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APPENDIX A

PennPraxis

Project Name: Developing PWSA's Strategic Plan for Stormwater

Project No.: 2020-025-OPS

ACTION 5: Communications Framework Recommendations

June 10, 2022

Introduction

One of the key elements of the PWSA Stormwater Strategic Plan (SWSP) for the city of Pittsburgh is developing a communications framework which aims to increase transparency, expand understanding of the strategic plan, and communicate the value proposition of the stormwater fee program. Intrinsic to a best-in-class communications framework is a commitment to equity and transparency and strategies for engaging community stakeholders in the shared work of stormwater management.

When forming this task action, PWSA and the planning team described the following:

Key Challenges this Addresses:

- Providing opportunities for engagement in the Strategic Plan.
- Increasing support for new Stormwater Fee and understanding of LOS concepts.
- Managing expectations, including with climate change, among Pittsburgh residents and ratepayers.

In order to fully undertake this work both within the SWSP process itself and into the future, PWSA and the planning team outlined a number of goals:

- To develop a public communication framework to include key, simple messages and clear communication of the possibilities and expectations around stormwater.
- To solidify public support for investment and ensure the public understands why the stormwater service fee is both essential and must be leveraged with other sources of investment and strategies to deliver improved levels of service.
- To employ deep community engagement and empowerment in the SWSP process as a means to model its effectiveness as a long-term strategy.
- To effectively keep all ratepayers informed through a comprehensive messaging effort related to the SWSP involving key milestones that highlight the strategic plan's development
- To communicate key issues (stormwater fee, LOS) an accessible way that centers equity associated with a stormwater fee in a combined sewer community

Key Recommendations for Future Engagement Strategy

Prior to considering the proper communication framework around stormwater work, it is important to define the public engagement foundation upon which it is built. As PWSA embarks on additional stormwater planning and strategic plan implementation, the lessons learned from best practices established in Pittsburgh's community engagement, public input throughout this SWSP process, and extensive case studies in peer cities, we recommend the following:

1. Principles for Engagement: Equitable outcomes rely on inclusive, accessible, and transparent communications and engagement at all times, not only when there is an active planning process or project underway. The goals outlined by PWSA for the Stormwater Strategic Plan (SWSP) can be applied in the future and achieved and replicated by devoting ample time and resources to community engagement.
2. Community Engagement at the Watershed Scale: The team heard from many stakeholders at many points in the planning process, and found examples in most peer cities we studied, that a formal and sustainably-funded structure for community involvement at the *watershed* scale is a successful model. This can continue to take the form of watershed task forces, ambassadors, and can and should be supported with staff community engagement positions within PWSA. An idealized structure can be found illustrated in Figure 3.
3. Dedicated Funding to Community Engagement: Ongoing financial support from PWSA will signal a long-term commitment to engagement by the authority. Leveraging support from outside partners such as the Pittsburgh Parks Conservancy, Grounded Strategies, community development organizations, universities, and philanthropy ensures that existing watershed task forces can flourish and achieve both a local and city-wide role. Partner resources can and should be leveraged into this work but developing and expanding staff expertise together with allocating dollars to supporting existing stormwater-focused community groups is also necessary.
4. Supporting Long-Term Involvement: A community engagement structure involving both ambassadors and watershed task forces that align with the SWSP-defined Pittsburgh watersheds will complement the intergovernmental/interagency stakeholder structure of the joint task force. Ambassadors are individuals willing to commit to training and neighbor-to-neighbor communications and education and receive compensation for their time and growing expertise. Watershed task forces are a diverse mix of stakeholders within a particular watershed and include members from public agencies. Creating meaningful representation between the watershed task forces and the joint task force will add transparency and equity in ongoing decision-making regarding strategic stormwater projects. These structures will provide both continuity and resilience.
5. Employing Effective and Dynamic Tools: As described in this task memo, PWSA should seek to satisfy the fundamental goals of equitable communications and authentic engagement. Neighbor-to-neighbor communications via ambassadors and task force members helps to minimize the "distrust in government" that can and does pervade. Tools that are widely employed are dynamic, visual, local, interactive, and up-to-date.

Story mapping offers a pliable platform to achieve those aims. Considering ways to link and embed this information within partners' communications is also important; the PWSA website is encompassing but not always intuitive. Community members should have access to information through many channels. Through community feedback in the planning process (see Appendix D), the majority of respondents report that their primary sources of information about PWSA work is via bill inserts/mail or email.

Guiding Principles for Equitable Communications and Engagement

A great deal of prior work both within and beyond PWSA related to equitable and engaged communications and participation inform the SWSP and future work. The critical foundations lie in a principle of "Do No Harm" in exchanging information and partnering with community stakeholders. This fundamental principle involves beginning all efforts by acknowledging and taking time to understand that poverty, class, racism, trauma, and other social inequities are real and have ongoing effects. These experiences apply to stormwater management as much as any other community needs. It is incumbent upon PWSA and all partners in this work to therefore recognize this and consistently work to address it. This can be achieved, in part, by ensuring that opportunities for authentic participation exist and that decisions can in actuality be shaped, in part, through that participation. It extends to data-gathering and sharing, which should be as inclusive as possible. And it means that people who have been historically neglected or are most challenging to reach and involve in processes are involved throughout. These ideas are present in many of the frameworks PWSA already works within, but cannot be taken for granted.

The City of Pittsburgh's Department of City Planning undertook an extensive process through 2018-19 to collaboratively establish its Pittsburgh's Guide to Public Engagement. This process encompasses all City departments and authorities, including PWSA, and offers many valuable principles for engagement and communication. The definition of equity helps to embody the goals for any public participation process in Pittsburgh: "Everyone has access to the opportunities necessary to satisfy their essential needs, advance their well-being, and achieve their full potential."

In order to meet these goals, therefore, public engagement must be:

- Values-based, decision-oriented, and goal-driven;
- Designed to arrive at insights into the experiences of the under-served and under-represented;
- Done in partnership with the community, allowing for members to feel, hear, and to have a sense of ownership;
- Structure to ensure that participation will increase as clarity and communications improve, belief systems are respected, and accessibility is maximized; and
- Contemplated to inform, consult, involve, collaborate, and empower, representing a full spectrum of participation opportunities.

Pittsburgh created a Water Equity Learning Team and Taskforce in partnership with the U.S. Water Alliance; PWSA and a number of community stakeholders co-created recommendations aimed at achieving water equity in all aspects (a "one water" perspective) of water use, management, and quality. "An Equitable Water Future: Pittsburgh" is a roadmap for achieving these ideas. The team recommends that:

- PWSA will involve communities from the earliest stages of planning and developing stormwater projects, and other agencies should too. A collaborative approach that incorporates feedback from a variety of stakeholders is critical to producing equitable outcomes;
- PWSA improve transparency and cultivate an engaged, educated customer base; and
- PWSA community engagement activities will seek to empower customers with information regarding services and PWSA's structure, policies, and regulatory obligations.

Those Pittsburgh-specific recommendations draw heavily from the U.S. Water Alliance's water equity national briefing paper. There, a number of do-no-harm principles help to shape how all water-related work should be approached. "Rebuilding trust is possible through education and restorative justice—stakeholders must come together, identify the harm and repercussions, and take steps to repair trust." Through their work and many partnerships across the country, One Water perspectives are also playing out. PWSA teamed with a number of partners to create the "One Water: Pittsburgh's Guide to Action" resource. Here again, the guide endorses an inclusive practice: "Informed citizens play an essential role in advocating and planning for equitable water infrastructure. If we work with community organizations, professionals, and agency staff, together we can develop an integrated system that protects water, people, and public green space. We need many voices to express how green infrastructure can benefit our families and communities." It encourages ongoing, active involvement by neighbors throughout Pittsburgh in understanding and staying involved in an ongoing water system improvement process.

Another important guardrail for both the SWSP and all communications moving forward is that they embody and reflect efforts to create a just and sustainable future for Pittsburgh and the region, best articulated in the p4 Pittsburgh framework for resilience and sustainability. Adhering to this new model for growth means that work is done in a manner that is inclusive for all citizens. It also means that each of the p4 principles (people, planet, place, and performance) are intentionally considered and valued in the way communities are involved and informed.

Links for this section:
https://drive.google.com/file/d/1Wb097h8Lf454BT3baNfqj8aQy1ZSVKLU/view
http://www.uswateralliance.org/sites/uswateralliance.org/files/publications/Pittsburgh%20Equity%20Roadmap_0.pdf
http://uswateralliance.org/sites/uswateralliance.org/files/publications/uswa_waterequity_FINAL.pdf
https://www.pgh2o.com/sites/default/files/2019-11/One%20Water%20Guide.pdf
http://www.p4pittsburgh.org/

Communications and Community Engagement Case Studies

The team drew from national precedents for communications and engagement both in our work during the planning process and to make recommendations to PWSA for its future work. Below is a table summarizing outstanding examples of work drawn from across the country, as well as from within Pittsburgh. The columns represent **five key activities within the SWSP process**; rows represent **best practices and principles** drawn from the sources described in the previous section. Within each cell of the table are one or more examples and a hyperlink to the source material; an appendix to this memo (Appendix A) includes a more detailed summary of precedents drawn from these cities and references for each.

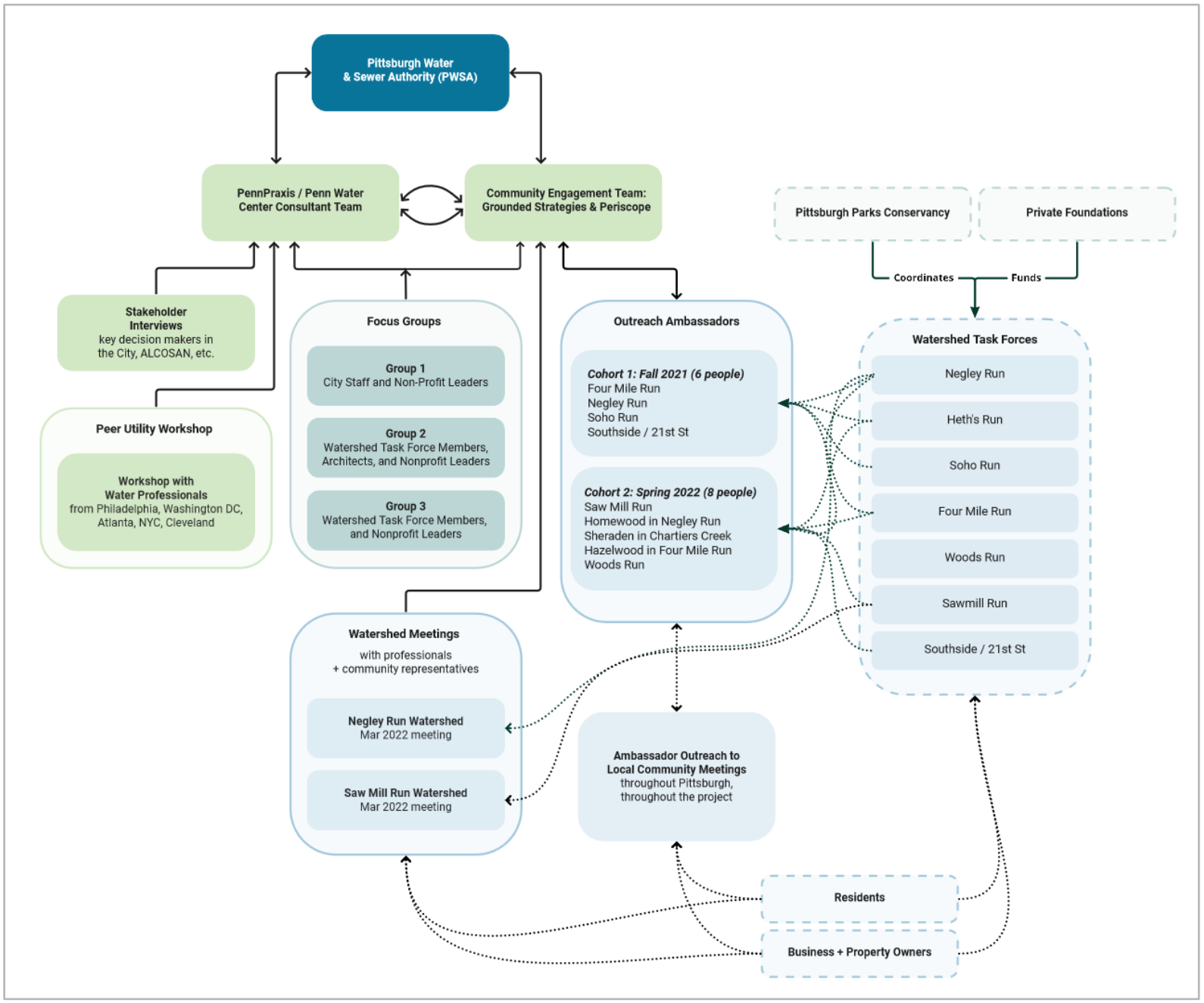
FocusPlan → ***Best Practices & Principles*** ↓	***Prioritize, define, and illustrate opportunities for catalytic investment***	***Leverage the impact of the stormwater fee***	***Guiding principles for level of service delivery and localized flooding reduction***	***Transparent, authentic public participation with awareness of impacts of other agencies and a changing climate***	***Inclusive governance structure for integrated investments***
Ensure authentic community voice in creation of plans, programs, policies, and projects	Member Community Infrastructure Program (Cleveland) SWMP/Stormwater Advisory Group (NYC) Negley Run Watershed Task Force model, and others (Pittsburgh)	Community Cost Share Program: 25% of fee for community projects (Cleveland) RiverSmart (DC)	One Water/One Vision - Watershed Improvement Plans - (Atlanta)	Cloudburst Masterplan Pilot Project (NYC)	Watershed Advisory Committees (WAC) and Watershed Team Leaders, (Cleveland) The Stormwater Controls Working Group and the inter-agency Cloudburst Task Force (NYC)
Practice civic engagement and shared leadership that reflects the communities served	Green City, Clean Waters Community Advisory Committee & Watershed partnerships (Philadelphia) Watershed Advisory Committees (Cleveland)	Community Benefits Program - Reduce Flooding Risk (Louisville, KY)	SMART Stormwater Management and Resource Training) Initiative (Camden)	Stormwater Plan (DC)	Green Infrastructure Task Force: (Atlanta) Rain Check 2.0 - (Buffalo)
Measure return on investments metrics that community stakeholders value	Bridging the Gap - (Kansas City) Green Infrastructure (Atlanta)	Minimum Control Measures MCMs (Cleveland)	Smart Sewer System and LOS/Fees (Kansas City)	Camden Collaborative Initiative (Camden)	Green City, Clean Waters Task Force- reps from 10 City agencies (Philadelphia)
Support ongoing participation through increased clarity and	Public Mtgs stormwater management implementation, (NYC)	Community Cost Share Program: 25% of fee for community projects	One Water/One Vision - Watershed Improvement Plans	Community Engagement Outreach Specialist (Philadelphia)	Watershed Team Leaders. (Cleveland)

FocusPlan → ***Best Practices & Principles*** ↓	***Prioritize, define, and illustrate opportunities for catalytic investment***	***Leverage the impact of the stormwater fee***	***Guiding principles for level of service delivery and localized flooding reduction***	***Transparent, authentic public participation with awareness of impacts of other agencies and a changing climate***	***Inclusive governance structure for integrated investments***
by maximizing accessibility		(Cleveland)	(Atlanta)	Watershed Stewardship Center, (Cleveland) Watershed Learning Network (Atlanta)	
Ensure the full spectrum of community engagement includes strategies to involve, collaborate, and empower	Green First Plan (Pittsburgh)	Fresh Coast Guardians Resource Center (Milwaukee) RiverSmart (DC) Soak It Up Adoption "Adopt a Feature" grant program and Rain Check program (Philadelphia)	Environmental Impact Bond - (Atlanta) Environmental Impact Bond - (DC)	Green Infrastructure Work / Action Plan (Atlanta) Fairmount Water Works Interpretive Center (Philadelphia)	Watershed Champions Program / Future Water Champions Program (Cleveland) Proctor Creek (Atlanta)

Community Engagement and Communications Structure

During the SWSP process, the team was intentional in ensuring that community stakeholders played an active and ongoing role in the process. The structure employed is illustrated below (Figure 1).

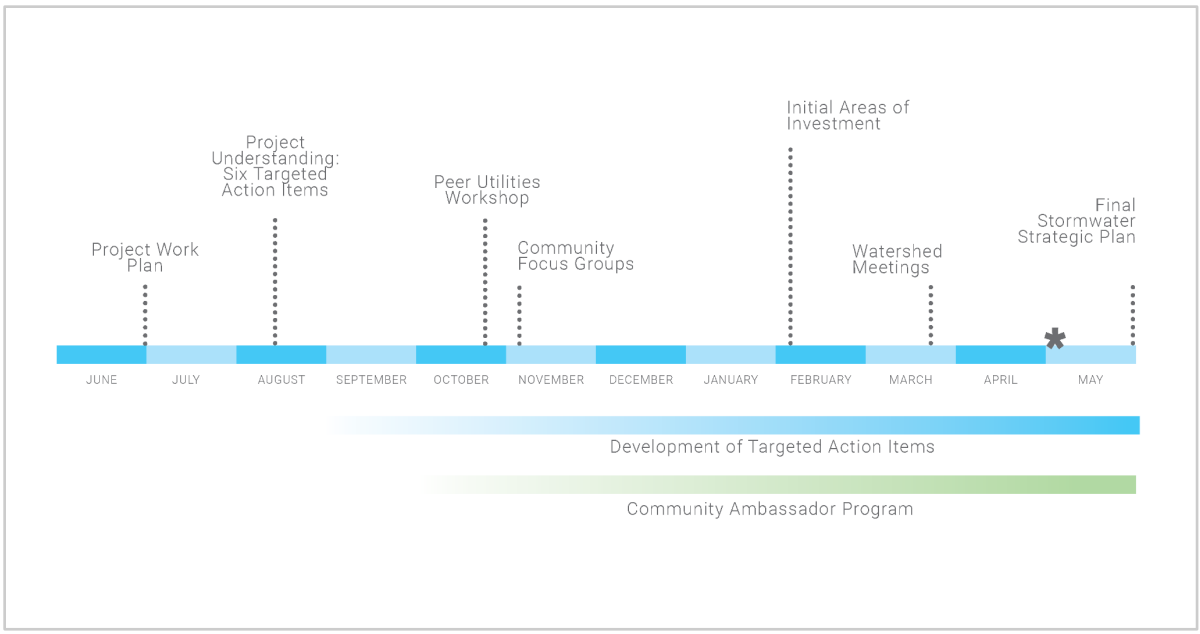
Figure 1: Community & Stakeholder Engagement in Stormwater Strategic Plan Process



Engagement Opportunities During the Stormwater Strategic Plan Development

Figure 2: Stormwater Strategic Plan community input

The team strived to optimize the principles of equitable communications and engagement in structuring opportunities for information sharing and gathering input for the plan itself. More detailed information about the existing Watershed Task Forces can be found in Appendix C.



More detailed information about the Stormwater Plan Ambassadors can be found in Appendix D. Early in the planning timeline (Figure 2), the team sought input from key stakeholders (ex. City departments, ALCOSAN) through interviews; from peer utility representatives through a focused joint meeting (Philadelphia, Washington D.C., Atlanta, New York City, and Cleveland); and in three focus group sessions (conducted in October and November 2021) including non-profit, business, public sector, and community representation). These sessions helped to shape the six priority actions for the plan, as well as to add depth and clarity to the approaches the team would take to satisfy activities within those priorities. In all cases, stakeholders emphasized the importance of community involvement.

In November 2021, Grounded Strategies together with nonprofit partners Pittsburgh Parks Conservancy and Pittsburgh United recruited six Stormwater Plan Ambassadors (Cohort 1) from areas that had long been known to have chronic stormwater management challenges, and that generally aligned with existing Watershed Task Forces. These Ambassadors were charged with focusing their efforts around communications needs. An additional eight Stormwater Plan Ambassadors (Cohort 2) were recruited from areas that aligned with the additional priority investment areas identified through SWSP analysis (summarized in the Task 3 deliverables). These Ambassadors were charged with continuing broad public information sharing and input gathering as well as focusing on more site-specific input and feedback related to catalytic and highest priority stormwater management investment areas. Throughout, existing Watershed

Task Force members were engaged and offered additional breadth and reach to communication and engagement activities.

Links for this section:

https://gtechcloud.egnyte.com/fl/304adArcAU

Messaging Recommendations

As emphasized throughout the task memo, good communications and engagement relies on an equity-driven, sustainable structure that centers and responds to the needs of community stakeholders. *What* is said is often less important than *how* it's said, and clear and consistent information flows are not uni-directional (i.e. from PWSA to stakeholders), but indeed multi-directional and dynamic.

There are several fundamental **information challenges** inherent to the actions recommended in the SWSP and to PWSA's stormwater management work into the future. These include:

1) Problems experienced throughout Pittsburgh resulting from stormwater management issues are complex, persistent, and affected by factors within and beyond PWSA's control.
2) Improving the quality of stormwater management services is best approached through ongoing collaboration and leveraging resources, and cannot be solved by a stormwater fee alone.
3) Historic, current, and future stormwater management issues affect different people and places throughout Pittsburgh differently, and strategies to address those issues are not one-size-fits-all.
4) The stormwater management system functions through shared management of existing and future infrastructure; the public expects PWSA and other agencies and City departments to coordinate well on operations, maintenance, and communications.
5) Climate change will create new challenges over time.

The SWSP prioritizes certain areas for stormwater management investment over others, but deploys approaches for improvements across the system (Task Memo 2). Communicating about this means being straightforward about the approach, in an effort to help stakeholders understand that strategies:

- Focus where there is a convergence of multiple challenges and the best opportunities for co-benefits.
- Create the biggest return on investment where activities are sustainable and equitable.
- Significantly reduce the biggest burdens to the system of stormwater management and help improve the system as a whole.
- Rely on individual ratepayers of all types joining the effort to manage stormwater.

When considering how the recommended community engagement structure helps to support and reinforce these messages, we see the following:

- A joint task force/shared governance model underlines that stormwater challenges are not the responsibility of one agency (PWSA) alone, but a shared, citywide challenge among all sectors. Ensuring that this citywide task force connects well with the local planning units, via watershed task forces and community ambassadors, is important– and that this governance structure improves operations, maintenance, and communications– not only project development.

    - EXAMPLE: The Washington D.C. Mayor's Flooding Task Force was convened by the District of Columbia mayor to address combined sewer overflow flooding, and was co-chaired by the DC Water General Manager and the City Administrator, and included representatives government agencies, environmental partners, and community organizations. The group used a consensus approach to provide recommendations to the mayor on plans to reduce flooding in the short, medium and long term on an ambitious and public timetable. While the structure and public nature of the task force, combined with clear milestones, helped to ensure that implementation was achieved, one of the weaknesses of the DC task force, as discussed in the SWSP Peer Utilities Focus Group (October 2021), was that a great deal of challenging work happened before and after public meetings. This task force also disbanded after the second phase of implementation. Starting with the approaches modeled in D.C., Philadelphia, and New York– which all created some form of this type of joint task force for governance– and linking those to community-focused efforts (akin to the NEORSD/Cleveland Watershed Advisory Committees) will extend this model into equitable community engagement, and will ensure that PWSA fulfills the vision advanced in Pittsburgh's Water Equity Task Force.

- Using the stormwater fee as a baseline revenue stream, partners have opportunities to leverage that base source to help increase investments, co-benefits, and impacts. Catalytic site investments will help to build enthusiasm and demonstrate what collaborative, community effort and shared investments can do.
    - EXAMPLE: Kansas City, MO was the first city in the country to approach compliance for combined sewer overflow reductions through green infrastructure. In 2016, they received the Institute for Sustainable Infrastructure's Envision Award for their Middle Blue River Green Infrastructure Project in the Marlborough neighborhood of south Kansas City. This was the first Envision Award given in the United States, recognition that is awarded internationally for third-party verified civil infrastructure that meets rigorous sustainability and resilience metrics. Kansas City's approach targeted several areas where CSO overflows and related challenges were most severe, and then deployed intensive efforts to layer in many investment sources, partners, holistic community co-benefits, with ongoing community engagement and buy-in regarding prioritization throughout. The stormwater fee serves as the basis for stormwater planning and maintenance in Kansas City, but is not used for stormwater system expansion.
- Watershed-specific personnel, localized task forces, and community ambassadors work together to clarify information that is hyper-local and to engage and empower shared investments.
    - EXAMPLE: Cleveland's Watershed Advisory Committees are established in each of the Northeast Ohio Regional Sewer Districts watershed areas, composed of community representatives from throughout the watershed (see Appendix A). Additionally, the sewer district employs Watershed Team Leaders who interface

with the public and the committee in each area. Watershed-specific master plans help to guide the types of stormwater infrastructure strategies that are deployed, but each committee makes its own decisions about local projects to prioritize from year to year, using a set aside from the stormwater fee specifically for that area, while NEORSD simultaneously focuses on system-wide needs.

- These governance, communication, and community engagement structures offer a long-term, sustainable and equitable framework that is adaptive.
    - EXAMPLE: Interagency collaboration is a critical component for the implementation of NYC's Stormwater Management Plan (SWMP). NYC Dept of Environmental Protection (NYCDEP) formed The Stormwater Controls Working Group, an inter-agency team with representatives from 13 NYC agencies with obligations under the MS4 Permit to collaborate and continue implementation. This team meets frequently and remains actively involved with the negotiations of the impending permit, annual reporting, and programming. Every year since the SWMP adoption in 2016, DEP staff publish and present an Annual Progress report related to implementation, to inform the public and solicit community feedback. The DEP has also maintained a publicly accessible, interactive web-map showing all green infrastructure practices at advanced design, in construction, or constructed statuses. While this is a good example of interagency cooperation that has proven to be effective, and it also exemplifies sustainable goals, this example is also a bit top-down. New York is a well-resourced city that dwarfs Pittsburgh in size and scale, but is offered as a chance to see how inter-agency governance and cooperation is achievable.
    - EXAMPLE: The p4 resilience priorities developed in Pittsburgh offer one of the best examples of a long-term, sustainable and equitable framework that may adapt over time to shifting conditions. Aligning across departments and agencies with the p4 framework at the core will help to ensure that multiple shared goals have exponential benefits.
- Ongoing education and community empowerment helps to build a shared understanding of system performance, limitations, and needs.
    - EXAMPLE: In Philadelphia, the PWD communicates to the public what the average number of breaks per year is because the system is aging. They publicly have committed to improve by replacing a certain percentage of that infrastructure per year to reduce the number of breaks, and ensure that reliability improves over time. When a water main break does happen, they communicate that repairs are made, on average, within a certain number of hours. At the same time, PWD presents a "What Can You Do?" message to ratepayers, sharing information and incentives for the public to get involved in improving local system performance together with PWD.

Community Engagement Structure for the Long-Term

As described, long-term funding and a commitment to facilitating and supporting equitable community and stakeholder engagement will ensure that the goals and principles that PWSA has committed to in its work are more fully realized. An idealized structure, informed by both experiences through the planning process, best practices found in peer cities, and through existing partnerships is seen in Figure 3.

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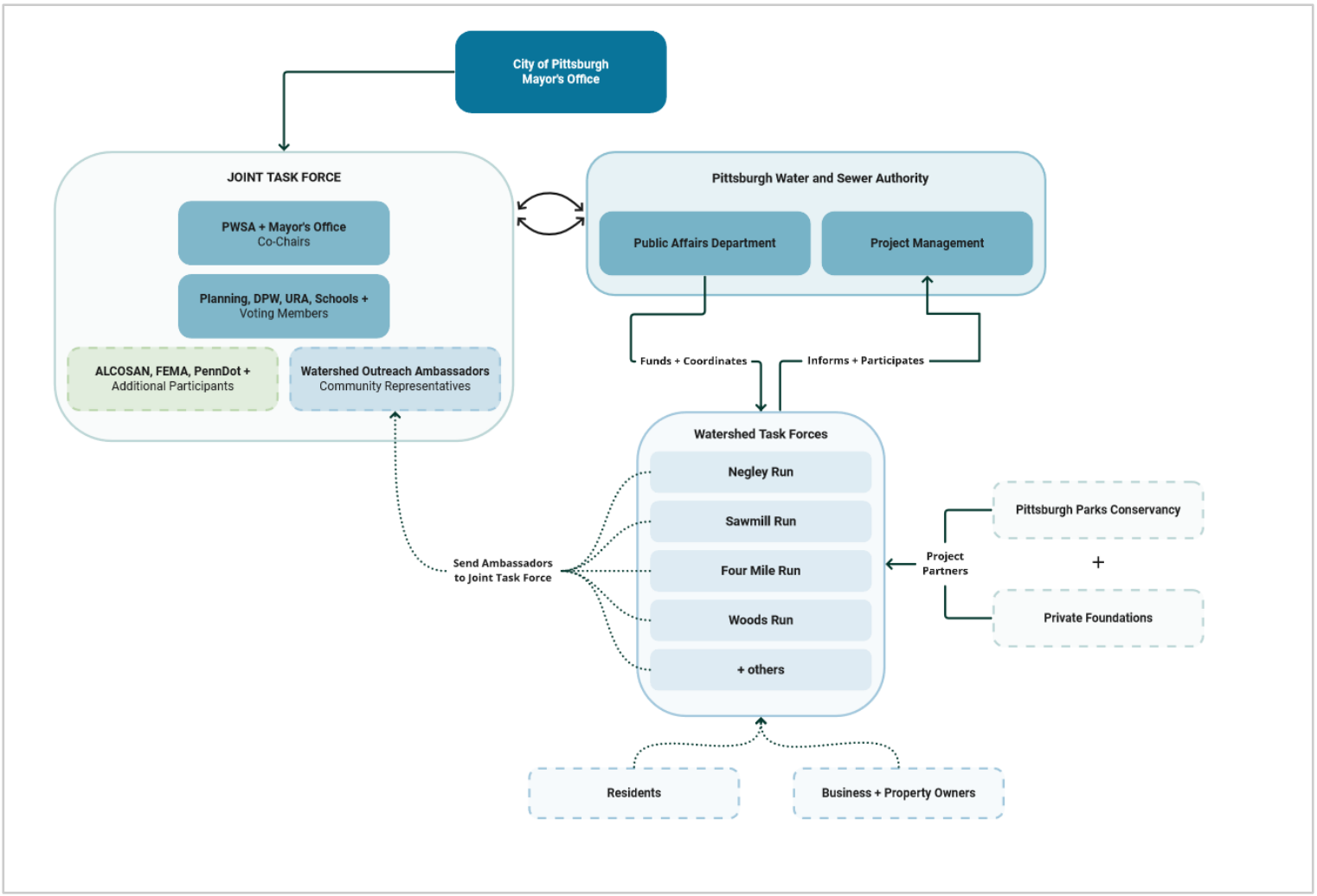


Figure 3: Recommended Ongoing Community Engagement Structure

Appendix A: Communication and Community Engagement Case Studies

This appendix offers a detailed summary of best practices found in various cities cited in the communications and community engagement case studies matrix. Examples were drawn from peer utilities who participated in SWSP focus groups, and other examples drawn from cities addressing similar challenges with a track record of success. Case studies were gathered through a combination of interviews and online research. Appendix B presents examples of effective and compelling visual communications tools employed in connecting stormwater management needs and activities with communities.

Each city is included because it has one or more good case studies illustrating how the SWSP planned focus areas have been undertaken in a manner that is consistent with one or more of the communications and engagement principles and best practices recommended. The summaries below are done by city; the plan focus and principles in action are listed, and an overall summary and a thumbnail sketch from the representative activity are provided. Links (active as of May 2022) are included for further research and to access each example.

Atlanta

Prioritize, define, and illustrate opportunities for catalytic investment
Measure return on investments metrics that community stakeholders value

Guiding principles for level of service delivery and localized flooding reduction
Support ongoing participation through increased clarity and by maximizing accessibility
Ensure the full spectrum of community engagement includes strategies to involve, collaborate, and empower

Transparent, authentic public participation with awareness of impacts of other agencies and a changing climate
Support ongoing participation through increased clarity and by maximizing accessibility

Inclusive governance structure for integrated investments
Practice civic engagement and shared leadership that reflects the communities served

Atlanta has a vibrant network of stakeholders and leaders that have prioritized stormwater management as an urgent environmental and social issue. The Green Infrastructure Task Force is a key force that convenes both public and private entities and spearheads partnerships. Over the years, Atlanta has continued to prioritize building a network of community leaders that will help establish processes for equitable decision-making— specifically, engaging and responding to community members for input on prioritization criteria of capital projects with direct community improvement impacts. In Atlanta, an Environmental Impact Bond (EIB) has provided an estimated $14 million to implement green infrastructure and resilience projects in the city's West Side watershed. The Proctor Creek case study pilot demonstrates how more co-benefits are realized when community residents and organizations take part in a project throughout its life cycle, from design to implementation to maintenance. In addition, the Watershed Learning

Network works to increase capacity for engagement, focusing on parks and green infrastructure as community assets.

One Water Vision Strategic Plan 2022; Watershed Improvement Plans; Green Infrastructure Task Force:

- The Atlanta Department of Watershed Management (DWM) convenes staff from several City departments and external partners to plan opportunities to optimize both public and private infrastructure investments by incorporating green infrastructure for stormwater management.

https://www.atlantawatershed.org/greeninfrastructure/
https://www.atlantawatershed.org/sp2022/
https://www.atlantawatershed.org/watershedimprovementplans/

Environmental Impact Bond (EIB):

- The second EIB in the U.S. (after Washington, D.C.), and the first to be offered in the public bond market, the EIB program will finance green stormwater infrastructure in an area of Atlanta that has been severely impacted by polluted stormwater runoff and flooding. This innovative financing mechanism gives DWM access to $14 million in funding for green infrastructure that will reduce stormwater runoff, increase flood storage, and enhance the quality of life of Westside neighborhoods. EIB-funded projects were derived from existing plans, citizen concerns, and Green Infrastructure Task Force partnerships, and include a mix of urban ecosystem restoration and green stormwater management practices in both the combined and separate sewer areas of upper Proctor Creek watershed. The projects aim to alleviate local flooding and improve water quality and stream health, while also providing access to greenspace, improved air quality, public environmental education, restored native habitat, and green jobs. Collectively, the projects are projected to reduce stormwater runoff by 55 million gallons annually. Construction began in 2021, and all projects aim to be completed by 2024. The Atlanta EIB issuance was supported by a grant from The Rockefeller Foundation's Innovative Financing program.

https://www.atlantawatershed.org/environmental-impact-bond/

Atlanta Watershed Learning Network (AWLN):

- Developed by Environmental Community Action Inc. (ECO-Action) and delivered in collaboration with American Rivers, West Atlanta Watershed Alliance, The Conservation Fund, Park Pride, Community Improvement Association, and the Metro Atlanta Urban Watershed Institute, AWLN increases the community capacity for engagement with parks and green infrastructure as community assets. This proven leadership development program has educated and activated dozens of residents from many locally challenged watersheds, including Intrenchment and Proctor Creeks. These AWLN graduates are now serving as watershed stewards and teachers themselves. AWLN exemplifies the values of equity, resiliency, and environmental justice in the planning and implementation of parks and green infrastructure.

https://urbanwaterslearningnetwork.org/resources/atlanta-watershed-learning-network-educating-empowering-communities-advocate-for-equity-environmental-protections-july2018/

http://wln.ecology.uga.edu/

Intrenchment Creek One Water Management Task Force:

- The Task Force compiled a synthesis of all known plans and relevant data layers accessible to the public. They prioritized community leadership and engagement in the assessment throughout every step of the planning process.
- The Task Force conducted meetings and interviews with community leaders and partners to share data collected and solicit additional information, as available. They presented the synthesis to community members and invited stakeholders who had not yet been involved. They sought community input into the solutions and criteria to select the preferred option, then shared plans for how the information will be used and what is possible in terms of next steps. They developed recommendations based on the synthesis of information and input from stakeholders.

https://www.americanrivers.org/wp-content/uploads/2020/12/20201015_IC_OneWater_TaskForce_Report.pdf

Case Study example of Proctor Creek neighborhood:

- The Proctor Creek Watershed in Atlanta is an example of a successful effort to rebuild trust, and promote environmental education and awareness with neighborhood groups in historically low-income African-American communities.
- Consent decrees from the 2000s reduced sewer spills into a historically polluted waterway, but did not regain public trust - illegal trash dumping and pollution continued.
- Outreach to the neighborhood through pre-existing community group structures rather than standard-practice, large utility town halls resulted in more community buy-in and successful land acquisition projects using Environmental Impact Bond funds.
- For many years, the West Atlanta Watershed Alliance (WAWA) has been instrumental in fighting to eliminate environmental stressors, and enhance quality of life for Northwest and Southwest portions of Atlanta. They recently formed a Proctor Creek Stewardship Council to lead efforts around stormwater stewardship, with the goal of having equal voices at decision-making tables. They work to train and educate residents on the greenway process, so they can become involved in coalitions.

http://uswateralliance.org/sites/uswateralliance.org/files/publications/1FINALuswa_equityinsights_070721_a.pdf
https://www.wawa-online.org/

Buffalo, NY

Inclusive governance structure for integrated investments
Practice civic engagement and shared leadership that reflects the communities served

Buffalo implements green stormwater infrastructure throughout the city to tackle their stormwater challenges, ensure climate resiliency, and advance social and environmental justice. The "Rain Check" program offers civic engagement and increases opportunities for partnerships with and between public entities. Buffalo will be launching a grant program in 2022 to fund green infrastructure retrofit projects on private property throughout the priority basins.

Rain Check 2.0:

- Launched in 2018, Rain Check 2.0 represents the next generation of Buffalo Sewer's green infrastructure program. This phase of the program will focus green infrastructure investments in six sewer basins. Unlike Rain Check 1.0, which focused investments in the public domain, Rain Check 2.0 will be broader—expanding public partnerships and exploring more private partnerships.The effort will involve partnering with large and small property owners, local colleges and schools, religious institutions, nonprofit agencies, housing authorities, and even residents.

https://raincheckbuffalo.org/opportunityreport/
https://raincheckbuffalo.org/grants/
http://uswateralliance.org/sites/uswateralliance.org/files/publications/uswa_equity_buffalo_040219_a.pdf

Camden

Guiding principles for level of service delivery and localized flooding reduction
Practice civic engagement and shared leadership that reflects the communities served

Transparent, authentic public participation with awareness of impacts of other agencies and a changing climate
Measure return on investments metrics that community stakeholders value

In Camden, local stakeholders work to improve water systems by prioritizing the installation of green infrastructure to address a plethora of environmental concerns. Camden has a strong public-private partnership effort that continues to grow, with ongoing collaboration between government entities and community-based organizations and groups. The Camden Collaborative Initiative Water Working Group helps to develop strategies, and prioritize transparency and keeping the public informed. The public is encouraged to participate in development from start to finish. Education and outreach campaigns help city residents understand the problems and to co-design solutions to a challenged infrastructure system. Advocates work toward policy change and offer training programs related to green infrastructure. Camden SMART has successfully installed more than fifty green infrastructure projects throughout Camden's neighborhoods, including schoolyard rain gardens, public parks, and environmental remediation projects.

Camden Collaborative Initiative:

- This solutions-oriented partnership exists between governmental, non-profit, private, and community-based agencies, and was formed to plan and implement innovative strategies to improve the environment, health, and quality of life for residents.
- Within the initiative, there is a Water Working Group, formed to support sustainable management of Camden's water resources and water infrastructure, including stormwater, drinking water, and access to surrounding waterways, facilitate stormwater management, facilitate the construction of green and gray infrastructures, extend the focus to drinking water safety, and reinforce the sustainability ordinance.

http://www.camdencollaborative.com/uploads/6/2/8/5/6285355/2022_cci_work_plan_water_final.pdf
http://www.camdencollaborative.com/
http://uswateralliance.org/sites/uswateralliance.org/files/Water%20Equity%20Roadmap_Camden_Final%20pdf.pdf

SMART Camden:

- Camden SMART (Stormwater Management and Resource Training) Initiative is a community-driven movement to protect human health, improve conditions for economic development, improve water quality, and enhance the quality of life for Camden City, its residents, and the Delaware River watershed through the broad use of green and gray infrastructure techniques for stormwater management. It has developed a citywide network of green infrastructure projects to reduce runoff and remediate environmental justice communities.

http://www.camdensmart.com/about-us.html

Cleveland

Prioritize, define, and illustrate opportunities for catalytic investment
Leverage the impact of the stormwater fee
Measure return on investments metrics that community stakeholders value
Practice civic engagement and shared leadership that reflects the communities served

Inclusive governance structure for integrated investments
Ensure authentic community voice in creation of plans, programs, policies, and projects
Ensure the full spectrum of community engagement includes strategies to involve, collaborate, and empower

Cleveland (within the Northeast Ohio Regional Sewer District, "NEORSD") has a vigorous regional network of watershed stakeholders that invest in water resources and infrastructure. NEORSD has a priority to focus on equitable and inclusive water management and utilizes strong community engagement in defining the city's water future. The district utilizes a Cost Share Program where 25% of the stormwater utility fee goes directly back to local communities- a way to ensure that local groups have control to improve their contributions, and reductions, to the larger system. In an interview with Keith McClintock, Manager of Watershed Programs at NEORSD, he cited that Watershed Task Forces and the staff that serve as stormwater point people within each watershed as the backbone of the successful water work. Advisory committees can help identify project prioritization from existing watershed Master Plans while ensuring that communities are fully educated, aware, and involved with the process from start to finish. This type of stakeholder network has helped to ensure broader public support. People who are actively engaged with the decision-making process are less likely to challenge the project, and can provide knowledge that is beneficial to the development, implementation and enforcement of the program.

Cleveland Metroparks created a Watershed Stewardship Center that provides that education and research, in close partnership with NEORSD. Peter Frank, a naturalist from the center, cites that awareness and outreach efforts have been key components of successful community building around stormwater management plans long term. For example, a very popular native plant sale event also doubles as a way to directly recruit and engage community members who want to be involved with a larger network. Cleveland is looking forward to expanding their "Watershed Ambassador" program to become a "Water Champions" program. This new

program will build a network of advocates with a greater capacity to be in touch with vulnerable communities around all water investments, and water management issues.

Community Cost Share Program

- The Community Cost Share Program provides funding to Member Communities for community-specific stormwater management projects. To implement the Community Cost Share Program, NEORSD has formed a set aside account for the aggregation and dissemination of funds derived from the Stormwater Fee collected in each member community.
- 25% of the total annual Stormwater Fee collected in each member community is allocated to the Community Cost Share Account for that community. The Community Cost Share Account is under the control of the District, with disbursement of funds to member communities through a grant application and reimbursement process.

https://www.neorsd.org/community/community-cost-share-program/

Member Community Infrastructure Program

- NEORSD offers a Member Community Infrastructure Program (MCIP) to assist member communities in addressing water quality and quantity issues associated with sewer infrastructure that adversely impact human health and the environment through cost-effective sewer infrastructure projects.
- The District provides funding for up to 75% of project costs. The MCIP funds will be provided by the District on a reimbursement basis directly to the community based on MCIP project costs. The District has an application process, and reviews and pre-approves design and/or construction of the project. The District then determines the appropriate funding mechanism, grant, or community operating lease, during project evaluation.

https://www.neorsd.org/community/member-community-infrastructure-program-mcip/

Minimum Control Measures:

- Municipal Separate Storm Sewer Systems (MS4) permittees, such as Cleveland, must develop, implement, and enforce a Stormwater Management Program (SWMP) designed to reduce the discharge of pollutants to the maximum extent practicable to protect water quality and to satisfy the appropriate water quality requirements of the Clean Water Act.
- Cleveland's SWMP explains how the program is run, describes best management practices (BMPs) and measurable goals that are used to address the Six Minimum Control Measures (MCMs) in the permit.
- One of the MCMs is a commitment to Public Education & Outreach through the Public Involvement/Public Education (PIPE) Program. This outreach program informs and educates residents on the impacts of stormwater discharge. The PIPE program operates on the premise that awareness is key to helping the public understand how behavioral changes can help reduce pollutants in urban runoff by practicing stormwater management best practices and other water-pollution-prevention practices. PIPE

functions on the premise that behaviors can be changed through education, and that "awareness is key."
- Another MCM, Public Participation and Involvement, has a strong focus on community engagement and a commitment to having the public participate in cleanup efforts in a meaningful way. These events help the public entity connect and interact with residents on-the-ground.

https://www.clevelandwpc.com/stormwater-management

Watershed Advisory Committees:

- Watershed Advisory Committees (WACs) give leadership, direction, and focused capacity to move stormwater work forward in the region. Engaged steering committees help to activate networks within each watershed.
- This model demonstrates strong and successful public/private partnerships within each watershed. Agreements are made between NEORSD and a range of community-based nonprofit groups, each which then are eligible for a range of grant opportunities described above. This partnership results in implementation of a shared vision that activates many interested parties.
- The WACs represent a formal mechanism for regular contact between member communities and the District. WACs are not, however, intended to be the only mechanism of communication between Member Communities and the District. District staff, specifically Watershed Team Leaders, are available to member communities at any time to discuss issues related to the Regional Stormwater Management Program.

https://www.clevelandwpc.com/stormwater-management
https://www.neorsd.org/I_Library.php?SOURCE=library/RR%20WAC%20March%202020%20MASTER.pdf&a=download_file&LIBRARY_RECORD_ID=7548

Watershed Champion Program and Water Champions:

- The Cuyahoga Watershed Champion Program is an example of a community engagement campaign to educate residents on their local watersheds, and then move them to action on what they can do in their own backyards. This campaign requires residents to complete a pledge to complete a stormwater management project on their property or on a local waterway
- Water Champions are community members who conduct outreach and education in vulnerable communities. They share information on water investments and programs and listen to community perspectives on water management decisions. Water Champions receive training in water systems and utility programs so they can help the community understand water systems and answer residents' questions about utility bills, water quality, cost savings programs, and more.
- The champions undergo equal training in advocacy and consensus-building so they can voice community concerns back to the utilities. This enables them to enhance the utilities' understanding of community needs. The program is designed so that water champions co-create additional programming with NEORSD to deepen community engagement.

- Public Engagement: To build water equity, it is essential to expand public awareness and engagement while deepening the understanding of community concerns. Building community capacity to engage with water management is critical. Residents of vulnerable communities have deep local knowledge and experience, incorporating their perspectives can lead to better, more sustainable processes and outcomes. Public engagement done right strengthens existing partnerships and creates new ones, among trusted community organizations, utilities, philanthropy, and other stakeholders.

https://cuyahogaswcd.org/programs/watershed-champion-program
https://www.clewaterequity.com/water-champions
https://www.google.com/url?q=http://uswateralliance.org/sites/uswateralliance.org/files/publications/1FINALuswa_equityinsights_070721_a.pdf&sa=D&source=docs&ust=1651251039373205&usg=AOvVaw1CYJlcphwBsza8E-246rjB

Watershed Stewardship Center:

- Watershed Stewardship Center, located in the West Creek Reservation, is the first facility in Cleveland Metroparks dedicated to scientific research and promoting sustainable action. Science-based programs invite teachers, students, professionals and the public to learn about replicable stormwater management methods. The center is staffed by natural resource and education professionals, land protection specialists, volunteers, and visiting scientists.
- The Watershed Stewardship Center's mission of enhancing and protecting our urban watersheds is pursued through innovative community programming, encouraging regional participation in watershed issues, and promoting scientific discovery. Its key partners include the NEORSD and West Creek Conservancy.

https://www.clevelandmetroparks.com/parks/visit/parks/west-creek-reservation/watershed-stewardship-center

Kansas City, MO

Prioritize, define, and illustrate opportunities for catalytic investment
Guiding principles for level of service delivery and localized flooding reduction
Measure return on investments metrics that community stakeholders value

Kansas City is a national leader in stormwater management. The city has innovatively combined green infrastructure to soak up excess rainfall with digital technology to monitor its flow. Their Smart Sewer System monitors water depth and flow sensors, conveying real-time data from underground infrastructure and allowing the city to better measure and understand stormwater movement. Kansas City has a vision to turn passive stormwater infrastructure into active ones that can be managed in real time to alleviate flooding. Thus far, this data-driven strategy has proven to be successful. Kansas City's green infrastructure projects have brought the community together to care for new green spaces. The city established a workforce development program for green infrastructure maintenance, providing work opportunities for people from under-resourced communities. Under this program, community members receive certificates in green infrastructure maintenance after one year on the job. The "Smart Sewer" program promotes, maintains, and evaluates the utilization of green infrastructure solutions to support this green-collar jobs program.

Smart Sewer System:

- The Kansas City Department of Water's (KC Water) Smart Sewer program is a multi-decade infrastructure investment to make sure sewer systems continue to work reliably and effectively. The program addresses the system-wide overflow control challenges facing the sewer system in a way that protects the community and restores sewer and stormwater infrastructure.
- The program is committed to capturing 85% of the combined sewer flows and eliminating wet weather separate sewer overflows for up to a 2-year, 24-hour storm event for the sanitary sewer system north of the Missouri River and up to a 5-year, 24 hour storm event for the sanitary sewer system south of the Missouri River. Over the past 10 years through fiscal year 2021, 40 projects were completed on time and on budget, and in the current fiscal year 2022, KC Water is implementing 51 projects to comply with their federal consent decree.
- Stormwater Credits: Many communities give stormwater fee credits to households that demonstrate efforts to reduce stormwater runoff by using best management practices because they reduce stress on the stormwater system. Kansas City Water Services offers two types of stormwater fee credits for property owners that use best management practices on their property. The first is a ratio credit for properties that have a large pervious area to help absorb stormwater and prevent it from entering storm drains. Property owners can receive a credit if the ratio of the total property area to the runoff surface area is at least 30:1. Properties that qualify are granted a 50 percent stormwater fee credit. The second type of stormwater fee credit is a detention credit for the installation of stormwater detention structures on the property. Stormwater detention structures are installed and maintained to hold stormwater during the heaviest parts of a storm, thereby reducing flooding and erosion downstream. With these two stormwater credit options, ratepayers get clear signals about how they are receiving a return on their property investments, and in turn, the overall level of service by KC Water improves system-wide.

https://www.kcsmartsewer.us/home-smartsewer
https://www.kcsmartsewer.us/projects
https://kcws.maps.arcgis.com/apps/Cascade/index.html?appid=8be27e83d420431e9679ca283f249655&folderid=33103bf3deef48bd899be072950d9a32

Bridging the Gap:

- Bridging The Gap (BTG) works to make the Kansas City region sustainable by "connecting environment, economy and community," and is the premier organization in the area providing environmental education and volunteer action through more than 1,800 volunteers annually.
- The Green Stewards program is a local workforce development program designed to support the City of Kansas City, Missouri in day-to-day maintenance and monitoring of 230 constructed green infrastructure installations in the areas of the city served by the combined sewer system. Bridging The Gap is contracted to manage the program, and works with area nonprofits to develop a pool of skilled maintenance workers to hire from at-risk communities in Kansas City. In addition to providing maintenance for designated green stormwater infrastructure sites, the program focuses on the development of the

Stewards' skills in green infrastructure and landscape maintenance to develop qualifications for long-term employment in those fields. The Stewards are provided a supportive and collegial working atmosphere with diverse training opportunities.

https://bridgingthegap.org/green-infrastructure-management/
https://www.kcwater.us/wp-content/uploads/2019/01/KCMO-Resident-Stormwater-Booklet.pdf

Milwaukee

Leverage the impact of the stormwater fee
Ensure the full spectrum of community engagement includes strategies to involve, collaborate, and empower

The Milwaukee Metropolitan Sewer District has set ambitious goals to model sustainable and resilient practices in its operations and throughout its footprint. One mechanism they've established to help the impact of their stormwater fee go farther through empowering residents to do more is the creation of a center to offer free technical assistance.

Fresh Coast Guardians Resource Center:

- The Milwaukee Fresh Coast Guardians Resource Center has a professional staff focused on providing residents with the tools and resources to manage stormwater effectively. The center provides up-to-date information about grants and other financial support available, helps to do basic designs and cost estimates for green stormwater installations for property owners, helps to identify native plants, shrubs, and trees and offer tips for planting and care, and provides green infrastructure training and certification opportunities to increase workforce development in the area.

https://www.google.com/url?q=https://www.freshcoastguardians.com/resources/services&sa=D&source=docs&ust=1651596639204854&usg=AOvVaw2zoees1h_FpSFze1Y6F1Je
https://www.freshcoastguardians.com/about-us/freshcoast-guardians-goal

New York City

Prioritize, define, and illustrate opportunities for catalytic investment
Ensure authentic community voice in creation of plans, programs, policies, and projects
Support ongoing participation through increased clarity and by maximizing accessibility

Transparent, authentic public participation with awareness of impacts of other agencies and a changing climate
Ensure authentic community voice in creation of plans, programs, policies, and projects

While NYC is quite different in terms of scale and resources, the city nonetheless presents good models for governance, communication, and engagement structures that are sustainable over the long-term, especially where a multitude of agencies need to coordinate shared responsibility for stormwater management efforts. NYC's highly-structured approach to public engagement creates a predictable rhythm and expectations around soliciting and incorporating community

input, and a vast array of web-based materials targeted at a variety of audiences help to keep a diverse public up-to-date and informed about the latest projects and initiatives.

2018 Stormwater Master Plan (updated in 2021) + the Stormwater Advisory Group:

- City formed a Stormwater Advisory Group (SAG) in 2016, who held meetings that were open to the public, to provide substantive feedback throughout the drafting of the SWMP Plan. SAG members were key stakeholders identified by their past participation in other water quality programs, and included representatives of neighborhood associations and community organizations, environmental advocates, as well as the design, construction, and development community, among others. At each SAG meeting, the City provided a general update on the legal authority development, stakeholder engagement as pertained to the individual permit provisions, and an in-depth look into the development of specific programs for the SWMP. These focused meetings created a space for participants to "dive deep" into the latest planning and analysis.
- City also conducted targeted outreach during SWMP development to stakeholder groups—meeting frequently met with the Stormwater Infrastructure Matters (SWIM) Coalition to receive detailed feedback from environmental advocates
- Every year since the SWMP process began, and as projects are implemented, NYCDEP issues an Annual Progress Report which includes a summary of all public comments received, their responses, and a description of any changes the City will incorporate because of public input.
- Ongoing engagement also includes waterbody-specific planning workshops and presentations—in 2020 NYCDEP held 6 public meetings total related to stormwater management implementation.

https://www1.nyc.gov/assets/dep/downloads/pdf/water/stormwater/green-infrastructure/gi-annual-report-2021.pdf
https://www1.nyc.gov/assets/dep/downloads/pdf/water/stormwater/ms4/nyc-swmp-plan-full.pdf

The Stormwater Controls Working Group:

- Interagency collaboration is a critical component for the implementation of NYC's Stormwater Management Plan (SWMP). NYC Dept of Environmental Protection (NYCDEP) formed The Stormwater Controls Working Group, an inter-agency team with representatives from 13 NYC agencies with obligations under the MS4 Permit to collaborate and continue implementation. This team meets frequently –every other month– and remains actively involved with the negotiations of the impending permit, annual reporting, and programming. The group compares 10-year plans for capital projects to identify places where stormwater project components may be added.

Public Education and Outreach Program:

- During the SWMP development, public input suggested that the City focus education efforts on schools and teachers located in the MS4 area; use social media platforms to raise awareness of MS4 issues; and incorporate more graphics in presentations and education materials. NYCDEP now provides extensive educational resources to schools and teachers interested in teaching about stormwater and stewardship in the form of

ArcGIS storymaps on NYC H20 HUB. (Note the survey visitors to collect info on how these resources are being used).

- In addition to presenting information about MS4 and SWMP development at multiple conferences, teacher professional development, and interagency meetings, program staff also facilitate community group involvement in waterbody-specific planning workshops, as well as attend various programs and community events with residents and neighborhoods timed with the widespread GI construction activity in those areas.These regular activities add up to an average of 36 public-engagement touchpoints each year.
- Brochures and door hangers are typically distributed during design and construction for area-wide GI contracts and contain DEP's green infrastructure "hotline" phone number and an outreach email address monitored regularly by a communications staff person.
- The DEP also maintains a publicly accessible, interactive web-map showing all green infrastructure practices at advanced design, in construction, or constructed statuses.

https://www.nych2ohub.org/
https://www.surveymonkey.com/r/FCP6XWY
https://www.arcgis.com/home/webmap/viewer.html?webmap=a3763a30d4ae459199dd01d4521d9939&extent=-74.3899,40.497,-73.3757,40.9523

Cloudburst Neighborhoods Approach:

- Green infrastructure has been rebranded in NYC— "Cloudburst Neighborhoods" is the new approach
- NYC Dept of Environmental Protection (NYCDEP)'s 2017 Cloudburst Resiliency Planning Study adapted an approach developed in Copenhagen to managing extreme rain events, or "cloudbursts," using streets and open space. See Cloudburst Resiliency Study—this study emphasizes creating increased livability, integrating cultural + social + physical, and using an iterative process to build improvements, and connecting many small projects into larger networks.
- To identify initial cloudburst neighborhoods and carry out a multi-year approach to cloudburst neighborhood planning, the City formed an inter-agency Cloudburst Task Force. The task force is led by NYCDEP and the Mayor's Office of Climate Resiliency, and includes the NYC Departments of City Planning, Parks and Recreation, Emergency Management, Design and Construction, Transportation, and the New York City Housing Authority, among others.
- For the 2017 Cloudburst Resiliency Planning Study, the process was designed around three stages of analysis connected via three workshops with stakeholders.Stakeholders identified two pilot projects on NYC Housing Authority property in Southeast Queens as part of the study to measure risks, prioritize responses, develop neighborhood-based solutions, and assess costs and benefits for managing large volumes of stormwater using this approach. The team engaged the residents through several workshops to solicit input and better understand what the property could look like after design intervention.

- In 2022 the City will conduct further cloudburst feasibility studies at different sites considering physical vulnerability, social and economic factors, and below-ground conditions, and will also seek public input on future projects through a community board consultation process.

https://www.arcgis.com/home/webmap/viewer.html?webmap=a3763a30d4ae459199dd01d4521d9939&extent=-74.3899,40.497,-73.3757,40.9523

Philadelphia

Prioritize, define, and illustrate opportunities for catalytic investment
Practice civic engagement and shared leadership that reflects the communities served
Transparent, authentic public participation with awareness of impacts of other agencies and a changing climate
Support ongoing participation through increased clarity and by maximizing accessibility
Ensure the full spectrum of community engagement includes strategies to involve, collaborate, and empower

The Philadelphia Water Department is a recognized pioneer of integrating innovative stormwater solutions in order to meet their obligations to improve water quality. The department's commitment to public engagement and community involvement may be an underappreciated piece of their successes over the past years. Through interviews with former head of Public Affairs, Joanne Dahme, and Howard Neukrug, former PWD (now with Penn Water Center and part of the SWSP consulting team, who also offered input via the Peer Utilities focus group), this plan's recommendations were informed by examples of what worked in the Philadelphia context, where many challenges are similar to Pittsburgh's — and resources are likewise limited.

The Philadelphia Water Department made a commitment to "continual engagement" years ago, with the "mission to help people understand what they are paying for." In the 1980's the water-emergency call center (which creates work tickets) was subsumed under Public Affairs, which has an annual budget of approximately $5 million and 100 employees, with approximately 30% dedicated to communications and engagement. According to Dahme, it's valuable to have the emergency call center under the Public Affairs division as they act like the canary in the coal mine or the voice of the customer, reporting back to the Water Department on emerging and common issues. Today, there are approximately 30 staff dedicated to communications and engagement in Public Affairs, including in-house graphic designers and web developers.

Green City, Clean Waters Plan: Community/Stakeholder Engagement Structure

- The **Community Engagement Outreach Specialist program** (previously "Water Outreach Ambassadors") began with Green City, Clean Waters (the plan approved by the Pennsylvania Department of Environmental Protection (PADEP) and the EPA in 2011-12). PWD recognized that installing GSI projects would mean disrupting community spaces and parks, so they would need to have a stronger presence in communities to make people aware of upcoming projects – the goal was "to have communities value the projects and see them as their own."

  - Role of Outreach Specialists in four districts: An outreach specialist is assigned to each of the four districts PWD determined based on combined sewer overflow areas. Through regular community engagement, the outreach specialists strive to make authentic relationships with as many residents while explaining how, why, where, and when new green tools will be installed in their neighborhood. Essential duties include: *study targeted communities and research resources that help build capacity to support bringing more amenities to communities (i.e. playground equipment), which will complement the green stormwater infrastructure; propose an outreach plan (including training) for targeted communities; develop a communications campaign for identified sites; develop toolkit with resources for community leaders; implement outreach plan and communications campaign; hold a celebratory event and strengthen partnerships with communities.*
- **Standing Community Advisory Committees** are places where representatives of both low-income customers and environmental groups come together. These groups are consulted before any rate increases or changes are implemented. PWD has found that having these groups meet together helps set expectations around the desired level-of-service versus the need to balance affordability for customers ("we'd love to do more, but we also have to make sure we remain affordable for customers").
- PWD recognized that improving inter-agency coordination is critical to GCCW's successes. In 2017, the **Clean Waters Taskforce** was formed, representing leadership from more than 10 city agencies, working toward establishing meaningful, cross agency collaborations to implement GSI. In the first years, the Task Force has focused on more basic pollution prevention practices. However, current efforts are underway for all city department heads, through this task force, to develop and formalize numeric targets and implementation plans to install and maintain GSI on their respective departmental properties, as well as establish guidelines and metrics that city agencies should follow to implement the city's green-first approach to stormwater management.

https://water.phila.gov/green-city/
https://water.phila.gov/community-resources/
https://www.pennfuture.org/Files/Admin/Common-Agenda/GreenStormwaterAgenda2.pdf

Partnership Programs

- Active relationships with non-governmental organizations and coalitions like Philadelphia Water Department's **Watershed partnerships** (such as with the Tookany/Tacony-Frankford Watershed Partnership) serve as a vehicle for stakeholders to participate through public outreach initiatives, watershed assessments, and watershed management plans.
- Partnerships with public parties outside of city government, such as the Philadelphia School District, Philadelphia Housing Authority, public transit, PennDOT and local universities have yielded additional stormwater management opportunities. For example, the **Fairmount Water Works Interpretive Center** hosts a collaboration with the School District of Philadelphia to present the Understanding the Urban Watershed curriculum to educate school students on urban water topics.

https://ttfwatershed.org/

https://fairmountwaterworks.org/
https://www.resourcewater.org/

Stewardship Programs

- The **Soak It Up** Adoption "Adopt-a-Feature" grant program has encouraged community groups to adopt rain features, to provide for maintenance, take photos, and make sure these features continue to thrive. These projects include installing physical signage that draws attention to the project's multiple benefits.
- Stewardship programs also include **Rain Check**, designed to encourage homeowners to install landscape improvements that manage stormwater as a partnership with Pennsylvania Horticultural Society (PHS).

https://water.phila.gov/adoption/
https://www.flickr.com/photos/philadelphiawater/albums/72157654299547526
https://www.pwdraincheck.org/en/

Pittsburgh

Prioritize, define, and illustrate opportunities for catalytic investment

Ensure authentic community voice in creation of plans, programs, policies, and projects
Ensure the full spectrum of community engagement includes strategies to involve, collaborate, and empower

Pittsburgh has spent years laying the groundwork, and can continue to prioritize, define, and illustrate opportunities for catalytic investments. The city has a wide network of active community collaborations that have grown over time. These networks have proven effective in bringing projects to fruition. Pittsburgh has a history of focusing on priority sites and then expanding on the initial investment. The "PWSA City-Wide Green Infrastructure Assessment" (2016- "Green-First Plan) is an excellent example of a city-wide effort to craft solutions designed to manage stormwater. It recommends the use of green stormwater solutions in several priority sewersheds and envisions a network of stormwater systems that will help to capture, reduce, and slow down the flow of water into the sewer system, and improve water quality. Strengths of the plan include its focus around identifying major sources of combined sewer overflows, considering intersections between those areas and other types of investment activities in Pittsburgh, and relying on an adaptive approach that puts green-stormwater infrastructure strategies first. The Green-First Plan is one of the primary plans that underpins the current SWSP; its context and inputs have, of course, been broadened to include other considerations. Plan implementation that also draws from the best practices and principles for community engagement is best illustrated within the context of the Negley Run Watershed Task Force (NRWTF) is a model of a successful interdisciplinary group consisting of public and private stakeholders. The group was formed to steward projects, and to ensure that the community was involved in a truly collaborative way. Advocates and stakeholders have proven to be empowered through this process. Indeed, the NRWTF serves as the model for ongoing community collaboration (see Appendix C), and stands shoulder to shoulder with other national models of engagement in the context of successful stormwater management strategies.

Green-First Plan:

- In 2016, the City of Pittsburgh and the Pittsburgh Water and Sewer Authority developed the Citywide Green First Plan. It outlines how Pittsburgh intends to use cost-effective green infrastructure solutions to manage stormwater. Implementing the plan will reduce local street flooding and sewer backups caused by large rainstorms, though at the time, the future of ALCOSAN's infrastructure investments were being revisited through a consent order revision. These innovative practices were considered a preferred, adaptive approach to aid Pittsburgh and the region in complying with the U.S. Environmental Protection Agency (EPA) combined sewer overflow mandates, and in improving the quality of local waterways.
- This plan outlines how Pittsburgh intends to use innovative, cost effective, and green infrastructure approaches to manage stormwater and reduce combined sewer overflows.

https://www.pgh2o.com/your-water/stormwater/stormwater-plans

Negley Run Watershed TaskForce:

- The Negley Run Watershed Task Force is an interdisciplinary collaboration to engage community, creatives, and professionals in urban ecosystem regeneration. With the City and related agencies, the Task Force will support innovative rainwater stewardship and conveyance strategies. The Task Force's approach will introduce habitat, (bio)diversity, ecological function, and stormwater stewardship into municipal, agency, and private development plans and programs that may otherwise lack a holistic systems perspective to watershed conservation and management, and CSO and flood control.

http://www.livingwaterspgh.org/landing-page/living-watersheds/negley-run-a42/negley-run-watershed-task-force/
https://upstreampgh.org/projects/negley-run-environmental-equity-study/

Washington, DC

Leverage the impact of the stormwater fee
Ensure authentic community voice in creation of plans, programs, policies, and projects
Transparent, authentic public participation with awareness of impacts of other agencies and a changing climate
Practice civic engagement and shared leadership that reflects the communities served
Guiding principles for level of service delivery and localized flooding reduction
Ensure the full spectrum of community engagement includes strategies to involve, collaborate, and empower

Washington, D.C. has proven its impact in leveraging a stormwater fee, while also ensuring community voices were front and center in the creation of plans, programs, policies, and projects. The City uses smart technologies and incentives to pay for their robust network of stormwater programs. There is a strong commitment for the public to drive priorities through civic engagement. George Hawkins (former CEO of District of Columbia Water and Sewer Authority, or "DC Water"), founder and President of Moonshot Missions cites the "Green Infrastructure Challenge" as a good introductory tactic to educate folks on the basics of stormwater management, and begin to increase visibility in the region. DC Water is also a national leader in the success of leveraging their Environmental Impact Bond. As the stormwater rate increased over the years, it helped to have clear, ongoing communications with residents. DC Water prioritizes proactive communications before, during, and after new

stormwater infrastructure projects. "Clean Rivers" was able to better engage with the community after a new, fresh branding launch. This marketing campaign (including a new look, name, website, logo, colors) increased visibility of the issue, and allowed the residents of DC to understand the stormwater work that was happening in their communities. The work thrived when staff were able to act as communications point people who were accessible, visible, and available to community members.

Stormwater Plan:

- The District is in the midst of a major strategic planning effort to address stormwater pollution from the city's Municipal Separate Storm Sewer System (MS4). The result of this planning effort, the Consolidated Total Maximum Daily Load (TMDL) Implementation Plan, will result in a performance based approach for reducing stormwater runoff volume and pollution, while still providing the District flexibility to plan and judiciously allocate limited resources. This project will utilize a combination of monitoring and modeling approaches to make the best possible estimates of pollution discharged from the District's MS4, any pollution reductions that have been achieved via programs and best management practices (BMPs) implemented in recent years, and the scale of further reductions still needed to meet Clean Water Act requirements.
- Example: The Clean Rivers program is improving the quality of the Anacostia Watershed, ultimately reducing combined stormwater and sewage discharge into rivers at times of heavy rainfall by 96% upon completion in 2030. To ensure success of the program, an array of water users in the watershed need to set higher water quality standards when discharging.

https://dcstormwaterplan.org/
https://dcstormwaterplan.org/wp-content/uploads/ExecutiveSummary_InteractivePDF.pdf
https://www.dcwater.com/cleanrivers

RiverSmart:

- RiverSmart is an example of a comprehensive program centered around stormwater fees but also encompassing grants, substantial rebates and incentives for property improvements and educational efforts.
- RiverSmart programs help to reduce stormwater runoff that harms the District's waterways and the Chesapeake Bay. The programs provide financial incentives to help District property owners install green infrastructure such as rain barrels, green roofs, rain gardens, permeable pavers, shade trees, and more. These practices allow rainwater to stay on site and soak into the ground, where natural processes help remove pollutants.
- The RiverSmart program has a wide offering of financial incentive programs to reduce stormwater runoff in the DC region. RiverSmart encourages green infrastructure projects for both small and large entities such as: private residences, nonprofits, churches, and schools. The DC Rewards program provides a discount of up to 55% off the stormwater fee, and up to 20% off DC's Clean Rivers Impervious Area Charge.

https://doee.dc.gov/riversmart

Environmental Impact Bond:

- The Environmental Impact Bond was launched in DC in 2016. In spring of 2017, DC Water announced the success of both its first green infrastructure (GI) projects in Rock Creek and the innovative Environmental Impact Bond (EIB) that financed them. Robust evaluation of project outcomes helped to establish the effectiveness of GI in the District and tracked reduced combined sewer and stormwater runoff into Rock Creek, improving the health of waterways. DC Water achieved the following objectives established at the outset of the financing opportunity:
- Ensure responsible stewardship of ratepayer funds by transferring a portion of performance risk associated with technologies that had never been implemented on a large scale in the District.
- Enhance future decision-making about how much and which types of green infrastructure to build.
- Create a model funding mechanism that other municipalities can leverage to advance the use of green infrastructure to address stormwater management in their communities.
- Establish a green jobs initiative targeting local workforce development and sustainable job creation, including training and certification opportunities for District residents.
- Improve transparency to local ratepayers by formally predicting, measuring, and publicly reporting the environmental impact of the green infrastructure.

https://dcwater.com/environmental-impact-bond
https://www.quantifiedventures.com/dc-water
https://www.epa.gov/sites/default/files/2017-04/documents/dc_waters_environmental_impact_bond_a_first_of_its_kind_final2.pdf

Appendix B: Effective Web-Based Communication Tactics

While PWSA customers and Pittsburgh residents surveyed during this planning process list bill inserts and emails as the primary sources of information they recall receiving information about stormwater services, those tools offer one-way information. Other tactics that are more engaging and dynamic include regular communications via Nextdoor, deploying the City's EngagePGH site and lists, coordinating with City Neighborhood Services representatives who attend all neighborhood meetings, using partner networks and social media channels, and creating PWSA staff lines of communication within a growing network of watershed task forces while also supporting watershed ambassadors. Additionally, these ideas for web-based tactics are recommended:

1- Good, accessible websites highlight key issues and make it easy to engage

High-quality information accessible through online platforms are key to the mission of making sure people understand what they are paying for, and how they may be involved in supporting efforts to improve water quality and infrastructure systems. Websites need to serve as a trusted source for information, and updating them with relative frequency is critical to achieving the expected level of transparency.

- ➔ *A good resource for this is:* The Water Research Foundation's Website Strategies for Water Professionals (or, What You See Is Not What Google Sees…) and the One Water: Pittsburgh's Guide to Action resource.

A great website, like any great communication tool, meets people where they are. In the context of a water and sewer authority's website that means putting the main issue (what's in the news, or the customer's largest concern) up-front when visitors navigate to the website. At different times that may mean emphasizing water quality, safe drinking water, or stormwater, depending on what is occurring in the community.

- ➔ *Good examples of this include:* DC Water's home page; Washington DC's Clean Rivers Project interactive website;

Several examples of effective websites also aim to present these issues in terms of shared responsibility and partnership, placing content related to "here's what you can do to help" in obvious or highly-emphasized positions on the webpages, making it as easy as possible for folks to figure out how to get involved. Clear, straightforward infographics help to present complex information about water issues in an easy-to-digest, accessible format.

- ➔ *Good examples of this include:* NYCDEP's page on CSO's; NYCDEP's Trash it, Don't Flush it; DC's page on CSO's; DC's Stormwater Management FAQs; Philadelphia's Community Resources Page; Buffalo's Rain Check website (excellent infographics)

Google analytics is a simple tool and an effective method for assessing how people are navigating the website — what they are clicking on most often and what pages get the most views, etc. Philadelphia's Water Department's communication team periodically does this form of assessment, and uses that data to redesign and update web content, hiring external consultants as needed while relying on internal staff to perform regular updates. Including a link to a live survey on the website may also be a good way to collect information on how web resources are being used.

- ➔ *Good examples of this include:* NYC H20 Hub Survey

2- Celebrate project success and advantage video content

Several water and sewer authority's websites offer good examples of celebrating shared success in implementing effective stormwater management efforts. This celebratory content

creates a sense of momentum that makes people want to be part of the larger project of improving water quality and infrastructure performance over the long term — which ultimately will be crucial to securing financial support. Strong video content creates an engaging medium for sharing project successes; videos grab people's attention, are more memorable than text, are easy to share, and if made right they can take lots of information and make it easy to interpret in a short amount of time. They also elicit emotional connections that make people want to share and comment (online videos get 1,200% more shares than text and images combined). Embedding videos on your web pages also drives web traffic to your site by causing those pages to rank higher in search engine results.

- ➔ *Good examples of this include:* Philadelphia's blog site ("A rolling collection of stories, tips, and news powered by the people of the Philadelphia Water Department"); Philadelphia's Soak it Up Program Adoption page; Washington DC's "Virtual Tour" of a Successful Project (PDF); Buffalo Rain Check filter-able project grid; NEORSD's Youtube Channel; Video: How green tools protect Philly's waterways

3- StoryMaps break down complex water issues and make good public education materials

Another common tool in use by many water and sewer authorities is the creation of public education materials in the form of ArcGIS StoryMaps — a relatively simple-to-use webpage builder tool that allows users to add text, photos, and videos to existing ArcGIS web maps to create an interactive narrative that can be published and shared. Using maps as an integral part of storytelling makes them a more effective and accessible tool. StoryMaps can be used for a wide variety of purposes- for advocacy and outreach, education, and to deliver public information. A major advantage of the StoryMap format is it facilitates a sequential breakdown of complex information while also offering opportunities to interact with content along the way – allowing visitors to absorb information at their own pace. These materials may be especially useful for teachers to engage students in learning about urban water issues in their home communities (think of these young people as future customers and rate-payers).

- ➔ *Good examples of this include:* NYC H20 HUB – StoryMap "lessons" for educating New Yorkers of all ages on city's local water ecology; Kansas City's Green Stormwater Infrastructure StoryMap; Northeast Ohio Regional Sewer District History StoryMap; Atlanta's Green Infrastructure Program StoryMap
- ➔ *As part of the Watershed Ambassador work in Pittsburgh through this plan, pro bono services were obtained by the international planning and architectural firm GBBN. In response to Ambassador input, GBBN is currently working on drafting a StoryMap with Grounded Strategies, PWSA, and the Pittsburgh Parks Conservancy — this project should be continued to include up-to-date information following the completion of the SWSP. We are aware that the PWSA GIS team is also completing a StoryMap for completed PWSA projects, and that the Negley Run Watershed Task Force is completing one for its watershed as well. Considering how to or whether to integrate the three is an important recommended next step.*

4- Interactive database maps of green infrastructure projects that are continually updated

Many water and sewer authorities who are engaged in similar stormwater management projects over the long term maintain transparency by providing online tools to help interested community members navigate information about the status of current, past, and future planned projects. These have varying degrees of depth of information, but most are presented in the form of interactive maps based on ArcGIS mapping of project data.

- ➔ *Good examples of this include:* NYCDEP Green Infrastructure Program Map; Philadelphia Water Department's Big Green Map: ArcGis map of all GSI public and

private projects; Kansas City's Smart Sewer program; NEORSD Green Infrastructure Grants Programs Storymap

- ➔ *Living Waters of Pittsburgh created "One Water Map" on their site, highlighting Pittsburgh's priority sewersheds in the Pittsburgh Area, which allows visitors to locate their sewershed but doesn't include any information about completed, current, or planned projects in those sewershed areas as the above examples from other cities show.*
- ➔ *Note: It is recommended that groups should combine efforts and integrate GIS maps with story maps.*

Links for this section:
https://www.waterrf.org/resource/website-strategies-water-professionals-or-what-you-see-not-what-google-sees

https://www.dcwater.com/
https://www.dcwater.com/cleanrivers

https://www1.nyc.gov/site/dep/water/combined-sewer-overflows.page
https://www1.nyc.gov/site/dep/whats-new/trash-it-dont-flush-it.page
https://www.dcwater.com/css
https://doee.dc.gov/service/stormwater-management-faqs
https://water.phila.gov/community-resources/
https://raincheckbuffalo.org/our-stormwater-challenge/

https://www.surveymonkey.com/r/FCP6XWY

https://water.phila.gov/blog/gccw10-outreach
https://water.phila.gov/adoption/
https://dcwater.com/sites/default/files/finance/rock_creek_project_green_infrastructure_virtual_tour.pdf
https://raincheckbuffalo.org/project/
https://www.youtube.com/user/neorsdccr
https://vimeo.com/205411916

https://www.esri.com/en-us/arcgis/products/arcgis-storymaps/overview
https://www.nych2ohub.org/
https://kcws.maps.arcgis.com/apps/Cascade/index.html?appid=8be27e83d420431e9679ca283f249655&folderid=33103bf3deef48bd899be072950d9a32
https://storymaps.arcgis.com/stories/823cb522dd79431281273a2946e68667
https://storymaps.arcgis.com/stories/c41bc3f84d8e4e70bc1672ffcd830f1f

https://storymaps.arcgis.com/stories/22e46cd887424ee69e084ba5febd7e3e
https://www.pgh2o.com/projects-maintenance/search-all-projects

https://www.arcgis.com/home/webmap/viewer.html?webmap=a3763a30d4ae459199dd01d4521d9939&extent=-74.3899,40.497,-73.3757,40.9523
https://phl-water.maps.arcgis.com/apps/webappviewer/index.html?id=c5d43ba5291441dabbee5573a3f981d2
https://www.kcsmartsewer.us/home-smartsewer
https://neorsd.maps.arcgis.com/apps/Shortlist/index.html?appid=efd0ff60d52f4860978c5bb4098cb3d9
https://www.google.com/url?q=http://www.livingwaterspgh.org/landing-page/map/&sa=D&source=docs&ust=1654106111632752&usg=AOvVaw0GdY5B-r9ng5u56sJTUSLy

Appendix C: Pittsburgh's Network of Watershed Task Forces

Pittsburgh

Following the release of the PWSA "City-Wide Green Infrastructure Assessment" (Green-First Plan), which identified the areas of Pittsburgh where large-scale green stormwater infrastructure projects could significantly manage the majority of combined sewer overflows and create community co-benefits, area non-profits focused efforts to organize collaborative working groups in the areas identified as high priorities. The Negley Run Watershed Task Force (NRWTF) assembled in an area covering the historic Negley Run watershed, approximately contiguous with the A-42 sewershed footprint. This task force grew out of longstanding, successful community organizing efforts in and around several key neighborhoods striving for sustainable redevelopment and affordable housing, having identified water resources and stormwater management as central to these efforts. Organizations including the Larimer Consensus Group, Kingsley Association, and groups including the Living Waters of Larimer were central to this long standing work. Emphasis on stormwater management improvements by initiatives including Project 15206 and organizations like Upstream Pittsburgh (then called the Nine Mile Run Watershed Association) and local and state elected officials had brought visibility, momentum, and important investments into this watershed, where chronic flooding and catastrophic loss of life have recurred. Local water activist and attorney, John Stephen, coordinates the task force, and since 2018, partnered with the Pittsburgh Parks Conservancy to jointly fundraise and manage the group. The NRWTF routinely meets, and has operated on a model of assembling a diverse set of stakeholders together to jointly discuss and strategize about opportunities to align goals and interests within the context of water issues inside the watershed. Representatives from local neighborhood groups, community development corporations, nonprofits, universities, elected offices, public agencies and departments, and allied professionals in the field come together under the auspices of the NRWTF.

A vision to replicate this watershed task force model in subsequent years was successfully pursued by the Pittsburgh Parks Conservancy and Pittsburgh United, attracting national funding from the Pisces Foundation, JPB Foundation, and locally from the Heinz Endowments to continue to support both the NRWTF as well as to more formally replicate the model in the other Green-First Plan priority sheds (Heth's Run, Soho Run, Four Mile Run, Woods Run, Sawmill Run, and SouthSide/21st Street). Numerous studies (including the City of Pittsburgh's "Watershed Resilience Accelerator Project Report," 2016; and the Water Research Foundation's "Pittsburgh Region: A Regional Scale Analysis of a One Water Approach," 2017) identified a lack of integration between plans and a lack of clarity around responsibility for action about water management. These same reports acknowledge the absence of community voices. Seeking to avoid the pitfalls of overlooking the critical role for community-based groups in shaping actions to achieve water management goals together with investments in public spaces, these groups identified a need to proliferate formal watershed task forces like the NRWTF. Citing a desire to ensure that stormwater infrastructure investments create collateral benefits, particularly for those most vulnerable people within these areas of Pittsburgh, six additional task forces assembled in those areas starting in 2019 and 2020. These groups have been coordinated by the Pittsburgh Parks Conservancy, who sought to add cohesion to loose affiliations that were more or less present in each watershed already.

The task forces educate and activate residents within their watersheds as advocates for plans that include ecological function, biodiversity, linkages to neighborhood priorities, and stormwater. Existing parks and vacant properties offer opportunities for capturing and slowing

stormwater, conveying it within a more decentralized and adaptive system. Task forces also offer local residents and businesses opportunities to collaborate with public agencies to perform stewardship and maintenance for green stormwater infrastructure installations. Integrating other perspectives and tactics, such as artist-led projects, has become a hallmark for the NRWTF, for example. The River Roots art installation adjacent to Liberty Green Park in Larimer, developed through the Living Waters of Larimer collaborative, completed in 2019) is one good example of how water is celebrated as a resource in the neighborhood, and how sustainably managing stormwater helps to return assets to a community. Another art-inspired joint project is the One Water Trail, a Concept Plan for Highland Park, where the landscape of Highland Park and its varied water resources, including the
drinking water reservoirs, human-made lake, water treatment brook, natural streams, and wetlands are embodied in a conceptual design for a water "trail" and interpretive program that reveals the connections among water resources, infrastructure, and the ways we experience water in our daily lives.

An important tool developed by Pittsburgh Parks Conservancy, in collaboration with PWSA and ALCOSAN, is the One Water: Pittsburgh's Guide to Action information piece. Created to serve as a fundamental overview of all things related to water in Pittsburgh, this tool is organized to offer comprehensive but accessible information about how water flows and is and can be more resiliently managed. Information about how the public can be engaged and involved at various scales (citywide, within a watershed, within a neighborhood, and within their own business or residence) are provided. The Guide was meant to serve as a primary tool for the Watershed Task Forces to use in their work. Keeping this guide up to date and perhaps replicating it in an online, more interactive format, might be a very useful option for the future.

Within the community engagement plan for this SWSP development, watershed task forces served as key connection points at many stages in the plan, including active participation and contributions to identifying plan priority focus areas within three focus groups (October-November 2021), contributing input to the refinement of the SWSP investment areas and strategies, disseminating community input surveys (described more fully in Appendix D), and hosting informational sessions regarding the plan development.

While PWSA routinely sends staff representatives to watershed task force meetings, and is open and responsive to their requests for input and assistance, there is no formal relationship between PWSA and these groups. Furthermore, the SWSP identifies areas that as of yet do not have an existing local task force. Finally, these task forces are under-resourced and supported entirely by philanthropy on a year-to-year basis; their continued existence and function is not sustainable under the current construct.

Watershed Task Forces beyond Pittsburgh

As described in the matrix and Appendix A, many cities studied for their approaches to equitable communications and engagement rely on and formally support some version of community-centered watershed task forces in their effective stormwater management efforts. A key element in those cities that is lacking in Pittsburgh is that the municipal government and/or the stormwater utility financially supports, in whole or in part, these groups. Another key element is that there is some formal mechanism identified in the decision-making process for the task forces to play a role, be it in disseminating resources to communities and residents, implementing stormwater management projects, and/or hosting paid staff from the stormwater agency with community engagement and water expertise.

Links for this section:

https://apps.pittsburghpa.gov/redtail/images/8376_WRAP_Workshop_Debrief_Document.pdf
https://www.alishabwormsley.com/riverroots
https://cdn2.hubspot.net/hubfs/415693/Highland%20Park%20Water%20Trail.pdf
https://cdn2.hubspot.net/hubfs/415693/One%20Water%20Guide.pdf

Appendix D: Watershed Ambassadors for Community Engagement in the Stormwater Strategic Plan Development

Recruiting, compensating, training, and supporting community members to serve as Ambassadors for stormwater engagement work is an adaptation of a model that Grounded Strategies has employed since its inception 15 years ago. In essence, the concept relies on the lived experience of residents as experts in their own neighborhoods, and in a desire to compensate people for their time and contributions to ongoing engagement within any given project or activity. Ambassadors agreed to a 10-18 hour/month commitment through July 2022, including six, two-hour training sessions. The Watershed Ambassadors would focus on communicating with the public about the planning effort, engaging with neighbors on stormwater-related matters, and also assisted with community level data collection. The team employed this model to demonstrate the value of both hyperlocal and equitable engagement.

Cohorts

In October 2021, a cohort of six community ambassadors (Cohort 1) located within sewersheds identified as priority areas in the PWSA Green-First Plan were recruited by Grounded Strategies to serve as direct correspondents both to and from PWSA, the project team, and Pittsburgh residents in their areas. Despite best efforts, it was not possible to recruit an Ambassador in this first group from Wood Run despite it being a previously identified priority area. Watershed Ambassadors were as follows (Figure 4):

- Four Mile Run (1)
- Negley & Heth's Run (3)
- South Side/21st Street (1)
- Soho Run (1)



Figure 4: Cohort 1 watersheds covered

In March 2022, an initial cohort of eight community ambassadors (Cohort 2) located within priority areas identified through the SWSP process were recruited to augment the community engagement team, serving in a similar capacity, but with the ability to communicate with neighbors regarding existing and future catalytic investment opportunities more closely aligned to the plan's refined geographic focus. Watershed Ambassadors were from the following areas (Figure 5):

- Sheraden/Chartiers Creek (1)
- Negley Run (2)
- Sawmill Run (2)

- Hazelwood (2)
- Woods Run (1)* *the Ambassador opted out following training, but the team was able to work directly with members of the Woods Run Watershed Task Force as an alternative*



Figure 5: Cohort 2 watersheds covered

Recruitment happened in partnership with the Pittsburgh Parks Conservancy, who in 2017 began working in close alignment as the fiscal sponsor for the Negley Run Watershed Task Force, and then received both national and local grant support for replicating the watershed task force model (see Appendix C) in other priority stormwater areas from 2019 to the present. Pittsburgh United was also a partner in creating the task forces and recruitment. Funding from PWSA through the SWSP was sufficient to cover the costs related to six of the Watershed Ambassadors; the other eight Ambassadors and additional planning team time were supported through the Parks Conservancy's 2021 and 2022 grant support.

<u>Training</u>
Grounded Strategies and Heather Sage, with close coordination and assistance from PWSA staff, created and provided training for both cohorts over an approximately six-week period for each. Education modules consisted of a blend of basic information related to stormwater, stormwater infrastructure, and One Water concepts; information specific to the watersheds and sewersheds of focus for each cohort; presentations from PWSA team members and other SWSP consulting team members and partners, covering a range of subjects, with a particular emphasis on the stormwater utility and how it functions as well as affordability options for residents; and engagement tactics and resources. Ambassadors were encouraged throughout to feel empowered to bring their experiences and perspectives to the work. Ambassadors were a diverse group geographically, racially, economically, professionally, and from a gender-identity perspective.

Training took place through hybrid in-person and online sessions; Ambassadors were offered both transportation compensation and Internet/technology access as needed. Hired as contractors to Grounded Strategies, each was compensated $15/hour for up to 18 hours/month, including training time. Google Classroom was used as the platform for housing training materials, presentations, additional resources, assignments (required for each training session),

and administrative documents. Recordings of all training sessions were made available to all participants; any missed sessions needed to be made up by viewing the recording. Each Watershed Ambassador was responsible for creating a work plan of activities to include communications and engagement around the plan priorities (identifying basement backup and localized flooding locations, understanding community information needs, etc.) and other PWSA stormwater priorities (the stormwater utility, affordability programs).

In addition to the staff and consultants supporting the Watershed Ambassadors, *pro bono* assistance was sought and obtained beginning in November 2021 by the planning and architecture firm GBBN as part of their annual Design Issue Series. Their 2022 theme was "Watershed." GBBN professionals lent their time and expertise, working most closely with Cohort 1 to support visual communication needs and community engagement concepts that the group expressed a desire to create. GBBN also assisted community-based groups in Cincinnati, OH with similar stormwater management community engagement efforts.

Following training, routine cohort check-in sessions were scheduled, both individually and as groups. Additionally, Watershed Ambassadors together with the existing watershed task forces and other stakeholders were invited to information sessions at various points in the plan development process, with a particular emphasis on understanding community priorities within the two catalytic investment opportunity areas identified in the SWSP: Negley Run (Homewood focus) and Sawmill Run (McKinley Park and Seldom Seen areas).

Activities

Equipped with knowledge about CSOs and stormwater infrastructure, Watershed Ambassadors undertook a variety of outreach and engagement activities to share what they learned within their watersheds. This included presenting at community meetings, tabling at community events (Figure 6), engaging residents through social media and Nextdoor, door-to-door canvassing, distributing information on door hangers at neighbors' homes, organizing and hosting community walks to share information and view stormwater projects, and participating in SWSP input sessions. One Ambassador was featured in a local news story to bring awareness to the work. Another Ambassador raised key issues related to accessibility; she provided, for example, versions of her work in large print and braille. Further work related to translated materials, customer service lines that are accessible to hearing impaired residents, and other accommodations should be explored.



Figure 6: Watershed Ambassadors providing information and gathering community input at a local Arbor Day event.

Ambassadors worked closely with Grounded Strategies and PWSA to create surveys to provide community-level feedback for the SWSP. Watershed Ambassadors were primarily responsible for the data collection efforts, distributing them through various means from early 2022 through June. Using that feedback together with anecdotal conversations at events and between their contacts with task forces and other community partners, Ambassadors also worked with GBBN to identify other tactics to help engage and educate residents. The team created an online story map site to help better explain Pittsburgh's watersheds and specific issues with videos, graphics, and text. They considered creating temporary, informational signage to place within a particular watershed (Four Mile Run) to help explain challenges, solutions, and ways to get further information. Mock-ups were developed, but the Ambassadors collectively decided not to invest in final signage, though this tactic is believed to be valuable in the future. They created a Pittsburgh watersheds display board consisting of a map of Pittsburgh with tear off sheets

encompassing different neighborhoods containing information about each watershed/sewershed that the location lies within (Figure 7). PWSA also developed a similar survey that can be used on an ongoing basis via the EngagePGH site for community feedback.



Figure 7: Tear-away neighborhood maps with watershed and sewershed specific information on the flip side.

Community Feedback

By early June 2022, Stormwater Ambassadors were able to collect 208 detailed surveys from area residents. Obtaining many of the surveys also involved conversations between Watershed Ambassadors and residents, and information sharing about the stormwater planning process and the new stormwater utility. Each Ambassador customized their survey with some watershed-specific components, and the data collected has been geo-located. For example, some areas were known to have issues with basement backups, and this data has been particularly challenging for PWSA and the planning team to acquire reliably. Any additional basement backup information was deemed to be a high priority in the engagement process. Information about nuisance flooding (i.e. very localized, repeated puddling/flooded areas within yards, roads, and neighborhoods) was obtained (Figure 8). Or in other cases, there was more of a focus around gathering renters' concerns and sharing affordability program information. All survey data collected is summarized here.

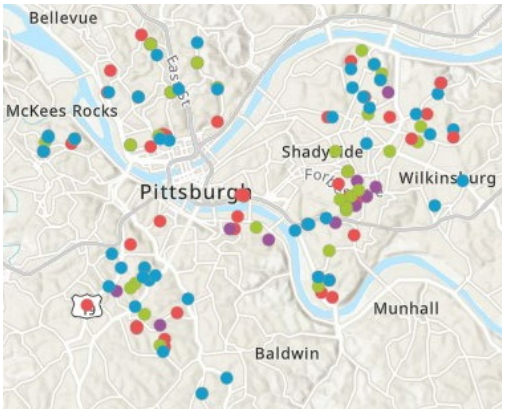


Figure 8: Nuisance flooding and basement backup occurrences collected via community surveys.

A number of themes emerged from the community surveys. These included:

- A need to reduce overland flooding and pooling and basement backups

- A preference for environmentally-focused designs, beautification, and protection for existing waterways
- A desire for PWSA to establish and maintain productive partnerships
- Understanding the relationships between stormwater management and city resilience
- Mixed results regarding awareness of the stormwater fee, with some areas expressing a clear lack of awareness and a high desire for additional information (Figure 9)
- Concerns related to flooding believed to have been caused by PWSA activities
- A large number of people experiencing localized flooding but many or most of them not reporting this to PWSA or others

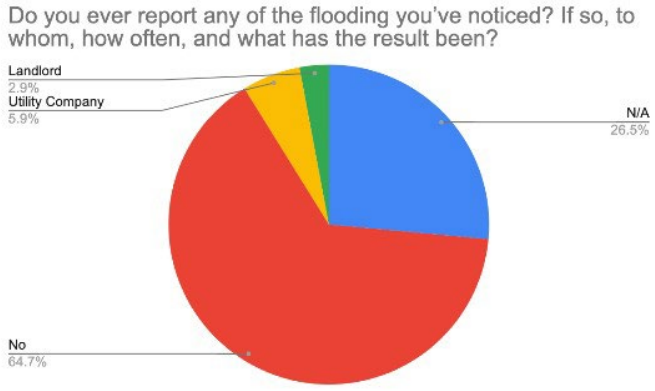


Figure 9: Data summarized from the Four Mile Run watershed regarding respondents' reports on flooding events.

Watershed Ambassadors will continue to share information within their neighborhoods throughout Summer 2022, and additional information and data will be summarized and shared with PWSA.



Figure 10: Watershed Ambassador and the GBBN team touring watershed to film story map videos.

Ambassadors at Work in Other Cities

Through our research into peer cities, we identified quite a few similar models of engagement at work (Appendix A). These include particularly well-developed and successful programs in Atlanta, Cleveland, and Philadelphia.

Links for this section:

https://www.gbbn.com/dis/
https://storymaps.arcgis.com/stories/22e46cd887424ee69e084ba5febd7e3e
https://engage.pittsburghpa.gov/
https://www.wesa.fm/health-science-tech/2022-05-31/pittsburgh-is-preparing-for-increasingly-severe-flooding-from-climate-change
https://arcg.is/15maKq

APPENDIX B

PennPraxis

Project Name: Developing PWSA's Strategic Plan for Stormwater

Project No.: 2020-025-OPS

TASK 4: *Interim Strategies Deliverable Update*

Initially submitted February 8, 2022
Revised June 14, 2022

Action 2: Definition of Initial Investment Strategy

Review of Existing Stormwater Capital Plans

As discussed in detail in our Peer Utilities briefing in October 2021, we are undertaking a geospatial analysis of the challenges and opportunities associated with Pittsburgh's stormwater challenges through the application of Four "Lenses":

1) Water quality challenges (PWSA CSO/SSO responsibility post-tunnel, MS-4)
2) Localized flooding and basement backups
3) Socioeconomic and environmental justice
4) Areas of opportunity

These four lenses were developed to help guide project selection for maximum impact in priority areas identified while developing the strategic plan. To understand which currently planned PWSA stormwater investments would represent progress towards addressing those priorities, we evaluated relevant projects listed in the PWSA 2021 – 2025 Capital Improvement Plan vis-a-vis the Four Lenses, and categorized the technologies selected as to how they address the concerns emphasized in each lens (See Figure 1 below for the project list and approximate location).

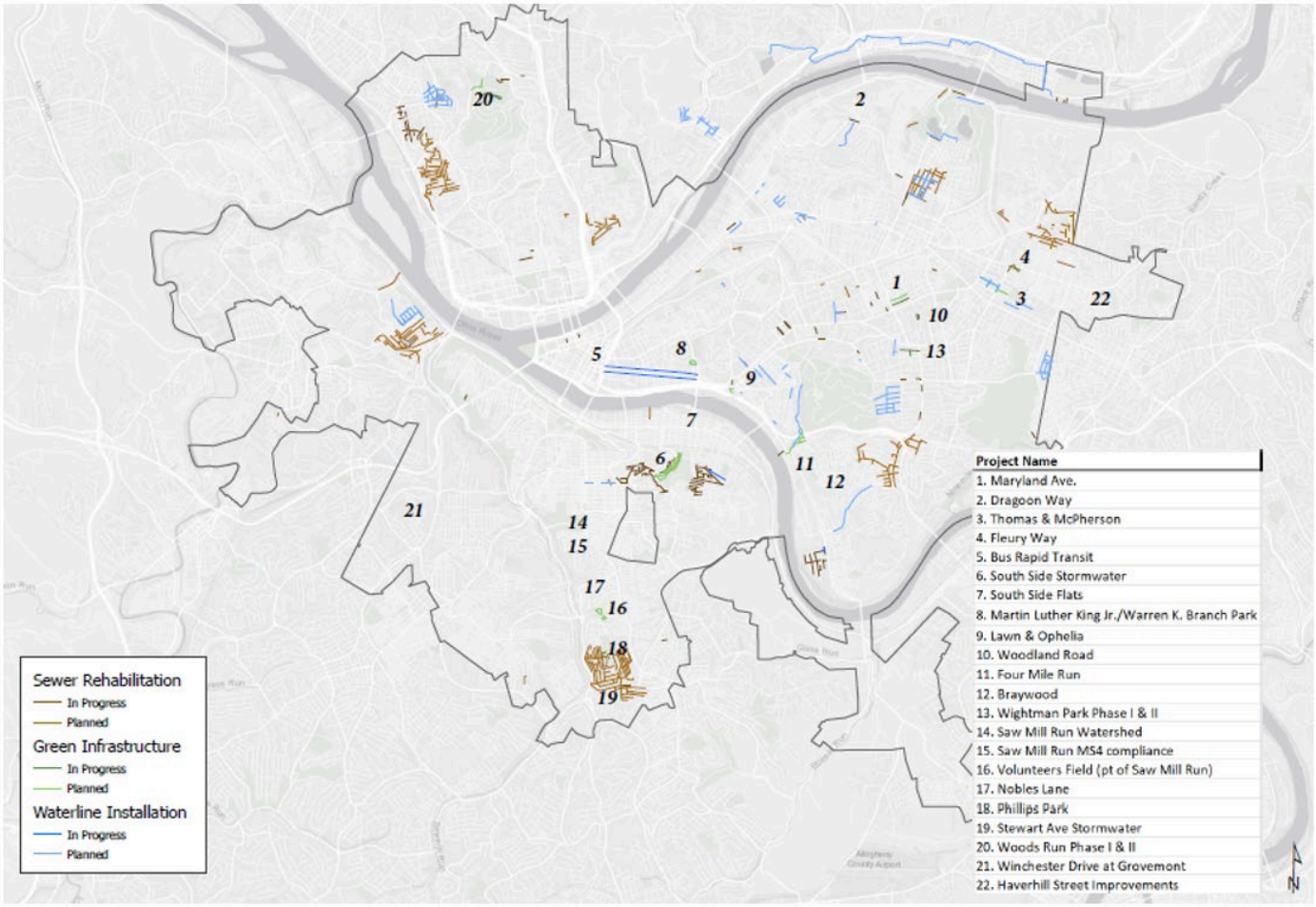
Preliminary Observations and Recommendations for PWSA

While most projects are designed to address multiple challenges, and the geospatial analysis is still undergoing refinement, we can offer the following observations:

- PWSA's existing projects are heavily focused on CSO mitigation in GreenFirst sheds, with lesser focus on flooding, basement backups, and MS4.
    - 11 out of 22 projects have CSO reduction among their primary stated goals, but only South Side Park & Flats (#6 & #7), Four Mile Run (#11) and Wightman Park (#13) appear to be located in areas with high post-tunnel volumes of CSOs for which PWSA will retain primary responsibility
    - 11 out of 22 projects are proposed to reduce flooding and an additional 5 to reduce basement backup. Maryland Ave (#1) and Woodland Rd (#10) address flooding and basement backups in the critical neighborhood of Shadyside
- Existing projects have a limited equity focus. Only 7 of the 22 projects (Thomas & McPherson (#3), Fleury Way (#4), Martin Luther King Jr./Warren K. Branch Park (#8), and Lawn & Ophelia (#9)) are located in areas identified for investment due to socioeconomic and environmental justice concerns. Saw Mill Run MS4 water quality projects (#14 & #15) may benefit portions of the Knoxville neighborhood but impacts may not be visible to residents.

- Only 5 of the 22 projects appear to address multiple lenses in a significant way.
- The majority of the 22 projects are either well in the design process or are part of multi-phase projects with some construction underway, limiting the scope for flexibility without stranding investment. Opportunities to adjust the project scope, even if later in design, to increase flood mitigation benefits (e.g., increasing storage, adding smart controls), should be considered.
- On many projects, PWSA has effectively partnered with other agencies such as the City, ALCOSAN and PennDOT to leverage funding, particularly with the ALCOSAN GROW Program. However, some partnerships have had mixed results, particularly with more ambitious projects like Four Mile Run, which have encountered challenges due to community expectations or delays relating to transportation elements out of PWSA's control. More extensive early feasibility analysis, partnership management, and expectation setting will benefit future projects of similar scale.
- Projects are distributed over a wide portion of the city, which may reduce the efficacy of the investments over shorter time scales. Consideration should be given to more intensively concentrating investments within a few priority areas

Figure 1: Location of the PWSA 2022 – 2026 Capital Improvement Plan Projects



The Table attached to this document as Appendix 1 outlines our analysis in detail.

Action 3: Leveraging Stormwater Fee Impact

3.1: Analysis of Incentives for Private Investment and Scaled "Pay-for-Performance" in Stormwater

Introduction

Pittsburgh Water and Sewer Authority (PWSA) has multiple regulatory obligations relating to combined sewer overflow control, pollution reduction within municipal separate storm sewer systems, in addition to shared responsibilities relating to flood mitigation, climate adaptation, and related concerns. Implementation of stormwater projects to address multiple objectives has typically proceeded through a design/bid/build process through which PWSA conducts planning studies to identify projects, primarily on public lands or in the right-of-way. Design projects are advanced through stand-alone contracts or using on-call contracts. Fully designed projects are then bid via low bid to qualified contractors.

While design/bid/build delivery offers many advantages, delivery under this mechanism can be costly and slow, causing many jurisdictions to explore the use of alternative delivery mechanisms, including full delivery, grant, and P3 models. These alternative delivery mechanisms are in wide use in several infrastructure markets, most notably transportation, and increasingly, water management. As PWSA looks to leverage the impact of its stormwater fee, looking at the potential for alternative delivery models to accelerate and reduce the cost of delivery is a critical strategy.

Why use an alternative delivery Model?

Alternative delivery models may offer a range of potential benefits to PWSA in implementing stormwater management. These include:

- Incentivizing private investment and participation
- Facilitating delivery of projects on private property.
- Leveraging market-based competition to lower
- Streamlining project assembly and delivery
- Risk transfer

What are the risks and rewards of alternative delivery?

The primary benefits of an alternative delivery model are to accelerate the pace of project delivery and lower the unit cost of the delivery. Alternative delivery also places the risk of delivery of the delivery entity, reducing risks to the municipality or utility. Risks/drawbacks to the municipality include a lack of control over the delivery, reduced input during project selection, design, etc. These risks can largely be mitigated through a well-structured contract and project delivery model that holds the delivery entity to pre-established standards.

Legal aspects
Alternative delivery models are in wide use throughout the U.S. as well as in the Commonwealth of Pennsylvania. Primarily legal obstacles include restrictions on the use of design/build, restrictions on the use public funds on private property, and procurement rules that can limit the use of certain contracting options such as best-value and qualifications-based contracting. A comprehensive legal review of options is outside of the scope of this contract but should be prioritized early in the program development process.

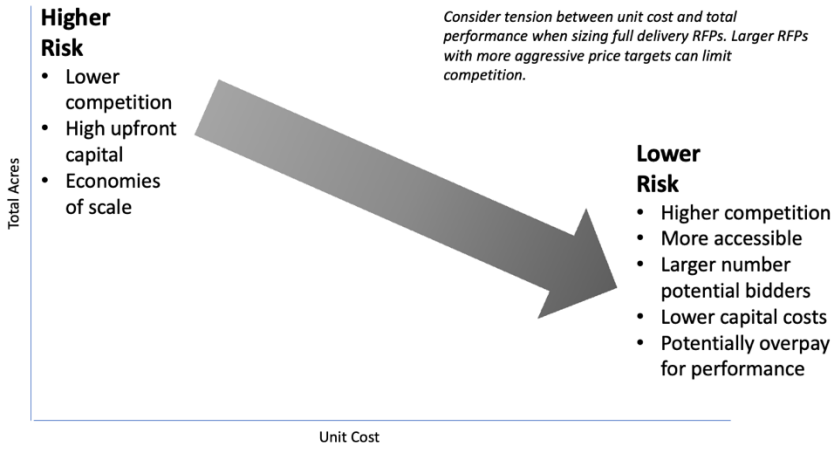
Types of models
There are several related alternative delivery models. For simplicity, these are divided into full delivery, grant, P3, banking and trading, and watershed district models. A detailed review of each model, as well as supporting case studies are provided at the end of this memo.

Recommendations and Conclusions for PWSA
Among the models evaluated, a full delivery program seems to offer the right combination of benefits for PWSA. Specifically, a full delivery program provides significant advantages versus a grant program, primarily because the contractual mechanism can include provisions such as liquidated damages that hold the provider financially accountable for delivery. While P3 is an attractive option in terms of the scope and scale of the program, full delivery contracts offer many of the same benefits of streamlining delivery and risk transfer, but also expand the potential for competition and for smaller sized firms to act as primes. Having a multitude of providers, rather than a single provider, can also be preferable given that each provider may bring a specialized approach and competition among providers can effectively lower the cost of delivery. Full delivery contracts would also allow PWSA to retain an additional measure of control in terms of site selection and implementation that is sometimes challenging with a P3.

Recommendations for full delivery contracts:

- Start with a moderate sized contract. *Starting with an initial contract of $5-$10 million would allow a multitude of local and regional providers to participate, while also attracting some national interest. If possible, PWSA should lead this procurement or partner with an appropriate city agency, such as URA, to the extent that the delivery is bundled with housing or other elements.*
- Conduct pre-screening and landowner negotiations, at least for some properties prior to the solicitation. *Queuing up willing landowners and highly feasible properties will jump start a full delivery program and encourage more participation. Following up with customers that are seeing large increases in stormwater fees would be a natural starting point for this engagement. Alternatively, focusing on groups that might be particularly vulnerable to the fee such as non-profits or faith based institutions could be a focus for initial outreach. PWSA should review property owner outreach that was conducted as part of the stormwater fee roll-out to identify a first cohort of property owners for early outreach. Prior to this outreach, the architecture of the full delivery program and associated funding should be in place.*
- Conduct market studies upfront to understand price versus supply and total supply at various rates of customer participation. *Understanding the availability of projects at*

various price points will allow for appropriate pricing and set expectations with the provider community. Studies on the effectiveness of various stormwater technologies within the Pittsburgh area, as are currently being conducted by PWSA, will help to align cost expectations per unit performance.



- Use a progressive award approach with a guaranteed maximum price. *Most stormwater projects have significant unknowns that can result in significant price uncertainty. This is far different than most stream restoration projects, which have been a focus of full delivery projects. The most effective strategy for dealing with this is to fund projects using a progressive model in which the provider can home in on a guaranteed price after subsurface investigations have been completed. Partial funding can be offered at this stage to mitigate risk.*

- Engage the provider community well in advance. *Providers may be reluctant or unaware of the program. Providing lots of information well in advance (e.g., at industry days) will inform the provider community and give required lead time for providers to come to a go decision based on the specifics of the solicitation. Industry events should be targeted—having one or more stand-alone rather than trying to incorporate into another event. That said, providing information at 3RWW conference or similar event could be good as a supplemental source of information. As with the landowner outreach, we would suggest that the specifics of the procurement be worked out ahead of time, including the approximate size and number of contract awards, schedule for release, etc.*

- Incorporate workforce and local participation requirements. *For instance, the delivery could require that a Pittsburgh-based firm provide a certain percentage of services, or that Pittsburgh residents provide a certain percentage of the labor hours for the project. The procurement could be structured to incentivize higher levels of participation. This is a great opportunity to get local companies and residents to participate in the delivery, understanding that at initially out-of-town firms may be leading efforts.*

- Use best value or qualifications-based selections. *Low bid contracting is likely to result in cost cutting measures with lots of change orders that delay implementation and inflate costs. Best value allows the best mix of qualification and cost-based selection.*

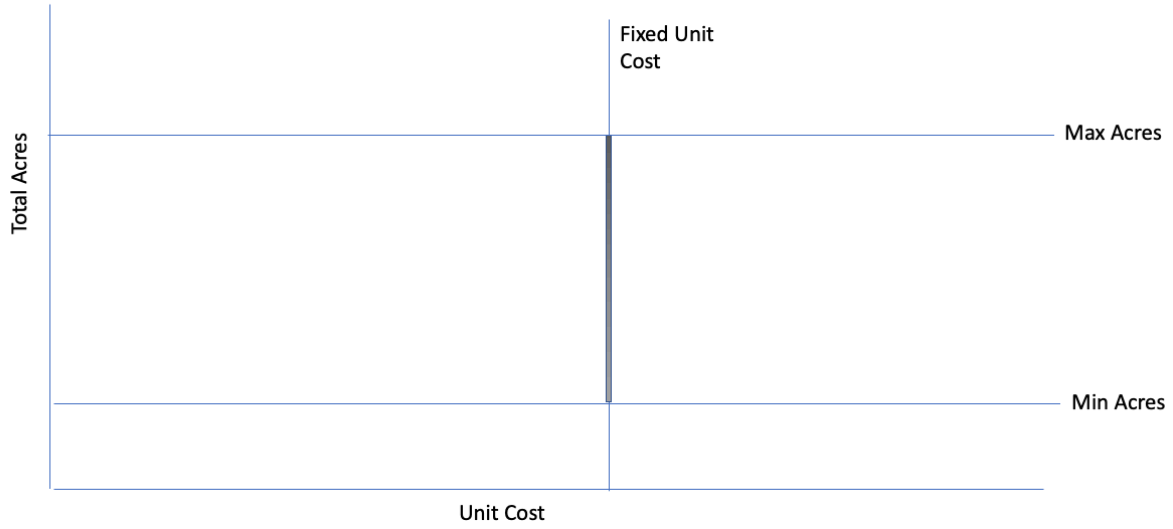
- Develop clear and simple criteria for design and acceptance. *The more predictable and consistent the requirements, the more providers will be interested in bidding. Establishing criteria upfront and minimizing changes over time that can introduce risk and uncertainty for providers is critical to maintaining a good pool of consistent providers.*

- Develop target implementation zones that reflect priorities. *Understanding where project opportunities intersect with priorities for implementation is critical and can be used to focus investments where they are needed most. In Pittsburgh, investments could be*

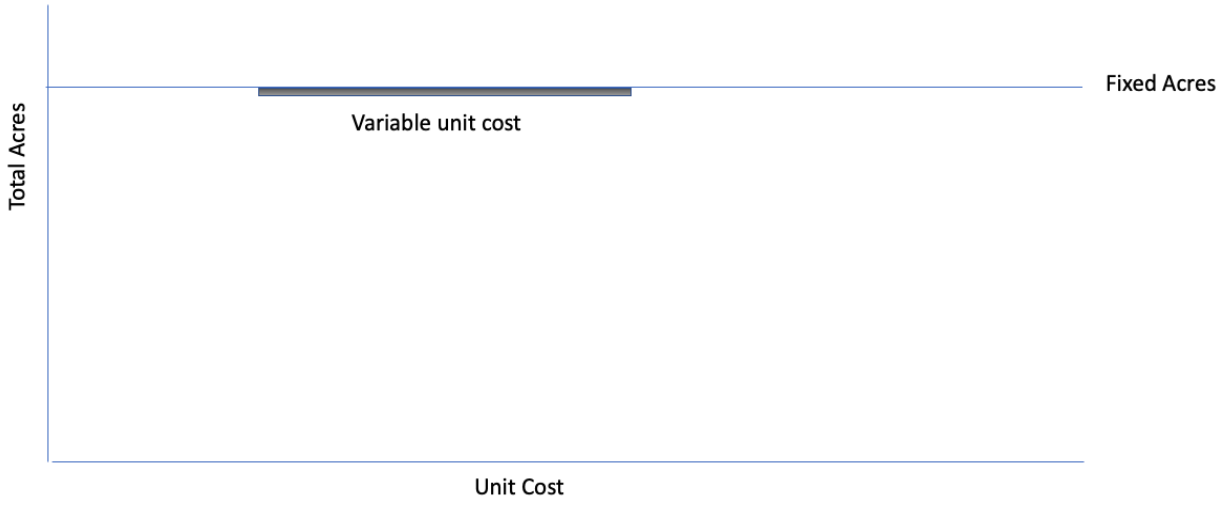
focused on the intersection of equity, water quality, flood mitigation, and opportunity, as represented by the four lenses mapping.

- Develop pre-engineered systems to reduce engineering requirements. *The use of pre-approved, standard designs can streamline delivery, reduce needed reviews, and ensure consistency in outcomes.*

Fixing Unit Costs. Fixed unit cost contracts allow flexibility on the minimum and maximum number of units for delivery. This ensures that the municipality can control the cost of delivery yet provides some flexibility for the aggregator/developer. This flexibility may be important in reducing the risk to the aggregator/developer, particularly if sites have not yet been identified. However, if sufficient supply is not available, total performance may be lower than desired.

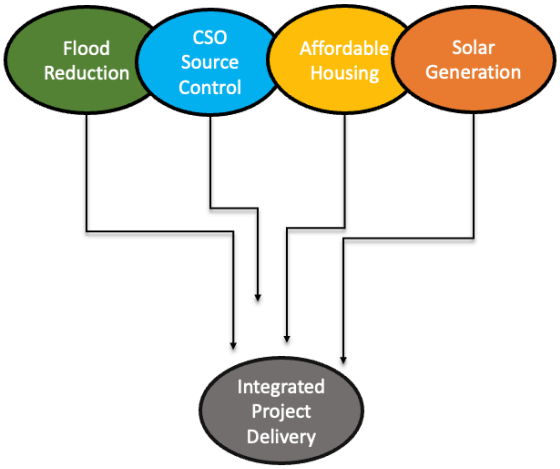


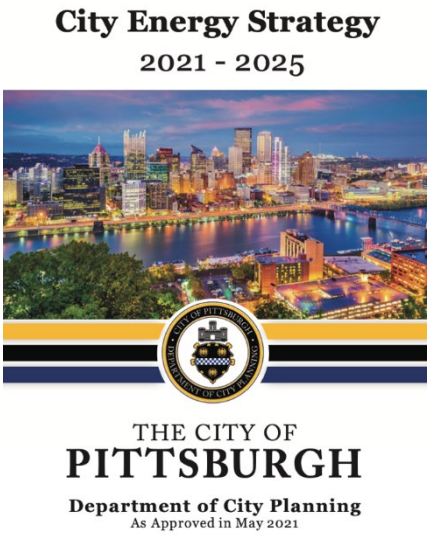
Fixing Total Performance. Fixed total performance contracts allow for a variable unit cost along with a minimum and maximum number of units for delivery. This ensures that the total number of units are delivered, while acknowledging that the cost of delivery may not be fully predictable at the outset of the contract. With this model, the costs can be managed through fixing the % mark up on the delivery or by negotiating costs on a project-by-project basis following initial design.



Neighborhood Integrated Environmental Full Delivery Contracts

Moving beyond the traditional full delivery model, PWSA has an opportunity to break new ground in advancing the concept of full delivery contracting for stormwater to encompass a much broader range of outcomes. Traditionally, full delivery projects have focused on a very narrow set of performance criteria, commonly either CSO volume reduction or MS4 pollutant load reduction. One potential expansion of this concept would be to incorporate a full delivery model for stormwater into developer-focused solicitations directed toward improving Pittsburgh disinvested neighborhoods. These neighborhoods, which include areas such as Homewood and Beltzhoover, are characterized by significant depopulation and disinvestment and abundant vacant land. Currently, Pittsburgh's Urban Redevelopment Authority (URA) is working to assemble vacant parcels for redevelopment in some of these neighborhoods. For instance, URA recently released a developer RFI requesting developer input and concept designs for a low-income mixed-use development of five-parcels in Homewood.





Integrated delivery models create the opportunity to fuse stormwater objectives with elements of Pittsburgh's energy strategy, some of which focus on renewable energy generation on public lands.

In addition to or as an alternative to a standalone full delivery contract, PWSA could partner with URA to incorporate green stormwater infrastructure and other stormwater improvements into affordable housing developments. These stormwater systems could extend beyond the level of stormwater management needed to comply with developer regulations. For instance, stormwater from the surrounding right-of-way could be managed, or on-site systems could be upsized to manage in excess of the volume and rate control requirements in the stormwater ordinance. In the latter case, the newly adopted stormwater code provides grants from the City for increasing the volume of stormwater storage provided beyond the regulatory minimum, providing a built-in mechanism to fund this work, at least in part. Incorporating stormwater management as a part of affordable housing developments would accomplish three important goals. First, integrated stormwater systems would be seen not as competing with development (as could a stand-alone project sited on an otherwise developable vacant parcel) but as a complement to development. Second, combining stormwater management and affordable housing acts as a potential hedge against

"green gentrification", an unintended consequence of green infrastructure investments within many disinvested communities.

One potential technology that could provide both energy generation and stormwater management is the solar green roof (see also Solar Green Roof section). Solar green roofs are commercially available products that combine a traditional sedum green roof with a roof-mounted solar array. This product could be easily incorporated into affordable housing developments and offers some interesting synergistic benefits versus stand-alone systems. For instance, the cooling properties of the green roof moderate roof temperatures in the summer months, which can significantly increase the efficiency of the solar array during these periods. Also, the green roof acts to ballast (hold down) the solar panels, eliminating the need to drill through the underlying roof membrane to anchor the solar panels to the roof structure. With this ballasting function, green roof becomes fundamental to the solar installation and therefore can be funded using solar incentives or under commonly used models for solar funding such as power purchase agreements (PPAs). Under a PPA, the solar provider funds the installation of the solar array (and in this case the accompanying green roof), selling power back to the owner or the grid, usually over a 20-year lease period. This model could provide a means for private financing of the green roof.

Beyond affordable housing, an integrated full delivery model could also incorporate various modes of renewable energy infrastructure including solar generation and battery storage. This approach would align well with Pittsburgh's recently released Energy Strategy (2021-2025). One of the recommendations of this plan (I-2) discusses the need to identify publicly owned lands (which would include vacant parcels assembled for redeveloped by URA) as sites for renewable energy storage and generation infrastructure.

Finally, additional local-based installations focused on flood mitigation, such as backflow prevention (e.g., installation of backflow preventers on private laterals) or inlet and curb reconstruction could be layered into the delivery, further extending the outcomes associated with the integrated full delivery model. In this case, SRF funding could be used to fund these upgrades, following a model used by the Chester Stormwater Authority in the Commonwealth of Pennsylvania. Using this model, the Authority has sourced over $34 million in SRF low interest loans to fund basic stormwater like inlet replacements as well as green infrastructure. Under a similar model, PWSA could source SRF funds that could be used by local developers to install neighborhood stormwater improvements in concert with affordable housing and solar generation projects. Further, ALCOSAN GROW funding could be leveraged to fund source control aspects of these projects, provided projects can be targeted in areas requiring source control under ALCOSAN's Interim Wet Weather Plan.

Alternative Delivery Implementation Models

Full Delivery Models

The full delivery model places the primary responsibility for project delivery on an aggregator/developer, which is typically a private, for-profit firm. This entity may self-perform all or a portion of the work. Typically, the aggregator/developer would bring on a team of support providers that may include designers, contractors, and specialty service providers. This model is in wide use in the Southeast for stream and wetland projects and is gaining in use in the northeast/mid-Atlantic for stream restoration and urban stormwater projects. There are a range full delivery models that vary in terms of several important elements, including:

- Services
- Number of Providers
- Asset Ownership
- Project Location and Portfolio Size
- Project Identification and Selection
- Land Control
- Contracting Models
- Pricing and Performance Models
- Funding Models

These elements largely drive the types of entities that can compete for contracts, the relative risk to the private delivery entity vs. the municipality, and other important aspect of program performance.

Services

Full delivery contracts typically include design and construction, but may also include pre-development services project origination and development, and post-construction services such as operations and maintenance.

Asset Ownership

Long term asset ownership typically rests with the procuring municipality or utility. In some cases, however the aggregator/developer may assume long term ownership of the asset, or at least responsible charge for operations, maintenance, and asset performance. Or ownership and responsibility for operations and maintenance could be turned over to a third party, such as a local community development corporation (CDC) or land trust.

Project Locations and Portfolio Size

Full delivery procurements may focus on a specific project type (e.g., schools, faith-based institutions, etc.), geography (e.g., target sewersheds) or may provide performance or minimum project criteria (i.e. at least XX feet of stream restored, XX acres of impervious surface managed) that may define the delivery. These criteria can be imposed on an individual project level or a portfolio scale. If private properties are included as target projects, municipalities/utilities may face restrictions in terms of the use of capital or operating dollars.

Project Identification and Selection

Full delivery models differ with regards to the entity responsible for project identification and selection. In some cases, the procuring entity may simply establish project criteria and ask proposers to identify project sites that meet qualifying criteria. This offers the proposers maximum number of project sites, but can be associated with some downsides for the municipality, including:

- Potential lack of interest/bids if risk is too high
- Lack of control of what sites are ultimately delivered (beyond initial criteria)

In other cases, the municipality may advance the selection process by conducting a screening level analysis, conducting landowner engagement, or advancing specific sites through preliminary design. This helps to reduce risk and encourages bidding, as the upfront costs of bidding are lessened.

Contracting Models

Full delivery can incorporate a wide variety of contracting models including low bid, best value, and qualifications-based contracts. Contracting models chosen may depend strongly on local procurement rules. Low bid contracting provides the most certainty around initial cost but limits the ability of the procurement agency to select a preferred provider or to manage the quality of the delivery. Qualifications-based selection can be an attractive alternative that lets the procuring entity on board one or more providers based on prior experience. However, the downside of this model is that the municipality/utility loses leverage on pricing once a qualifications-based selection is made. Best value contracting offers a nice combination of selection based on price and qualification.

Pricing and Performance Models

Full delivery contracts typically stipulate fixed pricing per unit of delivery/performance. Most commonly this is expressed as a managed volume or managed impervious area, such as the greened acre, or acre-in. or in terms of unit pollutant reduction, typically lb/yr of sediment. Full delivery models can incorporate traditional payment structures based on percent completion, or more commonly a structured around one or more milestone payments. Milestones can range from multiple milestones, for instance at the completion of design or permitting, construction, etc. or may be restricted to a single payment upon delivery. Other payment structures can include a recurring payment over time based on continued performance following delivery (either presumed or measured). In some cases, incentive payments are provided for achieving particular levels of performance or for accelerated delivery.

Payment/Funding Models

Most full delivery models rely on the developer aggregator to self-fund part or all the delivery with the municipality reimbursing the developer for services, performance, or for purchase of the asset. In some cases, the aggregator/developer may be required to fund some or all the pre-

development work, design, or construction prior to payment. In these instances, significant outside funding streams are often required, and one or more private financing partners may be part of the delivery team, sometimes as an equity partner. If large quantities of upfront capital are needed to facilitate the delivery, particularly if sites have not yet been selected, this may escalate the cost of the delivery, due to the high cost of private capital at this stage. This may in turn restrict the number of potential bidders.

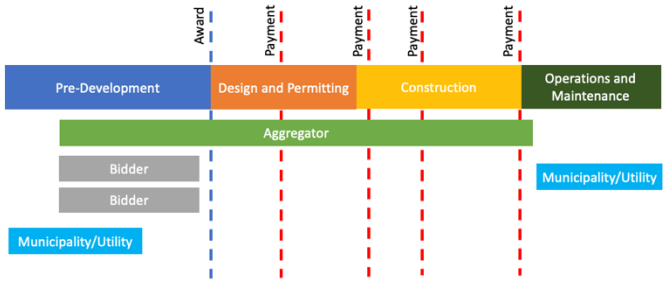
Land Control

For municipally owned land, land control is typically negotiated prior to the procurement to the extent that varying agencies need to provide consent. For private properties, land control is typically obtained by aggregator/developer in the form of a Letter of Intent and later a Landowner Agreement. The Landowner agreement may or may not stipulate compensation to the landowner, but a lease or upfront payment is common. Stormwater fee credits may play a significant role in obtaining landowner participation.

Examples of full delivery models include solicitations from Springettsbury Township, PA, Anne Arundel County, MD, Howard County, MD, and DC Water Rock Creek A. Summaries of these programs are provided below:

<u>Springettsbury Township, PA</u>

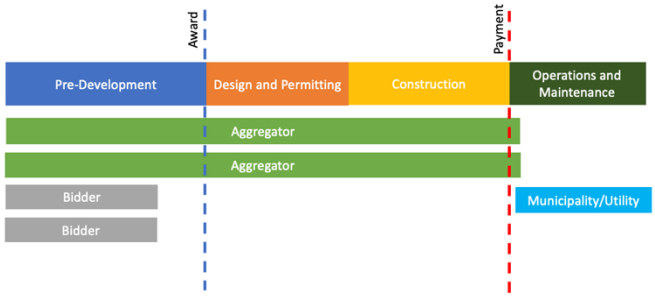
- ~$2 million contract for MS4 compliance, ~700,000 lb of annual sediment reduction
- Design/build stream restoration
- Single award, best value including fixed cost per unit sediment reduction
- Public sites pre-selected by municipality, with an option to provide alternative sites
- Milestone payments negotiated with provider
- Long term O&M by municipality with short term O&M by aggregator/developer (one permit cycle)



Full Delivery Model for Springettsbury Township, PA.

<u>Anne Arundel County, MD</u>

- Several rounds of full delivery solicitations ~ $5 million each
- Design/build + 5 years of maintenance
- Single or multiple awardees per round
- Private property only within MS4 boundary
- All pre-development conducted by aggregator during bid phase, no compensation for non-selected bidders

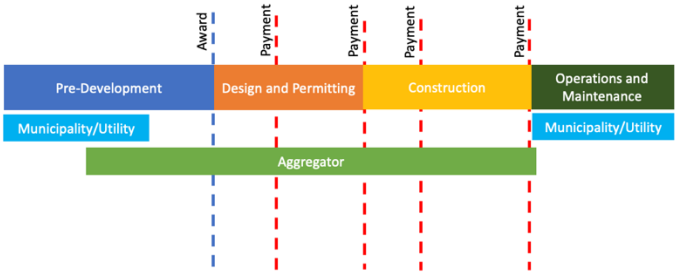


Full Delivery Anne Arundel County. Note: pre-development is 100% the responsibility of the aggregator

- Award based on cost per acre of impervious + technical evaluation and experience.
- Negotiated payment schedule
- County responsible for O&M, aggregator/developer must provide easement

Howard County, MD

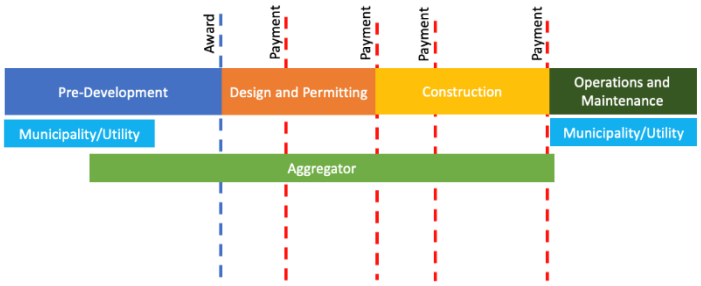
- $2 million full delivery for stormwater retrofits including design and construction
- Single award – best value
- Project sites located on institutional properties pre-vetted by County with land ownership, owner consent pre-negotiated



Full Delivery for Howard County. The County provided significant upfront project development and landowner coordination, allowing bidders to propose only on properties that were pre-vetted.

DC Water Green Infrastructure Rock Creek A

- Design/build + maintenance for 1-year guarantee period
- Green infrastructure installations for publicly owned sites in ROW
- 50% engineering drawings provided to bidders
- Initial short list based on qualifications
- Short listed bidders develop engineering designs in several month collaboration period with stipend for non-selected bidders
- Payment is based on fixed price bid with milestone payments



Full Delivery for Howard County. The County provided significant upfront project development and landowner coordination, allowing bidders to propose only on properties that were pre-vetted.

Grant Models

Grants offer a unique but related model to full delivery contracting that does not require the use of a traditional competitive procurement process. With a grant model, municipalities/utilities provide grant monies to project grantees, who then lead project delivery. Typically, projects are selected and proposed within a grant application process. Grants are distributed to selected grantees, which are usually either individual property owners or project aggregators, In the latter case, a single grant may be awarded to an aggregator for the delivery of several projects across sites owned by multiple landowners.

Grants typically offer less certainty around the delivery than a full delivery contracting mechanism. Grants impose a lower level of contractual obligation to deliver the project, creating a larger potential for the grantee to fail to deliver (default) without facing significant financial or legal consequences. By contrast, many full delivery contracts can impose penalties, including liquidated damages for failure to deliver, and are a stronger delivery mechanism for this reason.

Grant Program Administration
Funding sources may be restricted on private property; therefore, the municipality/utility may elect to use a third party to administer the program. Alternatively, municipality/utility may act as the grant administrator.

Single vs. Multiple Owner
Grant programs differ with respect to what entity can apply for funding. In many cases the grantee is an individual property owner. The owner then contracts with a team of engineers and contractors to implement the project. In the case of multiple owner grants, grants are awarded to an aggregator/developer, who then works with individual property owners to deliver projects across multiple sites.

Long Term O&M
Grant programs typically require property owners (not aggregators) to assume long term O&M responsibilities. This is one of the key advantages of grant programs but can also lead to challenges with property owner participation.

Payments
As private owners are typically not able or willing to provide private financing, grant programs typically (but not always) provide payments on a milestone basis and reimburse grantees for expenses as incurred. Grants directed at aggregators may operate closer to a pay for performance model in which payments are delayed toward the end of the delivery.

Examples of grant models include programs in Philadelphia, Cleveland, San Francisco, and St. Louis. Summaries of these programs are provided below:

<u>Philadelphia, PA</u>
<u>Philadelphia Water Department Stormwater Grants Program</u>

- Long standing grant program with extensive history
- Funds design and construction for green infrastructure with 1.5 inches of managed precipitation depth required
- Annual funding round ~ $5-10 million per year, some years up to $25 million
- Provides grants to both property owners and aggregator/developers
- Deep discount on stormwater fees creates strong impetus for participation
- Reimbursement program based on negotiated milestones
- Landowners must commit to 45-year maintenance agreement at own expense
- Current program uses multi-factor rubric to fund projects
- Priorities are low cost, community involvement, CSO, ROW management, match, and greening
- Changes in program guidance, funding levels have been challenging for providers

St. Louis, MO

MSD Project Clear Rainscaping Large Grants Program

- Funds a variety of green infrastructure types including design and construction
- Applicants can be owners or aggregator/developers
- No set cost limit for competitive program but cost effectiveness is a major component. $180,000 per acre of total drainage area for non-competitive" development-review grants"
- Payment is on a reimbursement basis upon project completion
- Funding levels are around $5 million per year with annual funding round for competitive projects and year-round submission of "development-review grants"
- Management of 1.14 in. or more preferred for competitive program
- Match preferred but not required
- Restricted to Mississippi CSO Region (a subset of the City) for competitive program
- Benefit points system for weighting factors such as visibility, sustainability, EJ considerations etc.

San Francisco, CA

SFPUC Green Infrastructure Grant Program

- Awarded 9 projects and nearly $8,000,000 since 2019
- Funds design and construction for a wide array of GI
- Must be with SFPUC sewer system service area
- Maximum award is $765,000 per acre of impervious managed and $2 million in total funding per award
- Payments at 4 milestones – one for planning and design, 3 for construction
- Must include at least 2 co-benefits
- Must manage a minimum of 0.5 acres
- 0.75 inches of precipitation depth minimum

Cleveland, OH

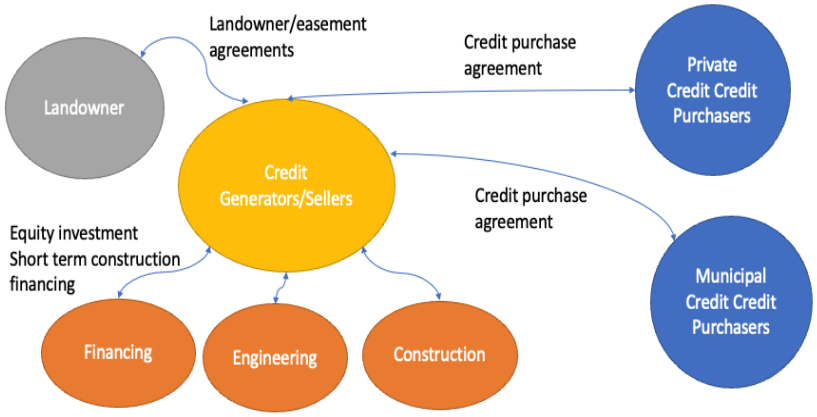
NEORSD Green Infrastructure Grants

- 45 projects funded at total award of ~8.3 million from 2014-2020.
- Awards limited to $250,000 for construction, $25,000 for design only. No unit cost restriction
- Covers design and construction and first year maintenance
- Combined sewer system only
- Applicants can be Sewer District member communities, governmental entities, non-profits or businesses working in partnership with their community.
- Maintenance required for "life expectancy of the project" as determined on case-by-case basis.
- Reimbursement basis without set milestones.
- Evaluation based on benefits, feasibility, programmatic capacity to maintain, visibility, etc.

Banking and Trading/Market Based Models

Banking and trading models offer an interesting alternative to full delivery and grant models. Under a banking and trading model, credit developers, usually for-profit firms, obtain land and build credit generating projects, usually on private properties. These credits are certified by the municipality/utility and are then sold on a credit exchange to credit buyers. Credit buyers can be land developers who require credits to meet stormwater regulations for new or redevelopment, or the municipality/utility who may purchase credits to meet MS4 or CSO compliance obligations. While banking and trading can provide some important benefits, it requires a significant upfront and on-going investment that can outweigh the potential benefits. The Stormwater Retention Credit program in Washington D.C. is the most advanced and well-developed banking and trading program for stormwater.

Banking and trading models involve transactions between credit sellers and purchasers. Sellers procure a range of technical services from service providers, while negotiating land control with property owners. Credit purchasers may include both private developers and the municipality.

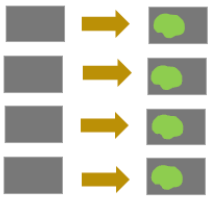


<u>Washington D.C.</u>
<u>Stormwater Retention Credit Program</u>

- Stormwater Retention Credit – one managed gallon for 1 year
- Developers can purchase SRCs in lieu of on-site management for 2 year. Up to 100% in certain areas.
- Credit generators can sell credits to DOEE if cannot sell to private buyer (this is a key risk mitigation strategy to encourage participation)
- On-line credit marketplace to facilitate trades
- High value credits generated in MS4 helps to focus projects in these areas

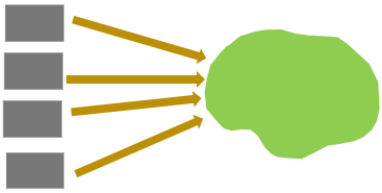
Watershed Districts

Watershed Districts are areas, typically neighborhoods or sewersheds) in which stormwater fees from within the district boundaries are collected and used to build centralized stormwater facilities within that locale. Residents and businesses within the district obtain reduced stormwater fees once the project or projects are built. This offers a potentially cost-effective alternative to building stormwater credit projects on individual properties, which can be cost prohibitive, particularly for smaller properties. Ongoing O&M of many small-scale installations on individual properties can also be challenging and expensive. The Watershed District concept has been evaluated by the Nature Conservancy within the Eastern Market Neighborhood of Detroit but remains primarily an untested concept.



Conventional credit program.
Provide credits on property-by-property basis

Problem – individual projects for small properties are very expensive



Watershed district program.
Build centralized, neighborhood projects.
Provide credits on pooled basis

The concept of watershed districts pools stormwater fee credits within a specific neighborhood and geography. Rather than invest in small scale projects that are credited on an individual basis. The pooled investment is used to build large scale green infrastructure within the target geography. Concept is relatively untested but could have some appeal in Pittsburgh.

Public Private Partnerships

Public Private Partnerships extend and expand the full delivery model to encompass a wide array of services, often at a large scale. The contract mechanism is a partnership agreement to which a private developer/aggregator and the municipality/utility are party. Typically, P3 models involve the delivery of a large portfolio of assets, as well as implementation of related programmatic functions such as contracting, procurement, work force development, and community outreach. P3 models are often structured such that private financing or, in some cases, State Revolving Funds (SRFs) may be used to fund the program, with repayment made as assets are built. Incentive structures may be incorporated for accelerated delivery or exceeding performance benchmarks. To date, the majority of P3 efforts have been implemented by Corvias Solutions, including partnerships in Prince Georges County, MD (see summary below), Milwaukee, WI, and Chester, PA. As of the writing of this memo, the City of Seattle has released an RFP for a stormwater focused P3 named RainCity.

P3s offers an attractive delivery mechanism in which program elements can be leveraged and scaled in ways that are difficult to achieved with smaller full delivery or grant-based alternative delivery mechanisms. However, this model can limit competition and places the delivery in the hands of a single provider over an extended time period.

<u>Prince Georges County, MD</u>
<u>Clean Water Partnership</u>

- P3 between the County and Corvias Solutions
- Total program costs of ~$200 million through 2021.
- To date, over 4,000 credit acres of impervious using a range of BMPs including ponds, GI, and stream restoration totaling over 232 projects.
- Local participation goals include 30-40% of the total project scope by the County's small, minority, and women-owned businesses. Additional goals for 50% local business participation and 51% county resident hours during peak construction season.
- Mentor/Protégé Program to develop local businesses.
  Alternative compliance targeting small projects on tax exempt, faith based, or 501(c)3s.

3.2: Exploration of Innovative Technologies

Maintaining an openness to adaptive management and technological innovation can allow for more cost-effective solutions that will leverage the impact of PWSA's stormwater fee.

Smart Sewers and Real Time Control

One example is the application of real time controls (RTC), or continuous monitoring and adaptive control (CMAC), which has proved successful in peer cities. Real time control systems encompass a range of technologies and processes, "including hydraulics, instrumentation, remote monitoring, process control, software development, mathematical modeling, organizational issues, and forecasting of rainfall or flows".[1] RTC systems do not have to be complex, as they are scalable, and the scope can be adjusted to fit site-specific operational needs.

Recommendations and Conclusions for PWSA

The following recommendations and conclusions are based on a case study and literature review:

- Insofar as RTC have primarily been deployed to date as an element of CSO/SSO control, clarify target sewer sheds where CSO/SSO control are a primary driver of planned investment
- Perform an initial system screening to gauge "control-worthiness" of PWSA's existing system using the Planning Aid for Sewer System real Time control (PASST). This can be performed in conjunction with detailed priority shed master planning so that RTC options can be evaluated in concert with other interventions.
    - PASST was developed and published in 2004 by Schütze et al. and updated in 2017. A fully worked case study is available which details the procedures of evaluating the control potential of the system and setting up an RTC system and control algorithm.[2]
    - A web-based version of the PASST evaluation table (in German) is available at http://www.passt.infraconsult.de/03_Bewertungstabelle/bewertungstabelle.html
- Evaluate dry weather system capacity to determine whether RTC inline storage is an option.
- If initial PASST screen indicates "control-worthiness", pursue detailed RTC evaluation using hydrodynamic model (see Stage 2 of Real Time Control evaluation procedure in Appendix 2). This evaluation could be applied first to one or two priority sheds to facilitate the implementation of a pilot scale application.
- RTC strategies can vary in complexity and extent and can be utilized in specific focus areas rather than trying to apply a full system smart sewer network from the outset. Initial implementation should focus on priority sheds identified in the Strategic Plan for

[1] Stinson, M. K. and C. Z. Vitasovic. *Real Time Control of Sewers: US EPA Manual*. In Proceedings, 2006 World Water and Environmental Resources Congress, Omaha, NE, May 22 - 25, 2006. American Society of Civil Engineers (ASCE), Reston, VA, ., (2006). Retrieved from: https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=154344

[2] Manfred Schütze, Maja Lange, Michael Pabst, Ulrich Haas; Astlingen – a benchmark for real time control (RTC). Water Sci Technol 31 May 2018; 2017 (2): 552–560. doi: https://doi.org/10.2166/wst.2018.172. Retrieved from: https://iwaponline.com/wst/article/2017/2/552/38794/Astlingen-a-benchmark-for-real-time-control-RTC

Stormwater, particularly where CSO/SSO source control is likely to be required post tunnel and post regionalization.

- Case studies of RTC implementation in South Bend, Cincinnati, and Buffalo show that a phased approach that builds incrementally has a higher success rate and easier management. Further, project managers involved recommend first installing sensors to provide real time monitoring for better sewer system characterization during wet and dry conditions.
- Dynamic flow diversion to convey flow away from overloaded interceptors during wet weather events could still present an opportunity for a system operating at the higher end of its design capacity during dry weather.

RTC Implementation Examples

South Bend, IN

The City of South Bend, IN developed a real time control and real time decision support system (RTDSS) in partnership with the University of Notre Dame and Purdue University to optimize the use of its existing infrastructure.[3] The partnership led to the formation of EmNet, a private company that has since worked with Evansville, IN; Columbus, OH; Buffalo, NY; and San Francisco, CA to implement RTC systems. EmNet is now a subsidiary of Xylem.

- Dry weather overflows have been completely eliminated and combined sewer overflow volumes were reduced by more than 70 percent annually (1000 MG/year).[4]
- The smart sewer program required 60 percent less infrastructure investment compared to their original long-term control plan, which saved the City $400 million in capital expenditure spending.[5]
- The project cost $7 million to implement and costs an additional $280,500 per year for data collection, operations, and maintenance fees. The project was completed in four years, between 2007 and 2011, which included the development of software and hardware.[6]
- The project managers recommend that cities seeking to adopt smart sewer technologies focus first on installing sensors and collecting data to help understand the existing system capacity, as well as "invest[ing] more, earlier".[7]
- Having good communication between the smart sewer infrastructure contractor, the city, and the water authority(s) is crucial, as is having clearly defined operation procedures and designated responsibilities.

[3] Gilot, Gary & Henthorn, Patrick & Ruggaber, Timothy. (2013). *From Concept to Practice: South Bend, IN's Intelligent Collection System.* Proceedings of the Water Environment Federation. 2013. 647-666. 10.2175/193864713813504395. Retrieved from: https://www.researchgate.net/publication/314524603_From_Concept_to_Practice_South_Bend_IN's_Intelligent_Collection_System
[4] "Utility Reduces CSO Volume by More Than 70% and Saves $400 Million in CapEx Spending Using "Smart Sewer" Technology," Xylem, accessed January 13, 2022, https://www.xylem.com/en-us/support/case-studies-white-papers/south-bend-indiana-reduces-combined-sewer-overflow-70-percent-saves-400-million/
[5] Ibid.
[6] "South Bend, Indiana Uses Smart Sewer Technology to Monitor and Manage Increased Water Levels," Indiana University Environmental Resilience Institute, accessed January 17, 2022, https://eri.iu.edu/erit/case-studies/south-bend-indiana-uses-smart-technology-to-monitor-and-regulate-wastewater-levels.html
[7] Ibid.

Cincinnati, OH

The Metropolitan Sewer District (MSD) of Greater Cincinnati worked with Xylem to implement real time control system as part of its CSO mitigation program. MSD reports a reduction of 247 million gallons of overflow reduction as a result of the RTC program and avoided capital costs of $38 million. Some additional reported benefits include:

- Reduction of overflows by 15% in the first year after implementing real time monitoring capabilities, and by 33% in the second year after implementing real time control capabilities.[8] [9]
- Low cost of implementation at approximately $.01/gal.

Buffalo, NY

The Buffalo Sewer Authority (BSA) operates a sewer system with a designed capacity of up to 750,000 people but is serving closer to 250,000. The excess capacity presented an opportunity to use real time control for inline storage and maximize the capacity of their collection system.[10] Additional highlights:

- Real time control program reduced their long-term control plan cost from $525 million to $380 million, a reduction of about 27 percent. The first three inline storage RTC sites have reduced Buffalo's CSO overflows by 450 million gallons (around 23%).[11]
- Used hydraulic model of the collection system to identify the locations best suited for RTC storage projects.

Albany, NY

Albany's Department of Water and Water Supply implemented a smart network using the Opti Platform in the Beaver Creek Sewershed, their largest combined sewershed that previously discharged over 530 MG/YR of combined sewer overflows to the Hudson River. Additional highlights:

- Increased wet weather capture from 10% to 90% at a cost of $0.005 per gallon.[12]
- enerated 93% capital savings and generated 6.5X improvement in wet weather capture mitigating downstream flooding and CSOs.

[8] *Smart Sewer Systems and Smart Data Infrastructure*, EPA. Retrieved from: https://www.epa.gov/system/files/documents/2021-11/smart-sewer-webinar.pdf
[9] *The Case for Operation Optimization*, Metropolitan Sewer District of Greater Cincinnati. Retrieved from: https://msdgc.org/downloads/initiatives/innovative_technologies/The_Case_for_Operational_Optimization_v2.pdf
[10] Hammerstein, Matt, "Artificial Intelligence in Wet Weather Infrastructure" (2019). Williams Honors College, Honors Research Projects. 893. https://ideaexchange.uakron.edu/honors_research_projects/893
[11] "Real-Time Decision Support System exceeds expectations – helps reduce CSOs by 450 million gallons helping reduce consent agreement by $145 million," Xylem, accessed January 19, 2022, https://www.xylem.com/en-us/support/case-studies-white-papers/machine-learning-reduces-combined-sewer-overflow-volume-and-helps-reduce-a-consent-decree-by-145/
[12] "City of Albany, NY," OptiRTC, https://optirtc.com/assets/images/case-studies/CaseStudy-Albany-New.pdf?_cchid=d4b8b7e9a4b7fe409bde53e3c850a831

Stormwater Management + Renewable Energy Systems

Another group of technologies that could help PWSA better leverage its stormwater fee are installations that integrate renewable energy generation or storage and stormwater management. These include projects that co-located stormwater retrofits with solar arrays or battery storage projects. Among the most promising of these technologies are solar green roofs – integrated rooftop installations that include both a green roof and solar arrays. These technologies have been in wide use within Europe, but have only been recently introduced commercially into the U.S.



Solar green roofs installed in conjunction with affordable housing offers a particularly potent combination of environmental and social benefits as well as multiple revenue streams and subsidies.

Recommendations and Conclusions for PWSA

- Engage with the Pittsburgh City Planning Department regarding the potential for co-locating stormwater and energy generating facilities that advance the City's Energy Strategy.
- Engage with URA regarding the possible inclusion of supplement stormwater management and solar generation pay for performance requirements into affordable housing RFPs (see also Alternative Delivery Memo).
- Evaluate the potential for incorporating stormwater retrofits and battery storage projects into a single incentive program that could reduce the installation costs of both project types.

Solar Green Roofs

Solar green roofs provide the potential to "stack" subsidies for property owners. For instance, an installer of a green roof solar system for stormwater compliance (e.g., as part of new or redevelopment) may qualify for a volume or rate control incentive grant under the new Pittsburgh Stormwater Ordinance, provided the green roof can be upsized to provide additional management beyond the required volume or rate control. This incentive could be paired with renewable energy incentives, such as the federal tax credit.

Installation of the solar roof system can also be funded privately as through a power purchase agreement, in which the solar provider pays for the cost of the system and then sells power to the owner or back to the grid for a period of time, typically 20 years. In this instance, the inclusion of a green roof component can increase the efficiency of the solar array, helping to reduce the return on investment. This can make smaller roof surfaces potential candidates for a PPA-funded solar installation than might be possible with a conventional solar array. The increase in the efficiency of the solar array is due to the cooling effect of the green roof, which

can increase solar capture efficiency during the summer months. Additionally, as the green roof provides a structural role in the solar panel array, acting to ballast the solar panels, the green roof itself can be funded through the PPA as an integral system component. Further, the ballasting function of the green roof means that the solar array can be installed without puncturing the waterproof roof membrane. While solar green roofs can prove challenging due to loading concerns when implementing as a retrofit of an existing building, incorporating into new construction is far more straightforward. In these instances, the roof design can incorporate the loading requirement for the solar, green roof, usually with only a small premium on the cost of construction.

Stormwater Retrofits and Battery Storage

Beyond solar green roofs, the emergence of battery storage incentive programs could create another opportunity to combine stormwater management and renewable energy infrastructure. Some jurisdictions are now implementing incentive programs to encourage the deployment of battery storage projects. One such program is Energy Storage Solutions, a new statewide program targeted at incentivizing battery storage projects within vulnerable communities in Connecticut. Enabled by state legislation, the program began on January 1, 2022, and will continue for nine years. The program provides an upfront subsidy (up to 50% of project costs for commercial customers) as well as incentive payments based on energy contributions back to the grid.

The emergence of programs like Energy Storage Solutions could provide an opportunity for co-location of stormwater retrofit projects that provide stormwater fee credit. By combining or "stacking" subsidies, customers can realize revenue/savings from multiple streams with a single capital project. Programs could benefit from cross-marketing as well, helping to increase the uptake of both battery storage and stormwater retrofit projects.

3.3 Exploring Sources of External Funding

Given the gaps between PWSA's current revenue and forecasted investments needed to meet the objectives of the Strategic Plan, securing external funding will be crucial to the success of the plan. Leveraging these sources of funds will be crucial to achieving a higher level of service faster while keeping stormwater fees affordable for customers. With the passage of the Infrastructure Investment and Jobs Act (IIJA), federal funding opportunities will be particularly strong over the next 5 years, while local and state-based programs such as the ALCOSAN Green Revitalization of Our Waterways (GROW) program and Pennsylvania DEP Growing Greener will continue to be effective and important sources of funding that can be used as non-federal match.

Potential External Funding Sources

Program	Type	Geography	Funding Level	Application Period	Strategic Plan Funding Priorities	Cost Share
ALCOSAN GROW	Grant	Allegheny County	$10 million per year (average since 2016)	Annually in Fall	Sewer separation projects that feed regional hilltop or ravine storage projects, particularly in watersheds that are not draining to proposed ALOSAN tunnels	Unknown
Growing Greener	Grant	Pennsylvania	18.2 million (2021)	4/22/22-6/24/22 (FY22)	Watershed storage in equity communities, Nature-based floodplain projects that incorporate pollutant load reduction in TMDL (i.e. Saw Mill Run) areas	15% local match

PennVest Clean Water State Resolving Funds	Loan	Pennsylvania		Quarterly (May 4, 2022 August 3, 2022 November 2, 2022, February 1 2023, May 3, 2023	Separate and combined sewer capacity enhancements	
FEMA BRIC	Grant	National	$1 billion (FY21)	9/30/21-1/28/22 (FY21)	Nature based floodplain restoration and associated property acquisition, particularly for Saw Mill Run	25% non-federal

PennVest Clean Water State Revolving Funds

PennVest Clean Water State Revolving Funds are typically looked at a source of capital funding for wastewater projects. The program does, however, allocate significant funding for stormwater projects. While PWSA has successfully procured PennVest funding to support other aspects of its capital budget, it has not previously sought PennVest funding for stormwater projects. With the current inflation environment and interest/bond rates going up, PennVest loans could be a potentially important source of low-cost capital to support implementation of aspects of the Strategic Plan. Given the focus of other programs like FEMA BRIC, ALCOSAN GROW and, PennVest loan applications might be most appropriately used to fund combined or separate sewer conveyance/capacity enhancements, either as stand-alone projects or in combination with watershed storage projects.

As of 2019, PennVest also provides a programmatic financing option that provides non-project specific funding for capital improvement plan. Although provided mainly for drinking water and wastewater, PennVest has a non-point source ProFi option that can fund "stormwater, green infrastructure applications, conservation easements, and other types of restoration projects for wetlands, streambanks, and watersheds." This option should be strongly considered as a strategy for funding projects through PennVest.

ALCOSAN GROW

ALCOSAN GROW funding has been successfully obtained by PWSA to fund projects such as the Four-Mile Run, Wightman Park, SoHo Green Infrastructure Project. With the implementation of the Interim Wet Weather Plan, ALCOSAN will likely shift future GROW funding to combined

sewer areas that are not managed under its current plan (i.e., by the proposed tunnels), providing an opportunity to leverage funding for projects such as partial sewer separation projects on sloped hillside and hilltop areas that feed regional storage projects in ravine typologies. According to recent input from ALCOSAN, the availability of this funding stream is questionable in the long term, but should be available to support near term projects.

Pennsylvania DEP Growing Greener

Pennsylvania DEP's Growing Greener Program (and associated Federal 319 Non-Point Source Program) provides funding primarily for water quality projects that address non-point source pollutants such as sediment, nitrogen, and phosphorus. In recent grant guidance, this traditional focus has been augmented by a new emphasis on projects that address flood resiliency and target equity areas. Growing Greener grants can be obtained for design and construction as a single grant. Alternatively, applicants can apply for funds for design only or for construction only. Given the current guidance, PWSA should look to Growing Greener to fund the design of integrated floodplain projects, particularly if addressing non-point source pollution (for instance through stream restoration).

FEMA Building Resilient Infrastructure and Communities (BRIC)

The Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure and Communities (BRIC) Program is FEMA's pre-disaster mitigation funding program. BRIC provides funding for a range of disaster mitigation activities, primarily through an annual national competition, a smaller pool of funding is allocated directly to states, territories, and tribal entities. BRIC provides funding for planning, project scoping, design, and construction. Applications to BRIC are made by states, territories, and tribes on behalf of local project applicants. In Pennsylvania, BRIC applications are packaged and submitted by the Pennsylvania Emergency Management Agency (PEMA).

BRIC is a highly competitive program that emphasizes cost effectiveness in project selection as demonstrated through FEMA's Benefit Cost Analysis methodology. In the first two years of the program (FY20 and FY21), requests have exceeded the available funding by an approximately 4:1 ratio. Funding priorities also include the use of nature-based communities and funding for underserved communities via the Justice40 Initiative. BRIC funding also requires alignment with County-level and State-level Hazard Mitigation Plans.

BRIC provides a potentially potent source of funding for PWSA, particularly with regards to nature-based flood mitigation projects, such as are depicted in the Floodplain Project Type. Pre-planning/scoping to ensure that projects are competitive based on FEMA's Benefit Cost Analysis is critical. In developing BRIC applications, PWSA should coordinate project development and identification efforts with the City of Pittsburgh, Office of Sustainability, Allegheny County Department of Emergency Services (which led the development of the County's Hazard Mitigation Plan, and Local nonprofits such ss the Watersheds of South Pittsburgh.

Recommendations

Develop a Joint Funding Strategy

PWSA, in collaboration with other city entities through the Joint Stormwater Task Force, should develop a stormwater and resilience funding strategy. This strategy would build on the grant opportunities identified in the Strategic Plan to build out specific agency roles, target projects, and application timelines. Particularly important to this effort will be to identify multi-objective, nature-based projects that can meet both PWSA's needs as well as meeting the goals of other agencies and neighborhood-based plans. These projects need to be developed with a detailed understanding of funding preferences to improve the chances of funding, particularly for highly competitive national funding programs like FEMA BRIC. Also critical will be to identify strategies for leveraging multiple outside funding sources. This will require careful alignment of project development, grant application, and implementation timelines through a collaborative planning process. This strategy will allow PWSA to align project timelines to facilitate funding from multiple programs. (For instance, obtain Growing Greener funds to provide design resources (and non-federal match) and subsequently pursue a FEMA BRIC grant and/or PennVest financing).

Additional considerations with respect to alignment of funding streams include:

- Alignment of Priorities – Developing a nuanced idea of how funding preferences interact will allow PWSA to plan for projects that appear to multiple funders. For instance, if PWSA is developing a project for Growing Greener funding to fund design but to BRIC or PennVest funding to support construction, the concepts offered in the initial Growing Greener Grant must also reflect FEMA and/or PennVest funding preferences and requirements.

- Procurement, Matching and Other Requirements – Each grant program has individual requirements for how design and construction services must be procured, what qualifies as matching funds, and topics such as prevailing wages and minority/woman owned business requirements. Understanding these requirements upfront is critical to deploying grant resources effectively. For instance, if competitive bidding is required, the use of a full delivery project delivery model may not be possible.

Hire a Grant and Funding Coordinator or Consultant

External funding is often limited by internal capacity. Given the anticipated high levels of funding available over the next several years, PWSA in collaboration with other city partners should co-fund a grant and funding coordinator or consultant. This coordinator would initially develop a funding strategy and subsequently to assist with the development of individual grant applications. A dedicated resource can bring the time and expertise to the grant development process required to optimize project selection and design to enhance funding possibilities. PWSA could also look to local foundations to provide grant development support, possibly through a consultant contract.

Action 6: Joint Task Force

As discussed in Task 2, one of the six Targeted Actions of the SWSP is to develop a framework and charge for a city-wide Joint Task Force focused on localized flooding and stormwater management. The initiative can maximize impact of investment despite resource scarcity, confront climate change and future adaptations, streamline project approvals and implementation, speed up delivery of quality-of-life improvements in environmental justice communities, and create compelling incentives for source reduction and increased cooperation.

Managing stormwater and localized flooding is a whole-of-government challenge. While PWSA has assumed significant responsibility for management of water quality and quantity issues around stormwater within the City, and the recent imposition of the stormwater fee cements the perception of PWSA's responsibility in the eyes of rate-payers, in reality PWSA exercises precious little control over many of the key factors that contribute to these challenges and complicate the implementation of solutions (e.g.: impervious public and private landscapes, overlapping utilities, etc.). Across city government, current siloed roles and responsibilities inhibit effective planning, funding, and execution of needed investment. Furthermore, given PWSA's limited resources in this regard, without leveraging the knowledge, capability, and resources of other departments/authorities, PWSA's efforts will not succeed.

The scope and terms of PWSA's engagement with city government is memorialized in a series of agreements and memoranda, with a specific MOU governing responsibility for MS-4 permit compliance currently under negotiation. In addition, it is expected that both PWSA and the City will be parties to the pending consent decree with respect to ongoing CSO/SSO compliance. The current change in mayoral administration provides a window for broadening, accelerating, and formalizing this cooperation.

Peer Utility Experiences

While the challenges faced by other cities with respect to stormwater and localized flooding vary somewhat, and the specific structure, history, and political dynamics among entities involved are necessarily unique, hard won experience from peer cities can provide valuable models to emulate and adapt to Pittsburgh. As the specific scope and operation of the proposed task force takes shape, PWSA can draw on specific input from peer utilities.

New York, DC, and Philadelphia have implemented similar approaches in response to distributed compliance responsibility and major flooding events, with promising results. We interviewed current and/or former utility management from each city:

- In the case of New York, the best analogue is the relatively new flooding Task Force currently addressing fallout and actions in response to Hurricane Ida.
- Philadelphia offers two examples to work from: A Clean Water Task Force developed to coordinate the City's various departments' response to MS-4 requirements, and the Flood

Risk Management Task Force developed to address longer-term flooding issues associated with floodplain management, floodplain development and climate change-induced changes to flood risk.

- The experience in Washington D.C. offers no fewer than four analogous task forces: The Stormwater Fee Task Force, The Green Cabinet, the Clean water Task Force, and the Mayor's Flooding Task Force.

Key takeaways/lessons learned from our conversations can be distilled as follows:

1. Establish joint goals and objectives.
2. Identify key issues for resolution to achieve goals and objectives.
3. Initiate resolution of conflicts or uncertainties.
    a. Either achieve consensus on a path forward
    b. Task smaller groups of agencies/parties to resolve
    c. Report back to group
    d. Elevate to decision-makers if unsuccessful
4. Report and highlight accomplishments

<u>Proposed Goals for the Task Force:</u>

Based on interviews with other key stakeholder agencies earlier in the planning process and input from peer cities, the following initial goals for the establishment of the Task Force, subject to agreement of the parties, are recommended:

1) Shared adoption of, and accountability for, the priorities of the PWSA Strategic Plan for Stormwater
2) Accelerated negotiation and adoption of applicable MOU's governing responsibility for stormwater compliance and management of flood risk
3) Improved collection and sharing of flooding and stormwater data
4) Coordination of public input and development of accurate, consistent messaging around localized flooding and stormwater issues
5) Identification and elimination of existing barriers to effective implementation of investment at scale, e.g.:
    a. Development of streamlined review and approval processes for PWSA-led stormwater projects in public spaces/ROW
    b. Criteria for inclusion of stormwater investments/benefits inclusion in other city-led projects
    c. Coordination of incentives and enforcement for stormwater activities undertaken as part of private investment
    d. Coordination of evaluation and approval for alternative delivery mechanisms of stormwater services

6) Identification of opportunities for shared investments with stormwater/flooding benefits by aligning stormwater planning, budgeting, and funding strategies with other capital investments in affected communities, e.g., transport, housing, recreation, education

Proposed Structure of the Task Force:

While the specific makeup of the task force will require agreement from PWSA and the City, we would propose the following basic structure:

a) A core group of "core members", jointly chaired by PWSA executive management and a senior member of the mayor's staff, to consist of senior staff from the following organizations:

- *PWSA Executive Management*
- *Mayor's Office (Chief Operating Office or Chief of Staff)*
- *City Planning/Resiliency*
- *DPW/Parks and Rec*
- *DOMI*
- *DPS/OEM*
- *City Finance*
- *URA*
- *Chief Equity Officer*
- *Pittsburgh Schools*

This group would be responsible for adoption of specific goals, responsibilities, and timelines for the Joint Task Force. While the head of each department would not necessarily serve as a task force member, experience elsewhere has shown that the various representatives should have sufficient seniority and decision-making authority within their respective groups to allow for meaningful negotiation and ability to commit their groups to a specific course of action.

b) Insofar as significant coordination of activities will be required with entities beyond the city, a larger group of stakeholders would be invited to participate to include:

- *PWSA Functional Area Management (Operations, Engineering, Stormwater, Finance)*
- *ALCOSAN*
- *PennDOT*
- *Duquesne Light*
- *People's Gas*
- *ACHD*
- *ACCD*

- *Regional FEMA*
- *Local ACOE*
- *Interested Labor, Business, and Community Organizations*

Proposed Initial Actions for Task Force:

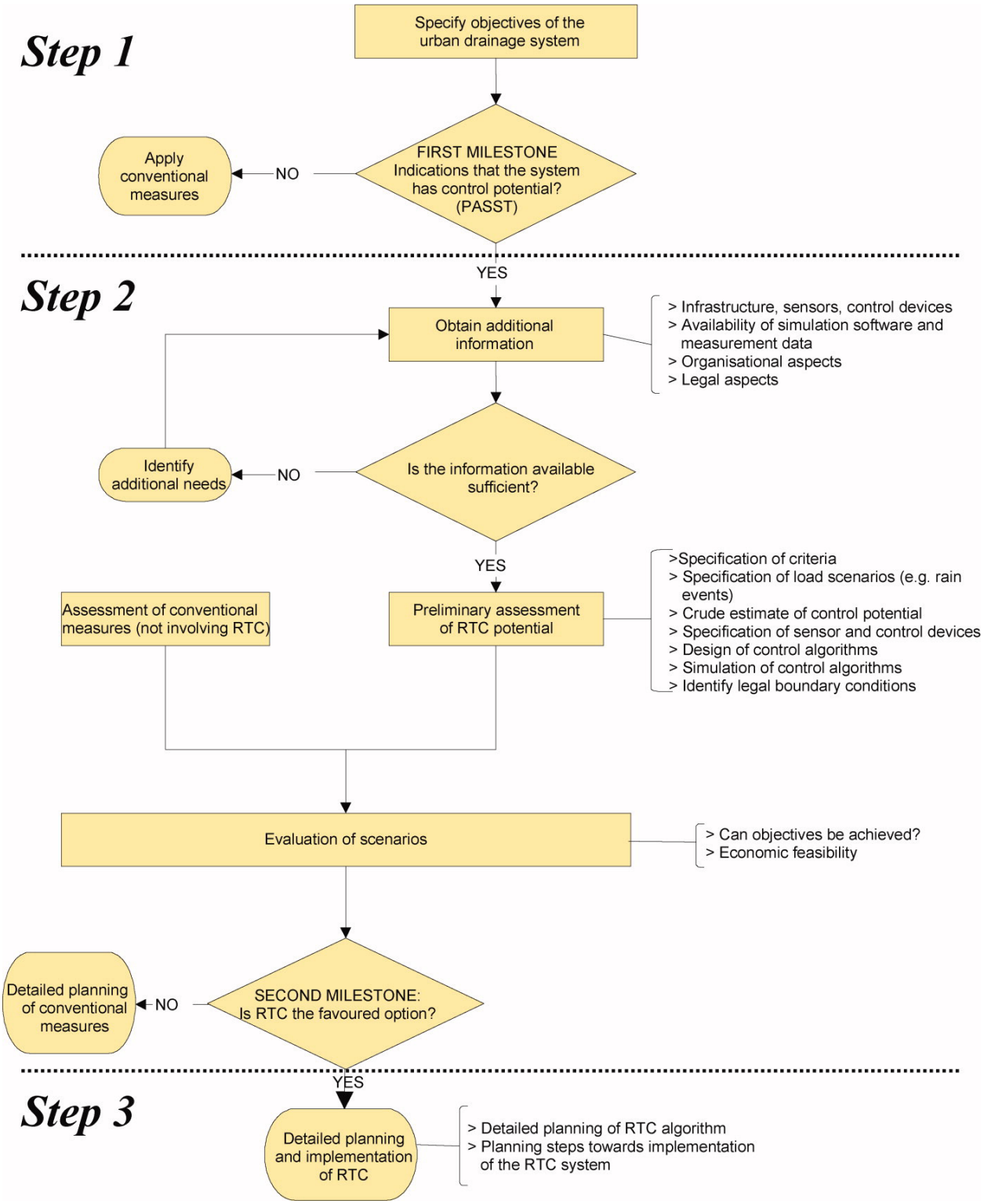
Based on the experience of other cities with this model, we propose the following initial actions to provide clarity around the mission and goals of the Joint Task Force:

- Secure Mayoral and Council buy-in, including any necessary executive orders or actions
- Public announcement regarding the JTF
- Agree consensus Goals/Objectives and associated schedule (assume semi-monthly meetings from outset),
- Commitment to information sharing, and public interaction
- Inventory current efforts/responsibilities and agreements among parties. Solicit JTF member and public input for identifying impediments and opportunities
- Undertake coordinated analysis of planning and capital/funding cycles and potential areas of leverage and joint funding opportunities.

APPENDIX 1 – Summary of Capital Projects

Project Name (per PWSA)	Proj ID	Sewershed	Neighborhoods	Technologies	addressing	Runoff Managed	Status	Budget Cost	Comments
1. Maryland Ave.	GROW: 2019_01-036		Ward 7	Permeable pavement GSI to handle 1" in 15 min downspout disconnection street tree protect/plantings	basement back-ups **Neighborhood flooding**	13 ac. impervious 1.5" runoff event		total $6.33M incl. previous	in public ROW documented flooding/backups in 2014, 2015 engage residents on private property improvements
2. Dragoon Way	Unidentified		Ward 10	upsizing infrastructure	street & property flooding		not started	$1.16M	
3. Thomas & McPherson	2018-GI-106-0 GROW: 2017_01-032	A-42	Point Breeze North Ward 7	Storage & slow release Permeable pavement bioretention	reduce CSOs	0.47 MGY 11.6 ac. impervious GROW estimate: 3.21 MGY	Const. 25%	$4.52M total $10.9M incl. previous	ALCOSAN GROW - partial funding combined with water main improvements
4. Fleury Way	2021-424-102-0 2019-424-103-3	A-42	N. Dallas Ave Ward 12	Sewer conveyance regrade and new catchbasins	Reduce flooding		Planning	$0.60M	cost share with City DOMI database has a 2019 ID number different than CIP
5. Bus Rapid Transit	2020-GI-100-0	M-05 M-19	Downtown Ward 1 & 4	permeable pavement subsurface storage bioretention	reduce CSOs?			$1.52M total $5.6M incl. previous	cost share with City DOMI
6. South Side Stormwater	2109-GI-100-0	M-16	South Side Slopes Wards 16 & 17	slow release swales & step pools sub & surface storage raingardens stormwater separation	reduce CSOs source control CSO consent order basement back-ups	26 ac impervious	Design 100%	$4.36M total $9.29 incl. previous	Aligns with City's South Side Park Master Plan
7. South Side Flats	Unidentified		South Side Flats Wards 16 & 17	separate sewer improved conveyance	reduce CSOs		Not started	$3.53M	
8. Martin Luther King Jr./Warren K. Branch Park	2019-GI-104-0 GROW: 2017_01-031	M-19	Terrace Village West Oakland Ward 4 & 5	Storage & slow release bioretention swale smart valve	reduce CSOs	7 MGY 7 ac. impervious	Design 90%	$5.35M Total $1.63M incl. previous	ALCOSAN GROW - partial funding
9. Lawn & Ophelia	2017-424-104-0 GROW: 2017_01-036	M-19B	South Oakland Ward 4	stormwater parklet rain garden permeable pavers subsurface storage	reduce CSOs improved park gathering	0.63 MGY 1.9 ac impervious	Design 100%	$0.76M Total $1.63M incl. previous	ALCOSAN GROW - partial funding: $0.31M data from both PWSA & ALCOSAN websites
10. Woodland Road	2018-GI-108-0 GROW: 2020_01-030	M-22	Shadyside Ward 14	dry stream restoration storage with slow release bioretention	reduce CSOs reduce surcharge sewer basement back-ups	3.28MGY 7ac impervious	Const. 70%	$0.58M Total $2.72 (inl. prior yrs)	Collaboration & cost share with Chatham Univ. ALCOSAN GROW - partial funding
11. Four Mile Run	2018-GI-102-0 GROW: 2021_01-021	M-29	Garfield Hazelwood Oakland Squirrel Hill Ward 15	stream daylight/restoration larger sewers/conveyance flood plain creation/bioretention subsurface storage **sewer separation** **Smart valve - Lake level control**	reduce CSOs basement back-ups Neighborhood flooding	24 MGY	Design 90%	$16.4M total $45M incl. previous	Includes water main relocation ALCOSAN GROW - $10m to be reimbursed data from both PWSA & ALCOSAN websites
12. Braywood	Unidentified		Ward 15	possible permeable paving bioswales subsurface detention	persistent flooding		not started	$0.91M	early planning stages to improve level of service
13. Wightman Park Phase I & II	2017-424-105-0 GROW: 2020_01-031A	M-29 Four Mile R	Squirrel Hill Ward 14	rain garden with storage subsurface storage street bumpouts separate SW	reduce CSOs sewer basement back-ups	2.24 MGY 12 ac impervious GROW estimate: 7.51 MGY	Const.: Ph I: 100% Ph II: 75%	$0.43M Total $6.7M (inl. prior yrs)	ALCOSAN GROW - partial funding Aligns with City's Wightman Park Improvement Proj.
14. Saw Mill Run Watershed	2020-424-109-0	Saw Mill Run	Overbrook Ward 32	stream restoration vegetated floodplain	reduce erosion MS4 water quality reconnect people to stream		Planning	$1.00M	
15. Saw Mill Run MS4 compliance	Unidentified	Saw Mill Run	Ward 32 & 29	MS4 compliance	MS4 compliance		not started	$3.5M	project types not identified
16. Volunteers Field (pt of Saw Mill Run)	2018-GI-104-0	Saw Mill Run	Carrick Ward 29	Ph I rain garden Ph II athetic field regrading inlet sediment traps	MS4 water quality	0.75 MGY sediment 2.2k lbs/yr	Const.: Ph I: 100% Design: Ph II: 90%	$0.94M Total $1.74 (inl. prior yrs)	
17. Nobles Lane	2021-424-104-0	Saw Mill Run	Carrick Ward 29	Sewer conveyance regrade and new catchbasins green filters in catchbasins	overland flooding			$0.16M	no existing stormsewer
18. Phillips Park	2019-424-103-2	Saw Mill Run	Carrick	subsurface storage - slow release Queenston sewer separation	street & property flooding		Const. 100% sewer design		emergency project
19. Stewart Ave Stormwater	Unidentified	Saw Mill Run	Carrick Ward 29	source control	street & property flooding		not started	$3.10M	project types not identified
20. Woods Run Phase I & II	2017-424-108-0 GROW: 2019_01-038		Perry North Ward 26	rain gardens stream & wetlands restoration tree plantings sewer separation	reduce CSOs reduce flooding & erosion Water quality	2.44 MGY 7.2 ac impervious	Const.: Ph I: 100% Design: Ph II: 90%	$3.01M Total $10.2M (inl. prior yrs)	ALCOSAN GROW - partial funding
21. Winchester Drive at Grovemont	Unidentified		Banksville Ward 20	Sewer conveyance regrade and new catchbasins	overland flooding hillside erosion		Const. 95%	$0.20M Total $0.84M (inl. prior yrs)	poorly designed street and catchbasins
22. Haverhill Street Improvements	Unidentified		Ward 13	intercept groundwater seep landslide stabilization	flooding & sediment		not started	$0.70M	

APPENDIX 2 – Real Time Control Evaluation Protocol



Real Time Control evaluation procedure (Schutze, M. et. al, 2008)

APPENDIX C

PennPraxis

Project Name: Developing PWSA's Strategic Plan for Stormwater

Project No.: 2020-025-OPS

ACTION 4: Level of Service Recommendations

March 18, 2022

Introduction

One of the key elements of the PWSA Stormwater Strategic Plan for the city of Pittsburgh is outlining an appropriate Level of Service for the stormwater program. At its core, Level of Service sets a standard for the performance of the stormwater system with respect to such issues as water quality and flood conveyance, and by extension, the capital and operational investments needed to attain this level of performance. Level of Service integrates both regulatory obligations (e.g., reducing combined sewer overflows, achieving required pollutant load reductions in MS4 areas) and aspirational goals (e.g., preventing flooding) that relate to sustainability or public health objectives. Various levels of service are associated with different costs of service, so the selection of an appropriate Level of Service depends not only on what is physically feasible or desirable, but on the ability of PWSA (and city partners) to pay for system upgrades and maintenance.

Peer City Level of Service Review

Building on the Task 2 deliverable, which articulated broad principles around Level of Service policy development, the team has conducted a review of Level of Service policies and related design criteria for several peer cities. Briefly, the team reviewed Level of Service and related policies for 13 peer cities, including Atlanta, Cincinnati, Cleveland, Milwaukee, and Philadelphia. For each community, the team reviewed pertinent policies to understand sizing requirements (i.e., design storm events) for combined sewer and separate sewershed areas, as well as for stream channels and floodplains. Although design standards and approaches varied considerably, a few important trends and best practices emerged from the review:

- Although there were exceptions, design standards in combined sewer areas (typically older areas) tended to target smaller events than did corresponding policies in separate sewer areas. Several communities based their design requirements for combined sewers on a 5-year recurrence interval, while requirements in separate sewershed areas tended to be based on a 10- or 25-year recurrence interval event.

- New York City was notable for the use of a short duration "cloudburst" event in determining design standards for combined sewers. This could be an interesting model for incorporating higher levels of performance within combined sewer areas.
- Both Cleveland and Philadelphia established policies that allowed flexibility at the individual project level. While minimum standards are important, incorporating a flexible policy that recognizes both opportunities and constraints at the local scale could be an important point of emphasis for Pittsburgh.
- Greenville, South Carolina established both strategic and tactical Level of Service policies. The strategic Level of Service policy expressed overall program goals, while the tactical level of service focused on specific targets for individual asset types. This model provided a useful precedent for thinking about the relationship between the performance of PWSA's sewer system and larger City-wide infrastructure protection goals.
- Greenville's policy included an interim or short-term Level of Service goals, as well as long-term or ultimate Level of Service targets. This approach could be important for PWSA in building and maintaining public support by attaining significant improvements in Level of Service within priority areas over a short period of time, even as more ambitious longer-term investments are planned.
- PennDOT used a roadway classification-based Level of Service policy that provided more stringent design standards for certain types of roadways such as emergency routes, while using less stringent standards for other roadway types. This approach provides a potentially useful framework for organizing Level of Service policies in Pittsburgh, as is discussed below.

The results of the peer-city research are further summarized in Appendix 1.

Overview: Level of Service Recommendations

Building on peer-city work, the team has developed the following recommendations for the development of Level of Service policies for Pittsburgh. Additional insight into each recommendation is provided in the paragraphs below.

- **Establish distinct but related Level of Service policies for 1) flooding of surface infrastructure (City) and 2) performance of the PWSA sewer system.** Level of Service relating to how frequently surface flooding occurs should be established as a broad-based City-wide policy, with connections to a more narrowly focused and separate Level of Service policy for PWSA conveyance infrastructure.

- **Work with City-agencies via the Joint Task Force to establish roadway classification-based standard for surface flooding.** PWSA can and should play a leadership role in working with the city-wide Joint Task Force (JTF) to establish a City-

wide Level of Service policy for surface flooding. Classification systems that establish Level of Service by roadway classification are suggested as a framework for this policy.

- **Develop a Level of Service policy for PWSA infrastructure that balances affordability and public responsibility.** PWSA should seek a balanced approach to Level of Service that improves capacity over time, effectively balancing affordability and public responsibility, starting with priority sheds. PWSA should avoid using a "stand pat" approach that maintains the existing system over time and thus fails to provide enhanced levels of flood control, and also an aggressive approach that envisions a much higher Level of Service at the expense of affordability.

- **Focus modeling efforts and condition assessment efforts on priority sheds to identify capacity issues and identify root causes.** Detailed hydraulic modeling of PWSA's existing system and updated condition assessments will be critical to understanding where the system is capacity limited and what root causes are responsible. Ultimately this level of detailed analysis is needed to understand what Level of Service can be achieved given available resources. This work should begin with priority sheds, where resources are needed most.

- **Clearly and transparently communicate with the public around Level of Service issues as part of an integrated communications strategy for stormwater.** Level of Service can be a difficult issue to communicate with the public since it involves a technical understanding of sewer and infrastructure performance and challenging conversations around affordability. Clear and transparent communication is needed to build public trust and set expectations. Communications around Level of Service should clearly articulate the important tradeoffs between the level of performance stormwater infrastructure is able to provide and the available resources needed to upgrade the system. Communications should emphasize that meaningful increases in Level of Service are a whole-of-government responsibility that require generational investments in both stormwater and roadway infrastructure. Communications should also emphasize that the Level of Service that can be achieved is also limited by affordability concerns and specifically the need to limit increases to the stormwater fee. PWSA's goal is to leverage external funding such as FEMA BRIC and State Revolving Funds, which will help achieve a higher Level of Service while limiting rate increases. This recommendation will be further developed as part of the Communication Framework developed under Action 5.

Detailed Level of Service Recommendations for Pittsburgh

Establish distinct but related Level of Service policies for 1) flooding of surface infrastructure (City of Pittsburgh) and 2) performance of the sewer system (PWSA)

Level of Service is a broad and potentially misleading term that can encompass a wide array of performance objectives relating to stormwater infrastructure. For instance, some Level of Service policies may set a performance objective with respect to the conveyance capacity of the storm sewer network, while other policies may refer to Level of Service with respect to the frequency that surface infrastructure assets such as roadways. PWSA should establish a Level of Service policy that relates specifically to the infrastructure that it owns and operates, namely, the combined and separate storm sewer system. With respect to flooding in particular, this Level of Service policy should be then linked to and informed by a separate City-wide Level of Service policy that stipulates acceptable flood frequency/duration/depth for surface infrastructure such as roadways, buildings, parks, etc. Importantly, attainment of the target Level of Service for the sewer system does not allow the city to attain a particular Level of Service for surface flooding. Attaining a surface flooding Level of Service may require a host of other infrastructure investments relating to roadways, bridges, buildings, floodplains and other City-assets.

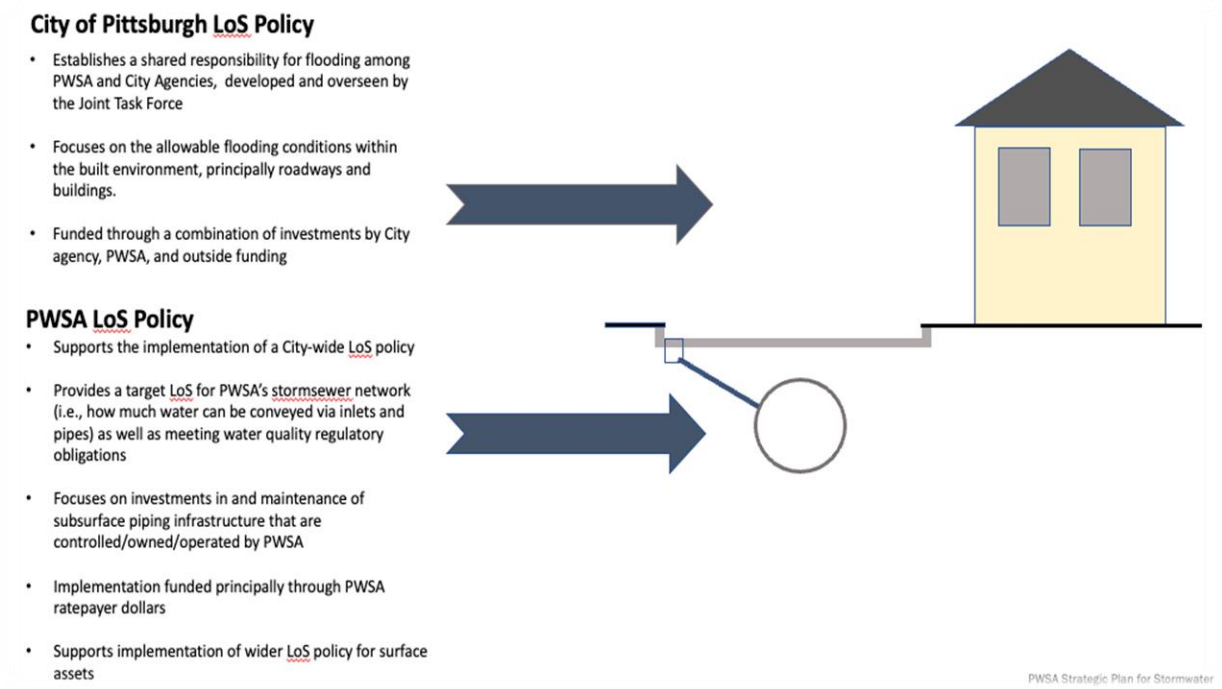


Figure 1. *Conceptual relationships between PWSA-specific and City-wide Level of Service policies*

Work with City-agencies via the Joint Task Force (JTF) to establish roadway classification-based standard for surface flooding

As described above, establishing and ultimately attaining a City-wide Level of Service policy for surface flooding is a whole-of-government responsibility that relies on a suite of related investments in sewer, roadway, and building infrastructure. Given the inherently cross-agency nature of this work, we see the development of this policy as best developed by the Stormwater/Flooding JTF proposed as Action 6 of the Stormwater Strategic Plan. Placing the City-wide Level of Service work in the hands of the JTF will help to ensure that surface flooding is viewed as a whole-of-government issue, rather than solely a PWSA problem. The Level of Service should directly influence and be influenced by capital and operational budgets for a range of city departments that will be involved in attaining the Level of Service, including City Planning, DOMI, Public Works, Parks etc. The JTF provides the most appropriate venue for this work. In fact, Level of Service policy development would provide a clear initial set of tasks for the JTF that would encourage a collective planning approach.

Although there are many conceptual frameworks around which to build a city-wide Level of Service for flooding, a roadway-based classification such as shown in Figure 2, seems the most useful and intuitive. Such a system establishes a target Level of Service (usually a particular depth and duration of flooding for a given recurrence interval event) for various roadway classifications. These classifications would range from roadways in which no street flooding would be allowed (Type A) for a particular flood, to roadways that act as intentional conveyance during a particular event (e.g., as with a cloudburst-type approach) (Type D). Figures 3a, b, and c. provide examples of roadway-based Level of Service schemes that have been implemented by other jurisdictions. These include PennDOT, whose Level of Service roadway classifications may provide a good starting point for locally-owned roadways in Pittsburgh.

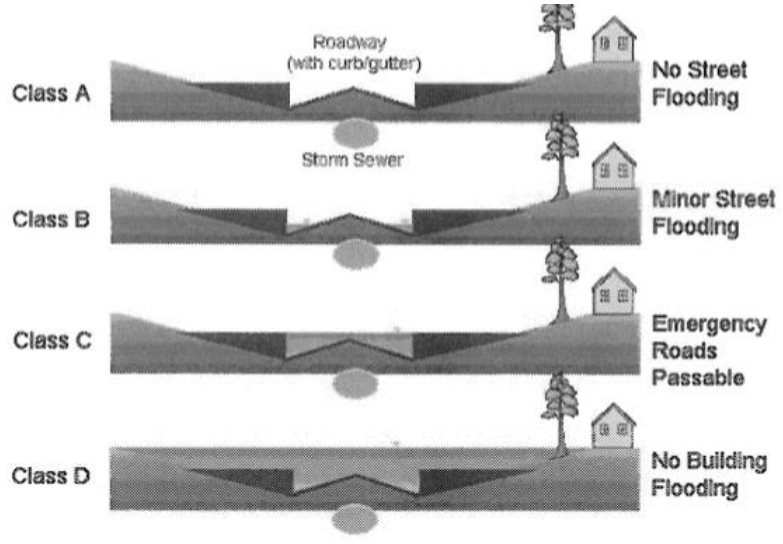


Figure 2. *Conceptual illustration of a roadway classification-based Level of Service framework.*

Gregory, M.M.F. Schmidt and Aldrich. 2003. "Level of Service Evaluations for Stormwater Assessments." *Journal of Water Management Modeling* R215-04.

A

Level of Service Category		Maximum Allowable Flooding Depths		
Category	Description	10-y/1-h event	25-y/24-h event	100-y/24-h event
A2	two-lane arterial	0 ft above inlet	no building flooding	no building flooding
A4	four-lane arterial	0.25 ft above inlet	no building flooding	no building flooding
A4/E	four-lane arterial/ emergency	0.25 ft above inlet	0.25 ft below crown	no building flooding
C2	two-lane collector	0 ft above inlet	no building flooding	no building flooding
C2/E	two-lane collector/ emergency	0 ft above inlet	0.25 ft below crown	no building flooding
C4	four-lane collector	0.25 ft above inlet	no building flooding	no building flooding
C4/E	four-lane collector/ emergency	0.25 ft above inlet	0.25 ft below crown	no building flooding
O	open channel	0 ft above top of bank	no building flooding	no building flooding
R	residential route	0.75 ft above inlet	no building flooding	no building flooding

B

DESIGN FLOOD SELECTION GUIDELINES

FUNCTIONAL CLASSIFICATION	MAXIMUM EXCEEDANCE PROBABILITY (%)	MINIMUM RETURN PERIOD (YEARS)
Interstate and Limited Access Highways	2	50
Principal Arterial System	2	50
Minor Arterial System	4	25
Rural Collector System, Major	4	25
Other Collector Systems	10	10
Local Road and Street Systems	10	10

C

Roadway Classification / Use	Design Storm	Flooding Depth
Emergency Access Routes	10-Year	8.0 ft Maximum Gutter Spread
Collector Roads	10-Year	8.0 ft Maximum Gutter Spread
Local Roads	10-Year	8.0 ft Lane Width Open
Roads with No Other Outlet	10-Year	8.0 ft Lane Width Open
Parking Lots (with a check of the 100-year storm flooding depth and maximum 1-foot depth)	10-Year	Maximum 0.5 ft Depth
Detention Areas utilized for other purposes with general public access (i.e. parking lot detention, etc.) with flood warning sign	10-Year	Maximum 1.5 ft Depth
Material Storage Areas / Landscape Areas with flood warning sign if area is utilized by the public (with a check of the 100-year storm flooding depth)	10-Year	Maximum 2.0 ft Depth

Figure 3. *Examples of roadway classification-based Level of Service policies from St. Petersburg, FL (A), Albany, NY (B), and PennDOT (C)*

Develop a Level of Service policy for PWSA infrastructure that balances affordability and public responsibility

A thoughtful Level of Service policy for PWSA infrastructure acknowledges PWSA's responsibilities to rate payers and the public as well as limitations on infrastructure spending imposed by affordability concerns, specifically the need to keep the stormwater fee affordable for all city residents. Within this framework, a wide range of potential Level of Service targets are possible (see Figure 4). At the low end, a baseline Level of Service target could consist of investments needed to 1) meet regulatory obligations for CSO and MS4, and 2) maintain the existing Level of Service for PWSA's conveyance and storage infrastructure, including maintenance and in-kind replacement.

A moderate Level of Service policy option would add to the baseline option investment in system upgrades in priority sheds to bring the system to provide conveyance for 5-year, 25-hour event (for combined sewer), 10-year, 24-hour event (for separate sewer) conveyance, and 100-year, 24-hour storm for floodplains, plus targeted investments in enhanced maintenance, backflow valves, buyouts, and other local flood mitigation measures.

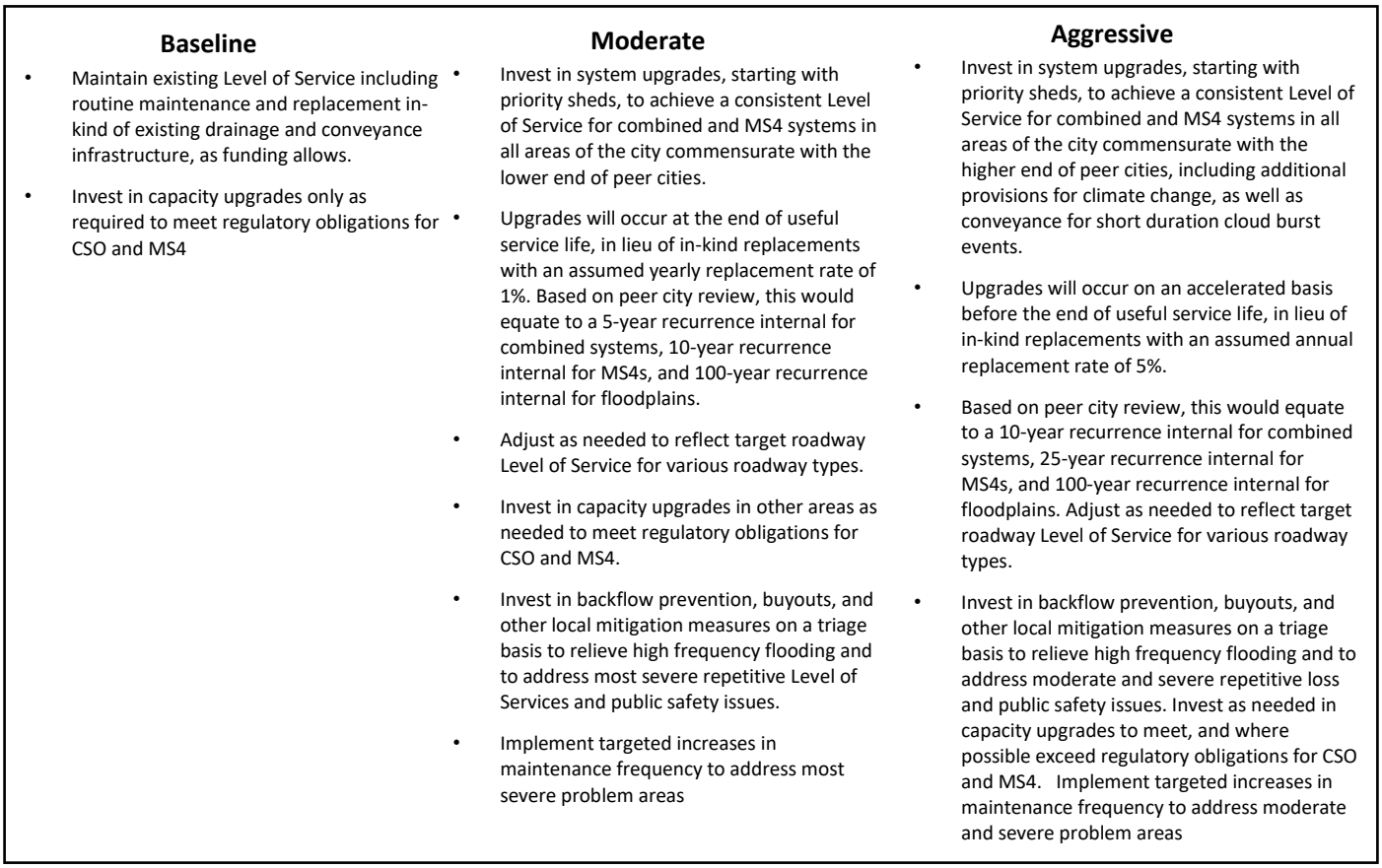


***Figure 4**. Potential baseline, moderate, and aggressive Level of Service policy options for PWSA infrastructure.*

More aggressive Level of Service policy options would invest in strategic upgrades to achieve a Level of Service commensurate with the higher end of peer-city range in all areas of the city (i.e., not just priority sheds), additional conveyance for short duration cloudburst events, and a more rapid replacement schedule.

In terms of homing in on a preferred policy option, it is likely that the Baseline option presented in Figure 4, while the most affordable, would present an unacceptable level of system performance particularly in terms of flood mitigation. On the other end of the spectrum, the Aggressive option, while providing superior levels of flood protection would likely represent an unaffordable target, even with substantial increases in the stormwater fee and significant external funding. The moderate option provides the best balance between affordability and performance, allowing PWSA to achieve a Level of Service in line with peer-cities while recognizing the limits of its financial resources.

Focus modeling and condition assessment efforts on priority sheds to identify capacity issues and identify root causes

Regardless of the Level of Service policy option selected, the development of a final Level of Service policy will need to be strongly informed by the detailed hydraulic and hydrologic (H&H) model that PWSA's Wet Weather Team is currently developing, in concert with condition assessments of PWSA infrastructure. This modeling will allow for a more precise understanding of the gap between the existing Level of Service and various Level of Service targets as well as root cause analysis through which PWSA can identify and evaluate the alternatives needed to attain a particular target Level of Service, and the associated investment level (Figure 5). The team recommends that these modeling efforts focus initially on priority sheds with documented capacity issues (as defined in this plan). Additional recommendations for modeling efforts to support Level of Service policy development include:

- Modeling collection and conveyance system at a level of detail needed to understand and predict overland flooding for a variety of events.
- Pairing modeling efforts with field inspections to identify maintenance and condition issues.
- Aggressively incorporating model calibration and verification via monitoring data, surveyed high water marks, etc.to ensure maximum model reliability
- Using modelling results to triage near term sewer capacity upgrades/watershed storage projects
- When interpreting model results to identify needed system upgrades, incorporating allowances for dry weather sanitary flow peaking factors and in-system surcharging in areas where deep sewers and high basement elevations exist.
- In combination with model results, using PWSA sewer system mapping and conservative estimates of adjacent basement elevations to determine potential locations of allowable system surcharge areas.

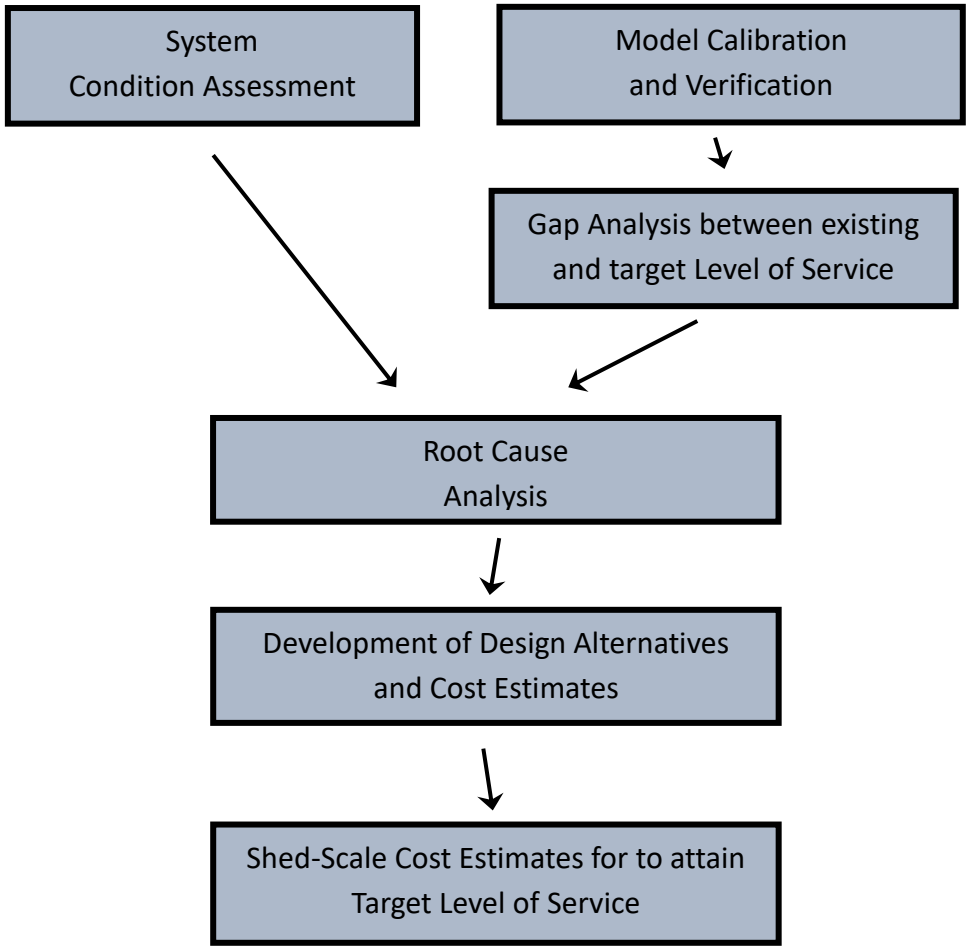


Figure 5. *Conceptual framework for evaluation of sewer capacity and flood mitigation projects in priority sheds.*

Clearly and transparently communicate with the public around Level of Service issues as part of an integrated communications strategy for stormwater.

Level of Service can be a difficult issue to communicate with the public since it involves a technical understanding of sewer and infrastructure performance and challenging conversations around affordability. The strategies below will help to share the conversation around Level of Service in ways that build public support and understanding while calibrating expectations.

Emphasize tradeoffs between Level of Service and affordability.
Integrating with PWSA's Outreach Plan for stormwater, communications around Level of Service should clearly articulate the important tradeoffs between the level of performance stormwater infrastructure is able to provide and the available resources needed to upgrade the system. Communications should also emphasize that the Level of Service that can be achieved is also limited by affordability concerns and specifically the need to limit increases to the stormwater fee. PWSA's goal is to leverage external funding such as FEMA BRIC and State Revolving Funds, which will help achieve a higher Level of Service while limiting rate increases.

Clearly explain the Level of Service issue as whole-of-government responsibility.
Communications should emphasize that meaningful increases in Level of Service are a whole-of-government responsibility that require generational investments in both stormwater and roadway infrastructure. Communication should include clearly explaining the relationships between the Level of Service for the PWSA sewer system and the City-wide Level of Service for surface infrastructure (as discussed above). Also important is the idea that, given PWSA's financial challenges and funding gaps, significant improvements to existing Level of Service will require a sustained effort over a long period of time and that, in the interim, investments will be strategically targeted where they are needed most. This targeting will ensure that the most vulnerable populations experiencing the most severe flooding and water quality problems are prioritized for investments in system upgrades.

Clearly explain the rationale for developing the Level of Service.
Transparency can help build the public's trust, so clearly explaining how the Level of Service for PWSA assets is being developed is key to bringing the public along. Specifically, the use of peer-city benchmarking helps the public understand PWSA's commitment to understanding and aligning with the current standard of practice. Investments in modeling, affordability studies, priority shed development and other components that support the Level of Service policy should be clearly explained so that the public understands the level of analysis and thoughtfulness underlying the policy.

Use accessible language.
The term Level of Service is challenging for the public (and some technical audiences) to understand. Conservations around Level of Service with the public and outside stakeholders would best be communicated using simple language that discusses the issue in terms of, for instance, "the amount of water that can be carried by PWSA's sewers" or "how often sewers back up and flood roadways". Similarly, the idea that

different types of roadways less suited to temporary flooding (like emergency routes) is an easy-to-understand concept that helps the public understand the drawbacks of a one-size-fits-all policy. The use of graphics, visualizations, and examples should be emphasized wherever possible. This can help to convey nuance around issues of flooding – for instance, how flood depth can vary across a roadway. Also, avoiding the use of technical terms and jargon (like "recurrence interval" or "conveyance", for instance) helps share the core ideas with the public in ways that are accessible to audiences of varied backgrounds.

This recommendation will be further developed as part of the Communication Framework developed under Action 5.

Appendix 1:Peer City Review of Level of Service Policies.

Environmental, Planning, and Engineering Consultants
322 North Shore Drive
Building 1B, Suite 200
Pittsburgh, PA 15212
tel: 412 770-3100
www.akrf.com

Memorandum

To:	Ellen Neisis, PennPraxis and Shandor Szalay, University of Pennsylvania Water Center
From:	AKRF, Inc.
Date:	January 24, 2022
Re:	PWSA Strategic Plan for Stormwater Peer Cities Level of Service Review

As part of the Pittsburgh Water and Sewer Authority (PWSA) Strategic Plan for Stormwater, AKRF conducted a stormwater level of service peer city review of several major cities and related stormwater agencies primarily located in the eastern and mid-western portions of the United States. For this study, "level of service" is defined as the exceedance probability design storm rain event (i.e. the 10% annual chance rain event or 10-year storm) in which stormwater infrastructure is designed as part of public capital improvement projects. For this research, level of service for various types of stormwater conveyance infrastructure were researched and separated into the following types:

- Combined sewer systems (CSS) for combination stormwater and sanitary conveyance
- Municipal Separate Storm Sewer Systems (MS4) for separate stormwater conveyance
- Streams, open channels, and floodplain conveyance

The locations chosen for peer city review were based on several factors of which include: AKRF's direct working experience in the city, prevalence of mixed CSS/MS4 systems, focus on Pennsylvania communities for on-going PWSA/Public Utility Commission discussions, and similar geography/rainfall climate as appropriate. For each city, public capital improvement stormwater design regulations/design guidance manuals and wet weather consent order agreements were primarily reviewed. Private development design manuals were generally not reviewed as these guidelines do not always align with design objectives associated with government agencies. The findings of the peer city review are summarized in Table 1. Document reference sources with corresponding page numbers are provided in Attachment A.

Table 1. Level of Service Design Goals

City/Agency	Combined Sewers	MS4	Streams, Channels, and Floodplains
Atlanta, GA (GA SW Design Manual)	Not Found	Evaluate both 10-year, 24-hour (minimum) and 25-year, 24-hour (maximum)[1]	25-year, 24-hour (roadside open channels)[2]
Camden, NJ	LOS design goals pending. Street Flooding Mitigation Plan written into Camden County Municipal Utilities Authority 2020 Consent Order with EPA. Consent order requires to "Identify design standards and best practices for flooding mitigation for use on public and private redevelopment projects."[3]		
Cincinnati, OH (MSD)	Backflow valve program based on 5-year event (see discussion)	10-year[5]	100-year (major stream channels)[6]
Cleveland, OH (NEORSD)	5-year, 6-hour with HGL remaining 10 feet below rim within NEORSD's interceptor system.[7]	No NEORSD guidelines on local stormwater piping conveyance. Use best engineering judgement.[8]	100-year (floodplains)[9]
Greenville, SC (MS4 System Only)	N/A	10-year (everywhere) 25-year (collector and arterial roads) 500-year (critical facilities)[10]	Not Found
Harrisburg, PA	25-year[11]	25-year[11]	25-year (natural or manmade channels or swales)[11]
Lancaster, PA	Not Found	25-year, 24-hour[12]	Not Found
Milwaukee, WI (MMSD)	5-year[13]	Not Found	Not Found
New York City, NY (NYCDEP)	5-year, 6-minute[14]	Not Found	Not Found
PennDOT	Based on road classification (see discussion)		
Philadelphia, PA (PWD)	Not disclosed. Determined internally by PWD Planning Unit based on watershed specific analysis.[15]	Not disclosed. Determined internally by PWD Planning Unit based on watershed specific analysis.[15]	Not Found
Raleigh, NC (MS4 System Only)	N/A	10-year[16]	2 feet of freeboard in the 10-year in stream channel, 100-year storm in for floodplain[17]
Richmond, VA	Not Found	10-year[18]	2-year (stream channel)[19]

Table 1. Level of Service Design Goals

City/Agency	Combined Sewers	MS4	Streams, Channels, and Floodplains
Toledo, OH	Not Found	5-year design for pipe full and confirm 10-year HGL is below grade[20]	Not Found
Washington, DC (DC Water)	15-year, 24-hour[21]	15-year, 24-hour[22]	Not Found

Discussion of Results and Key Findings

Level of Service for Combined Systems

In general, level of service design goals for combined system communities are difficult to obtain within publicly available documents. For many the cities researched (including cities not on the above list that were researched such as Boston, Buffalo, and Chicago), combined system level of service goals were not found or not publicly disclosed. Key findings are summarized below for select cities.

- **Cleveland Ohio Northeast Ohio Regional Sewer District (NEORSD)**

  NEORSD combined system level of service goals are outlined in their Hydrologic and Hydraulic Modeling of Sewer Systems Standards and Protocols. Within these protocols NEORSD states that the "design level of service is to convey the 5-yr, 6-hr event with the peak hydraulic grade line (HGL) remaining 10 feet or more below rim elevation within the District's interceptor system." However, it is stated that the use of this event is "subject to change based on project specific conditions" and that "consultants should exercise sound engineering judgment in project specific situations where providing the targeted LOS should be relaxed based on benefit/cost balance." In general, the 5-year, 6-hour event sets a minimum baseline level-of-service goals for NEORSD but the policy leaves some flexibility in instances in which there may be need to deviate. The approach also provides allowances for system surcharging (10 feet) where deep sewers exist, presumably to account for additional pressurized system conveyance during modeling evaluations.

- **Cincinnati Metropolitan Sewer District (MSD)**

  Cincinnati MSD has a level of service goal tied to their sewer backup (SBU) response program which was included as part of their consent order mandates with the EPA. The details of this program are described in their consent order under Exhibit 6: Water in Basement Prevent Program Plan. Within this exhibit MSD states the following:

  "Subject to the requirements of this Plan, eligible property owners whose property experiences the backup of wastewater into buildings due to inadequate capacity in MSD's Sewer System (both the combined and the sanitary portions) can receive, at no cost to the property owner, the installation of systems or devices to prevent the backup of wastewater in the future. The Prevention Program is not intended to address water in buildings caused by: 1) overland flooding not emanating from MSD's Sewer System; or 2) blockages in lateral or public sewer lines. Blockages, whether in lateral or public sewer lines, generally are temporary conditions that are better addressed by rodding and other measures that are less permanent than the systems and devices offered by this Plan."

  Eligible property owners "apply to buildings that have suffered multiple reported capacity-related building back-ups in the five years immediately preceding the assessment of that building's eligibility." Certain buildings may be ineligible for the program due to several factors stipulated in the exhibit, of which include overland flooding areas not covered by the program. The program is solely focused on basement backups that are proven to be a result of known system capacity limitations. When it is demonstrated that a sewer backup as a result of MSD system capacity occurs on the same property more than once in a five-year window, that property is eligible for a backflow prevention device at the

cost of MSD. Essentially this means that one 5-year reoccurrence basement flooding event is permitted per the consent order, but the moment there is two occurrences the requirements kick-in. In a way the backflow prevention program is a de facto level-of-service benchmark for MSD's sewer system.

- **New York City Department of Environmental Protection (NYCDEP and Milwaukee Metropolitan Sewer District (MMSD)**

Both NYCDEP and MMSD have also selected a 5-year event for their system level of protection goals. Each city indicated that selection of this event takes into consideration known systemwide capacity challenges and hydraulic capacity assessment of the sewer system. NYCDEP selected a short-term event duration of 6-minutes to specifically address cloudburst rain events. MMSD does not specifically state the event duration of their 5-year event level of protection goal.

- **DC Water and Harrisburg, PA**

As seen above, of the cities found with combined system level of service goals most use a 5-year event for planning purposes. Two outliers found are DC Water (15-year) and Harrisburg (25-year). However, it should be noted that these values appear to be more related to new construction combined sewer infrastructure within their design guidance manuals and do not specifically speak to the issue of upgrading existing capacity limited/flood prone areas.

Sanitary Flow Allocation in Combined Systems

Cities with combined sewer systems have established varying approaches to accounting for sanitary flows as part of the sewer level of service conveyance design. Harrisburg requires that combined sewer systems convey both the design stormwater flows (from a 25-year storm, as noted in Table 1) and the peak sewage flows from the tributary area, which is defined as four times (4x) the average daily flow. New York City defines the combined sewer baseflow based on zoning and floor-area ratio within a given tributary area, and interceptor sewers must be sized to convey four times (4x) the sanitary flow in residential areas and two times (2x) the sanitary flow in industrial areas.

Level of Service for MS4

In general, MS4 level of service design goals are more readily available with some having more open and robust policies. This is likely due to the fact that MS4 capacity issues are less sensitive as compared to combined systems that contain public health ramifications with mixed sewage in habitable dwellings. Most cities reviewed have a consistent level of service of a minimum 10-year reoccurrence event with some cities evaluating a 15-year (Washington DC) or 25-year (Lancaster, PA and Harrisburg, PA). In general level of service goals for MS4 systems are higher than combined sewer level of service goals for the cities reviewed.

Tiered Level of Service for MS4 Approach (Greenville, SC and PennDOT)

While most of the subject cities apply a consistent level of service across a given infrastructure type, some apply varying levels of service standards based on geographic location or infrastructure characteristics. One notable example found is Greenville, SC which requires a higher level of service for certain infrastructure components and areas of the city, including critical infrastructure areas and major roadways. Level of service goals are further categorized according to strategic (citizen/customer) and tactical (asset unit) approaches. Greenville defines each of these categories as follows: "The strategic level of service goal is focused on the stormwater program as a whole as defined by the stormwater ordinance to include citizen needs, regulatory drivers, and environmental concerns of the City. The tactical level of service identifies the infrastructure goals for the maintenance, repair, rehabilitation, and replacement of the system components." Under the tactical level of service category there are two level of service sub-classifications: 1. Short-term LOS and 2. Desired LOS. The short-term level of service classification uses risk analysis likelihood of failure and consequence of failure. The city recognizes a complete inventory is required to establish the short-term LOS and states a complete inventory of the system to be completed in five years to accomplish this goal. The Desired LOS is defined as "the preferred level of service for the Stormwater 2.0 program, which is a proactive approach that will achieve regulatory compliance, water quality goals, and

citizen expectations while optimizing system functionality and minimizing repair and replacement costs: however, this LOS may require additional funding and/or resources beyond the Short-term LOS to achieve." However, as with the Short-term LOS the City is relying a complete inventory of the system to inform its Desired LOS goals.

Similarly, the Pennsylvania Department of Transportation (PennDOT) level of service standards also apply the same tiered approach to roadway drainage and associated stormwater conveyance piping. Figure 1, represents design flood selection guidelines from PennDOT based on road classification taken from PennDOT Publication 13M Highway Design Manual.

Figure 1. PennDOT Design Flood Level of Service Based on Road Classifications

DESIGN FLOOD SELECTION GUIDELINES

FUNCTIONAL CLASSIFICATION	MAXIMUM EXCEEDANCE PROBABILITY (%)	MINIMUM RETURN PERIOD (YEARS)
Interstate and Limited Access Highways	2	50
Principal Arterial System	2	50
Minor Arterial System	4	25
Rural Collector System, Major	4	25
Other Collector Systems	10	10
Local Road and Street Systems	10	10

Stream Flood Protection Level of Service

Healthy streams (i.e. streams not incised by excess peak flows) and are meant to overtop their banks and be connected with adjacent floodplains and wetlands. Typically, most healthy streams overtop the main channel banks and disperse into the floodplain around the 1 or 2-year flood event. Many cities and agencies (including FEMA) recognize that in order to adequately protect citizens from natural flooding from open streams, a much larger flood protection goal is necessary. Cities participating in the National Flood Insurance Program (NFIP) are mandated to regulate all activities and existing structures in the 100-year floodplain. Given this interaction between streams and floodplains its important to understand that level-of-service sizing requirements are often separated between these two stream channel flow regimes. The results in Table 1 are presented based on these stream flow regimes (streams, channels, and floodplains). Ultimately the floodplain level of service along open streams should adhere to FEMA minimum floodplain regulations set forth in the NFIP. This is the case in Northeast Ohio Regional Sewer District (NEORSD) in Ohio. NEORSD strives to provide protection for its regional stream floodplains to the 100-year flood event. However, NEORSD in its November 4, 2021 board meeting minutes recognized "that this is not possible in all areas." NEORSD further states that "NEORSD continues to incrementally raise the level of service as high as it can. In some areas the level of service cannot exceed a 10-year or 25-year storm level of service, however, the intent is to increase the level of service across the area in a comprehensive manner."

Climate Change Considerations

All of the level of service values in Table 1 do not reflect increased rainfall due to climate change, though some cities acknowledge that designing infrastructure in anticipation of future increased rainfall should be considered as part of on-going capital planning and climate resilience efforts. New York City is the furthest along in incorporating climate change into the stormwater design standard and will ultimately require use of the future yet to be determined 5-year storm at the end of the asset's useful life. The City of Pittsburgh recently passed updates to Title 13, which requires volume, rate, and conveyance sizing using climate change rainfall projections from Carnegie Mellon University/RAND. These rainfall estimates could be used for future PWSA sewer system level of service analysis.

Conclusions and Recommendations

This review of stormwater level of service standards and performance requirements reveals a range of standards based on infrastructure type. Generally combined systems are the lowest (typically 5-year),

followed by MS4 (10 to 25-year), and streams being the greatest (100-year). The duration of the design rain events are typically 24-hour or are not specified with the exceptions being NYCDEP (6-minute) and NEORSD (6-hour).

Based on our peer city review ARKF presents the following level of service recommendations for consideration as part of the PWSA Strategic Stormwater Masterplan.

- For combined systems, it is recommended that PWSA conduct a systemwide level of service system evaluation with the systemwide SWMM hydrologic and hydraulic model. For the cities reviewed, it is generally indicated that the level of service design storm selection was based on systemwide hydraulic capacity evaluation. Based on the results of the peer review it is anticipated that the level of service for Pittsburgh will likely be in the 5-year (minimum) to 10-year (maximum) range based on precedent elsewhere. Allowances for dry weather sanitary flow peaking factors and in-system surcharging should also be considered in areas where deep sewers and high basement elevations exist. The locations of allowable system surcharge areas should be determined using PWSA sewer system mapping and conservative estimates of adjacent basement elevations. Hydraulic gradeline results of the with a systemwide hydraulic capacity assessment should also be incorporated into this analysis
- Provide flexibility in the level of service policy with the following:
    - As part of the policy allow for flexibility in the ultimate level of service based on engineering on cost benefit analysis on a project-by-project basis (see language from NEORSD). Develop cost-benefit analysis modeling guidance approach for use by consultants using a range of design storms (including future climate change) and standardized cost metrics based on full lifecycle costs. Perform knee-of-curve analysis to determine most appropriate level of service design storm for the project area.
    - Consider a level of service policy similar to Greenville, SC based on Pittsburgh geographical risk analysis and short-term and desired level of service goals based on known system capacity challenges from the hydraulic model capacity evaluation. It is likely to take many years, if not decades, for PWSA to address all of its level of service capacity challenged areas. Development of a short term and long term level of service policy could provide useful flexibility for prioritizing its most capacity challenged geographical areas using metrics such as existing hydraulic capacity, environmental justice areas, roadway classification, and locations of critical emergency facilities. This could then be used for a level of service risk analysis for future PWSA capital investment. For consistency purposes in Pennsylvania, the PennDOT road classification system can be implemented for all City of Pittsburgh roads as a starting point as many PennDOT state-owned roads traverse flood prone areas in Pittsburgh (Saw Mill Run Boulevard, Banksville Road, Streets Run Boulevard, Washington Boulevard, to name a few). It is also recommended to identify emergency facilities in consultation with City of Pittsburgh.
- For open streams and stream flooding protection, it is recommended that the level of service policy be developed in collaboration between PWSA and City of Pittsburgh floodplain management departments. The level of service policy should consider both the main stream channel and floodplains as separate level of service metrics as healthy streams are meant to overtop its banks and engage floodplains, where appropriate and safe. It is recommended that PWSA engage City of Pittsburgh to develop a floodplain mitigation strategy to understand existing level of service of Pittsburgh flood prone open streams, identify repetitive loss NFIP properties (not collected as part of mapping task), and identify watershed mitigation strategies (willing homeowner buyout properties, locations of floodplain storage/restoration, capacity limited culverts/bridge decks, etc.) for increasing existing level of service around the 100-year regulatory floodplain.

- It is recommended that consideration should be given to future precipitation patterns due to climate change, either by selecting a higher level of service using the current design storms or by incorporating future precipitation projections into project alternatives cost benefit analysis. As part of the flood mapping exercise, AKRF collected dates and times of major flooding events for several years of flooding data. It is recommended that PWSA perform statistical rainfall analysis of these flooding events using 3RWW rainfall data to understand rainfall depths, intensities, durations, and rainfall temporal distribution of flooding events in Pittsburgh. The results should be then compared to existing NOAA Atlas 14 values. The implementation of climate change adjustment factors using future rainfall projection estimates from Carnegie Mellon University should also be considered.

Attachment A - Reference Materials for Table 1

Source Documentation:	Link:
1 Georgia Stormwater Management Manual Volume 2: Technical Handbook, 2016 (Page 9 of document and Page 22 of PDF)	https://cdn.atlantaregional.org/wp-content/uploads/gsmm-2016-edition-final-v2.pdf
2 Georgia Stormwater Management Manual Volume 2: Technical Handbook, 2016 (Page 402 of document and Page 420 of PDF)	https://cdn.atlantaregional.org/wp-content/uploads/gsmm-2016-edition-final-v2.pdf
3 CCMU Selection and Implementation of Alternatives Report (Page 93 of PDF)	http://www.ccmua.org/wp-content/uploads/2020/09/CCMUA-Camden-Gloucester-SIAR-09-30-20.pdf
4 Metropolitan Sewer District of Greater Cincinnati (MSDGC), Ohio, Global Consent Decree filed on June 9, 2004 in the matter of, United State of America, the State of Ohio, and Ohio River Valley Water and Sanitation Commission v. the Board of County Commissioners of Hamilton County, Ohio and the City of Cincinnati, U.S. District Court, Southern District of Ohio, Western Division, Case No. C-1-02-107 (Exhibit 6, Water-In-Basement Program)	https://www.epa.gov/sites/default/files/2014-09/documents/hamilton-cd2.pdf
5 City of Cincinnati Department of Public Works Stormwater Management Rules and Regulations Part 2 Stormwater Management Design Manual (Page 28 of PDF)	https://www.cincinnati-oh.gov/sites/stormwater/assets/File/SMU_Rules_Regs_Part_2.pdf
6 City of Cincinnati Department of Public Works Stormwater Management Rules and Regulations Part 2 Stormwater Management Design Manual (Page 28 of PDF)	https://www.cincinnati-oh.gov/sites/stormwater/assets/File/SMU_Rules_Regs_Part_2.pdf
7 Northeast Ohio Regional Sewer District PROJECT CLEAN LAKE | Green infrastructure project plans through 2018	https://www.neorsd.org/I_Library.php?SOURCE=library/GI-Project_Summaries.pdf&a=download_file&LIBRARY_RECORD_ID=6249
8 NEORSD Hydrologic and Hydraulic Modeling of Sewer Systems Standards and Protocols Version 4.1 (Page 55 of document, Page 64 of PDF)	https://neorsdpmo.org/ExternalUserPage/Pages/320_HydraulicModelingStandardsforCollectionSystems.pdf
9 NEORSD November 11, 2021 Board of Trustees Meeting Minutes (Page 7 of document, Page 6 of PDF)	https://www.neorsd.org/I_Library.php?SOURCE=library/BA-Minutes-110421.pdf&a=download_file&LIBRARY_RECORD_ID=7737
10 City of Greenville Public Works Deparment Stormwater Level of Service February 27, 2018 (Page 3 of document and PDF)	https://www.greenvillesc.gov/DocumentCenter/View/11255/Stormwater-Level-of-Service-Policy
11 Section § 9-903.5 "Downstream hydraulic capacity analysis"	https://ecode360.com/13783420

12 City of Lancaster Green Infrastrucutre Design Manual, February 2019 (Page 218 of Document and Page 225 of PDF)	https://cityoflancasterpa.com/wp-content/uploads/2014/03/Lancaster-GI-Design-Manual_Final_reduced_0.pdf
13 MMSD System Evaluation and Capacity Assurance Plan, (Page 97 of PDF)	https://www.mmsd.com/docs/2014_MMSD_CMOM_Program.pdf
14 New York City Stormwater Resiliency Plan, May 2021 (Page 5 of document and pdf)	https://www1.nyc.gov/assets/orr/pdf/publications/stormwater-resiliency-plan.pdf
15 Water/Sewer Design Manual Version 3.10.1, July 9 2019 (Page 5-1 of document and 32 of PDF)	https://s3.amazonaws.com/phillywaterdesign/Design+Manual/Water+Sewer+Design+Manual+V3.10.1.pdf
16 City of Raleigh Stormwater Management Design Manual, 2002 (Page 10 of document and PDF)	https://cityofraleigh0drupal.blob.core.usgovcloudapi.net/drupal-prod/COR16/StormwaterDesignManual.pdf
17 City of Raleigh Stormwater Management Design Manual, 2002 (Page 11 of document and PDF)	https://cityofraleigh0drupal.blob.core.usgovcloudapi.net/drupal-prod/COR16/StormwaterDesignManual.pdf
18 City of Richmond Stormwater Management Design Manual, 2002 (Page 5-3 of document and Page 30 of PDF)	https://www.rva.gov/sites/default/files/2021-06/Stormwater_Management_Design_and_Construction_Standards_Manual.pdf
19 City of Richmond Stormwater Management Design Manual, 2002 (Page 4-2 of document and Page 21 of PDF)	https://www.rva.gov/sites/default/files/2021-06/Stormwater_Management_Design_and_Construction_Standards_Manual.pdf
20 City of Toledo Infrastructure Design and Construction Requirements, May 2014 (Page 21 of PDF)	https://cdn.toledo.oh.gov/uploads/documents/Public-Utilities/Engineering-Services/2014-infrastructure-requirements.pdf
21 DC Water Project Design Manual Volume 3 - Linear Infrastructure Design, July 2018 (Page 3-5-5 of document, Page 55 of PDF)	https://www.dcwater.com/sites/default/files/engineering/PDM%20Vol%203%20-%20Linear%20Infrastructure%20Design_0.pdf
22 DC Water Project Design Manual Volume 3 - Linear Infrastructure Design, July 2018 (Page 3-4-5 of document, Page 54 of PDF)	https://www.dcwater.com/sites/default/files/engineering/PDM%20Vol%203%20-%20Linear%20Infrastructure%20Design_0.pdf

APPENDIX D

Project Name: Developing PWSA's Strategic Plan for Stormwater

Project No.: 2020-025-OPS

Detailed Four Lenses Mapping and Methodology Memo

June 17, 2022

Purpose

The purpose of this analysis is to use the lenses of environmental justice, water quality, and flooding to determine priority areas for investment for PWSA.

A Note on the Planning Units

The spatial data used in this analysis has multiple geographic boundaries, including sewershed boundaries, MS4 subshed boundaries, census tracts, point data, and polyline data, as well as incorporates raster data. To handle the inconsistency across all geographic boundaries, and specifically to handle the gaps inherent to CSO sewershed coverage area, a set of Planning Units were created that correspond with local watershed boundaries of smaller creeks, major sewersheds, or direct drainage areas to the large rivers. These planning units are subdivisions of current hydrologic units established by the U.S. Geological Survey and align with the historic watersheds of several streams and runs that have been diverted underground.

Localized Flooding Lens

The localized flooding lens combines data sources obtained from PWSA, NOAA, PennDOT, Twitter, and First Street Foundation. This lens is not a flood risk assessment, rather it aggregates multiple data sources to determine where flooding related problems have occurred in the past and includes projected flood inundation during a 100 year storm during 2050 climate conditions. As with the previous two lenses, the scoring is assigned from 1 to 5, where 5 is highest combined observation of flooding related problems and projected flood inundation.

Methodology

The flood data was combined by determining how many occurrences of these data were within each planning unit, or how much of any of these data were within each planning unit. For the flood inundation data, the total inundation volume within each planning unit was calculated. For polyline layers such as the surcharging pipes data, the total linear feet of surcharging pipe within each planning unit were calculated. For point layers such as the capacity backups data, the number of backups within each planning unit were calculated. Finally, all the layers were reclassified and summed within each planning unit boundary, then reclassified in to the five groups.

The general workflow was as follows:

1. Summarize the volume/length/number of the input layer within the Planning Units boundaries.
2. Create a planning unit score for that layer on a scale of 1 to 5 using Jenks natural breaks of the layer's values.
3. Repeat for all input layers, creating a planning unit score for each layer.
4. Add all planning unit scores together, then regroup again into five groups on a scale of 1 to 5 using Jenks natural breaks.

Data Used:

- PWSA confirmed capacity related backups
- Modeled sewer pipes - surcharging under different storm intensities.
- NOAA flooding points
- PennDOT flood related road closures
- Flood incidents scraped from Twitter
- FloodFactor flood inundation, 2050 climate conditions, 1 in 100 year storm

Equity Lens

The equity lens uses the Environmental Justice Index created by the Allegheny County Health Department's Bureau of Assessment, Statistics & Epidemiology in 2019. The index aggregates the following eight indicators at the census level by ranking each raw metric in deciles on a scale of 1 to 10 and taking a simple mean of each indicator score. For indicators such as median household income, where higher value indicates lower need, the scores were assigned in descending order. For use in this analysis, the scores of 1 to 10 were then recategorized into five groups scored from 1 to 5.

Data Used:

- Median Household Income (MHINC)
- Diesel Particulate Matter (DPM)
- Particulate Matter ≤ 2.5 µm (PM2.5)
- Percent of the population identified as a racial minority
- Proximity to Greenspace
- Educational Attainment
- Miles of Railroad Track Coverage
- Housing Vacancy

Additionally, the team reviewed the EPA Environmental Justice Screening tool, as it is a nationally recognized resource for environmental justice mapping used across many states and jurisdictions. There is little variance between the priorities established by the Allegheny County environmental justice data and the EJ Screening tool data. The environmental justice indices included in the EJ Screening tool include:

- Particulate Matter 2.5
- Ozone
- 2017 Diesel Particulate Matter

- 2017 Air Toxics Cancer Risk
- 2017 Air Toxics Respiratory Health Index
- Traffic Proximity
- Lead Paint
- Superfund Proximity
- RMP Facility Proximity
- Hazardous Waste Proximity
- Underground Storage Tanks
- Wastewater Discharge

Opportunity Lens

The opportunity lens includes existing parks, greenways, and vacant lands that would provide opportunities for developing stormwater management projects. This lens was ultimately excluded from the final prioritization scoring, as the Strategic Plan team felt that the prioritization should ultimately be driven by need (i.e., the problem) rather than the ease of finding a cost-effective solution. However, this lens informed the selection of investment strategies and project types.

Water Quality Lens

The water quality lens integrates CSO outflow volumes and MS4 reduction requirements. A cumulative impact of each outfall is considered from 2022 until the projected completion of the Interim Measures Wet Weather Plan in 2037. The scoring methodology and the CSO volume analysis methodology are outlined below. As with the environmental justice lens, the scoring is from 1 to 5.

Overall Water Quality Scoring where 1 is lowest and 5 is highest:
1—3. Sewersheds that will eventually connect to the tunnel are grouped into three classes based on their cumulative outflow volumes projected over the next 15 years. Non-tunnel sewersheds that connect to sewer mains that will be transferred are included in these classes based on their cumulative outflow volume as well.

4. Non-tunnel sewersheds that are not in the PWSA confirmed transfer data layer ALCOSAN_Regionalization_Sewer_Mains were scored 4.

5. All MS-4 sheds were given the score of 5.

CSO Volumes Methodology

1. The timeline for the calculations is based on the implementation schedule in Section 11 – Interim Measures Wet Weather Plan of ALCOSAN Clean Water Plan.
2. The phase of the plan that each sewershed belongs to is determined by the sewersheds point of connection (POC), indicated by the first letter of the POC, such as A-42, which indicates that the POC flows in the Allegheny River and is associated with the Allegheny River Tunnel Segment. Sewershed points of connection are a field in the sewershed boundaries layer provided by PWSA.

   a. The POCs were also verified against the maps provided in the plan.
   b. Note, the plan is preliminary and subject to change according to ALCOSAN.
3. Determining the phase each sewershed belongs to establishes how long the shed's outfall will overflow at its current conditions flow rate before decreasing to its post-IWWP flow rate. The following calculation is used to determine cumulative volume using the two flow rates and the transition year determined by each sewersheds phase.
   a. Calculation for cumulative volume:
      (Current Flow Rate) * (Phase Year - 2022) +
      (Post-IWWP Flow Rate) * (2037 - Phase Year)
4. The cumulative outflow volumes were scored grouped into three groups and score 1 to 3, where 3 is the highest outflow volumes.

Data Used:

- ALCOSAN projected outfall volumes for current conditions and conditions after the Interim Wet Weather Plan interventions.
- Sewershed boundaries layer from PWSA.
- Outfall points layer from PWSA.
- PWSA confirmed sewer main transfer layer (ALCOSAN_Regionalization_Sewer_Mains)
- ALCOSAN Clean Water Plan

Aggregate of Environmental Justice, Water Quality, and Flooding Lenses

The preceding analysis led to three lenses that are then combined to create composite layers at both the Planning Unit and Sewershed geographic scale. These final composite layers can then be grouped again or ranked depending on the desired use of the final analysis.

Methodology

Each lens is considered equal in the aggregation steps. The three layers are converted from polygon layers, at geographic scales of census tract, sewershed/MS4 shed, and planning unit, to raster layers, which are then summed using raster algebra. The result is a raster layer with pixel values ranging from a minimum possible value of 1 to a maximum possible value of 15 (a score of 5 in each contributing lens). To overlay this composite back on to Planning Units or Sewersheds, zonal statistics are used to take the average pixel value found within each Planning Unit or Sewershed. The Planning Units and Sewersheds can then be ranked by these average values or grouped again into priority groups.

Detailed Four Lenses Mapping

The following maps show the detailed data that was aggregated to the planning unit boundaries, which are included in the Strategic Plan.

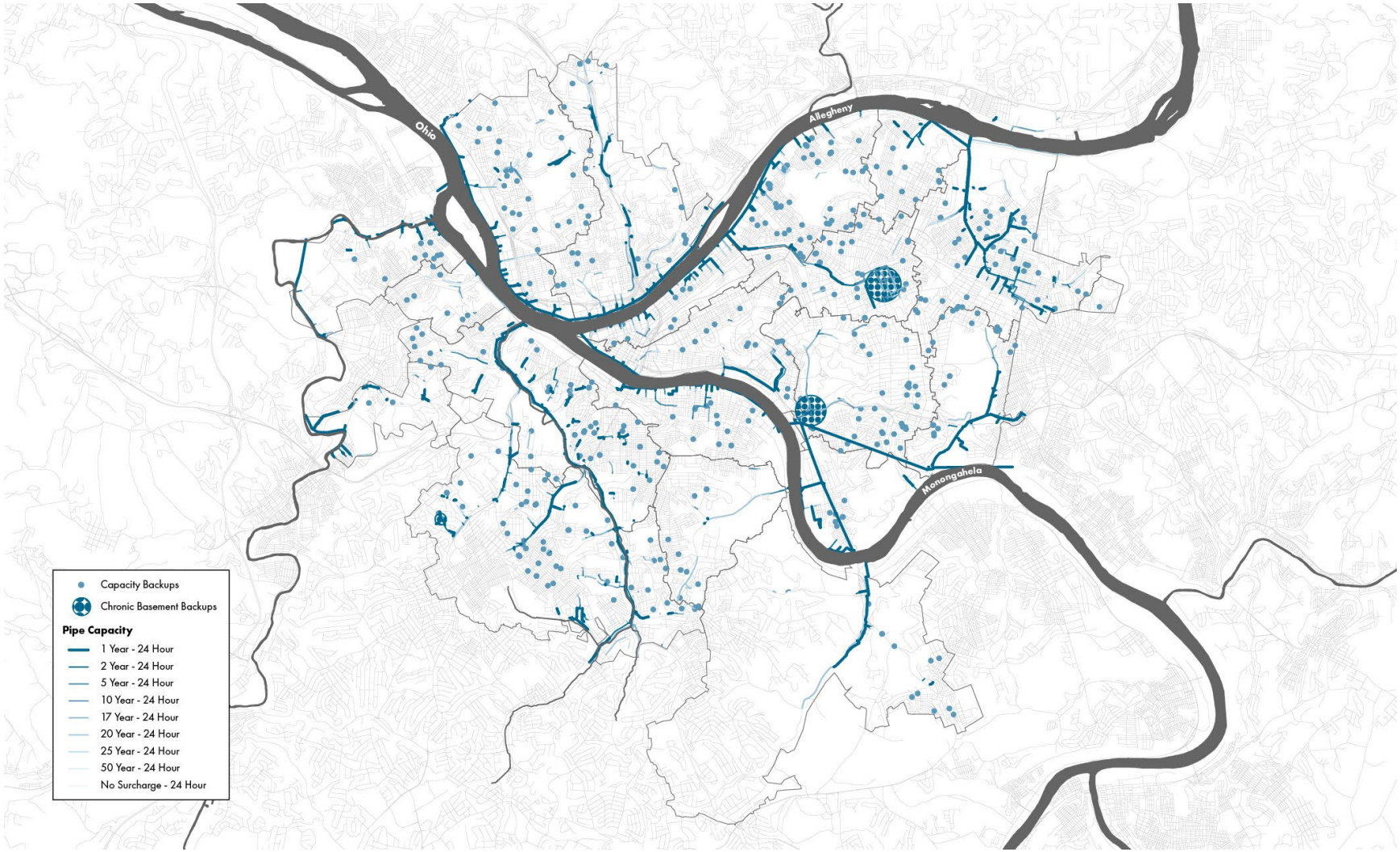


Figure 1: Localized Flooding Lens: Flooding Capacity

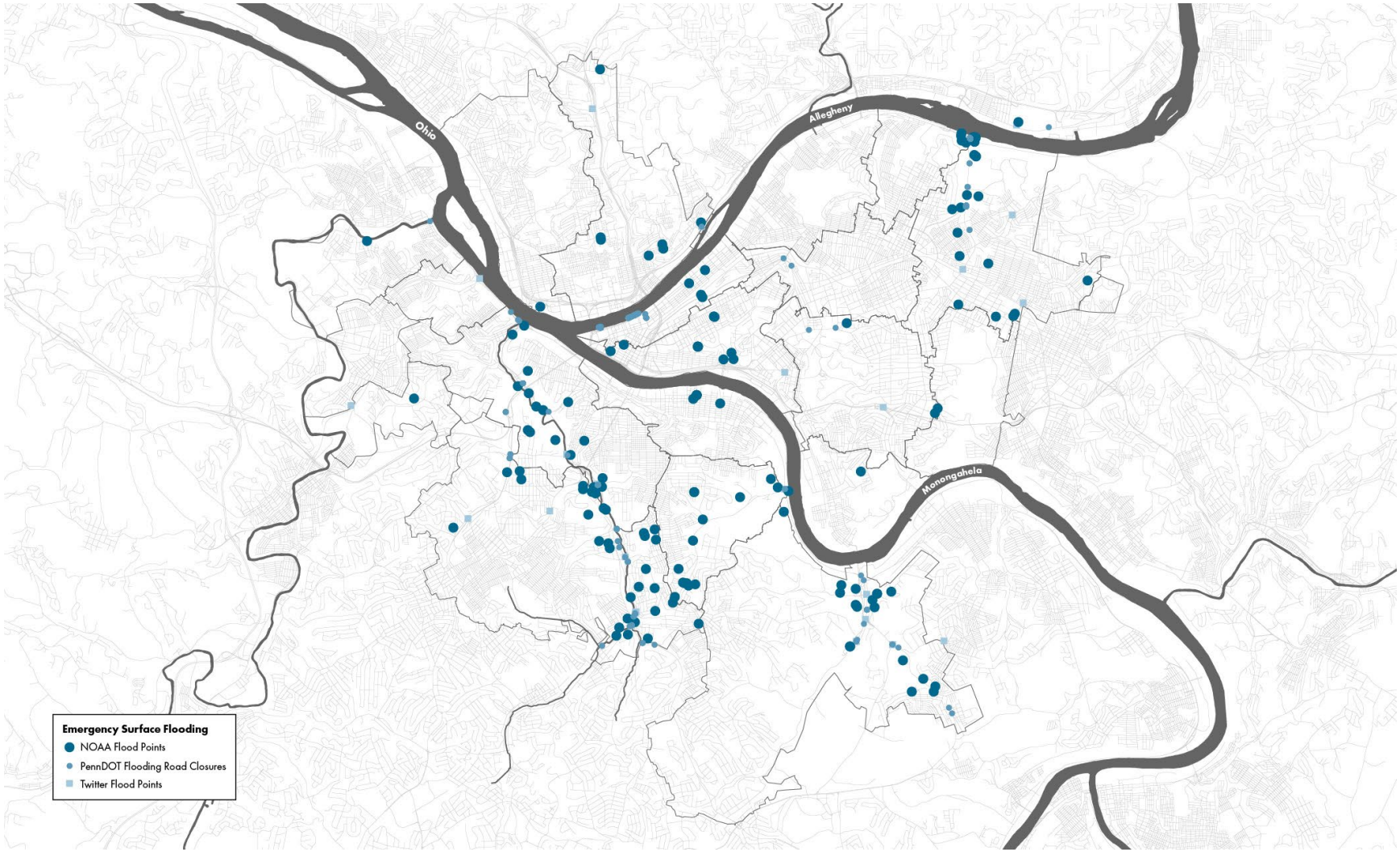


Figure 2: Localized Flooding Lens: Flooding Complaints

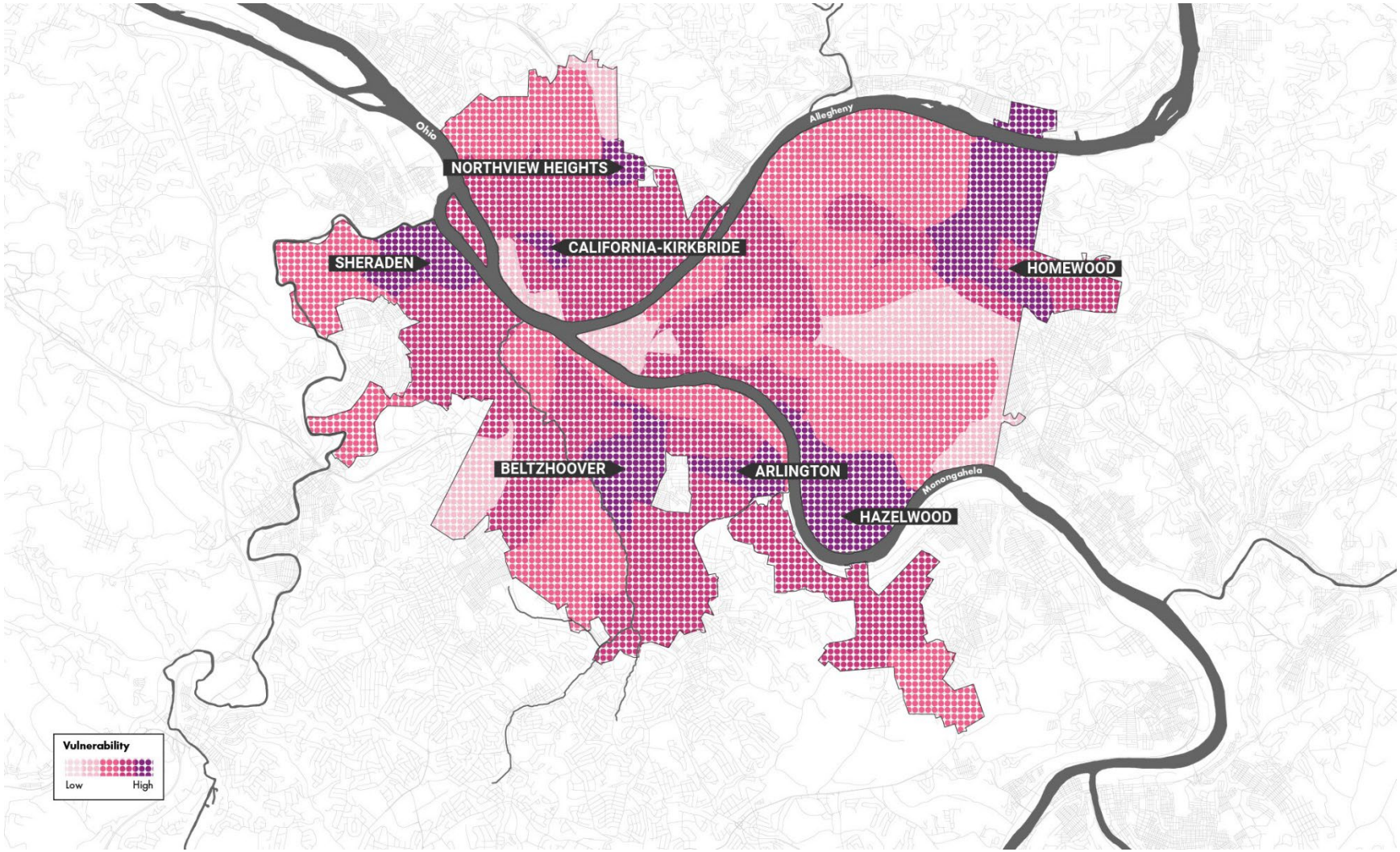


Figure 3: Equity Lens: Allegheny County Environmental Justice Index

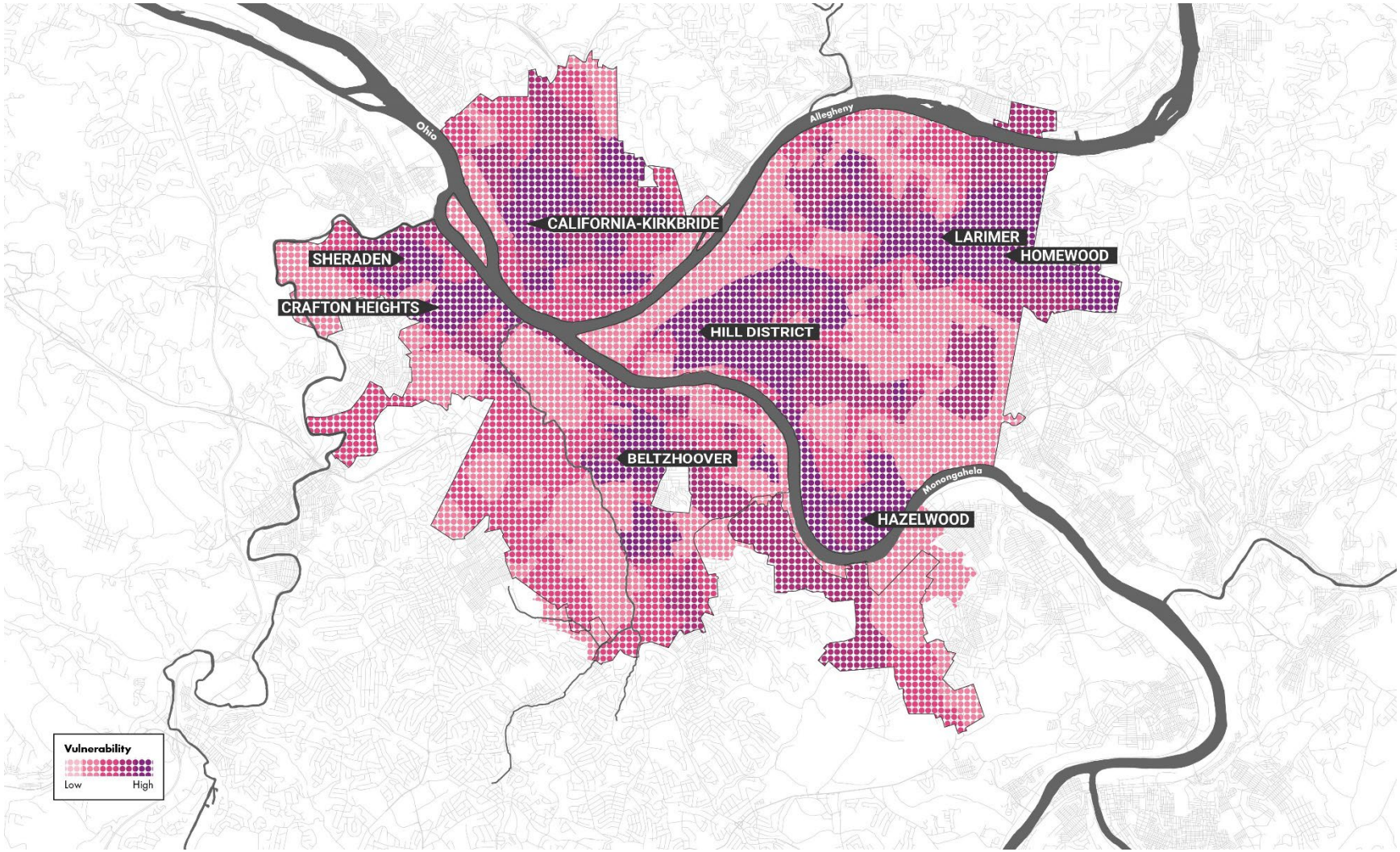


Figure 4: Equity Lens: EPA EJ Screen Environmental Justice Index

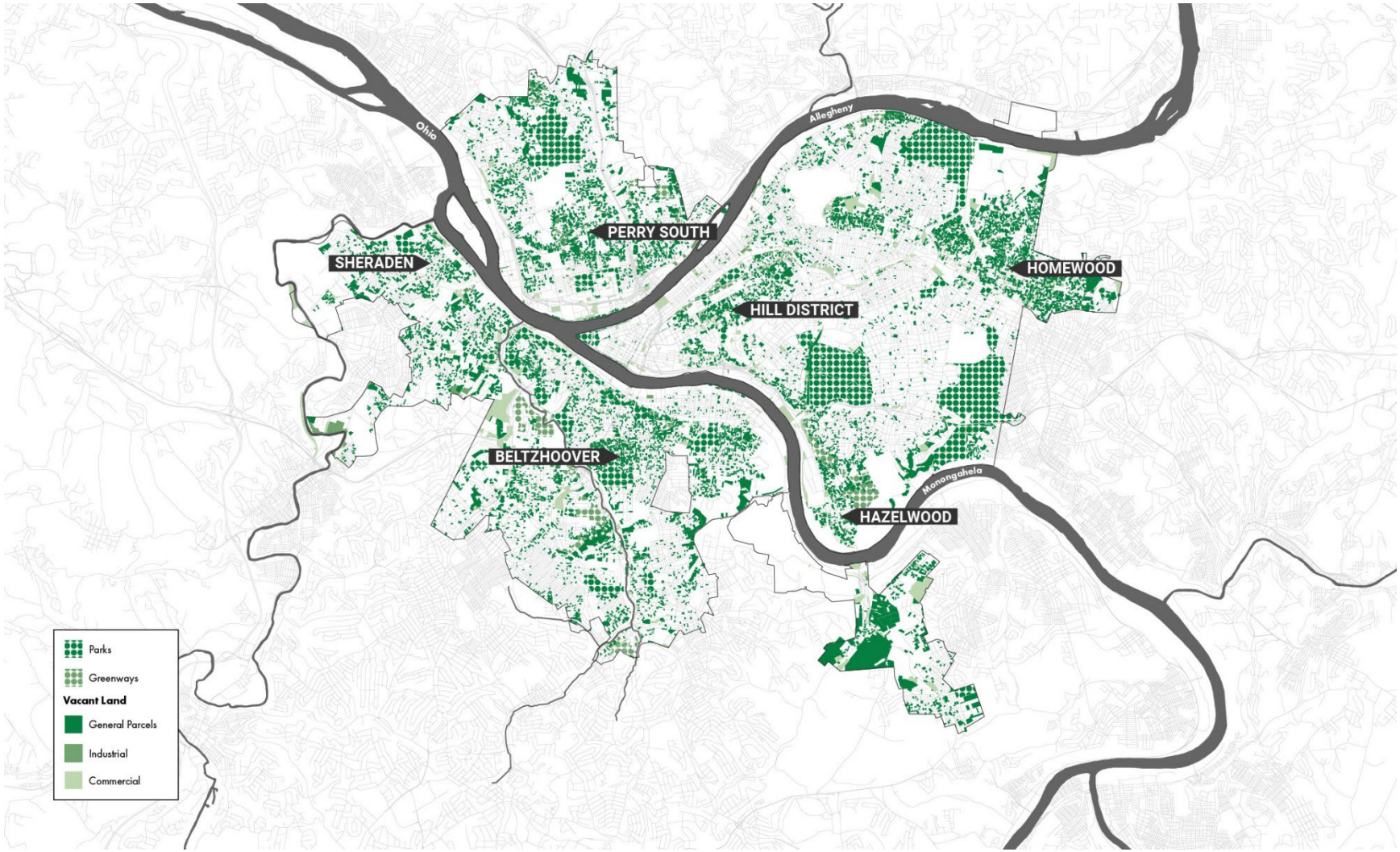


Figure 5: Opportunity Lens

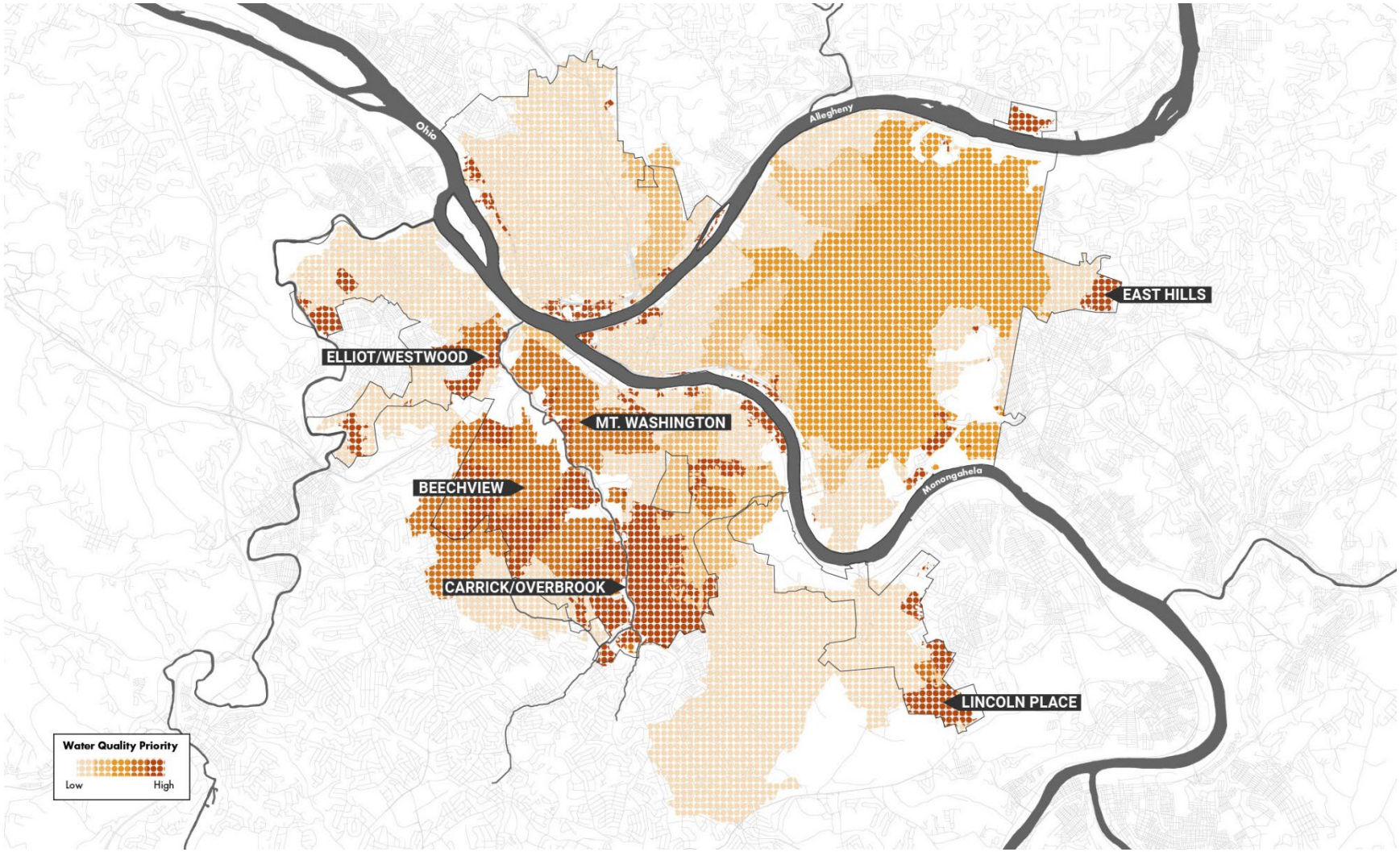
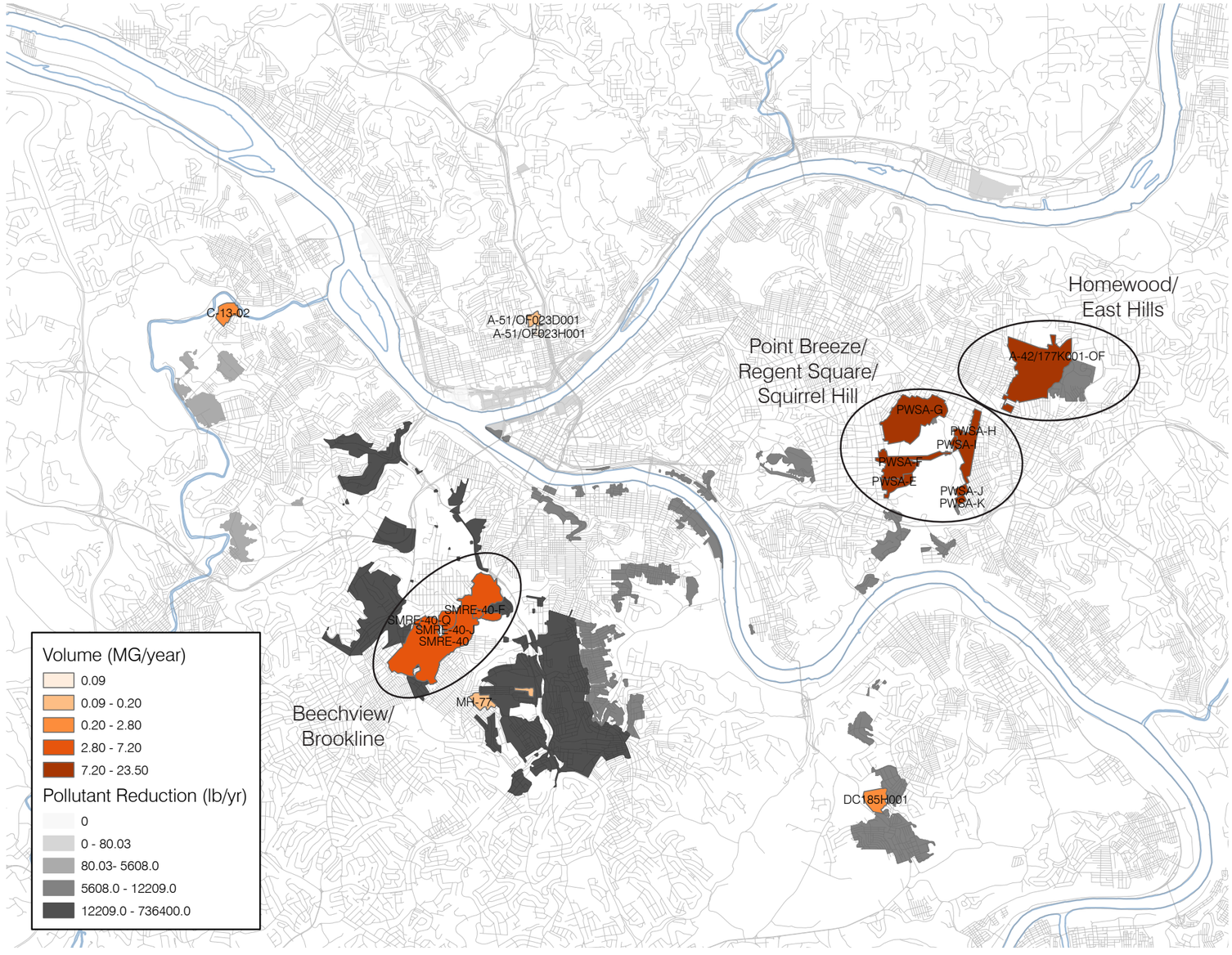


Figure 6: Water Quality Lens

APPENDIX E

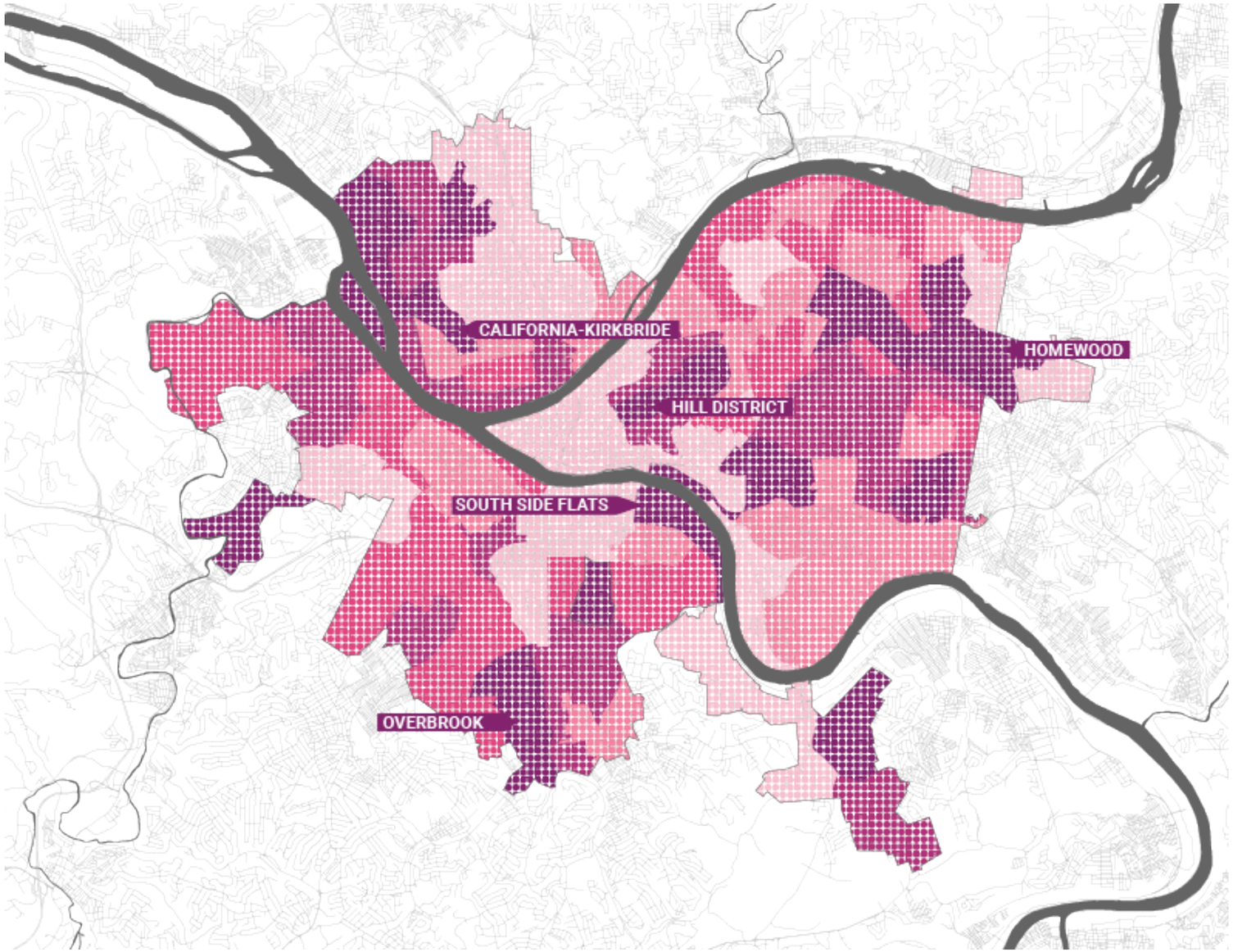
Project Area Prioritization

PWSA Water Quality Responsibility



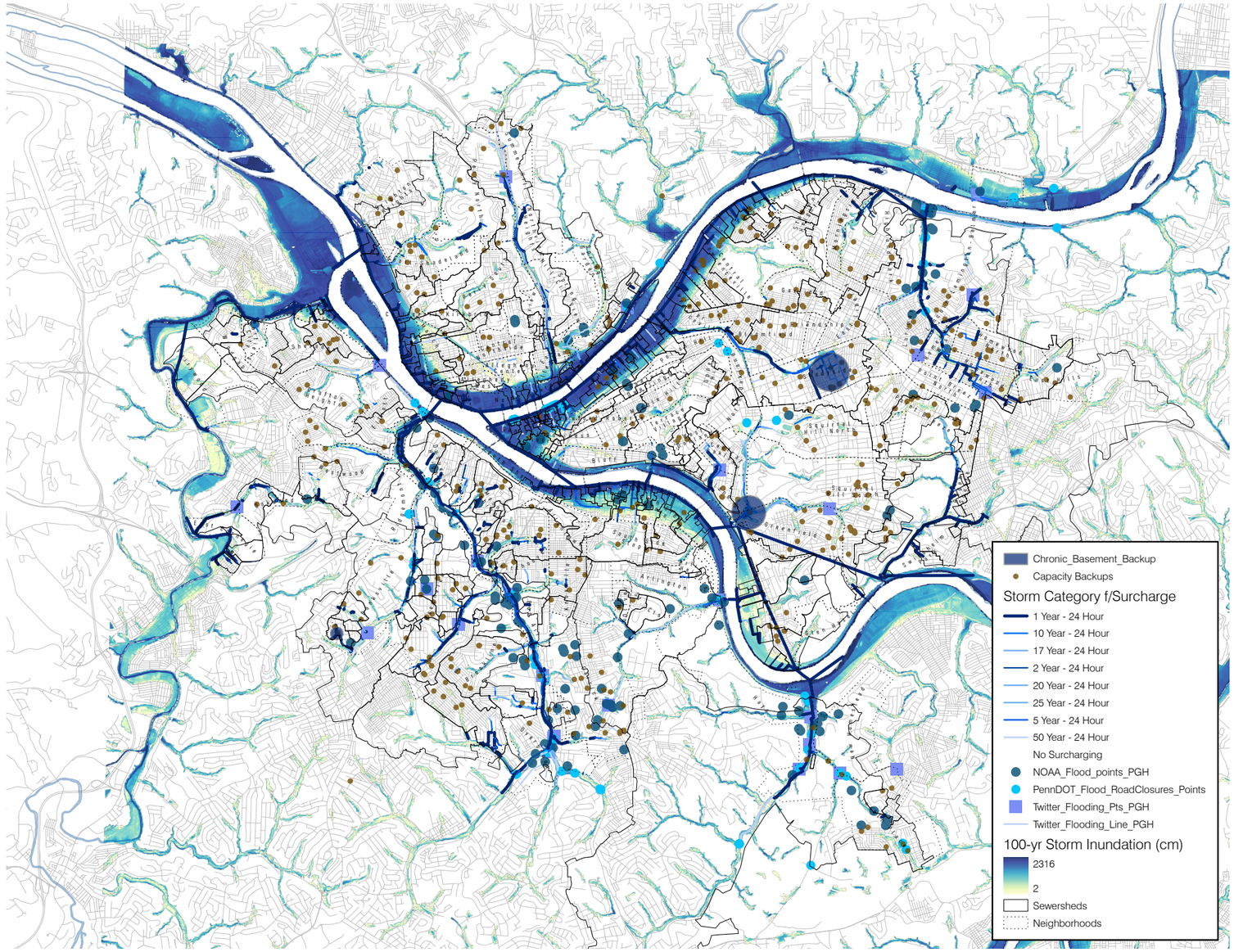
- There are only a handful of sewersheds with outfall volume that will remain fully PWSA's responsibility.
- The highest volume areas are found in Homewood/East Hills, Point Breeze/Regent Square/Squirrel Hill, and Beechview/Brookline

Environmental Justice Composite



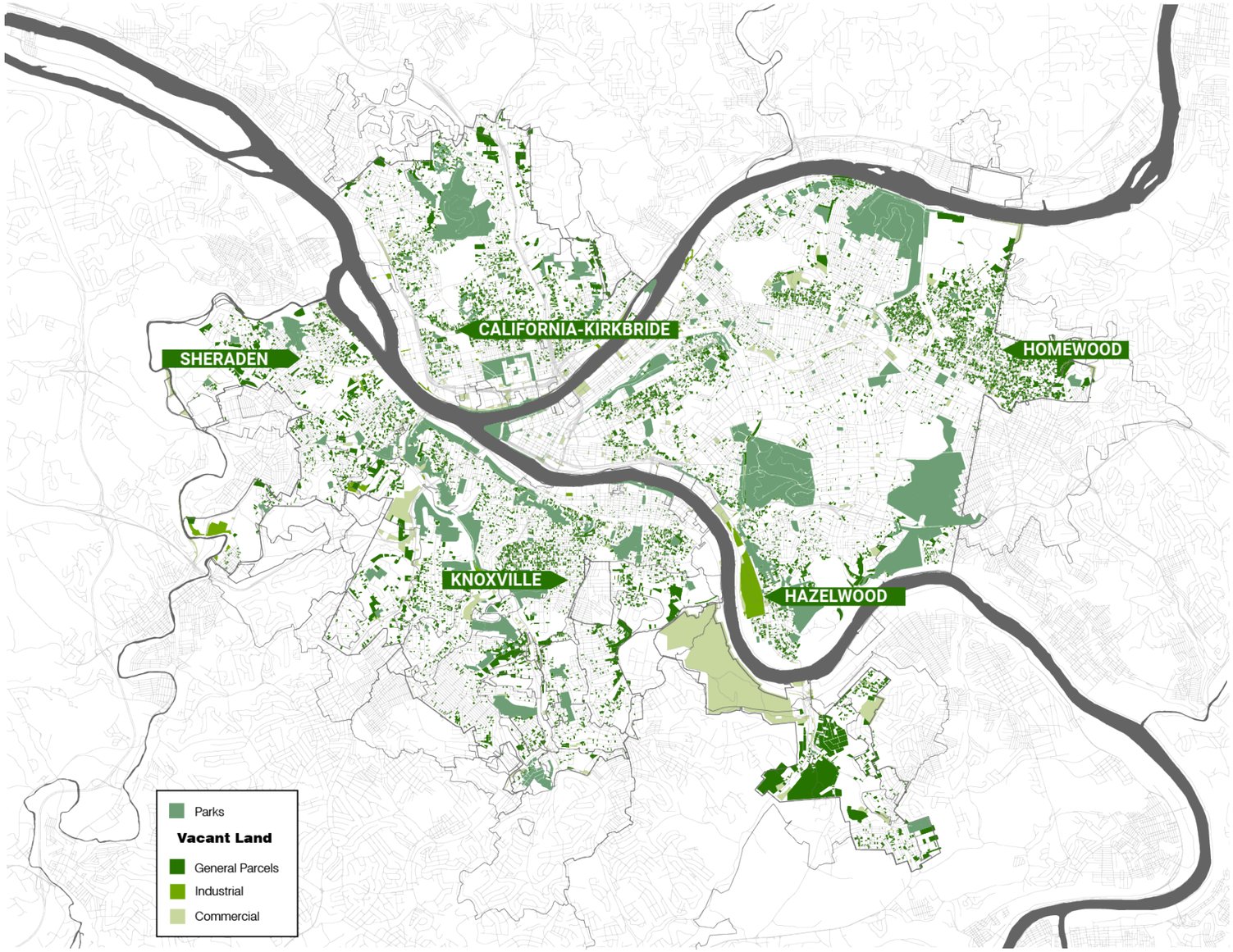
- Allegheny County Environmental Justice Index

Flooding Hazard Data



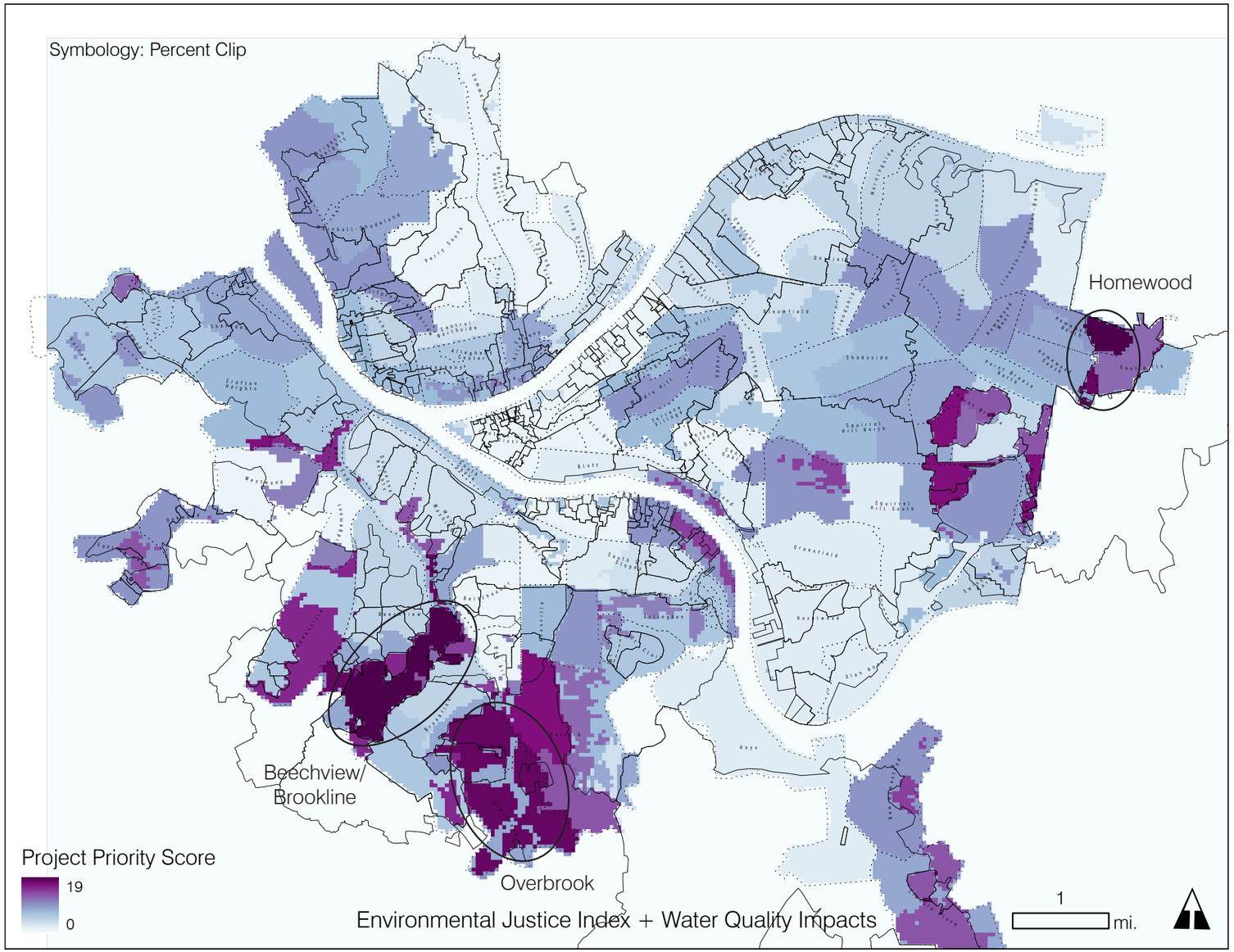
- First Street Foundation Flood Factor inundation forecast for 1-in-100 year storm event in 2020 climate conditions.
- Pipe surcharging data.
- PWSA investigated and confirmed capacity-related basement backup locations between 2020 and 2021.
- NOAA overland flooding concern points
- Overland flooding locations scraped from Twitter

Opportunities Data



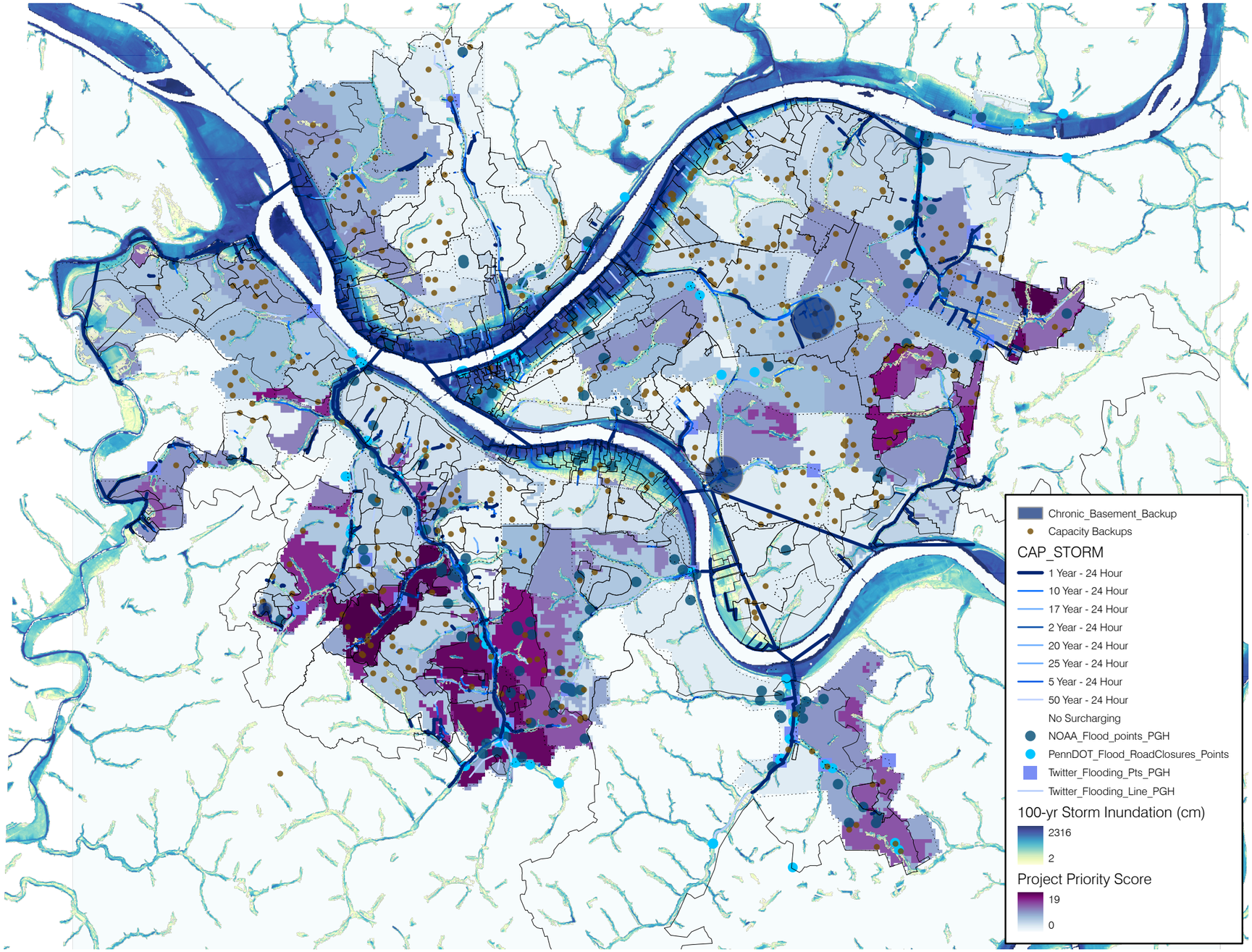
- Parks + Greenways
- Vacant Parcels (general, industrial, commercial)

Water Quality + Environmental Justice Composite



- Contributing layers are PWSA CSO Volumes post-IWWP, MS4 Required Pollutant Reductions, and the Allegheny County Environmental Justice Index.

Water Quality + EJ Index, with Flooding data overlayed



- Flooding data will remain as individual vector data to guide priority selection rather than being combined in to a composite.

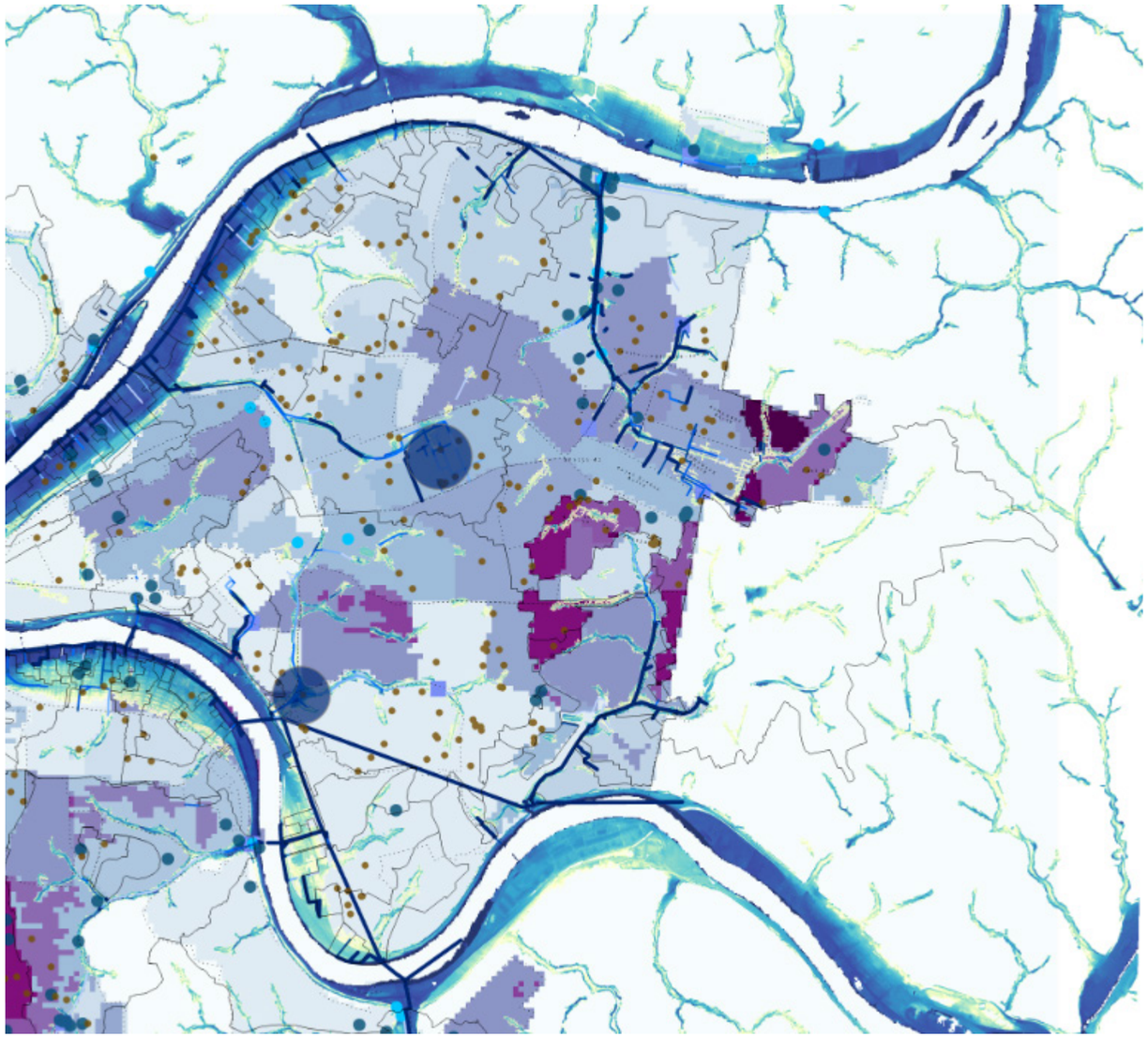
Selection Criteria

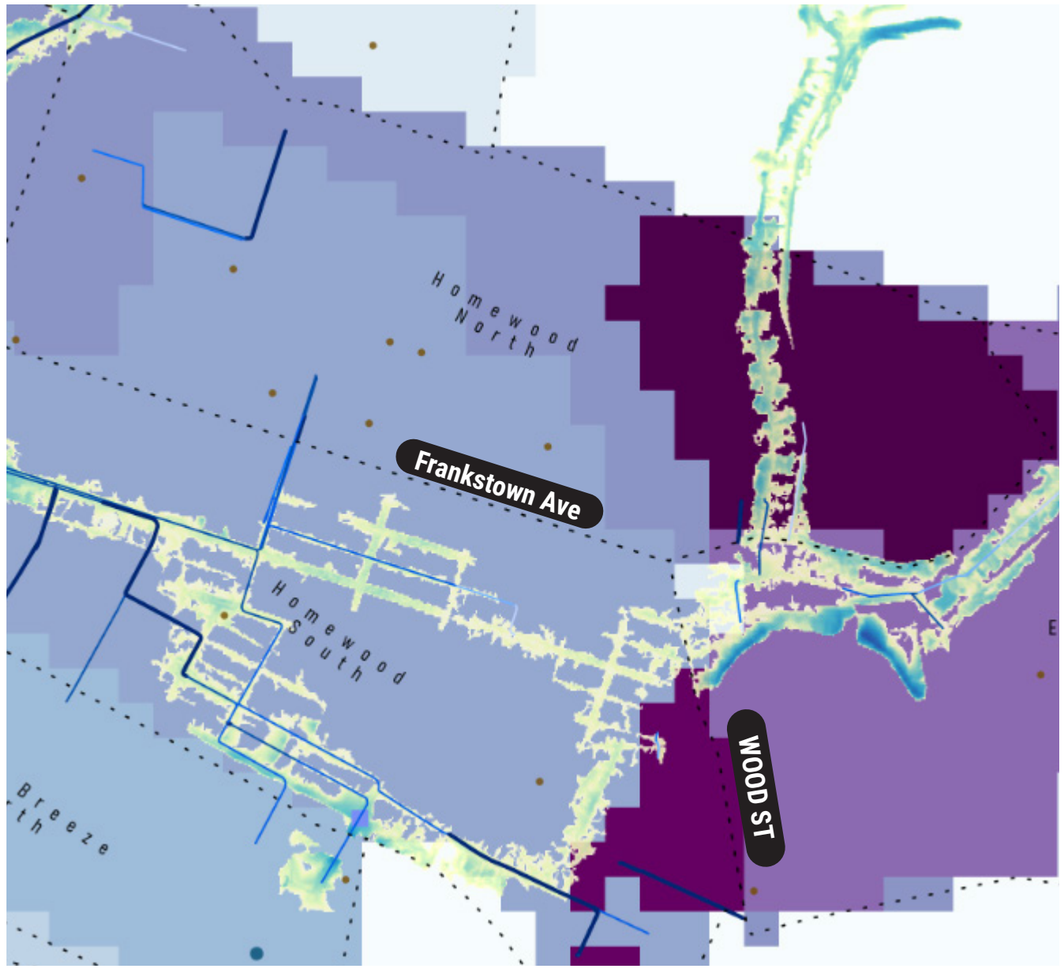
- Meaningful Intersection of flooding, water quality, and equity.
- Moderately sized watershed where modest investment could result in a measurable, substantial improvement in WQ and flooding in a short-term focused investment.
- No fatal flaw or high level feasibility issues.
- Opportunity for the creation of transformational public space that advances community goals.

Feasibility Layers

- Topography
- Steep Slopes
- Undermined Areas
- Parcel ownership

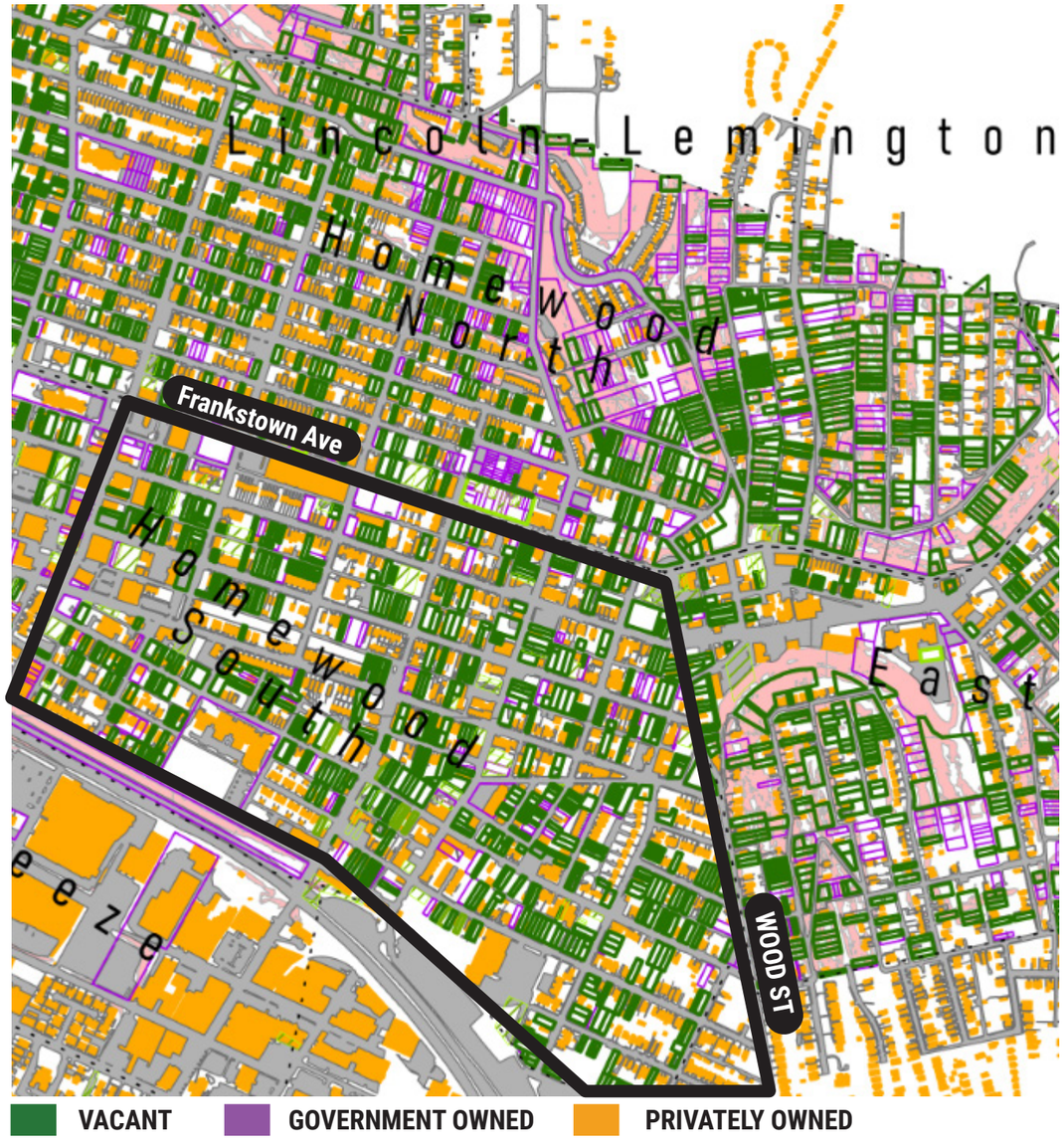
Homewood/East Hills





Homewood/East Hills

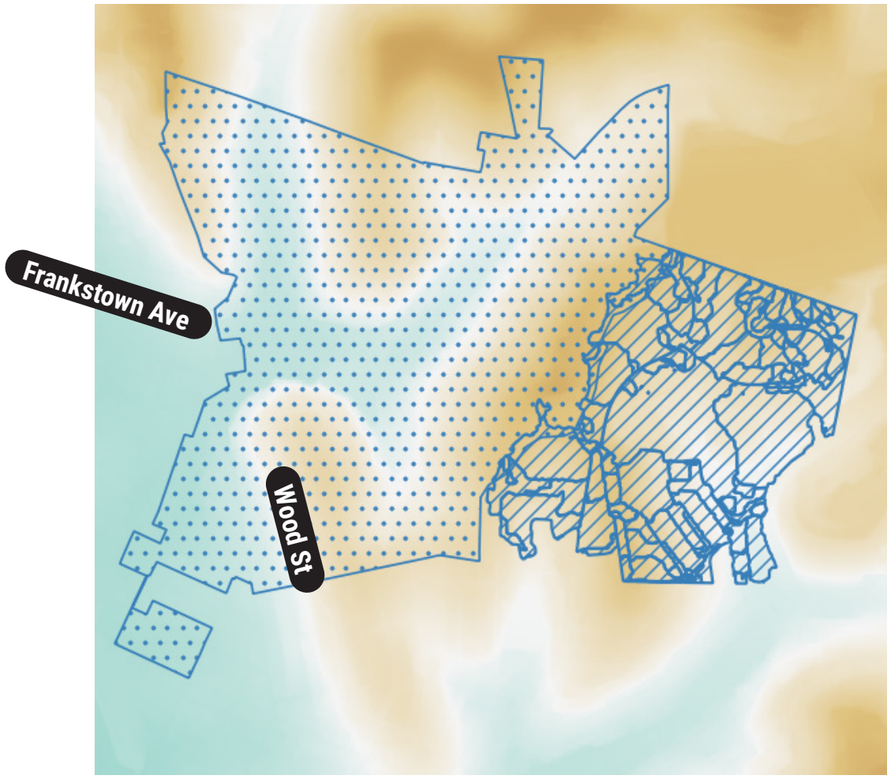
- Includes CSO shed with long term PWSA responsibility (A-42/177K001-OF)
- Absence of steep slopes and undermined areas
- Frequent flooding and basement backups
- Tributary to high-risk flooding areas in Negley Run watershed
- Large number of vacant properties creates potential for city-wide model
- High level of disinvestment enables potential linkage with affordable housing/repopulation and anti-gentrification measures
- Potential for neighborhood-scale impact



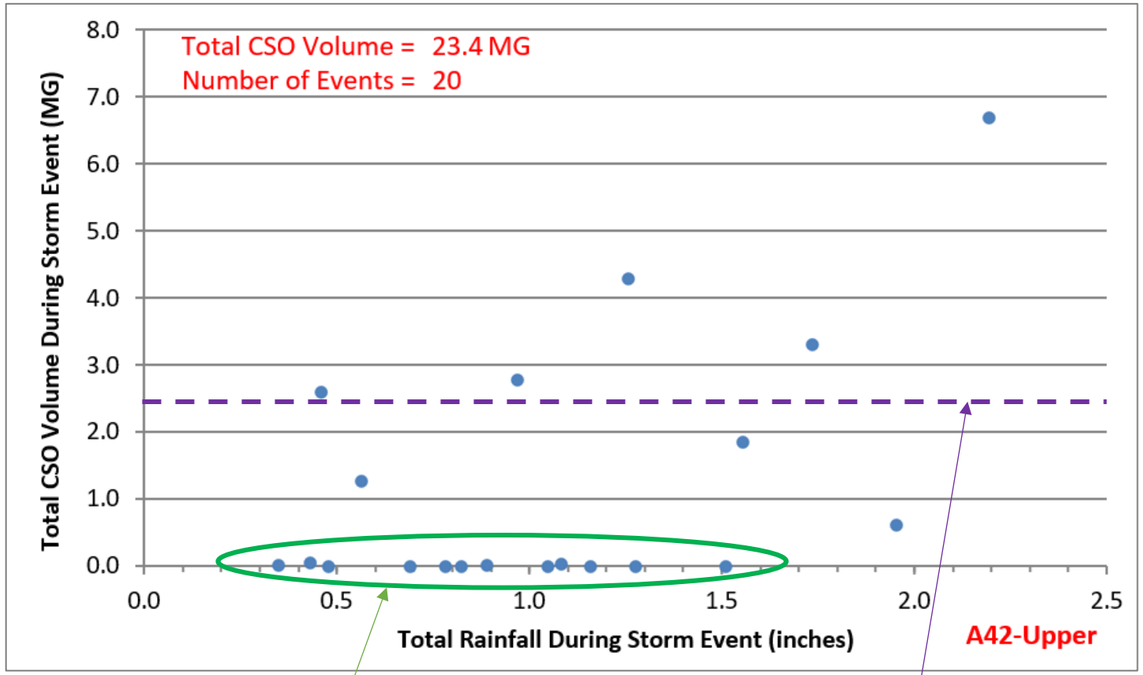
Homewood


Monticello St Steps
Monticello St
Baptist Temple Church
Homewood North Apartments
Idlewild St
Carrone Baptist Church
Frankstown Ave
House of Manna Faith Community
The New Stanley's Lounge
Steffen Achievement Center
Bennett St
Strong II Dry Cleaners
Homewood Brushton Branch YMCA
Dana's Bakery
Kelly St
Galaxy Lounge & Entertainment Center
Hamilton Ave
Salik Hardware
Alma Illery Health Center
Brushton Ave
Homewood Swimming Pool
Homewood Playground
Tioga St
The Dream BBQ
Everyday Cafe
Susquehanna St
Helen S. Faison Arts Academy
Faison K-8
M.L.K. Jr. East Busway
Finance St
McPherson Blvd
N Homewood Ave
N Braddock Ave

Homewood



CSO MS4

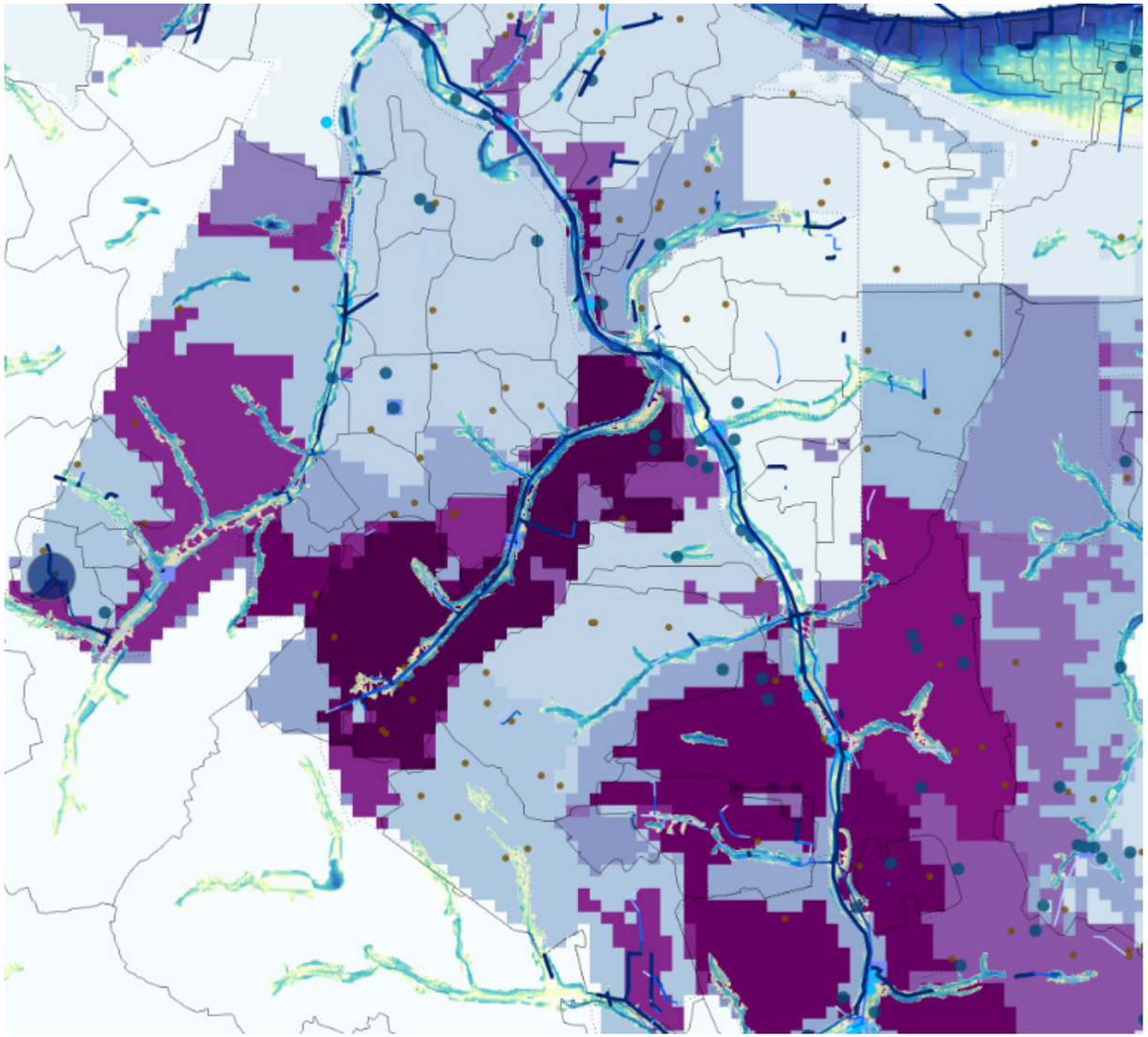


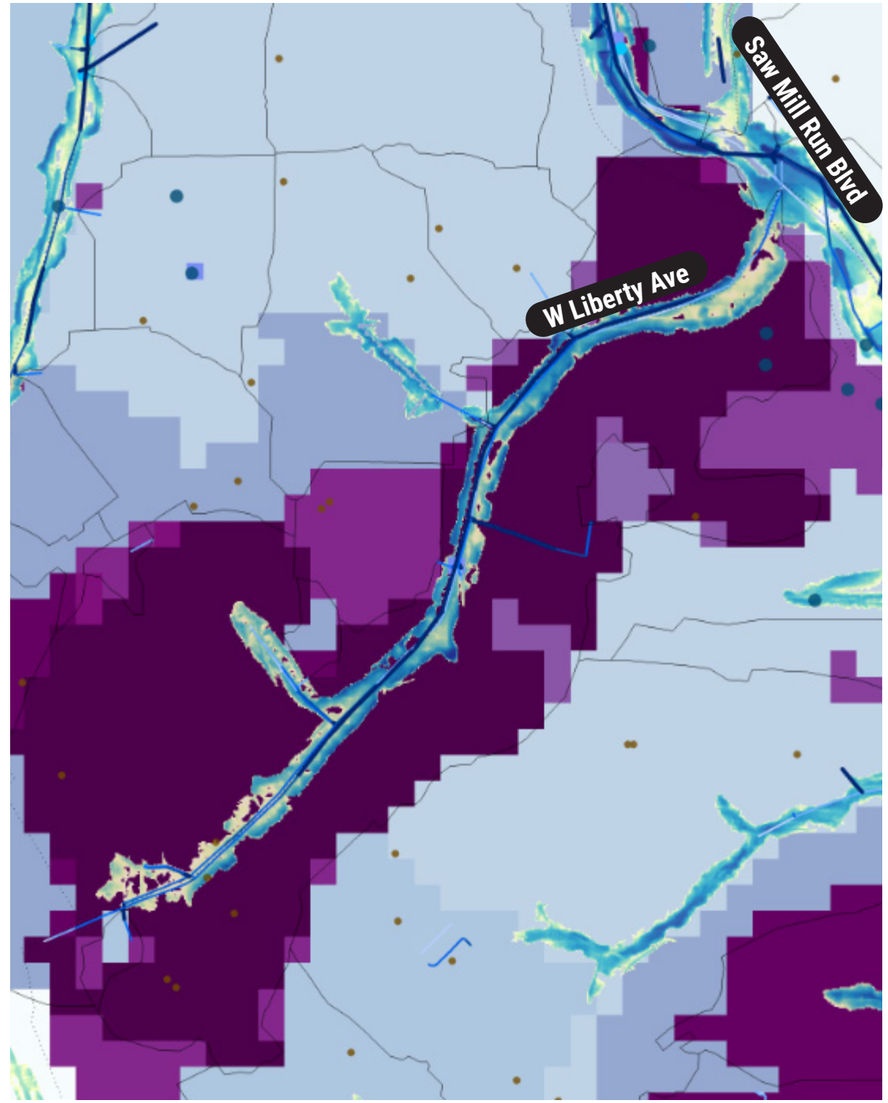
Most of the 20 events are small < 0.1 MG

2016 WWFS (AECOM)
2.25 MG tank and pump station
4 overflows per year target

Other Areas Considered

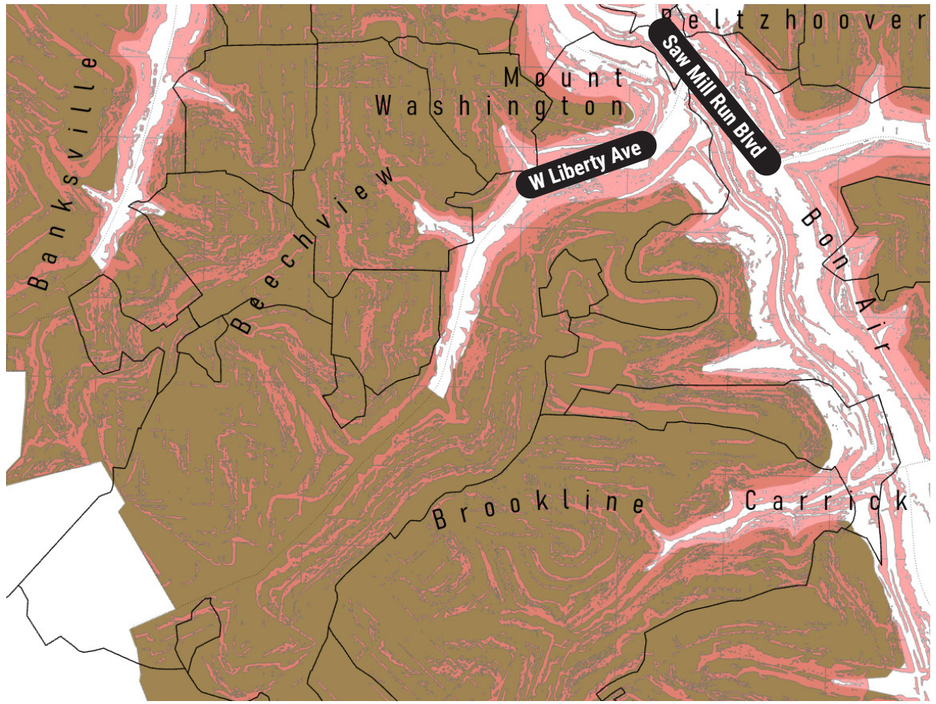
Beechview/Brookline

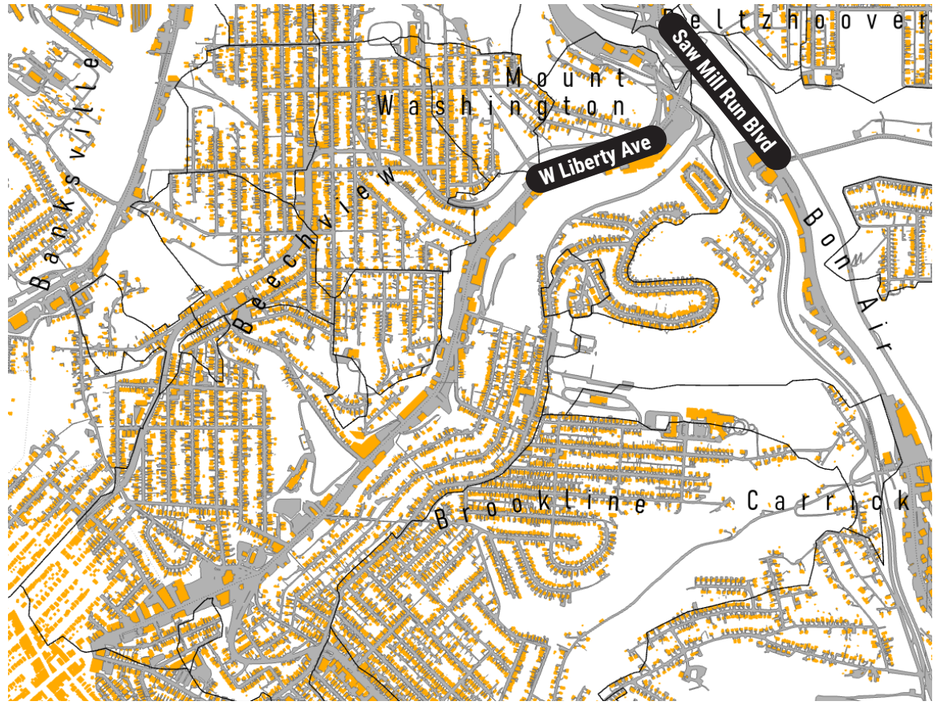




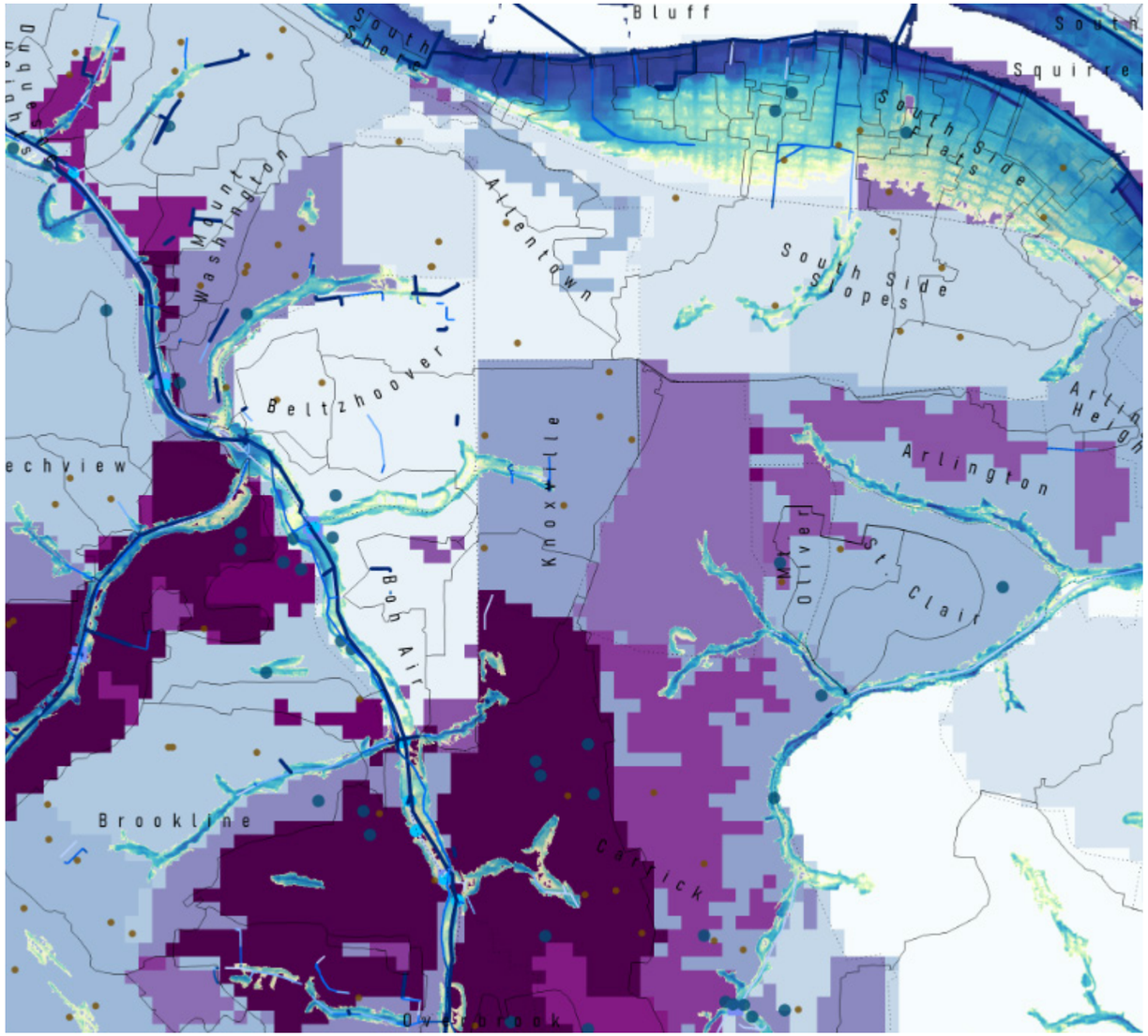
Beechview/Brookline: Prohibitively Constrained

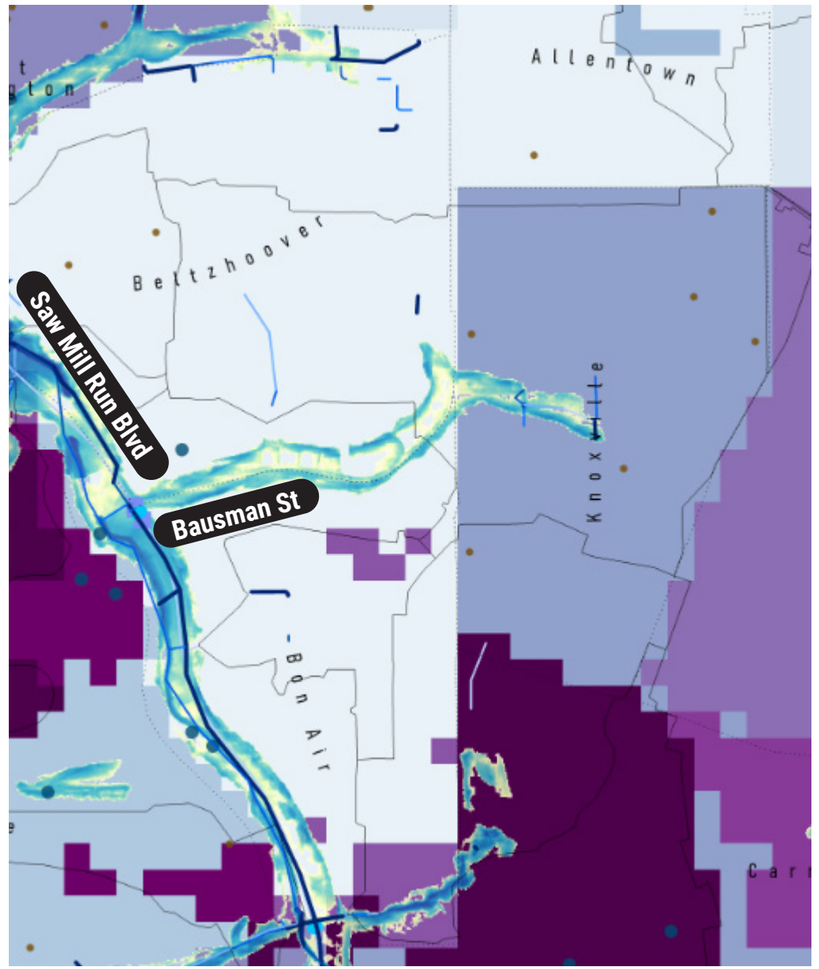
- Located in high flooding, WQ and EJ index ranked area
- Economically less disadvantaged than Knoxville
- Heavily developed, so limited opportunity for intervention: commercial corridor, lots of road/ parking/auto-related lots and businesses.
- Steep slopes, tight valleys, almost entirely undermined.





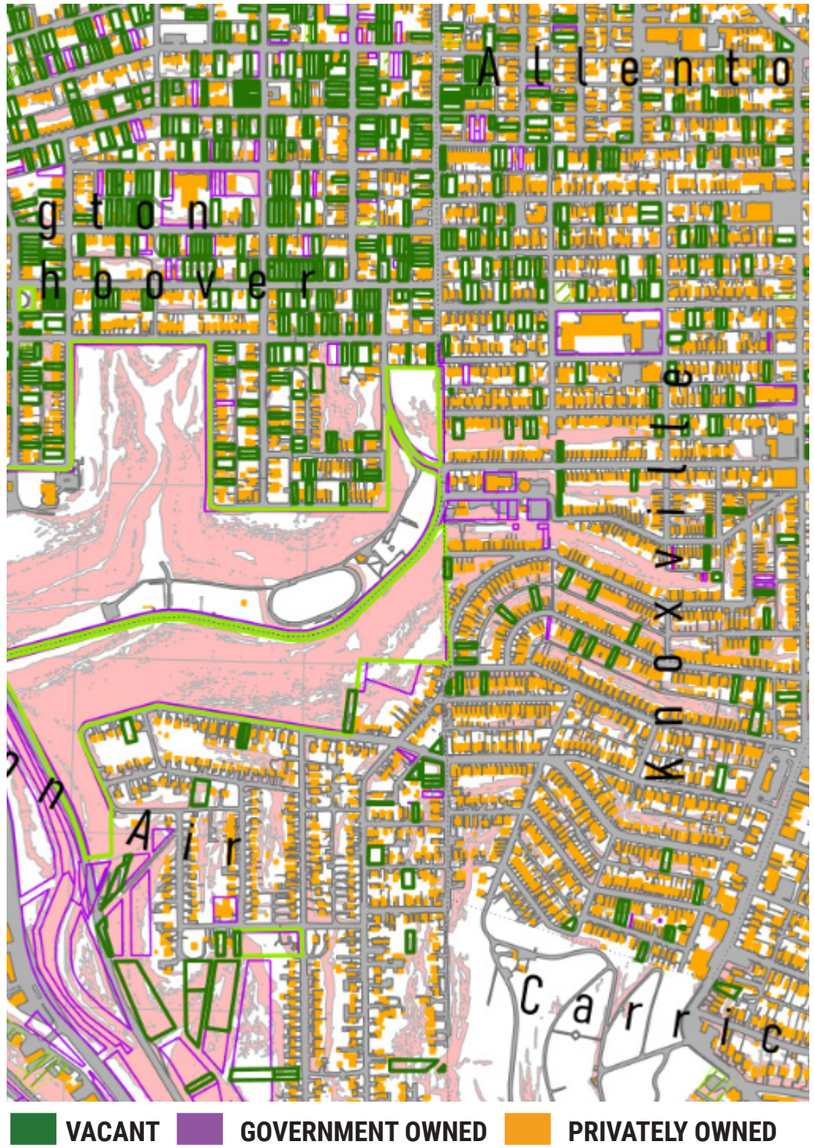
Knoxville/McKinley Park/Beltzhoover



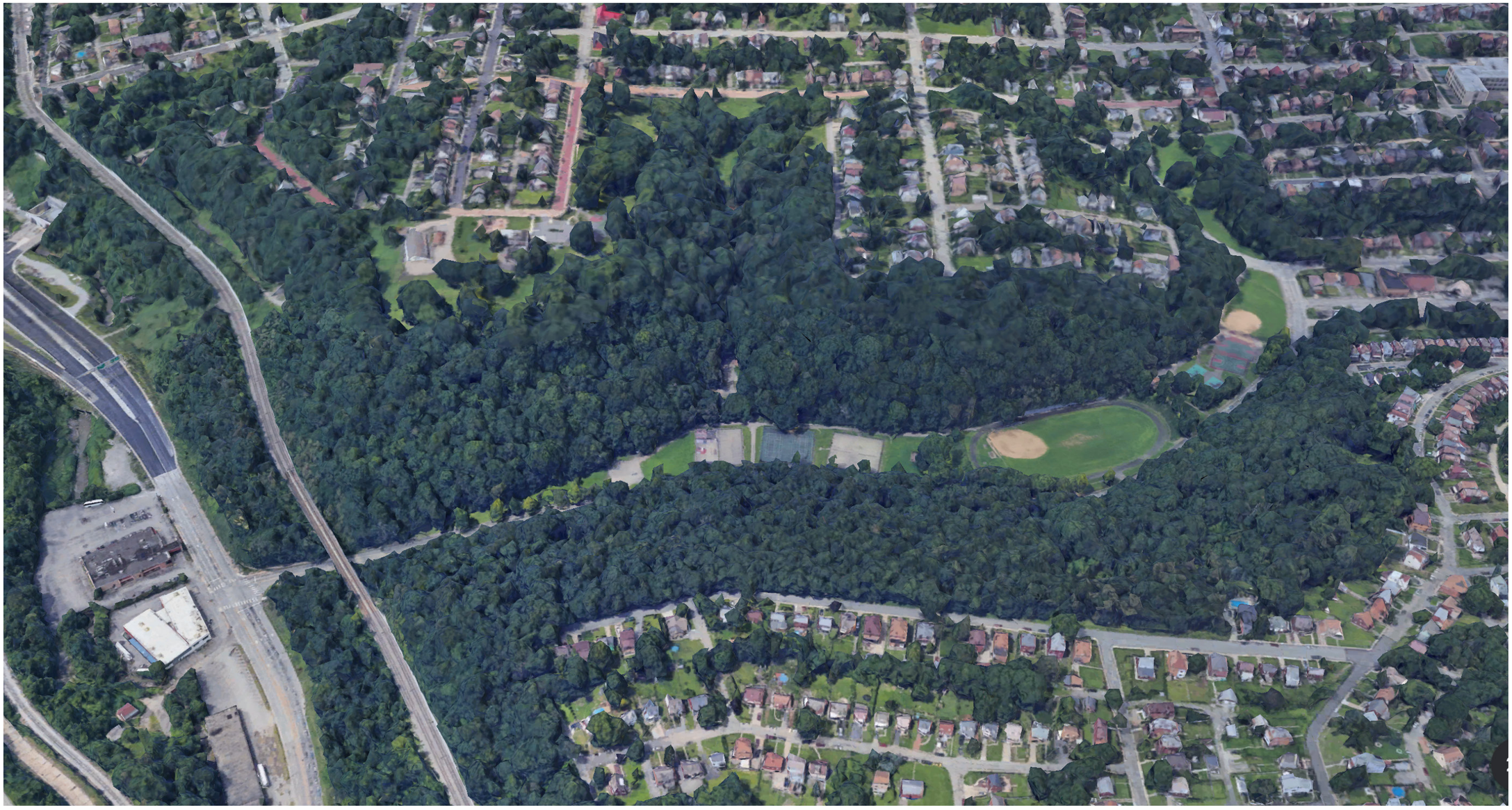


Knoxville/McKinley Park/Beltzhoover

- Mid-level environmental justice index score within Knoxville
- Creates opportunities for potential “trading” across CSO sheds or MS4 sheds
- CSO sheds will not be managed under interim wet weather plan
- Tributary to major “red, white, and blue” flooding zone on Saw Mill Run Blvd
- McKinley Park is #1 ranked park in PPC park screening but steep slopes could pose a challenge for implementation + need sewer separation to get large amounts of flow.
- Majority of area is undermined

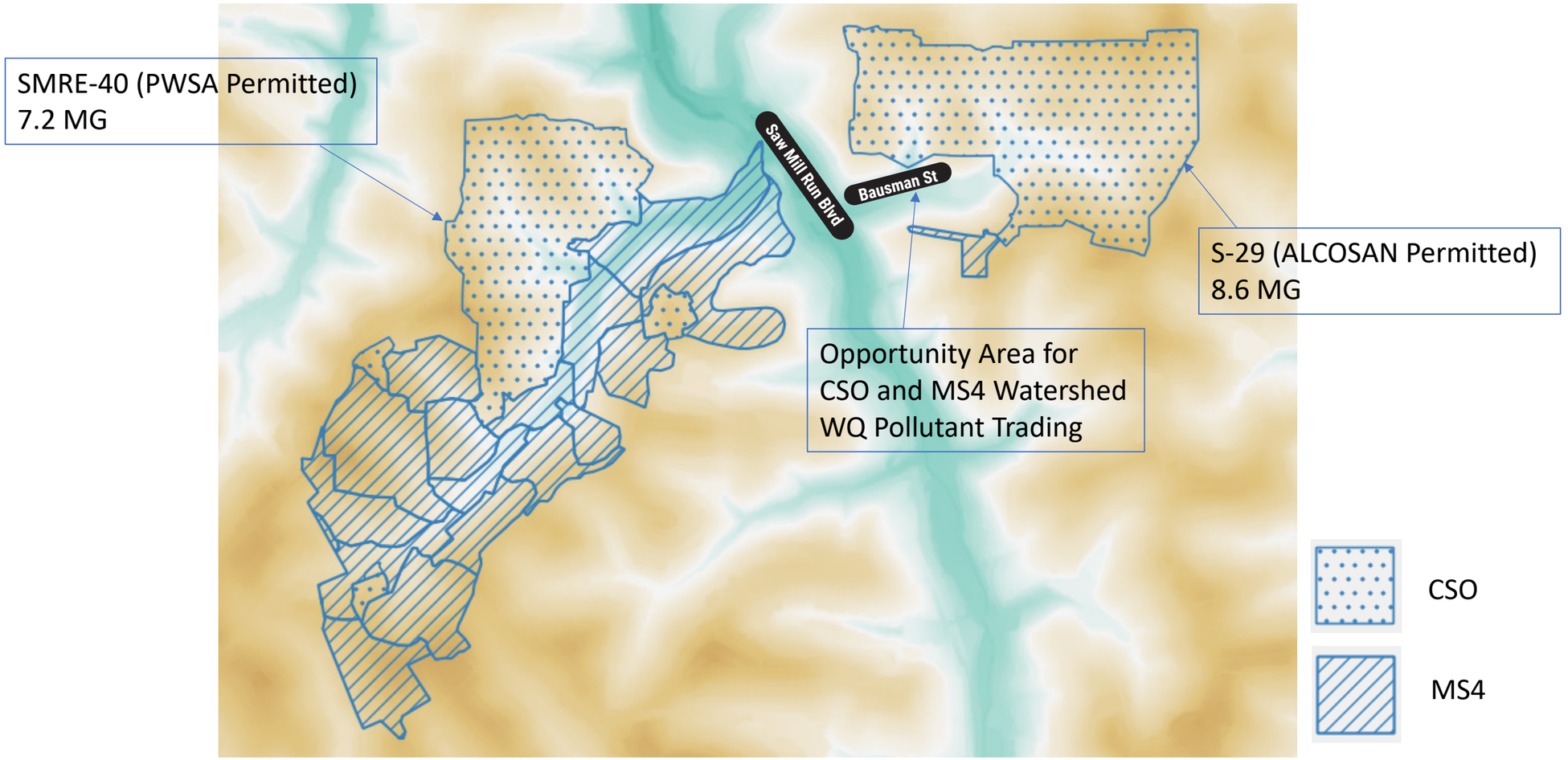


Knoxville/McKinley Park/Beltzhoover

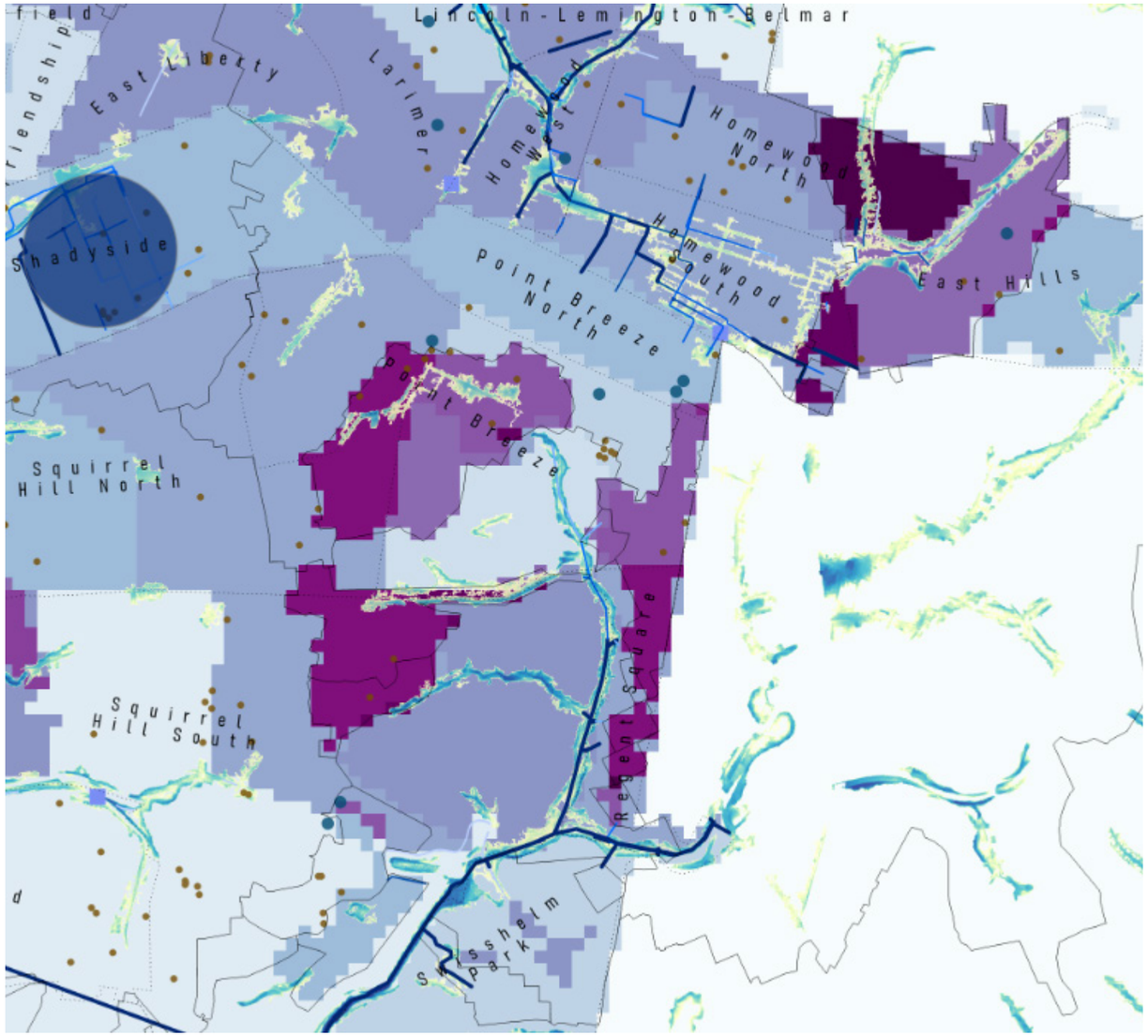


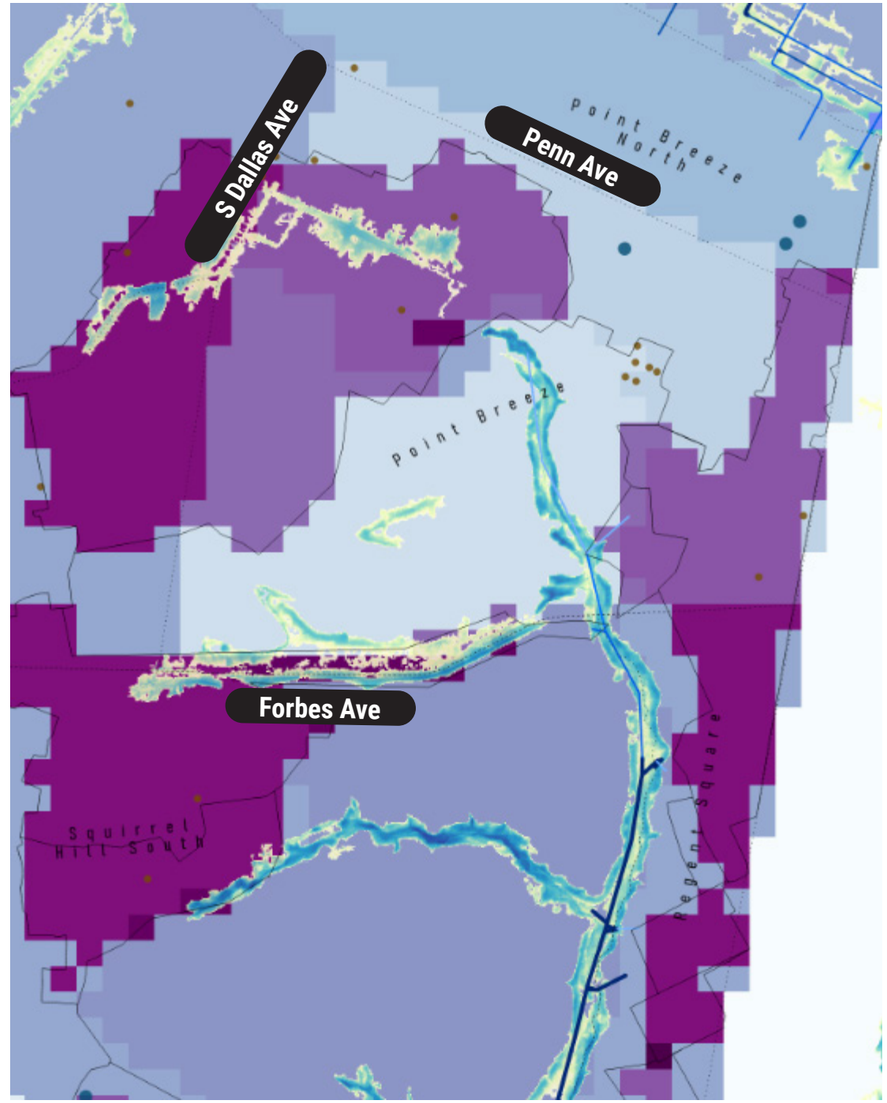
Knoxville/McKinley Park/Beltzhoover

Advance IWM Approach and Watershed Pollutant Trading



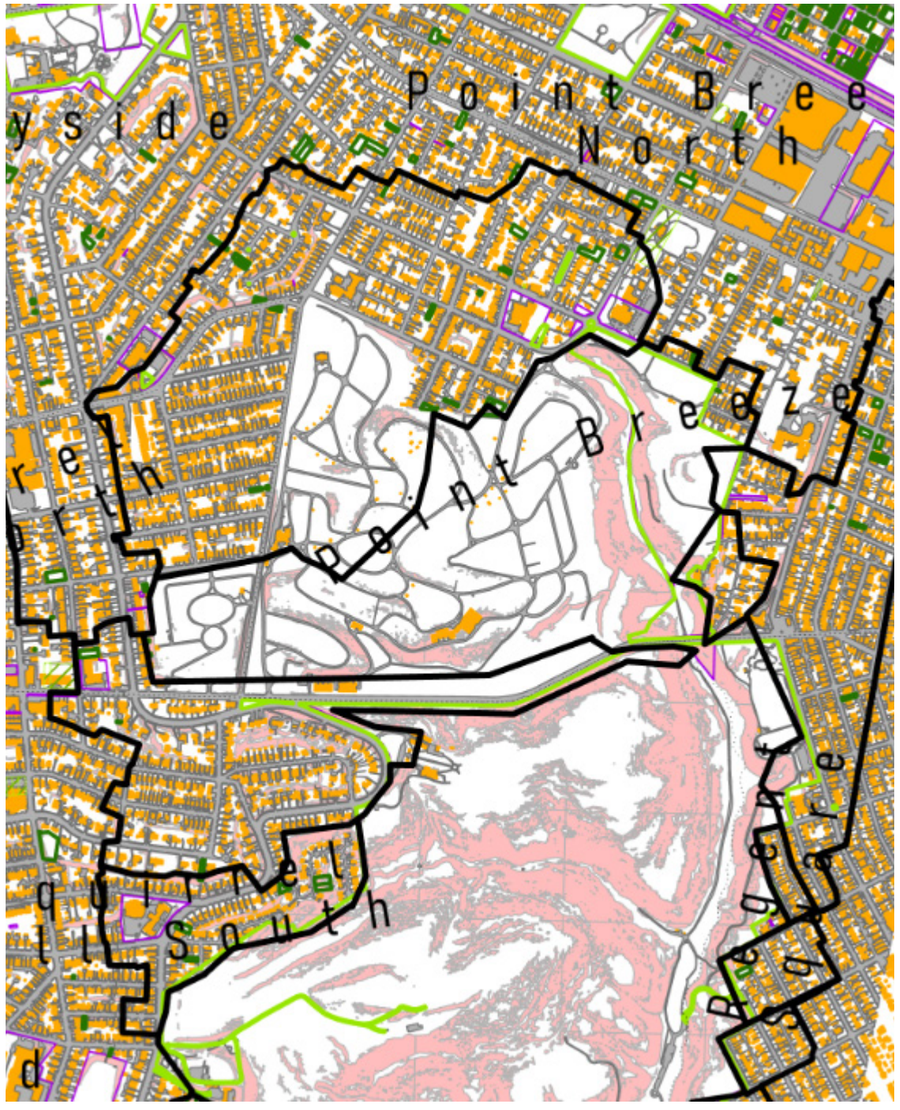
Point Breeze



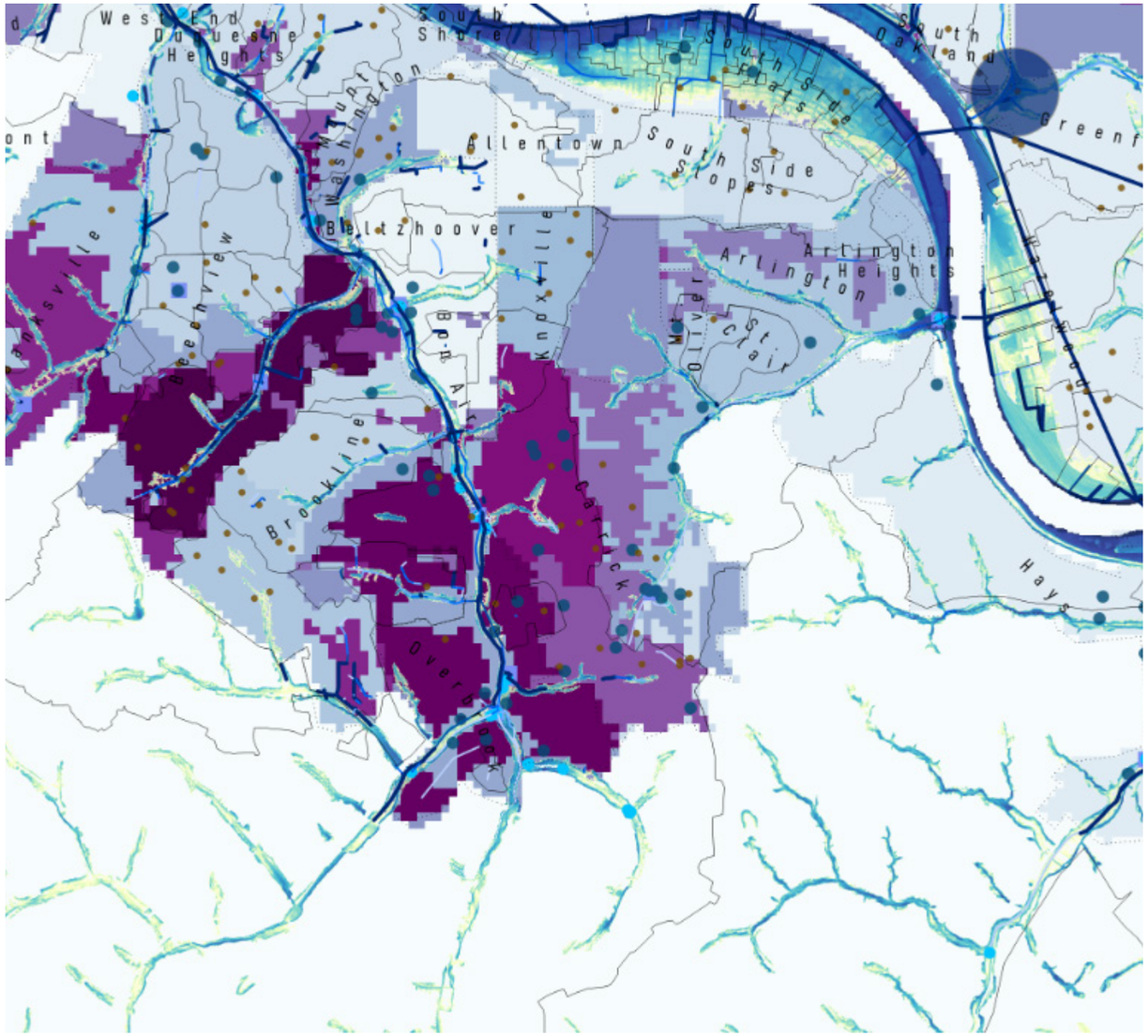


Point Breeze

- Lower EJ index score
- Limited vacancy, substantial private development
- Less acute flooding concerns

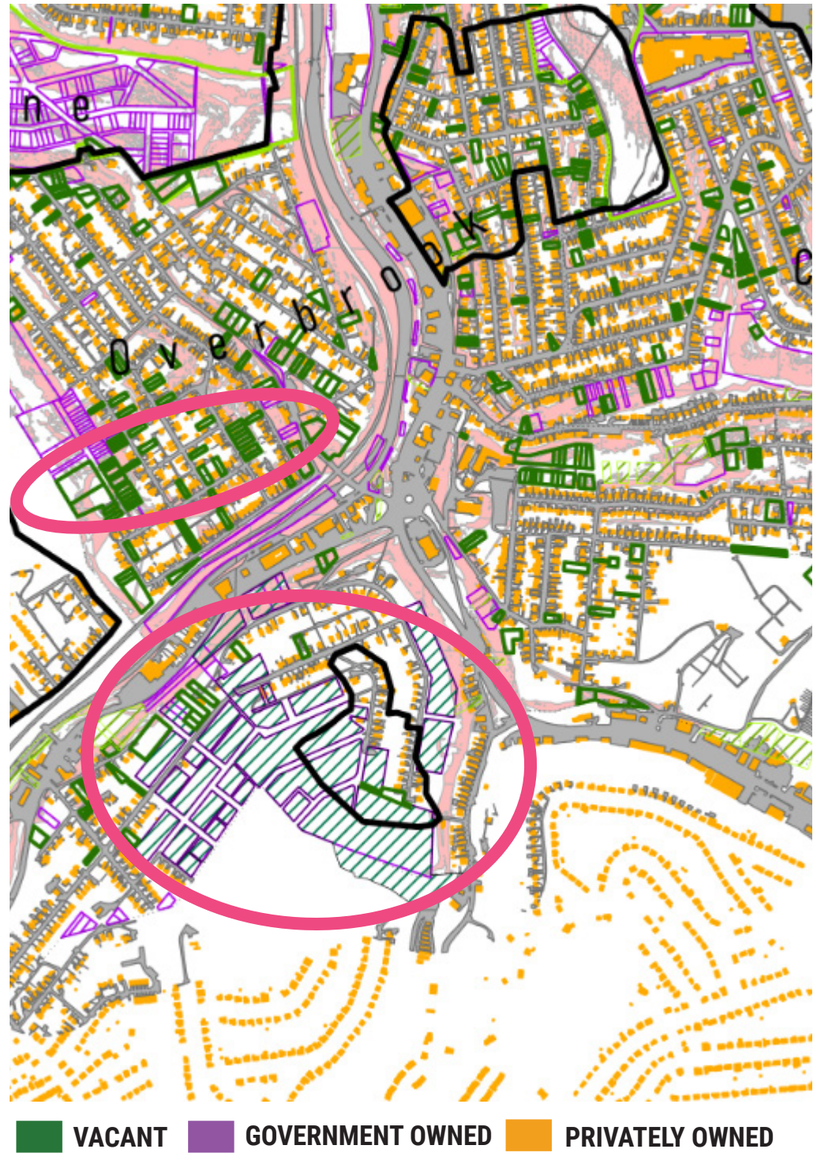


Overbrook


West End
Duquesne Heights
South Shore
South Side Flats
South Side Slopes
Allentown
Beltzhoover
Arlington
Arlington Heights
Mount Washington
Knoxville
Beechview
Brookline
Carrick
Overbrook
Hays
Mt. Oliver
St. Clair
Bon Air
Greenf
Saw Mill Run Blvd
Library Rd

Overbrook

- MS4 obligations, but no CSO obligations
- High level of flood hazards at Saw Mill Run Blvd & Library Rd
- One large greenway system (Fairhaven Greenway)
- Limited vacant parcel opportunities
- Mostly undermined



APPENDIX F

Stormwater Project Types

What kinds of stormwater investments fit best within each of Pittsburgh’s unique terrain types?

Stormwater Project Types

- Stormwater Project Types are targeted project groupings recommended for distinct Pittsburgh terrains.
- Project Types provide the “building blocks” to define the initial investment strategy within target areas as defined by the four lenses mapping
- Project Types refer to physical project installations as well as the incentives and policies that make the projects possible.

Terrain Type	Description
Upper Plateau and Hilltops	Areas located in the upper watershed typically with ground slopes ranging from 0 to 5 percent.
Sloped Hillside	Areas located in a transition zone from the upper plateaus to the pocket ravine with ground slopes ranging from 5 to 20 percent.
Pocket Ravines	Smaller narrow ravines typically containing culverted historic streams or seasonally ephemeral streams. These areas act as funnels for stormwater generated from upper plateaus and sloped hillsides. Stormwater concentrates and moves fast in these areas especially during intense rain events.
Floodplains	Medium to larger valley and ravines containing larger streams with perennial base stream flows. These areas act as the second funnel from water originating from smaller pocket ravines. In these areas stormwater is often dangerous and sometimes life threatening.
Dense Urban Area and River Flats	Dense urban areas typically consisting of a mix of commercial, industrial, and residential properties. These are primarily located in areas along the main three rivers and neighborhoods around the universities.

Stormwater Project Types

Terrain	Objectives	Stormwater Project Types
Upper Plateau and Hilltops	Concentrate, Store, Treat	Store in larger more centrally located facilities that require lower maintenance. Look to provide treatment via filtration especially in MS4 areas.
Sloped Hillside	Move, Protect, Store (with modifications) Treat	Centrally located facilities to store stormwater typically smaller in size. Storage sites may require more costly modifications (check dams, liners, velocity control) and generally not recommended unless on large perched flat open area. Where storage not available or cost prohibitive, provide protective flood mitigation in the form of increased surface (new curbing and inlets) and subsurface conveyance (new or upsized sewers), road raising, or backflow prevention on private laterals.
Pocket Ravines	Move, Protect, Treat	Storage naturally concentrated but potentially more challenging due to slope, narrow valleys, and access constraints. Where not possible to store, move water through the ravine to downstream larger floodplains. Provide flood protection, increased conveyance, and backflow prevention. Incorporate ecological restoration aspects where possible.
Floodplains	Store, Treat, Protect	Reconnect stream with adjacent floodplains. Provide storage in floodplain to allow for flood relief and water quality treatment. Couple with stream restoration and bank stabilization for MS4 credits. Explore buyouts for repetitive loss properties for potential floodplain restoration sites. Coordination with adjacent transportation opportunities with major roadway flooding (Washington Blvd, Saw Mill Run Blvd)
Dense Urban Area and River Flats	Move, Protect, Store (private land)	Provide storage in private areas such as parking lots and common areas as part of redevelopment likely most cost effective. Consider grant and incentive programs to invest public dollars in these areas. Avoid right-of-way work in dense areas due to greater cost risks. Increase sewer and surface conveyance and provide flood protection (e.g., via smart valves and inline storage).

Note: For all terrains - look for continuous vacant lots typically at intersections and large public open areas (parks, greenways, schools, parking lots). Incorporate a neighborhood integrated environmental full delivery approach as part of vacant lot areas to ensure equitable outcomes (see Alternative Delivery slides).

Core Technologies

Create storage

- Distributed Infrastructure
- Regional (i.e., downstream)
- In-line and “smart-sewers”
- Floodplain creation
- Retrofit existing storage

Improve/create conveyance

- Larger sewers
- New sewers
- Sewer separation
- Surface conveyance
  - Curb and gutter
  - Stream restoration / separation
- New inlets
- Bridge/culvert replacement
- Pump stations

Protect existing assets

- Buy-outs
- Flood proofing
- Roadraising
- Backflow valves

Upper Plateau and Hilltops Terrain

Common issues:

Overland flooding, basement backups, water quality, contribution to downstream issues

Technologies:

Distributed storage, new piping, new inlets, partial separation, surface conveyance improvements

Implementation challenges:

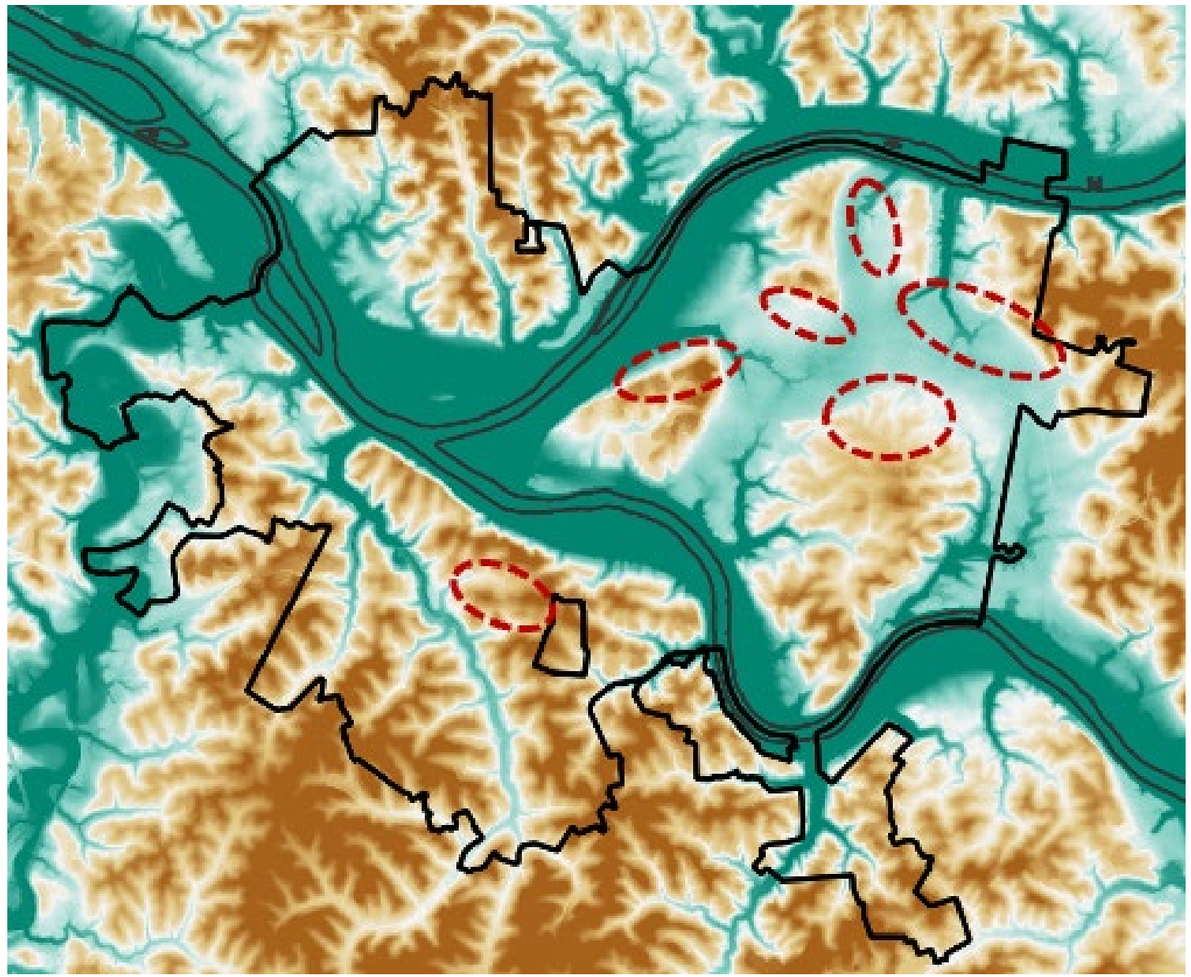
Utility constraints, urban uses, lack of sufficient drainage area, lack of slope

Co-benefits:

Passive recreation, urban heat island reduction, repaving, streetscape improvements, complete streets, cost sharing, environmental justice

Example areas in Pittsburgh:

Homewood, Larimar, Point Breeze, Morningside, Knoxville/Beltzhoover, Lower Garfield/Friendship, Upper Hill District, Squirrel Hill



Note: Identified areas are for illustrative purpose only and not representative of all areas fitting this terrain.

Upper Plateau Terrain

Key precedent: Fourth Ward Park Atlanta, GA

Before



After







Upper Plateau Terrain

Key precedent: Towerside District, Minneapolis, MN

The system includes a first-of-its-kind district stormwater agreement between four private landowners. The system collects storm water runoff from six development parcels totaling eight acres, conveying that runoff into two biofiltration basins for treatment, storage, and reuse on nearby development sites and community garden.





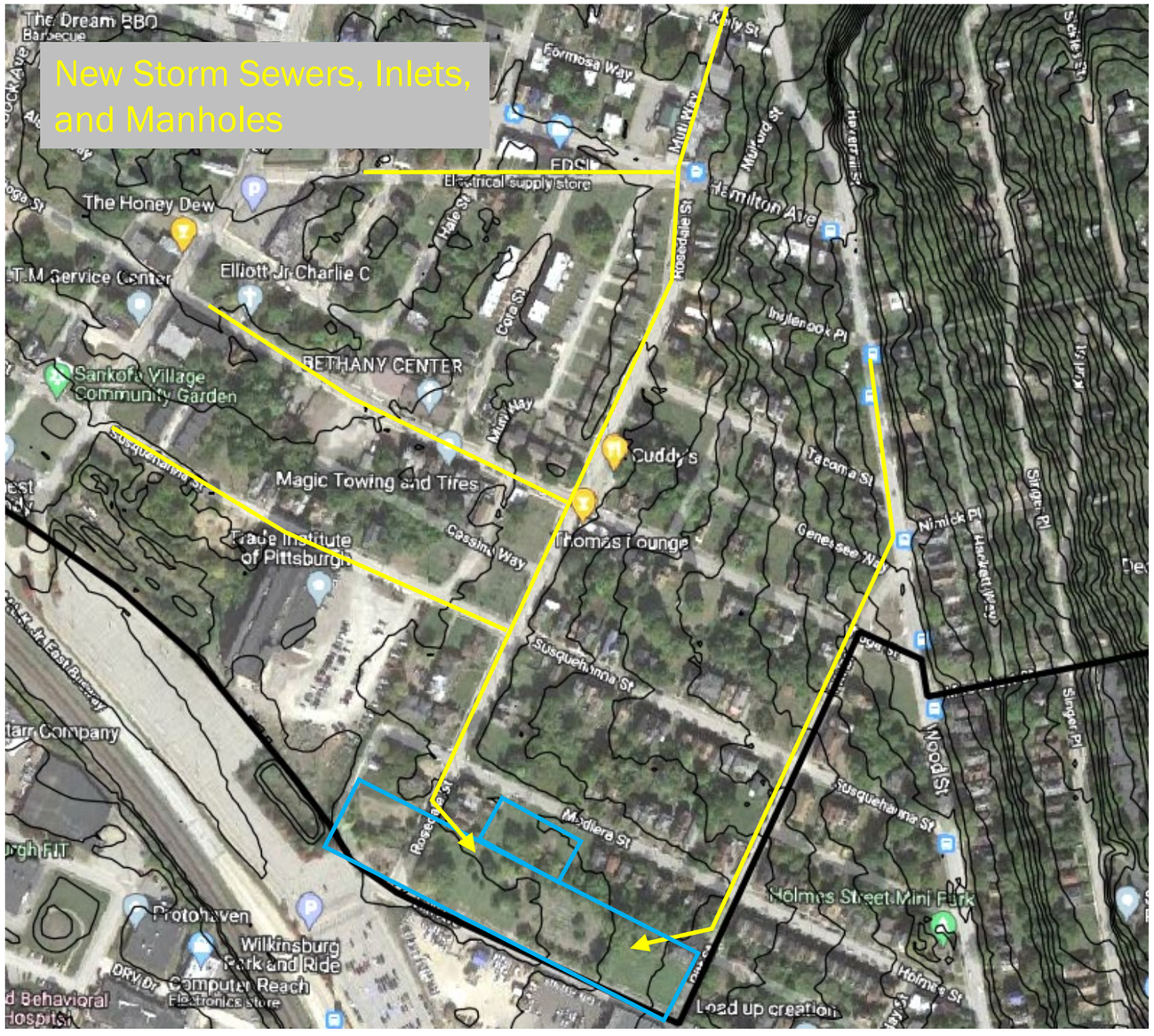


The agreement made with property owners makes it possible to manage stormwater for future development jointly and reduce each individual property owners' expense, while also unencumbering a portion of their property to allow more flexibility for development and reducing surface and groundwater pollution.

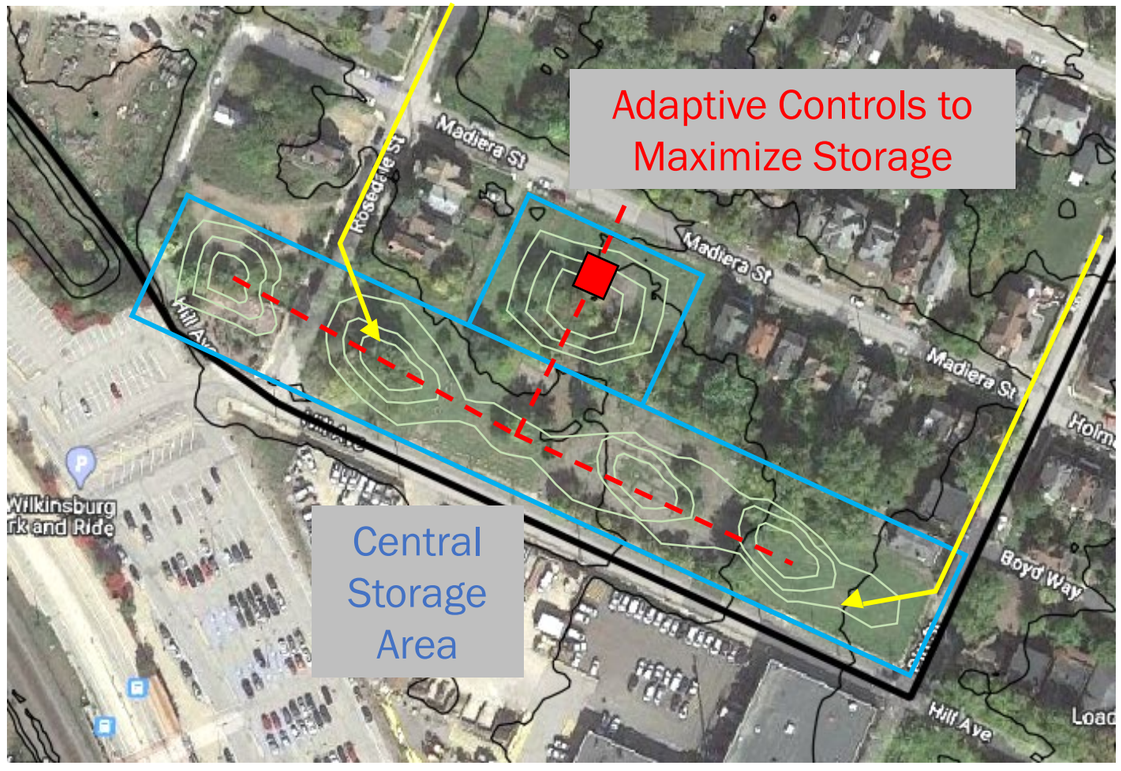
http://towersidemsp.org/

Upper Plateau Terrain Example Concept

Focus Area: Homewood



Large Continuous Vacant Lot Adjacent to Wilkinsburg Park and Ride



Sloped Hillside Terrain

Common issues:

Overland flooding, landslides, groundwater seeps and springs, water quality and AMD

Technologies:

Some storage in limited areas, larger sewers, new sewers, surface conveyance improvements, new inlets

Implementation challenges:

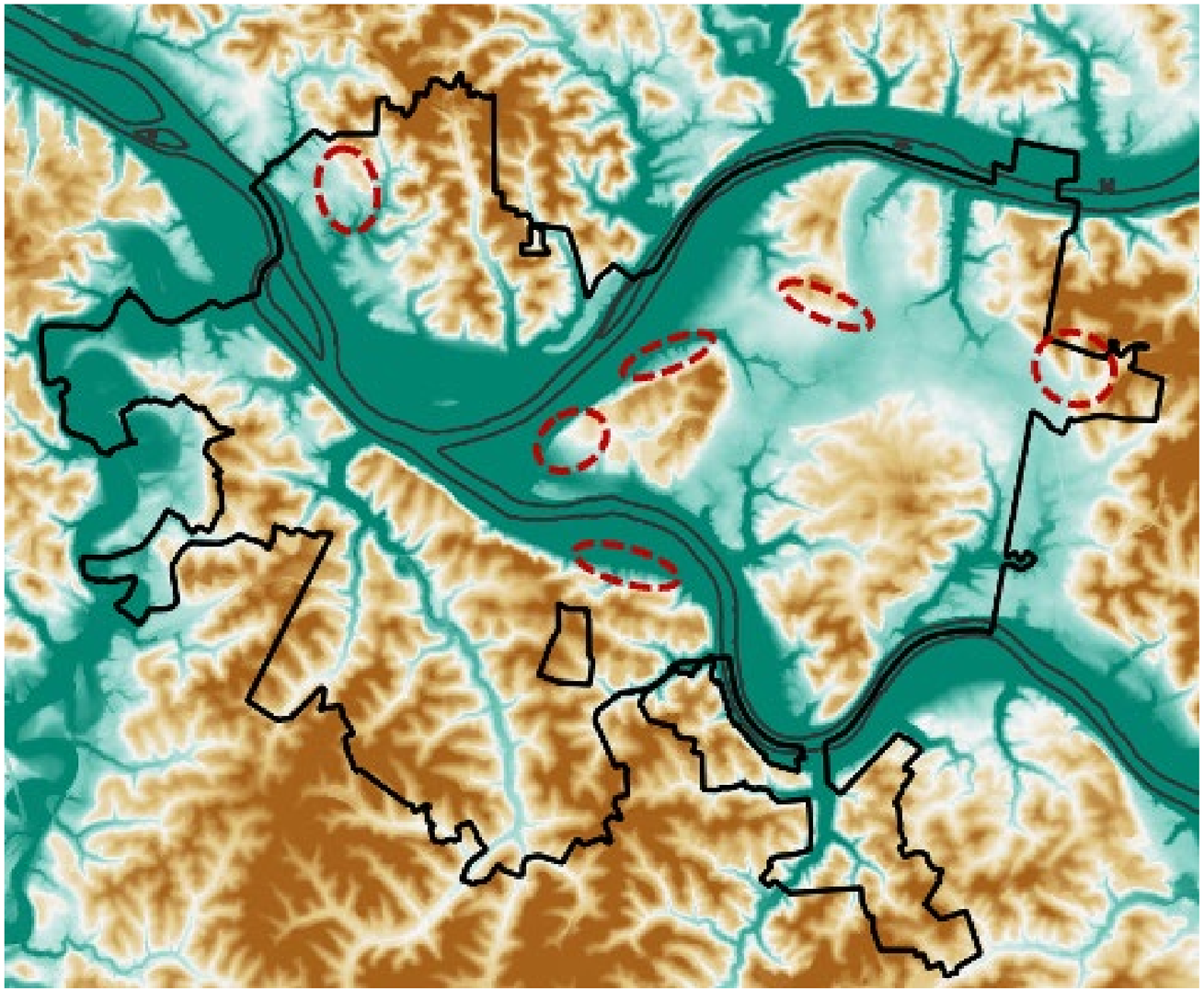
Wooded or naturalized areas, steep slopes

Co-benefits:

Active Recreation, Passive Recreation, Cost Sharing

Example areas in Pittsburgh:

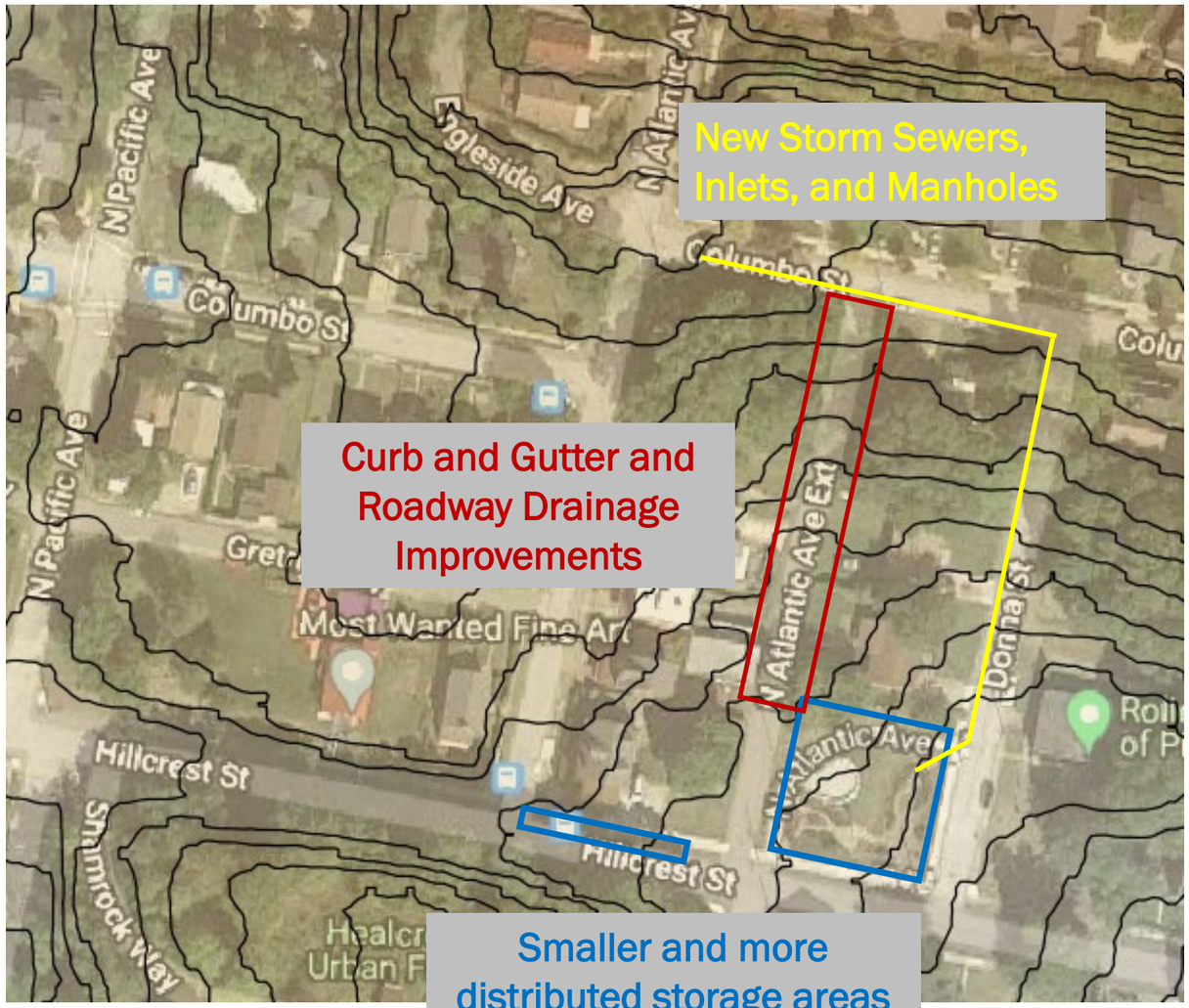
Brighton Heights, Upper Garfield, Polish Hill, Lower Hill District, East Hills, South Side Slopes, Carrick



Note: Identified areas are for illustrative purpose only and not representative of all areas fitting this terrain.

Sloped Hillside Terrain Example Concept

Hillcrest GSI





Storage possible but would be more challenging and costly per acre managed.

Greater maintenance costs over full life cycle.



Installation of impermeable liners, concrete formed check dams, and flow junction boxes required.

Sloped Hillside Terrain

Other Representative Projects

Polish Hill – Melwood and Finland

Lower Hill District – Sports Authority Street Tree Trenches

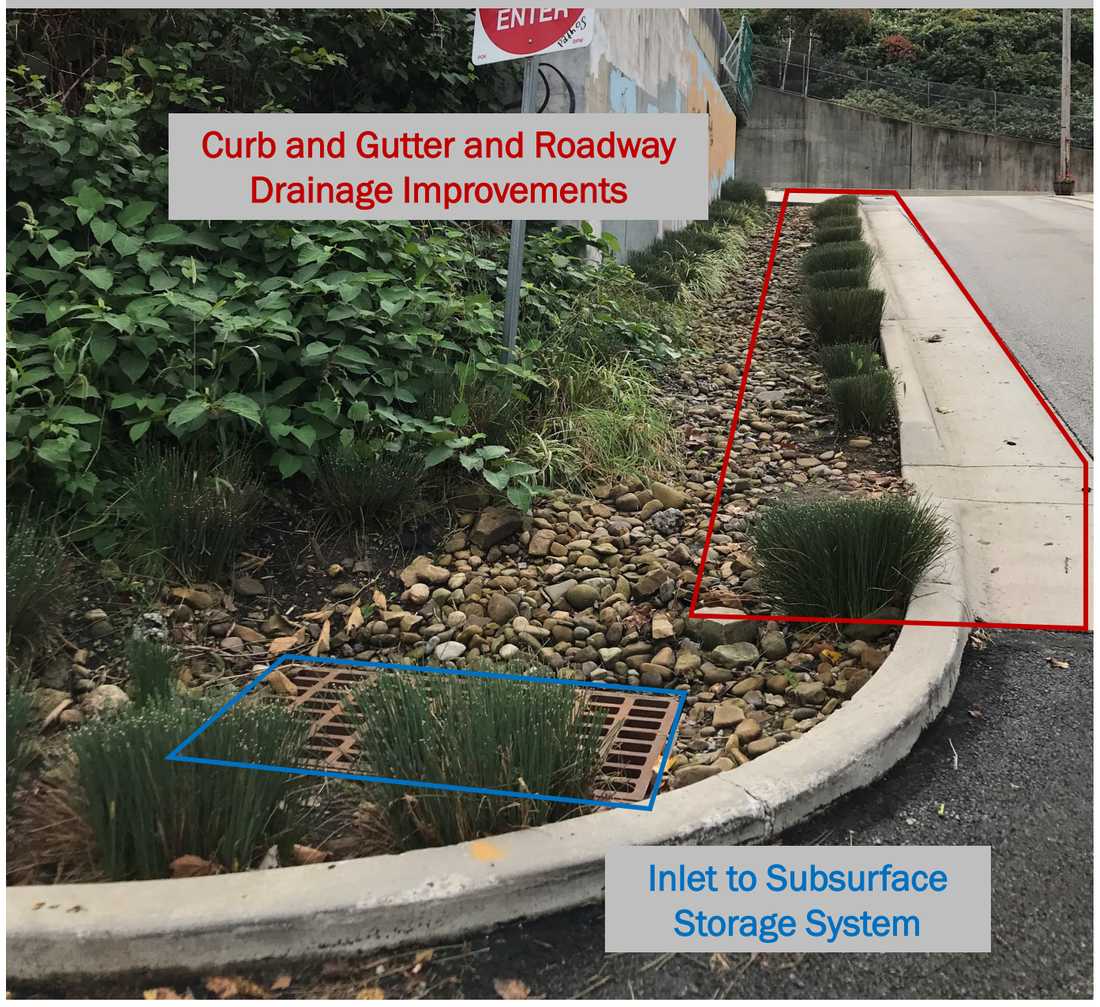
Red Oak and Hayson Bioswales

Steward Avenue Stormwater Improvements (future)



Lower Hill District Street Tree Pits

Polish Hill Cobble Swale and Subsurface Storage

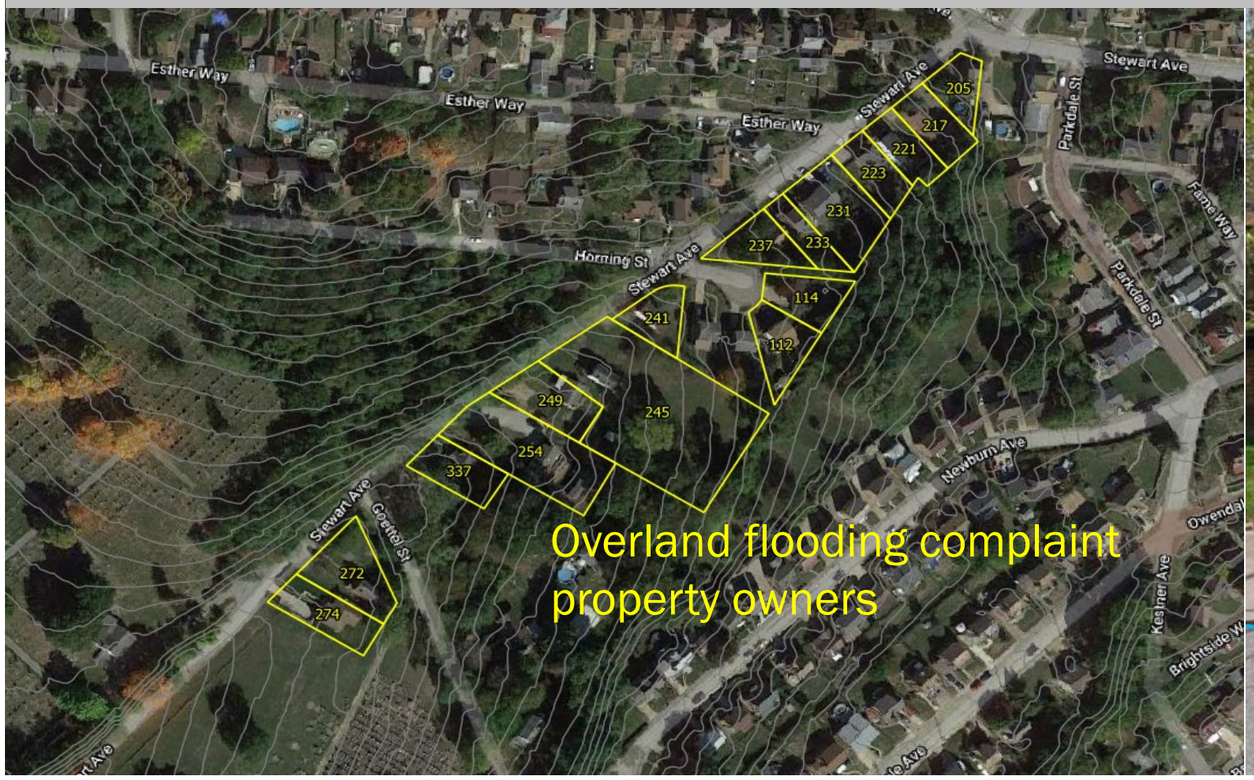


Sloped Hillside Terrain Example Concept

Stewart Ave Project Recommendations

Increase surface conveyance (move), provide cost effective treatment (MS4)

Lack of adequate ROW drainage capacity leading to flooding complaints.





Sloped Hillside Terrain Example Concept

Stewart Ave Project Recommendations

Increase surface conveyance (move)



- Upgrade curb, gutter and sidewalk
- Regrade road with proper crown
- Construct new sewers and stormwater inlets
- Develop standardized approach and cost share with DOMI
- Lack of ROW capacity a widespread issue city-wide

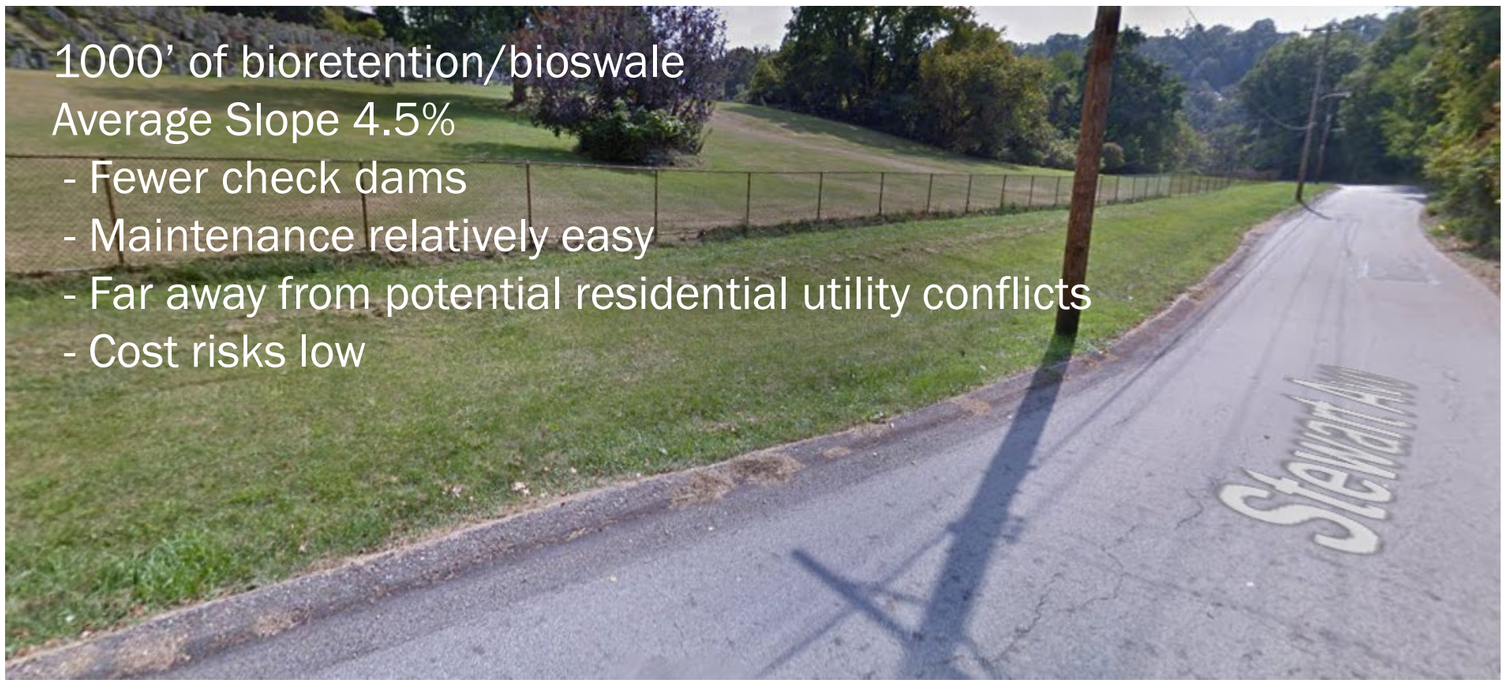
Sloped Hillside Terrain Example Concept

Stewart Ave Project Recommendations

Provide cost effective treatment (MS4)



Integrate Downstream Bioswale into new stormwater conveyance for MS4 water quality treatment. Topography flattens out near bottom of Stewart Avenue.



Pocket Ravines Terrain

Common issues:

Overland flooding, flash flooding, landslides, water quality, groundwater seeps and springs, AMD

Technologies:

Smaller floodplain and storage creation, increased conveyance (piping and surface), limited ephemeral stream restoration, storm sewer separation

Implementation challenges:

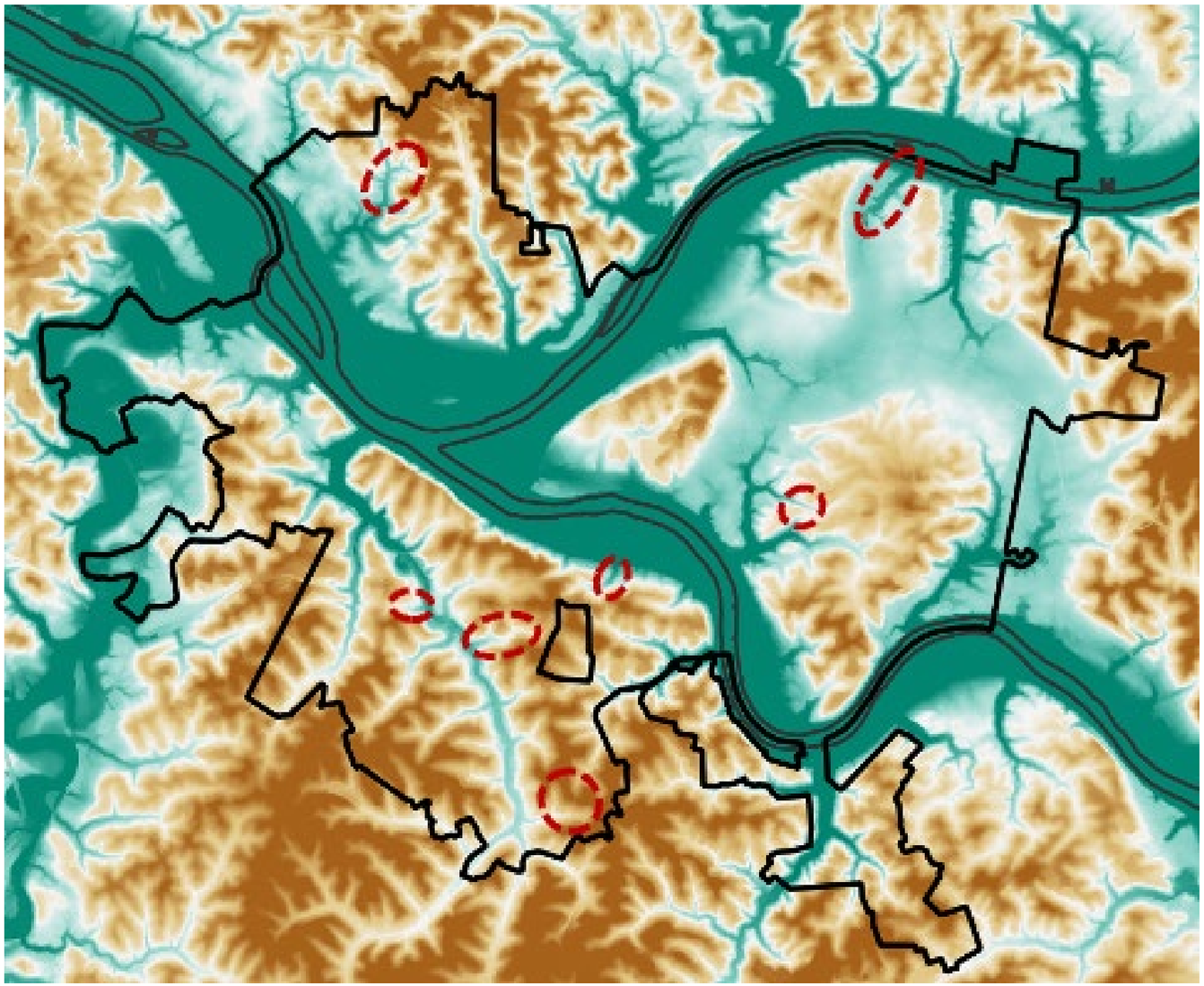
Wooded or naturalized areas, steep slopes, equipment access, landslide prone

Co-benefits:

Active Recreation, Passive Recreation, Complete Streets, Cost Sharing

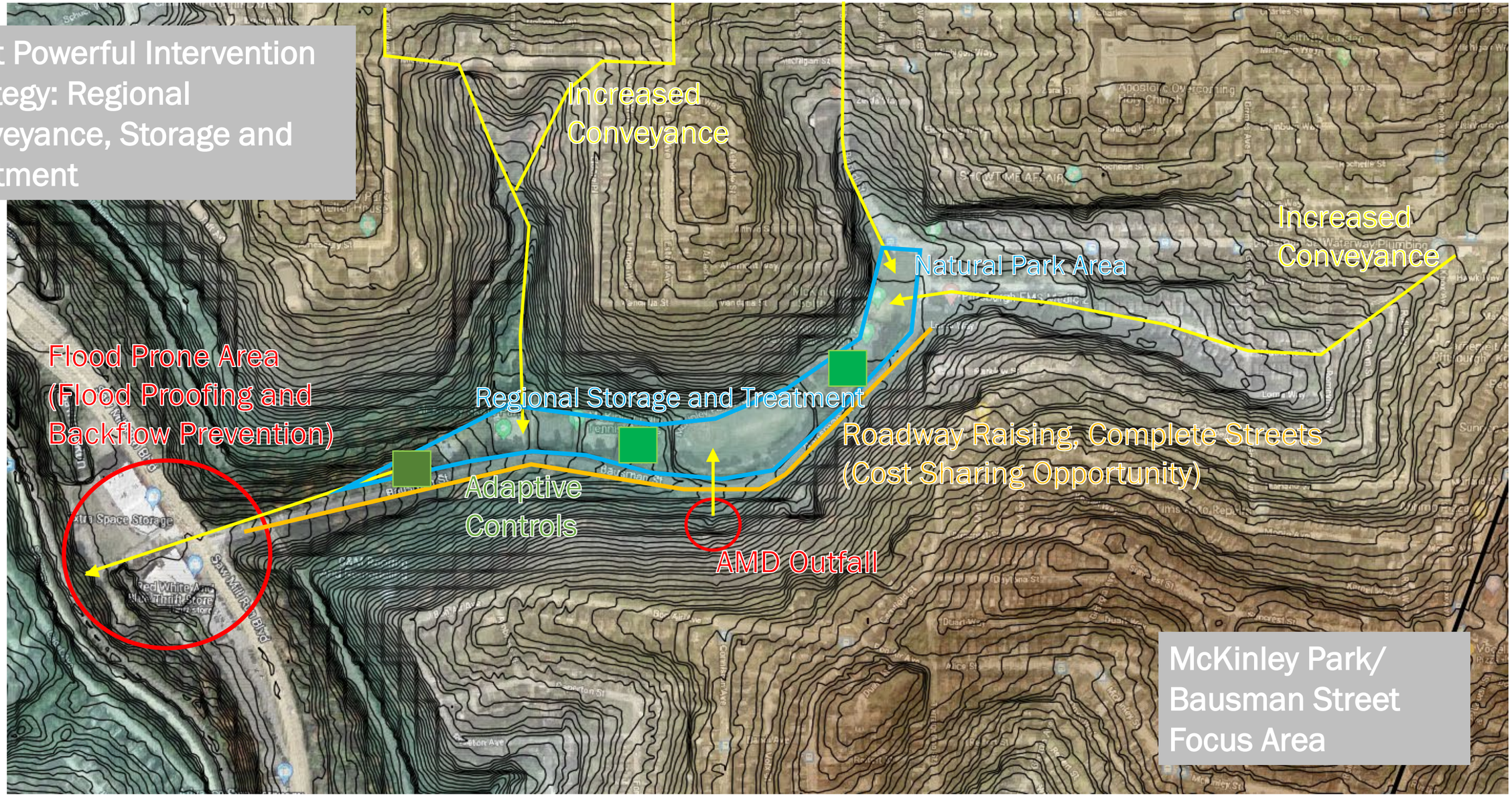
Example areas in Pittsburgh:

Woods Run, Heth's Run, McKinley Park/Bausman Street, Moore Park, Naylor Run, Southside Park



Note: Identified areas are for illustrative purpose only and not representative of all areas fitting this terrain.

Pocket Ravines Terrain Example Concept



Floodplain Terrain

Common issues:

Severe overland flooding, dangerous flash flooding, water quality

Technologies:

Regional Storage, Floodplain creation, Storage Retrofits, Buy-outs, Flood Proofing, Road Raising, Storm sewer separation

Implementation challenges:

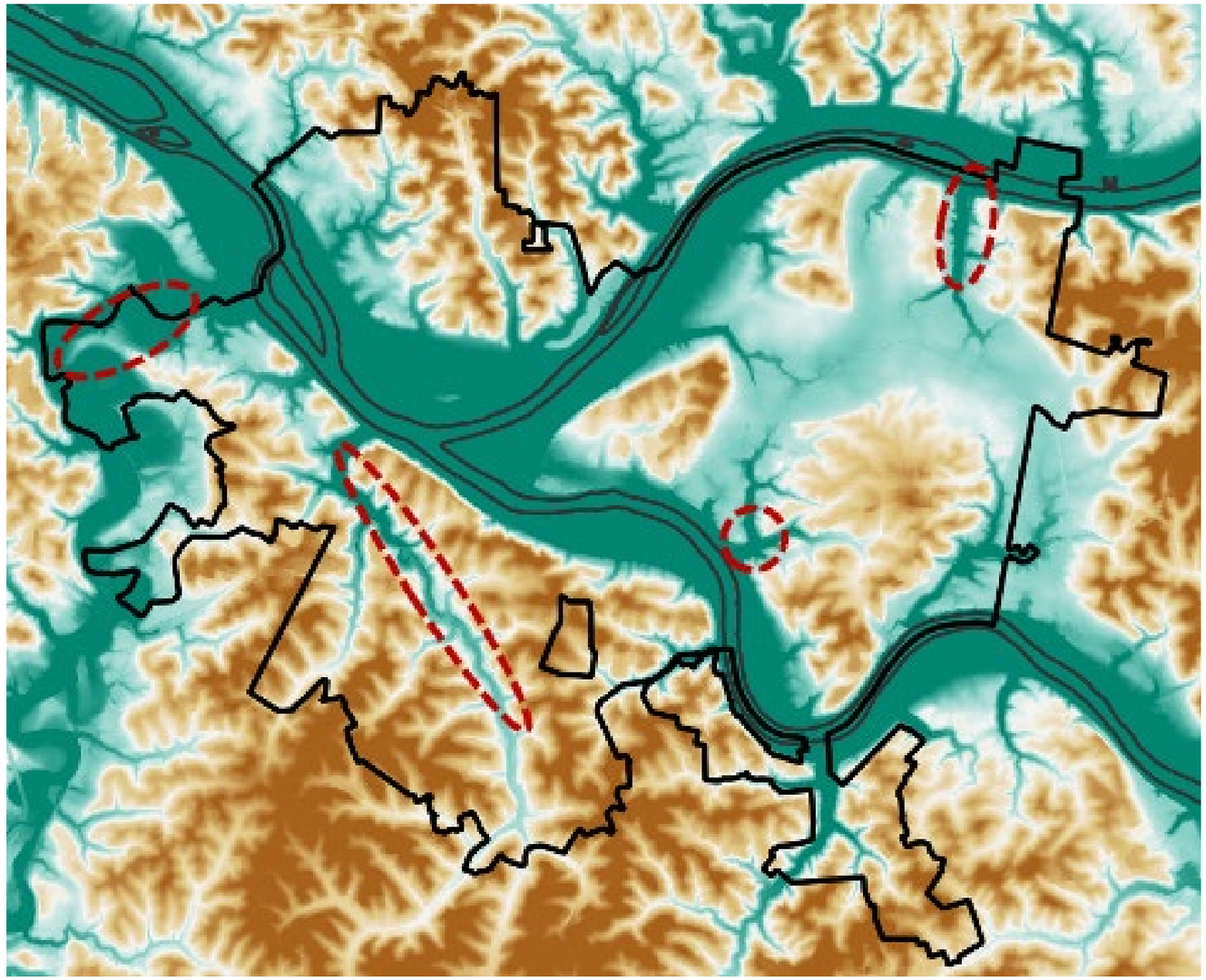
Wooded or naturalized areas, existing occupied structures/floodplain encroachment, utility conflicts, transportation conflicts

Co-benefits:

Active Recreation, Passive Recreation, Urban Heat Island Reduction, Economic Development, Repaving, Streetscape Improvements, Complete Streets, Cost Sharing, Environmental Justice.

Example areas in Pittsburgh:

Lower Four Mile Run, Saw Mill Run, Streets Run, Washington Boulevard, Lower Chartiers



Note: Identified areas are for illustrative purpose only and not representative of all areas fitting this terrain.

Floodplain Terrain Project Example

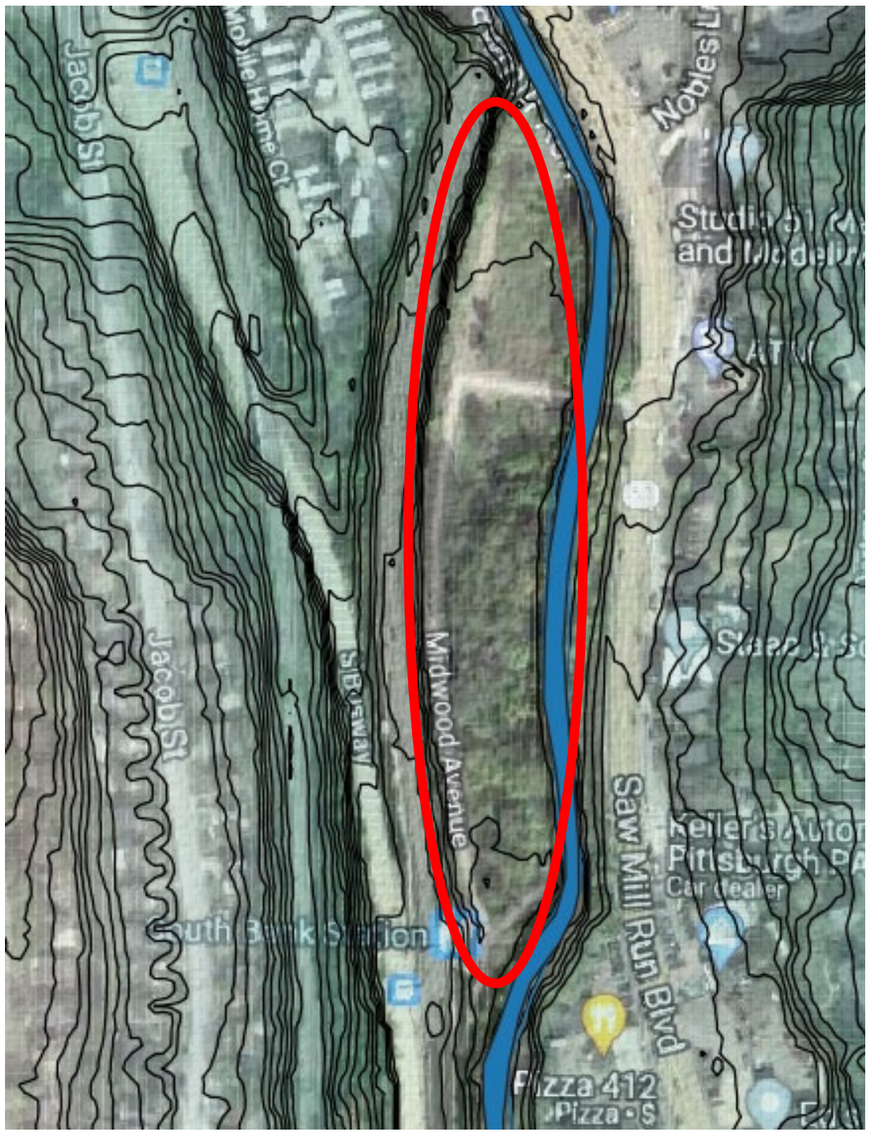
Key precedent: Foster Floodplain Natural Area - Portland, Oregon



- 60 property buyouts/families relocated
- Obtained $2.7M FEMA grants via Pre-disaster Mitigation Program (now BRIC)
- Flood storage
- Habitat enhancement
- Neighborhood improvements
- Trails and recreation

Floodplain Terrain Project Concept

Saw Mill Run Ansonia Place Floodplain Restoration



- Approx. 3.5 acres
- Floodplain reconnection
- Streambank stabilization
- Constructed wetlands and storage



Dense Urban Areas/River Flats Terrain

Common issues:

Riverine flooding, surface flooding, water quality

Technologies:

Distributed storage in private redevelopment, subsurface storage, larger sewers, new sewers, new Inlets, full storm separation

Implementation challenges:

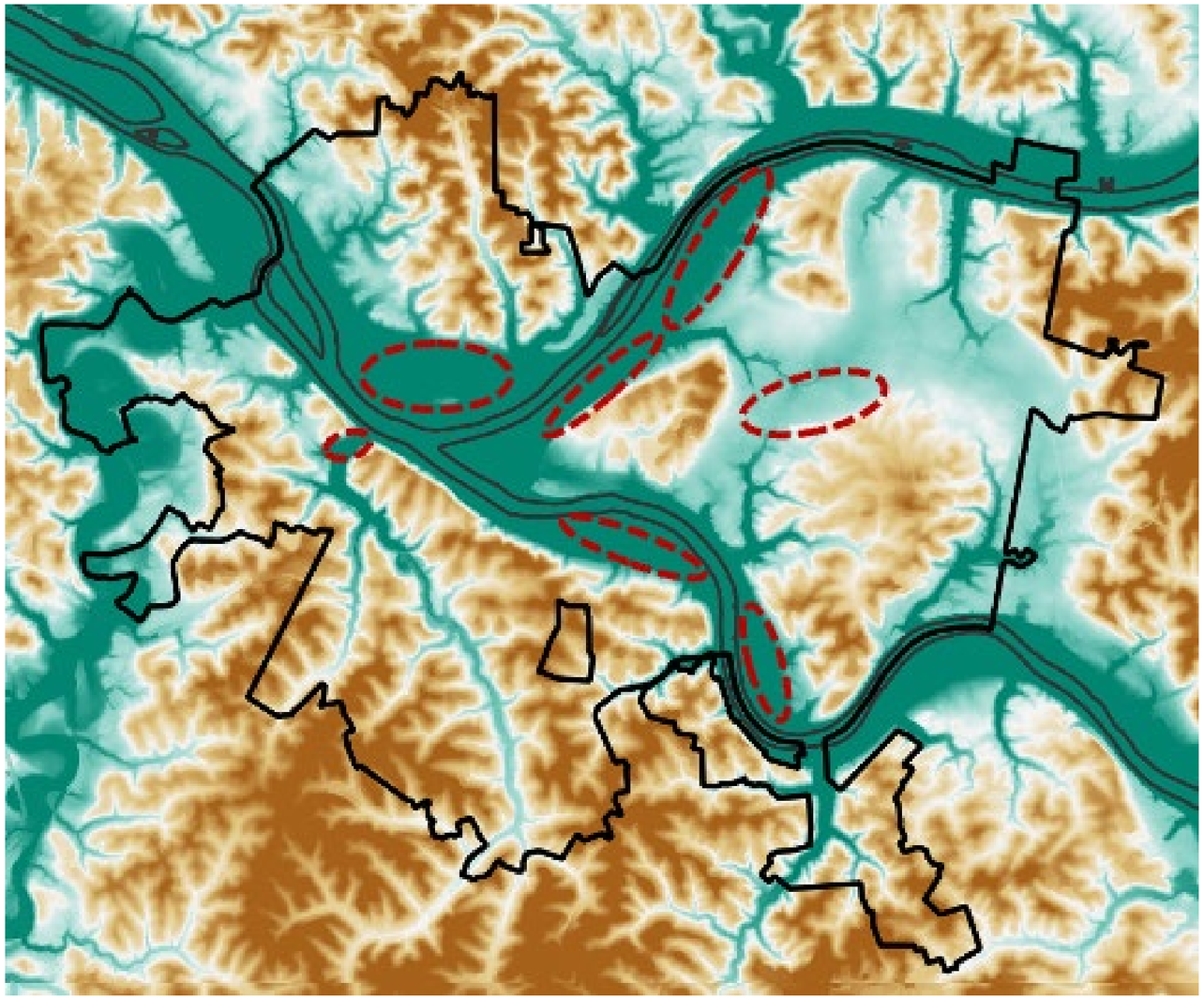
Utility constraints, urban uses, lack of slope, transportation conflicts

Co-benefits:

Active Recreation, Passive Recreation, Urban Heat Island Reduction, Economic Development, Repaving, Streetscape Improvements, Complete Streets, Cost Sharing, Environmental Justice.

Example areas in Pittsburgh:

Northside, Strip District, Lawrenceville, Oakland/Shadyside/Bloomfield, Southside Flats, Hazelwood, West End Village



Note: Identified areas are for illustrative purpose only and not representative of all areas fitting this terrain.

Dense Urban Areas/River Flats

Key precedents:

- Strip District Storm Sewer Separation Project
- South Side Flats Storm Sewer Separation (On-Going PWSA Project)
- Continue to look for opportunities to leverage past sewer separation work as part of new and redevelopment projects



Terrain/Stormwater Project Types Summary

Terrain	Description of Terrain	Common Issues	Stormwater Project Types	Typical Technologies	Potential Challenges	Potential Co-benefits	Example Area
Upper Plateaus and Hilltops	Areas located in the upper watershed typically with ground slopes ranging from 0 to 5 percent.	Overland flooding, basement backups, water quality, contribution to downstream issues	Store in centrally located facilities that require lower maintenance. Look for vacant lots typically at intersections and large public open areas (parks, greenways, schools, parking lots).	Distributed storage, new piping, new inlets, partial separation, surface conveyance improvements	Utility constraints, urban uses, lack of sufficient drainage area, lack of slope	Passive recreation, urban heat island reduction, repaving, streetscape improvements, complete streets, cost sharing, environmental justice	Homewood, Larimar, Point Breeze, Morningside, Knoxville/Beltzhoover, Lower Garfield/Friendship, Upper Hill District, Squirrel Hill
Sloped Hillsides	Areas located in a transition zone from the upper plateaus to the pocket ravine with ground slopes ranging from 5 to 20 percent.	Overland flooding, landslides, groundwater seeps and springs, water quality and AMD	Centrally located facilities to store stormwater less available. Storage sites may require more costly modifications (check dams, liners, velocity control). Protective flood measures may be required in the form of improved surface and subsurface conveyance.	Some storage in limited areas, larger sewers, new sewers, surface conveyance improvements, new inlets	Wooded or naturalized areas, steep slopes	Active Recreation, Passive Recreation, Cost Sharing	Brighton Heights, Upper Garfield, Polish Hill, Lower Hill District, East Hills, South Side Slopes, Carrick
Pocket Valleys	Smaller narrow ravines typically containing culverted historic streams or seasonally ephemeral streams. These areas act as funnels for stormwater generated from upper plateaus and sloped hillsides. Stormwater concentrates and moves fast in these areas especially during intense rain events.	Overland flooding, flash flooding, landslides, water quality, groundwater seeps and springs, AMD	Storage may be challenging due to slope and access constraints. Moving and conveying water to downstream floodplains may be more cost effective. May need to include flood protection, improved surface conveyance, and backflow prevention.	Smaller floodplain and storage creation, increased conveyance (piping and surface), limited ephemeral stream restoration, storm sewer separation	Wooded or naturalized areas, steep slopes, equipment access, landslide prone	Active Recreation, Passive Recreation, Complete Streets, Cost Sharing	Woods Run, Heth's Run, McKinley Park/Bausman Street, Moore Park, Naylor Run, Southside Park
Large Floodplains	Medium to larger valley and ravines containing larger streams with perennial base stream flows. These areas act as the second funnel from water originating from smaller pocket ravines. In these areas stormwater is often dangerous and sometimes life threatening.	Severe overland flooding, dangerous flash flooding, water quality	Storage in floodplain areas allows for water quantity peak flow reductions and water quality treatment. Land management strategies such as floodplain ordinance, floodplain buyout programs, and zoning critical. Flood proofing and protection for some properties may be needed.	Regional Storage, Floodplain creation, Storage Retrofits, Buy-outs, Flood Proofing, Road Raising, Storm sewer separation	Wooded or naturalized areas, existing occupied structures/floodplain encroachment, utility conflicts, transportation conflicts	Active Recreation, Passive Recreation, Urban Heat Island Reduction, Economic Development, Repaving, Streetscape Improvements, Complete Streets, Cost Sharing, Environmental Justice.	Lower Four Mile Run, Saw Mill Run, Streets Run, Washington Boulevard, Lower Chartiers
Urban River Flats	Dense urban areas typically consisting of a mix of commercial, industrial, and residential properties. These are primarily located in areas along the main three rivers and neighborhoods around the universities.	Riverine flooding, surface flooding, water quality	Fewer available opportunities for publicly owned off right-of-way storage facilities. Greater cost risks due to work in the dense right-of-way. Storage in private areas such as parking lots and common areas as part of redevelopment likely most cost effective. Increasing public conveyance and providing flood protection .	Distributed storage in private redevelopment, subsurface storage, larger sewers, new sewers, new Inlets, full storm separation	Utility constraints, urban uses, lack of slope, transportation conflicts	Utility constraints, urban uses, lack of slope, transportation conflicts	Northside, Strip District, Lawrenceville, Oakland/Shadyside, Southside Flats, Hazelwood, West End Village

APPENDIX G

Environmental, Planning, and Engineering Consultants
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Memorandum

To:	Karl Russek, University of Pennsylvania Water Center
From:	AKRF, Inc.
Date:	April 1, 2022
Re:	PWSA Strategic Plan for Stormwater - Impervious Area Analysis

Introduction:

A high-level impervious area analysis for the City of Pittsburgh was conducted by AKRF as part of the Pittsburgh Water and Sewer Authority (PWSA) Strategic Plan for Stormwater. The analysis was performed to provide a base understanding of the sources of stormwater generation by using impervious area as a surrogate for stormwater runoff. Generally, the quantity and quality of stormwater runoff in urban areas is directly proportional to the quantity of impervious surface area. Understanding the spatial distribution of impervious area across the City, as well as the types of impervious areas (i.e. impervious area located in the public right-of-way versus impervious area on private land), provides a base understanding of the sources of stormwater which can then inform long-term strategic planning efforts.

Methodology:

As part of the PWSA Strategic Plan for Stormwater, AKRF was provided a geodatabase file titled "StormwaterPlan.gdb" containing the following relevant datasets for the purposes of the impervious area analysis:

- "Transportation" - Polygon feature class representing ground level impervious transportation features (roads, sidewalks, driveways, parking lots)
- "Buildings" - Polygon feature class representing building footprints
- "Other" - Polygon feature class representing other types of ground level impervious features such as courtyards, small pads, patios, and swimming pools.
- "Sewersheds" - Polygon feature class representing City of Pittsburgh sewershed boundaries
- "Bridges" - Polygon feature class that was not used for this analysis as upon visual inspection this layer is already included within the "Transportation" polygon layer referenced above.

Figure 1 depicts the Transportation, Buildings, and Other impervious area features provided by PWSA.

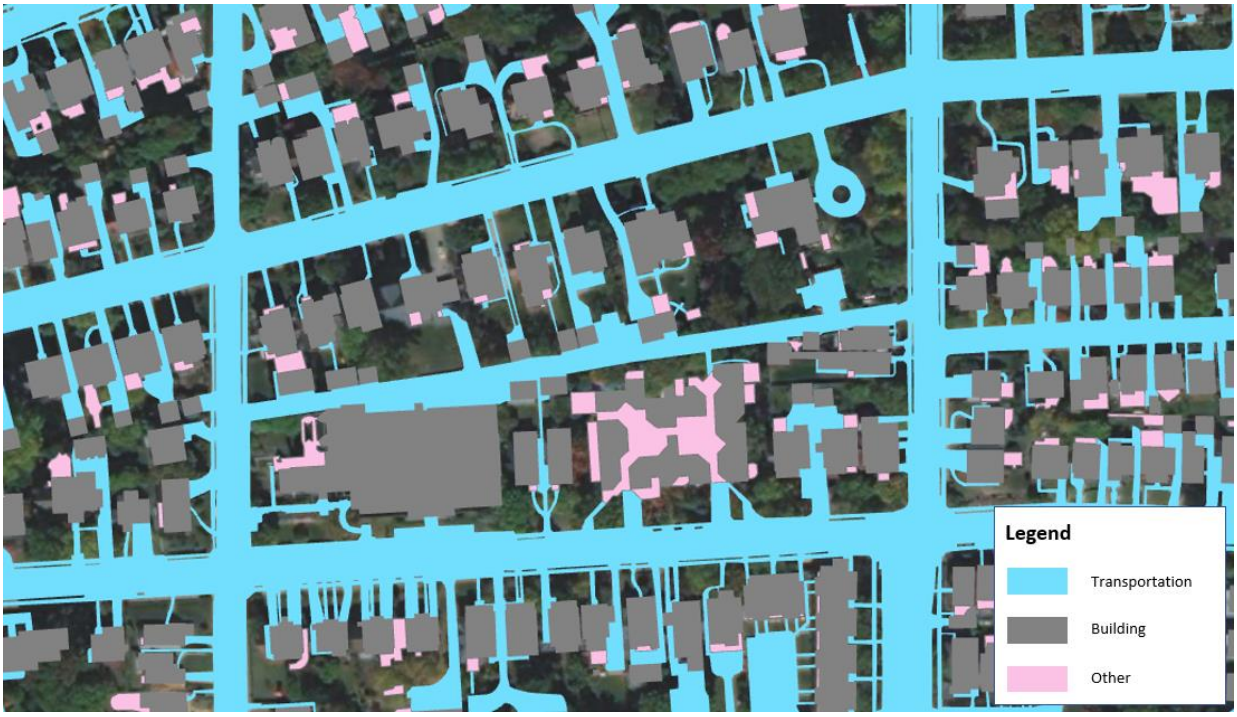


Figure 1. PWSA Transportation, Building, and Other Impervious Data Layers

In addition to the impervious area files in the "StormwaterPlan.gdb" file, AKRF obtained the publicly available "2022 - Allegheny County Parcels" polygon boundary shapefile data from the Pennsylvania Spatial Data Access (PASDA) Geospatial Data Clearinghouse. The Allegheny County parcel polygon GIS data was used to determine the approximate limits of the public right-of-way. A planning level assumption was made that any area not within a designated Allegheny County parcel boundary is to be within the public right-of-way. It is understood that the exact limits of the public right-of-way may extend onto some parcel boundaries, however the exact survey limits of the public right-of-way for the City of Pittsburgh were unavailable at the time of this study. For the purposes of this analysis, the parcel data provides the best available option for calculating an estimate of the amount of impervious area that can be managed solely within the public right-of-way. Figure 2 depicts the Allegheny County parcel data intersected with PWSA's impervious data layers from the previous image in Figure 1.



Figure 2. PWSA Transportation, Building, and Other Impervious Data Layers Intersected with Allegheny County Parcel Data to Estimate ROW Impervious

The impervious area layers were then intersected in GIS by the Allegheny County Parcel data to separate impervious area features by right-of-way and non-right-of-way impervious area to determine the amount of impervious area in the public realm.

In addition to the right-of-way impervious area analysis, the impervious area stats were summarized by the PWSA "Sewersheds" layer provided in the "StormwaterPlan.gdb" file. The impervious area values then summed across the entire city as well as for each of PWSA's 289 sewersheds to understand the distribution of impervious area types across the city as well as individual sewersheds.

Results:

City-Wide Impervious Results

The total impervious area in the City of Pittsburgh by impervious data type is shown in Table 1. Results are provided as total impervious area, total impervious in ROW, and total impervious in parcels (not in ROW). Total impervious area is the summation of the total impervious in ROW and total impervious in parcels.

Table 1. City-Wide Total Impervious Area by Impervious Area Type

Impervious Type	Total Impervious (sq mi)	Total Impervious in ROW (sq mi)	Total Impervious in Parcel (sq mi)
Transportation	14.72	7.45	7.28
Buildings	7.57	0.00	7.57
Other	1.32	0.01	1.31
Total Impervious	**23.61**	**7.45**	**16.15**

The total area results in Table 1 were then calculated as a percentage of the total city area (55.76 square miles) and total city impervious area (23.61 square miles) to determine the percentage contribution from each impervious area type. The percentage results are shown in Table 2.

Table 2. City-Wide Percentage of Impervious Area by Impervious Area Type

Impervious Type	Percent of Total City Area	Percent of City Total Impervious Area
Transportation (Total)	26.40%	62.36%
Transportation (ROW)	13.35%	31.54%
Transportation (Parcel)	13.05%	30.82%
Buildings (Total)	13.57%	32.06%
Buildings (ROW)	0.00%	0.00%
Buildings (Parcel)	13.57%	32.06%
Other (Total)	2.36%	5.58%
Other (ROW)	0.02%	0.04%
Other (Parcel)	2.35%	5.55%
Total Impervious	**42.34%**	**100.00%**
Total Impervious in ROW	**13.37%**	**31.58%**
Total Impervious in Parcels	**28.97%**	**68.42%**

As shown in Table 2, the city is roughly 42% impervious with approximately 13% of that located in the right-of-way. When looked at from the perspective of the percentage of the total impervious area, 62% of the impervious area is within the transportation layer which includes roads, parking lots, sidewalks, and driveways. 32% of the total impervious area is from building rooftops with the remaining 6% classified as "other". Assuming all "transportation" and "other" impervious areas are ground level impervious, roughly 68% of the impervious area in the city is located on the ground surface level, with the remaining 32% coming from building rooftops. Finally, 32% of the total impervious area in the city is estimated to be in the right-of-way with nearly all of this area classified as "transportation."

Individual Sewershed Impervious Results

The impervious area statistics were also calculated by sewershed boundary. There are 289 individual PWSA sewersheds in that file that intersect the City of Pittsburgh municipal boundary. Various statistical analyses on the sewersheds as well as choropleth heat maps were generated to understand the spatial distribution of impervious area for the sewersheds. These results are summarized below.

Sewershed Results By Total Impervious Area:

The distribution plot of the total impervious area in acres across all 289 sewersheds is shown in Figure 3. The mean and mean values of total impervious area are 49.5 acres and 15.0 acres, respectively.

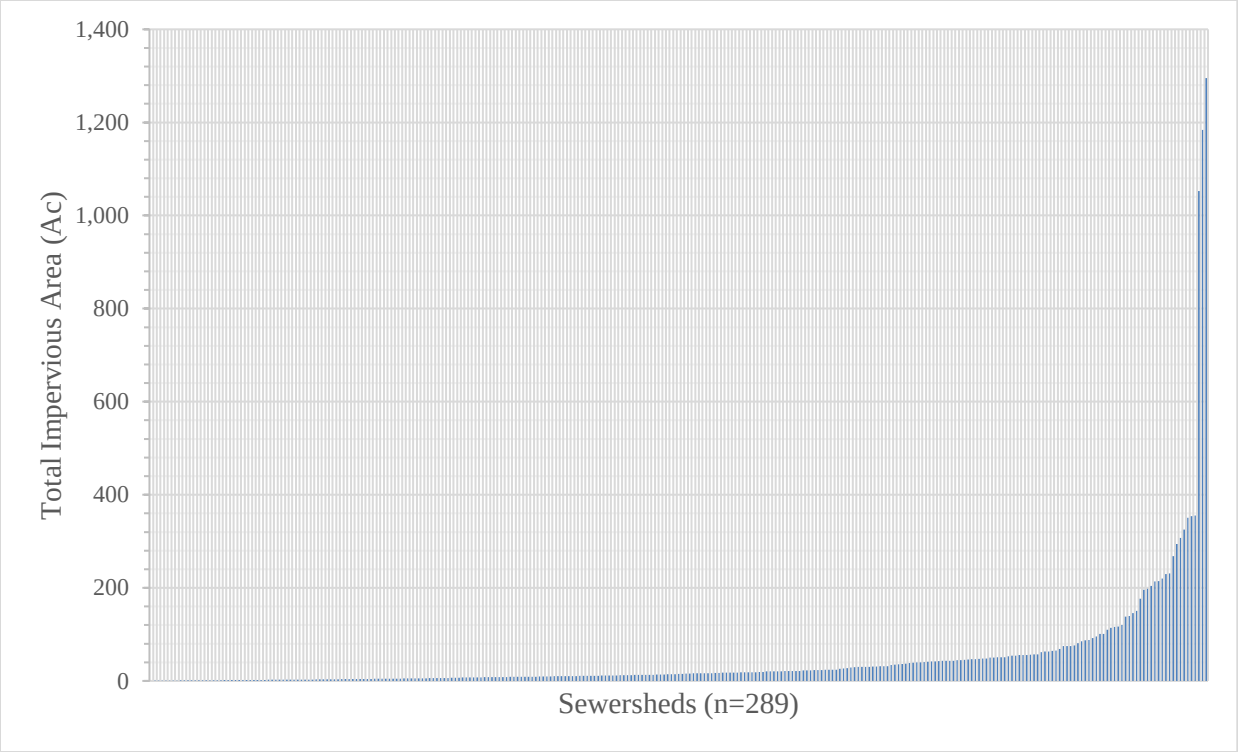


Figure 3. Total Impervious Distribution by Sewersheds

Another way to visualize total impervious area is by creating a scatter plot of cumulative fraction of impervious area on the y-axis and cumulative fraction of sewersheds on the x-axis. The purpose of this type of plot is to understand how the impervious area is concentrated spatially within the sewersheds. This plot is shown in Figure 4. Examples are drawn in blue and red on the plot for help in interpreting the results using either the x-axis or the y-axis. The blue arrow (using the x-axis) indicates that in 50% of the sewersheds, there is only approximately 16% of the total impervious area. Likewise, using the red arrow (y-axis) this indicates that 40% of the total impervious area is contained within 82% of the sewersheds; or inversely the red arrow example could be thought of as 60% of the total impervious area is within 18% of the sewersheds. This is not entirely surprising given that there are many large sewersheds with large quantities of impervious area. The top three sewersheds in terms of total impervious area are: A-42 (1295 Ac), M-29 (1183 Ac), and A-22 (1053 Ac). These large sewersheds contain the largest quantities of impervious area within the city. Choropleth sewershed maps depicting total impervious area results are provided in Appendix Map A-1.

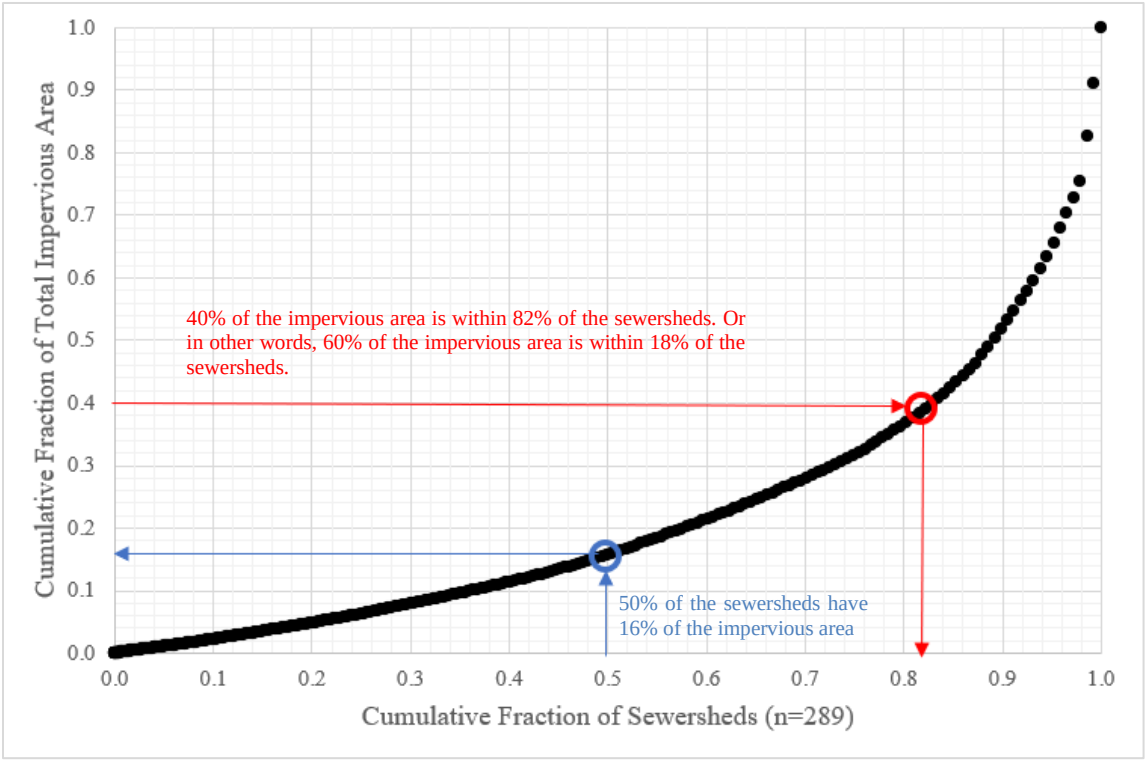


Figure 4. Total Impervious Area Cumulative Fraction Distribution

Sewershed Results by Impervious Area Type:

In addition to the total imperviousness of each sewershed, the impervious area type (Transportation, Building, Other, and Right-of-Way) were analyzed. For each sewershed the following was calculated for each impervious data type:

1. The percentage of each impervious type by total sewershed area, and
2. The percentage of each impervious type by total sewershed impervious area.

Box and whisker plots were generated for each impervious area type to observe the statistical variation of the results. The percent of total sewershed area by impervious area type box and whisker plots are shown in Figure 5. The percent of total sewershed impervious area by impervious area type box and whisker plots are shown in Figure 6. A box and whisker plot a simple way of visualizing probability density of a large dataset around a statistical value, in this case impervious area percentage. On the graph X represents the mean value, the middle line of the box is the median, the outer edges of the box represent the 25th and 75th percentiles, the whisker edges outside of the box represent the “maximum” and “minimum”, and values outside of the whiskers represent outliers in the dataset. It should be noted that a handful of sewersheds have small slivers that cross into the city and are the sources of many of the outlier data points. For example, there are sewersheds with ROW impervious area upwards of 100% of the total area and were confirmed to be small slivers of sewersheds that intersect the city boundary. Choropleth sewershed maps of the results shown in Figures 3 and 4 are provided in Appendix Maps A-2 through A-5.

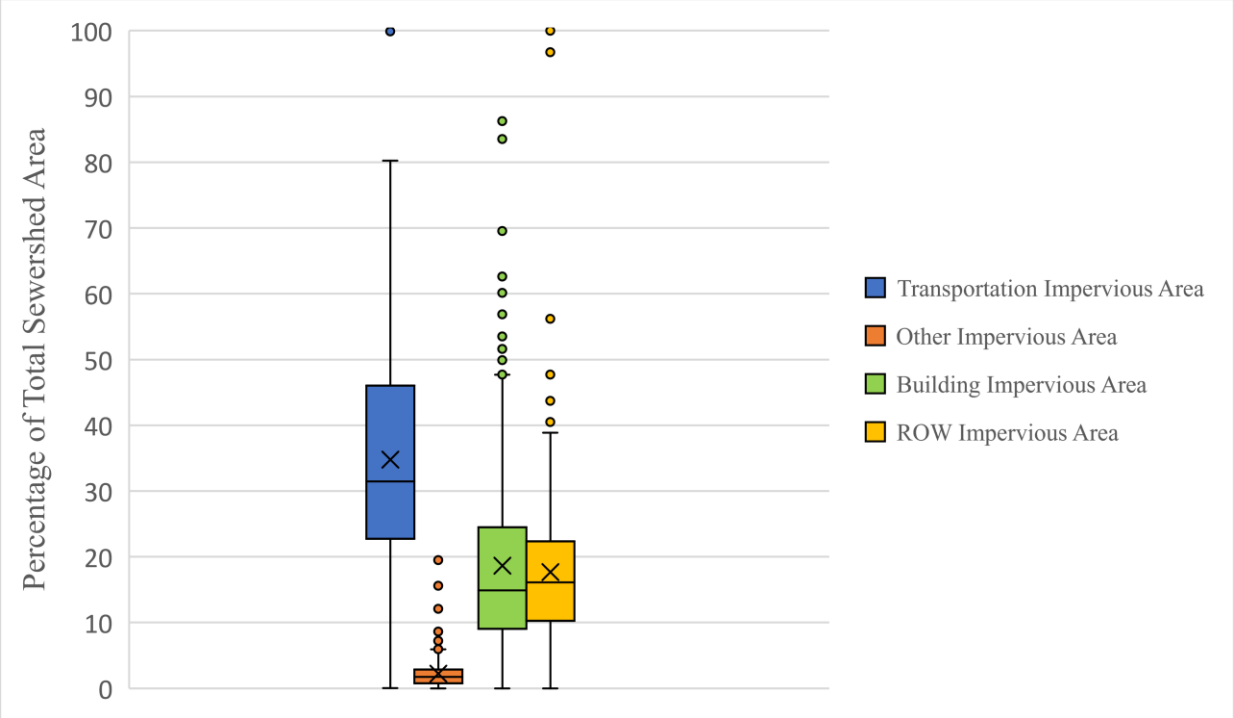


Figure 5. Percentage of Total Sewershed Area by Impervious Area Type for Sewersheds (n =289)

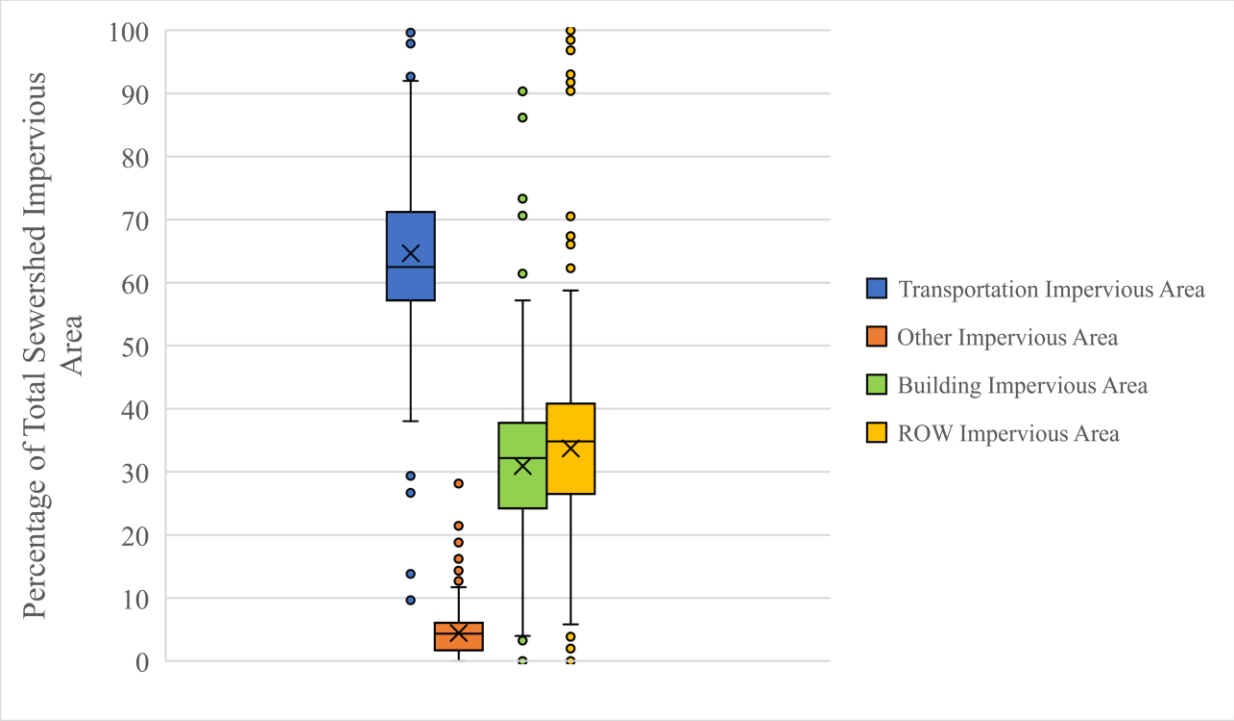


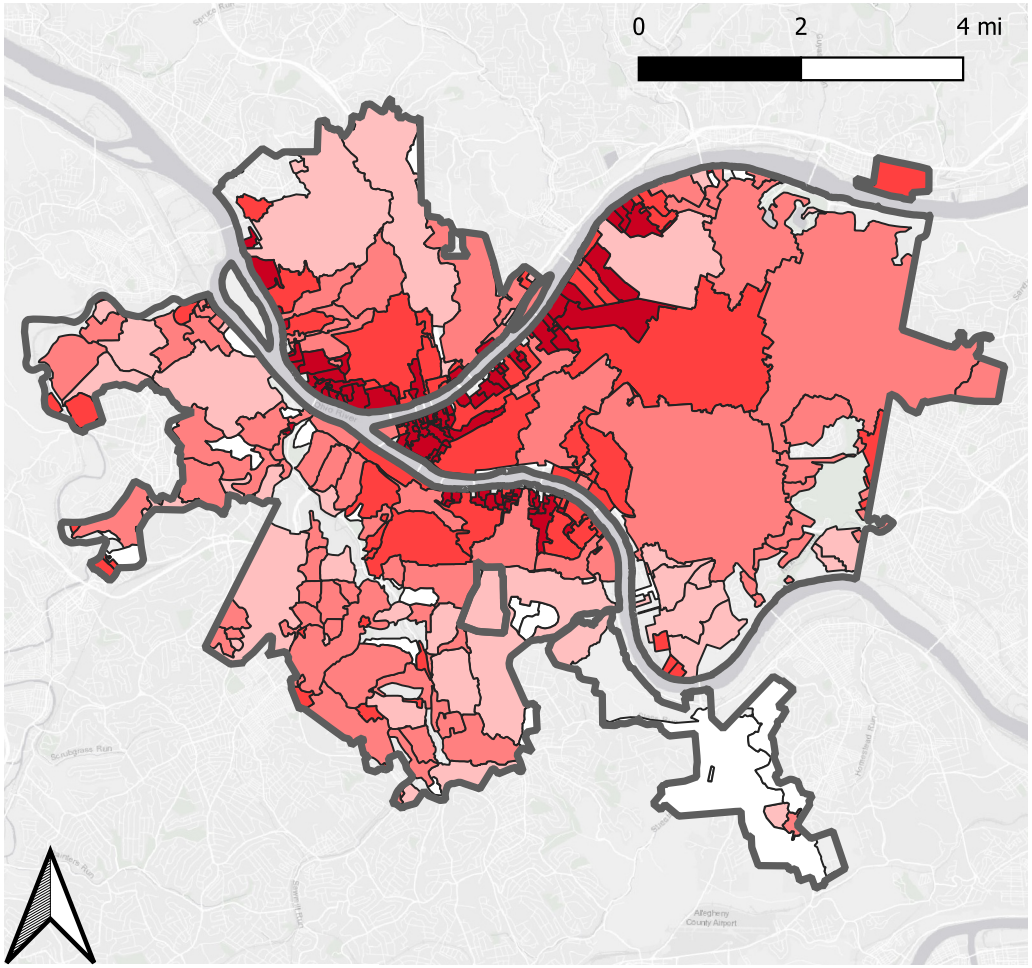
Figure 6. Percentage of Total Sewershed Impervious Area by Impervious Area Type for Sewersheds (n =289)

Conclusions and recommendations:

Based on the results of the impervious area analysis, the following are several key conclusions and recommendations for consideration as part of PWSA's Strategic Plan for Stormwater:

1. The city is approximately 42% impervious with the area distributed between transportation (26.4%), buildings (13.6%), and other impervious (2.0%).
2. Of the total impervious area in the city (23.61 acres), only 31.5% is located approximately in the right-of-way indicating that future stormwater mitigation will likely need to consider on-parcel sources of impervious stormwater generation in addition to right-of-way impervious. Private stormwater incentive programs should be explored along with leveraging the city's fee-in-lieu stormwater trust fund from private development stormwater permits.
3. The vast majority (+99%) of the right-of-way impervious is in the transportation impervious area layer. Stormwater mitigation efforts from right-of-way transportation impervious will need to consider coordination with the Department of Mobility and Infrastructure (DOMI). Stormwater agreements that establish stormwater "ground rules" between PWSA and DOMI should be explored and developed, including working towards a common understanding on stormwater design standards and cost sharing agreements.
4. 32% of the total impervious area are from building roofs. This indicates that private downspout disconnection strategies from buildings need further development and consideration. Strategies, incentives, and public education around private downspout disconnections and on-parcel stormwater management should be explored as part of PWSA planning projects where feasible.
5. Over 60% of the total impervious area is in 20% of highest ranking sewersheds in terms of total impervious area. These are concentrated in the large sewersheds primarily in the East End portion of the City (See Map A-1 right panel).
6. The highest concentrations of Transportation impervious are in Downtown, Northside, South Side, Uptown and Strip District areas (See Map A-2 right panel). However, many of these are small sewersheds and in dense neighborhoods where stormwater management may be difficult.
7. Percentages of other impervious areas are very small across most sewersheds (<10% of the total sewershed area). Just about all this area is located on parcels.
8. Buildings make up the highest percentages in downtown as well as East End sheds (A-22, M-29). Of the total impervious area, values are upwards of 40 to 50% in these sewersheds (See Map A-4 left panel).
9. Right-of-way impervious rarely exceeds 45% across all sewersheds. However, it is highest in A-41 and A-42 as well as in Saw Mill Run (roughly 40% of the total impervious area - See Map A-5 left panel). Strategies targeting right-of-way stormwater management should be explored in these areas and coordinated with future DOMI capital investments.

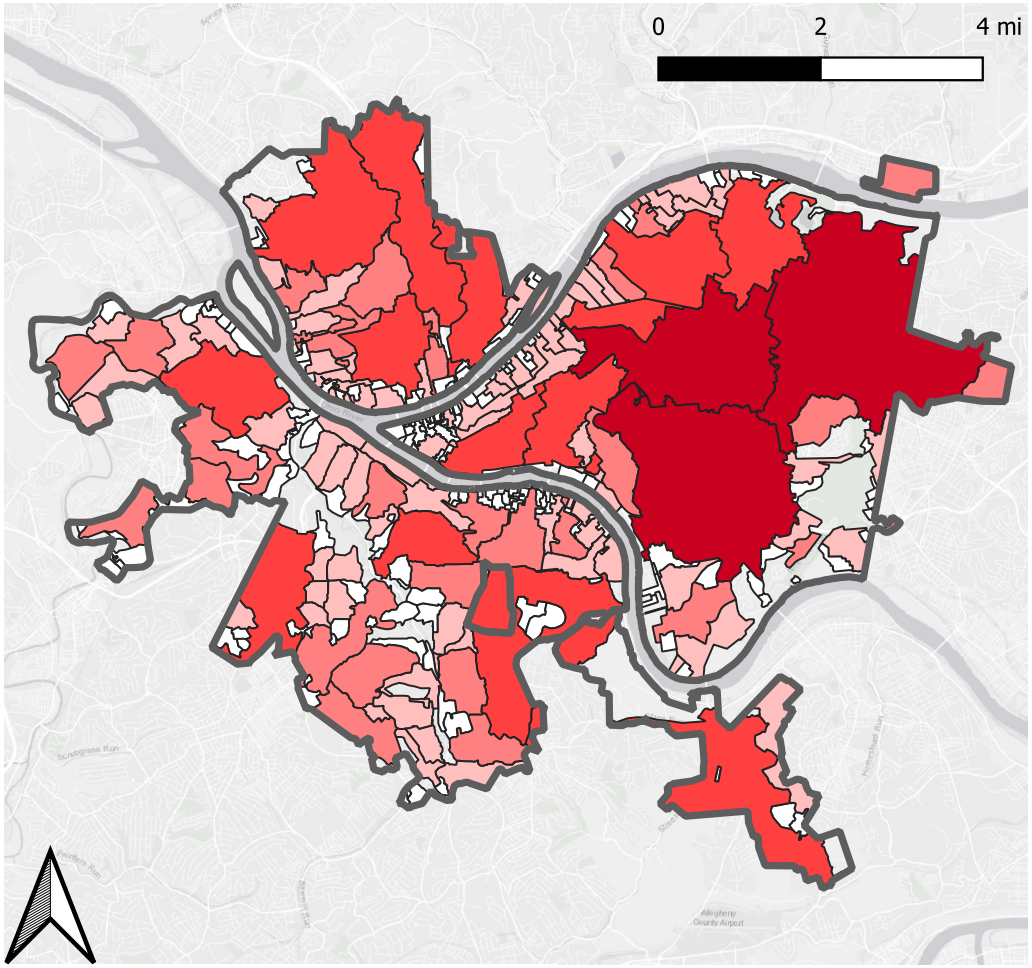
Percent Impervious Area In Sewershed



Percent Impervious Area

- 0 - 25
- 25 - 35
- 35 - 55
- 55 - 75
- 75 - 100

Total Cumulative Fraction of Total Impervious Area

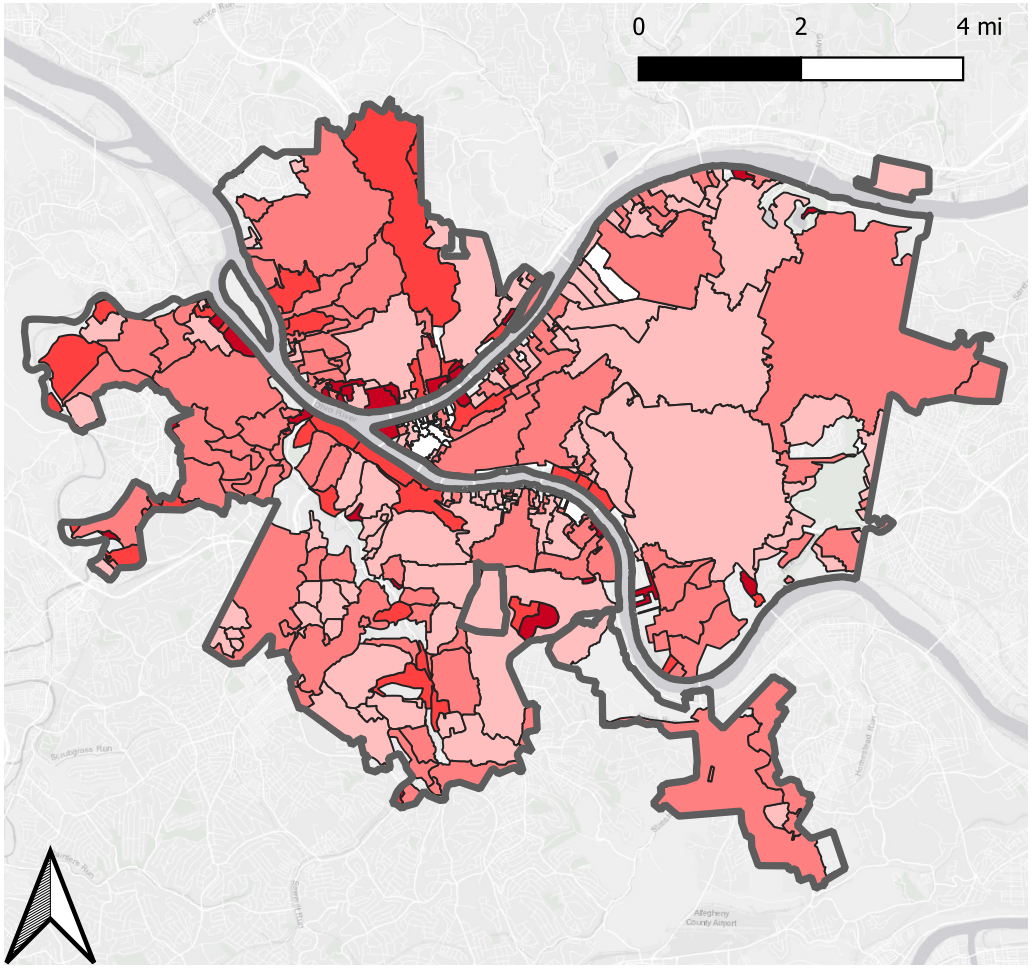


Total Impervious Cumulative Fraction

- 0 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 0.8
- 0.8 - 1

Map A-1. Total Impervious Area

Percent of Transportation Impervious Area In Sewershed as Percentage of Impervious Area in Sewershed

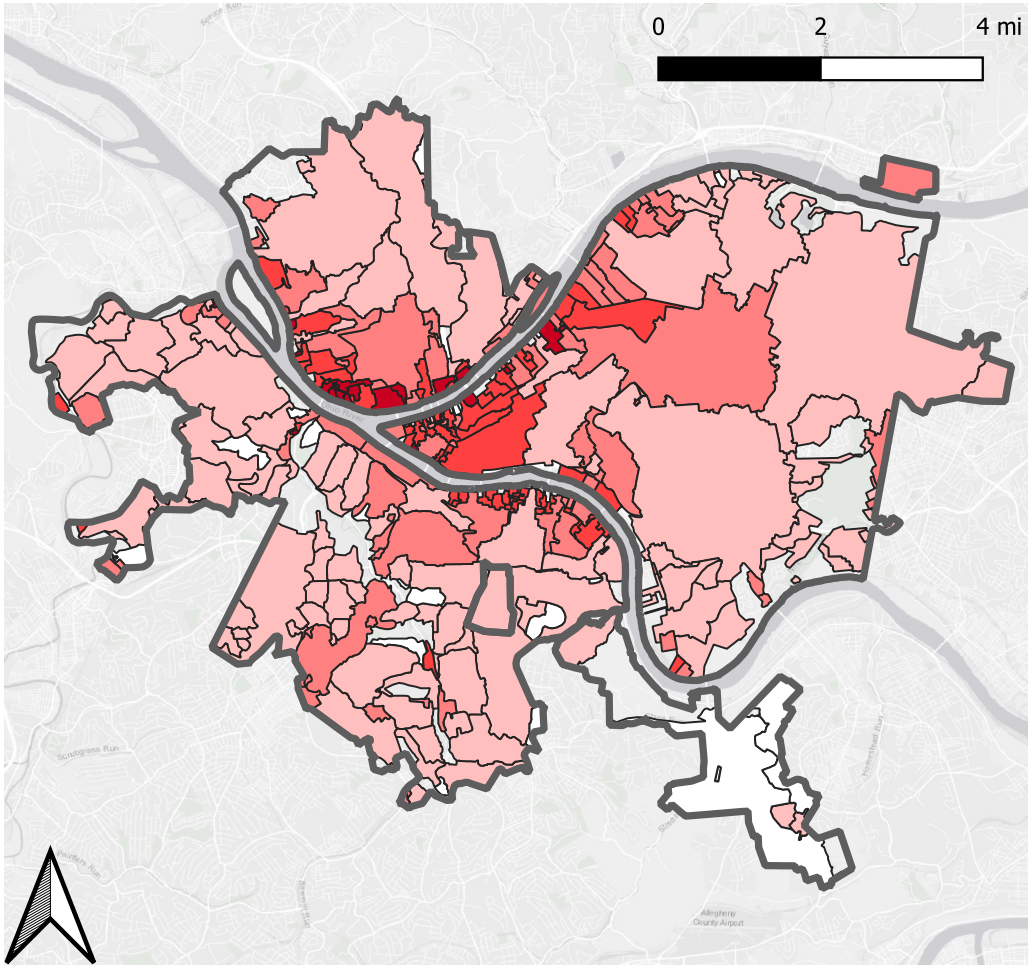


Percent of Total Impervious

Percent Transportation Impervious

- 9.6 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 100

Percent of Transportation Impervious Area In Sewershed as Percentage of Total Area of Sewershed



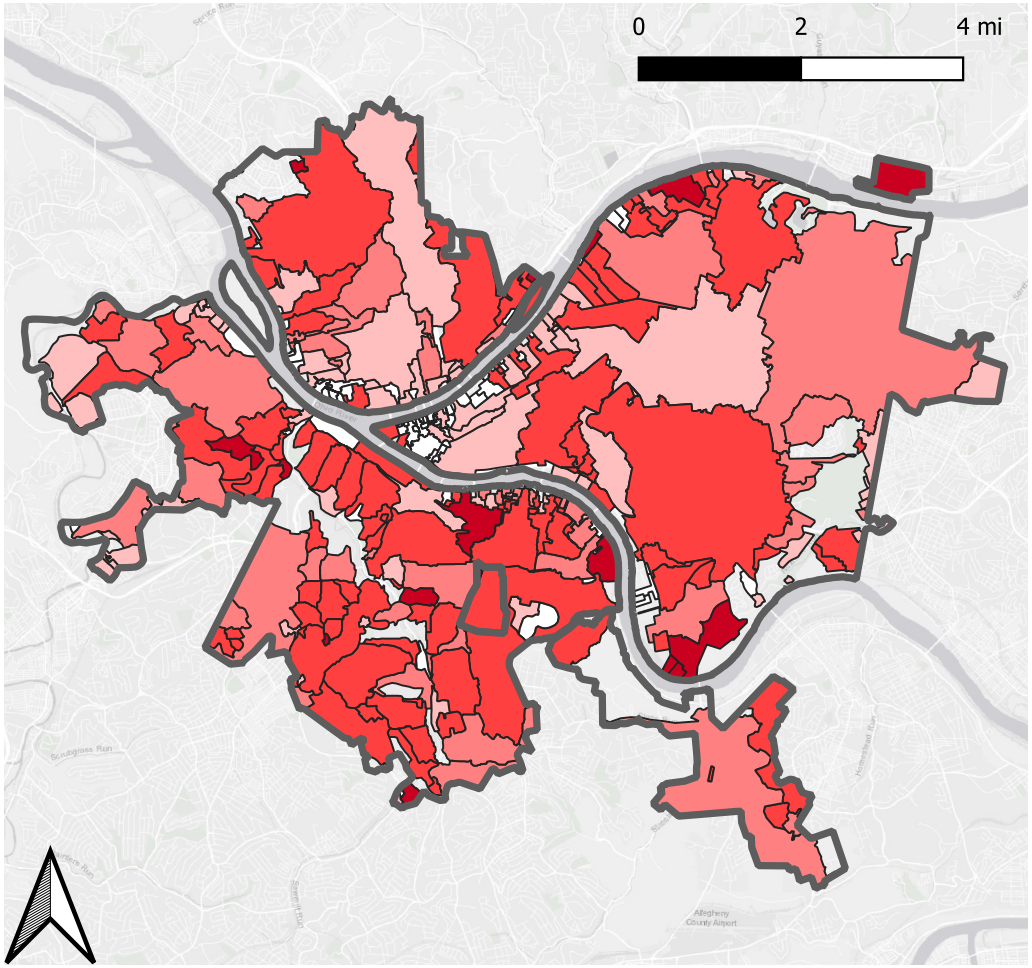
Percent of Total Area

Percent Transportation Impervious

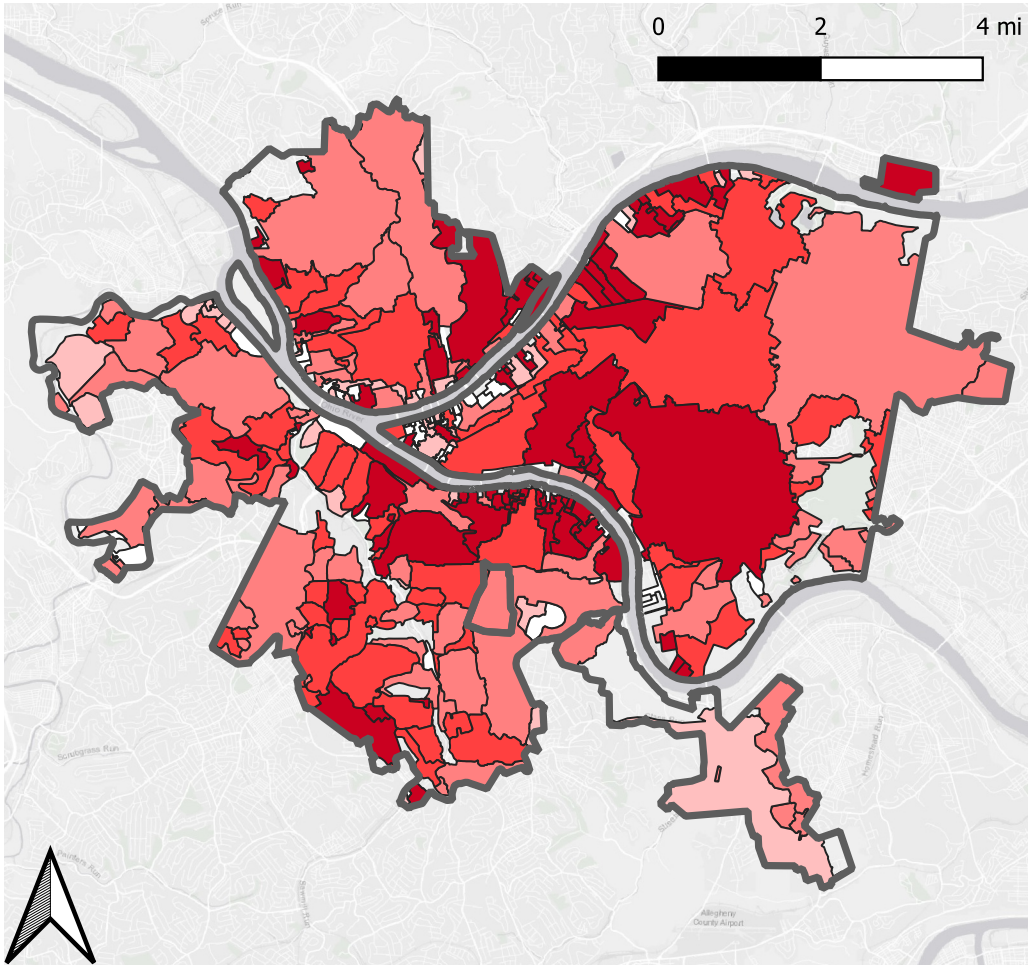
- 0 - 15
- 15 - 30
- 30 - 45
- 45 - 60
- 60 - 100

Map A-2. Transportation Impervious Area

Percent of Other Impervious Area In Sewershed as Percentage of Impervious Area in Sewershed



Percent of Other Impervious Area In Sewershed as Percentage of Total Area of Sewershed



Percent of Total Impervious

Percent Other Impervious

- 0 - 1
- 1 - 4
- 4 - 5
- 5 - 10
- 10 - 28.17

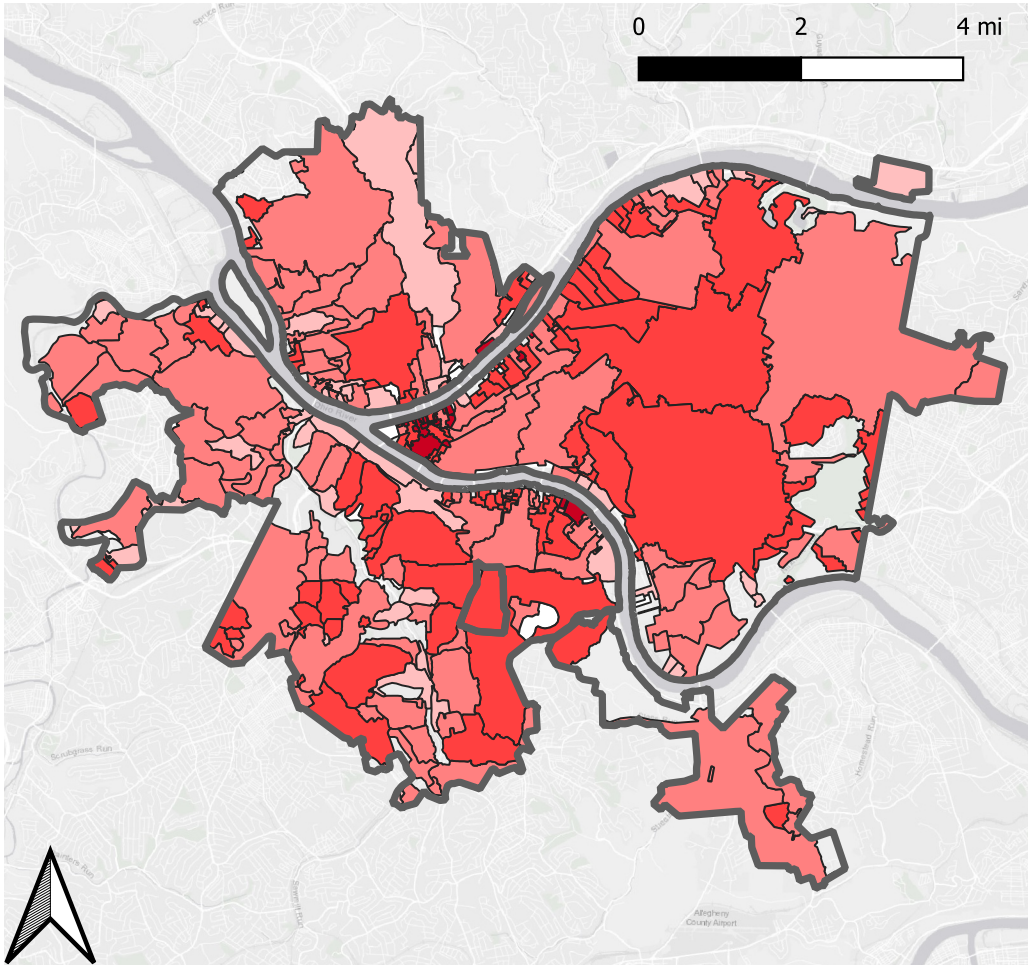
Percent of Total Area

Percent Other Impervious

- 0 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 19.47

Map A-3. Other Impervious Area

Percent of Building Impervious Area In Sewershed as Percentage of Impervious Area in Sewershed

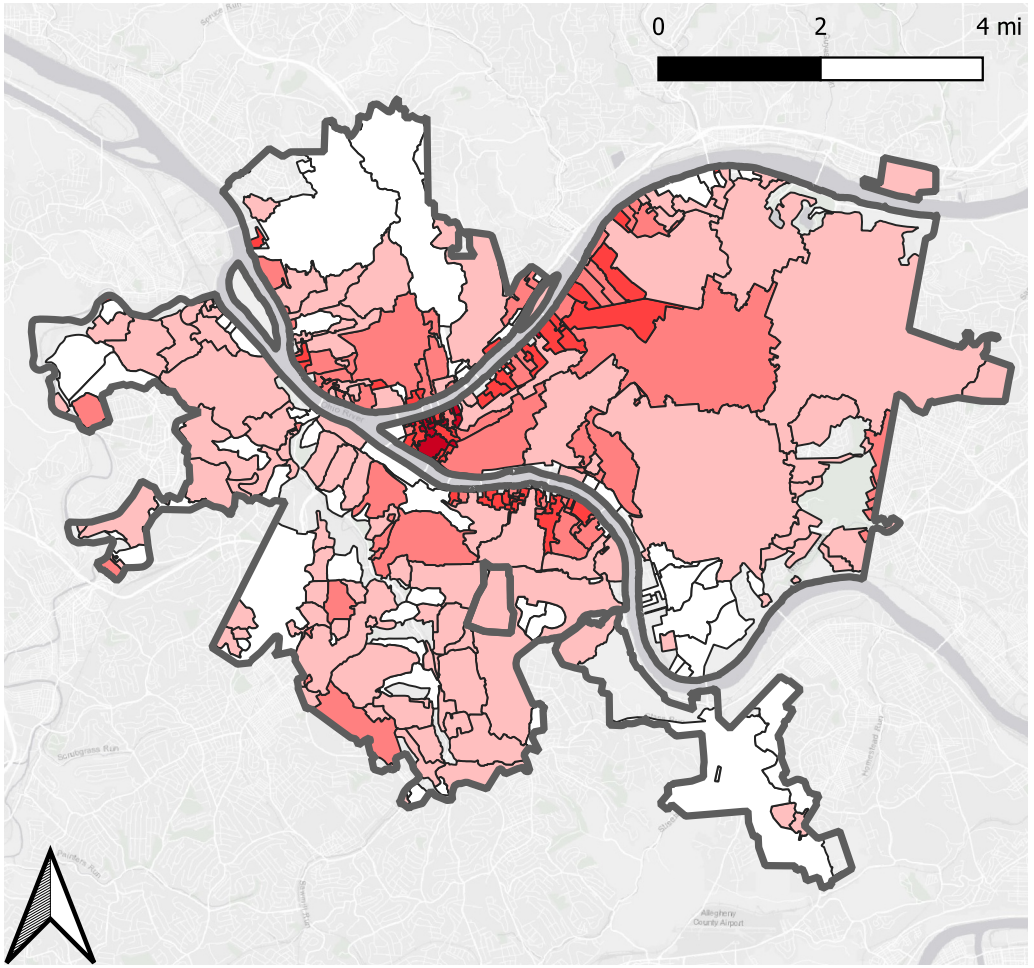


Percent of Total Impervious

Percent Building Impervious

- 0 - 10
- 10 - 25
- 25 - 35
- 35 - 50
- 50 - 90.4

Percent of Building Impervious Area In Sewershed as Percentage of Total Area of Sewershed



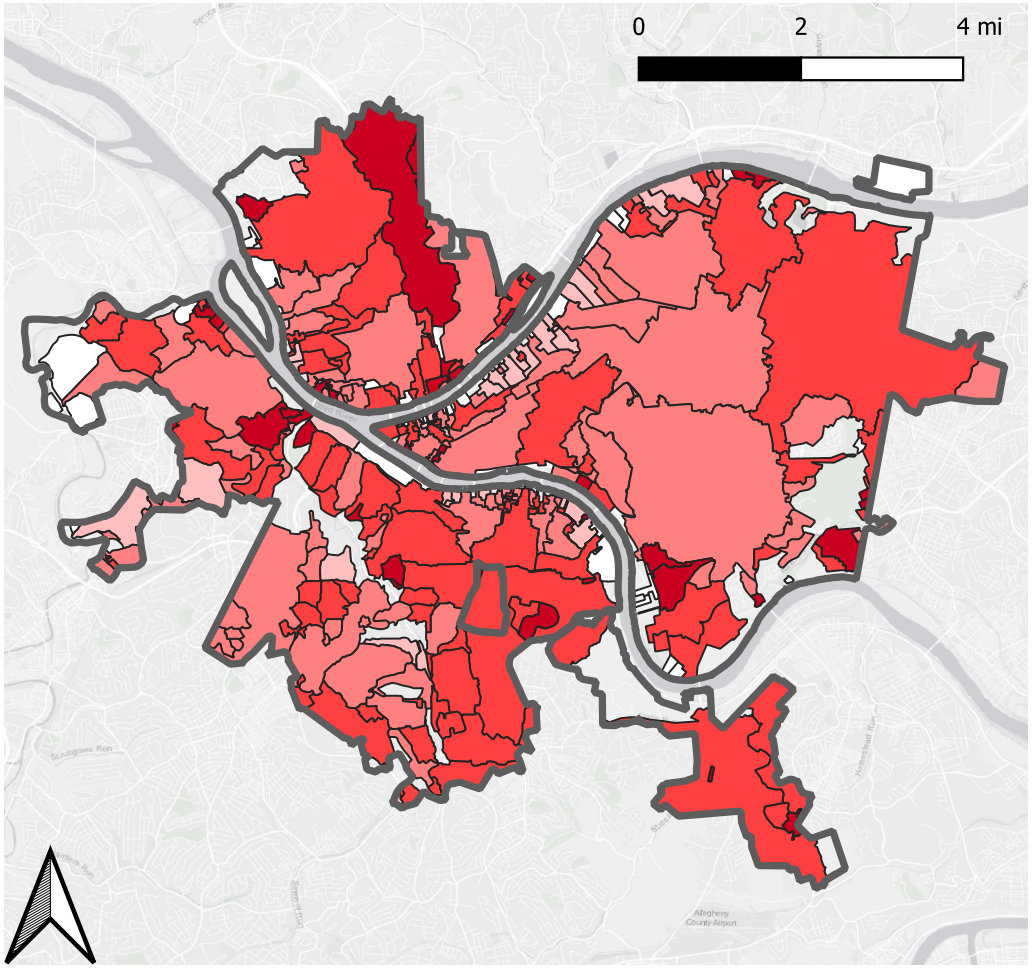
Percent of Total Area

Percent Building Impervious

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 50
- 50 - 86.3

Map A-4. Building Impervious Area

Percent of Right of Way Impervious Area In Sewershed as Percentage of Impervious Area in Sewershed

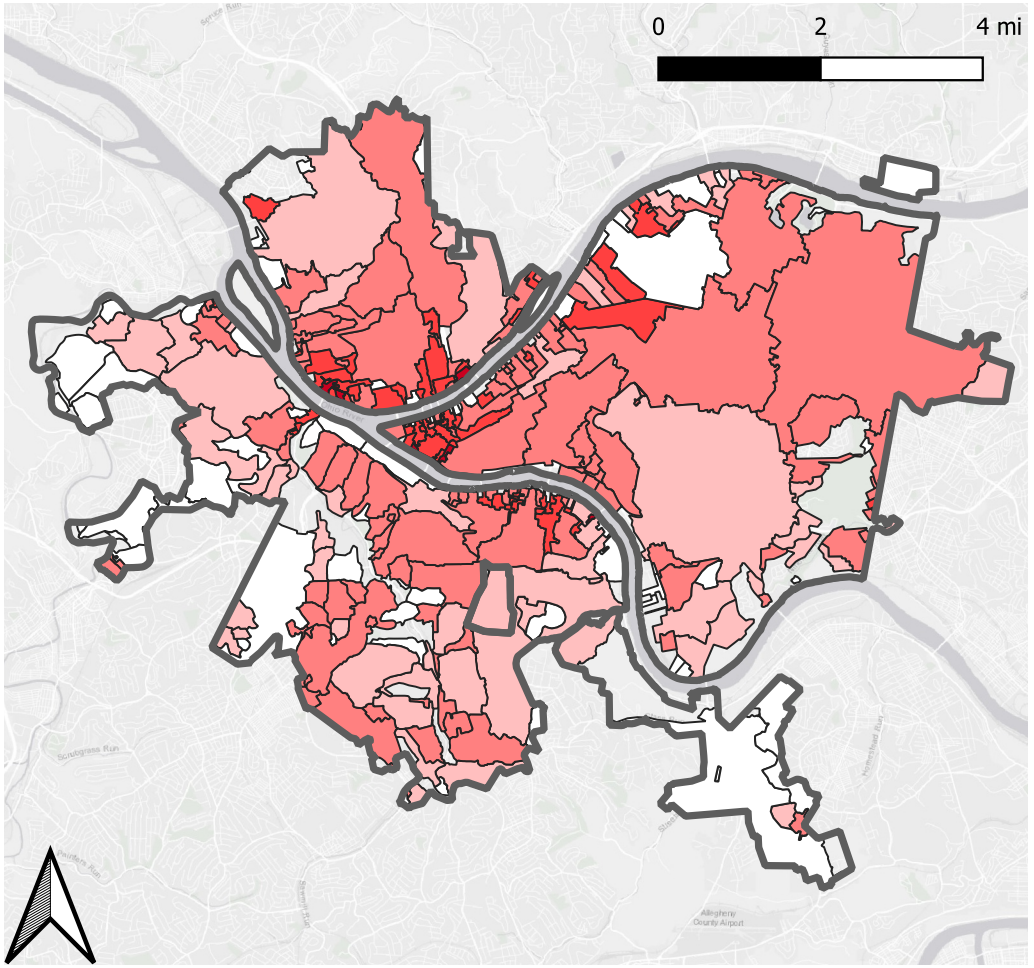


Percent of Total Impervious

Percent ROW Impervious

- 0 - 15
- 15 - 25
- 25 - 35
- 35 - 45
- 45 - 100

Percent of Right of Way Impervious Area In Sewershed as Percentage of Total Area of Sewershed



Percent of Total Area

Percent ROW Impervious

- 0 - 10
- 10 - 15
- 15 - 25
- 25 - 40
- 40 - 100

Map A-5. Right of Way Impervious Area

APPENDIX H

9/19/2022 Addendum - When the Silver Lake project was presented as a design opportunity at the March 28, 2022 community meeting, some residents within the Negley Run Watershed strongly supported a continued incremental approach of projects already in the pipeline or projects throughout the watershed, rather than one large signature site. The Silver Lake planning information is included in the Stormwater Strategic Plan appendix for reference.

Environmental, Planning, and Engineering Consultants
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Pittsburgh, PA 15212
tel: 412 770-3100
www.akrf.com

Memorandum

To:	Karl Russek, University of Pennsylvania Water Center
From:	AKRF, Inc.
Date:	March 11, 2022
Re:	PWSA Strategic Plan for Stormwater - Engineering Feasibility Analysis for Silver Lake and McKinley Park

As part of the Pittsburgh Water and Sewer Authority (PWSA) Strategic Plan for Stormwater, AKRF conducted a concept level engineering feasibility analysis for potential stormwater management strategies for the former Silver Lake site in Homewood and the existing bottom portion of McKinley Park along Bausman Street in Beltzhoover. Sites were provided to AKRF by the University of Pennsylvania Water Center/PennPraxis team for further refinement and development of early stormwater management action sites. The following provides a summary of the engineering feasibility findings for each site.

Silver Lake

Existing Parcel Ownership:

Existing Allegheny County Parcel data for Silver Lake was reviewed to determine land ownership status. As shown in Table 1, the majority of the site is privately owned industrial, with the exception of Parcel 1 (URA - Silver Lake Drive) and Parcel 4 (Pittsburgh School District - Westinghouse Academy High School). To build stormwater management within the footprint of the site, property acquisition of private land would be required including parcels with existing warehouse storage facilities.

Table 1. Silver Lake Site Parcel Ownership

Parcels	Property Owner	State Description	Use Description
1	URBAN REDEVELOPMENT AUTH OF PITTSBURGH	Government	MUNICIPAL URBAN RENEWAL
2	SILVER LAKE ASSOCIATES	Industrial	WAREHOUSE
3	SILVER LAKE ASSOCIATES	Industrial	WAREHOUSE
4	BOARD OF PUBLIC EDUCATION OF THE SCHOOL DISTRICT OF PITTSBURGH	Government	OWNED BY BOARD OF EDUCATION
5	SILVER LAKE ASSOCIATES	Industrial	LIGHT MANUFACTURING
6	JVZ LTD	Industrial	LIGHT MANUFACTURING

Silver Lake Historic Desktop Environmental Assessment:

Historic maps of the site were reviewed to check for any possible history of contamination around and at the project site. These maps are prepared using Pittsburgh Historic Maps (arcgis.com) website and are included in Appendix A. Below are findings from this review.

- Areas around the site have a history of industrial/commercial use.
- Maps indicate that the railroad and viaduct on the western edge of the project site was constructed in early 1900.
- In a map of 1957, the lake no longer exists indicating infill of material at the site of undetermined quality.

Given the industrial history of the site and likely presence of infill material, further investigation into possible soil contamination at the site would be required as part of future design considerations.

Silver Lake Stormwater Capture Potential:

Stormwater volume capture potential at Silver Lake was estimated using readily available GIS spatial layers and engineering design assumptions. The following assumptions were made to determine storage footprint and volume of Silver Lake:

- Existing 8-inch water line servicing existing warehouses within the project area to be abandoned. No major water transmission lines are present.
- Buildings within the project area to be purchased and demolished.
- Gas utility data for this site, currently is not available. Requested via PA One Call but not received. Unknown if major transmission lines are within the project site.
- Several combined sewers converge at the center of the site into two major combined sewer trunk lines. These sewers are a 92-inch by 96-inch box sewer and a 57-inch circular pipe. Given the large size of these sewers, relocation of sewer lines may be cost prohibitive.
- Using upstream manhole depth and sewer diameter from GIS, 9.75 feet of cover is assumed for the sewer main. Max excavation depth for stormwater storage is assumed to be 9 feet, limited by sewer main depth as the likely connection/discharge point of storage areas. 1 foot of freeboard space above the water surface was also assumed.
- 100 feet offset from steep slopes (>25%); this assumption is made based on guidance per the City of Stormwater Design Manual (draft).
- 10 foot offset form the sewer main is assumed to put the storage footprint out of 1:1 Zone of Influence (ZOI). This assumption is also based on the Stormwater Design Manual referenced above.
- Using GIS offsets above the potential width of the storage assumed to be 90 feet and storage length is 500 feet. Available storage footprint is approximately 66,400 square feet.
- To determine storage volume, the storage pond is assumed to be a fully open system with a trapezoidal cross section with 4H:1V side slopes.
- It is assumed that the storage pond would need an impermeable liner to retain a permanent water storage/wet pond/lake design element feature. Soil survey data is obtained from Web Soil Survey (usda.gov) and is included in Appendix B.

Figure 1 depicts a map of the Silver Lake site and the storage volume area based on the above design assumptions.

In calculating the storage volume, two design scenarios were explored:

Scenario 1: Assuming an empty 9-foot-deep pond with 8 feet of storage depth available.

Scenario 2: Assuming 3-foot-deep permanent pool in the pond and 5 feet of storage depth available.

The storage volume results of each scenario are shown in Table 2.

Table 2. Storage Volume Capture Potential at Silver Lake

Effective Storage Depth (ft)	Available Storage Volume (CF)
8	232,000
5	115,000

Using calculated storage volumes in Table 1, the upstream contributing impervious drainage area capture was back calculated for a 1-inch, 1.5-inch and 2-inch rainfall event.

Table 3. Impervious Area Capture Potential at Silver Lake for 1-inch, 1.5-inch, and 2-inch Design Storm Events

Scenario	Contributing Impervious DA Capture (Ac) 1" storm	Contributing Impervious DA Capture (Ac) 1.5" storm	Contributing Impervious DA Capture (Ac) 2" storm
Scenario 1	63.91	42.61	31.96
Scenario 2	31.68	21.12	15.84

Using drainage areas delineated from a previous engineering study by ALCOSAN, and the calculated storage volume from Table 1, the calculated depth of runoff managed at Silver Lake was calculated.

Table 4. Rainfall Depth Inches Captured Using ALCOSAN Drainage Areas to Silver Lake

ALCOSAN Drainage Area Scenario	Impervious Area Captured (ac)	Depth of Runoff Managed (in) Scenario 1	Depth of Runoff Managed (in) Scenario 2
Local GSI	2.05	31.80	15.76
Enhanced DA	5.15	12.66	6.27
Total	7.2	9.05	4.49
Source of drainage area values: http://www.livingwaterspgh.org/wp-content/uploads/2020/03/2019_10_00_ACSA_ConceptPlans_NegleyRun.pdf			

Silver Lake Constructability and Long-Term O&M Considerations:

- Purchasing of properties is a significant cost unknown. RAND concluded the following in its 2020 report "*Managing Heavy Rainfall with Green Infrastructure: An Evaluation in Pittsburgh's Negley Run Watershed*":

  "We also estimated compensation for either the purchase or eminent domain acquisition of the self-storage businesses at Silver Lake. This cost was estimated at $3.8 million in NRIP. Appendix E details our two bounding methodologies in full, but extrapolating its 2016 sale value at a 30-percent market increase would result in a low estimate of $4.4 million. This compares to a high estimate based on a $12-per-square-foot net annual income and 10-percent capitalization rate common to industrial properties in the area. Assuming an assembled, buildable site of substantial

density, this could reach up to $22 million. This is a substantial source of uncertainty and would have a notable impact on the overall cost-efficiency of proposed GSI in Homewood and beyond."

- Adjacent steep hillsides will likely necessitate the need for contractor site access from Washington Boulevard and under the existing railroad viaduct. Heavy equipment access via railroad easements may need to be discussed with railroad owner.
- Soil contamination and offsite disposal requirements will need further exploration and will impact costs pending results. Given the history of Pittsburgh in-fill practices, and presence of contamination, offsite soil removal may be needed.
- To maintain a permanent pool to act as a central water feature piece the installation of an impermeable liner will likely be required. Existing water table and streams are likely fully contained within the twin large existing combined sewers that bisect the project site.
- Sources of stormwater to the storage facility will likely be from roadside runoff from upland areas from Homewood and adjacent neighborhoods from newly constructed storm sewers. The placement and design challenges associated with these new storm sewers were not explored as part of this memo. Design considerations for the pond and the upstream inlets will need to consider pretreatment and regular cleaning of sediments, trash, and other pollutants commonly found in urban areas. A network system of green infrastructure features upstream of the Silver Lake site would help alleviate sediment, trash, and debris concerns. The loading ratio of the pond footprint to contributing the upstream impervious drainage area should be considered in designing pretreatment facilities.
- Existing foundations of warehouse buildings is unknown and a significant source of cost uncertainty. The condition and thickness of building foundations for removal may be expensive. The placement of foundations in relation to existing steep hillsides will also need further consideration as removal of foundations that may destabilize the toe of adjacent steep hillsides.
- Silver Lake appears to be a flood mitigation opportunity given its central proximity to dangerous downstream flooding on Washington Boulevard and upstream basement backups in the Homewood Area. Detention in the storage area coupled with upstream conveyance is likely to help reduce flooding frequency. More detailed modeling for right sizing of the pond is recommended to balance both additional upstream conveyance and pond storage for downstream peak flow mitigation.

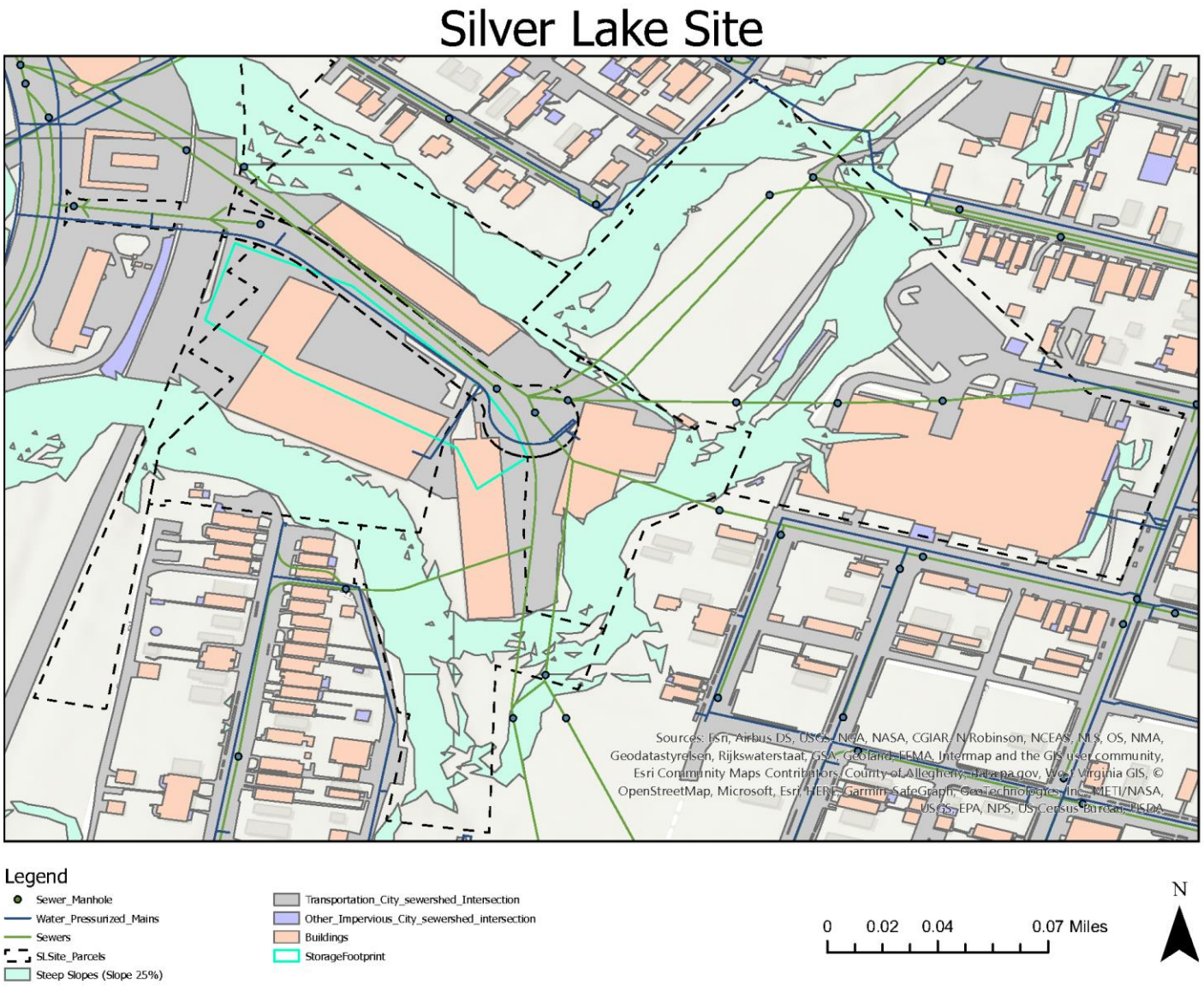


Figure 1. Silver Lake Site Map

McKinley Park Site:

Existing Parcel Ownership:

Existing Allegheny County Parcel data for McKinley Park was reviewed to determine land ownership status. As shown in Table 5, the project site is entirely owned by the City of Pittsburgh.

Table 5. McKinley Park Site Parcel Ownership

Parcels	Property Owner	State Description	Use Description
1	CITY OF PITTSBURGH	Government	PUBLIC PARK

McKinley Park Historic Desktop Environmental Assessment:

Historic maps of the site were reviewed to check for any possible history of contamination around and at the project site. These maps are prepared using Pittsburgh Historic Maps (arcgis.com) website and are included in appendix A. Below are findings from this review.

- Areas around the site have a history of mostly residential use but there are signs of history of industrial/mine sites around the project area.
- It seems that there used to be a stream (GIS data also available) where the park sport fields are constructed. Historic map of 1903-06 shows city combined sewer connection to this stream.
- Historic map of 1923 shows that a combined sewer main was constructed approximately where the stream was located, the sewer main exists to date.
- It seems that sport fields in the park were constructed starting around 1939.

The presence of mining around the site would require more detailed site investigations of potential acid mine drainage which could potentially impact the performance of green infrastructure and associated plantings.

McKinley Park Stormwater Capture Potential:

Stormwater volume capture potential at McKinley Park was estimated using readily available GIS spatial layers and engineering design assumptions. The following assumptions were made to determine storage footprint and volume of McKinley Park:

- No gas and water utility lines are located at this project site. PA One-Call data provided by PA American Water and Columbia Gas is included in Appendix C.
- Buildings, parking lots and playgrounds within the project area to be demolished.
- Undermined areas found around the project site. Further investigation and analysis needed.
- Soil survey data is obtained from Web Soil Survey (usda.gov) and is included in appendix B.
- Storage areas 100 feet offset from steep slopes (>25%). This does not apply to steep slopes next to the roads or fully developed areas (buildings, parking lots, etc.). Also, steep slopes with minor area in the middle of the park are ignored.
- Storage areas to have 10 feet offset from roads and streets.
- Storage areas to have 15 feet offset from the 72-inch combined sewer main within the park.
- Using upstream manhole depth and sewer diameter from GIS, 19.20 feet of cover is assumed for the sewer main.

- Max excavation depth is assumed to be 8 feet to keep total excavation depths reasonable and minimize potential rock excavation.
- Storage cells are assumed to be modular storage systems with a 92% void space with 2 feet of ground cover above storage cells.

Figure 2 depicts a map of the McKinley Park site and the storage volume area based on the above design assumptions. Available storage footprint and storage volume are as shown in Table 6.

Table 6. Storage Volume Capture Potential at McKinley Park

Total Storage Footprint (SF)	Available Storage Depth (ft)	Storage Volume (CF)
135,900	6	750,000

Using calculated storage volumes in Table 6, the upstream contributing impervious drainage area capture was back calculated for a 1-inch, 1.5-inch and 2-inch rainfall event. The results are shown in Table 7.

Table 7. Impervious Area Capture Potential at McKinley Park for 1-inch, 1.5-inch, and 2-inch Design Storm Events

Contributing Impervious DA Capture (Ac) 1" storm	Contributing Impervious DA Capture (Ac) 1.5" storm	Contributing Impervious DA Capture (Ac) 2" storm
206.60	137.73	103.30

McKinley Park Constructability and Long-Term O&M Considerations:

- Sources of stormwater to the storage facilities in the park will likely mostly be from roadside runoff from upland areas from Beltzhoover, Allentown and adjacent neighborhoods from newly constructed storm sewers. Although some adjacent springs may be captured (see next bullet). The placement and design challenges associated with these new storm sewers were not explored as part of this memo. Design considerations for the storage areas and the upstream inlets will need to consider pretreatment and regular cleaning of sediments, trash, and other pollutants commonly found in urban areas. A network system green infrastructure features upstream of the McKinley Park site would help alleviate sediment, trash, and debris concerns. The loading ratio of the McKinley Park storage footprints to contributing the upstream impervious drainage area should be considered in designing pretreatment facilities.
- Sources of acid mine drainage (AMD) need to be investigated further within the project site. Effectively managing AMD typically requires large footprint area, which may be infeasible given the available project footprint area. Management of AMD sources may need to consider bypassing the sources of these flows around storage areas so that they do not compromise the performance of the GSI features.
- Bausman Street, particularly its intersection with Route 51, is a known location of severe overland flooding, both from Saw Mill Run overflowing its banks and from visible stormwater erosion from runoff from adjacent hillsides on Bausman Street within McKinley Park. Design considerations should consider ways to effectively manage bypass flows during extreme events and keep an active road corridor safe for pedestrians and traffic. Considerations for the raising of Bausman Street to prevent stormwater from flooding the roadway could also be explored.

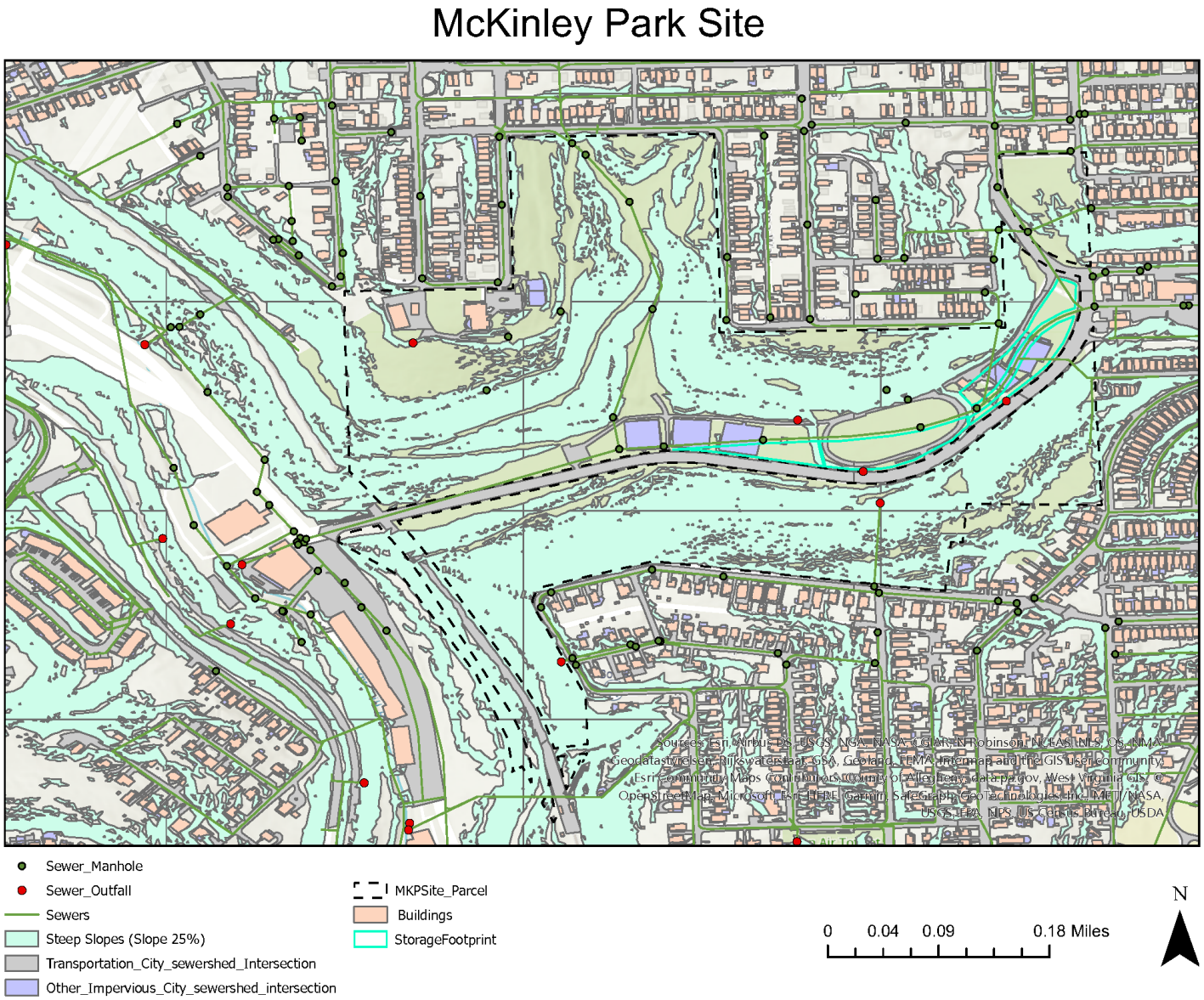
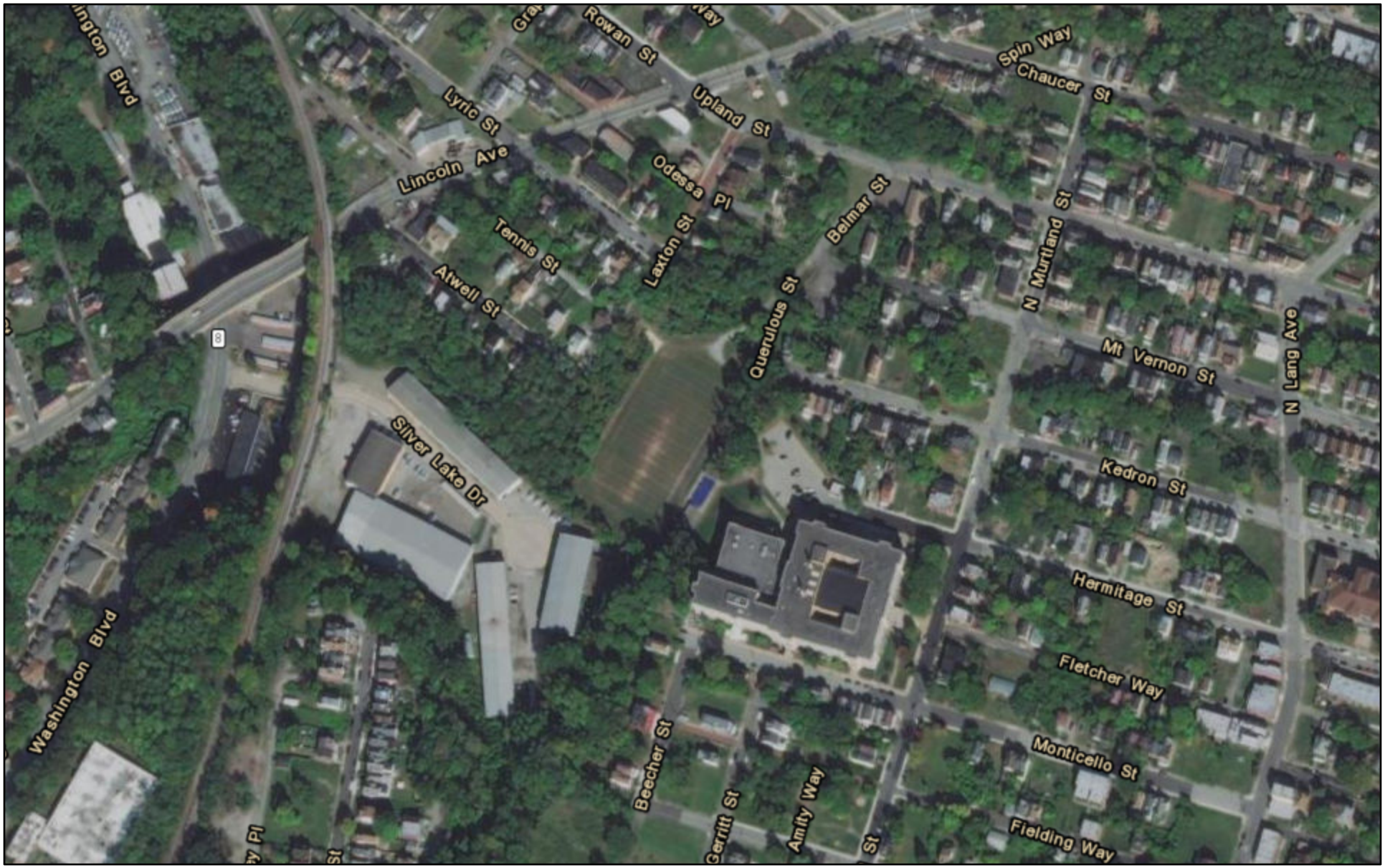


Figure 2. McKinley Park Site Map

Appendix A - Current and Historical Site Maps

Silver Lake



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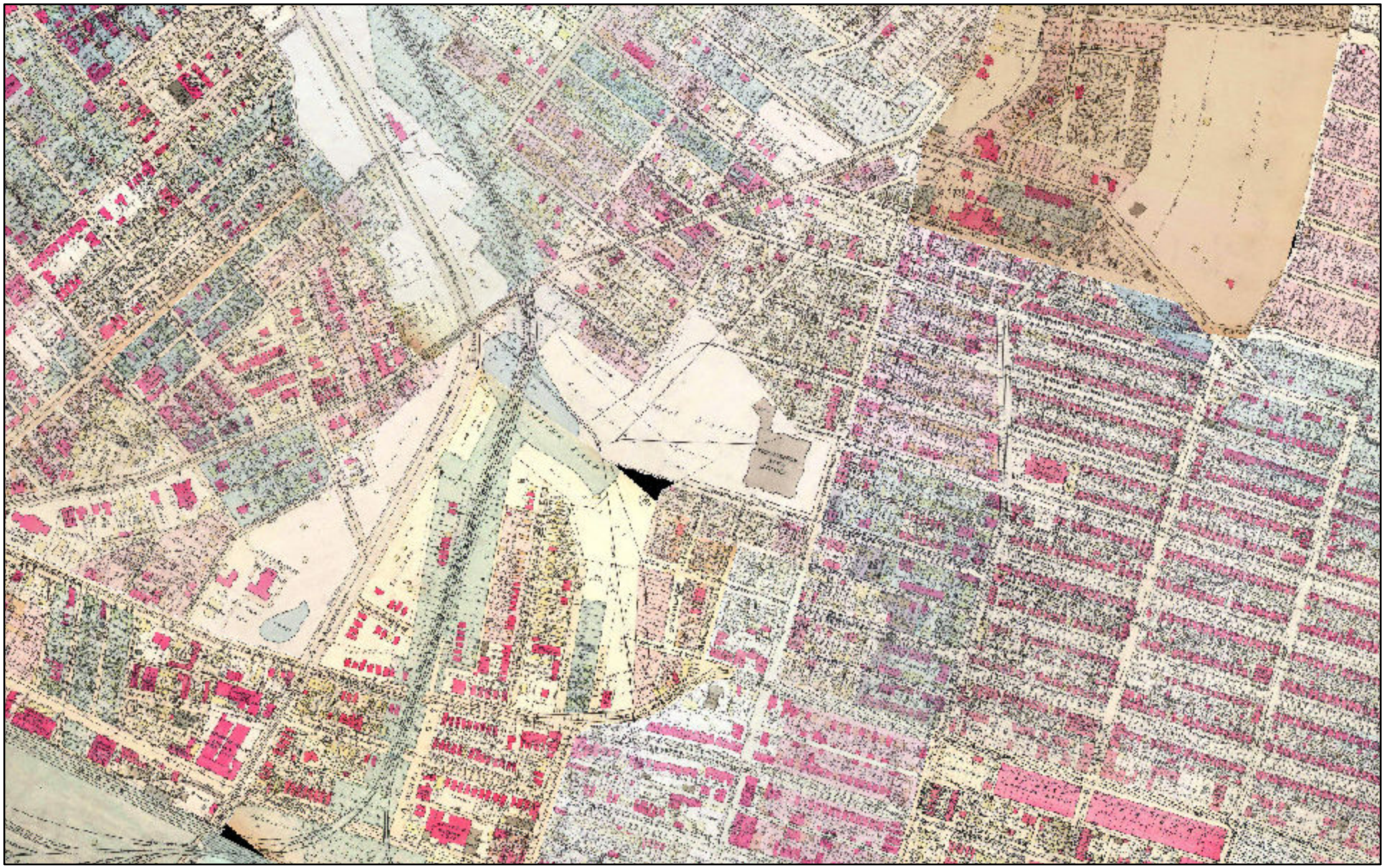
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Silver Lake - 1923



February 24, 2022

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Historic Pittsburgh http://digital.library.pitt.edu/maps, Maxar

Silver Lake - 1967



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Penn Pilot, USGA, Maxar

Silver Lake - 1993



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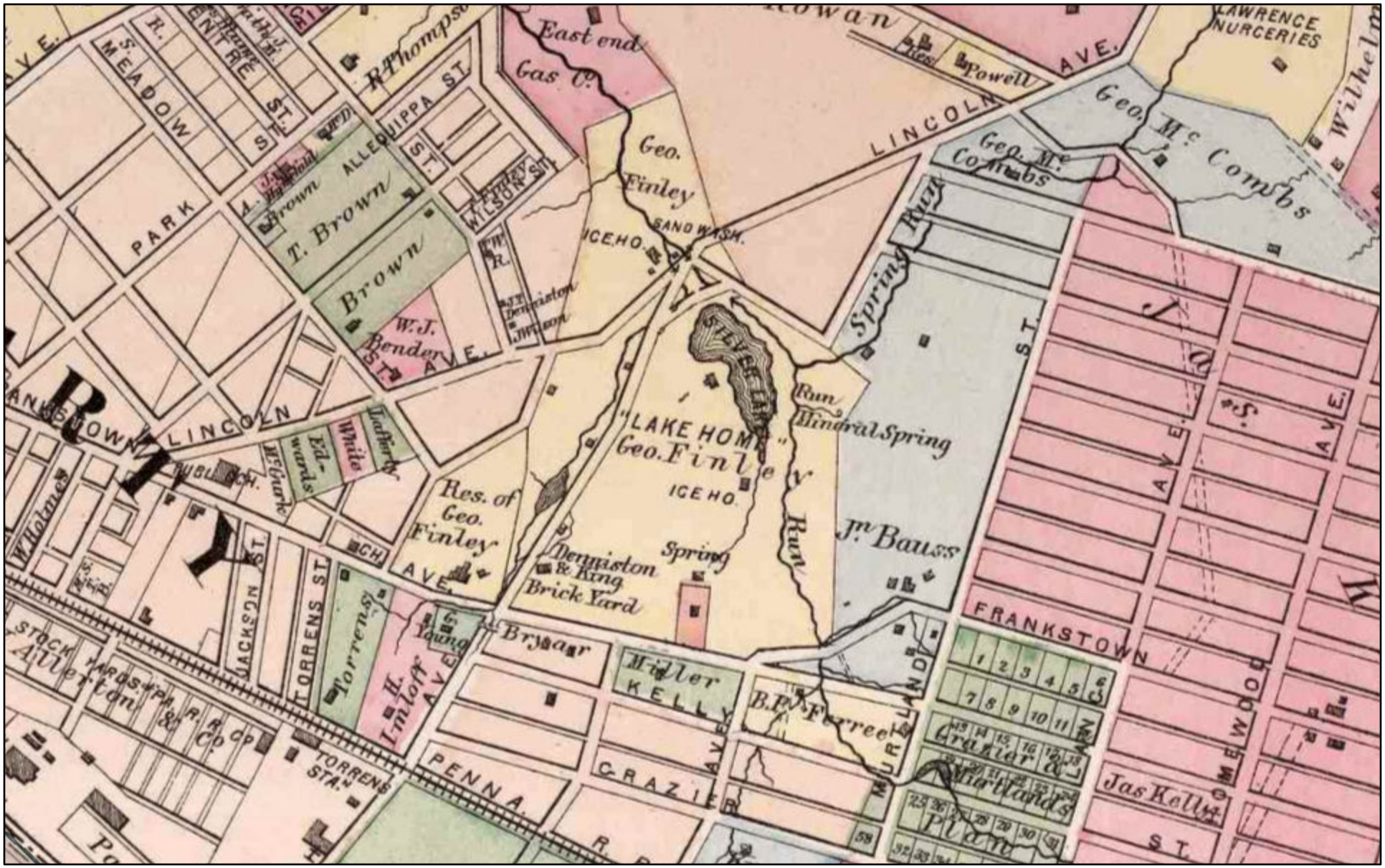
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USGS, Esri, Maxar

Silver Lake - 1872



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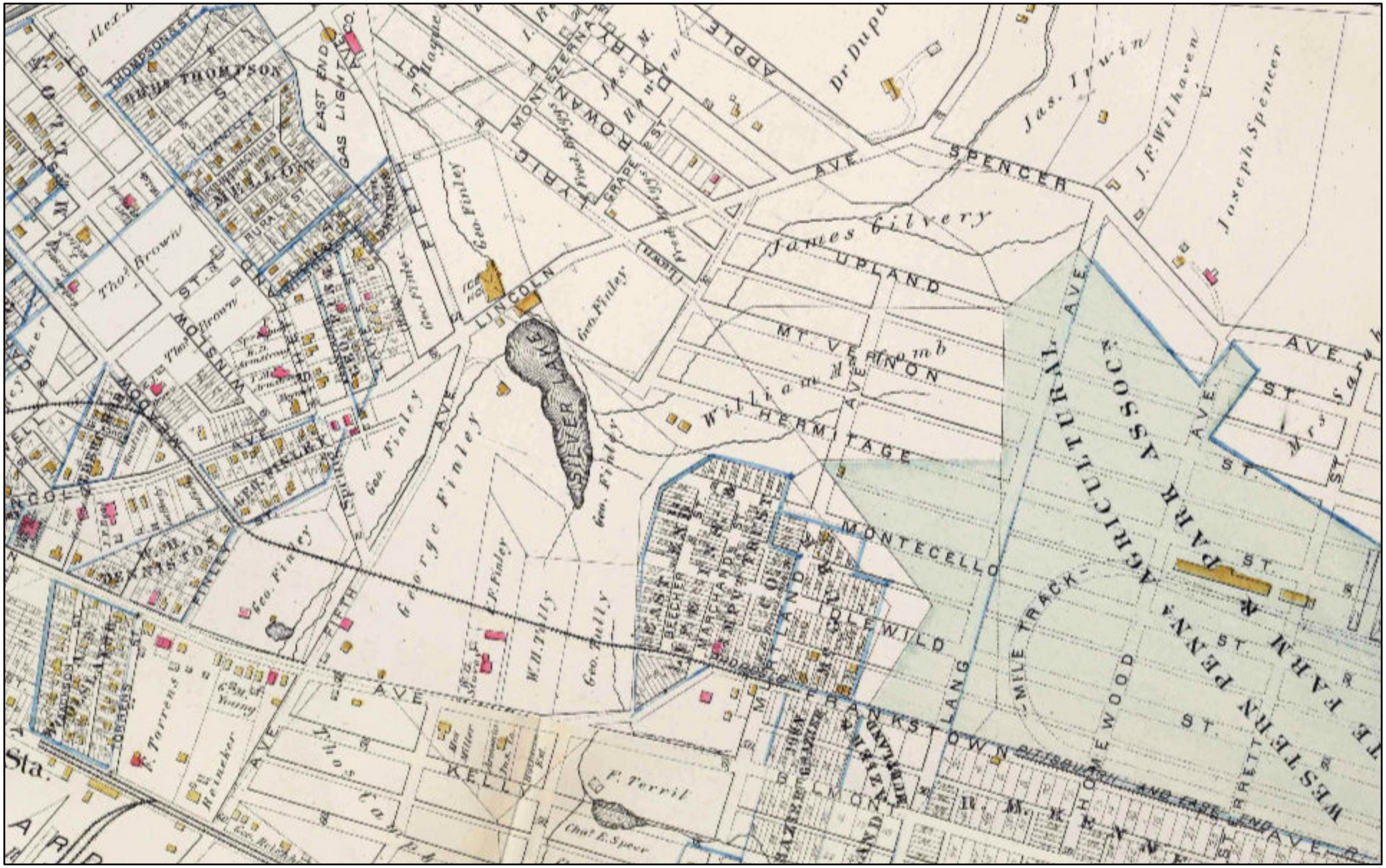
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Silver Lake - 1882



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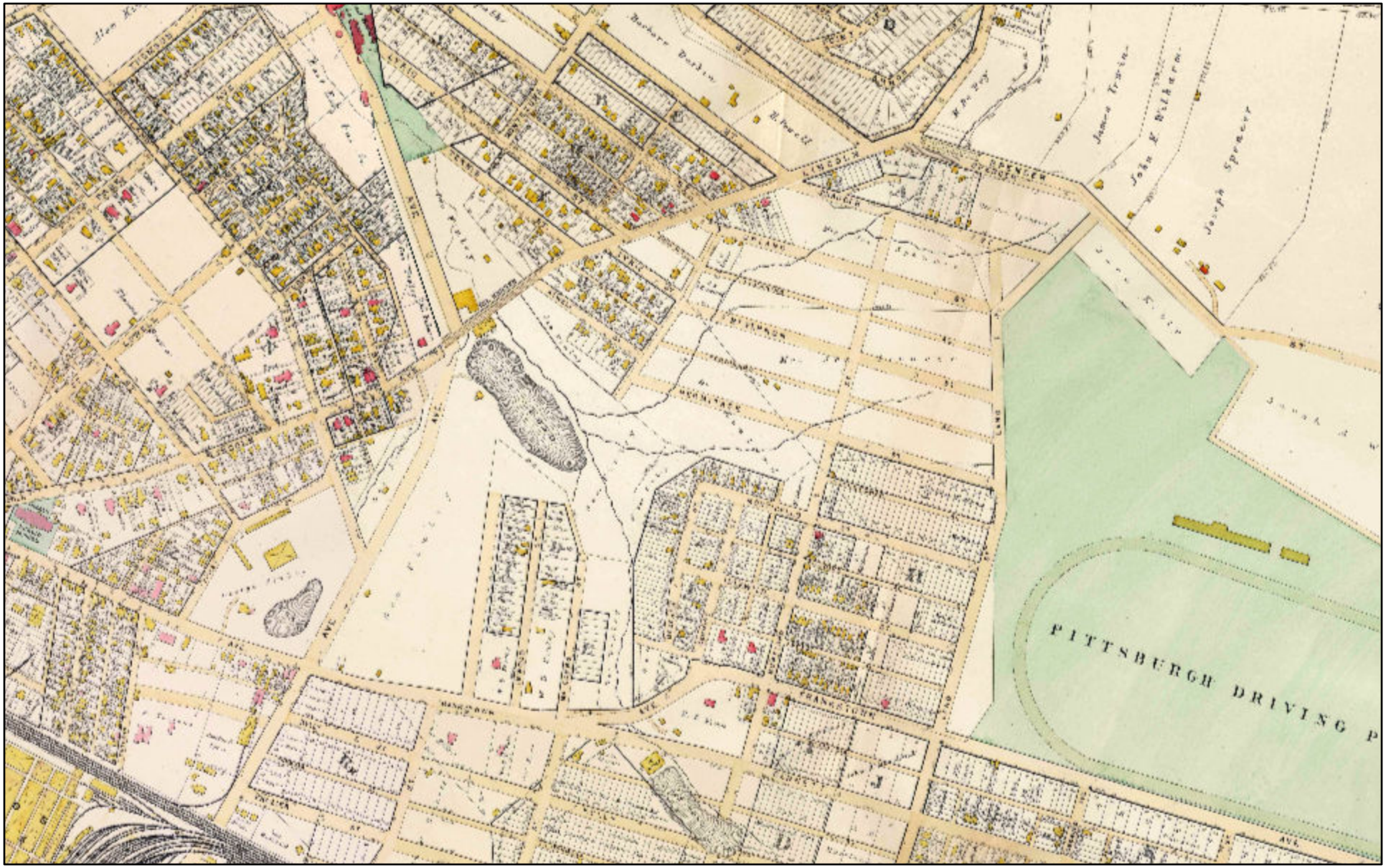
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Silver Lake - 1890



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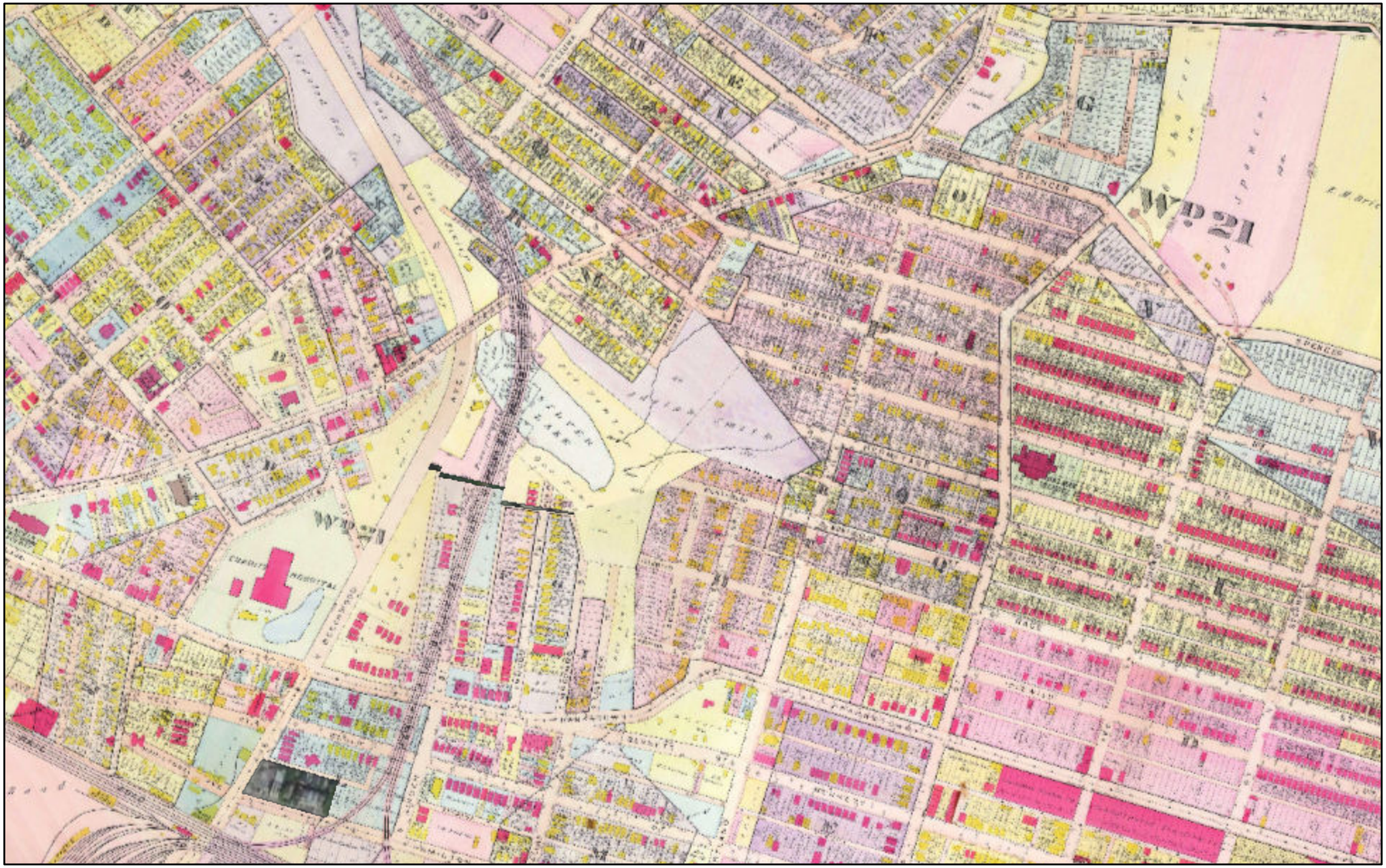
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Silver Lake - 1903 to 1906



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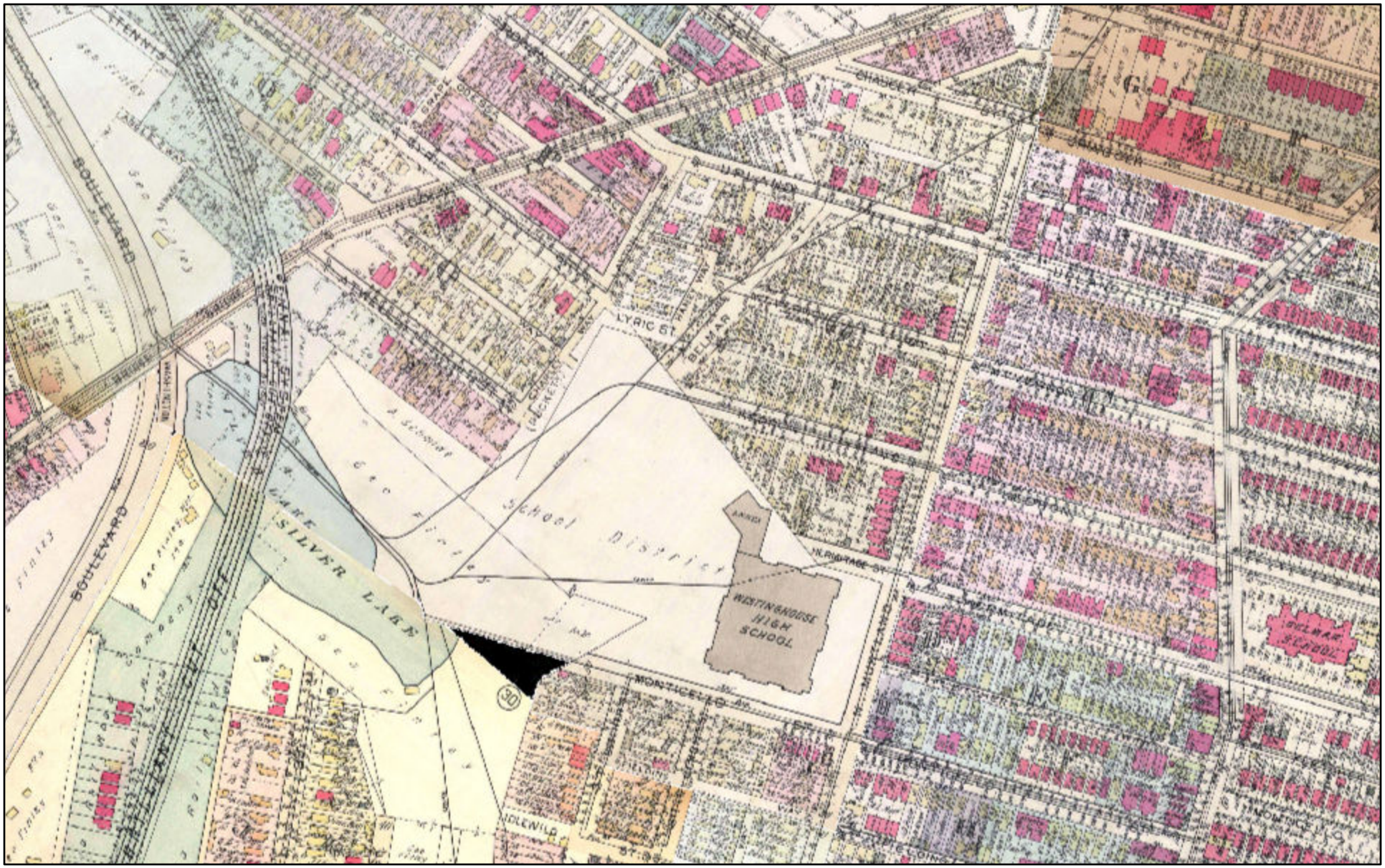
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Silver Lake - 1923



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Silver Lake - 1939



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Penn Pilot, Maxar

Silver Lake - 1957



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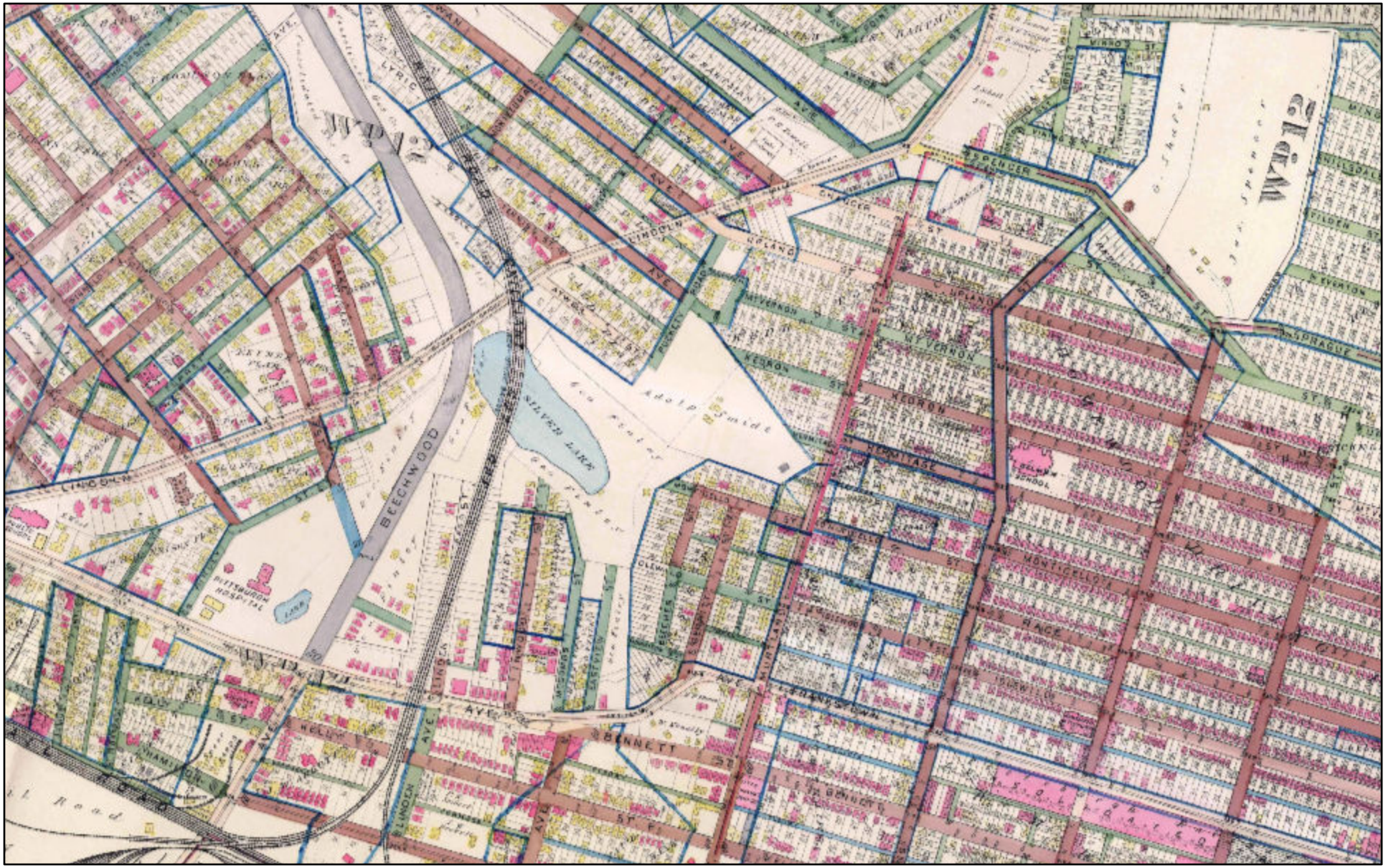
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ESRI, Penn Pilot, Maxar

Silver Lake - 1910



February 24, 2022

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McKinley Park



February 24, 2022

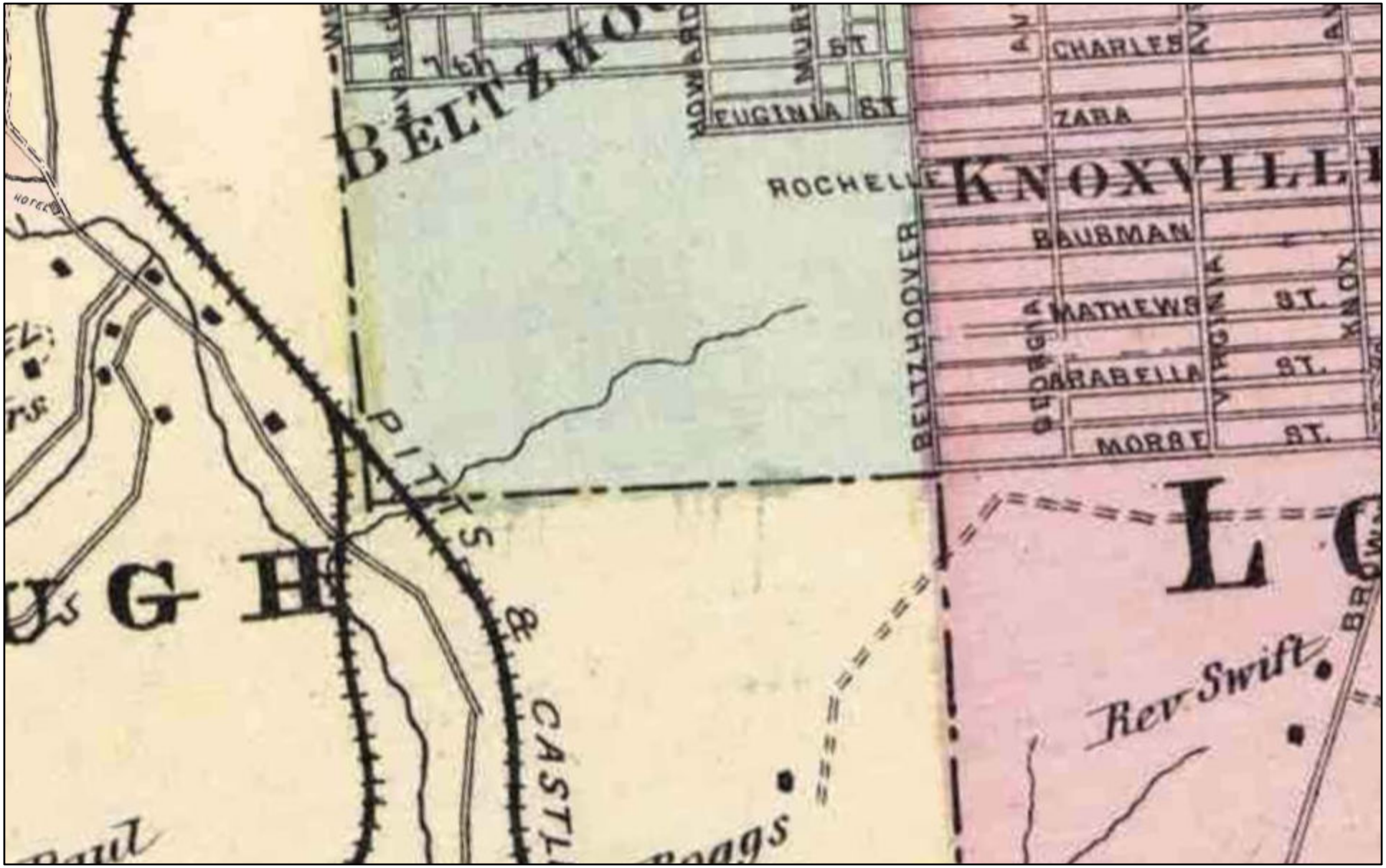
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McKinley Park - 1872



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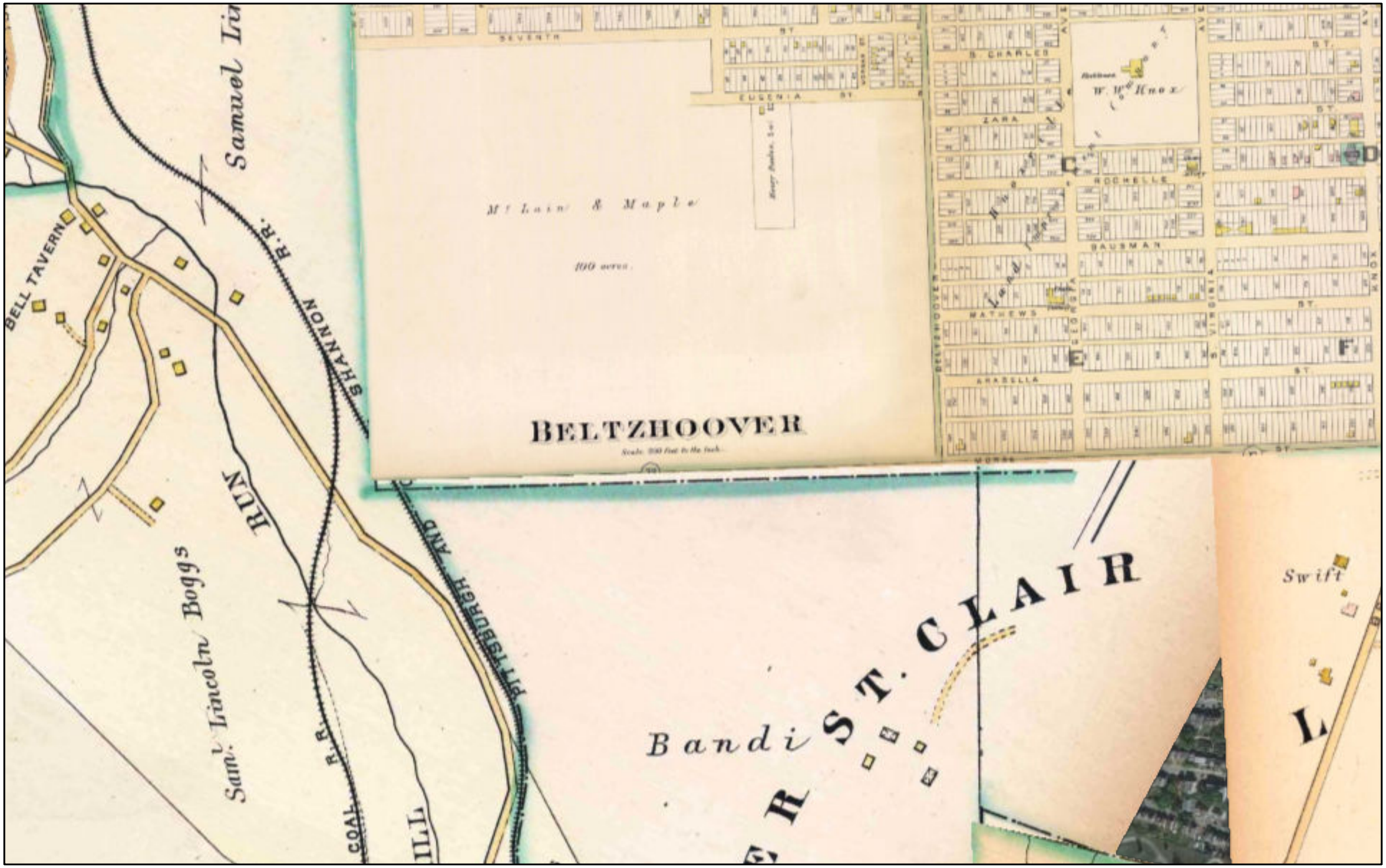
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McKinley Park - 1882



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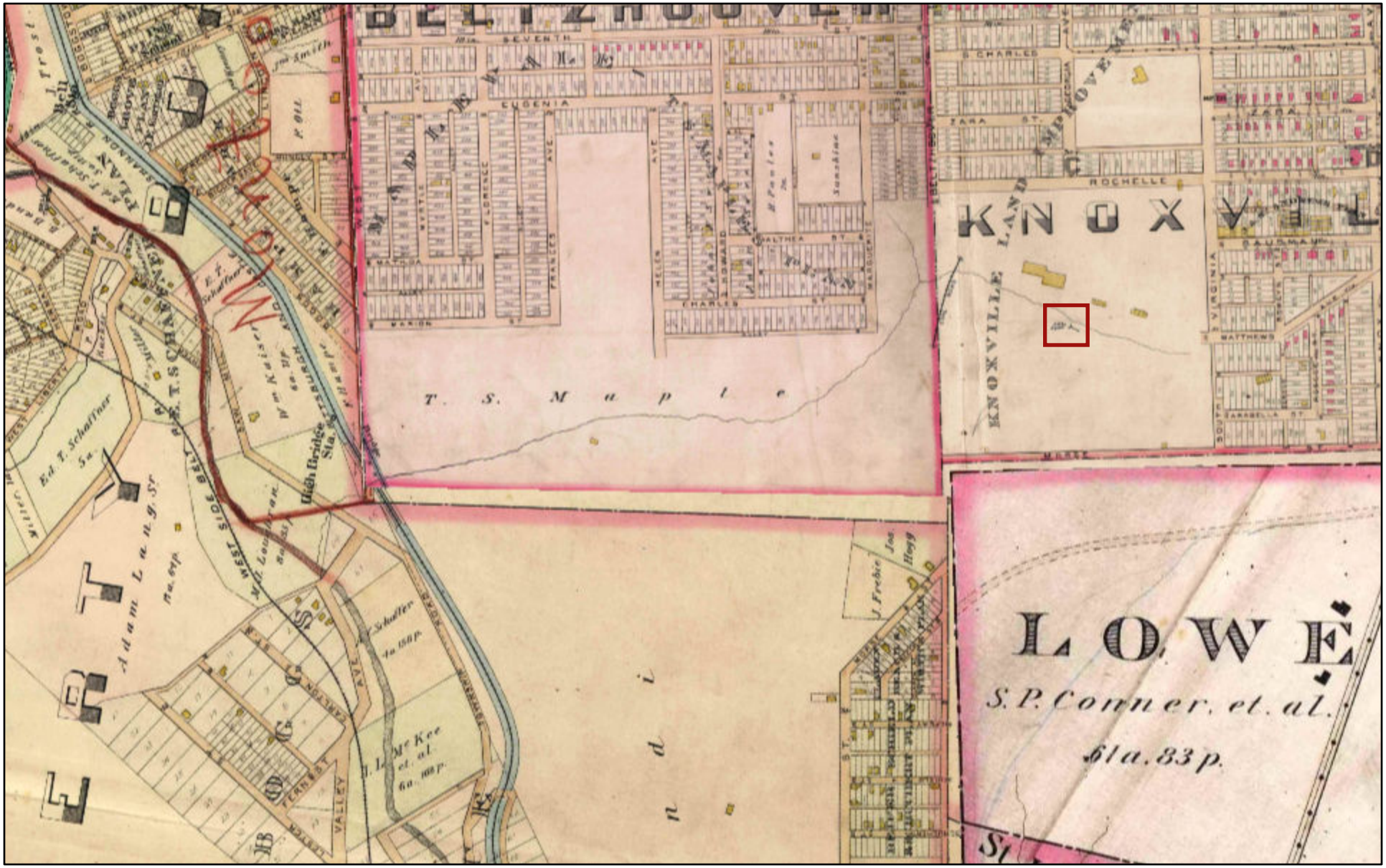
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Historic Pittsburgh, Maxar

McKinley Park - 1890



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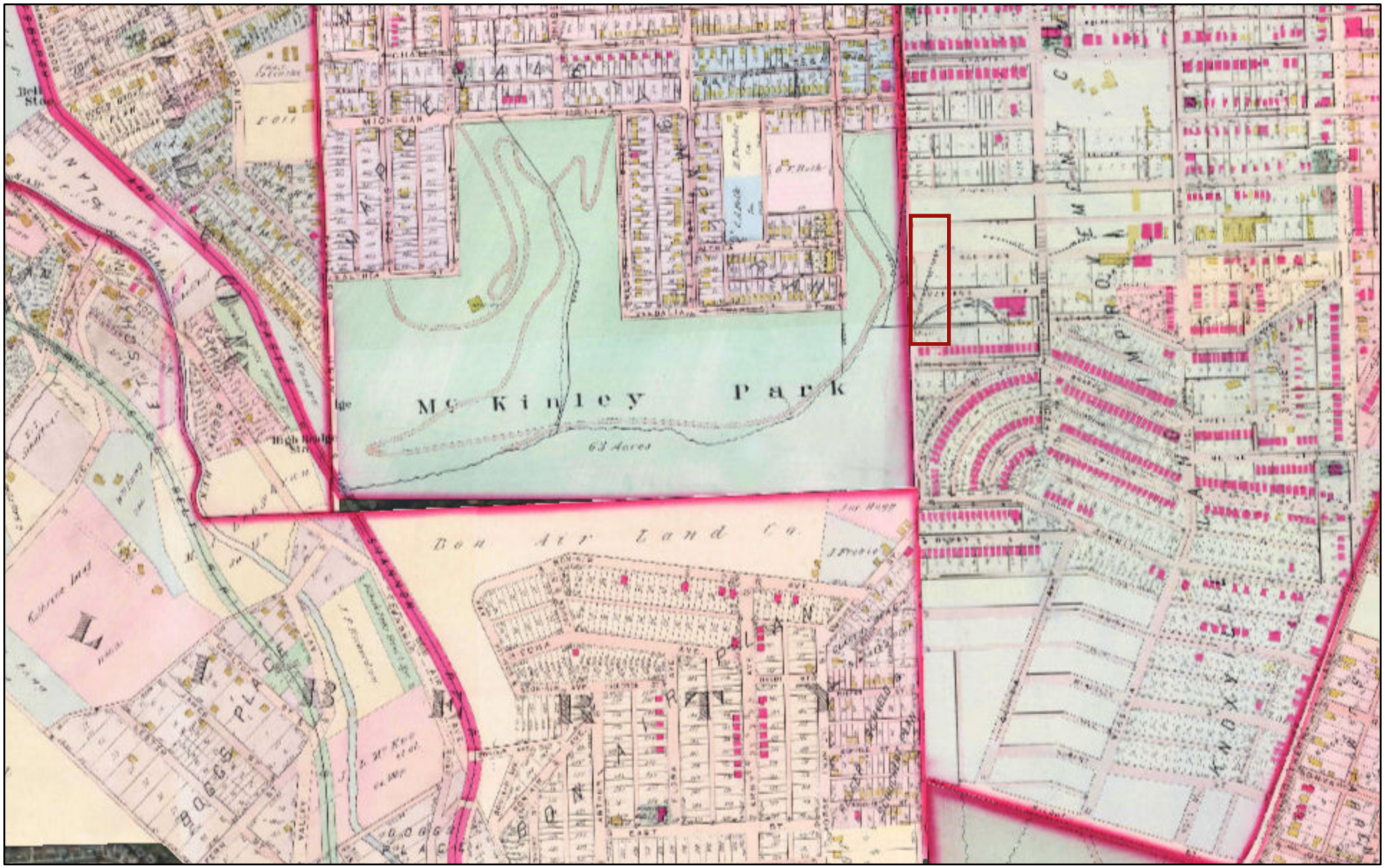
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McKinley Park - 1903-06



February 24, 2022

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McKinley Park - 1910



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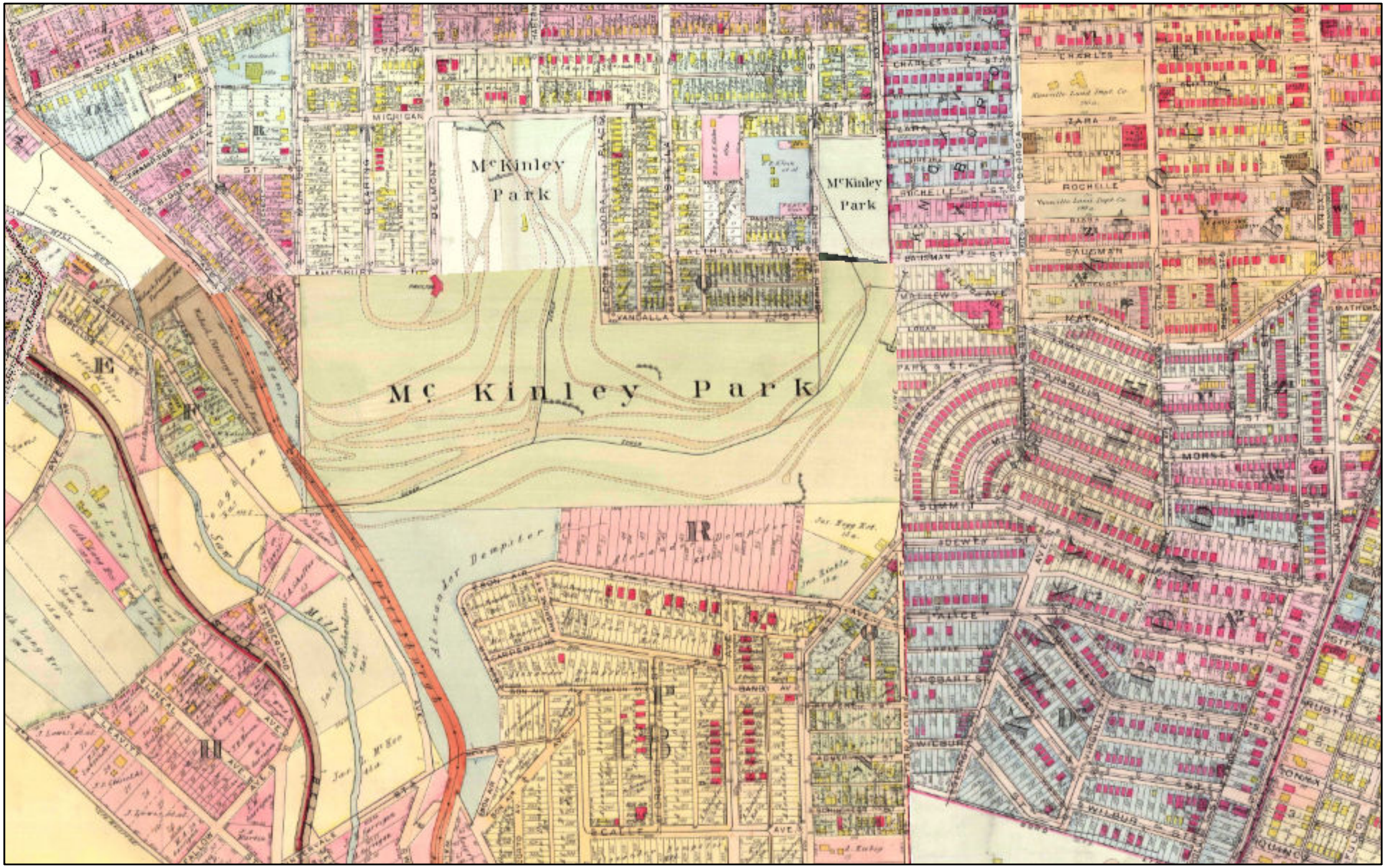
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McKinley Park - 1923



February 24, 2022

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McKinley Park - 1939



February 24, 2022

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Penn Pilot, Maxar

McKinley Park - 1957



February 24, 2022

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ESRI, Penn Pilot, Maxar

McKinley Park - 1967



February 24, 2022

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Penn Pilot, USGA, Maxar

McKinley Park - 1993



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USGS, Esri, Maxar

Appendix B - Soil Survey Reports

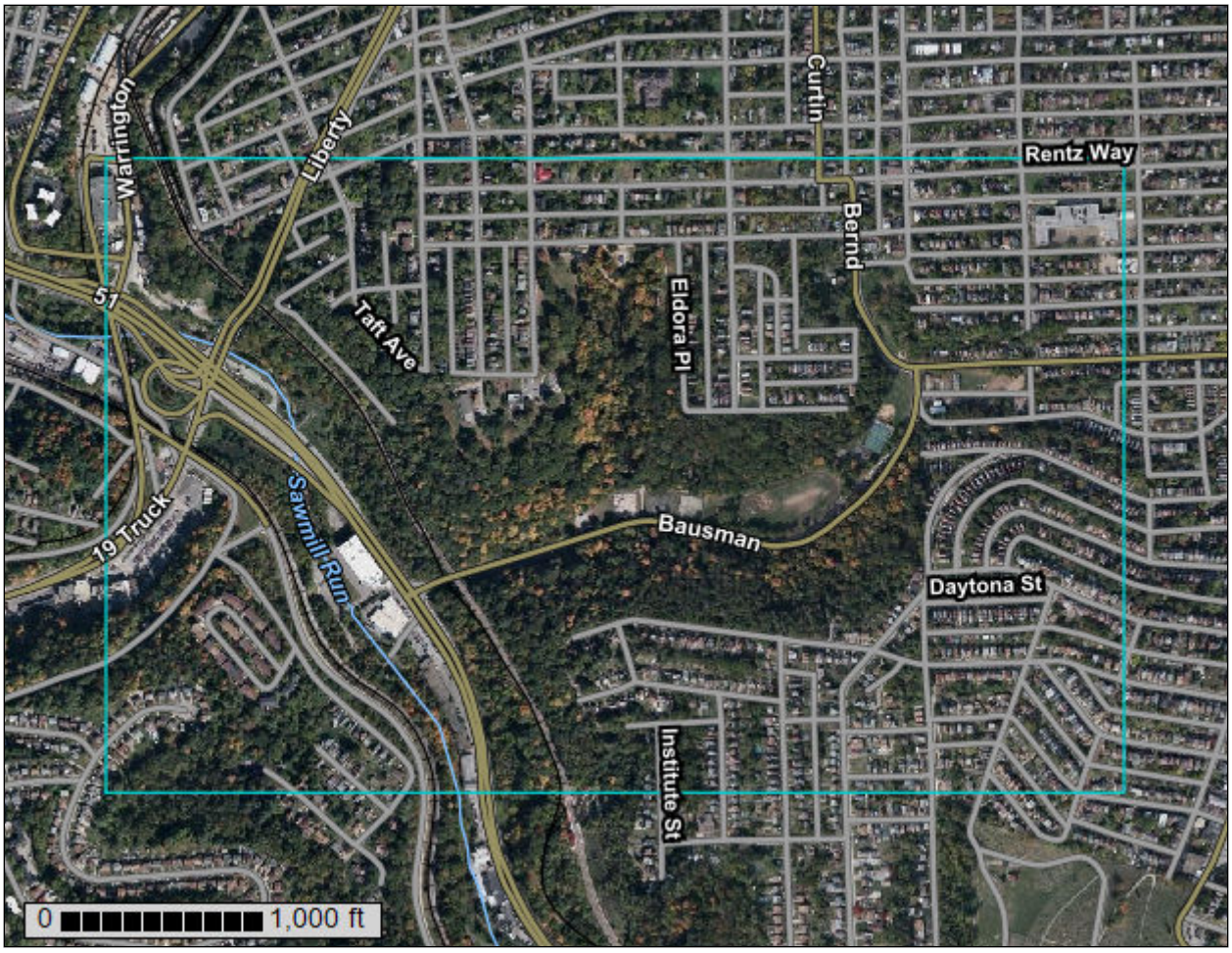
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Allegheny County, Pennsylvania



March 8, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Allegheny County, Pennsylvania
Survey Area Data: Version 17, Aug 31, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 25, 2020—Nov 8, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CuB	Culleoka channery silt loam, 3 to 8 percent slopes	1.5	0.4%
CuD	Culleoka channery silt loam, 15 to 25 percent slopes	18.9	5.2%
DoD	Dormont silt loam, 15 to 25 percent slopes	9.0	2.5%
GSF	Gilpin, Weikert, Culleoka channery silt loams and 25 to 80 percent slopes	90.5	24.9%
UB	Urban land	53.7	14.8%
UCB	Urban land-Culleoka complex, gently sloping	3.9	1.1%
UGB	Urban land-Guernsey complex, gently sloping	4.2	1.2%
UGD	Urban land-Guernsey complex, moderately steep	174.6	48.0%
UWD	Urban land-Wharton complex, moderately steep	3.3	0.9%
WhC	Wharton silt loam, 8 to 15 percent slopes	4.0	1.1%
Totals for Area of Interest		**363.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties

and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Allegheny County, Pennsylvania

CuB—Culleoka channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2s5gm
Elevation: 720 to 1,610 feet
Mean annual precipitation: 37 to 48 inches
Mean annual air temperature: 49 to 53 degrees F
Frost-free period: 173 to 206 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Culleoka and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Culleoka

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 19 inches: channery silt loam
BC - 19 to 26 inches: very channery silt loam
C - 26 to 31 inches: very channery silt loam
R - 31 to 41 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 24 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Dormont

Percent of map unit: 10 percent
Landform: Hills

Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Lowell

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

CuD—Culleoka channery silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2s5gp
Elevation: 720 to 1,610 feet
Mean annual precipitation: 37 to 48 inches
Mean annual air temperature: 49 to 53 degrees F
Frost-free period: 173 to 206 days
Farmland classification: Not prime farmland

Map Unit Composition

Culleoka and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Culleoka

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 19 inches: channery silt loam
BC - 19 to 26 inches: very channery silt loam
C - 26 to 31 inches: very channery silt loam
R - 31 to 41 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 24 to 40 inches to lithic bedrock
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Dormont

Percent of map unit: 15 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Lowell

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

DoD—Dormont silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2s5gk
Elevation: 800 to 1,540 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Dormont and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dormont

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Concave, linear
Parent material: Fine-loamy residuum weathered from limestone, sandstone, and shale

Typical profile

Ap - 0 to 11 inches: silt loam
Bt1 - 11 to 21 inches: silt loam
Bt2 - 21 to 31 inches: silty clay loam
Bt3 - 31 to 46 inches: channery silty clay loam
Bt4 - 46 to 62 inches: channery silty clay loam
BC - 62 to 75 inches: channery silty clay loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.66 in/hr)
Depth to water table: About 24 to 44 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Culleoka

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Guernsey

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Fluvaquents

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Lowell

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

GSF—Gilpin, Weikert, Culleoka channery silt loams and 25 to 80 percent slopes

Map Unit Setting

National map unit symbol: 2wds4
Elevation: 730 to 1,380 feet
Mean annual precipitation: 37 to 41 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 179 to 206 days
Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 35 percent
Weikert and similar soils: 30 percent
Culleoka and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Acid fine-loamy residuum weathered from shale and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 8 inches: channery silt loam
Bt - 8 to 24 inches: channery silt loam

C - 24 to 33 inches: extremely channery loam
R - 33 to 43 inches: bedrock

Properties and qualities

Slope: 25 to 80 percent
Depth to restrictive feature: 30 to 36 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Weikert

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Acid loamy residuum weathered from shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 7 inches: channery silt loam
Bw - 7 to 15 inches: very channery silt loam
C - 15 to 17 inches: extremely channery silt loam
R - 17 to 26 inches: bedrock

Properties and qualities

Slope: 25 to 80 percent
Depth to restrictive feature: 14 to 19 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Culleoka

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Nonacid fine-loamy residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 10 inches: channery silt loam
Bt - 10 to 19 inches: channery silt loam
BC - 19 to 26 inches: very channery silt loam
C - 26 to 31 inches: very channery silt loam
R - 31 to 41 inches: bedrock

Properties and qualities

Slope: 25 to 80 percent
Depth to restrictive feature: 24 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Wharton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

UB—Urban land

Map Unit Setting

National map unit symbol: l5px
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 120 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artifically covered areas

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to densic material
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Udorthents, steep

Percent of map unit: 10 percent
Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

UCB—Urban land-Culleoka complex, gently sloping

Map Unit Setting

National map unit symbol: l5py
Elevation: 700 to 1,500 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 60 percent
Culleoka and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artifically covered areas human transported material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Culleoka

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from sandstone and siltstone

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 26 inches: channery silt loam
C - 26 to 31 inches: very channery silt loam
R - 31 to 33 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

UGB—Urban land-Guernsey complex, gently sloping

Map Unit Setting
National map unit symbol: l5q1
Elevation: 200 to 1,200 feet
Mean annual precipitation: 32 to 48 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 75 percent
Guernsey and similar soils: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting
Parent material: Human transported material

Typical profile
H1 - 0 to 6 inches: variable

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to
Runoff class: Very high

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Guernsey

Setting
Landform: Hills
Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Residuum weathered from limestone and calcareous shale

Typical profile

Ap - 0 to 7 inches: silt loam
Bt - 7 to 27 inches: silty clay loam
Btg - 27 to 47 inches: clay
Cg - 47 to 56 inches: silty clay
R - 56 to 63 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 50 to 75 inches to lithic bedrock
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 17 to 25 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Thorndale

Percent of map unit: 5 percent
Landform: Draws
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

UGD—Urban land-Guernsey complex, moderately steep

Map Unit Setting

National map unit symbol: l5q2
Elevation: 800 to 1,200 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 75 percent
Guernsey and similar soils: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Human transported material

Typical profile

H1 - 0 to 6 inches: variable

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 10 inches to
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Guernsey

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Residuum weathered from limestone and calcareous shale

Typical profile

Ap - 0 to 7 inches: silt loam
Bt - 7 to 27 inches: silty clay loam
Btg - 27 to 47 inches: clay
Cg - 47 to 56 inches: silty clay
R - 56 to 63 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 50 to 75 inches to lithic bedrock
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 17 to 25 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D

Hydric soil rating: No

Minor Components

Library

Percent of map unit: 5 percent
Hydric soil rating: No

Culleoka

Percent of map unit: 5 percent
Hydric soil rating: No

UWD—Urban land-Wharton complex, moderately steep

Map Unit Setting

National map unit symbol: l5q6
Elevation: 740 to 1,500 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 65 percent
Wharton and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Human transported material

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 10 inches to
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Wharton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Concave

Parent material: Fine-loamy residuum weathered from shale and siltstone

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 42 inches: silty clay loam
H3 - 42 to 60 inches: silty clay
H4 - 60 to 73 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 48 to 72 inches to lithic bedrock
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Cavode

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Gilpin

Percent of map unit: 5 percent
Hydric soil rating: No

WhC—Wharton silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2t5mm
Elevation: 620 to 2,160 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 47 to 53 degrees F
Frost-free period: 161 to 205 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wharton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wharton

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Fine-loamy residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 9 inches: silt loam
Bt1 - 9 to 16 inches: silt loam
Bt2 - 16 to 22 inches: silt loam
Bt3 - 22 to 31 inches: silt loam
BC - 31 to 46 inches: silty clay loam
C - 46 to 69 inches: channery silty clay loam
Cr - 69 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 40 to 71 inches to paralithic bedrock
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: About 16 to 28 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Forage suitability group: Unnamed (G126XYA-6OH)
Other vegetative classification: Unnamed (G126XYA-6OH)
Hydric soil rating: No

Minor Components

Gilpin

Percent of map unit: 10 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Ernest

Percent of map unit: 5 percent

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Rarden

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

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United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Allegheny County, Pennsylvania



March 2, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:5,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Allegheny County, Pennsylvania
Survey Area Data: Version 17, Aug 31, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 15, 2019—Nov 7, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GQF	Gilpin-Upshur complex, very steep	15.4	16.9%
UB	Urban land	9.9	10.9%
UCB	Urban land-Culleoka complex, gently sloping	18.5	20.2%
URB	Urban land-Rainsboro complex, gently sloping	47.5	52.0%
Totals for Area of Interest		**91.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Allegheny County, Pennsylvania

GQF—Gilpin-Upshur complex, very steep

Map Unit Setting

National map unit symbol: 2xqvc
Elevation: 680 to 1,330 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 179 to 206 days
Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 45 percent
Upshur and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acid fine-loamy residuum weathered from shale and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: channery silt loam
Bt - 6 to 24 inches: channery silt loam
C - 24 to 30 inches: very channery loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 25 to 75 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Upshur

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Residuum weathered from clayey shale and/or residuum weathered from mudstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 6 inches: silty clay loam
Bt1 - 6 to 9 inches: silty clay
Bt2 - 9 to 25 inches: silty clay
Bt3 - 25 to 35 inches: silty clay
BCt - 35 to 40 inches: parachannery silty clay loam
C - 40 to 50 inches: very parachannery silty clay loam
Cr - 50 to 60 inches: bedrock

Properties and qualities

Slope: 25 to 75 percent
Depth to restrictive feature: 42 to 84 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Weikert

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Culleoka

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear

Across-slope shape: Linear
Hydric soil rating: No

Guernsey

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Hazleton

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Wharton

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

UB—Urban land

Map Unit Setting

National map unit symbol: l5px
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 120 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artifically covered areas

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to densic material
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Udorthents, steep

Percent of map unit: 10 percent
Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

UCB—Urban land-Culleoka complex, gently sloping

Map Unit Setting

National map unit symbol: l5py
Elevation: 700 to 1,500 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 60 percent
Culleoka and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artifically covered areas human transported material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Culleoka

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from sandstone and siltstone

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 26 inches: channery silt loam
C - 26 to 31 inches: very channery silt loam
R - 31 to 33 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

URB—Urban land-Rainsboro complex, gently sloping

Map Unit Setting

National map unit symbol: l5q3
Elevation: 700 to 1,100 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 176 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 75 percent
Rainsboro and similar soils: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Human transported material

Typical profile

H1 - 0 to 6 inches: variable

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Rainsboro

Setting

Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Old alluvium

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 26 inches: silt loam
H3 - 26 to 40 inches: silt loam
H4 - 40 to 60 inches: sandy clay loam
H5 - 60 to 72 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 19 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Ginat

Percent of map unit: 5 percent
Landform: Terraces

Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

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Pittsburgh, PA 15212
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www.akrf.com

Memorandum

To:	Karl Russek, University of Pennsylvania Water Center
From:	AKRF, Inc.
Date:	March 22, 2022
Re:	PWSA Strategic Plan for Stormwater - Engineering Feasibility Analysis for Seldom Seen

As part of the Pittsburgh Water and Sewer Authority (PWSA) Strategic Plan for Stormwater, AKRF conducted a concept level engineering feasibility analysis for floodplain restoration strategies for Seldom Seen Greenway.

Existing Parcel Ownership:

Existing Allegheny County Parcel data was reviewed to determine land ownership status. As shown in Table 1, the majority of the site is owned by the City of Pittsburgh or Allegheny County with additional portions privately held by the Pittsburgh and West Virginia Railway along the active railway and Wabash Properties owning the portion of the land near the entryway to the greenway. To build floodplain management within the footprint of the site, property acquisition of private land and or land owner negotiations may be required.

Table 1. Seldom Seen Site Parcel Ownership

Parcels	Property Owner	State Description	Use Description
1	PITTSBURGH & WEST VIRGINIA RAILWAY	Utilities	R.R. USED IN OPERATION
2	WABASH PROPERTIES LLC	Industrial	LIGHT MANUFACTURING
3	CITY OF PITTSBURGH	Government	GOVERNMENT
4	COUNTY OF ALLEGHENY	Government	GOVERNMENT

Seldom Seen Historic Desktop Environmental Assessment:

Historic maps of the site were reviewed to check for any possible history of contamination around and at the project site. These maps are prepared using Pittsburgh Historic Maps (arcgis.com) website. Below are findings from this review.

- There are signs of history of industrial/mine sites around the project area.

- The stream appears to always have been present however it may have been moved locations once the West Side Belt railroad was constructed around the latter half of the 19th century. The railroad viaduct that passed over the stream has a historical marker construction date of 1902.
- Historic map of 1923 shows the presence of a residential community in the Seldom Seen Greenway with what appear to be numerous residential structures on the western bank of Saw Mill Run. These structures are present up until the 1960s.
- Previous site visits by AKRF staff to Seldom Seen have shown historical presence of fill material on the east sides of the bank directly upstream from the viaduct. Material from eroded stream banks contain large fragments of broken glass/antique glassware and burnt slag material (see Figures 6, 7, and 8).

Given the industrial history of the site and likely presence of infill material, further investigation into possible soil contamination at the site would be required as part of future design considerations.

Seldom Seen Stream Flows and Capture Potential:

Seldom Seen is a floodplain and streambank restoration project and requires engineering design considerations beyond the traditional green infrastructure project that detains and stores stormwater runoff from impervious area. Floodplain and stream bank restoration projects involve evaluation of the stream hydraulic behavior for a range of flood frequency flows. The general design goals for a successful restoration project like Seldom Seen is to stabilize eroded stream banks and create more floodplain storage by improving the stream banks and regrading the floodplains. Restoration efforts also include revegetation of the banks and floodplain areas with plantings conducive to highly erosive and wet flood prone environments.

As part of the design process, it is critical to evaluate the hydraulics of the stream and its associated floodplains. Typically, this is done using a hydraulic model such as HEC-RAS to understand stream behavior for a range of design flows and corresponding base flood elevations, velocities, and shear stresses during each design condition. This will ensure that proposed stream and floodplain improvements are able to withstand erosive conditions often seen in streams during large design floods. A stream bank assessment is also recommended as part of the design process to quantify existing streambank erosion rates for TMDL and MS4 permit pollutant crediting.

The stream hydraulics of Saw Mill Run at Seldom Seen were preliminarily evaluated at a conceptual high level for the 10-year and 100-year flood frequency flows using the existing HEC-RAS model developed by the United States Army Corps of Engineers for Saw Mill Run. It is important to note that the results of the HEC-RAS model simulations have not been QA/QC'd by AKRF nor discussed with the model developers at the Army Corps. All results should be considered preliminary and for use as high level conceptual planning purposes only. Existing streambank conditions for potential pollutant crediting were not evaluated and are beyond the scope of this work.

Existing Stream Flows

Stream flows on Saw Mill Run can rise very quickly and result in dangerous public safety flash floods. On September 6, 2018 at the intersection of Saw Mill Run Boulevard and Woodruff Street (the main entrance to Seldom Seen) was closed due to flooding. The Saw Mill Run USGS stream flow gage for this rain event was obtained and is shown in Figure 1. Water depths during this flood event rose 3 feet in approximately 30 minutes and quickly receded back to previous levels in about 2 hours after the peak. Given the steep topography of the Saw Mill Run watershed, impervious area cover, and lack of upstream stormwater management, streams flows during flood events in Seldom Seen are likely very "flashy" with rapid changes in depth and velocity.

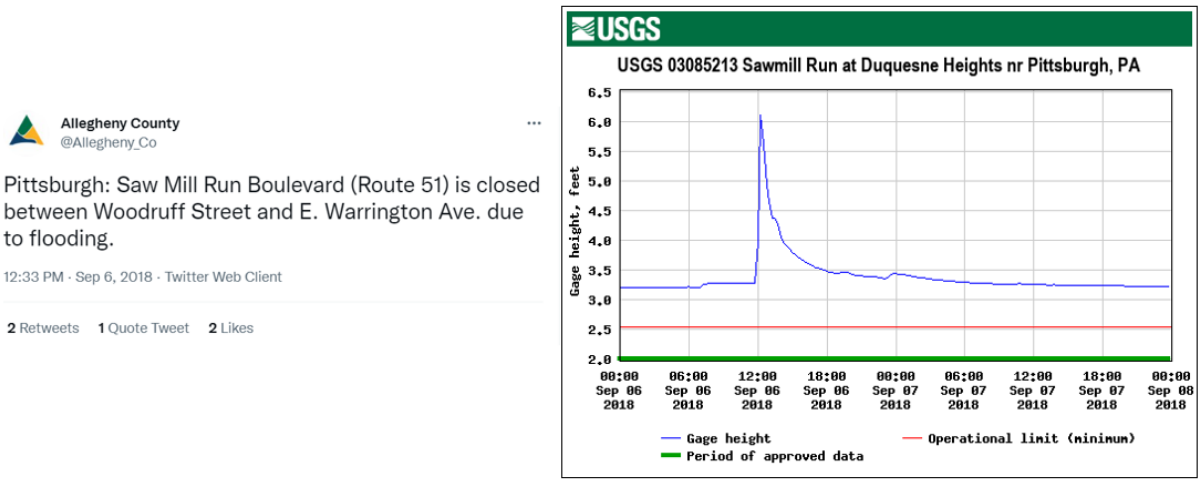
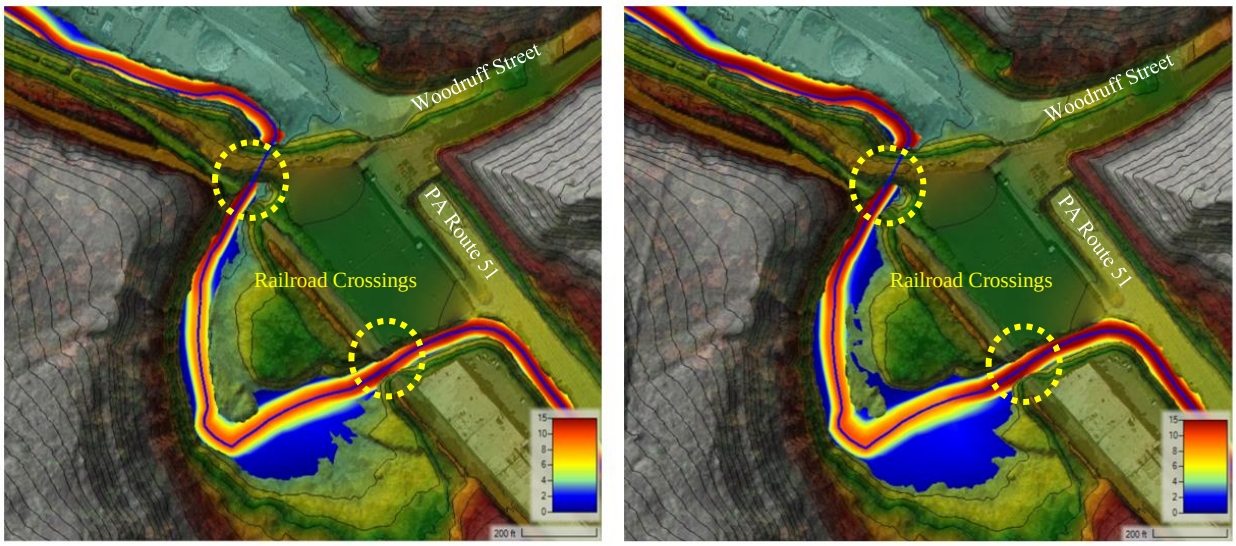


Figure 1. Rapid Rise in Saw Mill Run Stream During September 8, 2018 Flood Event

According to the HEC-RAS model for Saw Mill Run, peak stream flows through Seldom Seen for the 10-year and 100-year event are 4,333 cfs and 7,333 cfs, respectively. According to USGS Stream Stats report generated for the project area expected baseflows at Seldom Seen are approximately 5 cfs. This is a very large change in flow in relatively short duration. Any floodplain and stream bank restoration project in Seldom Seen must consider these rapid changes in stream flow regime within the Saw Mill Run stream. Intensifying rain events from climate change should also be considered as the stream flood flows may be higher than what is predicted in the HEC-RAS model.

Stream Channel Velocities

According to the HEC-RAS model simulation results, stream velocities in Seldom Seen for the both the 10-year and 100-year event are approximately 10 feet per second in the main portion of the stream channel. In the narrower stream sections through the railroad viaduct crossings at the upstream and downstream portion of the site velocities exceed 15 feet per second. Figure 2 depicts the maximum stream velocities in Seldom Seen as per the HEC-RAS model. Any stream channel or stream bank improvements must consider these types of velocities as part of the design.



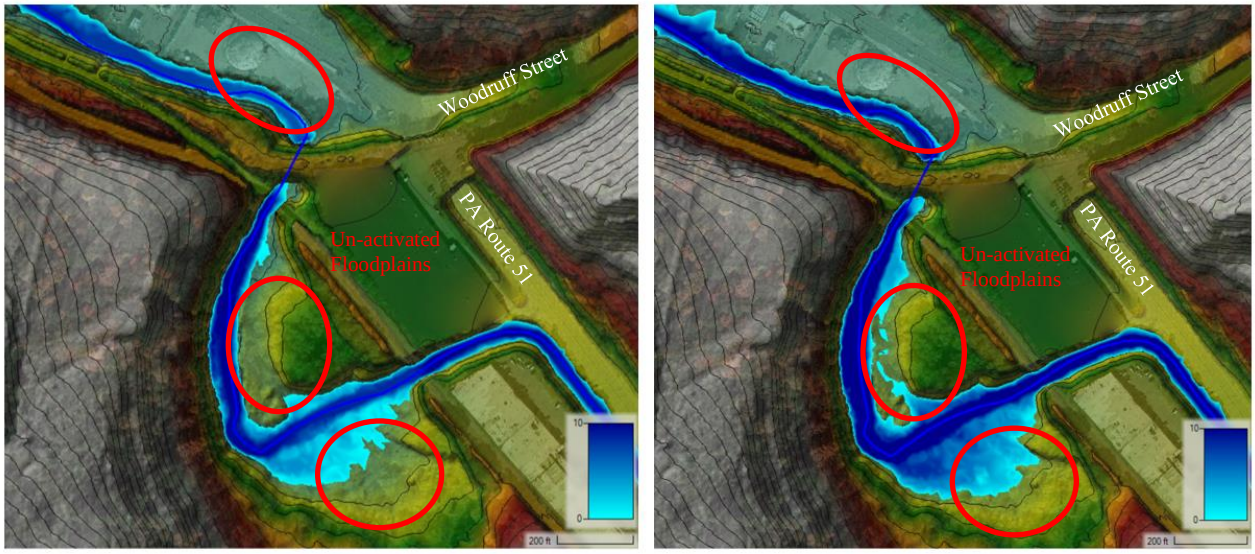
10-year stream velocity

100-year stream velocity

Figure 2. Seldom Seen HEC-RAS Maximum Stream Velocity Results (legend in fps)

Floodplain Activation

Healthy streams should naturally overtop their banks into the floodplain during large storm events. This provides peak flood mitigation and storage, as well as valuable filtration and settling of pollutants and sediments. The HEC-RAS model was used to determine the existing floodplain activation in Seldom Seen for the 10-year and 100-year events and are shown in Figure 3.



10-year stream water depths

100-year stream water depths

Figure 3. Seldom Seen HEC-RAS Maximum Stream Water Depth Results (legend in feet)

As shown in Figure 3, the adjacent floodplains in Seldom Seen only partially activate. This is especially evident in the areas circled in red on Figure 3. It is evident that more effective floodplain activation could be realized in Seldom Seen. Potential realized floodplain storage is primarily a regrading exercise by modifying the existing terrain and re-simulating the HEC-RAS model to confirm appropriate activation typically during a 1 or 2-year flood event. This iterative modeling process is outside the scope of this work. However, the areas indicated in Figure 3 in red are approximately 4 acres in total combined area. Assuming these areas were regraded to capture 2 feet of additional flood plain storage this would be equal to approximately 8 ac-ft of storage on the site. The quantity of soil to excavate this much material to achieve this storage was not estimated and is beyond the scope of work. However, removal of soil would likely be substantial, especially on the eastern side of the Seldom Seen where historic infill is suspected.

Seldom Seen Constructability and Long-Term O&M Considerations:

- Existing sewers infrastructure is not present according to PWSA GIS layers provided. Water and gas utilities were not obtained for the project area.
- Site access for heavy machinery to excavate and remove soil will be a challenge. The project site is surrounded by adjacent steep hillsides, two railroad lines (based on conversations with Lisa Brown from Watersheds of South Pittsburgh it is suspected that one line is active and the other is not), and industrial buildings (see Figure 4). For the contractor to get excavators and trucks into the site, it may be needed to cut a long access road from the hilltop on Brashear High School that is graded at a low slope for truck access. Contractor site access via underneath the historic viaduct at the main entrance to Seldom Seen may be infeasible depending on the size of the equipment needed. The viaduct is narrow with minimal overhead clearance (See photo in Figure 5.) Additionally, the land at the viaduct entrance to Seldom Seen is not owned by the City of Pittsburgh and is owned by a combination of the railroad company and Wabash Properties LLC. Access easements via the viaduct may be needed to be discussed with both property owners to access the site via the main entrance.

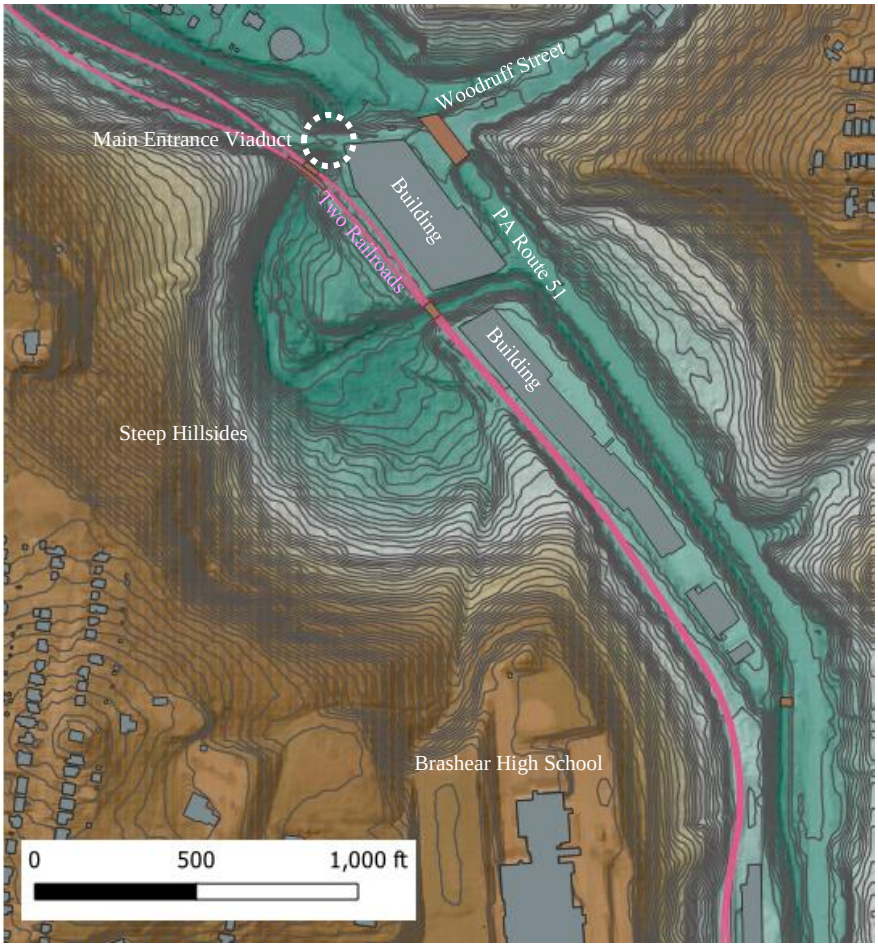


Figure 4. Site Access Constraints (Contours are shown at 5' interval)



Figure 5. Viaduct Main Entrance Clearance Access Constraint

- Soil contamination and offsite disposal requirements will need further exploration and will impact costs pending results. Given the history of Pittsburgh in-fill practices, evidence of dumping in the area, and presence of contamination, offsite soil removal may be needed. See photos in Figures 6, 7, and 8 (photos provided courtesy of Lisa Brown) of stream bank on the eastern side of Seldom Seen with evidence of significant dumping and infill.



Figure 6. Eastern Streambank with Evidence of Historic Infill



Figure 7. Eastern Streambank with Evidence of Historic Infill



Figure 8. Eastern Streambank with Evidence of Historic Infill

- Existing foundations of the historic Seldom Seen residential community that were abandoned in the 1960s is unknown and a significant source of cost uncertainty. The condition and thickness of building foundations for removal may be expensive. The placement of foundations in relation to existing steep hillsides will also need further consideration as removal of foundations that may destabilize the toe of adjacent steep hillsides.
- As previously discussed in this memo, stream flows, depths, and velocities in Saw Mill Run rapidly change from baseflow to flood condition in a matter of minutes. High stream velocities and shear stresses should be considered as part of the design. This may necessitate the design of stream banks with larger boulder sizes that can withstand these conditions and not mobilize during flood events. Hydraulic bypass during high flood flows using structures such as weirs may need to be considered to protect sensitive stream restoration components and plantings.
- Given the large urbanized upstream drainage area (~15 square miles), trash and litter within the stream and floodplains will be a continual source of on-going maintenance for any project constructed in Seldom Seen. This will likely necessitate semi-annual volunteer pickups, as are currently being done by the Watersheds of South Pittsburgh.

APPENDIX I

PITTSBURGH WATER AND SEWER AUTHORITY (PWSA) STRATEGIC PLAN FOR STORMWATER









Community Meeting
March 28, 2022

PITTSBURGH WATER AND SEWER AUTHORITY (PWSA) STRATEGIC PLANNING TEAM

PennPraxis + The Water Center at Penn
water systems analysis and planning, policy and partnership design, communication

AKRF Inc.
engineering and technical engagement

Grounded Strategies stakeholder engagement

Heather Sage local policy communication

Moonshot Missions water economics and equity strategies

Andropogon Associates land use planning and design

CMU Center for Engineering & Resilience for Climate Adaptation
local climate change modeling and resilience planning

AGENDA

6:00 - 6:15	Strategic Planning Progress
6:15 - 6:20	People, Performance, and Planet in Places
----------	***Negley Run Visioning*** ----------
6:25 - 7:20	Past Plans + Current Visions
----------	***Negley Run Visioning*** ----------
7:20 - 7:24	Next Steps and Ambassador Kick-off
7:24 - 7:30	PWSA on Context for Strategic Planning

Strategic Planning Update

STORMWATER PLANNING TIMELINE

JANUARY 2008

ALCOSAN enters into consent decree with USEPA and PaDEP

JULY 2012

Draft ALCOSAN Clean Water Plan for public comment

(Predominantly gray plan tunnels and plant expansion)

OCTOBER 2008

PWSA Feasibility Study Report

(PWSA going alone - propose regional tunnels)

JULY 2013

PWSA Wet Weather Feasibility Study

(Predominantly gray plan for conveyance and storage)

PWSA Greening the Wet Weather Plan

(What is needed for green for PWSA?)

AUGUST 2015

ALCOSAN Starting at the Source

(What can green do? Is it more cost effective?)

DECEMBER 2016

Watershed Resilience Accelerator

(Increased focus on flash flooding)

MAY 2017

OnePGH Resilience Strategy

(Increased focus on climate adaptation and equity)

NOVEMBER 2016

PWSA Green First Plan

(What would an all green strategy look like?)

MARCH 2019

PWSA MS4 Permit & Pollutant Reduction Plan

(PaDEP 10% sediment reduction)

SEPTEMBER 2019

ALCOSAN Modified Consent Decree and Clean Water Plan Submitted to EPA/PaDEP

MAY 2020

ALCOSAN Modified Consent Decree and Clean Water Plan Approved by EPA/PaDEP

JULY 2020

ALCOSAN Controlling the Source

(Spatial cost effectiveness analysis of GSI)

DECEMBER 2019

PWSA Saw Mill Run Integrated Watershed Management Plan

(Increased focus on IWM planning for permitting)

JUNE 2021

Begin Strategic Plan for Stormwater

OCTOBER 2021

Updated Stormwater Codes & Ordinances

(Increased focus on private stormwater)

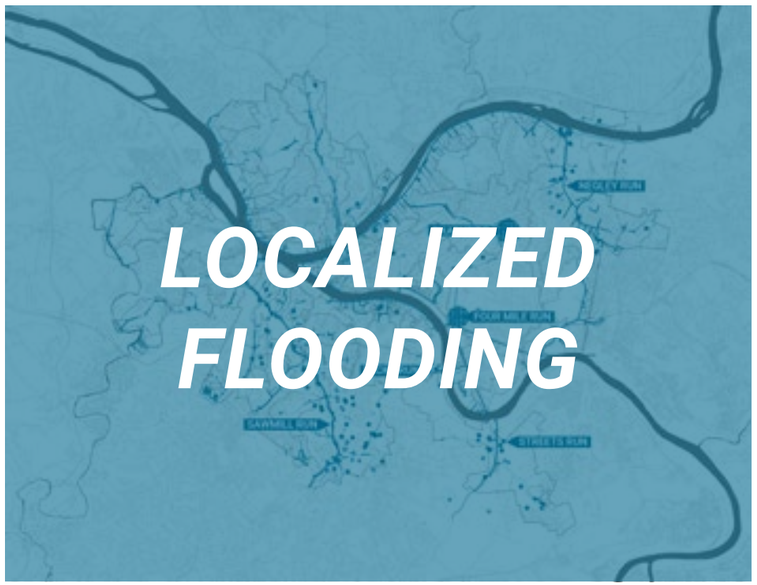
2022-2023

PWSA Stormwater Fee

(Need for dedicated stormwater funding)

Why This Plan Now?



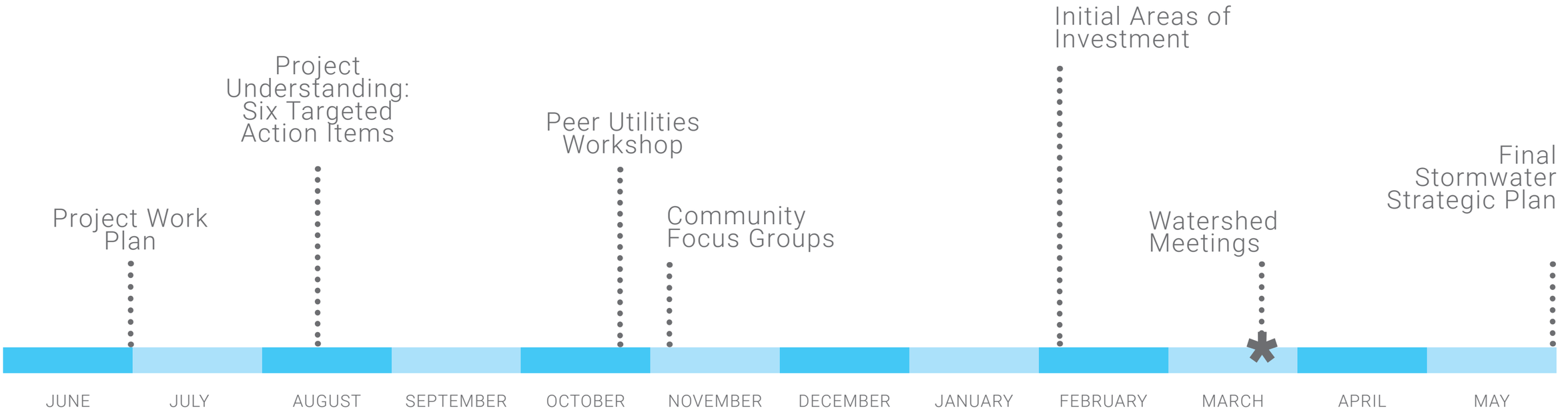






- Green First focused only on green infrastructure planning to improve water quality because the county's stormwater plan (still in development at the time) was going to concentrate on "gray" infrastructure upgrades--on pipes and tunnels.
- The county water authority (called ALCOSAN) has now finalized a plan for the construction of tunnels which will significantly reduce sewage overflow into the rivers when it rains. The plan will be implemented over the next ten years.
- This means the Pittsburgh Water and Sewer Authority (PWSA) can expand its focus to include residents' and businesses' concerns about flooding and basement backups, and consider equity and environmental justice in setting priorities for water investment.

PROJECT TIMELINE



Development of Targeted Action Items

Community Ambassador Program

TOP SIX PRIORITY ACTIONS

1. Analyze Priority Areas of Investment
2. Define Initial Investment Strategy & Illustrate It In a Few Places
3. Leverage Stormwater Fee Impact
4. Establish Guiding Principles to Level of Service & Flooding
5. Develop a Communication Framework to Increase Transparency
6. Develop a Framework for a Joint Task Force on Stormwater

TOP SIX PRIORITY ACTIONS

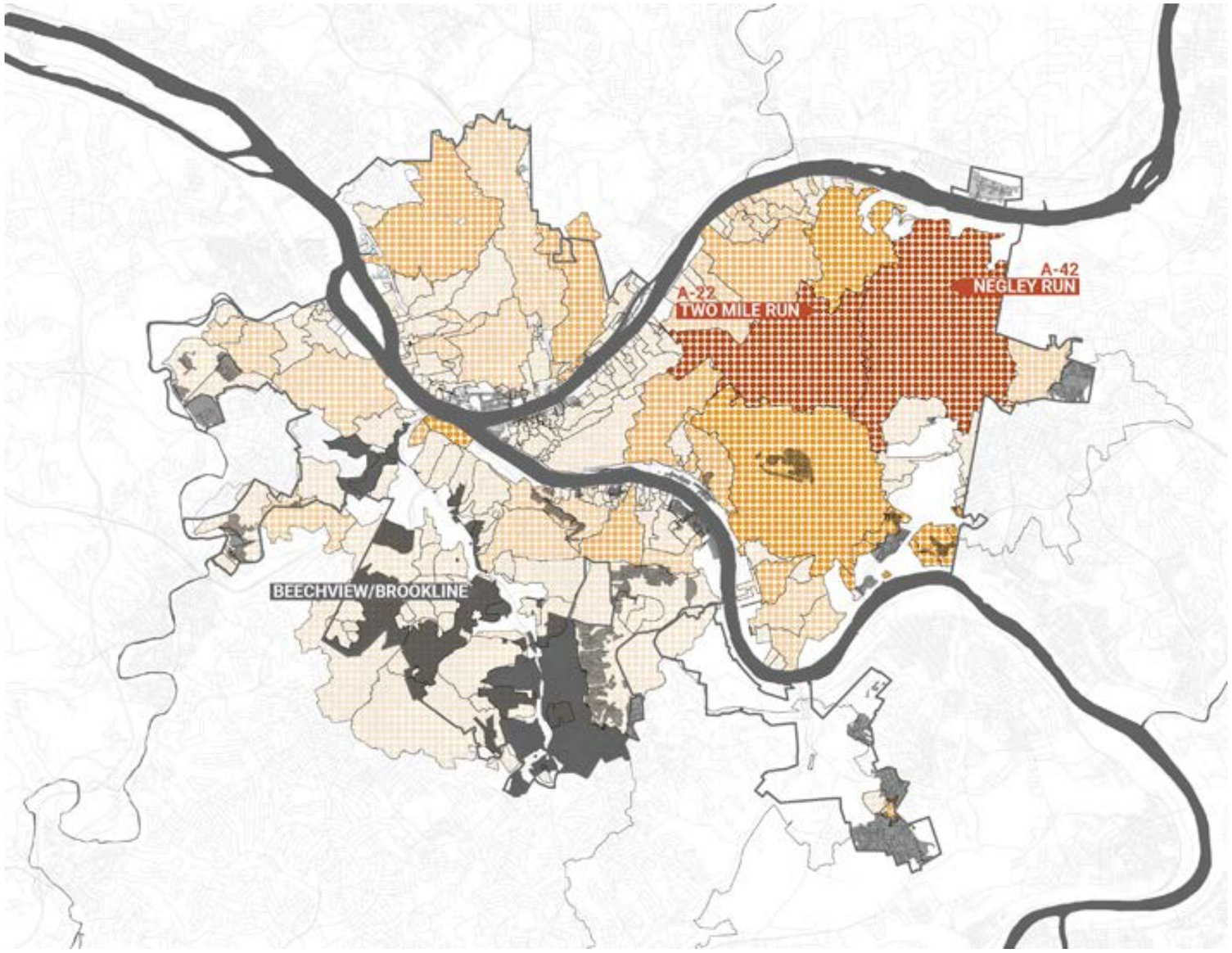
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6. Develop a Framework for a Joint Task Force on Stormwater

1 Analyze Priority Areas for Investment

We will map many kinds of data to identify areas in the city where investment could have a major impact on local flooding and create community benefits.

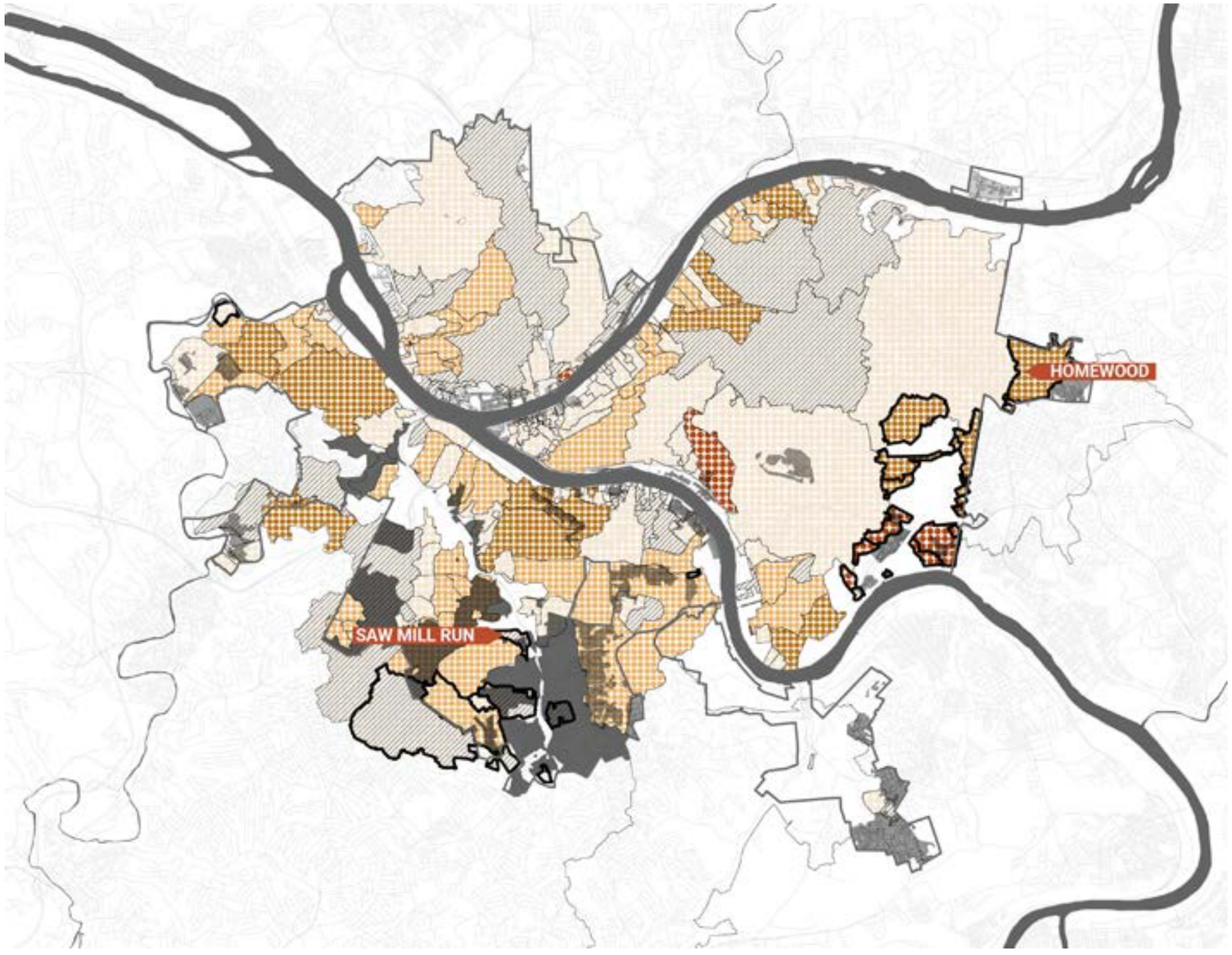
- Prioritize more kinds of water management, not only water quality and sewer overflows
- Map local flooding impacts, basement backups, and environmental justice areas for water investment
- Study geographic priorities with input from PWSA and other stakeholders
- Review good work being done in other cities to prioritize investment to create more kinds of benefit

Water Quality: Current CSO Volumes

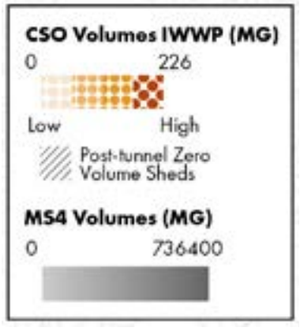


- Ongoing conversations with PWSA have provided updated information on CSO volumes
- Highest volumes are in Negley Run and Two Mile Run
- MS4 outfalls are shown to illustrate opportunities for intervention to meet MS4 compliance

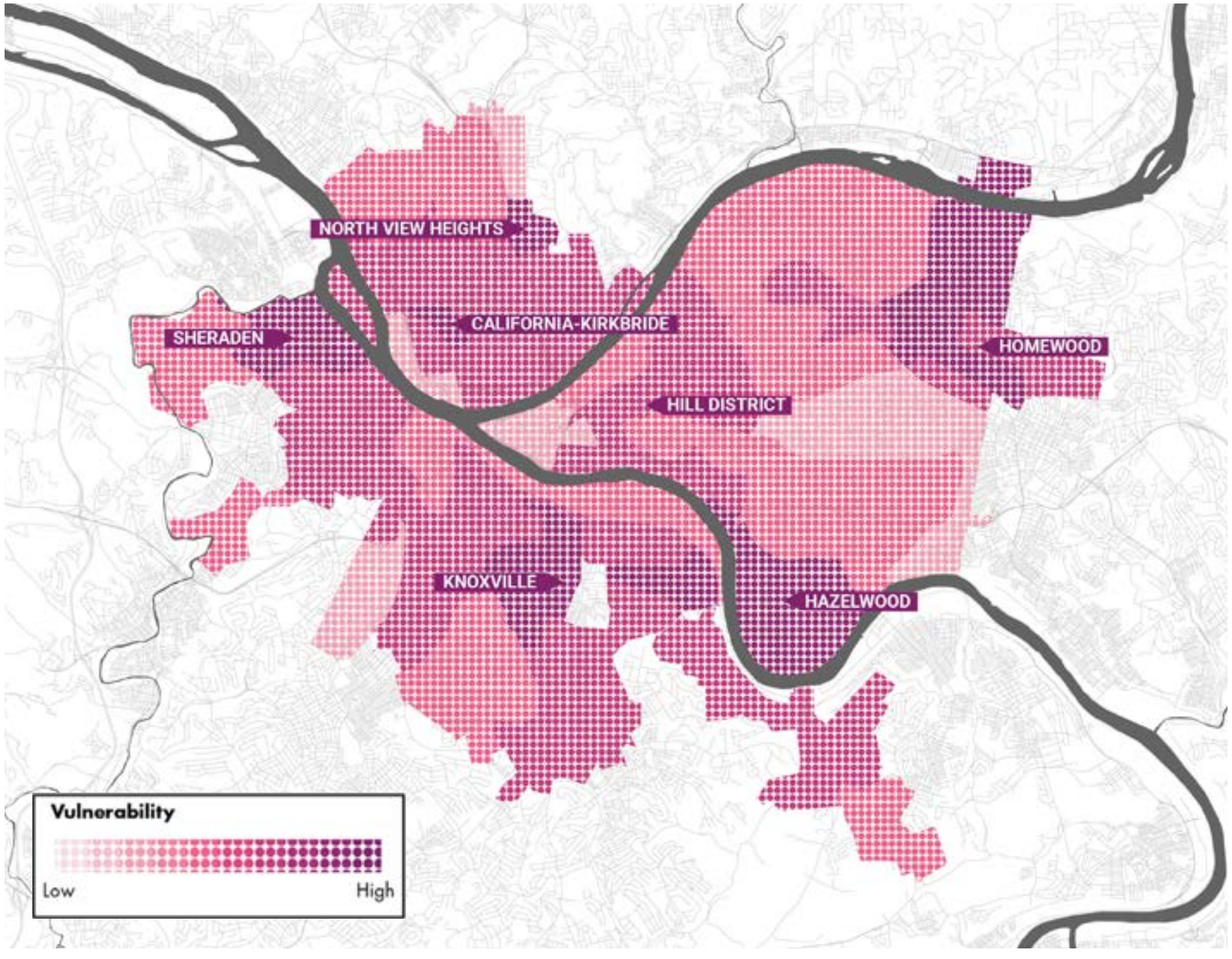
Water Quality: Post ALCOSAN Tunnel CSO Volumes



- Ongoing conversations with PWSA have provided updated information on outfall volume that will remain fully PWSA's responsibility. Those are highlighted here. Others are ongoing negotiation with ALCOSAN.
- The highest volume areas are found in Homewood/East Hills, Point Breeze/Regent Square/Squirrel Hill, and Beechview/Brookline in Saw Mill Run
- While volumes will be significantly reduced post-tunnel, there remain many opportunities for reduction in the near term



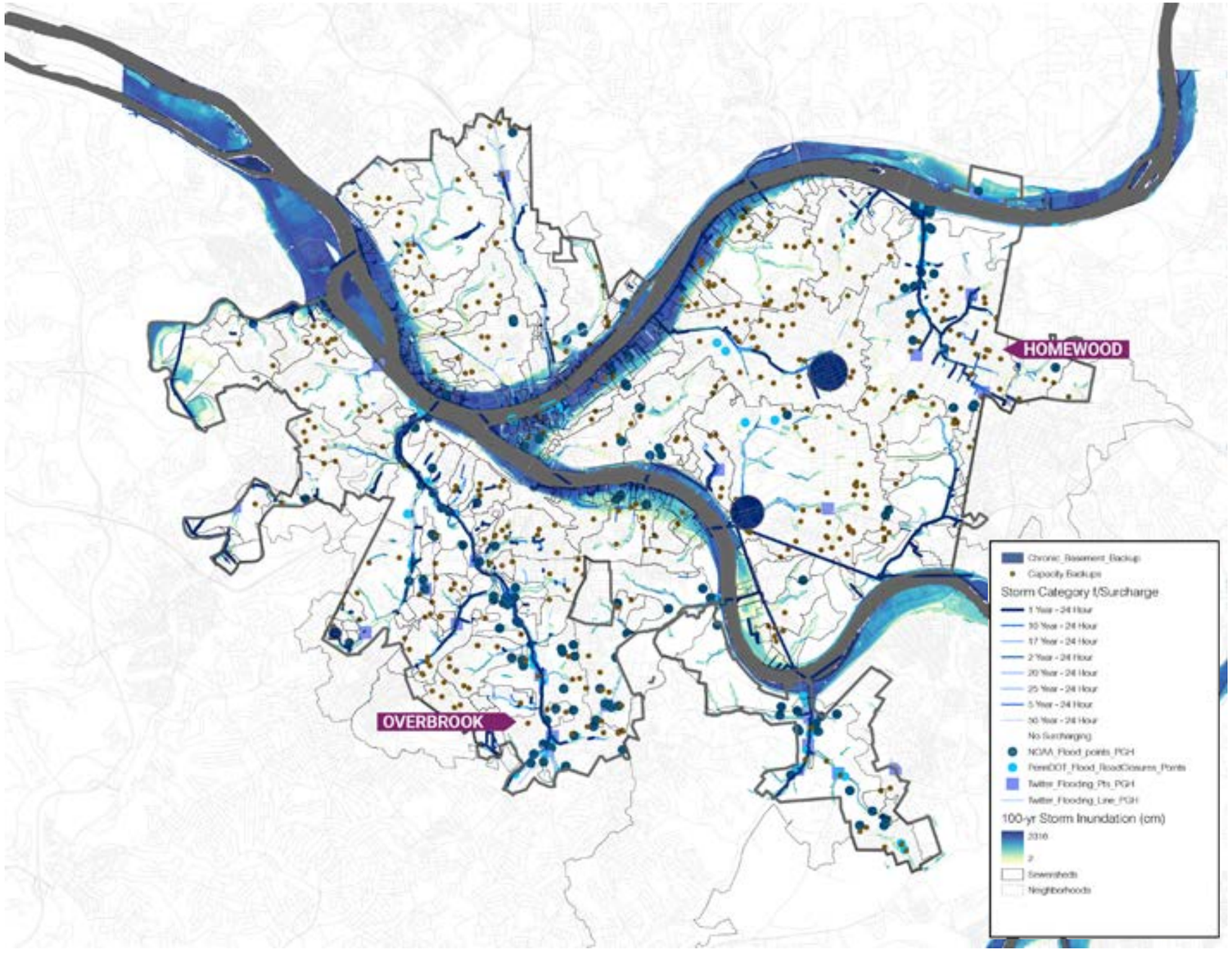
Environmental Justice: Allegheny County



Source: Allegheny County Health Department, 2018.

- Updated to include Allegheny County Environmental Justice Index which includes:
  - *Median Household Income*
  - *Diesel Particulate Matter*
  - *Particulate Matter ≤ 2.5 µm*
  - *Percent Minority*
  - *Proximity to Green Space*
  - *Educational Attainment*
  - *Miles of Railroad Track Coverage*
  - *Housing Vacancy*

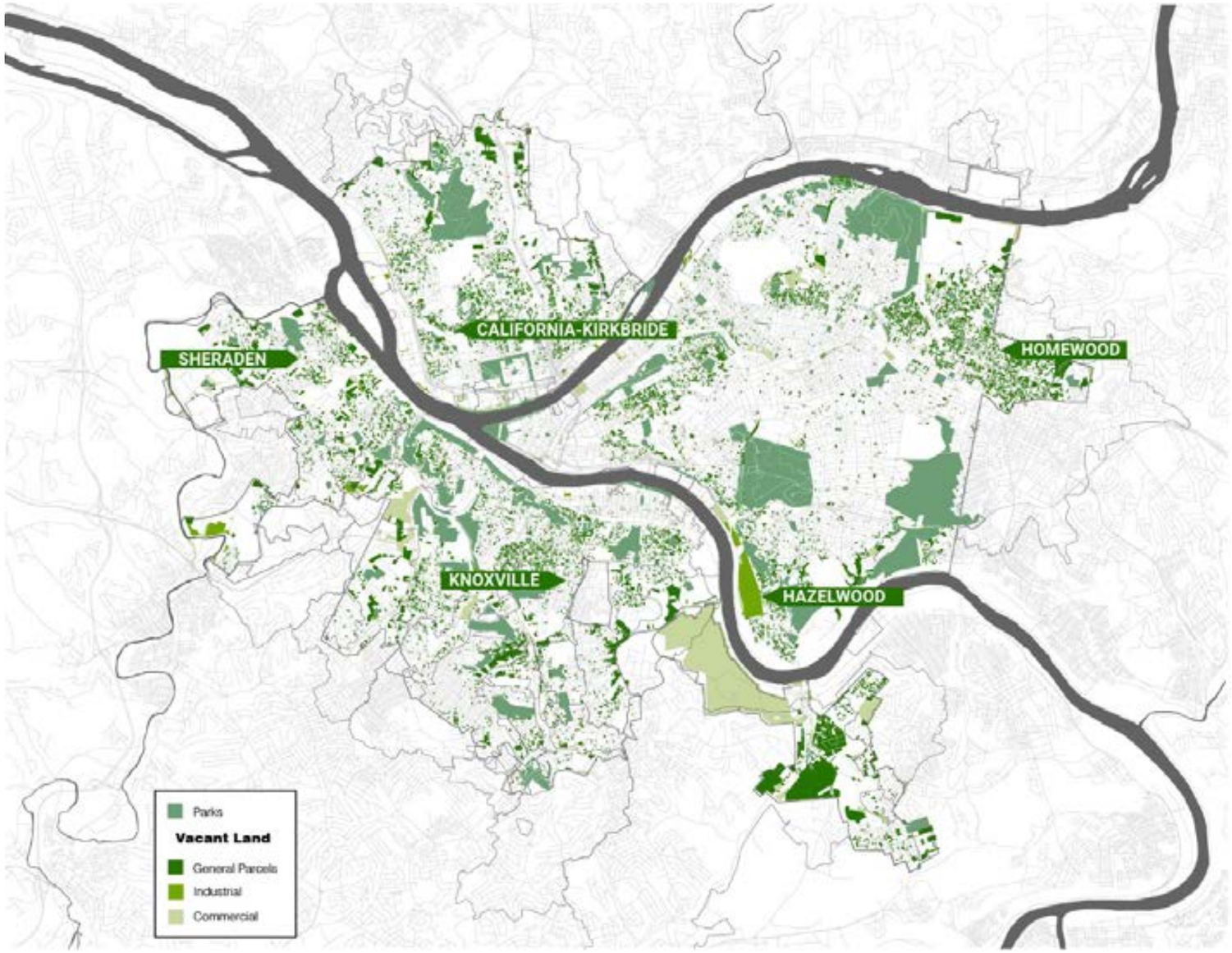
Local Flooding



- Flooding data updated to include First Street Foundation Flood Factor inundation forecast for 1-in-100 year storm event in 2020 climate conditions.
- PWSA investigated and confirmed capacity-related basement backup locations between 2020 and 2021.
- Other data includes:
  - *PennDOT Road Closures*
  - *NOAA Storm Events Flood and Flash Floods*
  - *Allegheny County Twitter Feed*

Source: First Street Foundation National Flood Risk Assessment, 2020.

Green Infrastructure Opportunity

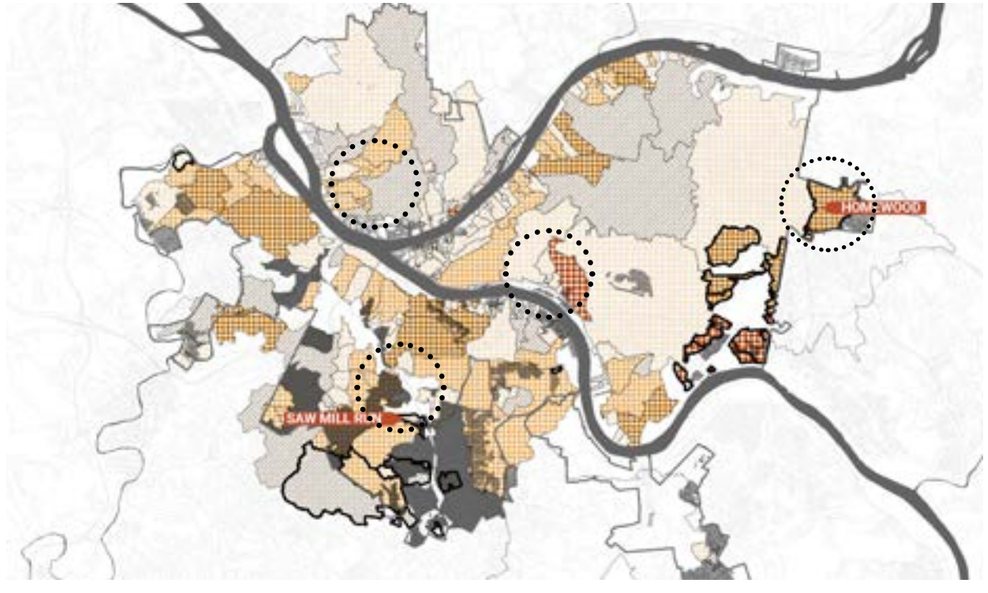


- Opportunities include known Parks + Greenways as of October 2021
- Vacant Parcels (general, industrial, commercial) added as opportunity areas since focus groups
- As of December 2021, six new parks to be transfered from Greenways for Pittsburgh Program to city ownership including: Bigelow, Fairhaven, Hazelwood, Knoxville Incline, Moore and Seldom Seen.

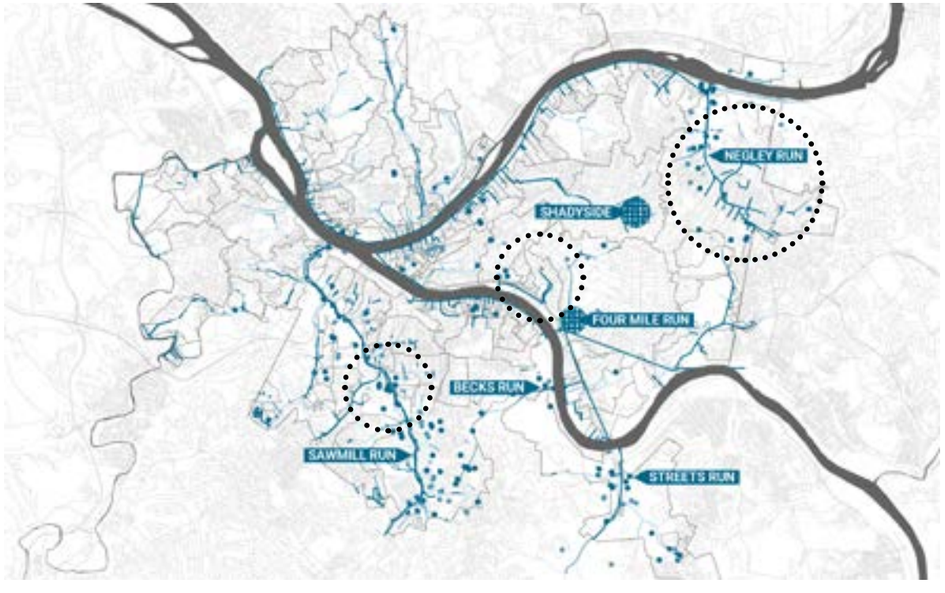
Source: Parcel Scale Cost Effectiveness and Siting Analysis - Micheal Blackhurst, University of Pittsburgh, and ALCOSAN Controlling the Source

Four Lenses

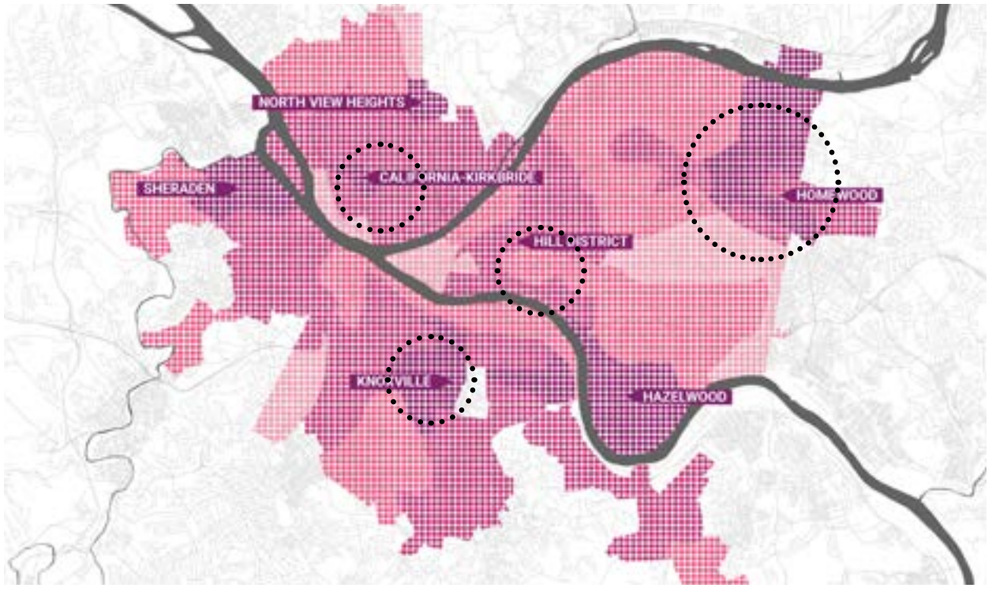
Water Quality



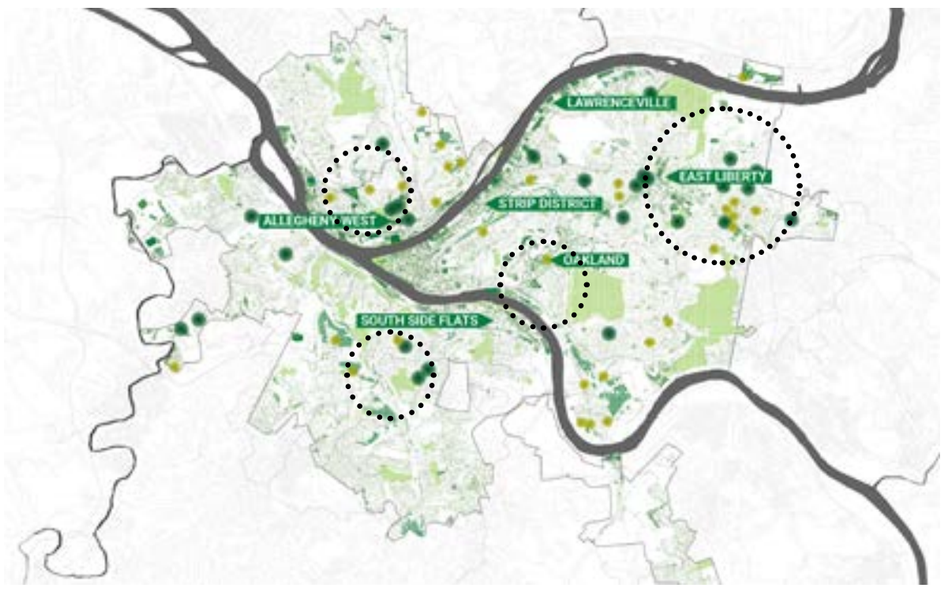
Localized Flooding



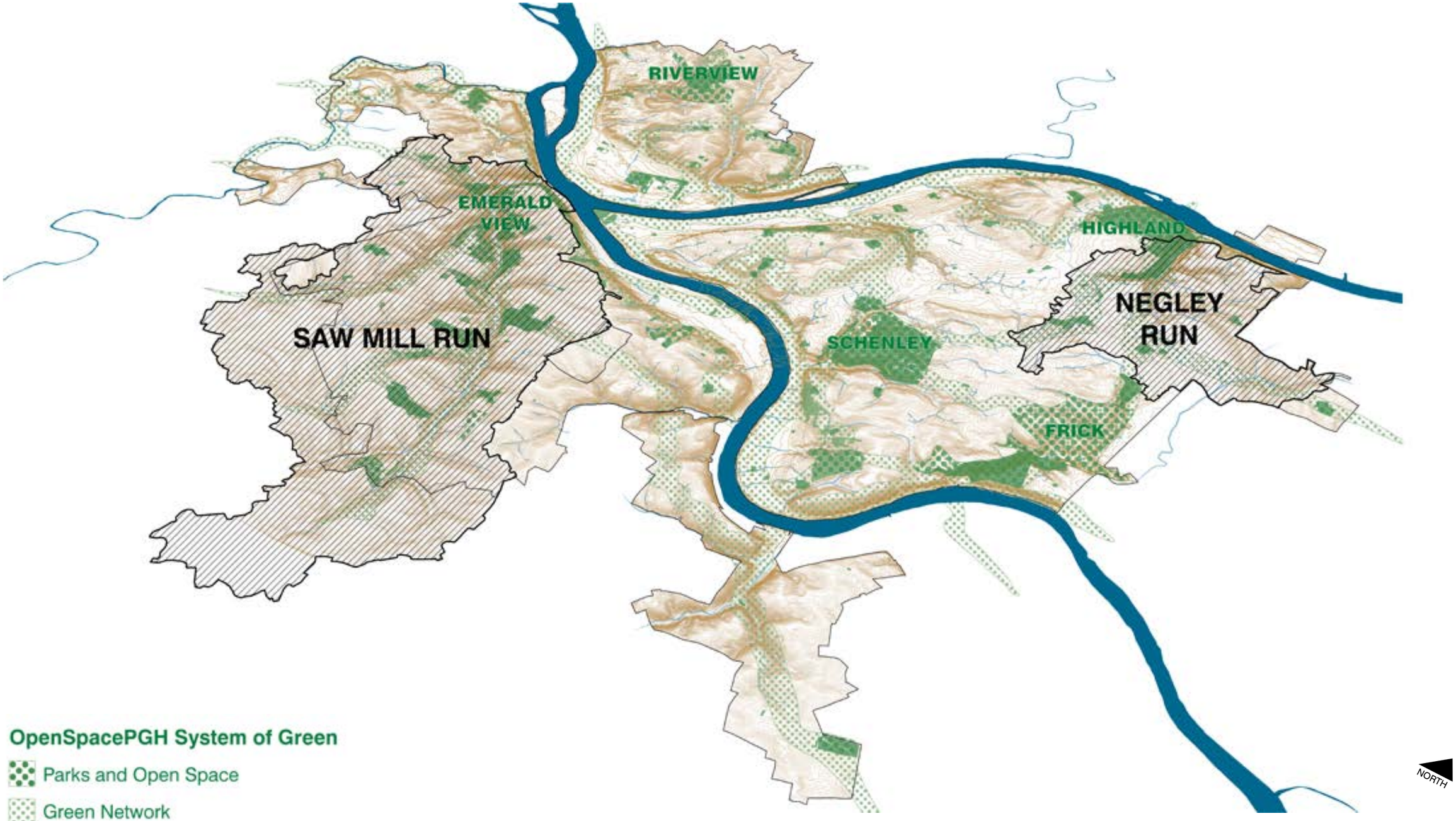
Socio-Economic & Environmental Justice



Areas of Opportunity

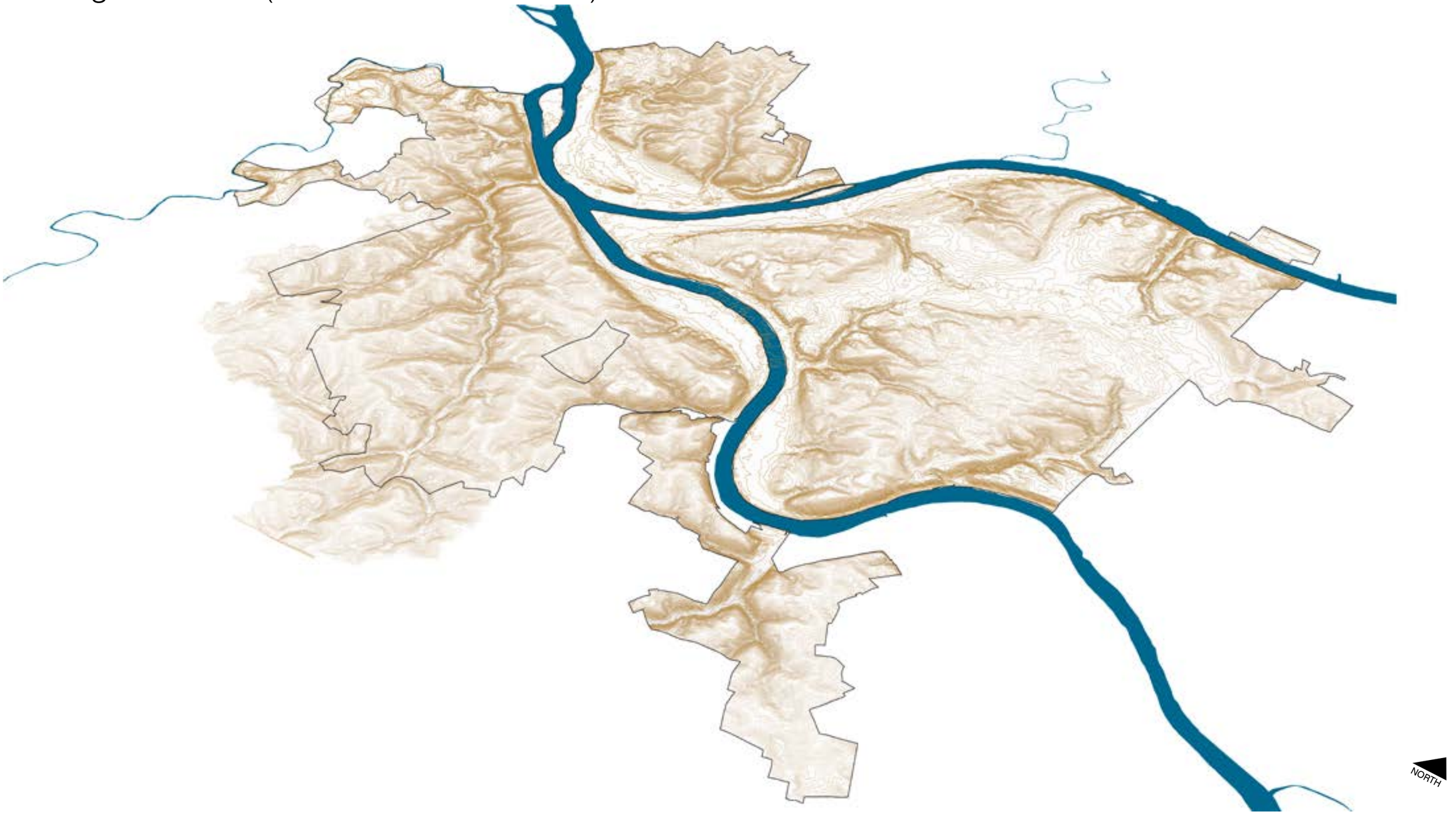


Priority Areas for Investment



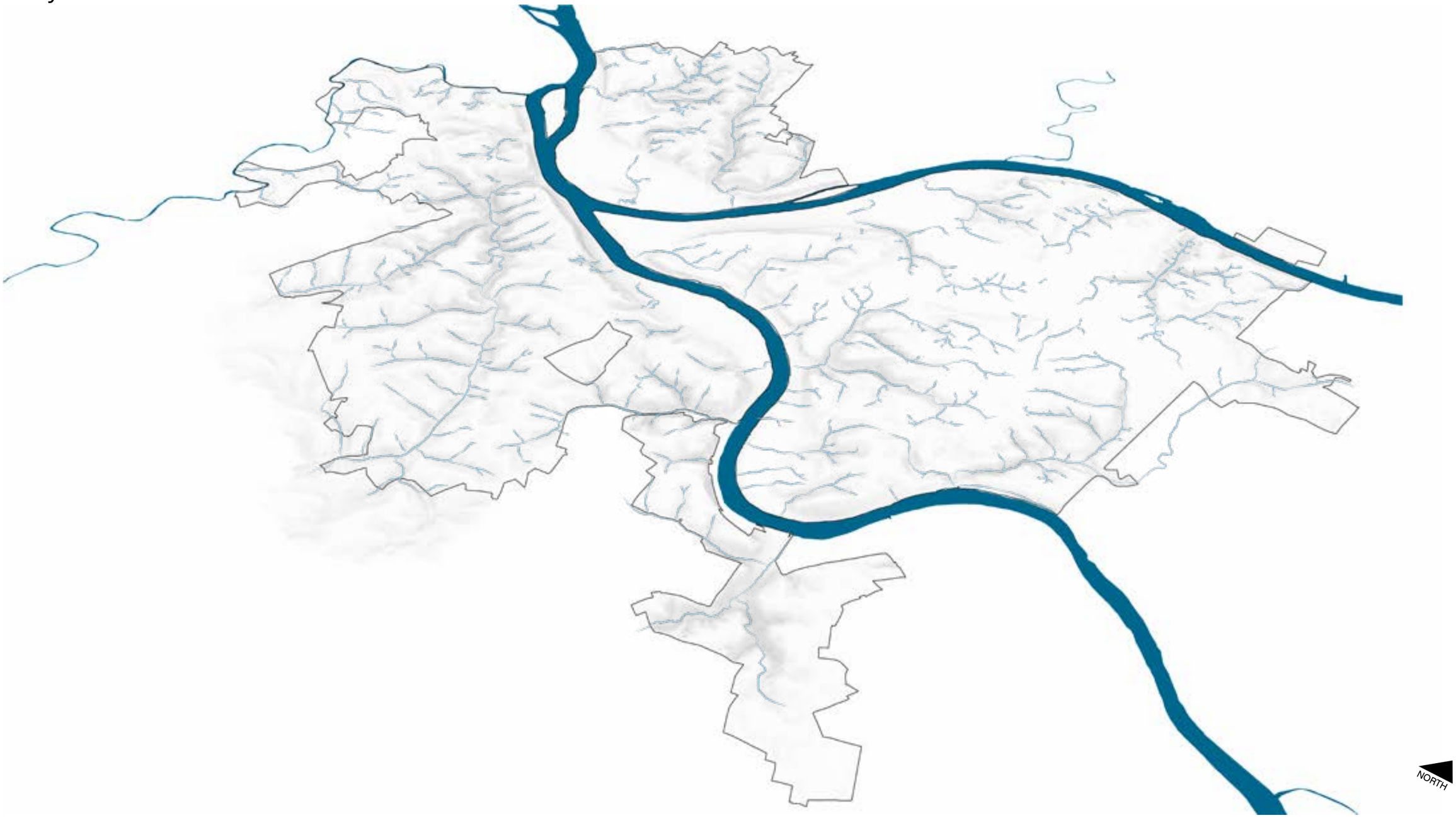
Citywide Terrain

Pittsburgh has hills! (shown in 10 ft contours)



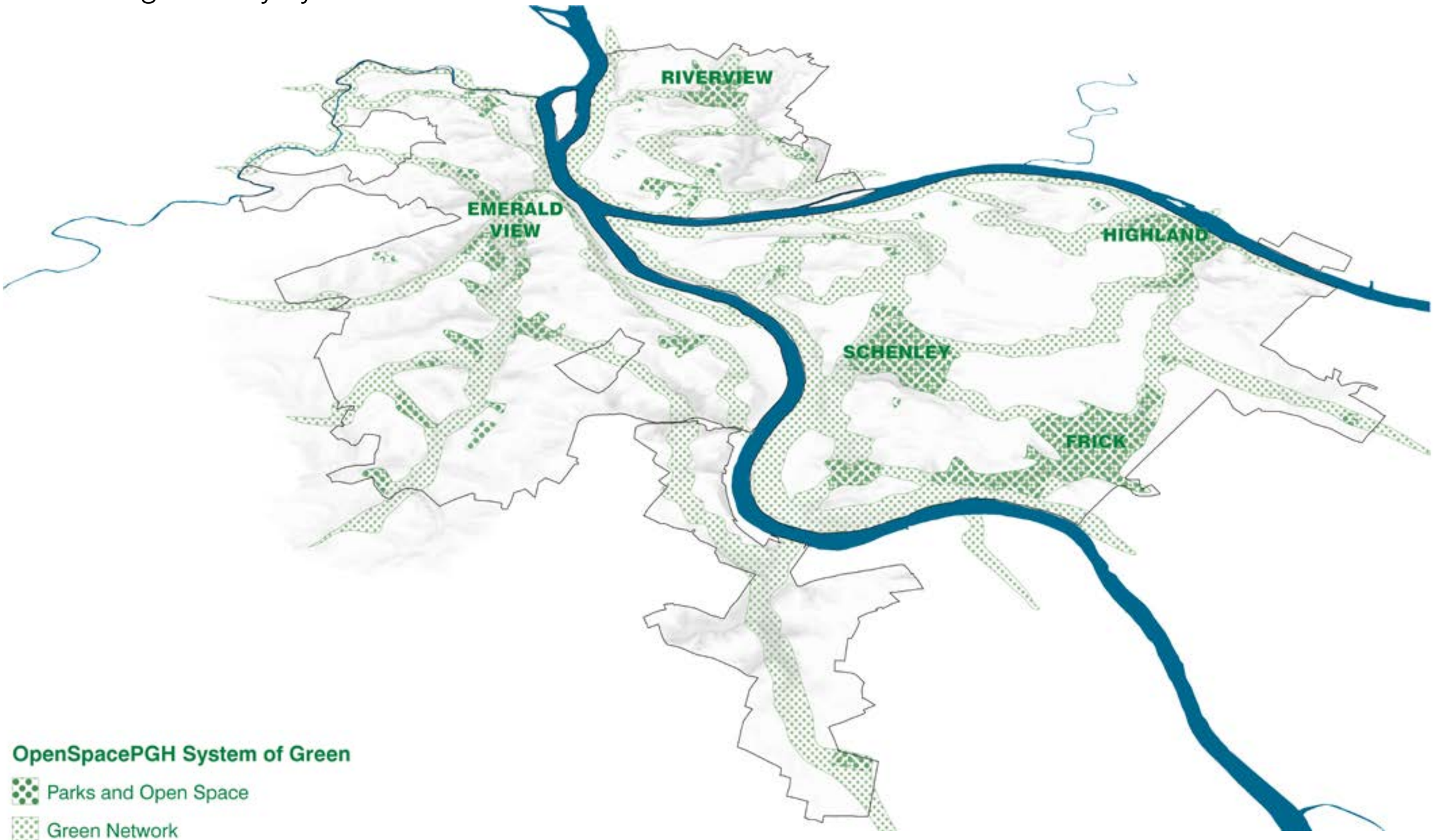
Citywide Networks

Many historical streams were buried



Citywide Networks

Thickened greenway system



2 Define Initial Investment Strategy and Illustrate It

We will define the options and a clear investment strategy, and then illustrate that strategy and communicate how money will be spent in exemplary places.

- Evaluate the current 5-Year Capital Plan
- Explore creative investment strategies that are in line with limited available funds and the city's bonding capacity
- Multiply the kinds of benefit each project generates for People, Place, Planet + Performance

"*Four Ps*"

People

- leverage the basic investments PWSA and other agencies are making in water to produce bigger, more comprehensive benefits for more people
- lift up community plans wherever possible
- create a place at the table for community members throughout the process
- increase collaboration of public and private partners to achieve the goals
- strengthen two-way communication and transparency of long-term process of change



"*Four Ps*"

Perfomance

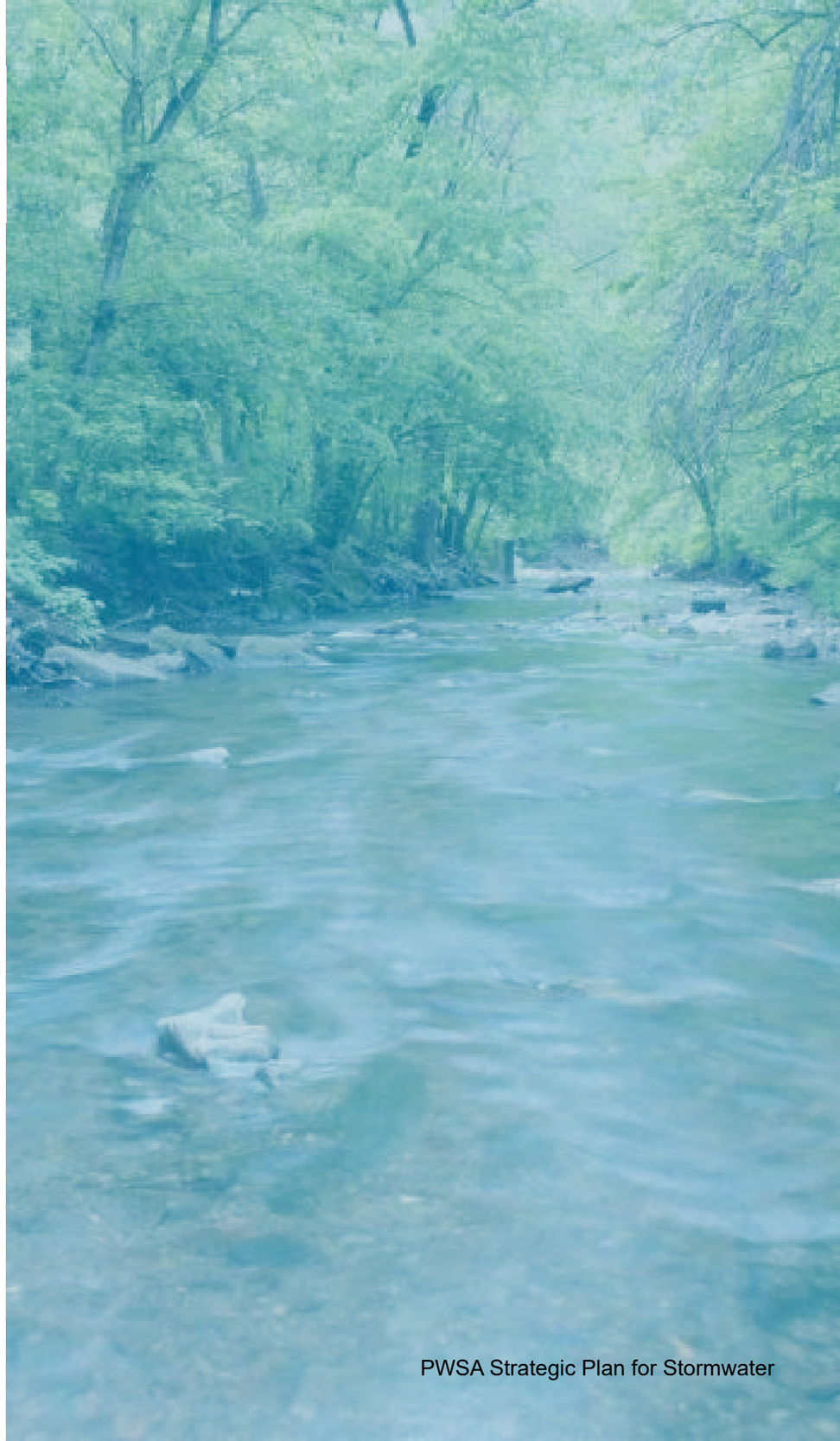
- incorporate more kinds of benefit into definition of performance
- layer or cluster projects to achieve bigger outcomes
- collect and analyze data for sound technical and policy thinking about delivery
- deliver more impact for the money (and more clarity about what impact fees and investments will produce)
- increase coordination and implementation speed and quality



"*Four Ps*"

Planet

- manage flooding
- anticipate climate change
- treat water as a resource, not waste
- promote biodiversity and health of natural systems through contributions to water quality
- increase the use of green infrastructure wherever possible



"*Four Ps*"

Place

- show what people, performance and planet can add up to in some exemplary places
- develop examples of catalytic projects centered on quality of life and place that resonate with people
- make water planning human and lift up local vision in a citywide plan

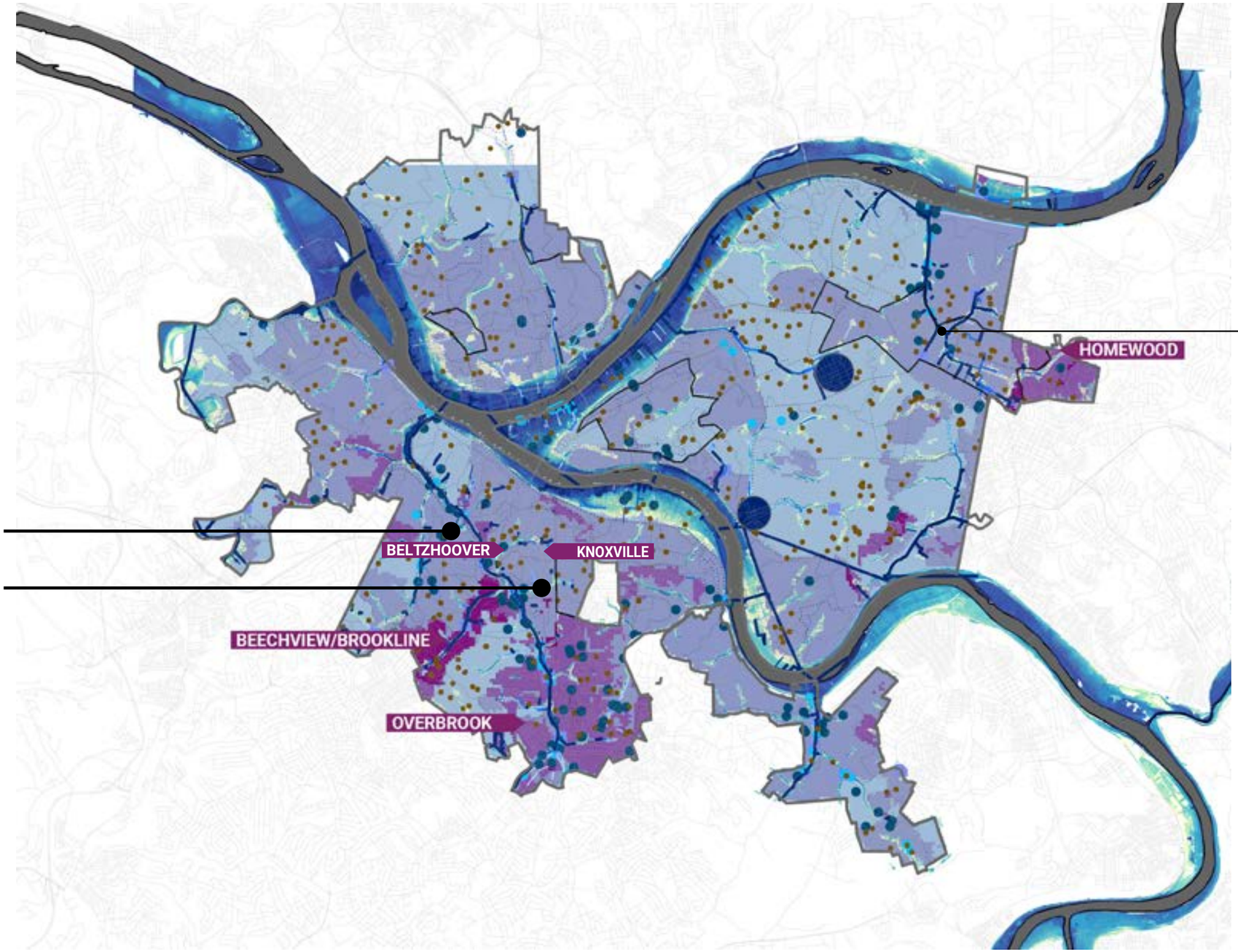


Negley Run

Selection Criteria for Catalytic Sites

- ✓ Strong intersection of **flooding, water quality, equity** and **green space potential** (4 lenses)
- ✓ **Alignment with plans and advocacy** of community organizations, watershed taskforces, the Parks Conservancy, City agencies and other stakeholders and partners—we are building on the work of others and inviting collaboration
- ✓ High probability of achieving **measurable gains in performance** with modest investment (and no fatal flaw or high level feasibility issues)
- ✓ Site conditions and community goals allow for exciting examples of People, Place, Planet and Performance that **communicate vision and value to citizens paying water fees**.
- ✓ Visualization of wider potential in the same priority water/sewersheds can **catalyze future investment** and multiply the performance impact

3 Lenses: Flooding, Water Quality + Environmental Justice



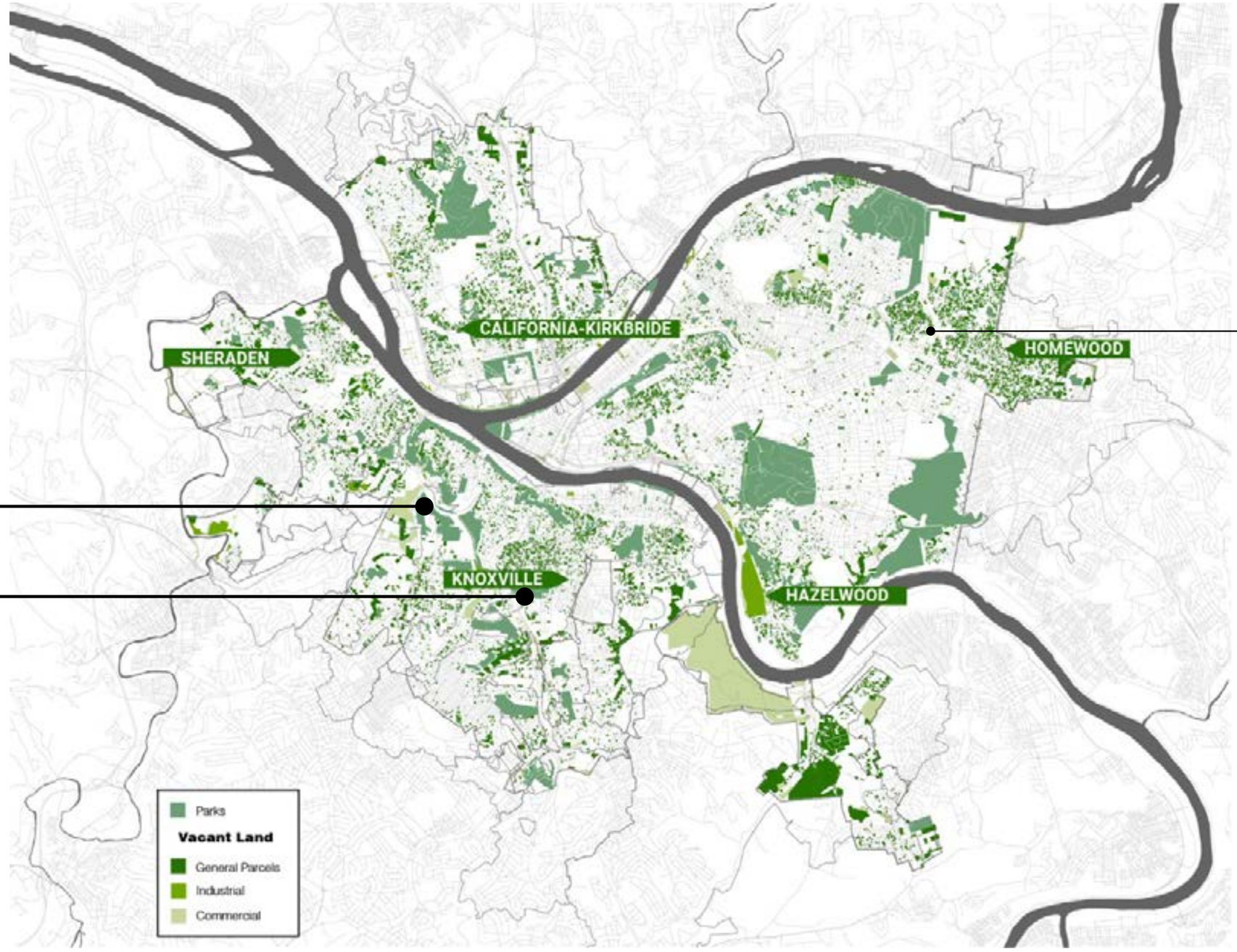
Seldom Seen Greenway

McKinley Park

Silver Lake/ Homewood/ Larimer

Note: Flooding data will remain as individual vector data to guide priority selection rather than being combined in to a composite.

4th lens: Green Infrastructure Opportunity



Silver Lake/ Homewood/ Larimer

Seldom Seen Greenway

McKinley Park

Silver Lake / Homewood / Larimer Criteria

✓ **Strong intersection of 4 lenses**	*Negley Run nexus with substantial flooding shared by Homewood and Larimer, adjacent to Westinghouse High School and YMCA*
✓ **Measurable performance with modest investment**	*Feasibility and quantification done by eDesign Dynamics (Negley Run Watershed Task Force Plan), mix of early action + bigger transformational projects*
✓ **Alignment with plans and advocacy**	*Restoration of Silver Lake is a major feature of Homewood and Negley Run Taskforce plans*
✓ **Value proposition of People, Place, Planet and Performance.**	*Rich site history and powerful physical presence, opportunity for art and design to elevate an African American cultural landscape*
✓ **Future investment catalyst/ multiplying impact**	*Longer term vision for new public space at Silver Lake can anchor investments upstream and downstream*



VISION STATEMENT

Homewood will be an African-American cultural destination where people choose to live, work, worship, and visit. It will be safe, green, healthy, and innovative. It will have quality schools. It will be a place that protects long-term and low-income residents and equips them to be engaged and informed.

Source: Homewood Community Development Collaborative.

The recent Homewood-based exhibition, **The People Are the Light** curated by Alisha B. Wormsley, was a series of public art installations and workshops running from September 16 to October 15, 2017 in various locations. The exhibition was a program of the Carnegie Museum of Art and centered on healing and cleansing and invited participants to reflect on Homewood's past, present, and future. With 12 artist-collaborators, The People Are the Light uplifted a citywide dialogue about Homewood and will result in photographs and a film premiering at Carnegie Museum of Art this December.

Figure 3.32 Murals in Homewood (right and below)



Image Source: Heather Manning via facebook.com

Figure 3.33 People Are the Light exhibition (below)



The exhibit brought significant positive attention to Homewood. Audience members, from Homewood and other parts of the city, spent time at formerly vacant lots, walked around the neighborhood to visit multiple installations, and patronized local businesses. This type of activity is significant for investment in Homewood. **The People Are the Light** bridged Culture - Institution, Public Space, and Now.



MURALS + ARTISTS.

Homewood has no shortage of local artists and craftsmen as evidenced by the People Are the Light exhibition (below). Murals are shown here and are throughout the walls of Homewood's buildings (left and top).

GOAL 6: Promote and preserve Homewood's African American heritage and culture

STRATEGY 6.1: PROMOTE HOMEWOOD'S PAST THROUGH INTERPRETIVE STORYTELLING, NEIGHBORHOOD BRANDING, MURALS AND PUBLIC ART AND THE REUSE OF VACANT PARCELS

TYPE Project
TIMELINE Short
CONNECTION TO PREVIOUS PLANS
N/A
ACTION TEAM
Culture and Recreation

Interpretative storytelling, community branding, public art and wayfinding has numerous benefits. It improves the commercial environment, promotes community pride, teaches community members and visitors the history of the neighborhood and improves the pedestrian environment, encouraging healthy living.

A branding, wayfinding and storytelling master plan and a public art master plan should both be developed, potentially in coordination with each other.

Both projects should engage deeply with community members in order to incorporate local stories, memories and mementos in the final product. Local artists should be engaged to participate in the development of art, and any such development should include opportunities for participation from the community's youth. National grant opportunities, such as those from Artspace, should be pursued in order to make Homewood Pittsburgh's community of the arts.

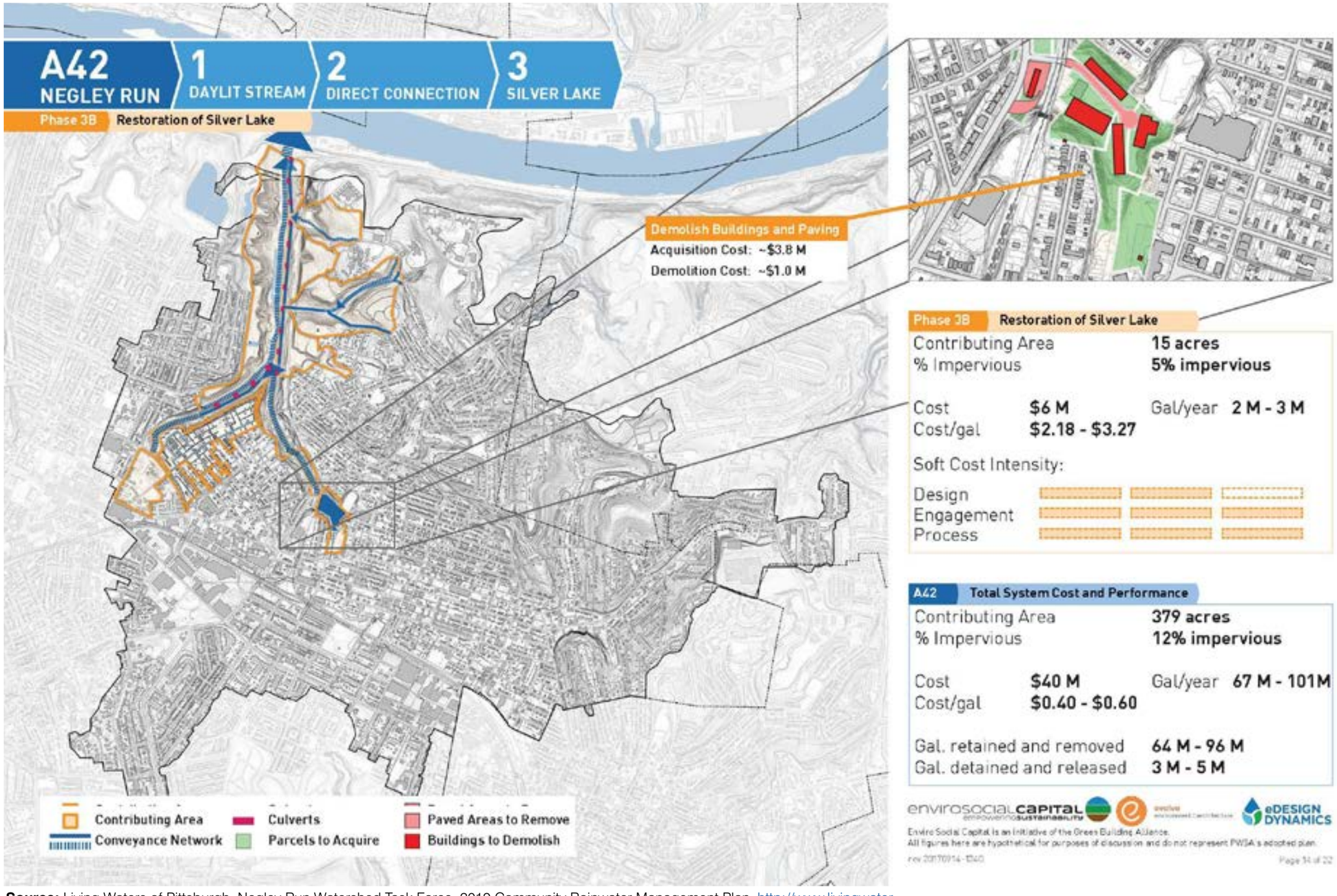
GOAL 21: Encourage the expansion of stormwater management

STRATEGY 21.1: ALIGN PLANNING AND REDEVELOPMENT EFFORTS TOWARD ESTABLISHING A NETWORK OF GREEN STORMWATER INFRASTRUCTURE PRACTICES THAT SAFELY ALLOW RUNOFF TO CONVEY TOWARD A RESTORED SILVER LAKE

TYPE Project
TIMELINE Long
CONNECTION TO PREVIOUS PLANS
Homewood-Brushton Community Coalition Organization Strategic Plan: Charting a New Future for Homewood-Brushton; Race Street 2020; City-Wide Green First Plan; Open Space PGH: Optimizing Pittsburgh's open space, parks, and recreation system; ONEPGH: Resilient Pittsburgh; Pittsburgh Climate Action Plan version 2.0; Homewood Urban Agenda Strategy: An Inner-City Model for Urban Revitalization; Pittsburgh Principles for Design & Planning
ACTION TEAM
Sustainability

Negley Run Watershed Association has begun visioning and planning work on the restoration of Silver Lake as a location that can act as detention for flood waters approaching Negley Run. While changes were made to the inflows of Silver Lake in the early 1870s, it was not until the 1930s that the lake was drained and filled to cover up the pollution accumulating. Not only could the restoration of the lake provide many hydrological benefits to both Homewood and the Negley Run Watershed, but it would also provide an opportunity to add new open space to the western edge of Homewood. Finally, a network of green infrastructure in Homewood would aim to slow and retain water, though in large storm events could be oriented to convey water to Silver Lake as a large volume detention basin with both gray and green stormwater controls to ensure improved water quality before water is released into Negley Run and the Allegheny River.

Negley Run Watershed Task Force 2019 Plan



Source: Living Waters of Pittsburgh, Negley Run Watershed Task Force. 2019 Community Rainwater Management Plan. http://www.livingwater-spgh.org/landing-page/living-watersheds/negley-run-a42/nrwtf-document-archive/.

RAND GSI Study Cost Estimation for Silver Lake

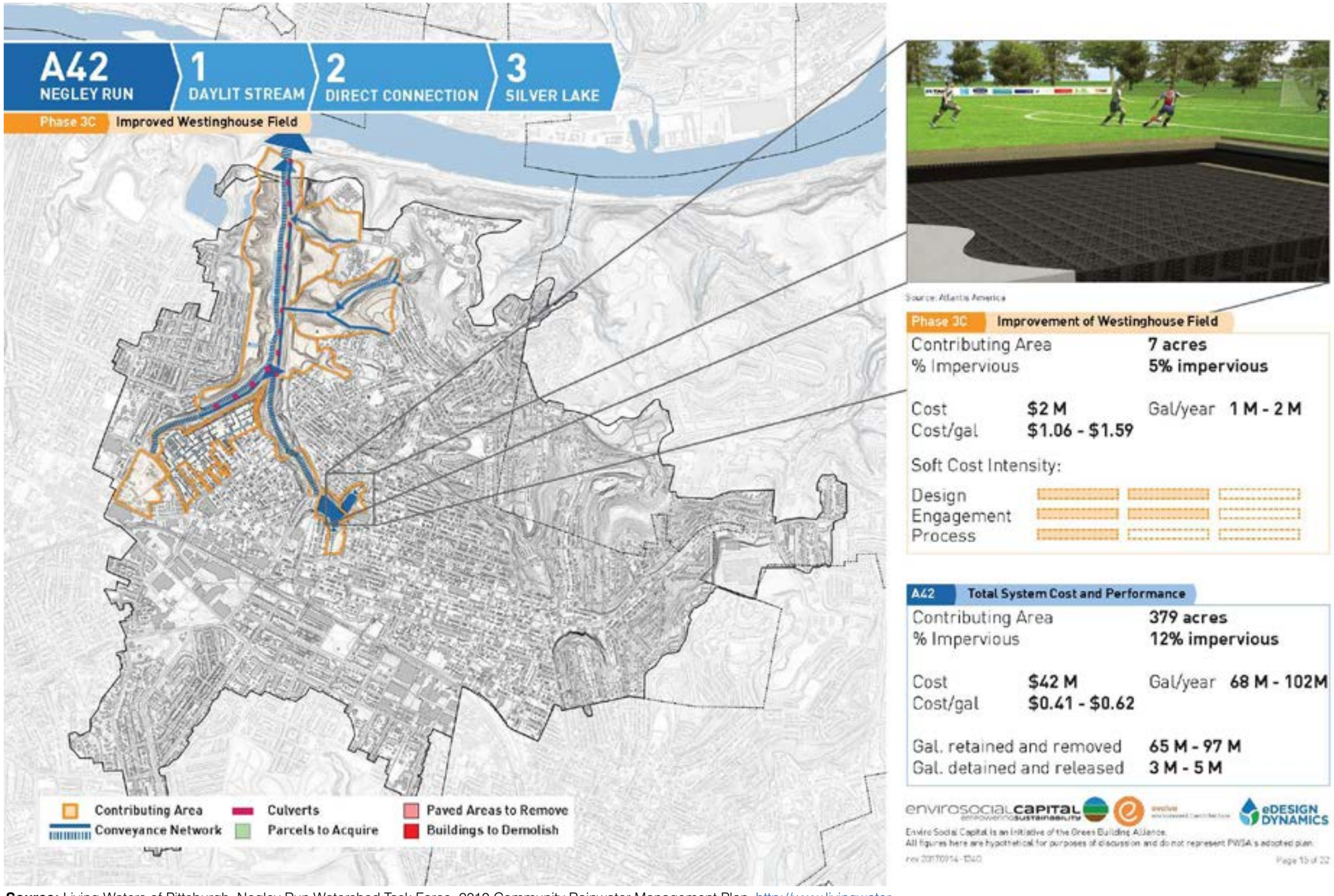
Table E.7. Silver Lake Retention Basin (12 Acre-Feet Capacity) Cost Subestimate

Description	Note	Qty	Unit	Unit Cost	Total
Silver Lake Expansion Site Preparation					
Clearing and grubbing		10	acre	$8,750	$87,500
Clearing and grubbing contingency		1	ea.	$10,000	$10,000
Remove existing pavement		28,000	yd^2	$6	$168,000
Building demolition		12,000	yd^2	$50	$600,000
Relocate existing utility		5	ea.	$20,000	$100,000
Temporary construction fence		4,000	LF	$6	$25,600
Excavation	Assume 6′ average depth	42,500	BCY	$20	$850,000
Backfill	Assume 2′ average depth	15,000	ECY	$6	$90,000
Hauling (within 10 miles)		65,000	LCY	$16	$1,040,000
Silver Lake Expansion					
Sand layer fill		3,600	LCY	$35	$126,000
Mulching		90	MSF	$340	$30,600
Sand layer compaction		3,600	ECY	$5	$19,260
Filter fabric		10,000	yd^2	$2	$19,000
Cobble (5"–10" bulk river rock)		80	tons	$95	$7,600
Riprap (>18" thickness)		120	tons	$160	$19,200
Boulders (>24" thickness)		1,200	tons	$280	$336,000
Stone armoring contingency		1	ea.	$10,000	$10,000
Fine grading		12,000	yd^2	$3	$33,600
Topsoil preparation		8,000	yd^3	$51	$408,000
Turf reinforcement mat		1,000	yd^2	$10	$10,000
Temporary seeding		4,000	yd^2	$1	$2,000
Permanent seeding		4,000	yd^2	$1	$3,000
Permanent wetland seeding		1	acre	$5,000	$5,000
Wetland planting		50,000	ft^2	$3	$125,000
Herbaceous groundcover		2,000	ea.	$20	$39,800
Shrubs		1,000	ea.	$69	$68,500
Trees		200	ea.	$150	$30,000
Additional planting cost		2,400	ea.	$11	$26,400
Vegetation contingency		1	ea.	$15,000	$15,000
Silver Lake Expansion Structures and Other Infrastructure					
72" RCP		800	LF	$450	$360,000
Replace pavement	Paths, access, and trails	3,000	yd^2	$30	$90,000
Replace curb and gutter		500	LF	$35	$17,500
Catch basin modifications		3	ea.	$10,000	$30,000
Manhole structure		4	ea.	$3,800	$15,200
Diversion structure		3	ea.	$30,000	$90,000
Inlet/outlet structure		3	ea.	$2,500	$7,500
				Total	**$4,915,260**

NOTE: Cost were modeled with range of –30 percent to +50 percent of subtotal shown. Strategy cost shown is additive and contingent on prior phase conveyance construction.

Source: Managing Heavy Rainfall with Green Infrastructure: An Evaluation in Pittsburgh's Negley Run Watershed, 2020. RAND Corporation. https://www.rand.org/content/dam/rand/pubs/research_reports/RRA500/RRA564-1/RAND_RRA564-1.pdf. Appendixes B-F. https://www.rand.org/content/dam/rand/pubs/research_reports/RRA500/RRA564-1/RAND_RRA564-3.appendixB-F.pdf.

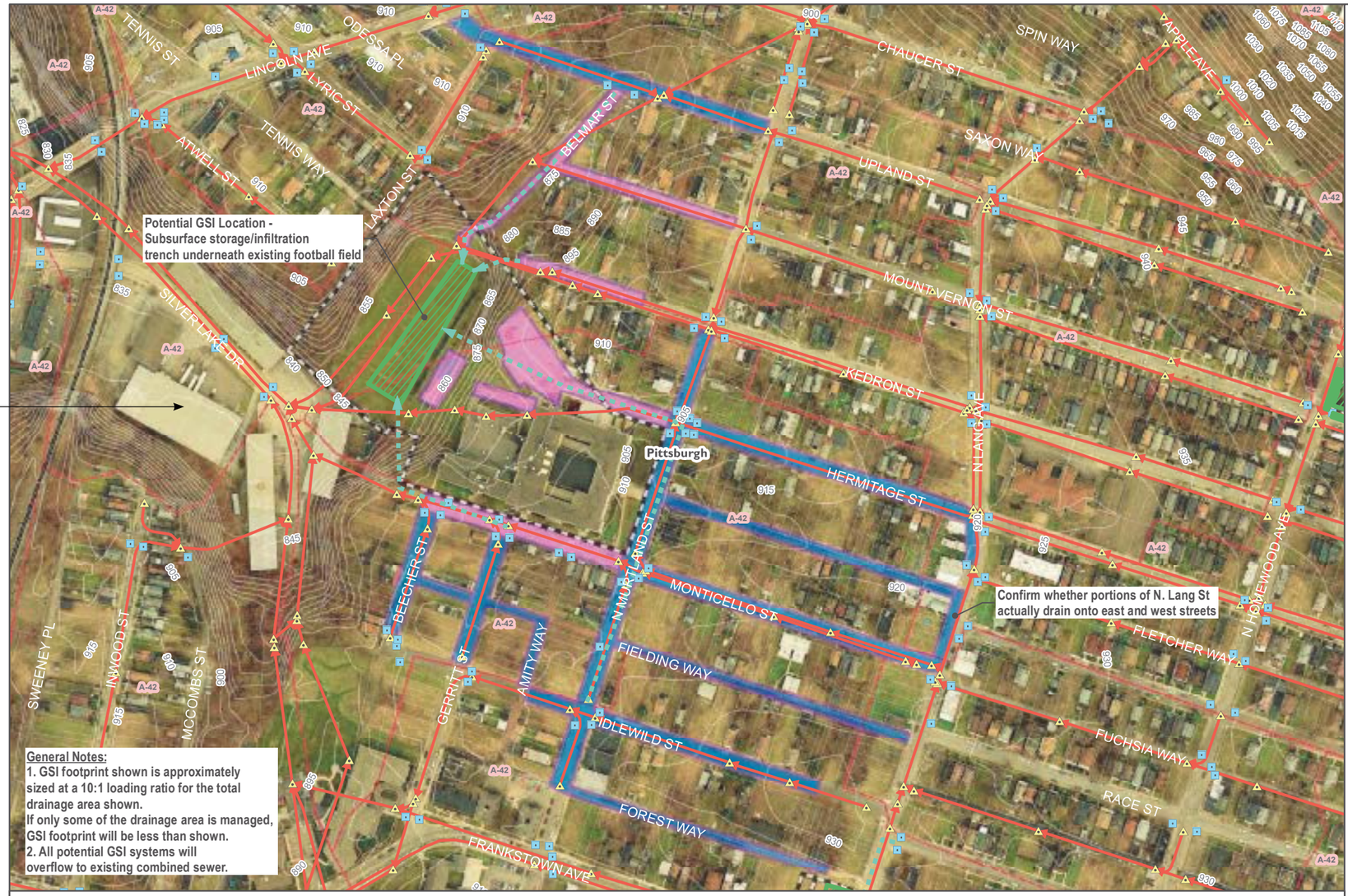
Negley Run Watershed Task Force 2019 Plan



Source: Living Waters of Pittsburgh, Negley Run Watershed Task Force. 2019 Community Rainwater Management Plan. http://www.livingwater-spgh.org/landing-page/living-watersheds/negley-run-a42/nrwtf-document-archive/.

Westinghouse Field GSI Concept

Silver Lake



General Notes:
1. GSI footprint shown is approximately sized at a 10:1 loading ratio for the total drainage area shown.
If only some of the drainage area is managed, GSI footprint will be less than shown.
2. All potential GSI systems will overflow to existing combined sewer.

3 RIVERS PROUD
Allegheny County Sanitary Authority

Upper Allegheny GSI CONCEPT PLAN

UA-27: Westinghouse Academy
City of Pittsburgh/ POC A-42

- Existing Inlets
- Sewer Structures
- Proposed Separate Storm Sewer

Sewer Pipes
- Combined
- Sanitary
- Stormwater
- Other Sewer Type
- Project Parcel Boundary
- Parcels
- Municipal Boundary
- GSI Footprint
- Impervious Drainage Area (Local)
- Impervious Drainage Area (Enhanced)*
- Surface Water
- Combined Sewer Area
- Runoff To Combined Area
- Separate Sewer Area
- Non-contributing Area (NCA)

**Enhanced drainage areas show potential additional capture that can be conveyed to proposed GSI footprints via the installation of new separate storm sewers which often result in significant increases in cost-efficient runoff capture.*

Data Sources:
ALCOSAN: Sewer Structures, Sewer Pipes, Subcatchments
Allegheny County: Parcel Data, Contours
JACOBS: Existing Inlets

Note that limited sewer data information is available in GIS, so all existing sewer system information may not be shown on this map.

N
0 100 200 Feet

Map prepared by JACOBS- July 2019

The existing football field at Westinghouse Academy is a prime candidate for green stormwater infrastructure (GSI) due to its topographic location downhill from many surrounding residential streets. Adjacent roadway runoff from adjacent streets including Belmar St, Kedron St, Hermitage St, N Murtland St, Monticello St, and additional streets could be directed to the site via new separate stormwater sewers and managed with a large subsurface storage/infiltration trench underneath the field. After construction, the subsurface storage/infiltration trench would not impact the current use of the field.

Project UA-27 (Parcel Owner: Board of Public Education of the School District of Pittsburgh)

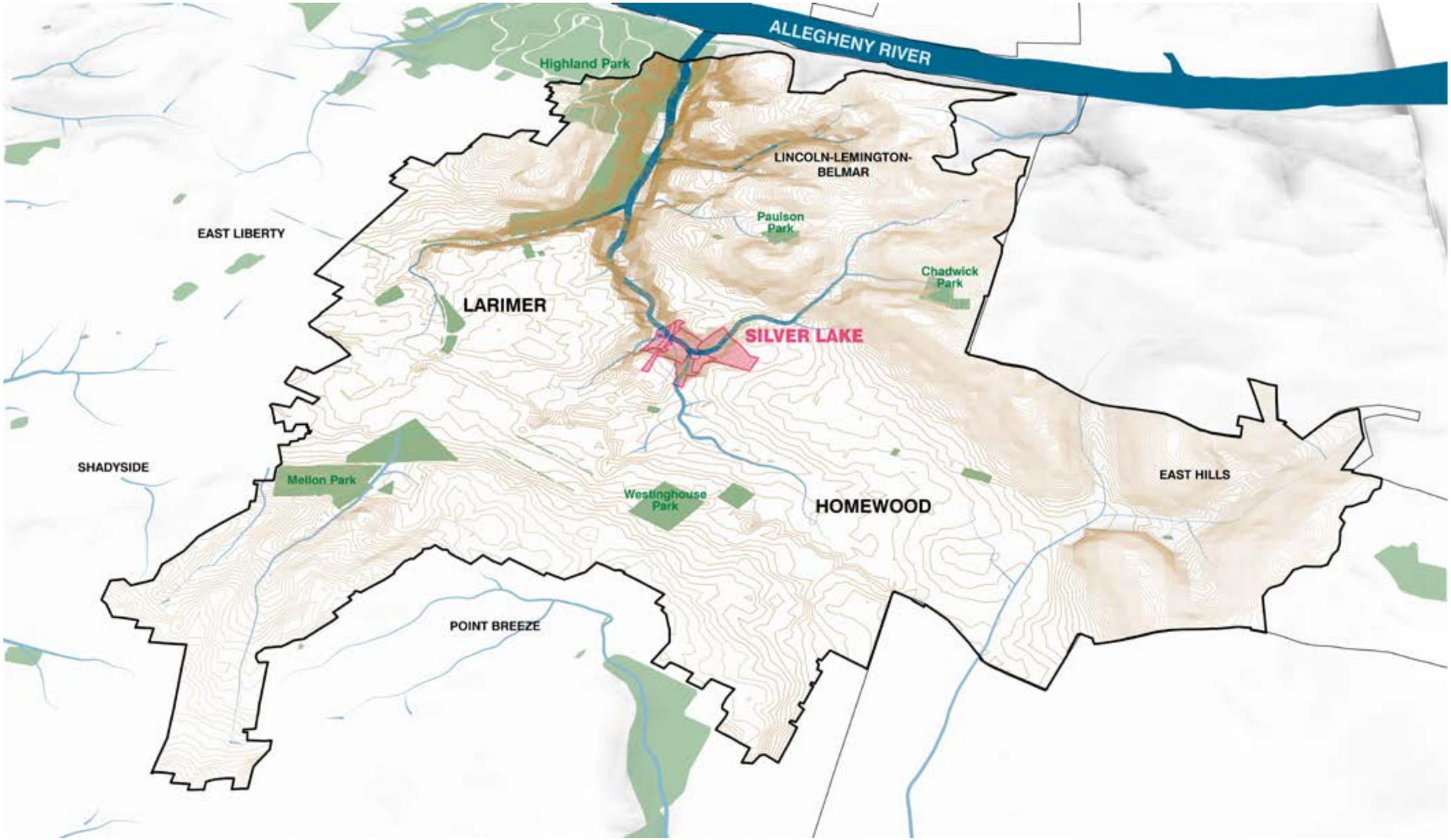
	Impervious Area Captured (ac)	*Construction Cost for Stand-alone GSI	*+Construction Cost for Integrated GSI	Relative Constraint Score	Runoff Capture (gal/yr)	Overflow Reduction Efficiency (ORE)	CSO Reduction (gal/yr)	**Cost Efficiency ($/gal/yr overflow reduction)
Local GSI	2.05	$320,000	$300,000	--	1,500,000	TBD	TBD	TBD
Enhanced Drainage Area	5.15	$980,000	$693,000	--	4,200,000	TBD	TBD	TBD
Project Totals	7.20	$1,300,000	$1,000,000	3.0	5,910,000	TBD	TBD	TBD

*Costs are planning-level estimates with an expected accuracy range of -25% to +50%. +Integrating GSI with other planned site improvements is assumed to result in a 25% cost reduction. **Efficiency based on construction cost for stand-alone GSI

Source: Living Waters of Pittsburgh. A-42 Negley Run. http://www.livingwaterspgh.org/landing-page/living-watersheds/negley-run-a42/

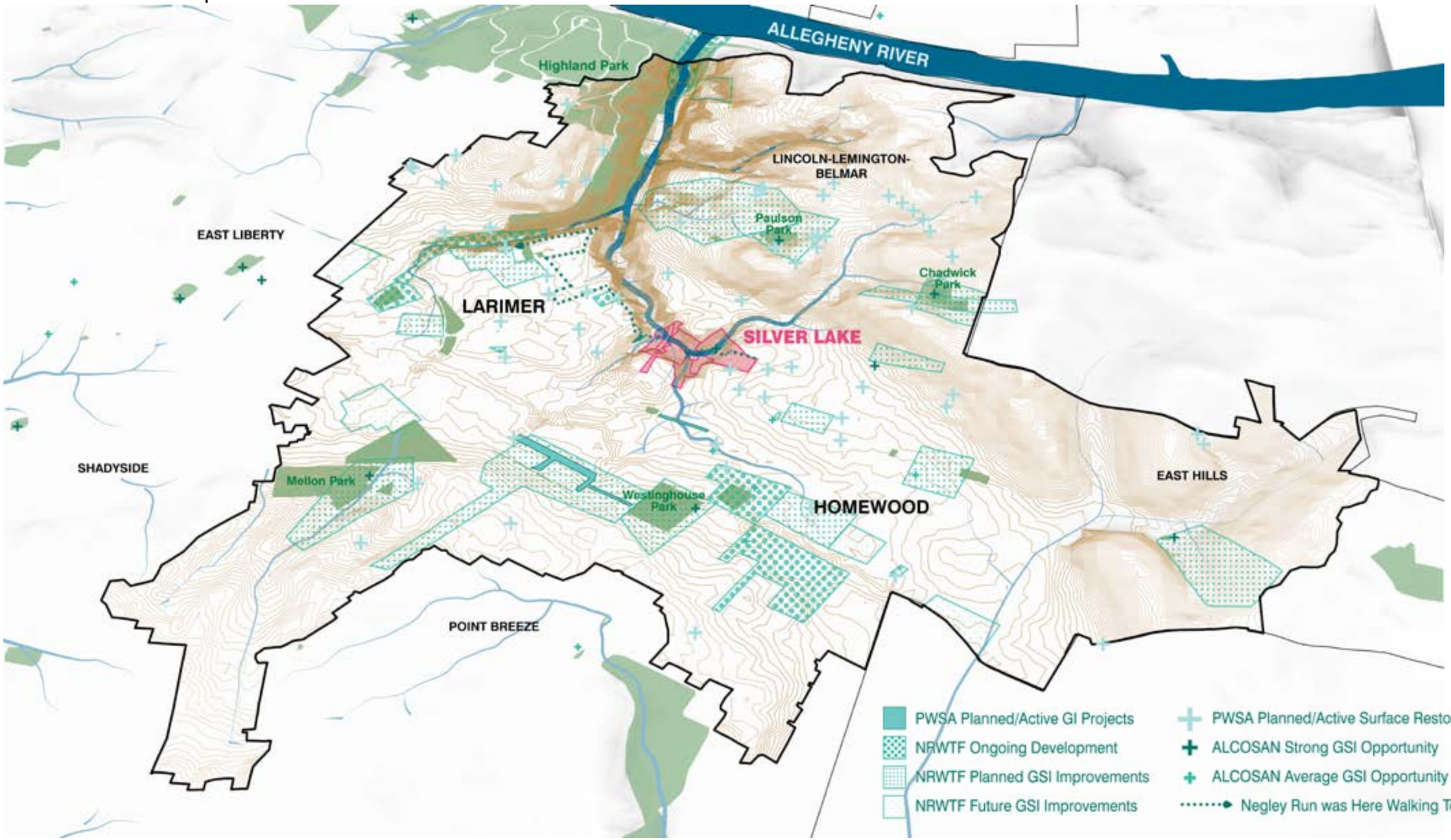
A-42 Negley Run

10ft Contours + Parks + Historic/Buried Streams

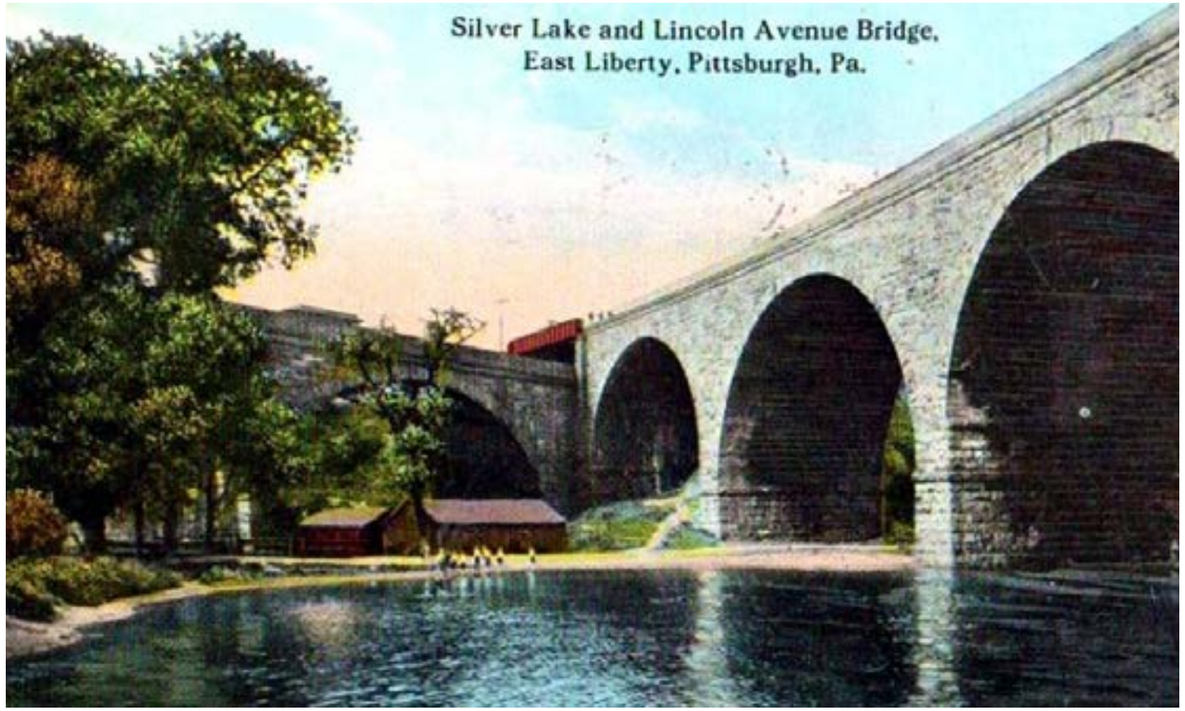


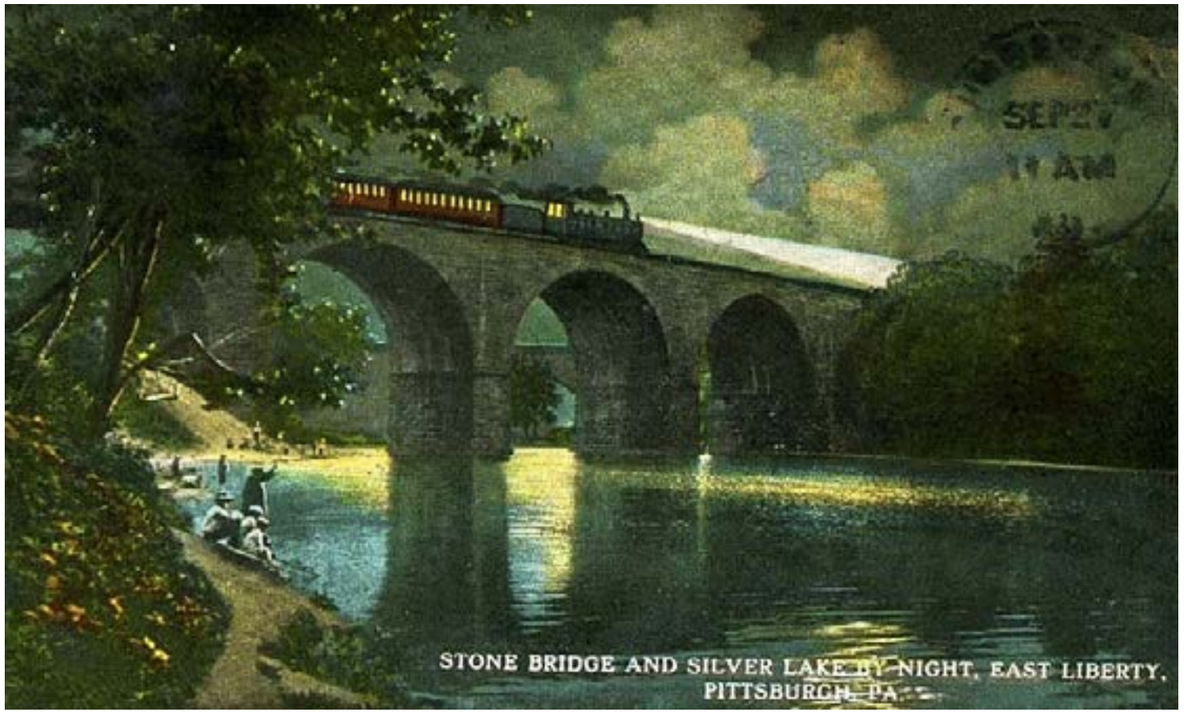
A-42 Negley Run

Watershed/GI Improvements



Silver Lake







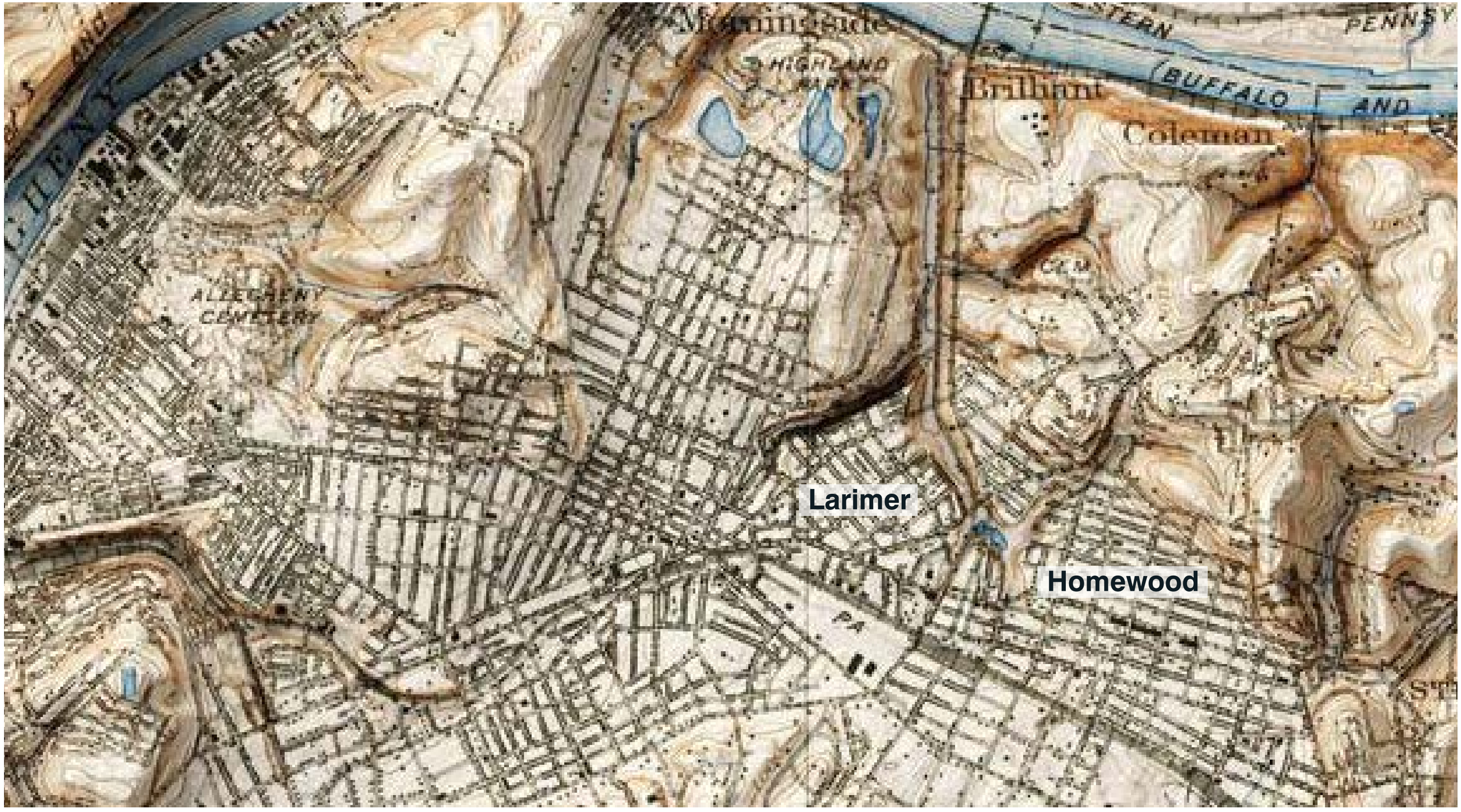
Source: Brilliant Cutoff Viaduct and Silver Lake, www.brooklineconnection.com/history/Facts/Brilliant.html

Silver Lake / Homewood / Larimer Site Area



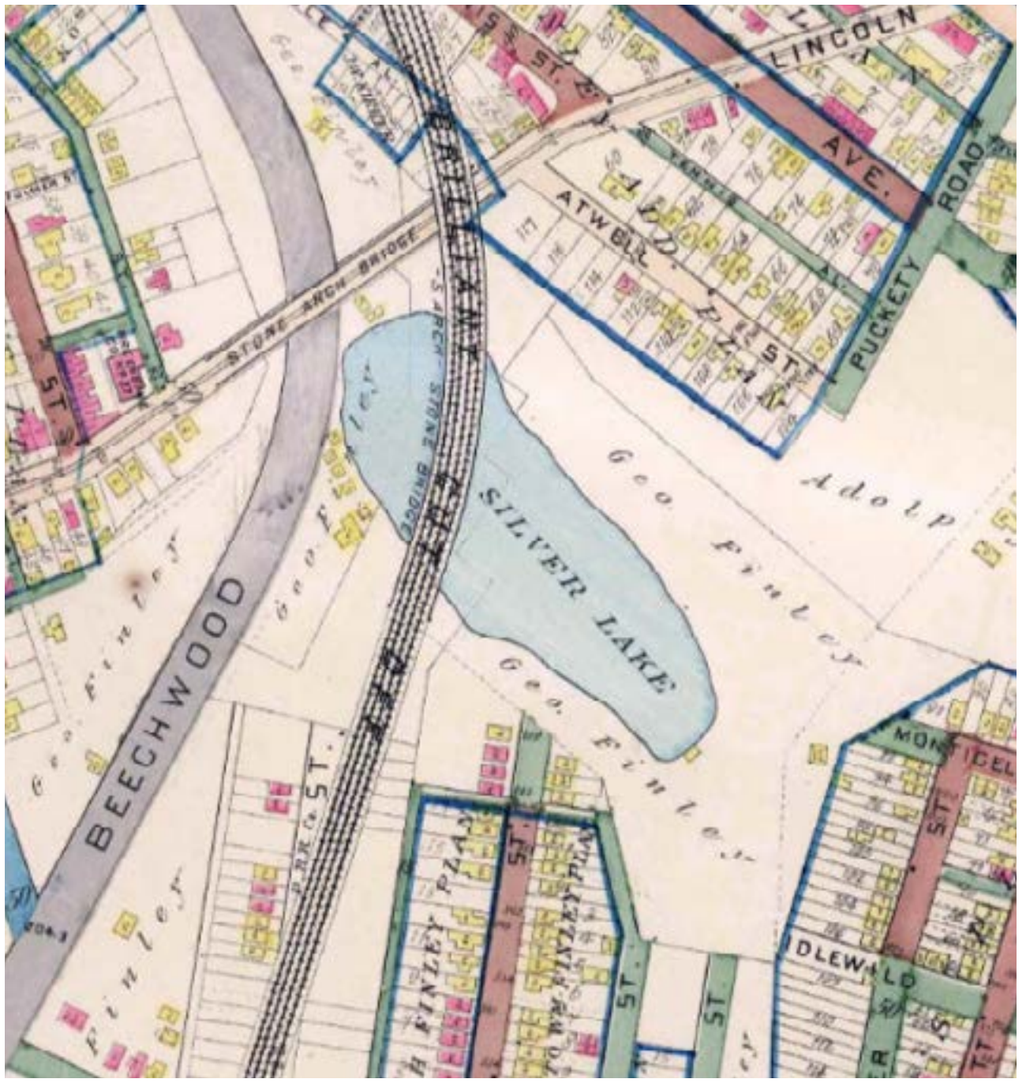
 Source: United States Geological Survey. USGS Topographic Map of Pittsburgh

Silver Lake / Homewood / Larimer Site Area



 Source: United States Geological Survey. USGS Topographic Map of Pittsburgh

Silver Lake Footprint, 1910 and 2022





Source: Pittsburgh Historic Maps. https://www.arcgis.com/apps/View/index.html?appid=63f24d1466f24695bf9dfc5bf6828126#!

Silver Lake Current Condition





Silver Lake Current Condition

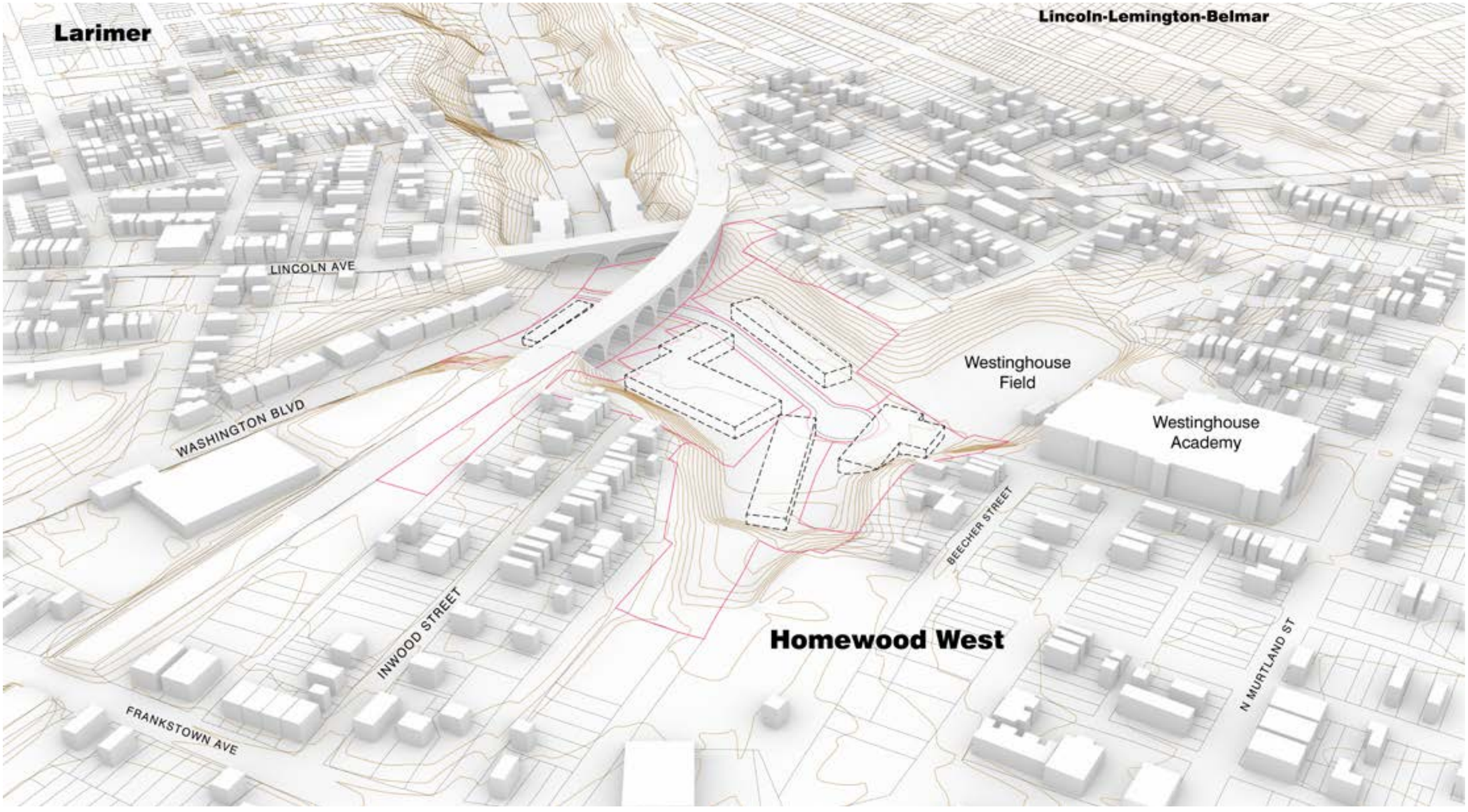




Early action on Westinghouse High School next to Silver Lake



Silver Lake


Larimer
Lincoln-Lemington-Belmar
LINCOLN AVE
WASHINGTON BLVD
Westinghouse Field
Westinghouse Academy
BEECHER STREET
INWOOD STREET
Homewood West
N MURTLAND ST
FRANKSTOWN AVE

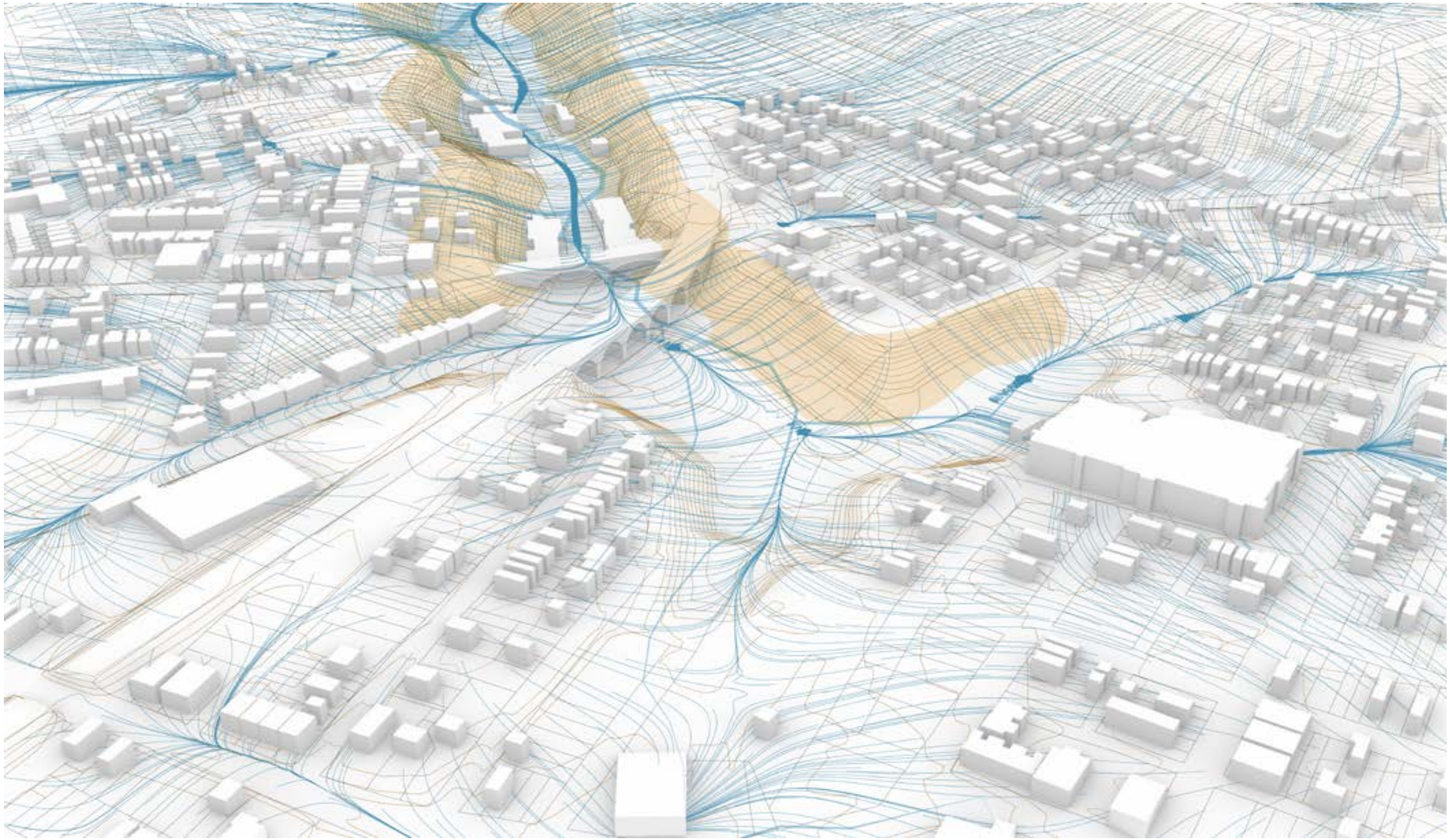
Silver Lake

Satellite View



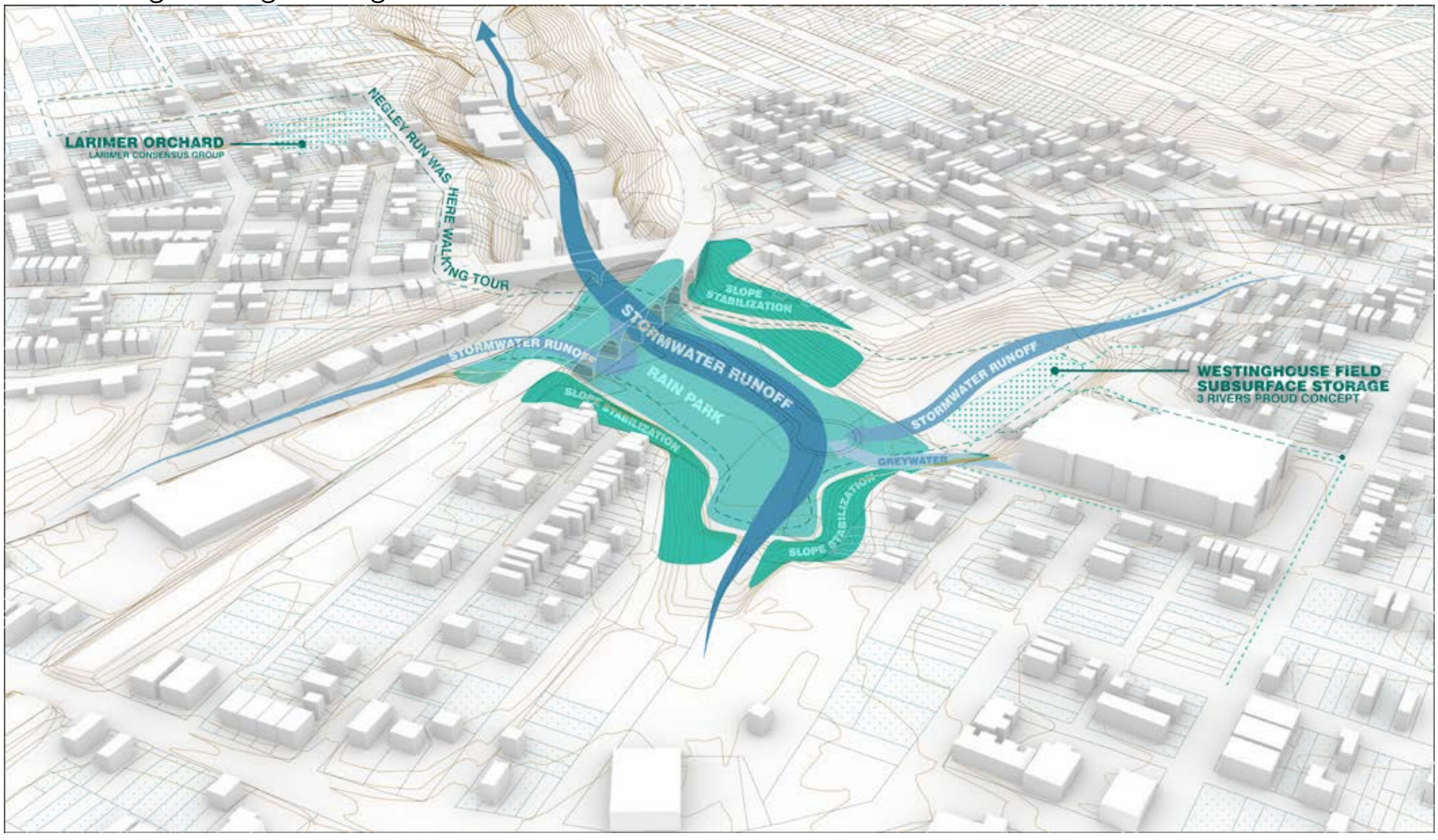
Silver Lake

Site Conditions: Buried Streams + Landslide Prone Areas + Stormwater Runoff



Silver Lake

Potential Engineering Strategies



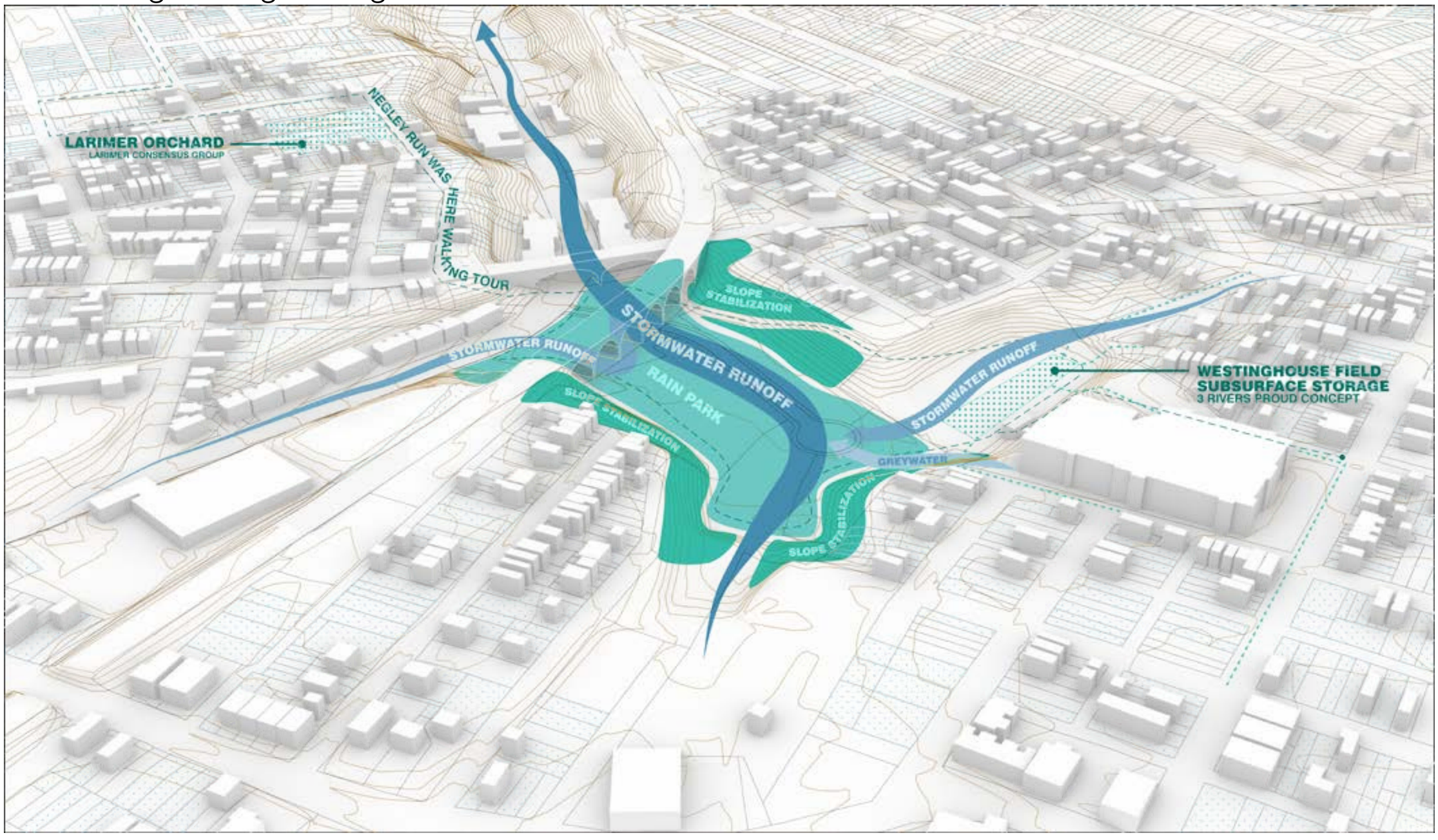
ANIMATION SLIDE

What would you like to see happen at Silver Lake and Westinghouse HS?

What should we know about past plans or current community visions for this place?

Silver Lake

Potential Engineering Strategies

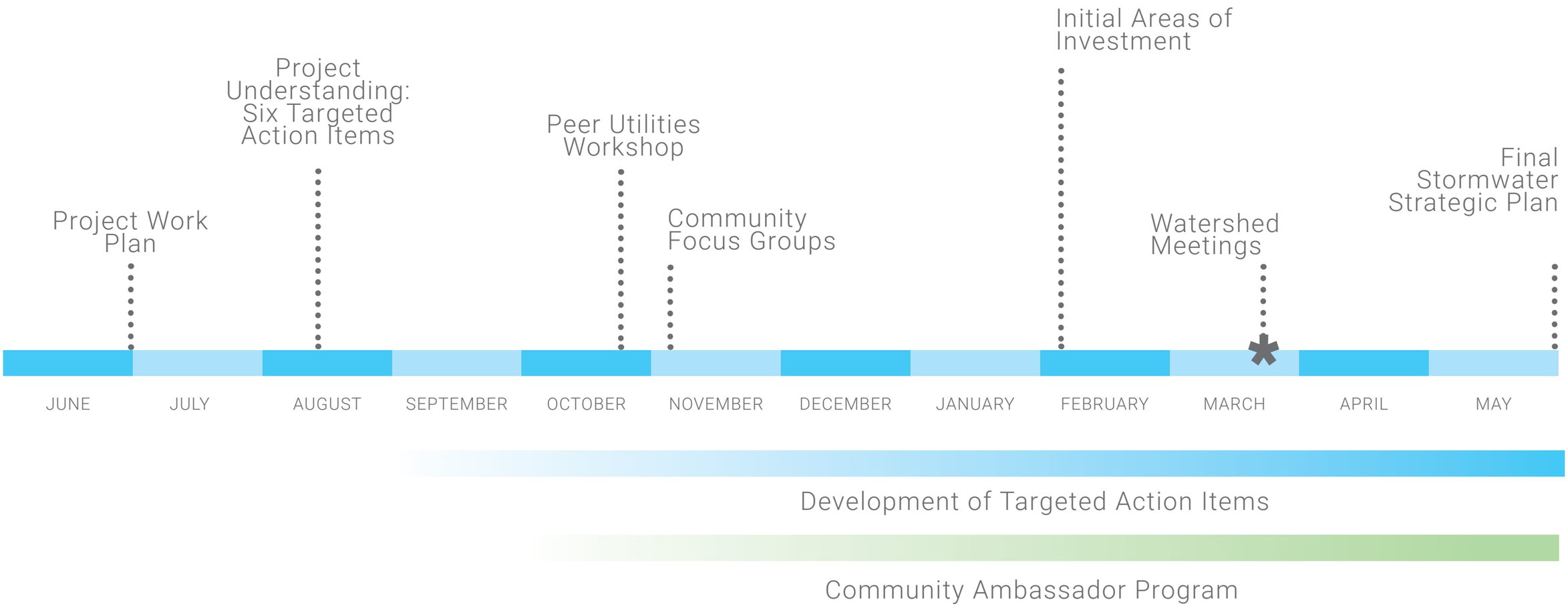


Do you think this is a good place to create a catalytic project that integrates environmental justice, flood management, and green infrastructure to achieve performance and quality of life for people?

Are there other places and projects in Negley Run you want to tell us about?

Next Steps

PROJECT TIMELINE



PWSA Next Steps

APPENDIX J

PITTSBURGH WATER AND SEWER AUTHORITY (PWSA) STRATEGIC PLAN FOR STORMWATER









Community Meeting
March 23, 2022

PITTSBURGH WATER AND SEWER AUTHORITY (PWSA) STRATEGIC PLANNING TEAM

PennPraxis + The Water Center at Penn
water systems analysis and planning, policy and partnership design, communication

AKRF Inc.
engineering and technical engagement

Grounded Strategies stakeholder engagement

Heather Sage local policy communication

Moonshot Missions water economics and equity strategies

Andropogon Associates land use planning and design

CMU Center for Engineering & Resilience for Climate Adaptation
local climate change modeling and resilience planning

AGENDA

6:00 - 6:15	Strategic Planning Progress
6:15 - 6:20	People, Performance, and Planet in Places
----------	***Saw Mill Run Visioning*** ----------
6:25 - 7:20	Past Plans + Current Visions
----------	***Saw Mill Run Visioning*** ----------
7:20 - 7:24	Next Steps and Ambassador Kick-off
7:24 - 7:30	PWSA on Context for Strategic Planning

Strategic Planning Update

STORMWATER PLANNING TIMELINE

JANUARY 2008

ALCOSAN enters into consent decree with USEPA and PaDEP

OCTOBER 2008

PWSA Feasibility Study Report

(PWSA going alone - propose regional tunnels)

JULY 2012

Draft ALCOSAN Clean Water Plan for public comment

(Predominantly gray plan tunnels and plant expansion)

JULY 2013

PWSA Wet Weather Feasibility Study

(Predominantly gray plan for conveyance and storage)

PWSA Greening the Wet Weather Plan

(What is needed for green for PWSA?)

AUGUST 2015

ALCOSAN Starting at the Source

(What can green do? Is it more cost effective?)

NOVEMBER 2016

PWSA Green First Plan

(What would an all green strategy look like?)

DECEMBER 2016

Watershed Resilience Accelerator

(Increased focus on flash flooding)

MAY 2017

OnePGH Resilience Strategy

(Increased focus on climate adaptation and equity)

MARCH 2019

PWSA MS4 Permit & Pollutant Reduction Plan

(PaDEP 10% sediment reduction)

DECEMBER 2019

PWSA Saw Mill Run Integrated Watershed Management Plan

(Increased focus on IWM planning for permitting)

SEPTEMBER 2019

ALCOSAN Modified Consent Decree and Clean Water Plan Submitted to EPA/PaDEP

JULY 2020

ALCOSAN Controlling the Source

(Spatial cost effectiveness analysis of GSI)

MAY 2020

ALCOSAN Modified Consent Decree and Clean Water Plan Approved by EPA/PaDEP

JUNE 2021

Begin Strategic Plan for Stormwater

OCTOBER 2021

Updated Stormwater Codes & Ordinances
(Increased focus on private stormwater)

2022-2023

PWSA Stormwater Fee
(Need for dedicated stormwater funding)

Why This Plan Now?









- Green First focused only on green infrastructure planning to improve water quality because the county's stormwater plan (still in development at the time) was going to concentrate on "gray" infrastructure upgrades--on pipes and tunnels.
- The county water authority (called ALCOSAN) has now finalized a plan for the construction of tunnels which will significantly reduce sewage overflow into the rivers when it rains. The plan will be implemented over the next ten years.
- This means the Pittsburgh Water and Sewer Authority (PWSA) can expand its focus to include residents' and businesses' concerns about flooding and basement backups, and consider equity and environmental justice in setting priorities for water investment.

PROJECT TIMELINE



Development of Targeted Action Items

Community Ambassador Program

TOP SIX PRIORITY ACTIONS

1. Analyze Priority Areas of Investment
2. Define Initial Investment Strategy & Illustrate It In a Few Places
3. Leverage Stormwater Fee Impact
4. Establish Guiding Principles to Level of Service & Flooding
5. Develop a Communication Framework to Increase Transparency
6. Develop a Framework for a Joint Task Force on Stormwater

TOP SIX PRIORITY ACTIONS

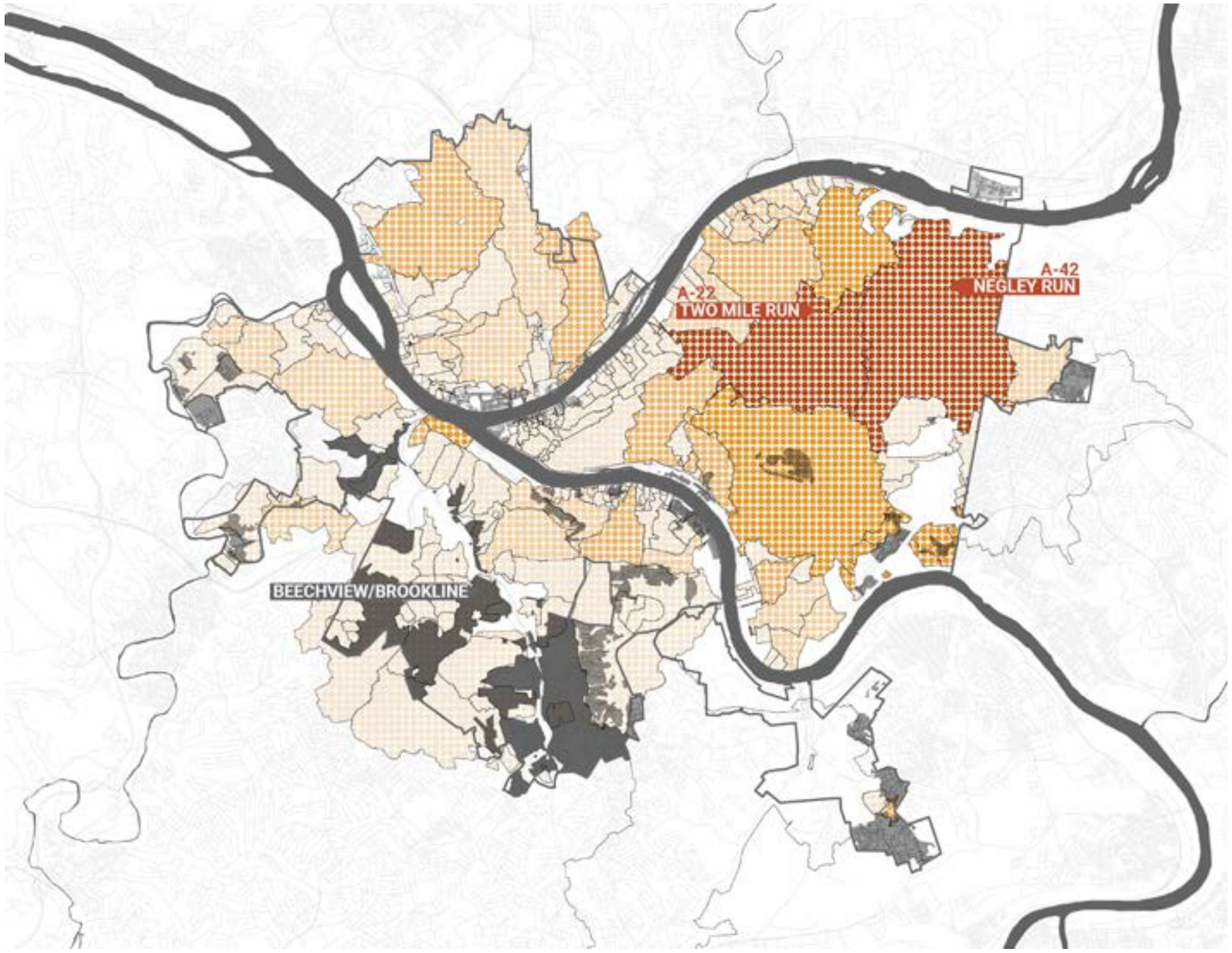
1. Analyze Priority Areas of Investment
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1 Analyze Priority Areas for Investment

We will map many kinds of data to identify areas in the city where investment could have a major impact on local flooding and create community benefits.

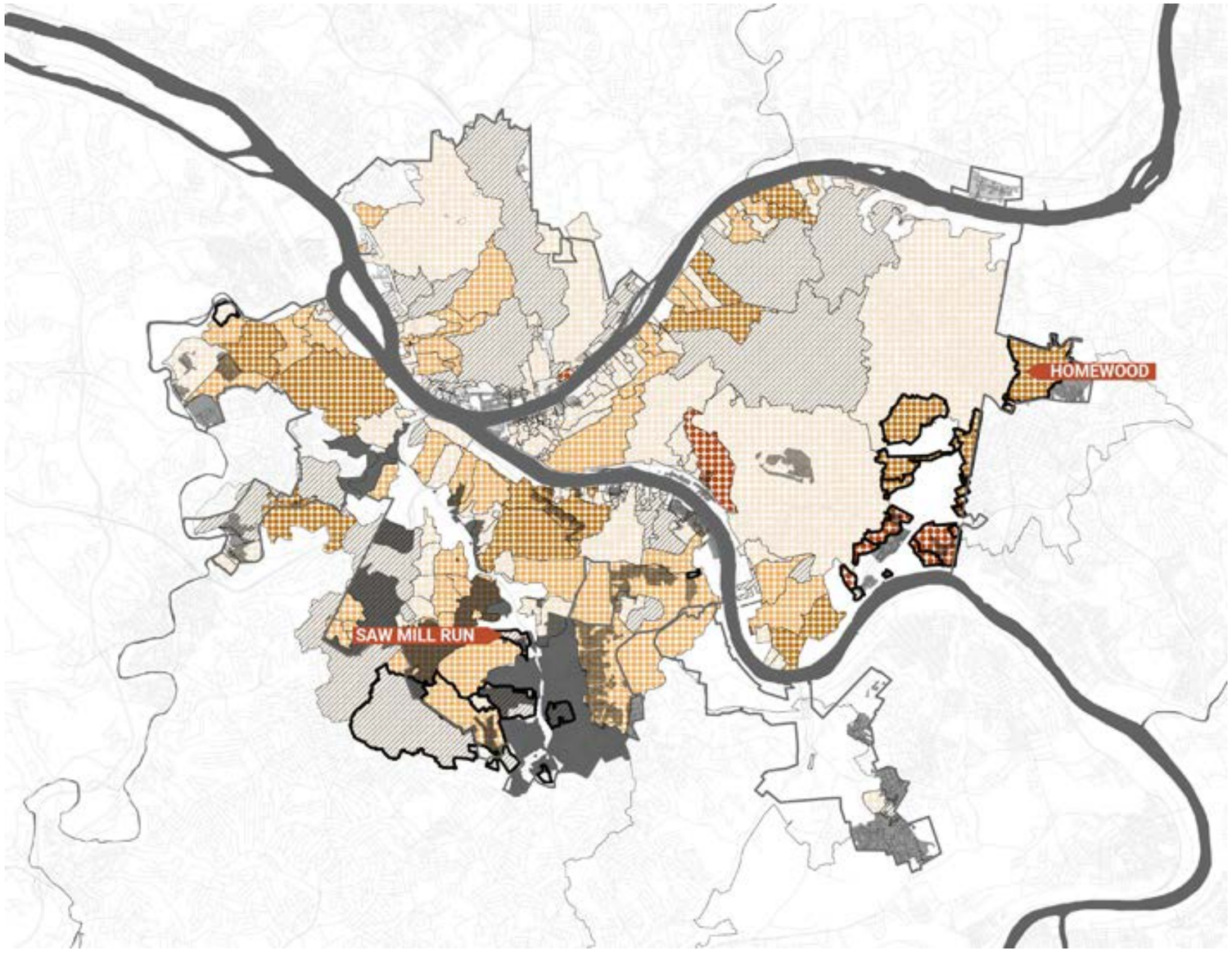
- Prioritize more kinds of water management, not only water quality and sewer overflows
- Map local flooding impacts, basement backups, and environmental justice areas for water investment
- Study geographic priorities with input from PWSA and other stakeholders
- Review good work being done in other cities to prioritize investment to create more kinds of benefit

Water Quality: Current CSO Volumes

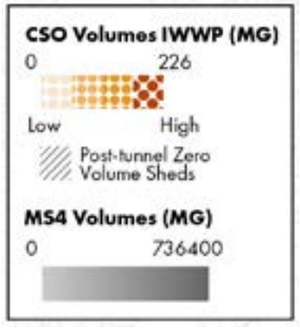


- Ongoing conversations with PWSA have provided updated information on CSO volumes
- Highest volumes are in Negley Run and Two Mile Run
- MS4 outfalls are shown to illustrate opportunities for intervention to meet MS4 compliance

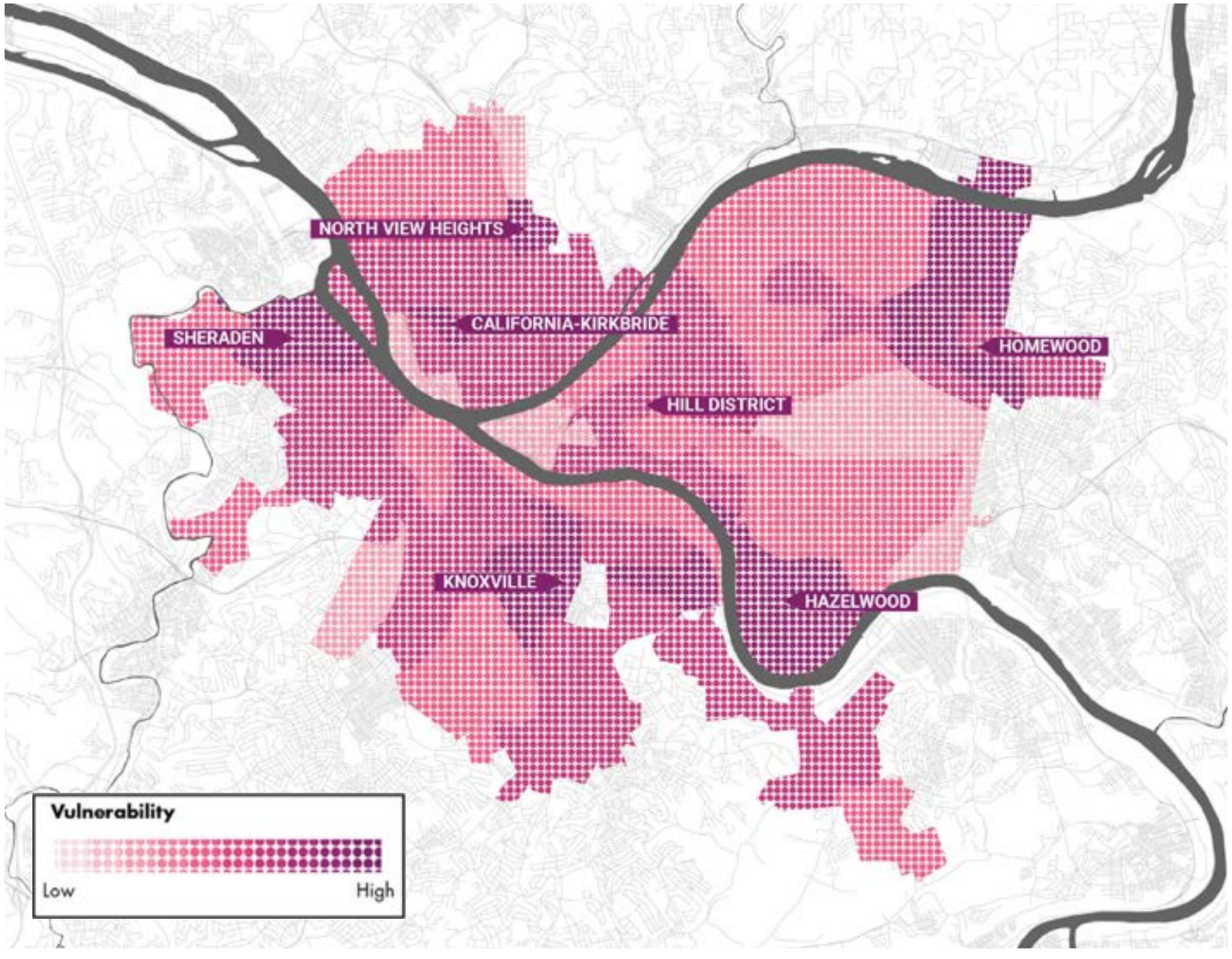
Water Quality: Post ALCOSAN Tunnel CSO Volumes



- Ongoing conversations with PWSA have provided updated information on outfall volume that will remain fully PWSA's responsibility. Those are highlighted here. Others are ongoing negotiation with ALCOSAN.
- The highest volume areas are found in Homewood/East Hills, Point Breeze/Regent Square/Squirrel Hill, and Beechview/Brookline in Saw Mill Run
- While volumes will be significantly reduced post-tunnel, there remain many opportunities for reduction in the near term



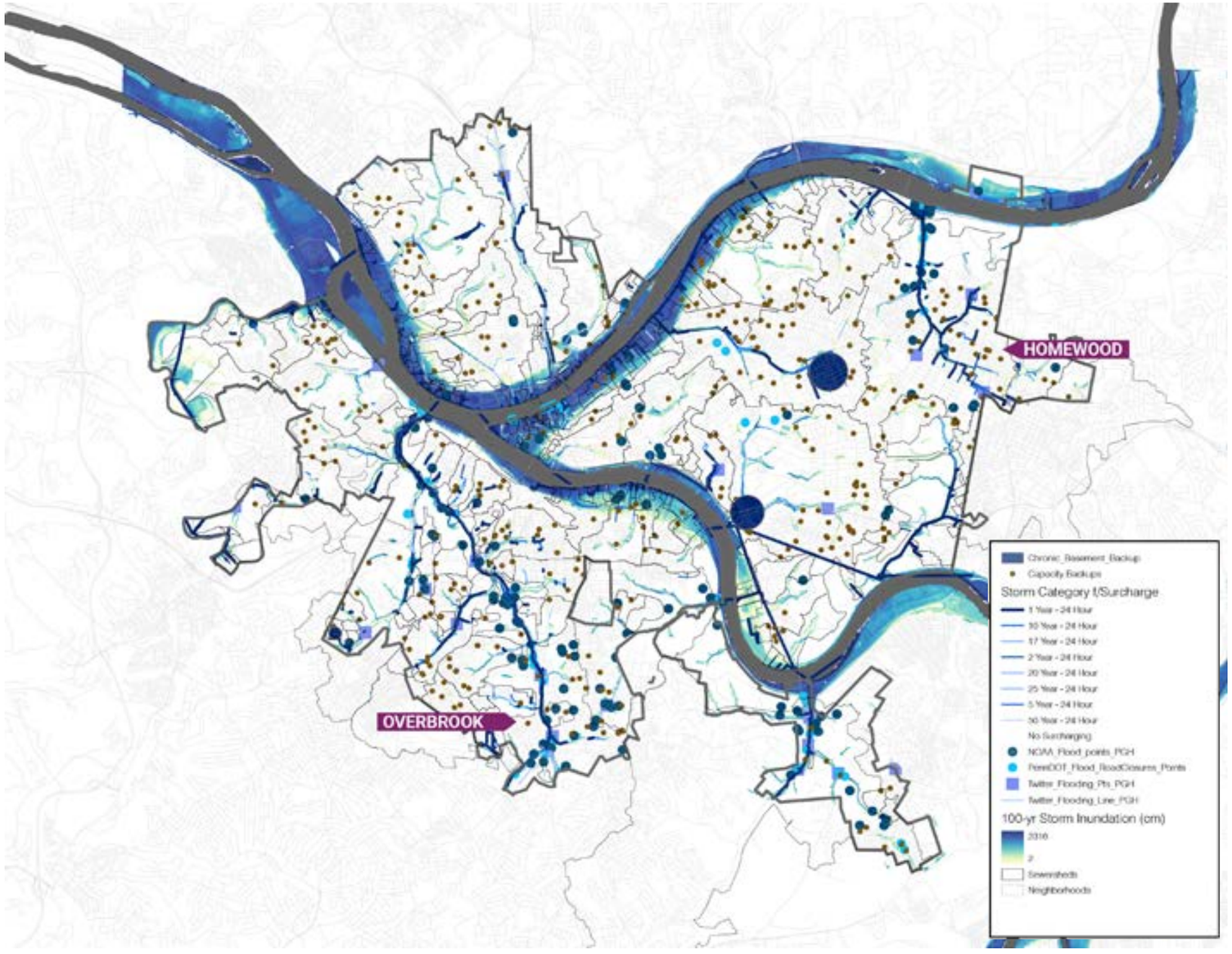
Environmental Justice: Allegheny County



Source: Allegheny County Health Department, 2018.

- Updated to include Allegheny County Environmental Justice Index which includes:
  - *Median Household Income*
  - *Diesel Particulate Matter*
  - *Particulate Matter ≤ 2.5 µm*
  - *Percent Minority*
  - *Proximity to Green Space*
  - *Educational Attainment*
  - *Miles of Railroad Track Coverage*
  - *Housing Vacancy*

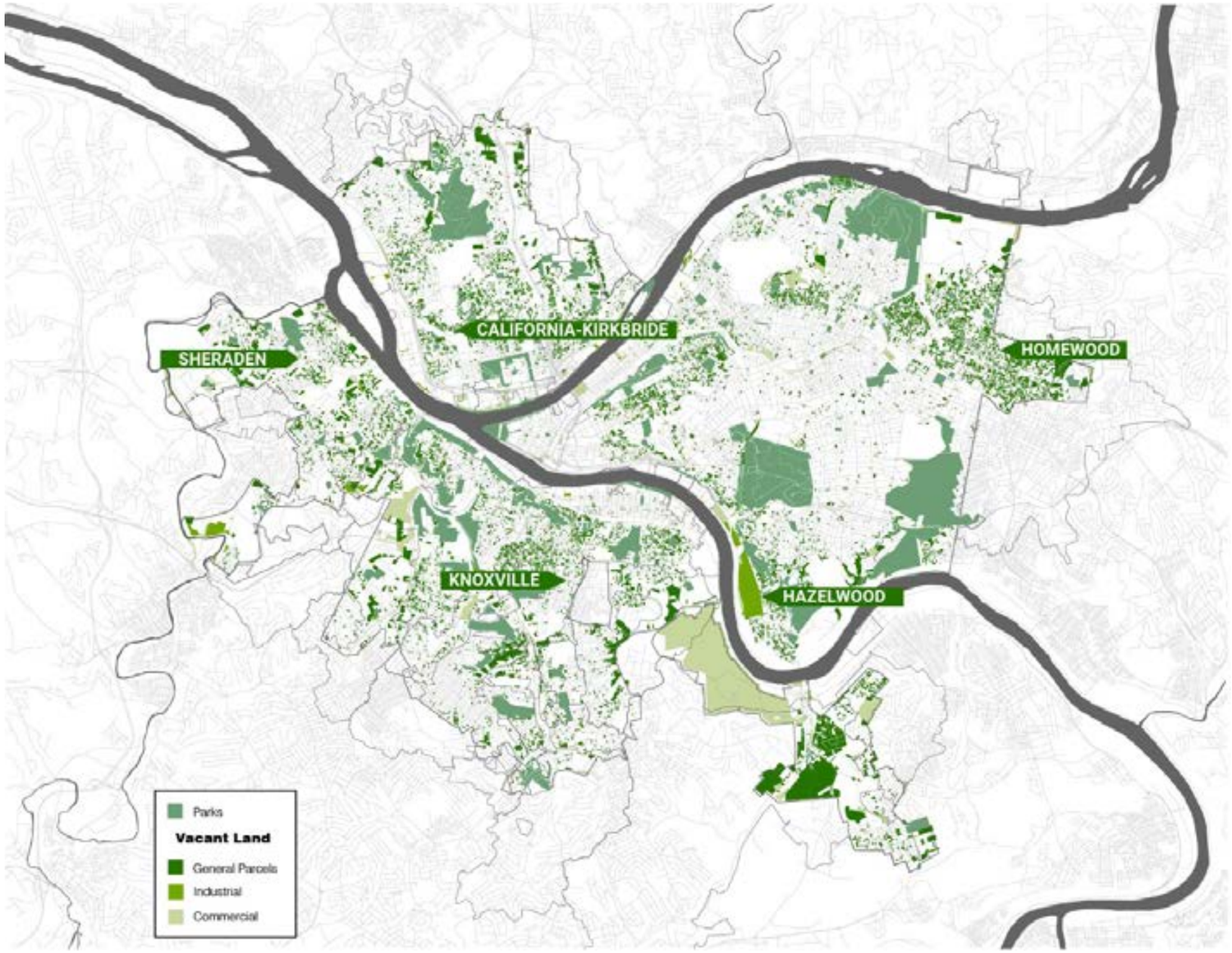
Local Flooding



- Flooding data updated to include First Street Foundation Flood Factor inundation forecast for 1-in-100 year storm event in 2020 climate conditions.
- PWSA investigated and confirmed capacity-related basement backup locations between 2020 and 2021.
- Other data includes:
  - *PennDOT Road Closures*
  - *NOAA Storm Events Flood and Flash Floods*
  - *Allegheny County Twitter Feed*

Source: First Street Foundation National Flood Risk Assessment, 2020.

Green Infrastructure Opportunity

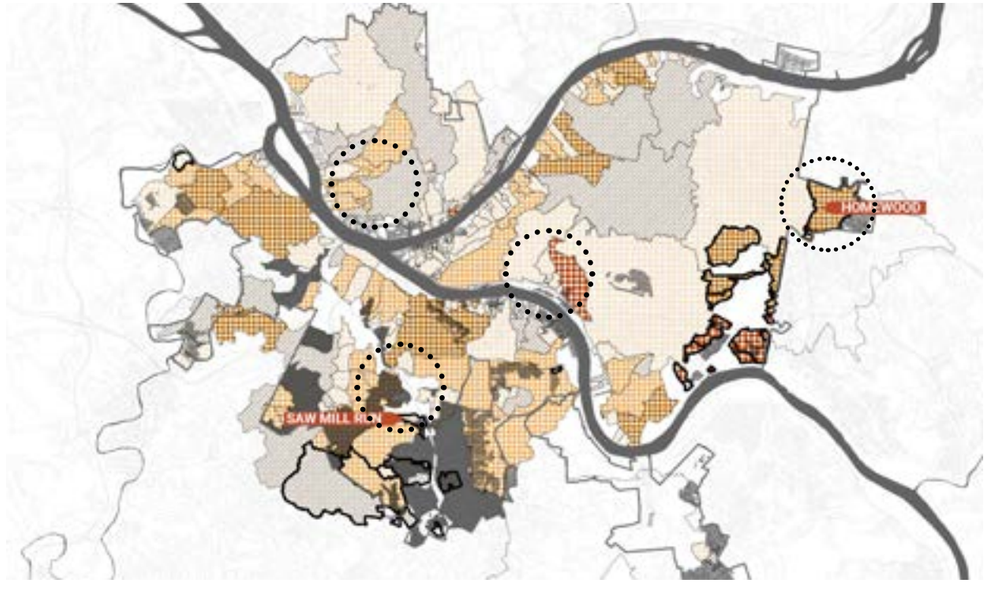


- Opportunities include known Parks + Greenways as of October 2021
- Vacant Parcels (general, industrial, commercial) added as opportunity areas since focus groups
- As of December 2021, six new parks to be transfered from Greenways for Pittsburgh Program to city ownership including: Bigelow, Fairhaven, Hazelwood, Knoxville Incline, Moore and Seldom Seen.

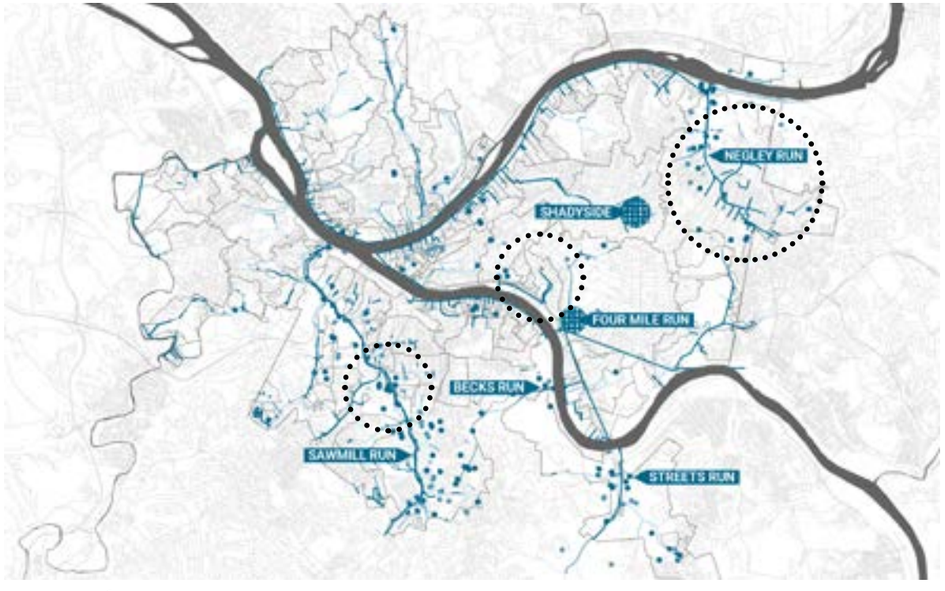
Source: Parcel Scale Cost Effectiveness and Siting Analysis - Micheal Blackhurst, University of Pittsburgh, and ALCOSAN Controlling the Source

Four Lenses

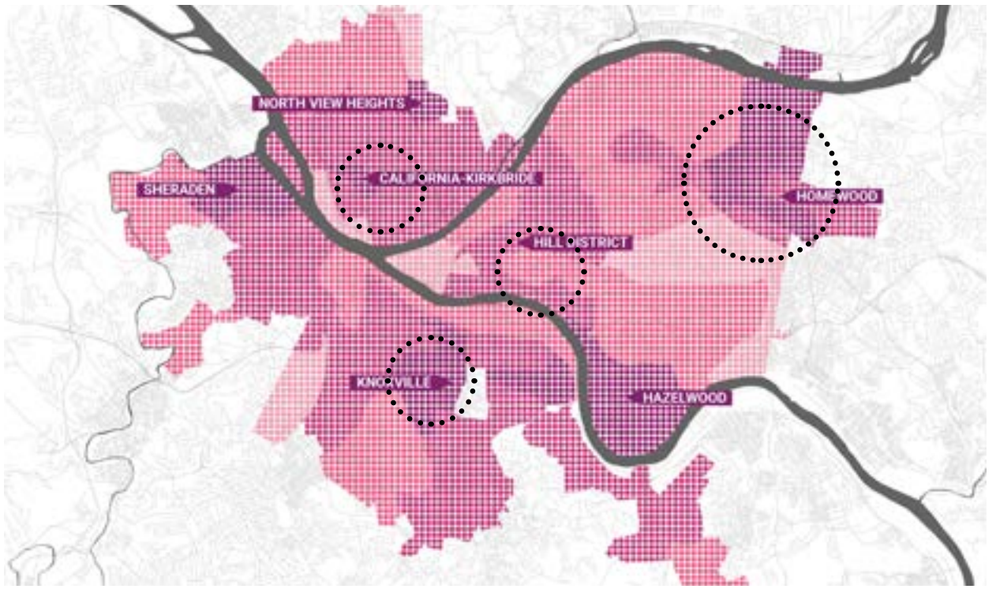
Water Quality



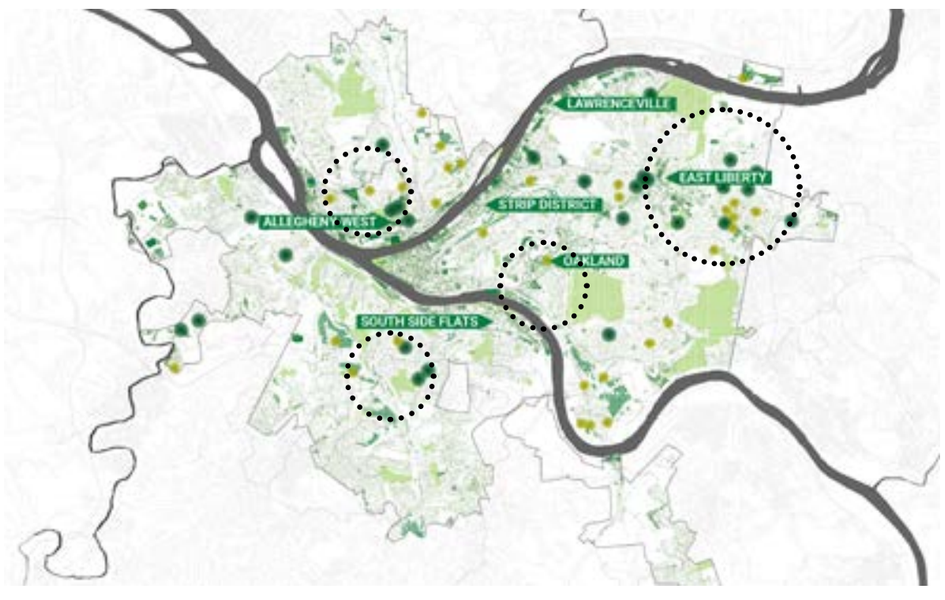
Localized Flooding



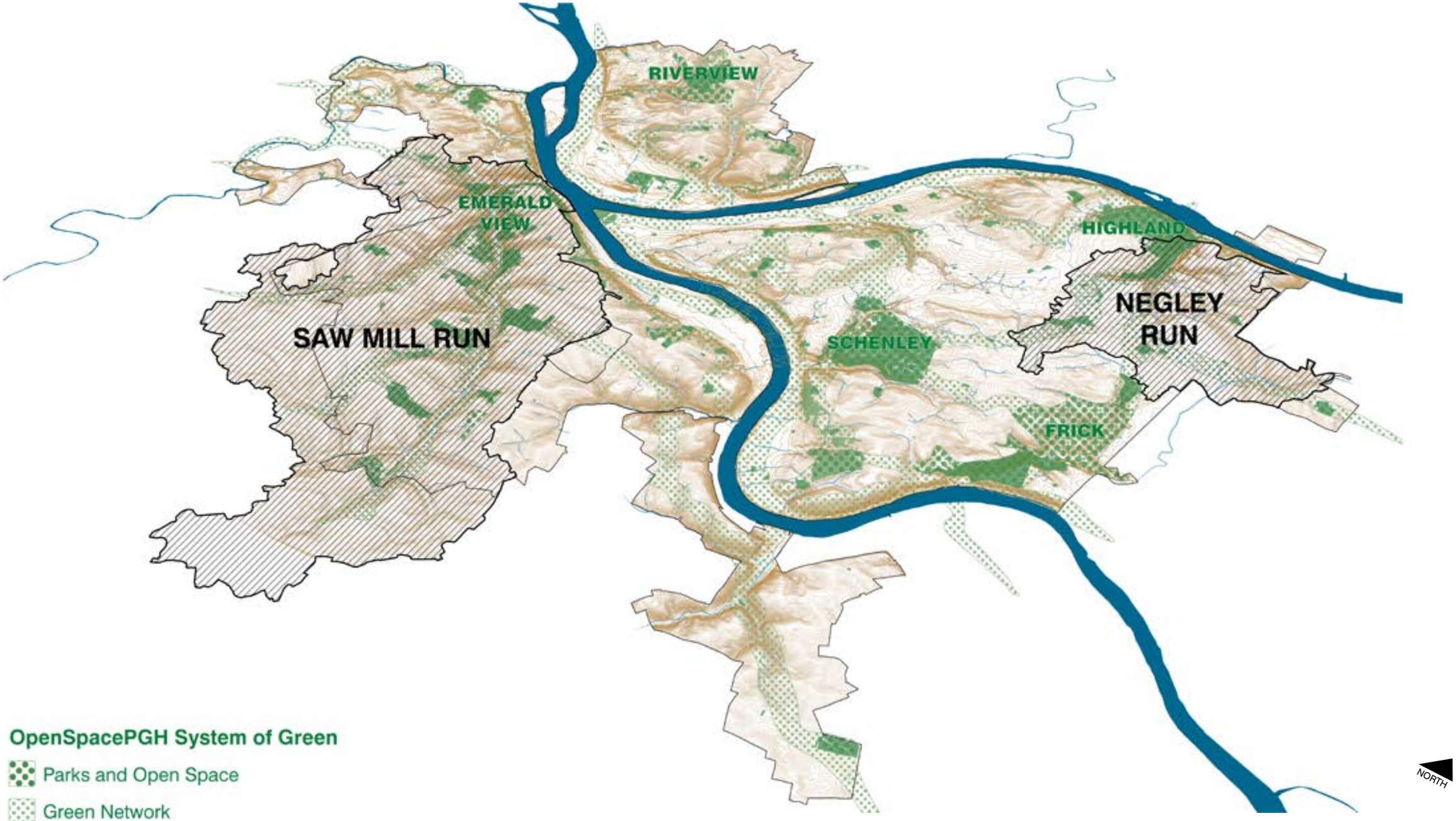
Socio-Economic & Environmental Justice



Areas of Opportunity

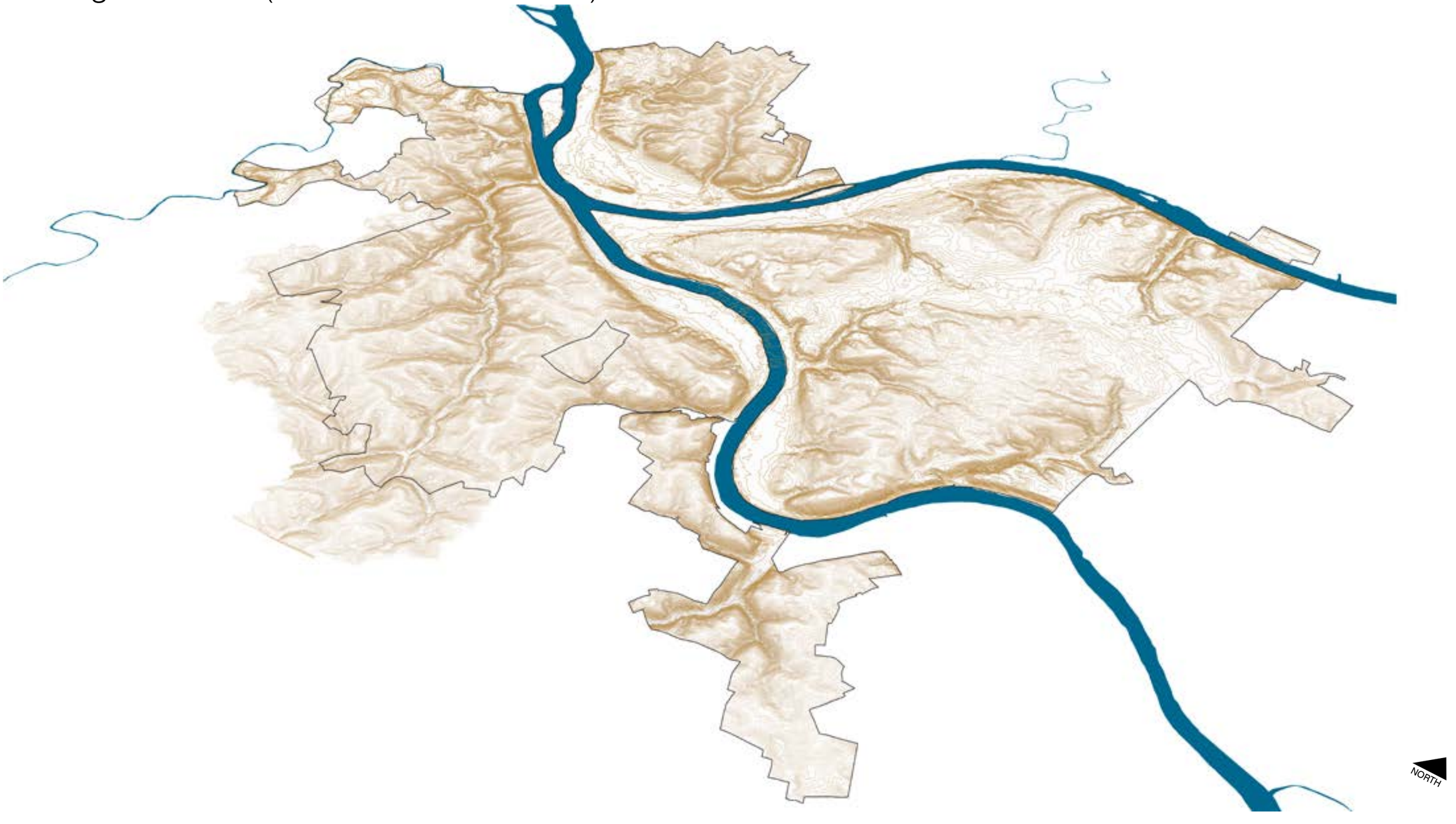


Priority Areas for Investment



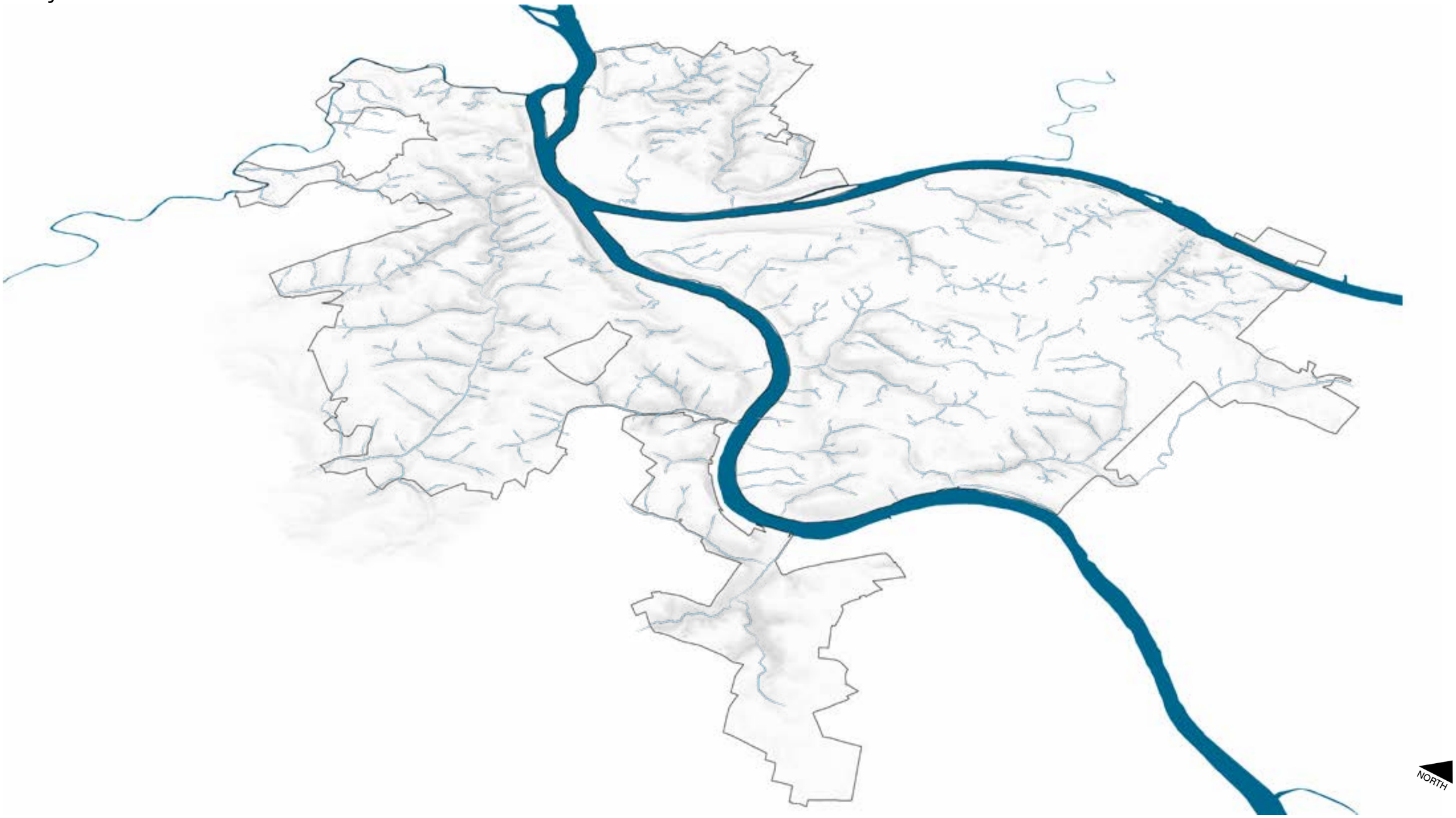
Citywide Terrain

Pittsburgh has hills! (shown in 10 ft contours)



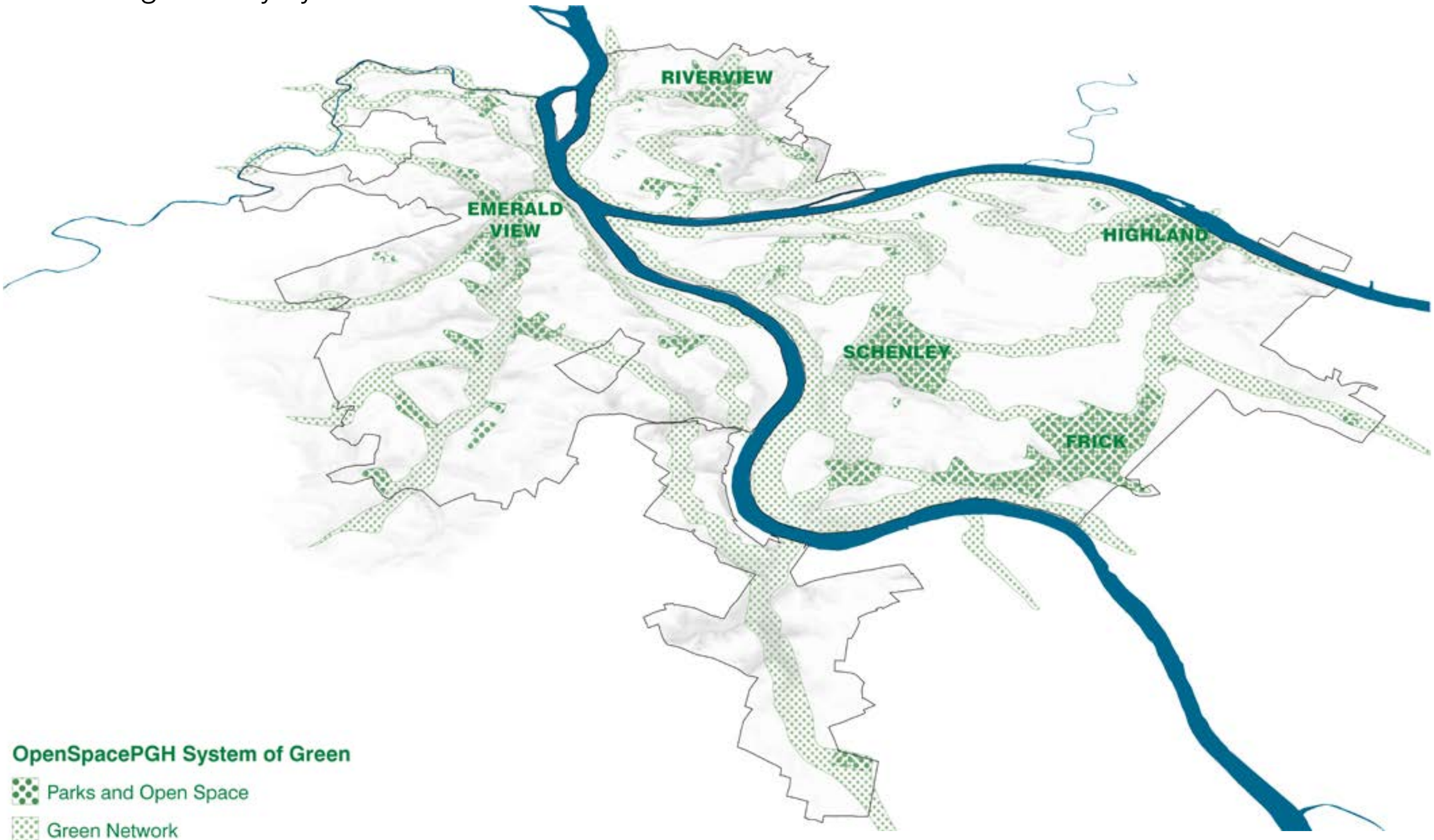
Citywide Networks

Many historical streams were buried



Citywide Networks

Thickened greenway system



2 Define Initial Investment Strategy and Illustrate It

We will define the options and a clear investment strategy, and then illustrate that strategy and communicate how money will be spent in exemplary places.

- Evaluate the current 5-Year Capital Plan
- Explore creative investment strategies that are in line with limited available funds and the city's bonding capacity
- Multiply the kinds of benefit each project generates for People, Place, Planet + Performance

Places

Places in the context of the "Four Ps"

People

- leverage the basic investments PWSA and other agencies are making in water to produce bigger, more comprehensive benefits for more people
- lift up community plans wherever possible
- create a place at the table for community members throughout the process
- increase collaboration of public and private partners to achieve the goals
- strengthen two-way communication and transparency of long-term process of change



Places in the context of the "Four Ps"

Perfomance

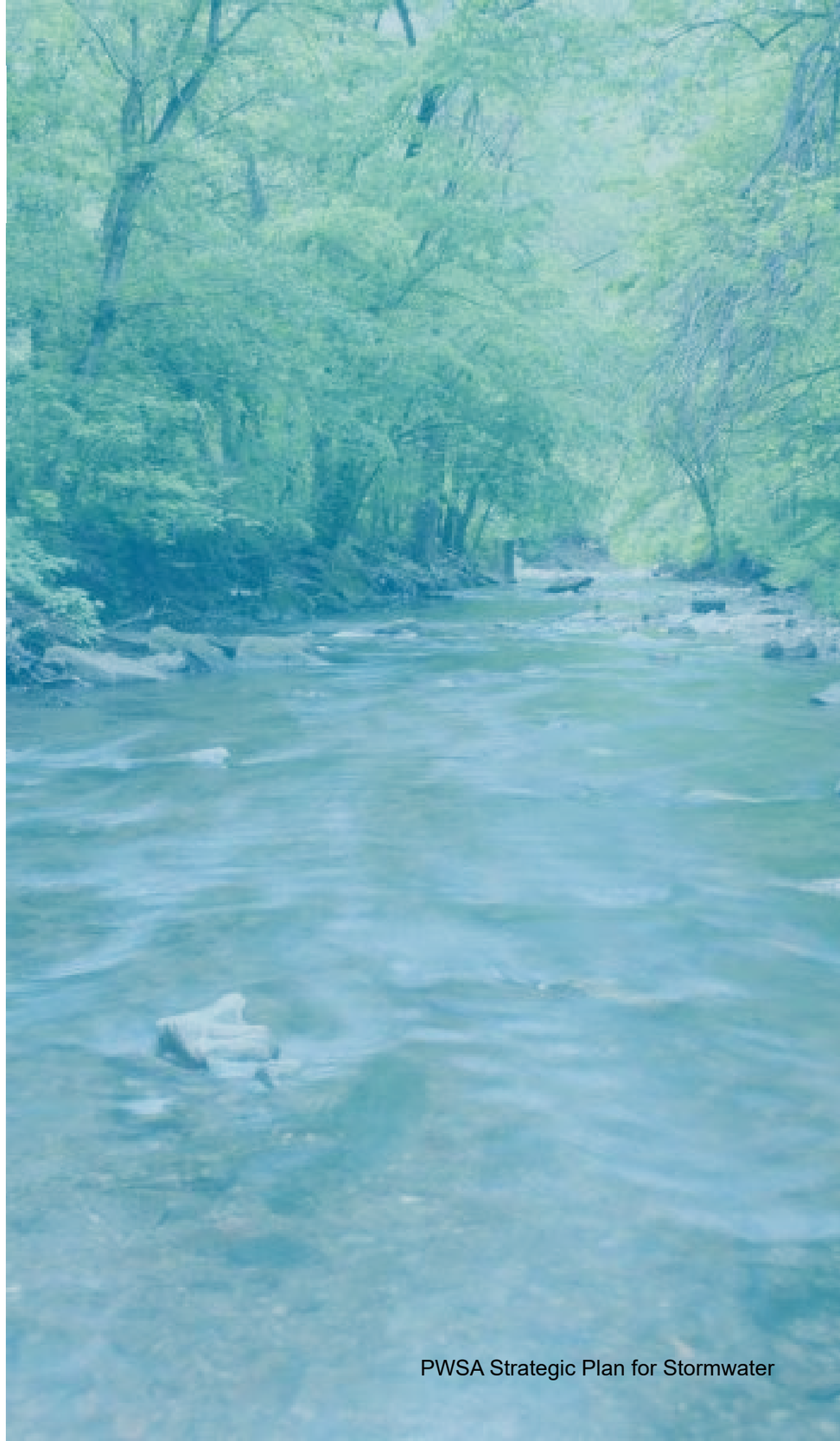
- incorporate more kinds of benefit into definition of performance
- layer or cluster projects to achieve bigger outcomes
- collect and analyze data for sound technical and policy thinking about delivery
- deliver more impact for the money (and more clarity about what impact fees and investments will produce)
- increase coordination and implementation speed and quality



Places in the context of the "Four Ps"

Planet

- manage flooding
- anticipate climate change
- treat water as a resource, not waste
- promote biodiversity and health of natural systems through contributions to water quality
- increase the use of green infrastructure wherever possible



Places in the context of the "Four Ps"

Place

- show what people, performance and planet can add up to in some exemplary places
- develop examples of catalytic projects centered on quality of life and place that resonate with people
- make water planning human and lift up local vision in a citywide plan

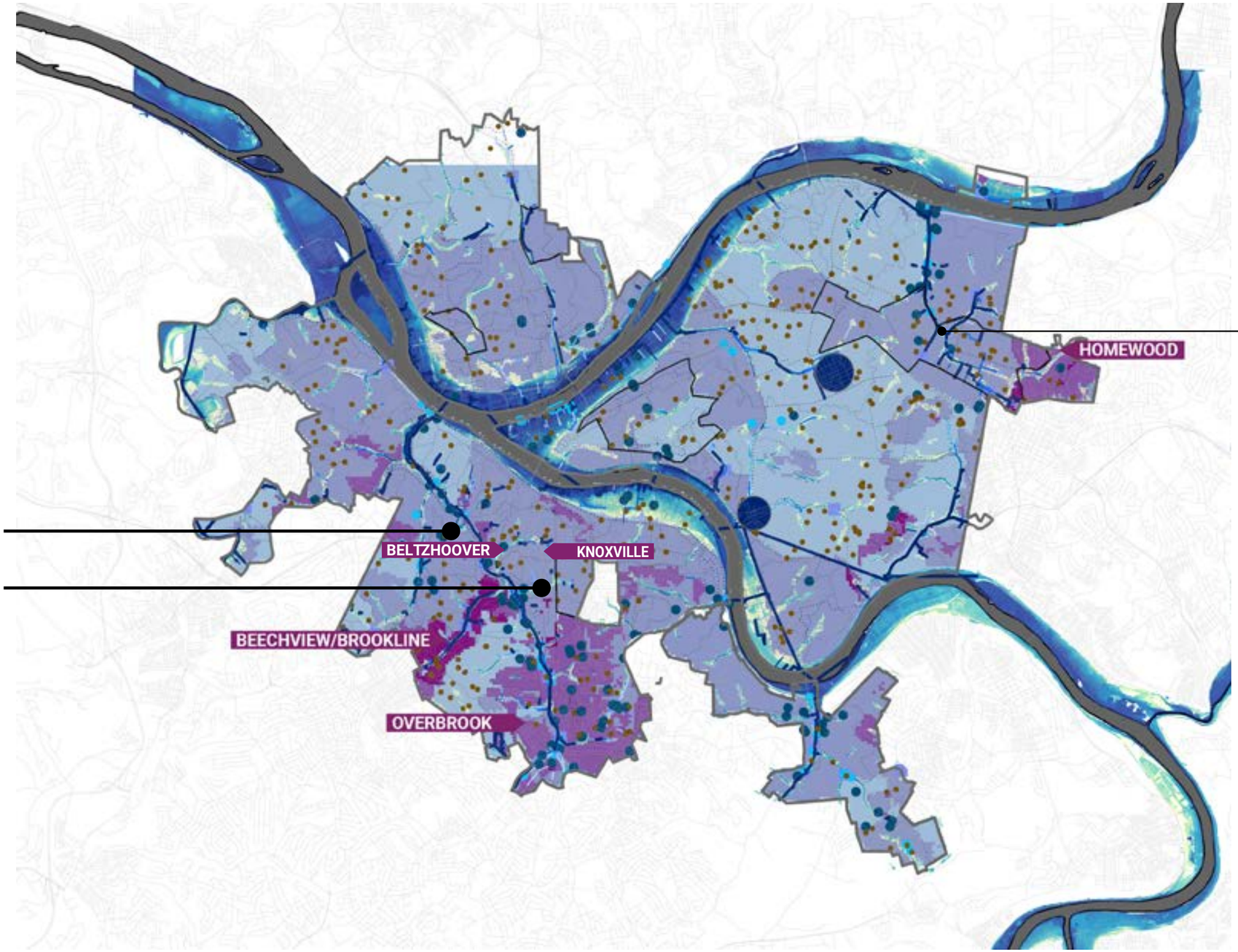


Saw Mill Run

Selection Criteria for Catalytic Sites

- ✓ Strong intersection of **flooding, water quality, equity** and **green space potential** (4 lenses)
- ✓ **Alignment with plans and advocacy** of community organizations, watershed taskforces, the Parks Conservancy, City agencies and other stakeholders and partners—we are building on the work of others and inviting collaboration
- ✓ High probability of achieving **measurable gains in performance** with modest investment (and no fatal flaw or high level feasibility issues)
- ✓ Site conditions and community goals allow for exciting examples of People, Place, Planet and Performance that **communicate vision and value proposition**.
- ✓ Visualization of wider potential in the same priority water/sewersheds can **catalyze future investment** and multiply the performance impact

3 Lenses: Flooding, Water Quality + Environmental Justice



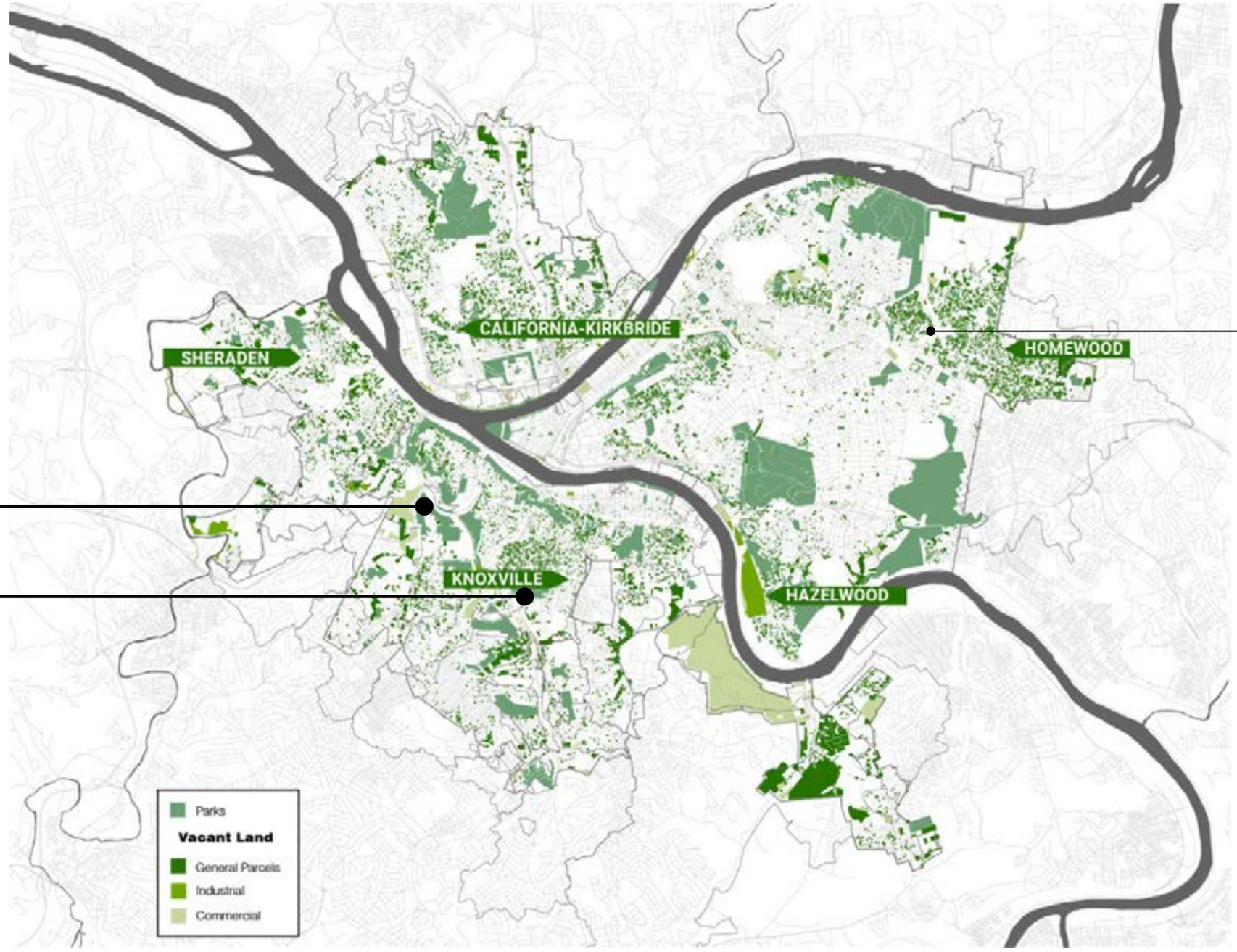
Silver Lake/ Homewood/ Larimer

Seldom Seen Greenway

McKinley Park

Note: Flooding data will remain as individual vector data to guide priority selection rather than being combined in to a composite.

4th lens: Green Infrastructure Opportunity



Silver Lake/ Homewood/ Larimer

Seldom Seen Greenway

McKinley Park

McKinley Park + Linkage to Seldom Seen Greenway Criteria

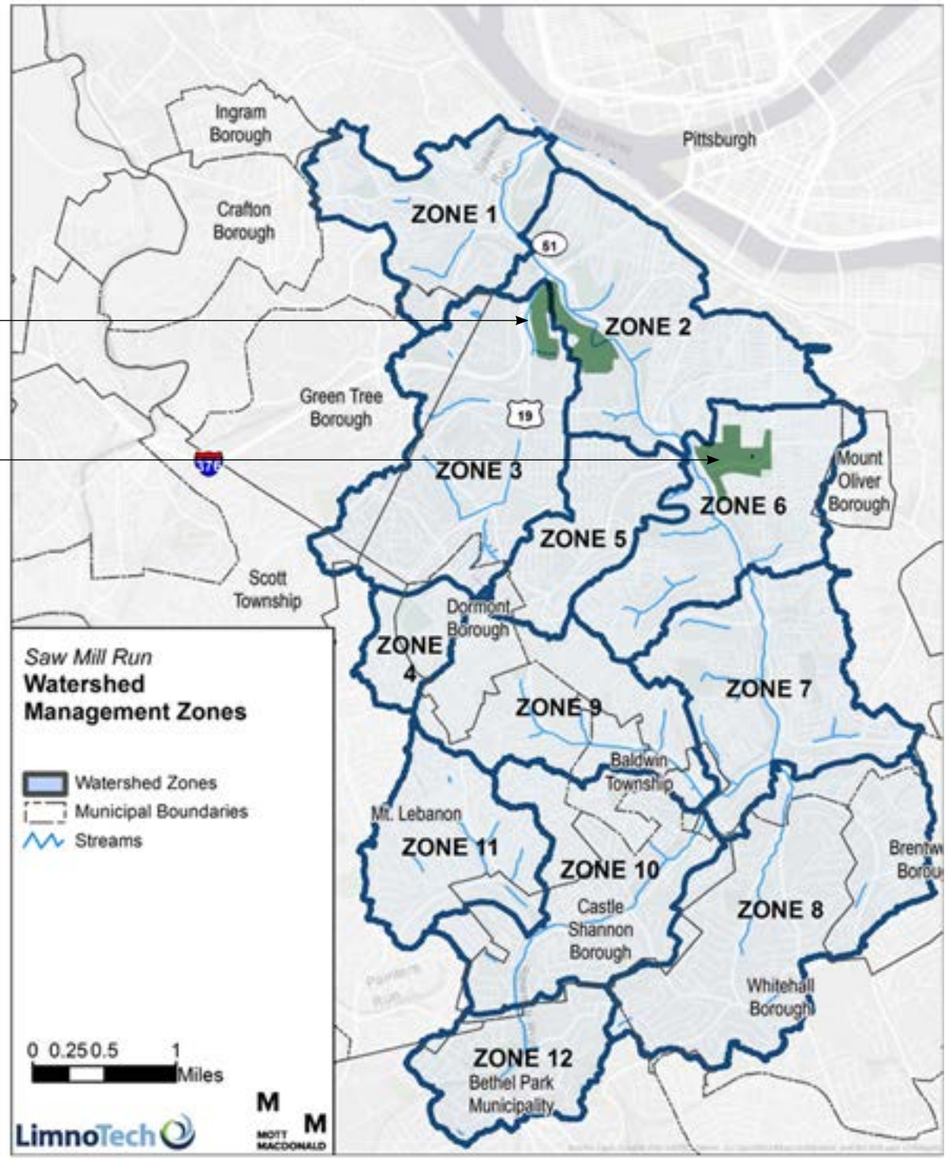
✓ **Strong intersection of 4 lenses**	*Saw Mill Run nexus with highly visible flooding adjacent to Beltzhoover, Knoxville and Beechview; ranked highest among park investments based on environmental justice*
✓ **Measurable performance with modest investment**	*Large water volumes managed within public lands*
✓ **Alignment with plans and advocacy**	*Alignment with Watersheds of South Pittsburgh / Saw Mill Run plans, Parks Conservancy plans and City Parks acquisition of Seldom Seen*
✓ **Value proposition of People, Place, Planet and Performance.**	*Example of large-scale ecological corridor restoration with Seldom Seen as a charismatic gem*
✓ **Future investment catalyst/ multiplying impact**	*Visualization of upstream / downstream cooperation + integration of transit and greenways can stimulate wider action.*

Watersheds of South Pittsburgh/ Saw Mill Run IWMP

Seldom Seen
130 acres

McKinley Park
79 acres

Figure 9.1: SMR watershed management zones map



High priority zones for increased detention storage in implementation plan

Table 9.1: SMR watershed management zones

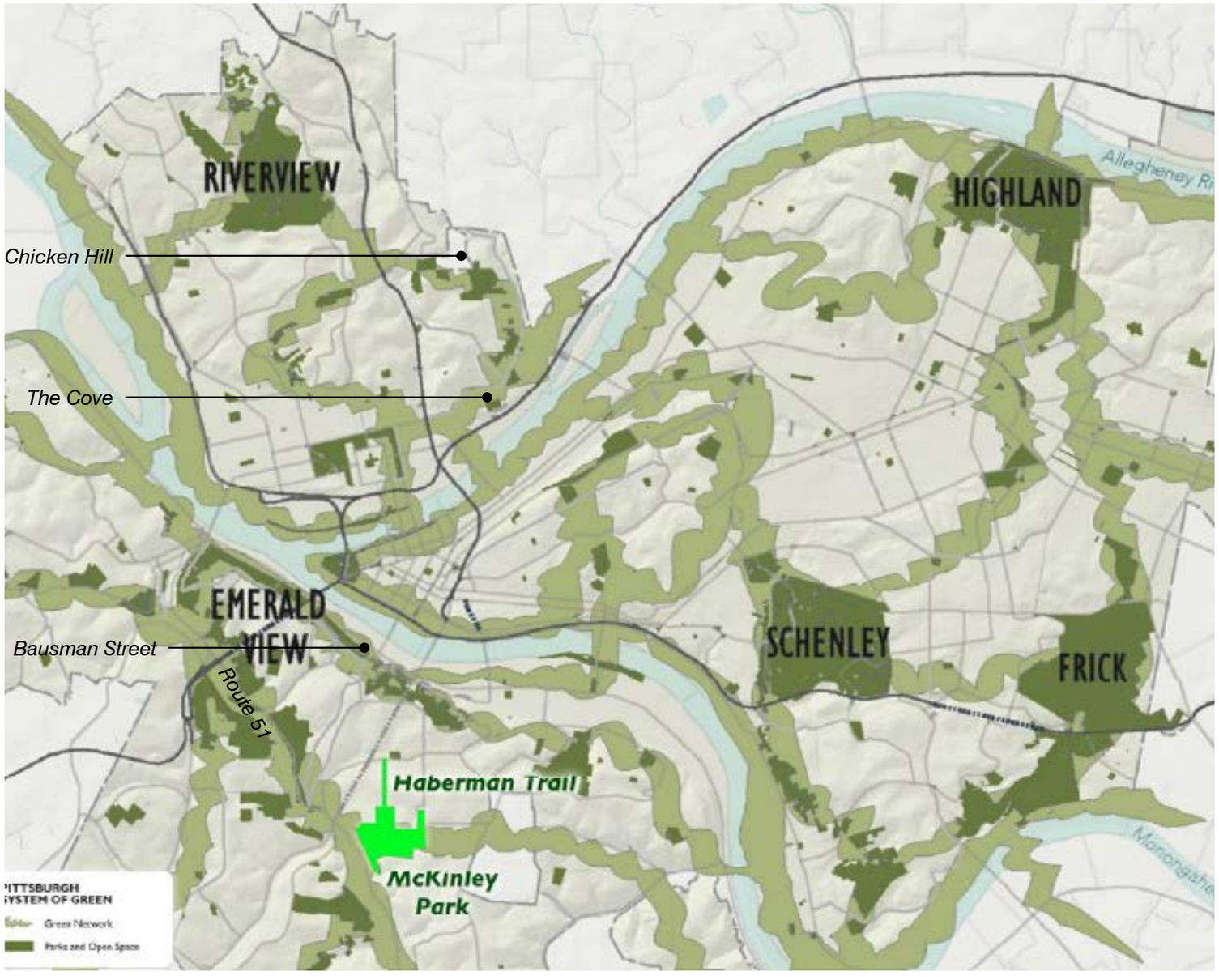
Watershed management zone	Description	Area (ac)	Percent of watershed area
1	West End/watershed outlet at the Ohio River	909	7%
2	Mt. Washington/Duquesne Heights	1,408	11%
3	Little SMR/Banksville Road	1,520	12%
4	Upper Banksville Road	295	2%
5	Plumbers Run/Liberty Avenue	609	5%
6	Brookline/Bon Air	1,109	9%
7	Overbrook/Carrick	1,190	10%
8	Weyman's Run	1,718	14%
9	McNeilly Run	1,066	9%
10	Castle Shannon SMR main stem	1,226	10%
11	Mt. Lebanon/Castle Shannon culvert tributary	787	6%
12	SMR headwaters	647	5%

Table 9.3: Target detention storage volumes in SMR watershed management zones

Zone	Total storage required upstream of zone outlet– 10-year storm peak flow limited to existing 5-Year peak flow (acre-feet) [Million Gallons]	Detention required within zone – 10-year storm (acre-feet) [Million Gallons]
1	131 [42.7]	0 [0]
2	142 [46.2]	18 [6]
3	14 [4.7]	10 [3.2]
4	5 [1.6]	5 [1.6]
5	11 [3.6]	11 [3.6]
6	98 [31.9]	14 [4.6]
7	84 [27.2]	23 [7.5]
8	23 [7.6]	23 [7.6]
9	7 [2.1]	7 [2.1]
10	31 [10]	7 [2.3]
11	12 [4]	12 [4]
12	12 [3.8]	12 [3.8]
Total		**142 [46.2]**

Source: Saw Mill Run - Integrated Watershed Management Plan Report. March 31, 2020.

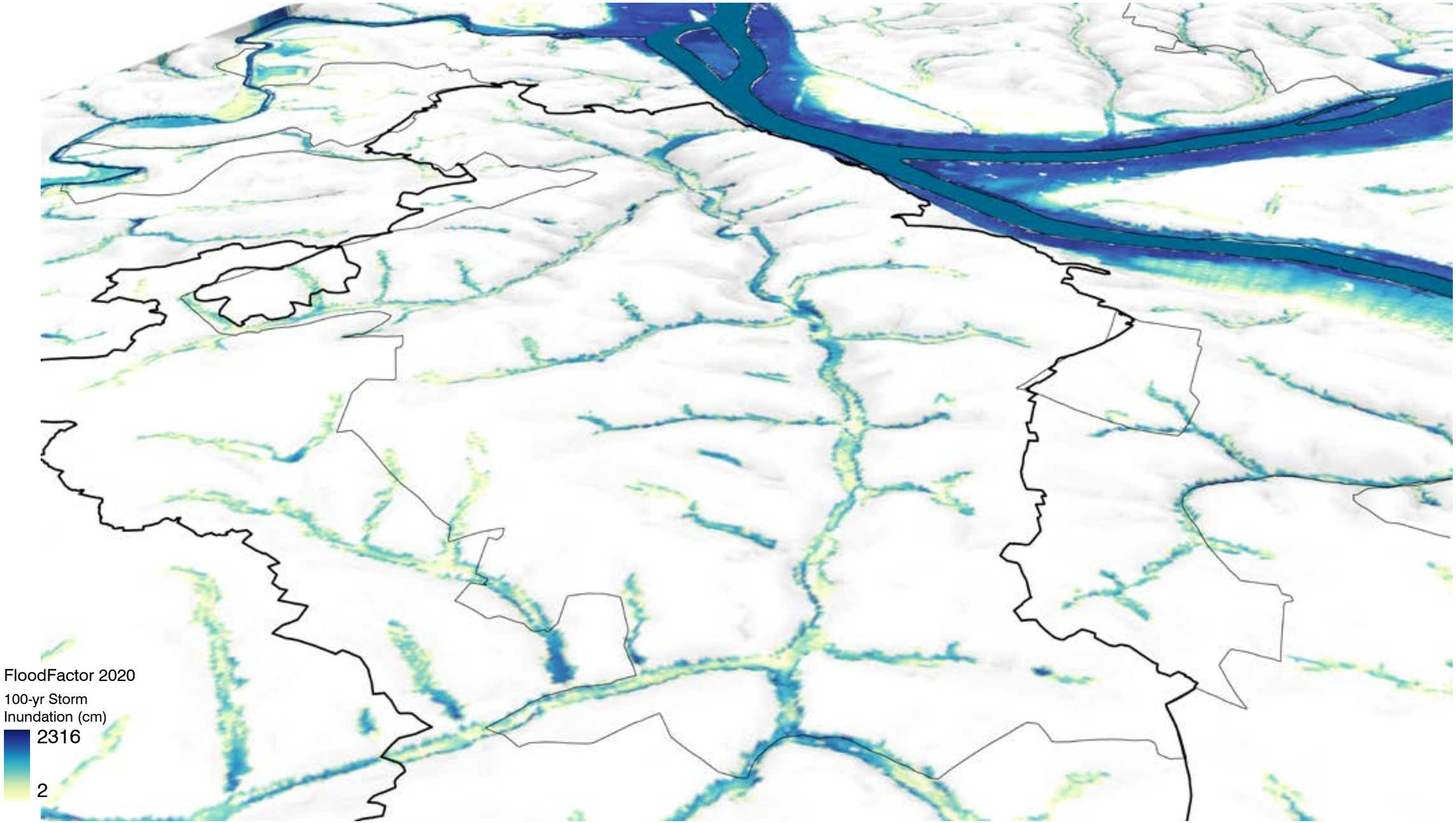
City's Greenways Plan (2017)



Opportunities from City's Greenways plan (2017):

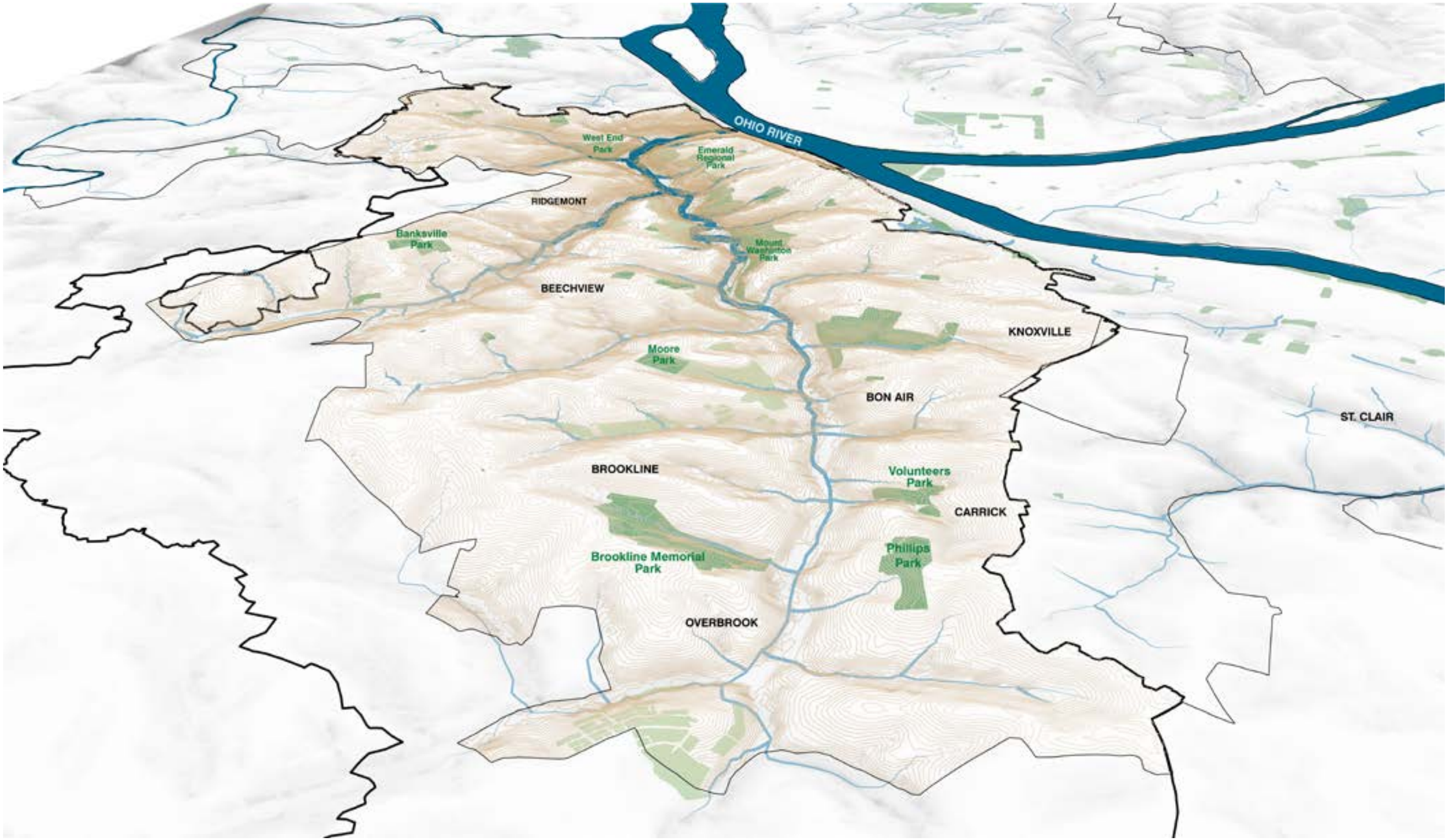
- Adjacent vacant hillsides, such as in Ridgemont, could be designated as part of Seldom Seen Greenway.
- A multi-modal mobility corridor through Seldom Seen could connect the greenway to regional trails and utilize a former railroad right-of-way to the West End.
- Stormwater management through watershed planning (with PWSA).

Saw Mill Run Watershed



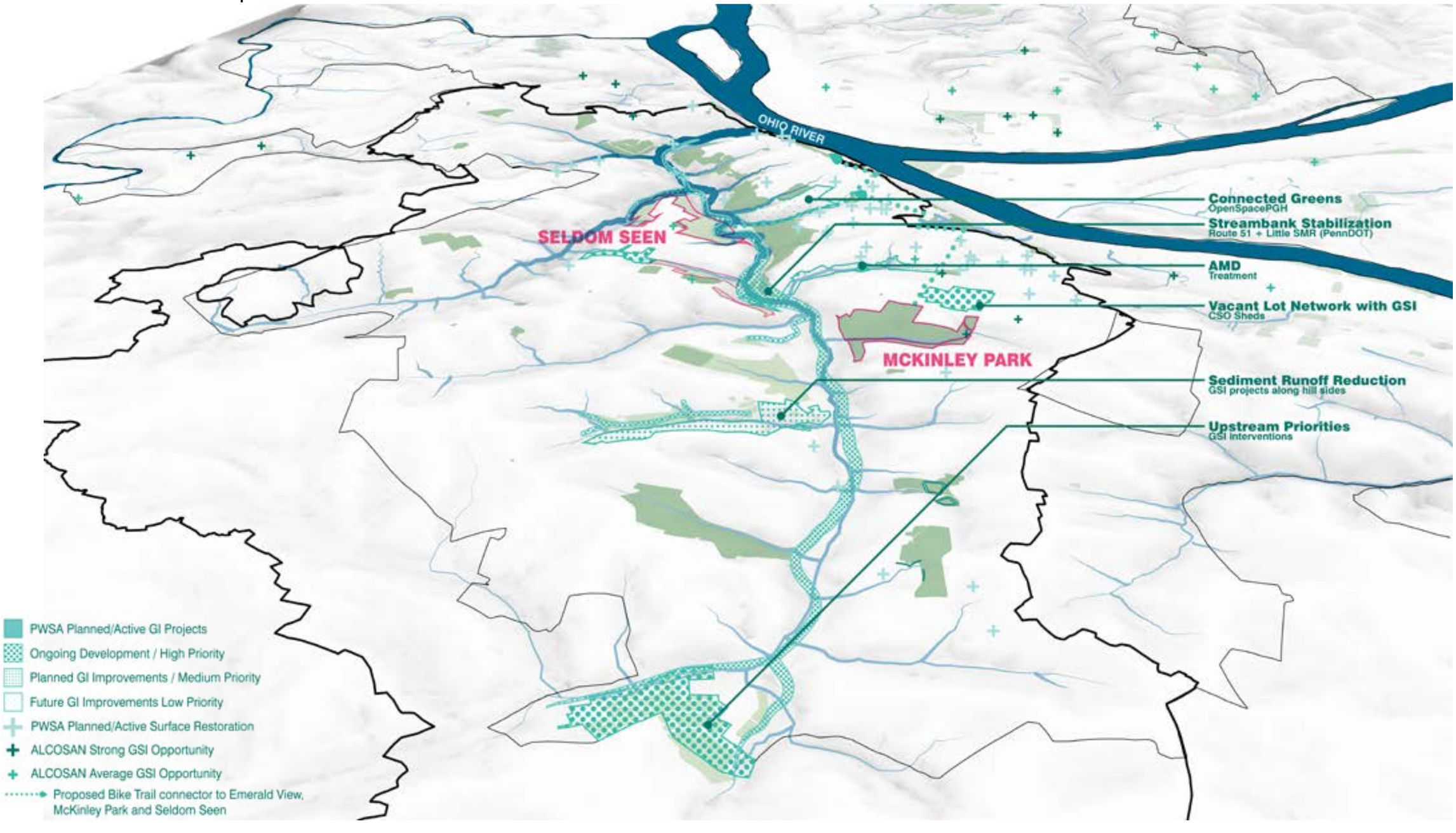
Saw Mill Run Watershed

10ft Contours + Parks + Historic/Buried Streams



Saw Mill Run Watershed

Watershed/GI Improvements



McKinley Park

McKinley Park Master Plan



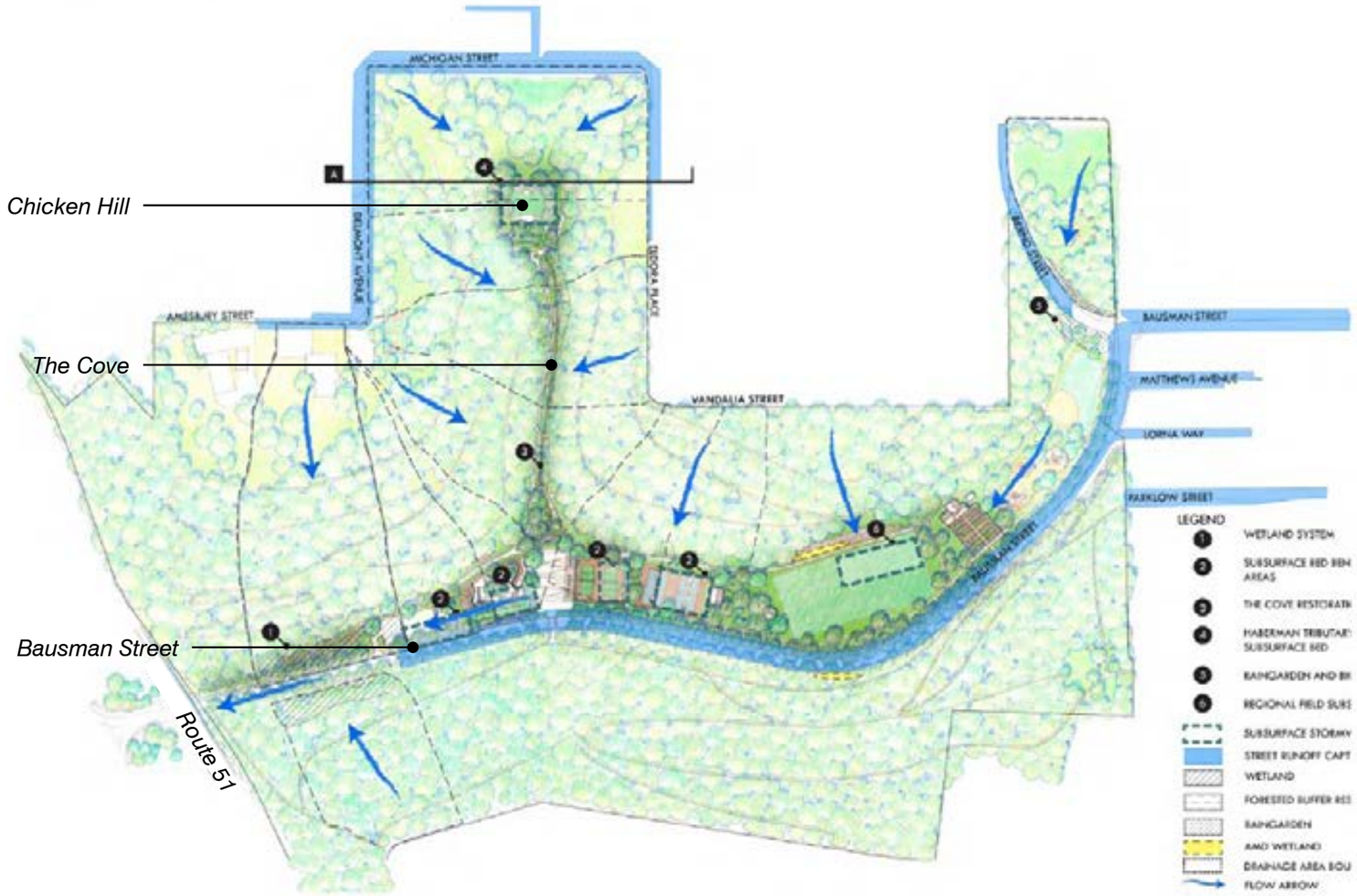
Goals:

- Improving connections to and within McKinley Park
- Using stormwater management as a catalyst to benefit the community and water quality in the Saw Mill Run watershed
- Improving recreation opportunities
- Improving neighborhood safety
- Spurring community and residential revitalization
- Remediating acid mine drainage

Master Plan Stormwater Calculations

Stormwater Management Practice	Drainage Area #	Total Drainage Area (ft^2)	Total Drainage Area (ac)	Percent Impervious %	SMP Footprint (ft^2)	Capture Volume (ft^3)	Capture Volume (gallons)
Sawmill Gateway Wetland System (A)	DA-1	271,907	6.2	5%	20,000	23,867	177,027
Sawmill Gateway Wetland System (B)	DA-2	130,796	3.0	0%	15,000	10,500	78,540
Proposed Parking Lot	DA-3	105,344	2.4	9%	9,000	8,640	64,627
Skate Park Expansion	DA-4	60,568	1.4	12%	3,500	4,900	36,652
Cove (3)	DA-5	177,413	4.1	3%	14,000	14,280	106,814
The Cove (2)	DA-6	164,617	3.8	4%	6,200	6,820	51,014
The Cove (1)	DA-7	142,654	3.3	0%	4,100	3,690	27,601
Haberman Ampitheater Subsurface Bed	DA-8	324,785	7.5	25%	21,500	25,800	192,984
Proposed Sport Courts	DA-9	107,164	2.5	7%	6,500	8,580	64,178
Proposed Basketball Courts	DA-10	89,549	2.1	14%	12,500	7,500	56,100
Bernd Street Park	DA-11	113,167	2.6	12%	6,000	8,400	62,832
Multipurpose Field Subsurface Bed	DA-12	110,286	2.5	100%	14,000	8,960	67,021
Bausman Green Street	DA-13	76,927	1.8	100%	8,000	6,400	47,872

McKinley Park Master Plan Stormwater Recommendations



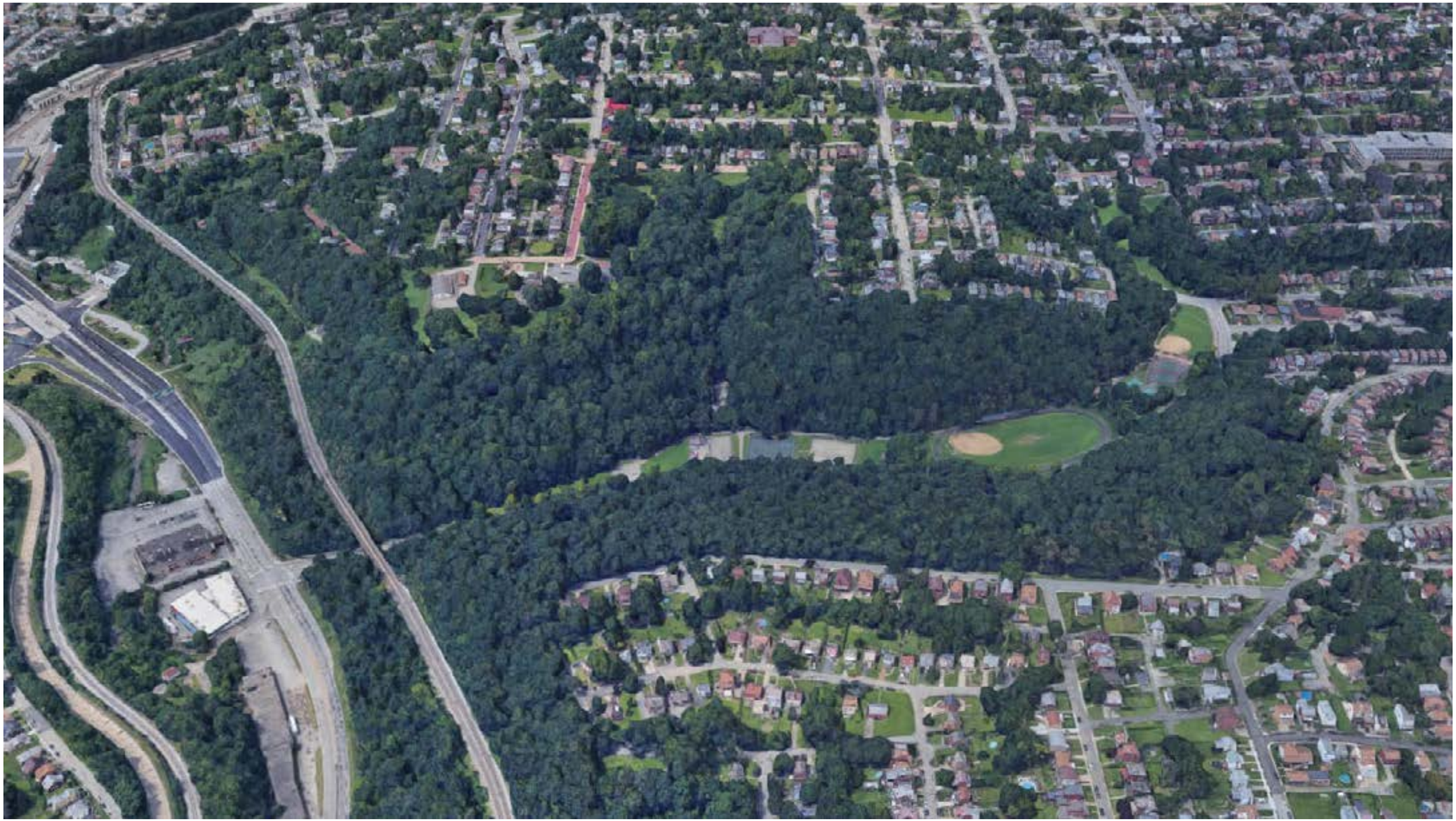
- Park maintenance and community clean-ups
- Erosion and sediment control measures
- Bioswales and raingardens
- Subsurface storage beds under new Chicken Hill Amphitheater and sports fields
- Retaining wall and acid mine drainage
- Greening Bausman Street
- Wetland system at intersection of Bausman Street and Route 51
- Slow-release step-pool system conveying water down the Cove toward Bausman Street

McKinley Park



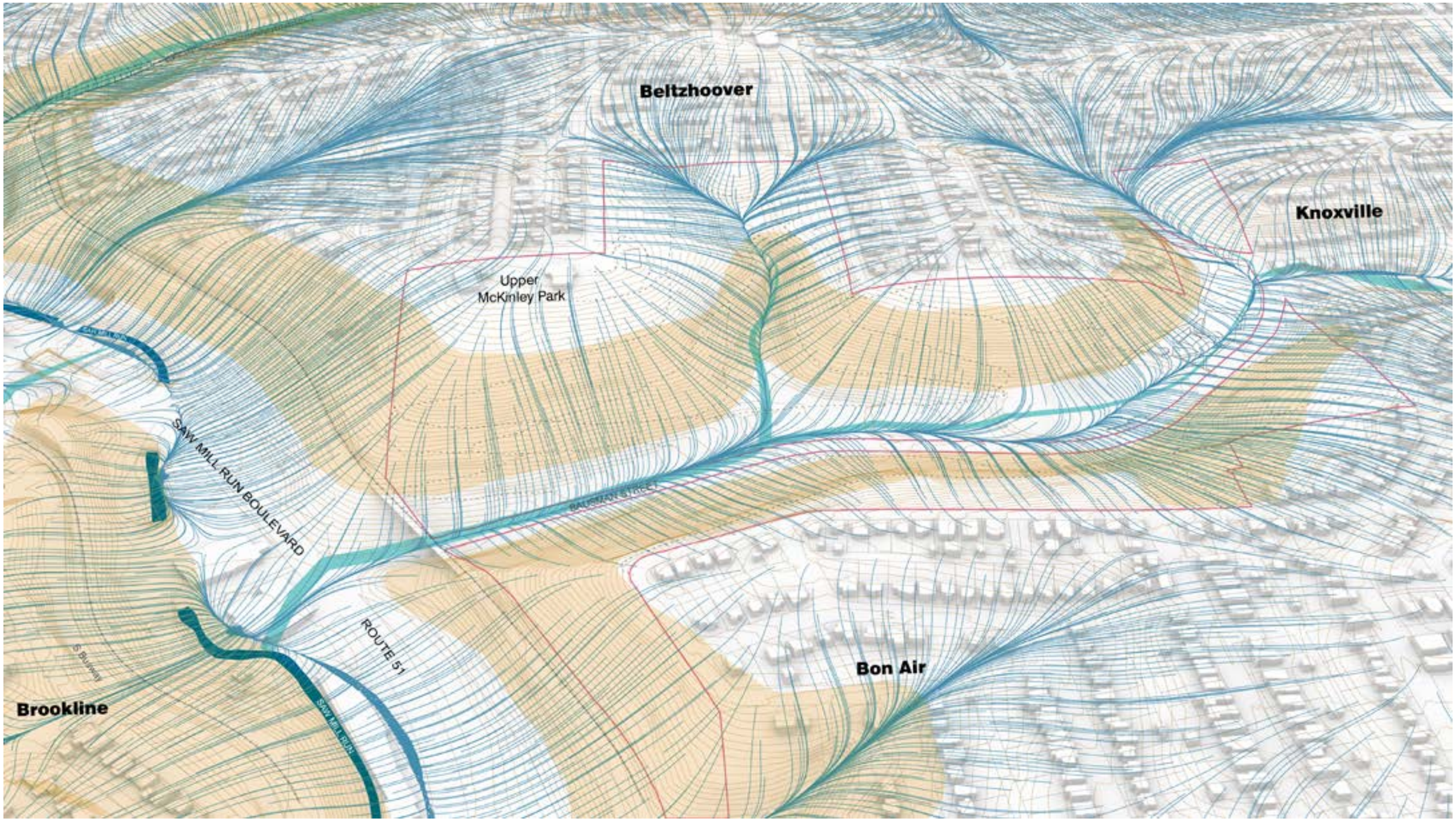
McKinley Park

Satellite View



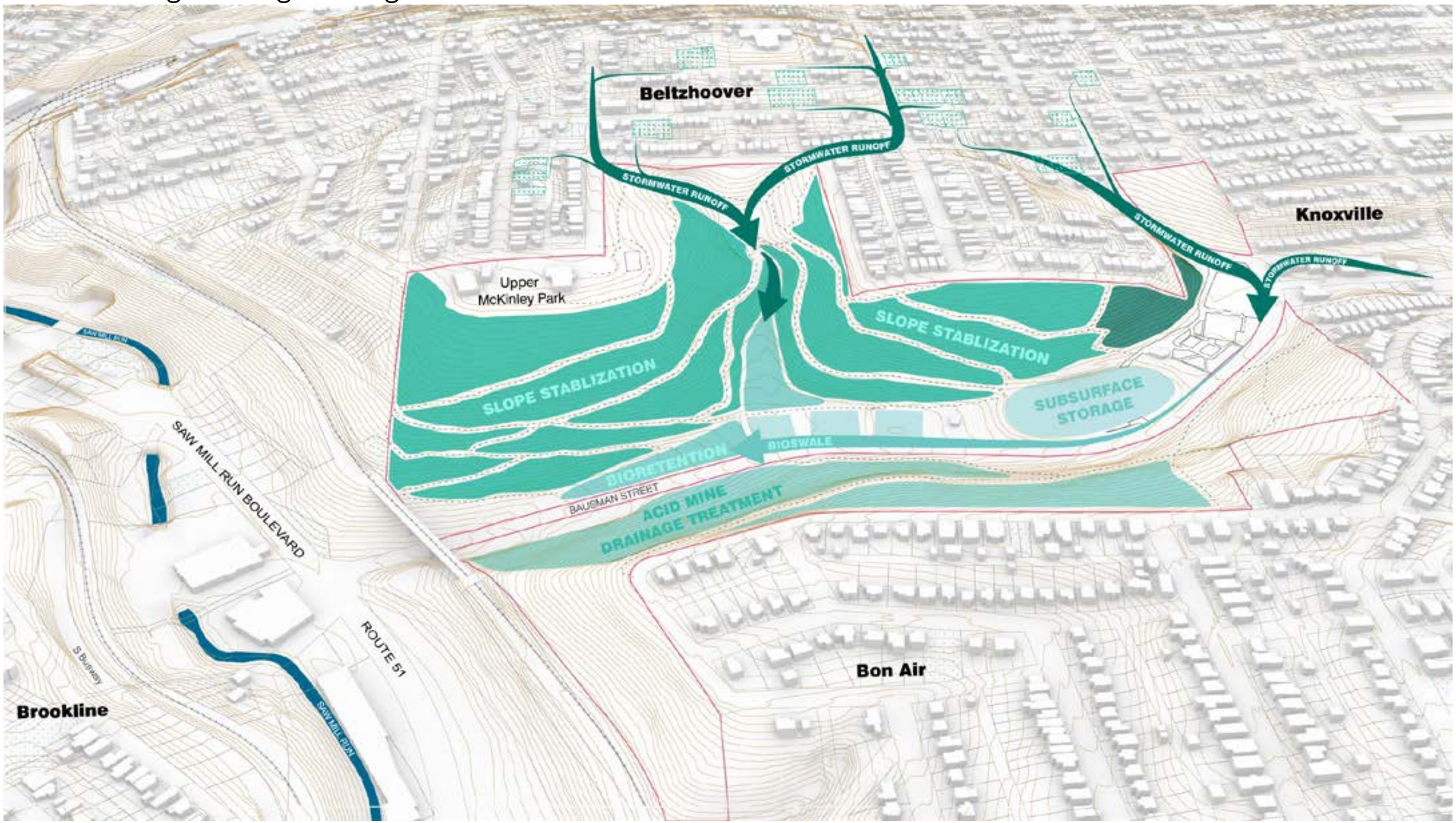
McKinley Park

Site Conditions: Buried Streams + Landslide Prone Areas + Stormwater Runoff



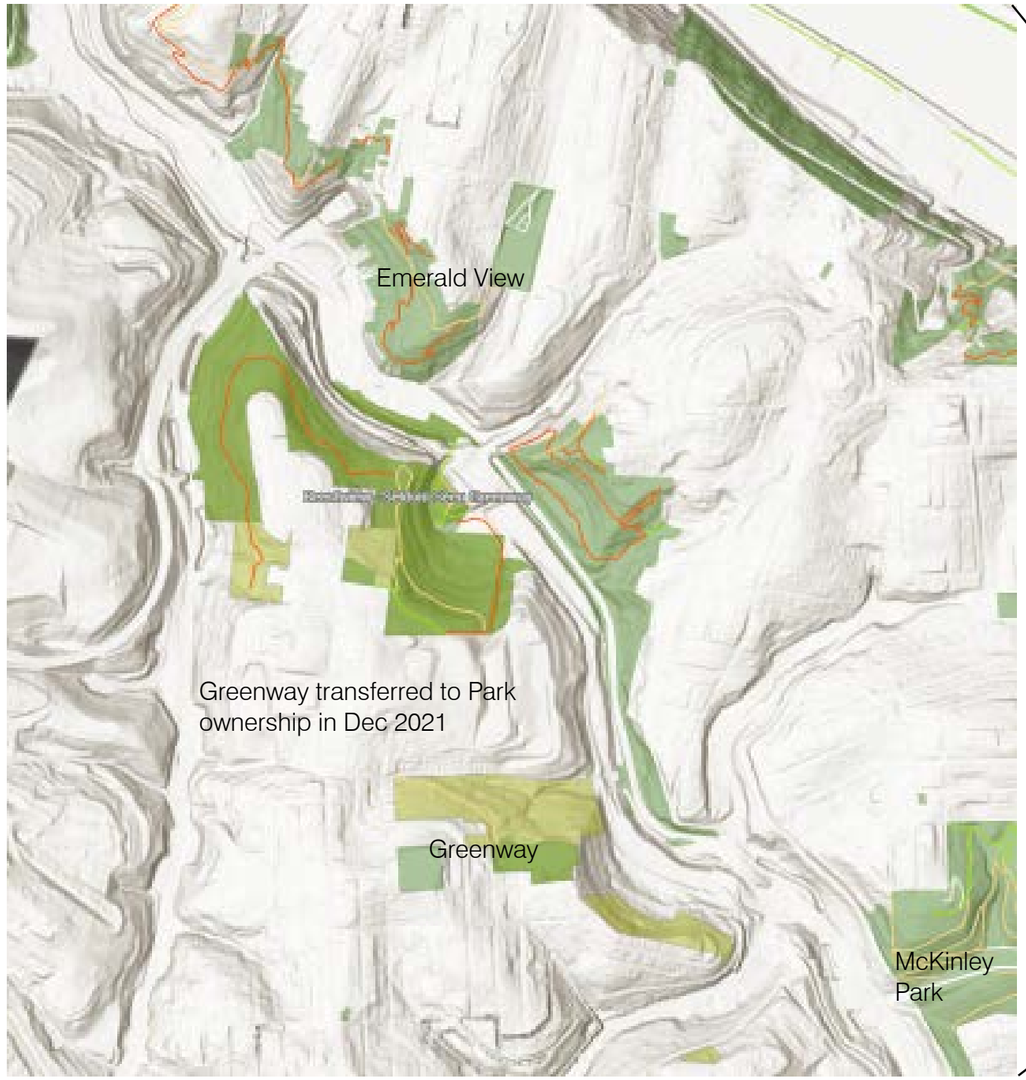
McKinley Park

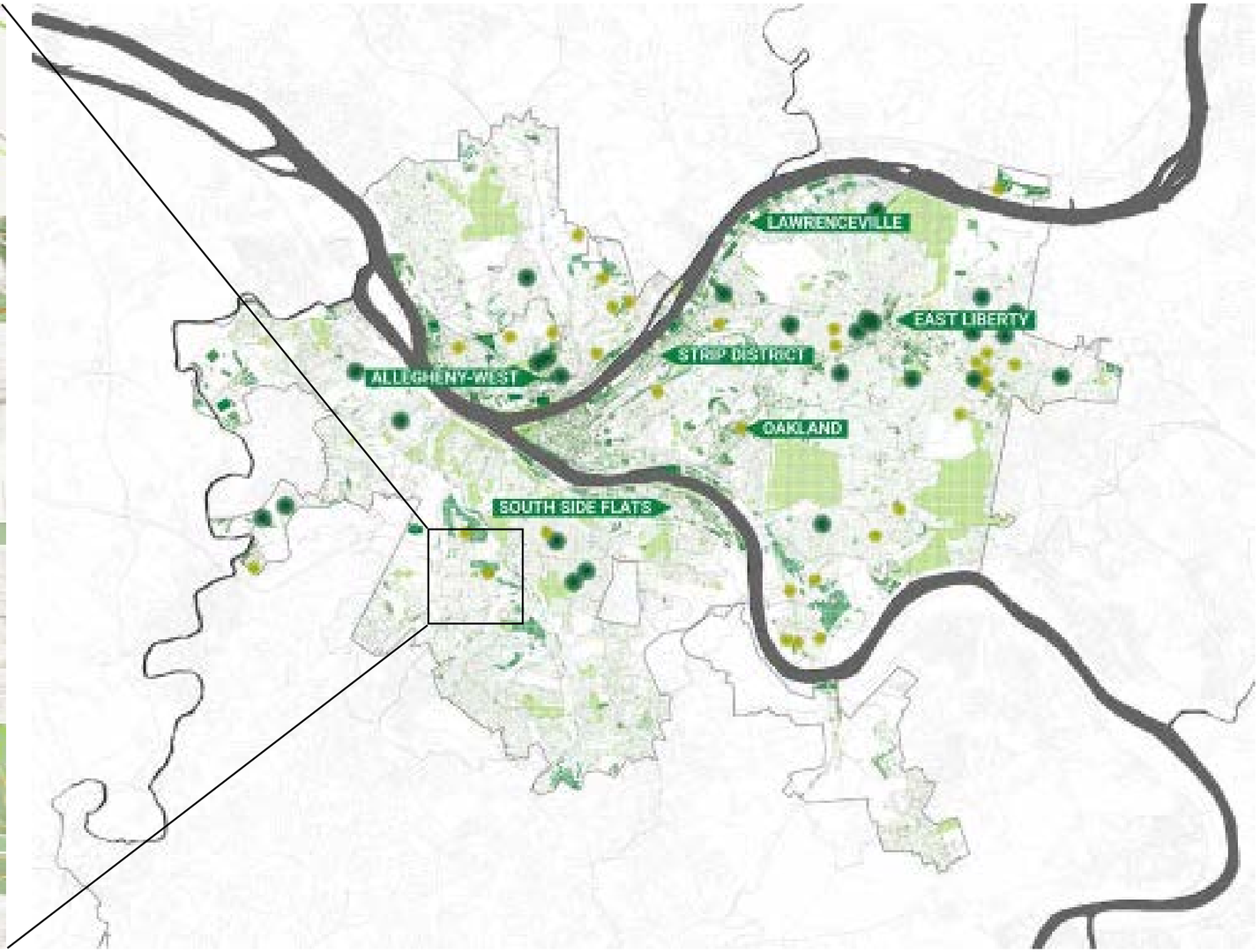
Potential Engineering Strategies



Seldom Seen Park

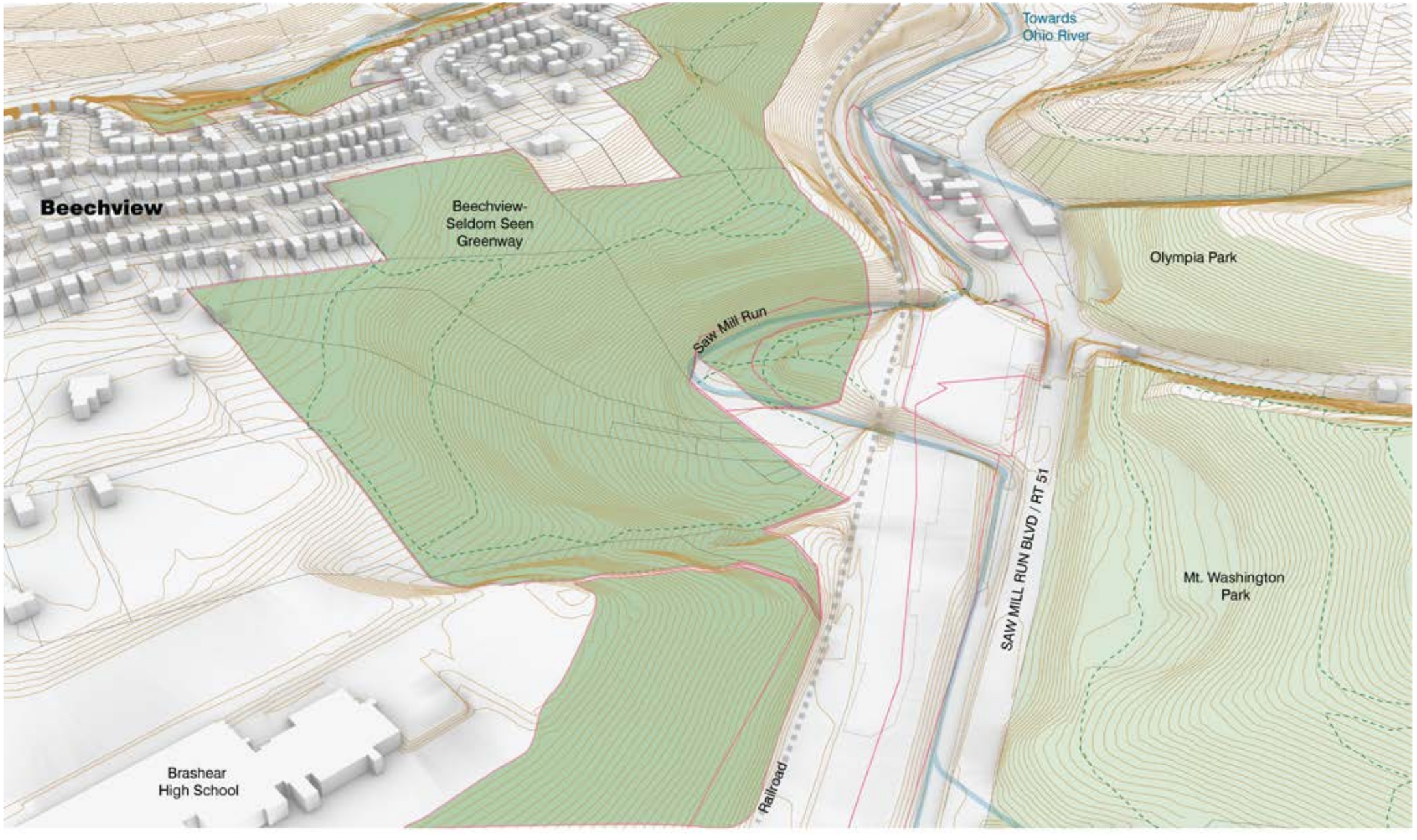
McKinley Park + Linkage to Seldom Seen Greenway (now Park)





- Increasing floodplain storage, slope stabilization and treatment in these parks to reduce downstream flooding
- Potential for vacant lot assemblage and scaled GSI interventions in Knoxville and Beltzhoover
- Opportunities for coordinated GSI along upgraded transportation corridors

Seldom Seen


Towards
Ohio River
Beechview
Beechview-
Seldom Seen
Greenway
Saw Mill Run
Olympia Park
SAW MILL RUN BLVD / RT 51
Mt. Washington
Park
Railroad
Brashear
High School

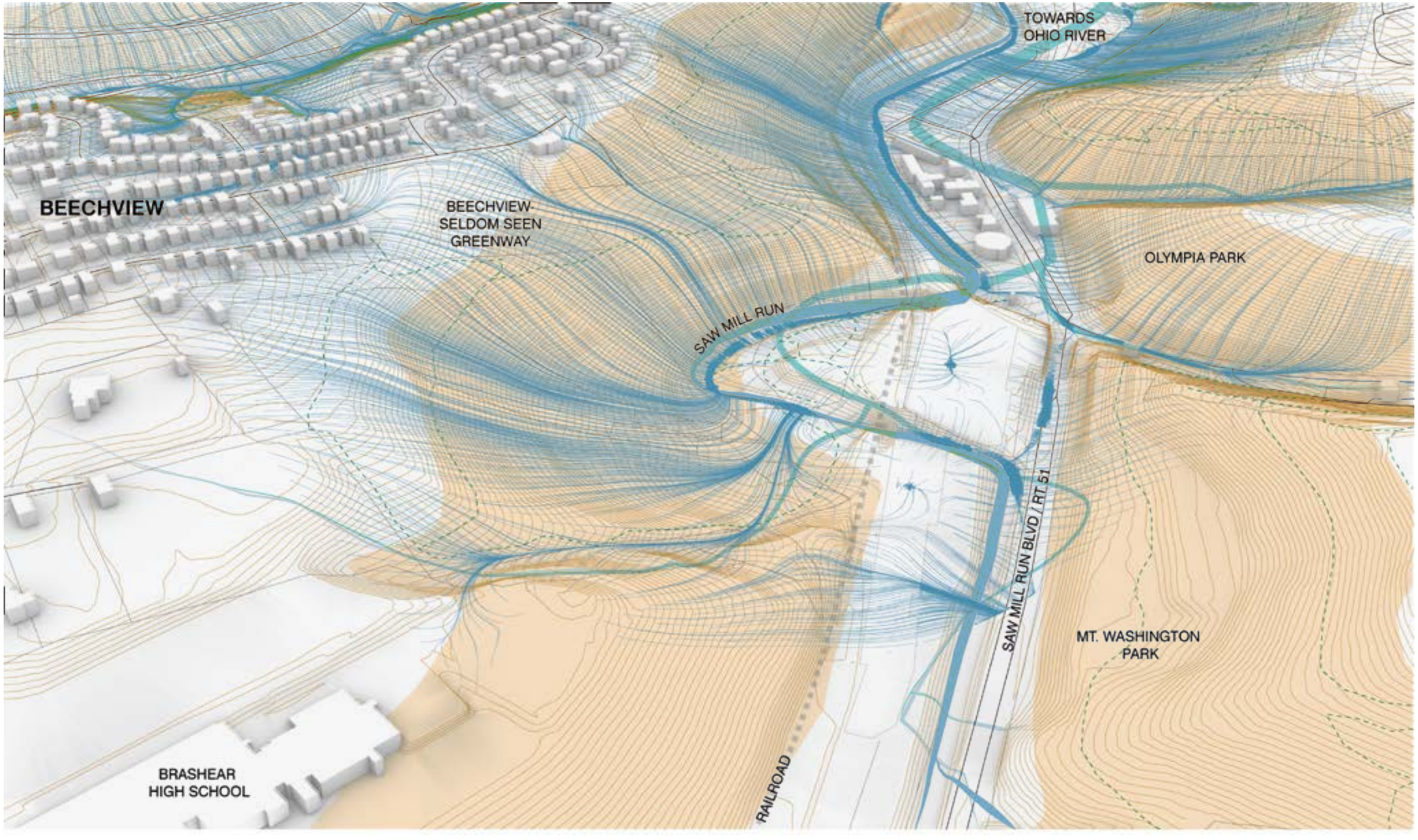
Seldom Seen

Satellite View



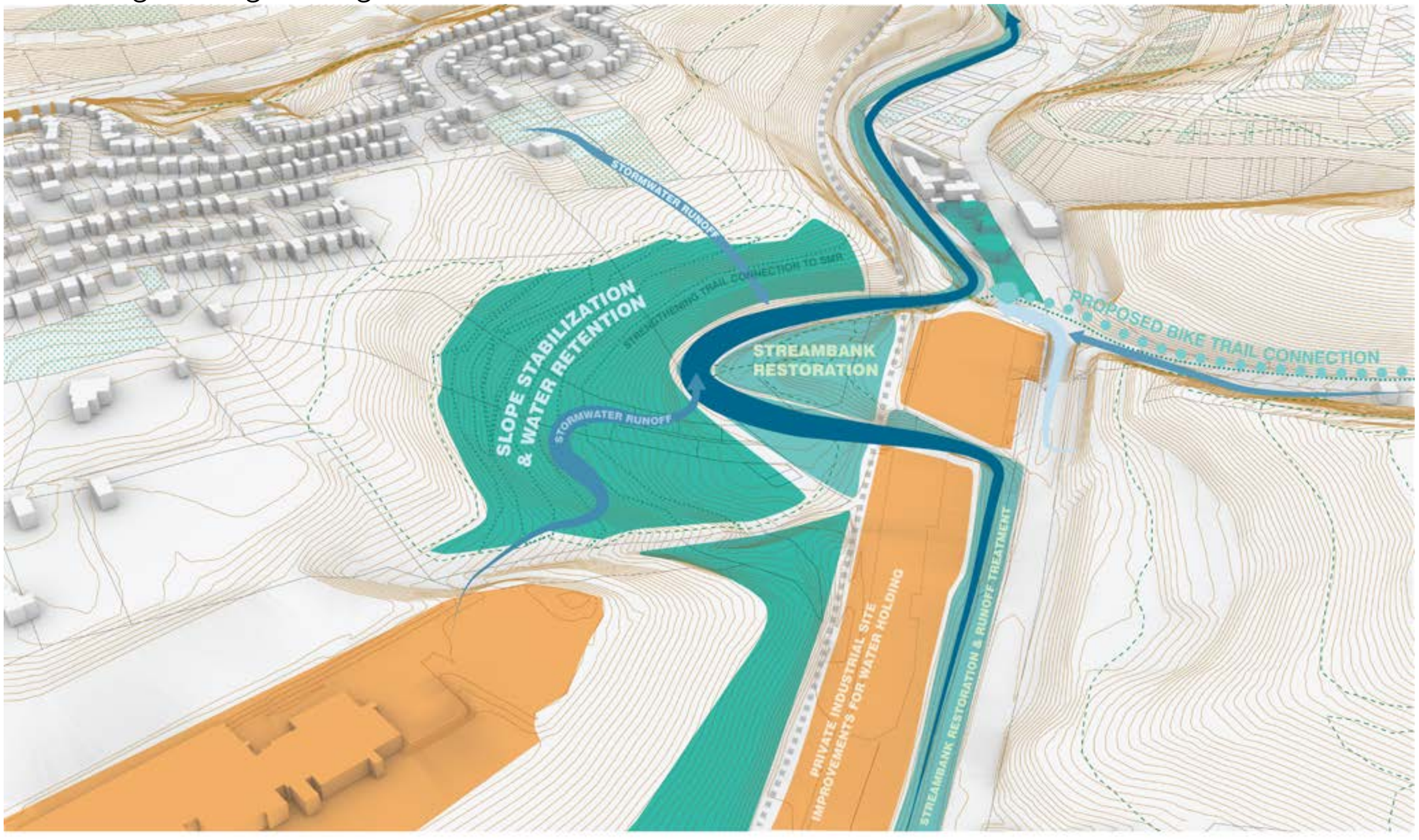
Seldom Seen

Site Conditions: Buried Streams + Landslide Prone Areas + Stormwater Runoff



Seldom Seen

Potential Engineering Strategies



What would you like to see happen at McKinley Park and Seldom Seen?

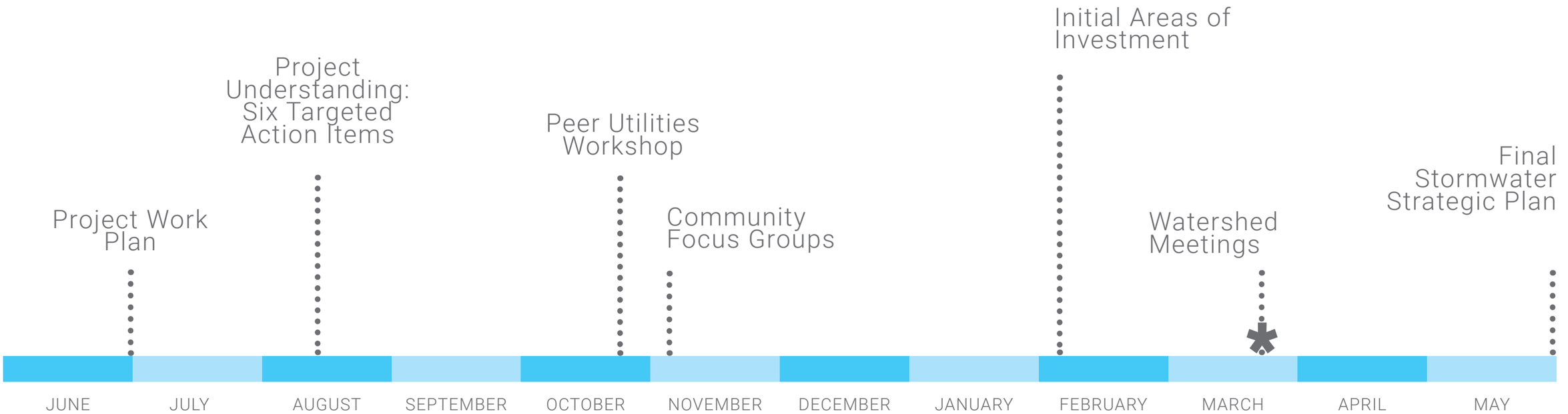
What should we know about past plans or current community visions for these places?

Do you think these are good places to create catalytic projects that integrate environmental justice, flood management, and green infrastructure to achieve performance and quality of life for people?

If not, are there other places and projects in Sawmill you want to tell us about?

Next Steps

PROJECT TIMELINE



Development of Targeted Action Items

Community Ambassador Program

PWSA Next Steps

APPENDIX K

PITTSBURGH WATER AND SEWER AUTHORITY (PWSA) STRATEGIC PLAN FOR STORMWATER









Ambassador Cohort 2 Meeting

May 9, 2022

PITTSBURGH WATER AND SEWER AUTHORITY (PWSA) STRATEGIC PLANNING TEAM

PennPraxis + The Water Center at Penn
water systems analysis and planning, policy and partnership design, communication

AKRF Inc.
engineering and technical engagement

Grounded Strategies stakeholder engagement

Heather Sage local policy communication

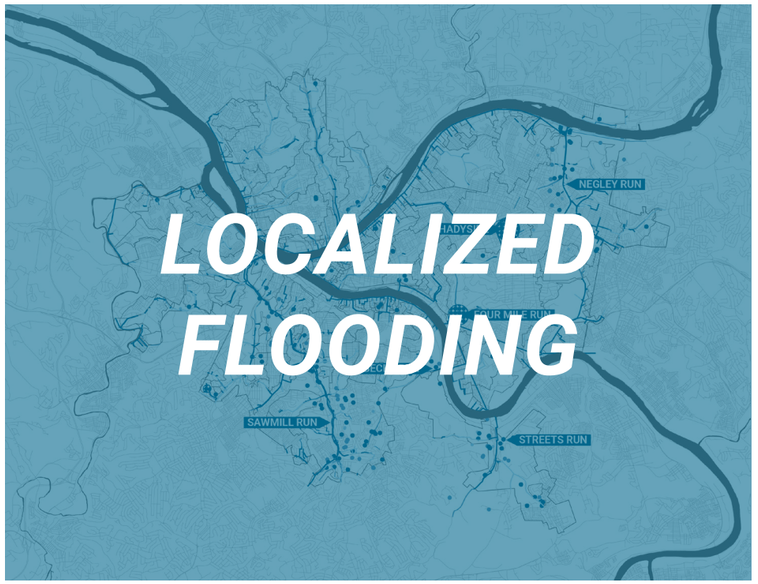
Moonshot Missions water economics and equity strategies

Andropogon Associates land use planning and design

CMU Center for Engineering & Resilience for Climate Adaptation
local climate change modeling and resilience planning

Why This Plan Now?



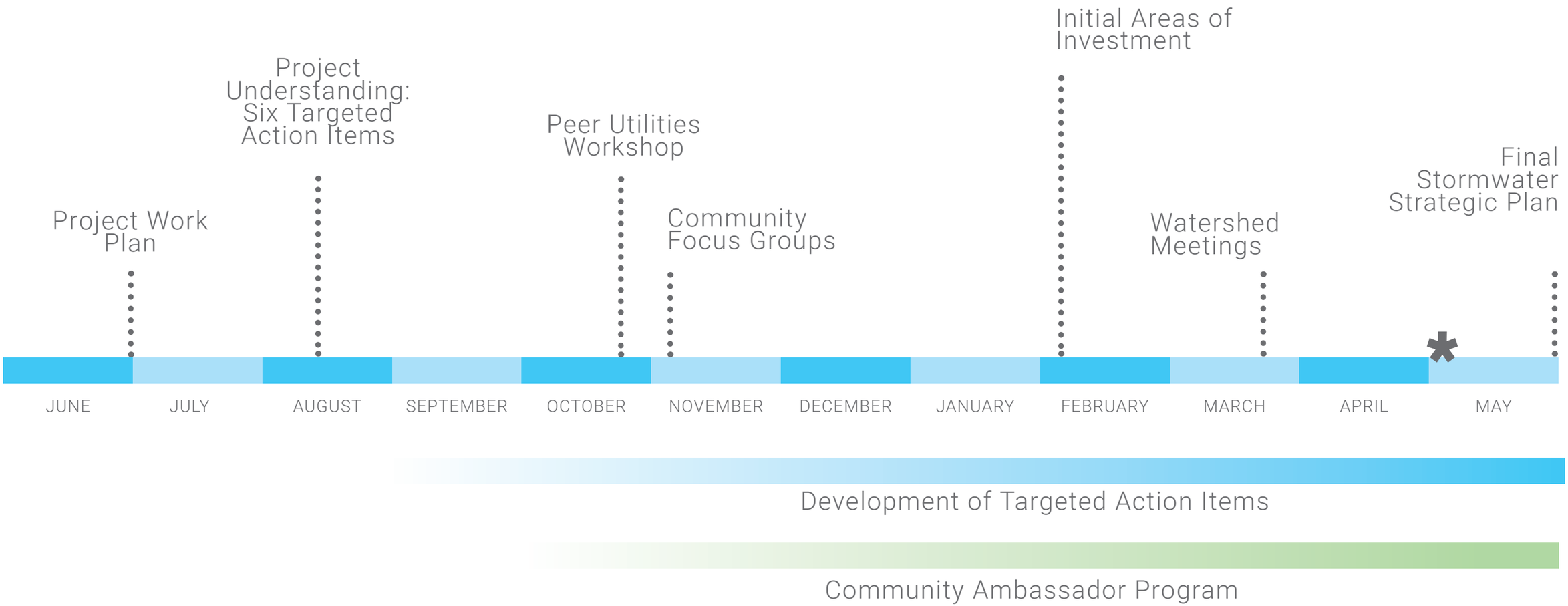






- Green First focused only on green infrastructure planning to improve water quality because the county's stormwater plan (still in development at the time) was going to concentrate on "gray" infrastructure upgrades--on pipes and tunnels.
- The county water authority (called ALCOSAN) has now finalized a plan for the construction of tunnels which will significantly reduce sewage overflow into the rivers when it rains. The plan will be implemented over the next ten years.
- This means the Pittsburgh Water and Sewer Authority (PWSA) can expand its focus to include residents' and businesses' concerns about flooding and basement backups, and consider equity and environmental justice in setting priorities for water investment.

PROJECT TIMELINE



TOP SIX PRIORITY ACTIONS

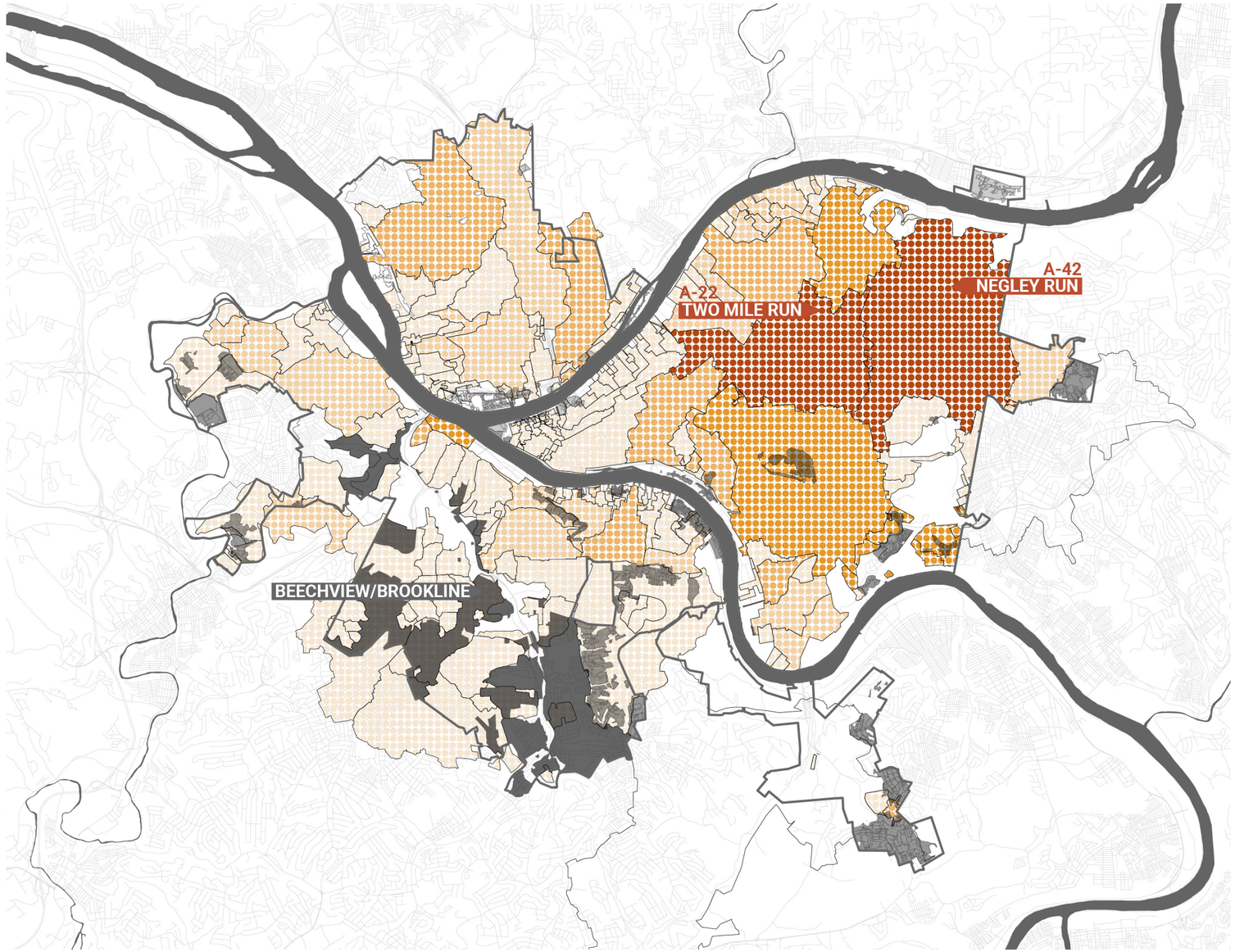
1. Analyze Priority Areas of Investment
2. Define Initial Investment Strategy & Illustrate It In a Few Places
3. Leverage Stormwater Fee Impact
4. Establish Guiding Principles to Level of Service & Flooding
5. Develop a Communication Framework to Increase Transparency
6. Develop a Framework for a Joint Task Force on Stormwater

1 Analyze Priority Areas for Investment

We will map many kinds of data to identify areas in the city where investment could have a major impact on local flooding and create community benefits.

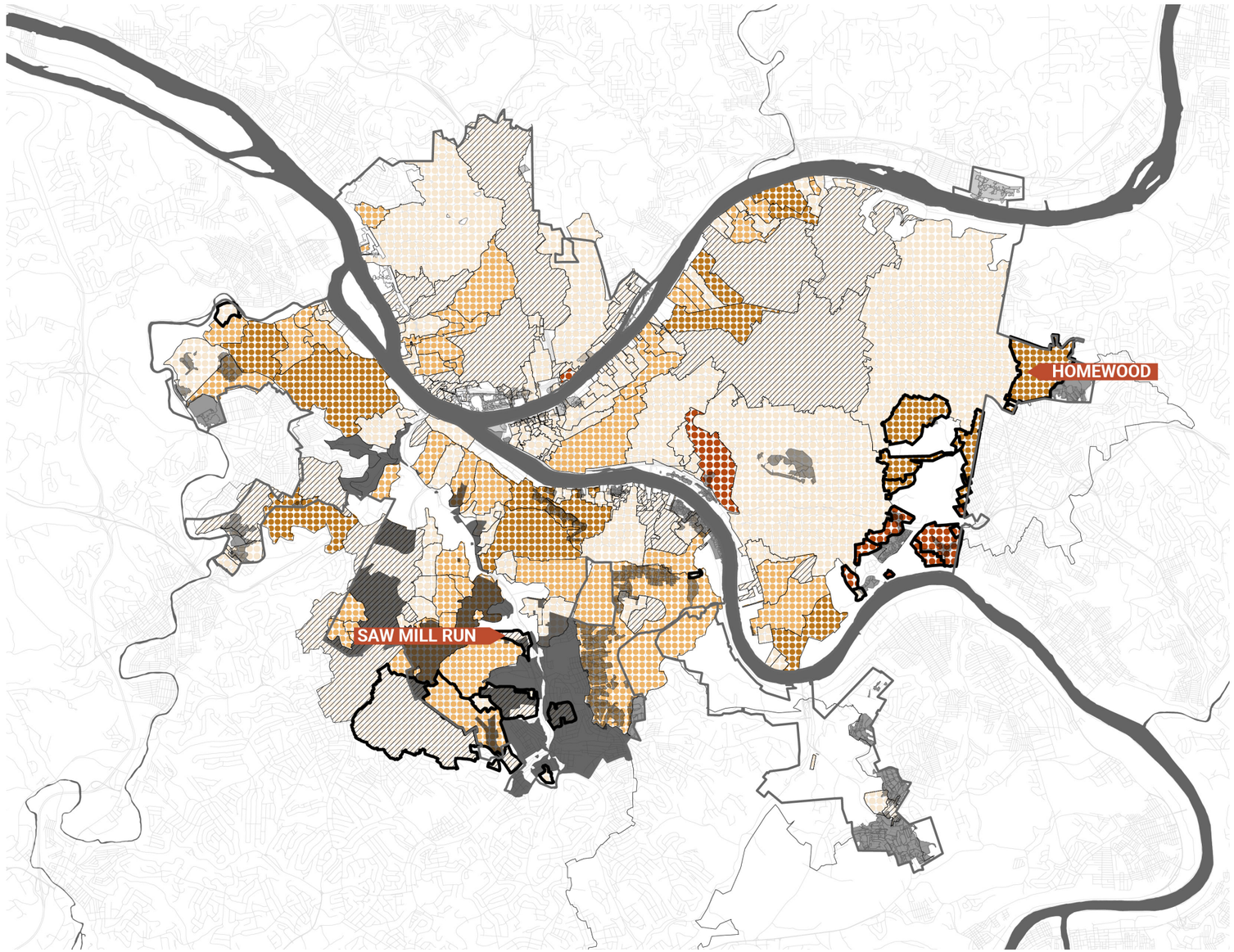
- Prioritize more kinds of water management, not only water quality and sewer overflows
- Map local flooding impacts, basement backups, and environmental justice areas for water investment
- Study geographic priorities with input from PWSA and other stakeholders
- Review good work being done in other cities to prioritize investment to create more kinds of benefit

Water Quality: Current CSO Volumes

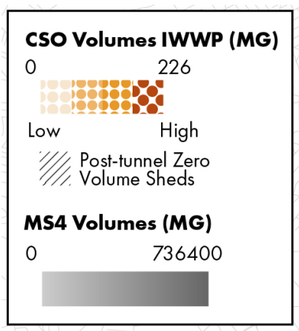


- Ongoing conversations with PWSA have provided updated information on CSO volumes
- Highest volumes are in Negley Run and Two Mile Run
- MS4 outfalls are shown to illustrate opportunities for intervention to meet MS4 compliance

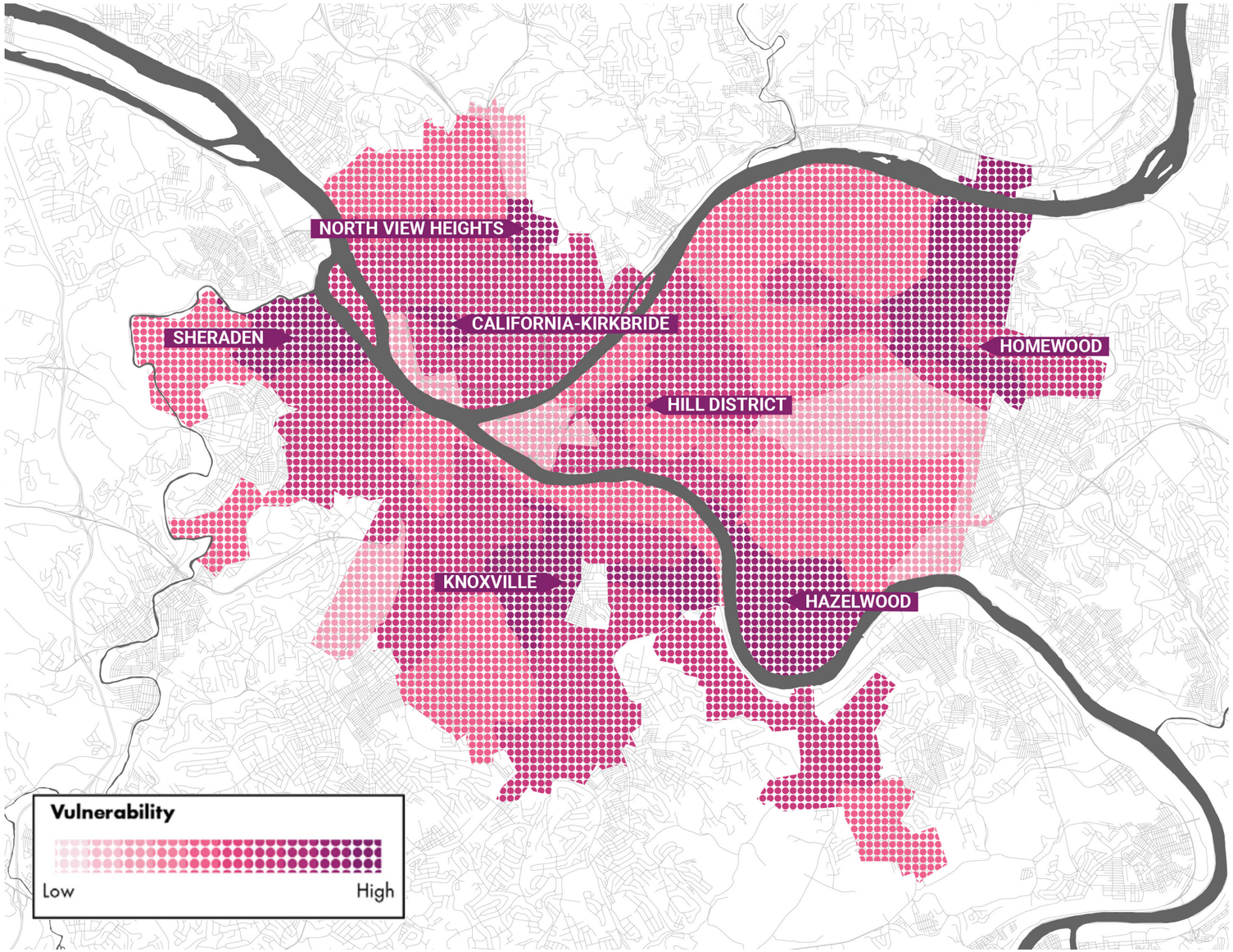
Water Quality: Post ALCOSAN Tunnel CSO Volumes



- Ongoing conversations with PWSA have provided updated information on outfall volume that will remain fully PWSA's responsibility. Those are highlighted here. Others are ongoing negotiation with ALCOSAN.
- The highest volume areas are found in Homewood/East Hills, Point Breeze/Regent Square/Squirrel Hill, and Beechview/Brookline in Saw Mill Run
- While volumes will be significantly reduced post-tunnel, there remain many opportunities for reduction in the near term



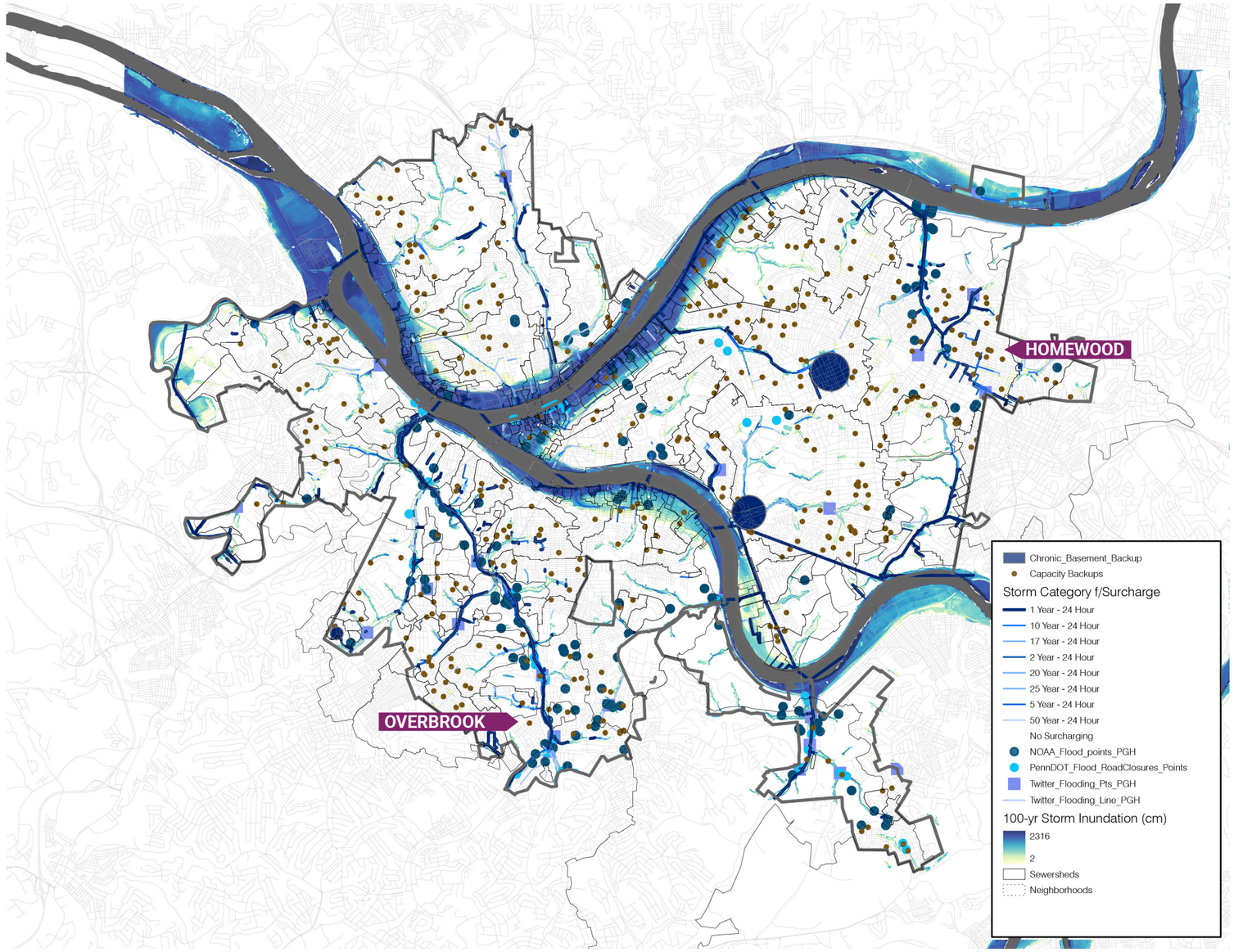
Environmental Justice: Allegheny County



- Updated to include Allegheny County Environmental Justice Index which includes:
  - Median Household Income
  - Diesel Particulate Matter
  - Particulate Matter ≤ 2.5 µm
  - Percent Minority
  - Proximity to Green Space
  - Educational Attainment
  - Miles of Railroad Track Coverage
  - Housing Vacancy

Source: Allegheny County Health Department, 2018.

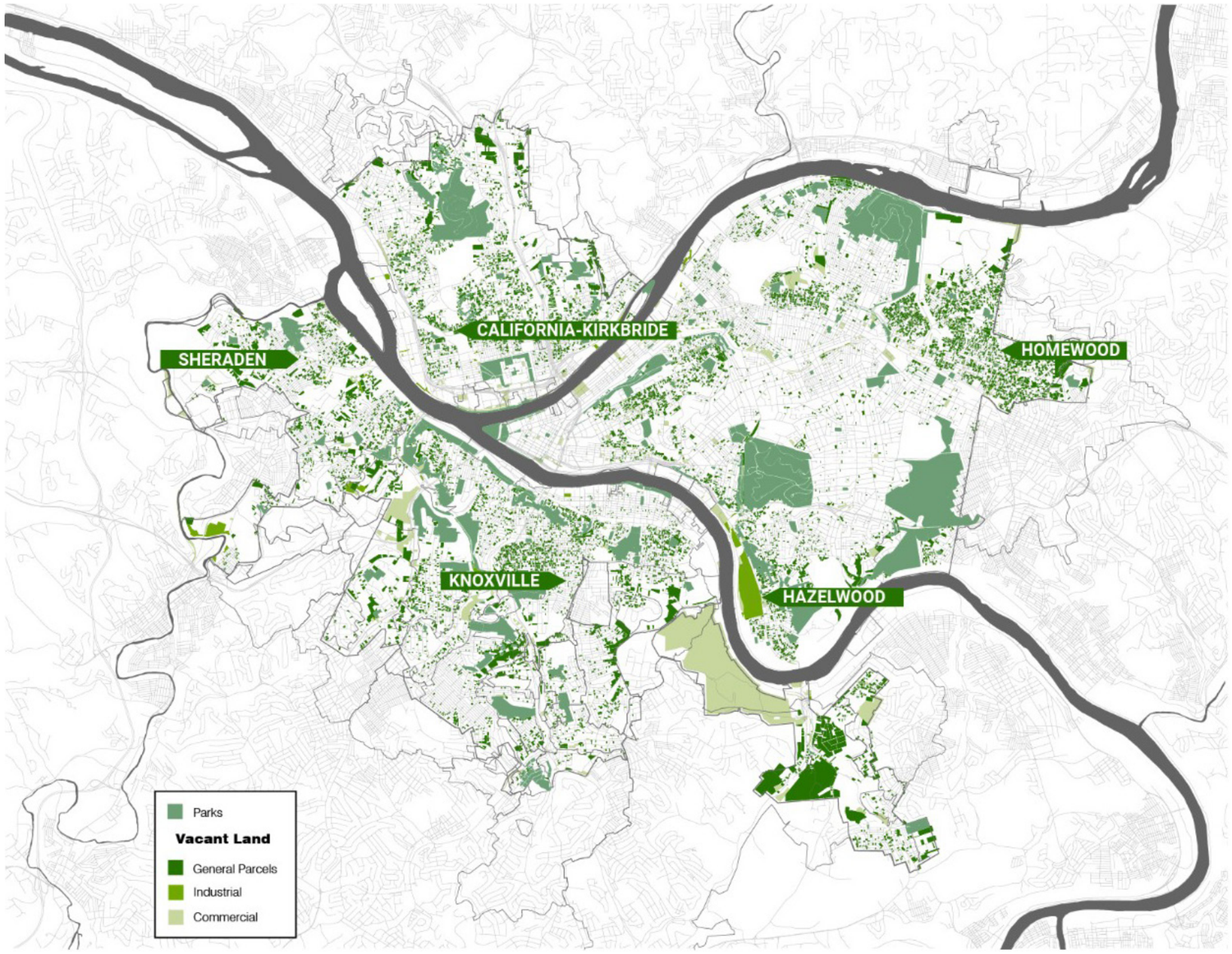
Local Flooding



- Flooding data updated to include First Street Foundation Flood Factor inundation forecast for 1-in-100 year storm event in 2100 climate conditions.
- PWSA investigated and confirmed capacity-related basement backup locations between 2020 and 2021.
- Other data includes:
  - PennDOT Road Closures
  - NOAA Storm Events Flood and Flash Floods
  - Allegheny County Twitter Feed

Source: First Street Foundation National Flood Risk Assessment, 2020.

Green Infrastructure Opportunity

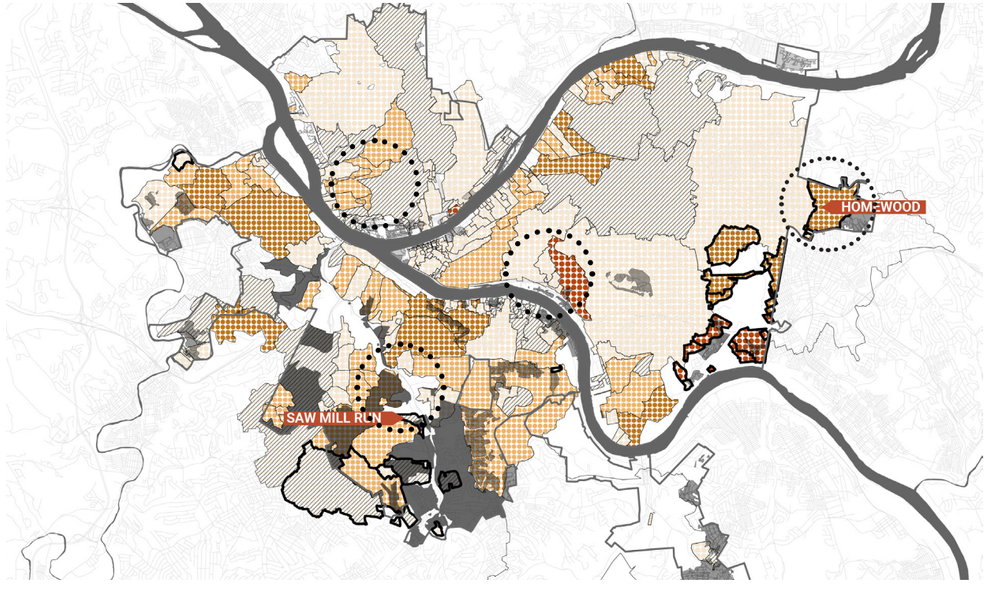


- Opportunities include known Parks + Greenways as of October 2021
- Vacant Parcels (general, industrial, commercial) added as opportunity areas since focus groups
- As of December 2021, six new parks to be transfered from Greenways for Pittsburgh Program to city ownership including: Bigelow, Fairhaven, Hazelwood, Knoxville Incline, Moore and Seldom Seen.

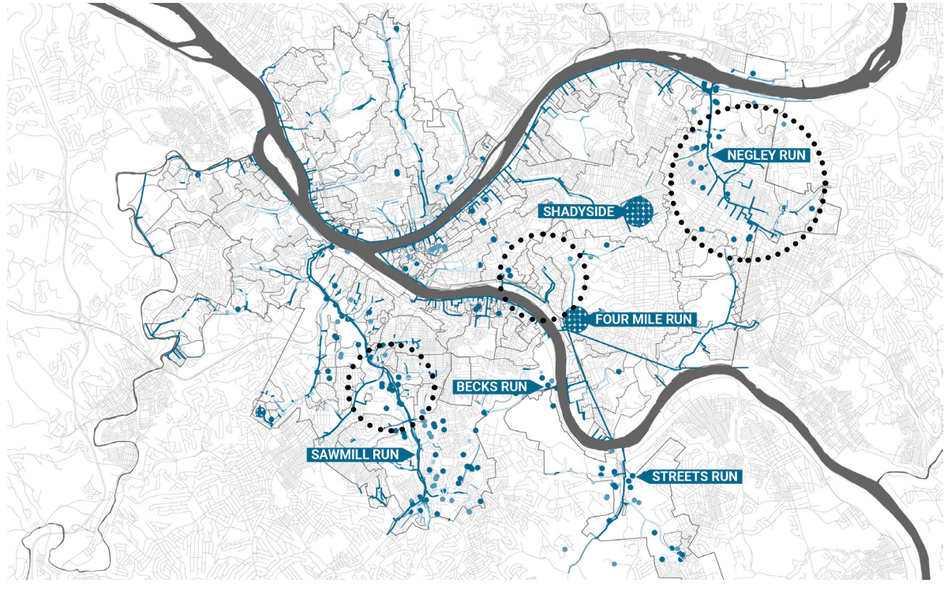
Source: Parcel Scale Cost Effectiveness and Siting Analysis - Micheal Blackhurst, University of Pittsburgh, and ALCOSAN Controlling the Source

Four Lenses

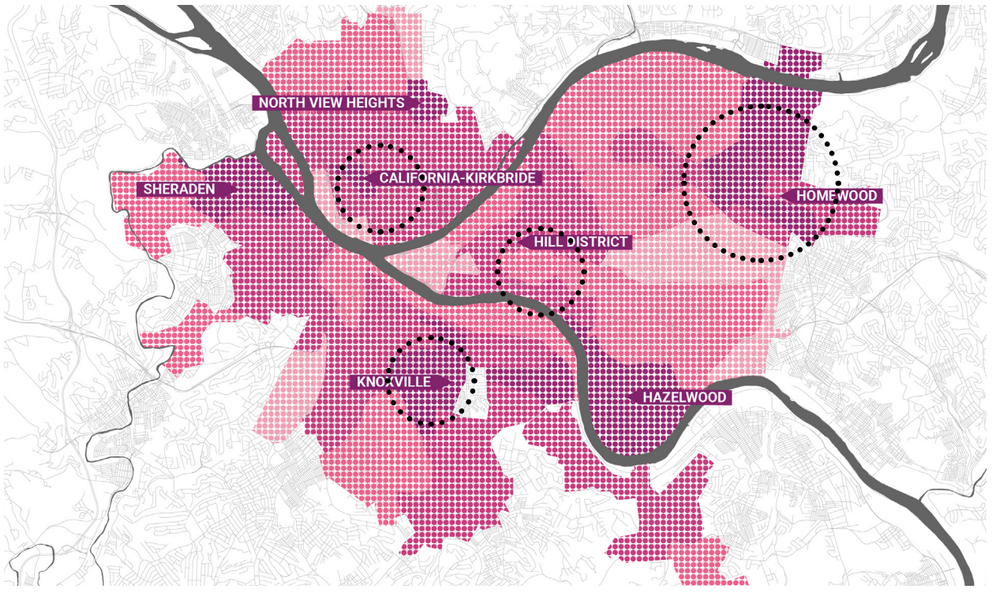
Water Quality



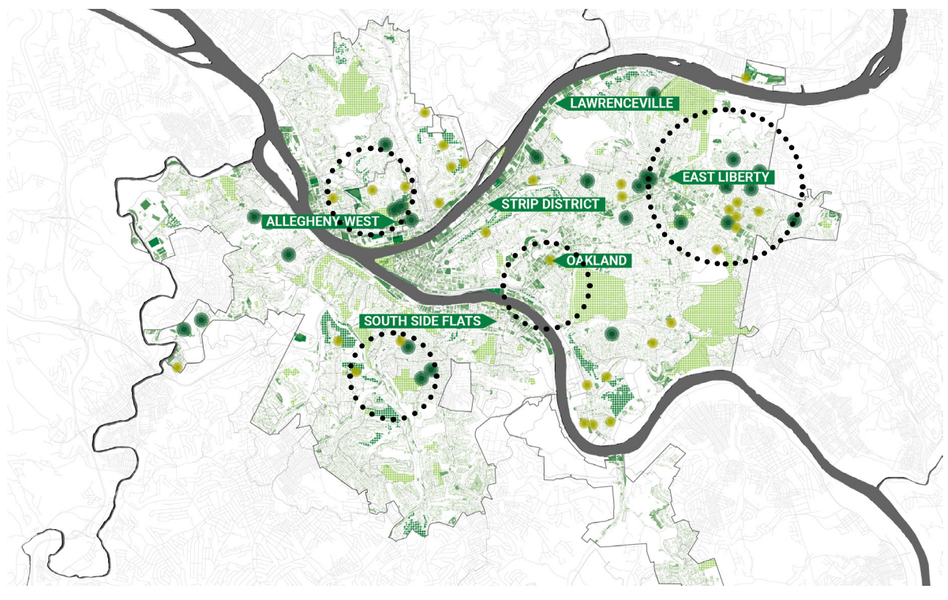
Localized Flooding



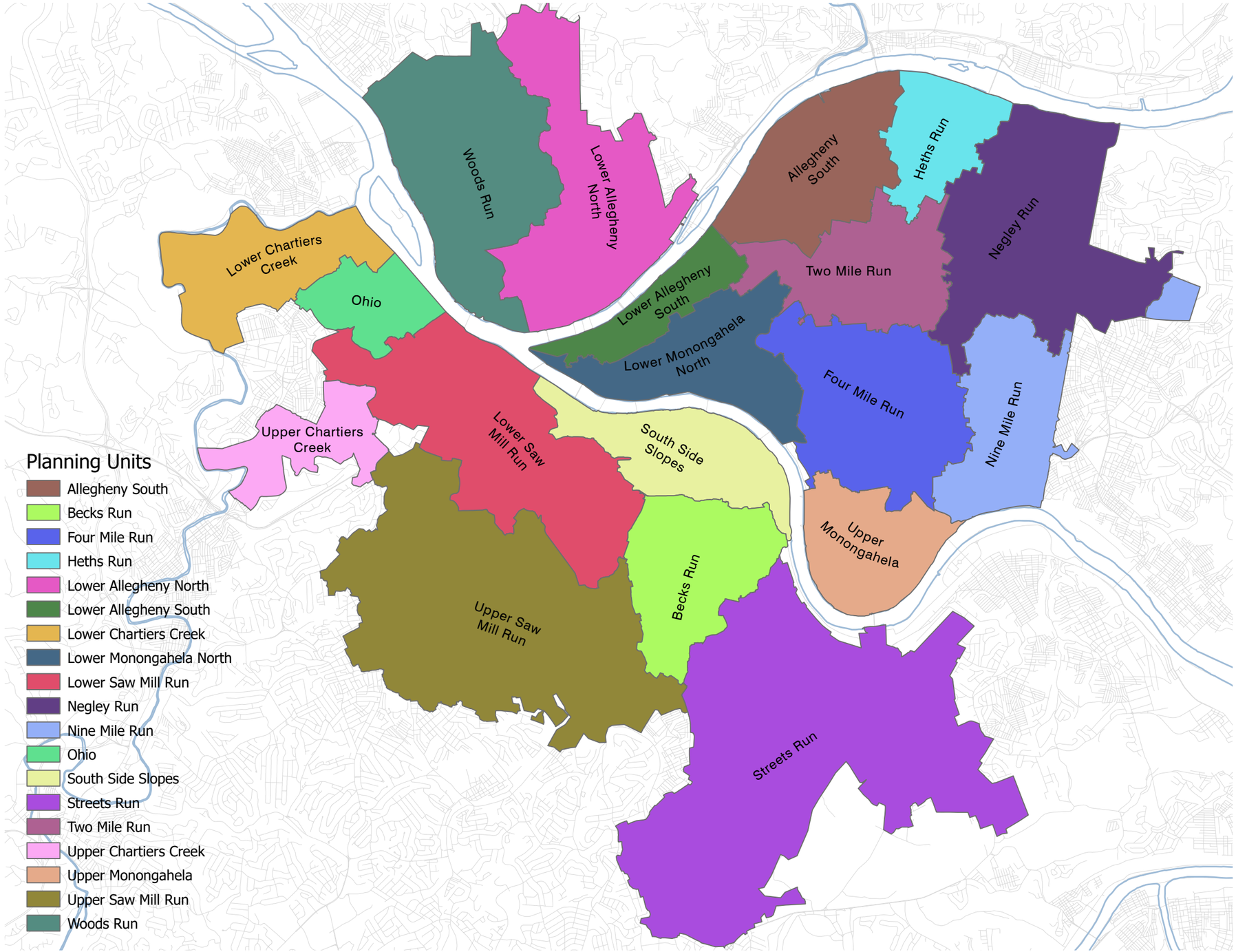
Socio-Economic & Environmental Justice



Areas of Opportunity

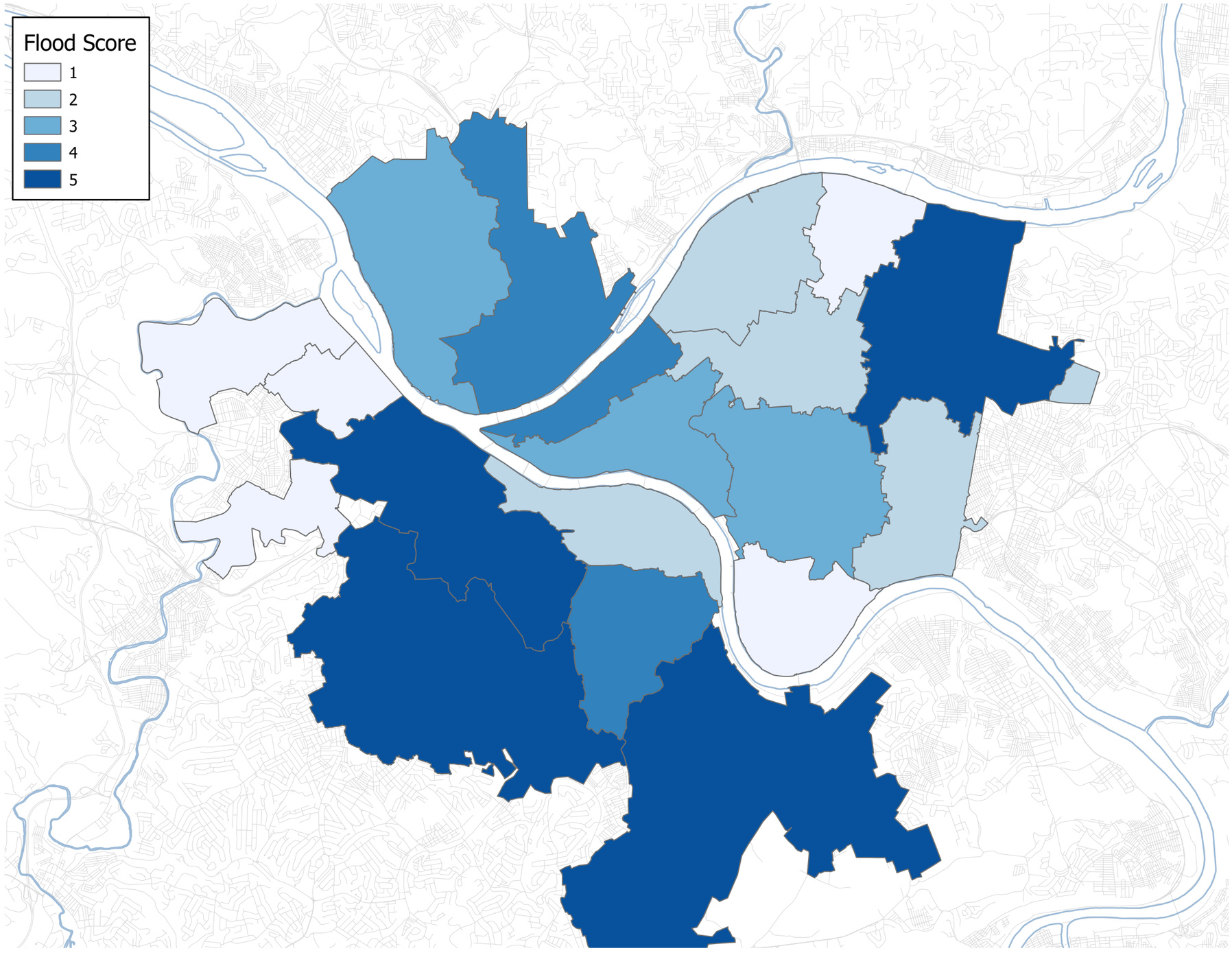


Proposed Planning Units



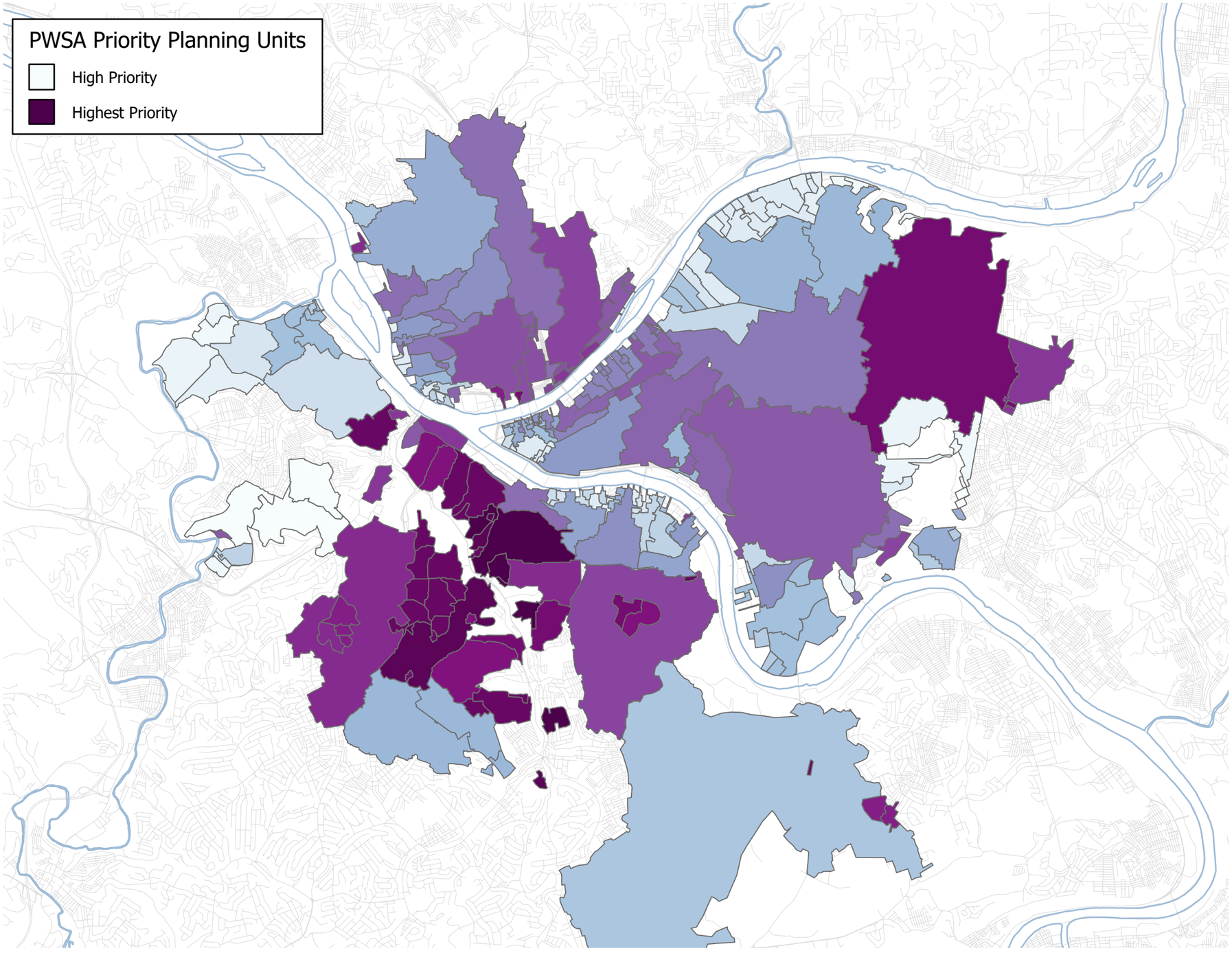
- Breaks the area into manageable units of similar size, based on historic watersheds, etc.

Flooding Data Composite



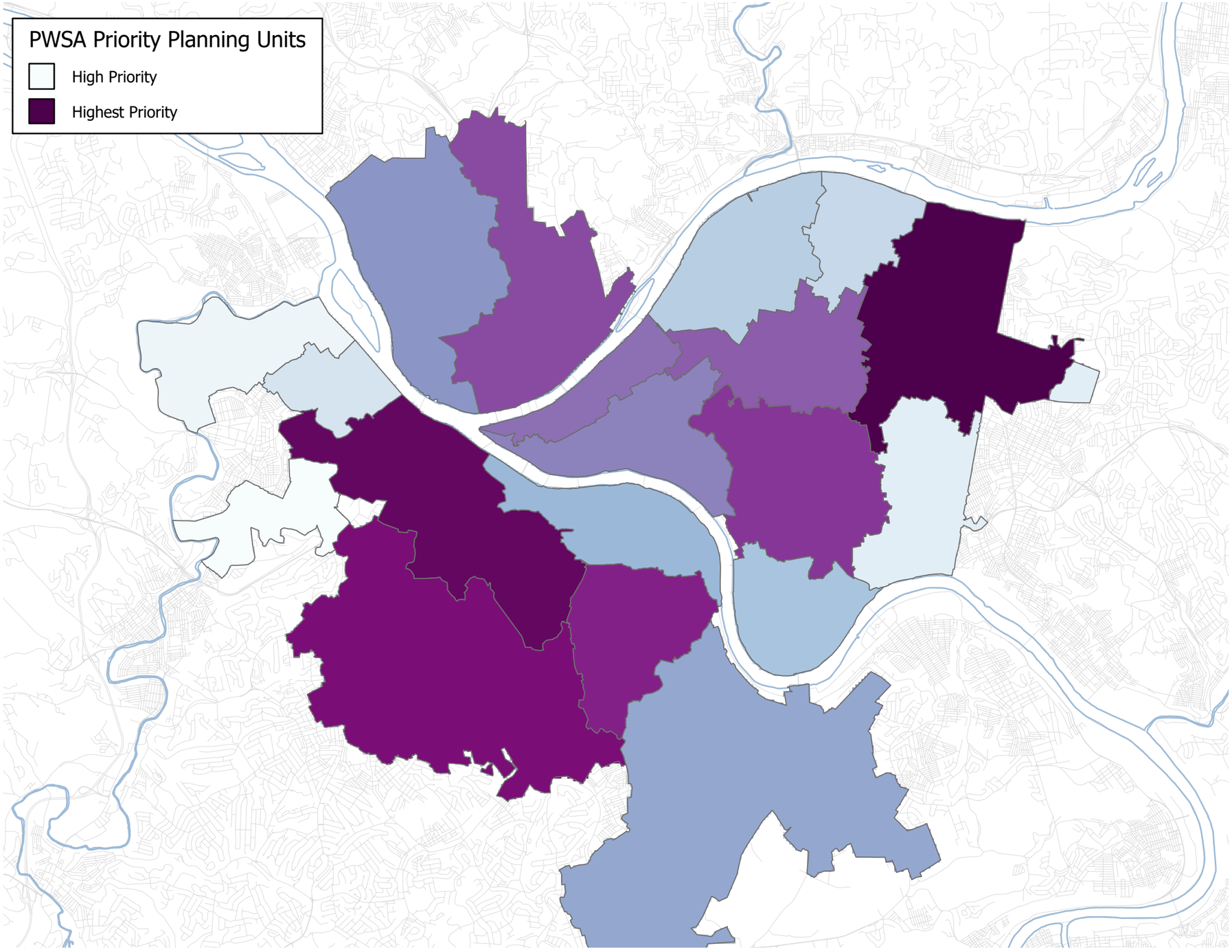
- Consolidates all the sources of flooding data

Priority Sewersheds for Water Quality



- Based on CSO volumes, PWSA Responsibility, expected tunnel timing, and MS-4 obligations

Proposed Priority Planning Units



- Overlays Flooding, Water Quality, and Environmental Justice mapping

Within each of these units, there will be localized, acute issues that will need to be addressed- no one is a "low priority."

How can we communicate this?

How do we keep community members engaged, knowing there is a long time frame to make projects become reality?

APPENDIX L

PennPraxis

Project Name: Developing PWSA's Strategic Plan for Stormwater

Project No.: 2020-025-OPS

ACTION 5: Communications Framework Recommendations- PWSA Ambassador Feedback

August 11, 2022

Introduction

At the end of the Pittsburgh Water and Sewer Authority (PWSA) Ambassador Program, each cohort member was given a volunteer survey to gauge the outcomes of their time as Ambassadors and their involvement in the Stormwater Strategic Planning Process. Of the 13 total Ambassadors that participated in the program, 10 responded to the survey. Below is a summarization of their feedback and recommendations for the program. Names or other identifiers have been removed to provide anonymity to participants.

Question 1: What are some of the biggest concerns you continue to have about stormwater in your community?

Respondent	Survey Responses
A	Flooding and property damage.
B	Sewers not being cleaned out.
C	Properly educating members so that collective efforts can be clear & efficient in supporting better infrastructure. The biggest concern is that some community members / older are not properly aware of the tools they can use.
D	Per discussion with my community and watershed: "Lack of trust from City residents towards City Hall and PWSA. No transparency amongst government or the Authorities. Stormwater is just a talking point."
E	Hillside and streambed erosion in Schenley Park, flooding in "The Run" section of Greenfield, the abandonment of the plan to daylight the stream in Junction Hollow (near the Schenley Park "lake").
F	I am still concerned about the length of time projects will take to begin and finish. Also the oversight of the revenue generated from the fee.
G	The community still not understanding the correlation to stormwater, billing and planning.

H	People need more community engagement opportunities in the neighborhoods of Negley Run watershed. I'm concerned that they will be unprepared for flooding, etc. Many have basements that get very wet during rains and there doesn't seem to be any recourse or resolution for these problems.
I	Lack of involvement and promotion of the Mayor's office and City council in community education engagement for the survey.
J	The strong flow of water that comes down from our hills are very strong and can swipe small children into some of the large PWSA storm drains and the continued flow down into the Washington Blvd. thoroughfare.

Question 2: What were some of the biggest takeaways you learned from your time as PWSA Ambassador?

Respondent	Survey Responses
A	How to be an Ambassador. So much about flooding and why it happens. Being able to talk to people in my neighborhood about PWSA and Flooding in the city.
B	How the system works and affects everyone.
C	Many community members are uninterested in lengthy surveys but do have many issues/complaints around sewage backups & water shut-offs / digging up the street.
D	Residents in my community and watershed are passionate about solving stormwater problems but feel they lack political access/support and residential wealth to see solutions.
E	PWSA is making a good faith effort to address stormwater issues. More people are aware of stormwater issues than I expected.
F	The general public has a very negative view of utility companies.
G	It takes a lot of research and planning to make a plan that will sustain Pittsburgh's stormwater issues.
H	That the people selected as Ambassadors care very much about stormwater issues and what can be done. That stormwater issues aren't going to go away and more needs to be done. That somehow I need to remain in touch with these issues.
I	The history of the stormwater and grey water infrastructure.
J	Talking with people in the community is very important and allows them to understand problems and solutions to get help to solve those problems.

Question 3: What has been your favorite part of being an Ambassador for your community?

Respondent	Survey Responses
A	Just being an ambassador and sharing the knowledge that I learned thru the program
B	Get paid to be at events I would have been at anyway and using that money to fund my community group
C	Talking & connecting with people, hearing their stories & perspectives about living in the neighborhood & what they've experienced & have seen over the years.
D	Meeting City residents and hearing their stories.
E	Meeting other stormwater ambassadors and learning about what's going on it their watersheds, reaching out to folks around Wightman Park to hear their concerns about stormwater mitigation elements that were recently installed in and around the park, and learning in detail what those elements are designed to do (the tour of the park on June 15). Creating a brief Powerpoint presentation that included stormwater management opportunities in Schenley Park and sharing it with the Parks Conservancy and a student organization at the U. of Pitt that is interested in fixing up trails in the park.
F	Meeting my neighbors.
G	Being able to understand and communicate stormwater management to the community. Especially its important.
H	Having the opportunity to meet people in the community and learn their views
I	Engagement with and education of the people in the community
J	Getting questions from the community, speaking plane enough for them to understand what stormwater issues they may have encountered when it rains, i.e. the water rises high during rainfall and it splashes children and adults so bad that they get soaked.

Question 4: What were some areas of improvement you could have seen for the Ambassador program?

Respondent	Survey Responses
A	I had no issues, I would give the whole process a 10 star!
B	Less drawn-out training more strategies in place for what events to target

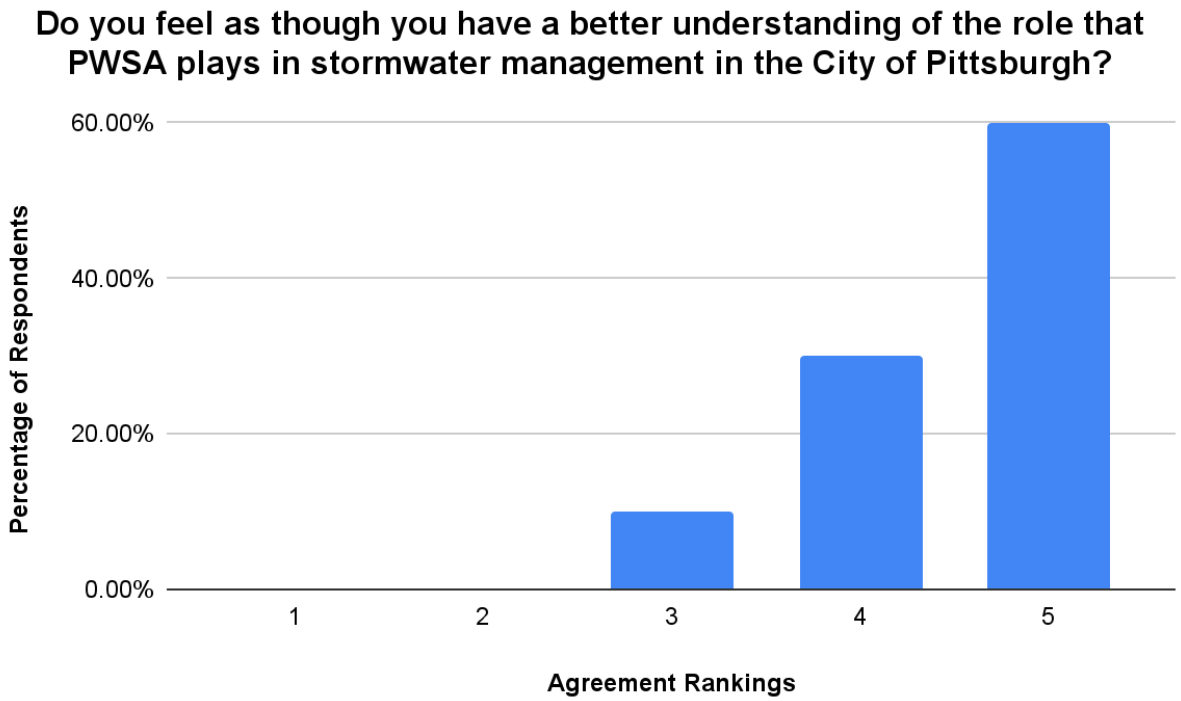
C	Better organization/communication on events like interviews, community meet ups, etc. There were a few last-minute changes to things where I could not attend due to that.
D	More in-person involvement amongst cohorts and better communication.
E	Less tech more talk (in person)!
F	For the level of engagement, the ambassador program was put together very well.
G	As an ambassador, I am not sure of my outcomes. If it was enough or it needed to be something more. I see this as being something that could be improved.
H	This type of program is important. An improvement would be more time to engage with the community such as a longer length of the program.
I	More involvement at the city level with community outreach through their media outlets
J	The GBBN consultants should have started when we started and we could have had the information to take out while tabling or on Zoom's with the community to understand their watershed area better.

Question 5: What have been some of the biggest takeaways you have had about being part of the PWSA Stormwater Strategic Planning process?

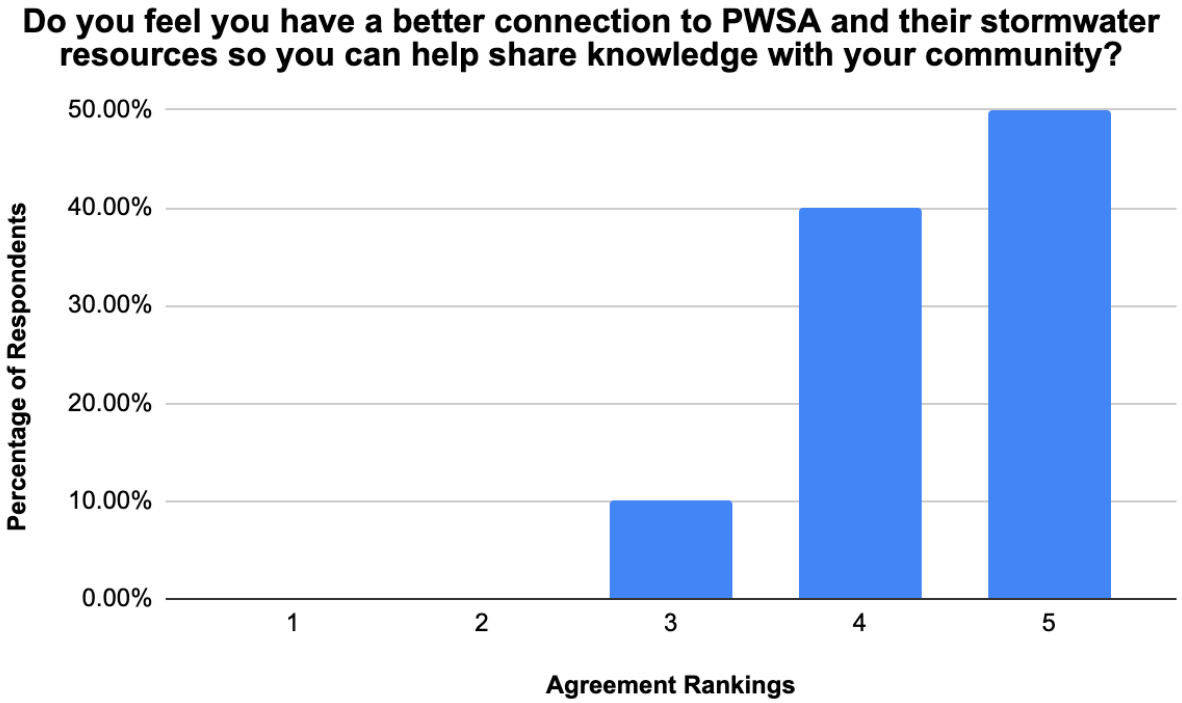
Respondent	Survey Responses
A	Everything! I truly enjoy the process and being a part of history! Biggest takeaway (Together we can make a change, especially working with Real people from PWSA.)
B	It was a long drawn-out process that involves way too much community input
C	That there are many moving parts & really good tools to help with green infrastructure & to support mitigation of Stormwater overflow / future issues.
D	I have learned there are more groups and organizations involved in Pittsburgh stormwater issues than I realized. Residents' trust in the City is dwindling and they are ready to leave.
E	Getting the feeling that it (the strategic planning process) has no endpoint. And for that matter, its starting point is beginning to fade from memory. That can create frustration for community members who have been involved in the process for a long time.
F	Public entities and utilities are beginning to follow public involvement processes earlier to develop projects.

G	Communities need to be more engaged.
H	I'm not sure how much our input went into the process. We were only asked once about our views. Also, establishing a joint task force is key to the resolution of issues, coming up with ideas to help communities, and ensuring that residents know what's going on and their opportunities to express their opinions. Our question on our survey was not included.
I	Gaining knowledge of the stormwater grey water infrastructure the pitfalls of local government and the utility companies' internal conflicts and the process methodology to correct issues and create sustainable solution-based methods taking into consideration of best practices and services for long-term successful outcomes.
J	I am glad to continue to engage in the community for them to become aware of issues that affect them daily when we have rain and how to get help.

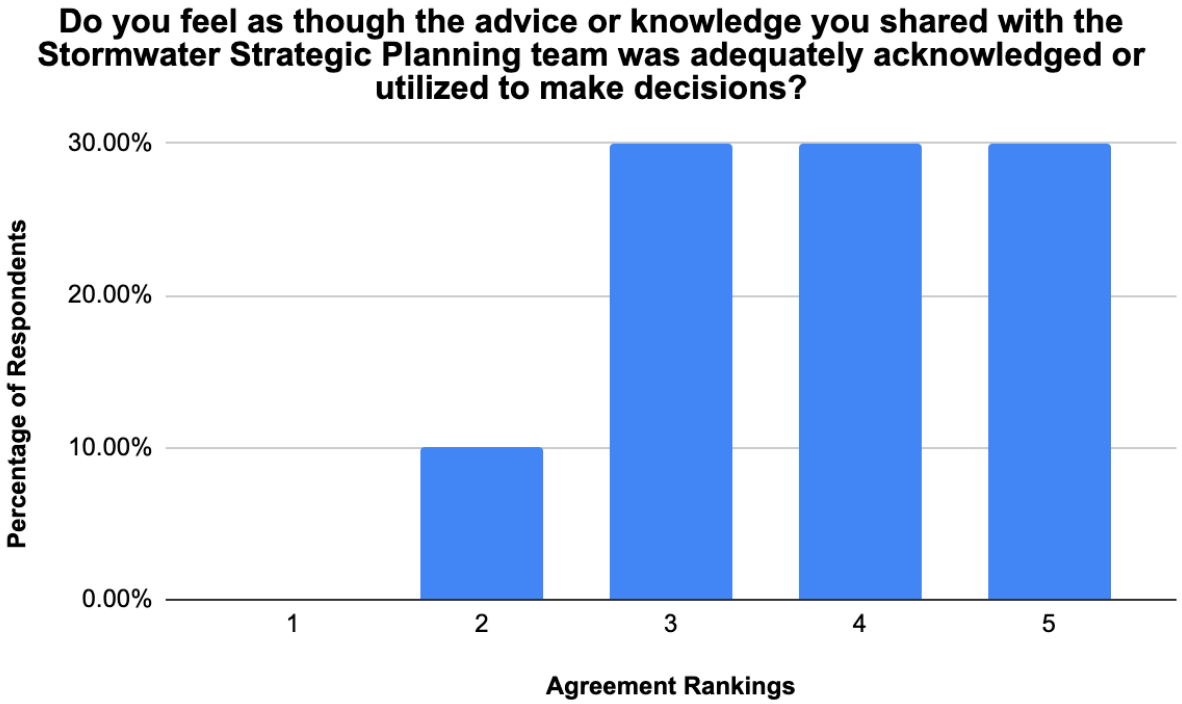
Question 6: Do you feel as though you have a better understanding of the role that PWSA plays in stormwater management in the City of Pittsburgh? Ranked 1-5 (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree).



Question 7: Do you feel you have a better connection to PWSA and their stormwater resources so you can help share knowledge with your community? Ranked 1-5 (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree).



Question 8: Do you feel you have a better connection to PWSA and their stormwater resources so you can help share knowledge with your community? Ranked 1-5 (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree).



Question 9: If this program were to happen again through PWSA, Grounded, or another entity what would like to see out of this program?

Respondent	Survey Responses
A	Just more people involved.
B	More focus on the community events.
C	Improved planning and communication around ambassador events.
D	In-person team collaboration.
E	Fewer open-ended questions on surveys.
F	Nothing.
G	More community engagement.
H	Ambassadors views brought in more to the process. The view of Tony Igwe being shared with the Ambassadors. A greater connection or sharing with the Mayor's administration or some idea that the information we have is being given to them, especially the views of residents.
I	Designs with green infrastructure designed to collect stormwater in communities for the purposes of gardens and independent household usage
J	1) During the class education stage time to work with any consultants at the same time to help to have everything prepared to share with the community to obtain a better volume for community engagement and representation. 2) To solicit teenagers in high school to help with the door knocking for such a large vast area like A41 and A42.

Takeaways

With this survey data, Ambassadors provided a wide range of feedback along the lines of Grounded's role in managing the program, PWSA's involvement, and the overall structure of the Strategic Planning process. There were many areas where growth can happen in future ambassador programs or for community engagement for future planning processes. While in many ways this was a pilot year for this kind of Ambassador model, every single respondent stated they would want to be part of an Ambassador Program should it happen again in the future.

APPENDIX M

Project Name: Developing PWSA's Strategic Plan for Stormwater

Project No.: 2020-025-OPS

TASK 5: Workforce Development Recommendations

May 11, 2022

Introduction

The PWSA's green stormwater infrastructure program offers an opportunity to provide multiple benefits to the Pittsburgh community, including development of green jobs for maintenance of the green infrastructure that has been created. In this way, green infrastructure can not only provide functional stormwater capture and provide green amenities to the community, but also provide new job opportunities for community members as well.

Philadelphia and Camden's PowerCorps programs, and DC Water's Green Infrastructure Training program are three examples of utilities hiring young men and women from the local community to help develop and maintain green infrastructure. In addition, The Corps Network has been very active in creating Civilian Climate Corps, with a similar mission, across the nation.

Discussion

There are several key components to developing a successful green infrastructure maintenance job program for the community. First, it is essential to develop a partnership with trusted community non-profit groups who can work with the utility to identify candidates from the community for the maintenance program. For example, Philadelphia, Buffalo and Reading are using Educationworks while Camden is using Hopeworks.

These community non-profits are skilled at vetting community candidates, helping to train them for general work circumstances (as in many cases, this may be the candidate's first job) and also training them for the specific green infrastructure maintenance work as well. In addition, these community groups are also able to provide life skills training, such as how to be prepared for work, to write a resume, go on an interview, or even individualized counseling. In Philadelphia and Camden, for ezample, the PowerCorps programs very specifically, and intentionally, focused on at-risk youth, between 18 and 26, to not only create a green infrastructure maintenance cohort but also to help save individual lives as well.

Second, it is also important to have very specific green infrastructure creation and maintenance knowledge on the training team. The aforementioned community non-profit groups have generalized job training skills but usually lack the specific green infrastructure experience needed. Philadelphia had this knowledge and wherewithal, collectively, within its own Water Department and Parks Department. In Camden, where resources were much more limited, the utility partnered with external partners, Rutgers University, the New Jersey Conservation

Foundation and the New Jersey Tree Foundation, to provide the technical assistance needed for green infrastructure maintenance job training. In both cases, the "train the trainer" approach was often used in which the green infrastructure expert would train the community job training expert, who would then incorporate the learned knowledge into the training of the community maintenance cohort. In addition, both Philadelphia and Camden adopted the strategy of hiring PowerCorps alumni to help with the job training, and life skills counseling, for subsequent cohorts.

Both Philadelphia and Camden saw the PowerCorps jobs as stepping stones in the careers of the cohort members, not final destinations. For this reason, both adopted rolling plans for six month cohorts in order to positively impact as many young people as possible. Therefore, job placement services toward the end of the six month duration for the cohort are absolutely essential to the success of the program. Cohort members are provided with complete job placement services, including assistance with resume writing and interview techniques. Job placement success is one of the most important yardsticks for measuring the overall success of the green infrastructure maintenance program. Educationworks, for example, has reported a 90% job placement record for its work in Philadelphia.

The aforementioned plan to rotate the cohorts out every six months, ensures a steady flow of new community members that can benefit from the green infrastructure maintenance program. It is also important to find funding for new green infrastructure projects not only to realize additional stormwater capture, and flooding reduction, benefits, but also to create additional job opportunities for the green infrastructure maintenance cohort. The State Revolving Fund program (PennVest in Pennsylvania) offers very attractive funding for green infrastructure projects in combined sewer communities like Pittsburgh. Specifically, the SRF program offers very low interest rates, and some principal forgiveness, plus 30 year payback periods, resulting in very low annual debt service for funded projects. In addition, FEMA's Building Resilient Infrastructure and Communities (BRIC) program offers grants for resiliency projects, including green infrastructure.

Lastly, there are also opportunities for funding to supplement the cost of the green infrastructure maintenance cohort itself. Both Philadelphia and Camden received AmeriCorps funding that significantly offset the cost of both the salaries of the working cohort and also the cost of the community non-profit's services. As mentioned above, the Corps Network also provides, on a state by state basis, funding for Civilian Climate Corps whose work includes green infrastructure but also can include other climate resiliency work such as flooding abatement, solar panel installation, etc.

In addition to creating a green infrastructure maintenance workforce, as discussed above, PWSA could also consider creating an employment pipeline from Pittsburgh's communities into the utility. Bayworks in the San Francisco Bay area, is one outstanding example of this type of program. In this program, wastewater utilities partner together to create a curriculum for various jobs, with various entry points, needed at the utilities. The utilities then partner with local community colleges and technical schools who then teach the curriculum, creating a flow of potential replacement workers from the community into the utility. There are several other successful water workforce programs that have been implemented across the nation and some of them have been captured in a compendium of best practices developed by the Water

Environment Federation (Workforce Development Compendium Provides a Menu of Best Practices (wef.org)



WEF - Workforce Development Compendium Provides a Menu of Best Practices

For this reason, WEF has collected 21 case studies demonstrating the ways in which the best-in-class water utilities across the country have implemented innovation to optimize the performance of their water workforces.

www.wef.org

This compendium is a cookbook of successful practices that can be replicated/adapted by other utilities, such as PWSA. It also includes contact information if more information is needed.

Recommendations For Pittsburgh

1) **Prioritize Green Infrastructure Maintenance In The Same Way As Grey Infrastructure**

   As with sewers, pumps or any type of grey infrastructure, the maintenance of green infrastructure will be critical to the success of the program. Maintenance of green infrastructure is not only essential to the functional capability of the green space to capture stormwater but also essential to the public perception of the efficacy of green infrastructure in general.

2) **Seek Community Benefit Opportunities In Fulfilling Green Infrastructure Maintenance Requirements**

   Since green infrastructure maintenance is necessary in order to ensure and sustain the efficacy of stormwater capture, PWSA can realize additional triple bottom line benefit by looking for opportunities to create new jobs for the community, in a manner similar to PowerCorps Philadelphia and PowerCorps Camden, as described above

3) Seek External Funding In Order To Reduce Direct Costs Of A Community-Based Green Infrastructure Maintenance Program

As described above, both Philadelphia and Camden were able to obtain AmeriCorps funding to significantly defray the costs of their PowerCorps, community-based, green infrastructure programs. For example, Camden's AmeriCorps grant accounted for more than 50% of the total cost of the program. In addition to AmeriCorps, there is Federal funding for Civilian Climate Corps programs, including green infrastructure maintenance in combined sewer communities, like Pittsburgh

4) Identify Community Partners To Assist With Screening of Community Candidates And Provision Of Life Skills Training

The success of Philadelphia and Camden's community based PowerCorps programs was largely dependent upon successful identification of a community partner which could:

---- work in the community to identify potential members of the community as candidates for the green infrastructure maintenance program

--- undertake job screening to select the best candidates for the maintenance program. One purpose of programs like these is to help community candidates who might not have been able to find work previously….but also to ensure the overall success of the program. Thus, a balance must be struck between helping individual community members, protecting the success of the overall cohort and protecting the success of the overall program. Selection of the right community partner to assist in this aspect of the program is one of the most critical for overall success

---- provide life skills training to the selected members of the green infrastructure maintenance cohort, including how to conduct oneself at work in general, and also specific and direct counseling assistance to cohort members as needed

---- work with green infrastructure maintenance experts to help convey the specific job training skills needed for the work to the cohort members

---- prepare the cohort members for a permanent work position through life skills training such as developing a resume and preparing for an interview and, most importantly, job placement assistance. The success of community based green infrastructure maintenance programs such as PowerCorps Philadelphia and PowerCorps Camden is not only measured in volume of gallons captured from green space but also measured in numbers of new jobs provided to community members and permanent job placement success.

5) Identify and Procure Green Infrastructure Maintenance Training Wherewithal

Most wastewater utilities lack the internal wherewithal to provide green infrastructure maintenance training. Therefore, in such cases, it must be procured externally as with the aforementioned community job training partner described above. Philadelphia partnered with the City's Parks Department to provide such training. Camden, lacking its own Parks Department, partnered with the Rutgers University Agricultural Cooperative Extension. In both cases, Philadelphia and Camden also supplemented the green infrastructure maintenance training with training on related stormwater management tasks, such as keeping storm inlets clean, leaf sweeping during autumn, etc. in order to maximize the benefits of the cohort and also widen the job experience for the cohort members. In the case of Camden, the PowerCorps members also provided general park maintenance and cleanup services as well, since the City does not have a Parks Department due to its economic constraints.

6) Utilize The Community Based Green Infrastructure Maintenance Team As A Team OF Ambassadors

Both the Philadelphia and Camden PowerCorps cohorts took great pride in considering themselves ambassadors for greening and cleaning their cities. They also took pride in going to schools and setting themselves up as examples to younger schoolchildren This is an opportunity to build pride in the community members that we seek to help and also build additional community support for the overall stormwater management program.

Conclusion

PWSA's green infrastructure program not only provides stormwater capture and flooding mitigation benefits, and the benefits of additional green space for the community but can also provide important opportunities for meaningful employment for the Pittsburgh community. PWSA is to be commended for its investment in the quality of life of the residents it serves. Implementing a community based green infrastructure maintenance program, like the Philadelphia and Camden programs described above, can be transformative to the community members selected for the program, and for the community itself.

APPENDIX N

PennPraxis

Project Name: Developing PWSA's Strategic Plan for Stormwater

Project No.: 2020-025-OPS

List of Documents Reviewed

June 2022

1. PWSA's Wet-Weather Feasibility Study, 2013
2. PWSA's Green First Plan
3. PWSA Current 5-Year Capital Budget
4. List of Green Infrastructure Projects completed and pending by PWSA
5. Findings from the Stormwater Advisory Group to PWSA
6. Sawmill Run Integrated Watershed Management Plan, 2020
7. Sawmill Run TMDL Strategy, December 2015
8. PWSA/City of Pittsburgh NPDES MS4 Permit, July 2020
9. PWSA/City of Pittsburgh Pollutant Reduction Plans for MS4, March 2019
10. City of Pittsburgh Code of Ordinances
11. One PGH Resilient Strategy
12. 100 Resilient Cities- The Rockefeller Foundation
13. Allegheny County's Act 167 Plan
14. ALCOSAN's Clean Water Plan and Controlling the Source documents
15. ALCOSAN's Modified Consent Decree
16. Homewood Comprehensive Community Plan 2020
17. Homewood Cluster Planning 2015: Cluster 2
18. Living Waters of Pittsburgh, A-42 Negley Run
19. McKinley Park Master Plan, 2016
20. City of Pittsburgh Greenways Plan, 2017
21. One Water: Pittsburgh's Guide to Action
22. P4 Pittsburgh: Framework for Resilience
23. City of Pittsburgh Public Engagement Guide, 2019
24. US Water Alliance. An Equitable Water Future: Pittsburgh, 2021.
25. First Street Foundation: The First National Flood Risk Assessment: Defining America's Growing Risk
26. Allegheny County Environmental Justice Index, 2019.
27. US Environmental Protection Agency, EJScreen.
28. City of Pittsburgh: Forging PGH, 2020.

Other documents reviewed, pertaining to subtopics, are listed as sources in those appendices.

APPENDIX O

Project Name: Developing PWSA's Strategic Plan for Stormwater

Project No.: 2020-025-OPS

Cost Assumptions and Methods for PWSA Stormwater Strategic Plan

July 27, 2022

As part of the development of a the PWSA Strategic Plan for Stormwater, estimated order-of-magnitude implementation costs were developed for the following improvements:

- Watershed storage
- Floodplain restoration
- Conveyance improvements

Costs were based on a number of assumptions, many of which may change during the next phases of plan implementation. Therefore, the costs provided should be viewed as a preliminary indication of the magnitude of investment required to achieve meaningful results and the need for significant increases in revenue to support plan implementation.

Construction estimates for each type of improvement were initially developed by priority watershed. Subsequently, construction estimates were marked up to account for design and operations and maintenance costs, escalated to account for inflation, and allocated over a 50-year plan implementation period.

Spreadsheets

Cost calculations are provided in two spreadsheets:

- *TypologiesInvestment.xlsx* – this spreadsheet computes watershed, conveyance, and floodplain restoration costs and then allocates and escalates these costs over a 50-year implementation period

- *Combined Unit Cost.xlsx* – this spreadsheet derives unit costs for watershed storage, floodplain restoration, and conveyance.

These spreadsheets can be used for iterative scenario analysis moving forward, including varying assumptions relating to PWSA cost-share, unit costs, precipitation depth, and other factors. One suggestion would be to develop batch processing capability using visual basic or other similar scripting tools. This would allow PWSA to better understand the envelope of cost possibilities and the sensitivity of the cost model to various inputs.

Method details are provided in the sections below:

Construction Costs

Watershed Storage

Watershed storage estimates were developed for each priority watershed. For each watershed, the total impervious area was computed by multiplying the watershed area by the percentage of the watershed that was mapped as impervious. Both total watershed area and percent impervious cover were derived from GIS data provided by PWSA. For purposes of the analysis all impervious area in each priority watershed was considered to be unmanaged. In future iterations, the percentage of impervious cover managed by existing BMPs could be subtracted from these totals.

Management targets for watershed storage were assigned by priority watershed category as follows:

Priority Watershed Category	Priority Watersheds	Target Impervious Cover Managed (%)
1	Negley Run, Lower Saw Mil Run, Upper Saw Mill Run	30%
2	Becks Run, Four Mile Run, Lower Allegheny North, Two Mile Run	20%
3	Lower Allegheny South, Lower Monongahela North, Woods Run, Streets Run	15%
4	South Side Slopes, Upper Monongahela, Allegheny South, Heth's Run	10%
5	Ohio, Nine Mile Run, Lower Chartiers Creek, Upper Chartiers Creek.	10%

The impervious area to be managed for each watershed was determined per Eq.1:

Eq. 1.

Impervious Area Managed (ac) = Watershed Area (ac) x Percent Impervious (%) x Target Impervious Managed (%)

Due to Pittsburgh's stormwater regulations, which require stormwater management for many of the City's developments, not all future impervious acres managed will require capital investment by PWSA. To determine the impervious area to be managed that will require PWSA capital investment, the impervious area to be managed was reduced by an assumed percentage to account for the managed impervious area that will accrue because of regulated development. This percentage was assumed to be 50% or approximately 1% per year for the 50-year plan implementation period. In future costing exercises, these estimates could be refined by watershed to reflect site specific redevelopment rates and predictions.

To assign unit costs, the impervious area be managed for each watershed was first allocated among five terrain types. For each terrain type, a % suitability ratio was defined that represented the percentage of each terrain that would be suitable for the placement of

watershed storage. Suitability ratios were determined by visual inspection of aerial photographs and topographic mapping as well as best professional judgement. Ratios used in the analysis were as follows:

Terrain Type	Suitability Ratio
Floodplain	0.01
Hollow	0.05
Sloped Hillside	0.01
Hilltop	0.10
RiverFlats	0.05

For each watershed, the maximum number of impervious acres that could be managed within each terrain type was calculated as follows:

Eq. 2.

Maximum Impervious Acres Managed (ac) = Terrain Area (ac) x Suitability Ratio (%) x Hydraulic Loading Ratio where:

Hydraulic Loading Ratio = 10. Hydraulic Loading Ratio is the ratio of the contributing drainage area to practice footprint.

The terrain area was determined through manual delineation and visual inspection of terrain types in GIS using a combination of aerial imagery, DEMs, and topographic mapping.

For each watershed, the number of impervious acres to be managed within each terrain type was determined by preferentially assigning acres to terrain types. This allowed for the assignment of terrain specific unit costs. Acres were assigned to the highest priority terrain until the impervious acres to be managed equaled the maximum impervious acres managed. Acres were then assigned to the next highest priority terrain type and so on.

The preference order used for the acreage assignments was as follows:

Terrain Type	Priority
Hilltop	1
Hollow	2
Riverflats	3
Floodplain	4
Sloped Hillside	5

To calculate the required volume of stormwater management required, the impervious area to be managed for each watershed was multiplied by an assumed precipitation depth of 1.66 in.

Unit Costs for Watershed Storage
Unit Costs were developed for each terrain type. Unit costs reflect the estimated cost to construct one unit of watershed storage (in acre-in) within each terrain type. Watershed storage unit costing assumptions and methods generally and by terrain type are listed below. Additional

detailed cost assumptions are provided in the referenced excel spreadsheet "Combined Unit Cost.xlsx" provided as a digital attachment to this memo.

General

- Detailed assumptions for conveyance and storage quantities are provided in the excel spreadsheet "Combined Unit Cost.xlsx"
- Aerial photos were used to develop quantity take offs for the total impervious area managed based on several sample drainage areas. Drainage areas for the hilltop and riverflats area were smaller, given the assumption of integrating into a development project with more limited space. Drainage areas for the sloped hillside and hollows areas were assumed to be larger given the setting of the storage practice within existing publicly owned parks, etc.
- Storage area required was determined by dividing the impervious area by an assumed storage depth per acre of 2 ft.
- Storage practices were sized for 1.66 in. of precipitation.
- Except where noted, unit costs for stormwater conveyance and storage (e.g., inlets, piping, excavation, etc.) were determined using unit costs from the 2021 PWSA Sewer Construction, Earthwork, and GI bid sheets and are further detailed in the excel spreadsheet "Combined Unit Cost.xlsx".
- 35% contingency was applied to account for mobilization, closeout, erosion and sediment control, etc.
- Average pipe size was based on 1/3 of the 5 and 10-year intensity storm event from NOAA Atlas 14 estimates.
- Costs for regional storage and conveyance were included – all other costs associated with typology implementation were not included in the base cost estimate

Hilltop and Riverflat

- Costs were based on a regional wetland storage facility integrated with a development project
- Marginal storage costs (the cost of enlarging the on-site practice) was assumed to be equal to the unit cost for the developer incentive provided by the city. This cost was however included as part of the cost estimate.

Floodplain and Sloped Hillside

- Costs were based on a stand-alone (e.g., not integrated with a development project) regional wetland storage facility

Hollow

- Costs were based on a stand-alone (e.g., not integrated with a development project) subsurface storage facility

Unit costs were multiplied by the impervious area to be managed to yield a construction cost for watershed storage for each watershed. This total was then multiplied by the percentage of the construction cost that is assumed to come from direct PWSA investment versus external sources (e,g., grants). This percentage was assumed to be 70%.

Floodplain Restoration
Floodplain restoration costs included the design strategies referenced in the floodplain terrain type. These include excavation and lowering of the floodplain surface, replanting, bank stabilization, land acquisition, building demolition, and bridge/culvert modifications. Additional assumptions and methods associated with cost estimate for floodplain restoration are listed below:

- Quantities for excavation, bank stabilization, demolition, etc. were based on estimates derived from a sample area of floodplain located in Saw Mill Run. Assumptions and specific methods are further detailed the excel spreadsheet "Combined Unit Cost.xlsx"
- Unit cost for determined using unit costs from the 2021 PWSA Sewer Construction, Earthwork, and GI bid sheets, PLI audit information, on-line sources, AKRF estimates, and best professional judgement, and are further detailed in the excel spreadsheet "Combined Unit Cost.xlsx".
- 35% contingency was applied to account for mobilization, closeout, erosion and sediment control, etc.
- Extra features not directly related to flood and stormwater management such as trails were not included in the cost estimates

The unit costs were multiplied by the estimated stream length located within the floodplain terrain type in each priority watershed. This stream length was obtained via GIS analysis. We also assumed an implementation percentage of 25% (this is the percentage of the total stream length that would be subjected to implementation) and that 40% of the costs would be incurred by PWSA.

Conveyance Improvements
Construction costs for conveyance improvements were estimated assuming that the primary conveyance upgrades would consist of increasing pipe sizes to provide an enhanced level of service. Replacement of inlets and laterals were not assumed. Unit costs were developed for each of five pipe diameter groupings (e.g., 8-12 in. sewer, etc.) For each size grouping the average additional capacity needed to accommodate upsizing the pipe from a 1-year storm intensity to a 5-year intensity and 10-year intensity (see tab "Conveyance_Sewer Capacity" within the spreadsheet "Combined Unit Cost.xlsx"). In all cases but one, the size increase (and therefore the marginal cost increase) associated with increasing capacity for the 5-year and 10-year intensity were identical. Unit costs for different size categories were developed using unit costs from PWSA's 2021 Bid Master spreadsheet. Unit cost derivation is provided in the tab "Conveyance_Unit Cost by Size" within the spreadsheet "Combined Unit Cost.xlsx. Unit costs for larger size categories that were outside of the ranges provided in PWSA's Bid Sheet (pipes over 66 in.) were estimated as detailed in the tab "Conveyance_Sewer Size Groupings" within the spreadsheet "Combined Unit Cost.xlsx".

To develop total costs for each size category, the marginal unit costs were multiplied by the length of piping associated with each size classification based on GIS data provided by PWSA. The raw GIS data file provided was first modified to remove sanitary pipes and privately owned laterals. The total percentage of the City's sewer network that would need to be upsized is not known at this time but was estimated to be 30% for costing purposes.

Allocation of Costs by Year

Construction costs were estimated for each year of the 50-year implementation period by assuming a percentage implementation per year for each watershed. The implementation percentages for each year were determined by first allocating the percentage of implementation that would occur in each decade of the implementation period according to watershed priority grouping. Groupings are identical to those described above in the watershed storage construction cost section. Percent allocations by decade are as follows:

Priority Watershed Category	Decade				
	1	2	3	4	5
1	0.2	0.2	0.2	0.2	0.2
2	0.2	0.2	0.2	0.2	0.2
3	0.1	0.1	0.1	0.3	0.4
4	0.1	0.1	0.1	0.3	0.4
5	0.1	0.1	0.1	0.3	0.4

Yearly allocations within a decade were assumed to be 10% of the decade allocation per year. Construction costs were not allocated in years 1 and 2 to account for the time required to design the initial projects. Similarly, design costs were not allocated in years 49 and 50. Operations and maintenance costs were allocated starting in year 4.

Escalation

Allocated raw construction costs were escalated by an assumed inflation rate of 3% per year. As design and O&M costs were calculated as percentages of escalated construction costs, these costs reflect a similar escalation.

Design and O&M Costs

Design and operations and maintenance (O&M) costs were estimated as a percentage of escalated construction costs. Design, which includes all pre-construction work such as planning, outreach, permitting, and bidding was estimated to be 30% of construction. O&M costs were estimated at 1% of construction per year.

APPENDIX P

Appendix P – Public Engagement and Comments
PWSA's Strategic Plan for Stormwater
Project Number 2020-O25-OPS
September 20, 2023

Overview

Appendix P presents the feedback that PWSA received about the *Strategic Plan for Stormwater*. These comments provided PWSA with valuable input on the strategy outlined in the report. PWSA is also committed to long-term public engagement on the topic of stormwater, and the concerns and ideas that the public shared with PWSA will be integrated into these initiatives as well.

Summary

PWSA appreciates all the reviewers and their time spent reviewing this plan to provide valuable comments, throughout the Stormwater Strategic Planning Process. The comments received from this plan will be incorporated as we develop a path forward for ongoing stormwater planning and implementation. PWSA will keep in mind the "p4 Framework" of People, Planet, Place, and Performance as we move forward with planning and ensure equity is valued. Some of the key comments received in this plan are as follows:

- Communications Framework: Creating opportunities for two-way communication is important. PWSA needs to invest more in community relations and engagement. The stormwater ambassador program was a successful initiative that can help build trust within the community. Partnering with grassroot organizations and non-governmental organizations (NGO) can help expand PWSA's reach.
- Joint Task Force: Roles and responsibilities need to be outlined in a Memorandum of Understanding (MOU) between the City of Pittsburgh and PWSA, and there should be an avenue for grassroots and community leaders to be involved.
- Priority Areas of Investment: The maps rely heavily on reported information; however, many people do not report issues in fear of negative consequences. Equity and areas of opportunities should be ranked higher as priorities.
- Investment Strategies: Collaboration with the residents in neighborhoods where projects will take place is important to implement the correct stormwater facility practice.
- Establishing guiding principles for level of service (LOS) and flooding: LOS is a complicated topic and needs to be explained more clearly in layperson's terms.
- Leveraging Stormwater fee: It is important for PWSA to proactively communicate how the stormwater fee revenues are being used.

The Stormwater Strategic Plan is the first step in PWSA's stormwater planning process. It presents a a high-level, visionary framework for future investments and is part of a larger wet weather planning effort currently underway. Throughout our planning process, PWSA is committed to engaging stakeholders and partners, soliciting input, incorporating concerns, and gathering feedback into the decision-making process. PWSA will incorporate next steps, a timeline, and how the Stormwater Strategic Plan coordinates with ALCOSAN's Clean Water Plan into ongoing and long-term public engagement on stormwater.

Comments

The public comment period ended on June 30, 2023, and PWSA received the following comments:

Source of Comments

1. Comments from the public meetings PWSA held – "Stormwater Conversations" – extensive comments from six meetings as presented in the following section.
2. Comments received electronically on the Stormwater Strategic Plan Feedback Form - 17, and Comments received f**rom Other Sources (e.g. letters, emails, phone conversations) – 20**
3. Comments received electronically on the EngagePGH website - 37

Comment Category

The feedback is organized according to the "Top Six Priority Actions" which are the six key actions in the Strategic Plan that provide focus for PWSA's stormwater strategy. These are:

1. Develop and Implement a Communication Framework to Increase Transparency and Understanding of the PWSA Strategy and the Stormwater Fee Value Proposition
2. Institute a Joint Task Force to Develop City-Wide Action Plans for More Coordinated and Effective Management of Stormwater
3. Analyze Priority Areas for Investment
4. Define Initial Investment Strategies
5. Establish Guiding Principles and Comprehensive Approach to Stormwater and Flooding "Level of Service"
6. Leverage Stormwater Fee Impact Through Public and Private Investment, Innovative Partnerships and Technologies, and Job Training Programs

PWSA's Responses to Comments

See each section below for PWSA's responses to comments.

1. Comments from Public Meetings – "Stormwater Conversations"

In the spring of 2023 the Pittsburgh Water and Sewer Authority (PWSA) hosted six Stormwater Conversations – these were community workshops spanning geographic areas in Pittsburgh to gather feedback about the Strategic Plan for Stormwater, and specifically on the Six Priority Areas in the Plan during facilitated, small group table discussions.

Date	**Geographic Area**	**Location**	**Number Attending**
April 13, 2023	West End	Sheraden Healthy Active Living Center	25
April 18, 2023	South	Phillips Recreation Center	5
April 25, 2023	East End	Kingsley Association	40+
May 16, 2023	Northside	Brighton Heights Healthy Active Living Center	10
May 23, 2023	Central	Hazelwood Healthy Active Living Center	15
June 20, 2023	Downtown and Vicinity	Carnegie Library – Hill District	15

Below summarizes the comments by common priority area theme, and PWSA's responses.

Communications:

Common Theme

- @ South, @ Hazelwood, East End, West End–
    - Multiple methods is necessary, be mindful that email and social media require digital access and that may be a barrier
        - Innovation –
            - Phone and bill inserts are good for elderly people and people without internet access, and more reminders
            - Provide virtual options or help people get rides to meetings
            - Post flyers at food banks, libraries, bus stops, healthy active living centers, VFW, church bulletins, door hangers
            - Ensure all renters also receive bill inserts, and encourage other households to read bill insert
            - Door knocking doesn't work anymore
            - Have WQED or other tv commercials advertise for meeting
            - Use nonprofit partners to help spread the word
            - Use community days to spread the word
            - Use the website to advertise and post any real time updates on the website
            - Present on what to look for to report sw issues

- Have news anchors send a message about how to report backup/stormwater issues
- Collect phone numbers for registrants in case we need to cancel

- @west end, South, east end, hazelwood
  - Everyone likes food – Meet people where they are
    - Innovation –
      - Hot dogs in the park to connect with residents where they live
- @East End
  - Presentation was very technical, need to have it in layman's term
- @West, North
  - Frequency of meetings. Only have meetings when you have something good to say, ppl want to know what PWSA is spending money on.
    - Explain what the rate increase is paying for, what were they paying for before?
- @ Hill District
  - Make clear what the purpose of the meeting is and expected outcome
- @ Hill District
  - Need more opportunities to talk to PWSA about misc problems (water and sewer open hours)
- @ West End
  - Define catch basin

Joint Task Force

- **Common Theme:**
  - @ West, North, East, South
    - Define roles and responsibilities of members, need people who can make decisions present
    - All city departments, city council, Mayor, and PennDOT should be involved and talk to each other, landowners should be involved (City, PennDOT, URA, Housing authority)
  - @East, North
    - Would like citizens represented in some way, homeowners and renters, including EJ communities
  - @hazelwood
    - Commercial and business representation
    - Would like an auditor to ensure money goes to the right neighborhood
  - @ Hazelwood, north
    - Keep the group small, neighborhood based
  - @ Hill District
    - Website or EngagePGH website to show progress of problems being resolved and status
  - @ Hill District
    - Want this effort to create job opportunities

Priority Areas of investment/ Investment Strategies

Common Theme

- @– Brighton Heights, Hazelwood, East End
    - Investment Strategy partnerships
        - Coordinate with Housing Authority
        - Partner with playgrounds, and vacant land, land banks to do projects
        - Partner with first time home buyers to educate and report problems – try to get funding from programs to partner
        - People want to see people in their neighborhood working
        - Collaborate with other agencies already doing development to incorporate SW
        - Utility coordination to not dig up road multiple times
        - Partnerships to stabilize hillsides and add more trees
        - Add more green
- @West End –
    - Who is responsible for springs
- @East End, SMR
    - Landslide strategies
    - For GI technologies, maintenance is important to get residents to like projects
- @ Brighton Heights
    - Provide more education to residents on what they can do to manage their own SW

- @ SMR
    - Have maintenance program for state roadway maintenance

Levels of Service/Stormwater Fee

Common Themes

- @South, Hazelwood
    - Increase SW fee for commercial properties to incentivize them to reduce impervious areas
    - Public Private Partnerships
- @ Brighton Heights, SMR
    - With the SW fee they expect to see more maintenance (Cleaning catch basins) and community amenities in projects
- @ West End, East End, SMR
    - More engagement on SW Fee and how it's being used, what happens if you don't pay the fee, more information on financial assistance programs
- @East End
    - Sliding scale for the SW Fee

<u>Common Themes at Community Meetings</u>

The common themes from the Stormwater Conversations provided PWSA with some useful input on:

- The best ways to get the word out to publicize future public meetings and distributing information includes a combination of media, such as email lists, US mail, telephone calls, articles in local

newspapers, social media posts, signs on public transportation, and in person and virtual meetings.

- The importance of using layperson terms in communication.
- The concept of the Joint Task Force was generally well-received, with broad representation supported.
- PWSA should collaborate with other agencies whenever possible.
- Maintenance of stormwater infrastructure is very important to the public.
- The need to address springs, landslides, and add more trees and "green" to neighborhoods.
- PWSA should provide more information on financial assistance, transparency in how PWSA is using the funds from the stormwater fee including specific infrastructure and costs, and steps homeowners can take to manage stormwater on their properties.

2. Comments Received Electronically on the Strategic Plan for Stormwater Feedback Form and from Other Sources (e.g. letters, emails, phone conversations).

Summary of Public Comments to the Stormwater Strategic Plan (as of 7/11/2023) by Six Top Priority Actions
Comment period ended on June 30, 2023
Comments received electronically on the Stormwater Strategic Plan Feedback Form - 17
Comments received from Other Sources (e.g. letters, emails, phone conversations) – 20
Highlight – Key comments
PWSA Response: provided for initiatives that are feasible and PWSA has not already addressed in other sections of the comments.

1. **Develop a Communications Framework** -
    - PWSA should set up avenues of communication that can be built upon, and at a minimum reaches out to people via social media, regular city-wide meetings, and ways to directly contact people who don't have access to media or events, such as through mailers and door to door efforts.
    - Actively engage the community on this, on a watershed by watershed basis. Make sure that you get actual community input, that represents community members like the City did with their participatory budget meetings a few years ago – e.g. the "Potholes and Pierogis" meeting at Goodwill in Lawrenceville.
    - Stormwater Ambassadors build trust and can help with communication, extend this program and consider compensating them for their time. **PWSA Response: PWSA will continue to consider ways that a Community Ambassador Program can be integrated into our outreach programs. We are evaluating this for implementation in 2024.**
    - PWSA needs to invest in more community relations/engagement. The one person you have working for you can't be everywhere all the time. You need to do more and do better. **PWSA Response: PWSA is actively hiring to build staff in the Public Affairs Department. Between additional staff and a potential Community Ambassador program, we hope to be able to expand outreach.**

- I would recommend expanding efforts and partnering with organizations that have a following on social media to get more involvement. I would also create communications for homeowners and workshops on how they can help- like what to plant in their yards and how to install rain barrels. **PWSA Response: These are great ideas. Noted for implementation.**
- Can you live stream or set up Zoom for these meetings? Most of the time I am out of town and would at least like to hear what's said. Also Zooming would help parents because they would not need childcare to attend a meeting.
- The communications framework presented in PWSAs draft plan mentions the need to partner and collaborate with grassroots community organizations, but it is not clear how that collaboration would function in practice.
- 3RWK is interested in the ways in which non-governmental organizations can be involved in the communication process. It is not clear from the plan how the communications framework would create space for new or small organizations to become involved. We would like to suggest that PWSA incorporate a working group for NGOs into its communications framework, through which local organizations can follow the plan's development and implementation. **PWSA Response: PWSA will add 3 Rivers Waterkeeper to our distribution list, as well as other relevant NGOs.**
- Regarding day-to-day communication strategies, 3RWK believes that a mix of approaches is necessary. Communication mediums such as email lists, physical mail, and telephone calls will all reach different people in different ways. Articles in local newspapers, social media posts, and signs on public transportation could likewise reach additional people. Meetings such as the stormwater conversation series provide an opportunity for individuals to interact directly with planners, asking questions and providing feedback. Because all of these strategies have different purposes and reach different audiences, 3RWK believes that an equitable communication strategy must use a combination of mediums. **PWSA Response: Agreed.**
- We appreciate the Ambassador Program. It's a good model for community engagement and should be continued as these projects progress.
- I think general alerts (either text or email) to accounts that have "work nearby" or upcoming work in their watershed might offer the most transparency and reach to the broadest level of residents.
- Having formal, organized and sustainable funded groups for each watershed may prove difficult and costly.
- Better general level of communication for planned/ongoing work. The map online doesn't reach anywhere near the level of details people need when construction is happening around their neighborhoods. Examples: when will projects start, estimated timelines, costs and most importantly: why work is even being done in the first place. **PWSA Response: PWSA will look into the feasibility of more detailed "work nearby" emails and alerts.**
- PGH2O should use phone numbers or emails (which are associated with user accounts) to alert account holders of work being done in their watershed.

- Critical that it be informative and transparent. Challenging to ensure that specific methods chosen reach all residents and stakeholders. And what are the funding mechanisms to support and maintain a high level of communication services?
- Seems like some % of these funds could serve to support local org stewardship, ambassadors programs, and similar initiatives, that could tie back-in directly with the Communication Framework and the propagation of urban/resident support for projects in their communities.
- Successful implementation will require an all-hands-on-deck approach, from different levels of government, public agencies, non-profits, and investors. The first comment for PWSA is to develop a relationship-building role to its Government Affairs and Consumer Relations departments. The second comment is to embrace transparency as a means to develop trust within those relationships. The financial leveraging and co-benefit opportunities identified in the stormwater plan requires transparent relationship building.
- Dialogues among the communities of the City's urban watersheds have been maturing with Task Force facilitation. This is a functioning model and PWSA should take official steps, such as Board resolution and budget to financially sustain its watershed and task force partners as they develop and deploy communications. This is also a means for PWSA to achieve Environmental Justice commitment with initial steps toward restoration of trust, transparent communication, relationship building, and true community process investment.
- Outreach to renters is really important. Emails and mailed pamphlets based on address rather than billing address would be helpful. **PWSA Response: This is good information. PWSA will look into alternatives to communicate with renters, who may not necessarily receive PWSA bills.**
- Pictures of women of color in the SSP are missing names. The names of the other Ambassadors are in the pictures. The picture of the Clean Water Action Event is missing the names (left to right): Jo Anne Tippett, Dana Fowler, Ix Pomaj Chakmam Yajalaji. **PWSA Response: Corrected in final text.**

2. Joint Task Force on Stormwater-

- JTF - hybrid system working at both neighborhood and city level. Grassroots community organizations are stakeholders with expertise - curious about what their role is.
- Regional Stormwater Program like NEORSD and include Allegheny County.
- MOUs between City Depts and PWSA on who pays for what and streamlining interdepartmental approvals.
- Pittsburgh needs a property buyout program to deal with flooding. This should be part of the Joint Task Force.
- Develop a schedule with deadlines for critical items identified in the report.
- The City needs to put money into the budget for GI maintenance.
- The JTF may be a great solution and avoids having to start over every time a new mayor is elected.
- The Allegheny County Conservation District is a proposed invitee to the JTF and would certainly agree to participate.

- Cost-benefit analyses are complex, ALCOSAN looks forward to more detailed project prioritization in the JTF and wishes to participate on the JTF.
- Working with the city to create a stormwater management-friendly landscaping guidelines for all new commercial projects and make sure that zoning allows for green roofs.
- What is the ideal way for PWSA and the City to collaborate? We are excited to hear about a proposed stormwater joint task force. How can our City SW Task Force work with the Joint Task Force? What is the status of this Task Force? (Comment from City Planning)
- Also include in the Joint Task Force city planning/zoning, SPC (who should represent and advise upstream municipalities as these municipalities have a large impact stormwater, and or other regional planning folks, Port Authority?
- City and PWSA still need cooperative agreement for who owns, operates and maintains infrastructure. Should be a part of Joint Task Force work.
- Page 16 - Surrounding MOUs, are/will there be timelines for these? Under point 4 of the proposed goals for joint-task force, we need to ensure there are very clear and specific expectations and guidelines surrounding what is and is not allowed in the ROW. Some of our engineers have concerns there is an assumption that parks and other green spaces are “free” space. We must ensure public spaces remain public-focused (both green spaces and ROW).
- Page 33 - PWSA and the City should work on a set of standard BMPs that work in various situations to facilitate permitting and standardize maintenance. (Comment from City Planning)
- Can we work to optimize City and PWSA ground disturbance? Better coordination on ROW work, so when PWSA needs to work on water lines we can line it up with other utility and repaving work. (Comment from City Planning)
- I support a Joint Task Force. But the idea of "fewer cooks in the kitchen" should apply here.
- The joint task force is a good idea, as long as the right parties are involved and there aren't too many entities involved, which would overcomplicate it. As someone who has worked in the federal government space, I know it is easy to make these processes overly bureaucratic, so simplification is crucial.
- Key to efficient service delivery, identification of priority projects, transparency, and effective region-wide communication/information sharing is a formation and sustainment of a Joint Task Force that pulls-in agencies and partners who work in this arena and those adjacent to it. Firm commitments (via an MOU or similar) for all relevant parties to commit to the plan and process. Given the investments that the Pittsburgh Parks Conservancy has made in and across numerous critical watersheds, I'm/we're hopeful that we'll be invited to join the Task Force.
- PWSA needs outside assistance to fully implement a functioning and credible Task Force. While PWSA must lead the establishment of this task force with ALL representatives listed in the plan, including community and watershed, groups, it needs elected official recognition. Someone needs to get the Mayor and other elected officials to provide it gravitas.

- PWSA must immediately finalize negotiations of a MOU with the City of Pittsburgh to formalize the structure, ownership, and responsibilities of the Task Force and the recommendations that come from it.
- The Joint Task Force needs to be charged with innovation to address barriers. For instance, workforce development can quickly get bogged down in contracting and budgetary constraints. The Pittsburgh region has a recent history with effective workforce development programs in manufacturing, culinary and other arts. Administrative and legal innovation needs to be encouraged to overcome barriers to applying those workforce development sector models to water infrastructure and landscape management.
- This Task Force should not be limited to governmental agencies or utilities. It is important to have watershed task force representatives, Indigenous organizations, land stewards, and community organizations as participants. Their knowledge, views, and opinions should be included in processes such as information sharing. In many situations, the community members are the last to know about projects, or are not included in decisions about projects.

PWSA Response: PWSA will use these comments to develop the Joint Task Force membership and agenda.

3. **Priority Areas for Investment** –
   - When defining areas for investment, more value should be placed on where there is overlap between equity (neighborhoods defined as having high vulnerability on both the Allegheny County Environment Justice Index and the EPA Environmental Justice Screen) as well as Areas of Stormwater Opportunity. This would change the top proposed priority watersheds to allow more people in need to be covered and the most underserved communities with the best prospects for green stormwater projects will be served. Environmental justice areas should receive priority. **PWSA Response: PWSA feels that all Four Lenses of Localized Flooding, Water Quality, Equity, and Areas of Stormwater Opportunity in the Strategic Plan strike the right balance of addressing flooding, regulatory water quality requirements, equity, and prioritizing areas of stormwater opportunity to feasibly and cost-effectively manage stormwater.**
   - We are concerned by the lack of an expected timeline, or an estimation of how the goals of the strategic plan would align with ALCOSAN's Clean Water Plan.
   - What is the plan for future work? The timelines seem to end with this document.
   - Without clear next steps and tangible plans, it is unclear how PWSA plans to incorporate green infrastructure in stormwater management.
   - PWSA needs a timeline for the Master Plan for each priority watershed identified in the Plan. PWSA can get rolling on this step with data already on hand and dialogues already consummated through the watershed groups and Task Forces. This process should be integrated with the communication process so that trust is built around long term watershed Master Plans. Those Watershed Master Plans must recognize that implementation will require collaboration and multiple funding sources. This issue is most apparent in the implementation of green infrastructure. Stormwater opportunities

can be found in Parks, open spaces, streets, vacant lots throughout the City. PWSA must be transparent about the distribution of its funding for Green Infrastructure so joint budgeting and financing for large scale holistic projects, such as the Negley Run Conveyance, can be accomplished.

- There is too much "could" or "shoulda" and not enough "will do" in the Plan. We encourage you to release the Final Plan with partners and identified implementation steps clearly identified.
- It would help to have an explanation of how the various stages of PWSA's plan interact with ALCOSAN's Clean Water Plan, or to have an estimated timeline for the next few stages.

PWSA Response: PWSA will incorporate next steps, a timeline and how the Stormwater Strategic Plan coordinates with ALCOSAN's Clean Water Plan into ongoing and long-term public engagement on stormwater.

- Coordinate water and sewer improvements with other utility tasks to avoid tearing up new road surfaces.
- Areas of Stormwater Opportunity needs to focus on small-scale opportunities as well, not just large ones. The curb bump-outs around Wightman Park are great, and they have made walking (especially street crossings) in the area safer and more enjoyable!
- A broader partnership with DOMI on this sort of work to improve pedestrian safety in other neighborhoods would be very valuable. Also, don't overlook considering incentives for homeowners to reduce their own stormwater production, as other cities have done.
- Hill District and Uptown should be a higher priority.
- Saw Mill Run should rank high but the stormwater problems (and projects) should be done upstream as well.
- Page 40 - there should be efforts to set up a framework to remediate the Saw Mill Run flood plain. Perhaps the use can remain similar but the way it's built up needs to be re thought. Eg. Abandoned lots could be reimagined as opportunities for repair or restorations and any heavy developments should have restrictions/requirements if allowed at all. **PWSA Response: This would be a good topic for the Joint Task Force.**
- Nine Mile Run should be a higher priority. Waterways that are accessible in public parks should be a higher priority because my children like to play in the streams and I don't want to worry about them getting a disease.
- Make sure you also consider issues related to undermined areas and landslide prone slopes when determining priority areas.
- Has PWSA considered privately owned vacant property as potential sites for BMPs? **PWSA Response: This would be a good topic for the Joint Task Force.**
- We should be investing in a green way strategy along all the major waterways that include wetland restorations to help improve water quality within the rivers to help mitigate CSO impacts.
- I think bioswales and creating green infrastructure on existing roadways should be added. For example all concrete dividers could be an opportunity for plantings.

- I think that there needs to be more of a focus in environmental justice and helping historically divested communities with stormwater management with the fees coming in.
- 3RWK does however have concerns about the localized flooding data that PWSA uses in the plan to weigh priority areas for investment. The map relies heavily on reported data, which might not accurately reflect flooding distribution. People with chronic basement flooding might eventually stop reporting if reporting those backups does not result in change. **PWSA Response: PWSA will incorporate more data gathering on problem areas into ongoing and long-term public engagement on stormwater.**
- In the interest of improving the localized flooding data, we believe that PWSA should consider taking advantage of the new communication strategy to simultaneously communicate to Pittsburghers how and when to report flooding. **PWSA Response: PWSA will incorporate more data gathering on problem areas into ongoing and long-term public engagement on stormwater.**
- How will ROW stormwater management be handled? What is PWSAs viewpoint on it as a viable method? Should we turn focus to vacant public land and other large scale projects? (Comment from City Planning).
- Climate risk should also be prioritized, using updated datasets/satellite imagery.
- Priority areas are those at highest risk and will continue to bring value to properties and businesses in PGH
- Data driven and impact on historically underserved communities will hopefully be front and center. Scaling of projects with the incorporation of peer-city best practices and models. Localized flooding, equity and critical areas of opportunity seem critically important.
- Land use practices need to change in order for the priority watersheds to execute and developed Watershed Master Plans. Stormwater ordinances for new developments are not enough. Codes and city ordinances need to be changed to more stormwater conveyance can occur on public lands and Rights-of-Ways. More investments on private lands connecting to public conveyances need to be envisioned. In addition, incentives need to be properly aligned. There may be opportunities for microshed planning where public and private landowners work in tandem to manage stormwater.
- The Strategic Plan outlines new water quality priorities that will consider how ALCOSAN's Clean Water Plan and the regionalization of intermunicipal sewers and associated facilities will work in concert with PWSA's Strategic Plan. ALCOSAN would like to better understand these priorities and the planned infrastructure as well as pair the priorities with strategic flow reduction to bring the most affordable value to the region. (ALCOSAN’s comment).
- If targeted buyouts are a strategy, involving housing orgs and being extremely transparent is of utmost importance.
- We also note the environmental justice implications of strategies such as targeted property buyouts. If PWSA is considering these types of strategies (as the plan suggests), we want to stress the importance of centering the affected communities. Some studies have shown the importance of involving residents, including renters, in the process and

ensuring that compensation is based on the residents' actual needs, with the consent and support of the affected communities.

- When prioritizing flooding areas, provide info on how residents can easily report flooding.
- Vacant land is an opportunity. Beware of eco-gentrification without pricing out low income residents. Could land be out to other good use - affordable housing? Community gardens? See Philadelphia LandCare lot greening studies.
- Equity and Areas of Stormwater Opportunity are major lenses for analyzing for the Lincoln-Lemington-Belmar community. This community should be given more focus. The maps used for these lenses leave the neighborhood out. The following are points of importance for consideration:

- Much work is still needed regarding developing a picture of stormwater flow, wet basements occurring during storms, and the extent of basement backups. There is a mistrust of PWSA and what the company will do if these issues are reported. It is felt there will be negative consequences or that PWSA will do nothing to help.

- Navarro Field may be an area of stormwater opportunity. It was created as a baseball field for neighborhood children. The current use seems to be a storage site for construction equipment (it's off of Dean Street). The site is on a hill above the Brilliant Railway tracks and is above Washington Blvd. Maybe it could be converted to a park with green infrastructure added and a water retention area to slow water from flowing downhill.

- Oakdene Street in the Chadwick area of Lincoln-Lemington is in the path of the Watershed while Chadwick Park and its sports field has been studied as to its potential for stormwater management, pond overflow basin restoration. It has also been studied for rainwater conservation catchment for rainwater reuse for food/forestry/orchard/permaculture conservation. While Grounded Strategies has documentation, there is more indigenous infrastructure documentation from Chief Ynga Council member Ix Pomaj-chakmam-yajalaji of the Iroquois Confederacy of Aborigine American People, and Grand Ynga of The Onkwehonwe Bah-kab kob-utzil ux-wi'il, creator of IPAA Food Forestry Arts and Culture, at law of the Constitution at Article 1, Section 2, Clause 3 "and excluding Indians not taxed". These documents should be reviewed by PWSA.

- Paulson Field should be evaluated for stormwater storage as was done at Mellon Park. There is often standing water for days after storms. The Lincoln-Lemington-Belmar Vision Plan is on Engage.pgh and has maps.

  PWSA Response: PWSA will evaluate these potential locations for stormwater management.

4. Define Initial Investment Strategies

- PWSA should invest in more sustainable stormwater management practices instead of containerizing and storage of large volumes of water, more progressive solutions to runoff.
- It is critically important to incorporate more green infrastructure into this plan and rely less on gray infrastructure.
- There is a lot of detailed grey water solutions in this plan, there needs to be more green infrastructure and greening details.
- Green infrastructure should be a key focus of the strategic plan including the creation of bioswales along roads, pocket parks, hillside plantings to prevent mudslides, planting native species, and decreasing impervious surface areas.
- The direction, concepts, and proposals of the draft Stormwater Strategic Plan are an impressive listing of potentials. The Negley Run Watershed Task Force is well-situated and eager to work with PWSA in the Plan's implementation. The breadth of the proposals are ambitious and the Task Force appreciates that PWSA did not let capacity concerns limit its vision. The report repeats often that stormwater program implementation will require partnerships and collaboration. PWSA must work hard to build those partnerships as they will not happen easily.
- The Negley Run Task Force is set to do its part and match PWSA's efforts to reach out to others. PWSA must reciprocate with public commitments within its budget and five year plans to pursue the innovation and partnerships that are suggested by the Plan.

5. **Establish Guiding Principles for Level of Service and Flooding**-
    - Fully funded backwater valve program for residents severely impacted by basement backups. This, plus pipe lining instead of full replacement to only a 5 year level of service would be less disruptive costly, and provide a higher level of basement protection.
    - PWSA is considering a new stormwater plan shortly after a major federal investment in stormwater infrastructure through the Infrastructure Investment and Jobs Act. This is something that PWSA briefly addresses in the new plan. Given the likelihood of substantial available funding over the next few years, the opportunity for ambitious new projects is unprecedented. We are interested in learning more about how PWSA plans to make use of this funding, and we hope that PWSA will communicate those plans to the public at the earliest opportunity.
    - Having SMART goals here may be helpful not only in both achieving them but communicating targets to customers. This will also hold PGH20 accountable for changes made to level of service and lessons learned from flooding events.
    - Level of service should be communicated better because it is a relatively complicated term for the layman. **PWSA Response: PWSA can provide a more in-depth explanation of Level of Service concepts, including return intervals of rainfall events. Both of these technical concepts can be a challenge to understand but are important for informed conversations about cost-effective services that utilities are able to provide to manage stormwater.**
    - A rigid Level of Service definition could deter collaboration or the leveraging of stormwater fee for innovative projects and limit opportunities to capture multiple co-benefits and meet inter-agency objectives. Allow the Level of Service definition apply only to limited purposes around achievement of PUC fee approval. Let the Level of

Service definition recede in decision-making importance when negotiating cross-media and inter-party collaborations.

6. **Leverage Stormwater Fee**–
   - The stormwater fee is a rain tax and just another way to extort money from residents.
   - Make the stormwater fee credit program as easy to use as possible.
   - Stormwater fee application is complicated and requires hiring an expensive engineer to perform the calculations. **PWSA Response: PWSA is streamlining and simplifying the stormwater fee credit application.**
   - Stormwater fee credit amount is currently too small to be an effective incentive. Incentivize to the maximum degree homeowner use of capture and storage practices, as *en masse* they have a great effect on downstream infrastructure use.
   - Water and sewage is outrageously expensive. We can't afford any more fees.
   - Establish a grant Program for GSI on Private Property (homeowners and small businesses) similar to the one in Philadelphia using SW Fee funds.
   - Private GSI grant program can help encourage on lot stormwater retention.
   - "Public-private partnerships" can often just be a hidden form of privatization. Don't give ratepayer funds to big business.
   - We love our public water and sewer system! Keeping rates under control is important, but we are so glad to have a publicly-owned and accountable system that is finally making the investments that are needed!
   - LandForce asked if they could please be included in the workforce development section of the plan (and appendix). It is a local resource and should be mentioned, as PowerCorps was. **PWSA Response: PWSA has refrained from mentioning specific PWSA contractors in the Stormwater Strategic Plan.**
   - Lowest bidder contracting hurts projects. Best value or qualifications-based selection options is huge, especially with non-traditional GSI.
   - A more steady or consistent program is also needed in addition to PWSA's GSI workforce development program. We need more maintenance for GI projects if they aren't going to be weed whacked down.
   - Target outreach for homeowner stormwater BMP projects in high priority areas.
   - PWA needs to inspect stormdrains even in non-flood prone areas.
   - The stormwater fee may be an important source of funding, but the fact that PWSA is imposing this additional fee makes it all the more important that PWSA proactively communicate how they are using that money. The public should know what specific plans PWSA is developing: how PWSA intends to use the money, what projects are being considered, and when communities can be expected to see results.
   - What is the plan for using the SW fee funding? Will this be a part of the master planning work?
   - As a public utility, PGH20 receives tax revenue in addition to a customer payment for profit. Any expenditures should ultimately be made in an effort to increase base tax revenue for PGH20, which then in turn allows the reduction in customer costs.
   - I encourage PGH20 to think creatively about ways/potential revenue streams for collecting, cleaning and repurposing storm water. (Again in an effort to reduce customer costs).

- Would love to see incentives added for green infrastructure installations, water collection and storage in/around commercial and residential properties. **PWSA Response: PWSA currently has a stormwater fee credit program.**
- Stormwater fee should be used for OTHER environmental investments outside of water so we have a multipronged climate approach. **PWSA Response: PWSA's PUC-approved tariff does not allow this.**
- I believe the perception is that the current fee structures are high and residents don't yet see where these additional $$s are going -- to address this comprehensively and point specifically to the infrastructure investments that are necessary and the cost of them will be an ongoing and necessary conversation.
- PWSA, in its tariff defense to PUC and within its budgeting, should identify a percentage of the stormwater fee revenue to support a formal structure for community involvement and mutual learning at the watershed scale. The Pittsburgh Parks Conservancy's work to convene and facilitate urban task forces around priority watersheds provides an appropriate community liaison partnership. In addition, the Watersheds of South Pittsburgh, Upstream Pittsburgh, and the Mon Water Project are positioned to provide communication assistance.
- PWSA should embrace an element of flexibility in the use of the stormwater fee revenue. In addition, PWSA must encourage contract innovation among its staff and to all of its agency and regulatory partners, especially, the Pennsylvania Utility Commission. Innovation should be encouraged in all PWSA departments and partners, such as project financing, contracting, design and delivery.
- PWSA needs to send out licensed insured installers with rainbarrels for all residential customers. They also need to work with the city to send out their concrete people to remove concrete from as many properties as possible. PWSA needs to use the infrastructure government from the government instead of raising rates all the time.
- Money from the fee can be used to help our community fund small research projects for stormwater management. Also, the fee can be used to paint/coat basement walls with non-toxic water protectant. This could be done like the lead line replacement program. Finally, the fee can fund community stormwater stewardship of public parks and spaces. As mentioned earlier, Paulson Field and Chadwick Park could be funded, as well as Highland Park and Riverview Park.
- Stormwater fee - transparency, show that fee was put to good use.

4. Comments Received Electronically on the EngagePGH Website

The EngagePGH platform, available through the City of Pittsburgh, provides an opportunity for residents to participate in the long-term stormwater strategic planning efforts underway at the Pittsburgh Water and Sewer Authority. The site also includes a video and an FAQ about our strategic planning efforts for multiple ways to learn about this important work.

Community input is essential to our long-term planning efforts, and EngagePGH is an additional tool PWSA can use to gather feedback about the stormwater challenges Pittsburgh residents experience.

Using the interactive web portal, engage.pittsburghpa.gov/stormwater, the Pittsburgh community can participate in helping PWSA develop stormwater solutions that over time will create a safer, more stormwater-resilient community. The site provides three opportunities for feedback, and currently remains active for input from the community.

1. Stormwater Issue Locations Map

Participants can add a marker at map locations to identify basement backups, overland flooding, routine maintenance locations, or other stormwater issues that were previously observed with the approximate date(s) when the issue occurred.

PWSA will use this information (37 contributions as of July 2023, with issues such as storm drains not properly working or areas of flooding reported) to inform our planning process. For current issues, PWSA requests that participants please contact our 24-hour emergency Dispatch at (412) 255-2423.

2. What topics do you want to see addressed in order of importance?

Participants can rank topics in order of importance, such as: public health and safety, stormwater runoff and pollution, green infrastructure to fortify neighborhoods, increasing partnerships, improving stormwater infrastructure to mitigate the effects of climate change.

As of July 2023, most important to the 36 respondents were:

- Improving stormwater infrastructure to create a more resilient city protected from the effects of climate change;
- Using green infrastructure to beautify and make neighborhoods more resilient;
- Protecting our waterways from erosion and pollution due to stormwater runoff.

Least important was - Increasing partnerships with the City of Pittsburgh, the Pittsburgh Parks Conservancy, Watershed Taskforces, and other community groups.

3. Do you have any questions about the Stormwater Strategic Plan?

Participants can pose stormwater-related questions to PWSA's stormwater project managers. Only three questions were logged as of July 2023, and these were inquiries about storm drains, curbing and flooding. PWSA will use this information (37 contributions as of July 2023, with issues such as storm drains not properly working or areas of flooding reported) to inform our planning process. (Note that PWSA encourages customers to report stormwater issues to contact our 24-hour emergency Dispatch at (412) 255-2423.)