

Federal Triangle Stormwater Drainage Study

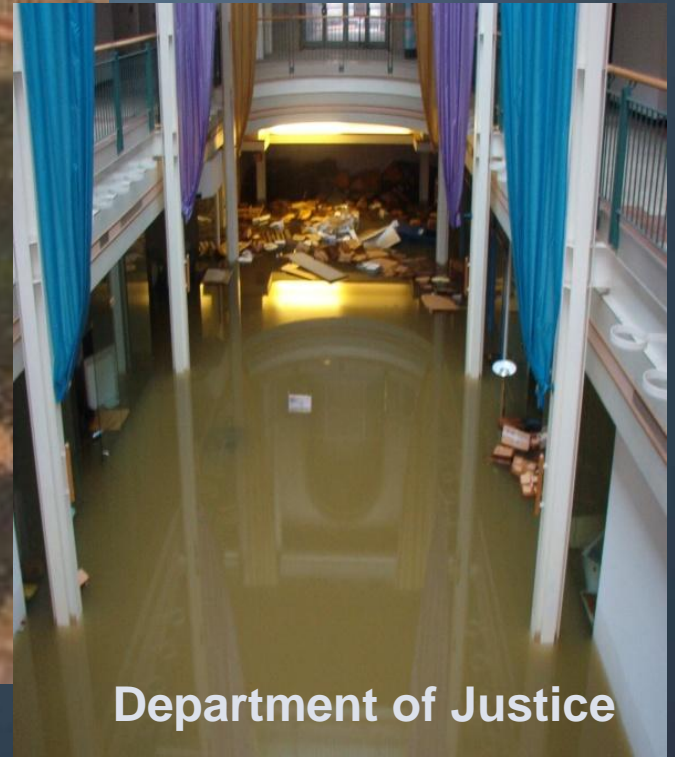
A Multi-agency Initiative by:
DC Department of the Environment
DC Office of Planning
DC Water and Sewer
Federal Emergency Management Agency
U.S. General Services Administration
Smithsonian Institution
and the
National Capital Planning Commission

October 6, 2011



Constitution Avenue

June 2006
Flooding in the
monumental core



Department of Justice

MULTI-AGENCY RESPONSE TO THE JUNE 2006 FLOODING IN THE MONUMENTAL CORE

GSA Flood Mitigation and
Prevention of Federal Triangle
Report (2006)

Flood Forum (June 2007)
**Federal Triangle Stormwater
Drainage Study by Greeley &
Hansen (2009 - 2011)**

West Potomac Park Levee
System Improvements (a.k.a.
17th Street Levee, 2007)

Interior Drainage Analysis (a.k.a.
Tetrattech Study, December
2008)

FEDERAL TRIANGLE STORMWATER STUDY WORKING GROUP

General Services Administration

DC Office of Planning

DC Department of the Environment

DC Homeland Security and Emergency
Management Agency

DC Water and Sewer Authority

Federal Emergency Management Administration

National Archives and Records Administration

National Capital Planning Commission

National Gallery of Art

National Park Service

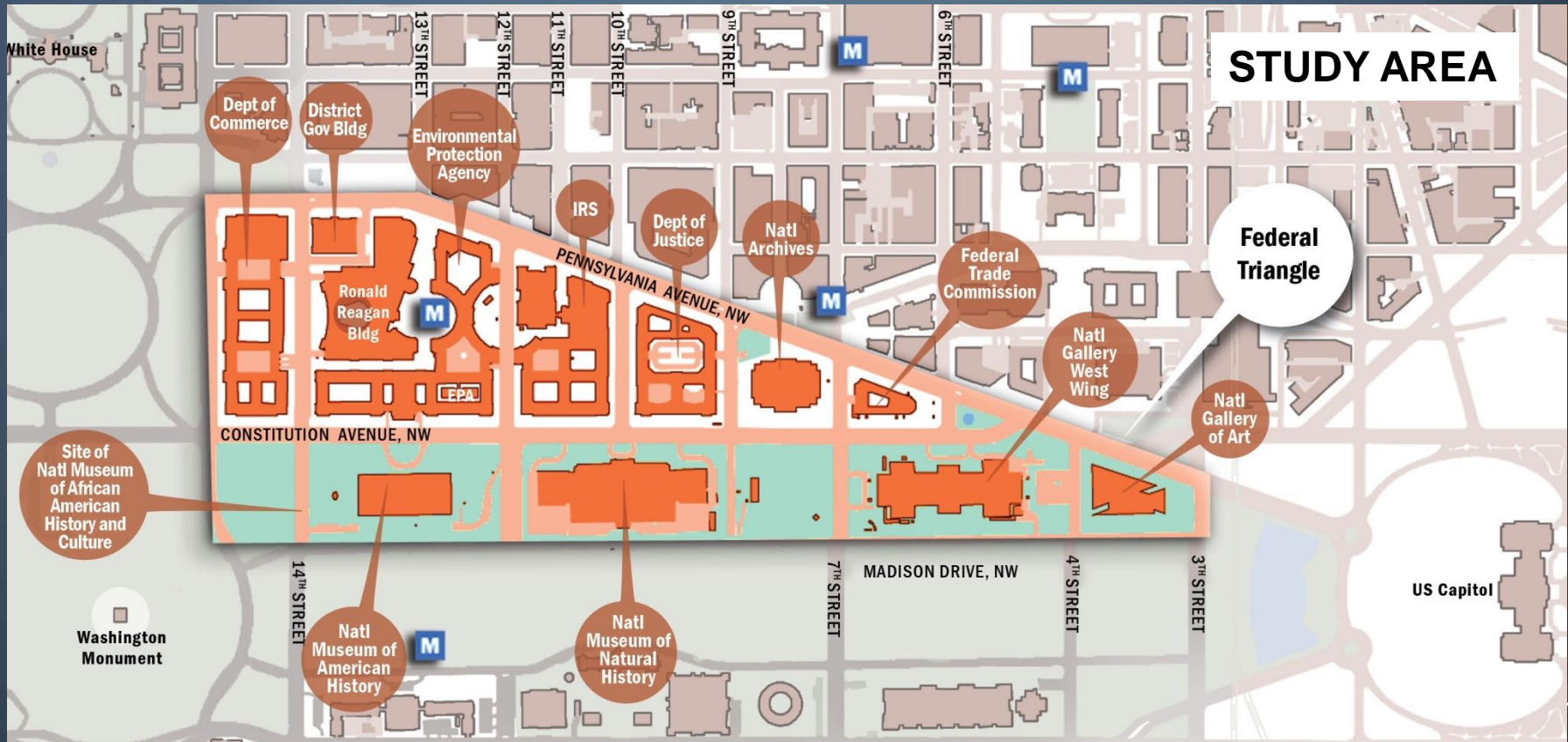
Smithsonian Institution

US Department of Justice

US Environmental Protection Agency

Washington Metropolitan Area Transit Authority

1. Scope of the Study
2. Existing Conditions
3. Findings
4. Important Considerations for Decision-makers
5. Next Steps for the Stormwater Working Group



How did the sewer system perform during the 2006 Flood?

Prediction of ponding levels for 5 design storms :

15 - year

50 - year

100 - year

200 - year

500 - year

Relationship of interior rain and river flooding in the Federal Triangle study area

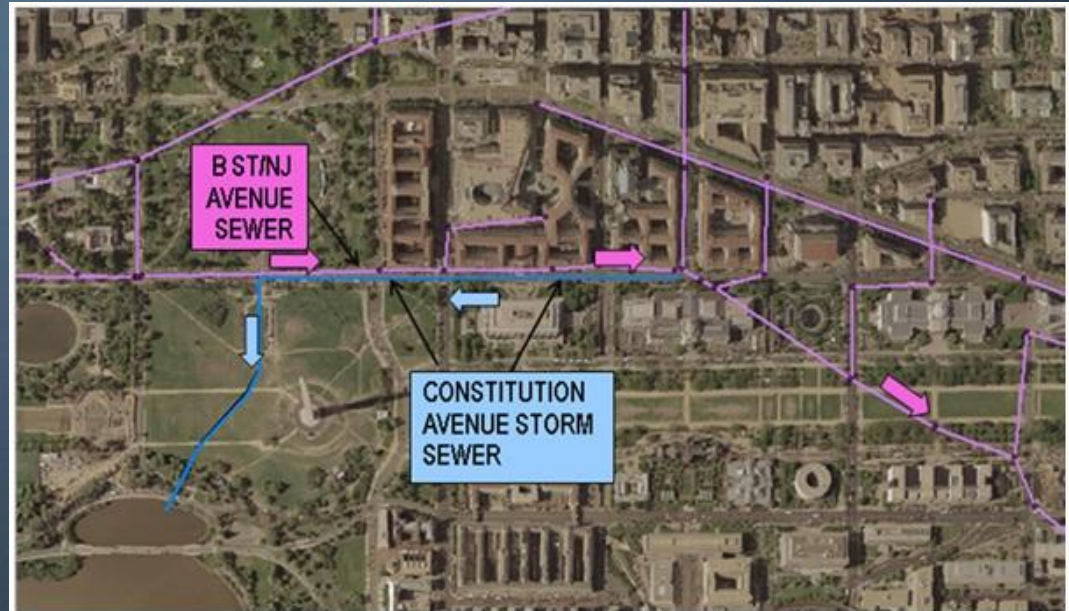
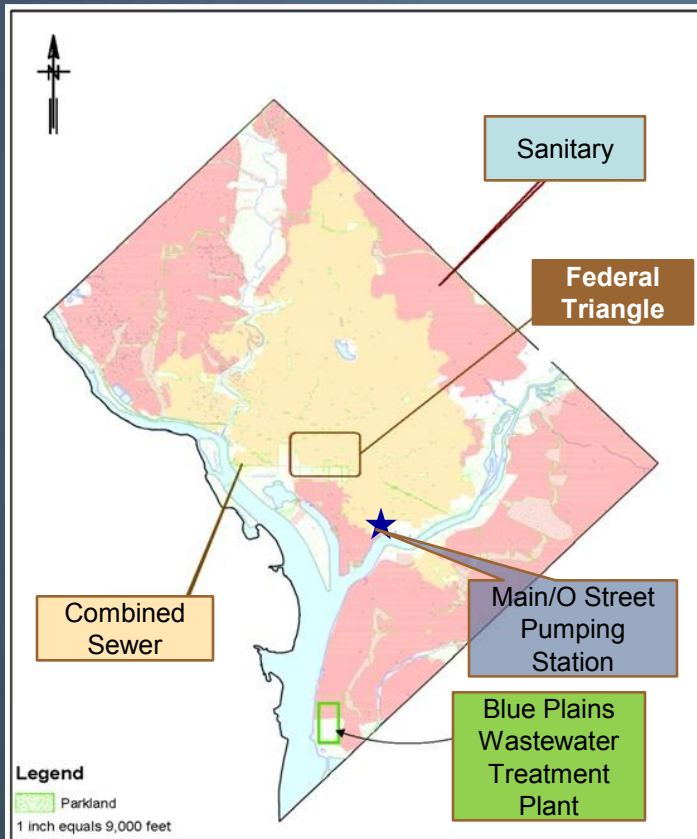
Effectiveness of an early warning system

Viability and costs of a range of **sewer capacity improvement alternatives** for a 15-year, 50-year, 100-year and 200-year storm

- Using **Low Impact Development**
- **Capturing stormwater upstream** of the drainage area
- Using an existing **GSA condensate line**
- **Storing stormwater under the Mall**
- Installing a **new pumping station at the Mall**
- Constructing a **new sewer tunnel** to the Main and O Street Pumping Station

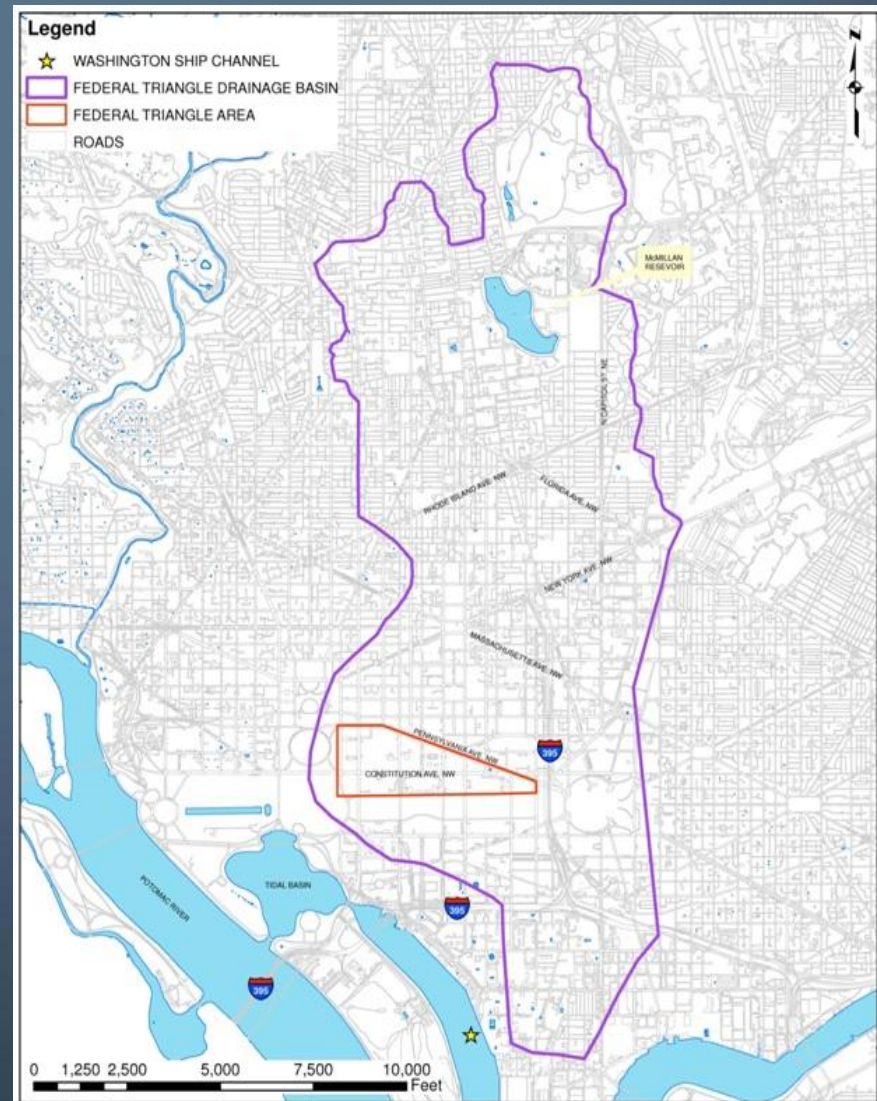
EXISTING STORMWATER SEWER LINES SERVING THE FEDERAL TRIANGLE

The sewer lines in the study area is not designed to handle stormwater volumes exceeding a 15-year storm event.



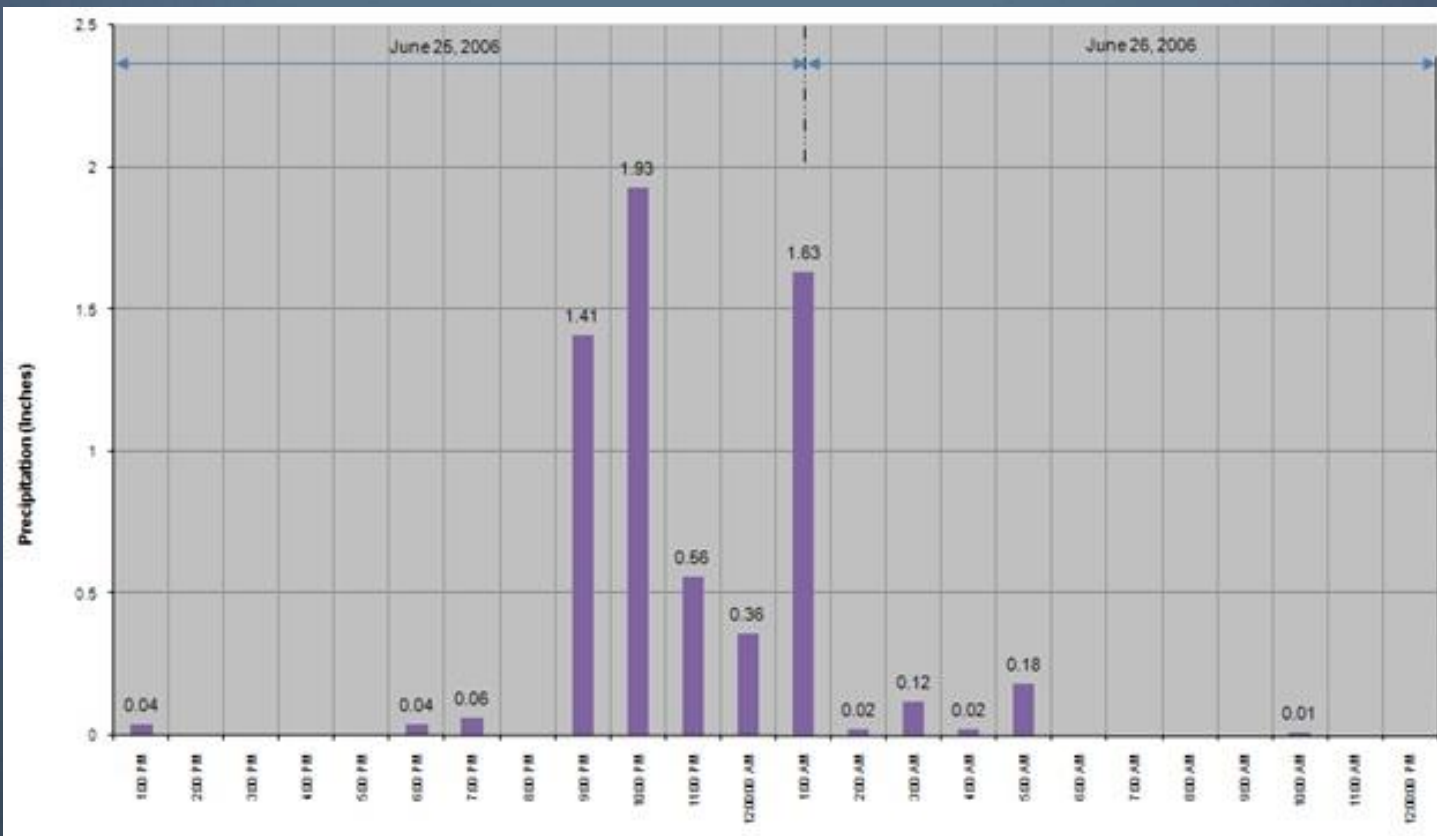
The Federal Triangle study area is in the lowest point of a large drainage basin

- The drainage basin is 24 times the size of the Federal Triangle
- Constitution Avenue is prone to flooding, even during small rain events.



The June 2006 rainfall event was a flash flood.

- Exceeded a 200-year storm event
- Most of the rain fell within 5 hours



Existing sewer system is not designed to absorb and discharge stormwater equal to a 200-year storm event in such a short period of time.

- DC Water pumping stations were working
- Combined sewer system was discharging the stormwater

Potomac River was not at flood stage in June 2006

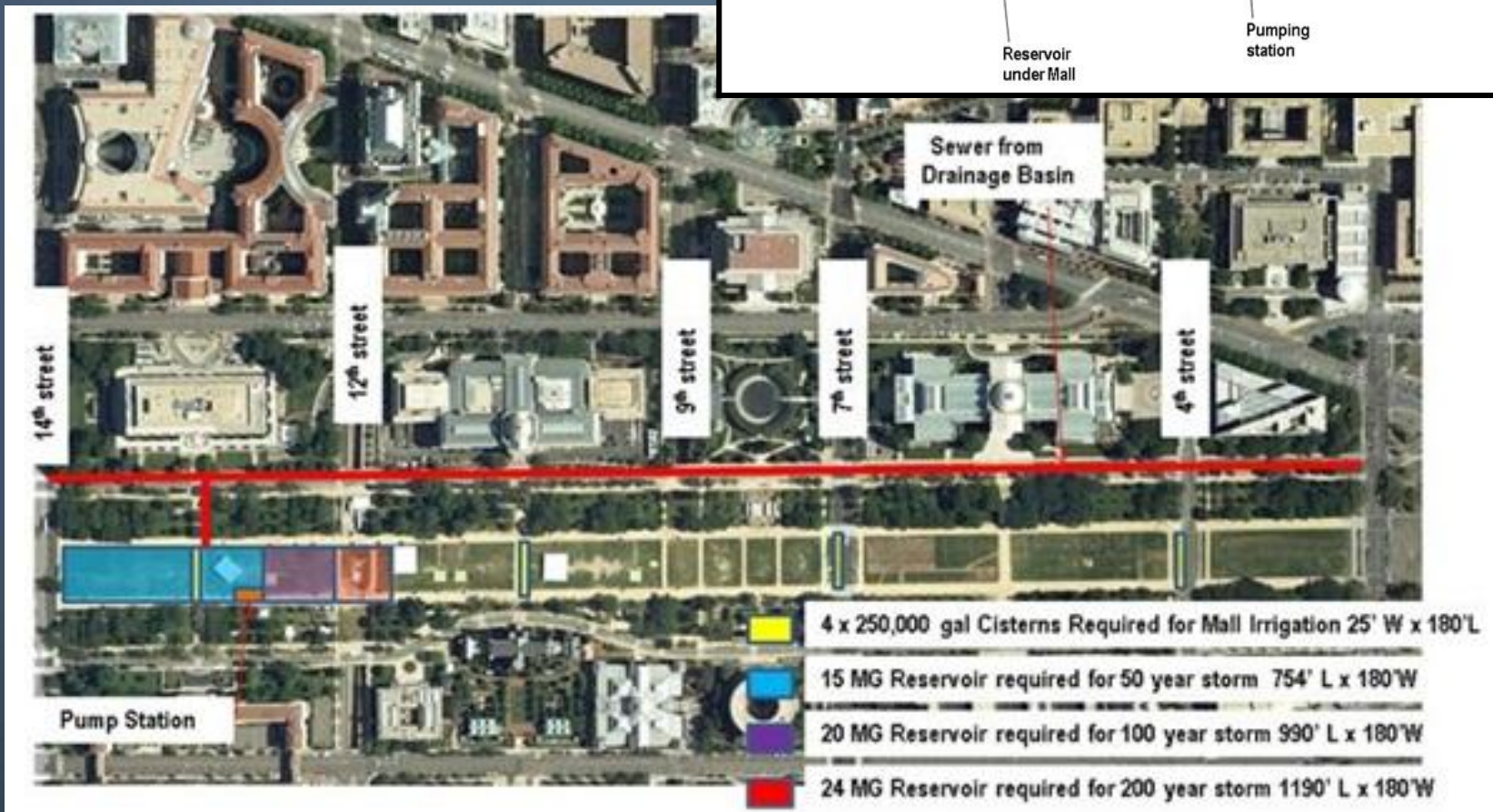
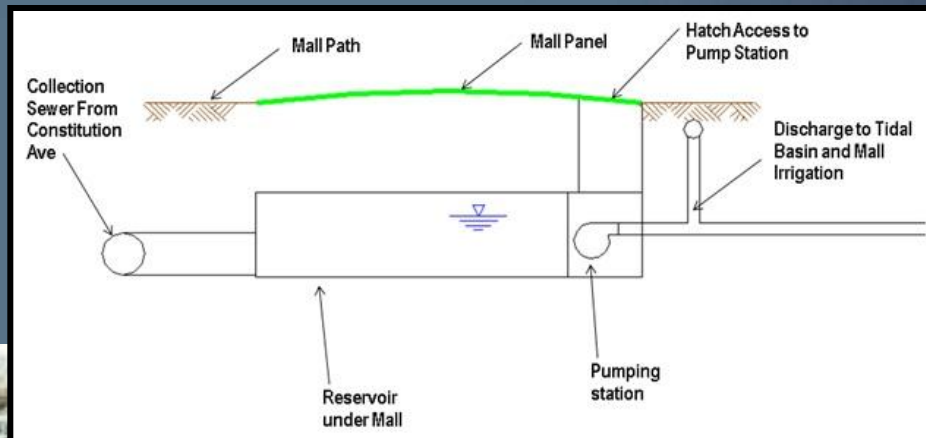
- The West Potomac Park Levee will not protect the Federal Triangle from interior drainage flooding

Of the 6 structural system-wide alternatives for mitigating interior drainage flooding, **3 are viable.**

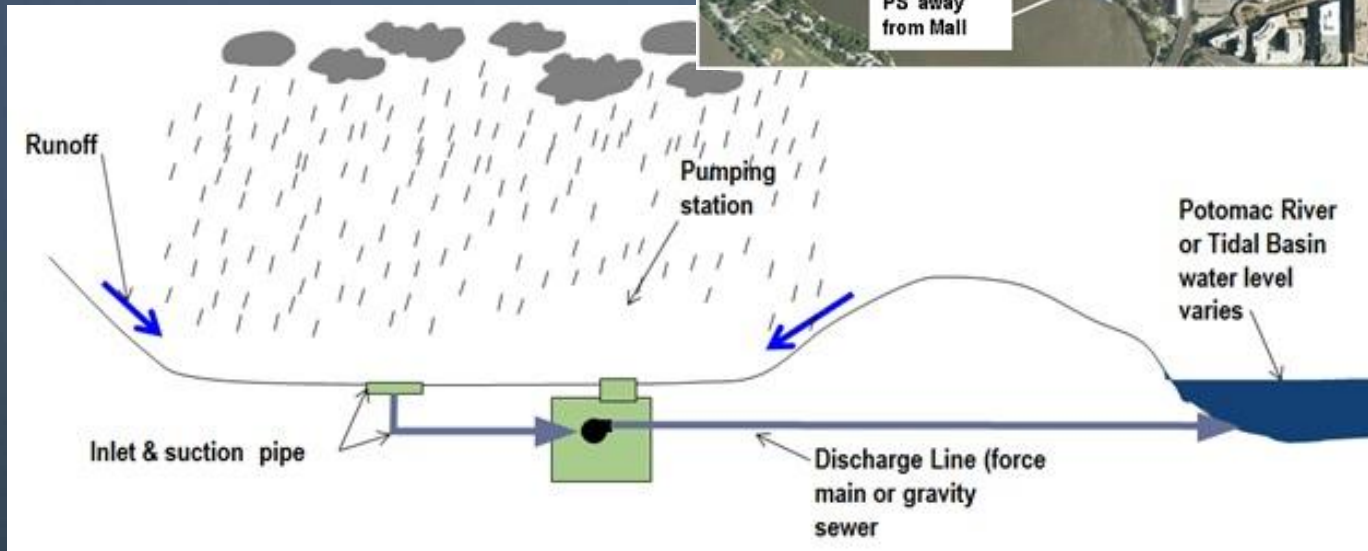
- Capturing stormwater in the upstream watershed through Low Impact Development (LID) such as green roofs and bio-swales
- Stormwater storage upstream of the study area in the watershed
- Using a 48-inch gravity condensate line at Constitution Avenue for storage
- **Providing a stormwater storage beneath the National Mall**
- **Providing a pumping station on the National Mall**
- **Constructing a new sewer tunnel to the O Street Pumping Station**

A site-by-site approach such as building floodproofing could be a cost-effective way to mitigate flooding but was beyond the scope of this Study

Alternative 4 (Viable): Providing a stormwater storage beneath the National Mall and reusing the water for irrigation

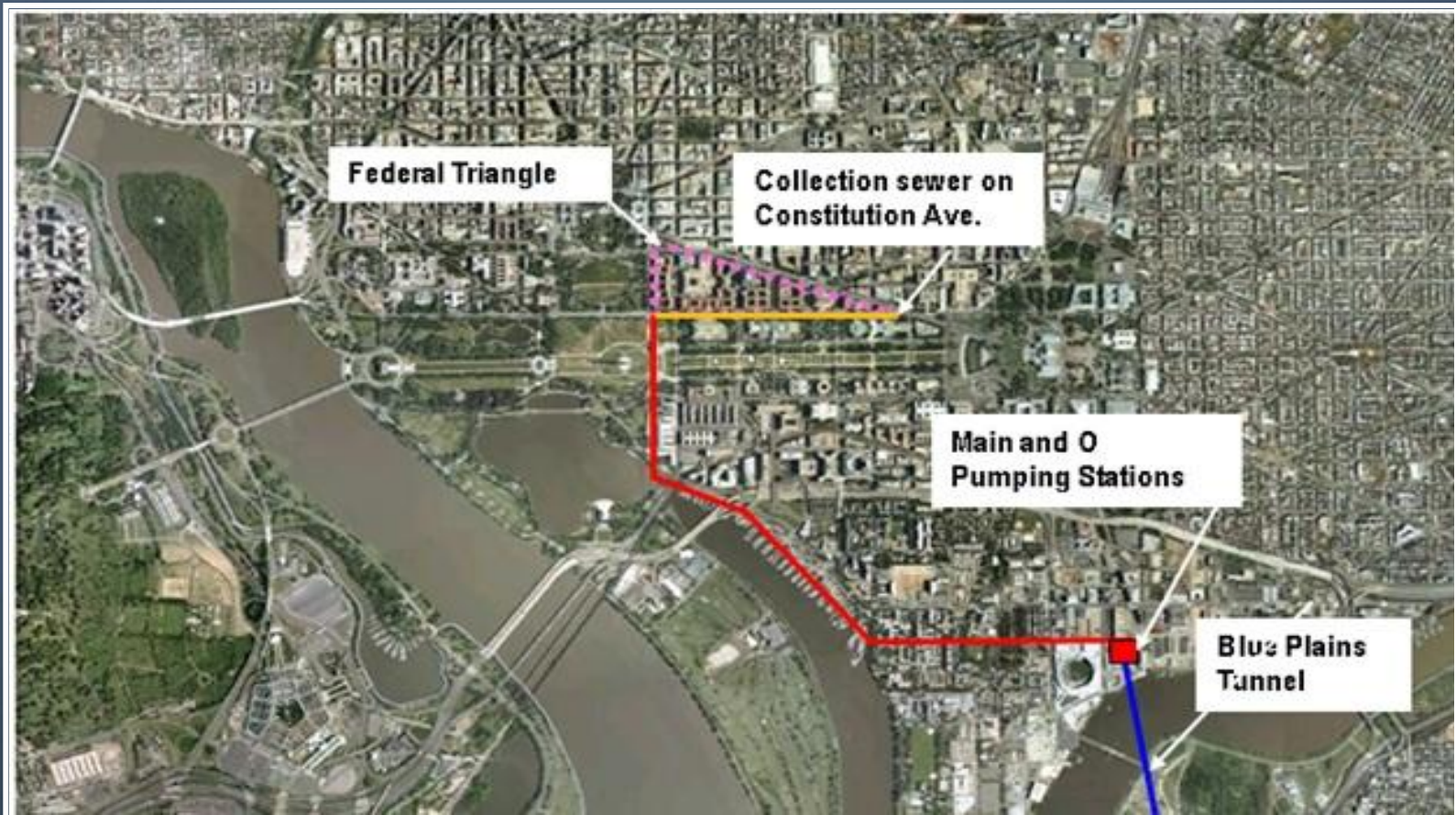


Alternative 5 (Viable): Providing a pumping station beneath the National Mall



Alternative 6 (Viable):

Constructing a new sewer tunnel to the Main and O Street Pumping Station



1. Cost: Expanded system capacity versus site-by-site floodproofing
2. Time: Short-term versus long-term solutions

System wide Stormwater Solutions	Capital Cost, 100-year storm	Capital Cost, 200-year storm
Storage Beneath the National Mall	\$400 M	\$455
Pumping Station Under the National Mall	\$360 M	\$400
14-foot diameter tunnel connected to Main and O Street Pumping Stations	\$405 M	\$470

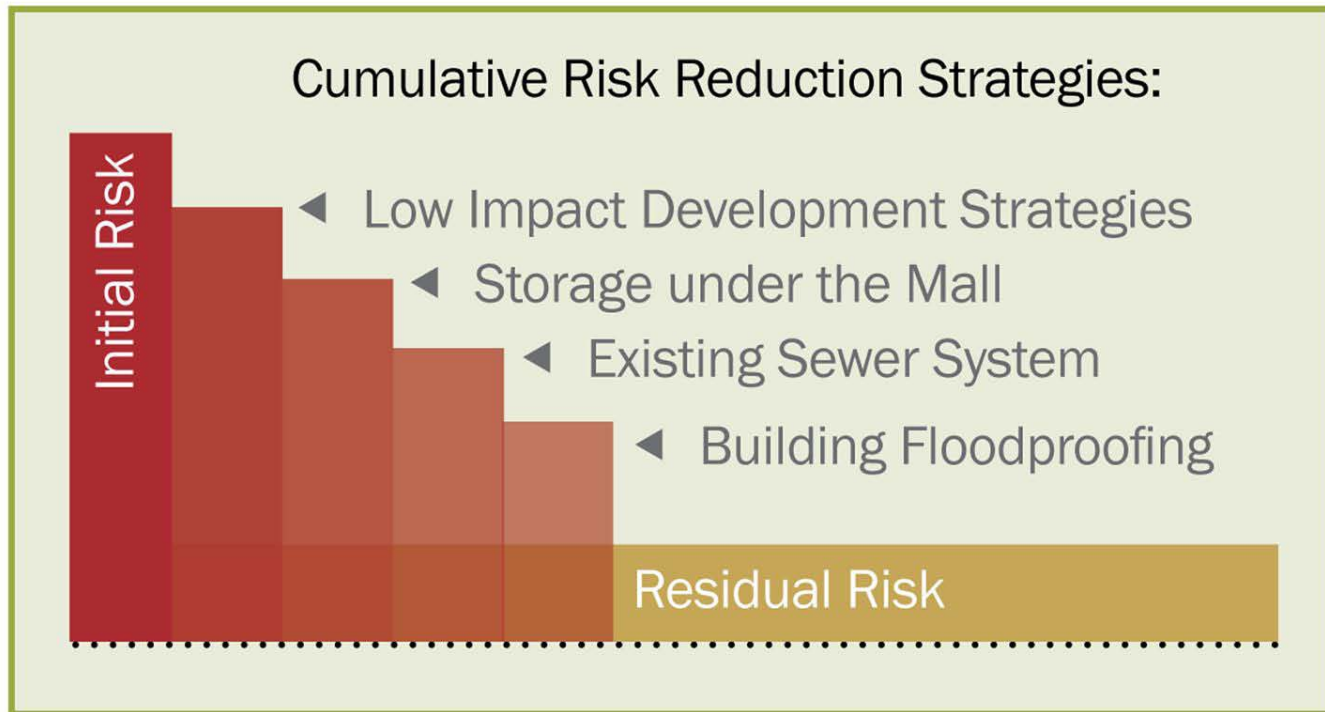


Self-rising flood gates at the National Archives, an example of a site-by-site solution

3. Ancillary Benefits: Multi-hazard mitigation

4. Risk Tolerance: Single structural solution versus hybrid solutions

Buying Down Flood Risk



How the Working Group will use the Study



Preparations for Hurricane Irene at IRS Headquarters



WMATA vents with one layer of sandbags prior to Federal Triangle Stormwater Study (above) and increased protection using the Study's predicted ponding levels (below)





Federal Triangle Floodproofing Seminar

October 31, 2011, 1:00 – 5:00 p.m.

National Archives William McGowan Theater

- Executive Order 11988, Floodplain Management
- Vulnerability Assessment and Building Floodproofing

QUESTIONS?

Impacts of the June 2006 Flood



Flooding in civic buildings and WMATA tunnels

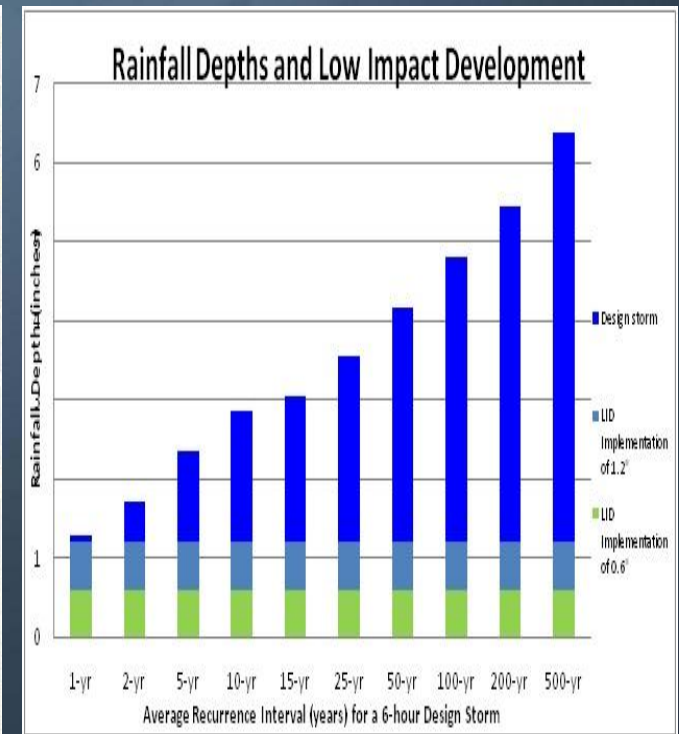
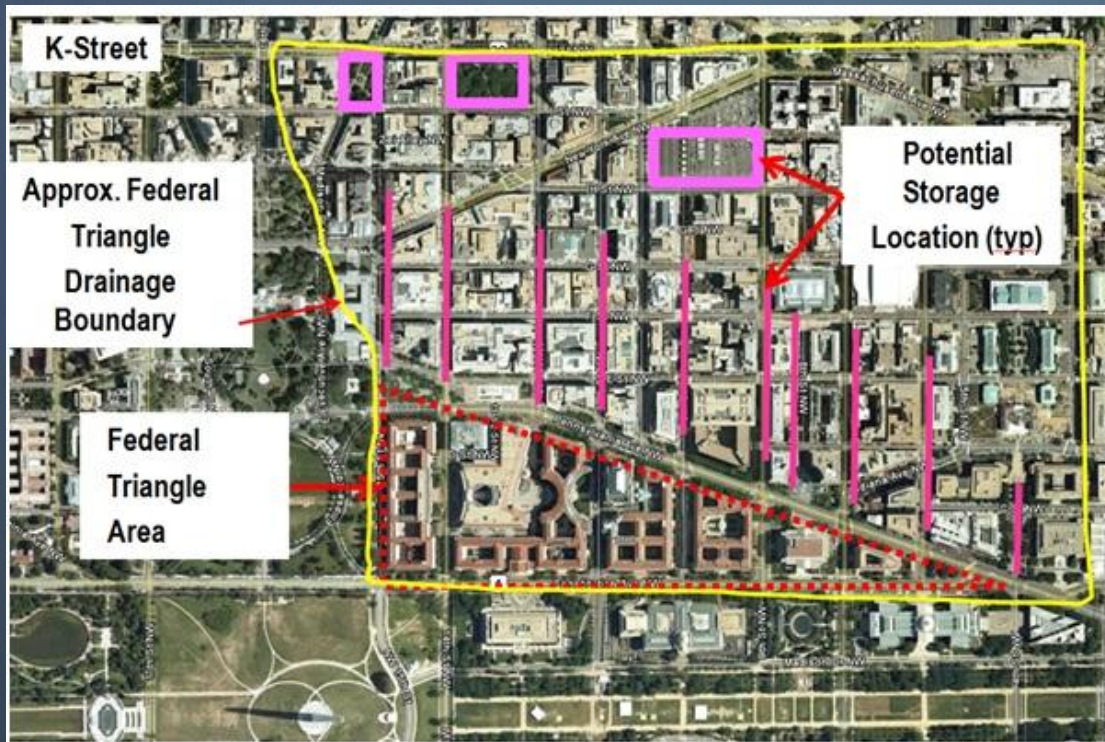
Security Threats

Losses to the federal government and the local economy

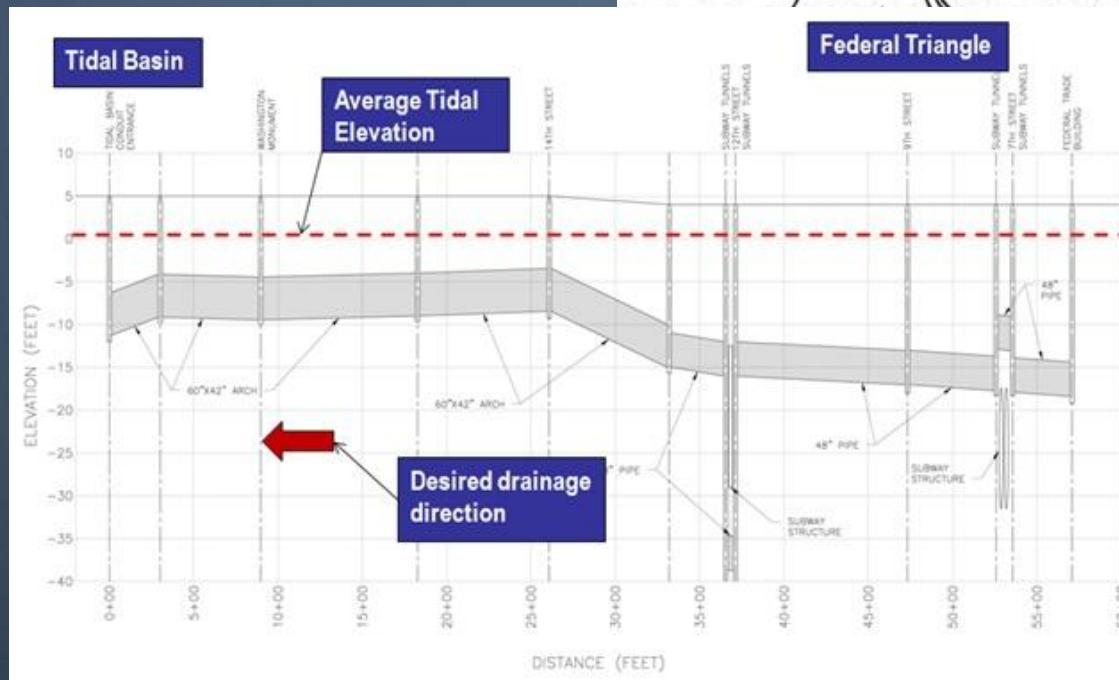
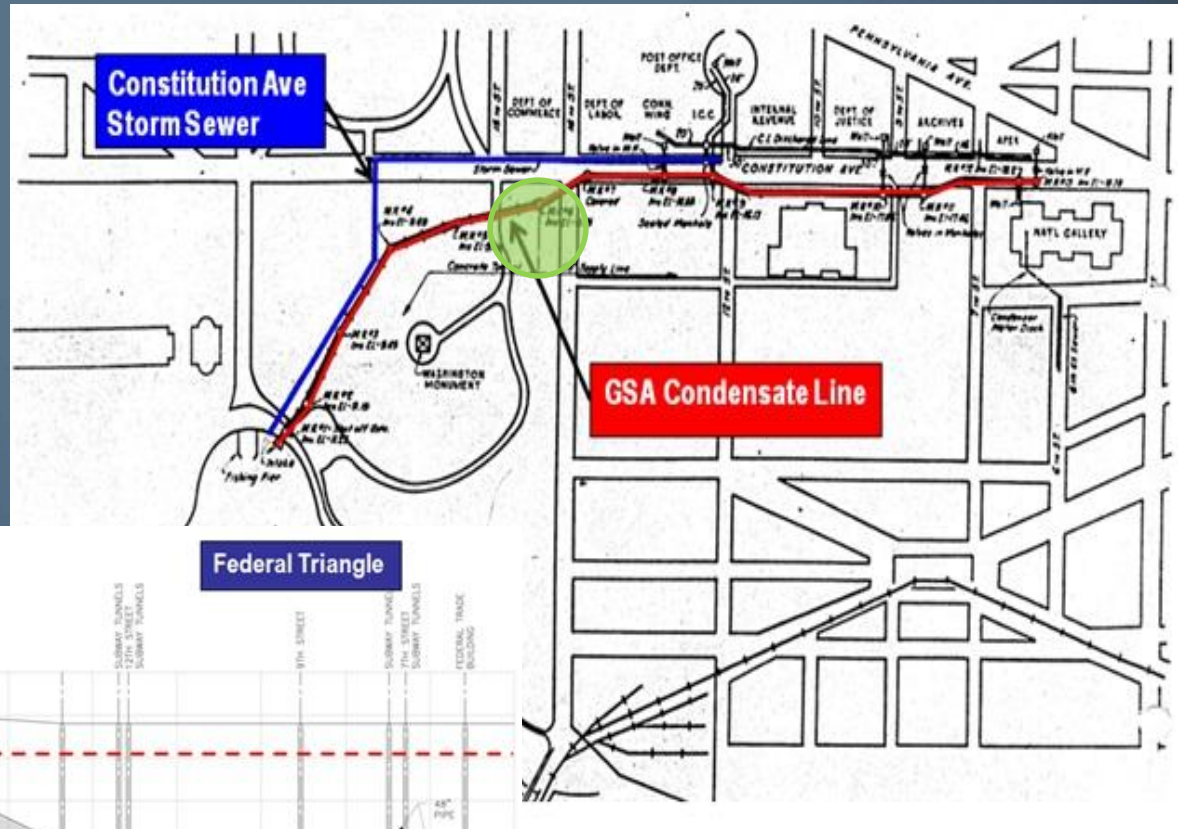


Alternatives 1 and 2: Sustainable approaches

- Capturing stormwater in the upstream watershed through Low Impact Development (LID) such as green roofs and bio-swales
- Stormwater storage upstream of the study area in the watershed

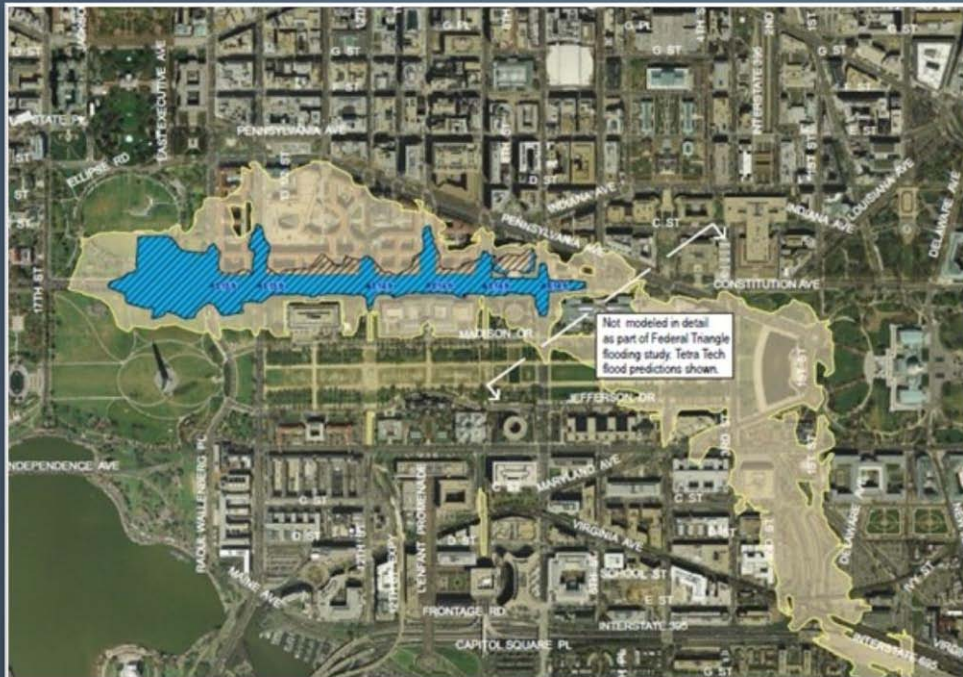


Alternative 3:
Using a 48-inch gravity
condensate line at
Constitution Avenue

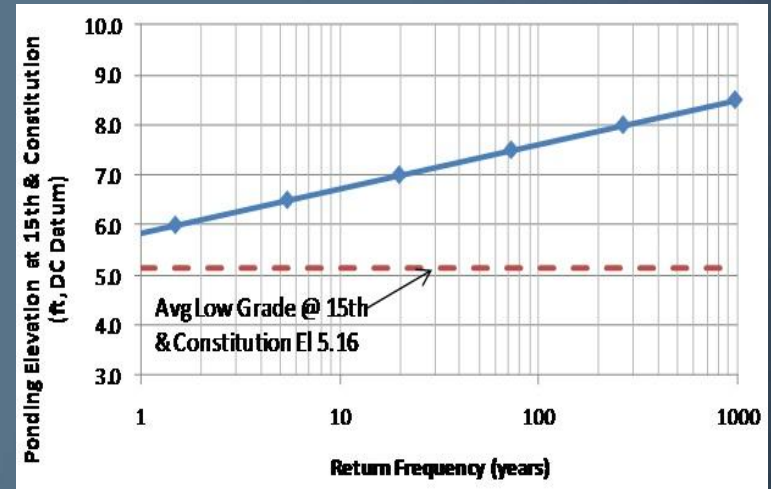


CONTRIBUTIONS OF THIS STUDY

More accurate site elevation and sewer system data provided more reliable prediction models



Comparison of 100-year flood area in the Federal Triangle between the Tetrattech and the Federal Triangle Stormwater Drainage Study



Preparations for Hurricane Irene at IRS Headquarters

CONTRIBUTIONS OF THIS STUDY

Considered a wide range of structural alternatives to mitigate flooding, such as:

- low-impact development
- re-using stormwater for irrigation of the National Mall

General cost estimates for construction and maintenance provides a basis for cost-benefit analysis but need to further evaluate:

- Ancillary benefits
- Other options such as building “armoring” or floodproofing



FINDINGS

An early warning system is ineffective in protecting the Federal Triangle from flash floods

- Designed to predict river flooding
- Only useful with slow rising floodwaters

