











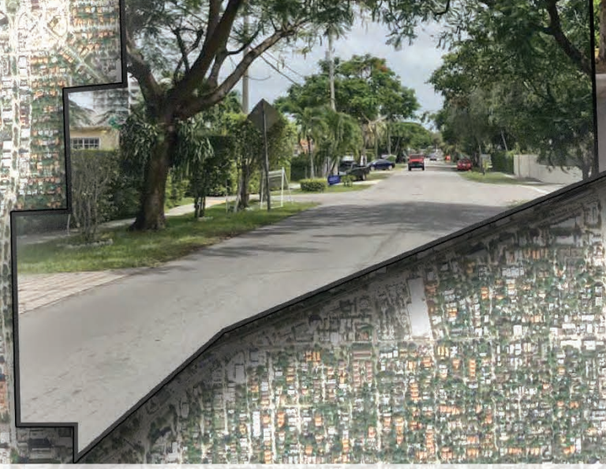

SW Streetscape and Street Tree Master Plan Volume 2

bcc engineering

ESciences ENGINEERING ENVIRONMENTAL ECOLOGICAL

LOCAL OFFICE LANDSCAPE & URBAN DESIGN

CURTIS+ ROGERS DESIGN STUDIO INC.

THE CITY OF MIAMI INCORPORATED 1896 DADE CO., FLORIDA

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Southwest Streetscape and Street Tree Master Plan

Volume 2

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Street Tree Master Plan - Volume 2 - Goals & Objectives

Volume 2 elaborates on how the goals and objectives of the project can be met through the development of practices for developing and maintaining the City's right-of-way.

Listed here are the Project Goals:

1. Strengthen the sense of place, neighborhood identity and aesthetics, through the identification of strategic tree planting locations at gateways, thoroughfares and choice of species to identify specific districts along major corridors, and the reintroduction of native local plant species
2. Build the community's resilience to the impacts of climate change through tree shading to reduce the heat island effect
3. Maintain and enhance the quality of the air, water and land through a mature tree canopy's ability to sequester carbon and release oxygen, and filter storm water
4. Promote and encourage actions that reduce greenhouse gas emissions through the creation of attractive and comfortable pedestrian and cycling routes which foster the use of alternate modes of transportation
5. Create a road map by which a sustainable urban forest can be developed, and implement a planning process that will support and cultivate the maintenance of ecological, social and economic functions and benefits, over time
6. Promote awareness with City residents, on the benefits of trees, through community education and outreach

Below are the sections of the Master Plan and the corresponding goals they address:

Planting Practices (Goals 2-5) - This section shows recommendations for species selection, location, spacing, and details for installation and protection. This section also includes guidelines for determining if additional infrastructure is needed to allow for parking in the ROW and preferred infrastructure methods and details.

Maintenance (Goal 5) - This section shows recommendations for maintenance strategies including planning and cultivating the urban forest over time.

Neighborhood Plans (Goal 1) - This section shows a summary by neighborhood of recommended strategies including species selection, priority planting areas and featured species.

Community Awareness Resources (Goal 6) - This section includes brochures and handouts for the City to use to educate the residents on the benefit of trees and the goals of this project.

Illustration of an Asymetrical planting plan for streets with overhead utility lines

Illustration of a tree with Structural soil

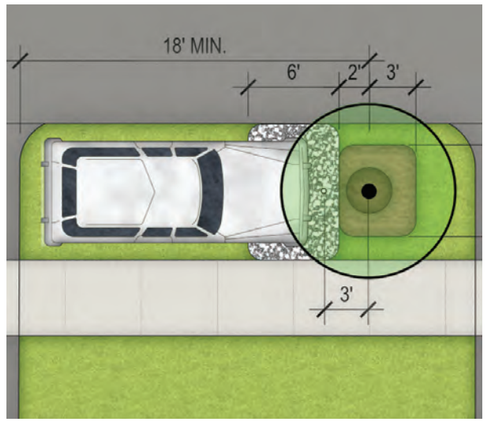


Diagram of tree planting adjacent to parking

Illustration of neighborhood mapping of suggested Green Streets

Executive Summary Volume 2

Summary

Increasing resiliency can be accomplished through two major interventions, increasing tree canopy coverage and increasing the percolation and storage of storm water runoff. Increasing the canopy provides the greatest overall benefit, as it not only brings down the ambient temperatures (reducing urban heat islands) but intercepts and absorbs storm water. Increasing the trees abilities to absorb the storm water through pervious materials surrounding them creates additional benefits. The Introduction to the Master Plan section looks at how the City can keep the canopy that it currently has, which is vitally important, as new trees take time to establish.

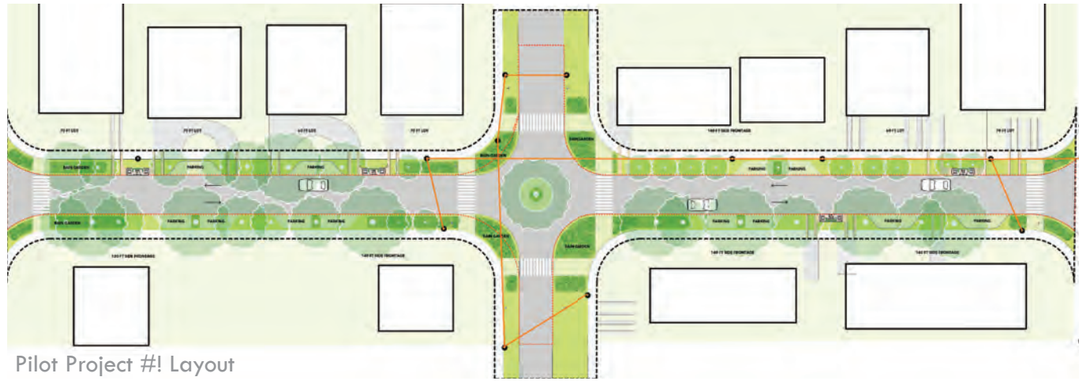
Using the mapping and analysis in Volume 1, a strategy for storm water was designed by targeting the interventions according to their locations topographically. Upland areas can be used to store more storm water (Green Streets), keeping it from flowing down into the Lowland areas (Blue Streets) where more below ground storage capacity can be added. This strategy for Blue and Green Streets is explained in the Pilot Projects section, which shows four sample streets (Two Blue, Two Green) and how the strategy can be implemented.

To ensure that new trees will provide maximum benefits, and because it was observed that many of the failures of the City's street trees were related to placement and species selection, this volume looks at how to avoid those pitfalls moving forward. The Master Plan outlines the recommended practices in the section Planting Practices, which is broken down into the following sections:

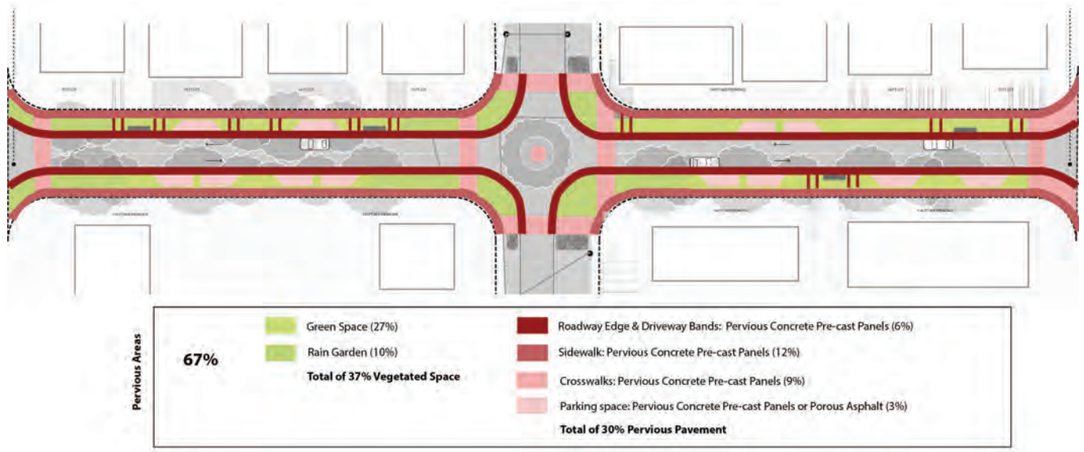
- Tree Placement: Optimal locations to place new trees according to site-specific factors.
- Species Selection: Species palettes with a flow chart to aid selection.
- Planting Methodologies: Best practices for the installation of trees.

Maintaining the new and existing trees is crucial to keeping them alive and gaining the optimal benefits from them. The Maintenance section outlines the importance of maintenance and the best practices for implementing it. Covered in this section are planting, pruning, soil management, infrastructure repair, pest/disease management, and storms and wind resistance.

The Neighborhood Plans section outlines urban forestry strategies for development of a resilient canopy. Specific streets are identified as green corridors with the intent of creating a network of walkability. The tree inventory of each neighborhood is then assessed by distribution of species and sizes to provide site-specific recommendations. Since diversity is vital to a healthy urban forest, recommendations offer multiple tree species categorized by size, so that they can be placed in the optimal growing conditions.



Pilot Project #! Layout



Pilot Project #! Materials

Illustration of a large swale street

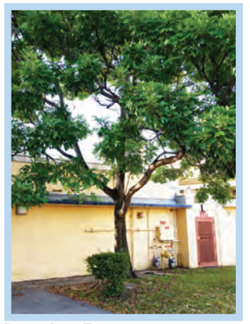
Executive Summary Volume 2

Completed Tasks

The Design team completed the following actions in gathering the information provided in this report:

- Observed and assessed current new tree planting within the city, looking at methods of planting, placement of trees and success over time
- Developed tree palettes with the input of the City for different growing conditions
- Identified streets within the project area where increased canopy could be used to create a more walkable city.
- Researched and developed guidelines for urban forestry and maintenance practices for the city.
- Created planting strategies for each “Street Typology” defined in Volume 1. These are based upon the streets; right-of-way size, sidewalks, size of swales, and parking.
- Developed strategies by typology for increasing the canopy coverage and calculated the maximum benefits achievable.
- Documented each street by typology and quantified typologies by neighborhood.
- Created graphics to depict the existing canopy coverage in each neighborhood by species and size.
- Made recommendations for species diversity for each neighborhood, noting species that have been over-represented.
- Identified signature species for each neighborhood for use as accents.
- Identified the priority areas in each neighborhood based upon the research done in Volume I.
- Identified and mapped walkability strategies for each neighborhood.
- Researched and analyzed pervious paving options and made recommendations based upon the findings.
- Developed four pilot projects, showing recommended changes to the street, swales and sidewalks through materials and plantings.
- Developed materials that can be distributed to the communities to inform and educate them on the efforts to make the City’s right-of-way more resilient and how they can help.

Gumbo Limbo



Paradise Tree

Mastic

Jamaican Dogwood

Tree Species Selections

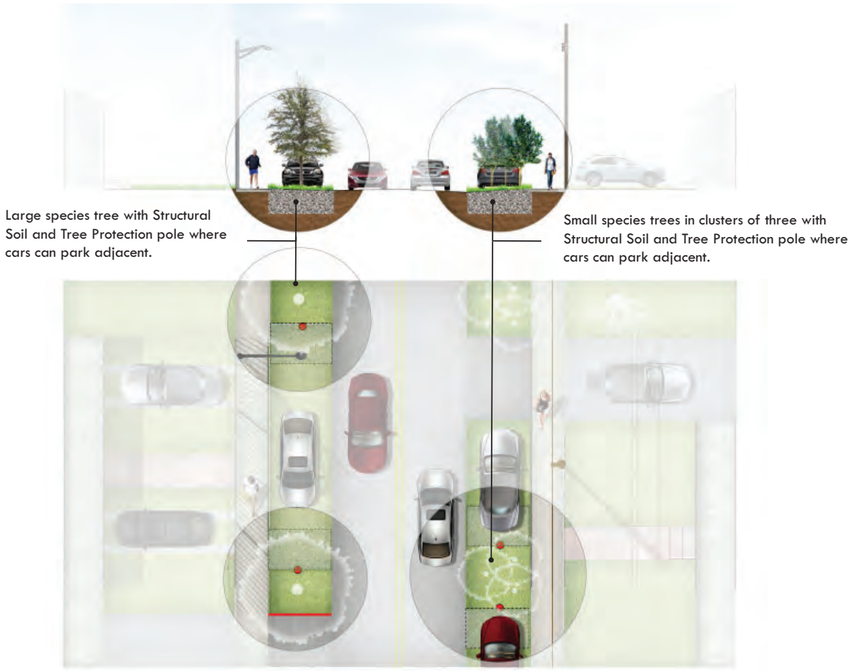
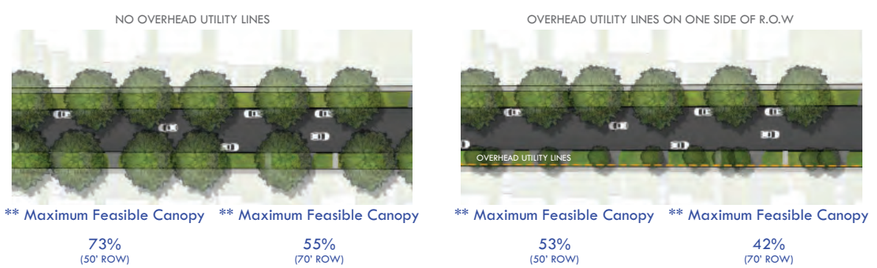


Diagram of Typology Planting Recommendations



Illustrations of how to obtain maximum canopy by Typology

Goal 1: Increase Tree Canopy

Increasing the City's canopy will not be accomplished simply by planting more trees. What is needed is more canopy coverage. Canopy is dependant upon the size of tree and it's health. Therefore it makes sense to maximize the limited amount of planting space that exists within the City's right-of-way with trees that will produce maximum shade. This Master Plan addresses how this limited space can be utilized most efficiently to create the maximum amount of canopy coverage for the SW Streetscape area.

Plant More Trees

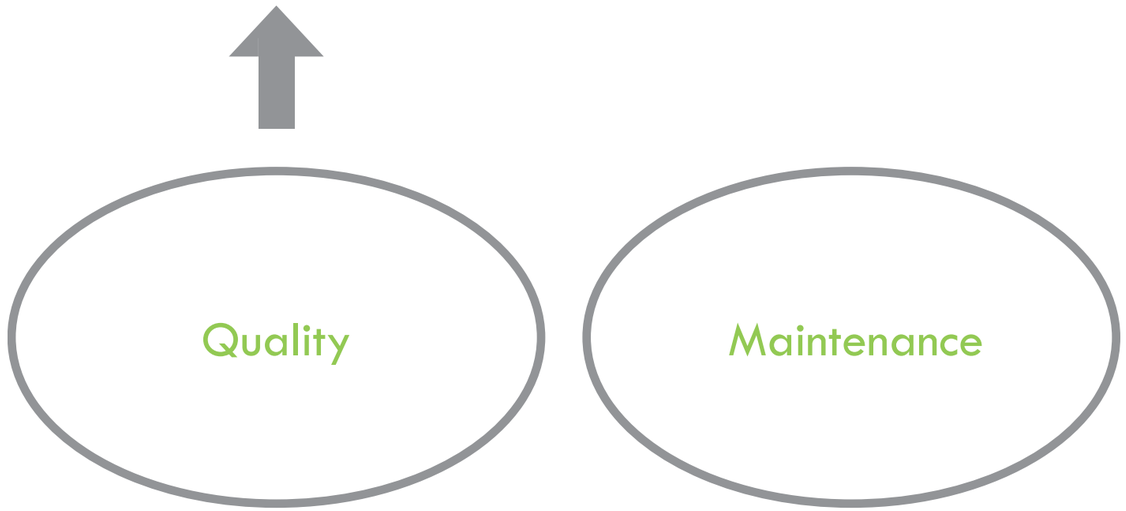
The greatest detriment to quality canopy is putting a tree in a location that does not have the proper infrastructure to support its healthy growth. Therefore, thoughtful and carefully planned tree planting practices are key to the long-term success of and lower maintenance costs of trees within the right-of-way. Much of the current money spent on maintenance is applied towards repairing infrastructure (Sidewalks, Streets, Utilities) damaged by improperly planted trees. Currently the City does not have the funding to provide the amount of maintenance requested by its residents for its street trees. This shortfall is largely due to trees that were planted improperly, or where development was allowed to limit the growing space of existing trees. With more careful street tree selection and improved planting practices, the City can reduce maintenance costs in the long term. However, because there are so many street trees within the City that do not have the required infrastructure, the current funding for maintenance needs to be increased, or re-structured to be a more efficient use of the funds.

Tree planting will have a standard layout with additional infrastructure being required where:

- the presence of swale parking is observed, or
- if a larger species tree is desired in a swale smaller than the recommended size.

Location strategies are based upon the goal of getting the highest quantity of high quality canopy on any given street within the project area while also providing city residents with parking in areas where it is needed. High quality canopy refers to a tree that has been planted in optimal conditions and would therefore require only minimal long-term maintenance.

The strategy overall in this Master Plan is to plant the right trees in the right place, maximizing their potential to provide shade.



There is a direct correlation between quality of trees and dollars required for maintenance

Higher Quality Canopy = Lower Maintenance Costs

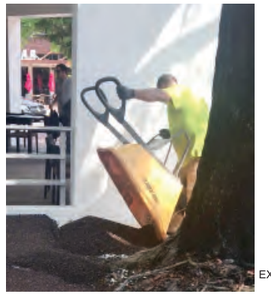
Goal 2: Preserve Existing Trees

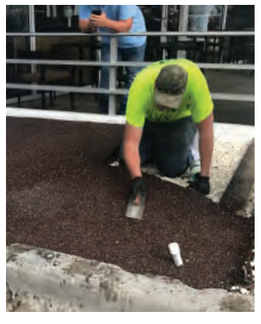
As previously mentioned, many of the trees that are today's most beneficial canopy for the City are currently growing in less than ideal conditions: Either below overhead utility lines, or in too small planting spaces. Though there is not much that can be done to correct the first problem, there are some solutions for the second. Coconut Grove has been dealing with its large trees and heaving sidewalks in its business district for several years now, and much has been learned from their endeavors. In highly urban areas where paved walking spaces are desirable and large trees are making this problematic, there are alternatives to removal that should be utilized. Enlarging the vegetated growing space for trees is the ideal solution to these issues, however that is not always an option in the urban environment. One of the most effective ways to address the heaving sidewalks is to replace the standard concrete with a flexible porous material. The new flexible porous aggregates like Flexipave are hard ADA approved surfaces that allow water and air to reach the roots, which encourages them to stay down. This product can be applied directly over the roots to a depth of as little as two inches, and is easy to grade up over large root masses. Ideally these flexible porous surfaces should be vacuumed periodically to provide optimal performance. However, even without periodic cleaning, the product is more porous than concrete or asphalt and better for the roots of the trees which discourages further destructive root growth.

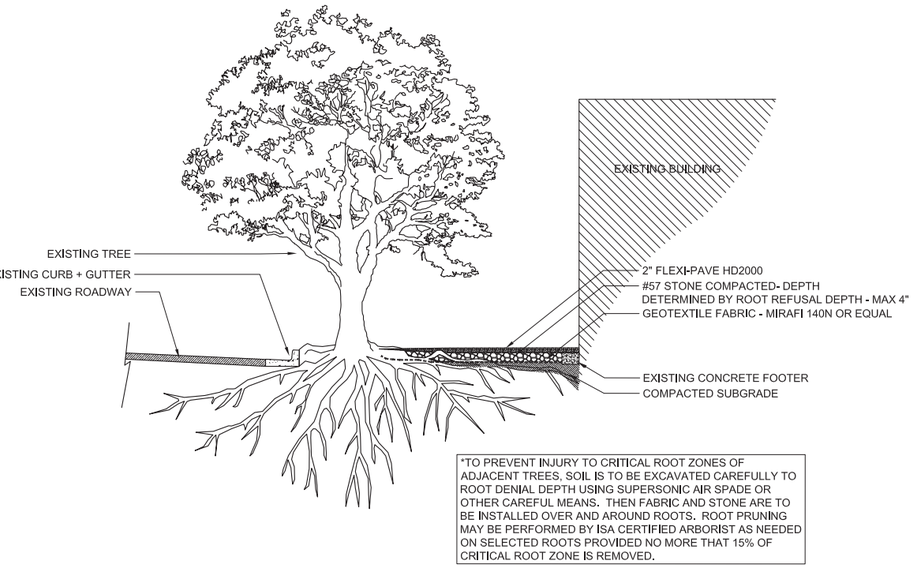
Main Highway in Coconut Grove. Sidewalks were hazardous and a temporary fix of asphalt was used by the County to try to make this passable - not meeting ADA requirements (Left). Bricks and concrete were removed to expose the root systems of the trees (Center). Flexi-Pave was installed and this area is now ADA accessible (Right).

Above: Mahogany trees in La Pastorita that have outgrown their space. This is an extra large species planted in a 3-FT swale (should be at least 15FT).

Right: A similar sidewalk in the City adjacent to Mahogany trees where the sidewalk was removed to evaluate the roots.







Flexi-Pave being poured out and smoothed to finished grade (Left). Detail of installation.

Reduce Maintenance Costs (large trees, small swales)

Equally costly is the need to frequently repair and replace sections of the roadway and curbing because of roots damaging the surface. If flexible porous pavement is the solution for the sidewalks, pervious pavement is the solution for the adjacent street. In many neighborhoods like Shenandoah North & South and Silver Bluff there are large trees growing in swales that are too small, these trees repeatedly damage the curbs, streets and sidewalks in these neighborhoods. These Typology C streets have parking on both sides of the street. The recommended correction for this condition would be to excavate the parking space and infill with Structural Soil and top with porous pavement. This would allow the trees roots to get the water and air they require, making them less likely to rise and damage the driving surface. (See diagram to the right)

Pervious concrete swale in Parkdale South

Pervious concrete swale in Parkdale South on left is dry during rain event - dirt swale on right is puddled from compaction due to cars.

Large mahogany tree in Shenandoah that has cracked the curb and the adjacent road.

Goal 3: Filter Storm Water & Reduce Flooding

A comparison between the 19th century hydrology of Miami-Dade County and the current patterns reveal how the movement of water has changed due to wide scale drainage of the Everglades. As urbanization expanded, the hydrology system was altered to create additional areas for urban infill. With urbanization comes an increase in impervious surfaces. Fast moving runoff flows toward these lower areas of infill, jeopardizing homes built within the former sloughs. As a result, these areas are vulnerable to flooding even during minor rain events. Our future streets need to adapt to the increasing pressure of more significant catastrophic storm events, which can bring up to 15" of rainfall within 24 hours.

Green Streets

Streets with a high ground elevation are considered a green street. The higher Delta permits a "living cistern" that holds water uphill using a filter liner filled with structural soil, and porous surfaces. This bioretention system self irrigates trees, and reduces downhill flooding and maintenance.

Blue Streets

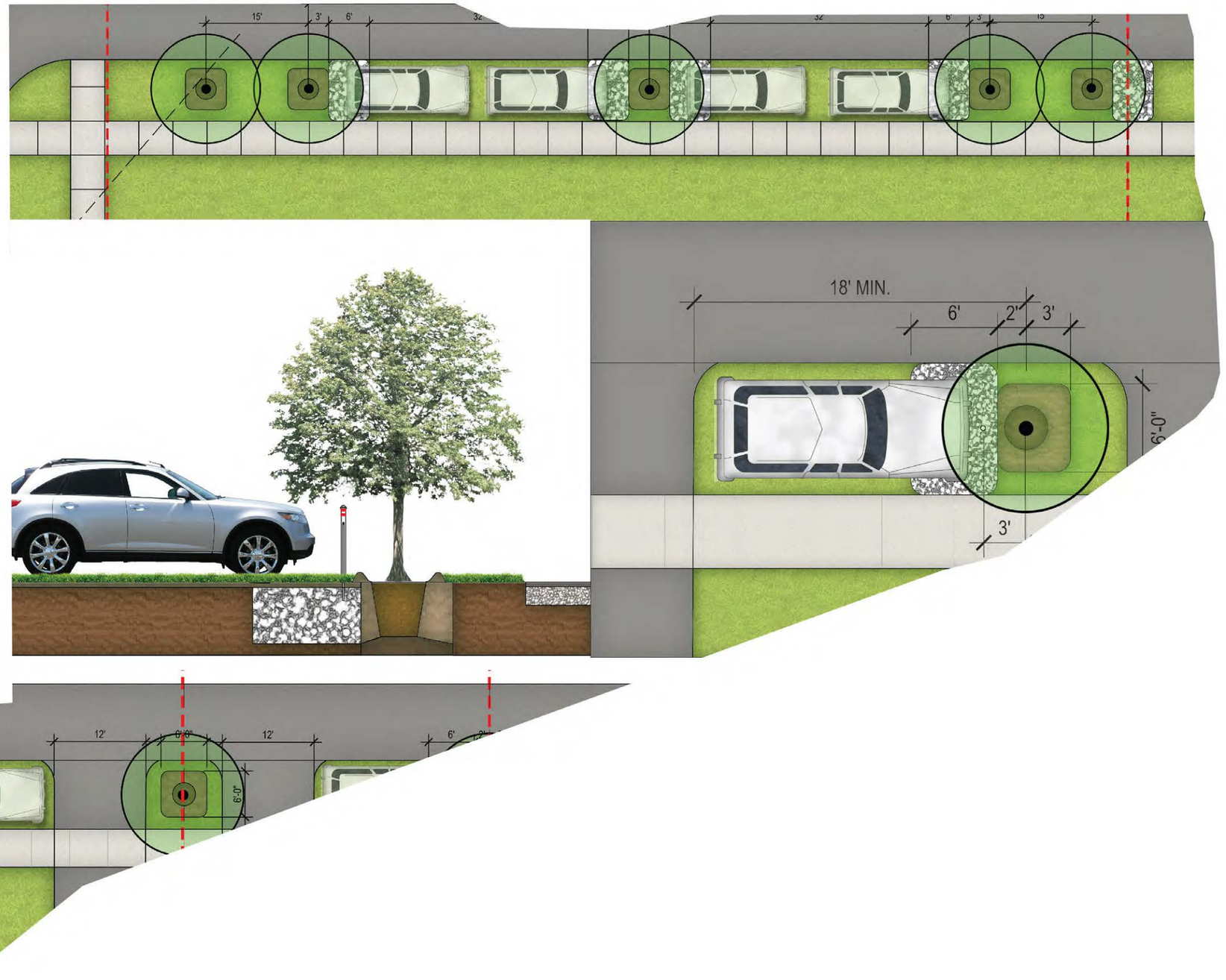
Streets with a low elevation are considered blue streets. Designed for intertidal longevity - porous paving, structural soils, and rain gardens are employed to lower groundwater, increase storage capacity, and clear ponding immediately after king tide events. Blue streets can reduce runtime and extend the life of flood pumps.

Pilot Projects

Using the mapping and analysis in Volume One, a strategy for storm water was designed by targeting the interventions according to their locations topographically. The application of this strategy has been demonstrated in the Pilot projects.

The Pilot Projects were developed to supply the City with Design Criteria for projects to test the application of the principles and strategies outlined in this Master Plan. Four specific streets were selected with the help of the City to provide a wide range of street typologies and project objectives. The projects, however could be applied to any similar street within the City so the exact locations were removed from the report.

The goal of these projects should be to test the use of the materials and layouts recommended, and to monitor the results. Looking at actual improvements in heat island reduction and storm water runoff. Similarly, the City can monitor the costs and any special needs for maintenance of these streets. This will help provide the City with quantifiable justifications for allocating more funding to improving the resiliency of their Right-of-Ways.



PLANTING PRACTICES

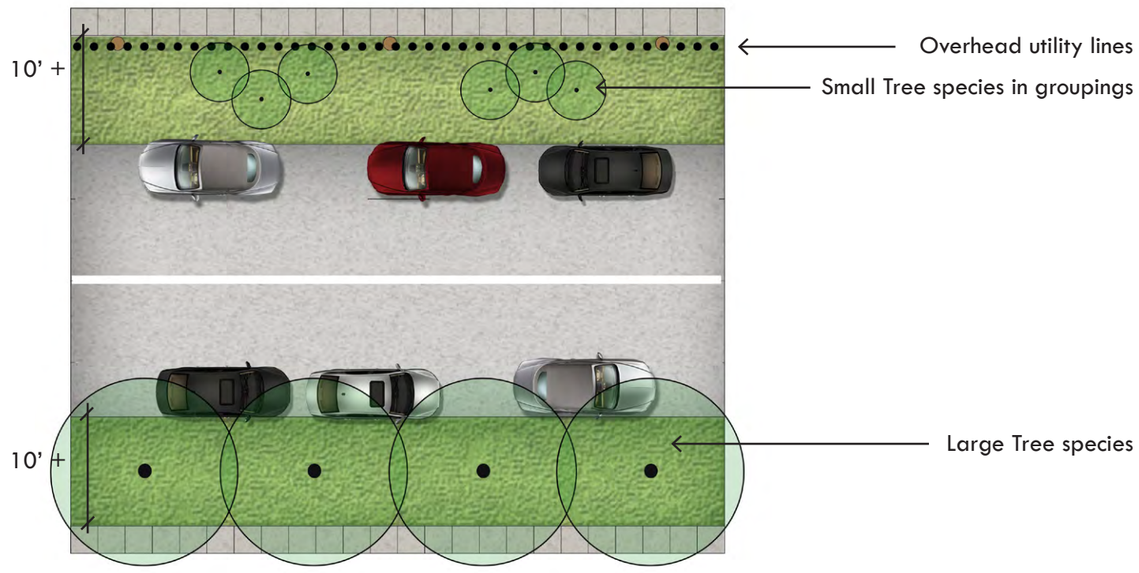
Tree Placement

Location Strategies

Tree location strategies were created with the goal of getting the highest quantity of high quality canopy on any given street within the project area while also providing city residents with parking in areas where it is needed. High quality canopy is canopy that requires only minimal long-term maintenance due to being planted in optimal planting conditions.

There are two major issues with existing trees in the swales observed within the project area; the first issue being that **large species trees have been planted under overhead utility poles requiring severe pruning to maintain them**, the second issue is **large species trees have been planted in small swales without adequate space or soil volume to support them.**

The overall strategy of this Master Plan is to plant the right trees in the right place, maximizing their potential to provide shade. This means that on streets where there are overhead utility lines, the species selection will not be uniform. Many people love the look of a uniform species of trees lining both sides of a street. However if there are overhead utility lines, this is a condition that should not be attempted. Instead, it is recommend that the side of the street without the overhead utility be optimized for planting the largest shade trees possible, and the side under the overhead utilities be planted only with smaller, appropriate species. This ***asymmetrical planting scheme*** will achieve the highest quantity *and* quality canopy coverage, that will require the least amount of long-term maintenance.



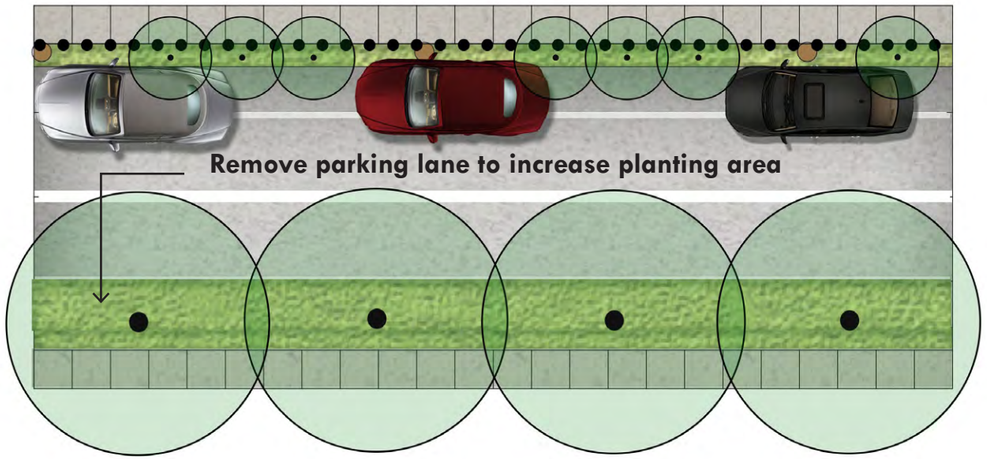
Asymmetrical Planting Scheme - Plan View

Asymmetrical Planting Scheme - Perspective View

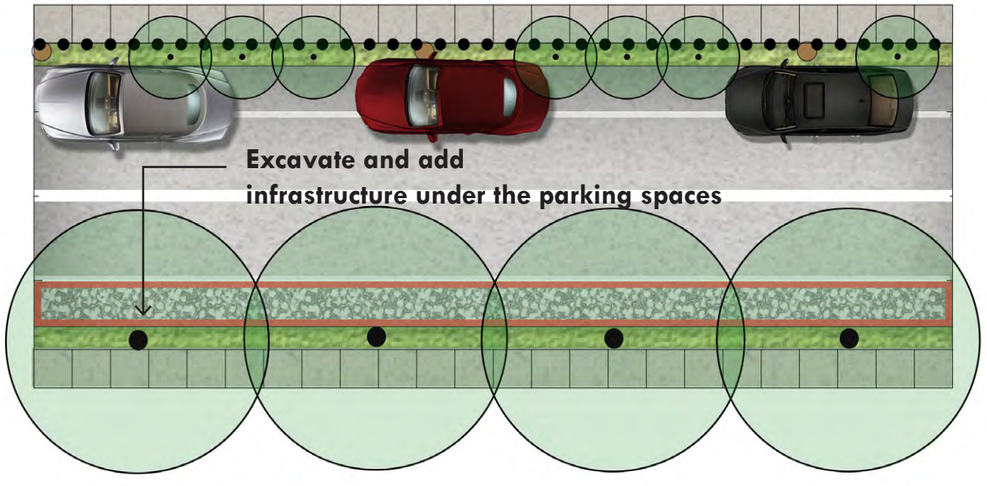
Tree Placement

Location Strategies - Utility Lines

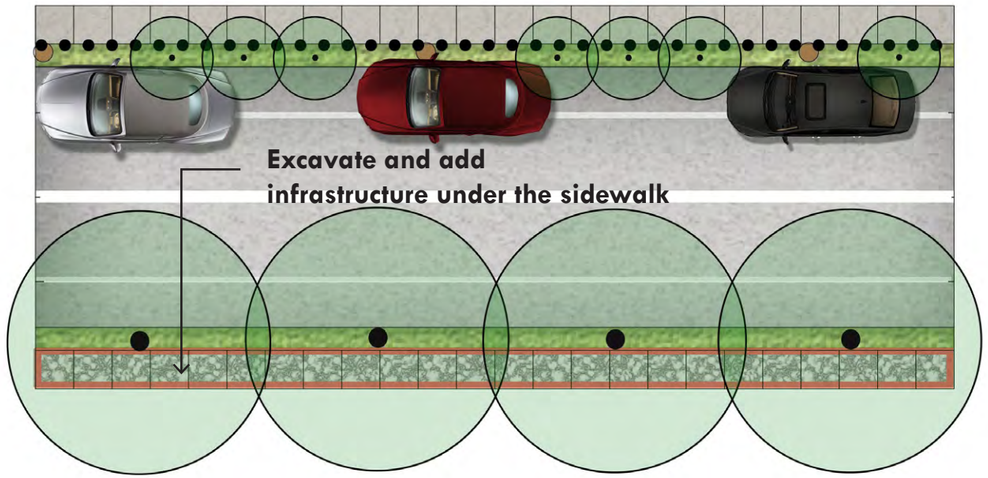
Where there is not enough swale space on the side of the street where there are no utilities to support a large species tree, alternative measures must be taken. One alternative is to remove parking spaces and increase the swale size (Option 1)- however in many of these neighborhoods the parking is very necessary. An alternative is to excavate the parking space, add infrastructure and top with paving or preferably porous paving (Option 2). Infrastructure could also alternatively be placed under the sidewalk (Option 3). For very small swales both options 2 and option 3 can be used. Current options for tree infrastructure are Structural Soil and Soil Cells; both systems are detailed on the following page.



OPTION 1



OPTION 2



OPTION 3

Newly planted Foxtail palms on left where there are no overhead utility lines and Mahogany trees (Large Species) under overhead utility lines on the right - in Douglas Park (2019)

Mature Tamarind tree (Large Species) under overhead utility line in Auburndale (2019) Severely pruned to one side, this tree is more likely to fail in storms.

Tree Placement
Location Strategies - Infrastructure

Large species tree in small swale - with Soil Cells

Soil Cells:

Soil Cells are a modular suspended pavement system that uses soil volumes to support large tree growth. The major manufacturers of these are Deep Root's Silva Cell, and GreenBlue Urban's Soil Cells. This product is FDOT approved and has been installed in Coconut Grove and Flagler Street in the City of Miami.

Silva Cell Installation on Flagler Street, Miami 2018

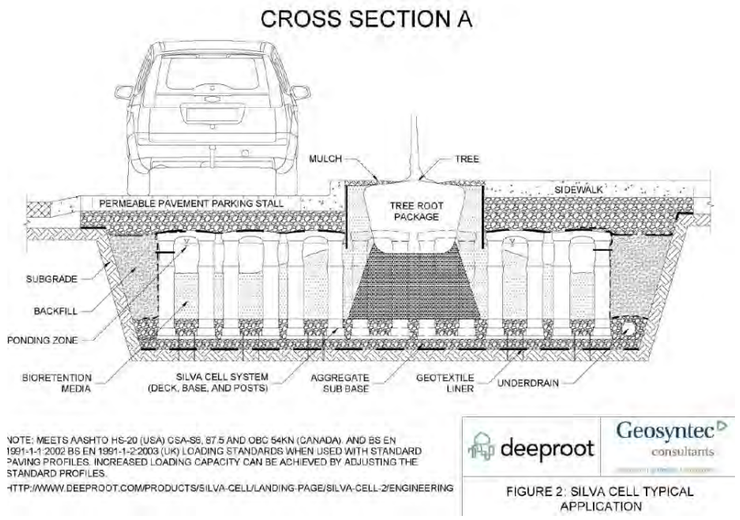


FIGURE 2: SILVA CELL TYPICAL APPLICATION

Large species tree in small swale - with CU-Structural Soil

CU-Structural Soil:

CU-Structural Soil™ (U.S. Patent # 5,849,069) is a two-part system comprised of a rigid stone "lattice" to meet engineering requirements for a load-bearing soil, and a quantity of soil, to meet tree requirements for root growth. This product is FDOT approved and has been installed on Coral Gables' Miracle Mile and Giralda Streets.

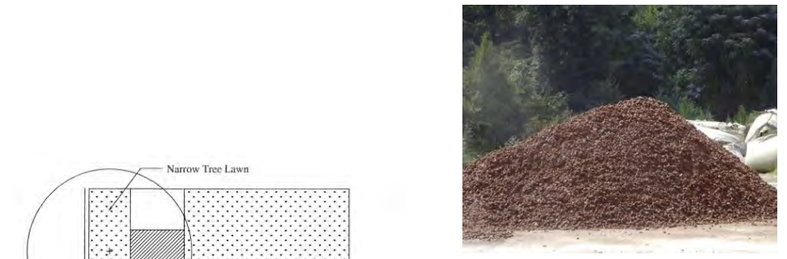
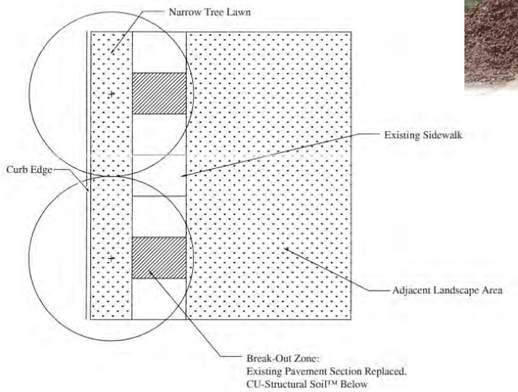


Fig. 1.20 Break-out zone with CU-Structural Soil™ under a sidewalk between a narrow tree lawn and adjacent landscape area



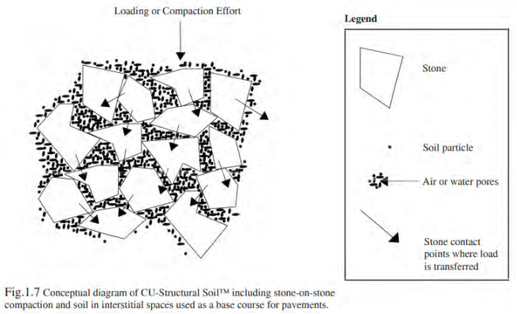


Fig.1.7 Conceptual diagram of CU-Structural Soil™ including stone-on-stone compaction and soil in interstitial spaces used as a base course for pavements.

From: "Using CU-Structural Soil in the Urban Environment", Cornell University, 2005.

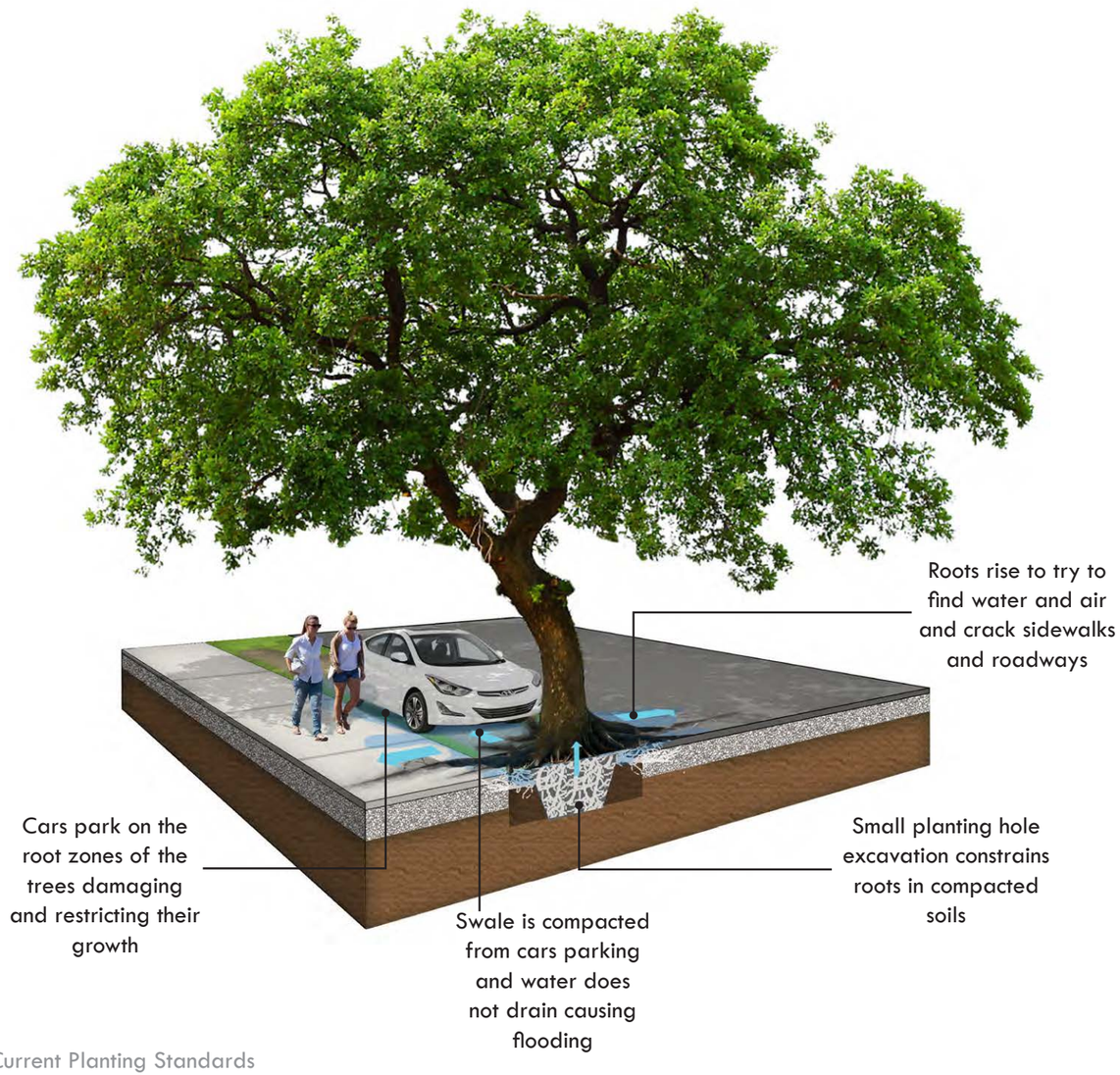
Tree Placement

Location Strategies - Swale Size

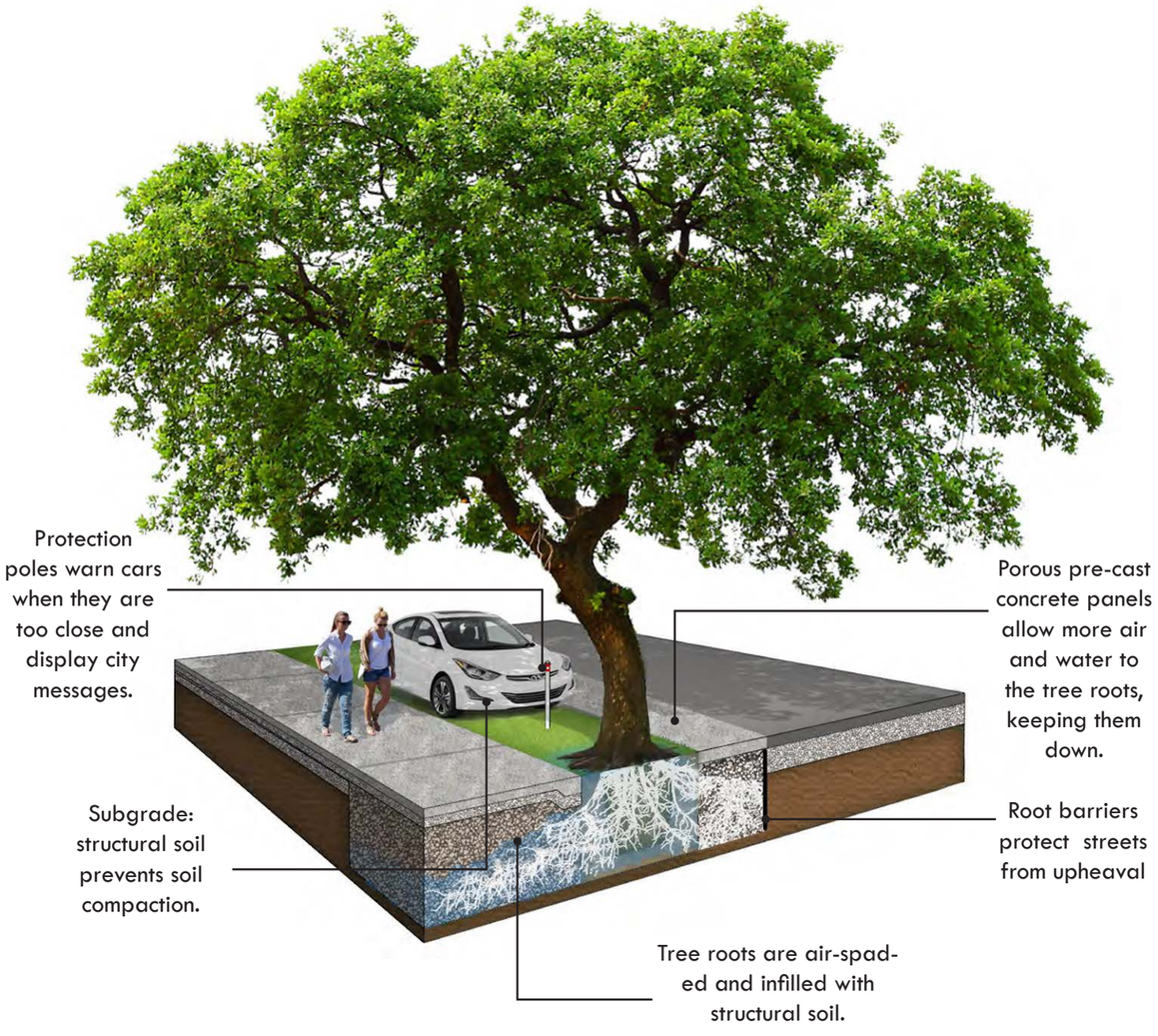
The second major issue with existing trees in the swales observed within the project area is: **Large species trees planted in small swales that are now causing upheaval of sidewalks, curbs and roadways**

When a large species of tree is placed in a small swale, eventually it will outgrow it's space, causing damage to the surrounding sidewalks and roads. Many of these trees are today's most beneficial canopy for the City and should not be removed. Rather than removal, which is perhaps the most costly as it can take up to 15 years for any new trees to produce a canopy similar to what was removed, taking steps to mitigate the damage are much more beneficial. Excavating and adding structural soil below and porous, flexible paving above is a costly expense upfront but saves money over time with lower long-term maintenance costs. Not doing anything at all will be very costly over time with the necessity to repeatedly replace the hardscape surroundings making long-term maintenance costs high.

Moving forward, as the City tries to increase its canopy, precautions need to be taken to avoid creating more problems like this in the future.



Current Planting Standards



Proposed Correction for Large Trees in Small Swales

Tree Spacing

Spacing Strategies

There are two major issues with new trees being planted within the project area which are related to spacing, they are:

- New trees being planted are being hit by cars that are parking on the swales
- Growth will be greatly stunted due to the compaction of the adjacent soils because of cars parking on the swale.

The spacing strategies proposed should limit the number of trees being impacted by the factors above, while still providing canopy for the street. The proposed strategy is to plant with car parking in mind - leaving an appropriate amount of space for either one car or two cars. Appropriate spacing to permit the parking of one car in the center is approximately 25'-30' apart. When trees are spaced at more than 30' apart drivers tend to try to fit more than one vehicle often times damaging trees. If two cars are desired, than 50'-60' spacing is ideal. All efforts should be made to avoid planting trees between 30'-50' apart, as this space is too small for two cars, but big enough for people to try to put them there anyway. Spacing at 20' apart should also be avoided, as it is too small for one car, but large enough that someone will try. It is recommend planting trees 15' apart if parking is to be discouraged. We also recommend that a deterrent pole be placed in areas where parking is common on the swale. These poles which are detailed later in this section, shall serve as reflective markers for people parking and also carry messages from the City regarding caring for the trees.

Tree spacing will be dictated by lot size, primary or secondary frontage, and observed residential usage. The following pages include guides for lots sized at 40', 50', 60', 100', and 150' including both principal and secondary frontages.

Too Little Space to Park...

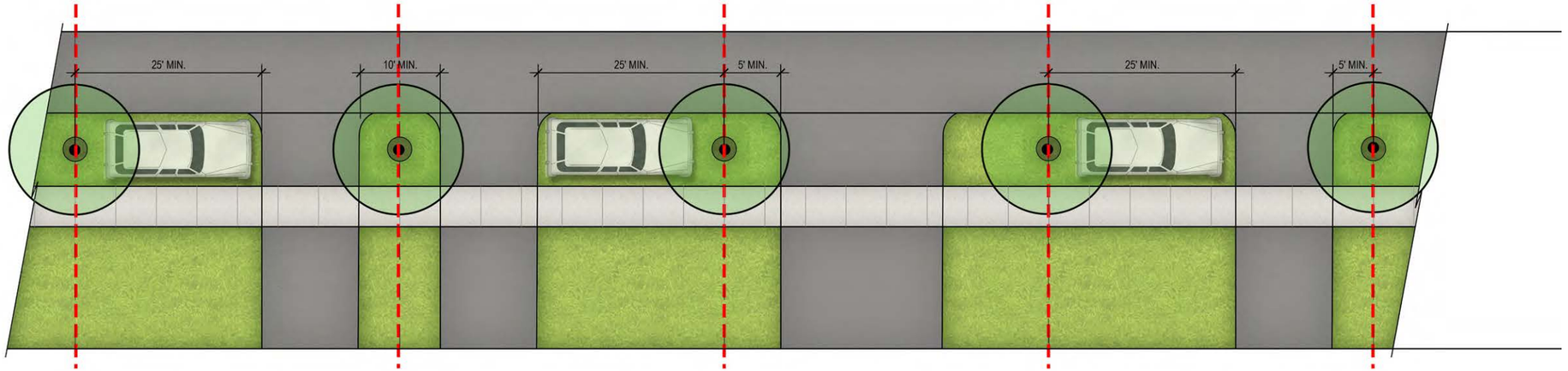
Newly planted Orange Geiger tree in Douglas Park (2019)
Left: October 2019 - Right: July 2020

Newly planted trees in Douglas Park (2019) 20' apart. If this homeowner had a larger car, it is unlikely these trees would still be standing.

Newly planted trees in Douglas Park (2019). Too much space for one car, too little space for two cars. Approximately 45' between trees. Recommend either 25' or 50' between.

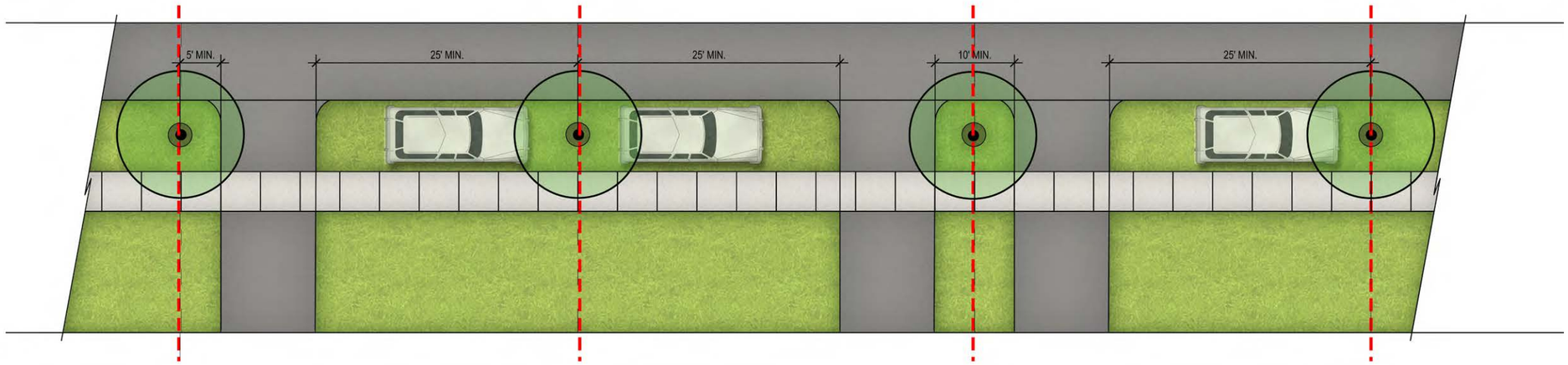
One of numerous dead trees of new plantings in Douglas Park in 2019

Newly planted trees in Douglas Park (October 2019) 20' apart. The supports for the tree were already broken in October 2019, by July 2020 this tree is dead.



40’ frontages are typically found in Multi Family areas where parking on the street is highly utilized and street trees are typically scarce. This is the recommended spacing for these lots, with the intent of placing a tree on each property line. (*) (**)

40’ Lots - Typically Multi-Family

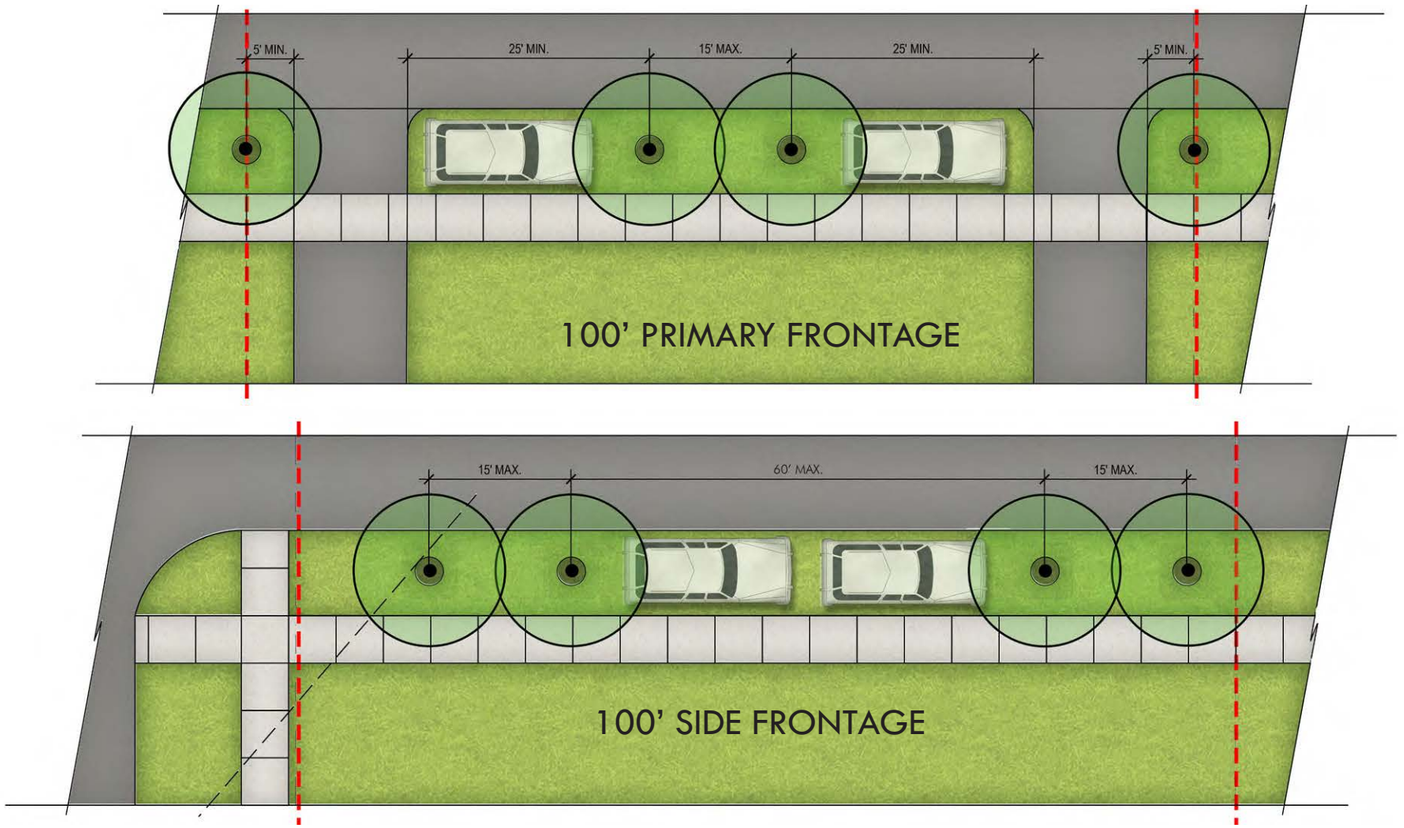


50’ frontages are predominant within this project area, however there are some 60’ lots as well. These properties are usually single family or multifamily within the Southwest Streetscape area. This is the recommended spacing for these lots, with the intent of placing a tree on each property line. (*) (**)

(*) On the side of the street where there are no overhead utility lines depending on the size of the swale, extra-large, large, or medium sized shade trees shall be planted.

(**) On the side of the street under the utility lines small species of trees shall be used.

50’-60’ Lots - Single Family & Multi-Family

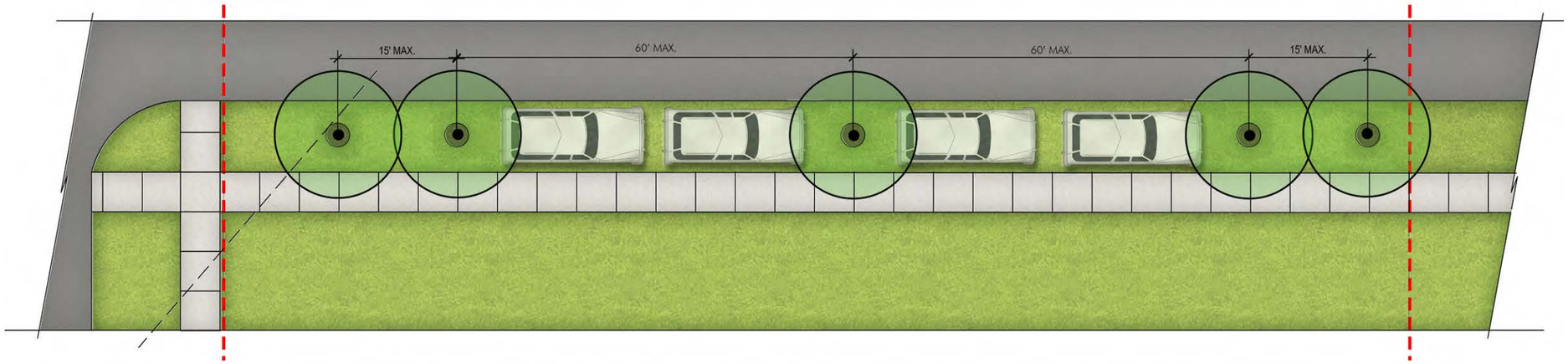


100' frontages are typically single family when they are Primary frontages, however there are many avenues within the Southwest Streetscape area that have side frontages that are 100' and these can also be multi-family areas. This is the recommended spacing for these lots, with the intent of placing four trees within the 100' and allowing for two cars to park. In neighborhoods with high density and high demand for parking, this could be reduced to two trees on the side frontages to allow for one more car to park.

On the side of the street where there are no overhead utility lines depending on the size of the swale, extra-large, large, or medium sized shade trees shall be planted.

On the side of the street under the utility lines small species of trees shall be used.

100' Lots - Single Family & Multi-Family



150' frontages are typically single family side frontages, however there are some streets within the Southwest Streetscape area that have primary frontages that are 150' and these are also typically single family homes. This is the recommended spacing for these lots, with the intent of placing five trees within the 150' and allowing for four cars to park. In neighborhoods with low density and low demand for parking, this could be increased to six trees.

On the side of the street where there are no overhead utility lines depending on the size of the swale, extra-large, large, or medium sized shade trees shall be planted.

On the side of the street under the utility lines small species of trees shall be used.

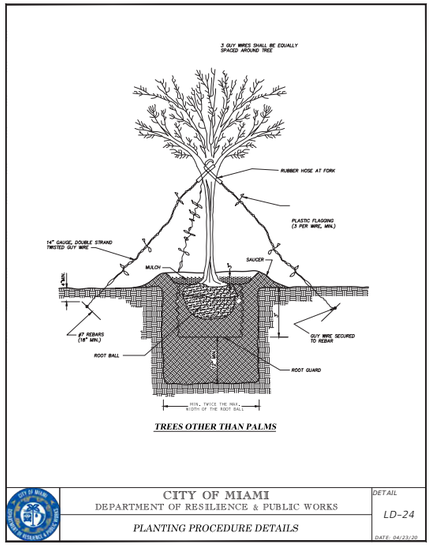
150' Lots - Single Family Typically

TREE SPACING

Observed Planting Practices

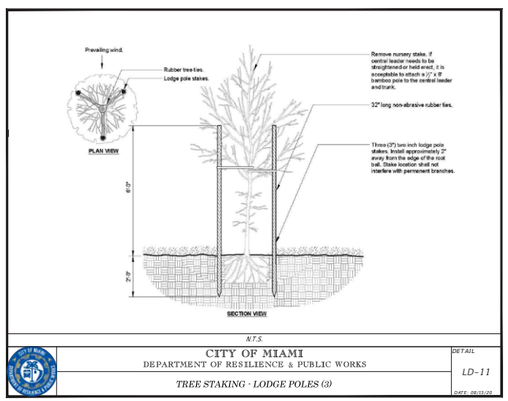
Pit Excavation

Industry standards state that the size of the planting hole should be two times the size of the root ball. We have found that current practices in the field have been less than this even with some of the Public Works department details showing this (see detail LD-24 below). There are several Public Works details about planting trees and it is not clear which should be used, since they contradict each other. Our observations are that detail LD-11 is what is likely being used in the field (although it is just for staking) and it shows the planting hole the same size as the rootball with the stakes inserted next to it. Detail LD-24 (Planting) shows an excessively deep tree pit and a different staking system. Most of our soils in Miami are less than 3' deep, and industry standards recommend placing the rootball on existing soil to reduce unwanted settling. The placement of the root guard is problematic and we do not recommend it be installed as shown. Our overall evaluation of the current City standards is that they are not adequate or realistic for the conditions in this area of the City. Our recommended details are shown in the following pages.



Current City detail shows planting pit 2x size of the root ball, but has a root guard around the ball (which will only limit the growth of the tree and is inappropriate at this location). The planting pit depth is unrealistic for our soil depths and would encourage settling of the tree.

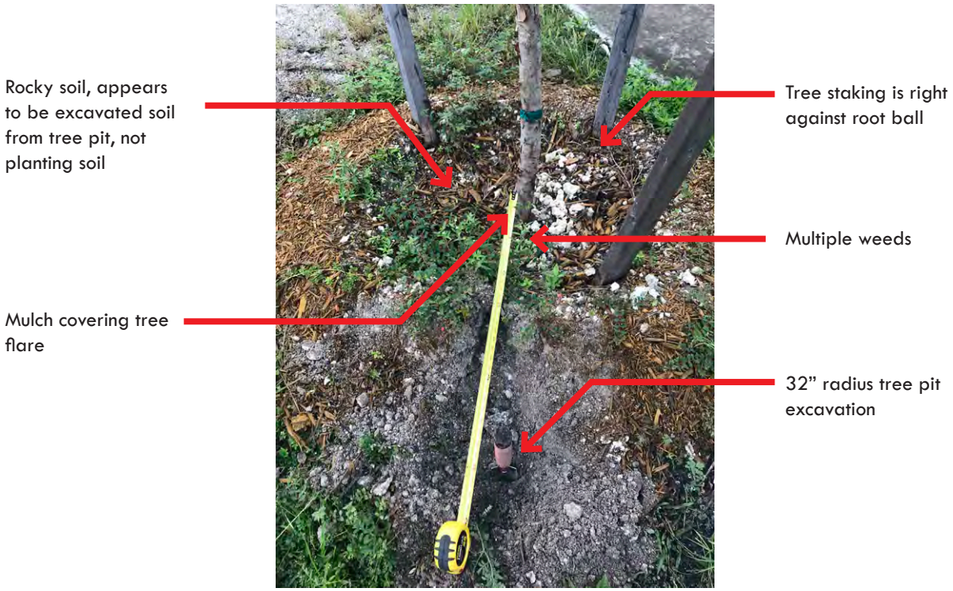
Inspection of tree installation in Douglas Park revealed that the planting hole was barely larger than the rootball, less than 3' radius



Current City detail which shows the planting pit only as large as the rootball and the staking adjacent. This is what we saw being used in the field and is not in line with industry standards.

Soils, Fertilizers and Root Barriers

City specifications for soils and fertilizers are adequate for new trees. However, there is no way of knowing if it was used as specified on the new trees we observed. Similarly, we could not observe if any root barriers were installed. The specifications call for them if the trees will be planted closer than 2 feet to a sidewalk or curb, but they also state "This item will be installed at the discretion of the City Engineer, Project Manager and/or Certified Arborist at citywide locations." Leading to the conclusion that it is unlikely root barriers are being installed with any regularity. Additionally the location of the root barrier should be only on the sides, not the bottom, and be adjacent to the surface they are to protect (sidewalk, road), not adjacent to theroot ball which will limit the trees growth.

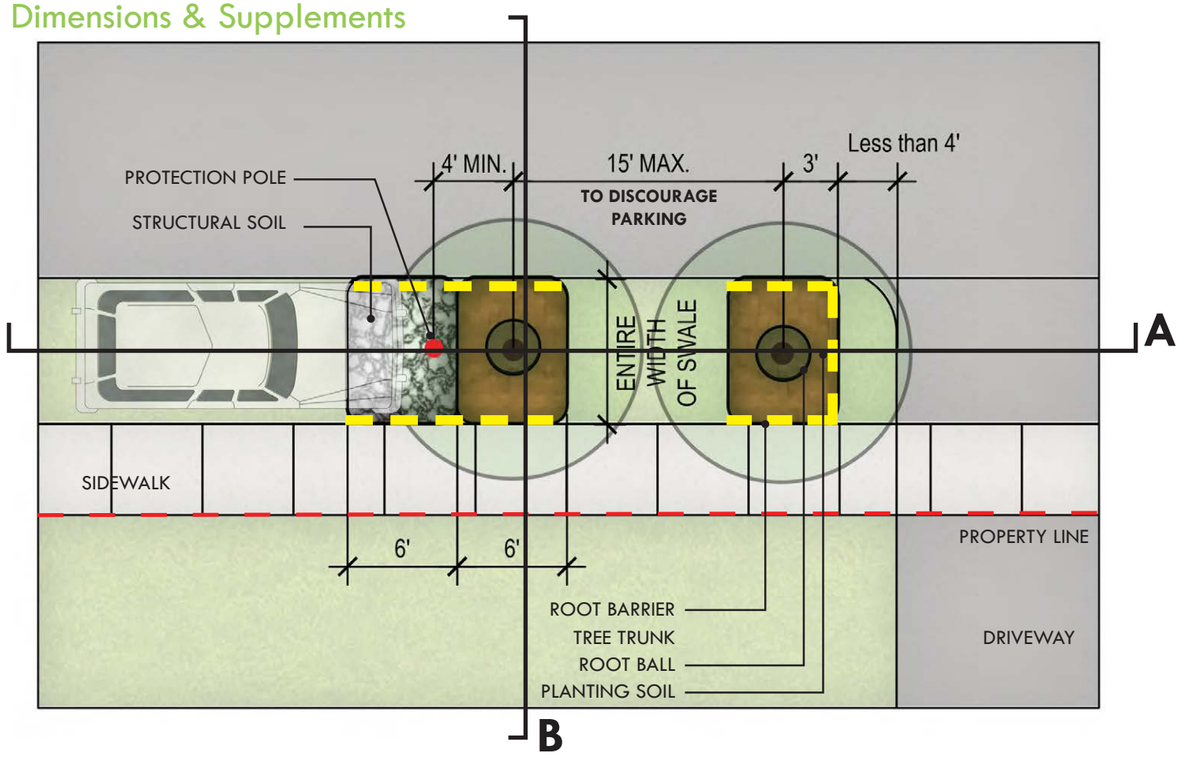


Observations

Inspection of tree installations in Douglas Park revealed that the planting holes were barely larger than the rootball, approximately 32" radius - which is what the staking detail (LD-11)shows, but not what the planting detail (LD-24) shows. The staking detail is a deceptive direction if given to the installers, in that it looks like the hole only needs to be as wide as the rootball. Additionally, the reality is that the stakes are very hard to get into the ground without excavating first, so it is easier to put them in the planting hole. This practice, however, is not what makes the most stable support for the tree, as it is anchoring it to the new planting soil instead of to the existing ground. On SW 34th Ct. in Douglas Park, we observed 31 new trees that were planted in 2019. Eleven of those trees died and eight were replaced in 2020. That is a 65% success rate. The following proposed planting practices should increase that percentage.

Proposed Planting Practices

Dimensions & Supplements



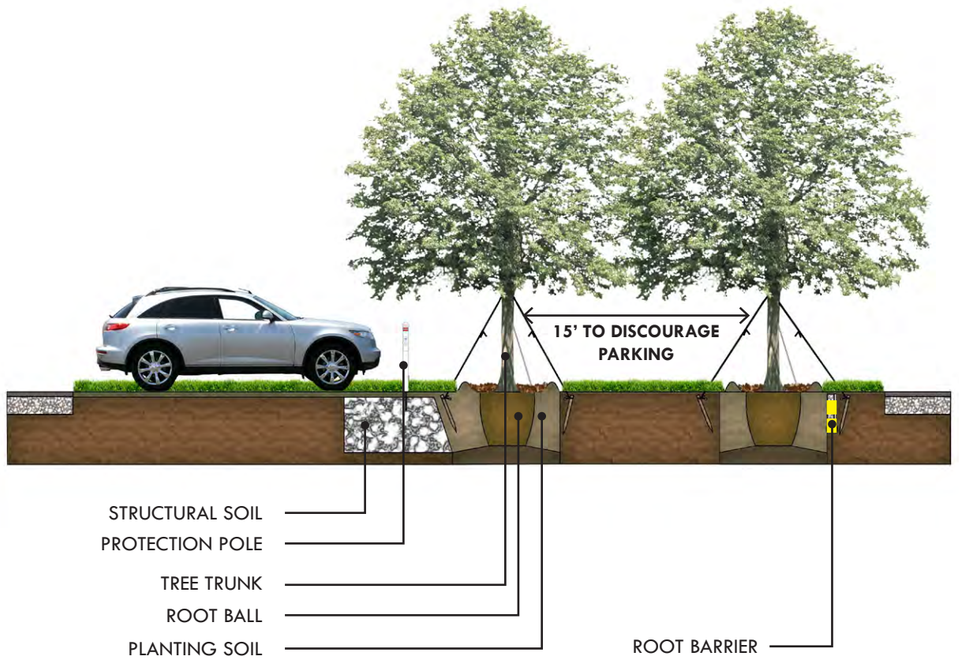
Planting pits for swales under 10' in width should be the entire width of the swale and 6' in length.

Root Barriers should be installed on the street and sidewalk sides of the tree pit (and structural soil area if applicable) and on the side of the planting pit if the tree is located within 4' of a driveway.

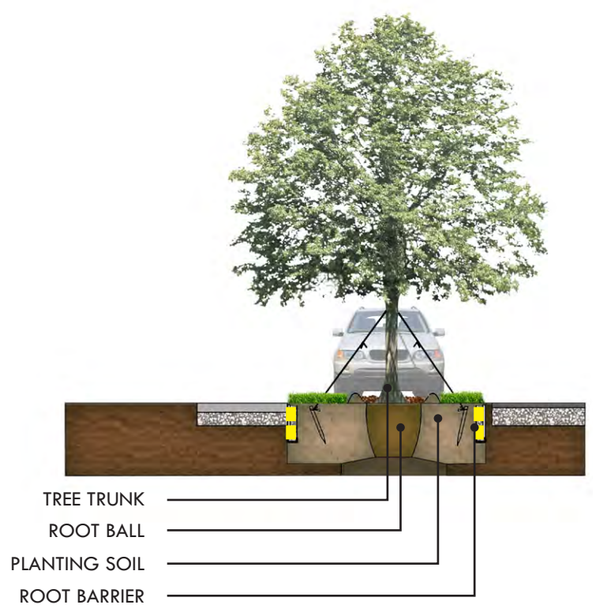
A Tree protection pole should be installed 4' from the trunk of the new tree on the side where parking is likely to happen.

Where Structural Soil is needed, it should match the size of the planting pit. Some areas utilize the swale for parking more than others, and discretion is needed to determine the particular parking needs of any given street (The Appendix of Volume I lists each street and notes whether swale parking is common) If parking on the swale is only intermittent for visitors, structural soil may not be necessary.

Less than 10' Wide Swale



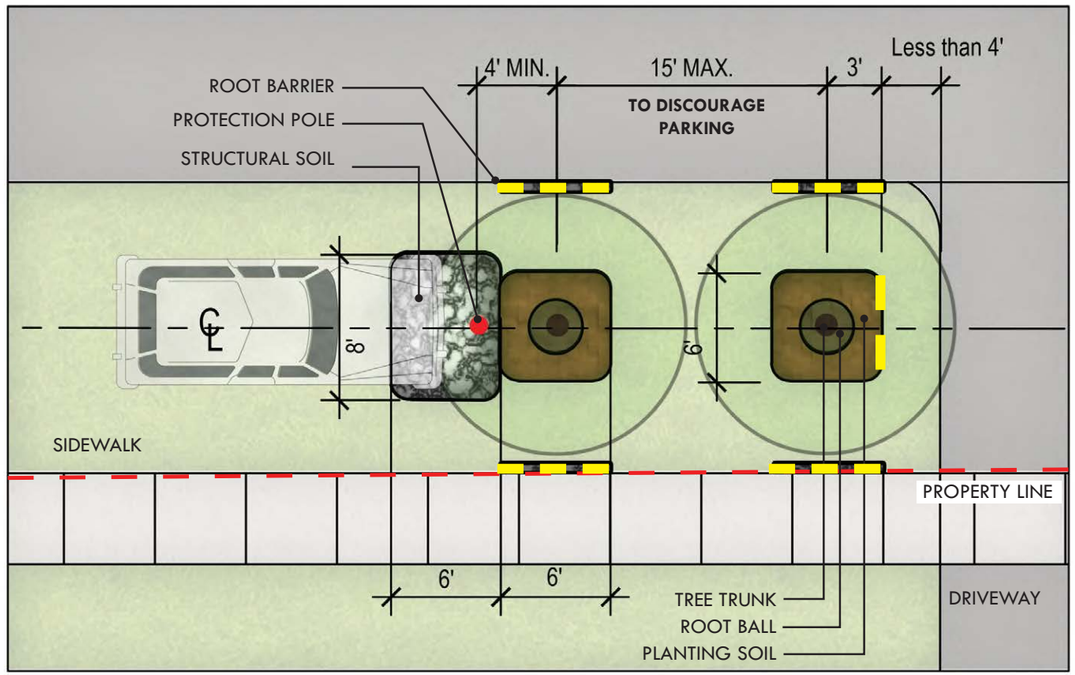
SECTION A



SECTION B

Proposed Planting Practices

Dimensions & Supplements



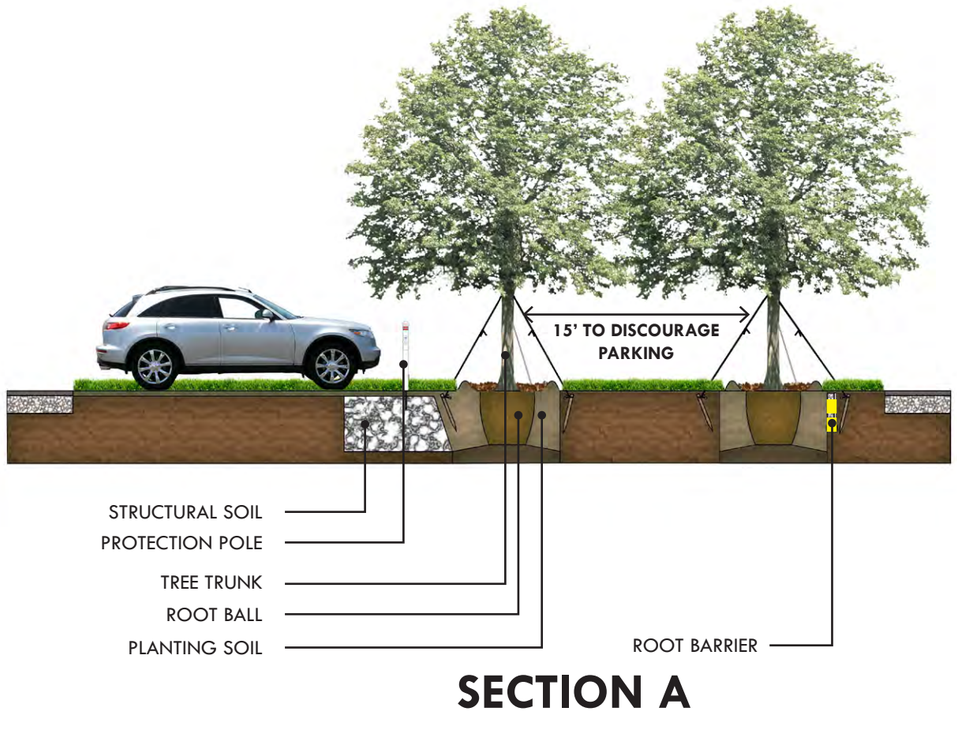
Planting pits for swales over 10’ in width should be 6’ wide and 6’ in length.

Root Barriers should be installed on the street and sidewalk sides aligned with the planting pits. A separate trench shall be dug in these locations and installed. This will allow the trees the maximum amount of soil to grow in. They shall also be installed on the side of the planting pit adjacent to driveways if the tree is located within 4’ of this pavement.

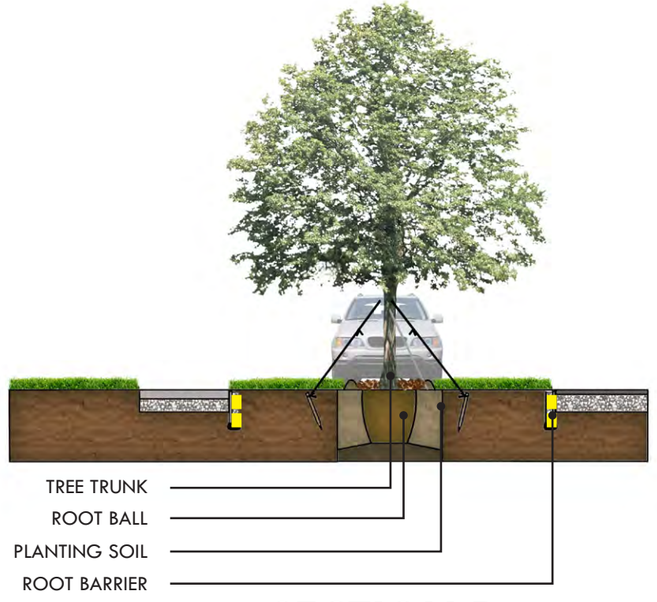
A Tree protection pole should be installed 4’ from the trunk of the new tree on the side where parking is likely to happen.

Where Structural Soil is needed, it should be 8’ wide and 6’ in length. Some areas utilize the swale for parking more than others, and discretion is needed to determine the particular parking needs of any given street. (The Appendix of Volume I lists each street and notes whether swale parking is common) If parking on the swale is only intermittent for visitors, structural soil may not be necessary.

Greater than 10’ Wide Swale



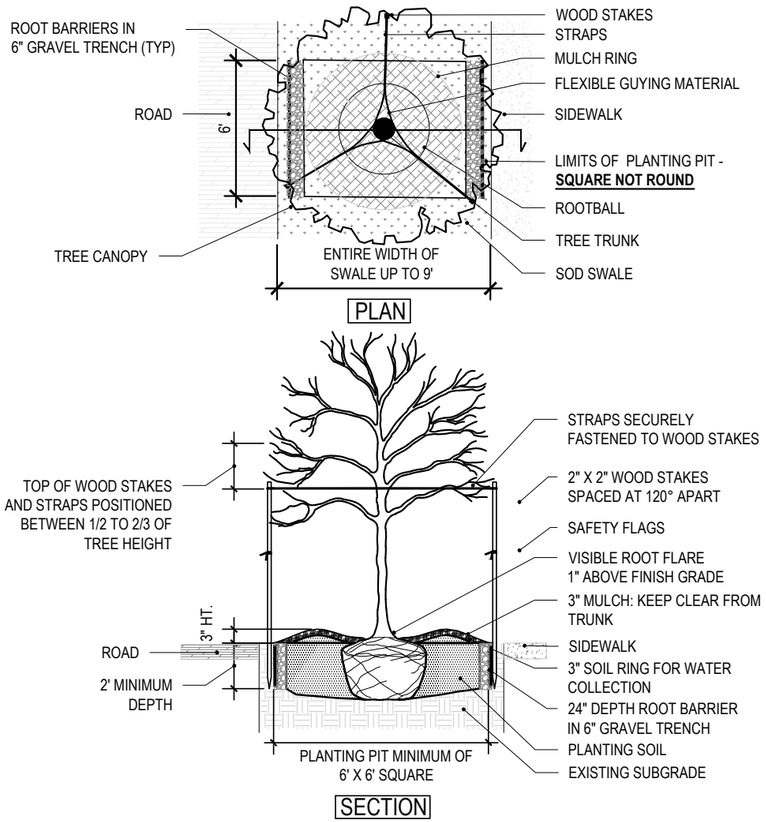
SECTION A



SECTION B

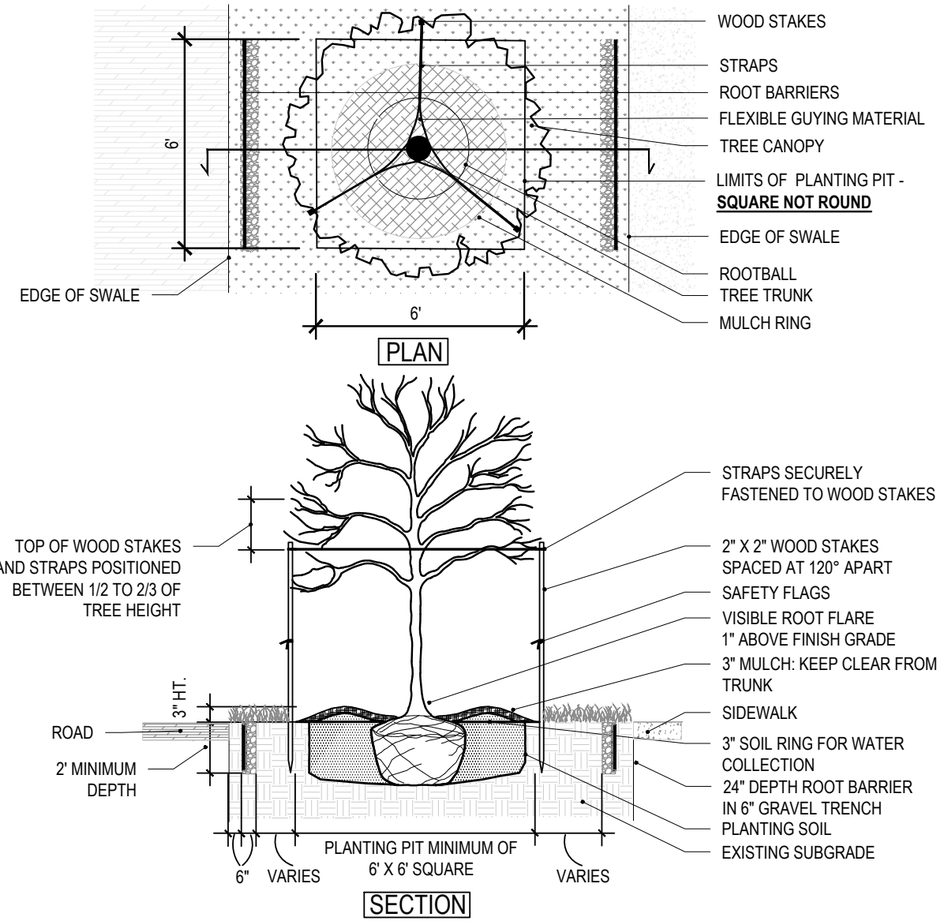
DIMENSIONS & SUPPLEMENTS

Proposed Details



1 TREE PLANTING DETAIL - LESS THAN 10' SWALE

Scale: 1/4"=1'-0"

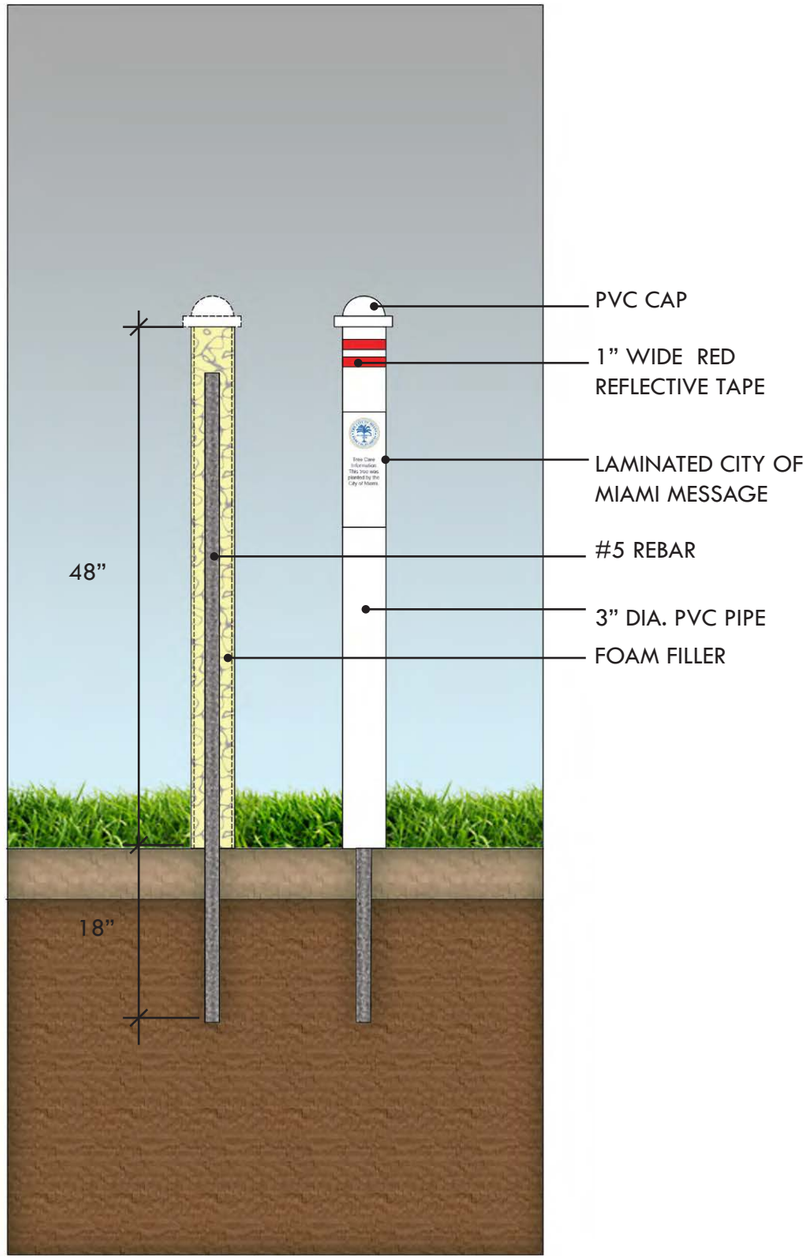


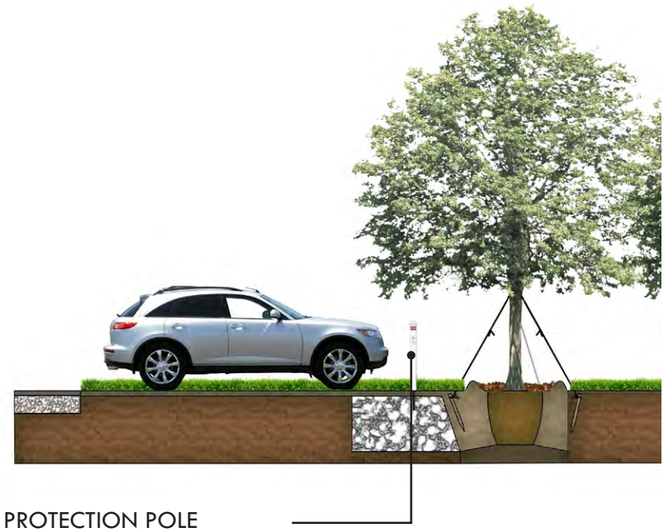
2 TREE PLANTING DETAIL - MORE THAN 10' SWALE

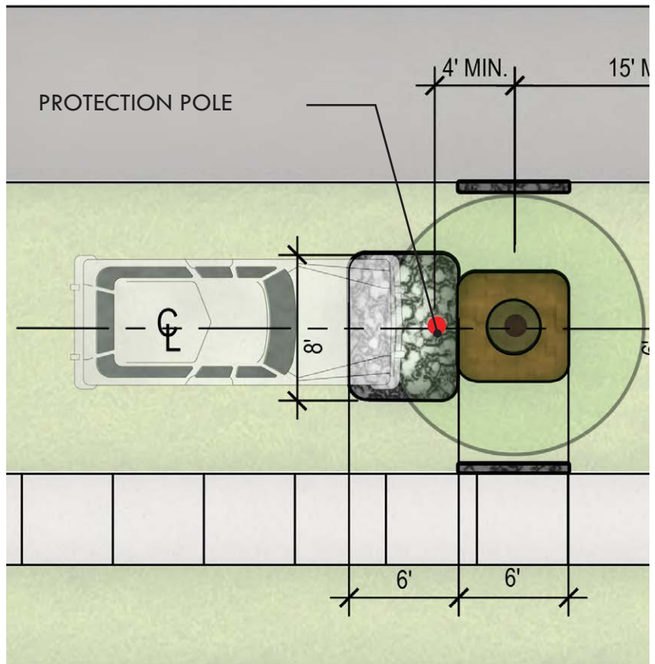
Scale: 1/4"=1'-0"

Proposed Planting Practices

Protection







You've got a New Tree!

What does that mean?

The city has invested in the health of your neighborhood by installing a new tree to assist with reducing urban heat and stormwater impacts.

What do you need to do?

Following these simple steps will help to ensure the success of this new tree

- Do not park closer then 5 feet from the tree (if you cannot see the bottom of the trunk from inside you car, you parked too close)
- If it hasn't rained in a while we would appreciate you splashing the new tree with a hose for a minute or two
- Report any damage or issues with the tree to 311. Either dial 311 or 305-468-5900 or report problems online at miamigov.com/Services/Solve-a-Problem

SPECIES SELECTION

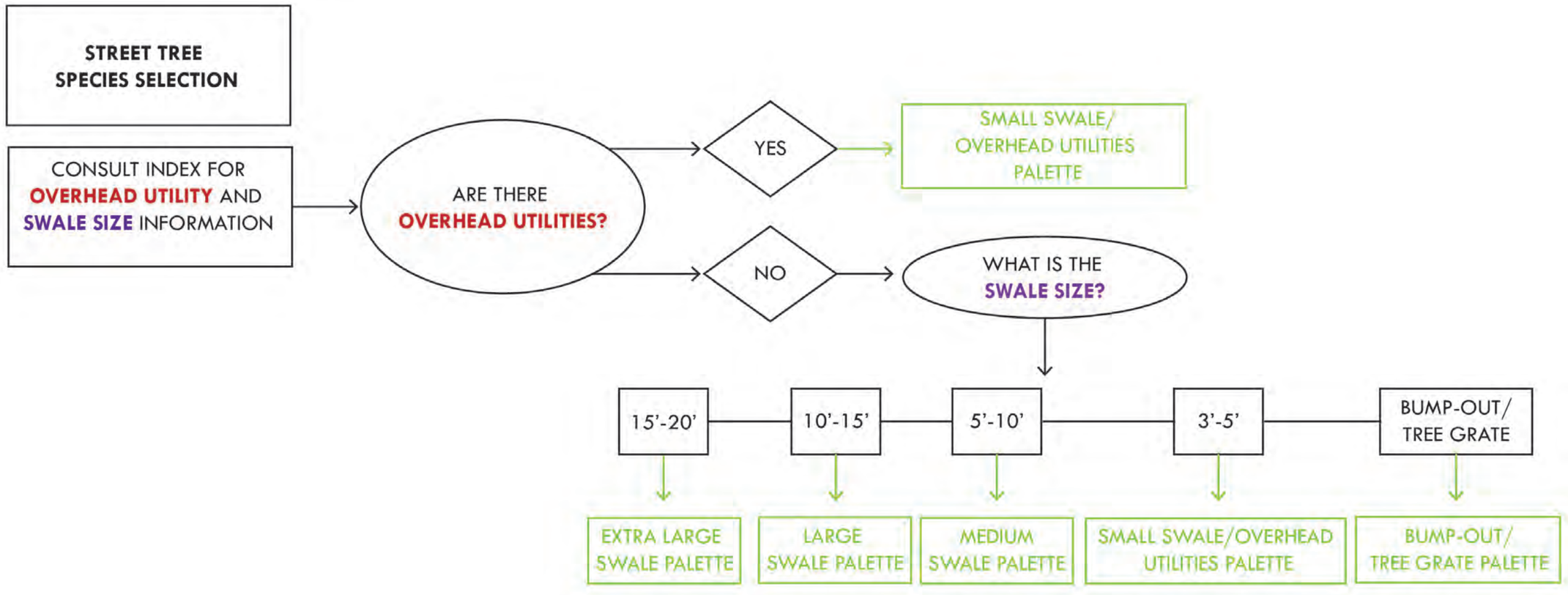
Species Selection

Selection Flow Chart

When selecting a new tree for a specific location the following flow chart should be used to guide selection. Street typology mappings and individual street conditions are included in the Volume 1 appendix for this report and should be consulted to find the relevant information for the street where new trees are proposed. The relevant information required is the size of the swale and the presence or lack thereof of overhead utilities.

- The presence of overhead utilities shall overrule swale size as an indicator of tree species and limits the selection of tree to the "Small Swale and/or Overhead Utility" species palette.
- Streets with a designated street tree in place can continue the use of that tree whether it is outside of the prescribed palette for the swale size only with additional infrastructure added (see this section in planting practices).

Outside of those two specific instances, swale size will dictate the appropriate tree species selection, as species selection is based on providing proper soil volumes and spacing for proper tree health. Consideration should also be given if the tree is proposed for a Rain Garden application: These areas will have more water than usual and species that are more suited to these locations are marked on the following pages.



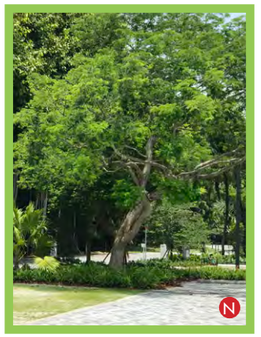
FLOW CHART

Tree Species Palette

Tree Palette - Partial listing

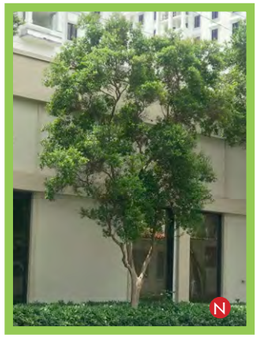

Live Oak


Mahogany


Wild Tamarind


Black Olive

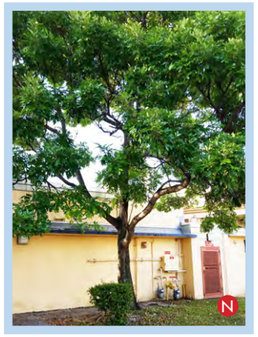

Spanish Stopper


Simpson's Stopper

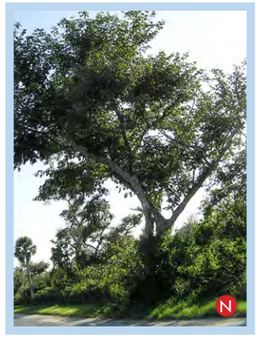

Silver Buttonwood

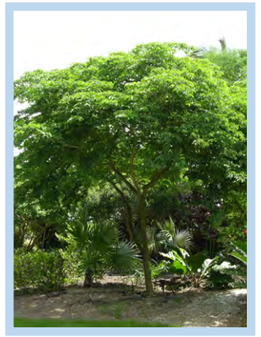

Red Stopper


Gumbo Limbo

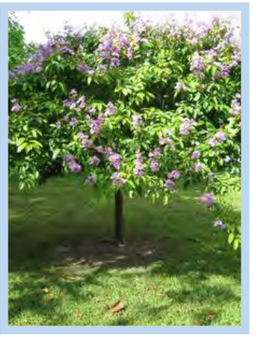

Paradise Tree

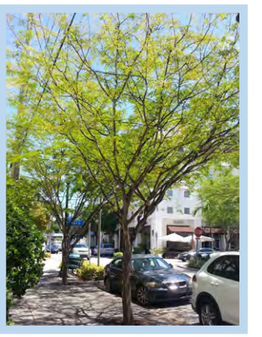

Mastic


Jamaican Dogwood


Verawood


Pink Tabebuia


Queen's Crepe Myrtle


Bridalveil


Green Buttonwood


Satin Leaf


Blolly


Fiddlewood


Cabbage Palm


Florida Thatch Palm


Montgomery Palm


Bismarck Palm

Non-Flowering

Flowering

Palm

N Florida Native

R Rain Garden Friendly

OVERALL SPECIES PALETTE

Overall Tree Species Palette

The following list of species chosen for the proposed palette reflect in large part species that are native to South Florida with other species being native to the tropics and therefore having high performance value within the context of the City's climate. The rankings provided per species within individual swale palettes is relative to three key aspects: wind resistance, and drought and salt tolerances. *Species ranking lists the species having higher thresholds within these categories first.*

OVERALL (TREES)

RANK	BOTANICAL NAME	COMMON NAME	NATIVE	FLOWERING (Color) SH-Showy/NS- Non-Showy	MATURE SIZE (Ft.) Spread x Height	GRADES & STAN-DARDS Matrix	MIN. SWALE WIDTH	SOIL VOLUME ft3	GOOD UNDER POWER LINES	GROWTH RATE	WIND RESISTANCE	DROUGHT TOLERANCE	AEROSOL SALT TOLERANCE	PLANT TYPE E-Evergreen / D-Deciduous	LIGHT REQUIREMENTS FS-Full Sun / PS - Partial Shade	NUTRITIONAL NEEDS	SOIL PH	PROBLEMATIC ROOTS	NOTES	AVAILABILITY
H-High/M-Med./L-Low																				
EXTRA LARGE TREES (30' setback from overhead utility lines)																				
1	*Quercus virginiana*	Live Oak	Yes	NS (Green)	60' x 40'	1	15'	2700	No	M	H	H	H	E	FS/PS		All	H	Stains	H
2	*Swietenia mahagoni*	Mahogany	Yes	NS (White)	50' x 40'	1	15'	2700	No	F	M-H	H	H	E	FS/PS		All	M-H	Drops hard seed pods	M
3	*Lysiloma latisiliquum*	Wild Tamarind	Yes	NS (White)	40' x 30'	1	15'	2700	No	M	H	H	H	E	FS/PS		All	L	Drops seed pods	M
*	*Lysiloma sabicu*	Horseflesh Mahogany	No	NS (White)	50' x 35'	1	15'	2700	No	S	H	H	L	E	FS		All	M	Drops seed pods	L
*	*Bucida buceras*	Black Olive	No	NS (Yellow)	50' x 50'	1	15'	2700	No	S	H	H	H	E	FS/PS		Acidic	L	Stains	M
*	*Ficus aurea*	Strangler Fig	Yes	NS	50' x 50'	1	10'	2700	No	F	M-L	H	M	E	FS/PS		All	H	Roots can be aggressive	L
*	*Ficus citrifolia*	Shortleaf Fig	Yes	NS	50' x 40'	1	10'	2700	No	M-F	M-L	H	L	Semi-D	FS	Moderate		H	Roots can be aggressive	L
*	*Taxodium distichum*	Bald Cypress	Yes	NS	100' x 50'	2	15'	2700	No	M	H	H	L	D	FS/PS		Acidic	H	Needs to be wet	M
LARGE TREES (30' setback from overhead utility lines)																				
1	*Bursera simaruba*	Gumbo Limbo	Yes	NS (Green/White)	40' x 35'	1	10'	2000	No	F	H	H	H	Semi-E	FS/PS		All	M	Susceptible to whitefly	H
2	*Simarouba glauca*	Paradise Tree	Yes	SH (Cream/White)	50' x 30'	1	10'	2000	No	M	H	M	H	E	FS/PS	Moderate		M	surface roots	M
3	*Sideroxylon foetidissimum*	Mastic	Yes	NS (Yellow)	45' x 30'	1	8'	2000	No	M	H	H	H	E	FS	Moderate	Alkaline	M		L
4	*Piscidia piscipula*	Jamaica Dogwood	Yes	SH (Red/Pink)	45' x 25'	3	8'	2000	No	M-F	M	H	H	D	FS/PS			L		L
5	*Pinus elliottii var. densa*	South Florida Slash Pine	Yes	NS (Yellow)	35' x 75'	2	8'	2000	No	F	L	H	H	E	FS/PS		Acidic	M	Sensitive to disturbance	M
6	*Tabebuia heterophylla*	Pink Tabebuia	No	SH (Pink & White)	25' x 20'	2	4'	1200	No	M	M-L	H	M	E	FS			L		M
7	*Acer rubrum*	Red Maple	Yes	SH (Red/Pink)	35' x 75'	1	10'	2000	No	F	M	M	L	D	FS/PS		Acidic	M	Good in swales	M
8	*Cassia javanica*	Apple Blossom Cassia	No	Showy (Pink)	50' x 30'	1	10'	2000	No	F	M	M	L	Semi-E	FS/PS			L	brittle limbs	M
9	*Delonix regia*	Royal Poinciana	No	Showy (Red)	40' X 60'	1	12'	2000	No	F	M	H	L	Semi-E	FS		All	H	brittle limbs	M
10**	*Ceiba speciosa*	Floss Silk Tree	No	SH (Pink & White)	40' x 45'	1	15'	2000	No	F	L	H	L	D	FS		Alkaline	M-H	Thorns on Trunk	M
11**	*Coccoloba uvifera*	Seagrape	Yes	Non-showy (Cream)	40' x 30'	3	12'	2000	No	M	H	H	H	E	FS		All	Low		M
MEDIUM TREES (20' setback from overhead utility lines)																				
1	*Conocarpus erectus*	Green Buttonwood	Yes	SH (Pale Green)	35' x 25'	1	6'	1200	No	M	H	H	H	E	FS/PS		All	L	Good coastal tree	H
2	*Chrysophyllum oliviforme*	Satinleaf	Yes	NS (White)	30' x 20'	1	6'	1200	No	S	M-H	H	M	E	FS/PS		All	L		M
3	*Guapira discolor*	Blolly	Yes	NS (Green)	30' x 40'	3	8'	1200	No	M	M	M	H	E	FS/PS	Moderate		L	Often Multi-trunked	L
4	*Citharexylum spinosum*	Fiddlewood	Yes	SH (White)	35' x 25'	2	10'	2000	No	S	M	H	L	E	PS		All	H		L
5	*Pimenta dioica*	Allspice	No	SH (White)	30' x 20'	3	6'	1200	No	M	H	M	L	E	FS/PS		All	L		L
6	*Tabebuia bahamensis*	White Tabebuia	No	SH (White)	25' x 8'	2	4'	1200	No	M	M	H	M	D	FS/PS			L	White flowers	M
7	*Caesalpinia granadillo*	Bridalveil	No	SH (Yellow)	35' x 25'	1	6'	1200	No	M	M-H	M	L	E	FS		All	L		M
8	*Bulnesia arborea*	Verawood	No	SH (Yellow)	30' x 25'	3	6'	1200	No	M	H	H	M	E	FS	Low		L		M
9	*Coccoloba diversifolia*	Pigeon Plum	Yes	SH (White)	30' x 25'	3	6'	1200	No	M	M-H	H	H	E	FS/PS		All	L	Berries/Messy	M
10	*Krugiodendron ferreum*	Black Ironwood	Yes	NS (Green)	30' x 20'	1	6'	1200	No	S	H	H	H	E	FS/PS			L	Slow growing	L
11	*Ilex cassine*	Dahoon Holly	Yes	NS (White)	25' x 10'	2	4'	1200	No	M	H	M	M	E	FS/PS		All	L	Small Berries	M
12	*Clusia rosea*	Pitch Apple	Yes	NS	30' x 25'	3	10'	2000	No	S	H	H	H	E	FS			H		M
13	*Lagerstroemia speciosa*	Queen's Crepe Myrtle	No	SH (Pink & Lavender)	45' x 35'	3	8'	1200	No	F	M	H	M	Semi-E	FS		All	L		L
14	*Noronhia emarginata*	Madagascar Olive	No	NS (Yellow)	25' x 20'	3	6'	1200	No	S	M-H	H	H	E	FS/PS		All	L		M
15	*Tabebuia caraiba*	Yellow Tabebuia	No	SH (Yellow)	25' x 15'	2	4'	1200	No	M	L	H	M	Semi-E	FS/PS		All	L	brittle limbs	M
SMALL TREES (can be planted under overhead utility lines)																				
1	*Eugenia foetida*	Spanish Stopper	Yes	SH (White)	15' x 15'	3	4'	300	Yes	M	H	H	H	E	FS/PS		All	L	shade tolerant	M
2	*Myrcianthes fragrans*	Simpson's Stopper	Yes	SH (White)	15' x 15'	3	4'	300	Yes	M	H	H	M	E	FS/PS		All	L	shade tolerant	M
3	*Conocarpus erectus var. sericeus*	Silver Buttonwood	Yes	NS (White)	25' x 20'	3	4'	1200	Yes	S	H	H	H	E	FS/PS		All	L	Good coastal tree	M
4	*Eugenia rhombea*	Red Stopper	Yes	NS (White)	20' x 10'	3	4'	300	Yes	M	H	H	M	E	FS/PS		All	L		L
5	*Capparis cynophallophora*	Jamaica Caper	Yes	SH (White)	20' x 15'	3	4'	300	Yes	S	H	H	H	E	FS/PS		All	L		L
6	*Lagerstroemia indica*	Crepe Myrtle	No	SH (Pink)	25' x 20'	3	4'	1200	Yes	M	H	H	M	D	FS		All	L		H
7	*Guaiacum sanctum*	Lignum vitae	Yes	SH (Purple)	15' x 15'	3	4'	300	Yes	S	H	H	H	E	FS/PS		All	L		L
8	*Cordia sebestena*	Orange Geiger	Yes	SH (Orange Red)	25' x 20'	3	6'	1200	Yes	S	H	H	H	E	FS/PS		All	L		M

* Only use when species is already in use as a designated street tree
** Only use in medians or traffic circles, away from pedestrians

Prefferred Species

OVERALL SPECIES PALETTE

Overall Tree Species Palette (Continued)

RANK	BOTANICAL NAME	COMMON NAME	NATIVE	FLOWERING (Color) SH-Showy/NS- Non-Showy	MATURE SIZE (Ft.) Spread x Height	GRADES & STAN-DARDS Matrix	MIN. SWALE WIDTH	SOIL VOLUME ft3	GOOD UNDER POWER LINES	GROWTH RATE	WIND RESISTANCE	DROUGHT TOLERANCE	AEROSOL SALT TOLERANCE	PLANT TYPE E-Evergreen / D-Deciduous	LIGHT REQUIREMENTS FS-Full Sun / PS - Partial Shade	NUTRITIONAL NEEDS	SOIL PH	PROBLEMATIC ROOTS	NOTES	AVAILABILITY
H-High/M-Med./L-Low																				
LARGE PALMS																				
1	*Roystonea regia*	Royal Palm	Yes	SH (Green/White)	80' x 20'		12'	300	No	F	M-H	H	H	E	FS/PS	Moderate	All	L	Fronds Fall	
2	*Cocos nucifera "Maypan'*	Coconut Palm	No	SH (White/Yellow)	60' x 20'		8'	200	No	M	M-H	H	H	E	FS	Moderate	All	L	Coconuts Fall	
3	*Bismarckia nobilis*	Bismarck Palm	No	NS (White)	60' x 16'		15'	300	No	S-M	M	H	M	E	FS/PS	Moderate	Acidic	L		
4	*Phoenix sylvestris*	Silver/Wild Date Palm	No	NS (Cream/Tan)	50' x 20'		15'	300	No	S-M	H	M	M	E	FS	Moderate	All	L	Needs trimming	
5	*Phoenix dactylifera 'Medjool'*	Medjool Date Palm	No	SH (Pale yellow)	80' x 20'		15'	300	No	S-M	H	H	M-H	E	FS/PS		Neutral	L	Needs trimming	
6	*Phoenix canariensis*	Canary Island Date Palm	No	SH (Orange)	50' x 20'		20'	300	No	S	H	M	M-H	E	FS	Moderate	All	L	Needs trimming	
SMALL/MEDIUM PALMS																				
1	*Sabal palmetto*	Sabal Palm	Yes	SH (White)	40' x 15'		8'	300	No	S	H	H	H	E	FS/PS		All	L		
2	*Thrinax radiata*	Florida Thatch Palm	Yes	NS (White/Yellow)	20' x 10'		4'	200	Yes	S	H	H	H	E	FS		Alkaline	L		
3	*Veitchia montgomeryana*	Montgomery Palm	No	NS (White/Yellow)	25' x 10'		4'	200	No	F	H	M	M	E	FS		Alkaline	L		
4	*Thrinax morrisii*	Key Thatch Palm	Yes	NS (White/Yellow)	20' x 10'		4'	200	Yes	S	H	H	H	E	FS		All	L		
5	*Hyophorbe verschaffeltii*	Spindle Palm	No	SH(White/Yellow)	25' x 15'		6'	200	Yes	S	H	H	H	E	FS			L		
6	*Wodyeta birfurcata*	Foxtail Palm	No	SH (White/Green)	30' x 10'		6'	200	No	F	H	M	M	E	FS/PS		Acidic	L	Needs Fertilizer	
7	*Coccothrinax miraguama*	Miraguama Palm	No	SH (Yellow)	25' x 15'		6'	200	No	S	H	H	H	E	FS/PS		Neutral	L		

* Only use when species is already in use as a designated street tree
** Only use in medians or traffic circles, away from pedestrians

Prefferred Species

OVERALL SPECIES PALETTE

Extra Large Swale Tree Species Palette

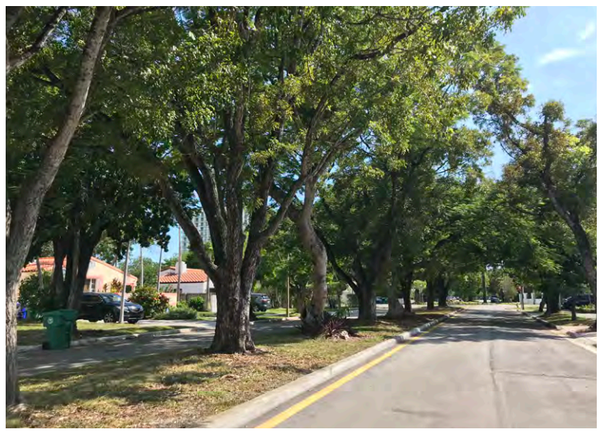
Extra Large swales are sized between 15-20' in width. While some species listed can be planted within less space, this sized swale will provide these large sized species with the ideal soil volumes to sustain proper growth habits. Live Oaks are the most recommended trees because of their strong resiliency to climate change and their general availability. Mahogany trees are the second choice, they grow faster than oak trees but they do drop large hard seed pods that can damage parked cars so care should be taken in site selection for this species. The native Wild Tamarind is also a great resilient tree and faster growing, but it does have messy seed pods - this Lysiloma should always be used instead of the Lysiloma sabicu, as it is native and more resilient - the sabicu is an established species in some neighborhoods and can continue to be used in these areas. Similarly, the Black Olive, and both Fig species are messy, but can be used where already established. The Bald Cypress is a great native species. but it needs a lot of water to grow properly and will do well in retention areas and deeper swales - this tree can get extremely tall, so this should also be considered when selecting.

Species ranking lists the species having higher thresholds within these categories first.

EXTRA LARGE SWALES	RANK	BOTANICAL NAME	COMMON NAME	NATIVE	FLOWERING (Color) SH-Showy/NS- Non-Showy	MATURE SIZE (Ft.) Spread x Height	GRADES & STAN-DARDS Matrix	MIN. SWALE WIDTH	SOIL VOLUME ft3	GOOD UNDER POWER LINES	GROWTH RATE	WIND RESISTANCE	DROUGHT TOLERANCE	AEROSOL SALT TOLERANCE	PLANT TYPE E-Evergreen / D-Deciduous	LIGHT REQUIREMENTS FS-Full Sun / PS - Partial Shade	NUTRITIONAL NEEDS	SOIL PH	PROBLEMATIC ROOTS	NOTES	AVAILABILITY
	H-High/M-Med./L-Low																				
	EXTRA LARGE TREES (30' setback from overhead utility lines)																				
	1	*Quercus virginiana*	Live Oak	Yes	NS (Green)	60' x 40'	1	15'	2700	No	M	H	H	H	E	FS/PS		All	H	Stains	H
	2	*Swietenia mahagoni*	Mahogany	Yes	NS (White)	50' x 40'	1	15'	2700	No	F	M-H	H	H	E	FS/PS		All	M-H	Drops hard seed pods	M
	3	*Lysiloma latisiliquum*	Wild Tamarind	Yes	NS (White)	40' x 30'	1	15'	2700	No	M	H	H	H	E	FS/PS		All	L	Drops seed pods	M
	4*	*Lysiloma sabicu*	Horseflesh Mahogany	No	NS (White)	50' x 35'	1	15'	2700	No	S	H	H	L	E	FS		All	M	Drops seed pods	L
	5*	*Bucida buceras*	Black Olive	No	NS (Yellow)	50' x 50'	1	15'	2700	No	S	H	H	H	E	FS/PS		Acidic	L	Stains	L
	6*	*Ficus aurea*	Strangler Fig	Yes	NS	50' x 50'	1	15'	2700	No	F	M-L	H	M	E	FS/PS		All	H	Roots can be aggressive	L
	7*	*Ficus citrifolia*	Shortleaf Fig	Yes	NS	50' x 40'	1	15'	2700	No	M-F	M-L	H	L	Semi-D	FS	Moderate	All	H	Roots can be aggressive	L
	8***	*Taxodium distichum*	Bald Cypress	Yes	NS	100' x 50'	2	15'	2700	No	M	H	H	L	D	FS/PS		Acidic	H	Needs to be wet	M

* Only use when species is already in use as a designated street tree
** Only use in medians or traffic circles, away from pedestrians
*** Only use in retenntion areas or bio-swales - needs to be wet

Prefferred Species



Row of mahogany (Swietenia mahagoni) lining median on SW 24th Road in the Roads

Black Olives (Bucida buceras) and Live Oaks (Quercus virginiana) within swales on SW 6th Street in Auburndale

Tamarinds (Lysiloma latisiliquum) lining the median on SW 33rd Avenue in Auburndale

Mahogany trees (Swietenia mahagoni) on SW 9th Street in Shenandoah North

Extra Large Swale Tree Species Palette

15-20’ Swale

	RANK	BOTANICAL NAME	COMMON NAME	NATIVE
EXTRA LARGE SWALES	EXTRA LARGE TREES (30' setback from overhead utility lines)			
	1	*Quercus virginiana*	Live Oak	Yes
	2	*Swietenia mahagoni*	Mahogany	Yes
	3	*Lysiloma latisiliquum*	Wild Tamarind	Yes
	4*	*Lysiloma sabicu*	Horseflesh Mahogany	No
	5*	*Bucida buceras*	Black Olive	No
	6*	*Ficus aurea*	Strangler Fig	Yes
	7*	*Ficus citrifolia*	Shortleaf Fig	Yes
	8***	*Taxodium distichum*	Bald Cypress	Yes
	* Only use when species is already in use as a designated street tree *** Only use in retention areas or bio-swales - needs to be wet			

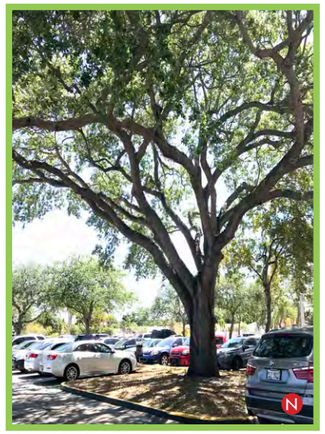
Rankings are meant to dictate a hierarchy of preference for tree selection

(R) Rain Garden Friendly (N) Florida Native

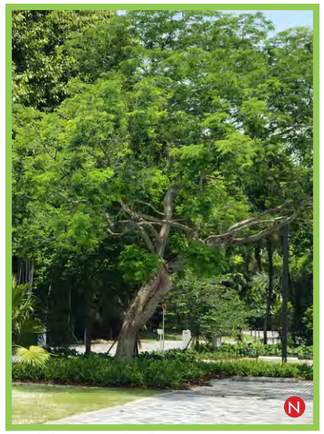
Non-Flowering

Flowering

Palm


Live Oak

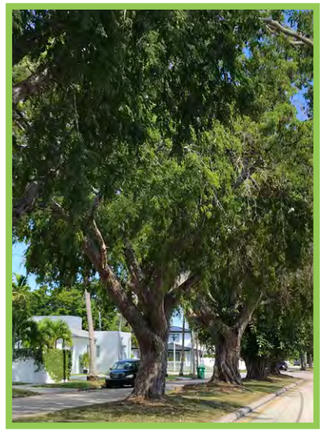

Mahogany


Wild Tamarind


Black Olive


Strangler Fig


Shortleaf Fig


Horseflesh Mahogany


Bald Cypress

EXTRA LARGE SWALE PALETTE

Large Swale Tree Species Palette

Large swales are sized between 10-15' in width. While some species listed can be planted within less space, this sized swale will provide these large sized species with the ideal soil volumes to sustain proper growth habits. Gumbo Limbos are the most recommended trees because of their strong resiliency to climate change and their general availability. Paradise trees are also resilient native trees with a small yellow flower, their roots can cause problems, however, if planted in a larger swale with root barriers, they should not be an issue. Royal Poinciana and Apple Blossom trees are spectacular flowering species, but are brittle and subject to wind damage, so care should be taken when selecting locations for these species. Sea Grapes are a great native resilient species, but are very messy with grape and leaf fall and should not be placed adjacent to parked cars. Floss Silk trees are beautiful flowering trees, but the trunks have thorns, and they should only be planted in roundabouts where pedestrians do not walk. *Species ranking lists the species having higher thresholds within these categories first.*

LARGE SWALES

RANK	BOTANICAL NAME	COMMON NAME	NATIVE	FLOWERING (Color) SH-Showy/NS- Non-Showy	MATURE SIZE (Ft.) Spread x Height	GRADES & STAN-DARDS Matrix	MIN. SWALE WIDTH	SOIL VOLUME ft3	GOOD UNDER POWER LINES	GROWTH RATE	WIND RESISTANCE	DROUGHT TOLERANCE	AEROSOL SALT TOLERANCE	PLANT TYPE E-Evergreen / D-Deciduous	LIGHT REQUIREMENTS FS-Full Sun / PS - Partial Shade	NUTRITIONAL NEEDS	SOIL PH	PROBLEMATIC ROOTS	NOTES	AVAILABILITY
H-High/M-Med./L-Low																				
LARGE TREES (30' setback from overhead utility lines)																				
1	*Bursera simaruba*	Gumbo Limbo	Yes	NS (Green/White)	40' x 35'	1	10'	2000	No	F	H	H	H	Semi-E	FS/PS		All	M	Susceptible to whitefly	H
2	*Simarouba glauca*	Paradise Tree	Yes	SH (Cream/White)	50' x 30'	1	10'	2000	No	M	H	M	H	E	FS/PS	Moderate	All	M	surface roots	M
3	*Sideroxylon foetidissimum*	Mastic	Yes	NS (Yellow)	45' x 30'	1	8'	2000	No	M	H	H	H	E	FS	Moderate	Alkaline	M	Berries/Messy	L
4	*Piscidia piscipula*	Jamaica Dogwood	Yes	SH (Red/Pink)	45' x 25'	3	8'	2000	No	M-F	M	H	H	D	FS/PS		All	L		L
5	*Pinus elliottii var. densa*	South Florida Slash Pine	Yes	NS (Yellow)	35' x 75'	2	8'	2000	No	F	L	H	H	E	FS/PS		Acidic	M	Sensitive to disturbance	M
6	*Tabebuia heterophylla*	Pink Tabebuia	No	SH (Pink & White)	25' x 20'	2	4'	1200	No	M	M-L	H	M	E	FS		All	L		M
7	*Acer rubrum*	Red Maple	Yes	SH (Red/Pink)	35' x 75'	1	10'	2000	No	F	M	M	L	D	FS/PS		Acidic	M	Good in swales	M
8	*Cassia javanica*	Apple Blossom Cassia	No	Showy (Pink)	50' x 30'	1	10'	2000	No	F	M	M	L	Semi-E	FS/PS		All	L	brittle limbs	M
9*	*Delonix regia*	Royal Poinciana	No	Showy (Red)	40' X 60'	1	12'	2000	No	F	M	H	L	Semi-E	FS		All	H	brittle limbs	M
10**	*Ceiba speciosa*	Floss Silk Tree	No	SH (Pink & White)	40' x 45'	1	15'	2000	No	F	L	H	L	D	FS		Alkaline	M-H	Thorns on Trunk	L
11**	*Coccoloba uvifera*	Seagrape	Yes	Non-showy (Cream)	40' x 30'	3	12'	2000	No	M	H	H	H	E	FS		All	Low		M

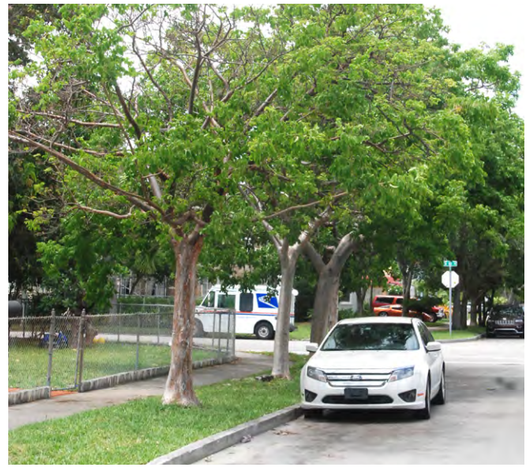
* Only use when species is already in use as a designated street tree
** Only use in medians or traffic circles, away from pedestrians

Prefferred Species

Royal Poinciana (Delonix regia) in a swales along SW 23rd Ave at SW 5th St. in Citrus Grove

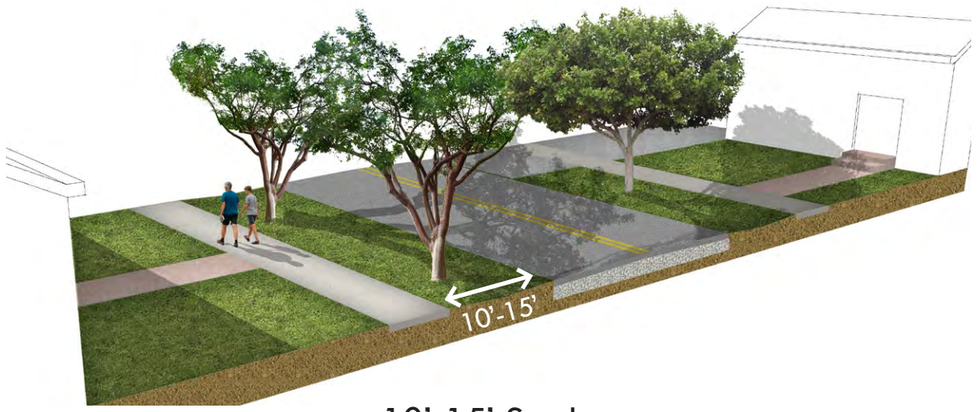
Mature Gumbo Limbo (Bursera simaruba) as street trees - outside of project area

Newly planted Apple Blossom Tree (Cassia javanica) on SW 26th Street in Douglas Park



Gumbo Limbo trees (Bursera simaruba) on SW 11th Street in Shenandoah North

Large Swale Tree Species Palette



10'-15' Swale

	RANK	BOTANICAL NAME	COMMON NAME	NATIVE
LARGE SWALES	LARGE TREES (30' setback from overhead utility lines)			
	1	*Bursera simaruba*	Gumbo Limbo	Yes
	2	*Simarouba glauca*	Paradise Tree	Yes
	3	*Sideroxylon foetidissimum*	Mastic	Yes
	4	*Piscidia piscipula*	Jamaica Dogwood	Yes
	5	*Pinus elliottii var. densa*	South Florida Slash Pine	Yes
	6	*Tabebuia heterophylla*	Pink Tabebuia	No
	7	*Acer rubrum*	Red Maple	Yes
	8	*Cassia javanica*	Apple Blossom Cassia	No
	9*	*Delonix regia*	Royal Poinciana	No
	10**	*Ceiba speciosa*	Floss Silk Tree	No
	11**	*Coccoloba uvifera*	Seagrape	Yes
	* Only use when species is already in use as a designated street tree ** Only use in medians or traffic circles, away from pedestrians			

Rankings are meant to dictate a hierarchy of preference for tree selection

(R) Rain Garden Friendly (N) Florida Native

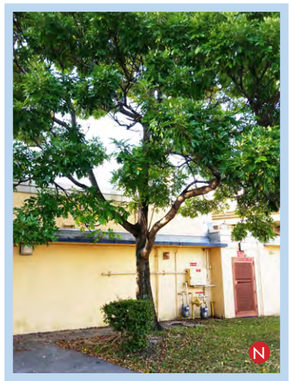
Non-Flowering

Flowering

Prefferred Species

Palm

Gumbo Limbo



Paradise Tree

Mastic

Jamaican Dogwood

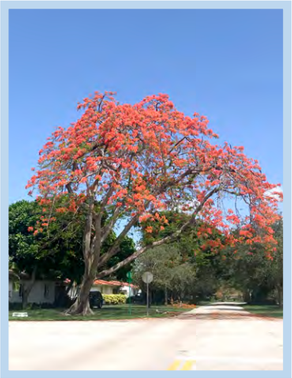
South Florida Slash Pine

Red Maple

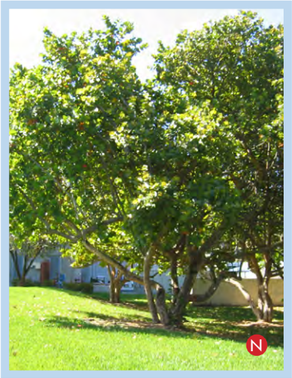
Apple Blossom Cassia

Floss Silk Tree

Pink Tabebuia



Royal Poinciana



Sea Grape

LARGE SWALE PALETTE

Medium Swale Tree Species Palette

Medium swales are sized between 5-10' in width. While some species listed can be planted within less space, this sized swale will provide these medium sized species with the ideal soil volumes to sustain proper growth habits. Green Buttonwoods are the most recommended trees because of their strong resiliency to climate change and their general availability. Care in selection should be taken with Pigeon Plum which are messy as they can cause problems if planted adjacent to parking, they are however, an outstanding native tree that is very resilient. *Species ranking lists the species having higher thresholds within these categories first.*

	RANK	BOTANICAL NAME	COMMON NAME	NATIVE	FLOWERING (Color) SH-Showy/NS- Non-Showy	MATURE SIZE (Ft.) Spread x Height	GRADES & STAN-DARDS Matrix	MIN. SWALE WIDTH	SOIL VOLUME ft3	GOOD UNDER POWER LINES	GROWTH RATE	WIND RESISTANCE	DROUGHT TOLERANCE	AEROSOL SALT TOLERANCE	PLANT TYPE E-Evergreen / D-Deciduous	LIGHT REQUIREMENTS FS-Full Sun / PS - Partial Shade	NUTRITIONAL NEEDS	SOIL PH	PROBLEMATIC ROOTS	NOTES	AVAILABILITY
								H-High/M-Med./L-Low													
								MEDIUM TREES (20' setback from overhead utility lines)													
MEDIUM SWALES	1	*Conocarpus erectus*	Green Buttonwood	Yes	SH (Pale Green)	35' x 25'	1	6'	1200	No	M	H	H	H	E	FS/PS		All	L	Good coastal tree	H
	2	*Chrysophyllum oliviforme*	Satinleaf	Yes	NS (White)	30' x 20'	1	6'	1200	No	S	M-H	H	M	E	FS/PS		All	L		M
	3	*Guapira discolor*	Blolly	Yes	NS (Green)	30' x 40'	3	8'	1200	No	M	M	M	H	E	FS/PS	Moderate	All	L	Often Multi-trunked	L
	4	*Citharexylum spinosum*	Fiddlewood	Yes	SH (White)	35' x 25'	2	10'	2000	No	S	M	H	L	E	PS		All	H		L
	5	*Pimenta dioica*	Allspice	No	SH (White)	30' x 20'	3	6'	1200	No	M	H	M	L	E	FS/PS		All	L		L
	6	*Tabebuia bahamensis*	White Tabebuia	No	SH (White)	25' x 8'	2	4'	1200	No	M	M	H	M	D	FS/PS		All	L	White flowers	L
	7	*Caesalpinia granadillo*	Bridalveil	No	SH (Yellow)	35' x 25'	1	6'	1200	No	M	M-H	M	L	E	FS		All	L		M
	8	*Bulnesia arborea*	Verawood	No	SH (Yellow)	30' x 25'	3	6'	1200	No	M	H	H	M	E	FS	Low	All	L		M
	9	*Coccoloba diversifolia*	Pigeon Plum	Yes	SH (White)	30' x 25'	3	6'	1200	No	M	M-H	H	H	E	FS/PS		All	L	Berries/Messy	M
	10	*Krugiodendron ferreum*	Black Ironwood	Yes	NS (Green)	30' x 20'	1	6'	1200	No	S	H	H	H	E	FS/PS		All	L	Slow growing	L
	11	*Ilex cassine*	Dahoon Holly	Yes	NS (White)	25' x 10'	2	4'	1200	No	M	H	M	M	E	FS/PS		All	L	Small Berries	L
	12	*Clusia rosea*	Pitch Apple	Yes	NS	30' x 25'	3	10'	2000	No	S	H	H	H	E	FS		All	H		M
	13	*Sideroxylon salicifolium*	Willow Bustic	Yes	SH (White)	30' x 20'	1	6'	1200	No	M	M	H	L	E	FS		All	L		L
	14	*Lagerstroemia speciosa*	Queen's Crepe Myrtle	No	SH (Pink & Lavender)	45' x 35'	3	8'	1200	No	F	M	H	M	Semi-E	FS		All	L		H
	15	*Noronhia emarginata*	Madagascar Olive	No	NS (Yellow)	25' x 20'	3	6'	1200	No	S	M-H	H	H	E	FS/PS		All	L		M
	16	*Tabebuia caraiba*	Yellow Tabebuia	No	SH (Yellow)	25' x 15'	2	6'	1200	No	M	L	H	M	Semi-E	FS/PS		All	L	brittle limbs	M
	17	*Callistemon rigidus*	Erect Bottlebrush	No	SH (Red)	20' X 10'	3	4'	1200	Yes	M	M	M	M	E	FS		All	L		M
	18	*Filicium decipiens*	Japanese Fern Tree	No	NS (White)	25' x 25'	3	10'	2000	No	S	M	L	L	E	FS/PS		All	L		L

Prefferred Species

Newly planted Pigeon Plums (Coccoloba diversifolia) on SW 17th Avenue in Citrus Grove

Yellow Tabebuia (Tabebuia caraiba) on SW 13th Court near 10th Street in Shenandoah North

Row of Green Buttonwood (Conocarpus erectus) on SW 3rd Street in the Latin Quarter

Street of Bridalveil trees (Caesalpinia granadillo) outside of project area

Medium Swale Tree Species Palette

5'-10' Swale

	RANK	BOTANICAL NAME	COMMON NAME	NATIVE
	MEDIUM TREES (20' setback from overhead utility lines)			
MEDIUM SWALES	1	*Conocarpus erectus*	Green Buttonwood	Yes
	2	*Chrysophyllum oliviforme*	Satinleaf	Yes
	3	*Guapira discolor*	Blolly	Yes
	4	*Citharexylum spinosum*	Fiddlewood	Yes
	5	*Pimenta dioica*	Allspice	No
	6	*Tabebuia bahamensis*	White Tabebuia	No
	7	*Caesalpinia granadillo*	Bridalveil	No
	8	*Bulnesia arborea*	Verawood	No
	9	*Coccoloba diversifolia*	Pigeon Plum	Yes
	10	*Krugiodendron ferreum*	Black Ironwood	Yes
	11	*Ilex cassine*	Dahoon Holly	Yes
	12	*Clusia rosea*	Pitch Apple	Yes
	13	*Sideroxylon salicifolium*	Willow Bustic	Yes
	14	*Lagerstroemia speciosa*	Queen's Crepe Myrtle	No
	15	*Noronhia emarginata*	Madagascar Olive	No
	16	*Tabebuia caraiba*	Yellow Tabebuia	No
	17	*Callistemon rigidus*	Erect Bottlebrush	No
	18	*Filicium decipiens*	Japanese Fern Tree	No

Rankings are meant to dictate a hierarchy of preference for tree selection

(R) Rain Garden Friendly (N) Florida Native

Non-Flowering

Flowering

Palm

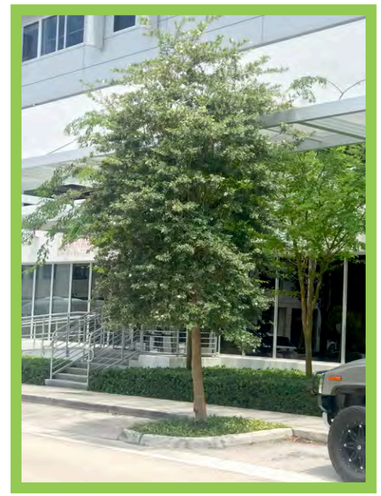
Green Buttonwood

Satin Leaf

Blolly

Fiddlewood

Allspice



White Tabebuia

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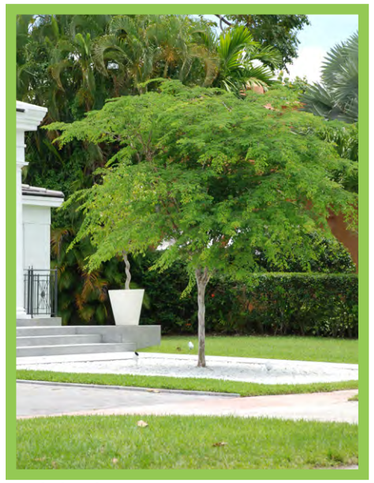
MEDIUM SWALE PALETTE

Medium Swale Tree Species Palette


Bridalveil


Verawood


Pigeon Plum


Black Ironwood


Dahoon Holly


Pitch Apple


Willow Bustic


Queen's Crepe Myrtle


Madagascar Olive


Yellow Tabebuia


Erect Bottlebrush


Japanese Fern Tree

R Rain Garden Friendly

N Florida Native

Non-Flowering

Flowering

Palm

MEDIUM SWALE PALETTE

Small Swale and/or Overhead Utility Tree Species Palette

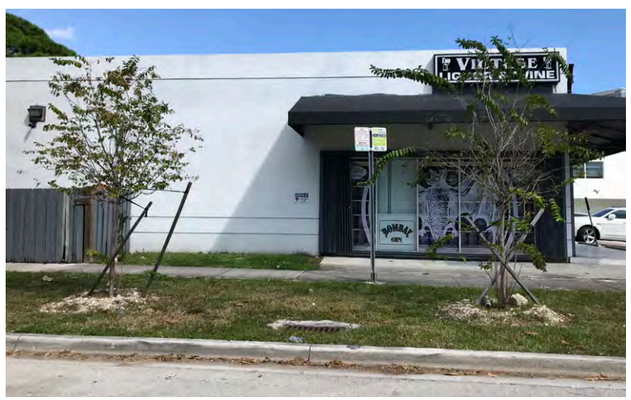
Shade trees should always be used instead of palms as they provide greater benefits: However, palms are included in these lists for areas where they are already an established species. **Swales sized between 3-5' in width are shown - swales less than 3' in width should not have any trees or palms, they are too small to support them properly.** When possible, these small trees should be planted in staggered clusters of three, each cluster space 25' apart. This clustering allows for the maximum ecological benefits and greatest resiliency to climate change, and the trees protect each other and establish better. *Species ranking lists the species having higher thresholds within these categories first.*

SMALL SWALE AND/OR OVERHEAD UTILITIES

RANK	BOTANICAL NAME	COMMON NAME	NATIVE	FLOWERING (Color) SH-Showy/NS- Non-Showy	MATURE SIZE (Ft.) Spread x Height	GRADES & STAN-DARDS Matrix	MIN. SWALE WIDTH	SOIL VOLUME ft3	GOOD UNDER POWER LINES	GROWTH RATE	WIND RESISTANCE	DROUGHT TOLERANCE	AEROSOL SALT TOLERANCE	PLANT TYPE E-Evergreen / D-Deciduous	LIGHT REQUIREMENTS FS-Full Sun / PS - Partial Shade	NUTRITIONAL NEEDS	SOIL PH	PROBLEMATIC ROOTS	NOTES	AVAILABILITY
H-High/M-Med./L-Low																				
SMALL TREES (can be planted under overhead utility lines)																				
1	*Eugenia foetida*	Spanish Stopper	Yes	SH (White)	15' x 15'	3	4'	300	Yes	M	H	H	H	E	FS/PS		All	L	shade tolerant	M
2	*Myrcianthes fragrans*	Simpson's Stopper	Yes	SH (White)	15' x 15'	3	4'	300	Yes	M	H	H	M	E	FS/PS		All	L	shade tolerant	M
3	*Conocarpus erectus var. sericeus*	Silver Buttonwood	Yes	NS (White)	25' x 20'	3	4'	1200	Yes	S	H	H	H	E	FS/PS		All	L	Good coastal tree	M
4	*Eugenia rhombea*	Red Stopper	Yes	NS (White)	20' x 10'	3	4'	300	Yes	M	H	H	M	E	FS/PS		All	L		L
5	*Capparis cynophallophora*	Jamaica Caper	Yes	SH (White)	20' x 15'	3	4'	300	Yes	S	H	H	H	E	FS/PS		All	L		L
6	*Lagerstroemia indica*	Crepe Myrtle	No	SH (Pink)	25' x 20'	3	4'	1200	Yes	M	H	H	M	D	FS		All	L		H
7	*Guaiacum sanctum*	Lignum vitae	Yes	SH (Purple)	15' x 15'	3	4'	300	Yes	S	H	H	H	E	FS/PS		All	L		M
8	*Cordia sebestena*	Orange Geiger	Yes	SH (Orange Red)	25' x 20'	3	6'	1200	Yes	S	H	H	H	E	FS/PS		All	L		M
9	*Acacia choriophylla*	Cinnecord	Yes	SH (Yellow)	20' x 15'	3	6'	1200	Yes	M	M	H	M	E	FS	Moderate	All	L		L
10	*Gymnanthes lucida*	Crabwood	Yes	NS	25' x 20'	3	6'	1200	Yes	S	M	M	M	E	FS/PS		All	L		M
11	*Ardisia escallonioides*	Marlberry	Yes	SH (White)	20' X 10'	3	4'	1200	Yes	M	M	M	H	E	PS		All	L		L
12*	*Senna polyphylla*	Desert Cassia	No	SH (Yellow)	10' X10'	3	4'	300	Yes	M	M	H	H	E	FS		All	L		M
SMALL/MEDIUM PALMS																				
1	*Thrinax radiata*	Florida Thatch Palm	Yes	NS (White/Yellow)	20' x 10'		4'	200	Yes	S	H	H	H	E	FS		Alkaline	L		M
2	*Thrinax morrisii*	Key Thatch Palm	Yes	NS (White/Yellow)	20' x 10'		4'	200	Yes	S	H	H	H	E	FS		All	L		L
3	*Hyophorbe verschaffeltii*	Spindle Palm	No	SH(White/Yellow)	25' x 15'		6'	200	Yes	S	H	H	H	E	FS			L		M
4	*Ptychosperma elegans*	Solitaire Palm	No	Showy (Green)	20' x 15'		4'	200	No	S	M	L	L	E	FS/PS	Moderate	All	L		H
**5	Pseudophoenix sargentii	Buckaneer Palm	Yes	Showy (Green)	10' x 8'		4'	200	Yes	S	H	L	M	E	FS	Moderate	Alkaline	L		M
**6	*Hyophorbe lagenicaulis*	Bottle Palm	No	SH(White)	10' X 10'		4'	200	Yes	S	H	M	H	E	FS	Moderate	All	L	Needs well drained soil	H
*7	*Adonidia merrillii*	Christmas Palm	No	NS(White)	25' X 12'		4'	200	Yes	M	H	M	M	E	FS/PS	Moderate	All	L	Needs well drained soil	H

* Only use when species is already in use as a designated street tree
** Only use in medians or traffic circles, away from pedestrians

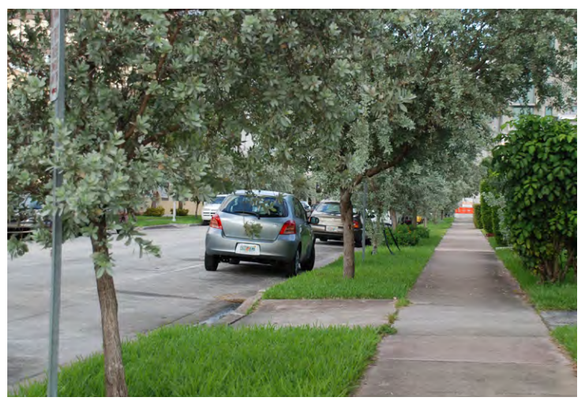
Prefferred Species



Newly planted Crepe Myrtle trees (Lagerstroemia indica) on SW 18th Terrace in the Roads

Newly planted Silver Buttonwood (Conocaprus erectus) under utility lines on SW 14th Avenue in Shenandoah North

SW 21st Avenue near 14th Terrace - Newly planted Bridal Veil (Caesalpinia granadillo) under utility lines.



Street of Silver Buttonwood trees (Conocarpus erectus var sericeus) outside of project area

Small Swale and/or Overhead Utility Tree Species Palette

3'-5' Swale/
Overhead Utilities

	RANK	BOTANICAL NAME	COMMON NAME	NATIVE
SMALL SWALES AND/OR OVERHEAD UTILITIES	**SMALL TREES** (can be planted under overhead utility lines)			
	1	*Eugenia foetida*	Spanish Stopper	Yes
	2	*Myrcianthes fragrans*	Simpson's Stopper	Yes
	3	*Conocarpus erectus var. sericeus*	Silver Buttonwood	Yes
	4	*Eugenia rhombea*	Red Stopper	Yes
	5	*Capparis cynophallophora*	Jamaica Caper	Yes
	6	*Lagerstroemia indica*	Crepe Myrtle	No
	7	*Guaiacum sanctum*	Lignum vitae	Yes
	8	*Cordia sebestena*	Orange Geiger	Yes
	9	*Acacia choriophylla*	Cinnecord	Yes
	10	*Gymnanthes lucida*	Crabwood	Yes
	11	*Ardisia escallonioides*	Marlberry	Yes
	12	*Senna polyphylla*	Desert Cassia	No
	SMALL/MEDIUM PALMS (can be planted under overhead utility lines)			
	1	*Thrinax radiata*	Florida Thatch Palm	Yes
	2	*Thrinax morrisii*	Key Thatch Palm	Yes
	3	*Hyophorbe verschaffeltii*	Spindle Palm	No
	4	*Ptychosperma elegans*	Solitaire Palm	No
	**5	Pseudophoenix sargentii	Buckaneer Palm	Yes
	**6	*Hyophorbe lagenicaulis*	Bottle Palm	No
	*7	*Adonidia merrillii*	Christmas Palm	No
	* Only use when species is already in use as a designated street tree ** Only use in medians or traffic circles, away from pedestrians			

Rankings are meant to dictate a hierarchy of preference for tree selection

(R) Rain Garden Friendly (N) Florida Native

Non-Flowering Flowering Palm

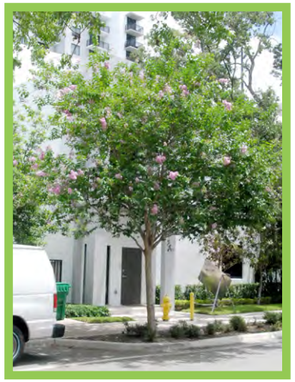

Spanish Stopper


Simpson's Stopper


Silver Buttonwood


Red Stopper


Jamaican Caper


Crepe Myrtle


Lignum Vitae


Orange Geiger


Cinnecord


Crabwood


Marlberry


Desert Cassia

Continued on next page

SMALL SWALE/UTILITY PALETTE

Small Swale and/or Overhead Utility Tree Species Palette


Florida Thatch Palm


Key Thatch Palm


Spindle Palm


Solitaire Palm


Buckaneer Palm


BottlePalm


Christmas Palm

Non-Flowering

Florida Native

Flowering

Palm

SMALL SWALE/UTILITY PALETTE

Bumpout/Tree Island & Tree Grate Tree Species Palette

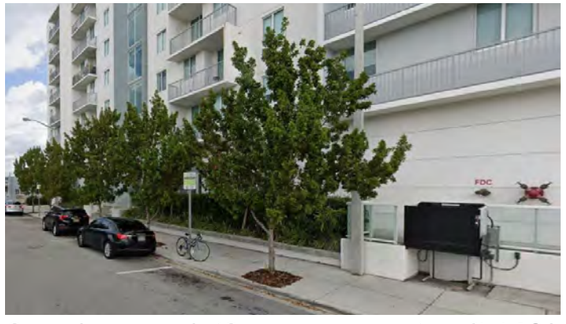
Shade trees should always be used instead of palms as they provide greater benefits: However, palms are included in these lists for areas where they are already an established species. Bump-out sizes vary but are generally less than 5 feet in length and should therefore have only smaller species of trees unless additional infrastructure is supplied. Tree grate category tree suggestions assume that the planting pit is the same size as the grate - if additional infrastructure is supplied, a larger species of tree can be specified. *Species ranking lists the species having higher thresholds within these categories first.*

BUMP-OUT/ TREE GRATES

RANK	BOTANICAL NAME	COMMON NAME	NATIVE	FLOWERING (Color) SH-Showy/NS- Non-Showy	MATURE SIZE (Ft.) Spread x Height	GRADES & STAN-DARDS Matrix	MIN. SWALE WIDTH	SOIL VOLUME ft3	GOOD UNDER POWER LINES	GROWTH RATE	WIND RESISTANCE	DROUGHT TOLERANCE	AEROSOL SALT TOLERANCE	PLANT TYPE E-Evergreen / D-Deciduous	LIGHT REQUIREMENTS FS-Full Sun / PS - Partial Shade	NUTRITIONAL NEEDS	SOIL PH	PROBLEMATIC ROOTS	NOTES	AVAILABILITY
H-High/M-Med./L-Low																				
Bump-outs: 5 ' Length maximum (Stand-alone) / Tree Grates: 4' x 4' or 16 SF maximum (with no additional infrastructure)																				
1	*Guaiacum sanctum*	Lignum vitae	Yes	SH (Purple)	15' x 15'	3	4'	300	Yes	S	H	H	H	E	FS/PS		All	L		M
2	*Krugiodendron ferreum*	Black Ironwood	Yes	NS (Green)	30' x 20'	1	6'	1200	No	S	H	H	H	E	FS/PS			L	Slow growing	L
3	*Gymnanthes lucida*	Crabwood	Yes	NS	25' x 20'	3	6'	1200	Yes	S	M	M	M	E	FS/PS		All	L		M
4	*Guaiacum sanctum*	Lignum vitae	Yes	SH (Purple)	15' x 15'	3	4'	300	Yes	S	H	H	H	E	FS/PS		All	L		M
5	*Sabal palmetto*	Cabbage Palm	Yes	SH (White)	40' x 15'		8'	300	No	S	H	H	H	E	FS/PS		All	L		H
6	*Thrinax radiata*	Florida Thatch Palm	Yes	NS (White/Yellow)	20' x 10'		4'	200	Yes	S	H	H	H	E	FS		Alkaline	L		M
7	*Thrinax morrisii*	Key Thatch Palm	Yes	NS (White/Yellow)	20' x 10'		4'	200	Yes	S	H	H	H	E	FS		All	L		L
8	*Veitchia montgomeryana*	Montgomery Palm	No	NS (White/Yellow)	25' x 10'		4'	200	No	F	H	M	M	E	FS		Alkaline	L		H
9	*Wodyeta birfurcata*	Foxtail Palm	No	SH (White/Green)	30' x 10'		6'	200	No	F	H	M	M	E	FS/PS		Acidic	L	Needs Fertilizer	M
5 '- 12' Length (Clusters of three)																				
1	*Eugenia foetida*	Spanish Stopper	Yes	SH (White)	15' x 15'	3	4'	300	Yes	M	H	H	H	E	FS/PS		All	L	shade tolerant	M
2	*Myrcianthes fragrans*	Simpson's Stopper	Yes	SH (White)	15' x 15'	3	4'	300	Yes	M	H	H	M	E	FS/PS		All	L	shade tolerant	M
3	*Conocarpus erectus var. sericeus*	Silver Buttonwood	Yes	NS (White)	25' x 20'	3	4'	1200	Yes	S	H	H	H	E	FS/PS		All	L	Good coastal tree	M
4	*Eugenia rhombea*	Red Stopper	Yes	NS (White)	20' x 10'	3	4'	300	Yes	M	H	H	M	E	FS/PS		All	L		L
5	*Capparis cynophallophora*	Jamaica Caper	Yes	SH (White)	20' x 15'	3	4'	300	Yes	S	H	H	H	E	FS/PS		All	L		L
6	*Acacia choriophylla*	Cinnecord	Yes	SH (Yellow)	20' x 15'	3	6'	1200	Yes	M	M	H	M	E	FS	Moderate	All	L		L
7	*Ardisia escallonioides*	Marlberry	Yes	SH (White)	20' X 10'	3	4'	1200	Yes	M	M	M	H	E	PS		All	L		L
Bump-outs: 5 '- 12' Length (Stand-alone) / Tree Grates: 4' x 8' or 32 SF minimum (with no additional infrastructure)																				
1	*Conocarpus erectus*	Green Buttonwood	Yes	SH (Pale Green)	35' x 25'	1	6'	1200	No	M	H	H	H	E	FS/PS		All	L	Good coastal tree	H
2	*Chrysophyllum oliviforme*	Satinleaf	Yes	NS (White)	30' x 20'	1	6'	1200	No	S	M-H	H	M	E	FS/PS		All	L		M
3	*Guapira discolor*	Blolly	Yes	NS (Green)	30' x 40'	3	8'	1200	No	M	M	M	H	E	FS/PS	Moderate	All	L	Often Multi-trunked	L
4	*Citharexylum spinosum*	Fiddlewood	Yes	SH (White)	35' x 25'	2	10'	2000	No	S	M	H	L	E	PS		All	H		L
5	*Pimenta dioica*	Allspice	No	SH (White)	30' x 20'	3	6'	1200	No	M	H	M	L	E	FS/PS		All	L		L
6	*Tabebuia bahamensis*	White Tabebuia	No	SH (White)	25' x 8'	2	4'	1200	No	M	M	H	M	D	FS/PS		All	L	White flowers	L
7	*Caesalpinia granadillo*	Bridalveil	No	SH (Yellow)	35' x 25'	1	6'	1200	No	M	M-H	M	L	E	FS		All	L		M
8	*Bulnesia arborea*	Verawood	No	SH (Yellow)	30' x 25'	3	6'	1200	No	M	H	H	M	E	FS	Low	All	L		M
9	*Krugiodendron ferreum*	Black Ironwood	Yes	NS (Green)	30' x 20'	1	6'	1200	No	S	H	H	H	E	FS/PS		All	L	Slow growing	L
10	*Lagerstroemia speciosa*	Queen's Crepe Myrtle	No	SH (Pink & Lavender)	45' x 35'	3	8'	1200	No	F	M	H	M	Semi-E	FS		All	L		H

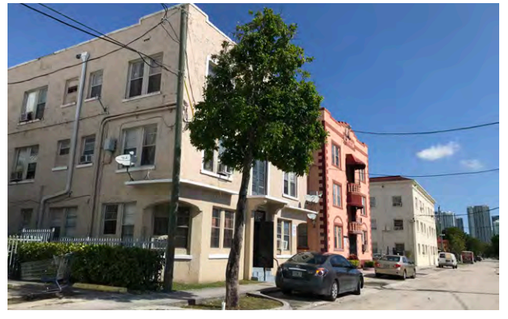
Prefferred Species

Cabbage Palms (Sabal palmetto) on SW 12th Avenue in the Latin Quarter. Appropriate species for size of tree grates.



Green buttonwoods (Conocarpus erectus) on SW 12th Avenue in the Latin Quarter. Too large a species for a small grate

Live Oak trees (Quercus virginiana) on SW 1st Avenue in East Little Havana. Too large a species for a small cut-out.



Pink Tabebuia (Tabebuia heterophylla) on SW 5th Street in East Little Havana. Too large a species for a small bump-out.

BUMP-OUT/TREE GRATE PALETTE

Bump-out/Tree Grate Tree Species Palette

Bump-out - Less than 5’ Length

BUMP-OUT/ TREE GRATES	RANK	BOTANICAL NAME	COMMON NAME	NATIVE
	Bump-outs: 5 ' Length maximum (Stand-alone) / Tree Grates: 4' x 4' or 16 SF maximum (with no additional infrastructure)			
	1	*Guaiacum sanctum*	Lignum vitae	Yes
	2	*Krugiodendron ferreum*	Black Ironwood	Yes
	3	*Gymnanthes lucida*	Crabwood	Yes
	5	*Sabal palmetto*	Cabbage Palm	Yes
	6	*Thrinax radiata*	Florida Thatch Palm	Yes
	7	*Thrinax morrisii*	Key Thatch Palm	Yes
	8	*Veitchia montgomeryana*	Montgomery Palm	No
	*9	*Wodyeta birfurcata*	Foxtail Palm	No
	** Only use in medians or traffic circles, away from pedestrians			

Rankings are meant to dictate a hierarchy of preference for tree selection

(R) Rain Garden Friendly (N) Florida Native

Non-Flowering

Flowering

Palm

Lignum Vitae

Black Ironwood

Crabwood

Sabal Palm

Florida Thatch Palm

Key Thatch Palm

Montgomery Palm

Foxtail Palm

BUMP-OUT/TREE GRATE PALETTE

Bump-out/Tree Grate Tree Species Palette

Bump-out - 5'- 12' Length - Clusters

	RANK	BOTANICAL NAME	COMMON NAME	NATIVE
BUMP-OUT	5 '- 12' Length (Clusters of three)			
	1	*Eugenia foetida*	Spanish Stopper	Yes
	2	*Myrcianthes fragrans*	Simpson's Stopper	Yes
	3	*Conocarpus erectus var. sericeus*	Silver Buttonwood	Yes
	4	*Eugenia rhombea*	Red Stopper	Yes
	5	*Capparis cynophallophora*	Jamaica Caper	Yes
	6	*Acacia choriophylla*	Cinnecord	Yes
	7	*Ardisia escallonioides*	Marlberry	Yes

Rankings are meant to dictate a hierarchy of preference for tree selection

(R) Rain Garden Friendly (N) Florida Native

Non-Flowering

Flowering

Palm

Spanish Stopper

Simpson's Stopper

Silver Buttonwood

Red Stopper

Jamaican Caper

Cinnecord

Marlberry

BUMP-OUT/TREE GRATE PALETTE

Bump-out/Tree Grate Tree Species Palette

Bump-out - 5’ - 12’ Length - Stand-alone
4’ x 8’ Tree Grates

	RANK	BOTANICAL NAME	COMMON NAME	NATIVE
BUMP-OUT/ TREE GRATES	Bump-outs: 5 '- 12' Length (Stand-alone) / Tree Grates: 4' x 8' or 32 SF minimum (with no additional infrastructure)			
	1	*Conocarpus erectus*	Green Buttonwood	Yes
	2	*Chrysophyllum oliviforme*	Satinleaf	Yes
	3	*Guapira discolor*	Blolly	Yes
	4	*Citharexylum spinosum*	Fiddlewood	Yes
	5	*Pimenta dioica*	Allspice	No
	6	*Tabebuia bahamensis*	White Tabebuia	No
	7	*Caesalpinia granadillo*	Bridalveil	No
	8	*Bulnesia arborea*	Verawood	No
	9	*Krugiodendron ferreum*	Black Ironwood	Yes
	10	*Lagerstroemia speciosa*	Queen's Crepe Myrtle	No

Rankings are meant to dictate a hierarchy of preference for tree selection

(R) Rain Garden Friendly (N) Florida Native

Non-Flowering

Flowering

Palm

Green Buttonwood

Satin Leaf

Blolly

Fiddlewood

Allspice

White Tabebuia

Bridalveil

Verawood

Black Ironwood

BUMP-OUT/TREE GRATE PALETTE

Palm Tree Species Palette

Palm trees do not provide equal benefits of shade trees and therefore should be used only for emphasis, not as a predominant species on a street.

Royal Palms can cause a hazard with their large falling fronds and should only be used to infill ones that have died in locations where they line a street like SW 8th street. Foxtail palms have high nutritional needs and regular fertilization is required, so they are not recommended unless already established. Canary Date Palms require cleaning of the dead fronds or they become home to undesirable wildlife. Buckaneer and bottle palms are very small and should only be used in planting masses away from cars and walking as their fronds may interfere. Christmas palms are very sensitive to light changes and will grow in reaction to them, often causing them to bend in strange ways (phototropism)- the Montgomery palms are not as susceptible to this and look very similar and should be used instead. *Species ranking lists the species having higher thresholds within these categories first.*

	RANK	BOTANICAL NAME	COMMON NAME	NATIVE	FLOWERING (Color) SH-Showy/NS- Non-Showy	MATURE SIZE (Ft.) Spread x Height	GRADES & STAN-DARDS Matrix	MIN. SWALE WIDTH	SOIL VOLUME ft3	GOOD UNDER POWER LINES	GROWTH RATE	WIND RESISTANCE	DROUGHT TOLERANCE	AEROSOL SALT TOLERANCE	PLANT TYPE E-Evergreen / D-Deciduous	LIGHT REQUIREMENTS FS-Full Sun / PS - Partial Shade	NUTRITIONAL NEEDS	SOIL PH	PROBLEMATIC ROOTS	NOTES	AVAILABILITY
	H-High/M-Med./L-Low																				
PALMS	**LARGE PALMS**																				
	1	*Cocos nucifera "Maypan'*	Coconut Palm	No	SH (White/Yellow)	60' x 20'		8'	200	No	M	M-H	H	H	E	FS	Moderate	All	L	Coconuts Fall	H
	2	*Phoenix sylvestris*	Silver/Wild Date Palm	No	NS (Cream/Tan)	50' x 20'		15'	300	No	S-M	H	M	M	E	FS	Moderate	All	L	Needs trimming	H
	3	*Bismarckia nobilis*	Bismarck Palm	No	NS (White)	60' x 16'		15'	300	No	S-M	M	H	M	E	FS/PS	Moderate	Acidic	L		H
	4	*Phoenix dactylifera 'Medjool'*	Medjool Date Palm	No	SH (Pale yellow)	80' x 20'		15'	300	No	S-M	H	H	M-H	E	FS/PS		Neutral	L	Needs trimming	H
	*5	*Roystonea regia*	Royal Palm	Yes	SH (Green/White)	80' x 20'		12'	300	No	F	M-H	H	H	E	FS/PS	Moderate	All	L	Fronds Fall	H
	*6	*Phoenix canariensis*	Canary Island Date Palm	No	SH (Orange)	50' x 20'		20'	300	No	S	H	M	M-H	E	FS	Moderate	All	L	Needs trimming	M
	SMALL/MEDIUM PALMS																				
	1	*Sabal palmetto*	Cabbage Palm	Yes	SH (White)	40' x 15'		8'	300	No	S	H	H	H	E	FS/PS	Moderate	All	L		H
	2	*Thrinax radiata*	Florida Thatch Palm	Yes	NS (White/Yellow)	20' x 10'		4'	200	Yes	S	H	H	H	E	FS	Moderate	Alkaline	L		M
	3	*Veitchia montgomeryana*	Montgomery Palm	No	NS (White/Yellow)	25' x 10'		4'	200	No	F	H	M	M	E	FS	Moderate	Alkaline	L		H
	4	*Thrinax morrisii*	Key Thatch Palm	Yes	NS (White/Yellow)	20' x 10'		4'	200	Yes	S	H	H	H	E	FS	Moderate	All	L		M
	5	*Hyophorbe verschaffeltii*	Spindle Palm	No	SH(White/Yellow)	25' x 15'		6'	200	Yes	S	H	H	H	E	FS	Moderate	All	L		M
	6	*Coccothrinax miraguama*	Miraguama Palm	No	SH (Yellow)	25' x 15'		6'	200	No	S	H	H	H	E	FS/PS	Moderate	Neutral	L		M
	7	*Ptychosperma elegans*	Solitaire Palm	No	Showy (Green)	20' x 15'		4'	200	No	S	M	L	L	E	FS/PS	Moderate	All	L		H
	*8	*Wodyeta birfurcata*	Foxtail Palm	No	SH (White/Green)	30' x 10'		6'	200	No	F	H	M	M	E	FS/PS	High	Acidic	L	Needs Fertilizer	M
	**9	*Pseudophoenix sargentii*	Buckaneer Palm	Yes	Showy (Green)	10' x 8'		4'	200	Yes	S	H	L	M	E	FS	Moderate	Alkaline	L		M
	**10	*Hyophorbe lagenicaulis*	Bottle Palm	No	SH(White)	10' X 10'		4'	200	Yes	S	H	M	H	E	FS	Moderate	All	L	Needs well drained soil	H
	*11	*Adonidia merrillii*	Christmas Palm	No	NS(White)	25' X 12'		4'	200	Yes	M	H	M	M	E	FS/PS	Moderate	All	L	Needs well drained soil	H

* Only use when species is already in use as a designated street tree
** Only use in medians or traffic circles, away from pedestrians

Prefferred Species

Newly planted Spindle Palms (Hyophorbe verschaffeltii) on SW 1st Street in the Latin Quarter

Canary Date Palms in median, Mahogany trees in swale on SW 25th Road in the Roads

Bismarck Palms in Roundabout on SW 5th Avenue in the Roads

Royal Palms on SW 8th Street in the Latin Quarter. Not recommended due to hazards of falling fronds.

Palm Palette


Bismarck Palm


Canary Island Date Palm


Medjool Date Palm


Wild Date Palm


Royal Palm


Sabal Palm


Miraguama Palm


Spindle Palm


Coconut Palm


Key Thatch Palm


Florida Thatch Palm


Montgomery Palm


Foxtail Palm

NOTE: Palm trees do not provide equal benefits of shade trees and therefore should be used only for emphasis, not as a predominant species on a street.

R Rain Garden Friendly N Florida Native

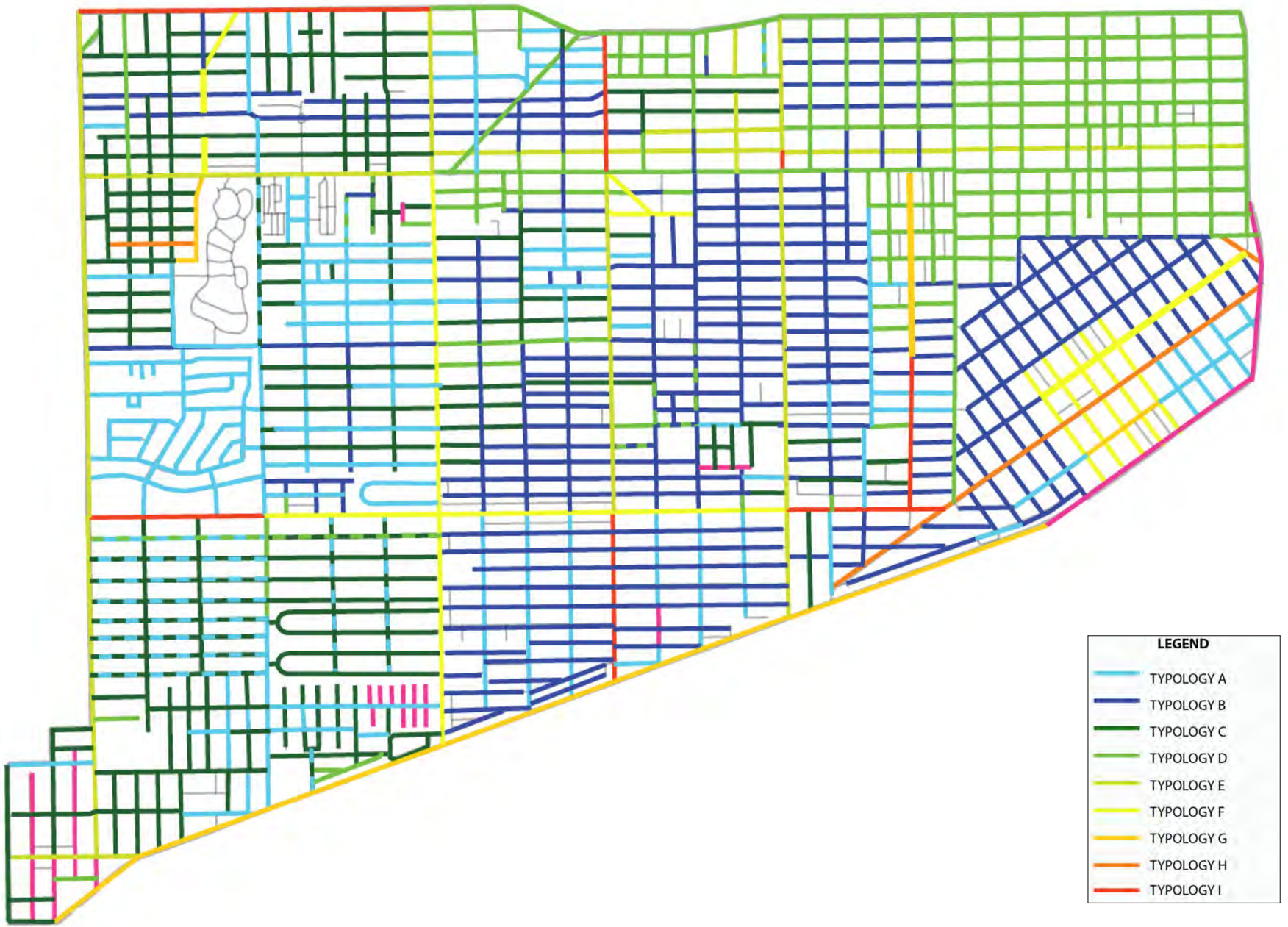
Non-Flowering

Flowering

Palm

PALM PALETTE

TYPOLOGY STRATEGIES



Typology Strategies Overview

Volume I identified nine different Typologies of streets found within the project limits. These typologies have been mapped and categorized in a spreadsheet to allow the City to easily identify and quantify the changes required to the infrastructure in order to maximize the canopy on any given street within the project area. This will allow for cost models and budget planning to achieve the planting goals. Not all Typologies require infrastructure in order to plant. We have identified the following infrastructure required per Typology below, and the following pages detail what action each typology requires.
To get neighborhoods to the 40% canopy coverage goal, maximizing planting will be necessary in certain areas. The addition of infrastructure to allow for the successful planting of extra-large trees would be required for maximizing the planting within most typologies.
Infrastructure: Refers to the addition of structural soil or soil cells and/or creating bump-outs when planting new trees.

Typology A : **No infrastructure** is typically required for this typology

Typologies B, F, G, I : **May require infrastructure** for new trees if large trees are desired in small swales.

Typologies C & H : **Requires infrastructure** to existing swales to allow trees to thrive with **cars parking** adjacent to them.

Typology D : This typology has little to no existing space to plant in and therefore will **require infrastructure in the creation of planting spaces,** eliminating some parking spaces for bump-outs.

Typology E : This typology does not have any space for planting, and it is not practical to create any as it would mean removing travel lanes from the streets.

A

B

C

D

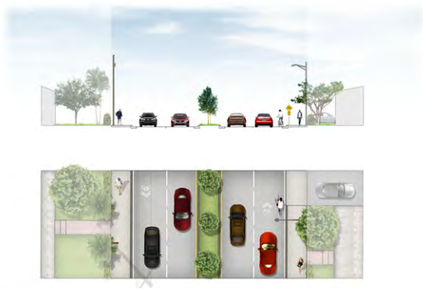
E

F

G

H

I



Typology Strategies

<u>Typology A</u> : No infrastructure is typically required for this typology.

Recommendations: Although no infrastructure is typically required in this typology, there are changes that should be made to the planting strategies, more details of these strategies are found within this section.
Asymmetrical planting strategy should be used in this typology where overhead utilities are present - see Planting Practices-Tree Placement in this section. This strategy utilizes large shade trees on the side where there are no overhead utilities, and clusters of small shade trees under the utility lines. If the swales are large enough to support large shade trees then no infrastructure would be required. However, should the swale on the side of the street where there are no overhead utilities be too small to support a large shade tree, additional infrastructure should be installed. See Planting Practices-Tree Placement this section.

This typology is the simplest to add canopy in, and is also where the most canopy is currently found. Therefore, the costs of planting in this typology are typically lower,and it is the typology that is the least in need of supplemental planting.

Typology Strategies

Typology A : **No infrastructure** is typically required for this typology

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

*Feasible canopy calculations based on 50' ROW **with no additional infrastructure and medium sized trees.**

NO OVERHEAD UTILITY LINES

*Feasible Canopy:

46%

OVERHEAD UTILITY LINES ON ONE SIDE OF R.O.W

*Feasible Canopy:

32%

On an A street with a typical 50' R.O.W, swale sizes ranges from 5-10' wide allowing for medium sized trees to be planted without the need for additional infrastructure. An asymmetrical planting scheme is to be used on streets with overhead utilities to optimize canopy coverage on those streets. Going one further step to maximize the amount of canopy within the R.O.W, extra large trees can be planted with the addition of supportive infrastructure that will allow for more extensive root systems; the following image and canopy coverage calculation depicts such a case.

Maximum feasible canopy calculations based on 50' ROW **with additional infrastructure and extra large sized trees.

NO OVERHEAD UTILITY LINES

*Maximum Feasible Canopy

77%

OVERHEAD UTILITY LINES ON ONE SIDE OF R.O.W

*Maximum Feasible Canopy

59%

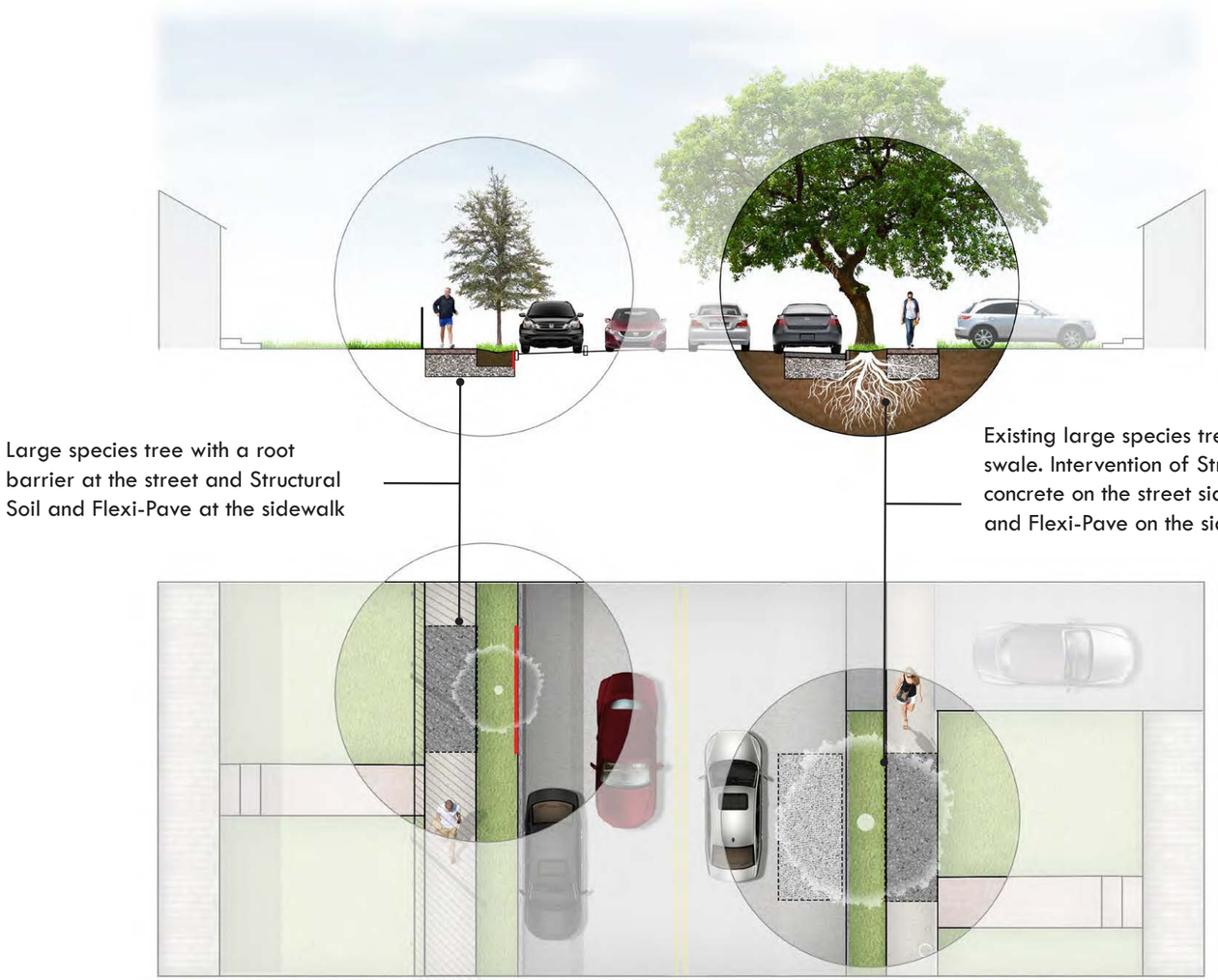
Typology Strategies

<u>Typologies B, F, G, I</u>: May require infrastructure for new trees if large trees are desired in small swales.

Recommendations: This typology on streets with 70' ROW usually have wide enough swales to support large trees. However, in the 50' ROW streets, which are the majority, the swale sizes are too small for large trees.

This typology is simple to add canopy in the 70' ROW streets where the swales are larger. On the 50' ROW streets, new trees in small swales either need to be a smaller species, or they need infrastructure. Many of these streets do not have any overhead utilities which allows for maximum planting. The diagrams here show a new large species tree on the left being planted in a small swale with Structural Soil and Flexi-Pave for the sidewalk and a root barrier on the street side. This will give the tree greater growing space and avoid having to replace and repair the sidewalks as the tree grows to its mature size. On the right is an existing large species tree in a small swale, and an **intervention** is shown of adding structural soil and porous concrete on the street and structural soil and Flexi-Pave on the sidewalk. This intervention is detailed further in the section of this volume "Keeping the canopy we have".

This typology is most prevalent in Shenandoah North and South, Silver Bluff and the Roads. In the Roads there are more 70' ROW, but Shenandoah and Silver Bluff have numerous streets with small swales and big trees. See those neighborhood plans for further information on recommendations.



Typology Strategies

<u>Typology B</u>: May require infrastructure for new trees if large trees are desired in small swales.

TYPOLOGY B

<u>GENERAL CHARACTERISTICS:</u>

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

*Feasible canopy calculations based on 50’ & 70’ ROW **with no additional infrastructure and medium sized trees**

NO OVERHEAD UTILITY LINES

*Feasible Canopy

50%
(50’ ROW)

*Feasible Canopy

33%
(70’ ROW)

OVERHEAD UTILITY LINES ON ONE SIDE OF R.O.W

*Feasible Canopy

35%
(50’ ROW)

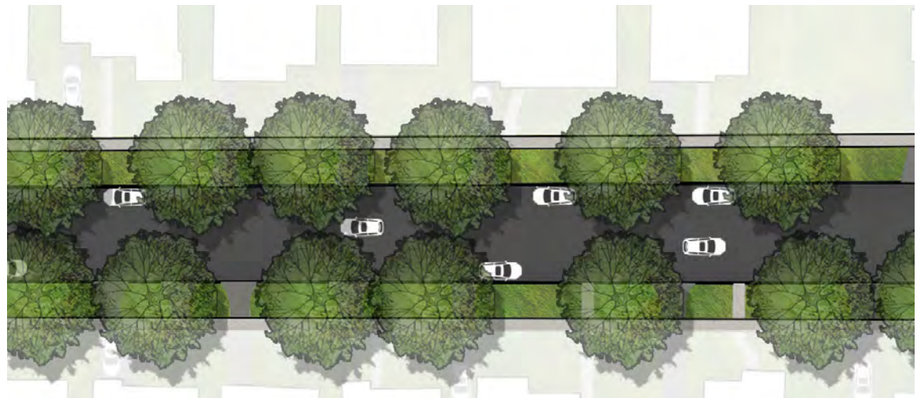
*Feasible Canopy

23%
(70’ ROW)

On a B street with typical 50’ or 70’ R.O.W swale sizes ranges from 5-10’ wide allowing for medium sized trees to be planted with the occasional need for additional infrastructure in smaller swales as this street typology includes on-street parking. An asymmetrical planting scheme is to be used on streets with overhead utilities to optimize canopy coverage on those streets. Going one further step to maximize the amount of canopy within the R.O.W, extra large trees can be planted with an increased use of the addition of supportive infrastructure that will allow for more extensive root systems in some of the wider swales as well; the following image and canopy coverage calculation depicts such a case.

Maximum feasible canopy calculations based on 50’ or 70’ ROW **with additional infrastructure and extra large sized trees.

NO OVERHEAD UTILITY LINES



** Maximum Feasible Canopy

73%
(50’ ROW)

** Maximum Feasible Canopy

55%
(70’ ROW)

OVERHEAD UTILITY LINES ON ONE SIDE OF R.O.W

** Maximum Feasible Canopy

53%
(50’ ROW)

** Maximum Feasible Canopy

42%
(70’ ROW)

Typology Strategies

<u>Typology F</u> : May require infrastructure for new trees if large trees are desired in small swales.

TYPOLOGY F

<u>GENERAL CHARACTERISTICS:</u>

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

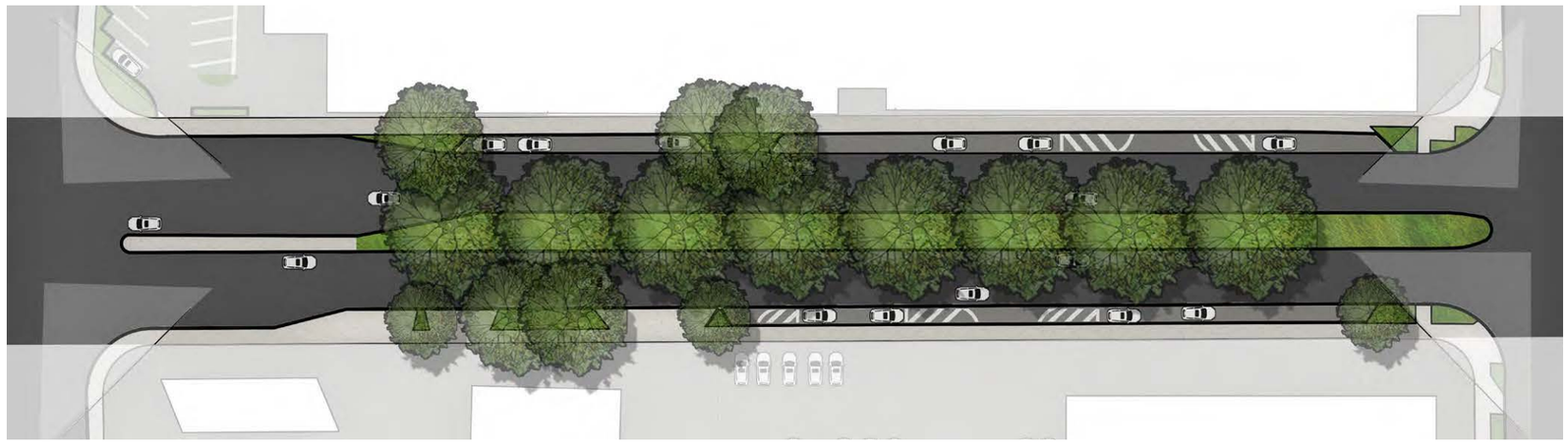
*Feasible canopy calculations based on 100' ROW **with limited additional infrastructure, medium sized trees within the swales and extra large trees are in the median.**

*Feasible Canopy

41%

On an F street with typical 100' R.O.W swale sizes ranges from 5-10' wide allowing for medium sized trees to be planted and medians range from 15-20' wide allowing for extra large sized trees. Swales in this typology have the occasional need for additional infrastructure as they may be small to accommodate on-street parking. To maximize the amount of canopy within the R.O.W, extra large trees can be planted with an increased use of the addition of supportive infrastructure that will allow for more extensive root systems in some of the wider swales as well; the following image and canopy coverage calculation depicts such a case.

Maximum feasible canopy calculations based on 100' ROW **with increased additional infrastructure and extra large sized trees within the swales and median.



**Maximum Feasible Canopy

62%

Typology Strategies

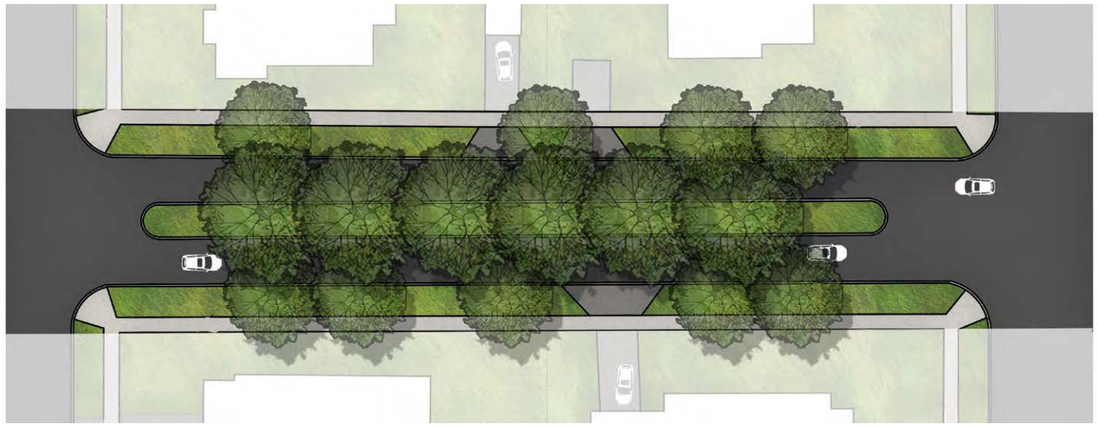
<u>Typology G</u> : May require infrastructure for new trees if large trees are desired in small swales.

TYPOLOGY G

<u>GENERAL CHARACTERISTICS:</u>

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

*Feasible canopy calculations based on 70' ROW **with no infrastructure, medium sized trees in the swales and large trees in the median.**

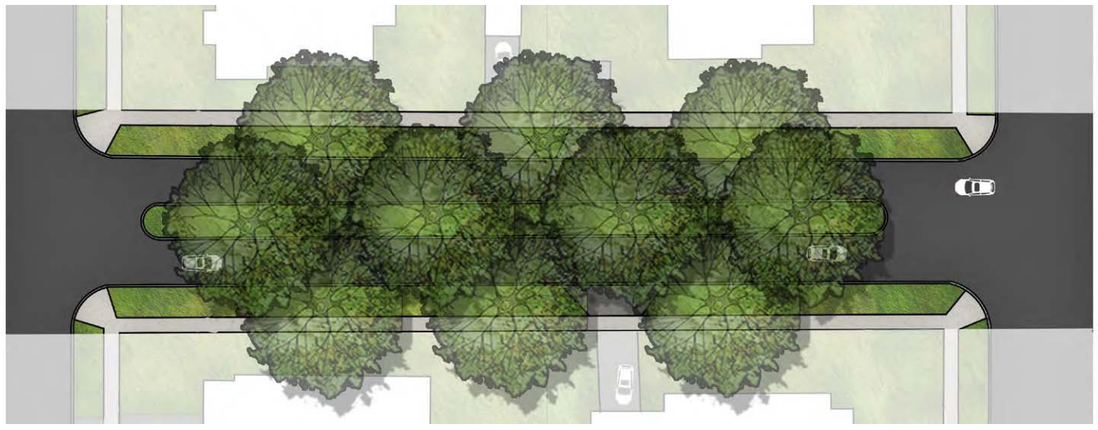


*Feasible Canopy

57%

On a G street with a typical 70' R.O.W swale sizes ranges from 5-10' wide allowing for medium sized trees to be planted with the occasional need for additional infrastructure in smaller swales as this street typology includes vegetated medians that range from 10-15' wide. To maximize the amount of canopy within the R.O.W, extra large trees can be planted with an increased use of the addition of supportive infrastructure that will allow for more extensive root systems in swales and medians; the following image and canopy coverage calculation depicts such a case.

Maximum feasible canopy calculations based on 70' ROW **with additional infrastructure and extra large sized trees.



**Maximum Feasible Canopy

75%

Typology Strategies

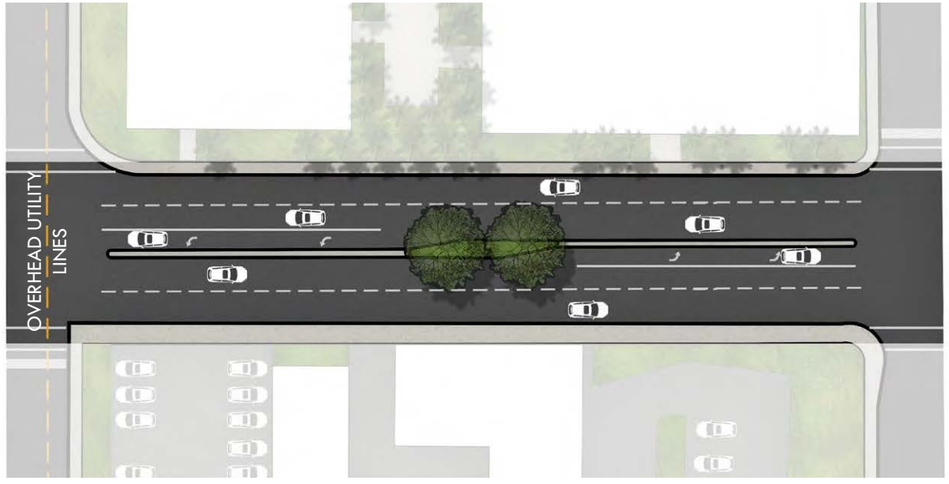
<u>Typology I</u>: May require infrastructure for new trees if large trees are desired in small swales.

TYPOLOGY I

<u>GENERAL CHARACTERISTICS:</u>

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

*Feasible canopy calculations based on a 70' and 100' ROW **with medium sized trees.**

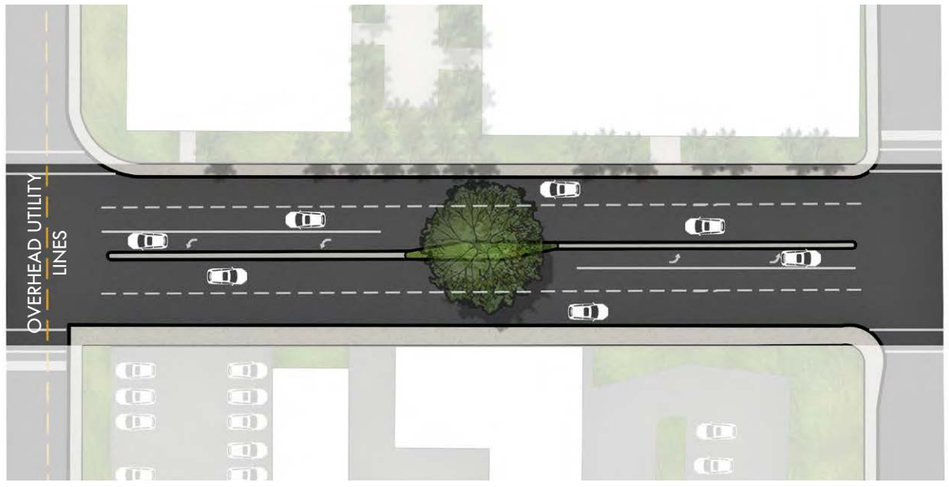


*Feasible Canopy

5-7%

On an I street with typical 70' or 100' R.O.W median sizes ranges from 5-10' wide allowing for medium sized trees to be planted. Going one further step to maximize the amount of canopy within the R.O.W, extra large trees can be planted with an increased use of the addition of supportive infrastructure that will allow for more extensive root systems; the following image and canopy coverage calculation depicts such a case.

Maximum feasible canopy calculations based on 70' and 100' ROW **with additional infrastructure and extra large sized trees.



**Maximum Feasible Canopy

5-8%

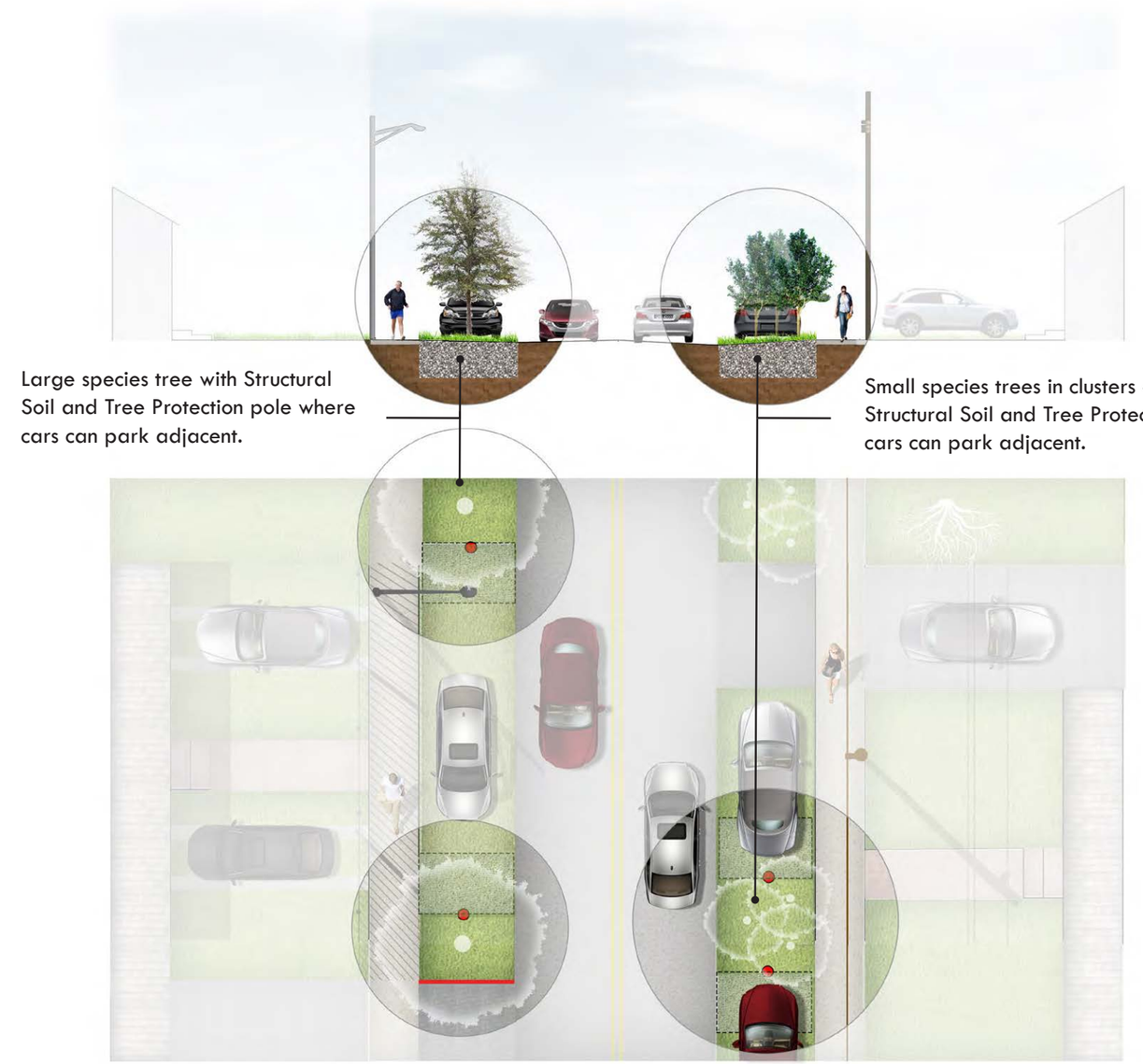
Typology Strategies

<u>Typologies C & H</u> : Requires infrastructure to existing swales to allow trees to thrive with **cars parking** adjacent to them.

Recommendations: The neighborhoods where this typology dominates are Auburndale, La Pastorita and Douglas Park. These streets typically have multi-family housing, often with little to no on-site parking. This means that a high number of cars are parking on the swales most of the time, not just periodically. This heavy use has killed the grass in most locations, and left only highly compacted dirt. In some locations home owners have paved their swale, probably because they were tired of the dirt. Ideally these streets should have something other than grass where the cars park, since it cannot survive with this heavy use and compaction. Other municipalities have offered homeowners alternatives to grass if they are willing to install it and maintain it. However the alternative needs to be pervious or the street will have drainage issues. There are several streets in Parkdale South where porous pavement has been installed in the swales. Coral Gables allows decomposed granite or crushed shells on portions of their swales as long as the homeowners plant ground covers on the rest of the swale.

To the right is the minimum recommended infrastructure that should be installed on streets with these typologies. When a new tree is planted on these streets, Structural Soil should be installed adjacent to the tree pit on any side where a car might park or drive over. This 6' x 8' x 3' section can have sod installed on top. We also recommend a tree protection pole in these locations - see Planting Practices section for more details on this recommendation.

The following page has an additional recommendation for streets with this typology.



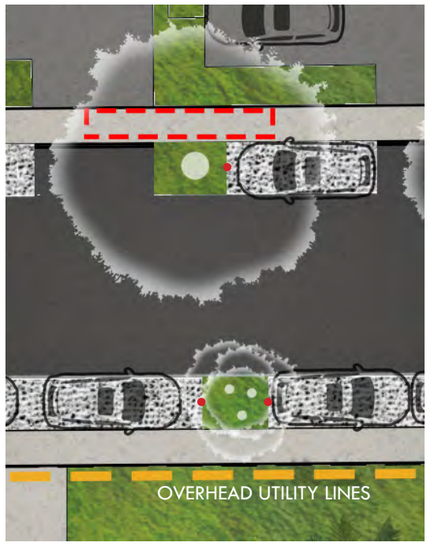
Typology Strategies

Typologies C & H : Additional Recommendations.

The swales in these typologies are being used almost constantly for parking, which leaves very little room for trees to thrive. We believe that both can coexist if given the proper planning and infrastructure. The previous page outlines the minimum infrastructure for this typology, however, this option does not solve the problem of the dirt swales and lack of drainage capacity these compacted swales create. The solution to the right shows a typical street in Typology C, with tree spaces flanked with Structural soil for growing space, and pervious pavement for the portions of the swale that can support cars parking. The pervious pavement will be cleaner for the homeowners, and will allow better drainage for the street. As on other streets with overhead utilities, we recommend small species trees in clusters on that side of the street. These small species trees can be planted 3'-4' apart in a triangular formation in smaller planting areas. The tight cluster allows the trees to protect each other and improves their chances of survival in the urban environment.
Since the growing space for the large trees is restricted some by the cars parking, we recommend in these situations to also install Structural Soil under the adjacent sidewalks to maximize tree growth on the side of the street where large species trees are planted.

See pilot projects section for porous paving recommendations.

Large species tree with Structural Soil and porous pavement with a Tree Protection pole where cars can park adjacent on the side of the street with no overhead utilities.



Large species tree with Structural Soil and porous pavement with a Tree Protection pole where cars can park adjacent.

Small species trees in clusters of three with Structural Soil and porous pavement with Tree Protection poles where cars can park adjacent.

Typology Strategies

<u>Typology C</u> : Requires infrastructure to existing swales to allow trees to thrive with **cars parking** adjacent to them.

TYPOLOGY C

<u>GENERAL CHARACTERISTICS:</u>

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

*Feasible canopy calculations based on 50' ROW **with no additional infrastructure and medium sized trees.**

NO OVERHEAD UTILITY LINES

*Feasible Canopy

37%

OVERHEAD UTILITY LINES ON ONE SIDE OF R.O.W

*Feasible Canopy

31%

On a C street with a typical 50' R.O.W, swale sizes ranges from 5-10' wide allowing for medium sized trees to be planted without the need for additional infrastructure. An asymmetrical planting scheme is to be used on streets with overhead utilities to optimize canopy coverage on those streets. Going one further step to maximize the amount of canopy within the R.O.W, extra large trees can be planted with the addition of supportive infrastructure that will allow for more extensive root systems; the following image and canopy coverage calculation depicts such a case.

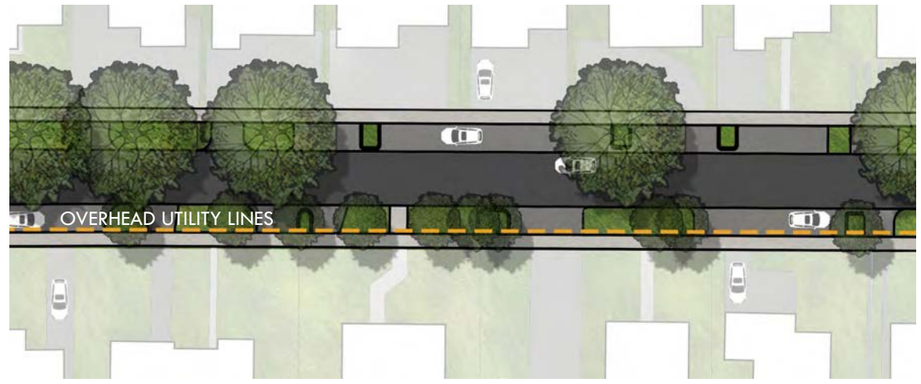
Maximum feasible canopy calculations based on 50' ROW **with additional infrastructure and extra large sized trees.

NO OVERHEAD UTILITY LINES

**Maximum Feasible Canopy

59%

OVERHEAD UTILITY LINES ON ONE SIDE OF R.O.W



**Maximum Feasible Canopy

42%

Typology Strategies

<u>Typology H</u> : Requires infrastructure to existing swales to allow trees to thrive with **cars parking** adjacent to them.

TYPOLOGY H

<u>GENERAL CHARACTERISTICS:</u>

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

*Feasible canopy calculations based on 70' ROW **with no additional infrastructure and medium sized trees.**

*Feasible Canopy

46%

On a H street with a typical 70' R.O.W swale sizes ranges from 5-10' wide allowing for medium sized trees to be planted with the occasional need for additional infrastructure in smaller swales as this street typology includes vegetated medians that range from 10-15' wide. To maximize the amount of canopy within the R.O.W, extra large trees can be planted with an increased use of the addition of supportive infrastructure that will allow for more extensive root systems in swales and medians; the following image and canopy coverage calculation depicts such a case.

Maximum feasible canopy calculations based on 70' ROW **with additional infrastructure and extra large sized trees.

**Maximum Feasible Canopy

63%

Typology Strategies

Typologies C & H : Code Violations

OBSERVATIONS:
Over the course of our inventory and analysis, our team noticed multiple instances of the swale areas being paved, we assumed by the homeowners. This was always in areas classified as Typology C or H, and typically in areas of higher density housing. This happens most frequently in Douglas Park, and Parkdale North & South. Photo 1 shows a multi-family home in Parkdale North where the entire frontage and swale of the property has been covered in concrete. This condition contributes more water to the street's grey infrastructure than planned for, as it is pitched to drain to the street.
Photo 2 shows a two house frontage all paved with either concrete or asphalt.
Photo 3 shows another house with the frontage completely paved. This house in Parkdale South has a pervious pavement swale for some of it's frontage. This application is fairly common in a two - three block radius in this neighborhood. When we asked Public Works and OCI, neither had any knowledge of any projects to install this product in the City, but there is too much of it spread out over this neighborhood for it not to have been a City project. We recommend the City further investigate this and see how it has been working - we have driven these areas in the rain, and they are consistently drier than the surrounding pavement.
Photo 4 shows another house with a completely paved frontage and swale, this one is more level and the result is a lot of standing water on the property with no where to drain to.

RECOMMENDATIONS: We recommend that the City approach these properties with alternative solutions to their parking demands, using the proposed solutions for the Typologies, some parking in the swale could be provided, but so could some trees. We recommend that the City require owners who have completely paved their frontages to at a minimum, change to a pervious material to better meet the Code Requirements.

1

2

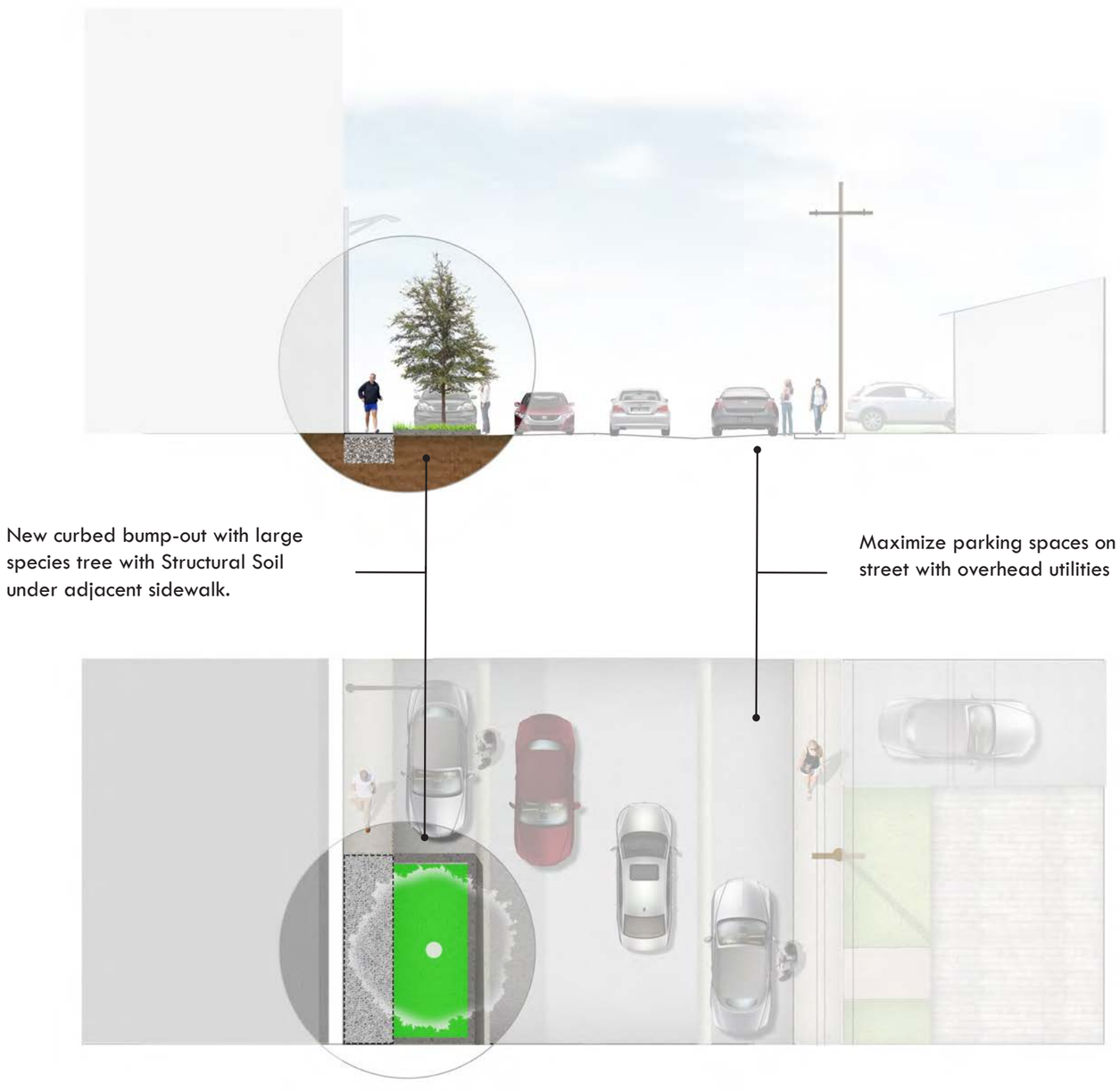
3

4

Typology Strategies

<u>Typology D</u> : This typology has little to no existing space to plant in and therefore will **require infrastructure in the creation of planting spaces**, eliminating some parking spaces for bump-outs.

This typology, which is most prevalent in East Little Havana has paved parking spaces on both sides of the road. There are often green spaces at the intersections, some with trees in them - some of which currently do not adhere to the City's visibility requirements. There are intermittent green bump-outs, some with trees, some without. The only way to plant on these streets is to add bump-outs. As many of these streets have multi-family housing and need additional parking, efforts should be made to keep as much parking as possible while maximizing the canopy. To meet this goal, the recommendation for these streets, as for others is to plant large shade trees on the side of the street where there are no overhead utility lines. On streets with this typology, we recommend only adding bump-outs when there are no overhead utilities and therefore allowing the side of the street with overhead utilities to be maximized for parking. To maximize the size of the trees, we recommend using structural soil and pervious pavement in the sidewalk space adjacent to the bump-out. The size of the bump-outs can be reduced where necessary to maximize parking with the use of structural soil and pervious pavement in the adjacent parking space as well.



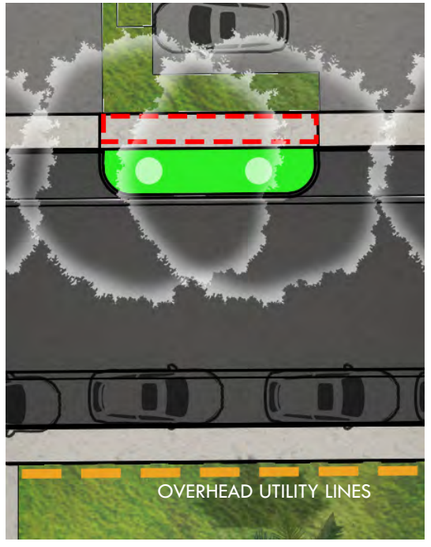
Typology Strategies

Typology D : This typology has little to no existing space to plant in and therefore will **require infrastructure in the creation of planting spaces**, eliminating some parking spaces for bump-outs.

Sample Street

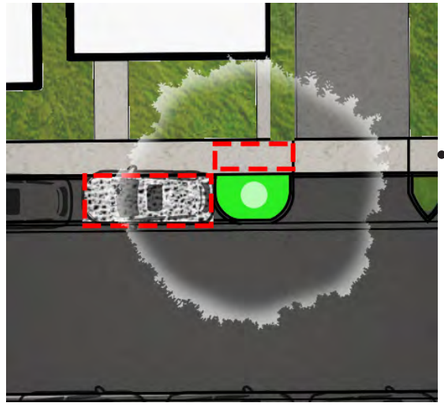
The diagrams to the right show a sample of the strategy proposed for a block. The goal is to maximize the planting on the side without the overhead utilities and maximize the parking on the side with overhead utilities. On the side under the overhead utilities, where parking is not possible because of space limitations and driveways, small species trees can be planted.

New bump-outs with large species tree with Structural Soil under the sidewalks on the side of the street with no overhead utilities.



New bump-outs with large species trees on side of street with no overhead utilities with Structural Soil under the adjacent sidewalk.

Leave parking spaces on side of the street where there are overhead utilities.



Small new bump-out to maximize parking with porous concrete over Structural Soil in the adjacent parking space., and Structural Soil under adjacent sidewalk.

Typology Strategies

Typology D : This typology has little to no existing space to plant in and therefore will **require infrastructure in the creation of planting spaces,** eliminating some parking spaces for bump-outs.

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

*Feasible canopy calculations based on 50' ROW **with medium sized trees.**

*Feasible Canopy

35%

On a D street with a typical 50' R.O.W swale do not exist. To add plantings to these streets an asymmetrical planting scheme moves much of the existing parking to the side of the street with overhead utilities and allows for the creation of extended bumpouts with additional infrastructure to support trees. The bumpout sizes range from 5-10' wide allowing for medium sized trees to be planted with the occasional need for additional infrastructure in smaller sections as the streets will still require on-street parking. To maximize the amount of canopy within the R.O.W, extra large trees can be planted with an increased use of the addition of supportive infrastructure that will allow for more extensive root systems underneath parking and sidewalks; the following image and canopy coverage calculation depicts such a case.

Maximum feasible canopy calculations based on 50' ROW **with additional infrastructure and extra large sized trees.

**Maximum Feasible Canopy

59%

MAINTENANCE

Cultivating a Resilient Urban Forest

Importance of Proper Maintenance

In the creation of a sustainable and resilient urban forest, maintenance, from the inception of planting all the way through the completed life cycle of a tree with eventual removal, is key. For all the benefits that trees provide whether ecological, social, economic or other, their maintenance is the factor that allows for the most capitalization on all fronts. A resilient urban forest is one that is safe, well established, growing and constantly changing to best fit the conditions of its location. When this structure is met, urban trees can then serve in all the functions of a properly running urban forest, providing the most benefits to the residents, municipality, and environment.

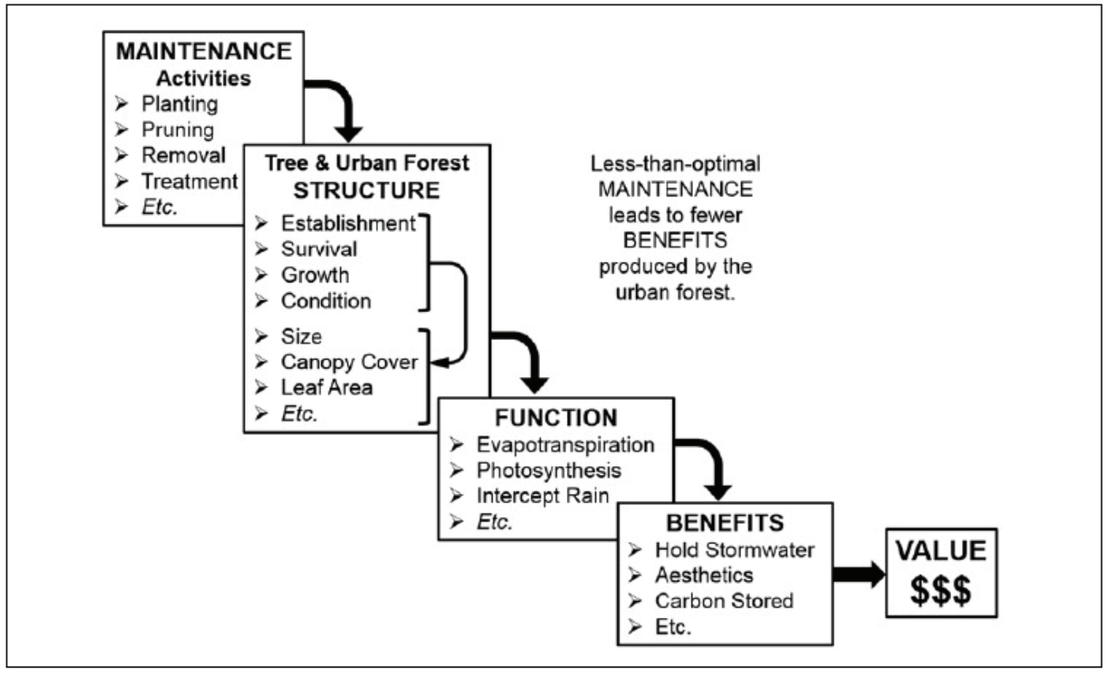


Figure 1: Arboriculture & Urban Forestry 2015. 41(6) 293-323

For the best outcome in fostering a resilient urban forest, a focus is placed on the stratification of tree sizes and age. In the management of the urban forest, keeping and maintaining the health of existing trees is just as important as the successful planting and upkeep of new specimens. In both of these cases, regular and systematic maintenance is required. For new plantings, ensuring proper watering and administration of care during the establishment period. For existing trees as they continue to mature, continued maintenance with trimming and pruning, pest and disease control, soil management, infrastructure management and repair, as well as tree protection all make up the maintenance regime.

Proper storm preparation and after care are also a part of the maintenance of our urban forest as a coastal city. Prior trimming and removal of dangerous limbs can help to prevent the uprooting and overturning of trees as well as the creation of hazardous debris that can be kicked up during the storm.

Overturned trees in the Roads neighborhood post Hurricane Irma in 2017

Best Practices

Planting

Proper planting is the first step for urban forest maintenance. Being sure to plant the right trees, in the right places can help to reduce future maintenance costs. For planting methodology, please refer to the *Planting Practices* section of this volume for in depth information on species selection, planting location, and technical details.

To reach the goal of 40% canopy coverage, one step towards reaching that goal is the planting of new trees within the right-of-way. The maintenance following the planting process is crucial to the establishment, survival, and growth of the tree going forward, contributing heavily to the overall tree success. Outlined in Figure 2 is a sample inspection and maintenance schedule to follow for new planting within the first five years.

Table19. Example Inspection and Maintenance Schedule*

Inspection and Maintenance Activity	Year 1	Year 2	Year 3	Year 4	Year 5
Regularly inspect tree health and survival	X	X	X	X	X
Water trees	X	X	X		
Remove tree shelters			X	X	X
Remove stakes and wires		X			
Implement invasive species and noxious weed control methods as needed	X	X	X	X	X
Prune damaged, dead, or diseased branches		X	X	X	X
Implement Integrated Pest Management methods as needed	X	X	X	X	X
Install supplemental plantings if desired		X	X	X	X

*Adapted from Hairston-Strang (2005) and Palone and Todd (1998)

Figure 2: USDA Urban Watershed Forestry Manual Part 3: Urban Tree Planting Guide

Appropriate follow up for new plantings acts as a preventative measure towards future issues that can befall a young tree. When following proper guidelines for tree species selection, placement, and planting methodology, the proper upkeep in those first few years is imperative for survival as well.

New tree planting in the Douglas Park neighborhood planted in 2019.

Pruning

Pruning is done for a variety of reasons related to the maintenance of trees. Pruning can be required to shape and form a tree for healthier more stable growth patterns, remove or alleviate structural issues, or manage pests and diseases. For whatever the reason, proper pruning techniques should be employed to ensure the safety of those doing the work as well as for the best results within the urban forest.

The City provides pruning and trimming for street trees and trees on City property upon request through the Public Works department using 311 calls and online submissions. However, regularly scheduled pruning on a rolling biannual basis provides the best results for urban forest management.

Tree and Palm Pruning Specifications

Trees

All tree and palm pruning shall be the responsibility of a qualified arborist or tree crew. All hardwood trees which are less than 15 feet in overall height shall be pruned as needed to remove dead branches, or to raise or reduce crowns to prevent them from encroaching into pedestrian/vehicular areas, over windows, sidewalks, signs, etc.

Palms

All palms which are less than 15 feet in overall height shall be pruned as needed to remove brown fronds, loose thatch, and inflorescences. Each individual frond shall be cut as close to the trunk as possible, without damaging the trunk or decorative “boots”. Thatch accumulations on trunks shall be regularly removed as it naturally loosens. Weeds growing in thatch or on trunks shall be removed during each pruning operation.

**All tree pruning shall be done to current City of Miami, Miami-Dade County and ANSI A300 standards by a qualified arborist and tree crew.*

Best Practices

Soil Management

Some of the most common causes of the mortality of urban trees has to do with issues concerning the soil in which the trees are living. Problems can range from limited soil volumes to poor soil quality, soil compaction, moisture issues, and specifically in our coastal environment soil salinity, as salt water intrusion becomes a more pressing matter.

The planting of trees within appropriately sized swales for the mature size of the tree helps to mitigate the issues of soil volume with the addition of structural soils or suspended pavement systems in strategic places where swales do not provide adequate soil volumes. The use of these additional infrastructure methods can also help to mitigate some of the effects of parking within swales along streets that do not provided on-street parking, such as those in Typology C, where swales tend to have compacted soils at much higher rates.

Current City specifications for soils and fertilizers are adequate for new trees however making sure planting crews are following those specifications is crucial. Prior to planting new trees, testing of planting location soil for nutrient quality, drainage function, salinity and compaction are the key first step to guarantee the long term success of planting within that space. Upon receipt of those results, it is imperative that soil amendments be made within the planting site to ensure the soil environment is adequate for what the new planting will require.

BOX 1. COMMON CAUSES OF URBAN TREE MORTALITY

- Limited soil volume
- Poor soil quality
- Air pollution
- Construction activities
- Physical damage from mowers, vehicles, or vandals
- Damage from insects or animals
- Soil compaction from heavy foot traffic
- Soil moisture extremes
- Exposure to wind and high temperatures
- Competition from invasive plant species
- Improper planting and maintenance techniques
- Poor nursery production practices
- Conflicts with infrastructure
- Disease
- Exposure to pollutants in storm water runoff

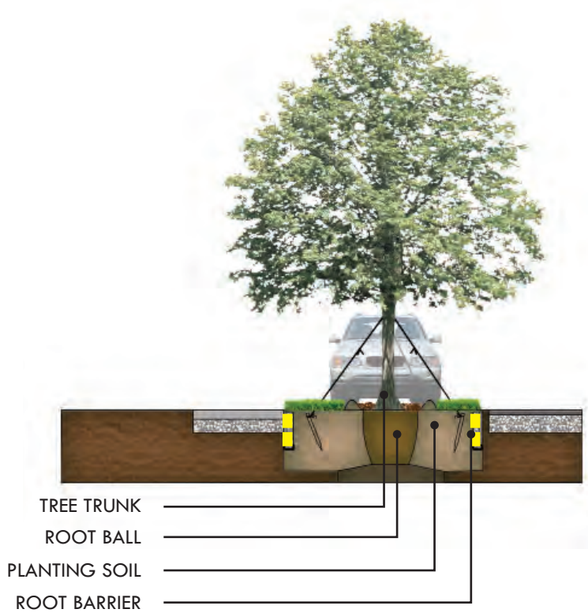
Figure 3: Source: USDA Urban Watershed Forestry Manual Part 3: Urban Tree Planting Guide

Infrastructure Repair

Past planting practices have left the door open for infrastructure damage as large tree species reach maturity in extremely small planting spaces, and species with significant surficial root systems having been planted near roads and sidewalks creating unsightly, dangerous and sometimes expensive problems for the City and its residents.

This thin planting strip was not the appropriate place for this large species tree which is now heaving the sidewalk

As tree roots search for water and air two elements critical to their growth and health, they can find it difficult to grow downward into compacted or nutrient depleted soils; this leads them to grow upward towards the surface. When this occurs in close proximity to roads and sidewalks we end up with situations similar to that depicted to the left. In cases where the tree is unsafe and hazardous because the structural integrity has been compromised, the repair of the infrastructure, relocation or removal may be required. However, an additional option to restore proper ADA compliance in some of the heavily trafficked sidewalks where heaving is an issue, is the application of porous aggregates, such as Flexipave. These can be used to restore sidewalk function while maintaining the necessary access to air and water the tree roots require.



Working proactively for the prevention of future sidewalk and asphalt heaving where new plantings are placed, the use of root barriers is suggested at the edge of the planting space against roadways and sidewalks. Please refer to the *Dimensions and Supplements* found in the *Planting Practices* section of this volume for more details.

Best Practices

Pest/ Disease Management

Pest and disease management is a maintenance measure that can help to ensure the health and resiliency of trees within the urban forest. With the spread of possible pests and diseases within the population of a specific species or genus, significant damage can be done to the canopy coverage throughout the city. Widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species. Promoting and ensuring biodiversity is pertinent to the resiliency of the urban forest in the face of a pest or disease outbreak but, proper inspection, identification, and management can work to prevent devastating tree loss. Inspections of trees should be done regularly by a pest control technician to identify pests or disease.

Pest Disease Management Specifications

Trees

Common pests of shrubs, such as insects and mites, shall be properly identified and treated with the most appropriate pesticide following all label directions and all local ordinances. In the event pest issues are evident, a licensed professional shall be consulted to obtain the least toxic approach that is absolutely necessary for the plant's survival. Follow-up treatments shall be provided as needed to completely control the infestations.

Fungicide treatments shall be provided on an as-needed basis. Product selection, application rates, and frequencies must be determined after diagnosis.

**All tree pest and disease management shall be diagnosed and treated by a qualified arborist or pest control technician.*

Storms and Wind Resistance

In the process of creating a wind resistant urban forest the removal of hazardous trees is necessary. A fine balancing act must be achieved between removing all hazardous material at once and removing hazardous trees and wind-prone species when opportunities present themselves or directly prior to a storm. Removing all hazardous and wind-prone material at once, though financially practical as it improves the efficiency of tree crews and reduces the cost the action, can also cause significant reductions in canopy within some of the neighborhoods currently struggling for coverage. A more effective way to reduce risk while managing the existing canopy would be to prune and trim trees on a regular schedule, proactively work to remove hazardous materials over time and replace removed materials with more wind resistant species.

Preventative pruning protocols for trees are meant to create the most structurally sound trees to reduce the risks of stem or branch breaking, and promote improved health. These protocols should be practiced for the first 15-25 years of a trees life span to foster a strong wind resistant structure. The following are the components of structural pruning.

Components of Structural Pruning	
1	Develop or maintain a dominant leader
2	Identify the lowest branches in the permanent canopy
3	Prevent branches below the permanent canopy from growing too large
4	Keep all branches less than one half the trunk diameter
5	Space main branches along one dominant trunk
6	Suppress growth on branches with included bark

Figure 4: Components of Structural Pruning
Source: UF EDIAS Urban Forest Hurricane Recovery Program Chapter 12

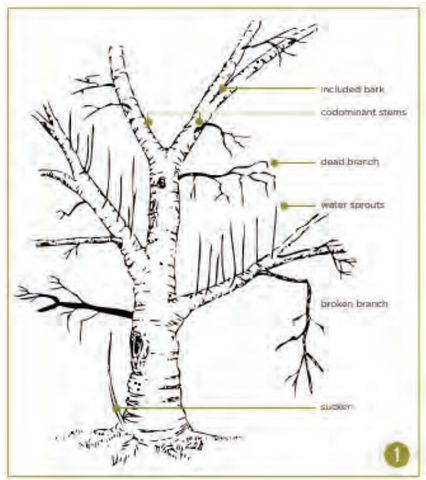
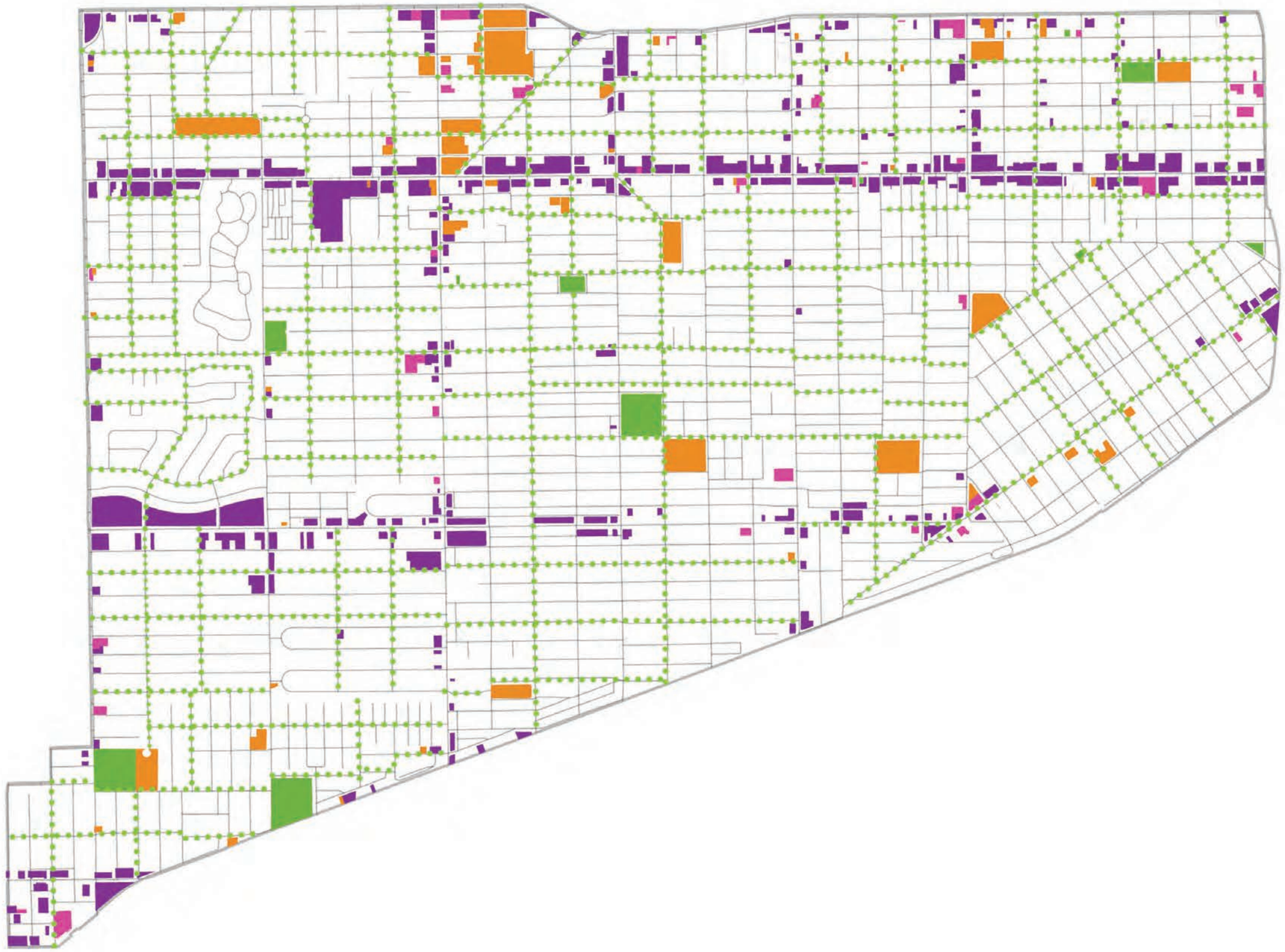


Figure 5: Problems that can develop on trees
Source: UF EDIAS Urban Forest Hurricane Recovery Program Chapter 12

The creation of a storm plan is an effective way to have a series of objectives and strategies to be followed when a storm happens. Planning for the removal of hazardous trees and branches prior to a storm as well as the clean up of downed trees that may be blocking roadways or causing significant damage are clear objectives to be planned for.



Typology Strategy

Project Area Typology Mapping

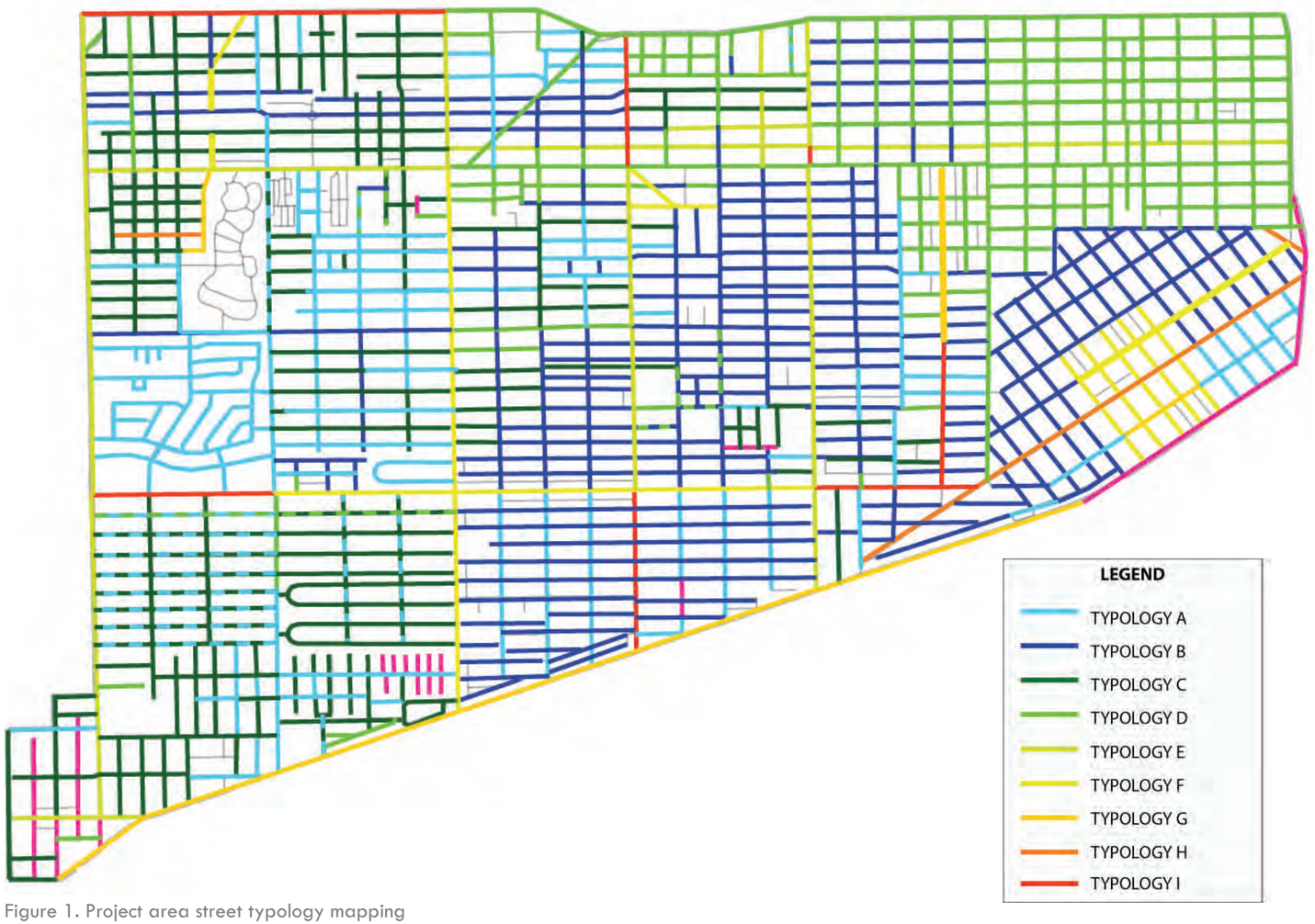


Figure 1. Project area street typology mapping

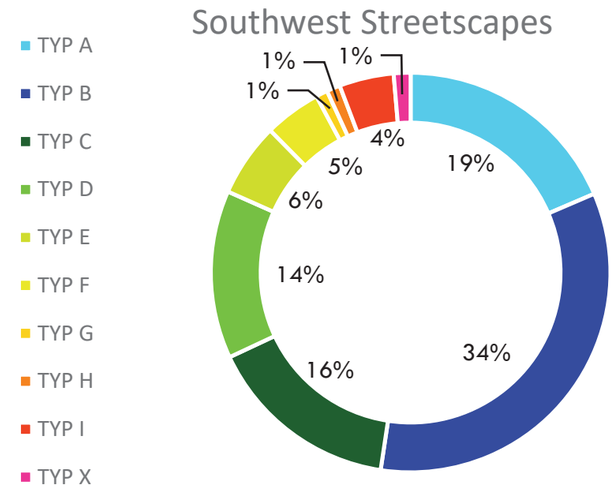


Figure 2. Project area street typology distribution

Just over 60% of the project areas streets are types with existing vegetated swales. Streets with typologies A, B, F, G and I, which account for 63% of the project area, require no additional infrastructure to be suitable for planting as long as proper guidelines are followed placing the correct trees in the correct sized swale. In neighborhoods with other street typologies such as Type C found more widespread throughout Auburndale, La Pastorita, Parkdale North and South as well as Douglas Park or Type D in East Little Havana, that are either lacking swales or the existing swales have been heavily compacted or paved over. In these areas, more infrastructural changes will be required to incorporate trees. These neighborhoods also fall within the priority zones for needing more canopy.

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Project Area Urban Forestry Figures

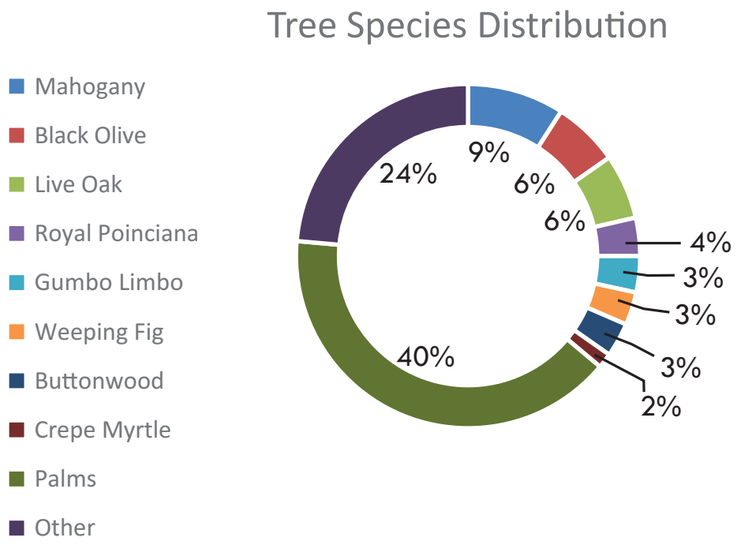


Figure 3. Project Area Tree Species Percentage Distribution

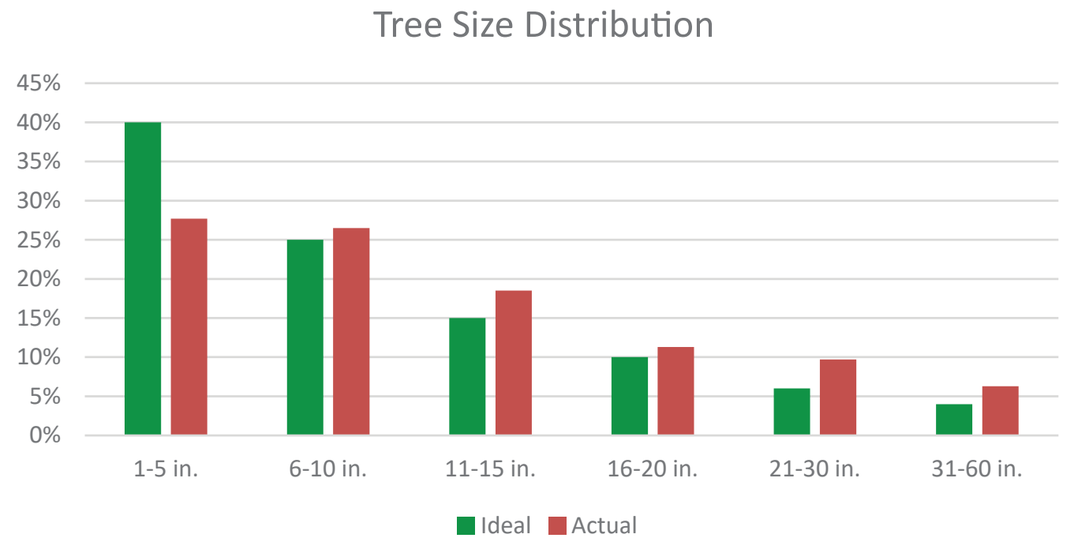


Figure 4. Project Area Tree Size Distribution

Through an urban forestry lens, the diversity of trees is imperative for a healthy and resilient canopy. Diversity can be approached from two sides, the first being tree species and the second tree size. Having more biodiversity within the population of canopy coverage creates greater resiliency to pests and diseases making it more manageable if a problem were to arise. The variety of tree sizes not only correlates to the spacing and structure of the urban forest but is more related to the age and maturity of the canopy which effects the flow of benefits from the trees as well as effecting proper allocation of funds for requisition and maintenance.

Figure 5. Mahogany

Figure 6. Black Olive

Figure 7. Live Oak

Mahoganies, Black Olives and Live Oaks are prominent species within the project area. Having reached their maximum numbers in some neighborhoods, no more should be planted within those areas, unless it is to replace one that has died.

Project Area Proposal

Project Area Street Tree Masterplan

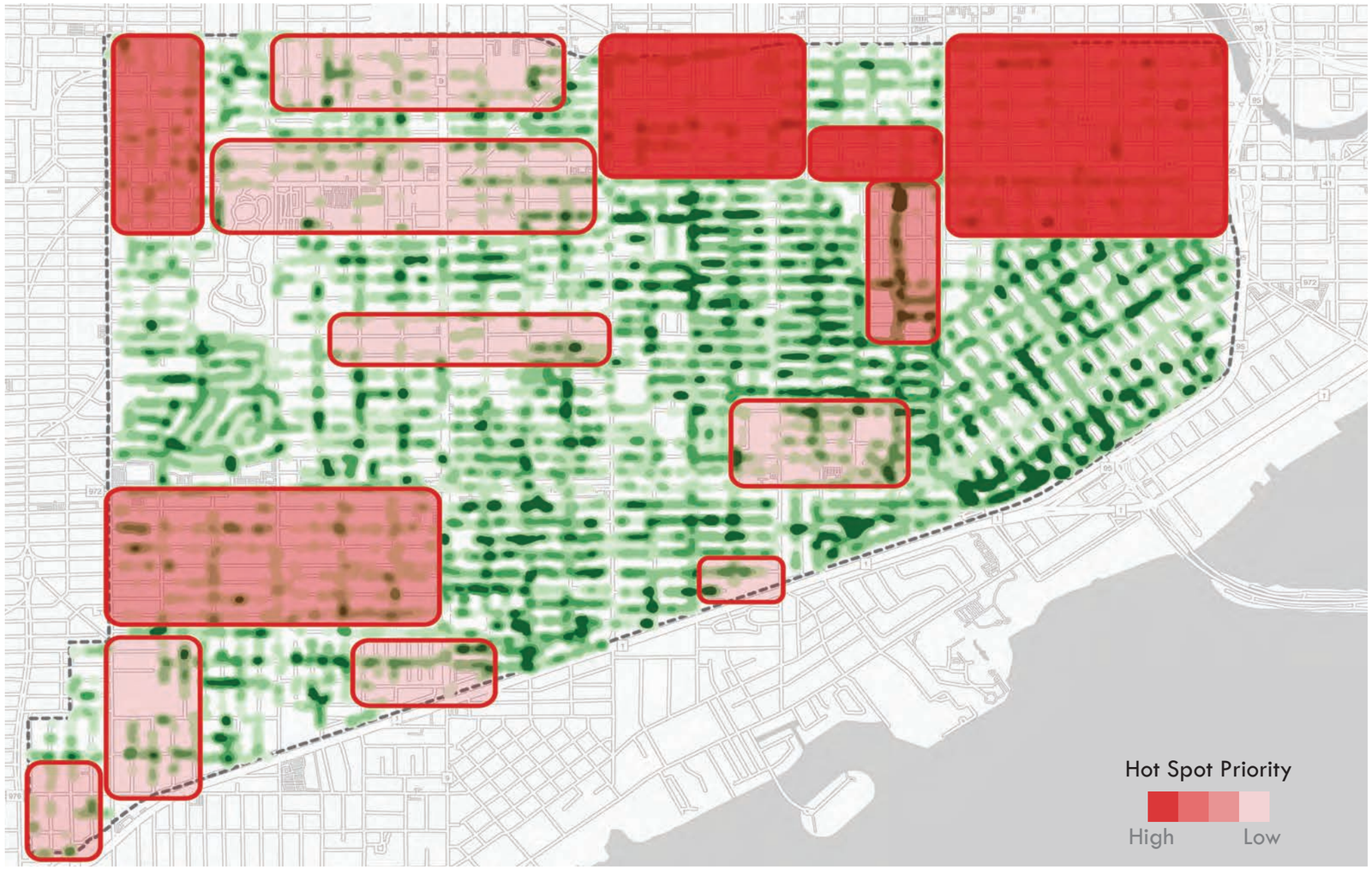
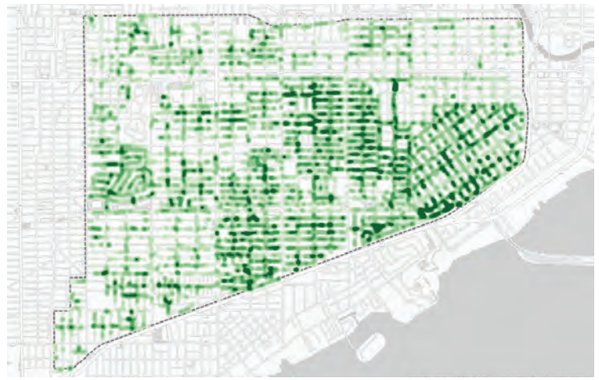
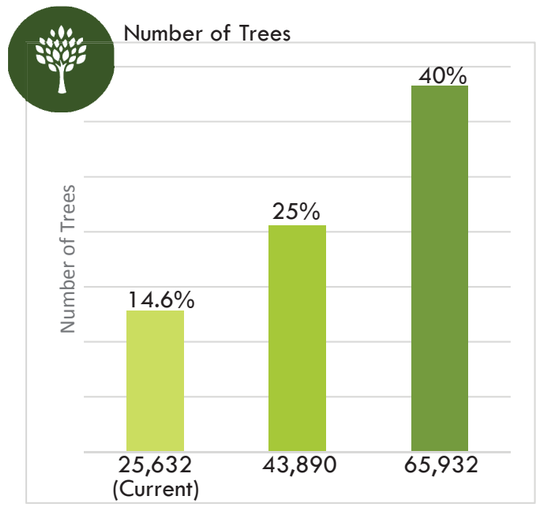


Figure 8. Project area Hot Spot Priority Mapping



Current Canopy Coverage (14.6%)



These hot spots highlight the priority zones for planting initiatives based on higher instances of vulnerable populations within the project area. The priority hierarchy helps to develop the strategies for increasing canopy coverage across the entire project area to a modest goal of 25% to start, and ultimately 40% in each neighborhood. Planting initiatives should start in the areas shown graphically as High priority, as these are the areas most vulnerable to the impacts of low canopy coverage, and are therefore the areas where the most significant changes can be made.

Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

40%

Connectivity and Walkability Strategy

Project Area Connective Fabric Plan

Figure 9. Project Area Connective Fabric Plan

Green Corridors - Walkability - Connectivity

Green corridors are streets where priority planting should occur to provide walkable passageways throughout the neighborhood to connect to vital services. The heat island effect in streets with little to no tree canopy can raise the ambient temperature by 20 degrees and makes people more susceptible to heat stroke on our hot summer days. Priority green corridors are sections that should be planted first. Each neighborhood was looked at for locations where pedestrians may desire to walk to such as schools, stores, and parks. Streets were then chosen to allow for routes through the neighborhoods, with the intent that no one should have to walk farther than three blocks, or about 5-10 minutes to reach a green corridor. On streets where overhead utility lines are present, the Asymmetrical Planting strategy (Detailed in the Planting Practices Section of this plan) should be undertaken to maximize the shade on the side of the street with no power lines. On streets that run East-West, priority planting of the largest trees possible should be given to the north sides of the streets (if there are no overhead utility lines there) as the southern angle of our sun will give the most shade on the sidewalk on this side of the street.

AUBURNDALE

Typology Approach

Auburndale Street Typology Mapping

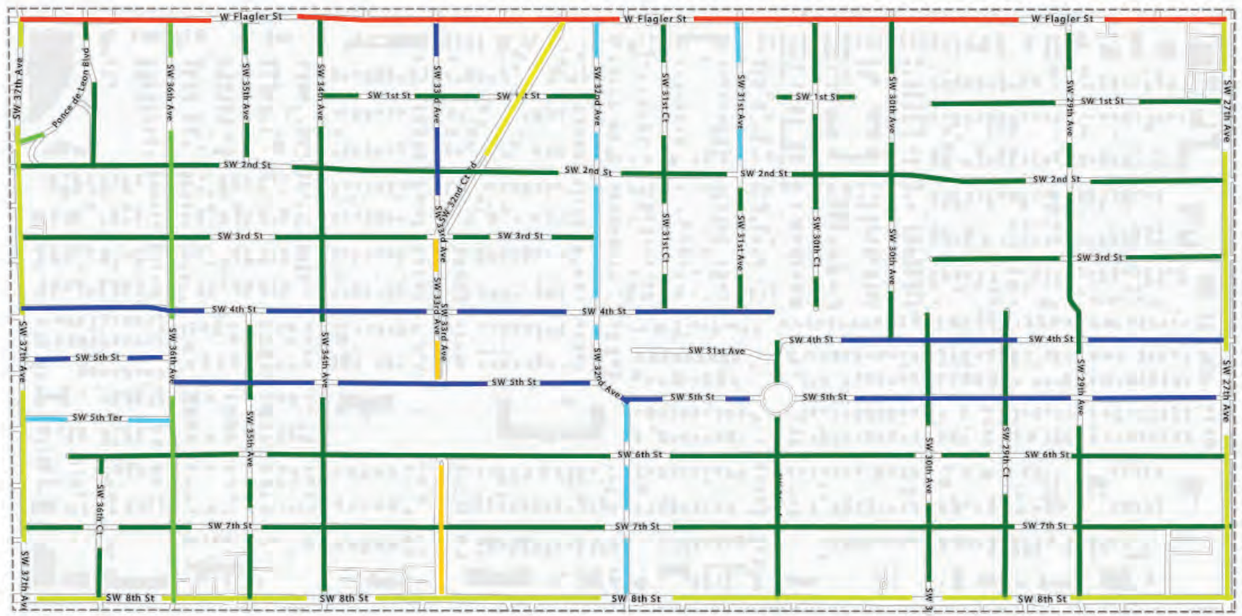
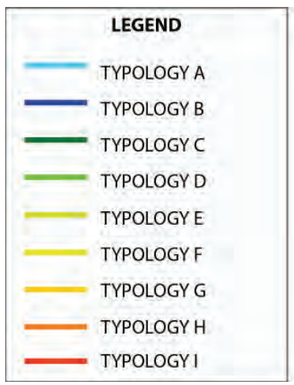


Figure 9. Auburndale Street Typology Distribution

- A majority of the streets within the neighborhood fall within typology C having been paved over or turned to dirt swales largely due to residents parking within the swale.
- The bordering Streets and Avenues serve as larger arterial corridors within the city, often having a larger number of lanes and lacking swales which makes the opportunities for adding planting more difficult.
- Maximizing the planting potential per major typologies will include plantings on A and B streets, and adding infrastructure where needed on C streets



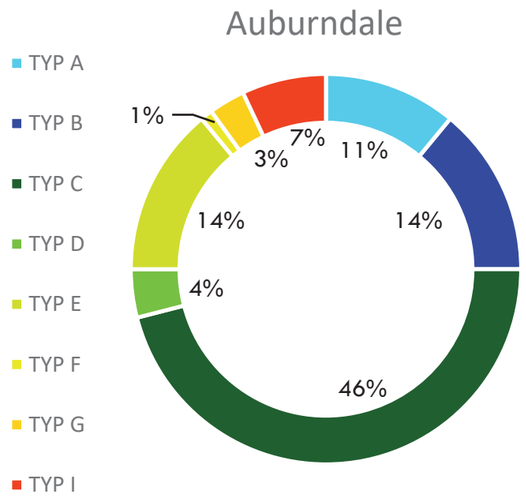


Figure 10. Auburndale Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Auburndale Urban Forestry Figures

Figure 10. Auburndale Tree Species Inventory

- With nearly half of the trees within the neighborhood, 45% currently, consisting of palms a large chunk of the neighborhoods tree species are coming from the same plant family. The planting of palms must be reserved for only very specific occasions when necessary and instead, more appropriately sized trees should be planted.
- The addition of new mahoganies should be limited as to not exceed the 10% per species as it currently at 9% of the canopy.
- The tree size distribution shows greater percentage of mature trees than the ideal number which can be harmful to canopy coverage; as these trees are more mature they are likely closer to the end of their life cycle.
- The greater number of mature trees coinciding with the less than ideal number of newer, less mature trees, can pose the future issue of keeping up with the replacement of canopy as it naturally dies off.
- To increase the canopy more sustainably, an effort to plant more newer trees will be required.

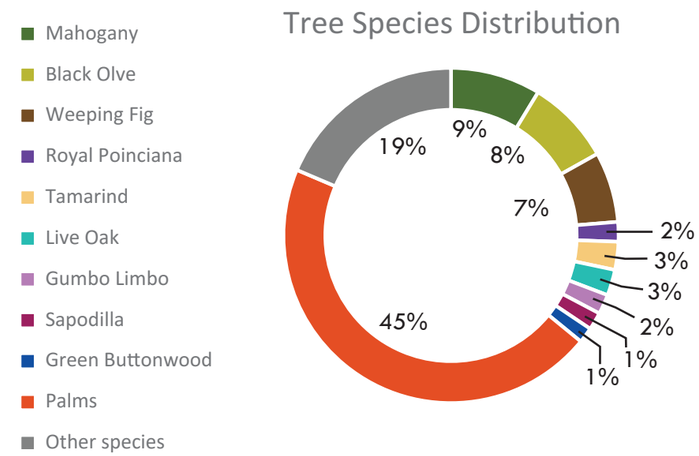


Figure 11. Auburndale Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

Figure 12. Auburndale Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

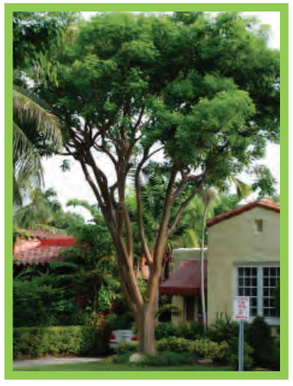
Auburndale

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Auburndale	*Mahogany	Gumbo Limbo	Green Buttonwood	Simpson's Stopper
	Tamarind	Mastic	Fiddlewood	Red Stopper
	Oak		Blolly	
* Indicates that this species has almost reached its maximum capacity and planting should be limited				

Tamarind

*Mahogany

Oak



Gumbo Limbo

Mastic

Green Buttonwood

Fiddlewood

Blolly

Simpson's Stopper

Red Stopper

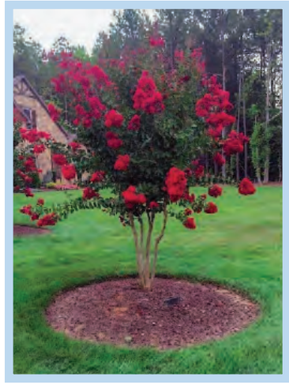
Non-Flowering

Species Diversity Proposal

Auburndale

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Auburndale	Royal Poinciana	Red Crape Myrtle	Date Palms	Thatch Palms

Royal Poinciana



Red Crepe Myrtle

Date Palms

Thatch Palms

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Median on SW 32nd Court Road in Auburndale
An example of a location where signature species could be used

Priority Streets and Canopy Coverage

Auburndale

Figure 13. Auburndale Priority Street Mapping

Priority Streets Hot Spots

C SW 2nd Street

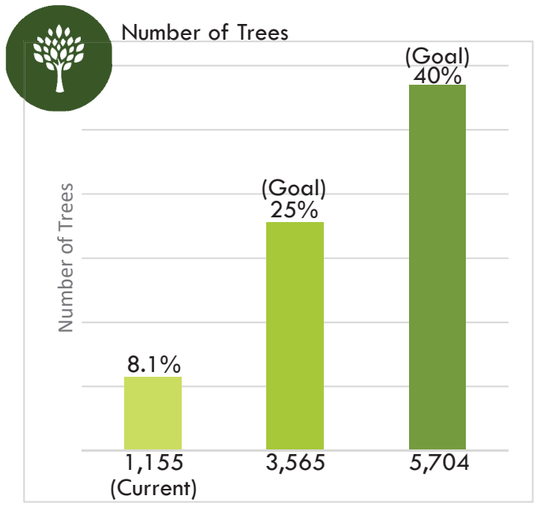
B SW 4th Street

C SW 6th Street

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- All the swales within the neighborhood fall within the 5-10' range making them medium sized warranting new plantings from the *Medium Swale Tree Species Palette*, unless infrastructure is added to allow a larger species.
- The western portion of the neighborhood, west of 34th Avenue has greater vulnerability within its population and sporadic canopy giving it higher priority for planting.
- Another priority street would be in the north-eastern portion of the neighborhood along SW 2nd Street, one of the few through streets of the neighborhood that connects from SW 37th Avenue to SW 27th Avenue.

Current Canopy Coverage (8.1%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

38%

Connectivity and Walkability Strategy

Auburndale

Figure 14. Auburndale Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage.

If Auburndale was planted to the standard capacity on all street typologies as previously mentioned the canopy coverage within the R.O.W could increase to 38%. If this same strategy was used but instead planting was maximized on the green corridors with additional infrastructure as outlined in the Typology Strategy section of this document, the canopy coverage within the R.O.W could be increased to as much as 43% within the neighborhood.

Green Corridor Recommendations

SW 2nd Street - 8' Swales - Typology C: Electric primarily on South side with other overhead utility on north. Recommend planting north side of street with Large/Extra Large sized trees and small on south side.*

SW 5th Street - 5' (east) & 9' (west) Swales - Typology B & C: Electric utility on South side. Recommend Large/Extra Large sized trees on North side, and Small on South side. *

SW 4th Street - 5' Swales, curbed - Typology B: Electric utility on South side. Recommend Large/Extra Large sized trees on North side, and Small on South side.

SW 36th Avenue - 8' Swales - Typology C & D: Electric utility switches from East side to West side. Recommend Large/Extra Large sized trees on side without utilities. *

SW 34th Avenue - 8' Swales - Typology C : Electric utility on West side. Recommend Large/Extra Large sized trees on East side and Small on the West side.*

SW 33rd Avenue - 8' Swales - Typology G & B : Electric utility on West side. Recommend Large/Extra Large sized trees on East side and Small on the West side.

SW 31st Avenue - 10' Swales - Typology C : Electric utility on West side. Recommend Large/Extra Large sized trees on East side and Small on the West side.*

SW 29th Avenue - 10' Swales - Typology C : Electric utility on West side. Recommend Large/Extra Large sized trees on East side and Small on the West side.*

****Care will need to be taken with placement for the areas where the swales are used for parking. See Typology Strategies for Typology C streets.***

LA PASTORITA

Typology Approach

La Pastorita Street Typology Mapping

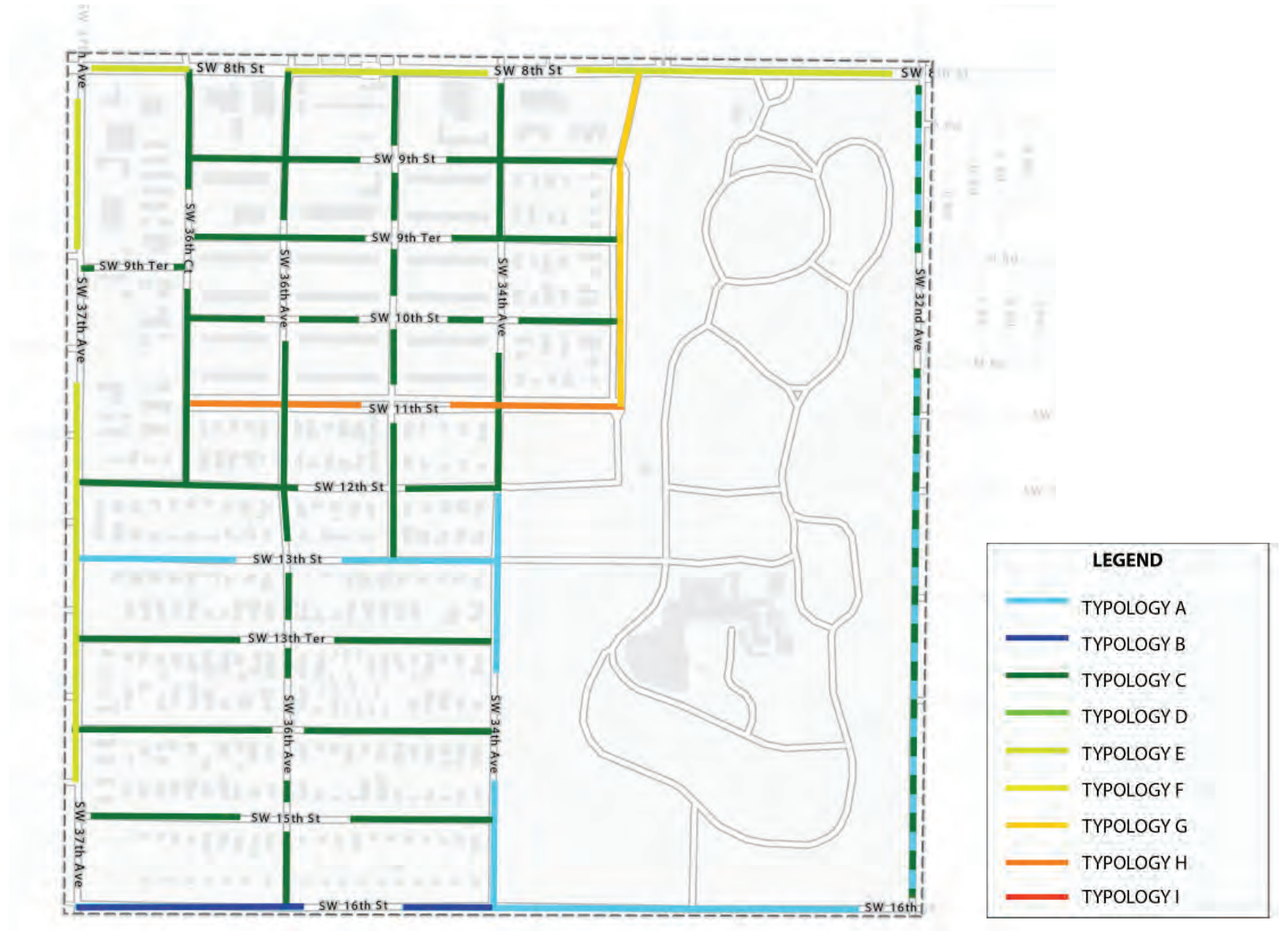


Figure 15. La Pastorita Street Typology Distribution

- The majority (75%) of the residential streets within La Pastorita have swales that are typology A, B or C
- La Pastorita has nearly half of its residential streets with paved or dirt swales due to residential parking needs. This has lead to extremely low canopy coverage throughout the neighborhood and some issues with drainage and water infiltration.
- Priority streets for interventions within the neighborhood fall mostly within the northern half surrounding the multi-family residential apartment complexes.
- Due to heavy soil compaction and residential parking, interventions to correct such compaction, and infrastructure to allow for adjacent parking, would be required in the area to support new plantings.

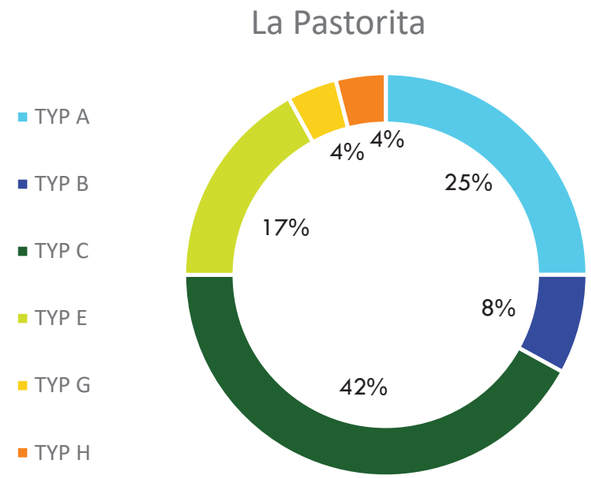


Figure 16. La Pastorita Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Urban Forestry Strategy

La Pastorita Urban Forestry Figures

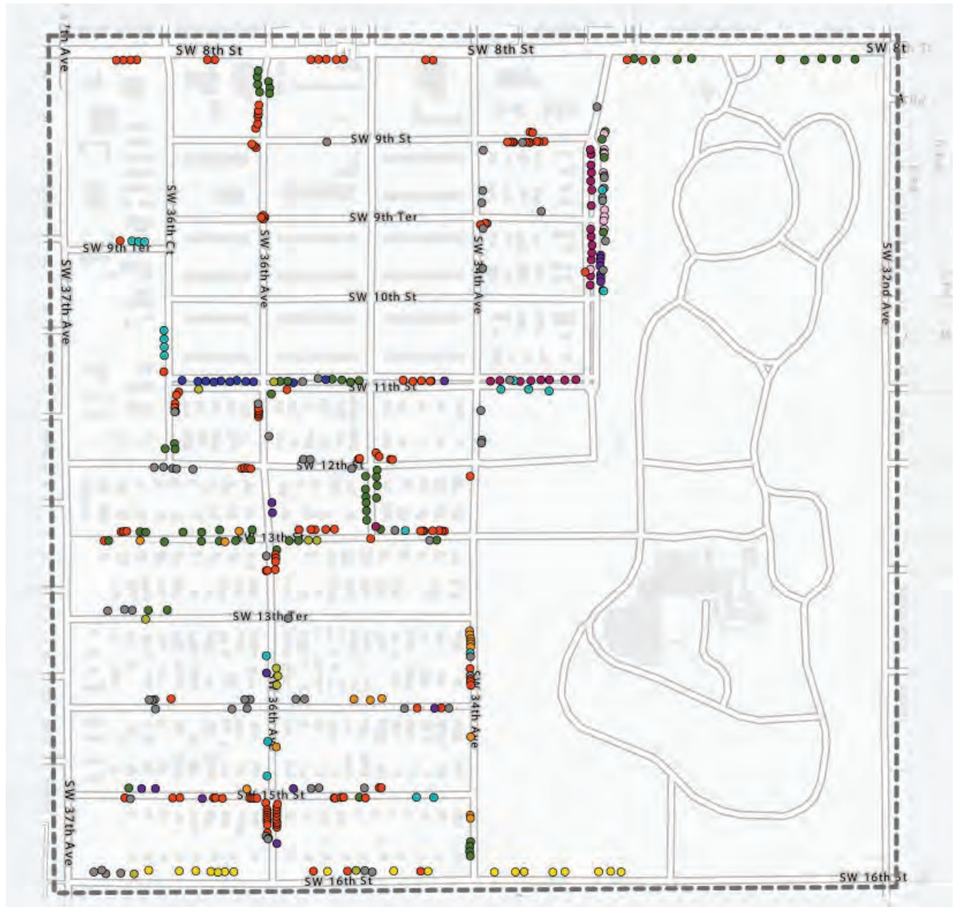


Figure 17. La Pastorita Tree Species Inventory

- La Pastorita has relatively good diversity of species, however Mahogany trees are at 17% which is nearly twice the ideal percentage to have of one species. Palms are at 35%, which is 5% above the ideal percentage for one family.
- When providing additional planting, the 10% ideal percentage for one species should be kept in mind to promote biodiversity.
- In terms of tree size and age La Pastorita has a greater number of older larger trees but is lacking with the newer and younger trees.
- By planting more newer more diverse types of trees in those areas currently lacking canopy, La Pastorita can see great boosts in the resiliency of the neighborhood canopy.

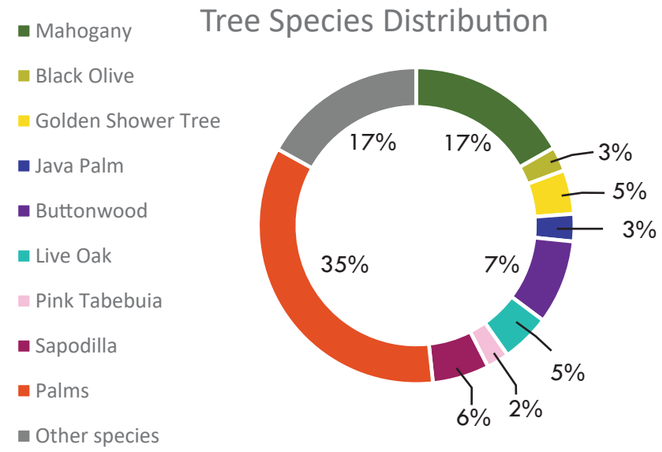


Figure 18. La Pastorita Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

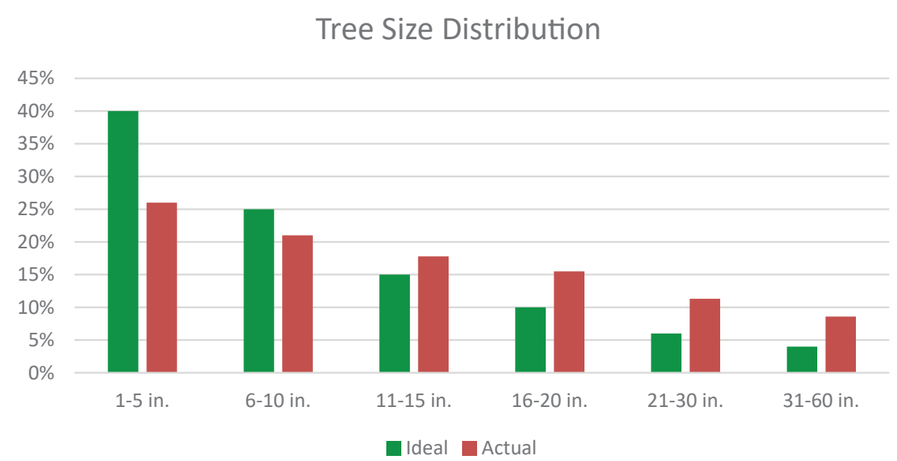


Figure 19. La Pastorita Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

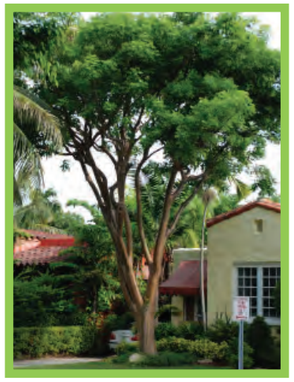
La Pastorita

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
LaPastorita	Oak	Paradise	Blolly	Silver Buttonwood
	Tamarind	Gumbo Limbo	Green Buttonwood	Spanish Stopper
			Fiddlewood	

Tamarind

Oak

Paradise Tree



Gumbo Limbo

Blolly

Green Buttonwood

Fiddlewood

Silver Buttonwood

Spanish Stopper

Non-Flowering

Flowering

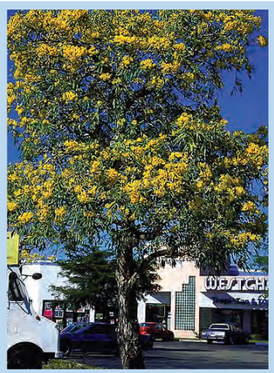
The mahogany is a species that has reached its maximum quantity and therefore no more should be planted unless it is to replace one that has died.

Mahogany

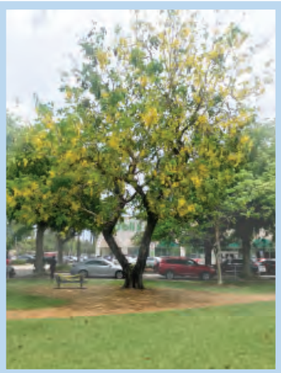
Species Diversity Proposal

La Pastorita

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
LaPastorita	Yellow Tabebuia	White Crape Myrtle	Royal Palms	Solitaires
	Golden Shower			



Yellow Tabebuia



Golden Shower Tree

White Crepe Myrtle

Royal Palm

Solitaire Palm

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Media on SW 33rd Avenue in La Pastorita

An example of a location where signature species could be used

Priority Streets and Canopy Coverage

La Pastorita

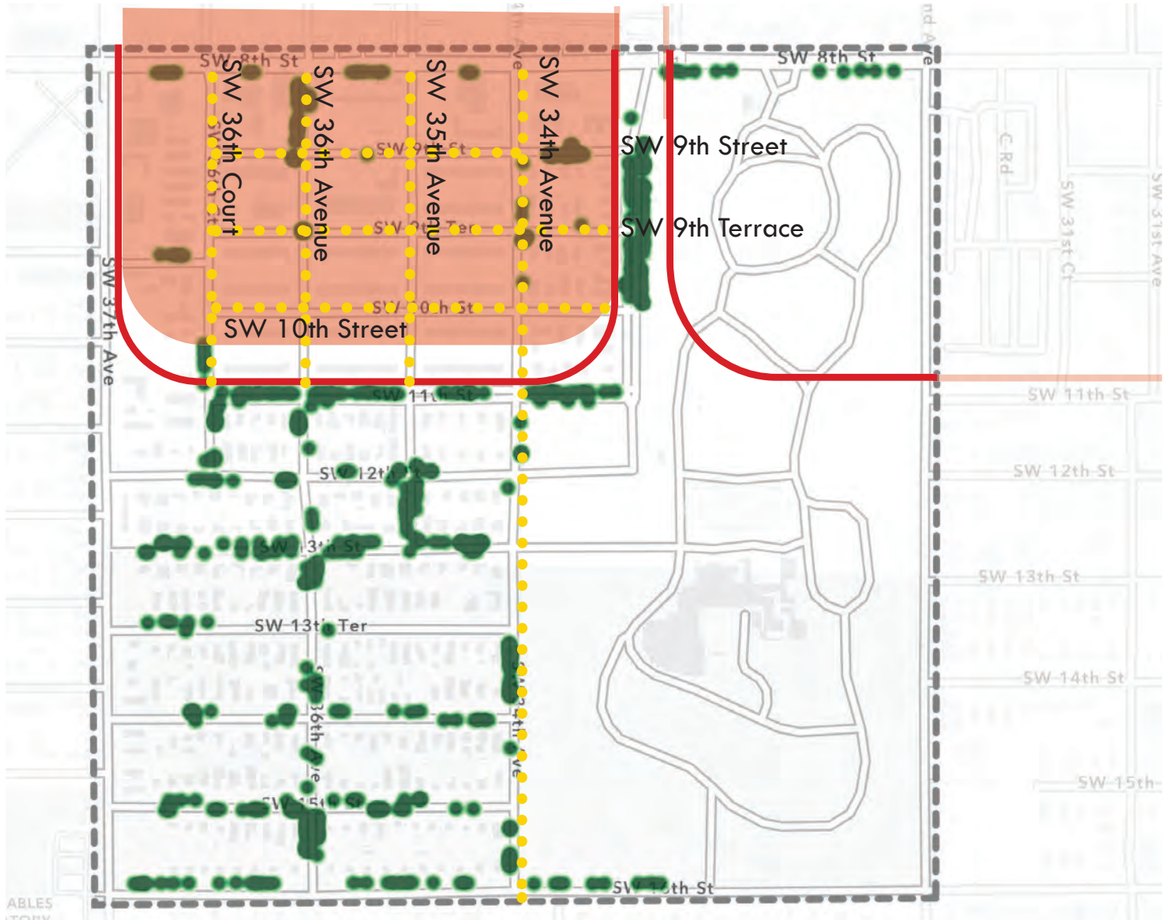
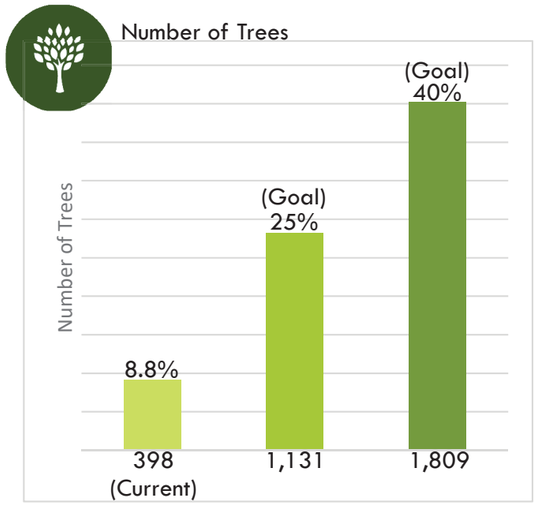


Figure 20. La Pastorita Priority Street Mapping

Current Canopy Coverage (8.8%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

35%

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- The north-west portion of the neighborhood, all that north of 11th Street has the greatest density and vulnerability with the least canopy within La Pastorita.
- The swales within these streets range from 6-10' wide placing them within the medium swale size warranting the *Medium Swale Tree Species Palette,* unless infrastructure is added to allow a larger species.
- The need for additional parking within the swale makes additional infrastructure to support cars a necessity.

Connectivity and Walkability Strategy

La Pastorita

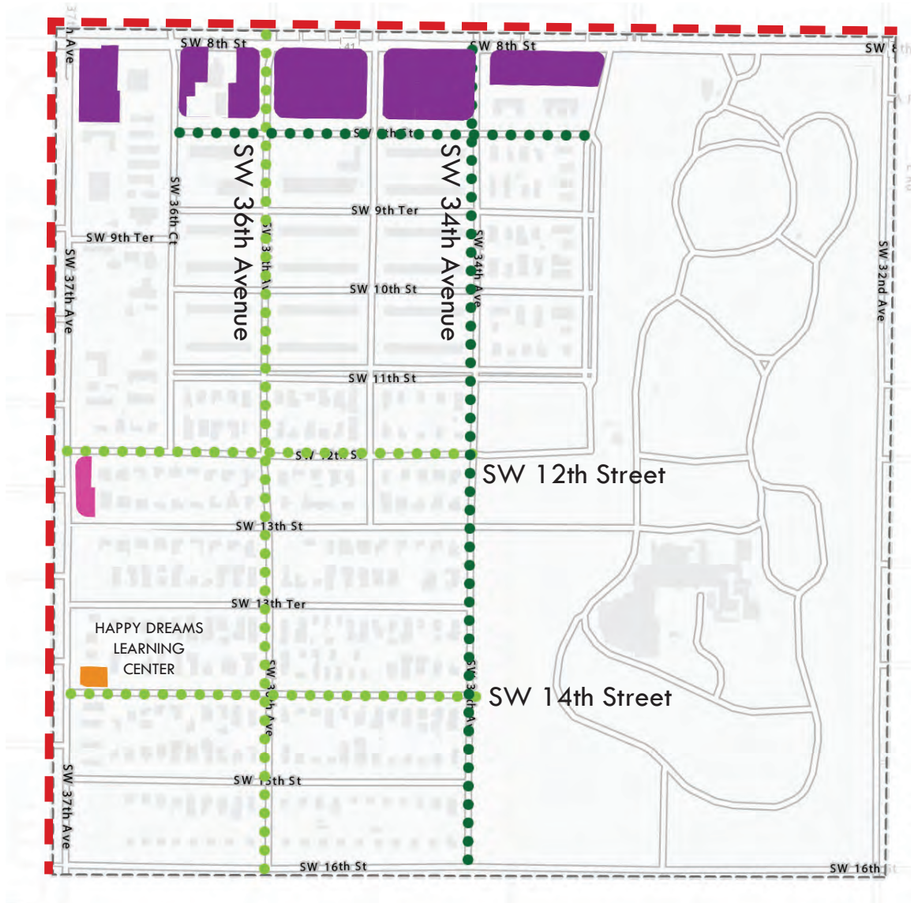


Figure 21. La Pastorita Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage.

If La Pastorita was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 35%. If this same strategy was used but instead planting was maximized on the green corridors with additional infrastructure as outlined in the Typology Strategy section of this document, the canopy coverage within the R.O.W could be increased to as much as 41% within the neighborhood.

Green Corridor Recommendations

SW 36th Avenue - 7' Swales - Typology C & A: Electric primarily on East side. Recommend planting west side of street with Large/Extra Large sized trees ** and small trees on east side if there are overhead utilities present. *

SW 34th Avenue - 7' Swales - Typology A & C: Some electric utility on west side, but mostly none. Recommend Large/Extra Large sized trees on both sides ** (except where Cemetery is adjacent), with Small trees if any overhead utilities are present. *

SW 12th Street - 10' Swales, curbed - Typology A & C: Electric utility on North side. Recommend Large/Extra Large sized trees on south side **, and Small on north side. *

SW 14th Street - 12' Swales - Typology C: Electric utility on North side. Recommend Large/Extra Large sized trees on south side**, and Small on north side. *

Care will need to be taken with placement for the areas where the swales are used for parking. See Typology Strategies for Typology C streets.

** ***Infrastructure required***

PARKDALE NORTH

Typology Approach

Parkdale North Typology Mapping

Figure 22. Parkdale North Street Typology Distribution

- Over three quarters of the neighborhood streets in Parkdale North are typologies that require little or no additional infrastructure to support planting, and in these areas is where much of the existing canopy within the neighborhood is found.
- The northern half of the neighborhood north of SW 11th Street is where the least amount of canopy is.
- The priority area for new planting to boost canopy among the residential zones is in the northern half that connect to the arterial road of SW 8th Street.

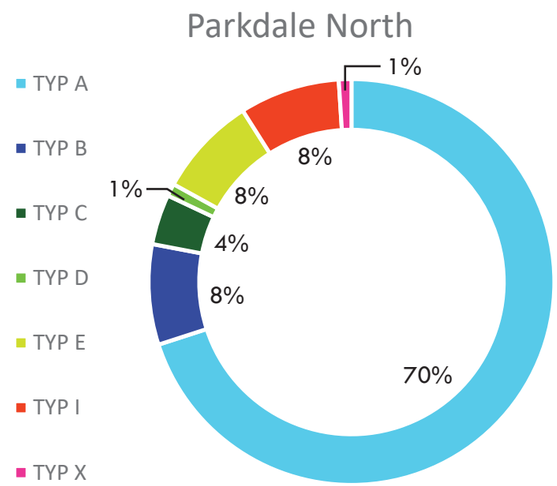


Figure 23. Parkdale North Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Parkdale North Urban Forestry Figures

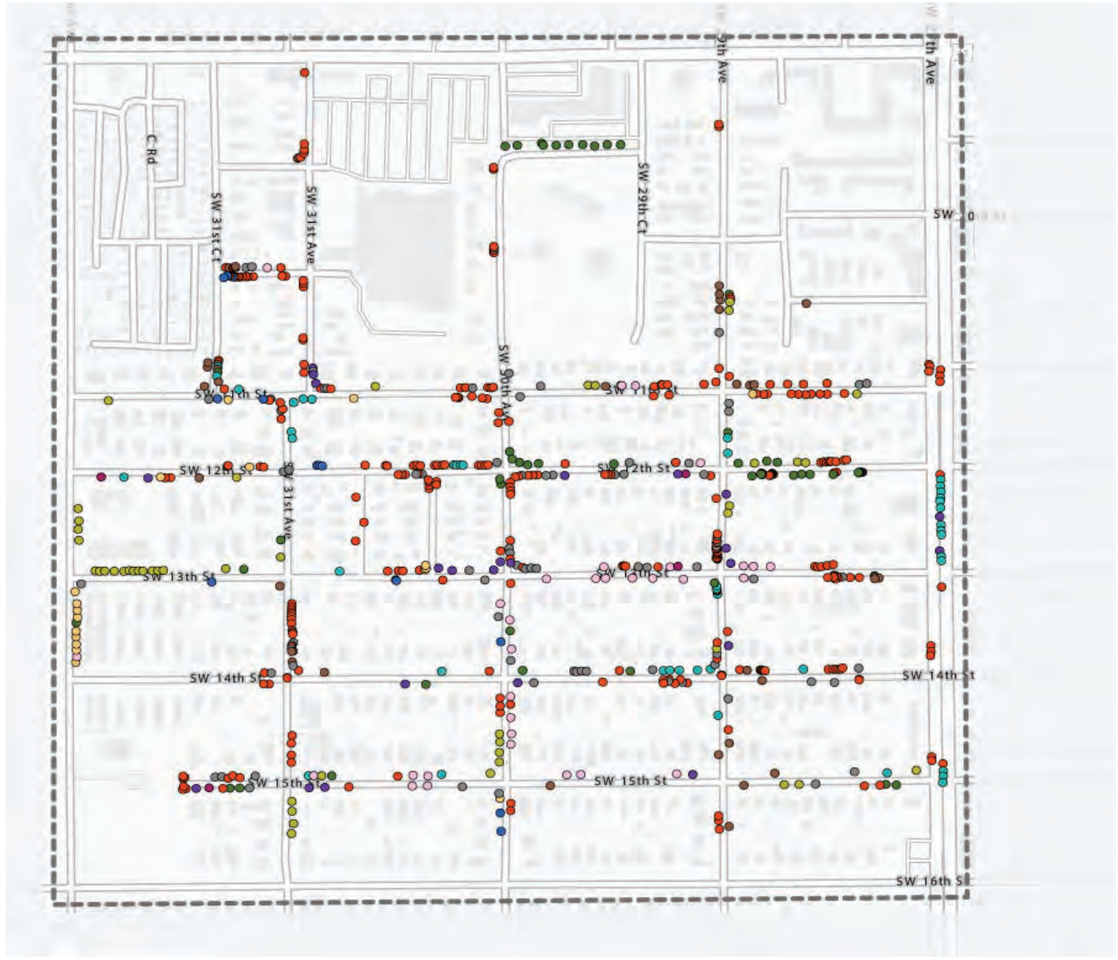


Figure 24. Parkdale North Tree Species Inventory

- Parkdale North has a fairly good diversity of tree species.
- The amount of palms is exceeding with ideal 30% of one family type of plants at 45%
- In terms of tree size, which is often a determinant of age, Parkdale North is 15% below the ideal amount of smaller, newer trees.
- The addition of newer smaller trees species such as Buttonwoods will increase diversity while bringing down the percentage of palms within the neighborhood and increase the resiliency of the neighborhood.

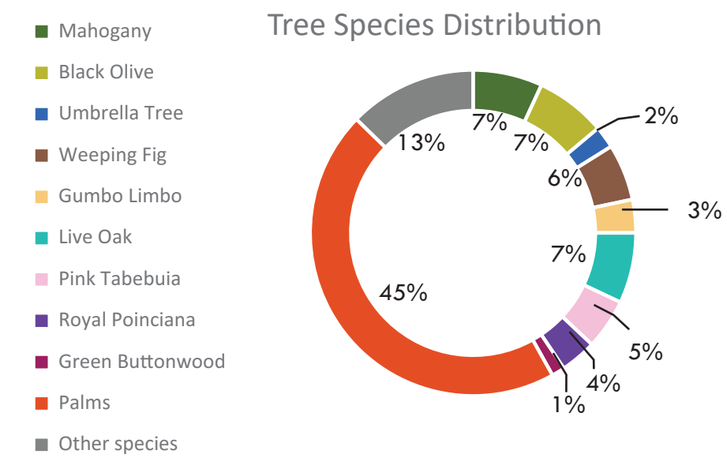


Figure 25. Parkdale North Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

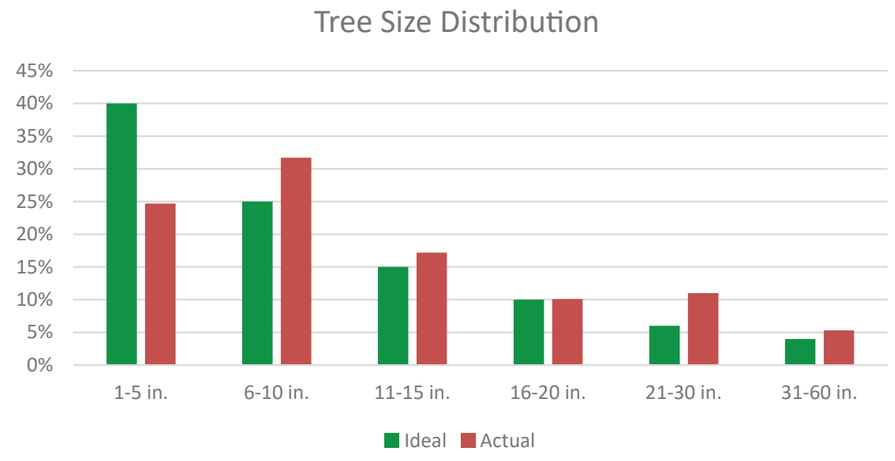


Figure 26. Parkdale North Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

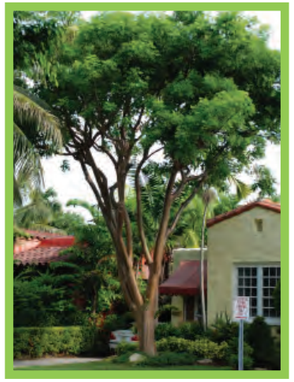
Parkdale North

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Parkdale North	*Mahogany	Paradise	Green Buttonwood	Spanish Stopper
	Oak	Gumbo Limbo	Allspice	Red Stopper
* Indicates that this species has almost reached its maximum capacity and planting should be limited				

*Mahogany

Oak

Paradise Tree



Gumbo Limbo

Green Buttonwood

Allspice

Spanish Stopper

Red Stopper

Non-Flowering

Flowering

Species Diversity Proposal

Parkdale North

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Parkdale North	Verawood	Pink Crape Myrtle	Coconut	Spindle Palms

Verawood

Pink Crape Myrtle

Coconut Palm

Spindle Palm

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Roundabout on SW 29th Avenue in Parkdale North

An example of a location where signature species could be used

Priority Streets and Canopy Coverage

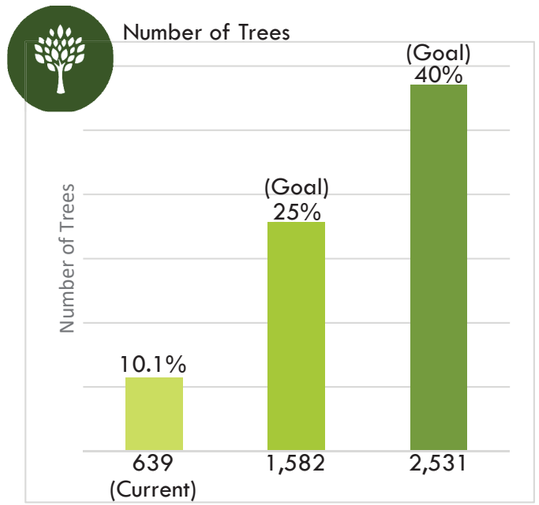
Parkdale North

Figure 27. Parkdale North Priority Street Mapping

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- The middle section of the neighborhood has the majority the single family residential homes, and as a result most of its canopy, leaving the northern and southern section as the hottest areas with the least canopy.
- SW 8th Street to the north serves as a commercial corridor within the City as well as large stores directly adjacent and a mobile home park.
- Priority should be placed on the northern half of the avenues connecting the residential core of the neighborhood to the arterial border streets.

Current Canopy Coverage (10.1%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

39%

Connectivity and Walkability Strategy

Parkdale North

Figure 28. Parkdale North Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage.

If Parkdale North was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 39%. If this same strategy was used but instead planting was maximized on the green corridors with additional infrastructure as outlined in the Typology Strategy section of this document, the canopy coverage within the R.O.W could be increased to as much as 48% within the neighborhood.

Green Corridor Recommendations

SW 31st Avenue - 9' Swales - Typology A: Electric primarily on West side. Recommend planting east side of street with Large/Extra Large sized trees** and small trees on west side if there are overhead utilities present.

SW 29th Avenue - 8' Swales - Typology A & C: Electric utility on west side. Recommend planting east side of street with Large/Extra Large sized trees** and small trees on west side if there are overhead utilities present. *

SW 11th Street - 9' Swales, curbed - Typology A & C: Electric utility on North side. Recommend Large/Extra Large sized trees** on south side, and Small on north side. *

SW 14th Street - 12' Swales - Typology A & C: Some electric utility on south side. Recommend Large/Extra Large sized trees** on north side, and Small on north side if overhead utilities are present. *

****Care will need to be taken with placement for the areas where the swales are used for parking. See Typology Strategies for Typology C streets.***

** ***Infrastructure required***

PARKDALE SOUTH

Typology Approach

Parkdale South Typology Mapping

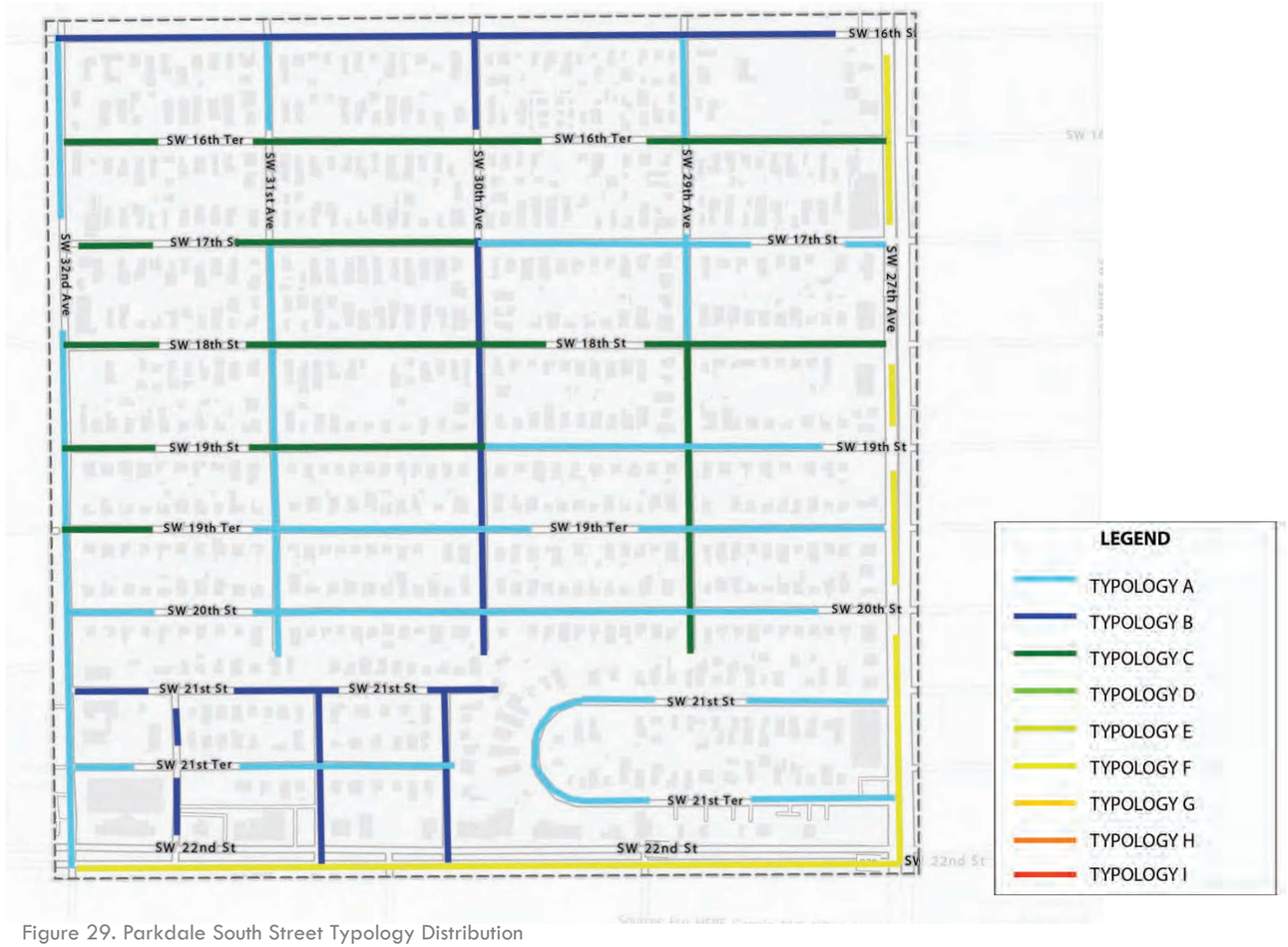


Figure 29. Parkdale South Street Typology Distribution

- With over 75% of Parkdale South consisting of street Types A, B, and F which need little to no additional infrastructure to support planting, the existing canopy within the neighborhood is fairly evenly spread.
- One priority area would fall within the north-eastern section of the neighborhood along SW 29th and 30th Avenues where there is currently little canopy.
- The second priority area would fall throughout the remaining neighborhood largely along the Type C streets which currently have much more sporadic canopy and will require additional infrastructure to support both residential parking and new planting.

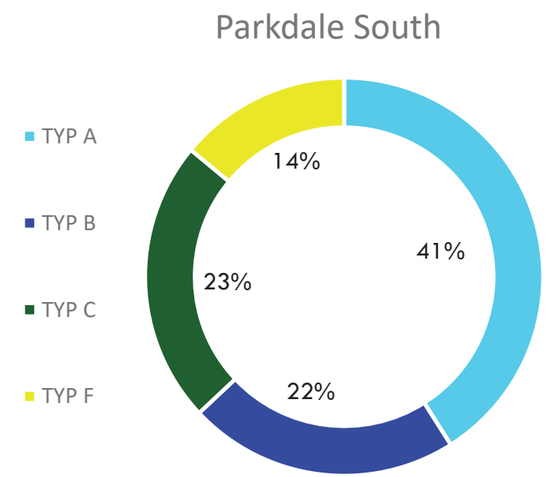


Figure 30. Parkdale South Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Parkdale South Urban Forestry Figures

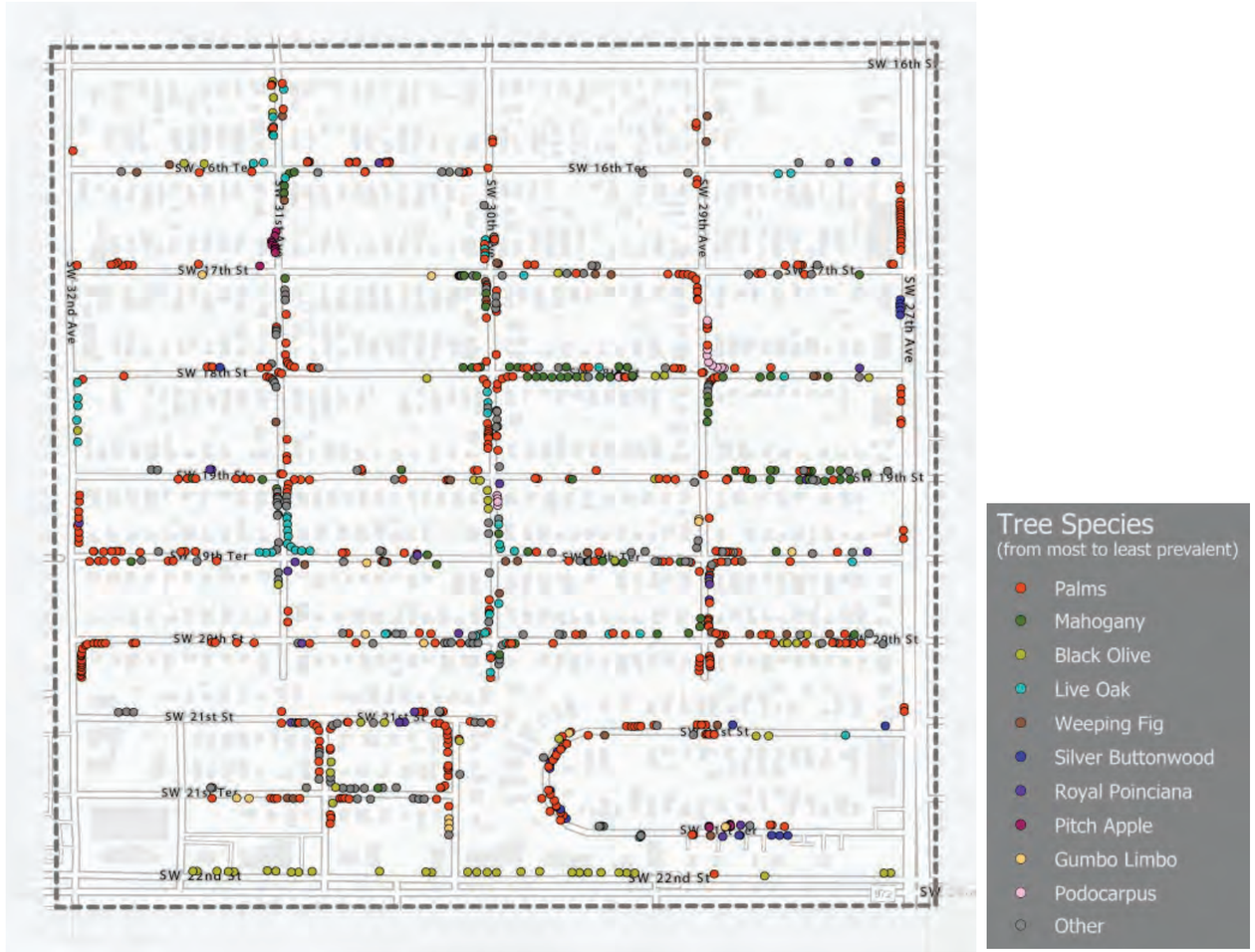


Figure 31. Parkdale South Tree Species Inventory

- Parkdale South like many of the neighborhoods within the project areas has fairly good biodiversity within its tree species, however the percentage of palms is 15% higher than the ideal percentage for one plant family.
- The addition of new trees within the smaller percentages and the strict restriction of palms can help to rectify this situation.
- The tree size distribution, on the other hand, is much closer to the ideal spread with a slight need for more young trees which could be satisfied when bringing in additional planting to increase canopy coverage.

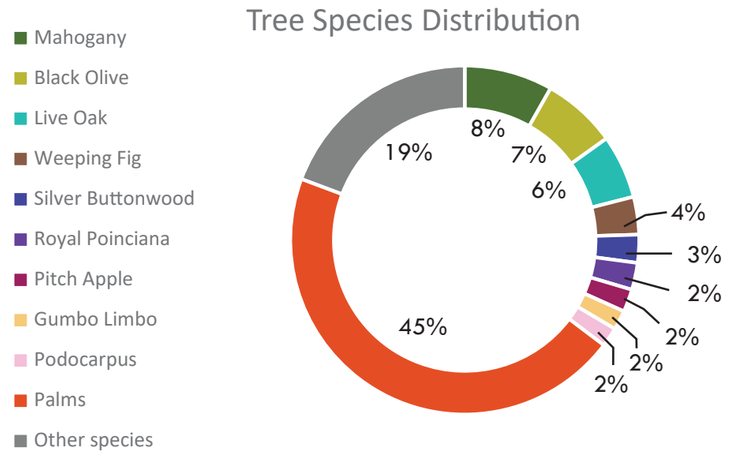


Figure 32. Parkdale South Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

Figure 33. Parkdale South Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

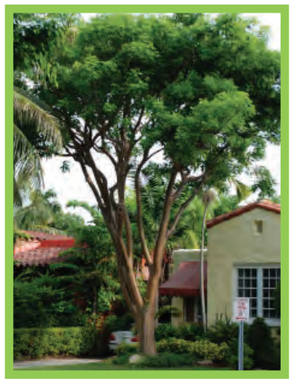
Parkdale South

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Parkdale South	*Mahogany	Gumbo Limbo	Green Buttonwood	Spanish Stopper
	Oak	Mastic	Fiddlewood	Red Stopper
* Indicates that this species has almost reached its maximum capacity and planting should be limited				


*Mahogany


Oak


Mastic


Gumbo Limbo


Green Buttonwood


Fiddlewood


Spanish Stopper


Red Stopper

Non-Flowering

Flowering

Species Diversity Proposal

Parkdale South

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Parkdale South	Verawood	Pink Crape Myrtle	Coconut	Spindle Palms

Verawood

Pink Crepe Myrtle

Coconut Palm

Spindle Palm

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

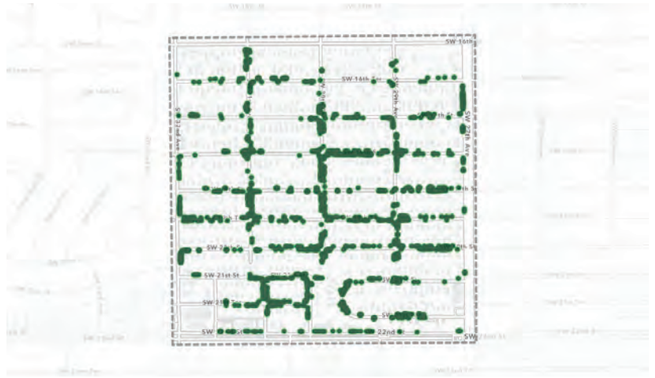
Roundabout on SW 29th Avenue in Parkdale South

An example of a location where signature species could be used

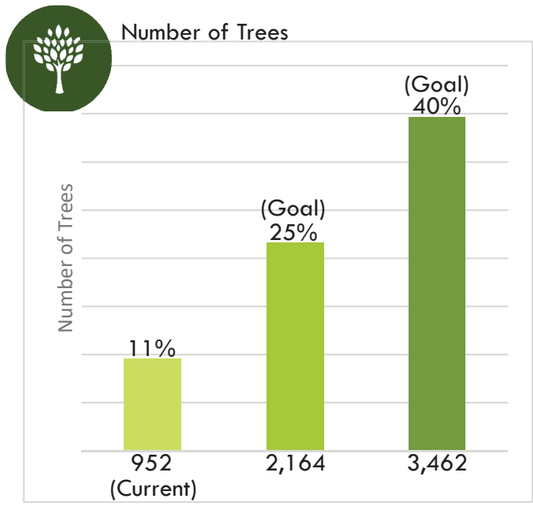
Priority Streets and Canopy Coverage

Parkdale South

Figure 34. Parkdale South Priority Street Mapping



Current Canopy Coverage (11%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

45%

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- Due to the relatively even distribution of the existing canopy throughout the neighborhood, priority planting should be focused where there is the least amount of canopy at the north eastern corner along SW 30th Avenue and SW 29th Avenue connecting to SW 16th Street.
- New planting should be extremely mindful of existing parking needs and spacing issues
- The neighborhood has swales ranging in sizes from 6' to 16' in width warranting the *Medium Swale Tree Species Palette* or *Large Swale Tree Species Palette,* when applicable unless infrastructure is added to support larger species.

Connectivity and Walkability Strategy

Parkdale South

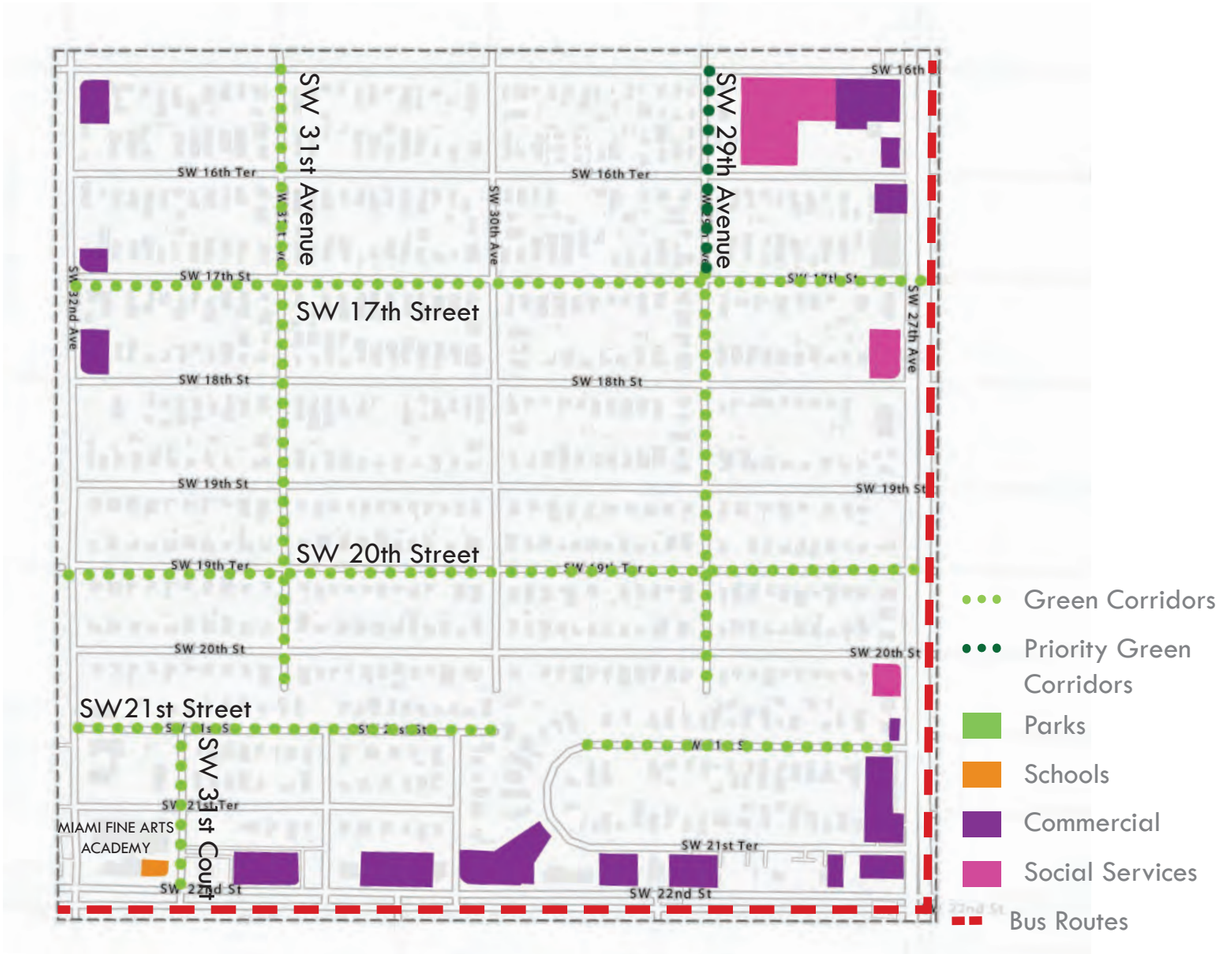


Figure 35. Parkdale South Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage.

If Parkdale South was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 45%. If this same strategy was used but instead planting was maximized on the green corridors with additional infrastructure as outlined in the Typology Strategy section of this document, the canopy coverage within the R.O.W could be increased to as much as 52% within the neighborhood.

Green Corridor Recommendations

SW 31st Avenue - 9' Swales - Typology B: Electric primarily on West side. Recommend planting east side of street with Large/Extra Large sized trees** and small trees on west side if there are overhead utilities present.
SW 29th Avenue - 9' Swales - Typology A & C: Electric utility on west side. Recommend planting east side of street with Large/Extra Large sized trees** and small trees on west side if there are overhead utilities present. *
SW 17th Street - 9' Swales, curbed - Typology C & A: Electric utility on North side. Recommend Large/Extra Large sized trees** on south side, and Small on north side. *
SW 20th Street - 9' Swales - Typology A: Some electric utility on south side. Recommend Large/Extra Large sized trees** on north side, and Small on south side if overhead utilities are present.
SW 21st Street - 6' & 9' Swales - Typology B: Some electric utility on north side. Recommend Large/Extra Large sized trees** on south side, and Small on north side if overhead utilities are present.
SW 31st Court - 6' Swale on east side only - Typology B: No overhead electric. Recommend Large/Extra Large sized trees** on east side.

****Care will need to be taken with placement for the areas where the swales are used for parking. See Typology Strategies for Typology C streets.***

*****Infrastructure Required***

CORAL GATE

Typology Approach

Coral Gate Typology Mapping

Figure 38. Coral Gate Street Typology Distribution

- The inner streets of Coral Gate consist of entirely type A streets with vegetated swales.
- This neighborhood does not have a particular problem area that severely lacks canopy however increasing the efficiency of water infiltration with additional planting can be useful particularly in areas with drainage issues such as that along Coral Gate Drive near SW 20th Street.
- Increasing canopy coverage within this neighborhood would likely not require any additional infrastructure as larger lots with longer driveways appears to negate a need for much additional parking by residents.

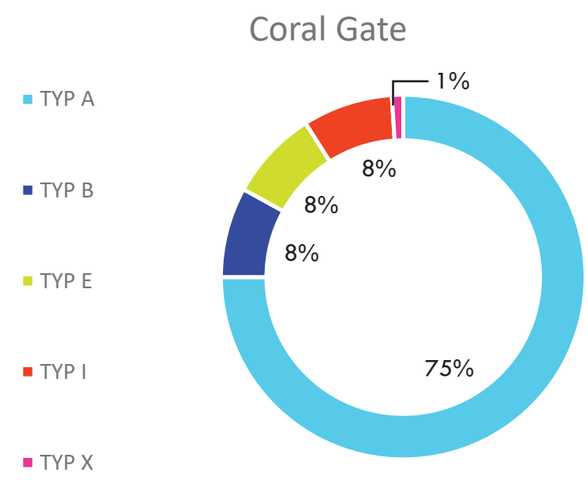


Figure 39. Coral Gate Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Coral Gate Urban Forestry Figures

Figure 40. Coral Gate Tree Species Inventory

- The tree species diversity within Coral Gate is generally within the commonly accepted percentages for different family, genus' and species with the exception of Live Oak trees which are over represented.
- The percentage of Palms is nearing the 30% maximum of one family and it is recommended that new palms not be planted unless absolutely necessary due to spacing.
- In the planting of new trees it is also recommended not to continue planting Live Oaks as the current number of this species is more than twice the recommended 10% maximum of one species in a population.
- As additional trees are planting to increase canopy coverage, the actual tree size distribution curve will reflect more closely with the ideal.

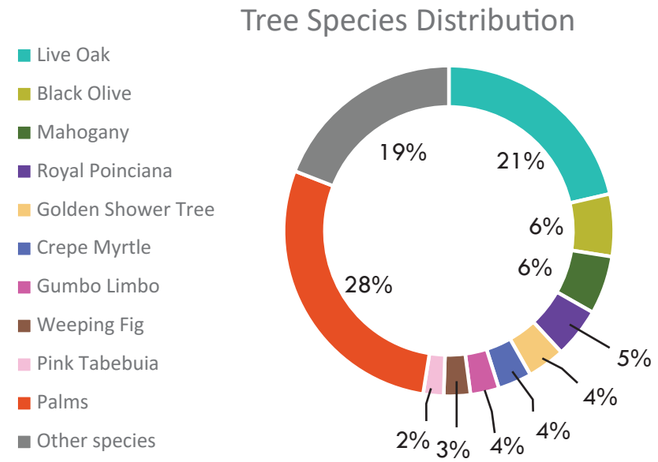


Figure 41. Coral Gate Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

Figure 42. Coral Gate Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

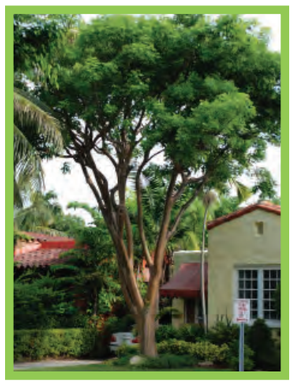
Coral Gate

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Coral Gate	*Mahogany	Paradise Tree	Satin Leaf	Silver Buttonwood
	Tamarind	Gumbo Limbo	Blolly	Lignum Vitae
* Indicates that this species has almost reached its maximum capacity and planting should be limited				

*Mahogany

Tamarind

Paradise Tree



Gumbo Limbo

Satin Leaf

Blolly

Silver Buttonwood

Lignum Vitae

Non-Flowering

Flowering

The live oak is a species that has reached its maximum quantity and therefore no more should be planted unless it is to replace one that has died.

Oak

Species Diversity Proposal

Coral Gate

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Coral Gate	Apple Blossom Tree	Pink Crape Myrtle	Bismark	Thatch Palms

Apple Blossom Tree

Pink Crepe Myrtle

Bismark Palm

Thatch Palm

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Roundabout on Coral Gate Drive in Coral Gate

An example of a location where signature species could be used

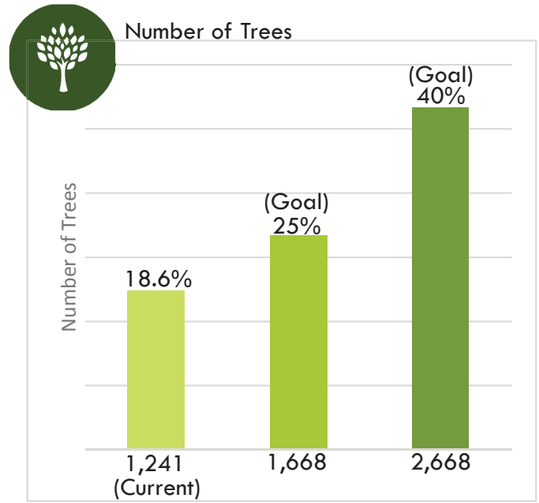
Priority Streets and Canopy Coverage

Coral Gate

Figure 43. Coral Gate Priority Street Mapping

- Having a well distributed canopy and relatively affluent population, Coral Gate has little space warranting priority planting status
- In the scheme of increasing canopy coverage as it relates to heat it is recommended to focus on the more commercial boundaries of the neighborhood and the few connective routes from within.
- Large swales within Coral Gate allow for a wide variety of new species to be introduced.

Current Canopy Coverage (18.6%)



Priority Streets (None)

Hot Spots (None)

Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

39%

Connectivity and Walkability Strategy

Coral Gate

Figure 44. Coral Gate Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage.

If Coral Gate was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 39%. If this same strategy was used but instead planting was maximized on the green corridors with additional infrastructure as outlined in the Typology Strategy section of this document, the canopy coverage within the R.O.W could be increased to as much as 53% within the neighborhood.

Green Corridor Recommendations

SW 16th Terrace - 12' Swales - Typology A: Electric utility on north side west of Coral Gate Drive. Recommend east of Coral Gate Drive: planting north side of street with Large/Extra Large sized trees and large trees on south side (pedestrian light poles). Recommend west of Coral Gate Drive: planting the south side of the street with Large sized trees (pedestrian light poles) and small trees on north side.
SW 17th Street - 10' Swales, curbed - Typology A: Electric utility on North side. Recommend Large sized trees on south side (pedestrian light poles), and Small on north side.
SW 18th Street - 12' Swales - Typology A: No overhead Electric. Recommend Large/Extra Large sized trees on north side, and large on south side (pedestrian light poles).
SW 18th Terrace (west) - 12' Swales - Typology A: No overhead Electric. Recommend Large/Extra Large sized trees on north side, and Medium on south side (pedestrian light poles).
SW 20th Street - 15' Swales - Typology A: No overhead Electric. Recommend Extra Large sized trees on north side, and Large on south side (pedestrian light poles).
SW 32nd Court - 12' Swales - Typology A: No overhead Electric. Recommend Large sized trees on east side (pedestrian light poles), and Extra Large on west side.
SW 36th Court - 12' Swales - Typology A: No overhead Electric. Recommend Extra Large sized trees on east side, and large on west side (pedestrian light poles).
Coral Gate Drive - 15' Swales - Typology A: No overhead Electric. Recommend Extra Large sized trees on east side, and large on west side (pedestrian light poles).

DOUGLAS PARK

Typology Approach

Douglas Park Typology Mapping

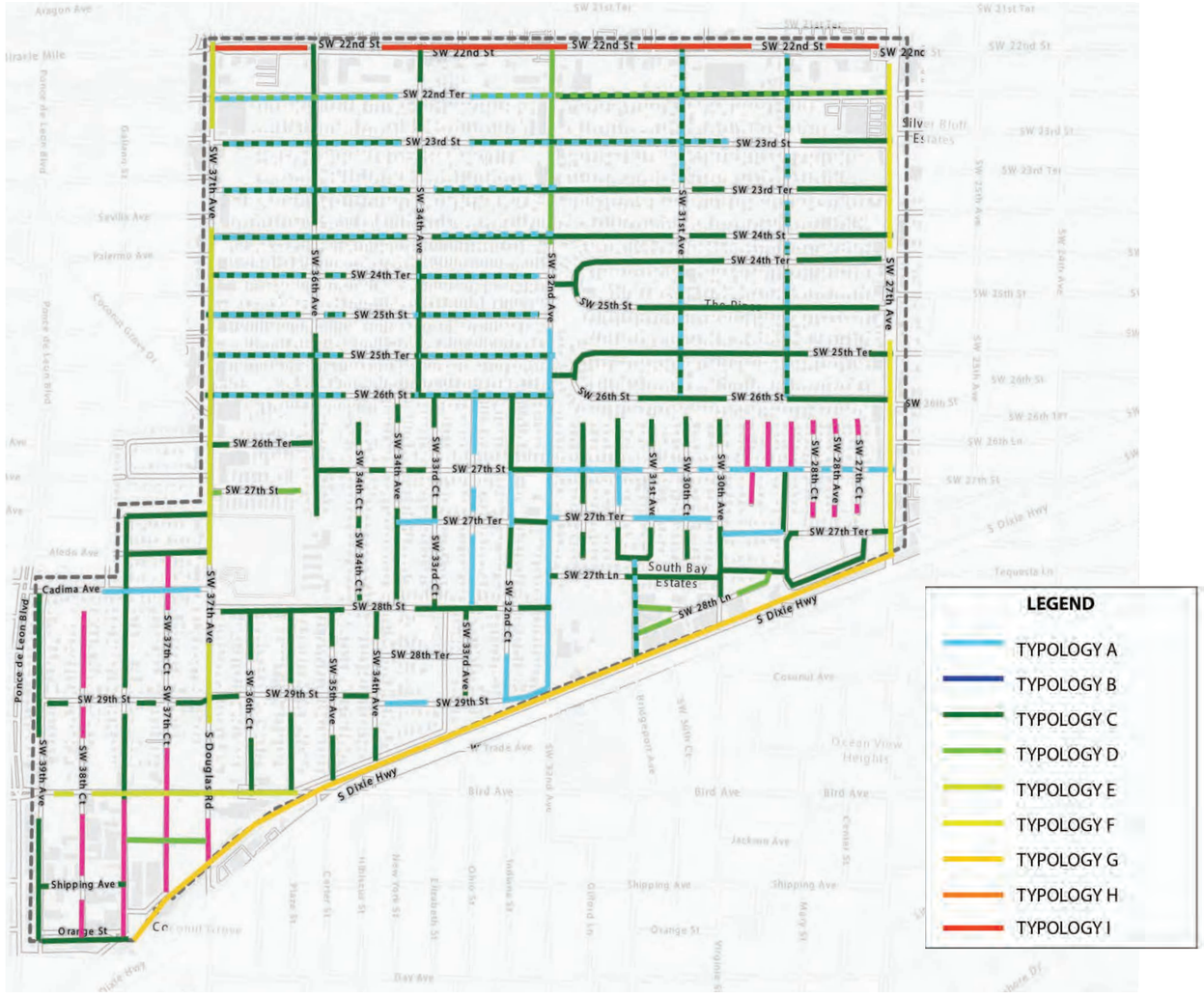


Figure 45. Douglas Park Street Typology Distribution

- Douglas Park is comprised mostly of a mix of street types A and C where additional parking is needed, and residents are making use of the swale.
- The northern half of the neighborhood is the area most lacking in canopy, so the priority zone for additional planting would be there. Where necessary additional infrastructure will be needed to support both parking and additional trees.
- Douglas Park also has nearly 10% of Typology X meaning the street doesn't fall within any of the categories, often times with no sidewalk or swale, or other anomalies distinguishing it from a common type. In these streets where there is such little ROW available new planting may not be feasible.

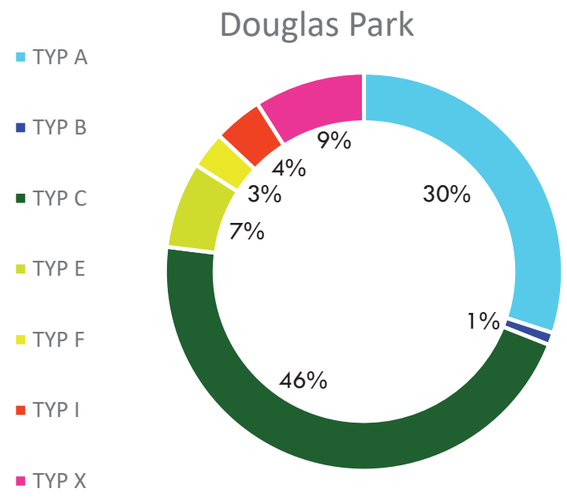


Figure 46. Douglas Park Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

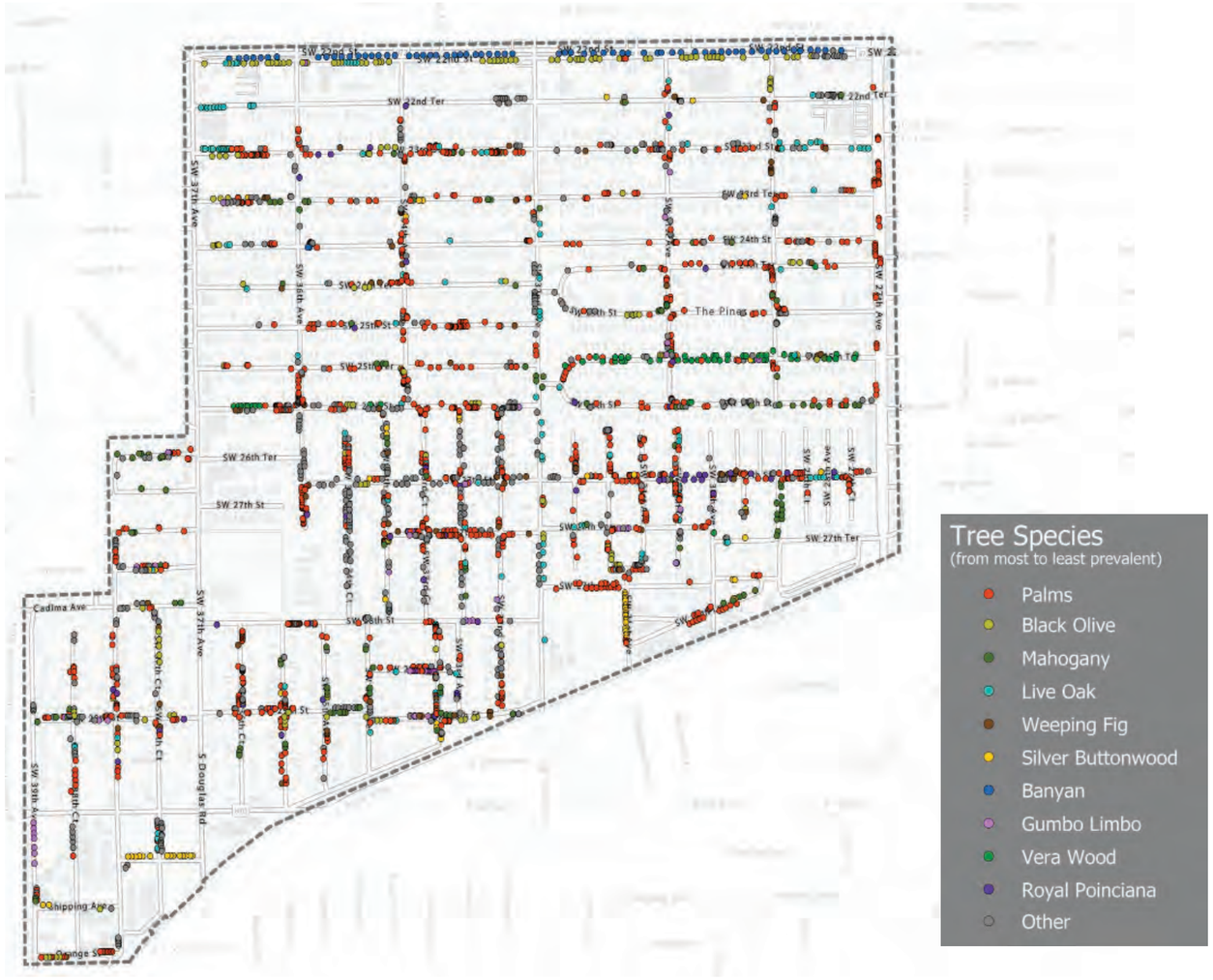


Figure 47. Douglas Park Tree Species Inventory

- The species distribution within Douglas Park highlights a common issue with many of the neighborhoods within the city which is an excessive number of palms, just over 40%.
- To resolve this issue new palms should only be planted when necessary and continued efforts towards supporting the existing biodiversity within the neighborhood should be followed.
- For tree size and maturity Douglas Park is much more successful in having tree sizes following the common standards of urban forestry.
- As new trees are planted to increase canopy the percentage of 1-5 in. DBH trees will increase, bringing that number closer to the ideal percentage.

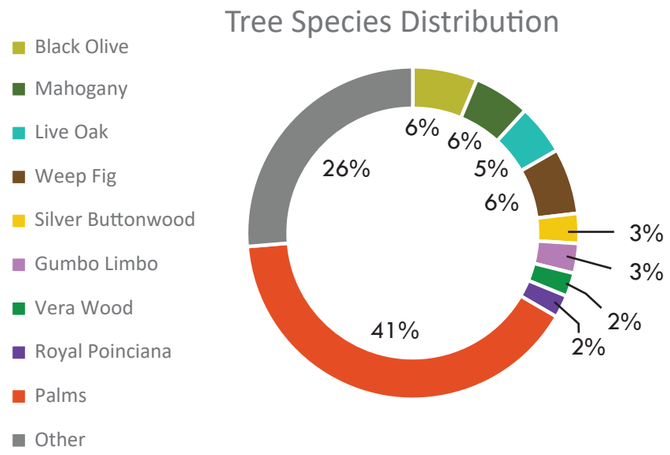


Figure 48. Douglas Park Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

Figure 49. Douglas Park Tree Size Distribution

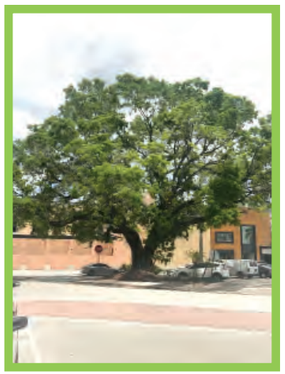
The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

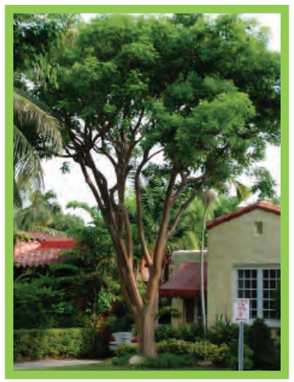
Douglas Park

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Douglas Park	Oak	Mastic	Green Buttonwood	Simpson's Stopper
	*Mahogany	Gumbo Limbo	Fiddlewood	Silver Buttonwood
			Blolly	
* Indicates that this species has almost reached its maximum capacity and planting should be limited				


Oak


*Mahogany


Mastic

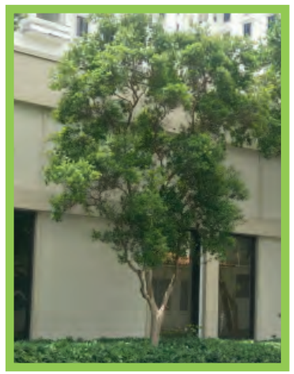

Gumbo Limbo


Green Buttonwood


Fiddlewood


Blolly


Silver Buttonwood


Simpson's Stopper

Species Diversity Proposal
Douglas Park

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Douglas Park	Jamaica Dogwood	Pink Crape Myrtle	Coconut	Bottle Palms

Jamacian Dogwood

Pink Crepe Myrtle

Coconut Palm

Bottle Palm

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Douglas Park entrance on SW 28th Street in Douglas Park
An example of a location where signature species could be used

Priority Streets and Canopy Coverage

Douglas Park

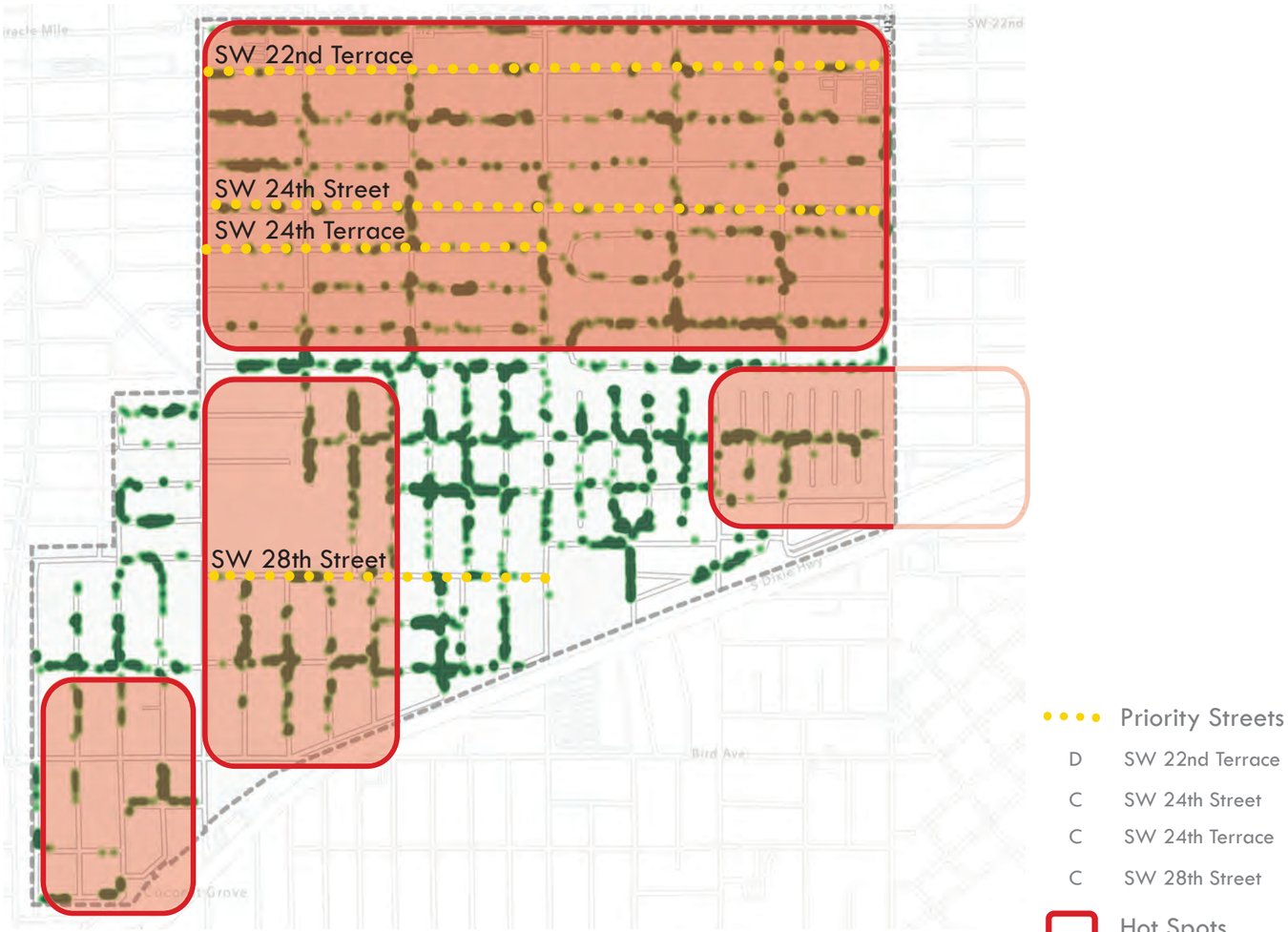
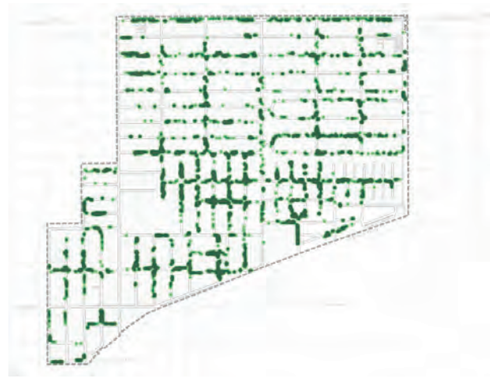
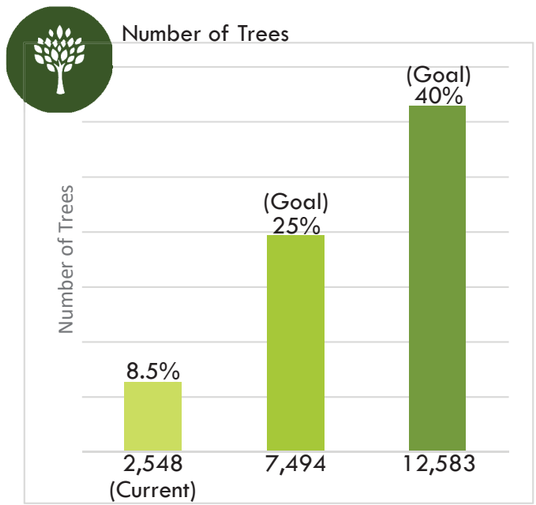


Figure 50. Douglas Park Priority Street Mapping



Current Canopy Coverage (8.5%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

33%

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- Douglas park has some of the lowest canopy within the project area, this in conjunction with the vulnerability of its resident population, warrants multiple priority zones.
- The north half of the neighborhood has greater density, with more vehicles and higher instances of compacted swales so a focus on infrastructure to protect new trees with be necessary.
- In the southern most priority zone a mix of uses from industrial to multi-family will require greater care in connecting resident to the major thoroughfares of Bird Road and US 1.

Connectivity and Walkability Strategy

Douglas Park

Figure 51. Douglas Park Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage.

If Douglas Park was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 33%. If this same strategy was used but instead planting was maximized on the green corridors with additional infrastructure as outlined in the Typology Strategy section of this document, the canopy coverage within the R.O.W could be increased to as much as 35% within the neighborhood.

Green Corridor Recommendations

SW 23rd Street - 18' Swales - Typology A & C: Electric utility on north side. Recommend planting south side of street with Large/Extra Large sized trees and small trees on south side. *

SW 24th Street & SW 24th Terrace - 9' Swales - Typology C: Electric utility on North side. Recommend Large/Extra Large sized trees on south side, and Small on north side. This street is a good candidate for maximizing parking on the north and planting on the south with infrastructure and careful placement.*

SW 26th Street - 10' Swales - Typology C & A: Electric utility on North side. Recommend Large/Extra Large sized trees on south side, and Small on north side. *

SW 27th Street - 15' Swales - Typology C & A: Electric utility on North side. Recommend Large/Extra Large sized trees on south side, and Small on north side. *

SW 27th Lane 8' Swales - Typology C: Electric utility on south side. Recommend Large/Extra Large sized trees on north side and small on south side.

SW 27th Terrace 10' Swales - Typology C: Electric utility on north side. Recommend Large/Extra Large sized trees on south side and small on north side. *

SW 28th Street - 8' Swales - Typology A & C: Electric utility on north side. Recommend Large/Extra Large sized trees on south side and small on north side. *

SW 29th Street - 9' Swales - Typology A & C: Electric utility on north side. Recommend Large/Extra Large sized trees on south side and small on north side. *

SW 38th Avenue - 9' Swales - Typology C: Electric utility on west side. Recommend Large/Extra Large sized trees on east side and small on west side.*

SW 36th Avenue - 9' Swales - Typology C: Electric utility on east side. Recommend Large/Extra Large sized trees on west side and small on east side.*

SW 34th Avenue - 9' Swales - Typology C & A: Electric utility on west side. Recommend Large/Extra Large sized trees on east side and small on west side.*

SW 31st Avenue - 10' Swales - Typology C & A: Electric utility on west side. Recommend Large/Extra Large sized trees on east side and small on west side.*

SW 29th Avenue (north) - 9' Swales - Typology C & A: Electric utility on west side. Recommend Large/Extra Large sized trees on east side and small on west side.*

SW 30th Avenue - 9' Swales - Typology C & A: Electric utility on west side. Recommend Large/Extra Large sized trees on east side and small on west side.*

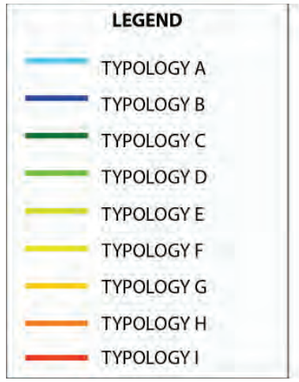
****Care will need to be taken with placement for the areas where the swales are used for parking. See Typology Strategies for Typology C streets.***

CITRUS GROVE

Typology Approach

Citrus Grove Typology Mapping

Figure 52. Citrus Grove Street Typology Distribution



- Over half of the residential streets of Citrus Grove (58%) have swales.
- Nearly half of the swales are paved or dirt swales so additional infrastructure will be required to allow for new plantings especially in those areas with multi-family housing, as parking is a much greater issue.
- Due to swale size restrictions within the neighborhood following the appropriate planting palettes will be extremely important as well as the incorporation of infrastructure to support proper root growth and protection.

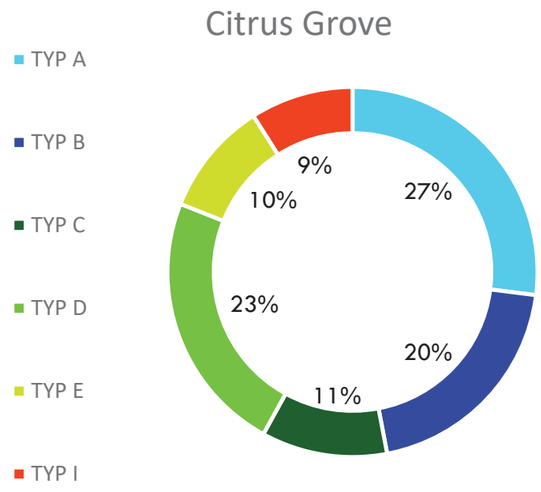


Figure 53. Citrus Grove Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Citrus Grove Urban Forestry Figures

Figure 54. Citrus Grove Tree Species Inventory

- Just three species make up over 25% of the trees within the neighborhood and palms make up for almost 40%.
- As with the other neighborhoods restricting palms to only when necessary and incorporating a variety of new trees will be imperative.
- Based on the tree size distribution, larger more moderately aged trees are doing well within the neighborhood but there is a lack of new smaller trees.
- As new trees are planted to increase canopy coverage this percentage will come close to the ideal for urban forestry standards.

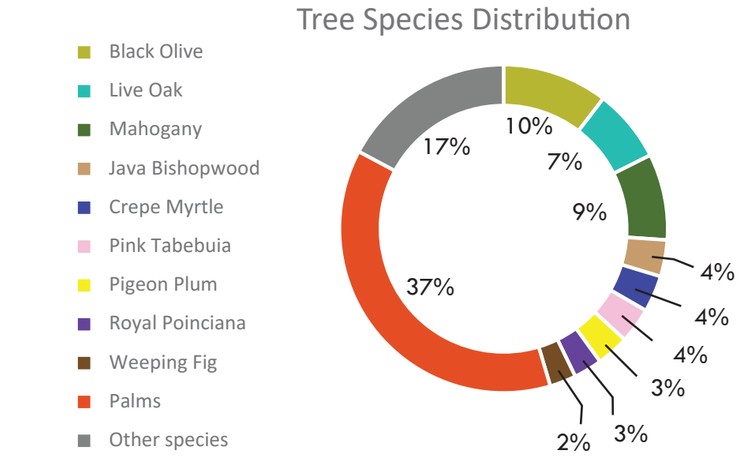


Figure 55. Citrus Grove Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

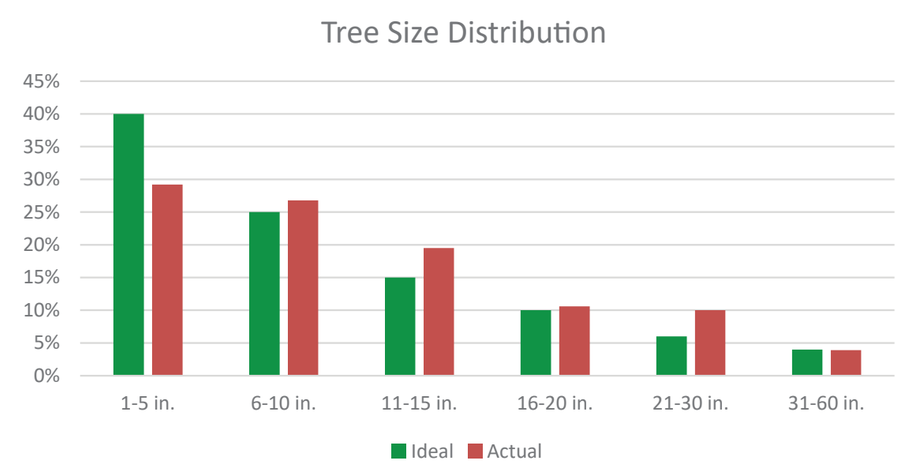


Figure 56. Citrus Grove Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

Citrus Grove

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Citrus Grove	*Mahogany	Gumbo Limbo	Green Buttonwood	Silver Buttonwood
	*Oak		Allspice	Jamaica Caper
	Tamarind		White Tabebuia	
* Indicates that this species has almost reached its maximum capacity and planting should be limited				

*Mahogany

Tamarind

*Oak

Gumbo Limbo

Green Buttonwood

Allspice

White Tabebuia

Silver Buttonwood

Jamaican Caper

Non-Flowering

Flowering

Species Diversity Proposal
Citrus Grove

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Citrus Grove	White Tabebuia	Red Crape Myrtle	Cabbage Palms	Thatch Palms

White Tabebuia

Red Crepe Myrtle

Cabbage Palm

Thatch Palms

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Swale on SW 2nd Street in Citrus Grove

An example of a location where signature species could be used

Priority Streets and Canopy Coverage

Citrus Grove

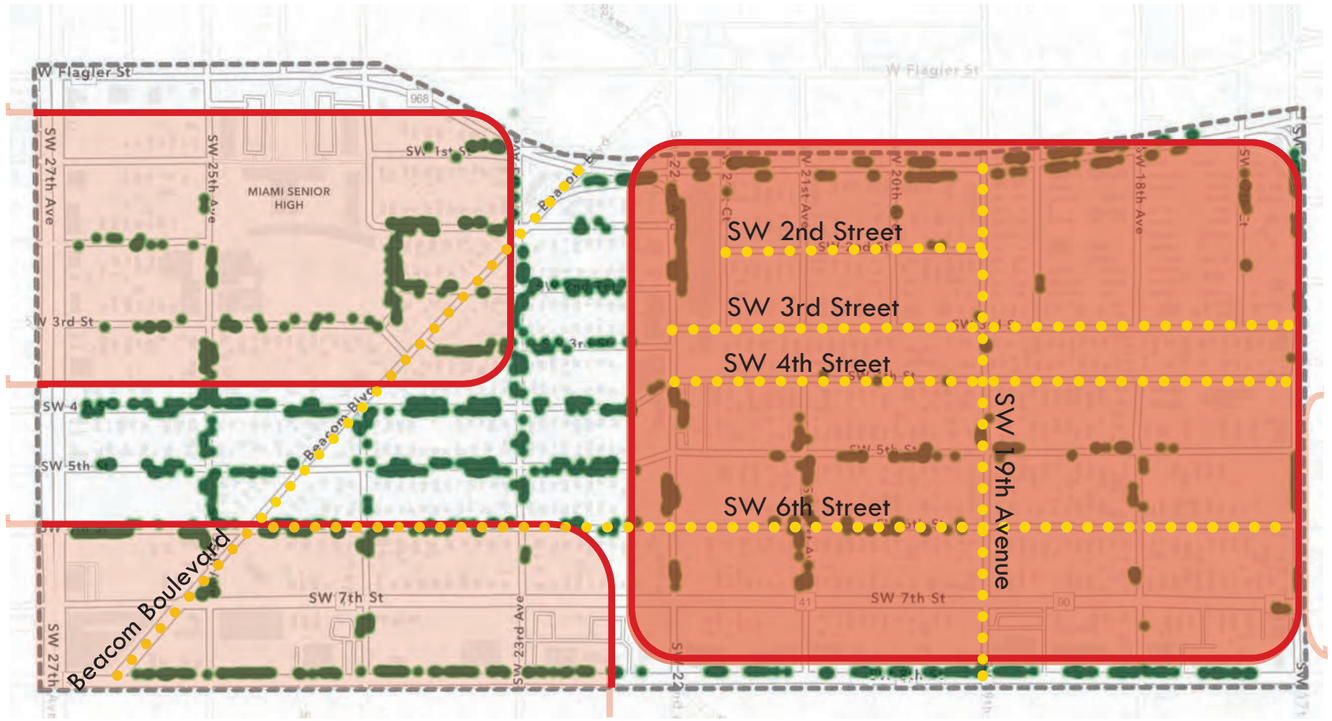
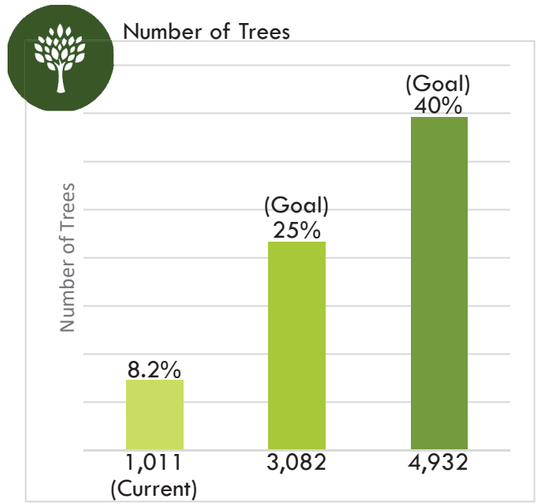


Figure 57. Citrus Grove Priority Street Mapping

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- Streets with existing vegetated swales within Citrus Grove tend to have narrower swales than what is found in some other parts of the project area. Therefore planting appropriately sized trees will be imperative and when specifying larger trees infrastructure will be necessary.
- Priority zones include some of the more sparse streets on the eastern side of the neighborhood such as SW 3rd and 4th Streets. In this case on a street such as SW 3rd the removal of a few parking spots in key locations to incorporate new tree islands would be valuable solution.
- Additional priority areas within the neighborhood would be the north-western corner surrounding Miami Senior High along some of the feeder streets such as SW 1st Street or SW 24th and 25th Avenues which currently lack canopy.

Current Canopy Coverage (8.2%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

35%

Connectivity and Walkability Strategy

Citrus Grove

Figure 58. Citrus Grove Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage.

If Citrus Grove was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 35%. If this same strategy was used but instead planting was maximized on the green corridors with additional infrastructure as outlined in the Typology Strategy section of this document, the canopy coverage within the R.O.W could be increased to as much as 42% within the neighborhood.

Green Corridor Recommendations

SW 25th Avenue - 5'-7' Swales - Typology A & D: Electric utility on west side. Recommend planting east side of street with Large/Extra Large sized trees and small trees on west side. *

SW 24th Avenue - 5' Swales - Typology B & D: Electric utility on west side. Recommend planting east side of street with Large/Extra Large sized trees and small trees on west side. *

SW 21st Avenue- 5' Swales - Typology C & D: Electric utility on west side only north of 3rd Street. Recommend Large/Extra Large sized trees on east side, and Small on west side. * **

SW 19th Avenue - 5' Swales - Typology C & D: Electric utility on west side in some areas east side in others. Recommend Large/Extra Large sized trees on side without utilities, and Small on side with utilities. * **

SW 3rd Street 7' Swales - Typology A & D: Electric utility mostly on south side. Recommend Large/Extra Large sized trees on north side and small on south side. *

SW 6th Street 6' Swales - Typology D & B: Electric utility mostly on south side. Recommend Large/Extra Large sized trees on north side and small on south side. *

Beacom Boulevard - No Swales - Typology D: No Electric utilities. Recommend Large/Extra Large sized trees on both sides of the street. This street could be a signature street and a central connector.*

****Planting spaces will need to be built strategically in parking areas with infrastructure to allow larger trees. See "Typology Strategies" for Typology D streets.***

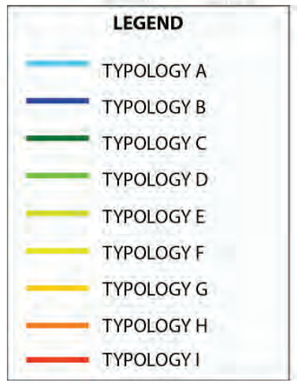
*****Care will need to be taken with placement for the areas where the swales are used for parking. See "Typology Strategies" for Typology C streets.***

SHENANDOAH NORTH

Typology Approach

Shenandoah North Typology Mapping

Figure 59. Shenandoah North Street Typology Distribution



- Shenandoah North is one of the neighborhoods with the highest canopy coverage within the project area. Street Typology B seems to be the most conducive to supporting trees within the neighborhood.
- Some of the larger through streets such as SW 22nd and 17th Avenue are almost completely without trees, but as typology E and with more lanes these are much less appropriate streets for planting without the removal of a lane.
- On some of the smaller streets such as SW 12th and 13 Court where there is much less traffic and a severe lack in canopy. A priority should be placed on the addition of new planting, likely at the sacrifice of a few parking spaces in strategic areas.

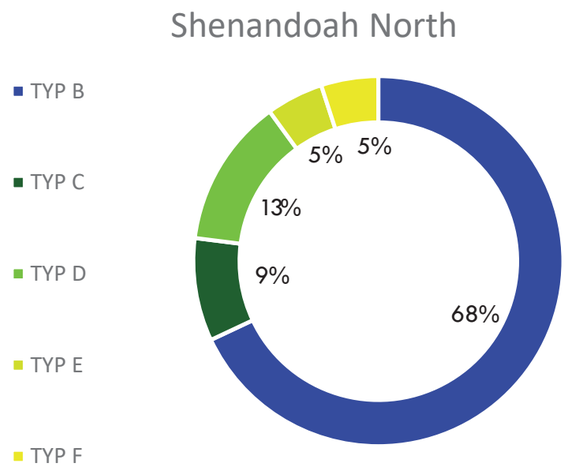


Figure 60. Shenandoah North Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Shenandoah North Urban Forestry Figures

Figure 61. Shenandoah North Tree Species Inventory

- Though Shenandoah North has some of the highest canopy coverage within the project area, this neighborhood also has a fairly high percentage of the coverage being attributed to palms, 43%.
- Looking at the remaining tree diversity, the number of Mahoganies is nearly at the maximum 10% for one species, it would be recommended to reserve planting additional mahoganies only on streets where they are a designated street tree.
- In terms of tree size distribution the neighborhood has the capacity to add new trees and get closer to the ideal number of smaller immature trees, and has done well with the maintenance of their more moderately aged trees based on those higher percentages.

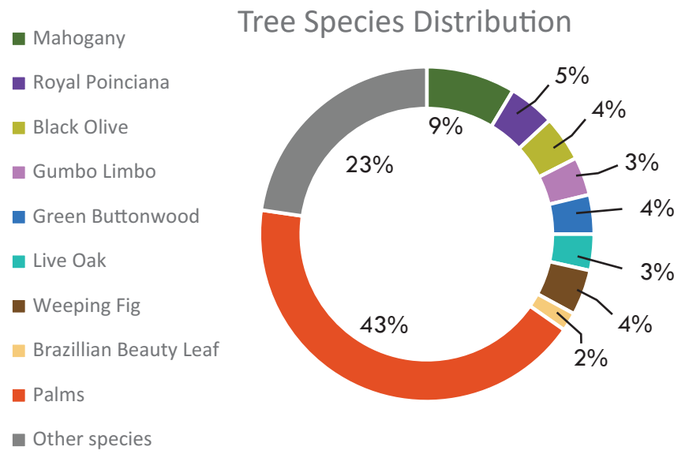


Figure 62. Shenandoah North Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

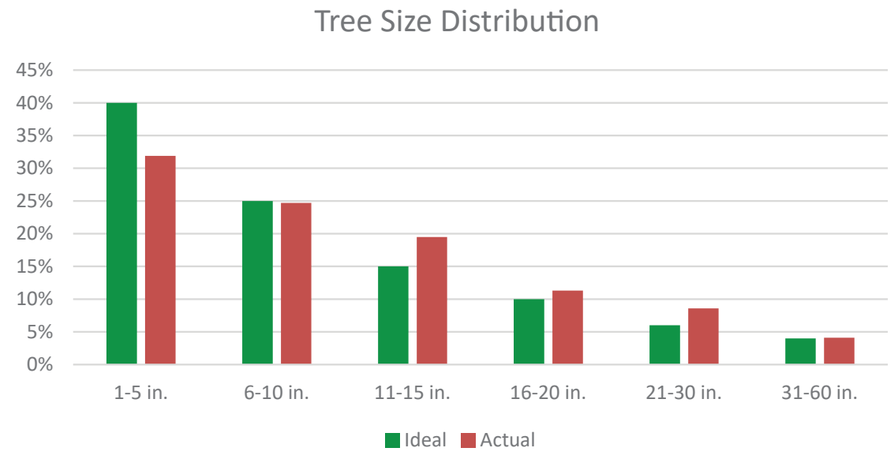


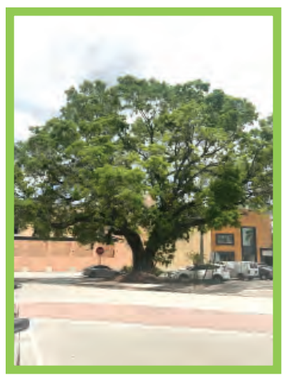
Figure 63. Shenandoah North Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

Shenandoah North

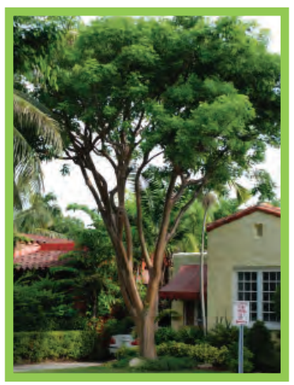
Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Shenandoah North	*Mahogany	Gumbo Limbo	Fiddlewood	Spanish Stopper
	Oak		Blolly	Red Stopper
	Tamarind		Allspice	
* Indicates that this species has almost reached its maximum capacity and planting should be limited				



*Mahogany

Oak

Tamarind



Gumbo Limbo

Fiddlewood

Blolly

Allspice

Spanish Stopper

Red Stopper

Non-Flowering

Species Diversity Proposal

Shenandoah North

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Shenandoah North	Queen Crape Myrtle	Orange Geiger	Royal Palms	Thatch Palms

Queen Crepe Myrtle

Orange Geiger

Royal Palm

Thatch Palms

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Median on SW 10th Street Road in Shenandoah North
An example of a location where signature species could be used

Priority Streets and Canopy Coverage

Shenandoah North

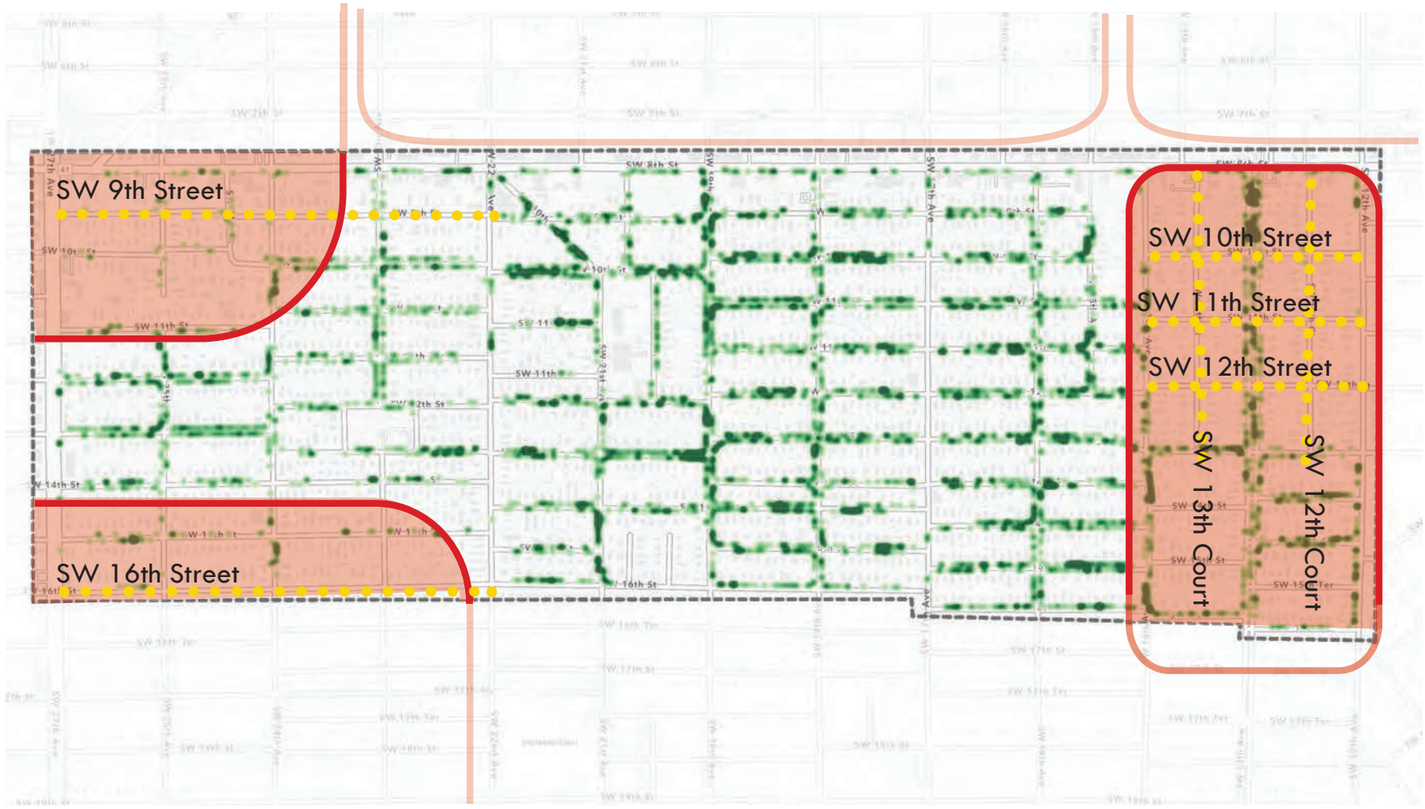
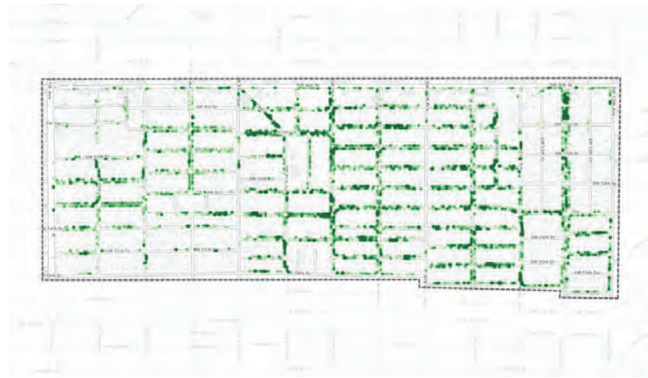


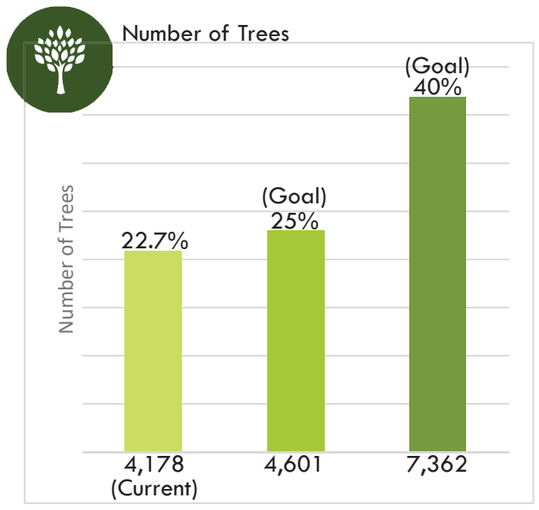
Figure 64. Shenandoah North Priority Street Mapping

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- Shenandoah North has a few different hot spots with the area to east being the highest priority.
- With the lack of swales along SW 12th and 13th Court in that high priority zone a need for additional infrastructure and a slight reduction in parking will be necessary to accommodate trees.
- There are additional hot spots at the western end of the neighborhood in both the northern and southern portions where the canopy is more sparse and streets have existing swales that can be planted with new trees.



Current Canopy Coverage 22.7%



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

44%

Connectivity and Walkability

Shenandoah North

Figure 65. Shenandoah North Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage.

If Shenandoah North was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 44%. If this same strategy was used but instead planting was maximized on the green corridors with additional infrastructure as outlined in the Typology Strategy section of this document, the canopy coverage within the R.O.W could be increased to as much as 50% within the neighborhood.

Green Corridor Recommendations

SW 23rd Avenue - 20' Swales - Typology A: No Electric utilities. Recommend planting both sides of street with Large/Extra Large sized trees - no additional infrastructure required. Already a number of trees, just need to infill empty areas.
SW 21st Avenue - 5' Swales - Typology B & D: Electric utility on west side. Recommend planting east side of street with Large/Extra Large sized trees and small trees on west side. *
SW 16th Avenue- 7' Swales - Typology B: Electric utility on east side. Recommend Large/Extra Large sized trees on west side, and Small on east side.
SW 13th Avenue - 6' Swales and 30' Median - Typology F & G: Electric utility in center median. This street already has many trees in the median with a sidewalk and is a great Green corridor already. Recommend planting small trees in the swales.
SW 10th Street - 7' Swales - Typology B & F: No Electric utilities. 10' Median between 22nd and 19th Avenues. Recommend Large/Extra Large sized trees on north side and medium on south side.
***SW 12th Street** 6' Swales - Typology D & B: Electric utility mostly on south side. Recommend Large/Extra Large sized trees on north side and small on south side. *
SW 14th Street 6' Swales - Typology D & B: Electric utility mostly on south side. Recommend Large/Extra Large sized trees on north side and small on south side. *
SW 16th Street 6' Swales - Typology D & B: Electric utility mostly on south side. Recommend Large/Extra Large sized trees on north side and small on south side. *
SW 10th Street Road 6' Swales - Typology D & B: Electric utility mostly on south side. Recommend Large/Extra Large sized trees on north side and small on south side. *

****Planting spaces will need to be built strategically in parking areas with infrastructure to allow larger trees. See "Typology Strategies" for Typology D streets.***

*****Care will need to be taken with placement for the areas where the swales are used for parking. See "Typology Strategies" for Typology C streets.***

SHENANDOAH SOUTH

Typology Approach

Shenandoah South Typology Mapping

Figure 66. Shenandoah South Street Typology Distribution

- Similar to Shenandoah North, Shenandoah South consists mainly of typology B streets which gives it an advantage towards having the capacity for more trees.
- In the Multifamily residential along SW 17th Avenue and in the nearby feeder streets, there is a need for more canopy as well as the infrastructure to support parking.
- In the North-west corner of the neighborhood along streets such as SW 16th Terrace there is a definite need for increased canopy but similar to some other neighborhoods the swales are much smaller. In this case planting smaller species would be the solution and the possible incorporation of infrastructure to support and expanded root zone may be required.

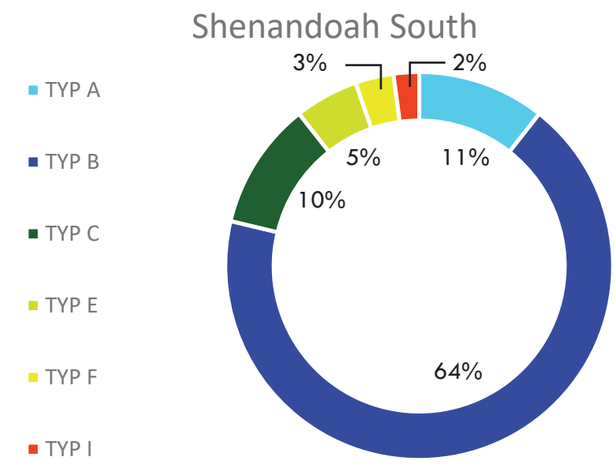


Figure 67. Shenandoah South Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Shenandoah South Urban Forestry Figures

Figure 68. Shenandoah South Tree Species Inventory

- Similar to many of the other neighborhoods, the issue of the excessive planting of palms is evident in Shenandoah South.
- Restricting the planting of newer palms as well as Mahoganies, which are over represented, should be followed within this neighborhood.
- As the neighborhood has the capacity for an increase in new plantings choosing appropriately sized trees for the swales from some of the other common species within Shenandoah South can create great variety within the canopy.
- The number of mature trees currently within the neighborhood is greater than the ideal. The addition of newer trees into the neighborhood will be important as some of those older trees begin to naturally die off at the end of their life cycles.

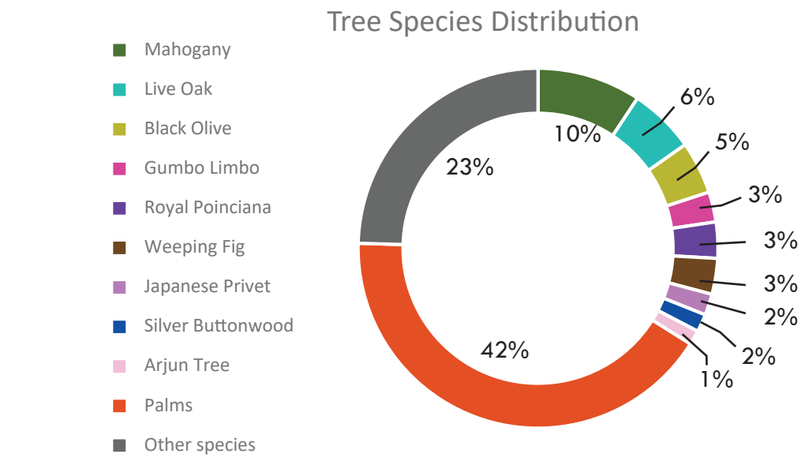


Figure 69. Shenandoah South Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

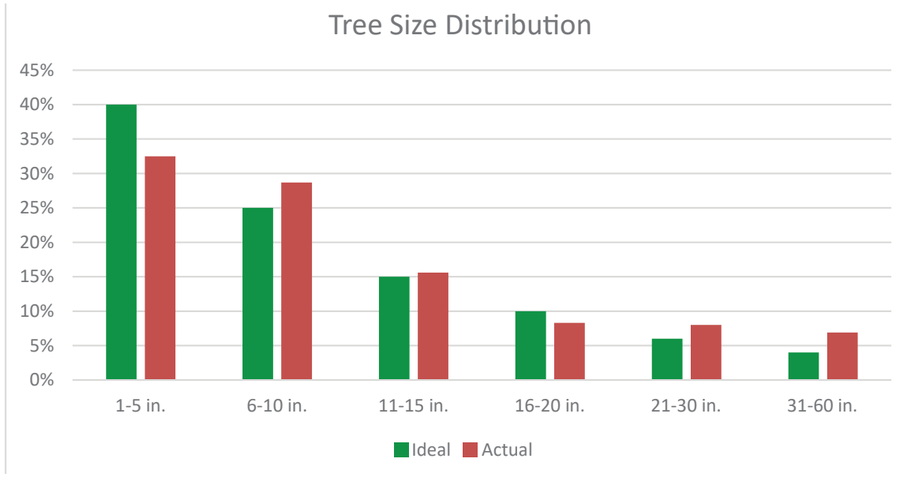


Figure 70. Shenandoah South Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

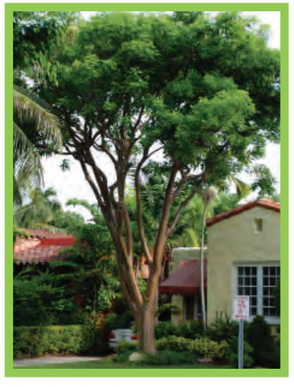
Species Diversity Proposal

Shenandoah South

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Shenandoah South	*Oak	Gumbo Limbo	Fiddlewood	Spanish Stopper
	Tamarind	Paradise Tree	Blolly	Red Stopper
			Allspice	
* Indicates that this species has almost reached its maximum capacity and planting should be limited				


*Oak


Tamarind


Gumbo Limbo


Paradise Tree


Fiddlewood


Blolly


Allspice


Spanish Stopper


Red Stopper

Non-Flowering

The mahogany is a species that has reached its maximum quantity and therefore no more should be planted unless it is to replace one that has died.


Mahogany

Species Diversity Proposal

Shenandoah South

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Shenandoah South	Royal Poinciana	Orange Geiger	Coconut Palms	Thatch Palms

Royal Poinciana

Orange Geiger

Coconut Palm

Thatch Palms

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

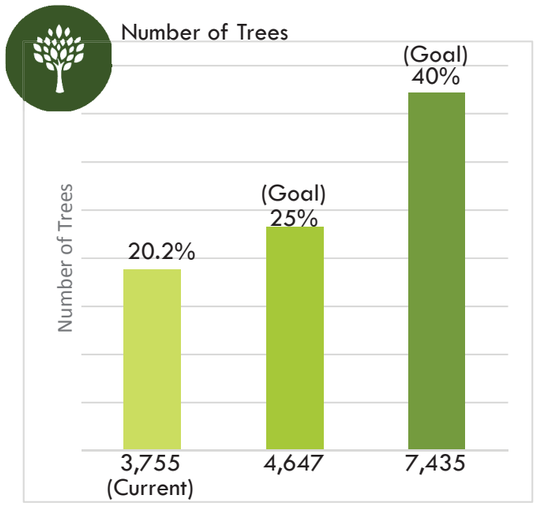
Median and swales on SW 22nd Avenue near Shenandoah Park
An example of a location where signature species could be used

Priority Streets and Canopy Coverage

Shenandoah South

Figure 71. Shenandoah South Priority Street Mapping

Current Canopy Coverage (20.2%)



Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- Hot spots within Shenandoah South occur in the north-western portion as well as surrounding SW 17th Avenue in the southern half of the neighborhood.
- SW 16th Street has extremely limited planted space within the hot spot area as it is a secondary arterial street transitioning to a lower trafficked neighborhood street within this area.
- SW 16th Terrace has utilities running along both sides of the street and small planting islands so the Small Swale/ Overhead Utilities Species Palette will be the main focus to incorporate new planting in this area.
- Higher density and a greater variety of street typologies makes the addition of new plantings in the eastern hot spot a more difficult task and will require proper planting and added infrastructure when necessary.

Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

42%

Connectivity and Walkability Strategy

Shenandoah South

Figure 72. Shenandoah South Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage. **If Shenandoah South was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 42%. If this same strategy was used but instead planting was maximized on the green corridors the canopy coverage within the R.O.W could be increased to as much as 50% within the neighborhood.**

Green Corridor Recommendations

SW 24th Avenue - 4' Swales - Typology B & A: Electric utility on east side. Curbed with parking on both sides. Recommend planting west of street with Large trees with infrastructure**-and west side with small/utility sized trees.

SW 21st Avenue - 4'-7' Swales - Typology B & D: Electric utility on west side for some of this street. Where the swale is 7' we recommend planting east side of street and west side (where there are no overhead lines) with Large/Extra Large sized trees** and small trees where the swale is only 4' or there are utility lines overhead.

SW 19th Avenue- 10' Swales (Only in some areas)- Typology B & D: Electric utility on east side. Parking on both sides with curbs in some areas. In areas where there is a swale we recommend Large/Extra Large sized trees on west side**, and Small/Utility sized on east side. Where there is no swale, we recommend creating islands on west side and planting Extra Large Trees with infrastructure.** Create fewer islands on east side and plant with Small/Utility sized trees. This is the asymmetrical planting plan spoken of in this report.

SW 13th Avenue - 6' Swales and 30' Median - Typology F & G: Electric utility in center median. This street already has many trees in the median with a sidewalk and is a great Green corridor already. Recommend planting small trees in the swales.

SW 16th Street - 5'-6' Swales, curbed with parking on both sides- Typology B & D: Electric utility on both sides -transmission on south (taller). Recommend creating islands on south side and planting Medium Trees with infrastructure.** Create fewer islands on north side and plant with Small/Utility sized trees.

SW 17th Street & Terrace- 9' Swales, curbed with parking on both sides - Typology B & C: Electric utility sporadic and crosses street. Recommend Large/Extra Large sized trees** where there are no overhead utilities, and Small/Utility sized where there are overhead utilities.

SW 19th Street - 8' Swales - Typology C & B & D: Some electric utility on west side. Recommend Large/Extra Large sized trees** where there are no overhead utilities, and Small/Utility sized where there are overhead utilities.

SW 21st Street - 4' & 7' Swales - curbed with parking on both sides Typology B & D: Some electric utility on east side. Where the swale is only 4' we recommend planting medium sized trees** Where the swale is 7' we recommend Large/Extra Large sized trees** and Small/Utility sized if overhead utilities are present.

Planting spaces will need to be built strategically in parking areas with infrastructure to allow larger trees. See "Typology Strategies" for Typology D streets.

** ***Infrastructure Required***

SILVER BLUFF

Typology Approach

Silver Bluff Typology Mapping

Figure 73. Silver Bluff Street Typology Distribution

- Silver Bluff consists of a high percentage of typology B streets along residential frontages which contributes to its higher tree canopy coverage many of its streets have the capacity to house trees within the swale without having the added pressure of residential parking.
- Along the typology A streets, which in this neighborhood makes up most of the Avenues the swales are also not likely to be burdened with residential parking which allows for the tree canopy to have high survival rates along these roads.
- The street typologies present in this neighborhood make increasing tree canopy fairly simple.

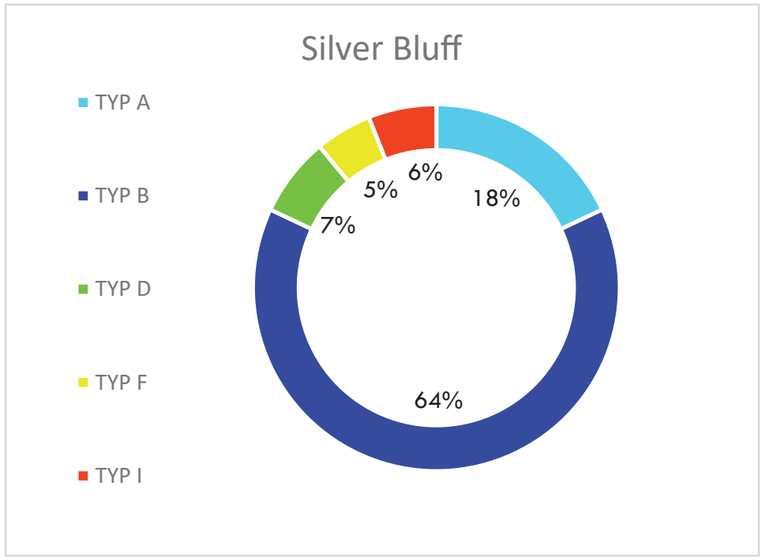


Figure 74. Silver Bluff Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Silver Bluff Urban Forestry Figures

Figure 75. Silver Bluff Tree Species Inventory

- Silver Bluff has the highest percentage of their canopy represented as palms with 50%.
- There is also a high percentages of other species like the Mahogany, also very prevalent within the neighborhood, surpassing the 10% suggested maximum percentage for one species.
- New palms should be extremely restricted in this neighborhood as well Mahoganies.
- Plantings should include diverse groups of new trees appropriately sized for their planting spaces.
- Based on the extremely low number of trees within the 6-10 in DBH class this indicated a critical issue with the maintenance of new trees that must be addressed within this neighborhood to sustain its current and incoming canopy.

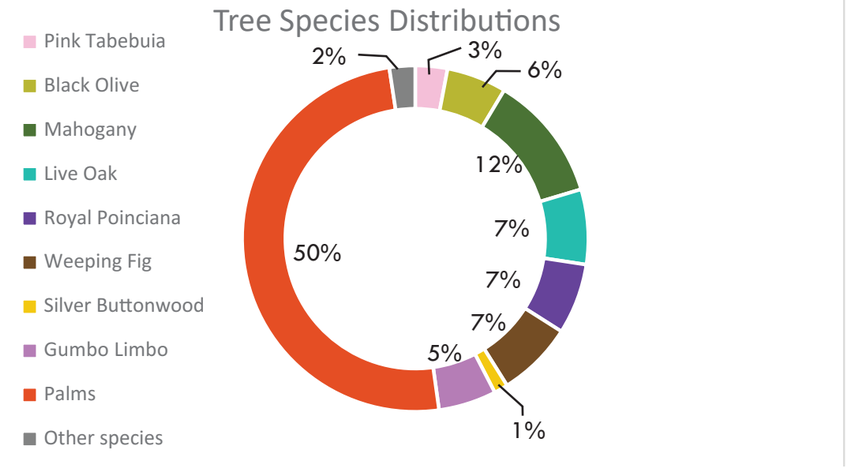


Figure 76. Silver Bluff Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

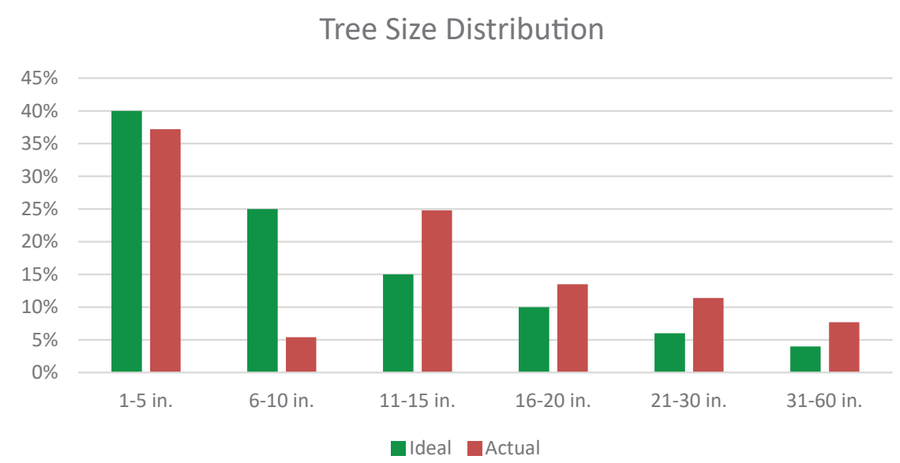


Figure 77. Silver Bluff Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

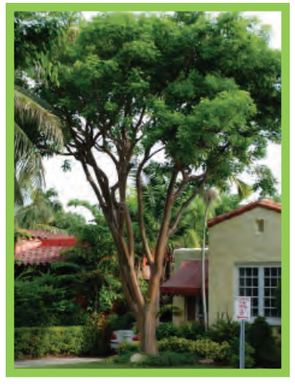
Species Diversity Proposal

Silver Bluff

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Silver Bluff	*Oak	Gumbo Limbo	Green Buttonwood	Spanish Stopper
	Tamarind	Mastic	Blolly	Red Stopper
		Jamaica Dogwood	Fiddlewood	
* Indicates that this species has almost reached its maximum capacity and planting should be limited				

Tamarind

*Oak



Gumbo Limbo

Mastic

Jamaican Dogwood

Green Buttonwood

Blolly

Fiddlewood

Spanish Stopper

Red Stopper

The mahogany is a species that has reached its maximum quantity and therefore no more should be planted unless it is to replace one that has died.

Mahogany

Species Diversity Proposal

Silver Bluff

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Silver Bluff	Royal Poinciana	Orange Geiger	Royal Palms	Thatch Palms

Royal Poinciana

Orange Geiger

Royal Palm

Thatch Palms

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Roundabout on SW 24th Avenue in Silver Bluff

An example of a location where signature species could be used

Priority Streets and Canopy Coverage

Silver Bluff

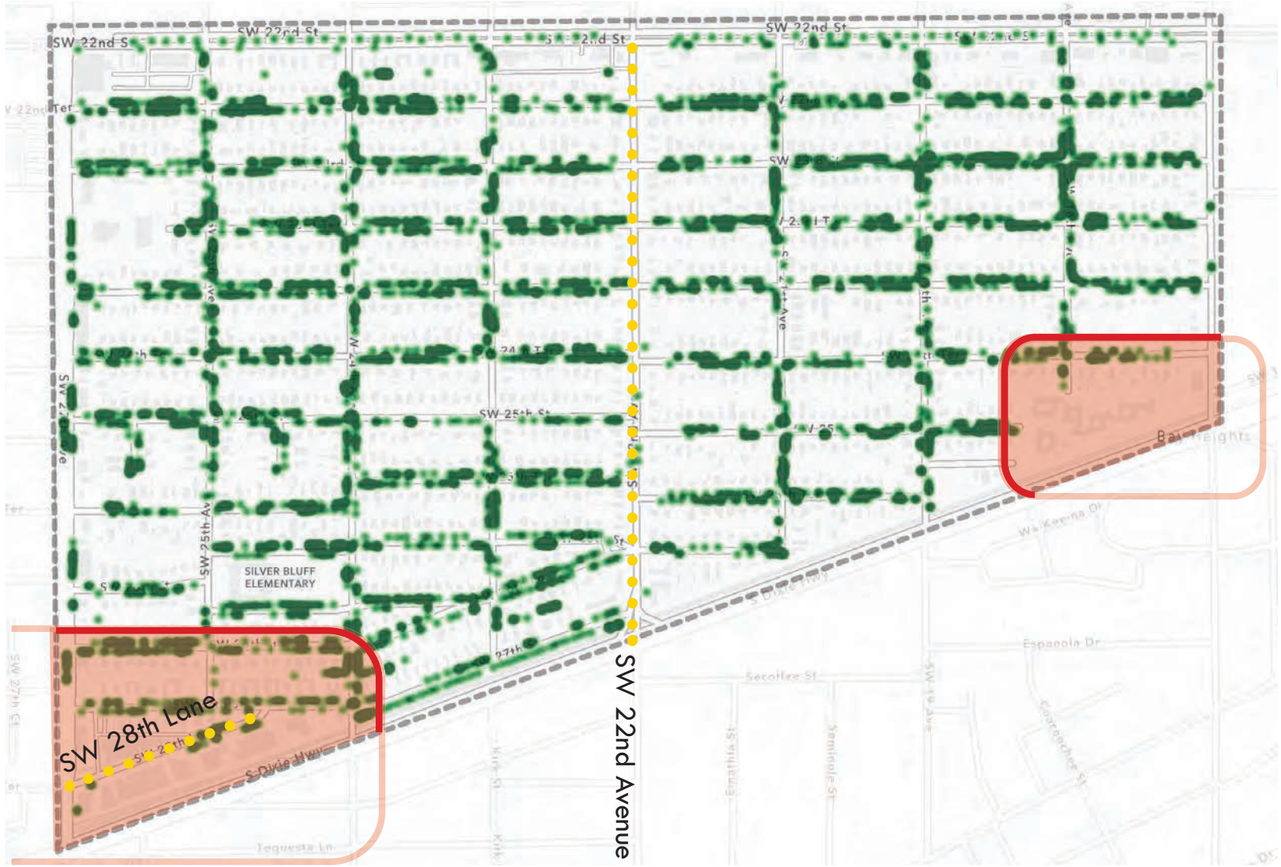
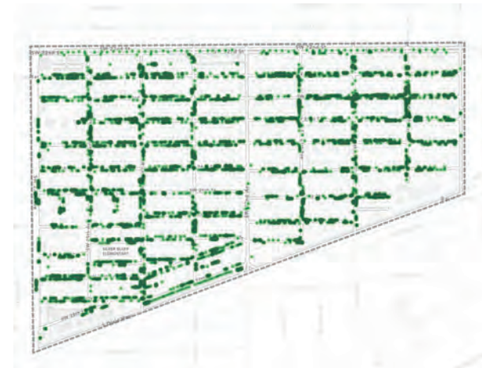


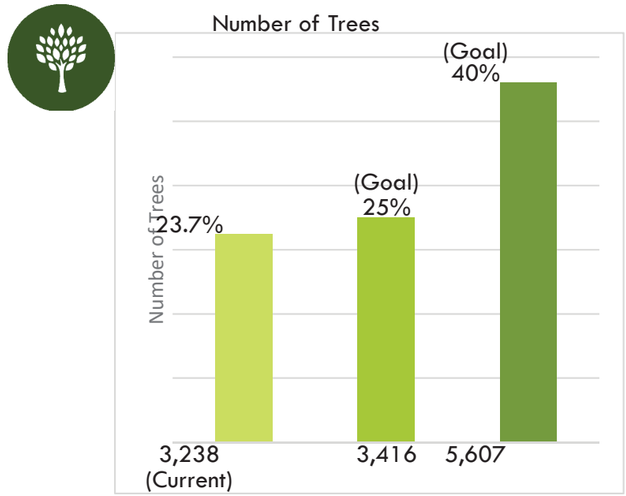
Figure 78. Silver Bluff Priority Street Mapping

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- With a relatively high canopy coverage percentage within the project area and a population with much less vulnerability, Silver Bluff has very few hot spots.
- Streets with the least existing planting would be SW 28th Lane and SW 22nd Avenue giving a level of priority for planting efforts.
- Having more commercial and industrial land usage surrounding SW 28th Lane parking is a concern for spacing so working with that constraint is important with deciding planting areas and infrastructure.
- SW 22nd Avenue has a few existing planted medians and no swales, so to increase planting along that roadway it would require reworking some existing non-planted medians with new infrastructure.



Current Canopy Coverage (23.7%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

42%

Connectivity and Walkability Strategy

Silver Bluff

Figure 79. Silver Bluff Connective Farbic Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage. **If Silver Bluff was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 45%. If this same strategy was used but instead planting was maximized on the green corridors the canopy coverage within the R.O.W could be increased to as much as 53% within the neighborhood.**

Green Corridor Recommendations

SW 24th Avenue- 8' Swales - Typology B: Curbed with parking both sides; Electric utility on west side. Recommend creating islands on east side and planting Extra Large Trees with infrastructure.** Plant Small/Utility sized trees on the west side. This is the asymmetrical planting plan spoken of in this report.
SW 24th Terrace - 7' Swales - Typology B & A: Curbed with parking both sides; Electric utility switches sides of the street several times. Recommend planting Small/Utility sized trees in clusters on sides of the street where there are utility lines. On sides of the street where there are no utility lines we recommend planting Large/Extra Large trees with infrastructure**.
SW 26th Street - 7' Swales, Curbed (mostly) with parking both sides - Typology B & A: Curbed with parking both sides; Electric utility switches sides of the street several times. Recommend planting Small/Utility sized trees in clusters on sides of the street where there are utility lines. On sides of the street where there are no utility lines we recommend planting Large/Extra Large trees with infrastructure**.
SW 24th Avenue - 8' Swales - Typology B: Curbed (mostly) with parking both sides - Electric utility on west side. Recommend creating islands on east side and planting Large/Extra Large trees.** On west side we recommend planting in Small/Utility sized trees in clusters.
SW 21st Avenue - 5' Swales - Typology A & E: Curbed north of SW 24th Terrace with parking on both sides. Electric utility on east side between SW 25th and SW 26th streets. Recommend creating islands on both sides and planting Small/Utility trees in clusters where there are overhead utilities. Everywhere else we recommend creating islands and planting Large/Extra Large trees with infrastructure.**

** ***Infrastructure Required***

LATIN QUARTER

Typology Approach

Latin Quarter Typology Mapping

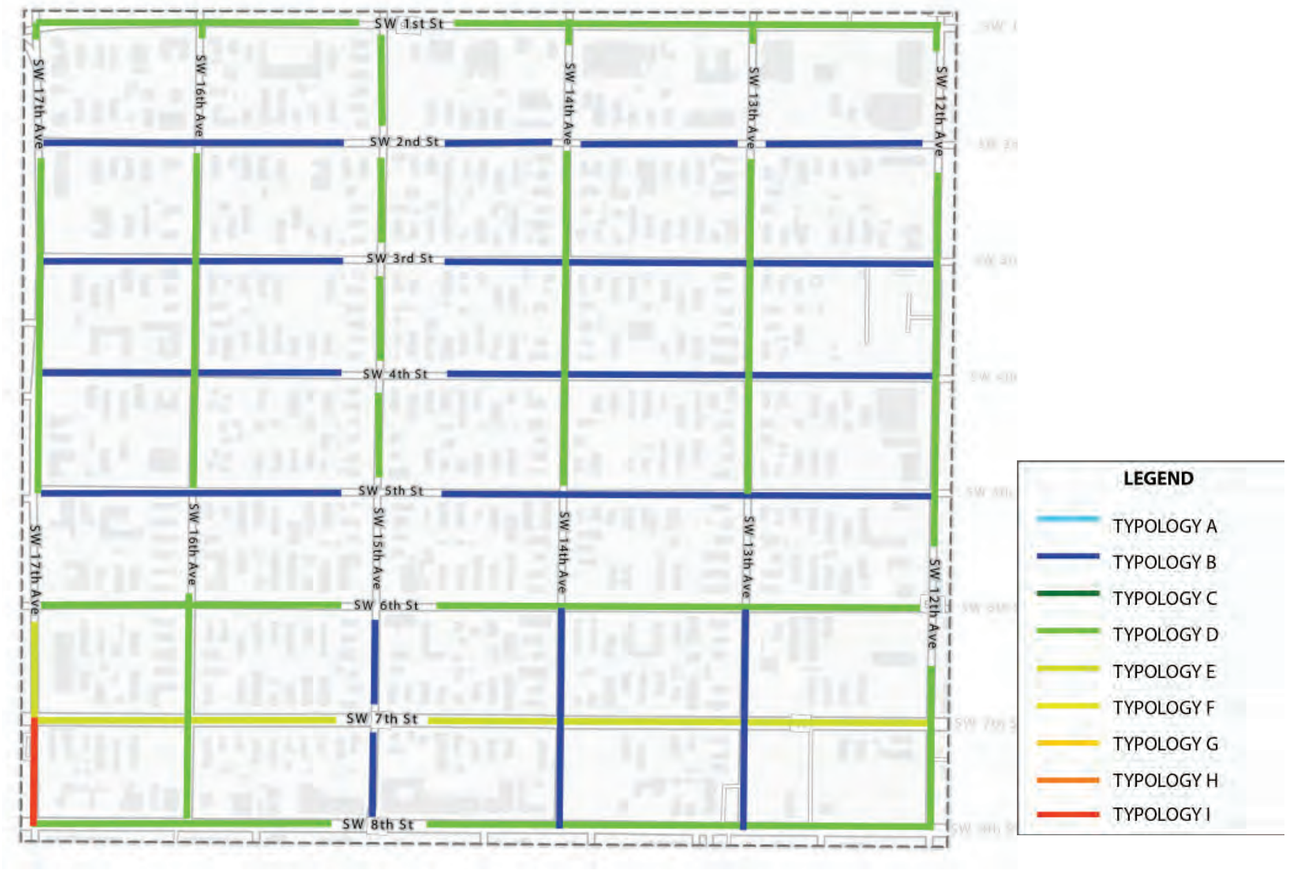


Figure 80. Latin Quarter Street Typology Distribution

- The Latin Quarter neighborhood has within its residential streets a large portion of typology B streets often with curbs that protect the swale from residents parking on them.
- Another large portion of the streets within the Latin Quarter are typology D which do not have swales but have on-street parking. In these cases to provide for more planting space along these streets it will be necessary to remove parking spaces in strategic locations, or possibly on one way streets, as many of the streets are within this neighborhood, reducing a lane could provide a solution.

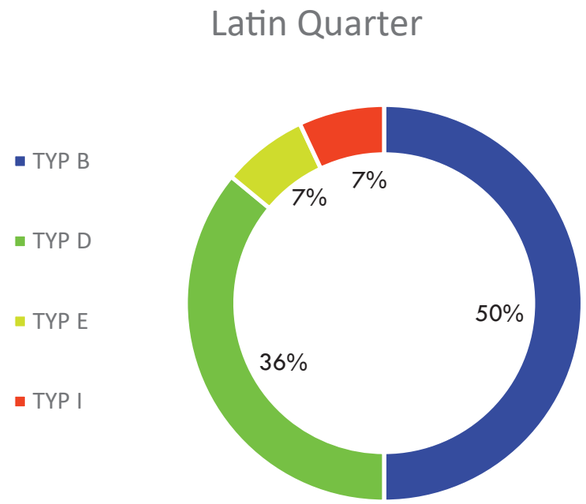


Figure 81. Latin Quarter Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Latin Quarter Urban Forestry Figures

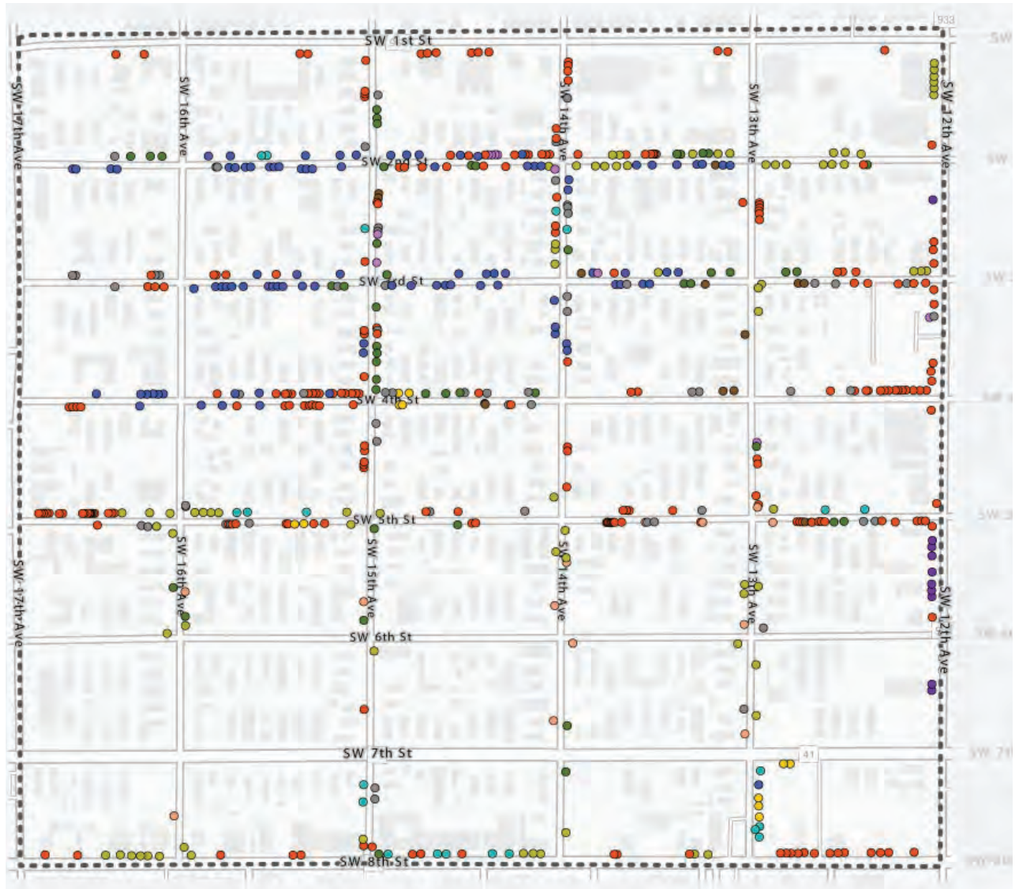


Figure 82. Latin Quarter Tree Species Inventory

- Due to the high usage of palms (38%) as well as both the Silver and green Buttonwood species (18%) the Arecaceae family and Concarpus genus have surpassed or are nearing maximum percentages.
- It would be recommended to restrict the planting of these species within the new plantings and use a more diverse set of species throughout all swale sizes to increase neighborhood biodiversity.
- The lower percentages of smaller and moderately small trees shows that many new trees haven't been incorporated within the neighborhood in recent years but that the maintenance of the existing trees has been successful with greater percentages of mature tree sizes.
- Boosting the number of new trees will ensure the creation of a more resilient canopy over time as older trees eventually die off at the end of their life cycles.

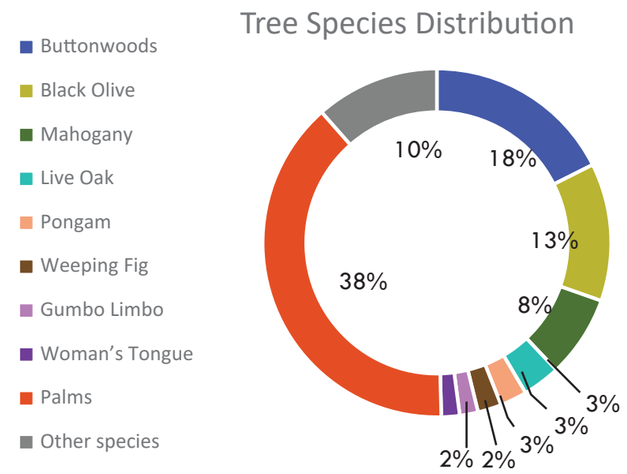


Figure 83. Latin Quarter Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

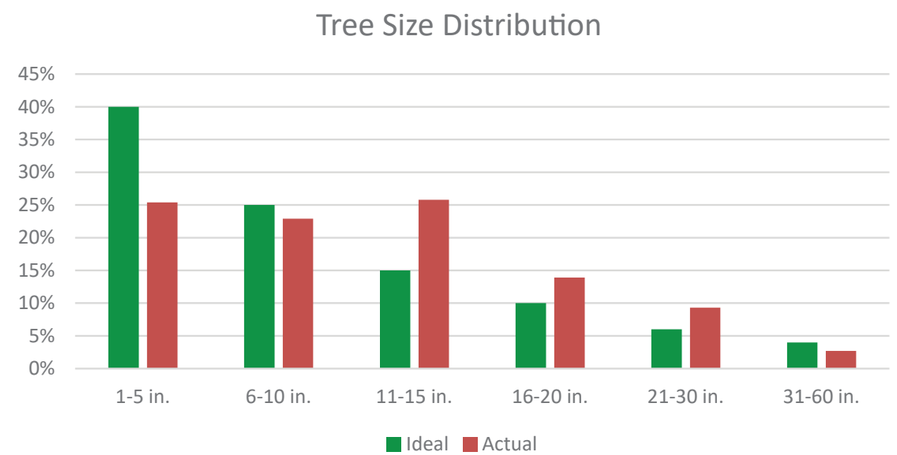


Figure 84. Latin Quarter Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

Latin Quarter

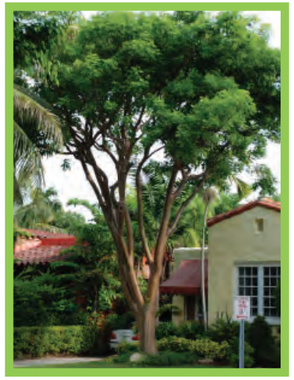
Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Latin Quarter	*Mahogany	Gumbo Limbo	Blolly *	Silver Buttonwood
	Oak	Mastic	Fiddlewood	Simpson's Stopper
	Tamarind	Jamaica Dogwood		Spanish Stopper
* Indicates that this species has almost reached its maximum capacity and planting should be limited				

*Mahogany

Oak

Tamarind

Mastic



Gumbo Limbo

Jamaican Dogwood

Blolly

Fiddlewood

*Silver Buttonwood

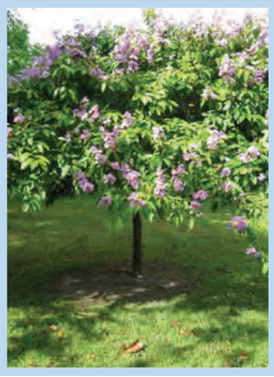
Simpson's Stopper

Spanish Stopper

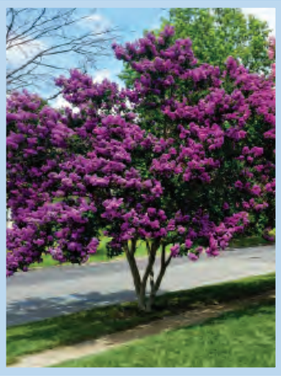
Non-Flowering

Species Diversity Proposal
Latin Quarter

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Latin Quarter	Queen Crape Myrtle	Purple Crape Myrtle	Date Palms	Spindle Palms



Queen Crepe Myrtle



Purple Crepe Myrtle

Date Palms

Spindle Palms

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Median on SW 17th Avenue in the Latin Quarter
An example of a location where signature species could be used

Priority Streets and Canopy Coverage

Latin Quarter

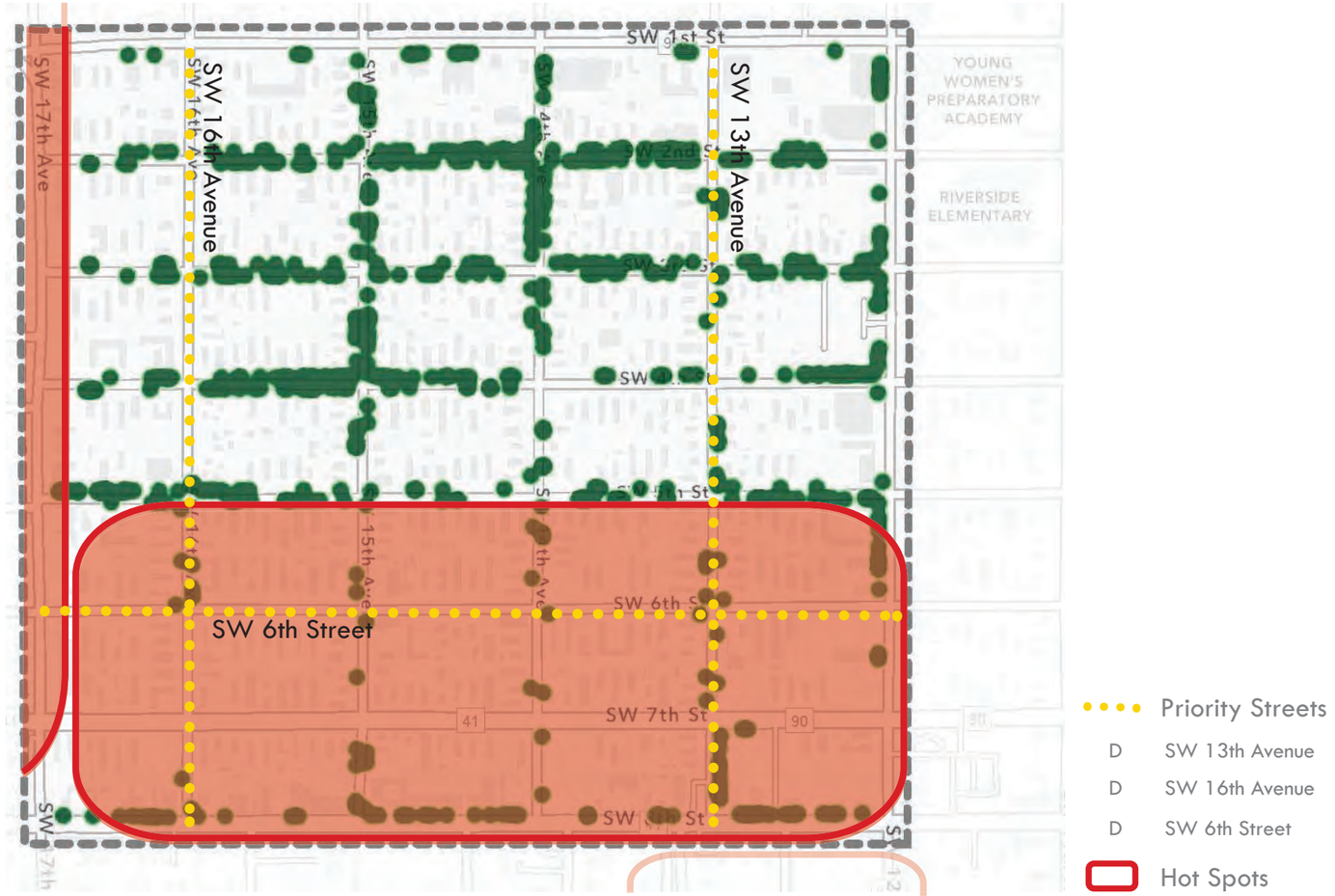
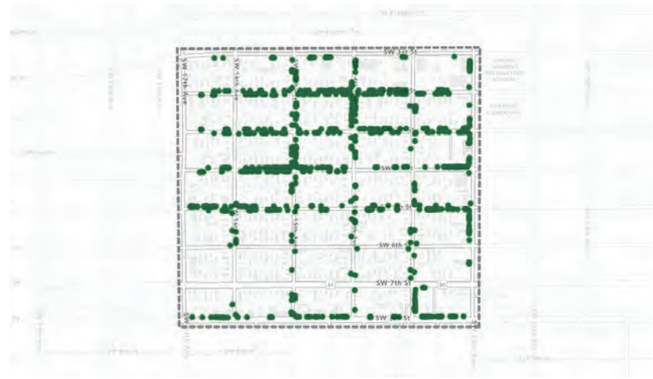


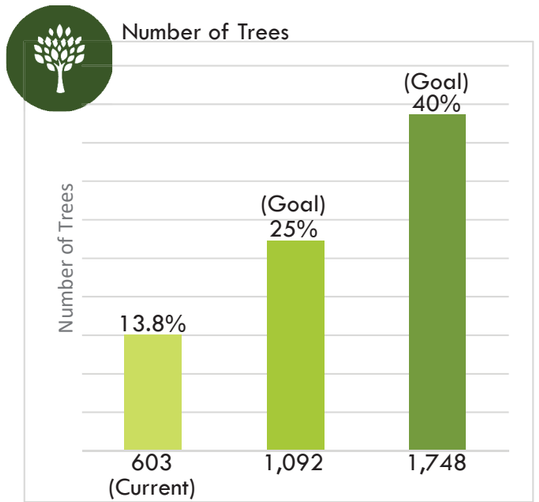
Figure 85. Latin Quarter Priority Street Mapping

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- Within the Latin Quarter neighborhood the southern portion is the most in need of canopy along SW 6th and 7th Streets as well as along SW 16th Avenue.
- Based on the typology of SW 7th street there is no space for planting leaving SW 6th Street and SW 16th Avenue as the top priorities.
- The swales along many of the streets are in the smaller size range so planting new trees following the appropriate street tree palette is necessary, unless it is planned to incorporate underground infrastructure to accommodate larger trees.



Current Canopy Coverage (13.8%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

38%

Connectivity and Walkability Strategy

Latin Quarter

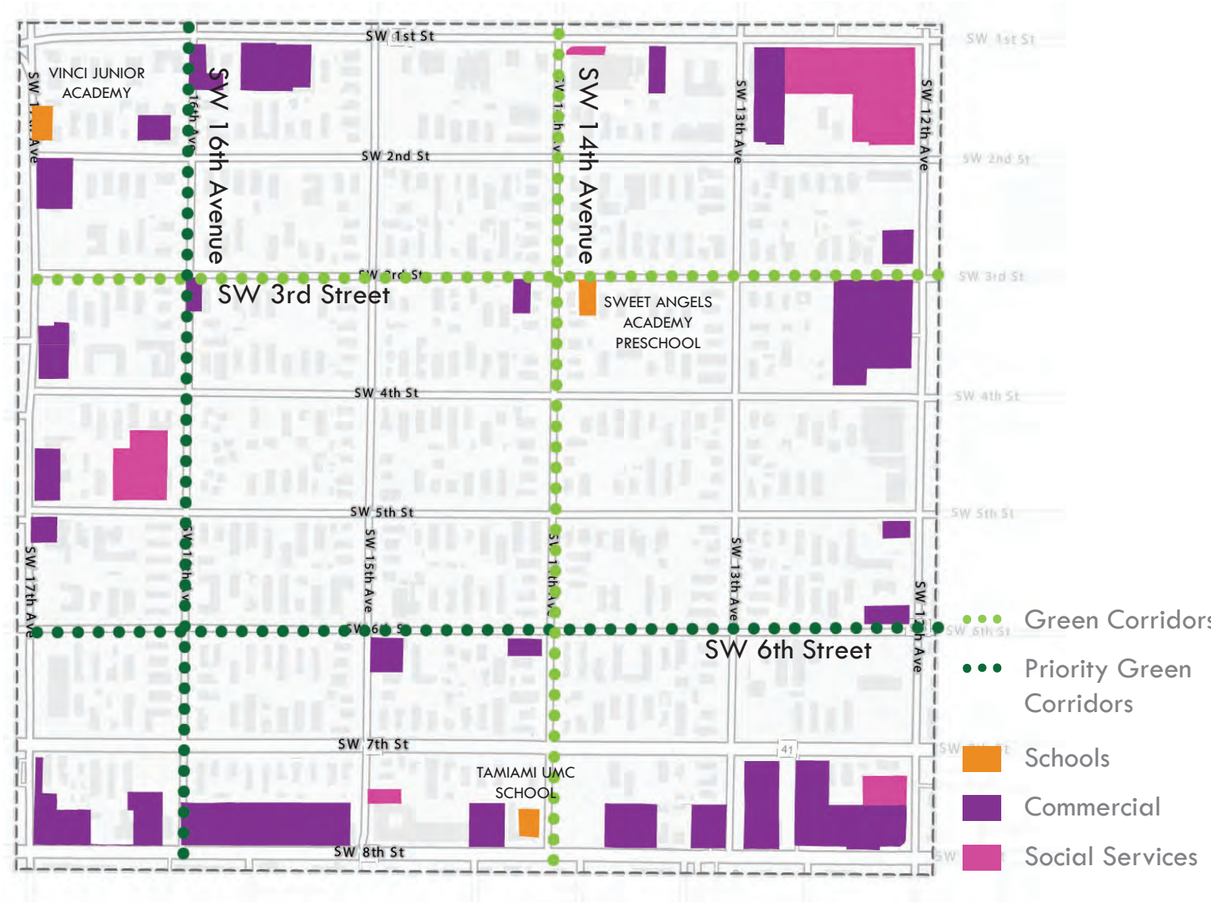


Figure 86. Latin Quarter Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage. **If Latin Quarter was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 33%. If this same strategy was used but instead planting was maximized on the green corridors the canopy coverage within the R.O.W could be increased to as much as 45% within the neighborhood.**

Green Corridor Recommendations

SW 16th Avenue- No Swales - Typology D: Curbed with parking both sides; Electric utility on west side. Recommend creating islands on east side and planting Extra Large Trees with infrastructure.** Create fewer islands on west side and plant with Small/Utility sized trees. This is the asymmetrical planting plan spoken of in this report.

SW 14th Avenue - 5' Swales - Typology D: Curbed with parking both sides; Electric utility on both sides. Recommend planting Small/Utility sized trees on both sides of the street, in clusters.

SW 3rd Street - 5' Swales, Curbed with parking both sides - Typology B: Electric utility on south side. Recommend Large sized trees on the north side with infrastructure, and Small/Utility sized trees on the south side.

SW 6th Street - No Swales - Typology D: Electric utility on both sides. Recommend creating islands on both sides and planting Small/Utility trees in clusters with infrastructure.**

** ***Infrastructure Required***

EAST LITTLE HAVANA

Typology Approach

East Little Havana Typology Mapping

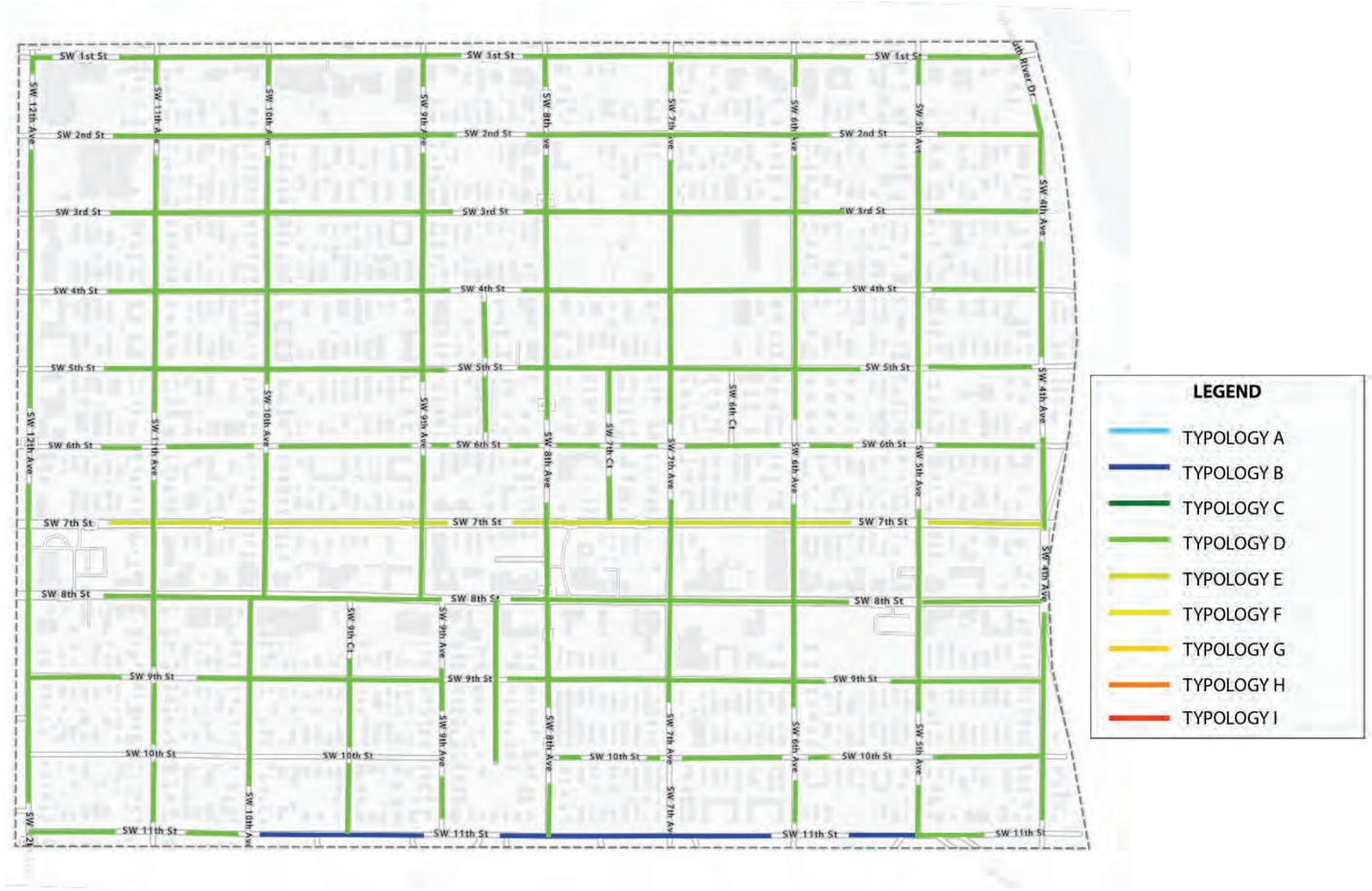


Figure 87. East Little Havana Street Typology Distribution

- East Little Havana is one of if not the most densely populated neighborhood within the project area. It has an extremely high percentage of typology D streets whose on street parking supports the mostly multi-family residences of the neighborhood.
- Little space is currently existing for tree canopy within the neighborhood which has high percentages of residents who walk and take advantage of public transportation.
- Much of the neighborhood falls within a high priority zone to increase canopy which will likely have to be at the sacrifice of a portion of the neighborhoods on-street parking in some strategic locations to make the sidewalk experience for residents more comfortable.

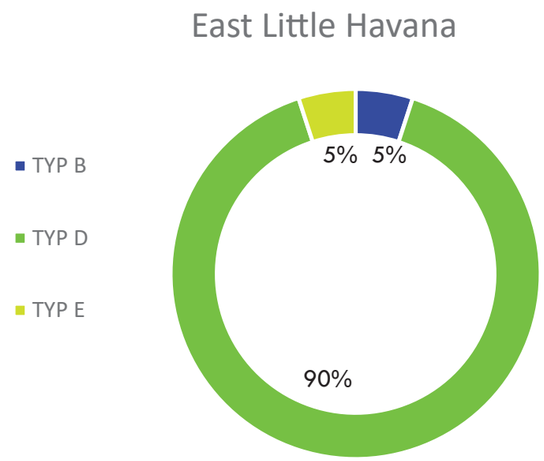


Figure 88. East Little Havana Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Urban Forestry Strategy

East Little Havana Urban Forestry Figures

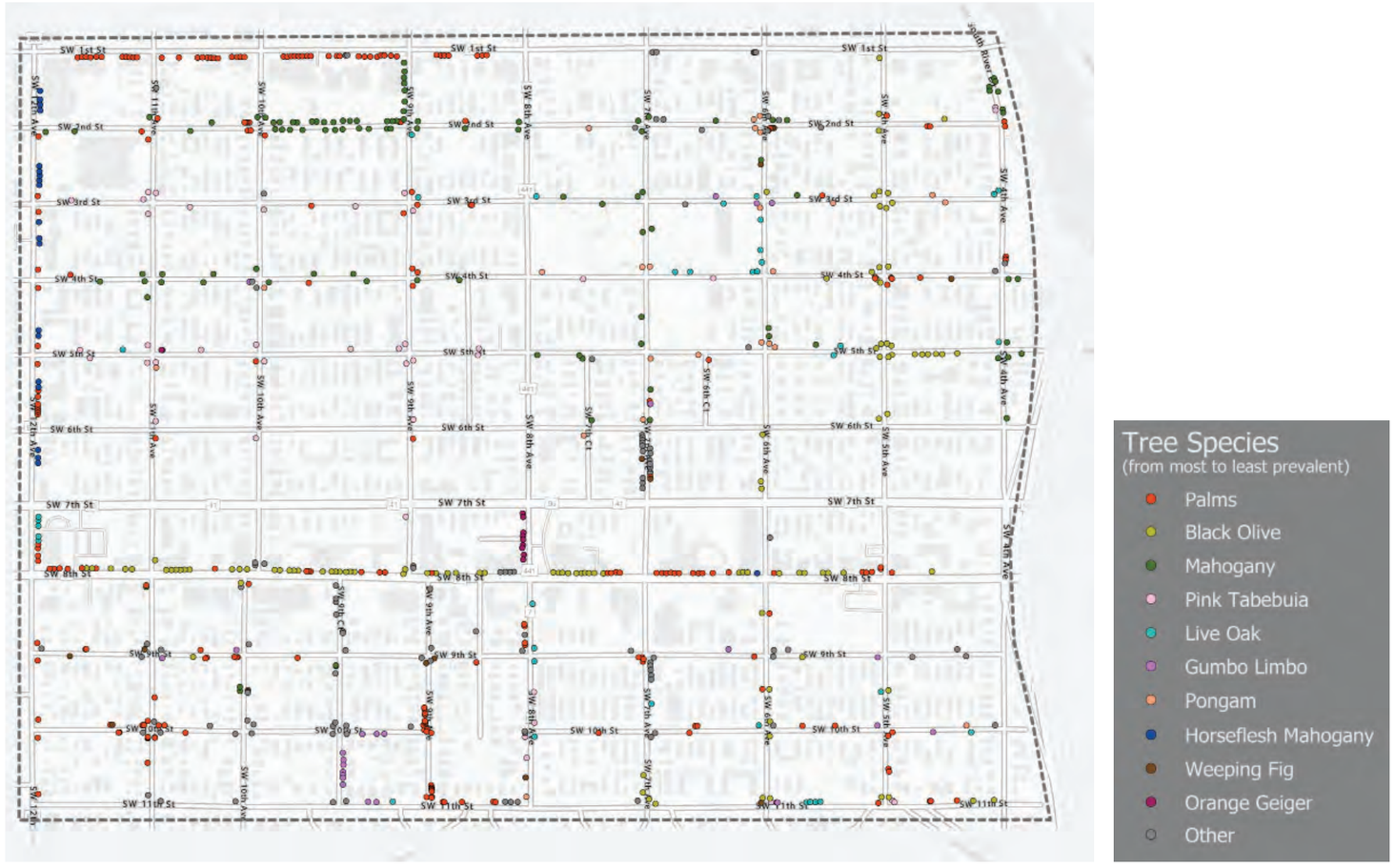


Figure 89. East Little Havana Tree Species Inventory

- East Little Havana also has one of the lowest percentages of palms which is a positive for its neighborhood biodiversity.
- Palms should still be restricted to only when absolutely necessary due to spacing. A similar designation should be given to Mahoganies and Black Olives within East Little Havana.
- Much of the planting space that would be able to be provided by selectively reducing parking would likely support smaller to medium sized tree species creating a diverse group of new species to add to the neighborhood.
- Though the maintenance of older larger trees within East Little Havana seems to be helping to keep the existing canopy, as those larger trees end their life cycles, new trees will be needed to sustain a healthy canopy.

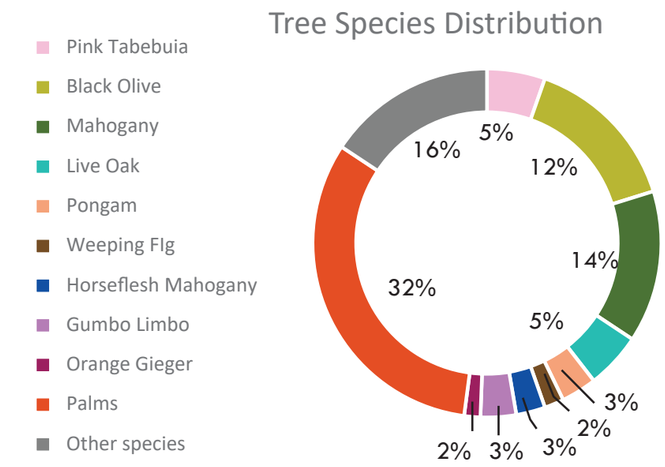


Figure 90. East Little Havana Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

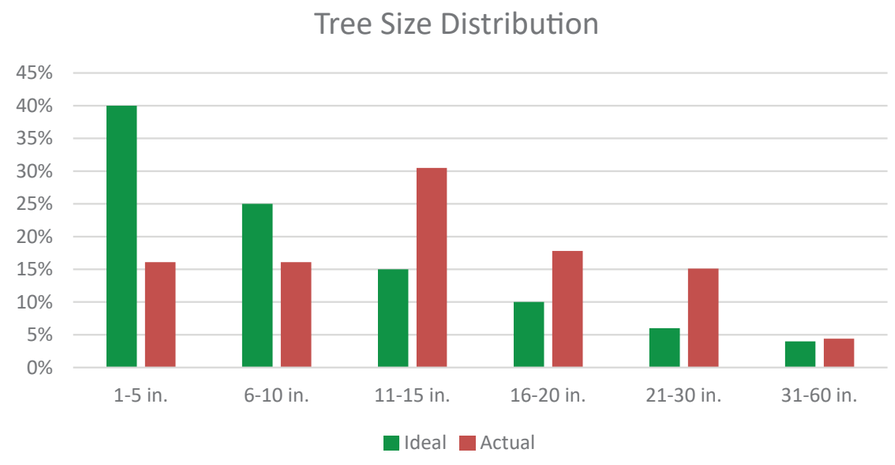


Figure 91. East Little Havana Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

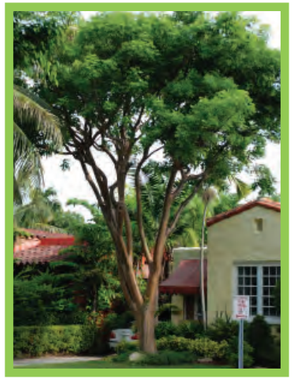
East Little Havana

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
East Little Havana	Tamarind	Mastic	Green Buttonwood	Spanish Stopper
	Oak	Gumbo Limbo	Blolly	Simpson's Stopper
		Jamaica Dogwood	Fiddlewood	

Tamarind

Oak

Mastic



Gumbo Limbo

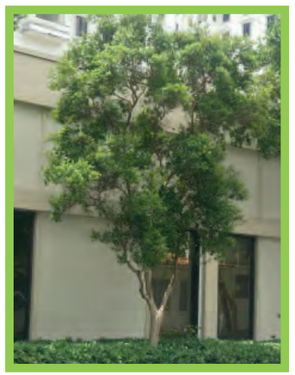
Jamaican Dogwood

Green Buttonwood

Blolly

Fiddlewood

Spanish Stopper



Simpson's Stopper

The mahogany is a species that has reached its maximum quantity and therefore no more should be planted unless it is to replace one that has died.

Mahogany

Non-Flowering

Species Diversity Proposal

East Little Havana

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
East Little Havana	Yellow Tabebuia	Orange Geiger		Cabbage Palms

Yellow Tabebuia

Orange Geiger

Cabbage Palm

Due to the limitations of the planting areas in this neighborhood, no large species palms are recommended.

Flowering

Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Swales on SW 8th Street in East Little Havana

An example of a location where signature species could be used

The Royal Palm is a species that has reached its maximum quantity and therefore no more should be planted unless it is to replace one that has died.

Royal Palm

Priority Streets and Canopy Coverage

East Little Havana

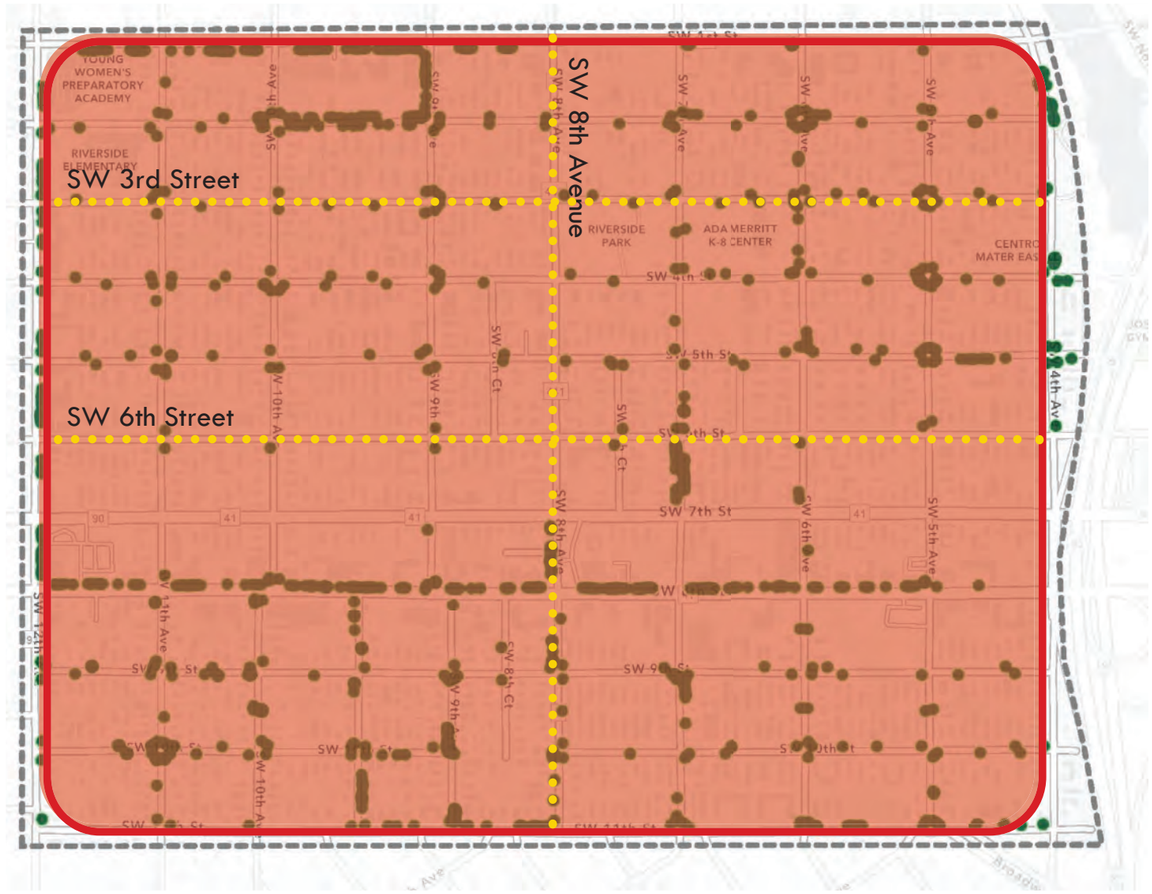
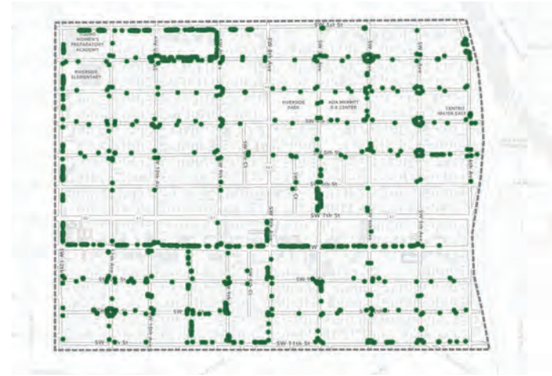


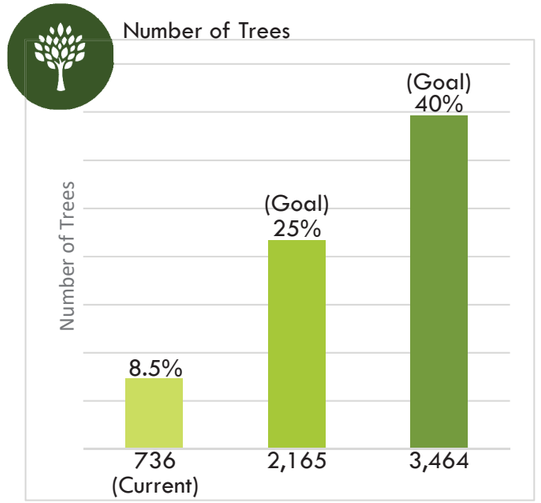
Figure 92. East Little Havana Priority Street Mapping

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- East Little Havana is a neighborhood with very low existing canopy coverage and high vulnerability within the population, putting the entire neighborhood as a high priority zone for new planting.
- Streets with the least existing canopy are SW 8th Avenue and SW 6th Street which would benefit the most from immediate additional planting.
- As an internal neighborhood arterial street connecting to nearby transportation lines and local parks, increasing the walkability along SW 8th Avenue has great importance, along with connecting SW 3rd Street to Ada Merritt K-8 Center.



Current Canopy Coverage (8.5%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

34%

Connectivity and Walkability Strategy

East Little Havana

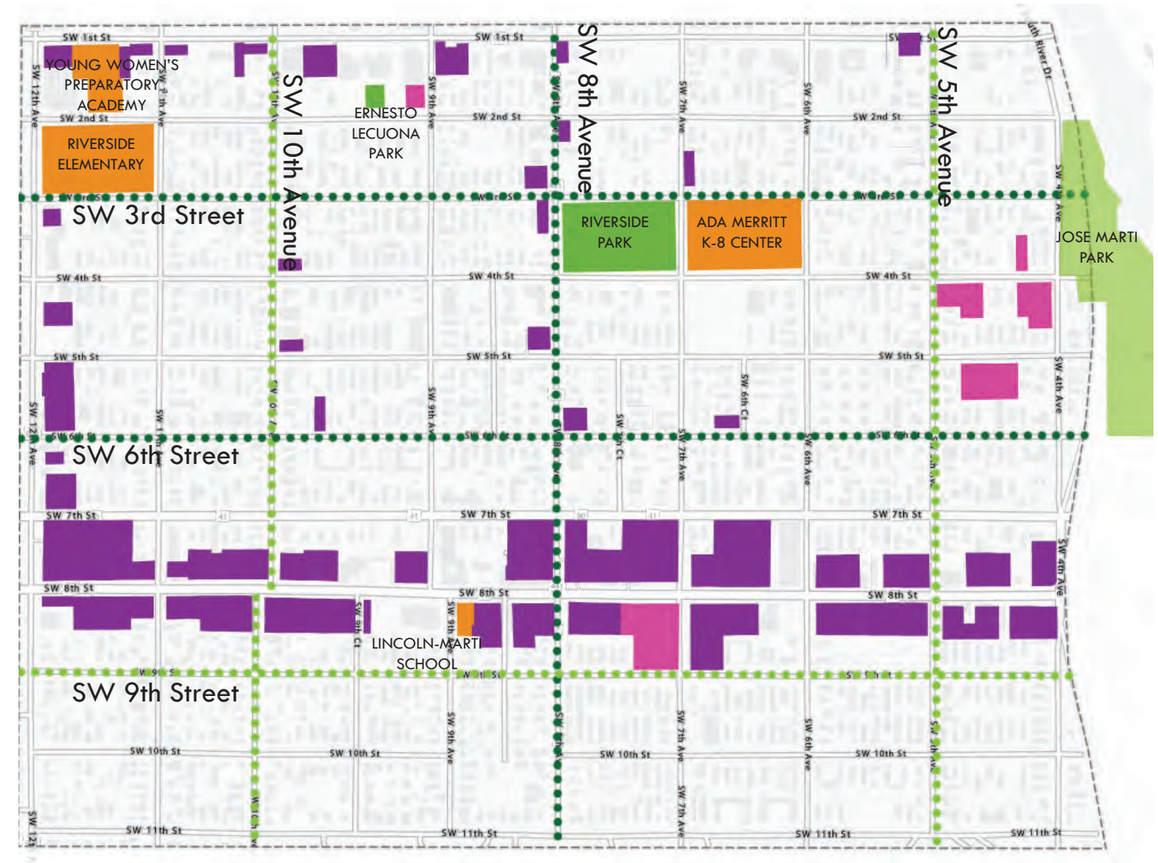


Figure 93. East Little Havana Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage. **If East Little Havana was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 34%. If this same strategy was used but instead planting was maximized on the green corridors the canopy coverage within the R.O.W could be increased to as much as 41% within the neighborhood.**

Green Corridor Recommendations

SW 3rd Street- No Swales - Typology D: Curbed with parking on both sides. Electric utility on south side. Recommend creating islands on north side and planting Extra Large Trees with infrastructure.** Create fewer islands on south side and plant with Small/Utility sized trees. This is the asymmetrical planting plan spoken of in this report.

SW 6th Street - No Swales - Typology D: Curbed with parking on both sides. Electric utility on south side. Recommend creating islands on north side and planting Extra Large Trees with infrastructure.** Create fewer islands on south side and plant with Small/Utility sized trees. This is the asymmetrical planting plan spoken of in this report.

SW 9th Street - No Swales - Typology D: Curbed with parking on both sides. Electric utility on north side. Recommend creating islands on south side and planting Extra Large Trees with infrastructure.** Create fewer islands on north side and plant with Small/Utility sized trees. This is the asymmetrical planting plan spoken of in this report.

SW 10th Avenue - No Swales- Typology D: Curbed with parking on both sides. Electric utility on West side. Recommend creating islands on east side and planting Extra Large Trees with infrastructure.** Create fewer islands on west side and plant with Small/Utility sized trees.* This is the asymmetrical planting plan spoken of in this report.

SW 8th Avenue- - No Swales- Typology D: Curbed with parking on both sides. Electric utility on West side. Recommend creating islands on east side and planting Extra Large Trees with infrastructure.** Create fewer islands on west side and plant with Small/Utility sized trees. This is the asymmetrical planting plan spoken of in this report.

SW 5th Avenue- - No Swales- Typology D: Curbed with parking on both sides. Electric utility on West side. Recommend creating islands on east side and planting Extra Large Trees with infrastructure.** Create fewer islands on west side and plant with Small/Utility sized trees. This is the asymmetrical planting plan spoken of in this report.

** ***Infrastructure Required***

THE ROADS

Typology Approach

Roads Typology Mapping

Figure 94. Roads Street Typology Distribution

- The Roads neighborhood has vegetated swales in nearly 85% of its streets and has the highest tree canopy of all the neighborhoods within the project area.
- Increasing the canopy coverage within the neighborhood can be evenly dispersed however as this neighborhood has already surpassed the first goal of 25% canopy coverage new planting efforts should start in lower coverage neighborhoods first.

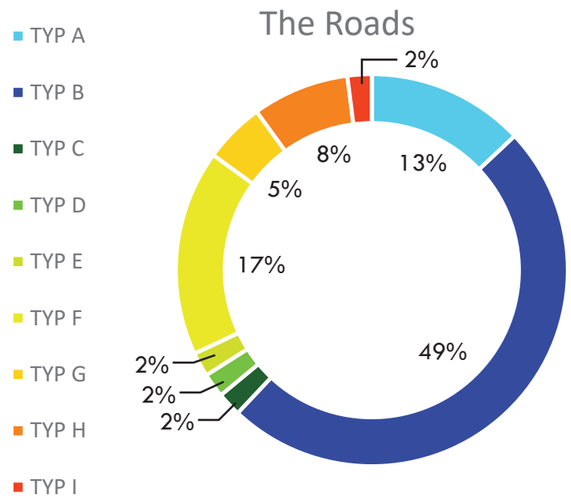


Figure 95. Roads Street Typology Distribution

TYPOLOGY A

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY B

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON STREET PARKING
- SIDEWALKS

TYPOLOGY C

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALES
- NO OFFICIAL PARKING (CARS PARKING ON SWALE)
- SIDEWALKS

TYPOLOGY D

GENERAL CHARACTERISTICS:

- NO SWALES
- ON-STREET PARKING
- SIDEWALKS

TYPOLOGY E

GENERAL CHARACTERISTICS:

- NO SWALES
- NO PARKING
- SIDEWALKS

TYPOLOGY F

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- ON-STREET PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY G

GENERAL CHARACTERISTICS:

- VEGETATED SWALES
- NO PARKING
- VEGETATED MEDIANS
- SIDEWALKS

TYPOLOGY H

GENERAL CHARACTERISTICS:

- PAVED/DIRT SWALE
- NO PARKING
- VEGETATED MEDIAN
- SIDEWALKS

TYPOLOGY I

GENERAL CHARACTERISTICS:

- NO SWALE
- VEGETATED MEDIAN
- NO PARKING
- SIDEWALKS

Urban Forestry Strategy

Roads Urban Forestry Figures

Figure 96. Roads Tree Species Inventory

- The Roads neighborhood has a relatively moderate percentage of palms at 34% which is just 4% higher than ideal.
- Planting more diverse species will give greater resiliency to the existing canopy as it increases biodiversity.
- With the number of Mahoganies over the 10% standard for one tree species their planting should be extremely limited in new plantings.
- The maintenance of older mature trees within the Roads is showing to be very successful, however as these trees reach the end of their life cycles it will create holes in the canopy.
- Increasing the number of newer, smaller trees will help to strengthen the sustainability of the canopy.

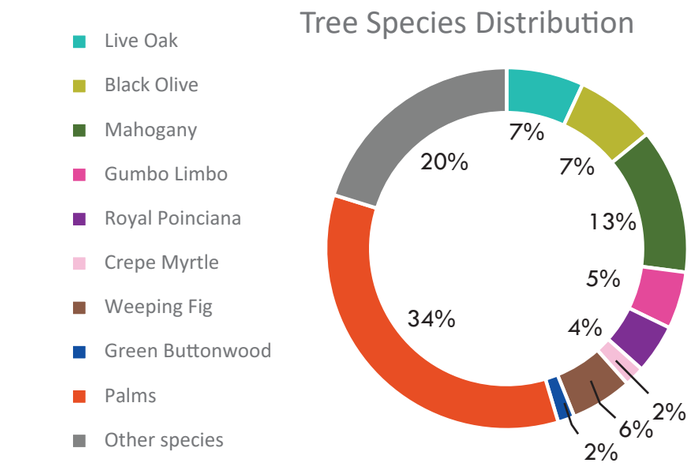


Figure 97. Roads Tree Species Percentage Distribution

The widely accepted urban forestry standards for biodiversity developed by F.S. Santamour recommend following a 30/20/10 rule with a maximum of 30% of the urban forest being from the same plant family, 20% from the same genus and 10% from the same species.

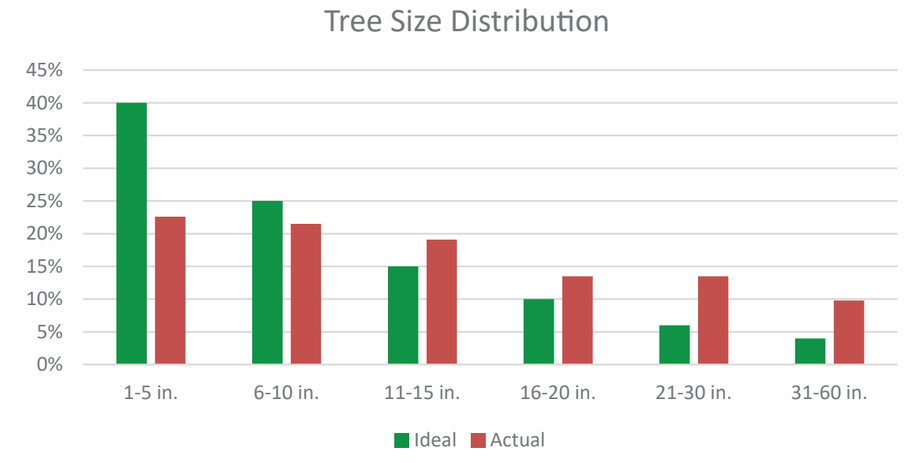


Figure 98. Roads Tree Size Distribution

The McPherson ideal distribution standard for urban forestry recommends 40% of the urban forest being 0-6" DBH, 25% 6"-12", 15% 12-18", 10% 18-24" 6% 24-30" and 4% >30".

Species Diversity Proposal

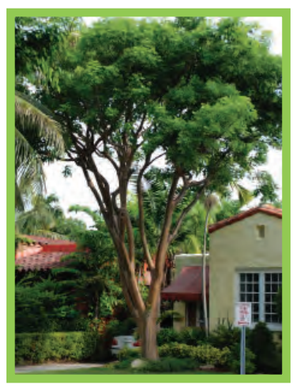
Roads

Preferred Species				
Neighborhood	Extra large Trees	Large Trees	Medium Trees	Small Trees
Roads	*Oak	Mastic	Satinleaf	Silver Buttonwood
	Tamarind	Gumbo Limbo	Green Buttonwood	Lignum Vitae
		Jamaican Dogwood		Fiddlewood
* Indicates that this species has almost reached its maximum capacity and planting should be limited				

*Oak

Tamarind

Mastic



Gumbo Limbo

Jamaican Dogwood

Satinleaf

Green Buttonwood

Silver Buttonwood

Lignum Vitae

Fiddlewood

Non-Flowering

Flowering

The mahogany is a species that has reached its maximum quantity and therefore no more should be planted unless it is to replace one that has died.

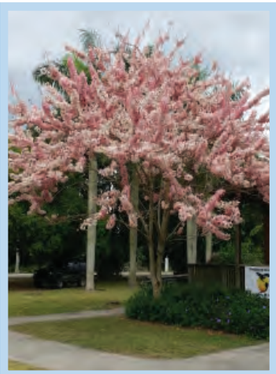
Mahogany

Species Diversity Proposal

Roads

Signature Species				
Neighborhood	Accent Trees-Large	Accent Trees-Small	Accent Palms-Large	Accent Palms-Small
Roads	*Royal Poinciana	Red Crape Myrtle	Bismark Palms	Thatch Palms
	Apple Blossom			
* Indicates that this species has almost reached its maximum capacity and planting should be limited				

*Royal Poinciana



Apple Blossom Tree

Red Crape Myrtle

Bismark Palm

Thatch Palm

Flowering

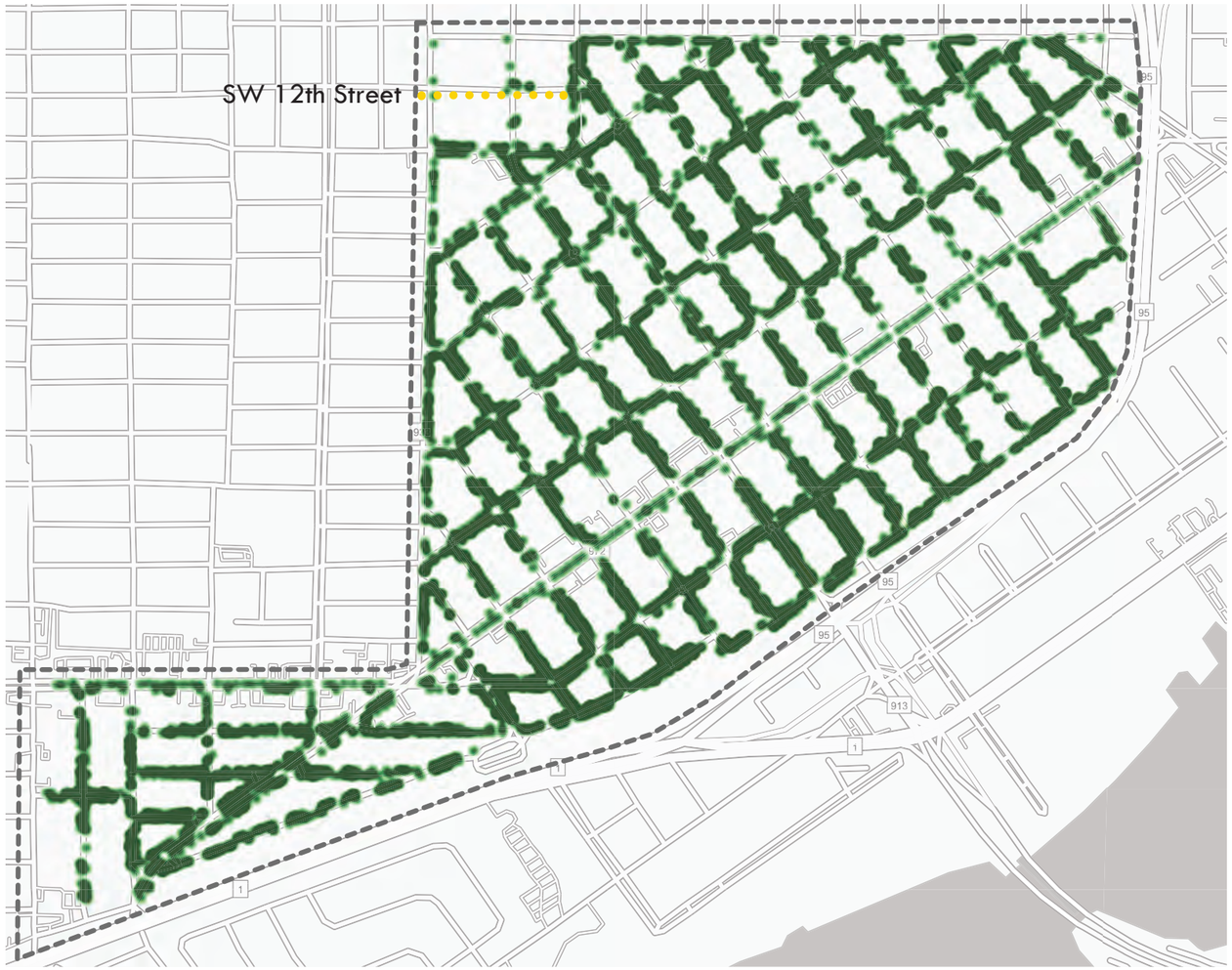
Palms

Signature species should be used in highly visible locations such as in roundabouts or within the swales or medians of prominent streets.

Roundabout on SW 26th Road in the Roads
An example of a location where signature species could be used

Priority Streets and Canopy Coverage

Roads



Priority Streets

D SW 12th Street

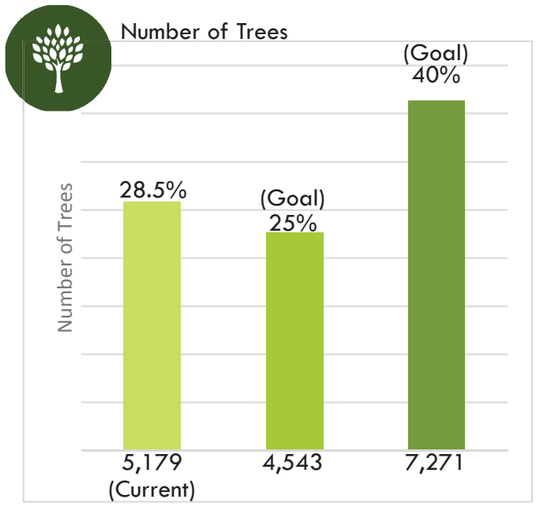
Hot Spots

Figure 99. Roads Priority Street Mapping

Priority streets for planting should take place within the highlighted hot spots of the neighborhood lacking existing canopy. The darker shade of the hot spots indicates which spot has higher instances of vulnerable populations and should be addressed first.

- With some of the highest existing canopy coverage within the project area and least vulnerable population, much of the neighborhood is on the lower end of the priority hierarchy having no obvious existing hot spots.
- The only priority area for new planting would be in the one hole the canopy currently has at the north-west corner of the neighborhood near SW 11th and 12th Streets. This area being one of the only without swales but having on-street parking could use the solution of removing a small number of parking spaces to incorporate trees.

Current Canopy Coverage (28.5%)



Feasible R.O.W. Canopy Coverage when planting all street typologies to their standard capacity.

43%

Connectivity and Walkability Strategy

Roads

Figure 100. Roads Connective Fabric Plan

Maximizing the planting potential along green corridors allows for the most canopy coverage to be directed on the streets where pedestrians may desire to walk encouraging the use of them as pedestrian corridors as well as boosting overall neighborhood canopy coverage. **If the Roads was planted to the standard capacity on all street typologies, as previously mentioned, the canopy coverage within the R.O.W could increase to 43%. If this same strategy was used but instead planting was maximized on the green corridors the canopy coverage within the R.O.W could be increased to as much as 51% within the neighborhood.**

Green Corridor Recommendations

SW 9th Avenue- 9' Swales - Typology B: Recommend planting south side of street with Large/Extra Large sized trees** and medium sized trees on the south side.*

SW 5th Avenue - 10' Swales - Typology B: Electric utility on SE side between 20th and 22nd roads. Recommend Large sized trees on South side (except where there are utilities, then they should be small/utility size trees, and Medium on the north side. *

SW 3rd Avenue (Some is Coral Way) - 8' Swales, curbed only NE of 22nd St. - Typology H: Recommend Medium sized trees on both sides where the median exists with large banyan trees. On the section SW of SW 22nd Street, recommend Large/Extra Large sized trees on both sides**

SW 16th Avenue - West side 10' Swales/ East side 5' Swales- Typology A & C: Electric utility on East side. Recommend Large sized trees on west side and Small/Utility sized trees on the east side.*

SW 22nd Street (Coral Way)- 10' Swales (Intermittent)- Typology I : Recommend Medium sized trees on both sides where the median exists with large banyan trees.*

****Care will need to be taken with placement for the areas where the swales are used for parking. See "Typology Strategies" for Typology C streets.***

*** Infrastructure Required***

POROUS PAVEMENT VIABILITY REPORT

bdc engineering
CURTIS+ ROGERS DESIGN STUDIO INC.

Executive Summary

The Southwest (SW) Streetscape and Street Tree Master Plan is a project whose objective is to identify opportunities for additional planting of trees through modifications to current facilities in the City of Miami. Most roadways currently in use have pavement designs that are characterized by dense pavements that are impervious to run-off. As such, extensive stormwater systems must be constructed to convey the water off the road and into a suitable location. Porous pavements, on the other hand, have built-in networks of voids where water can pass through, typically through the reduction of sand and other fine aggregates, which allows for more infiltration and porosity. Three porous pavement technologies, porous asphalt, porous concrete, and permeable interlocking concrete pavers, were studied for this report.

Porous asphalt is made of single-size aggregates bound together by bituminous asphalt binders (Ferguson, 2005). Typically, open-graded aggregates are used in the pavement design, and this, in conjunction with the lack of fine aggregates, allows for increased infiltration rates. Porous concrete is made through the binding of open-graded aggregate and Portland cement. Chemically similar to dense concrete, porous concrete gets much of its permeability through its open-graded aggregate which creates the voids in the structure. Permeable Interlocking Concrete Pavers (PICP), also known as Open-Jointed Paving Blocks, are solid units, typically manufactured of concrete, that are placed in a method that leaves open spaces between each unit. Joints can be filled with porous aggregates or left vacant altogether.

All three pavement types share several benefits and challenges. These pavements have shown the ability to filter infiltrating water of suspended solids, heavy metals, and hydrocarbons, and using these technologies allows for a decreased need for stormwater conveyance systems. Porous asphalt is generally cheaper than concrete or PICP, but does not hold up well in hot temperatures and on heavily trafficked roadways. PICP can be prohibitively expensive, and porous concrete has long construction durations. All three pavement types require rigorous attention to maintenance to ensure longevity and high infiltration rates. According to data compiled by the Virginia Department of Conservation and Recreation in 2010, the construction cost for porous asphalt, porous concrete, and PICP, in order, are: $4.50 to $9 per square yard, $18 to $58.50 per square yard, and $45 to $90 per square yard. This cost is used as a tool to compare with other porous pavement options, and does not include other materials like geotextiles and aggregates, and is likely higher due to inflation and increases in material costs over the last 13 years.

After careful consideration of cost, benefits, challenges, and constructability of each porous pavement option, porous pavement is not recommended for use in the travel lanes. Research has shown that porous pavements are best used for areas that are lightly trafficked at very low speeds. Although the costs outweigh the benefits for application in the travel lanes, there are other opportunities to use this technology in a more pointed manner. When researching manufacturers of porous pavement alternatives, Stormcrete was found to be an attractive solution, as it negates many challenges faced by porous pavements and has been used in other municipalities. Stormcrete is a porous concrete that is manufactured in a controlled environment rather than in the field. This porous concrete technology is recommended for use in the bike lane and parking zone.

Porous concrete swale in Parkdale North

Project Overview

The Southwest (SW) Streetscape and Street Tree Master Plan is a project whose objective is to identify opportunities for additional planting of trees through modifications to current facilities in the City of Miami. This can be accomplished through the addition of medians, reduction of lane widths, construction of bulb outs, removal of parking, or the removal of travel lanes. The project looks to present opportunities for these modifications.

The project also includes provisions for research to be conducted on sustainable green strategies in roadway design. This includes research on porous pavement and its viability within the corridor.

Source: Pros.techo-bloc:SophieRheaume

Purpose

This report is intended to satisfy the research needed for sustainable green strategies in roadway design. One of these technologies is porous pavement. The vast majority of roadways currently in use have pavement designs that are characterized by dense pavements that are impervious to run-off. As such, extensive stormwater systems must be constructed to convey the water off the road and into a suitable location. Porous pavements, on the other hand, have built-in networks of voids where water can pass through, typically through the reduction of sand and other fine aggregates, which allows for more infiltration and porosity. Porous pavements come in three groups: porous asphalt, porous concrete, and permeable interlocking concrete pavers (PICP), and all three will be discussed in this report.

Dating back to the 18th Century, porous pavements have long been used in urban settings. It is only recently that this technology has been explored as a sustainable solution to handle storm run-off (Muttuvelu and Kjems, 2021). Climate models have been developed showing a variety of different scenarios for warming and the implications of these varying degrees of warming. A commonality among these scenarios is the amplification of heavy precipitation events, for which the IPCC stated will very likely “intensify and become more frequent in most regions with additional global warming” (IPCC). Just recently, Fort Lauderdale received upwards of 25.91” of rain within a 24-hour period (Baisas, 2023), an astronomical value that contributed to widespread catastrophic flooding in the afflicted areas. Porous pavements present the opportunity to bolster the resiliency of roadways in the City of Miami given trends in precipitation.

Porous pavements have also been found to assist root growth outside of tree pits, or the underground soil area designated for tree roots (Ferguson, 2005). Trees in medians surrounded by impervious pavements have been found to be “dead or dying only seven years after planting” (Moll, 1989). Many are also found to be much smaller than other trees of comparable age. Healthier trees in urban settings can work to remove excess greenhouse gases; through strategic placement of foliage in the median, increased growth of trees may also lead to decreased surface temperatures in the summer. Given the need to modernize infrastructure in South Florida to combat current trends in climate change and the desire to beautify roads within the City of Miami, porous pavements will be analyzed as an option to replace current impervious typical sections.

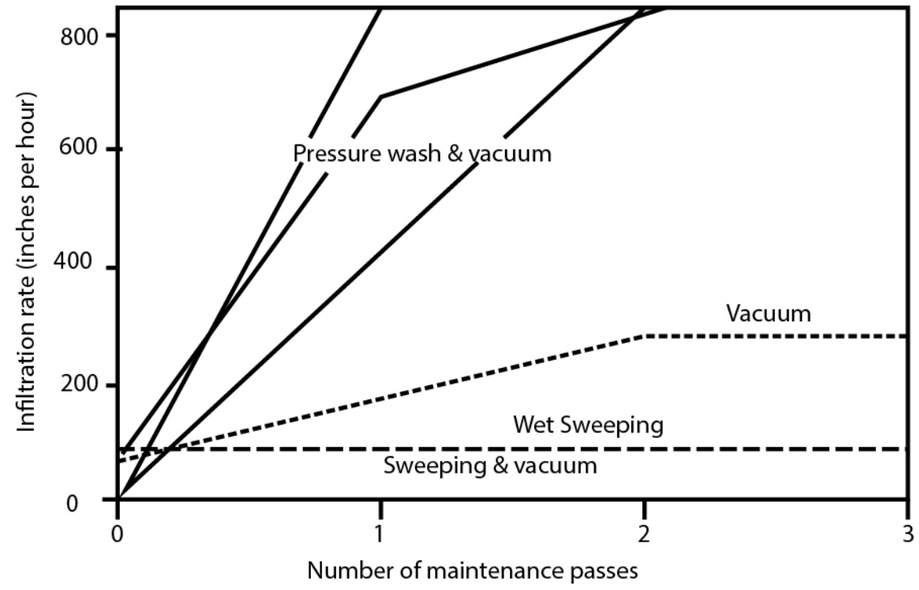
Porous Asphalt

Description

Porous asphalt is made of single-size aggregates bound together by bituminous asphalt binders (Ferguson, 2005). Typically, open-graded aggregates are used in the pavement design, and this, in conjunction with the lack of fine aggregates, allows for increased infiltration rates. Porous asphalt is typically constructed over uncompacted subgrade to maximize infiltration; geotextile fabrics are also often used to prevent the migration of fine aggregates into the pavement (US FHA, 2015). Porous asphalt typically has less shear strength than its impervious counterparts and deflects more as a result. This asphalt is typically recommended in parking areas or low-volume roadways, but it has also been used in sidewalks and bike lanes. Infiltration rates vary widely and are largely a function of void spacing, maintenance, and pavement mix. Freshly installed porous asphalt has been found to have infiltration rates from about 11 inches per hour to 5,290 inches per hour due to different approaches to mix-design and design of underlying reservoirs.

Construction and Cost

First and foremost, work zones for the construction of porous asphalt facilities must be protected from uncontrolled runoff to avoid clogging of the surface and stone reservoir. Additionally, compaction of the surrounding soil should be avoided. Excessive compaction will reduce permeability, and thus, infiltration. Construction should be planned as late as possible in the schedule to avoid the previously mentioned detriments to performance. To commence, subgrade soil should be excavated using equipment with tracks or oversized tires to avoid excessive compaction. Once excavated, fabric filter should be placed and any proposed drainage pipes should be installed. When using a stone reservoir, place aggregate stone carefully to ensure the fabric filter is not damaged. Light rolling or vibration should be used in lifts of 8 to 12 inches. A stabilizing course should then be placed at a thickness of approximately 1 inch. Following guidelines for levels of traffic, place porous asphalt. Once placed, compact using 10-ton static roller over two to four passes; traffic should be restricted for at least 24 hours following placement (FHWA, 2015) According to data compiled by the Virginia Department of Conservation and Recreation in 2010, the construction cost for porous asphalt is approximately $4.50 to $9 per square yard (WisDOT, 2012). This cost is used as a tool to compare with other porous pavement options, and does not include other materials like geotextiles and aggregates, and is likely higher due to inflation and increases in material costs over the last 13 years.



Maintenance

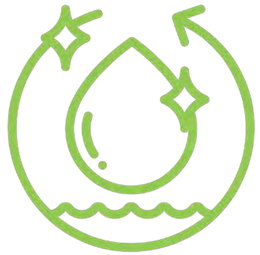
Rigorous attention to maintenance is vital to ensure the continuing viability of porous asphalt. Often, a roadway design will have a less robust stormwater conveyance system because it uses porous pavements, and if the voids become clogged, and roadway may begin to behave like its dense counterparts. As such, maintaining these systems is pivotal. Porous asphalt can be maintained using a mixture of vacuuming and pressure washing; the equipment for this is not hard to come by and is widely available (Ferguson, 2005). The graph on the left shows changes in infiltration rates for different methods of maintenance, clearly showing the superiority of a combination of pressure washing and vacuuming (Balades et al., 1995). Frequency of maintenance procedures is largely dependent on environmental conditions; areas that are highly trafficked in sandy locations will need more maintenance than most. The Minnesota Stormwater Manual, for example, suggests performing maintenance procedures on all porous pavements at least twice a year (Minnesota Stormwater Manual, 2023).

Porous Asphalt

Pros and Cons

Using porous asphalt is bolstered by a number of benefits, but it is also severely hampered by several challenges. Studies have shown that this pavement can remove upwards of 90% of total suspended solids from the surface water before it ever reached sewer systems or is percolated into the subgrade. The asphalt also works to filter out total metals and hydrocarbons, both of which are detrimental to water quality (Zanoni et al, 2019). To ensure this benefit is preserved, it is imperative to regularly maintain porous asphalt areas. There are also construction benefits to porous asphalt. Compared to porous concrete, porous asphalt can be constructed in a quicker time frame as there is no need to cure. This leads to a decrease in labor costs and a decrease in the time needed for road closures. Additionally, through a reduction in need for extensive stormwater systems, using porous asphalt can be cheaper than many impervious asphalt options in the long run. The up-front costs for porous asphalt mixtures are more expensive than their impervious counterparts, but they are often offset over time given the decrease in drainage system considerations. **Porous asphalt has also been found to be cheaper than other porous pavement options.** Using porous asphalt also helps to improve wet-weather visibility and decrease risk of hydroplaning, and this is a benefit shared by the other porous pavement options.

On the other hand, there are several challenges to consider when using porous asphalt. As stated previously, there are higher up-front costs when using porous asphalt over impervious options, and this may be an issue when securing funding. In practice, **the mix typically used for porous asphalt has been found to fail in high temperatures**, and this is akin to a fatal flaw for a road that is to be paved in South Florida, where the average ambient high temperate in the Summer is in the upper 80s. Porous asphalt is not as strong as its impervious counterparts and is not well suited for areas seeing constant traffic and heavy loads. That being said, New York City has conducted pilot projects using porous asphalt and found certain approaches to pavement thickness that have warranted use in certain applications. Sharp turns have also been found to be harmful to porous asphalt areas, which is not conducive to longevity when roads in residential areas typically see sharp turns into homes and businesses. Porous asphalt typically requires a higher binder content, which typically does not hold up well with high loading of trucks and cars. The binder has been found to migrate downward through the voids of the asphalt, clogging the layers and significantly decreasing infiltration rates. Areas that have had porous asphalt for a number of years have found that a new binder layer forms about half an inch below the surface, stymying infiltration and contributing to a higher level of runoff. This is not at all conducive to longevity of porous asphalt roadways. This phenomena, called “drain-down”, has been well documented by the asphalt industry and has been found in areas most trafficked by vehicles (Ferguson, 2005). Additionally, porous asphalt needs regular maintenance to prevent the clogging of pores, which is an additional cost consideration for any municipality.



CLEAN WATER

UP-FRONT COST

ROADWAY SAFETY

HEAVY USE

QUICK INSTALL

MAINTENANCE

Porous Concrete

Description

Porous concrete is made through the binding of open-graded aggregate and Portland cement (Ferguson, 2005). Chemically similar to dense concrete, porous concrete gets much of its permeability through its open-graded aggregate which creates the voids in the structure. Aggregates are typically evenly graded and have a size of about 3/8th of inch. Like porous asphalt, sand and fine aggregates are not used in the mixture to allow for increased infiltration rates. Porous concrete can be cast-in-place or at a controlled facility, as some manufacturers prefer. Stormcrete, for example, is cast in a facility where all variables are controlled to ensure the strongest and highest quality product. Florida is a pioneer in the use of porous concrete for its environmental benefits, they have been installing surfaces with the material since the 1970s (Ferguson, 2005).

Source: Stormcrete, Porous Technologies, LLC

Construction and Cost

Work zones for the construction of porous concrete facilities must be protected from uncontrolled runoff to avoid clogging of the surface. Excavation should be conducted to the desired depth to account for the proposed pavement design. Subgrades, especially in Florida, should be compacted to about 90-95% Proctor density. Florida is mentioned as it typically has sandy soils that will allow for adequate infiltration even after compaction. An aggregate layer subbase should then be placed at the thickness required for traffic load and stormwater storage. The subbase layer can be extended beyond the edge of the slab to support the slab during concrete placement. On-site porous concrete installation is accomplished using fixed-form construction. Consolidation is typically performed using a steel roller. Bull floats and trowels, typical for concrete placement, should not be used for porous concretes. Once joints have been placed in the desired locations, it is pivotal that the concrete be effectively cured by placing a thick plastic sheeting for at least 7 days (Ferguson, 2005). According to data compiled by the Virginia Department of Conservation and Recreation in 2010, the construction cost for porous concrete is approximately $18 to $58.50 per square yard (WisDOT, 2012). This cost is used as a tool to compare with other porous pavement options and is likely higher due to inflation and increase in material costs over the last 13 years.

Maintenance

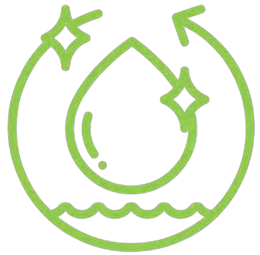
Actions that can be taken to properly maintain a porous concrete system are very similar to those taken for porous asphalt. Pressure washing and brooming work well to clear out voids, as well as vacuuming. In fact, an experiment was carried out for a porous concrete facility in Florida (where sand is a huge issue), and using pressure washing followed by immediate brooming was found to return infiltration back to previous levels.

Porous Concrete

Pros and Cons

Many benefits offered by porous asphalt are shared with porous concrete. Porous concrete offers the opportunity to reduce the runoff volume, and in turn, reduce the need for an extensive stormwater conveyance system. Additionally, porous concrete can filter sediments, heavy metals, and hydrocarbons from water percolating through the system. Using porous concrete also presents the opportunity to be more efficient with land use by reducing the need for swales and retention ponds while also recharging groundwater supplies. As discussed with porous asphalt, this technology also reduces surface ponding and the potential for hydroplaning due to the almost instant infiltration of surface water. Unlike porous asphalt, **the albedo of porous concrete is higher due to the light color of the concrete mix. This has the added benefit of both reducing retention of heat (which would typically contribute to the urban heat island effect) and increasing visibility at night.** Both porous concrete and porous asphalt have also been found to reduce street noise when compared to conventional pavement applications.

The use of porous concrete does bring some inherent challenges that must be addressed as well. The pouring of porous concrete on-site presents procedural challenges that only well-trained professionals should oversee. When not applied correctly, concrete can lose all viability as a porous medium. This disadvantage may be mitigated by using concrete slabs that are fabricated in a controlled setting, and this option will be discussed further later in this report. Unlike porous asphalt, porous concrete has an extended curing time that must be adhered to, and as such, traffic must be closed in these locations for a longer period of time. Additionally, porous concrete, in-line with other porous pavements, does not hold up well in heavily trafficked areas. A dedicated maintenance crew must also be available to ensure that the porous concrete locations are not clogging up, as this would present a fatal issue with infiltration and runoff. Porous concrete is also often more expensive than dense concrete due to the specialized installation and special mixtures.

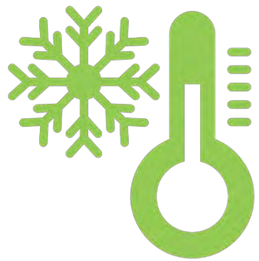


CLEAN WATER

COMPLEX INSTALL

ROADWAY SAFETY

HEAVY USE



HIGH ALBEDO

MAINTENANCE

Permeable Interlocking Concrete Pavers

Description

Permeable Interlocking Concrete Pavers (PICP), also known as Open-Jointed Paving Blocks, are solid units, typically manufactured of concrete, that are placed in a method that leaves open spaces between each unit. Joints can be filled with porous aggregates or left vacant altogether. The block units are often manufactured in controlled conditions. A bedding layer can be found under the units, which consists of permeable aggregates. This layer is placed over the base and subbase of permeable open-graded aggregates (FHWA, 2015). These last two layers allow for storage capabilities before eventual infiltration into the subgrade. PICP can typically be found in walkways, parking lots, driveways, and low-speed roads.

Construction and Cost

As with previous porous pavements, it is imperative that work zones be protected from uncontrolled runoff to avoid unnecessary clogging of intentional voids. Once the site is excavated, ensure that the subgrade is composed of gravel, sand, or a mixture of both. Test permeability of the layer once compacted by a vibratory compactor to a maximum density of 92%. Ensure the subgrade is kept adequately moist through construction. Once the subgrade is prepped, place geotextiles on surface of subgrade and secure in place. Above the geotextiles, place open-graded base material, making sure to use 4”-6” lifts. Each lift should be passed by vibratory equipment at least twice, making sure not to crush the aggregate. A geotextile may also be placed above this layer if specified. Bedding material should then be placed above the base and lightly compacted using a plate compactor. It is also important to have a dedicated edge restraint, as this will help to prevent horizontal shifting of the blocks and bedding materials. Once the bedding has been prepped, lay the PICP as specified in the plans. Joints should then be filled with a uniform aggregate as designed in plans; sand should not be used, as it interferes with the infiltration rate. According to data compiled by the Virginia Department of Conservation and Recreation in 2010, the construction cost for PICP is approximately $45 to $90 per square yard. This cost is used as a tool to compare with other porous pavement options and is likely higher due to inflation and increase in material costs over the last 13 years.

Maintenance

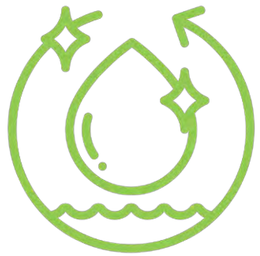
Compared to porous asphalt and porous concrete, PICP have similar procedures for maintenance. Vacuum sweeping is a method that is most widely used and has been found to be very effective. In the extreme case where the clogging of aggregates has reached a point that cannot adequately be addressed by vacuuming, the aggregate may have to be replaced entirely. It is also important to consider the maintenance of certain areas of pavement in terms of traffic volumes; as seen in the data to the right, areas with high traffic tend to have significant decreases in infiltration rates when compared to low traffic areas (James and Gerrits, 2003). This means that these heavily trafficked portions should be focused on more intently and is also a reason to avoid using PICP for these traffic volumes.

Permeable Interlocking Concrete Pavers

Pros and Cons

PICP shares many benefits with both porous asphalt and porous concrete while also retaining certain benefits to itself. For one, because of the high infiltration rates inherent to porous pavements, the need for stormwater conveyance systems is diminished. This is no different for PICP. Additionally, pollutants can effectively be filtered by the aggregates found in the joints in conjunction with the bedding and base materials found underneath. There can also be a reduction in ponding of water and hydroplaning risks, as the water is percolating through the surface rather than being conveyed to curb or shoulder. **PICP is the sole porous pavement option that can be made available in a large variety of colors per the wishes of the owner. This presents an opportunity to be creative with the aesthetic approach of any new roadways, bike lanes, or parking zones. This also allows the designer to increase the solar reflectance index (SRI) through the use of a lighter color unit and, in turn, reduce the urban heat island effect in localized areas.** As PICP are produced in factories with testing requirements prior to delivery, they also can be made stronger than other porous pavements, and as such, can withstand more traffic.

A main concern with PICP when compared to other porous pavements is the time it takes to install. Each paver must be individually placed which contributes to a long construction duration and longer time the road must be kept closed. The longer a roadway is kept in construction, the more labor costs that are accrued. PICP are also the most expensive option of the three porous pavements, mostly due to the off-site fabrication process, transportation requirements, and extended construction durations. These factors make it untenable for long stretches of roadway. Like other porous pavements, PICP must be maintained regularly to avoid reduction in infiltration, and this is another cost that must be absorbed by any municipality choosing to use it in future projects. **The gravel in PICP joints must also be periodically replaced and filled (predominantly in the first year after being laid). Pavers may shift if this maintenance process is not adhered to.**

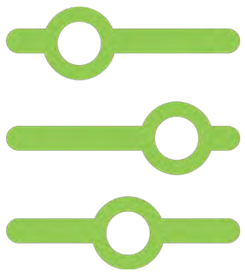


CLEAN WATER

TIME CONSUMING

ROADWAY SAFETY

UP-FRONT COST



CUSTOMIZABLE

MAINTENANCE

Design Examples

Research was conducted to determine possible designs for porous and impervious pavements in several locations of the pilot roadway typical section. These locations include the travel lane, parking zone, bike lane, and sidewalk. For the impervious travel lane option, the standard Miami-Dade County pavement design was used which includes 1” of Hot Mix Asphalt Friction Course, 2” of Hot Mix Asphalt Structural Course, 8” of Limerock Base and 12” of Type B Stabilization. Parking zones omit the structural course. The cost per square foot for the impervious options are as follows: $6.75 for the travel lane, $6.26 for the sidewalk, and $1.86 for the parking zone. Using porous concrete is a viable alternative for many parts of the proposed typical section.

Stormcrete, which is a pre-cast porous concrete that is manufactured in a controlled environment and placed on site, has been researched thoroughly and is being presented as a porous pavement option. An example of the placement of these pre-cast panels can be seen to the right. A Stormcrete pavement design typically consists of a 6” concrete panel, which is supported underneath by a 2” layer of No. 8 crushed stone and 3” layer of No. 57 crushed stone surrounding a storage system. The storage system, called R-Tank, is typically found within the No. 57 stone layer and can retain stormwater before it eventually percolates into the soil. An 8” thick concrete panel may also be used for areas within the travel lane. Current estimates provided by Ferguson Waterworks, a manufacturer of Stormcrete products, priced a porous concrete panel at $26.50 per square foot and a 20”x 24”x 2” R-Tank panel at $10.60. Using an assumption of 10” of storage volume, this translates to roughly $16 per square foot. Area contractors provided a cost of $850 per truckload of the No. 57 and No. 8 stone, which translates to approximately $47.22 per cubic yard, or about $0.15 per inch in the square foot column. The total cost would be approximately $44 per square foot given the example design.

Coordination was held with municipalities that used porous asphalt within the travel lanes and possible pavement designs were shared with this team. One of those municipalities, New York City, has used porous asphalt in several locations and found it to be an option worth considering. An example pavement design for lightly trafficked travel lanes includes 2” of a permeable asphalt wearing surface followed by a 6” permeable asphalt binder mixture. This is underlaid by 3” of 3/4” open graded stone and 9” of 1 1/2” open graded stone. The parking zones have the same pavement design excluding the 1 1/2” stone layer, which would be 4” instead of 9”. The costs for this design were provided during research, but were given in New York City prices and should be viewed under this lens. Additionally, the spread rate for the asphalt was assumed to be 110 lb/square yard. Given these assumptions, the cost per square foot of this porous asphalt design is approximately $34 for the travel lanes and $33 for the parking zone.

Source: Stormcrete, Porous Technologies, LLC

Source: Stormcrete, Porous Technologies, LLC

Recommendations

After careful consideration of cost, benefits, challenges, and constructability of each porous pavement option, porous pavement is not recommended for use in the entirety of the travel lanes. Research has shown that porous pavements are best used for areas that are lightly trafficked at very low speeds. For example, parking lots often see traffic at these low-speeds and porous pavements have had success in these locations. However, the maintenance requirements needed for these pavement options present a hurdle for the City of Miami, especially if they choose to move beyond the pilot project areas and start application of porous pavements in more heavily trafficked roadways with larger footprints.

A typical section for this pilot project may include a parking zone, bike lane, and sidewalk. Additionally, a rain garden may be presented as an option in the median or adjacent to the sidewalk. Certain porous pavements may also be considered in crosswalks.

When researching manufacturers of porous pavement alternatives, Stormcrete was found to be a viable solution, as it negates many challenges faced by porous pavements and has been used in other municipalities. Stormcrete is a porous concrete that is manufactured in a controlled environment which ensures that the concrete is at optimal strength and durability. Additionally, as Stormcrete is placed in panels, they can easily be replaced and removed at any point. As stated previously, construction of porous concrete requires specialized personnel and at least 7 days of curing; the use of Stormcrete circumvents these needs. Stormcrete also provides a technology, called an “R-Tank”, that can be placed under the porous concrete system and act as a storage and conveyance system. This is especially useful in areas with shallow depth restrictions and high groundwater tables. . When placed, Stormcrete panels can have a infiltration rate of approximately 500-750 inches/hour. It should also be noted that the Stormcrete panels are prefabricated and thus do not need as much time in construction or amount of laborers to install and inspect. This porous concrete technology can be used in the bike lane, parking zone, and sidewalk and at the curb; Stormcrete currently has a product that incorporates the porous concrete into a curbed section. Given the relative success of porous concrete in areas like New York City, it may also be warranted to test porous concrete on non-trafficked areas like the parking zones.

To aid trees in growth, another technology offered by Stormcrete, “Stratavault”, can be used in lieu of suspended soils to allow for tree roots to propagate safely underneath roadways. Filtration media also exist, like Bold and Gold developed at the University of Central Florida which is composed of sand, clay, and recycled tire, that help remove nitrogen, phosphorus, and bacteria.

Source: Stormcrete, Porous Technologies, LLC

Porous Paving for Pedestrian-Only Surfaces

Flexipave

Pros

Flexipave by KBI Industries is a flexible porous bound aggregate that can be applied in as little as 1 1/2" of depth. This material is not appropriate for vehicular use, but makes an excellent choice for sidewalk replacement, especially in areas with large existing trees. This material was used in Coconut Grove on Main Highway and has been holding up well. As there are a number of streets in Miami that have overgrown large trees that are causing pavement heaving, this is one of the few successful treatments for that condition. This is elaborated on in the Introduction section of this Master Plan. For new construction in areas where large trees are being planted, it would also be a good preemptive choice to keep the sidewalks from heaving in the future. Flexipave will be better for the neighboring trees, as it will allow more air and water flow to the roots, which will keep them from growing upwards in search of these.

Cons

Flexipave is best when it is contained by hardscape like a curb or building edge. This is not always the typical condition on a residential street. Edging can be installed in areas that abut softscape, but this will add some cost to the installation.

Precast Porous Concrete

Pros

Precast porous concrete panels are a great option for sidewalks, especially adjacent to street trees, as it will allow more air and water flow to the roots, which will keep them from growing upwards in search of these. The panels can be replaced in segments if needed. They are pre-formed and require no forms for installation or permanent edging.

Cons

This product is not as good as the flexipave for large existing trees, as the roots may cause segments to rise above others causing a tripping hazard as we find with traditional concrete sidewalks. However, because it is porous it is less likely to have this problem than traditional concrete. As some machinery is required to lift the panels into place, repairs may be more complicated.

Permeable Interlocking Concrete Pavers

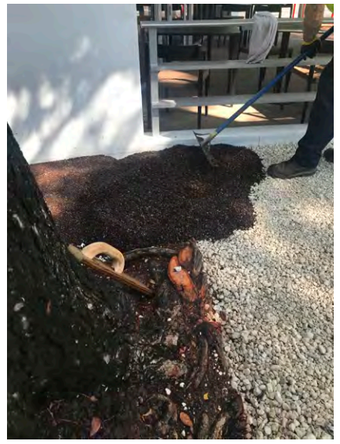
Pros

Permeable Interlocking Concrete Pavers are a great option for sidewalks, especially adjacent to street trees, as it will allow more air and water flow to the roots, which will keep them from growing upwards in search of these. The pavers can be replaced easily if needed.

Cons

This product is not as good as the flexipave for large existing trees, as the roots may cause sections to rise above others causing a tripping hazard as we find with traditional concrete sidewalks. However, because it is porous it is less likely to have this problem than traditional pavers. The pavers will need something to contain them, either a concrete band or edging. Replacement pavers will need to be stored somewhere, as paver manufacturers frequently change their color mixes and availability of replacement pavers cannot be guaranteed in the future.

Flexipave installed on Main Highway in Coconut Grove



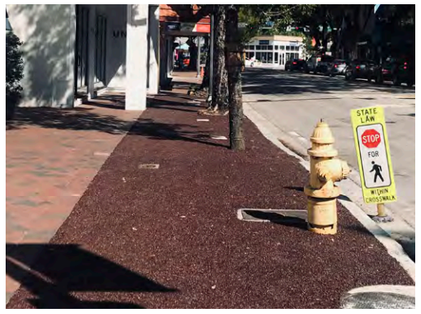
Permeable interlocking concrete pavers

Precast porous concrete sidewalk and installation photo. Source: Stormcrete, Porous Technologies, LLC

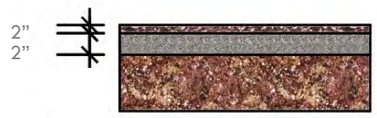
Materials

Products

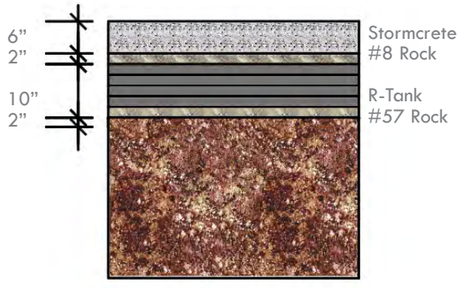
The team researched a variety of products that can aid in achieving a more resilient Right-of-Way. There are pervious paving options, the best three we researched are Flexipave, Stormcrete, and Permeable Interlocking Concrete pavers (numerous manufacturers). There are two tree infrastructure products we recommend; Structural Soil, and Soil Cells. Structural Soil is a patented blend of rock and soil that allows more space and air for roots to grow than compacted soil. It can be used under roadways or pedestrian areas. Structural Soil does also supply some storage for stormwater, but it is not as beneficial to the trees as the Soil Cells. There are three major suppliers of Soil Cells: Deep Root Silva Cell, GreenBlue, and Ferguson's Strata Vault. All have similar structures with differences being in shipping and installation primarily. The Silva Cells have been used in the Business District of Coconut Grove and on Flagler Street in downtown Miami. Below are sections of the basic installations of the various materials.



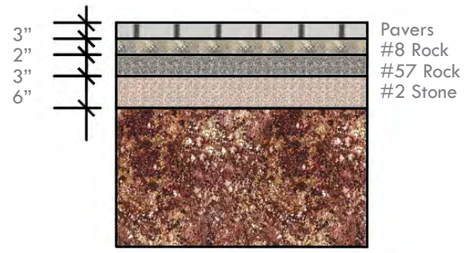
Flexipave product for the sidewalks (2" thick)



Stormcrete product for the roadway edge/ with 10" R-Tank storage or Drainage rock (6" thick)



Permeable Interlocking Concrete Pavers



Structural Soil

Soil Cells
(in lieu of Structural Soil under sidewalks)

Materials

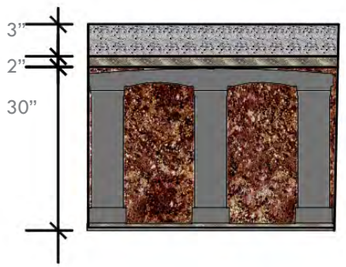
Costs

The team researched the basic costs of the following pervious paving and tree infrastructure and compared them to the cost of traditional materials (asphalt road, concrete sidewalk). The multipliers below are the differences in cost between the items.

While these products cost more to install than traditional materials, there are many important benefits. The use of these materials will:

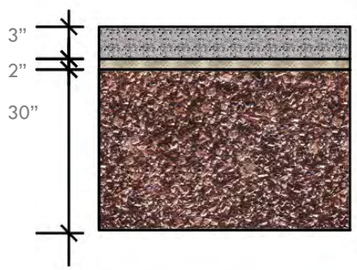
- **Reduce the amount of run-off being handled by traditional storm sewer systems**
- **Reduce flooding in rain events that might cause road closures**
- **Allow the trees to grow large which will in turn provide the following benefits:**
  - **Reduce rain accumulation by capturing water in canopy**
  - **Reduce stormwater run-off through absorption of water through root systems**
  - **Reduce Heat-Island effect by lowering ambient temperatures**

Pedestrian Use Areas



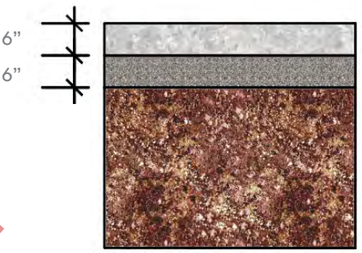
Stormcrete with Soil Cell

+ 7x
Cost Difference

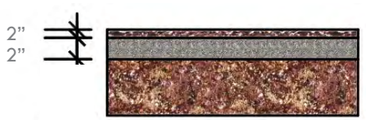


Stormcrete with Structural Soil

+ 2x
Cost Difference



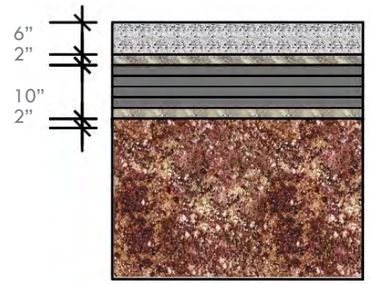
Standard concrete Sidewalk



Flexipave

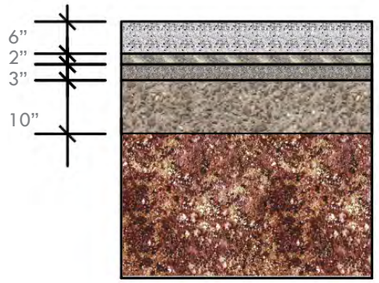
+2x
Cost Difference

Vehicular Use Areas



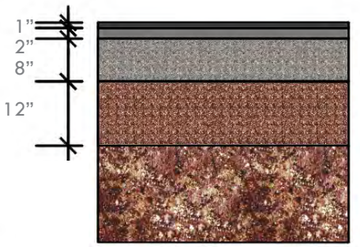
Stormcrete with R-Tank

+ 6x
Cost Difference

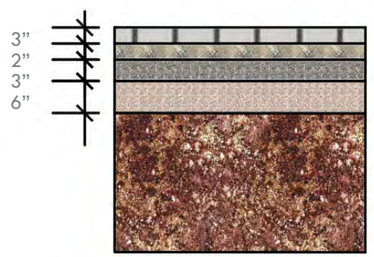


Stormcrete with drainage rock

+ 4x
Cost Difference

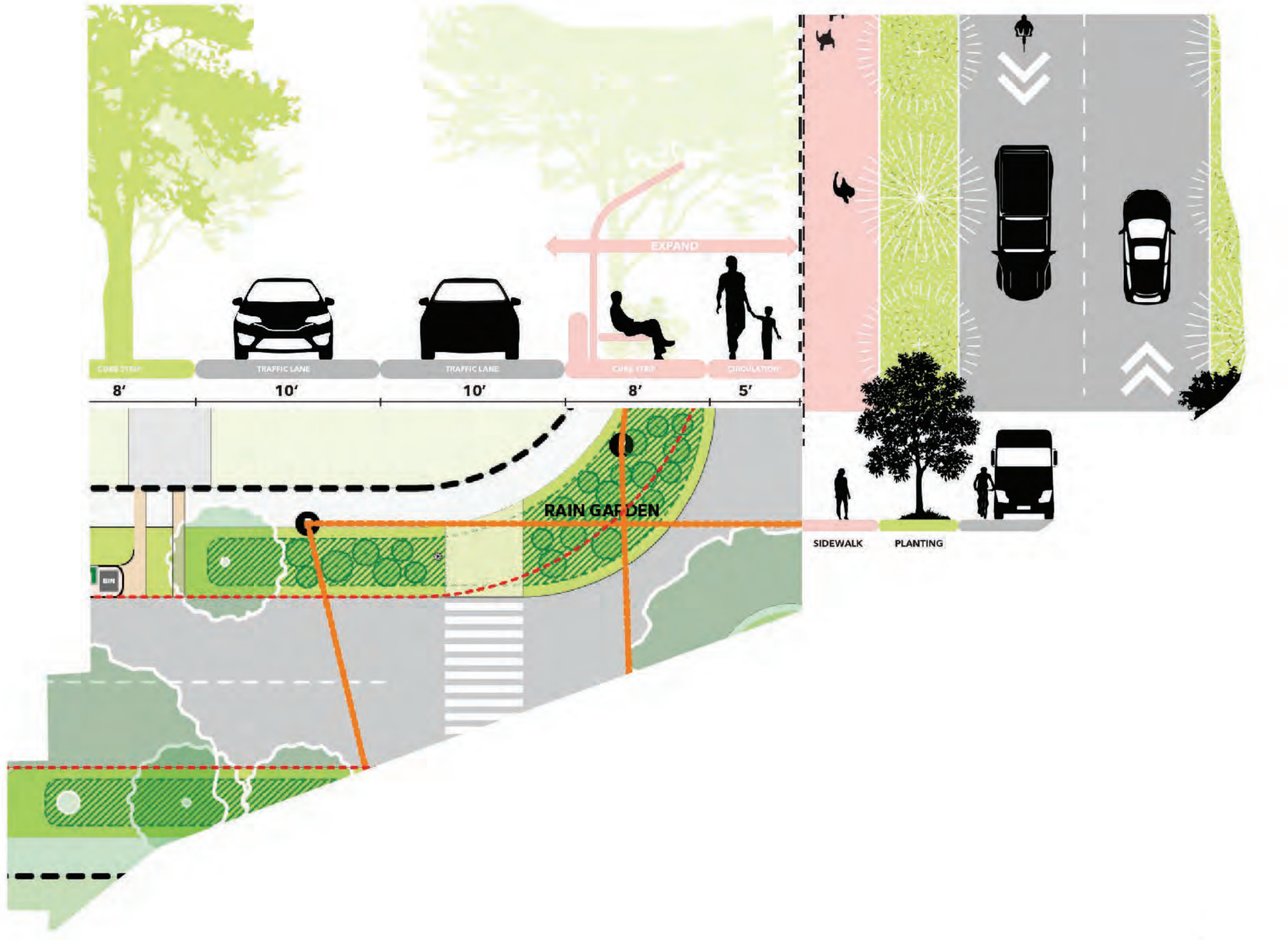


Standard Asphalt road



Permeable interlocking concrete pavers

=
Cost Difference



PILOT PROJECTS

Introduction to the Pilot Projects

Purpose

The Pilot Projects were developed to supply the City with Design Criteria for projects to test the application of the principles and strategies outlined in this Master Plan. Four specific streets were selected with the help of the City to provide a wide range of street typologies and project objectives. The projects, however could be applied to any similar street within the City so the exact locations were removed from the report.

The goal of these projects should be test the use of the materials and layouts recommended, and to monitor the results; looking at improvements in heat island reduction and stormwater runoff. Similarly, the City can monitor the costs and any special needs for maintenance of these streets. These results will help provide the City with quantifiable justifications for allocating more funding to improving the resiliency of their Right-of-Ways.

By better preparing for our changing climate, we can create opportunities for an improved public realm that supports safety, alternative modes of transportation, and environmental sustainability.

Objectives

Provide Relief from Urban Heat

Increased tree canopies will provide shade to enhance pedestrian comfort.

Alleviate Stormwater

Improved streets can accommodate increased flood events by acting as absorbent sponges.

Increase Micromobility

Planted buffers and clear viewsheds promote safer means of transportation while encouraging walkability.

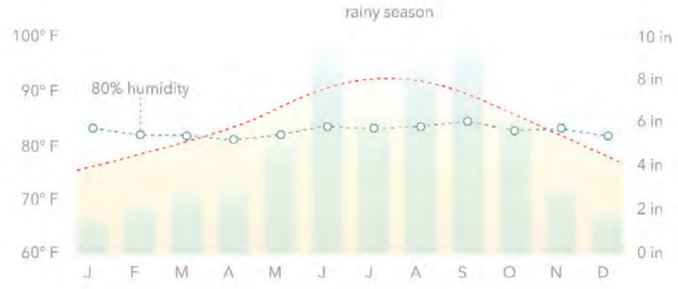
Support Biodiversity

Diversified native planting areas help promote environmental sustainability.

Promote Environmental Justice

Protect vulnerable communities from the dangers of climate change and increased storm events.

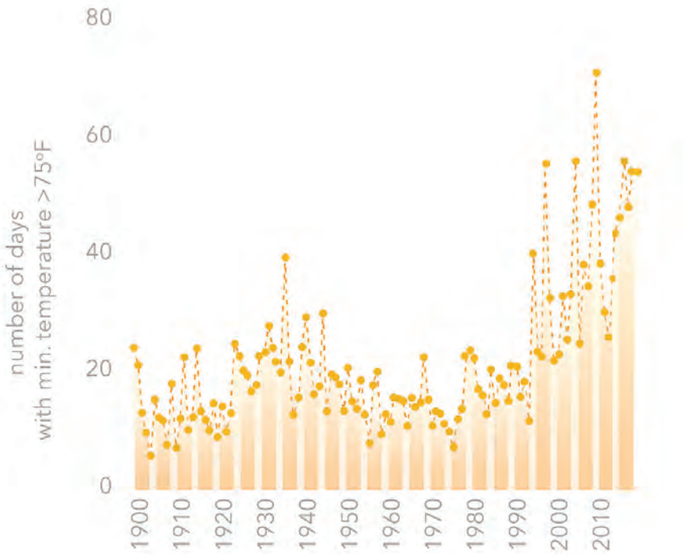
The climate in Miami consists of both rainy and dry seasons, with warmer temperatures in the summer. Peak rain events occur in June, August, and September, with continued year-long humidity.



Source: 2010-2023 World Weather & Climate Information

MIAMI CLIMATE ANALYSIS

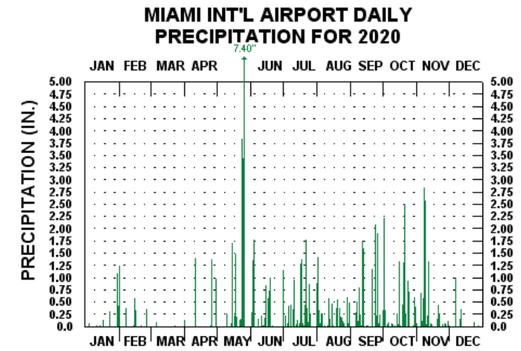
According to NOAA, the future of southeast florida's climate entails warmer summer days



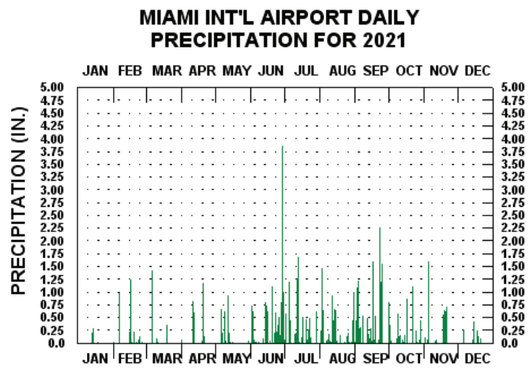
Source: https://statesummaries.ncics.org/chapter/fl/

INCREASING HOTTER DAYS

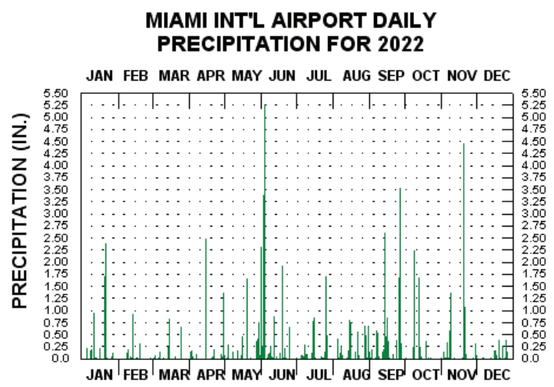
By studying the past 3 years, we can better understand peak storm events and design each landscape to better respond to anticipated cloudburst rain events.



2020: 7.4”



2021: 4”



2022: 5.25”

MIAMI PEAK RAIN EVENTS 2020-2022

2019 500-YEAR RAIN EVENT: 7” IN 24 HOURS

HURRICANE IAN: 12” IN 24 HOURS

HURRICANE IRMA: 10-15” IN 24 HOURS

TROPICAL STORM ALEX: 10” IN 24 HOURS

We envision a collection of streetscapes as a performative natural infrastructure that alleviates the impacts of urban heat islands and promotes species diversity while managing stormwater.

Canopy Corridors

Tree-lined streets that double as cooling corridors while improving air quality and sequestering carbon.

Permeable Surfaces

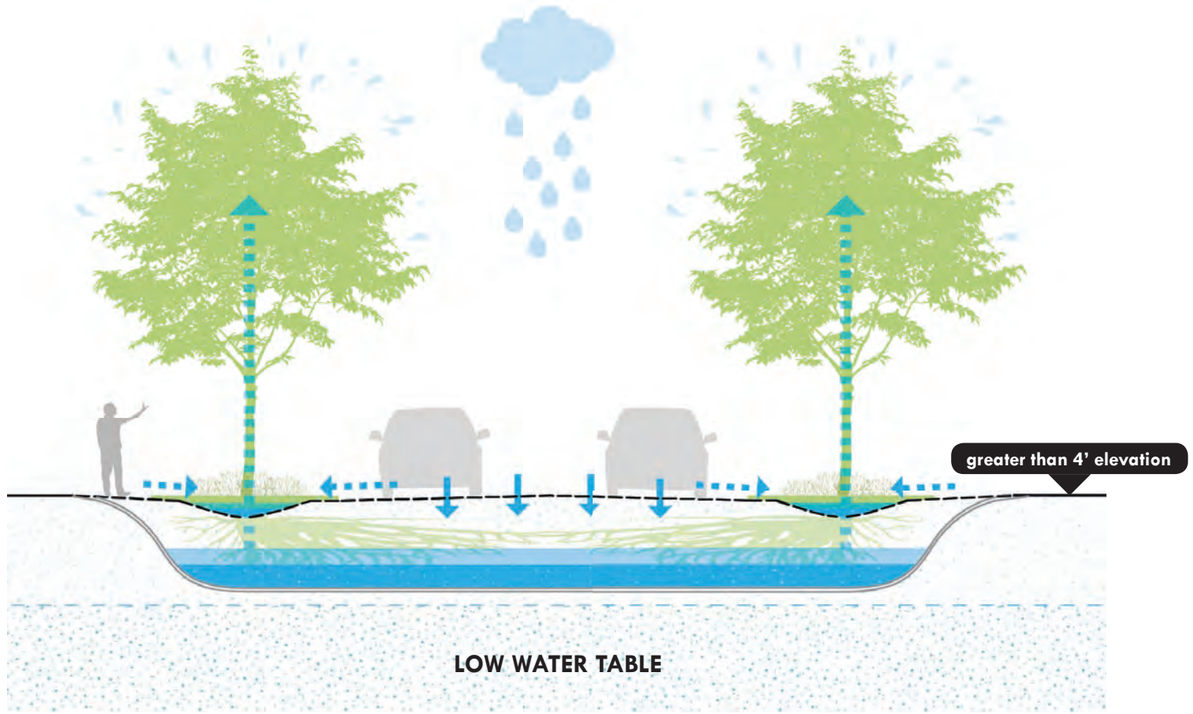
Permeable surfaces for streets lets rainwater filter through allowing for increased water storage below the surface.

Living Streets

Structural soils permit the tree roots to travel under the streets allowing for stormwater to infiltrate into the living street growing medium.

Planted Bioswales

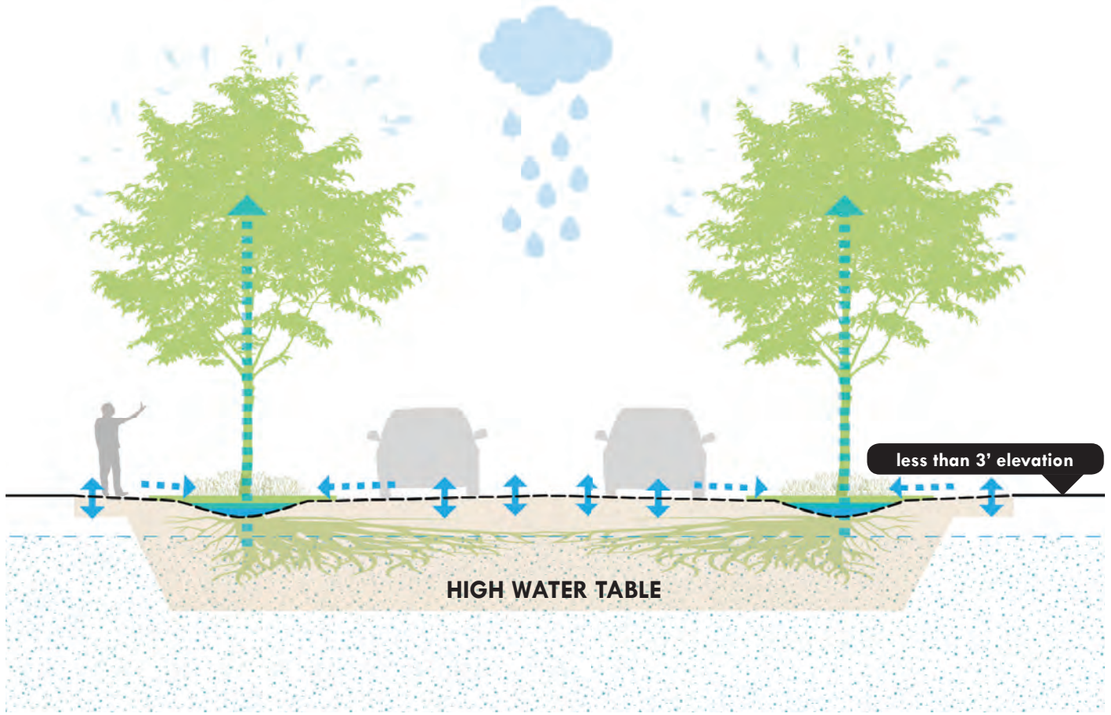
Planted bioswales collect increased stormwater runoff while promoting species diversity.



GREEN STREET

Streets with a high ground elevation are considered a green street. The higher Delta permits a "living cistern" that holds water uphill using a filter liner filled with structural soil, and porous surfaces. This bioretention system self irrigates trees, reducing downhill flooding and maintenance.

Higher elevation "green streets" have lower groundwater, affording the capacity to carry, store, and infiltrate as much stormwater as possible. Lower elevation "blue streets" collect, hold, and distribute rainwater.



BLUE STREET

Streets with a low elevation are considered blue streets. Designed for intertidal longevity - porous paving, structural soils, and rain gardens are employed to lower groundwater increasing storage capacity and clearing ponding immediately after king tide events. Blue streets can reduce the runtime and extending the life cycle of flood pumps.

STREETSCAPES FOR CLIMATE CHANGE

Design considerations respond to community lot sizes, affording ample tree placement while maximizing flexibility for future uses, including parking and community amenities.

Placement

- Location strategies that navigate site constraints.
- Asymmetrical placement to maximize tree canopy coverage.
- Avoid sub-surface constraints such as utility lines and drain inlets.
- Replace some on-street parking with planting areas by incorporating bioswales.
- Large trees require larger bioswales or infrastructure to avoid upheaval.
- Spacing strategies conforming with sight lines while guiding vehicular parking areas in multiples of 15’ dimensions.

Parcels

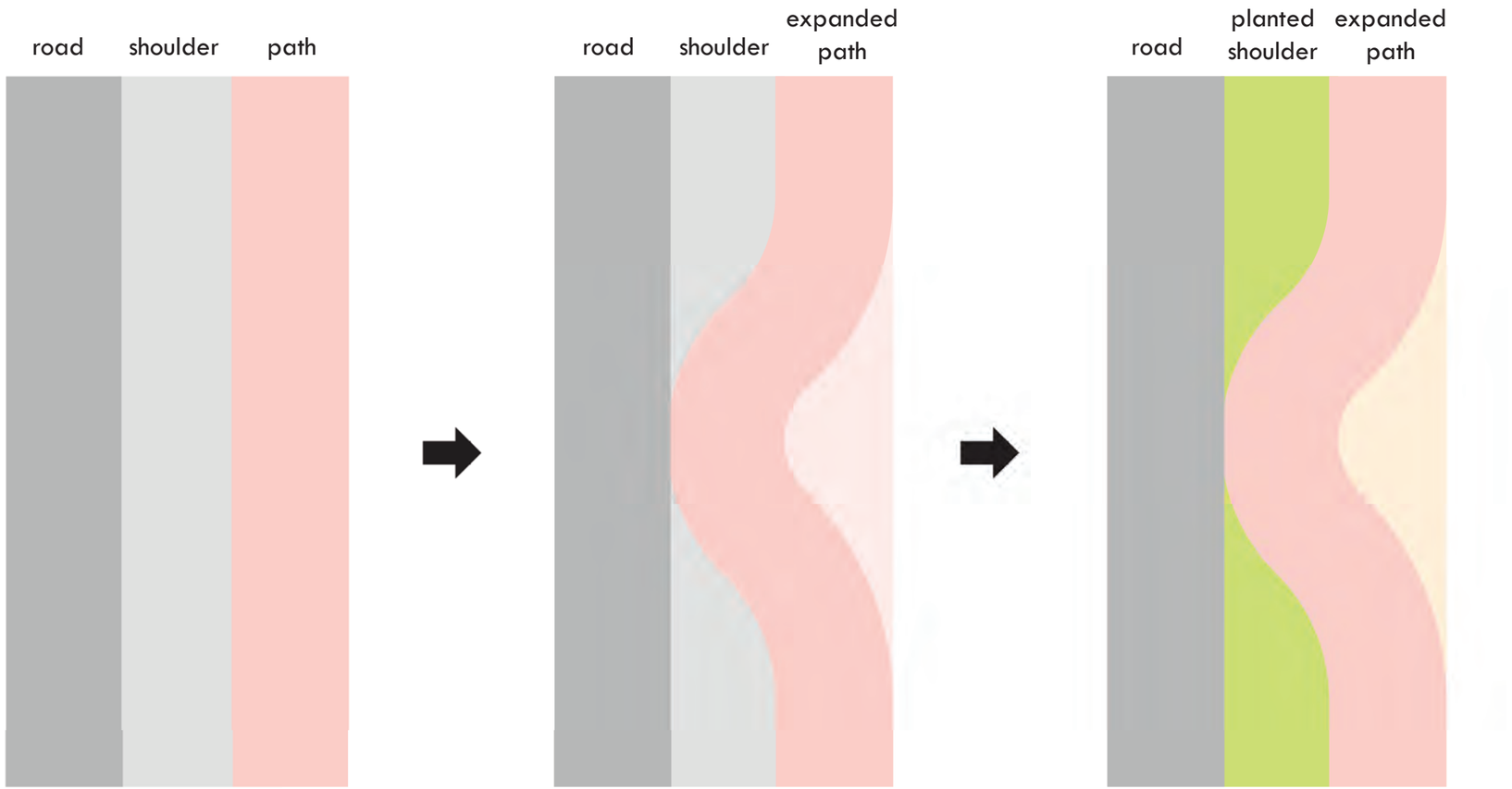
- 40-Foot Lots - Tree placement to consider access to multi-family units while promoting ample flexibility in site parking. Tree placement is very site specific.
- 50 to 60-Foot Lots - Trees act as indicators between property extents, marking the boundaries of lots while offering flexibility for increased planting.
- 100-Foot Lots - Increased tree canopy placement along each lot frontage while allowing parking. Corner parcels do not block lines of sight.
- 150-Foot Lots - Increased tree canopy along the frontage that can accommodate car parking.

Details

- Soil systems (modular or structural) support tree roots while increasing capacity to carry stormwater.
- Rootball pit sizing needs to accommodate below-ground site constraints and tree health.
- Root barriers in constrained areas to prevent sidewalk and street interference.
- Tree protection poles can help protect the tree from vehicular damage.
- Structural soil is placed in between trees below designated parking zones.

Braiding Public Corridors

By integrating the shoulder as a flexible space for each street we can utilize this for parking, planting, and public amenities.

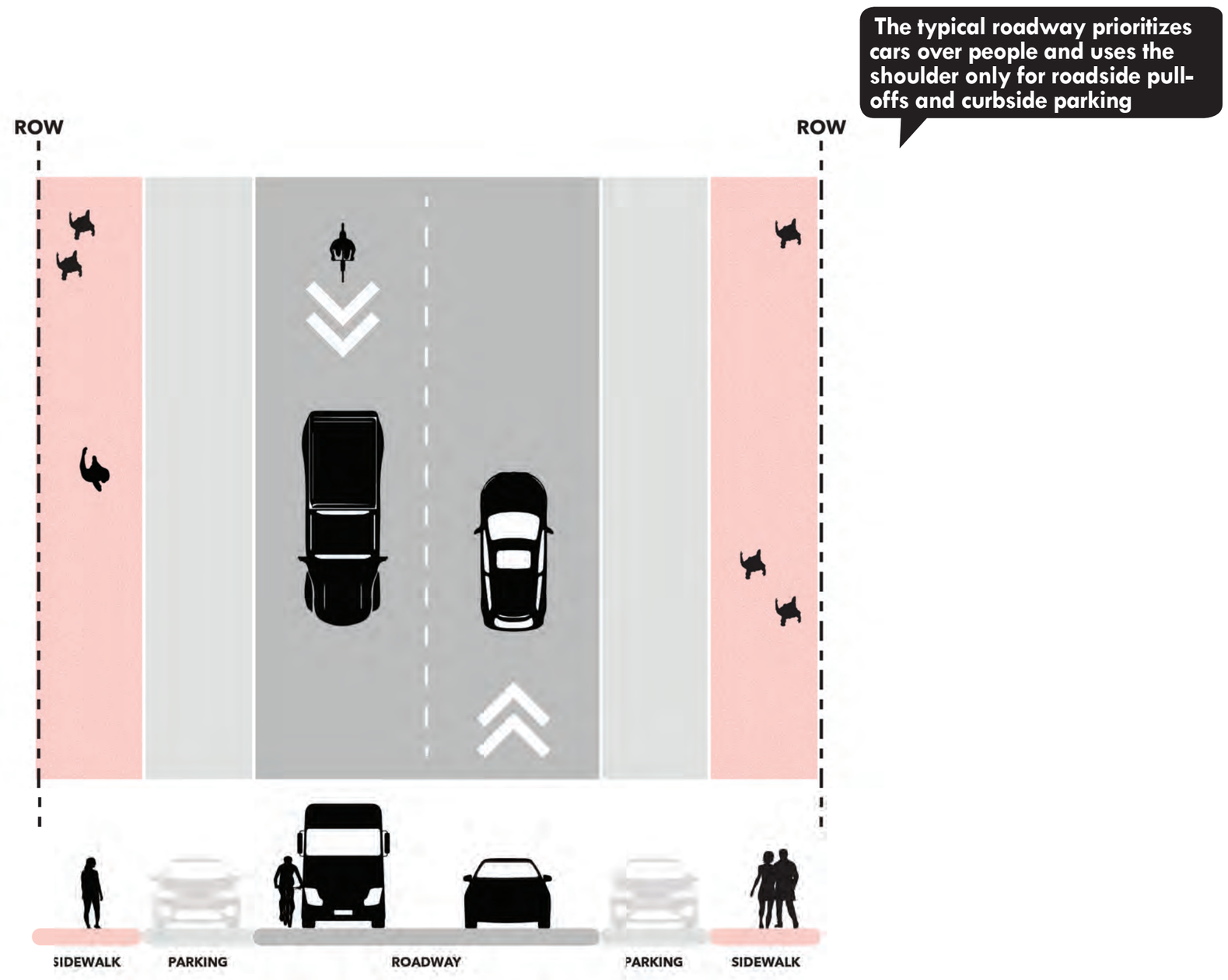


typical roadway public realm

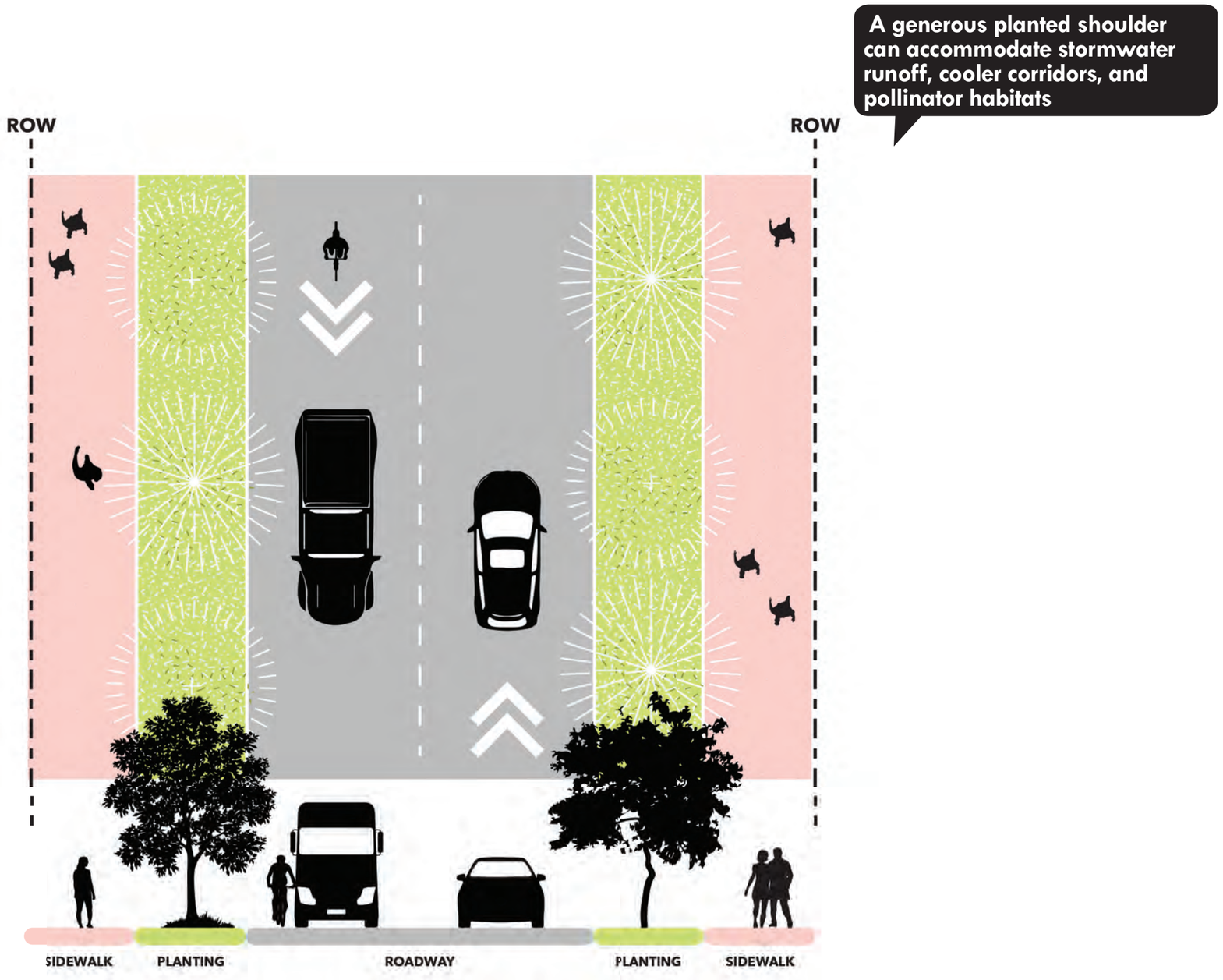
flexible shoulder space

introducing amenity elements

Existing Roadway Relationship

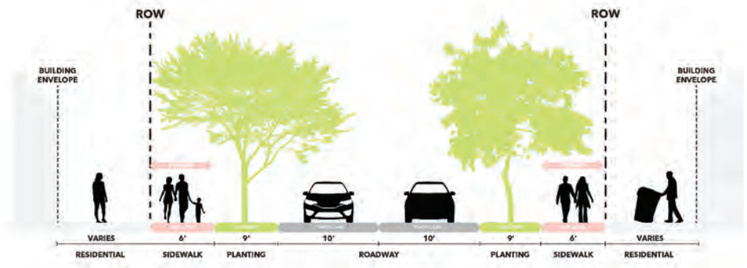


Planted Shoulder Roadway



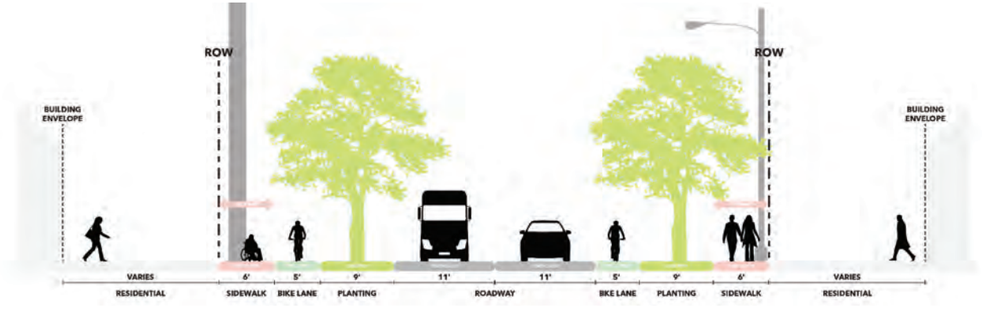
New Human-Centric Streetscapes

pilot site 1



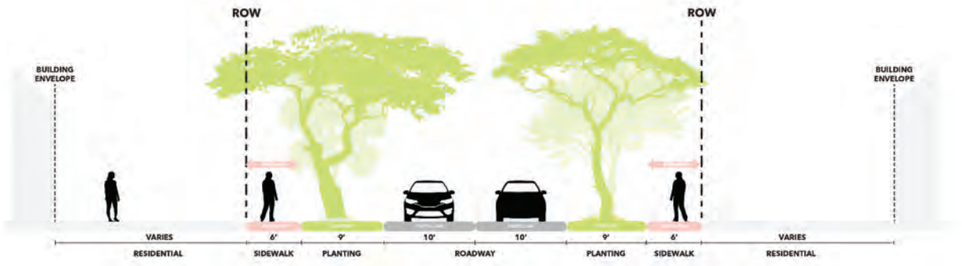
the community terrace

pilot site 2



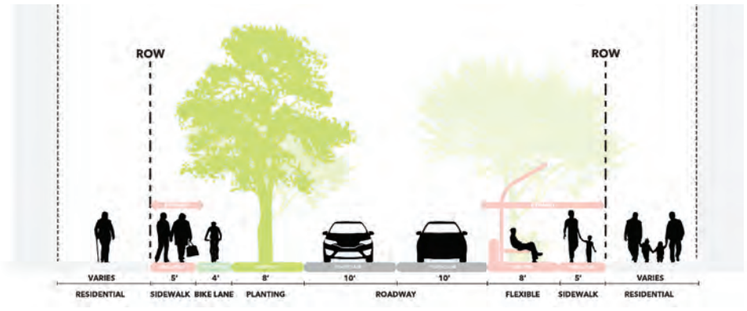
the mobility street

pilot site 3



the park street

pilot site 4



the social street

Pilot Site 1: Community Terrace

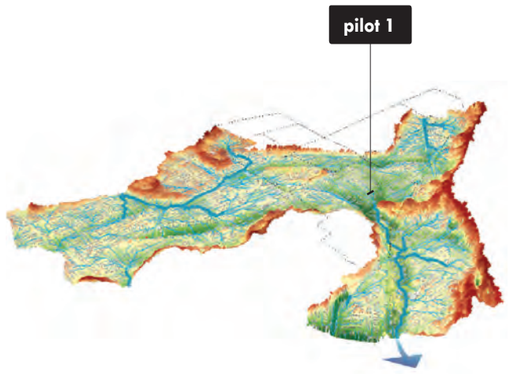
Neighborhood Context

COMMUNITY TERRACE GOALS

- Increase tree canopy coverage to reduce urban heat island.
- Support and frame residential parking areas with landscape.
- Infiltrate stormwater and lower groundwater as a blue street.
- Define a common utility area between neighbors.
- Increase planting manage biodiversity and watersheds.

Pilot Site 1: Community Terrace

Hydrology



10-YEAR FLOOD:

Source: CDM 10yr Inundation Map

Source: Analytic graphics generated by LOCAL from 2018 County LIDAR

Pilot Site 1: Community Terrace

Design Opportunities

By studying the street's character we can play off the details and materials unique to the context of the neighborhood and landscape.

Lush Pockets of Vegetation

Due to the low-lying nature of the roadway, water easily supports pockets of biological zones.

Under utilized Shoulders

Streetside shoulders bear runoff from increased storm events while serving as parking zones.

The street offers unique paving opportunities for residential drives while bearing the need for the utilization of public shoulders as a neighborhood amenity

Shoulder Balding

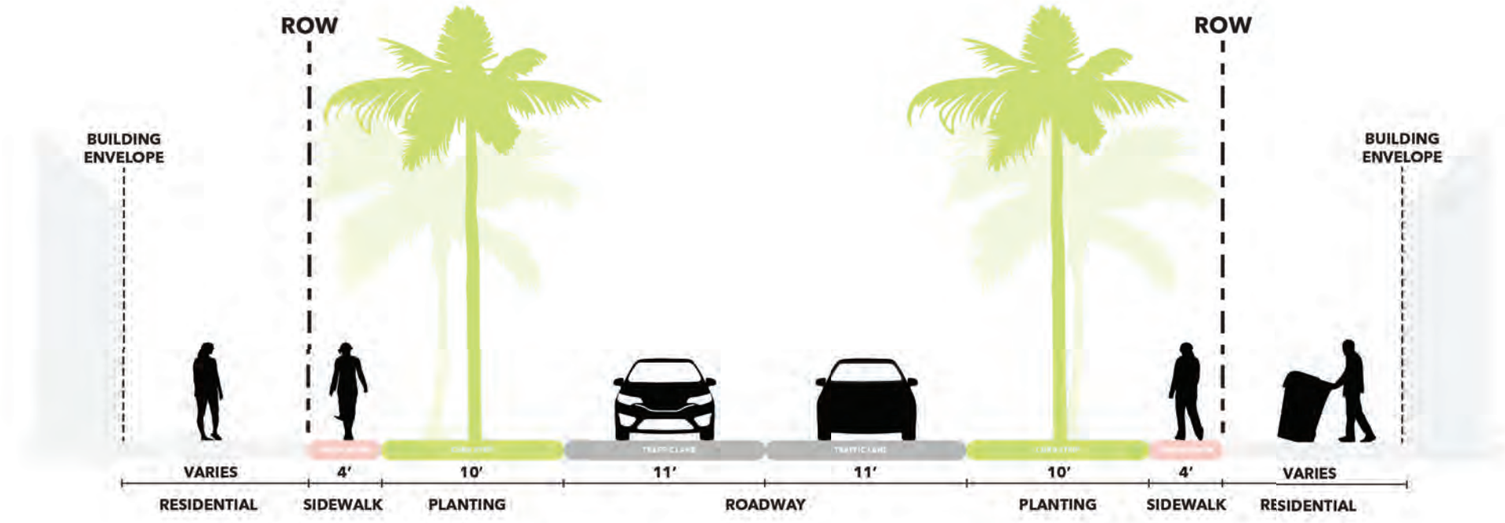
Due to repetitive usage of the shoulder via refuse storage, vegetated areas degrade and erode over time.

Planted Intersection Islands

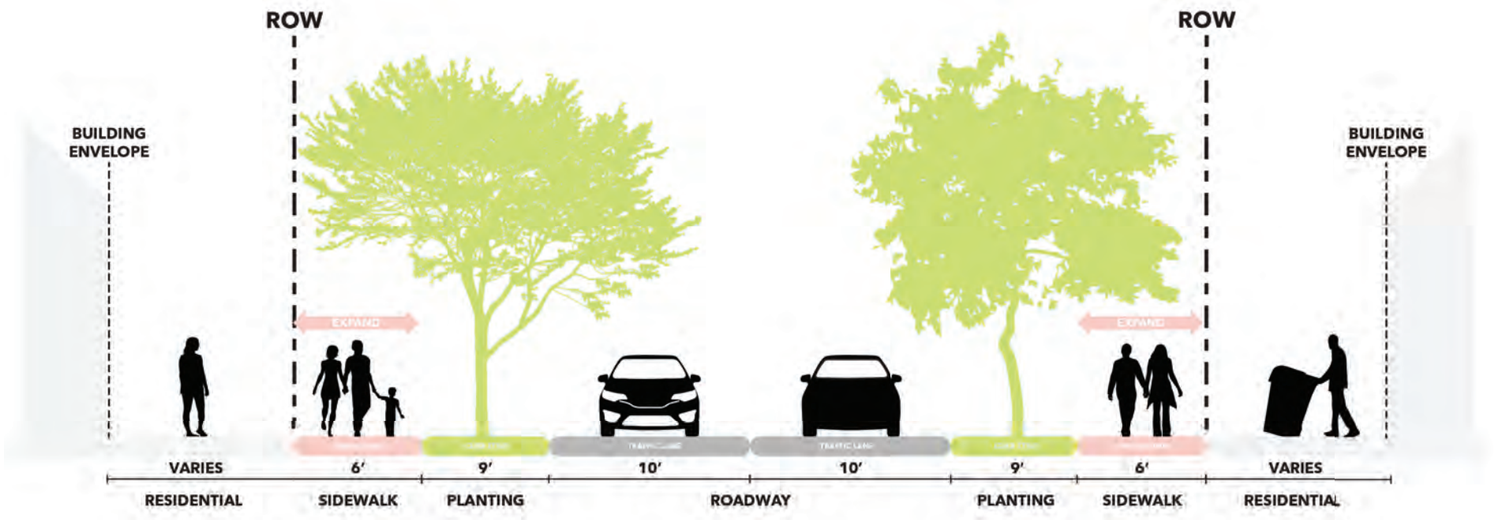
At key intersections, a few planted islands help calm traffic.

Pilot Site 1: Proposed Community Terrace

Increase Public Realm



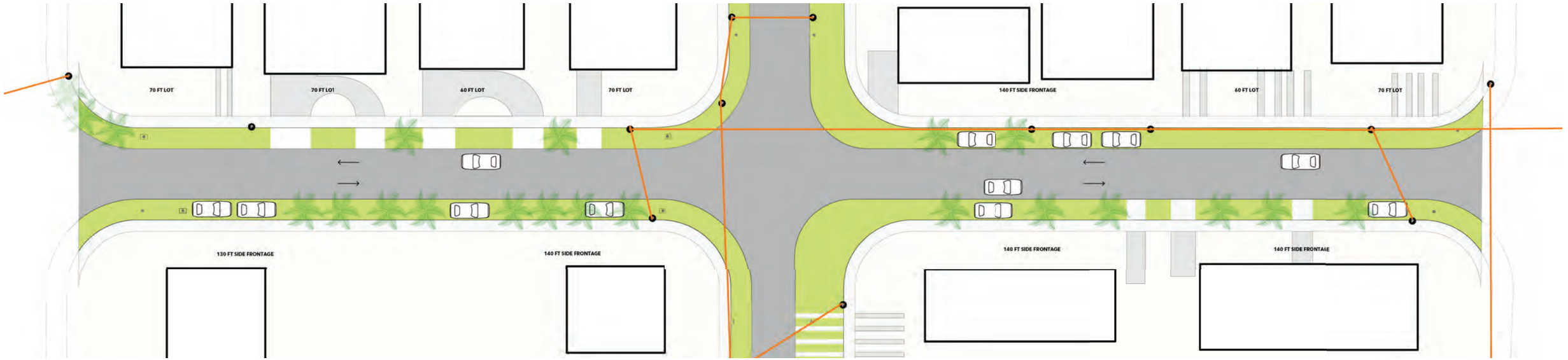
EXISTING STREET TODAY

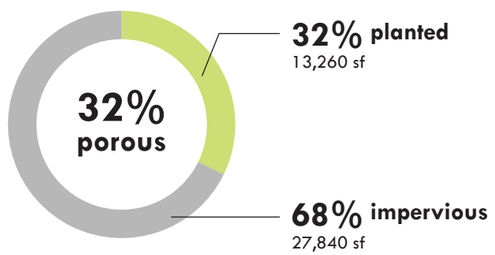


PROPOSED COMMUNITY TERRACE - INCREASE PUBLIC REALM

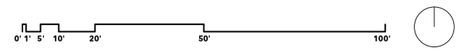
Community Terrace

Existing Street Today





Site 1: 41,100 sf



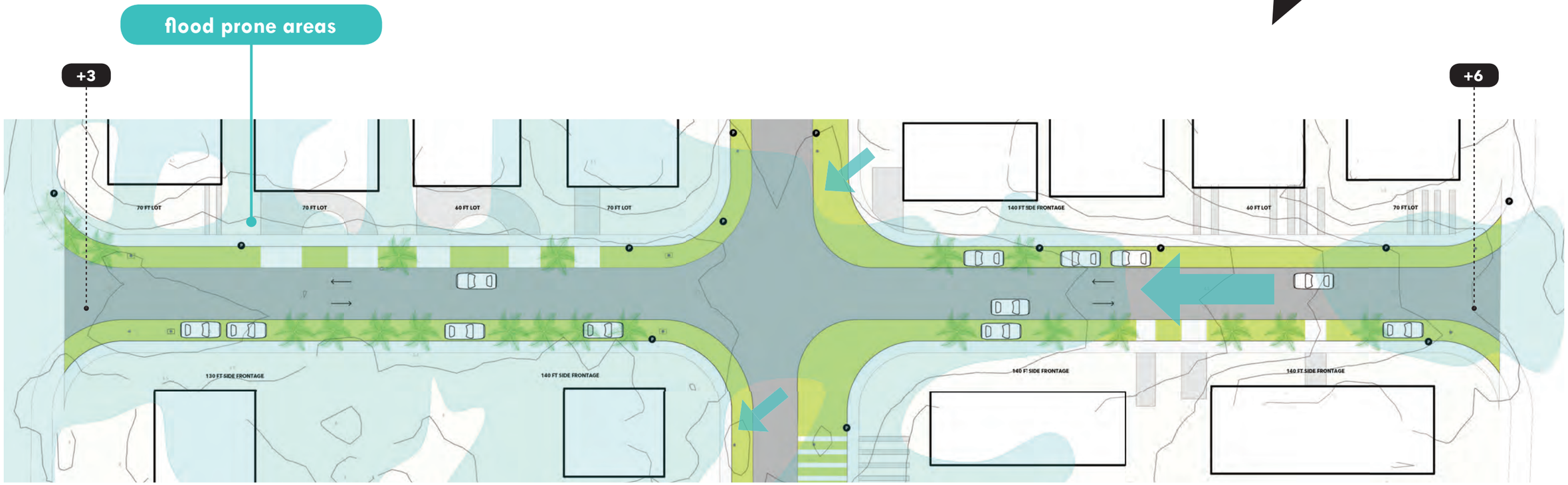
EXISTING CONDITIONS	
41,100 sf	Site Size
20	Parking Spots
13,260 sf	Porous Surfaces
0	Rain Gardens
27,840 sf	Impervious Surfaces
22	Palm Trees

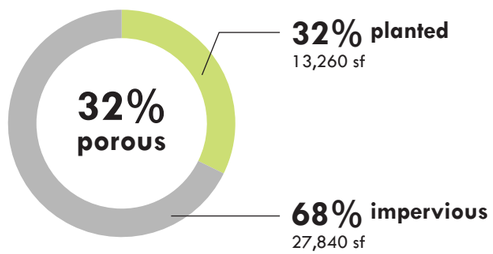
Community Terrace

Existing Stormwater Inundation

A 1,000 year storm (15") cloud burst event will produce 382,000 gallons (51,000 cubic feet) of rain within a 24-hour period.

The western portion of the street is the lowest point of the street, therefore collecting increased amounts of stormwater runoff





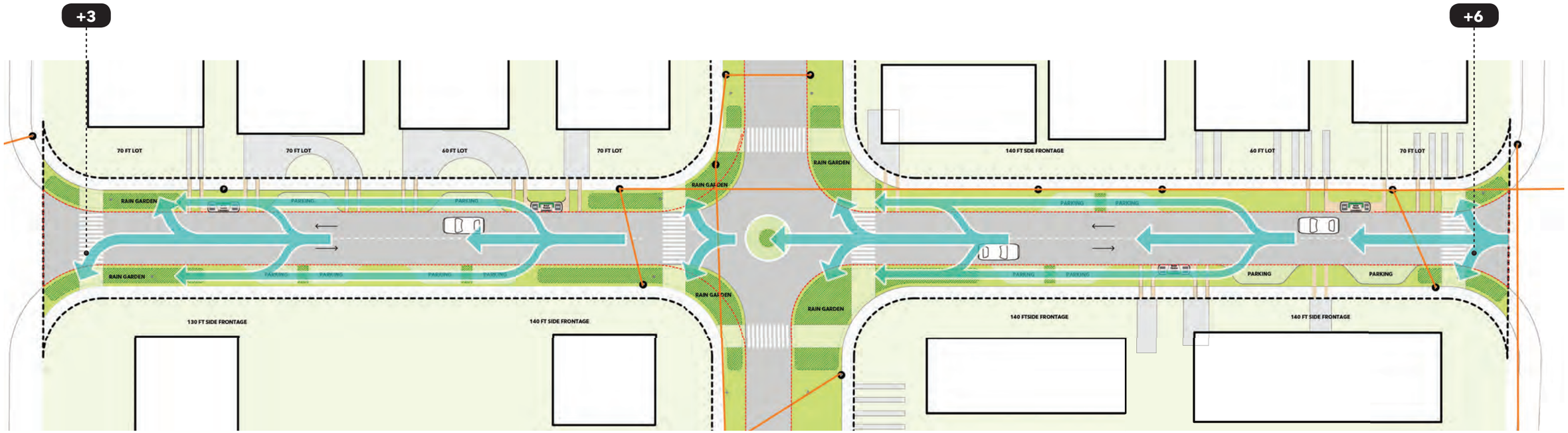
EXISTING CONDITIONS	
41,100 sf	Site Size
20	Parking Spots
13,260 sf	Porous Surfaces
0	Rain Gardens
27,840 sf	Impervious Surfaces
22	Palm Trees

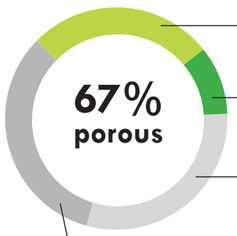
Community Terrace

Proposed Stormwater Management

A 1,000 year storm (15”) cloud burst event will produce 382,000 gallons (51,000 cubic feet) of rain within a 24-hour period.

Our Site 1 proposal can accommodate up to 824,054 gallons (110,160 cubic feet) of storage.





27% planted areas
11,100 sf

10% rain gardens
4,110 sf

30% porous paving
12,330 sf

33% impervious
13,560 sf

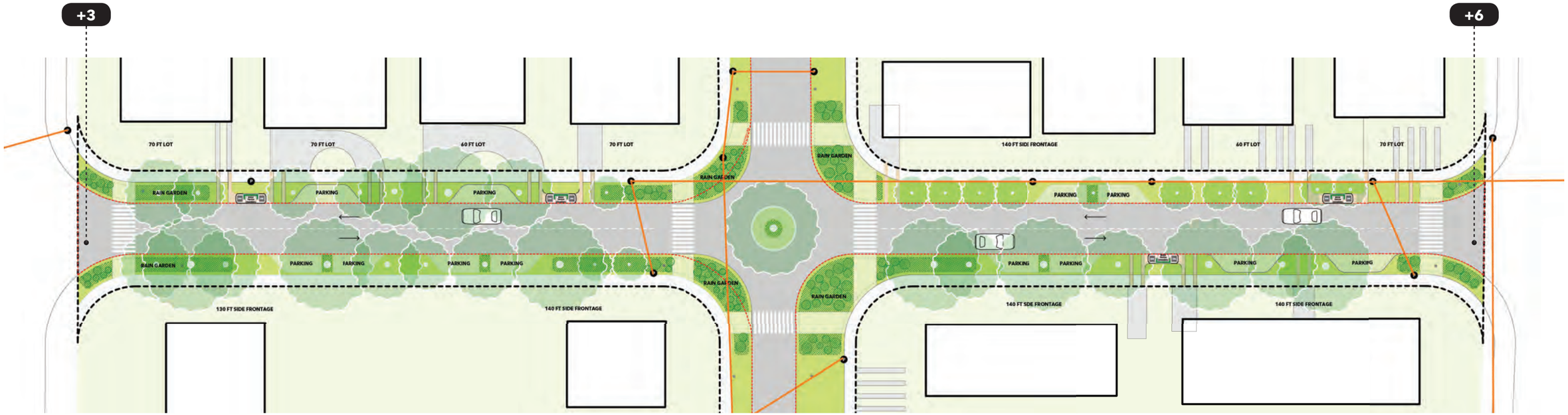
PROPOSED DESIGN	
41,100 sf	Site Size
12	Parking Spots
12,330 sf	Porous Surfaces
11,100 sf	Planted Areas
4,110 sf	Rain Gardens
13,560 sf	Impervious Surfaces

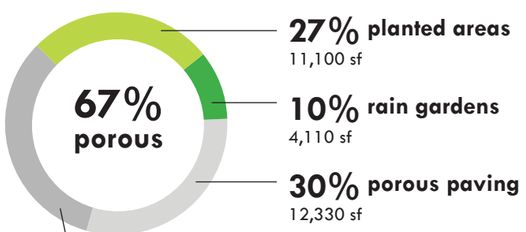
Structural Soil Porosity 40% per: Grabosky, Jason & Bassuk, Nina & Trowbridge, P.. (2002). Structural soils.(LATIS). Am. Soc. Landscape Architects. 636. 20001-23736.

Community Terrace

Proposed Design Stormwater Management

Our Site 1 proposal can add an additional 36 trees creating up to 42,387 square feet of new tree canopy.





27% planted areas
11,100 sf

10% rain gardens
4,110 sf

30% porous paving
12,330 sf

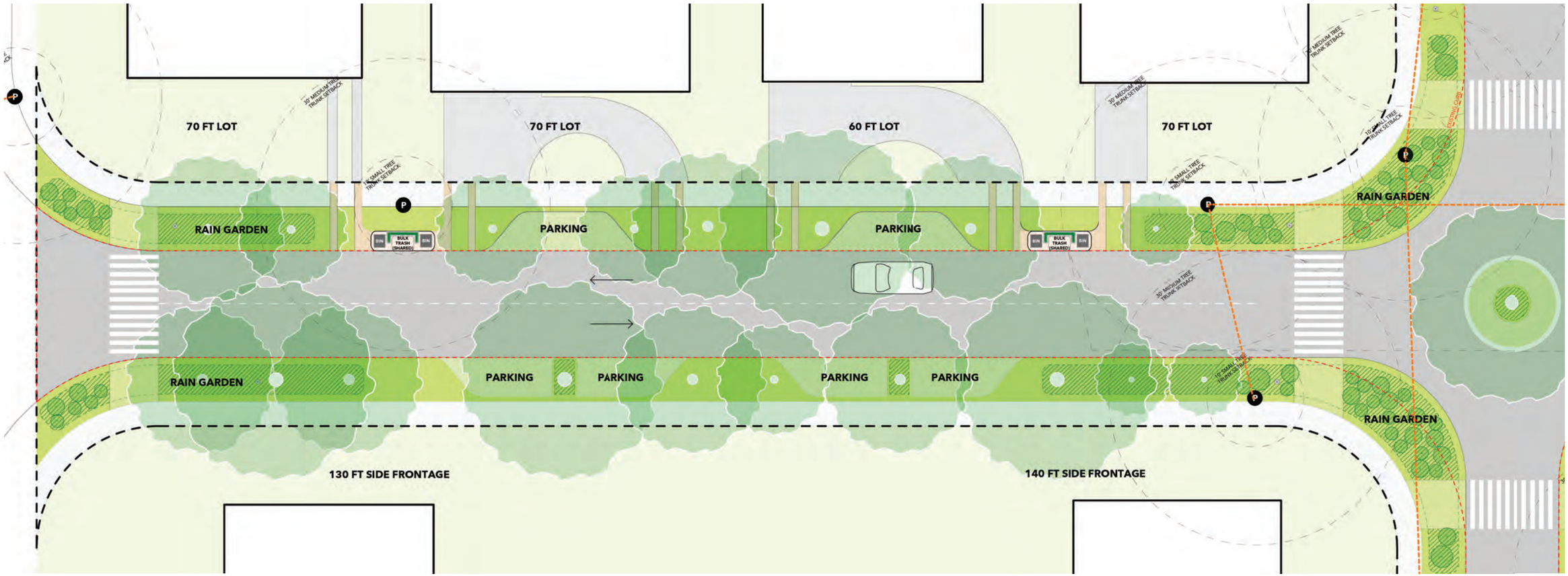
33% impervious
13,560 sf

PROPOSED DESIGN	
41,100 sf	Site Size
12	Parking Spots
12,330 sf	Porous Surfaces
11,100 sf	Planted Areas
4,110 sf	Rain Gardens
13,560 sf	Impervious Surfaces

Structural Soil Porosity 40% per: Grabosky, Jason & Bassuk, Nina & Trowbridge, P.. (2002). Structural soils.(LATIS). Am. Soc. Landscape Architects. 636. 20001-23736.

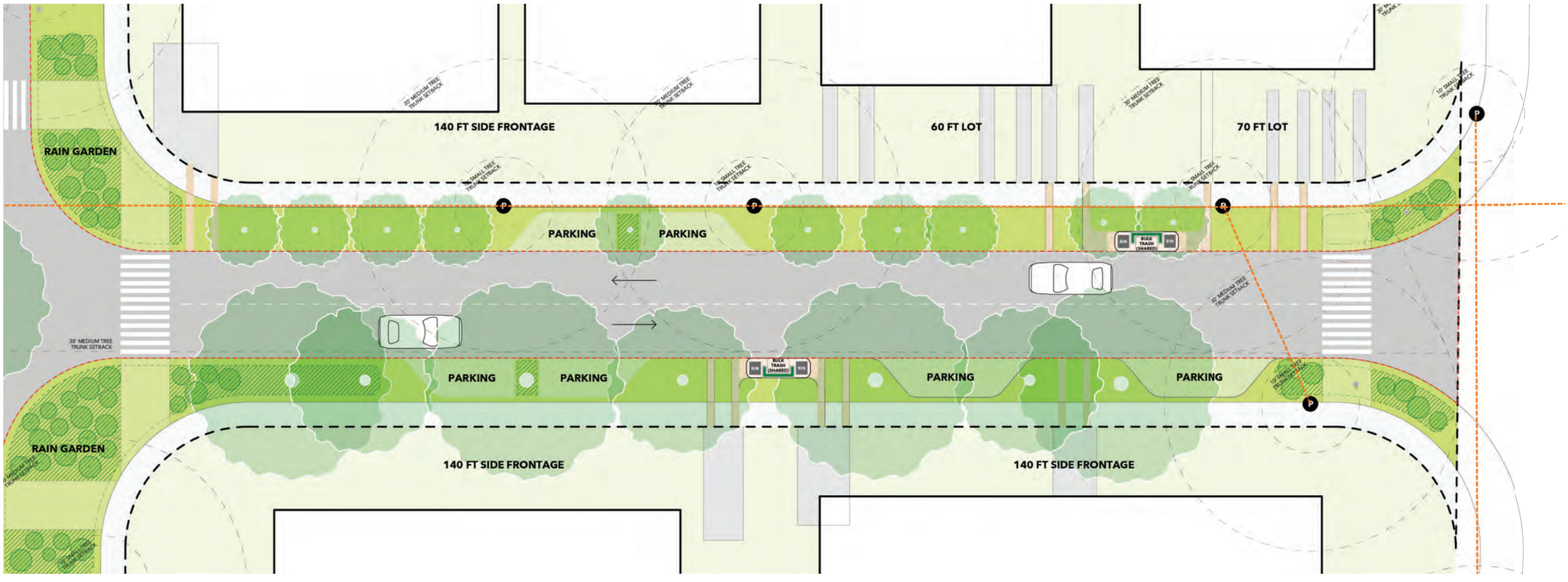
Community Terrace

Proposed Design



Community Terrace

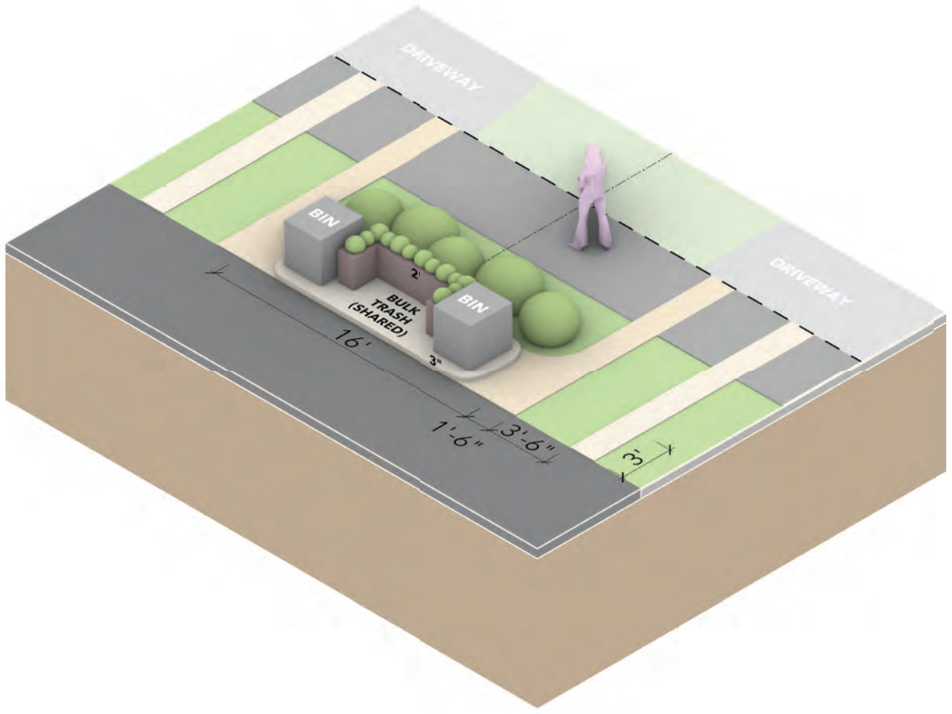
Proposed Design



Community Terrace

Proposed Community Amenity

A trash collection pad can blend into the street fabric and provide a community amenity

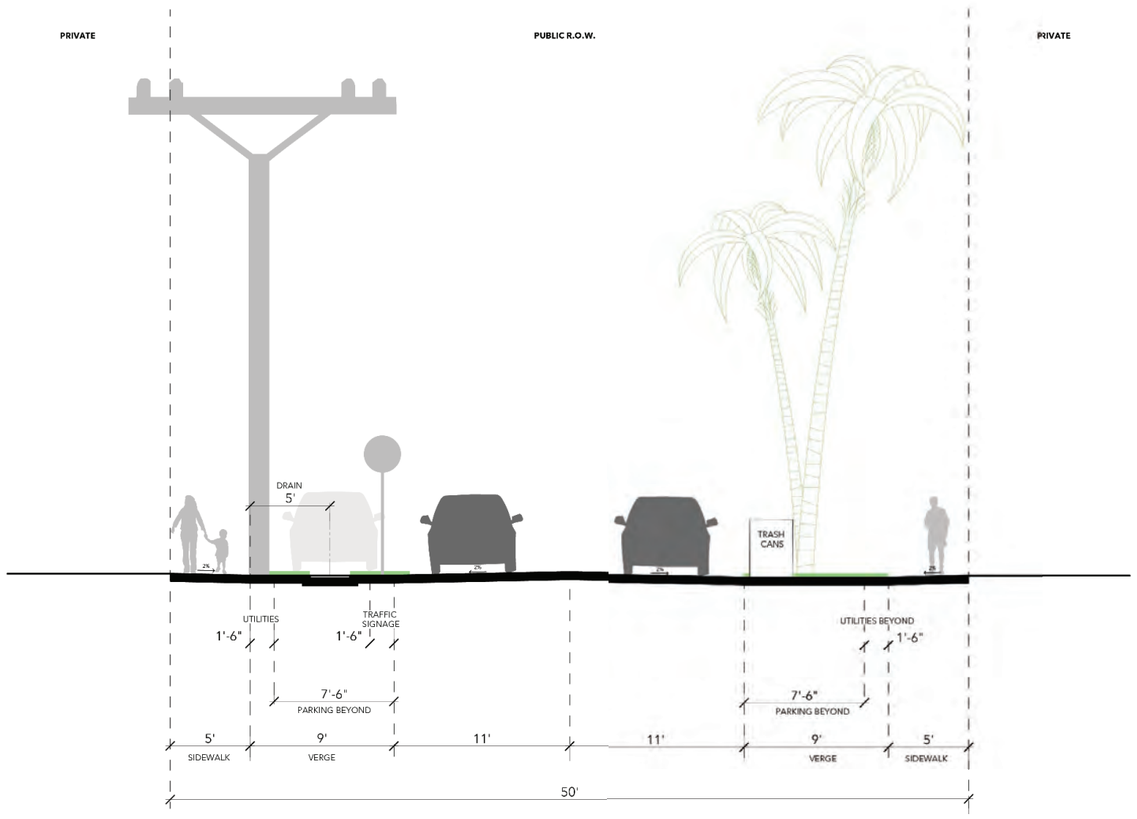


PROPOSED COMMUNITY TRASH COLLECTION PAD

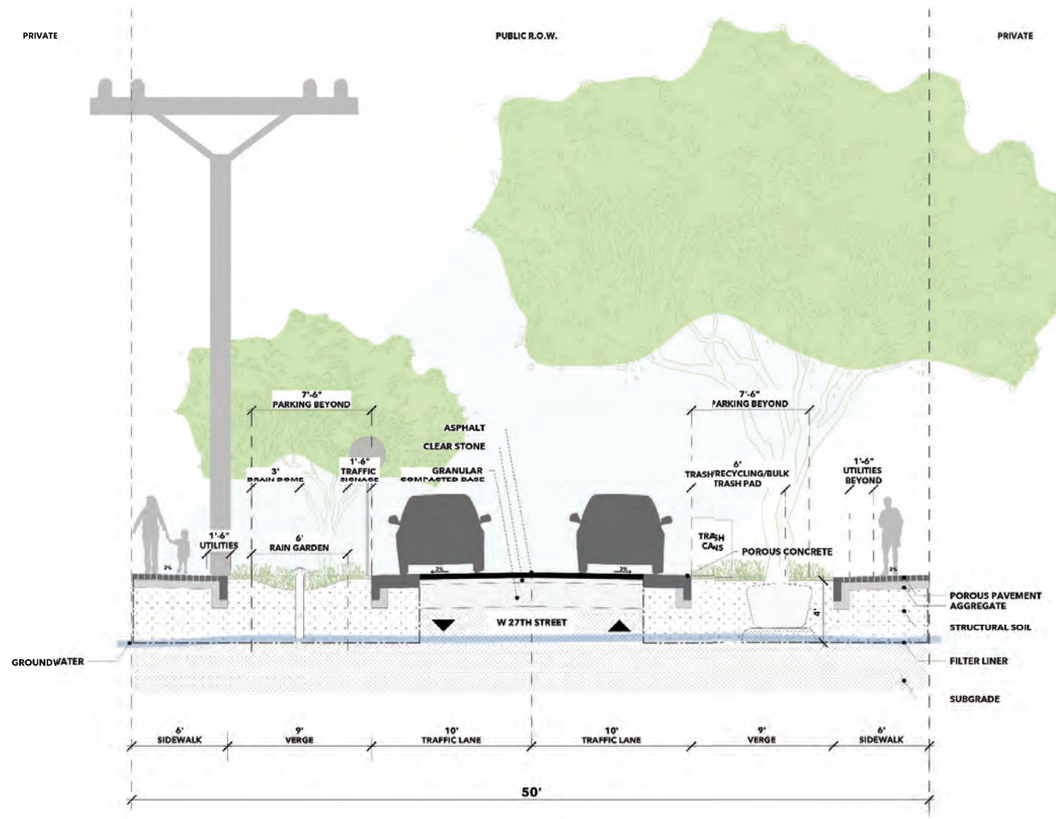
LONDON LIVEABLE NEIGHBORHOODS PROGRAM [Reference Image]

Community Terrace

Proposed Design



EXISTING STREET SECTION

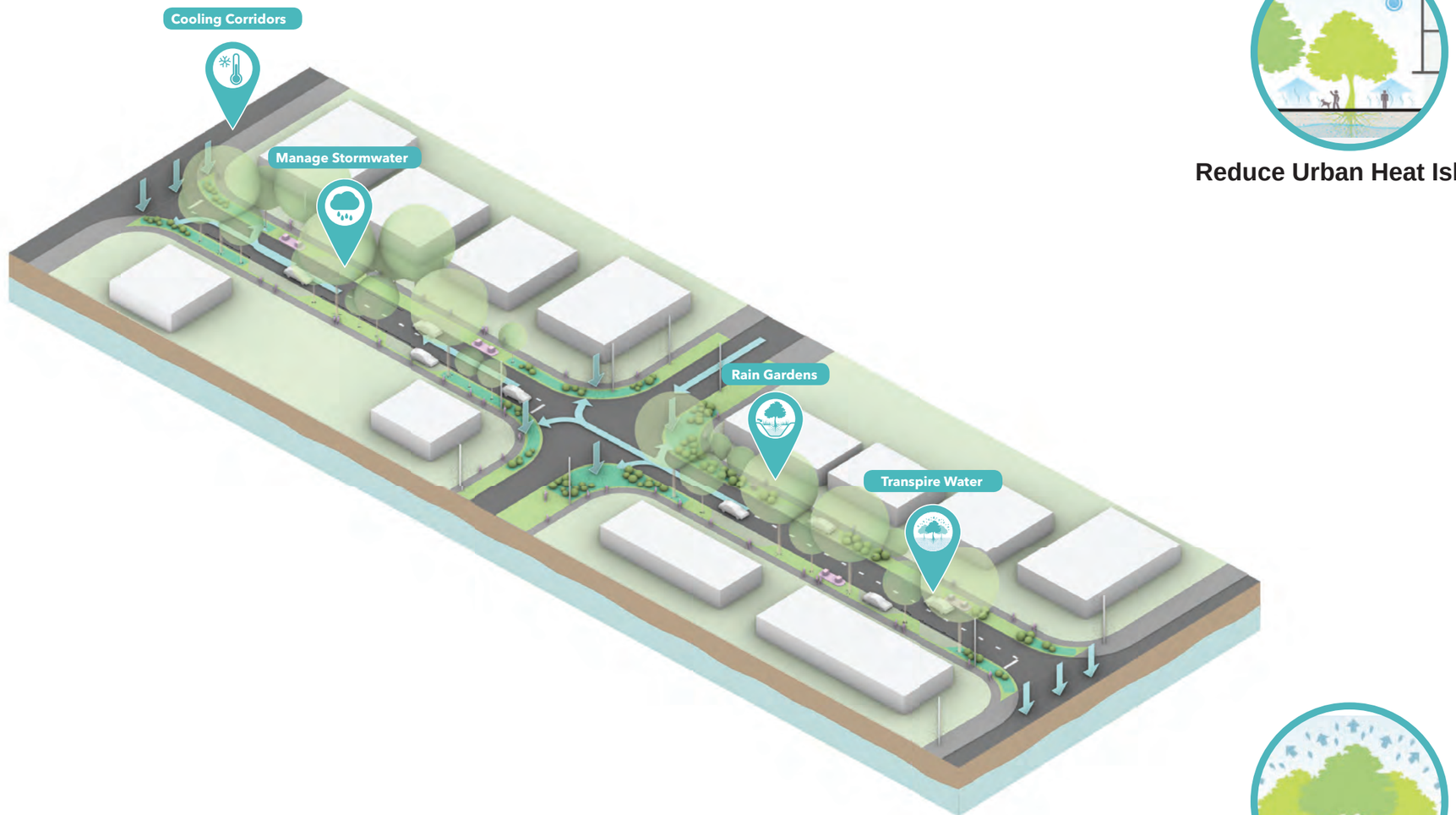


PROPOSED SECTION

Community Terrace

Vision

Promote Resiliency



Reduce Urban Heat Island

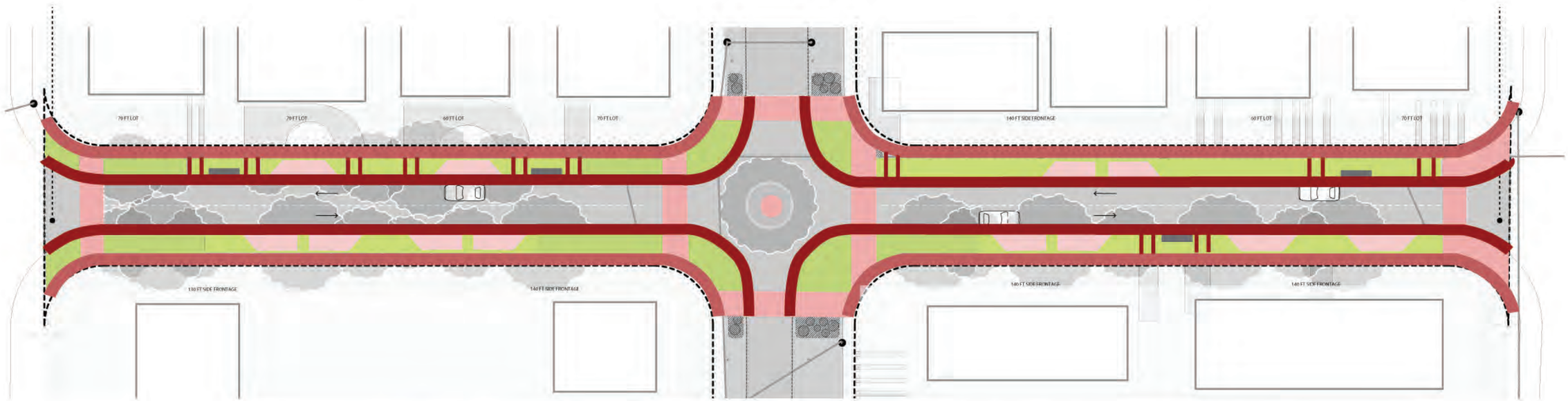
Living Street to Absorb Groundwater

Promote Dense Tree Canopies

Community Terrace Materials

Guidelines

The recommended surfacing materials for the Pilot projects were selected based upon the research and findings of the teams investigations into the available pervious paving materials found in the previous section of this document. This diagram shows the areas and recommended materials and percentage of the right-of way each represents. They are broken down this way to better inform decisions about what to include on each street and what the implications are for not making all of these areas pervious.



Pervious Areas

67%

- Green Space (27%)
- Rain Garden (10%)

Total of 37% Vegetated Space

- Roadway Edge & Driveway Bands: Pervious Concrete Pre-cast Panels (6%)
- Sidewalk: Pervious Concrete Pre-cast Panels, Flexipave, or Pavers (12%)
- Crosswalks: Pervious Concrete Pre-cast Panels (9%)
- Parking space: Pervious Concrete Pre-cast Panels, Pavers or Porous Asphalt (3%)

Total of 30% Pervious Pavement

Impervious Areas

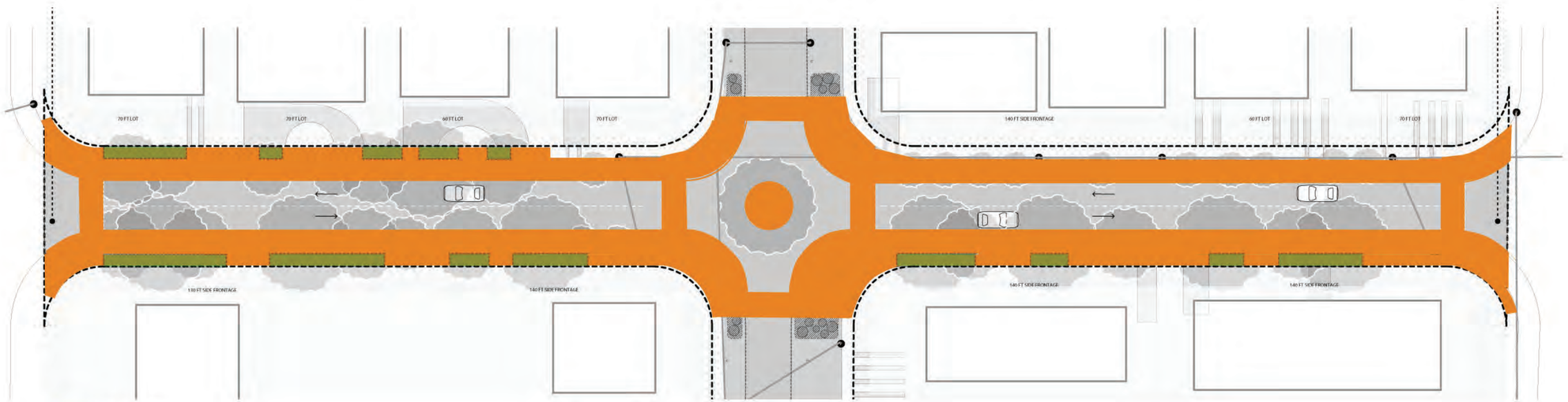
33%

- Amenity Pad: Standard PIP Concrete (1%)
- Roadway: Standard Asphalt (32%)

Community Terrace Materials

Guidelines

The recommended subsurface infrastructure proposed below were selected to support optimal tree growth and success. This below-grade infrastructure includes the use of soil cells below sidewalks where larger species tree are proposed and structural soils within the pervious areas to facilitate a more extensive and expansive root system within the ROW. The following diagram shows the proposed locations for structural soils and soil cells within this pilot site.



Large Tree Planted with Soil Cells beneath sidewalk

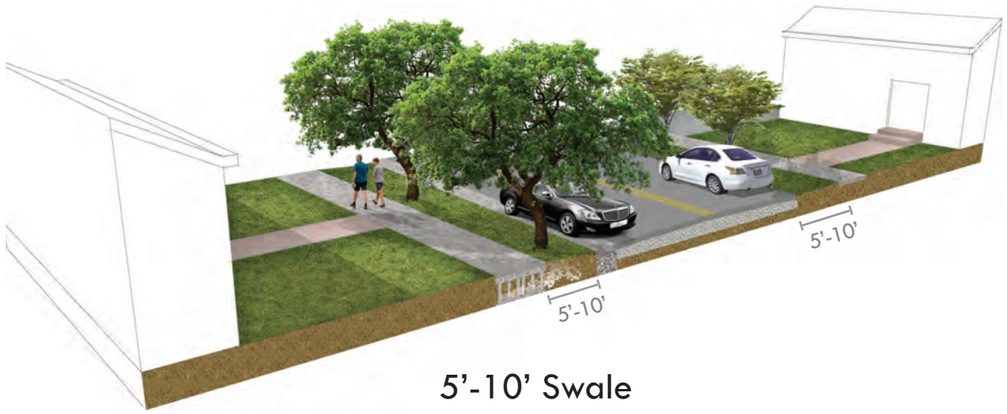
Large Tree Planted with Structural Soil beneath sidewalk

Community Terrace Planting

General Guidelines

Planting for the Pilot Projects should refer to the guidelines presented in this report in the *Planting Practices* and *Neighborhood Plans* sections. Care must be taken with placement of the trees to not block visibility from driveways or intersections. It is vitally important that the species of trees selected be appropriate for the size of the space they are being planted in. Shade trees should always be used in lieu of palms, as they provide much greater benefits: exceptions to this would be in high visibility areas for emphasis entering a neighborhood.

Medium Swale



5'-10' Swale

Street Trees

The Community Terrace Pilot Project shows a nine foot swale on both sides of the street. Additionally there are overhead electrical lines on one side of one of the blocks.
A nine foot swale without any infrastructure (structural soil or soil cells) can support a medium tree (refer to *Medium Swale Palette* for species). This palette would also apply to the areas between two parking spaces due to the narrowness of the space, even with structural soil on both sides.
Otherwise, where structural soil or soil cells are used adjacent to the trees - as they are shown in this pilot project, large trees can be planted (refer to *Large Swale Palette* for species).
Under the overhead electrical lines only small trees should be used (refer to *Small Swale/ Utility Palette* for species). Within a rain garden area, species that can handle more water should be selected from the palettes.
The neighborhood plan (refer to the *Neighborhood Plans* section for additional info) should then be consulted to see what the preferred species are for each sized tree required. This example is in the Douglas Park neighborhood, so the trees shown are from that palette as well as being selected for their sizes.

Figure 1: Rain Garden Section

Rain Gardens

The intent of the Rain Gardens for these areas are to absorb and filter as much water as possible. Ideally ground covers should be placed in these areas for maximum absorption and filtration, however bahia sod could also be used. These areas should have rock beneath them to hold water. In areas where there are no trees, like the corners of the intersections, standard #57 drainage rock would be sufficient. In areas where shade trees are also planted, structural soil is preferred to allow greater growth for the trees. Care should be taken to select trees from the palettes that can handle more water. Below are some species recommended for use in the rain gardens.

Tripsacum floridana
Dwarf Fakahatchee Grass

Hymenocalis latifolia
Spider Lily

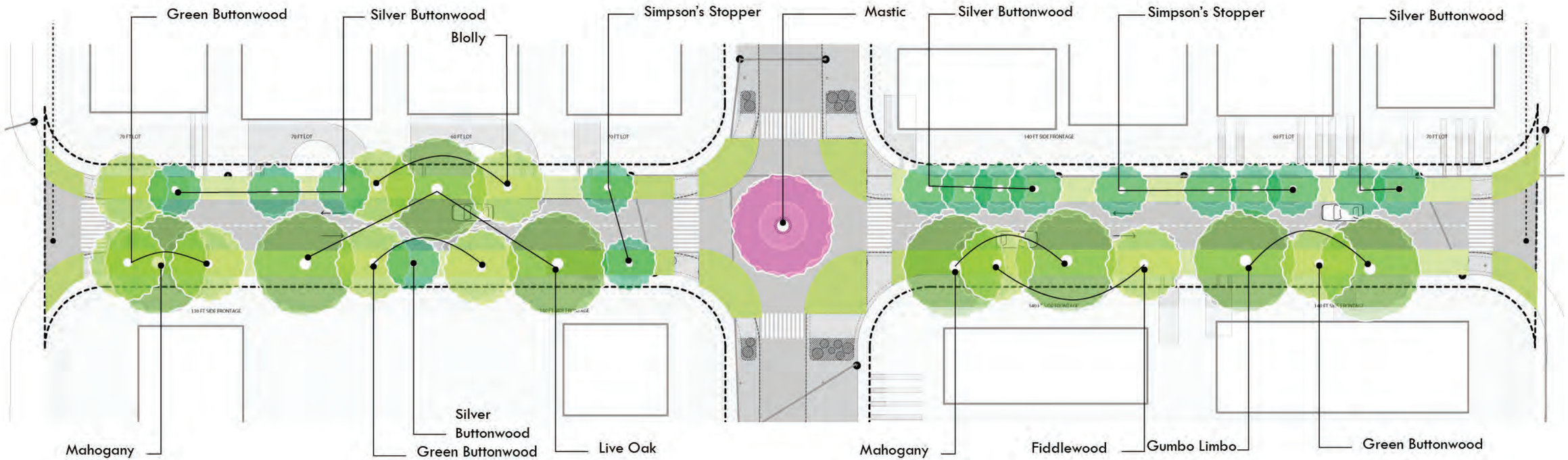
Phyla nodiflora
Frog Fruit

Stachytarpheta jamaicensis
Blue Porterweed

Community Terrace Planting

Diversity

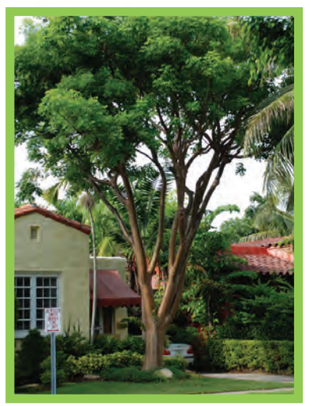
Diversity is vital to a healthy urban forest. High biodiversity reduces risks from pests and diseases and from climate change, improving resiliency and the supply of ecosystem services.
Below is an example of a potential planting scheme applied to the pilot project to enhance biodiversity. Tree species and sizes were selected using the recommendations of this plan for the sizes of the swales and the neighborhood the street is in (Douglas Park).



Gumbo Limbo
Large Tree

Green Buttonwood
Medium Tree

Red Maple
Rain Garden Tree



Simpson's Stopper
Overhead Utility Tree

Pilot Site 2: Mobility Street

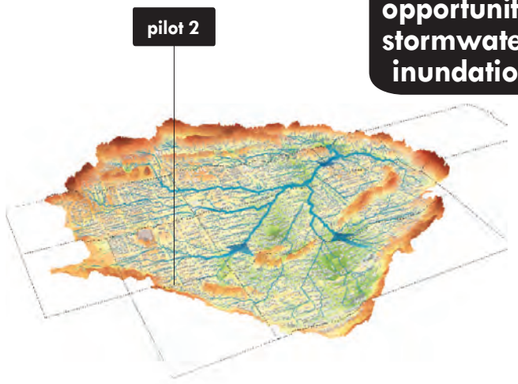
Neighborhood Context

MOBILITY STREET GOALS

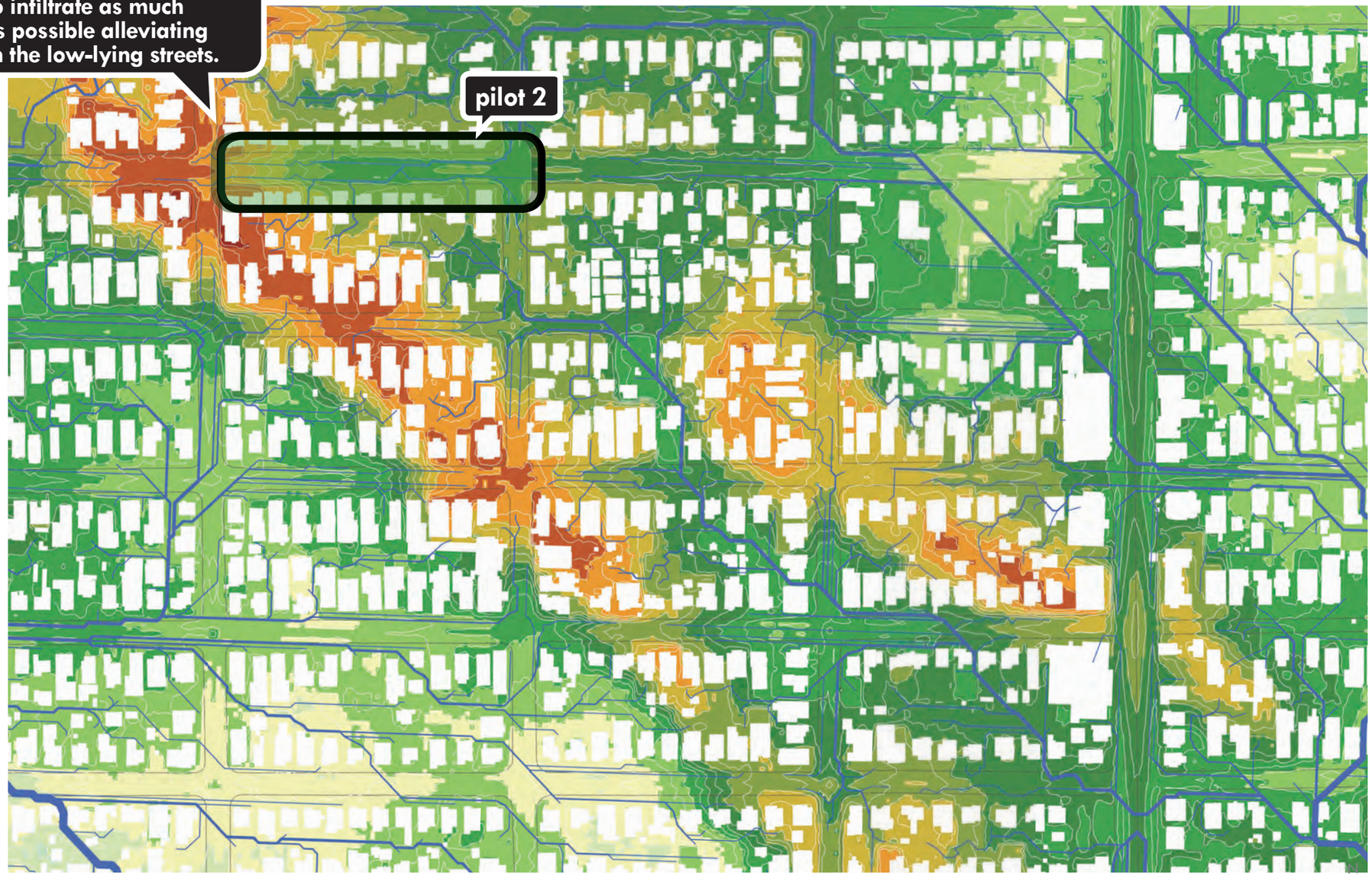
- Increase tree canopy coverage to reduce urban heat island.
- Utilize traffic calming measures for the busy corridor.
- Create more room for pedestrians
- Support bike lanes and other opportunities for micromobility.
- Provide flexibility for streetside parking.
- Comply with FPL's tree placement criteria.

Pilot Site 2: Mobility Street

Hydrology



Our GREEN STREET pilot is a higher elevation street. Here, we have the opportunity to infiltrate as much stormwater as possible alleviating inundation in the low-lying streets.



10-YEAR FLOOD:

Source: CDM 10yr Inundation Map

Source: Analytic graphics generated by LOCAL from 2018 County LIDAR

Pilot Site 2: Mobility Street

Design Opportunities

By studying the streets character we can play off the details and materials unique to the context of the neighborhood and landscape.

Shared Street

The existing bicycle route presents an opportunity to accommodate micromobility and the need to provide cyclist safety.

Utility Infrastructure

A mix of large and medium sized electrical lines present both challenge and opportunity for canopy placement.

Pilot Site 2: Mobility Street

Types of Bicycle Facilities per USDOT FHWA

Different "bicycle facilities" exist in the U.S. and are outline in the federal highway DOT standards. The transition from the existing shared street to a designated bike lane should be as seamless as possible.

TODAY

SIGNED ROUTES (NO PAVEMENT MARKINGS)
a roadway designated as a preferred route for bicycles

SHARED LANE MARKINGS
a shared roadway with pavement markings providing wayfinding guidance to bicyclists and alerting drivers that bicycles are likely to be operating in mixed traffic

ON-STREET BIKE LANES
an on-road bicycle facility designated by striping, signing and pavement markings

ON-STREET BUFFERED BIKE LANES
bike lanes with a painted buffer increase lateral separation between bicyclists and motor vehicles

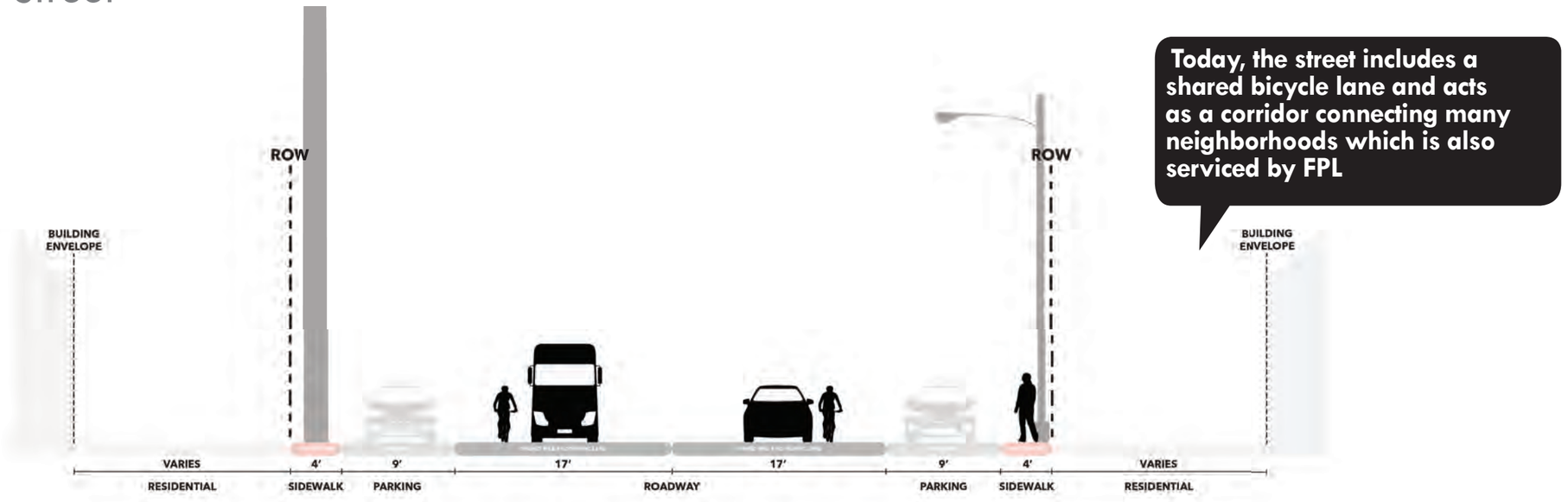
BEST CASE SCENARIO

SEPARATED BIKE LANES
a separated bike lane is an exclusive facility for bicyclists that is located within or directly adjacent to the roadway and that is physically separated from motor vehicle traffic with a vertical element

OFF STREET TRAILS
bicycle facilities physically separated from traffic, but intended for shared use by a variety of groups, including pedestrians, bicyclists and joggers.
SOURCE: SEPARATED BIKE LANE PLANNING AND DESIGN GUIDE, MAY 2015, USDOT FHWA

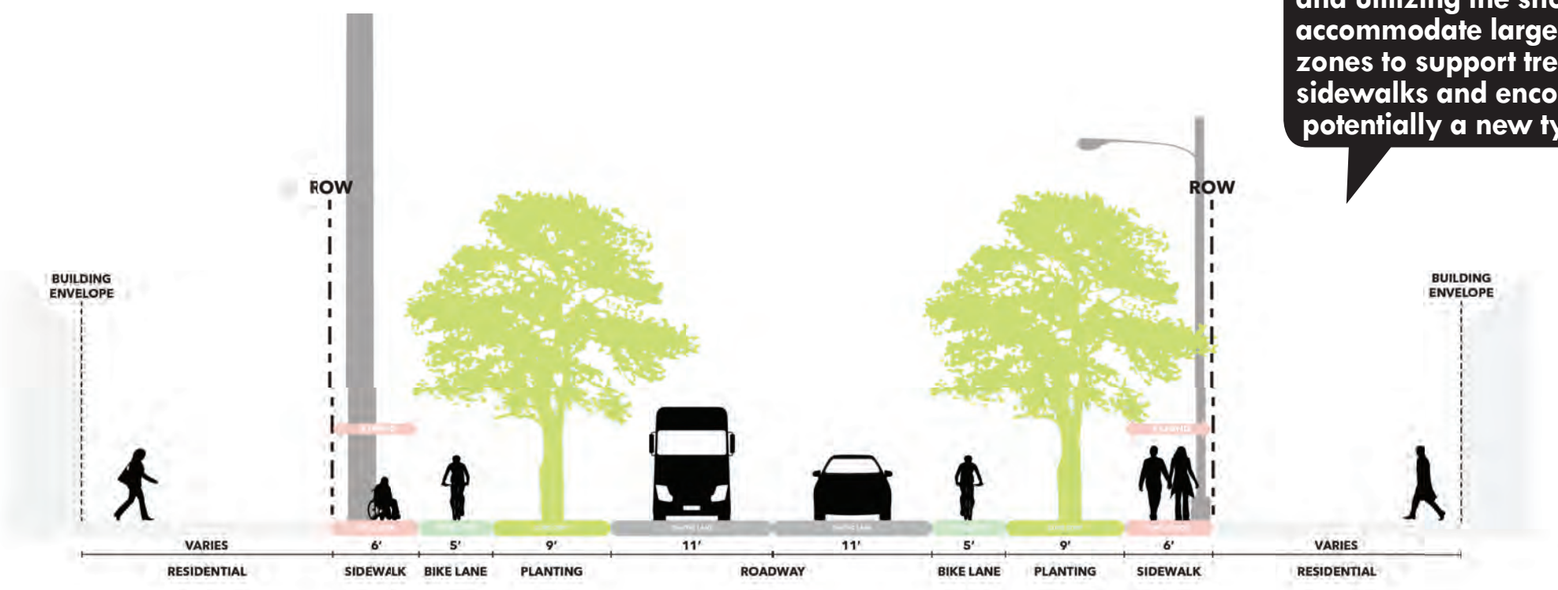
Pilot Site 2: Mobility Street

Proposed Design



Today, the street includes a shared bicycle lane and acts as a corridor connecting many neighborhoods which is also serviced by FPL

EXISTING STREET TODAY

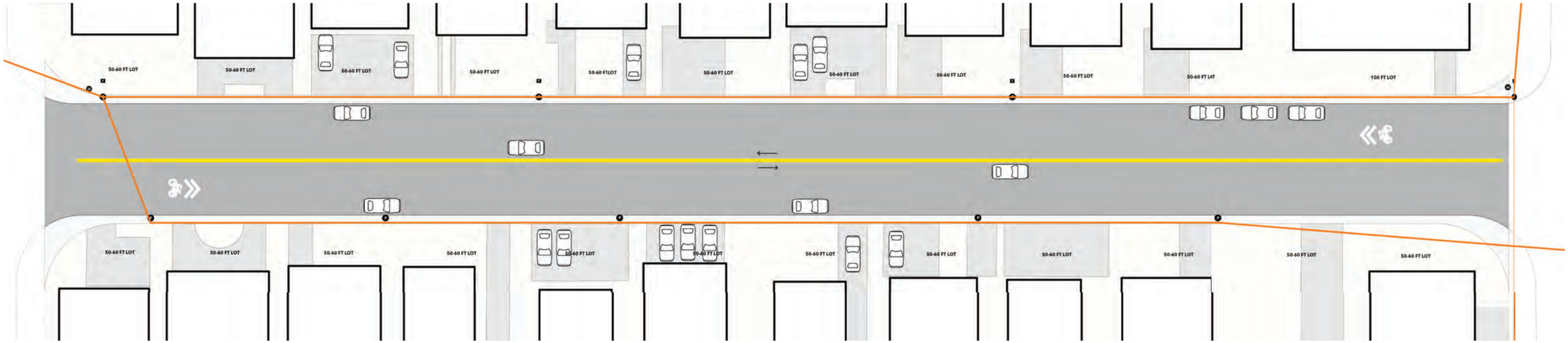


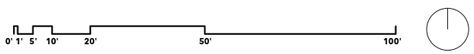
By expanding into the improved street and utilizing the shoulder, we can accommodate large enough planting zones to support trees, ADA accessible sidewalks and encourage cycling safety - potentially a new typology for the street!

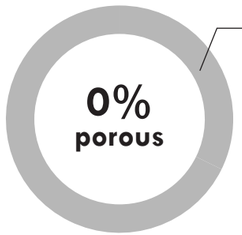
PROPOSED MOBILITY STREET

Pilot Site 2: Mobility Street

Existing Street







100% impervious
41,800 sf

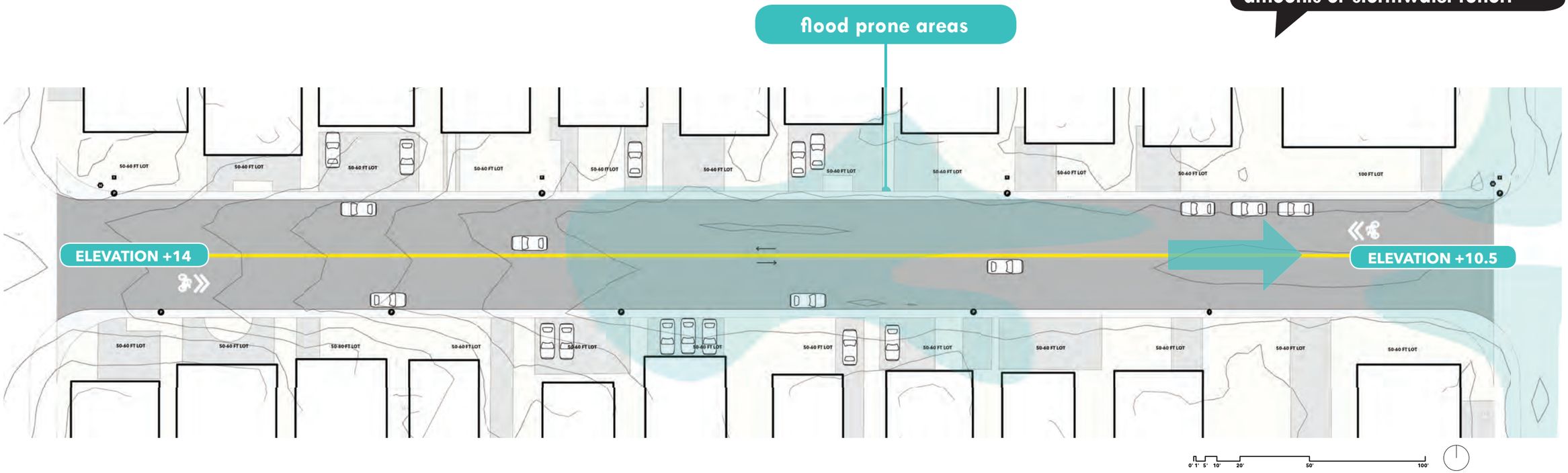
EXISTING CONDITIONS	
41,800 sf	Site Size
0	Parking Spots
0	Porous Surfaces
0	Rain Gardens
41,800 sf	Impervious Surfaces
0	Trees

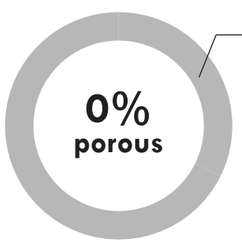
Pilot Site 2: Mobility Street

Existing Stormwater Inundation

A 1,000 year storm (15") cloud burst event will produce 391,000 gallons (52,250 cubic feet) of rain within a 24-hour period.

The eastern portion of the street is the lowest point of the street, therefore collecting increased amounts of stormwater runoff





100% impervious
41,800 sf

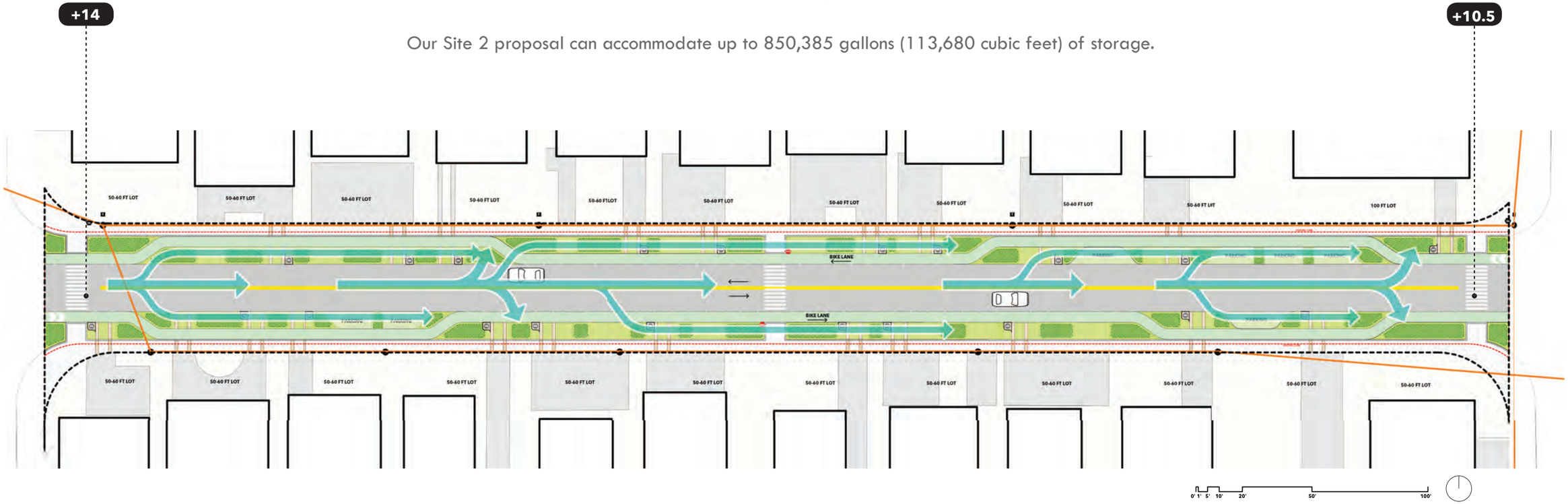
EXISTING CONDITIONS	
41,800 sf	Site Size
0	Parking Spots
0	Porous Surfaces
0	Rain Gardens
41,800 sf	Impervious Surfaces
0	Trees

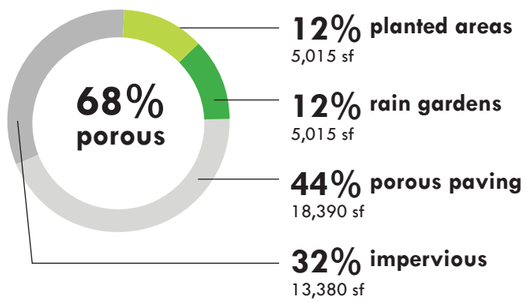
Pilot Site 2: Mobility Street

Proposed Stormwater Management

A 1,000 year storm (15") cloud burst event will produce 391,000 gallons (52,250 cubic feet) of rain within a 24-hour period.

Our Site 2 proposal can accommodate up to 850,385 gallons (113,680 cubic feet) of storage.





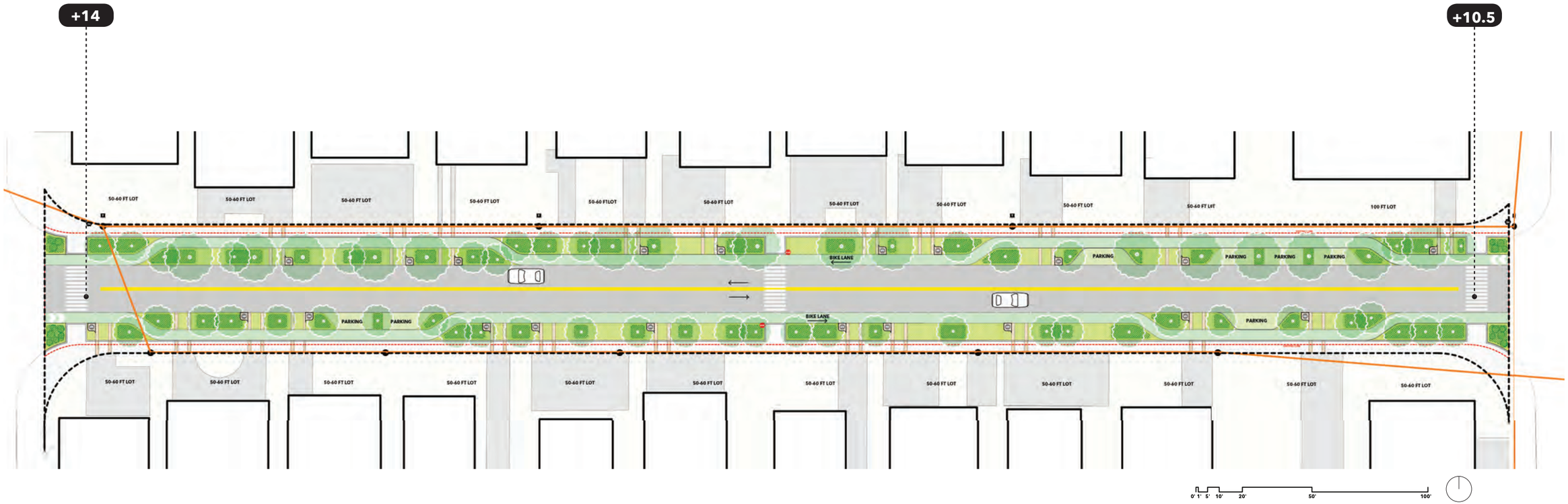
PROPOSED DESIGN	
41,800 sf	Site Size
7	Parking Spots
18,390 sf	Porous Surfaces
5,015 sf	Planted Areas
5,015 sf	Rain Gardens
13,380 sf	Impervious Surfaces

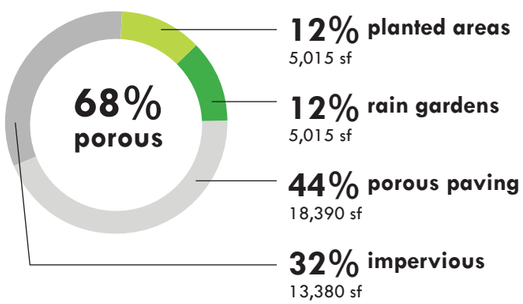
Structural Soil Porosity 40% per: Grabosky, Jason & Bassuk, Nina & Trowbridge, P.. (2002). Structural soils.(LATIS). Am. Soc. Landscape Architects. 636. 20001-23736.

Pilot Site 2: Mobility Street

Proposed Design - Option 1

Our Site 2 proposal option 1 can add an additional 63 trees creating up to 19,568 square feet of new tree canopy.





12% planted areas
5,015 sf

12% rain gardens
5,015 sf

44% porous paving
18,390 sf

32% impervious
13,380 sf

large species shade trees

medium species shade trees

small species shade trees

PROPOSED DESIGN	
41,800 sf	Site Size
7	Parking Spots
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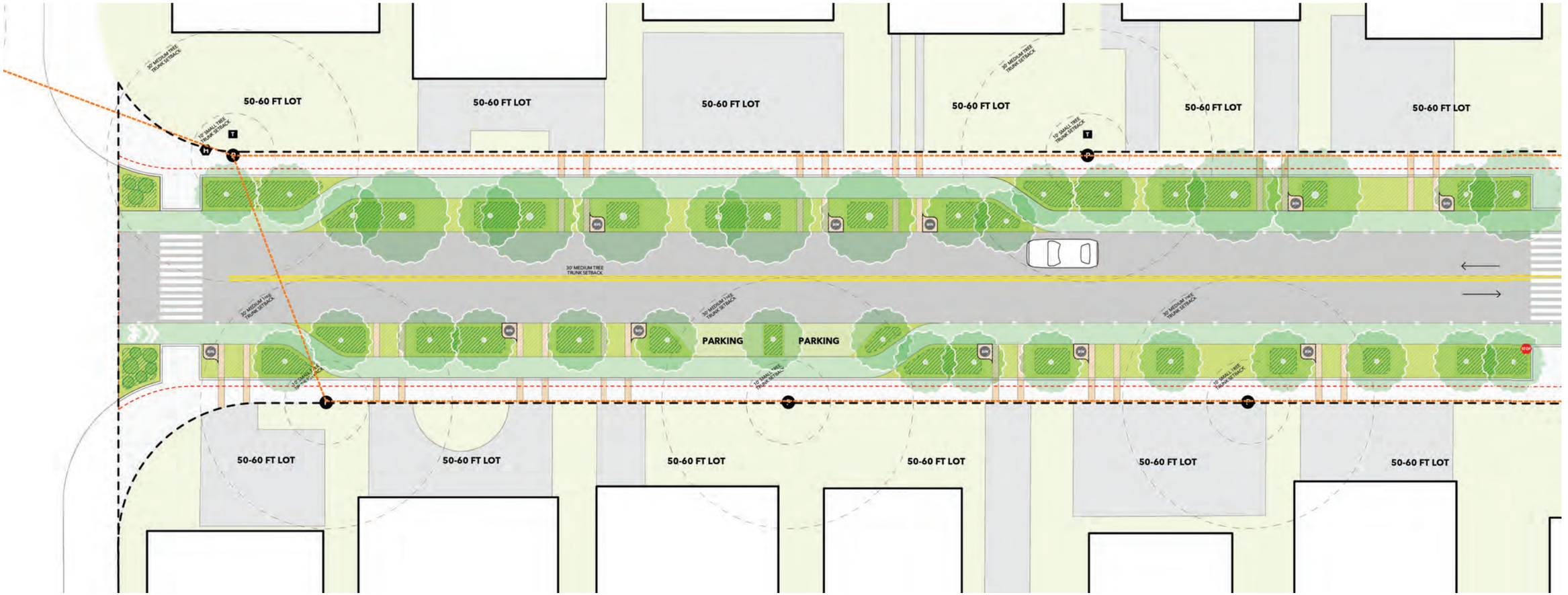
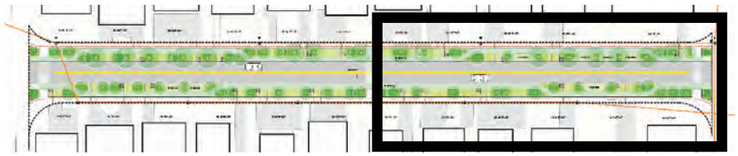
Pilot Site 2: Mobility Street

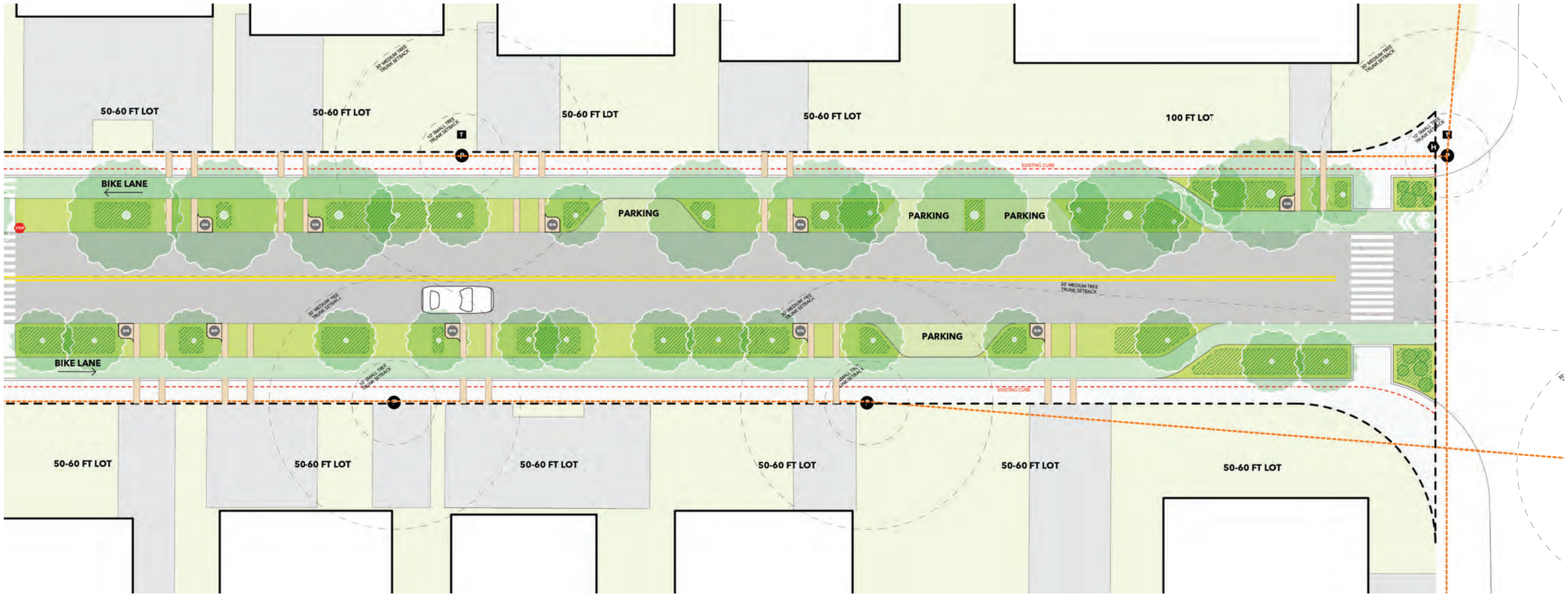
Proposed Design - Option 1



Pilot Site 2: Mobility Street

Proposed Design - Option 1





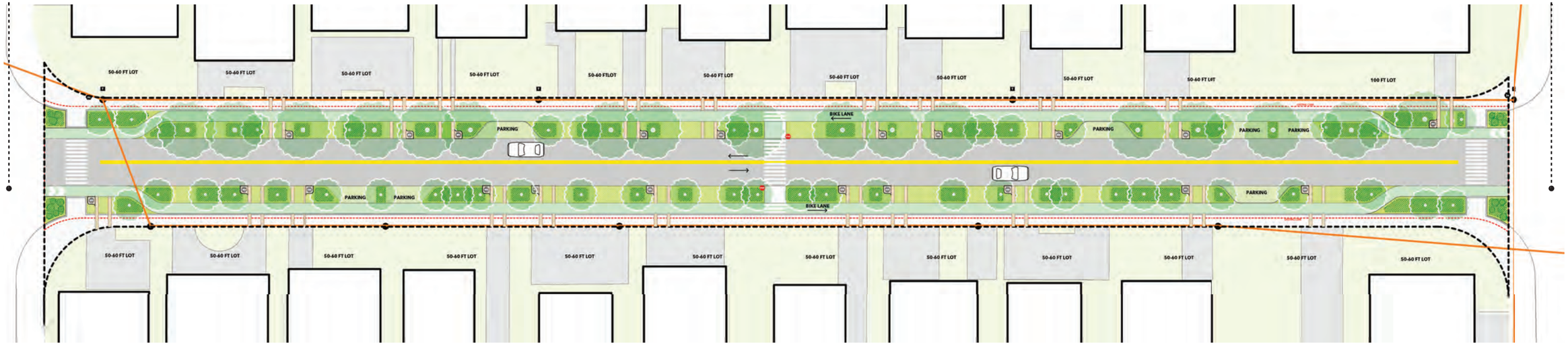
Pilot Site 2: Mobility Street

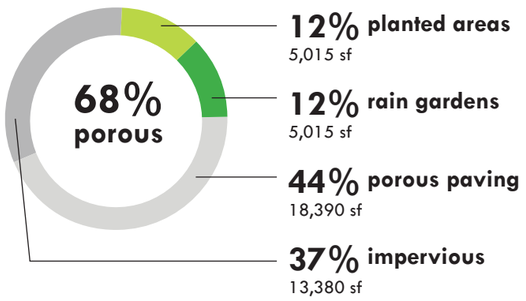
Proposed Design - Option 2

+14

Our Site 2 proposal option 2 can add an additional 64 trees creating up to 35,302 square feet of new tree canopy.

+10.5



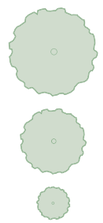


12% planted areas
5,015 sf

12% rain gardens
5,015 sf

44% porous paving
18,390 sf

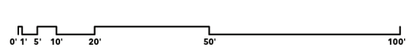
37% impervious
13,380 sf



large species shade trees

medium species shade trees

small species shade trees



PROPOSED DESIGN	
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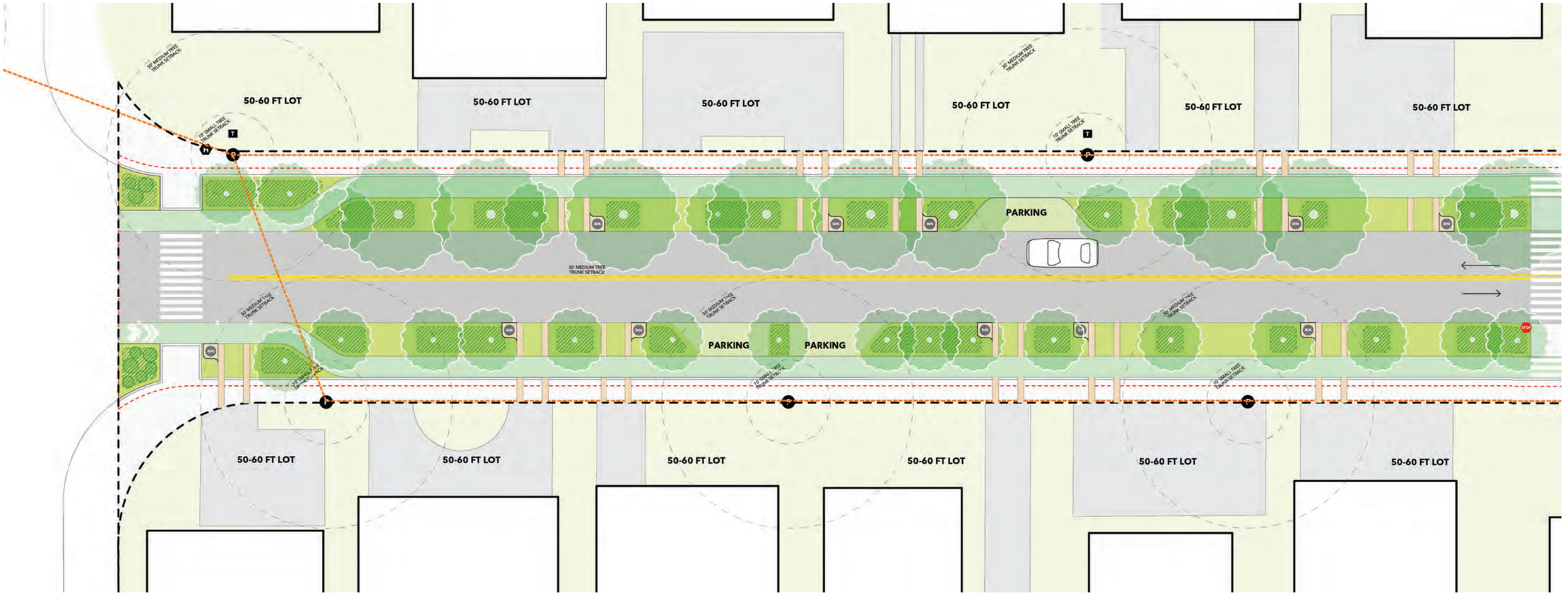
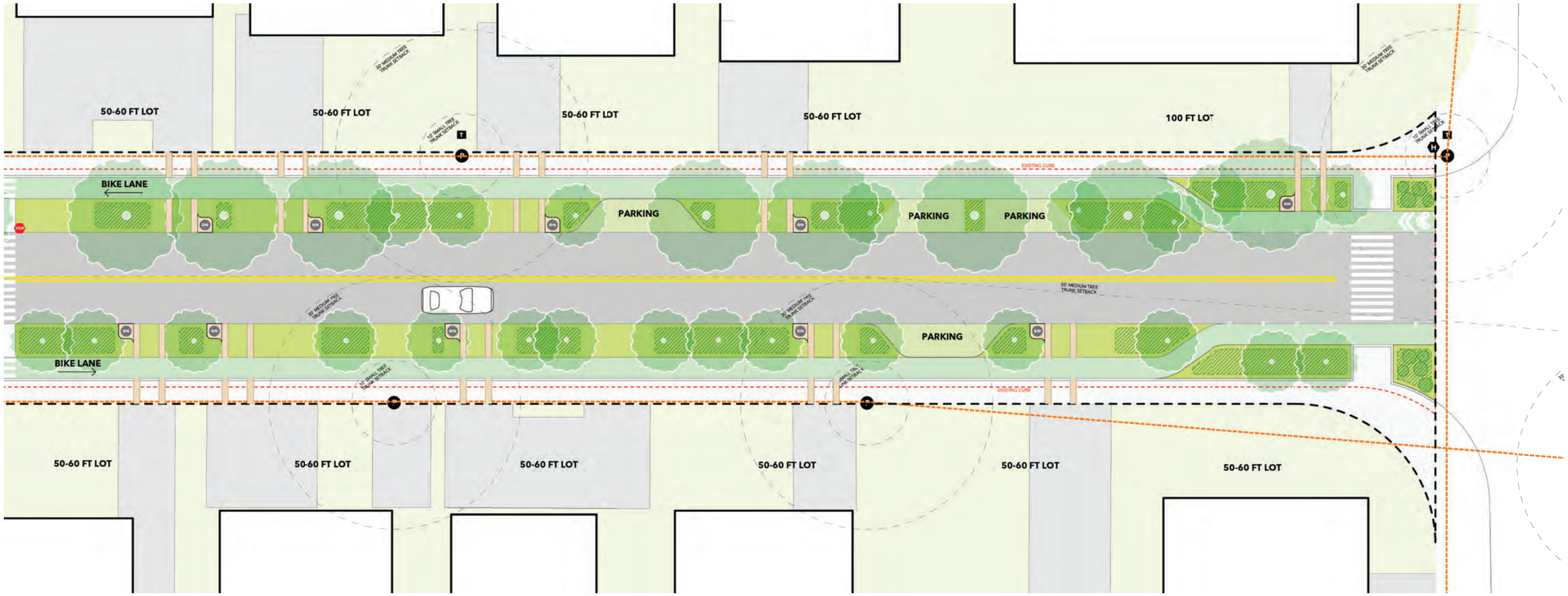
Pilot Site 2: Mobility Street

Proposed Design - Option 2



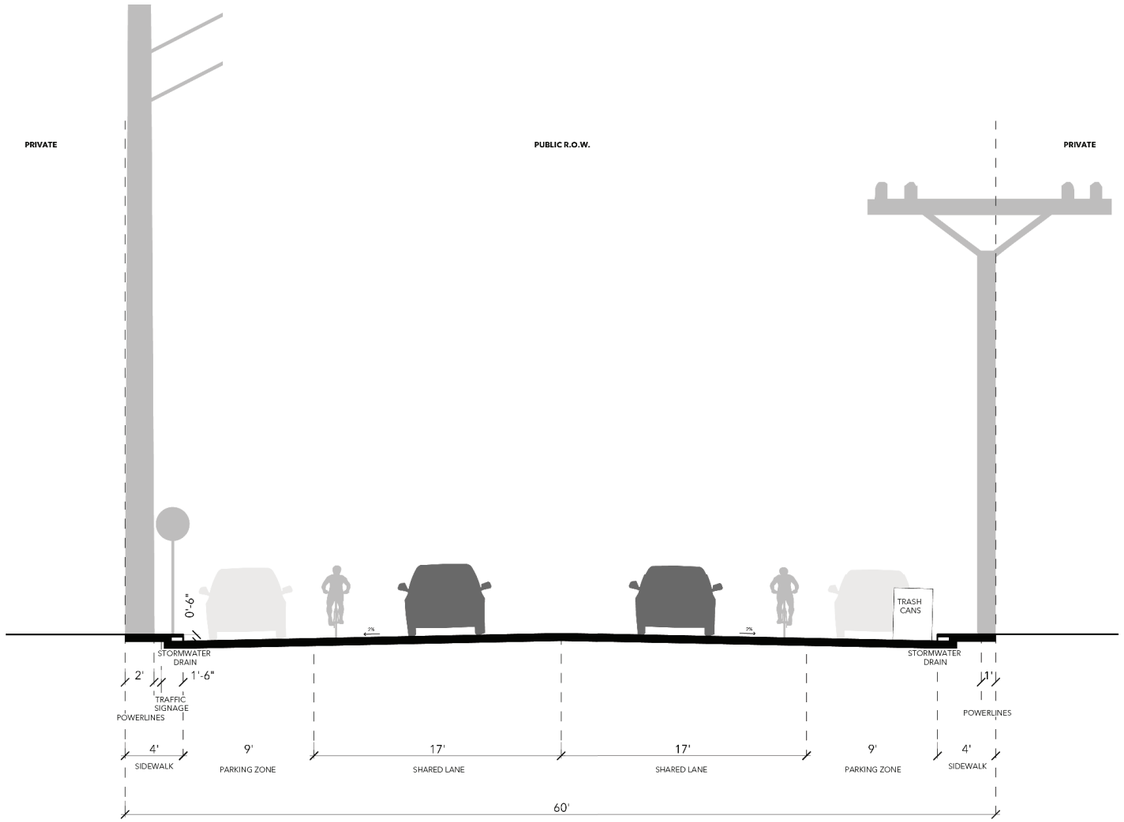
Pilot Site 2: Mobility Street

Proposed Design - Option 2

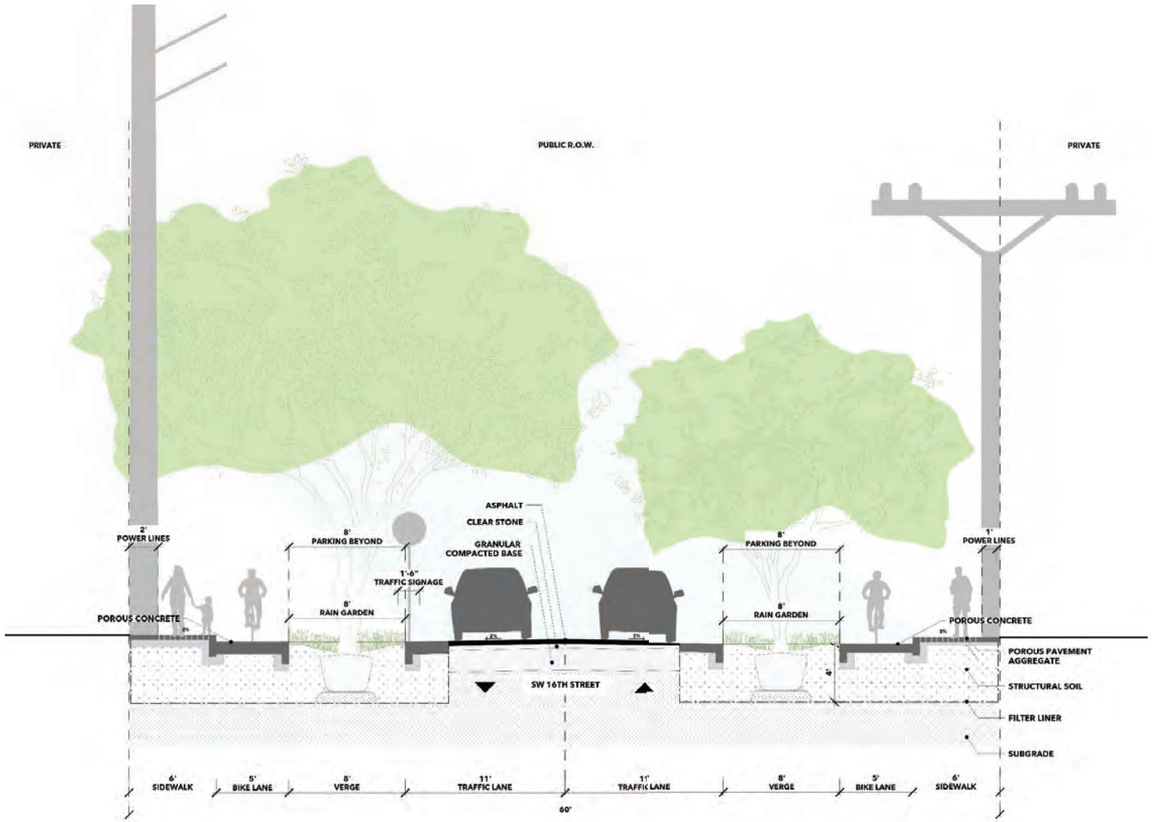


Pilot Site 2: Mobility Street

Proposed Design



EXISTING STREET SECTION

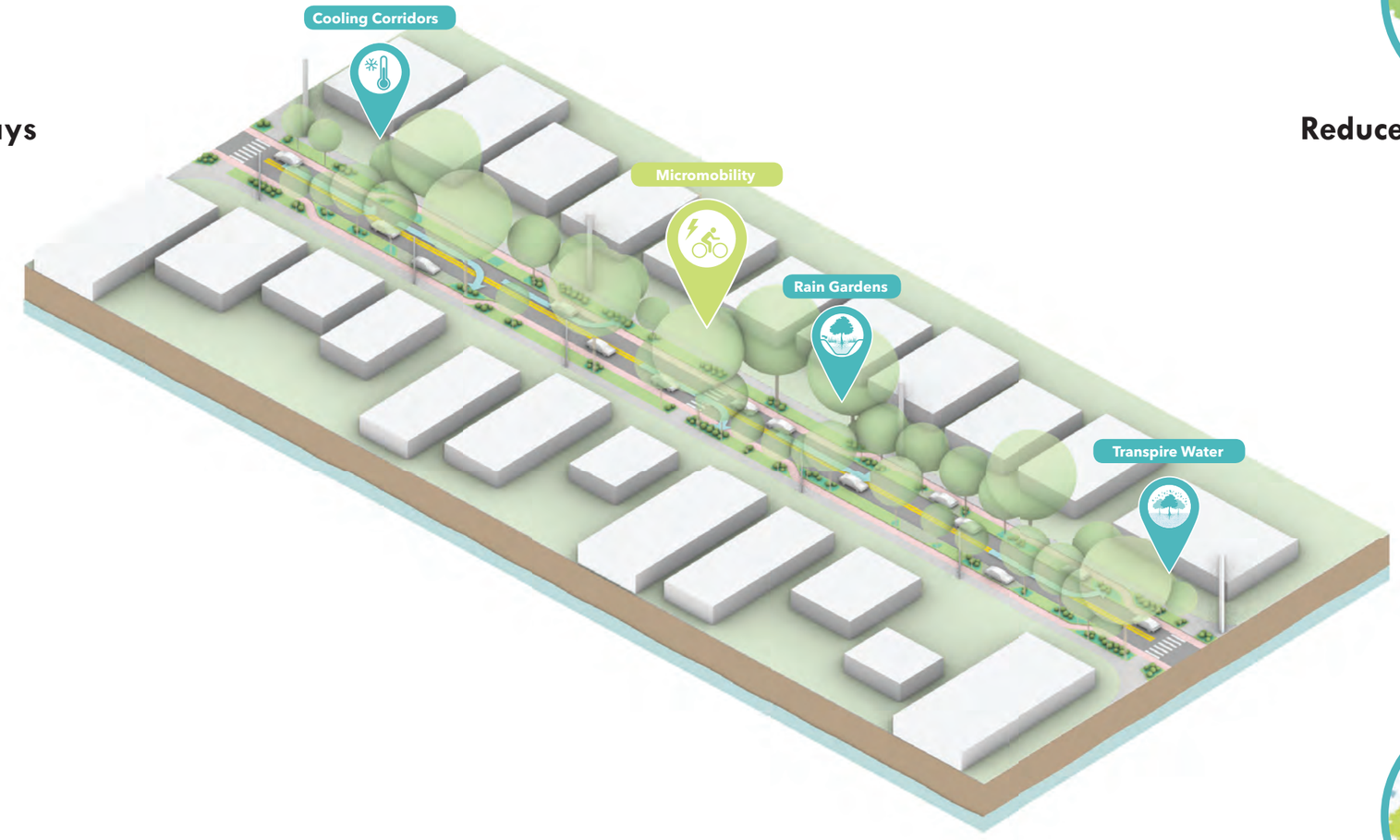


PROPOSED SECTION

Pilot Site 2: Mobility Street

Vision

Protected Greenways



Reduce Urban Heat Island

Living Street to Absorb Groundwater

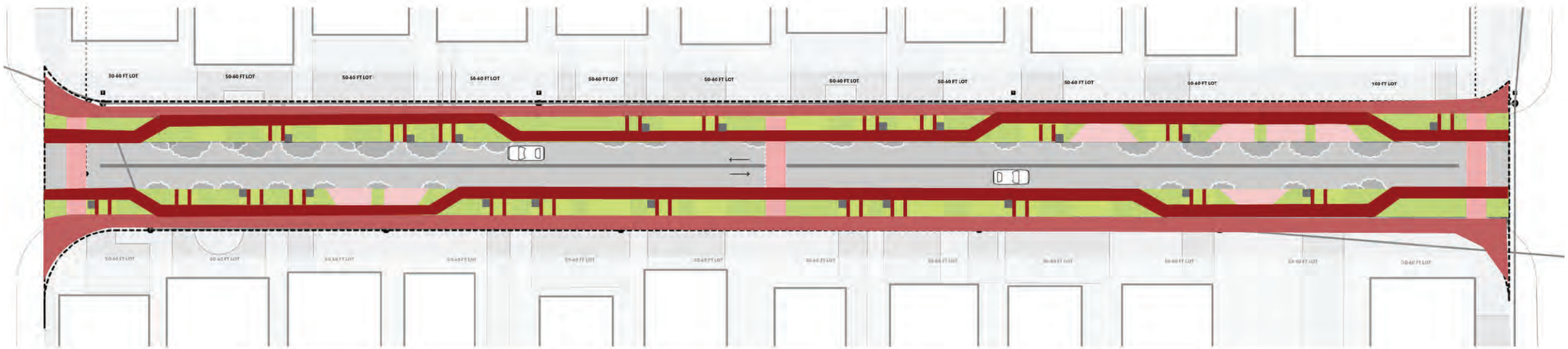
Promote Dense Tree Canopies

Mobility Street Materials

Guidelines

The recommended surfacing materials for the Pilot projects were selected based upon the research and findings of the teams investigations into the available pervious paving materials found in the previous section of this document. This diagram shows the areas and recommended materials and percentage of the right-of way each represents. They are broken down this way to better inform decisions about what to include on each street and what the implications are for not making all of these areas pervious.

OPTION 1



Pervious Areas

68%

- Green Space (12%)
- Rain Garden (12%)

Total of 24% Vegetated Space

- Bike Lanes & Driveway Bands: Pervious Concrete Pre-cast Panels (19%)
- Sidewalk: Pervious Concrete Pre-cast Panels, Flexipave, or Pavers (12%)
- Crosswalks: Pervious Concrete Pre-cast Panels (2%)
- Parking space: Pervious Concrete Pre-cast Panels, Pavers or Porous Asphalt (3%)

Total of 44% Pervious Pavement

Impervious Areas

32%

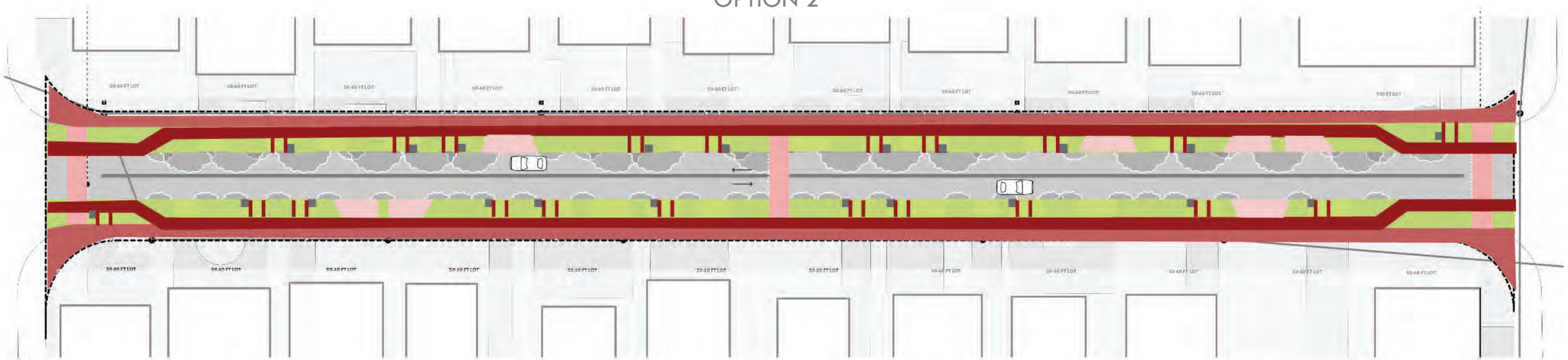
- Amenity Pad: Standard PIP Concrete (1%)
- Roadway: Standard Asphalt (31%)

Mobility Street Materials

Guidelines

The recommended surfacing materials for the Pilot projects were selected based upon the research and findings of the teams investigations into the available pervious paving materials found in the previous section of this document. This diagram shows the areas and recommended materials and percentage of the right-of way each represents. They are broken down this way to better inform decisions about what to include on each street and what the implications are for not making all of these areas pervious.

OPTION 2



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Total of 44% Pervious Pavement

Impervious Areas

32%

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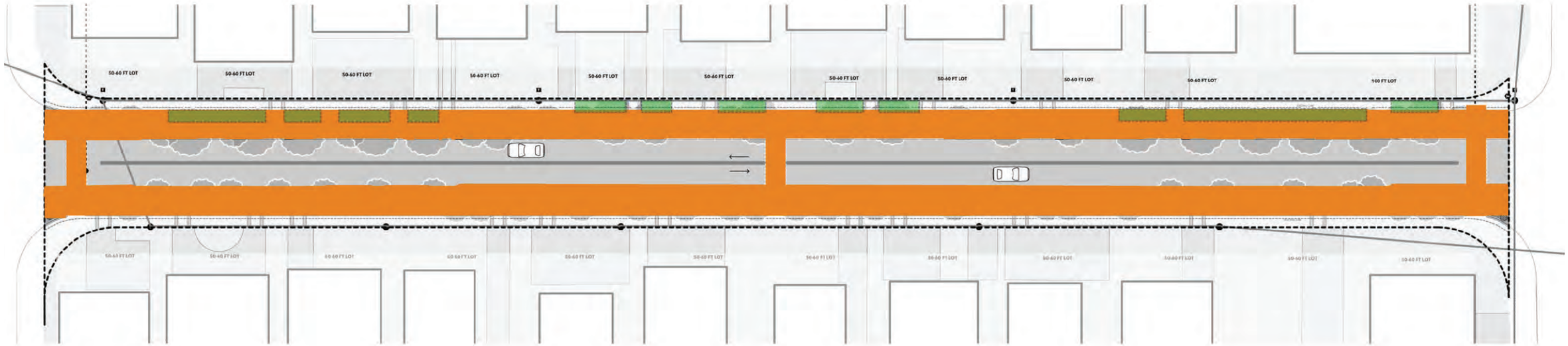
- Roadway: Standard Asphalt (31%)

Mobility Street Materials

Guidelines

The recommended subsurface infrastructure proposed below were selected to support optimal tree growth and success. This below-grade infrastructure includes the use of soil cells below sidewalks where larger species tree are proposed and structural soils within the pervious areas to facilitate a more extensive and expansive root system within the ROW. The following diagram shows the proposed locations for structural soils and soil cells within this pilot site.



Soil Cells

Structural Soil

Large Tree Planted with Soil Cells beneath sidewalk

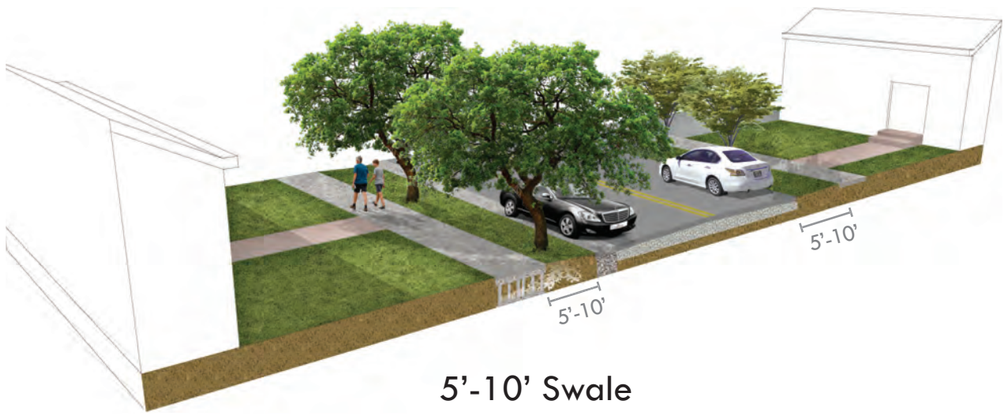
Large Tree Planted with Structural Soil beneath sidewalk

Mobility Street Planting

General Guidelines

Planting for the Pilot Projects should refer to the guidelines presented in this report in the *Planting Practices* and *Neighborhood Plans* sections. Care must be taken with placement of the trees to not block visibility from driveways or intersections. It is vitally important that the species of trees selected be appropriate for the size of the space they are being planted in. Shade trees should always be used in lieu of palms, as they provide much greater benefits: exceptions to this would be in high visibility areas for emphasis entering a neighborhood.

Medium Swale



5'-10' Swale

Street Trees

The Mobility Street Pilot Project shows a nine foot swale and overhead electrical lines on both sides of the street.

A nine foot swale without any infrastructure (structural soil or soil cells) can support a medium tree (refer to *Medium Swale Palette* for species). This palette would also apply to the areas between two parking spaces due to the narrowness of the space, even with structural soil on both sides.

Otherwise, where structural soil or soil cells are used adjacent to the trees - as they are shown in this pilot project, large trees can be planted (refer to *Large Swale Palette* for species). Under the overhead electrical lines only small trees should be used (refer to *Small Swale/ Utility Palette* for species). Within a rain garden area, species that can handle more water should be selected from the palettes.

The neighborhood plan (refer to the *Neighborhood Plans* section for additional info) should then be consulted to see what the preferred species are for each sized tree required. This example is in the Parkdale South neighborhood, so the trees shown are from that palette as well as being selected for their sizes.

Figure 1: Rain Garden Section

Rain Gardens

The intent of the Rain Gardens are for these areas to absorb and filter as much water as possible. Ideally groundcovers should be placed in these areas for maximum absorption and filtration, however bahia sod could also be used. These areas should have rock beneath them to hold water. In areas where there are no trees, like the corners of the intersections, standard #57 drainage rock would be sufficient. In areas where shade trees are also planted, structural soil is preferred to allow greater growth for the trees. Care should be taken to select trees from the palettes that can handle more water. Below are some species recommended for use in the rain gardens.

Tripsacum floridana
Dwarf Fakahatchee Grass

Hymenocalis latifolia
Spider Lily

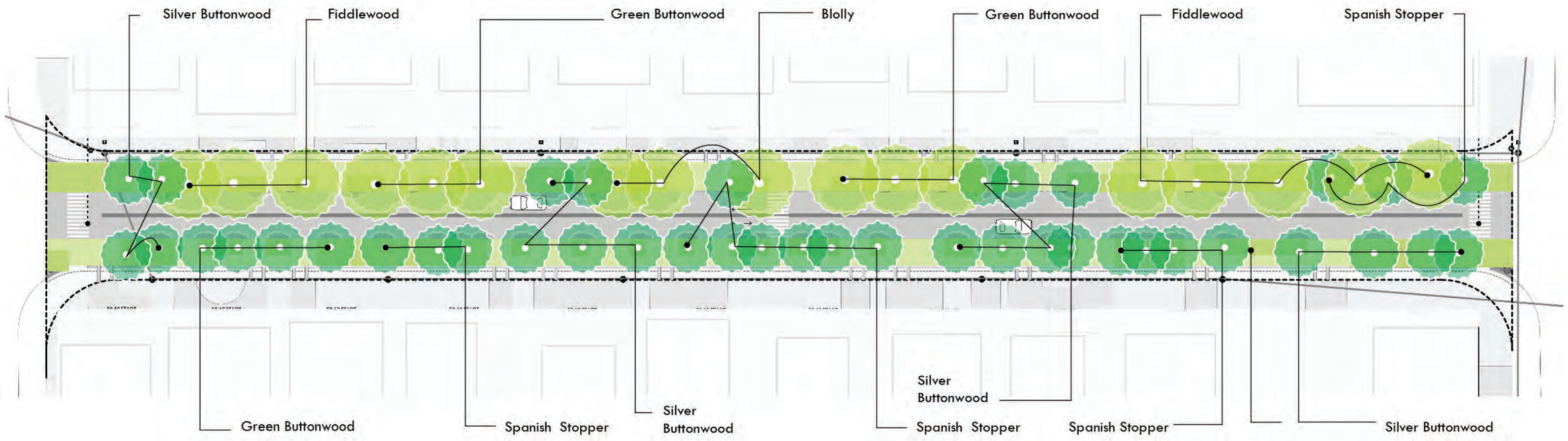
Phyla nodiflora
Frog Fruit

Stachytarpheta jamaicensis
Blue Porterweed

Mobility Street Planting

Diversity

Diversity is vital to a healthy urban forest. High biodiversity reduces risks from pests and diseases and from climate change, improving resiliency and the supply of ecosystem services.
Below is an example of a potential planting scheme applied to the pilot project to enhance biodiversity. Tree species and sizes were selected using the recommendations of this plan for the sizes of the swales and the neighborhood the street is in (Parkdale North/La Pastorita).



Green Buttonwood
Medium Tree

Spanish Stopper
Small/Utility Tree

Silver Buttonwood
Small/Utility Tree

Blolly
Rain Garden Tree

Pilot Site 3: Park Street

Neighborhood Context

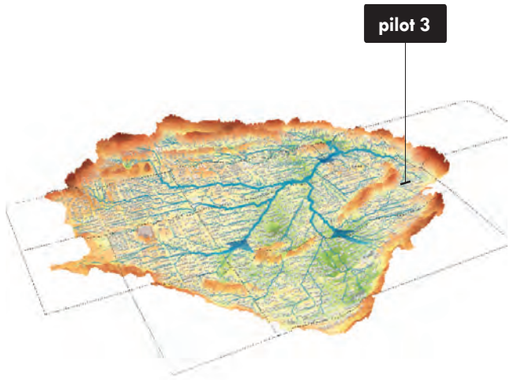
This pilot street offers ample opportunity to provide increased tree canopy while expanding on the city's existing greenway network.

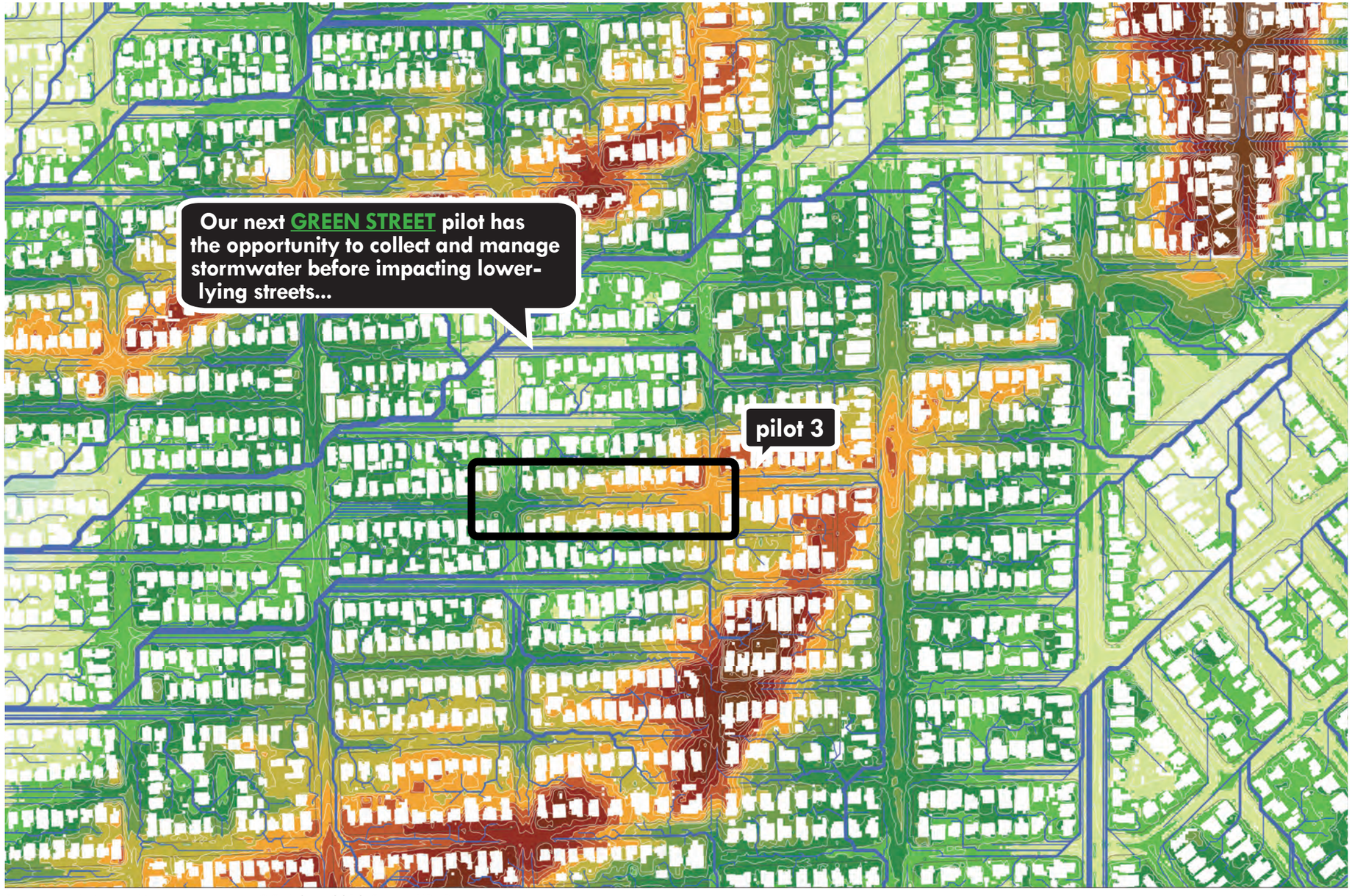
PARK STREET GOALS

- Increase tree canopy coverage to reduce urban heat island.
- Support residential parking opportunities along street.
- Receive excess stormwater.
- Increase pedestrian zones by creating wider sidewalks.

Pilot Site 3: Park Street

Hydrology





Source: Analytic graphics generated by LOCAL from 2018 County LIDAR

10 Year Inundation

Source: CDM 10yr Inundation Map

Pilot Site 3: Park Street

Design Opportunities

Plaza-Like Frontages

The Street has the opportunity to become utilize areas in front of full-paved houses to increase porosity along the street.

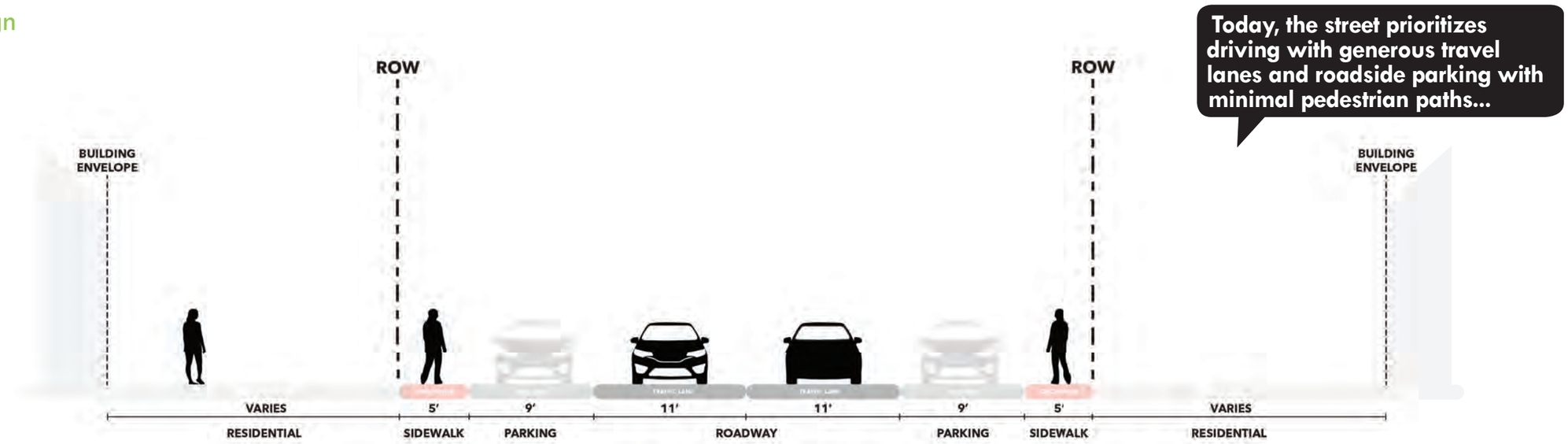
The Street has the opportunity to become a park-like, tree-lined street that acts as a community outdoor space for the neighborhood.

Generous ROW

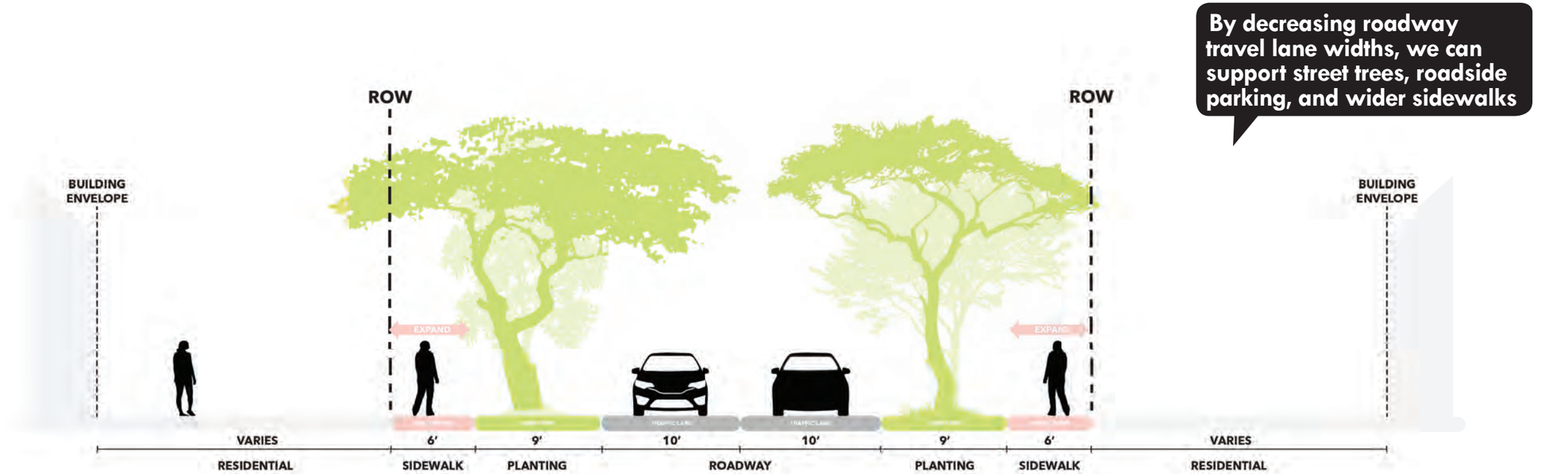
The wide ROW encourages speeding traffic, we can slow traffic while promoting a greener street.

Pilot Site 3: Park Street

Proposed Design



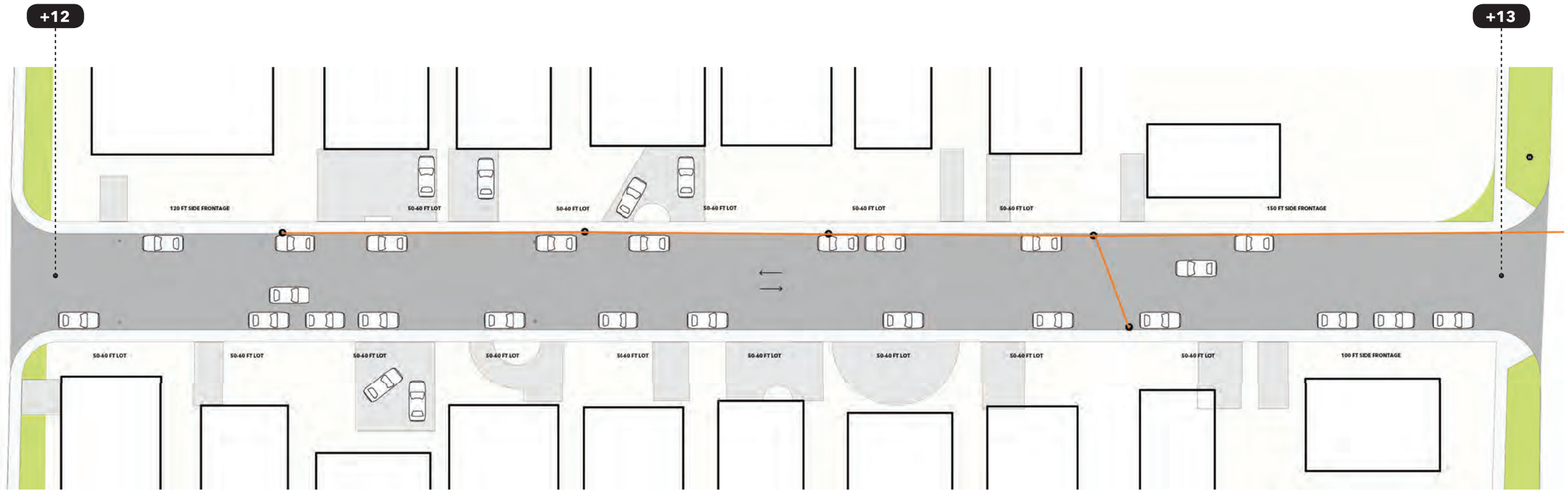
EXISTING STREET TODAY

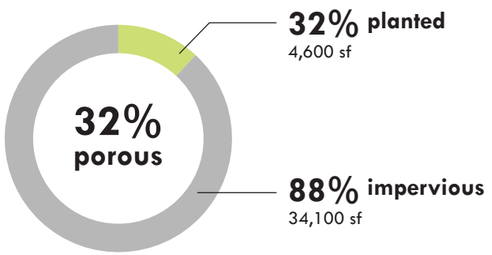


PROPOSED PARK STREET

Pilot Site 3: Park Street

Existing Street

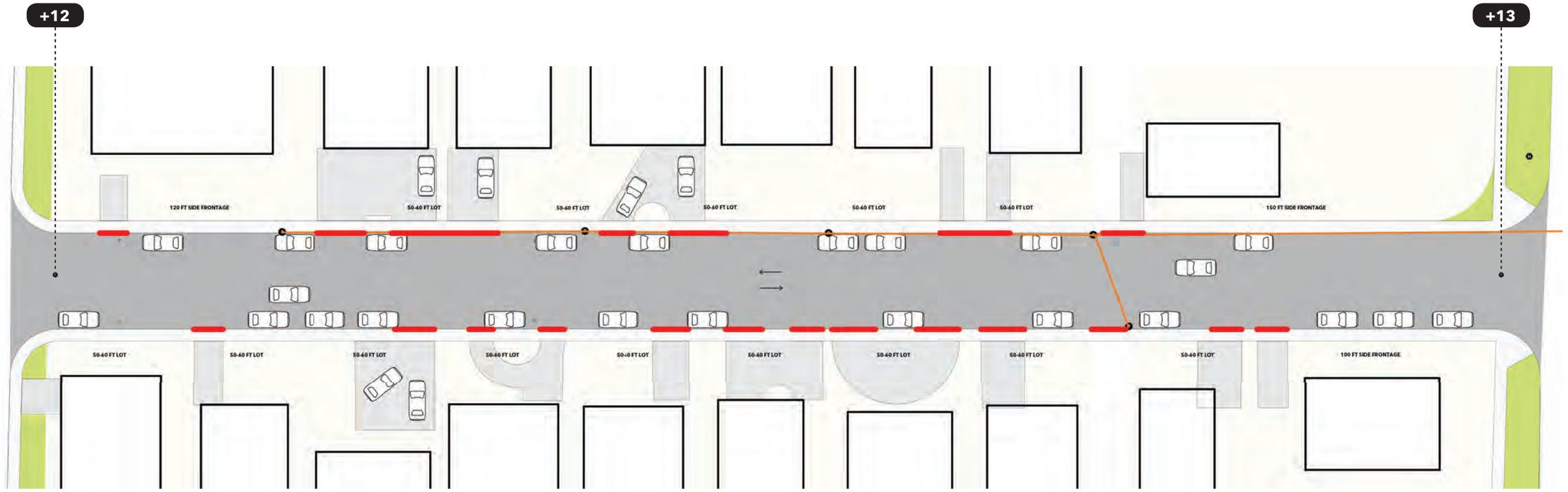


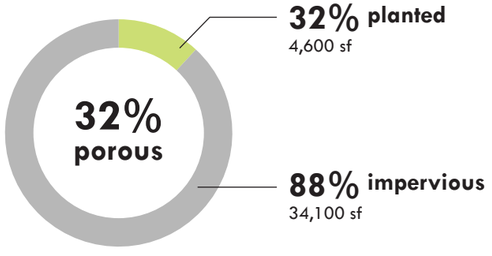


EXISTING CONDITIONS	
38,700 sf	Site Size
35	Parking Spots
4,600 sf	Porous Surfaces
0	Rain Gardens
34,100 sf	Impervious Surfaces
0	Trees

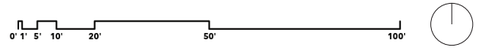
Pilot Site 3: Park Street

Existing Curb Cuts





Existing curb cuts
Some of the properties do not meet the code allowable cuts for their frontage.



EXISTING CONDITIONS	
38,700 sf	Site Size
35	Parking Spots
4,600 sf	Porous Surfaces
0	Rain Gardens
34,100 sf	Impervious Surfaces
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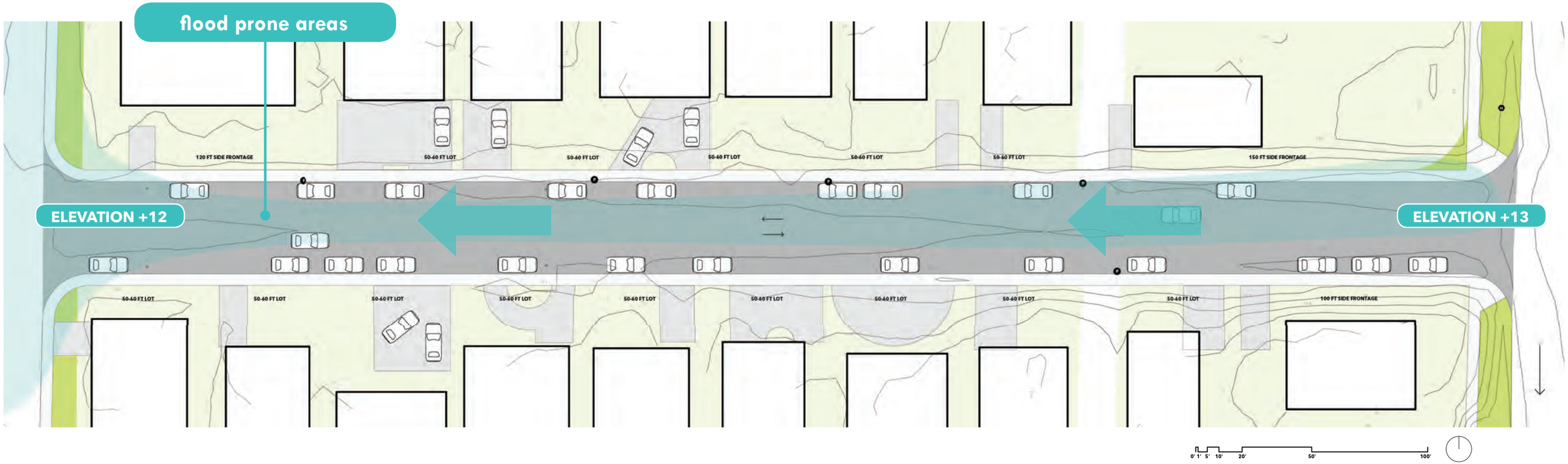
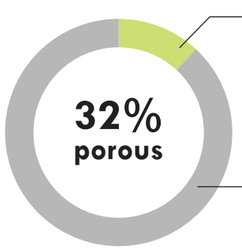
Pilot Site 3: Park Street

Existing Stormwater Inundation

A 1,000 year storm (15") cloud burst event will produce 362,000 gallons (48,375 cubic feet) of rain within a 24-hour period.





32% planted
4,600 sf

88% impervious
34,100 sf

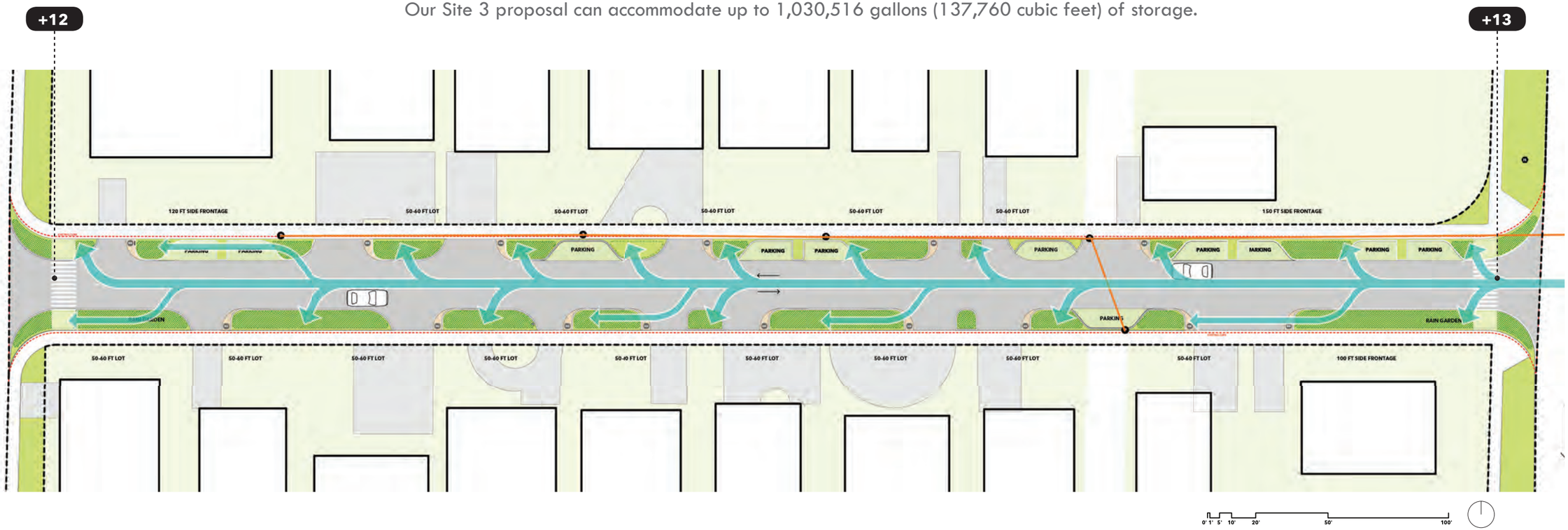
EXISTING CONDITIONS	
38,700 sf	Site Size
35	Parking Spots
4,600 sf	Porous Surfaces
0	Rain Gardens
34,100 sf	Impervious Surfaces
0	Trees

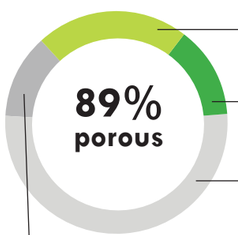
Pilot Site 3: Park Street

Proposed Stormwater Management

A 1,000 year storm (15") cloud burst event will produce 362,000 gallons (48,375 cubic feet) of rain within a 24-hour period.

Our Site 3 proposal can accommodate up to 1,030,516 gallons (137,760 cubic feet) of storage.





20% planted areas
7,480 sf

12% rain gardens
4,900 sf

47% porous paving
22,060 sf

11% impervious
4,260 sf

This plan removes the excessive curb cuts but allows for the code-allowed amount per property.

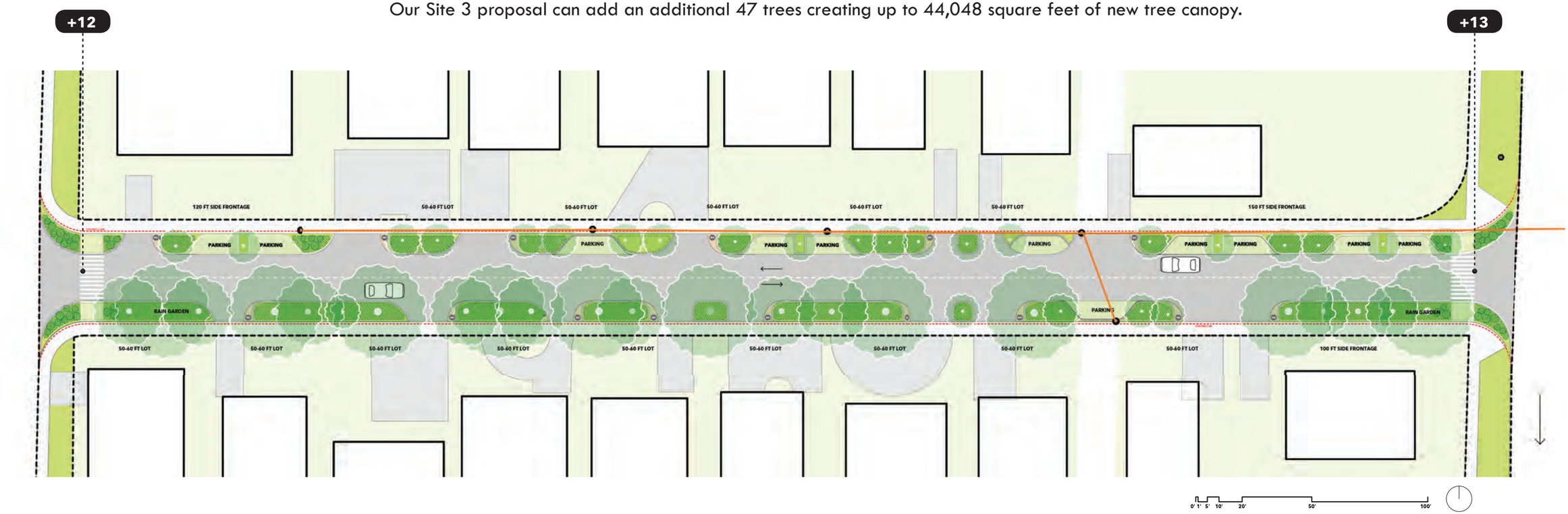
PROPOSED DESIGN	
38,700 sf	Site Size
11	Parking Spots
22,060 sf	Porous Surfaces
7,480 sf	Planted Areas
4,900 sf	Rain Gardens
4,260 sf	Impervious Surfaces

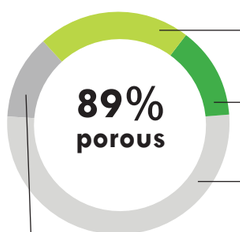
Structural Soil Porosity 40% per: Grabosky, Jason & Bassuk, Nina & Trowbridge, P.. (2002). Structural soils.(LATIS). Am. Soc. Landscape Architects. 636. 20001-23736.

Pilot Site 3: Park Street

Proposed Design

Our Site 3 proposal can add an additional 47 trees creating up to 44,048 square feet of new tree canopy.





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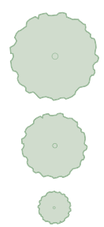

large species shade trees

medium species shade trees

small species shade trees

PROPOSED DESIGN	
38,700 sf	Site Size
11	Parking Spots
22,060 sf	Porous Surfaces
7,480 sf	Planted Areas
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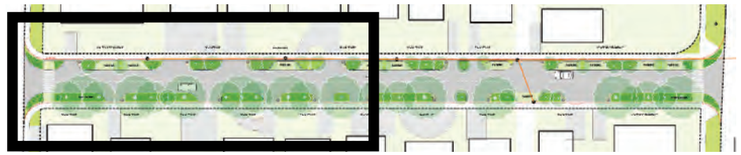
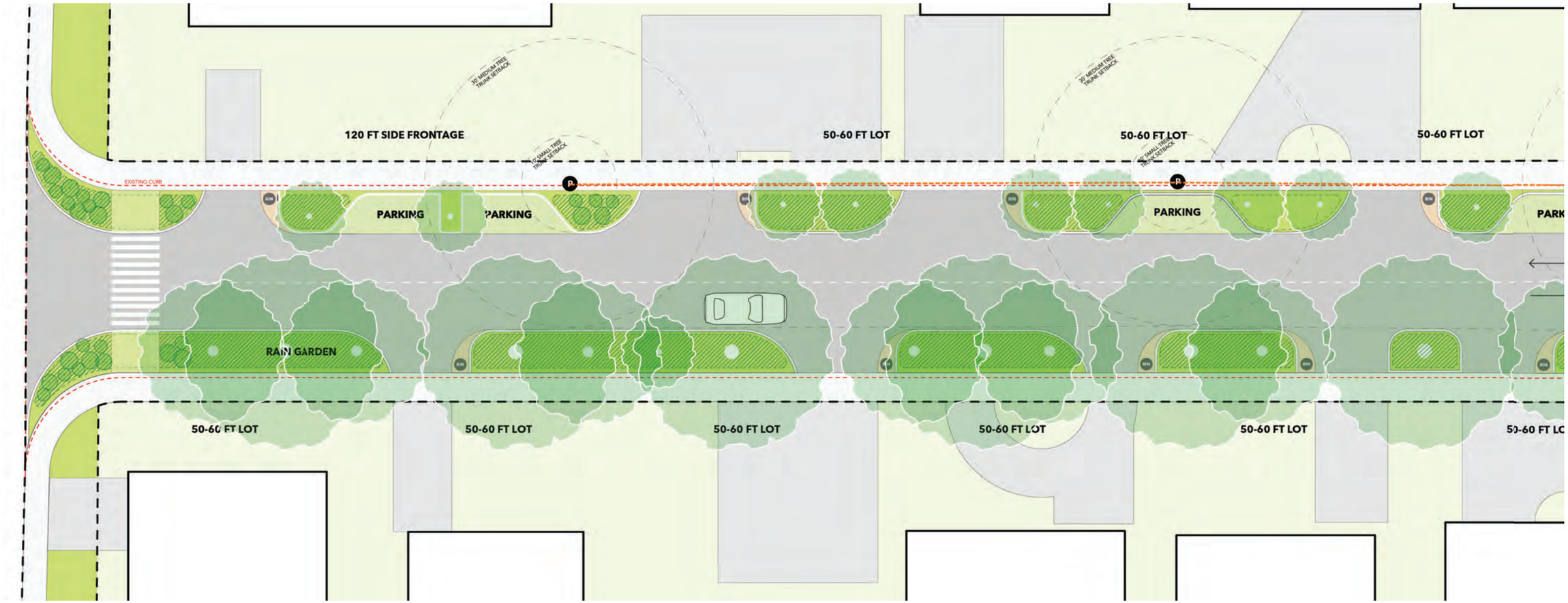
Pilot Site 3: Park Street

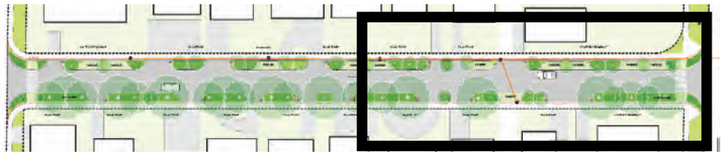
Proposed Design





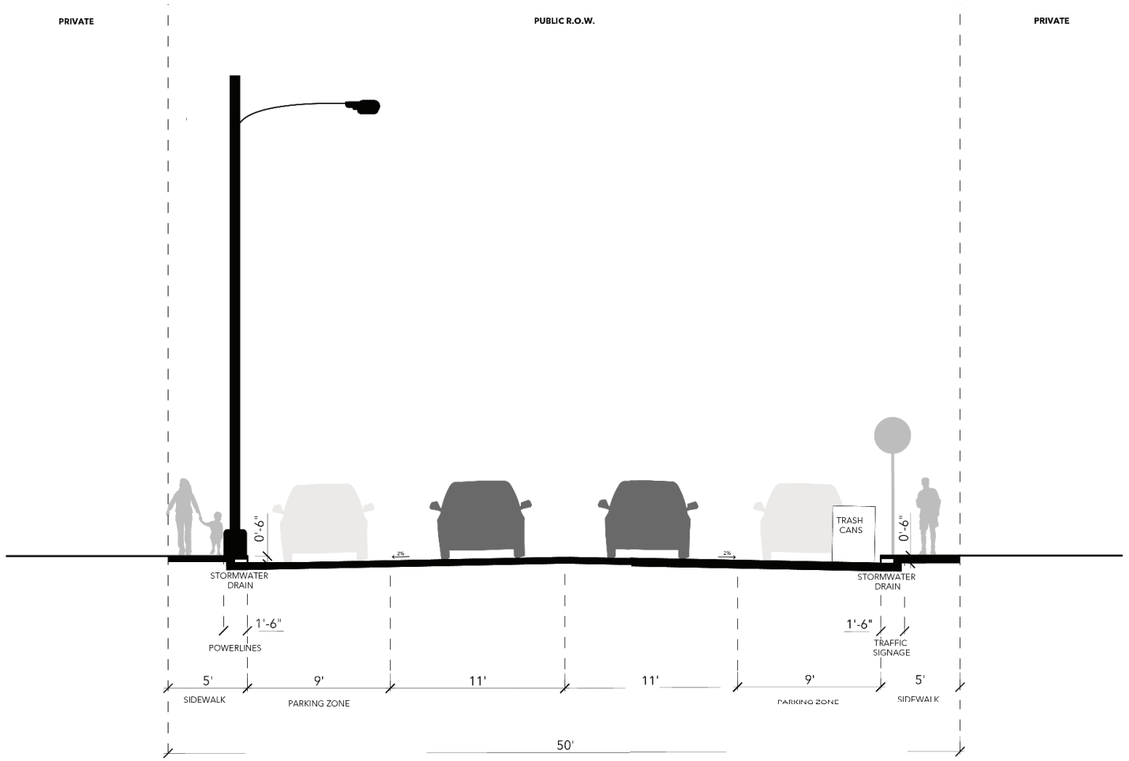
Pilot Site 3: Park Street

Proposed Design

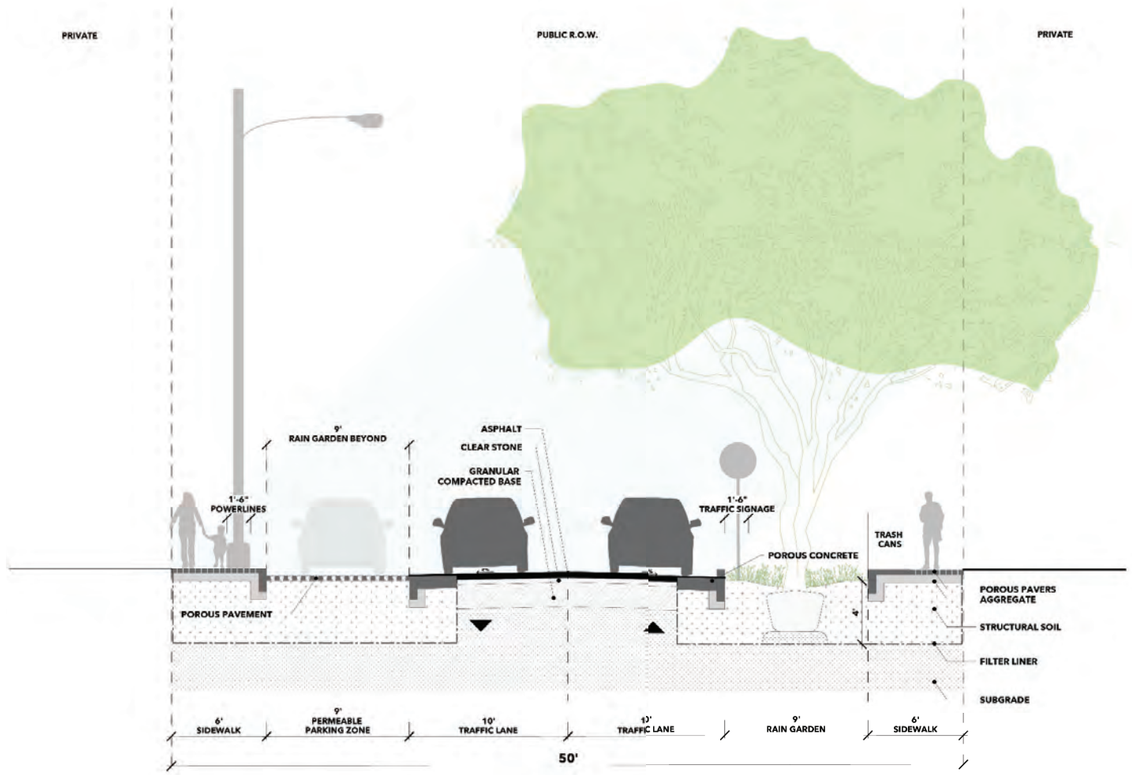


Pilot Site 3: Park Street

Proposed Design



EXISTING STREET SECTION

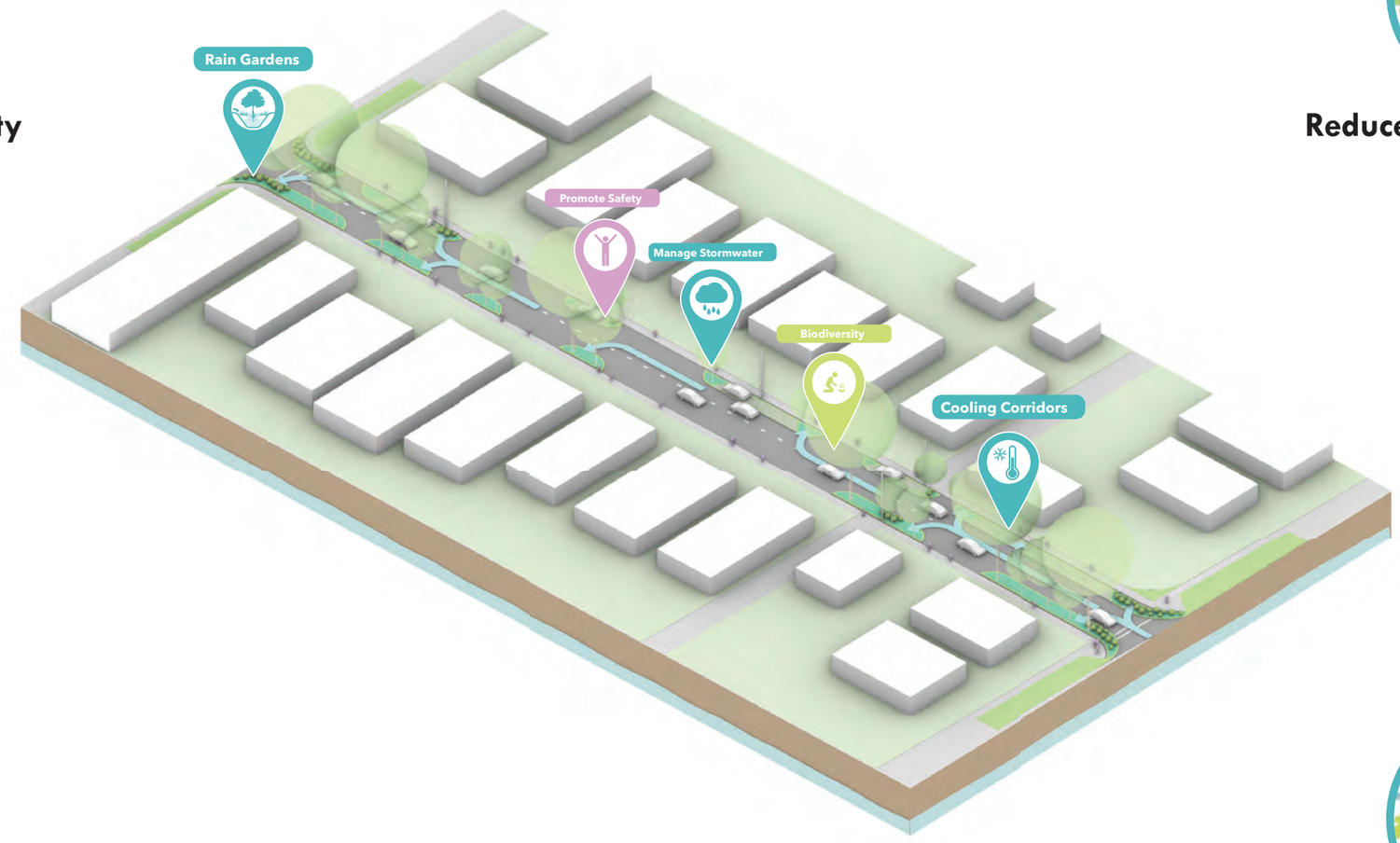


PROPOSED SECTION

Pilot Site 3: Park Street

Vision

Support Biodiversity



Reduce Urban Heat Island

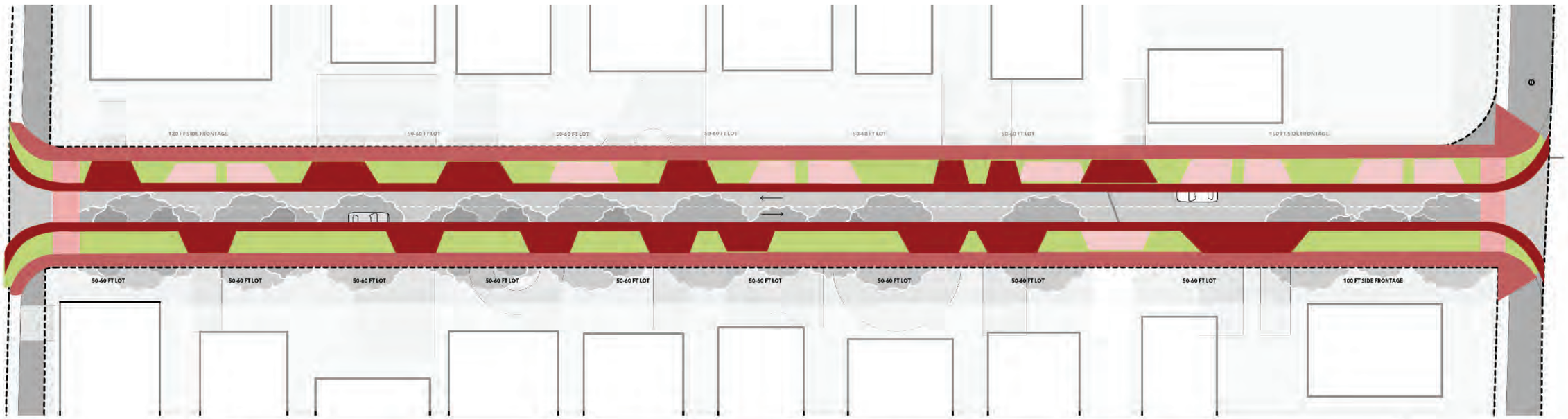
Living Street to Absorb Groundwater

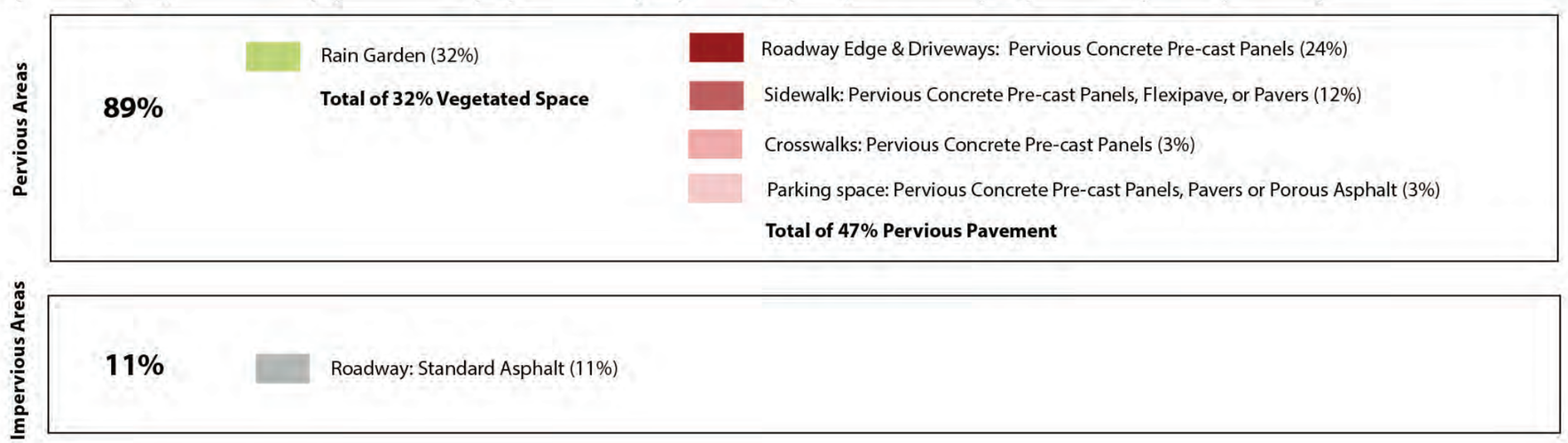
Promote Dense Tree Canopies

Park Street Materials

Guidelines

The recommended surfacing materials for the Pilot projects were selected based upon the research and findings of the teams investigations into the available pervious paving materials found in the previous section of this document. This diagram shows the areas and recommended materials and percentage of the right-of way each represents. They are broken down this way to better inform decisions about what to include on each street and what the implications are for not making all of these areas pervious.





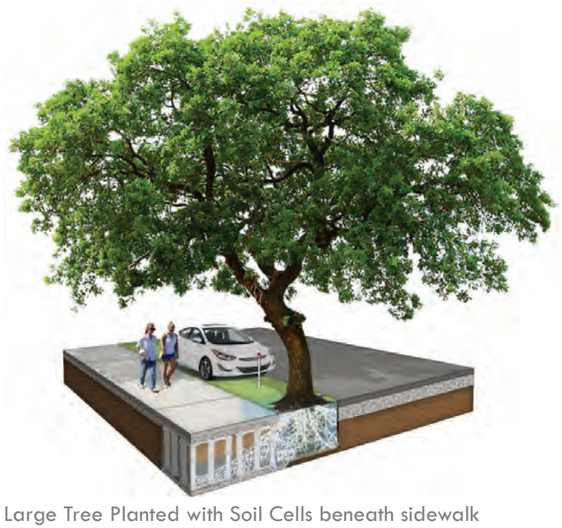
Park Street Materials

Guidelines

The recommended subsurface infrastructure proposed below were selected to support optimal tree growth and success. This below-grade infrastructure includes the use of soil cells below sidewalks where larger species tree are proposed and structural soils within the pervious areas to facilitate a more extensive and expansive root system within the ROW. The following diagram shows the proposed locations for structural soils and soil cells within this pilot site.

Soil Cells

Structural Soil



Large Tree Planted with Soil Cells beneath sidewalk

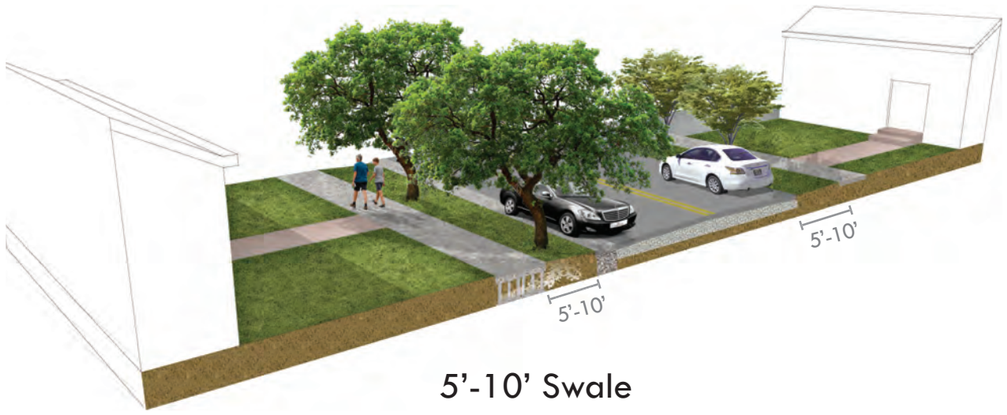
Large Tree Planted with Structural Soil beneath sidewalk

Park Street Planting

General Guidelines

Planting for the Pilot Projects should refer to the guidelines presented in this report in the *Planting Practices* and *Neighborhood Plans* sections. Care must be taken with placement of the trees to not block visibility from driveways or intersections. It is vitally important that the species of trees selected be appropriate for the size of the space they are being planted in. Shade trees should always be used in lieu of palms, as they provide much greater benefits: exceptions to this would be in high visibility areas for emphasis entering a neighborhood.

Medium Swale



5'-10' Swale

Street Trees

The Park Street Pilot Project shows a nine foot swale on both sides of the street. Additionally there are overhead electrical lines on one side of the street.

A nine foot swale without any infrastructure (structural soil or soil cells) can support a medium tree (refer to *Medium Swale Palette* for species). This palette would also apply to the areas between two parking spaces due to the narrowness of the space, even with structural soil on both sides.

Otherwise, where structural soil or soil cells are used adjacent to the trees - as they are shown in this pilot project, large trees can be planted (refer to *Large Swale Palette* for species).

Under the overhead electrical lines only small trees should be used (refer to *Small Swale/ Utility Palette* for species). Within a rain garden area, species that can handle more water should be selected from the palettes.

The neighborhood plan (refer to the *Neighborhood Plans* section for additional info) should then be consulted to see what the preferred species are for each sized tree required. This example is in the Shenandoah North neighborhood, so the trees shown are from that palette as well as being selected for their sizes.

Figure 1: Rain Garden Section

Rain Gardens

The intent of the Rain Gardens for these areas are to absorb and filter as much water as possible. Ideally ground covers should be placed in these areas for maximum absorption and filtration, however bahia sod could also be used. These areas should have rock beneath them to hold water. In areas where there are no trees, like the corners of the intersections, standard #57 drainage rock would be sufficient. In areas where shade trees are also planted, structural soil is preferred to allow greater growth for the trees. Care should be taken to select trees from the palettes that can handle more water. Below are some species recommended for use in the rain gardens.

Tripsacum floridana
Dwarf Fakahatchee Grass

Hymenocalis latifolia
Spider Lily

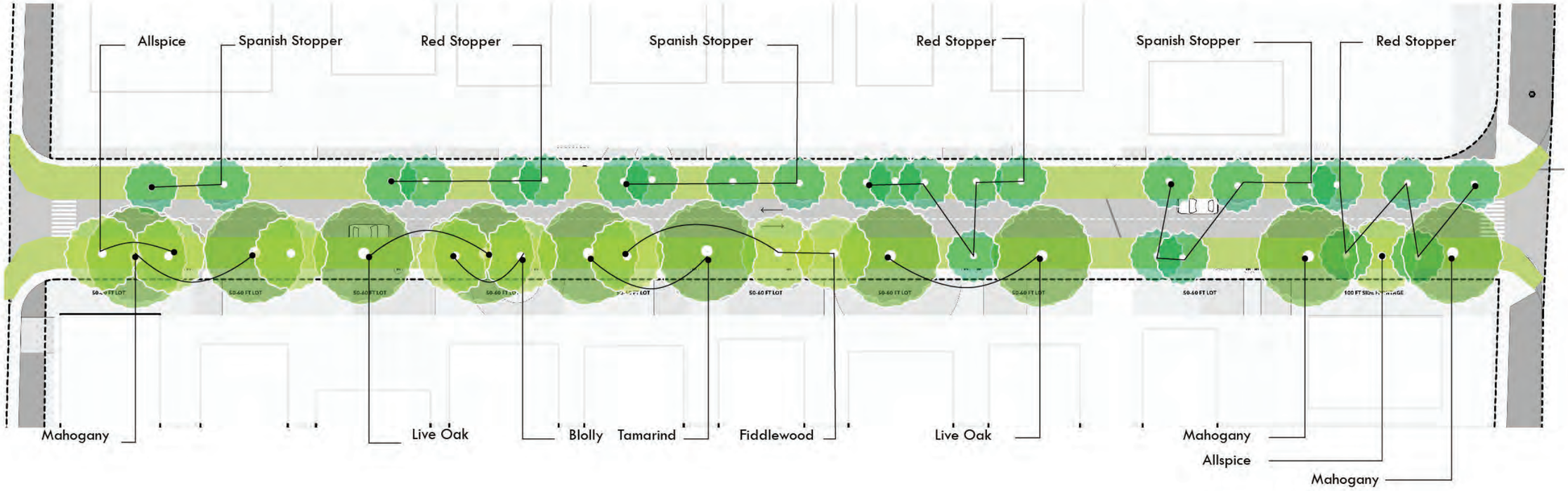
Phyla nodiflora
Frog Fruit

Stachytarpheta jamaicensis
Blue Porterweed

Park Street Planting

Diversity

Diversity is vital to a healthy urban forest. High biodiversity reduces risks from pests and diseases and from climate change, improving resiliency and the supply of ecosystem services.
Below is an example of a potential planting scheme applied to the pilot project to enhance biodiversity. Tree species and sizes were selected using the recommendations of this plan for the sizes of the swales and the neighborhood the street is in (Shenandoah North).



Gumbo Limbo
Large Tree

Green Buttonwood
Medium Tree

Red Maple
Rain Garden Tree

Simpson's Stopper
Utility Tree

Pilot Site 4: Social Street

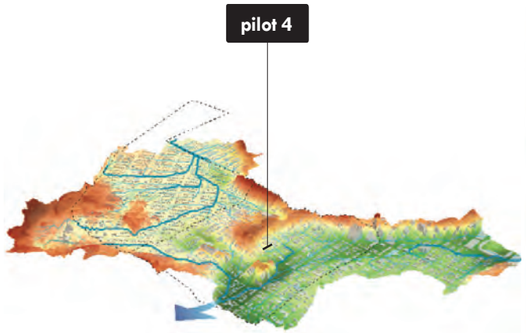
Neighborhood Context

SOCIAL STREET GOALS

- Increase tree canopy coverage to reduce urban heat island.
- Support residential parking opportunities along street.
- Receive and infiltrate excess stormwater.
- Increase pedestrian zones by creating wider sidewalks.
- Support opportunities for social gathering along sidewalk.

Pilot Site 4: Social Street

Hydrology



Source: Analytic graphics generated by LOCAL from 2018 County LIDAR

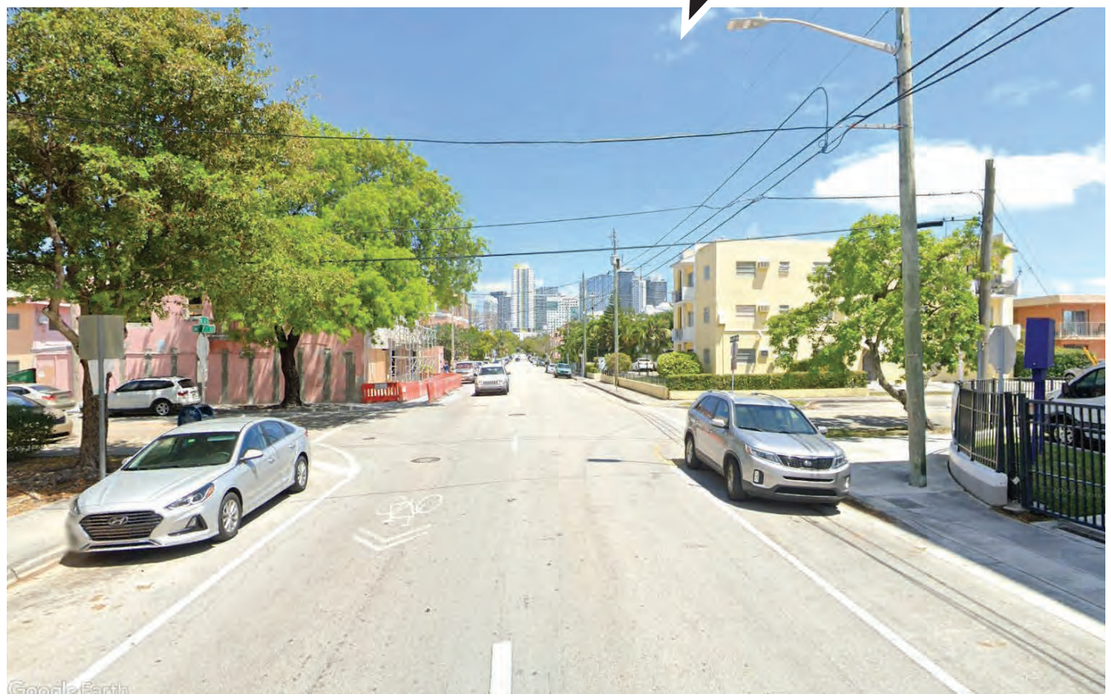
10-YEAR FLOOD:

Source: CDM 10yr Inundation Map

Active Street Frontage

Mixed use zoning fronts this busy roadway presenting opportunities for increased planting and pedestrian safety.

By studying the streets character we can play off the details and materials unique to the context of the neighborhood and landscape.

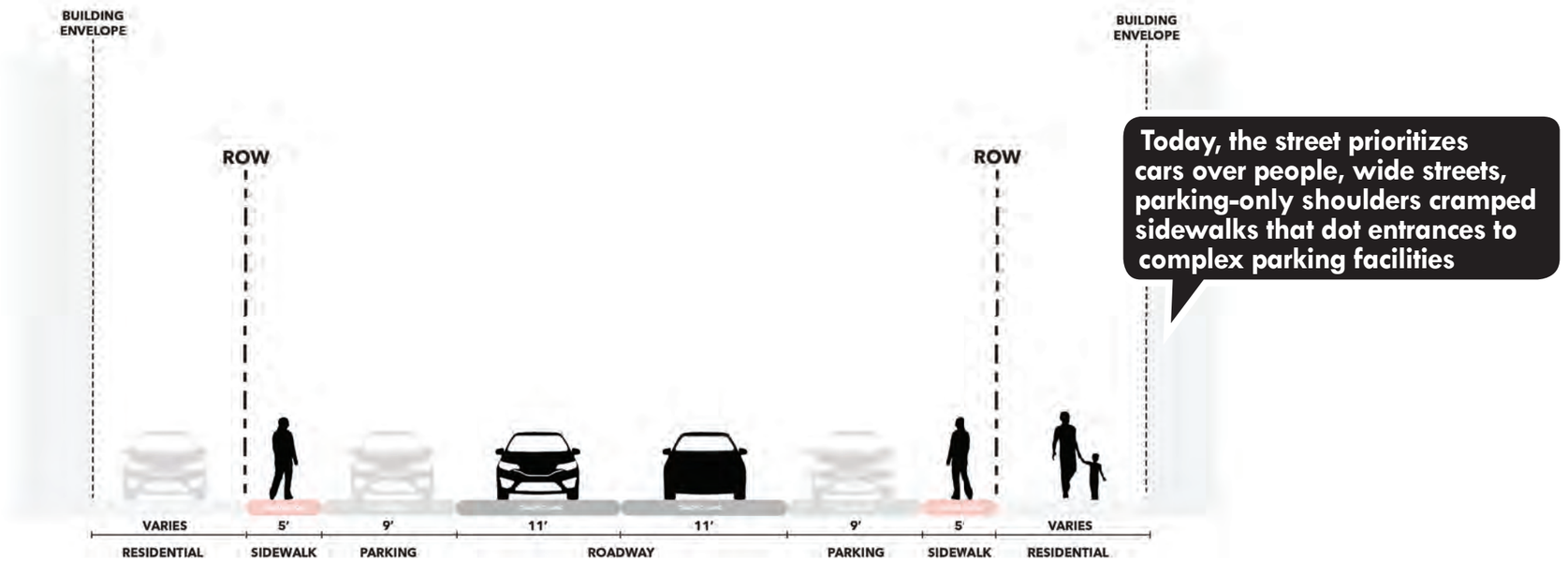


Generous ROW

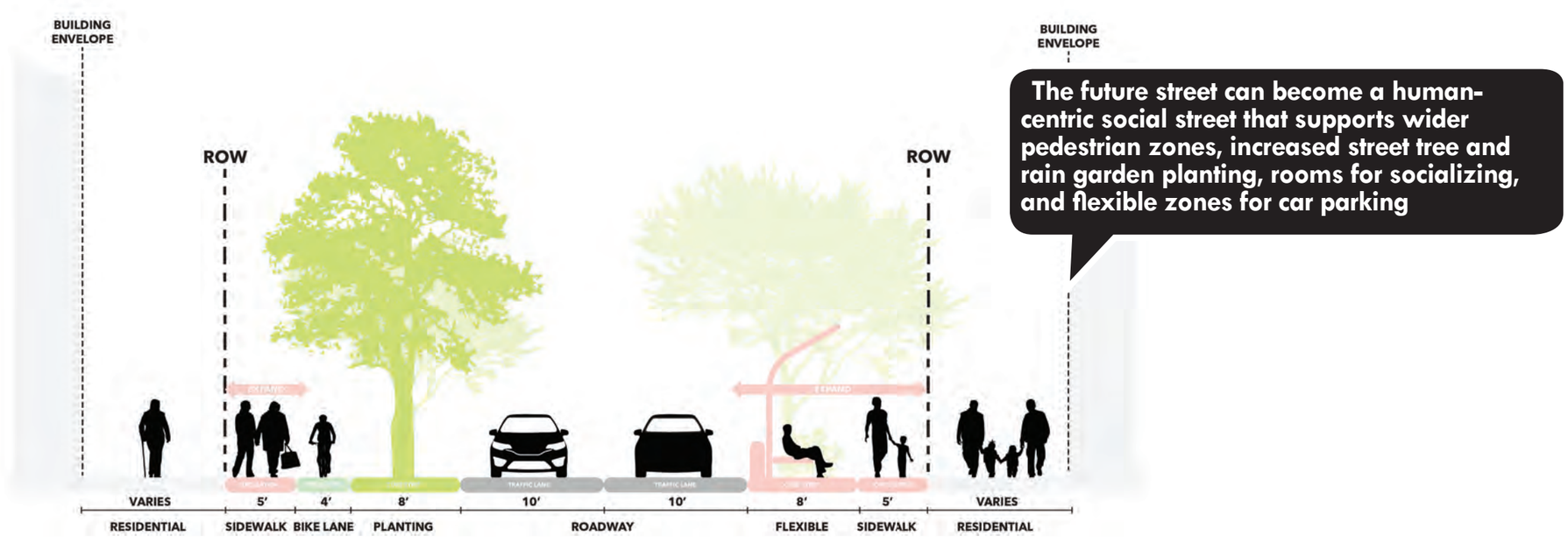
This generous ROW is close to the city center and offers one-way vehicular and bicycle traffic.

Pilot Site 4: Social Street

Proposed Design



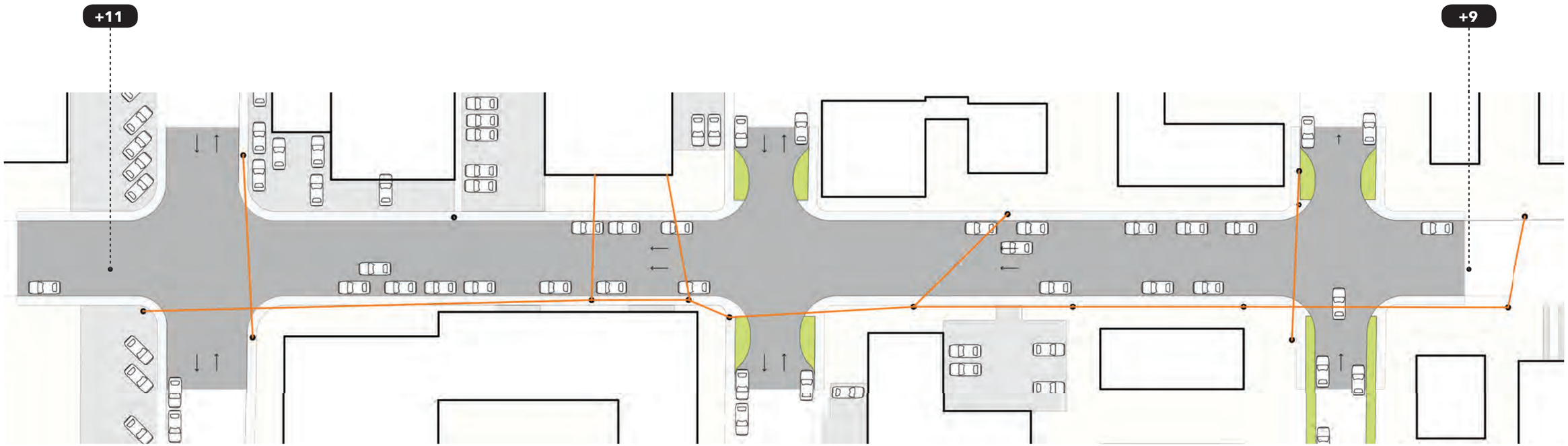
EXISTING STREET TODAY

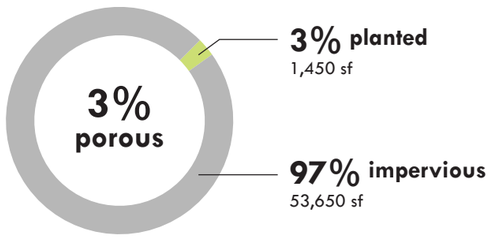


PROPOSED SOCIAL STREET

Pilot Site 4: Social Street

Existing Street



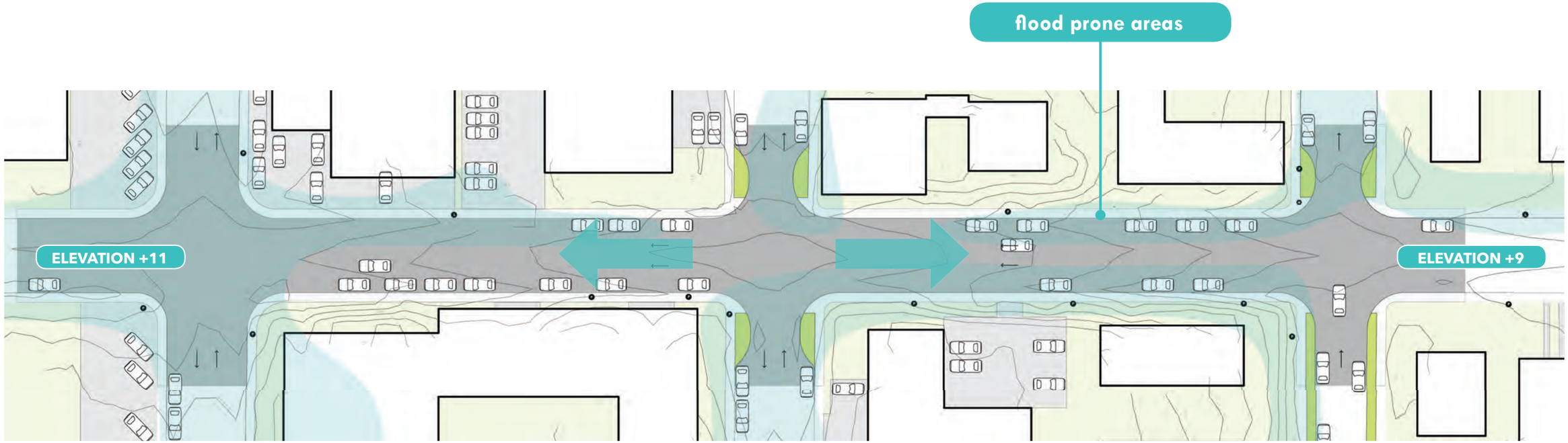


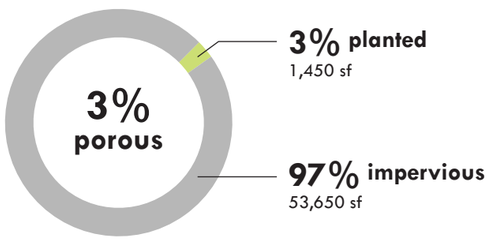
EXISTING CONDITIONS	
55,100 sf	Site Size
30	Parking Spots
1,450 sf	Porous Surfaces
0	Rain Gardens
53,650 sf	Impervious Surfaces
0	Trees

Pilot Site 4: Social Street

Stormwater Inundation

A 1,000 year storm (15") cloud burst event will produce 515,200 gallons (68,875 cubic feet) of rain within a 24-hour period.





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Pilot Site 4: Social Street

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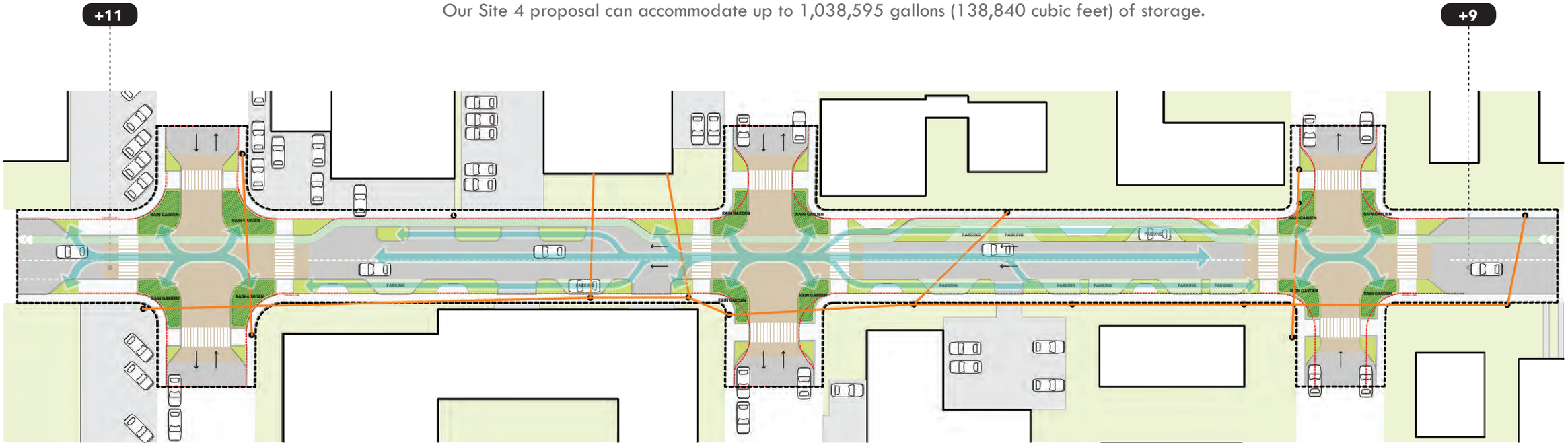
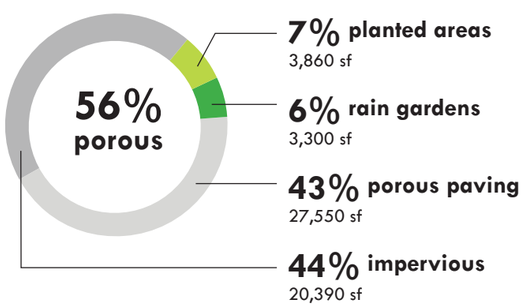
Our Site 4 proposal can accommodate up to 1,038,595 gallons (138,840 cubic feet) of storage.





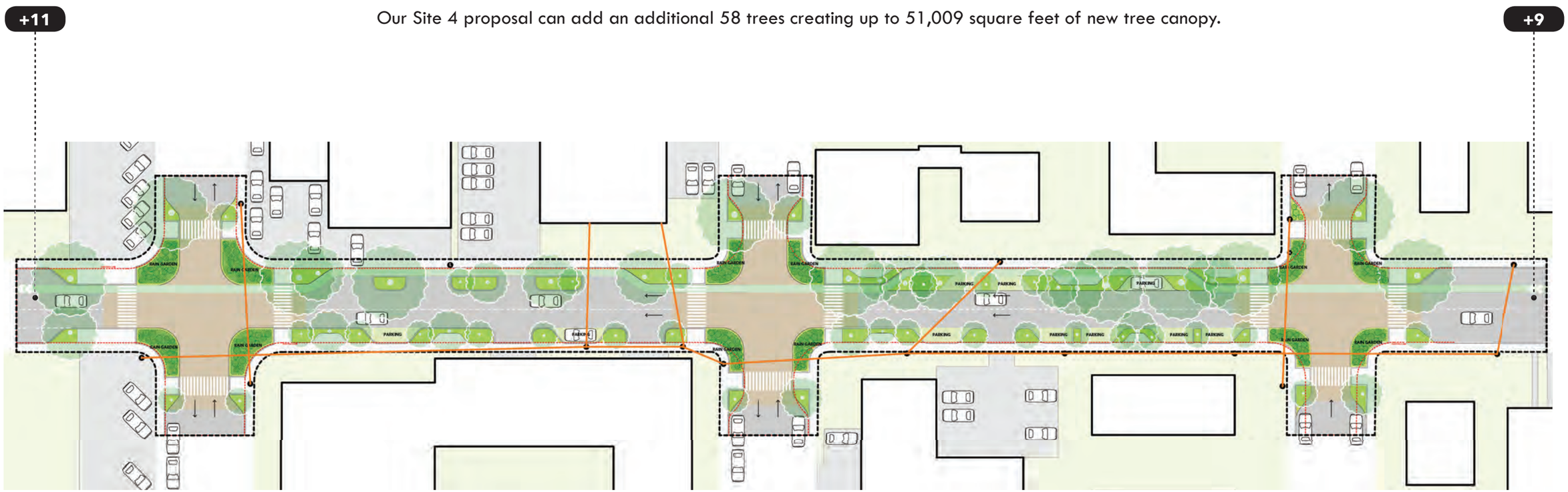
PROPOSED DESIGN	
55,100 sf	Site Size
10	Parking Spots
27,550 sf	Porous Surfaces
3,860 sf	Planted Areas
3,300 sf	Rain Gardens
20,390 sf	Impervious Surfaces

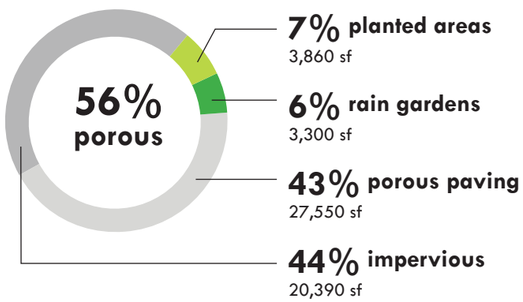
Structural Soil Porosity 40% per: Grabosky, Jason & Bassuk, Nina & Trowbridge, P.. (2002). Structural soils.(LATIS). Am. Soc. Landscape Architects. 636. 20001-23736.

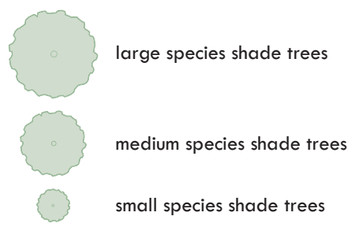
Pilot Site 4: Social Street

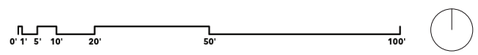
Proposed Design

Our Site 4 proposal can add an additional 58 trees creating up to 51,009 square feet of new tree canopy.









PROPOSED DESIGN	
55,100 sf	Site Size
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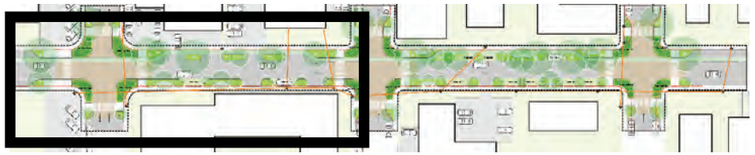
58	Shade Trees

Structural Soil Porosity 40% per: Grabosky, Jason & Bassuk, Nina & Trowbridge, P.. (2002). Structural soils.(LATIS). Am. Soc. Landscape Architects. 636. 20001-23736.

Pilot Site 4: Social Street

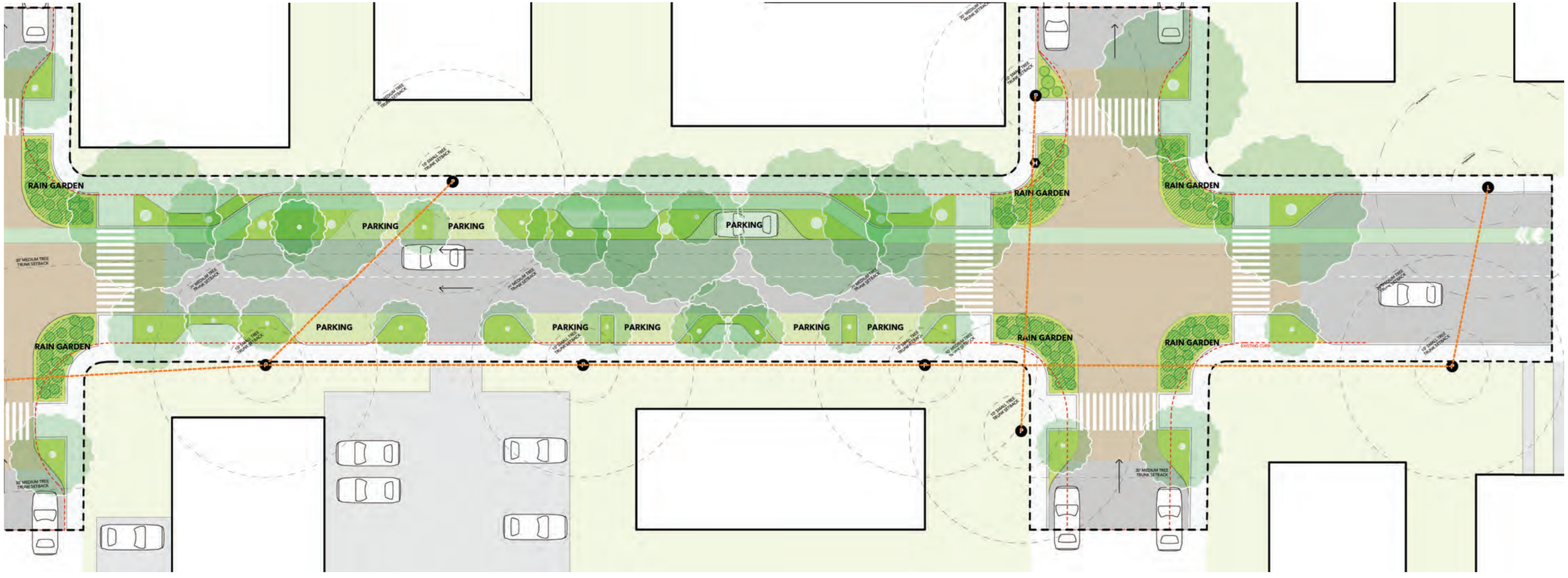
Proposed Design



0' 1' 5' 10' 20' 50' 100'

Pilot Site 4: Social Street

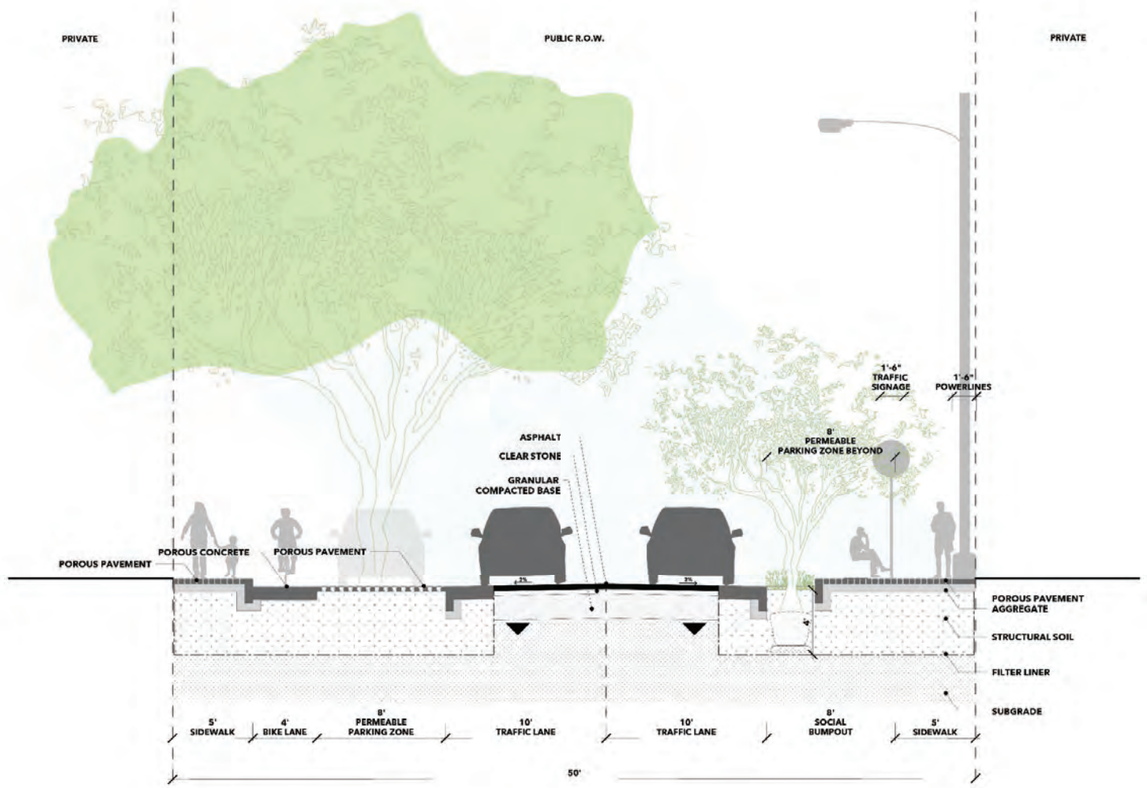
Proposed Design



Pilot Site 4: Social Street

Proposed Design

EXISTING STREET SECTION

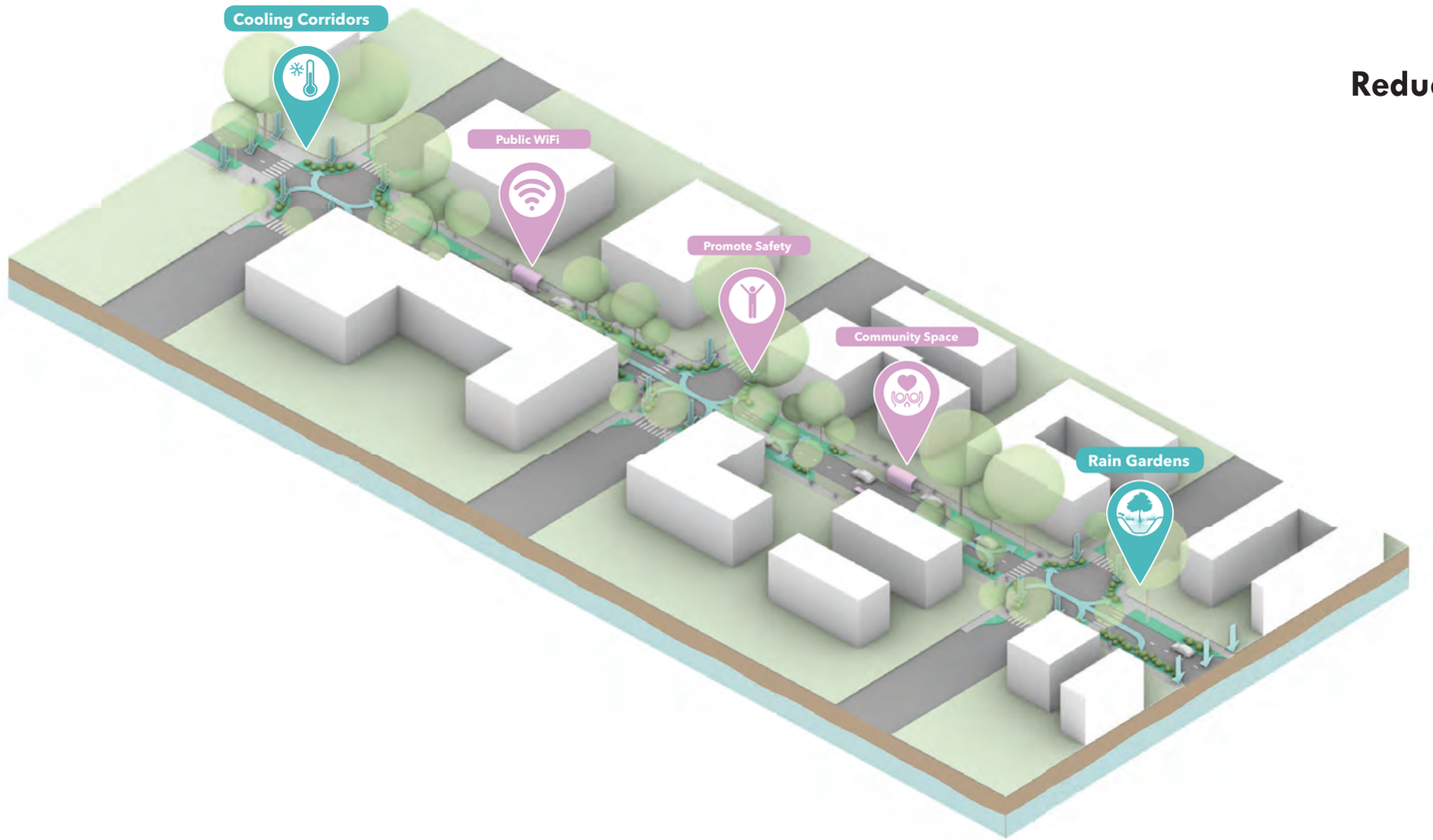


PROPOSED SECTION

Pilot Site 4: Social Street

Vision

Support Community



Reduce Urban Heat Island

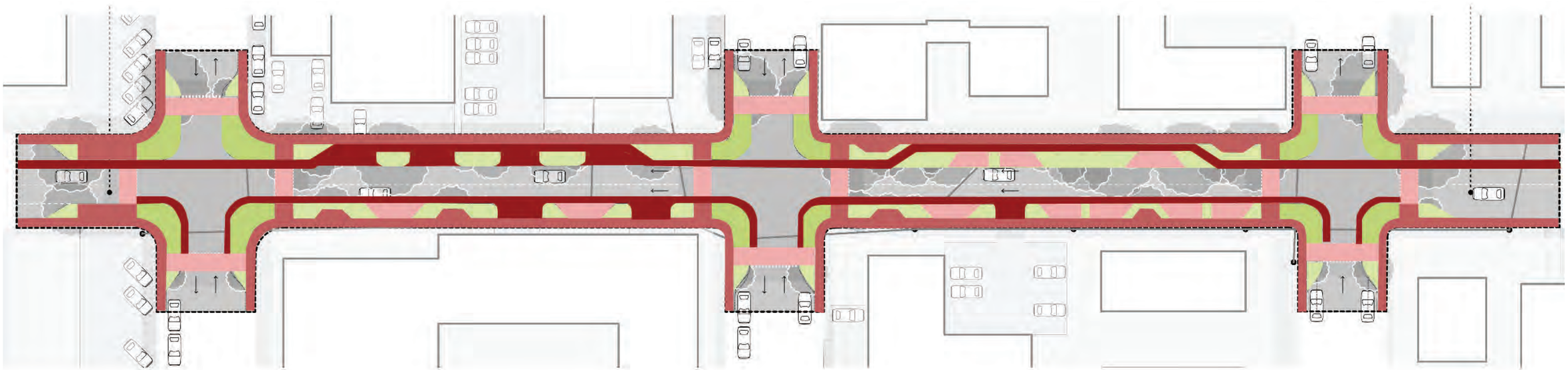
Living Street to Absorb Groundwater

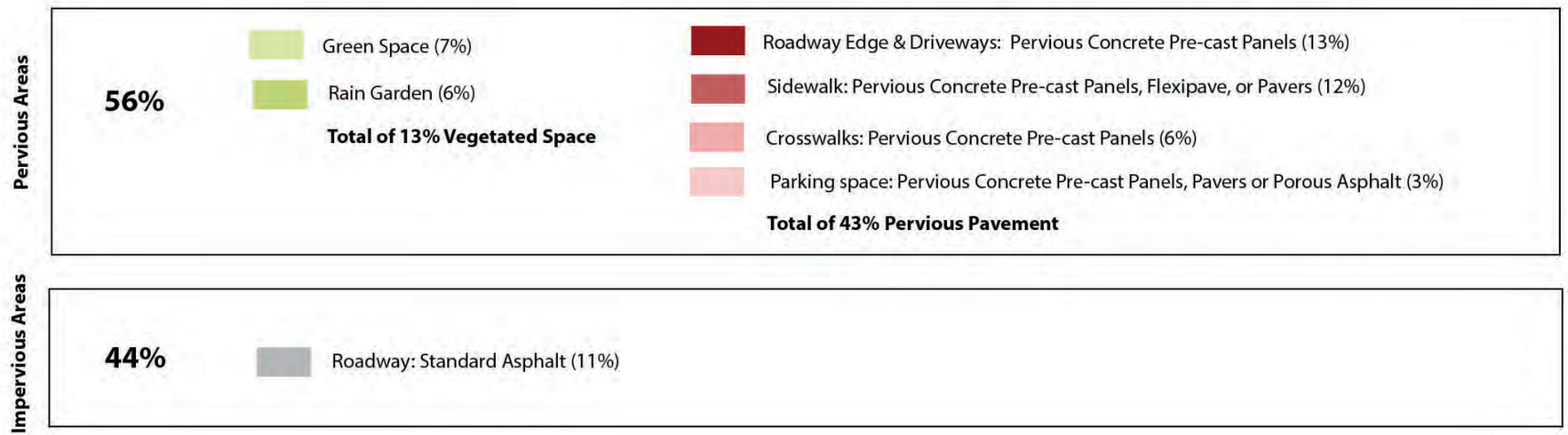
Promote Dense Tree Canopies

Social Street Materials

Guidelines

The recommended surfacing materials for the Pilot projects were selected based upon the research and findings of the teams investigations into the available pervious paving materials found in the previous section of this document. This diagram shows the areas and recommended materials and percentage of the right-of way each represents. They are broken down this way to better inform decisions about what to include on each street and what the implications are for not making all of these areas pervious.

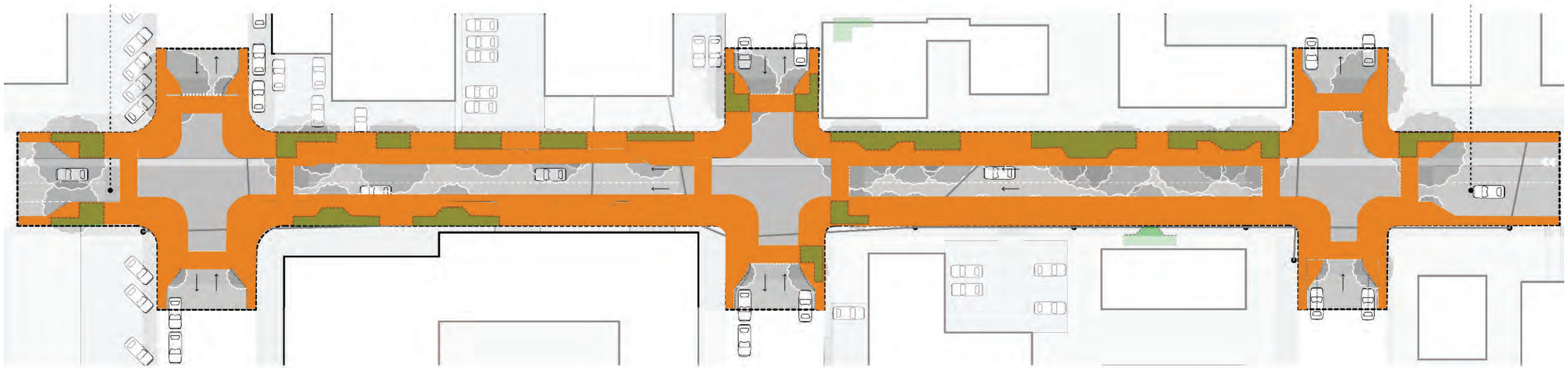




Social Street Materials

Guidelines

The recommended subsurface infrastructure proposed below were selected to support optimal tree growth and success. This below-grade infrastructure includes the use of soil cells below sidewalks where larger species tree are proposed and structural soils within the pervious areas to facilitate a more extensive and expansive root system within the ROW. The following diagram shows the proposed locations for structural soils and soil cells within this pilot site.



Soil Cells

Structural Soil

Large Tree Planted with Soil Cells beneath sidewalk

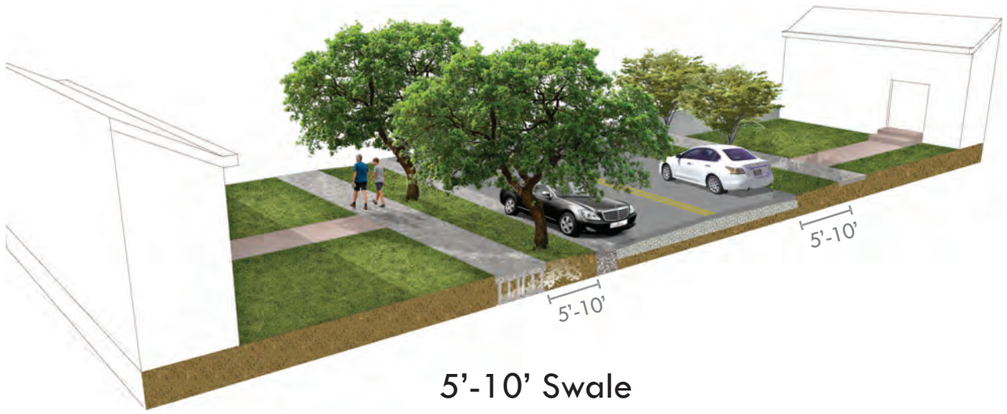
Large Tree Planted with Structural Soil beneath sidewalk

Social Street Planting

General Guidelines

Planting for the Pilot Projects should refer to the guidelines presented in this report in the *Planting Practices* and *Neighborhood Plans* sections. Care must be taken with placement of the trees to not block visibility from driveways or intersections. It is vitally important that the species of trees selected be appropriate for the size of the space they are being planted in. Shade trees should always be used in lieu of palms, as they provide much greater benefits: exceptions to this would be in high visibility areas for emphasis entering a neighborhood.

Medium Swale



5'-10' Swale

Street Trees

The Social Street Pilot Project shows a nine foot swale on both sides of the street with overhead electrical lines on one side.

A nine foot swale without any infrastructure (structural soil or soil cells) can support a medium tree (refer to *Medium Swale Palette* for species). This would apply to the areas between two parking spaces due to the narrowness of the space, even with structural soil on both sides. Otherwise, where structural soil or soil cells are used adjacent to the trees - as they are shown in this pilot project, they can be Large trees (refer to *Large Swale Palette* for species).

Under the overhead electrical lines only small trees should be used (refer to *Small Swale/ Utility Palette* for species). If the trees fall within a rain garden area, species that can handle more water should be selected from the palettes.

The neighborhood plan (refer to the *Neighborhood Plans* section for additional info) should then be consulted to see what the preferred species are for each sized treee required. This example is in the East Little Havana neighborhood, so the trees shown are from that palette as well as being selected for their sizes.

Figure 1: Rain Garden Section

Rain Gardens

The intent of the Rain Gardens for these areas are to absorb and filter as much water as possible. Ideally ground covers should be placed in these areas for maximum absorption and filtration, however bahia sod could also be used. These areas should have rock beneath them to hold water. In areas where there are no trees, like the corners of the intersections, standard #57 drainage rock would be sufficient. In areas where shade trees are also planted, structural soil is preferred to allow greater growth for the trees. Care should be taken to select trees from the palettes that can handle more water. Below are some species recommended for use in the rain gardens.

Tripsacum floridana
Dwarf Fakahatchee Grass

Hymenocalis latifolia
Spider Lily

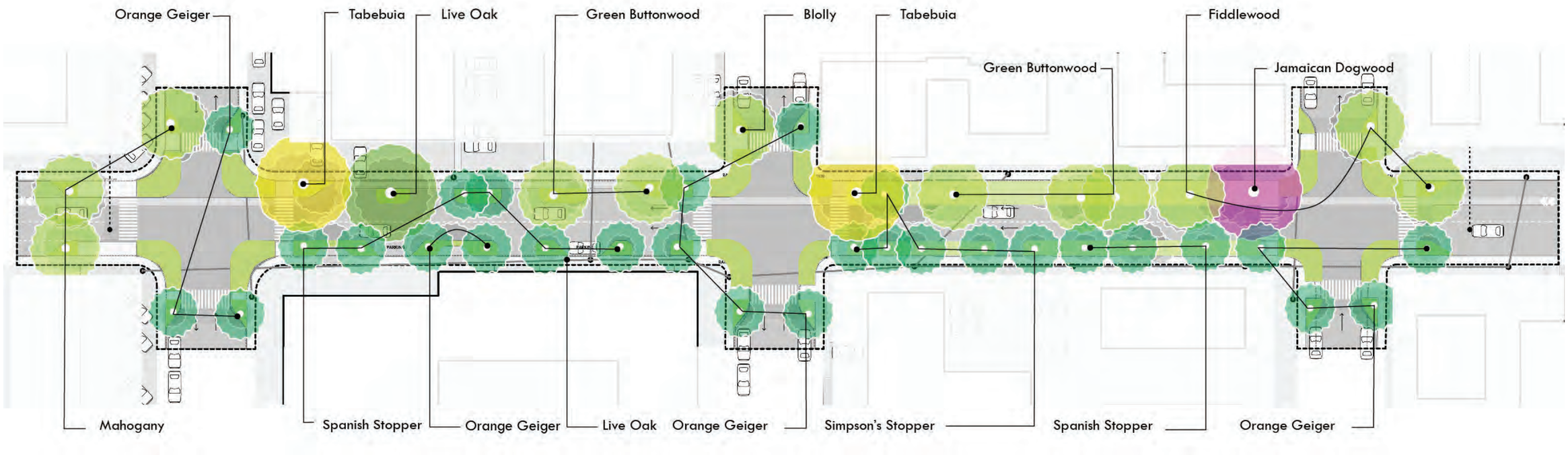
Phyla nodiflora
Frog Fruit

Stachytarpheta jamaicensis
Blue Porterweed

Social Street Planting

Diversity

Diversity is vital to a healthy urban forest. High biodiversity reduces risks from pests and diseases and from climate change, improving resiliency and the supply of ecosystem services.
Below is an example of a potential planting scheme applied to the pilot project to enhance biodiversity. Tree species and sizes were selected using the recommendations of this plan for the sizes of the swales and the neighborhood the street is in (East Little Havana).



Gumbo Limbo
Large Tree

Green Buttonwood
Medium Tree

Red Maple
Rain Garden Tree

Simpson's Stopper
Utility Tree

Materials

General Guidelines

The recommended materials for the Pilot projects were selected based upon the research and findings of the teams investigations into the available pervious paving materials found in the previous section of this document.

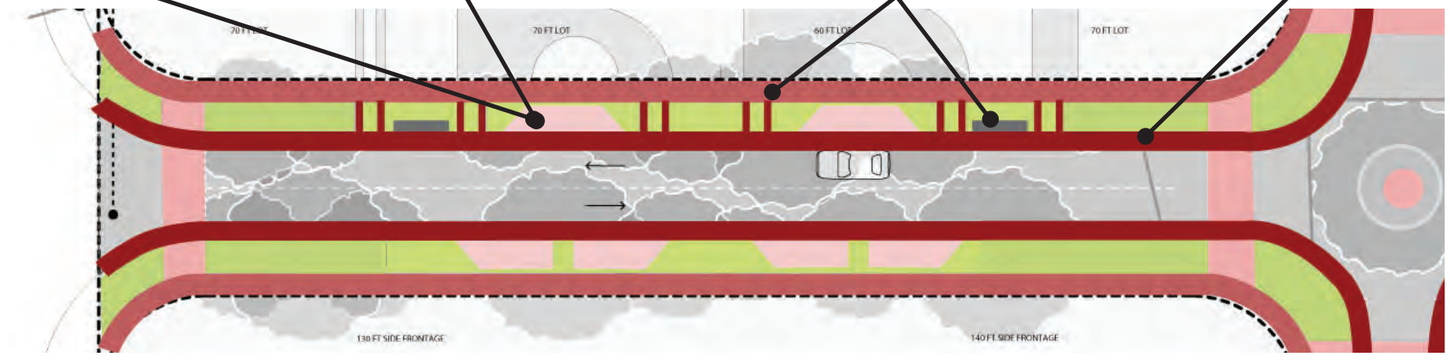
The portions of the ROW that need to be paved, but we recommend be porous, are; the sidewalks, parking spaces, driveways, and the edges of the roadway.

The diagrams shown for each Pilot Project show the areas and recommended materials and percentage of the right-of way each represents. They are broken down this way to better inform decisions about what to include on each street and what the implications are for not making all of these areas pervious. For example; not making the sidewalks pervious might take the calculation from 67% pervious to 55% pervious. Making the sidewalks pervious would greatly benefit the trees in particular, whereas making the roadway edges and crosswalks pervious would greatly aid in stormwater runoff for the streets. Therefore decisions should be made according to a particular streets more pressing issues.

Parking Application -
Permeable Interlocking Concrete Pavers or
Porous pre-cast concrete

Sidewalk & Amenity Pad Applications -
Porous pre-cast concrete or
Flexipave

Edge of Roadway Application -
Porous pre-cast concrete
with or without R-Tank storage



pilot 1

pilot 2

pilot 3

pilot 4

Typologies C & H : Requires infrastructure to existing swales to allow trees to thrive with **cars parking** adjacent to them.

Recommendations: The neighborhoods where this typology dominates are Auburndale, La Pastorita and Douglas Park. These streets typically have multi-family housing, often with little to no on-site parking. This means that a high number of cars are parking on the swales most of the time, not just periodically. This heavy use has killed the grass in most locations, and left only highly compacted dirt. In some locations home owners have paved their swale, probably because they were tired of the dirt. Ideally these streets should have something other than grass where the cars park, since it cannot survive with this heavy use and compaction. Other municipalities have offered homeowners alternatives to grass if they are willing to install it and maintain it. However the alternative needs to be pervious or the street will have drainage issues. There are several streets in Parkdale South where porous concrete has been installed in the swales. Coral Gables allows decomposed granite or crushed shells on portions of their swales as long as the homeowners plant ground covers on the rest of the swale.

To the right is the minimum recommended infrastructure that should be installed on streets with these typologies.
When a new tree is planted on these streets, Structural Soil should be installed adjacent to the tree pit on any side where a car might park or drive over. This 6' x 8' x 3' section can have sod installed on top. We also recommend a tree protection pole in these locations - see Planting Practices section for more details on this recommendation.

The following page has an additional recommendation for streets with this typology.

Typology D : This typology has little to no existing space to plant in and therefore will require infrastructure in the creation of planting spaces, eliminating some parking spaces for bump-outs.

This typology, which is most prevalent in East Little Havana has paved parking spaces on both sides of the road. There are often green spaces at the intersections, some with trees in them - some of which currently do not adhere to the City's visibility requirements. There are intermittent green bump-outs, some with trees, some without. The only way to plant on these streets is to add bump-outs. As many of these streets have multi-family housing and need additional parking, efforts should be made to keep as much parking as possible while maximizing the canopy. To meet this goal, the recommendation for these streets, as for others is to plant large shade trees on the side of the street where there are no overhead utility lines. On streets with this typology, we recommend only adding bump-outs when there are no overhead utilities and therefore allowing the side of the street with overhead utilities to be maximized for parking. To maximize the size of the trees, we recommend using structural soil and pervious concrete in the sidewalk space adjacent to the bump-out. The size of the bump-outs can be reduced where necessary to maximize parking with the use of structural soil and pervious concrete in the adjacent parking space as well.

Table 3 – 20 Minimum Lane Widths

Facility		ADT (vpd)	Design Speed (mph)	Lane Width – (feet)		
				Travel Lanes[1]	Turn Lanes[6] (LT/RT/MD)	Passing Lanes
Freeway	Rural	All	All	12	--	--
	Urban	All	All	12	--	--
Arterial	Rural	All	All	12[8]	12[9]	12[9]
	Urban	All	≥ 50	12	12	12
		All	≤ 45	11[3, 4]	11[3, 4, 7]	11[3, 4]
Collector	Rural	> 1500	All	12[8]	12[8]	12[9]
		401 to 1500	All	11[3, 4]	11[3, 4]	--
		≤ 400	≥ 50	11	11[7]	--
			≤ 45	10	10	--
	Urban	All	All	11[2, 3, 4]	11[2, 7]	--
Local	Rural	> 1500	All	12[8]	12[9]	12[9]
		401 to 1500	All	11[3, 4]	11[3, 4]	--
		≤ 400	≥ 55	11[3]	11[3, 4]	--
			45 to 50	10	10	--
			≤ 40	9	9	--
	Urban	All	All	10[2, 5]	10[8]	--

See Footnotes on next page

SITE 1: LOCAL ROAD: 10’ WIDTH, 25MPH, 15 NEAR SCHOOL
SITE 2: MAJOR COLLECTOR: 11’ WIDTH, 30 MPH
SITE 3: LOCAL ROAD: 10’ WIDTH 25 MPH
SITE 4: LOCAL ROAD: 10’ WIDTH 25 MPH

SOURCE: 2022 FDOT ROADWAY DESIGN OFFICE MANUAL OF UNIFORM MINIMUM STANDARDS FOR DESIGN, CONSTRUCTION AND MAINTENANCE (FLORIDA GREENBOOK)

FPL is working hard to deliver worry-free energy, now and in the future, and we need your help.

Did you know that trees are among the most common causes of outages and flickers, especially during storms? And that during Hurricane Irma in 2017, trees were the number one cause of outages?

While FPL trims trees near power lines located in the public right of way or easement, most damage was due to large trees located outside of the utility pruning zone, falling into FPL equipment and our Right Tree/Right Place guidelines not being followed.

One of the most important things homeowners and businesses can do is follow FPL's Right Tree/Right Place guidelines.

A tree planted too close to a power line falls in September 2017 during Hurricane Irma in Sarasota. Trees and vegetation blowing over or knocking into power lines is one of the leading causes of power outages. Following FPL's Right Tree/Right Place guidelines for tree planting and maintenance can help reduce these occurrences.

1

Line clearing helps prevent outages

What FPL does

The purpose of FPL's line clearing program is to protect our equipment and maintain service reliability.

FPL is committed to delivering safe, reliable electric service to our nearly 5 million customers. The company operates more than 45,000 miles of overhead power lines.

FPL trims vegetation growing near power lines on continual, planned trimming and clearing cycles. We clear main power lines every three years and neighborhood lines every six years, on average.

FPL directs its contractors to follow the International Society of Arboriculture and American National Standard Institute pruning guidelines. FPL uses directional pruning to protect the health of trees while helping them grow away from power lines. Directional pruning, which is considered industry best practice, removes entire branches and limbs down to the main trunk of the tree where trees normally shed. This method directs future tree growth away from the power lines and reduces re-growth.

Side-trim directional pruning

V-trim directional pruning

Proper pruning for tree health

2

Remember: Always keep yourself and the end of any object you are holding at least 10 feet from main and neighborhood power lines and 30 feet from higher voltage transmission lines.

What customers can do

FPL customers play an important role in keeping power lines clear

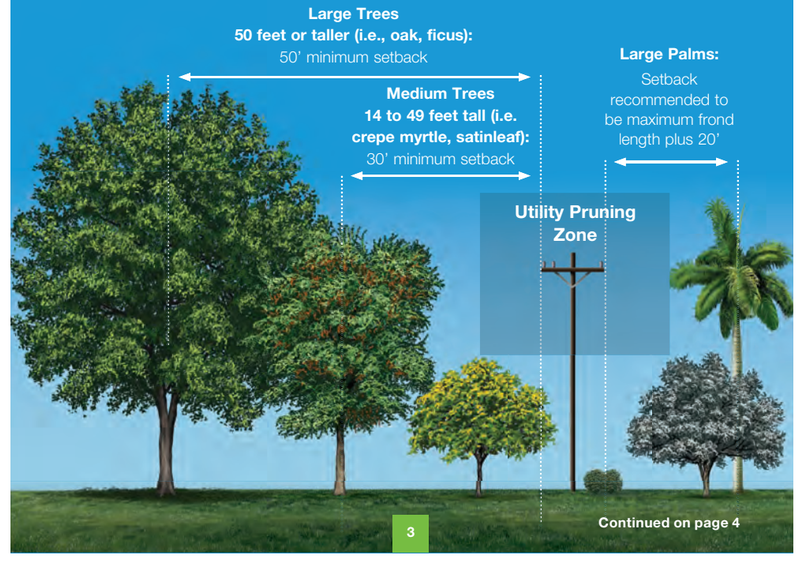
Plant the Right Tree in the Right Place

One of the most important things businesses and homeowners can do is **follow FPL's Right Tree/Right Place guidelines.**

If you're planting trees on your property, look up and note the location of power lines. Before you plant, keep in mind the setback dimensions in the diagram below. Think about how your tree will impact existing utility lines as it grows taller, wider and deeper. Keeping trees away from power lines means that, in the event they blow over or tree limbs become loose, they're much less likely to hit a power line and knock out power. This also keeps debris farther away from the lines to speed our restoration efforts.

Additionally, be sure to proactively perform yardwork on your property that isn't near power lines. Don't wait for a hurricane or other major event. No amount of trimming can substitute for smart landscaping and responsible maintenance of trees and other vegetation by property owners.

Note: Small trees less than 14 feet tall and shrubs may be planted adjacent to power lines. These set-back guidelines increase around transmission lines and equipment. Trees are shown at mature height.



3

Continued on page 4

Community Resources

Handouts

The following section includes several handouts that can be distributed within the community as short guides to residents , they provide information about the Street Tree Master Planning efforts going on within their neighborhood. The handouts are a standard Letter size for easy duplication, or the digital versions can be used for online communications. Handout topics include; notification of work being conducted within the area, the benefits of trees, projects goals and proposed solutions, as well as a post tree planting care guide.

Southwest Streetscape and Street Tree Master Planning

The City of Miami has started a project to restore and enhance the Urban Forest (tree canopy) in the southwest portion of the City.
This project consists of:

- Analysis of existing trees on public right of way
- Analysis of the effectiveness of swales for drainage
- Community Outreach to identify neighborhood issues and concerns
- Development of Pilot Projects for improvements related to resiliency, canopy coverage, identity and drainage.

You may see specialists in your neighborhood surveying conditions (measuring & photographing), They should have identification as employees of (City of Miami, Curtis + Rogers Design Studio, ESciences, BCC Engineering, or Local Offices Landscape Architecture - LOLA)

If you have further questions, please call or email the City of Miami's Chief of Environmental Resources Quatisha Oguntoyinbo-Rashad at QOguntoyinbo-Rashad@miamigov.com or 305-416-2038.

Plan Maestro para la Restauración del Bosque Urbano

La ciudad de Miami ha comenzado un proyecto de restauración y mejoramiento del bosque urbano en el suroeste de la ciudad.
El proyecto consiste en:

- Análisis de los árboles existentes dentro de la vía pública
- Análisis sobre la efectividad de drenaje dentro de la vereda pública
- Participación de la comunidad sobre temas de interés relacionados con la vereda pública
- Desarrollo de proyectos "piloto" relacionados al mejoramiento de la vereda pública, aumento del bosque urbano, mejoramiento de drenaje y resistencia al cambio climático

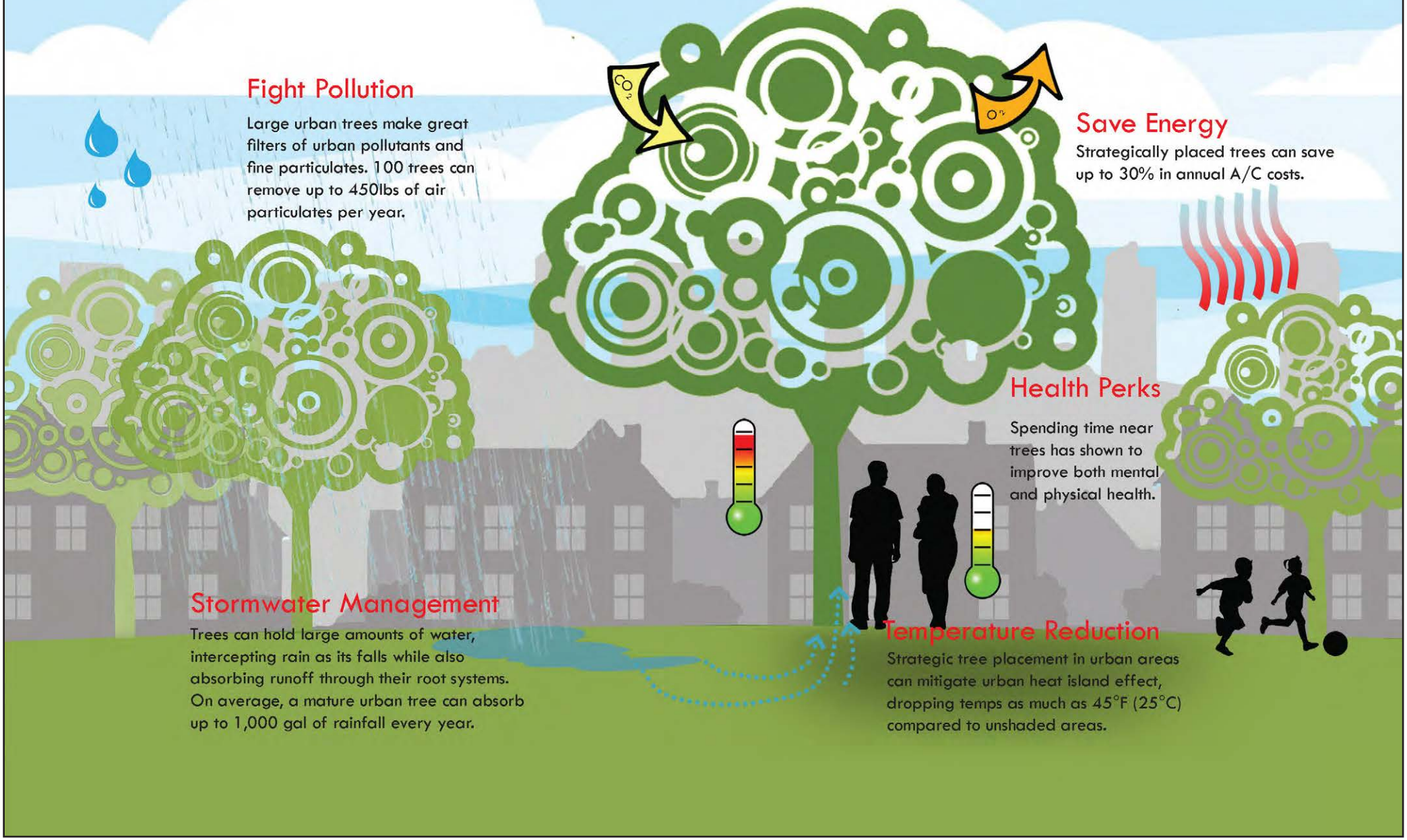
Quizá observe a nuestros especialistas en su vecindario haciendo inspecciones, midiendo y fotografiando el entorno, ellos(as) llevan identificación como empleados (Ciudad de Miami, Curtis + Rogers Design Studio, ESciences, BCC Engineering o Local Offices Landscape Architecture - LOLA).

Si tiene preguntas o desea más información por favor llame o mande un correo electrónico a Efren Nunez a EfrenNunez@miamigov.com o 305-416-1402.

Benefits of Trees

Reduce Carbon Emissions

Mature trees can absorb up to 48lbs of CO_2 per year, sequestering carbon and offsetting emissions while producing oxygen.



Fight Pollution

Large urban trees make great filters of urban pollutants and fine particulates. 100 trees can remove up to 450lbs of air particulates per year.

Save Energy

Strategically placed trees can save up to 30% in annual A/C costs.

Health Perks

Spending time near trees has shown to improve both mental and physical health.

Stormwater Management

Trees can hold large amounts of water, intercepting rain as its falls while also absorbing runoff through their root systems. On average, a mature urban tree can absorb up to 1,000 gal of rainfall every year.

Temperature Reduction

Strategic tree placement in urban areas can mitigate urban heat island effect, dropping temps as much as 45°F (25°C) compared to unshaded areas.

You've got a New Tree!

What does that mean?

The city has invested in the health of your neighborhood by installing a new tree to assist with reducing urban heat and stormwater impacts.

What do you need to do?

Following these simple steps will help to ensure the success of this new tree:

- Do not park closer then 5 feet from the tree (if you cannot see the bottom of the trunk from inside you car, you parked too close)
- If it hasn't rained in a while we would appreciate you splashing the new tree with a hose for a minute or two
- Report any damage or issues with the tree to 311. Either dial 311 or 305-468-5900 or report problems online at miamigov.com/Services/Solve-a-Problem

Southwest Streetscape and Street Tree Master Plan

Goal: To make the City's Right-of-Ways more resilient.

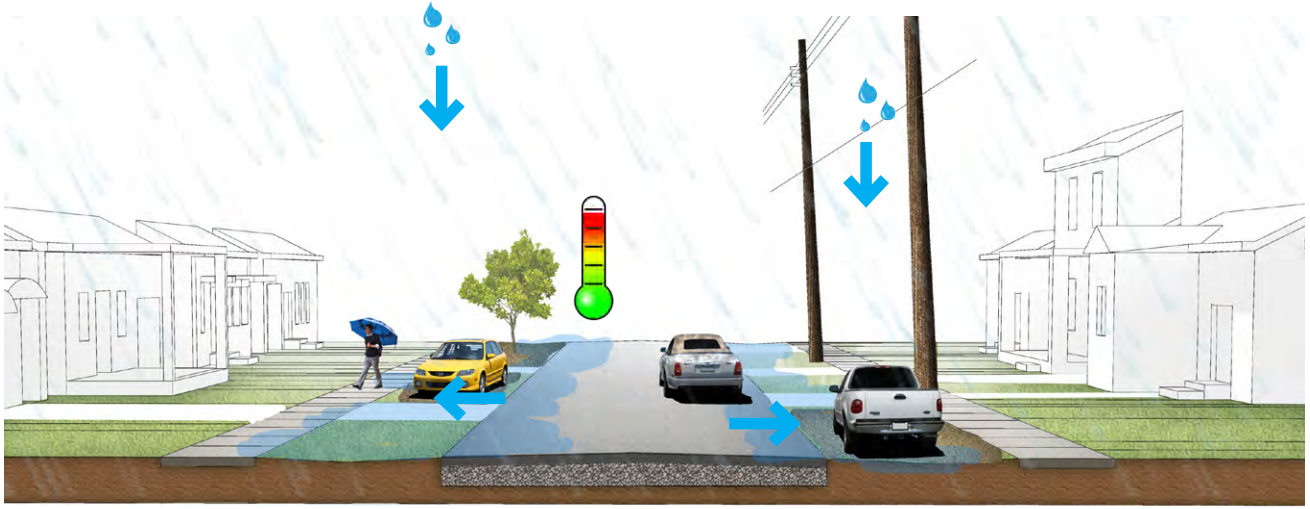
What does that mean?

With Global warming Miami can expect our temperatures to rise as well as our waters. This means a greater threat of flooding and of health related consequences of living with higher temperatures.

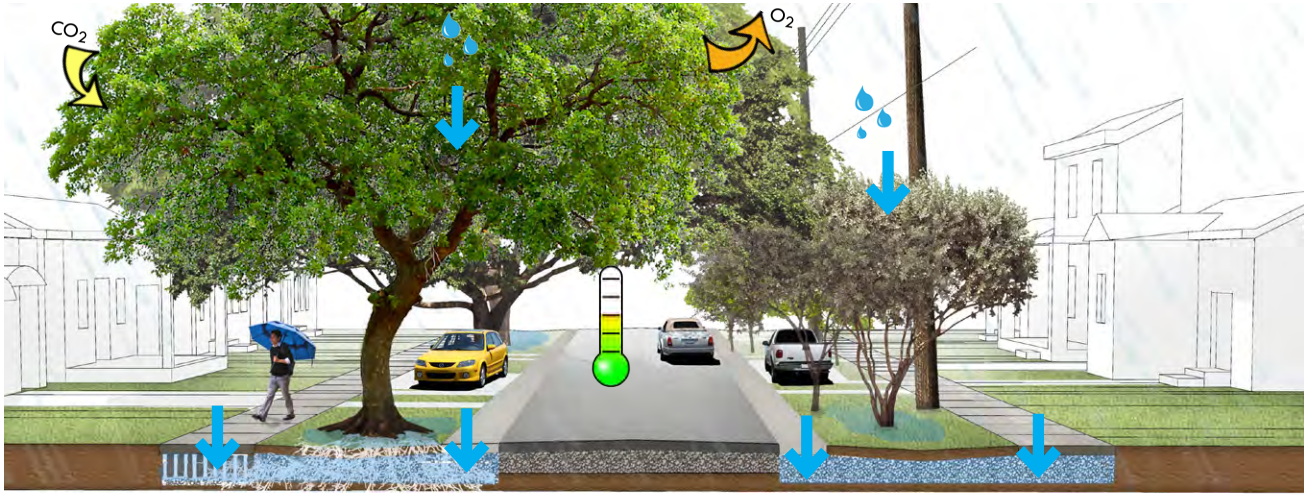
This plan looks at ways to lessen the impacts of these changes through planting more trees and creating more pervious surfaces within the streets of the City.

The results will make for a more habitable and walkable city.

- Porous pavements can be used on the roadway edges, parking spaces and sidewalks to allow rainfall to percolate down and away from the surface.
- Structural Soils or Soil Cells can be used underneath these pavements to increase the storage capacity of the rainfall.
- Trees can absorb carbon, intercept and hold rainfall and reduce the ambient temperature significantly helping to reduce energy costs and improve residents health.

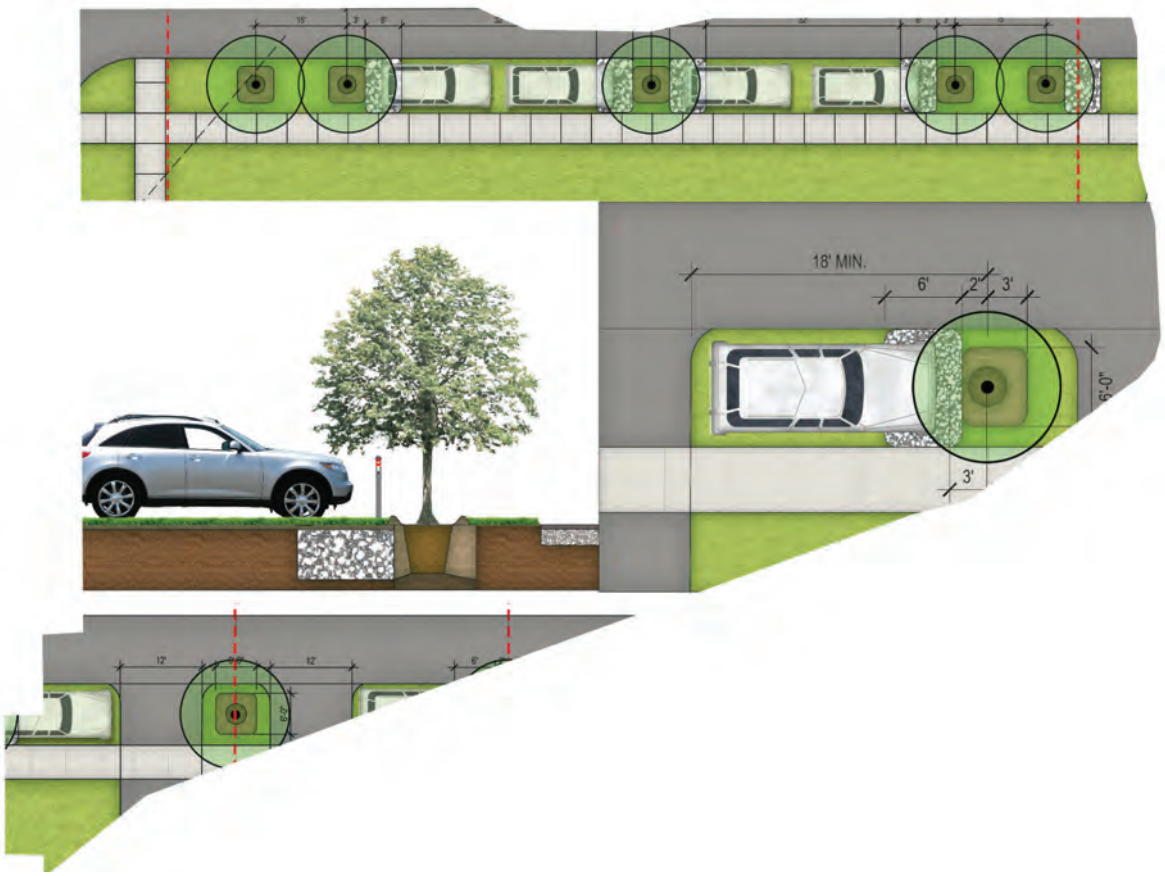


Average Residential Street



Proposed Resilient Street

PLANTING FIELD GUIDE



Planting Methodologies - Proposed Practices

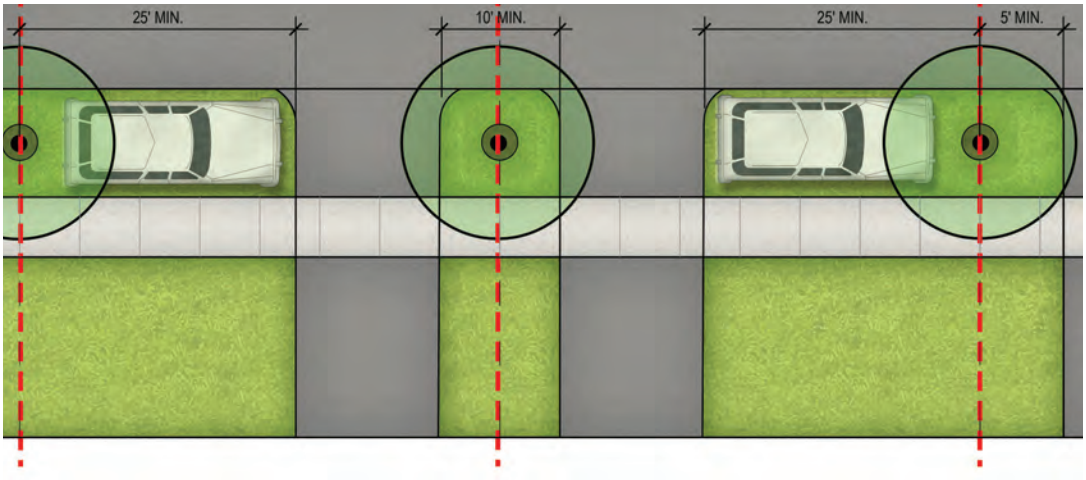
Spacing Strategies

There are two major issues with new trees being planted within the project area which are related to spacing, they are:

- New trees being planted are being hit by cars that are parking on the swales
- Growth will be greatly stunted due to the compaction of the adjacent soils because of cars.

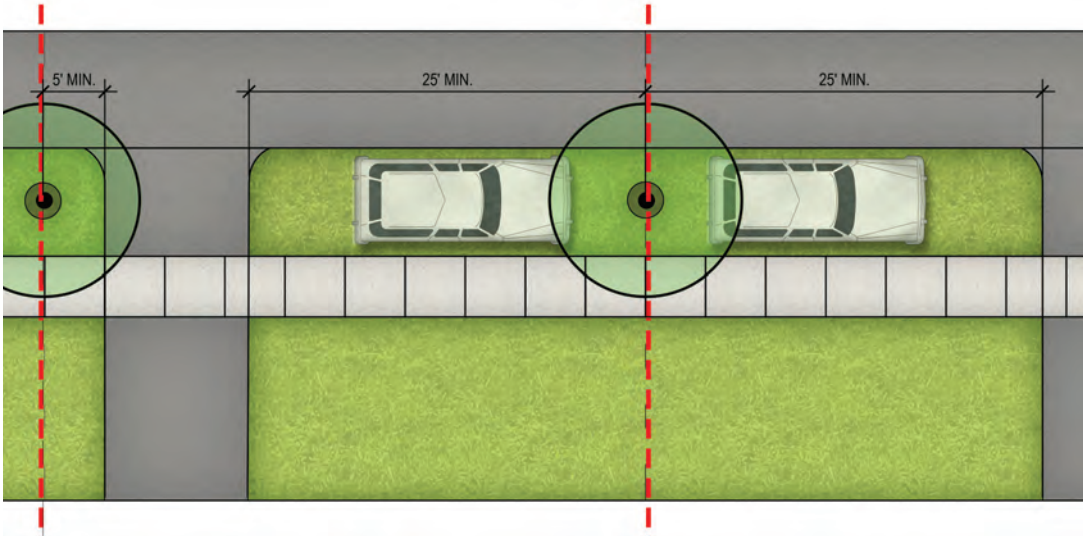
The spacing strategies proposed should limit the number of trees being impacted by the factors above. The proposed strategy is to plant with car parking in mind - leaving an appropriate amount of space for either one car or two cars. Appropriate spacing to permit the parking of one car in the center is approximately 25'-30' apart. When trees are spaced at more than 30' apart drivers tend to try to fit more than one vehicle often times damaging trees. If two cars are desired, than 50'-60' spacing is ideal. All efforts should be made to avoid planting trees between 30'-50' apart, as this space is too small for two cars, but big enough for people to try to put them there anyway. Spacing at 20' apart should also be avoided, as it is too small for one car, but large enough that someone will try. It is recommend planting trees 15' apart if parking is to be discouraged. We also recommend that a deterrent pole be placed in areas where parking is common on the swale. These poles which are detailed later in this section, shall serve as reflective markers for people parking and also carry messages from the City regarding caring for the trees.

Tree spacing will be dictated by lot size, primary or secondary frontage, and observed residential usage. The following pages include guides for lots sized at 40', 50', 60', 100', and 150' including both principal and secondary frontages.



40’ Lots - Typically Multi-Family

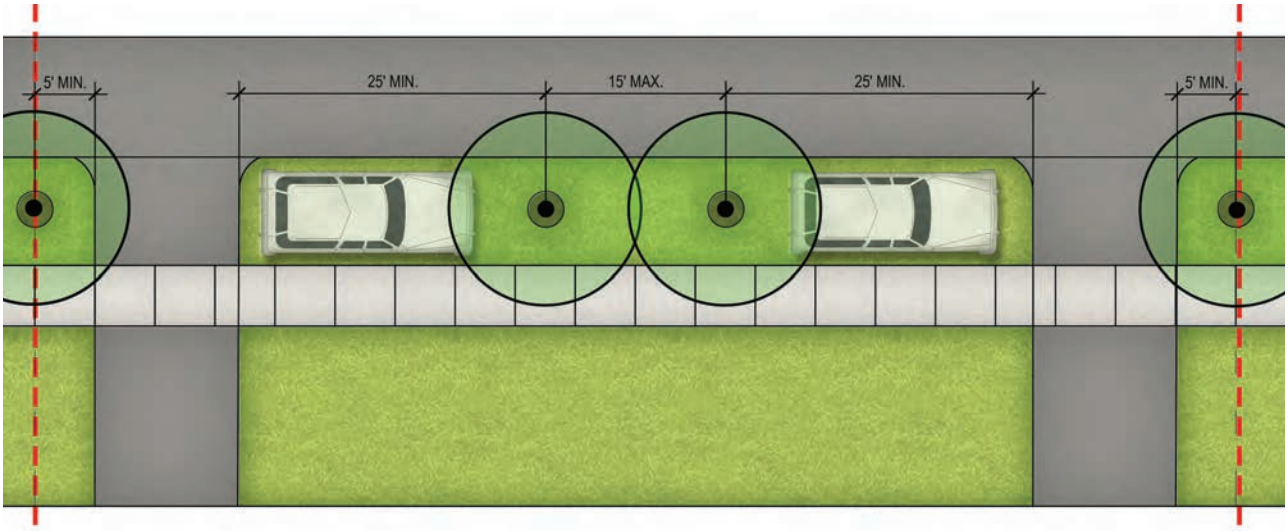
40’ frontages are typically found in Multi Family areas where parking on the street is highly utilized and street trees are typically scarce. This is the recommended spacing for these lots, with the intent of placing a tree on each property line.



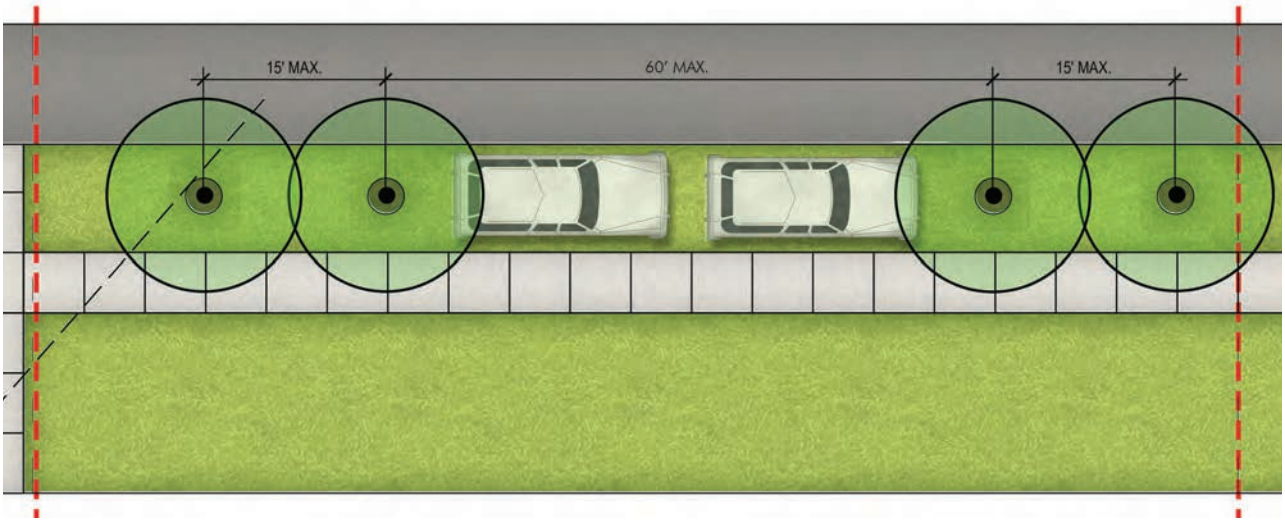
50’ frontages are predominant within this project area, however there are some 60’ lots as well. These properties are usually single family or multifamily within the Southwest Streetscape area. This is the recommended spacing for these lots, with the intent of placing a tree on each property line.

50’-60’ Lots - Single Family & Multi-Family

100’ PRIMARY FRONTAGE

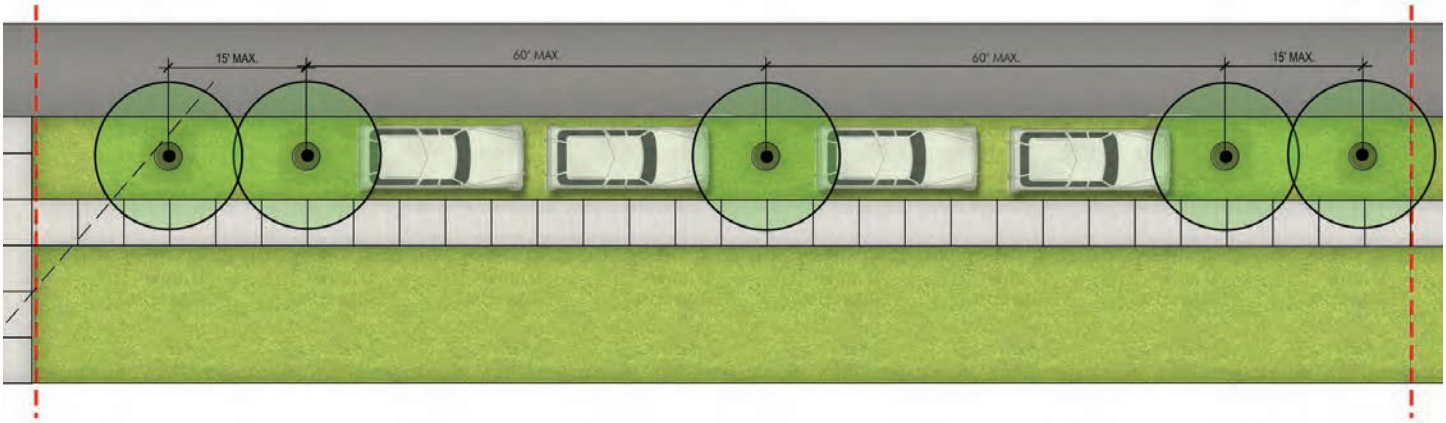


100’ SIDE FRONTAGE



100’ frontages are typically single family when they are Primary frontages, however there are many avenues within the Southwest Streetscape area that have side frontages that are 100’ and these can also be multi-family areas. This is the recommended spacing for these lots, with the intent of placing four trees within the 100’ and allowing for two cars to park. In neighborhoods with high density and high demand for parking, this could be reduced to two trees on the side frontages to allow for one more car to park.

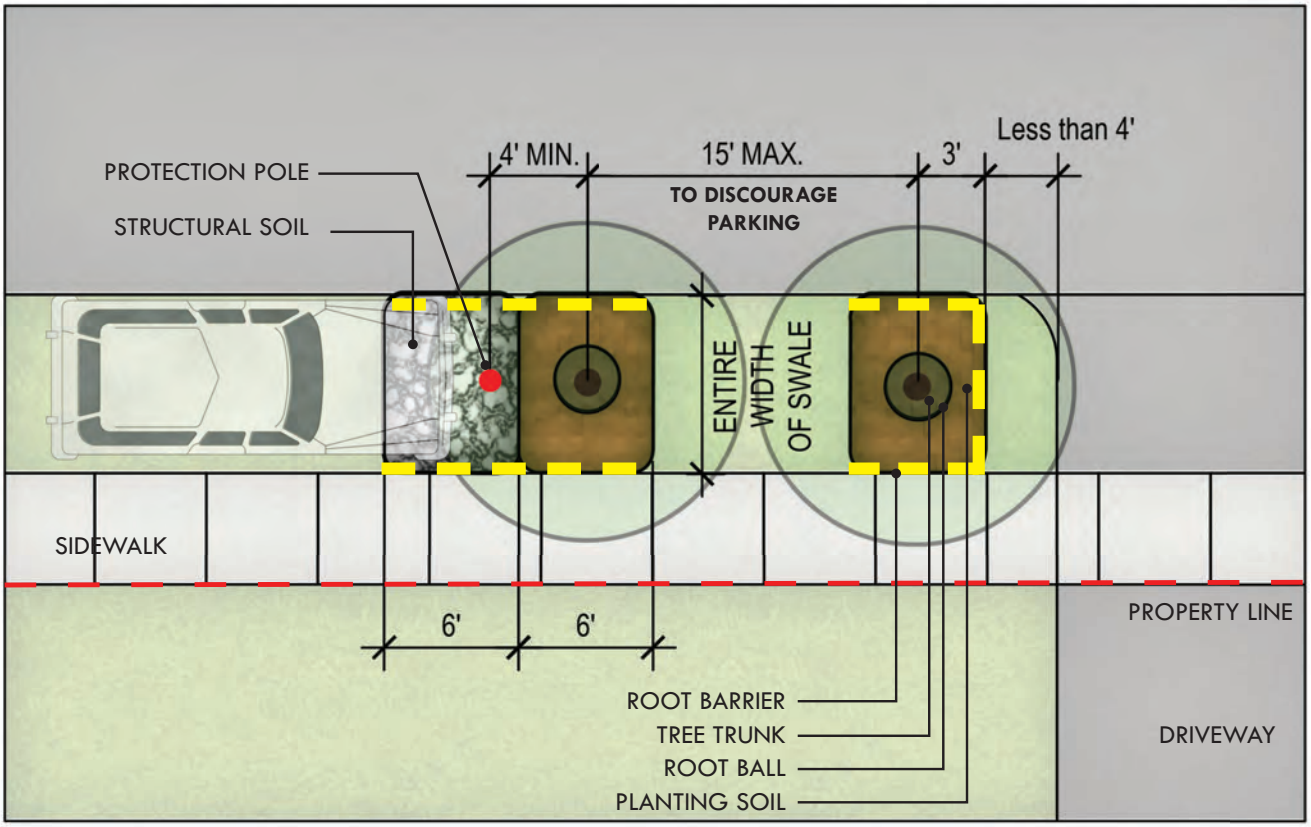
100’ Lots - Single Family & Multi-Family



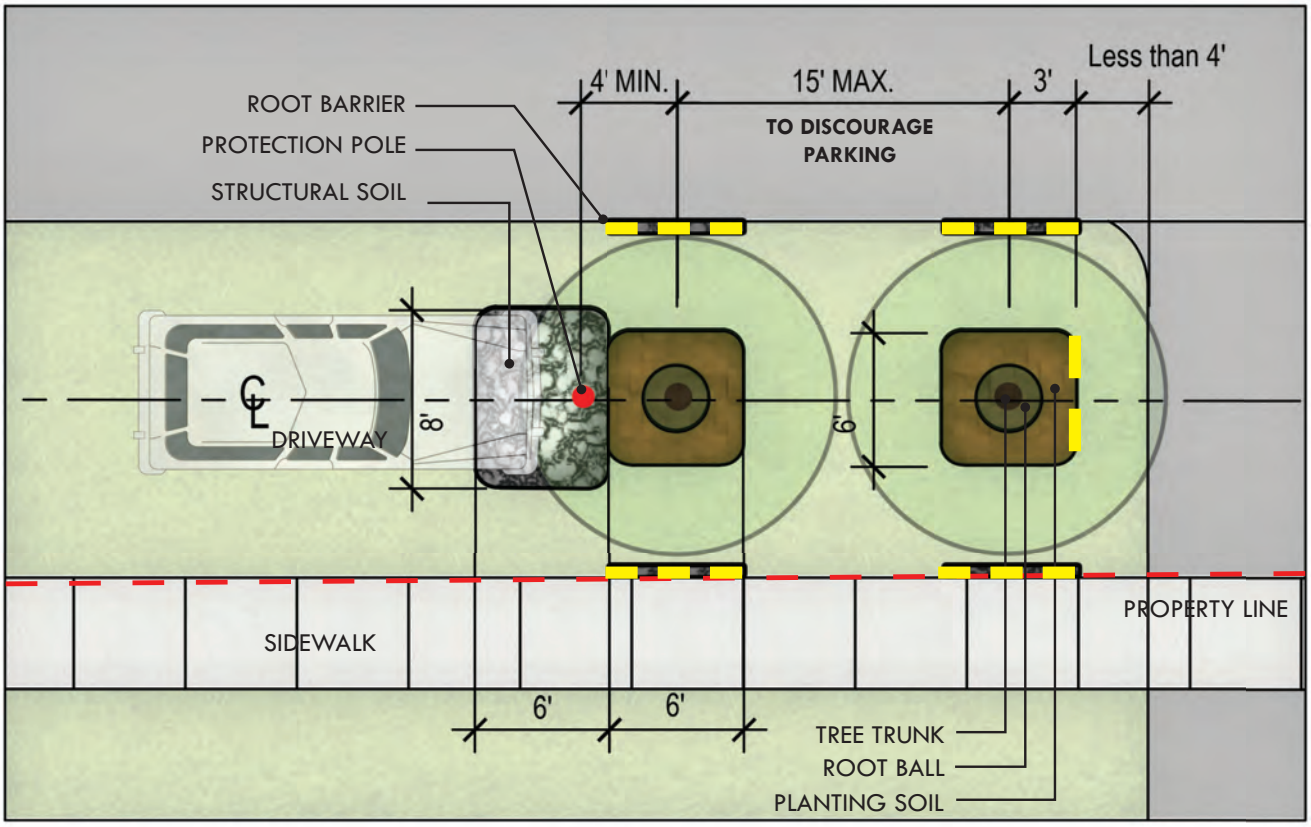
150' frontages are typically single family side frontages, however there are some streets within the Southwest Streetscape area that have primary frontages that are 150' and these are also typically single family homes. This is the recommended spacing for these lots, with the intent of placing five trees within the 150' and allowing for four cars to park. In neighborhoods with low density and low demand for parking, this could be increased to six trees.

150' Lots - Single Family Typically

Planting Pit Dimensions



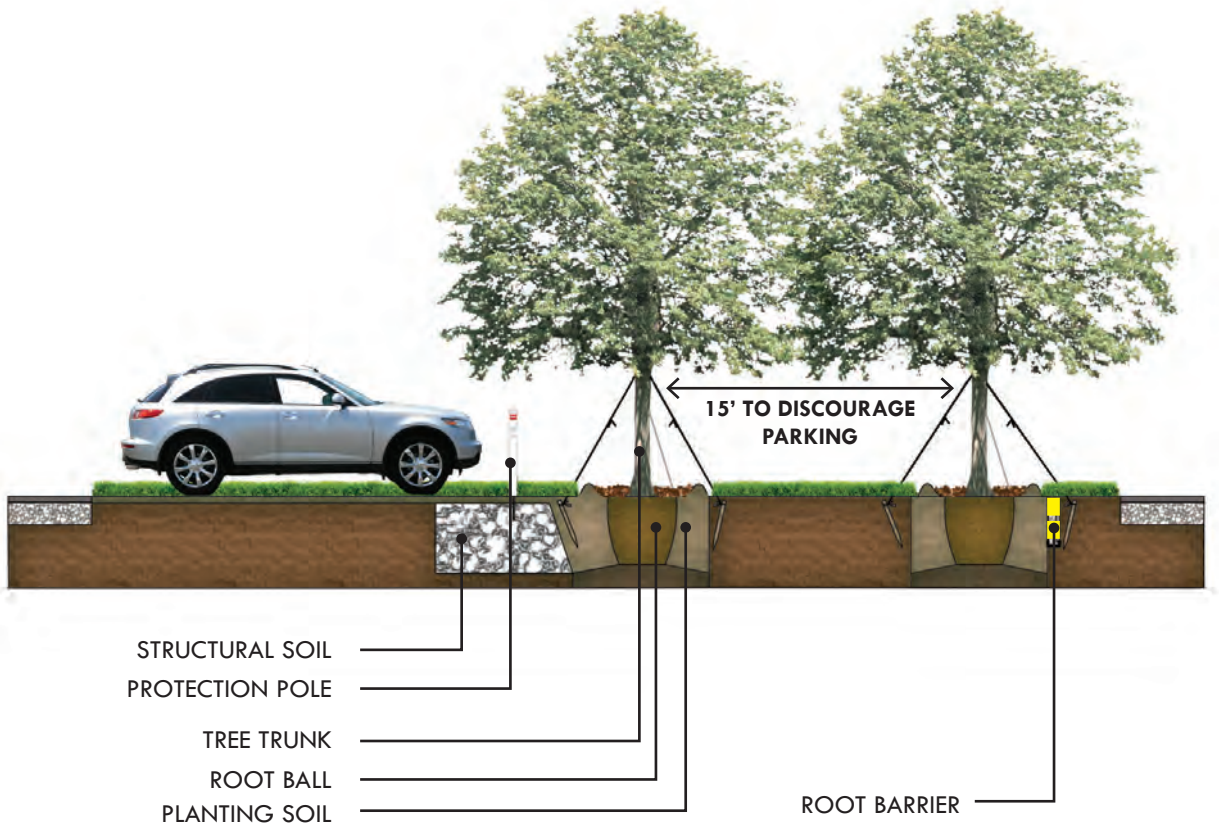
Less than 10' Swale



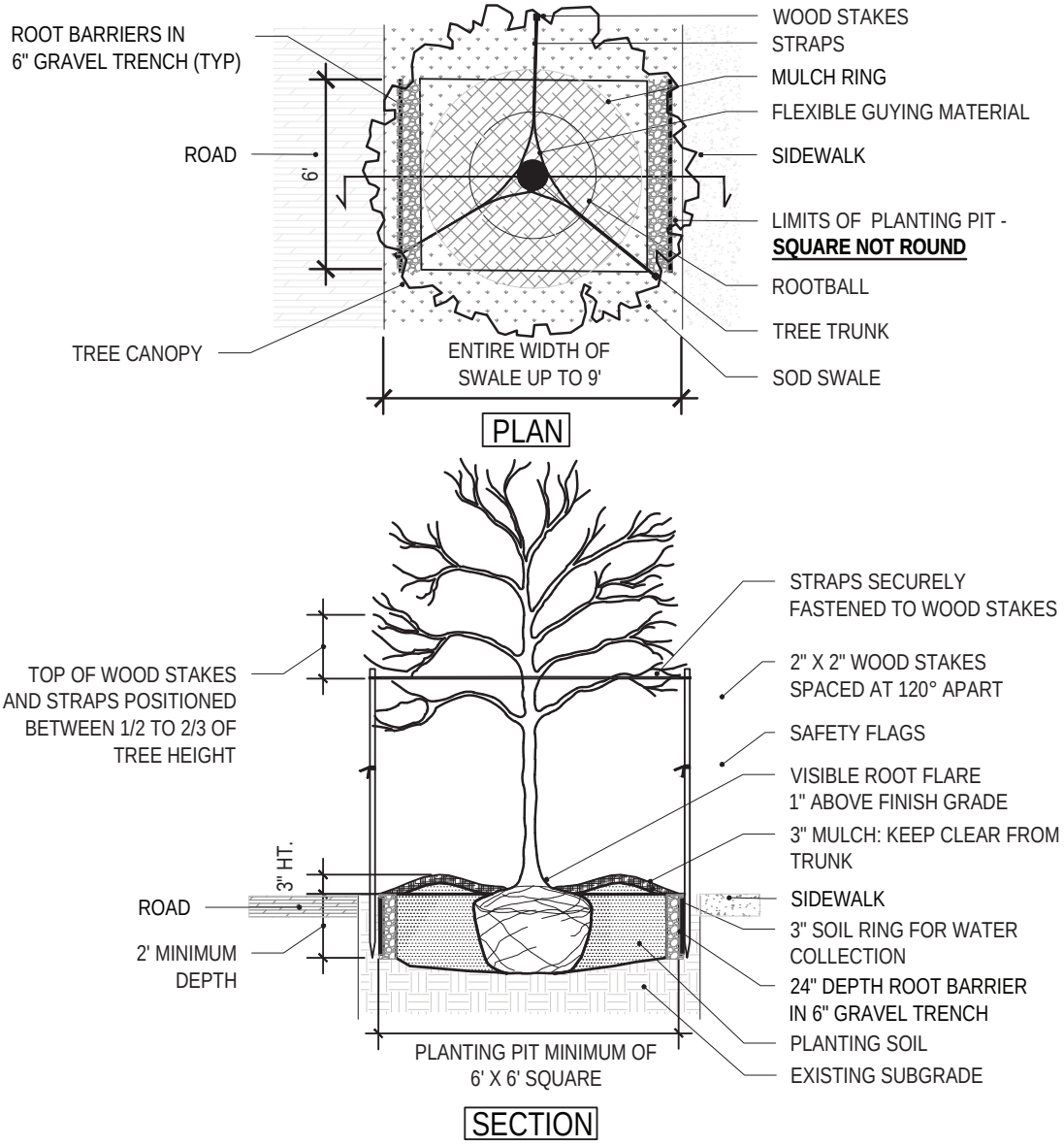
Greater than 10' Swale

CURTIS+ ROGERS DESIGN STUDIO INC.

Planting Pit Dimensions

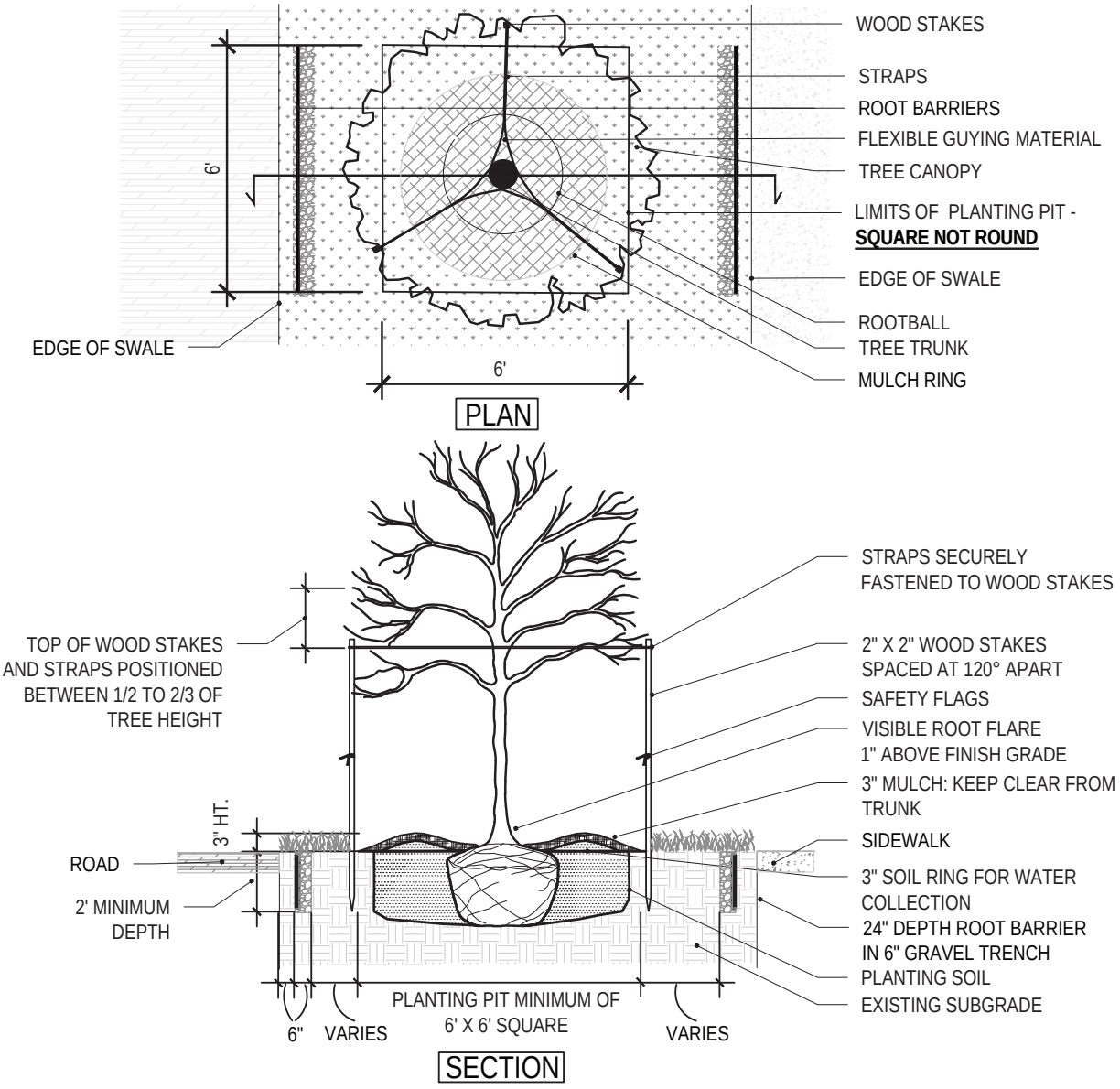


Note:
Planting pits for swales under 10' in width should be the entire width of the swale and 6' in length. In planting pits for swales over 10' in width should be 6' wide and 6' in length.



1 TREE PLANTING DETAIL - LESS THAN 10' SWALE

Scale: 1/4"=1'-0"



2 TREE PLANTING DETAIL - MORE THAN 10' SWALE

Scale: 1/4"=1'-0"