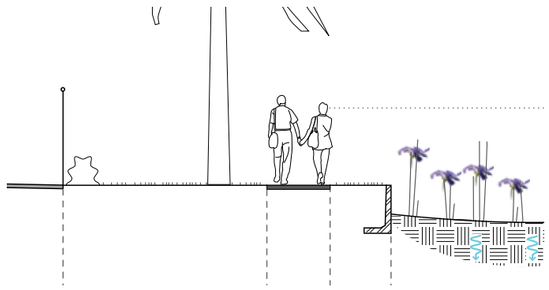
RETROFIT OF IMPERVIOUS LAND

Water Lanes
Parking Fields
(similar design as Elmwood Fields)
Covered Canals
Pump to the River

BALANCING WATER

Elmwood Resilient Retrofit + Pilot

WATER LANES

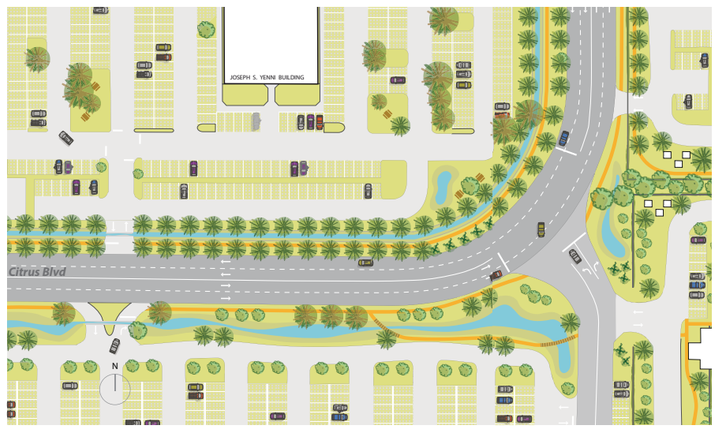


Street Retrofit

STRENGTHENING DRAINAGE

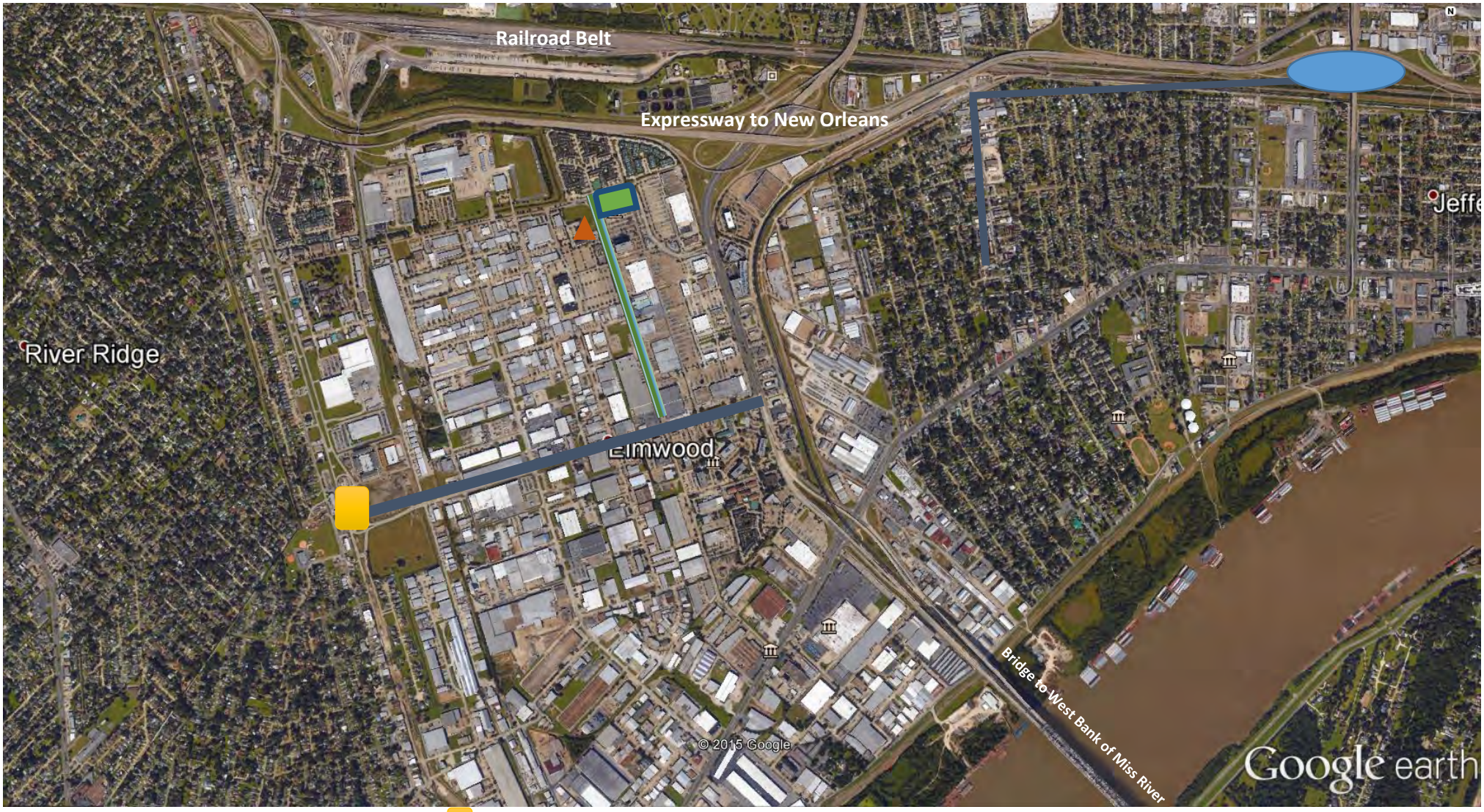
STRENGTHENING SEWER

ELMWOOD FIELDS



Transforming Parking Lots

Balancing Water: Resilient Elmwood



Retrofit Vulnerable Sewer Infrastructure

Retention Pond

Harahan Pump to the River

Parking Fields

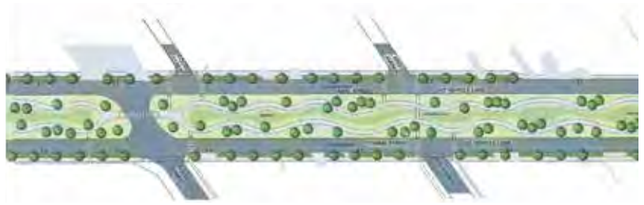
Water Lanes

Retrofit Drainage

BALANCING WATER

Strengthening Infrastructure for a Resilient Fat City

DRAINAGE IMPROVEMENT & CANAL SAFETY



PARKLANDS

SEWER LIFT STATIONS

Lift Station Locations

- Energy saving retrofits for sewer lift stations

- Retrofits will mitigate impacts during a disaster and loss of power

- Resilient sewer technology will monitor lift stations and increase efficiency

PEDESTRIAN & BICYCLE CONNECTIVITY

Esplanade Canal

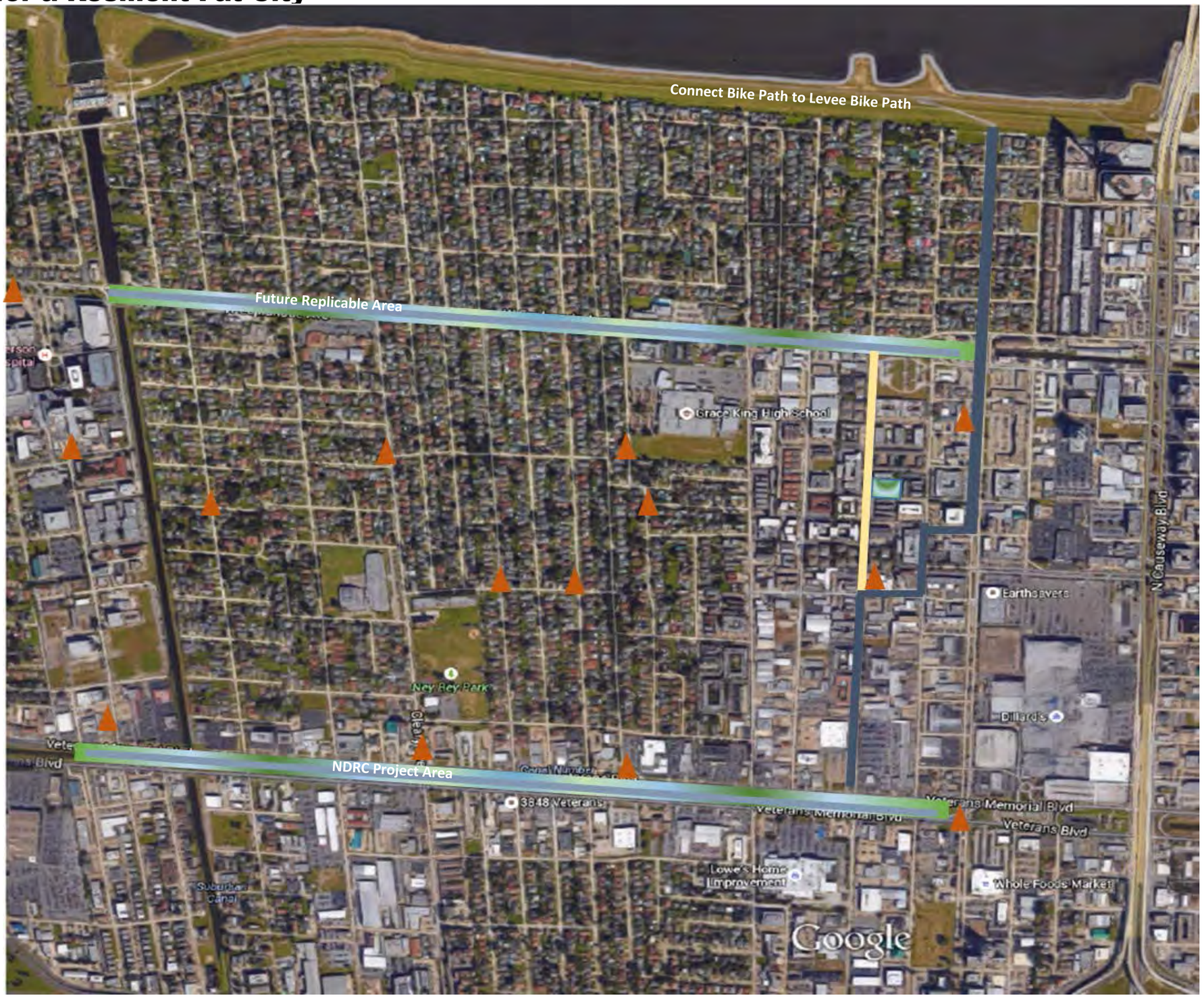
Clearview Pkwy.

Edenborn Drainage

Causeway Blvd.

Veterans Canal

Balancing Water:
Retrofit of Impervious Lands for a Resilient Fat City



Strengthen of Sewer Lift Stations

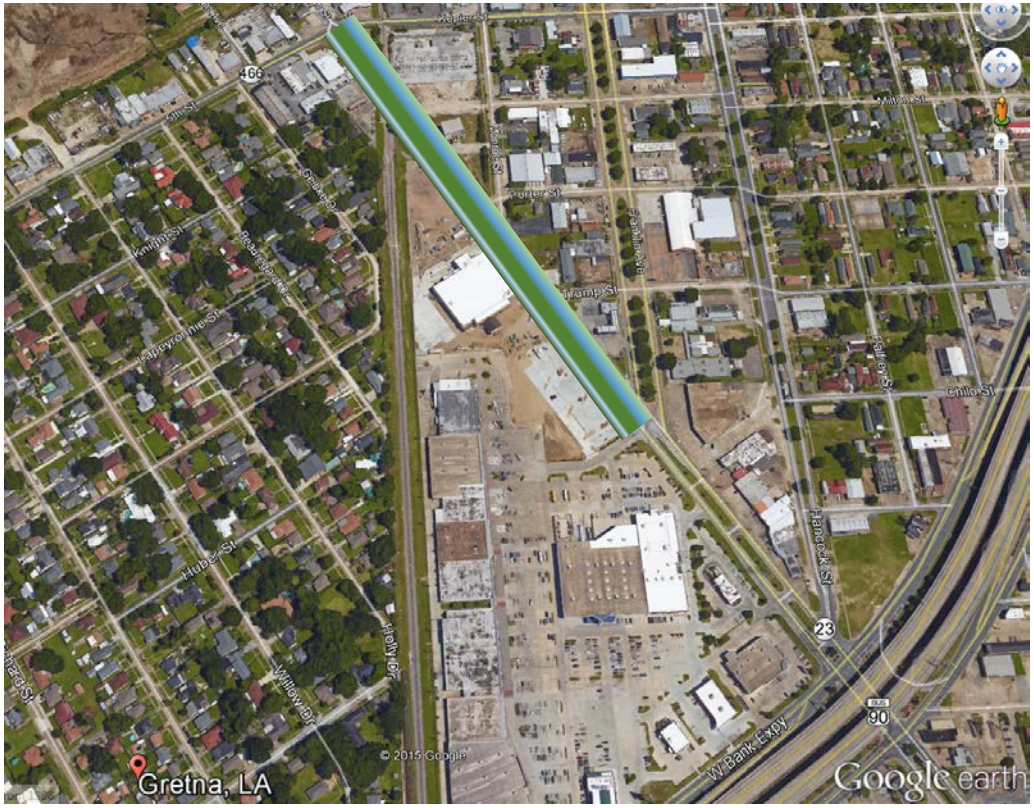
Edenborn Drainage Project

Severen Drainage and Bike Path

Connecting Bike Paths over canals: NDRC funds

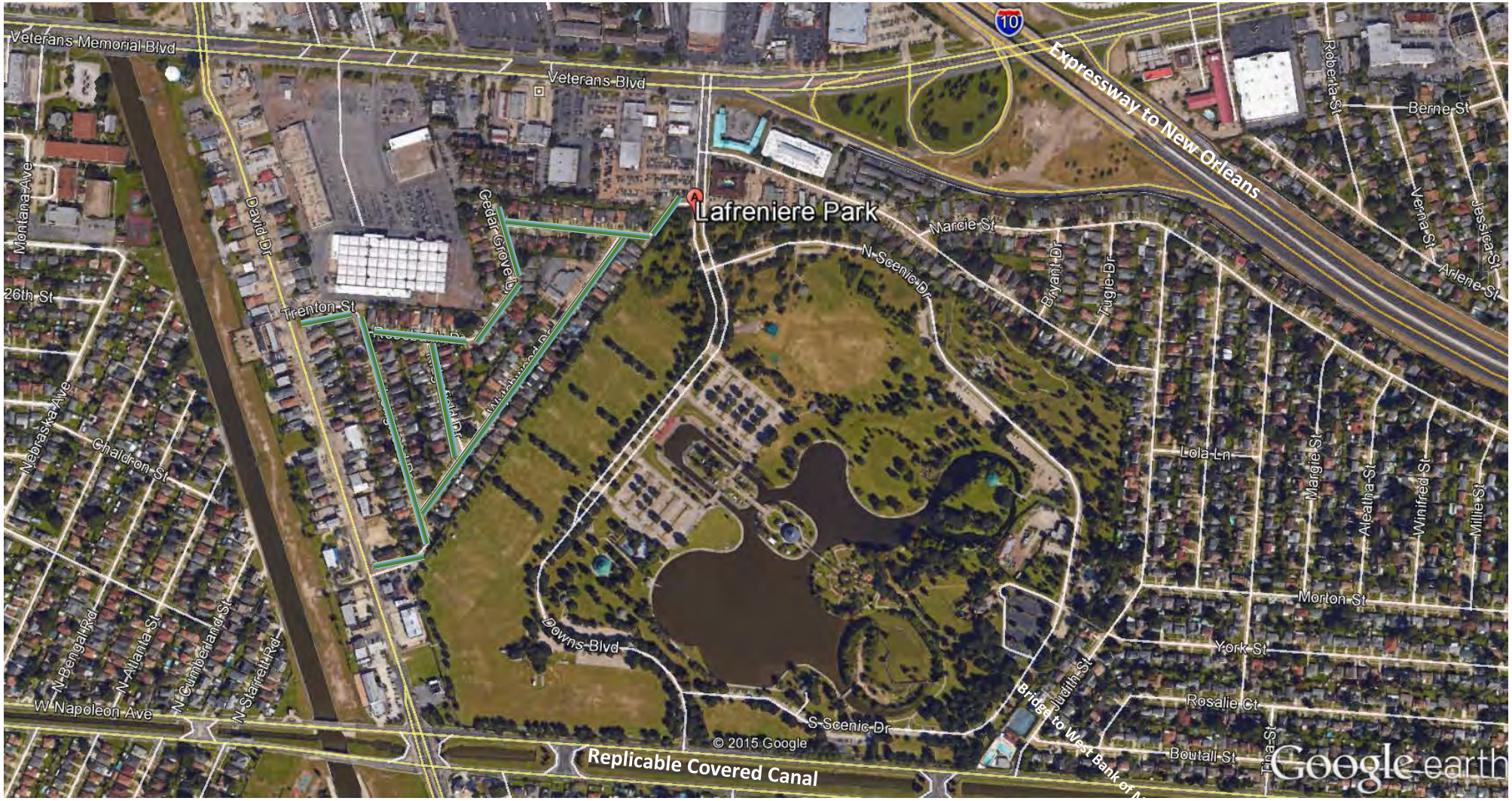
Increase carrying capacity of canals, cover with pervious materials, install bioswales; as needed streets sloped to the canal

Balancing Water: Retrofit of Impervious Lands, Gretna



Canal Retrofits

Balancing Water: Retrofit of Impervious Land, Lafreniere



Water Lanes and Subsurface Drainage

Greater New Orleans
Urban Water Plan

livingwithwater.com

Waggonner & Ball *Architects*

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ELMWOOD FIELDS AND WATER LANES

WATER LANE
YENNI BUILDING PARKING LOT

The Elmwood industrial and commercial areas are some of the most heavily paved areas in Jefferson Parish. Because of the large amount of pavement, the storm water runoff of can cause considerable damage to nearby properties. This also makes the site less attractive for visitors and can even negatively impact sales when visitors can't enter due to flooding.

Three demonstration projects show how the site can be transformed through the implementation of a new water strategy and includes the addition of water lanes, trees, and vegetation. Water lanes are multifunctional. They collect, transport, and encourage the infiltration of water. These areas will give Elmwood a new spatial structure; with live oak trees alongside the streets and irises growing in the waterlanes, nature will once again have a strong presence in what are now typically gray streets.

Infiltration elements added to the parking lots will help reduce the amount of water immediately entering the drainage system and add green spaces to the vast existing expanses of concrete and asphalt. Pervious pavement encourages storage of water underneath the parking lot and additional beautification comes from planting trees along the medians. These measures will increase Elmwood's resiliency and attractiveness.

Introduction

This report expands upon projects introduced in the Elmwood District Report, which describes how and where innovative water management strategies should be employed to improve quality of life and reduce flooding for the district. The goals for Elmwood are to:

- Reduce runoff through retention, which should be done as high on the backslope as possible
- Create new areas for water storage
- Provide a water conveyance system that increases infiltration and reduces flooding
- Create attractive urban fabric for Elmwood

In this report, we take a closer look at three measures:

- a water lane along part of Edwards Avenue
- on-site retention in the parking lot of the Yenni Building
- on-site retention in commercial parking lots on the Upper Slope

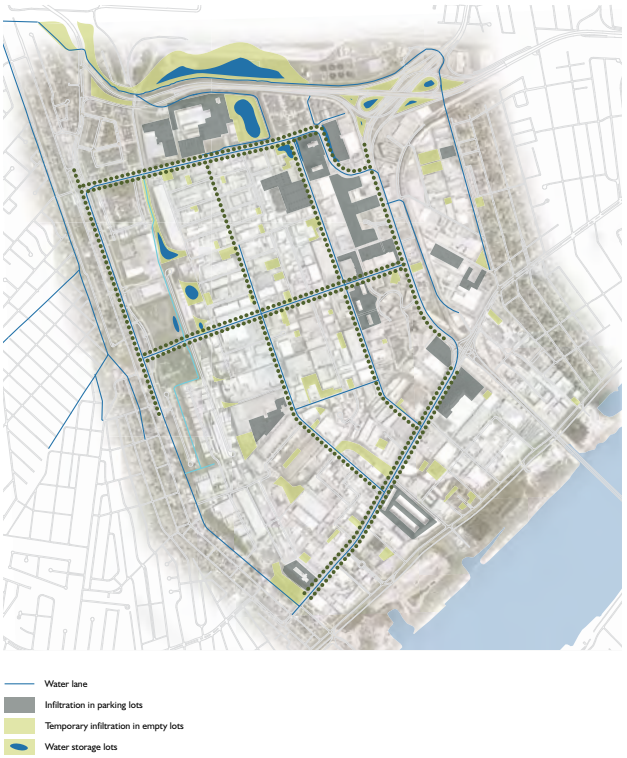
DEMONSTRATION PROJECTS OBJECTIVES

A. Water and Soil Objectives

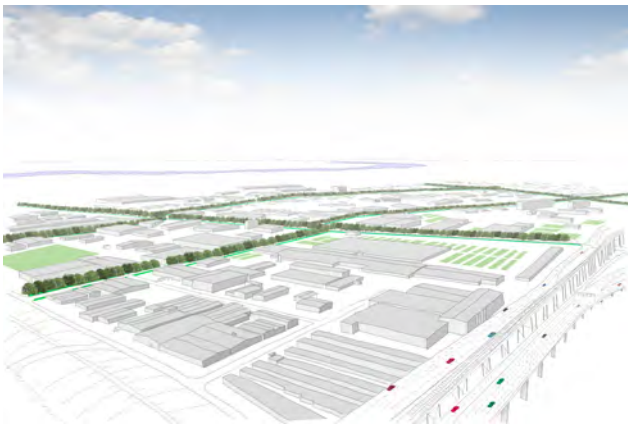
- Increase on-site stormwater storage capacity
- Reduce stormwater volumes that burden systems downstream with features for detaining and retaining runoff from buildings and large parking areas, expecially for large institutional and commercial areas
- Improve quality of water that leaves each site
- Infiltrate and evapotranspire water, especially in upslope areas with sandy soils

B. Design Objectives

- Reduce large areas of underutilized impervious parking areas to improve aesthetics of these areas and their associated entrances
- Develop ‘water lanes’ for existing roadways that retain, infiltrate, and convey water, and improve the district’s air and water quality
- Improve major commercial corridors along Jefferson Highway, and in the Citrus and Clearview Parkway area
- Improve environmental qualities of the area by introducing vegetation and open spaces for occupants of adjacent buildings; improve walkability by providing linkages between businesses and neighboring residences



Elmwood District, existing



Elmwood District, proposed

EDWARDS AVENUE WATER LANE

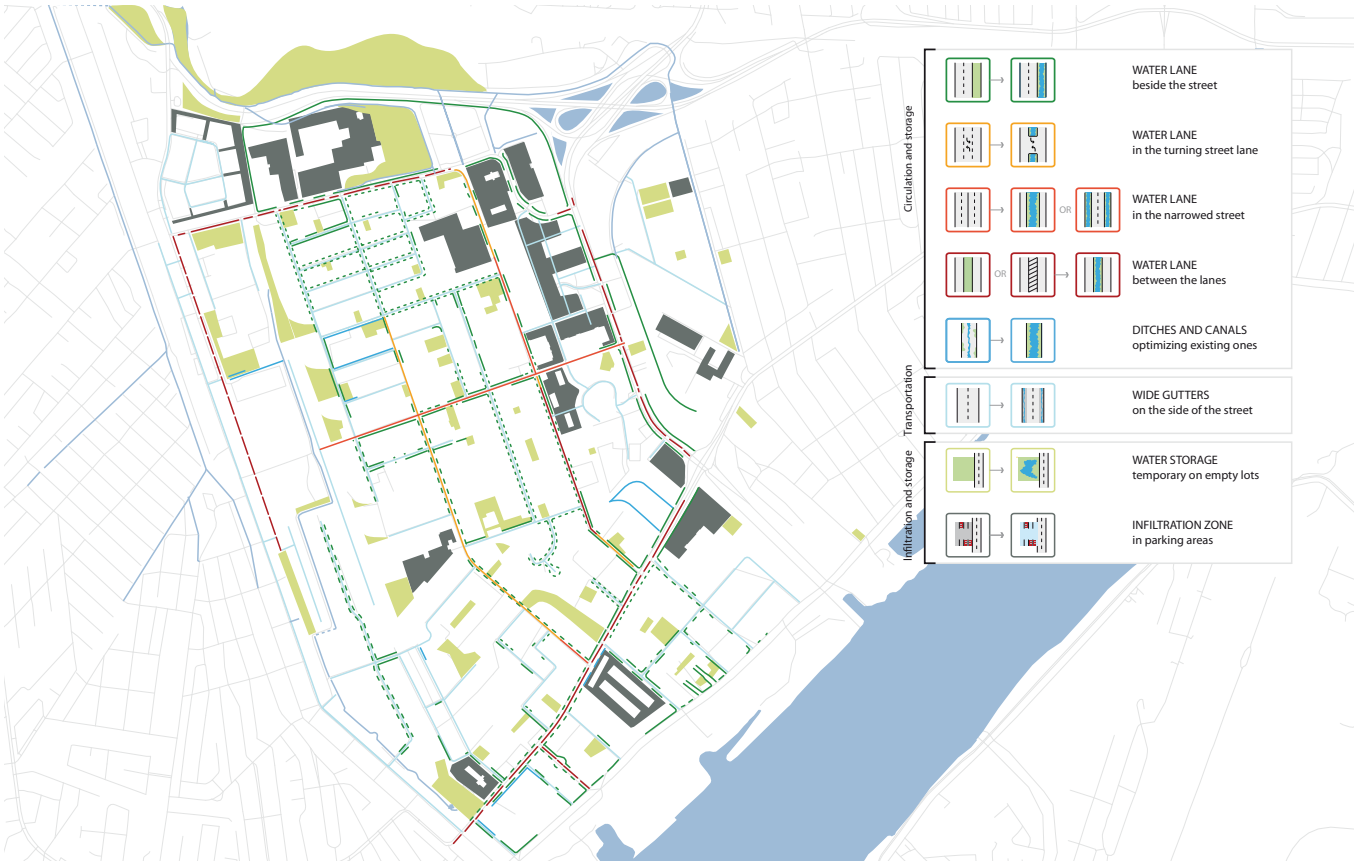
YENNI BUILDING PARKING LOT

1. Water Lanes

A. INTRODUCTION

The water lanes are part of a new spatial structure of Elmwood. Besides the function of the waterway, areas of water storage and infiltration, the water lanes will help define a new identity for Elmwood. The water lanes accentuate the main streets, especially since these measures include planting lines of trees along these lanes, making the streets more appealing. Since the water lanes rely on gravity to move water, these features would be specific to Elmwood, but can be used in other backslope areas with a gradual changes in elevation.

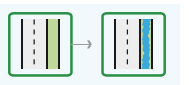
Location of water lanes



Location of water lanes

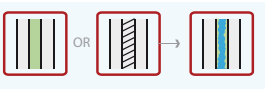
B. 3 TYPES OF WATER LANES

WATER LANE
besides the street



If the right of way is wide enough, introducing a water lane beside a street is possible. In many places, it is possible to make water lanes that are as wide as 10 feet, sometimes even 20 feet.

WATER LANE
between the lanes



Water lanes that replace portions of turning lanes can be built where turning lanes are unnecessarily long. Water lanes should be designed where turning lanes are at least 500 feet long. Breaks in the water lanes should be maintained to allowcars and trucks to turn.

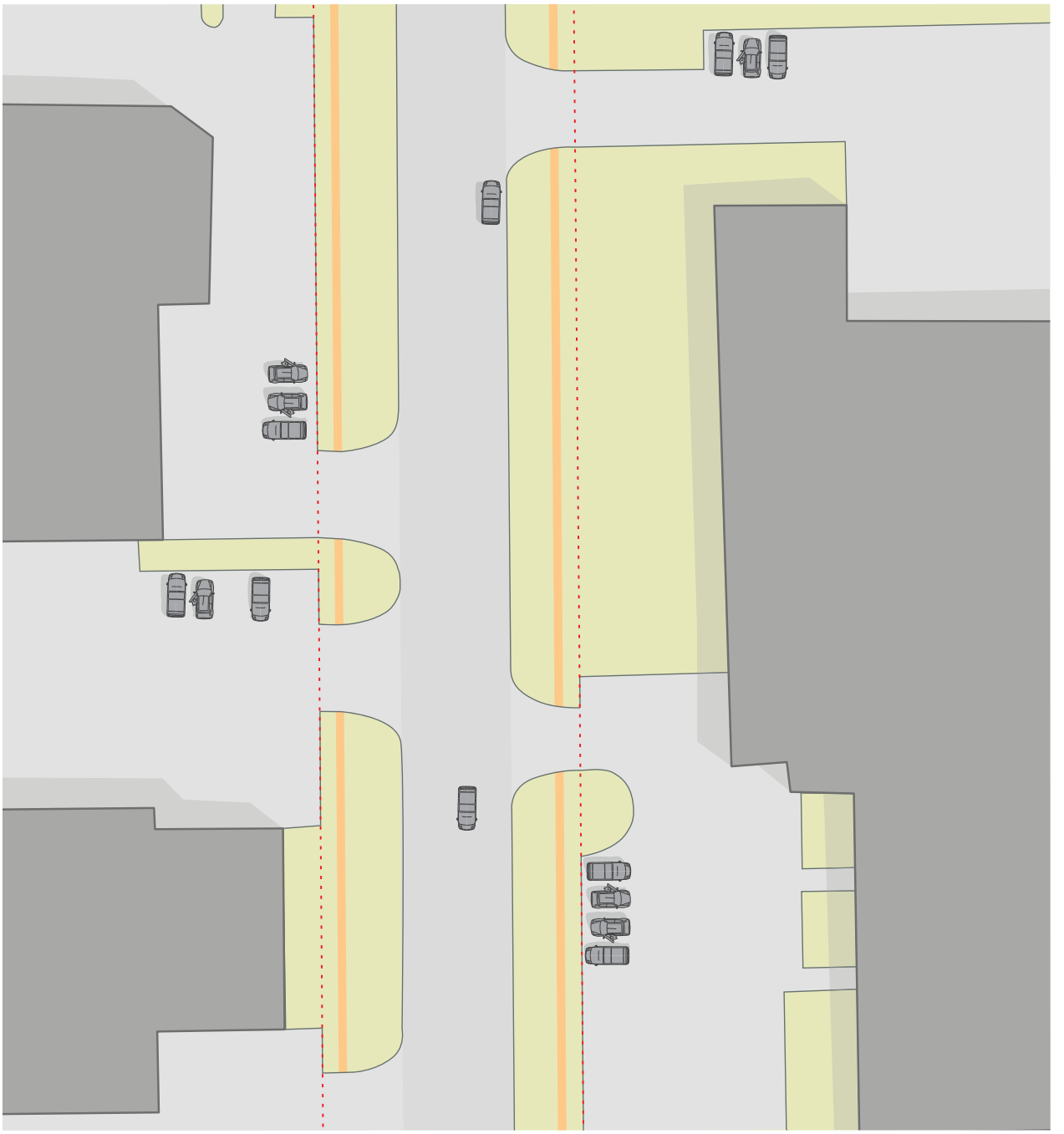
Occasionally, there are former railroad rights-of-way alongside the roads. These are good opportunities for introducing additional water lanes.

Present situation

Proposed situation: A road lined with live oaks with a parallel water lane with irises within the turning lane and alongside the sidewalks


Ryder

C. DESIGNING WATER LANES: Edwards Avenue

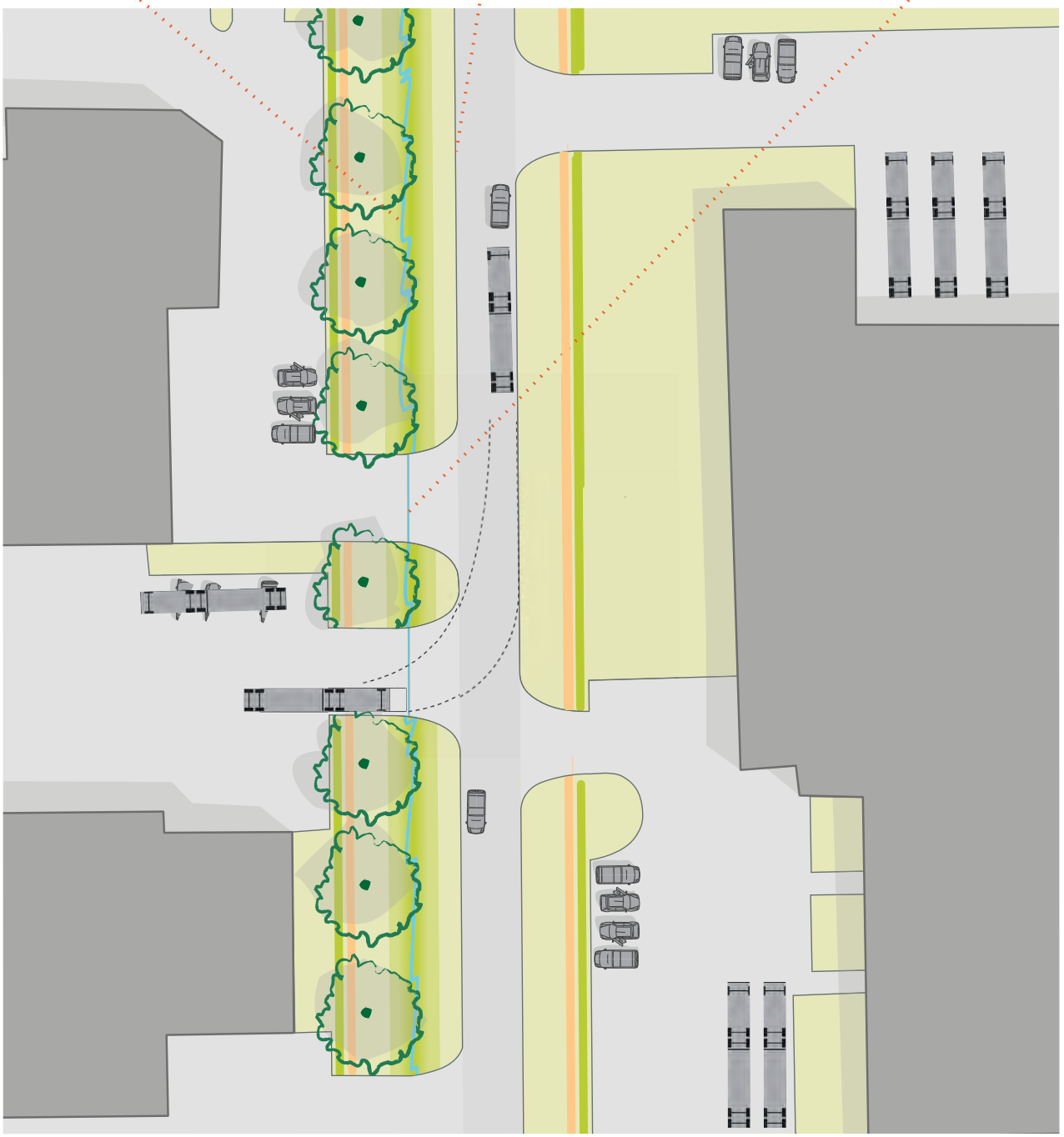


Current Situation: Edwards Avenue between Mounes Street and Pepsi Street

road view

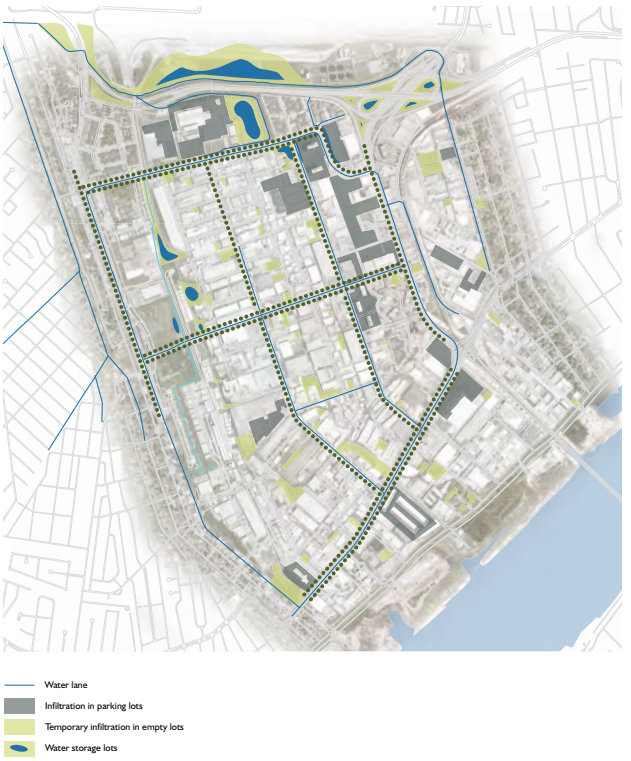
curb cut

hidden gutter in roadway

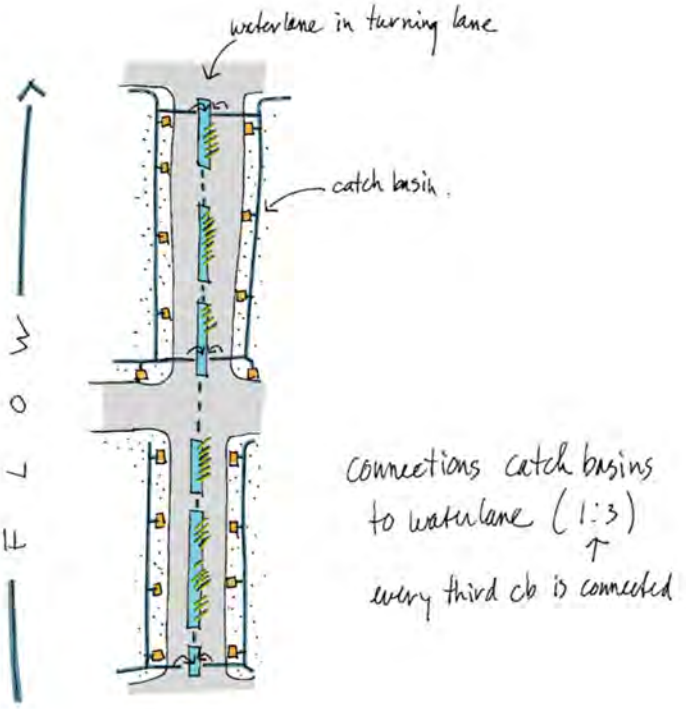


Water Lane Design: Edwards Avenue between Mounes Street and Pepsi Street

D. WATER LANE APPLICATION



District Plan: Elmwood Water Lanes

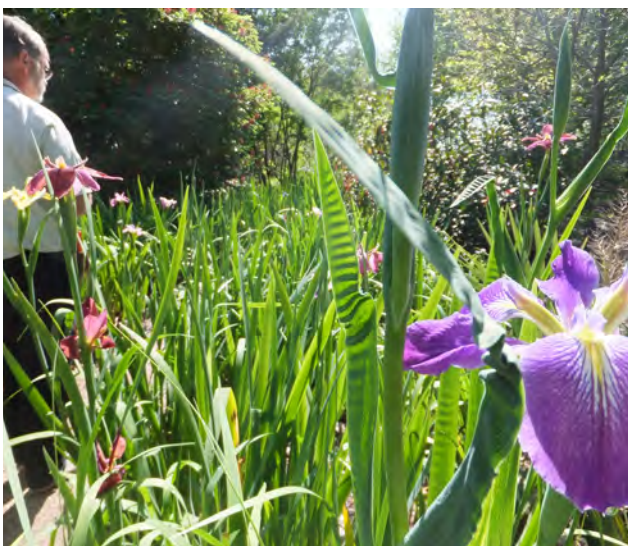


To transport the water needed for the water lanes it is necessary to connect the water lanes with the existing drainage system. Approximately every third catch basin would have a subsurface connection with a water lane.

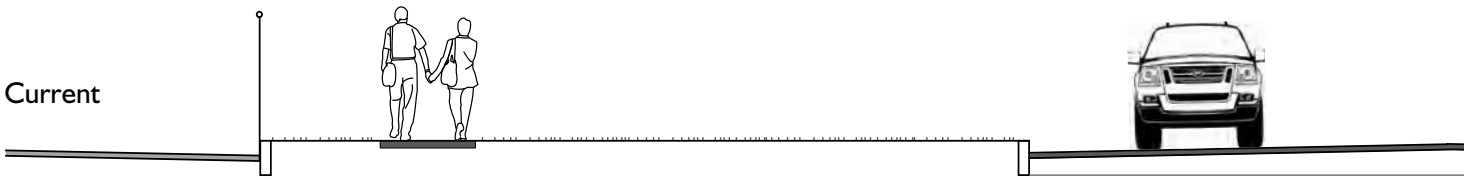
Proposed Water Lane Perspective

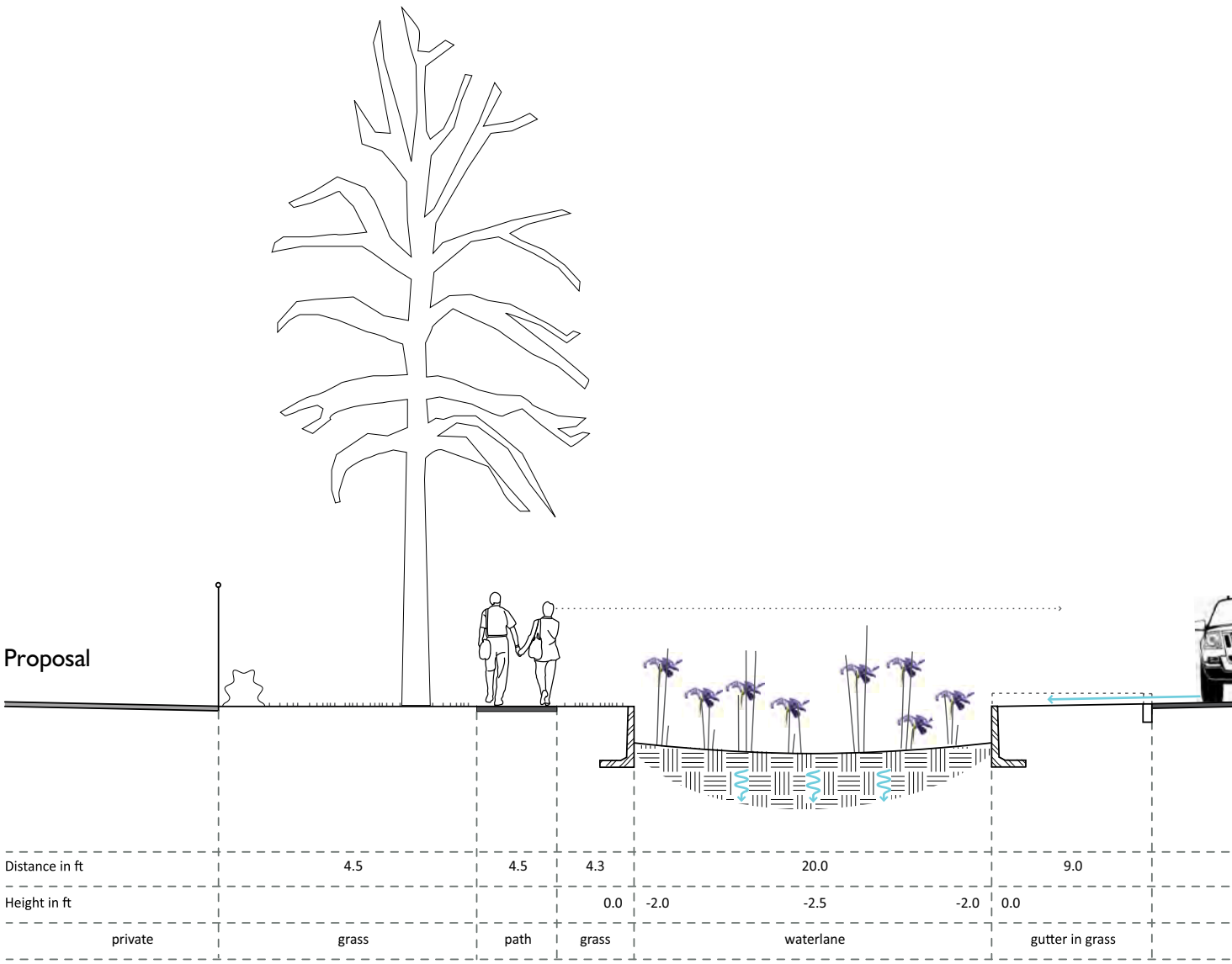
The water lane is the main component for making attractive green street profiles. Private lots are still fullly accessible through wide entrances. New vegetation does not have to stop at the edge of the right of way. Green rooftops, additional trees, and pervious paving can contribute to a new identity for Elmwood.

E. REFERENCES AND INSPIRATION

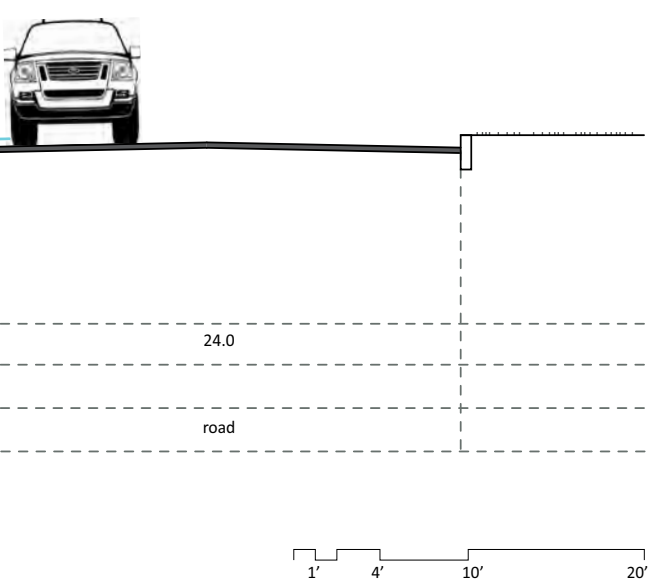


F. DESIGN DETAILS



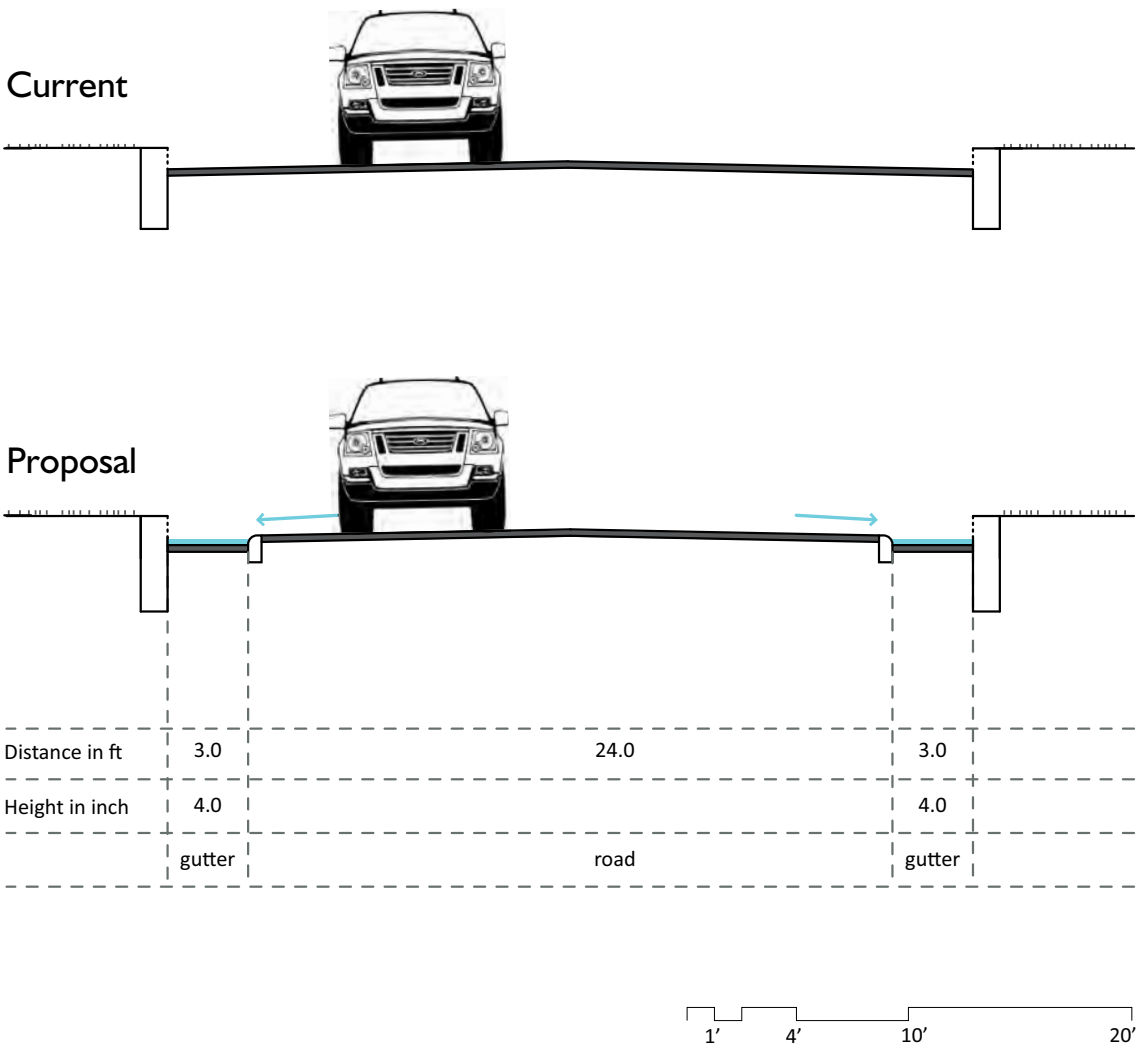


Edwards Avenue has a wide right of way. The road has two driving lanes, with a turning lane in the middle and a wide swath of grass on one side. A ditch previously ran parallel to the avenue.



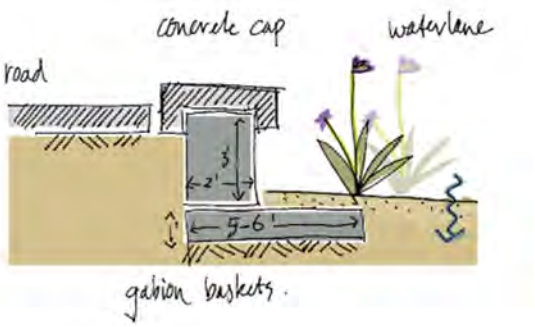
The water lane will be constructed beside the street in order to create the new street profile. However, the two infrastructures require a little breathing room: they should be far enough apart to make entrances into businesWses and pedestrian circulation clear. At the non-street side of the water lane there will be a tree-lined walking path.

The profile will need to be wide enough to allow a 20-foot-wide water lane. The water lane will be built so that it is about two feet lower than edge. Low railings will be placed along the edge of water lanes in areas to protect pedestrians from passing cars.

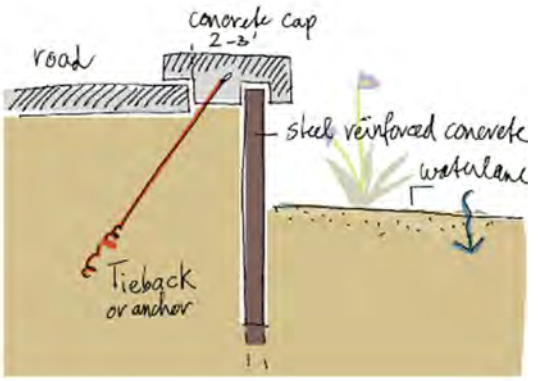


Gutter in the street profile
Narrow streets often do not have enough space for the construction of water lanes or other storage measures. In these instances it is very important to move the water to the nearest area with enough space. For these instances, a wide but shallow gutter is introduced. Cars can drive over or park in the gutter.

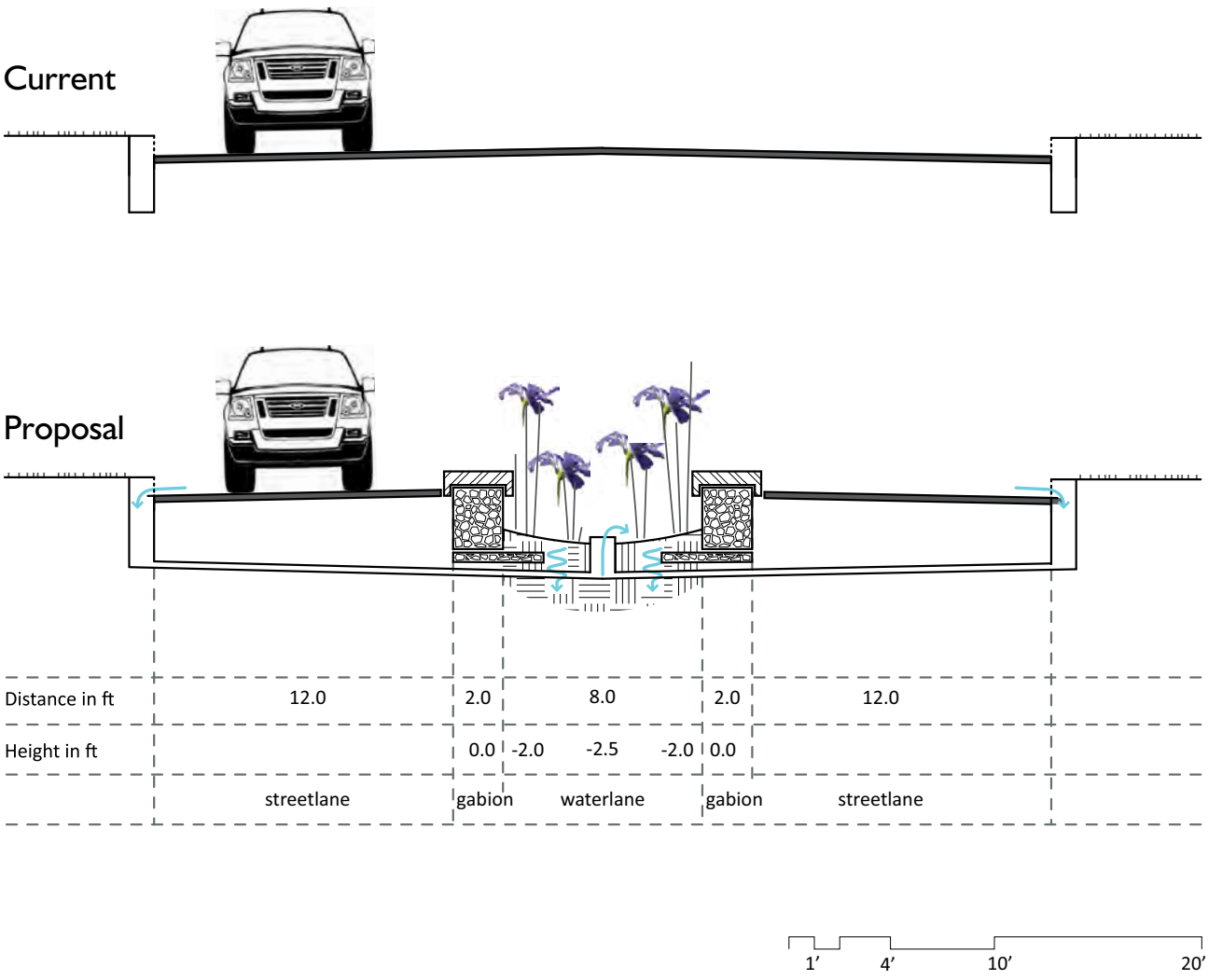
There are two options to construct the edge of a water lane:



Gabion baskets with a concrete cap. Attention is needed to place the cape in longitudinal direction in a straight line.



A tieback prevents the sheet to fall over.



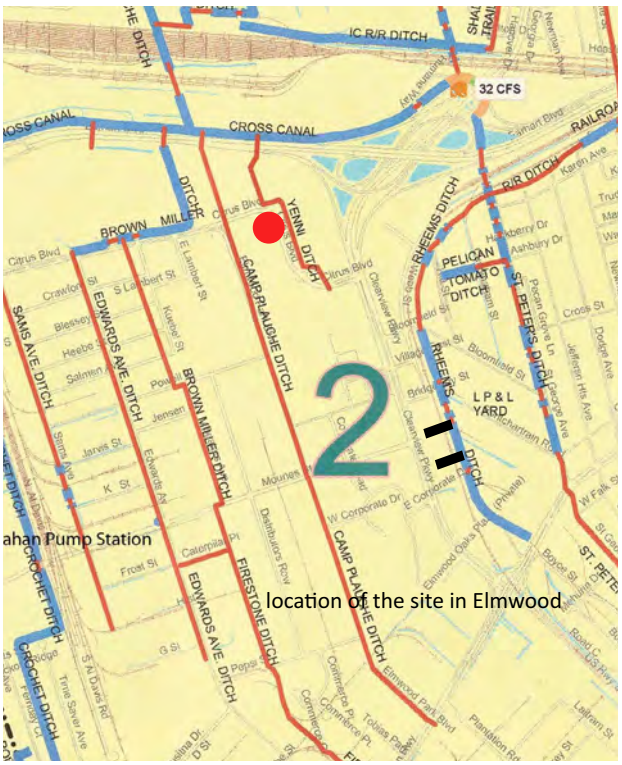
Water lane in a turning street lane
In wide streets, water lanes can be added to the middle of the street. Runoff from the street flows to the gutters and via subsurface catchment basins and pipes to the water lane. That makes this solution cheaper than rebuilding the entire street.

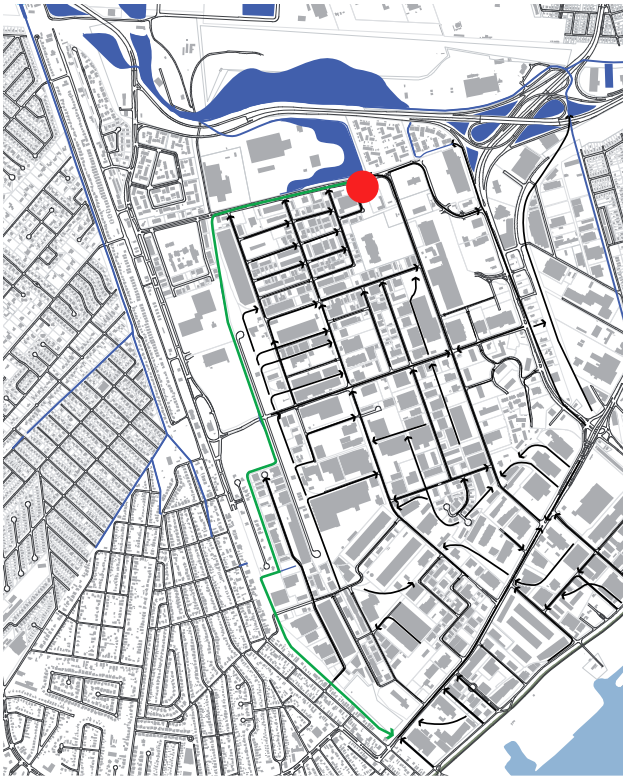
2 Yenni Building Parking Lot

A. INTRODUCTION

The Yenni Building houses the Department of Public Works for Jefferson Parish and is situated at one of the lowest points in Elmwood. Considering these factors, it is important to have a strong water management proposal for this site. This project can serve as an example for the entire parish and highlight the benefits of living, shopping, and working in Elmwood.

The residential area of Palmetto Creek is just to the north of the Yenni Building.



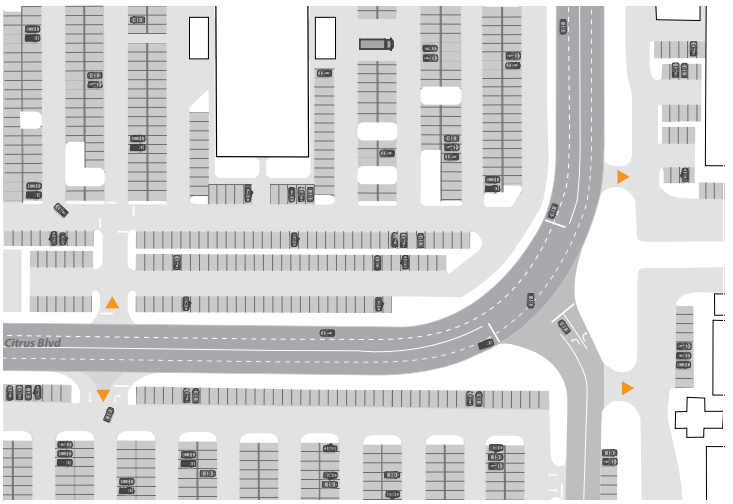


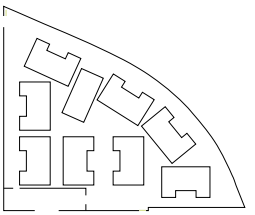
FLOW DIRECTION

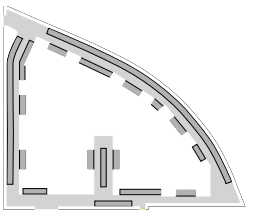
Elmwood New Orleans

The red dot indicates Yenni building and parking lot

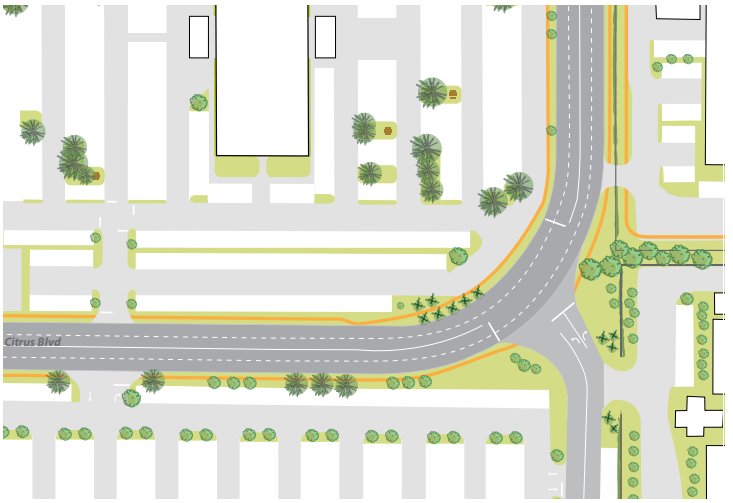
Current situation: parking area of Joseph S. Yenni building



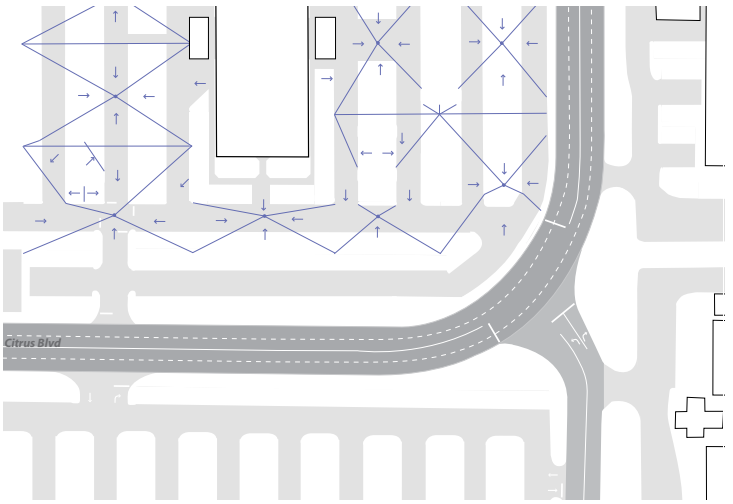




Existing condition - PARKING PLACES



Existing Condition - GREEN AND PEDESTRIAN ROUTES



Existing Condition - WATER

Eagle's eye view of the existing condition of the parking area Joseph S. Yenni building

Current situation: parking area of Joseph S. Yenni building
Large historical cypress trees reference the time when this area was a swamp. However, currently, the once protective forest has been removed and replaced with a parking lot.

B. STRATEGY

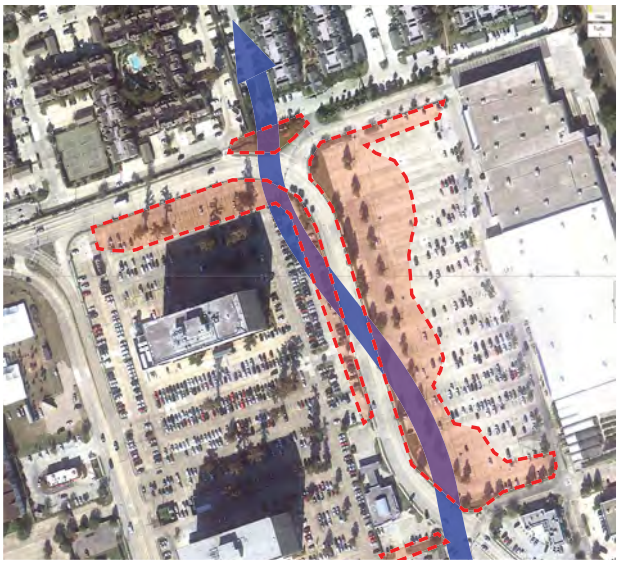
Spatial design objectives for the Elmwood Demonstration Project

There are several possible concepts for the site:

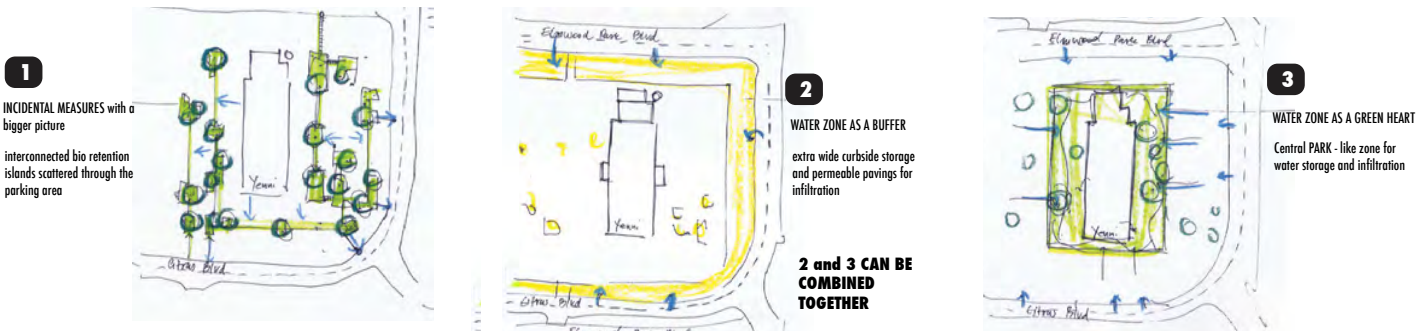
1. Connected Incidents
Several spots are connected by aboveground and underground waterways. Flexible, abundant parking is possible with connected waterways.

2. Water zone as a buffer
Situate a water buffer between the parking lot and the public street. This can be a small park or an underground infiltration zone. Optimize different functions and keep spaces large.

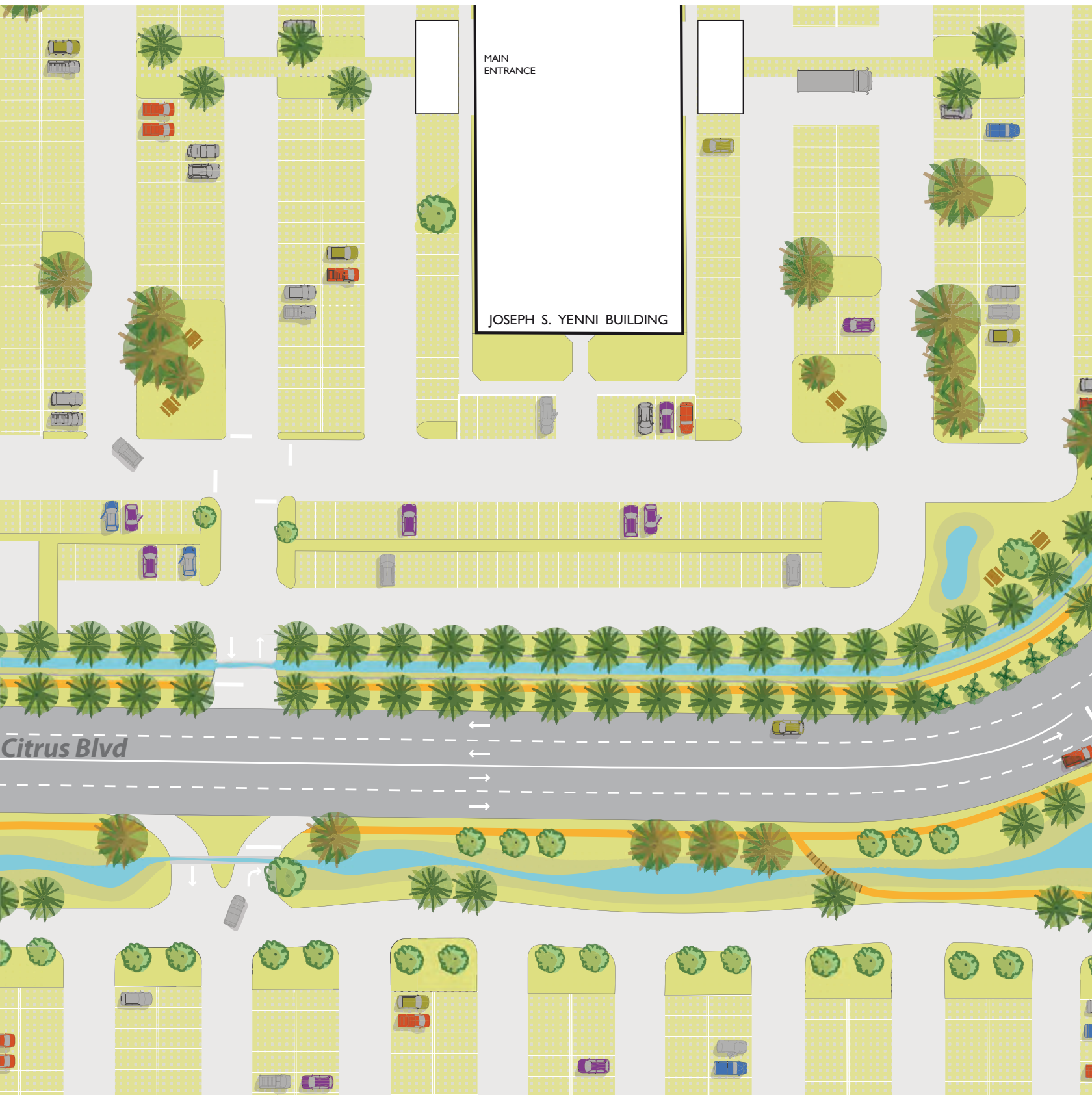
3. Building a new park
Build a green space and water storage area close to the building. Create a beautiful, shaded entry and recreational area for employees and visitors. Reducing the amount of cars near the entry will increase the aesthetics.



Technical Point of View
It is particularly inconvenient when the Citrus Boulevard area floods. Capturing this excess water near the road is an important step.



Options for the Joseph S. Yenni Building



Elmwood Fields and Water Lanes

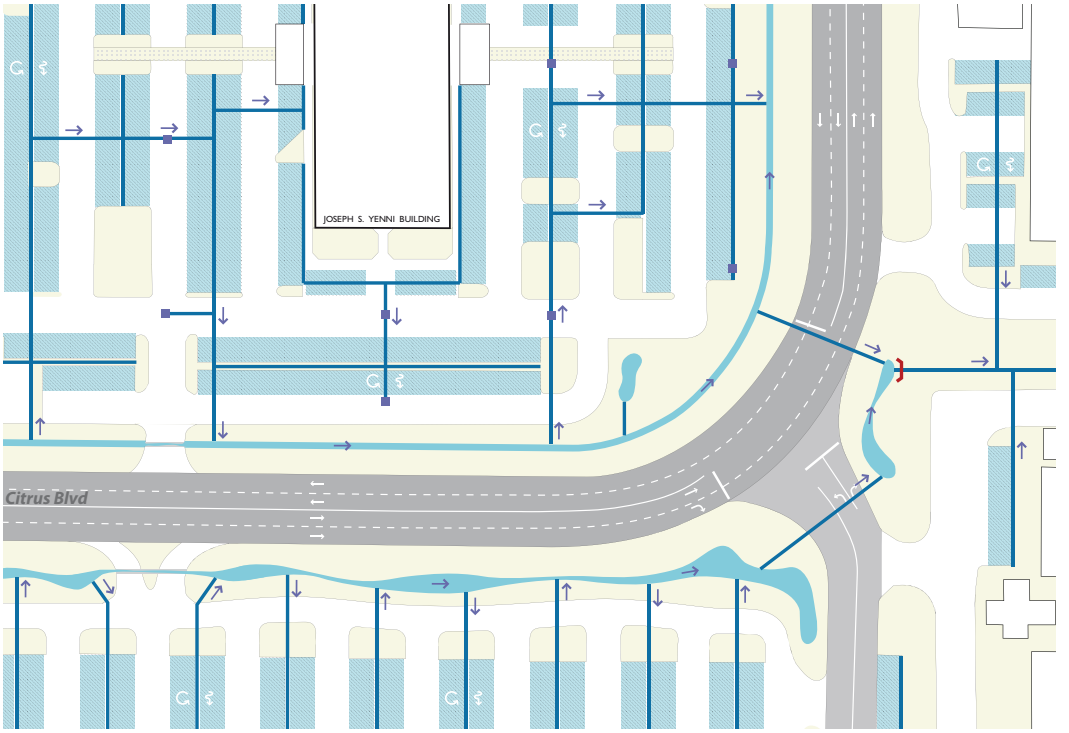
Storage along Citrus Boulevard is more effective and therefore a priority. The design has two sides. A water lane will be constructed on one side of the Yenni Building, one row of parking stalls will be removed, and two lines of trees with cypresses planted. The rows of cypress will gives grandeur and identity to the site.

Additional park zones should be designed on the other side of Citrus Boulevard. These can be turn into a walking or jogging path that links the residential areas to the shopping malls. The residential areas of Palmetto Creek will be more park-like by introducing a one-way road. This makes it possible to reduce the width of the road and plant more trees.

LEGEND

- tree lined water lane
- water lane in park zone
- pervious parking spaces
- gutter across the street
- excisting tree
- new tree
- small pedestrian bridge
- path
- grass
- picnic site
- building

D. DESIGN DETAILS



LEGEND

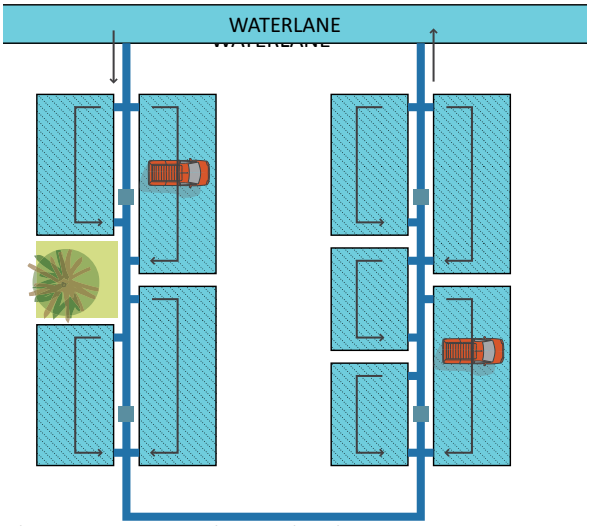
- water lane
- pervious parking places
- drainage pipe
- catchment basin
- gutter across the street
- grass
- building
- weir

WATER DRAINAGE SYSTEM

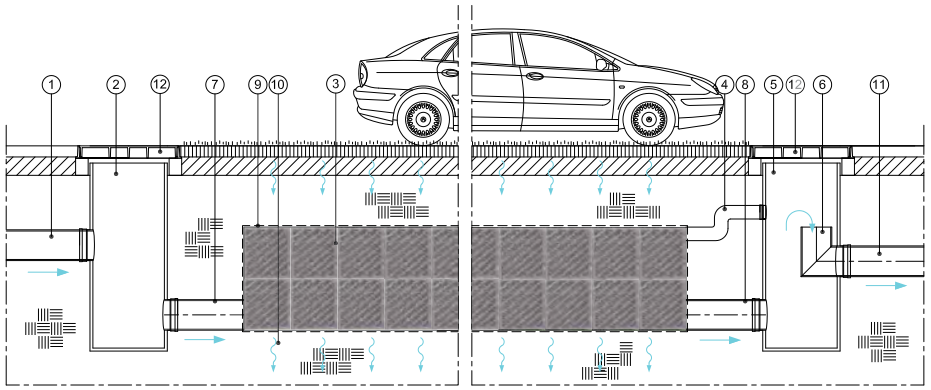
A drainage and storage system is introduced underneath the parking lot. It is made out of storage chambers filled with gravel. During rainy periods, water can be stored in these chambers. Depending on the type of soil and the height of the groundwater table, water within the boxes will infiltrate back into the ground or will be stored temporarily.

Storage chambers are connected to the water lanes. Water can flow between water lanes and storage chambers. This will optimize the overall capacity. Previously problematic areas will benefit from the introduction of these storage chambers, which can be implemented in other areas.

The target is to store one foot of water across the whole parking lot. The storage chambers cover approximately 50 percent of the parking lot. If optimized, full storage chambers allow the entire area of the parking lot to store two feet of water.

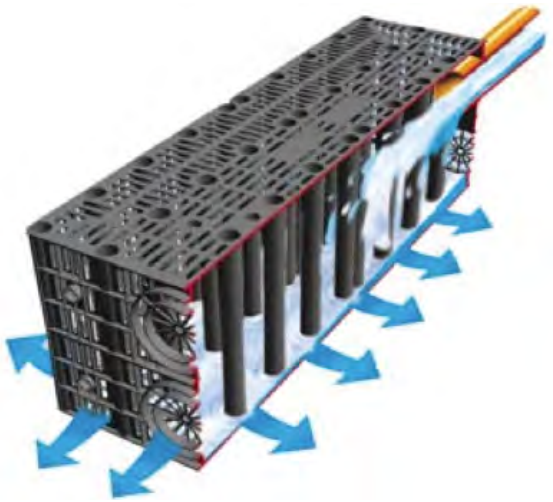


Circulation system water lane and parking



1 Supply rainwater
2 Catchment basin
3 Storage and infiltration box
4 Ventilation
5 Catchment basin
6 Overflow
7 Incoming rainwater connection
8 Drain rainwater
9 Pervious textile
10 Infiltration
11 Overflow pipe
12 Lid catchment basin

Technical drawing: Infiltration and storage in parking space



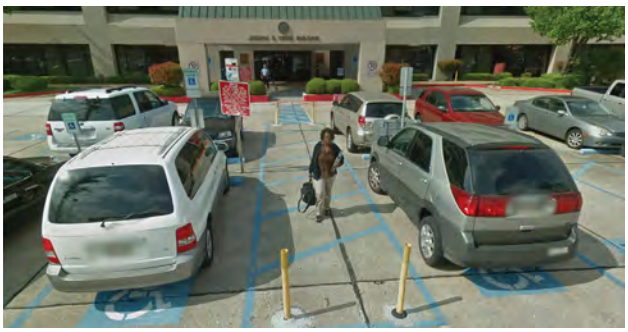
Infiltration and Storage Boxes

Infiltration Pipe

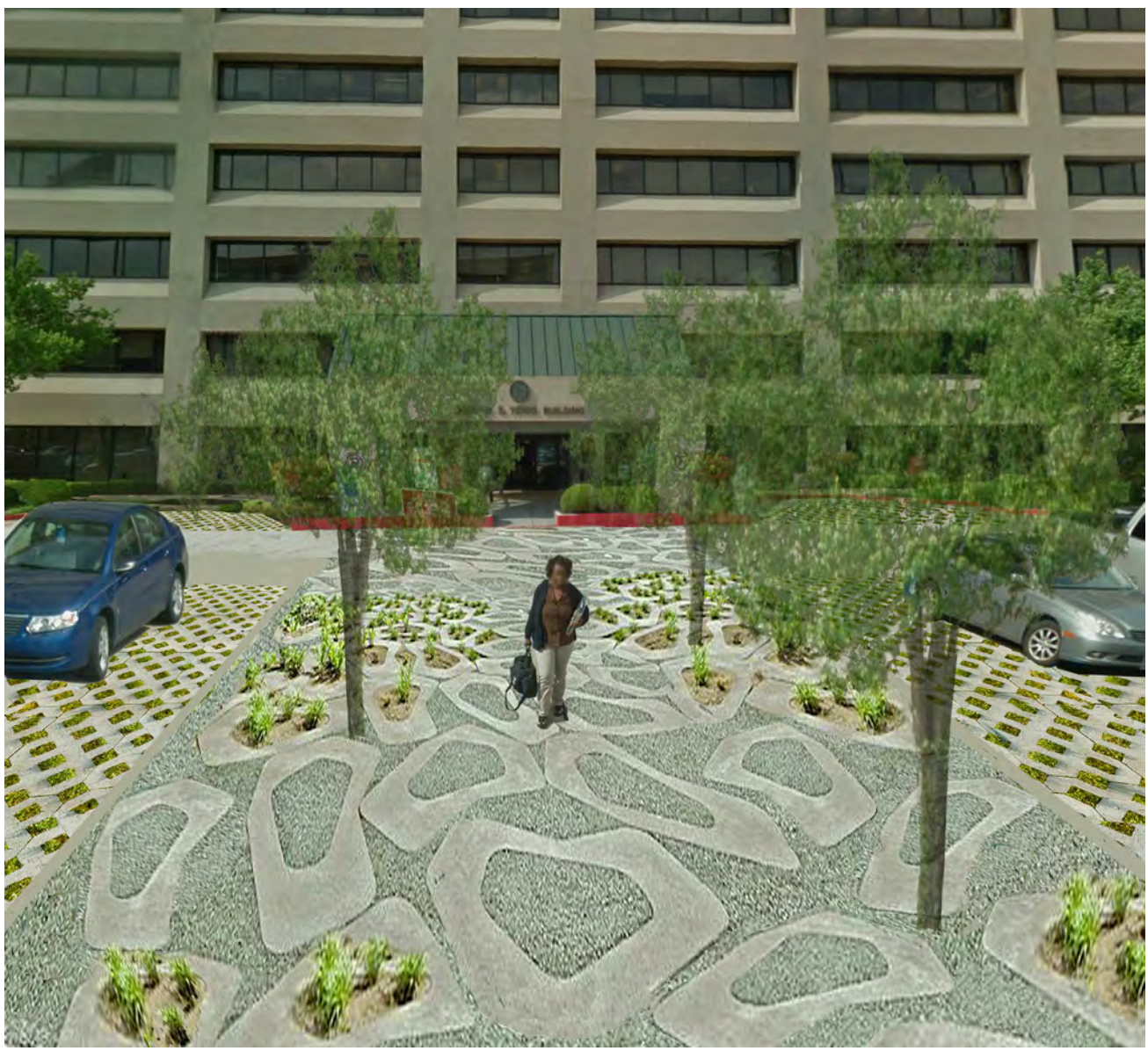
Infiltration Pipe with Pervious Textile

Main Entrance: Joseph S. Yenni Building

The main entrance will be redesigned in addition to the installation of the storage chambers in the parking lot. The small sidewalk can also be widened. Pervious concrete will be laid out to bring people from the parking lot to the entrance.



Existing Entryway



Entryway Proposal

E. REFERENCES AND INSPIRATIONS

Covered Canals

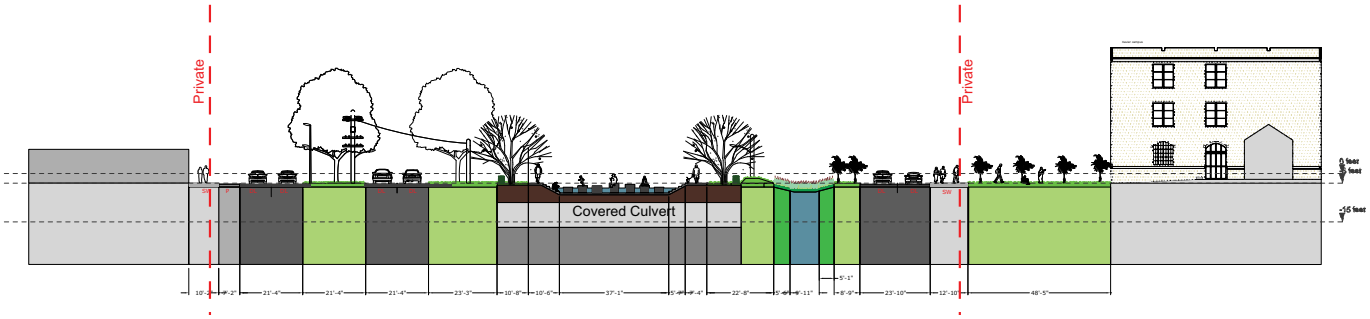
Existing Canal, Dry Weather

Existing Canal, Wet Weather

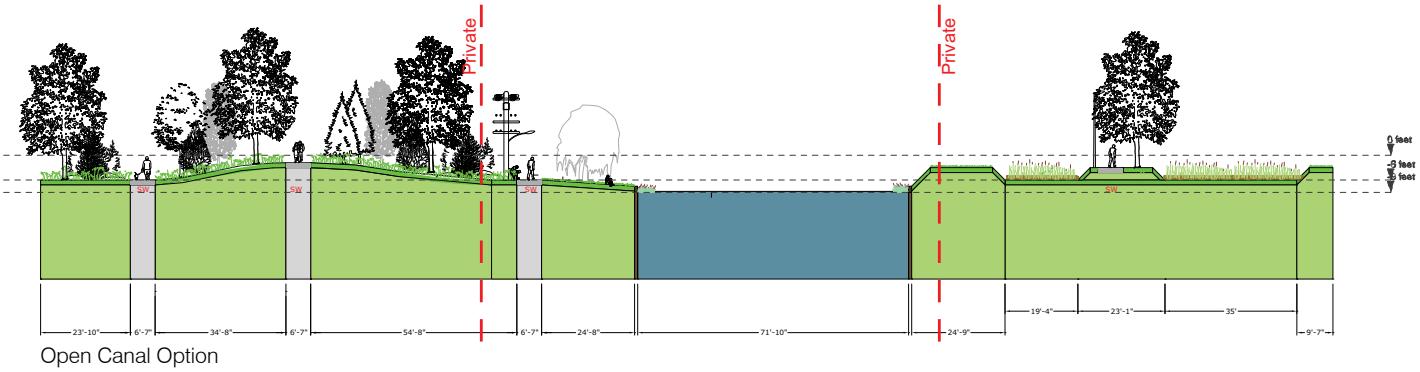
Canals are one of the most visible elements of water infrastructure in Greater New Orleans but serves as a barrier rather than a place for public life.

This opportunity reflects the interconnected nature of watersheds and water systems. Slowing runoff from the backslope, with water management elements on interceptor streets, is one of the necessary improvements that makes the transformation from a concrete ditch into a beautiful waterway possible.

One design solution is to create a new landscaped surface that covers a box culvert in place of the existing Canal. This solution provides a recreational space for nearby residents. The Canal can then become a beautiful open waterway and public amenity in the heart of the city.



Covered Canal Option

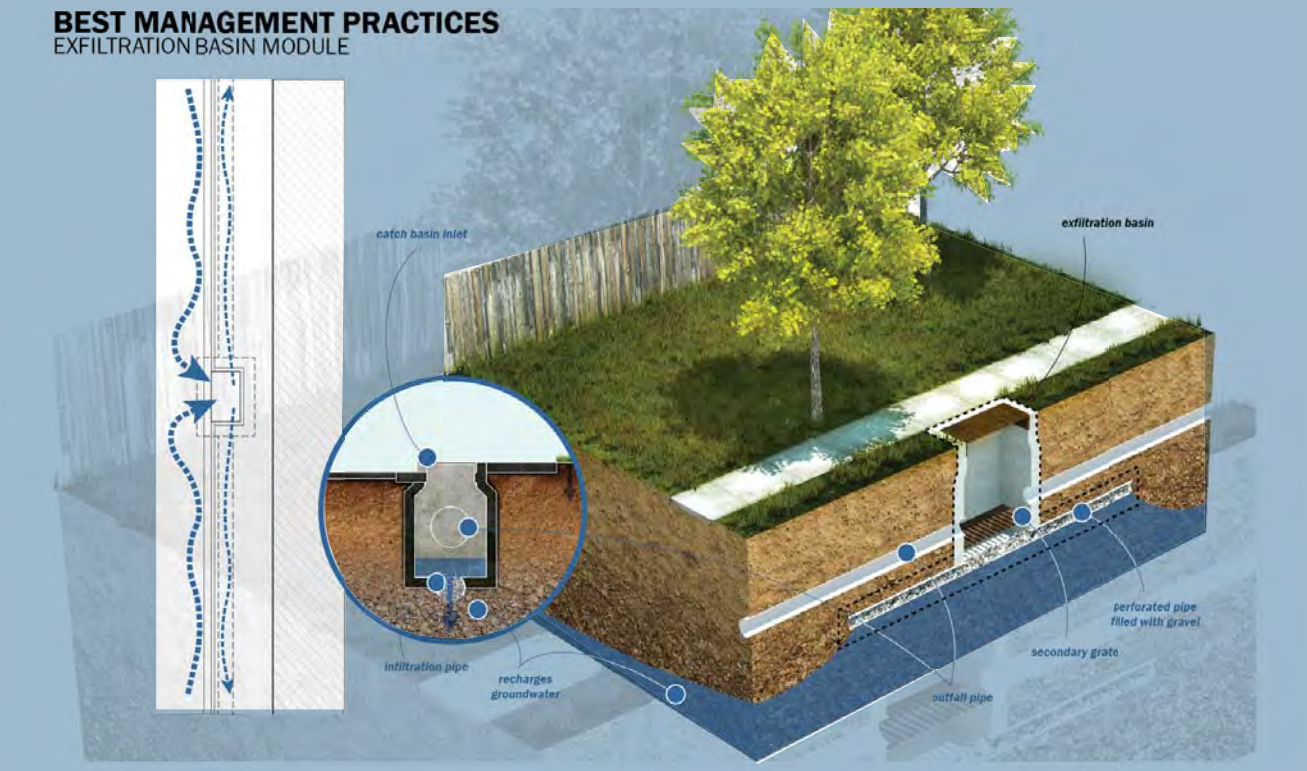


Open Canal Option

Existing: Canal

Covered Canal Option

Open Canal Option



Exfiltration Catch Basin

Design for an innovative catch basin that directs stormwater into the ground with an open bottom and perforated pipe.

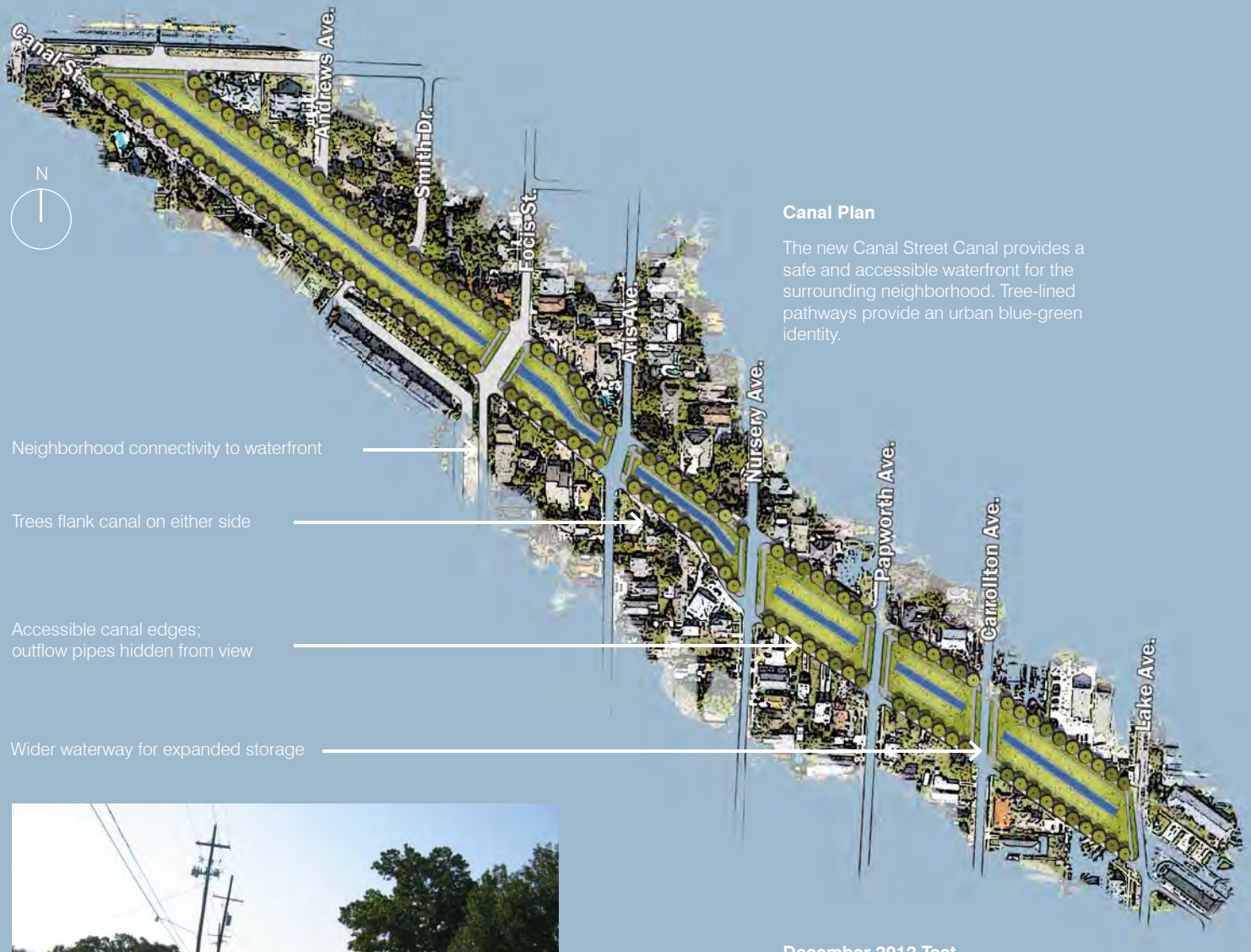
Canal Sections

Canal banks are steep and lined with grass. Unsightly pipes project from canal banks and water levels are low, with stagnant water during dry weather. In the redesign, outfall pipes are concealed with plantings, gabions, and higher water levels. Pedestrian pathways and trees line the canal.

Existing Canal Street Section

Proposed Canal Street Section Option A

Proposed Canal Street Section Option B



Canal Plan

The new Canal Street Canal provides a safe and accessible waterfront for the surrounding neighborhood. Tree-lined pathways provide an urban blue-green identity.

December 2012 Test

In an experiment to test the effects of raising water levels in a canal, the Jefferson Parish Drainage Department closed the gate at Focis Street and siphoned water from the 17th St. Canal into the Canal St. Canal to raise water levels from 13' C.D. to 17' C.D. Surface water levels then dropped two feet in just 24 hours, either due to infiltration through the bottom of the canal or leaky pipes, or leakage at the gate.

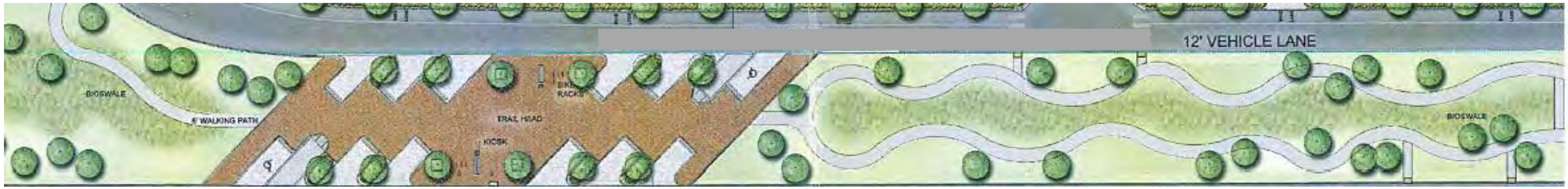
Monitoring wells were installed to track groundwater levels, and backflow into the drainage pipes that feed into the canal was observed in catch basins as far as the I-10 service road. Higher water levels hide outfall pipes and canal banks, greatly improving the aesthetics of the canal.

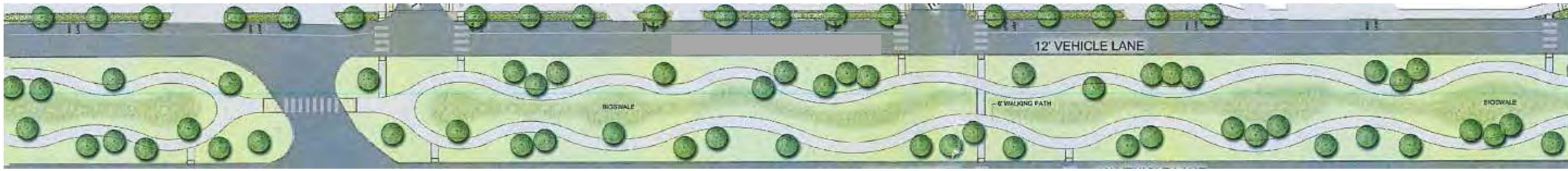
Right: With the proposed canal redesign, stormwater rises to fill the second tier during rain events. Both tiers are lined with gabions to improve canal bank stability and to filter large sediments and floatables. Pedestrian and bicycle pathways alongside the canal and in the

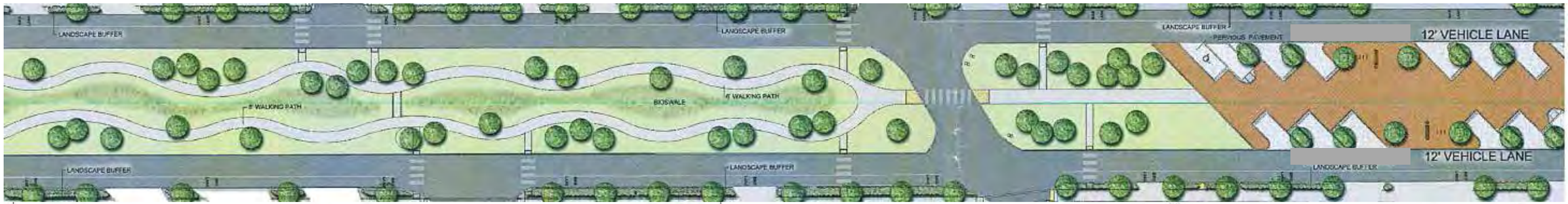
Existing Canal Street Canal

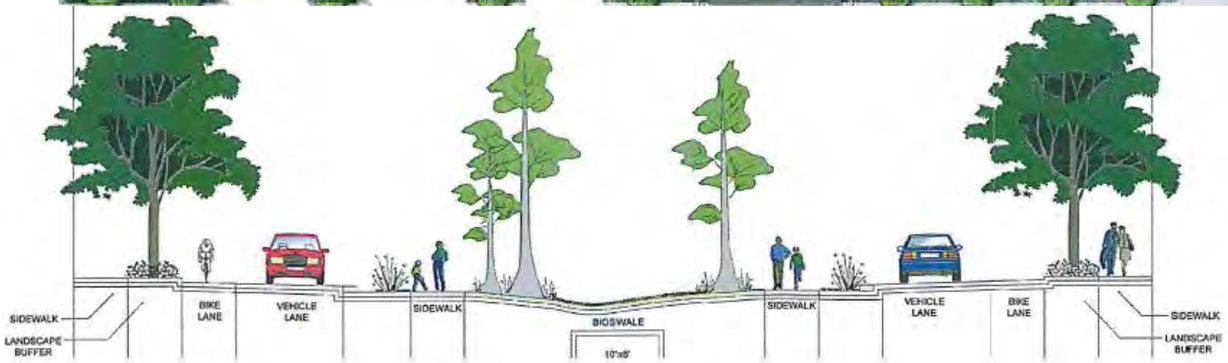
Proposed Canal Street Canal

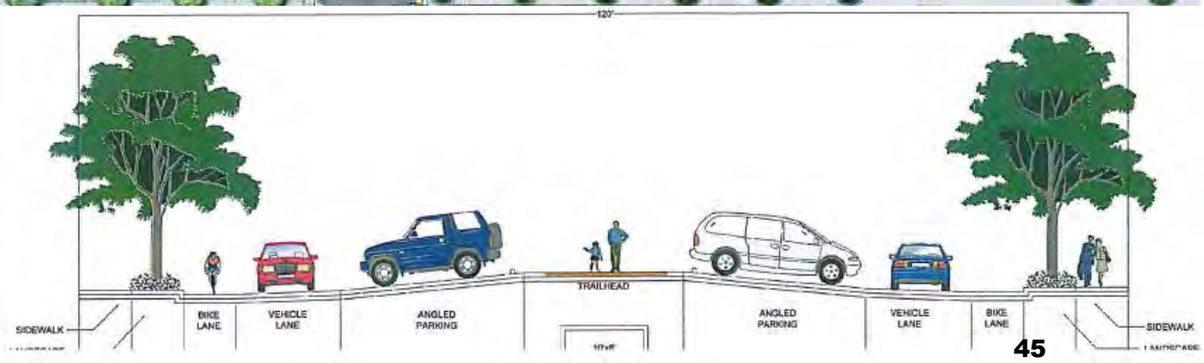
Covered Canal Conceptual Drawings











Project Team

WAGGONNER & BALL TEAM

David Waggonner	*Director*
Mac Ball	*Consulting Principal*
Maria Papacharalambous	*Project Manager/Implementation*
Andy Sternad	*Design Coordination/Planning*
Aron Chang	*Design Coordination/Planning*
Ramiro Diaz	*Design/Planning/GIS*
Derek Hoeferlin	*Design/Planning/Review*
William Marshall	*Graphics/Marketing*
John P. Klingman	*Design/Editing*
Kathleen Peaden	*Design/Planning*
Megan Harris	*Design/Planning*
Francis Aguillard	*Design/Planning*

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Waggonner & Ball Architects
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Project Lead, Coordination

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District Landscape Architecture and Project Design

City of Rotterdam
Daniel Goedbloed
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Deltares
Roelof Stuurman, Frans van de Ven
Geohydrology, Implementation

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System Landscape Architecture and Urban Design

Palmbout Urban Landscapes
Jaap van den Bout, Sabien Thomaes
Landscape Urbanism

Robbert de Koning Landscape Architect
Robbert de Koning, Emilka Zemlak
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Nanco Dolman
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H+N+S Landscape Architects

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Bill Gwyn
Geotechnical and Hydrogeological Data

GCR
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Economic Benefit Analysis

LSU Coastal Sustainability Studio
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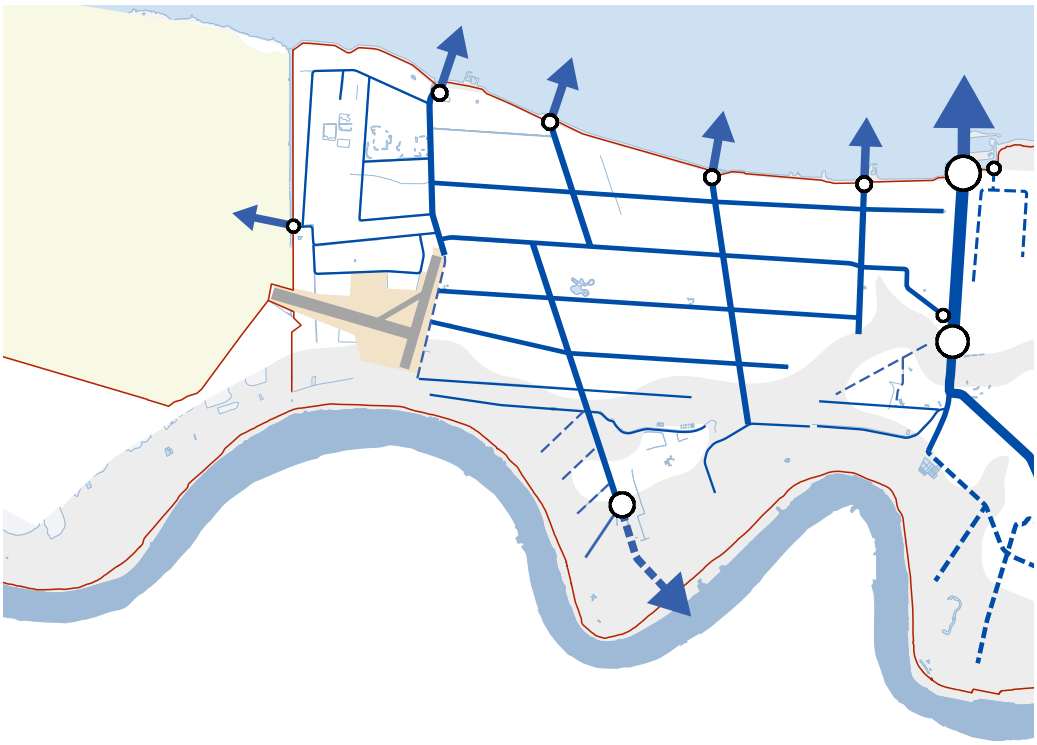
Matthew Siebert
Visualization Tools

Waldemar S. Nelson and Company, Inc.
Charles Nelson, Michelle Bales, Timothy Kay,
Kim Nguyen, Stephen Champagne
Project Cost Estimating

Pump to the River



Existing Drainage System

All stormwater currently flows by gravity through a canal network to the lakefront, where it is pumped into the lake or the LaBranche Wetlands. The USACE Pump to the River project in Harahan is currently under construction.

Jefferson Parish

Bordered by the Mississippi River, the LaBranche Wetlands, Lake Pontchartrain, and the Orleans Parish line, Jefferson Parish grew when developers looked upriver from the historic city for new land. Streets radiating from the river recall the geometry of agricultural plots and plantation boundaries. Away from the river and past the Metairie Ridge, drainage channels were dug to drain cypress swamps and to enable the development of Metairie's characteristic suburban neighborhoods.

The Backslope

Beginning with a loose grid shaped by the curves of the river, open drainage ditches characterize the drainage system of the backslope. An exception to the area's residential developments is the largely paved Elmwood Business Park, which lies in the shadow of the Huey P. Long Bridge. Here, runoff from the area's rooftops, parking lots, and streets collects so quickly that roadways frequently become impassable. Furthermore, runoff from Elmwood flows downstream into the lowland canal network, exacerbating drainage problems there. Further west, in the city of Kenner, is the old settlement of Rivertown, as well as the parking lots, warehouses, and industrial areas that characterize the landscape around Louis Armstrong International Airport.

Bowl Landscape

The low-lying bowl is located between Airline Highway and the Earhart Expressway. While the roadways are on relatively high ground, neighboring homes and businesses experience flooding. New water storage areas can hold significant volumes of stormwater are needed to reduce flood risk in this area.

Lowland Landscape

Once an uninhabited area of cypress swamp, the land was developed into swaths of suburban neighborhoods divided by broad boulevards and canals that extend north-south and east-west across the broad low-lying areas of Metairie and Kenner.

Commercial enterprises and associated parking lots are concentrated along these boulevards, and are responsible for the massive quantities of runoff that make drainage in the lowlands so difficult . The canals that run through the neutral grounds of these boulevards are unsightly ditches with stagnant water during dry periods, and fill to the brim with runoff during rain events. The low static water levels in the canals, and the lack of infiltration due to the prevalence of impervious surfaces, lower the water table and contributes to the soil subsidence that has dropped many of these lowland areas five feet or more below sea level over the course of the last century.

The insertion of water retention features and tree plantings along Metairie's grid of boulevards and in commercial districts, improvements to canal banks, and the construction of parklands that store and filter stormwater bolster soil stability and the basin's capacity for safely handling intense rainfall. Additionally, the Urban Water Plan proposes investing in the Airline Corridor as an important hydrological boundary, and also as a critical connection joining the Airport to downtown New Orleans and the rest of the region. Improved canals and walking trails connect residential neighborhoods to the lakefront.

Proposed Living Water System

The new drainage system splits the basin into two distinct subbasins. Water from the backslope, south of the Metairie ridge, is pumped to the river instead of the lake. Strategic parklands in Kenner and along the Airline corridor provide storage and filtration.

Jefferson's Blue Networks

Jefferson Parish is part of the Jefferson-Orleans Basin, so that Urban Water Plan strategies that are appropriate for Orleans Parish are appropriate in Jefferson Parish as well. As in Orleans, there is a proposal to divide this area into two subbasins along the Metairie Ridge, diverting backlsope runoff back towards the river in order to relieve the lowland canal network and pump stations.

Split at the Ridge

Airline Highway demarcates the northern edge of the river side subbasin. All drainage south of the ridge can be pumped to the river, either through the Monticello Canal along the Jefferson-Orleans Parish line or the Soniat Canal via the Pump to the River project that is currently under construction.

New detention and retention features on the backslope, such as rain gardens, water lanes (bioswales), parking lots that infiltrate and store stormwater, and pervious paving, can all be used to slow the flow of stormwater across the backslope.

The construction of strategic parklands along the Airline Corridor can anchor the redevelopment of this swath of land as a key hydrological boundary and as a restored entryway to the region that connects from Louis Armstrong International Airport all the way to downtown New Orleans. Integrated into this landscape are existing assets such as Zephyr Field and the New Orleans Saints practice facility.

Lowland Canal Networks

New vegetation and trees can be planted on both sides of the lowland canals, offering shade and heightening evapotranspiration. Reducing runoff from both backslope and lowland neighborhoods will make it possible for system managers to maintain higher water levels in the canals without increasing flood risk. Higher water levels and canal bank retrofits will improve the aesthetics of each of these boulevard/canal corridors, while balancing groundwater and slowing subsidence.

In dry weather, water drawn from Lake Pontchartrain will feed the circulating canal network, which will ensure improved water quality and canal ecology year-round. Strategic parklands located in Kenner will feature filtration wetlands that will clean the water that flows through the canal network, and store and filter stormwater during wet weather.

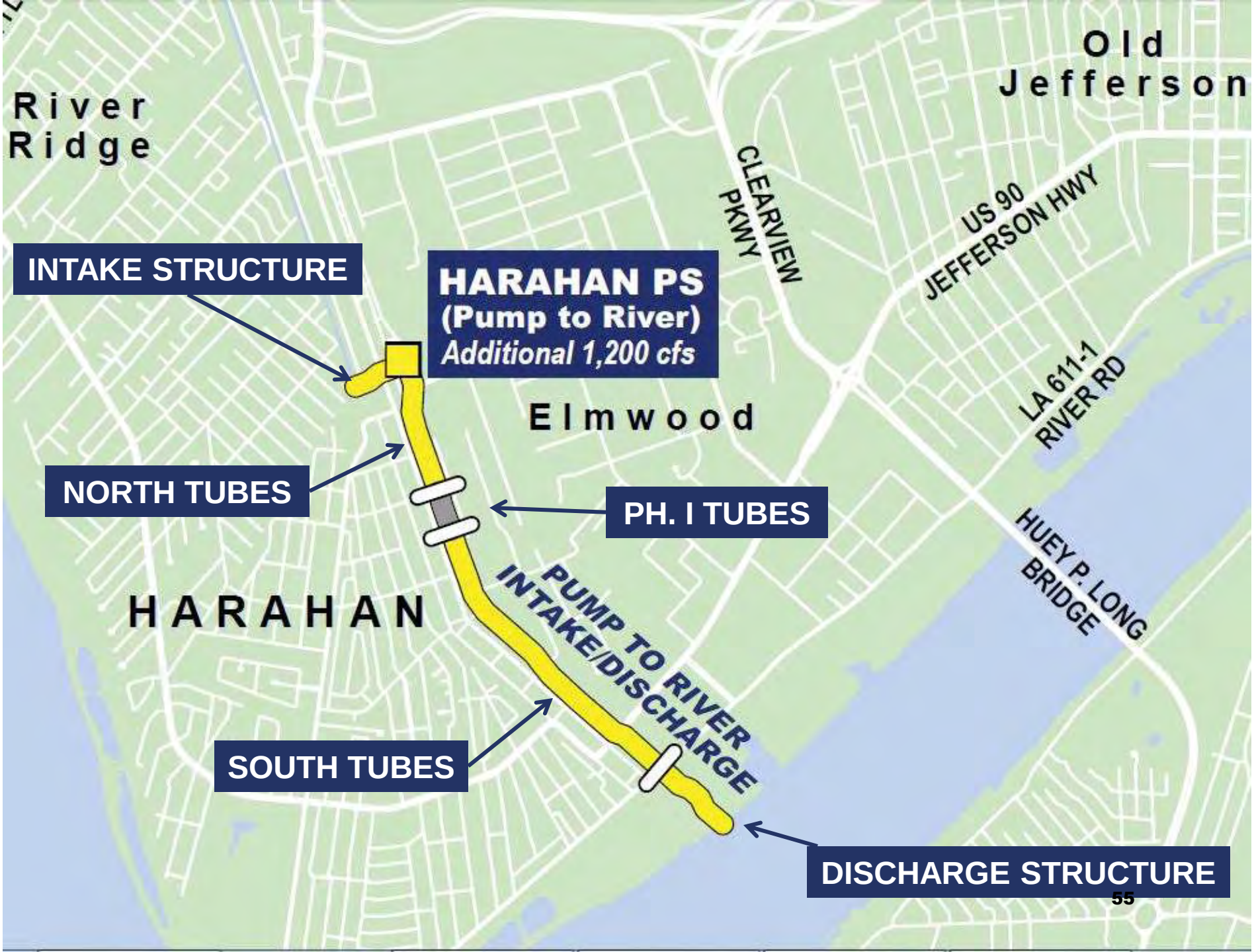
As a part of the remediation of the flooding problem, the Harahan Pump to the River project came into being. This project will take 1200 CFS of rain water from head waters of the Soniat Canal and pump it to the Mississippi River, thus reducing the threat of flooding for River Ridge, Harahan, and Elmwood and provide additional pumping capacity for the remaining drainage basin.

HARAHAN PUMP-TO-THE-RIVER PHASES

•Phase I Tubes	$8.4 Million	Complete
•Pump Station	$31.6 Million	Under Construction
•Intake Structure	$10.6 Million	Under Construction
•North Discharge Tubes	$10.7 Million	Under Construction
•South Discharge Tubes	$23.8 Million	Under Construction
•Discharge Structure	$24.5 Million	Under Construction

FUNDING OF HARAHAN PUMP-TO-THE-RIVER
TOTAL CONSTRUCTION COST OF ALL (6) PHASES

FEDERAL SHARE (65%) = $71,241,300
PARISH SHARE (35%) = $38,360,700
$109,602,000


River Ridge
Old Jefferson
CLEARVIEW PKWY
US 90 JEFFERSON HWY
LA 611-1 RIVER RD
HUEY P. LONG BRIDGE
INTAKE STRUCTURE
HARAHAN PS
(Pump to River)
Additional 1,200 cfs
Elmwood
NORTH TUBES
PH. I TUBES
HARAHAN
PUMP TO RIVER INTAKE/DISCHARGE
SOUTH TUBES
DISCHARGE STRUCTURE

Technical Specifications

- Prime Power ---- EMD 12 Cylinder 3000 Hp /pump
- Pump ------ Three 400 CFS Patterson pumps for a total of 1200 CFS
- Total Dynamic Head ------ 53 feet
- All pump station operations can be accomplished remotely from within the Safe Room
- Station has sufficient generator power to operate without outside sources plus a 100% redundant generator source
- Station superstructure is designed for 156 MPH wind speed
- Safe Room is designed for a 250 MPH wind speed plus impact load resulting from collapse of the station superstructure
- Climber screens are being supplied which will allow remote operation i.e. from safe room
- Vacuum breakers at the levee crossing can be operated from the safe room.

Wood pile for Pump Station Foundation

Pile driving underway and tension anchor

Intake basin and scaffolding for floor construction

Operating Floor Slab

Operator and Safe Room in Pump Station

Connection box for discharge pipes leaving the station

Looking south towards Mississippi River 3 -84” discharge pipes leaving the station

Excavation and installation of discharge pipes

Pump To The River Discharge

Pump To The River – Pump Station


Pump 1