CITY OF ALEXANDRIA
Project Implementation

Waterfront Flood Mitigation Project Discussion

June 23, 2025

Draft, Deliberative, Pre-Decisional

AWA Alternative Concept:

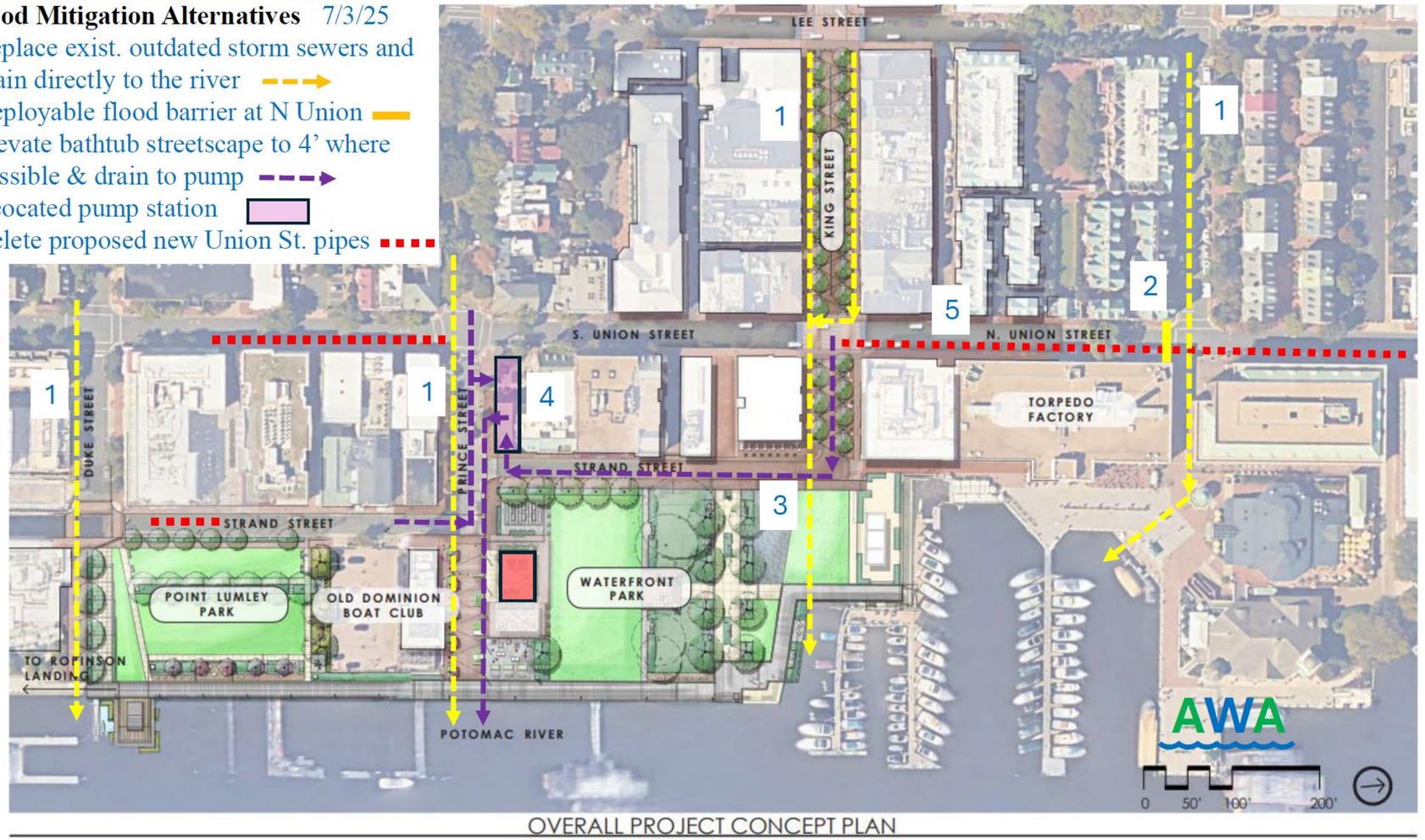
Stated Objectives

1) **Reduce the size & footprint of the pump station**
2) **Reduce community impacts**

Alexandria Waterfront Alliance

Flood Mitigation Alternatives 7/3/25

1. Replace exist. outdated storm sewers and drain directly to the river
2. Deployable flood barrier at N Union
3. Elevate bathtub streetscape to 4' where possible & drain to pump
4. Reocated pump station
5. Delete proposed new Union St. pipes



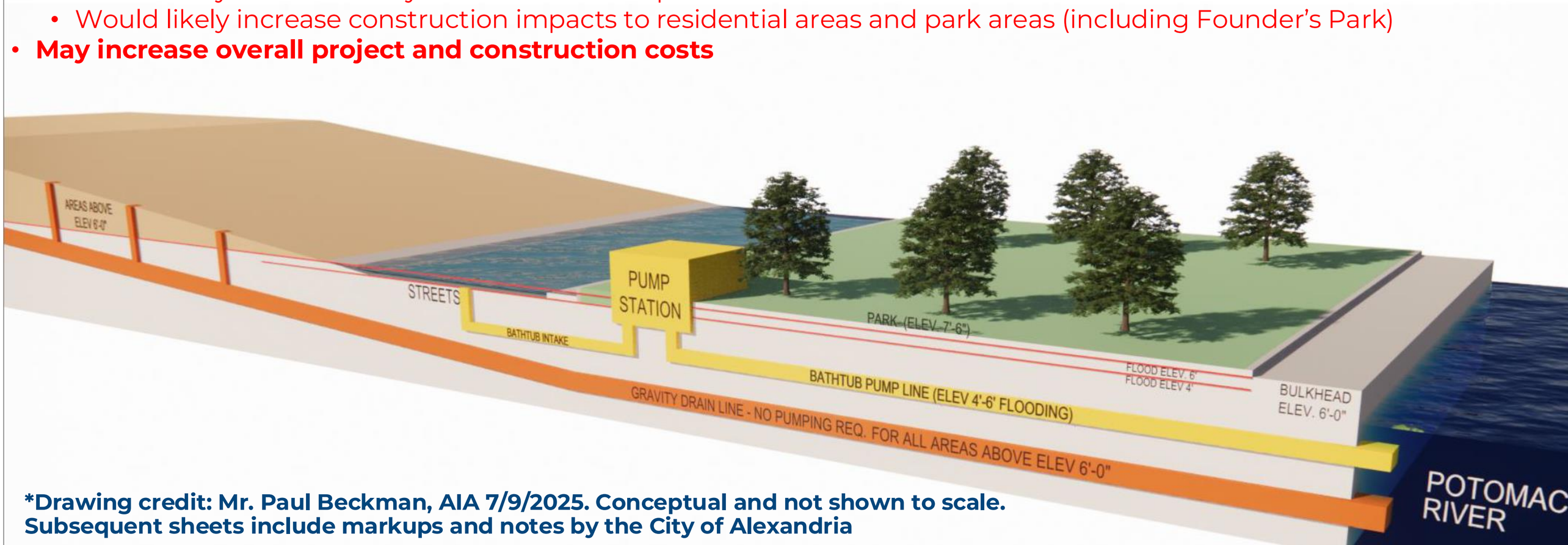
OVERALL PROJECT CONCEPT PLAN

*** Conceptual Drawing credit: Mr. Al Cox, AIA 7/3/2025. Subsequent sheets include markups and notes by the City of Alexandria**

AWA Alternative Concept

This theoretical concept proposes a dual stormwater system which, after evaluation by engineering analysis and modeling:

- **Does not substantially reduce the footprint/size of the pump station**
- **Increases construction impacts as compared to the City's current proposal:**
  - Would require deep excavations and deeper outfall structures than is feasible/sustainable
  - Would still requires phased street closures
  - Would likely increase utility conflicts and disruption due to relocations
  - Would likely increase construction impacts to residential areas and park areas (including Founder's Park)
- **May increase overall project and construction costs**



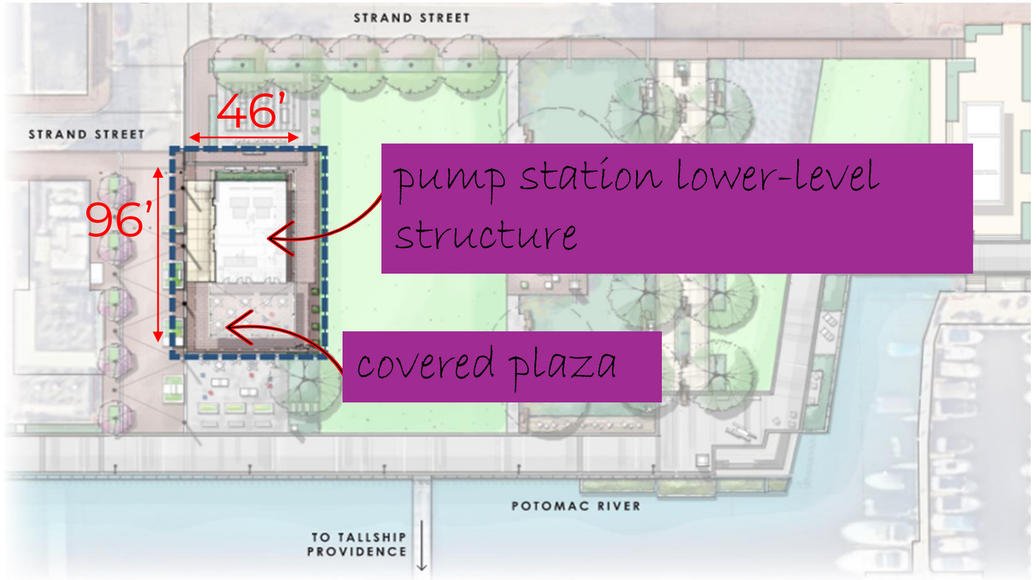
***Drawing credit: Mr. Paul Beckman, AIA 7/9/2025. Conceptual and not shown to scale.**
Subsequent sheets include markups and notes by the City of Alexandria

AWA Alternative Concept:

Pump Station Size Constraints

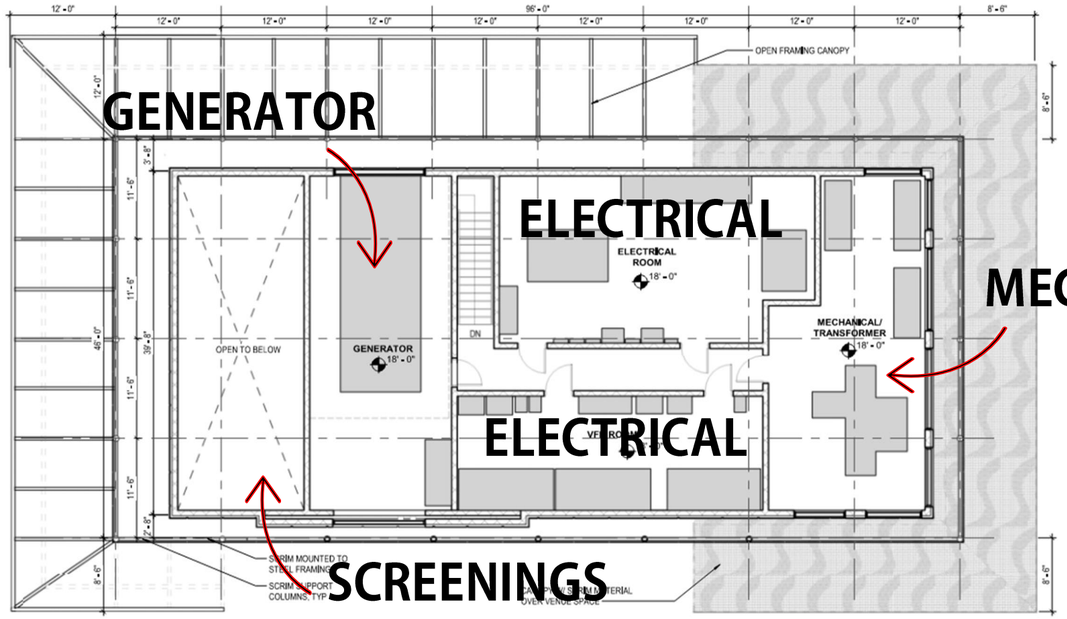
Waterfront Park Pump Station

Explaining the Numbers



The Pump Station footprint is approx. 96' x 46' (4,420 SF).

~~On~~ the lower level, the footprint includes a covered plaza supporting a portion of the second story.



MECHANICAL/ HVAC

The second floor sets the building footprint.

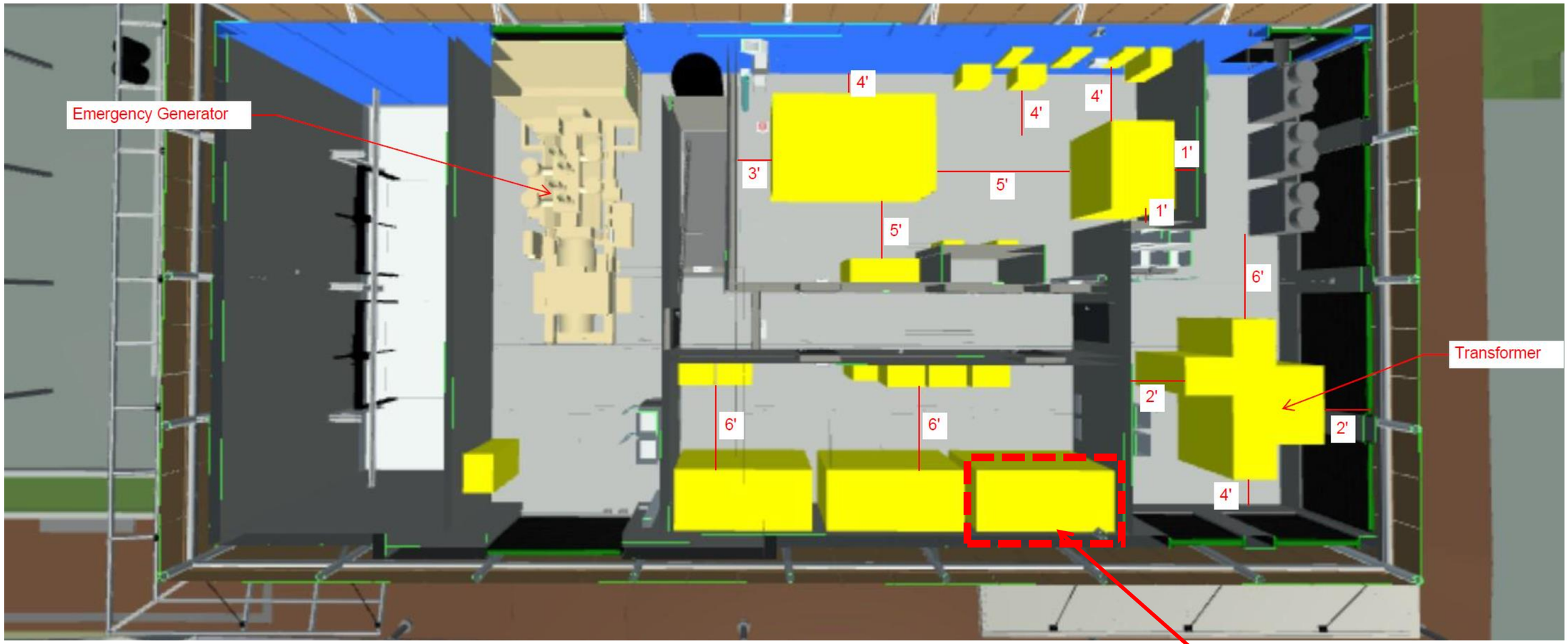
These rooms are fundamental to the operation of any pump station, regardless of flow/capacity.

AWA Alternative Concept:

Pump Station Size Constraints

Minimum Clearance Requirements per NEC and/or Equipment Manufacturer

Meeting the requirements prevents the 2nd floor from being reduced, even with the elimination of a VFD Pump Controller.



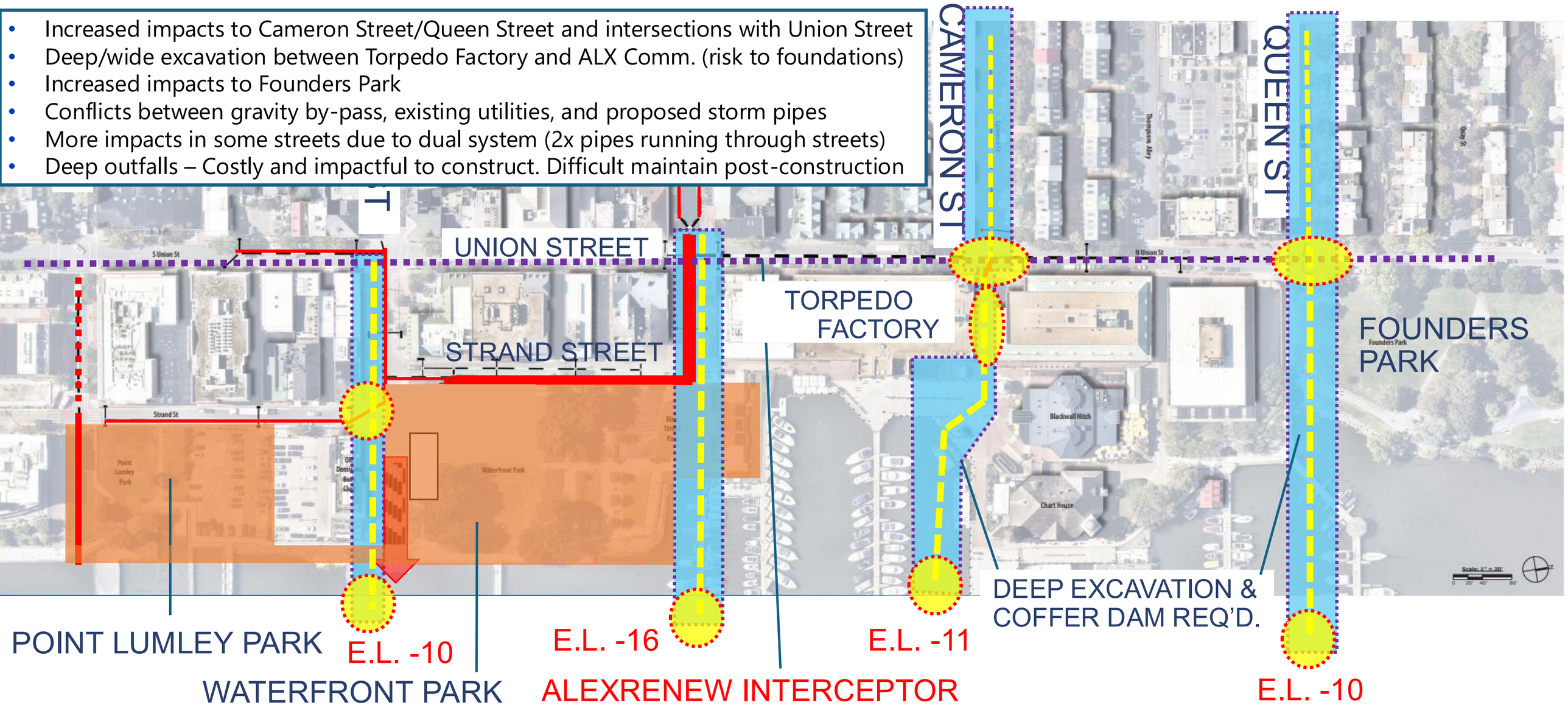
Even if we could reduce pump station pumping capacity by 50% (to ~ 115 MGD) - only one Pump/**VFD Pump Controller** would be eliminated.

This will not substantially reduce the size of the pump station as suggested by AWA.

Impacts of AWA Alternate Concept

This approach would be more impactful than the City's proposal.
Would still require deep excavation, long-term street closures, and additional impacts to street ends and park areas (including Founder's Park)

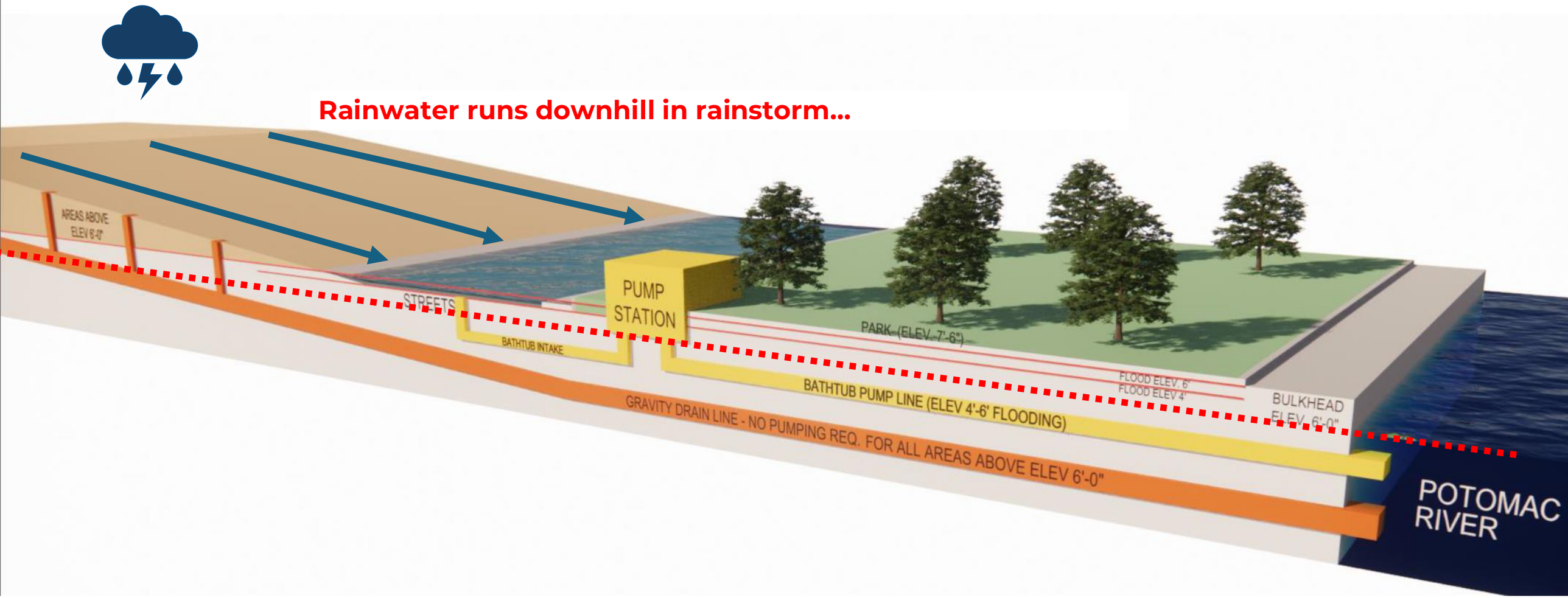
- Increased impacts to Cameron Street/Queen Street and intersections with Union Street
- Deep/wide excavation between Torpedo Factory and ALX Comm. (risk to foundations)
- Increased impacts to Founders Park
- Conflicts between gravity by-pass, existing utilities, and proposed storm pipes
- More impacts in some streets due to dual system (2x pipes running through streets)
- Deep outfalls – Costly and impactful to construct. Difficult maintain post-construction



Impacts of AWA Alternate Concept: Deep Excavation and Coffer Dam (example)

AWA Alternative Concept:

Capacity Constraints



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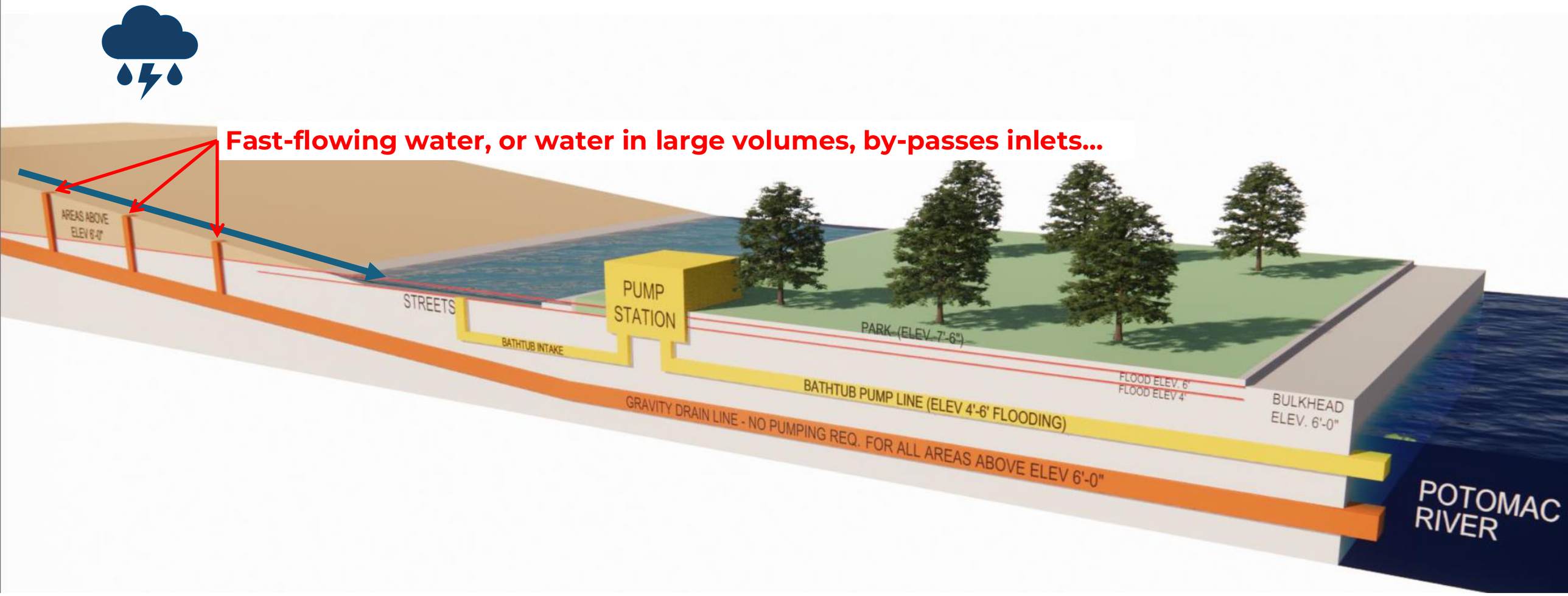
Capacity Constraints



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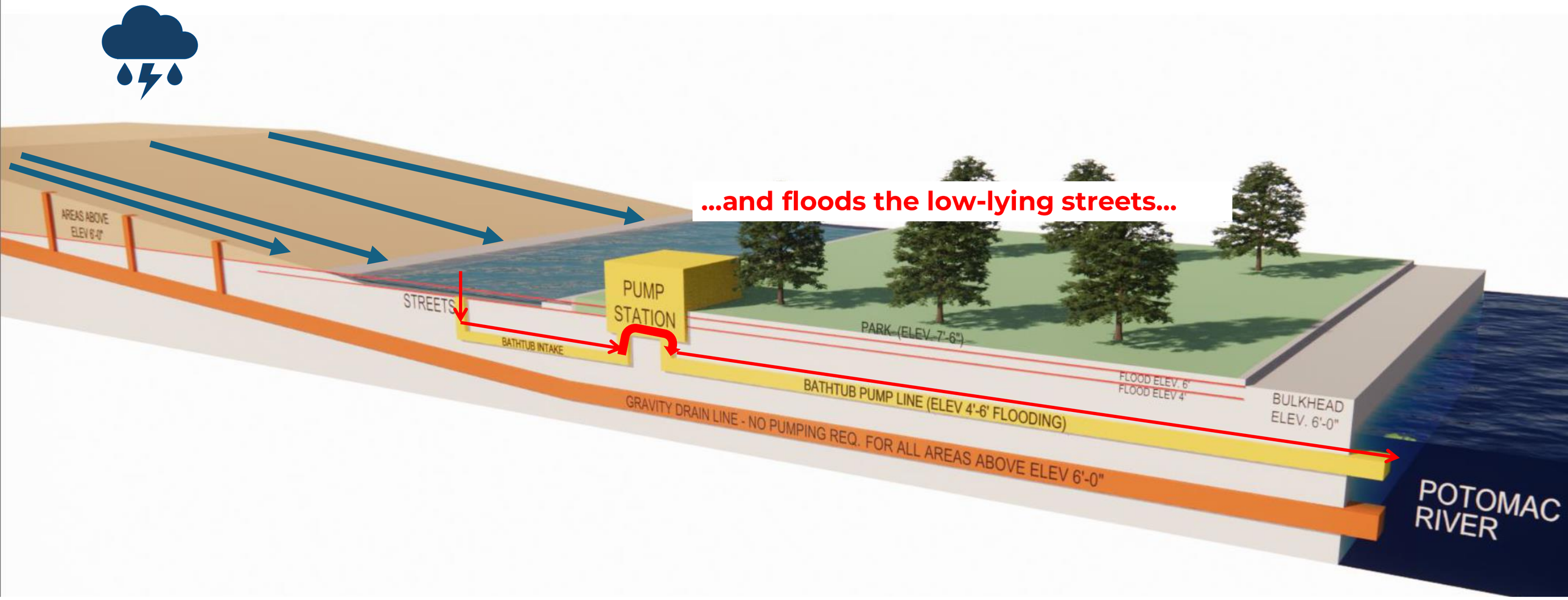

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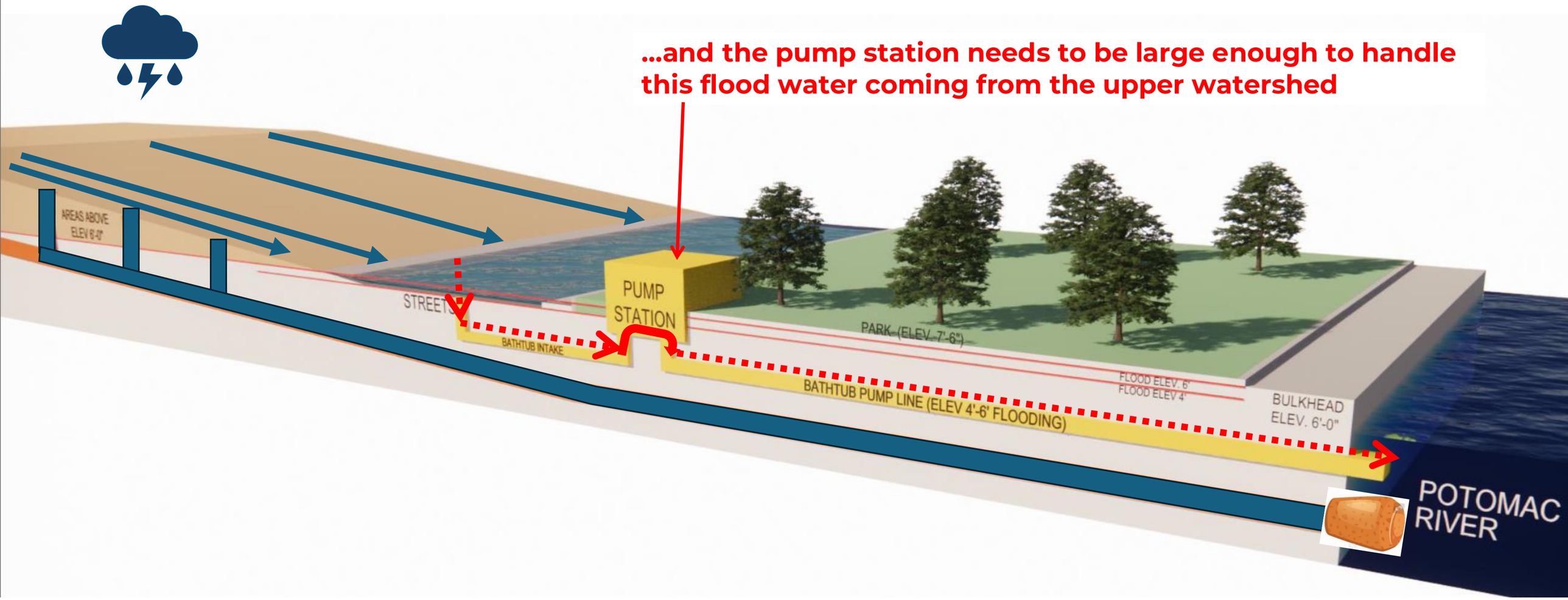
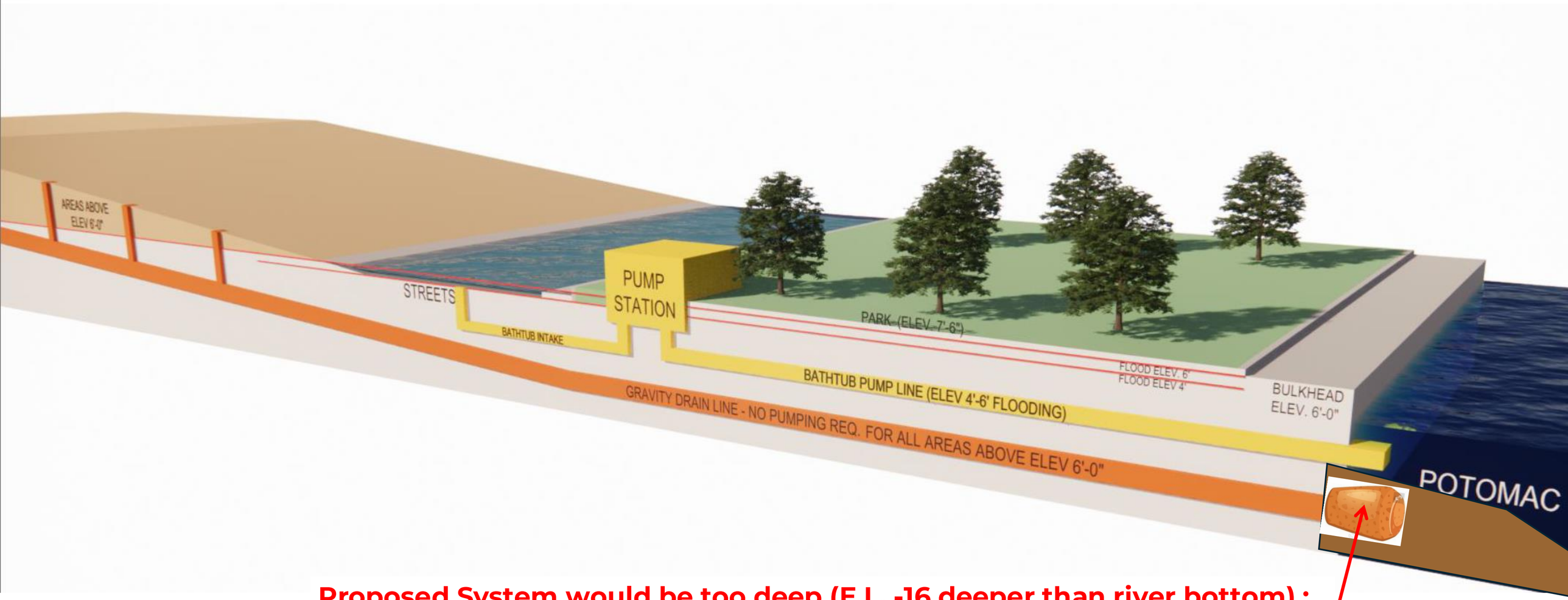


AWA Alternative Concept:

Gravity System & Tailwater Constraints



Proposed System would be too deep (E.L. -16 deeper than river bottom) :
Force of Potomac River and mudline will act like a giant drain plug

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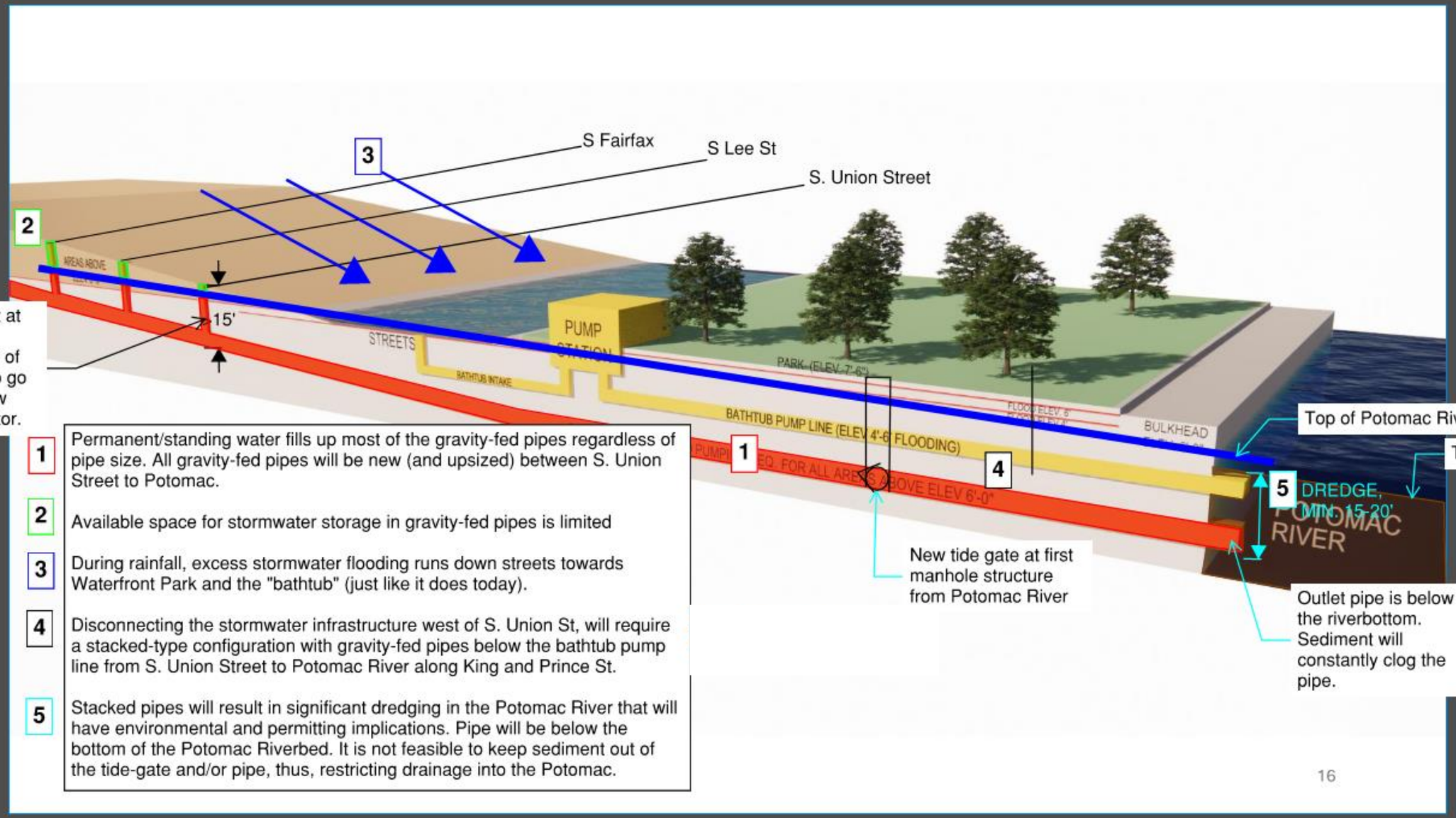
AWA Alternative Concept:

Gravity System Depth Constraints



Excavations start at S. Union. Min excavation depth of 15 ft is needed to go below AlexRenew sanitary interceptor.

1. Permanent/standing water fills up most of the gravity-fed pipes regardless of pipe size. All gravity-fed pipes will be new (and upsized) between S. Union Street to Potomac.
2. Available space for stormwater storage in gravity-fed pipes is limited
3. During rainfall, excess stormwater flooding runs down streets towards Waterfront Park and the "bathtub" (just like it does today).
4. Disconnecting the stormwater infrastructure west of S. Union St, will require a stacked-type configuration with gravity-fed pipes below the bathtub pump line from S. Union Street to Potomac River along King and Prince St.
5. Stacked pipes will result in significant dredging in the Potomac River that will have environmental and permitting implications. Pipe will be below the bottom of the Potomac Riverbed. It is not feasible to keep sediment out of the tide-gate and/or pipe, thus, restricting drainage into the Potomac.

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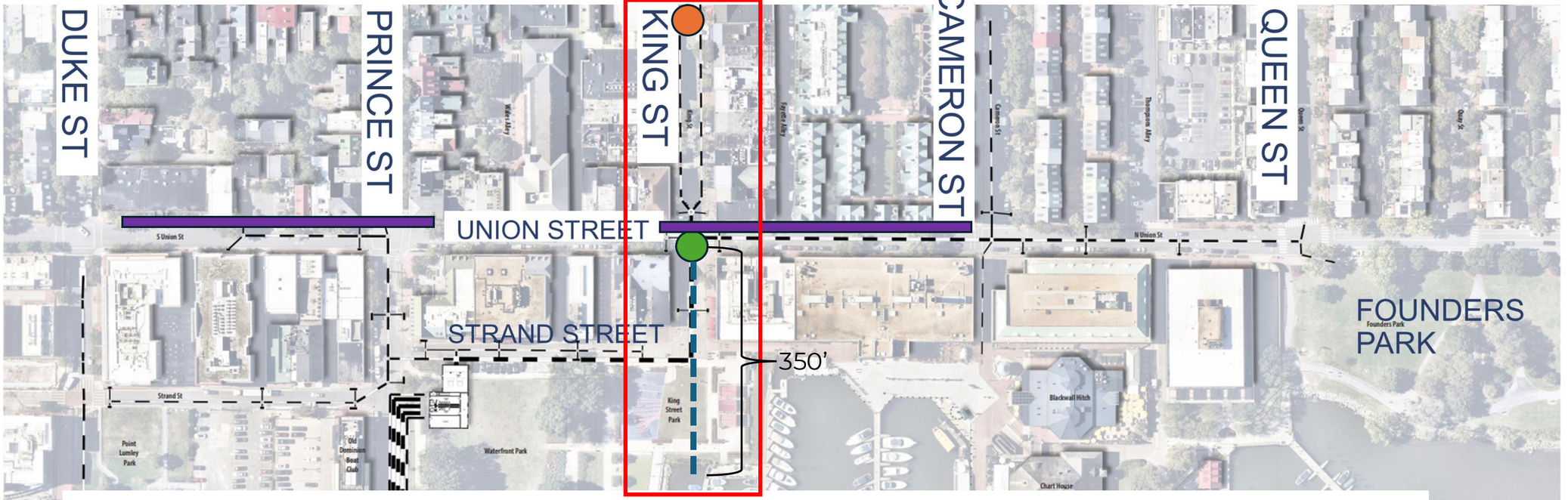
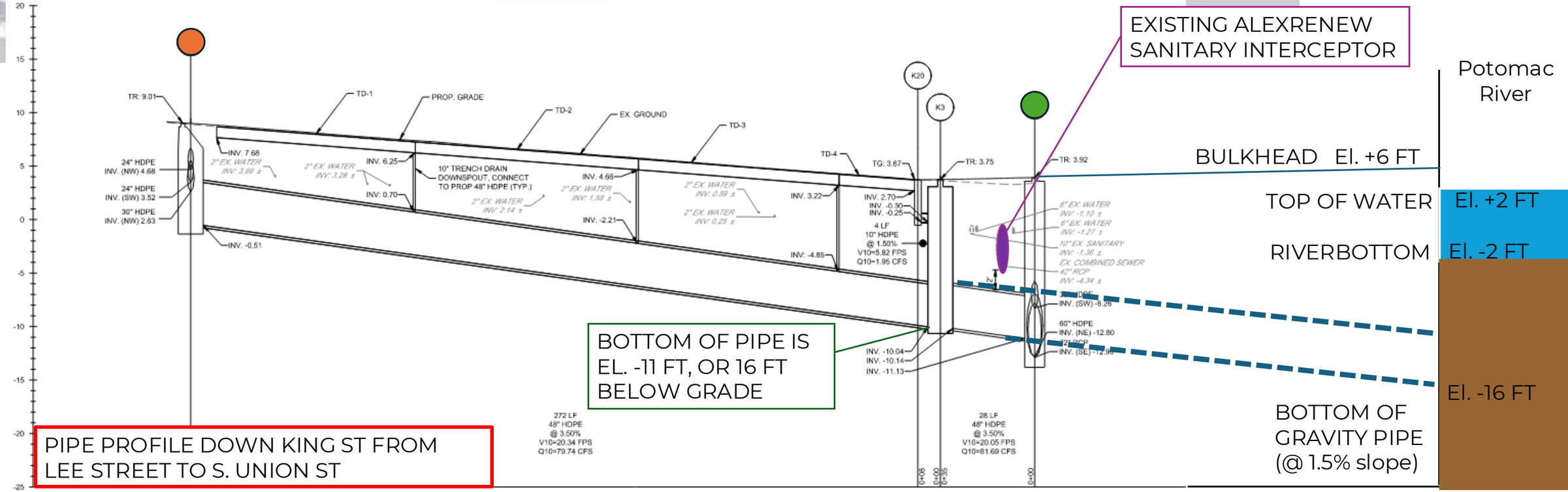
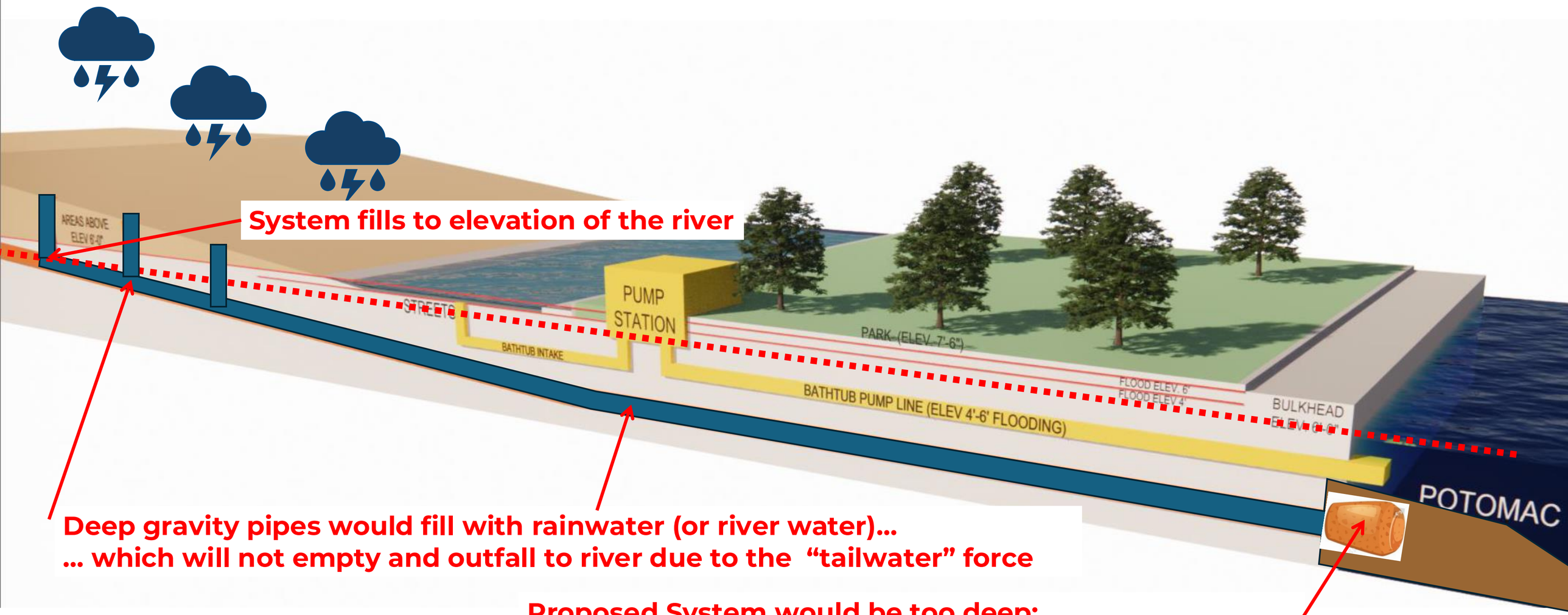

DUKE ST
PRINCE ST
KING ST
CAMERON ST
QUEEN ST
UNION STREET
STRAND STREET
350'
FOUNDERS PARK
S Union St
N Union St
Strand St
King Street Park
Waterfront Park
Point Lumley Park
Old Dominion Boat Club
Blackwall Hitch
Chart House


EXISTING ALEXRENEW SANITARY INTERCEPTOR
Potomac River
BULKHEAD El. +6 FT
TOP OF WATER El. +2 FT
RIVERBOTTOM El. -2 FT
El. -16 FT
BOTTOM OF GRAVITY PIPE (@ 1.5% slope)
BOTTOM OF PIPE IS EL. -11 FT, OR 16 FT BELOW GRADE
PIPE PROFILE DOWN KING ST FROM LEE STREET TO S. UNION ST
TR: 9.01
TD-1
PROP. GRADE
TD-2
EX. GROUND
TD-3
TD-4
TG: 3.67
TR: 3.75
TR: 3.92
K20
K3
24" HDPE
INV. (NW) 4.68
24" HDPE
INV. (SW) 3.52
30" HDPE
INV. (NW) 2.63
INV. 7.68
INV. 6.25
INV. 0.70
INV. -0.51
10' TRENCH DRAIN
DOWNSPOUT, CONNECT
TO PROP 48" HDPE (TYP.)
INV. 4.66
INV. -2.21
INV. 3.22
INV. -4.85
INV. 2.70
INV. -0.30
INV. -0.25
4 LF
10" HDPE
@ 1.50%
V10=5.82 FPS
Q10=1.95 CFS
272 LF
48" HDPE
@ 3.50%
V10=20.34 FPS
Q10=79.74 CFS
28 LF
48" HDPE
@ 3.50%
V10=20.05 FPS
Q10=81.69 CFS
INV. -10.04
INV. -10.14
INV. -11.13
60" HDPE
INV. (NE) -12.80
INV. (SE) -12.96
INV. (SW) -8.26
0+00
0+08
0+35
0+40

AWA Alternative Concept:

Gravity System & Tailwater Constraints



System fills to elevation of the river

Deep gravity pipes would fill with rainwater (or river water)…
… which will not empty and outfall to river due to the "tailwater" force

Proposed System would be too deep:
Potomac River and mudline acts like a giant drain plug

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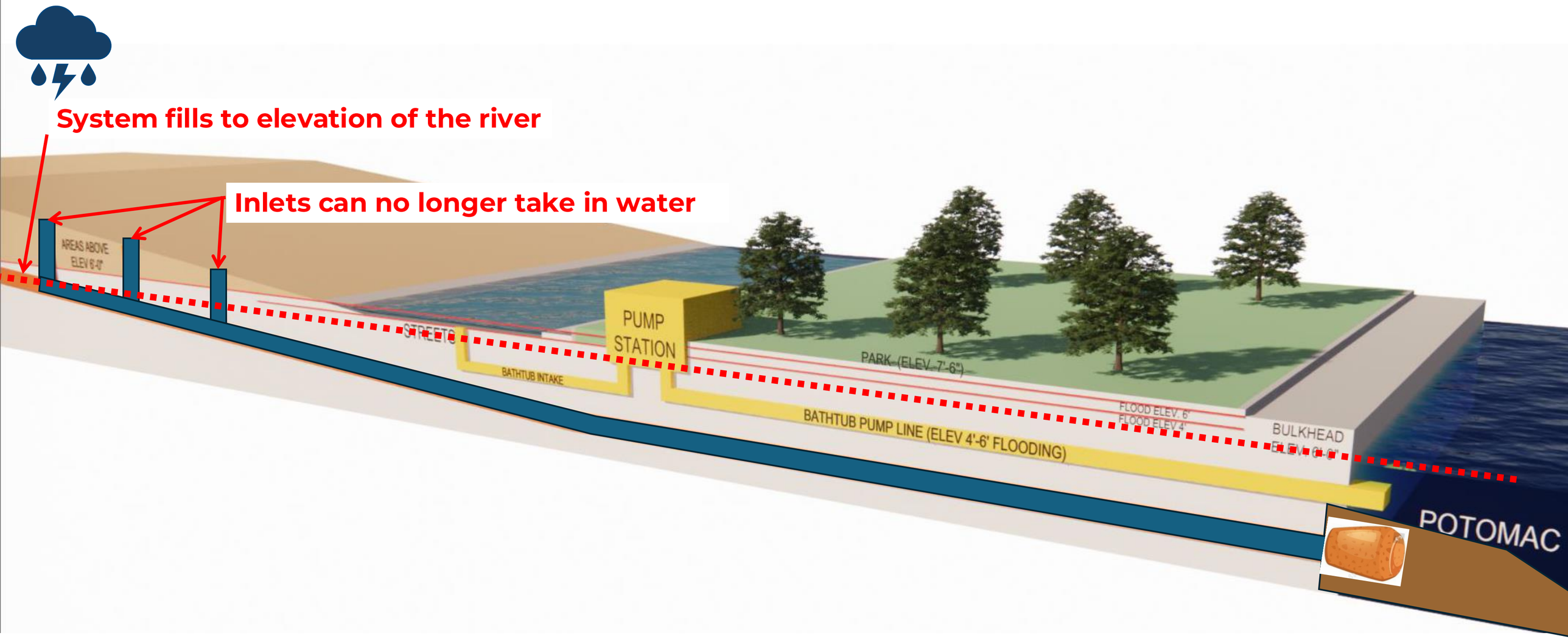

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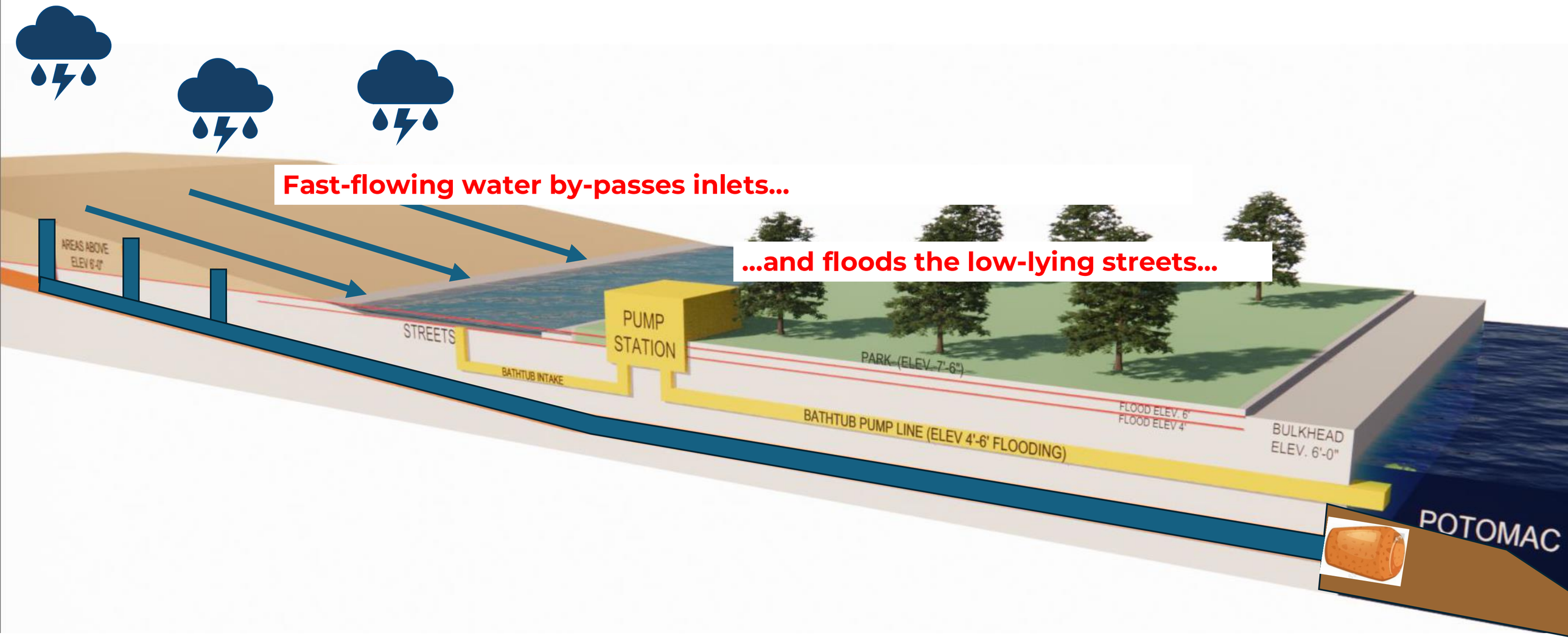

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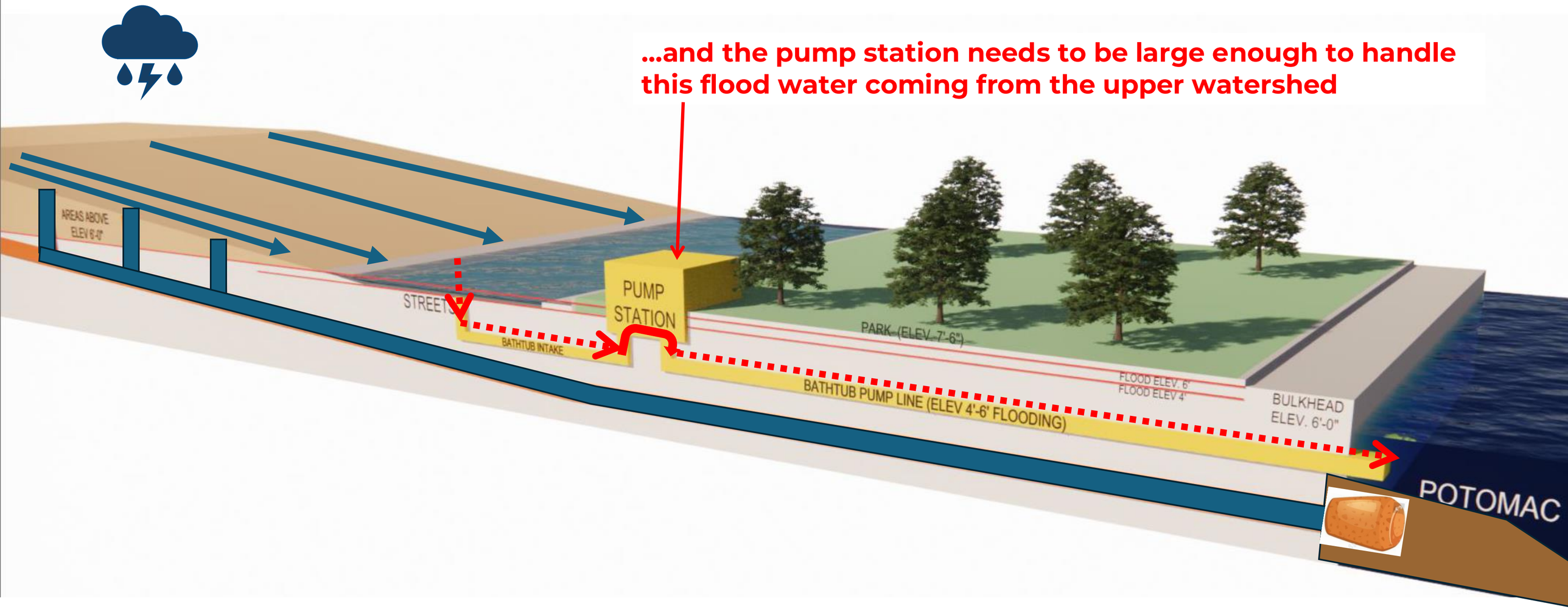

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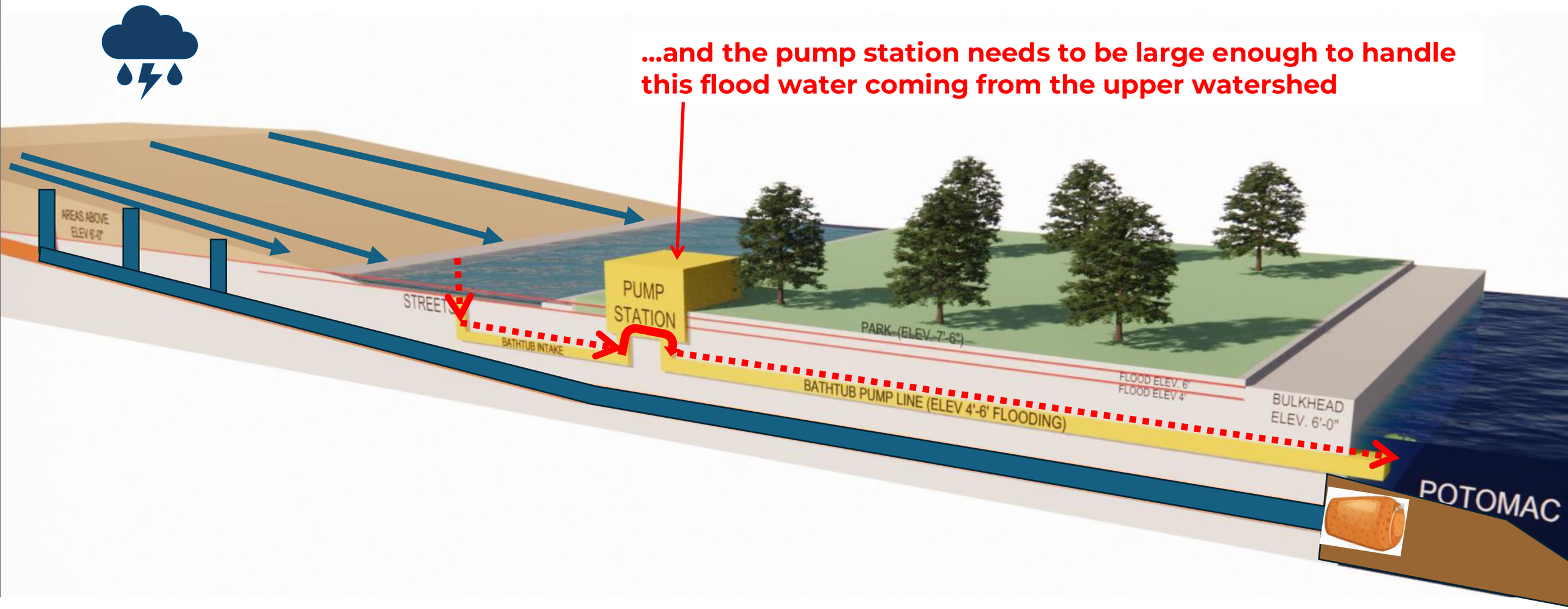

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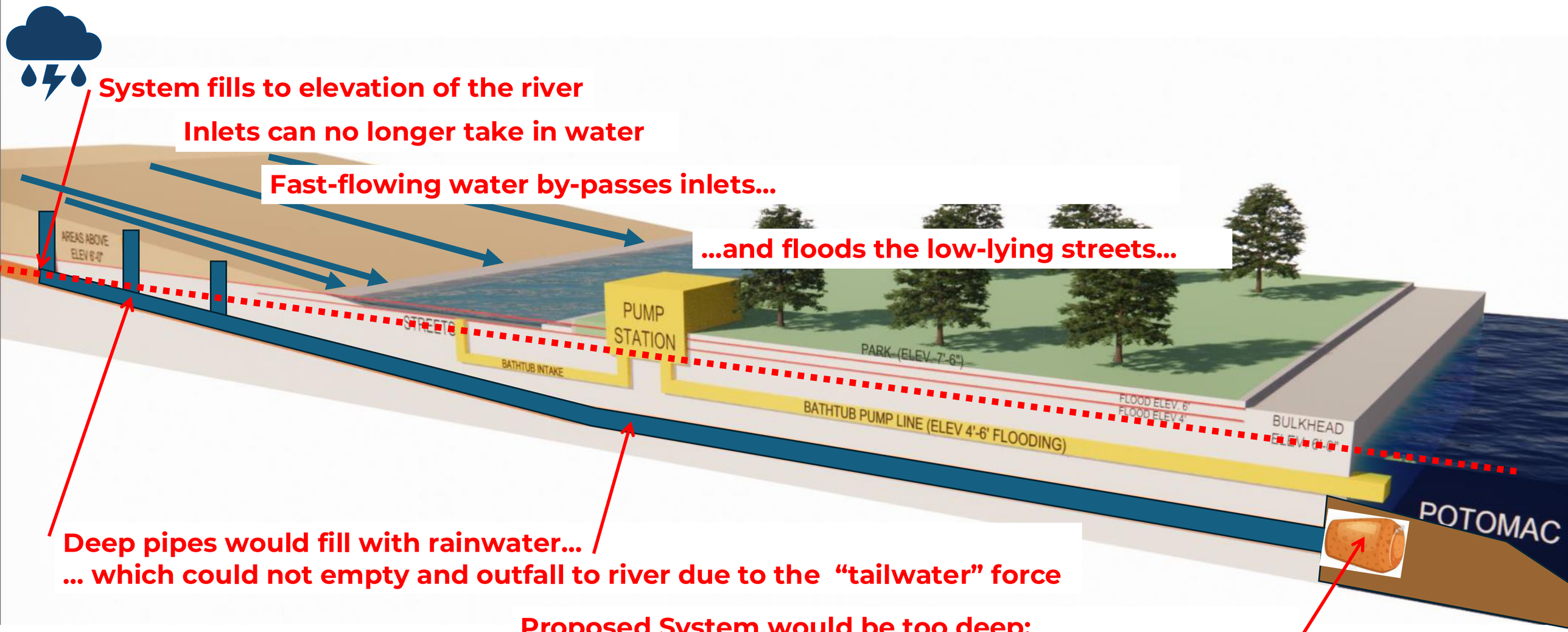

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Stormwater Modeling Results: “85% Solution” Concept

Gravity Stormwater System, Backflow Prevention & Capacity Improvements North of King St

AWA Concept - Flooding at the Storm Peak

This concept fails to prevent 1 - 1.5 feet of flooding

STREET FLOODING

FLOODING IMPACTS

Key Results

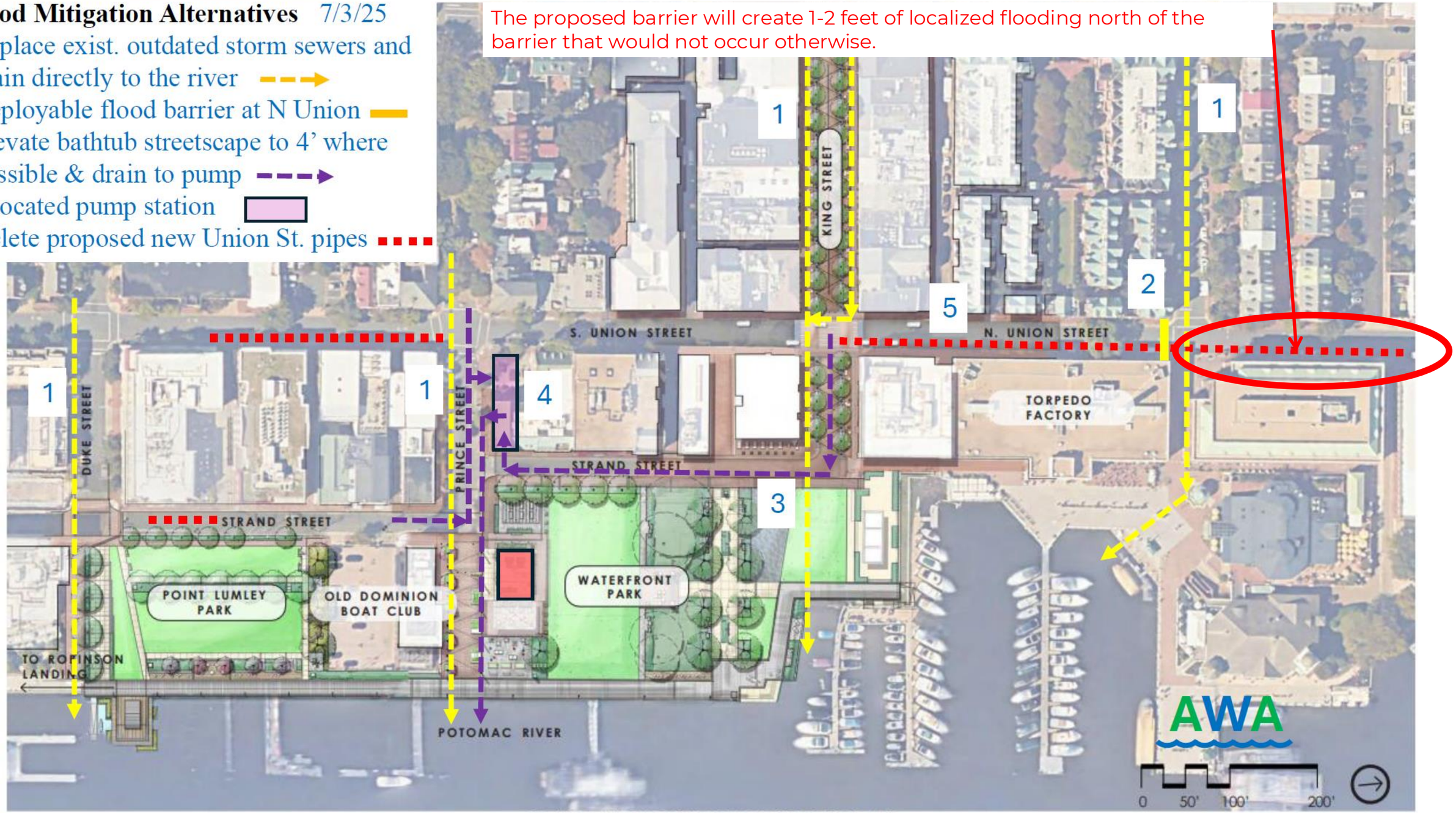
- Potential damage to buildings and cars, including parking garages, residences, and businesses.
  - N Union from Thompsons Alley to Cameron Street
  - Unit Block of Thompsons Alley
- Impacts may include the basement, first floor, or building access.
- Sidewalks and roadways are passible and drivable in less than 30 minutes.

Alexandria Waterfront Alliance

Flood Mitigation Alternatives 7/3/25

1. Replace exist. outdated storm sewers and drain directly to the river
2. Deployable flood barrier at N Union
3. Elevate bathtub streetscape to 4' where possible & drain to pump
4. Reocated pump station
5. Delete proposed new Union St. pipes

The proposed barrier will create 1-2 feet of localized flooding north of the barrier that would not occur otherwise.



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Alexandria Waterfront Alliance

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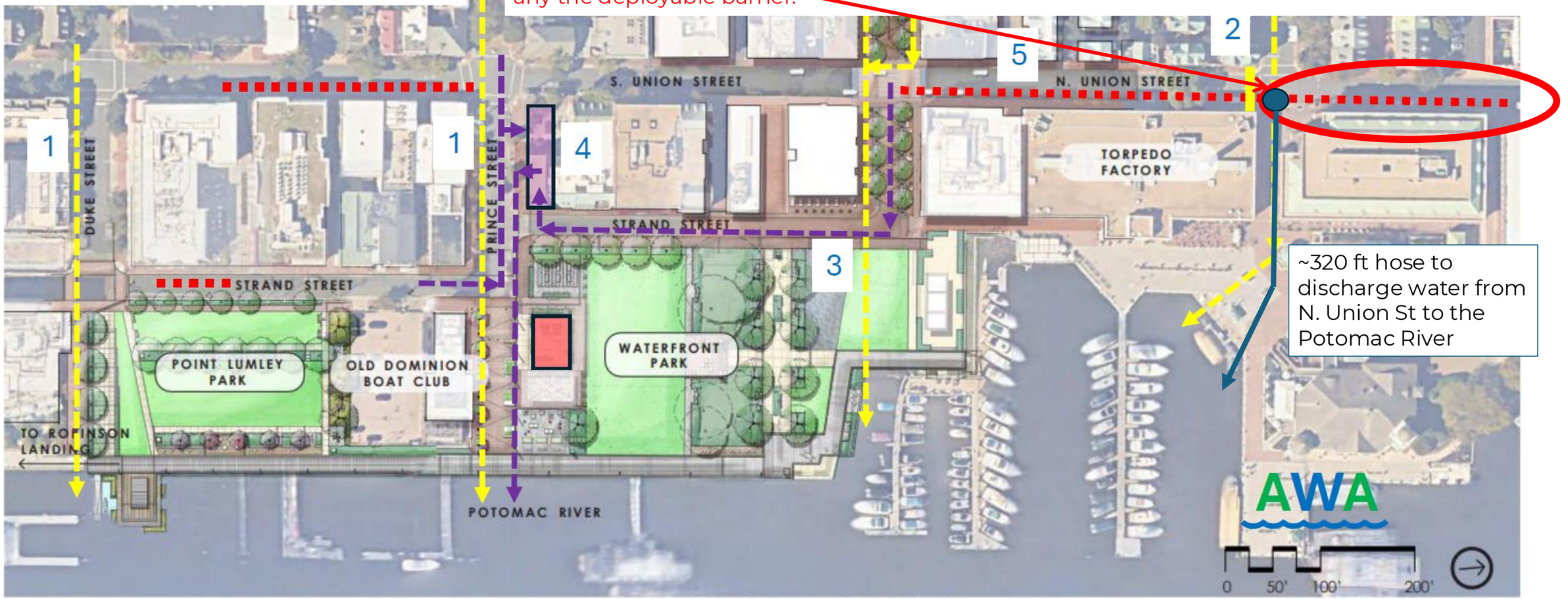
A deployable pump can be further evaluated for this location; however, it won't reduce the pump station size.

Potential that manhole at Cameron/Union intersection could be used as a point for bypass pumping.

Would require further analysis of capacity of a trailer-mounted bypass pump on Union St. Potential route for discharge hose to the Potomac River shown.

The bypass pump would need to be sized to handle the floodwater that accumulates behind any the deployable barrier.



OVERALL PROJECT CONCEPT PLAN

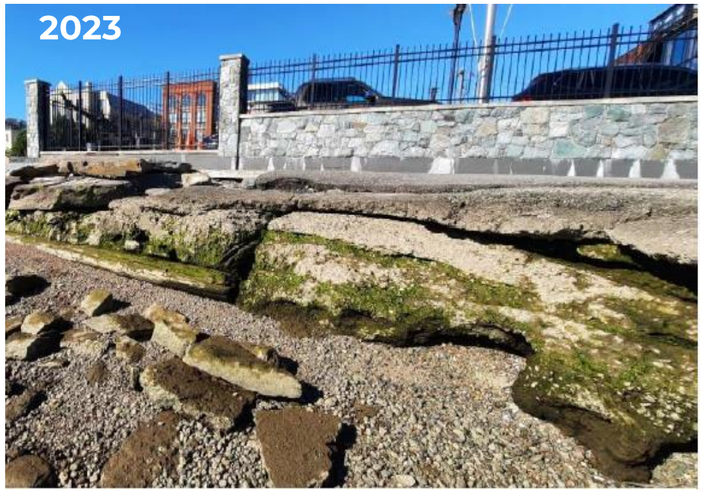
Project Information & Updates

- Participate in upcoming Business-Owner Stakeholder Meetings
- https://www.alexandriava.gov/Waterfront
- Email Project Manager: Matthew.Landes@AlexandriaVA.gov

- Signup for Updates and Newsletter:

- Signup for Alexandria eNews:
  - Go To Planning & Zoning category
  - Select “Waterfront Planning”

Aging & Failing Infrastructure



Riverine Overtopping & Flooding

The Number of Overtopping Events Continues to Increase

Potomac River Surface Elevation Flooding Analysis Over Time At Prince Street/Waterfront	Prince Street-End (Elev. 2.4)	Bulkhead at Waterfront (Elev. 3.0)
In the Last 20 Years, we've seen an average of	145 events/yr	37 events/yr
In the Last 5 Years, we've seen an average of	185 events/yr	48 events/yr
In the Last 2 Years, we've seen an average of	194 events/yr	54 events/yr
In the Last 1 Year, we've seen...	227 events/yr	93 events/yr
By Year 2100, we anticipate...	353 events/yr	341 events/yr