

RESILIENT URBAN LANDSCAPES

Landscape as an Evolutionary Socio Ecological System



INTRODUCTION

URBAN FLOODS



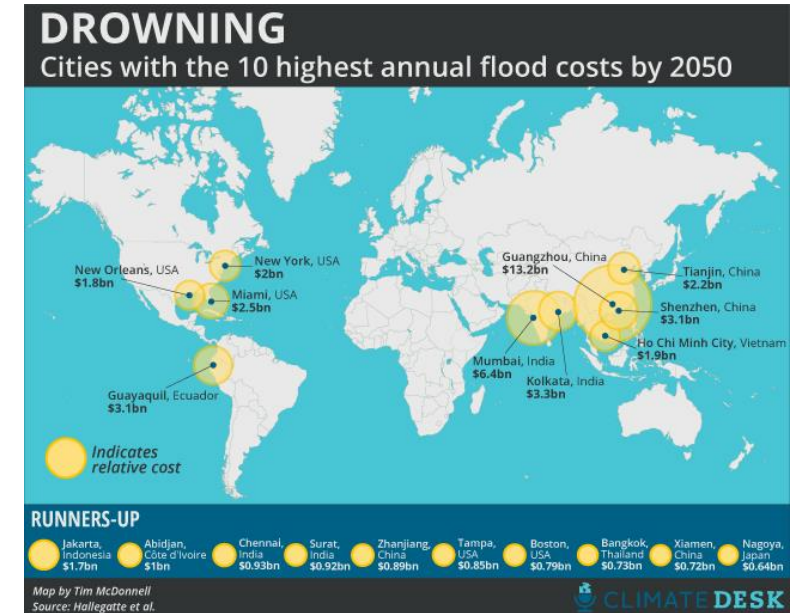
Image 1. Brazil flood April 2019. Photo credit: Camila Vargas/ Source: Vila Velha City hall

Table 1. Types of loss from floods. Modified from Disaster Loss Assessment Guidelines

Can the lost item be bought and sold for dollars?	Direct loss: Loss from contact with flood water	Indirect loss: No contact – loss as a consequence of flood water
Yes – monetary (tangible)	e.g. Buildings and contents, vehicles, livestock, crops, infrastructure	e.g. Disruption to transport, loss of value added in commerce and business interruption, legal costs associated with lawsuits
No – non-monetary (intangible)	e.g. Lives and injuries, loss of memorabilia, damage to cultural or heritage sites, ecological damage	e.g. Stress and anxiety, disruption to living, loss of community, loss of cultural and environmental sites, ecosystem resource loss

Chart 1. Types of loss from floods

Source: <https://www.chiefscientist.qld.gov.au/publications/understanding-floods/flood-consequences>



Cities with the highest annual floods by 2050. Source: <https://www.motherjones.com/environment/2013/08/map-top-cities-billion-dollar-floods/>



Urban flood in downtown Miami

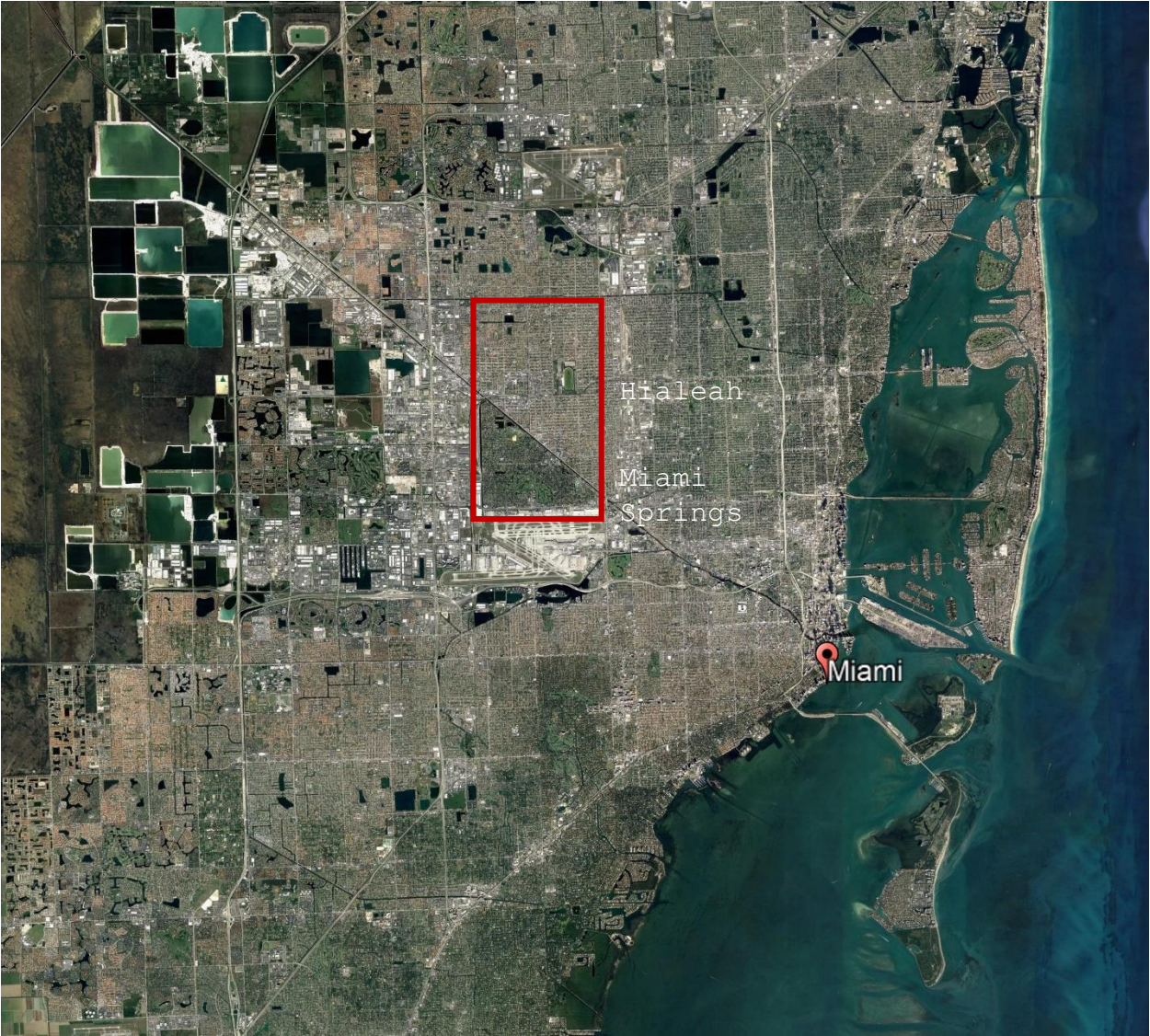
MOTIVATION: HIALEAH & MIAMI SPRINGS



Inland flood in Hialeah



Inland flood in South Florida



MIAMI METROPOLITAN AREA

MOTIVATION: HIALEAH & MIAMI SPRINGS

Cities Most Vulnerable to Coastal Flooding Today

Top 25 cities and their populations at risk (thousands) within FEMA's 100-year coastal floodplain

1.	New York	245	14.	Lauderhill, Fla.	66
2.	Miami	126	15.	Charleston, S.C.	64
3.	Pembroke Pines, Fla.	118	16.	Cape Coral, Fla.	59
4.	Coral Springs, Fla.	115	17.	Tamarac, Fla.	58
5.	Miramar, Fla.	93	18.	Margate, Fla.	50
6.	St. Petersburg, Fla.	88	19.	Tampa, Fla.	50
7.	Davie, Fla.	87	20.	Fountainbleau, Fla.	48
8.	Fort Lauderdale, Fla.	85	21.	Miami Gardens, Fla.	44
9.	Miami Beach, Fla.	85	22.	Country Club, Fla.	43
10.	Hialeah, Fla.	76	23.	Atlantic City, N.J.	37
11.	Sunrise, Fla.	74	24.	North Lauderdale, Fla.	37
12.	Pompano Beach, Fla.	73	25.	Kendale Lakes, Fla.	37
13.	Hollywood, Fla.	69			

Source: <https://www.climatecentral.org>

Cities Most Vulnerable to Coastal Flooding by 2050

Top 25 cities and their populations at risk (thousands) within FEMA's 100-year coastal floodplain as augmented by projected sea level rise

1.	New York	426	14.	Hollywood, Fla.	76
2.	Hialeah, Fla.	204	15.	Miami Gardens, Fla.	72
3.	Miami	154	16.	Norfolk, Va.	66
4.	Fort Lauderdale, Fla.	127	17.	Lauderhill, Fla.	66
5.	Pembroke Pines, Fla.	120	18.	Cape Coral, Fla.	66
6.	Coral Springs, Fla.	119	19.	Boston	62
7.	Miramar, Fla.	100	20.	Tamarac, Fla.	60
8.	St. Petersburg, Fla.	91	21.	Virginia Beach, Va.	58
9.	Davie, Fla.	90	22.	Tampa, Fla.	57
10.	Miami Beach, Fla.	87	23.	Fountainbleau, Fla.	56
11.	Charleston, S.C.	83	24.	Margate, Fla.	53
12.	Pompano Beach, Fla.	80	25.	Kendale Lakes, Fla.	51
13.	Sunrise, Fla.	79			

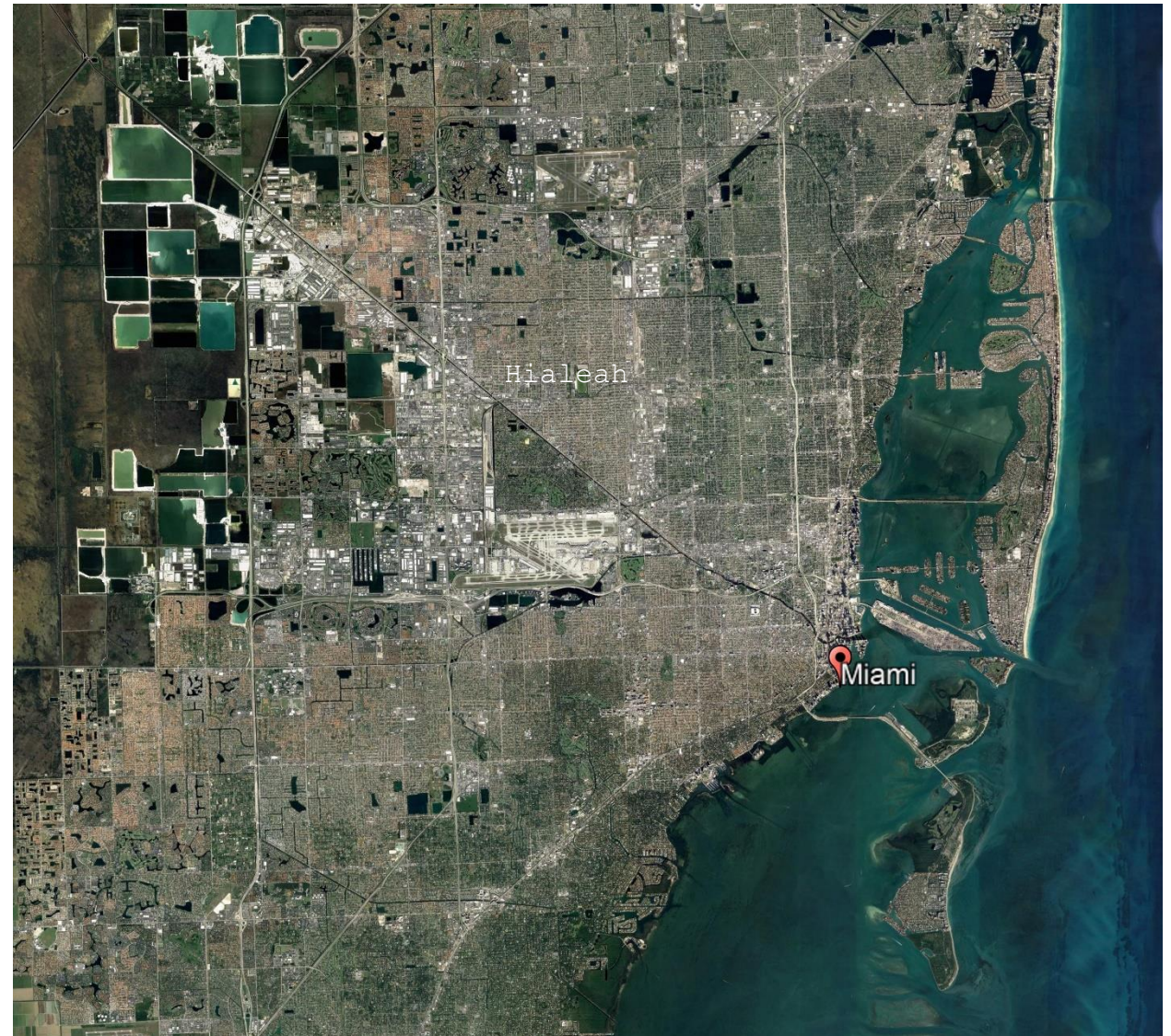
Source: <https://www.climatecentral.org>

High Social Vulnerability Populations Most at Risk by 2050

Top 25 cities and their high social vulnerability populations at risk (thousands) within FEMA's 100-year coastal floodplain

1.	Hialeah, Fla.	204	14.	Westchester, Fla.	27
2.	New York	189	15.	Kendall West, Fla.	26
3.	Miami	110	16.	Sunrise, Fla.	23
4.	Fountainbleau, Fla.	56	17.	Pembroke Pines, Fla.	22
5.	Miami Gardens, Fla.	41	18.	University Park, Fla.	22
6.	Kendale Lakes, Fla.	38	19.	West Little River, Fla.	22
7.	Miami Beach, Fla.	35	20.	Fort Lauderdale, Fla.	20
8.	Pompano Beach, Fla.	33	21.	St. Petersburg, Fla.	20
9.	Tamarac, Fla.	32	22.	Lauderhill, Fla.	20
10.	Tamiami, Fla.	30	23.	Lauderdale Lakes, Fla.	20
11.	Hallandale Beach, Fla.	29	24.	Galveston, Texas	19
12.	Atlantic City, N.J.	28	25.	Hialeah Gardens, Fla.	19
13.	Country Club, Fla.	28			

Source: <https://www.climatecentral.org>



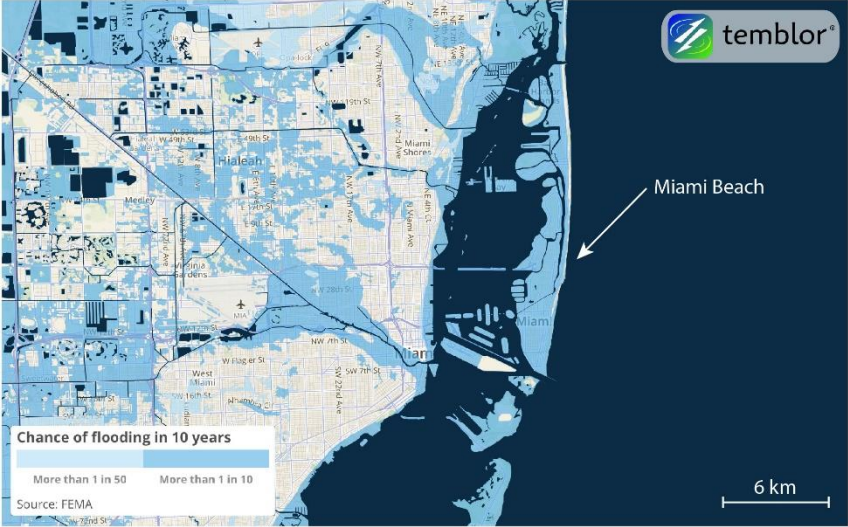
MIAMI METROPOLITAN AREA

MOTIVATION: HIALEAH & MIAMI SPRINGS

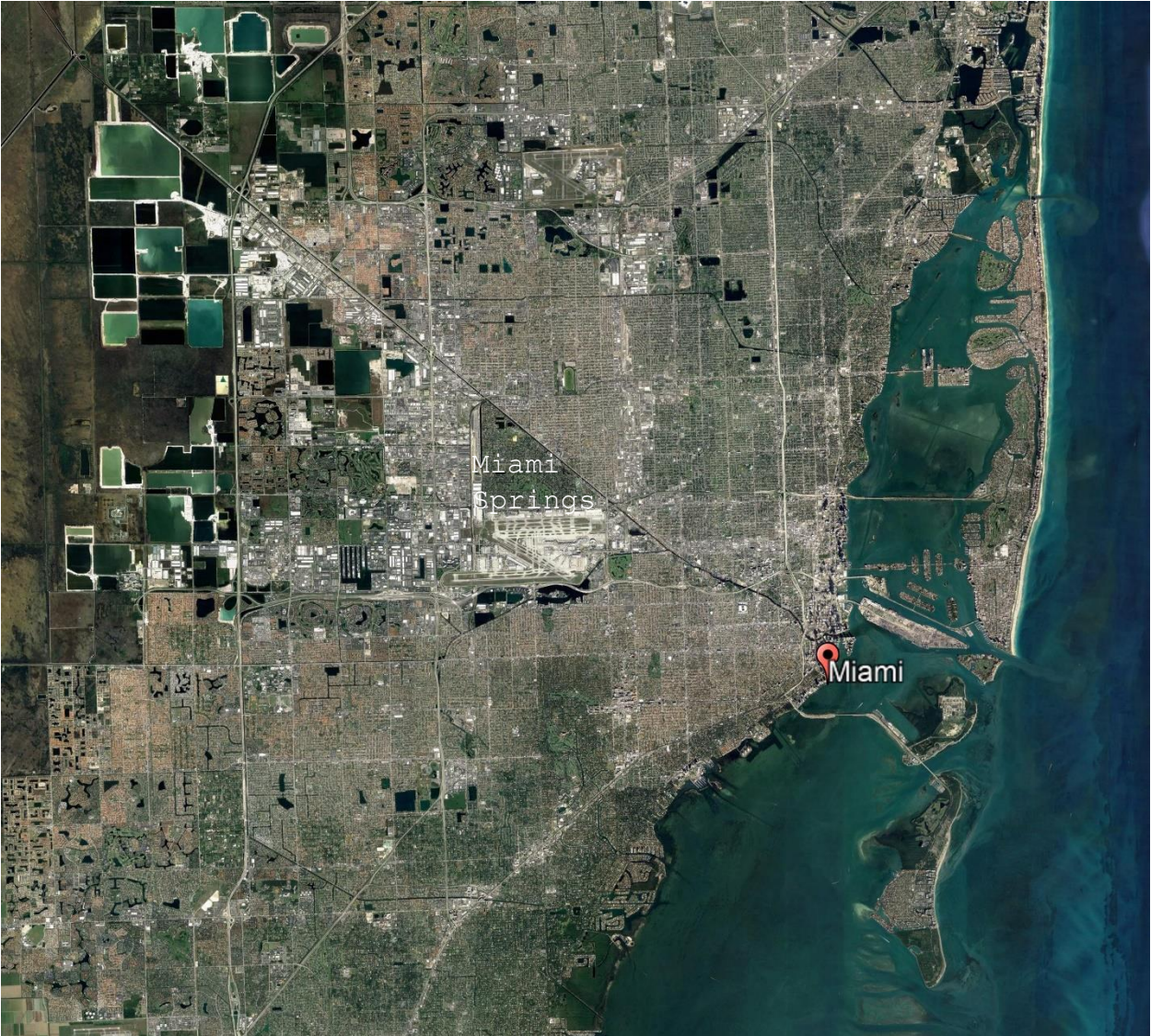


Flood in Miami Springs 1950s

Flood in Miami Springs 1950's. Source: <https://www.miamisprings-fl.gov/building/flood-hazard-information>



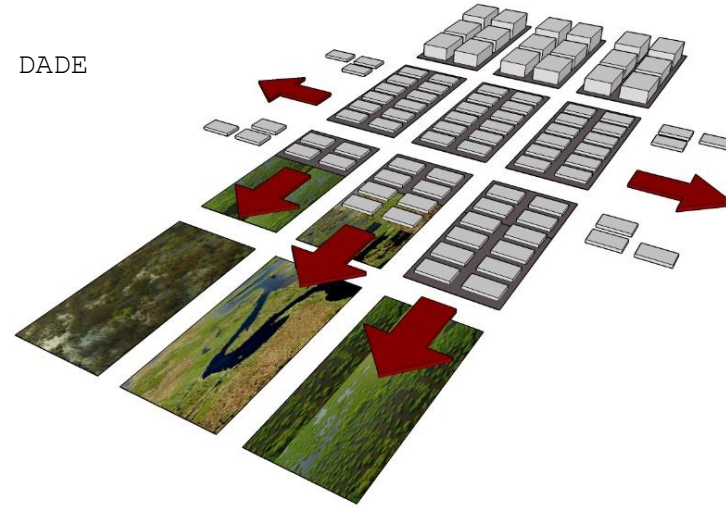
Miami Dade County flood map. Source: <http://www.fema.org>



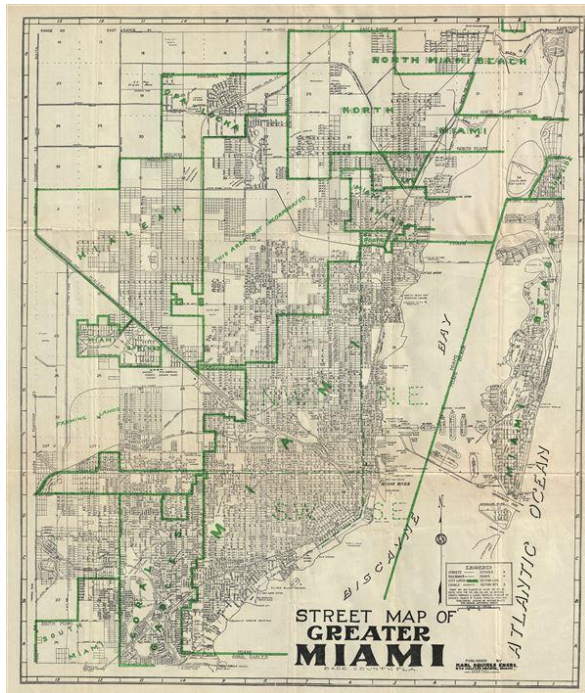
MIAMI METROPOLITAN AREA

PROBLEM FIELD

CAUSES OF INLAND FLOODS IN THE MIAMI DADE COUNTY



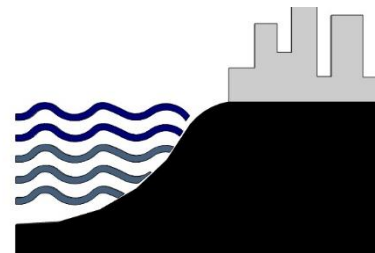
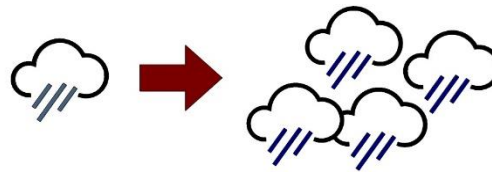
RAPID URBAN SPRAWL:
INCREASE OF IMPERVIOUS SURFACES



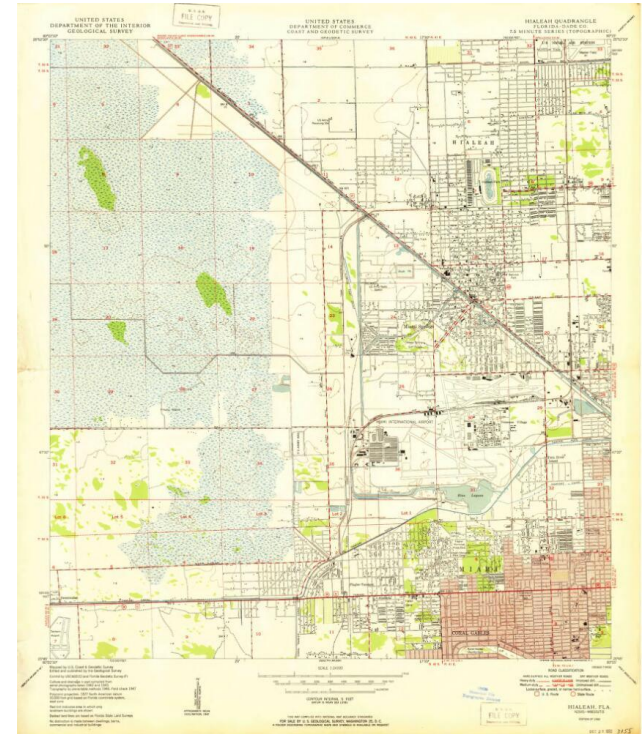
GREATER MIAMI AREA: 1945

<https://www.geographicus.com/P/AntiqueMap/GreaterMiami-newscompany-1945>

REDUCTION OF WETLANDS



CLIMATE CHANGE EFFECTS



HIALEAH AND MIAMI SPRINGS: 1950

<https://www.oldmapsonline.org/map/usgs/5624878>

PROBLEM STATEMENT



Image 6. Aerial view of central Hialeah: Race Track. Year:1947.
Source: <https://www.pbase.com/image/78860939>

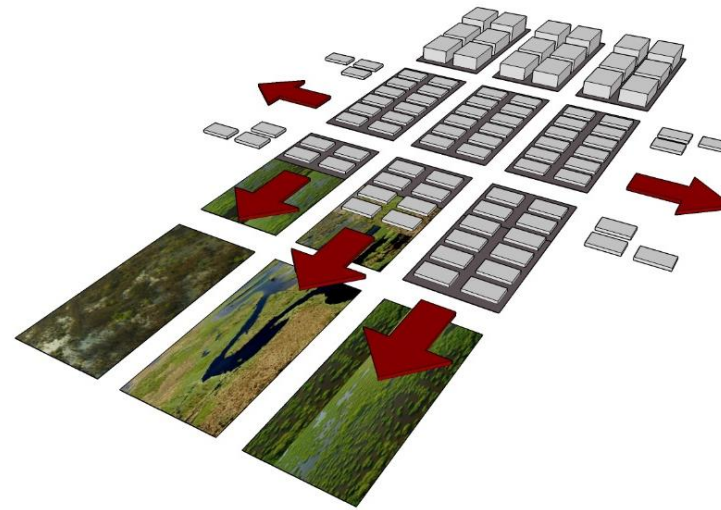


Diagram 3. Horizontal urban sprawl and depletion of wetlands (natural water buffer areas). Source: author



Image 7. Aerial view of central Hialeah: Race track and residential surrounding areas. Year:2016. Source: Google maps

PROBLEMS

- Hialeah and Miami Springs constantly flood due to the limited rainwater infiltration and surface storage capacities of the urban landscape.
- An inexistent resilient and long term sustainable plan to deal with the surplus of rainwater under a climate change scenario.
- Social and socio environmental issues:
 - The lack of public spaces in Hialeah.
 - The lack of socio ecological production landscapes in both Hialeah and Miami Springs.

RESEARCH OBJECTIVE AND RESEARCH QUESTION

Research Objective

To test responsive local landscape solutions in Hialeah and Miami Springs in order to:

- Provide surface room to storage the excess amounts of rainwater.
- Increase the amount of pervious surfaces and reduce storm water runoff during rainfall events.
- Improve the socio ecological qualities of the existing public space network.
- Increase the amount usable public space in Hialeah.

Research Question

How can public space provide resilient and sustainable solutions to deal with the surplus of water during the rainy season in Hialeah and Miami Springs and improve their current socio environmental conditions?

Research Sub questions

UNDERSTAND THE PROBLEM

How does the current water management system of the Miami Dade County works and what are the causes behind the increase of hydrological problems in Hialeah and Miami Springs?

UNDERSTAND THE SITE

What are the current urban conditions of each city and the potentials they offer to mitigate the impact of urban floods and to improve their socio ecological features?

CONCEPTUALIZE THE PROBLEM

Which theories could provide the guidelines to address the public space transformations needed in Hialeah and Miami Springs?

DESIGN QUESTION

What physical changes are needed within the current public space networks and public urban infrastructures in order to improve the infiltration and storage capacities on both sites?

REFLECTION QUESTION

How could the transformation of public space networks improve the social and socio ecologic wellbeing of Hialeah and Miami Springs and contribute to the current water management system of the County?

METHODOLOGY

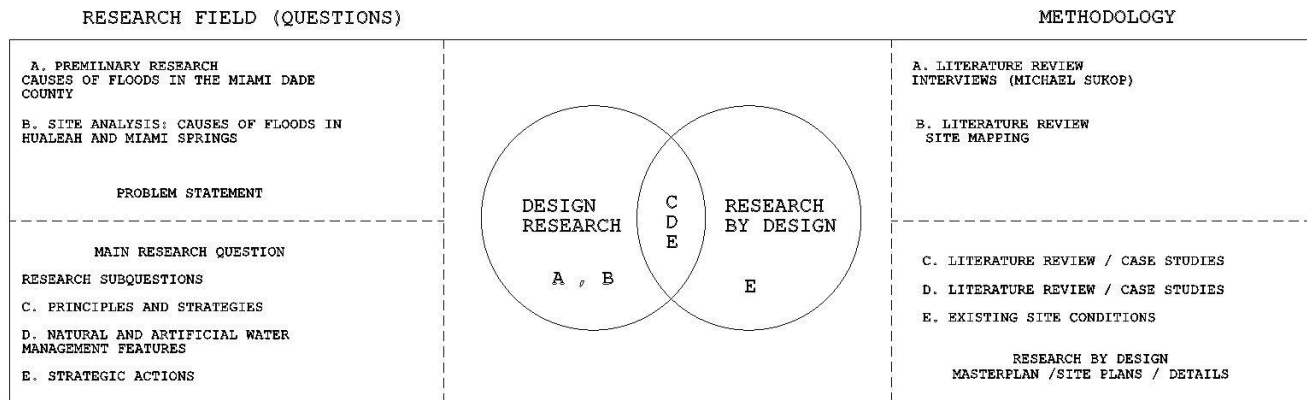


Diagram 4. Research methodology . Source: author

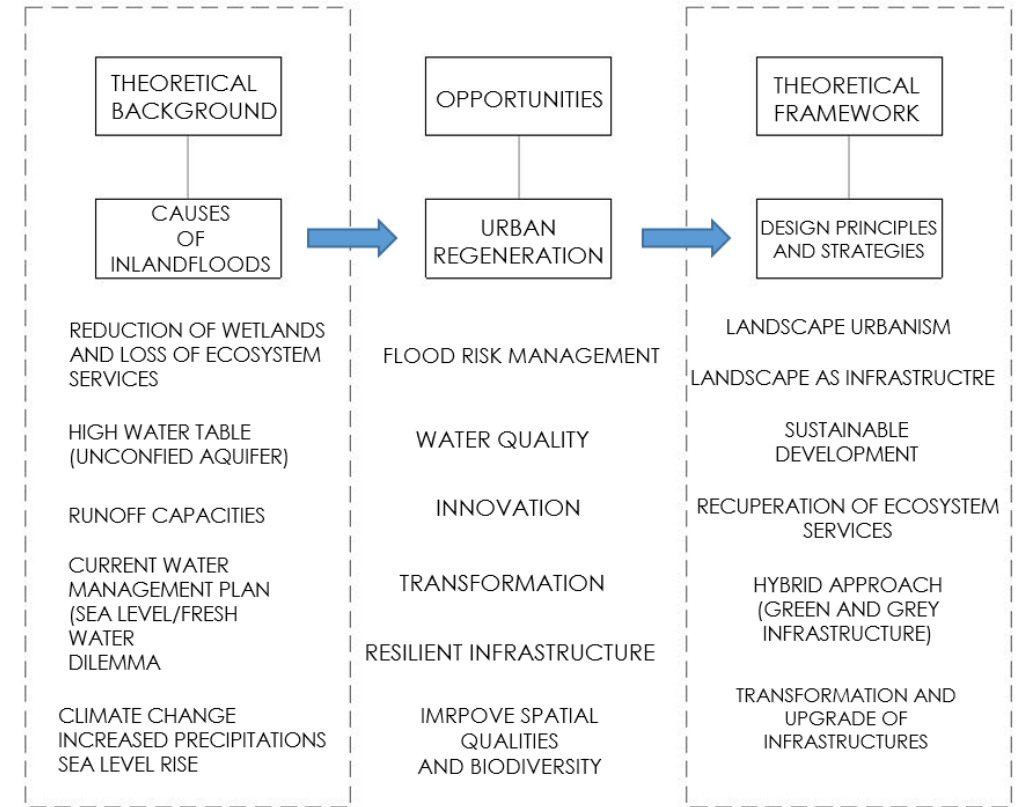


Diagram 5. Research process. Theoretical background. Source: author

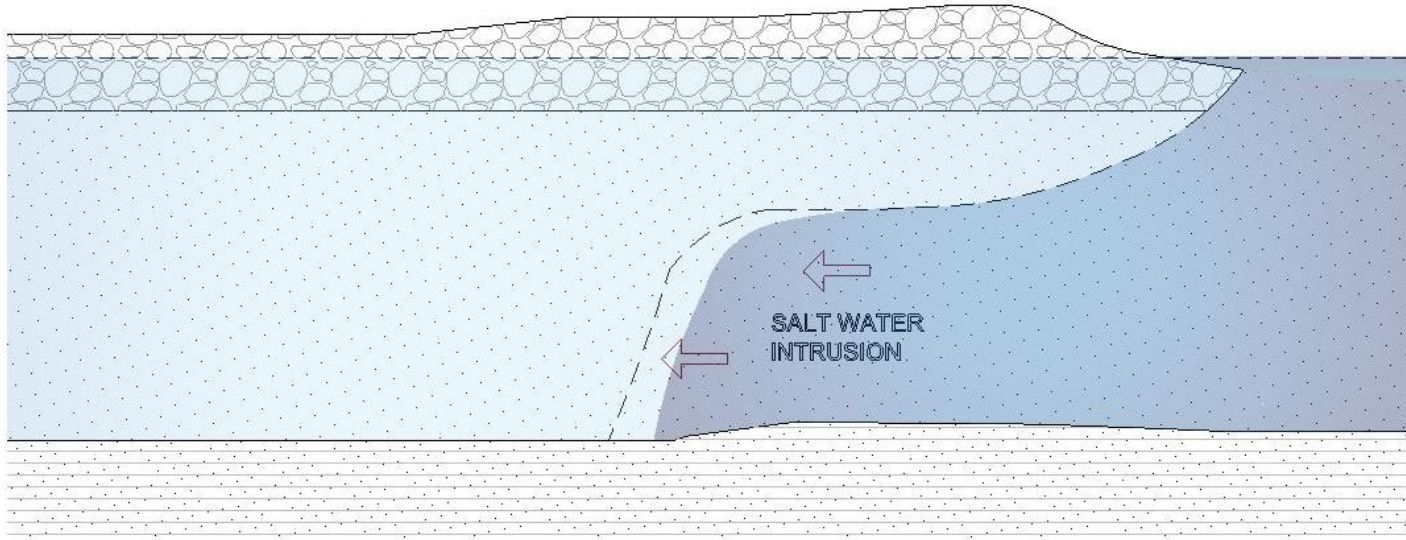
METHODOLOGY

- Design Research
- Research by Design

HYDROGEOLOGICAL ANALYSIS

- Current hydrogeological conditions in the area
- Water management system of the Miami Dade County
- Relationship between sea level rise and groundwater under a climate change scenario
- Types of drainage systems in the Miami Dade County
- Conclusions (design principles)

THE BISCAIYNE AQUIFER



Map 12. South Florida Map: Biscayne Aquifer. Source: author

THE BISCAIYNE AQUIFER

- An unconfined slow moving river located beneath the surface of the the Miami Dade County
- It is mainly composed of limestone soil, which makes it very permeable and easily rechargeable
- Constitutes one of the main drinking water supplies for the Miami Dade County
- The top part constitutes the water table, which varies during the dry and rainy seasons.

WATER TABLE BEHAVIOR

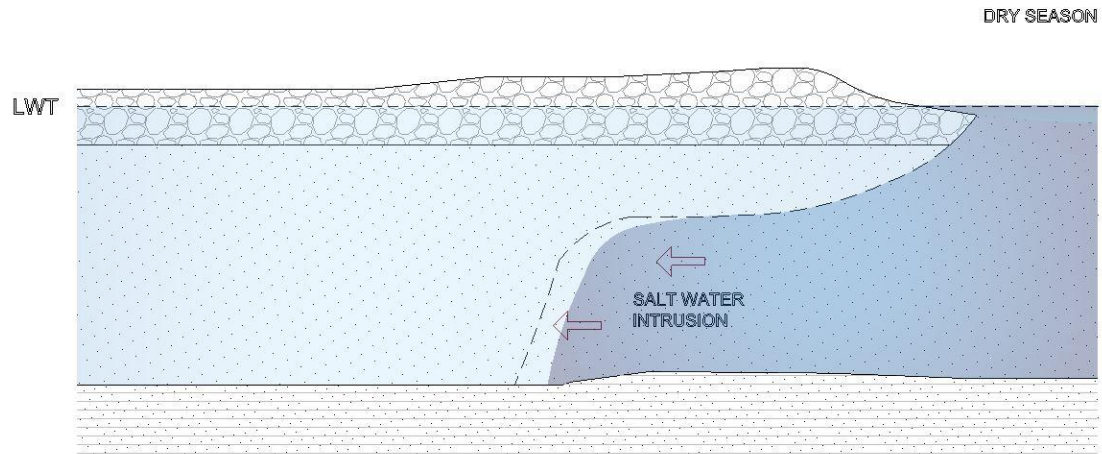
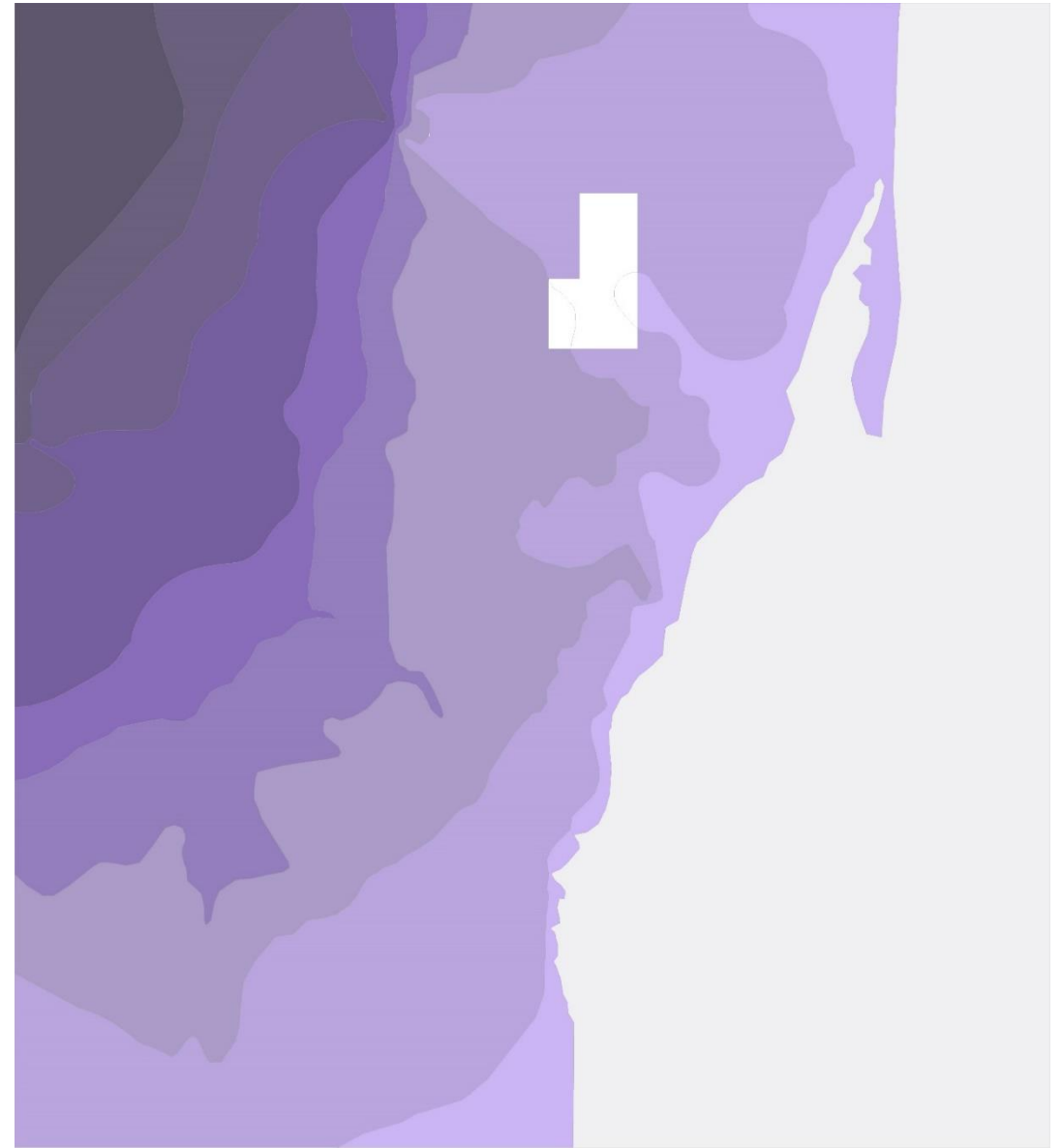


Diagram 8. Miami Dade County water table behavior during the dry season (November -May). Source: author.

DRY SEASON

The water table drops during the dry season due to the decrease of rainfall events. There is risk of salt water intrusion



Map 13. Water table contour lines: dry season (December - May). Source: author

WATER TABLE BEHAVIOR

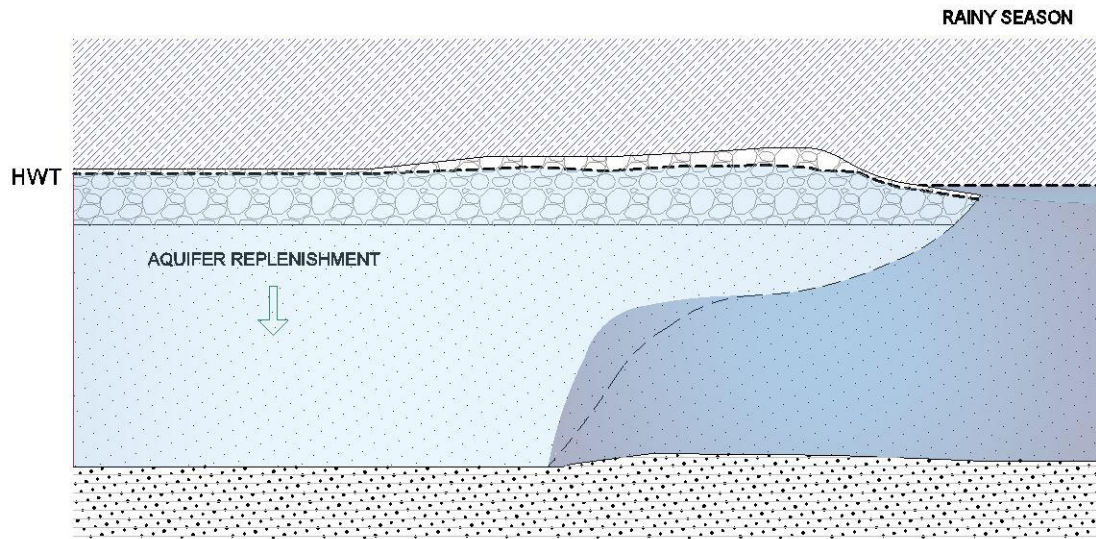
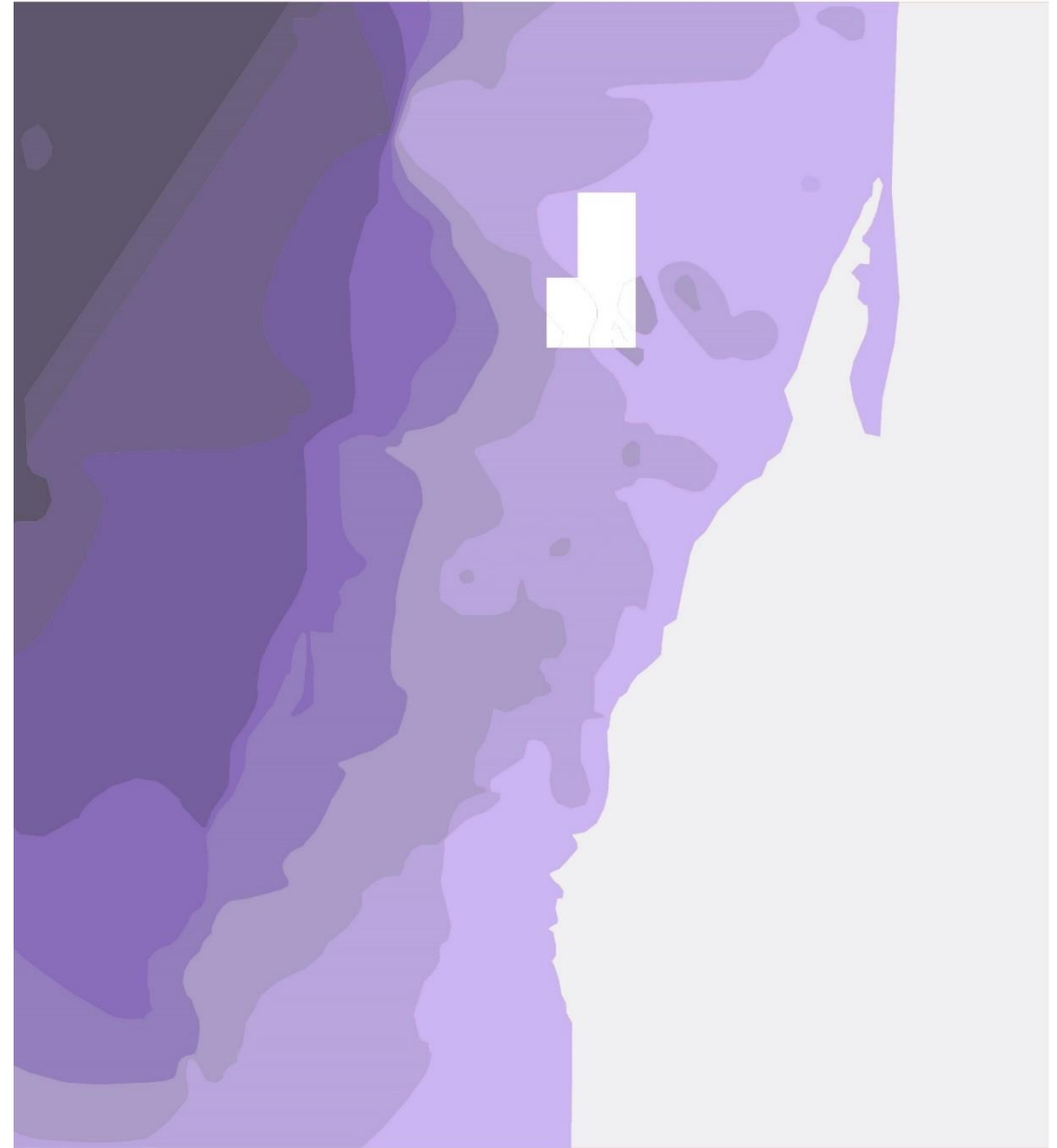


Diagram 9. Miami Dade County water table behavior during the rainy season (May -December). Source: author.

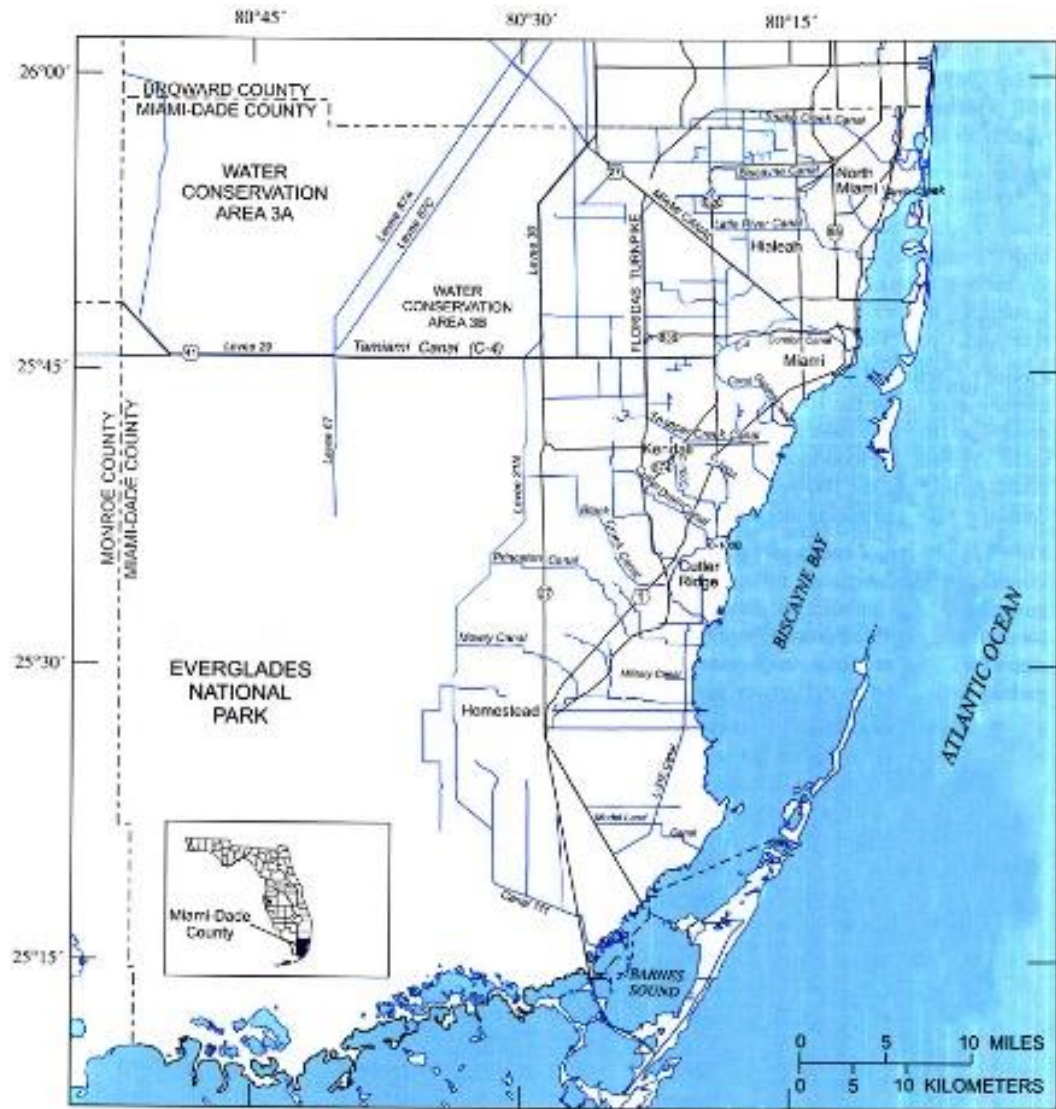
RAINY SEASON

The water table level rises very close to the surface during the rainy season. There is a very high risk for groundwater related floods



Map 14. Water table contour lines: rainy season (may – November)
Source: author

WATER MANAGEMENT SYSTEM MIAMI DADE COUNTY



Map 15. Miami Dade system of primary, secondary and tertiary canals.
Source: <http://fcit.usf.edu/florida/maps/pages/9000/f9069/f9069.htm>

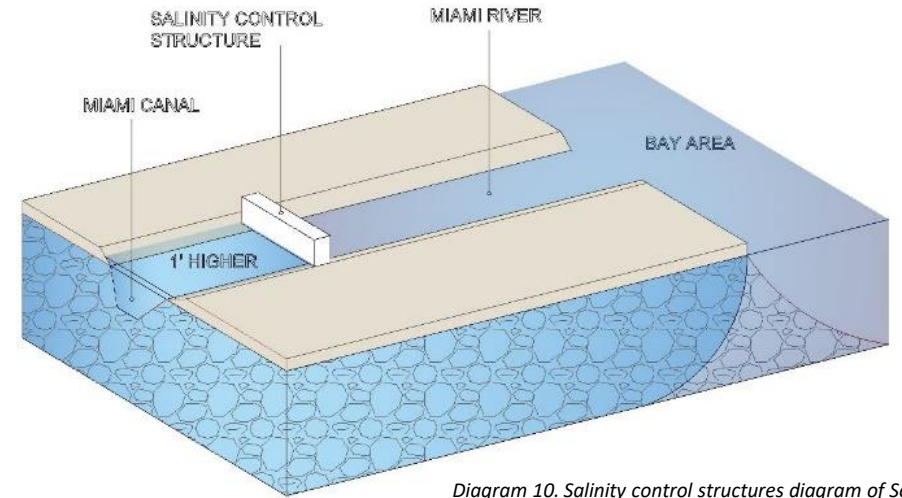


Diagram 10. Salinity control structures diagram of South Florida. Source: author, based on an image found at: <https://pubs.usgs.gov/circ/2003/circ1262/>

WATER MANAGEMENT SYSTEM OF SOUTH FLORIDA AND THE MIAMI DADE COUNTY

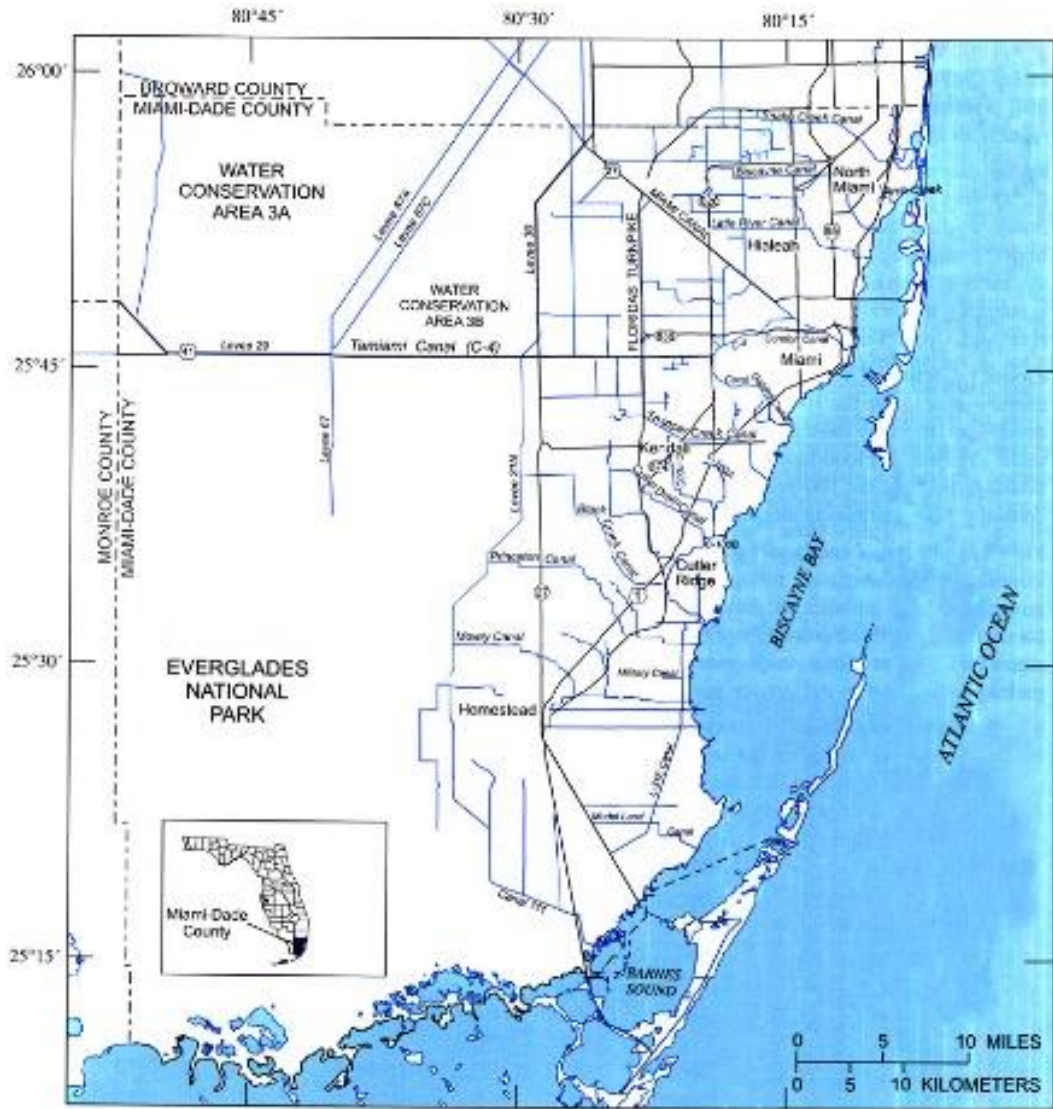
The South Florida and Miami Dade County water management system is composed by:

- A system of main, secondary and tertiary canals.
- A system of levees, pumps and lock structures (salinity control structures).

The main purposes of the canal system are to:

- Replenish the aquifer during both seasons
- Discharge the excess of rain water during the wet season to the Biscayne Bay and water conservation areas in order to lower the water table and prevent floods
- To keep the water table higher during the dry season in order to prevent salt water intrusion

WATER MANAGEMENT SYSTEM MIAMI DADE COUNTY



Map 15. Miami Dade system of primary, secondary and tertiary canals. Source: <http://fcit.usf.edu/florida/maps/pages/9000/f9069/f9069.htm>

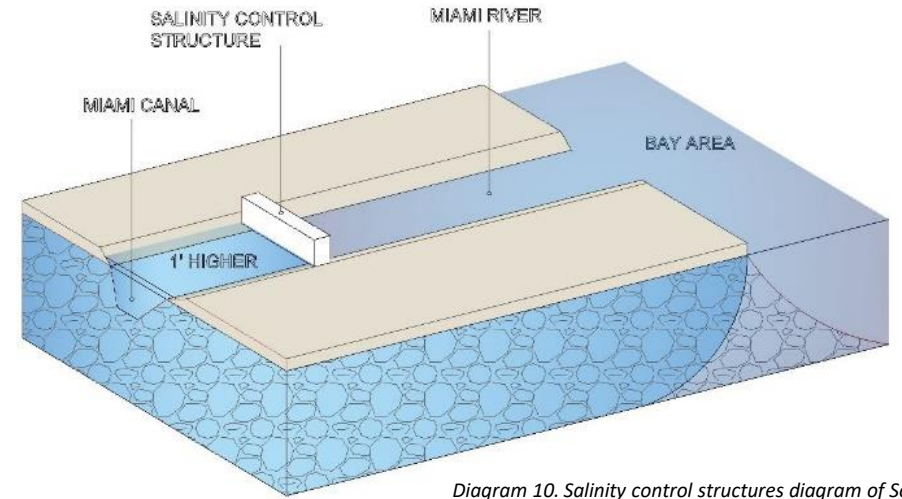


Diagram 10. Salinity control structures diagram of South Florida. Source: author, based on an image found at: <https://pubs.usgs.gov/circ/2003/circ1262/>

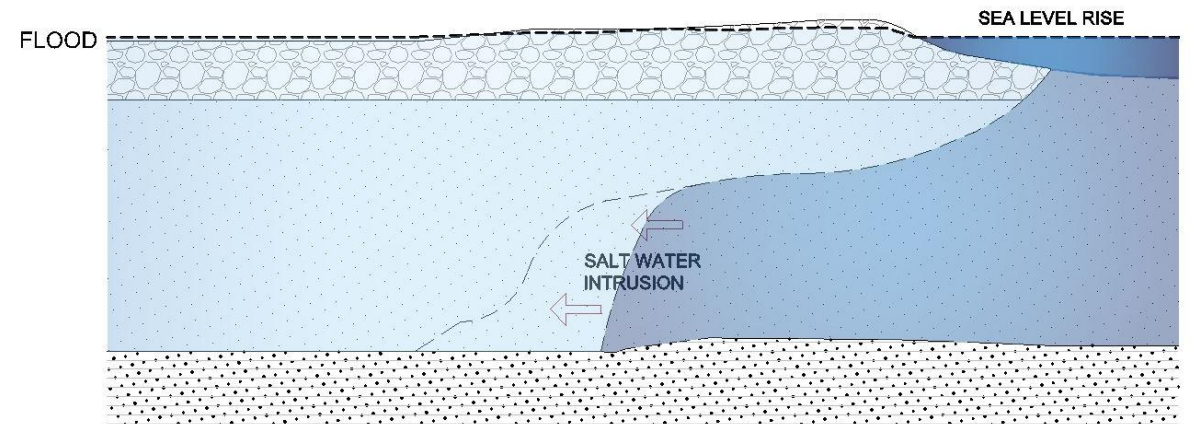


Diagram 11. Miami Dade County water table behavior during high tides / future sea level rise scenario. Source: author.

LOCAL DRAINAGE SYSTEM
HIALEAH & MIAMI SPRINGS

- A system of inlets and pipes that infiltrate the water directly into the Biscayne Aquifer.

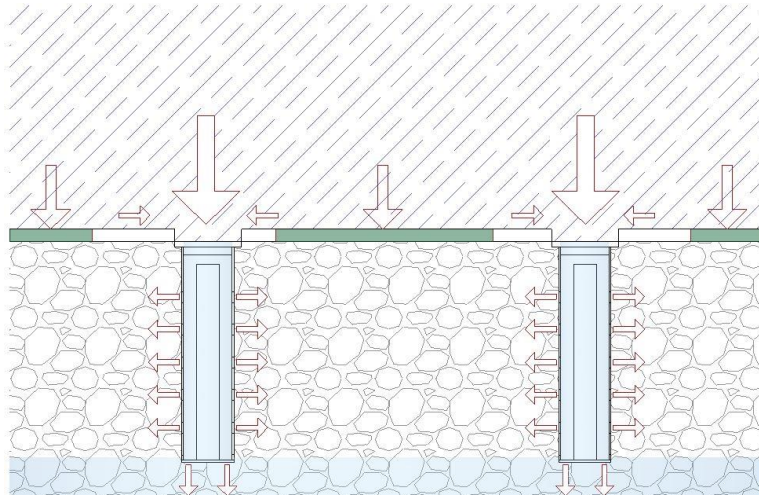


Diagram 16. Hialeah and Miami Springs drainage system of inlets and pipes. Rainwater is directly discharged into the groundwater system (Biscayne aquifer)
Source: author.



Image 16, &18. Drainage system of inlets and pipes in Hialeah. Source: Michael Sukop.

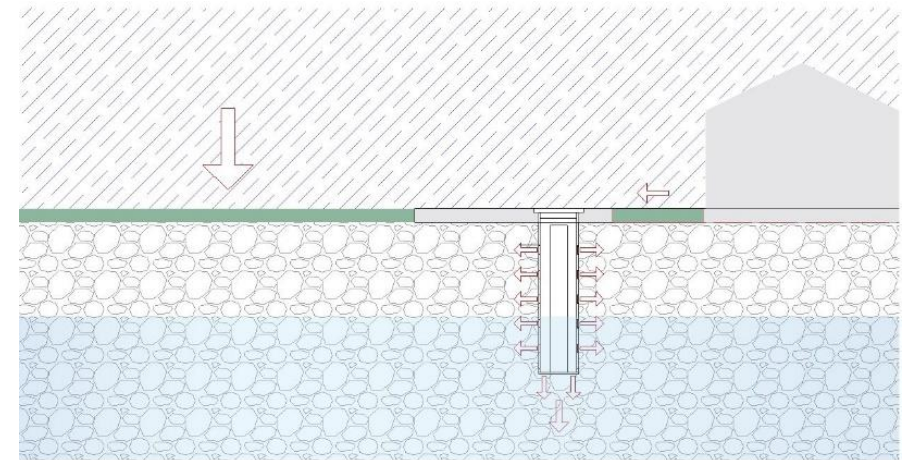


Diagram 18. Hialeah and Miami Springs drainage system of inlets and pipes around 1.950. Both cities were located adjacent to the Everglades. Source: author.

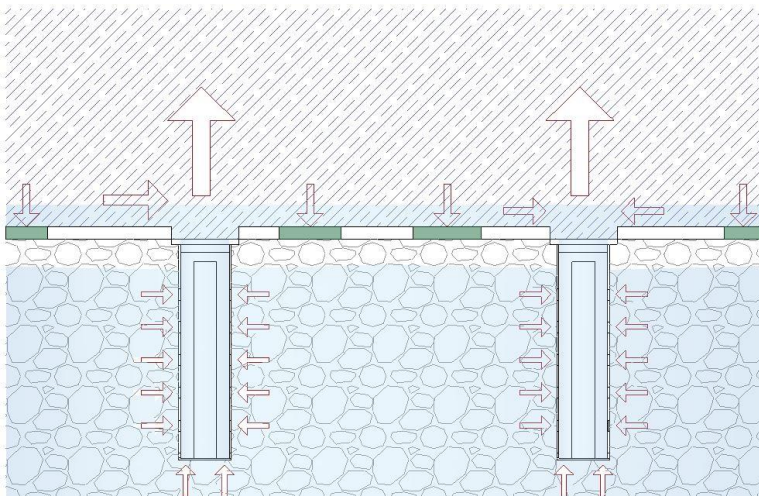


Diagram 17. Collapse of Hialeah and Miami Springs drainage system of inlets and pipes during heavy rainfalls.
Source: author.

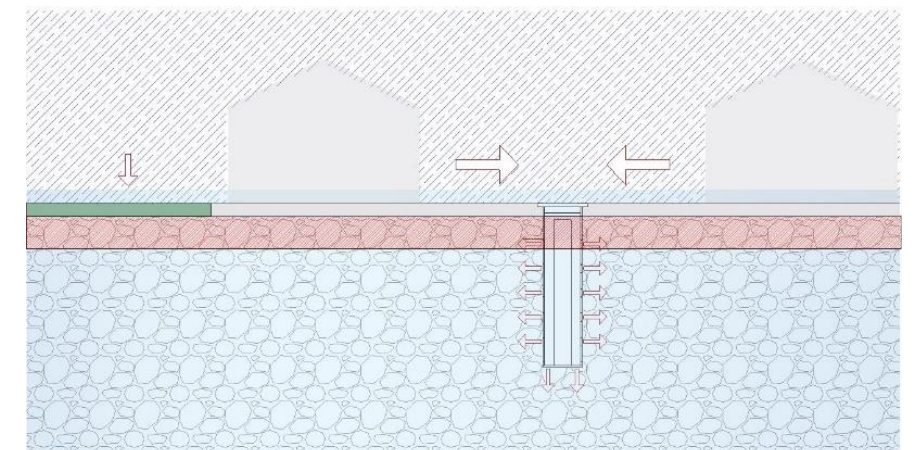


Diagram 20. collapse of grey drainage systems of Hialeah and Miami Springs due to a saturated subsoil. Source: author.

CONCLUSIONS

There is a need to implement a **WATER STRATEGY** to mitigate floods through the urban landscape of both cities

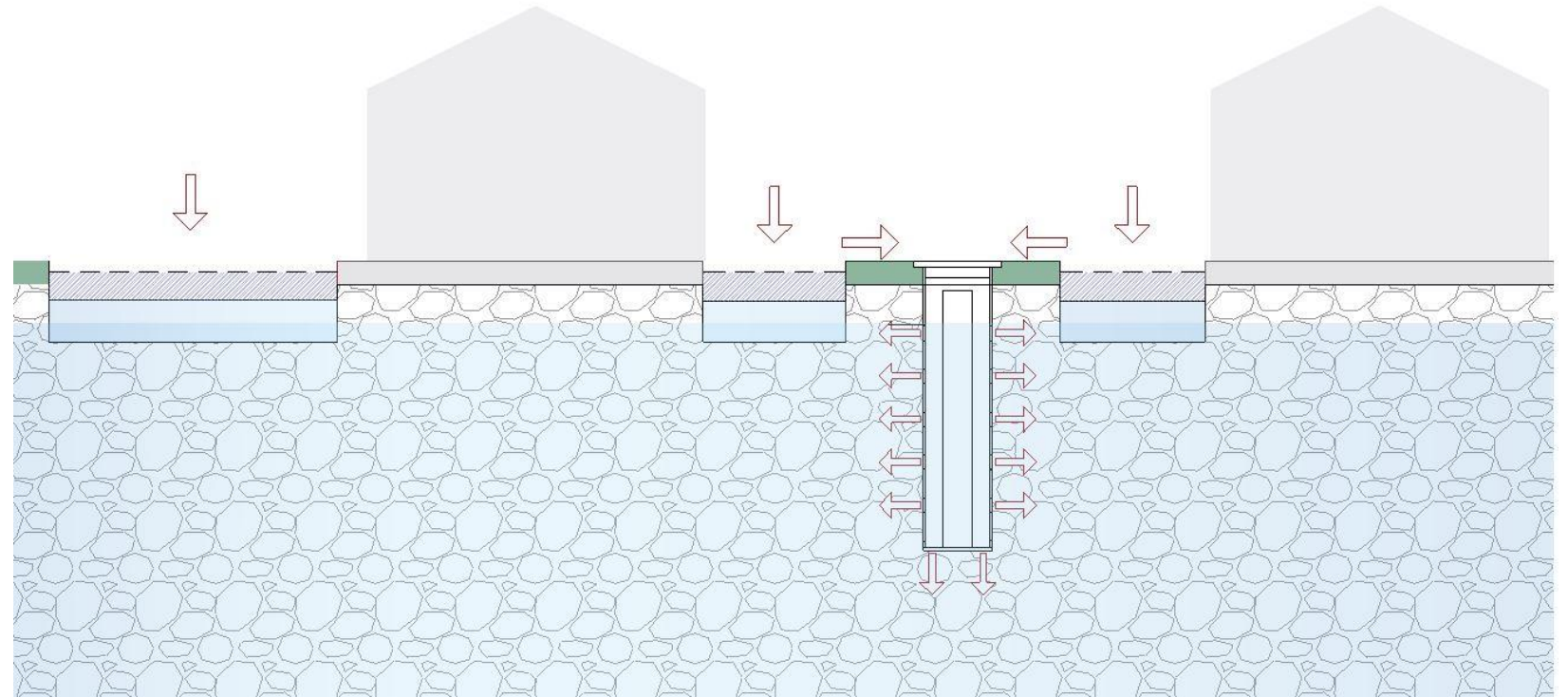


Diagram 21. Hydrogeological conclusions and design principles for the new water strategy. Source: author.

DESIGN PRINCIPLES TO IMPROVE HIDROGEOLOGICAL CONDITIONS ON SITE:

From the conclusions of the hydrogeological site analysis 3 design principles for the water strategy were extracted:

- The creation of green and blue surface areas to provide room for water.
- The new blue infrastructure will be connected to the water management system of canals.
- The new blue infrastructure will be connected to the water table.



SITE ANALYSIS

- General features of Hialeah & Miami Springs
- Urban fabric
- Land use analysis
- Public transit infrastructures
- Green infrastructure analysis
- Blue infrastructure analysis
- Transformable & non-transformable infrastructures
- Site analysis conclusions Hialeah
- Site analysis conclusions Miami Springs

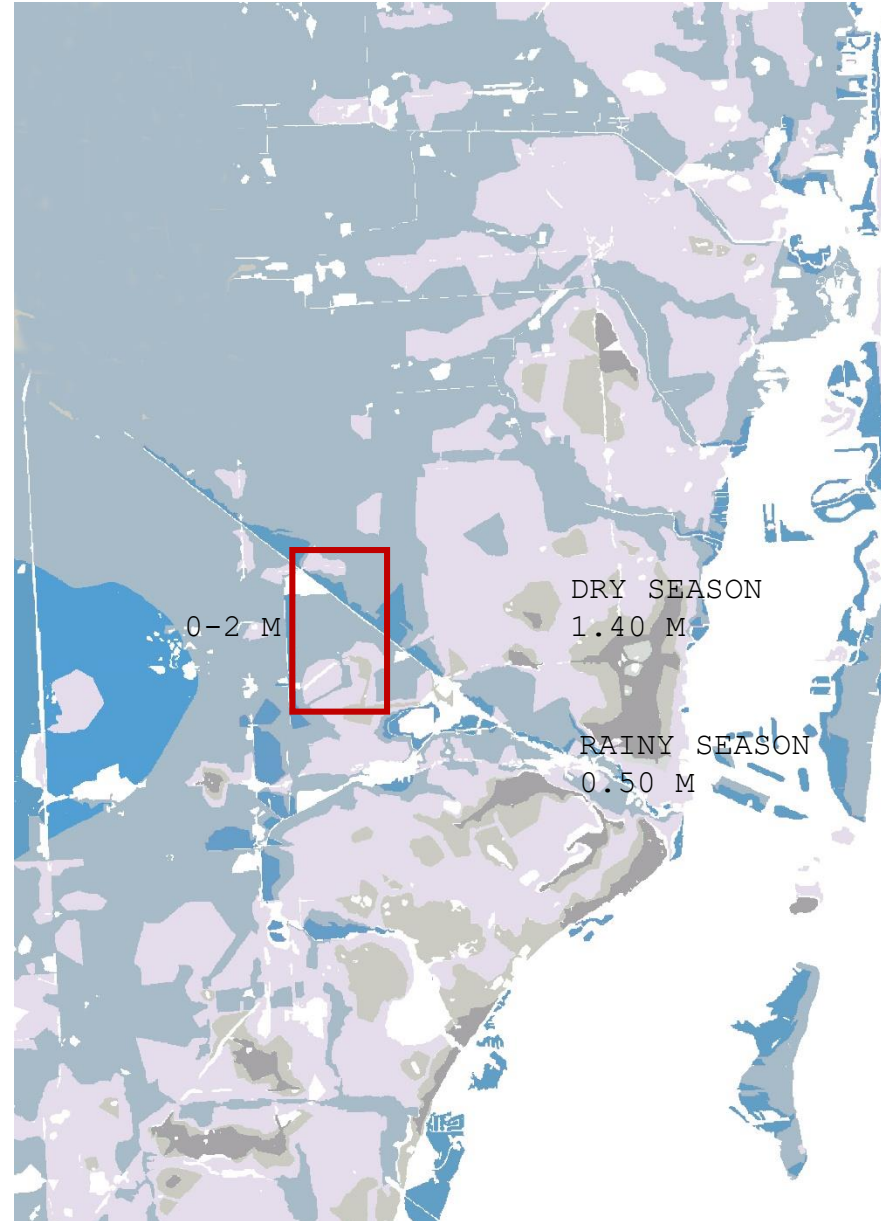
MIAMI SPRINGS



Images 20. Main entrance to Miami Springs. Source: author.



Chart 3. Miami Springs median household income and property value. Source: <https://datausa.io/profile/geo/hialeah-fl/?compare=miami-springs-fl>



ELEVATION MAP

HIALEAH



Image 21. Main entrance to the city of Hialeah, adjacent to the downtown area. Source: author.



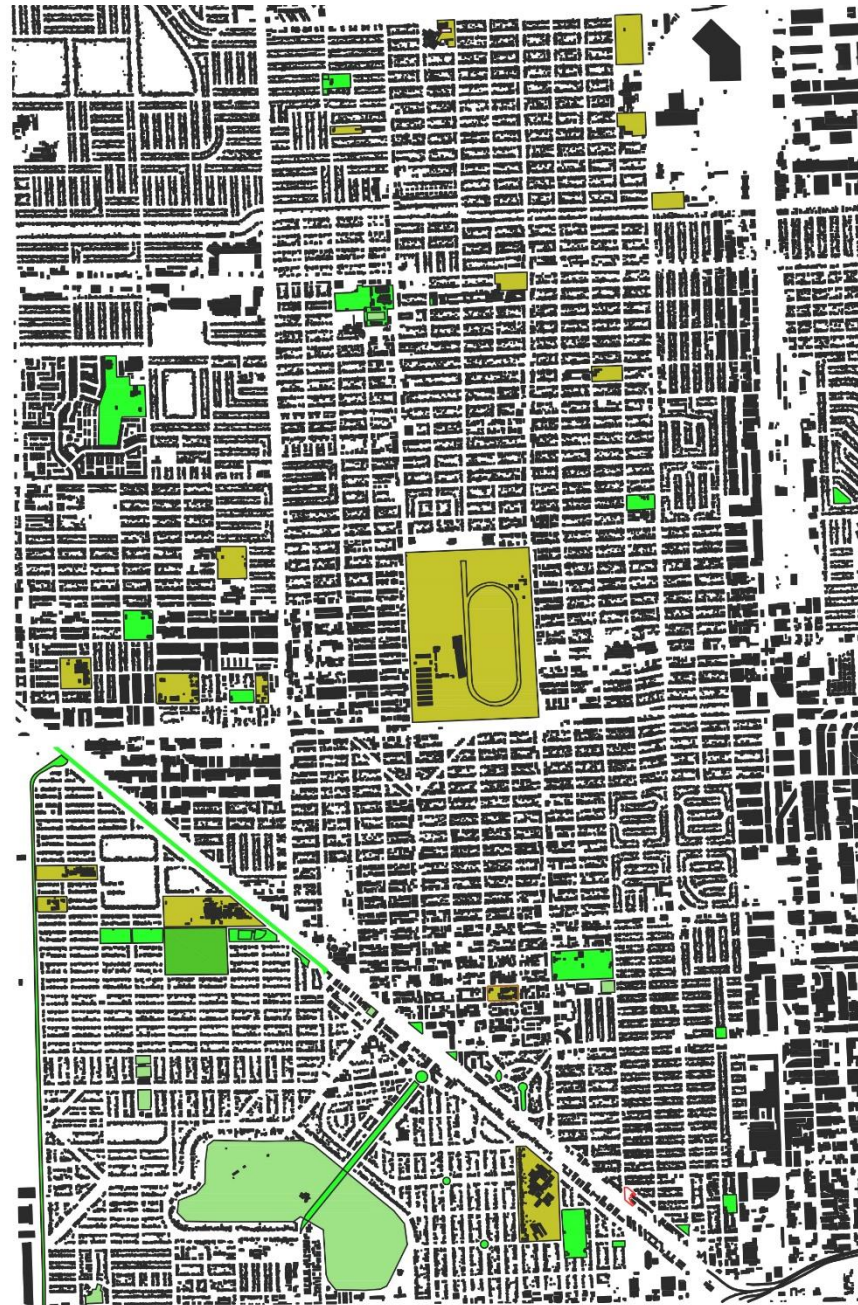
Chart 4. Hialeah median household income and property value. Source: <https://datausa.io/profile/geo/hialeah-fl/?compare=miami-springs-fl>



Image 22. Central block alleys in Miami Springs. Source: author.



Image 23. Central block alleys in Hialeah. Source: author.



Map 16. Urban fabric map of Hialeah and Miami Springs. Source: author

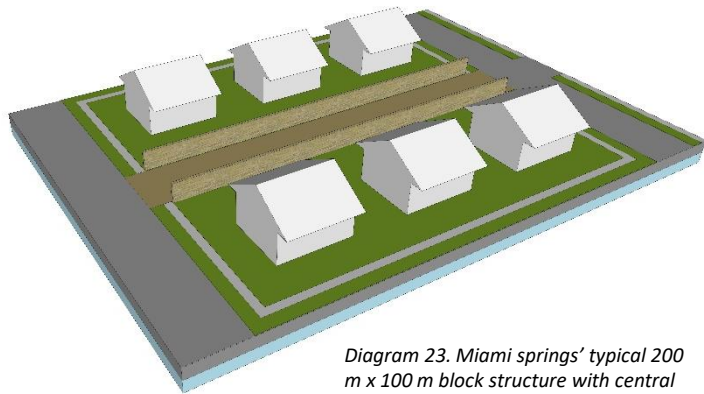


Diagram 23. Miami springs' typical 200 m x 100 m block structure with central back alley. Source: author.

Miami springs block structure
200 m x100 m

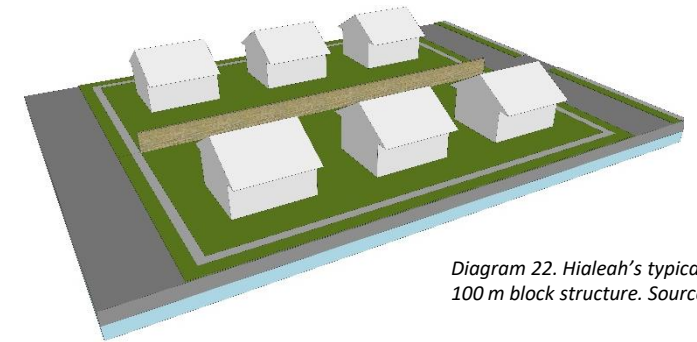


Diagram 22. Hialeah's typical 200 m x 100 m block structure. Source: author.

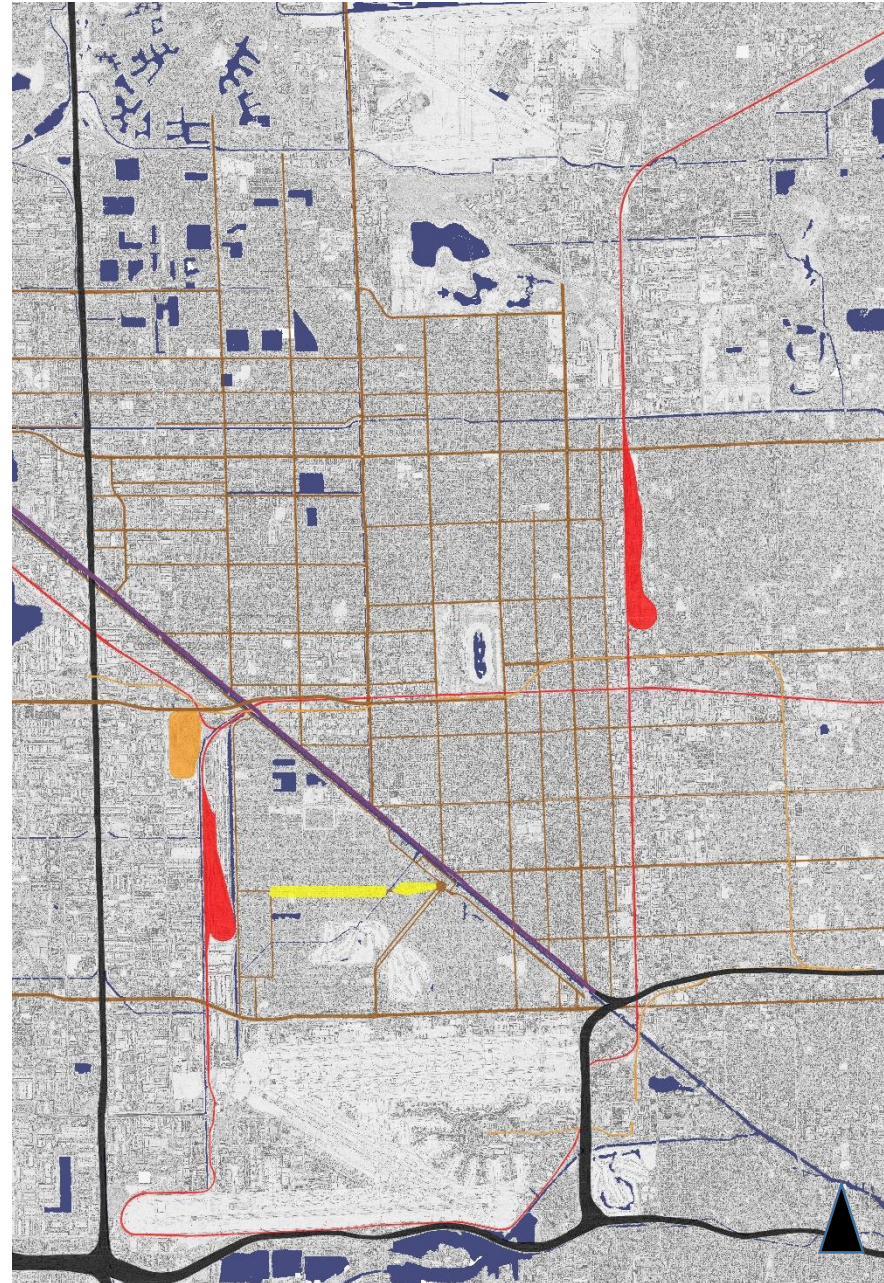
Hialeah block structure
200 m x100 m

TRANSIT INFRASTRUCTURE

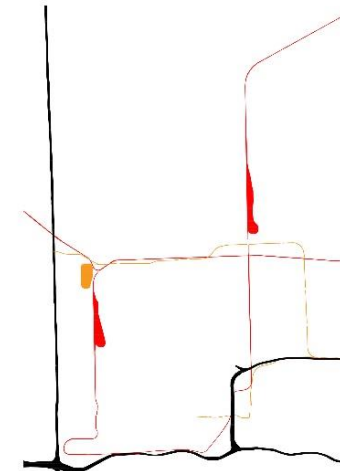


The public vehicular traffic networks of Hialeah and Miami Springs are composed by:

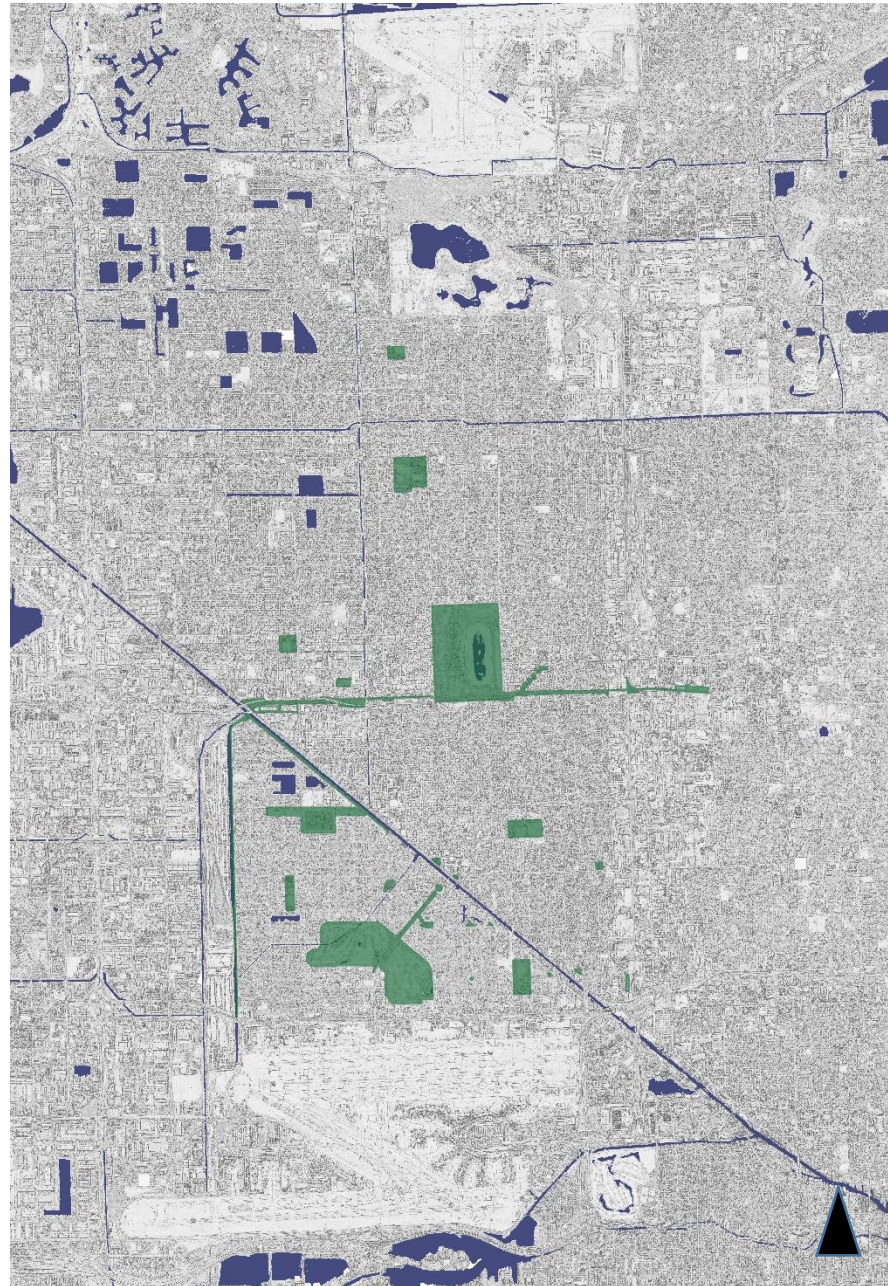
- A system of major and secondary roads:
- There are no highways that pass through the cities.
- A train and elevated metro rail systems
- There are no bicycle lanes in the cities and there is only one pedestrian boulevard in the city of Miami Springs.



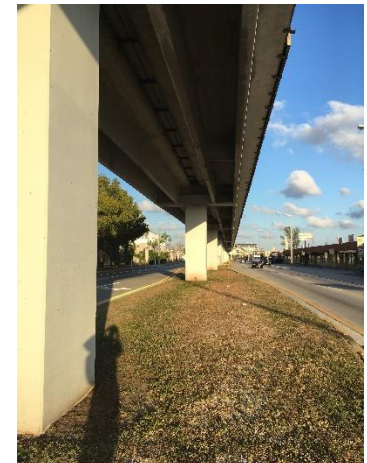
Map 20. Commercial buildings in Hialeah and Miami Springs. Source: author



GREEN INFRASTRUCTURE



GREEN INFRASTRUCTURE



TYPES OF GREEN PUBLIC SPACES

- BUFFER ZONES (HIALEAH)
- PARKS
- SPORTS FACILITIES
- ELECTRIC INFRASTRUCTURE (MIAMI SPRINGS)

BLUE INFRASTRUCTURE

- The blue infrastructure of Hialeah and Miami Springs consists of 5 canals that are part of the water management system of the Miami Dade County and a few lakes.
- From those 5 canals, The Little River Canal and one of its tributaries are located in Hialeah and two tributaries of the Miami Canal are located in Miami Springs. The Miami Canal passes through both cities and constitute the physical border between them.

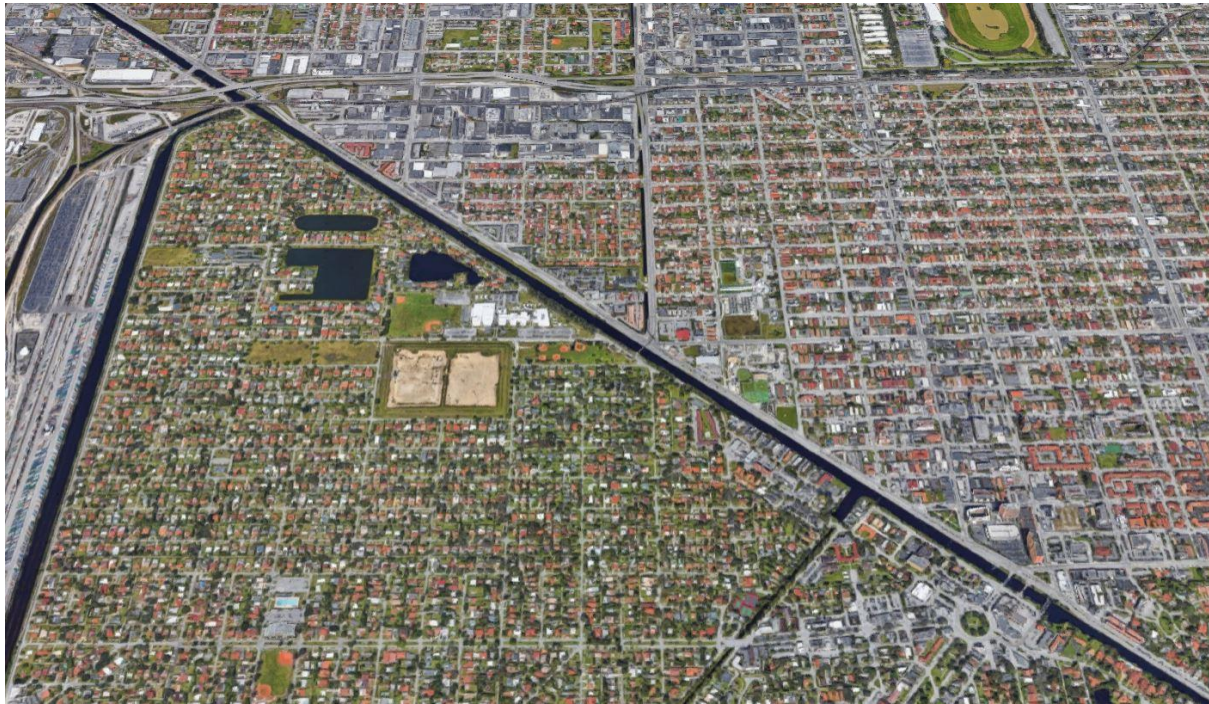
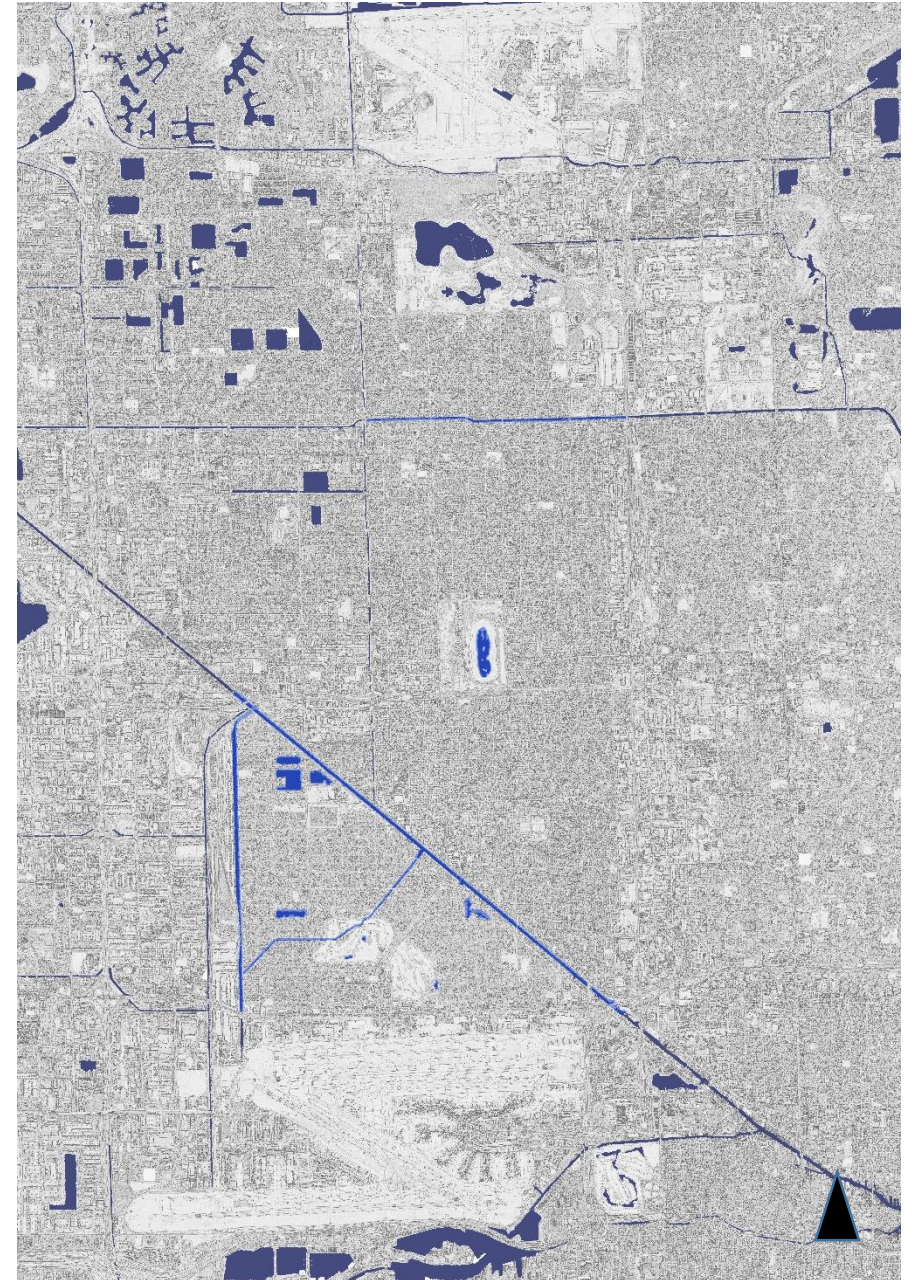
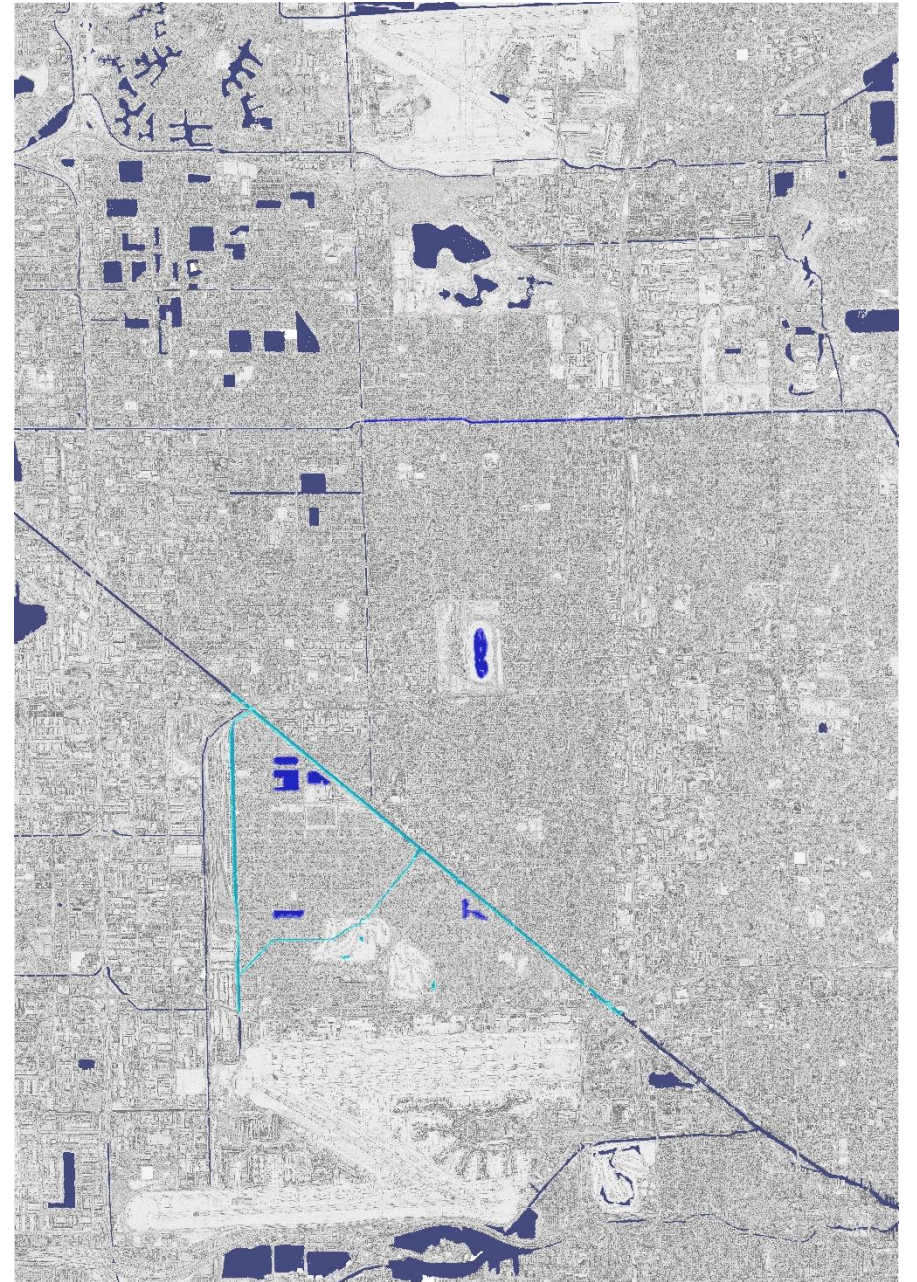


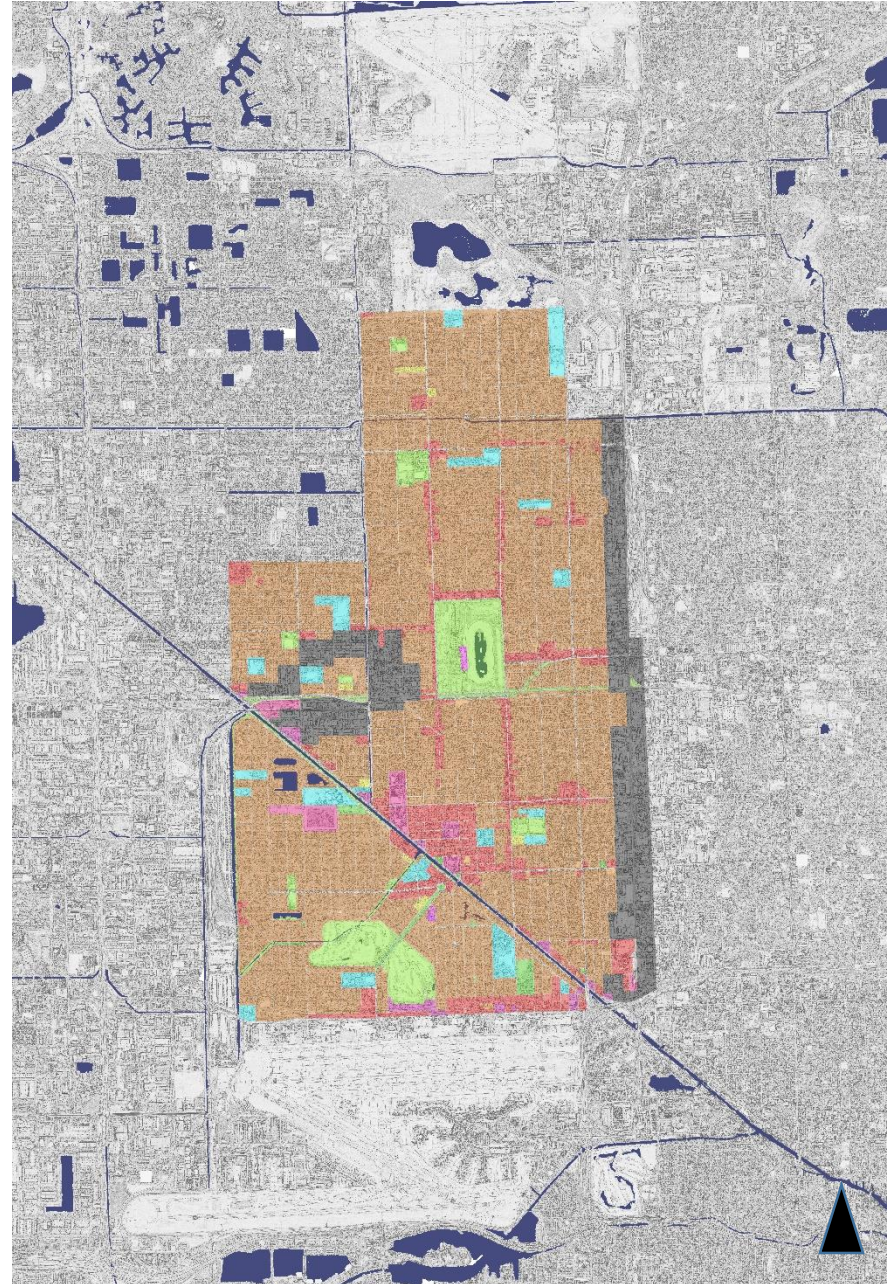
Image 56. The Miami Canal divides the cities of Hialeah and Miami Springs. It is connected to the secondary canals that transverse both cities. Source: Google maps.



BLUE INFRASTRUCTURE



LAND USE MAP



In terms of program or land use, both Hialeah and Miami Springs are mainly composed into:

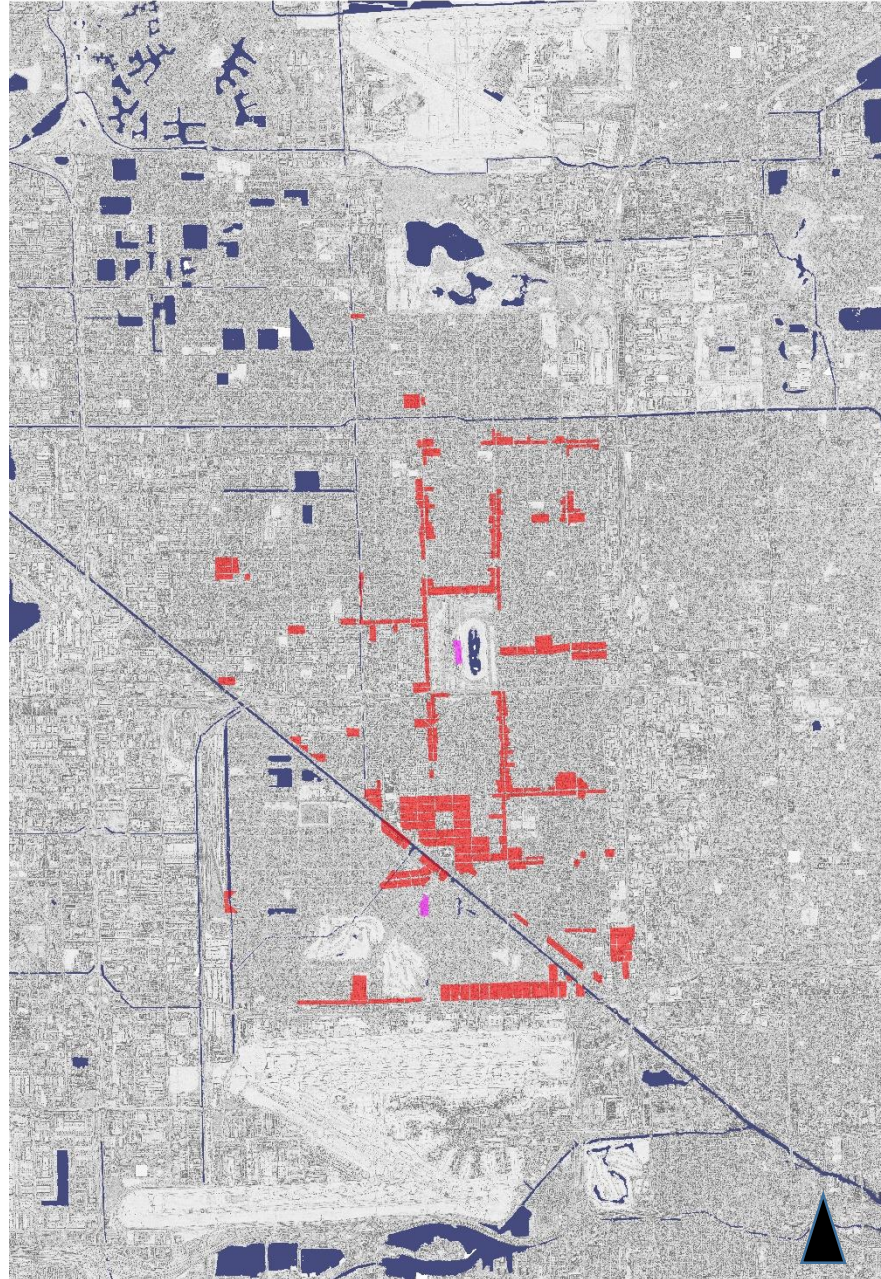
- Residential areas
- Commercial areas
- Educational buildings
- Religious buildings
- Community centers
- Government buildings and lots
- Recreation public and private spaces: clubs, parks and sports facilities
- Hotels

The city of Hialeah has two industrial areas



Map 17. Land use map of Hialeah and Miami Springs. Source: author

MIAMI SPRINGS

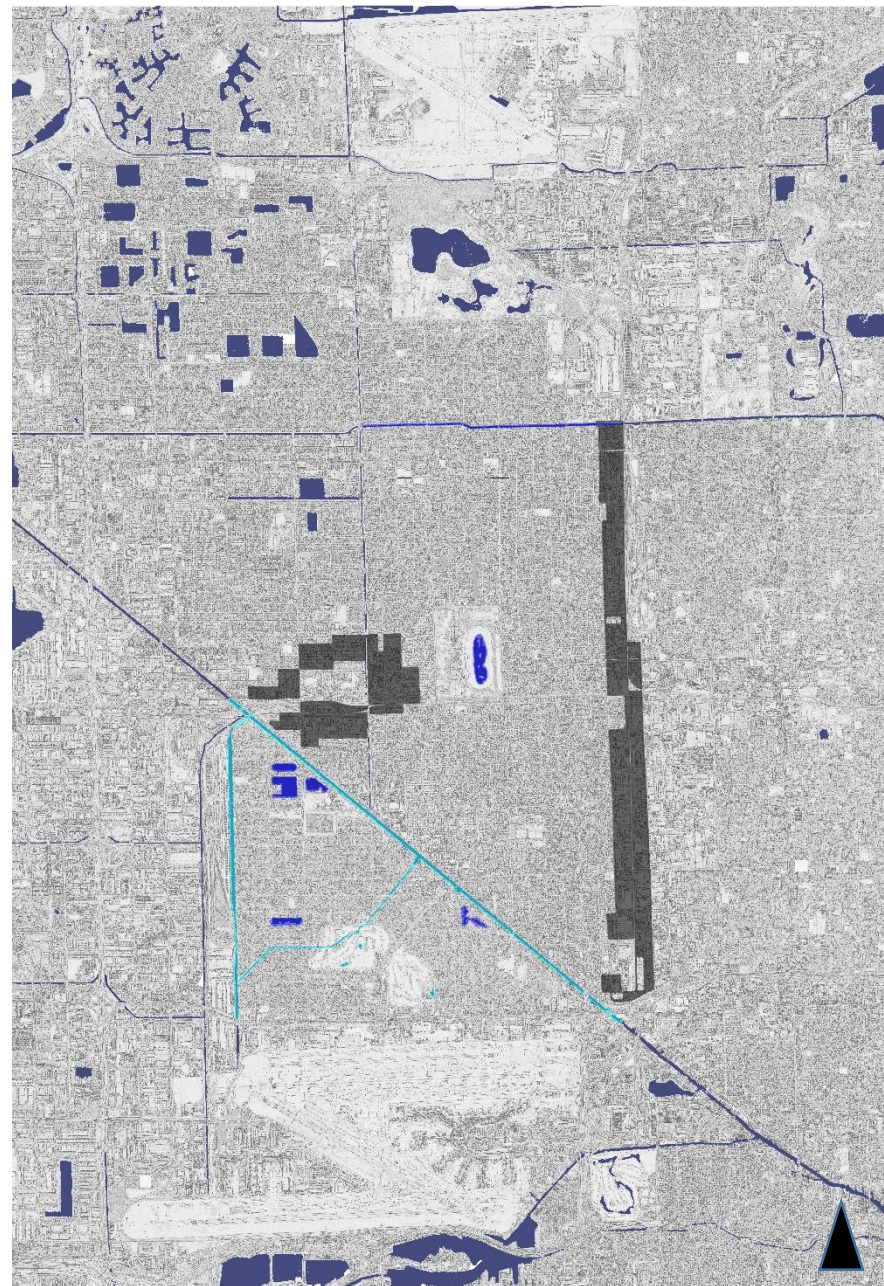


COMMERCIAL AREAS

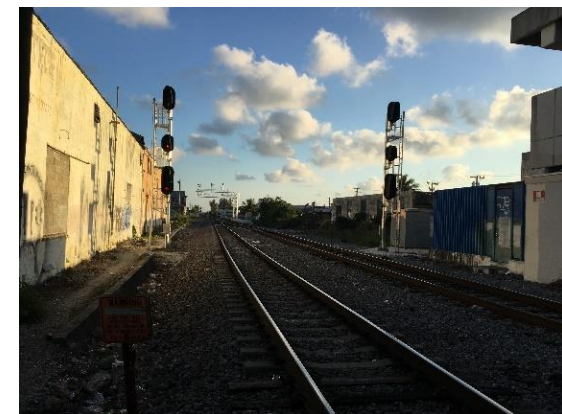
HIALEAH



INDUSTRIAL AREAS
HIALEAH



Map 21. Industrial areas in Hialeah. Source: author



TRANSFORMABLE AND NON TRANSFORMABLE INFRASTRUCTURES

Based on the site analysis, it can be concluded that regarding to public city infrastructures, these can be divided in transformable and non-transformable areas (map 29 & image 60).

In the case of Hialeah, minor secondary roads with lower traffic, as well as buffer zones for the train and elevated metro rail can be transformed into different types of spaces (map 31 & 32).

The vast green infrastructure of Miami Springs and a network of vehicular service alleys also offer potentials for transformation (maps 30 & 31).

Most of the blue infrastructure is non transformable since it is bounded by private property and it is also part of the Miami Dade water management system. Moreover, there is an urgent need to expand the blue system in both cities.



Map 29. Urban public infrastructures of Hialeah and Miami Springs. Source: author

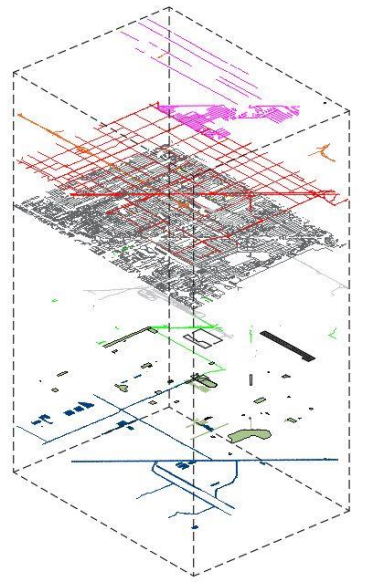
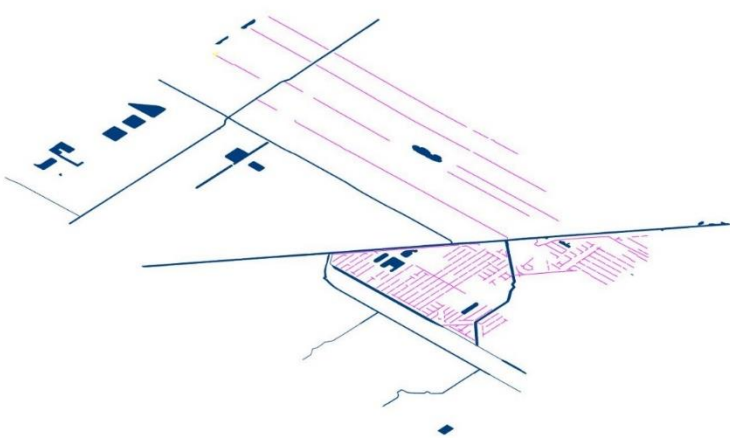


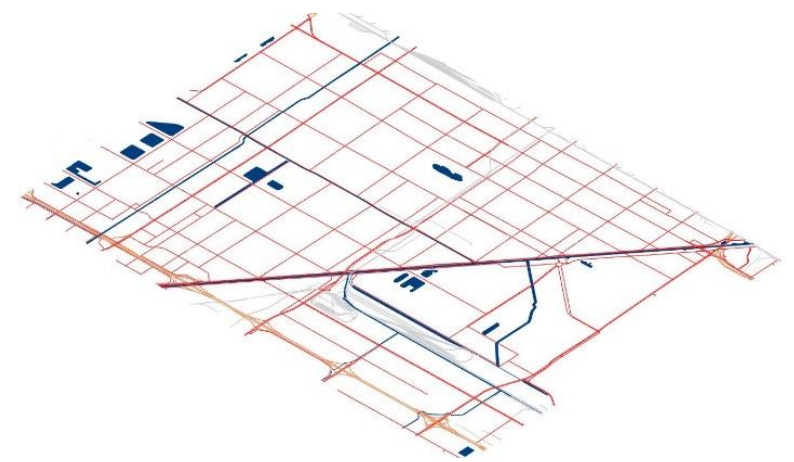
Image 60. Layers of urban infrastructures of Hialeah and Miami Springs. Source: author



Map 30. Green and blue public and semi public infrastructures of Hialeah and Miami Springs. The blue infrastructure is non transformable, while there is a major opportunity for the transformation of the green infrastructure into a more sustainable and ecologic urban landscape. Source: author



Map 31. Transformable public vehicular infrastructure of Hialeah and Miami Springs. Hialeah: secondary north to south two way secondary roads. Miami Springs: back service alleys for garbage recollection Source: author



Map 32. Non transformable public traffic infrastructures of Hialeah and Miami Springs. The train and metro rail transportation systems, as well as the main roads are non transformable urban structures. However, the buffer zones adjacent to the train tracks and the space beneath the elevated metro line constitute an opportunity to improve the urban landscape Source: author



THEORETICAL FRAMEWORK

- Theoretical background
- Case studies
- Conclusions (initial strategies and design principles)

THEORETICAL FRAMEWORK



LANDSCAPE URBANISM



LANDSCAPE AS INFRASTRUCTURE



RECUPERATION
OF ECOSYSTEM SERVICES

THEORETICAL FRAMEWORK



LANDSCAPE URBANISM

- To remediate local social existing problems and deficiencies through the urban landscape



LANDSCAPE AS INFRASTRUCTURE

- Explore the potentials of 3 urban landscape infrastructure that can work in an interdisciplinary way: transport, green, and water in order to implement strategies and tangible solutions for traffic, public space connectivity, ecologic and water management issues



RECUPERATION
OF ECOSYSTEM SERVICES

- Implement a healthy green and green-blue infrastructures to provide ecological services that are highly cost effective, flexible and reliable
- To provide multiple hazard regulation functions through natural systems

THEORETICAL FRAMEWORK



LANDSCAPE URBANISM

SOCIAL STRATEGY:

- New programmatic public & private spaces that respond to current social needs



LANDSCAPE AS INFRASTRUCTURE

WATER STRATEGY:

- A supportive water management system through the public space network to mitigate floods
- **LAND STRATEGY:** physical connection of public spaces through alternative transit systems



RECUPERATION
OF ECOSYSTEM SERVICES

WATER STRATEGY:

- The implementation of natural resilient and sustainable public spaces to mitigate floods

SOCIAL STRATEGY:

- Improve the socio ecological features of the urban landscape

THEORETICAL FRAMEWORK



LANDSCAPE URBANISM

DESIGN PRINCIPLE:

- More public space (Hialeah)



LANDSCAPE AS INFRASTRUCTURE

• **DESIGN PRINCIPLE:**

- To create surface room for rainwater through public space(quantitative aspect)

• **DESIGN PRINCIPLE:**

- Create a transit system for cyclists
- Improve the pedestrian transit network



RECUPERATION OF ECOSYSTEM SERVICES

DESIGN PRINCIPLES:

- New blue and green system
- Natural water detention, retention, purification and infiltration area (qualitative aspects)

DESIGN PRINCIPLE:

- Increase biodiversity

POTENTIAL AREAS OF INTERVENTION



- Potential areas of intervention (general)
- Description of the potential areas for intervention in Hialeah
- Description of the potential areas for intervention in Miami Springs

SOURCE: AUTHOR

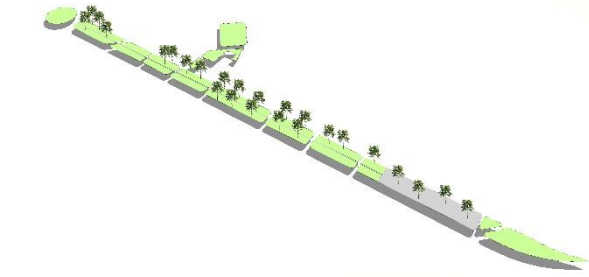


Diagram 27. Potential # 5: Central linear park, pocket and square parks. Source: author.

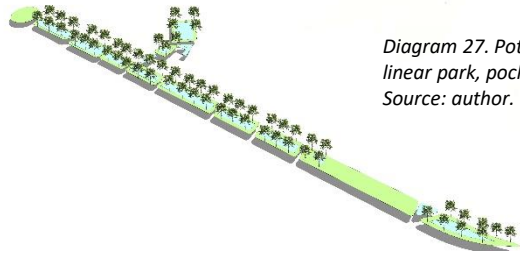


Diagram 28. Potential # 6: The blocks located below the high voltage electricity and canal banks. Source: author.

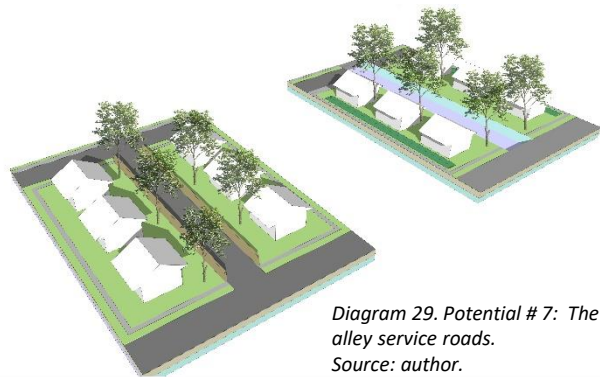
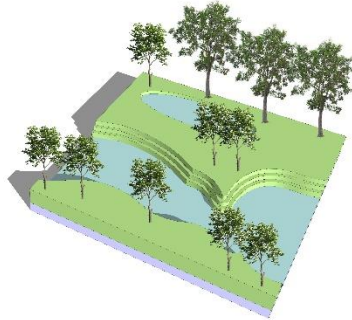
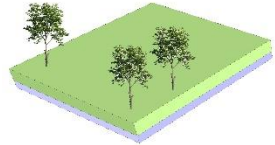
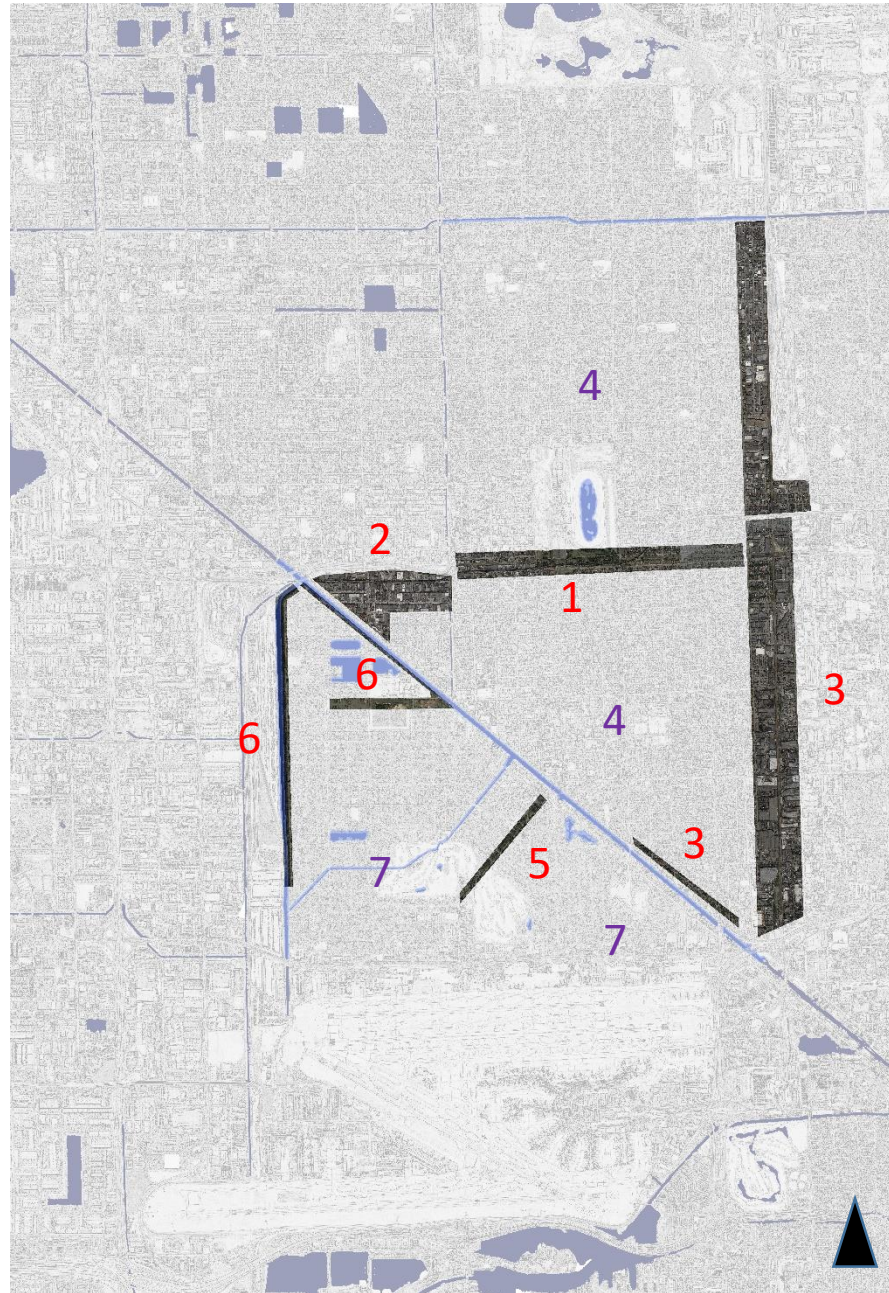


Diagram 29. Potential # 7: The back alley service roads. Source: author.



Map 37. Potential areas for intervention in Hialeah and Miami Springs. Source: author

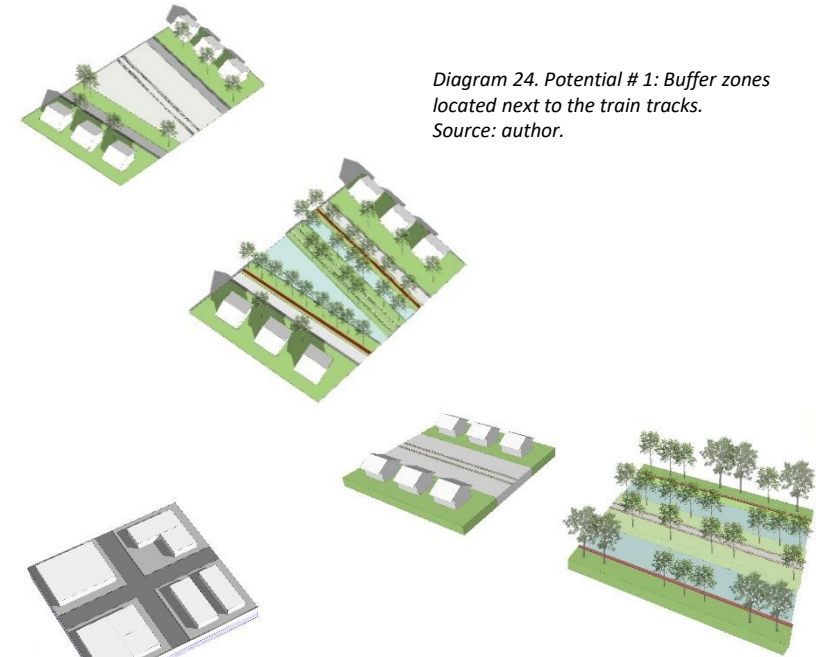


Diagram 24. Potential # 1: Buffer zones located next to the train tracks. Source: author.

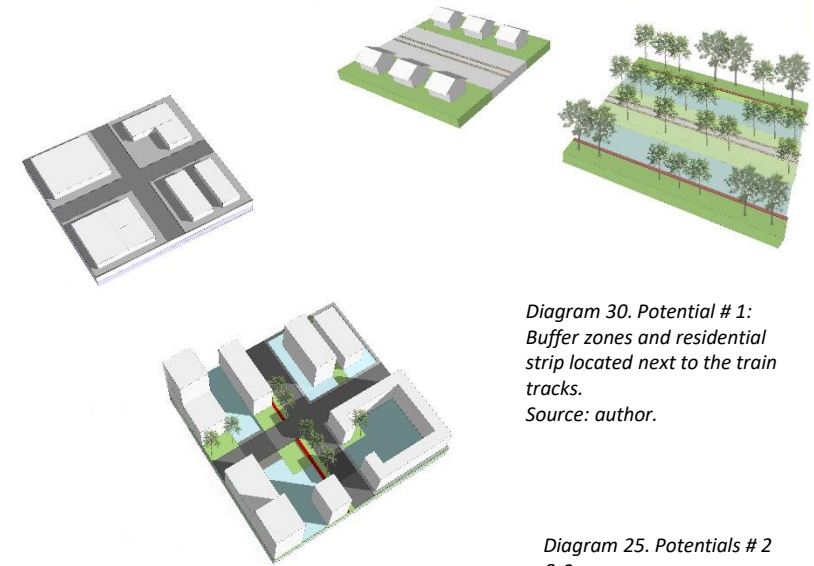


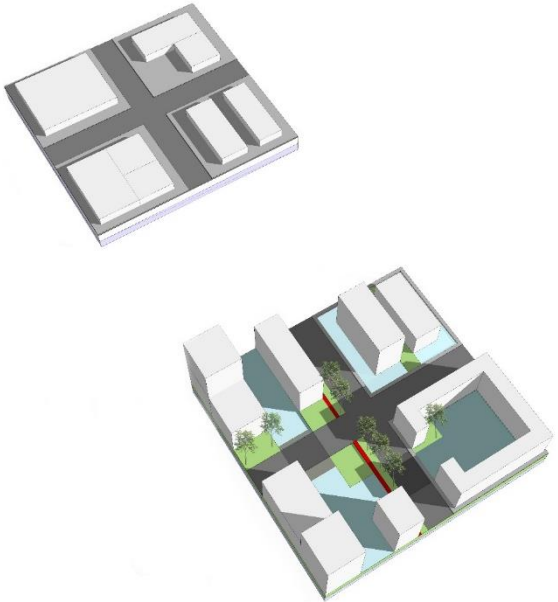
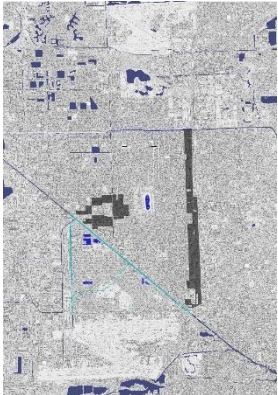
Diagram 30. Potential # 1: Buffer zones and residential strip located next to the train tracks. Source: author.



Diagram 26. Potential # 4: Minor vehicular city roads that run north to south. Source: author.

Diagram 25. Potentials # 2 & 3:
-East industrial district.
-West industrial district.
Source: author.

HIALEAH: POTENTIAL AREA 1

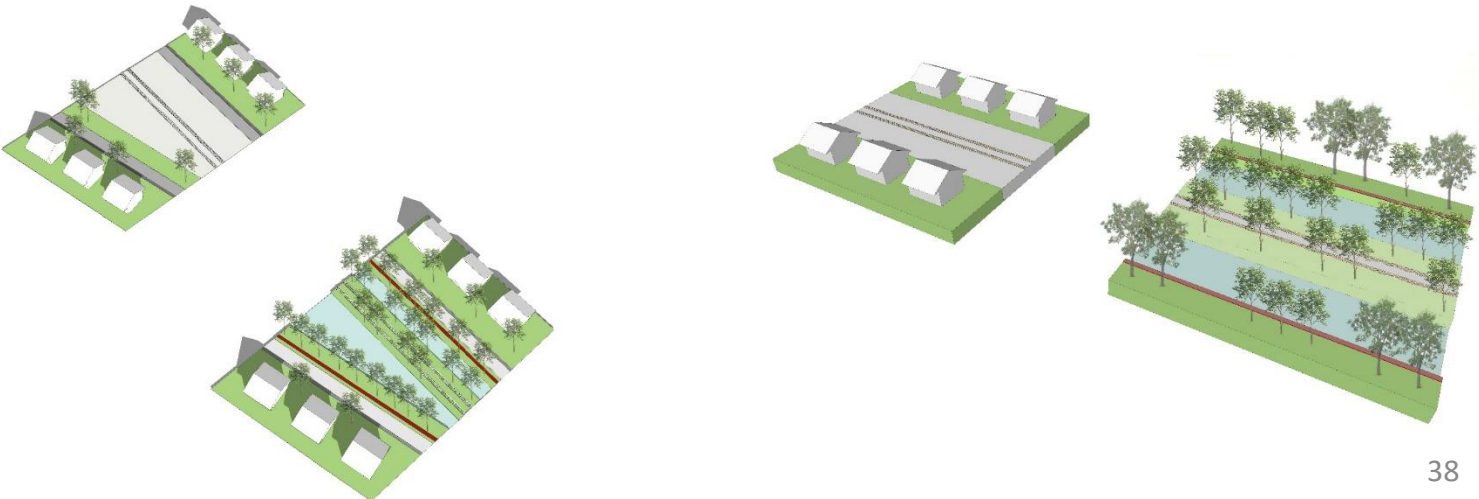


REDEVELOPMENT OF THE EAST INDUSTRIAL DISTRICT

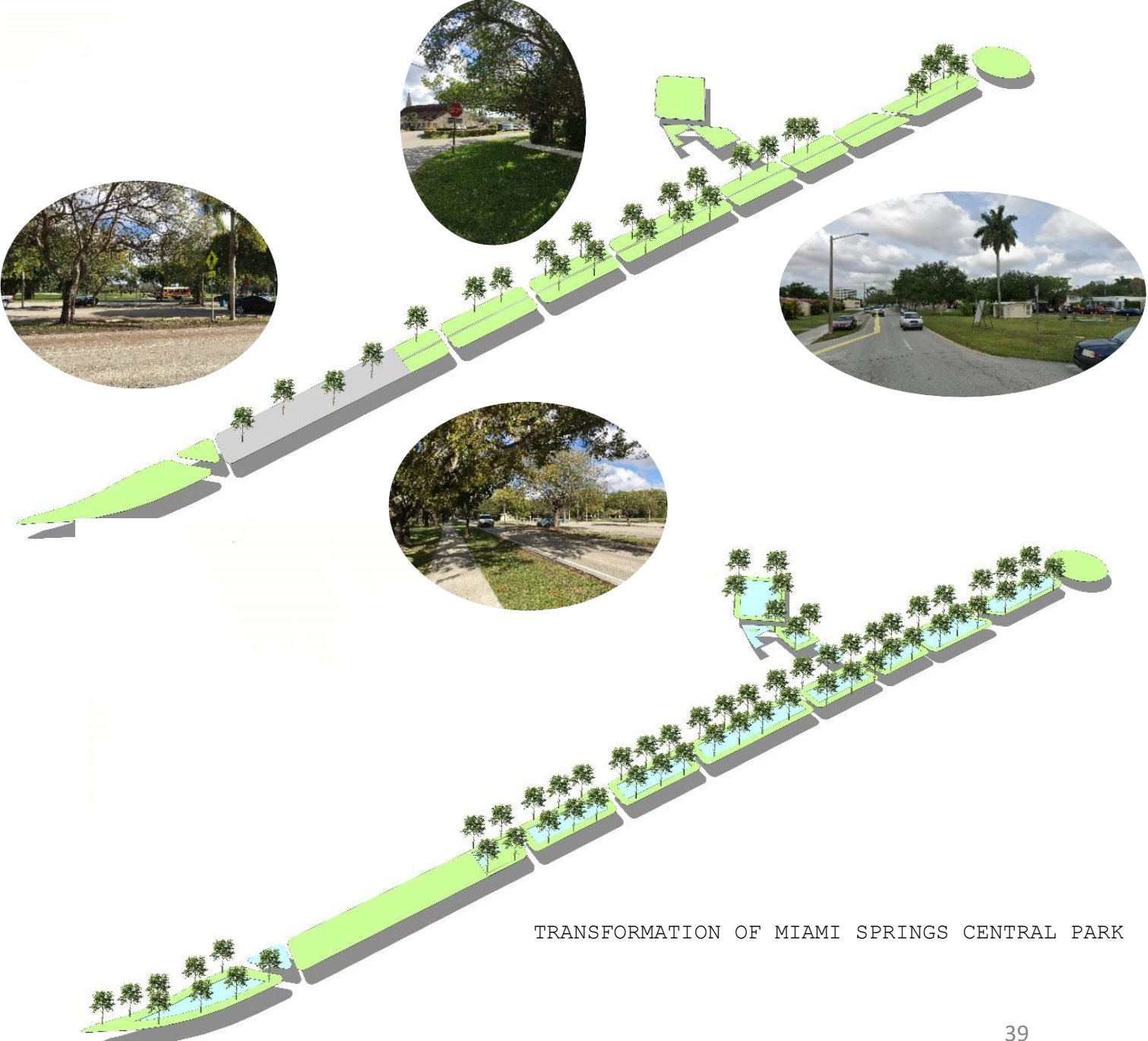




TRANSFORMATION OF BUFFER
ZONES ADJACENT TO TRAIN & METRORAIL

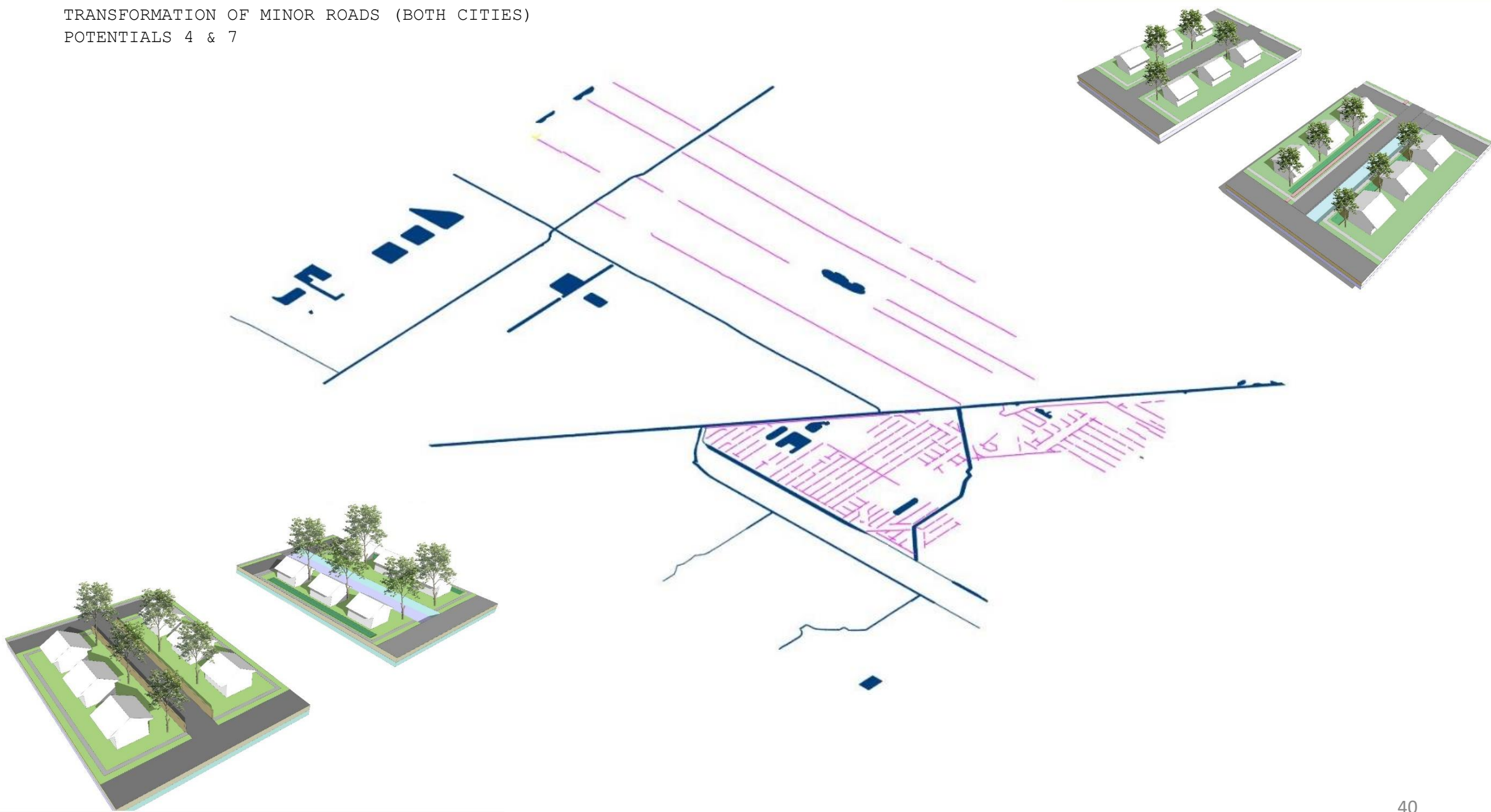


MIAMI SPRINGS:
POTENTIAL AREA 5



TRANSFORMATION OF MIAMI SPRINGS CENTRAL PARK

TRANSFORMATION OF MINOR ROADS (BOTH CITIES)
POTENTIALS 4 & 7



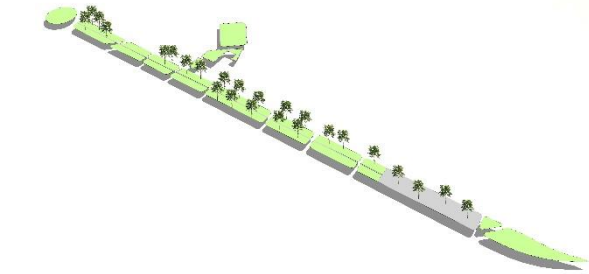


Diagram 27. Potential # 5: Central linear park, pocket and square parks. Source: author.

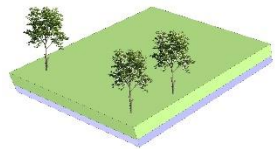
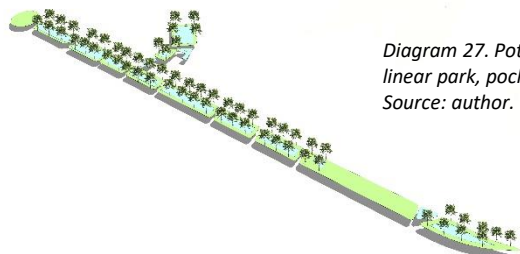


Diagram 28. Potential # 6: The blocks located below the high voltage electricity and canal banks. Source: author.

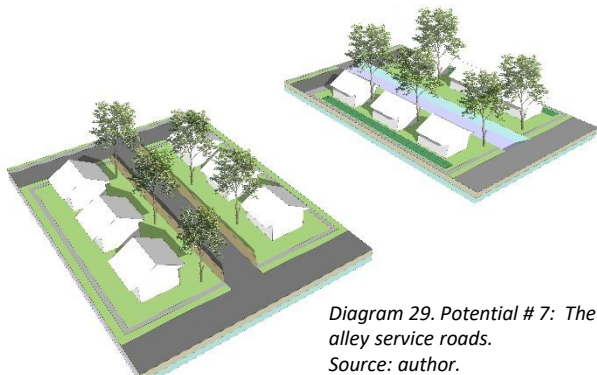
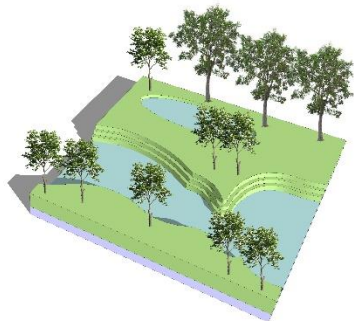
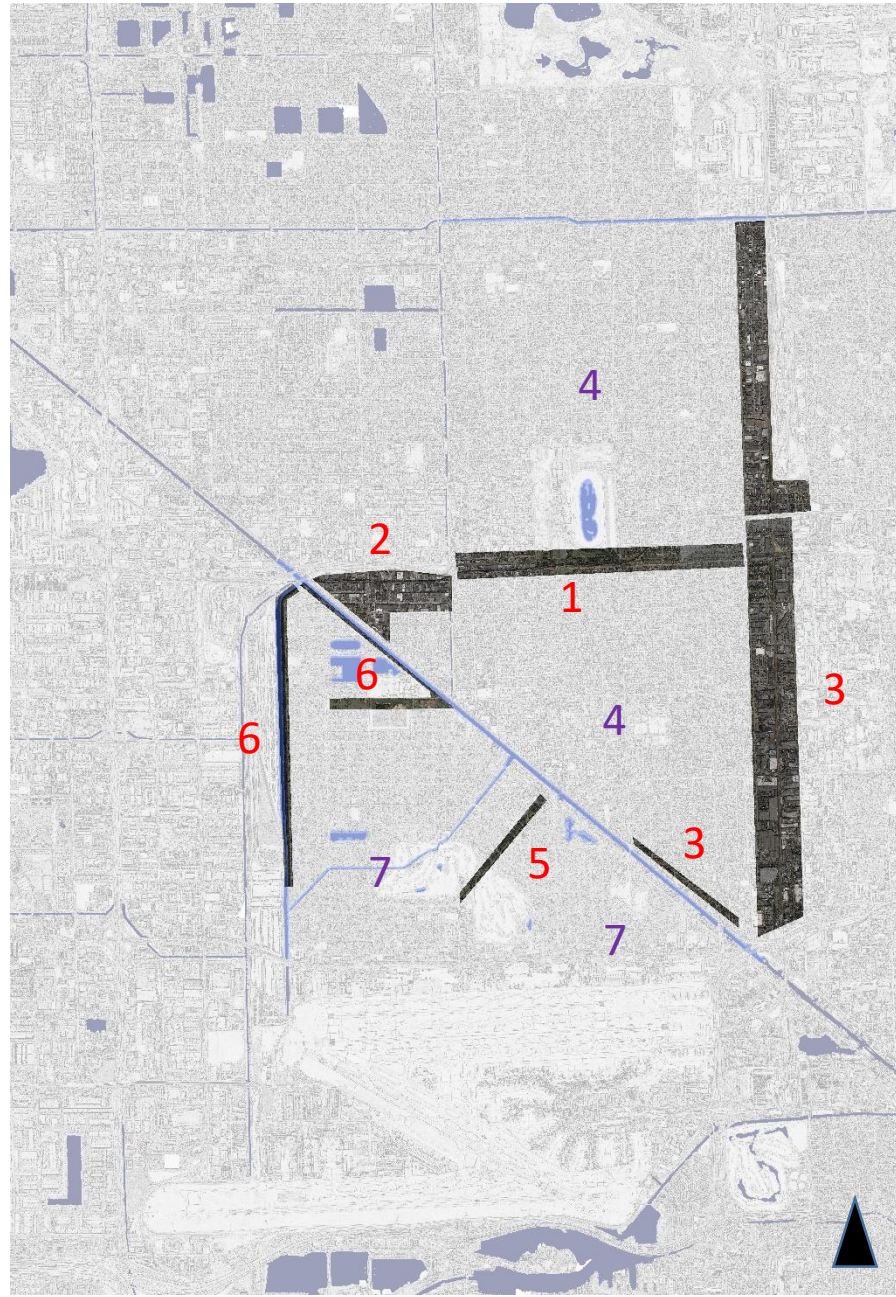


Diagram 29. Potential # 7: The back alley service roads. Source: author.



Map 37. Potential areas for intervention in Hialeah and Miami Springs. Source: author

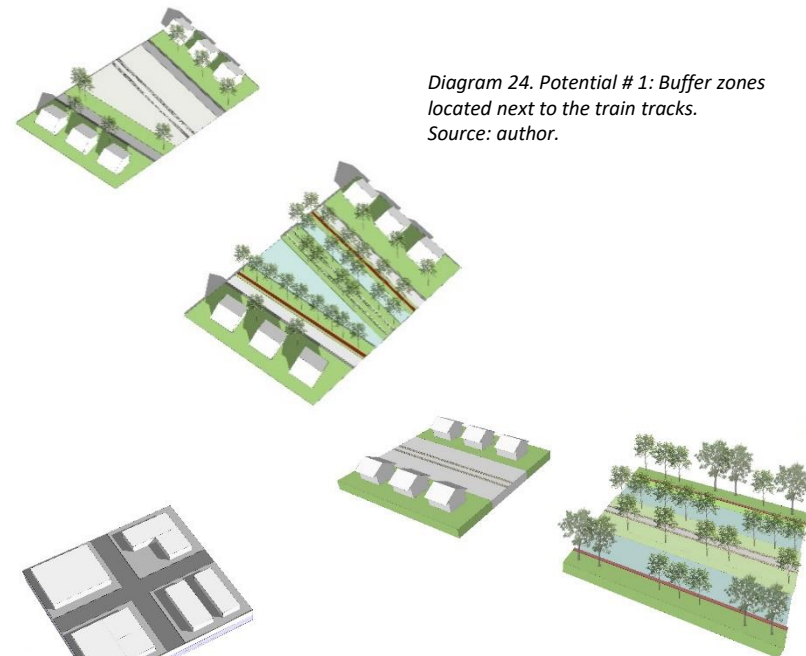


Diagram 24. Potential # 1: Buffer zones located next to the train tracks. Source: author.

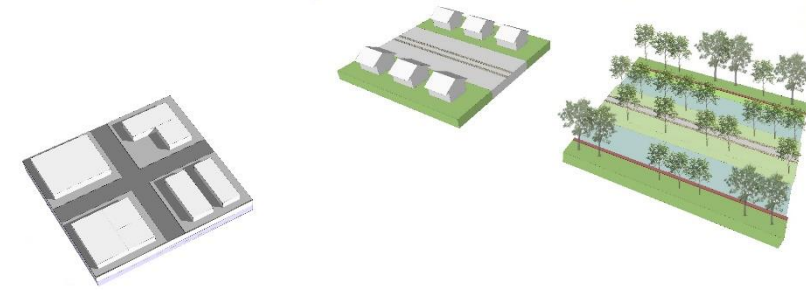


Diagram 30. Potential # 1: Buffer zones and residential strip located next to the train tracks. Source: author.

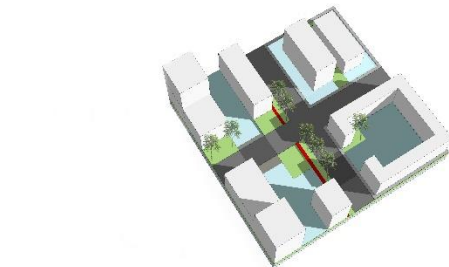
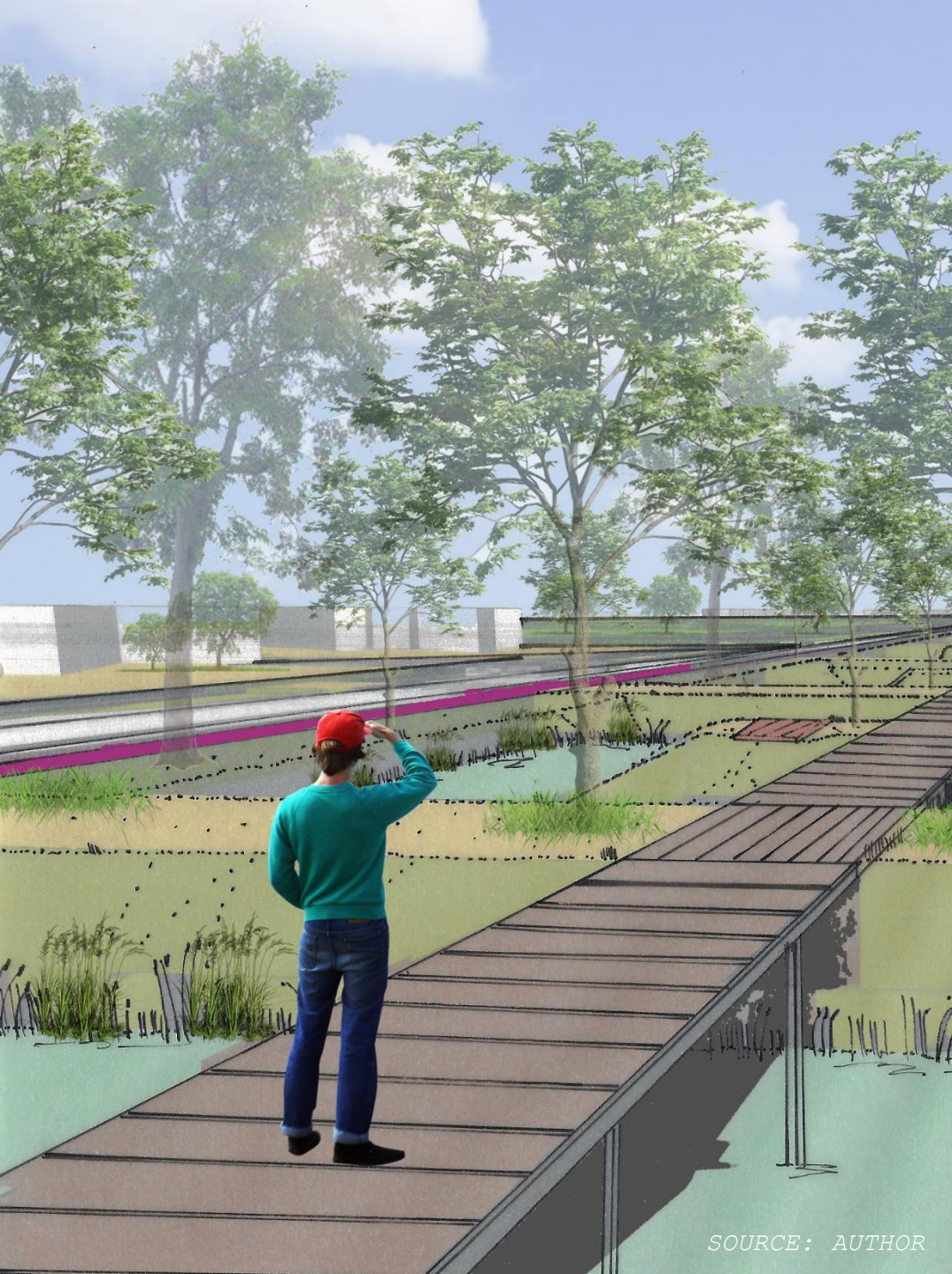


Diagram 25. Potentials # 2 & 3:
-East industrial district.
-West industrial district. Source: author.



Diagram 26. Potential # 4: Minor vehicular city roads that run north to south. Source: author.



DESIGN

- Vision
- Strategies and design principles
- Phasing plan
- Stakeholders
- Master plans
- Sections
- Impressions
- Water storage calculations

STRATEGIES AND DESIGN PRINCIPLES

There are 3 strategies to be implemented in the vision, master plans and the design of different spaces of the project, in order to improve the public urban landscape of the cities of Hialeah and Miami Springs:

- **WATER STRATEGY (HYDROGEOLOGICAL FEATURES)**

This strategy would improve the detention, retention, purification and infiltration capacities of rainwater through the public space network and contribute to produce a resilient and sustainable blue and green system to mitigate urban floods.

The main design principle is the introduction of a blue and green urban system in both cities. Other design principles that derive from the main one are:

- The new blue infrastructure would be connected to the existing water management system of canals.
- The new bodies of water would be unconfined and connected to the water table.
- The creation of blue surface areas to provide room for water.
- The introduction of wetlands to purify and delay infiltration of rainwater

- **LAND STRATEGY (PHYSICAL FEATURES)**

This strategy would improve the public space physical connections within and between the 2 cities.

The main design principle is to introduce a pedestrian and bicycle transit system for both cities. Other design principles that derive from the main one are:

- bicycle connections to the train and metro stations of Hialeah within the neighborhood and from the city of Miami Springs to avoid driving to the stations.
- The alternative transit system would connect all the potentials areas of redevelopment.

- **PROGRAMMATIC STRATEGY (SOCIAL AND SOCIO ECOLOGICAL FEATURES)**

This strategy would introduce new programmatic spaces and functions through the private and public urban landscape.

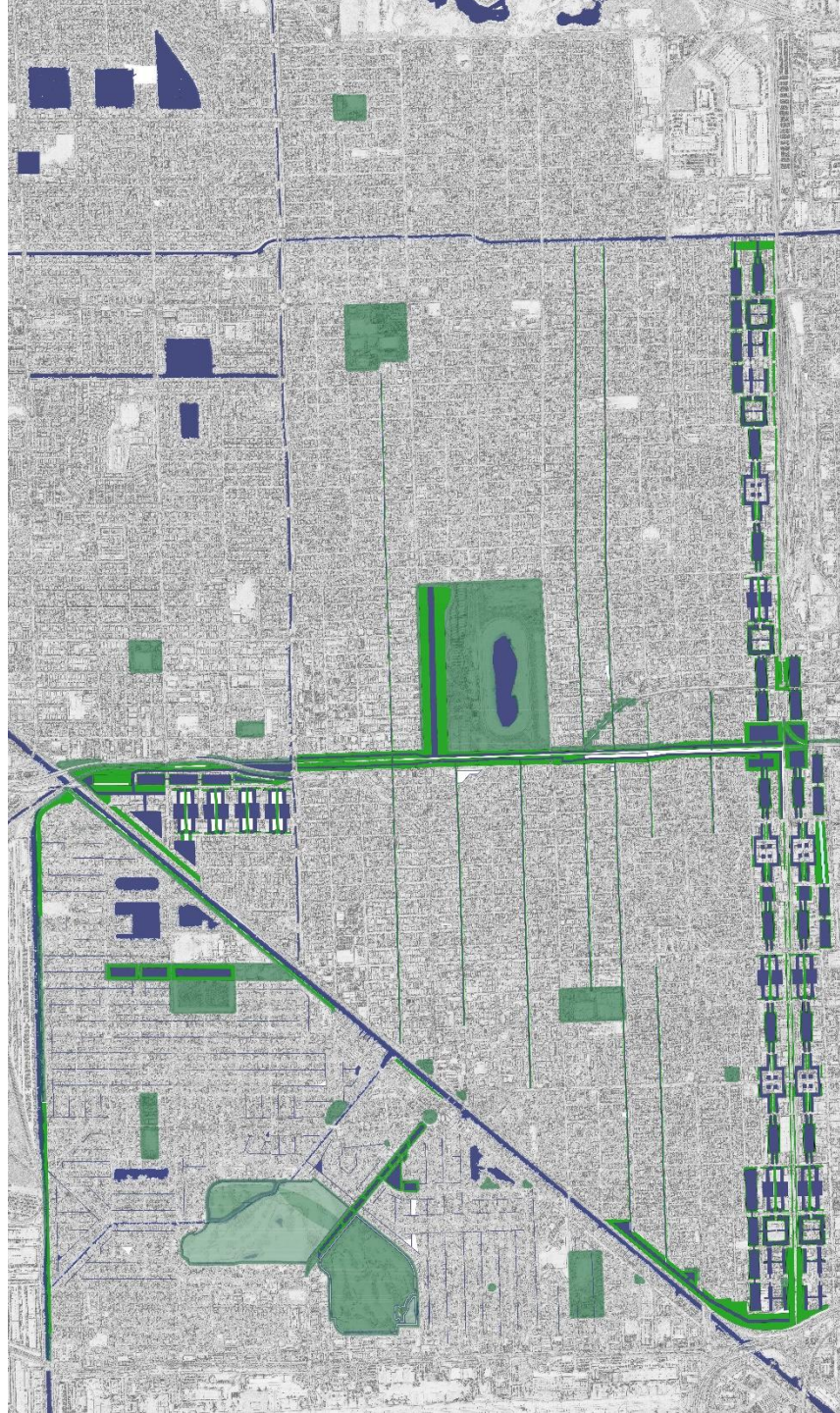
The design principles for both cities are:

- To increase biodiversity in public spaces.

The design principles for Hialeah:

- Increase the amount of usable public space.
- Provide affordable housing for young adults
- Create public gathering spaces: public city market and city squares
- Introduce cultural facilities: space for micro theater, museum, and city library.

PROPOSED NEW GREEN AND BLUE SYSTEM

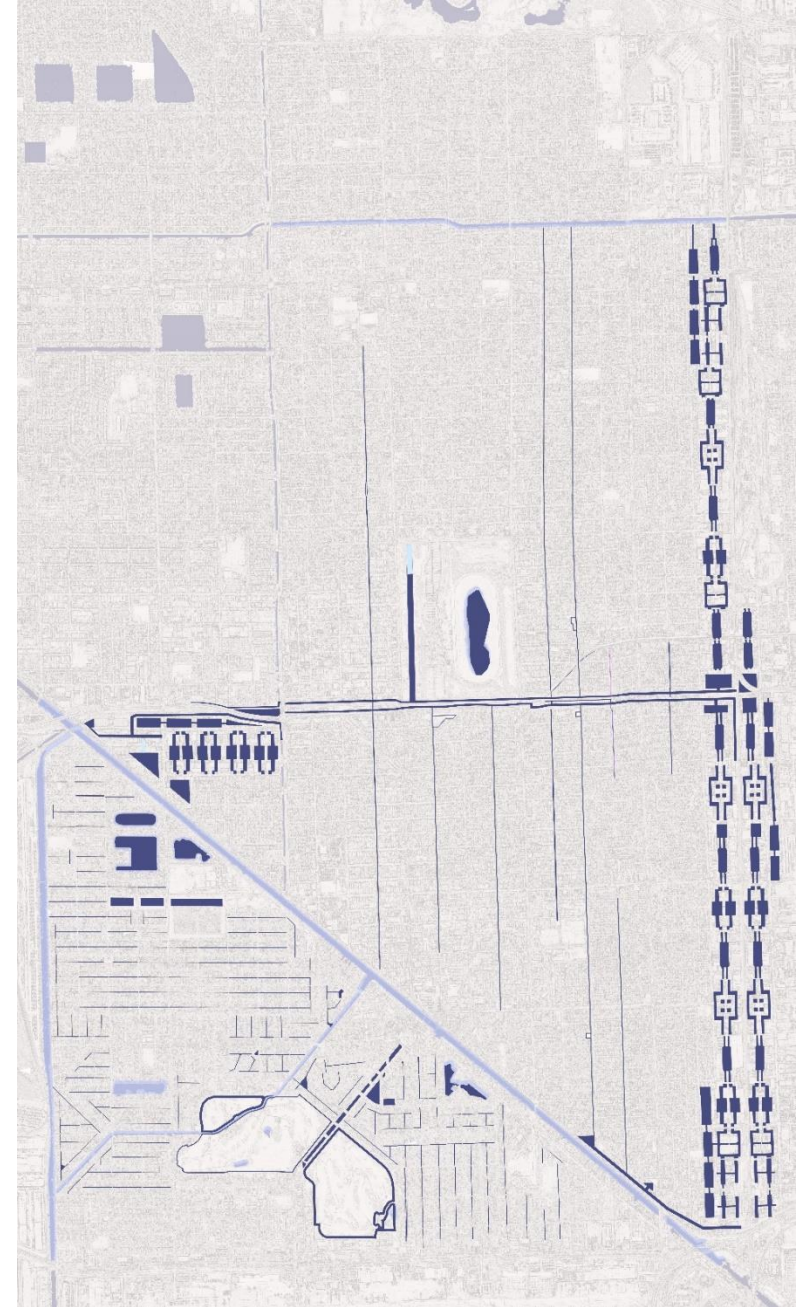


VISION

BLUE INFRASTRUCTURE
EXISTING & NEW

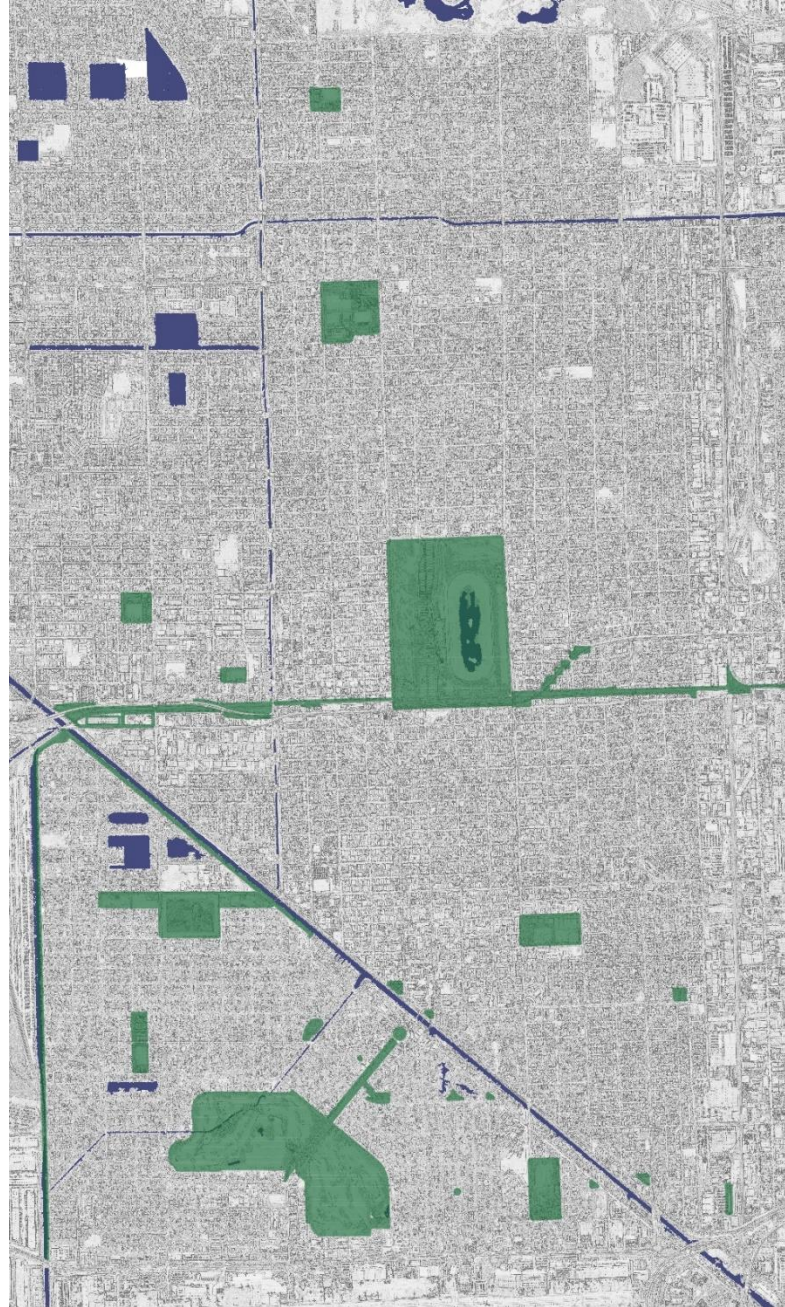


EXISTING BLUE INFRASTRUCTURE

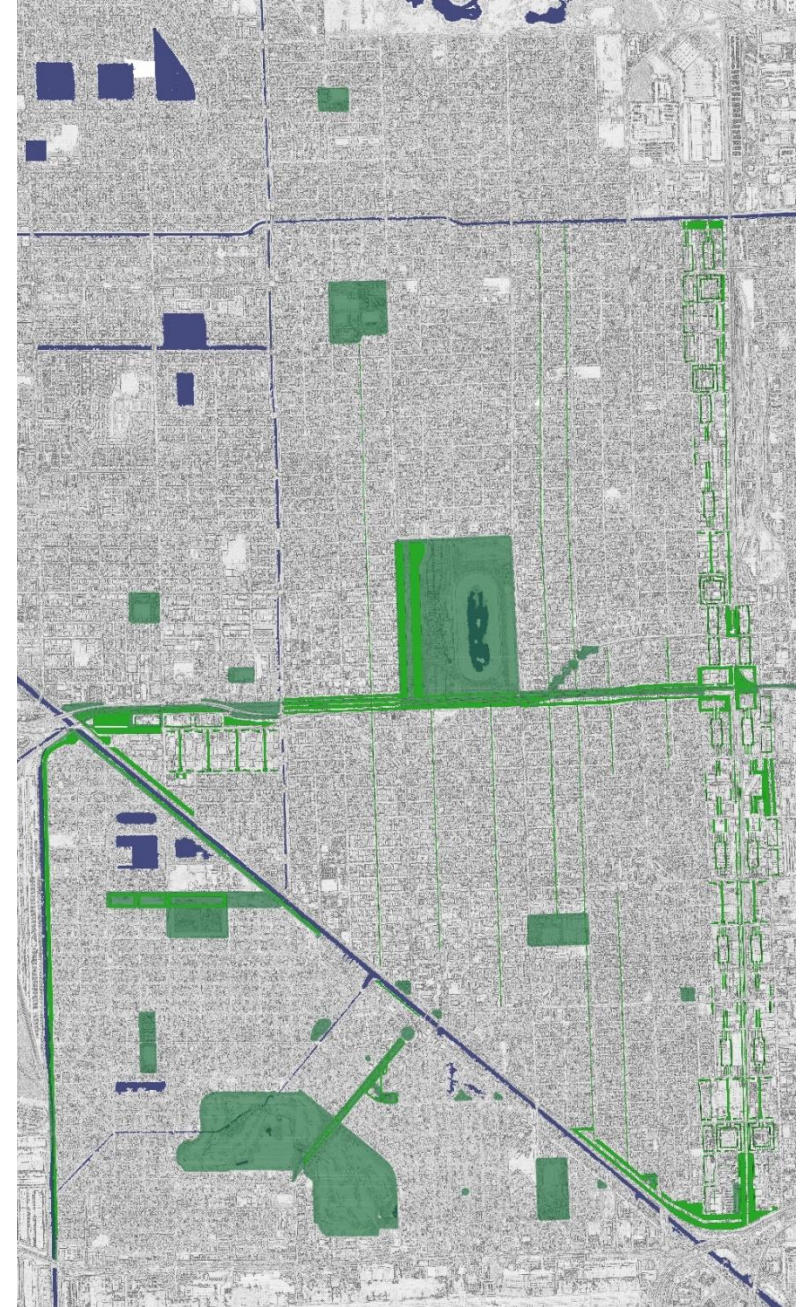


PROPOSED BLUE INFRASTRUCTURE

GREEN INFRASTRUCTURE
EXISTING & NEW



EXISTING GREEN INFRASTRUCTURE



PROPOSED GREEN INFRASTRUCTURE

PROPOSED TRANSIT SYSTEM

- PEDESTRIANS
- CYCLISTS
- VEHICULAR

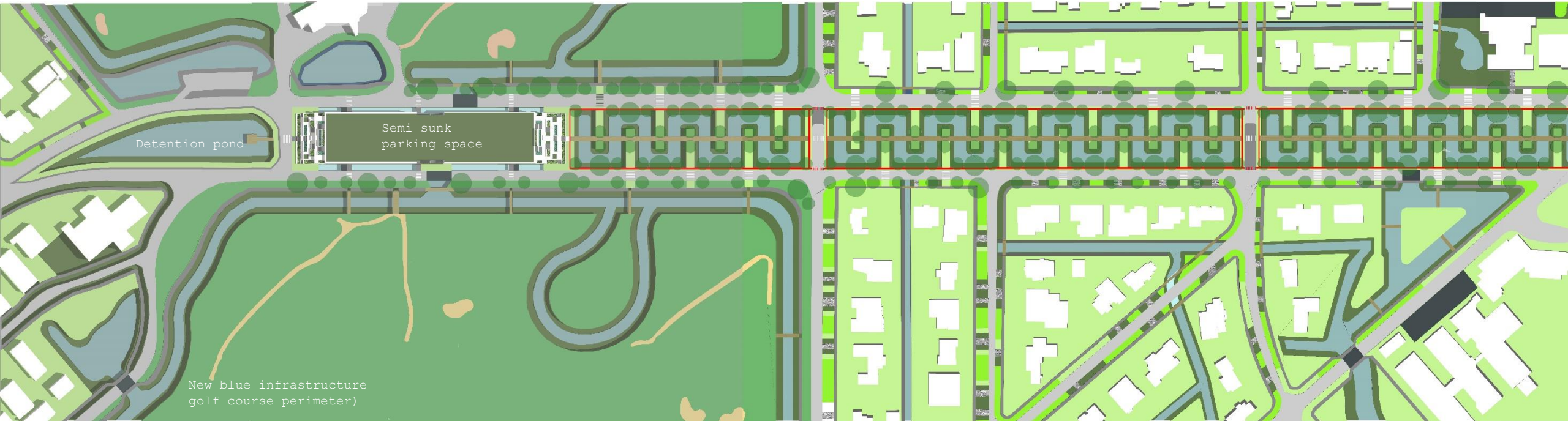
VISION



Plan 2. New vehicular, pedestrian and bicycle lanes routes for Hialeah and Miami Springs.
Source: author

MASTER PLAN MIAMI SPRINGS GREEN AND BLUE SYSTEM

- WATER STRATEGY (HYDROGEOLOGICAL FEATURES)
- LAND STRATEGY (PHYSICAL FEATURES)



• Mahogany tree
(Swietenia Mahagoni)



• Black Olive tree
(Bucida Buceras)



• Gumbo Limbo
(Bersera Simaruba)

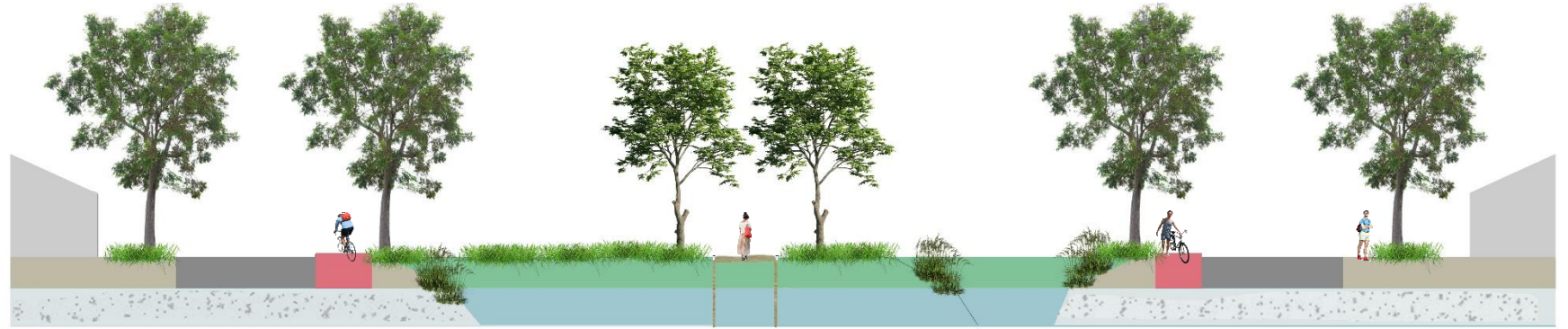


• Live Oak tree
(Quercus Virginiana)

Mater plan 1. Miami Springs new green and blue system.
Source: author.



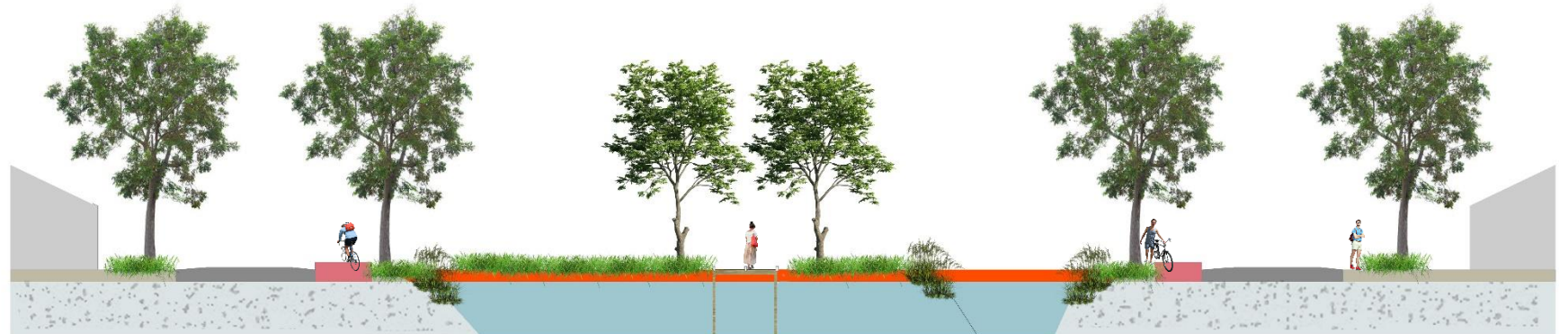
SECTION:
 MIAMI SPRINGS NEW
 GREEN AND BLUE CENTRAL
 LINEAR SYSTEM



LWT



HWT

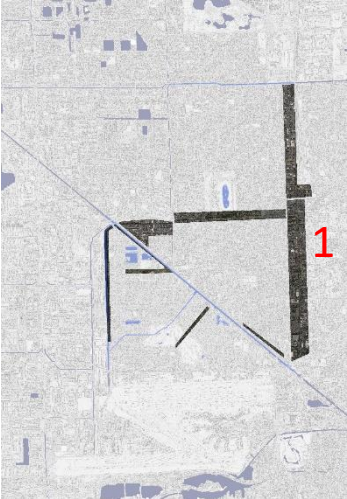


HEAVY RAINFALL



*Impression 1. Miami Springs new green and blue system in the central linear park
Source: author.*

MASTER PLAN REDEVELOPMENT EAST INDUSTRIAL AREA (HIALEAH'S NEW WATER TOWN)



- WATER STRATEGY (HYDROGEOLOGICAL FEATURES)
- LAND STRATEGY (PHYSICAL FEATURES)



*Master plan 2. Hialeah's new water town in the former east industrial district.
Source: author.*



Train tracks

Mix-use

Mix-use



Train tracks



Floating homes

Affordable housing

Affordable housing





- Mahogany tree (Swietenia Mahagoni)



- Ficus tree (Ficus Aurea)



- Gumbo Limbo (Bersera Simaruba)



- Black Olive tree (Bucida Buceras)

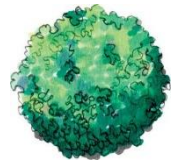


*Impression 2. Hialeah's new mix-use water town in the former east industrial district.
Source: author.*

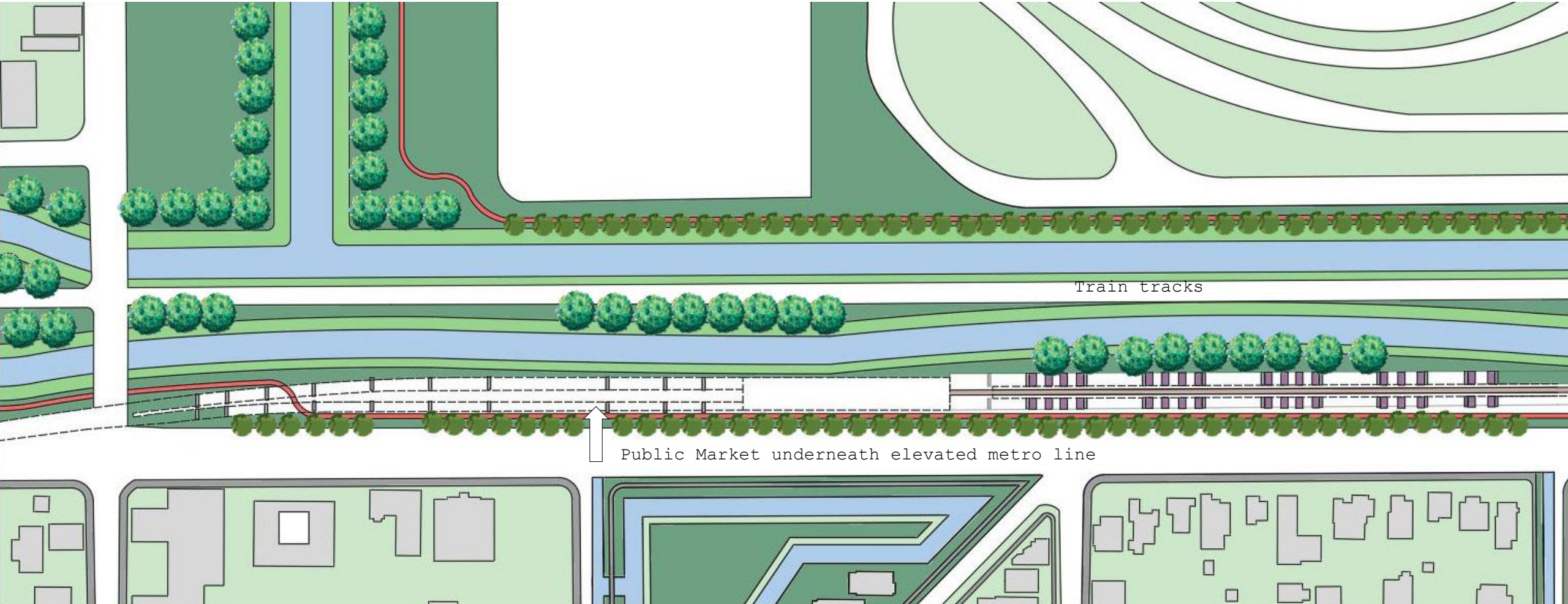
MASTER PLAN CENTRAL LINEAR PARK HIALEAH



• Live Oak tree
(Quercus Virginiana)



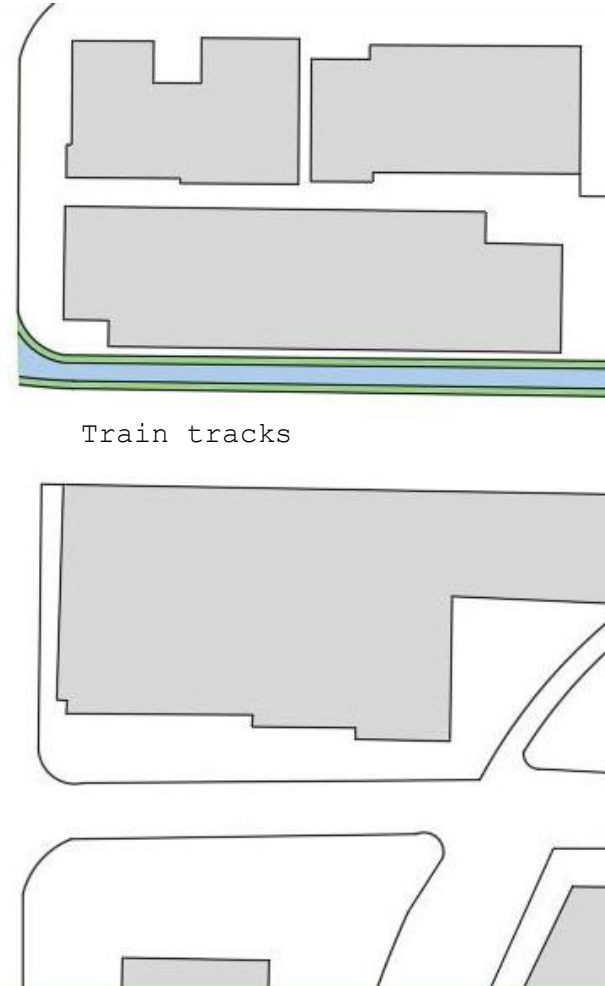
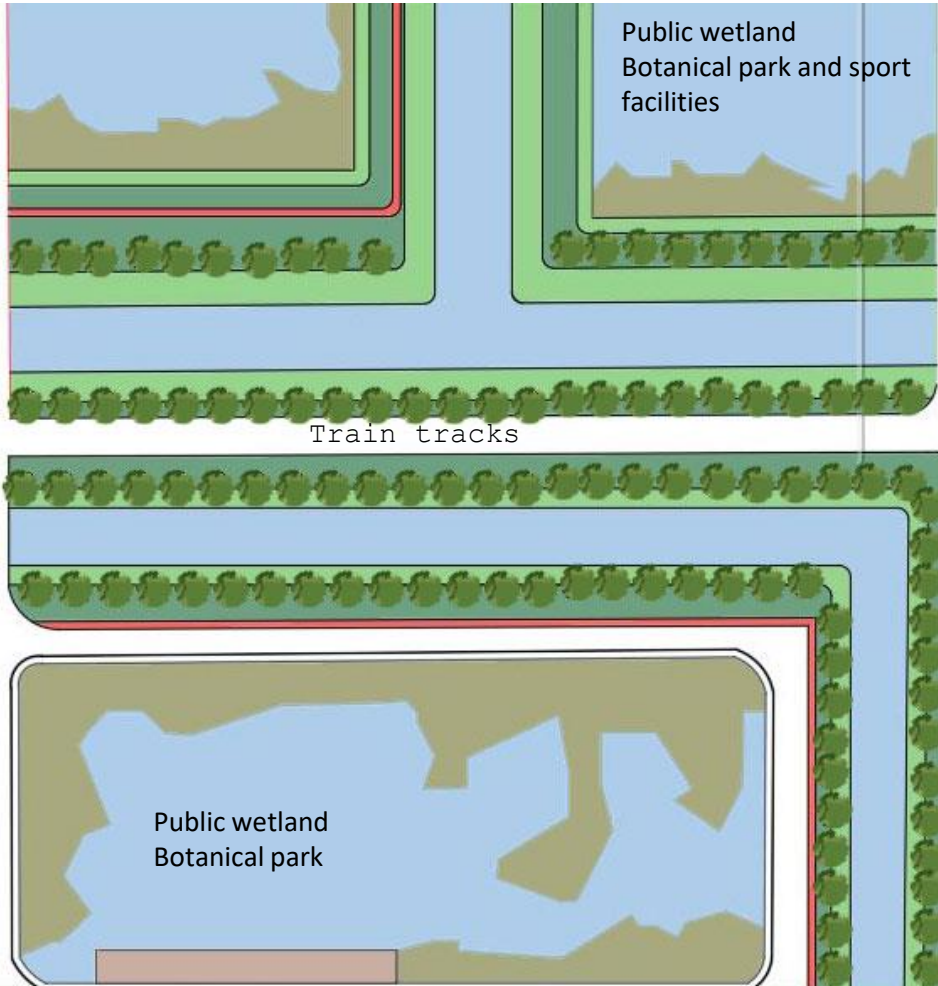
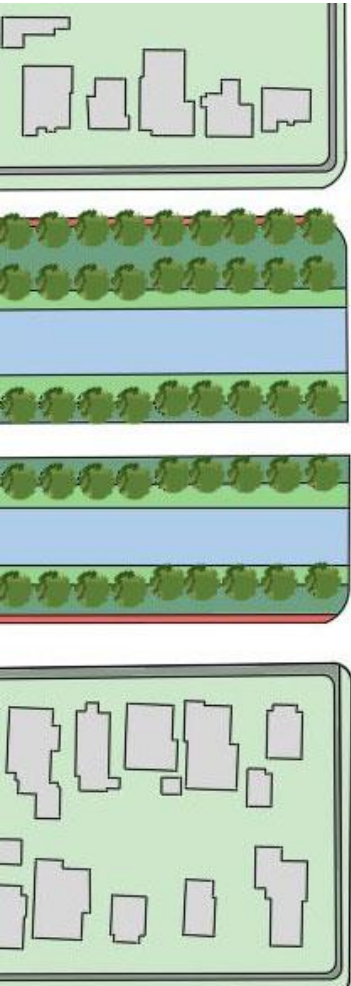
• Mahogany tree
(Swietenia Mahagoni)



Increase of public space underneath
elevated metro line: shadowed plants
park







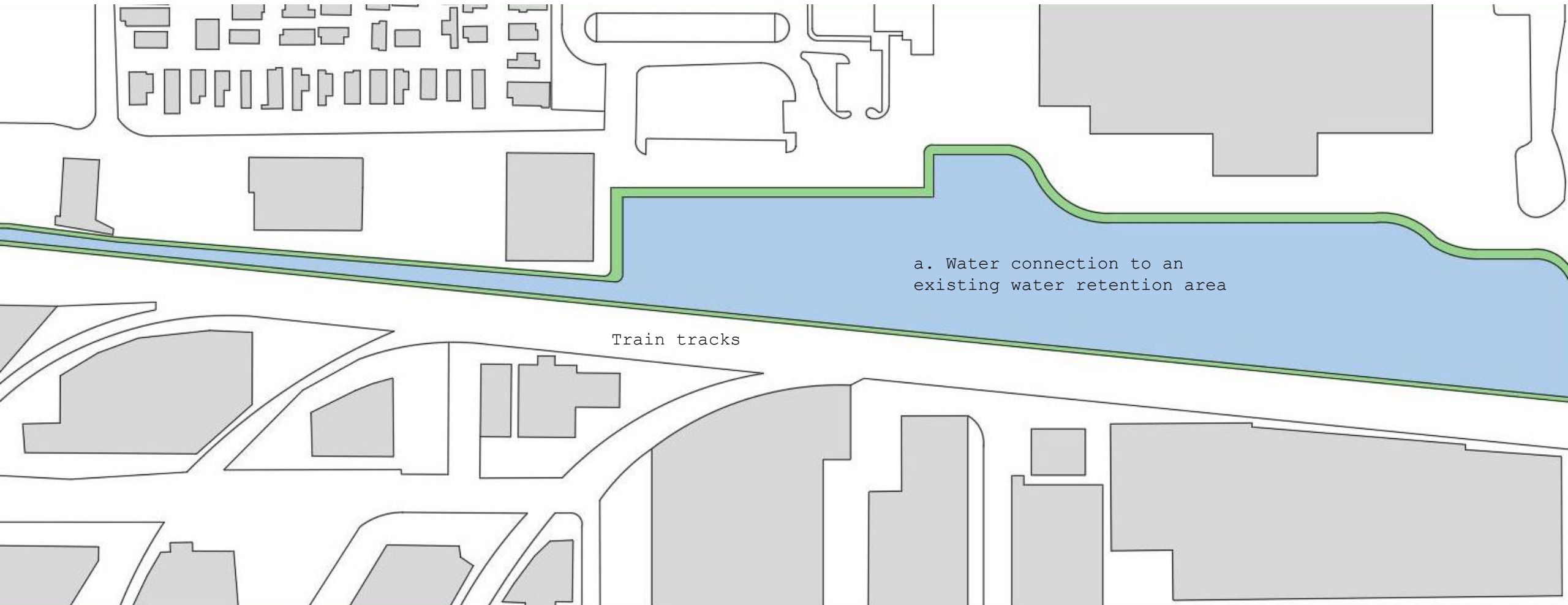
Train tracks

Train tracks





a. Water connection to an existing water retention area



Train tracks

a. Water connection to an existing water retention area





SECTION:
HIALEAH CENTRAL LINEAR PARK



LWT



HWT

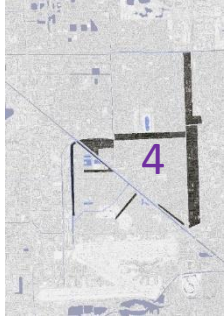


HEAVY RAINFALL

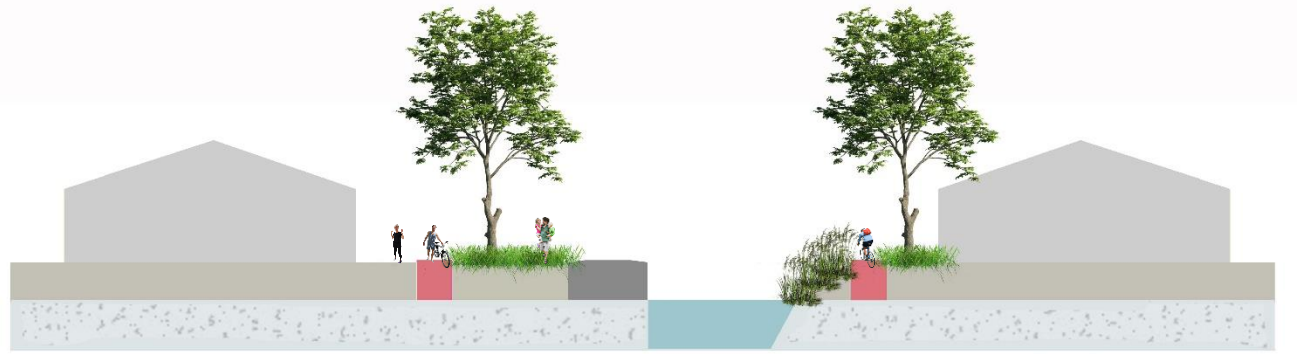
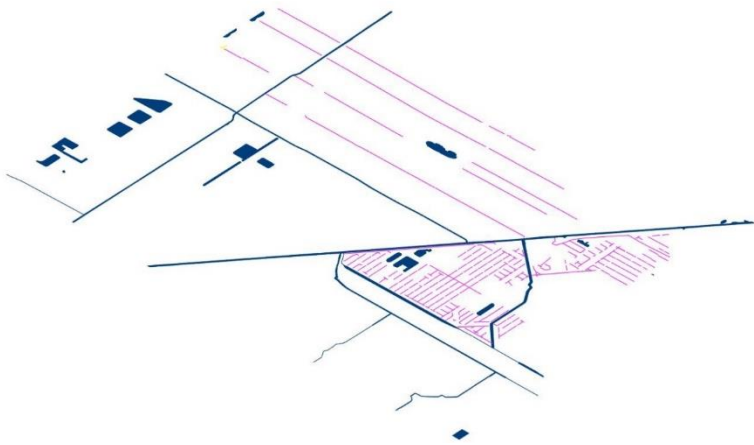
Section 6. Green and blue system adjacent to the railroad tracks. New central linear park in Hialeah.
Source: author



Impression 3. Hialeah's sports wetlands park at the end of the central Green and blue new system
Source: author.



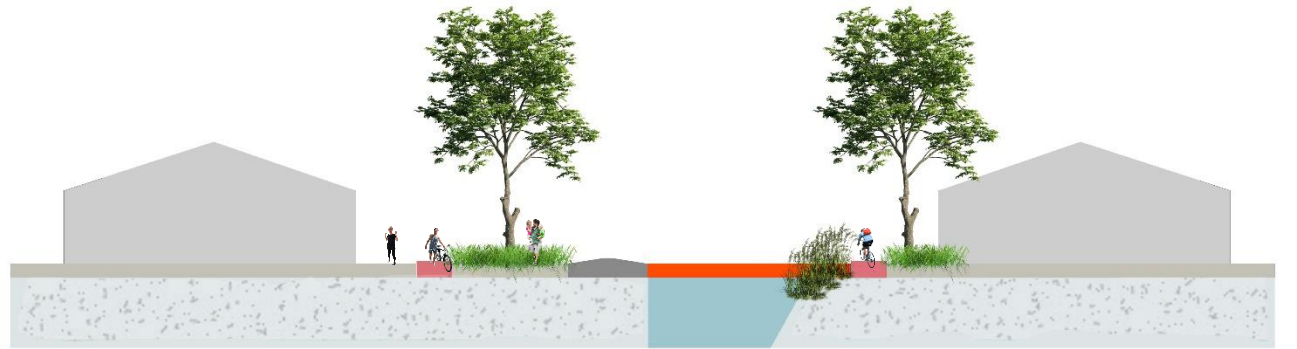
SECTION:
NEW CANALS IN
HIALEAH



LWT

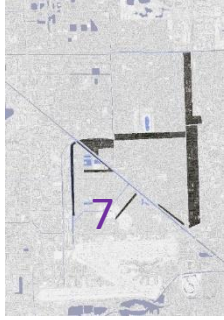


HWT

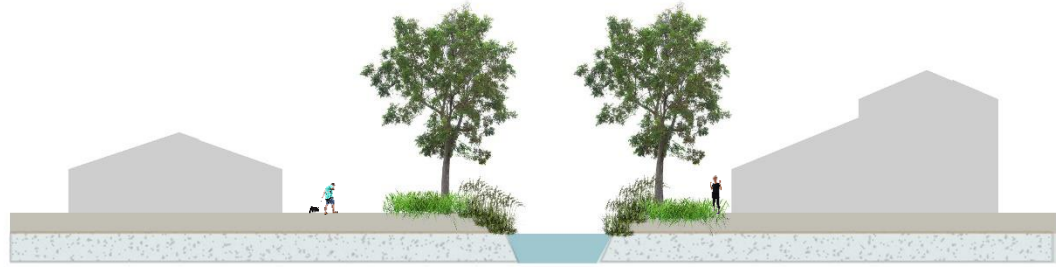
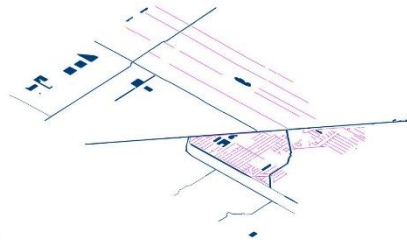


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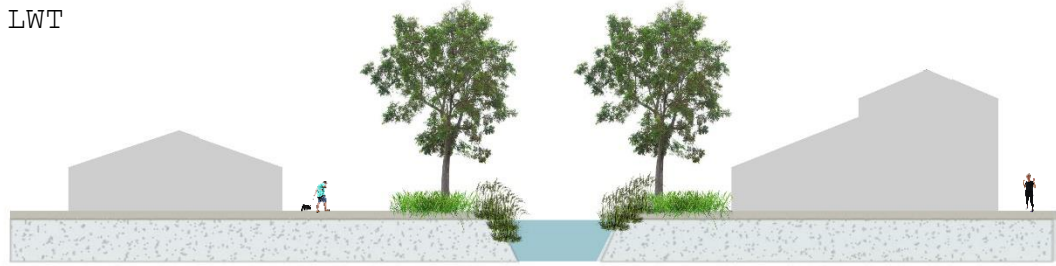
Section 5. North to south canals adjacent to the new one way roads and bicycle lanes in Hialeah.
Source: author



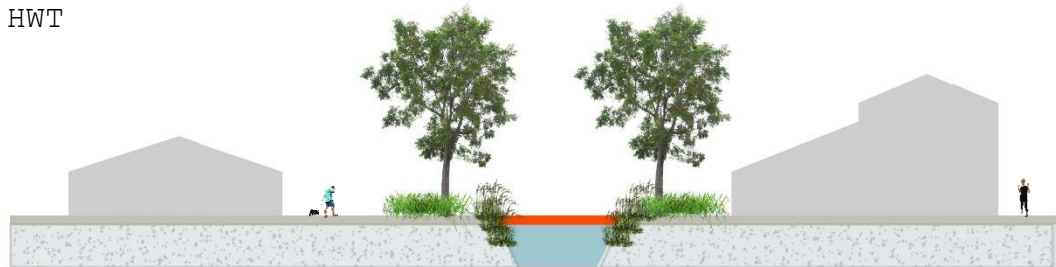
SECTION:
MIAMI SPRINGS NEW
BACKYARD CANALS



LWT

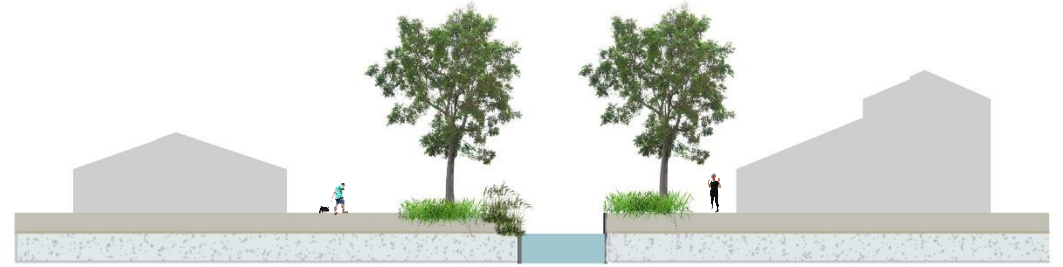


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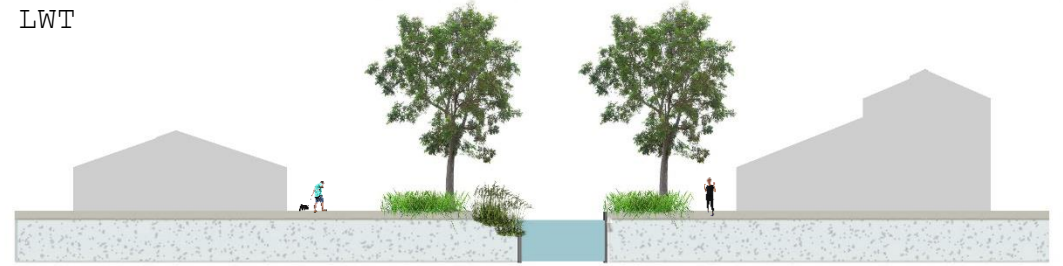


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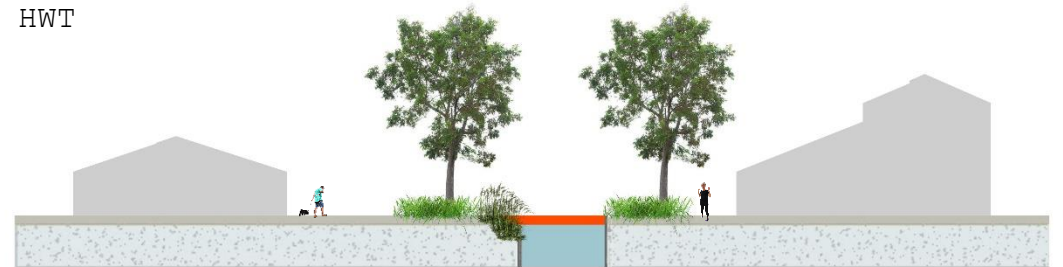
Section 2. Residential canals in Miami Springs with natural banks (former back service alleys)
Source: author



LWT



HWT

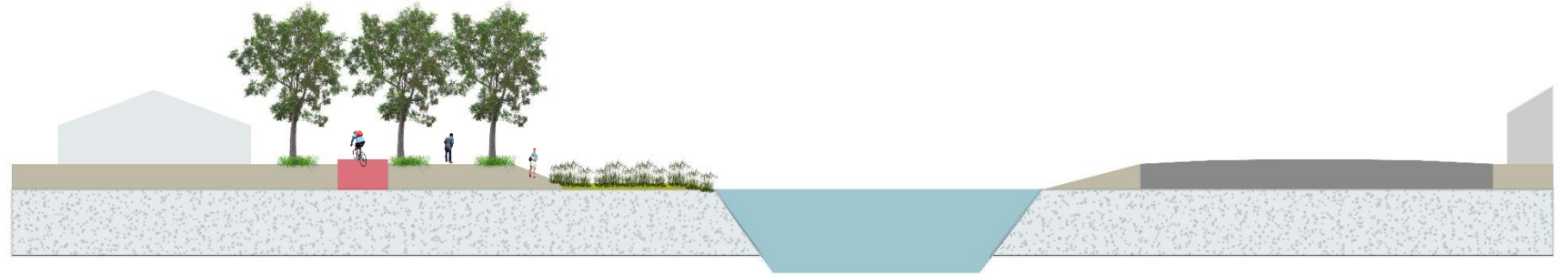


HEAVY RAINFALL

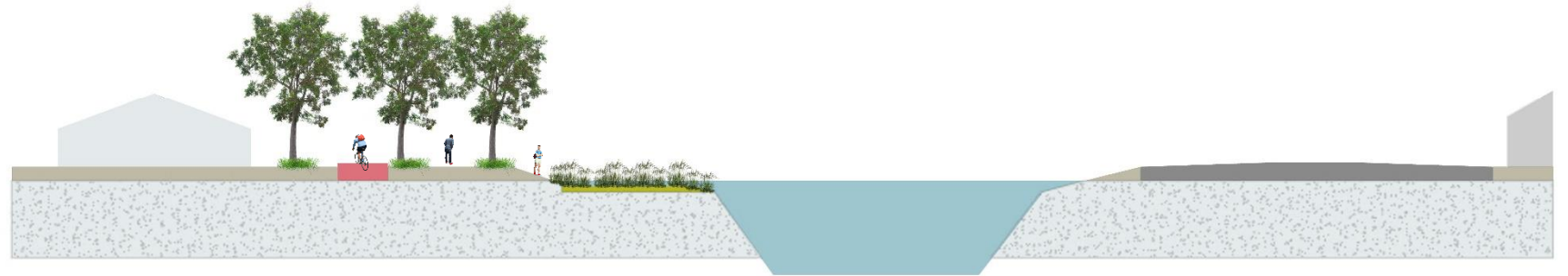
Section 3. Residential canals in Miami Springs with artificial banks due to reduced space for the necessary transformation (former back service alleys)
Source: author



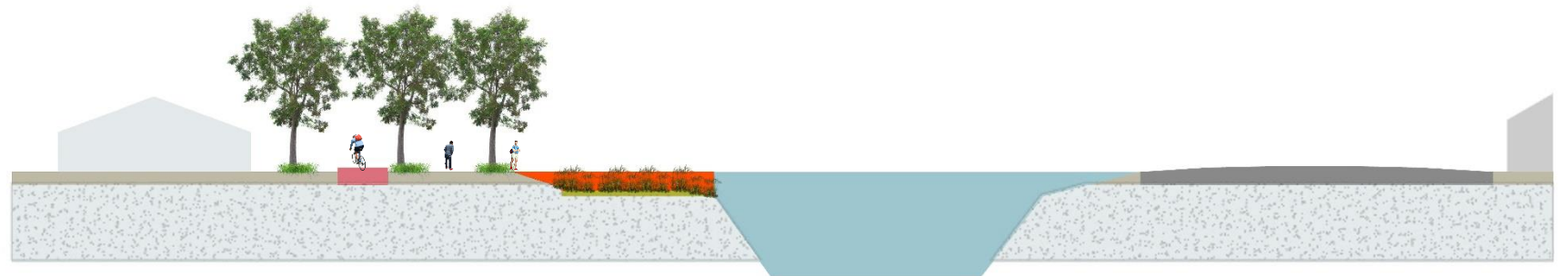
SECTIONS MIAMI SPRINGS
WETLAND PARK



LWT



HWT



HEAVY RAINFALL

Section 4. Wetland park on the Miami Canal banks on the side of Miami Springs.
Source: author

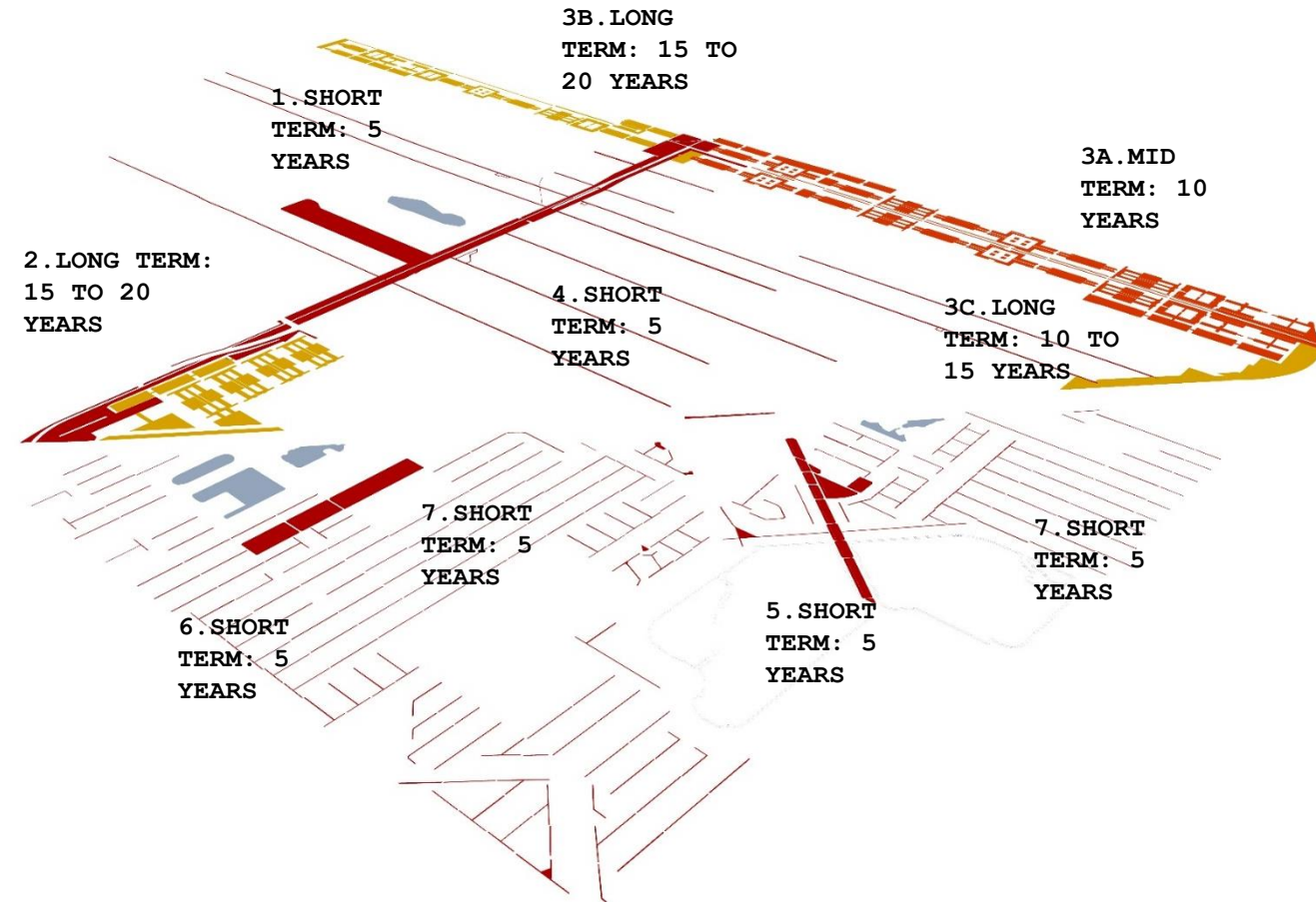
"The implementation of long-term solutions will require time, coordination, research, planning and funding, none of which has been dedicated in significant enough quantities to combat this threat."

- Roman Gastesi, Monroe County Administrator

*Referring to climate change and Sea level rise in Florida

	PUBLIC	PRIVATE	SEMI -PUBLIC
NATIONAL	<ul style="list-style-type: none"> • Parks and Recreation • National Department of transit • U.S department of Intern (National Park System) • U.S. Department of Housing and Urban Development 	<ul style="list-style-type: none"> • Private Investors • Private Developers 	Optional Stakeholders: <ul style="list-style-type: none"> • Open Space Institute (ONG that purchases land for ecologic programs) • National Resilience Institute (ONG- Help the helpers)
REGIONAL	<ul style="list-style-type: none"> • TRI Rail South Florida Regional Transportation Authority • Miami Metrorail • Florida Department of Environmental Protection • Miami Dade Government Office of Resilience 	<ul style="list-style-type: none"> • Private Investors • Private Developers 	Optional Stakeholder: <ul style="list-style-type: none"> • Resiliency Florida
LOCAL (CITY)	<ul style="list-style-type: none"> • Municipality of Hialeah • Municipality of Miami Springs • Sanitation Department of Miami Springs • Public Works • (roads, bridges, canals, sidewalks) 	<ul style="list-style-type: none"> • Homeowners • Private Investors • Private Developers • Golf Course of Miami Springs • Commerce owners of Hialeah 	<ul style="list-style-type: none"> • Golf Course of Miami Springs (receives funds from local government)

Diagram 22. Stakeholders matrix Source: author



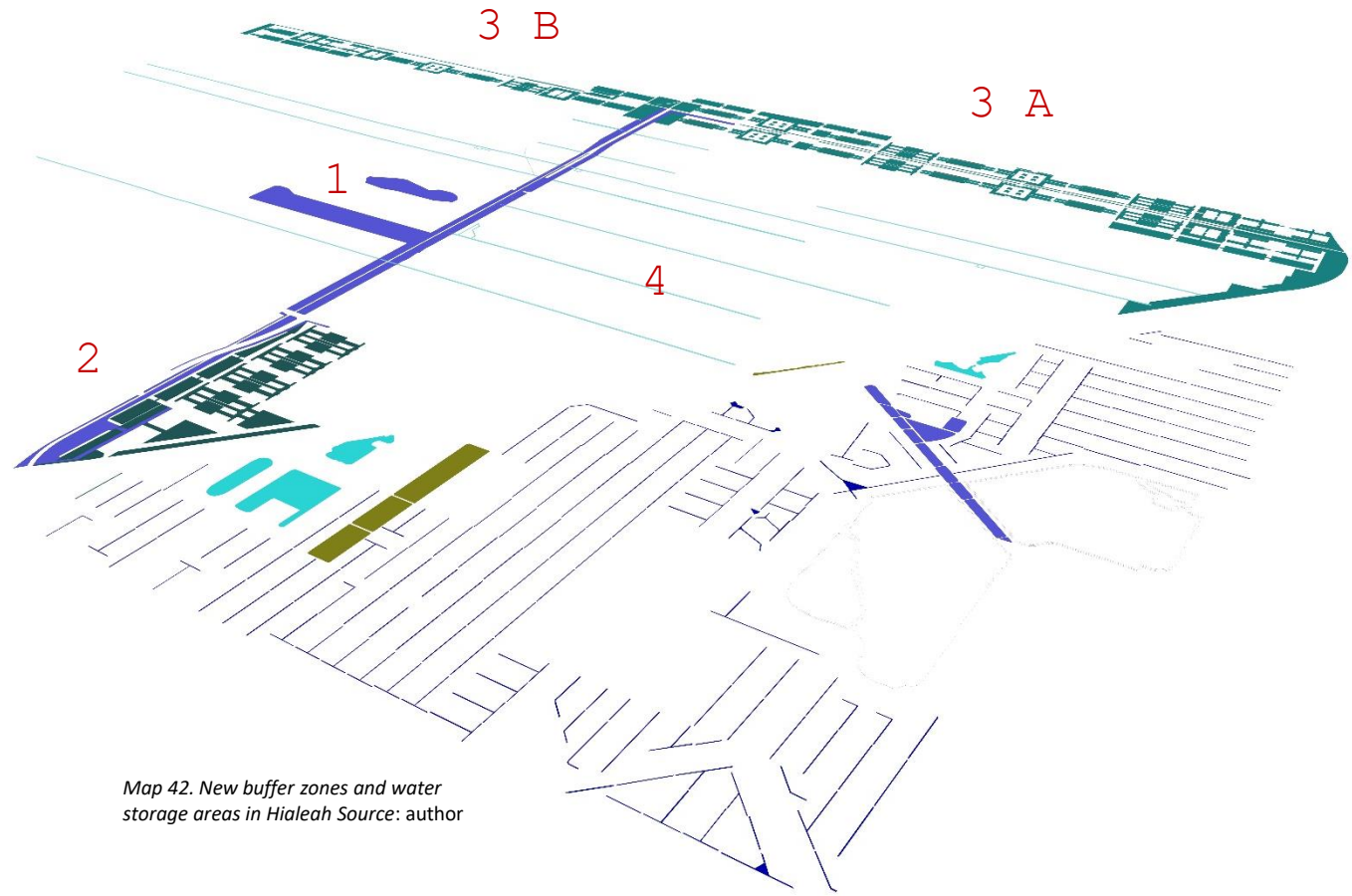
PHASING PLAN & STAKEHOLDERS

Map 40. Phasing plan for execution and timetable of construction:
 -The areas marked on red represent short term execution
 -The area marked in orange represents mid term execution
 -The areas marked on yellow represent long term execution
 Source: author

WATER CALCULATION

HIALEAH WATER STORAGE CAPACITY BLUE SYSTEM

- 1.-Central green & blue system = 181.140 m² x 0.5 m= 90.570 m³
 - 2.-West industrial zone= 209.648,1687 m² x 0.5 m= 104.824 m³
 - 3A.-East industrial area (south from central green & blue system)= 486.195 m² x 0.5 m= 243.097,5 m³
 - 3B.-East industrial area (north from central green & blue system)= 224.234,2327 m² x 0.5 m= 112.117,11 m³
 - 4.-North to south canals= 193.111 m² x 0.5 m= 96.505,5 m³
- TOTAL HIALEAH= 647.114,11 m³



Map 42. New buffer zones and water storage areas in Hialeah Source: author

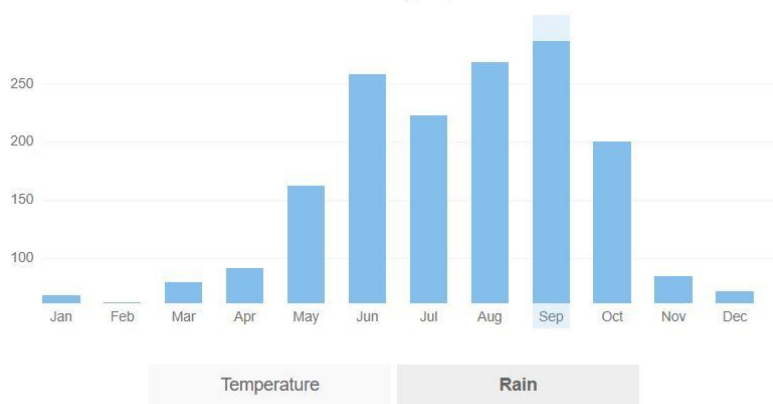
Weather history for Hialeah, Florida

Average rainfall

September

287.01 in|cm

Rain 29 days
 Snow 0 days
 Avg temps 89° / 76° F



Current forecast - Radar map - Data from Weather Trends

Chart 8. Weather history for Hialeah. Average rainfall during the month of September. Source: Weather trends

September is the month with the highest rainfall events in Hialeah. According to Weather Trends, the average rainfall for that month is 2.87,01 m.

28'190.284,0933 m² (Study area of Hialeah) x 2.87,01 m= 80'906.115,08 m³ / 29 days of rain= 2'789866,037 m³ of daily rainfall.

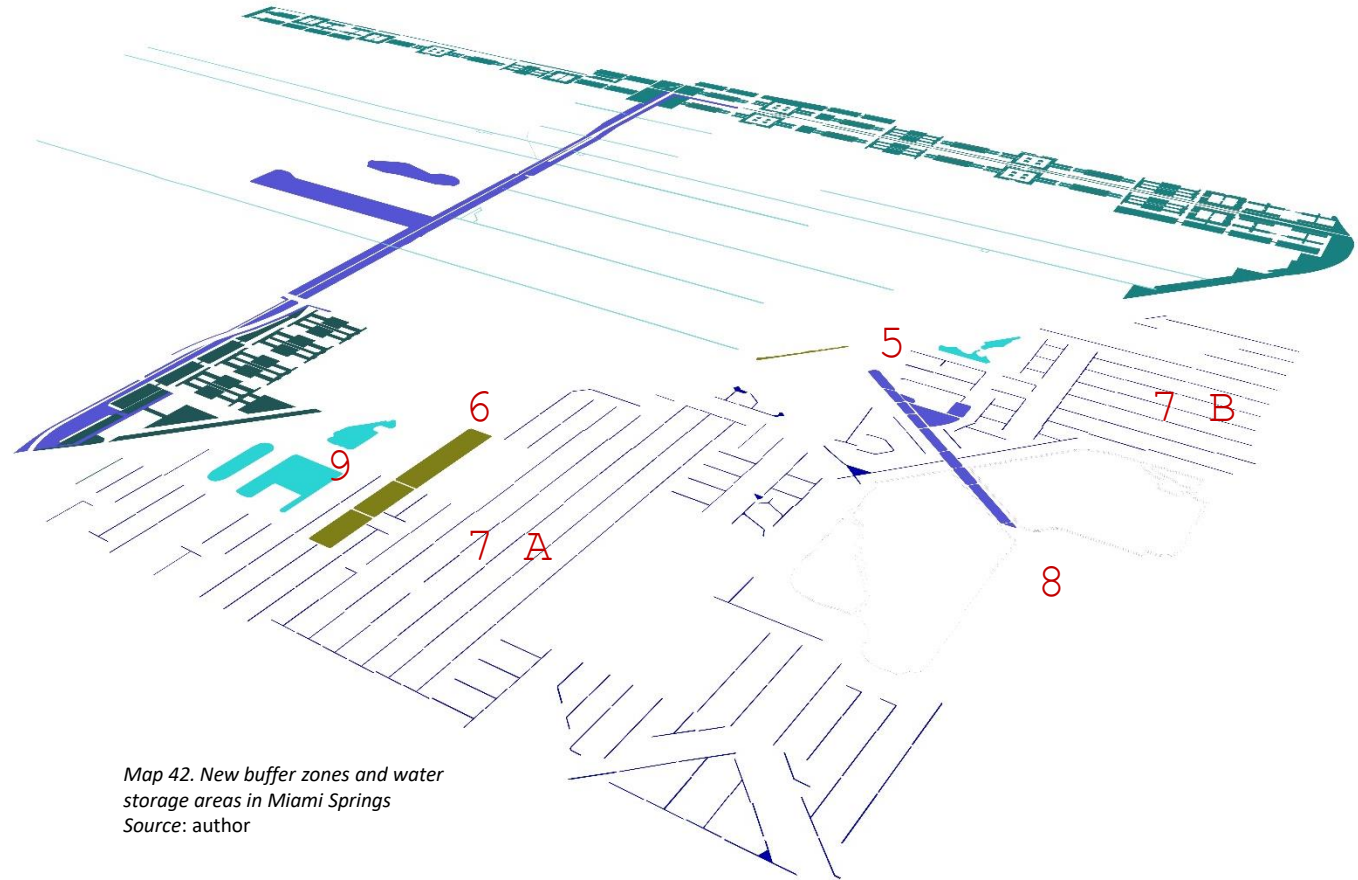
2'789.866,037 m³ - 647.114,11 m³ = 2'142.751,92 m³

There is the need to storage 2'142.751,92 m³ of rainwater daily in Miami Springs under current conditions. The new system storages 23,2 % of rainwater per day.

WATER CALCULATION

MIAMI SPRINGS WATER STORAGE CAPACITY BLUE SYSTEM

- 5.-Central linear green and blue system (park)= 28.215 m2 x 0.5 m= 14.107 m3
 - 6.-Wetlands (canal banks & new park)= 135.015 m2 x 0.5 m= 67.507,5 m3
 - 7A.-Residential canal system(north from central green & blue system)= 98.343 m2 x 0.5 m= 49.171 m3
 - 7B.-Residential canal system (south from central green & blue system)= 39.068,0138 m2 x 0.5 m= 19.534 m3
 - 8.-NorGolf course blue system= 51.700 m2 x 0.5 m= 25.850 m3
 - 9.-Existing lakes= 10.985 m2 x 0.5 m= 5.492 m3
- TOTAL MIAMI SPRINGS= 195.769,5 m3

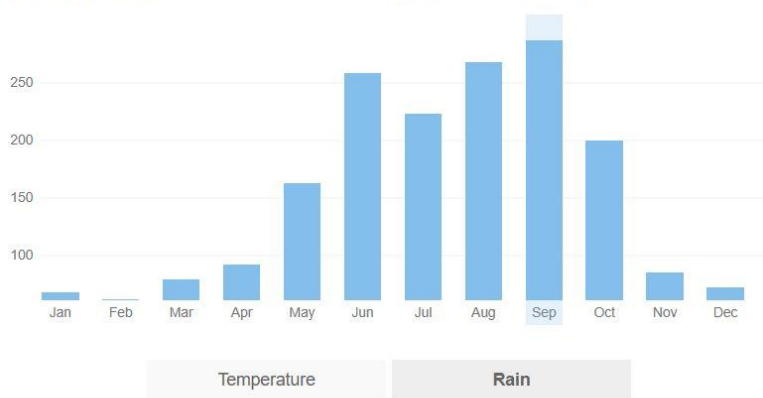


Map 42. New buffer zones and water storage areas in Miami Springs
Source: author

Weather history for Miami Springs, Florida

Average rainfall

September
287.01 in | cm
 Rain 29 days
 Snow 0 days
 Avg temps 89° / 76° F



Current forecast - Radar map - Data from Weather Trends

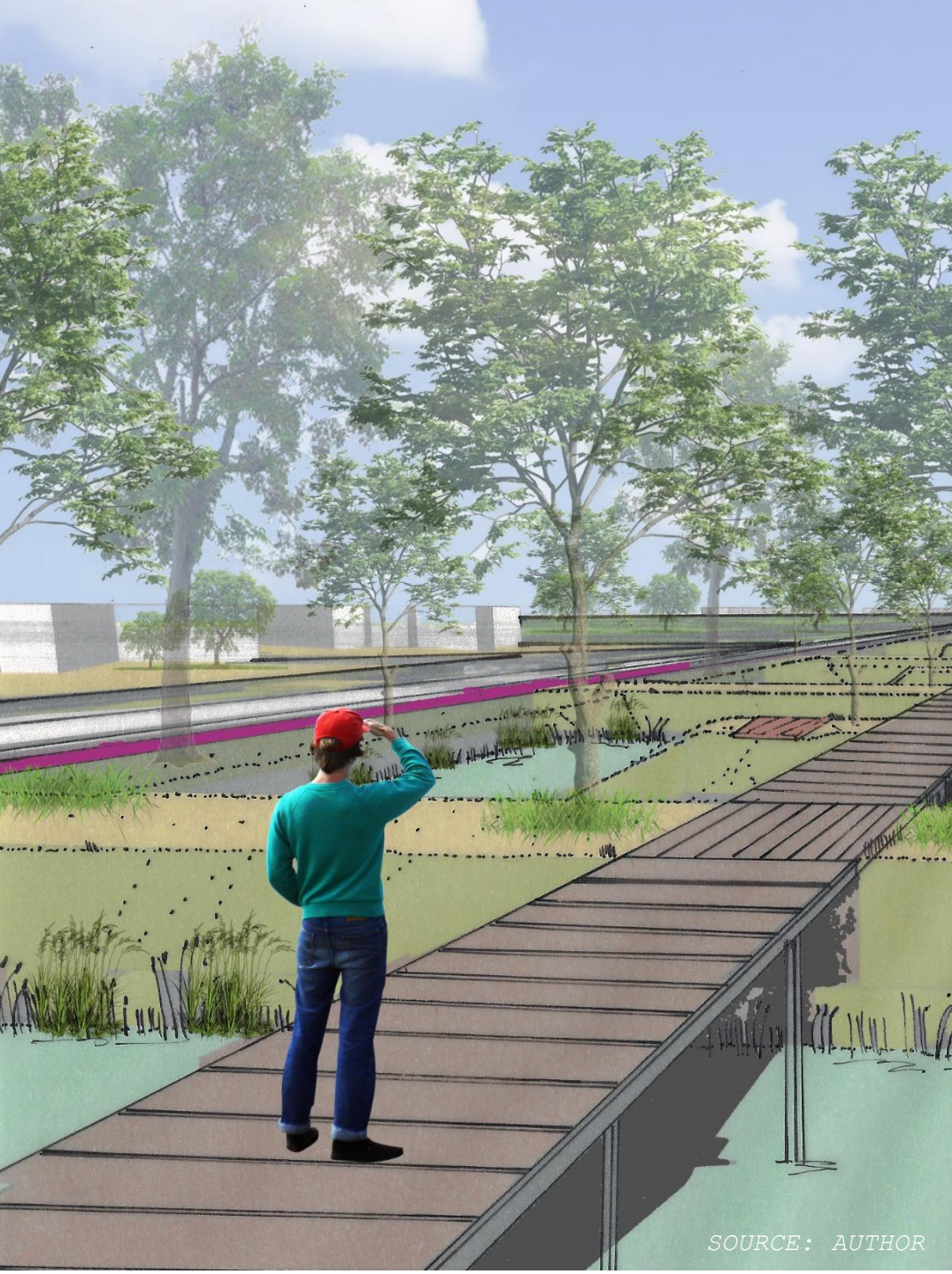
Chart 9. Weather history for Miami springs. Average rainfall during the month of September. Source: Weather trends

September is the month with the highest rainfall events in Miami Springs. According to Weather Trends, the average rainfall for that month is 2.87,01 m.

7'769.964,331008 m2 (Miami Springs area) x 2.87,01 m= 22.300.574,62 m3 / 29 days of rain= 768.985,3317 m3 of daily rainfall.

768.985,3317 m3 - 195.769,5 m3 = 573.215,83 m3

There is the need to storage 573.215,83 m3 of rainwater daily in Miami Springs under current conditions. The new system storages 23,2 % of rainwater per day.



SOURCE: AUTHOR

VIII. REFLECTION

- Relationship Between Research and Design
- Relationship between the Graduation and the Studio Topic
- Potential Applications of the Results in Practice
- Relationship between the graduation project and the wider professional and scientific framework