
# Erosion and Stormwater Analysis of Lassing Park

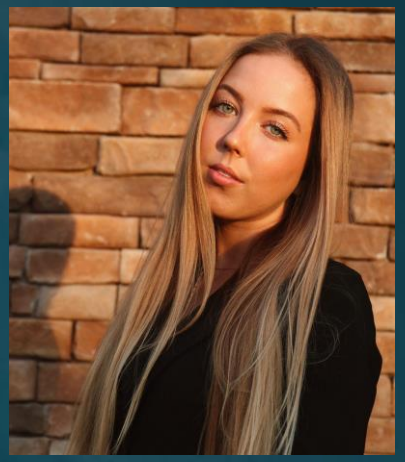
Prepared By: AQUA ENGINEERING

University of South Florida
Environmental Category

Anna Zimmerman, Jordin Kahler, Mariko Peltz, Alex Orellana, Andres Lora Santos

Aqua Engineering

# Team Members & Roles



Anna Zimmerman - Project Manager

Andres Lora Santos- Lead Water Resources Engineer

Jordin Kahler - Lead Civil Design Engineer

Alex Orellana (Right) - Heavy Civil Engineer
Mariko Peltz (Left) - Lead Technical Engineer

# Outline

Problem

Background

Objectives

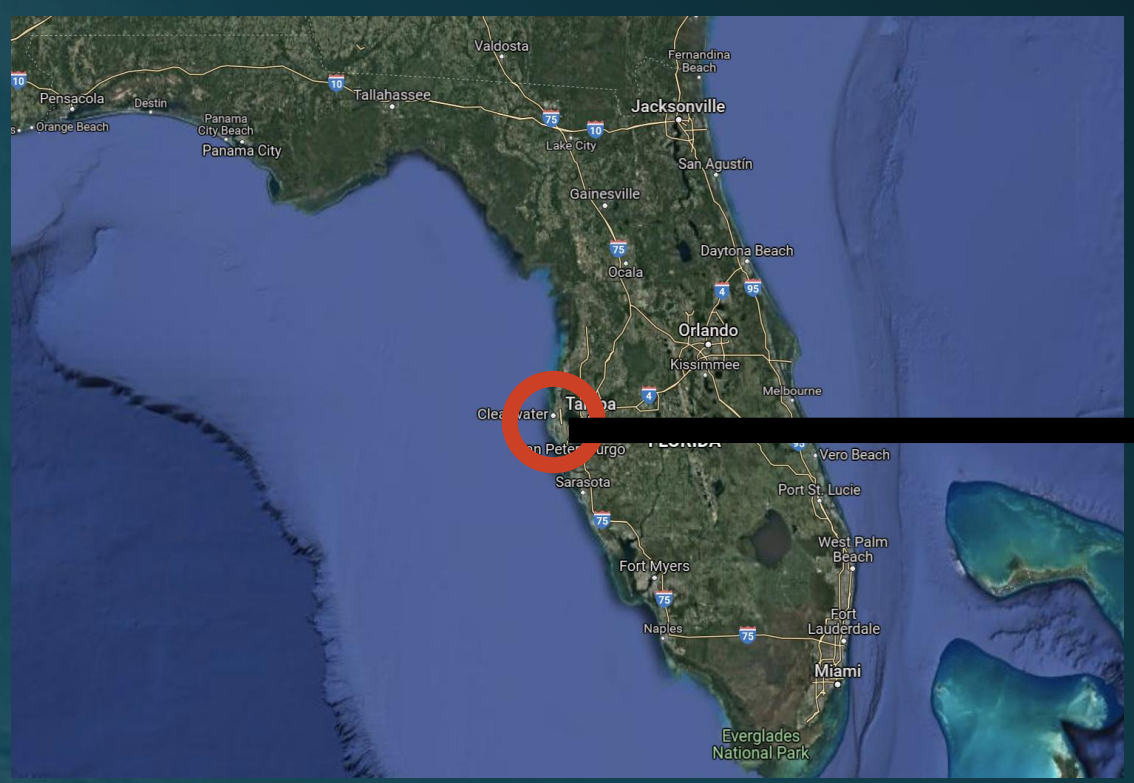
Tasks

Recommendations

Evaluation of Recommendations

Permitting

# Location: Saint Petersburg, Florida




# Problem

Current Problems at Lassing Park:

- Erosion
  - Since 1994, the shoreline has receded about 20,000 sq. feet
  - Increased erosion at north end
  - Rising sea levels and Florida rainy season

- Stormwater
  - Structures in unacceptable conditions
  - Piping in need of significant repair
  - Poor water quality
  - Florida rainy season

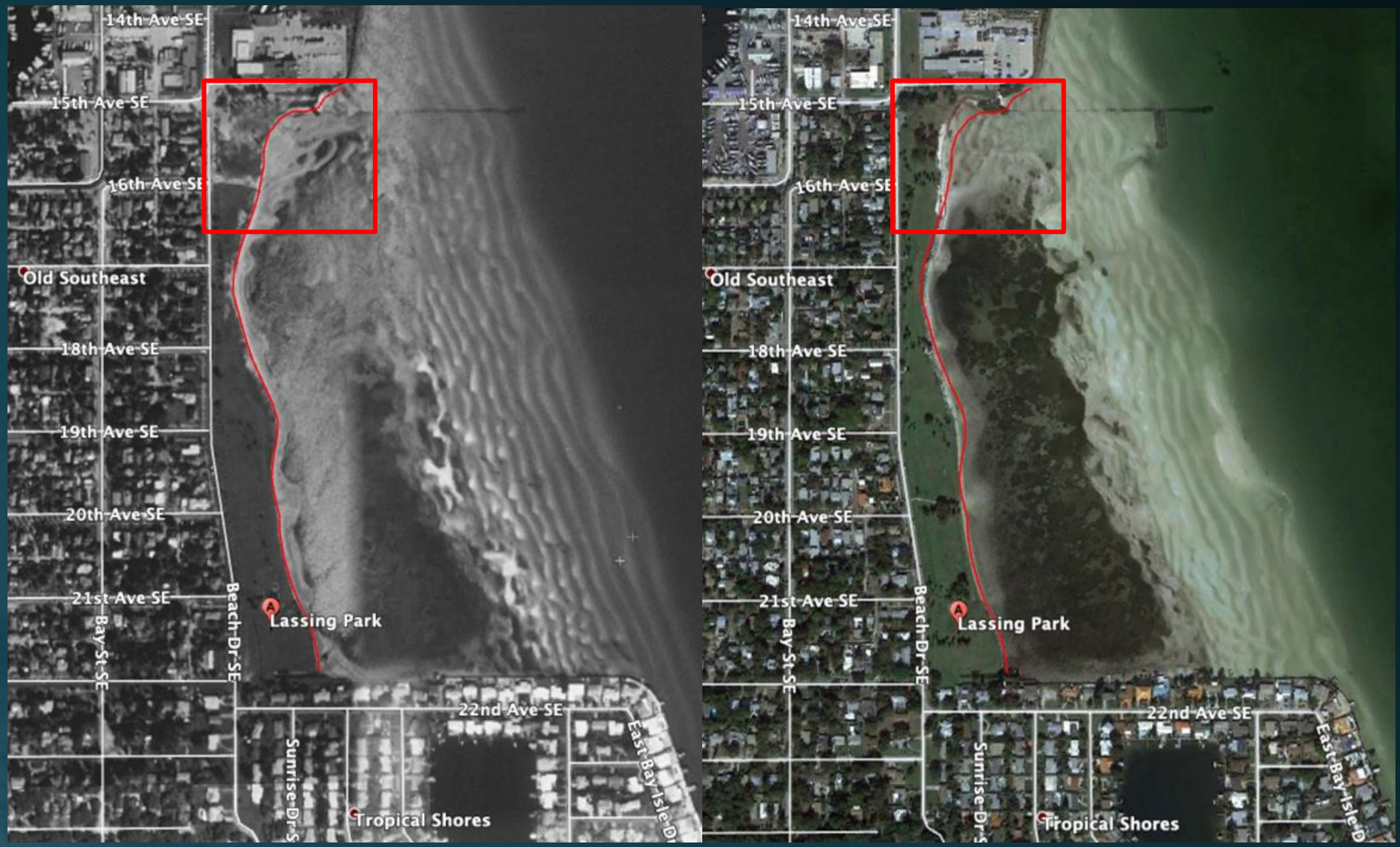



Figure 1: Progression of Erosion at Lassing Park (1994 Left, 2020 Right)


Figure 2: Progression of Erosion at Lassing Park at the North End (1994 Left, 2020 Right)

# Background

- 14.2 acre site
- 2800 ft of coastal frontage
- 2011 Tampa Bay Watch proposal
- 2015 AECOM Master Plan
- Community Survey


Figure 3: Satellite Image of Lassing Park

# Objectives

City's Mission Statement:

"To preserve, protect, maintain and enhance the City's parklands and recreational facilities and engage people in leisure activities that contribute to their quality of life."

Project Goals:

- Address current stormwater design failures to improve water quality
- Combat erosion
- Protect the coast
- Create habitat and preserve natural aquatic ecosystems
- Without compromising the needs and lifestyles of the community

# Tasks Completed

- Kickoff Meeting
- **Site Visit (January 18, 2021)**
- Data Request
- **Community Survey**
- Weekly Internal Meetings
- Literature Review
- **Erosion Modeling**
- **Basin Delineation**
- Stormwater Analysis
- Retrieval of Water Quality Records
- Deliberation of Potential Alternatives
- **AutoCAD Modeling**
- **Cost Analysis**
- **Permitting**
- Incorporation of Client Comments
- Verification of Parameters
- Evaluation of Alternatives
- **Schedule of Implementation**
- Proposal of Finalized Alternative Solutions

# Community Survey Results

# of Surveys Distributed: 300

# of Responses: 72

| Question | Most Popular Answer |
|---|---|
| What do you use the park for? | Exercise, Relaxation, Water Sports |
| What needs updates? | Piping, Water Quality, Ditch on South End |
| Would you be unhappy with the existing stormwater structures at Lassing Park being updated or replaced? | No (82%) Yes (18%) |
| If yes, please explain why. | No park development preferred |
| If there were to be any updates to the park or beach, what kind of updates would you be against? | No structures<br>Keep the park natural |
| Which of the following natural solutions would you be most satisfied with to address water quality? Check as many boxes that you agree with. | Rain Garden<br>Living Shoreline<br>Vegetated Swale |
| Would you be opposed to the addition of riprap and mangroves at the north end to help with the erosion? | No, but did not like the riprap addition |

# Alternatives

0. “Do Nothing”
1. Old Pier Removal
2. Geotextiles & Living Shoreline
3. Stormwater Improvements
4. Bioretention Bed
5. Vegetated Swale

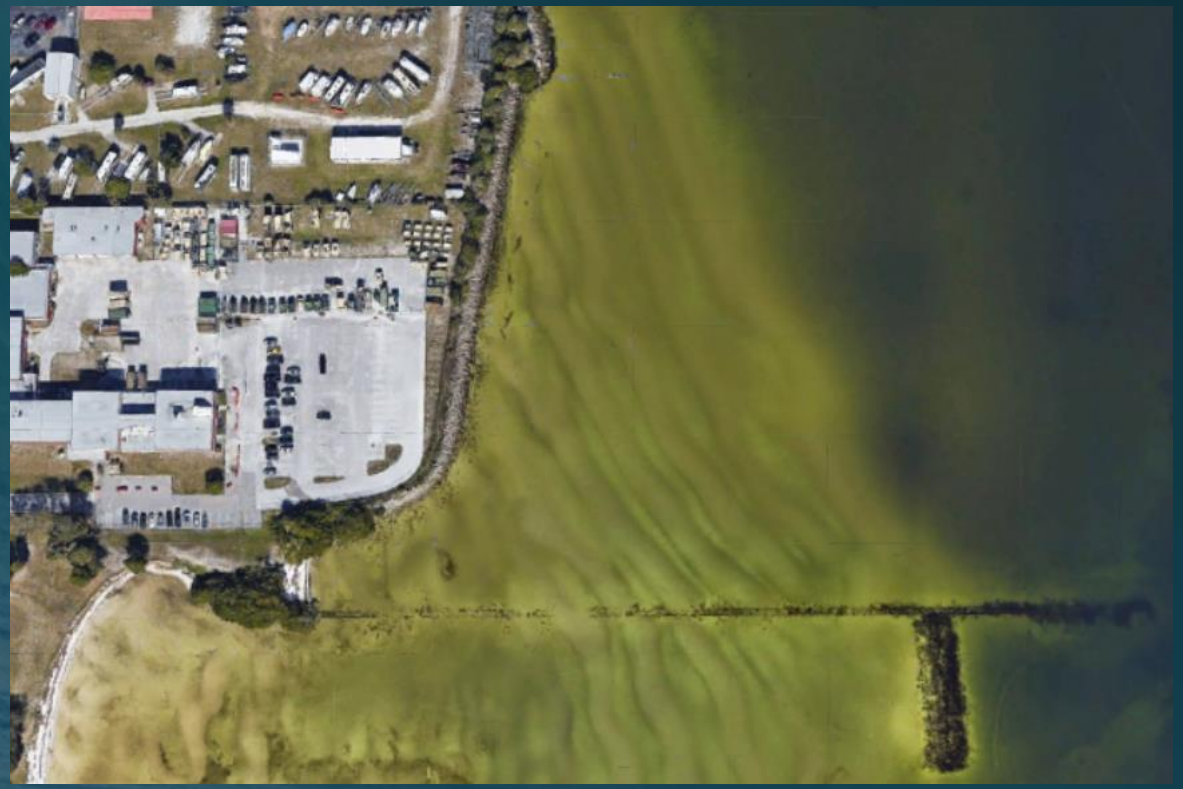
# Recommendation 0 - "Do Nothing"

- No substantial changes based on Community Survey
- Baseline option

Figure 4: Current Beach Conditions at Lassing Park.

# Recommendation 1 - Old Pier Removal

- Sediment reservoir on the north side of the pier



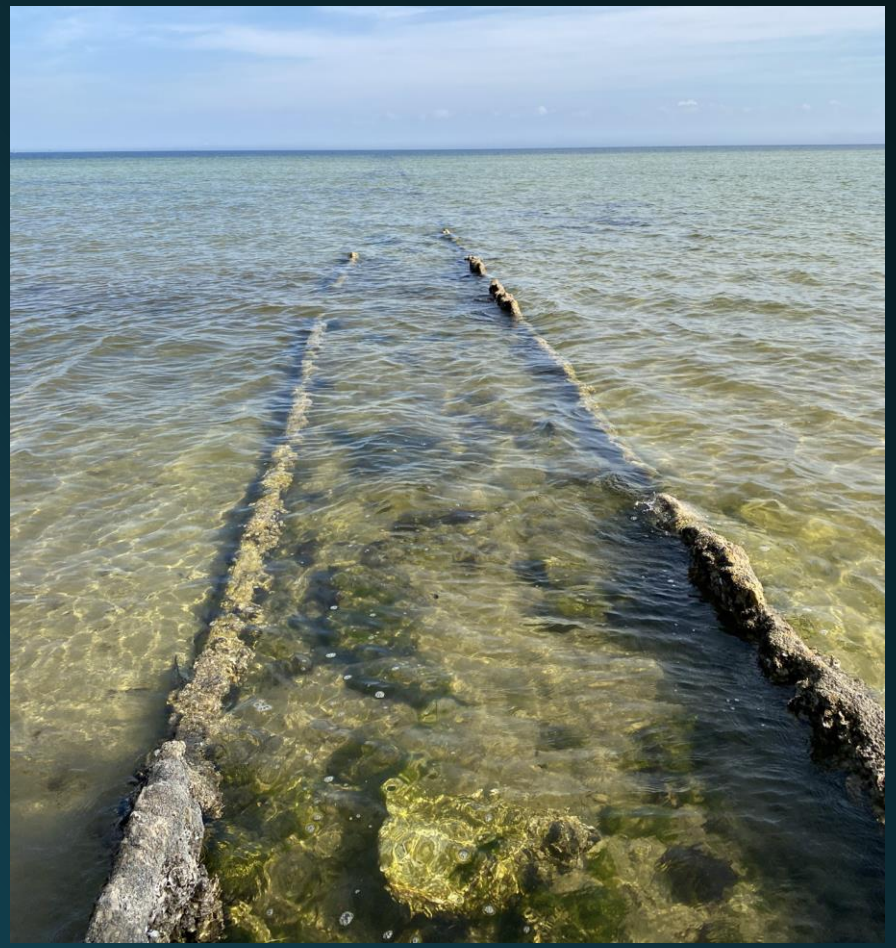


Figure 5: Satelite (left) and Field (right) Images of Existing Pier

# Recommendation 1 - Old Pier Removal

- Meeting with Dr. Hapke
  - Some potential to limit longshore drift
  - Removal would allow new sediment to enter north side of park
  - Would not need to remove subsurface materials

    - Capital Cost: $92,000
    - O&M: None

- Predominant wind direction is southeast

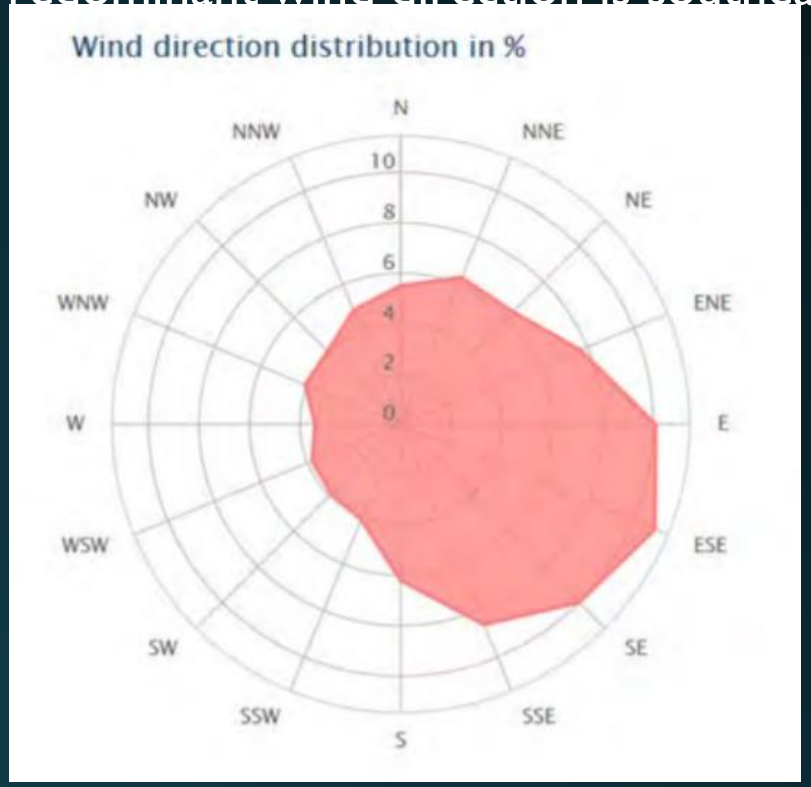



Figure 6: Wind Direction for Lassing Park Zone
Credit: Dr. Cheryl Hapke

# Recommendation 2 - Geotextiles & Living Shoreline

- Geotextile reinforcement mat:
  - Biodegradable coir material
  - 1835 SY, 1/2 inch thick

Figure 7: Geotextile Reinforcement Mat

- Geotextile sandbags will form a wall:
  - 2 ft high, 200 feet long

Figure 8: Geotextile Sandbags

# Recommendation 2 - Geotextiles & Living Shoreline

- Red Mangroves:
  - Planted along the north end
  - Need time to establish
  - Prop roots stabilize sand
  - Currently successful at the site

- Capital Cost: $70,000
- O&M: $500/year

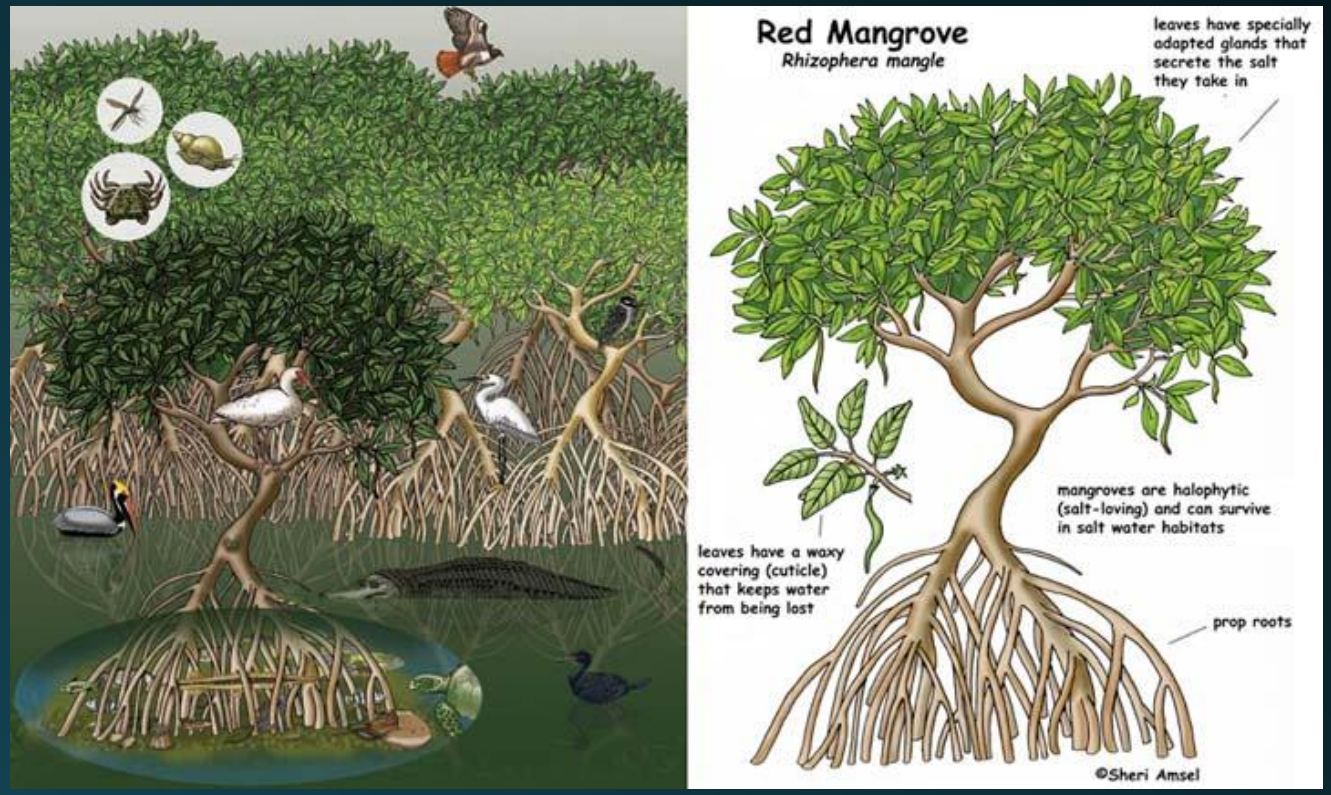
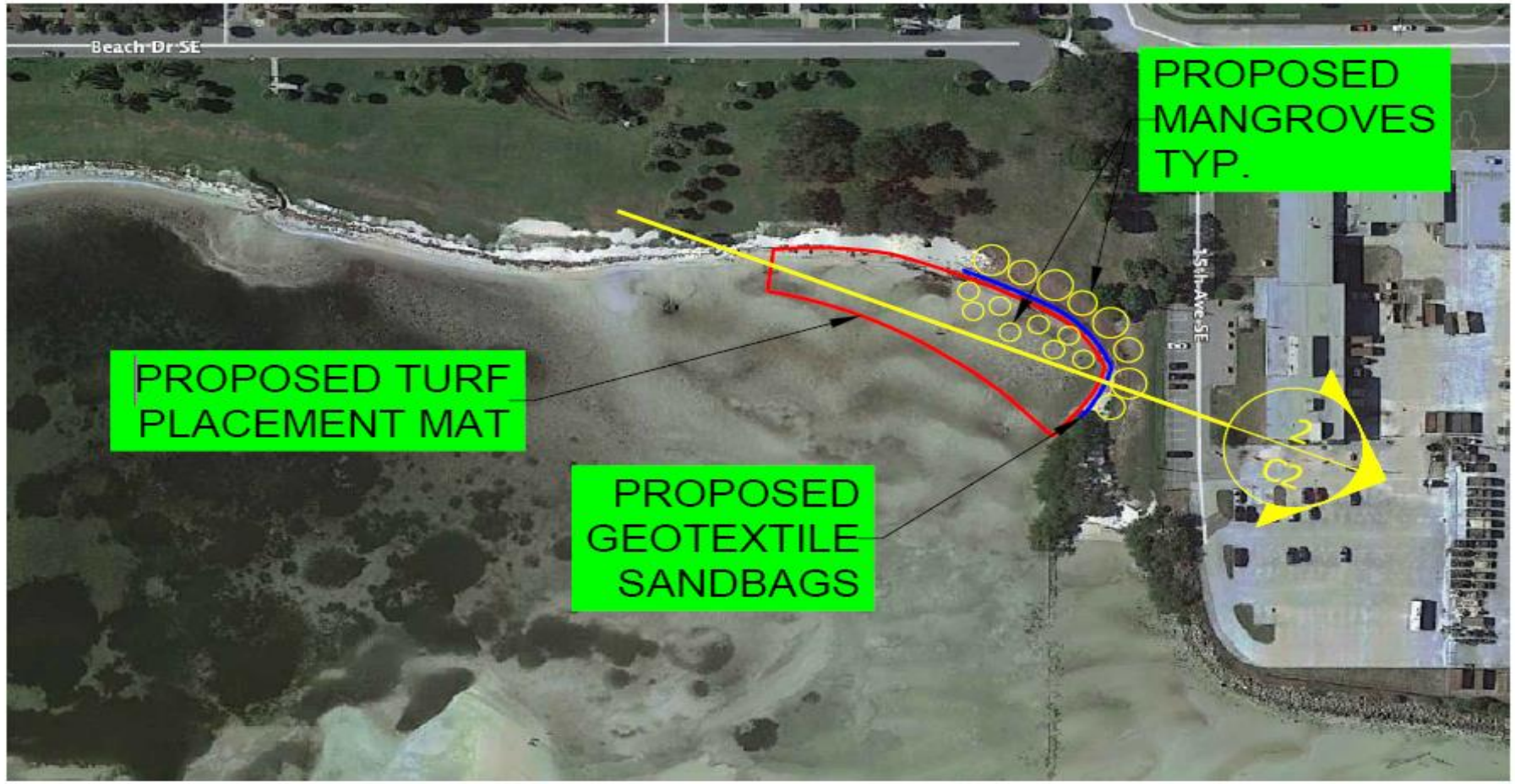



Figure 9: Mangrove Root System Diagram




1 GEOTEXTILE AND LIVING SHORELINE LAYOUT

Scale: 1:150

Aqua Engineering

AQUA ENGINEERING
4202 E FOWLER AVE
TAMPA, FL 33620

CITY OF ST.PETERSBURG
LASSING PARK
2042 BEACH DR. SE
ST.PETERSBURG, FL 33705

DATE: 04/09/2021

DRAWN BY: JK

SCALE AS SHOWN

SHEET C1

# Recommendation 3 - Stormwater Improvements: Flow Parameters

SCS Method:

- Curve numbers for residential space are hydrologic soil group A.
- Significant difference between the results of both methods.
- Less limitations in application.

$$Q = \frac{(P-I_a)^2}{(P - I_a) + S}$$

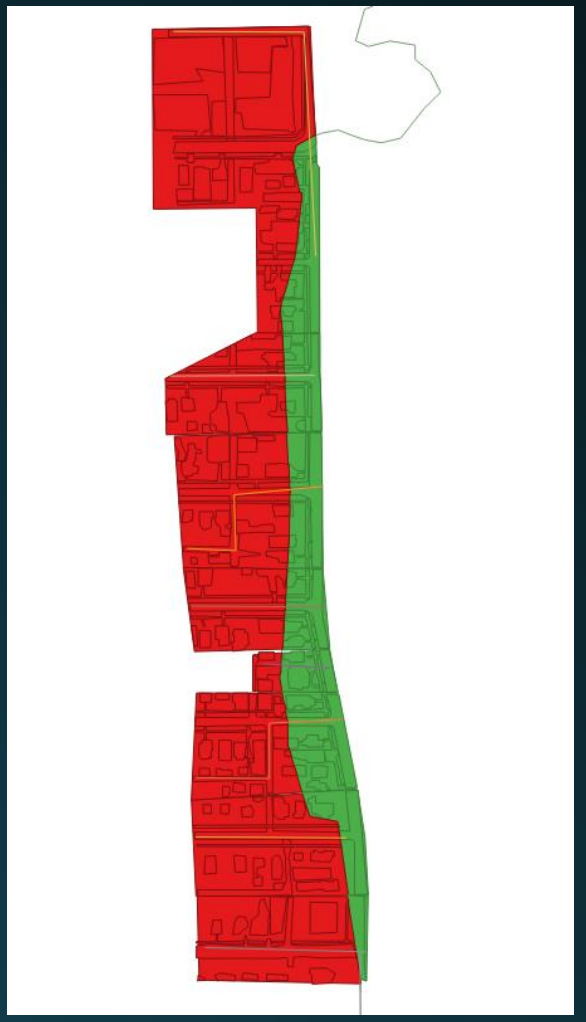



Figure 10: Hydrologic Soil Group Boundary

# Recommendation 3 - Stormwater Improvements

Table 1: SCS Peak Flow Results

| Flows for 25-Year Design Storm | | | | | |
|---|---|---|---|---|---|
| Basin | Area | SCS Curve # | Hydraulic Length (ft) | Slope | Q peak (cfs) |
| H | 8.5 | 67.5 | 448.21 | 0.0141 | 12 |
| G | 3.25 | 54 | 387.55 | 0.0136 | 2.7 |
| F | 3.5 | 54 | 448.21 | 0.00849 | 2.2 |
| E | 2.5 | 54 | 387.55 | 0.006 | 1.5 |
| D | 1 | 54 | 252.75 | 0.00869 | 0.9 |
| C | 3.5 | 54 | 421.25 | 0.0028 | 1.4 |
| B | 4 | 54 | 498.76 | 0.00535 | 1.7 |
| A | 3.25 | 54 | 485.28 | 0.00454 | 1.5 |

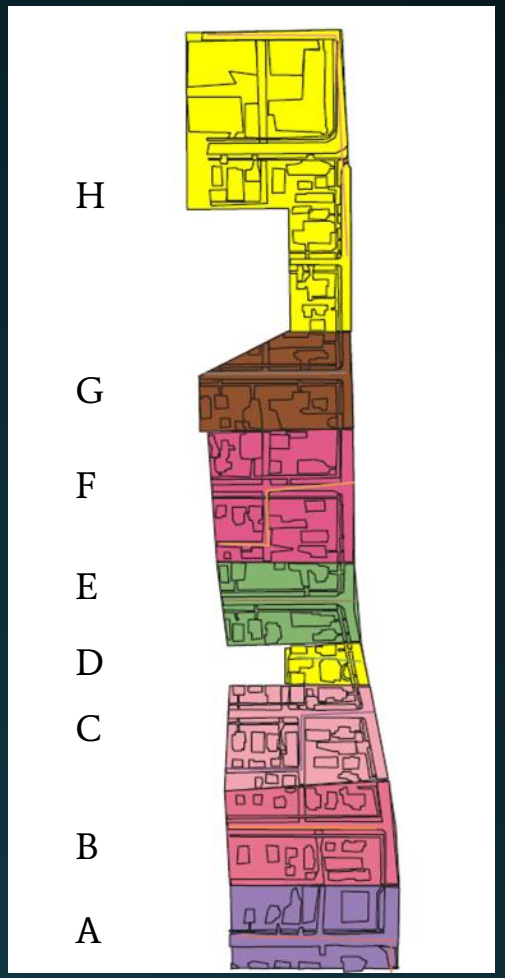



Figure 11: Sub Basins for Flow Calculation

# Recommendation 3 - Stormwater Improvements: Existing Infrastructure

- 3D Global Mapper model of surface generated.
- Pipe networks drawn in Civil 3D.
  - Surface info and atlases provided by City.
- 8 stormwater pipe networks were generated.

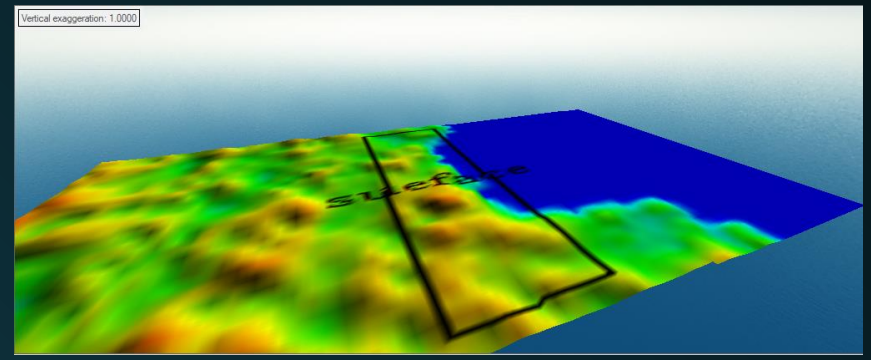



Figure 12: Surface Elevation Model

Table 2: Pipe Slope Calculations

| Pipe # | Inlet Height | Inlet Correction (- 3 feet) | Exit Height | Length (feet) | Slope(%) |
|---|---|---|---|---|---|
| H | 5 | 2 | 0 | 928 | 0.22 |
| G | 5 | 2 | 0 | 171 | 1.17 |
| F | 7 | 4 | 0 | 177 | 2.26 |
| E | 8 | 5 | 0 | 203 | 2.46 |
| D | 10 | 7 | 0 | 294 | 2.38 |
| C | 10 | 7 | 0 | 242 | 2.89 |
| B | 10 | 7 | 0 | 279 | 2.51 |
| A | 8 | 5 | 2 | 190 | 1.58 |

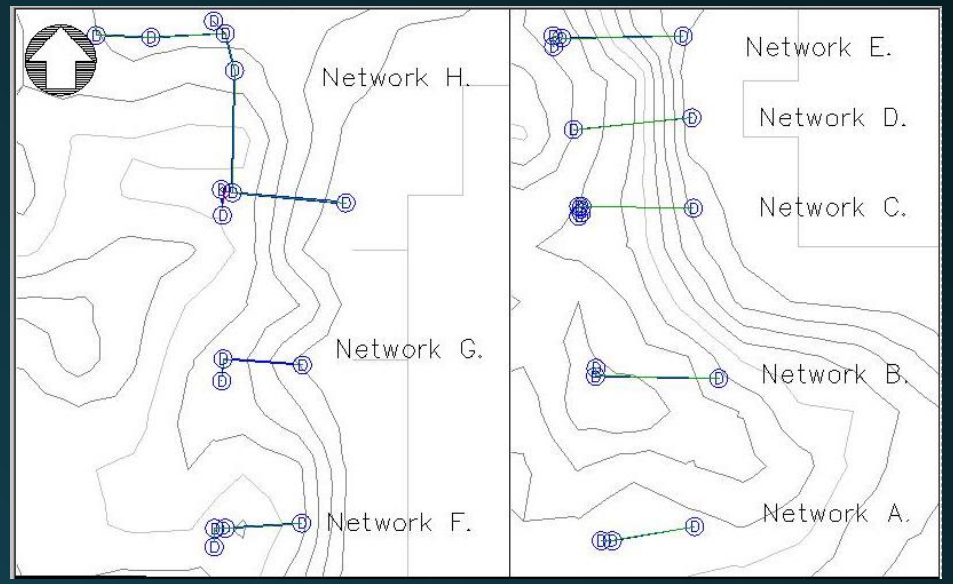



Figure 13: Stormwater Networks Model

# Recommendation 3 - Stormwater Improvements

Fat Oil & Grease (FOG) Skimmers

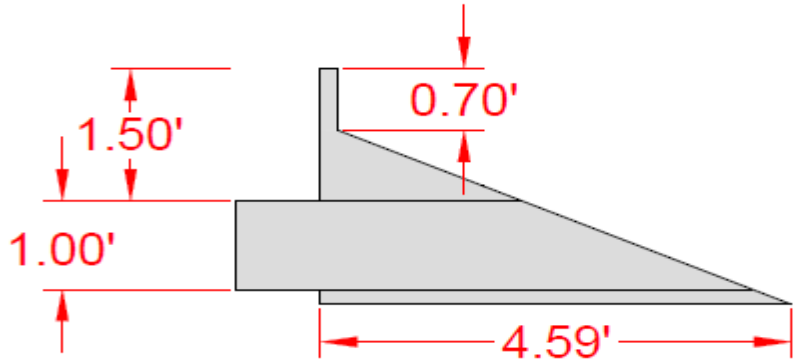
- Inserted in the stormwater curb inlets.
- Prevents disruption of the stormwater systems.

Concrete Armoring

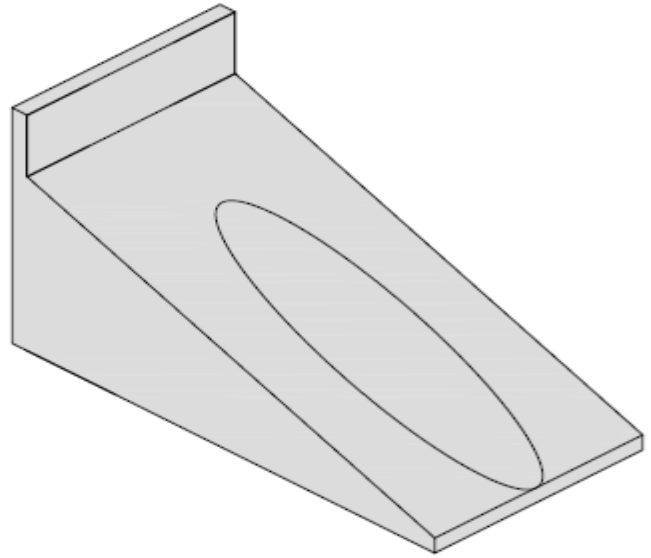
- Benefit existing outlets
- Prevent sediment obstruction in the outflow.

- Capital Cost: $21,000
- O&M: $800/year

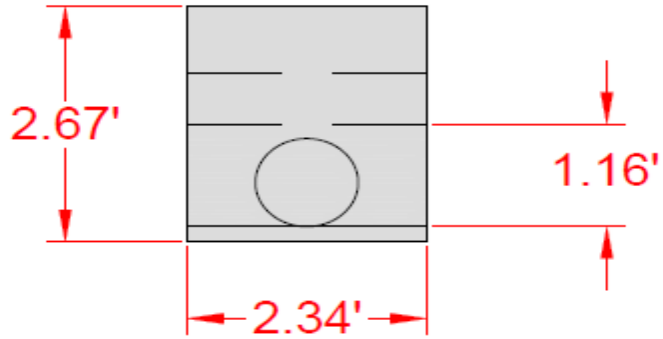
Figure 14: Stormwater Alternatives Considered




SIDE VIEW



3D VIEW




FRONT VIEW

3 STORMWATER STRUCTURES

Scale: 1:150

| | | | |
|---|---|---|---|
| Aqua Engineering | AQUA ENGINEERING<br>4202 E FOWLER AVE<br>TAMPA, FL 33620 | CITY OF ST.PETERSBURG<br>LASSING PARK<br>2042 BEACH DR. SE<br>ST.PETERSBURG, FL 33705 | DATE: 04/09/2021<br>DRAWN BY: AO<br>SCALE AS SHOWN<br>SHEET C5 |

# Recommendation 4 - Bioretention Bed

Design Criteria:

- Depth: 1 ft
- Area: 0.38 acres
- FL friendly vegetation and soil
- Non-toxic to dogs

- Capital Cost: $418,000
- O&M: $12,000/5 Years

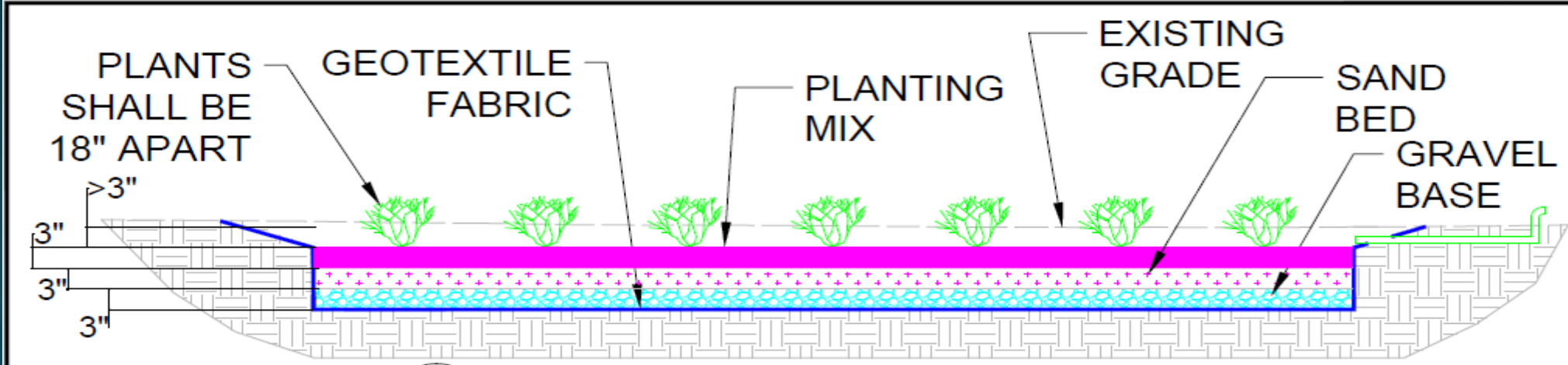
1. 
2. 
3. 
4. 
5. 
6. 

Figure 14: Selection of plants for bioretention bed. Numbered 1-6.


4 BIORETENTION GARDEN

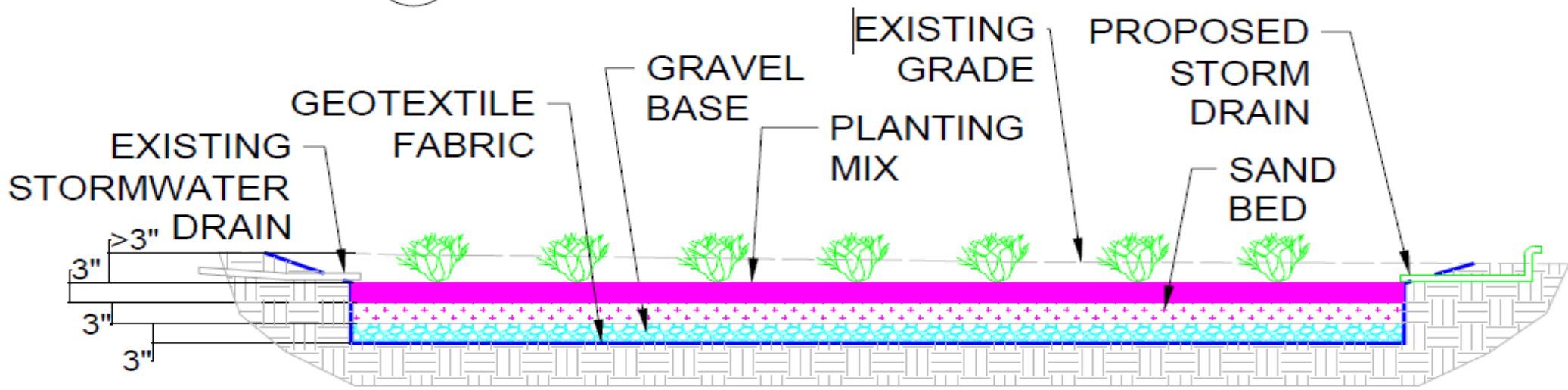
Scale: 1:50

| | | | |
|---|---|---|---|
| Aqua Engineering | AQUA ENGINEERING<br>4202 E FOWLER AVE<br>TAMPA, FL 33620 | CITY OF ST.PETERSBURG<br>LASSING PARK<br>2042 BEACH DR. SE<br>ST.PETERSBURG, FL 33705 | DATE: 04/09/2021<br>DRAWN BY: JK<br>SCALE AS SHOWN<br>SHEET C6 |




6 BIORETENTION GARDEN SECTION NS

Scale: NTS




5 BIORETENTION GARDEN SECTION EW

Scale: NTS

| | | | |
|---|---|---|---|
| Aqua Engineering | AQUA ENGINEERING<br>4202 E FOWLER AVE<br>TAMPA, FL 33620 | CITY OF ST.PETERSBURG<br>LASSING PARK<br>2042 BEACH DR. SE<br>ST.PETERSBURG, FL 33705 | DATE: 04/09/2021<br>DRAWN BY: JK<br>SCALE AS SHOWN<br>SHEET C7 |

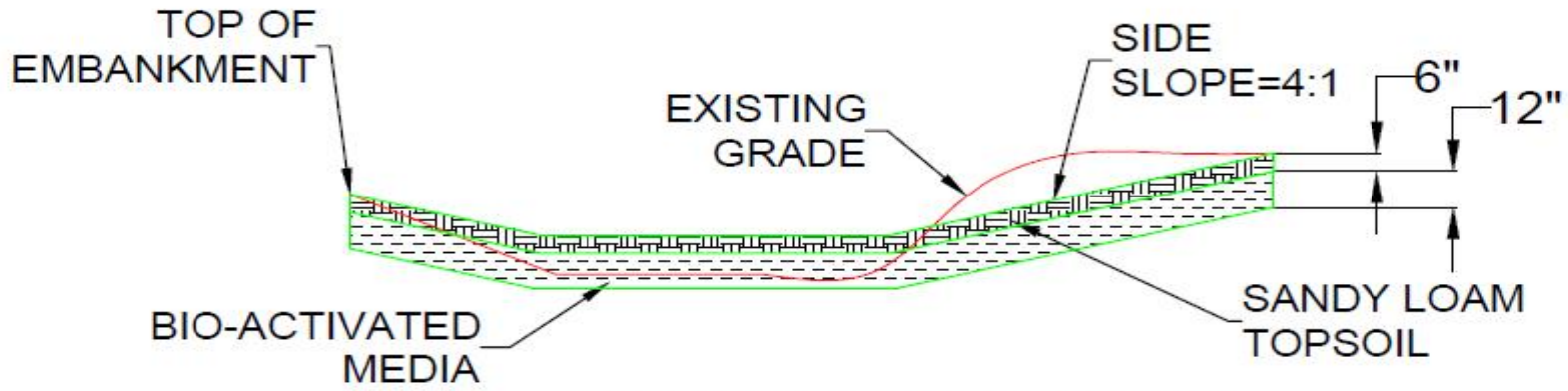
# Recommendation 5 - Vegetated Swale

- Vegetation incorporated to existing swale
- Modification/ resloping of existing swale
- Capital Cost: $156,000
- O&M: $12,000/10 Years

Figure 13: Example of a Vegetated Swale

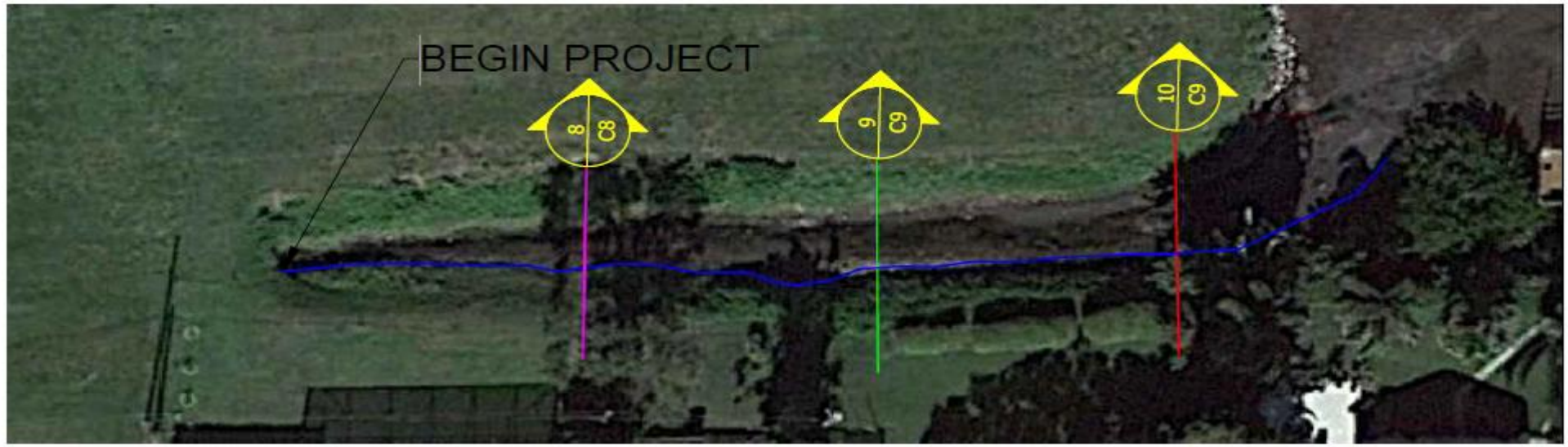
Table 3: Vegetated Swale Hydraulic Calculations

| Parameter | Proposed |
|---|---|
| Slope (ft/ft) | 1.28% |
| Velocity (ft/s) | 4 |
| Side Slope (ft/ft) | 0.25 |
| Roughness Coefficient | 0.033 |
| Hydraulic Radius (ft) | 0.6923 |




8 VEGETATED SWALE PROFILE

Scale: NTS

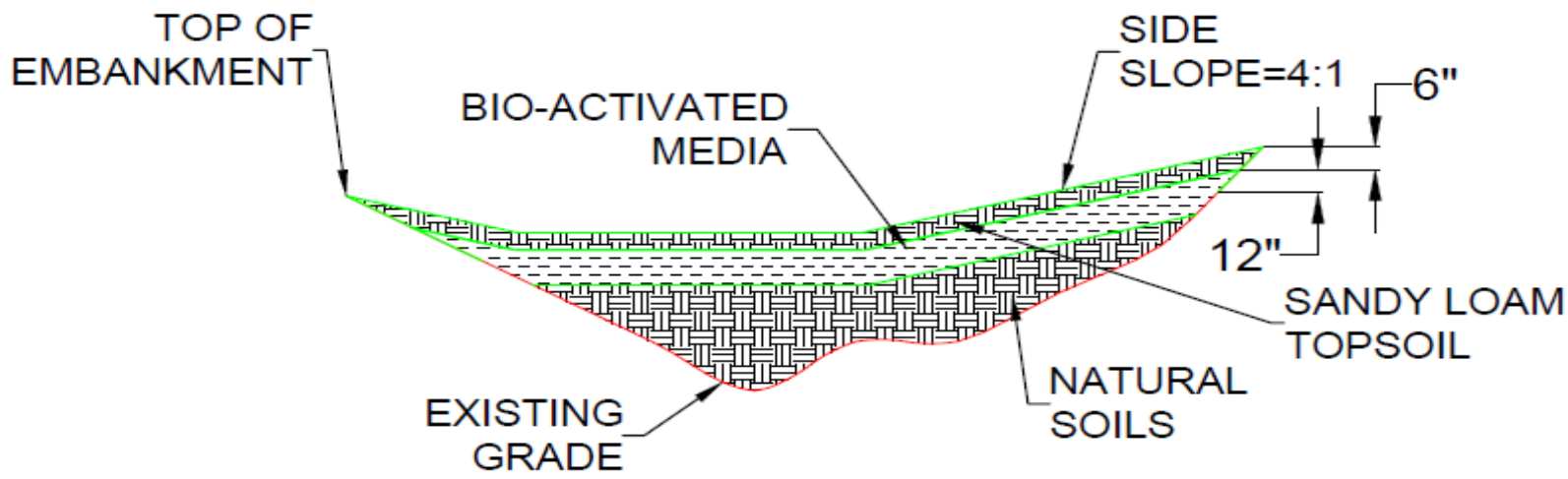



N

7 VEGETATED SWALE

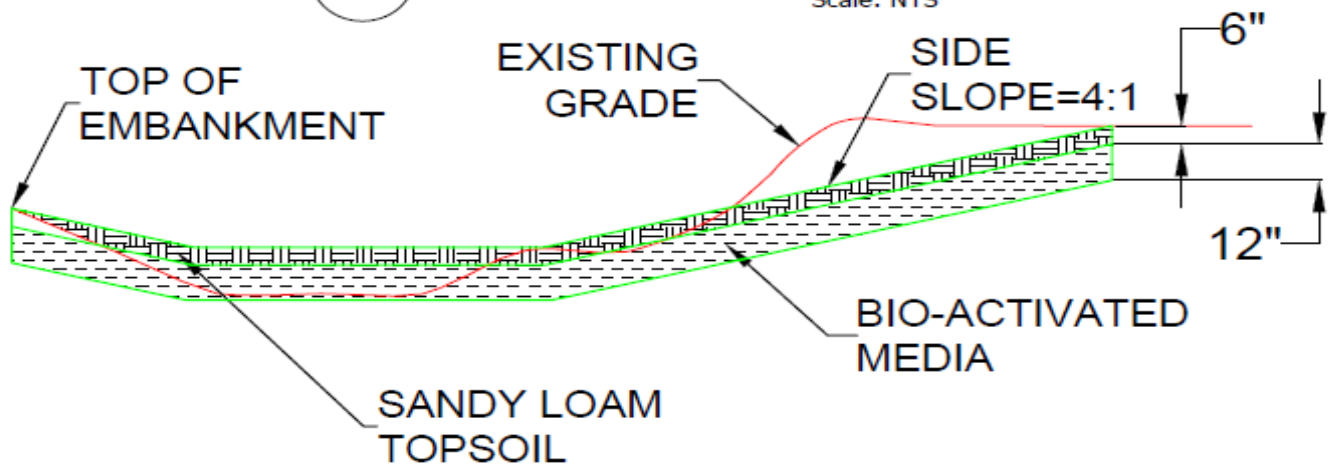
Scale: 1:20

| | | | |
|---|---|---|---|
| Aqua Engineering | AQUA ENGINEERING<br>4202 E FOWLER AVE<br>TAMPA, FL 33620 | CITY OF ST.PETERSBURG<br>LASSING PARK<br>2042 BEACH DR. SE<br>ST.PETERSBURG, FL 33705 | DATE: 04/09/2021<br>DRAWN BY: MP<br>SCALE AS SHOWN<br>SHEET C8 |




10 VEGETATED SWALE PROFILE

Scale: NTS




9 VEGETATED SWALE PROFILE

Scale: NTS

| | | | |
|---|---|---|---|
| Aqua Engineering | AQUA ENGINEERING<br>4202 E FOWLER AVE<br>TAMPA, FL 33620 | CITY OF ST.PETERSBURG<br>LASSING PARK<br>2042 BEACH DR. SE<br>ST.PETERSBURG, FL 33705 | DATE: 04/09/2021<br>DRAWN BY: MP<br>SCALE AS SHOWN<br>SHEET C9 |

# Evaluation of Recommendations

- A Pugh Matrix was used to weight each criteria and rank recommendations
- The Do Nothing Recommendation was evaluated as a baseline

Table 4: Pugh Matrix for Evaluation of Recommendations

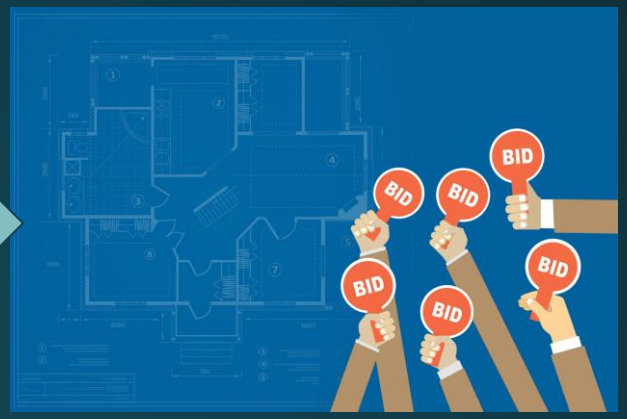
| Criteria | Weight | Recommendation | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0. Do Nothing | 1. Old Pier Removal | 2. Geotextile & Living Shoreline | 3. Stormwater Improvements | 4. Bio-retention bed | 5. Vegetated Swale |
| Cost (Initial + O&M) | 4 | 10 | 7 | 8 | 10 | 1 | 5 |
| Community Safety and Quality of Life | 4 | 2 | 7 | 10 | 10 | 10 | 10 |
| Control Erosion/Address WQ | 5 | 1 | 6 | 8 | 8 | 7 | 6 |
| Environmental Impact | 2 | 2 | 4 | 7 | 10 | 10 | 10 |
| Sustainability/Resilience | 3 | 2 | 10 | 5 | 7 | 6 | 9 |
| | **Total** | **63** | **124** | **141** | **161** | **117** | **141** |

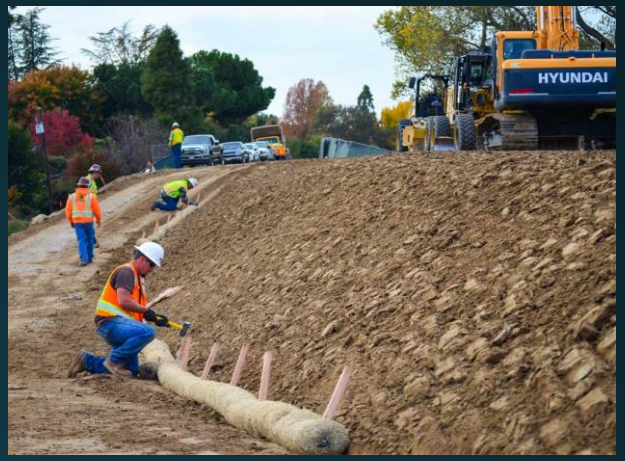
Table 5: Permitting

| | Stormwater Improvements | Living Shoreline, Swale & Rain Garden | Construction & Administration |
|---|---|---|---|
| **South West Florida Water Management District (SWFWMD)** | YES | NO | NO |
| **City of St. Petersburg** | YES | NO | YES |
| **Florida Administrative Code** | YES | YES | YES |
| **Florida Statutes** | NO | NO | YES |
| **Nationwide** | YES | YES | NO |

# Schedule

- Implement project in the following phases:
    1. Stormwater Infrastructure Improvements
    2. Vegetated Swale addition/re-design
    3. Geotextile and Mangrove Living Shoreline
    4. Bioretention Bed if funding allows



# Acknowledgements


- Dr. Ergas: For orienting and giving us the feedback and resources to carry out a successful project.
- Tom Cross: For giving us insight into the problem and providing important knowledge on the problem at Lassing Park.
- Dr. Hapke: For giving us a professional opinion and judgement on the erosion problems at the beach.



# Thank You!

Aqua Engineering


# Contact Information

Anna Zimmerman:

Email - anna.zimmerman@verizon.net
Phone - 941-526-6738

Jordin Kahler:

Email - jkjordin@gmail.com
Phone - 813-997-6735

Andres Lora Santos:

Email - alorasantos@usf.edu
Phone - 813-706-8365

Aqua Engineering