

Increasing Stormwater Resiliency Through Innovative Codes and Ordinances

July 20, 2022



Southwestern Pennsylvania Commission



Presented by:

- James J. Stitt, Sustainability Manager, Pittsburgh Water & Sewer Authority
jstitt@pgh2o.com
- Marti Battistone, Senior Environmental Planner, Dept. of City Planning
martina.battistone@pittsburghpa.gov
- Kevin Flynn, Senior Vice President, AKRF
kflynn@akrf.com



Agenda

- »» Stormwater in Pittsburgh
- »» Project Overview
- »» New Regulations
- »» Design Manual + New Resources
- »» Main Takeaways



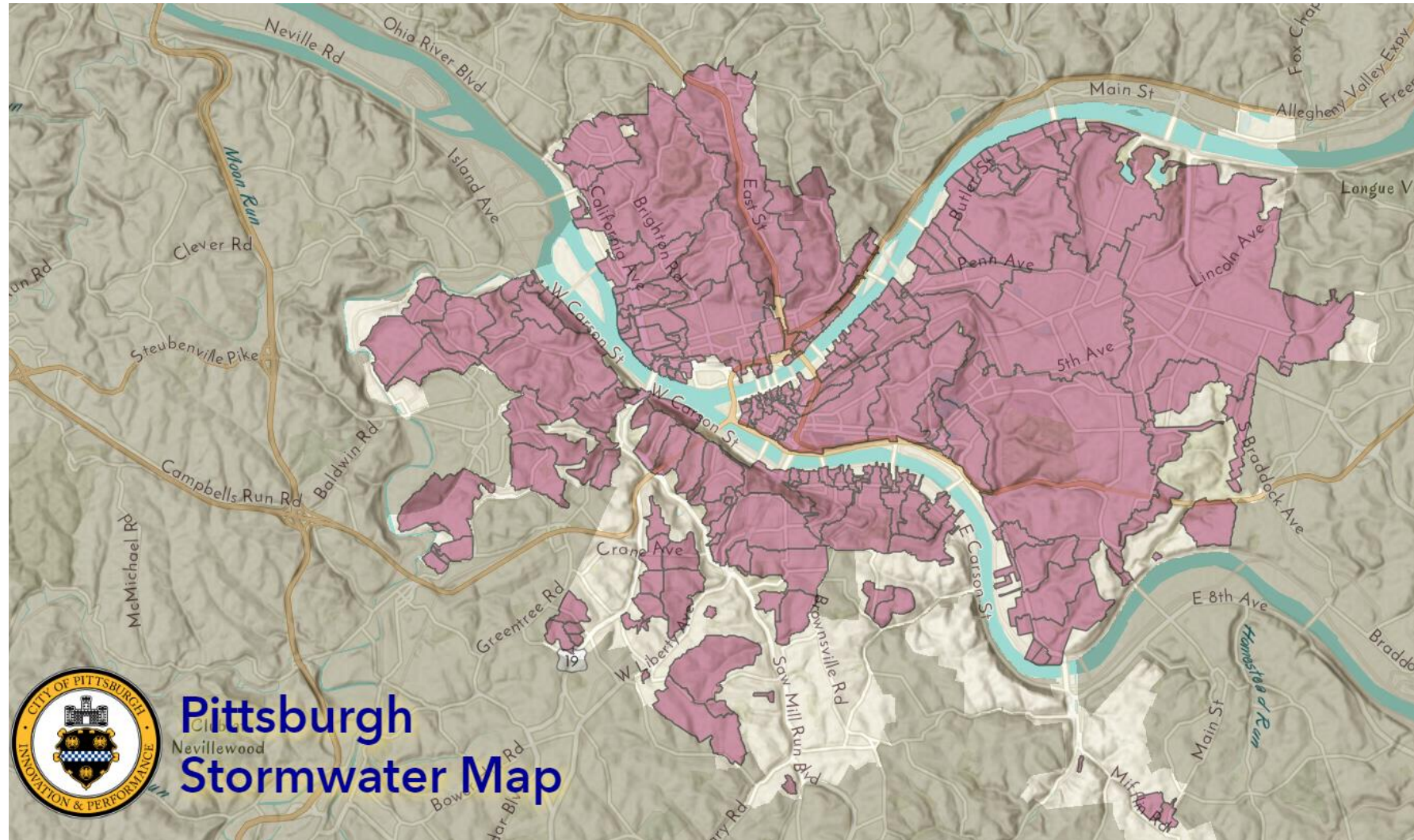
Stormwater in Pittsburgh

Stormwater Challenges in Pittsburgh

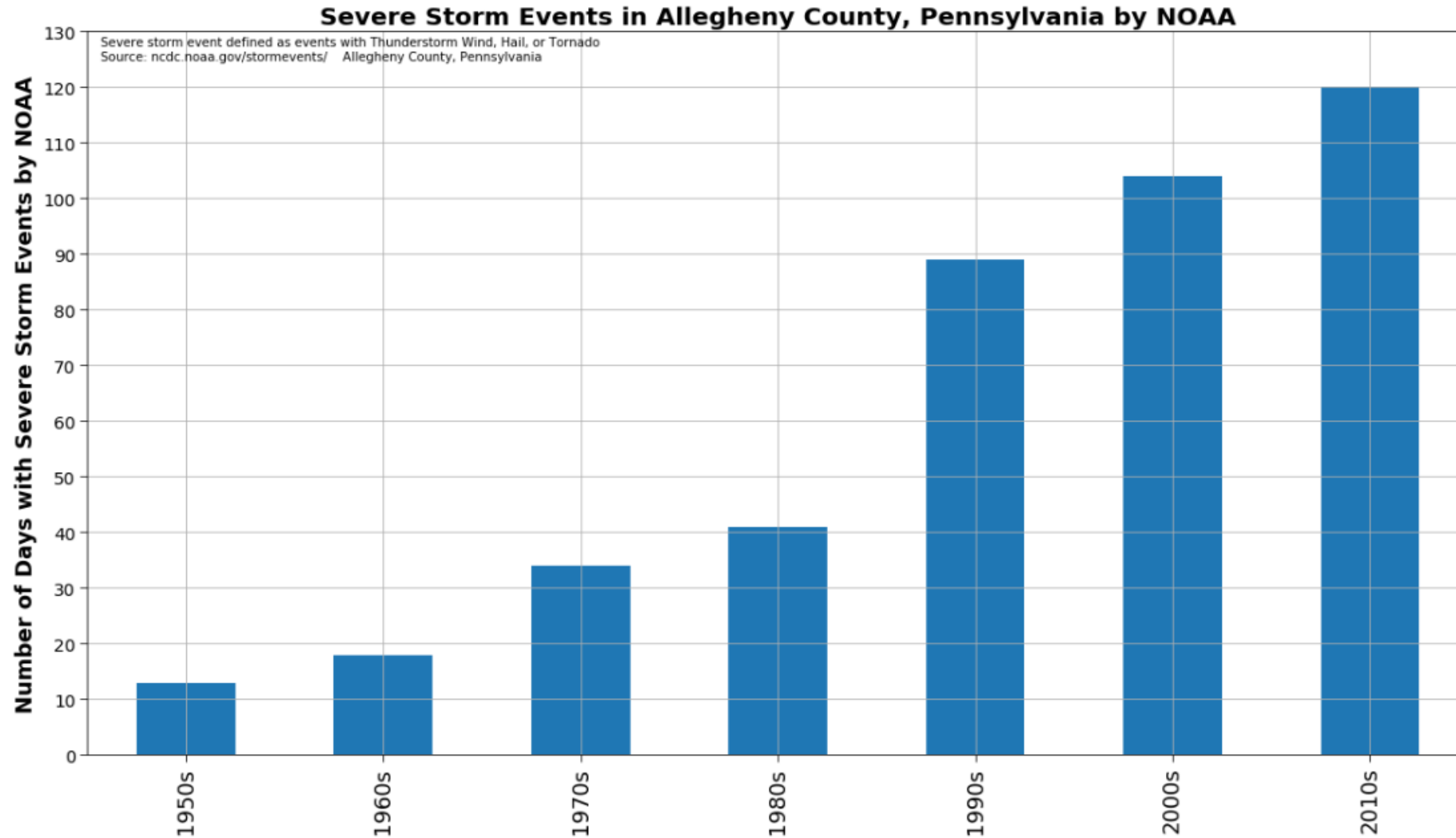
- Aging infrastructure
- Combined sewer overflows
- Impaired streams
- Flash flooding
- Basement backups
- Landslides



Combined Sewersheds

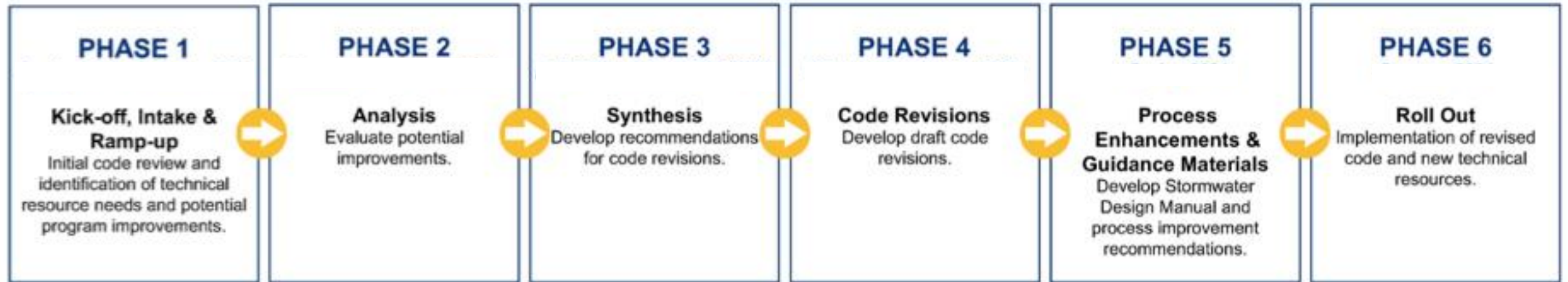


Stormwater in Pittsburgh





Project Overview



January 2020

March 2022

Project Objectives

Update City Stormwater Management Code

- Consolidate stormwater-related content scattered throughout City Code
- Eliminate conflicts and overlapping regulations
- Align development requirements with City and PWSA goals and objectives, including regulatory compliance goals

Development New Technical Resources

- Stormwater Design Manual
- Online Stormwater Map

Recommend and Implement Process Improvements

- Streamline Stormwater Plan Review, Inspection, and Enforcement
- Clarify stormwater-related roles and responsibilities between agencies

Project Tasks

- Review of SWM-related code and technical guidance
- Review of regulatory requirements including new MS4 permit
- Analysis of current SWM review processes and land development approvals
- Analysis of current SWM construction closeout, inspection, and enforcement processes
- Agency staff and stakeholder input: meetings, interviews, surveys, mailings, etc.
- Technical analysis and development of policy recommendations
- Final policy recommendations incorporating feedback, and additional analysis
- Code revisions and legislative approval
- Technical resource development and rollout

Engagement Process

Agency Working Group

- City (Law, PLI, Zoning, Planning, DPW, DOMI)
- Pittsburgh Water and Sewer Authority (PWSA)
- Allegheny County Conservation District (ACCD)
- Allegheny County Health Department (ACHD)

Stakeholder Group








- Engineers, developers, architects, community organizations, watershed groups, institutions, etc.
- Three meetings with over 125 attendees, along with a focus group on affordable housing

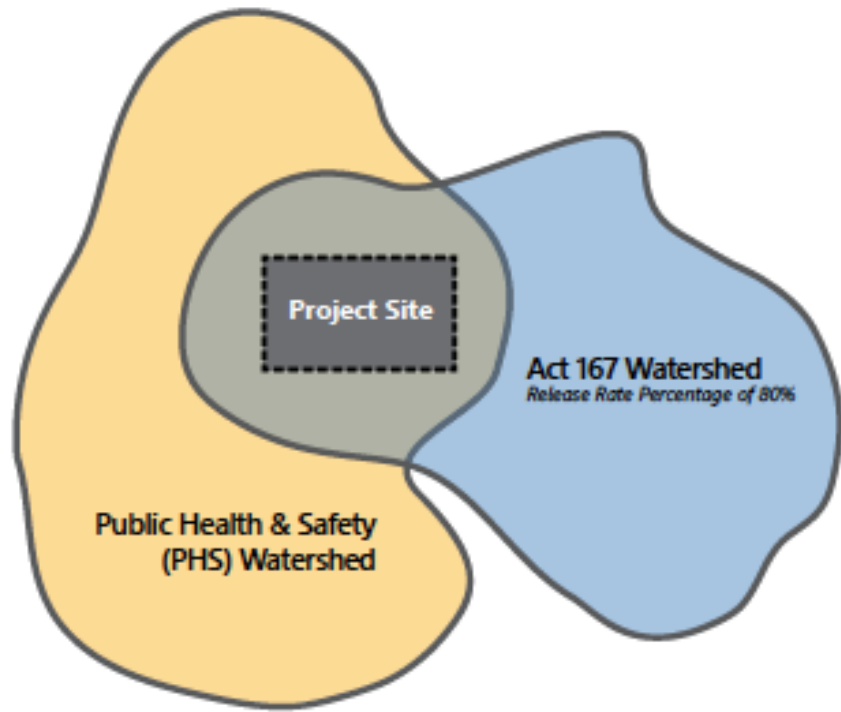


Legislative Process

Planning Commission + City Council

- Zoning Code Public Notice requirements
 - Over 30,000 mailers sent...twice.
- Timing of Briefings + Formal Presentations
 - MS4 Compliance also drove timeline

	How will this effect my property at 4024 Beechwood Blvd. Shelly asked a day ago Question asked to Martina Battistone	4 views
	Location of watershed by my property Cas asked 5 days ago Question asked to Martina Battistone	14 views
	How will this affect my properties at 6416 and 6418 Kemper Street? Dan asked 5 days ago Question asked to Martina Battistone	12 views
	How does this affect my property. 3347 Dawson street, pgh,pa. Oakland area? Email address. annette g7@verizon.net. Thanks Annette Galluze asked 6 days ago	22 views
	We use rain barrels for half the run-off from our house, how do we get credit for that? poanes@verizon.net asked 6 days ago	25 views
	What Watershed is within 150 feet of my property? Tracy asked 6 days ago Question asked to Martina Battistone	37 views
	Is there a map of the area evolved? Agnes asked 6 days ago	25 views



New Regulations

Code/Policy Development Categories



Process Improvements



Technical Changes



Alternative Compliance, Trading, Equity, Incentives



Inspection and Enforcement

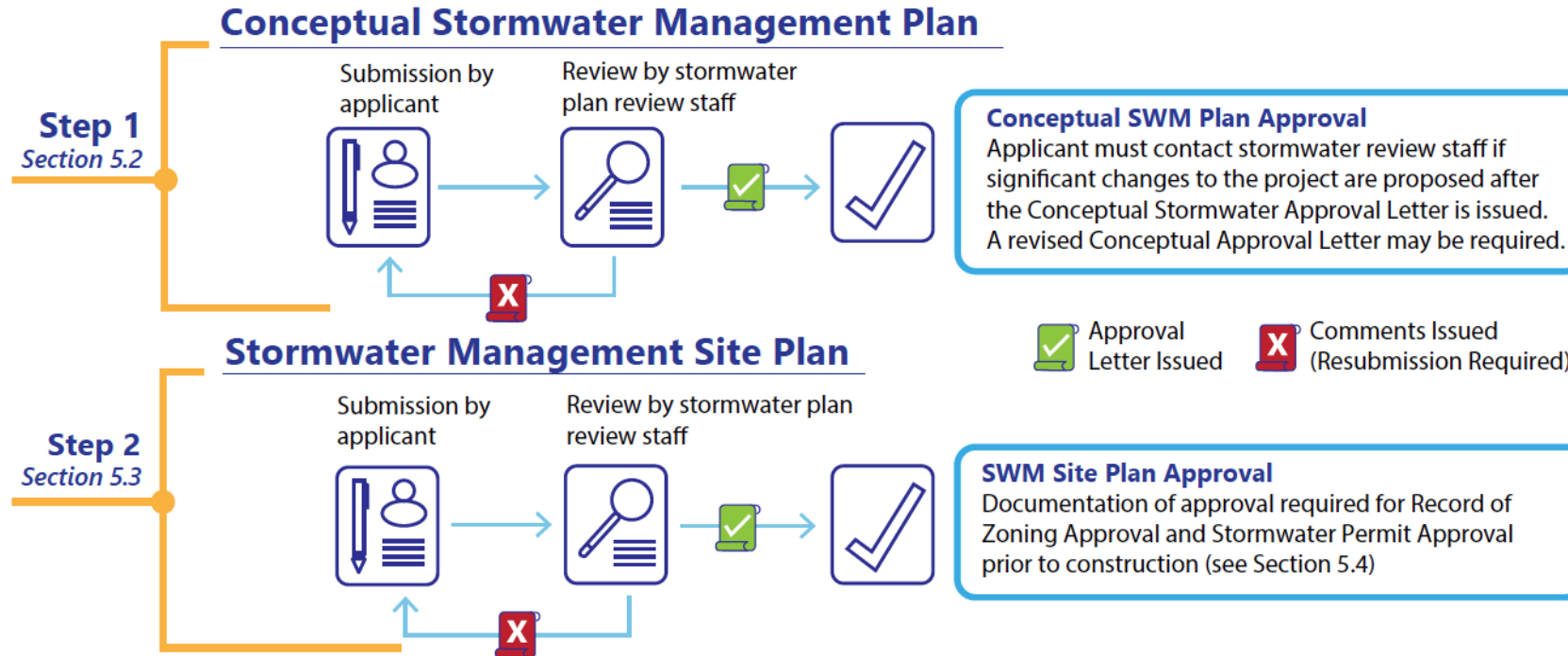
New Regulations + Policies

- Two-Step Review Process
- Better Coordination with Allegheny County Plumbing Permits
- Clarification of Filtration Requirements in Separate Sewer Areas
- Requirements to Reduce Sanitary Sewer Inflow
- Public Health and Safety Release Rates
- Addressing Climate Change
- Strengthening Pretreatment Requirements
- Limiting Right-of-Way Discharges
- Limiting Groundwater Discharge
- Addressing Non-Sewered Areas
- Controlling Discharges to Landslide Prone Areas
- Infiltration Testing Requirements
- Stronger Technical Infeasibility Criteria
- Consistent In-Lieu Fees
- Hardship Waivers for M/W/VBEs and Affordable Housing Developments
- Same Owner Banking and Trading
- Innovation Track for Approving New Technologies
- Incentives for Preferred Technologies and Additional Stormwater Management
- Enhanced construction inspection and long-term O&M enforcement resources

New Regulations + Policies

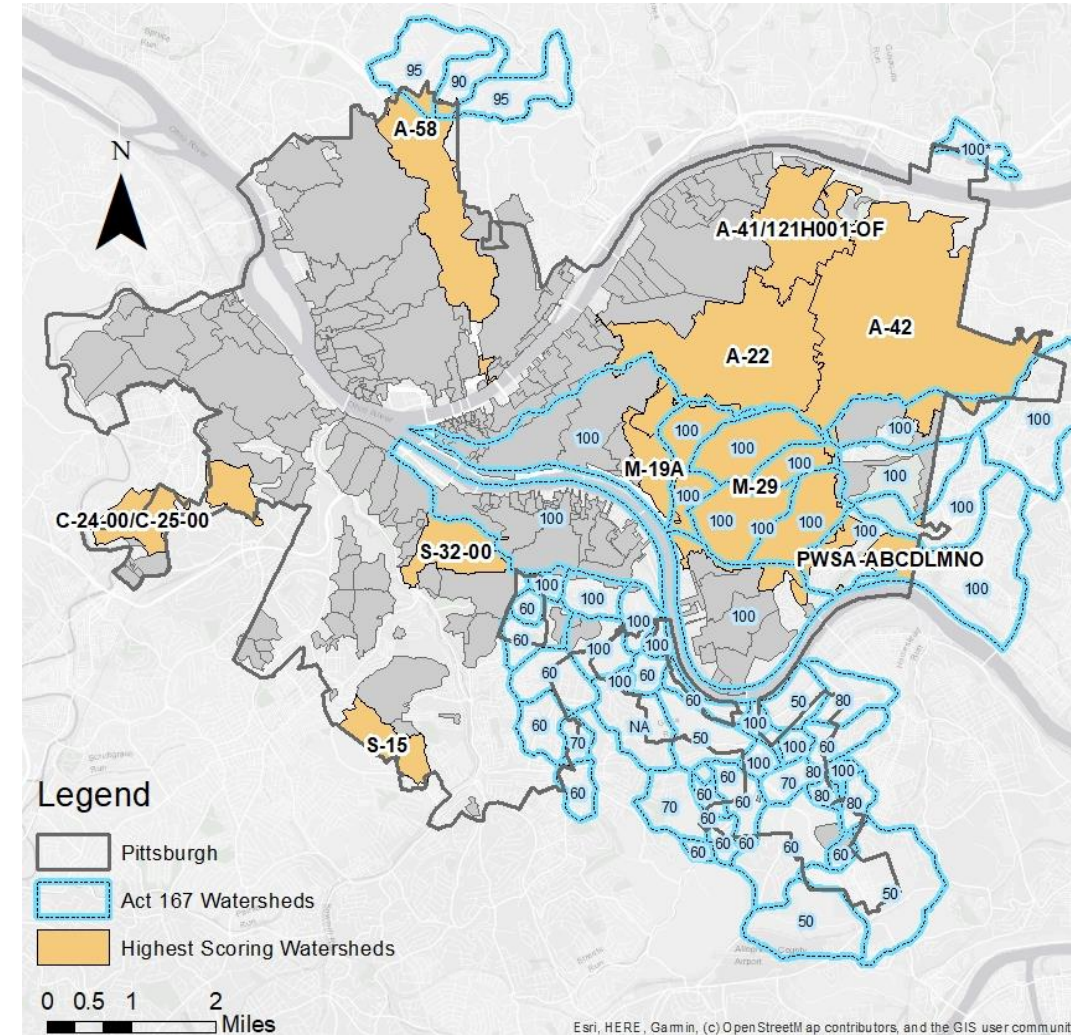
- **Two-Step Review Process**
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- **Public Health and Safety Release Rates**
- **Addressing Climate Change**
- Strengthening Pretreatment Requirements
- Limiting Right-of-Way Discharges
- Limiting Groundwater Discharge
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- Controlling Discharges to Landslide Prone Areas
- Infiltration Testing Requirements
- **Stronger Technical Infeasibility Criteria**
- **Consistent In-Lieu Fees**
- Hardship Waivers for M/W/VBEs and Affordable Housing Developments
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Two-Step Application Process



Public Health and Safety Release Rates

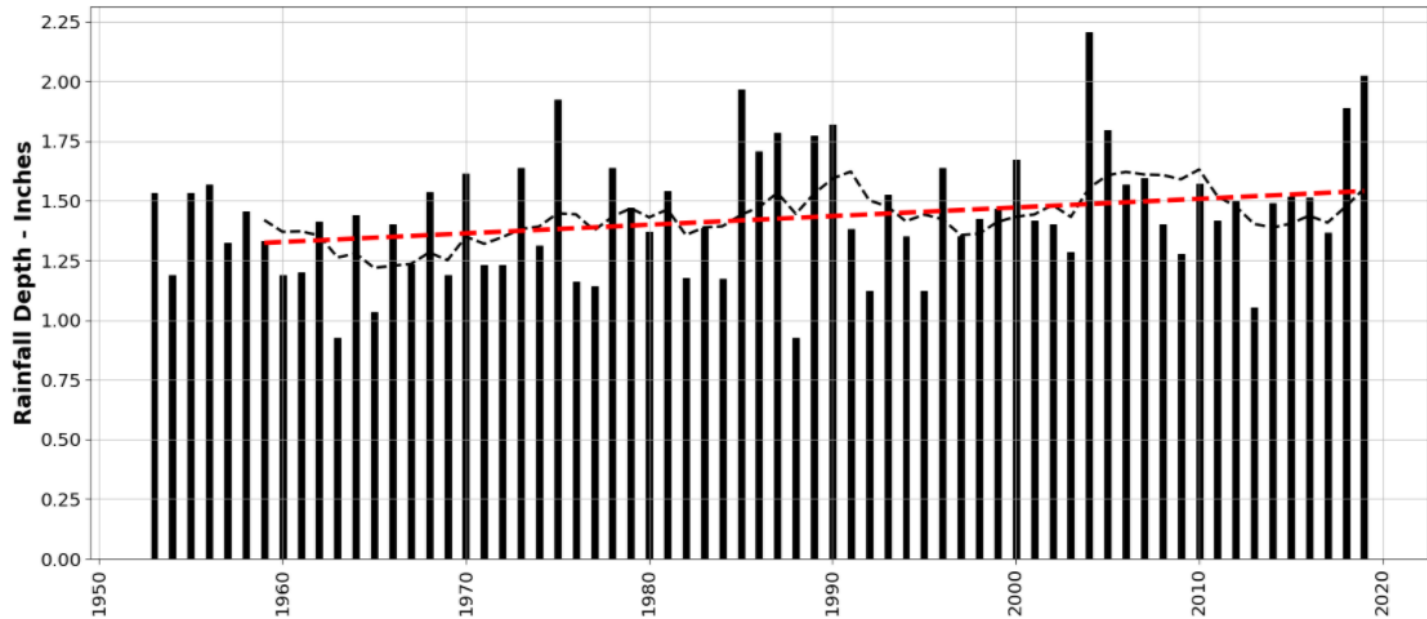
- Ranking of flooding susceptibility of combined sewersheds considering:
 - Flood complaint data
 - Sewer hydraulic capacity analysis
- Highest scoring watersheds are subject to Public Health and Safety Release Rate requirements
 - Approx. 25% of the City
- Overlap with Act 167 watersheds



Climate Change Policy - 95th Percentile Rain Event

Analysis of historic rainfall data and trends:

- 13% increase over period of analysis
- Following same trend:
2050=1.56" and
2100=1.66"



Pittsburgh International Airport Hourly Rainfall Data (1953-2019)

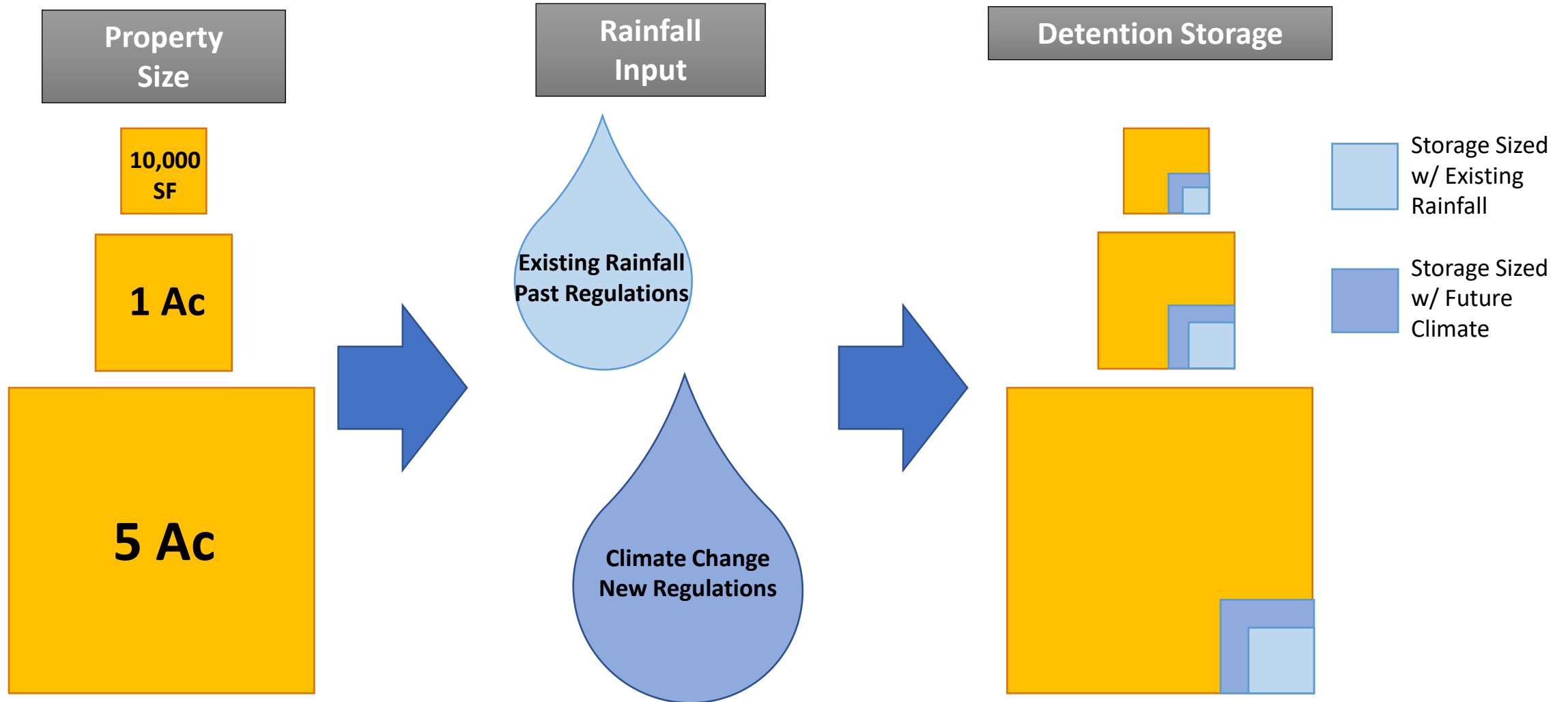
Climate Change Policy - Design Storm Rainfall Depths

Return Period (Yr)	Current Code Requirements	CMU Climate Change Study	Percent Difference between Existing and Future Climate Return Period Values			
	NOAA Atlas 14* (inches of rainfall)	Average Future* (2020-2099) (inches of rainfall)	Pittsburgh	VA Beach	Auckland, NZ	Vancouver, BC**
2	2.3	2.5	8%	20%	9%	21%
5	2.9	3.3	12%	20%	11%	19%
10	3.3	3.9	15%	20%	13%	22%
25	3.9	4.8	19%	20%	15%	21%
50	4.4	5.6	21%	20%	17%	21%
100	4.9	6.4	23%	20%	17%	20%

*Values taken from Table C.4 *Managing Heavy Rainfall with Green Infrastructure* (RAND 2020)

**Estimated from visual comparison of Vancouver, BC 2014 and 2100 IDF Curves in City of Vancouver Rainwater Management Bulletin July 11, 2018

Cost Analysis - Model Scenarios



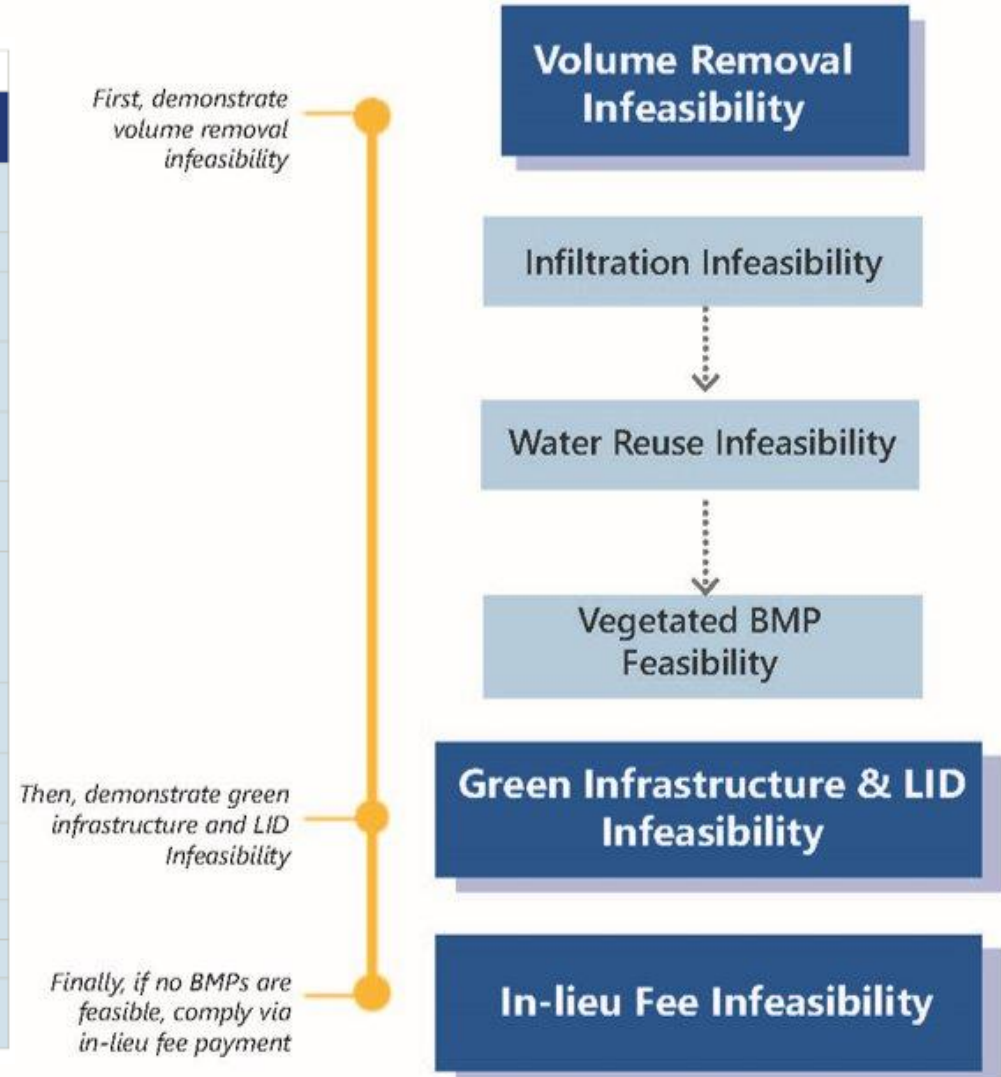
Modeling - Increase in Storage Volume

Development Scenario	Required Storage Volume		Storage Increase CF	Storage Increase %
	Past	New		
	CF	CF		
10,000 sf with 25% IA plus 25% IA	1,002	1,736	735	42%
10,000 sf with 25% IA plus 100% IA	1,489	2,085	596	29%
10,000 sf with 75% IA plus 25% IA	1,447	2,314	867	37%
10,000 sf with 75% IA plus 100% IA	1,653	2,524	871	35%
1 Ac with 25% IA plus 25% IA	3,241	5,156	1,915	37%
1 Ac with 25% IA plus 100% IA	4,905	6,981	2,075	30%
1 Ac with 75% IA plus 25% IA	5,768	9,453	3,685	39%
1 Ac with 75% IA plus 100% IA	6,050	9,811	3,761	38%
5 Ac with 25% IA plus 25% IA	16,682	25,781	9,099	35%
5 Ac with 25% IA plus 100% IA	25,208	37,813	12,604	33%
5 Ac with 75% IA plus 25% IA	27,498	42,753	15,254	36%
5 Ac with 75% IA plus 100% IA	29,754	45,375	15,621	34%

Technical Infeasibility

TABLE 3.8. REPORT REQUIREMENTS FOR TECHNICAL INFEASIBILITY CRITERIA

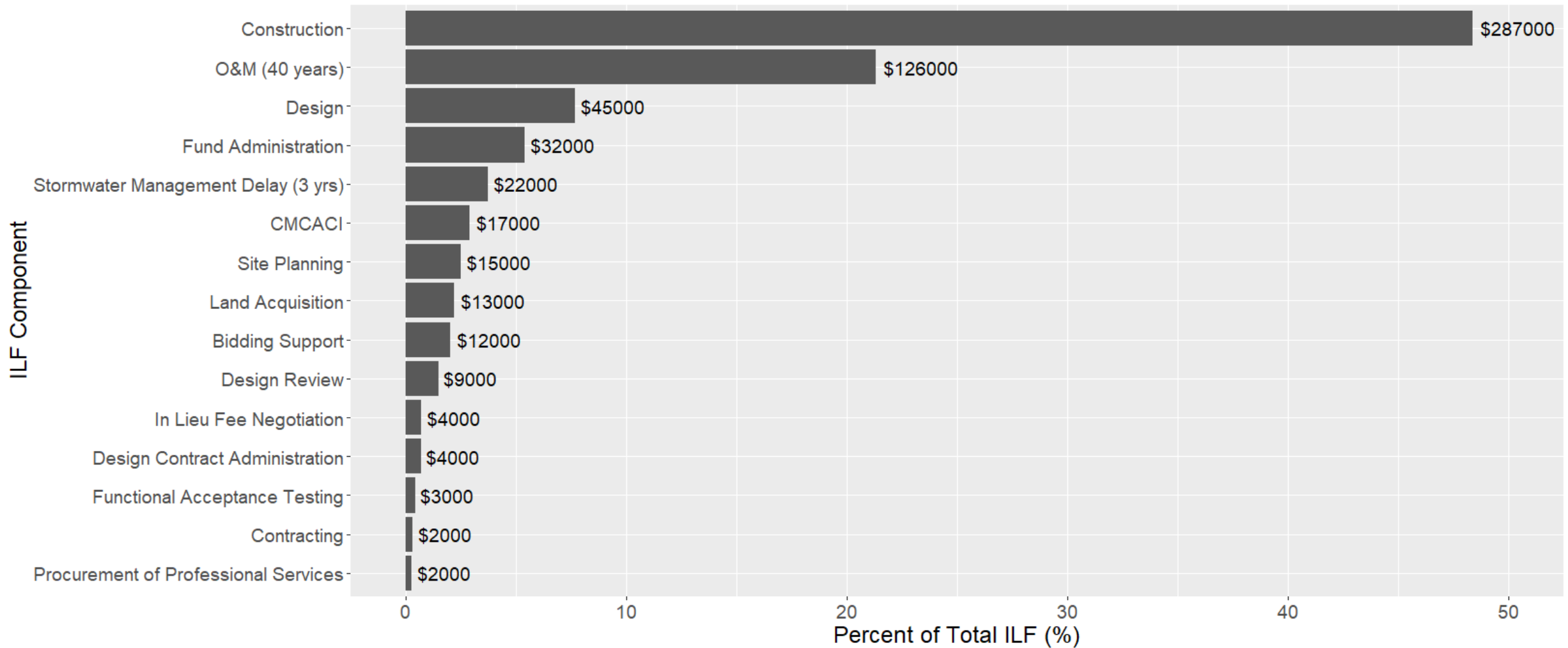
Technical infeasibility criteria	Report requirement
Excessive sediment loading	Quantitative analysis (see excessive sediment loading narrative section) showing why proposed use will generate sediment loading that will make BMP maintenance infeasible.
Steep slopes	Topographic mapping showing that the area exceeds slope thresholds, including offsets..
Landslide prone or undermined areas	Mapping showing the areas as landslide prone or undermined and area certification from a geotechnical engineer that the area is landslide prone.
Low infiltration	Infiltration testing in accordance with Section 3.4 and Appendix B demonstrating insufficient infiltration rates.
Insufficient water reuse	Narrative explaining why the proposed condition has insufficient need for water reuse or why water uses are infeasible..
Environmental contamination	Report prepared by an environmental professional stipulating that infiltration or other BMPs cannot be installed due to environmental contamination.
Potential for settlement or subsidence/presence of uncompacted fill/ Uncompacted urban fill	Report prepared by a geotechnical engineer, including boring logs, showing that BMP cannot be located in a specific areas due to the potential for settlement based on soil bearing capacity. Applicants must also note why over excavation of material is not possible (up to 3 ft of removal).
Floodplain/Floodway	FEMA-compliant mapping of floodway in a published flood insurance rate map or flood insurance study or similar study. Inundation analysis for floodplains/floodways around small streams.
Wetlands	Wetland delineation report prepared in accordance with current USACE methods prepared by an individual with expertise in wetland delineation.
Groundwater	Monitoring well data or boring logs indicating seasonal high groundwater levels.
Riparian buffers	Delineation of riparian buffers along mapped watercourses.
Mature trees	Topographic survey locating mature trees by category. Certified arborist report indicating tree condition.
Setbacks	Offsets from field surveyed or proposed structure/utility locations and property boundaries.
Bedrock	Boring logs indicating depth of refusal due to bedrock. Note that weathered bedrock can typically be excavated and replaced and is not considered a limiting layer.



Alternative Compliance + In Lieu Fee

- ILF amount based on full life cycle cost for a volume control BMP
- Unit costs (\$/ac-in) estimated for each ILF component
 - Line-item labor effort and or historical project data analysis
 - Incorporated historical data from projects in Pittsburgh, Philadelphia, Harrisburg, and Youngstown (OH)
 - Used labor costs by category and overhead from 2020 city operating budget and DCP data
 - Used net present value for on-going costs such as operations and maintenance (O&M)
- Key assumptions
 - Average BMP manages 1 ac-inch of volume
 - 5 BMPs constructed per year
 - 40-year lifespan for average BMP

Alternative Compliance + In Lieu Fee

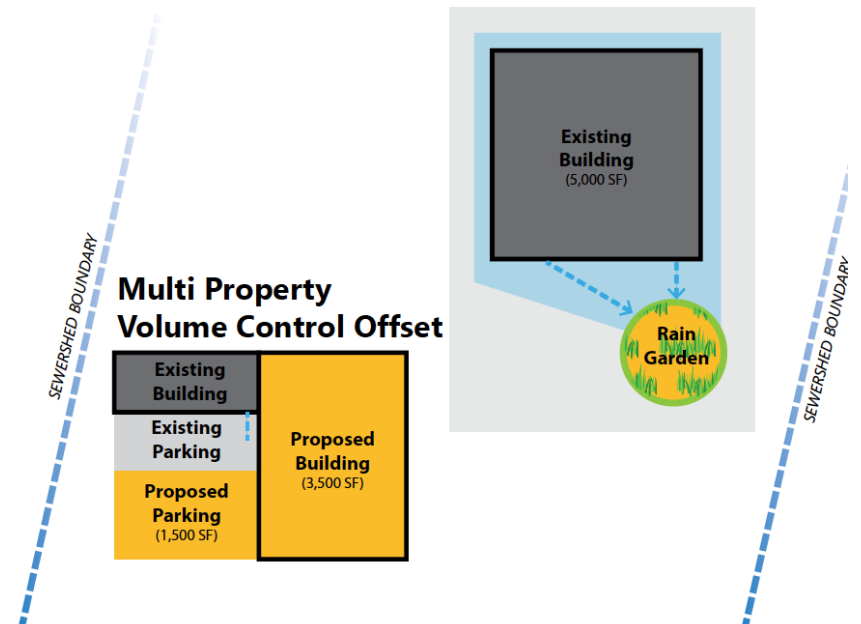
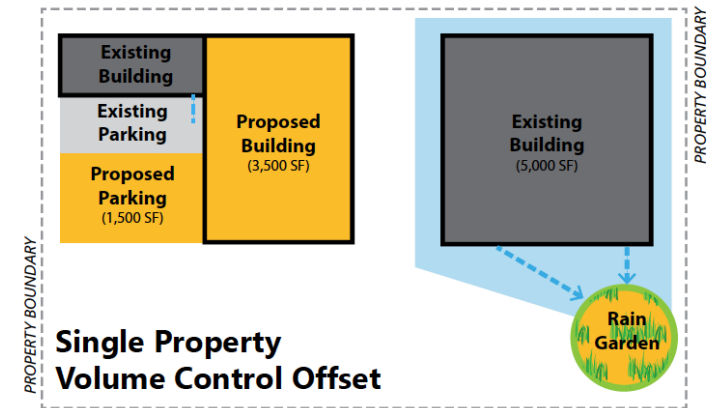


Trading, Incentives, and Innovation Policies

- Grant payments for additional volume and/or rate control in excess of the requirements.
- Expedited 5-business day SWM Site Plan review for using a combination of preferred BMPs, water reuse, and active controls.
- Ability to offset the volume control requirement for current or future development projects by managing an equivalent area outside of the project site.
- Ability to meet rate control requirements at a downstream point of interest that includes lands owned by the applicant but outside of the project site.
- Innovation track for non-standards BMPs and stormwater management approaches.

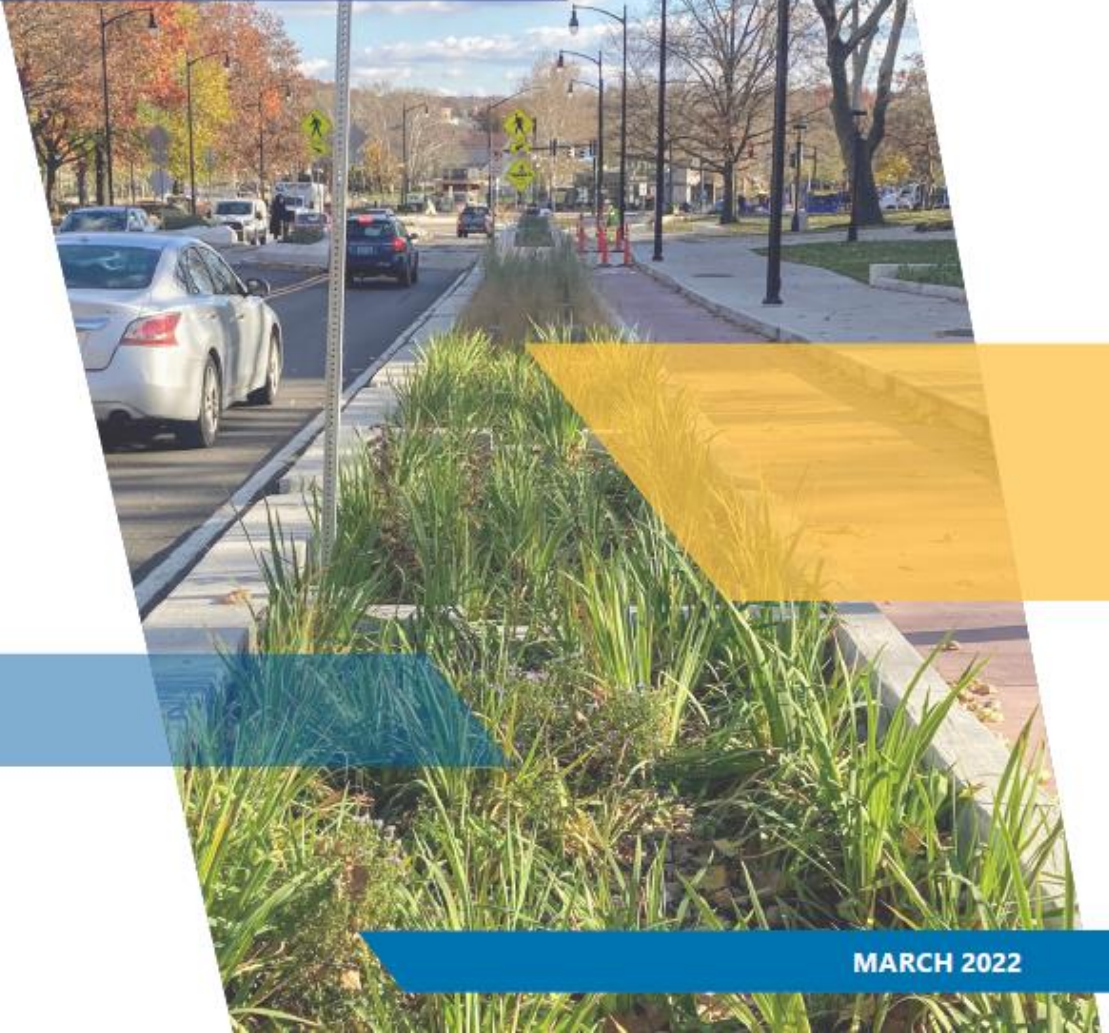
Same Owner Banking and Trading - Volume Control Offset

- Provides applicants with more flexibility in complying with the volume control requirement.
- Useful for projects where the regulated activity is occurring within a more constrained portion of a property.
- Must be on a property with the same owner.
- Must be in the same sewershed.



THE CITY OF PITTSBURGH

STORMWATER DESIGN MANUAL



MARCH 2022

Design Manual + New Resources

Design Manual

- Technical supplement to City Code
 - Incorporated by reference into Code.
 - Comprehensive resource for siting, design, construction, and maintenance of stormwater systems in the City.
 - Process and approval guidance and resources.
- Primary audience:
 - Engineers
 - Design professionals

Design Manual Contents

- 1.0 Introduction and Purpose
- 2.0 Stormwater Management Requirements
- 3.0 Integrating Stormwater Management with Site Design
- 4.0 Stormwater Best Management Practice Design Standards
- 5.0 Stormwater Plan Review Requirements
- 6.0 Construction Guidance
- 7.0 Operations and Maintenance

Regulation Applicability Determination

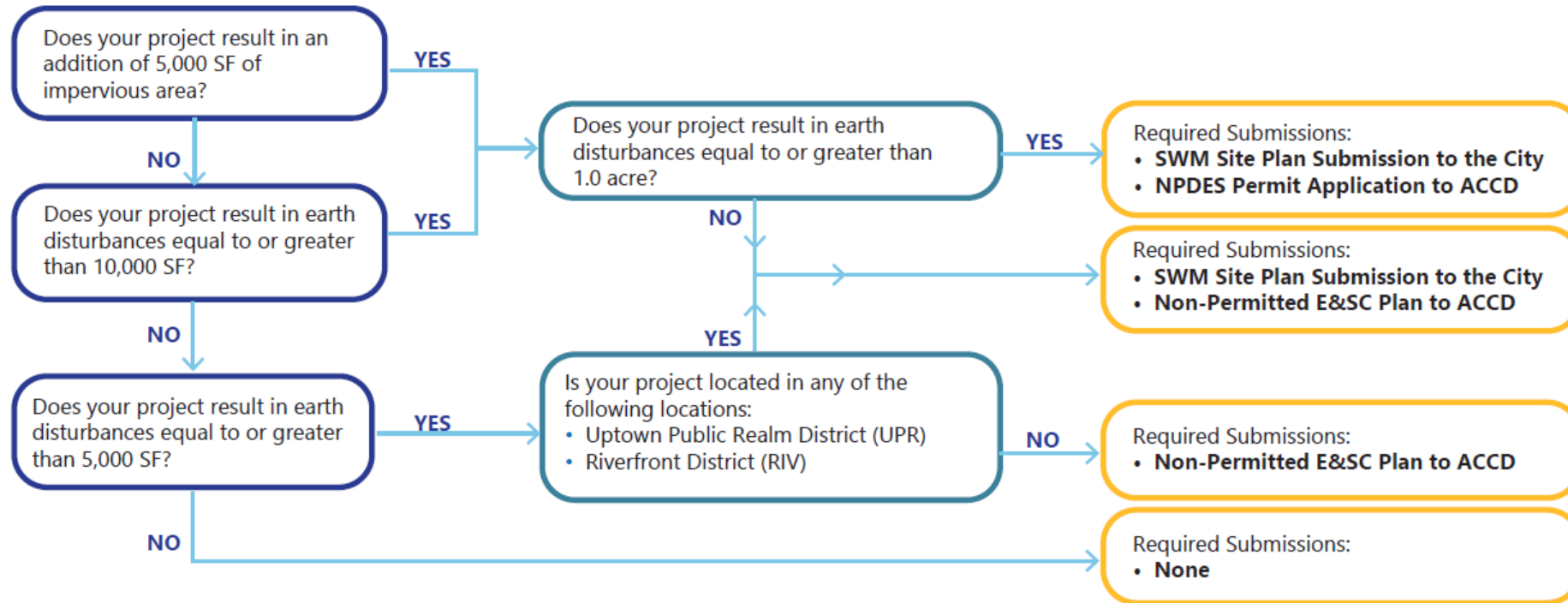
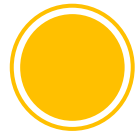


Figure 2.1. Regulated Activities and Required Submissions Flow Chart

Technical Infeasibility



BMP technology is feasible



BMP technology is feasible with modifications to the design



BMP technology is infeasible (constraints prevent BMP implementation in all cases)

Category	Bioretention	Bioinfiltration	Green Roof	Dry Extended Basins	Constructed Wetland/ Wet Pond	Porous Pavement	Cisterns	Subsurface Infiltration	Sand Filter	Subsurface Detention
Elevated sediment loading	★	★	★	★	★	★	★	★	★	★
Excessive sediment loading	✗	✗	✗	★	★	✗	★	✗	✗	★
Slope (0-8%)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Slope (8-15%)	★	★	✓	★	★	★	✓	★	★	★
Slope (>15%)	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗
Slope (>25%)	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Landslide prone	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗
Low infiltration	✓	✗	n/a	✓	✓	★	✓	✗	✓	✓
Undermined areas	★	✗	n/a	★	✗	★	✓	✗	✓	★
Environmental contamination areas	★	✗	n/a	★	✗	★	★	✗	★	★
Unconsolidated Urban Fill < 3 Ft.	★	★	n/a	★	★	★	★	★	★	★
Unconsolidated Urban Fill > 3 Ft.	✗	✗	n/a	✗	✗	✗	✗	✗	✗	✗
Floodway	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Floodplain	★	★	✓	★	★	✗	★	★	★	★
Wetlands	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Within 2 ft. of seasonal high groundwater	★	✗	n/a	✗	✓	✗	✓	✗	✓	✗
Riparian buffers	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Within 2 ft. of bedrock	★	✗	n/a	★	★	★	✓	✗	✓	★
Mature tree or high value mature tree removal or critical root zone disturbance	★	★	n/a	★	★	★	★	✗	★	✗
Exceptional value mature tree removal or critical root zone disturbance	✗	✗	n/a	✗	✗	✗	✗	✗	✗	✗
Utilities within setback thresholds	✗	✗	n/a	✗	✗	✗	✗	✗	✗	✗
Buildings and structures within setback thresholds	✗	✗	n/a	✗	✗	✗	✗	✗	✗	✗
Roof slope >8%	n/a	★	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
✓ BMP Applicable/Feasible ★ BMP Potentially Applicable/Feasible With Modifications ✗ BMP Not Applicable/Infeasible										

Figure 3.1. BMP Applicability Factors for Typically Encountered Underlying Conditions Site Constraints

Setbacks for Structural BMPs

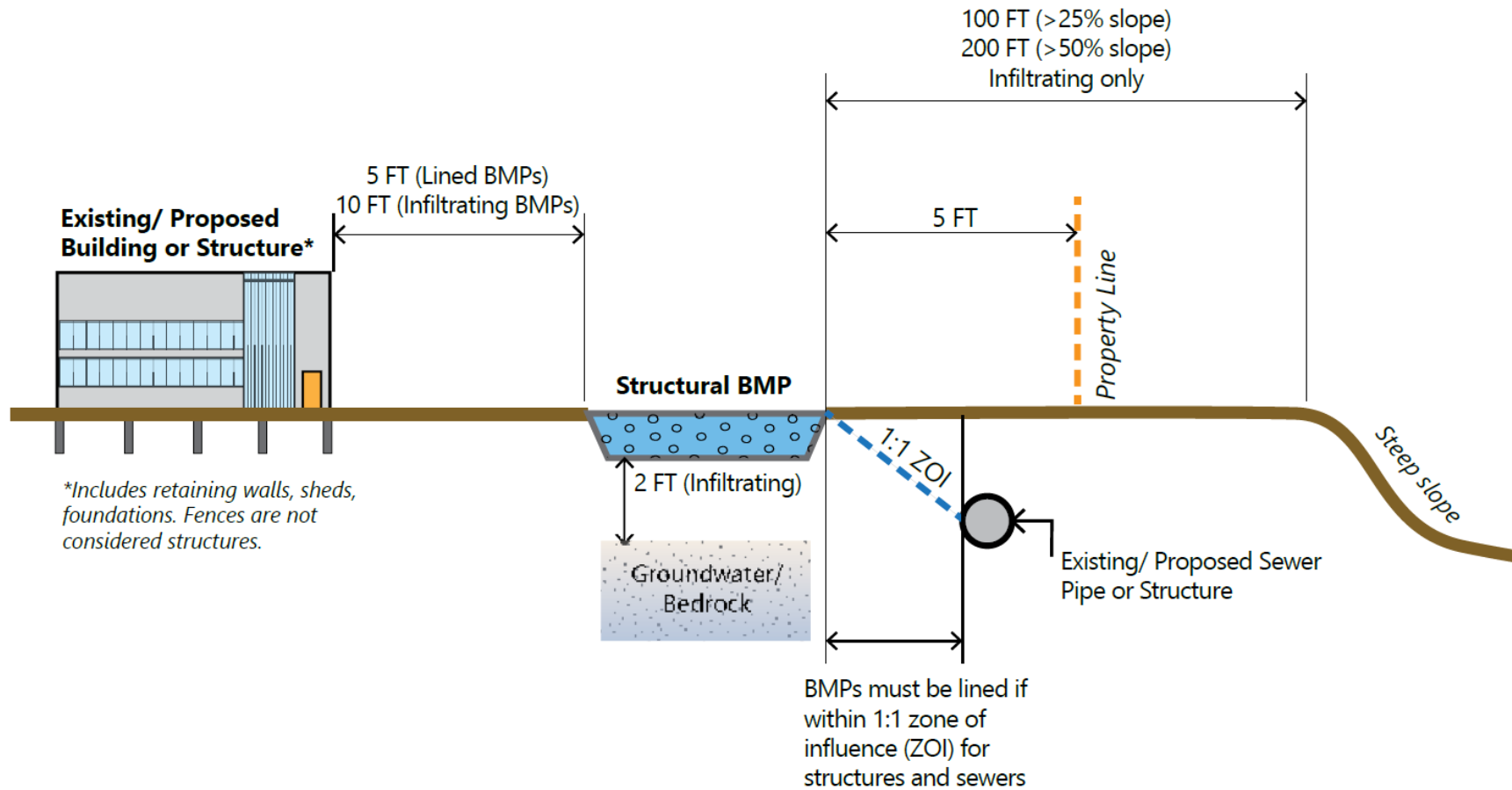


Figure 4.1. Setbacks for Structural BMPs. Setbacks for structural BMPs ensure that BMPs are placed in locations where they can perform optimally and pose the least risk to existing infrastructure.

Construction Guidance

TABLE 6.1. BEST PRACTICES FOR BMPS CONSTRUCTION

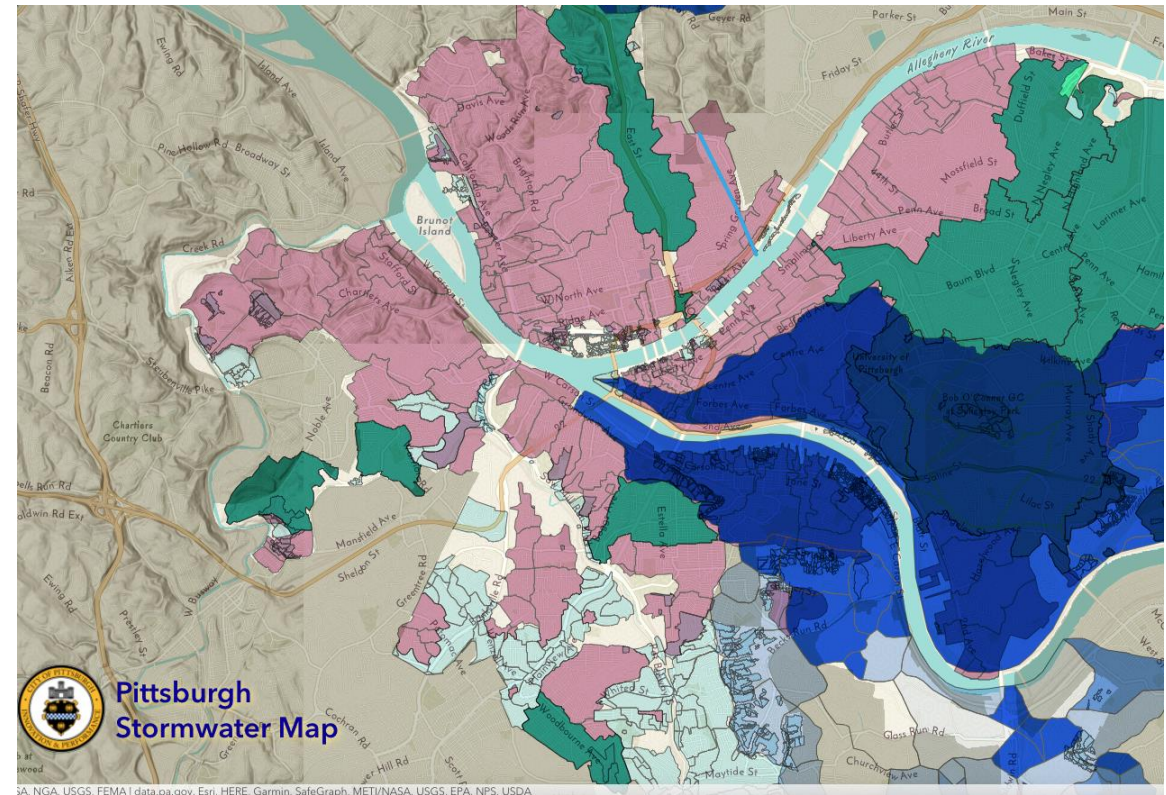
Topic	Best Practice
Erosion and Sedimentation Control	<p>All BMP footprints and existing conveyance structures downstream of construction activities must be protected from erosion and sedimentation.</p> <p>E&S measures must be properly installed and maintained until the site is stabilized.</p> <p>All inflow points must be blocked to prevent water from entering the BMP until the BMP construction is complete and any areas of earth disturbance have been stabilized with vegetation.</p>
Protection of Infiltration Footprint	<p>Clearly delineate marking of infiltration footprint.</p> <p>Compaction of the infiltration footprint of a BMP must be avoided as it can reduce the BMP's capacity to hold and infiltrate stormwater</p> <p>Construction equipment must not be stored on the BMP footprint.</p> <p>Heavy vehicles must not be driven over the BMP footprint.</p>
Stone Storage	<p>Stone used for stormwater storage must be clean and free of debris (i.e., "double washed" clean run) to ensure that the void spaces between the stone are available for stormwater storage (i.e., not clogged with sediment).</p>
Subgrade Preparation	<p>Ensure adequate compaction of subgrade below structures.</p>
Plantings	<p>Install plantings within designated planting windows. Water thoroughly immediately after installation.</p>
Elevation Tolerances	<p>Final elevations of media layers (e.g., sand, stone, soil, etc. and structures grates must not deviate greater than or less than 1 inch from design elevations. Any proposed elevation changes must be approved by the qualified professional and city stormwater inspector assigned to the project.</p>

Checklists

- Conceptual Review Submission
- Site Plan Review Submission
- BMP Maintenance Guide

Stormwater Map

- Includes previously accessible environmental data (e.g., landslide prone soils, steep slopes, etc.)
- New data:
 - PADEP impaired waters
 - Act 167 watersheds
 - Public health and safety watersheds
 - Watersheds and sewersheds
 - RIV
- Data will be kept up-to-date in the online GIS interface hosted by the City and will be available for download [here](https://gis.pittsburghpa.gov/v/pghstormwater/).



<https://gis.pittsburghpa.gov/v/pghstormwater/>

Stormwater Map

Layer	Source	Open Data or Other Link
Riverfront Uptown Public Realm Zoning	City	https://pghgishub-pittsburghpa.opendata.arcgis.com/datasets/zoning/explore?location=40.430846%2C-79.979819%2C12.76
Steep Slopes	City	https://pghgishub-pittsburghpa.opendata.arcgis.com/datasets/25-or-greater-slope/explore?location=40.431325%2C-79.980725%2C12.74
Landslide Prone	City	https://pghgishub-pittsburghpa.opendata.arcgis.com/datasets/194cdce70d084b7e893653dece2de0bd_0/explore?location=40.437813%2C-79.986794%2C12.89
Undermined Areas	City	https://pghgishub-pittsburghpa.opendata.arcgis.com/datasets/428f48cd3ba540339ab3d2afc94d65a9_0/explore?location=40.429490%2C-79.968416%2C12.80
Watersheds	City	https://pghgishub-pittsburghpa.opendata.arcgis.com/datasets/pgh-watersheds/explore?location=40.431284%2C-79.980796%2C12.89
City Limits	City	https://pghgishub-pittsburghpa.opendata.arcgis.com/datasets/a99f25fffb7b41c8a4adf9ea676a3a0b_0/explore?location=40.430838%2C-79.979816%2C12.76
Floodplain	FEMA/City	https://pghgishub-pittsburghpa.opendata.arcgis.com/datasets/2014-fema-flood-zones/explore?location=40.425406%2C-79.988203%2C12.86 ; https://www.fema.gov/flood-maps/national-flood-hazard-layer
Tree Canopy	County	https://www.pasda.psu.edu/uci/DataSummary.aspx?dataset=1235
Combined Sewer Areas	PWSA	Combined Sewershed - Datasets - WPRDC
PADEP Impaired Waters	PADEP	https://newdata-padep-1.opendata.arcgis.com/documents/2022-integrated-report-restoration-priorities-data/about
MS4 Areas	PADEP	https://gis.dep.pa.gov/ms4/index.html



Key Takeaways

Key Takeaways and Lessons Learned

- Understand your local legislative process—timing can be tough!
- Stakeholder engagement including multi-agency coordination and cooperation was critical to project success.
- Real-world implementation of future climate change projections for the design of stormwater infrastructure
 - 1st non-coastal city in the U.S. to implement
- Proactive approaches to help flood prone areas.
- Balance of requiring the development community to do more while providing new tools and resources to make approval processes more predictable as well as new options for innovation and flexibility.
- Stormwater Management is a Land Use Issue

References, Resources & Additional Information

- **SPC:** <https://spcwater.org/>
- **City DCP:** <https://pittsburghpa.gov/dcp/stormwater-code-update>
- **PWSA Stormwater information:**
 - <https://www.pgh2o.com/your-water/stormwater>
 - <https://www.pgh2o.com/your-water/stormwater/stormwater-fee>
 - <https://www.pgh2o.com/your-water/stormwater/stormwater-fee/stormwater-credit-program>
 - <https://www.pgh2o.com/your-water/stormwater/stormwater-fee/stormwater-fee-finder>
 - <https://pwsa.maps.arcgis.com/apps/webappviewer/index.html?id=df39e93b5a0e403f8a29889a42125edc>
- **City Stormwater Code & Ordinance Review and Update information page:** <https://engage.pittsburghpa.gov/stormwater-code>
- **ACCD:** <https://www.conservationcenter.org/>
- **ALCOSAN:**
 - <https://www.alcosan.org/our-plan/plan-documents>
 - <https://stormworkspgh.com/>
 - <https://ninemilerun.org/>
 - <https://wospgh.org/>
- **RAND:** <https://www.rand.org/well-being/community-health-and-environmental-policy/centers/climate-resilience/projects/resilient-stormwater-management-in-allegheny-county.html>
- **WPC:** <https://waterlandlife.org/gardens-greenspace/stormwater-solutions/>
- **One Water: Pittsburgh's Guide to Action - Living Waters of Pittsburgh** (livingwaterspgh.org)

Thank you!

- James J. Stitt, Sustainability Manager, Pittsburgh Water & Sewer Authority
jstitt@pgh2o.com
- Marti Battistone, Senior Environmental Planner, Dept. of City Planning
martina.battistone@pittsburghpa.gov
- Kevin Flynn, Senior Vice President, AKRF
kflynn@akrf.com
- Southwestern Pennsylvania Commission Water Resource Center,
wrc@spcregion.org