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Wightman Park Stormwater Project

Westmoreland Conservation District
2025 Engineers' Workshop

March 20 & 21, 2025

Ryan Quinn, PE, PMP
Associate Project Manager
Pittsburgh Water

Barton Kirk, PE
Principal
Ethos Collaborative

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Agenda

- Background of **Pittsburgh Water's Stormwater Program** and Projects to date
- **Wightman Park as a case study** of coordinated planning for stormwater management and community co-benefits
- Highlight Project Performance for Wightman Park and **Lessons Learned overall**

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Our System

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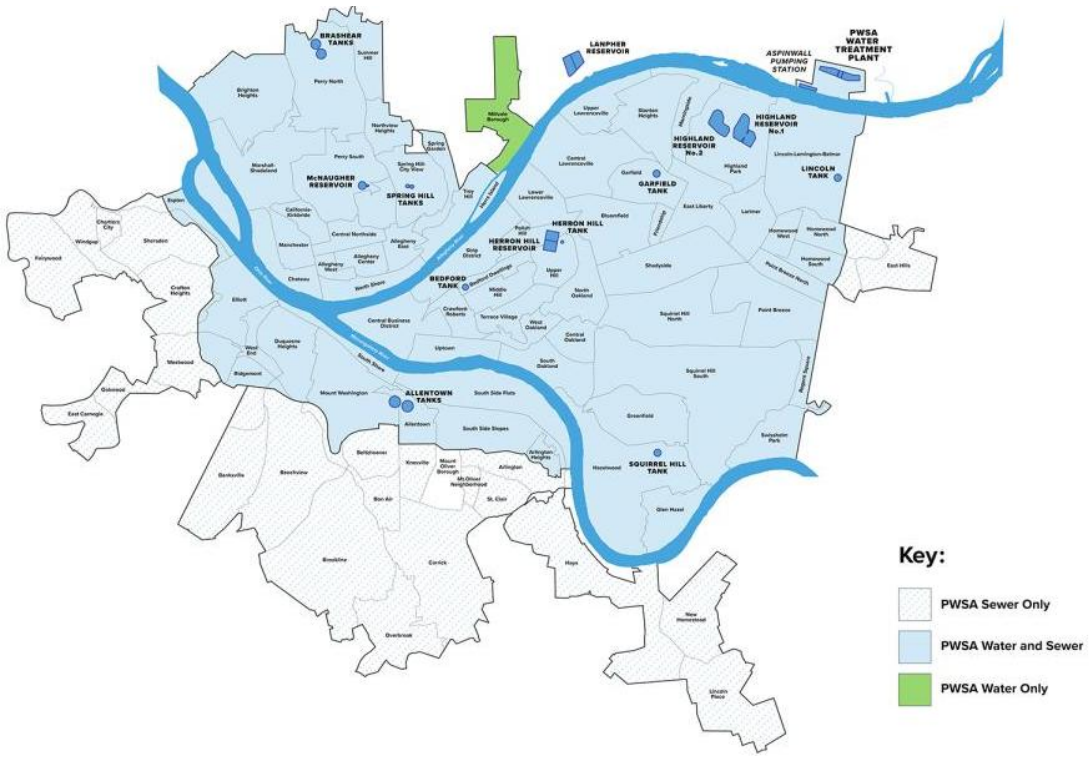
Pittsburgh Water's Service Area



Service Area Facts

- Pittsburgh Water is the largest combined water, wastewater, and stormwater authority in Pennsylvania.
- 520,000 consumers throughout the City of Pittsburgh and Surrounding area
- Provide drinking water to approximately 84% of the City's population
- System includes water treatment plant, approx. 964 miles of water mains, 4 in-ground reservoirs, 10 storage tanks, 1,220 miles of sanitary, storm, and combined sewers, and 25,000 catch basins
- Wastewater treatment is provided by Allegheny County Sanitary Authority, "ALCOSAN"

Pittsburgh Water Customer Accounts

- Total Customers: 116,365
- Water, Sewer, Stormwater: 80,524
- Sewer and Stormwater: 30,197
- Stormwater Only: 5,644

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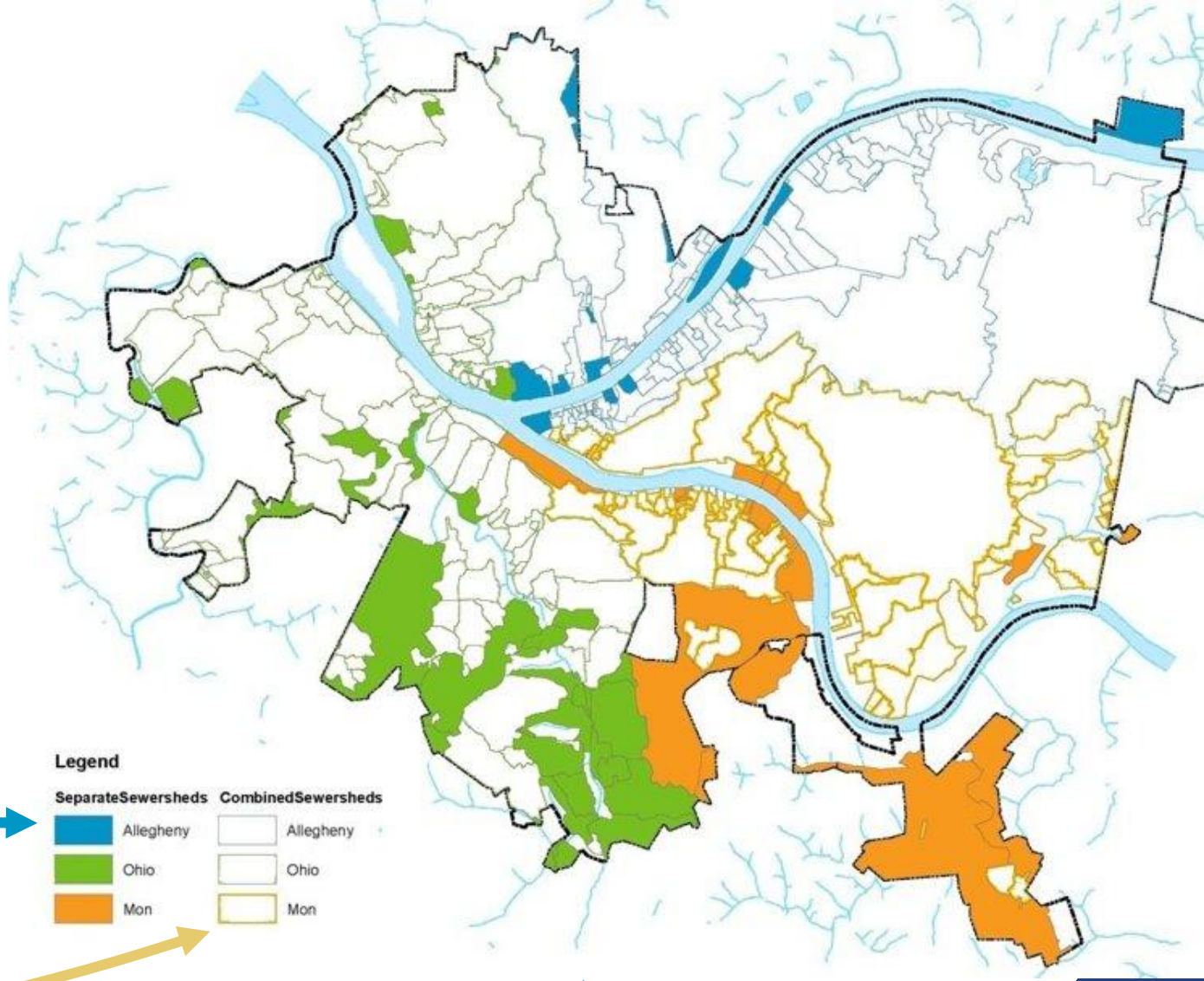
Where are the Combined and Separate Sewersheds?

- 25% of Pittsburgh's land area flows through the separated MS4 system
- 75% flows through combined sewers



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Why Does Pittsburgh Water Have Stormwater Projects?

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Too much stormwater, combined with sewage pollutes our rivers

It doesn’t take much to overflow the system – it can happen with just a quarter of an inch of rainfall or less.

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Our system was not built for this volume of stormwater

- We have more pavement and hard surfaces than we did 100 years ago
- We have more rain, and localized severe storms, than the system is built to handle
- Previously, Pittsburgh has not had a unified stormwater strategy

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Stormwater Program

Regulatory Requirements for Water Quality

- Reduce or Eliminate Sewer Overflows and Basement Sewer Backups
- Compliance with NPDES Permit for MS4
  - NPDES – National Pollutant Discharge Elimination System
  - MS4 – Municipal Separate Storm Sewer System

Flooding

- Investigate Reported Issues
- Reduce Neighborhood Flooding Risk

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Where Are Pittsburgh Water's Stormwater Projects?

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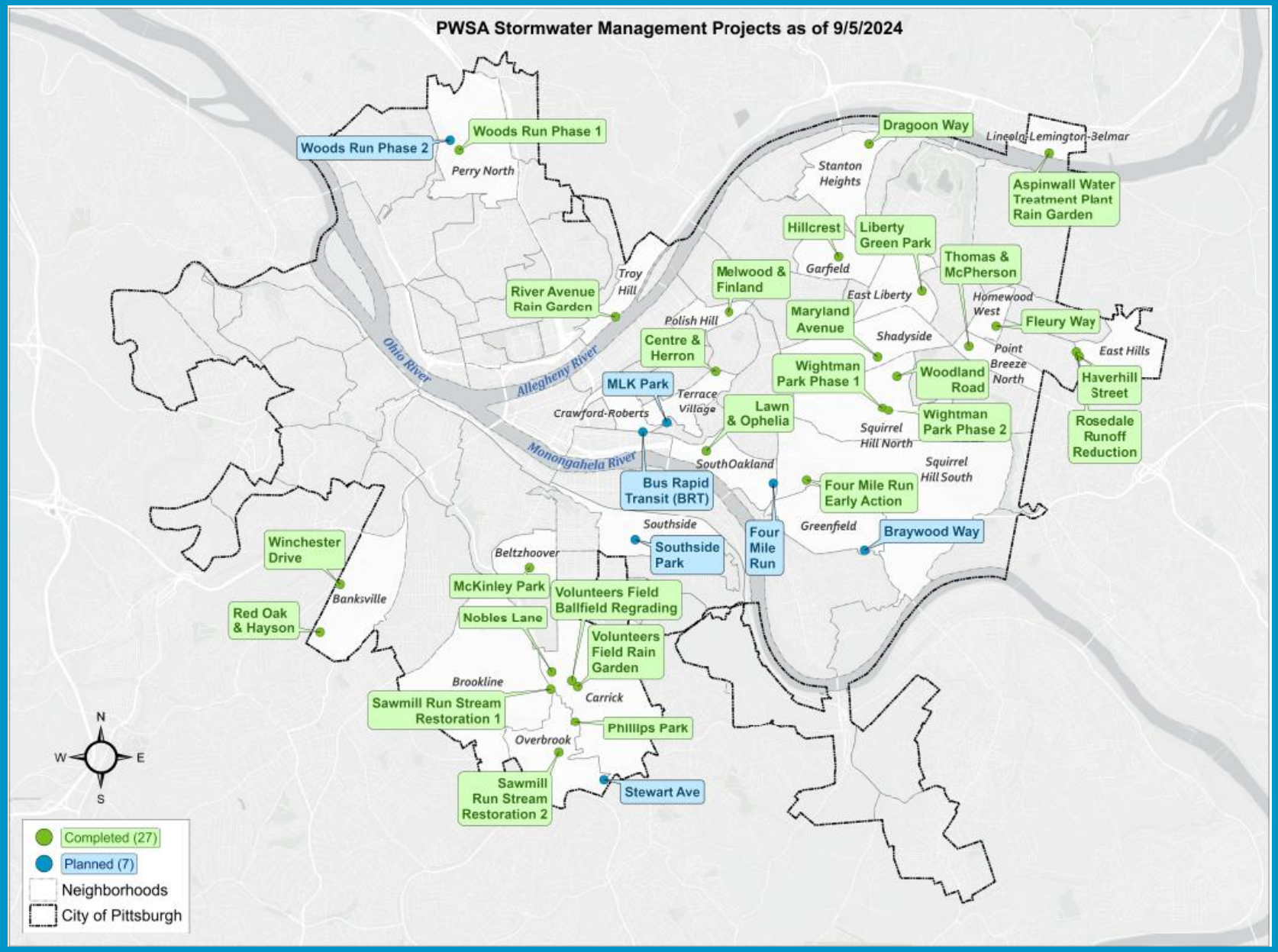
15 of Pittsburgh Water's 27 completed stormwater projects are in a moderate to high Environmental Justice Area, per the EPA EJ Screening



For more details on the stormwater projects go to: https://www.pgh2o.com/projects-maintenance/search-all-projects

Pittsburgh Water Stormwater Projects

Technologies

- 2 Projects – Permeable Pavers
- 10 Projects – Bioretention + Underground Storage
- 7 Projects – Bioretention
- 2 Projects – Stream Restoration
- 6 Projects – Stormwater Infrastructure Improvements

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Pittsburgh Water Stormwater Projects

Locations

- 16 Projects – Roadway or Right-of-Way
- 9 Projects – Parks
- 2 Projects – Other (Chatham University, Pittsburgh Water's Water Treatment Plant)

Other Metrics (Completed Projects)

- 65 Acres Managed
- 35 MG Estimated Annual CSO Reduction
- $34.3M Pittsburgh Water Costs
- 18 ALCOSAN GROW project grant awards

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Going Above and Beyond at

WIGHTMAN PARK

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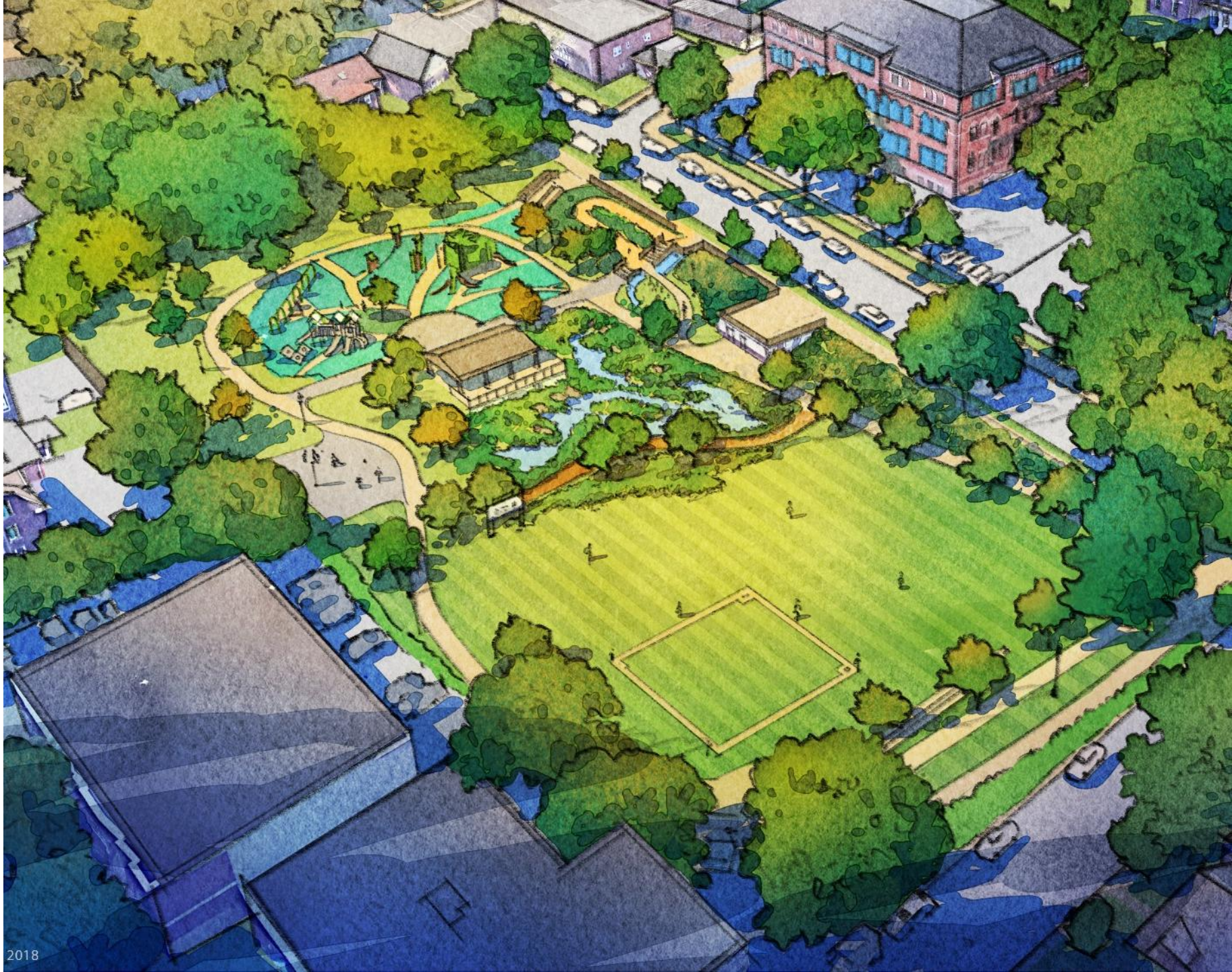

Key Partners:

Two Projects Integrated Together

CITY OF PITTSBURGH

PASHEK MTR

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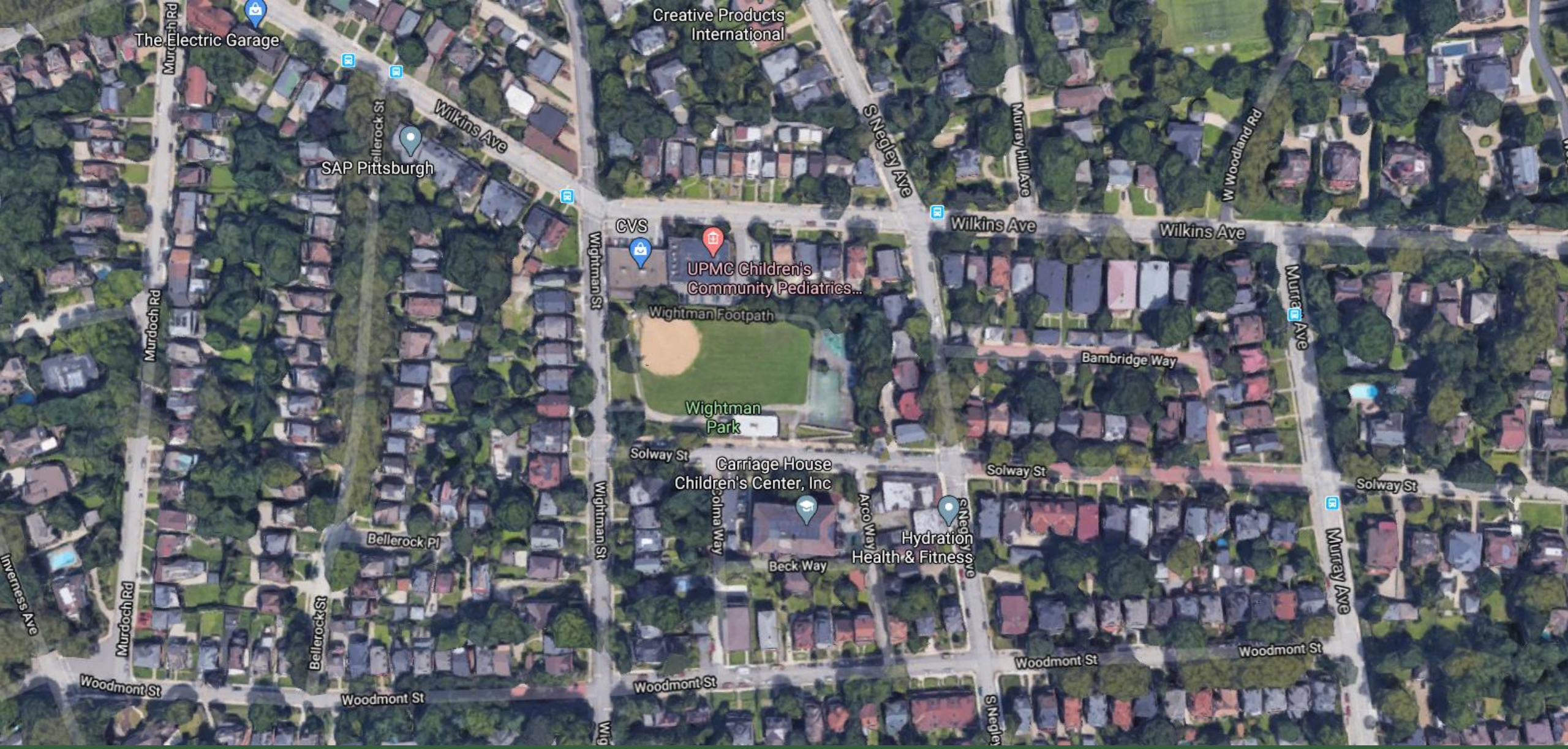
ethos collaborative

water-energy-climate-community

alcosan

allegheny county sanitary authority


The Electric Garage
Creative Products International
SAP Pittsburgh
Wilkins Ave
CVS
UPMC Children's Community Pediatrics...
Wightman Footpath
Wightman Park
Carriage House Children's Center, Inc
Hydration Health & Fitness
Bambridge Way
Solway St
Beck Way
Bellerock Pl
Woodmont St
Murdoch Rd
Bellerock St
Wightman St
Colma Way
Arco Way
S Negley Ave
Murray Hill Ave
W Woodland Rd
Murray Ave
Inverness Ave

Location

Existing Conditions

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Credit: Pashek+MTR

Community / Watershed Map

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Park Redesign - Community Priorities

Recreation Related

1. Half-court basketball
2. Coach-pitch/multi-use field
3. Play areas for all ages, abilities
4. Walking paths
5. Something for everyone
6. Contact with nature

Stormwater Related

1. City-Wide Combined Sewer Overflow (CSO) issues
2. Basement flooding
3. Green stormwater infrastructure

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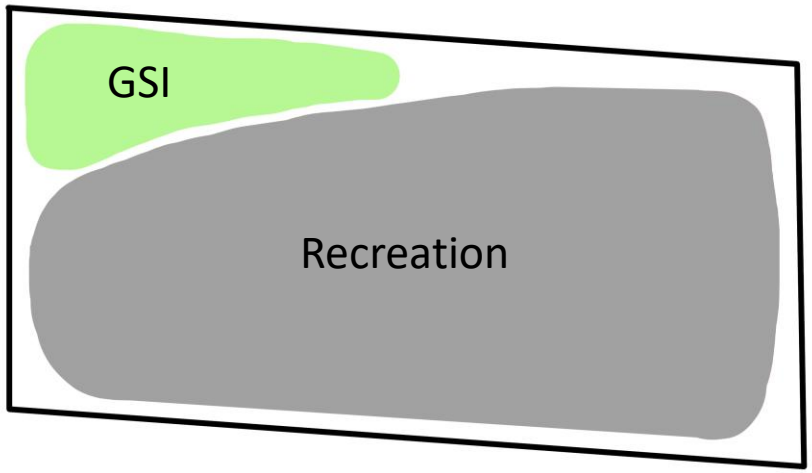
Going Above and Beyond Stormwater Requirements



Typical Development

- Meets minimum stormwater requirements
- One or two BMPs
- BMPs are squeezed into “leftover” space
- BMPs are singularly functional

Wightman Park

- Bring in partners during master plan
- Captures stormwater at neighborhood scale
- Four different types of BMPs
- BMPs integrated throughout
- Using BMPs for education
- Using BMPs to connect people to nature

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Credit: Pashek+MTR

Preliminary Pittsburgh Water Design

Legend

- PWSA Sewers
- Upstream Fair Oaks Sewershed
- Wightman Park Wetland - Roads
- Wightman Park Storage Facility - Roads
- Wightman Park Storage Facility - Roofs
- Wide Street Bioretention - Roads
- Wide Street Biorention - Roofs
- Impervious Surfaces

N

Total Impervious Area in Sewershed = 47.5 Ac

Potential GI Management Strategies = 20.9 Ac
Wightman Park Wetland
  Roads = 0.31 Ac
Wightman Park Storage Facility
  Roads = 2.94 Ac
  Roofs = 3.12 Ac
Wide Street Bioretention
  Roads = 8.10 Ac
  Roofs = 6.39 Ac

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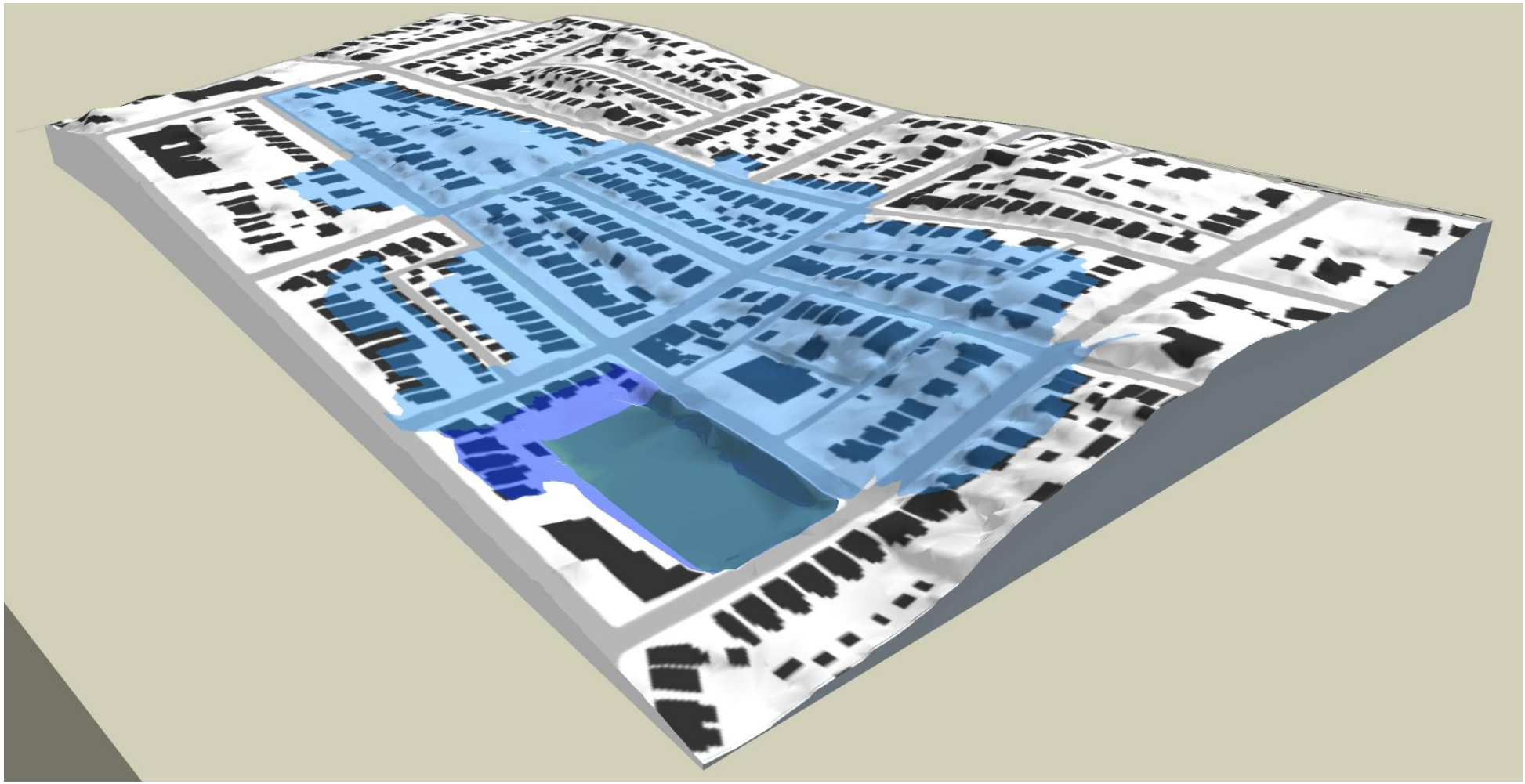
Going Above and Beyond

Captures Stormwater at a Multi-block Neighborhood Scale



The “Bath Tub”

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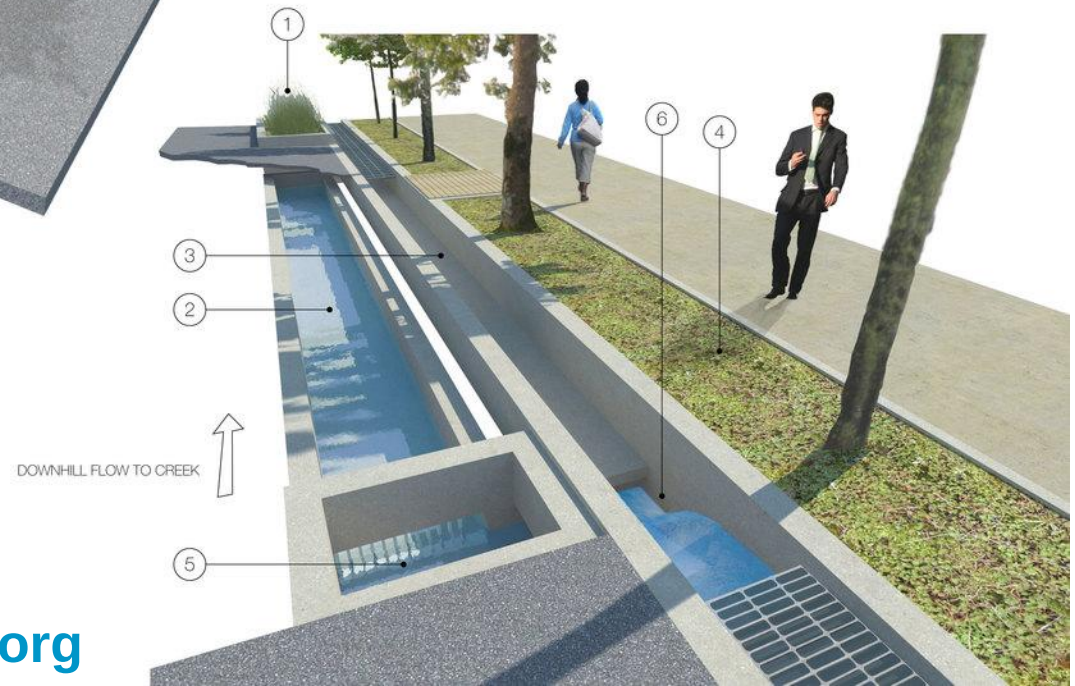
RAIN GARDEN &
SUB-SURFACE CHAMBERS
DETAIN UP TO 412,000 GALLONS
OF STORMWATER PER EVENT
FINAL OUTLET
CONTROL STRUCTURE
CONNECTS TO COMBINED SEWER
ON WIGHTMAN
PHASE 1
"PARK"
CAPTURE AREA 3.4 ACRES
PHASE 2
"NEIGHBORHOOD CAPTURE"
CAPTURE AREA 25. 4 ACRES
WIGHTMAN STREET
S NEGLEY AVENUE
BAMBRIDGE WAY
MURRAY AVE
VEGETATED STORMWATER
BUMPOUT
SOLWAY & S NEGLEY
VEGETATED STORMWATER
BUMPOUT
SOLWAY & MURRAY
SOLWAY STREET
VEGETATED STORMWATER
BUMPOUT
SOLWAY & WIGHTMAN
STONE CASCADE OUTLET
TO RAIN GARDEN
MIDBLOCK PLANTERS
SOLWAY
ENHANCED CURB &
GUTTER CONVEYANCE
COLMA WAY
ARCO WAY
WOODMONT STREET
VEGETATED STORMWATER
BUMPOUT
WOODMONT & S NEGLEY
IRMA WAY

Street Creeks

1. **BIOSWALE:**
   CLEANS FIRST FLUSH BEFORE RELEASING IT BACK INTO CHANNEL AND TOWARD CREEK
2. **FIRST FLUSH CISTERN:**
   LOCATED BELOW STREET SURFACE, INTERCEPTS AND CAPTURES FIRST FLUSH FROM EACH BLOCK FOR RELEASE INTO BIOSWALE
3. **STREET CHANNEL:**
   COLLECTS STORMWATER RUNOFF FROM CATCHMENT AREA AND DIRECTS IT TOWARD CREEK
4. **PERVIOUS PLANTING ZONE:**
   ABSORBS STORMWATER RUNOFF FROM SIDEWALK
5. **CATCH BASIN:**
   COLLECTS DEBRIS AND FLOATABLES FOR REMOVAL
6. **CISTERN INLET:**
   INLET POINT FOR FIRST FLUSH; WHEN CISTERN IS FULL, CLEAN RUNOFF PROCEEDS OVER INLET TO CREEK



FIRST FLUSH CATCHMENT AND CLEANING SYSTEM

THE "FIRST FLUSH" (.15 INCHES) OF STREET RUNOFF CONTAINS THE MAJORITY OF SURFACE POLLUTANTS DURING A RAIN EVENT.

LOCATED AT THE DOWNHILL END OF EACH BLOCK THROUGHOUT THE WATERSHED, THIS GRAVITY-FED BIOFILTER COLLECTS AND CLEANS THE FIRST FLUSH, DIRECTING THE REMAINING STORMWATER RUNOFF DOWNHILL TO THE CREEK.

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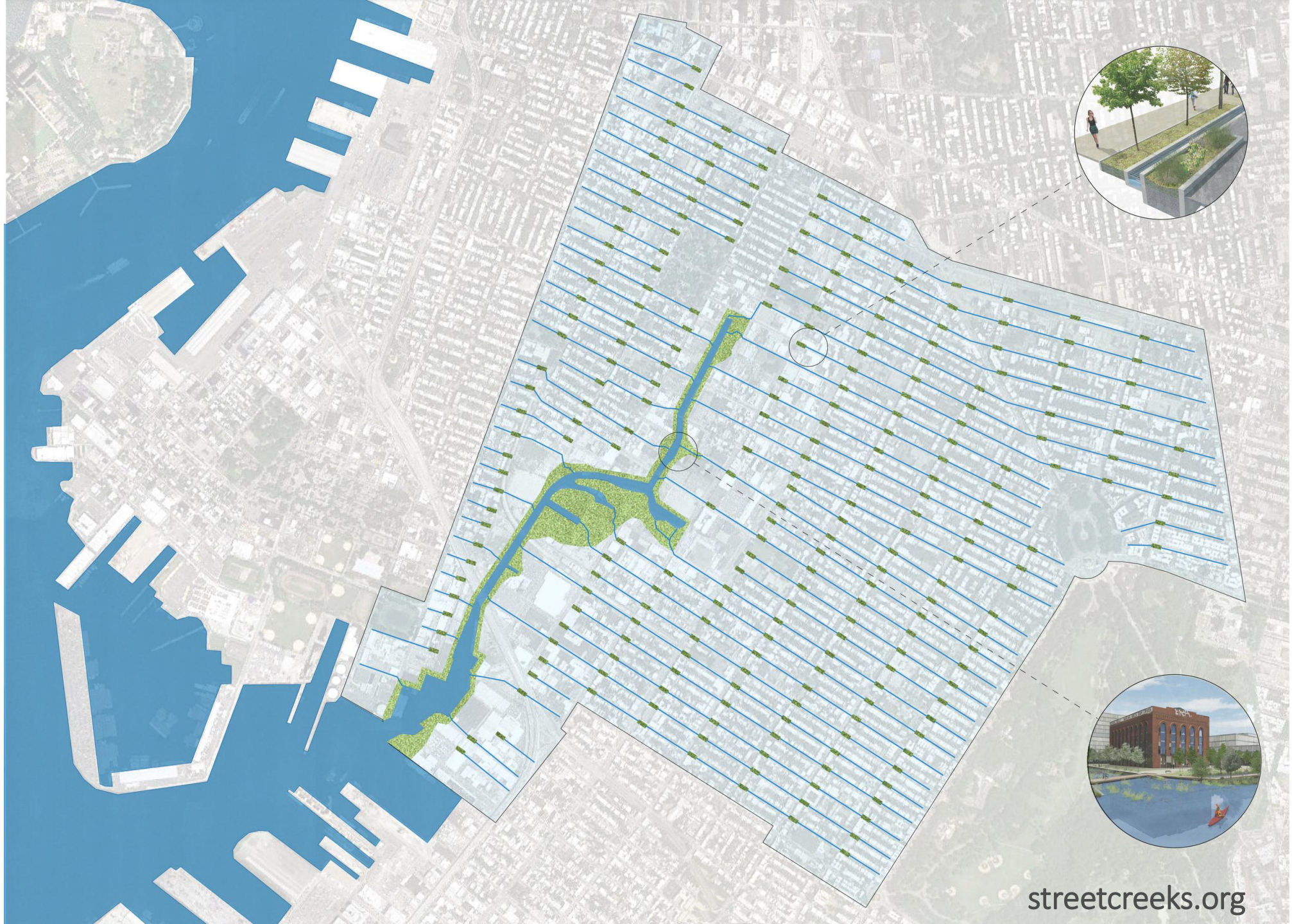
streetcreeks.org

Street Creeks



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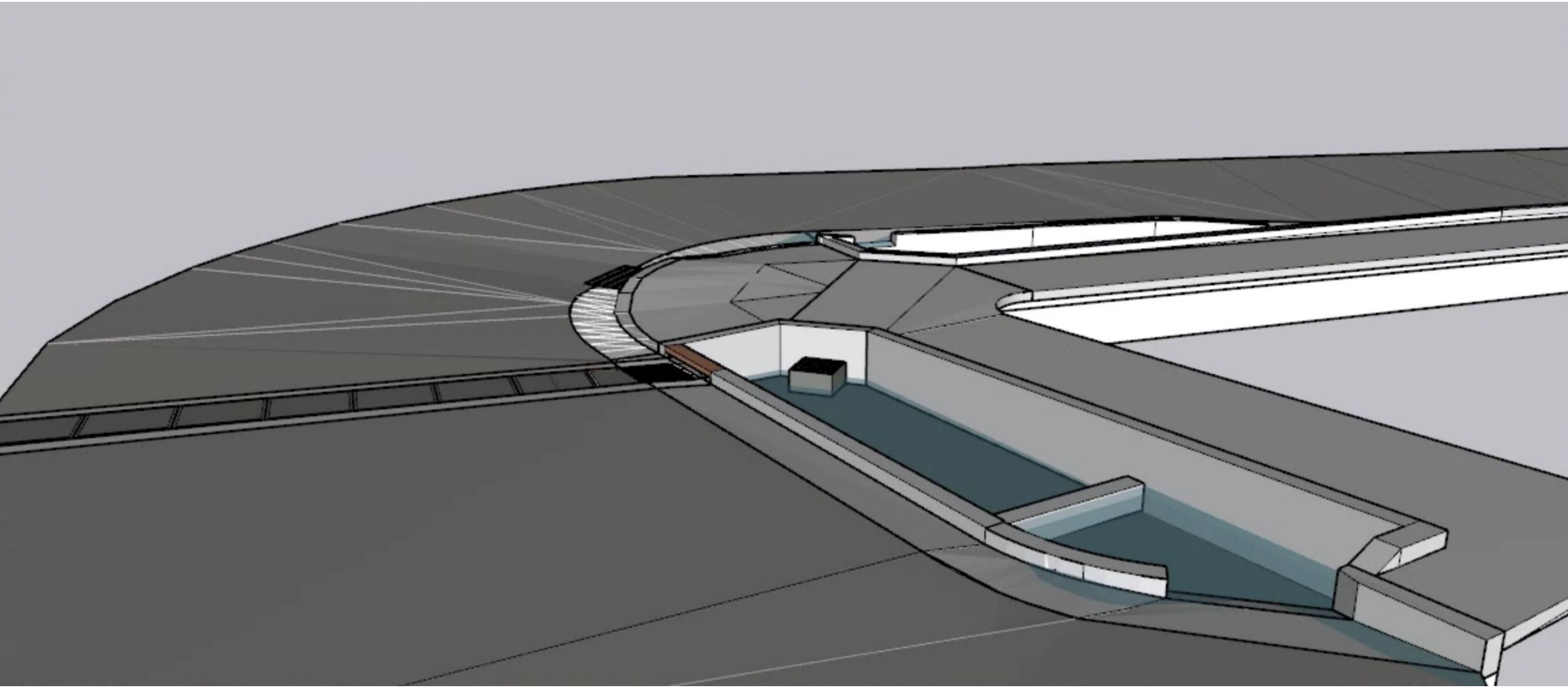
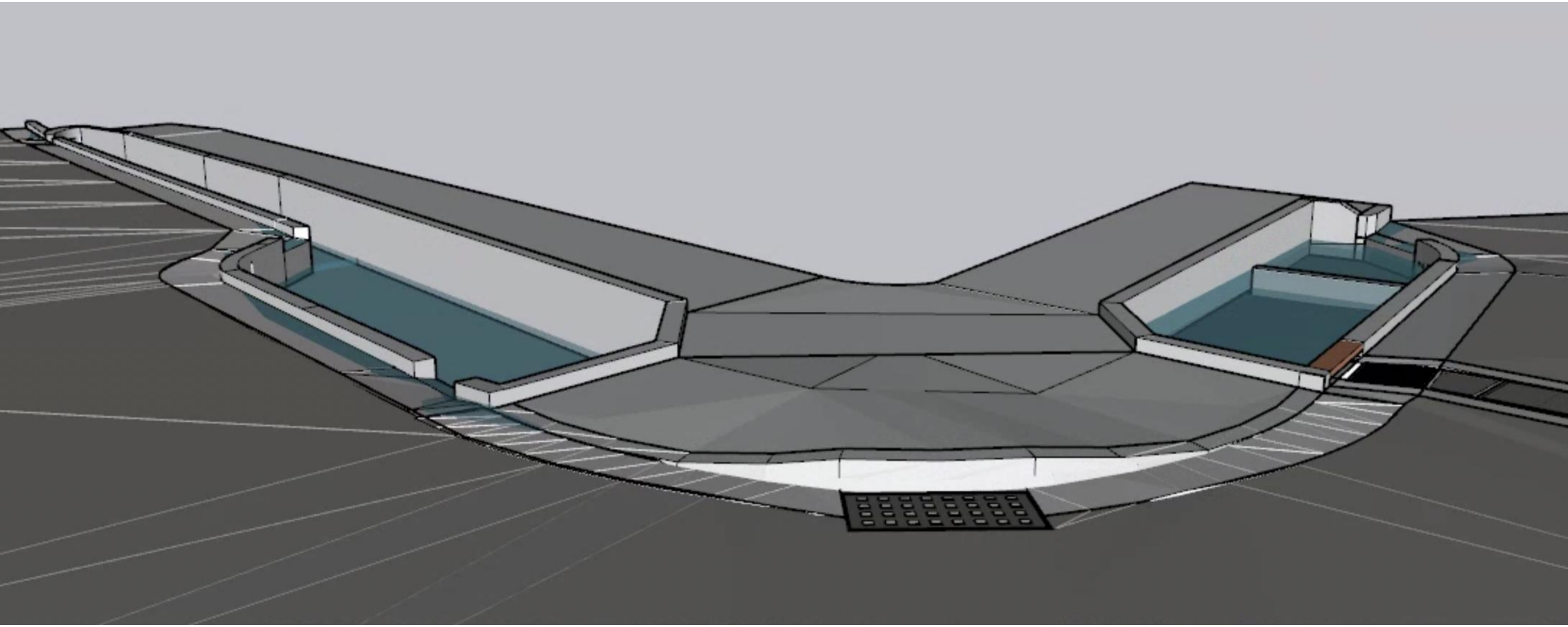
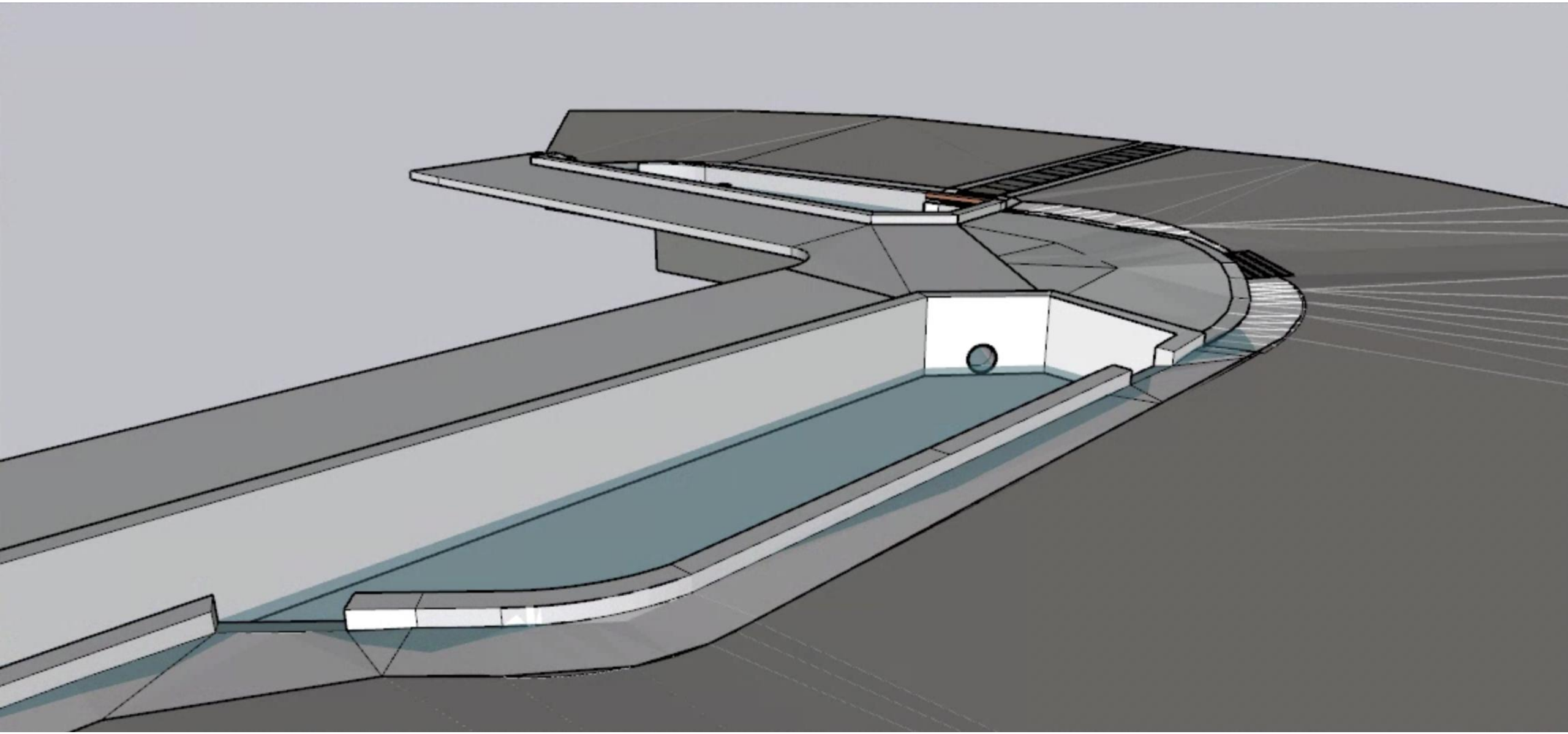
streetcreeks.org

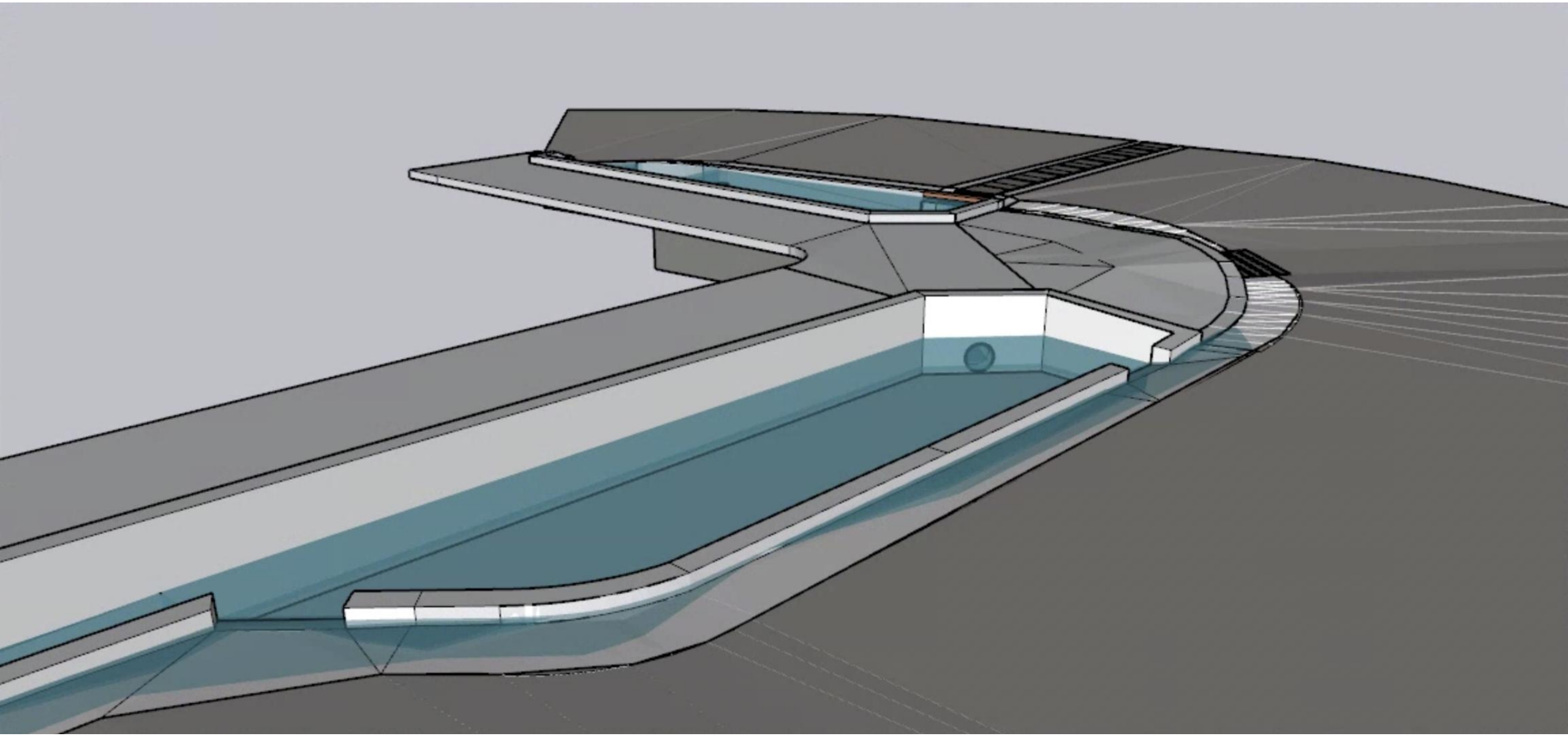
Wightman Park Curb Bumpouts
@ Negley Ave & Solway St

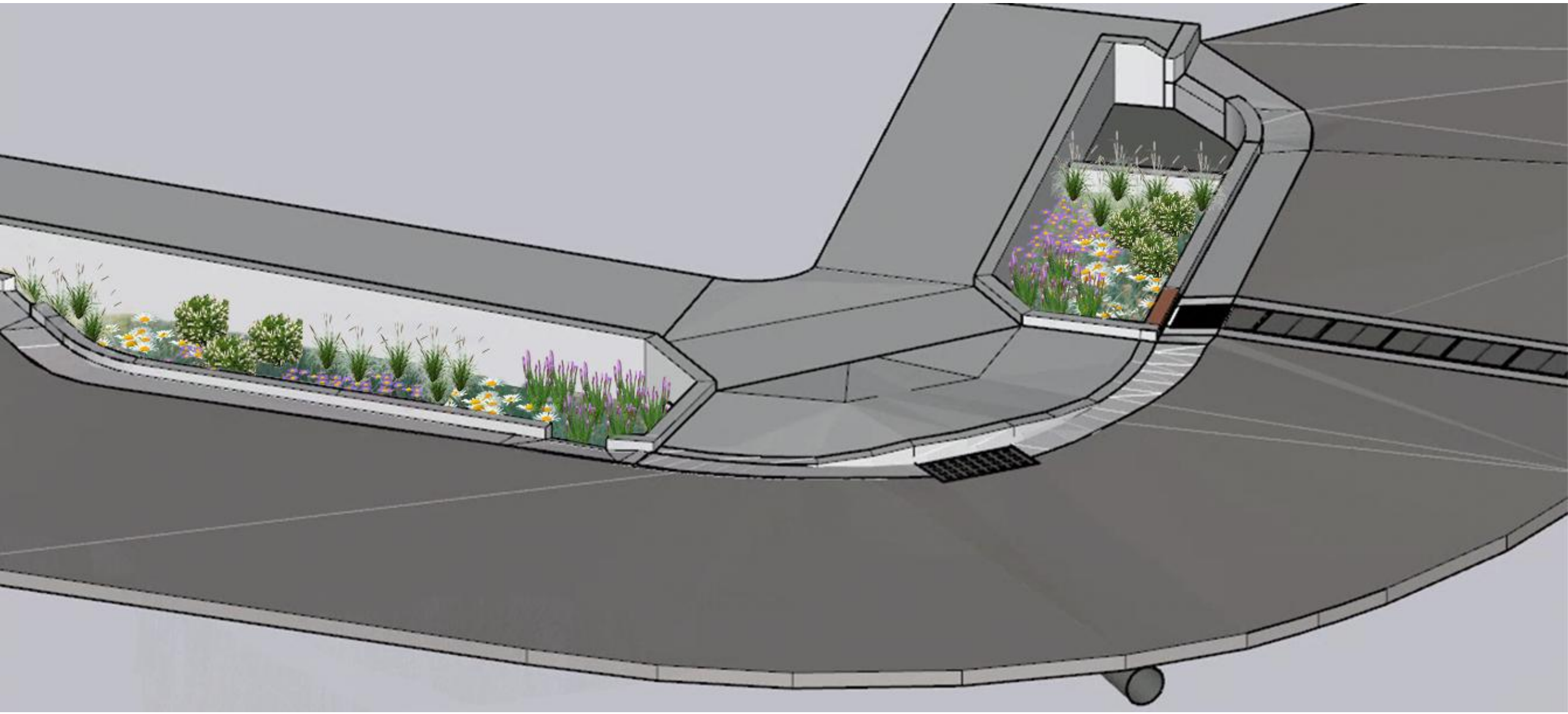


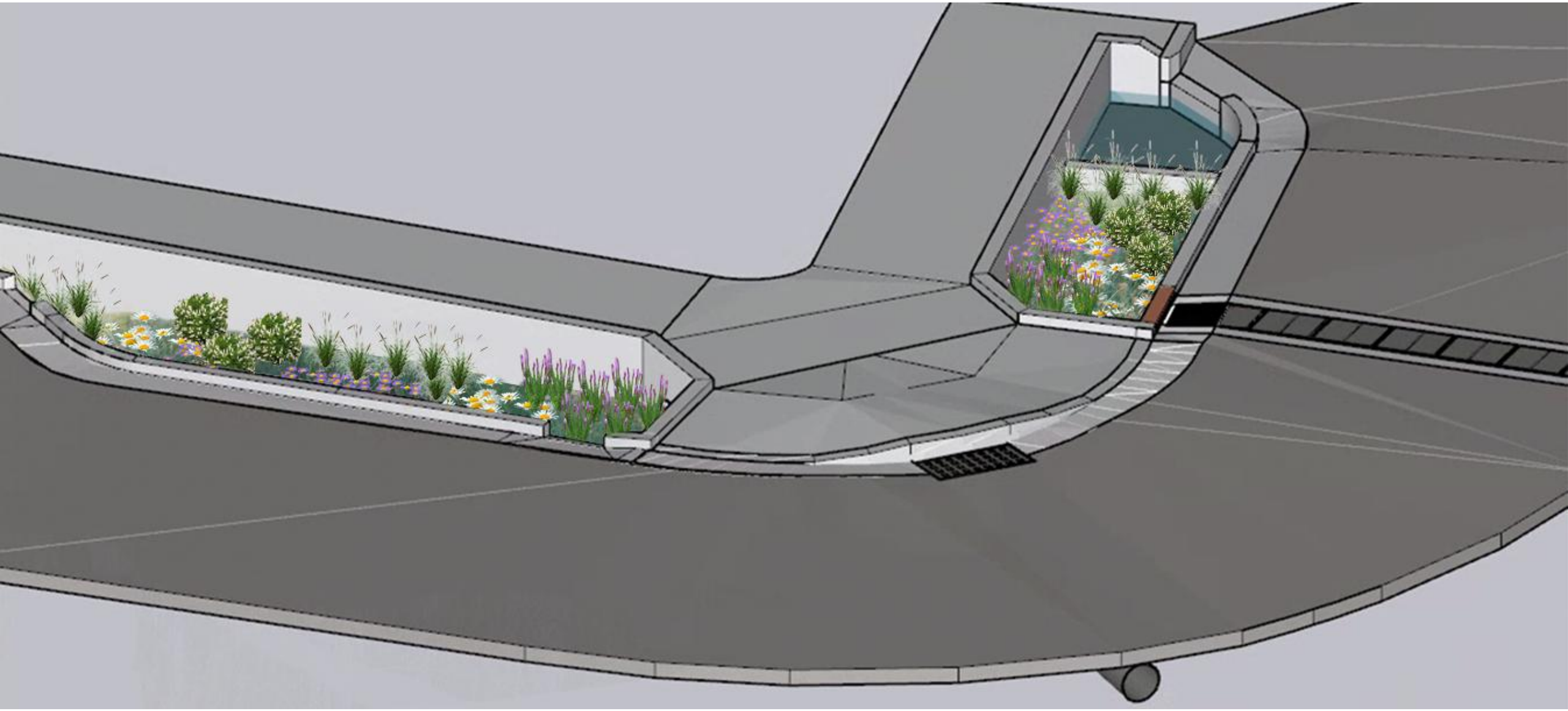
Wightman Park Curb Bumpouts
@ Negley Ave & Solway St

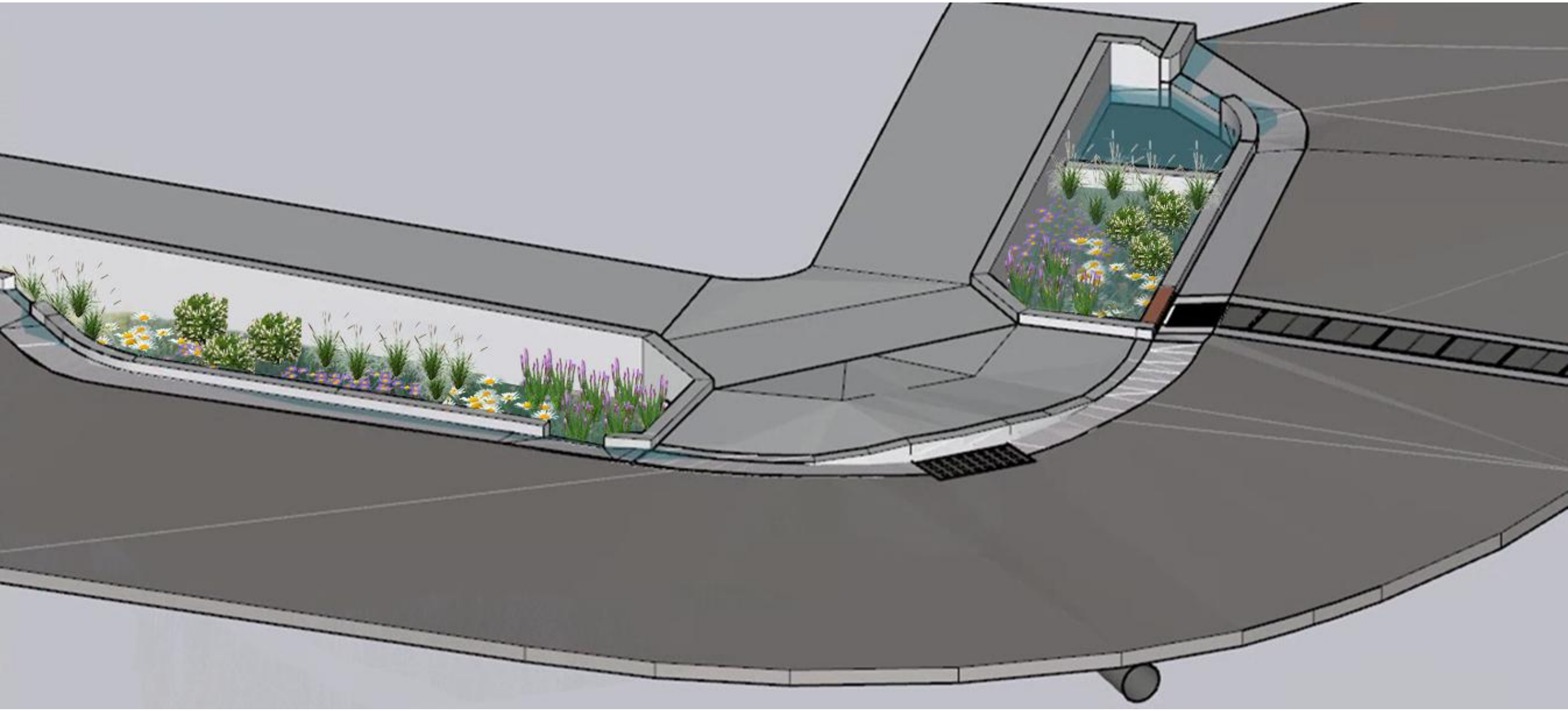


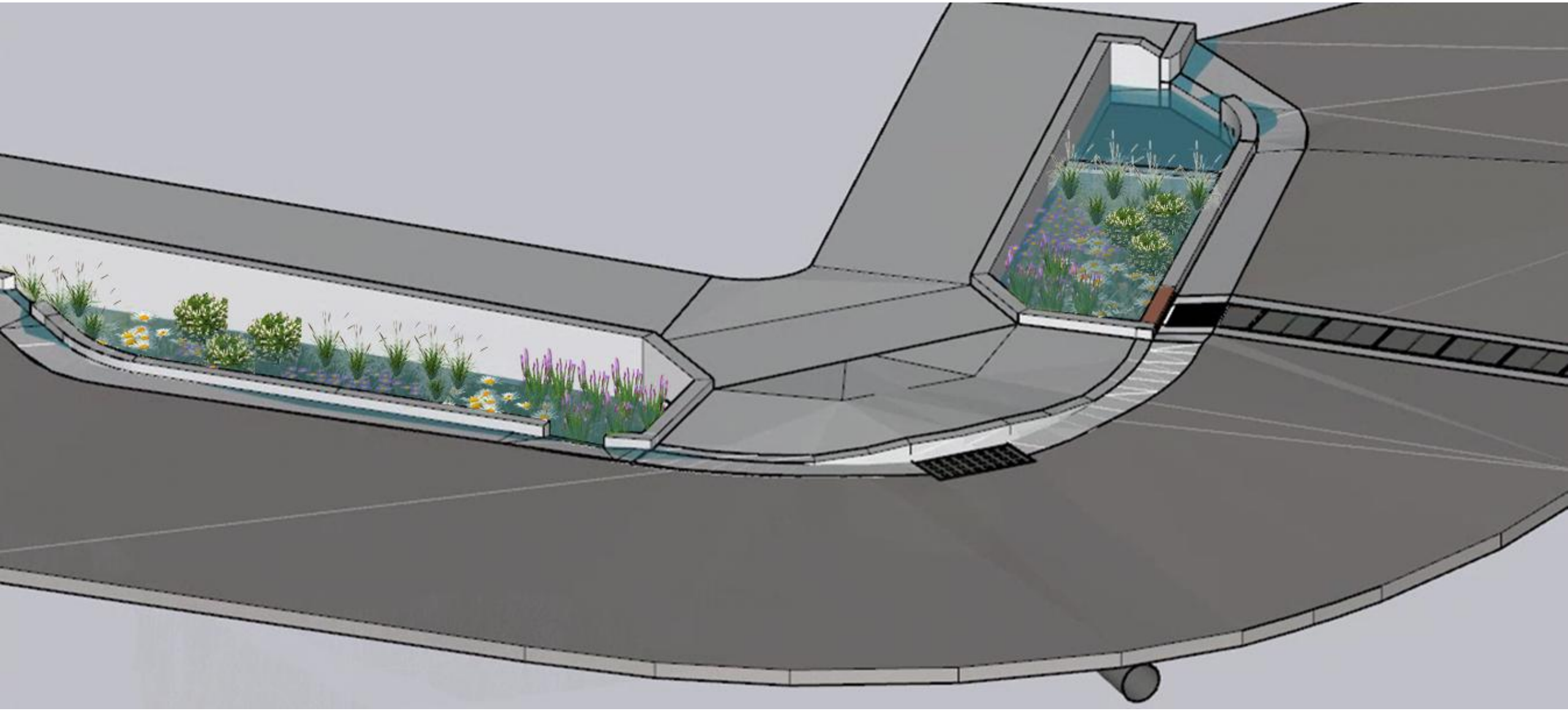


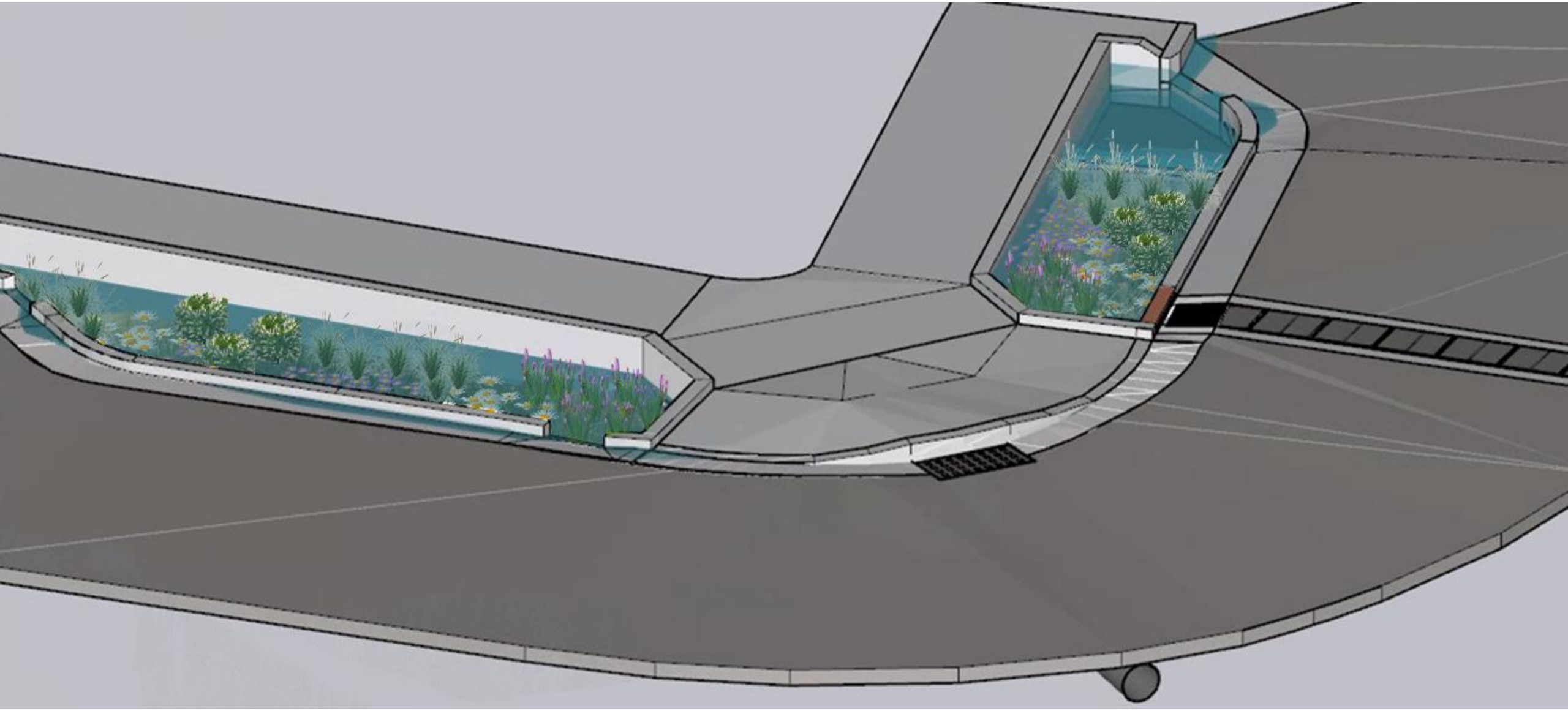


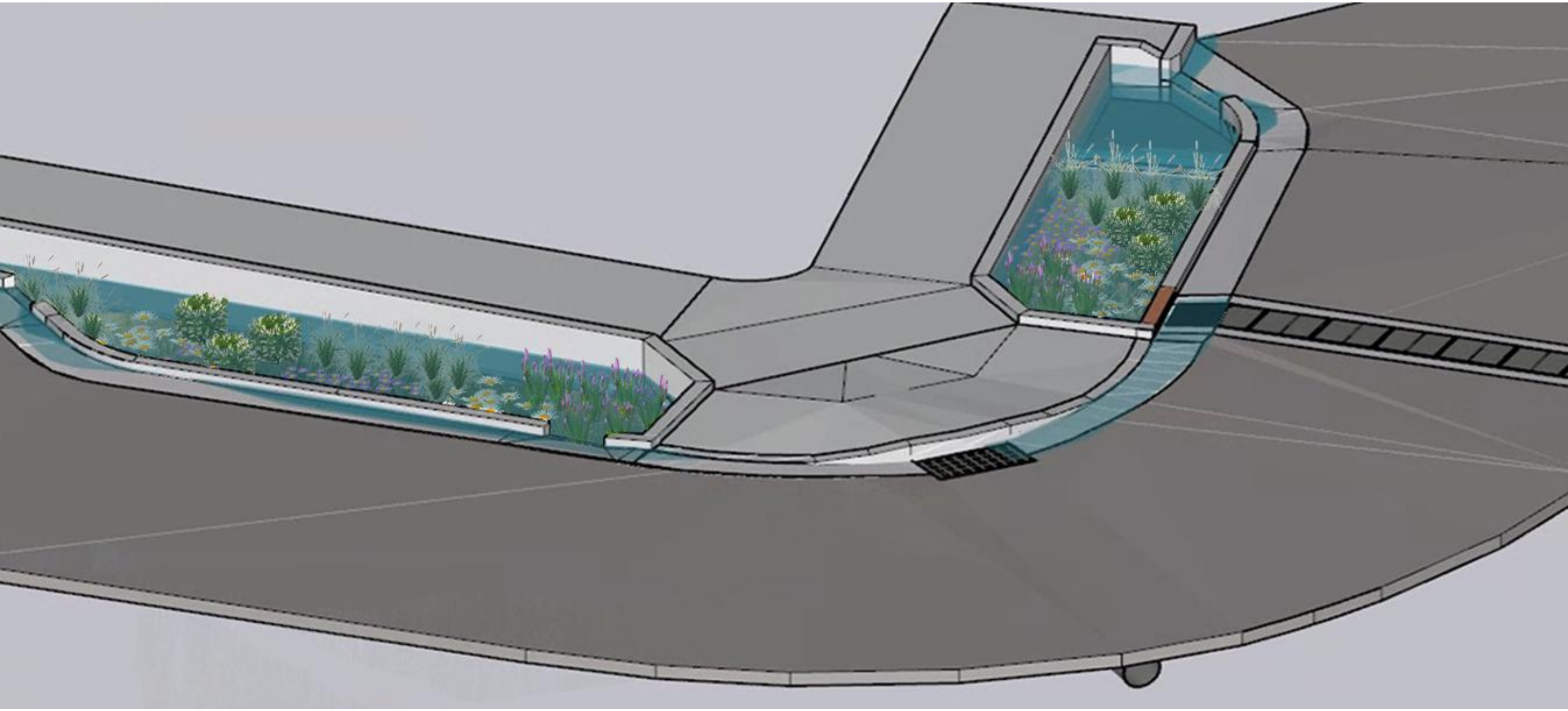












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Going Above and Beyond

Four Different Types of Stormwater BMPs

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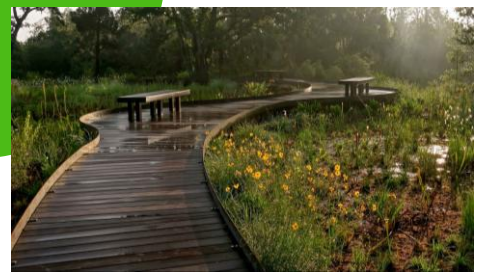
Schematic Plan

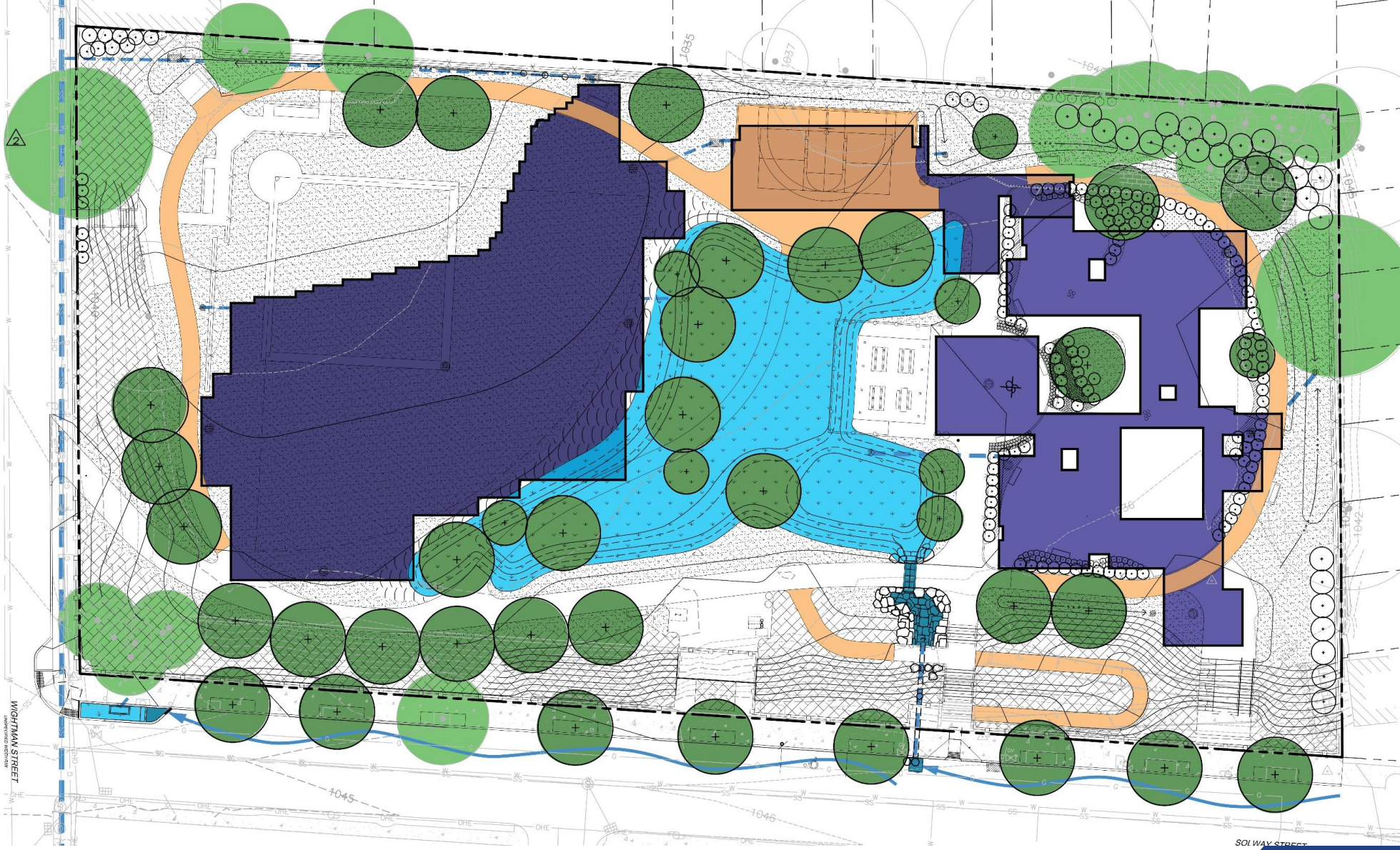


Rain Garden

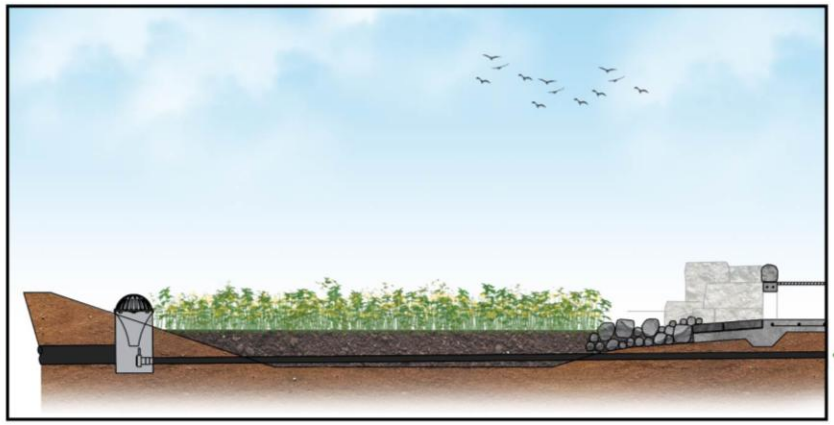
R-Tanks

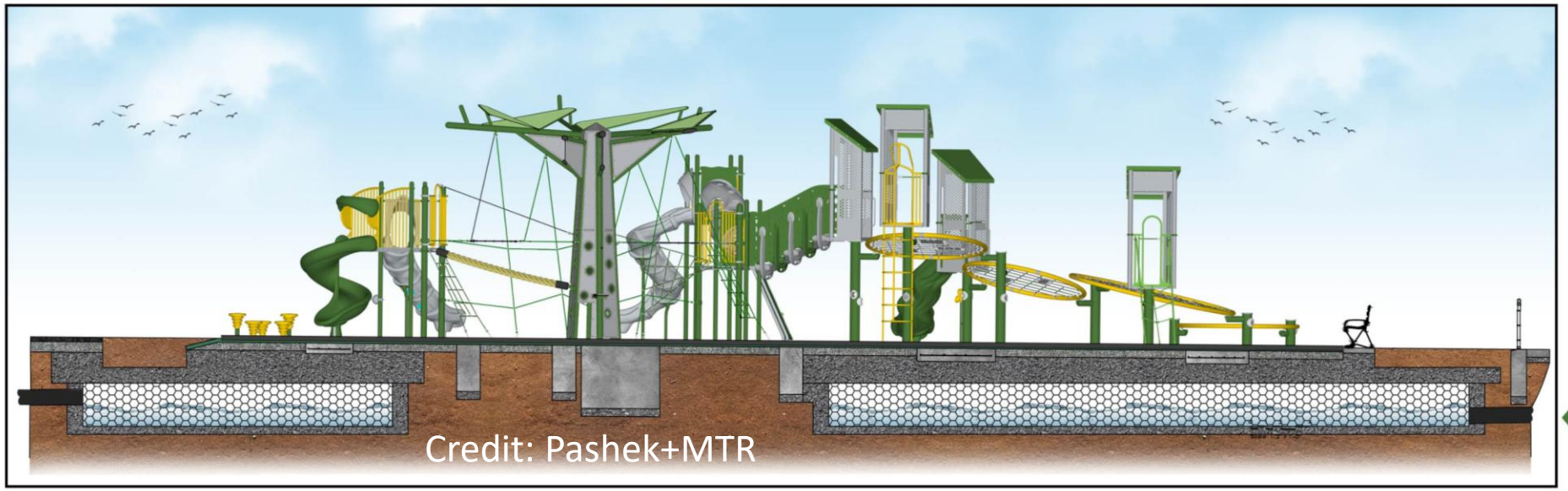
Pervious Asphalt

Trees



Types of Green Infrastructure





Credit: Pashek+MTR

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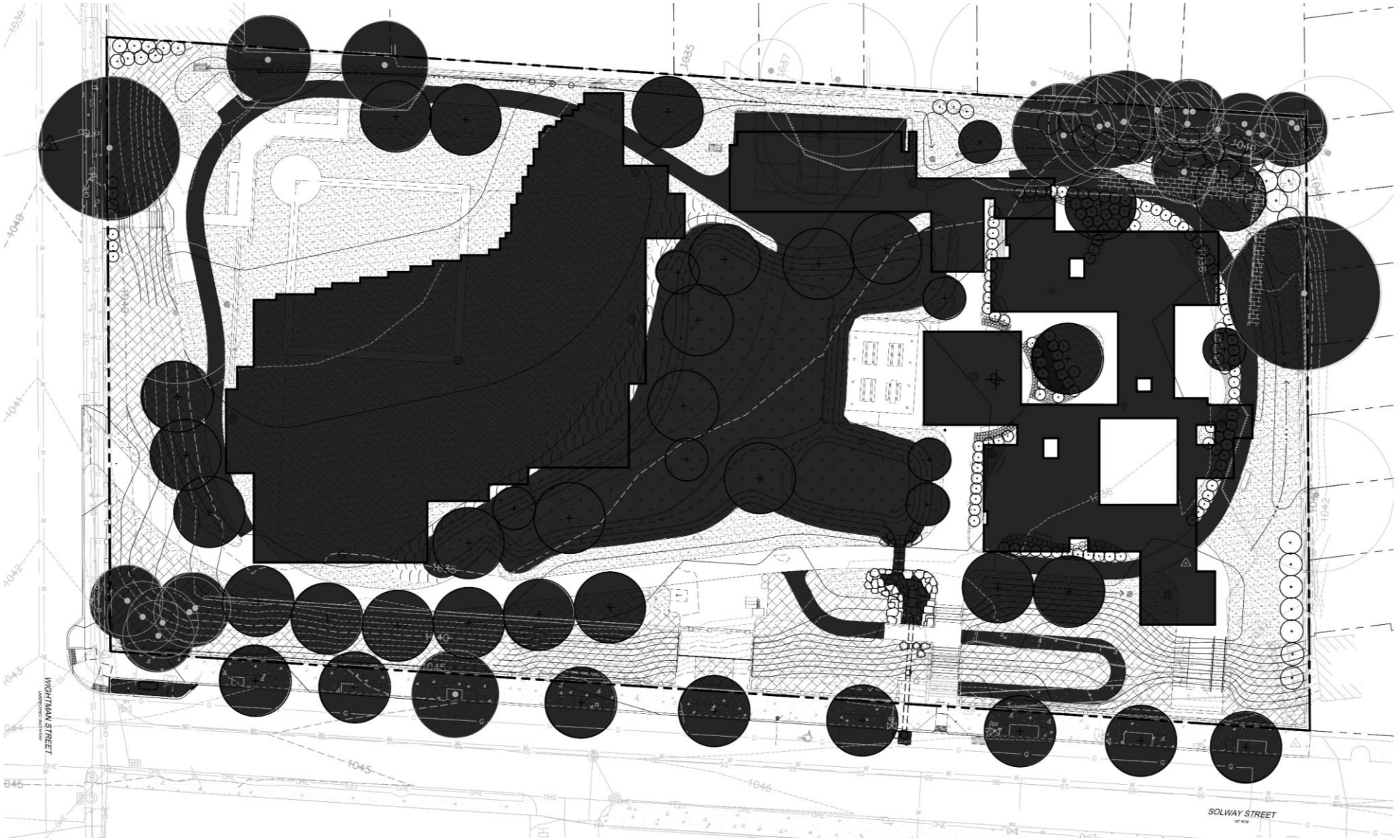
Stormwater BMPs Integrated Throughout the Site



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Total Site GSI Coverage

Credit: Pashek+MTR

Credit: City of Pittsburgh

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Using Green Infrastructure to Educate


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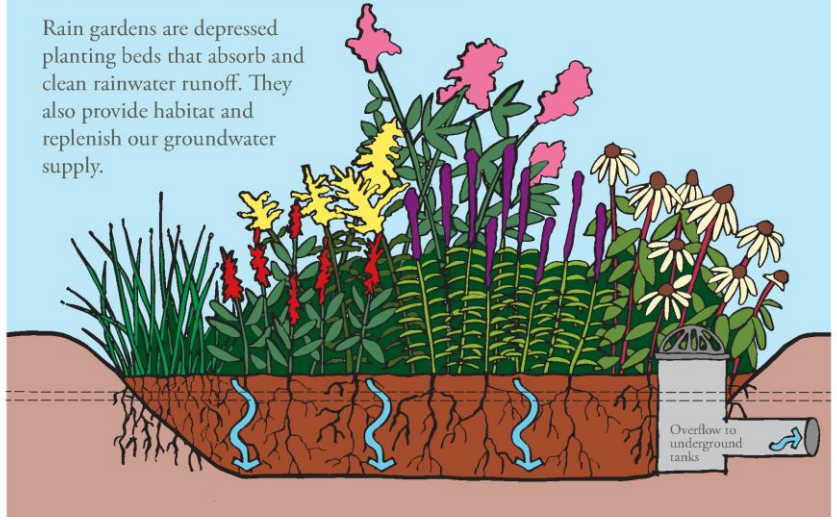
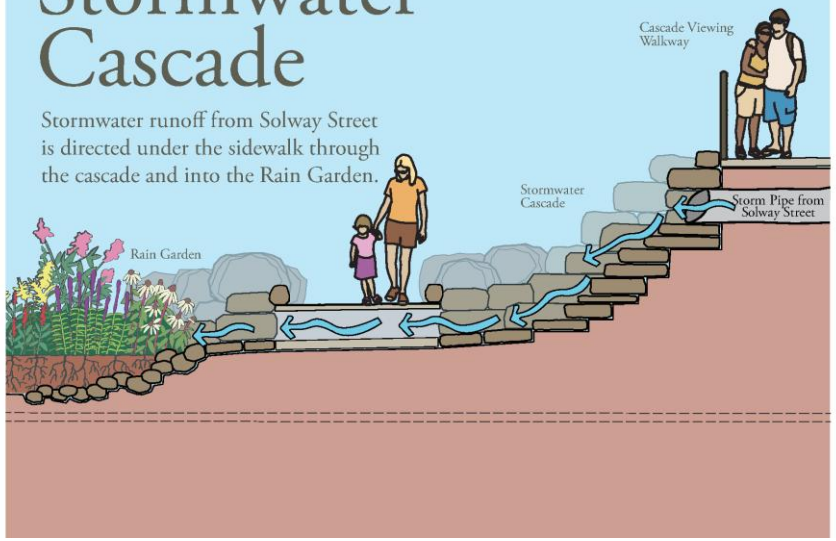
Rain Garden

Rain gardens are depressed planting beds that absorb and clean rainwater runoff. They also provide habitat and replenish our groundwater supply.



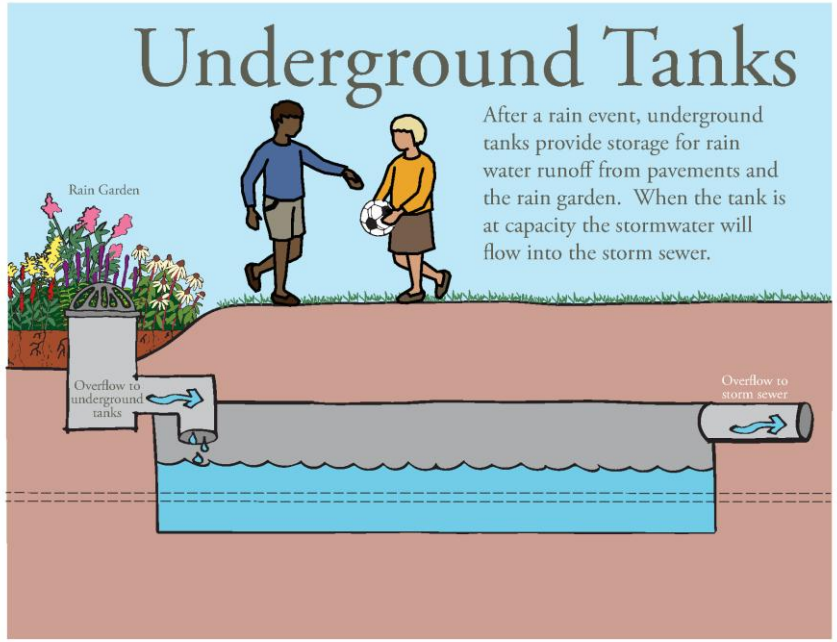
Stormwater Cascade

Stormwater runoff from Solway Street is directed under the sidewalk through the cascade and into the Rain Garden.



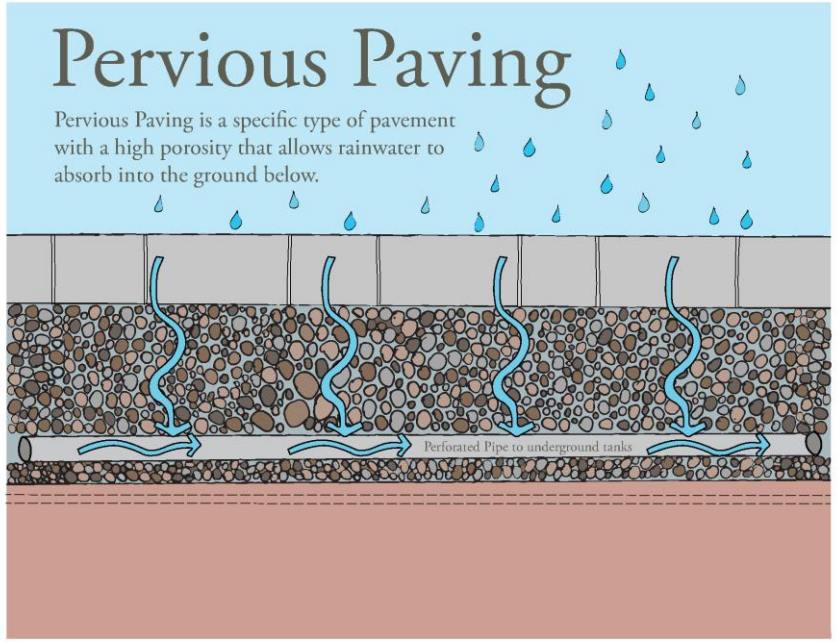
Underground Tanks

After a rain event, underground tanks provide storage for rain water runoff from pavements and the rain garden. When the tank is at capacity the stormwater will flow into the storm sewer.



Pervious Paving

Pervious Paving is a specific type of pavement with a high porosity that allows rainwater to absorb into the ground below.

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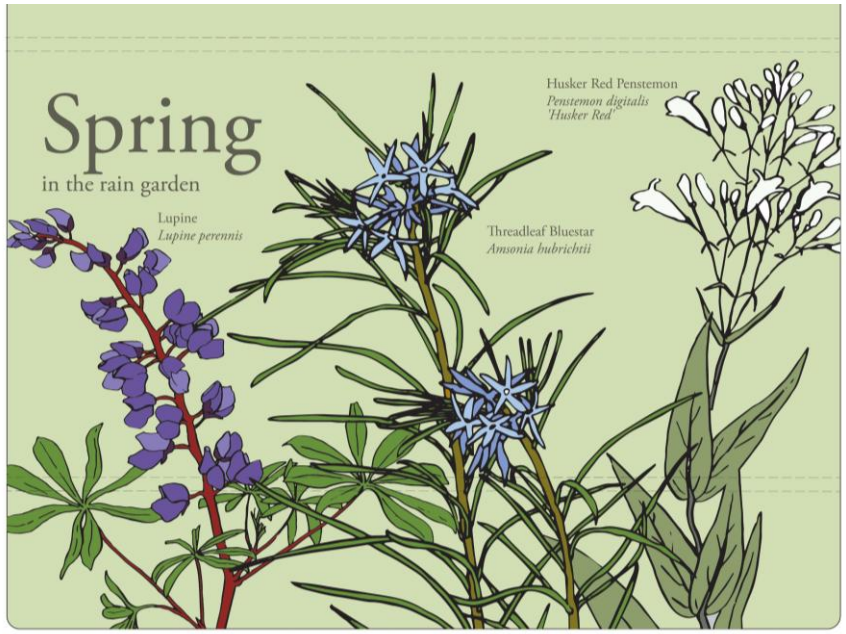

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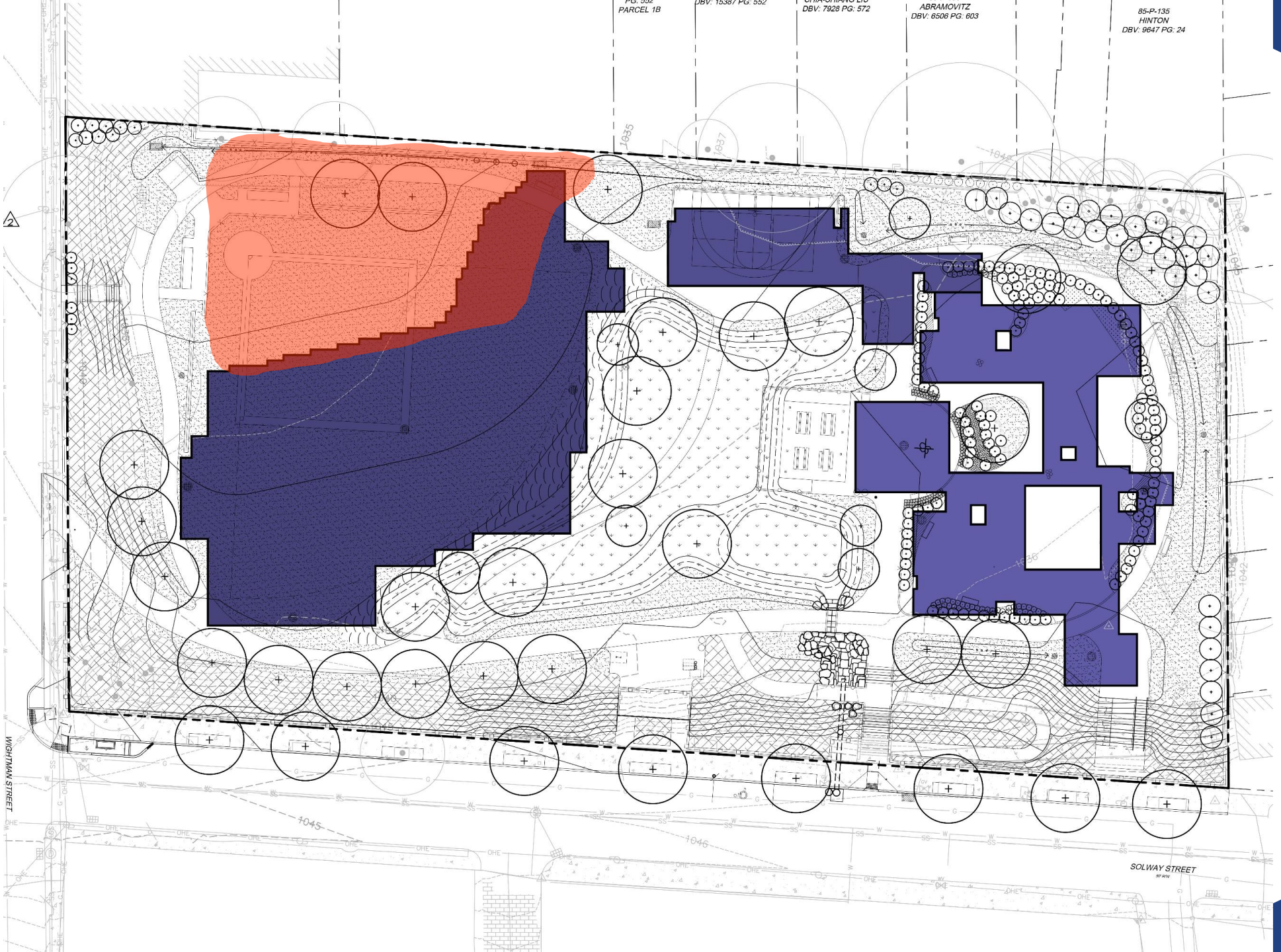
Challenges of Integrating Park Features with Green Infrastructure

- High water table
- Meeting existing conditions
- R-Tank maintenance ports
- R-Tanks with footings and Trees
- Low maintenance and high aesthetic value

Challenges

High Water Table


PARCEL 1B
DBV: 15387 PG: 552
DBV: 7928 PG: 572
ABRAMOVITZ
DBV: 6506 PG: 603
85-P-135
HINTON
DBV: 9647 PG: 24
WIGHTMAN STREET
SOLWAY STREET
1045
1046

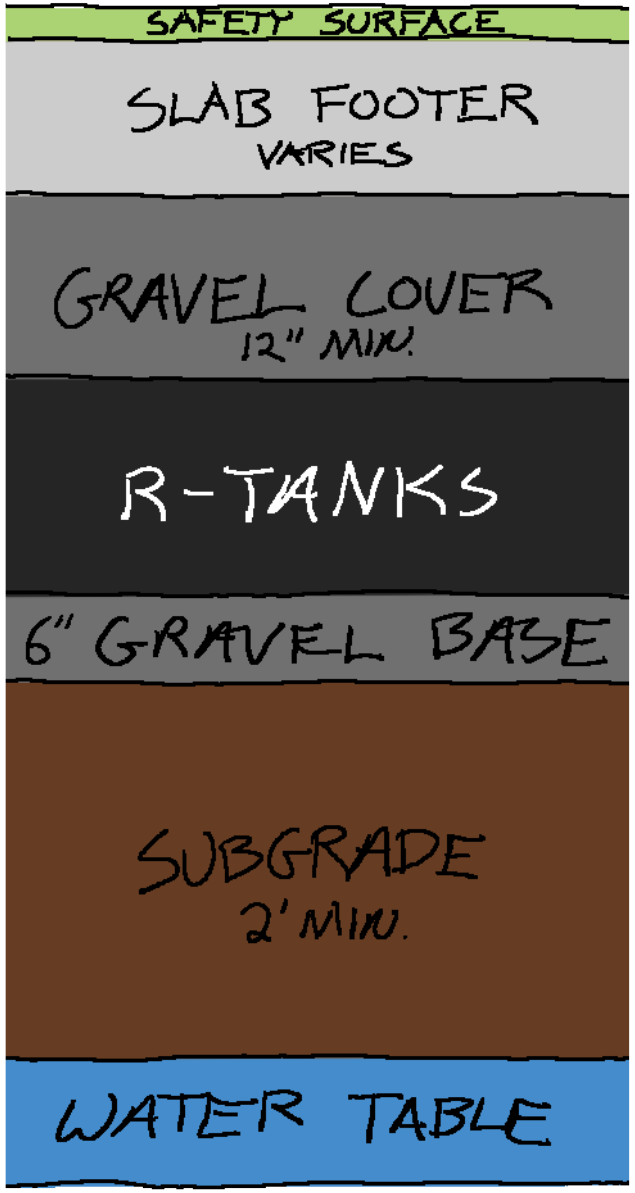
Challenges

Meeting Existing Conditions


REFER TO GP2 - GRADING PLAN ENLARGEMENTS
REFER TO GP2 - GRADING PLAN ENLARGEMENTS
WISHMAN STREET
SOLWAY STREET
REPLACE WITH GALVANIZED CHAIN LINK FENCE FABRIC ATTACHED TO EXISTING FENCE POST. VERIFY LIMITS WITH
GRAVEL AREAS
CHAIN LINK FENCE
NO PARKING SIGNS
ADA RAMPS
GUY WIRE
CONC RETAINING WALL 2' TALL
RAMP WITH RAILINGS
STAIRS WITH RAILINGS
3' TALL METAL RAILING
NO PARKING SIGN
2' CONC LID OVER DIRT FILLED WHOLE
EMPTY TREE PITS
SURVEY NAIL N: 411716.62' E: 1362716.81' ELEV: 1048.15'
4" VERTICAL PIPE (OLD DRAIN)
STONE RETAINING WALL 2' TALL
BRICK RETAINING WALL 2.5' TALL
STONE RETAINING WALL 3' TALL
WOOD RETAINING WALL 3.5' TALL
CHAIN LINK FENCE 6' TALL TO WEST HEIGHT VARIES TO EAST
BITUMINOUS PAVEMENT
SCOREBOARD
METAL POLE
REBAR & CAP N: 411821.43' E: 1362410.85' ELEV: 1040.00'
RIM: 1043.50' WL: 1038.43'
RIM: 1044.21' WL: 1040.05'
GRATE: 1045.52' WL: 1042.11'

Ball Field Cross Section

Playground Cross Section



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Challenges

R-Tanks with Footings and Trees

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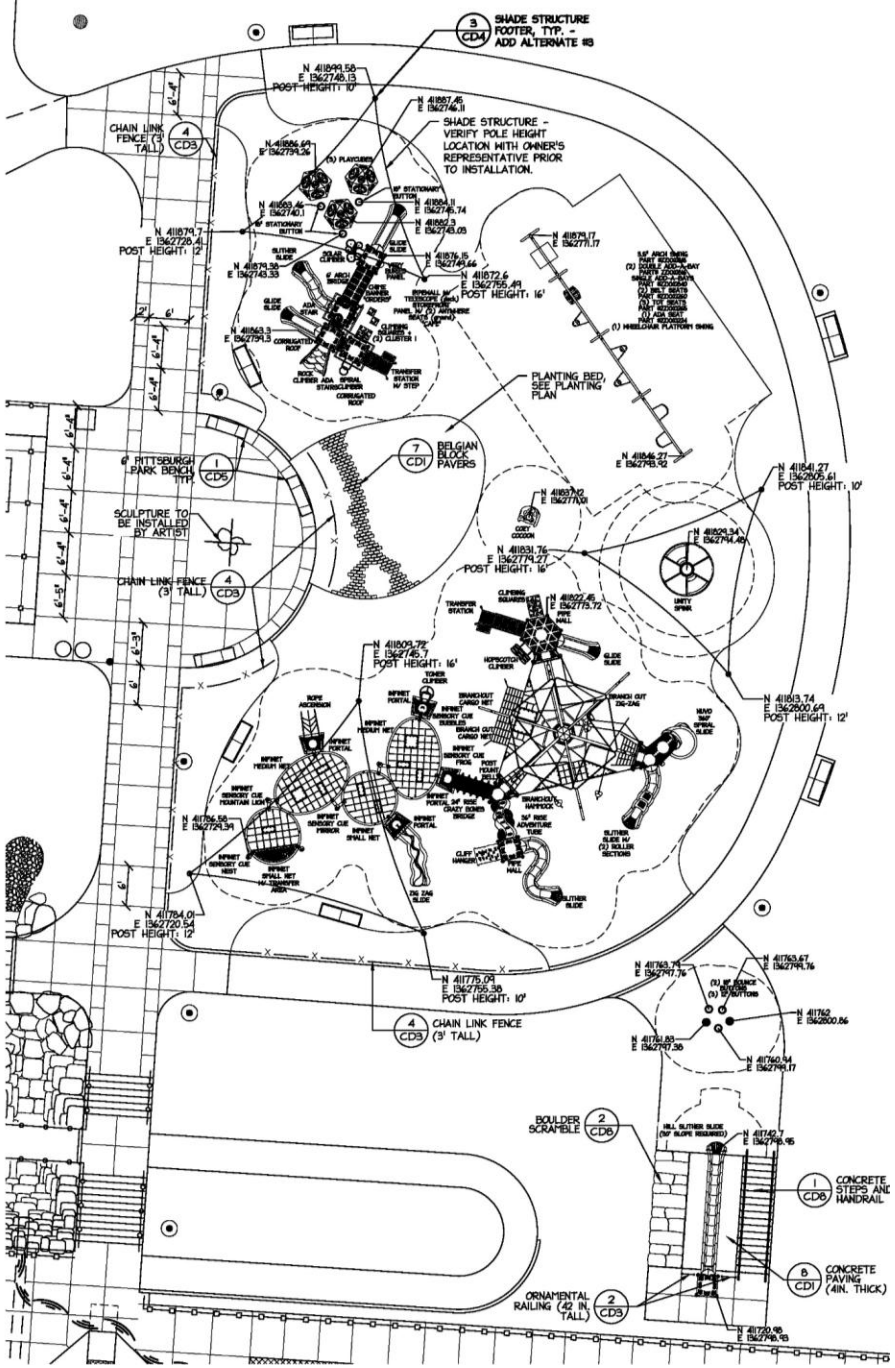
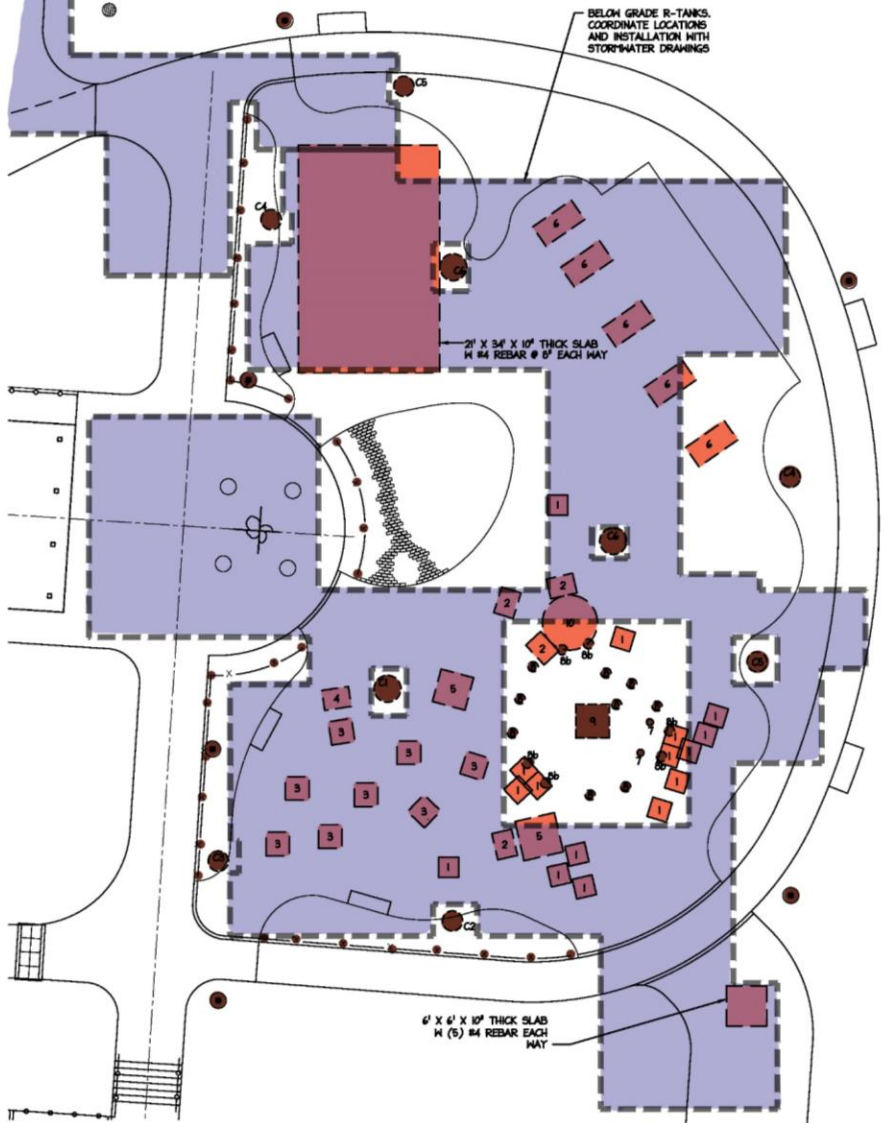


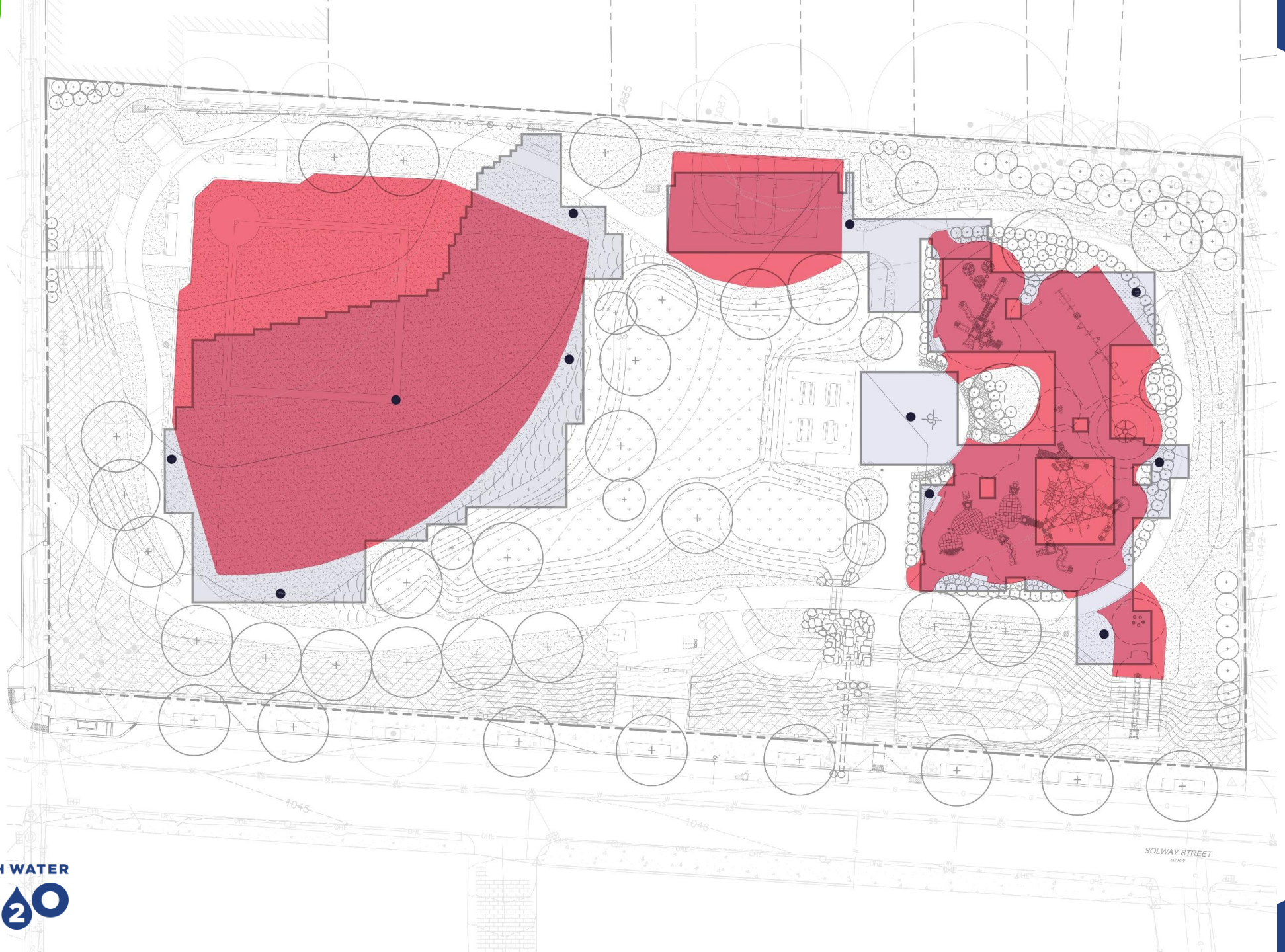


PLAYGROUND FOOTING KEY

1	3'-0"X3'-0"X8" SLAB W/(4) #4 REBAR EACH WAY (3 CD3)	8	18"ØX3'-0" FOOTING SEE FOOTING DETAIL #1 (4 CD3)
2	3'-0"X4'-0"X8" SLAB W/(5) #4 REBAR EACH WAY (3 CD3)	8b	18"ØX4'-0" FOOTING SEE FOOTING DETAIL #2 (4 CD3)
3	3'-6"X3'-6"X10" SLAB W/(5) #4 REBAR EACH WAY (3 CD3)	9	5'X5'X4'-0" FOOTING SEE FOOTING DETAIL #4 (4 CD3)
4	3'-0"X4'-0"X10" SLAB W/(6) #4 REBAR EACH WAY (3 CD3)	10	8'Ø"X8" FOOTING W/(8) #4 REBAR EACH WAY (4 CD1)
5	5'-0"X5'-0"X10" SLAB W/(7) #4 REBAR EACH WAY (3 CD3) ADD ALTERNATE #3	C1+C6	REFERENCE DETAIL #3 ON CD4 FOR FOOTING SIZE AND REINFORCEMENT (3 CD4)
6	3'-6"X6'-6"X1'-3" FOOTING W/(5) #5 REBAR X 6'-0" AND (5) #5 REBAR X3'-0" ADD ALTERNATE #3 (3 CD3)	C2-C5	REFERENCE DETAIL #3 ON CD4 FOR FOOTING SIZE AND REINFORCEMENT (3 CD4)
9	12"ØX2'-0" FOOTING SEE FOOTING DETAIL #3 (4 CD3)		

Challenges

R-Tank Maintenance Ports



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Challenges

Low Maintenance and High Aesthetic Value

Typical Rain Garden Planting

- Plants spaced 1’ or more apart
- Large swaths of a single species
- Lots of Mulch
- How does this accomplish high aesthetic quality and low maintenance?

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Wightman Rain Garden

- Treat it like a meadow
- Plant mixes
- Plant small plugs and close together
- Use a seed mix to fill in between plugs

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Key Takeaways

What Makes this Project Different

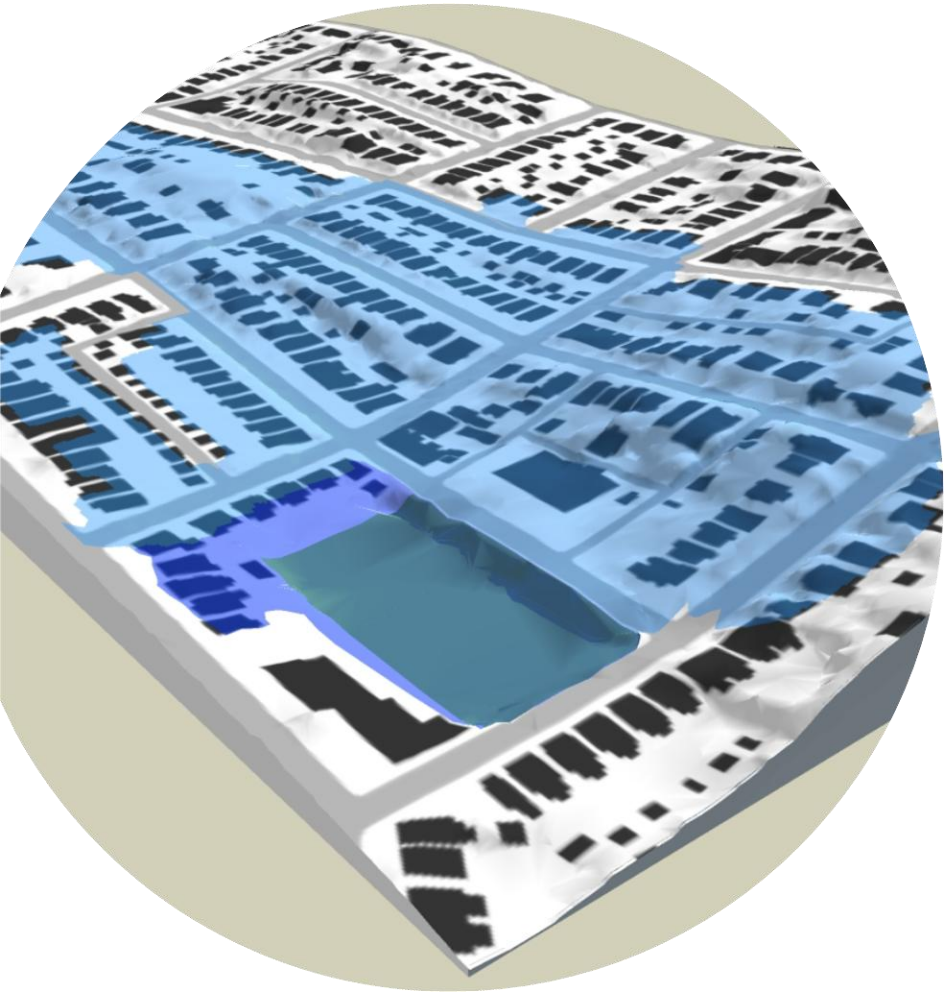
- Bring in potential partners during Master Plan
- Captures stormwater at a neighborhood scale
- Achieves resilience thru networking & redundancy
- GSI integrated throughout the park and neighborhood
- Using GSI for education
- Using GSI to connect people to nature

Challenges

- High water table
- Meeting existing conditions
- R-Tank maintenance ports
- R-Tanks with footings and Trees
- Low maintenance and high aesthetic value

Target Outcomes

Solving Stormwater on a Neighborhood Scale



Stormwater Design Stats

- 1.5” storm
- 28 acres are captured
- 12 acres of impervious area captured
- 58,000 cubic feet of storage
- 17% retained in rain garden
- 78% detained in R-Tanks
- 5% retained by ROW BMPs (84% intercepted)

Project Performance

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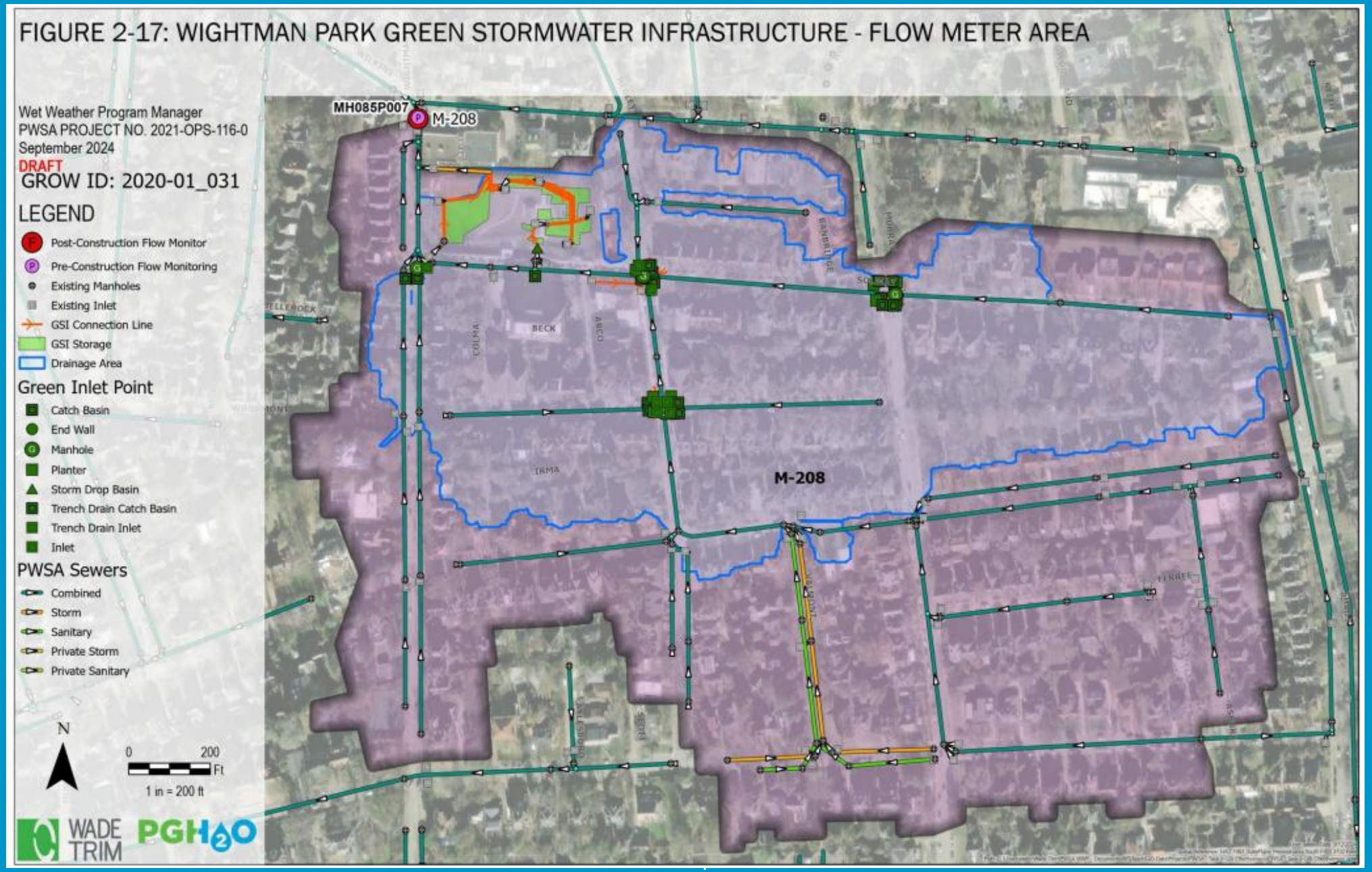
Flow Monitoring Area Map



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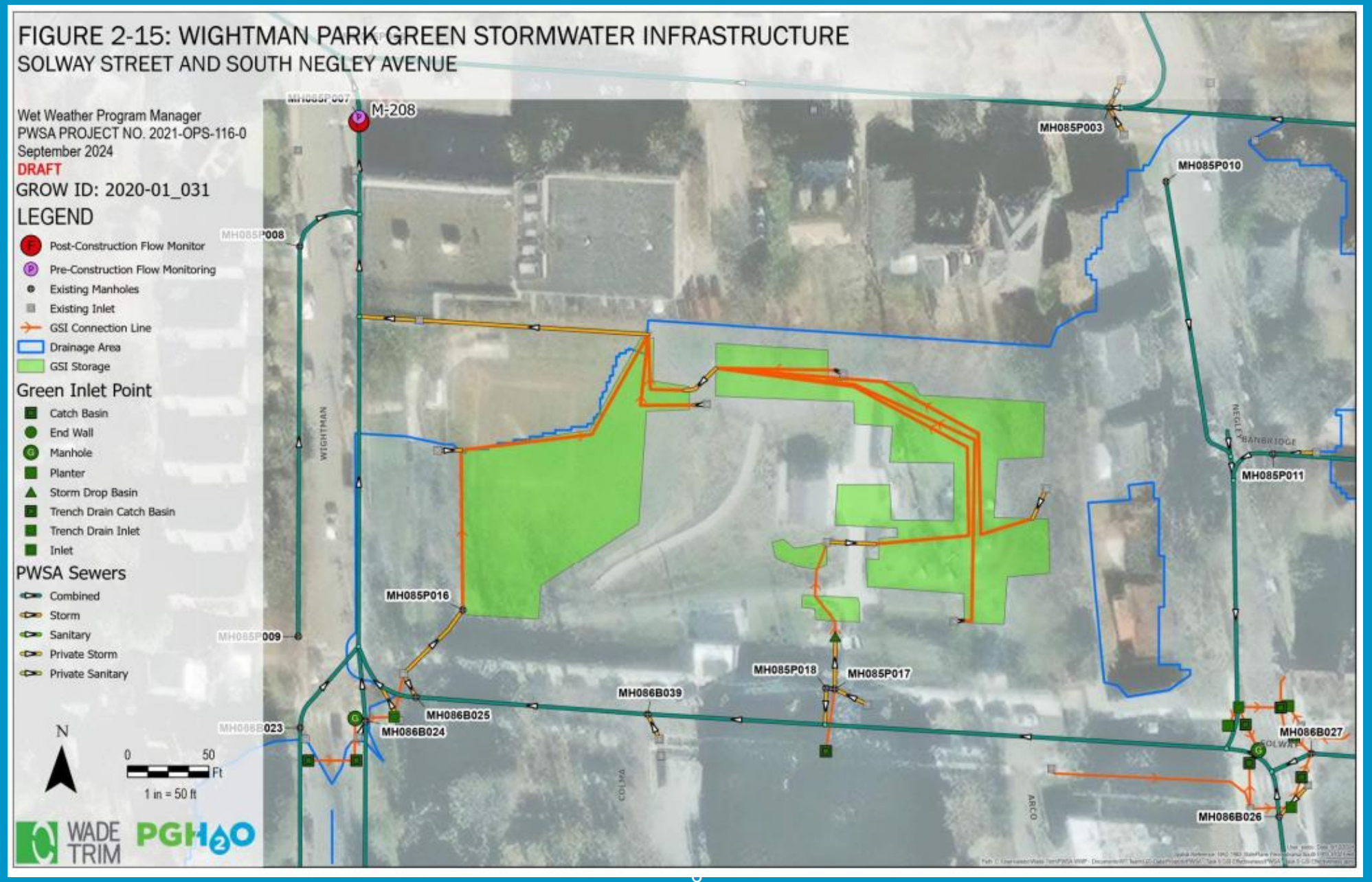
SWMM Model – LID components



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Project Performance

Analysis Results

- Drainage Area – **12.1** impervious acres (32.4 total acres)
- Runoff managed in Typical Year – **15.2 MG**
- CSO Reduction estimate in Typical Year – **6.5 MG**
- Percent Flow Reductions in Sewer System
  - **15-30%** reduction in Volume
  - Appx. **33%** reduction in Peak Flow Rate
  - Positive impact to reduce risk of basement backups

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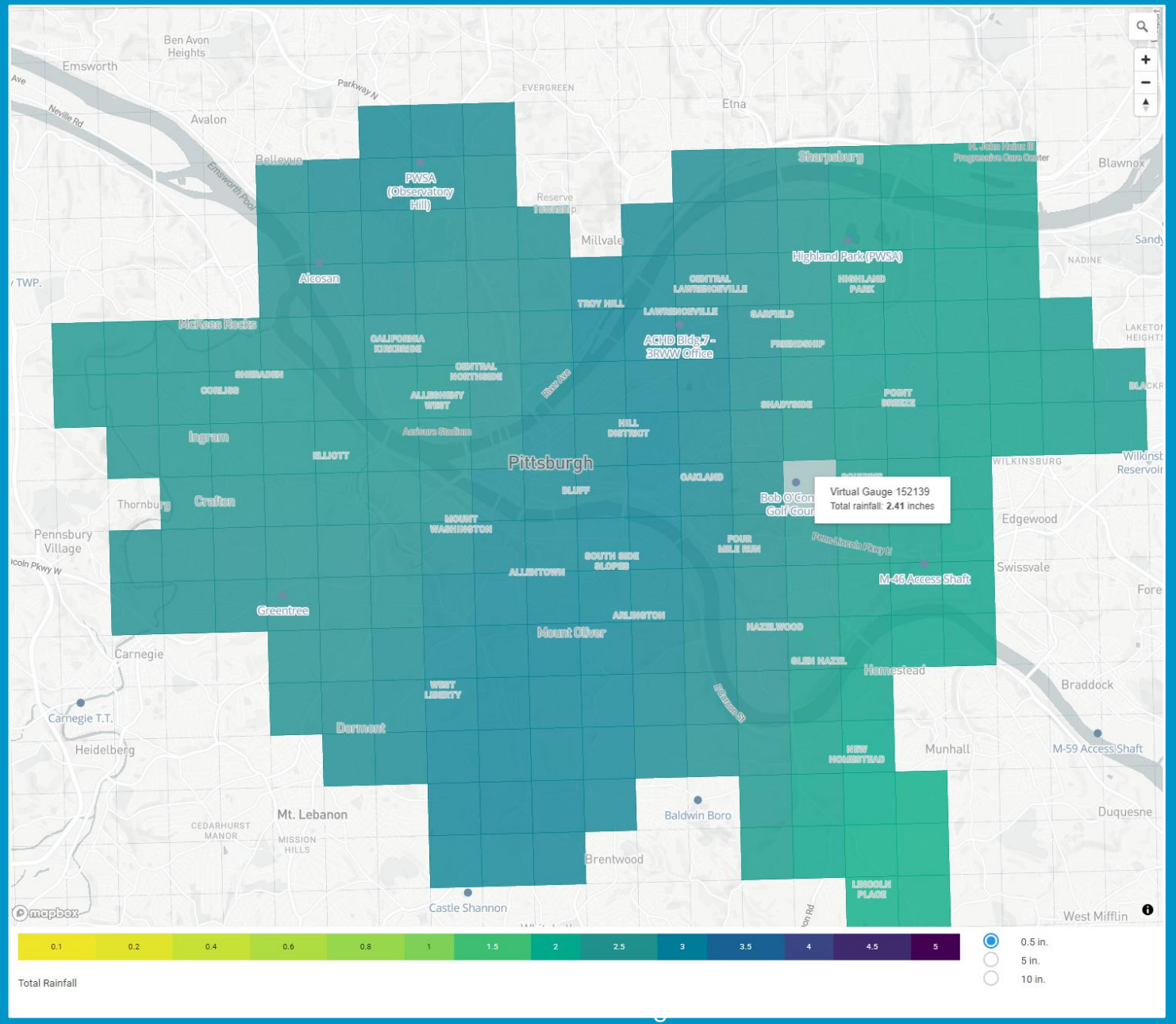
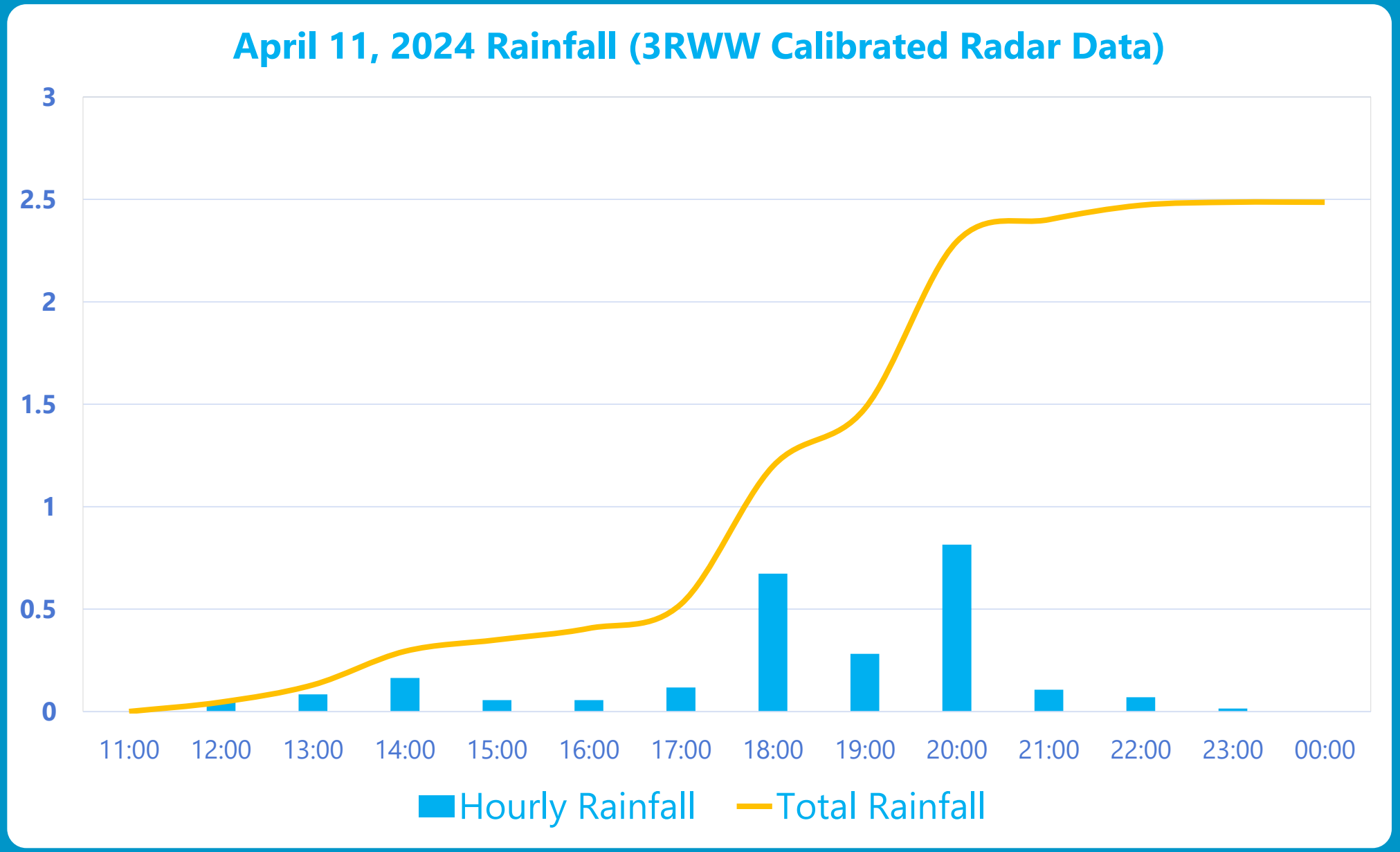
April 11, 2024 Rainfall Event



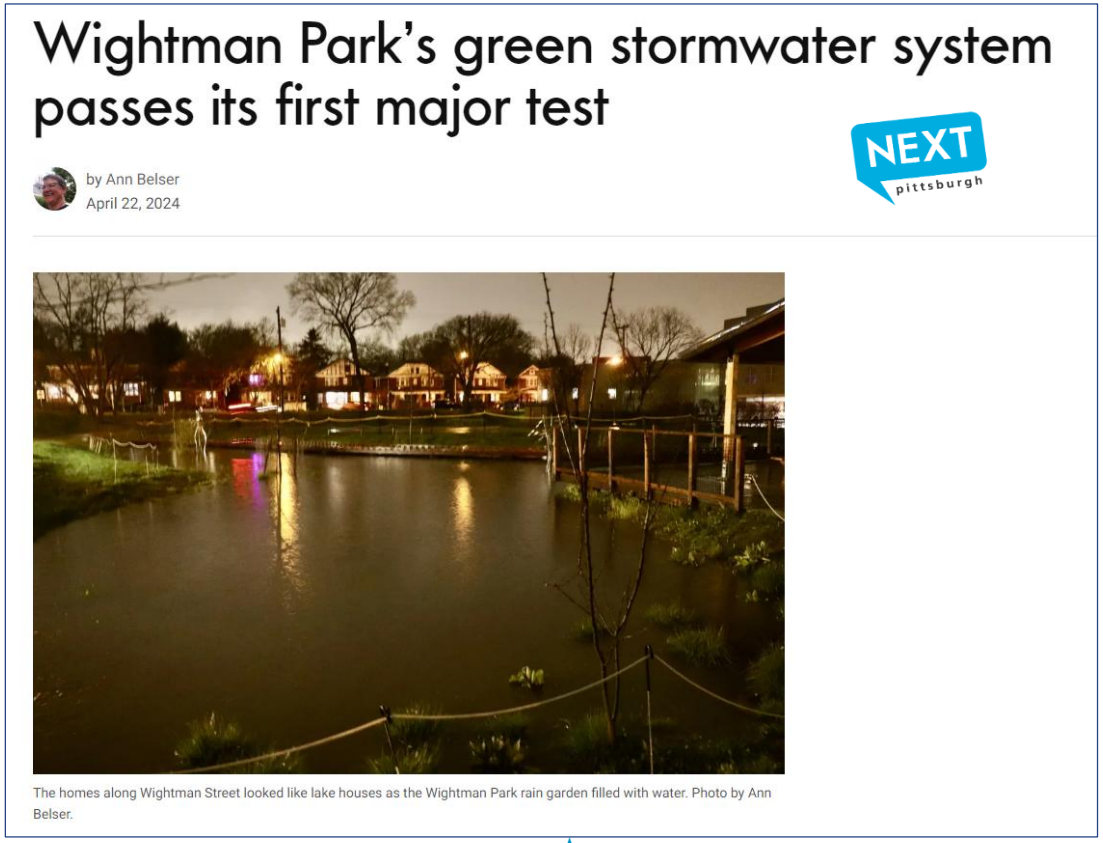
April 11, 2024 Rainfall Event



April 11, 2024 Rainfall Event

2.4 inches in 12 hours

- Peak 15min. intensity: 2 inch/hour
- Surface ponding drained < 2 days
- Equivalent to a 5-year recurrence rainfall event



Wightman Park's green stormwater system passes its first major test

NEXT pittsburgh

by Ann Belser
April 22, 2024

The homes along Wightman Street looked like lake houses as the Wightman Park rain garden filled with water. Photo by Ann Belser.

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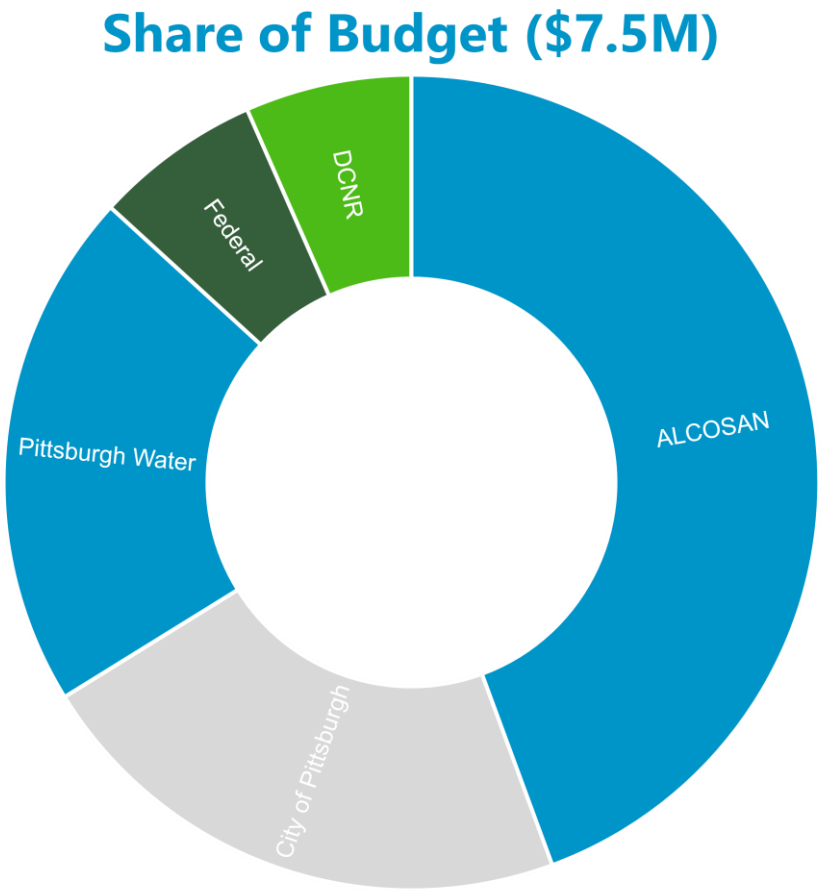
Experience with Green Infrastructure

- GI projects in more **natural environments**, on public land (such as parks) are easier to build (generally fewer utility conflicts) and maintain.
- Green Infrastructure affords opportunities to support **community benefits and community education.**
- **Maintenance responsibility and costs** need to be defined before implementation.

Signage

- Implementing signage in 2025
- Four park sites
- Two stream restorations sites
- Two GSI sites along roads
- Graphic shows connection to river (and water quality!)
- Larger/simpler signs for areas with mainly visibility from car traffic
- Template so can replicate cost-effectively

Strategic Partnerships are Key



Leveraging Funds

- ALCOSAN - $3.35M
- City of Pittsburgh - $1.65M
- DCNR Grant - $0.50M
- Federal Grant - $0.50M
- Pittsburgh Water - $1.56M

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Thank you

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R-TANK
STORMWATER
MAINT. PORT
MADE IN USA


Winter
in the rain garden