

Overcoming Obstacles of LID: Tonbo Meadow



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Red Line Engineering, PC





Site Introduction

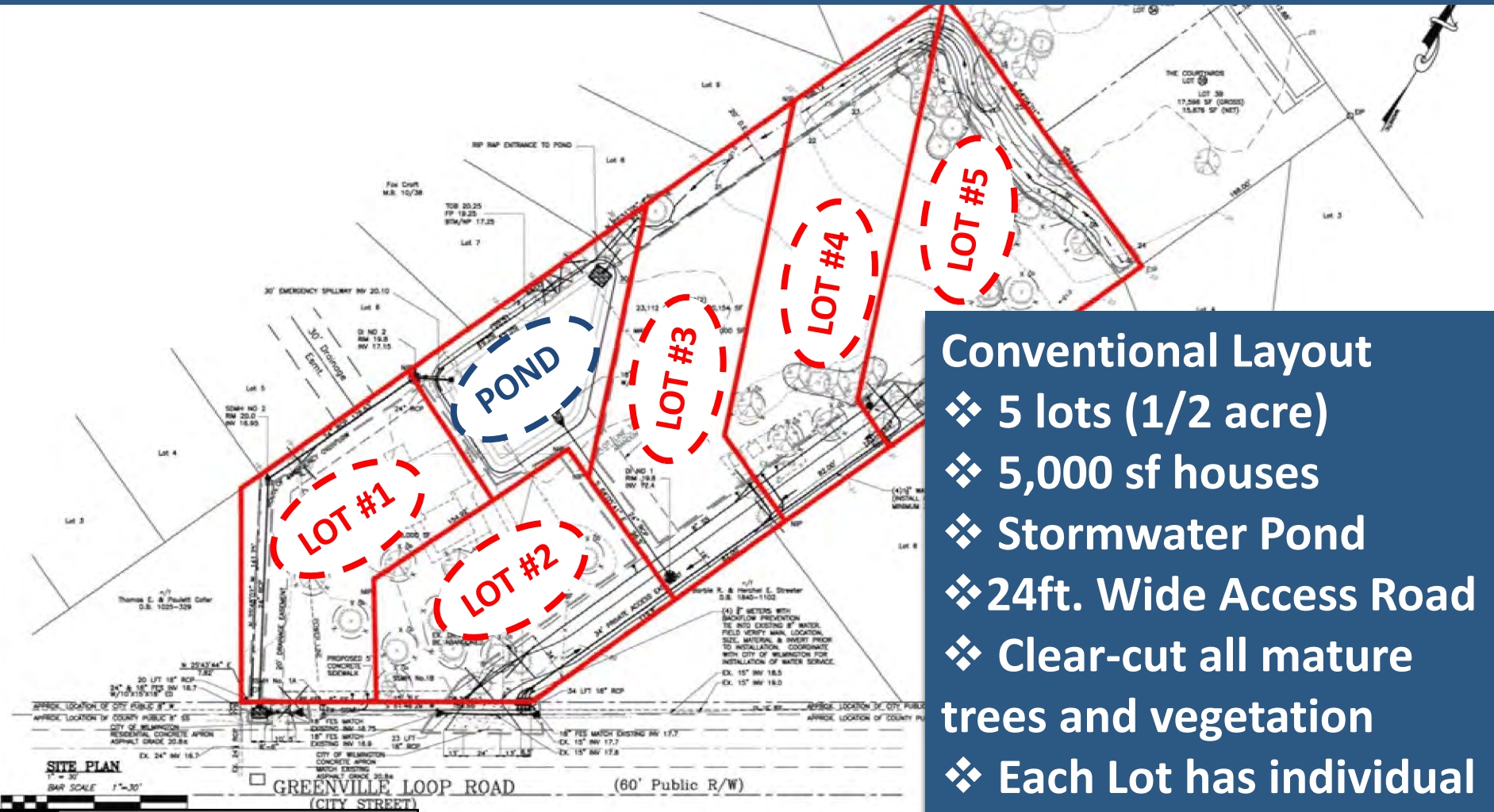


**3.19 acres along Greenville Loop Rd.
in City of Wilmington, NC
Formerly the Peterson Family Farm
Located in Protected Watershed &
Resource Protection Area**



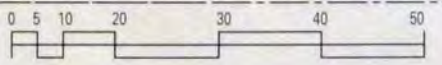


Site Introduction



- Conventional Layout
- ❖ 5 lots (1/2 acre)
- ❖ 5,000 sf houses
- ❖ Stormwater Pond
- ❖ 24ft. Wide Access Road
- ❖ Clear-cut all mature trees and vegetation
- ❖ Each Lot has individual water and sewer

Site Introduction





Site Introduction

LID (2008 Version)

- 10 Single Family Detached Units (3,500 sf)
- Treatment Train for Stormwater
- Minimized Impacts to Existing Trees and Resources
- Approved for Construction with Requested Waivers





Site Introduction

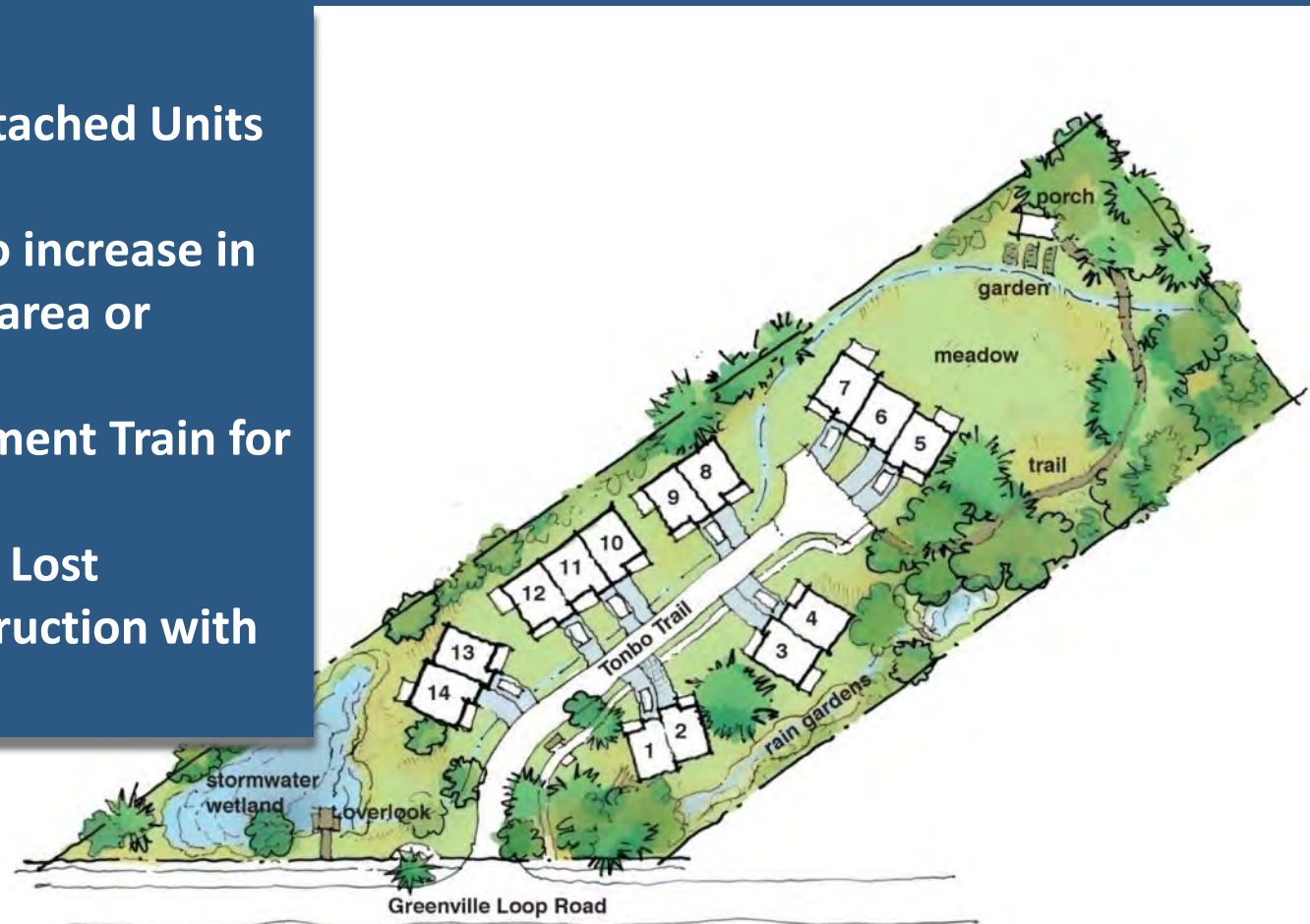




Site Introduction

LID (2012 Version)

- 14 Single Family Attached Units (1,800 -2,400 sf)
- Redesigned with no increase in impervious surface area or utilities.
- Utilizes Same Treatment Train for Stormwater
- No Additional Trees Lost
- Approved for Construction with Requested Waivers



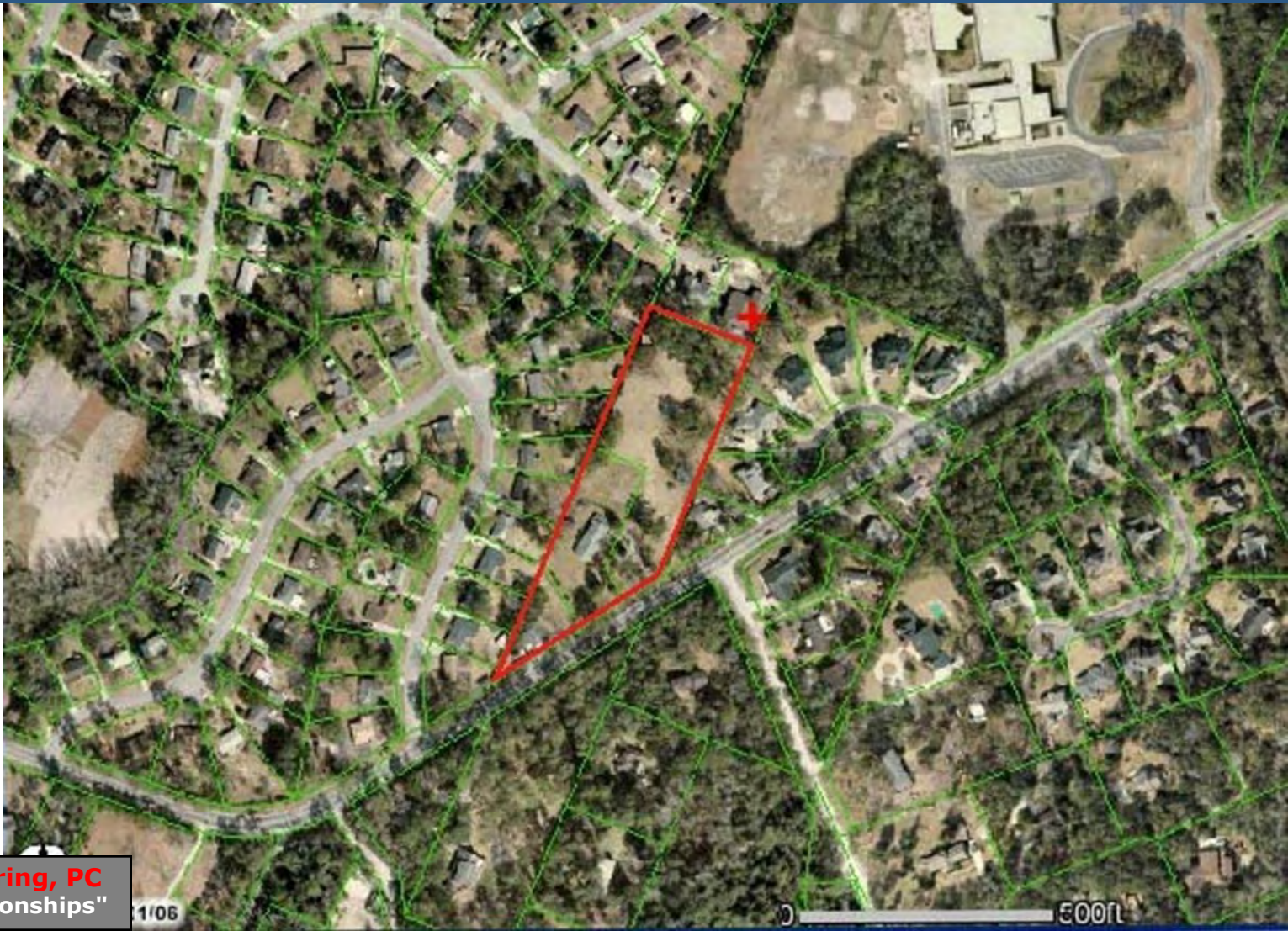
LID Obstacles

Types of Obstacles for LID

- Site Obstacles
- Code Obstacles
- Human Obstacles



Site Obstacles



Site Obstacles

Site Challenges

- Located in Protected Watershed & Resource Protection Area



Site Obstacles

Site Challenges

- Located in Protected Watershed & Resource Protection Area
- Site Orientation and Dimensional Requirements



Site Obstacles

Site Challenges

- Located in Protected Watershed & Resource Protection Area
- Site Orientation and Dimensional Requirements
- Existing Drainage Patterns



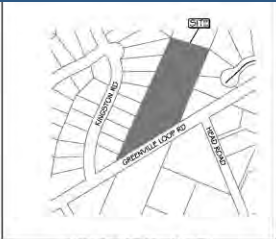
Site Obstacles

Site Challenges

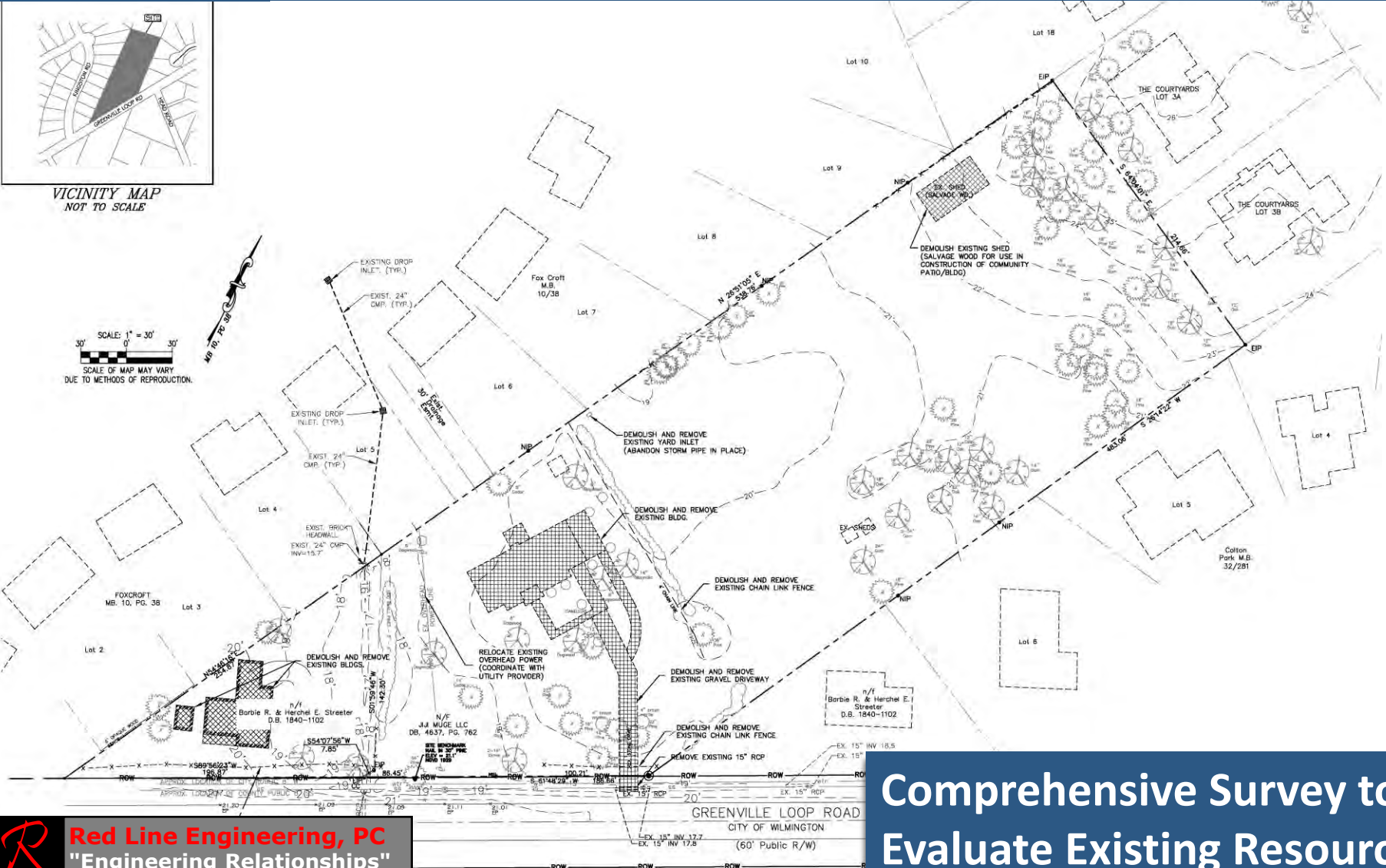
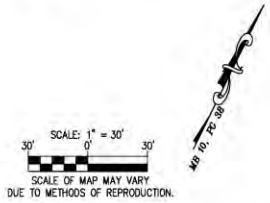
- Located in Protected Watershed & Resource Protection Area
- Site Orientation and Dimensional Requirements
- Existing Drainage Patterns
- Soils and Depth to Water Table



Overcoming Site Obstacles



VICINITY MAP
NOT TO SCALE



Comprehensive Survey to Evaluate Existing Resources

Overcoming Site Obstacles

Survey and field inspection to evaluate vegetative resources

14"	GUAM	REGULATED	3	4 x 2 x 3
12"	GUAM	REGULATED	1	3 x 1 x 3
10"	GUAM	REGULATED	1	2 x 1 x 2
18"	DAK	REGULATED	2	3 x 2 x 8
14"	DAK	REGULATED	1	3 x 1 x 3
12"	DAK	REGULATED	2	1 x 2 x 8
4"	DOGWOOD	REGULATED	1	1 x 1 x 1
4"	CR MYRTLE	REGULATED	2	1 x 2 x 2

43 TOTAL TREES, 153 TOTAL TREE CREDITS

EXISTING TREES TO BE REMOVED DUE TO ESSENTIAL SITE IMPROVEMENTS

DNR TYPE	LOCATION	CATEGORY	MITIGATION
20"	FRSIAH	STORMWATER WETLAND	SIGNIFICANT 28 x 2 x 1 = 18 TREES REQUIRED
14"	MAGNOLIA	SWALE	SIGNIFICANT 14 x 2 x 1 = 9.3 TREES REQUIRED
14"	CEDAR	SWALE	REGULATED EXEMPT
12"	CEDAR	SWALE	REGULATED EXEMPT
10"	MUL TITUBAK	STORMWATER WETLAND	REGULATED EXEMPT
8"	CEDEAR	STORMWATER WETLAND	REGULATED EXEMPT

EXISTING TREES TO BE TRANSPLANTED

DNR TYPE	LOCATION
8"	DOGWOOD
8"	DOGWOOD
8"	DOGWOOD
8"	DOGWOOD
8"	DOGWOOD
8"	DOGWOOD

GRADE AT SITE OF REMOVAL SHALL BE RESTORED TO SAME OR NEARLY SAME GRADE AS EXISTING TO PREVENT EROSION.

2. TREE RELOCATION SERVICES SHALL BE CARRIED OUT BY A COMPANY WITH A MINIMUM OF 5 YEARS OF EXPERIENCE IN TREE LOCATION.

3. NEW LOCATIONS FOR TRANSPLANTED TREES SHALL BE EXCAVATED AND WATERED PRIOR TO REMOVING TREES TO BE REPLANTED.

4. TREES TO BE TRANSPLANTED SHALL BE PRUNED PRIOR TO REMOVAL AS REQUIRED TO INCREASE PROBABILITY OF SUCCESSFUL TRANSPLANTING. IF POSSIBLE, TREES SHALL BE REMOVED AND REPLANTED WITHIN THE SAME DAY TO REDUCE STRESS AND POSSIBILITY OF INJURY. TREES THAT CANNOT BE REPLANTED IN THE SAME DAY AS REMOVAL SHALL BE SHADDED, WATERED, AND STORED IN AN UPRIGHT POSITION IN A PROTECTED AREA ON SITE UNTIL REPLANTING CAN TAKE PLACE.

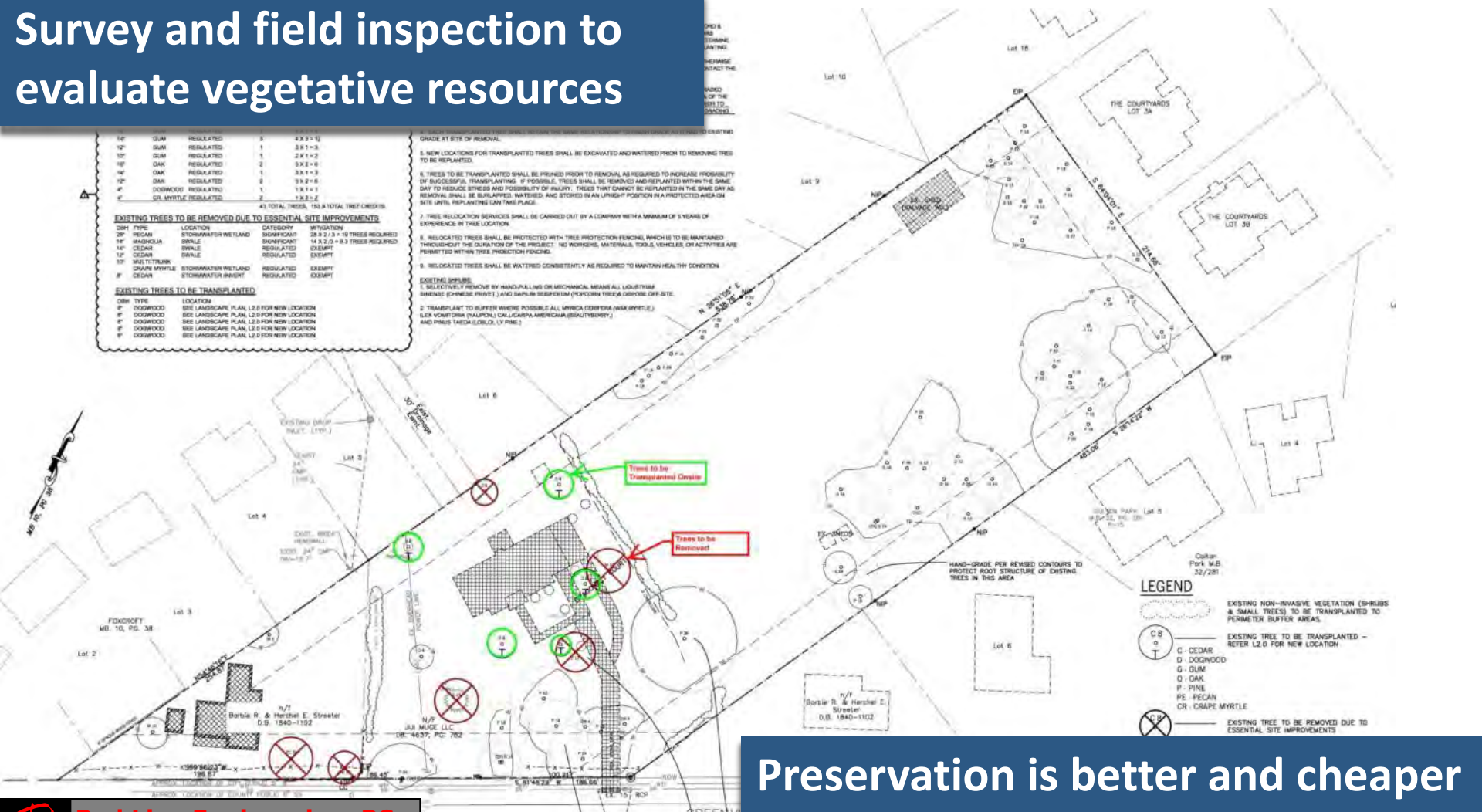
5. RELOCATED TREES SHALL BE PROTECTED WITH TREE PROTECTION FENCING WHICH IS TO BE MAINTAINED THROUGHOUT THE DURATION OF THE PROJECT. NO WORKERS, MATERIALS, TOOLS, VEHICLES OR ACTIVITIES ARE PERMITTED WITHIN TREE PROTECTION FENCING.

6. RELOCATED TREES SHALL BE WATERED CONSISTENTLY AS REQUIRED TO MAINTAIN HEALTHY CONDITION.

EXISTING SHRUBS

1. SELECTIVELY REMOVE BY HAND-PULLING OR MECHANICAL MEANS ALL LOGSKRIMP BIRNENSE (CHENED PRIVATE) AND SAPLIM SEED CUM (POPCORN TREE) & GIBBOE DFF-SITE.

2. TRANSPLANT TO BUFFER WHERE POSSIBLE ALL MYRTLE CORYMBOSA (WAX MYRTLE), ALEX VORSTROMIA (VALPONI), CALICAPMA AMERICANA (BEAUTYBERRY), AND PHILUS THEOPHOLI (LY PINE).

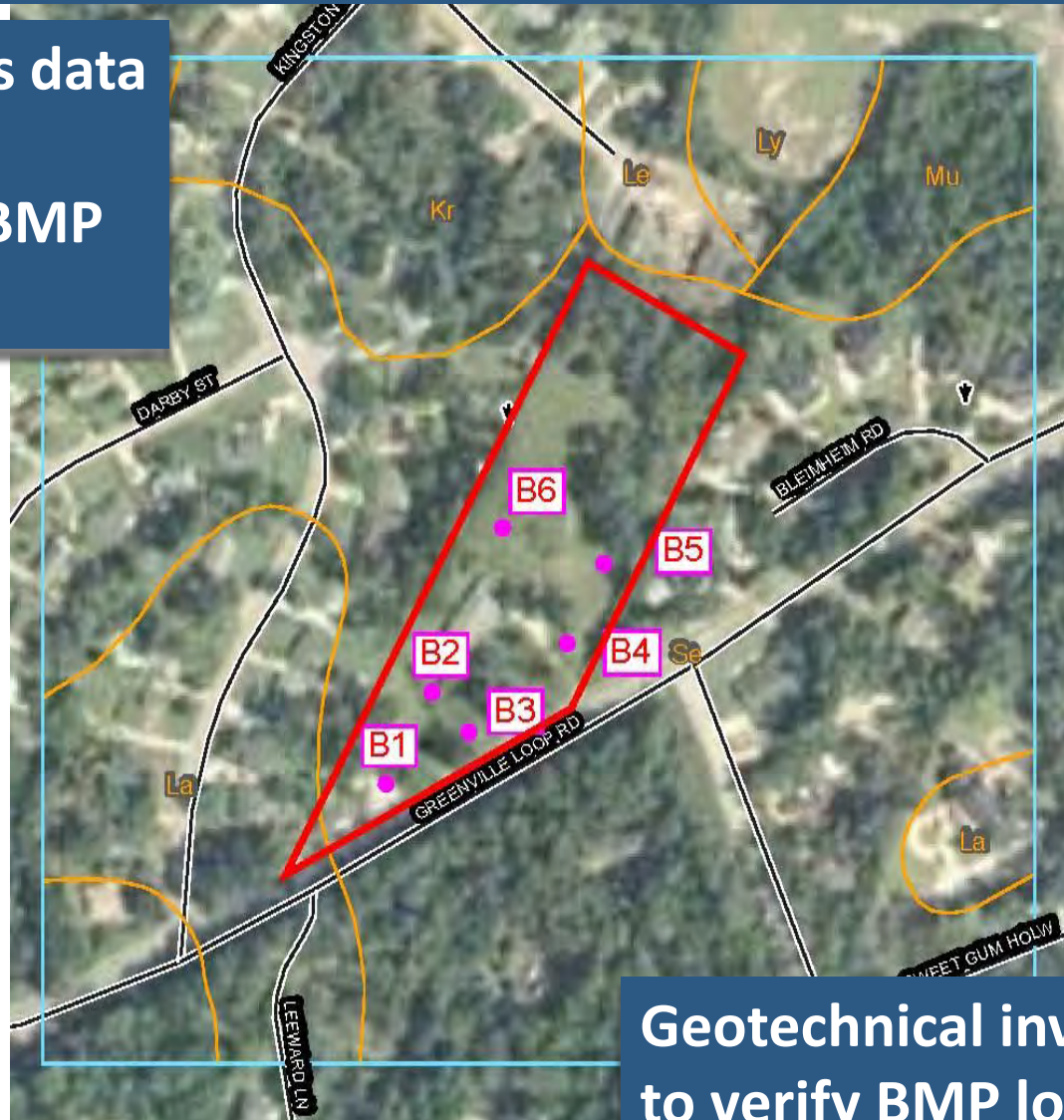


Preservation is better and cheaper than creation or mitigation

Overcoming Site Obstacles

Evaluate USGS soils data

Identify potential BMP locations

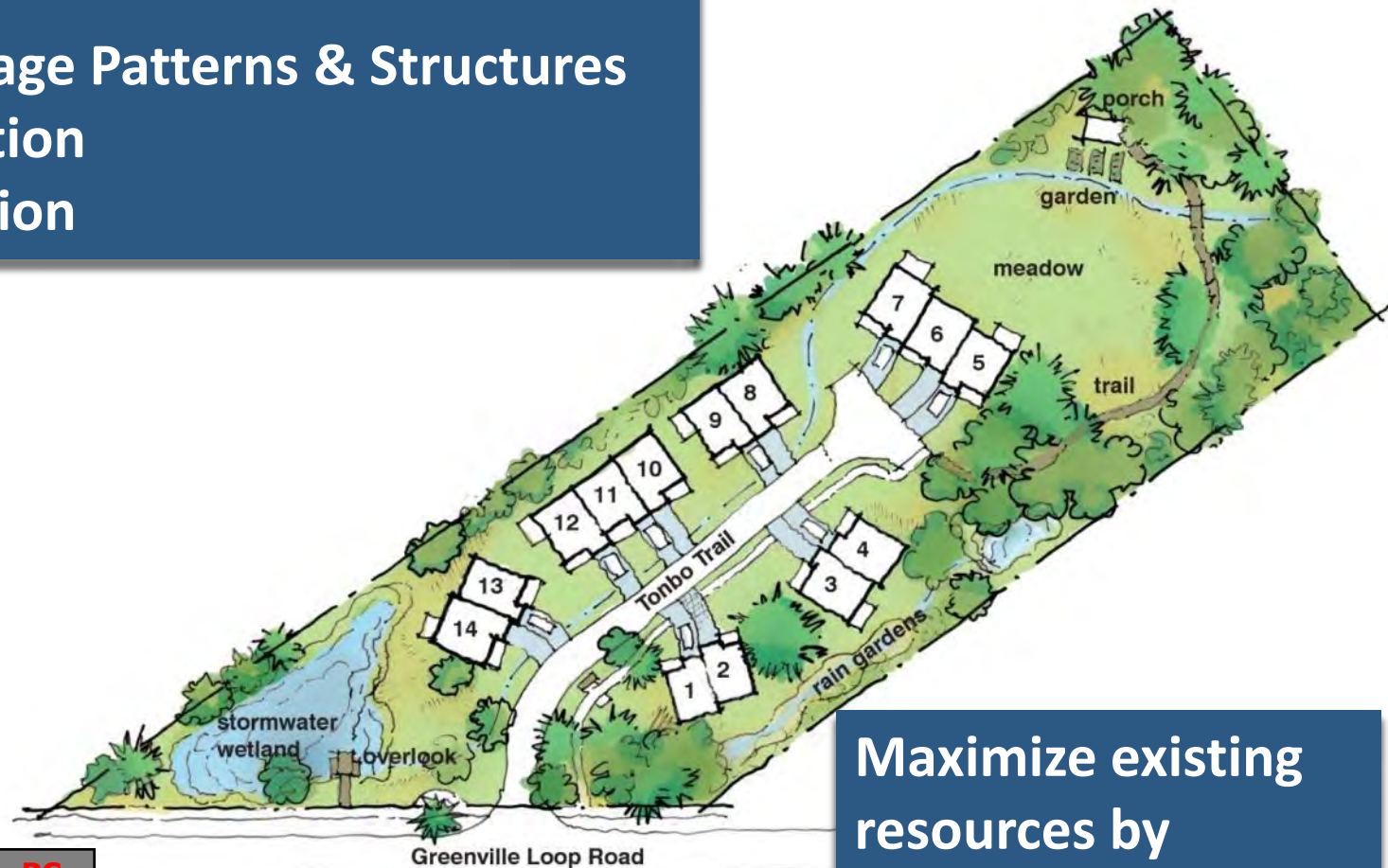


Geotechnical investigation to verify BMP locations

Overcoming Site Obstacles

Conceptual layout with consideration for:

- Existing Soils
- Existing Drainage Patterns & Structures
- Tree Preservation
- Solar Orientation

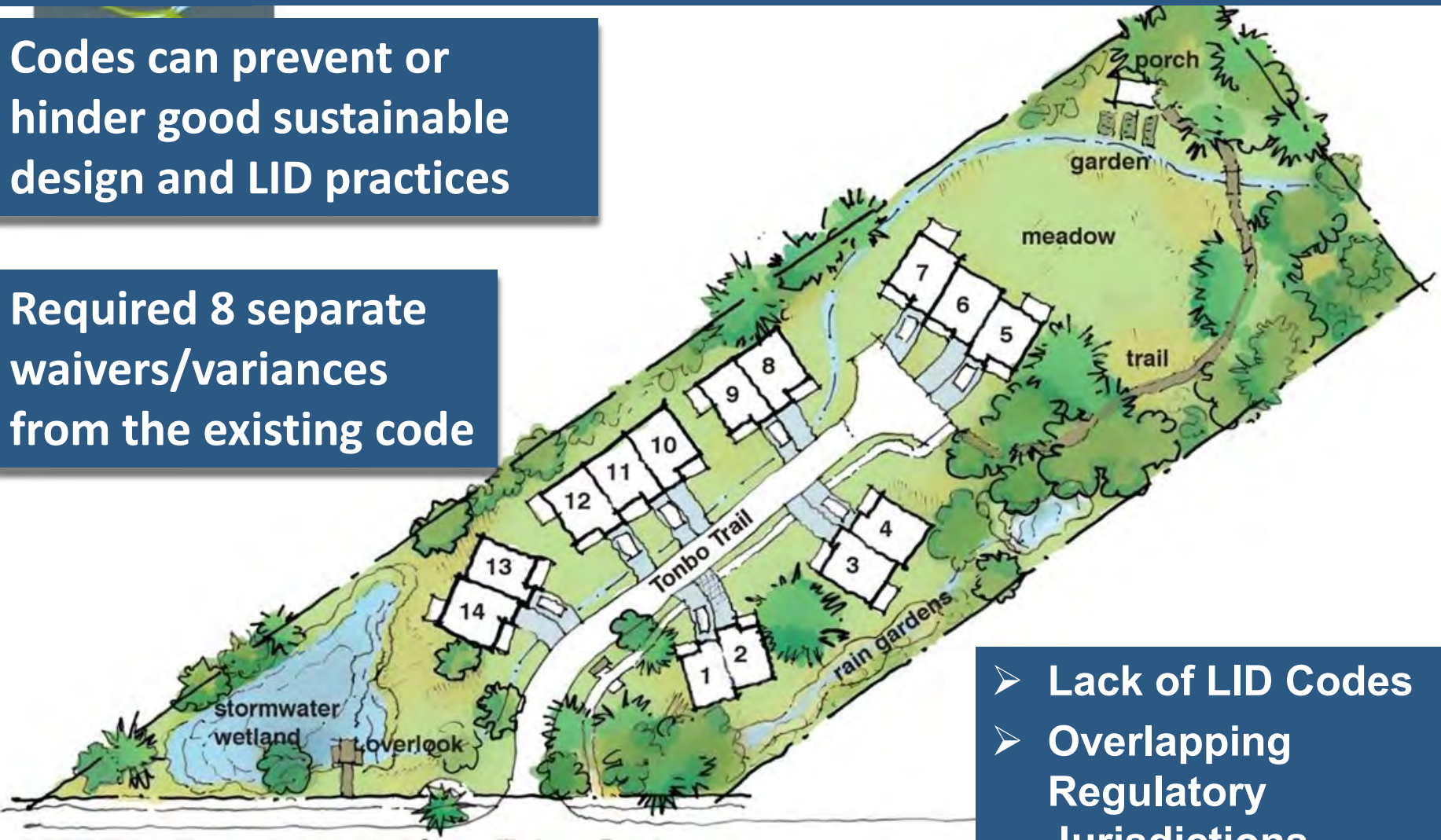


Maximize existing resources by reducing impacts

Code Obstacles

Codes can prevent or hinder good sustainable design and LID practices

Required 8 separate waivers/variances from the existing code



- Lack of LID Codes
- Overlapping Regulatory Jurisdictions

Code Obstacles

Codes can prevent or hinder good sustainable design and LID practices

Required 8 separate waivers/variances from the existing code



Waiver #1 – Install sidewalk on only one side of the street to reduce impervious surfaces.

Code Obstacles

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Waiver #2 - Reduced Centerline Radius of Road to 60 Ft. to preserve existing mature trees and to create safer intersection (Reduced Speed Limit to 15 mph)

Code Obstacles

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Waiver #3 – Allowance to include area of 25 ft. perimeter buffer in open space calculations (51% Open Space)

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Waiver #4 – Waived all building setbacks according to the Cluster Development Ordinance “Exceptional Design Criteria”.

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Waiver #5 – Reduction in street section to 20 ft total width (18 ft. pavement with 1 ft. header curb on either side).

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Waiver #6 – Use of 1 ft. header curb to promote sheet flow instead of traditional curb and gutter.

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Waiver #7 – Reduction in plaza strip width to 3 ft. and waived planting requirements within the plaza strip

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Waiver #8 – Use of permeable materials on hammerhead and driveways.



Human Obstacles

Human Challenges

- Public Perception of LID and the Laws of Physics & Hydrology
- Contractor Perception of LID & Cost Inflation
- Lack of Experienced Contractors and Design Professionals





How do you Overcome Human Obstacles?



JUST DO IT!
(This phrase may or may not be trademarked by Nike Corporation)





Tangible Results of LID



By preserving our natural resources with good LID practices, sometimes we create something far more valuable than a finished site...we create ecosystems.



Tangible Results of LID



Before



Meadow Area Preserved with minimal impacts

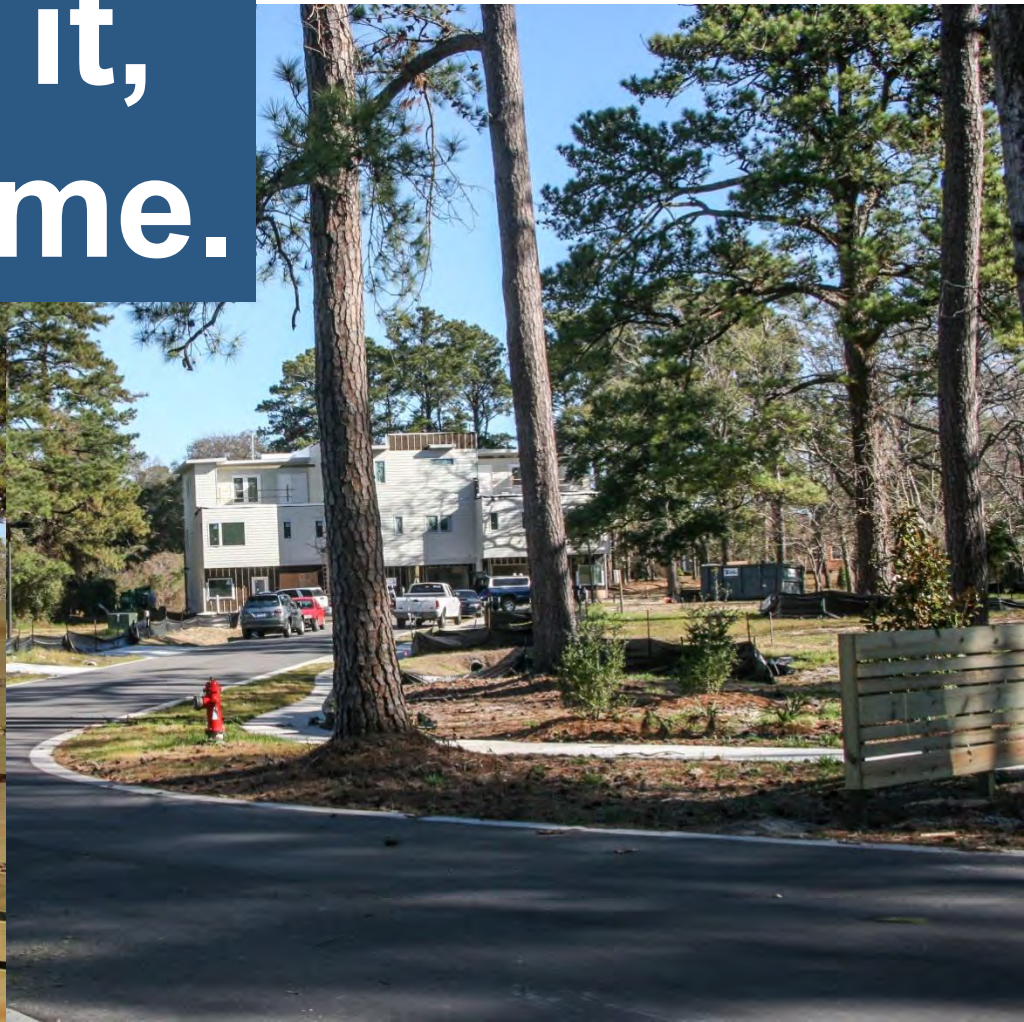
After





Tangible Results of LID

If you build it,
they will come.



Red Line Engineering, PC
"Engineering Relationships"



In Retrospect

How to Overcome Site, Code & Human Obstacles

- Don't Re-Invent the Wheel – Utilize All of the Natural Resources Already Available Onsite
- Don't be afraid to meet with neighbors (Educate Them)
- City Staff & Regulatory Agency Involvement EARLY (Make them part of your team!)
- Motivated, Environmentally Conscious Client
- Utilize Educational /Research Resources Available (i.e. NC State BAE and Cooperative Extension Staff)





In Retrospect

Lessons Learned

- **LID can be BOTH PROFITABLE AND ENVIRONMENTALLY FRIENDLY!**
- **Despite Public Perception, LID is more than just Stormwater treatment**
- **Team Selection and Client Involvement are Crucial to Successful LID Design**
- **Most Municipalities in North Carolina do NOT have LID Ordinances but are open to it so work WITH the City Staff**
- **Contractor Selection is CRITICAL! (Check References and Ask what other LID jobs they have done)**





Any Questions ?





Contact Information

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