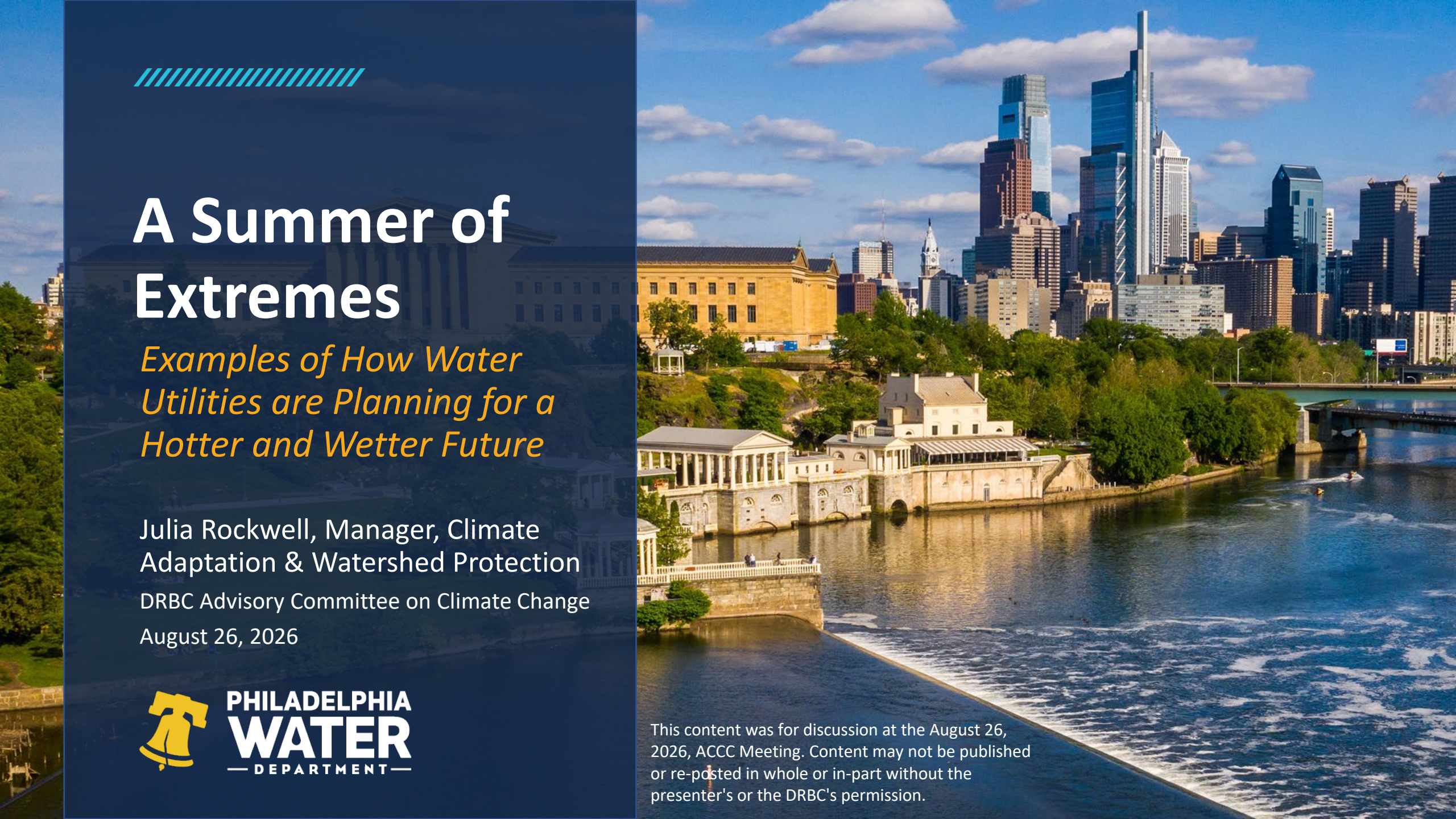




A Summer of Extremes

*Examples of How Water
Utilities are Planning for a
Hotter and Wetter Future*

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DRBC Advisory Committee on Climate Change
August 26, 2026



This content was for discussion at the August 26, 2026, ACCC Meeting. Content may not be published or re-posted in whole or in-part without the presenter's or the DRBC's permission.



Photo courtesy of @whitneylatelyxxoo

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Extreme Heat, Intense Rainfall, Wildfire Smoke

- **June 22nd:** severe storms brought heavy rain that caused flooding in neighborhoods including Germantown and West Oak Lane
- **July 4th weekend:** temperatures rose above 100°F, leading the City to declare a Heat Health Emergency and Code Red
- **July 11th:** powerful thunderstorms brought heavy rain, strong winds, and flooding to parts of the city (microbursts!)
- **Week of July 13th:** Phila once again experienced extreme heat and wildfire smoke from Canada that lowered air quality across the region

What a string of intense storms, floods, heatwaves and wildfire smoke says about Philadelphia's climate future – Philadelphia Office of Sustainability

July 11th Microbursts



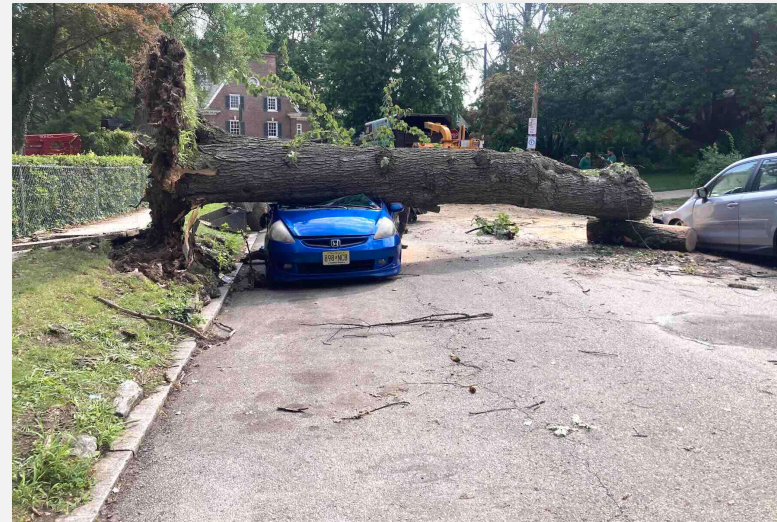
NWS Mount Holly 

@NWS_MountHolly · [Follow](#)



A series of at least 4 severe microbursts with wind gusts of 60-70 mph impacted far southern Montgomery Co (Lower Merion Twp/Narberth), West Philadelphia, & South Philadelphia between 2:44-3:15 PM. The damage was caused straight line winds from the microbursts, not a tornado.

8:28 PM · Jul 11, 2026



July 11th Microbursts



Photos courtesy of @whitneylatelyxxoo

WEST PHILADELPHIA – COBBS CREEK AREA RAINFALL HIGHLIGHT



Based on preliminary analyses, the West Philadelphia Cobbs Creek area rain gauge recorded peak rainfall for a **MORE THAN 1,000 YEAR EVENT** for the 5-minute, 10-minute and 15-minute durations.

WHAT DOES “MORE THAN 1,000 YEARS” MEAN?



It doesn't mean this happens only once every 1,000 years. It means that in any given year, there is less than a 0.1% chance of rainfall this intense happening. It is extremely rare.

PEAK RAINFALL INCREMENTS FOR GIVEN DURATIONS FROM PWD RAIN GAUGE NETWORK

DURATION	COBBS CREEK AREA RAINFALL	RETURN PERIOD (HOW RARE?)
5 minute	0.88 inches	> 1,000 YEARS
10 minute	1.41 inches	> 1,000 YEARS
15 minute	1.58 inches	> 1,000 YEARS
30 minute	1.82 inches	> 25 YEARS
60 minute	1.90 inches	> 5 YEARS
120 minute	1.91 inches	> 2 YEARS
3 hour	1.91 inches	> 2 YEARS
6 hour	1.91 inches	< 1 YEAR



The most intense rainfall happened in the first 15 minutes of the storm.



This short, powerful burst of rain overwhelmed drainage systems and led to widespread flooding across parts of West Philadelphia.

Climate Change is increasing the frequency and intensity of extreme events

According to a peer-reviewed method developed by PWD and our consultants, we found that:

The most extreme precipitation events are likely to increase by the largest amounts.

For example, for a 100-year event, increases could be as high as 50-60% depending on the duration (high emissions scenario).



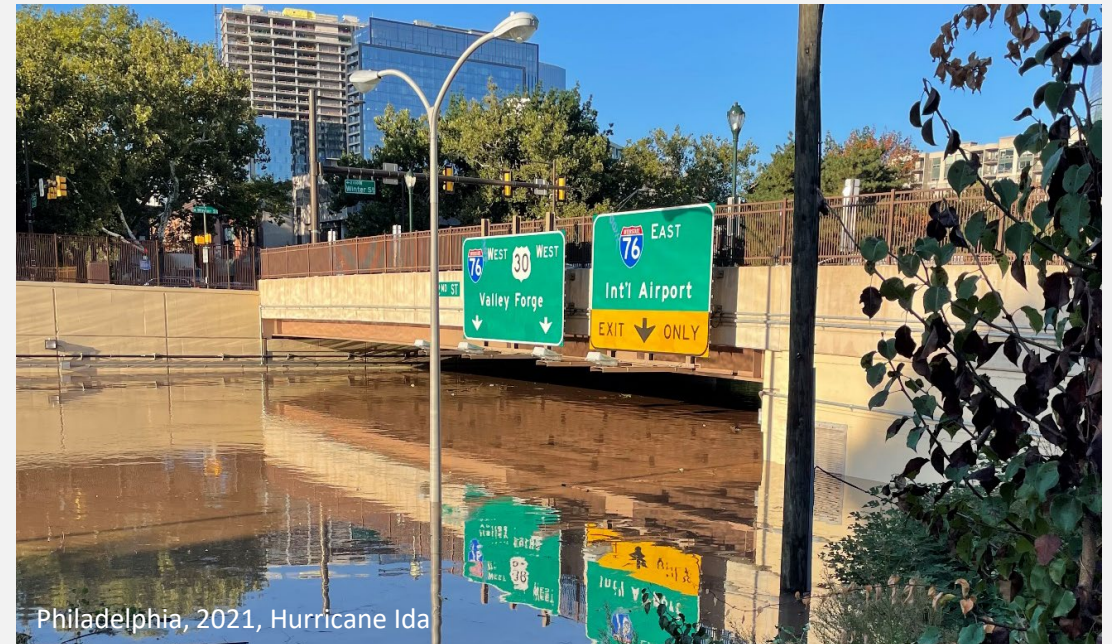
Risks associated with increasingly intense precipitation include:

Water quality impacts

- Increased stormwater runoff and pollutant loadings to our surface drinking water supplies, the Schuylkill and Delaware Rivers
- Increased collection system capacities issues, which can lead to localized flooding and combined sewer overflows

Flooding

- Localized flooding (infrastructure-based/urban/inland)
- Riverine flooding damaging critical assets



Philadelphia, 2021, Hurricane Ida

What is PWD Doing?

Key risk management strategies

1. Continued investment in actionable climate science
2. Mainstreaming climate science
3. Exploring new / innovative approaches (yesterday's solutions are not adequate to address tomorrow's problems)
4. Employing adaptive planning & design practices



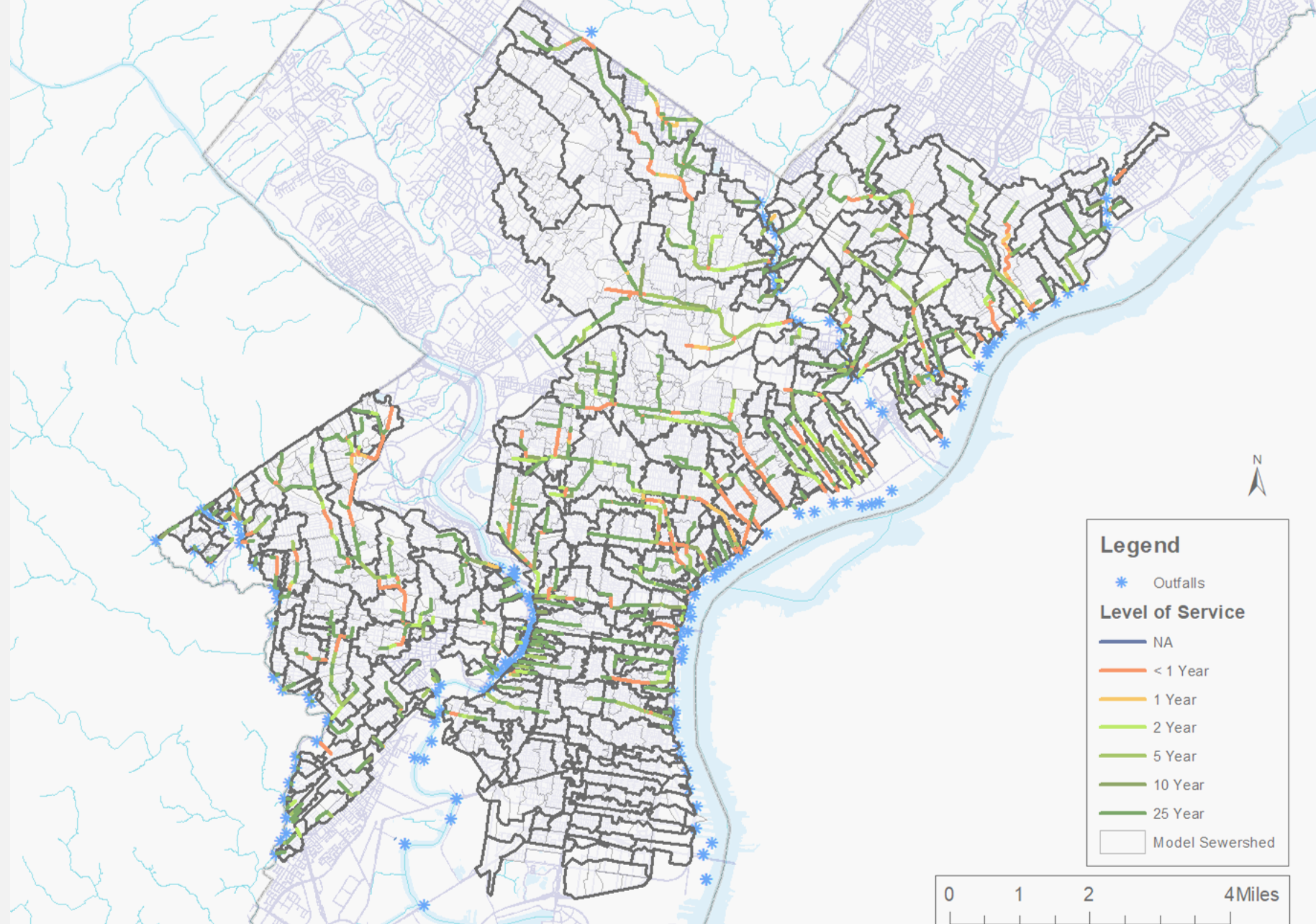
Implementing the Steps to Resilience: a Practitioner's Guide, NOAA 2022

July 11th Microburst: 1,000 Year Event



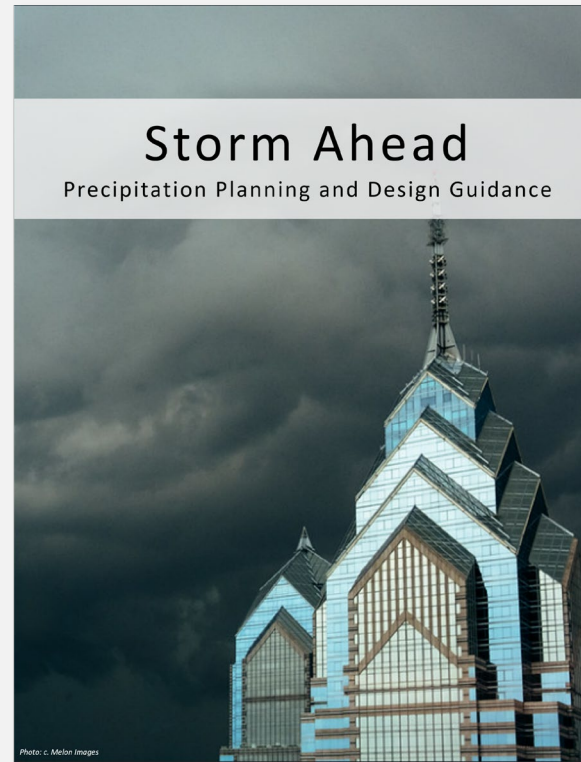
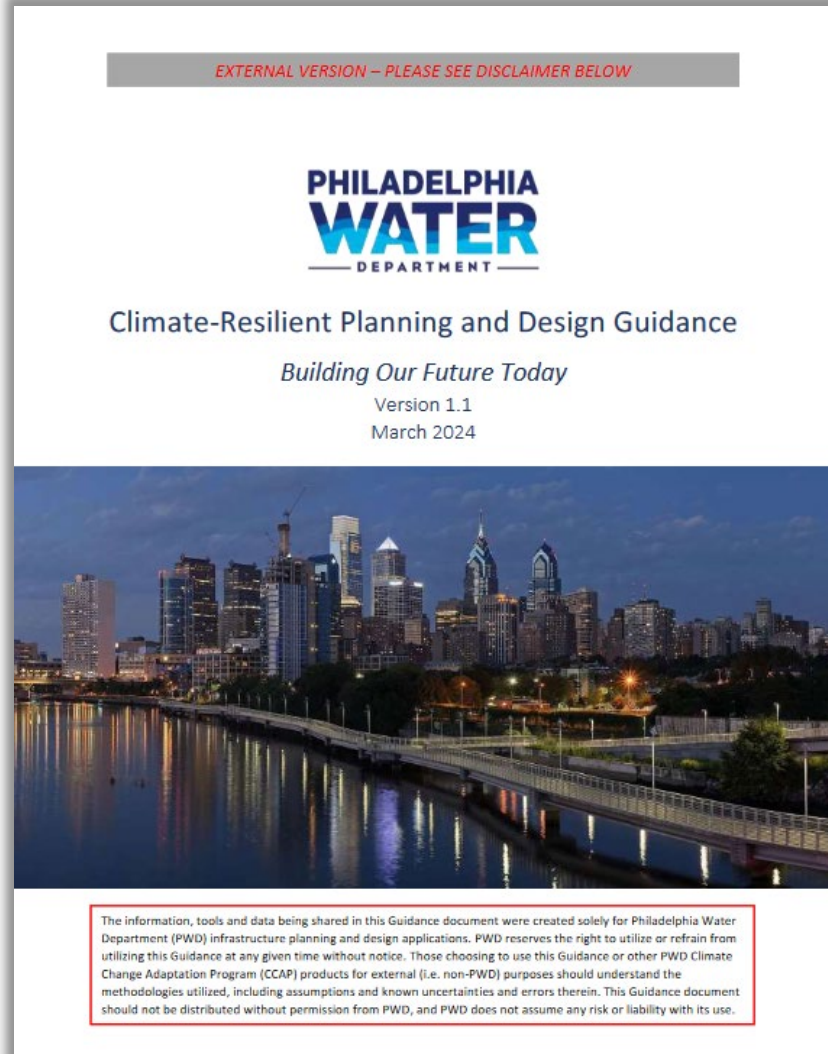
Drainage system level of service

- PWD Design Storm was not formalized until 1915
- Majority of Trunk Sewers constructed before 1915
- Level of service varies between less than 1-year up to 25-year design storm



Strategy #1:

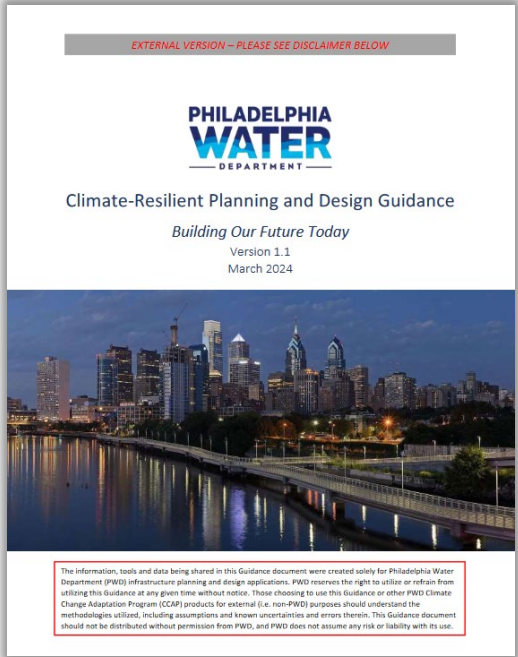
Continue investing in actionable climate science



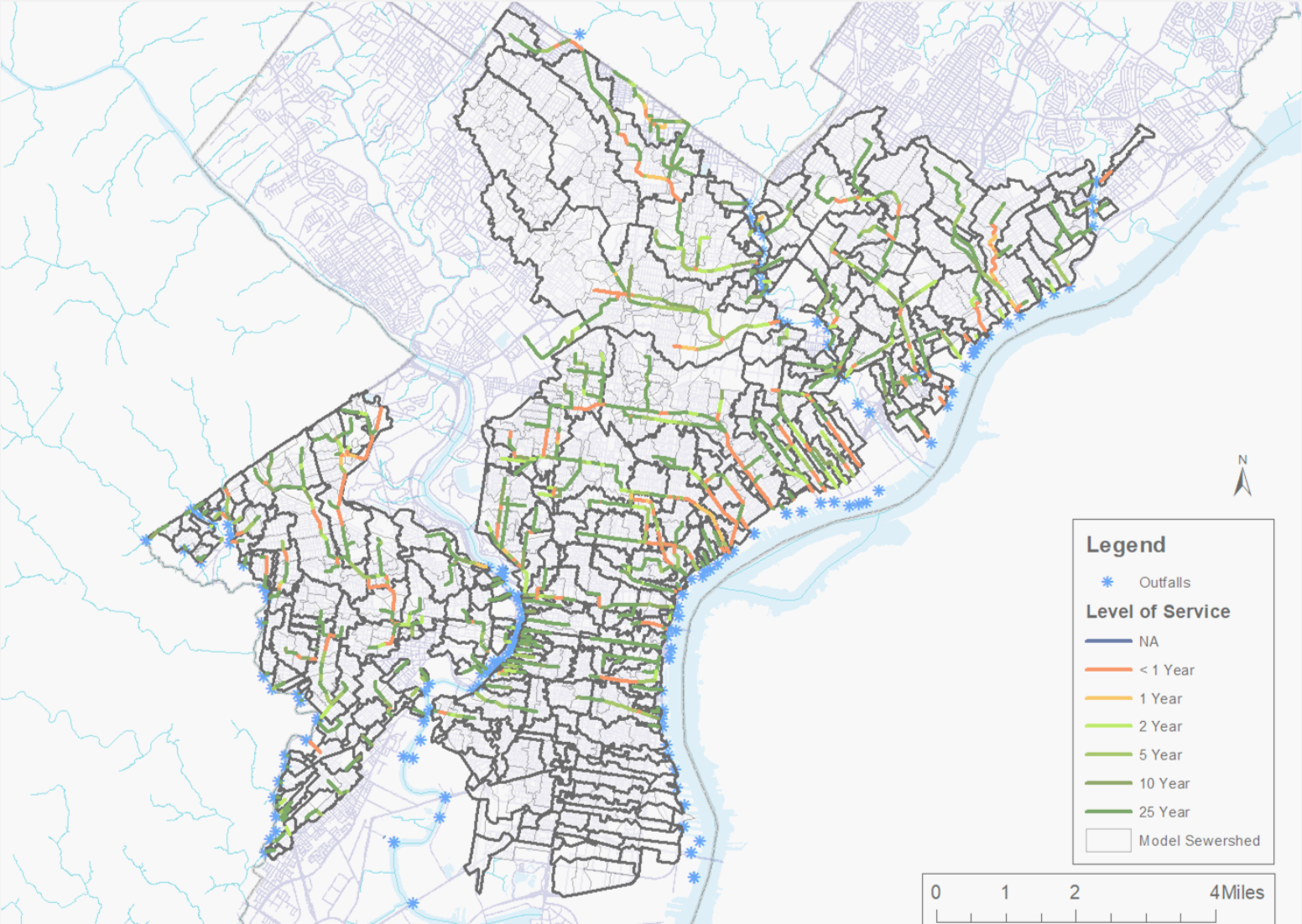
Available online!

<https://water.phila.gov/wp-content/uploads/files/climate-resilient-guidance.pdf>

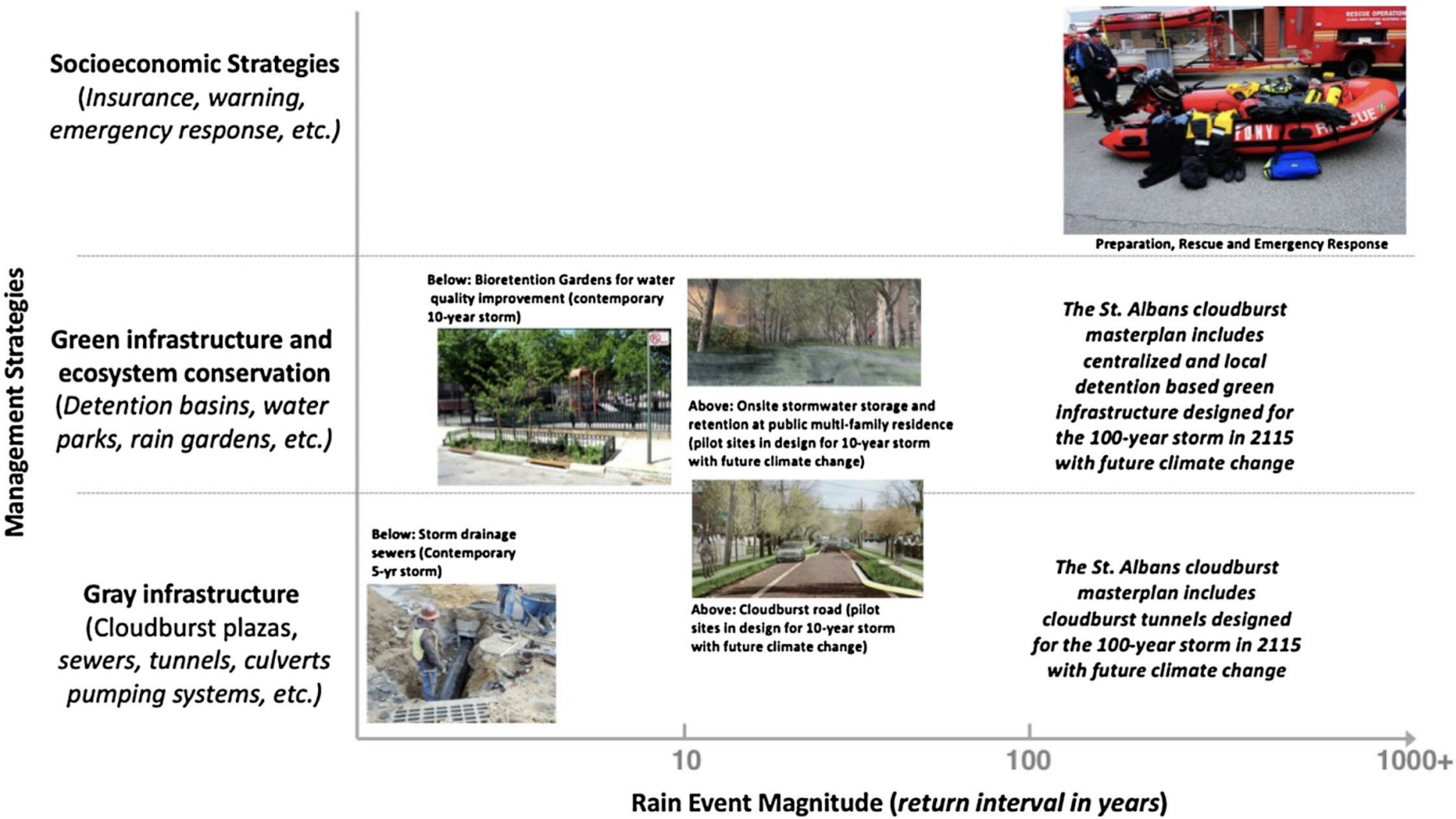
Strategy #2: Mainstream climate science



Branch sewers currently being designed for end-of-century 5-year PWD Design Storm

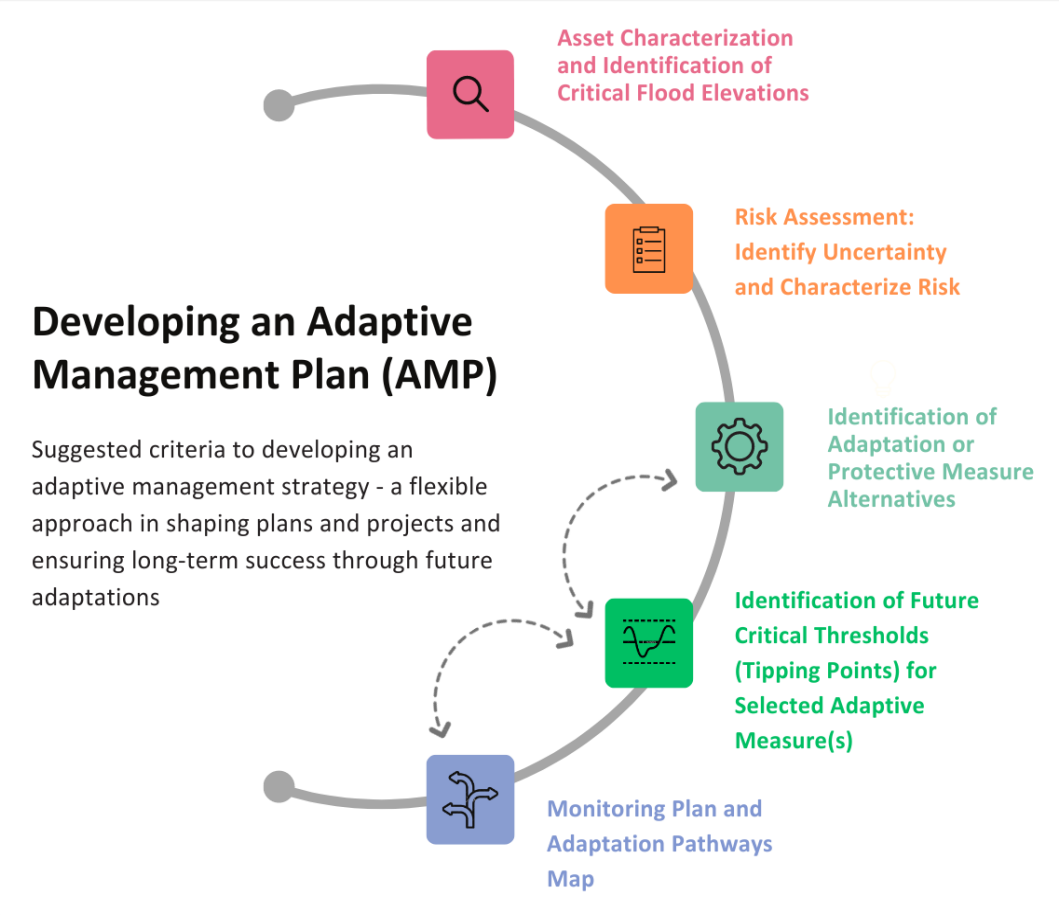


Strategy #3: Explore new/innovative approaches



Rosenzweig, B., et al. (2019). Developing knowledge systems for urban resilience to cloudburst rain events. *Environmental Science & Policy*, 99, 150–159. <https://doi.org/10.1016/j.envsci.2019.05.020>

Strategy #4: Employ adaptive planning



PHILADELPHIA WATER DEPARTMENT

Climate Change Adaptation Program - Additional Information and Resources
AIR SHEET - Adaptive Management Plan

Introduction

As impacts from climate change become more prevalent, PWD has an opportunity to learn from and respond to new and changing conditions by adapting plans and projects over time. **Adaptive management** is an iterative and dynamic process used to evaluate and apply information learned over time to improve management, planning, and design decisions. It promotes a flexible approach in shaping plans, projects, and programs, ultimately ensuring their long-term resilience through future adaptations.

The principles of adaptive management can be applied to any climate impacts, including increasing precipitation, higher air temperature, and sea level rise. In the context of the Climate-Resilient Planning & Design Guidance, adaptive management exists for PWD infrastructure at risk of coastal storm surge. Despite uncertainty in the specific rate and magnitude, climate models and localized projections indicate that 2100 and beyond coastal flood risks will increase. Develop a strategy that identifies future adaptation measures and incorporates up-to-date uncertainties as we begin to adapt to the effects of climate change. Enabling flexibility in planning and design leaves room for future long-term resilience.

PWD requirements for an Adaptive Management Plan (AMP) are defined in the PWD Design Flood Elevation (DFE) Table. Before determining if the DFE applies to your project and which Plan (AMP) is part of the PWD Design Flood Elevation (DFE) requirements, it must be developed and submitted to CCAP and/or the Additional guidance to determine the appropriate DFE for a PWD Flood Elevation (DFE) AIR Sheet.

Table 1: PWD Design Flood Elevation (DFE) Table showing DFEs for non-critical a near-term to end-of-century.

Asset Criticality	PWD Design Flood Elevations	
	Near-term End of useful life does not extend beyond 2050	Mid-century End of useful life 2050-2075
Non-Critical	Current floodplain regulations apply	Lower:
Critical*	Current floodplain regulations apply	14 ft. NAVD83 DFE Lowest DFE with an appropriate justification

1

PHILADELPHIA WATER DEPARTMENT

Climate Change Adaptation Program - Additional Information and Resources
AIR SHEET - Adaptive Management Plan

Asset Characterization in Practice: Southwest Pollution Control Plant

In 2023, CCAP completed a flood risk assessment at the Southwest Pollution Control Plant (SWPCP) to quantify coastal flood risk over time and establish how susceptible the facility is to flood damages under current and future flooding conditions with sea level rise.

As part of the initial asset characterization phase, lowest elevations and lowest points of entry were determined for each electrical and mechanical asset included in the flood risk assessment. In line with the 'Critical Asset Flood Elevation' component, the 'lowest elevation' is defined as the elevation of the asset where water could reach and damage the asset. Unsurprisingly, a flood pathways assessment of the facility was used to identify lowest points of entry. The lowest point of entry (LPE) is defined as the elevation at which water can enter a building or come in contact with outdoor equipment or processes. An understanding of the facility's flood pathways and LPEs is essential to determining the consequences of flooding because floodwaters must reach the LPE before assets in the area can be damaged.

The figure below provides an example of how LPEs were assigned to a building without underground gallery connections to another building. Asset #1A to Asset #5A are assets in a building without a gallery, so all LPEs are equal to the building's lowest ground floor elevation (17.5 ft NAVD83), regardless of if it is in the basement or ground floor.

2. Accounting for Uncertainty and Characterizing Risk

For an asset that is vulnerable to inundation at several elevations, the quantifiable risk of different flood levels must be examined to develop appropriate adaptive actions. Developing an appropriate AMP requires identifying the critical flood elevations where risk of inundation (i.e., in probable cost to replace an asset) exceeds a pre-determined acceptable value (i.e., the value of flood protection). This is generally the point where risk-based costs (i.e., cost to replace an asset) exceed the cost of protecting the asset. CCAP recommends that planning assessments consider multiple sea level rise scenarios (e.g., for use in model runs), including PWD's Low SLR Scenario and the PWD Primary Planning SLR Scenario¹. CCAP also provides probabilities associated with future storm intensity and storm surge events². However, if only one scenario can be included in the planning and risk assessments, the PWD Primary Planning SLR Scenario in combination with the 100-year storm event should be used.

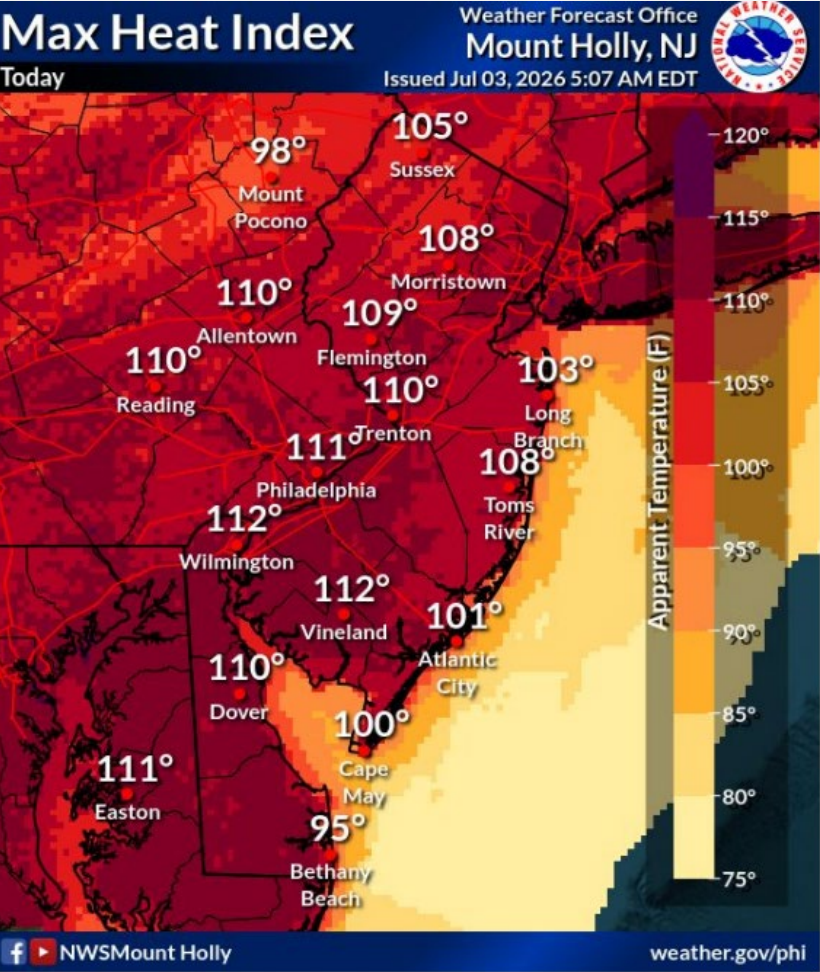
¹ See the PWD Climate-Resilient Planning and Design Guidance V1.1, Section 4.4(a), for detailed information on CCAP's recommended Sea Level Rise scenarios.

² PWD Climate-Resilient Planning and Design Guidance V1.1, Table 4-4

4

*Adaptive management acknowledges that **flood mitigation measures can be installed at facilities incrementally over time, as new information about climate patterns becomes known.***

Extreme Heat Risks



Water quality impacts
Worker health and safety

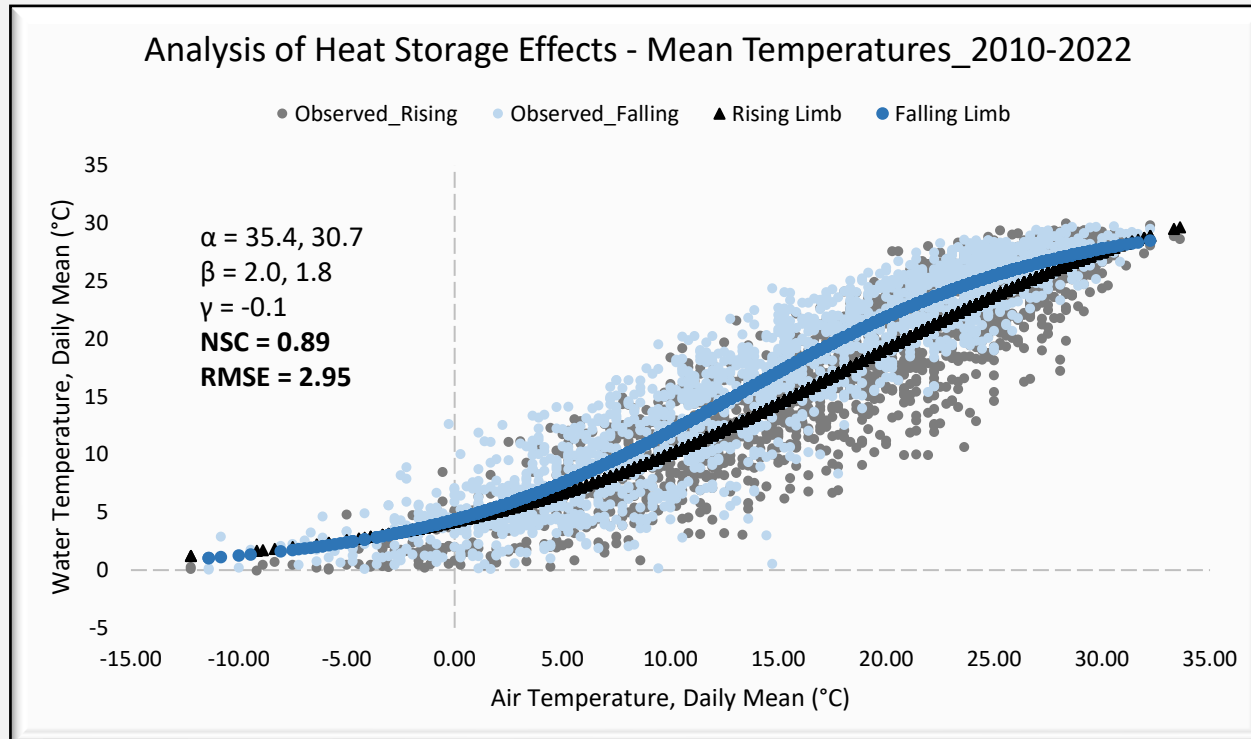


Delaware & Schuylkill River Air/Water Temperature Analyses

Analysis

- Projected Delaware and Schuylkill River temperature increases
- Nonlinear air-water temperature relationships
- Seasonal hysteresis between warming and cooling periods

Air-Water Temperature Analysis, Delaware River



Potential Applications / Impacts

- Dissolved oxygen levels
- Algal growth / eutrophication
- Bacteria decay
- Disinfection byproduct formation
- Water quality modeling & long-term treatment planning

Learning from our Peers – WUCA Heat Impact Case Studies

OSHA Heat-Index Associated Risk Levels

Heat Index	Risk Level	Protective Measure
Less than 91°F	Lower (Caution)	Basic heat safety and planning
91° to 103°F	Moderate	Implement precautions and heighten awareness
103° to 115°F	High	Additional precautions to protect workers
Greater than 115°F	Very High to Extreme	Triggers even more aggressive protective measures

Heat Index	Observed PHL Airport 1995-2014	GCM RCP4.5 Near-Term 2030-2049	GCM RCP8.5 Near-Term 2030-2049	Risk Level (OSHA)
Days per year between 80°F to 90°F	77	71	68	Lower (Caution)
Days per year between 91°F to 103°F	31	46	50	Moderate
Days per year between 103°F to 115°F	3	9	11	High
Days per year greater than 115°F	0	0	0	Very High to Extreme
Total days per year greater than 80°F	111	126	129	Low to Extreme

Climate Adaptation is a Shared Challenge





Photos courtesy of @whitneylatelyxxoo



Thank you!

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