



Waterfront Implementation Project

Update to Waterfront Commission Flood Mitigation Subcommittee

October 4th, 2021

Terry Suehr, PE, PMP

Department of Project Implementation, Director

Matthew Landes, PLA, ISA

Department of Project Implementation, Division Chief / Waterfront Program Manager



Recap of Last Meetings



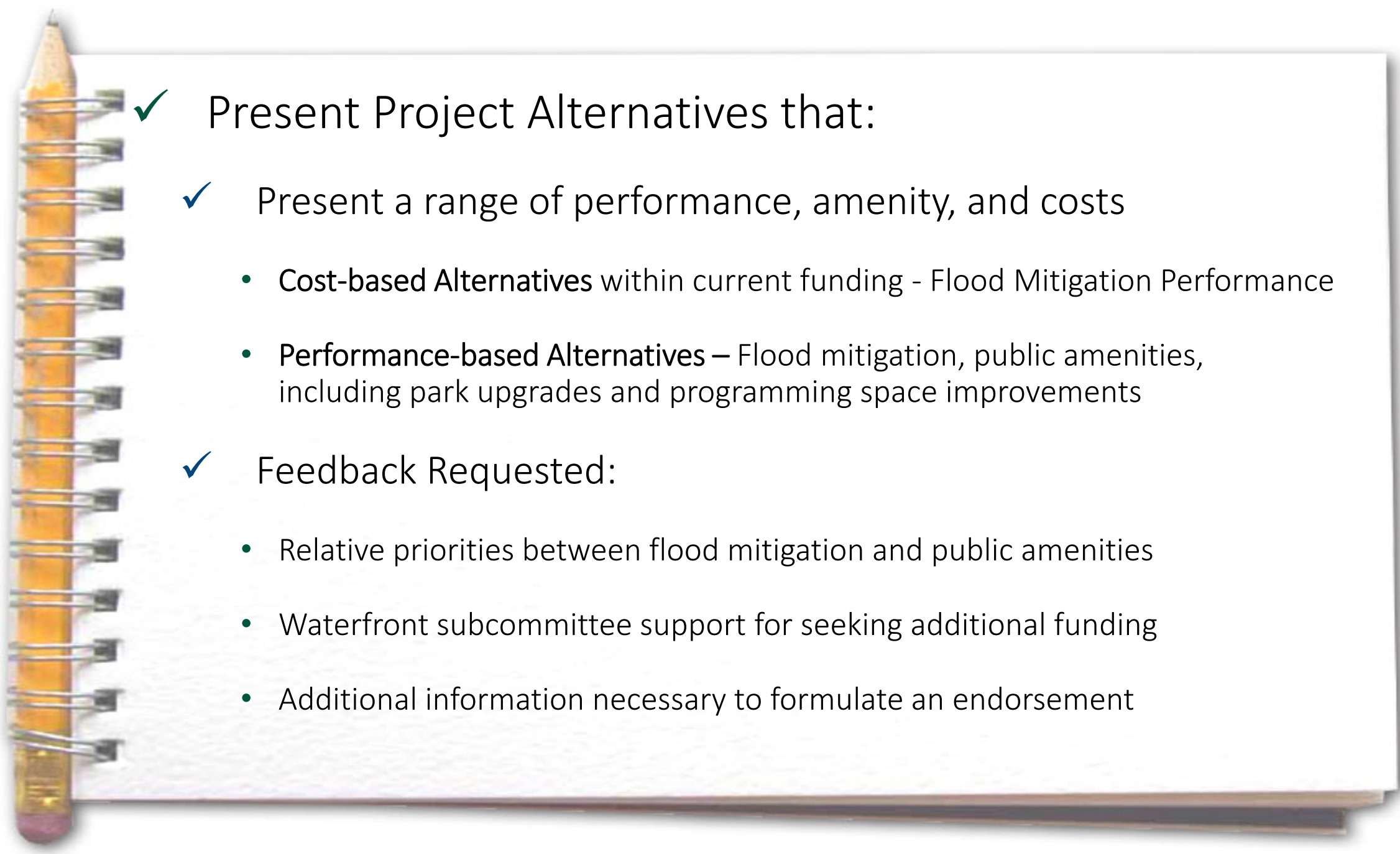
Flood Mitigation Sub-Committee

- ✓ Flooding is complex and a comprehensive flooding solution will have many components:
 - Backflow prevention
 - Stormwater infrastructure and pumping stations
 - New bulkhead or other Landscape-based flood protection strategies
- ✓ We can incorporate resiliency and green infrastructure without significantly adding cost.
- ✓ However, the Baseline Project exceeds the current City's funding

Parks and Recreation Commission

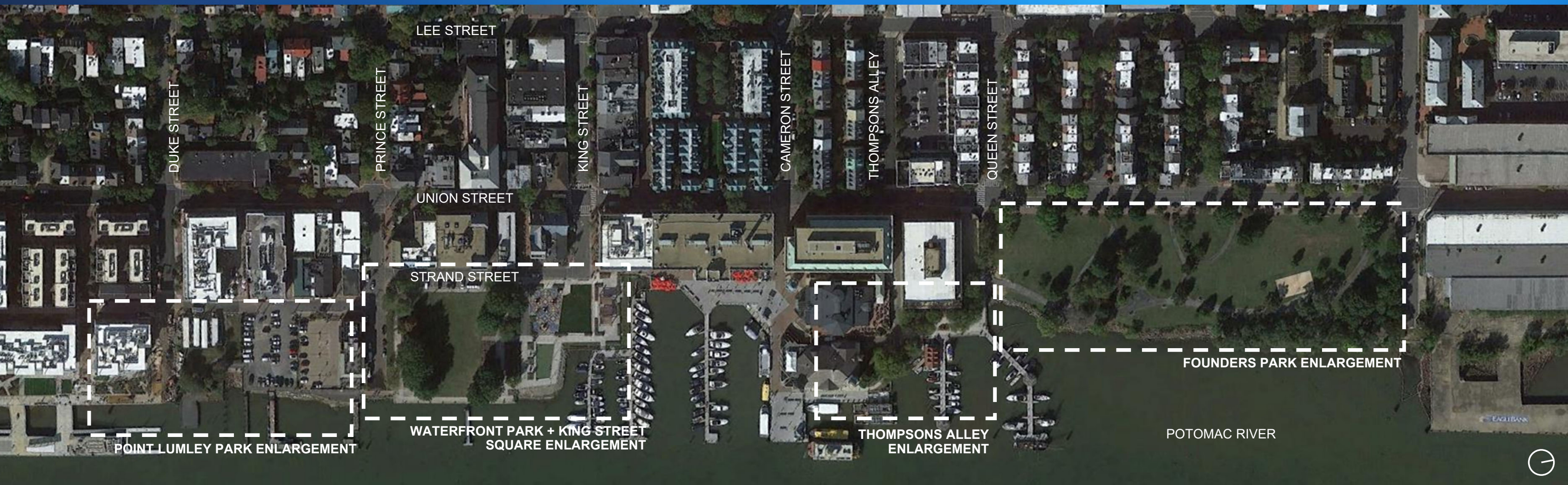
- ✓ Supportive of bioretention and stormwater attenuation in parks
- ✓ Endorsed aligning project with Green Building Policy and Environmental Action Plan 2040

Meeting Objectives

- 
- ✓ Present Project Alternatives that:
 - ✓ Present a range of performance, amenity, and costs
 - Cost-based Alternatives within current funding - Flood Mitigation Performance
 - Performance-based Alternatives – Flood mitigation, public amenities, including park upgrades and programming space improvements
 - ✓ Feedback Requested:
 - Relative priorities between flood mitigation and public amenities
 - Waterfront subcommittee support for seeking additional funding
 - Additional information necessary to formulate an endorsement

Overview

- Cost Based Option – 1 *Prioritizing Rainfall-Runoff Flooding*
 - Potential add-On A - Landscape Based Flood Protection (Strand)
 - Potential add-On B - Landscape Based Flood Protection (River)
- Cost Based Option – 2 *Prioritizing Flood Mitigation from Duke to King Street*
- Performance Alternative A – Flood Protection-Focused
- Performance Alternative B – Core Area Waterfront Plan with Added Resiliency and Sustainability
- Funding Opportunities
- Next Steps



Cost Based Option - 1

Addresses flooding due to rainfall runoff with improved streetscape and stormwater infrastructure and pump stations within the City's CIP budget of \$100M.

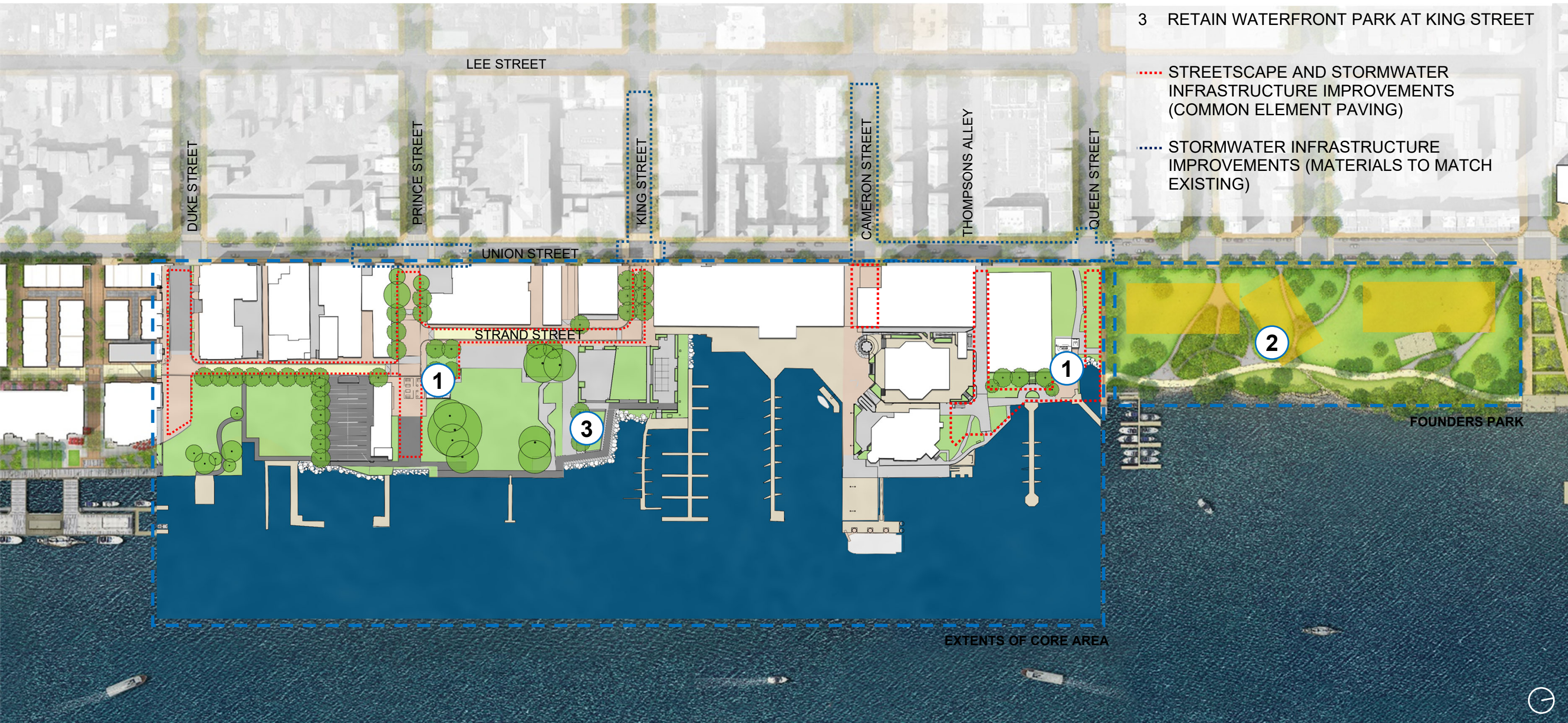
// Cost Based Option – 1

Mitigates Rainfall Flooding; Defers Shoreline and Park Improvements

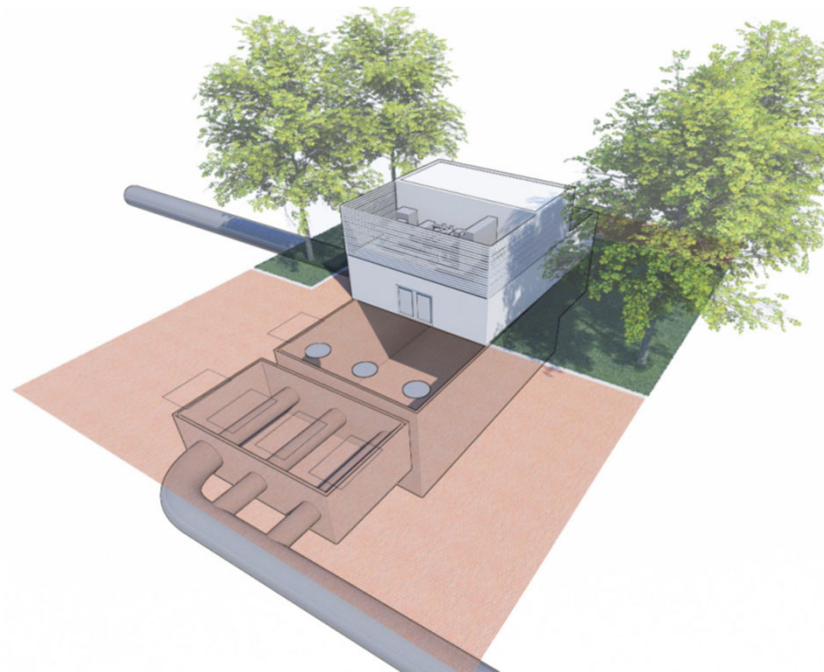
LEGEND

- 1 PUMP STATION
- 2 UNDERGROUND STORMWATER DETENTION CHAMBERS
- 3 RETAIN WATERFRONT PARK AT KING STREET

- STREETSCAPE AND STORMWATER INFRASTRUCTURE IMPROVEMENTS (COMMON ELEMENT PAVING)
- STORMWATER INFRASTRUCTURE IMPROVEMENTS (MATERIALS TO MATCH EXISTING)



// Project Elements



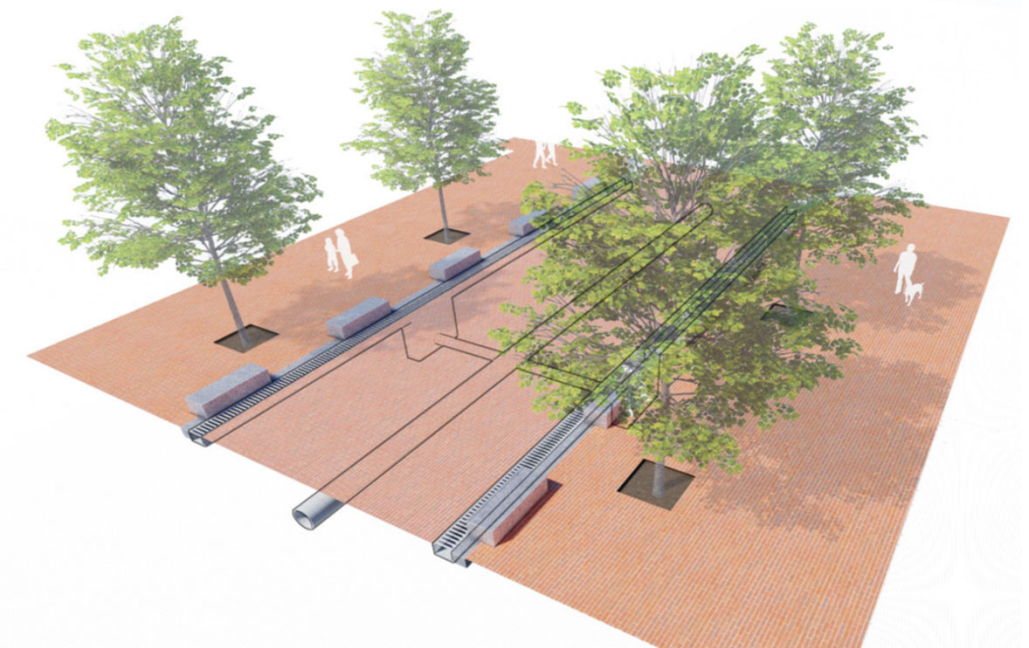
PUMP STATIONS

- Utilitarian structure housing stormwater pumps and associated mechanical and electrical equipment
- No city storage or amenity space
- Thompsons Alley PS capacity reduced by 95%



UNDERGROUND DETENTION

Stormwater storage chambers sited under existing parkspaces



STREETSCAPE AND STORMWATER INFRASTRUCTURE IMPROVEMENTS

- New and upsized stormwater inlets and conveyance pipes
- Common elements paving proposed for streets within the core area only. All others to match existing materials

// Green Infrastructure approach in Alignment with Regulation and Local Policy

Green Building Policy (Adopted 2019)

- Requires that **public development** “will treat 100% of the required stormwater treatment through green infrastructure.”
- **Water quality requirements for nutrient reductions shall be addressed by on-site management of stormwater via green infrastructure.**
- The City must use practices approved by Virginia Department of Environmental Quality in order to comply (such as the underground storage chambers with isolator row and/or hydrodynamic separators).

Environmental Action Plan 2040 (Adopted 2019)

- “Green Infrastructure Program Plan to prioritize projects, **increase green infrastructure projects on public and private property, and promote green infrastructure as the leading approach for stormwater management in the City.**

Eco-City Charter (2008)

- Laid out initial vision and framework to create a more sustainable future and City approach to infrastructure

New solutions in park spaces support: Eco-City Alexandria, Green Building Policy, and VDEQ Regulatory Compliance

Water Resources

Reduce stormwater phosphorus concentrations

- Chambers with an Isolator Row are proven to **remove total phosphorus by 40%**
- Opportunity to comply with water quality regulatory requirements without the purchase of credits

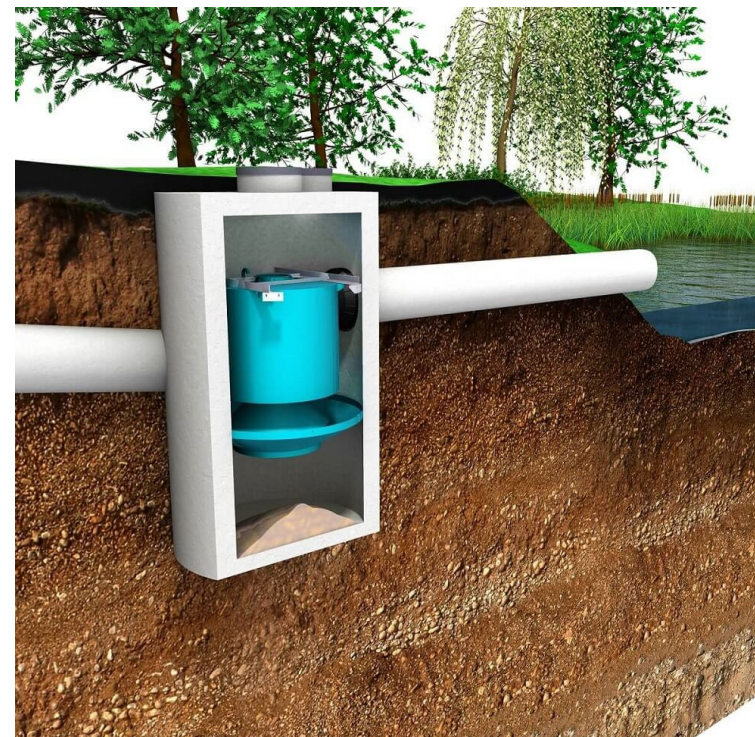
VA DCR STORMWATER DESIGN SPECIFICATION NO. 9

BIORETENTION

VIRGINIA DCR STORMWATER
DESIGN SPECIFICATION No. 9

BIORETENTION

VERSION 2.0
January 1, 2013



VA DEQ has approved these solutions for stormwater pollutant removal and water quality improvements

1. Bioretention
2. Downstream Defender, a hydrodynamic separator
3. Isolator Row, a pretreatment for the StormTech Stormwater Chambers

Underground stormwater chambers have successfully been installed in other green & park spaces

- Stadiums



Football field in Canton, OH



DC United Soccer Stadium



- Fairfax County Schools
- South Run Park in Fairfax County installed over 8 years ago



// Project Expectations

- Address the highest flooding priorities and goals within existing CIP funding

BACKFLOW
of River Outfalls



INUNDATION
of Storm Sewers



OVERTOPPING
of Bulkhead



- Maintaining existing shoreline infrastructure and elevations
- No new promenade or major park upgrades; material improvements to retain Waterfront Park at King St Square and establish permanent park space
- Underground detention chambers add water quality benefits

// Project Cost Range

- Class 4 Level Estimate: -30% to +50%
 - Total Estimated Total Project Cost: \$90M
 - Total Estimated Project Cost Range: \$63M - \$136M
- Emphasizes the need to understand community priorities

Cost Estimate Accuracy (AAEC Classification System)

	Primary Characteristic	Secondary Characteristic			
ESTIMATE CLASS	LEVEL OF PROJECT DEFINITION Expressed as % of complete definition	END USAGE Typical purpose of estimate	METHODOLOGY Typical estimating method	EXPECTED ACCURACY RANGE Typical variation in low and high ranges [a]	PREPARATION EFFORT Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgment, or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100

- Class 4 Level Estimate by Owner-Advisor Team
- Determine priorities



- Class 3, 2, & 1 Estimates by Engineer of Record / D/B Team
- Will determine costs of priorities & affordability



Scoping to Budget

ITEMS ESTIMATED TO BE WITHIN BUDGET:		\$	ITEMS ESTIMATED TO BE WITHIN BUDGET:		\$
UTILITIES - PUMP STATION #1	\$\$\$\$\$		UTILITIES - PUMP STATION #1	\$\$\$\$\$	
UTILITIES - PUMP STATION #2	\$\$\$\$\$		UTILITIES - PUMP STATION #2	\$\$\$\$\$	
UTILITIES - STORM SEWER	\$\$\$\$\$		UTILITIES - STORM SEWER	\$\$\$	
UTILITIES - DRY	\$\$\$		UTILITIES - DRY	\$\$\$	
UTILITIES - WET	\$\$		UTILITIES - WET	\$\$	
RESTORATION OF PARKS	\$\$\$		RESTORATION OF PARKS	\$\$\$	
RESTORATION OF ROW	\$\$		RESTORATION OF ROW	\$\$	
			STRUCTURAL BULKHEAD	\$\$\$	
			PROMENADE	\$\$	
			KING STREET SQUARE IMPROVEMENTS	\$\$\$	
TOTAL DIRECT COSTS	\$\$\$\$\$\$\$				
PRIORITIZED ITEMS NOT CURRENTLY WITHIN BUDGET:		\$			
STRUCTURAL BULKHEAD	\$\$\$\$\$		TOTAL DIRECT COSTS	\$\$\$\$\$\$\$	
PROMENADE	\$\$\$				
KING STREET SQUARE IMPROVEMENTS	\$\$\$		PRIORITIZED ITEMS NOT CURRENTLY WITHIN BUDGET:		\$
WATERFRONT PARK IMPROVEMENTS	\$\$		WATERFRONT PARK IMPROVEMENTS	\$\$	
MARINA IMPROVEMENTS	\$\$\$		MARINA IMPROVEMENTS	\$\$\$	
POINT LUMLEY IMPROVEMENTS	\$\$		POINT LUMLEY IMPROVEMENTS	\$\$	
KING STREET PIER	\$\$\$		KING STREET PIER	\$\$\$	
ADDITIONAL PIERS	\$\$\$		ADDITIONAL PIERS	\$\$\$	
TOTAL ADDITIONAL COST	\$\$\$\$\$\$\$		TOTAL ADDITIONAL COST	\$\$\$\$\$\$\$	



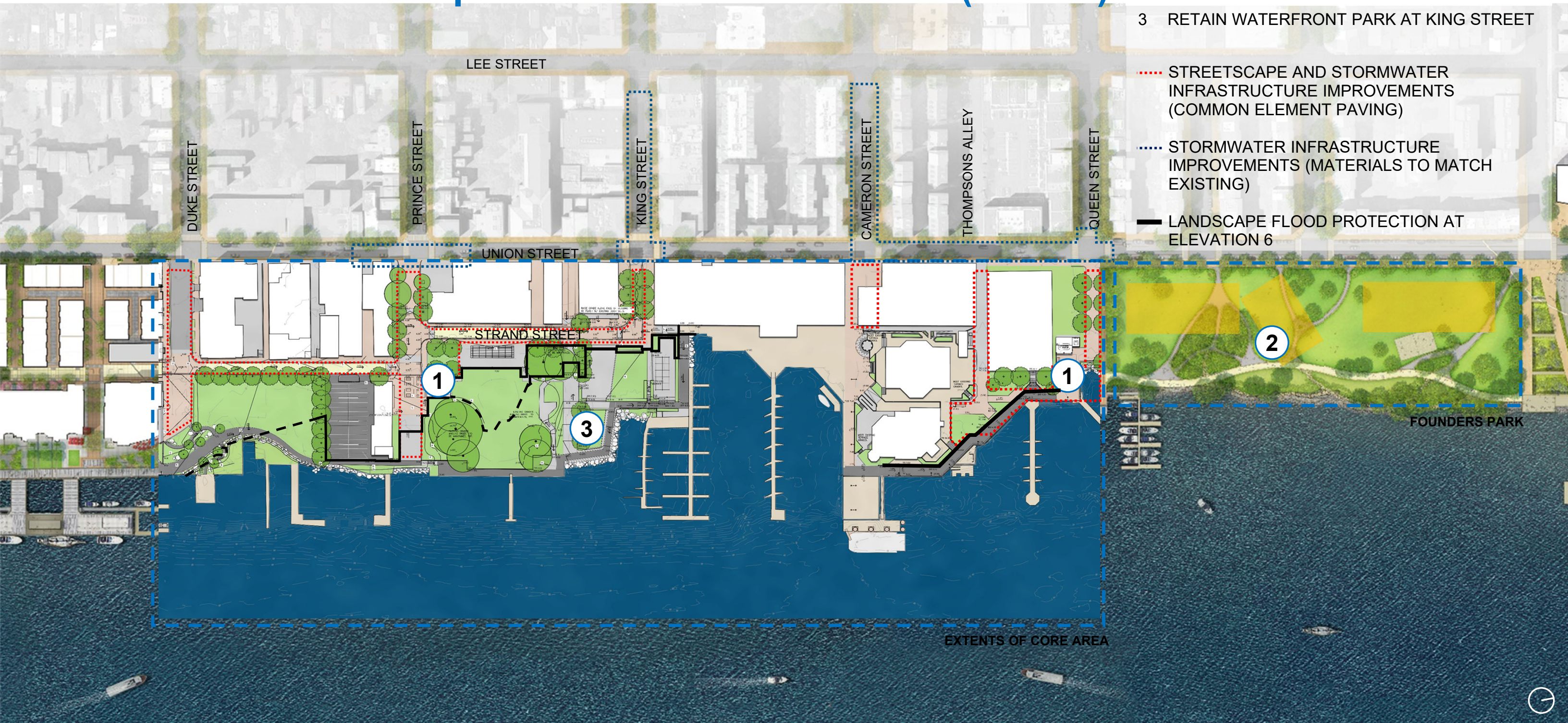
// Cost Based Option - 1

Add-On A: Landscape Based Flood Protection (Strand)

LEGEND

- 1 PUMP STATION
- 2 UNDERGROUND STORMWATER DETENTION CHAMBERS
- 3 RETAIN WATERFRONT PARK AT KING STREET

- STREETSCAPE AND STORMWATER INFRASTRUCTURE IMPROVEMENTS (COMMON ELEMENT PAVING)
- STORMWATER INFRASTRUCTURE IMPROVEMENTS (MATERIALS TO MATCH EXISTING)
- LANDSCAPE FLOOD PROTECTION AT ELEVATION 6

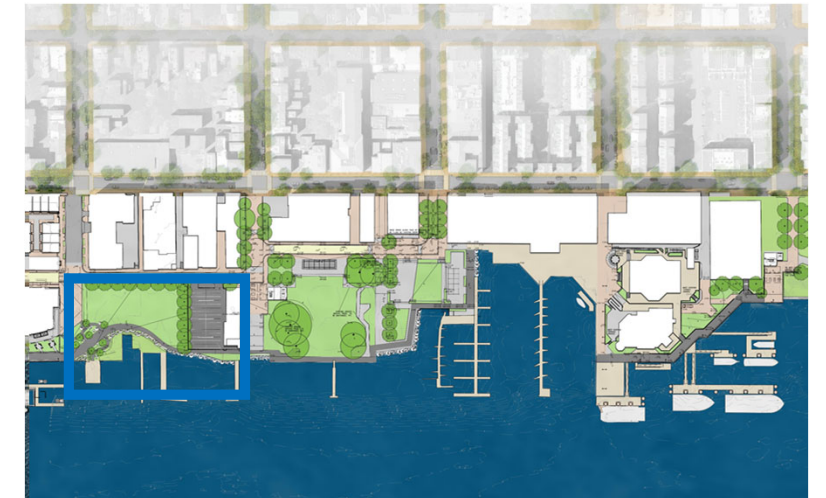


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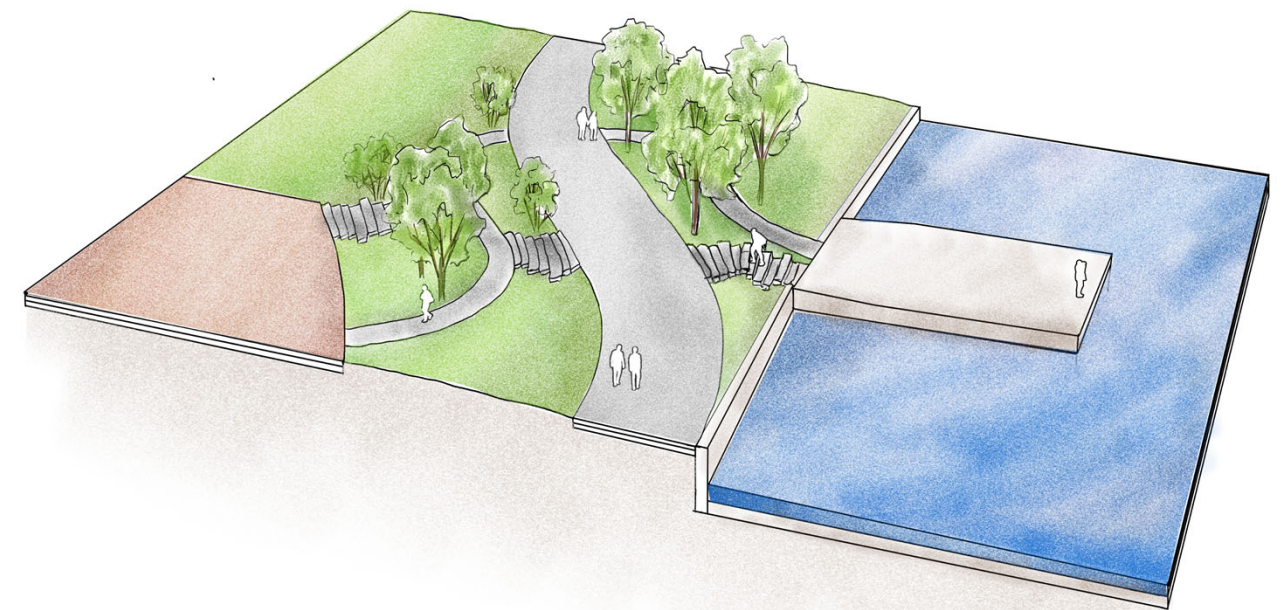
Add-On A: Landscape Based Flood Protection (Strand)

Point Lumley Park Improvements

- Extension of green space with new hardscape and landscape improvements
- New waterfront promenade
- Connection to Robinson Landing and Waterfront development to the north



KEY PLAN

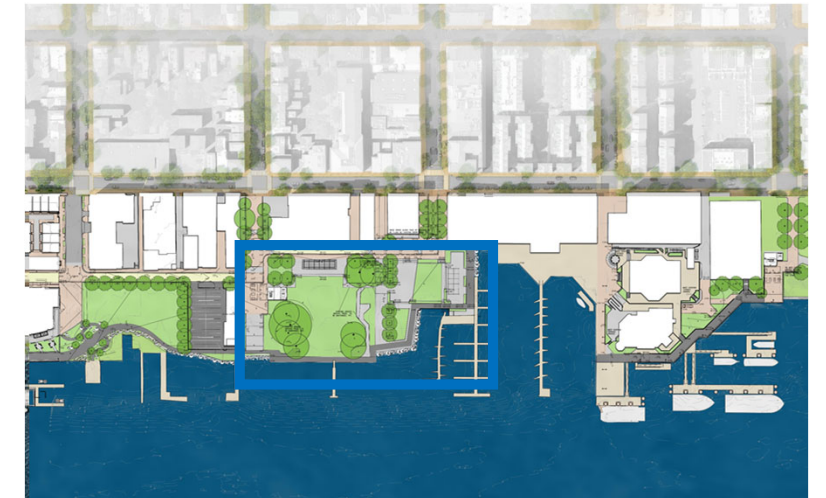


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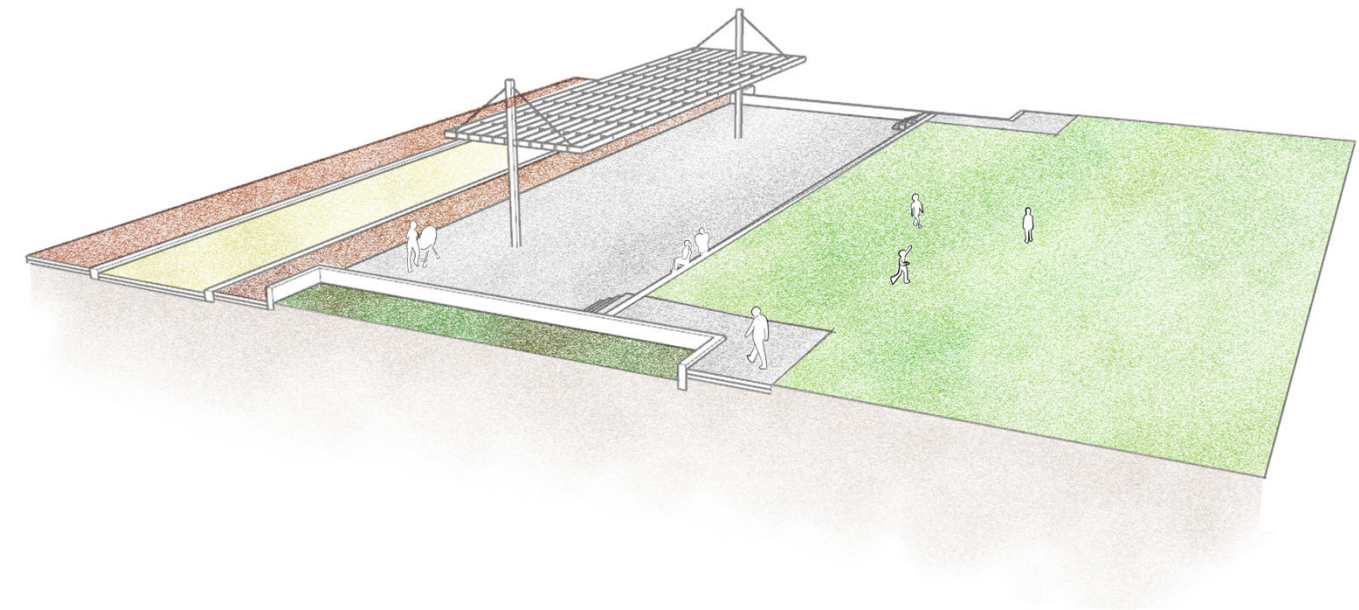
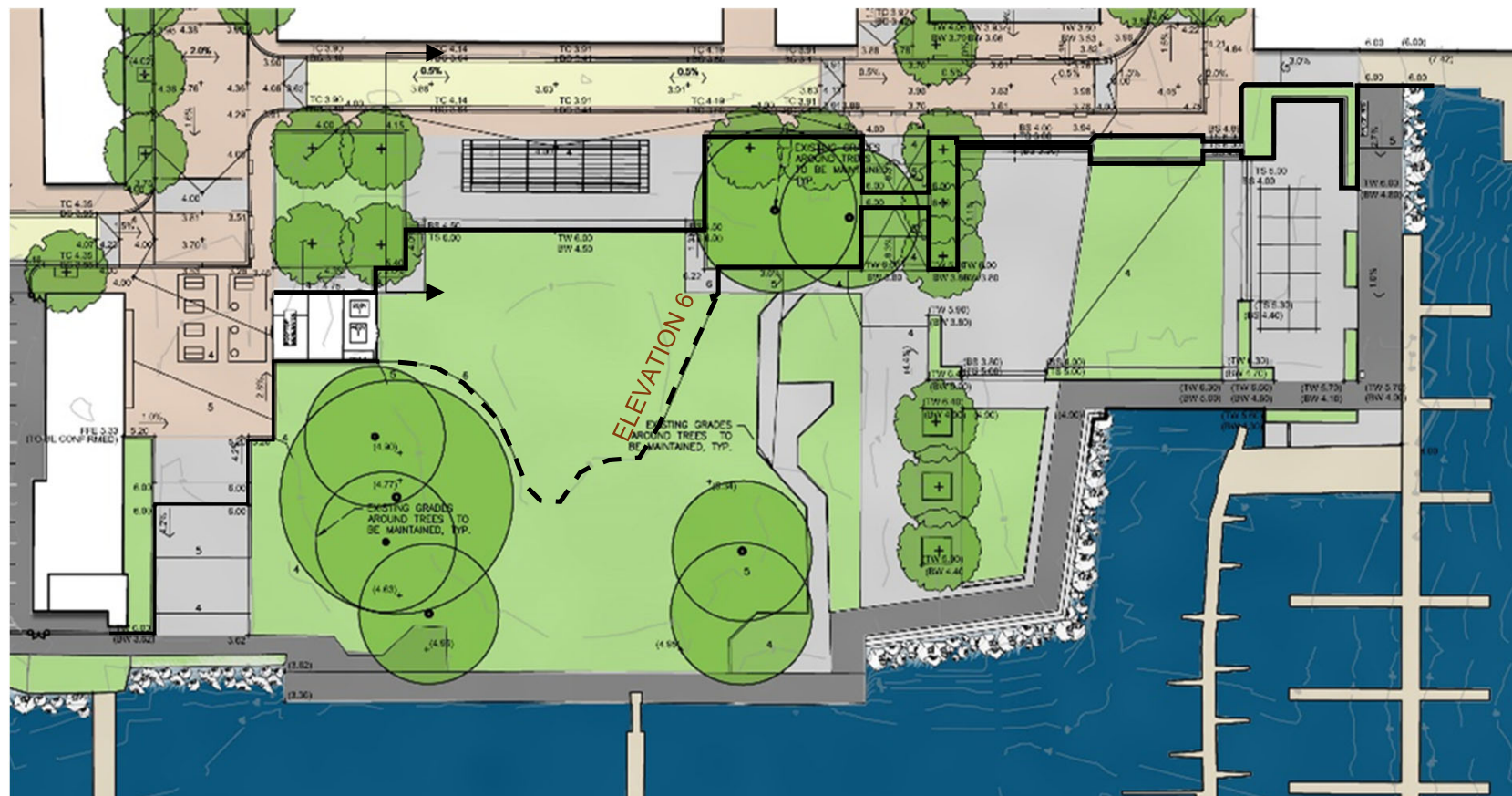
Add-On A: Landscape Based Flood Protection (Strand)

Waterfront Park and King Street Sq Improvements

- Incorporates stairs, ramps, and ha-ha walls
- Pump station



KEY PLAN

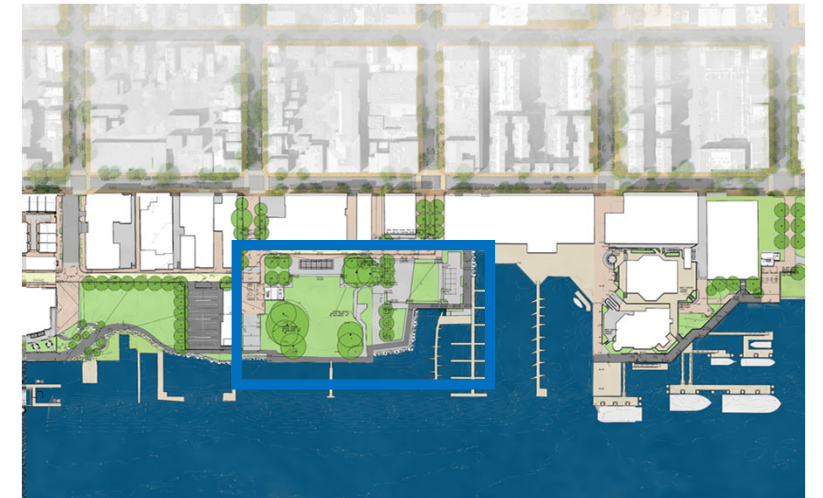


// Cost Based Option - 1

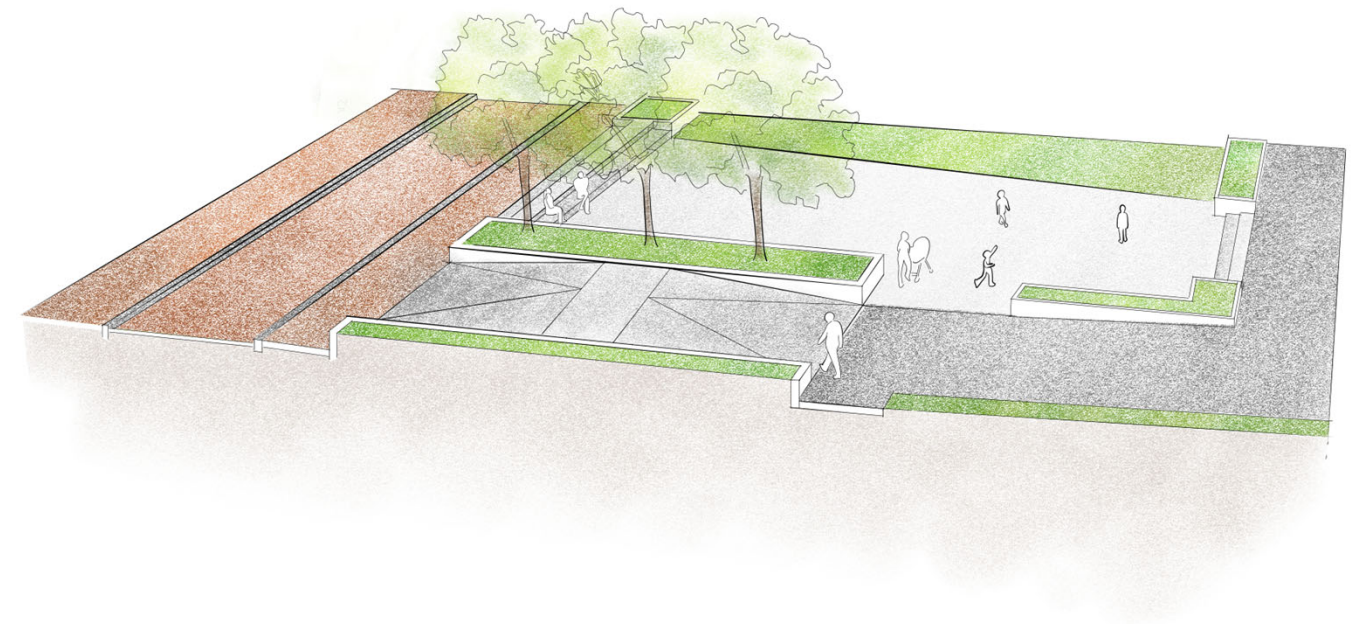
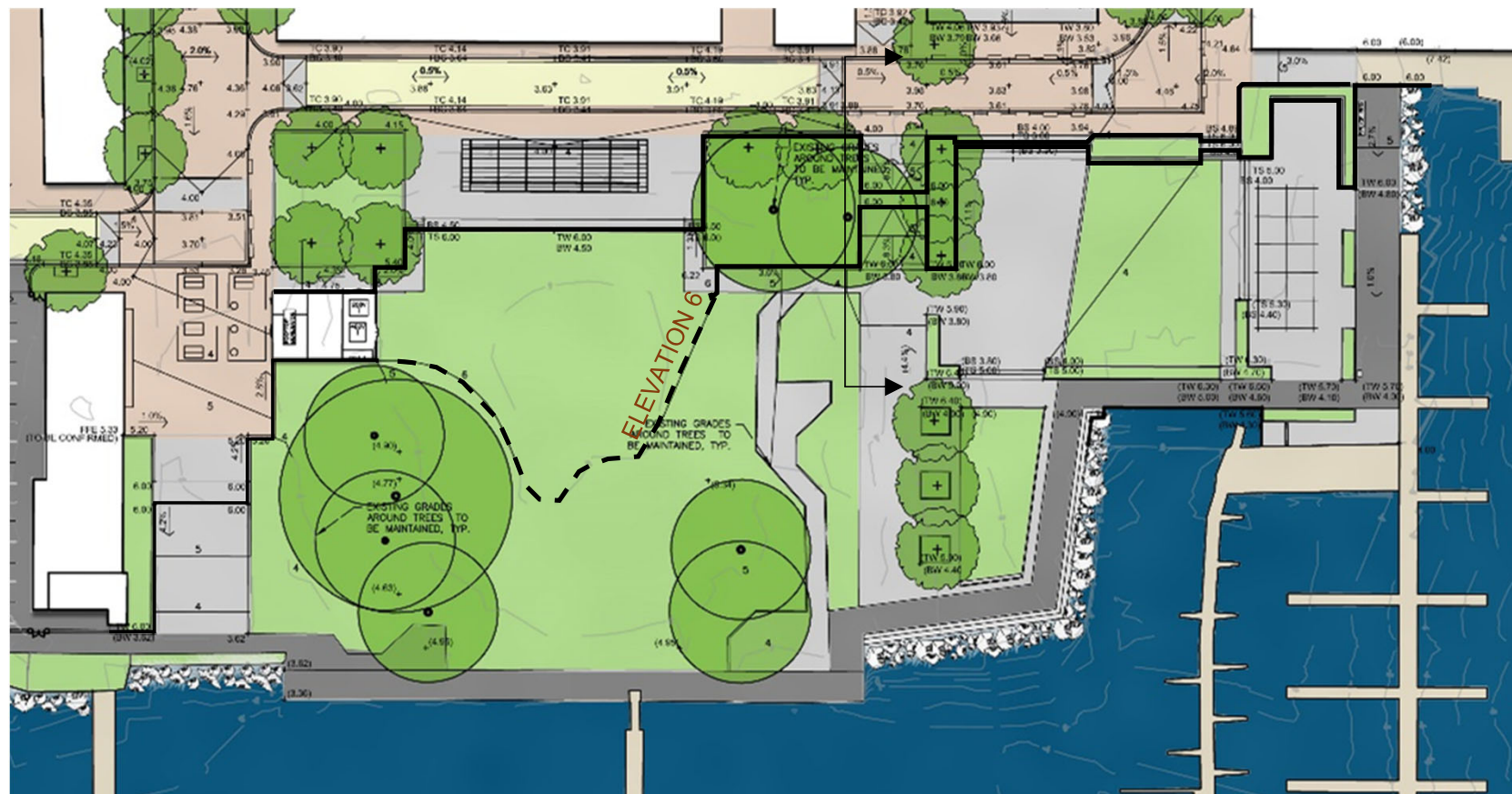
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- Incorporates stairs, ramps, and ha-ha walls
- Pump station



KEY PLAN

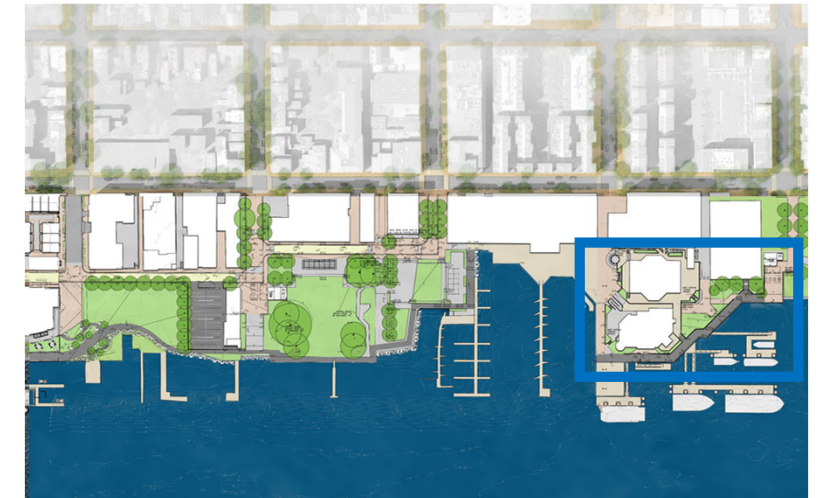


// Cost Based Option - 1

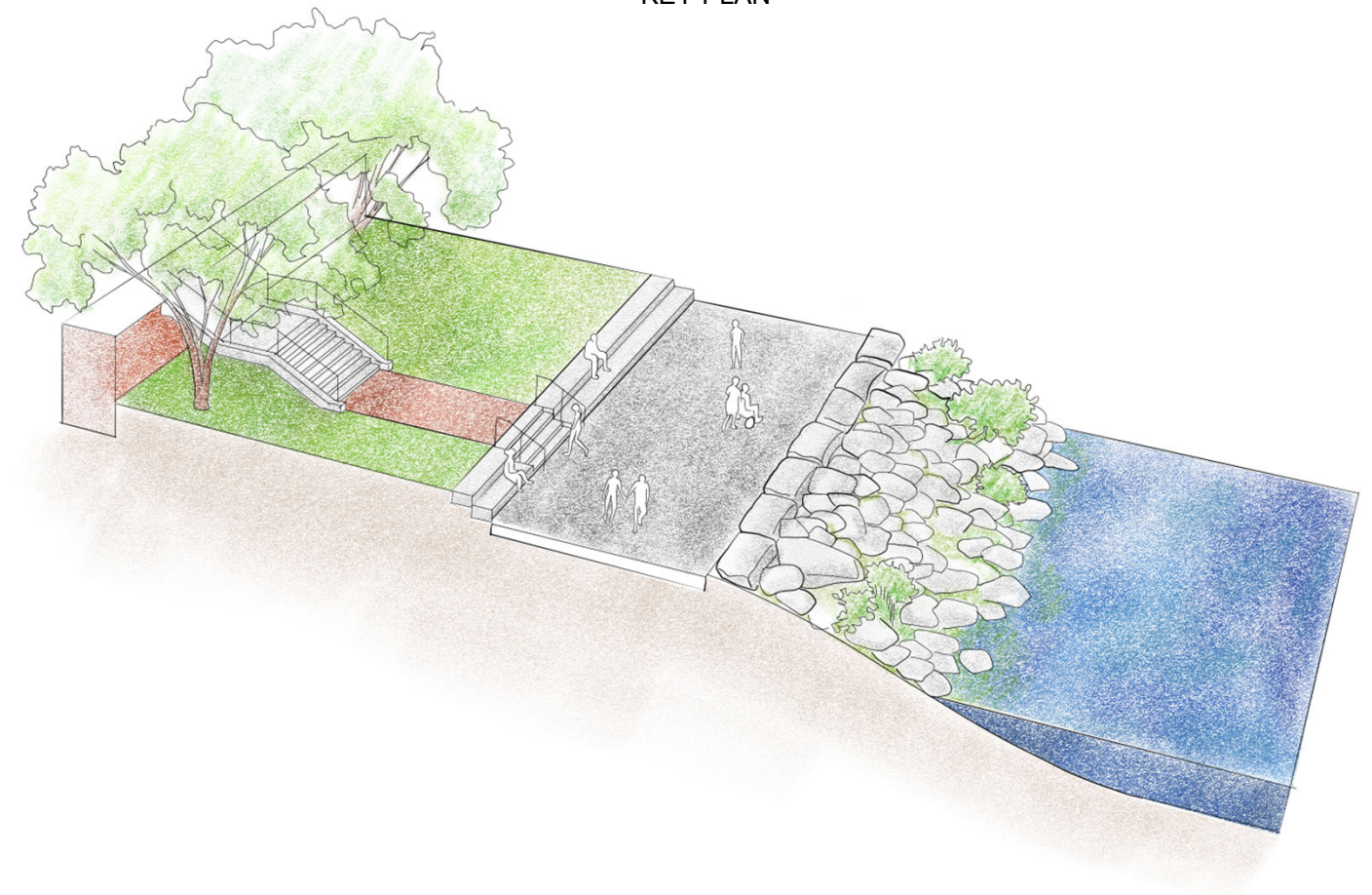
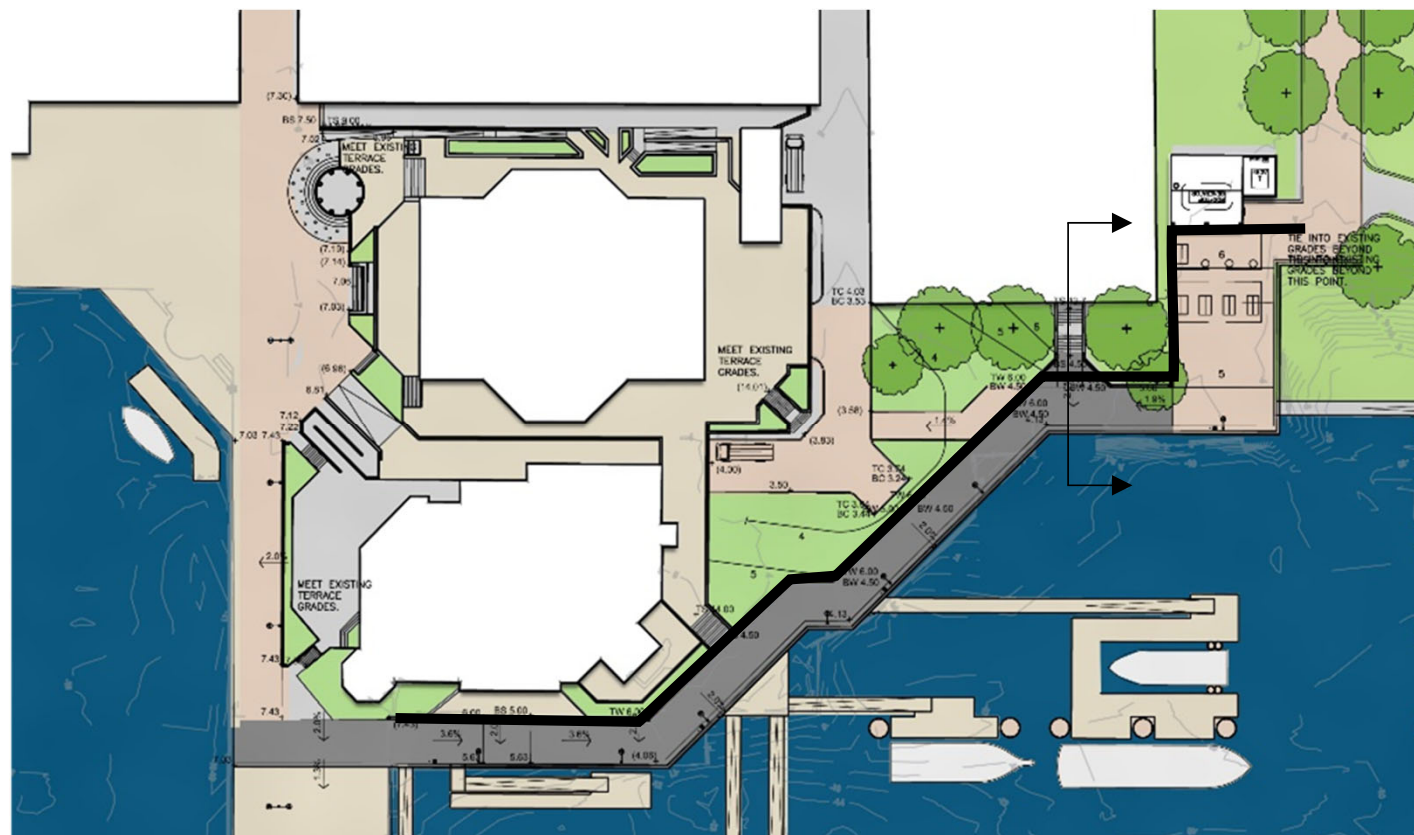
Add-On A: Landscape Based Flood Protection (Strand)

Thompsons Alley Improvements

- Ha-ha wall to promenade
- Pump Station
- Maintain existing waterfront promenade



KEY PLAN



// Cost Based Option - 1

Add-On B: Landscape Based Flood Protection (River)

LANDSCAPE ELEMENTS PROVIDE 6' ELEVATION FLOOD PROTECTION

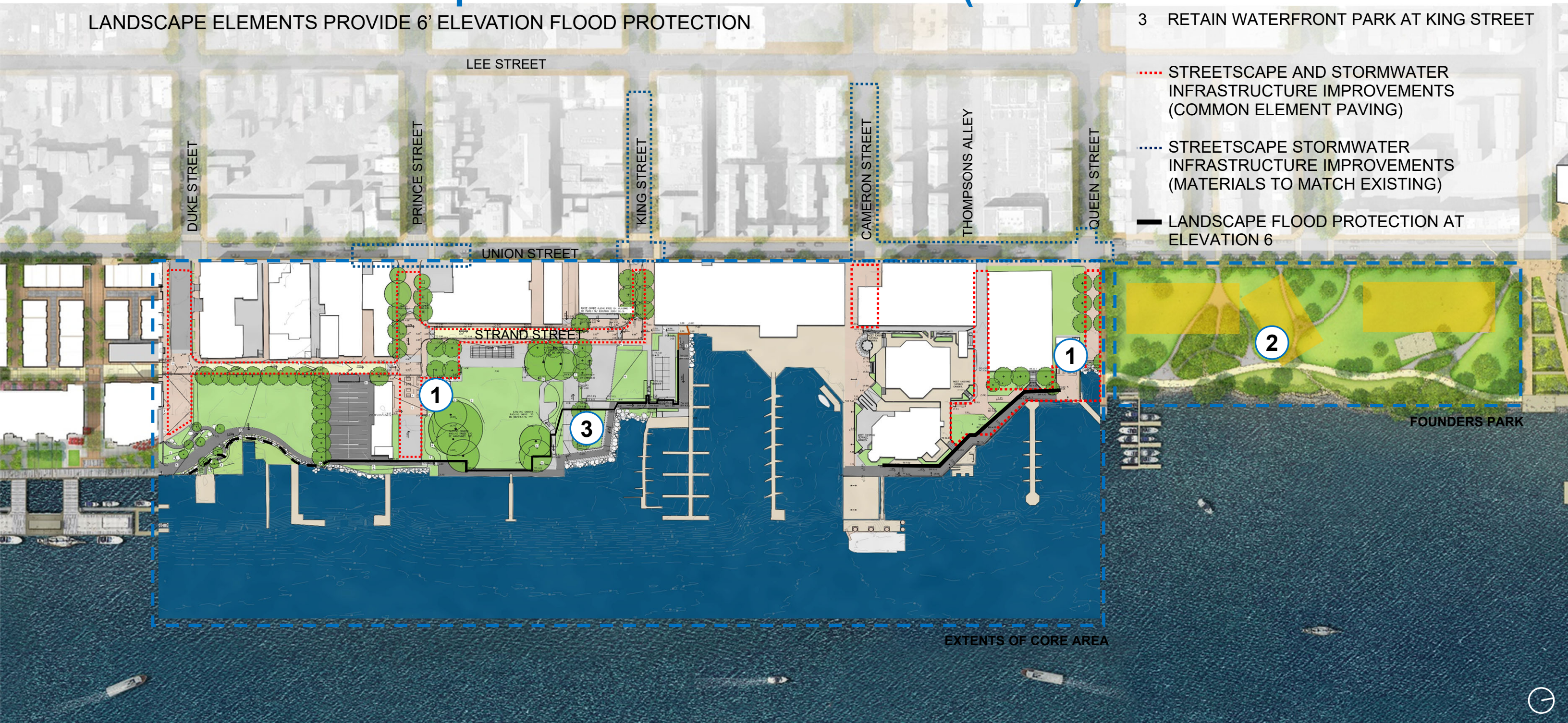
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--- STREETScape AND STORMWATER INFRASTRUCTURE IMPROVEMENTS (COMMON ELEMENT PAVING)

--- STREETScape STORMWATER INFRASTRUCTURE IMPROVEMENTS (MATERIALS TO MATCH EXISTING)

— LANDSCAPE FLOOD PROTECTION AT ELEVATION 6



// Cost Based Option - 1

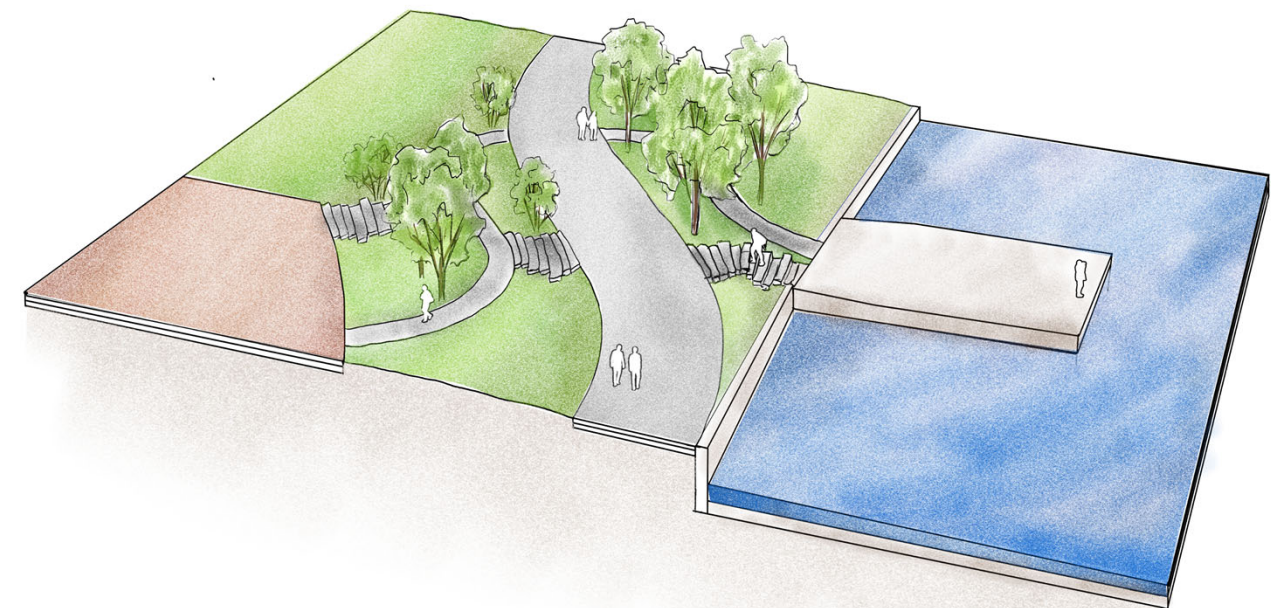
Add-On B: Landscape Based Flood Protection (River)

Point Lumley Park Improvements

- Extension of green space with new hardscape and landscape improvements
- New waterfront promenade
- Connection to Robinson Landing and Waterfront development to the north



KEY PLAN



// Cost Based Option – 1 With Add-On A or B

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- Address all flooding priorities and goals within existing CIP funding

BACKFLOW
of River Outfalls



INUNDATION
of Storm Sewers



OVERTOPPING



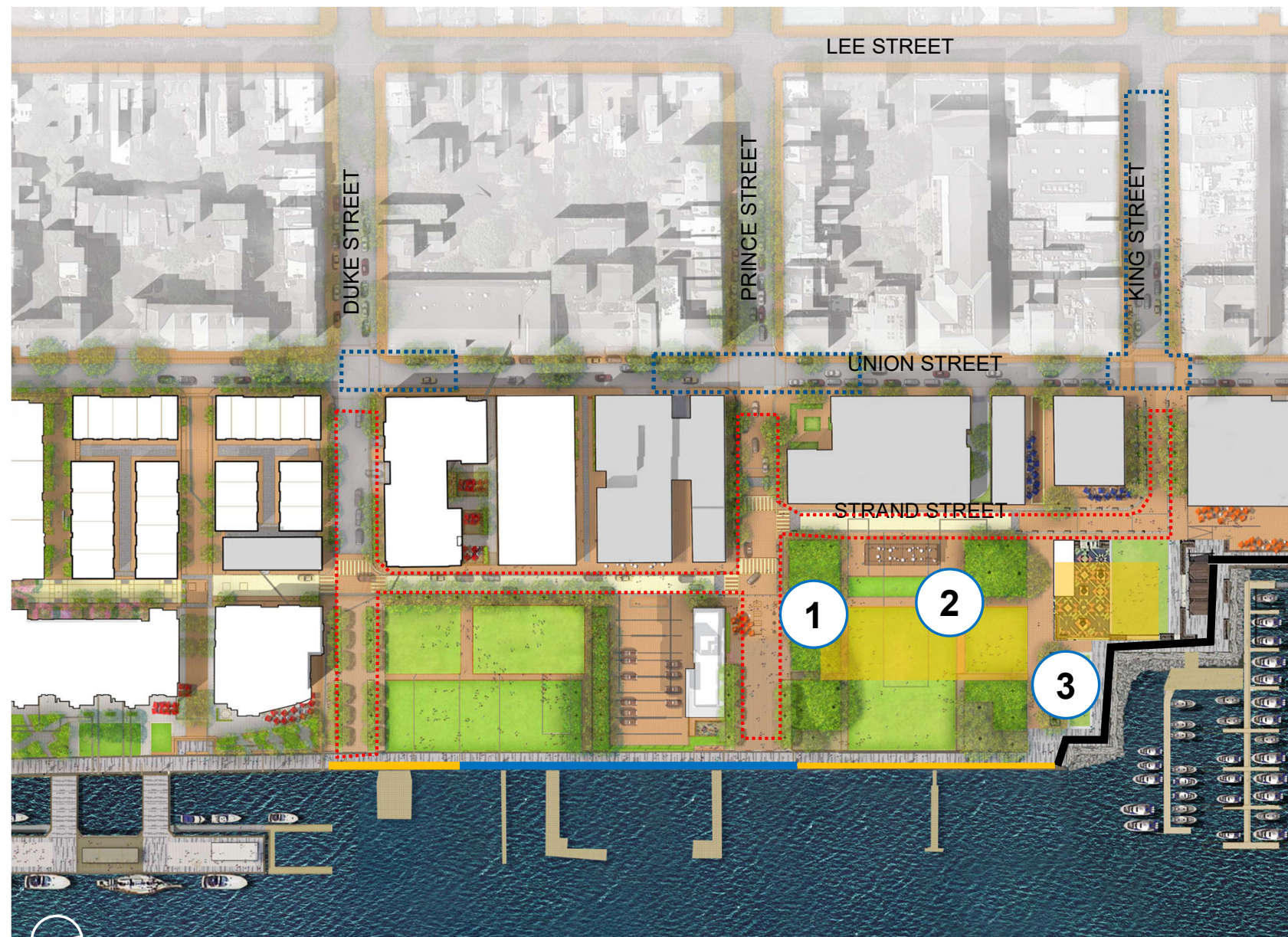
- **New landscape-based flood barrier at or near the existing shoreline**
- **New waterfront promenade at Point Lumley** and connection to existing promenade across Waterfront with minimal changes
- **Some landscape and hardscape park upgrades**; material improvements to make interim Waterfront Park a permanent park space
- Underground storage adds water quality benefits

Cost Based Option - 2

*Prioritizes all elements of flood mitigation from Duke St to King St.
Potential to realize the Core Area Waterfront Plan at Point Lumley,
Waterfront Park, and King Street Square within the City's CIP budget
of \$100M.*

// Cost-Based Option – 2

Duke to King Improvements;
Defers Northern Catchment Improvements



KEY PLAN

LEGEND

- 1 PUMP STATION
- 2 UNDERGROUND STORMWATER DETENTION CHAMBERS
- 3 RETAIN WATERFRONT PARK AT KING STREET
- STREETScape AND STORMWATER INFRASTRUCTURE IMPROVEMENTS (COMMON ELEMENT PAVING)
- STORMWATER INFRASTRUCTURE IMPROVEMENTS (MATERIALS TO MATCH EXISTING)
- LANDSCAPE FLOOD PROTECTION AT ELEVATION 6
- REUSE EXISTING BULKHEAD TO ACHIEVE ELEVATION 6
- NEW BULKHEAD WITH PROMENADE

// Project Expectations

- Does not meet flood mitigation goals from Duke to King Street



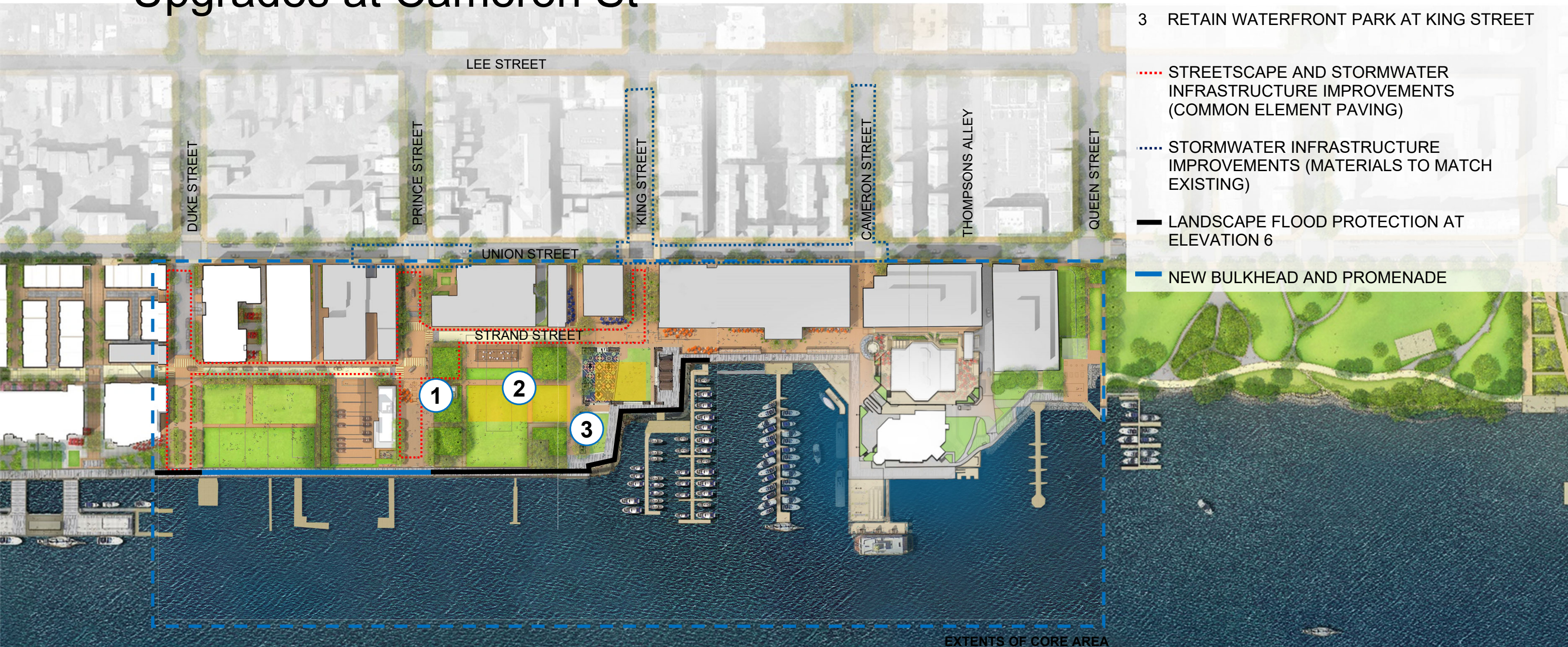
- No improvements north of King to Queen Street, including stormwater infrastructure and pumping stations, new bulkhead or Thompsons Alley Park

// A Potential for Improvement Adds Stormwater Upgrades at Cameron St

LEGEND

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- 2 UNDERGROUND STORMWATER DETENTION CHAMBERS
- 3 RETAIN WATERFRONT PARK AT KING STREET

- STREETSCAPE AND STORMWATER INFRASTRUCTURE IMPROVEMENTS (COMMON ELEMENT PAVING)
- STORMWATER INFRASTRUCTURE IMPROVEMENTS (MATERIALS TO MATCH EXISTING)
- LANDSCAPE FLOOD PROTECTION AT ELEVATION 6
- NEW BULKHEAD AND PROMENADE



External Project Funding Opportunities

External Funding Opportunities

- **Virginia Community Flood Preparedness Fund**

- Fund established to provide support for regions/localities to reduce impacts of flooding
- The Fund's cost share would cover 50% (or up to \$10 million) of planning and design costs.
- A total of \$17 million is available
- Anticipate a lower award amount than requested

- **Building Resilient Infrastructure and Communities (BRIC) Grant Program**

- Pre-disaster hazard mitigation program to incentivize new, innovative large infrastructure projects that build resilient communities and reduce risks from all hazards.
- Grant up to 75% or a max of \$50 Million per project mostly for construction costs.
- FY 2021 funding is \$1 billion
- Award notification is expected July 2022

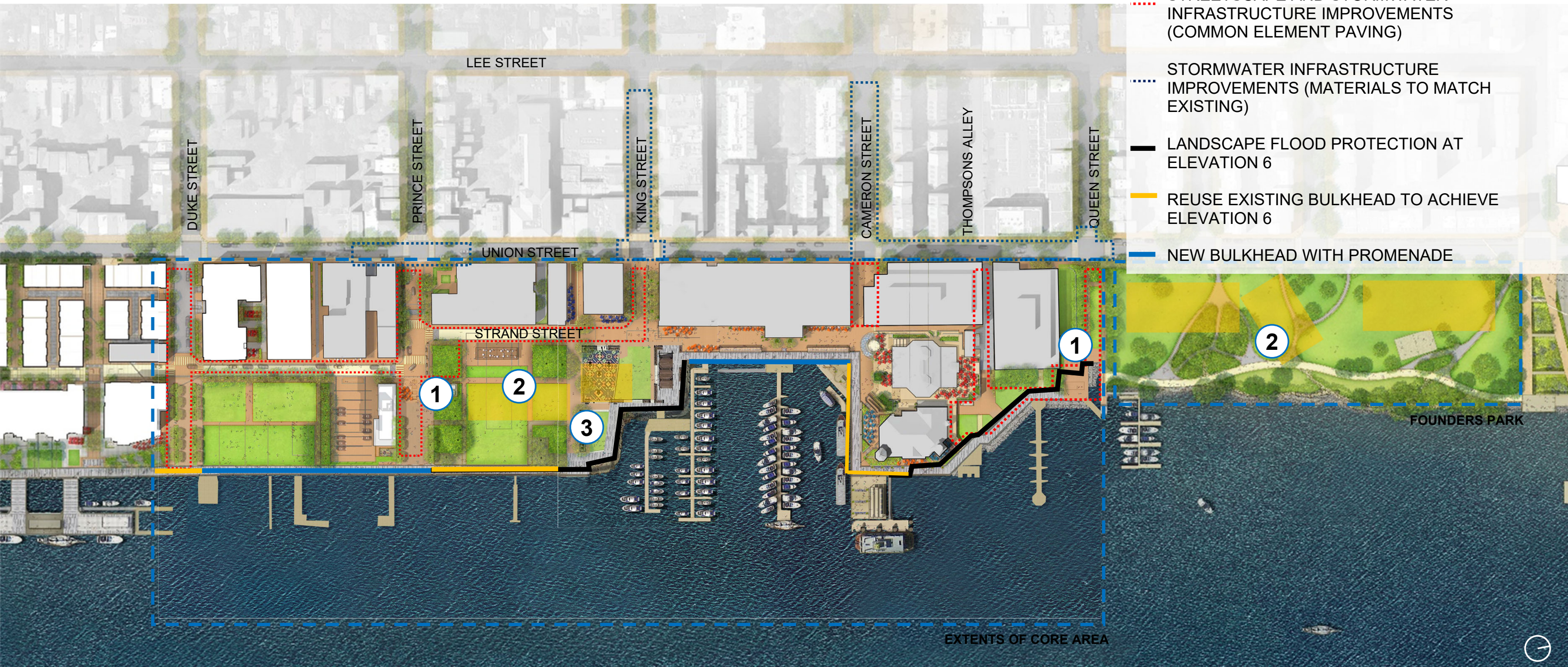
Performance Alternative A

Prioritizes flood protection in the form of streetscape and stormwater infrastructure improvements, pump stations, and overtopping protection at El. +6ft with a 20' wide promenade along the water's edge

// Performance Alternative A

LEGEND

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- 2 UNDERGROUND STORMWATER DETENTION CHAMBERS
- 3 RETAIN WATERFRONT PARK AT KING STREET
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- STORMWATER INFRASTRUCTURE IMPROVEMENTS (MATERIALS TO MATCH EXISTING)
- LANDSCAPE FLOOD PROTECTION AT ELEVATION 6
- REUSE EXISTING BULKHEAD TO ACHIEVE ELEVATION 6
- NEW BULKHEAD WITH PROMENADE



// Project Expectations

- Adapts value engineering and innovation solutions to satisfy flood mitigations goals while reducing the capacity of both pumping stations

BACKFLOW
of River Outfalls



INUNDATION
of Storm Sewers



OVERTOPPING



- Maximize bulkhead reuse and landscape-based solutions for overtopping protection
- Provides new promenade with changes in shoreline only from Duke to Prince St
- Scales back community amenities, e.g., maintaining Interim Waterfront Park

// Project Cost Range

- Class 4 Level Estimate: -30% to +50%
 - Total Estimated Project Cost: \$170M
 - Total Estimated Project Cost Range: \$120M - \$255M

There is an opportunity for cost savings by minimizing new bulkhead construction and using landscape-based solutions for flood protection while still providing a new promenade.

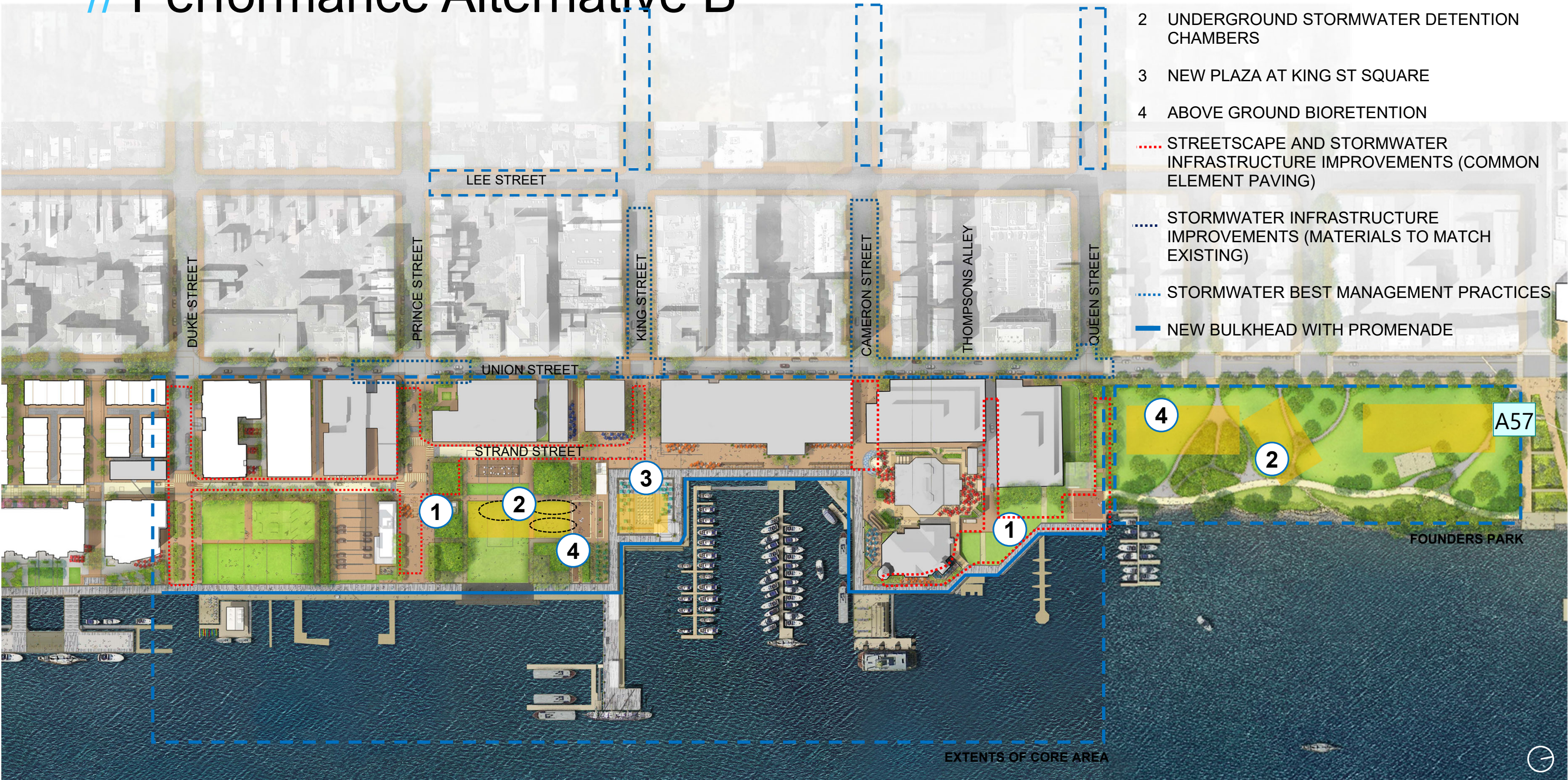
Performance Alternative B

Achieves all objectives of the 2014 City Council approved Waterfront Plan while improving the overall resilience and sustainability of the Project without significantly adding cost

// Performance Alternative B

LEGEND

- 1 PUMP STATION
- 2 UNDERGROUND STORMWATER DETENTION CHAMBERS
- 3 NEW PLAZA AT KING ST SQUARE
- 4 ABOVE GROUND BIORETENTION
- STREETScape AND STORMWATER INFRASTRUCTURE IMPROVEMENTS (COMMON ELEMENT PAVING)
- STORMWATER INFRASTRUCTURE IMPROVEMENTS (MATERIALS TO MATCH EXISTING)
- STORMWATER BEST MANAGEMENT PRACTICES
- NEW BULKHEAD WITH PROMENADE



// Performance Alternative B

Stormwater Best Management Practices

- Green infrastructure including permeable pavements and infiltration basins



KEY PLAN



// Project Expectations

- Incorporates more sustainable and resilient best practices while achieving the goals of the 2014 approved Waterfront Plan

BACKFLOW
of River Outfalls



INUNDATION
of Storm Sewers



OVERTOPPING



- Underground detention chambers, bioretention, and other stormwater best management practices enhance the Project's resiliency and sustainability while adding water quality benefits

// Project Cost Range

- Class 4 Level Estimate: -30% to +50%
 - Total Estimated Total Project Cost: \$215M
 - Total Estimated Project Cost Range: \$150M - \$322M

We can add value – sustainability metrics and resiliency best practices – to the project without significantly increasing the total project cost.

Exclusions from 2014 Endorsed Waterfront Plan

- Certain elements of the Project were excluded due to cost in the 2019 budget cycle:
 - King Street Pier
 - New Piers
 - Street End Gardens

Conceptual Cost Estimate Comparison

Cost Type	Baseline	Strengthened Sustainability / Resiliency
Estimated Cost	\$200M	\$215M
Low Range	\$140M	\$150M
High Range	\$300M	\$322M

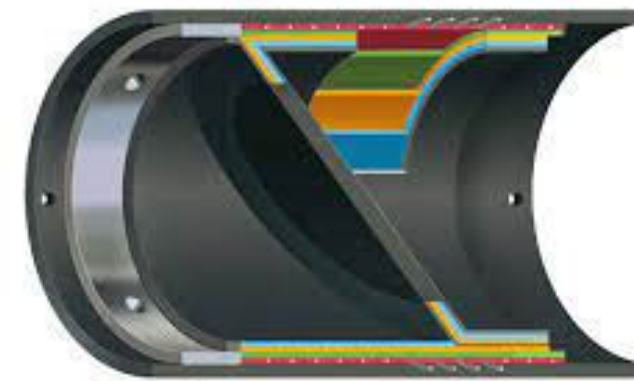
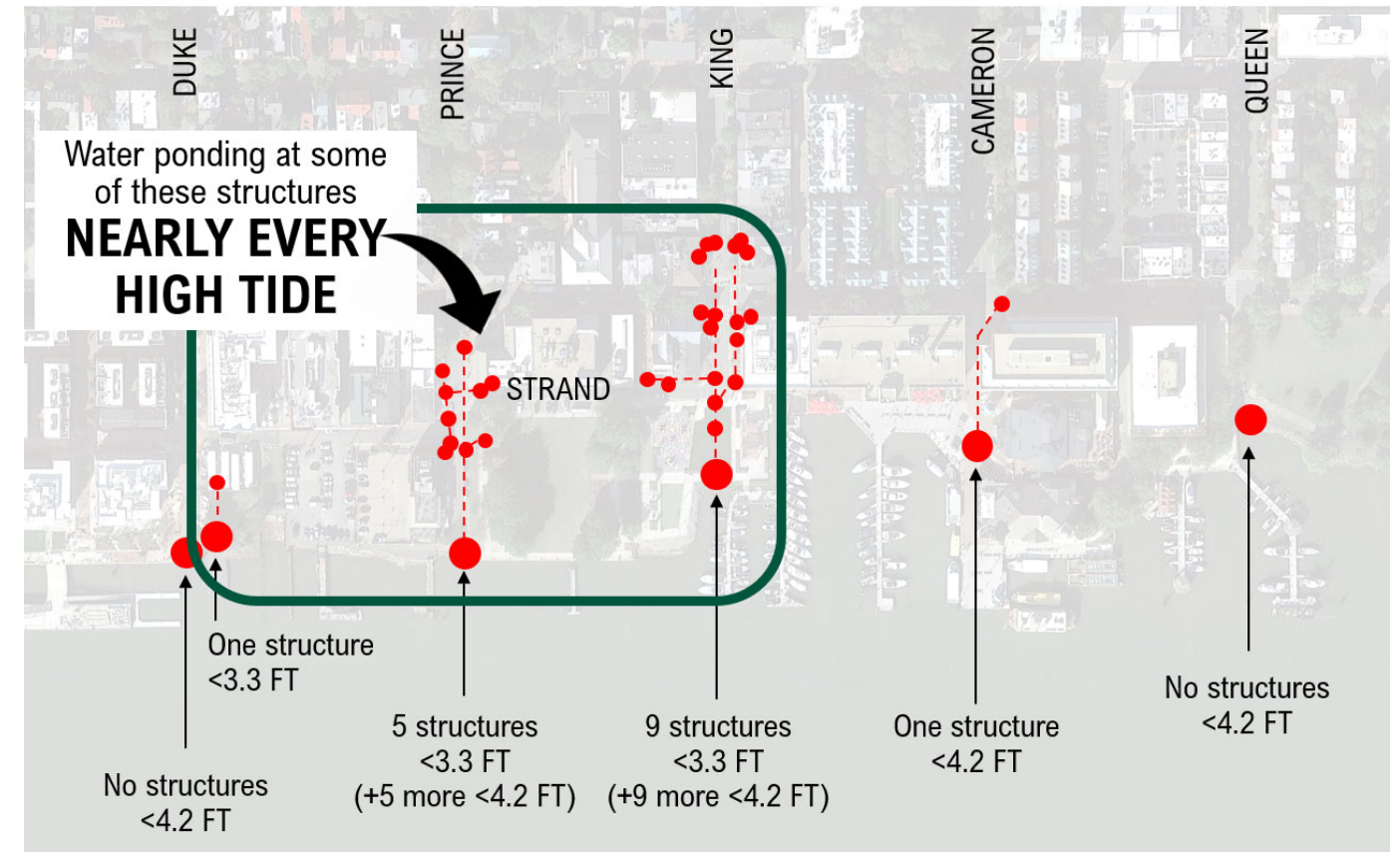
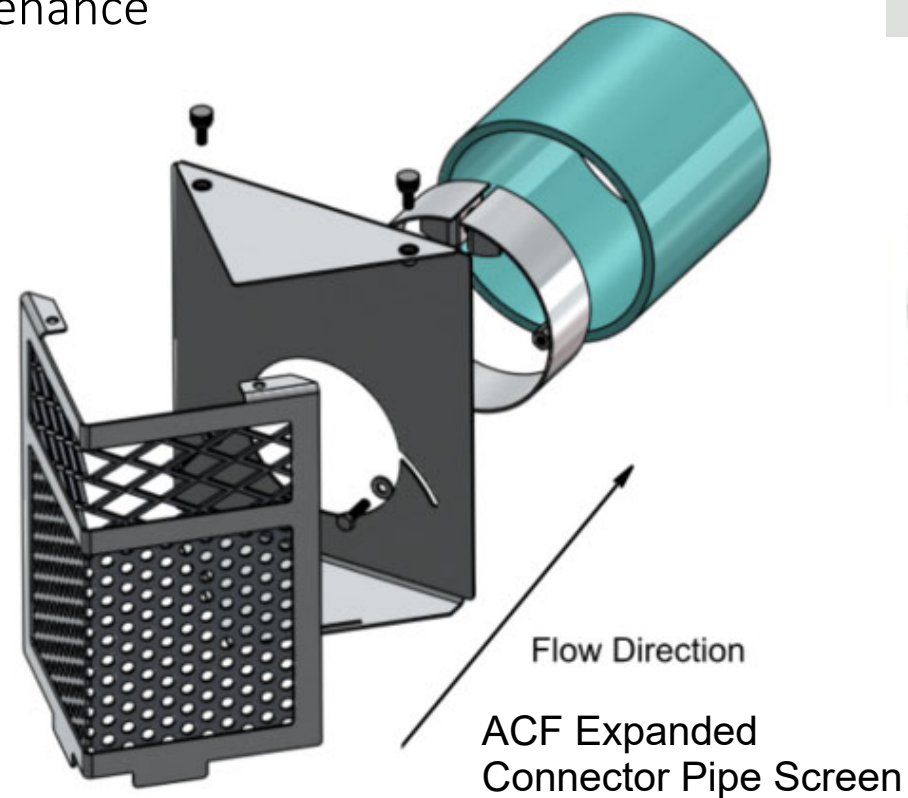
- We can strengthen the Waterfront Plan with more sustainable and resilient project elements without adding substantially to the project cost
- Class 4 Cost Estimate provides a -30% to 50% level of accuracy
- Both approaches exceed current CIP funding:
 - Reconciled Cost-based alternatives will be presented at next Subcommittee Meeting
 - City applying for external grant funding
 - Ongoing field investigations will assess further opportunities to reduce costs, e.g., bulkhead option, foundations, backfill, and material hauling and disposal

Next Steps

Quick Win Strategy

FY22 Rapid Deployment Control Measures:

- Installation of Backflow Prevention Solutions
 - Install at the terminus of the King Street and Prince Street Outfalls
 - Require upstream pretreatment and ongoing maintenance
 - Minimal disturbance to the Project Area during installation and maintenance



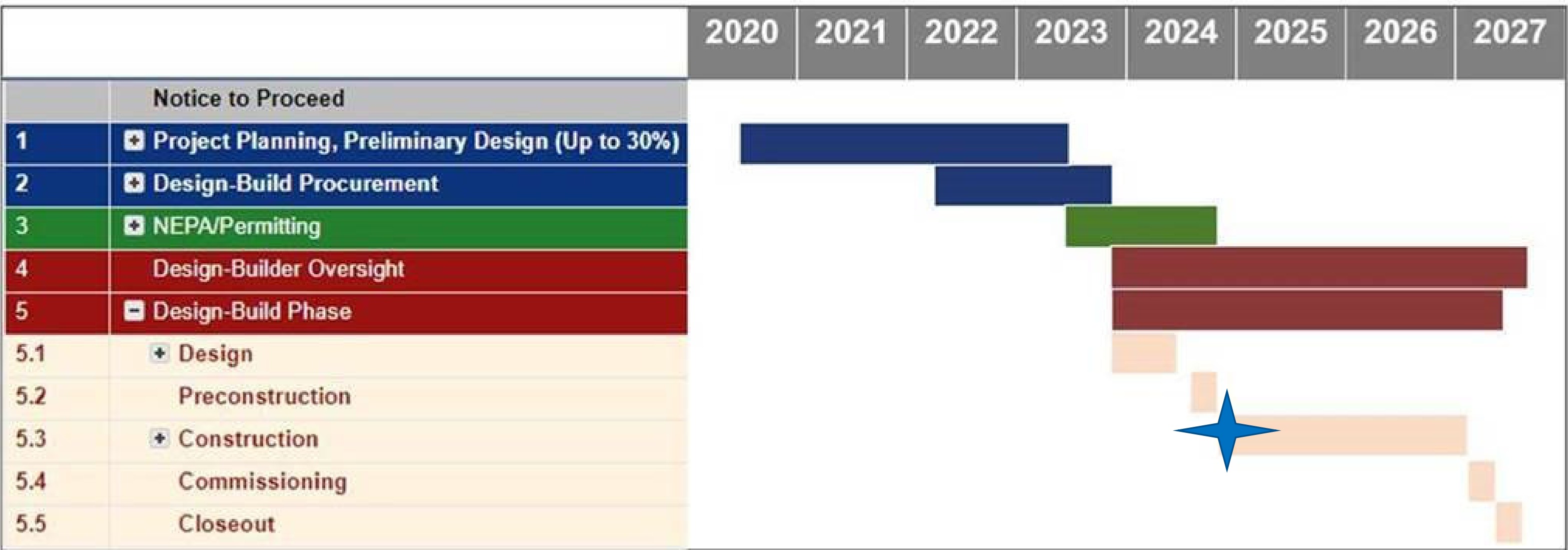
Red Valve Tideflex Valve



Immediate Next Steps

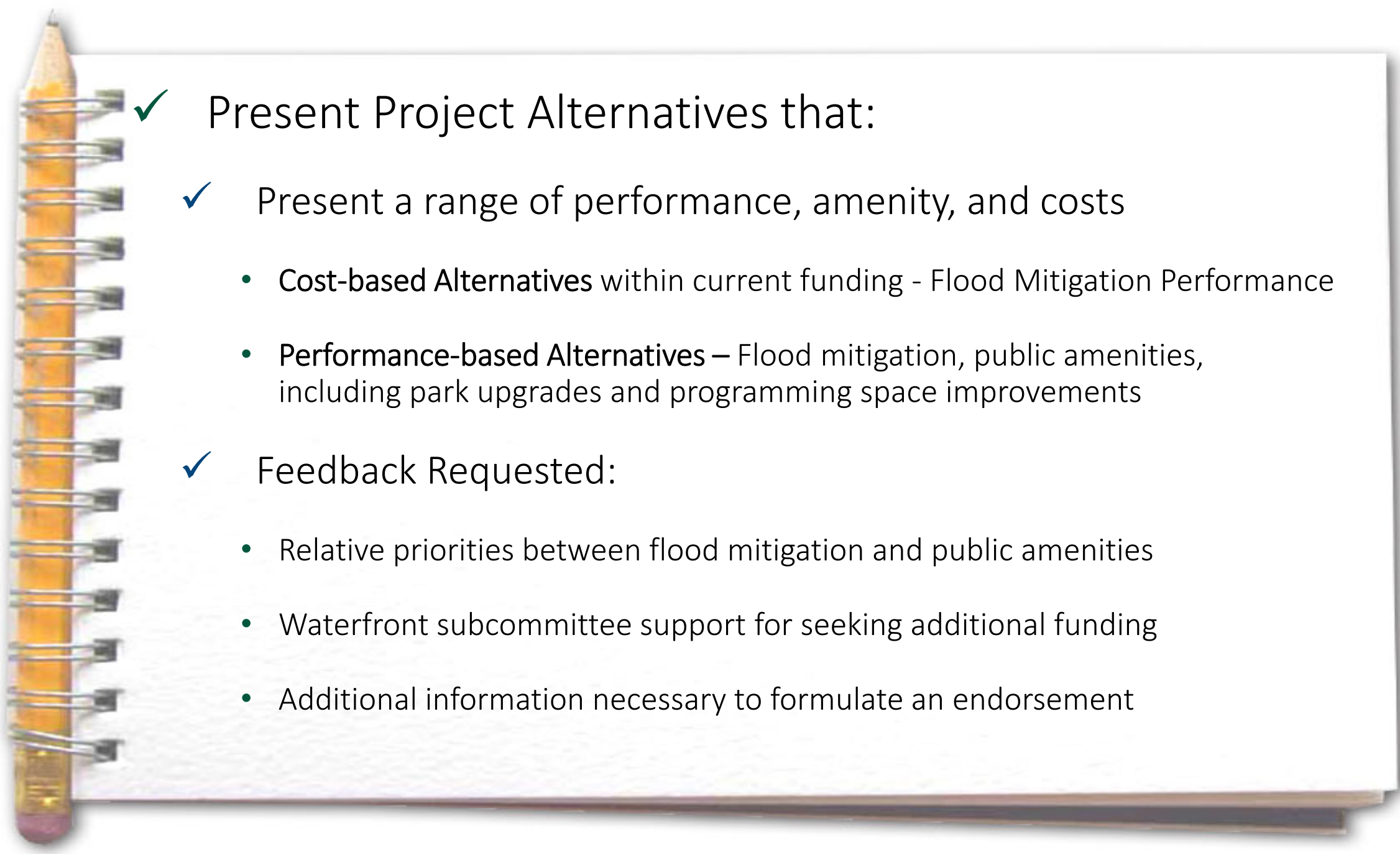
- **Ongoing field investigations**
 - Geotechnical testing and structural analysis
 - Survey
- **Evaluation and Refinement of Project Alternatives**
 - Community feedback
 - Field investigation data reports and engineering design recommendations
- **External funding opportunities**
 - FEMA – VDEM Building Resilient Infrastructure and Communities (BRIC) Program
 - DCR - Virginia Community Flood Preparedness Fund
- **Next Sub-Committee Meeting – TBD in November / December**

Timeline



★ Construction will commence AFTER City’s 275th birthday celebration

Meeting Objectives

- 
- ✓ Present Project Alternatives that:
 - ✓ Present a range of performance, amenity, and costs
 - Cost-based Alternatives within current funding - Flood Mitigation Performance
 - Performance-based Alternatives – Flood mitigation, public amenities, including park upgrades and programming space improvements
 - ✓ Feedback Requested:
 - Relative priorities between flood mitigation and public amenities
 - Waterfront subcommittee support for seeking additional funding
 - Additional information necessary to formulate an endorsement

Flood Mitigation Sub-Committee Feedback:

Requesting specific feedback and support of Project Alternatives, including concepts and approaches:

- **Working in a range of solutions depending on various funding realities, but fundamental project elements:**
 - **Landscape-based flood protection**
 - Prefer protection at the Waterfront? or along the Strand?
 - Cost-based 1 or Cost-based 2 (to determine if additional investigation warranted)
 - **Concealed stormwater chambers** – Founders Park
 - **Stormwater feature as Public Amenity** – Founders Park
 - Are some changes to site programming and visual aesthetic acceptable?
 - **Park Restoration and Improvements** – Founders Park
 - What would you recommend we change or improve in Founder Park?
- **May provide feedback now, at next Subcommittee meeting, or via email to: Matthew Landes via email: Matthew.Landes@AlexandriaVA.gov**