

Pine Grove Corridor Study

Transportation Bond

May 7, 2019

Pine Grove Corridor Study History

Date

Details

October 2015

**Additional Engineering Project
Management Staff Hired**

August 2016

**Pine Grove Drive Corridor Study
Initiated**

March 2017

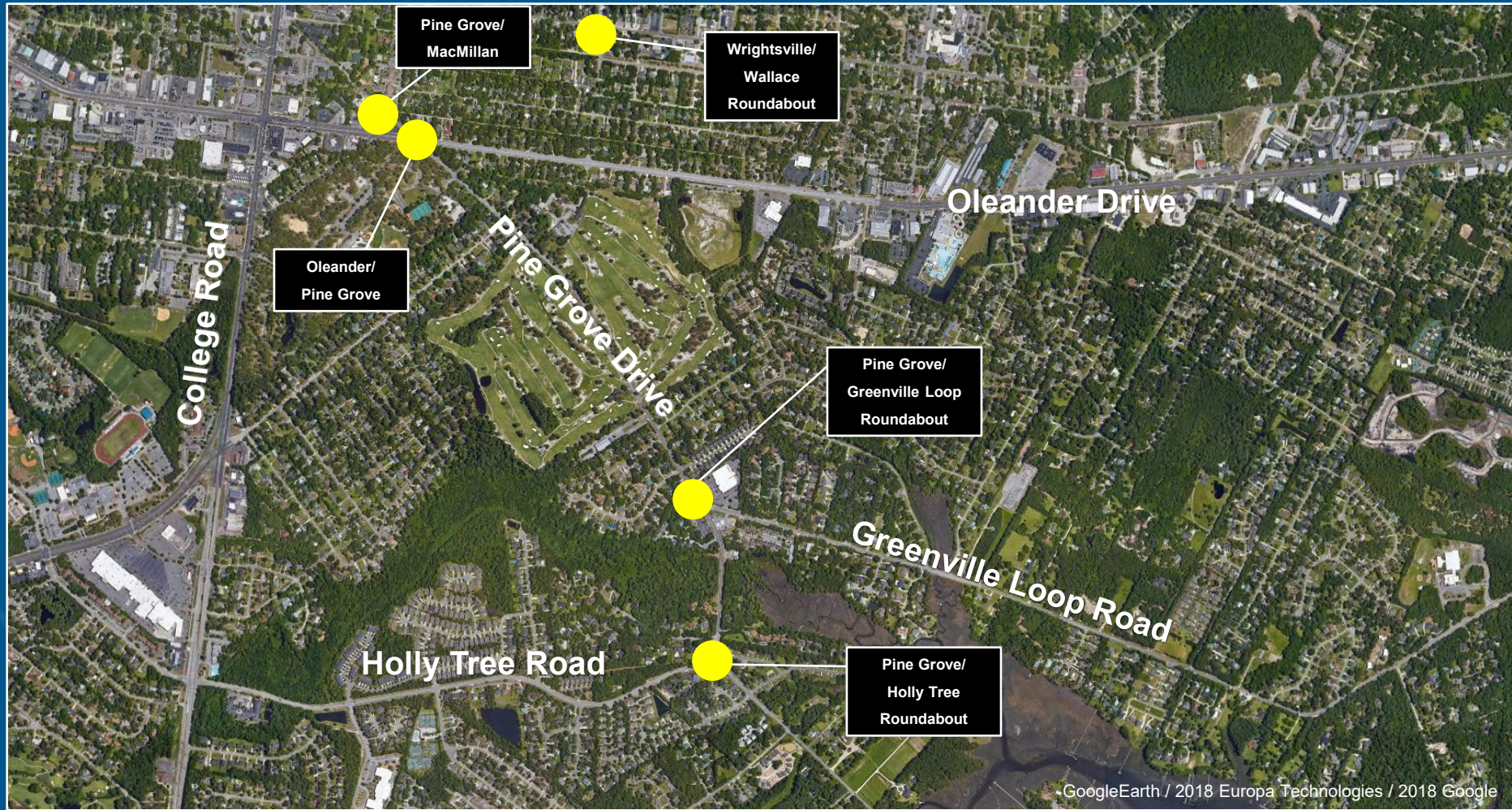
Additional Analysis Scenarios Added

June 2017

**Concept Designs & Cost Estimates
Added**

**October 2017 –
Current**

**Project Manager Transitions / Cost
Estimate Analysis / Additional
Concepts Evaluated**



Pine Grove Corridor Study Area




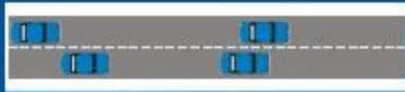






PINE GROVE CORRIDOR STUDY - TRANSPORTATION BOND PROJECTS

BOND PROJECT	DESCRIPTION OF IMPROVEMENTS
Pine Grove Drive @ MacMillan Avenue Intersection Improvements	Intersection realignment and signalized pedestrian crossings to improve safety
Pine Grove Drive @ Oleander Drive Realignment	Intersection realignment to remove skew of intersection with signalized and marked pedestrian accommodations to improve safety
Wrightsville Avenue @ Wallace Avenue Roundabout	Construction of a roundabout to improve traffic flow and safety
Pine Grove Drive @ Greenville Loop Road Roundabout	Construction of a roundabout to improve traffic flow and safety
Pine Grove Drive @ Holly Tree Road Roundabout	Construction of a roundabout to improve traffic flow and safety

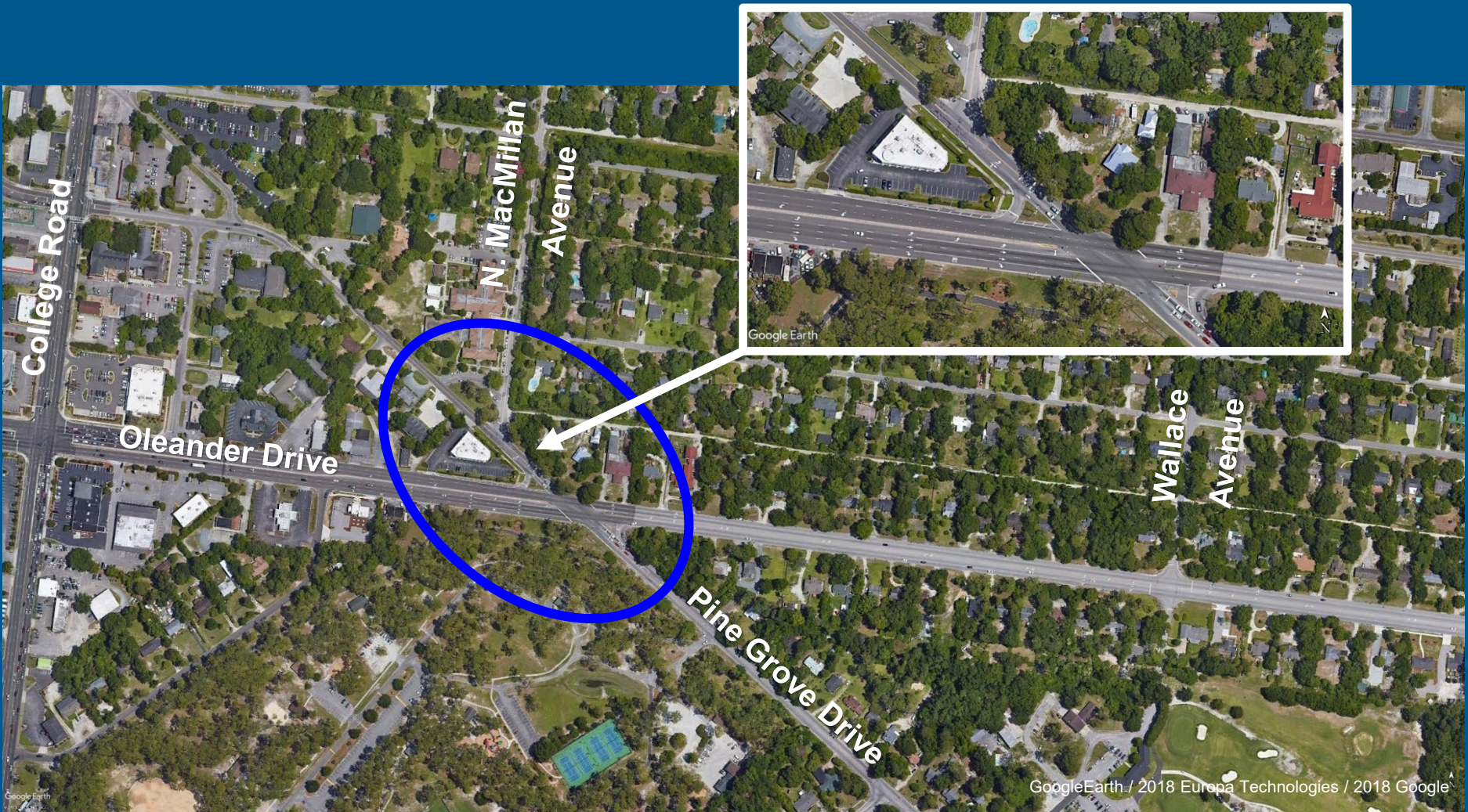
What is Level of Service (LOS)?

Level of Service is a quantitative measure of traffic operational conditions. Ranges of operation are defined for each type of roadway section (signalized intersections, freeways, ramp junctions and weaving sections) and are related to the amount of traffic demand at a given time as compared to the capacity of that type of roadway section.

Six levels of service are defined for each type of roadway section and are given letter designations from A to F, with A representing good operating conditions and F representing unsatisfactory operating conditions.

Intersection	Roadway
<ul style="list-style-type: none"> Highly stable, free-flow condition with little or no congestion Delay: <10 seconds/vehicle 	<p>LOS A</p>  <ul style="list-style-type: none"> Free flowing Uninterrupted vehicle
<ul style="list-style-type: none"> Stable, free-flow condition with little congestion Delay: 10 to 20 seconds/vehicle 	<p>LOS B</p>  <ul style="list-style-type: none"> Stable flow Other vehicles are more noticeable
<ul style="list-style-type: none"> Free-flow condition with moderate congestion Delay: 20 to 35 seconds/vehicle 	<p>LOS C</p>  <ul style="list-style-type: none"> Stable flow Vehicle operations affected by other vehicles
<ul style="list-style-type: none"> Approaching unstable condition with increasing congestion Delay: 35 to 55 seconds/vehicle 	<p>LOS D</p>  <ul style="list-style-type: none"> High density free flow Operation of vehicle is affected by other vehicles
<ul style="list-style-type: none"> Unstable, congested condition Delay: 55 to 80 seconds/vehicle 	<p>LOS E</p>  <ul style="list-style-type: none"> High density traffic flow, nearing capacity Operating conditions are extremely poor
<ul style="list-style-type: none"> Stop and go Delay: >80 seconds/vehicle 	<p>LOS F</p>  <ul style="list-style-type: none"> Forced or breakdown flow Amount of traffic exceeds capacity

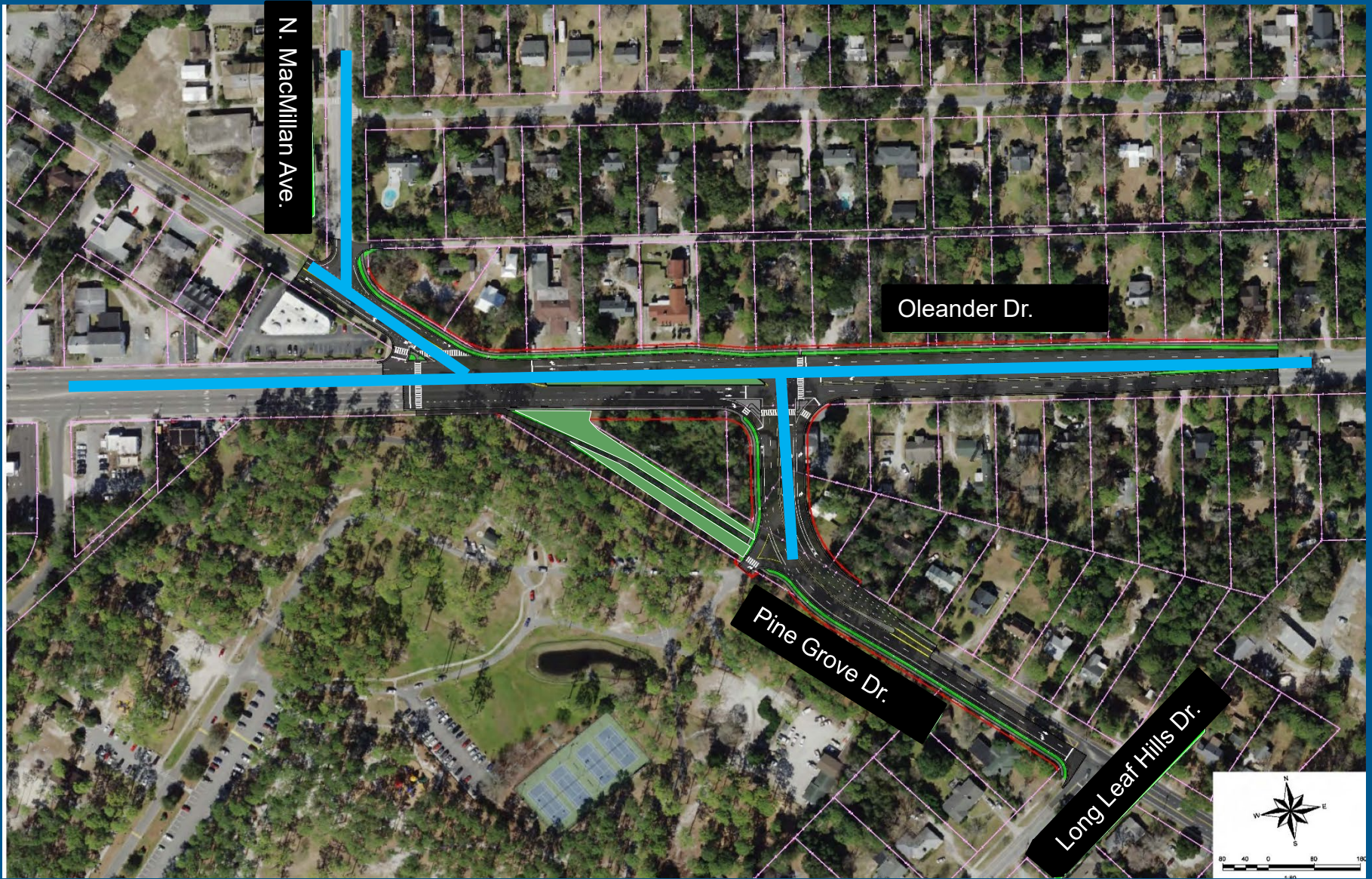
LEVEL OF SERVICE (LOS)



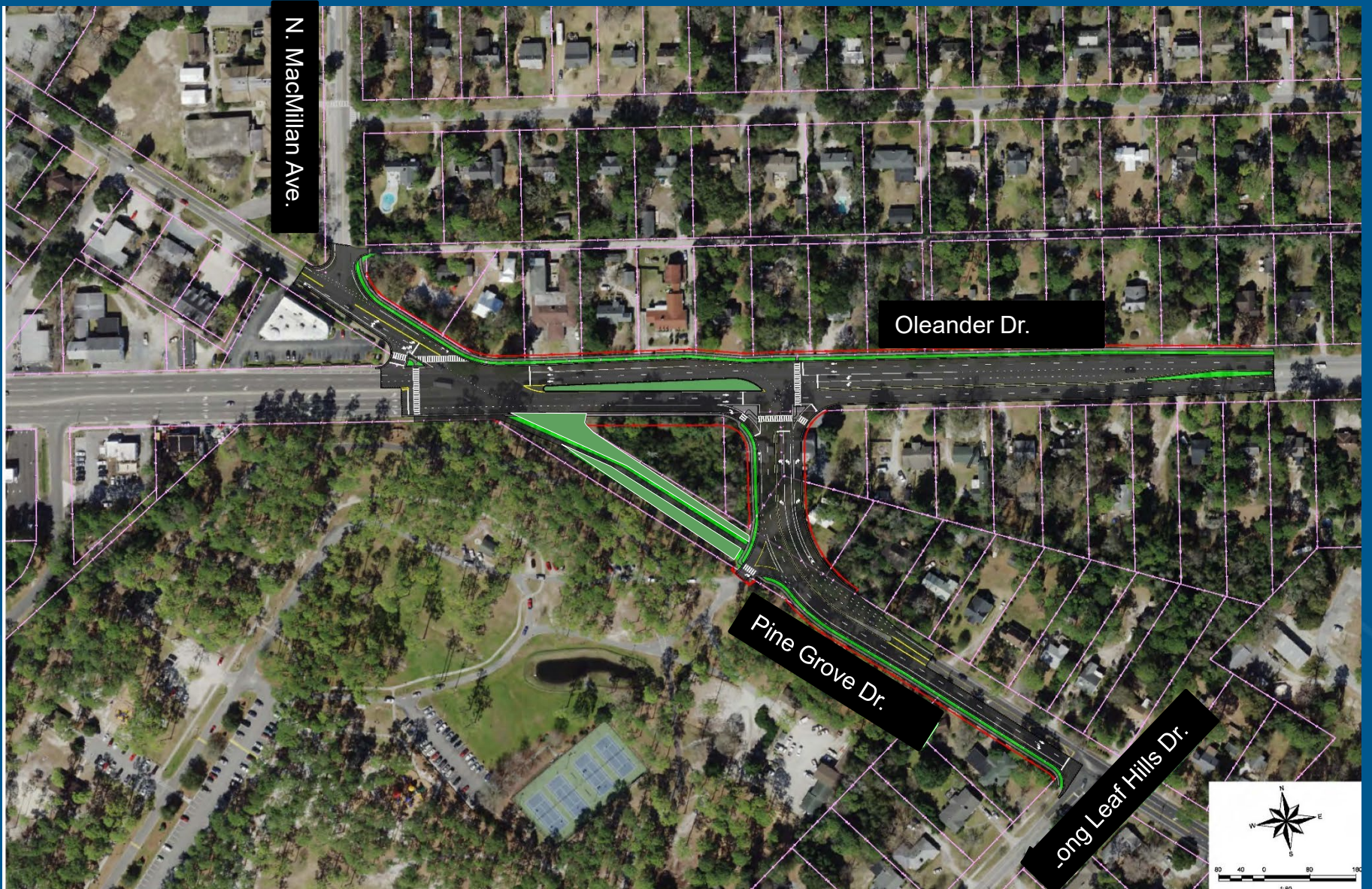
Pine Grove Corridor Study - Northern Projects



**Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Existing Conditions 2019 PM Peak Hour – Video Simulation**



Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Offset Ts – Concept Plan



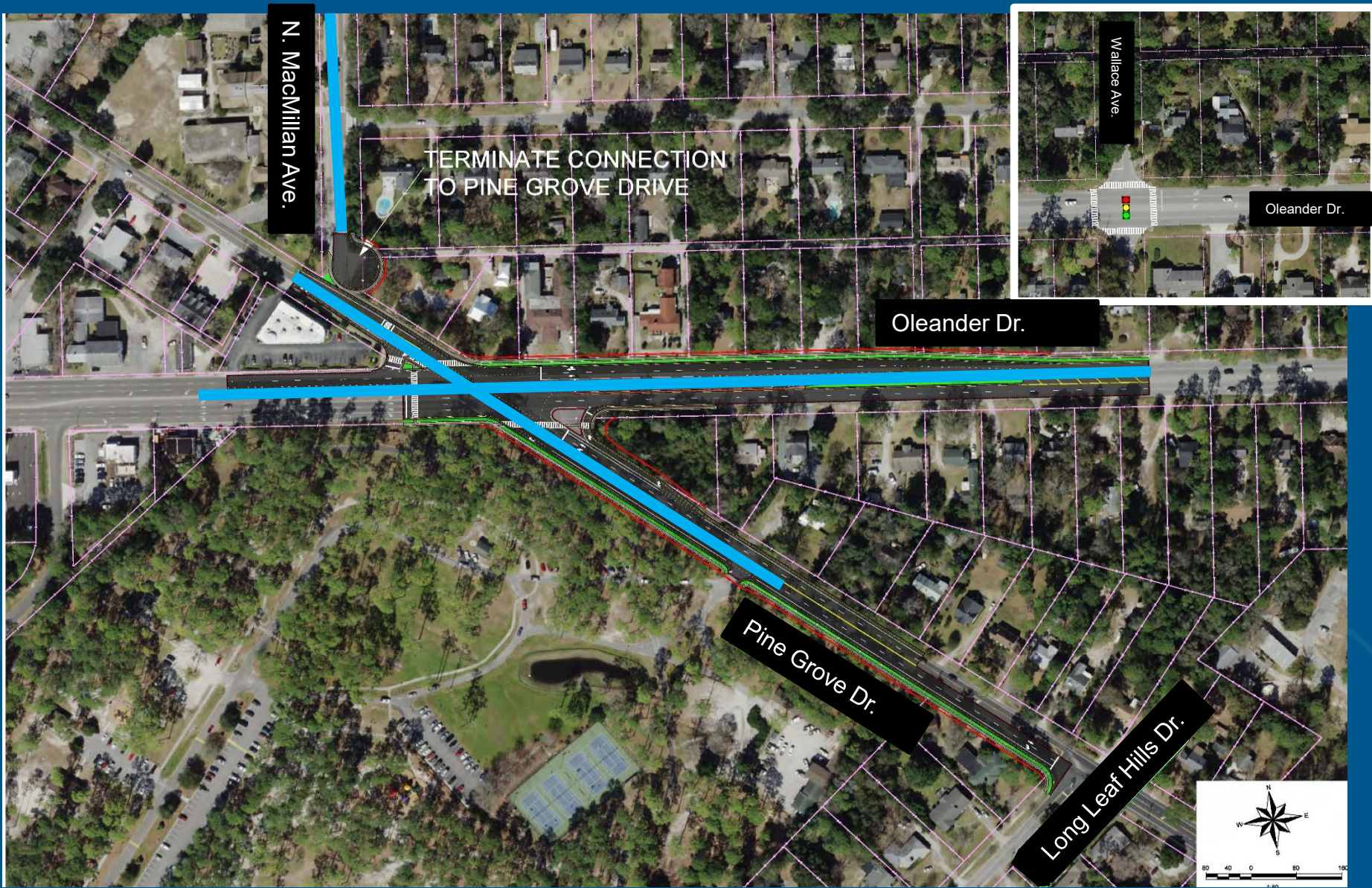
Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Offset Ts – Concept Plan



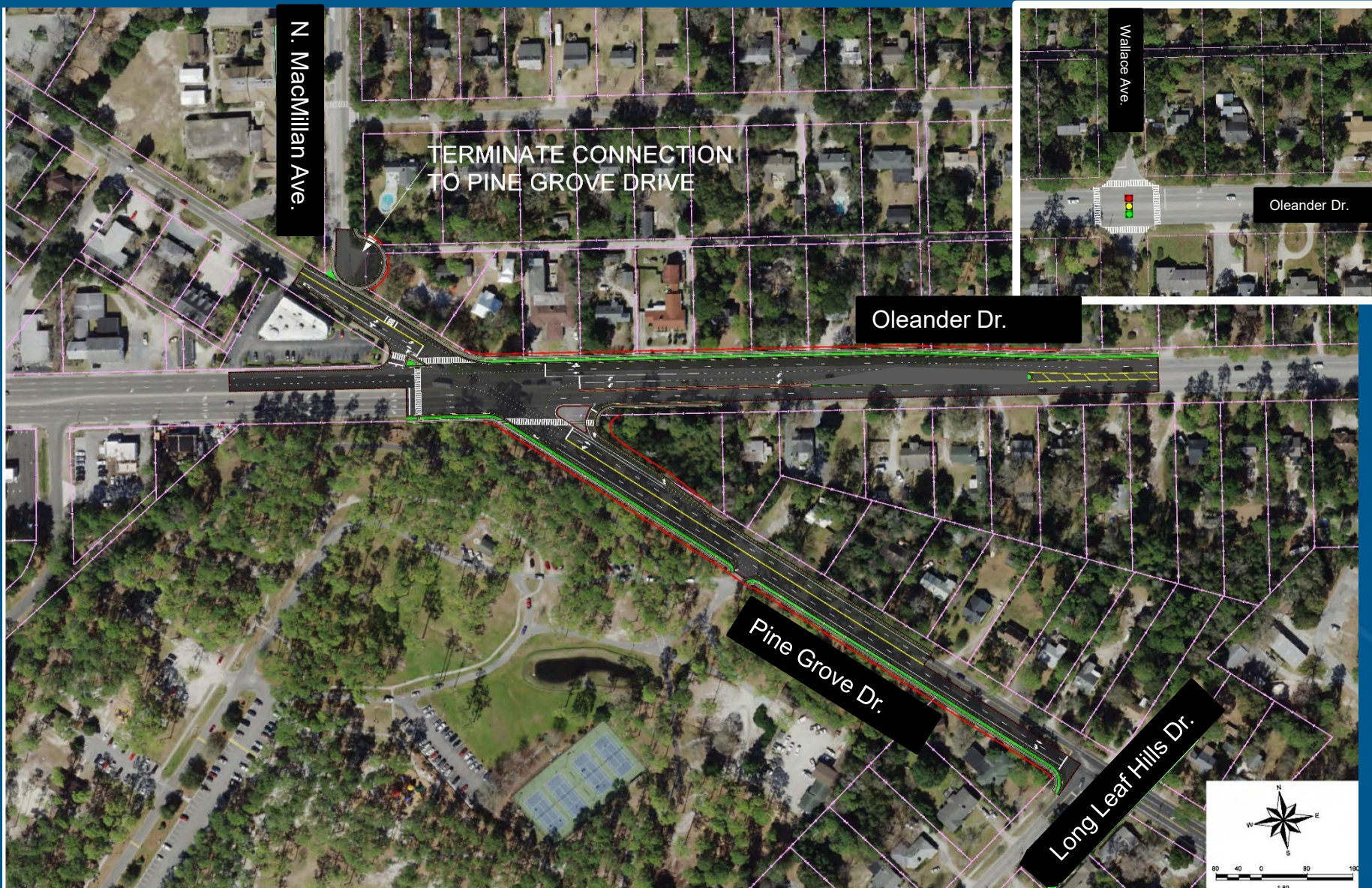
**Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Offset Ts 2019 PM Peak Hour– Video Simulation**

Pros	Cons
<ul style="list-style-type: none"> - Improves safety by removing skewed approach at Oleander 	<ul style="list-style-type: none"> - Introduces a new intersection on Oleander and potential to “stop”
<ul style="list-style-type: none"> - Improves safety by providing protected “green arrow” phase for westbound dual left-turns on Oleander - Accommodates more vehicles by providing dual left-turn lanes on Oleander 	<ul style="list-style-type: none"> - Increased Right-of-Way acquisition required and expense - Exceeds project budget
<ul style="list-style-type: none"> - Decreases overall delay at Oleander/Pine Grove by more than 30% and at Pine Grove/MacMillan by more than 50% 	
<ul style="list-style-type: none"> - Provides gaps for MacMillan to Pine Grove movements 	
<ul style="list-style-type: none"> - Improves pedestrian network and crossings 	

**Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Offset Ts - Pros and Cons**



Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Dual Lefts – Concept Plan



N. MacMillan Ave.

TERMINATE CONNECTION TO PINE GROVE DRIVE

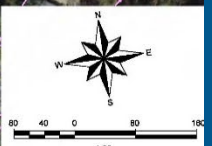
Oleander Dr.

Pine Grove Dr.

Long Leaf Hills Dr.

Wallace Ave.

Oleander Dr.



**Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Dual Lefts – Concept Plan**



**Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Dual Lefts 2019 PM Peak Hour – Video Simulation**

Pros	Cons
<ul style="list-style-type: none"> - Improves safety by providing protected “green arrow” phase for westbound dual left-turns on Oleander 	<ul style="list-style-type: none"> - Retains skewed intersection geometry
<ul style="list-style-type: none"> - Accommodates more vehicles by providing dual left-turn lanes on Oleander 	<ul style="list-style-type: none"> - Removes connection between Pine Grove and MacMillan; traffic reroutes needed (need to coordinate w/ NH Co. School Board)
<ul style="list-style-type: none"> - Decreases delay at Oleander/Pine Grove by more than 45% 	<ul style="list-style-type: none"> - Potential increase to traffic volumes on adjacent residential roadways
<ul style="list-style-type: none"> - Improves pedestrian network and crossings 	<ul style="list-style-type: none"> - Increased vehicle miles traveled (VMT)
	<ul style="list-style-type: none"> - Exceeds project budget

Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Dual Lefts – Pros and Cons

Intersection	No-Build (2041)	“Offset Ts” (2041)	“Dual Lefts” (2041)
Pine Grove Drive @ Oleander Drive	“F” 126.5 seconds	“C” 28.4 seconds (West) “E” 57.1 seconds (East)	“E” 65.7 seconds
Pine Grove Drive @ MacMillan Avenue	“F” 101.6 seconds	“E” 48.3 seconds	Intersection Removed

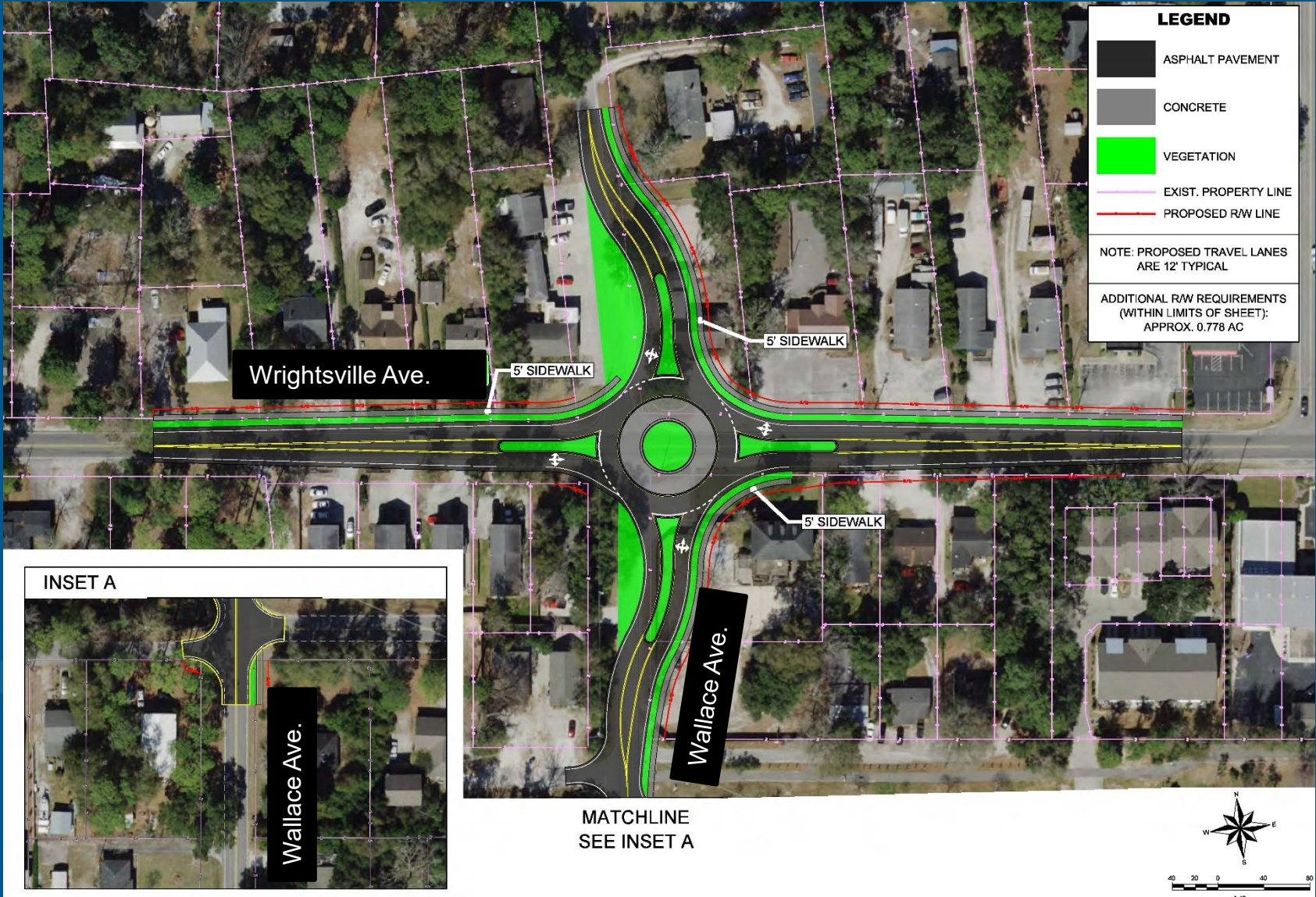
Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Concept Comparison - LOS

	No-Build	“Offset Ts” (2041)	“Dual Lefts” (2041)
Design & Construction	No Cost	\$6,139,400	\$5,323,100
Budget	No Cost	\$4,600,000	\$4,600,000
Budget Overrun	No Cost	\$1,539,400	\$ 723,100

Pine Grove Drive @ Oleander Drive
Pine Grove Drive @ MacMillan Avenue
Concept Comparison – Budget Impact



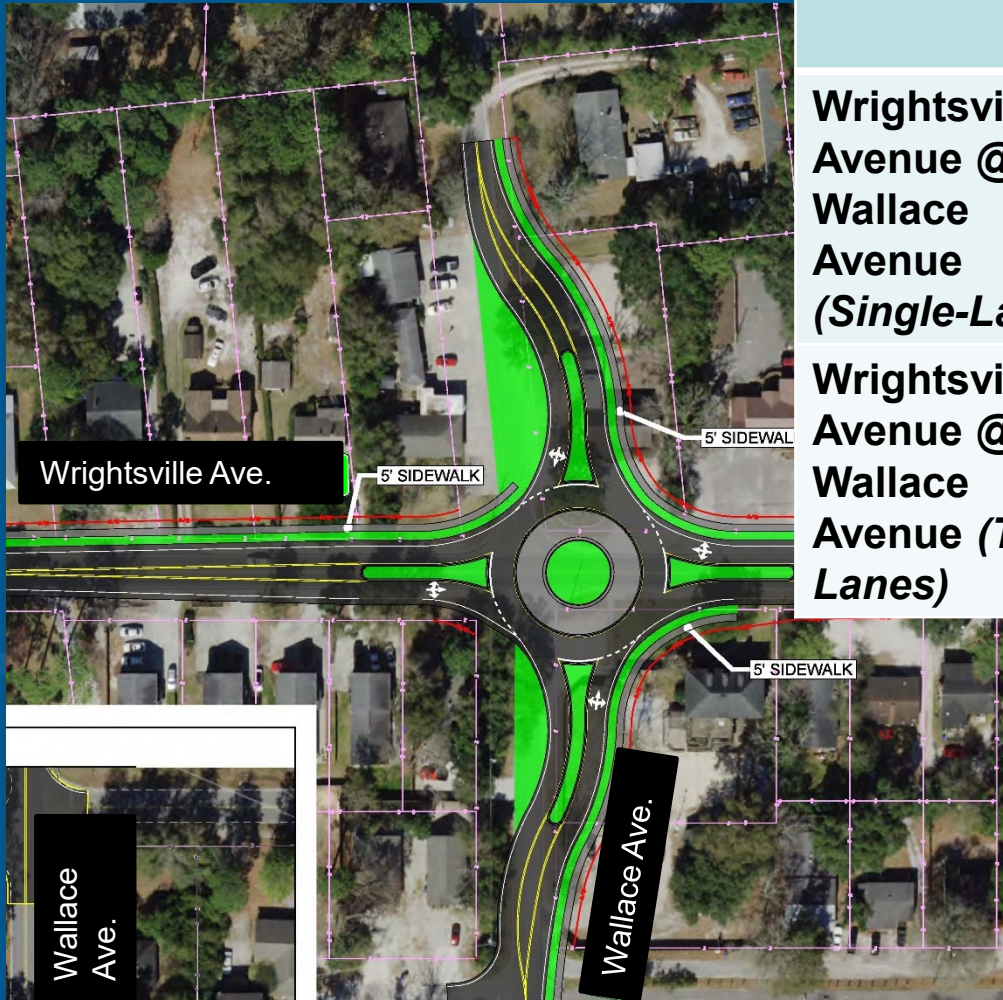
Wrightsville Ave - Wallace Ave



Wrightsville Avenue @ Wallace Avenue Roundabout – Concept Plan



Facts About
5
Roundabouts



Intersection	No-Build (2041)	Build (2041) w/ "Offset Ts"	Build (2041) w/ "Dual Lefts"
Wrightsville Avenue @ Wallace Avenue (Single-Lane)	"F" 864.2 seconds (Stop Sign)	"C" 19.4 seconds	"D" 29.7 seconds
Wrightsville Avenue @ Wallace Avenue (Two-Lanes)		"B" 13.3 seconds	"B" 12.3 seconds

Wrightsville Avenue @ Wallace Avenue Roundabout - LOS



Intersection	Build (2041) w/ "Offset Ts"	Build (2041) w/ "Dual Lefts"
Wrightsville Avenue @ Wallace Avenue (Single-Lane)	0.888	0.986
Wrightsville Avenue @ Wallace Avenue (Two-Lanes)	0.778	0.778

Wrightsville Avenue @ Wallace Avenue Roundabout - Volume-to-Capacity Ratio

Pros	Cons
<ul style="list-style-type: none"> - Improves traffic flow, levels of service, and queues - decreases delay by at least 95% 	<ul style="list-style-type: none"> - Increased Right-of-Way acquisition required (and expense)
<ul style="list-style-type: none"> - Improves safety and can reduce severity of crashes 	<ul style="list-style-type: none"> - Driver learning curve for roundabouts
<ul style="list-style-type: none"> - Provides equal access to enter intersection 	<ul style="list-style-type: none"> - Additional Right of Way may be needed in future for 2-lane roundabout approaches
<ul style="list-style-type: none"> - Accommodates future growth – it can easily convert to a 2-lane roundabout 	<ul style="list-style-type: none"> - Exceeds project budget

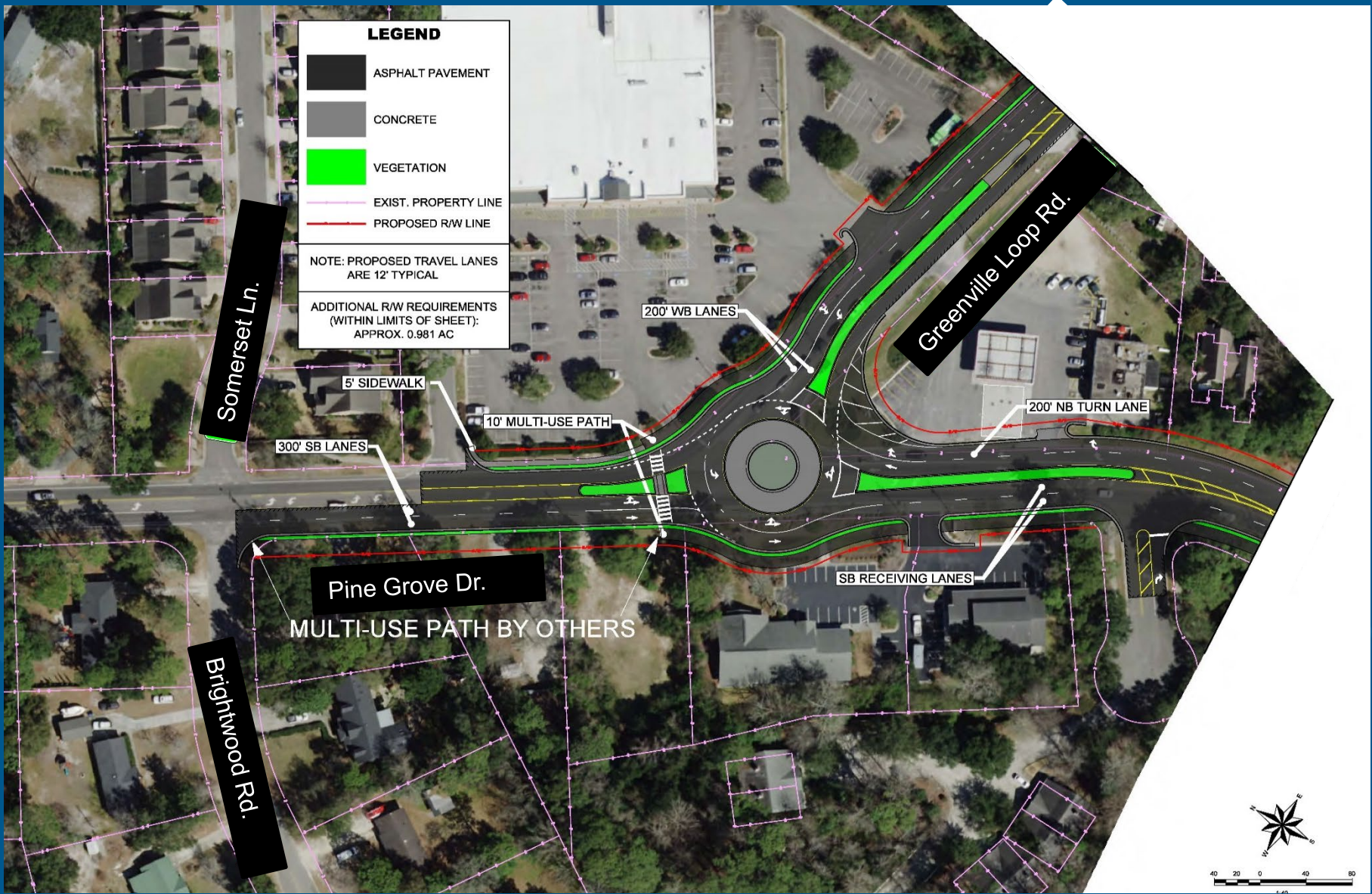
**Wrightsville Avenue @ Wallace Avenue:
Roundabout - Pros and Cons**

	No-Build	Roundabout
Design & Construction	No Cost	\$2,202,100
Budget	No Cost	\$1,500,000
Budget Overrun	No Cost	\$ 702,100

**Wrightsville Avenue @ Wallace Avenue
Roundabout – Budget Impact**



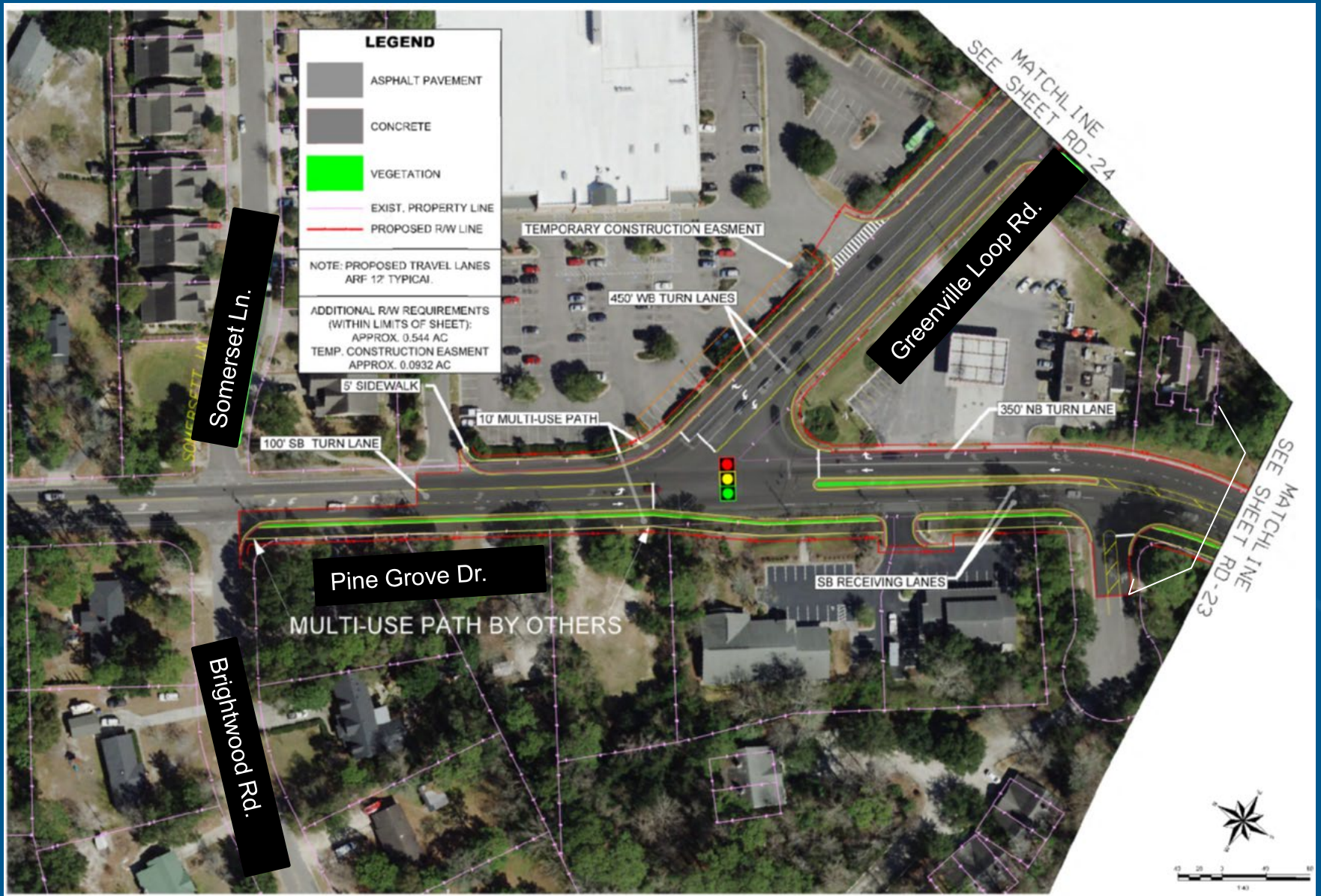
Pine Grove Corridor Study - Southern Projects



Pine Grove Drive @ Greenville Loop Road Roundabout – Concept Plan

Pros	Cons
- Improves traffic flow, levels of service, and queues	- Increased Right-of-Way acquisition required (and expense)
- Improves safety and can reduce severity of crashes	- Driver learning curve for roundabouts
- Provides equal access to enter intersection - Adds second southbound lane on Pine Grove Drive	- Exceeds project budget

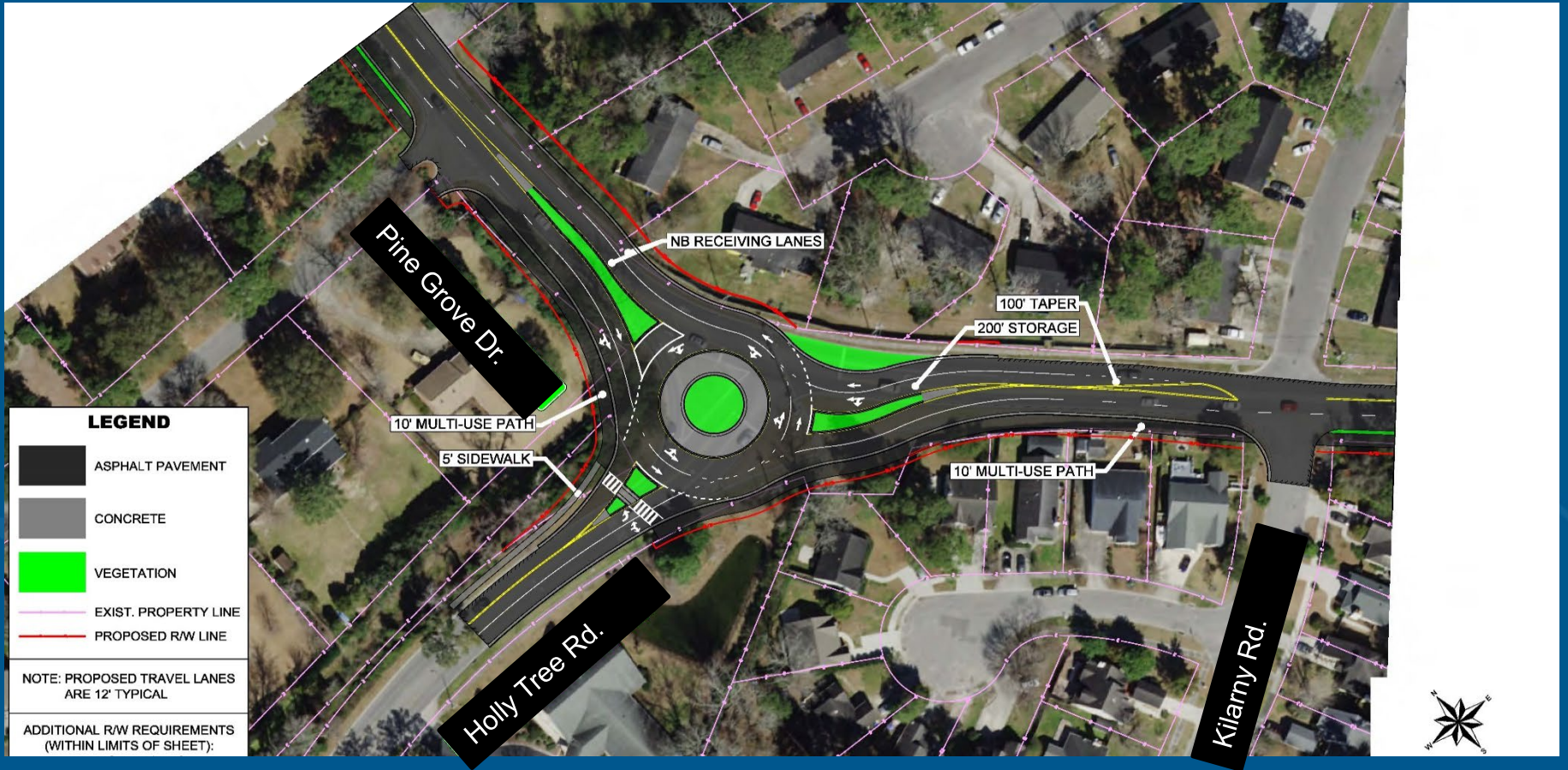
**Pine Grove Drive @ Greenville Loop Road
Roundabout - Pros and Cons**



**Pine Grove Drive @ Greenville Loop Road
 Traffic Signal – Concept Plan**

Pros	Cons
<ul style="list-style-type: none">- Improves traffic flow, levels of service, and queues	<ul style="list-style-type: none">- Queue for WB Left from Greenville is 450' vs 200' for RAB Concept
<ul style="list-style-type: none">- Decreases delay by over 60%	<ul style="list-style-type: none">- Annual operating costs of \$4,000 to \$8,000 for a traffic signal
<ul style="list-style-type: none">- Adds second southbound lane on Pine Grove Drive	<ul style="list-style-type: none">- Exceeds project budget

**Pine Grove Drive @ Greenville Loop Road
Traffic Signal - Pros and Cons**



Pine Grove Drive @ Holly Tree Road Roundabout – Concept Plan

Pros	Cons
	<ul style="list-style-type: none">- <u>Demand exceeds capacity – doesn't function from a traffic operations standpoint.</u>

**Pine Grove Drive @ Holly Tree Road
Roundabout - Pros and Cons**



Pine Grove Drive @ Holly Tree Road Traffic Signal – Concept Plan

Pros	Cons
<ul style="list-style-type: none"> - Improves traffic flow, levels of service, and queues 	<ul style="list-style-type: none"> - Sight distance issues for northbound left-turn (to be addressed during design)
<ul style="list-style-type: none"> - Decreases delay by almost 70% 	<ul style="list-style-type: none"> - Restriction of left turns from stop controlled side streets will be seen as an inconvenience for many drivers
<ul style="list-style-type: none"> - Adds second southbound lane on Pine Grove Drive 	<ul style="list-style-type: none"> - Exceeds project budget

**Pine Grove Drive @ Holly Tree Road
Traffic Signal - Pros and Cons**

Intersection	No-Build (2041)	Roundabout & Traffic Signal (2041)	Traffic Signal & Traffic Signal (2041)
Pine Grove Drive @ Greenville Loop Road	"E" 74.7 seconds	"C" 23.6 seconds	"C" 28.2 seconds
Pine Grove Drive @ Holly Tree Road	"F" 90.3 seconds	"C" 27.9 seconds	"C" 27.9 seconds

Pine Grove Drive @ Greenville Loop Road
Pine Grove Drive @ Holly Tree Road
Concept Comparison - LOS

	No-Build	Greenville Loop Road Roundabout & Holly Tree Road Traffic Signal Improvements	Greenville Loop Road Traffic Signal & Holly Tree Road Traffic Signal Improvements
Design & Construction	No Cost	\$5,555,300	\$5,669,900
Budget	No Cost	\$3,000,000	\$3,000,000
Budget Overrun	No Cost	\$2,555,300	\$2,669,900

**Pine Grove Drive @ Greenville Loop Road
Pine Grove Drive @ Holly Tree Road
Concept Comparison - Budget Impact**

Staff Recommended Improvements

Northern Projects Offset Ts Intersection

Wrightsville Ave @ Wallace Ave
Single Lane Roundabout (Dual in Future)

Southern Projects
Greenville Loop Road – Dual Lane Roundabout
Holly Tree Road - Signal Improvements
Restrict Left Turns in Project Limits

Project Budget – Recommended Improvements

Project	Budget	Cost Estimate	Budget Overrun	Comments
Pine Grove Drive at Oleander Drive and MacMillan Avenue - Offset Ts Concept	\$4,600,000	\$6,139,400	\$1,539,400	Oleander Drive \$2,100,000 MacMillan Avenue \$2,500,000
Pine Grove Drive at Greenville Loop Road and Holly Tree Road - Roundabout & Traffic Signal Improvements	\$3,000,000	\$5,555,300	\$2,555,300	Greenville Loop Road \$1,500,000 Holly Tree Road \$1,500,000
Wrightsville Avenue at Wallace Avenue - Roundabout	\$1,500,000	\$2,202,100	\$702,100	
Total	\$9,100,000	\$13,896,800	\$4,796,679	

Potential Funding Sources

Funding Source	Available Funding	Comments
Premium Bond Sale	\$787,358	Use Entire Amount Available
Transportation Bond – Roadway Project Savings to Date	\$819,506	Use Entire Amount Available
Transportation Bond – Bike and Pedestrian Project Savings to Date	\$2,045,905	Use \$320,000 - \$500,000 for Bike Lanes, Multi-Use Path, Ped Signal, Sidewalk, Etc.
Transportation Bond - Roadway Contingency	\$1,500,000	Use \$1,000,000 and Leave \$500,000 for Future Projects
Transportation Bond – Roadway Contingency Interest Earnings	\$350,562	Use Entire Amount Available
Streets and Sidewalks Capital Balances	\$893,622	Use Half and Leave \$483,090 for Future Projects
Eastwood Road Access Management (Anticipated Cost Savings)	\$1,500,000	Use Entire Amount Available / Assumes Contingencies in Projects are Sufficient with Phase 1 Nearing Completion

Recommended Funding

Funding Source	Amount of Funding
Budget Deficit	(\$4,796,800)
Premium Bond Sale	\$787,358
Transportation Bond – Roadway Project Savings to Date	\$819,506
Transportation Bond – Bike and Pedestrian Project Savings to Date	\$320,000
Transportation Bond – Roadway Contingency	\$1,000,000
Transportation Bond – Roadway Contingency Interest Earnings FY20	350,562
Streets and Sidewalks Capital Balances	\$483,090
Eastwood Road Access Management (Anticipated Project Savings)	\$1,500,000
Project Balance	\$463,716

Next Steps

- Respond to Questions of City Council
- Present City Council with Design Contracts for Northern and Southern Pine Grove Projects for Authorization to Proceed
- Begin Coordination with NCDOT and External Agencies
- Begin Design Phase for the Pine Grove Projects

Questions?

