# Southwest Resiliency Park, Phase 1
## Methods

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# Acknowledgements
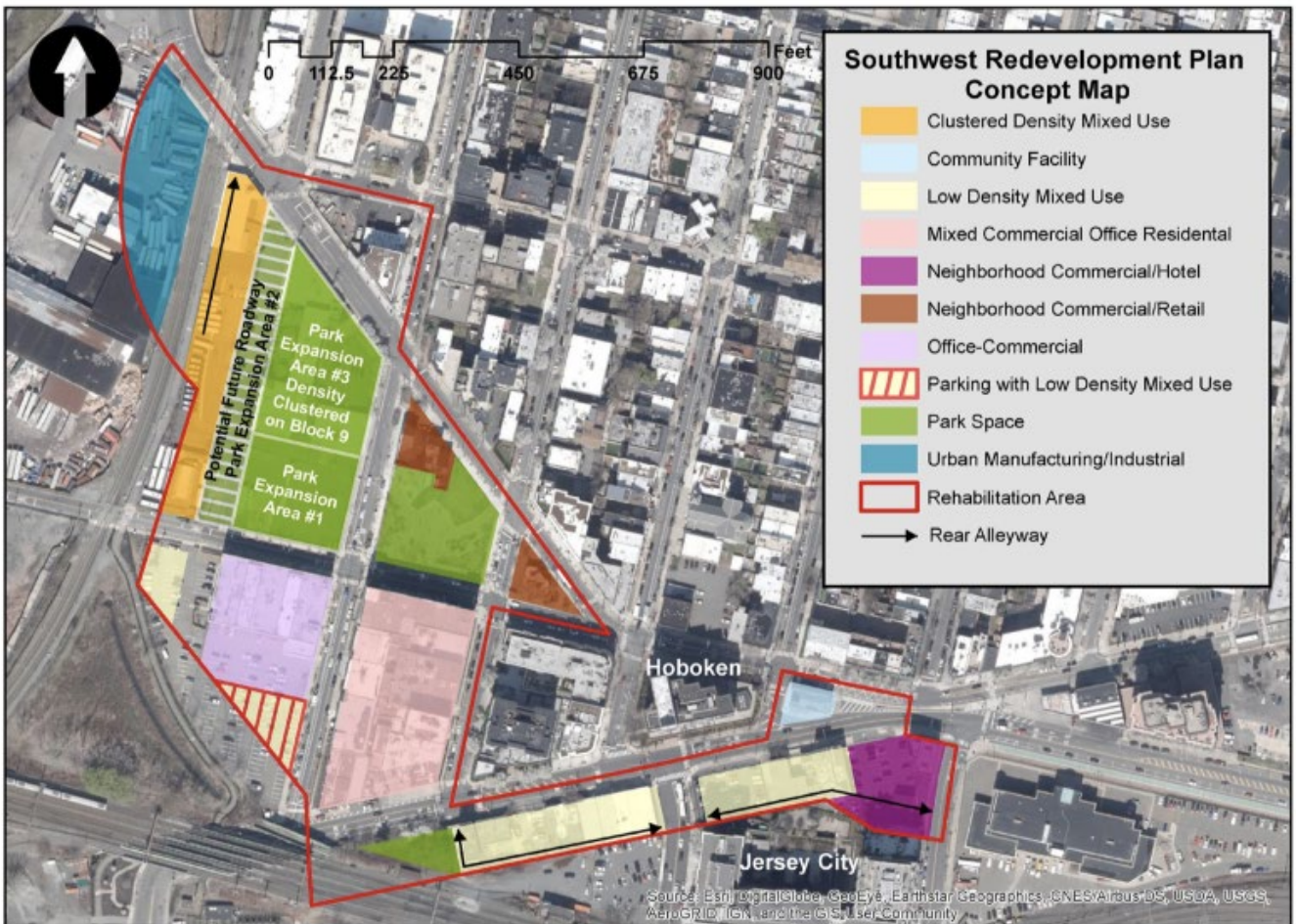
## Research Strategy

Southwest Resiliency Park, Phase 1, is a significant element of Hoboken's resiliency strategy. Constructed in 2017, catalyzed by the Rebuild by Design Competition, the park was built to control flooding in southwest Hoboken while creating amenities to revitalize the community. For this study we investigated the Environmental, Social, and Economic benefits of the park. There is a considerable amount of post-construction data used in this performance study to help determine how successful the design has been since implementation.

Monitoring systems from the North Hudson Sewerage Authority, as well as the City of Hoboken, and studies conducted by Starr Whitehouse allowed for a plethora of data to review for this study. Collaboration with these groups made this research possible. Further, the research team conducted on site intercept surveys, Limitations based on lack of data can be found under each benefit studied.

## Project Goals

- The minimum requirement stated by the New Jersey Department of Environmental Protection was to detain 100% of the ten-year storm event, equivalent to 82,000 gallons of water. However, the project goal was to go beyond that NJDEP standard through an underground storage system combined with green infrastructure.
- Reduce localized surface flooding and reduce the time it takes for floodwater to drain from the street, while reducing strain on the combined sewer system by delaying the amount of flood water entering the system during major rain events.
- Provide recreation and open space benefits for the community by fulfilling the programmatic elements prioritized in the community engagement process.
- Reduce negative impacts on vehicular traffic due to flooding in the adjacent right-of-way.
- Create a publicly visible expression of the City's stormwater management priorities for purposes of education and generating public support for future environmental interventions.

## Redevelopment Plan: (City of Hoboken)



**Southwest Redevelopment Plan Concept Map**

Legend:
- Clustered Density Mixed Use
- Community Facility
- Low Density Mixed Use
- Mixed Commercial Office Residential
- Neighborhood Commercial/Hotel
- Neighborhood Commercial/Retail
- Office-Commercial
- Parking with Low Density Mixed Use
- Park Space
- Urban Manufacturing/Industrial
- Rehabilitation Area
- Rear Alleyway

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

The 2004 Hoboken Master Plan and 2010 Master Plan Reexamination Report presented a variety of recommendations regarding Southwest Hoboken, including the preservation of urbanized industry and industrial arts, the need for **more public park space**, and the potential for transit-oriented, mixed-use development. The park is the centerpiece of the Rehabilitation Plan, which focused not only on revitalizing the area by providing open space and walkability for all residents, but also on controlling flooding in Southwest Hoboken. See *Neighborhood History/Context* in Case Study Brief.

Site Plan: (SWLAP)

# _Environmental Benefits_

Several environmental benefits were studied at Southwest Resiliency Park to develop an understanding of the programmatic flood infrastructure that is laterally integrated with social space. Green infrastructure implementations like rain gardens, greenspace, and tree cells located throughout the park work together with an underground weir storage system with the goals of detaining stormwater while providing social space, improving biodiversity, and creating habitat for pollinators. Each of the metrics for the study were chosen to best quantify these environmental benefits to determine their levels of success.

_The presence of insects and pollinators is a good indicator of the ecological health of a landscape. Although we were unable to quantify the number of insects in the garden plantings and green infrastructure due to project constraints, we assessed the plants that were present at the time of study. Though any planting project has some losses as plants establish, thriving plantings within the rain gardens and curb bump outs include swamp rose mallow (_Hibiscus moschuetos_), Northern blue flag (_Iris versicolor_), and aster 'Purple Dome' (_Aster novae-angliae 'Purple Dome')_, which all attract pollinators. Due to the abundance of pollinator friendly species compared to preconstruction conditions, it can be assumed that there has been an increase in the amount of insect species on site even though for this study, due to limitations, the number has not been quantified._



_Team member assessing plantings, Wolfram Hoefer, 6/26/24_

**Environmental Benefit 1:**

- **Reduces combined sewer overflow (CSO) by detaining stormwater equivalent to at least 1.8% of annual CSO volume, or over 1 million gallons, from the larger 268-acre sewershed – of which the park makes up only 0.47% in area.**

*Background*
Before implementation the area was regularly impacted by flooding and overflow due to major rain events and storms, leading to major flooding in roadways and adjacent properties. Southwest Hoboken was under 6 ft of water during Hurricane Sandy. Frequent torrential rain events caused overflow of the combined sewer system.

Stormwater infrastructure throughout the park and along adjacent streets were implemented to reduce the strain of floodwater on the area and detain water so sewage systems would not overflow. The minimum requirement stated by the New Jersey Department of Environmental Protection was to detain 100% of the ten-year storm event, equivalent to 82,000 gallons of water. However, the project goal was to go beyond that NJDEP standard through an underground storage system combined with green infrastructure (rain gardens + bioswales). Taking up only 1.25 acres, the Southwest Resiliency Park makes up 0.47% of the area of the sewershed it is located within. At such a small size, the park has a massive impact by detaining over 1 million gallons of stormwater annually.

*Methods*
Data accumulation was provided by the North Hudson Sewerage Authority (NHSA). For this calculation, the CSI research team used the summation of the volume of rain held by Southwest Resiliency Park across major storm events from the year 2023 (data provided by NHSA). This was compared to the overflow volume by drainage basin in the typical year in the H1 Sewershed (see sewershed diagram below). Combined sewer overflow (CSO) is the amount of water and sewage that is pumped out of the city annually. In the typical year, the H1 sewershed has a CSO overflow of 65.5 million gallons. Detaining this water and delaying the release of stormwater into the sewage system prevents flash flooding after major storm events.

*Calculations*
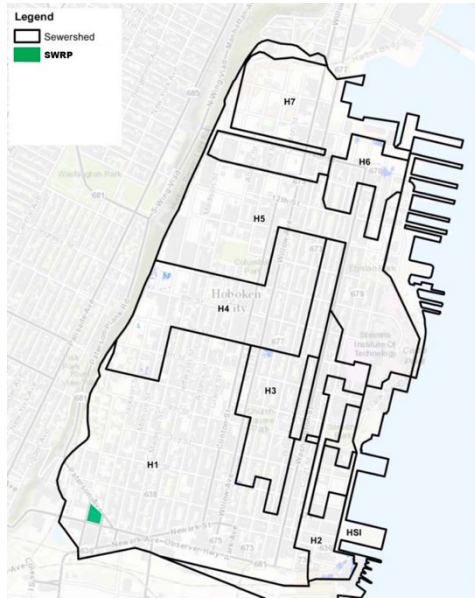


**Hoboken Sewersheds |** Southwest Resiliency Park is located in H1.
(*HUD/CSI RESEARCH TEAM*)

**Overflow Volume by Drainage Basin in the Typical Year, Existing Conditions**

| Drainage Basin | CSO Volume Typical Year, MG |
|---|---|
| H1 | 65.5 |
| H3/H4/HSI | 82.3 |
| H5 | 23.8 |
| H6/H7 | 13.9 |
| 18PS | 6.1 |
| W1234 | 24.9 |
| W5 | 6.3 |
| TOTAL | 407.7 |

MG = million gallons

**H1 Annual Overflow volume: 65.5 million Gallons**

2023 rain events

| | Date | Duration (hours) | Rainfall Amount (inches) | Peak 15 min Intensity (in/hr) |
|---|---|---|---|---|
| 56 | 4/29/2023 | 25 | 3.04 | 0.44 |
| 57 | 4/30/2023 | 15 | 2.57 | 0.92 |
| 58 | 6/26/2023 | 26 | 0.75 | 2.04 |
| 59 | 9/11/2023 | 1.75 | 0.76 | 1.64 |
| 60 | 9/25/2023 | 52.00 | 2.15 | 0.44 |
| 61 | 9/29/2023 | 26.75 | 3.77 | 1.44 |
| 62 | 11/22/2023 | 11.75 | 2.38 | 0.76 |
| 63 | 12/18/2023 | 12.25 | 2.5 | 0.84 |

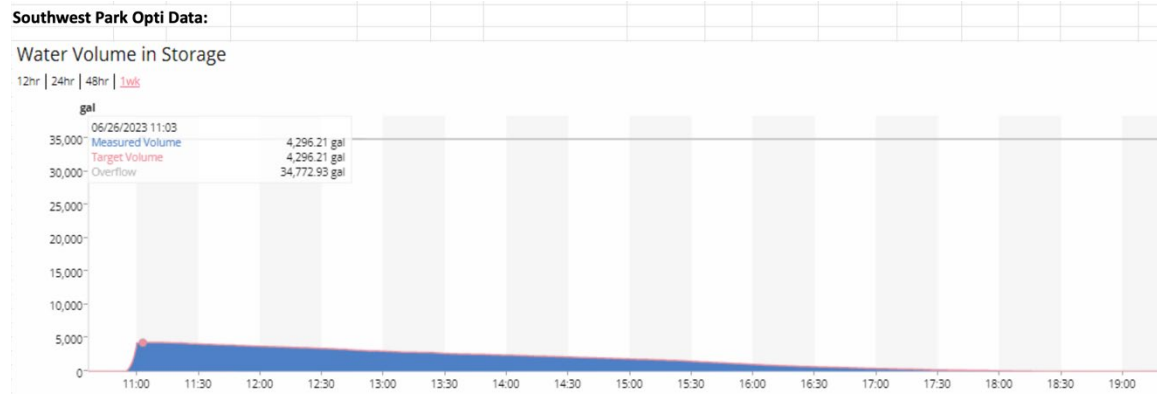**NHSA Rain Event Data (4/29/2023) - Southwest Park**



*Measured volume: 71,281.87 Gallons*
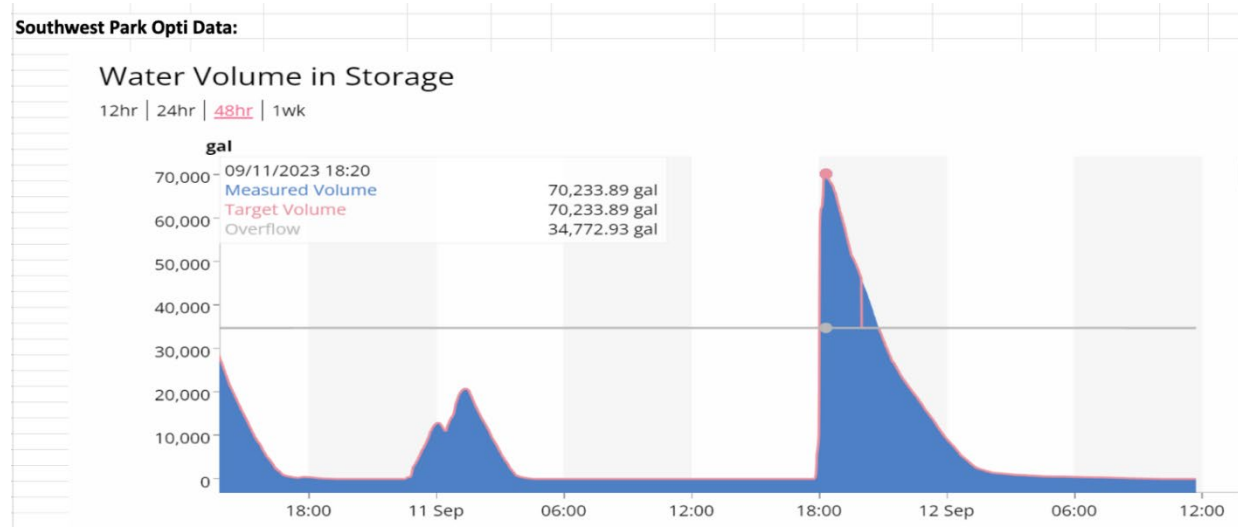
**NHSA Rain Event Data (4/30/2023) - Southwest Park**



*Measured volume: 71,281.87 Gallons*

## NHSA Rain Event Data (6/26/2023) - Southwest Park

**Southwest Park Opti Data:**

Water Volume in Storage

12hr | 24hr | 48hr | 1wk

gal

| 06/26/2023 11:03 | |
|---|---|
| Measured Volume | 4,296.21 gal |
| Target Volume | 4,296.21 gal |
| Overflow | 34,772.93 gal |

*Measured volume:* 4,296.21 Gallons

## NHSA Rain Event Data (9/11/2023) - Southwest Park

**Southwest Park Opti Data:**

Water Volume in Storage

12hr | 24hr | 48hr | 1wk

gal

| 09/11/2023 18:20 | |
|---|---|
| Measured Volume | 70,233.89 gal |
| Target Volume | 70,233.89 gal |
| Overflow | 34,772.93 gal |

*Measured volume:* 70,233.89 Gallons

## NHSA Rain Event Data (9/25/2023) - Southwest Park

**Southwest Park Opti Data:**

Water Volume in Storage

12hr | 24hr | 48hr | 1wk

gal

| | |
|---|---|
| Measured Volume | gal |
| Target Volume | gal |
| Overflow | gal |

*Measured volume:* 15,000 Gallons*

## NHSA Rain Event Data (9/29/2023) - Southwest Park



*Measured volume: 71,281.87 Gallons*

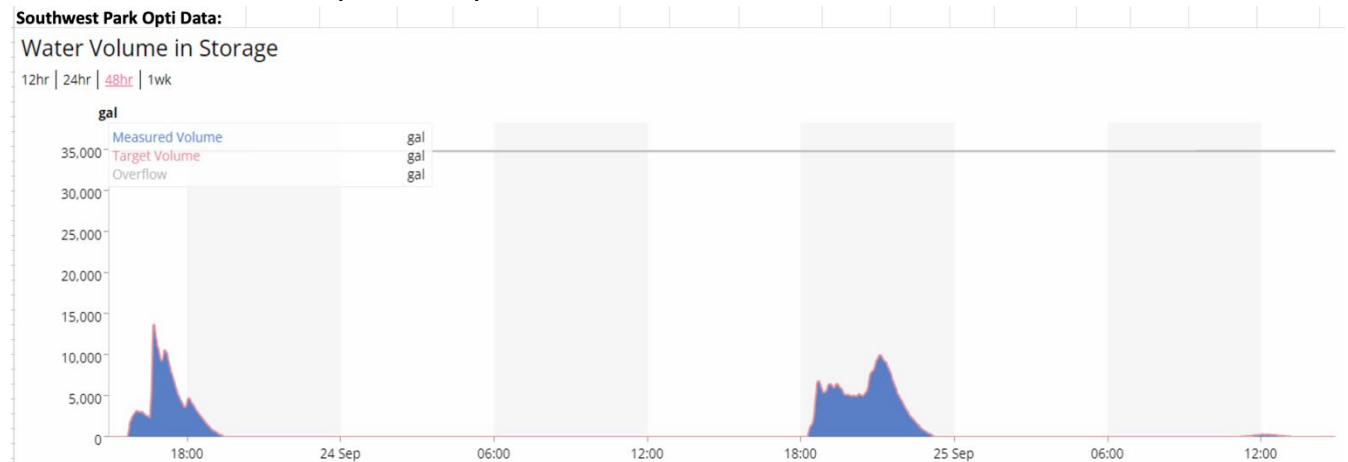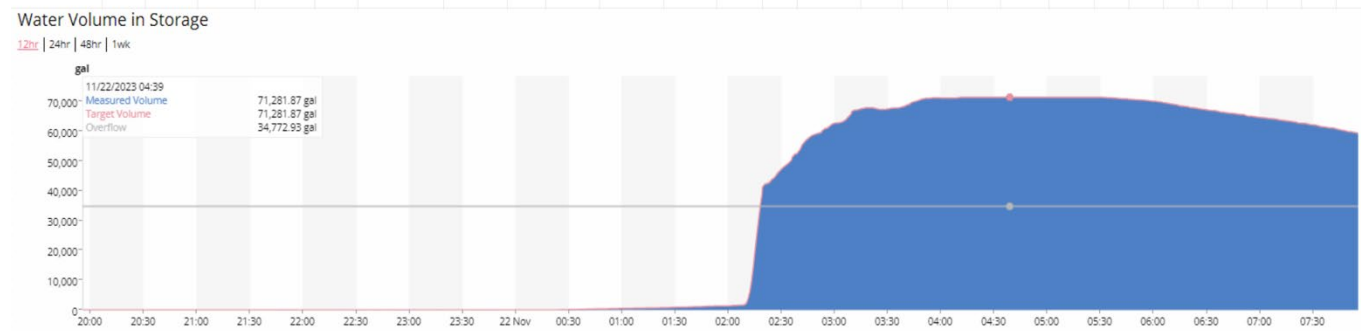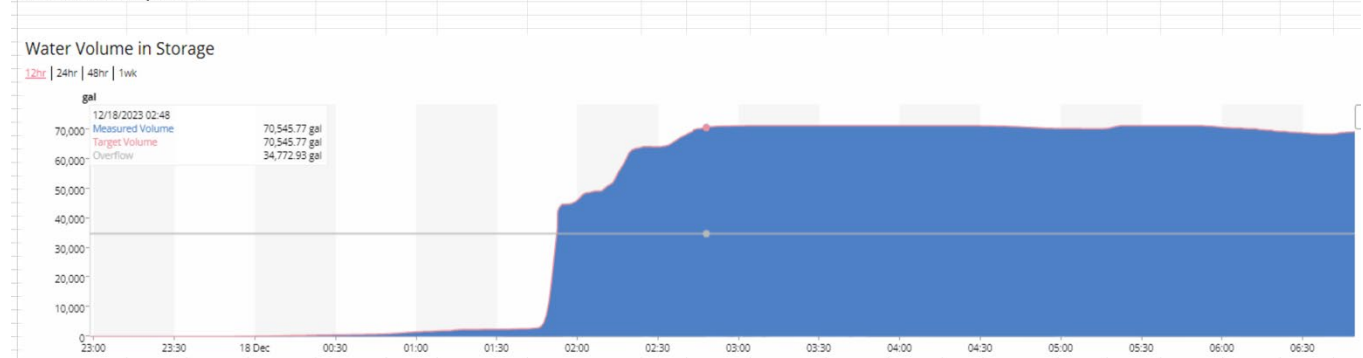## NHSA Rain Event Data (11/22/2023) - Southwest Park



*Measured volume: 71,281.87 Gallons*

## NHSA Rain Event Data (12/18/2023) - Southwest Park



*Measured volume: 70,545.77 Gallons*

**TOTAL MEASURED VOLUME 2023** (major storm events)

| | | |
|---|---|---|
| 1 | 70,545.77 | |
| 2 | 71,281.87 | |
| 3 | 71,281.87 | |
| 4 | 15,000 | |
| 5 | 70,233.89 | |
| 6 | 4,296.21 | |
| 7 | 71,281.87 | |
| 8 | 71,281.87 | |
| 9 | **445,203.35** | TOTAL |

**Measured Volume 2023** (major storm events): *445,203.35 gallons*
*H1 Annual Overflow volume: 65.5 million gallons*

In 2023 the Southwest Resiliency Park held 445,203.35 gallons of stormwater from major storm events in the underground storage system. This does not include water absorbed within bump outs, rain gardens, and other green infrastructure. This water was eventually released into the sewerage system and released in a CSO outfall. With 65.5 million gallons of stormwater released annually from H1 sewershed outfalls, the SWRP was able to hold **0.7%** of water annually in 2023*.

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The CSI research team used data based on the measured storage volume from sensors within the system during all recorded storm events in 2023. We found the summation of water volume in storage of Southwest Resiliency Park over all recorded storm events in 2023 to determine the total water volume held by the underground system. Each storm event was considered "Major" by the North Hudson Sewerage Authority and resulted in flash flooding in Hoboken. Comparing this with annual H1 Sewer-shed CSO data we were able to determine the % of stormwater held by the underground storage system at SWRP.

*The rain gardens and lightweight fill used throughout the rest of the park act as sponges, absorbing water and increasing the total capacity to approximately 190,000 gallons.*

*Using calculation of:*
*% of storage system filled per storm event and applying that % to the 118,718.13 max capacity of green infrastructure (190,000 gal - 71,281.87 gal) yields an estimate of:*

| Storage Tank | SWRP Total | Green Infrastructure |
|---|---|---|
| 70,545.77 | 188,037.94 | 117,492.17 |
| 71,281.87 | 190,000 | 118,718.13 |
| 71,281.87 | 190,000 | 118,718.13 |
| 15,000 | 39,982 | 24,982 |
| 70,233.89 | 187,183 | 116,949.23 |
| 4,296.21 | 11,454.91 | 7,158.70 |
| 71,281.87 | 190,000 | 118,718.13 |
| 71,281.87 | 190,000 | 118,718.13 |
| **445,203.35** | **1,186,657.97** | **741,454.62** |

Calculations Example (Same calculation used from all rows of above table)

| Storage tank/max storage capacity =% | Max green infrastructure storage * % = estimate of GI storage during event | estimate of GI storage during event + storage tank = SWRP total (estimate) during event |
|---|---|---|
| 70,545.77/71281.87=.9897 | 118,718.13 * .9897 =117,492.17 | 117,492.17 + 70,545.77 =188,037.94 |

***1,186,657.97 gallons*** *held during major storm events in 2023 by SWRP\**

***1,186,657.97 gallons / 65.5 million gallons =*** <u>***1.8%***</u>

<u>*Source*</u>
Data and documents provided by the North Hudson Sewerage Authority and Starr Whitehouse. Calculations by the CSI Research Team.

<u>*Limitations*</u>
*The CSI research team was unable to determine the exact amount of stormwater held by the green infrastructure (including permeable pavers, tree cells, green space, and rain gardens, etc.) throughout the park during each storm event as this is not measured. For these calculations, the underground system is the only quantified storage. The park is capable of holding much more water than the calculations show.

Another limitation was the lack of annual data for SWRP. Data was only recorded for "major" storm events, not all rain events throughout 2023. This is only a fraction of rain held by this park annually.

## Environmental Benefit 2:

- **Detains up to 71,282 gallons of stormwater, or 100% of a 10-year storm event, in the underground storage system.**

*Background*
The park boasts an extensive underground storage system. Necessary after Hurricane Sandy, NJDEP required the system to hold 100% of a ten-year storm event, or 82,000 gallons of water. Through data accumulated by the NHSA it was found that the most water the underground storage system detained, going back to 2017, was 71,281.87 gallons.

*Method*
Evaluation of the peak amount of stormwater detained during major rain events using data measured by the City of Hoboken and the North Hudson Sewerage Authority.

*Calculations*
Looking at the storm event with the most volume Rainfall amount (in) and Intensity (in/hr) in which the sensor remained on-line we used valve data to determine the water detained.
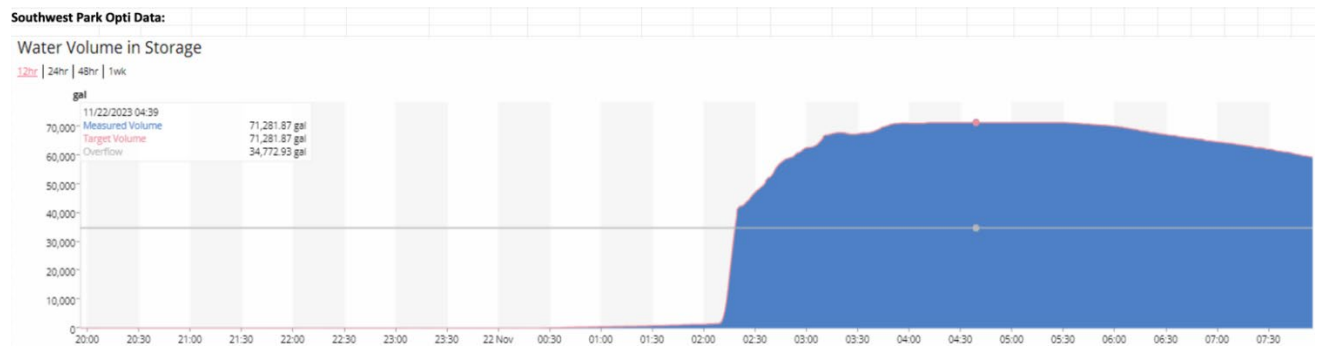


*Water Volume in Storage: **71,281.87 gallons***

*Source*
Data and documents provided by the North Hudson Sewerage Authority

*Limitations*
The storage available by volume of the underground system is 82,000 gallons. According to the North Hudson Sewerage Authority, the sensors are not always 100% accurate with the volume of water held. This is the highest recorded amount of water detained. The system is back calculating based on height to determine the amount of water that being stored, so this number may not be 100% accurate. In extreme storm events like Tropical Storm Ida (9/1/2021) (6.54 inches of rain) (4.32 inches/second) the system was overloaded and went offline so there is no data. The CSI Research team was unable to estimate the amount of water held preconstruction, but anecdotally the space mostly was a reason for runoff into the sewer system due to the asphalt material.

# Environmental Benefit 3:

- **Allows for effective detention and controlled release of stormwater, with the sensor system being utilized to delay stormwater from entering the sewer system during every storm event in the past 5 years, including 61 major storm events, 5 tropical storms, and 1 hurricane.**

*Background*
One of the goals of the Rebuild by Design Project in Hoboken was to implement infrastructure to detain and hold stormwater – reducing strain on the sewage system. To quantify the success of these measures, sensors across the city determine the appropriate time in which stormwater held by a single park is released into the combined sewer system to prevent overflow.  At the Southwest Park, the sensor is used during every storm event, and the level sensor determines when to release the detained water into the sewer system after the storm has passed. It also analyzes weather patterns to determine the optimal time to release the water being held, by predicting if more flows will come. When it senses another storm in the area, water will be released into the sewer system to make room for another rain event in the park storage system. All valves in the underground storage system remain closed until the sensor determines there is room for additional flows in the H1 sewershed. The sensor at Southwest Resiliency Park will hold water for up to 8 hours when the sewer system is full.

*Method*
Evaluation of the number of rain events in which the sensor technology was necessary and successful using valve data measured by the City of Hoboken and the North Hudson Sewerage Authority.

*Calculations*
Major Storm events (61 total):
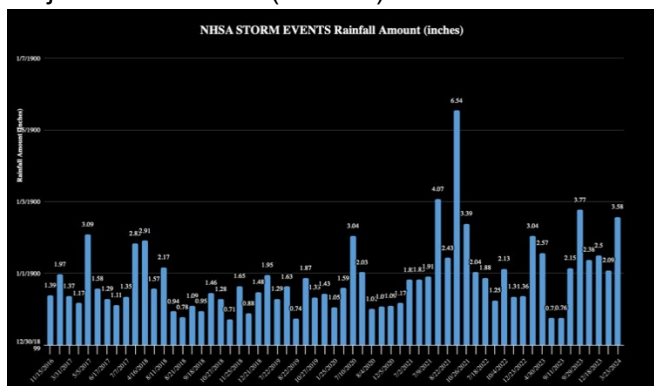


*Source*
Data and documents provided by the North Hudson Sewerage Authority

N/A

## Environmental Benefit 4:

- **Effectively prevents flooding, with stormwater from 60% of recorded major storm events, 27 out of 45, being completely captured by underground storage system in park since the park's opening.**

*Background*
Characteristic of the Delay portion of the Rebuild by Design competition, the park is vital in preventing runoff from storm events by detaining the water and slowly releasing it into the sewer system to prevent overflow into the streets of Hoboken. The park itself was required to hold a ten-year storm event, and in 60% of major rain events it completely captured all stormwater.

*Method*
Data from rain events from 2018-2024 were reviewed by the CSI Research Team to determine the number of events the storage system did not reach max capacity

*Calculations*
Examining the data set from the North Hudson Sewerage Authority there are 45 major storm events with data recorded at Southwest Resiliency Park going back to 2018.

Events in which storage system did not reach capacity:

| Date | Duration (hours) | Rainfall Amount (inches) | Peak 15 min Intensity (in/hr) |
|---|---|---|---|
| 8/11/2018 | 6.5 | 2.17 | 3.4 |
| 8/17/2018 | 3.25 | 0.94 | 1.72 |
| 8/21/2018 | 2.25 | 0.78 | 1.36 |
| 9/18/2018 | 4.25 | 0.95 | 0.8 |
| 9/25/2018 | 10 | 1.46 | 0.48 |
| 10/27/2018 | 23.75 | 1.28 | 0.36 |
| 11/25/2018 | 8 | 1.65 | 0.6 |
| 11/26/2018 | 12.25 | 0.88 | 0.56 |
| 12/21/2018 | 12.5 | 1.48 | 0.6 |
| 7/17/2019 | 3.75 | 1.95 | 4.12 |
| 7/22/2019 | 3 | 1.29 | 1.52 |

| 10/16/2019 | 8.75 | 1.87 | 1.48 |
|---|---|---|---|
| 10/27/2019 | 8.25 | 1.33 | 1.4 |
| 1/25/2020 | 4.5 | 1.05 | 1.08 |
| 7/6/2020 | 1.75 | 1.59 | 3.72 |
| 8/4/2020 | 3.25 | 1.01 | 2.36 |
| 11/30/2020 | 6 | 1.07 | 0.8 |
| 12/5/2020 | 13.5 | 1.09 | 0.36 |
| 3/24/2021 | 6.5 | 1.17 | 0.48 |
| 7/18/2022 | 12.5 | 1.88 | 1.76 |
| 9/25/2022 | 2 | 1.25 | 1.28 |
| 10/4/2022 | 19 | 2.13 | 0.88 |
| 12/23/2022 | 8 | 1.36 | 1.76 |
| 6/26/2023 | 26 | 0.75 | 2.04 |
| 9/11/2023 | 1.75 | 0.76 | 1.64 |
| 9/25/2023 | 52.00 | 2.15 | 0.44 |
| 12/18/2023 | 12.25 | 2.5 | 0.84 |

In 27 of these 45 events the parks underground storage system did not reach full capacity, or 60% of all recorded major storm events.

*Source*
Data and documents provided by the North Hudson Sewerage Authority

*Limitations*
There is only data on "major storm events" recorded by the NHSA. The CSI research team was unable to estimate performance during regular storm events because of this limitation the sample size is small.

## Environmental Benefit 5:

- **Improves perceptions of flooding frequency, with 95% of 19 surveyed visitors that were familiar with the area before park construction reporting that they notice less flooding in streets adjacent to the park post-construction.**

*Background*
Streets in Southwest Hoboken would be inundated with water for hours after major rain events. One of the goals of this park, more specifically the low impact development along the street, was to keep water off the streets.
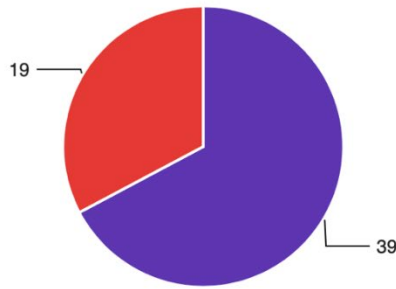
*Method*
Conduct surveys with community members to obtain anecdotal evidence of whether those using the area noticed a change in street flooding. Comparison of pre- and post- construction.
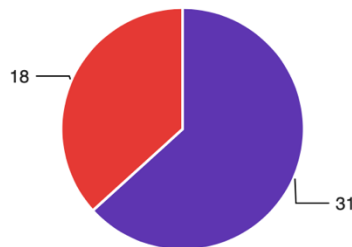*Calculations*

Q10 - Were you familiar with the site and area around it before the park was completed?

19 ──

── 39

■ No  ■ Yes

Q13 - ASK IF people were familiar with the area; Have you noticed if the streets around the park show less flooding compared to before it was built?

18 ──

── 31

■ No  ■ Yes

18/49 respondents reported noticing that the streets around the park show less flooding compared to before it was built (37%). Comparing this with the amount of people familiar with the site and area preconstruction (19 respondents) 18 out of 19 people familiar with the area have noticed less flooding compared to before the park was built. (95%)

Quotes:
"I have lived in the area for more than 25 years and decided to move my business to Southwest Hoboken because of the creation of this park, and the future construction of Phase 2 across the street, so it can be protected from flooding."

"The streets adjacent to the park occasionally flash flood, but the time water is in the streets has been greatly reduced."

"Major storm events are really the only time that traffic is affected by flooding in this area since the park has been built."

*Source*
Survey conducted by the CSI Research Team (see more information in Social Benefits)

*Limitations*
There is no quantified data referring to "flooding days" by the City of Hoboken or the North Hudson Sewerage Authority. This is anecdotal evidence from community members.

In Question 13, most of the "No" answers are a result of people not being familiar with the area. An N/A option should have been available.


# *Social Benefits: Background + Methods*

When planning the revitalization of Southwest Hoboken in 2010, the City conducted a study to determine areas for improvement within the district. Recommendations included the preservation of urbanized industry and industrial arts, the need for **more public park space**, and the potential for transit-oriented, mixed-use development. The decision was made to make greenspace the centerpiece of a new masterplan that would solve the needs of the area. Today, Southwest Resiliency Park (SWRP) Phases 1 and 2 are in the center of Block 11 (*see pg. 2*) with mixed-use housing surrounding the park space. The park is the centerpiece of the Rehabilitation plan, which focused on revitalizing the area by providing open space and walkability for all residents while controlling flooding in Southwest Hoboken. Unlike Phase 2 of SWRP, Phase 1 has limited recreational amenities and is more of a passive park space that provides a tranquil environment within a dense mixed-use area. Many social amenities can be found in this space including dog run, terraced seating, event space, and lawn. The main social goals of the revitalization plan were to improve walkability and provide open space within the designated "area in need" (*see pg. 2*).

The social benefits of Southwest Resiliency Park that were studied focused on the main uses of the space, number of users, increase in accessibility for community members of Southwest Hoboken, as well as number of visitors that understood the functions of the park.

In-person surveys were conducted throughout the summer of 2023. 58 total responses were collected over the course of four site visits. Days and times were strategically chosen for the highest turnout of people. Visit 1: 5/29; Visit 2: 6/02; Visit 3: 6/06 (farmers market event); Visit 4: 6/26. The same 18-question survey was given out to each person with the goal of determining the benefits below. During the farmers market a separate survey was conducted to vendors to better understand the economic benefits the park provides. (*See Economic Benefits*)

*CSI Team conducting interviews, Wolfram Hoefer, 5/29/2024*

## Social Benefit 1:

- **Supports daily visitation, with 39% of 58 surveyed visitors reporting that they come to the park daily, and 45% of 56 visitors reporting spending 10 to 30 minutes per visit.**
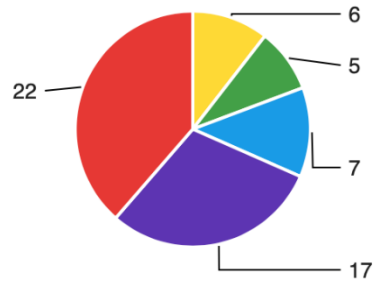
*Background*
Southwest Resiliency Park is the central feature of this area of Hoboken. With the goal to provide public outdoor amenities for community members, the park is accessible from all sides of the property.

*Method*
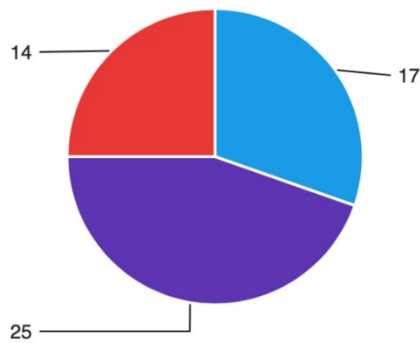On-site observations and survey data from multiple site visits.

## Q4 - How often do you visit the park?



Legend: This is my first time at the park. • Occasionally, a few times a year. • 2-3 times a month • 2-3 times a week • Every day

## Q5 - How long do you usually stay?



Legend: More than 30 minutes • 10 – 30 minutes • less than 10 minutes

*Source*
Survey responses collected by CSI team.

*Limitations*
To determine the total number of daily visitors, observations would have to be conducted throughout all operating hours of the park.

## Social Benefit 2:

- **Promotes community engagement by providing space for 45 social events in 2024, with 19% of 58 surveyed visitors reporting being in the park to attend an event.**

*Background*
The central plaza is made up of permeable pavers and provides space for diverse events year-round including community events, summer music festivals, and classes including CrossFit and exercise classes. Amenities in the space include terraced seating and local food and produce vendor programs.
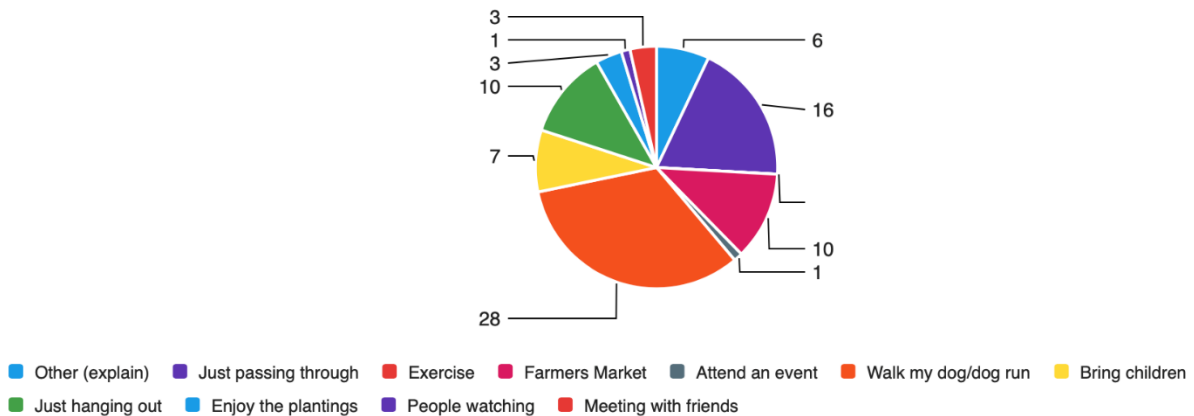
*Method*
On-site observations and survey data, review of past and present event calendars provided by the City.

*Calculations*
Out of 58 total responses, 1 user reported visiting to attend an event, and 10 visitors came to attend the farmer's market. (19% of respondents). 6 visitors cited the event space and/or farmers market as their favorite aspects of the park.

Q6 - Why do you visit the park?
Name all that apply. - Selected Choice



Legend:
- Other (explain)
- Just passing through
- Exercise
- Farmers Market
- Attend an event
- Walk my dog/dog run
- Bring children
- Just hanging out
- Enjoy the plantings
- People watching
- Meeting with friends

## June 2024



## November 2024

*Source*
Survey responses collected by CSI team. Calendar of events provided by the City of Hoboken.
*https://hoboken.recdesk.com/Community/Calendar?facilityId=94*

The research team only visited the park during 1 farmer's market event and 1 exercise class. Although only 11 people were surveyed during these events, many more were observed.

Adding a question "Have you ever attended an event held here?" would have allowed for a more accurate account of attendance during events over the park's lifetime.



*Exercise class, Wolfram Hoefer, 7/26/24*

## Social Benefit 3:

- **Promotes year-round use by providing outdoor space for dogs, with 48% of 58 surveyed visitors reporting using the dog run every day or 2 to 3 times per week.**

*Background*
The dog run provides space for dog owners to bring their dogs in a dense urban environment year-round. As this is only 1 of 2 dog parks in southern Hoboken (population of 20,000+) at the time of construction, this is an important amenity for pet owners in this area.
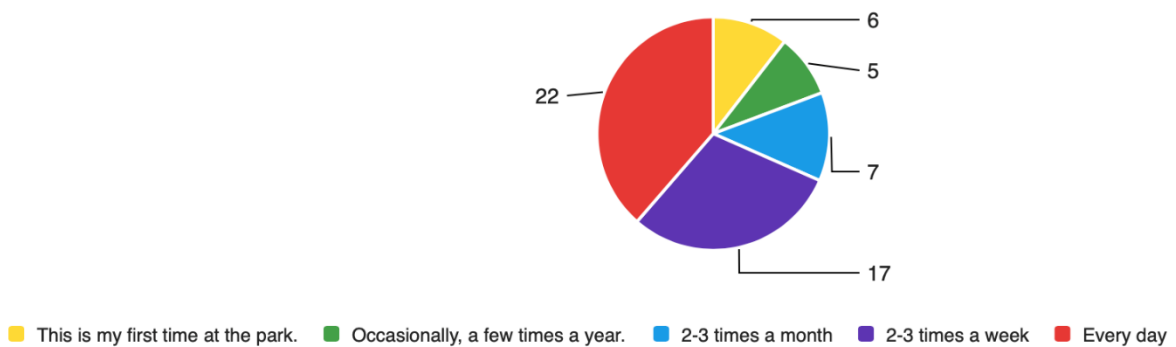
*Visitors using dog run, Wolfram Hoefer, 1/11/24*

## Method
On-site observations and survey data from multiple site visits.

## Calculations
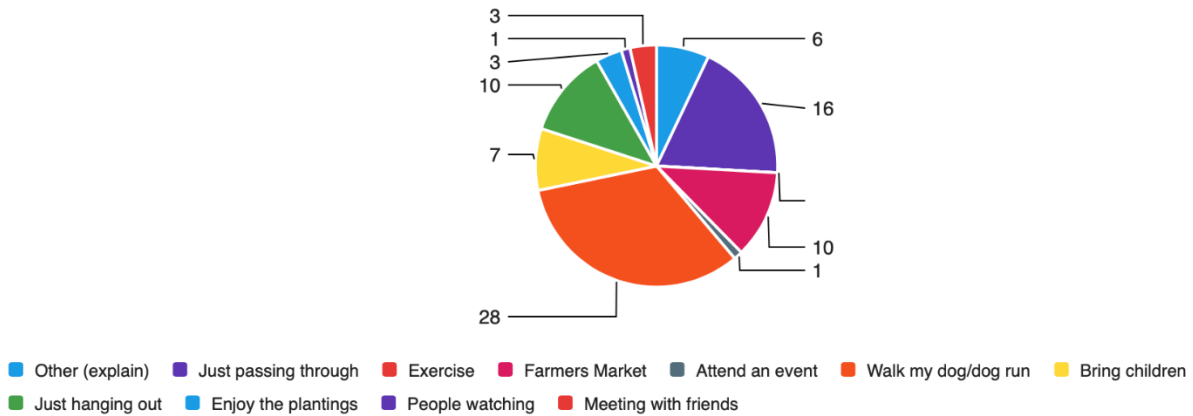Out of 58 total responses, 22 visitors (39% of respondents) visit daily (all of which had pets), 28 visitors (48% of respondents) come to walk their dogs, and 24 visitors' (41% of respondents) favorite aspect of the park was the dog run.

### Q4 - How often do you visit the park?



🟨 This is my first time at the park.   🟩 Occasionally, a few times a year.   🟦 2-3 times a month   🟪 2-3 times a week   🟥 Every day

Q6 - Why do you visit the park?
Name all that apply. - Selected Choice



Legend:
- Other (explain)
- Just passing through
- Exercise
- Farmers Market
- Attend an event
- Walk my dog/dog run
- Bring children
- Just hanging out
- Enjoy the plantings
- People watching
- Meeting with friends

*Source*
Survey responses collected by CSI team.

*Limitations*
'Multiple times per day' should have been added as an option for survey responses.

Many dog owners expressed that they visited the park multiple times per day to allow their pets to spend time outdoors.

## Social Benefit 4:

- **Provides educational value, with 40% of 58 surveyed visitors correctly answering questions related to the stormwater functions of the park.**

*Background*

The centrally located Information sign provides an overview of the main resiliency features and how they contribute to the overall Hoboken storm water system and the history of the city. This sign was erected to provide a learning opportunity for visitors. The effect of this signage and information from the city was studied to determine how many residents understand the importance of this park and the overall system of Hoboken.
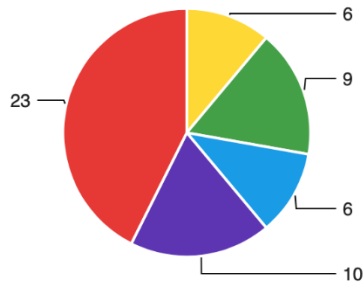
*Method*
On-site survey data from multiple site visits.

Q9 - Why was this park created?
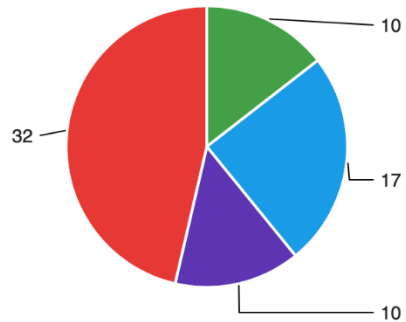


*Legend:* ■ Event space.  ■ Reduce flooding.  ■ Dog run.  ■ Provide open space for people
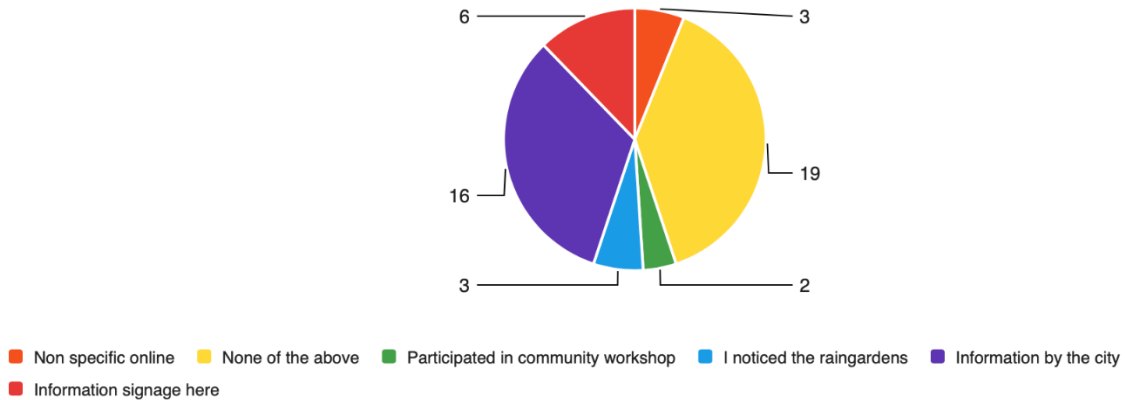
*Not Shown: 5 users did not answer.*

Q11 - Reducing flooding is among the most important objectives of the park. Do you know how this objective is achieved?



*Legend:* ■ Park was elevated  ■ Permeable pavers  ■ Bigger Storm drains  ■ Rain garden  ■ Underground tank

*Not Shown: 4 users simply said No.*

Q12 - If YES to the above question, how did you learn about the resiliency function of the park?



Legend:
- Non specific online
- None of the above
- Participated in community workshop
- I noticed the raingardens
- Information by the city
- Information signage here

Pie chart values: 3, 19, 2, 3, 16, 6

*Not Shown: 9 users did not answer.*

*Source*
Survey responses collected by CSI team.

*Limitations*
Having a yes or no answer to Q11 would have prevented guesses from being made. Many respondents were unsure but still decided to give an answer.

## Social Benefit 5:

- **Promotes non-motorized transit, with 98% of 58 surveyed visitors accessing the park by walking, 84% of whom live within a 10-minute walk of the park.**
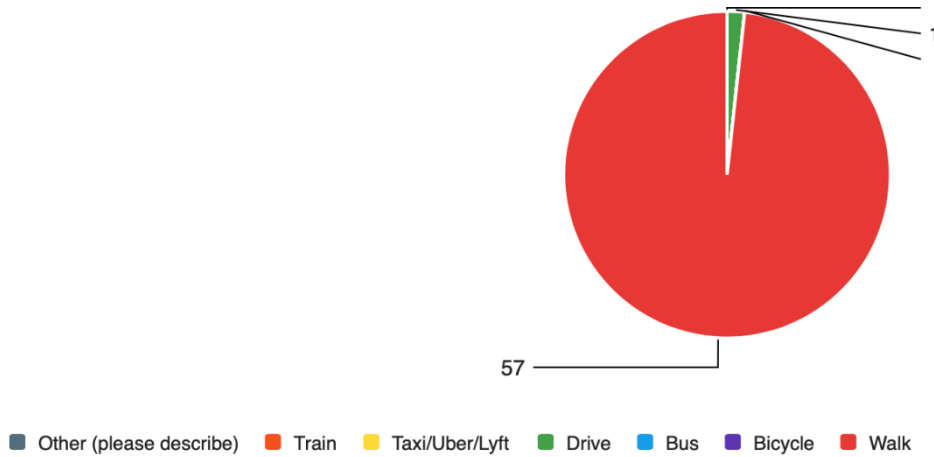
*Background*
One of the main goals of the Southwest Hoboken Rehabilitation Plan was to improve walkability in the area. The location of Southwest Resiliency Park was chosen for this reason. Surrounded by residential zoning on all sides, the park is easily accessible for residents. Promoting walkability promotes an active lifestyle which increases public health. Engaging with community members, spending time outdoors, and walking all directly impact the mental and physical wellbeing of community members.
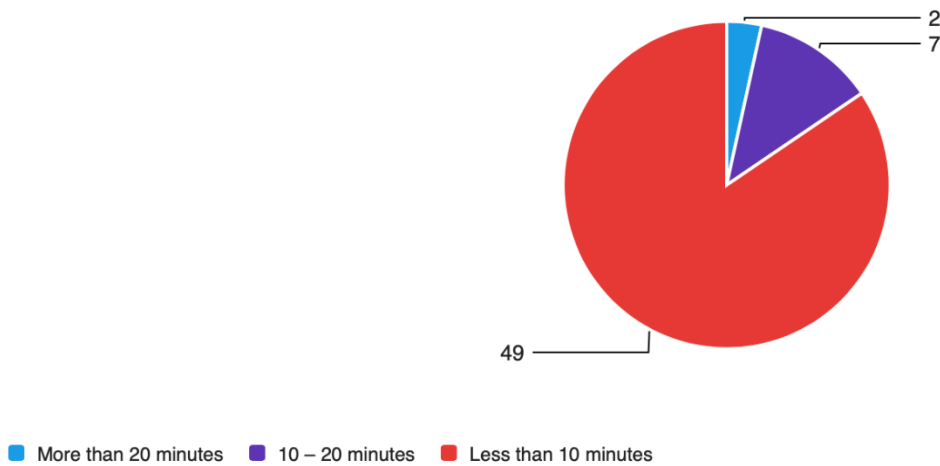
*Method*
On-site survey data from multiple site visits.

## *Calculations*

## Q7 - How did you get here? - Selected Choice



Legend: Other (please describe) · Train · Taxi/Uber/Lyft · Drive · Bus · Bicycle · Walk

Values shown: 1, 57

## Q8 - How long does it take you to get here?



Legend: More than 20 minutes · 10 – 20 minutes · Less than 10 minutes

Values shown: 2, 7, 49

## *Source*
Survey responses collected by CSI team.

## *Limitations*
There is a Citi-bike facility on the park's eastern edge. Unfortunately, data could not be obtained for the number of users for that specific station. Quantifying that would allow for an even more in-depth study of the number of non-motorized visitors to this park and Southwest Hoboken.

## *Economic Benefits: Background + Methods*

Resiliency Park was the product of the Rebuild by Design competition as well as the Rehabilitation plan of Southwest Hoboken. As the centerpiece of this reestablished block group, the goal of economic research was to determine the effect the park has had on local businesses and residential properties since construction was completed in 2017. The CSI research team's ultimate objective was to determine how much the construction of the park has catalyzed growth in the area, while being considerate of the fact that this growth may contribute to gentrification.

## Economic Benefit 1:

- **Contributed to an increase in property values within a half-mile by an estimated 38% from the five years pre-construction to the five years post-construction, as compared to a 32% increase in property values across the entire city over the same period.**

*Background*
Southwest Resiliency Park is the centerpiece of the Rehabilitation plan of Southwest Hoboken, with a goal of catalyzing redevelopment in a mainly industrial area. The rehabilitation plan has led to more mixed-use and residential properties surrounding the park. The purpose of this study by the CSI Research team was to compare the Southwest Hoboken Blockgroup pre- and post-construction of the park to determine how much property values within this area were increased post-construction.
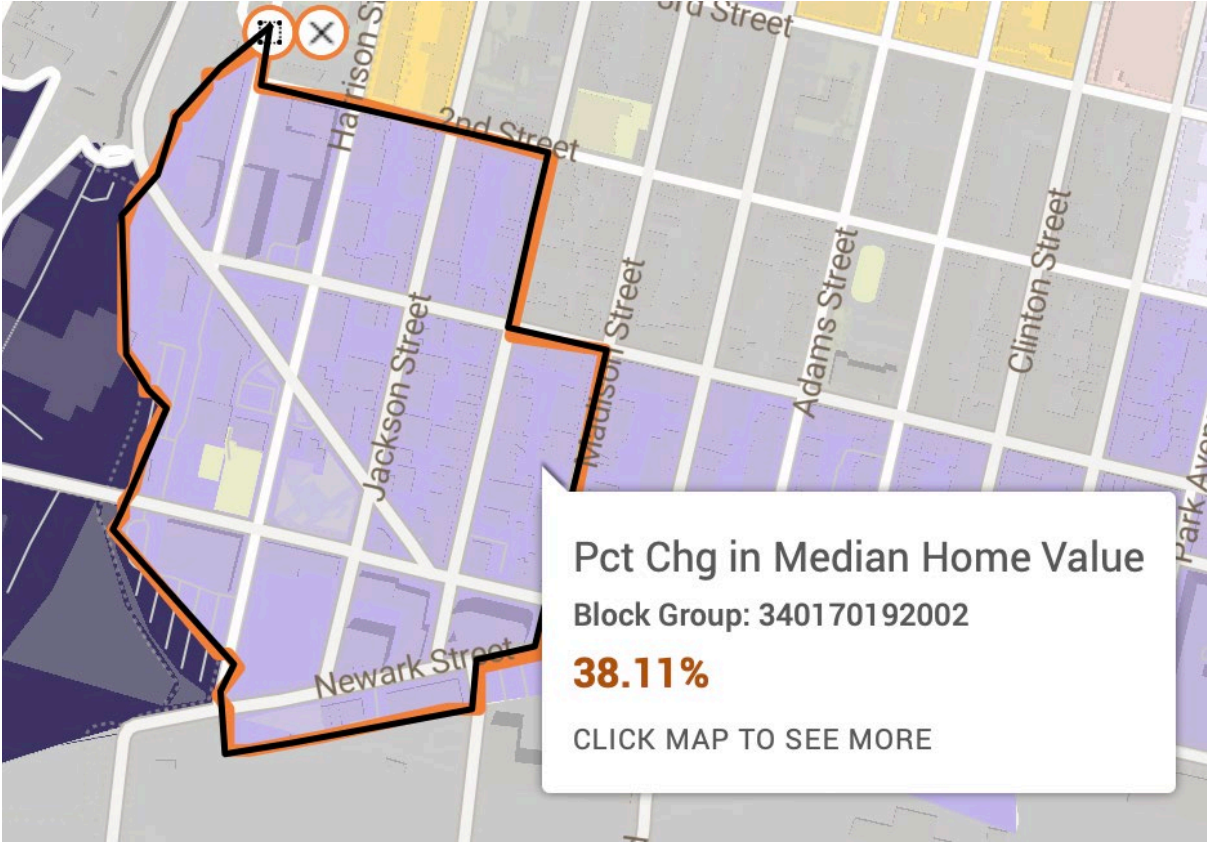
*Method*
Review of property value data within the Southwest Hoboken Block group using PolicyMap.

*Calculations*
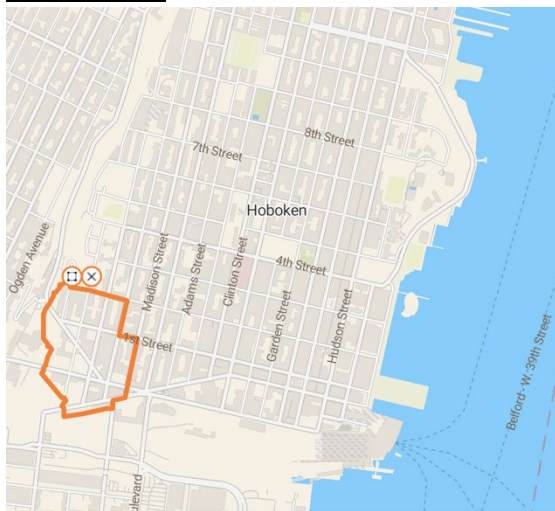


Southwest Hoboken Block Group (Policy map, 2024)

**Estimated percent change in the median value of an owner-occupied home between the periods of 2013-2017 and 2018-2022 in Southwest Hoboken.**



(Policy map, 2024)

**Estimated percent change in the median value of an owner-occupied home between the periods of 2013-2017 and 2018-2022 in all of Hoboken.**



Pct Chg in Median Home Value
City: Hoboken
**31.75%**
CLICK MAP TO SEE MORE
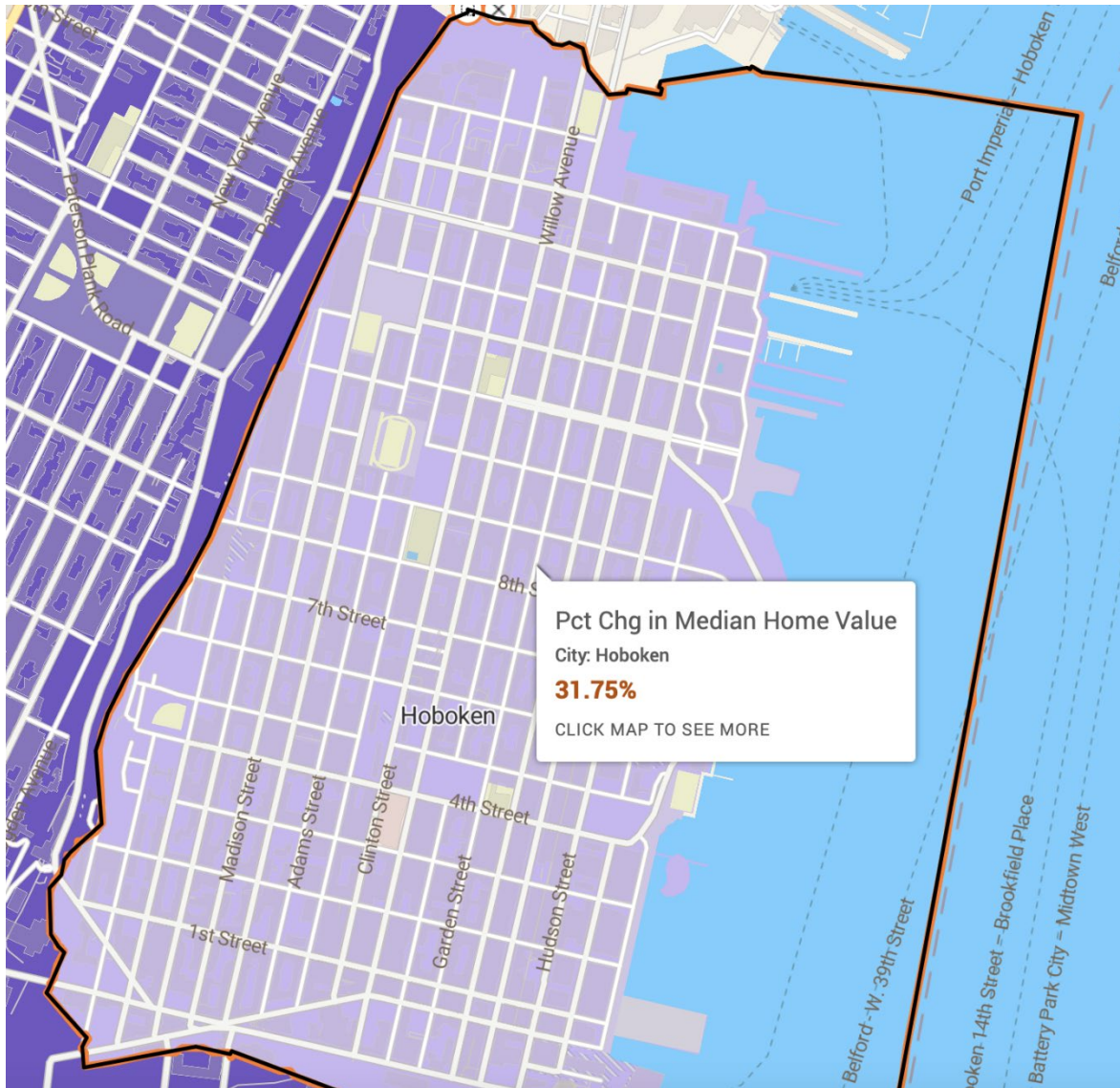
(Policy map, 2024)

*Source*
Policy Map

*Limitations*
Estimation is based on the overall southwest block group. The park being a catalyst for this redevelopment and increase in population/property values is impossible to directly correlate. The Southwest Hoboken Block group was chosen because all areas are within a .5-mile radius of the park.

# *Inconclusive Benefits*

Environmental:

- **Captured 100% of T1 rain events since park opening.**

*Background*
HUD developed a conceptual, sewershed, and outfall based, water balance model and calculated the Hoboken water assignment as the required (delay &) storage capacity in the existing situation. The water balance results are represented by calculated surplus volume of water in the streets or urban flash floods for a T1 flood event (2013 calculations) (T1 used for SWRP due to the size of the park. For these calculations by HUD, the entire city of Hoboken was considered, which 2.011 mi^2)

| Return Period T Storm event | Rain Depth (inch/24 hrs) | Volume assignment [water] | Volume assignment [water] | Volume assignment [water] |
|---|---|---|---|---|
| T1 [1/1] | 2.86 | 18.85 acre/ft | 821,106 cubic ft | 6,142,299.43 gallons |

*Method*
Data from rain events with Rain Depth of 2.86 in/24 hrs from 2017-2024 were reviewed by the CSI Research Team to determine effectiveness of Underground Storage.

*Calculations*
**Rain Events exceeding 2.86 in/24 hrs**
4/16/2018: 2.91 in/ 18.25 hrs
7/10/2020: 3.04 in/ 6 hrs
8/21/2021: 4.07 in/ 4.5 hrs (H Henri)
9/1/2021: 6.54 in/ 8 hrs (TS Ida)
10/26/2021: 3.39 in/ 10.25 hrs (nor'easter)
4/29/2023: 3.04 in/ 25 hrs
9/29/2023: 3.77 in/ 26.75 hrs
3/23/2024: 3.58 in/ 13 hrs

In data from every storm event the park storage system reached max capacity. 82,000 gallons of water were detained.

*Source*
Data and documents provided by the North Hudson Sewerage Authority and HUD

Data from HUD is for a storm event lasting 24 hours. The majority of rain event data provided by the NHSA has much greater per 1 hour's intensity but did not last 24 hours. Storms with a depth of more than 2.86 inches were considered in these calculations.

# ***Additional Project Information:***

## Neighborhood Information:
SOUTHWEST BLOCKGROUP POPULATION
2000: 861 (Hoboken pop: 38577)
2010: 2280 (Hoboken pop: 50005)
2020: 3156 (Hoboken pop: 60419)

SOUTHWEST BLOCKGROUP MEDIAN HOUSEHOLD INCOME
2000: $71,544
2008-2012: $171,138
2018-2022: $182,204

## Rainwater Detention Capabilities of Park:
- Subsurface detention basin pipe storage (9,500 cf) – 71,300 gallons
- Rain garden storage (1,400 cf) – 10,500 gallons
- Stone around basin storage (10,600 cf) – 79,200 gallons
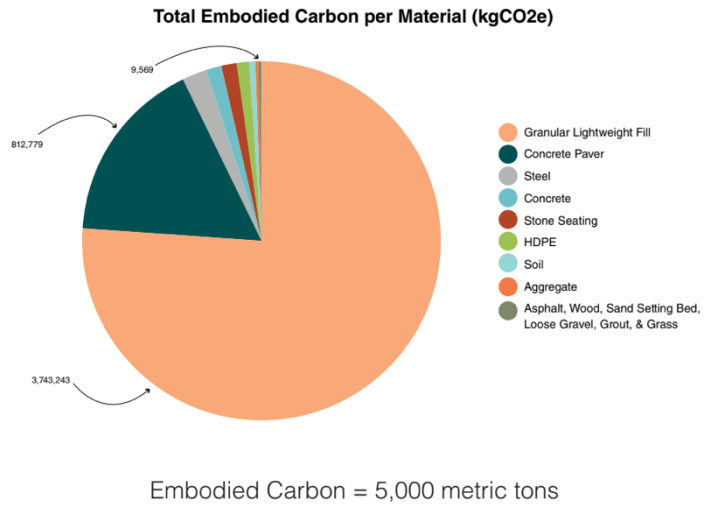- Lightweight fill storage (3,980 cf) – 29,800 gallons

## Carbon Footprint of Park:

CASE STUDY: SOUTHWES T RESILIENCY PARK EXPANSION
EMBODIED CARBON CALCULATION

**EC by Material**

| Material | Embodied Carbon (kgCO2e) |
|---|---|
| Granular Lightweight Fill | 3,743,243.02 |
| Concrete Paver | 812,779.35 |
| Steel | 108,978.93 |
| Concrete | 69,352.00 |
| Stone Seating | 65,211.33 |
| HDPE | 63,417.65 |
| Soil | 23,091.15 |
| Aggregate | 9,569.32 |
| Asphalt | 8,317.70 |
| Wood | 10.17 |
| Sand Setting Bed | 2,250.75 |
| Loose Gravel | 193.05 |
| Grout | 150.83 |
| Grass | 1,732.50 |

**EC by Design Component**

| Component | Embodied Carbon (kgCO2e) |
|---|---|
| Park Surface | 4,219,865.16 |
| Planters | 182,367.02 |
| Hill | 144,325.51 |
| Terrace | 101,665.78 |
| Restroom | 66,381.74 |
| Basin | 63,419.97 |
| Dog Run | 41,764.68 |
| Retaining Wall | 36,020.33 |
| Fencing | 24,146.08 |
| Bridge | 15,523.09 |
| Sidewalk | 8,317.70 |
| Furniture | 4,517.35 |

**Total Embodied Carbon per Material (kgCO2e)**

- Granular Lightweight Fill
- Concrete Paver
- Steel
- Concrete
- Stone Seating
- HDPE
- Soil
- Aggregate
- Asphalt, Wood, Sand Setting Bed, Loose Gravel, Grout, & Grass

9,569
812,779
3,743,243

Embodied Carbon = 5,000 metric tons

SUSTAINABILITY SCOPING
October 14, 2022

STARR WHITEHOUSE
Landscape Architects
and Planners PLLC

## Urban Heat Island Mapping:

Urban heat island is a problem in densely populated municipalities due to the lack of shade and the amount of impervious surface such as concrete that reflect heat from the sun. Urban heat island mapping was conducted by Starr Whitehouse. The CSI Research Team was limited by the time of study in further pursuing this Benefit, and no pre-construction data available for comparison – thought the park is likely providing a cooling effect compared to pre-construction conditions.
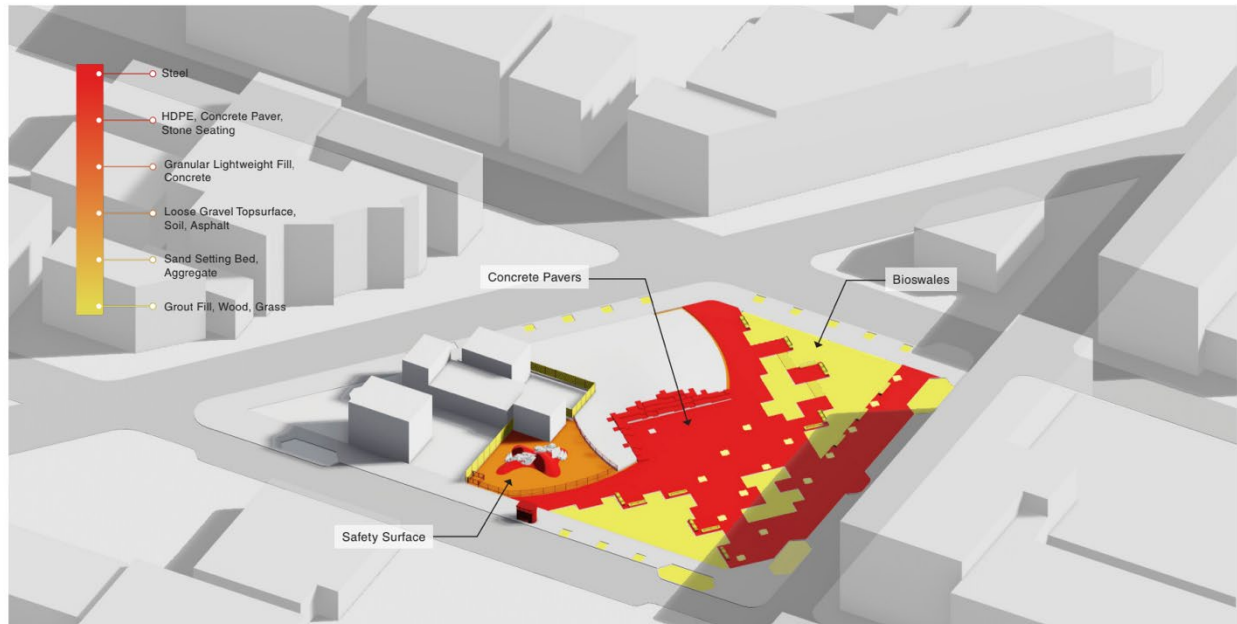
## CASE: SOUTHWEST HOBOKEN RESILIENCE PARK

## CASE: SOUTHWEST HOBOKEN RESILIENCE PARK
### CARBON HEATMAP: SURFACE MATERIALS



Steel

HDPE, Concrete Paver, Stone Seating

Granular Lightweight Fill, Concrete

Loose Gravel Topsurface, Soil, Asphalt

Sand Setting Bed, Aggregate

Grout Fill, Wood, Grass

Concrete Pavers

Bioswales

Safety Surface

## CASE: SOUTHWEST HOBOKEN RESILIENCE PARK
**CARBON HEATMAP: SUB-SURFACE MATERIALS**



Legend:
- Steel
- HDPE, Concrete Paver, Stone Seating
- Granular Lightweight Fill, Concrete
- Loose Gravel Topsurface, Soil, Asphalt
- Sand Setting Bed, Aggregate
- Grout Fill, Wood, Grass

HDPE Vaults

Concrete Retaining Walls

## CASE: SOUTHWEST HOBOKEN RESILIENCE PARK
**CARBON HEATMAP: SUB-SURFACE FILL**



Legend:
- Steel
- HDPE, Concrete Paver, Stone Seating
- Granular Lightweight Fill, Concrete
- Loose Gravel Topsurface, Soil, Asphalt
- Sand Setting Bed, Aggregate
- Grout Fill, Wood, Grass

Lightweight Aggregate Fill
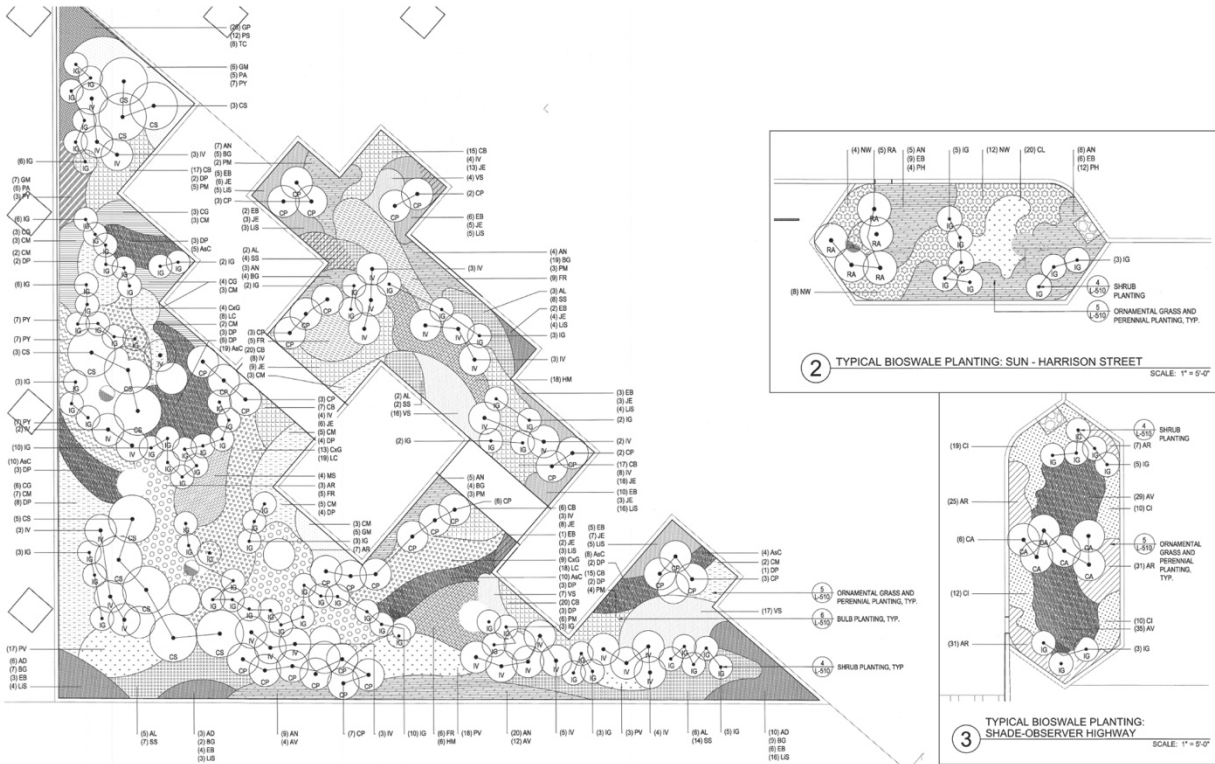
Starr Whitehouse data from post-construction studies
- New York City Council Data Team
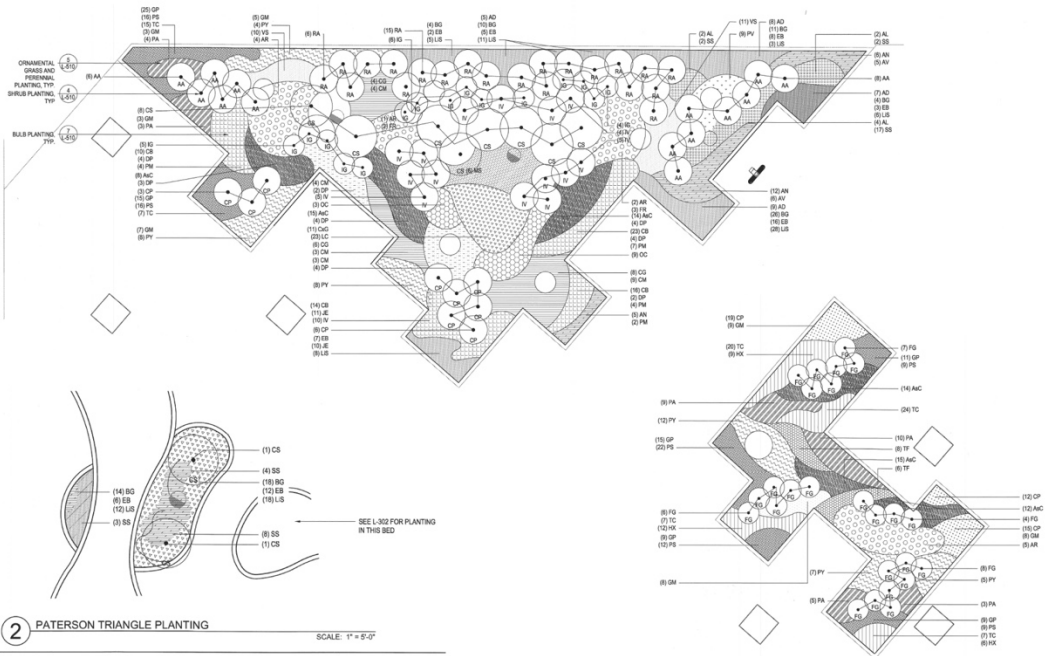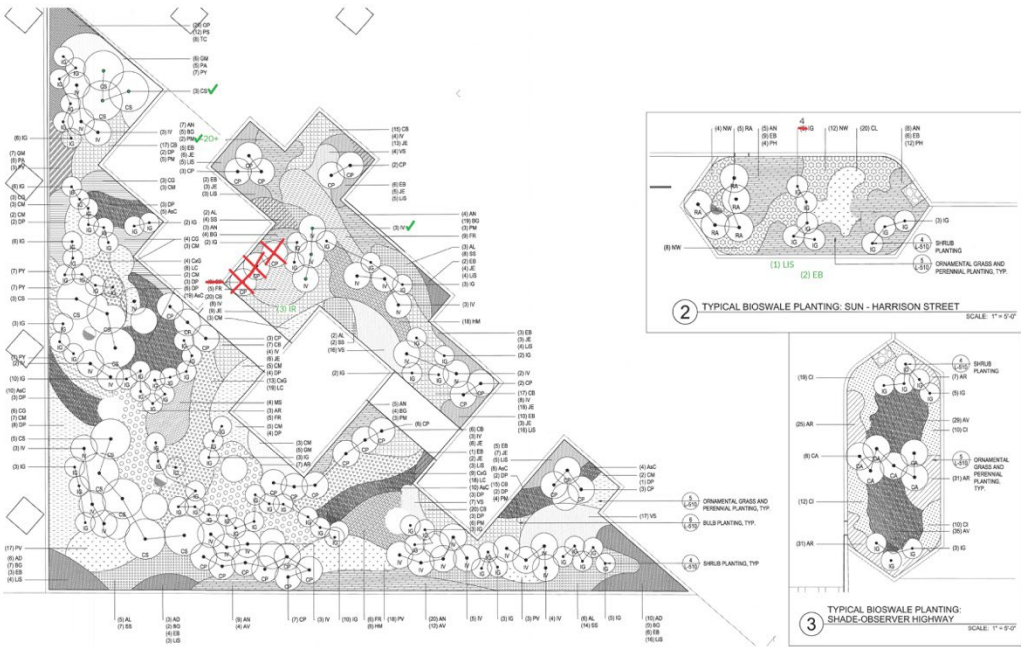- NYC Environment and Health Heat Vulnerability Index
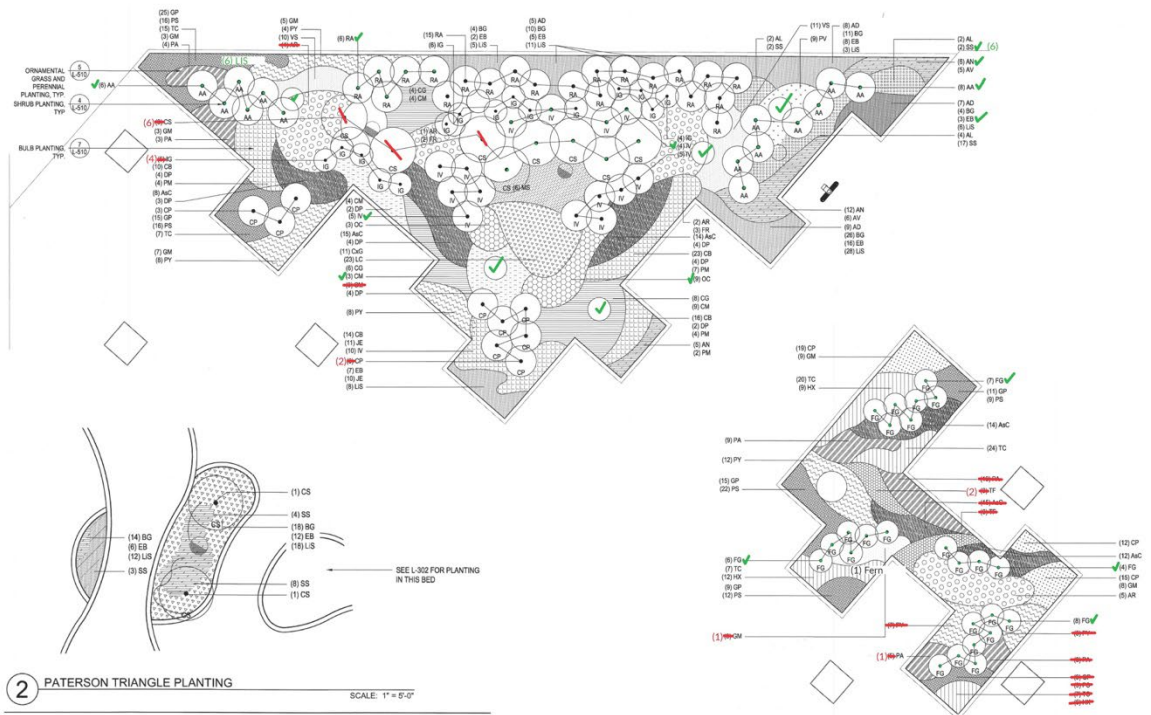- Rhino

# Long-term Success of Plantings

*Background*

The CSI research team analyzed the rain gardens throughout Southwest Resiliency Park. We found that several plants are no longer alive or have been succeeded by the growth of other plants from the original planting palette, which is typical for comparable projects. This was not reportable or quantifiable as a Benefit. Observational study conducted by CSI Research team using data provided by Starr Whitehouse and original planting palette as reference.

*Calculations*

TYPICAL BIOSWALE PLANTING: SUN - HARRISON STREET
SCALE: 1" = 5'-0"
(1) LIS
(2) EB

TYPICAL BIOSWALE PLANTING: SHADE-OBSERVER HIGHWAY
SCALE: 1" = 5'-0"

PATERSON TRIANGLE PLANTING
SCALE: 1" = 5'-0"

SEE L-302 FOR PLANTING IN THIS BED

ORNAMENTAL GRASS AND PERENNIAL PLANTING, TYP.
SHRUB PLANTING, TYP.
BULB PLANTING, TYP.

SHRUB PLANTING

ORNAMENTAL GRASS AND PERENNIAL PLANTING, TYP.

(1) CS
(4) SS
(16) BG
(12) EB
(18) LIS
(6) EB
(12) LIS
(3) SS
(8) SS
(1) CS
(14) BG

② PATERSON TRIANGLE PLANTING

SCALE: 1" = 5'-0"

**Source**
CSI Research Team observations

# Endnote

*https://www.hud.gov/sites/documents/OMA_IP_BRIEFING_BOOK.PDF*

https://hostedfiles.civilsolutions.biz/HudsonCo/Towns/0905/Redevelopment_Plans/Southwest_Hoboken_Redevelopment_Plan_2023_Amendments.pdf

https://www.hobokennj.gov/resources/southwest-area-rehabilitation-area