

City of Alexandria, Virginia

# Potomac River Flood Mitigation

Old Town Civic Association  
February 13, 2013



# Recent Timeline

- \* Hurricane Isabel, September 2003
- \* Potomac River Flood Mitigation Study (URS) completed 2010
- \* Waterfront Small Area Plan, January 2012
- \* Waterfront Plan Implementation

# Potomac River Flood Mitigation

- \* Overview of URS Flood Mitigation Study
- \* Flood Mitigation in Waterfront Small Area Plan
  - Protection for a 10 year storm event (Elevation 6.0)
  - Minimize nuisance flooding at King and Strand Streets
- \* Current Implementation Efforts
- \* FEMA Flood Insurance Rate Map
- \* City Resources Available

# URS Flood Mitigation Study

## Purpose

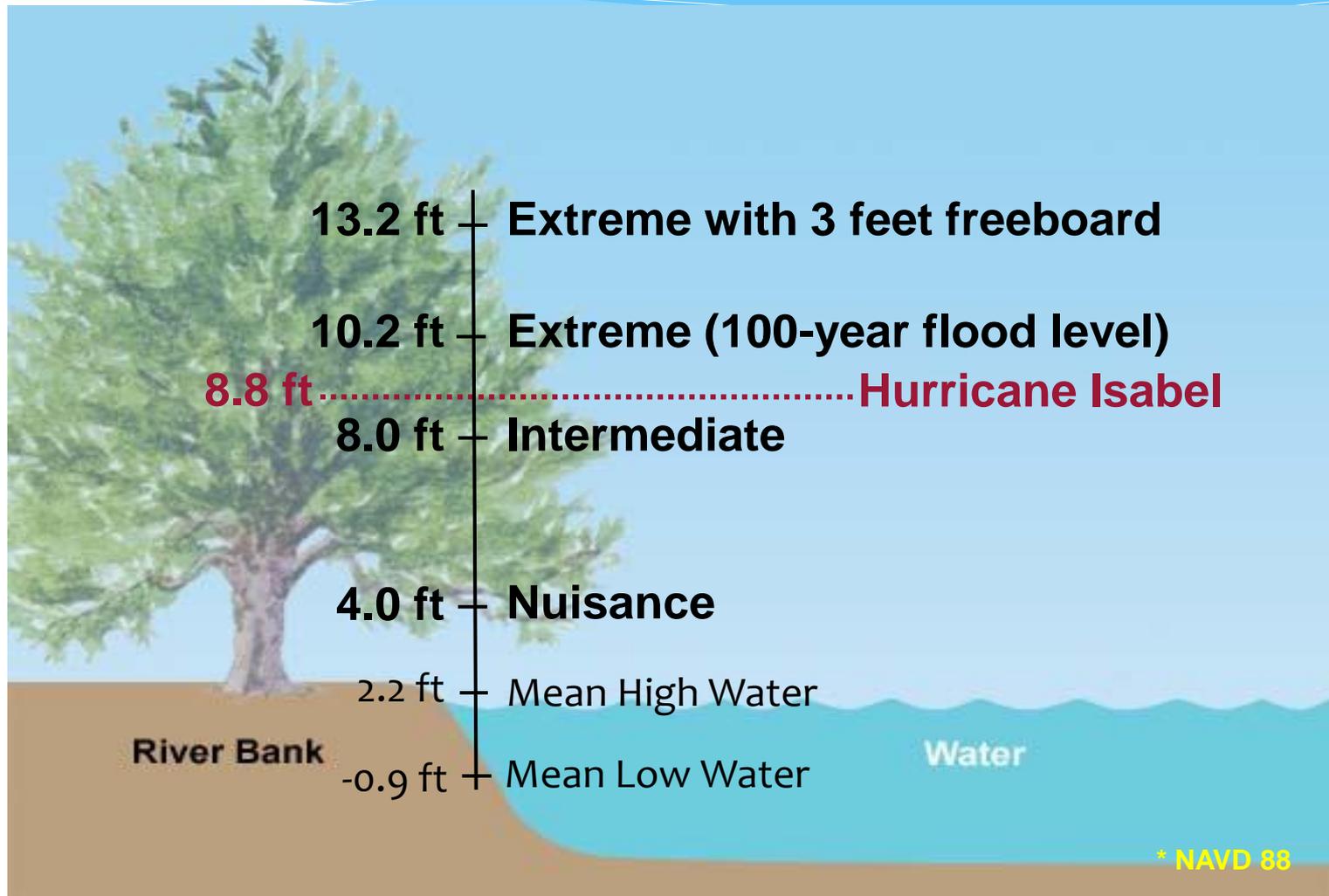


### Purpose of the Study:

Identify, evaluate and recommend flood mitigation solutions along the Potomac River Waterfront



# Flood Levels Studied



# Study Process

- \* Brainstorming sessions with public to identify wide range of potential solutions
- \* Solutions were evaluated based on multiple criteria:
  - Floodplain management
  - Aesthetic and cultural resources
  - Economic and environmental impacts
  - Cost and feasibility

# Study Process

- \* Evaluated potential solutions using benefit-cost ratio
- \* Benefits: avoidance of costs
  - Property damage (structure and content)
  - Lost revenues
  - Displacement costs
- \* Costs: implementation and operation
  - Design and permitting
  - Construction
  - Property acquisition
  - Operation and maintenance

# Study Process

- \*  $BCR = \text{Benefits} \div \text{Costs}$ 
  - At least 1 for a project to be considered feasible
  - A useful tool, but must be applied with judgment
- \* Other factors considered include potential impacts to
  - Aesthetics
  - Business operations
  - Natural resources
  - Historic and archeological

# Recommended Flood Mitigation Solutions

- \* Dry floodproofing
- \* Internal relocation of supplies
- \* Improve floodplain ordinance
- \* Enhance sandbag program
- \* Elevated pedestrian walkway (floodwall)
- \* Increase road and inlet elevations

# Dry Floodproofing Floodgate



# Dry Floodproofing Raised Patio: Before



# Dry Floodproofing Raised Patio: After



# Waterfront Small Area Plan

## Flood Mitigation Recommendations

- \* Flood Mitigation System to protect to Elevation 6.0 between Queen Street and Duke Street
- \* Grading and Drainage Improvements at King Street and Strand Street to minimize nuisance flooding

# Elevation 6.0

## Duke and Queen Street

### Legend

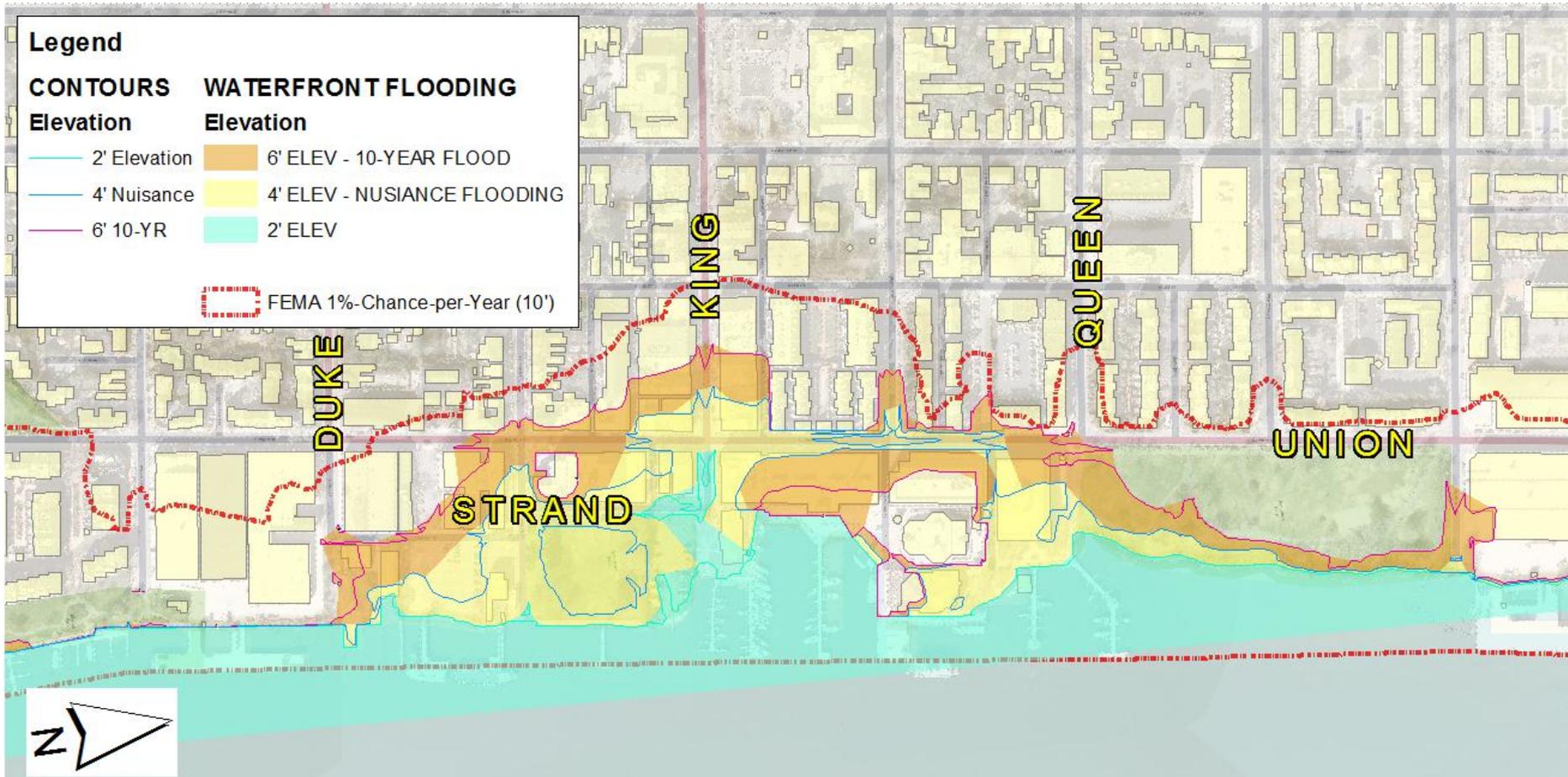
#### CONTOURS Elevation

- 2' Elevation
- 4' Nuisance
- 6' 10-YR

#### WATERFRONT FLOODING Elevation

- 6' ELEV - 10-YEAR FLOOD
- 4' ELEV - NUISANCE FLOODING
- 2' ELEV

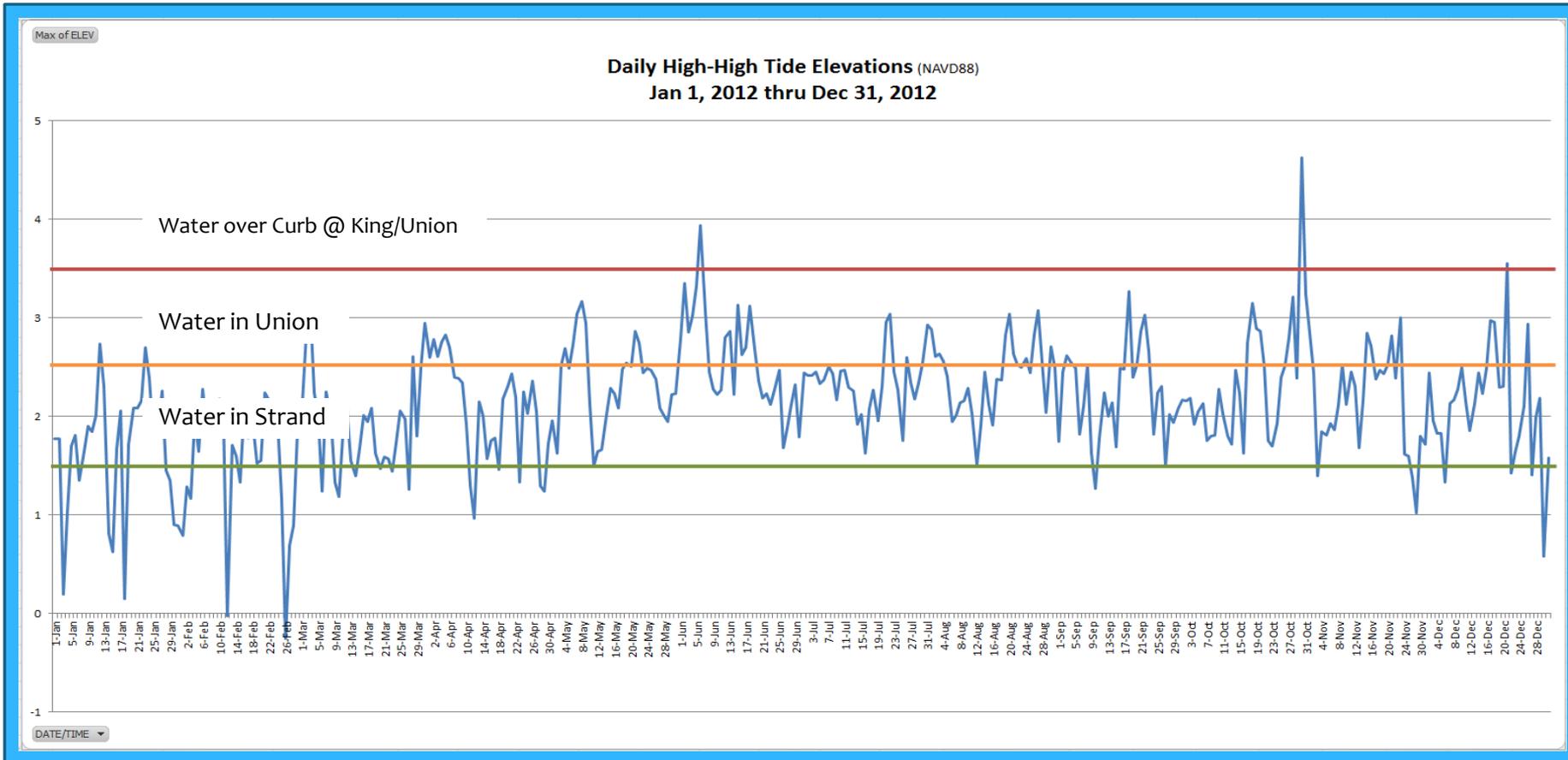
FEMA 1%-Chance-per-Year (10')



# Waterfront Plan Recommendations



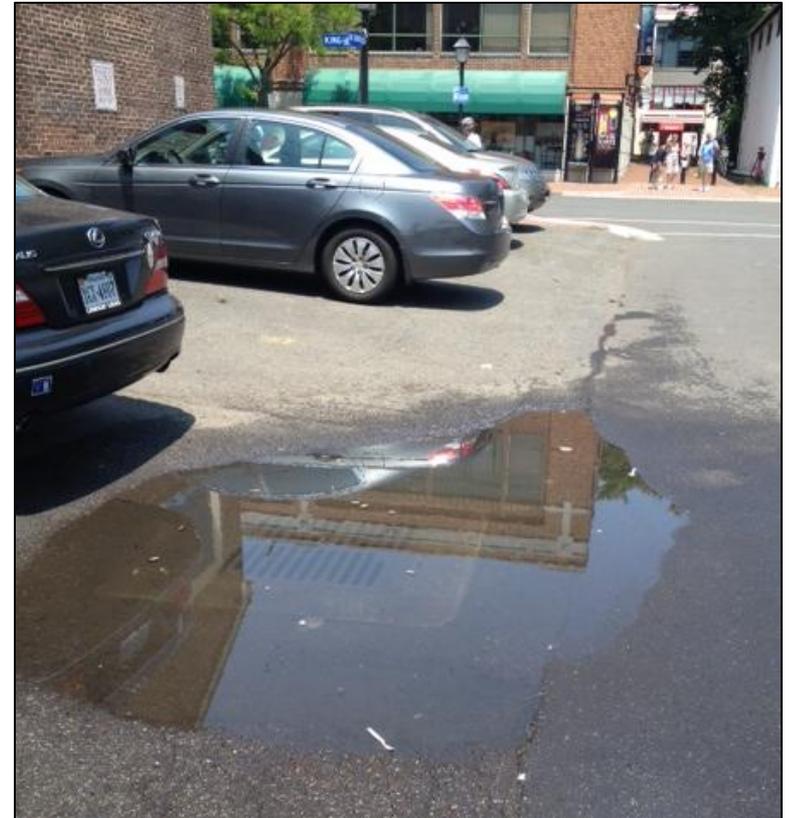
# Daily High Tides for 2012



# King/Strand Nuisance Flooding

What causes the flooding?

- Some flooding is caused by rainfall
  - **However** -
- Most of the flooding is caused by tidal backups through the storm sewers on Strand, King and Union Streets

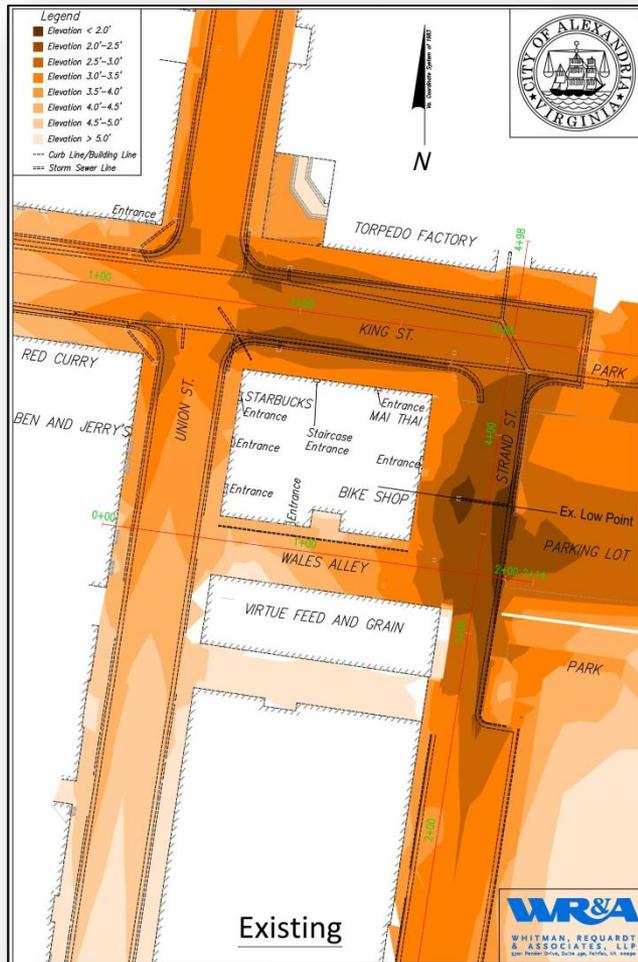


# Project Goals

- Substantially reduce nuisance flooding raising the elevation of storm inlets
  - Minimize impacts to private properties
  - Minimize cost



# Existing Conditions



- The existing lowest point is along Strand Street at Elevation 1.45'
- Low points along King Street between Elevation 2.6' and 2.8'

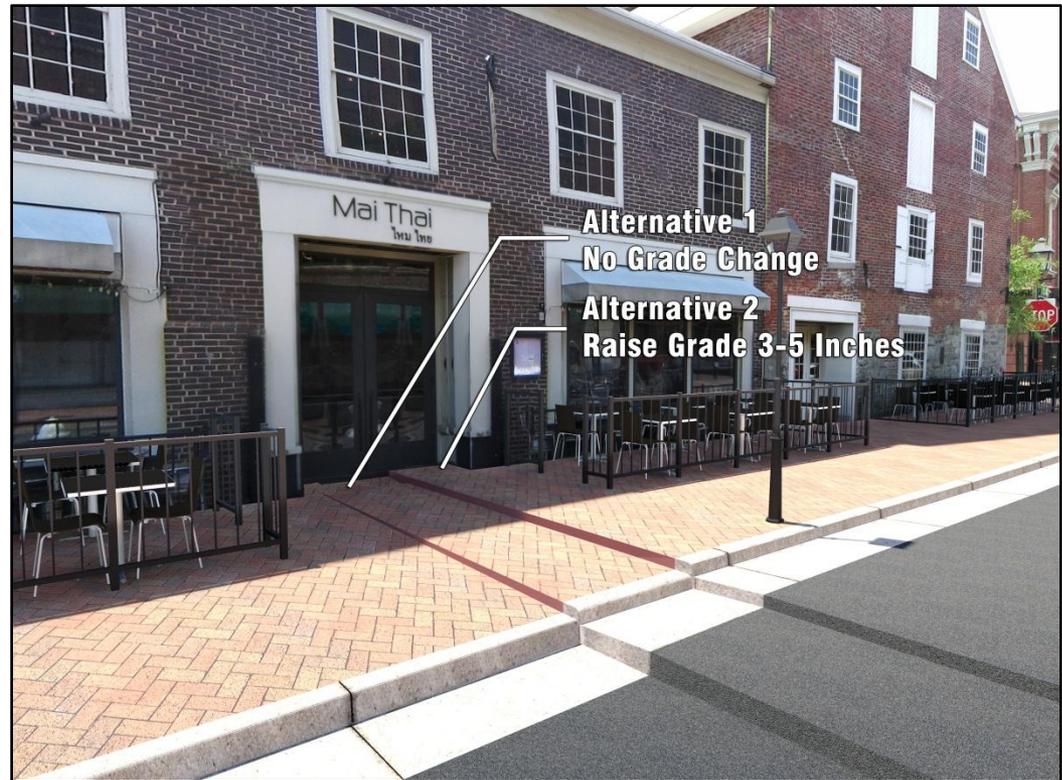
# Constraints

- Elevations of existing building entrances
- Minimum slopes required for drainage
- Road and sidewalk design standards
- ADA compliance



# Alternative 1 & 2 Summary

- Relocates the low point from Strand Street to King Street
- Raises lowest storm inlet opening from 1.45' to 2.66' (Alt.1) or 3.22' (Alt.2)
- Annual projected flood days will be reduced from 303 to 61 (Alt.1) or 13 (Alt.2)
- Impacts to properties:
  - Mai Thai (remove internal ramp) (Alt.2 only)
  - Stairwell (possibly reconstruct stairs and entrance) (Alt.2 only)
  - Re-Grade Portion of Boat Club Parking Lot
- Cost estimate: \$925,000, (Alt.1) or \$1,150,000 (Alt.2)

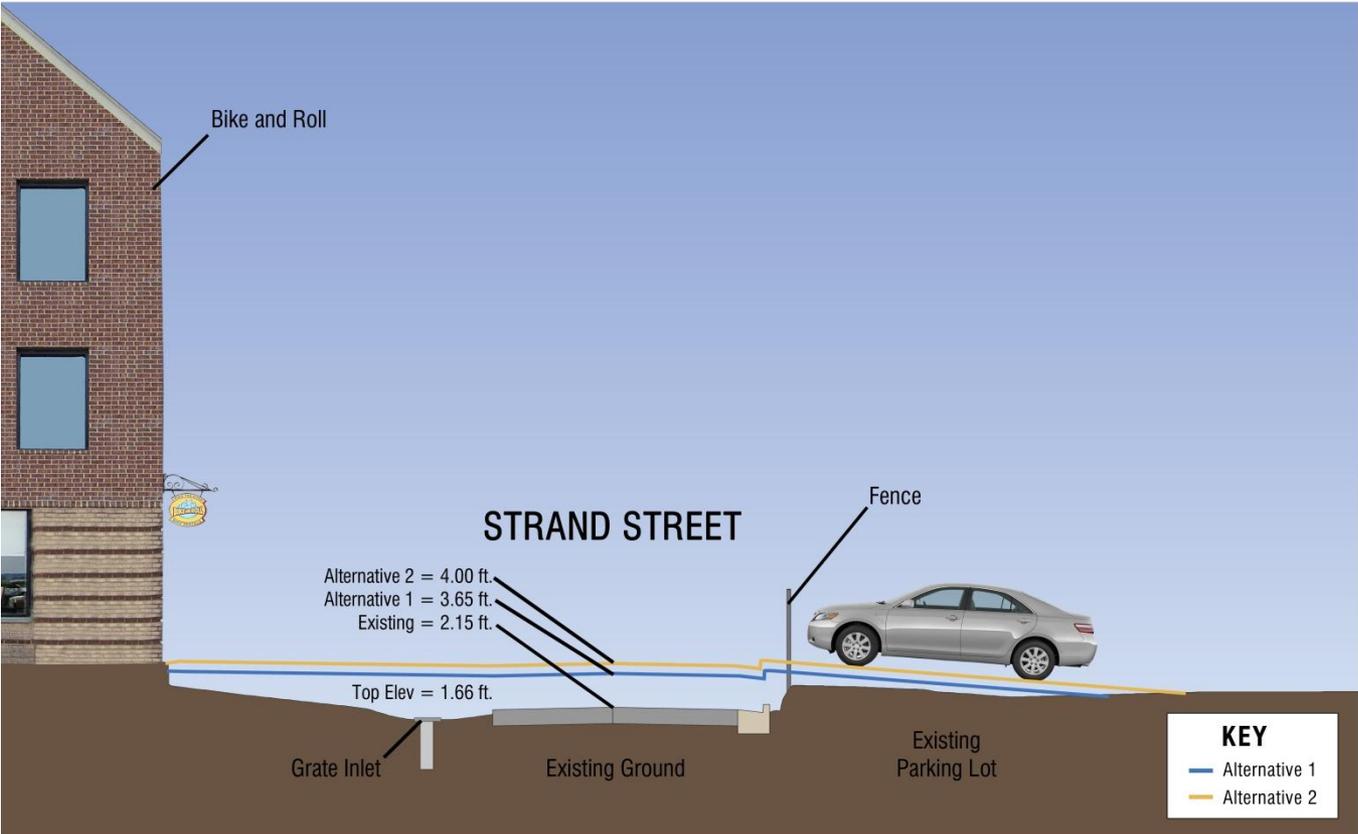




# Strand Street Looking South



# Strand Street Cross Section Looking North



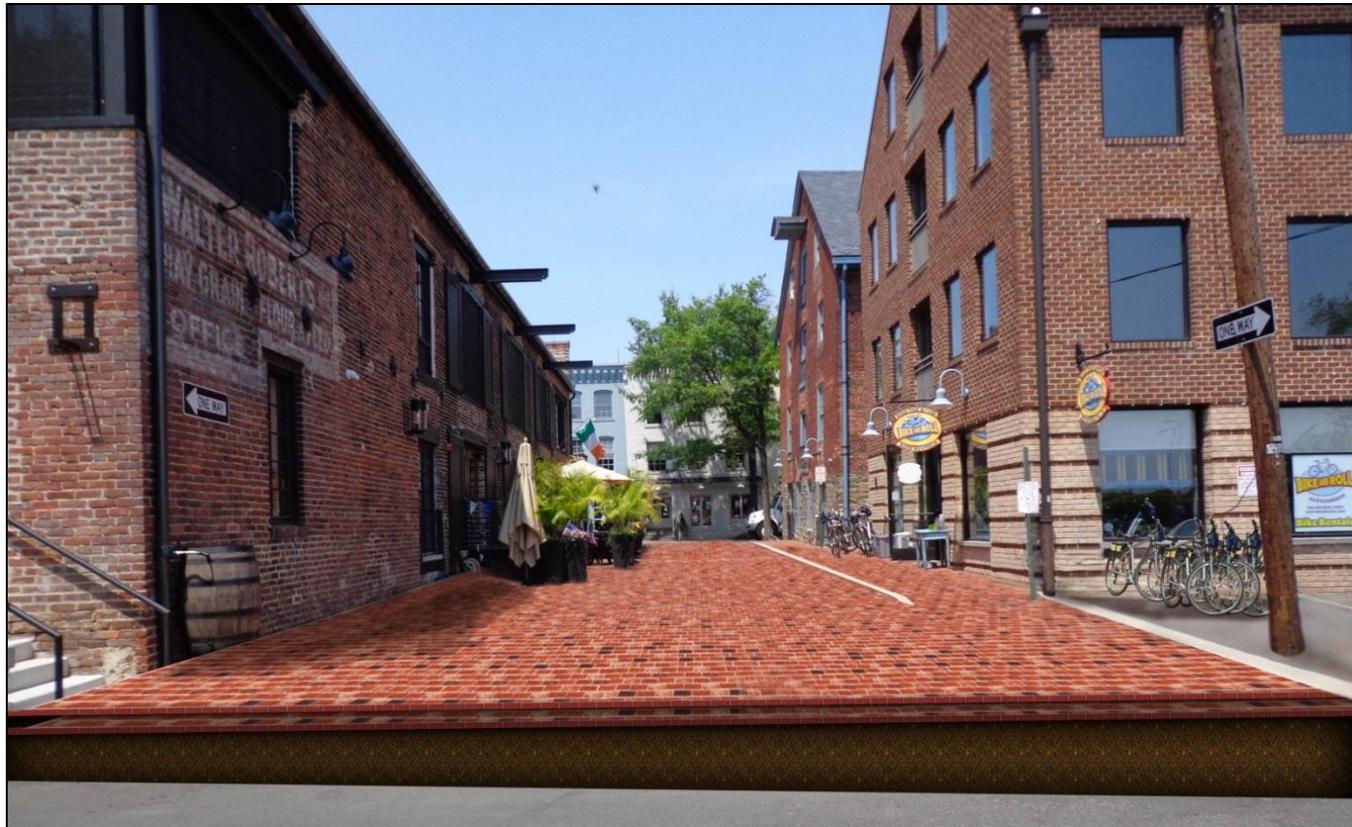
# Boat Club Parking Lot Alternative 1 & 2



# Flooding on the Strand



# Wales Alley Cross Section Alternative 1 & 2



# Summary & Comparison

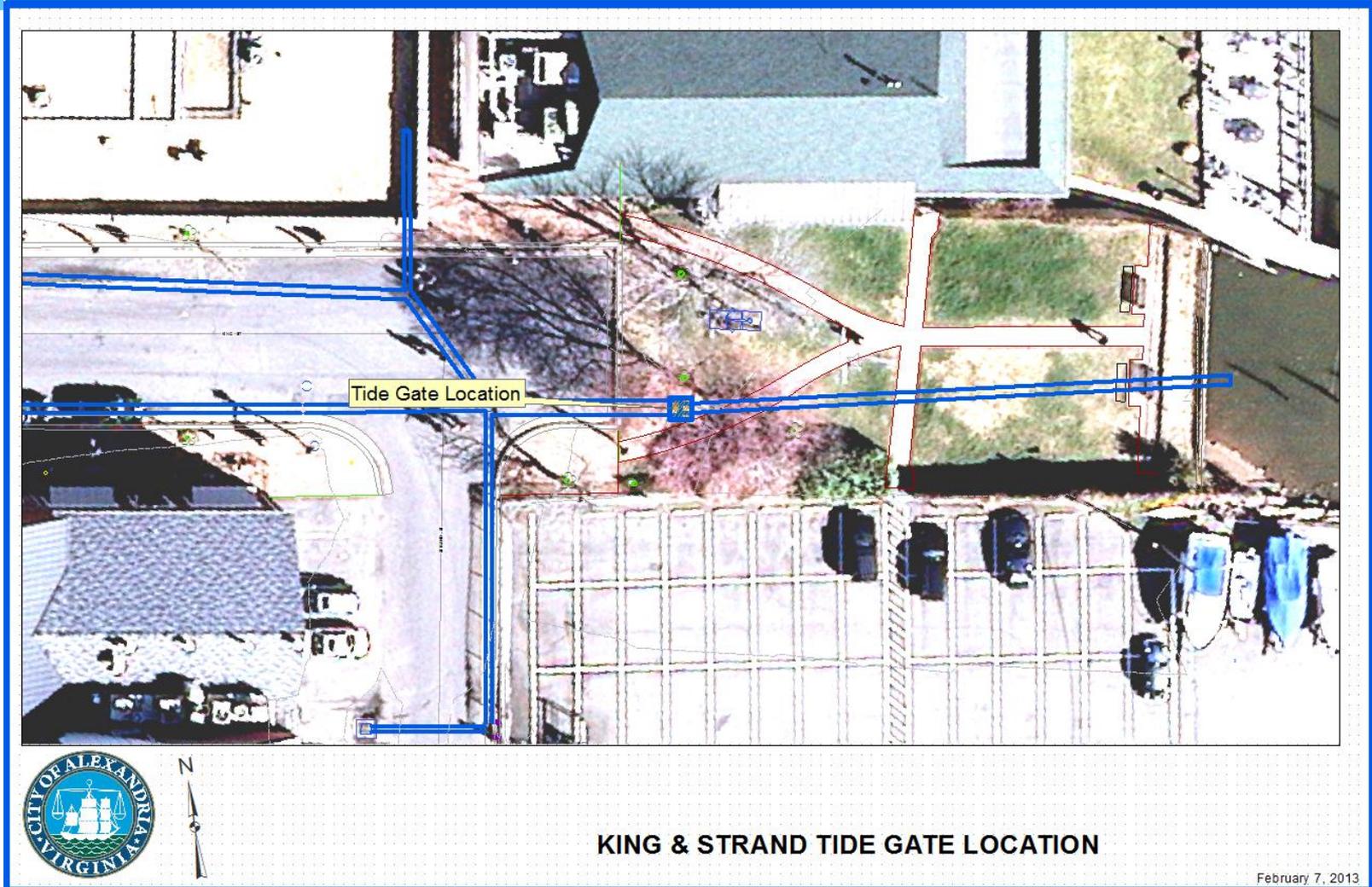
	Low Point Elevations (ft)		
	Existing	Alternative 1	Alternative 2
Lowest Throat Opening @ Strand Street	1.45	<i>Eliminated</i>	<i>Eliminated</i>
Thai Restaurant Entrance	3.47	3.47	3.70
Stairwell Entrance	3.40	3.40	3.77
Lowest Throat Opening @ King Street	2.43	2.66	3.27
Lowest Throat Opening @ Union Street	3.22	3.22	3.22
Average Flood Days Per Year 2005-2011	303	61	13
Preliminary Cost Estimate	N/A	\$925,000	\$1,150,000

# Depth of Flood Events

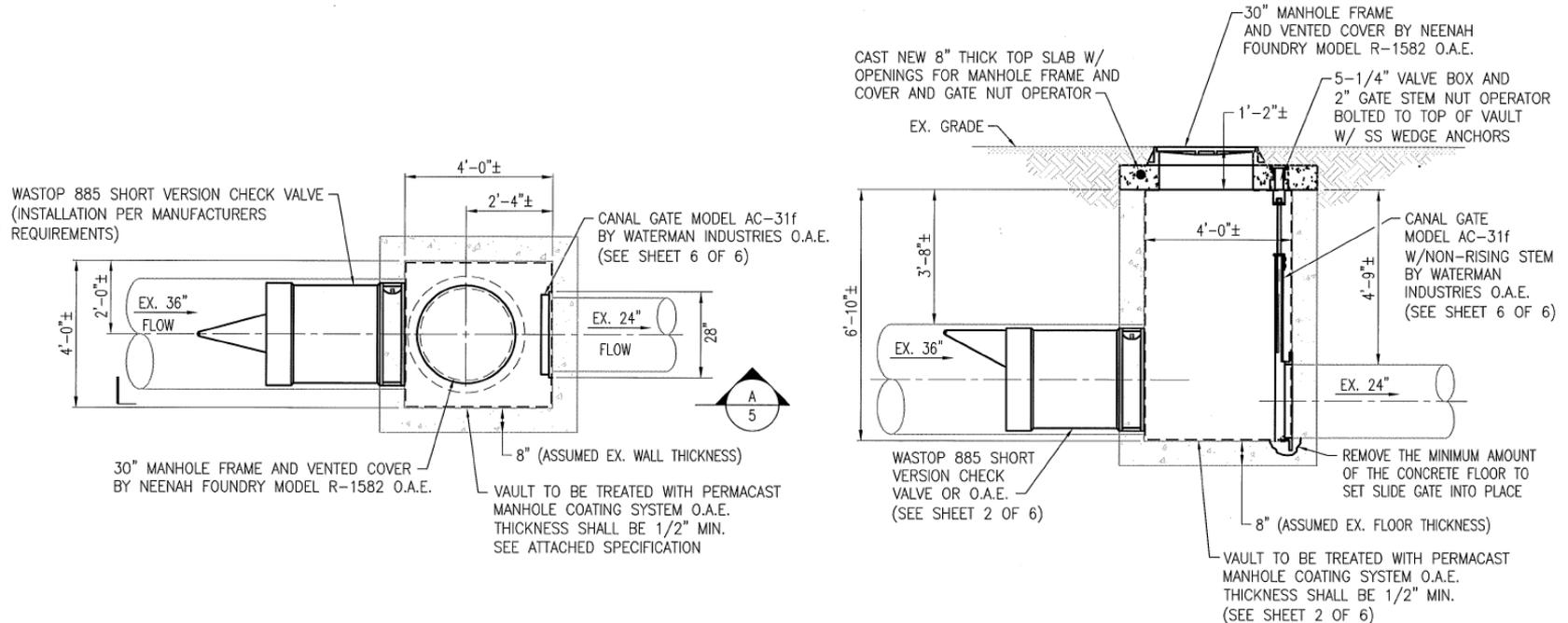
Approximate Annual Average Flood Depths For Existing Roadway Elevations			
Depth Greater Than	Strand Street (Elev. 1.45)	King Street (Elev. 2.43)	King & Union Street (Elev. 3.22)
6"	223	30	7
1'	100	7	2
1.5'	30	2	<1
2.0'	7	<1	<1
2.5'	2	<1	<1

- With Alternative 1:
  - Average of less than 1 incident of flooding per year at Strand Street
  - Flood incidents on King Street will be shallower by 3"
- With Alternative 2:
  - Average of less than 1 incident of flooding per year at Strand Street and King Street

# Tide Gate Installation at Foot of King Street



# Engineering Plan for Tide Gate



**NOTE:**

1. THE CONTRACTOR SHALL FIELD MEASURE THE EXACT INSIDE DIAMETER OF THE 36" PIPE PRIOR TO PREPARING SHOP DRAWINGS TO ENSURE A PROPER FITTING VALVE IS ORDERED.



KING-UNION-STRAND STREETS  
STORM DRAINAGE IMPROVEMENTS

Drawing Title  
PROPOSED STORM VAULT RECONSTRUCTION  
PLAN AND SECTION

Drawing No.  
5

Scale: As Shown Date: JANUARY 2013

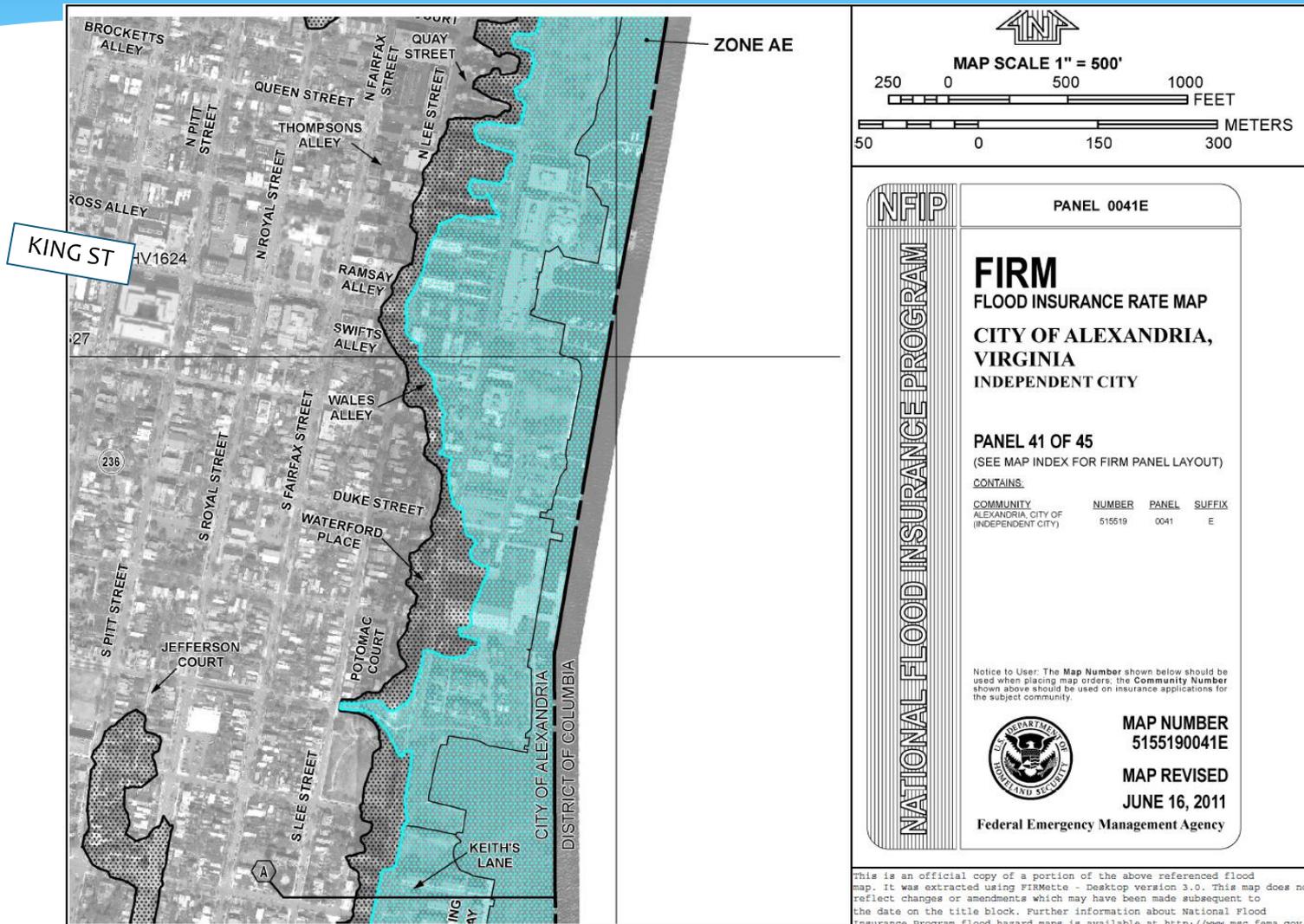
Sheet 5 of 6

# Implementation Next Steps

- \* URS under contract to begin Engineering Concept Design
- \* Landscape Architect design team in selection process
- \* Field Survey work to begin
- \* Extensive Community Outreach to develop Concept Alternatives, Park Programming and Flood Mitigation

# Flood Insurance Rate Map

## Adopted June 2011



# City Resources Available

- \* Flood Plain Determination Support
- \* Assistance Identifying Resources for
  - Floodproofing
  - Elevation Certificates
  - Flood Insurance
- \* Permitting Questions