

WORKSHOP DEBRIEF

WATERSHED RESILIENCE ACCELERATOR PITTSBURGH

Workshop Conducted 7 December 2016
Omni William Penn Hotel, Pittsburgh Oakmont Room
City of Pittsburgh | 100 Resilient Cities | Arcadis



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The City of Pittsburgh, 100 Resilient Cities, and Arcadis would like to acknowledge and thank the following entities for their generous investment of time and contributions to the WRAP Workshop, its planning, coordination, and follow up:

3 Rivers Wet Weather

ALCOSAN

*Allegheny Conference on
Community Development*

*Allegheny County Conservation
District*

Allegheny County

Allegheny Land Trust

BNY Mellon

CONNECT

e Design Dynamics

Ethos Collaborative

evolveEA

Green Building Alliance

gtech

Hatch Mott McDonald

Homewood Children's Village

Landbase Systems Corporation

Parks Conservancy

Phronesis

*Pittsburgh Water and Sewer
Authority (PWSA)*

*Urban Redevelopment Authority
(URA)*

RAND Corporation

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*United States Army Corps of
Engineers Pittsburgh District*

1 WRAP WORKSHOP SUMMARY

The U.S. Environmental Protection Agency (EPA) issued a federal consent decree in 2008 that requires Allegheny County Sanitary Authority (ALCOSAN) and its 83 member communities, including the City of Pittsburgh, to reduce system overflows to a negotiated level of control by the year 2026. ALCOSAN, the City of Pittsburgh, and Pittsburgh Water and Sewer Authority (PWSA) consider green infrastructure a viable approach to help meet the requirements of the consent decree, while generating additional environmental, social, and economic benefits within Pittsburgh (variously known as triple bottom line benefits, co-benefits, or holistic benefits).



Grant Ervin, Pittsburgh's Chief Resilience Officer, Welcomes WRAP participants to the workshop and kicks off the full day of brainstorming implementation of green infrastructure in Negley Run.

The three organizations, in collaboration with community partners, already encourage integration of new green elements with existing gray infrastructure assets throughout Pittsburgh via grant programs and other initiatives, and are now also evaluating the merits of focused green infrastructure investments to meet regional needs of the City and surrounding municipalities. The Negley Run project proposal consists of a large green infrastructure redesign of the Negley Run watershed, and represents a case study of some of these efforts. Implementation planning for the Negley Run project, and others like it, can be challenging because of the need to coordinate many stakeholder groups, because implementation responsibility is not always clear, and because resources are ever scarce. Nevertheless, a regional approach to the conception and implementation of integrated stormwater management solutions is becoming incrementally necessary due to the ever-changing built environment and effect on stormwater.

On December 7, 2016, Arcadis and 100 Resilient Cities (100RC), pioneered by the Rockefeller Foundation, hosted the Watershed Resilience Accelerator Workshop for the City of Pittsburgh (WRAP) to help address these implementation challenges. The workshop included leaders from the City of Pittsburgh, ALCOSAN, PWSA, and other organizational stakeholders from southwestern Pennsylvania. Together, these groups conducted a 360-degree implementation assessment, focused on interagency collaboration and strategies that will help accelerate implementation of green infrastructure projects in the Negley Run Watershed. The Negley Run watershed was identified for the exercise due to its size, need for public improvements, and hazard mitigation and safety implications. These qualities present an opportunity to develop a template for green infrastructure implementation in Pittsburgh, particularly the ability to scale project size and scope.

The WRAP workshop built on extensive planning and design work done to date by reviewing global and local best resilience practices and focusing on three broad topics and associated questions essential to successful project implementation:

1. **Policy and Governance:** Do governance processes and rules need to change to advance large-scale and regional projects like Negley Run? If so, how?
2. **Benefit Cost Analysis and Value Proposition:** Why is the project worth funding?
3. **Implementation Strategies:** How can the project be funded?



“The level of energy, enthusiasm, and can-do attitude was very refreshing!”

- *Representative of ALCOSAN*

Participants split into three break-out sessions focused on each of the three principal questions, according to stakeholder responsibilities, roles, and interests: Theme 1 - Policy Work Session, Theme 2 - Financial Benefits and Benefit Cost Session, and Theme 3 - Implementation Strategies.

Response from participating stakeholders was unanimously positive after the workshop. Several attendees acknowledged that it took many years to get where Pittsburgh is right now, and that the City is ready to build on that momentum to create and implement a cutting-edge program that will drastically accelerate large scale implementation of green infrastructure solutions. The purpose of this document is to convey the results of the WRAP workshop and provide an Action Plan for policy makers to build momentum for large-scale green infrastructure implementation.

Key workshop takeaways follow. Detailed findings and outcomes are presented in Section 2 of this document.

Summary Takeaways

Takeaways below represent stakeholder consensus and consolidated findings and feedback of the WRAP. WRAP takeaways reinforce many recommendations of PWSA’s Green First Plan, and align with the objectives of the ALCOSAN GROW Program: reduce excess water by starting at the source. The recommendations presented in this document are organized using the OnePGH Strategy Framework presented in Figure 1: Initiate, Accelerate, Coordinate, and Amplify. For more detailed findings, see Section 2 - Detailed Findings and Section 3 - Consolidated Key Findings, Possible Implications, and Next Steps.

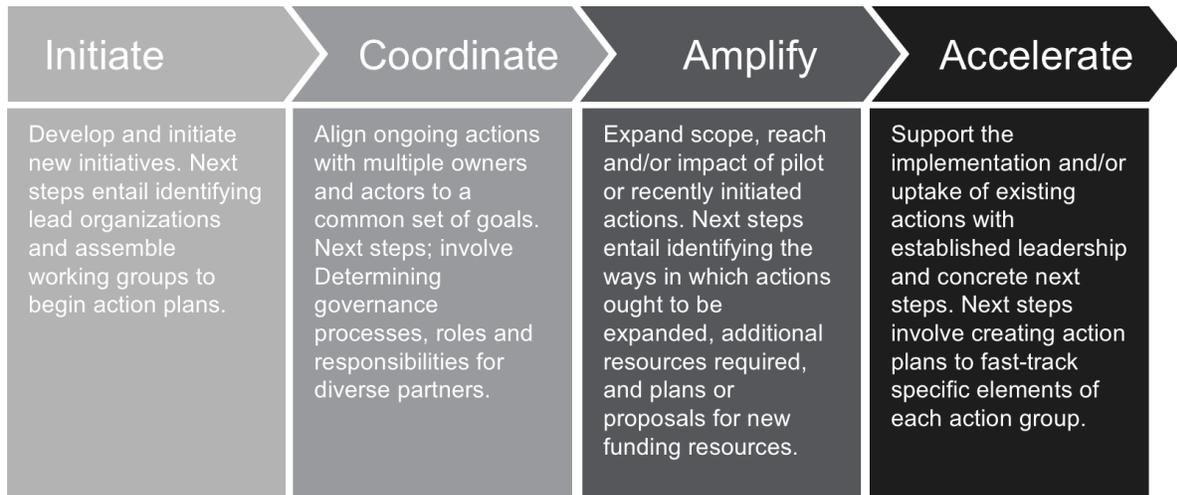


Figure 1. OnePGH Strategy Framework

Note: The use of the term “Pittsburgh” below is meant to refer to the area of the city and its stakeholders, and is not used to refer to a particular entity.

Initiative	Recommendation	Timeframe	Potential Lead
Local Coordinating Body	Accelerate the PWSA Watershed Manager efforts by establishing a Local Coordinating Body within the Negley Run Watershed	Near-term; perhaps temporary	PWSA
Task Force Development	Initiate the creation of a City-wide Task Force of Key Inter-Agency Partners to provide policy change recommendations and coordinate investment decisions	Near-term policy objectives; Long-term coordination of functions	PWSA, ALCOSAN
Decision-making Process	Amplify the PWSA efforts to develop a decision-making and prioritization framework for green infrastructure	Near-term. The framework can be revisited in the mid-term and long-term	PWSA and City-wide task force
Financing	Initiate the Creation of a Storm-Water Utility with clear investment objectives and sufficient resources	Near to Mid-term. Initiate in the near term	City-wide task force
Metric Development	Accelerate the Creation of Flow Reduction Targets to Guide Policy and Investment Decision Making	Mid-term	3RWW

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Initiative	Recommendation	Timeframe	Potential Lead
Outreach	Amplify the Communication of Flow Reduction Targets	Mid-term, dependent on metric development	ALCOSAN, City-wide task force
Maximizing existing open and public space	Accelerate and Prioritize the Use of Public Spaces for Capital Investment and Storm-Water Objectives	Mid-term	ALCOSAN, PWSA, City Parks
Leverage capital improvements	Coordinate financial investments from Related Infrastructure Projects in the Negley Run watershed to accomplish storm-water mitigation objectives	Mid-term	PWSA, Alcosan, City-wide task force
Substantiation and Monitoring Program	Initiate uniform monitoring practices and guidelines	Mid-term	City-wide task force
Planning and Zoning	Initiate the Development of a Storm-Water Overlay District to guide land use and development decisions	Long-Term	City Planning

2 NEGLEY RUN PROJECT ORIENTATION

The green infrastructure strategy for Negley Run proposes a mix of pervious collection, bioswale conveyance, and detention and capture features to provide a potential capture volume of 48.2 million gallons. The strategy breaks the sewershed into six project areas, each with its own goals for capture potential and conveyance to the Allegheny River. The seven project areas, beginning at the top of the sewershed, include: Beechwood Boulevard and Mellon Park, MLK Busway and Fifth Avenue Parking Lots, the Westinghouse Academy, Highland Park, Washington Boulevard, and the VA Campus. Negley Run was chosen for the WRAP exercise due to the size of the watershed and the ability to scale to parcels and corridors to target within the larger watershed.

Table 1. Negley Run Project Area Descriptions

Project Area	Detailed Description
Beechwood Boulevard and Mellon Park	Beechwood Boulevard provides an important connection to the south and offers opportunity as a Complete Street, which will support collecting and conveying runoff to Mellon Park. The capture potential in this project area is 1.4 million gallons.
MLK Busway and Fifth Avenue Parking Lots	Currently, extensive impervious area exists along the MLK Busway, the bus terminal, and in large surface parking lots at Chatham University’s East Side Campus. Reducing the overall impervious area and implementing pervious pavement would collect and capture approximately 7.4 million gallons of stormwater. Green infrastructure improvements to the busway also offer the opportunity to improve access to public transportation.
Westinghouse Academy and Homewood Neighborhood	The Westinghouse Academy and surrounding Homewood neighborhood provide an opportunity to use green infrastructure as a catalyst for redevelopment. Streets radiating away from the Academy can collect and convey stormwater downstream. The school’s athletic field and the former Silver Lake site (now industrial), are proposed locations for storage sites, with capture potential of 13.9 million gallons of stormwater.
Highland Park	The Highland Park neighborhood has several potential high-yield areas, and streets like Stanton Avenue, Highland Avenue, and Heberton Street are proposed to collect and convey runoff to Negley Run Boulevard with a capture potential of 4.6 million gallons. Construction is already underway for some improvements at Negley Run Boulevard, which has an adjacent natural drainage channel that conveys runoff from East Liberty Avenue.
Washington Boulevard	Washington Boulevard is a valley that serves as convergence for several sub-basin drainage paths. Large surface lots adjacent to the City Police and Fire facilities, along with an existing bike track, offer pervious pavement and subsurface capture potential. Low slopes and a broad profile west of Washington Boulevard offer high storage volumes and can provide sedimentation capture areas. The capture potential for Washington Boulevard is 13.6 million gallons, which will also reduce flooding in the low-lying area.
VA Campus	The VA Campus, located west of Washington Boulevard, includes the VA Center, Juvenile Detention Center, and Job Corps. The Campus has large areas of undeveloped open space, which can collect and convey water to basins along Highland Drive where runoff is ultimately taken to Washington Boulevard. Beyond the potential volumes of capture surrounding these institutions (7.3 million gallons), they offer a tremendous opportunity for workforce training focused on green infrastructure and sustainable development.

3 DETAILED FINDINGS

Session participants split into three break-out sessions focused on each of the three principal topics and questions, according to stakeholder responsibilities, roles, and interests: Theme 1 - Policy Work Session, Theme 2 - Financial Benefits and Benefit Cost Session, and Theme 3 - Implementation Strategies. Findings that help to answer each of the three questions emerged from across the workshop. As such, detailed findings are organized by topic and question, as opposed to by session.

Policy and Governance

Successful public project implementation is heavily dependent upon the governmental and policy framework and organization from which the project emerges, is built, and maintained. Workshop participants were asked to recognize and define potential policy or organizational roadblocks to project success, as well as possible methods to reduce those roadblocks and streamline project implementation. This challenge was most thoroughly explored in Theme 1 - Policy Work Session, moderated by Rebecca Kiernan with the City of Pittsburgh and Tanya McCoy-Caretti of Arcadis.

During the session, participants measured, identified, and ranked policy restrictions and process opportunities through the lens of the following project considerations:

- Who are the key agency stakeholders and what are their responsibilities?
- What are the key operation and maintenance considerations?
- What are the public and private participation opportunities, obstacles, and participation catalysts?

Workshop participants reviewed the project proposal and discussed relevant stakeholders and governance structures, including policy restrictions and opportunities, with an eye towards how processes and rules may need to change to advance large-scale project implementation.

The key take-away from the Theme 1 Policy Work Session is that Pittsburgh needs **a comprehensive stormwater management strategy**, which captures the requirements, policies, and accountability that exist among various entities, with **a single task force or organization to spearhead strategy development and implementation**.

Outcomes

- Session participants identified **ALCOSAN, PWSA**, and the **City of Pittsburgh** as the entities which carry the heaviest weight of stormwater management responsibilities in Pittsburgh, acknowledging that PADOT, Allegheny County, and the Allegheny County Health Department play a role by managing their own policies and infrastructure.

Each of these organizations have their own requirements, policies, preferred practices, and responsibilities in managing water; **no single agency has jurisdiction** or charter with respect to stormwater management in Pittsburgh, and there is **no master implementation plan** that coordinates all stakeholder objectives.

Property and infrastructure owners, both public and private, are also key players in stormwater management, and sometimes ownership presents a major challenge in a coordinated approach to implementation. Moving forward, **a single framework and organization to plan, implement, and maintain green infrastructure in a coordinated fashion between all agencies must be named / created** if Pittsburgh is to comprehensively manage stormwater as a system. The timing for such coordination is ripe, considering the current political good will between the offices of the

electorate. Act 167, Pennsylvania’s Stormwater Management Act, could be a conduit to facilitate movement in this direction.

Within the context of Negley Run, the Urban Redevelopment Authority (URA) is a significant land owner in the area. URA can aggregate vacant properties to the highest and best use, but needs direction from the Comprehensive Plan to do so. The City Planning Department and URA are coordinating to this end on a Comprehensive Plan review and update. Alternatively, the City / URA could buy out other landowners and implement a transfer of development rights (TDR) program on lots proximate to the bus route. This would create more density elsewhere and leave space to implement green infrastructure projects in the corridor.

- **Shed morphology and managing stormwater as a system** is an important aspect of ownership, and speaks to the regional needs of project conception and implementation. This also applies to operation and maintenance considerations. The Policy Work group supports the use of an **asset management plan** to maintain a systems-based approach to stormwater management in Pittsburgh. The asset management plan will consolidate all maps, existing assets, and future investments to bring stakeholders together and simplify stormwater management as it applies to green and gray infrastructure. The asset management plan can also assist in coordinating ownership and responsibility for long-term asset maintenance between stakeholders.
- Pittsburgh needs to **develop partnerships** with other public and private entities to ensure a **consistent approach for infrastructure coordination**. Triple bottom line evaluations, as discussed in the Benefit Cost Analysis and Value Proposition section, can leverage different performance metrics of interest to various stakeholders to build partnerships. Perhaps organizations that invest in publicly-used assets should begin to require stormwater management standards and best management practices to enhance the capacity for co-benefits and partnerships.

Table 2. Programmatic Opportunities and Barriers

Programmatic Opportunities	Barriers
<ul style="list-style-type: none"> • Transfer of Development Rights program. Potential for this in Larimer is high because there is primarily one landowner. • Use overlay districts to put Transfer of Development Rights (TDR) or other green initiatives in place. • Incorporate green infrastructure requirement in neighborhood plans. Many are currently being updated. • Current administration is receptive to stormwater regulations. • Act 167 ordinance provides a deadline to develop a stormwater management code. • Work with PADOT to develop standards for green urban development. 	<ul style="list-style-type: none"> • Managing volumes from storms, rather than level of service, calls for gray infrastructure. • AVRR (railroad) is a physical barrier between Washington Boulevard and the river. The railroad is physically lower than the road and higher than the river. As such, getting stormflow quickly and efficiently to the river is difficult and may require boring under the railroad with a very large pipe or drop shaft. • The series of Army Corp Locks and Dams on the Allegheny River are a physical barrier to the installation of piping in some instances and must be factored into plans and cost. • New federal governance may change the consent decree requirements. • Property ownership may present legal limitations and challenges to implementation.

Programmatic Opportunities	Barriers
<ul style="list-style-type: none">A task force should have ability to influence RFP's to set city up for desired outcome.	<ul style="list-style-type: none">There is no incentive for green in the City. Need uniform policy and implementation program.

Next Steps

Near-term

- Accelerate** existing coordinating efforts by **establishing a local coordinating body**. The infrastructure conversation in general needs coordination among all utilities. Communication between stakeholders has improved markedly in recent years, but needs to be taken to the next level and emphasize community engagement and capacity enhancement. Pittsburgh may wish to consider the possibility of making the local coordinating body temporary until an inter-agency task force is created and stabilized.
- Initiate the creation of a City-wide Task Force of Key Inter-Agency Partners**. A clear next step for Pittsburgh is to assemble an inter-agency “strike team” or task force which will address and establish a simplified decision matrix or work flow diagram with respect to stormwater. This will assist with developing a clear definition of responsibilities in terms of owning and maintaining the infrastructure. The strike team may also be responsible for informing procurements and developing appropriate “green” codes and standards with respect to public assets. Non-governmental organizations that invest in public assets should also adopt green standards.

Mid-term

- Accelerate** the **creation of flow reduction targets**, and **amplify communication** of such targets. Compliance goals currently being negotiated with the regulatory agencies (DEP/EPA) have been based upon a reasonable expectation and level of investment by all of the electorate within the watersheds. Regardless of current negotiations, the regulatory agencies will ultimately establish the goals and push those goals down through the consent order. Once the goals have been set, a clearer determination of the mix of gray and green infrastructure needed for compliance can be established. The Negley Run green infrastructure plan may need to be tweaked to meet compliance goals.

Long-term

- Initiate** the **Development of a Storm-Water Overlay District**. Pittsburgh and its agency partners need to inventory facilitators and barriers to low-impact development in codes, and develop a uniform green policy that will lower demands on stormwater management. For example, commercial properties may be required to implement impervious surfaces when repaving or replacing sidewalks and parking lots.

Benefit Cost Analysis and Value Proposition

Implementation of projects the size of Negley Run often require external sources of funding. These external sources of funding may include grants, public or private financing, or public private partnerships, for example. In all cases, funding gatekeepers must have a compelling reason to invest in a project. Workshop participants were asked to explore, qualitatively, the value proposition and benefits of the project as they would be presented to potential project financiers and funding gatekeepers. This challenge was most thoroughly explored in Theme 2 - Financial Benefits and Benefit Cost Session, moderated by James Stitt of PWSA and Kelli Thurson, CFM of Arcadis.

In addition, the group collected information that could be used to begin the development of a project benefit cost analysis, depending upon funding / financing strategies. This information was collected through five open ended questions, as follow:

1. What is the problem being alleviated OR objective being accomplished?
2. What are the existing conditions being changed? How much and what type of change is expected?
3. Who will benefit from the change?
4. What are the project benefits? Will they differ by scale and location within the watershed?
5. How will we know that the project has succeeded in addressing the problem?

The key takeaways for Theme 2 Financial Benefits and Benefit Cost Session are as follows: The City of Pittsburgh should begin by implementing smaller scale elements of the Negley Run project, as well as track and quantify project success for existing green infrastructure projects. This strategy would create “quick wins” that could make opportunistic use of smaller grants and funding sources as they become available, all the while demonstrating the value of, and building momentum toward, watershed-level implementation.

Outcomes

- The Negley Run watershed is a flat, dense, urban area. Approximately 10 percent of the land is undeveloped, and there is **limited flow capacity to the Allegheny River**. Large surface parking lots make up the highest portion of the watershed, and despite large areas of undeveloped public and private land at the bottom of the watershed, heavy precipitation in the area causes severe flash flooding which has resulted in traffic delays, loss of property, and even loss of life. The project’s main objectives are to **reduce stormwater flood impacts** and improve transit corridor conditions to **facilitate better traffic flow**, as well as **neighborhood connectivity**.
- The green infrastructure plan proposes to use large paved areas at the top of the watershed to **capture, retain, and detain water** using porous pavement and other pervious collection measures, and then **convey excess drainage to the lower, less developed end of the watershed** (towards Highlands Park and the VA Campus) using bioswale conveyance structures. Additional retention areas are proposed in public and private space at the bottom of the watershed before the water flows into the Allegheny River. The green infrastructure measures as a whole are expected to **reduce CSOs by 48 million gallons**, and significantly reduce flood risk due to stormwater accumulation.

- **Beneficiaries** of the Negley Run green infrastructure project will be diverse and include, but are not limited to: **the Department of Labor, the U.S. Army Corps of Engineers, Army Reserve, PADOT, Allegheny County, ALCOSAN, City of Pittsburgh, PWSA, private developers and investors, philanthropists, local NGO partners, and local residents and land owners.** The team did not have the opportunity to discuss in detail how each of these groups would benefit from the project. Deliberation on this topic would be a beneficial next step.
- The following table summarizes the project scale considerations, as well as potential social, economic, and environmental benefits and costs of the proposed Negley Run project, as identified by workshop participants.

Table 3. Scale Considerations, Benefits, Costs, and Barriers to Green Infrastructure

Benefits	Costs/Barriers
Small-Scale Green Infrastructure	
<ul style="list-style-type: none"> • Easier and thus faster to implement • Small-scale pilots can demonstrate the type of change that could be expected from green infrastructure to residents. • Small-scale projects provide “quick wins” to substantiate the value of the projects and catalyze greater investment. 	<ul style="list-style-type: none"> • Small-scale green infrastructure projects contribute little to the overall solution and are typically not visible to a wide audience.
Large-Scale Green Infrastructure	
<ul style="list-style-type: none"> • Introducing green infrastructure at a larger scale, such as in transit corridors, has a larger measurable effect and reaches a larger audience. 	<ul style="list-style-type: none"> • Larger projects typically have larger governance structures and thus take more time to navigate and implement. An inter-agency team may help break down or reduce governance barriers.
Economic	
<ul style="list-style-type: none"> • Investment in older commercial corridors in the Negley Run watershed may lead to neighborhood revitalization, and an increase in property value. • Increased neighborhood aesthetics can also increase property value. • Potential job creation and economic stimulation through local job force training programs. • Flood risk reduction benefits include avoided damage, lost work productivity, and business interruption. • Green infrastructure often has a higher community recapture rate (uses local resources to implement and maintain) than gray infrastructure. 	<ul style="list-style-type: none"> • Gentrification is an externality associated with neighborhood revitalization and increased property values, but may be minimized by including requirements for inclusive, affordable, or low-income housing, or implementing a property tax relief system. • In desirable neighborhoods, green infrastructure may not be considered the most economically beneficial use of space. • Maintaining green infrastructure is typically resource-heavy for the first few years as new plantings adjust to their new environment. Nevertheless, the project team must consider maintenance as it is required over the life of the project – which is typically less intensive than gray infrastructure.

Benefits	Costs/Barriers
Environmental	
<ul style="list-style-type: none"> CSO reductions and pollutant infiltration from capture and retention measures will improve water quality. Capture and retention measures reduce the need for water treatment, reducing energy needs and pollutant emissions. Increased tree cover in a sparse area means more carbon sequestration, potentially more ecologic biodiversity, and reduced emissions due to insulation provided by vegetation. Reduced emissions and increased sequestration can mean reduction in the urban heat island effect, thereby further reducing the need for energy for heating and cooling. 	<ul style="list-style-type: none"> Current environmental conditions (poor infiltration, steep slopes, contaminated soils) are a current barrier to typical stormwater infrastructure, as remediating and mitigation environmental conditions can be expensive. Temporary disruption of existing ecological systems is a potential environmental cost of the project, although this may be balanced with a long-term increase in biodiversity.
Social	
<ul style="list-style-type: none"> Aesthetic improvements can increase the quality of life for individuals who live, work, and play in Negley Run. Neighborhood revitalization can incite increased community cohesion, involvement, and pride. More public space and increased access to pedestrian transportation alternatives will increase recreational opportunities and increase health. Reduced time spent in traffic associated with flood reduction and alternative modes of transportation will increase quality of life and health. 	<ul style="list-style-type: none"> Traffic disturbance during construction may worsen existing congestion issues, although this will be for a short time in comparison with the project useful life.

- Session participants noted that **long-term performance unknowns** are a significant **barrier** to implementing large-scale infrastructure projects in Pittsburgh. The group discussed the feasibility of setting up a **monitoring program** for existing green infrastructure projects to measure and demonstrate effectiveness of existing green infrastructure. Project metrics would need to be developed.

Next Steps

Near-term

- Amplify** the PWSA efforts to develop a **decision-making and prioritization framework for green infrastructure**. Pittsburgh should consider developing a framework to identify and quantify social, economic, environmental, and project-scale benefits of green infrastructure projects. This may be a responsibility of the task force with the help of PWSA, who working with their consultants are developing a process to outline social, economic, and environmental benefits

typically realized through green infrastructure, and provide standard methods to quantify such benefits so that PWSA has an objective approach for valuing the green infrastructure impacts. Theme 3 - Implementation Strategy session participants noted that prioritization of benefits for green infrastructure projects should be consistent with community priorities.

Mid-term

- **Amplify the Communication of Flow Reduction Targets.** Conduct a detailed analysis of the benefits and costs of the Negley Run watershed green infrastructure proposal. Evaluate and communicate expected outcomes and metrics, so that project partners may begin the search for funding sources.
- **Initiate uniform monitoring practices and guidelines.** Pittsburgh should develop a monitoring program for existing small-scale green infrastructure projects to measure and demonstrate effectiveness of green infrastructure. The results can be used as leverage to approach sources of private capital and larger public sources, should they become available, to implement projects at a larger scale. Such an approach would also allow for the opportunistic use of smaller grants and funding sources as they become available, all the while demonstrating the value of, and building momentum toward, watershed-level implementation.

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Implementation Strategies

Theme 3 - Implementation Strategies built upon the Benefit Cost Analysis and Value Proposition theme to evaluate the viability and practicability of traditional and innovative financing alternatives, including but not limited to taxes, user charges, grants, public-private partnerships, and social impact bonds. The Theme 3 session was moderated by John Mastracchio of Arcadis and considered the following four questions:

- Which government agencies should “own” the funding of the project?
- Where could the funding come from?
- What options are there to finance the project given the funding sources that have been identified?
- Which financing options are most viable given their cost, prevalence, benefits, and limitations?

Workshop participants agreed that there are a broad spectrum of financing approaches available for green infrastructure, and the Negley Run project, specifically, because of the array of outcomes and benefits that can be expected from such an endeavor.

Session participants ultimately preferred the “stacked benefit fund” approach to financing large-scale green infrastructure projects (\$50 million to \$100 million). The stacked benefit fund is an investment mechanism which uses project benefits and expected outcomes to engage multiple stakeholders and leverage multiple sources of funding. This approach allows stakeholders to invest in the outcomes of greatest interest to them. Participants also agreed that a stormwater utility fee is a likely candidate for at least partial project funding, although the project team must decide which entity will establish the fee.

Outcomes

- Funding ownership refers to the responsibility for obtaining and managing funding for the project, and is typically aligned with the responsibility to implement the project. As explored under Theme 1, **implementation responsibility is not entirely clear at this time**. Responsibility for funding the project, and various elements of the project, may also change based on the extent to which project benefits and outcomes can be communicated and monetized. Owners of project funding could be a combination of ALCOSAN, PWSA, the City of Pittsburgh, and others. The proportional ownership may depend on the amount of grey and green infrastructure, the outcome of action items associated with Theme 1, as well as potential sources of funding. Other potential funding owners for various elements of the Negley Run green infrastructure ambition include: PADOT, Penn Hills Municipality, insurers, developers, and philanthropists.
- The **“project payers”** will consist of those who are most willing to see the desired outcome realized. The following are some entities discussed as potential project funders:
 - Department of Labor
 - Army Reserve
 - Allegheny County
 - City of Pittsburgh
 - PADOT
 - State Revolving Loan Funds
 - Philanthropy
 - Community / Crowd funding
 - Private Investment
 - Existing Land Owners
 - Private Developers
 - CDFIs (community development financial institutions)
 - Port Authority
 - ALCOSAN Grow
 - U.S.A.C.E.
 - PPPS
 - PWSA

- **Financing options**, given funding sources identified:
 - Long term leases – Private investor first right of refusal
 - Stormwater bank – this is a tool for focusing improvements on where they are needed most
 - Stormwater reuse to generate revenue (tie in with community gardens / urban agriculture)
 - Benefit funds. “Stacked benefits fund” – Can also become a governance structure. Community ownership and sense of place can drive a “stacked” funding
 - Ensure local labor participation
 - Community based public private partnerships
 - Stormwater utility – This could potentially become the entity that controls revenue and governs the project
 - Transfer development rights
 - Keeping water above ground / keep it visible / enhance awareness / pride
 - Define outcomes and build the team around these defined expected outcomes
- Two of the group’s **preferred funding sources** include the **stormwater utility fee** and the **stormwater bank**.

Next Steps

Near-term

- **Amplify** the PWSA efforts to develop a **decision-making and prioritization framework for green infrastructure**. Understand and monetize triple bottom line (social, economic, and environmental) benefits for the Negley Run watershed and develop a value proposition to align benefits and desired outcomes with funding requirements from stakeholders. This is the first step in funding Negley Run green infrastructure measures using the “stacked benefits” approach. Related, Pittsburgh should focus on building a framework and strategy to attract stakeholder investment for large-scale infrastructure projects that are not affordable through a single financing mechanism (generally \$50 to \$100 million dollars).

Near to Mid-term

- **Initiate** the **Creation of a Storm-Water Utility**. Pittsburgh should consider conducting feasibility studies for viable funding sources to ensure that financing options are affordable for funding contributors and rate payers. The feasibility study should consider risk mitigation and risk control and make recommendations as to which entity will establish the stormwater fee and govern green infrastructure projects.

4 CONSOLIDATED KEY FINDINGS, POSSIBLE IMPLICATIONS, AND NEXT STEPS

Finding	Possible Implications	Recommendation	Timeframe	Potential Lead
Stormwater needs to be managed system-wide, dependent upon shed morphology, rather than piecemeal.	Merging together existing assets, planned improvements, and maintenance schedules of the various entities involved in stormwater management will be time-consuming and raise questions of ownership and maintenance responsibility. Once instituted, this will provide the framework for a coordinated approach to system-wide stormwater management in Pittsburgh.	Accelerate the PWSA Watershed Manager efforts by establishing a Local Coordinating Body within the Negley Run Watershed. Build on existing organizational efforts, leverage the Project 15206 Network.	Near-term	PWSA
No entity has absolute jurisdiction or responsibility of stormwater management in Pittsburgh.	Responsibility for coordinating, implementing, financing, and maintaining large-scale green infrastructure is ambiguous.	Initiate the creation a City-Wide Task Force of Key Inter-Agency Partners to provide policy change recommendations and help to coordinate investment decisions aimed at reaching storm-water reduction targets (PWSA, ALCOSAN, DPW, DOMI, URA, DCP, Pgh Parks, PennDOT, ACHD). The Task Force could serve both near term policy objectives and longer-term coordination functions. Targets include: Codes, Investment Coordination and Data Sharing.	Near-term policy objectives; Long-term coordination functions.	PWSA, ALCOSAN
Pursuing a mix of small (parcel-scale), internally-funded green infrastructure with large (corridor) projects for a robust and effective implementation plan and funding approach.	Pursuit of green infrastructure at various scales requires a highly strategized and coordinated approach.	Amplify the PWSA efforts to develop a decision-making and prioritization framework for green infrastructure . Benefit cost analyses and value propositions can be used to strategize project funding and financing.	Near-term. The framework can be revisited in the mid-term and long-term	PWSA and City-wide task force

Finding	Possible Implications	Recommendation	Timeframe	Potential Lead
It is difficult to balance the blend of gray and green infrastructure without knowledge of consent decree requirements and reduction goals for each watershed.	Projects being designed or implemented currently may not be effectively reducing overflows.	Accelerate the Creation of Flow Reduction Targets to Guide Policy and Investment Decision Making. Related, Amplify the Communication of Flow Reduction Targets (similar to 2030 District reduction targets), encourage people to rally around the reduction goal.	Near-term	3RWW, City-wide task force
A stormwater utility fee is a likely candidate for at least partially funding the project.	The project team will need to decide which entity will establish the stormwater fee. This entity will become the controlling party that governs the project, since they are responsible for the revenues.	Initiate the Creation of a Storm-Water Utility with clear investment objectives and sufficient resources. Creation of the Storm-Water Utility is something that would need to proceed the creation of a “stacked benefits fund” or any other type of financial investment scheme.	Near to Mid-Term. Implementation approach for the utility must begin in the near-term.	City-wide task force
Pursuing a mix of parcel-scale and large corridor projects makes for a robust and effective implementation plan and funding approach.	If Pittsburgh continues to internally fund parcel-scale projects, then these investments may catalyze large public and private funding sources to implement large-scale projects, such as those that span across neighborhood boundaries.	Accelerate and Prioritize the Use of Public Spaces for Capital Investment and Storm-Water Objectives	Mid-term	ALCOSAN, PWSA, City Parks
Funding / financing approach should focus on all of the dispersed benefits of the project.	There are many stakeholders that may benefit based on the details of the project. This should drive the funding/financing and perhaps the schedule for improvements.	Coordinate Financial Investments from Related Infrastructure Projects in the Water Shed to Accomplish Storm-Water Mitigation Objectives. Using existing resources better, by incorporating storm-water management is a key resilience strategy. Trigger events like road reconstruction, property sales transactions, development or other capital programming can be used to help address storm-water investment needs.	Mid-term	PWSA, Alcosan, City-wide task force

WRAP WORKSHOP DEBRIEF
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Finding	Possible Implications	Recommendation	Timeframe	Potential Lead
<p>The effect of green infrastructure projects needs to be measured and demonstrated. It may be difficult to approach large sources of private capital and public funding sources without demonstrated proof of effectiveness.</p>	<p>Start with demonstrated quick wins through small, publicly funded projects to attract larger funding sources to implement more effective projects at the top.</p>	<p>Initiate Uniform Monitoring Practices and Guidelines</p>	<p>Mid-term</p>	<p>City-wide task force</p>
<p>Pittsburgh and its agency partners need to inventory facilitators and barriers to low-impact development in codes, and develop a uniform green policy that will lower demands on stormwater management.</p>	<p>An overlay district will allow for Pittsburgh to target green policies in certain areas or for particular development types.</p>	<p>Initiate the Development of a Storm-Water Management Overlay District to Guide Land Use and Development Decisions to guide land use and site-review decisions to provide concurrence with storm-water needs. The use of the Interim Planning Overlay District (IPOD) might be a tool here.</p>	<p>Long-Term</p>	<p>City Planning</p>

APPENDICES

Workshop Attendees

Theme 1 - Policy Work Session

Organization	Attendee
Urban Redevelopment Authority	Emily Mitchell
Urban Redevelopment Authority	Bethany Davidson
Pittsburgh Water and Sewer Authority	Katherine Camp
ALCOSAN	Alex Sciulli
ALCOSAN	David Borneman
City of Pittsburgh	Josh Lippert
City of Pittsburgh	Andrew Dash
City of Pittsburgh	Rebecca Kiernan
3 Rivers Wet Weather	John Schombert
BNY Mellon	Anna Kearney
CONNECT	Kristen Michaels
Homewood Childrens Village	Dan Dickerman
Allegheny Conference on Community Development	Brian Jensen
Richard King Mellon Foundation	Brian Hill
ARCADIS	Tanya McCoy-Caretti
ARCADIS	Mark Lenz

Theme 2 - Financial Benefits and Benefit Cost Session

Organization	Attendee
Urban Redevelopment Authority	Krynn Hoyer-Winfield
Pittsburgh Water and Sewer Authority	James Stitt
ALCOSAN	Tim Prevost
City of Pittsburgh	Grant Ervin
US Army Corps of Engineers	Elliott Porter
BNY Mellon	Rob Steiner
BNY Mellon	Charlie Goodwin
RAND Corporation	Jordan Fischbach
Green Building Alliance/Ethos Collaborative	Damon Weiss
EvolveEA	Christine Mondor
Landbase Systems Corporation	Matt Graham
Green Building Alliance/Ethos Collaborative	Cassie Guerin
ARCADIS	Kelli Thurson
ARCADIS	John Amend
ARCADIS	Edgar Westerhof
ARCADIS	Piet Dircke

Theme 3 - Implementation Strategies

Organization	Attendee
Urban Redevelopment Authority	Kyra Straussman
Pittsburgh Water and Sewer Authority	Megan Zeigler
Pittsburgh Water and Sewer Authority	Ryan Quinn
ALCOSAN	Jan Oliver
Allegheny County	Darla Cravotta
Allegheny Land Trust	Roy Kraynik
Parks Conservancy	Susan Rademacher
Phronesis	Tim Duggan
Phronesis	Lance Klein
e Design Dynamics	Ian Lipsky
ALCOSAN	Mike Lichte
Allegheny County Conservation District	Jan Lauer
Allegheny County Conservation District	Rebecca Zeyzus
GTECH Strategies	Sarah Koenig
US Army Corps of Engineers	Shane Michael
Negley Run Watershed Committee	John Stephen
ARCADIS	Jerry Kleyman
ARCADIS	John Ross
ARCADIS	John Mastracchio
100 Resilient Cities	Sandy Tung
100 Resilient Cities	Katya Sienkiewicz

Workshop Agenda

Wednesday – 7 December 2016		
Time (EST)	Item	Presenter
8:00 a.m.	Arrival, registration and refreshments	All participants
8:30 a.m.	Welcome and introductions	
	100 Resilient Cities	Katya Sienkiewicz (100RC)
	Remarks Grant Ervin, Chief Resilience Officer	Grant Ervin (Pittsburgh)
9:00 a.m.	Plenary Session	
	Global lessons learned	Piet Dircke (Arcadis)
	Pittsburgh's green infrastructure best practices	Tanya McCoy-Caretti (Arcadis)
	Conventional and innovative finance models	John Mastracchio (Arcadis)
	Revealing the value of green infrastructure	John Williams (Impact Infrastructure)
10:45 a.m.	Current state of practice – how do we deliver?	
	ALCOSAN: current, upcoming and expected developments	Dave Borneman, PE (ALCOSAN)
	PWSA: current, upcoming and expected developments	James Stitt (PWSA)
	Pittsburgh: Community climate change ambition	
11:45 a.m.	First impressions and lunch	Grant Ervin (Pittsburgh)
12:30 p.m.	Breakout Session I, Introduction	Edgar Westerhof (Arcadis)
	Theme 1 – Policy Work Session	Tanya McCoy-Caretti (Arcadis), Rebecca Kiernan (Pittsburgh)
	Theme 2 – Financial Benefits and Benefit Cost Session	Kelli Thurson (Arcadis), James Stitt (PWSA)
	Theme 3 – Implementation Strategies	Moderators: John Mastracchio (Arcadis)
2:00 p.m.	Initial key findings	Grant Ervin (Pittsburgh)
2:30 p.m.	Implementation Session II	
3:30 p.m.	Presenting results to city representatives + panel reflection	
4:15 p.m.	Final statements	Grant Ervin
4:30 p.m.	Happy hour at the Omni William Penn Hotel	All participants

Breakout Session

Theme 1 – Policy Work Session

Moderators: Tanya McCoy-Caretti (Arcadis), Rebecca Kiernan (Pittsburgh)

Theme 1 will work with the Negley Run plans that have recently been developed and aim to reduce the annual 777 million-gallon (MG) combined sewer overflow (CSO) overflow. This group will be (co)-moderated by the City of Pittsburgh Division of Sustainability and Resilience, who have been fundamental in the development of the plans. In preparation of the Policy Work Session, PWSA with the city will summarize project goals and benefits on a project sheet and visualize local functions and solution strategies on large full color prints. The assembled group will discuss the proposed green infrastructure strategies which include large scale retention opportunities, open green/grey spaces, existing and future community assets and transit and infrastructure corridors.

The goal of the session is to think through governance structures and stakeholder implications relative to the green infrastructure ambition for Negley Run. The group will assess measures at a high level, identify and rank policy restrictions and process opportunities. The question the group is tasked to answer is how processes and rules needs to change in order to advance the large-scale implementation.

The group will assess and map:

- Stakeholders, stakeholder responsibilities and ownership
- Operation & Maintenance considerations
- Public and private participation opportunities, game breakers and rain makers
- Existing quality of public space and projected quality of solution strategies

The targeted group should include city and stakeholder policy people, agency representatives involved in operation of assets and maintenance of public space and a range of users and community representatives.

BREAKOUT AGENDA: Theme 1 – Policy Work Session	
Time (EST)	Item
12:30 – 1:00 p.m.	The Negley Run GI Plan, a “high level deep dive”
1:00 – 1:45 p.m.	360-degree implementation assessment
1:45 – 2:00 p.m.	Report out preparation

Breakout Session

Theme 2 – Financial Benefits and Benefit Cost Session

Moderators: Kelli Thurson (Arcadis), James Stitt (PWSA)

Theme 2 will explore qualitatively the value proposition and benefits of the project as they would be presented to potential project financiers and funding gatekeepers. The outcomes of the session will be presented to the group and will answer the following high level question for different stakeholder types: Why should I fund/finance/promote this project? In addition, the group will complete a table that could be used to begin the development of a project benefit cost analysis, depending upon funding/financing strategies.

The table might include the following information for each major project element:

- What problem being alleviated OR objective being accomplished?
- What are the existing conditions being changed?
- How much and what type of change are we implementing?
- Who will benefit from the change?
- Do benefits differ by stakeholder and how?
- How will we know that this project element has met the objective/succeeded in addressing the problem (metrics)?

In preparation for the session, moderators will gather all available information about the project, including scope documentation, cost estimates, and begin breaking down project elements/providing examples with which to proceed.

The group of 15 will be broken into three (3) sub-groups of five (5) each. Each sub-group must come up with a value proposition for the project and address specific project elements. Each group will present their findings to the full group of 15, and the group will come to a consensus on the value proposition and presentation of the project benefits table.

BREAKOUT AGENDA: Theme 2 – Financial Benefits and Benefit Cost Session	
Time (EST)	Item
12:30 – 12:45 p.m.	Introduction on financial benefits
12:45 – 1:30 p.m.	Groups of five (5) break out
1:30 – 1:45 p.m.	Five (5) minute presentations from each group
1:45 – 2:00 p.m.	Report out preparation

Breakout Session

Theme 3 – Implementation Strategies

Moderators: John Mastracchio (Arcadis)

Theme 3 aims to build upon results of Theme 2 and will identify and evaluate traditional and new/emerging financing alternatives that may be applicable to funding the Negley Run project. The funding sources for paying for the financing of the project will be identified and considered based on the identification of the benefits of the project (from Theme 2). Various funding sources, such as taxes, user charges, grants, etc. will be explained and explored, along with financing options, such as public-private partnerships, tax increment financing, green bonds, social impact bonds, etc.

The outcome of the session is the identification of various approaches to funding and financing the project considering the value and benefits that the project brings to various stakeholders.

The breakout group could answer the following questions:

- Which government agencies should “own” the funding of the project?
- Where could the funding come from?
- What options are there to finance the project given the funding sources that have been identified?
- Which financing options are most viable given their cost, prevalence, benefits and limitations?

The group members under Theme 2 will also discuss the Theme 3 questions above, and come to consensus on an overall funding and financing approach for the Negley Run project. Each group will then present their results and recommendations.

The outcome of this theme is an implementable approach to funding and financing the Negley Run project. In order to accomplish this, the moderator will set the stage with a description of traditional and new/emerging funding and financing alternatives, their applicability, benefits, and limitations. Also, this breakout session would require finance representatives in each break out group (e.g. municipal finance officers, external finance professionals, etc.).

BREAKOUT AGENDA: Theme 3 – Implementation Strategies	
Time (EST)	Item
12:30 – 1:00 p.m.	Introduction on funding opportunities (moderator + participants)
1:00 – 1:45 p.m.	Group discussion on feasible scenarios
1:45 – 2:00 p.m.	Report out preparation

About the Hosts

About the City of Pittsburgh

The goal of the Department of City Planning is simple: to create and maintain an orderly, timely, environmentally-sustainable, and consistent approach to land use and development within the City. To achieve this end, City Planning works with communities, civic organizations, and public entities to develop long-term plans to sustain and revitalize a thriving city of neighborhoods for people who live, work, learn, and visit here.

The Department of City Planning is comprised of six divisions:

1. **Community development** – This division administers all federal funds received by the City in compliance with federal regulations.
2. **Geographic Information Systems (GIS)** - This division provides data and analysis services to City Departments and Authorities. The GIS team incorporates Open Data into divisional workflow for better sharing and more standardized data use by all. This division collaborates with outside agencies to establish critical authoritative data with a focus on greater accuracy.
3. **Public Art and Civic Design** – This division promotes and ensures quality design of city-owned architecture, infrastructure, and landscape in order to create and enhance place-making by the inclusion of art and arts programming that reflect the city's history, diversity, and culture. The division performs three main functions: staffing of the City's Art Commission, conservation and maintenance of the City's collection of public artwork and memorials, and planning and implementation of new commissions of public art and arts programs on City property, citywide.
4. **Strategic Planning** – This division initiates and guides planning processes to enhance quality of life and to assure the orderly and efficient development of real property within the City of Pittsburgh. This Division conducts project development reviews related to Americans with Disabilities Act compliance, traffic impacts, storm water management, geotechnical, and other environmental concerns. Strategic Planning also represents the City on regional and citywide transportation planning panels, manages the Residential Parking Permit Program, and both plans and implements bicycle and pedestrian infrastructure within the city. Neighborhood Planners serve to empower neighborhoods to plan for their future, providing a key link to city government and resources. Strategic Planning is also charged with coordinating and developing the City's Comprehensive Plan, a resource combining analysis of neighborhood and system-wide challenges with identification of opportunities.
5. **Zoning and Development Review** – This division initiates and reviews all building permits—from fences to stadiums—for compliance with the City's Zoning Code. It manages and staffs department commissions, boards, and panels: Planning Commission, Zoning Board of Adjustment, Contextual Design Advisory Panel, and Historic Review Commission. Functions of the division include proposing Zoning Code text amendments and map changes in order to adopt best management practices and regulations to promote high quality planning and development; as well as reviewing for and providing consultation to developers, residents, and City Council Offices on proposed text amendments, map changes, special planning districts, signage, and other land use and development activity.

6. **Sustainability and Resiliency** – This division works to improve the quality of life for residents and visitors of Pittsburgh through the principles of environmental stewardship, resource efficiencies, and climate change resilience.

About 100 Resilient Cities

100 Resilient Cities – Pioneered by the Rockefeller Foundation (100RC) is dedicated to helping cities around the world become more resilient to the physical, social, and economic challenges that are a growing part of the 21st century. 100RC supports the adoption and incorporation of a view of resilience that includes not just the shocks – such as earthquakes, floods, disease outbreaks, etc. – but also the stresses that weaken the fabric of a city on a day to day or cyclical basis. Examples of these stresses include high unemployment; an overtaxed or inefficient public transportation system; endemic violence; or chronic food and water shortages. By addressing both the shocks and the stresses, a city can better respond to adverse events and is more capable of delivering basic functions in both good times and bad, to all populations.

Cities in the 100RC network are provided with resources along four pathways:

1. Financial and logistical guidance for establishing an innovative new position in city government, a [Chief Resilience Officer \(CRO\)](#), who will lead the city's resilience efforts;
2. Support for a Chief Resilience Officer to lead stakeholders in the development of a resilience-building strategy. This strategy, developed over the course of six to nine months, will serve as the city's roadmap to resilience.
3. Access to tools, service providers, and partners from the private, public, and non-profit sectors who can help cities develop and implement their resilience strategies. [Current Partners](#) include data analysis companies, reinsurance companies, architects, energy experts, and more.
4. Inclusion in the [100RC Network](#), through which CROs can share best practices, solve problems collectively, and learn from each other and from other resilience experts.

Through these offerings, 100RC aims to not only help individual cities become more resilient, but to facilitate the creation of a global practice of resilience building. 100RC began working with their first cohort of 30 cities in December 2013, announced their second class of 33 cities in December 2014, and announced its final cohort of cities in May 2016.

100RC is financially supported by The Rockefeller Foundation and managed as a sponsored project by Rockefeller Philanthropy Advisors (RPA), an independent 501(c)(3) nonprofit organization that provides governance and operational infrastructure to its sponsored projects.

Learn more at www.100resilientcities.org/.

About Arcadis

From climate change and rising sea levels to rapid urbanization and pressure on natural resources, our world is a more complex place. [Arcadis](#) helps you navigate this complexity by understanding the bigger picture. Whether it is helping cities diversify their water supply portfolios, protecting coastlines from natural hazards, or simply taking what you do further, we deliver exceptional and sustainable outcomes safely and consistently. Connecting your vision to our know-how, our people work collaboratively to create value through built and natural assets that work in harmony with their surroundings— from piloting a direct potable reuse facility in El Paso to leading a climate risk and vulnerability study for Boston.

Our global operations and diverse experience mean we apply collective wisdom to every challenge big and small. In this way, our experience protecting the Dutch coast for generations is applied to securing New York’s flood defenses today. So, whatever your challenge, our teams bring the necessary perspective to provide the right answers now and in the future.

Arcadis is made up of 27,000 people who are active in more than 70 countries. We work in partnership with our clients to deliver exceptional and sustainable outcomes through the application of design, consultancy, engineering, project and management services, and generate more than \$3.8 billion in revenues. Visit <http://arcad.is/waterindex-NA> to learn how we are helping cities harness water for long-term success.

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