental to the workers' safety and health.

CAG Comments.
5.8 The EA should consider an alternative that moves the proposed diversion structure to a location other than the middle of K St.

The Rock Creel Pumping Station looking east from the parkway.

A possible alternative site is the area between Rock Creek Parkway and the pumping station. A pipe (approach channel) could head south from the diversion structure under K St. to the planned dropshaft to the Potomac tunnel that would be built in the square bounded on the north by the Whitehurst Freeway and K St., on the west by the Parkway, on the south by Virginia Ave., and on the east by 27th St.

This dropshaft is planned for diverted overflows from CSO 022 (a combined sewer east of Rock Creek) and for flows from the Upper Potomac interceptor Relief Sewer. The latter flows would result from a temporary, operational shutdown of the Potomac Pumping Station.

6. Other comments
6.1 The EA fails to address the implications of various precipitation, storm surge, sea level rise, and flood scenarios outlined in the Climate Change Adaption Plan for the District of Columbia, prepared for the District of Columbia's Department of Energy and Environment, June 2015. As the report notes on p. 38, "Current FEMA flood mapping is based on riverine modeling with historical flood frequency inputs, and does not account for potential future effects of climate change. For example, if FEMA riverine modeling inputs were revised to account for 100 -year, 24-hour precipitation projections, then projected 100-year flood depths and extents would increase relative to current estimates."

The 100 year flood contour line in the EA is for the Potomac River only. A flood contour line for Rock Creek should also be included particularly as Rock Creek flooding may affect structures built near Virginia Ave. The flood of record for Rock Creek is Hurricane Agnes in 1972.

NPS Visitor Center near Virginia Ave. NW, damaged by Rock Creek
flooding during Hurricane Agnes and subsequently demolished.

6.2 Page 4 Construction could require tree removal and disturb submerged aquatic vegetation. Trees. Clarify that tree removal for CSO 029 is not on NPS land. Clarify the location of the 15-20 cherry trees to be removed.

No representation was ever made by DC Water that trees might need to be cut down to allow for installation of GI in the sewersheds for CSOs 027, 028, and 029. Describe the type of GI installations that would necessitate cutting down trees in the historic district.

"Each removed tree would be replaced in kind or with native species at a ratio coordinated with the NPS." Clarify that this replacement commitment does not apply to trees that are not on NPS land.

6.2 Various pages. The EA repeatedly references that the diversion facility for a combined sewer "must divert a minimum of [x] million gallons of combined sewer flows from the outfall to the tunnel." For CSO 027, the volume to be diverted is "92 MGD". These values are artifacts from the original Consent Decree, which called for no overflows. As the First Amendment allows overflows from combined sewers when more than 1.2 inches of rain falls, these artifact values are misleading, alarmist, and should be deleted.

6.3 Page 5. The EA states that portions of the project area are in the 100-year floodplain. The EA then states: "This issue has been dismissed from detailed analysis and a Floodplain Statement of Findings is not necessary (NPS Water Resources Division, Martin, pers. comm. 2018)".

The 2016 EA covering the expansion of the Kennedy Center included a 13 page appendix addressing this project's siting in the Potomac River floodplain. The EA was prepared for NPS' National Mall and Memorial Parks unit. The EA for the Potomac River tunnel and its associated structures, most of which are in the same floodplain, includes only a parenthetical reference to an assertion by a NPS hydrologist in Fort Collins Colorado that the requirements of E O 11988, EO 13690, and National P:ark Service Procedural Manual 77-2 need not be met. The EA should discuss the basis of this assertion and why an EA was prepared for a more modest Kennedy Center expansion but need not be prepared for the more expansive tunnel project.

6.4 Appendix D Page D-7. Summary of results of Phase IA Archaeological Assessment and Phase IB Survey with Recommendations for the Potomac River Tunnel. The assessment does not reference that the Aqueduct Bridge was a principal line of communication for the Army of the Potomac into Virginia during the Civil War, and artifacts from that period may be present in the adjacent ground.

6.5 Emergency Overflow Structure. CAG supports alternatives that locate this structure downstream of the Kennedy Center, rather than an alternative that places it west of Virginia Ave., near the Watergate. (The Emergency Overflow Structure is separate from the Emergency Surge Relief Pipe.) A downstream site will reduce the impact of any emergency overflows on recreational activities on the Georgetown mole (Thompson's boathouse), and not detrimentally affect the eastward-looking view from the C&O Canal's Tidal Lock.

*Please note that a mailed copy of these electronically submitted comments is being sent to the DC Clean Rivers Project at the address provided.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 29

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | William Moroney |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 3303 Water St NW 8N<br>Washington, DC 20007<br>USA |
| E-mail: | bill.moroney@me.com |


## Correspondence Information

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| Status:New | Park Correspondence Log: |
| Date Sent: Dec 4, 2018 | Date Received: Dec 4, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

I am writing as a private citizen and as a resident of Georgetown. I live in a condominium "nestled" between the C&O Canal and the Georgetown Waterfront Park. As a life-long resident of Washington, DC,I realize how far we have come and how much more there is still to be done to improve the quality of the Potomac River.

I am concerned, however, that the current discussion regarding the building of a Potomac River Tunnel through the Georgetown Waterfront Park is shortsighted, could likely do more harm than good, and ignores potentially better alternatives.

I will not try and reiterate other, more thorough comments from organizations such as the Friends of Georgetown Waterfront Park, the Georgetown Business Improvement District, Georgetown Heritage, and the Citizens Association of Georgetown. Rather, allow me to highlight one argument in alternative to the current tunnel plan that I believe has not received the serious attention it deserves.

If a tunnel must be built, I would encourage the National Park Service and DC Water to consider looking at the bed of the C&O Canal. Doing this would cost less (as open trenching is cheaper that tunneling) and would enable much-needed restoration and repair work to the Georgetown section of the Canal. One great Park gets improved while another great Park is not destroyed.

I hope these comments are helpful. If I can be of any further assistance, please let me know.

Respectfully submitted,<br>
William R. Moroney<br>
3303 Water Street, NW, Washington, DC 20007

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 30

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Christopher Murphy |
| Organization: | Georgetown University |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 37th and O Streets, NW<br>Washington, DC 20057<br>USA |
| E-mail: | ckm28@georgetown.edu |


## Correspondence Information

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| Status:New | Park Correspondence Log: |
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| Notes: | |

## Correspondence Text

Comments of Georgetown University to the October 2018 Potomac River Tunnel Environmental Assessment Prepared by the National Park Service in Cooperation with the District of Columbia Water and Sewer Authority

Submitted December 4, 2018

Georgetown University (GU) submits the following comments with respect to the October 2018 Potomac River Tunnel Environmental Assessment (EA) prepared by the National Park Service (NPS) in cooperation with the District of Columbia Water and Sewer Authority (DC Water):

1. CSO 027 & CSO 028 (Sections 2.2.9 and 2.2.10, pages 19-23 of the EA)

a. Impacts on Traffic

Comments and Suggestions: CSO 027 Control Option 1 (K Street, NW/Georgetown Waterfront Park, without Emergency Surge Relief Pipe) would have a greater adverse impact on traffic than CSO 027 Option 2 (Georgetown Waterfront Park); however, GU is concerned that the extent of anticipated traffic impacts have not been fully evaluated and detailed in the EA. These traffic impacts will have significant consequences given that the impacted location of Water Street provides the only vehicular access to all locations west of Potomac Street (i.e., Water Street has no outlet west of the impacted location). GU requests that additional information and details regarding transportation restrictions, detours, and resulting impacts be provided, along with additional opportunities and time for review and comment.

b. Georgetown Non-Motorized Boathouse Zone Impacts

Comments and Suggestions: The construction and subsequent operation of improvements described in the EA with respect to CSO 027 and CSO 028 could have significant impacts on the planned development and long-term utilization of the Georgetown Non-Motorized Boathouse Zone (plans for which are subject to a FONSI issued in February of 2017). The EA does not provide clear details as to the alignment of the Potomac River Tunnel between CSOs 027 and 028, and as a result, the impact that the tunnel and its related appurtenances may have on potential future boathouse sites identified in the FONSI, including areas immediately north or immediately south of Key Bridge, cannot be fully assessed.

Particularly in light of the University's interest in developing a boathouse facility pursuant to the February 2017 FONSI in this zone, GU requests that details associated with the impacts between the CSOs be provided, along with additional opportunities for public input related to potential impacts on the Georgetown Non-Motorized Boathouse Zone.

c. Emergency Surge Relief Pipe Outfalls

Comments and Suggestions: The proposed emergency surge relief pipe outfalls described in the EA appear to be significantly larger than the existing outfalls. It is anticipated that this structure may have a substantial adverse impact on the waterfront and adjacent facilities, and that impacts to the existing channel depths as well as increases in adjacent bank erosion could also result from the surge pipes. GU is concerned that these issues are not fully addressed in the EA. GU requests that these issues be fully evaluated and addressed and that further information on proposed structure depths as well as a rendering of the proposed surge pipes be provided, along with additional opportunities and time for review and comment.

d. Ventilation Vault Location

Comments and Suggestions: Given concerns over odor and adjacent uses, any ventilation vault should include odor control and be located away and downwind from primary public use areas, and should be carefully integrated into the surrounding landscape and local historic architecture. Renderings or preliminary engineering drawings of the shaft and vaults are requested in order for GU to provide substantive responses regarding the full scope of the impact of the proposed CSO 027 ventilation vault.

e. Additional Impacts

Comments and Suggestions: Although visitor use impacts are addressed in the EA, GU is concerned that a wide range of additional environmental impacts, including those associated with maintaining access to and detours for the Capital Crescent Trail, access to currently-operating boat houses and other existing facilities as well as facilities that may be developed within the Georgetown Non-Motorized Boathouse Zone, do not appear to be addressed by the EA. GU requests that further information regarding these additional impacts be provided, along with additional opportunities and time for review and comment.

f. Emergency Overflow Structure and Ventilation Control Facility Options

Comment: The University supports the determination addressed in the EA to dismiss the design alternatives listed as Options 2.3.2 and 2.3.3 for the emergency overflow structure and the ventilation control facility in light of potential impacts these alternatives may have on the Georgetown Non-Motorized Boathouse Zone.

2. CSO 029 (Section 2.2.11.2, pages 23-24 of the EA)

a. Impact on GU Canal Road Entrance

Comments and Suggestions: All options presented in the EA for CSO 029 appear to require closure, partial or otherwise, of the GU Canal Road Entrance (identified in the EA document as the Georgetown University Southwest Entrance), although the EA notes that vehicular access would be maintained "to the extent practicable."

The Canal Road Entrance is an essential access point to Georgetown University and MedStar Georgetown University Hospital (MGUH or Hospital). Given its proximity to Key Bridge and many major arterial networks, it is the primary entrance for University faculty, staff, students and visitors and well as delivery, service, and emergency response vehicles (including DC Fire, EMS, and hazmat response teams). Furthermore, in response to long-standing community concerns, the University's Campus Plan Order of Approval specifically requires that the University utilize the Canal Road Entrance for four of five of the Georgetown University Transportation Shuttle (GUTS) routes. Ongoing, reliable, and efficient GUTS service is essential to University operations in that it provides access between campus and Metrorail and other key destinations for more than 22,000 riders each week - including students, faculty, staff, patients, and visitors. As the Campus Plan prohibits GUTS buses from using other campus access points, there is no alternative to the Canal Road Entrance for these essential GUTS routes. The Canal Road Entrance also provides important campus access for other modes of transportation beyond conventional vehicular traffic (e.g., pedestrians and bicycles), which do not appear to be fully addressed in the EA.

Beginning on February 1, 2019, Entrance 1 on Reservoir Road, which currently serves as a major north campus access point for the University and Hospital, will be closed for approximately three years to accommodate construction of a new MGUH medical/surgical pavilion. During this time, the volume of traffic using the Canal Road Entrance to enter and exit campus is expected to increase significantly.

For all of these reasons, GU needs to be assured that the Canal Road Entrance will remain fully open and accessible at all times, and will not suffer a loss in capacity or level of service. Given the existing topography in the proposed shaft areas and the extent of the proposed construction staging area, GU is concerned that the statement regarding "open access" noted in the EA may not have been fully vetted.

GU requests that traffic control and grading plans which detail how the Canal Road Entrance will remain open and fully functional during all phases of construction of the improvements, and an assessment of how any construction activities will impact GUTS buses, passenger vehicles, delivery vehicles, pedestrians, and bicycles be provided, along with additional opportunities and time for review and comment.

b. Location of CSO 029

Comments and Suggestions: It is noted that the alignment of CSO 029 depicted in the preferred option (CSO 029 Control Option 2, Figure 2-22) of the EA is new to GU; specifically, CSO 029 Control Option 2 does not align with the location most recently presented by DC Water to GU on May 23, 2018. Notably, the EA's preferred option represents a significantly increased adverse impact on the operation of Canal Road and the Canal Road Entrance and is therefore not supported by the University. The extent of the anticipated road closures associated with CSO 029 Control Option 2 were not discussed with GU prior to release of the EA document, and are inconsistent with the options presented by DC Water to GU in May 2018. Specifically, the options reviewed with GU did not depict any proposed infrastructure within the paved area of the Canal Road Entrance, or to the extent they did, envisioned a full width temporary detour road. However, the only two options presented for CSO 029 in the EA include construction within these same paved areas, without any commitment to the nature of proposed vehicular bypass strategies. In both options presented in the EA, more than one acre of construction phasing area is depicted, encompassing the entire expanse of the Canal Road Entrance, with little detail as to the intended use of this area, construction vehicle access points, and other critical data that would be necessary to fully assess the impacts of these elements. Given the lack of detail for these staging areas, combined with the aggressive footprint completely encompassing GU's area of greatest concern, GU does not support the preferred option detailed in the EA. GU requests further study and the development of a plan, including renderings and preliminary engineering drawings of the CSO 029 control improvements, that will address the need for the Canal Road Entrance to remain fully open and accessible at all times, with no loss in capacity or level of service.

In addition, it appears the potential environmental impacts from the necessary grading to maintain the access roadway during construction were not fully addressed in the EA. GU requests that additional information regarding potential environmental impacts from the necessary detours be provided, particularly given the topography and the likely need for significant retaining walls, along with additional opportunities and time for public comment once the information is available.

c. Broader Canal Road Traffic Impacts

Comments and Suggestions: As noted above, the Canal Road Entrance is of vital importance to GU. As a result, the efficient operation of Canal Road itself is of significant concern to GU, and short or long term closures of this major arterial as well as other traffic control measures during construction will have significant impacts on GU as well as the surrounding community and users of the transportation network in this area at large.

GU requests more detailed information regarding how construction of the proposed CSO 029, subject to the concerns noted above, will impact the operation of Canal Road with respect to GU, MedStar Georgetown University Hospital, and the surrounding neighborhoods, along with additional opportunities for review and comment.

GU appreciates the opportunity to submit these comments and requests the opportunity to continue to work with DC Water and other interested stakeholders to address the important issues related to the Clean Rivers Potomac River Tunnel Project.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 31

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Peter Sacco |
| Organization: | Advisory Neighborhood Commission 2E |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 3265 S Street NW<br>Washington, DC 20007<br>USA |
| E-mail: | 2E@anc.dc.gov |


## Correspondence Information

| | |
|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Dec 4, 2018 | Date Received: Dec 4, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

E has reviewed the DC Clean Rivers Project Potomac River Tunnel Environmental Assessment dated October 2018 A"), which was prepared by the National Park Service in cooperation with the District of Columbia Water and Authority ("DC Water").

E notes that the EA reflects DC Water's plan to install so-called Green Infrastructure ("GI") to control combined verflows from three sewersheds in ANC 2E (CSOs 27, 28, and 29) if DC Water determines that use of GI for this is "practicable."

describes the proposed GI measures in very cursory fashion and says only that, "[d]etailed facility siting and design t been performed for the level of GI implementation required . . . should GI be determined practicable."

fails to disclose what, if any, objective criteria DC Water would use to determine whether the installation of GI in tified sewersheds would be practicable.

E notes, however, that the Amended Consent Decree mandates that DC Water consider, among other things, the cceptability of GI when determining the practicability of the use of GI in the sewersheds connected to CSOs 27, 28,

to comments from Georgetown University and a determination of the constructability, operability, efficacy, and impervious acre of the GI proposed for CSO 29, ANC 2E does not object to further consideration of the use of GI ewershed that flows into CSO 29.

vershed connected to CSO 28 is relatively small. ANC 2E opposes the installation of GI in this sewershed and that DC Water consider other alternatives for controlling overflows from CSO 28, including sending overflows to er Potomac Interceptor sewer.

indicates that if GI is determined to be practicable, DC Water proposes to use GI to abate storm water runoff from of impervious acres in the sewershed connected to CSO 27. As previously noted, the EA does not disclose exactly cilities would be constructed and where those facilities would be sited, but it is indisputable that the installation of e CSO 27 sewershed would, among other things, have a severely negative impact on the Georgetown National Landmark District.

E firmly opposes the use of so-called Green Infrastructure to control overflows in the CSO 27 sewershed and notes at public acceptability is a critical factor in the practicability analysis mandated by the Amended Consent Decree.

ng to the EA, the only alternative approach to addressing overflows in CSO 27 would be connecting CSO 27 to an d Potomac River Tunnel, which would require construction of "gray infrastructure" facilities in or near the own Waterfront Park and along Water Street NW. ANC 2E applauds DC Water's efforts to reduce the intrusiveness roposed facilities, and supports the preferred construction options described in the EA. To be clear, however, ANC oses the construction of any "gray infrastructure" facilities on park land and would oppose any construction plan templates the closing of Water Street and does not adequately address the impact that major construction would the residents of the area of Georgetown south of the C&O Canal and west of Wisconsin Avenue NW.

E requests that DC Water consider alternatives that would eliminate the need for the construction of any structures ark or along Water Street NW. In that connection, ANC 2E supports the location of the proposed Emergency Surge ipe west of the Aqueduct Bridge and asks DC Water to consider alternatives to the "gray infrastructure" facilities ed in the EA. In particular, ANC 2E requests that DC Water give serious consideration to the possibility of sewer on in the areas of the CSO 27 sewershed that lie south of M Street NW. Separating sewers in this area could render essary to connect the CSO 27 sewershed to the Potomac River Tunnel.

E requests DC Water to give consideration to other alternative measures proposed by the Citizens Association of own, the Friends of Georgetown Waterfront Park, and the Georgetown Business Improvement District with the eliminating the need for either GI in the CSO 27 and CSO 28 sewersheds or permanent structures in or near the ont park.

E contends that the discussion in the EA of DC Water's plans for the siting and construction of structures associated O 24 is woefully inadequate in light of the fact that any construction in or near K Street east of 30th Street NW ave a profoundly negative impact on the entire Georgetown community. As has been suggested by the Citizens tion of Georgetown, the EA should include a discussion that is glaringly absent: a thorough assessment of the l impact on traffic flows in lower Georgetown if major construction in this area were to be undertaken.

marize, ANC 2E is firmly opposed to the installation of Green Infrastructure in CSOs 27 and 28, and is equally l to construction in K Street and Water Street NW as currently described in the EA. Therefore, ANC 2E requests Water rethink the plans for major construction in lower Georgetown to identify ways to minimize impacts on the own Waterfront Park and the entire historic district, its businesses, and its residents.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 32

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Matthew P Hoeft |
| Organization: | |
| Organization Type: | I-Unaffiliated Individual |
| Address: | Red Lion, PA 17356<br>USA |
| E-mail: | |


## Correspondence Information

| | |
|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Dec 4, 2018 | Date Received: Dec 4, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Great idea, as a tax payer I'm willing to give my money to this project. While making sure our nations capital is clean in general. Also to have clean waters for all of the wildlife in the Potomac River.

# PEPC Project ID: 50548, DocumentID: 91568
# Correspondence: 33

## Author Information


| | |
|---|---|
| Keep Private: | No |
| Name: | Joe Sternlieb |
| Organization: | Georgetown Business Improvement District |
| Organization Type: | I-Unaffiliated Individual |
| Address: | 1000 Potomac St., NW<br>Suite 122<br>Washington, DC 20007<br>USA |
| E-mail: | info@georgetowndc.com |


## Correspondence Information

| | |
|---|---|
| Status:New | Park Correspondence Log: |
| Date Sent: Dec 4, 2018 | Date Received: Dec 5, 2018 |
| Number of Signatures: 1 | Form Letter: No |
| Notes: | |

## Correspondence Text

Comments from the Georgetown Business Improvement District on the DC Clean Rivers Project Potomac River Tunnel Environmental Assessment
December 4th, 2018

Standing as a Consulting Party
The Georgetown Business Improvement District (Georgetown BID) is a consulting party to the DC Water Clean Rivers Project Potomac River Tunnel. For more information about our standing, please refer to previous comments submitted by the Georgetown BID, most recently in July 2018.

The Georgetown BID continues to believe that DC Water has not sufficiently explored feasible alternatives to the solutions proposed in this EA to solve the CSO problem along the Georgetown portion of the Potomac River. DC Water should commence a formal, public alternatives analysis process with opportunity for significant public comment and provide full disclosure of all costs, tradeoffs, and possible alternatives to those presented in this EA prior to adoption of a preferred alternative. This step has not been done, particularly for the diversion structure for CSO 024 described below, which is being introduced for the first time in this EA. The Georgetown BID continues has also been following comments provided by the Citizen's Association of Georgetown and the Friends of Georgetown Waterfront Park, and shares their concerns about specific impacts to Georgetown of the projects presented in this EA. We raise the following specific concerns to the projects presented in the EA.

Continued Potential for Alternative Green Infrastructure Projects
The Georgetown BID has previously provided comments to DC Water regarding its "gray infrastructure" solution and "green infrastructure" solutions. We continue to believe that there are options for green infrastructure in the Georgetown commercial district, particularly within CSO 027, where water accumulates from rooftops, alleyways, and roadways through green roofs, pervious

pavement, bioswales, and other infrastructure that can hold, filter, and divert water from the sewer system and prevent overflows into the Potomac. Green infrastructure projects within the commercial portion of the CSO 027 drainage could provide some of the acreage needed for green infrastructure solutions.

Component 8: CSO 024 and UPI Diversion Structure and Significant Disruption to K Street
The Environmental Assessment identifies the need for a Diversion Structure for the Upper Potomac Interceptor sewer at CSO 024 at the intersection of 30th and K Street. Construction in this location would be enormously disruptive to the Georgetown commercial district. The K Street corridor is the main travel corridor for the office tenants, residents, and visitors to Georgetown, accounting for more than 10,000 trips per day, accounting for all modes of travel. The construction of a diversion structure here would have significant negative impacts on multiple large office buildings at this location. There are also hundreds of residents who live in the corridor, for whom K Street is the primary access point into and out of Georgetown. Diverting vehicle traffic around construction at this site would put more traffic on side streets and on M Street, creating major congestion issues and negatively impacting the quality of life for the residents and businesses in the neighborhood.

Furthermore, the plans shown on the EA for a diversion structure as this site do not include any elevations or adequately convey the nature of the construction or completed structure. The visual impacts and occupancy of public space for these new structures cannot be understood from the plans provided in this EA. Finally, this particular project has not been discussed in previous meetings with stakeholders and is newly introduced in this EA. WE are concerned that a project with such potential impacts is only now being considered.

In Section 2.3 of the EA, an alternative site for this structure was identified south of the House of Sweden but was dismissed given the proximity to Georgetown Waterfront Park, lack of roadway access, and difficulty connecting to the Rock Creek Pumping Station. The preferred site at 30th and K is a similarly high-use area for pedestrians, cyclists, and vehicles, and access to the site would have significant transportation and public space impacts.

Instead of this alternative site at the House of Sweden, which is unworkable for significant reasons, DC Water should consider all potential locations for this diversion chamber, including the large public space on either side of 27th Street south of K Street. A location here would provide site access, allow staging and construction without major roadway disruption or disruption to adjacent users, minimize impacts of above-ground structures, and provide proximity to the Rock Creek Pumping Station. We strongly believe DC Water has a legal obligation to conduct a formal, complete, public alternatives analysis before making any determination of the location of this diversion structure.

Sincerely,
Joe Sternlieb
President and CEO
Georgetown Business Improvement District

# Appendix H

# 2020 Green Infrastructure Survey Results

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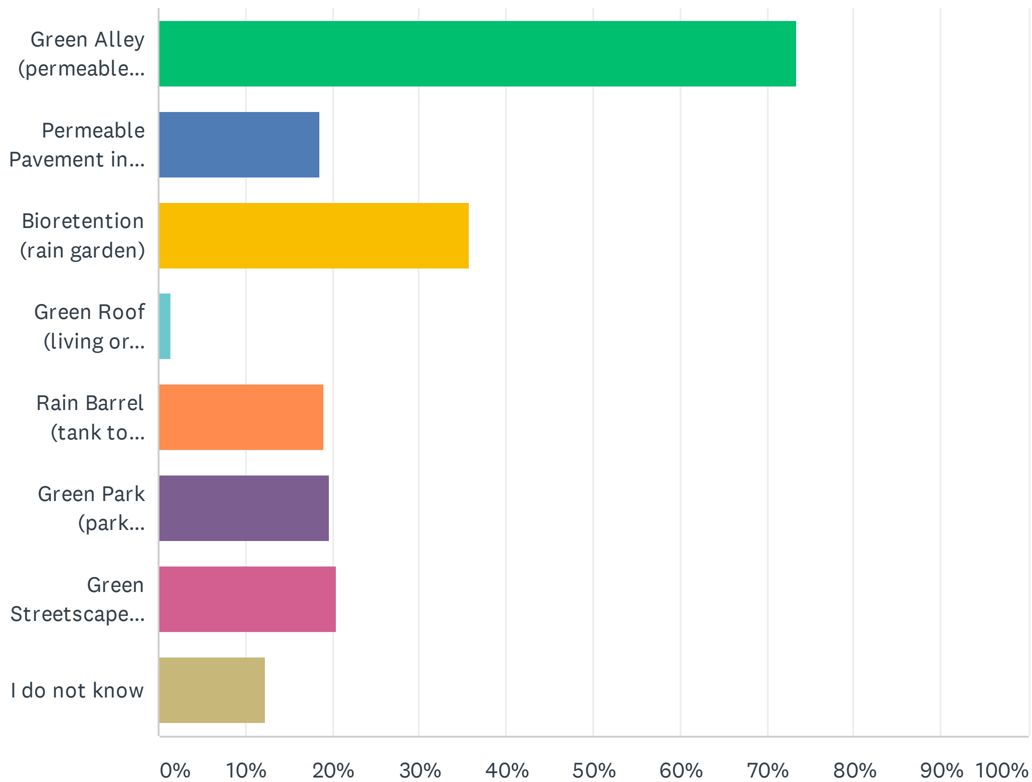
# Q1 What type of green infrastructure has been installed in your neighborhood? (Check all the apply.)

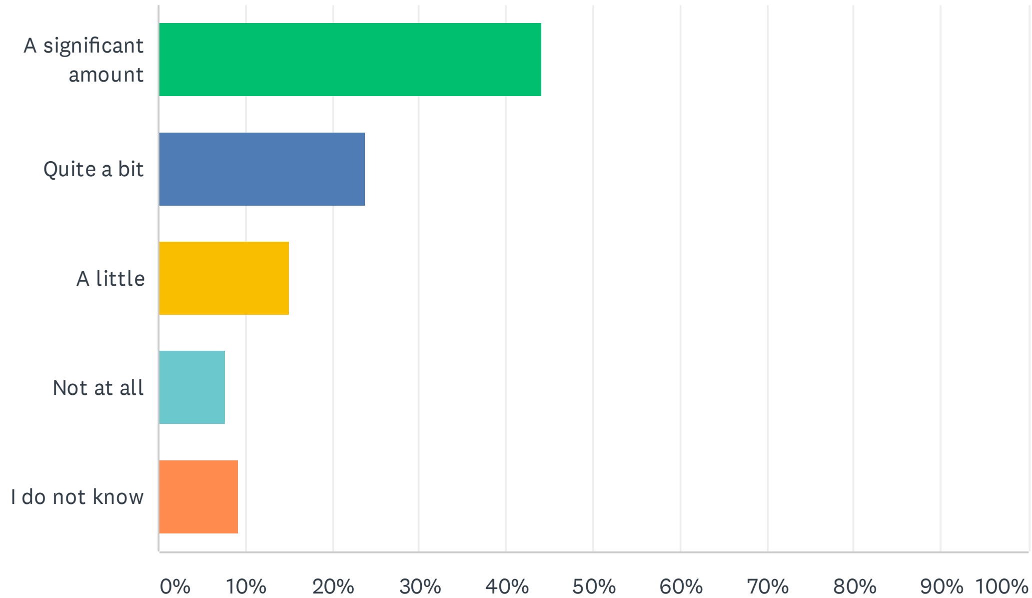
Answered: 204    Skipped: 2




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Green Alley (permeable pavers/permeable asphalt) | 73.53% | 150 |
| Permeable Pavement in Parking Lane (permeable asphalt) | 18.63% | 38 |
| Bioretention (rain garden) | 35.78% | 73 |
| Green Roof (living or vegetated roof) | 1.47% | 3 |
| Rain Barrel (tank to capture and store rainwater) | 19.12% | 39 |
| Green Park (park containing green infrastructure/stormwater management features) | 19.61% | 40 |
| Green Streetscape (block containing green infrastructure/stormwater management features) | 20.59% | 42 |
| I do not know | 12.25% | 25 |
| Total Respondents: 204 | | |

# Q2 Would you like more green infrastructure in your neighborhood?

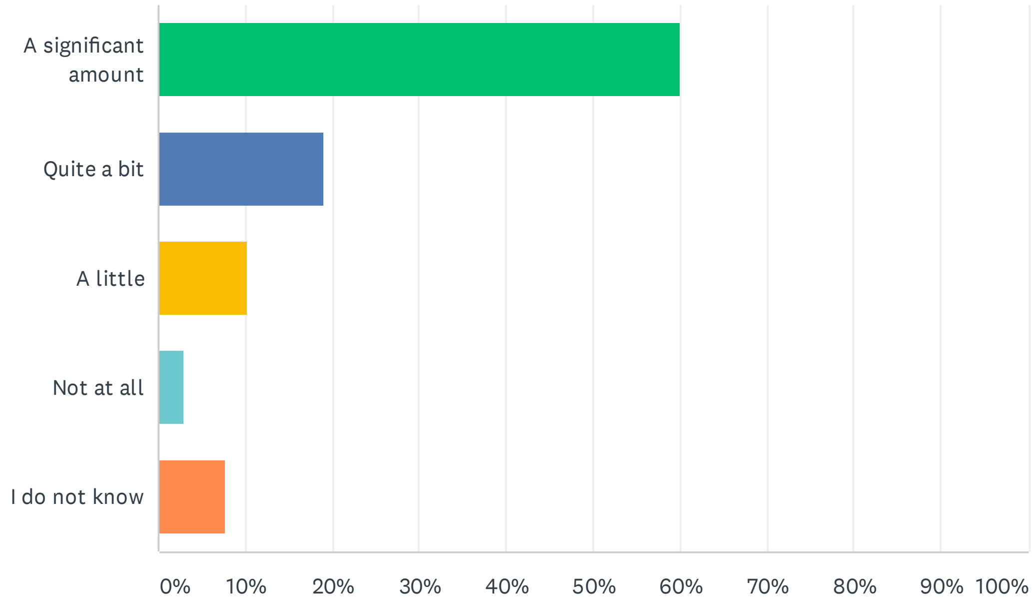
Answered: 206 Skipped: 0




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| A significant amount | 44.17% | 91 |
| Quite a bit | 23.79% | 49 |
| A little | 15.05% | 31 |
| Not at all | 7.77% | 16 |
| I do not know | 9.22% | 19 |
| TOTAL | | 206 |

# Q3 Would you like more green infrastructure in the District?

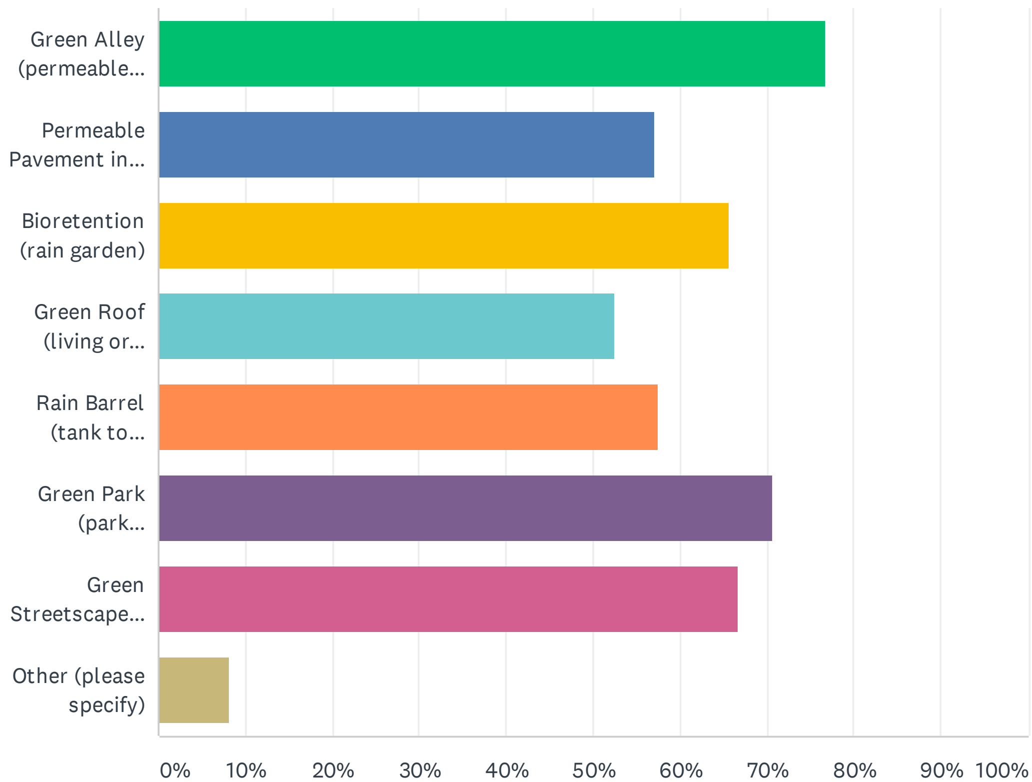
Answered: 205    Skipped: 1




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| A significant amount | 60.00% | 123 |
| Quite a bit | 19.02% | 39 |
| A little | 10.24% | 21 |
| Not at all | 2.93% | 6 |
| I do not know | 7.80% | 16 |
| TOTAL | | 205 |

# Q4 Which type of green infrastructure would you like to see more of in the District? (Check all the apply.)

Answered: 198 Skipped: 8

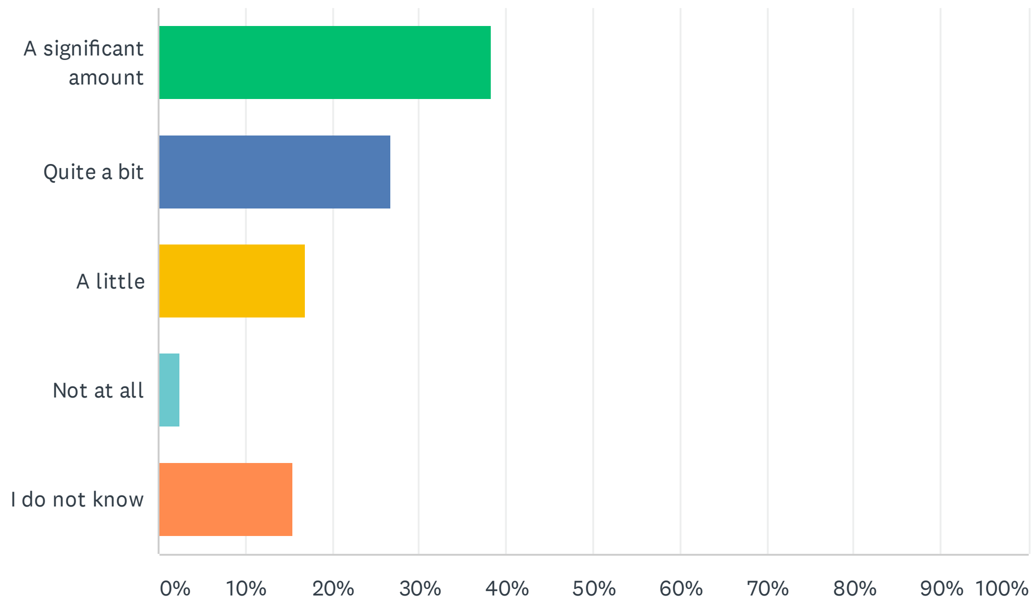



| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Green Alley (permeable pavers/permeable asphalt) | 76.77% | 152 |
| Permeable Pavement in Parking Lane (permeable asphalt) | 57.07% | 113 |
| Bioretention (rain garden) | 65.66% | 130 |
| Green Roof (living or vegetated roof) | 52.53% | 104 |
| Rain Barrel (tank to capture and store rainwater) | 57.58% | 114 |
| Green Park (park containing green infrastructure/stormwater management features) | 70.71% | 140 |
| Green Streetscape (block containing green infrastructure/stormwater management features) | 66.67% | 132 |
| Other (please specify) | 8.08% | 16 |
| Total Respondents: 198 | | |

| # | OTHER (PLEASE SPECIFY) | DATE |
|---|---|---|
| 1 | stream daylighting | 4/1/2020 7:56 PM |
| 2 | Athletic fields under the control of DCPS, DPR, and private entities that DO NOT USE artificial tuff | 4/1/2020 2:18 PM |
| 3 | require solar on every new roof, and incentivize installation where appropriate on existing roofs.. . . . irrespective of historic designation! COmmunication dishes exist, and not as important and reducing use of fossil fuels | 4/1/2020 10:28 AM |
| 4 | Solar/Wind generating power sources for utilities (e.g., traffic lights, street lights; Metro bus stops); permeable pavers used for cross walks; additional green infrastructure that not only manages rain/storm water, but also mitigates mosquito populations/vector-borne diseases in the summer | 3/31/2020 4:00 PM |
| 5 | Terrible question. Depends on cost to ratepayers and on thorough environmental analyses of specific projects with advance neighborhood input, consistent with the NEPA review process. This was not followed in connection with the green alleys project in our neighborhood and resulted in a wasteful process, among other things. Our alleys had been redone not long ago so were in good repair. Other nearby alleys in terrible repair should have been targeted. | 3/31/2020 3:33 PM |
| 6 | Replacement of rusted pipes. My water has lots of rust which is very unhealthy for my challenged health and destroys certain items items in my home. | 3/31/2020 3:30 PM |
| 7 | Anything to make the city look better. However, I would also like to see less constructions on the street. Construction is almost everywhere in DC. Why can't one project be completed then move on to another area. It's crazy with the detours a person has to take to get around DC because of the construction. | 3/31/2020 3:26 PM |
| 8 | I like rain tank on my roof for my use. | 2/25/2020 2:38 PM |
| 9 | More tree planting, and practices to support tresses as SWM BMPs | 2/14/2020 5:40 PM |
| 10 | More trash barrels on the streets R.O.W - particularly near public spaces. Also, perhaps combined trash/recycle barrels. | 1/27/2020 11:28 AM |
| 11 | ? | 1/27/2020 9:29 AM |
| 12 | At the end of the 1900 block of 39th St. NW | 1/23/2020 4:27 PM |
| 13 | None | 1/23/2020 3:30 PM |
| 14 | more waste and recycling receptacles to reduce trash and litter getting into GI infrastructure and storm drains | 1/18/2020 12:54 PM |
| 15 | Grey water and compost systems for sure! | 1/17/2020 2:25 PM |
| 16 | pocket wetlands | 1/15/2020 8:52 PM |

# Q5 Does the green infrastructure installed bring a benefit to your neighborhood?

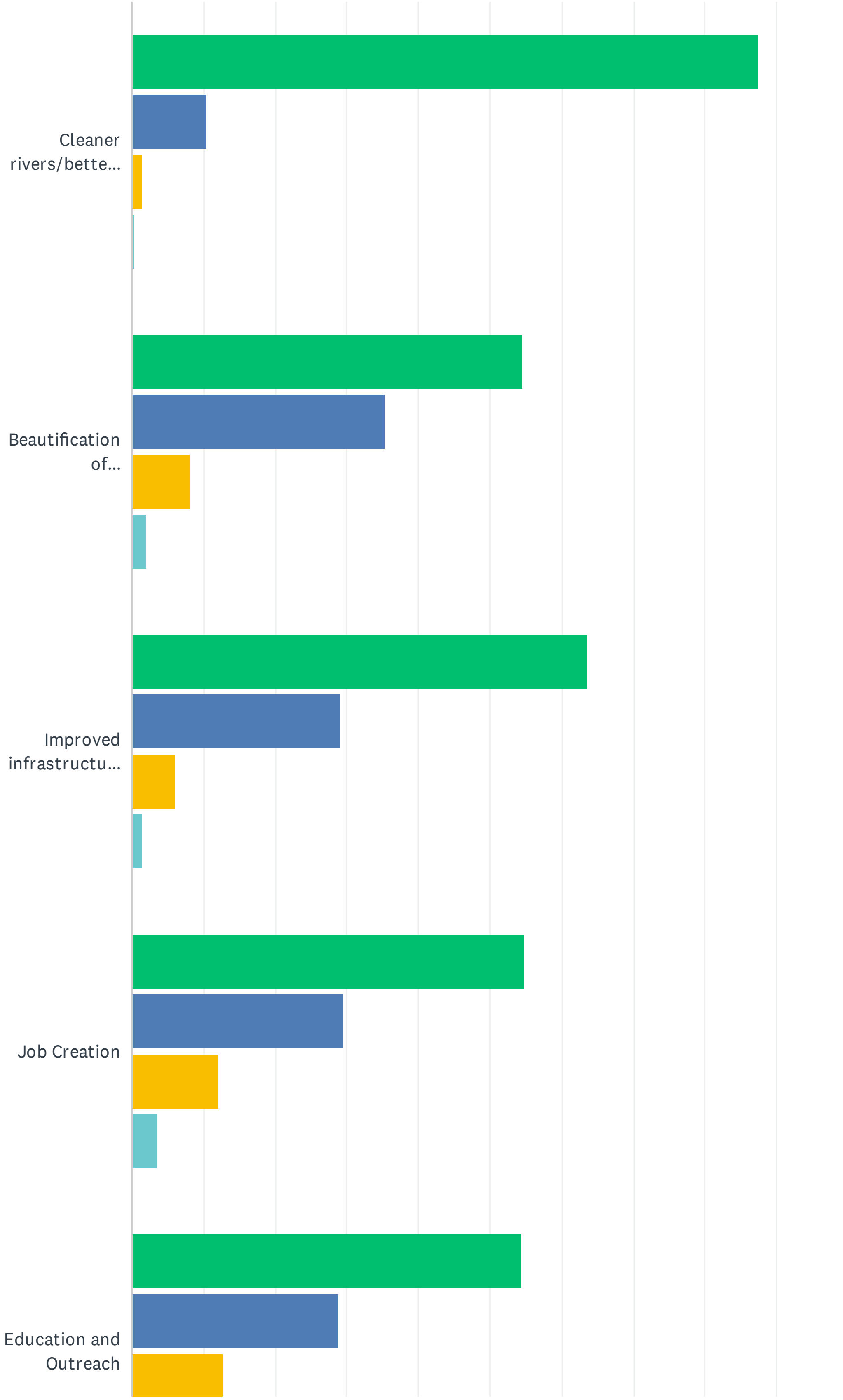
Answered: 201 Skipped: 5

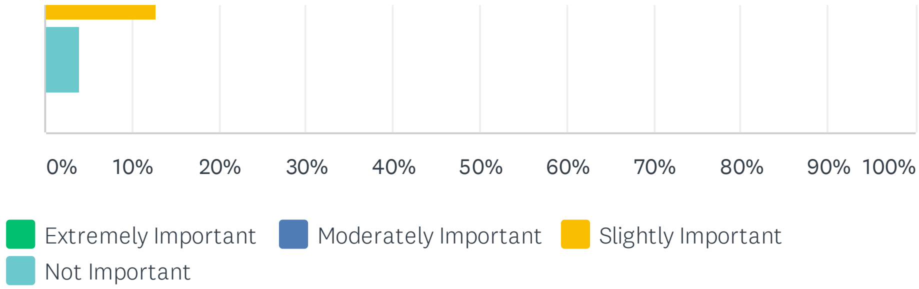



| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| A significant amount | 38.31% | 77 |
| Quite a bit | 26.87% | 54 |
| A little | 16.92% | 34 |
| Not at all | 2.49% | 5 |
| I do not know | 15.42% | 31 |
| TOTAL | | 201 |

# Q6 Rate importance of green infrastructure benefits to you.

Answered: 201 Skipped: 5

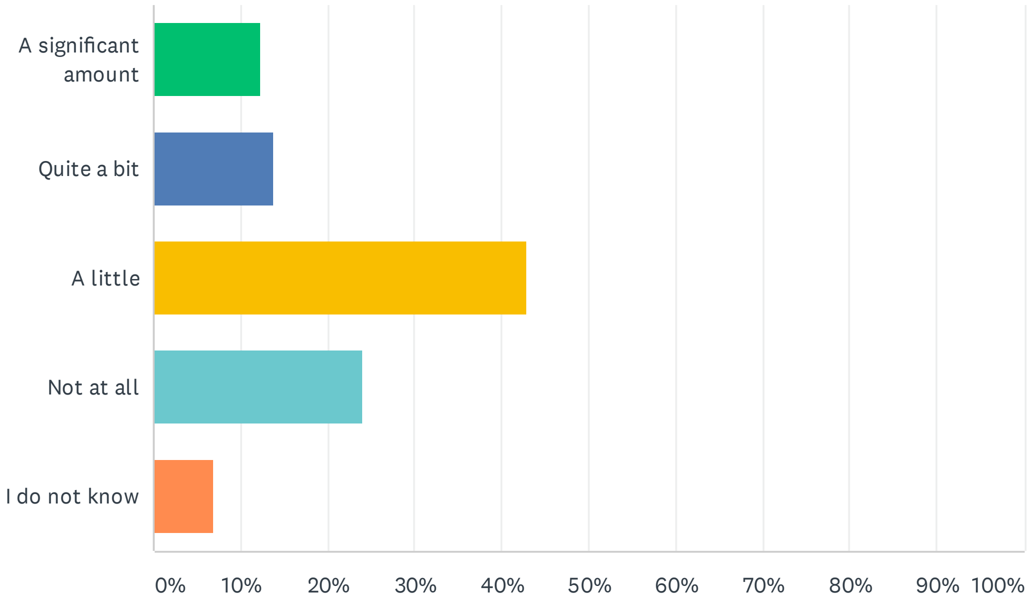





| | EXTREMELY IMPORTANT | MODERATELY IMPORTANT | SLIGHTLY IMPORTANT | NOT IMPORTANT | TOTAL | WEIGHTED AVERAGE |
|---|---|---|---|---|---|---|
| Cleaner rivers/better water quality | 87.50% 175 | 10.50% 21 | 1.50% 3 | 0.50% 1 | 200 | 3.85 |
| Beautification of neighborhoods | 54.55% 108 | 35.35% 70 | 8.08% 16 | 2.02% 4 | 198 | 3.42 |
| Improved infrastructure (i.e. repaved alleys) | 63.50% 127 | 29.00% 58 | 6.00% 12 | 1.50% 3 | 200 | 3.54 |
| Job Creation | 54.82% 108 | 29.44% 58 | 12.18% 24 | 3.55% 7 | 197 | 3.36 |
| Education and Outreach | 54.31% 107 | 28.93% 57 | 12.69% 25 | 4.06% 8 | 197 | 3.34 |

# Q7 How disruptive was the construction of green infrastructure to your day-to-day life?

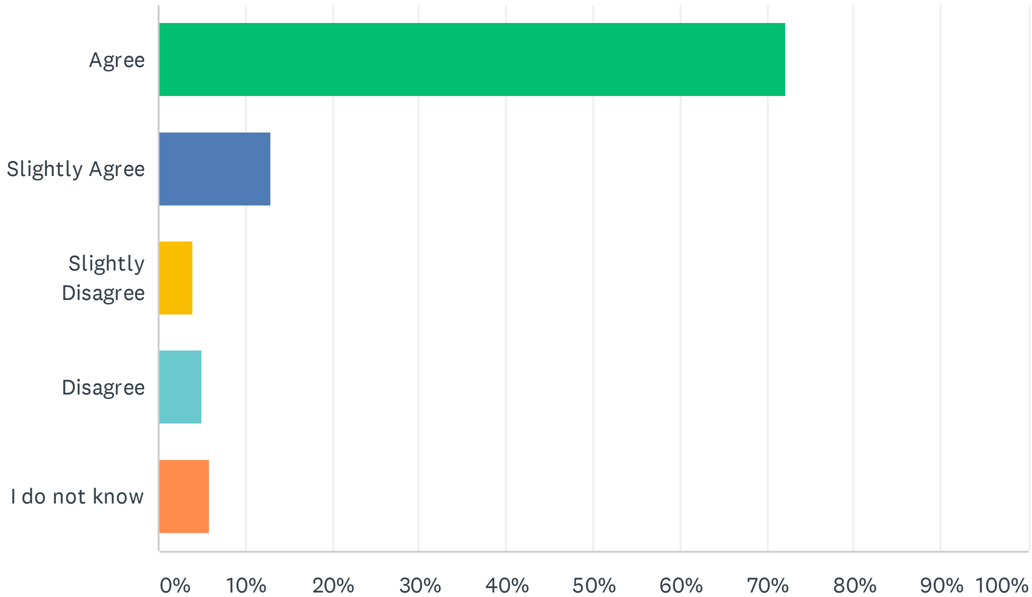
Answered: 203 Skipped: 3




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| A significant amount | 12.32% | 25 |
| Quite a bit | 13.79% | 28 |
| A little | 42.86% | 87 |
| Not at all | 24.14% | 49 |
| I do not know | 6.90% | 14 |
| TOTAL | | 203 |

# Q8 Do you agree with the following statement: The benefit of green infrastructure outweighs the disruption of construction.

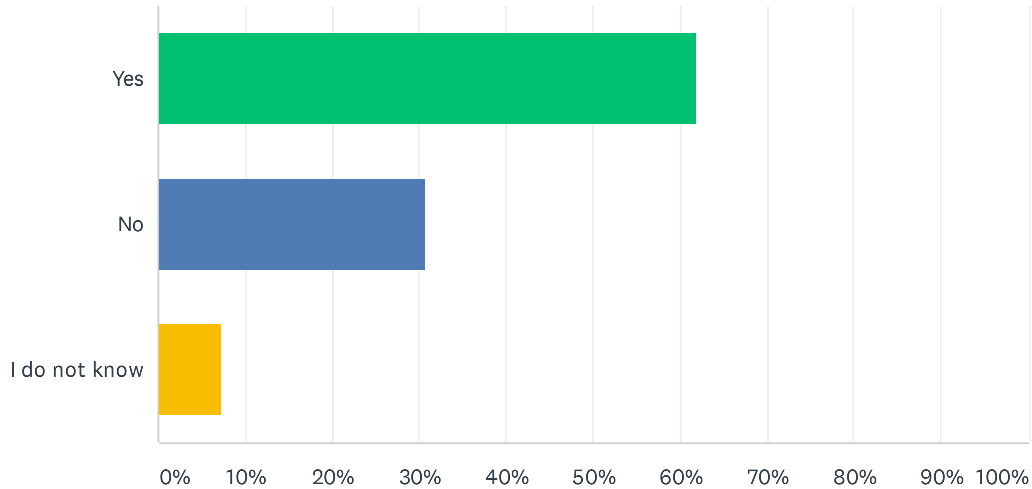
Answered: 202    Skipped: 4




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Agree | 72.28% | 146 |
| Slightly Agree | 12.87% | 26 |
| Slightly Disagree | 3.96% | 8 |
| Disagree | 4.95% | 10 |
| I do not know | 5.94% | 12 |
| TOTAL | | 202 |

# Q9 Do you agree with the following statement: I was aware that DC Water was bringing green infrastructure to my neighborhood before construction started.

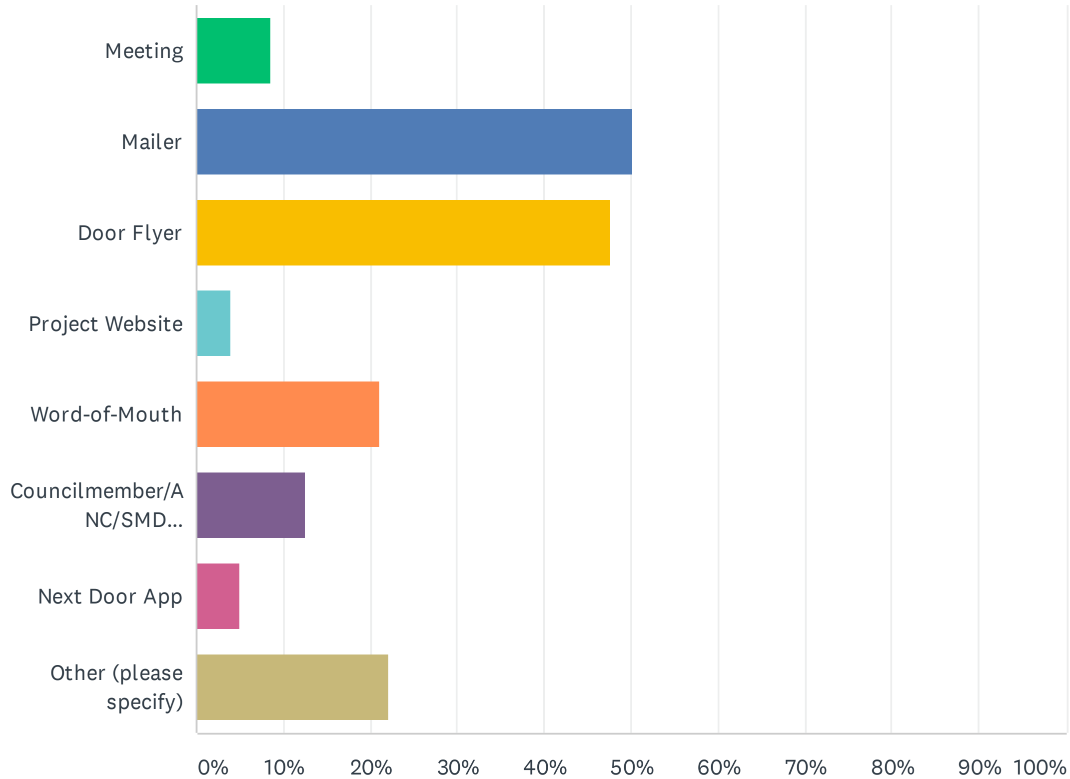
Answered: 202 Skipped: 4




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Yes | 61.88% | 125 |
| No | 30.69% | 62 |
| I do not know | 7.43% | 15 |
| TOTAL | | 202 |

# Q10 How did you find out that green infrastructure was coming to your neighborhood? (Check all that apply).

Answered: 199 Skipped: 7



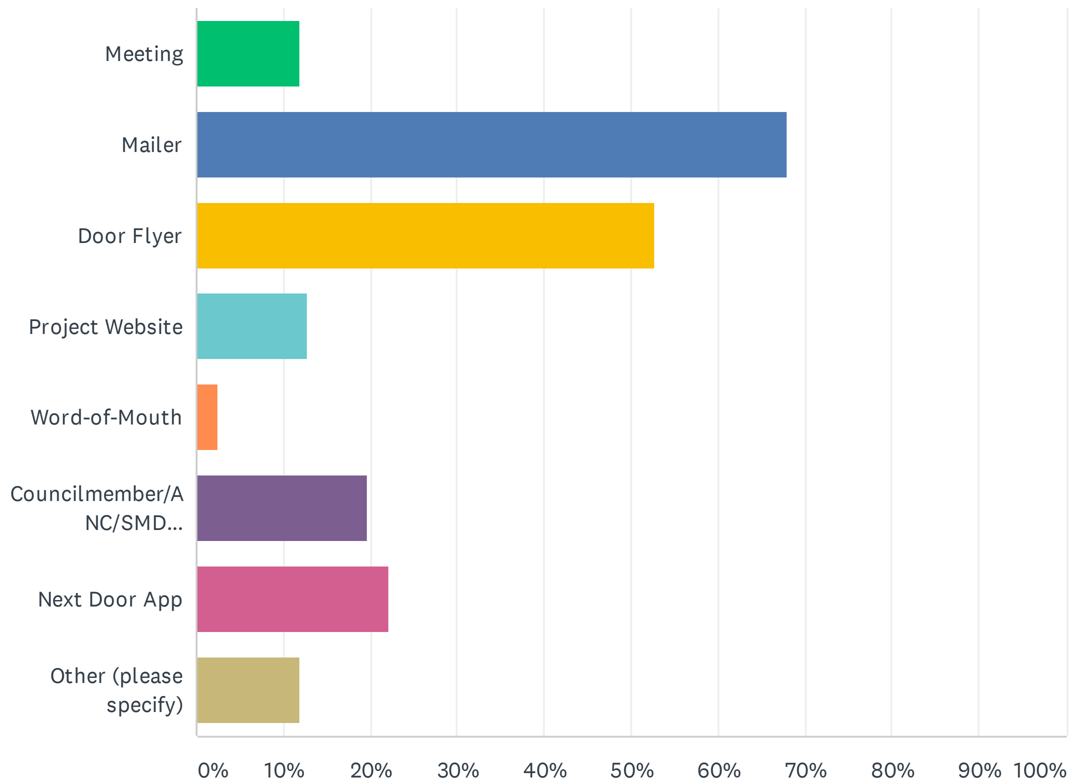

| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Meeting | 8.54% | 17 |
| Mailer | 50.25% | 100 |
| Door Flyer | 47.74% | 95 |
| Project Website | 4.02% | 8 |
| Word-of-Mouth | 21.11% | 42 |
| Councilmember/ANC/SMD Representative | 12.56% | 25 |
| Next Door App | 5.03% | 10 |
| Other (please specify) | 22.11% | 44 |
| Total Respondents: 199 | | |

| # | OTHER (PLEASE SPECIFY) | DATE |
|---|---|---|
| 1 | We looked outside and saw the alley was blocked | 4/3/2020 5:13 AM |
| 2 | I didn't find out until work began | 4/1/2020 3:13 PM |
| 3 | Asked surveyors what they were doing | 4/1/2020 11:18 AM |
| 4 | I never knew. | 4/1/2020 10:34 AM |
| 5 | different social networks | 4/1/2020 10:28 AM |
| 6 | Email | 4/1/2020 10:25 AM |
| 7 | Just moved to the neighborhood | 4/1/2020 9:57 AM |
| 8 | Infrastructure was complete prior to my moving to this neighborhood. | 4/1/2020 8:03 AM |
| 9 | Found out due to receipt of this survey | 3/31/2020 8:17 PM |
| 10 | Honestly I do not remember the specifics but I knew it was happening. | 3/31/2020 7:08 PM |
| 11 | No notification to date. | 3/31/2020 6:20 PM |
| 12 | Phone call from DCWATER | 3/31/2020 4:21 PM |
| 13 | The just started tearing up our alley without notice, though when I complained to my council member, DC WASA claimed they put a notice on our door. We did not receive any such notice. | 3/31/2020 3:41 PM |
| 14 | No door flyer or meaningful notice at a stage where we could be involved. Process violated federal and DC NEPA and the public meetings were ridiculous. It was cynical wasteful treatment of the affected public. Happy to expand on this if you contact me. | 3/31/2020 3:33 PM |
| 15 | When they started working and caused many cracks in my home which drained my savings to repair some, but was never reimbursed. Really unconscionable since it created a big financial hardship for me. Really unjust. | 3/31/2020 3:30 PM |
| 16 | I found out when they were doing it and parking all their equipment on my property where I couldn't even move my trash cans | 3/31/2020 3:26 PM |
| 17 | THE DAY IT STARTED I ASKED A JOB SITE SUPERVISOR WHAT WAS HAPPENING | 3/31/2020 3:11 PM |
| 18 | Construction started | 3/31/2020 3:10 PM |
| 19 | The alley was re-done an after the fact my neighbor told me about the "green" part of it. In fact, I was not even notified that the work was being done and my car was blocked int my driveway for 2 weeks without notice. | 3/31/2020 3:00 PM |
| 20 | walking by and seeing it | 3/31/2020 2:50 PM |
| 21 | Just finding out | 3/31/2020 2:49 PM |
| 22 | seeing construction as it happens | 2/25/2020 3:03 PM |
| 23 | DC Water attended annual picnic | 2/13/2020 9:50 AM |
| 24 | The team showed up in an alley. | 2/6/2020 10:24 AM |
| 25 | This Survey | 1/30/2020 9:49 AM |
| 26 | Some features were in place when I moved here. | 1/27/2020 11:28 AM |
| 27 | Saw Crews Working | 1/27/2020 10:58 AM |
| 28 | Local website: www.burleith.org | 1/27/2020 10:52 AM |
| 29 | ? | 1/27/2020 9:29 AM |
| 30 | Literally this flyer | 1/23/2020 5:03 PM |
| 31 | This Survey | 1/23/2020 5:01 PM |
| 32 | Community association Group | 1/23/2020 4:54 PM |

| | | |
|---|---|---|
| 33 | Trucks & Workers disrupting alley with no notice. | 1/23/2020 4:13 PM |
| 34 | Seeing the results after construction | 1/23/2020 4:03 PM |
| 35 | I didn’t know. I thought the construction had something to do with the bus depot. | 1/23/2020 1:05 AM |
| 36 | flyers on the trees | 1/20/2020 10:12 PM |
| 37 | yard signs | 1/20/2020 6:23 PM |
| 38 | I was not alerted. I just heard them working in the alley. | 1/19/2020 11:38 AM |
| 39 | Found out about it when construction began | 1/18/2020 3:27 PM |
| 40 | pamphlet in the water bill | 1/18/2020 12:53 PM |
| 41 | wasn't aware before alley work began | 1/15/2020 5:47 PM |
| 42 | Already present | 1/15/2020 1:05 AM |
| 43 | Listserv | 1/14/2020 7:33 AM |
| 44 | Annual Burleith piicnic. You had a table with info | 1/13/2020 2:51 PM |

# Q11 What is your preferred way to receive information about construction projects in your neighborhood? (Check two methods).

Answered: 203    Skipped: 3

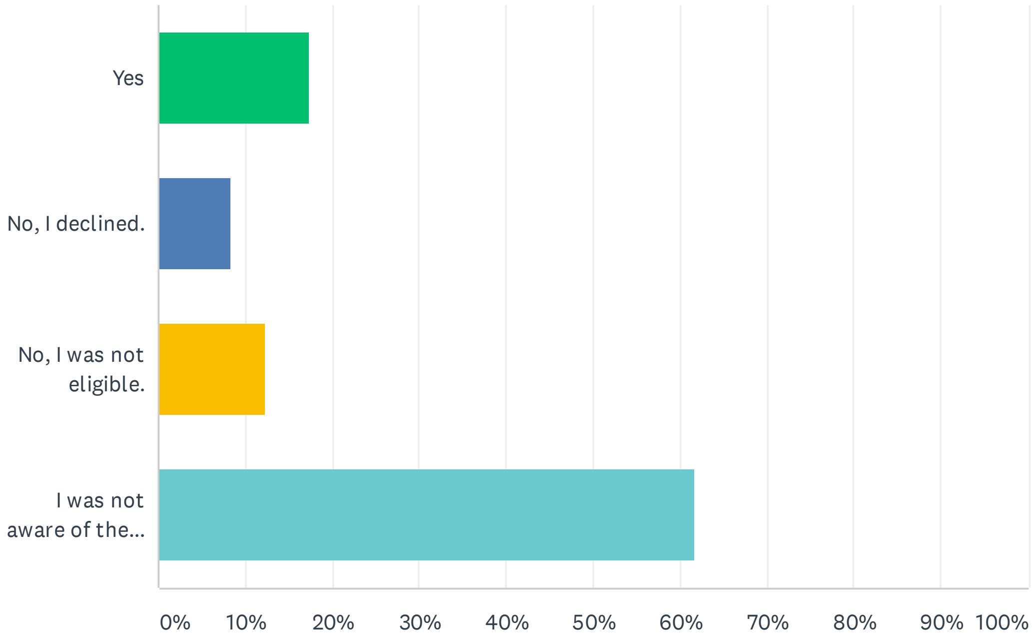



| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Meeting | 11.82% | 24 |
| Mailer | 67.98% | 138 |
| Door Flyer | 52.71% | 107 |
| Project Website | 12.81% | 26 |
| Word-of-Mouth | 2.46% | 5 |
| Councilmember/ANC/SMD Representative | 19.70% | 40 |
| Next Door App | 22.17% | 45 |
| Other (please specify) | 11.82% | 24 |
| Total Respondents: 203 | | |

| # | OTHER (PLEASE SPECIFY) | DATE |
|---|---|---|
| 1 | Email | 4/3/2020 5:13 AM |
| 2 | email | 4/1/2020 3:13 PM |
| 3 | Email or text | 4/1/2020 10:34 AM |
| 4 | email | 4/1/2020 10:28 AM |
| 5 | Email | 4/1/2020 10:25 AM |
| 6 | Email !!! send emails or add to neighbor list | 4/1/2020 8:54 AM |
| 7 | Email | 3/31/2020 8:17 PM |
| 8 | Email would be best if possible. | 3/31/2020 6:20 PM |
| 9 | 411 notifications | 3/31/2020 3:39 PM |
| 10 | We do not want to be told of construction projects like green infrastructure after decisions have been made. This is a terrible question that misses the point. You must make sure citizens are informed and participate in the decision process while it is still in the decision stage. | 3/31/2020 3:33 PM |
| 11 | I would prefer a mailer or even a voicemail | 3/31/2020 3:26 PM |
| 12 | Email | 3/31/2020 3:11 PM |
| 13 | Email would be great | 3/31/2020 3:00 PM |
| 14 | email | 2/25/2020 3:03 PM |
| 15 | email | 2/14/2020 5:40 PM |
| 16 | email | 2/4/2020 1:28 PM |
| 17 | News (TV) | 1/30/2020 9:49 AM |
| 18 | Prefer any communication that does not generate litter - NO to mailers & flyers and even signage that is not removed after event. | 1/27/2020 11:28 AM |
| 19 | co,,umity Blogs like Popville, Greater Greater Washington | 1/27/2020 10:58 AM |
| 20 | Community Representative | 1/23/2020 4:54 PM |
| 21 | email | 1/20/2020 7:08 PM |
| 22 | the water bill notice was effective | 1/18/2020 12:53 PM |
| 23 | Listserv | 1/14/2020 7:33 AM |
| 24 | Email | 1/13/2020 8:05 PM |

# Q12 Did you participate in DC Water's Downspout Disconnection and Rain Barrel Program (Drain the Rain)?

Answered: 201 Skipped: 5




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Yes | 17.41% | 35 |
| No, I declined. | 8.46% | 17 |
| No, I was not eligible. | 12.44% | 25 |
| I was not aware of the program | 61.69% | 124 |
| TOTAL | | 201 |

# Q13 Additional Comments:

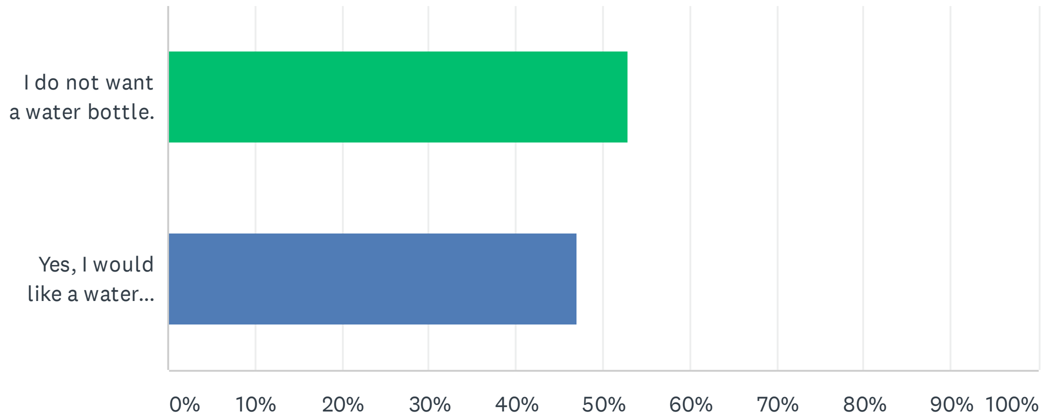
Answered: 33 Skipped: 173

| # | RESPONSES | DATE |
|---|---|---|
| 1 | Wished you would installed permeable pavers throughout the entire alley. | 4/3/2020 5:13 AM |
| 2 | i declined to participate in the downspout disconnection program because they did not offer rain barrels that would fit in the area near my downspout. A broader selection of rain barrel sizes and shapes would be helpful. | 4/1/2020 4:28 PM |
| 3 | I would like to have an assessment of the community -- Cloisters West -- for water retention methods. | 4/1/2020 10:28 AM |
| 4 | As much as I like my new alley, the permeable pavers/alley that was put in behind my house was EXTREMELY DISRUPTIVE. The door flyers kept coming and changing the dates. The last date on the last door flyer came and went. No construction. Then out of the blue work started and lasted over 6 weeks. It was insane. I couldn't get in and out of my driveway, which is a problem because as a healthcare worker, my schedule was insane and street parking was really hard to come by during those 6 weeks. Additionally, I had to call the project manager multiple times because THERE WAS NO PLAN IN PLACE FOR TRASH PICKUP. The PM said the construction workers were supposed to move our bins for us, but that rarely happened, and trash and recycling was piling up. It was gross. AND the trash/recycle trucks would completely skip our alley because the part that wasn't under construction was still blocked by their trucks. It was infuriating. Rats are gross. Our alley was nasty. I was so pissed one day I dumped my trash in their machines because despite the notes I tried to leave them and the calls I constantly had to make, no one was picking up our trash. GROSS. So next time you start a project, have a trash plan in place. Tell the residents the plan and MAKE SURE THE WORKERS DO WHAT THEY'RE SUPPOSED TO. AND YOU SHOULD LET US KNOW THE ACTUAL DATE YOU ARE GOING TO START AND A PROJECTED END DATE. 6 Weeks for half a fucking alley is ridiculous. Love the end result, but come on, be more efficient. | 4/1/2020 1:00 AM |
| 5 | I just found out about the rain barrel program and would like to participate. | 3/31/2020 7:25 PM |
| 6 | I have never seen such poorly managed construction. Unfortunately, as a water user I get to pay for this. | 3/31/2020 4:15 PM |
| 7 | If there is construction that disrupts street parking, lift parking restrictions on or around the block(s) (e.g., temporarily suspend ticketing of vehicles parked in front of no parking signs near construction areas at night) to reduce frustration to residents living near construction areas) | 3/31/2020 4:00 PM |
| 8 | Ever since our alley was "improved," we have noticed significant disruption to the water table in our area. We have noticed significant settling of the ground of our back yard and, for the first time in 14 years of living in this house, we have started to have water back up into our basement during heavy rains. It comes from the floor and interior basement walls and is not the result of running water traveling to the house. We are being forced to expend significant money to have a sump pump installed, whereas prior to the "improvements" this was not necessary. | 3/31/2020 3:41 PM |
| 9 | I was told that I was not eligible, however, most of my neighbors have a Rain Barrel. I'd like for someone to re-visit my home at [redacted] and consider installing a Rain Barrel for my home. Thank you. | 3/31/2020 3:39 PM |
| 10 | This project was carried out without legal compliance with notice and comment requirements. It was performed by Fort Myer Construction company, known for a history of misconduct, corruption and poor performance. I was assured there would be adequate oversight of their work. There was not. They knocked into a streetlight on 36th St. NW where it intersects with the alley between Whitehaven and T. This lamp post remains leaning. I have photos of the equipment that did the damage. Moreover, the green alley on the west side of 35th Place NW, just south of Whitehaven, has badly cracked in less than a year. Clearly substandard work. The company (Fort Myer) needs to correct these things at their expense and the public needs assurance this is happening. Also, no one needs a free water bottle. DC Water is a terrible company and our rates are ridiculous. Stop doing things like offering free water bottles that we pay for. And explain to the public how the generous programs for free or reduced water charges work. Isn't that generosity being paid for by the rest of us??? | 3/31/2020 3:33 PM |
| 11 | When work done at the city's request result in damage to property, we should not have to should the expense, especially seniors on very limited income. Very limited. And I may lose my home. | 3/31/2020 3:30 PM |
| 12 | The construction during this process left the tree box area in front of my house and half of the 5200 2nd Street NW block a total mess. There are dangerous lumps on the soil and soil erosion | 3/31/2020 3:27 PM |

| | | |
|---|---|---|
| | at the curb side. Many of us complained about this to your organization and DDOT. I personally had email communication with Ms. Zander but all you guys did was pass the buck and pass me back and forth between agencies. And nothing has happened. It is still a big mess. | |
| 13 | I don't know why I wasn't made aware of the participation in the DC Water Downspout since I see several houses on my block who has them. I read all mailers received from the DC Government. | 3/31/2020 3:26 PM |
| 14 | Space saving rain barrels should be incorporated into the program for those with smaller lawns. | 3/31/2020 2:57 PM |
| 15 | re: #12, they were talking to a neighbor about it when I was outside and I said sure let me know and I never heard back | 3/31/2020 2:50 PM |
| 16 | We participate in River Smart Homes. We have 3 barrels. | 2/6/2020 10:24 AM |
| 17 | I signed up for this last time & never received a call or mail materials | 2/6/2020 10:07 AM |
| 18 | Tried, but to complicated. I paid for my water barrel | 2/6/2020 9:52 AM |
| 19 | Still Considering | 2/6/2020 9:28 AM |
| 20 | In the process of Participating. | 1/30/2020 9:57 AM |
| 21 | Neighbors who did participate said barrel leaked & flooded basement. | 1/30/2020 9:52 AM |
| 22 | I am interested | 1/30/2020 9:29 AM |
| 23 | Everything is good | 1/27/2020 11:19 AM |
| 24 | We have a rain barrel | 1/27/2020 9:18 AM |
| 25 | Through my neighbor | 1/23/2020 4:54 PM |
| 26 | I applied, no response | 1/23/2020 4:21 PM |
| 27 | We would like to participate - Rain Barrel! | 1/23/2020 4:13 PM |
| 28 | I was previously a participant in the RiverSmart program so already had rain barrels. | 1/16/2020 12:30 AM |
| 29 | I would love to participate in any rain barrel programs | 1/15/2020 10:51 PM |
| 30 | While the communication about the construction was associated with the green alley project was good, the communication about maintenance has been poor. Indeed, to my surprise, there was a crew blocking the alley and kicking up dust using a heavy machine last summer for which there was no notice. If that kind of intrusive maintenance is going to happen, there needs to be some notice so that neighbors know not to be in their backyards or so that they can move their cars. | 1/15/2020 9:45 AM |
| 31 | First, the team in our neighborhood - Glover Park - was wonderful. They were always pleasant, informative, and did their best to minimize disruption. It was a long project though - lots of weather delays. I would be all for more green infrastructure if we know more about the benefits. My understanding is that this was pretty experimental. I'd like to know more about the costs and benefits of this versus other options to be greener and change behavior. Can a few select blocks and alleys make a big difference? If yes, please bring more. The pavers make the neighborhood look better. I fear the rain gardens could become trash pits. I hope not. | 1/14/2020 11:29 PM |
| 32 | Renter | 1/14/2020 11:06 AM |
| 33 | My only complaint during construction of the green alley was the pavers were higher than the prior surface and my back gate wouldn't open. No one from the construction team was aware of the problem. I had to hire someone to come change my back gate door so I would have access to the alley. | 1/13/2020 4:19 PM |

# Q14 A free water bottle is available for completing this survey. If you would like a free water bottle, select yes and enter your contact information.

Answered: 204 Skipped: 2




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| I do not want a water bottle. | 52.94% | 108 |
| Yes, I would like a water bottle.Provide Address and Email/Phone Number (required to receive water bottle): | 47.06% | 96 |
| TOTAL | | 204 |

| # | YES, I WOULD LIKE A WATER BOTTLE.PROVIDE ADDRESS AND EMAIL/PHONE NUMBER (REQUIRED TO RECEIVE WATER BOTTLE): | DATE |
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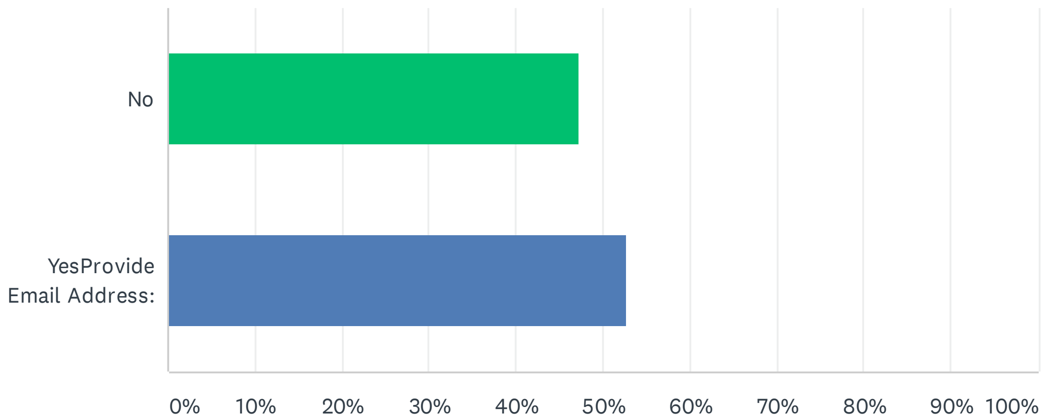
# Q15 Would you like us to include you in future emails/updates? If so, select yes and enter your email address.

Answered: 199 Skipped: 7




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| No | 47.24% | 94 |
| YesProvide Email Address: | 52.76% | 105 |
| TOTAL | | 199 |

| # | YESPROVIDE EMAIL ADDRESS: | DATE |
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# Q16 Name (optional)

Answered: 62 Skipped: 144

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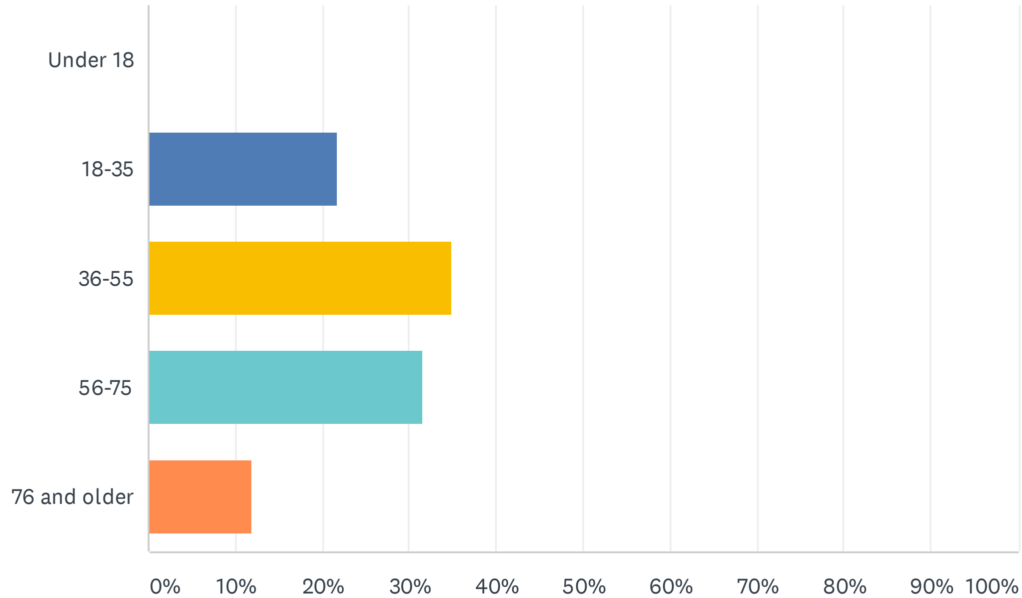
# Q17 What is your age range? (optional)

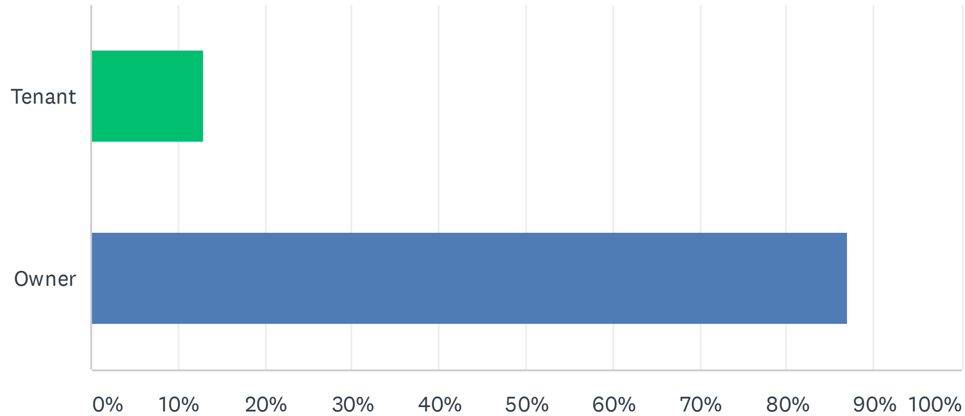
Answered: 203    Skipped: 3




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Under 18 | 0.00% | 0 |
| 18-35 | 21.67% | 44 |
| 36-55 | 34.98% | 71 |
| 56-75 | 31.53% | 64 |
| 76 and older | 11.82% | 24 |
| TOTAL | | 203 |

# Q18 Are you a tenant or owner at this property? (optional)

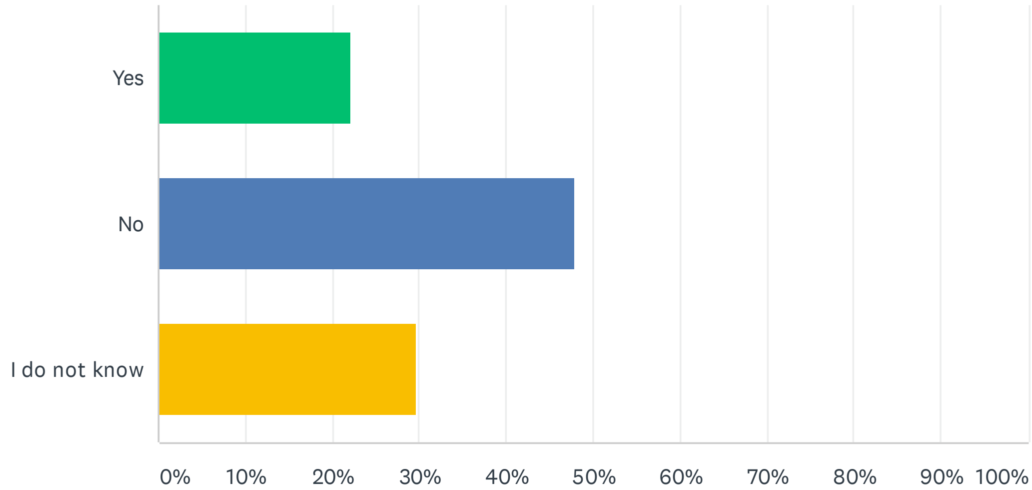
Answered: 200 Skipped: 6




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Tenant | 13.00% | 26 |
| Owner | 87.00% | 174 |
| TOTAL | | 200 |

# Q19 Have you participated in DOEE's RiverSmart Program? (optional)

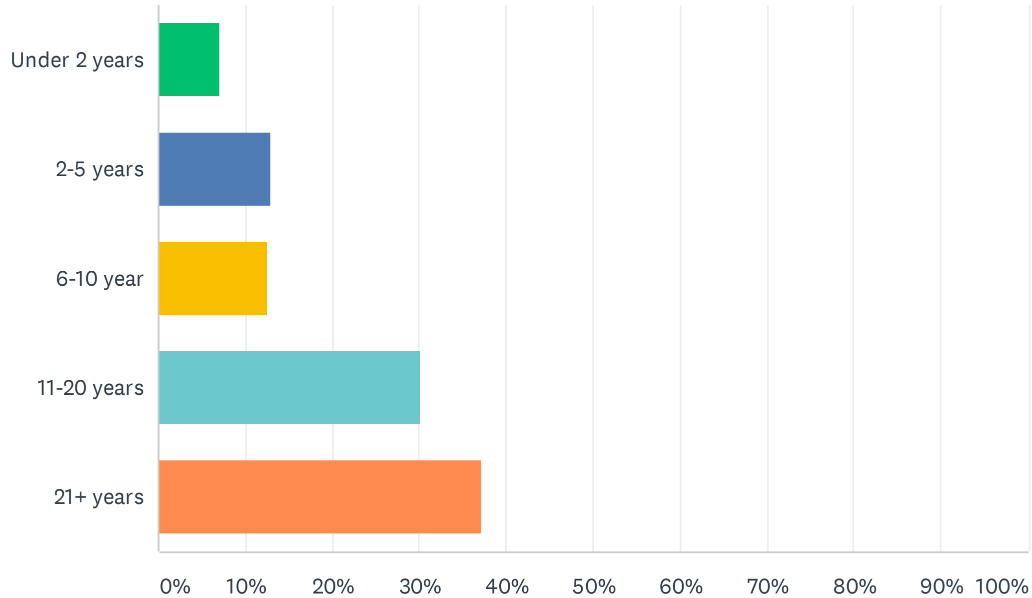
Answered: 198    Skipped: 8




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Yes | 22.22% | 44 |
| No | 47.98% | 95 |
| I do not know | 29.80% | 59 |
| TOTAL | | 198 |

# Q20 How long have you lived in the District? (optional)

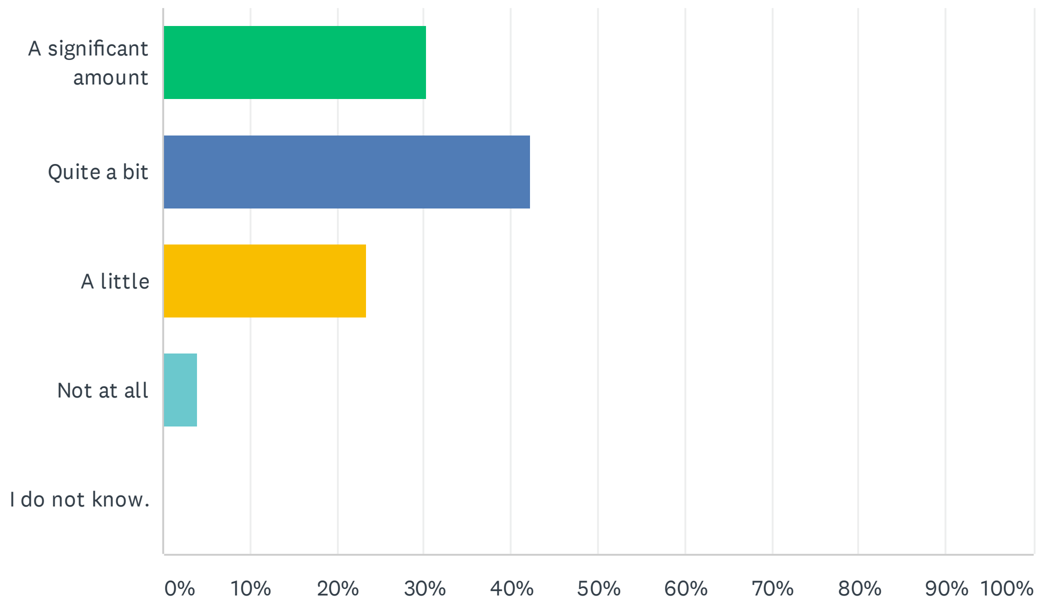
Answered: 199 Skipped: 7




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Under 2 years | 7.04% | 14 |
| 2-5 years | 13.07% | 26 |
| 6-10 year | 12.56% | 25 |
| 11-20 years | 30.15% | 60 |
| 21+ years | 37.19% | 74 |
| TOTAL | | 199 |

# Q21 Do you consider environmental impacts when making decisions and purchases? (optional)

Answered: 201 Skipped: 5




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| A significant amount | 30.35% | 61 |
| Quite a bit | 42.29% | 85 |
| A little | 23.38% | 47 |
| Not at all | 3.98% | 8 |
| I do not know. | 0.00% | 0 |
| TOTAL | | 201 |

# Appendix I

# Utility Protection Guidelines

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dc water is life

# DC WATER GREEN INFRASTRUCTURE UTILITY PROTECTION GUIDELINES

## PURPOSE

The DC Water Green Infrastructure Utility Protection Guidelines (Guidelines) provide guidance on the design and construction of green infrastructure adjacent or connected to DC Water utilities. The Guidelines provide information related to the following practices: street tree planting, trees and tree box filters; bioretention and bioswales; permeable pavements and pavers; alleys with bioretention; and underdrains adjacent to catch basins. DC Water utilities adjacent to, crossing, or connected to these green infrastructure practices include water mains, sewers, water services, sewer laterals, meters, shutoffs, valve boxes, cleanouts, hydrants and other structures.

## DEVELOPMENT

The development of these Guidelines included consultation with other agencies, analysis of similar guidelines in other localities and a review of local regulations (including the District of Columbia Municipal Separate Storm Sewer System permit). The specific requirements outlined herein reflect the due diligence performed as part of the development process.

## USE

This document should be used by professionals to assist in the design, siting and installation of green infrastructure without conflicting with DC Water-owned utilities. In addition to these Guidelines, users of this document should follow all applicable local and federal regulations associated with their project. Waivers from these Guidelines are subject to review and approval from DC Water. Granting of waivers is at the sole discretion of DC Water.

These guidelines represent a living document and will be updated as necessary to reflect the most current science and technology available.

## AUTHORITY

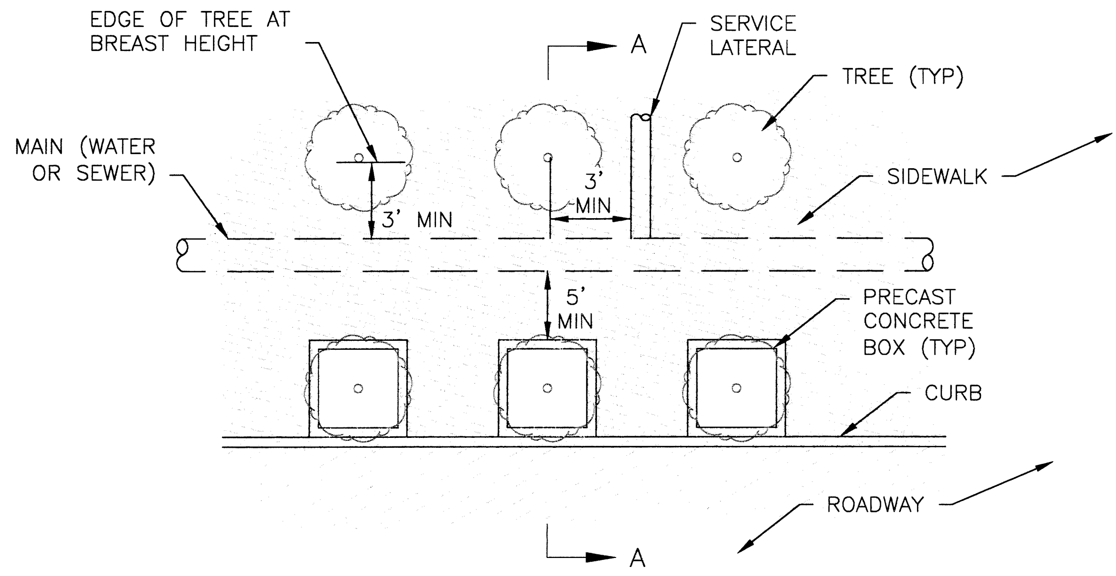
*DCMR – 12 (Construction Codes), Section 102.2 – Public Works Standards*: Work performed in public space, not specifically addressed in the Construction Codes, shall conform to the pertinent standards of the District of Columbia Department of Transportation (DDOT) and the District of Columbia Water and Sewer Authority.

## GENERAL

Proprietary materials removed by utility work performed by DC Water will be replaced with standard construction materials that have flow transmission capability (i.e. #57 stone). Structural / proprietary devices, including but not limited to, structural soil framing systems, precast concrete boxes, and cast in place walls, shall not be placed within 5' horizontally of the outer edge of DC Water utilities.

DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY



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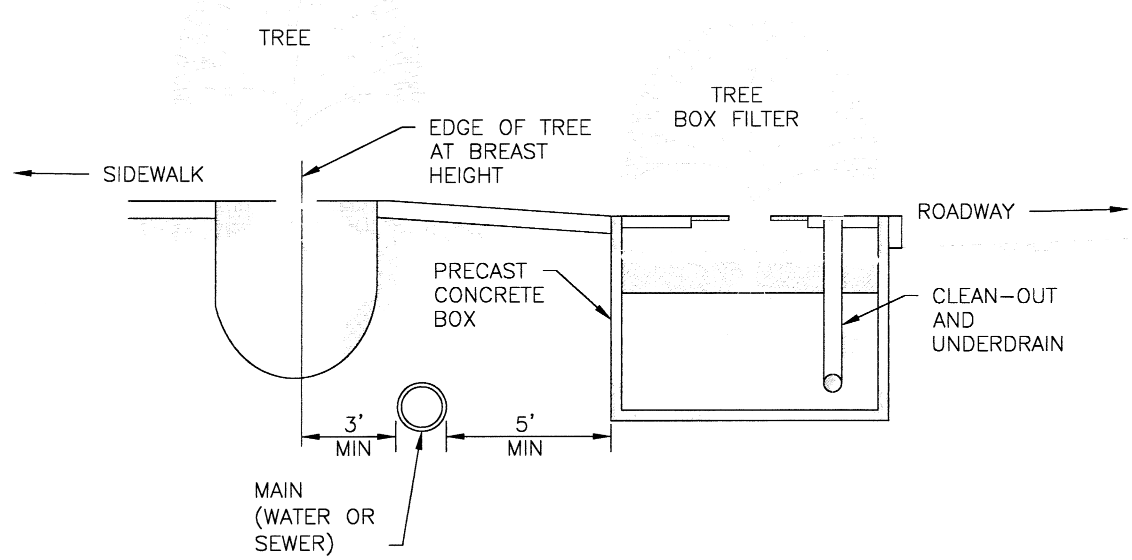


SECTION A-A

NOTES:

1. GREEN INFRASTRUCTURE MEASURES SHALL MEET OTHER APPLICABLE DDOT, DDOE AND DC WATER STANDARDS.
2. HORIZONTAL CLEARANCE IS 3' MIN FOR TREES FROM OUTER EDGE OF TREE AT BREAST HEIGHT TO OUTER EDGE OF UTILITY. WHEN MIN DISTANCE CANNOT BE MET, EXCEPTIONS MAY BE GRANTED IF THE UTILITY IS GREATER THAN 15' BELOW FINISHED GRADE, OR OTHERWISE APPROVED BY DC WATER.

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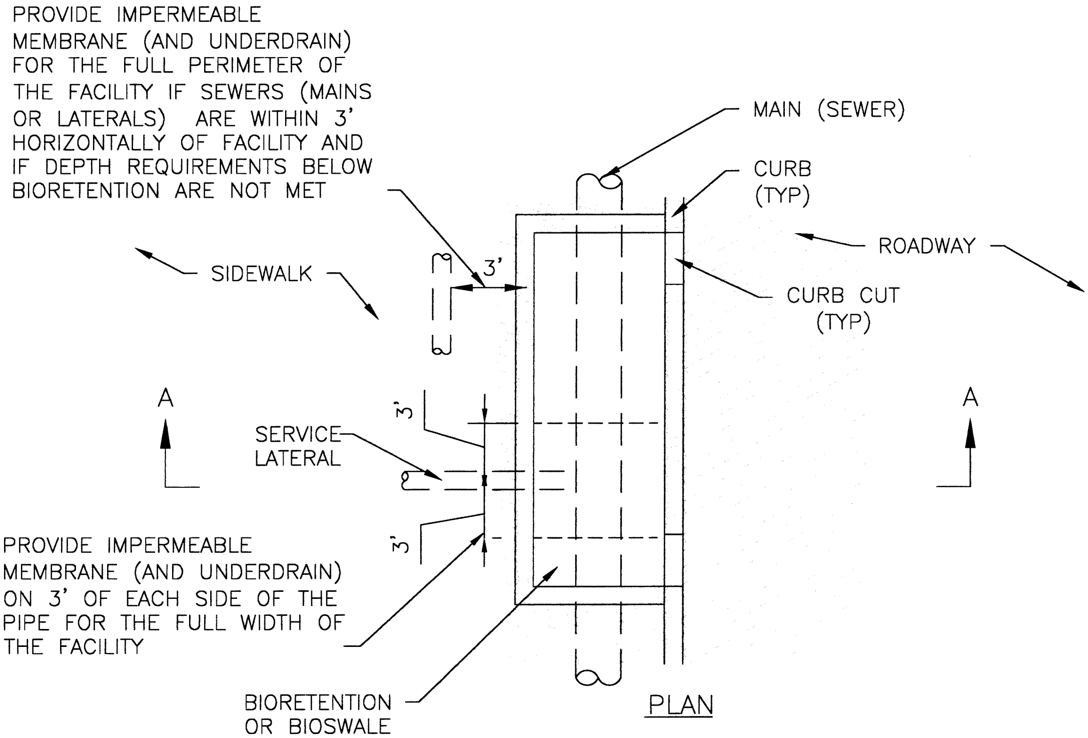
| APPROVED DATE: 7-19-13<br>CHIEF ENGINEER | REVISION NO.: 1<br>DATE: 07/19/13<br>PREPARED BY: DCCR<br>CHECKED BY: J. CASSIDY | STANDARD DETAIL<br>WATER AND SEWER CLEARANCES<br>FOR TREES |

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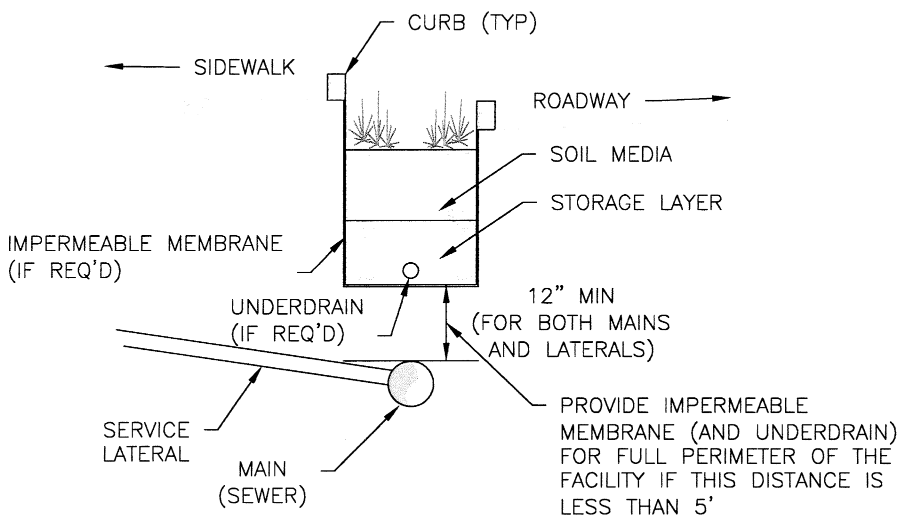


SECTION A–A

NOTES:

1. GREEN INFRASTRUCTURE MEASURES SHALL MEET OTHER APPLICABLE DDOT, DDOE AND DC WATER STANDARDS.
2. BIORETENTION OR BIOSWALES SHALL NOT DISTURB PIPE BEDDING AS IDENTIFIED IN DC WATER'S DESIGN MANUAL.
3. LINING SEWERS AND LATERALS FROM MANHOLE TO MANHOLE IS REQUIRED IF THE IMPERMEABLE MEMBRANE (AND UNDERDRAIN) IS NOT USED.

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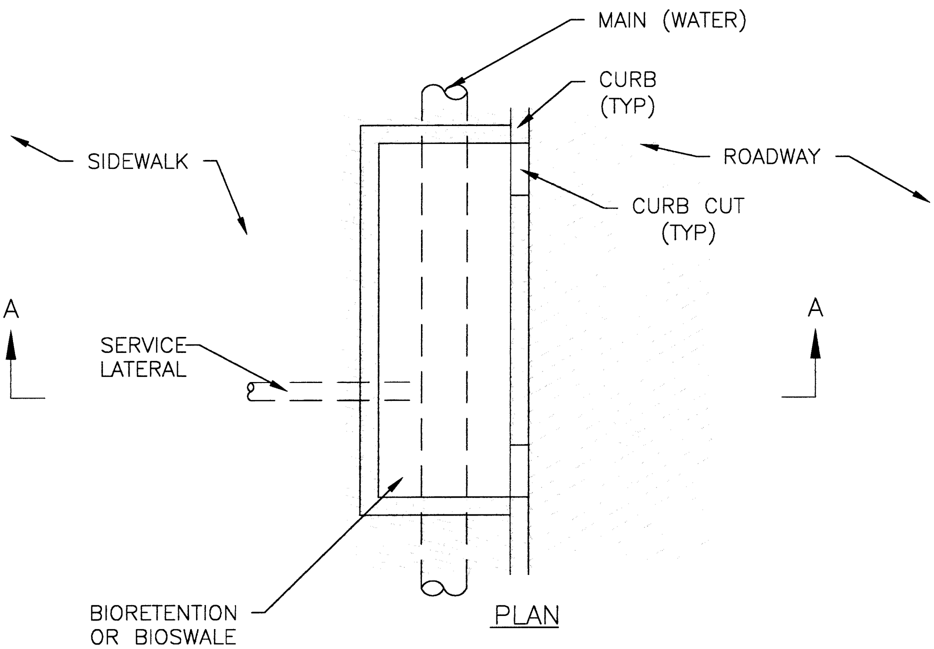


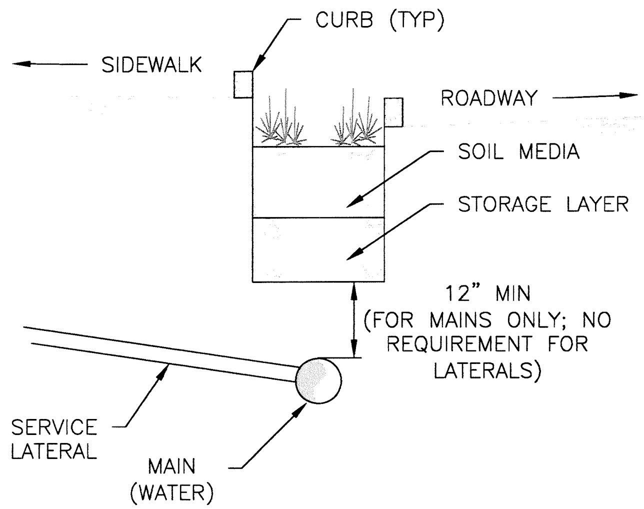


SECTION A–A

NOTES:

1. GREEN INFRASTRUCTURE MEASURES SHALL MEET OTHER APPLICABLE DDOT, DDOE AND DC WATER STANDARDS.
2. BIORETENTION OR BIOSWALES SHALL NOT DISTURB PIPE BEDDING AS IDENTIFIED IN DC WATER'S DESIGN MANUAL.
3. WATER SERVICE PIPES GREATER THAN 2" IN DIAMETER SHALL BE CONSIDERED AS WATER MAINS.
4. WATER SERVICE LATERALS SHALL NOT BE EXPOSED AND HAVE 18" SOIL COVER, MIN.

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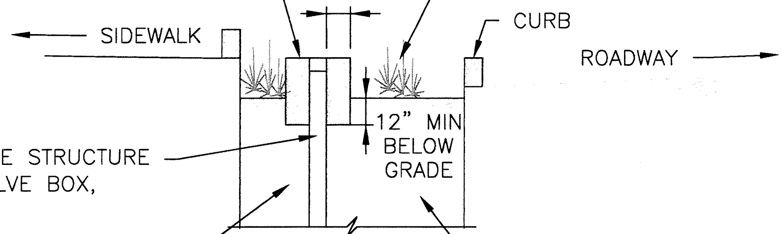


SECTION

NOTE:
GREEN INFRASTRUCTURE MEASURES SHALL MEET OTHER APPLICABLE DDOT, DDOE AND DC WATER STANDARDS.

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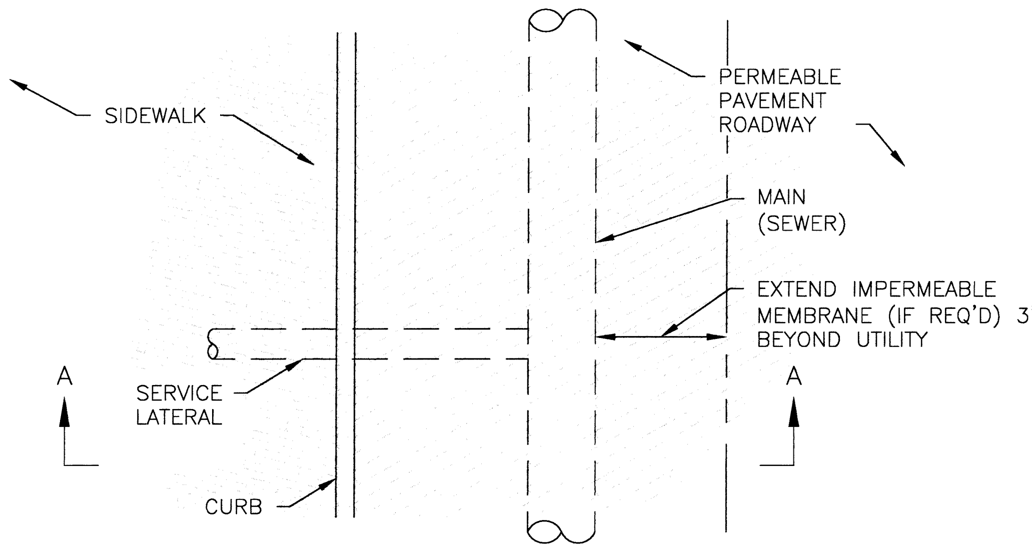


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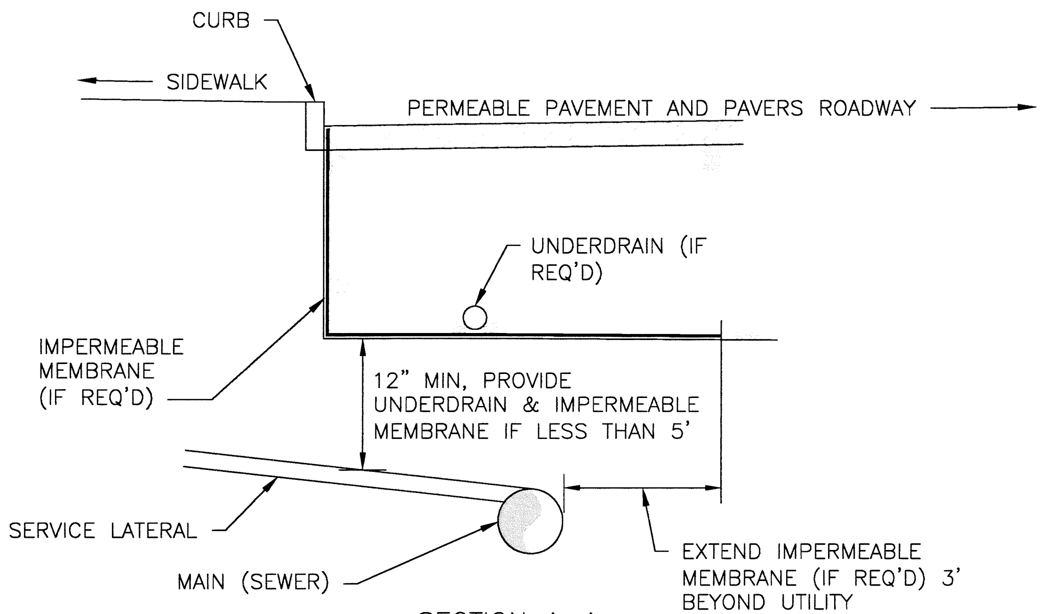


SECTION A–A

NOTES:

1. GREEN INFRASTRUCTURE MEASURES SHALL MEET OTHER APPLICABLE DDOT, DDOE AND DC WATER STANDARDS.
2. PERMEABLE PAVEMENT AND PAVER SYSTEMS SHALL NOT DISTURB PIPE BEDDING AS IDENTIFIED IN DC WATER'S DESIGN MANUAL.
3. LINING SEWERS AND LATERALS FROM MANHOLE TO MANHOLE IS REQUIRED IF THE IMPERMEABLE MEMBRANE (AND UNDERDRAIN) IS NOT USED.

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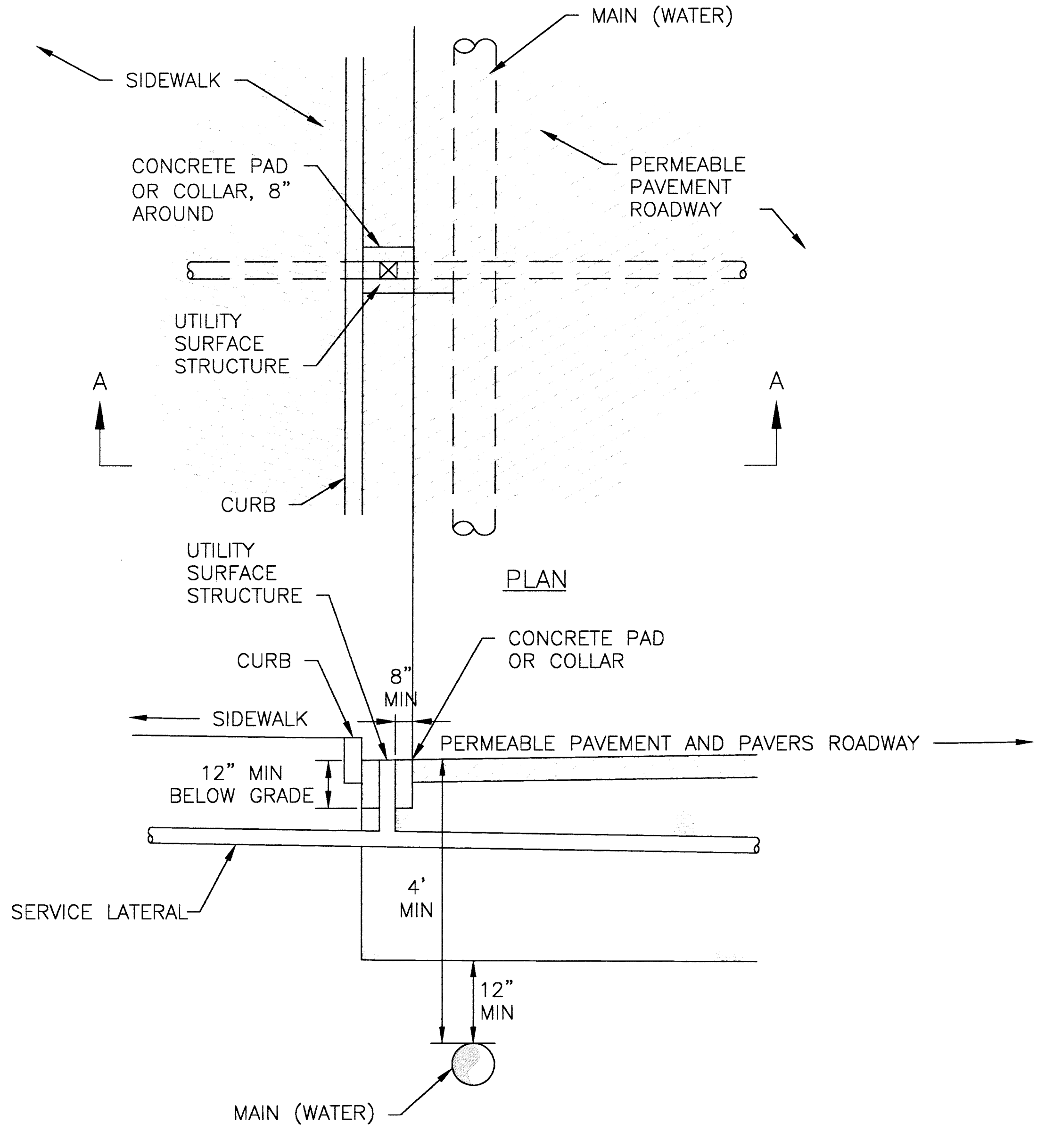


SECTION A–A

NOTES:
1. GREEN INFRASTRUCTURE MEASURES SHALL MEET OTHER APPLICABLE DDOT, DDOE AND DC WATER STANDARDS.
2. PERMEABLE PAVEMENT AND PAVER SYSTEMS SHALL NOT DISTURB PIPE BEDDING AS IDENTIFIED IN DC WATER'S DESIGN MANUAL.
3. WATER SERVICE PIPES GREATER THAN 2" IN DIAMETER SHALL BE CONSIDERED AS WATER MAINS.

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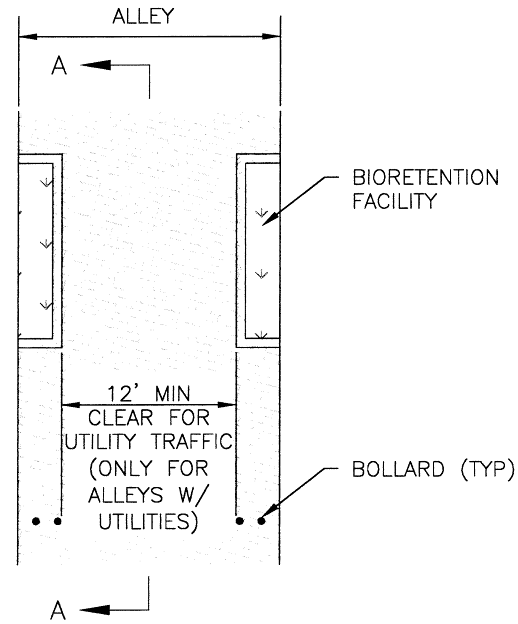


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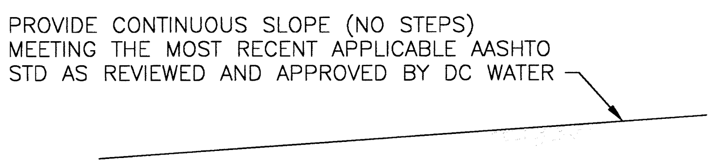


SECTION A–A

NOTE:

1. GREEN INFRASTRUCTURE MEASURES SHALL MEET OTHER APPLICABLE DDOT, DDOE AND DC WATER STANDARDS.

2. THIS DETAIL IS ONLY APPLICABLE FOR ALLEYS WITH WATER AND SEWER UTILITIES.

3. LARGE STRUCTURES WITH FOUNDATIONS SHALL NOT BE PLACED WITHIN 5' OF DC WATER UTILITIES.

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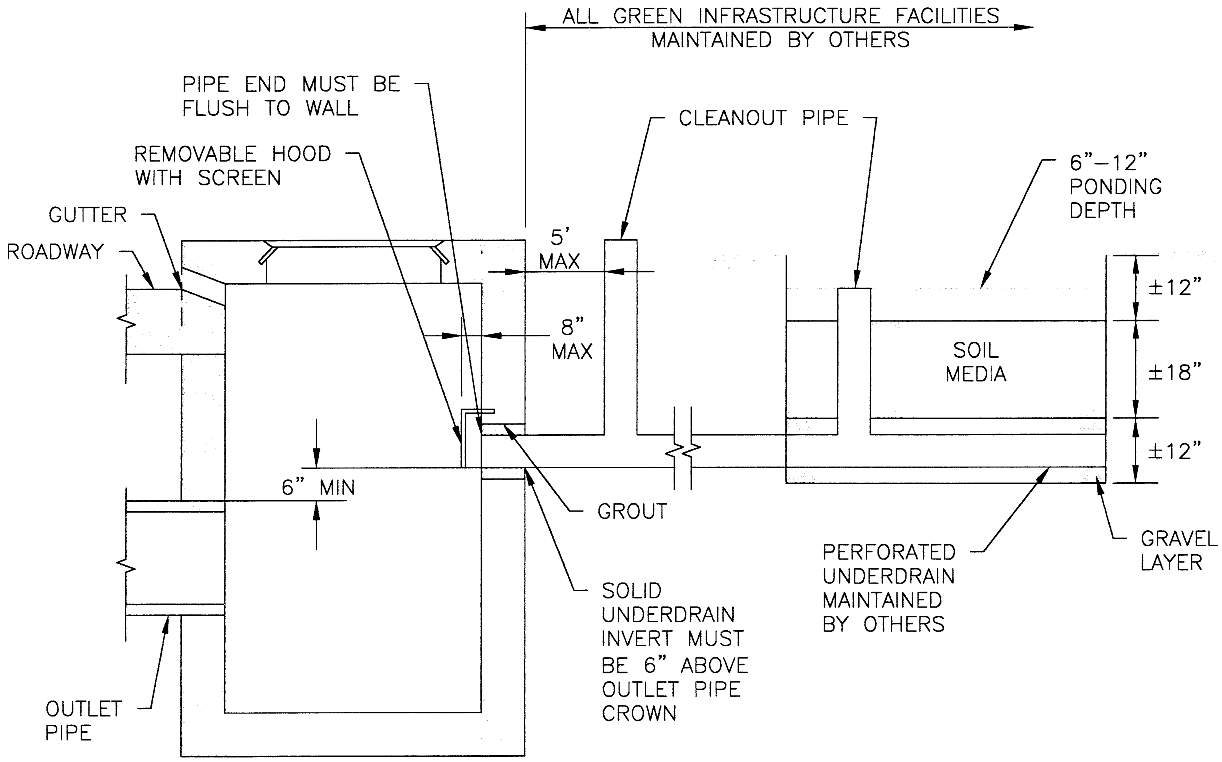


SECTION

NOTES:
1. GREEN INFRASTRUCTURE MEASURES SHALL MEET OTHER APPLICABLE DDOT, DDOE AND DC WATER STANDARDS.
2. THE PREFERRED LOCATIONS FOR CONNECTING UNDERDRAINS ARE AT MANHOLES AND SEWERS.
3. UNDERDRAIN CONNECTIONS TO CATCH BASINS ARE ONLY ALLOWED IF THE GREEN INFRASTRUCTURE FACILITY IS GREATER THAN 20' FROM AN EXISTING MANHOLE OR SEWER LINE OR IF TOTAL SURFACE AREA OF ALL GREEN INFRASTRUCTURE MEASURES IS LESS THAN 250 SQ FT.
4. CATCH BASIN CONNECTIONS FROM UNDERDRAINS SERVICING PRIVATE PROPERTY ARE PROHIBITED.
5. CLAY DAMS OR OTHER APPROVED WATERSTOPS SHALL BE PROVIDED AT 100' INTERVALS (MINIMUM ONE) ALONG THE LENGTH OF THE UNDERDRAIN TO PREVENT MIGRATION OF WATER ALONG THE LENGTH OF THE PIPE.
6. CLEAN OUTS SHALL BE PLACED AT 100 FOOT INTERVALS (MINIMUM ONE MUST BE LOCATED AT A MAX OF 5' FROM CATCH BASIN).
7. DC WATER IS NOT RESPONSIBLE FOR CLOGGING OF THE UNDERDRAIN OR FOR CLEANING.
8. THE UNDERDRAIN SYSTEM SHALL BE DESIGNED TO FILTER INCOMING WATER TO PREVENT THE MIGRATION OF SILT AND OR TURBIDITY TO THE SEWER SYSTEM.
9. UNDERDRAINS SHALL BE LOW-FLOW, SUBSURFACE PIPES THAT DRAIN ONLY THE GREEN INFRASTRUCTURE MEASURE.

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# Appendix J

# National Green Infrastructure Certification Program (NGICP)

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NATIONAL
GREEN
INFRASTRUCTURE
CERTIFICATION
PROGRAM

ngicp

Water Environment Federation
the water quality people

# BODY OF KNOWLEDGE

Initiated under the leadership of DC Water and the Water Environment Federation, the National Green Infrastructure Certification Program (NGICP) sets national certification standards for green infrastructure (GI) construction, inspection and maintenance workers. Designed to meet international best-practice standards, the certification advances the establishment of sustainable communities by promoting GI as an environmentally and economically beneficial stormwater management option, supporting the development of proficient green workforces and establishing a career path for skilled GI workers.

# INTRODUCTION

The Body of Knowledge (BoK) is a document that lists the resources that were identified, reviewed and selected as reference materials for the technical basis of the National Green Infrastructure Certification Program (NGICP). Tables 1 through 6 represent the recommended foundational reference list to be used during the development of the NGICP. Table 7 represents a comprehensive list of all resources that were identified and reviewed.

The intended purpose of this list is to act as a "library" of prescreened reference material that is specifically applicable as knowledge needed to conduct tasks related to the construction, inspection and maintenance of green infrastructure systems. This material will be helpful as foundational references for individuals who are writing and reviewing the NGICP curricula, training materials, exam items and for certification candidates who are preparing to take the exam.

# BACKGROUND

The District of Columbia Water and Sewer Authority (DC Water) and the Water Environment Federation (WEF), along with a group of partner organizations from all over the United States, are leading the development of a National Green Infrastructure Certification Program (NGICP) for construction, inspection and maintenance workers. The goal of this certification program is to provide a nationally recognized credential for individuals who install, inspect and maintain green infrastructure (GI) systems. In addition, the program will help support community-based job creation in U.S. cities investing in green infrastructure and create a skilled work force that has the needed knowledge to properly install, inspect and maintain these systems to ensure long-term, reliable performance.

The national green infrastructure certification is intended as an entry-level credential that will verify that certified individuals possess a well-rounded foundational knowledge about what green infrastructure is, how it is intended to function and how to properly install, maintain and visually verify its proper operation. The national program must focus on common aspects of green infrastructure that will be true in any region of the United States, regardless of climate, soil types, specific local regulations, etc. Specific regional aspects of green infrastructure must be addressed separately.

For the purposes of the NGICP, green infrastructure is defined as an approach to stormwater management that combines a variety of different technologies and practices that use natural systems or engineered systems that mimic natural processes to filter and store stormwater to protect local surface water quality. The certification program will address GI practices such as bioretention (rain gardens, bioswales, tree/planter boxes, tree trenches), green and blue roofs, permeable pavements, dry wells, rainwater harvesting (rain barrels, cisterns, rainwater harvesting systems), stormwater wetlands, as well as others. These practices help to capture and filter stormwater, holding it until it can be infiltrated or evapotranspirated or slowly released to gray infrastructure systems, managing the water locally in order to reduce flow to local stormwater or combined sewer systems and reducing the volume of water flowing directly to local waterways. Green infrastructure protects local surface water quality, reduces combined sewer overflows (CSOs), helps meet Municipal Separate Storm Sewer System (MS4) requirements, as well as provides additional triple-bottom-line (environmental, social and economic) benefits in the areas where they are correctly installed and properly maintained.

# REVIEW OF MATERIALS

Materials reviewed include manuals, presentations (PPT), webcasts, related technical memorandums, books and outreach material such as on-line videos, brochures and factsheets. In addition, existing GI training materials from other utilities and related documents from other industry trade groups/organizations were also reviewed.

Although these materials were read through to ensure that they are applicable as foundational knowledge for GI construction, inspection and maintenance tasks, the technical accuracy of these materials has not been verified. The fact that they are included in this body of knowledge document in no way implies that these materials are endorsed, approved or verified in any way. The individual users must practice due diligence in the use and application of this information.

The materials are grouped by type – training material, jurisdiction, industry/trade group/organization, books, factsheets/brochures/forms/checklists and videos/webcasts. Several of the most applicable reference documents related to the core competencies identified as important to workers carrying out tasks in constructing, inspecting and maintaining green infrastructure are listed under each type.

## 1. REVIEW OF EXISTING GI TRAINING MATERIAL

The existing GI training materials reviewed included training materials produced by San Francisco Public Utilities Commission (SFPUC), Washington State Department of Ecology, Onondaga County, NY, Department of Energy and Environment (DOEE) District of Columbia and Alliance for the Chesapeake Bay. Also reviewed were PowerPoint slide presentations from workshops conducted by Northeast Ohio Stormwater Training Council (NEOSWTC) in 2014 and 2015. Table 1 (page 9) provides a summary of existing GI training materials that are considered as additional resources for the NGICP.

There are highlights from several references that are particularly useful as background documents for the NGICP:

The SFPUC has developed a GI Construction Training Guidebook and four training modules (PowerPoint slide presentations):

- **Course 1.1** – Introduction to GI Construction
- **Course 1.2** – GI Site Management
- **Course 2.1** – Bioretention Planter Construction
- **Course 2.2** – Permeable Pavement Construction

This material was developed in 2015 and is being used by SFPUC to train local contractors working on their GI construction projects. It also includes a PDF titled "Tailgate Talks" that briefly discusses the construction/installation and maintenance of bioretention planters and permeable pavements.

The Washington State Department of Ecology's "Low Impact Development Operations and Training" PowerPoint slide presentation provides information about the following GI practices – bioretention, permeable pavement and green roofs. It includes diagrams and maintenance standards/procedures for each of the GI practices covered.

The "Green Infrastructure Maintenance Training" PowerPoint presentation by Onondaga County, NY, provides diagrams and maintenance information about the following GI practices – porous pavements, green roofs, rain gardens, green streets (vegetated curb extensions, sidewalk planters), cisterns/rain barrels, infiltration beds (dry well, infiltration bed, infiltration trench/tree trench). This material is presented as Appendix D of the Save the Rain Program's Green Infrastructure Maintenance Manual.

The materials from the NEOSWTC workshop in 2014 and 2015 provides extensive information and a variety of photos of the maintenance aspects of the following GI practices, as presented by:

- Bill Hunt of North Carolina State University (NCSU): swales, green roofs, cisterns and rainwater harvesting, bioretention, permeable pavement and parking lot best management practices (BMPs) (such as permeable pavement, sand filters and manufactured products)
- Brian Prunty, Stormwater Specialist, Summit Soil & Water Conservation District: Operations & Maintenance for Bioretention Stormwater Practices (Part 1 & 2)
- Roger Gettig, Director of Horticulture and Conservation: Plants for Rain Gardens and Bioretention

The Philadelphia Water Department developed a Green Infrastructure Maintenance Manual in 2014 that contains procedures for specific maintenance tasks. Each protocol provides information on required training, equipment/materials, health and safety issues and a detailed procedure for executing the tasks. Appendices provide supplementary reference materials including health and safety procedures, a comprehensive listing of typical maintenance personnel classifications and additional guidance on site access and permits. The GI practices addressed in this manual include stormwater tree trenches, rain gardens, stormwater planters, stormwater wetlands, bioswales, stormwater tree planters, rain barrels/cisterns, green roofs, pervious paving and blue roofs. They also have published a Plant Identification Manual in 2014 that provides concise information and photos for hundreds of plants and trees that are commonly used in GI practices.

## 2. JURISDICTIONAL STANDARDS/GUIDELINES (MANUALS, TECHNICAL BULLETINS, CONSTRUCTION AND DESIGN GUIDANCE DOCUMENTS)

Several jurisdictions within the United States and Canada provided information on low impact development (LID) practices, operation and maintenance (O&M) of various GI types, GI design standards, stormwater management manuals, technical bulletins, construction and design guidance documents, etc. These documents represent critical regional information but they include detailed information that is too localized to be widely applicable in the National GI Certification Program. Therefore, they provide important local information but the majority of the information is not suitable to be used as specific references to support the NGICP. **Table 2** (page 10) provides a summary of all reference materials (by jurisdiction) that are considered as additional resources for the NGICP.

The following utilities'/governments'/jurisdictions' standards and guidelines have been identified and collected in this Body of Knowledge:

- Bay Area Stormwater Management Agencies Association (BASMAA)
- Blue Water Baltimore
- Chesapeake Stormwater Network
- City of Atlanta, Watershed Department
- City of Columbus, OH
- City of New Orleans
- City of Omaha, NE
- City of Portland, OR
- City of Santa Barbara, CA
- City of Tucson, AZ
- Clean Water Services, OR
- Contra Costa Clean Water Program, CA
- Credit Valley Conservation, Canada
- DC Water
- Delta Institute, IL
- Department of Natural Resources and Environmental Control, DE
- District of Columbia's Department of Energy and the Environment
- District of Columbia's Department of Transportation
- Fairfax County Public Works and Environmental Services, VA
- Georgia Environmental Protection Division
- Louisiana Department of Environmental Quality
- Metropolitan Nashville—Davidson County, TN
- Metropolitan Sewer District of Louisville, KY
- Metropolitan St. Louis Sewer District, MO Department of Natural Resources
- Michigan Department of Environmental Quality
- Minnesota Pollution Control Agency
- Montgomery County, Maryland Department of Environmental Protection
- New York Department of Environmental Protection
- New York State

- North Carolina Department of Environment and Natural Resources
- Northeast Ohio Stormwater Training Council
- Northern Virginia Regional Commission
- Onondoga County, NY
- Pennsylvania Department of Environmental Protection
- Philadelphia Water Department
- Pima County, AZ
- Prince George's County, MD
- Seattle Public Utilities
- Southern California Stormwater Monitoring Coalition
- Tennessee Department of Environment and Conservation
- Urban Drainage and Flood Control District, CO
- U.S. Army Corps of Engineers
- U.S. Department of Transportation, Federal Highway Administration
- U.S. Environmental Protection Agency (USEPA)
- Virginia Department of Environmental Quality
- Washington State Department of Ecology
- West Virginia Department of Environmental Protection

## 3. INDUSTRY/TRADE GROUP/ORGANIZATION REVIEW

Table 3 (page 15) provides a summary of references from Industry/trade groups/organizations that were reviewed as potential additional resources for the NGICP. Several references with useful information on installation, inspection and maintenance aspects of GI are highlighted here.

The Interlocking Concrete Pavement Institute (ICPI) publishes a document titled, "Industry Guidelines for Permeable Interlocking Concrete Pavement in the United States and Canada". It is a PowerPoint presentation that can be downloaded. Also, at their website, www.icpi.org, they have a section dedicated to permeable pavers: there are resources useful for the NGICP that can be accessed by clicking on "Installation" and "Maintenance". On the permeable paver maintenance page, they have a downloadable document titled, "ICPI Inspector's Guide for PICP Installation and Maintenance".

The National Asphalt Pavement Association (NAPA) publishes a booklet labeled Information Series 131 that is titled, "Porous Asphalt Pavements for Stormwater Management: Design, Construction and Maintenance Guide". It was updated in 2008. This booklet can be purchased ($30 nonmember price) and downloaded from NAPA's website by following this link: https://store.asphaltpavement.org. Although approximately half of the 24-page guide booklet is dedicated to design aspects, this is still a valuable reference for porous pavement for the NGICP because it includes labeled cross sections of typical porous pavement, a step-by-step overview of the construction sequence and a brief discussion of post-construction and on-going maintenance considerations. There is also a materials discussion. It is focused on specifications for materials, which is more detailed than necessary for the NGICP.

The National Ready Mixed Concrete Association (NRMCA) has information regarding pervious concrete available at www.perviouspavement.org. This site has information pertinent to the NGICP that can be found by clicking on the "Benefits" button, the "Construction" button, the "Inspection and Maintenance" button and the "Materials" button at the top of the page.

In addition to the above, information on stormwater products was also collected from manufacturers of stormwater products used in various GI practices. They include:

- Chambers that replace the conventional stormwater retention/detention systems such as ponds, swales, pipe and stone trenches or beds, or concrete structures. These chambers may also be used as drywells
- An engineered biofiltration device with components similar to bioretention in pollutant removal and application but has been optimized for high volume/flow treatment in a compact system
- An engineered soil that meet typical specifications for road sub-base while allowing tree root growth (for use under porous pavements and with street trees)
- A prefabricated modular bioretention system made from high-quality precast concrete, that uses physical, chemical and biological processes to remove sediment, metals, nutrients, petroleum hydrocarbons, gross solids and trash from stormwater runoff
- A tree box filter that provides exceptional stormwater treatment capable of removing fine sediment and dissolved pollutants
- A modular stormwater detention system, which is an underground structural precast concrete system provides many solutions for detention, retention, infiltration, treatment and harvesting

- An all-inclusive stormwater runoff control system that manages water volume in addition to protecting water quality by providing integrated pretreatment, combined with the advantages and versatility of structural precast concrete modules (vaults) with the aesthetics and performance of permeable interlocking concrete pavers to provide a stand-alone, low maintenance, LID green solution for stormwater retention, detention, reuse, ground water recharge and flood management

## 4. FACTSHEETS/BROCHURES/FORMS/CHECKLISTS

A number of brief technical documents were reviewed that include factsheets, brochures forms and checklists on O&M of the specific GI types included in the NGICP. Any one or two page document that provided a description of the GI type including maintenance details was considered to be a factsheet. Brochures included more illustrations and were primarily targeted for outreach. Table 4 (page 16) provides a summary of these brief two to ten page documents that are considered as additional resources for the NGICP.

The references from Montgomery County, MD, include factsheets that provide information on maintenance activities and the time frame during which they should be performed, including some very useful trouble shooting tips for the following GI practices – green roof, porous pavement, swales, rain gardens, rain barrels, dry wells and vegetated stormwater facilities, a brochure that describes the planting design for bioretention and rain gardens, and a guide for permeable pavements that provides information on the design, installation and maintenance aspects.

The factsheets from the City of Alexandria, VA, provided information on routine maintenance tasks and frequency for the following GI practices – bioretention, permeable pavement, rainwater harvesting, constructed wetlands, vegetated roofs and urban bioretention areas.

The City of Lancaster's "Green Infrastructure Plan" includes an Appendix of factsheets on various GI technologies that provides a description, benefits, cost and maintenance information for the following GI practices – rain gardens, bioswales, tree boxes, bioretention planters, permeable pavements, green roofs and rain barrels.

Washington State Department of Ecology's inspection forms for bioretention and permeable pavements provide helpful insight into items to be checked at each of these facility types.

The references from Rutgers University included factsheets on maintenance of rain gardens, tree boxes and permeable pavements. Specifically, there was good information on how to keep rain gardens free from mosquitoes.

Milwaukee Metropolitan Sewerage District's (MMSD) factsheet provides useful information about equipment needs for maintenance of GI practices. This is in DRAFT form and has not been made final yet.

The factsheets from Minnehaha Creek Watershed District cover several different types of BMPs (such as filtration practices, infiltration basins and trenches, rain gardens, swales and permeable pavements) and maintenance information applicable to all of them.

The references from the University of New Hampshire Stormwater Center include inspection checklists and maintenance factsheets for pavements and bioretention systems/tree filters, to provide regular inspection and maintenance guidance. There are also several design guidelines that also have maintenance topics and recommended inspection information at the end of the document. These documents can be downloaded from the Center's website at http://www.unh.edu/unhsc/.

The Interlocking Concrete Pavement Institute's (ICPI) "Inspector's Guide for PICP Installation & Maintenance" consists of a checklist intended to assist in identifying critical items that should be checked during construction, immediately after construction prior to acceptance and then during on-going maintenance inspections.

The Seattle Public Utilities has published a checklist titled "Natural Drainage Systems Landscape Maintenance Categories (LMC) and Characteristics" that provides a list of items to verify during maintenance activities for various GI practices.

The Metropolitan St. Louis Sewer District's brochures provide useful information on inspection and maintenance of porous pavements, planter boxes and rain gardens. The checklists for pervious pavement and bioretention inspection, to be used during inspection, consists of a list of items that should be checked during routine maintenance inspection.

The factsheet on Bioretention Soil Mix, found as a resource on the Washington State University-sponsored www.12000raingardens.org website, was produced by Cedar Grove Landscape and Construction services and outlines bioretention soil mix specifications and recommendations for bioretention swales and rain gardens.

The factsheets from Fairfax County Public Works and Environmental Services, provides information on the maintenance of the following GI practices – bioretention practices, permeable pavement, rainwater harvesting, tree box filters, soil compost amendments, vegetated swales, vegetated roofs and wet and dry stormwater ponds. There is also a recommended plant list available for plantings in bioretention area in Fairfax County.

The factsheets from University of Delaware Co-operative Extension provides useful information related to design, installation and maintenance of rain gardens and green roofs.

The City of Omaha Stormwater Program has published inspection forms for rain gardens, bioretention system and permeable pavers and pervious pavement, which can be used as a tool in evaluating that specific GI facility and also serve as a document of maintenance.

Rain garden information on design, plant selection and maintenance topics included:

- "A Resident's Reference Guide to Creating a Rain Garden" from Kansas City Water Services
- The "Rain Garden Care (Brochure)" from Milwaukee Metropolitan Sewerage District

The factsheets authored by M. Cahill found on the Oregon State University Stormwater Solution's website provide detailed information on design, construction and maintenance of the following GI practices — stormwater planters, dry wells and swales.

The USEPA has published stormwater technology factsheets on bioretention, vegetated swales, constructed wetlands and porous pavements, that provide information regarding the cost, performance, design criteria, operation and maintenance for each of those GI practices.

The factsheets from BASMAA provide information on the feasibility, design checklist, maintenance considerations and typical materials including an example application, for the following GI practices – pervious pavements, rain gardens, and rain barrels and cisterns.

The "Stormwater Treatment BMP Inspection Data Collection Form" published by Santa Clara Valley Urban Runoff Pollution Prevention Program can be used for many GI practices ranging from biofiltration (vegetated swale, green roof, planter boxes, bioretention) to detention (constructed wetland) to structural GI practices such as porous pavements.

## 5. OTHERS (VIDEOS, WEBCASTS)

Several webcasts and videos were also identified as valuable resources to help identify common maintenance tasks for various GI practices and inspection considerations. **Table 5** (page 19) provides a summary of videos/webcasts that are considered as additional resources for NGICP.

The references from Chesapeake Stormwater include:

- Videos that are geared towards construction, inspection and maintenance of Low Impact Development (LID) stormwater practices for local governments and contractors
- A PowerPoint slide presentation (PDF) that provides information on "Analyzing the Bioretention Construction Sequence"
- A webcast on "Bioretention Design, Installation and Maintenance"

The videos by DDOE, as part of the RiverSmart Program, provide information on maintenance of green roofs and rain barrels.

The DVD titled "Getting Polluted Runoff under Control" by Stormwater PA and GreenTreks Network includes two videos – one targeting homeowners and the other one on GI (gives big picture – water cycle, how living roofs, rain gardens, etc. can transform cityscapes into oases of green and help with stormwater management). This DVD is available for purchase through Stormwater PA's website.

The video by Metropolitan St. Louis Sewer District on rain gardens and planter boxes provides information on the installation and maintenance topics.

The video titled "Rainscapes Rain Garden" by Montgomery County, MD, describes the reasons for installing RainScape projects in general and rain gardens in particular. The video titled "How Green Streets Work" features the Department of Environmental Protection's Green Street program and discusses some of the community based practices used to collect, treat and allow rainwater from hard surfaces to absorb into the ground.

The webcasts by USEPA include the following:

- Greening Your Backyard: Water Efficiency and Stormwater Solutions for Homeowners and Communities
- Green Infrastructure in Arid Communities
- Best Practices for Green Infrastructure Operation & Maintenance
- Getting More Green from your Stormwater Infrastructure

The slides and transcripts for the above webcasts are available on USEPA's website for download.

# REFERENCES

The following tables are categorized by type of reference (manuals, books, outreach and technical bulletins) and also by GI category (design, construction and maintenance). Notes on which sections of each document are most relevant, also are included.

## TABLE 1

Provides a summary of existing GI training materials that are considered as additional resources for the NGICP.

## TABLE 2

Provides a summary of all jurisdictional reference materials that are considered as additional resources for the NGICP. They include GI design standards, stormwater management manuals, technical bulletins, construction and design guidance documents, etc.

## TABLE 3

Provides a summary of references from industry/trade groups/organizations that were reviewed as potential additional resources for the NGICP.

## TABLE 4

Provides a summary of factsheets, brochures, forms and checklists on O&M (of the specific GI types included in the NGICP) that are considered as additional resources for the NGICP.

## TABLE 5

Provides a summary of videos/webcasts (related to inspection and maintenance of GI practices) that are considered as additional resources for the NGICP.

## TABLE 6

Provides a list of books that were considered as additional resources.

## TABLE 7

Represents a complete list of all the references/resources that were researched and reviewed for consideration as additional resources for the development of the NGICP. This table is categorized by author/publisher and GI type covered.

## TABLE 1
## GI TRAINING MATERIALS

### CONSTRUCTION

| Title | Author/ Publisher | Year | Notes |
|---|---|---|---|
| San Francisco Green Infrastructure Construction Training Guidebook | San Francisco Public Utilities Commission | 2015 | The guide has factsheets on bioretention planter construction, permeable pavement construction. |
| Course 1.1 – Introduction to Green Infrastructure Construction | | 2015 | PPT/Slides |
| Course 1.2 – Green Infrastructure Site Management | | 2015 | PPT/Slides |
| Course 2.1 – Bioretention Planter Construction | | 2015 | PPT/Slides |
| Course 2.2 – Permeable Pavement Construction | | 2015 | PPT/Slides |
| Tailgate Talks | | 2015 | |

### MAINTENANCE

| Title | Author/ Publisher | Year | Notes |
|---|---|---|---|
| Low Impact Development Operations and Maintenance Training | Washington State Department of Ecology | | PPT/slides that talk about bioretention, permeable pavement, green roof (each section includes: diagram, how it works, maintenance standards & procedures by component (for each GI type)). |
| Save the Rain Program Green Infrastructure Maintenance Training | Onondaga County, NY | 2012 | This training material includes GI technology factsheets for porous pavement, rain garden, vegetated roof, tree trenches, cistern/rain barrel, in addition to maintenance procedures and a list of commonly used plants in bioretention. |
| Grassy Swales (& Bioswales) Maintenance | Bill Hunt of NCSU | 2015 | These are PPT/slides (by various authors) from Northeast Ohio Stormwater Training Council (NEOSWTC) workshops held in 2014 and 2015. |
| Green Roofs Maintenance | | 2015 | |
| Cisterns & Rainwater Harvesting Maintenance | | 2015 | |
| Bioretention Maintenance (Part 1 and 2) | | 2015 | |
| Permeable Pavement Maintenance (Part 1 and 2) | | 2015 | |
| Parking Lot BMPs (Part 1 and 2) | | 2014 | |
| Operations & Maintenance for Bioretention Stormwater Practices (Part 1 & 2) | Brian Prunty, Stormwater Specialist, Summit Soil & Water Conservation District | 2014 | |
| Plants for Rain Gardens and Bioretention | Roger Gettig, Director of Horticulture and Conservation | 2014 | |

## TABLE 2

### MATERIALS FROM VARIOUS JURISDICTIONS

| Jurisdiction | Document | Year | Category | Comments/Notes |
|---|---|---|---|---|
| Bay Area Stormwater Management Agencies Association | Start at the Source: Design Guidance Manual for Stormwater Quality | 1999 | | Permeable pavements (based on types of materials used), dry wells, rain barrels/cisterns, grass/ vegetated swales (maintenance, grass selection). |
| Bay Area Stormwater Management Agencies Association (& WRA Consultants) | Regional Bioretention Soil Guidance & Model Specification | 2010 | | This report provides model soil guidance and specification with a goal of providing a long-term infiltration rate of 5 to 10 inches per hour, providing stormwater treatment and supporting plant health. |
| Blue Water Baltimore | Routine Maintenance for Rain Gardens | | Maintenance | This document provides detailed information on routine maintenance of rain gardens including plant care and infiltration maintenance. |
| City of Atlanta, Watershed Department | Green Infrastructure Stormwater Management Practices for Small Commercial Development | 2014 | Design | Chapter 7 addresses mostly design guidelines for bioretention, infiltration trenches, bioswales, permeable pavement, stormwater planters, subsurface infiltration, rainwater harvesting/cisterns, green roofs. Very little information on maintenance & inspection. |
| | Green Infrastructure for Single Family Residences | 2012 | Design, Construction & Maintenance | Information presented very concisely – design, construction & maintenance of cisterns, dry wells, vegetated filter strips, modified French drains, permeable pavers, rain gardens. |
| City of Columbus, OH | Stormwater Strategic Plan — Green Infrastructure Design & Implementation Guidelines | 2015 | Design, Inspection & Maintenance | The intent of this manual is to provide the user with considerations for the placement and design of GI in right-of-way (ROW) and retrofit of existing urban environments, including standard component designs within GI facilities such as inlets, area protection, plantings, underdrains, overflow structures and outlets. Includes information on construction, inspection & maintenance. The chapters on storage media and permeable surfaces provide good NGICP-related information. |
| City of Omaha, NE | Bioretention Gardens: A Manual for Contractors in the Omaha Region to Design and Install Bioretention Gardens | 2016 | Design, Construction, Maintenance | This manual provides important knowledge to help design, build and maintain a viable rain garden. Along with regional specific information there are also details about site assessment, garden design, drainage and soil management, effective selection and use of plants, and the relative costs associated with bioretention implementation. |
| City of Portland, OR | Stormwater Management Manual | 2014 | | The most relevant sections in this manual are: Appendix F.3 – top soil specifications, F.4 – plant templates and plan lists, G.3 – green street design, maintenance indicators and corrective action for green roofs, swales, planters, dry wells and permeable pavement (Chapter 3). |
| City of Santa Barbara | Stormwater BMP Guidance Manual | 2013 | Construction, O&M | Chapter 5 – rain gardens, rain barrels, soil amendments; Chapter 6 – bioretention (advantages, limitations, design criteria, plant/filter media, O&M), vegetated swale filters, rain barrels, planter boxes, green roofs. |
| City of Tucson | Water Harvesting Guidance Manual | 2006 | | Water harvesting techniques – microbasins, French drains, gabions, water tanks, etc. Pages 16-17 include an inspection & maintenance table. |
| Chesapeake Stormwater Network (serving the regional interstate watershed of Chesapeake Bay) | CSN Technical Bulletin No. 10 Bioretention Illustrated: A Visual Guide for Constructing, Inspecting, Maintaining, and Verifying the Bioretention Practice | 2013 | Design, Construction, O&M, Inspection | Focuses mainly on Bioretention (Design, Construction, Inspection & Maintenance), Appendix A – Visual Indicator Profile Sheets for Bioretention Inspections, Appendix B – Visual indicators for Grass Channels, Filter Strips/Sheet flow to Buffer, Permeable Pavement, Subsurface Infiltration. |
| | Maintenance Matters Now! The Changing World of BMP Inspection | 2014 | Maintenance | PPT/slides – a part of the Chesapeake Bay Stormwater Training Partnership and includes photos of GI practices (visual inspection – right and wrong pics), similar to the technical bulletin. |
| Clean Water Services | Low Impact Development Approaches (LIDA) Handbook | 2009 | Design, Maintenance | In this handbook, Chapter 4 provides information on application/limitations, design factors & maintenance of the following GI practices — porous pavement, green roof, rain garden, vegetated swale, constructed wetland. And detailed autocad drawing files are included in the Appendix. |

## TABLE 2

### MATERIALS FROM VARIOUS JURISDICTIONS

| Jurisdiction | Document | Year | Category | Comments/Notes |
|---|---|---|---|---|
| Contra Costa Clean Water Program | Stormwater C.3 Guidebook | 2012 | Design | Through the Contra Costa Clean Water Program, Contra Costa municipalities have prepared a Stormwater C.3 Guidebook to assist applicants through the process of submittals and reviews. Appendix B provides information on soils, plantings & irrigation for bioretention. Design sheets are also included for pervious pavements, bioretention, dry wells, cisterns and planter boxes. |
| Credit Valley Conservation | Low Impact Development Construction Guide – Version 1.0 | 2012 | Construction, Maintenance | Bioretention soil specifications – page 54; Appendix B – LID Landscape Design Guide, concepts (siting, design, construction/installation, maintenance) related to general LID practices. Information on pervious pavers. |
| Delta Institute | Green Infrastructure Designs – Scalable Solutions to Local Challenges | 2015 | Design, Construction & Maintenance | This publication covers the following GI practices – bioswales, rain gardens, stormwater planters and permeable pavement. It provides nice diagrams including CAD files. |
| District Department of the Environment (DDOE) | Stormwater Management Guidebook for the DDOE (now called Department of Energy and Environment (DOEE)) | 2013 | Design, Construction, Maintenance | Chapter 3 includes feasibility, detailed design calculations, plan views, information on pretreatment, conveyance, material specifications, sizing, construction sequencing and maintenance. Appendices include construction & maintenance checklists. |
| District of Columbia – Department of Transportation | Green Infrastructure Standards | 2014 | Design (drawings), Maintenance, Plant selection for bioretention | Supplement to Design & Engineering Manual. Includes GI Plant list and GI Maintenance schedules. |
| DC Water | Technical Memorandum #6 Green Infrastructure Technologies | 2012 | Construction, O&M | Contains construction, O&M, good schematics and photos. |
| | DC Water Green Infrastructure Utility Protection Guidelines | 2013 | Construction | This document provides guidance on the design and construction of GI adjacent or connected to DC Water utilities. Includes plan views of GI types. |
| | DC Clean Rivers (DCCR) GI Design Standards | 2015 | Design, Construction, O&M | DRAFT Version. |
| Delaware Department of Natural Resources and Environmental Control (DNREC) | Green Infrastructure Primer for Delaware | 2016 | Construction & Maintenance | This guide provides information on the benefits and types of GI. It has pertinent information on construction & maintenance of rain gardens, vegetated swales, tree boxes/tree trenches, rain barrels, cisterns, green roofs. |
| Fairfax County Public Works and Environmental Services | Public Facilities Manual | 2011 | Design, Construction & Maintenance | Chapter 6 is particularly useful since it covers the design, construction specification and maintenance of constructed wetlands, bioretention, vegetated swales, tree box filters, vegetated roofs, rainwater harvesting and permeable pavement. |
| | Fairfax County Maintenance Contractor Awareness Training | 2015 | Maintenance | Includes 5 training presentations that are available for download: http://www.fairfaxcounty.gov/dpwes/stormwater/maintenance-training.htm Part I: Overview; Part II: Above Ground Facilities; Part III: Above Ground Facilities; Part IV: Below Ground Facilities; Part V: Vegetative Practice. |
| Flexible Pavements of Ohio | Technical Bulletin: Porous Asphalt Pavement | 2012 | Design, Construction & Maintenance | This document provides information on design consideration, construction and maintenance of porous asphalt pavement. |
| Louisiana Department of Environmental Quality (DEQ) | Stormwater BMP Guidance Tool (A Stormwater Best Management Practices Guide for Orleans and Jefferson Parishes) | 2010 | | Includes overview and diagram for planter boxes, green roofs, cisterns/rain barrels, biofiltration BMPs and permeable pavement. It is mostly focused on design aspects, very little on inspection/maintenance. |
| Metropolitan Nashville – Davidson County, TN | LID Manual | 2016 | Design, Construction & Maintenance | |

## TABLE 2

### MATERIALS FROM VARIOUS JURISDICTIONS

| Jurisdiction | Document | Year | Category | Comments/Notes |
|---|---|---|---|---|
| Metropolitan Sewer District of Louisville, KY | Green Infrastructure Design Manual | 2015 | Design, Operation & Maintenance | A new addition to the MSD Design Manual is Chapter 18, Green Management Practices (GMP) Manual. It provides information on site feasibility, design criteria, O&M, benefits & limitations, etc., for bioswales, rain gardens, constructed wetlands, green roofs, blue roofs, permeable pavers, porous concrete, porous asphalt, planters, tree boxes, rainwater harvesting, in the form of factsheets. Note: This manual is being updated and a revised version will be available in summer of 2016. |
| Metropolitan St. Louis Sewer District | Landscape Guide for Stormwater Best Management Practice Design | 2012 | | In this guide, Section 3 provides information on native species, invasive species, site preparation, planting design, plant selection and installation and management. Section 4 presents more specific guidance on landscaping criteria and plant selection for the following BMP design types: wet ponds, wetlands, infiltration basins and dry swales, surface sand filters, bioretention and organic filters. Section 7 lists various plants specific for each BMP type outlined. |
| Michigan Department of Environmental Quality | Low Impact Development Manual for Michigan | 2008 | O&M | Structural BMPs – rain gardens, planter boxes, green roofs, vegetated swales, pervious pavement. |
| Mid-America Regional Council & American Public Works Association (Kansas City Metro Area) | Manual of Best Management Practices For Stormwater Quality | 2012 | Inspection & Maintenance | Good figures and tables. Describes maintenance and inspection for rain gardens, bioretention, permeable pavements and green roofs. Figures 4-23, 8-7, 8-28 are helpful. Tables covering typical maintenance activity and frequency are included. |
| Minnesota Pollution Control Agency | Minnesota Stormwater Manual | 2008 | | This manual together with the electronic wiki webpage provides a well-rounded introduction to stormwater management. |
| Missouri Department of Natural Resources | Missouri Guide to Green Infrastructure | 2012 | Inspection & Maintenance | This guide addresses economic costs and benefits to developers and municipalities, as well as environmental benefits. This is not a technical manual. Chapter 6 addresses siting & safety consideration, maintenance, benefits & includes inspection & maintenance checklist. |
| Montgomery County, MD | Rainscapes Projects Manual | | Design, Construction & Maintenance | This technical manual provides information on design, construction/installation and maintenance of the following types of GI practices - green roofs, rain barrels/cisterns, permeable pavers, rain gardens and dry wells. |
| | Raingardens for Rainscapes | | | This technical manual provides information on the design, construction/installation and maintenance of rain gardens. |
| NY Department of Environmental Protection | Guidelines for Design & Construction of Stormwater Management Systems | 2012 | Design, Construction, O&M | Chapter 4 includes rooftop systems (green & blue roofs) – siting considerations, design, construction, O&M (includes inspection & troubleshooting). |
| Northern Virginia Regional Commission | Maintaining Stormwater Systems – A Guidebook for Private Owners and Operators in Northern Virginia | 2007 | Inspection & Maintenance | This guidebook provides information on stormwater systems & their components including inspection/ maintenance/troubleshooting guide for rain gardens, vegetated swale, green roof & permeable pavement. |
| North Carolina State University (published by NC Co-operative Extension) | Low Impact Development – A Guidebook for North Carolina | 2009 | Design & Maintenance | Bioretention, permeable pavement, cisterns & water harvesting, swales, green roofs. |
| Northeast Ohio Stormwater Training Council | Maintaining Stormwater Control Measures Guidance for Private Owners & Operators | 2015 | Inspection & Maintenance | Addresses inspection and maintenance of GI practices – permeable pavements, green roofs, bioretention area/rain gardens etc. Includes good illustrations. |
| Onondaga County, NY | Save the Rain Program Green Infrastructure Maintenance Manual | 2013 | O&M | Appendix A – Detailed Green Infrastructure Standard Maintenance Procedures, Appendix E – Factsheets. |

## TABLE 2
### MATERIALS FROM VARIOUS JURISDICTIONS

| Jurisdiction | Document | Year | Category | Comments/Notes |
|---|---|---|---|---|
| Oregon State University Stormwater Solutions | Field Guide: Maintaining Rain Gardens, Swales and Stormwater Planters | 2013 | Maintenance | This field guide provides information needed to properly maintain rain gardens, swales, stormwater planters, and other facilities. Topics covered include erosion, sedimentation, vegetation and weeds, structures, trash and debris, safety. The field manual covers the most common maintenance activities that workers will need to remedy and provides lots of photos as a guide. |
| Philadelphia Water Department | Green Infrastructure Maintenance Manual Development Process Plan | 2012 | Maintenance | Chapter 4 – National Inventory of Maintenance Practices and Procedures, Info on maintenance task/data sheet template (Appendix II and III), Inventory of Maintenance Practices and Procedures by GSI Practice (Appendix VI), page 3 – definitions of various GI practices. |
| | Stormwater Management Guidance Manual | 2015 | Construction, Inspection & Maintenance | Chapters 4, 5, 6 address the following topics – bioretention, porous pavement, green roofs, cisterns, blue roofs. |
| | Green Stormwater Infrastructure Maintenance Manual | 2014 | Maintenance | This document contains standard operating procedures for executing specific maintenance tasks. Each protocol provides information on required training, equipment/materials, health and safety issues, including a detailed procedure for executing tasks. Appendices provide supplementary reference materials including health and safety procedures, a comprehensive listing of typical maintenance personnel classifications, and additional guidance on site access and permits. The GI practices addressed in this manual include stormwater tree trenches, rain gardens, stormwater planters, stormwater wetlands, bioswales, stormwater tree planters, rain barrels/cisterns, green roofs, pervious paving, blue roofs. |
| | Plant Identification Manual | 2014 | | This provides concise plant information along with a photo of each type. |
| Pima County & City of Tucson, AZ | Low Impact Development & Green Infrastructure Guidance Manual | 2015 | Design, Construction, O&M | Appendix G – plant list, design criteria, site selection, and construction. Includes a maintenance summary related to general GI practices. |
| Prince George's County, MD | Bioretention Manual | 2007 | Construction & Inspection | The manual provides information on bioretention types, applications, landscaping techniques & practices, construction & inspection including guidance on sizing, location & design. |
| | Prince George's County Stormwater Design Manual | 2014 | Design, Construction, O&M | Mostly design information presented. Chapter 14 includes inspection requirement during construction. Chapter 10 includes some O&M information for rainwater harvesting, rain gardens, swales, green roofs, permeable pavements, dry wells. |
| Seattle Public Utilities | Green Stormwater Infrastructure Manual Volume V: Operations & Maintenance | 2015 | Maintenance | Topics of interest for curriculum development include – equipment needs, materials required, maintenance during construction period. Appendices include planting guidance for Trees & vegetation (G), Maintenance checklists (E). |
| | City of Seattle Stormwater Manual – Volume 3: Project Stormwater Control | 2015 | Maintenance | Chapter 2 provides information on the various BMP categories. Chapter 5 includes information on description, performance mechanism, applicability, site considerations, design criteria, BMP sizing, construction requirements and O&M for dry wells, rain gardens, permeable pavement, rainwater harvesting and swales. |
| Southern California Stormwater Monitoring Coalition | LID for Southern California | 2010 | Design, O&M | Chapter 4 - bioretention, pervious pavement, green roofs, BMP factsheets, soil amendments, dry wells, infiltration basins, trenches, vegetated swales. |
| Tennessee Department of Environment & Conservation | Tennessee Permanent Stormwater Management and Design Guidance Manual | 2014 | | Chapter 5 addresses the following topics – bioretention, green roofs, permeable pavement, rainwater harvesting, and bioswales in Appendices C, D, E and F. |
| University of Minnesota | An Introduction to Stormwater Practices Maintenance – Vegetated & Biological Stormwater Practices Maintenance | | Maintenance | Excellent PPT targeted towards maintenance, with great visuals. |

## TABLE 2

### MATERIALS FROM VARIOUS JURISDICTIONS

| Jurisdiction | Document | Year | Category | Comments/Notes |
|---|---|---|---|---|
| U.S. Army Corps of Engineers | Army Low Impact Development Technical User Guide | 2013 | Design, Construction & Maintenance | The guide addresses the following GI practices – bioretention, vegetated swales, permeable pavements, rainwater harvesting, green roofs. Chapter 5 covers the description, types, components, design criteria, materials, construction considerations, maintenance of the GI practices. |
| U.S. Department of Transportation, Federal Highway Administration | Porous Asphalt Pavements with Stone Reservoirs (Technical Brief -FHWA-HIF-15-009) | 2015 | Design, Construction & Maintenance | This technical brief provides an overview of the benefits, limitations and applications of porous asphalt pavements with stone reservoirs. Design, construction and maintenance aspects are all discussed. |
| USEPA | Green Roofs for Stormwater Runoff Control | 2009 | | This report evaluates green roofs as a stormwater management tool. The influence of media type, media depth and drought during plant establishment on plant growth and long-term management of media pH were investigated. |
| | Green Infrastructure Case Studies | 2010 | | This case study report describes a dozen cities and counties that are using green infrastructure approaches to reduce imperviousness and preserve natural open space throughout a watershed and at the neighborhood scale, as well as adding green infrastructure practices at the site level. |
| Urban Drainage and Flood Control District, Denver, CO | Urban Storm Drainage Criteria Manual Volume 3 | Updated 2010 | Maintenance | BMP maintenance – bioretention, green roofs, permeable pavement, grass buffers and swales. |
| Virginia Department of Environmental Quality (DEQ) | Virginia Stormwater BMP Clearing House | | Design, Inspection, Maintenance | This clearing house website provides design standards & specifications for all stormwater BMPs approved for use in Virginia. |
| Washington State Department of Ecology | Western Washington Low Impact Development (LID) Operation & Maintenance (O&M) | 2013 | O&M | Maintenance standards and procedures, equipment & materials, skills and staffing. Compost amended soils information on page 81. |
| Washington Department of Ecology & Washington State University Extension | Rain Garden Handbook for Western Washington | 2013 | Design, Installation & Maintenance | A guide for design, maintenance and installation. |
| Watershed Management Group – Funded by USEPA & Arizona DEA | Green Infrastructure for Southwestern Neighborhoods – Version 1.2 Revised October 2012 | 2012 | Maintenance | Design, construction, maintenance (site selection, soils, O&M, plan view diagrams) – mainly in arid climate. |

## TABLE 3
### INDUSTRY/TRADE GROUPS/ORGANIZATIONS MATERIALS

| Organization | Source Document | Type | Category | Comments/Notes |
|---|---|---|---|---|
| Contech Engineered Solutions | Filterra Solutions Brochure | Brochure | Installation & Maintenance | These documents provide installation and maintenance information on an engineered biofiltration device. It can be used in different configurations in both new construction and urban retrofits as well as streetscapes, urban areas, parking lots, roof drains, etc. |
| | Filterra Operations & Maintenance Guide | Manual/Guide | Installation & Maintenance | |
| CULTEC, Inc. | CULTEC Plastic Chamber as Dry Well | Brochure | | This brochure provides information on benefits and specifications for use in a dry well. |
| | CULTEC stormwater product booklet | Booklet | Installation & Maintenance | These documents provide information on product features, benefits, components, specifications, installation and drawings. |
| Interlocking Concrete Pavement Institute (ICPI) | Industry Guidelines for Permeable Interlocking Concrete Pavement in the United States and Canada | PPT/slides | Design, Construction & Maintenance | Includes good visuals. |
| Oldcastle Stormwater Solutions | BioMod Modular Bioretention Brochure | Brochure | | This brochure describes the BioMod modular bioretention system and provides information on benefits, application, design and configurations. |
| | BioMod Modular Maintenance Manual | Booklet | Maintenance | This brochures provides information on general specifications for maintenance of BioMod modular bioretention system. |
| | TreePod Biofilter | Brochure | | This brochure provides information on its application, capabilities and design. |
| | StormCapture Harvesting & Reuse Brochure | Brochure | | This brochure provides information on StormCapture harvesting system. |
| | StormCapture Installation Manual | Booklet | Installation | This brochure provides information on the installation process. |
| | StormCapture Maintenance Manual | Booklet | Maintenance | This brochure provides information on maintenance. |
| | PermeCapture Brochure | Brochure | | This brochure provides information on benefits, application & performance. |
| Urban Horticulture Institute, Cornell University (CU) | CU-Structural Soil – A Comprehensive Guide | Guide | | Overview on using CU-Structural Soil® to support trees, turf and porous pavement. |
| | Using Porous Asphalt and CU-Structural Soil | Booklet | | Booklet details how the combination of porous asphalt and CU-Structural Soil™ reduces runoff and improves water quality. |

## TABLE 4

### FACTSHEETS/BROCHURES/CHECKLISTS/FORMS

| Source Document | Organization | Type | Category | Comments/Notes |
|---|---|---|---|---|
| Pervious Pavement (Stormwater Control for Small Projects) | Bay Area Stormwater Management Agencies Associations | Factsheet | Design, Installation & Maintenance | This factsheet provides information on feasibility, maintenance considerations, typical materials & example applications and a design checklist. |
| Rain Gardens (Stormwater Control for Small Projects) | | Factsheet | Design, Installation & Maintenance | This factsheet provides information on feasibility, maintenance considerations, how to plan & install and a design checklist. |
| Rain Barels & Cisterns (Stormwater Control for Small Projects) | | Factsheet | Design, Installation & Maintenance | This factsheet provides information on feasibility, operation & maintenance, components and a design checklist. |
| Bioretention Area Maintenance Schedule and Guidelines | City of Alexandria, VA | Factsheet | Maintenance | Routine maintenance task & frequency. |
| Permeable Pavement Maintenance Schedule and Guidelines | | Factsheet | Maintenance | |
| Rainwater Harvesting Maintenance Schedule and Guidelines | | Factsheet | Maintenance | |
| Urban Bioretention Area Maintenance Schedule and Guidelines | | Factsheet | Maintenance | |
| Vegetated Roof Maintenance Schedule and Guidelines | | Factsheet | Maintenance | |
| Constructed Wetlands Maintenance Schedule and Guidelines | | Factsheet | Maintenance | |
| Bioretention System Annual Evaluation Form | City of Omaha Stormwater Program | Inspection Form | Inspection & Maintenance | This form can be used as a tool in evaluating bioretention system, as well as act as a document of maintenance. |
| Permeable Pavers & Pervious Pavement Annual Evaluation Form | | | | This form can be used as a tool in evaluating permeable pavers and pervious pavement, as well as a document of maintenance. |
| Rain Garden Annual Evaluation Form | | | | This form can be used as a tool in evaluating your rain garden, as well as a document of maintenance. |
| Bioretention Practices | Fairfax County Public Works and Environmental Services | Factsheet | Maintenance | |
| Permeable Pavement | | Factsheet | Maintenance | |
| Rainwater Harvesting | | Factsheet | Maintenance | |
| Tree Box Filters | | Factsheet | Maintenance | |
| Soil Compost Amendments | | Factsheet | Maintenance | |
| Vegetated Roofs | | Factsheet | Maintenance | |
| Vegetated Swales | | Factsheet | Maintenance | |
| Wet and Dry Stormwater Ponds | | Factsheet | Maintenance | |
| Recommended Plant List for Bioretention Facilities | | Plant List | | |
| A Resident's Reference Guide to Creating a Rain Garden | Kansas City Water Services | Brochure | Design | Rain garden design & plant selection information. |
| City of Lancaster Green Infrastructure Plan: Appendix A – Green Infrastructure Technology Fact Sheets | City of Lancaster, PA | Brochure | Description, Maintenance, Benefits, Cost | Includes information on rain gardens, bioswales, tree boxes, bioretention planters, permeable pavements, green roofs, rain barrels. |

## TABLE 4

### FACTSHEETS/BROCHURES/CHECKLISTS/FORMS

| Source Document | Organization | Type | Category | Comments/Notes |
|---|---|---|---|---|
| Factsheet on Stormwater Planters | M. Cahill, D.C. Godwin and M. Sowles | Factsheet | Design, Construction & Maintenance | This factsheet provides detailed information on design, construction & maintenance. |
| Factsheet on Dry Wells | | Factsheet | Design, Construction & Maintenance | This factsheet provides detailed information on design, construction & maintenance. |
| Factsheet on Swales | | Factsheet | Design, Construction & Maintenance | This factsheet provides detailed information on design, construction & maintenance. |
| Porous Pavement Ownership and Maintenance | Metropolitan St. Louis Sewer District | Brochure | Inspection & Maintenance | |
| Rain Garden Ownership and Maintenance | | Brochure | Inspection & Maintenance | |
| Planter Box Ownership & Maintenance | | Brochure | Inspection & Maintenance | |
| Bioretention Maintenance Inspection Checklist | | Checklist | Inspection | |
| Pervious Pavement Maintenance Inspection Checklist | | Checklist | Inspection | |
| Rain Garden Care | Milwaukee Metropolitan Sewerage District | Brochure | | |
| Stormwater Tree Factsheet | | Factsheet | | |
| DRAFT Green Infrastructure Maintenance and Equipment Needs | | Factsheet | Maintenance | |
| Inspection Guide (Filtration Practices, Infiltration Basins and Trenches, Bioretention (Rain Gardens), and Swales) | Minnehaha Creek Watershed District | Factsheet (Inspection Guide) | Inspection | |
| Inspection Guide for Permeable Pavers | | Factsheet (Inspection Guide) | Inspection | |
| Green Roof Maintenance | Montgomery County | Factsheet | Description, Maintenance | Maintenance activities, frequency and troubleshooting tips. |
| Porous Pavement Maintenance | | Factsheet | | |
| Rain Garden/Bioswale Maintenance | | Factsheet | | |
| Swale Maintenance | | Factsheet | | |
| Vegetated Stormwater Facility Maintenance | | Factsheet | | |
| Buried Dry Well Maintenance | | Factsheet | | |
| Rain Barrels | | Factsheet | | |
| Planting Design for Bioretention & Rain Gardens | | Brochure | Design | |
| Permeable Pavement Design Template | | Guide | Design, Installation & Maintenance | This guidebook provides information on the design, installation and maintenance of permeable pavements. |
| Inspector's Guide for Permeable Interlocking Concrete Pavers (PICP) Installation & Maintenance | PICP Institute | Checklist | Inspection | This PICP inspector's guide for project construction and maintenance consists of a checklist developed from the ICPI PICP manual and the PICP certificate course. |
| Green Infrastructure Practices: An Introduction to Permeable Pavement | Rutgers University | Factsheet | Maintenance | Types, benefits, maintenance. |
| Rain Gardens and Mosquitoes | | Factsheet | Maintenance | How to keep rain gardens free from mosquitoes. |
| An Introduction to Green Infrastructure Practices | | | | Introduction/benefits/types. |
| Green Infrastructure Practices: Tree Boxes | | Factsheet | Maintenance | Fact Sheet FS1209, includes information on installation, maintenance of tree boxes. |

## TABLE 4
### FACTSHEETS/BROCHURES/CHECKLISTS/FORMS

| Source Document | Organization | Type | Category | Comments/Notes |
|---|---|---|---|---|
| Stormwater Treatment BMP Inspection Data Collection Form | Santa Clara Valley Urban Runoff Pollution Prevention Program | Form | Inspection & Maintenance | |
| Natural Drainage Systems Landscape Maintenance Categories (LMC) and Characteristics Checklist | Seattle Public Utilities | Checklist | Maintenance | |
| Rain Gardens | University of Delaware Co-operative Extension | Factsheet | Design, Installation & Maintenance | This factsheet provides information related to design, installation and maintenance. |
| Green Roofs | | Factsheet | Design, Installation & Maintenance | This factsheet provides information related to design, installation and maintenance. |
| Rainwater Harvesting | | Factsheet | | |
| Regular Inspection and Maintenance Guidance for Porous Pavements | University of New Hampshire Stormwater Center | Factsheet & Checklist | Inspection & Maintenance | Inspection checklist and maintenance activities. |
| Regular Inspection and Maintenance Guidance for Bioretention Systems/Tree Filters | | Factsheet & Checklist | Inspection & Maintenance | Inspection checklist and maintenance activities. |
| USEPA Stormwater Technology Factsheet (Vegetated Swales) | USEPA | Factsheet | Design, Operation & Maintenance | Cost, performance, design criteria, operation & maintenance. |
| USEPA Stormwater Technology Factsheet (Constructed Wetlands) | | Factsheet | Design, Operation & Maintenance | Cost, performance, design criteria, operation & maintenance. |
| USEPA Stormwater Technology Factsheet (Porous Pavement) | | Factsheet | Design, Operation & Maintenance | Cost, performance, design criteria, operation & maintenance. |
| USEPA Stormwater Technology Factsheet (Bioretention) | | Factsheet | Design, Operation & Maintenance | Cost, performance, design criteria, operation & maintenance. |
| Bioretention Inspection Form | Washington State Department of Ecology | Forms | | |
| Permeable Pavement Inspection Form | | Forms | | |
| Bioretention Soil Mix | Found as a resource on the 12,000 Rain Gardens program webpage | Factsheet | | This factsheet helps understand the composition of soil mixes for bioretention. |

## TABLE 5
### VIDEOS/WEBCASTS

| Title | Source | Type | Category | Comments/Notes |
|---|---|---|---|---|
| A Guide to Proper Construction Techniques for Contractors, Local Governments and Involved Homeowners | Chesapeake Stormwater (Videos) | Construction | https://youtu.be/efu1LfF1rio?list=PLvAwYhXd7L0I_Fmj2HsMXMqdN5MU6OWfh | Covers construction practices and the importance of following the construction sequence. |
| Inspecting LID Stormwater Practices: A Guide to Proper LID Inspection Practices for Local Governments and Contractors | | Inspection | https://youtu.be/eAFuMro0gvA?list=PLvAwYhXd7L0I_Fmj2HsMXMqdN5MU6OWfh | Offers tips on how to conduct routine and more formal inspections of LID-type stormwater management practices such as bioretention, bioswales and permeable pavement. |
| Stormwater BMP and LID Maintenance: A Guide to Proper Maintenance Practices for Local Government Staff and Landscapers | | Maintenance | https://www.youtube.com/watch?v=coFbdMB-q0U&feature=youtu.be&list=PLvAwYhXd7L0I_Fmj2HsMXMqdN5MU6OWfh | Discusses routine maintenance of LID-type stormwater management practices including commonly encountered maintenance problems and offers potential solutions for remediating them. |
| Analyzing the Bioretention Construction Sequence | Chesapeake Stormwater (PDF of PPT/slides) | Construction | http://chesapeakestormwater.net/wp-content/uploads/downloads/2013/10/Bioretention-Construction-Sequence.pdf | |
| Bioretention Design, Installation and Maintenance | Chesapeake Stormwater (Webcast) | Design, Installation & Maintenance | http://chesapeakestormwater.net/2010/04/bioretention-design-installation-and-maintenance/ | |
| RiverSmart Rooftops in Washington, DC | DDOE (Videos) | Construction & Maintenance | https://vimeo.com/122354242 | |
| RiverSmart Homes – Rain Barrel Maintenance | | Maintenance | https://vimeo.com/85290827 | |
| MSD Rain Garden and Planter Box Maintenance | Metropolitan St. Louis Sewer District (Video) | Maintenance | https://www.youtube.com/watch?v=nK4x1rtyMds&feature=youtu.be | |
| Getting Polluted Runoff Under Control | Stormwater PA and GreenTreks Network (DVD/Videos) | | This DVD can be purchased at: http://www.greentreks.tv/?tag=green-building | The videos targeting homeowners and the one on GI gives useful big picture information on water cycle, how living roofs, rain gardens, etc., green stormwater management). |
| Greening Your Backyard: Water Efficiency and Stormwater Solutions for Homeowners and Communities | USEPA | | https://www.youtube.com/watch?v=WOMLB2kLYVA&feature=youtu.be | This webcast provides information to homeowners and communities about some of the latest tools and information on water efficiency and stormwater solutions. |
| Green Infrastructure for Arid Communities | | | Webcast slides and transcript can be found at: https://www.epa.gov/green-infrastructure/green-infrastructure-arid-communities | This webcast showcases how green infrastructure practices and the many associated benefits can be effective not only in wetter climates, but also for those communities in arid and semi-arid regions around the nation that have different precipitation patterns and water demand challenges. |
| Best Practices for Green Infrastructure O&M | | | Webcast slides and transcript can be found at: https://www.epa.gov/green-infrastructure/best-practices-green-infrastructure-om-webcast | This webcast provides a general overview of best practices to consider when creating a green infrastructure O&M plan. |
| Getting More Green from your Stormwater Infrastructure | | | Webcast slides and transcript can be found at: https://www.epa.gov/green-infrastructure/getting-more-green-your-stormwater-infrastructure-webcast | This webcast showcases different ways of communicating both cost savings and benefits related to green infrastructure. |

## TABLE 6
### BOOKS

| Organization | Source Document | ISBN | Comments/Notes |
|---|---|---|---|
| Green Roof Plants: A Resource & Planting Guide | Edmund Snodgrass & Lucie Snodgrass | ISBN-13: 978-0-88192-787-0 | Great plant identification guide, focuses primarily on green roof plants. |
| Permeable Interlocking Concrete Pavements | David R. Smith | ISBN 978-1-4507-8440-5 | Design, specifications, construction, maintenance. |

## TABLE 7
### REFERENCES, DOCUMENTS AND TRAINING MATERIALS FOR GREEN STORMWATER INFRASTRUCTURE

| # | Title | Author/Publisher | Bioretention* | Porous/ Permeable Pavements | Green Roofs | Blue Roofs | Dry Wells | Rainwater Harvesting** | Stormwater/ Constructed Wetland |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Start at the Source: Design Guidance Manual for Stormwater Quality | Bay Area Stormwater Management Agencies Association | ✓ | ✓ | | | ✓ | ✓ | |
| 2 | Pervious Pavement (Stormwater Control for Small Projects) | | ✓ | ✓ | | | | | |
| 3 | Rain Gardens (Stormwater Control for Small Projects) | | | | | | | | |
| 4 | Rain Barrels & Cisterns (Stormwater Control for Small Projects) | | | | | | | ✓ | |
| 5 | Regional Bioretention Soil Guidance & Model Specification | Bay Area Stormwater Management Agencies Association (& WRA Consultants) | ✓ | | | | | | |
| 6 | Routine Maintenance for Rain Gardens | Blue Water Baltimore | ✓ | | | | | | |
| 7 | Stormwater Management Guidebook for the DC DOEE | Center for Watershed Protection | ✓ | ✓ | ✓ | | | ✓ | ✓ |
| 8 | A Guide to Proper Construction Techniques for Contractors, Local Governments and Involved Homeowners | Chesapeake Stormwater | | | | | | | |
| 9 | Inspecting LID Stormwater Practices: A Guide to Proper LID Inspection Practices for Local Governments and Contractors | | ✓ | ✓ | | | | | |
| 10 | Stormwater BMP and LID Maintenance: A Guide to Proper Maintenance Practices for Local Government Staff and Landscapers | | | | | | | | |
| 11 | Bioretention Design, Installation and Maintenance Webcast | | ✓ | | | | | | |
| 12 | Analyzing the Bioretention Construction Sequence | | ✓ | | | | | | |
| 13 | CSN Technical Bulletin No. 10 Bioretention Illustrated: A Visual Guide for Constructing, Inspecting, Maintaining, and Verifying the Bioretention Practice | | ✓ | ✓ | | | | | |
| 14 | Maintenance Matters Now! The changing world of BMP Inspection | | | | | | | | |
| 15 | Low Impact Development Construction Guide – Version 1.0 | Credit Valley Conservation | ✓ | ✓ | | | | | |

* For the purposes of this table, bioretention refers to the following Green Infrastructure practices: Rain Gardens, Bioswales, Tree Boxes, Bioretention Planters

** For the purposes of this table, Rainwater Harvesting refers to the following Green Infrastructure practices: Rain Barrels, Cisterns, Rainwater Harvesting systems

## TABLE 7
### REFERENCES, DOCUMENTS AND TRAINING MATERIALS FOR GREEN STORMWATER INFRASTRUCTURE

| # | Title | Author/Publisher | Bioretention* | Porous/ Permeable Pavements | Green Roofs | Blue Roofs | Dry Wells | Rainwater Harvesting** | Stormwater/ Constructed Wetland |
|---|---|---|---|---|---|---|---|---|---|
| 16 | Post-Construction Stormwater Management | City of Alexandria, VA | | | | | | | |
| 17 | Bioretention Area Maintenance Schedule and Guidelines | | | | | | | | |
| 18 | Permeable Pavement Maintenance Schedule and Guidelines | | | ✓ | | | | | |
| 19 | Rainwater Harvesting Maintenance Schedule and Guidelines | | | | | | | ✓ | |
| 20 | Sheet Flow to Vegetated Filter Areas and Conserved Open Space Maintenance Schedule and Guidelines | | | | | | | | |
| 21 | Urban Bioretention Area Maintenance Schedule and Guidelines | | ✓ | | | | | | |
| 22 | Vegetated Roof Maintenance Schedule and Guidelines | | | | ✓ | | | | |
| 23 | Constructed Wetlands Maintenance Schedule and Guidelines | | | | | | | | ✓ |
| 24 | Green Infrastructure Stormwater Management Practices for Small Commercial Development | City of Atlanta, Watershed Department, GA | ✓ | ✓ | ✓ | | | ✓ | |
| 25 | Green Infrastructure for Single Family Residences | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| 26 | Stormwater Strategic Plan – Green Infrastructure Design & Implementation Guidelines | City of Columbus, OH | | ✓ | | | | | |
| 27 | LID Guidance Manual | City of Flagstaff, AZ | | | | | | | |
| 28 | Permeable Pavement Factsheet | City of Omaha Stormwater Program, NE | | ✓ | | | | | |
| 29 | Bioretention Systems Factsheet | | ✓ | | | | | | |
| 30 | Bioretention System Annual Evaluation Form | | ✓ | | | | | | |
| 31 | Permeable Pavers & Pervious Pavement Annual Evaluation Form | | | ✓ | | | | | |
| 32 | Rain Garden Annual Evaluation Form | | ✓ | | | | | | |
| 33 | Bioretention Gardens: A Manual for Contractors in the Omaha Region to Design and Install Bioretention Gardens | | ✓ | | | | | | |
| 34 | Stormwater Management Manual | City of Portland, OR | ✓ | ✓ | ✓ | | ✓ | | |
| 35 | Stormwater BMP Guidance Manual | City of Santa Barbara, CA | ✓ | | ✓ | | | | |
| 36 | Water Harvesting Guidance Manual | City of Tucson, AZ | | | | | | ✓ | |
| 37 | Low Impact Development Approaches (LIDA) Handbook | Clean Water Services, OR | ✓ | ✓ | ✓ | | | | ✓ |
| 38 | Stormwater Maintenance Training for Municipal Employees in Northeast Ohio | Cleveland, OH | ✓ | ✓ | ✓ | | | ✓ | |
| 39 | Filterra® Solutions Brochure | Contech Engineered Solutions | ✓ | | | | | | |
| 40 | Filterra® Operation & Maintenance Guide | | ✓ | | | | | | |
| 41 | Stormwater C.3 Guidebook | Contra Costa Clean Water Program, CA | ✓ | ✓ | | | ✓ | ✓ | |
| 42 | CULTEC Plastic Chamber as Dry Well | CULTEC, Inc | | | | | | | |
| 43 | CULTEC Stormwater Product Booklet | | | | | | | | |
| 44 | Industry Guidelines for Permeable Interlocking Concrete Pavement in the United States and Canada | David R. Smith of ICPI | | ✓ | | | | | |
| 45 | Green Infrastructure Primer for Delaware | Delaware Department of Natural Resources and Environmental Control (DNREC) | ✓ | | ✓ | | | ✓ | |

* For the purposes of this table, bioretention refers to the following Green Infrastructure practices: Rain Gardens, Bioswales, Tree Boxes, Bioretention Planters

** For the purposes of this table, Rainwater Harvesting refers to the following Green Infrastructure practices: Rain Barrels, Cisterns, Rainwater Harvesting systems

## TABLE 7
### REFERENCES, DOCUMENTS AND TRAINING MATERIALS FOR GREEN STORMWATER INFRASTRUCTURE

| # | Title | Author/Publisher | Bioretention* | Porous/ Permeable Pavements | Green Roofs | Blue Roofs | Dry Wells | Rainwater Harvesting** | Stormwater/ Constructed Wetland |
|---|---|---|---|---|---|---|---|---|---|
| 46 | Green Infrastructure Designs – Scalable Solutions to Local Challenges | Delta Institute, IL | ✓ | ✓ | | | | | |
| 47 | Green Infrastructure Standards | District of Columbia – Department of Transportation | ✓ | ✓ | | | | | |
| 48 | Technical Memorandum #6 – Green Infrastructure Technologies | DC Water | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| 49 | DC Water Green Infrastructure Utility Protection Guidelines | | ✓ | ✓ | | | | | |
| 50 | DCCR GI Design Standards (Draft) | | ✓ | ✓ | ✓ | | | ✓ | |
| 51 | Riversmart Homes (Training materials) | District Department of the Environment (DDOE)*** and Alliance for the Chesapeake Bay | ✓ | | | | | | |
| 52 | Low Impact Development (LID) Construction and Maintenance Guidance Manual | District Department of the Environment (DDOE)*** and LID center | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| 53 | RiverSmart Rooftops in Washington, DC | District Department of the Environment (DDOE)** | | | ✓ | | | | |
| 54 | RiverSmart Homes – Rain Barrel Maintenance | | ✓ | | | | | | |
| 55 | RiverSmart Homes | | ✓ | ✓ | | | | ✓ | |
| 56 | Stormwater Management Guidebook | | | | | | | | |
| 57 | Green Roof Plants: A Resource & Planting Guide | Edmund Snodgrass & Lucie Snodgrass | | | ✓ | | | | |
| 58 | Bioretention Practices | Fairfax County, VA | | | | | | | |
| 59 | Permeable Pavement | | ✓ | | | | | | |
| 60 | Rainwater Harvesting | | ✓ | | | | | ✓ | |
| 61 | Tree Box Filters | | | | | | | | |
| 62 | Soil Compost Amendments | | | | | | | | |
| 63 | Vegetated Roofs | | | | ✓ | | | | |
| 64 | Wet and Dry Stormwater Management Ponds | | | | | | | | |
| 65 | Vegetated Swales | | ✓ | | | | | | |
| 66 | Public Facilities Manual (Chapter 6) – Fairfax County | | ✓ | ✓ | ✓ | | | ✓ | ✓ |
| 67 | Fairfax County Maintenance Contractor Awareness Training | | ✓ | ✓ | ✓ | | | | ✓ |
| 68 | Recommended Plant List for Bioretention Facilities | | | | | | | | |
| 69 | 40-hrs Stormwater Inspection Team Training Materials (Internal) | | | | | | | | |
| 70 | Technical Bulletin: Porous Asphalt Pavement, (Rev. 16 July 2012) | Flexible Pavements of Ohio | | ✓ | | | | | |
| 71 | Georgia Stormwater Management Manual | Georgia Environmental Protection Division ( and Atlanta Regional Commission) | | | | | | | |
| 72 | Change the Game with Green Infrastructure – Retrofits of Existing Detention Basin may be Orders of Magnitude More Cost-Effective than New BMP Construction: A Preliminary Report | Goodrich et al. | | | | | | | |
| 73 | Cost-Effective Stormwater Management Retrofit Device | | | | | | | | |

* For the purposes of this table, bioretention refers to the following Green Infrastructure practices: Rain Gardens, Bioswales, Tree Boxes, Bioretention Planters

** For the purposes of this table, Rainwater Harvesting refers to the following Green Infrastructure practices: Rain Barrels, Cisterns, Rainwater Harvesting systems

*** Now called Department of Energy and Environment (DOEE)

## TABLE 7
### REFERENCES, DOCUMENTS AND TRAINING MATERIALS FOR GREEN STORMWATER INFRASTRUCTURE

| # | Title | Author/Publisher | Bioretention* | Porous/ Permeable Pavements | Green Roofs | Blue Roofs | Dry Wells | Rainwater Harvesting** | Stormwater/ Constructed Wetland |
|---|---|---|---|---|---|---|---|---|---|
| 74 | Green Roof Design 101: Introductory Course, Second Edition Participant's Manual | Green Roofs for Healthy Cities | | | ✓ | | | | |
| 75 | Green Roof Waterproofing and Drainage 301: Participant's Manual | | | | ✓ | | | | |
| 76 | Strategic Green Infrastructure Planning | Green Infrastructure Center Inc. | | | | | | | |
| 77 | Permeable Interlocking Concrete Pavements (Fourth Edition) | Interlocking Concrete Pavement Institute | | ✓ | | | | | |
| 78 | Inspector's Guide for PICP Installation & Maintenance | | | ✓ | | | | | |
| 79 | A Resident's Reference Guide to Creating a Rain Garden | Kansas City Water Services | ✓ | | | | | | |
| 80 | Green Infrastructure Pilot Through The Seasons | | ✓ | ✓ | | | | | |
| 81 | City of Lancaster Green Infrastructure Plan: Appendix A – Green Infrastructure Technology Fact Sheets | City of Lancaster and Pennsylvania DCNR | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| 82 | Construction Field Guide | Louisville and Jefferson County Metropolitan Sewer District | | | | | | | |
| 83 | Stormwater BMP Guidance Tool | Louisiana Department of Environmental Quality (LDEQ) | ✓ | ✓ | ✓ | | | | |
| 84 | LID for Southern California | Low Impact Development Center | ✓ | ✓ | ✓ | | ✓ | | |
| 85 | Maryland Stormwater Design Manual (Volumes 1 and 2) | Maryland Department of the Environment | | | | | | | |
| 86 | Factsheet on Stormwater Planters | M. Cahill, D.C. Godwin and M. Sowles | ✓ | | | | | | |
| 87 | Factsheet on Dry Wells | | | | | | ✓ | | |
| 88 | Factsheet on Swales | | ✓ | | | | | | |
| 89 | 2016 LID Manual | Metropolitan Nashville–Davidson Co | ✓ | ✓ | ✓ | | | ✓ | |
| 90 | Green Infrastructure Design Manual | Metropolitan Sewer District of Louisville, KY | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| 91 | Chapter 18 of the GI Design Manual (Draft) | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| 92 | Qualified Post-Construction Inspector (QPCI) Exam | | | | | | | | |
| 93 | Qualified Post-Construction Inspector Training Program | | | | | | | | |
| 94 | Porous Pavement Ownership & Maintenance | Metropolitan St. Louis Sewer District | | ✓ | | | | | |
| 95 | Rain Garden Ownership & Maintenance | | ✓ | | | | | | |
| 96 | Planter Box Ownership & Maintenance | | ✓ | | | | | | |
| 97 | Bioretention Maintenance Inspection Checklist | | ✓ | | | | | | |
| 98 | Pervious Pavement Maintenance Inspection Checklist | | | ✓ | | | | | |
| 99 | MSD Rain Garden and Planter Box Maintenance | | ✓ | | | | | | |
| 100 | Landscape Guide for Stormwater BMP Design | | ✓ | | | | | | ✓ |
| 101 | Low Impact Development Manual for Michigan | Michigan Department of Environmental Quality | ✓ | ✓ | ✓ | | | | |
| 102 | Manual of Best Management Practices For Stormwater Quality | Mid-America Regional Council And American Public Works Association | ✓ | ✓ | ✓ | | | | |

* For the purposes of this table, bioretention refers to the following Green Infrastructure practices: Rain Gardens, Bioswales, Tree Boxes, Bioretention Planters
** For the purposes of this table, Rainwater Harvesting refers to the following Green Infrastructure practices: Rain Barrels, Cisterns, Rainwater Harvesting systems

## TABLE 7
### REFERENCES, DOCUMENTS AND TRAINING MATERIALS FOR GREEN STORMWATER INFRASTRUCTURE

| # | Title | Author/Publisher | Bioretention* | Porous/ Permeable Pavements | Green Roofs | Blue Roofs | Dry Wells | Rainwater Harvesting** | Stormwater/ Constructed Wetland |
|---|---|---|---|---|---|---|---|---|---|
| 103 | MMSD Stormwater Tree Factsheet | Milwaukee Metropolitan Sewerage District | ✓ | | | | | | |
| 104 | Rain Garden Care | | ✓ | | | | | | |
| 105 | Green Infrastructure Maintenance and Equipment Needs (Draft) | | ✓ | ✓ | ✓ | | | ✓ | ✓ |
| 106 | Inspection Guide (Filtration Practices, Infiltration Basins and Trenches, Bioretention (Raingardens), and Swales) | Minnehaha Creek Watershed District | ✓ | | | | | | |
| 107 | Inspection Guide for Permeable Pavers | | | ✓ | | | | | |
| 108 | Minnesota Stormwater Manual | Minnesota Pollution Control Agency | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| 109 | Missouri Guide to Green Infrastructure | Missouri Department of Natural Resources | | | | | | | |
| 110 | Factsheet on Green Roof Maintenance | Montgomery County | | | ✓ | | | | |
| 111 | Factsheet on Porous Pavement Maintenance | | | ✓ | | | | | |
| 112 | Factsheet on Rain Garden/ Bioswale Maintenance | | ✓ | | | | | | |
| 113 | Factsheet on Swale Maintenance | | ✓ | | | | | | |
| 114 | Factsheet on Vegetated Stormwater Facility Maintenance | | ✓ | | | | | | |
| 115 | Factsheet on Buried Dry Well Maintenance | | | | | | ✓ | | |
| 116 | Factsheet on Rain Barrels | | ✓ | | | | | ✓ | |
| 117 | RainScapes Rain Garden Video | | ✓ | | | | | | |
| 118 | How Green Streets Work | | ✓ | | | | | | |
| 119 | Site Assessment for a Rain Garden | | ✓ | | | | | | |
| 120 | Planting Design for Bioretention & Rain Gardens | | ✓ | | | | | | |
| 121 | Permeable Pavement Design Template | | | ✓ | | | | | |
| 122 | Raingardens for Rainscapes | | ✓ | | | | | | |
| 123 | Rainscapes Projects Manual | | ✓ | ✓ | | | | ✓ | |
| 124 | Grassy Swales (& Bioswales) Maintenance | NEOSWTC (Workshop Materials 2015) | ✓ | | | | | | |
| 125 | Green Roofs Maintenance | | | | ✓ | | | | |
| 126 | Cisterns & Rainwater Harvesting Maintenance | | | | | | | ✓ | |
| 127 | Bioretention Maintenance (Part 1 and 2) | | ✓ | ✓ | | | | | |
| 128 | Permeable Pavement Maintenance (Part 1 and 2) | | | | | | | | |
| 129 | Parking Lot BMPs (Part 1 and 2) | NEOSWTC (Workshop Materials 2014) | | | | | | | |
| 130 | Operations & Maintenance for Bioretention Stormwater Practices (Part 1 & 2) | | ✓ | | | | | | |
| 131 | Plants for Rain Gardens and Bioretention | | | | | | | | |
| 132 | High Performance Landscape Guidelines | New York City Department of Parks & Recreation | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| 133 | Guidelines for Design & Construction of Stormwater Management Systems | New York Department of Environmental Protection | | | ✓ | ✓ | | | |
| 134 | New York State Stormwater Management Design Manual | New York State Department of Environmental Conservation | | | | | | | |
| 135 | Maintaining Stormwater Systems – A Guidebook for Private Owners and Operators in Northern Virginia | Northern Virginia Regional Commission | ✓ | ✓ | ✓ | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| 136 | Stormwater Best Management Practices Manual | North Carolina Department of Environment and Natural Resources | | | | | | | |
| 137 | Stormwater BMP Inspection & Maintenance Certification – Participant's Manual | North Carolina State University | ✓ | | | | | | ✓ |
| 138 | Low Impact Development A Guidebook for North Carolina | North Carolina Cooperative Extension | | ✓ | ✓ | | | ✓ | ✓ |
| 139 | Maintaining Stormwater Control Measures Guidance for Private Owners & Operators | Northeast Ohio Storm Water Training Council | ✓ | ✓ | ✓ | | | ✓ | |
| 140 | BioMod Modular Bioretention Brochure | Oldcastle Stormwater Solutions | ✓ | | | | | | |
| 141 | BioMod Modular Maintenance Manual | | ✓ | | | | | | |
| 142 | TreePod Biofilter | | ✓ | | | | | | |
| 143 | StormCapture Harvesting & Reuse Brochure | | | | | | | ✓ | |
| 144 | StormCapture Installation Manual | | | | | | | ✓ | |
| 145 | StormCapture Maintenance Manual | | | | | | | ✓ | |
| 146 | PermeCapture Brochure | | | ✓ | | | | | |
| 147 | Save the Rain Program Green Infrastructure Maintenance Manual | Onondaga County, NY | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| 148 | Save the Rain Program Green Infrastructure Maintenance Training | | ✓ | ✓ | ✓ | | | ✓ | |
| 149 | Field Guide: Maintaining Rain Gardens, Swales and Stormwater Planters | Oregon State University Stormwater Solutions | ✓ | | | | | | |
| 150 | Pennsylvania Stormwater Best Management Practices Manual | Pennsylvania Department of Environmental Protection | | | | | | | |
| 151 | Green Infrastructure Maintenance Manual Development Process Plan | Philadelphia Water Department | ✓ | ✓ | ✓ | | | ✓ | |
| 152 | Stormwater Management Guidance Manual | | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| 153 | Plant Identification Manual | | ✓ | | | | | | |
| 154 | Green Stormwater Infrastructure Maintenance Manual | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| 155 | Low Impact Development & Green Infrastructure Guidance Manual | Pima County & City of Tucson, AZ | ✓ | ✓ | | | ✓ | ✓ | |
| 156 | Prince George's County Stormwater Design Manual | Prince George's County, MD | ✓ | ✓ | ✓ | | ✓ | | |
| 157 | Bioretention Manual | | ✓ | | | | | | |
| 158 | Green Infrastructure Practices: An Introduction to Permeable Pavement | Rutgers University | | ✓ | | | | | |
| 159 | Rain Gardens & Mosquitoes | | ✓ | | | | | | |
| 160 | An Introduction to Green Infrastructure Practices | | | | | | | | |
| 161 | Green Infrastructure Practices: Tree Boxes | | ✓ | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| 162 | GI Construction Training Program | San Fransisco Public Utilities Commission | | | | | | | |
| | Green Infrastructure Construction Guide Book | | ✓ | ✓ | | | | | |
| | Course 1.1 – Introduction to Green Infrastructure Construction | | | | | | | | |
| | Course 1.2 – Green Infrastructure Site Management | | | | | | | | |
| | Course 2.1 – Bioretention Planter Construction | | ✓ | | | | | | |
| | Course 2.2 – Permeable Pavement Construction | | | ✓ | | | | | |
| | Tailgate Talks | | ✓ | ✓ | | | | | |
| 163 | Stormwater Treatment BMP Inspection Data Collection Form | Santa Clara Valley Urban Runoff Pollution Prevention Program | ✓ | ✓ | ✓ | | | | ✓ |
| 164 | Natural Drainage Systems Landscape Maintenance Categories (LMC) and Characteristics Checklist | Seattle Public Utilities | | | | | | | |
| 165 | City of Seattle Stormwater Manual Volume 3: Project Stormwater Control | | ✓ | ✓ | | | ✓ | ✓ | |
| 166 | Green Stormwater Infrastructure Manual – Volume 5: Operations and Maintenance | | ✓ | ✓ | | | | | |
| 167 | Low Impact Development (LID) for Southern California | Southern California Stormwater Monitoring Coalition | | | | | | | |
| 168 | Site Design Procedures for Better Stormwater Management | Stormwater PA | | | | | | | |
| 169 | Getting Polluted Runoff Under Control | Stormwater PA and GreenTreks Network | ✓ | | ✓ | | | | |
| 170 | Tennessee Permanent Stormwater Management and Design Guidance Manual | Tennessee Dept of Environment and Conservation Division of Water Resources | ✓ | ✓ | ✓ | | | ✓ | |
| 171 | Porous Asphalt Pavements with Stone Reservoirs | U.S. Department of Transportation, Federal Highway Administration | | ✓ | | | | | |
| 172 | Army Low Impact Development Technical User Guide | U.S. Army Corps of Engineers | ✓ | ✓ | ✓ | | | ✓ | |
| 173 | Rain Gardens | University of Delaware Co-operative Extension | ✓ | | | | | | |
| 174 | Green Roofs | | | | ✓ | | | | |
| 175 | Rainwater Harvesting | | | | | | | ✓ | |
| 176 | An Introduction to Stormwater Practices Maintenance – Vegetated & Biological Stormwater Practices Maintenance | University of Minnesota | ✓ | | | | | | ✓ |
| 177 | Regular Inspection & Maintenance Guidance for Bioretention System/Tree Filters | University of New Hampshire Stormwater Center | ✓ | | | | | | |
| 178 | Regular Inspection & Maintenance Guidance for Porous Pavements | | | ✓ | | | | | |
| 179 | Rain Garden Educator's Kit | University of Wisconsin-Extension Basin Education Program & Wisconsin DNR | | | | | | | |
| 180 | Urban Storm Drainage Criteria Manual Volume 3 | Urban Drainage and Flood Control District, Denver, CO | ✓ | ✓ | | | | | |
| 181 | CU-Structural Soil – A Comprehensive Guide | Urban Horticulture Institute, Cornell University | ✓ | | | | | | |
| 182 | Using Porous Asphalt and CU-Structural Soil | | | ✓ | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| 183 | Post-Construction Performance Standards & Water Quality-Based Requirements | USEPA | | | | | | | |
| 184 | Stormwater Technology Factsheet (Bioretention) | | ✓ | | | | | | |
| 185 | USEPA Stormwater Technology Factsheet (Vegetated Swales) | | ✓ | | | | | | |
| 186 | USEPA Stormwater Technology Factsheet (Constructed Wetlands) | | | | | | | | ✓ |
| 187 | USEPA Stormwater Technology Factsheet (Porous Pavement) | | | ✓ | | | | | |
| 188 | Performance of Stormwater Retention Ponds and Constructed Wetlands in Reducing Microbial Concentrations | | | | | | | | ✓ |
| 189 | Green Roofs for Stormwater Runoff Control | | | | ✓ | | | | |
| 190 | Green Infrastructure Case Studies | | | | | | | | |
| 191 | Greening Your Backyard: Water Efficiency and Stormwater Solutions for Homeowners and Communities | | ✓ | | | | | ✓ | |
| 192 | Green Infrastructure for Arid Communities | | | | | | | | |
| 193 | Best Practices for Green Infrastructure O&M | | | | | | | | |
| 194 | Getting More Green from your Stormwater Infrastructure | | | | | | | | |
| 195 | Virginia Stormwater BMP Clearing House | Virginia Department of Environmental Quality | | | | | | | |
| 196 | Low Impact Development Operations and Maintenance Training | Washington State Department of Ecology | ✓ | ✓ | ✓ | | | | |
| 197 | Bioretention Inspection Form | | | | | | | | |
| 198 | Permeable Pavement Inspection Form | | | ✓ | | | | | |
| 199 | Western Washington Low Impact Development (LID) Operation and Maintenance (O&M) | | ✓ | ✓ | ✓ | | ✓ | | |
| 200 | Washington State Low Impact Development Training Plan | | | | | | | | |
| 201 | Rain Garden Handbook for Western Washington | Washington State Department of Ecology & WSU Extension | ✓ | | | | | | |
| 202 | Green Infrastructure Implementation | Water Environment Federation | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| 203 | Green Infrastructure for Southwestern Neighborhoods | Watershed Management Group (Funded by USEPA and Arizona Department of Environmental Quality) | | | | | | | |
| 204 | West Virginia Stormwater Management and Design Guidance Manual | West Virginia Department of Environmental Protection | ✓ | ✓ | ✓ | | | ✓ | ✓ |
| 205 | Bioretention Soil Mix | 12,000 Rain Gardens Program webpage | ✓ | | | | | | |
| 206 | Sustainable Stormwater Kit | Found as a resource on the ASLA website | | | | | | | |

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# THANK YOU!

WEF thanks the NGICP Program Partners for their assistance in building the Body of Knowledge. The Body of Knowledge document is an outcome of a collective effort of various subject matter experts (SMEs) in the field of stormwater and GI. We are thankful to the Technical Advisory Group (TAG) members and the Governing Body members for their time and commitment in reviewing this document and providing comments.

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# Appendix K

# Sensitivity Analysis on Economic Impacts and Benefits of Green Infrastructure Controls

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CORONA ENVIRONMENTAL CONSULTING

# Memorandum

| | |
|---|---|
| To: | DC Water |
| From: | Corona Environmental Consulting |
| Date: | June 30, 2020 |
| Re: | Sensitivity Analysis on Economic impacts and benefits of green infrastructure controls |

This memo presents the results of a sensitivity analysis to evaluate the economic impacts (EIA) and triple bottom line (TBL) benefits for varying levels of green infrastructure (GI) projects. This analysis is based on managing 10 acres of impervious area using a mix of bioretention and permeable pavement as described below.

- Scenario 1: 50% of impervious acres are managed through permeable pavement, 50% managed through bioretention.
- Scenario 2: 70% of impervious acres are managed through permeable pavement, 30% managed through bioretention.
- Scenario 3: 90% of impervious acres are managed through permeable pavement, 10% managed through bioretention.

Table 1 provides a summary of these scenarios, including the stormwater management practices incorporated, associated volume managed, timeline for construction, and total capital, annual operations and maintenance (O&M), and replacement/rehabilitation costs through 2060. In terms of costs, the scenarios are very similar; however, differences in spending patterns and labor requirements for bioretention and permeable pavement result in different economic impacts. Similarly, bioretention projects generally bring more TBL benefits relative to permeable pavement.

Subsequent sections present the results of the economic impact and TBL analysis, respectively. This sensitivity analysis is based on more detailed assessment and economic modeling performed for the Rock Creek analysis in May 2020. Specifically, results from Rock Creek were scaled to total spending on GI under the scenarios evaluated in this memo to estimate economic impacts.

## 1. Economic Impact Analysis

### 1.1 Background

When policymakers make decisions about public investments, they must always weigh competing priorities and different levels of return on investment for different uses of public funds. According to Green for All (2011), investments in water and other infrastructure are one of the most efficient methods of job creation. The report states that infrastructure investments create 16% more jobs, dollar-for-dollar, than a payroll tax holiday; nearly 40% more jobs than an across-the-board tax cut; and more than five times as many jobs as a temporary business tax cut (Green For All, 2011, based on Moody's Analytics).

*Table 1. Summary of GI scenarios evaluated (2019 USD)*

| | Scenario 1 – 50% BR / 50% PP | Scenario 2 – 30% BR / 70% PP | Scenario 3 – 10% BR / 90% PP |
|---|---|---|---|
| **Stormwater management practices (storage capacity)** | 10 greened acres (0.45 MG)<br>50% of GI acres BR; 50% PP | 10 greened acres (0.45 MG)<br>30% of GI acres BR; 70% PP | 10 greened acres (0.45 MG)<br>10% of GI acres BR; 90% PP |
| **Capital cost** | $10 M (includes 30% capital markup) | $10 M (includes 30% capital markup) | $10 M (includes 30% capital markup) |
| **Construction timeline** | 2022 - 2023 | 2022 - 2023 | 2022 - 2023 |
| **Annual O&M** | $150,000/year | $150,000/year | $150,000/year |
| **Rehabilitation /replacement costs through 2060[a]** | $3.0 M | $3.2 M | $3.4 M |
| **GI practice footprint (sq. ft.)[a]** | BR: 11,786<br>PP: 35,574 | BR: 7,072<br>PP: 49,804 | BR: 2,357<br>PP: 64,033 |

BR = bioretention; PP = permeable pavement

Values have not been discounted to present value

a. Practice footprint is based on 0.6 cubic feet of storage per square foot of permeable pavement; for bioretention calculation assumes 3 foot depth, porosity of 0.437, and ponding depth of 6 inches. Practice footprint is used as an input for many of the benefits calculations.

All infrastructure spending will create economic impacts; it is therefore important to compare impacts across alternatives to inform decisions on the use of public funds. Evidence suggests that compared to gray infrastructure, wide-scale implementation of GI has the potential to create more positive local economic impacts. Gray civil engineering projects often require specialized skills, and firms performing these activities typically have these skill sets with their existing staff. Acquiring additional staff for a new project happens largely by hiring labor from competitors or other markets that are low on work. For the most part, these skilled laborers are also represented by trade unions, and are therefore already in the labor force. When a city water department implements a traditional infrastructure project in this manner, the net effect is that these already employed workers are simply bid away from other construction projects, resulting in a transfer of employment. In addition, many of the large engineering/ construction firms hired for this work may be located outside of the District.

In contrast, GI construction and O&M may require fewer highly trained and skilled employees. If GI jobs can be targeted to District residents who are not already employed or are underemployed, this can result in a net gain in employment in the local economy, providing significant economic and social benefits. In our analysis of the Rock Creek watershed, Corona Environmental Consulting found that per dollar spent, the economic impacts associated with alternatives that incorporated GI were much greater than for the all gray infrastructure alternative.

For this analysis, we compare the impacts of alternative GI scenarios to those associated with spending on an equivalent level of gray infrastructure. To perform this assessment, we analyzed impacts per million dollars spent under the GI scenarios and compare them to the gray infrastructure impacts per million dollars spent from the Rock Creek analysis.

As an important note, for the Rock Creek analysis, we modeled savings to households under the hybrid green/gray alternatives because these alternatives were less expensive than the all-gray infrastructure alternative. This allowed for a direct comparison across all alternatives analyzed. The economic impacts for the GI scenarios presented below do not include any household savings because the level of spending across scenarios is similar (i.e., relative to each other, none of scenarios result in a significant savings to households). In the summary section, we compare results to a hypothetical gray scenario both with and without household savings. For additional detail on the economic impact analysis, including key concepts and assumptions, see the report that Corona Environmental Consulting prepared for DC Water: Economic Impact Analysis and Triple Bottom Line Assessment of CSO Control Alternatives in Rock Creek Watershed, Washington D.C. (May 2020).

## 1.2 Economic impacts of GI scenarios

This section presents the results of the economic impact analysis, as related to employment (i.e., jobs generated) and other key economic indicators.

**Employment**

In IMPLAN, a job is defined as the annual average of monthly jobs in an industry (this is the same definition used nationally by the Quarterly Census of Employment and Wages, Bureau of Labor Statistics, and Bureau of Economic Analysis). Thus, one job lasting 12 months is equal to two jobs lasting six months each, and three jobs lasting four months each.

Table 2 shows the direct, indirect, and induced employment generated by infrastructure spending under the GI scenarios. As shown, despite the same level of spending (within 1%), Scenario 1 creates slightly more jobs because the construction and maintenance of bioretention is more labor intensive than the construction and maintenance of permeable pavement.

In the Rock Creek Watershed, our analysis found that the hybrid green/gray alternatives offer higher levels of local employment across all three categories of effects compared to the gray-only alternative. This is likely due to the higher O&M requirements associated with GI (which creates local direct jobs), the higher percentage of local jobs created, and the increased local spending that occurs under the hybrid alternatives (which creates additional indirect and induced employment).

For direct effects, IMPLAN includes all employment created by direct spending, including jobs filled by non-residents, because these jobs occur in DC. We adjusted the direct effects to reflect DC Water's green jobs goal of filling 51% of GI-related construction and maintenance jobs with DC residents. The estimates below include the total direct jobs that would be created under each alternative, as well as the direct jobs that would likely be filled by local DC residents (in parentheses). Indirect and induced impacts reported by IMPLAN only includes jobs that are filled by DC residents.

*Table 2. Employment impacts (jobs created) through 2060, 2019 USD*

| Impact type | Scenario 1 – 50% BR / 50% PP | Scenario 2 – 30% BR / 70% PP | Scenario 3 – 10% BR / 90% PP |
|---|---|---|---|
| Direct effects | 163 (84 local) | 153 (75 local[a]) | 143 (65 local) |
| Indirect effects | 16 | 16 | 17 |
| Induced effects | 22 | 23 | 23 |
| **Total effects** | **201 (122)** | **194 (115 local)** | **183 (105 local)** |

a. Local jobs include jobs filled by local residents, assuming 51% of GI construction and maintenance jobs are filled locally.

Totals may not sum due to rounding.

**Labor income**

Table 3 shows the total labor income generated under each scenario; again, results are very similar. Total labor income includes all forms of employment income, including employee compensation (wages, benefits, and taxes paid by the employer) and proprietor income (which represents one form of profit). In the analysis for Rock Creek, we found a higher level of labor income generated under the hybrid green/gray infrastructure alternatives compared to the gray only alternative. However, the ratio of direct labor income-to-direct employment was lower under the hybrid alternatives, indicating that individuals employed in the relevant industry sectors for these alternatives will earn less income and profit compared with those employed under the gray-only alternative.

*Table 3. Labor income impacts ($M, 2019 USD)*

| Impact type | Scenario 1 – 50% BR / 50% PP | Scenario 2 – 30% BR / 70% PP | Scenario 3 – 10% BR / 90% PP |
|---|---|---|---|
| Direct effects | $11.6 | $12.1 | $12.7 |
| Indirect effects | $ 1.7 | $1.8 | $1.9 |
| Induced effects | $ 1.7 | $1.7 | $1.8 |
| **Total effects** | $15.0 | **$15.7** | **$16.3** |

Totals may not sum due to rounding.

**Total economic output**

Table 4 presents the local (i.e., within the District) direct, indirect, and induced effects on economic output under the GI scenarios. Economic output represents the value of industry production.[1] The economic output associated with each scenario is equivalent to the direct spending (including capital and O&M through 2060). Findings from the economic impact analysis for Rock Creek indicate that GI results in greater economic output for the District compared to gray infrastructure. This is due to the greater amount of goods, services, and labor purchased locally under these alternatives.

*Table 4. Economic output impacts* *($M, 2019 USD)*

| **Impact type** | **Scenario 1 – 50% BR / 50% PP** | **Scenario 2 – 30% BR / 70% PP** | **Scenario 3 – 10% BR / 90% PP** |
|---|---|---|---|
| Direct effects | $18.6 | $18.8 | $19.0 |
| Indirect effects | $ 3.4 | $3.6 | $3.7 |
| Induced effects | $ 3.9 | $4.0 | $4.0 |
| **Total effects** | $26.0 | **$26.3** | **$26.7** |

Totals may not sum due to rounding.

**Total value added**

Total value added is defined as the difference between the total economic output of an industry and the cost of its intermediate inputs. It equals gross output (i.e., sales or receipts and other operating income, plus inventory change) minus intermediate inputs (i.e., consumption of goods and services purchased from other industries or imported). Value added consists of employee compensation (wages, benefits, taxes paid), any taxes on production and imports that the industry pays, and gross operating surplus (i.e., proprietor income and other profits). Table 5 presents the total value added generated within the District under the GI scenarios through 2060.

*Table 5. Total value added impacts through 2060* *($M, 2019 USD)*

| **Impact type** | **Scenario 1 – 50% BR / 50% PP** | **Scenario 2 – 30% BR / 70% PP** | **Scenario 3 – 10% BR / 90% PP** |
|---|---|---|---|
| Direct effects | $11.4 | $11.2 | $11.0 |
| Indirect effects | $ 2.3 | $2.4 | $2.5 |
| Induced effects | $ 2.6 | $2.7 | $2.7 |
| **Total effects** | **$16.4** | **$16.3** | **$16.2** |

Totals may not sum due to rounding.

[1]. For manufacturers, this represents sales plus or minus the change in inventory. For service sectors, production is equal to sales. For retail and wholesale trade, output is equal to gross margin, not gross sales.

**Summary**

Table 6 summarizes the total direct, indirect, and induced effects for employment, labor income, total value added, and economic output associated with the construction and maintenance of GI projects under the scenarios. As shown, given the same level of spending and only slightly different spending patterns, impacts are similar under the scenarios. The scenario that includes more bioretention creates more jobs compared to the scenario that is dominated by permeable pavement.

*Table 6. Summary of economic impacts over design, construction, implementation, and O&M through 2060*

| Impact type | Scenario 1 – 50% BR / 50% PP | Scenario 2 – 30% BR / 70% PP | Scenario 3 – 10% BR / 90% PP |
|---|---|---|---|
| Employment (jobs) | 201 | 192 | 183 |
| Labor income ($M, 2019 USD) | $ 15.0 | $15.7 | $16.3 |
| Total value added ($M, 2019 USD) | $ 16.4 | $16.3 | $16.2 |
| Economic output ($M, 2019 USD) | $26.0 | $26.3 | $26.7 |

All spending on infrastructure creates economic impacts. It is therefore important to compare economic impacts of different alternatives to a baseline (i.e., gray infrastructure) scenario. Tables 7 and 8 compare the economic impacts of the three GI scenarios to the economic impacts associated with gray infrastructure (per million dollars spent), based on results from the analysis of CSO control alternatives in the Rock Creek watershed. Table 7 results are based on impacts associated with the same level of spending for gray and green infrastructure. As shown, GI results in a much higher economic impact across all key indicators for the GI scenarios.

*Table 7. Total economic impacts per million dollars spent, 2019 USD*

| Impact type | Scenario 1 – 50% BR / 50% PP | | Scenario 2 – 30% BR / 70% PP | | Scenario 3 – 10% BR / 90% PP | |
|---|---|---|---|---|---|---|
| | Impact /$M | % increase from gray | Impact /$M | % increase from gray | Impact / $M | % increase from gray |
| **Employment (jobs)** | 10.77 | **21%** | 10.2 | **14%** | 9.63 | **8%** |
| **Labor income** | 807,621 | **9%** | 833,414 | **13%** | 859,207 | **16%** |
| **Total value added** | 881,136 | **38%** | 866,596 | **36%** | 852,056 | **34%** |
| **Economic output** | 1,394,813 | **8%** | 1,398,441 | **8%** | 1,402,069 | **8%** |

The significant difference in value added between the GI and gray alternatives is largely because value added for the construction sector associated with gray infrastructure spending has a negative value associated with property income in DC.

Table 8 accounts for the differences in costs for green versus gray infrastructure to achieve the same level of stormwater management. Specifically, in the Rock Creek analysis, they hybrid green/gray alternatives were less expensive than the all gray infrastructure alternative. To directly compare alternatives, Corona modeled the difference in costs as a savings to households under the hybrid alternatives. This allows for an "apples-to-apples" comparison of economic impacts under the various scenarios. The household savings result in positive impacts for the local DC economy, which show up as induced effects. Table 8 compares the economic impacts of green versus gray alternatives, assuming the same (relative) level of household savings under the GI alternatives as was modeled for Rock Creek. Results show an even greater increase in economic impacts, per million dollars spent, compared to an all gray alternative. This is because the impacts per million dollars spent on infrastructure the same as shown in Table 7, but the household savings result in additional overall impacts.

*Table 8. Total economic impacts per million dollars spent, including household savings for GI, 2019 USD*

| Impact type | Scenario 1 – 50% BR / 50% PP | | Scenario 2 – 30% BR / 70% PP | | Scenario 3 – 10% BR / 90% PP | |
|---|---|---|---|---|---|---|
| | Impact /$M | % increase from gray | Impact /$M | % increase from gray | Impact / $M | % increase from gray |
| **Employment (jobs)** | 11.35 | 27% | 10.74 | **20%** | 10.12 | **13%** |
| **Labor income** | 851,849 | 15% | 874,005 | **18%** | 896,162 | **21%** |
| **Total value added** | 953,062 | 50% | 932,355 | **46%** | 911,647 | **43%** |
| **Economic output** | 1,500,272 | 16% | 1,496,350 | **16%** | 1,492,429 | **15%** |

The significant difference in value added between the hybrid and gray alternatives is largely because value added for the construction sector associated with gray infrastructure spending has a negative value associated with property income in DC.

## 2. Triple Bottom Line Assessment of GI Co-Benefits

This section describes the methods, assumptions, and results for the TBL assessment of co-benefits associated with the scenarios.

### 2.1 Background and Assumptions

Corona Environmental Consulting is currently developing an economic framework and tool (the Green Stormwater Infrastructure Benefits Valuation Framework and Tool) to help stormwater practitioners quantify and monetize the co-benefits of GI. The development of the Tool is being funded by the Water Research Foundation. We have applied the methodology developed for the Tool to quantify and monetize the co-benefits associated with bioretention and permeable pavement. Based on this methodology, the TBL analysis of GI co-benefits includes the following benefit categories:

- Energy Savings Wastewater Treatment
- Air Emissions Reduction
- Property Value Increase
- Recreation Value
- Heat Stress Reduction
- Carbon Emissions Reduction

- Ecosystem Value
- Avoided Social Costs of Green Jobs

The following general assumptions apply across multiple benefit categories in the analysis:

- Design storm depth: 1.2 inches
- District population (2018): 702,455 people
- Area of the District: 61.05 square miles

For detail on the assumptions incorporated into the analysis for each benefit category, refer to the report Corona Environmental Consulting prepared for DC Water: Economic Impact Analysis and Triple Bottom Line Assessment of CSO Control Alternatives in Rock Creek Watershed, Washington D.C. (May 2020).

## 2.2 TBL Co-Benefit Estimates and Comparison to Cost

Benefits are assumed to be constant over time starting in 2024 when the GI will have been completely installed, following a ramp-up in benefits in year 2023 after installation begins. Benefits are assumed to accrue at a constant rate throughout the analysis period ending in the year 2060. There are two exceptions - heat stress reduction is estimated for the years 2020 and 2050 and is linearly interpolated for years between 2020 and 2050, as well as from 2050 to 2060. Green construction jobs are valued for 2023 and 2024, while green O&M jobs are valued starting in 2024.

In terms of physical benefits, each scenario will reduce energy use by reducing the volume of stormwater pumped and treated through the District's combined sewer system. Each scenario prevents the same amount of stormwater runoff, and therefore the same amount of energy from pumping and treatment: 511 kWh per year. Each scenario will also create green jobs. For Scenario 1 (50/50), at total of 30.5 job-years will be created for construction, and 2.2 jobs per year will be created for O&M of the installed GI. For Scenario 2 (30/70), a total of 29.5 job-years will be created for construction, while 2 jobs per year will be created for O&M. And, for Scenario 3 (10/90), 28.6 job-years will be created for construction, and 1.8 jobs per year for O&M.

Table 9 shows the total present value of the monetized co-benefit estimates for each scenario through 2060, using a 3 percent discount rate. The table includes the monetary estimates for each co-benefit category. For all scenarios, the largest present value total for a benefit is property value increase. Property values have been shown to increase significantly as a result of installation of bioretention – we assume a 4.25% increase, based on a range of increases from 0.44% to 7% in the literature. Even though a relatively small amount of bioretention is being installed in each scenario, high property values in the District result in large dollar amount increases relative to dollar amounts associated with other co-benefits. The value of carbon reduction and pollutant /emissions reductions are also relatively high across alternatives. Carbon and emissions reductions depend on the avoided energy use associated with reduced wastewater pumping and treatment due to capture of stormwater by GI. A small amount of carbon is also sequestered annually by the vegetation included in bioretention facilities. The value of green jobs for construction and O&M is also a significant benefit under each scenario. The total present value benefits shown in Table 9 are largest for Scenario 1 and smallest for Scenario 3, because more bioretention means more property value, heat stress reduction, carbon emission reduction, ecosystem value, and green jobs, relative to controlling stormwater with permeable pavement. Also, Scenario 1 assumed that a triangle park was added, resulting in recreation value that was not assumed under Scenarios 2 or 3.

*Table 9. Present value of co-benefits by benefit category and scenario, through 2060, (2019 USD)*

| Benefit Categories | 50/50 Scenario | 30/70 Scenario | 10/90 Scenario |
|---|---|---|---|
| Energy Savings WW Treatment | $ 72,146 | $ 72,146 | $ 72,146 |
| Air Emissions Reduction | $ 426,547 | $ 426,547 | $ 426,547 |
| Property Value Increase [a] | $ 3,361,031 | $ 2,016,618 | $ 672,206 |
| Heat Stress Reduction | $ 19,354 | $ 11,612 | $ 3,871 |
| Carbon Emissions Reduction | $ 224,953 | $ 221,427 | $ 217,901 |
| Ecosystem Value | $ 5,164 | $ 3,098 | $ 1,033 |
| Recreation Value [b] | $ 918,385 | $ - | $ - |
| Value of Green Jobs - Construction | $ 231,068 | $ 223,646 | $ 216,247 |
| Value of Green Jobs - O&M | $ 208,328 | $ 182,069 | $ 162,566 |
| Total | $ 5,466,974 | $ 3,157,162 | $ 1,772,516 |

[a] Larger property value increases across scenarios result from installation of larger amounts of bioretention; no property value increases are associated with permeable pavement installations.

[b] Recreation benefit is tied to the assumption that one pocket park would be added in the 50/50 scenario, and no pocket parks would be added in either the 30/70 or 10/90 scenarios. If one pocket park was added to either of those scenarios, the recreation value added would be the same as the recreation value shown for the 50/50 scenario.