



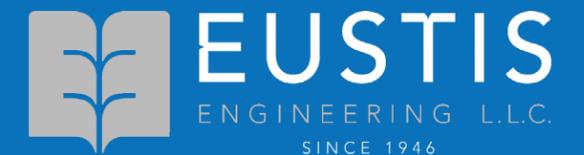
OCTOBER 2021

City Park Hazard Mitigation Project

90% Design



WAGGONNER
& BALL





- I **Project Overview**
- II **Hydrologic & Hydraulic Modeling**
- III **Design Focus Areas**

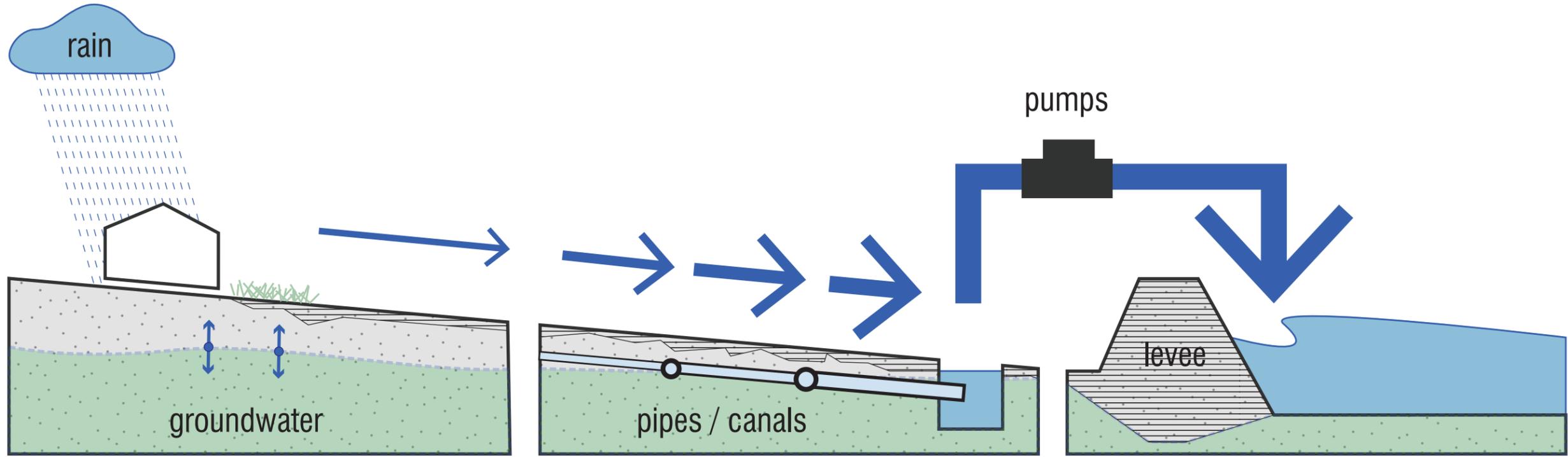
An aerial photograph of a golf course. A large, dark pond is in the foreground, with a paved road running alongside it. The golf course is lush green with many trees and sand traps. In the background, there are residential houses and a clear blue sky.

I Project Overview

Historic Approach

Greater New Orleans Urban Water Plan

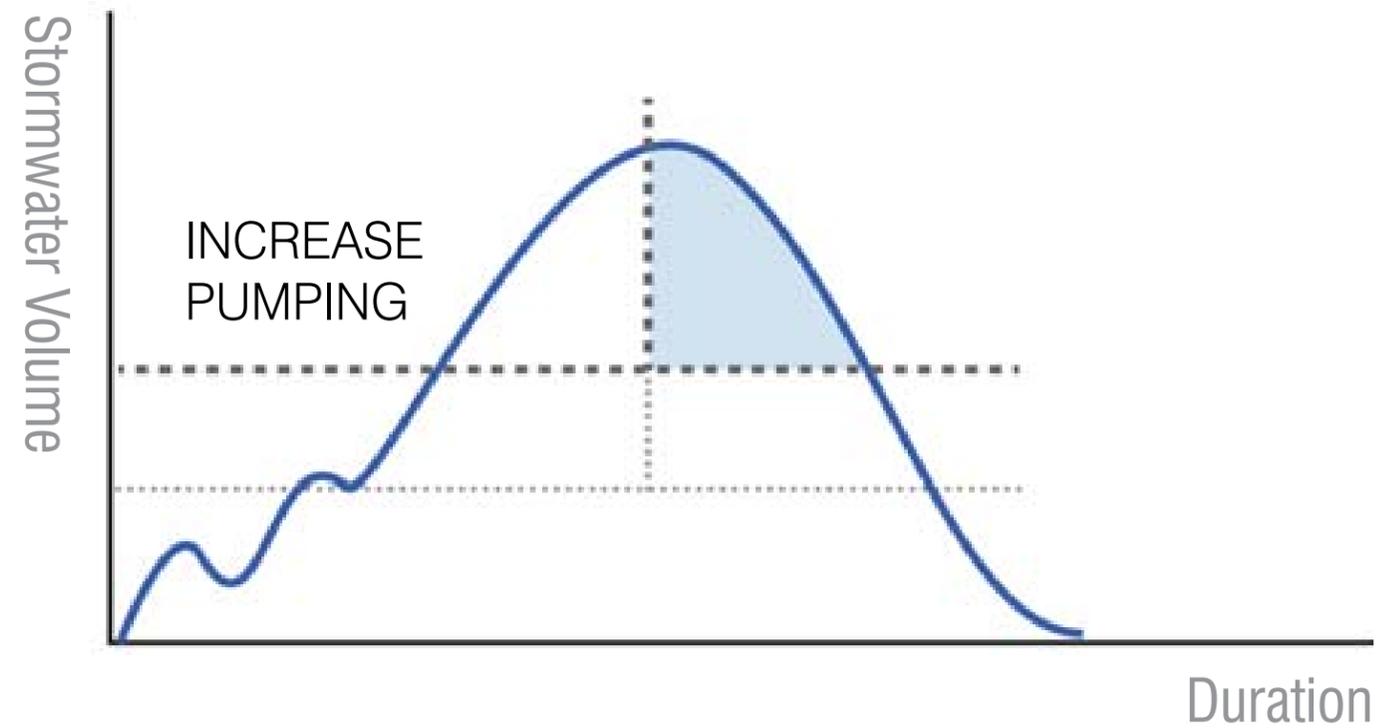
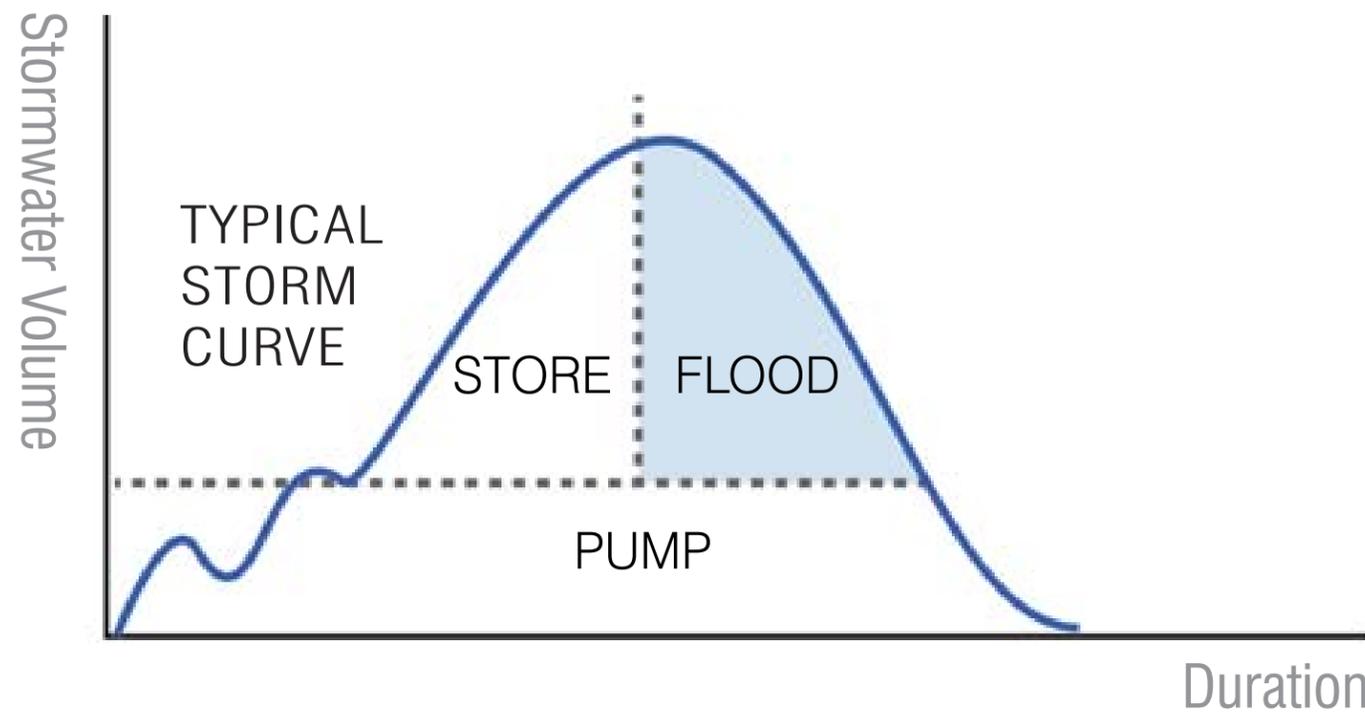
BATTURE - WAGGONER & BALL - BIOHABITATS - EUSTIS - GREENPOINT - ROSTAN - WINGATE



Pave + Pipe

Pump

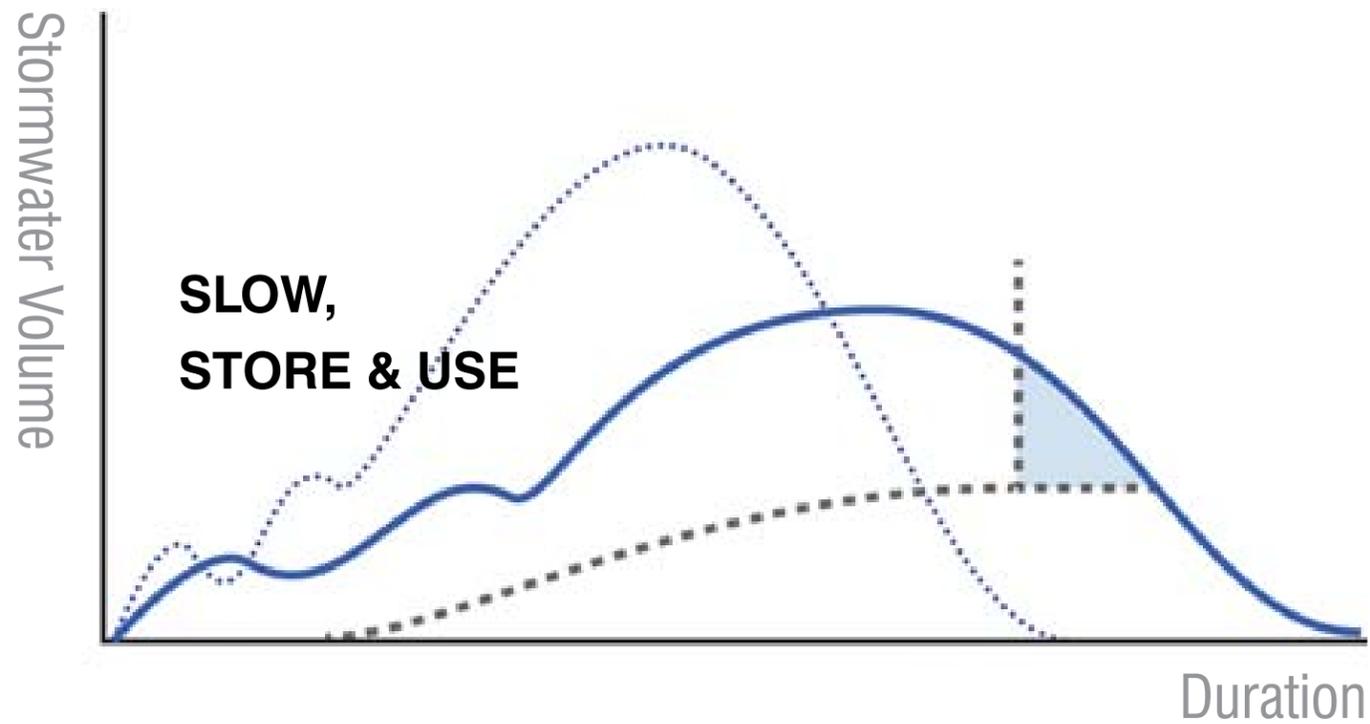
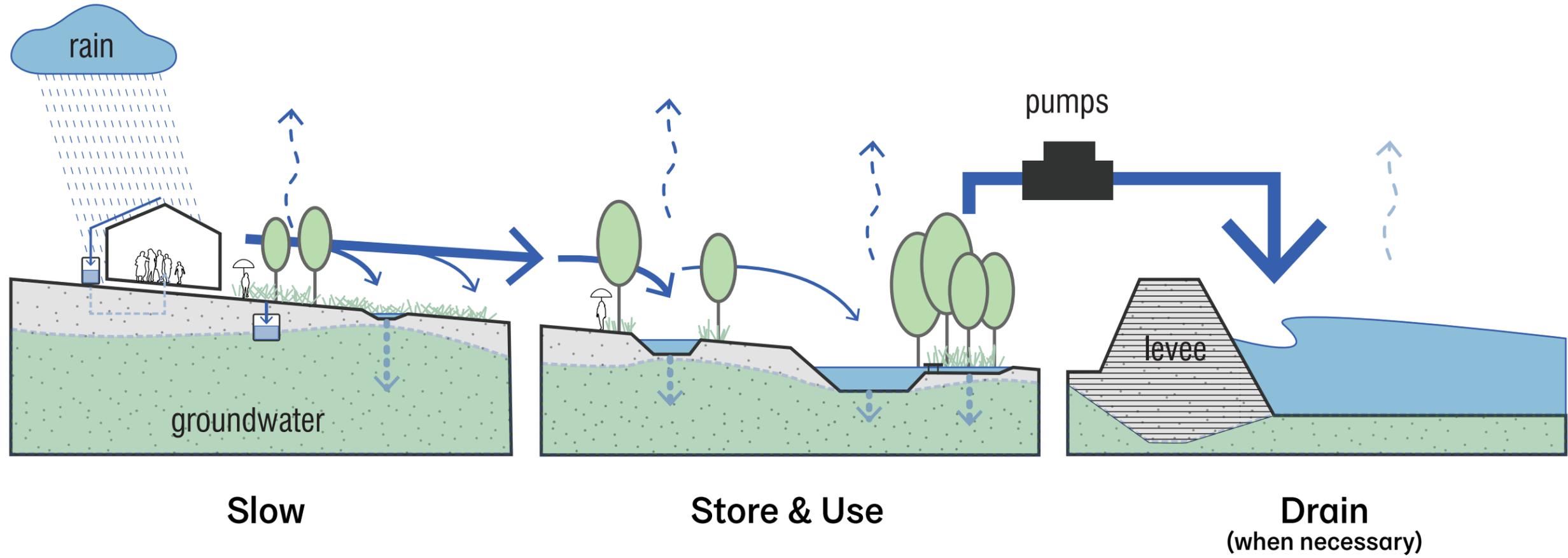
Drain



Paradigm Shift

Living With Water® Approach

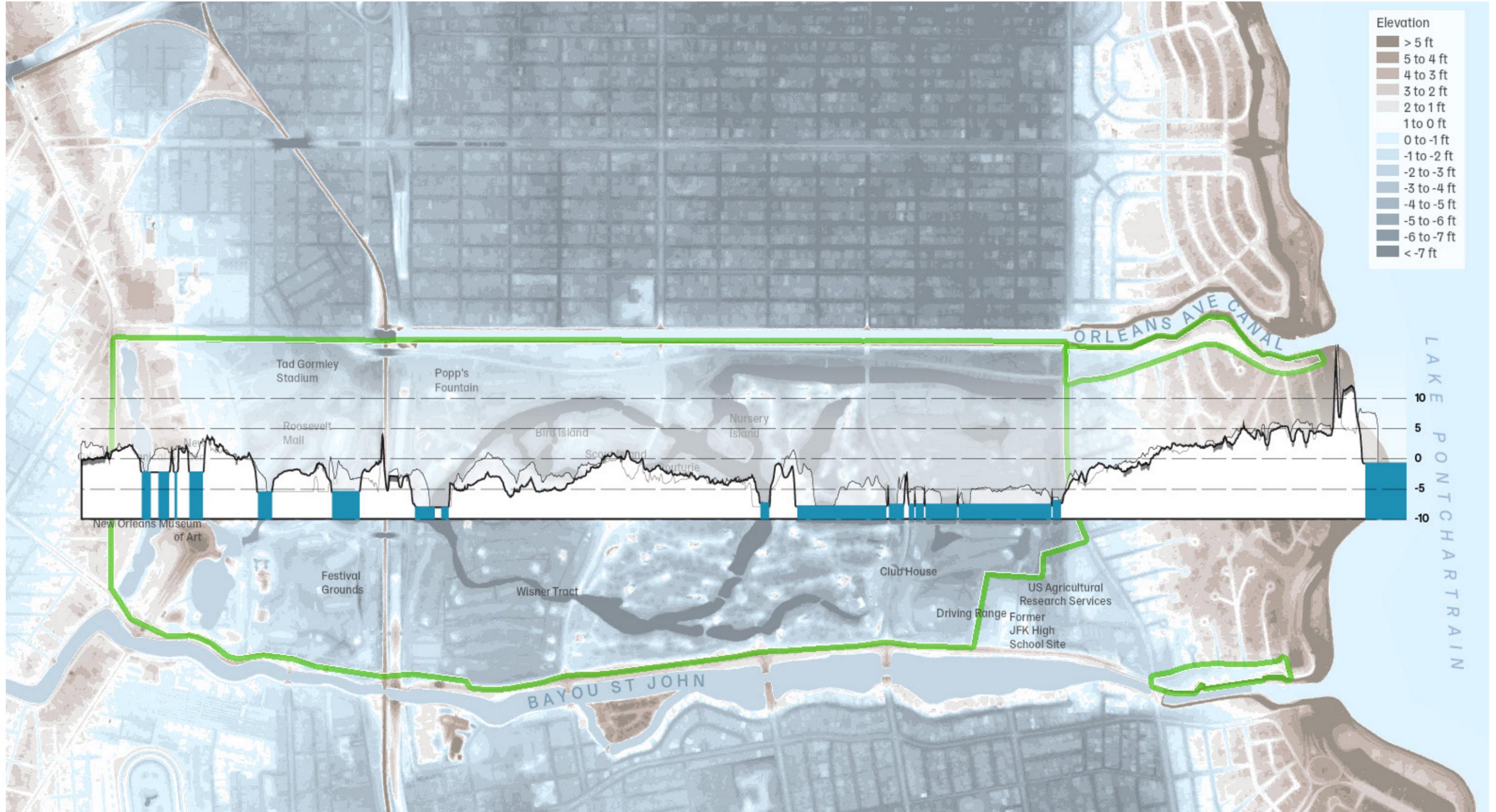
BATTURE - WAGGONER & BALL - BIOHABITATS - EUSTIS - GREENPOINT - ROSTAN - WINGATE



Surface Elevations

North/South Section Profile

BATTURE - WAGGONER & BALL - BIOHABITATS - EUSTIS - GREENPOINT - ROSTAN - WINGATE



Project Overview

This project will alleviate flooding in neighborhoods adjacent to New Orleans City Park by enhancing existing lagoons in the park to store stormwater, and relieve pressure on the existing conventional drainage system of pumps and pipes. Stormwater will be diverted from the drainage system along Robert E. Lee Boulevard into a natural filtration zone in City Park, allowing sediment and runoff to be captured before stormwater is released to the park's lagoons and finally to the municipal drainage system.

Central to this project is a multi-benefit Approach to Resilience, with the primary goal to:

-Reduce Repetitive Flooding and Losses within the NFIP

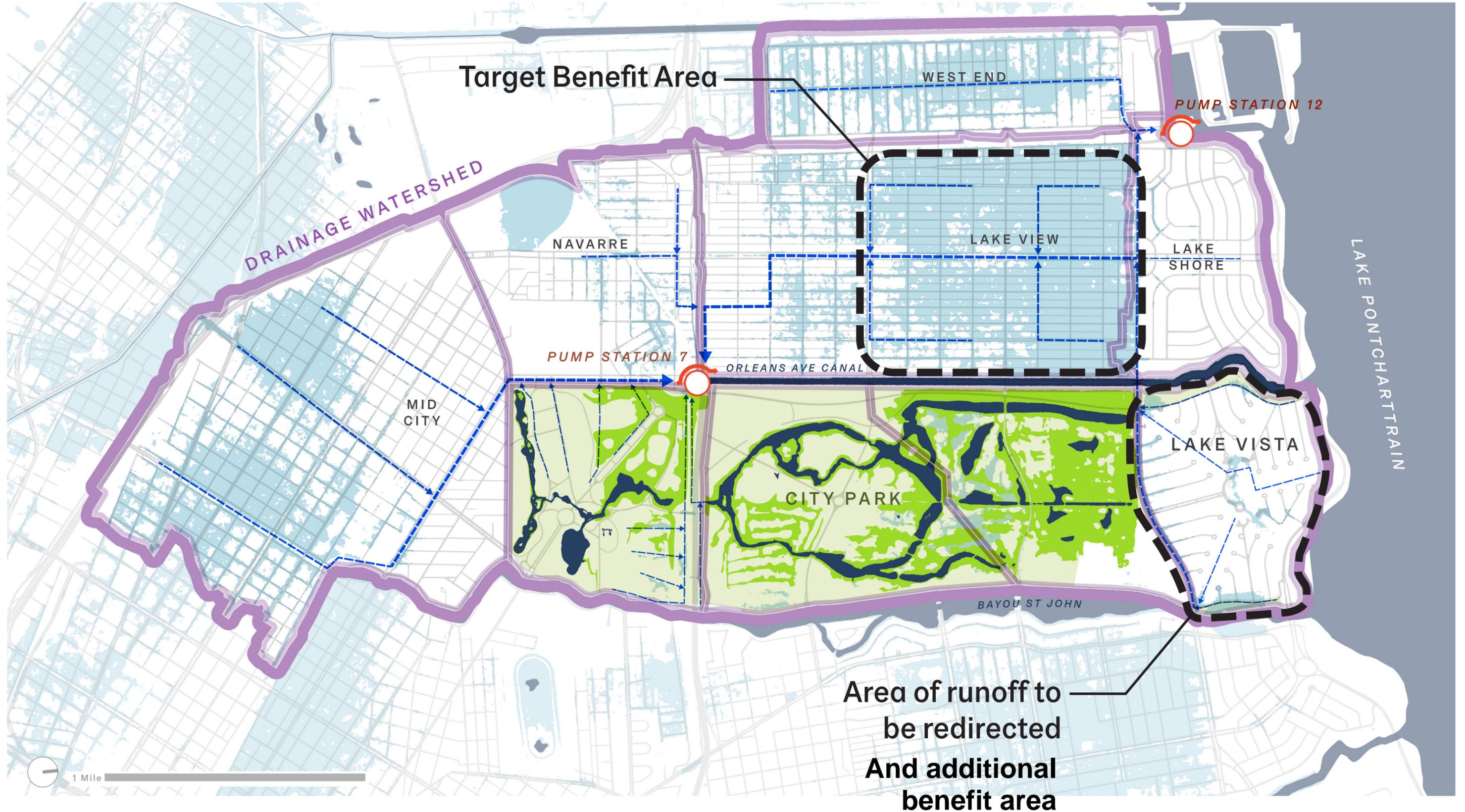
In working toward that goal we get secondary benefits:

- Improved Watershed Function and Storage Capacity
- Additional Recreational Opportunities
- Ecological Health

Project Impact Area

Drainage Pump Station 7 + 12 Watersheds

BATTURE - WAGGONER & BALL - BIOHABITATS - EUSTIS - GREENPOINT - ROSTAN - WINGATE

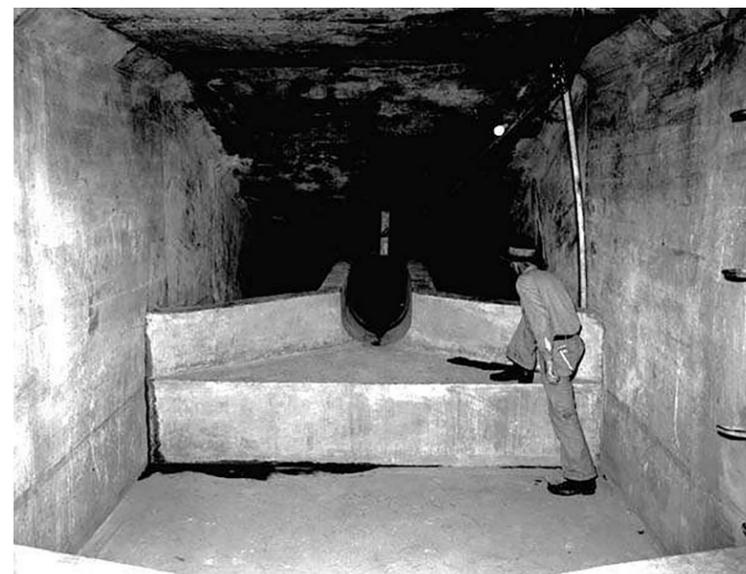
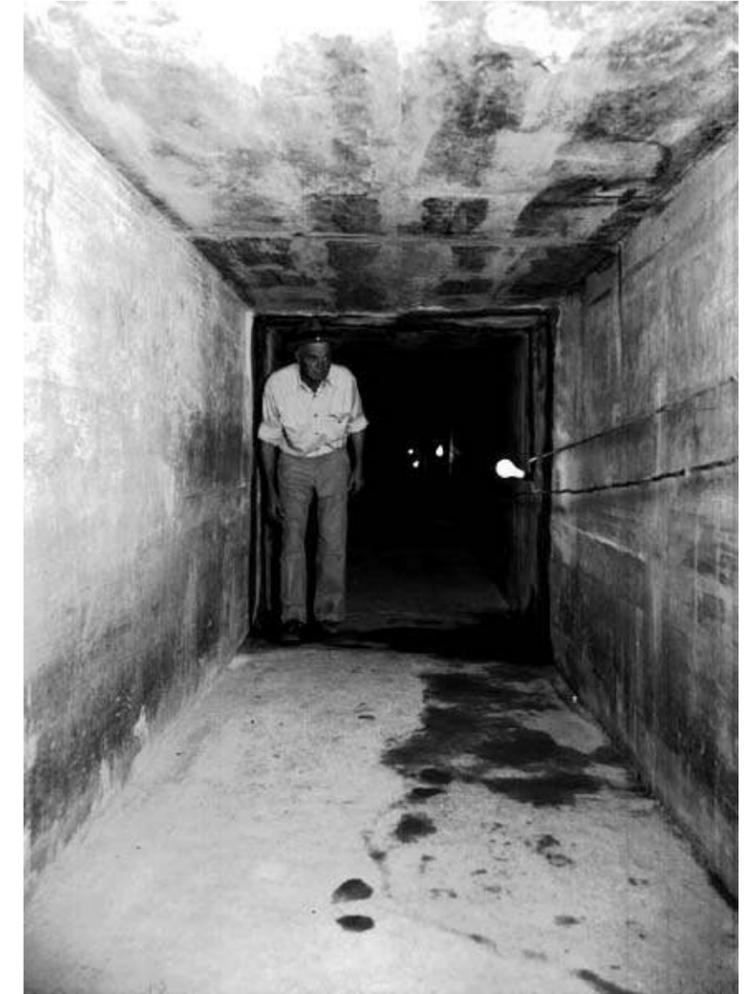
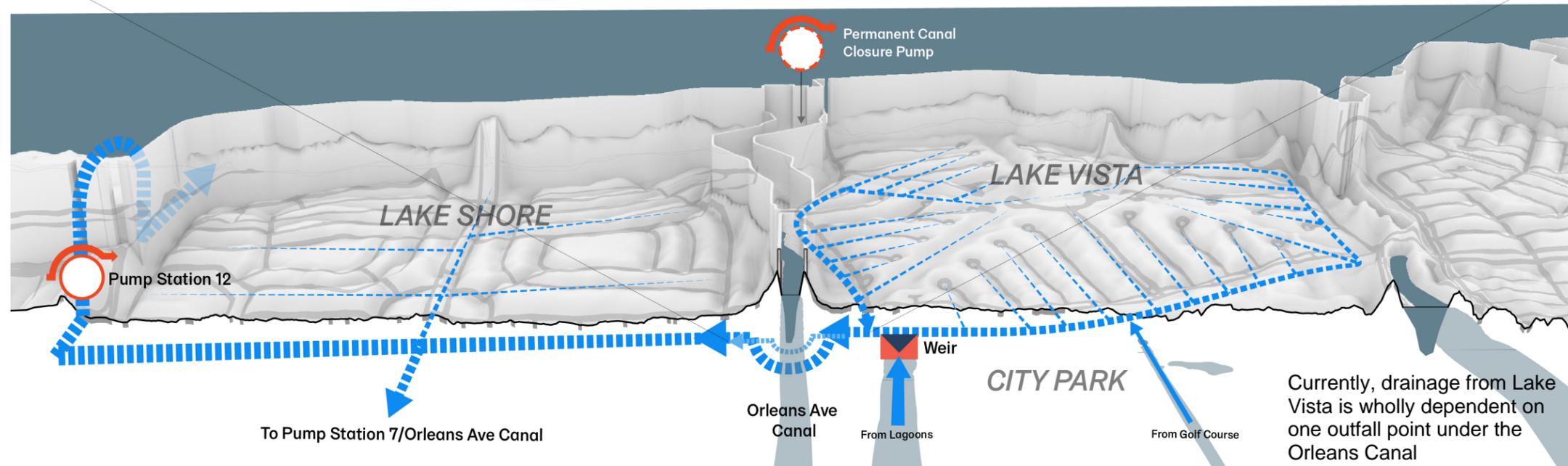


City Park Existing Drainage Diagram



Siphon under Orleans Canal

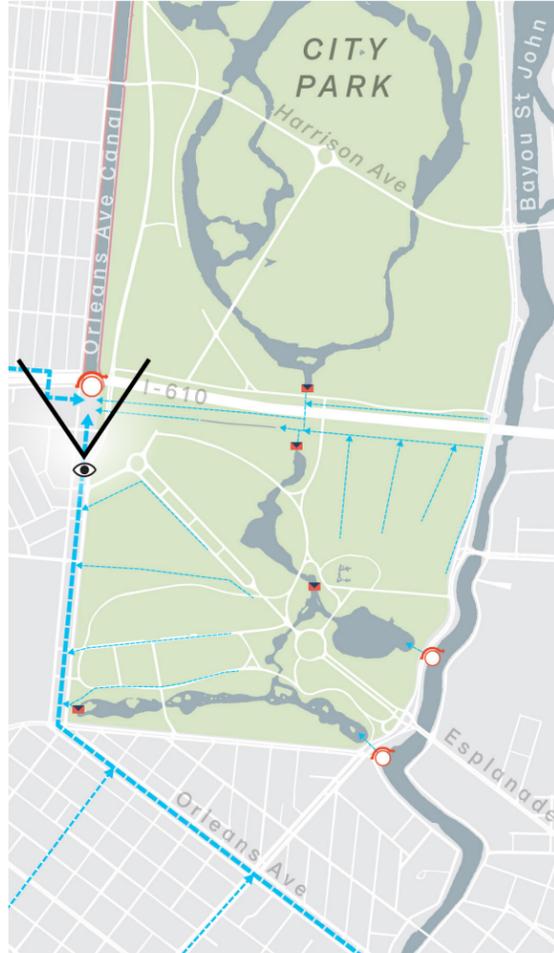
REL Boulevard Box Culvert



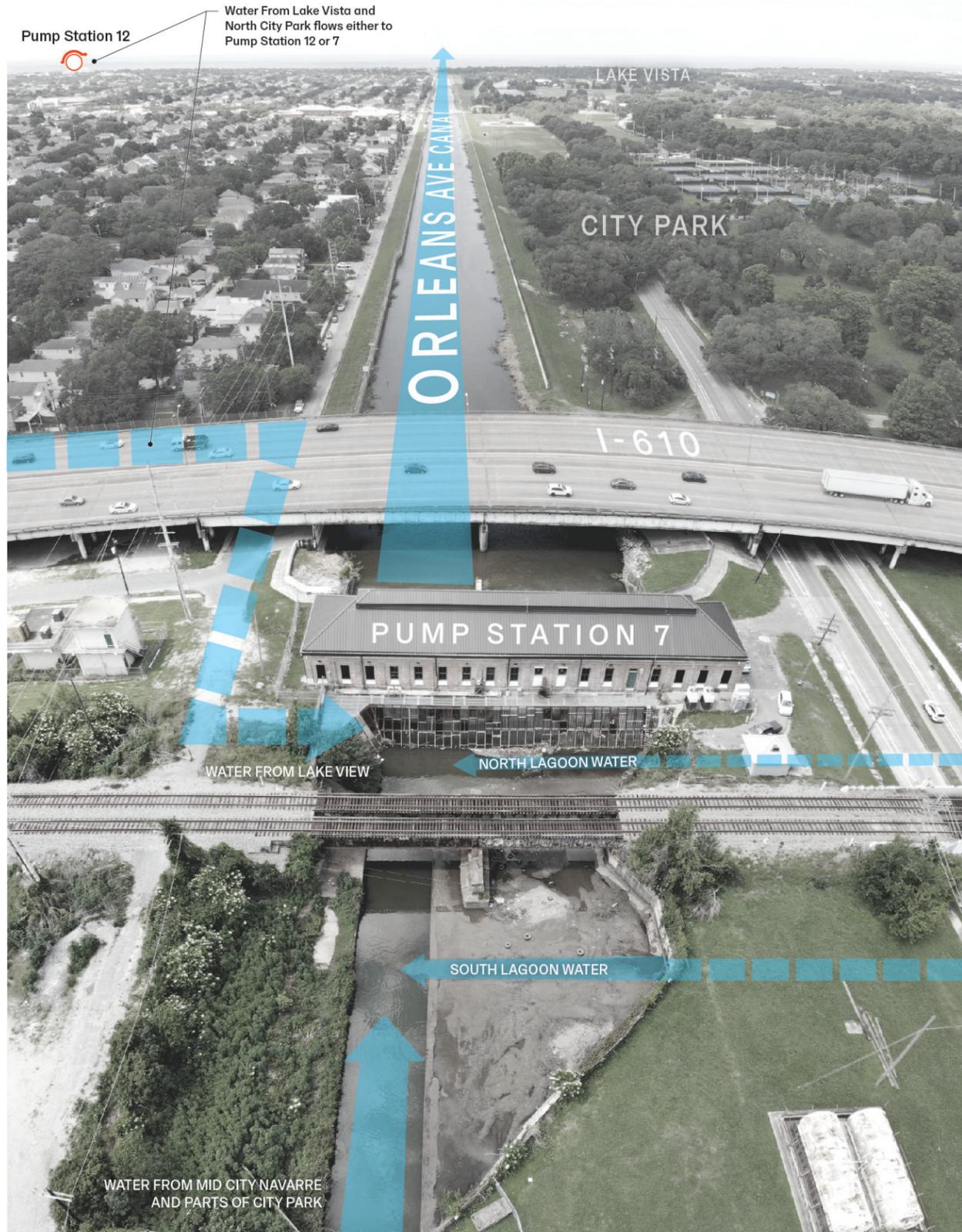
Drainage Pump Station 7

Flows from City Park, Mid-City, Orleans Canal

BATTURE - WAGGONER & BALL - BIOHABITATS - EUSTIS - GREENPOINT - ROSTAN - WINGATE



Capacity of the existing system is limited by the operation of Pump Station 12 and Pump Station 7.



DPS 7 Forebay and Trash Screen



City Park Culvert

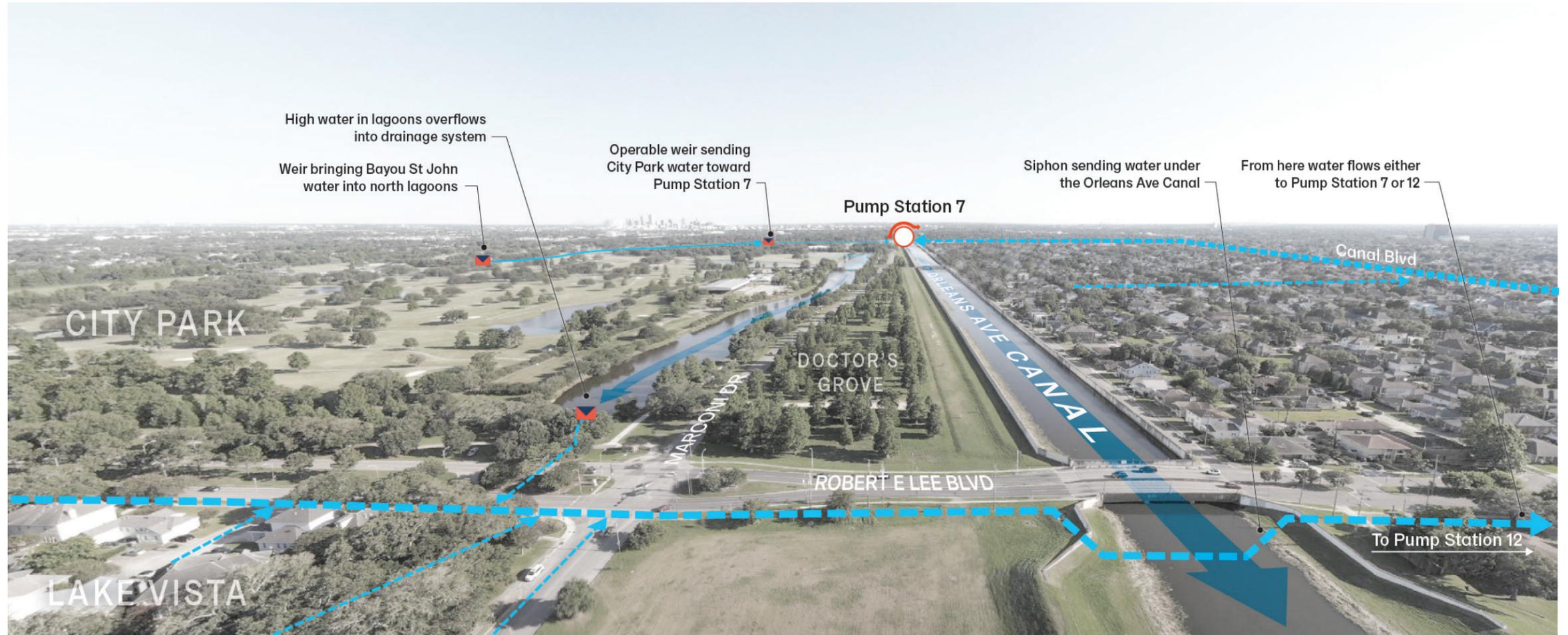
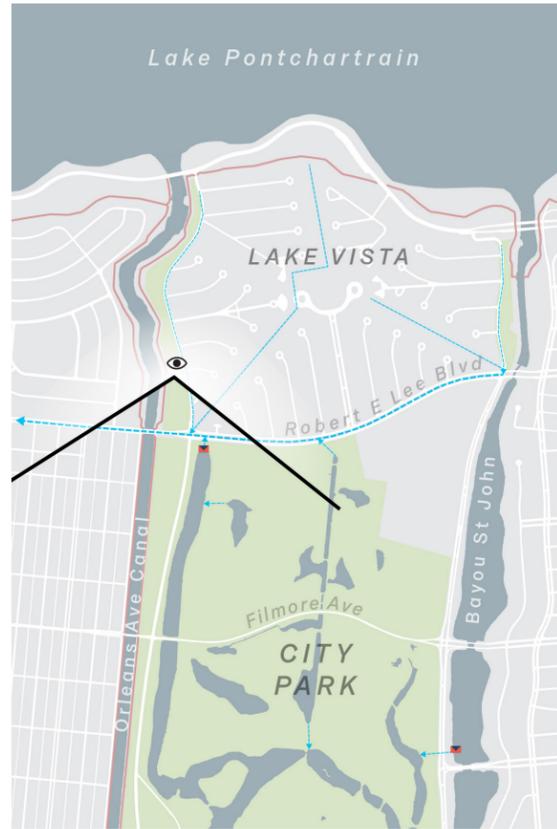


Orleans Avenue Culvert

Existing Condition

View Looking South from Lake Vista

BATTURE - WAGGONER & BALL - BIOHABITATS - EUSTIS - GREENPOINT - ROSTAN - WINGATE

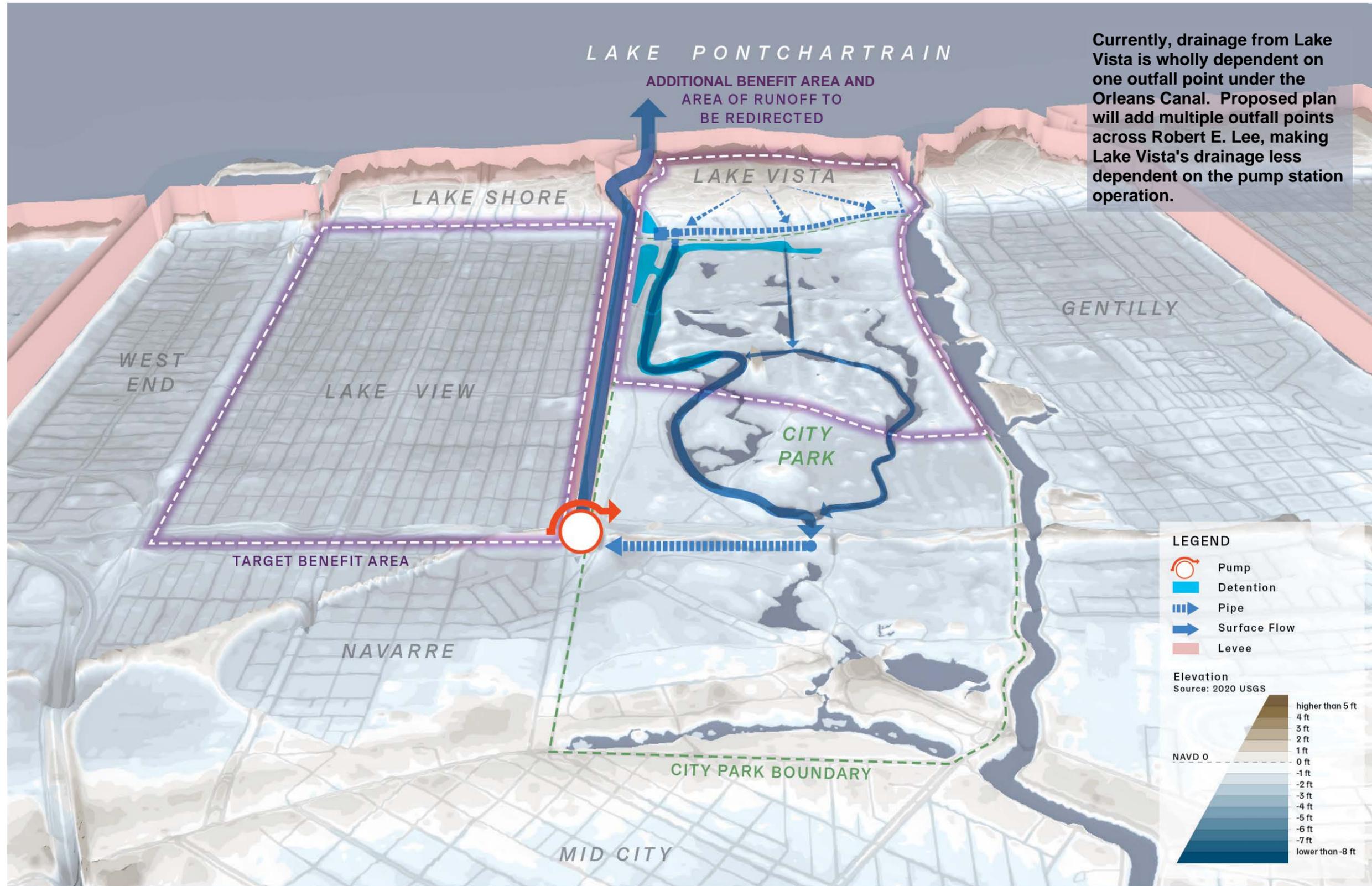


Water Flows Out of Lake Vista and City Park North Lagoons

Drainage from the neighborhood of Lake Vista and the City Park water bodies closest to Lake Pontchartrain discharge into a large culvert underneath Robert E. Lee Boulevard, which flows west under the Orleans Canal via a siphon structure, and continues to DPS 12 at West End Boulevard. Drainage from Lake Vista and City Park impacts the lower lying neighborhoods to the west, worsening flooding when the system is overwhelmed by large rain events. A weir allows the lagoons to overflow into the culvert underneath Robert E. Lee Boulevard during high water events.

Currently, drainage from Lake Vista is wholly dependent on one outfall point under the Orleans Canal

City Park Proposed Drainage Diagram



Currently, drainage from Lake Vista is wholly dependent on one outfall point under the Orleans Canal. Proposed plan will add multiple outfall points across Robert E. Lee, making Lake Vista's drainage less dependent on the pump station operation.

Geotech + Groundwater

Soil Borings and Piezometer Installation

BATTURE - WAGGONER & BALL - BIOHABITATS - EUSTIS - GREENPOINT - ROSTAN - WINGATE



Water Quality

Water Sampling

BATTURE - WAGGONER & BALL - BIOHABITATS - EUSTIS - GREENPOINT - ROSTAN - WINGATE

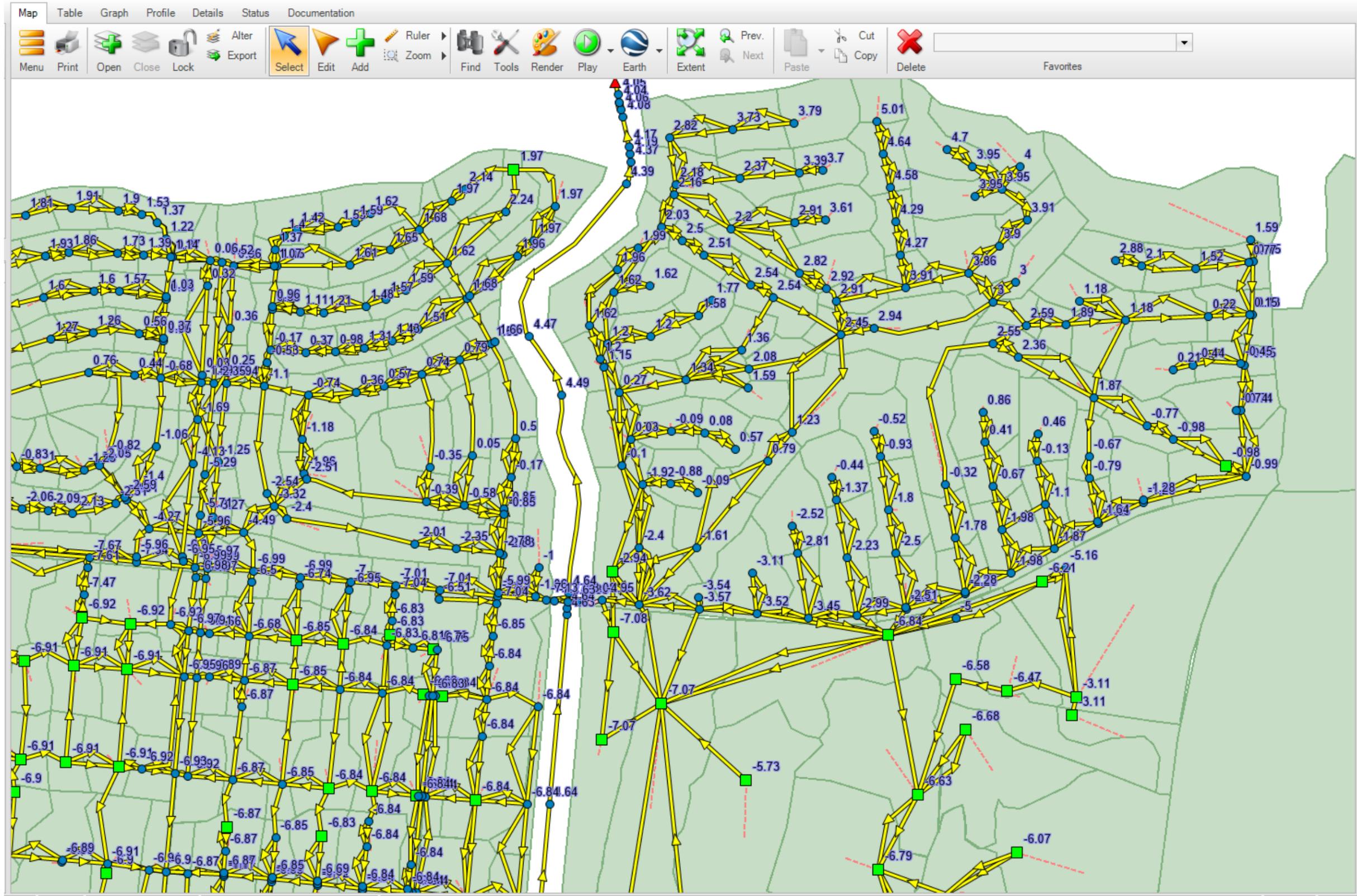




III Hydrologic & Hydraulic

Hydrologic & Hydraulic Model PCSWMM

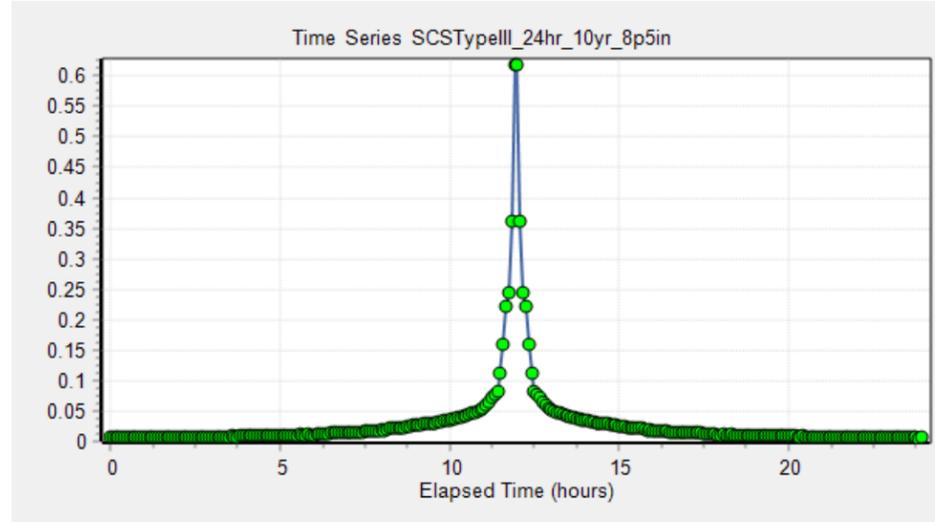
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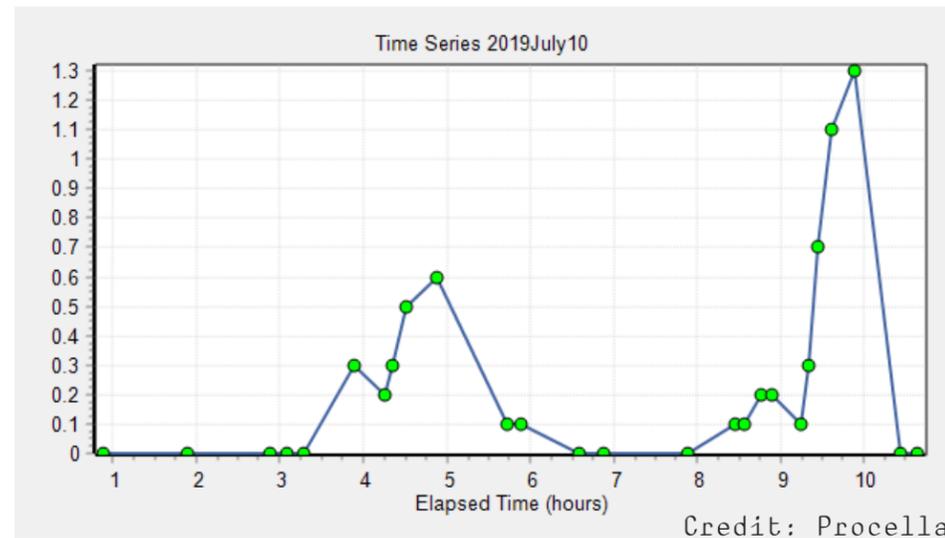
Storm Events

Historic and Design Precipitation

In New Orleans, the 10 year, 24 hour precipitation event is around 8.5 inches of rain. This means that every year there is around a 10% chance that 8.5 inches of rain will fall over a 24 hour period. Within that day most of that 8.5 inches will fall over a more intense 1 to 2 hour period.



Hyetograph, 10 Year, 24 Hour Design Storm in New Orleans



Hyetograph for Storm Event on 10 July 2019, MSY Airport Data



Design Precipitation Events

10 inches in 24 Hours
25 Year (5% Annual Chance)

8.5 inches in 24 Hours
10 Year (10% Annual Chance)

This is the design event used in the stormwater model

5.4 inches in 24 Hours
2 Year (50% Annual Chance)

Historic Precipitation Events, 2009 -2019

Major rain days over the last TEN years as measured at the NOAA Audubon Park rain gauge

9.26 inches: Hurricane Isaac, 8/29/12

8.1 inches: Tropical Storm Lee, 9/3/11
+/-8.0-10.0 inches: Rain, 8/5/17 *

7.2 inches: Rain, 12/12/2009
7.1 inches: Rain, 07/11/2019

5.7 inches: Rain, 8/27/19

0 inches

* estimated amount, not measured at NOAA Audubon Park rain gauge

Storm Events

Rainfall Distribution

Gulf Coast Rain

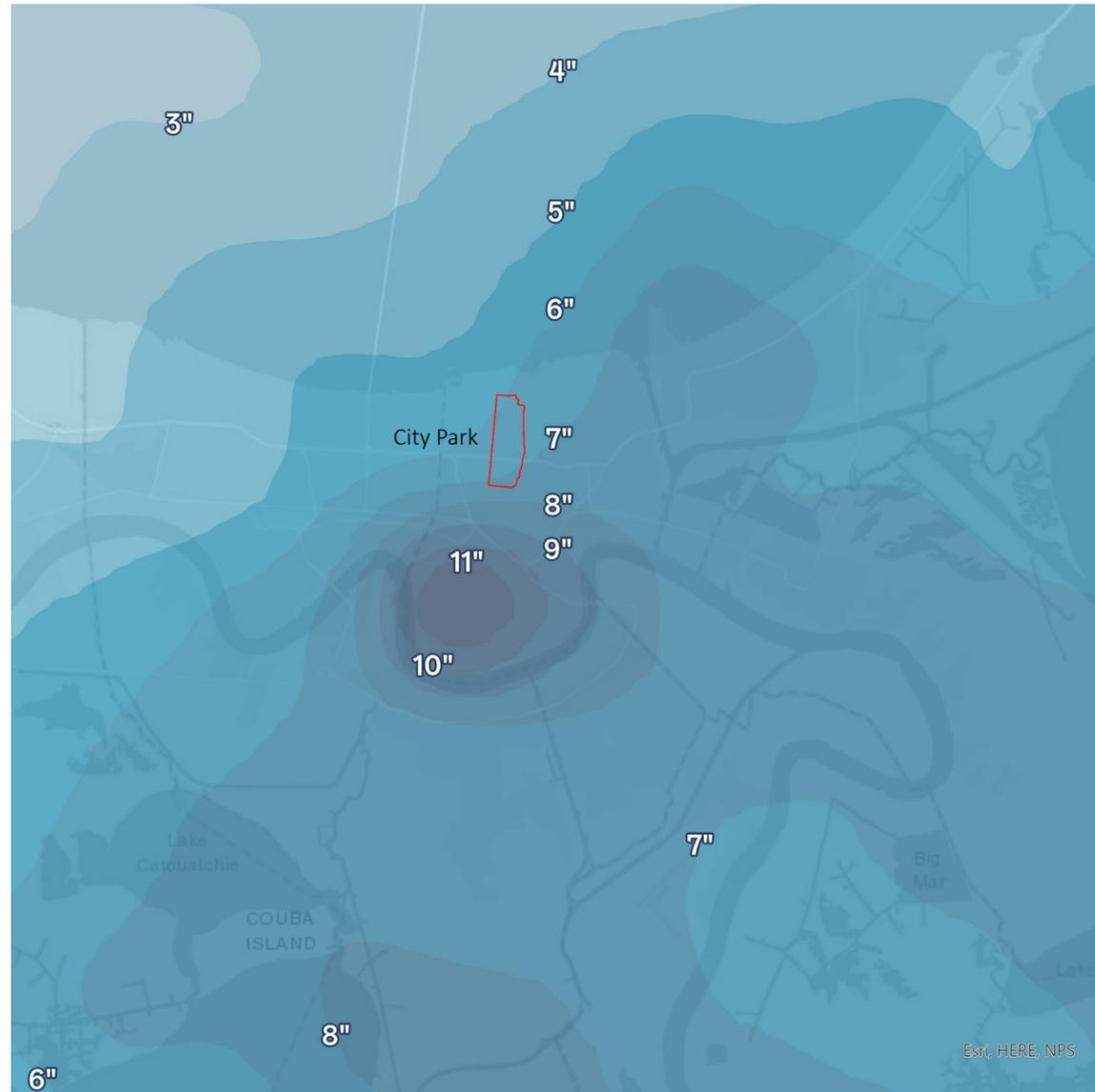
Rainfall in New Orleans and along the Gulf Coast occurs more frequently and with greater intensity than in most of the United States. In the summer months, thunderstorms with intense rainfall are common and often unpredictable. Isolated showers can inundate a particular neighborhood while another nearby area receives only a gentle rain. The uneven distribution of rainfall during storms stresses drainage systems by placing heavy loads on different points in the system, overwhelming pipes and pumps and resulting in street flooding.

Hurricanes

Hurricane season overlaps the summer months where intense rainfall is most frequent in New Orleans. Hurricanes can bring heavy rainfall across the entire city with local areas of exceptional precipitation. Hurricanes and Tropical Storms are responsible for around a third of the major precipitation events over the past 25 years (at right). Historically, these events have occurred when significantly fewer full time students and staff are on campus- a trend which may not hold in the future, as climate change disrupts predictable patterns.

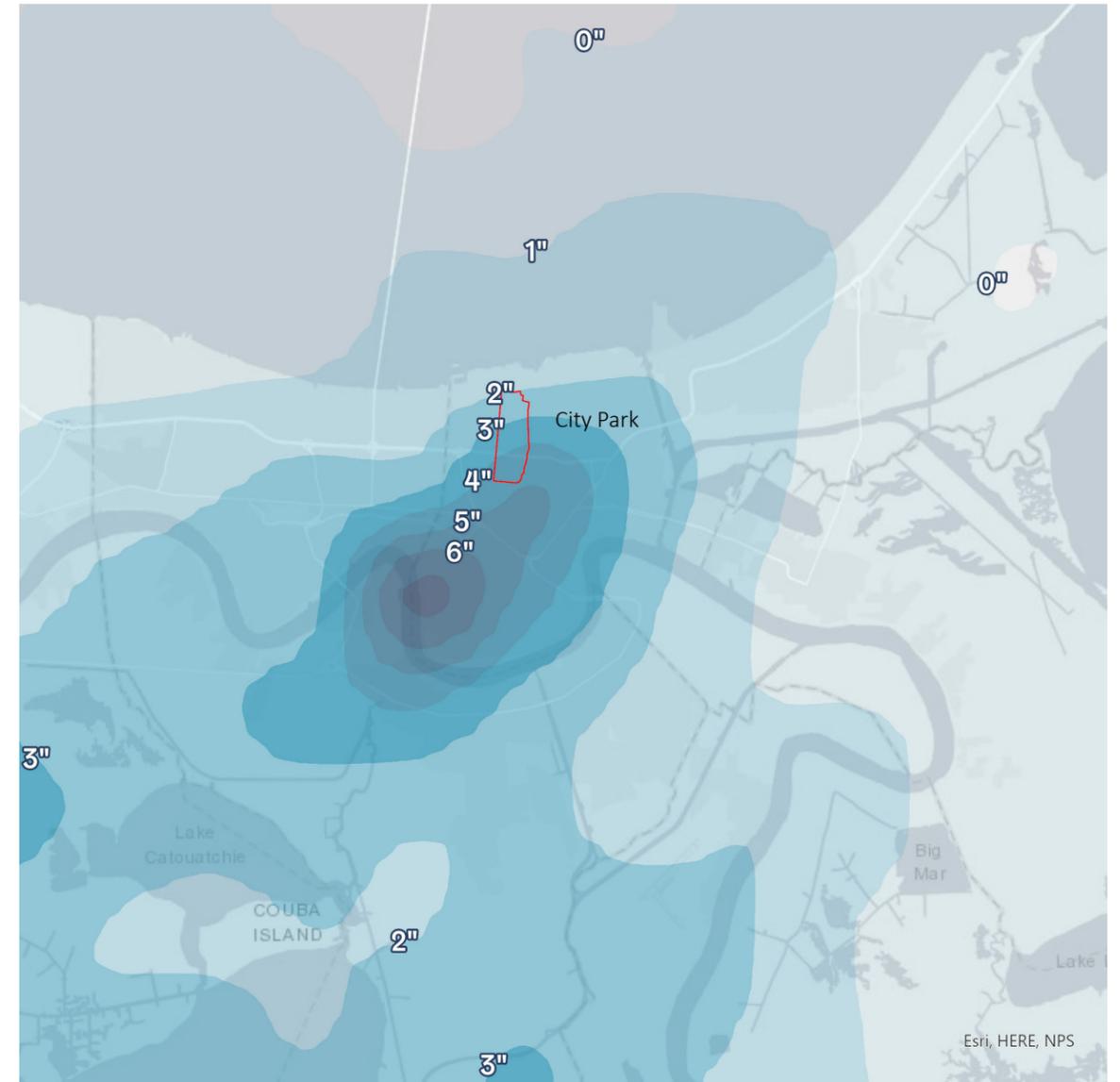
Precipitation Events and Flood Modeling

Precipitation events are developed by NOAA, and are used to describe the likelihood of various types of rainstorms. They are categorized by the annual chance of occurrence, or “year,” and duration, or “hour.” For instance, in New Orleans the “10 year 24 Hour event” equals approximately around 8.5 total inches of rain. This means that every year, an approximately 10% chance exists that 8.5 inches of rain will fall over a 24 hour period. For the Tulane Stormwater Master Plan, three storms were modeled to evaluate different stormwater management tactics: the 2, 10, and 25 year, 24 hour events.



Hurricane Rain Event

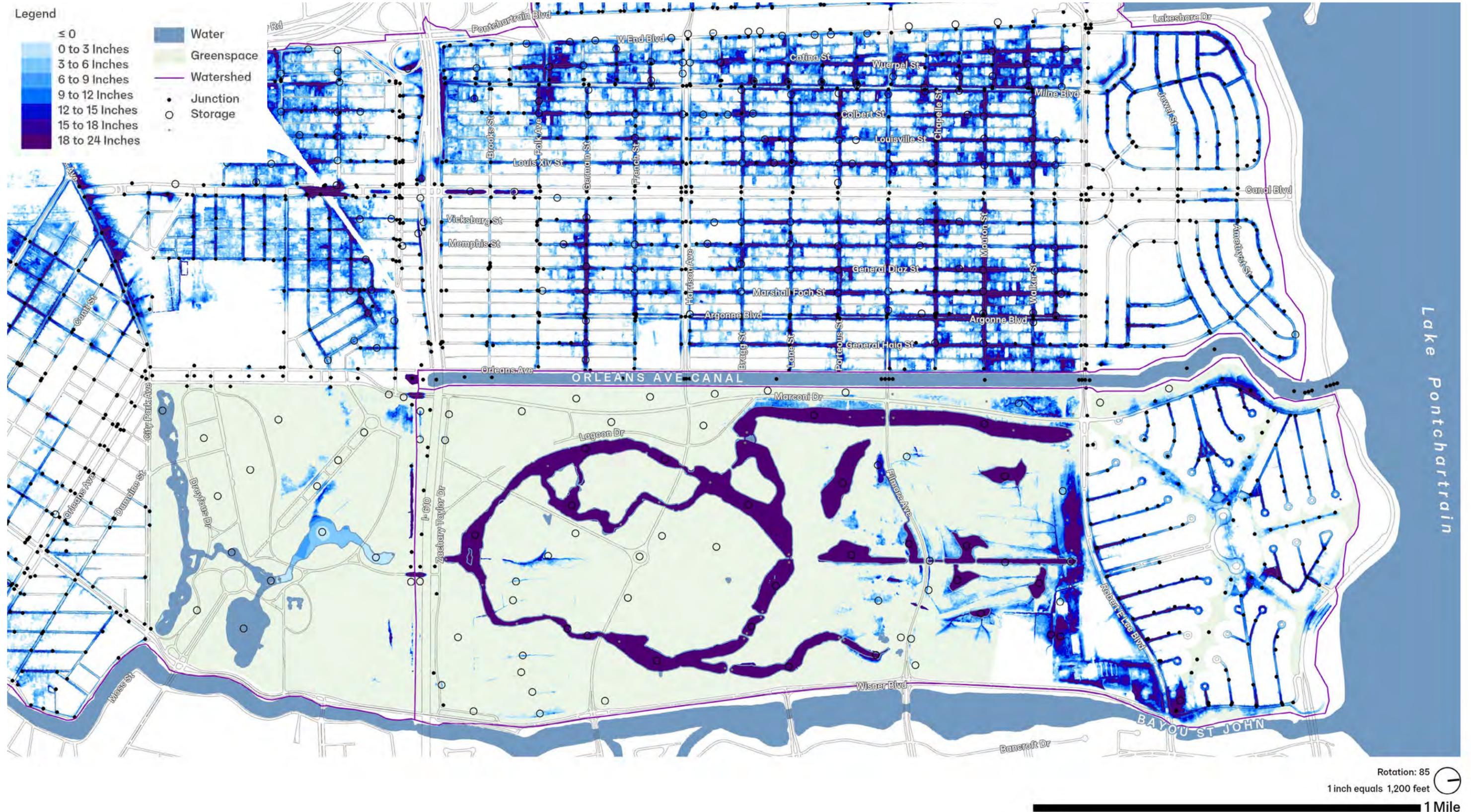
Hurricanes create a high amount of rainfall over a large geographic area, yet still cause precipitation that is relatively concentrated over smaller zones.



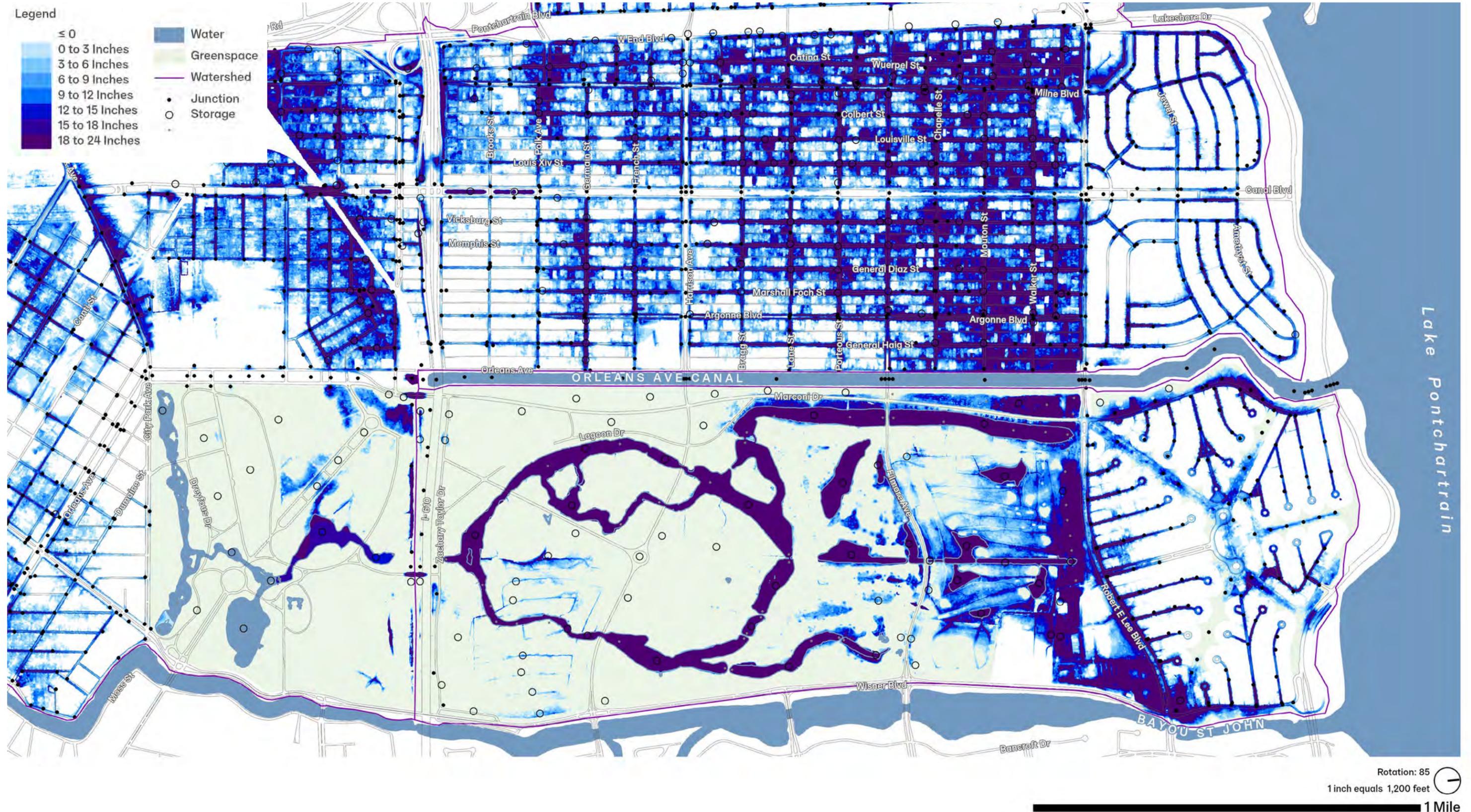
Non-Hurricane Rain Event

While bringing rainfall across the metro area, precipitation events in New Orleans are often specifically concentrated over small areas.

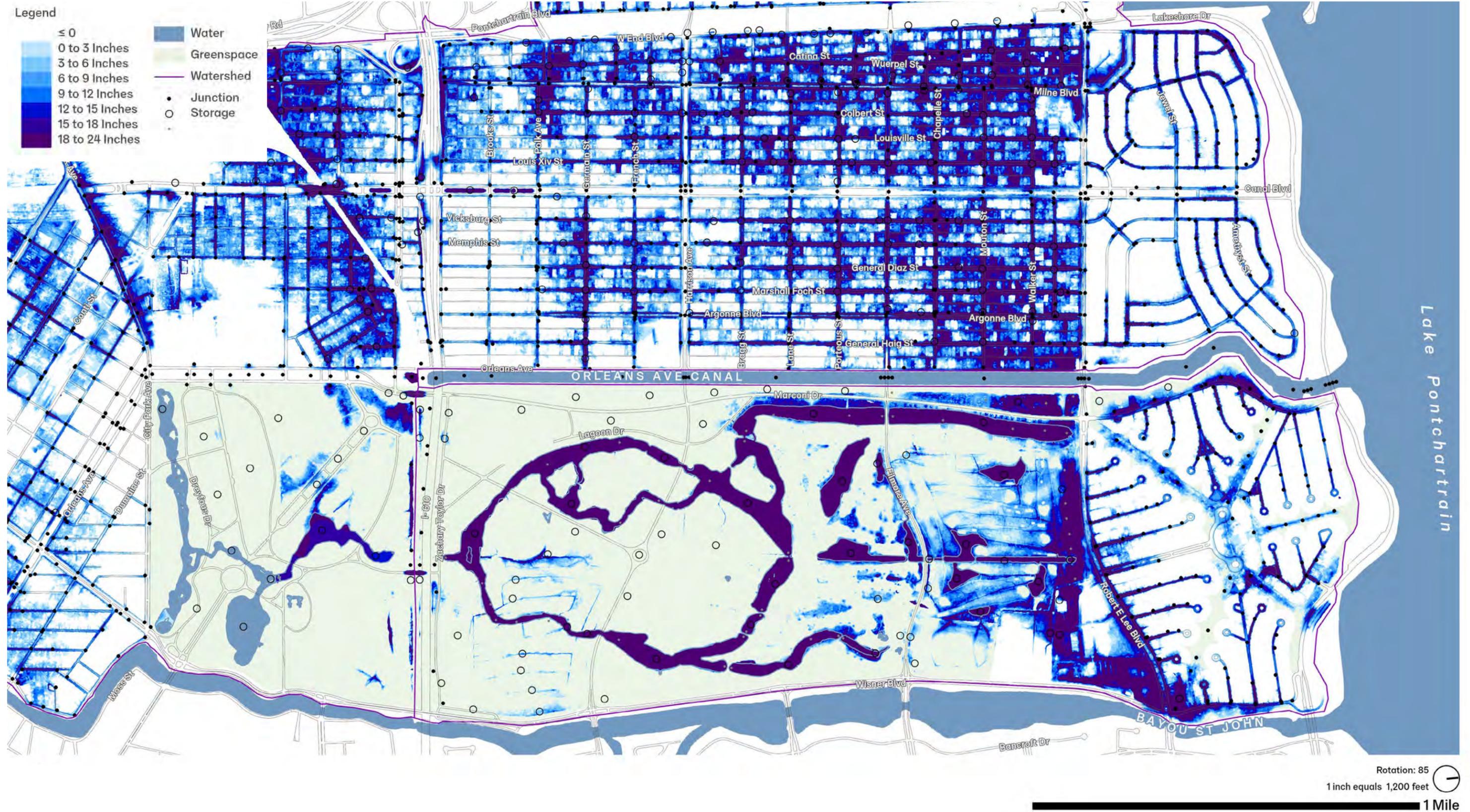
Flood Depth: 10 Year Storm - Proposed



Flood Depth: 100 Year Storm Event - Existing



Flood Depth: 100 Year Storm - Proposed



Hydrologic & Hydraulic Model

Runoff Volumes

BATTURE - WAGGONNER & BALL - BIOHABITATS - EUSTIS - GREENPOINT - ROSTAN - WINGATE

187
Million Gallons

Storage Volume Available in
City Park in Proposed Condition
North of I-610 (123MG Existing)
(Between -8.5' and -5.0')

53
Million Gallons

Runoff volume from Lake Vista
(10-year 24-hour storm)

132
Million Gallons

Runoff volume from City Park
North of I-160
(10-year 24-hour storm)

Enough storage capacity even
without any outflow!

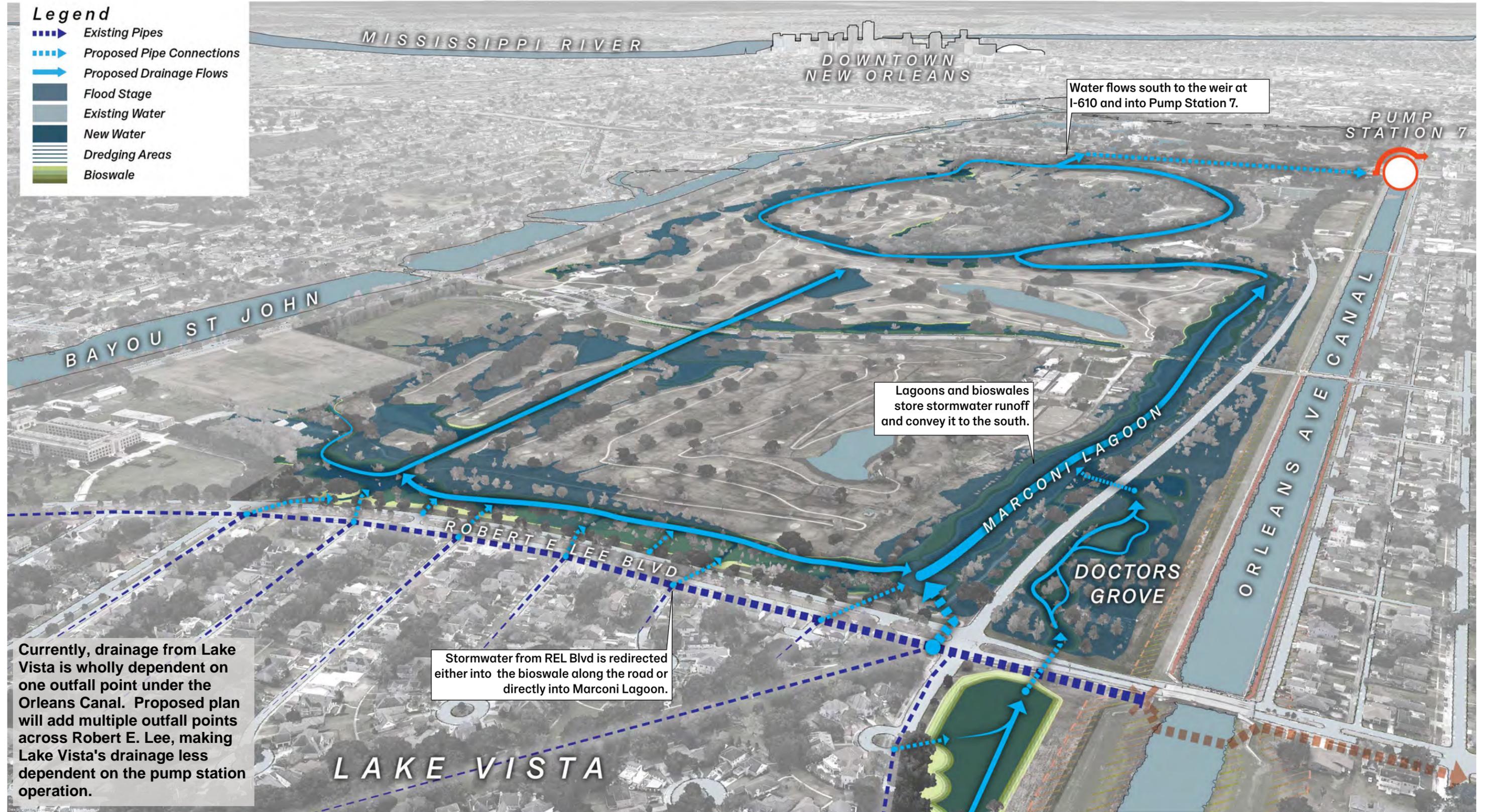


III Design Focus Areas

City Park Design Strategies



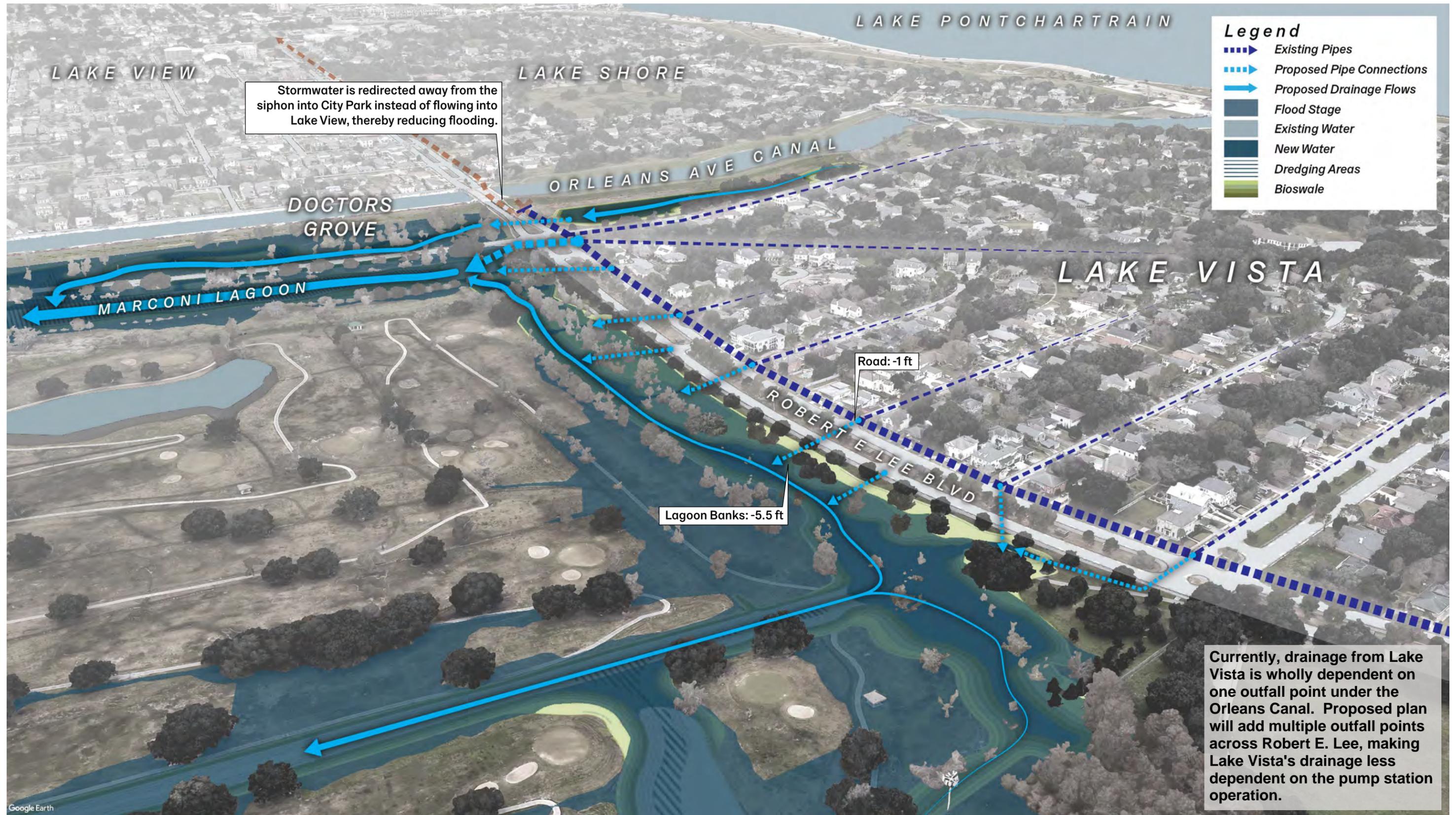
City Park Design Strategies: Flood Stage



City Park Design Strategies



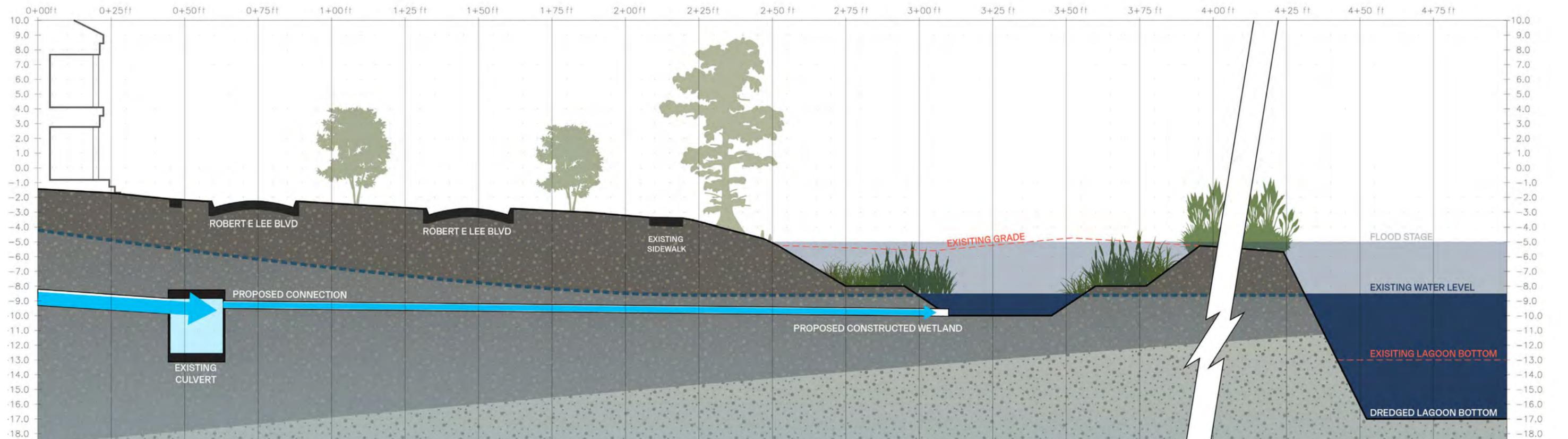
City Park Design Strategies: Flood Stage



Lake Vista, REL Boulevard, North Golf Course



Section through REL Boulevard, Bioswale, Constructed Wetland, Marconi Lagoon



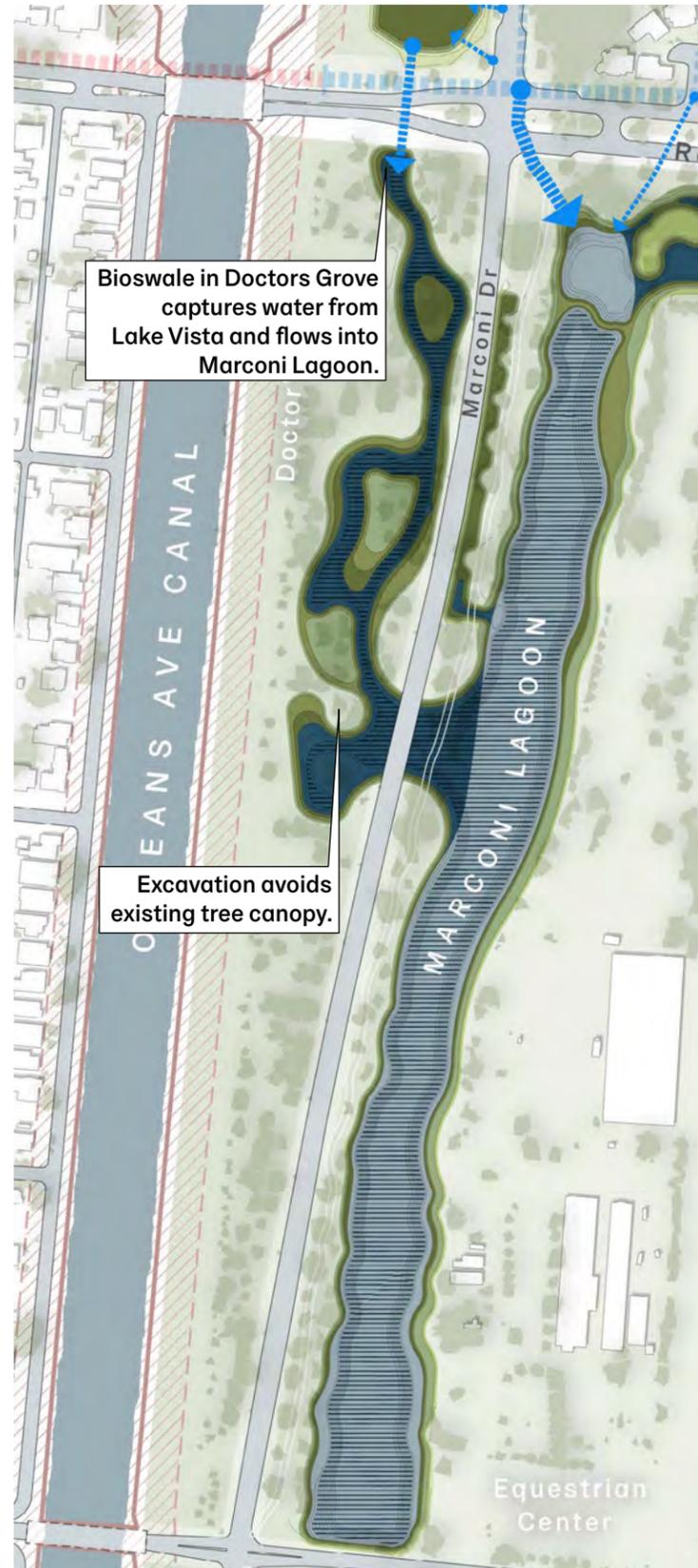
Prototypical Lagoon and Stormwater Management System

Connecting the existing culvert to a new constructed wetland relieves pressure on the drainage system while filtering and temporarily storing additional stormwater in the landscape. New wetland vegetation cleans the water and increases infiltration. A new bioswale in between the roadway and sidewalk is also connected to the constructed wetland. Finally, the wetland is connected to the lagoon system to provide overflow and bring water into the park.

Doctors Grove, North Golf Course



Doctors Grove



Doctors' Grove Cypress Trees



Big Lake Boardwalk



Doctors' Grove Monument. The Rod of Caduceus, along with the Rod of Asclepius, are symbols of medicine

Doctor's Grove Marker

1974

30°00.735N 90°05.896W

In 1973, the Women's Auxiliary of Orleans Parish Medical Society initiated plans to establish a Cypress grove between Filmore Avenue and Robert E Lee along Marconi Drive. Before Hurricane Katrina, the grove included as many as 500 trees with name tags of honored doctors and other deserving citizens. The plaque is missing.

Bayou Oaks Golf Course, Couturie Forest, Nursery Island



Legend

- Existing Water
- New Water
- Dredging Areas
- Bioswale
- Existing Drain Line
- New Drain Line
- Levee
- Levee Buffer Area

Concept Design

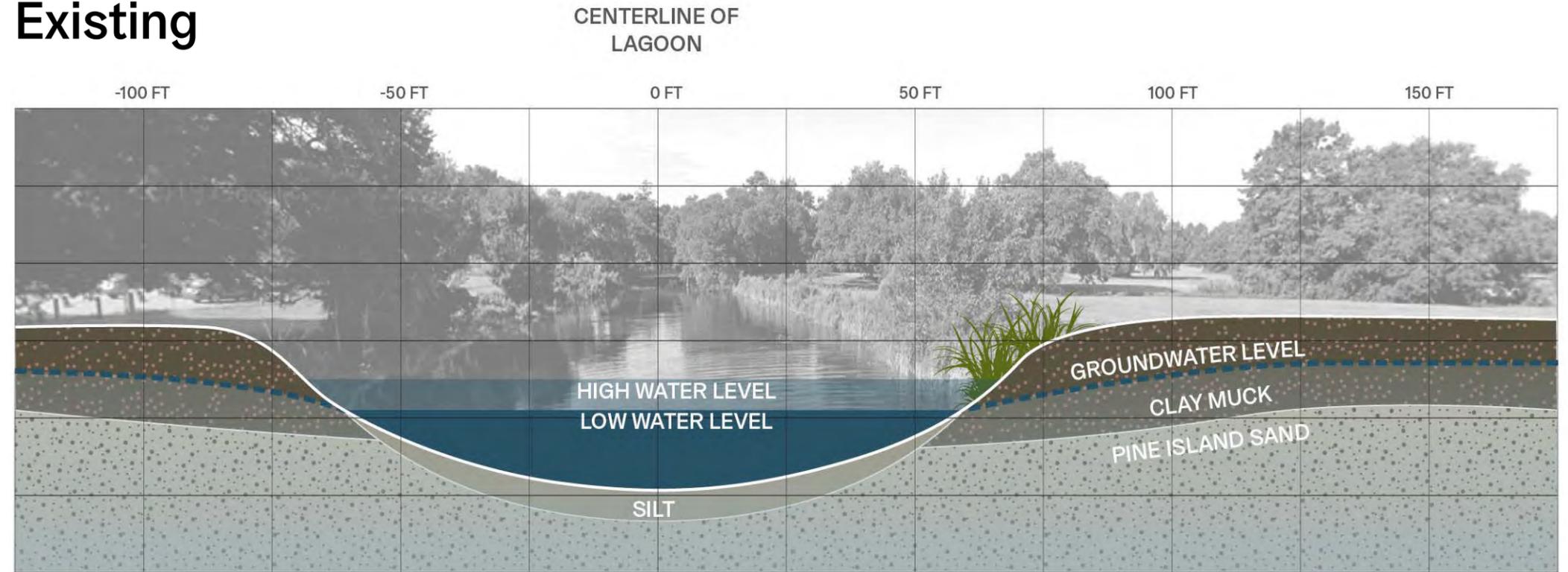
Typical Lagoon Profiles



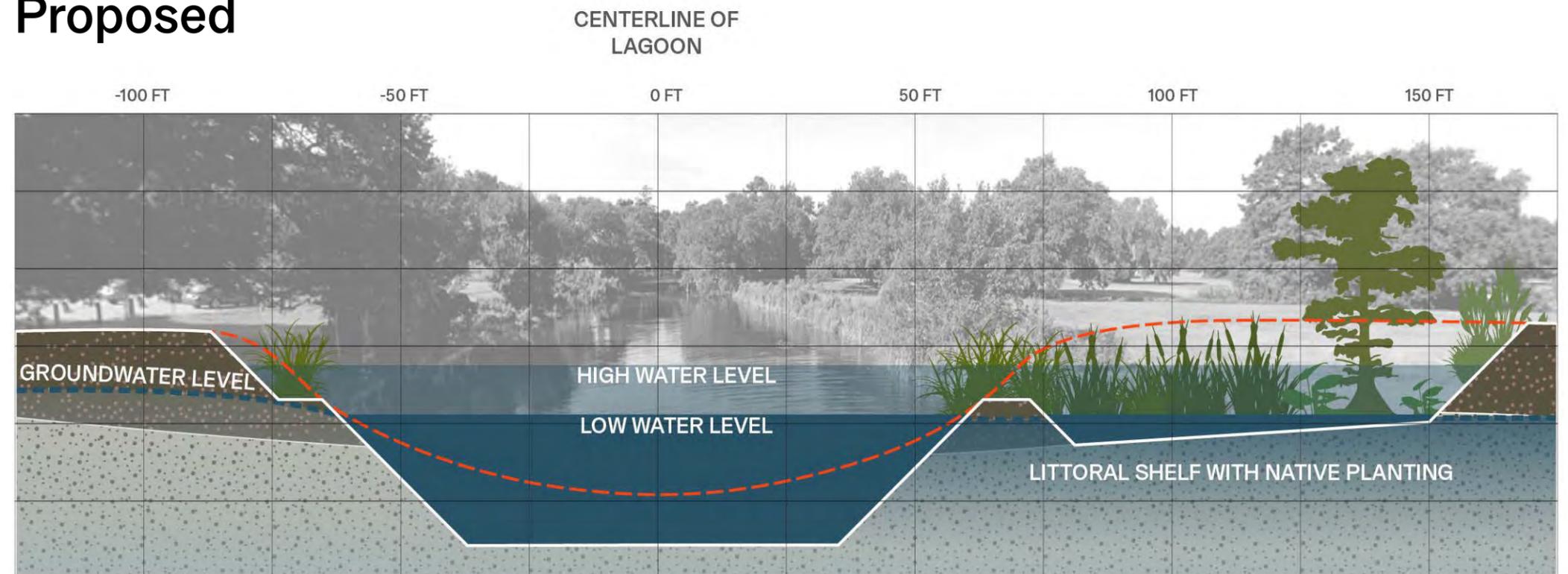
Typical Lagoon Bank: Proposed

Design changes to the lagoons include removing silt deposits, increasing depth, stabilizing the slopes, expanding the width by creating wetland terraces, and a riparian edge with wetland plantings. Together, these modifications will store a greater amount of stormwater in the lagoons, slow and filter the water with vegetation, and increase infiltration into the soil. Improved water quality and vegetation will also create habitat and provide a range of ecosystem benefits.

Existing



Proposed



Edge Conditions

City Park Precedents



Louisiana Childrens Museum

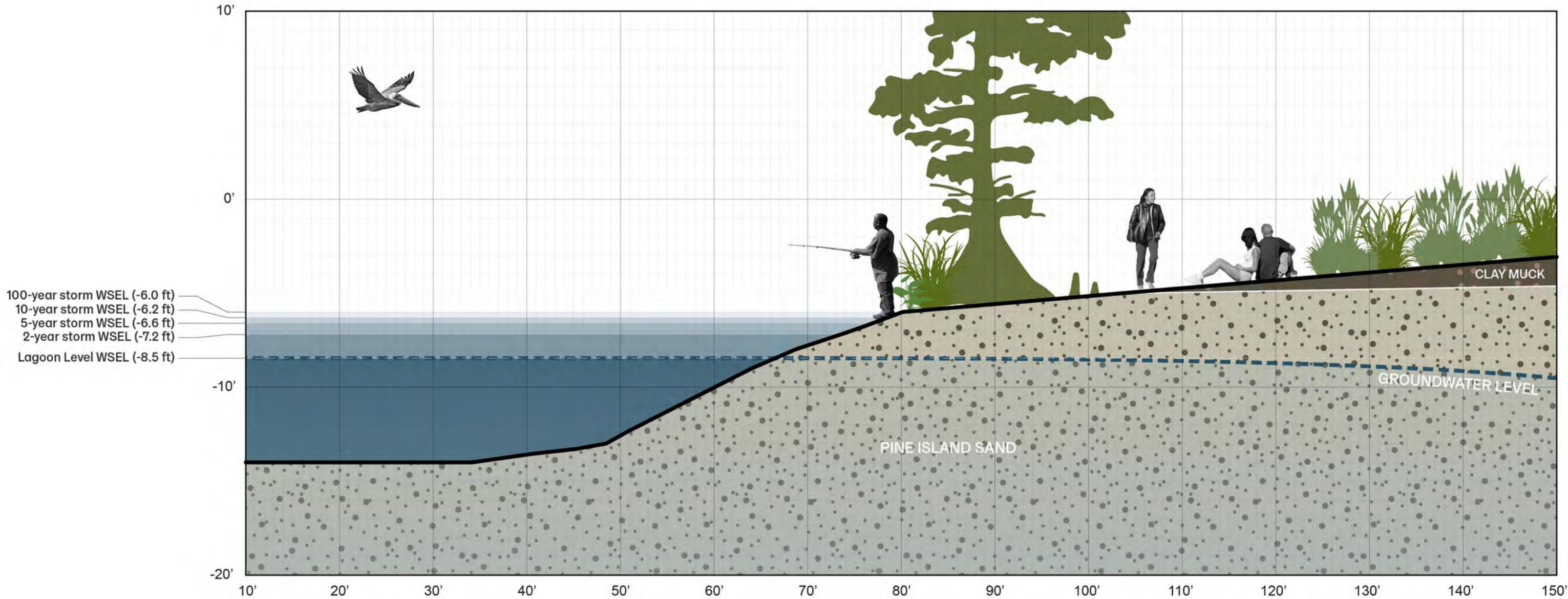


Shoreline Restoration at Volunteer Center



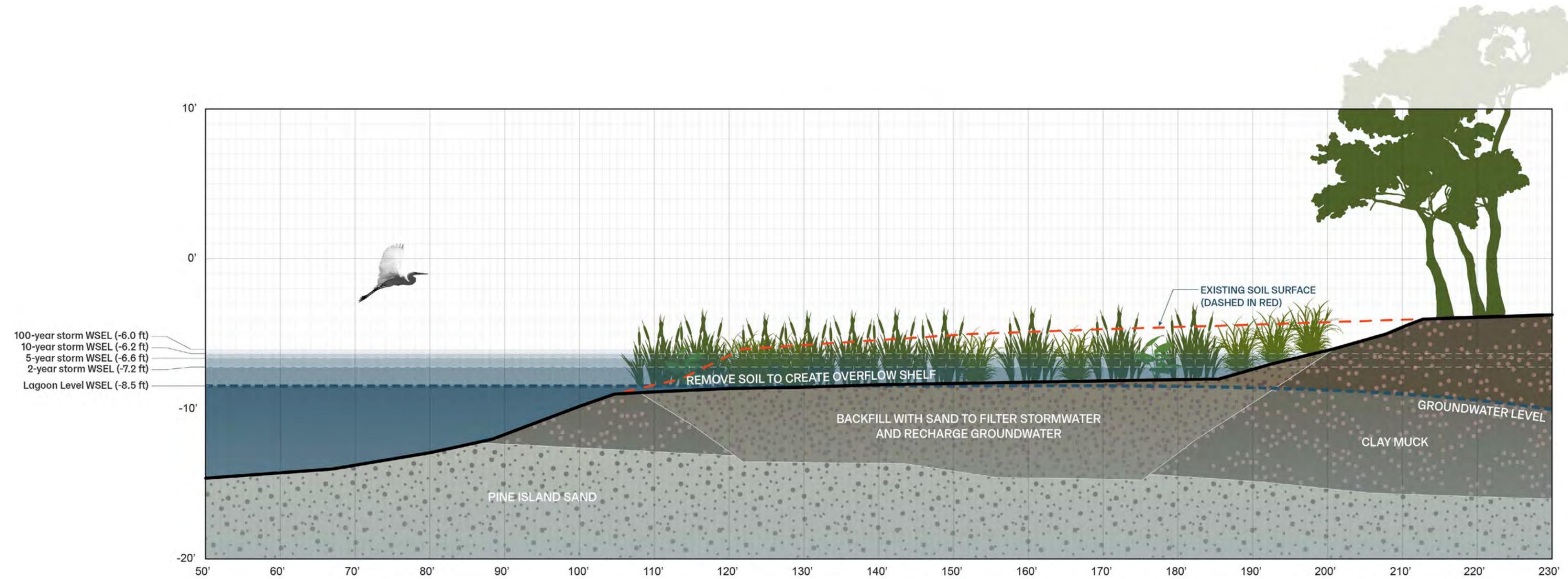
Typical Lagoon Profiles

Unreinforced Embankment (5:1 Max Slope)



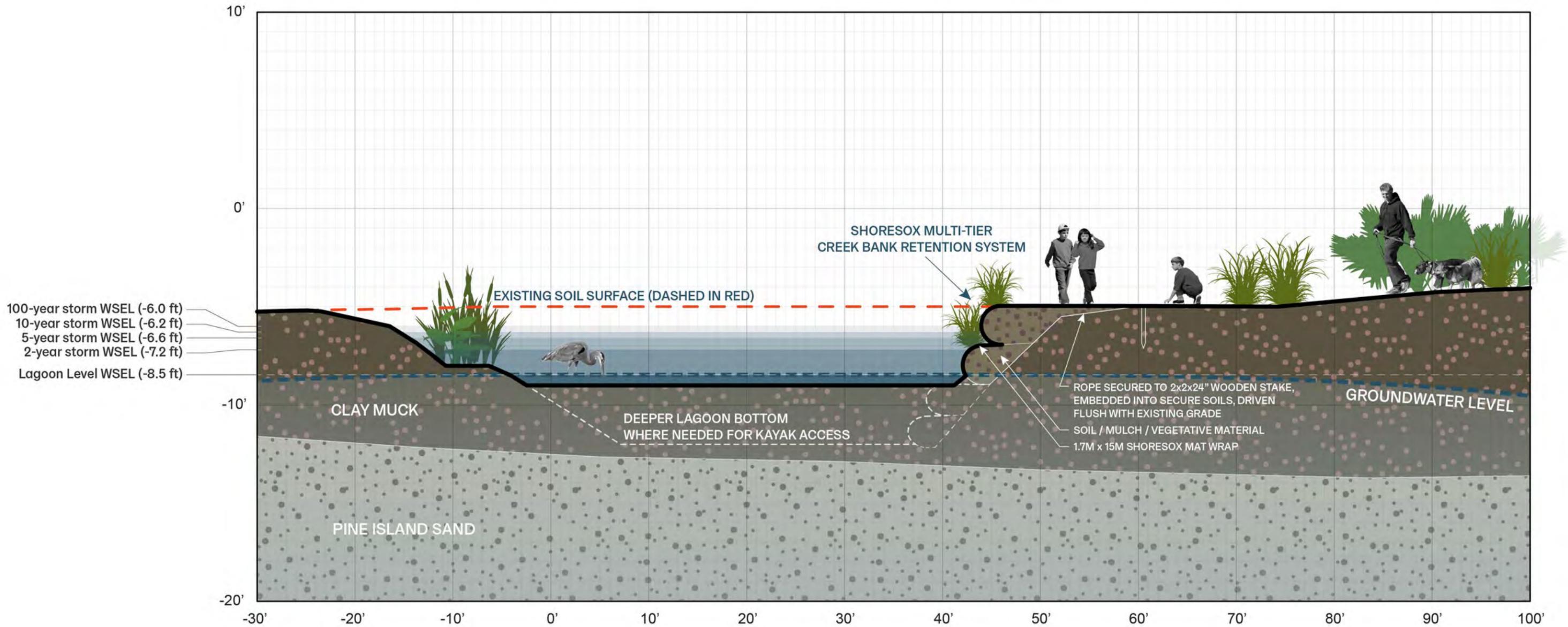
Typical Lagoon Profiles

Terraced Embankment / Overflow Shelf



Typical Lagoon Profiles

Embankment with Stabilization / Erosion Control (3:1 Max Slope)



ORLEANS AVENUE CANAL

ORLEANS AVENUE CANAL

WATER LEVEL: RL CANAL
@ 19.15 (2/20/00)

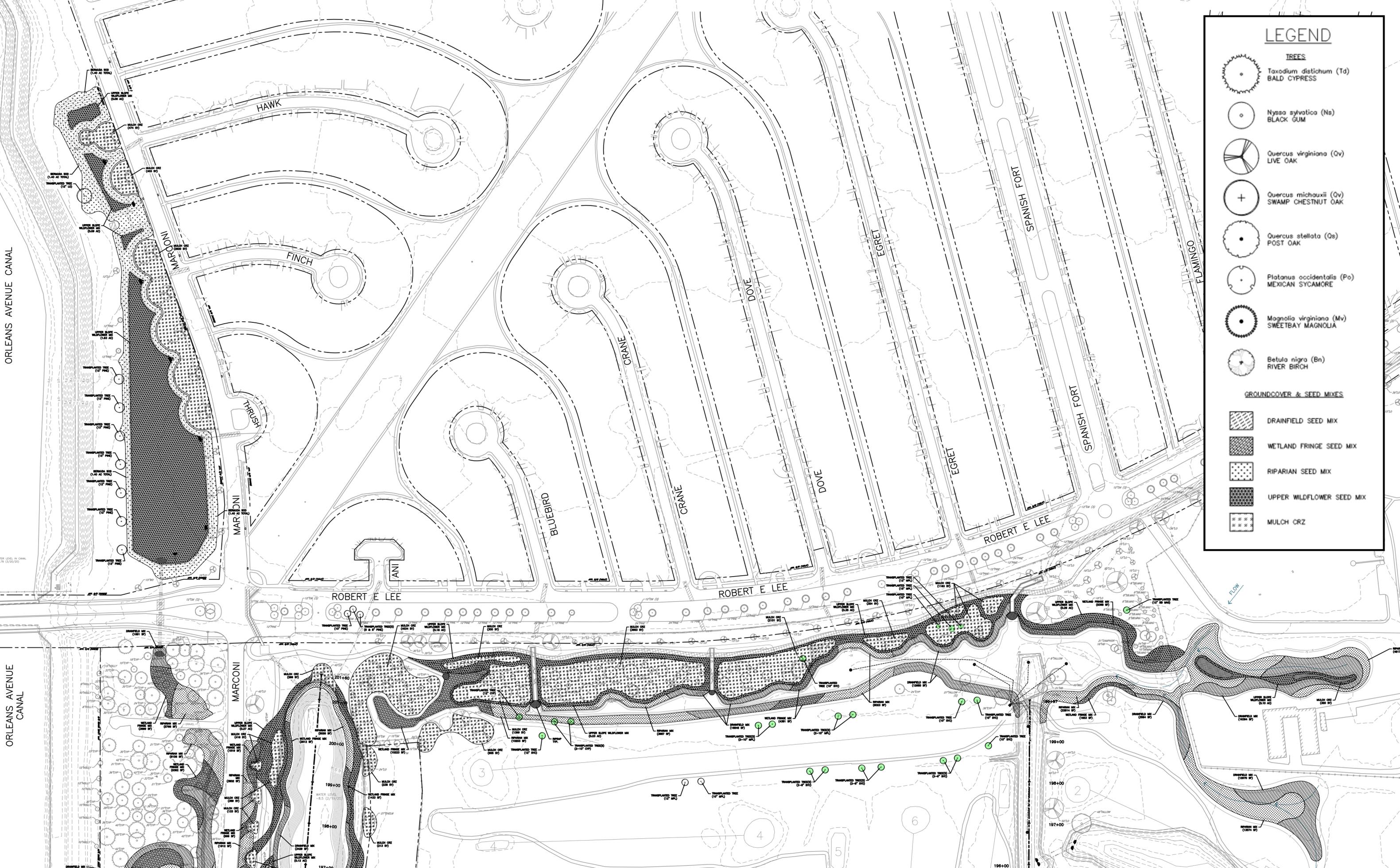
LEGEND

TREES

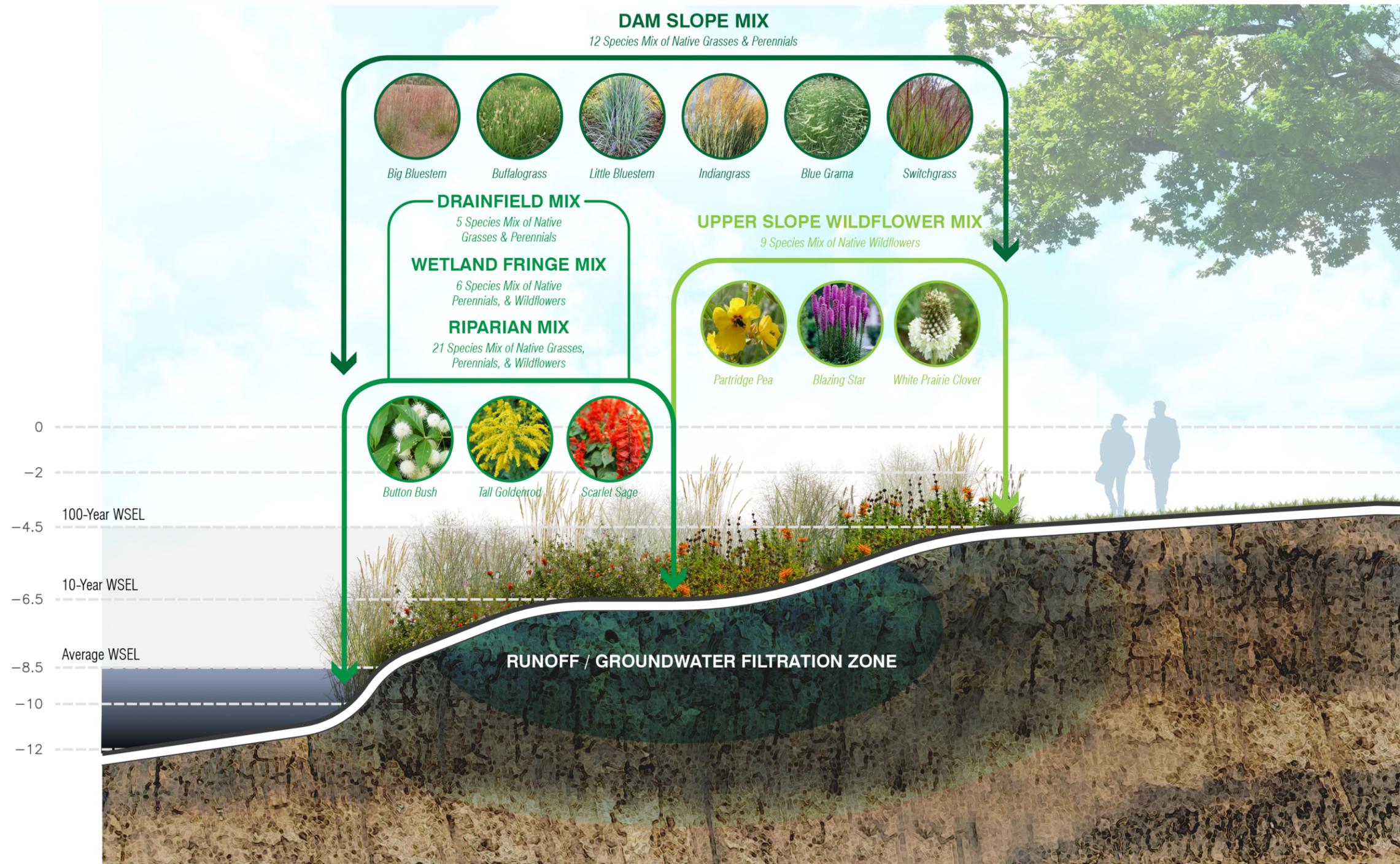
- Taxodium distichum (Td) BALD CYPRESS
- Nyssa sylvatica (Ns) BLACK GUM
- Quercus virginiana (Qv) LIVE OAK
- Quercus michauxii (Qm) SWAMP CHESTNUT OAK
- Quercus stellata (Qs) POST OAK
- Platanus occidentalis (Po) MEXICAN SYCAMORE
- Magnolia virginiana (Mv) SWEETBAY MAGNOLIA
- Betula nigra (Bn) RIVER BIRCH

GROUNDCOVER & SEED MIXES

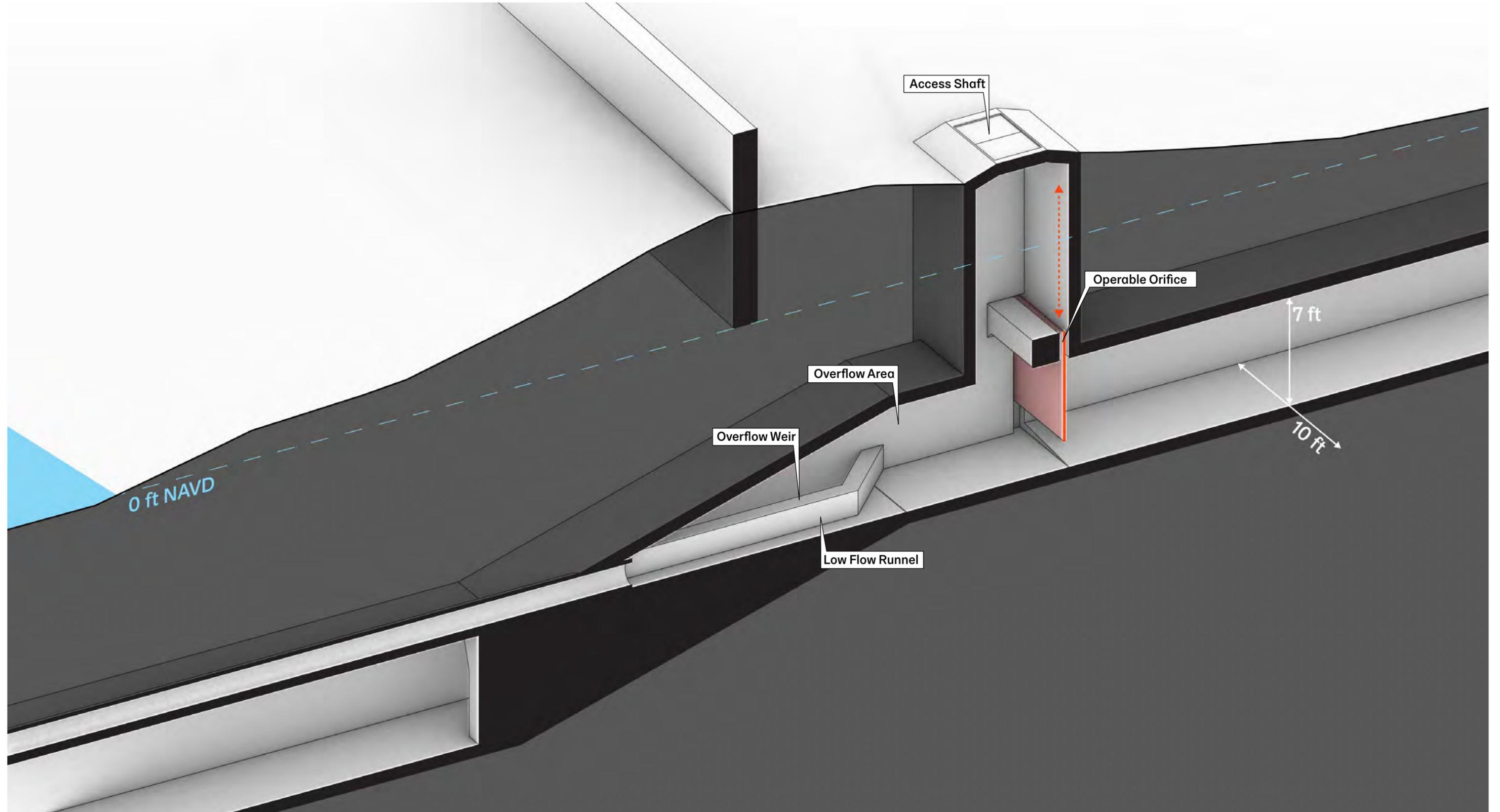
- DRAINFIELD SEED MIX
- WETLAND FRINGE SEED MIX
- RIPARIAN SEED MIX
- UPPER WILDFLOWER SEED MIX
- MULCH CRZ



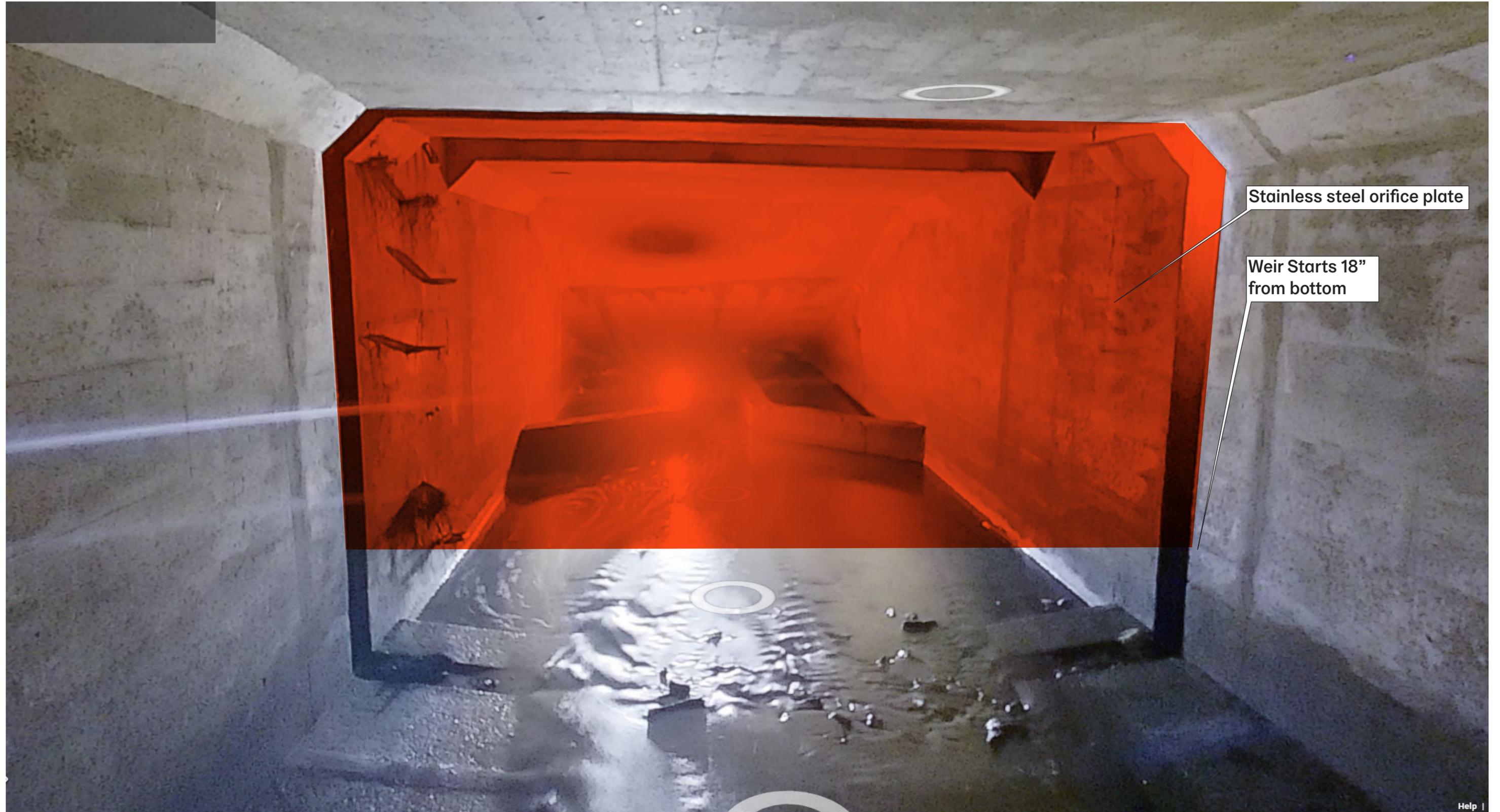
Planting Strategies



Siphon Proposed Conditions



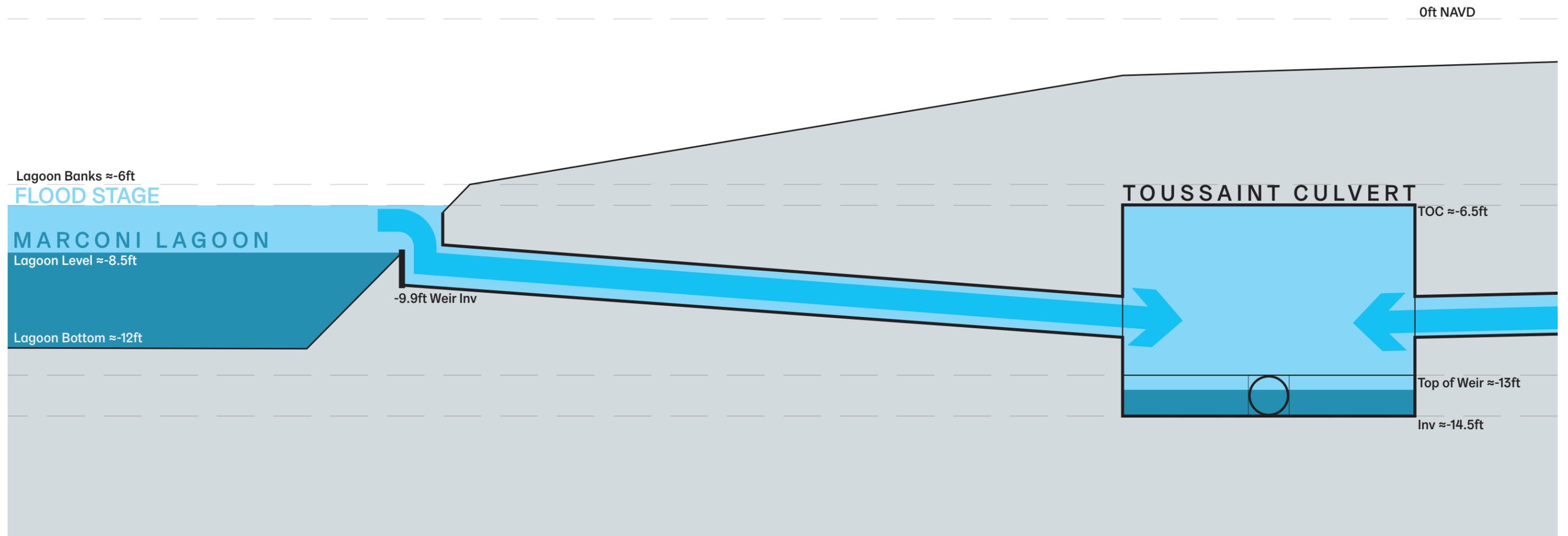
Siphon Proposed Conditions



Existing Connection

Lake Vista to Marconi Lagoon

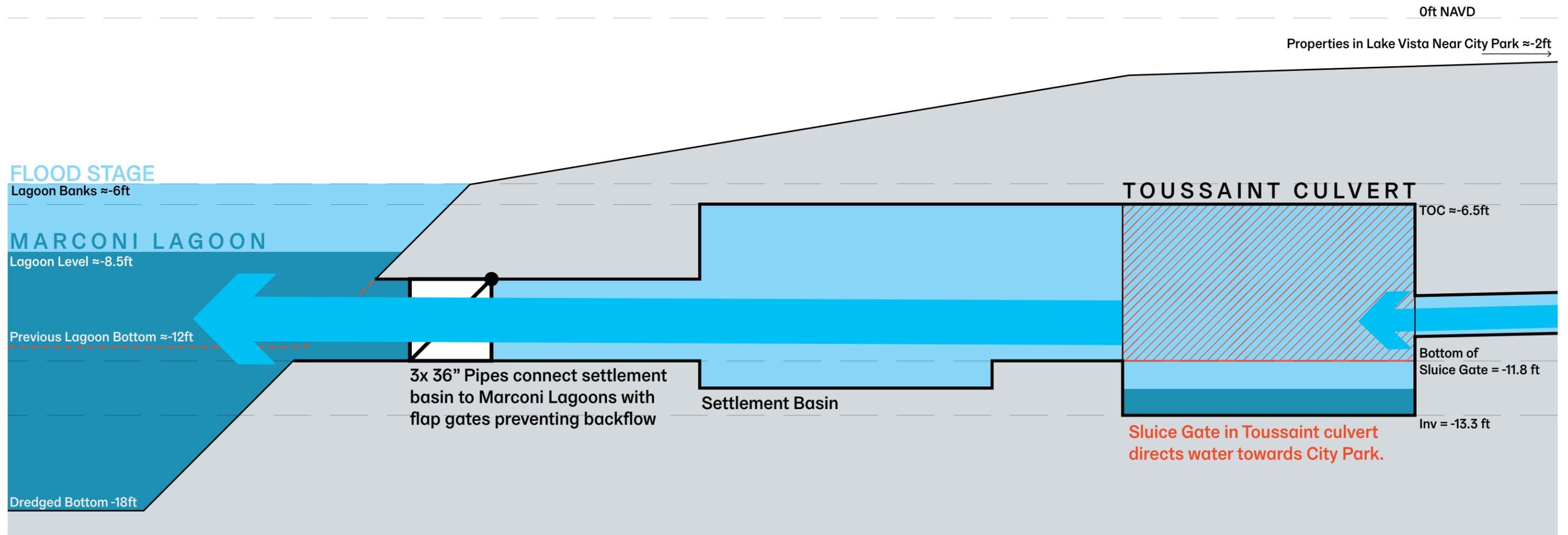
Low weir separates Marconi Lagoon from Toussaint culvert. Weir inside culvert directs flow into a 21" pipe flowing over the siphon.



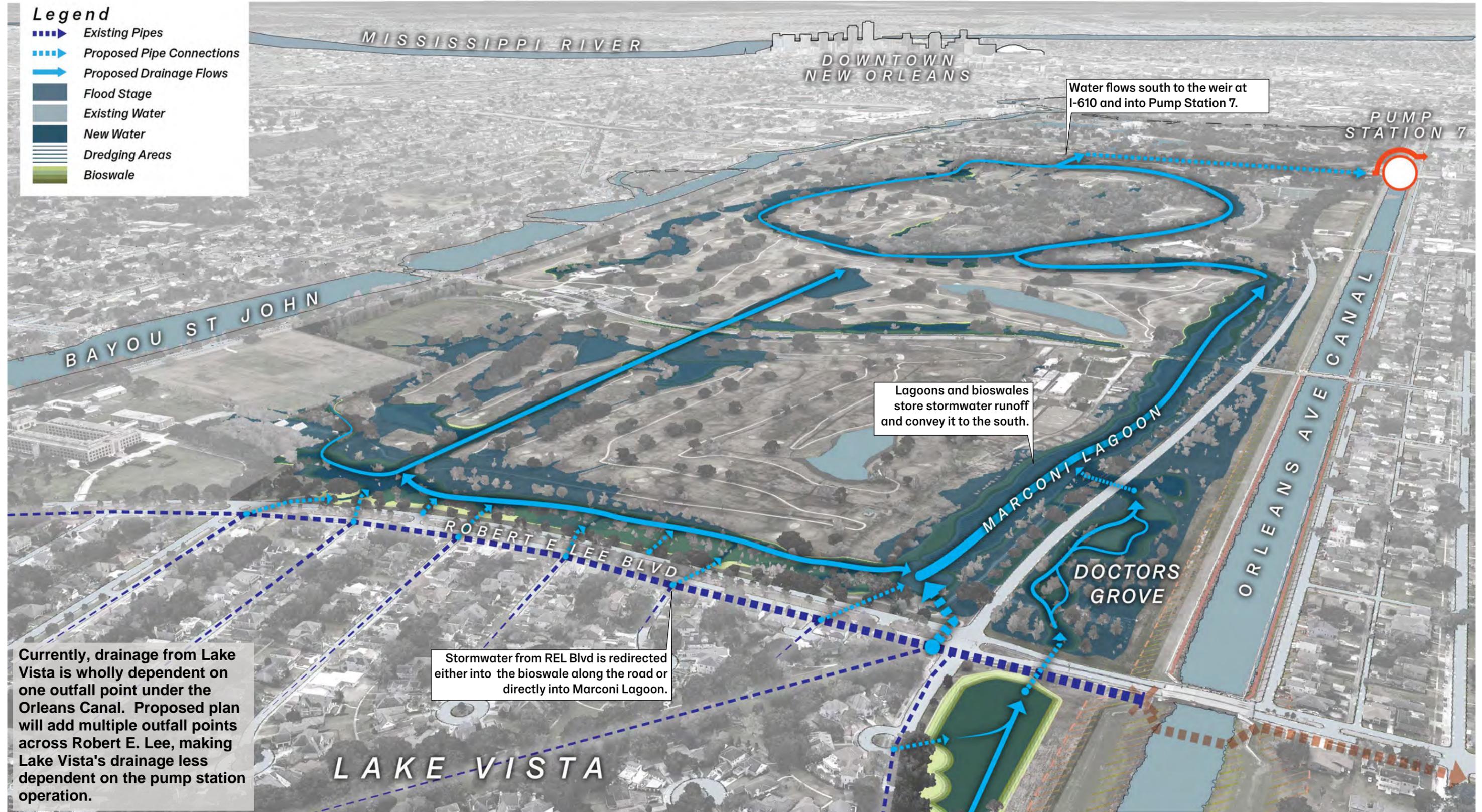
Proposed Connection

Lake Vista to Marconi Lagoon

Sluice Gate inside of Toussaint culvert directs water into a settlement basin and then into Marconi Lagoon via 3 large pipe connections.



City Park Design Strategies: Flood Stage



Next Steps

Ongoing design refinement

Community Engagement

Production of 90% Drawings, Specifications, and Operations and Maintenance Plan