STAFF REPORT
Rezoning #19CZ21 Heelan PUD
October 6, 2020 Town Council Meeting

All property owners within three hundred (300) feet of this rezoning have been notified per UDO Sec. 2.2.11 *Public Notification*.

BACKGROUND INFORMATION:

Location:	8824 & 8829 New Hope Farm Road; 3108 & 3120 Olive Farm Road; 0 Humie Olive Road
Applicant:	Jason Barron, Morningstar Law Group
Authorized Agent:	Erica Leatham, M/I Homes of Raleigh, LLC
Owners:	Henry Steven Kastelberg, Carol B Heelan Irrevocable Trust, Lisa & Jerif Cicin, and Deborah N & Edward A Peart

PROJECT DESCRIPTION:

Acreage:	+/- 141.732 acres
PINs:	0710986889 (portion of), 0720093139 (portion of), 0720181967, 0720075965, 0720092779
Current Zoning:	Wake County Residential-40W (R-40W)
Proposed Zoning:	Planned Unit Development–Conditional Zoning (PUD-CZ)
2045 Land Use Map:	Low Density Residential/Medium Density Residential
Town Limits:	Outside the ETJ

ADJACENT ZONING & LAND USES:

	Zoning	Land Use
North:	Wake County Residential-40W; Conservation Buffer (CB)	Single-family residential & Vacant (future Town park); Humie Olive Rd
South:	Planned Unit Development-Conditional Zoning (PUD-CZ #16CZ01 & 19CZ17)	Single-family residential(Woodbury Subdivision)
East:	Planned Unit Development-Conditional Zoning (PUD-CZ #18CZ02); Wake County Residential-40W; Conservation Buffer (CB)	Single-family residential (future Friendship Station PUD); Protected Open Space (State of North Carolina)
West:	Wake County Residential-40W; Planned Unit Development-Conditional Zoning (PUD-CZ #18CZ34)	Single-family residential; Single-family residential (future Olive Ridge Subdivision)

EXISTING CONDITIONS:

The site consists of five (5) parcels totaling +/- 141.732 acres. The Heelan Property PUD is in the southwest region of Apex, south of Humie Olive Road, east of New Hill Olive Chapel Road, and west of Olive Farm Road. The Friendship Station PUD is under development east of the site and the Woodbury Subdivision is under development south of the site. The lots are primarily vacant and wooded with a few cleared areas and several large streams throughout. The parcel comprising the southern half of the site is identified by Wake County as forest land, which means it is actively engaged in the commercial growing of trees under a management program. A portion of the southernmost property is located within a FEMA designated floodplain. This project is adjacent to the Little Beaver Creek conservation easement.

NEIGHBORHOOD MEETING:

The applicant conducted a neighborhood meeting on September 26, 2019. The meeting report is attached to the staff report.

2045 LAND USE MAP:

The 2045 Land Use Map designates the northwestern portion of the site as Low Density Residential and the

remaining area as Medium Density Residential. Density within the region designated as Low Density Residential on the 2045 Land Use Map shall not exceed 3 units per acre, with a maximum of 96 residential units in this area. As proposed, the overall gross density shall not exceed 3.7 units per acre. The proposed rezoning is consistent with the 2045 Land Use Map designations.

PLANNED UNIT DEVELOPMENT PLAN:

The applicant is proposing a Planned Unit Development with uses and development standards as follows:

Proposed Uses:
The Rezoned Lands may be used for, and only for, the uses listed immediately below. The permitted uses are subject to the limitations and regulations stated in the UDO and any additional limitations or regulations stated below. For convenience, some relevant sections of the UDO may be referenced; such references do not imply that other sections of the UDO do not apply.

- Accessory apartment
- Single-family
- Townhouse
- Greenway
- Recreation Facility, private
- Park, active
- Park, passive
- Utility, minor

Conditions:

A. A maximum of 520 residential units shall be permitted upon the property, no more than 260 of which may be developed as townhomes.
B. No covenant prohibiting the accessory apartment use shall encumber the property.
C. Richardson Road Conservation Easement Mitigation: In concert with the Town's request for release from the State of North Carolina, at the time of master subdivision approval, the developer shall dedicate or cause to be dedicated to the State of North Carolina a conservation easement area over and upon approximately 7.946 acres of land as shown on the attached Exhibit A and more particularly described therein.
D. Energy Efficiency:
    a. All single-family detached dwellings constructed upon the property will be designed and constructed to include pre-configuration measures for future installation of roof-mounted solar panels.
    b. A minimum of two (2) model homes for single-family detached dwellings constructed upon the property shall include installation of solar panels and power system of at least 4 KW capacity.
    c. Solar PV systems shall be installed upon the primary amenity building constructed upon the property. The size of such PV systems shall have a capacity of not less than 0.75 KW/1,000 HSF of building floor area.
    d. Development of the property shall include the installation of a minimum of two (2) electric vehicle charging stations within the primary amenity area as designated on the Master Subdivision Plan.
E. Affordable Housing: Prior to recording the plat containing the 200th lot upon the property, the developer shall record with the Wake County Register of Deeds an Option in favor of Habitat for Humanity of Wake County, Inc. ("Habitat Wake") or other non-profit affordable housing provider, granting them an option to purchase a minimum of ten (10) finished townhome lots within the community, with the cost of such lots being the cost that the developer pays for such lots.
F. Tree Canopy: To demonstrate the project's commitment to preserving and re-establishing tree canopy in our region, the developer seeks to replant and restore existing tree canopy that is removed from those portions of the property that are anticipated to contain single family and townhome lots. To that end, prior to recording the first subdivision plat for the property, the developer will provide a donation of

$19,200 to a local non-profit organization with a mission towards tree preservation and replacement. In those portions of the site where trees are removed for single family or townhome lots, the developer anticipates it can offset such removal by preserving 33.7 acres of existing tree canopy in other places on the site, and replacing and replanting trees over 95.82 acres of the rest of the property. As such, this $19,200 donation represents an assigned per-tree value in substitute canopy for the remainder of the property.

Architectural Conditions:

The proposed development offers the following architectural controls to ensure a consistency of character throughout the development, while allowing for enough variety to create interest and avoid monotony. Changes to the exterior materials, roof, windows, doors, process, trim, etc. are allowable with administrative approval at the staff level. Further details shall be provided at the time of Site Plan submittal. The following conditions shall apply:

A. Vinyl siding is not permitted; however, vinyl windows, decorative elements, and trim are permitted.
B. Residential areas will utilize brick, stone, and fiber cement plank siding.
C. Windows that are not recessed shall be trimmed. Windows shall vary in size and/or type.
D. At least four of the following decorative features shall be used on each building: decorative shake, board and batten siding, decorative porch rails and posts, shutters, decorative functional foundation and roof vents, recessed windows, decorative windows, decorative brick or stone, decorative gables, decorative cornices, or metal roofing.
E. A varied color palette shall be utilized throughout the development to include a minimum of three-color families for siding and shall include varied trim, shutter, and accent colors complementing the siding color.
F. The rear and side elevations of the units that can be seen from the right-of-way shall have trim around the windows.
G. Garage doors shall have windows, decorative details or carriage-style adornments on them.
H. The front façade of any front-loaded garage shall not protrude farther than one foot forward of (i) the front façade of the dwelling unit, or (ii) the front porch of the dwelling unit, whichever is closer to the right-of-way from which the dwelling unit is addressed.
I. J-drives or courtyard driveways shall be exempt from condition G above but shall make up no more than 30% of all single-family homes. There shall be no more than two (2) residences with a J-drive constructed in a row. Any lots eligible for a J-driveway home shall be identified on the Final Plat.
J. Garages on the front façade of a single-family home that faces the street shall not exceed 40% of the total width of the house and garage together.
K. Eaves shall project at least 12 inches from the wall of the structure.
L. House entrances for units with front-facing single-car garages shall have a prominent covered porch/stoop area leading to the front door.
M. Front porches shall be a minimum of 6 feet deep.
N. The visible side of a home on a corner lot facing the public street shall contain at least 3 decorative elements such as, but not limited to, the following elements:
    1. Windows
    2. Bay window
    3. Recessed window
    4. Decorative window
    5. Trim around the windows
    6. Wrap around porch or side porch
    7. Two or more building materials
    8. Decorative brick/stone
    9. Decorative trim
    10. Decorative shake
    11. Decorative air vents on gable
    12. Decorative gable
    13. Decorative cornice
    14. Column
    15. Portico
    16. Balcony
    17. Dormer

O. Additionally, the following conditions shall apply to any Townhome building(s):
   1. The roof of each unit shall be horizontally and/or vertically distinct from any adjacent unit to avoid the appearance of a single mass.

Proposed Design Controls:

Overall Maximum Density:	3.7 units/acre
Max in Low Density:	3 units/acre
Max in Medium Density:	6 units/acre
Maximum Residential Units:	520
Max # in Low Density:	96
Max # of Townhomes:	260
Minimum Lot Width:	
Single-family:	40 ft
Townhomes:	18 ft
Maximum Building Height:	45 ft & 3 stories
Maximum Built-Upon Area:	70%

Building Setbacks:	Single-Family:	Townhomes:
Front:	10 ft	10 ft
Side:	5 ft	0 ft
Rear:	20 ft	20 ft
Corner:	5 ft	5 ft
Building side to side:	N/A	10 ft
From Buffers/RCA:		
For buildings:	10 ft	10 ft
For parking areas:	5 ft	5 ft

Proposed RCA & Buffers:

This application was submitted prior to the UDO change that required 30% of the site to be dedicated as RCA. As such, it complies with the UDO requirement in effect at the time of application to preserve or establish at least 25% of the project as RCA. Because the project is planned to be mass graded, the applicant is proposing an additional 5% RCA within the single-family detached areas as required per Section 7.2.5.B of the Town's UDO.

Buffers:	UDO Requirement:	Proposed:
Humie Olive Road (Thoroughfare):	30-foot Type B	50-foot Type B
North boundary:	20-foot Type B	20-foot Type B
South boundary:	10-foot Type B	15-foot Type A
East boundary		
Adjacent to Use Class 1:	20-foot Type B	20-foot Type B
Adjacent to Other Use Classes:	15-foot Type A	15-foot Type A
West boundary		
Adjacent to Use Class 1:	20-foot Type B	20-foot Type B

Adjacent to Other Use Classes:	15-foot Type A	15-foot Type A

Public Facilities:

The Heelan PUD will be served by Town of Apex water, sanitary sewer, and electrical systems. The utility design will be finalized at Master Subdivision Plan review. A conceptual Utility Plan is included in the PUD Plan for reference. There is a 35-foot Town of Apex Electric easement running north-south on the eastern portion of the property. Three (3) water connections have been identified on the Utility Plan Sheet: from the east on Olive Farm Road, from the west through the Olive Ridge subdivision, and from the south through the Woodbury subdivision. Sewer connections are provided to the south. The ultimate design for the utilities shall meet the current Town of Apex Master Water and Sewer Plans for approval.

Apex Transportation Plan/Access and Circulation:

Per the Apex Thoroughfare and Collector Street Plan map, Humie Olive Road is designated as an existing 2-lane thoroughfare and a future major collector is shown where Horton Ridge Boulevard connects from Woodbury. The developer will dedicate right-of-way along their property frontage on Humie Olive Road to meet the requirements shown in Advance Apex. The Apex Bicycle, Pedestrian and Equestrian Plan shows future sidepath along the north side of Horton Ridge Boulevard, a greenway connection to the Olive Ridge Subdivision, and a streetside greenway along Humie Olive Road. The project proposes a 50-foot buffer along Humie Olive Road, which will accommodate the streetside greenway. The PUD will provide sidewalks along both sides of all internal streets.

Roadway improvements are subject to modification and final approval by the Town of Apex and NCDOT as part of the Master Subdivision Plan review and approval process. A Traffic Impact Analysis has been performed as part of this PUD rezoning consistent with the Town's standards for the same. Based upon the Traffic Impact Analysis, the following traffic improvements are proposed for this development:

1. Developer shall construct a westbound left turn lane on Humie Olive Road at the proposed Site Drive with minimum 75 feet of storage and appropriate deceleration length and taper.
2. Developer shall restripe the existing westbound approach of Horton Ridge Boulevard at New Hill Olive Chapel Road to accommodate an exclusive right turn lane and a shared through-left lane at the intersection.
3. An eastbound left turn lane shall be constructed on Humie Olive Road at Richardson Road with minimum of 200 feet of storage plus appropriate deceleration length and taper prior to the 200 platted lot.
4. Developer shall construct an eastbound right turn lane on Humie Olive Road at the proposed Site Drive with minimum 75 feet of storage and appropriate deceleration length and taper.
5. Consistent with the 2045 Advance Apex Thoroughfare and Collector Street Plan and State law, the Developer shall construct Horton Ridge Boulevard in accord with the Town's design standards for a Major Collector.
6. A westbound left turn lane with 50 feet of storage and appropriate deceleration length and taper shall be provided on Humie Olive Road at Olive Farm Road prior to platting access to Olive Farm Road.
7. Developer shall improve Olive Farm Road based on a minimum 27' back-to-back roadway section along the development frontage and avoid direct residential access. Where development is on one side of the road and the opposite side is unimproved, the opposite side shall be constructed based on a minimum 22' edge-to-edge typical section.
8. Olive Farm Road shall be paved based on a minimum 22' edge-to-edge typical section with minimum 30 mph design speed from the development boundary to Humie Olive Road prior to platting access to Olive Farm Road.

9. Olive Farm Road shall meet Apex Minor Collector Street and NCDOT minimum requirements for secondary road pavement structure for all improved sections.
10. A southbound left turn lane with 150 feet of full width storage and appropriate deceleration length and taper shall be constructed on New Hill Olive Chapel Road at Humie Olive Road prior to the 200th platted lot.
11. The westbound left turn lane on Humie Olive Road at New Hill Olive Chapel Road shall be constructed to provide 200 feet of full width storage and appropriate deceleration length and taper prior to the 200th platted lot.
12. Developer shall monitor the intersection of Richardson Road at Humie Olive Road for installation of a traffic signal and install when warranted. A warrant study shall be conducted following the 200th platted lot or as otherwise directed by Apex staff. If a traffic signal is not permitted by NCDOT prior to the 300th platted lot, the Developer shall construct a southbound left turn lane on Richardson Road at Humie Olive Road with 150 feet of storage and appropriate deceleration length and taper. Construction of the southbound left turn lane shall release the developer from the requirement to install a traffic signal.

The Apex Thoroughfare and Collector Street Plan map includes a future four-lane thoroughfare, Richardson Road, east of the PUD. The planned corridor for Richardson Road crosses the Little Beaver Creek conservation easement. The area where the corridor passes through the conservation easement measures approximately 2.05 acres. The Interagency Review Team (IRT) made up of state and federal environmental agencies must approve any release of land from the conservation easement prior to allowing the crossing of Richardson Road. In 2019, the IRT advised the mitigation land should be provided adjacent to and upstream or downstream of the conservation easement. The PUD is adjacent to the existing conservation easement. Detailed information about the conservation easement is available in Attachments #9a and #9b, and was presented to Town Council during a work session on January 7, 2020.

The applicant is proposing a condition to dedicate 7.946 acres of land to the State of North Carolina in order to assist the Town on obtaining the release of land needed for Richardson Road. On August 17, 2020, Town staff met with the IRT and were advised that the proposed land has been evaluated and is acceptable to the IRT. The minutes of that meeting are provided as Attachment #9c.

Parks, Recreation, and Cultural Resources Advisory Commission:

Based on the Bike Apex and the Parks, Recreation, Greenways, and Open Space Master Plan maps, this project is required to both build a portion of one (1) greenway and one (1) streetside greenway and dedicate land for a future park.

The Parks, Recreation, and Cultural Resources Advisory Commission reviewed the Heelan Assemblage Planned Unit Development at their January 29, 2020 meeting. The Advisory Commission unanimously recommended the following with the understanding that the final credits for greenway construction and acreage for dedication will be determined at the time of Master Subdivision Plan approval:

1. The dedicated land will be contiguous and directly south of the Town of Apex property intended for the future Olive Farm Park (PIN #s 0720-19-6276; 0720-19-0665; 0720-19-7417), being a portion of Parcel ID # 0720-18-1967 in Wake County.
2. The dedicated land shall not be bisected by any road(s) providing access into the applicant's property, nor by any public or private utilities corridors.
3. In the event the applicant acquires agreed upon property located offsite, being Parcel ID #s 0720-19-7898 and 0721-10-4045, as needed to meet dedication requirements, that property may be substituted for the property identified in section 1 above and may be dedicated in satisfaction of the requirements of the UDO and upon the confirmation of the dedication calculations identified in the UDO, at any time prior to

subdivision plan approval. Subdivision plan approval shall not be granted until applicant confirms which of the above options is being offered in satisfaction of dedication requirements.

The calculations for dedication are based on the proposed 520 units with no more than 260 single-family attached units. That would result in a dedication of:

260 single-family attached units	x .0223	= 5.8 acres
260 single-family detached units	x .0333	= 8.7 acres

The greenway construction is planned for an estimated .80 miles which should be calculated at $1.2M per mile or $960,000. The cost of construction of .80 miles divided by the unit fee equals the number of units that the dedication requirement could be reduced.

260 single-family detached units	x $3,446.98	= $896,214.80 (leaving $63,785.20)
27.5 single-family attached units	x $2,321.54	= $63,842.35 (leaving 232.5 units for land dedication)
232.5 single-family attached units	x .0223	= 5.2 acres of dedication

PLANNING STAFF RECOMMENDATION:

Planning staff recommends approval of Rezoning #19CZ21 Heelan PUD as proposed.

PLANNING BOARD RECOMMENDATION:

Planning Board heard this petition at their September 14, 2020 Public Hearing. At the September 16, 2020 meeting, Planning Board recommended approval with a vote of 6-0. One member abstained due to technical difficulties. The Tree Canopy condition was added after the Planning Board meeting.

ANALYSIS STATEMENT OF THE REASONABLENESS OF THE PROPOSED REZONING:

This Statement will address consistency with the Town's comprehensive and other applicable plans, reasonableness, and effect on public interest:

The 2045 Land Use Map designates the site as Low Density Residential and Medium Density Residential. Density within the region designated as Low Density on the 2045 Land Use Map shall not exceed 3 units per acre, with a maximum of 96 residential units in this area. The overall gross density shall not exceed 3.7 units per acre. The proposed rezoning is consistent with the 2045 Land Use Map designations.

The proposed rezoning is reasonable and in the public interest because it will permit a variety of energy efficient housing types and offer an affordable housing option. The proposed development is consistent with the approved residential developments to the east, south, and west. It will also provide mitigation land needed to release the future Richardson Road corridor from the conservation easement. The IRT expressed appreciation for the proposed mitigation as it provides ecological value.

PLANNED UNIT DEVELOPMENT DISTRICT AND CONDITIONAL ZONING STANDARDS:

Standards

In return for greater flexibility in site design requirements, Planned Development (PD) Districts are expected to deliver exceptional quality community designs that preserve critical environmental resources; provide high quality community amenities; incorporate creative design in the layout of buildings, Resource Conservation Area and circulation; ensure compatibility with surrounding land uses and neighborhood character; provide high quality architecture; and provide greater efficiency in the layout and provision of roads, utilities, and other infrastructure. The Planned Development (PD) Districts shall not be used as a means of circumventing the Town's

adopted land development regulations for routine developments.

1) *Planned Unit Development (PUD-CZ) District*

In approving a Planned Development (PD) Zoning District designation for a PUD-CZ, the Town Council shall find the PUD-CZ district designation and PD Plan for PUD-CZ demonstrates compliance with the following standards:

a) *Development parameters*

(i) The uses proposed to be developed in the PD Plan for PUD-CZ are those uses permitted in Sec. 4.2.2 *Use Table.*

(ii) The uses proposed in the PD Plan for PUD-CZ can be entirely residential, entirely non-residential, or a mix of residential and non-residential uses, provided a minimum percentage of non-residential land area is included in certain mixed use areas as specified on the 2045 Land Use Map. The location of uses proposed by the PUD-CZ must be shown in the PD Plan with a maximum density for each type of residential use and a maximum square footage for each type of non-residential use.

(iii) The dimensional standards in Sec. 5.1.3 *Table of Intensity and Dimensional Standards, Planned Development Districts* may be varied in the PD Plan for PUD-CZ. The PUD-CZ shall demonstrate compliance with all other dimensional standards of the UDO, North Carolina Building Code, and North Carolina Fire Code.

(iv) The development proposed in the PD Plan for PUD-CZ encourages cluster and compact development to the greatest extent possible that is interrelated and linked by pedestrian ways, bikeways and other transportation systems. At a minimum, the PD Plan must show sidewalk improvements as required by the Apex Transportation Plan and the *Town of Apex Standard Specifications and Standard Details*, and greenway improvements as required by the Town of Apex Parks, Recreation, Greenways, and Open Space Plan and the Apex Transportation Plan. In addition, sidewalks shall be provided on both sides of all streets for single-family detached homes.

v) The design of development in the PD Plan for PUD-CZ results in land use patterns that promote and expand opportunities for walkability, connectivity, public transportation, and an efficient compact network of streets. Cul-de-sacs shall be avoided unless the design of the subdivision and the existing or proposed street system in the surrounding area indicate that a through street is not essential in the location of the proposed cul-de-sac, or where sensitive environmental areas such as streams, floodplains, and wetlands would be substantially disturbed by making road connections.

(vi) The development proposed in the PD Plan for PUD-CZ is compatible with the character of surrounding land uses and maintains and enhances the value of surrounding properties.

(vii) The development proposed in the PD Plan for PUD-CZ has architectural and design standards that are exceptional and provide higher quality than routine developments. All residential uses proposed in a PD Plan for PUD-CZ shall provide architectural elevations representative of the residential structures to be built to ensure the Standards of this Section are met.

b) *Off-street parking and loading*. The PD Plan for PUD-CZ shall demonstrate compliance with the standards of Sec. 8.3 *Off-Street Parking and Loading*, except that variations from these standards may be permitted if a comprehensive parking and loading plan for the PUD-CZ is submitted as part

of the PD Plan that is determined to be suitable for the PUD-CZ, and generally consistent with the intent and purpose of the off-street parking and loading standards.

c) *RCA.* The PD Plan for PUD-CZ shall demonstrate compliance with Sec. 8.1.2 *Resource Conservation Area*, except that the percentage of RCA required under Sec. 8.1.2 may be reduced by the Town Council by no more than two percent (2%) provided that:

(i) The PD Plan for PUD-CZ includes a non-residential component; or

(ii) The PD Plan for PUD-CZ has an overall density of 6 residential units per acre or more.

d) *Landscaping*. The PD Plan for PUD-CZ shall demonstrate compliance with the standards of Sec. 8.2 *Landscaping, Buffering and Screening*, except that variations from these standards may be permitted where it is demonstrated that the proposed landscaping sufficiently buffers uses from each other, ensures compatibility with land uses on surrounding properties, creates attractive streetscapes and parking areas and is consistent with the character of the area. In no case shall a buffer be less than one half of the width required by Sec. 8.2 or 10 feet in width, whichever is greater.

e) *Signs.* Signage in the PD Plan for PUD-CZ shall demonstrate compliance with Sec. 8.7 *Signs*, except that the standards can be varied if a master signage plan is submitted for review and approval concurrent with the PD plan and is determined by the Town Council to be suitable for the PUD-CZ and generally consistent with the intent and purpose of the sign standards of the UDO. The master signage plan shall have design standards that are exceptional and provide for higher quality signs than those in routine developments and shall comply with Sec. 8.7.2 *Prohibited Signs*.

f) *Public facilities.* The improvements standards and guarantees applicable to the public facilities that will serve the site shall comply with Article 7: *Subdivision and* Article 14: *Parks, Recreation, Greenways, and Open Space*.

(i) The PD Plan for PUD-CZ demonstrates a safe and adequate on-site transportation circulation system. The on-site transportation circulation system shall be integrated with the off-site transportation circulation system of the Town. The PD Plan for PUD-CZ shall be consistent with the Apex Transportation Plan and the *Town of Apex Standard Specifications and Standard Details* and show required right-of-way widths and road sections. A Traffic Impact Analysis (TIA) shall be required per Sec. 13.19.

(ii) The PD Plan for PUD-CZ demonstrates a safe and adequate on-site system of potable water and wastewater lines that can accommodate the proposed development, and are efficiently integrated into off-site potable water and wastewater public improvement plans. The PD Plan shall include a proposed water and wastewater plan.

(iii) Adequate off-site facilities for potable water supply, sewage disposal, solid waste disposal, electrical supply, fire protection and roads shall be planned and programmed for the development proposed in the PD Plan for PUD-CZ, and the development is conveniently located in relation to schools and police protection services.

(iv) The PD Plan shall demonstrate compliance with the parks and recreation requirements of Sec. Article 14: *Parks, Recreation, Greenways, and Open Space* and Sec. 7.3.1 *Privately-owned Play Lawns* if there is a residential component in the PUD-CZ.

g) *Natural resource and environmental protection.* The PD Plan for PUD-CZ demonstrates compliance with the current regulatory standards of this Ordinance related to natural resource and environmental protection in Sec. 6.1 *Watershed Protection Overlay District*, Sec. 6.2 *Flood Damage*

Prevention Overlay District, and Sec. 8.1 *Resource Conservation*.

h) *Storm water management.* The PD Plan shall demonstrate that the post-development rate of on-site storm water discharge from the entire site shall not exceed pre-development levels in accordance with Sec. 6.1.7 of the UDO.

i) *Phasing.* The PD Plan for PUD-CZ shall include a phasing plan for the development. If development of the PUD-CZ is proposed to occur in more than one phase, then guarantees shall be provided that project improvements and amenities that are necessary and desirable for residents of the project, or that are of benefit to the Town, are constructed with the first phase of the project, or, if this is not possible, then as early in the project as is technically feasible.

j) *Consistency with 2045 Land Use Map.* The PD Plan for PUD-CZ demonstrates consistency with the goals and policies established in the Town's 2045 Land Use.

k) *Complies with the UDO.* The PD Plan for PUD-CZ demonstrates compliance with all other relevant portions of the UDO.

Legislative Considerations

The Town Council shall find the Planned Unit Development–Conditional Zoning (PUD-CZ) designation demonstrates compliance with the following standards. 2.3.3(F):

The applicant shall propose site-specific standards and conditions that take into account the following considerations, which are considerations that are relevant to the legislative determination of whether or not the proposed conditional zoning district rezoning request is in the public interest. These considerations do not exclude the legislative consideration of any other factor that is relevant to the public interest.

1) *Consistency with 2045 Land Use Map.* The proposed Conditional Zoning (CZ) District use's appropriateness for its proposed location and consistency with the purposes, goals, objectives, and policies of the 2045 Land Use Map.

2) *Compatibility.* The proposed Conditional Zoning (CZ) District use's appropriateness for its proposed location and compatibility with the character of surrounding land uses.

3) *Zoning district supplemental standards.* The proposed Conditional Zoning (CZ) District use's compliance with Sec 4.4 *Supplemental Standards,* if applicable.

4) *Design minimizes adverse impact.* The design of the proposed Conditional Zoning (CZ) District use's minimization of adverse effects, including visual impact of the proposed use on adjacent lands; and avoidance of significant adverse impacts on surrounding lands regarding trash, traffic, service delivery, parking and loading, odors, noise, glare, and vibration and not create a nuisance.

5) *Design minimizes environmental impact.* The proposed Conditional Zoning District use's minimization of environmental impacts and protection from significant deterioration of water and air resources, wildlife habitat, scenic resources, and other natural resources.

6) *Impact on public facilities.* The proposed Conditional Zoning (CZ) District use's avoidance of having adverse impacts on public facilities and services, including roads, potable water and wastewater facilities, parks, schools, police, fire and EMS facilities.

7) *Health, safety, and welfare.* The proposed Conditional Zoning (CZ) District use's effect on the health, safety, or welfare of the residents of the Town or its ETJ.

8) *Detrimental to adjacent properties.* Whether the proposed Conditional Zoning (CZ) District use is

substantially detrimental to adjacent properties.

9) *Not constitute nuisance or hazard.* Whether the proposed Conditional Zoning (CZ) District use constitutes a nuisance or hazard due to traffic impact or noise, or because of the number of persons who will be using the Conditional Zoning (CZ) District use.

10) *Other relevant standards of this Ordinance.* Whether the proposed Conditional Zoning (CZ) District use complies with all standards imposed on it by all other applicable provisions of this Ordinance for use, layout, and general development characteristics.

November 20, 2019

Joshua Reinke, P.E.
Ramey Kemp & Associates, Inc.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609

Subject: **Staff summary and comments for the Heelan Property TIA, 09/30/2019**

Mr. Reinke:

Please review the following summary of my comments and recommendations. You may schedule a meeting with me and your client to discuss at your convenience.

Study Area

The TIA studied access to the development at the following four intersections:

- Humie Olive Road and Site Drive
- Humie Olive Road and Olive Farm Road
- New Hill Olive Chapel Road and Olive Ridge Drive (via connection through the future Olive Ridge development)
- New Hill Olive Chapel Road and Horton Ridge Boulevard (via connection through the Woodbury development)

The following four intersections were also studied in the TIA:

- Humie Olive Road and New Hill-Olive Chapel Road
- Humie Olive Road and Richardson Road
- Humie Olive Road and Evans Road
- New Hill Olive Chapel Road / New Hill Holleman Road and Old US 1

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Trip Generation

The Heelan Property development is proposed to consist of 250 single family homes and 268 townhomes. The development is anticipated to generate approximately 73 new trips entering and 231 new trips exiting the site during the weekday A.M. peak hour and 243 new trips entering and 144 new trips exiting the site during the weekday P.M. peak hour. The development is expected to add a total of 4,410 weekday trips to the adjacent roadway network.

Background traffic

Background traffic consists of 2% annual background traffic growth compounded to build out year 2026, and the following approved developments:

- Jordan Manors (60% of built-out development traffic)
- Jordan Pointe (35% of built-out development traffic)
- Woodbury (75% of built-out development traffic)
- Friendship Station
- Jordan Vistas (formally New Hill Assembly)
- Olive Ridge

Trip Distribution and Assignment

Trip distribution to and from the development are as follows:

- 30% to/from the east via Humie Olive Road
- 30% to/from the north via Richardson Road
- 30% to/from the north via New Hill Olive Chapel Road
- 10% to/from the south via New Hill Olive Chapel Road

Traffic Capacity Analysis and Recommendations

Level of Service (LOS) is a grade of A through F assigned to an intersection, approach, or movement to describe how well or how poorly it operates. LOS A through D is considered acceptable for peak hour operation. LOS E or F describes potentially unacceptable operation and developers may be required to mitigate their anticipated traffic impact to improve LOS based on the Apex Unified Development Ordinance (UDO).

Tables 1 through 8 describe the levels of service (LOS) for the scenarios analyzed in the TIA. "*NA"* is shown when the scenario does not apply. The scenarios are as follows:

- **Existing 2019** - Existing year 2019 traffic.
- **No Build 2026** – Projected year (2026) with background growth, approved development traffic from others, and committed transportation improvements by others where applicable.
- **Build 2026 –** Projected year (2026) with background traffic, background improvements, and site build-out including recommended improvements where applicable.

Humie Olive Road and Site Drive (Unsignalized)

Table 1. A.M. / P.M. Unsignalized Peak Hour Levels of Service Humie Olive Road and Site Drive	
	Build 2026
Overall	NA
Eastbound (Humie Olive Road)	*NA*
Westbound (Humie Olive Road)	*A / A*[1]
Northbound (Site Drive)	*B / B*[2]

1. Level of service for left turn movement on free-flowing approach
2. Level of service for stop-controlled minor street approach.

TIA recommendations:

- The TIA recommends a stop-controlled single lane northbound approach with a single lane of ingress. The TIA also recommends constructing a westbound left turn lane with minimum 75 feet of storage and appropriate deceleration length and taper on Humie Olive Road.

Apex staff recommendations:

- Apex staff concurs with the recommendations. Short delays are expected on the minor street approach with LOS B in both peak hours and 95th percentile queues are not anticipated to be more than a vehicle in length. The 75 feet of storage should be provided in addition to 50 feet of full width deceleration length per NCDOT guidance.

Humie Olive Road and Olive Farm Road (unsignalized)

Table 2. A.M. / P.M. Unsignalized Peak Hour Levels of Service Humie Olive Road and Olive Farm Road			
	Existing 2019	**No Build 2026**	**Build 2026**
Overall	NA	NA	NA
Eastbound (Humie Olive Road)	*NA*	*NA*	*NA*
Westbound (Humie Olive Road)	*A / A*[1]	*A / A*[1]	*A / A*[1]
Northbound (Olive Farm Road)	*A / A*[2]	*B / B*[2]	*B / B*[2]

1. Level of service for left turn movement on free-flowing approach
2. Level of service for stop-controlled minor street approach.

TIA recommendations:

- The TIA recommends no improvements at this intersection, assuming that a westbound left turn lane with 50 feet of storage and appropriate deceleration length and taper is already constructed by the Friendship Station development.

Apex staff recommendations:

- Assuming the committed improvements are in place by others, Apex staff concurs with the TIA recommendations. However, if the westbound left turn lane is not provided by Friendship Station prior to access being open to the Heelan Property, then staff recommends construction of the left turn lane by Heelan Property. In addition, staff recommends that the existing Olive Farm Road be widened and paved based on a minimum 27' back-to-back roadway section along the development frontage and 22' edge-to-edge asphalt with shoulder section offsite from the development boundary to Humie Olive Road, including a pavement structure to meet Apex minor collector street standards and NCDOT secondary road requirements, subject to review and approval. Additionally, residential driveways should be avoided along Olive Farm Road. Minimum design speed is recommended to be 30 mph. Staff recommends a speed limit reduction from statutory 55 mph to 30 mph based on the function and alignment of this roadway.

New Hill Olive Chapel Road and Jordan Manors Drive/Olive Ridge Drive (unsignalized)

Table 3. A.M. / P.M. Unsignalized Peak Hour Levels of Service New Hill Olive Chapel Road and Jordan Manors Drive/Olive Ridge Drive		
	No Build 2026	**Build 2026**
Overall	NA	NA
Eastbound (Jordan Manors Drive)	*D / E*[2]	*D / E*[2]
Westbound (Olive Ridge Drive)	*F / F*[2]	*F / F*[2]
Northbound (New Hill Olive Chapel Road)	*A / A*[1]	*A / A*[1]
Southbound (New Hill Olive Chapel Road)	*A / B*[1]	*A / B*[1]

1. Level of service for major street left turn movements
2. Level of service for minor street stop controlled approaches

TIA recommendations:

- The TIA does not recommend any improvements at this intersection. The existing intersection has three approach legs, and the Olive Ridge development is committed to building the fourth westbound approach leg with stop control and a single lane of ingress and egress. Additionally a left turn lane is committed in the southbound direction and a left turn lane has already been constructed in the northbound direction on New Hill Olive Chapel Road by the adjacent developments. The TIA analyzed this intersection for signal warrants, but based on the residential nature of the development, the intersection is not anticipated to meet the required warrants for a traffic signal to be permitted by NCDOT.

Apex staff recommendations:

- Apex staff concurs with the recommendation. The alignment of Olive Ridge Drive across from Jordan Manors Drive will create a 4-leg intersection with stop control on the minor street approaches. The southbound left turn lane will help mitigate delays associated with turning movements on New Hill Olive Chapel Road. With the addition of traffic from the development, the westbound approach is projected to operate at LOS F in the A.M. and P.M. peak hours. Average vehicle delays are projected to be over 2 minutes per vehicle in the P.M. peak hour. Operational failure is mainly due to a limited number of gaps in the traffic stream on New Hill Olive Chapel Road for left turn and through maneuvers from the minor street approach. Synchro analysis indicated that providing an additional right turn storage lane on the westbound approach will only marginally improve overall vehicle delays since the majority of the traffic is projected to turn left at that intersection.

New Hill Olive Chapel Road and Horton Ridge Boulevard (unsignalized)

Table 4. A.M. / P.M. Unsignalized Peak Hour Levels of Service New Hill Olive Chapel Road and Horton Ridge Boulevard			
	Existing 2019	**No Build 2026**	**Build 2026**
Overall	NA	NA	NA
Eastbound (Horton Ridge Boulevard)	*C / C*[2]	*E / F*[2]	*F / F*[2]
Westbound (Horton Ridge Boulevard)	*C / C*[2]	*F / F*[2]	*F / F*[2]
Northbound (New Hill Olive Chapel Road)	*A / A*[1]	*A / A*[1]	*A / A*[1]
Southbound (New Hill Olive Chapel Road)	*A / A*[1]	*A / B*[1]	*A / B*[1]

1. Level of service for left turn movement on free-flowing approach
2. Level of service for stop-controlled minor street approach.

TIA recommendations:

- The TIA recommends to restripe the existing westbound approach of the intersection to accommodate a right turn and a shared through-left turn at the intersection. The TIA also analyzed this intersection for signal warrants, but based on the residential nature of the development in the area, the intersection is not anticipated to meet the required warrants for a traffic signal to be permitted by the NCDOT.

Apex staff recommendations:

- Apex staff concurs with the recommendation. The striping of the westbound approach recommended in the TIA is a committed requirement of the Woodbury development. With the addition of traffic from the development, the westbound approach is projected to operate at LOS F in the A.M. and P.M. peak hours. Average vehicle delays are projected to be over 2 minutes per vehicle in the P.M. peak hour and 95th percentile queues are projected to be over 5 vehicles in length during both peak hours on the westbound approach. Operational failure is mainly due to a limited number of gaps in the traffic stream on New Hill Olive Chapel Road for left turning and through maneuvers from the minor street approaches. The existing intersection geometry already provides left turn movements from New Hill Olive Chapel Road, as well as a right turn and a through-left movement from Horton Ridge Boulevard. Additional improvements to mitigate delays on the minor street approaches would require installation of a traffic signal, which is not warranted based on traffic volume projections per the TIA.

Humie Olive Road and New Hill Olive Chapel Road (unsignalized)

Table 5. A.M. / P.M. Unsignalized Peak Hour Levels of Service Humie Olive Road and New Hill Olive Chapel Road			
	Existing 2019	**No Build 2026**	**Build 2026**
Overall	NA	NA	NA
Westbound (Humie Olive Road)	*C / C[2]*	*D / F[2]*	*D / F[2]*
Northbound (New Hill Olive Chapel Road)	*NA*	*NA*	*NA*
Southbound (New Hill Olive Chapel Road)	*A / A[1]*	*A / B[1]*	*A / B[1]*

1. Level of service for left turn movement on free-flowing approach
2. Level of service for stop-controlled minor street approach.

TIA recommendations:

- The TIA does not recommend any improvements at this intersection. The Woodbury development has already constructed a westbound left turn lane with 100 feet of storage, and the Friendship Station development is committed to extending the westbound left turn lane to provide 250 feet of full width storage and appropriate deceleration length and taper. In addition the Friendship Station development is also committed to constructing a southbound left turn lane on New Hill Olive Chapel Road with 150 feet of full width storage and appropriate deceleration length and taper. Although the westbound approach is projected to fail in the P.M. peak hour during the Build condition, the 95th percentile westbound left turn queues were analyzed to be 8 vehicles (200 feet) which would not surpass the storage capacity of the left turn lane.

Apex staff recommendations:

- Apex staff recommends Heelan Property construct the southbound left turn lane with 150 feet of full width storage, as well as extend the westbound left turn lane to provide 200 feet of full width storage and appropriate deceleration length and taper per NCDOT guidance, if these improvements are not provided by others. A traffic signal should also be installed if warranted, provided it is not already in the process of being designed and installed by others.

  The development will add more than 10% traffic to both the southbound approach and the westbound left turn movement in the P.M. peak hour. The westbound left turn movement currently provides 100 feet of storage. Projected queue lengths are anticipated to be 200 feet in the Build condition, requiring additional capacity if not built by other developments in the area, per the UDO. The westbound approach of this intersection is also anticipated to experience average delays of over 2 minutes per vehicle in the P.M. peak hour during Build conditions.

Humie Olive Road and Richardson Road (unsignalized)

Table 6. A.M. / P.M. Unsignalized Peak Hour Levels of Service Humie Olive Road and Richardson Road			
	Existing 2019	**No Build 2026**	**Build 2026**
Overall	NA	NA	NA
Eastbound (Humie Olive Road)	*A / A*[1]	*A / A*[1]	*A / A*[1]
Westbound (Humie Olive Road)	*A / A*[1]	*A / A*[1]	*A / A*[1]
Northbound (Richardson Road)	*B / A*[2]	*C / C*[2]	*D / D*[2]
Southbound (Richardson Road)	*B / A*[2]	*F / F*[2]	*F / F*[2]

1. Level of service for left turn movement on free-flowing approaches.
2. Level of service for stop-controlled approaches.

TIA recommendations:

- The TIA recommends constructing an eastbound left turn lane with minimum of 200 feet of storage plus appropriate deceleration length and taper per NCDOT guidance.

Apex staff recommendations:

- In addition to the eastbound left turn lane improvement recommended in the TIA, Apex staff recommends monitoring the intersection for signalization and installing a signal if warranted and approved by NCDOT, provided it is not already in the process of being designed and installed by others. If the signal is not warranted, Apex staff recommends constructing a southbound left turn lane with 150 feet of storage and appropriate deceleration length and taper per NCDOT guidance, to mitigate queues on the southbound approach.

  This intersection is projected to experience LOS F in the southbound direction during the Build condition, with average vehicle delays of over 5 minutes per vehicle and 95th percentile queues of over 700 feet during both peak hours. The development is also anticipated to add more than 10% of traffic to the intersection, and more than 10% of traffic to the southbound approach during both peak hours. Per the UDO a traffic signal if warranted would improve operations in both peak hours to LOS C or better. However if the signal is not warranted and approved by NCDOT, then per the UDO it's recommended that the development mitigate delays and queuing on the southbound approach as much as possible, in this case by providing a southbound left turn lane.

Old US 1 and New Hill Olive Chapel Road/New Hill Holleman Road

Table 7. A.M. / P.M. Peak Hour Levels of Service Old US 1 and New Hill Olive Chapel Road/New Hill Holleman Road			
	Existing 2019[1]	**Signalized**	
		No Build 2026	**Build 2026**
Overall	D / D	C / E	D / E
Eastbound (Old US 1)	*B / D*	*D / F*	*E / F*
Westbound (Old US 1)	*C / C*	*D / C*	*D / C*
Northbound (New Hill Holleman Road)	*C / E*	*B / D*	*B / D*
Southbound (New Hill Olive Chapel Road)	*E / D*	*D / D*	*D / D*

1. Level of service for all-way stop controlled intersection and approaches

TIA recommendations:

- The TIA does not recommend any improvements at this intersection. Although traffic analysis showed this intersection to perform over capacity in the future Build condition with and without a traffic signal, development traffic is anticipated to be between 2-3 percent of the overall traffic volume.

Apex staff recommendations:

- Apex staff concurs with the recommendation for no turn lane additions as part of the development in accordance with the UDO based on the relatively low amount of additional traffic. Jordan Pointe has provided a fee-in-lieu for the construction of a traffic signal at this intersection, and the Town of Apex plans to proceed with the installation of the signal once warranted by traffic volumes and approved by NCDOT. In the future Build condition, this signalized intersection will experience operational failure in the P.M. peak hour with the eastbound approach experiencing the heaviest vehicular delays of over 2 minutes per vehicle, and 95th percentile queues of over 500 feet. Both the southbound and northbound approaches will be operating at LOS D in the P.M. peak hour with 95th percentile queues of over 590 feet. This intersection will require turn lanes to meet future traffic demand. The Gracewood development zoning conditions require construction of turn lanes at this intersection, but that has not yet moved forward with a subdivision plan following rezoning. If the Gracewood development moves forward in the foreseeable future, a revised TIA will likely be required to evaluate this intersection for a new build out year. Overall vehicular traffic growth has increased by 35% at the intersection during the peak hours in the past two (2) years. If not improved by others in the near future, the Town may want to consider a public project along with or shortly following installation of the traffic signal to construct left turn lanes on all four approaches to mitigate background growth. There are potential right of way impacts including

impacts to historic property at this location as well as a railroad crossing to the south that would need to the considered in the design.

Humie Olive Road and Evans Road (signalized)

Table 8. A.M. / P.M. Signalized Peak Hour Levels of Service Humie Olive Road and Richardson Road			
	Existing 2019	**No Build 2026**	**Build 2026**
Overall	B / B	B / B	B / B
Eastbound (Humie Olive Road)	*A / A*	*B / A*	*B / B*
Westbound (Humie Olive Road)	*A / A*	*B / A*	*B / A*
Northbound (School Drive)	*E / E*	*E / E*	*E / E*
Southbound (Evans Road)	*C / D*	*C / D*	*C / D*

TIA recommendations:

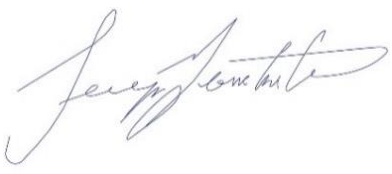
- The TIA recommends no improvements at this intersection. Overall level of service is projected to be LOS B during both peak hours in the future Build condition.

Apex staff recommendations:

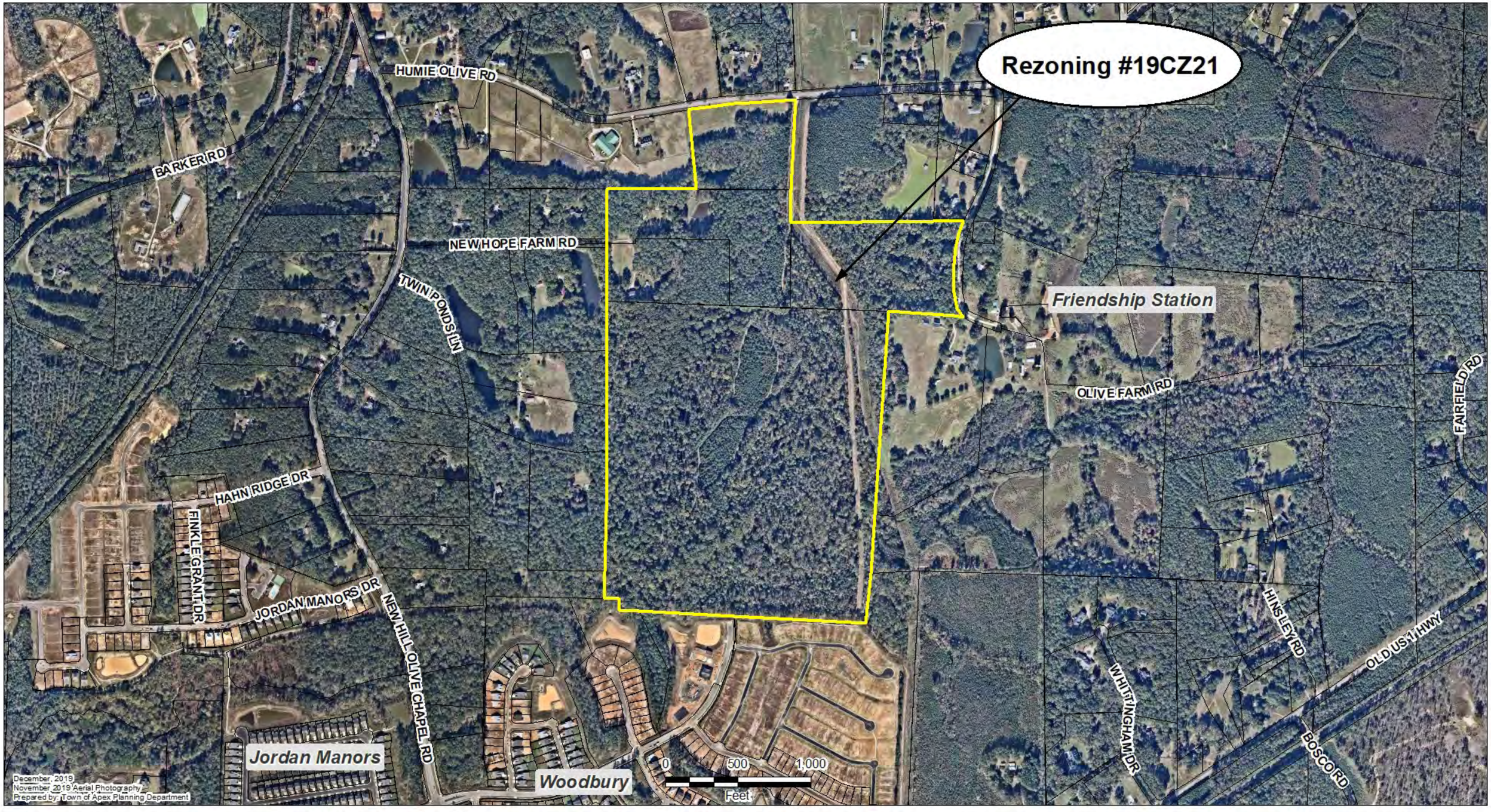
- Apex staff concur with the recommendation. This signalized intersection will have enough capacity to meet future traffic demand. Delays of over 60 seconds are projected on the northbound approach of the school driveway. However traffic coming in and out of the school is limited during the A.M. and P.M. peak hours, and longer approach delays are attributed to signal timing priority on Humie Olive Road.

Please coordinate with the NCDOT District Engineer's Office concerning recommended improvements. Town staff will be available for meetings with NCDOT staff to discuss improvements on state maintained roadways as needed. All recommendations are subject to review by Town Council prior to approval.

Sincerely,



Serge Grebenschikov
Traffic Engineer
919-372-7448


Rezoning #19CZ21
HUMIE OLIVE RD
BARKER RD
NEW HOPE FARM RD
TWIN PONDS LN
Friendship Station
OLIVE FARM RD
FAIRFIELD RD
HAHN RIDGE DR
FINKLE GRANT DR
JORDAN MANORS DR
NEW HILL OLIVE CHAPEL RD
HINSLEY RD
OLD US 1 HWY
WHITTINGHAM DR
BOSCO RD
Jordan Manors
Woodbury
0
500
1,000
Feet
December, 2019
November, 2019 Aerial Photography
Prepared by: Town of Apex Planning Department

PLANNED UNIT DEVELOPMENT APPLICATION

This document is a public record under the North Carolina Public Records Act and may be published on the Town's website or disclosed to third parties.

Application #: _____ Submittal Date: _____

Fee Paid $ _____ Check # _____

PETITION TO AMEND THE OFFICIAL ZONING DISTRICT MAP

Project Name: Heelan Rezoning

Address(es): 8824 & 8829 NEW HOPE FARM RD; 3108 & 3120 OLIVE FARM RD; & 0 HUMIE OLIVE RD

PIN(s) 0710-98-6889 & 0720- 07-5965, 09-2779, 09-3139, & 18-1967

Acreage: 142.42

Current Zoning: R-40W Proposed Zoning: PUD-CZ

Current 2045 LUM Designation: Low Density Residential & Medium Density Residential

Requested 2045 LUM Designation: No Change

See next page for LUM amendment

If any portion of the project is shown as mixed use (3 or more stripes on the 2045 Land Use Map) provide the following:

Area classified as mixed use: Acreage: _____

Area proposed as non-residential development: Acreage: _____

Percent of mixed use area proposed as non-residential: Percent: _____

Applicant Information

Name: Jason Barron - Attorney for M/I Homes of Raleigh, LLC

Address: 1511 Sunday Drive | Ste 100

City: Raleigh State: NC Zip: 27607

Phone: 919-590-0371 E-mail: jbarron@morningstarlawgroup.com

Owner Information

Name: See Attached

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ E-mail: _____

Agent Information

19CZ21

Name: M/I Homes of Raleigh, LLC

Address: 1511 Sunday Drive | Ste 100

City: Raleigh State: NC Zip: 27607

Phone: 919-590-0371 E-mail: jbarron@morningstarlawgroup.com

Other contacts: _____

Property Owners

PIN	Owner	Mailing Address	City, State Zip	Deed Acres	Site Address
0710-98-6889	KASTELBERG, HENRY STEVEN	8824 NEW HOPE FARM RD	NEW HILL NC 27562-9178	8.86	8824 NEW HOPE FARM RD
0720-07-5965 0720-18-1967	CAROL B HEELAN IRREVOCABLE TRUST c/o GEORGE HEELAN TRUSTEE	12940 DORMAN RD APT 2206	PINEVILLE NC 28134-9386	91 16.77	3120 OLIVE FARM RD 3108 OLIVE FARM RD
0720-09-2779	CICIN, JERFI CICIN, LISA	104 CORSICA LN	CARY NC 27511-6476	9.49	0 HUMIE OLIVE RD
0720-09-3139	PEART, EDWARD A PEART, DEBORAH N	8829 NEW HOPE FARM RD	NEW HILL NC 27562-9179	15	8829 NEW HOPE FARM RD

CERTIFIED LIST OF NEIGHBORING PROPERTY OWNERS

Application #: _____ Submittal Date: _____

Provide a certified list of property owners subject to this application and all property owners within 300' of the subject property and HOA Contacts.

	Owner's Name	PIN
1.	See Attached	
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

I, Nil Ghosh, certify that this is an accurate listing of all property owners and property owners within 300' of the subject property.

Date: 10/1/19 By: _____

COUNTY OF WAKE STATE OF NORTH CAROLINA

Sworn and subscribed before me, Jeffrey Phillips, a Notary Public for the above State and County, on this the 1st day of October, 2019.

_____
Notary Public

Jeffrey Phillips
Print Name

SEAL

JEFFREY PHILLIPS NOTARY PUBLIC DURHAM COUNTY, N.C. My Comm. Exp. 02-24-2024.

My Commission Expires: 02-24-2024

Certified List of Neighboring Property Owners

Owner's Name	PIN
3 BOYS CAPITAL LLC MUSIC ROW INVESTMENTS LLC	0720-17-7185
3 BOYS CAPITAL LLC SB CAPITAL LLC	0720-28-2995 0720-28-6437
ADAMS-KNOUFF, CAREY	0710-87-9844 0710-88-9126
ALBRECHT, DONNA J TRUSTEE DONNA J ALBRECHT RVCBLE LVNG TRUST	0710-88-9798
APEX TOWN OF	0720-19-0665 0720-19-6276 0720-19-7417
CAROL B HEELAN IRREVOCABLE TRUST	0720-18-1967 0720-07-5965
CICIN, JERFI CICIN, LISA	0720-09-2779
FMR INVESTMENTS LLC CHATHAM CAPITAL GROUP LLC	0720-27-6714
GENTILE, CHRISTOPHER D	0721-00-9530
GOODMAN, WILLIAM DAVID JR GOODMAN, JILL M	0710-99-0226
HOFFMAN, JOSEPH E JR HOFFMAN, SHIRLEY J	0710-88-4797
JUDD, MILDRED B JUDD, LINDA FAYE	0721-00-5342
KASTELBERG, HENRY STEVEN	0710-98-6889
KELLY, ROBERT L KELLY, MILDRED D	0720-29-4621
MCKEITHAN, KAREN D ST CLAIR, LANCE	0710-88-7654
MCKINNISH, TIMOTHY D	0710-86-5906
NORMAN, JOHN K	0710-97-0228
OLIVE, A C HEIRS	0720-19-9119
OLIVE, JUDITH H OLIVE, ROBERT A	0720-18-5030
OLIVER, JAMES E JR OLIVER, JANICE	0721-00-0505
OLIVER, JAMES E JR OLIVER, JANICE	0721-00-3444
OLIVER, JAMES E. JR. OLIVER, JANICE	0711-90-3580
PAIRIS-GARCIA, MONIQUE GARCIA, JUAN	0710-89-6246
PEART, EDWARD A PEART, DEBORAH N	0720-09-3139
PULTE HOME COMPANY, LLC	0710-86-7029 0710-95-2812 0710-96-3227 0710-96-4235 0710-96-8199 0720-05-7756
YUMEEWARRA FARM LLC	0710-99-3712

DEVELOPMENT NAME APPROVAL APPLICATION

Application #: _____ Submittal Date: _____

Proposed Subdivision/Development Information

Description of location: 8824 & 8829 NEW HOPE FARM RD; 3108 & 3120 OLIVE FARM RD; & 0 HUMIE OLIVE

Nearest intersecting roads: Humie Olive Road at Olive Farm Road

Wake County PIN(s): 0710-98-6889 & 0720- 07-5965, 09-2779, 09-3139, & 18-1967

Township: Buckhorn

Contact Information (as appropriate)

Contact person: Jason Barron

Phone number: 919-590-0371 Fax number: 919-301-8936

Address: 421 Fayetteville St | Ste 530 Raleigh, NC 27601

E-mail address: jbarron@morningstarlawgroup.com

Owner: _____

Phone number: _____ Fax number: _____

Address: _____

E-mail address: _____

Proposed Subdivision/Development Name

1st Choice: Fallsgrove

2nd Choice *(Optional)*: _____

Town of Apex Staff Approval:

_____ _____

Town of Apex Planning Department Staff Date

STREET NAME APPROVAL APPLICATION

Application #: _____ Submittal Date: _____

Wake County Approval Date: _____

Guidelines:

- No names duplicating or sounding similar to existing road names
- Avoid difficult to pronounce names
- No individuals' names
- Avoid proper names of a business, e.g. Hannaford Drive
- Limit names to 14 characters in length
- No directionals, e.g. North, South, East, West
- No punctuation marks, e.g. periods, hyphens, apostrophes, etc.
- Avoid using double suffixes, e.g. Deer Path Lane
- All names must have an acceptable suffix, e.g. Street, Court, Lane, Path, etc.
- Use only suffixes which are Town of Apex approved
- Town of Apex has the right to deny any street name that is determined to be inappropriate

Information:

Description of location: 8824 & 8829 NEW HOPE FARM RD; 3108 & 3120 OLIVE FARM RD; & 0 HUMIE OLIVE

Nearest intersecting roads: Humie Olive Road at Olive Farm Road

Wake County PIN(s): 0710-98-6889 & 0720- 07-5965, 09-2779, 09-3139, & 18-1967

Township: Buckhorn

Contact information (as appropriate)

Contact person: Jason Barron

Phone number: 919-590-0371 Fax number: 919-301-8936

Address: 421 Fayetteville St | Ste 530 Raleigh, NC 27601

E-mail address: jbarron@morningstarlawgroup.com

Owner: _____

Phone number: _____ Fax number: _____

Address: _____

E-mail address: _____

STREET NAME APPROVAL APPLICATION

Application #: _____ Submittal Date: _____

# of roads to be named: 2

Please submit twice as many road names as needed, with preferred names listed first. Proposed road names should be written exactly as one would want them to appear. Town of Apex Planning Department staff will send all approved street names to the Wake County GIS Department for county approval. Please allow several weeks for approval. Upon approval Wake County GIS – Street Addressing will inform you of the approved street names.

Example:	Road Name	Suffix
	Hunter	Street

1	Fallsgrove Boulevard	11	
2	Sun Ochre Drive	12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

TOWN OF APEX STAFF APPROVAL

Town of Apex Staff Approval Date

WAKE COUNTY STAFF APPROVAL:

GIS certifies that _____ names indicated by checkmark ☑ are approved.
Please disregard all other names.

Comments:

Wake County GIS Staff Approval Date

TOWN OF APEX UTILITIES OFFER AND AGREEMENT

Application #: _____ Submittal Date: _____

Town of Apex
73 Hunter Street
P.O. Box 250 Apex, NC 27502
919-249-3400

WAKE COUNTY, NORTH CAROLINA CUSTOMER SELECTION AGREEMENT

3108 & 3120 OLIVE FARM RD; 0 HUMIE OLIVE RD; &

8824 & 8829 NEW HOPE FARM RD

(the "Premises")

The Town of Apex offers to provide you with electric utilities on the terms described in this Offer & Agreement. If you accept the Town's offer, please fill in the blanks on this form and sign and we will have an Agreement once signed by the Town.

M/I Homes of Raleigh, LLC, the undersigned customer ("Customer") hereby irrevocably chooses and selects the Town of Apex (the "Town") as the permanent electric supplier for the Premises. Permanent service to the Premises will be preceded by temporary service if needed.

The sale, delivery, and use of electric power by Customer at the Premises shall be subject to, and in accordance with, all the terms and conditions of the Town's service regulations, policies, procedures and the Code of Ordinances of the Town.

Customer understands that the Town, based upon this Agreement, will take action and expend funds to provide the requested service. By signing this Agreement the undersigned signifies that he or she has the authority to select the electric service provider, for both permanent and temporary power, for the Premises identified above.

Any additional terms and conditions to this Agreement are attached as Appendix 1. If no appendix is attached this Agreement constitutes the entire agreement of the parties.

Acceptance of this Agreement by the Town constitutes a binding contract to purchase and sell electric power.

Please note that under North Carolina General Statute §160A-332, you may be entitled to choose another electric supplier for the Premises.

Upon acceptance of this Agreement, the Town of Apex Electric Utilities Division will be pleased to provide electric service to the Premises and looks forward to working with you and the owner(s).

ACCEPTED:

CUSTOMER: M/I Homes of Raleigh, LLC TOWN OF APEX

BY: _____ BY: _____
Authorized Agent Authorized Agent

Erica Leathom, VP Land Acq

DATE: 9.27.19 DATE: _____

AGENT AUTHORIZATION FORM

Application #: _____ Submittal Date: _____

KASTELBERG, HENRY STEVEN is the owner* of the property for which the attached application is being submitted:

- ☑ Land Use Amendment
- ☑ Rezoning: For Conditional Zoning and Planned Development rezoning applications, this authorization includes express consent to zoning conditions that are agreed to by the Agent which will apply if the application is approved.
- ☑ Site Plan
- ☑ Subdivision
- ☐ Variance
- ☐ Other: _____

The property address is: 8824 NEW HOPE FARM RD (0710-98-6889)

The agent for this project is: M/I Homes of Raleigh, LLC

☐ I am the owner of the property and will be acting as my own agent

Agent Name: Erica Leatham

Address: 1511 Sunday Drive | Ste 100 Raleigh, NC 27607

Telephone Number: _____

E-Mail Address: _____

Signature(s) of Owner(s)*

Henry Steven Kastelberg

Henry Steven Kastelberg — 26 Sept 2019

Type or print name — Date

_____

_____ _____

Type or print name — Date

Attach additional sheets if there are additional owners.

*Owner of record as shown on the latest equalized assessment rolls of Wake County. An option to purchase does not constitute ownership. If ownership has been recently transferred, a copy of the deed must accompany this authorization.

Pursuant to Article 40 of Chapter 66 of the North Carolina General Statutes (the Uniform Electronic Transactions Act) this application and all documents related hereto containing an electronic or digitized signature are legally binding in the same manner as are hard copy documents executed by hand signature. The parties hereby consent to use electronic or digitized signatures in accordance with the Town's Electronic Signature Policy and intend to be bound by the application and any related documents. If electronic signatures are used the application shall be delivered in an electronic record capable of retention by the recipient at the time of receipt.

AGENT AUTHORIZATION FORM

Application #: _____ Submittal Date: _____

CICIN, JERIF CICIN, LISA is the owner* of the property for which the attached application is being submitted:

- ☑ Land Use Amendment
- ☑ Rezoning: For Conditional Zoning and Planned Development rezoning applications, this authorization includes express consent to zoning conditions that are agreed to by the Agent which will apply if the application is approved.
- ☑ Site Plan
- ☑ Subdivision
- ☐ Variance
- ☐ Other: _____

The property address is: 0 HUMIE OLIVE RD (0720-09-2779)

The agent for this project is: M/I Homes of Raleigh, LLC

☐ I am the owner of the property and will be acting as my own agent

Agent Name: Erica Leatham

Address: 1511 Sunday Drive | Ste 100 Raleigh, NC 27607

Telephone Number: _____

E-Mail Address: _____

Signature(s) of Owner(s)*

_____

JERIF CICIN — Type or print name — 9/25/19 — Date

_____

Lisa Cicin — Type or print name — 9/25/19 — Date

Attach additional sheets if there are additional owners.

*Owner of record as shown on the latest equalized assessment rolls of Wake County. An option to purchase does not constitute ownership. If ownership has been recently transferred, a copy of the deed must accompany this authorization.

Pursuant to Article 40 of Chapter 66 of the North Carolina General Statutes (the Uniform Electronic Transactions Act) this application and all documents related hereto containing an electronic or digitized signature are legally binding in the same manner as are hard copy documents executed by hand signature. The parties hereby consent to use electronic or digitized signatures in accordance with the Town's Electronic Signature Policy and intend to be bound by the application and any related documents. If electronic signatures are used the application shall be delivered in an electronic record capable of retention by the recipient at the time of receipt.

AGENT AUTHORIZATION FORM

Application #: _____ Submittal Date: _____

CAROL B HEELAN IRREVOCABLE TRUST is the owner* of the property for which the attached application is being submitted:

- ☑ Land Use Amendment
- ☑ Rezoning: For Conditional Zoning and Planned Development rezoning applications, this authorization includes express consent to zoning conditions that are agreed to by the Agent which will apply if the application is approved.
- ☑ Site Plan
- ☑ Subdivision
- ☐ Variance
- ☐ Other: _____

The property address is: 3108 OLIVE FARM RD (0720-18-1967) & 3120 OLIVE FARM RD (0720-07-5965)

The agent for this project is: M/I Homes of Raleigh, LLC

☐ I am the owner of the property and will be acting as my own agent

Agent Name: Erica Leatham

Address: 1511 Sunday Drive | Ste 100 Raleigh, NC 27607

Telephone Number: _____

E-Mail Address: _____

Signature(s) of Owner(s)*

George Heelan

George Heelan — Sept. 25, 2019

Type or print name — Date

_____

_____ — _____

Type or print name — Date

Attach additional sheets if there are additional owners.

*Owner of record as shown on the latest equalized assessment rolls of Wake County. An option to purchase does not constitute ownership. If ownership has been recently transferred, a copy of the deed must accompany this authorization.

Pursuant to Article 40 of Chapter 66 of the North Carolina General Statutes (the Uniform Electronic Transactions Act) this application and all documents related hereto containing an electronic or digitized signature are legally binding in the same manner as are hard copy documents executed by hand signature. The parties hereby consent to use electronic or digitized signatures in accordance with the Town's Electronic Signature Policy and intend to be bound by the application and any related documents. If electronic signatures are used the application shall be delivered in an electronic record capable of retention by the recipient at the time of receipt.

AGENT AUTHORIZATION FORM

Application #: _____ Submittal Date: _____

PEART, EDWARD A PEART, DEBORAH N is the owner* of the property for which the attached application is being submitted:

- ☑ Land Use Amendment
- ☑ Rezoning: For Conditional Zoning and Planned Development rezoning applications, this authorization includes express consent to zoning conditions that are agreed to by the Agent which will apply if the application is approved.
- ☑ Site Plan
- ☑ Subdivision
- ☐ Variance
- ☐ Other: _____

The property address is: 8829 NEW HOPE FARM RD (0720-09-3139)

The agent for this project is: M/I Homes of Raleigh, LLC

☐ I am the owner of the property and will be acting as my own agent

Agent Name: Erica Leatham

Address: 1511 Sunday Drive | Ste 100 Raleigh, NC 27607

Telephone Number: _____

E-Mail Address: _____

Signature(s) ~~of~~ Owner(s)*

E. Aaron Peart — Type or print name — 9-29-19 — Date

Deborah N. Peart — Type or print name — 9-29-19 — Date

Attach additional sheets if there are additional owners.

*Owner of record as shown on the latest equalized assessment rolls of Wake County. An option to purchase does not constitute ownership. If ownership has been recently transferred, a copy of the deed must accompany this authorization.

Pursuant to Article 40 of Chapter 66 of the North Carolina General Statutes (the Uniform Electronic Transactions Act) this application and all documents related hereto containing an electronic or digitized signature are legally binding in the same manner as are hard copy documents executed by hand signature. The parties hereby consent to use electronic or digitized signatures in accordance with the Town's Electronic Signature Policy and intend to be bound by the application and any related documents. If electronic signatures are used the application shall be delivered in an electronic record capable of retention by the recipient at the time of receipt.

Kathleen M Angel
NOTARY PUBLIC
Wake County, State of North Carolina
My Commission Expires 4-29-22

AFFIDAVIT OF OWNERSHIP

Application #: _____ Submittal Date: _____

The undersigned, Erica Leatham (the "Affiant") first being duly sworn, hereby swears or affirms as follows:

1. Affiant is over eighteen (18) years of age and authorized to make this Affidavit. The Affiant is the sole owner, or is the authorized agent of all owners, of the property located at 8824 & 8829 NEW HOPE FARM RD; 3108 & 3120 OLIVE FARM RD; & 0 HUMIE OLIVE RD and legally described in **Exhibit "A"** attached hereto and incorporated herein (the "Property").

2. This Affidavit of Ownership is made for the purpose of filing an application for development approval with the Town of Apex.

3. If Affiant is the owner of the Property, Affiant acquired ownership by deed, dated _____, and recorded in the Wake County Register of Deeds Office on _____, in Book _____ Page _____.

4. If Affiant is the authorized agent of the owner(s) of the Property, Affiant possesses documentation indicating the agency relationship granting the Affiant the authority to apply for development approval on behalf of the owner(s).

5. If Affiant is the owner of the Property, from the time Affiant was deeded the Property on _____, Affiant has claimed sole ownership of the Property. Affiant or Affiant's predecessors in interest have been in sole and undisturbed possession and use of the property during the period of ownership. Since taking possession of the Property on _____, no one has questioned Affiant's ownership or right to possession nor demanded any rents or profits. To Affiant's knowledge, no claim or action has been brought against Affiant (if Affiant is the owner), or against owner(s) (if Affiant is acting as an authorized agent for owner(s)), which questions title or right to possession of the property, nor is any claim or action pending against Affiant or owner(s) in court regarding possession of the Property.

This the 27th day of Sept, 2019.

_____ (seal)
Erica Leatham
Type or print name

STATE OF NORTH CAROLINA
COUNTY OF Wake

I, the undersigned, a Notary Public in and for the County of Wake, hereby certify that Erica Leatham, Affiant, personally known to me or known to me by said Affiant's presentation of said Affiant's Erica Leatham, personally appeared before me this day and acknowledged the due and voluntary execution of the foregoing Affidavit.

[NOTARY SEAL]

SARA S. CLIFTON NOTARY PUBLIC WAKE COUNTY, N.C.

_____
Notary Public Sara S Clifton
State of North Carolina
My Commission Expires: 1-10-2020

AFFIDAVIT OF OWNERSHIP: EXHIBIT A – LEGAL DESCRIPTION

Application #: _____ Submittal Date: _____

Insert legal description below.

Beginning at an existing iron pipe found in Olive Farm Road (SR 1178)(60' Public Right of Way), said iron pipe being South 49°37'44" West 28,658.33 feet from NCGS monument "Staley" having N.C. Grid Coordinates (NAD83/2011) of N=727,821.36, E=2,043,644.97, thence from said Beginning point, with a line in said road the following 8 calls; South 21°48'27" West 100.04 feet to a point, thence South 12°15'17" West 100.09 feet to a point, thence South 03°45'42" West 100.03 feet to a point, thence South 01°43'47" West 100.04 feet to a point, thence South 00°11'33" East 100.03 feet to a point, thence South 10°26'03" East 99.95 feet to a point, thence South 37°21'17" East 74.79 feet to an existing iron pipe, thence South 62°11'48" East 52.88 feet to a rebar set, thence leaving said line in Olive Farm Road (SR 1178) North 82°02'43" West 78.75 feet to a rebar set on the southwestern right of way of Olive Farm Road (SR 1178)(60' Public Right of Way), thence leaving said right of way North 82°02'43" West 64.50 feet to an existing iron pipe, thence North 85°44'16" West 448.90 feet to an existing iron pipe, thence South 03°55'05" West 1,407.26 feet to an existing iron pipe, thence South 03°53'40" West 401.10 feet to an existing iron pipe, thence South 06°15'03" West 347.00 feet to a rebar set, thence North 87°04'04" West 851.57 feet to an existing iron pipe, thence North 86°43'16" West 847.07 feet to a rebar set, thence North 01°00'24" East 76.02 feet to nail found at a bent iron pipe, thence North 89°12'54" West 100.50 feet to an existing iron pipe found, thence North 00°14'54" East 1,005.76 feet to an existing iron pipe, thence North 00°16'46" East 692.82 feet to an existing iron pipe, thence North 00°15'45" East 344.53 feet to an existing iron pipe, thence North 00°15'45" East 372.44 feet to a rebar set, thence North 00°22'39" East 30.01 feet to a rebar set, thence North 00°18'40" East 30.01 feet to an existing iron pipe, thence North 00°16'16" East 344.87 feet to an existing iron pipe, thence South 89°48'42" East 617.69 feet to an existing iron pipe, thence North 06°53'33" West 580.45 feet to a point in the centerline of Humie Olive Road (SR 1142)(60' Public Right of way), thence with said centerline North 81°10'21" East 136.24 feet to a point, thence North 81°24'46" East 53.40 feet to a point, thence North 83°08'38" East 60.19 feet to a point, thence North 85°15'06" East 77.57 feet to a point, thence North 85°46'28" East 104.35 feet to a point, thence North 85°53'22" East 147.45 feet to a point, thence North 86°13'49" East 26.06 feet to a point, thence North 86°13'49" East 35.00 feet to a point, thence North 86°13'49" East 115.00 feet to a point, thence leaving said centerline South 02°39'12" West 30.17 feet to a point on the southern right of way of Hume Olive Road (SR 1142)(60' Public Right of Way), thence leaving said right of way South 02°47'15" West 621.32 feet to an existing iron pipe, thence South 00°29'09" West 225.80 feet to an existing rebar, thence North 89°34'45" East 1,224.62 feet to the point and place of Beginning containing 141.732 Acres more or less.

NOTICE OF NEIGHBORHOOD MEETING

This document is a public record under the North Carolina Public Records Act and may be published on the Town's website or disclosed to third parties.

9/16/19

Date

Dear Neighbor:

You are invited to a neighborhood meeting to review and discuss the development proposal at

8824 & 8829 NEW HOPE FARM RD; 3108 & 3120 OLIVE FARM RD; & 0 HUMIE OLIVE RD — Address(es)

0710-98-6889 & 0720- 07-5965, 09-2779, 09-3139, & 18-1967 — PIN(s)

in accordance with the Town of Apex Neighborhood Meeting procedures. This meeting is intended to be a way for the applicant to discuss the project and review the proposed plans with adjacent neighbors and neighborhood organizations before the submittal of an application to the Town. This provides neighbors an opportunity to raise questions and discuss any concerns about the impacts of the project before it is officially submitted. Once an application has been submitted to the Town, it may be tracked using the Interactive Development Map or the Apex Development Report located on the Town of Apex website at www.apexnc.org.

A Neighborhood Meeting is required because this project includes (check all that apply):

	Application Type	Approving Authority
☑	Rezoning (including Planned Unit Development)	Town Council
■	Major Site Plan	Town Council (QJPH*)
☐	Special Use Permit	Town Council (QJPH*)
☑	Residential Master Subdivision Plan (excludes exempt subdivisions)	Technical Review Committee (staff)

*Quasi-Judicial Public Hearing: The Town Council cannot discuss the project prior to the public hearing.

The following is a description of the proposal (also see attached map(s) and/or plan sheet(s)):

The applicant hopes to rezone about 142 acres to allow for the development of a residential community with about 475 dwelling units consisting of a mix of single-family detached homes on lots of different sizes and well as townhomes.

Estimated submittal date: October 1

MEETING INFORMATION:

Property Owner(s) name(s): HENRY KASTELBERG, CAROL B HEELAN IRREVOCABLE TRUST, JERIF & LISA CICIN, AND EDWARD & DEBORAH PEART

Applicant(s): Jason Barron - Attorney for Applicant

Contact information (email/phone): 919-590-0371

Meeting Address: 237 N Salem St., Apex, NC 27502

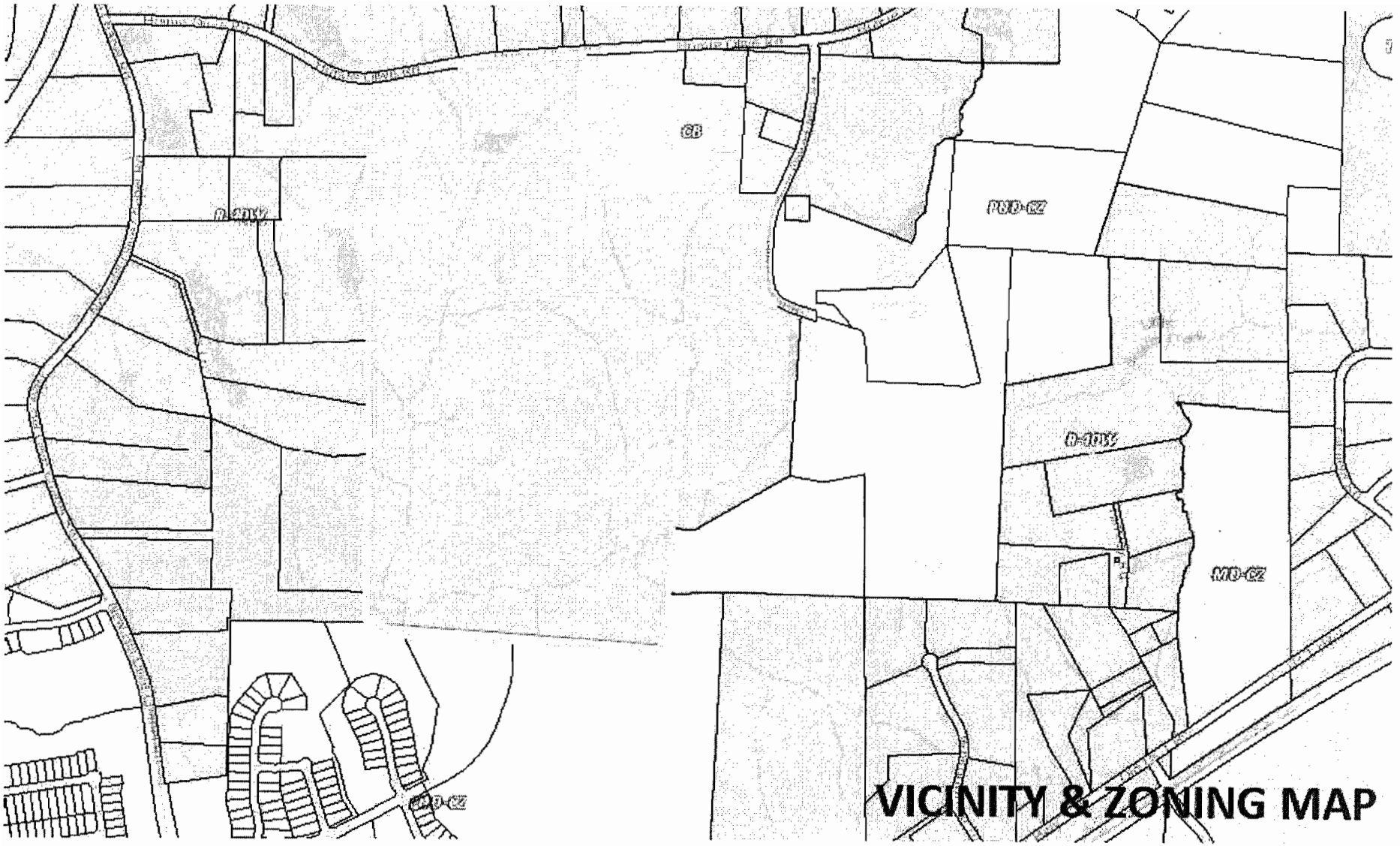
Date of meeting**: September 26, 2019

Time of meeting**: 6:00 PM

MEETING AGENDA TIMES:

Welcome: 6:00 - 6:05 Project Presentation: 6:05 - 6:10 Question & Answer: 6:10 - end

**Meetings shall occur between 5:00 p.m.-9:00 p.m. on a Monday through Thursday (excluding Town recognized holidays). If you have questions about the general process for this application, please contact the Planning Department at 919-249-3426. You may also find information about the Apex Planning Department and on-going planning efforts at http://www.apexnc.org/180/Planning.


CB
PUD-CZ
O-40X
MU-CZ
VICINITY & ZONING MAP

3 BOYS CAPITAL LLC MUSIC ROW INVESTMENTS LLC
1018 N WELLONSBURG PL
APEX NC 27502-7127

3 BOYS CAPITAL LLC SB CAPITAL LLC
1018 N WELLONSBURG PL
APEX NC 27502-7127

ADAMS-KNOUFF, CAREY
8833 TWIN PONDS LN
NEW HILL NC 27562-9235

ALBRECHT, DONNA J TRUSTEE DONNA J ALBRECHT
RVCBLE LVNG TRUST
8820 NEW HOPE FARM RD
NEW HILL NC 27562-9178

TOWN OF APEX PLANNING DEPARTMENT
PO BOX 250
APEX NC 27502-0250

APEX TOWN OF
PO BOX 250
APEX NC 27502-0250

CAROL B HEELAN IRREVOCABLE TRUST
c/o GEORGE HEELAN TRUSTEE
12940 DORMAN RD APT 2206
PINEVILLE NC 28134-9386

CICIN, JERIF CICIN, LISA
104 CORSICA LN
CARY NC 27511-6476

FMR INVESTMENTS LLC CHATHAM CAPITAL GROUP LLC
1018 N WELLONSBURG PL
APEX NC 27502-7127

GENTILE, CHRISTOPHER D
1816 CROSS COUNTRY LN
APEX NC 27502-9600

GOODMAN, WILLIAM DAVID JR GOODMAN, JILL M
PO BOX 307
NEW HILL NC 27562-0307

HOFFMAN, JOSEPH E JR HOFFMAN, SHIRLEY J
8800 NEW HOPE FARM RD
NEW HILL NC 27562-9178

JUDD, MILDRED B JUDD, LINDA FAYE
8600 HUMIE OLIVE RD
APEX NC 27502-8976

KASTELBERG, HENRY STEVEN
8824 NEW HOPE FARM RD
NEW HILL NC 27562-9178

KELLY, ROBERT L KELLY, MILDRED D
3000 GALLOWAY RDG APT B302
PITTSBORO NC 27312-3803

MCKEITHAN, KAREN D ST CLAIR, LANCE
8812 NEW HOPE FARM RD
NEW HILL NC 27562-9178

MCKINNISH, TIMOTHY D
PO BOX 58232
RALEIGH NC 27658-8232

NORMAN, JOHN K
8848 TWIN PONDS LN
NEW HILL NC 27562-9234

OLIVE, A C HEIRS
3101 OLIVE FARM RD
APEX NC 27502-9632

OLIVE, JUDITH H OLIVE, ROBERT A
3132 OLIVE FARM RD
APEX NC 27502-9632

OLIVER, JAMES E JR OLIVER, JANICE
8620 HUMIE OLIVE RD
APEX NC 27502-8976

OLIVER, JAMES E JR OLIVER, JANICE
8608 HUMIE OLIVE RD
APEX NC 27502-8976

PAIRIS-GARCIA, MONIQUE GARCIA, JUAN
8815 NEW HOPE FARM RD
NEW HILL NC 27562-9179

PEART, EDWARD A PEART, DEBORAH N
8829 NEW HOPE FARM RD
NEW HILL NC 27562-9179

PULTE HOME COMPANY, LLC
1225 CRESCENT GRN STE 250
CARY NC 27518-8119

YUMEEWARRA FARM LLC
8633 HUMIE OLIVE RD
APEX NC 27502-8976

AFFIDAVIT OF CONDUCTING A NEIGHBORHOOD MEETING, SIGN-IN SHEET AND ISSUES/RESPONSES SUBMITTAL

This document is a public record under the North Carolina Public Records Act and may be published on the Town's website or disclosed to third parties.

I, Nil Ghosh, do hereby declare as follows:
Print Name

1. I have conducted a Neighborhood Meeting for the proposed Rezoning, Major Site Plan, Master Subdivision Plan, or Special Use Permit in accordance with UDO Sec. 2.2.7 *Neighborhood Meeting*.

2. The meeting invitations were mailed to the Apex Planning Department, all property owners within 300 feet of the subject property and any neighborhood association that represents citizens in the area via first class mail a minimum of 10 days in advance of the Neighborhood Meeting.

3. The meeting was conducted at 237 N Salem St (location/address) on 9/26/19 (date) from 6:00 (start time) to 8:00 (end time).

4. I have included the mailing list, meeting invitation, sign-in sheet, issue/response summary, and zoning map/reduced plans with the application.

5. I have prepared these materials in good faith and to the best of my ability.

9/27/19
Date

By: _____

STATE OF NORTH CAROLINA
COUNTY OF WAKE

Sworn and subscribed before me, Jeffrey Phillips, a Notary Public for the above State and County, on this the 27th day of September, 2019.

SEAL

JEFFREY PHILLIPS NOTARY PUBLIC DURHAM COUNTY, N.C. My Comm. Exp. 02-24-2024.

_____
Notary Public

Jeffrey Phillips
Print Name

My Commission Expires: 02-24-2024

NEIGHBORHOOD MEETING SIGN-IN SHEET

This document is a public record under the North Carolina Public Records Act and may be published on the Town's website or disclosed to third parties.

Meeting Address: 237 N Salem St

Date of meeting: 9/26/19 Time of meeting: 6:00 PM

Property Owner(s) name(s): HENRY KASTELBERG, CAROL B HEELAN IRREVOCABLE TRUST, JERIF & LISA CICIN, AND EDWARD & DEBORAH PEART

Applicant(s): Jason Barron - Attorney for Applicant

Please print your name below, state your address and/or affiliation with a neighborhood group, and provide your phone number and email address. Providing your name below does not represent support or opposition to the project; it is for documentation purposes only.

	NAME/ORGANIZATION	ADDRESS	PHONE #	EMAIL	SEND PLANS & UPDATES
1.	DONNA ARSENAULT	8820 New Hope Farm	[redacted]	[redacted]	Yes
2.	Steve Kastelberg	8824 New Hope Farm			
3.	Mimi & Bob Kelly	3000 Galloway St. Hebron			
4.	Paul Barth	2108 New Hill Olive Chapel Rd			
5.	Joe Hoffman	8800 New Hope Farm Rd New Hill, N.C 27562			
6.	Bill Zahn	8633 Humble Olive			
7.	Denis Connaghan	8633 Humble Olive			
8.	Steve Knight	"			
9.	Rob Tessar	1901 N. Harrison Ave			
10.	V+D Cadagan	8824 New Hope Farm			
11.					
12.					
13.					
14.					

Use additional sheets, if necessary.

SUMMARY OF DISCUSSION FROM THE NEIGHBORHOOD MEETING

This document is a public record under the North Carolina Public Records Act and may be published on the Town's website or disclosed to third parties.

Property Owner(s) name(s): HENRY KASTELBERG, CAROL B HEELAN IRREVOCABLE TRUST, JERIF & LISA CICIN, AND EDWARD & DEBORAH PEART

Applicant(s): Jason Barron - Attorney for Applicant

Contact information (email/phone): jbarron@morningstarlawgroup.com/919.590.0371

Meeting Address: 237 N Salem St

Date of meeting: 9/26/19 Time of meeting: 6:00PM

Please summarize the questions/comments and your response from the Neighborhood Meeting in the spaces below (attach additional sheets, if necessary). Please state if/how the project has been modified in response to any concerns. The response should not be "Noted" or "No Response". There has to be documentation of what consideration the neighbor's concern was given and justification for why no change was deemed warranted.

Question/Concern #1:
There was a concern about the Town annexing surrounding property in conjunction with this application

Applicant's Response:
We explained that the Town does not have the authority to independently annex property without the owner's consent, so no other property would be annexed as a result of our application.

Question/Concern #2:
There was a concern about increased runoff

Applicant's Response:
We explained that the project will meet the Town's requirements for stormwater runoff controls and that there are required buffers around streams on the property which will help to keep it clean

Question/Concern #3:
There was a concern about the hours of construction activity because the project will be in the Town while the neighboring properties are in the County which might have different rules

Applicant's Response:
We explained that though the Town and County ordinances may differ, we would be happy to work with this particular neighbor to coordinate construction activities with his horse farm activities

Question/Concern #4:
How long will it take to build out this community?

Applicant's Response:
A community of this size will be built out in phases. Once we break ground, it will take at least 5 to 6 years to build out the entire community.

PROJECT CONTACT INFORMATION

This document is a public record under the North Carolina Public Records Act and may be published on the Town's website or disclosed to third parties.

Development Contacts:

Project Name: Heelan Zoning: PUD-CZ

Location: 8824 & 8829 NEW HOPE FARM RD; 3108 & 3120 OLIVE FARM RD; & 0 HUMIE OLIVE RD

Property PIN(s): 0710-58-6689 & 0720- 07-5965, 09-2779, 09-3139, & 16-1967 Acreage/Square Feet: 141.12

Property Owner: HENRY KASTELBERG, CAROL B HEELAN IRREVOCABLE TRUST, JERIF & LISA CICIN, AND EDWARD & DEBORAH PEART

Address:

City: State: Zip:

Phone: Email:

Developer: Jason Barron - Attorney for Developer

Address: 421 Fayetteville St | Ste 530

City: Raleigh State: NC Zip: 27601

Phone: 919.590.0371 Fax: Email: jbarron@morningstarlawgroup.com

Engineer: Peter Cnossen

Address: P.O. Box 1062

City: Apex State: NC Zip: 27502

Phone: 919.387.1174 Fax: Email: peter@jonescnossen.com

Builder (if known):

Address:

City: State: Zip:

Phone: Fax: Email:

Please note that Town staff will not have complete information about a proposed development until the application is submitted for review. If you have a question about Town development standards and how they relate to the proposed development, please contact the appropriate staff person listed below.

Town of Apex Department Contacts

Planning Department Main Number (Provide development name or location to be routed to correct planner)	(919) 249-3426
Parks, Recreation & Cultural Resources Department Angela Reincke, Parks Planner	(919) 249-7468
Public Works - Transportation Russell Dalton, Senior Transportation Engineer	(919) 249-3358
Water Resources Department Mike Deaton, Stormwater & Utility Engineering Manager Stan Fortier, Senior Engineer (Sedimentation & Erosion Control)	(919) 249-3413 (919) 249-1166
Electric Utilities Division Rodney Smith, Electric Technical Services Manager	(919) 249-3342

Providing Input to Town Council:

Each Town Council meeting agenda includes a Public Forum time when anyone is permitted to speak for three (3) minutes on any topic with the exception of items listed as Public Hearings for that meeting. The Town Council meets on the 1st and 3rd Tuesdays of each month at 7:00 p.m. (except for holidays, see schedule of meetings at http://www.apexnc.org/838/Agendas-Minutes). You may also contact Town Council by e-mail at AllCouncil@apexnc.org.

Private Agreements and Easement Negotiation:

The Town of Apex cannot enforce private agreements between developers and neighbors and is not a party to the easement and right-of-way negotiation that occurs between developers and neighboring property owners for easements or rights-of-way that are necessary to build the project.

It is recommended that all private agreements be made in writing and that if a property owner feels it necessary, they should obtain private legal counsel in order to protect their interests in both private agreements and during easement negotiations. The only conditions that the Town of Apex can enforce are those conditions that are made a part of the conditional zoning of the property by agreement of the developer and the Town.

As an example, if a developer offers to build a fence for a neighbor to mitigate some impact, the Town can only enforce the construction of the fence if the fence becomes a condition of the rezoning. This would occur by the developer offering the condition as part of their conditional zoning application package or at the Town Council public hearing on the conditional zoning and the Town accepting it as a condition. Private agreements regarding a fence being constructed will not be enforced by the Town.

To request that any agreement with a developer is made a part of the conditional zoning at the time of approval, you may ask at the Town Council public hearing if the agreement is included in the conditions. If it is not, you may request that the Town Council not approve the rezoning without the agreement being included in the conditions (note that it is up to Town Council whether to approve or deny the rezoning but they cannot impose conditions that the applicant does not agree to add). The developer's proposed conditions can be viewed any time after a rezoning is submitted on the Interactive Development Map at: http://apexnc.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=fa9ba2017b784030b15ef4da27d9e795

Documentation:

Neighbors to a requested new development and/or rezoning are strongly encouraged to fully document (such as through dated photographs) the condition of their property before any work is initiated for the new development. Stormwater controls installed on developed property are not designed to and will likely not remove 100% of the soil particles transported by stormwater runoff. As a result, creeks and ponds could become cloudy for a period of time after rain events.

COMMON CONSTRUCTION ISSUES & WHO TO CALL

This document is a public record under the North Carolina Public Records Act and may be published on the Town's website or disclosed to third parties.

Noise & Hours of Construction: Non-Emergency Police 919-362-8661

Noise from tree removal, grading, excavating, paving, and building structures is a routine part of the construction process. The Town generally limits construction hours from 7:00 a.m. to 8:30 p.m. so that there are quiet times even during the construction process. Note that construction outside of these hours is allowed with special permission from the Town when it makes more sense to have the construction occur at night, often to avoid traffic issues. In addition, the Town limits hours of blasting rock to Monday through Friday from 8:00 a.m. to 5:00 p.m. Report violations of construction hours and other noise complaints to the Non-Emergency Police phone number at 919-362-8661.

Construction Traffic: James Misciagno 919-372-7470

Construction truck traffic will be heavy throughout the development process, including but not limited to removal of trees from site, loads of dirt coming in and/or out of the site, construction materials such as brick and wood brought to the site, asphalt and concrete trucks come in to pave, etc. The Town requires a construction entrance that is graveled to try to prevent as much dirt from leaving the site as possible. If dirt does get into the road, the Town can require they clean the street (see "Dirt in the Road" below).

Road Damage & Traffic Control: Water Resources – Infrastructure Inspections 919-362-8166

There can be issues with roadway damage, roadway improvements, and traffic control. Potholes, rutting, inadequate lanes/signing/striping, poor traffic control, blocked sidewalks/paths are all common issues that should be reported to Water Resources – Infrastructure Inspections at 919-249-3427. The Town will get NCDOT involved if needed.

Parking Violations: Non-Emergency Police 919-362-8661

Unless a neighbor gives permission, there should be no construction parking in neighbors' driveways or on their property. Note that parking in the right-of-way is allowed, but Town regulations prohibit parking within 15 feet of driveways so as not to block sight triangles. Trespassing and parking complaints should be reported to the Non-Emergency Police phone number at 919-362-8661.

Dirt in the Road: James Misciagno 919-372-7470

Sediment (dirt) and mud gets into the existing roads due to rain events and/or vehicle traffic. These incidents should be reported to James Misciagno. He will coordinate the cleaning of the roadways with the developer.

Dirt on Properties or in Streams: James Misciagno 919-372-7470
Danny Smith Danny.Smith@ncdenr.gov

Sediment (dirt) can leave the site and get onto adjacent properties or into streams and stream buffers; it is typically transported off-site by rain events. These incidents should be reported to James Misciagno at 919-372-7470 so that he can coordinate the appropriate repairs with the developer. Impacts to the streams and stream buffers should also be reported to Danny Smith (danny.smith@ncdenr.gov) with the State.

Dust: James Misciagno 919-372-7470

During dry weather dust often becomes a problem blowing into existing neighborhoods or roadways. These incidents should be reported to James Misciagno at 919-372-7470 so that he can coordinate the use of water trucks onsite with the grading contractor to help control the dust.

Trash: James Misciagno 919-372-7470

Excessive garbage and construction debris can blow around on a site or even off of the site. These incidents should be reported to James Misciagno at 919-372-7470. He will coordinate the cleanup and trash collection with the developer/home builder.

Temporary Sediment Basins: James Misciagno 919-372-7470

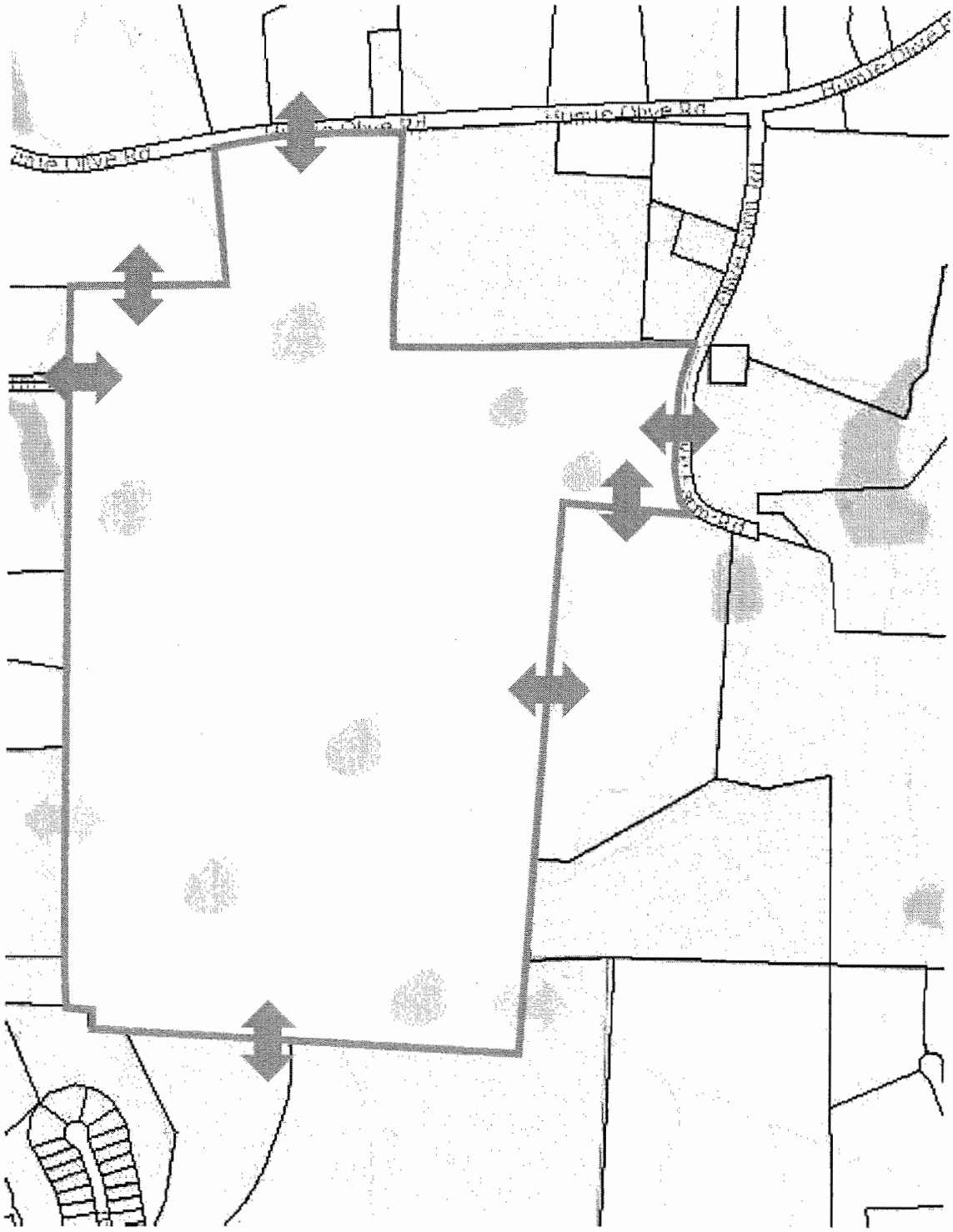
Temporary sediment basins during construction (prior to the conversion to the final stormwater pond) are often quite unattractive. Concerns should be reported to James Misciagno at 919-372-7470 so that he can coordinate the cleaning and/or mowing of the slopes and bottom of the pond with the developer.

Stormwater Control Measures: Mike Deaton 919-249-3413

Post-construction concerns related to Stormwater Control Measures (typically a stormwater pond) such as conversion and long-term maintenance should be reported to Mike Deaton at 919-249-3413.

Electric Utility Installation: Rodney Smith 919-249-3342

Concerns with electric utility installation can be addressed by the Apex Electric Utilities Department. Contact Rodney Smith at 919-249-3342.



- ≈ 141 acres
- Mix of Townhomes and single-family detached
- 520 units max (3.7 du/ac)

Heelan Property PUD

PD PLAN

APEX, NORTH CAROLINA

Submitted:

October 1, 2019

Revised:

November 7, 2019

December 6, 2019

January 9, 2020

January 26, 2020

July 31, 2020

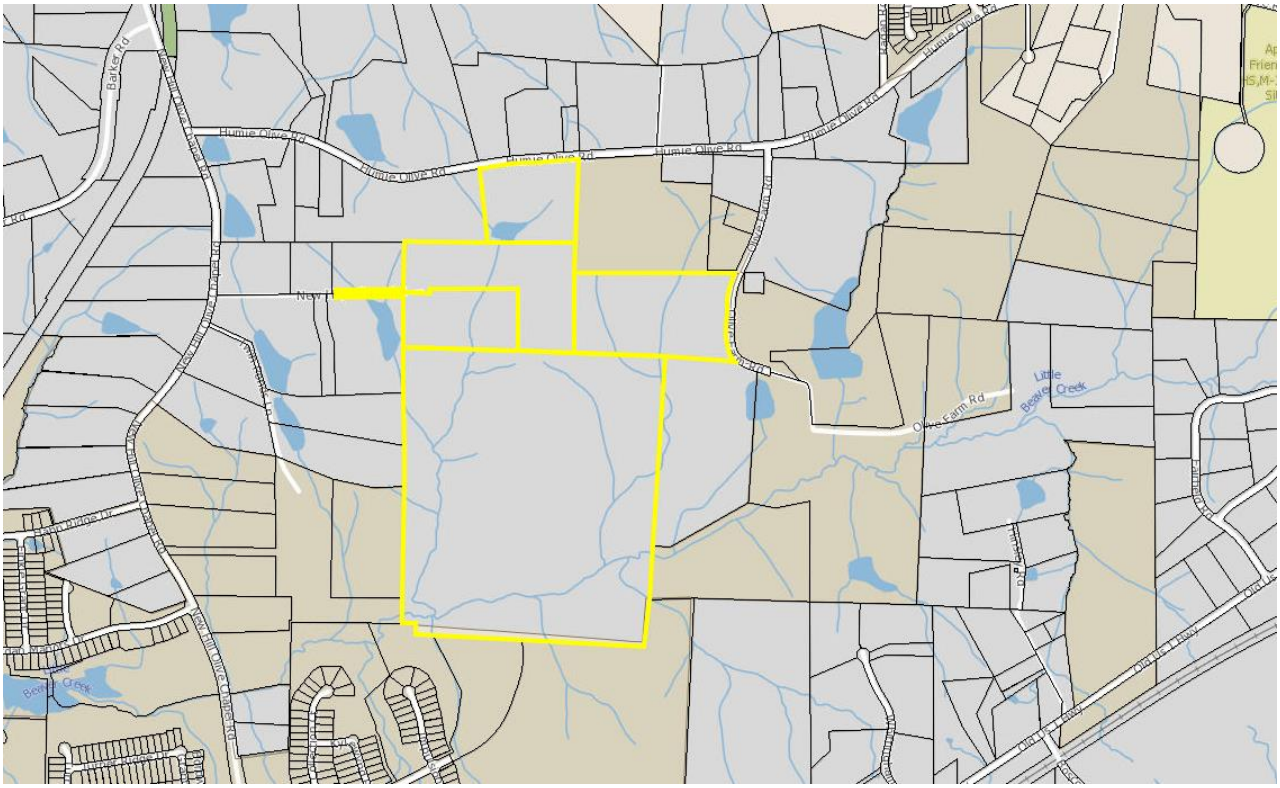
August 27, 2020

PREPARED BY:

MORNINGSTAR LAW GROUP

Section 1: Table of Contents – PUD Text

Section 2: Vicinity Map



The Heelan Property PUD is in the southwest region of Apex, east of New Hill Olive Chapel Road, south of Humie Olive Road, west of Olive Farm Road, and north of Old US-1. The Friendship Station PUD is being developed just east of the property. The Woodbury Community is being developed south of the property and Jordan Manors is further west of the property.

Section 3: Project Data

A. Name of Project:
Heelan Property PUD

B. Property Owners:
Henry Steven Kastelberg
Carol B Heelan Irrevocable Trust
Lisa & Jerif Cicin
Deborah N & Edward A Peart

C. Prepared By:
Jason Barron, Partner
Morningstar Law Group
421 Fayetteville St | Ste 530
Raleigh, NC 27601

D. Current Zoning Designation:
Residential-40 Watershed (R-40W)

E. Proposed Zoning Designation:
Planned Unit Development – Conditional Zoning (PUD-CZ)

F. Current 2045 Land Use Map Designation:
Low Density Residential (≤3 units/acre)
Medium Density Residential (3-7 units/acre)

G. Proposed 2045 Land Use Map Designation:
Medium Density Residential
Low Density Residential

H. Proposed Use
Up to 520 dwelling units and associated open space, recreational amenities and infrastructure.

I. Size of Project

Wake County Tax Identification Number	Acreage
0710-98-6889 0720-07-5965 0720-09-2779 0720-09-3139 0720-18-1967	142.42 acres

Section 4: Purpose Statement

The Heelan Property PUD development will be a single-family residential community with both detached and townhomes. The maximum building height shall be forty-five feet (45') measured to the top of any pitched roof. A 20-ft Type B Buffer will be established along the majority of the project's boundary, except for a 50-foot Type B Thoroughfare Buffer along Humie Olive Road, and a 15-ft Type A Landscape Buffer along the southern boundary and portions of the east and west boundaries. Additionally, all the buildings shall be prewired for solar.

This concept is consistent with the Town's stated PUD goal to provide site specific, high quality neighborhoods that preserve natural features and exhibit compatibility with, and connectivity to, surrounding land uses. More specifically, this plan will:

- Allow uses that are compatible with Section 4.2.2, *Use Table* of the UDO
- Provide for the preservation of existing open space areas.
- Provide appropriate buffering and screening from the proposed use to the existing residential areas.
- Demonstrate dimensional standards that are consistent with the UDO, and where variations occur, said variations will be included herein and subject to Council approval.
- Provide a high-quality community that is linked by a network of connected streets and pedestrian sidewalks that promotes connectivity, walkability and healthy lifestyles.
- Exhibit character and quality that is compatible with surrounding communities, which is expected to enhance the value of surrounding land uses.
- Provide significant open space and walkable trails to promote pedestrian activity, while appropriately buffering adjacent residential areas.
- Extend Horton Ridge Boulevard from its current terminus through and to the eastern edge of the property.
- Construct and install a Town greenway addition through the property from the adjacent Olive Ridge PUD.
- In an effort to facilitate the Town's ability to extend Richardson Road in the future, dedication to the State of North Carolina of a conservation easement area of not less than 7.9 acres in order to facilitate release of other conservation easement area from the State of North Carolina.
- Provide energy efficient amenities, including prewiring of all single-family detached dwellings for solar installation, installation of electric vehicle charging stations at the amenity, and active solar installations for several single family model homes along with the primary amenity building for the property.
- In partnership with Habitat for Humanity or other non-profit affordable housing provider, provide for up to ten (10) affordable townhome dwellings on the property.

All site-specific standards and conditions of this PUD Plan shall be consistent with all Conditional Zoning (CZ) District standards set forth in the UDO Section 2.3.3, *Conditional Zoning Districts* and UDO Section 2.3.4.F.1, *Planned Unit Development (PUD-CZ) District*. The proposed PUD will provide a development density that is consistent with principles found throughout the recently updated Advance Apex 2045.

Section 5: Permitted Uses:

The development will only include residential and supporting uses. Specifically, the permitted uses include:

- Accessory apartment
- Single-family
- Townhouse
- Greenway
- Recreation Facility, private
- Park, active
- Park, passive
- Utility, minor

Additionally, the following conditions shall also apply:

A. A maximum of 520 residential units shall be permitted upon the property, no more than 260 of which may be developed as townhomes.

B. No covenant prohibiting the accessory apartment use shall encumber the property.

C. Richardson Road Conservation Easement Mitigation:

a. In concert with the Town's request for release from the State of North Carolina, at the time of master subdivision approval the developer shall dedicate or cause to be dedicated to the State of North Carolina a conservation easement area over and upon approximately 7.946 acres of land as show on the attached Exhibit A and more particularly described therein.

D. Energy Efficiency:

a. All single-family detached dwellings constructed upon the property will be designed and constructed to include pre-configuration measures for future installation of roof-mounted solar panels.

b. A minimum of two (2) model homes for single family detached dwellings constructed upon the property shall include installation of solar panels and power system of at least 4 KV capacity.

c. Solar PV systems shall be installed upon the primary amenity building constructed upon the property. The size of such PV systems shall have a capacity of not less than .75 KW/1,000 HSF of building floor area.

d. Development of the property shall include the installation of a minimum of two (2) electric vehicle charging stations within the primary amenity area as designated on the master subdivision plan.

E. Affordable Housing:

a. Prior to recording the plat containing the 200th lot upon the property, the developer shall record with the Wake County Register of Deeds an Option in favor of Habitat for Humanity of Wake County, Inc. ("Habitat Wake") or other non-profit affordable housing provider granting them an option to purchase a minimum of ten (10) finished townhome lots within the community, with the cost of such lots being the cost that the developer pays for such lots.

F. Tree Canopy:

a. To demonstrate the project's commitment to preserving and re-establishing tree canopy in our region, the developer seeks to replant and restore existing tree canopy that is removed from those portions of the property that are anticipated to contain single family and townhome lots. To that end, prior to recording the first subdivision plat for the property, the developer will provide a donation of $19,200 to a local non-profit organization with a mission towards tree preservation and replacement. In those portions of the site where trees are removed for single family or townhome lots, the developer anticipates it can offset such removal by preserving 33.7 acres of existing tree canopy in other places on the site, and replacing and replanting trees over 95.82 acres of the rest of the property. As such, this $19,200 donation represents an assigned per-tree value in substitute canopy for the remainder of the property.

Section 6: Proposed Design Controls

A. Maximum Non-Residential Design Controls

This PUD does not provide for any non-residential land uses (see Section 5, *Permitted Uses*).

B. Residential Densities and Design Controls

Density - The overall gross density shall not exceed 3.7 units per acre. Density within the region designated as Low Density on the 2045 Land Use Map shall not exceed 3 units per acre, with a maximum of 96 residential units in this area. A density of up to 6 units per acre is allowed within areas designated as Medium Density on the 2045 Land Use Map.

Design Controls – At a minimum all residential uses shall comply with the following dimensional standards:

Maximum Density: (including RCA and rights-of-way)	3.7 Units/Acre
Maximum Number of Units:	520
Within Low Density Residential:	96
Maximum Built-Upon Area:	70%
Minimum Lot Size:	n/a
Minimum Lot Width:	
Townhome Lots:	18’
Single-Family Lots:	40’
Maximum Building Height:	45’ and 3 stories

Minimum Setbacks	Single-Family	Townhome
Front	10’	10’
Rear	20’	20’
Side	5’	0’
Corner	5’	5’
Building to Building	NA	10’
From Buffer/RCA	10’ for Buildings 5’ for Parking Areas	10’ for Buildings 5’ for Parking Areas

Note: Porches, patios, decks and other accessory structures may encroach into building setbacks as allowed by the Town of Apex UDO.

C. Buffers

Perimeter Buffers

North boundary:	20-foot Type B
South boundary:	15-foot Type A
West boundary:	
Adjacent to Use Class 1:	20-foot Type B
Adjacent to Other Use Classes:	15-ft Type A
East boundary:	
Adjacent to Use Class 1:	20-foot Type B
Adjacent to Other Use Classes:	15-ft Type A

Note: Where perimeter buffers coincide with stream buffers or 100-year floodplain, existing vegetation will be used to meet the buffer width and opacity.

Thoroughfare Buffers

As depicted on the PD Plan, a 50-ft Type B Buffer shall be established along Humie Olive Road. Acreage within this buffer may be used to accommodate easements for other purposes including, but not limited to, greenways, public utilities, sidewalk, and the like.

Section 7: Proposed Architectural Controls

The proposed development offers the following architectural controls to ensure a consistency of character throughout the development, while allowing for enough variety to create interest and avoid monotony. Changes to the exterior materials, roof, windows, doors, process, trim, etc. are allowable with administrative approval at the staff level. Further details shall be provided at the time of Site Plan submittal. The following conditions shall apply:

A. Vinyl siding is not permitted; however, vinyl windows, decorative elements, and trim are permitted.
B. Residential areas will utilize brick, stone, and fiber cement plank siding.
C. Windows that are not recessed shall be trimmed. Windows shall vary in size and/or type.
D. At least four of the following decorative features shall be used on each building: decorative shake, board and batten siding, decorative porch rails and posts, shutters, decorative functional foundation and roof vents, recessed windows, decorative windows, decorative brick or stone, decorative gables, decorative cornices, or metal roofing.
E. A varied color palette shall be utilized throughout the development to include a minimum of three-color families for siding and shall include varied trim, shutter, and accent colors complementing the siding color.
F. Garage doors shall have windows, decorative details or carriage-style adornments on them.
G. The front façade of any front-loaded garage shall not protrude farther than one foot forward of (i) the front façade of the dwelling unit, or (ii) the front porch of the dwelling unit, whichever is closer to the right-of-way from which the dwelling unit is addressed.

H. J-drives or courtyard driveways shall be exempt from condition G above but shall make up no more than 30% of all single-family homes. There shall be no more than two (2) residences with a J-drive constructed in a row. Any lots eligible for a J-driveway home shall be identified on the Final Plat.
I. Garages on the front façade of a single-family home that faces the street shall not exceed 40% of the total width of the house and garage together.
J. Eaves shall project at least 12 inches from the wall of the structure.
K. House entrances for units with front-facing single-car garages shall have a prominent covered porch/stoop area leading to the front door.
L. The rear and side elevations of the units that can be seen from the right-of-way shall have trim around the windows.
M. Front porches shall be a minimum of 6 feet deep.
N. The visible side of a home on a corner lot facing the public street shall contain at least 3 decorative elements such as, but not limited to, the following elements:
    1. Windows
    2. Bay window
    3. Recessed window
    4. Decorative window
    5. Trim around the windows
    6. Wrap around porch or side porch
    7. Two or more building materials
    8. Decorative brick/stone
    9. Decorative trim
    10. Decorative shake
    11. Decorative air vents on gable
    12. Decorative gable
    13. Decorative cornice
    14. Column
    15. Portico
    16. Balcony
    17. Dormer
O. Additionally, the following conditions shall apply to any Townhome building(s):
    1. The roof of each unit shall be horizontally and/or vertically distinct from any adjacent unit to avoid the appearance of a single mass.

Section 8: Parking and Loading

Parking for the development shall be per Town of Apex UDO. The requirements under Section 8.3 of the Town's UDO will be met.

Section 9: Signage

All signage for this PUD shall comply with Section 8.7, Signs, of the Town of Apex UDO.

Section 10: Natural Resource and Environmental Data

A. River Basins and Watershed Protection Overlay Districts

The project is located within the primary watershed within the Beaver Creek Basin. Portions of the subject property along the southern boundary lie within Zone AE flood hazard areas according to the FEMA Floodplain Maps #s 3720072000J and 3720071000K. Based on review of the FEMA Floodplain Map #s 3720072000J and 3720071000K the majority of the subject property is located in the Zone X (non-shaded) area that is determined to be outside the 0.2% annual chance and future conditions 1% annual chance floodplain.

B. Resource Conservation Areas (RCA) – Required and Provided

This PUD will be subject to, and meet the requirements of Section 8.1.2 of the UDO, *Resource Conservation Area* and Section 2.3.4, *Planned Development Districts*.

The Site is located on the west of the 540 corridor and therefore is required to preserve a minimum of 25% Resource Conservation Area (RCA). Because the

project is planned to be mass graded, an additional 5% RCA is required per Section 7.2.5(B) of the Town's UDO. Designated RCA areas will be consistent with the items listed in Section 8.1.2(B) of the Town's UDO. Preserved streams, wetlands, and associated riparian buffers provide the primary RCA's throughout the site. Additional RCA area provided may include stormwater management areas, perimeter buffers, and greenway trails within the walkable community.

C. Any Historic Structures Present

As confirmed by the North Carolina State Historic Preservation Office and Capital Area Preservation, Inc. there are no historic structures present within the project boundary.

Section 11: Stormwater Management

This PUD shall meet all stormwater management requirements for quality and quantity treatment in accordance with Sections 2.3.4.F.1.h & 6.1.7 of the UDO, such that post development peak runoff shall not exceed pre-development peak runoff conditions for the 1 year, 10 year, and 25 year 24-hour storm events.

Section 12: Parks and Recreation

The Parks, Recreation, and Cultural Resources Advisory Commission reviewed the Heelan Assemblage Planned Unit Development at the January 29, 2020 Meeting. The Advisory Commission unanimously recommended the following with the understanding that the final credits for greenway construction and acreage for dedication will be determined at the time of Master Subdivision approval:

1. The dedicated land will be contiguous and directly south of the Town of Apex property intended for the future Olive Farm Park (PIN #s 0720-19-6276; 0720-19-0665; 0720-19-7417), being a portion of Parcel ID # 0720-18-1967 in Wake County.
2. The dedicated land shall not be bisected by any road(s) providing access into the applicant's property, nor by any public or private utilities corridors.
3. In the event the applicant acquires agreed upon property located offsite, being Parcel ID #s 0720-19-7898 and 0721-10-4045, as needed to meet dedication requirements, that property may be substituted for the property identified in Section 1 above and may be dedicated in satisfaction of the requirements of the UDO and upon the confirmation of the dedication calculations identified in the UDO, at any time prior to subdivision plan approval. Subdivision plan approval shall not be granted until applicant confirms which of the above options is being offered in satisfaction of dedication requirements.

Calculations for acreage dedication normally are based upon the total number of proposed units within a development. While the Heelan PUD contemplates a total of 520 units, no more than 260 of which would be Single Family Attached, the acreage dedication must be adjusted on account of credit the developer will receive for installation of a planned greenway.

The greenway construction for the Heelan PUD is planned for an estimated 0.80 miles which should be calculated at $1.2M per mile or **$960,000**. If the developer were not dedicating land for open space, the Recreation fee for the Heelan PUD would be:

(260 Single Family Attached units X $2,321.54 per unit) + (260 Single Family

Detached units X $3,446.98 per unit) = **$1,499,815.20**

Subtracting the greenway construction cost from the calculated Recreation fee shows a remaining value of **$539,815.20** = $1,499,815.20 - $960,000.00.

Dividing this remaining value by the per unit Recreation fee determines the number of units which should serve as the basis for the required acreage dedication:

$539,815.20 / $2,321.54 per Single Family Attached unit ≈ **232.5 Single Family Attached units**

Therefore, the required acreage dedication can be calculated using the Town's per unit acreage schedule:

232.5 Single Family Attached units X 0.0223 acres per unit ≈ **5.2 acres**

Section 13: Public Facilities

The proposed PUD shall meet all Public Facilities requirements as set forth in UDO Section 2.3.4(F)(1)(f) and be designed according to sound engineering standards and shall comply with Town of Apex Sewer and Water Master Plan and the Town of Apex Standards and Specifications. Specifically, road and utility infrastructure shall be as follows:

A. General Roadway Infrastructure

Developer shall provide minimum frontage widening based on ½ of a 2-lane thoroughfare in the rural context with public right-of-way dedication based on a 110-foot right-of-way along Humie Olive Road. The road network will promote connectivity wherever possible to adjacent neighborhoods and undeveloped property. Further, cul-de-sacs will be avoided except where environmental features make through streets unfeasible. Sidewalks will be provided on both sides of streets internal to the site and along street frontage.

Please refer to the concept plan of the PUD plan for proposed access points, stub streets and planned vehicular connectivity. All access and circulation are conceptual and will be finalized at the time of Development Plan review and approval.

B. Transportation Improvements

Roadway improvements are subject to modification and final approval by the Town of Apex and NCDOT as part of the site plan and construction plan approval process. A traffic study has been performed as part of this PUD rezoning consistent with the Town's standards for the same. Based upon the traffic study, the following traffic improvements are proposed for this development:

- Developer shall construct a westbound left turn lane on Humie Olive Road at the proposed Site Drive with minimum 75 feet of storage and appropriate deceleration length and taper.
- Developer shall restripe the existing westbound approach of Horton Ridge Boulevard at New Hill Olive Chapel Road to accommodate an exclusive right turn lane and a shared through-left lane at the intersection.
- An eastbound left turn lane shall be constructed on Humie Olive Road at Richardson Road with minimum of 200 feet of storage plus appropriate deceleration length and taper prior to the 200 platted lot.
- Developer shall construct an eastbound right turn lane on Humie Olive Road at

the proposed Site Drive with minimum 75 feet of storage and appropriate deceleration length and taper.

- Consistent with the 2045 Advance Apex Thoroughfare and Collector Street Plan and State law, the Developer shall construct Horton Ridge Boulevard in accord with the Town's design standards for a Major Collector.

C. Water and Sanitary Sewer

All lots within the project will be served by the Town of Apex for water and sanitary sewer. The utility design will be finalized at the time of Development Plan review and approval based upon available facilities adjacent to the site at that time. A conceptual utility plan is included in the PUD plan for reference. The ultimate design for the utilities must meet the current Town of Apex master water and sewer plans for approval.

D. Other Utilities

Electricity will be provided by Apex Electric. Phone, cable and gas will be provided by the developer and shall meet the Town of Apex standards as outlined in the UDO.

Section 14: Phasing Plan

This development is expected to be phased. The number and timing of the phases will depend on market conditions and other factors. Construction is anticipated to begin in 2022. Project phasing will be planned to ensure the points of access are provided in accordance with the UDO.

Section 15: Consistency with the 2045 Land Use Map

The proposed land use is consistent with the 2045 Land Use Map.

Section 16: Compliance with the UDO

The development standards adopted for this PUD follow those set forth in the current version of the Town's Unified Development Ordinance (UDO). Any deviations from UDO requirements have been specifically defined elsewhere within this document and/or below:

Section 17: Compliance with Comprehensive Transportation Plan and Bicycle Plan

Development plans for new development made pursuant to this amendment to the Official Zoning District Map shall comply with the adopted Comprehensive Transportation Plan in effect at the time the development plan is submitted as provided for in the Unified Development Ordinance. Further, development of the Property shall be consistent with the Town's adopted Bicycle Plan. Pursuant to Bike Apex, new development on the property shall provide a 20' easement generally along Humie Olive Road within which a 10' wide asphalt meandering trail shall be installed.

WETLAND MITIGATION PARCEL

Beginning at an existing Iron pipe on the eastern property line of the Heelan Property, said Iron pipe being South 46°59'52" West 30,771.52' from NCGS survey monument "STALEY" having N.C. Grid Coordinates (NAD83/2011) of N=727,821.36, E=2,043,644.97,thence from said Beginning point along said eastern property line South 06°15'03" West 29.76' to a point on the northern line of the Town of Apex 40' Public Utility Easement recorded in Deed Book 17419, Page 2651, Wake County Registry, thence leaving said eastern property line with said northern easement line North 64°16'42" West 280.47' to a point, thence South 63°35'54" West 174.31' to a point, thence leaving said easement North 18°40'10" East 251.15' to a point, thence North 53°39'09" West 53.01' to a point, thence North 19°45'46" West 43.36' to a point, thence North 03°05'56" West 187.40' to a point, thence North 08°03'50" East 210.66' to a point, thence North 36°31'13" East 24.99' to a point, thence North 65°42'05" East 77.21' to a point, thence North 43°26'33" East 86.71' to a point, thence North 38°14'05" East 92.04' to a point, thence North 57°58'37" East 87.98' to a point, thence North 74°34'56" East 93.13' to a point, thence South 60°16'07" East 28.36' to a point, thence North 67°21'25" East 49.85' to a point on the eastern property line of the Heelan Property, thence along said eastern property line South 03°55'05" West 585.31' to an existing Iron pipe, thence continuing with said eastern property line and crossing Little Beaver Creek South 03°53'40" West 401.10' to the point and place of Beginning containing 7.946 Acres more or less.

LEGEND

(IPF)–IRON PIPE FOUND
(RBS)–REBAR SET
(NPF)–NO POINT FOUND
(CLD)–CENTERLINE CREEK
(PP)–POWER POLE
(OHPL)–OVERHEAD POWER LINE
(SPP)–STEEL POWER POLE
(POB)–POINT OF BEGINNING
(X)–CALCULATED POINT
(–E–)–ELECTRIC EASEMENT
(–SS–)–PIPELINE EASEMENT
(–F–)–100 YR. FLOOD ZONE
XXX–ADDRESS
:::::–STATE OF N.C. CONSERVATION EASEMENT FOR STREAM RESTORATION

LINE TABLE		
LINE	BEARING	DISTANCE
L1	S 06°15'03" W	29.76'
L2	N 64°16'42" W	280.47'
L3	S 63°35'54" W	174.31'
L4	N 18°40'10" E	251.15'
L5	N 53°39'09" W	53.01'
L6	N 19°45'46" W	43.36'
L7	N 03°05'56" W	187.40'
L8	N 08°03'50" E	210.66'
L9	N 36°31'13" E	24.99'
L10	N 65°42'05" E	77.21'
L11	N 43°26'33" E	86.71'
L12	N 38°14'05" E	92.04'
L13	N 57°58'37" E	87.98'
L14	N 74°34'56" E	93.13'
L15	S 60°16'07" E	28.36'
L16	N 67°21'25" E	49.85'
L17	S 03°55'05" W	585.31'
L18	S 03°53'40" W	401.10'

NORTH CAROLINA PROFESSIONAL SEAL L-4432 LAND SURVEYOR STUART E. PLANTE III
Stuart E. Plante III
6/5/2020

NOTES:
1. A PORTION OF THE PROPERTY IS IN THE 100 YR. FLOOD AND FLOODWAY, ZONE AE, BY FEMA FIRM MAP NO. 3720071000K PANEL 0710, EFFECTIVE DATE 2/2/2007 AND FIRM MAP NO. 3720072000J PANEL 0720, EFFECTIVE DATE 5/2/2006. 100 YR. FLOOD AND FLOODWAY LINES TAKEN FROM NCFLOODMAPS.COM ON 8/2/19.
2. PROPERTY IS SUBJECT TO ALL EASEMENTS AND RESTRICTIONS OF RECORD.
3. THE PURPOSE OF THIS EXHIBIT IS TO SHOW THE PROPOSED MITIGATION AREA.

NORTH CAROLINA PROFESSIONAL SEAL L-4432 LAND SURVEYOR STUART E. PLANTE III
Stuart E. Plante III
5/29/2020

☑ D. THIS SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT–ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION;

Stuart E. Plante III — PROFESSIONAL LAND SURVEYOR
2/26/2020 — DATE

NORTH CAROLINA PROFESSIONAL SEAL L-4432 LAND SURVEYOR STUART E. PLANTE III

NORTH CAROLINA
WAKE COUNTY

I STUART E. PLANTE III CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION, DESCRIPTION RECORDED IN REFERENCES AS SHOWN, THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN REFERENCES AS SHOWN; THAT THE RATIO OF PRECISION OR POSITIONAL ACCURACY AS CALCULATED IS 1: 28,682 ±; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47–30 AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER AND SEAL THIS 26th DAY OF FEBRUARY, 2020 A.D.,

Stuart E. Plante III — PROFESSIONAL LAND SURVEYOR
LICENSE NO. L–4432

MITIGATION AREA EXHIBIT
BUCKHORN TOWNSHIP
WAKE COUNTY, N.C.

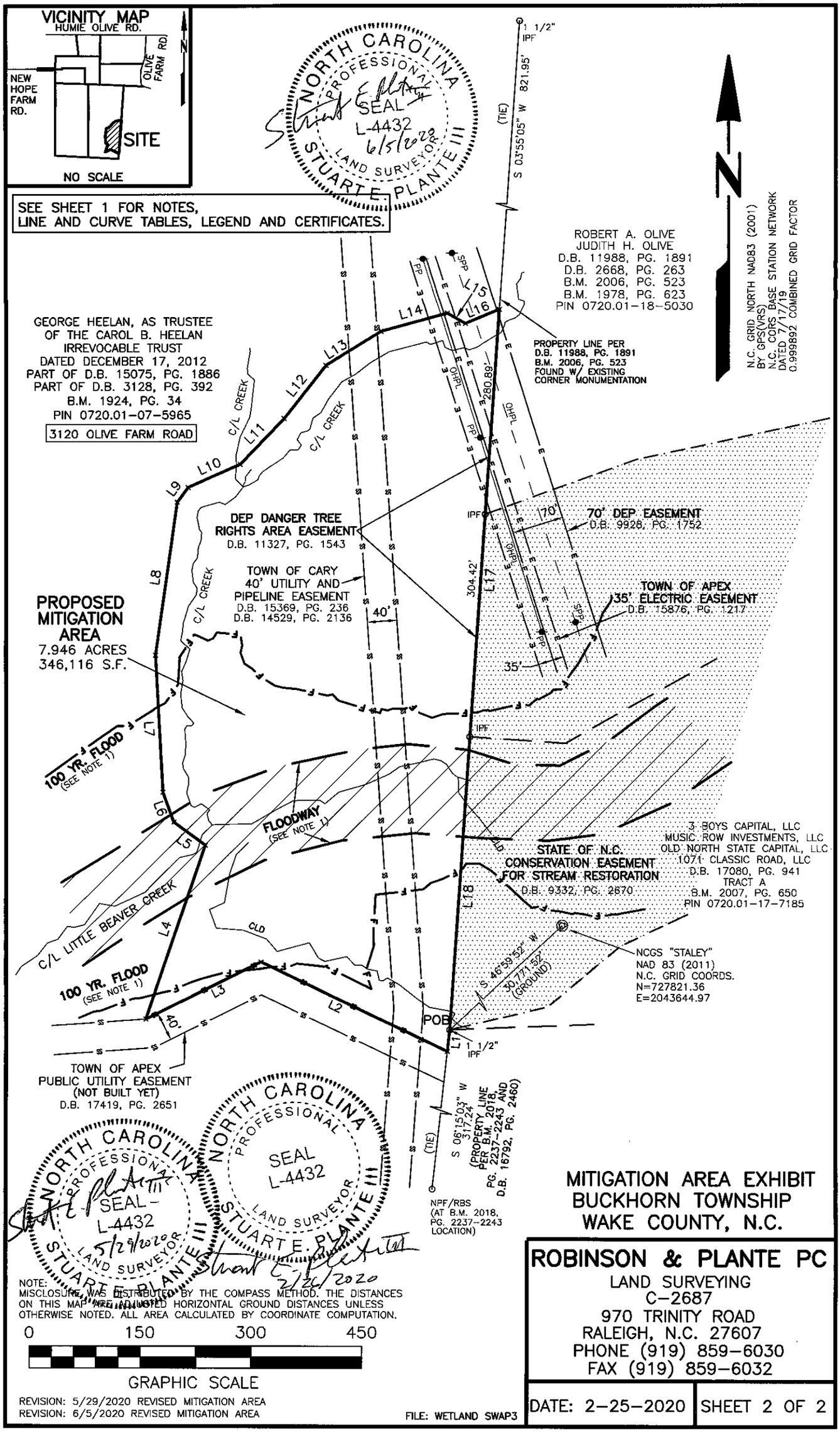
ROBINSON & PLANTE PC
LAND SURVEYING
C–2687
970 TRINITY ROAD
RALEIGH, N.C. 27607
PHONE (919) 859–6030
FAX (919) 859–6032

THIS MAP MAY NOT BE A CERTIFIED SURVEY AND HAS NOT BEEN REVIEWED BY A LOCAL GOVERNMENT AGENCY FOR COMPLIANCE WITH ANY APPLICABLE LAND DEVELOPMENT REGULATIONS AND HAS NOT BEEN REVIEWED FOR COMPLIANCE WITH RECORDING REQUIREMENTS FOR PLATS.

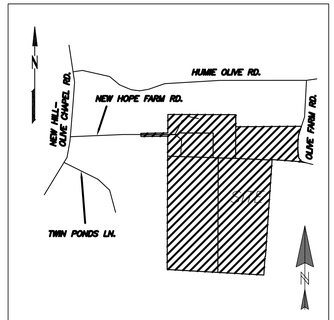
REVISION: 5/29/2020 REVISED MITIGATION AREA
REVISION: 6/5/2020 REVISED MITIGATION AREA

FILE: WETLAND SWAP3

DATE: 2–25–2020


VICINITY MAP
HUMIE OLIVE RD.
OLIVE FARM RD.
NEW HOPE FARM RD.
SITE
NO SCALE
N
SEE SHEET 1 FOR NOTES, LINE AND CURVE TABLES, LEGEND AND CERTIFICATES.
NORTH CAROLINA PROFESSIONAL SEAL L-4432 LAND SURVEYOR STUART E. PLANTE III
6/5/2020
1 1/2" IPF
S 03°55'05" W 821.95'
(TIE)
ROBERT A. OLIVE
JUDITH H. OLIVE
D.B. 11988, PG. 1891
D.B. 2668, PG. 263
B.M. 2006, PG. 523
B.M. 1978, PG. 623
PIN 0720.01-18-5030
PROPERTY LINE PER D.B. 11988, PG. 1891 B.M. 2006, PG. 523 FOUND W/ EXISTING CORNER MONUMENTATION
N
N.C. GRID NORTH NAD83 (2001) BY GPS(VRS) N.C. CORS BASE STATION NETWORK DATED 7/17/19 0.999892 COMBINED GRID FACTOR
GEORGE HEELAN, AS TRUSTEE OF THE CAROL B. HEELAN IRREVOCABLE TRUST DATED DECEMBER 17, 2012 PART OF D.B. 15075, PG. 1886 PART OF D.B. 3128, PG. 392 B.M. 1924, PG. 34 PIN 0720.01-07-5965
3120 OLIVE FARM ROAD
L1 L2 L3 L4 L5 L6 L7 L8 L9 L10 L11 L12 L13 L14 L15 L16 L17 L18
280.89'
304.42'
C/L CREEK
C/L LITTLE BEAVER CREEK
CLD
OHPL
PP
SPP
IPF
DEP DANGER TREE RIGHTS AREA EASEMENT
D.B. 11327, PG. 1543
70' DEP EASEMENT
D.B. 9928, PG. 1752
TOWN OF CARY 40' UTILITY AND PIPELINE EASEMENT
D.B. 15369, PG. 236
D.B. 14529, PG. 2136
TOWN OF APEX 35' ELECTRIC EASEMENT
D.B. 15876, PG. 217
PROPOSED MITIGATION AREA
7.946 ACRES
346,116 S.F.
100 YR. FLOOD (SEE NOTE 1)
FLOODWAY (SEE NOTE 1)
STATE OF N.C. CONSERVATION EASEMENT FOR STREAM RESTORATION
D.B. 9332, PG. 2670
3 BOYS CAPITAL, LLC
MUSIC ROW INVESTMENTS, LLC
OLD NORTH STATE CAPITAL, LLC
1071 CLASSIC ROAD, LLC
D.B. 17080, PG. 941
TRACT A
B.M. 2007, PG. 650
PIN 0720.01-17-7185
NCGS "STALEY"
NAD 83 (2011)
N.C. GRID COORDS.
N=727821.36
E=2043644.97
S 46°59'52" W
30,771.52'
(GROUND)
POB
1/2" IPF
TOWN OF APEX PUBLIC UTILITY EASEMENT (NOT BUILT YET)
D.B. 17419, PG. 2651
S 06°15'03" W
317.24'
(PROPERTY LINE PER B.M. 2018, PG. 2237-2243 AND D.B. 16792, PG. 2460)
NPF/RBS (AT B.M. 2018, PG. 2237-2243 LOCATION)
NORTH CAROLINA PROFESSIONAL SEAL L-4432 LAND SURVEYOR STUART E. PLANTE III
5/29/2020
5/29/2020
NOTE: MISCLOSURE WAS DISTRIBUTED BY THE COMPASS METHOD. THE DISTANCES ON THIS MAP ARE ADJUSTED HORIZONTAL GROUND DISTANCES UNLESS OTHERWISE NOTED. ALL AREA CALCULATED BY COORDINATE COMPUTATION.
0 150 300 450
GRAPHIC SCALE
REVISION: 5/29/2020 REVISED MITIGATION AREA
REVISION: 6/5/2020 REVISED MITIGATION AREA
FILE: WETLAND SWAP3
MITIGATION AREA EXHIBIT
BUCKHORN TOWNSHIP
WAKE COUNTY, N.C.
ROBINSON & PLANTE PC
LAND SURVEYING
C-2687
970 TRINITY ROAD
RALEIGH, N.C. 27607
PHONE (919) 859-6030
FAX (919) 859-6032
DATE: 2-25-2020
SHEET 2 OF 2

HEELAN PROPERTY
PLANNED UNIT DEVELOPMENT



VICINITY MAP
N.T.S.

SITE DATA

PROJECT NAME	HEELAN PROPERTY PUD
PREPARERS CONTACT INFORMATION	JONES & CNOSSEN ENGINEERING, PLLC P.O. BOX 1062 APEX, NORTH CAROLINA 27502 PHONE - (919) 387-1174 FAX - (919) 387-3375 CONTACT PERSON - PETER D. CNOSSEN
OWNER / DEVELOPER CONTACT INFORMATION	M/I HOMES-RALEIGH 1511 SUNDAY DRIVE SUITE #110 RALEIGH, NC 27607 PHONE - (919) 205-9980 CONTACT PERSON - ERICA LEATHAM
CURRENT ZONING	R-40W
CURRENT 2045 LAND USE MAP DESIGNATION	LOW & MEDIUM DENSITY RESIDENTIAL (LD & MD)
PROPOSED ZONING DESIGNATION	PUD-CZ
PROPOSED 2045 LAND USE MAP DESIGNATION	LOW & MEDIUM DENSITY RESIDENTIAL (LD & MD)
WAKE COUNTY PINS	0710-98-6889 (PARTIAL), 0720: 07-5965, 09-2779, 09-3139 (PARTIAL), 15-1967
TOTAL PROJECT AREA	142.42 ACRES
AREA IN HUMIE-OLIVE ROAD R/W DEDICATION	0.95 ACRE
AREA IN LAND DEDICATION	0.69 ACRE
NET SITE AREA	140.78 ACRES
MAXIMUM ALLOWED NUMBER OF UNITS	746 UNITS (108.57 AC. MEDIUM DENSITY AT 6 UNITS/ACRE, 31.86 AC. LOW DENSITY AT 3 UNITS/ACRE)
PROPOSED NUMBER OF UNITS	520 UNITS (3.7 UNITS/ACRE)
REQUIRED RCA / BUFFER AREA	42.13 ACRES (30.0%)
PROVIDED RCA / BUFFER AREA	42.26 ACRES (30.1%)
MAXIMUM BUILT UPON AREA FOR PUD	70% OR 98.3 ACRES
MAXIMUM BUILDING HEIGHT	45'
OFF STREET PARKING	PARKING WILL COMPLY WITH TOWN OF APEX UDO SECTION 8.3 FOR BOTH SINGLE-FAMILY RESIDENTIAL LOTS & TOWNHOME LOTS.
PUBLIC RECREATION REQUIREMENT	MULTI-FAMILY ATTACHED
WATERSHED INFORMATION	PRIMARY: BEAVER CREEK BASIN
APEX BUFFER DETERMINATION	APEX 19-003
HISTORIC STRUCTURE?	NO
PHASED DEVELOPMENT	YES
FEMA FLOODPLAIN INFORMATION	MAP #3720072000J & #3720071000K PROJECT IS WITHIN 100 YEAR FLOODPLAIN

PERMITTED USE:

- Single-family
- Townhouse
- Greenway
- Recreation Facility, private
- Park, active
- Park, passive
- Utility, minor

MINIMUM BUILDING SETBACKS-TOWNHOME

FROM BUILDING TO BUILDING	10'
FROM BUFFER/RCA	10' FOR BUILDINGS, 5' FOR PARKING
FRONT	10'
REAR	20'
SIDE	5'
CORNER SIDE	5'

PD PLAN - DRAWING SHEET INDEX

MINIMUM BUILDING SETBACKS-SINGLE FAM.

FROM BUFFER/RCA	10' FOR BUILDINGS, 5' FOR PARKING
FRONT	10'
REAR	20'
SIDE	5'
CORNER SIDE	5'

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

0 75 150 300
GRAPHIC SCALE

THIS SHEET IS FOR
ILLUSTRATIVE PURPOSES ONLY

Jones & Cnossen
ENGINEERING, PLLC
Civil Engineering | Construction Management | Land Planning

221 N. SALEM ST.
SUITE 001
PO BOX 1062
APEX, NC 27502
Office: 919-387-1174
Registration: P-0151
www.jonescnossen.com

FOR REVIEW ONLY

HEELAN PROPERTY PUD
PD PLANS
TOWN OF APEX · WAKE COUNTY, NORTH CAROLINA

COVER SHEET

SCALE	1"=300'
DRAWN	PDC
DATE	OCTOBER 1, 2019

REVISION	
11/07/19	1st TRC REVIEW
12/05/19	2nd TRC REVIEW
01/09/20	3rd TRC REVIEW
01/27/20	4th TRC REVIEW

SHEET	1
PROJECT	1910

NOTES:

1. BOUNDARY AND EXISTING CONDITIONS INFORMATION WAS TAKEN FROM A SURVEY COMPLETED BY ROBINSON & PLANTE SURVEYORS.
2. THE DATE ON THE ALTA SURVEY PROVIDED BY ROBINSON & PLANTE SURVEYORS IS 10/29/19.
3. TOPOGRAPHIC INFORMATION FOR THE SITE WAS TAKEN FROM NORTH CAROLINA SPACIAL DATA LIDAR.
4. THE SITE HAS BEEN EVALUATED FOR THE EXISTENCE OF WETLANDS AND STREAMS BY SPANGLER ENVIRONMENTAL, INC. THE LOCATION OF THESE ENVIRONMENTAL FEATURES INCLUDING STREAM BUFFERS ARE SHOWN AS SURVEYED.
5. CONSTRUCTION VEHICLE PARKING SHALL BE LIMITED TO ONE SIDE OF THE ROAD (OPPOSITE OF FIRE HYDRANTS). SIGNS INDICATING "NO CONSTRUCTION VEHICLES THIS SIDE OF STREET" IN ENGLISH AND SPANISH.
6. ONCE THE FIRST LIFT OF ASPHALT IS PASSABLE BY VEHICLES, TEMPORARY STREET SIGNS ARE REQUIRED.
7. INSTALLATION OF SILT FENCE SHALL MAINTAIN 3' OF CLEARANCE AROUND FIRE HYDRANTS.
8. PRIMARY ENTRANCE LOCATION MAY SHIFT TO AVOID RELOCATION OF POWER POLE. FINAL LOCATION TO BE DETERMINED AT MASTER SUBDIVISION PLAN.

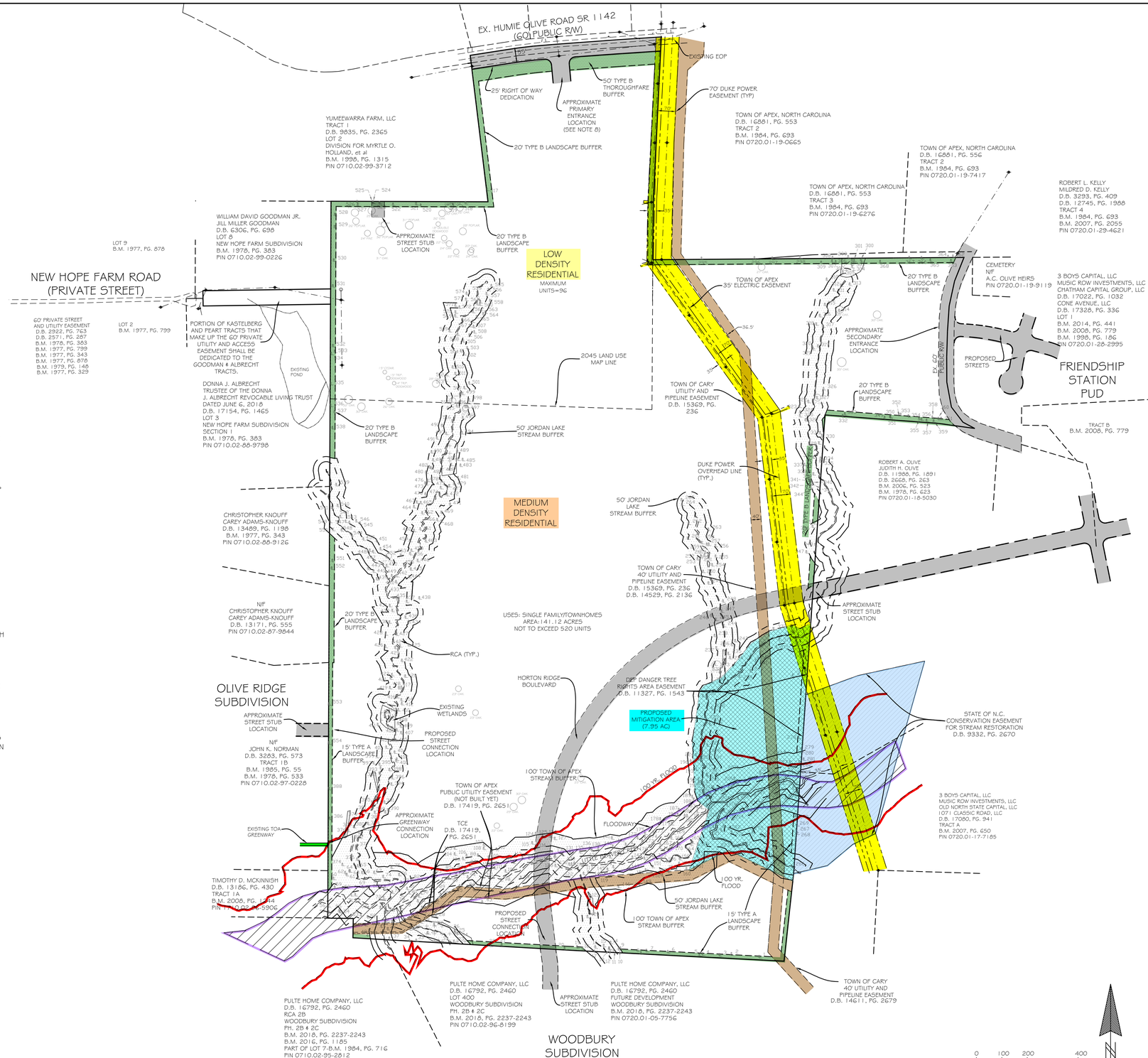
- WETLANDS
- PROPOSED MITIGATION AREA
- RCA

PLANNING NOTES:

1. STREET STUB CONNECTIONS SHOWN HEREON ARE PRELIMINARY AND MAY CHANGE AT THE TIME OF MASTER PLAN APPROVAL.
2. THE RESOURCE CONSERVATION AREA (RCA) SHOWN HEREON IS PRELIMINARY AND MAY CHANGE AT THE TIME OF MASTER PLAN APPROVAL.
3. THE MAINTENANCE OF RCA, LANDSCAPE BUFFERS, PASSIVE OPEN SPACE, COMMON AREAS, AND THE STORMWATER DEVICES SHALL BE THE RESPONSIBILITY OF THE PROPERTY ASSOCIATION.
4. ALL SIGNAGE SHALL COMPLY WITH TOA UDO SECTION 8.7, SIGNS
5. THE PUD SHALL MEET TOWN OF APEX STORMWATER REQUIREMENTS OUTLINED IN TOA UDO SECTION 6.1.7 SUCH THAT POST-DEVELOPMENT RUNOFF SHALL NOT EXCEED THE PRE-DEVELOPMENT RUNOFF FOR THE 1-YEAR AND 10-YEAR, 24 HOUR STORM EVENTS.
6. ALL SINGLE-FAMILY HOMES ON THE PROPERTY SHALL PROVIDE SOLAR CONDUIT FOR THE INSTALLATION OF ROOFTOP SOLAR PANELS.
7. THE PUD SHALL PROVIDE TWO EV CHARGING STATIONS AT THE PLANNED AMENITY CENTER. ACTIVE SOLAR INSTALLATION FOR A MINIMUM OF TWO MODEL HOMES, AND ACTIVE SOLAR INSTALLATION FOR THE PRIMARY AMENITY BUILDING.
8. THE ALIGNMENT OF HORTON RIDGE BOULEVARD IS PRELIMINARY. THE FINAL ALIGNMENT SHALL BE DETERMINED AT MASTER SUBDIVISION IN REVIEW WITH TOWN OF APEX STAFF.
9. ALL ENVIRONMENTAL PERMITTING ASSOCIATED WITH THE CONSTRUCTION OF HORTON RIDGE BOULEVARD SHALL BE HANDLED BY THE TOWN OF APEX.
10. THIS SHALL BE A PHASED DEVELOPMENT COMPLETED IN UP TO 5 PHASES. ALL PHASES SHALL BE SHOWN AT THE TIME OF MASTER SUBDIVISION PLAN SUBMITTAL.
11. THIS DEVELOPMENT WILL BE MASS GRADED SO AN ADDITIONAL 5% RCA WILL BE REQUIRED PER UDO SECTION 7.2.5(B).
12. THE 50' TYPE B THOROUGHFARE BUFFER ALONG HUMIE OLIVE ROAD SHALL INCLUDE A MEANDERING 10' ASPHALT PATH WITHIN A 20' GREENWAY EASEMENT. COORDINATION OF PATH LOCATION WITH PLANNING STAFF SHALL OCCUR AT THE MASTER SUBDIVISION PLAN PROCESS.
13. THE PUD SHALL DEDICATE A CONSERVATION EASEMENT OF NOT LESS THAN 7.9 ACRES TO THE STATE OF NORTH CAROLINA IN ORDER TO FACILITATE RELEASE OF OTHER CONSERVATION EASEMENT AREA FROM THE STATE OF NORTH CAROLINA. THIS DEDICATION IS TO PROVIDE THE TOWN WITH THE ABILITY TO EXTEND RICHARDSON ROAD IN THE FUTURE.
14. THE PUD SHALL PROVIDE HABITAT FOR HUMANITY OR OTHER NON-PROFIT AFFORDABLE HOUSING PROVIDER UP TO TEN (10) AFFORDABLE TOWNHOME LOTS PRIOR TO PLATTING THE 200TH LOT.
15. TO DEMONSTRATE THE PROJECTS COMMITMENT TO PRESERVING AND RE-ESTABLISHING TREE CANOPY IN OUR REGION, THE DEVELOPER SEEKS TO REPLANT AND RESTORE EXISTING TREE CANOPY THAT IS REMOVED FROM THOSE PORTIONS OF THE PROPERTY THAT ARE ANTICIPATED TO CONTAIN SINGLE-FAMILY AND TOWNHOME LOTS. TO THAT END, PRIOR TO RECORDING THE FIRST SUBDIVISION PLAT FOR THE PROPERTY, THE DEVELOPER WILL PROVIDE A DONATION OF $19,200 TO A LOCAL NON-PROFIT ORGANIZATION WITH A MISSION TOWARDS TREE PRESERVATION AND REPLACEMENT. IN THOSE PORTIONS OF THE SITE WHERE TREES ARE REMOVED FOR SINGLE-FAMILY OR TOWNHOME LOTS, THE DEVELOPER ANTICIPATES IT CAN OFFSET SUCH REMOVAL BY PRESERVING 33.7 ACRES OF EXISTING TREE CANOPY IN OTHER PLACES ON THE SITE, AND REPLACING AND REPLANTING TREES OVER 95.82 ACRES OF THE REST OF THE PROPERTY. AS SUCH, THIS $19,200 DONATION REPRESENTS AN ASSIGNED PER-TREE VALUE IN SUBSTITUE CANOPY FOR THE REMAINDER OF THE PROPERTY.

TRANSPORTATION ELEMENTS:

1. AN EASTBOUND LEFT-TURN LANE SHALL BE CONSTRUCTED ON HUMIE OLIVE ROAD AT RICHARDSON ROAD WITH MINIMUM OF 200 FEET OF STORAGE PLUS APPROPRIATE DECELERATION LENGTH AND TAPER PRIOR TO THE 200 PLATTED LOT.
2. DEVELOPER SHALL RESTRIPE THE EXISTING WESTBOUND APPROACH OF HORTON RIDGE BOULEVARD AT NEW HILL OLIVE CHAPEL ROAD TO ACCOMODATE AN EXCLUSIVE RIGHT-TURN LANE AND A SHARED THROUGH-LEFT LANE AT THE INTERSECTION.
3. THE DEVELOPER SHALL CONSTRUCT HORTON RIDGE BOULEVARD TO THE TOWN OF APEX'S MAJOR COLLECTOR STANDARD.
4. DEVELOPER SHALL CONSTRUCT A WESTBOUND LEFT-TURN LANE ON HUMIE OLIVE ROAD AT THE PROPOSED SITE DRIVE WITH MINIMUM 75 FEET OF STORAGE AND APPROPRIATE DECELERATION LENGTH AND TAPER.
5. DEVELOPER SHALL CONSTRUCT AN EASTBOUND RIGHT-TURN LANE ON HUMIE OLIVE ROAD AT THE PROPOSED SITE DRIVE WITH MINIMUM 75 FEET OF STORAGE AND APPROPRIATE DECELERATION LENGTH AND TAPER.
6. A WESTBOUND LEFT TURN LANE WITH 50 FEET OF STORAGE AND APPROPRIATE DECELERATION LENGTH AND TAPER SHALL BE PROVIDED ON HUMIE OLIVE ROAD AT OLIVE FARM ROAD PRIOR TO PLATTING ACCESS TO OLIVE FARM ROAD.
7. DEVELOPER SHALL IMPROVE OLIVE FARM ROAD BASED ON A MINIMUM 27' BACK-TO-BACK ROADWAY SECTION ALONG THE DEVELOPMENT FRONTAGE AND AVOID DIRECT RESIDENTIAL ACCESS. WHERE DEVELOPMENT IS ON ONE SIDE OF THE ROAD AND THE OPPOSITE SIDE IS UNIMPROVED, THE OPPOSITE SIDE SHALL BE CONSTRUCTED BASED ON A MINIMUM 22' EDGE-TO-EDGE TYPICAL SECTION.
8. OLIVE FARM ROAD SHALL BE PAVED BASED ON A MINIMUM 22' EDGE-TO-EDGE TYPICAL SECTION WITH MINIMUM 30 MPH DESIGN SPEED FROM THE DEVELOPMENT BOUNDARY TO HUMIE OLIVE ROAD PRIOR TO PLATTING ACCESS TO OLIVE FARM ROAD.
9. OLIVE FARM ROAD SHALL MEET APEX MINOR COLLECTOR STREET AND NCDOT MINIMUM REQUIREMENTS FOR SECONDARY ROAD PAVEMENT STRUCTURE FOR ALL IMPROVED SECTIONS.
10. A SOUTHBOUND LEFT TURN LANE WITH 150 FEET OF FULL WIDTH STORAGE AND APPROPRIATE DECELERATION LENGTH AND TAPER SHALL BE CONSTRUCTED ON NEW HILL OLIVE CHAPEL ROAD AT HUMIE OLIVE ROAD PRIOR TO THE 200TH PLATTED LOT.
11. THE WESTBOUND LEFT TURN LANE ON HUMIE OLIVE ROAD AT NEW HILL OLIVE CHAPEL ROAD SHALL BE CONSTRUCTED TO PROVIDE 200 FEET OF FULL WIDTH STORAGE AND APPROPRIATE DECELERATION LENGTH AND TAPER PRIOR TO THE 200TH PLATTED LOT.
12. DEVELOPER SHALL MONITOR THE INTERSECTION OF RICHARDSON ROAD AT HUMIE OLIVE ROAD FOR INSTALLATION OF A TRAFFIC SIGNAL AND INSTALL WHEN WARRANTED. A WARRANT STUDY SHALL BE CONDUCTED FOLLOWING THE 200TH PLATTED LOT OR AS OTHERWISE DIRECTED BY APEX STAFF. IF A TRAFFIC SIGNAL IS NOT PERMITTED BY NCDOT PRIOR TO THE 300TH PLATTED LOT, THE DEVELOPER SHALL CONSTRUCT A SOUTHBOUND LEFT TURN LANE ON RICHARDSON ROAD AT HUMIE OLIVE ROAD WITH 150 FEET OF STORAGE AND APPROPRIATE DECELERATION LENGTH AND TAPER. CONSTRUCTION OF THE SOUTHBOUND LEFT TURN LANE SHALL RELEASE THE DEVELOPER FROM THE REQUIREMENT TO INSTALL A TRAFFIC SIGNAL.



PRELIMINARY PLANS NOT FOR CONSTRUCTION

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FOR REVIEW ONLY

HEELAN PROPERTY PUD
PD PLANS
TOWN OF APEX — WAKE COUNTY, NORTH CAROLINA

PRELIMINARY LAYOUT PLAN

SCALE	1"=200'
DRAWN	PDC
DATE	OCTOBER 1, 2019

REVISION	
11/07/19	1st TRC REVIEW
12/05/19	2nd TRC REVIEW
01/09/20	3rd TRC REVIEW
01/27/20	4th TRC REVIEW
08/13/20	5th TRC REVIEW
08/27/20	6th TRC REVIEW

SHEET	2
PROJECT	1910

TOWN REQUIRED PUD NOTES:

1. PROTECTION FENCING MUST BE PLACED AWAY FROM ANY SAVED TREE ONE FOOT FOR EACH INCH OF TREE CALIPER. PROTECTION FENCING MUST BE PLACED AT LEAST 10 FEET AWAY FROM ANY OTHER DESIGNATED RESOURCE CONSERVATION AREA, SUCH AS BUT NOT LIMITED TO HISTORIC BUILDINGS AND STRUCTURES, WETLANDS, AND PONDS. PROTECTION FENCING MUST BE PLACED ALONG THE OUTSIDE LINE OF THE 100-YEAR FLOODPLAIN, AND THE OUTSIDE EDGE OF ANY RIPARIAN BUFFER. ADDITIONAL PROTECTION FENCING MAY BE REQUIRED IN OTHER LOCATIONS CLOSE TO CONSTRUCTION ACTIVITY WHERE IT IS DEEMED NECESSARY BY THE ZONING ENFORCEMENT OFFICER; SUCH AREAS MAY INCLUDE BUT ARE NOT LIMITED TO COMMON PROPERTY LINES OR NEAR PUBLIC AREAS (SIDEWALKS, ETC.).
2. SITE ELEMENTS REQUIRED TO SATISFY RECREATIONAL REQUIREMENTS SUCH AS BUT NOT LIMITED TO PLAY FIELDS AND GREENWAY TRAILS AND ITEMS TYPICALLY ASSOCIATED WITH THEM (BENCHES, TRASH CONTAINERS, SIGNS, ETC.) MUST MEET ANY APPLICABLE STANDARDS FOUND IN THE TOWN OF APEX STANDARD SPECIFICATIONS AND CONSTRUCTION DETAILS AND THE REQUIREMENTS OF THE TOWN OF APEX PARKS AND RECREATION DEPARTMENT.
3. ALL REQUIRED SITE ELEMENTS SHOWN WITHIN A PARTICULAR PHASE MUST BE INSTALLED BEFORE A FINAL CERTIFICATE OF OCCUPANCY MAY BE ISSUED FOR ANY BUILDING WITHIN THAT PHASE.
4. NO SIGNS ARE APPROVED AS PART OF A PUD-CZ PLAN APPROVAL. A SEPARATE SIGN PERMIT MUST BE OBTAINED.

NOTES:

1. BOUNDARY AND EXISTING CONDITIONS INFORMATION WAS TAKEN FROM A SURVEY BY ROBINSON & PLANTE SURVEYORS.
2. TOPOGRAPHIC INFORMATION FOR THE SITE WAS TAKEN FROM NORTH CAROLINA SPACIAL DATA LIDAR.
3. THE SITE HAS BEEN EVALUATED FOR THE EXISTENCE OF WETLANDS AND STREAMS BY SPANGLER ENVIRONMENTAL, INC. THE LOCATION OF THESE ENVIRONMENTAL FEATURES INCLUDING STREAM BUFFERS ARE SHOWN AS SURVEYED.
4. CONSTRUCTION VEHICLE PARKING SHALL BE LIMITED TO ONE SIDE OF THE ROAD (OPPOSITE OF FIRE HYDRANTS). SIGNS INDICATING "NO CONSTRUCTION VEHICLES THIS SIDE OF STREET" IN ENGLISH AND SPANISH.
5. ONCE THE FIRST LIFT OF ASPHALT IS PASSABLE BY VEHICLES, TEMPORARY STREET SIGNS ARE REQUIRED.
6. INSTALLATION OF SILT FENCE SHALL MAINTAIN 3' OF CLEARANCE AROUND FIRE HYDRANTS.

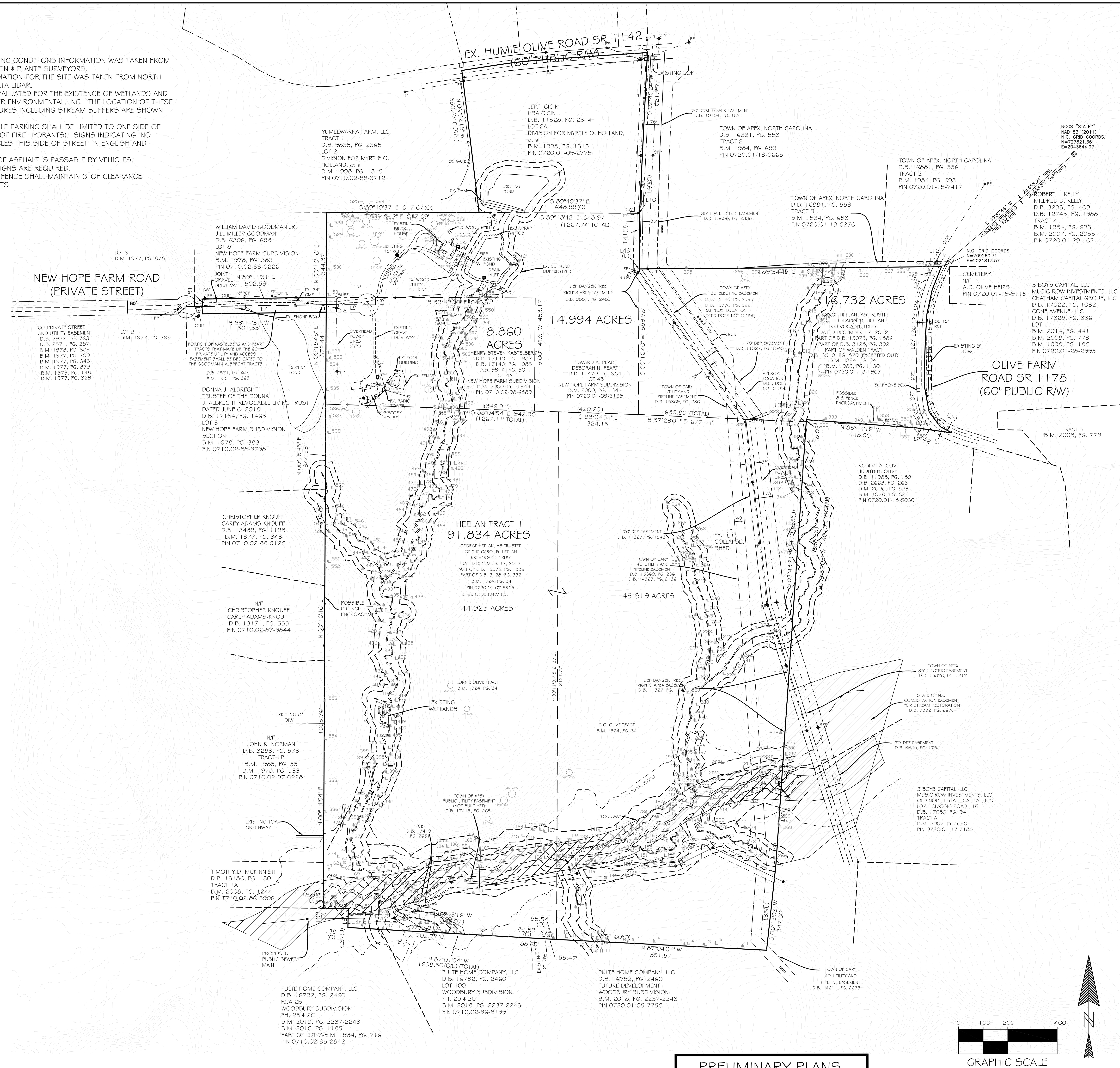
- WETLANDS

- RCA

LINE TABLE

LINE	BEARING	DISTANCE	L26	S 01°31'10" W	51.23'
L1	N 82°02'43" W	78.75'	L27	S 00°48'41" W	100.85'
L2	N 82°02'43" W	64.50'	L28	S 00°07'38" E	100.78'
L3	N 01°00'24" E	76.02'	L29	S 02°58'58" E	53.35'
L4	N 89°12'54" W	100.50'	L30	S 13°59'14" E	57.97'
L5	N 00°48'29" W	30.00'	L31	S 32°03'06" E	60.35'
L6	N 00°48'29" W	30.00'	L32	S 52°15'03" E	20.12'
L7	N 89°11'31" E	501.95'	L33	S 03°53'40" W	401.10'
L8	S 89°48'46" E	200.00'	L34	N 87°29'01" W	3.36'
L9	N 00°10'30" E	30.00'	L35	S 04°53'09" W	345.87'
L10	S 89°48'42" E	1.08'	L36	S 87°47'41" W	8.33'
L11	S 00°29'09" W	225.80'	L37	N 01°00'24" E	3.64'
L12	N 89°34'45" E	32.90'	L38	N 86°43'16" W	81.79'
L13	S 21°48'27" W	100.04'	L39	N 01°06'45" E	72.46'
L14	S 12°15'17" W	100.09'	L40	S 00°16'40" W	0.34'
L15	S 03°45'42" W	100.03'	L41	S 00°16'40" W	225.80'
L16	S 01°43'47" W	100.04'	L42	S 82°02'43" E	33.58'
L17	S 00°11'33" E	100.03'	L43	N 00°15'45" E	10.05'
L18	S 10°26'03" E	99.95'	L44	N 06°52'51" W	101.55'
L19	S 37°21'17" E	74.79'	L45	N 03°07'19" E	22.13'
L20	S 62°11'48" E	52.88'	L46	S 88°43'43" E	215.50'
L21	S 23°47'54" W	36.43'	L47	S 06°52'51" E	0.17'
L22	S 22°31'40" W	51.58'	L48	N 89°34'45" E	33.65'
L23	S 17°34'35" W	53.33'	L49	N 89°34'45" E	0.26'
L24	S 10°08'49" W	53.06'	L50	S 09°28'09" E	0.47'
L25	S 05°13'38" W	52.14'	L51	S 09°28'09" E	10.71'

Point	Description	101	POPLAR\22"	202	GUM\20"	300	POPLAR\24.6"	401	PINE\18.5"	501	PINE\24.6"
1	OAK\20.6"	102	POPLAR\27"	203	GUM\20.6"	301	GUM\19.1"	402	POPLAR\19.8"	502	PINE\27.3"
2	GUM\19"	103	OAK\22.5"	204	GUM\23"	302	POPLAR\18.7"	403	GUM\19.4"	503	PINE\22.9"
3	OAK\26"	104	OAK\21"	205	POPLAR\30.2"	303	GUM\18.7"	404	POPLAR\21.6"	504	POPLAR\22.9"
4	GUM\52.5"	105	OAK\24.2"	206	OAK\19.1"	304	GUM\21.4"	405	PINE\18"	505	SWEETGUM\21"
5	OAK\19.7"	106	OAK\22"	207	OAK\21.3"	305	GUM\21.5"	406	PINE\18.3"	506	OAK\18"
6	OAK\22.5"	107	OAK\24.3"	208	GUM\23.4"	306	OAK\21.6"	407	PINE\18.3"	507	SWEETGUM\21.7"
7	OAK\20.4"	108	POPLAR\19.5"	209	GUM\20"	307	PINE\18.6"	408	POPLAR\18.4"	508	OAK\20"
8	OAK\31.9"	109	OAK\24.3"	210	POPLAR\25"	308	POPLAR\22.4"	409	PINE\18.9"	509	POPLAR\22.8"
9	POPLAR\19.2"	110	OAK\26.3"	211	GUM\19.3"	309	POPLAR\19.1"	410	POPLAR\26"	510	POPLAR\19.2"
10	OAK\25"	111	GUM\21.5"	212	POPLAR\20.1"	310	OAK\20.4"	411	GUM\21"	511	POPLAR\18.2"
11	OAK\29"	112	POPLAR\30"	213	GUM\24.5"	311	OAK\20.1"	412	POPLAR\21.4"	512	OAK\28.2"
12	OAK\29"	113	GUM\23.3"	214	GUM\19"	312	POPLAR\32.5"	413	GUM\19.8"	513	OAK\18.5"
13	GUM\19"	114	MAPLE\22.4"	215	POPLAR\29.2"	313	OAK\18"	414	POPLAR\18.2"	514	OAK\26.8"
14	POPLAR\19.2"	115	OAK\21"	216	GUM\22"	314	OAK\27.3"	415	POPLAR\21"	515	OAK\23.6"
15	GUM\23.8"	116	OAK\34.2"	217	OAK\32.5"	315	MAPLE\20"	416	POPLAR\19.1"	516	POPLAR\25.6"
16	PINE\19.1"	117	MAPLE\24.8"	218	POPLAR\36.8"	316	OAK\19.5"	417	POPLAR\19"	517	PINE\27.2"
17	PINE\23.2"	118	GUM\24.9"	219	MAPLE\21"	317	MAPLE\24"TWIN	418	POPLAR\19.5"	518	POPLAR\24.7"
18	OAK\26"	119	MAPLE\19.1"	220	MAPLE\19.2"	318	POPLAR\19.8"	419	OAK\22"	519	POPLAR\25"
19	OAK\19"	120	GUM\23.5"	221	MAPLE\22"	319	OAK\21.7"	420	POPLAR\28"	520	OAK\22"
20	OAK\19.6"	121	GUM\19"	222	GUM\33.5"	320	POPLAR\18"	421	POPLAR\22.8"	521	SWEETGUM\23"
21	OAK\20.6"	122	POPLAR\22.5"	223	POPLAR\22"	321	POPLAR\21"	422	OAK\20.3"	522	SWEETGUM\22.5"
22	OAK\19.2"	123	GUM\45"TRIPLE	224	POPLAR\21.7"	322	OAK\21.1"	423	OAK\27"	523	POPLAR\18.9"
23	OAK\26"	124	OAK\24"	225	GUM\19.7"	323	OAK\18.7"	424	OAK\22.5"	524	OAK\18.5"
24	OAK\25.4"	125	OAK\24.5"	226	GUM\22"	324	POPLAR\21.1"	425	GUM\26"	525	OAK\23.4"
25	OAK\19"	126	POPLAR\19.6"	227	POPLAR\23.5"	325	OAK\25.9"	426	OAK\20"	526	SWEETGUM\19"
26	GUM\21"	127	GUM\27"	228	GUM\30.5"	326	OAK\21"	427	OAK\21.8"	527	PINE\23.7"
27	OAK\23.1"	128	MAPLE\20.5"	229	POPLAR\30.1"	327	OAK\27.7"	428	PINE\20.8"	528	POPLAR\22.5"
28	MAPLE\20.5"	129	MAPLE\21"	230	OAK\20.1"	328	GUM\25.2"	429	OAK\25.8"	529	PINE\19"
29	OAK\30.4"	130	MAPLE\26"	231	GUM\33.4"	329	GUM\19.5"	430	GUM\20.7"	530	OAK\25.3"
30	MAPLE\24.8"	131	MAPLE\22"	232	OAK\41	330	PINE\31.3"	431	OAK\18"	531	OAK\20"
31	OAK\22.3"	132	GUM\21.5"	233	GUM\22.6"	331	OAK\23.8"	432	GUM\18.5"	532	PINE\26"
32	GUM\34.3"TWIN	133	MAPLE\20"	234	POPLAR\19"	332	PINE\19.5"	433	GUM\19"	533	SWEETGUM\19"
33	OAK\22.7"	134	MAPLE\25"	235	POPLAR\19.2"	333	PINE\23.7"	434	OAK\41.5"	534	OAK\18"
34	OAK\22.9"	135	GUM\24.5"	236	GUM\22.3"	334	POPLAR\18"	435	POPLAR\18.4"	535	OAK\21"TWIN
35	MAPLE\19.4"	136	GUM\26.3"	237	OAK\19"	335	POPLAR\18.9"	436	POPLAR\22.5"	536	OAK\18.7"
36	OAK\24.3"	137	GUM\25.4"	238	OAK\20.7"	336	GUM\29.2"	437	OAK\18.8"	537	OAK\20.7"
37	OAK\22.3"	138	GUM\23.9"	239	GUM\21"	337	GUM\20.7"	438	OAK\24"	538	OAK\21.8"
38	GUM\20.4"	139	OAK\39.5"	240	GUM\20.6"	338	POPLAR\26.5"	439	POPLAR\20.3"	539	PINE\20"
39	MAPLE\29.2"	140	GUM\21"	241	GUM\23.2"	339	PINE\36.7"	440	OAK\21.8"	540	OAK\21"
40	POPLAR\19.1"	141	OAK\25.3"	242	BIRCH\28"	340	POPLAR\19.7"	441	OAK\20"	541	OAK\18.8"
41	MAPLE\21.9"	142	GUM\23.9"	243	GUM\20"	341	POPLAR\29.5"TWIN	442	POPLAR\19.5"	542	POPLAR\19.1"
42	OAK\19.9"	143	MAPLE\22"	244	POPLAR\22"	342	POPLAR\24.5"	443	POPLAR\20.5"	543	SWEETGUM\23.5"
43	GUM\22.2"	144	GUM\19"	245	OAK\21.7"	343	OAK\19.6"	444	POPLAR\18.2"	544	SWEETGUM\20.4"
44	OAK\19.6"	145	GUM\27"	246	OAK\24"	344	POPLAR\37.3"TWIN	445	OAK\19.9"	545	OAK\20.6"
45	POPLAR\22.8"	146	GUM\23"	247	POPLAR\22.5"	345	OAK\27.3"	446	OAK\23.2"	546	OAK\19.5"
46	OAK\20.7"	147	GUM\23.9"	248	GUM\19"	346	POPLAR\21.9"	447	OAK\25.5"	547	POPLAR\20"
47	OAK\19.4"	148	GUM\26"	249	POPLAR\24.5"	347	OAK\18"	448	PINE\24.6"	548	MAPLE\21.3
48	OAK\22.4"	149	GUM\24"	250	GUM\19.4"	348	OAK\24.9"	449	PINE\21"	549	OAK\27"
49	OAK\21.2"	150	OAK\31"	251	GUM\19.1"	349	GUM\44"TRIPLE	450	POPLAR\21.7"	550	PINE\25.4"
50	OAK\22.2"	151	POPLAR\22.2"	252	GUM\23.3"	350	OAK\27.4"	451	OAK\22.3"	551	OAK\22.5"
51	OAK\25.7"	152	POPLAR\20"	253	OAK\22.4"	351	OAK\22"	452	OAK\21.7"	552	OAK\25.8"
52	MAPLE\19.4"	153	POPLAR\20"	254	POPLAR\29.7"	352	PINE\20.2"	453	OAK\23.3"	553	OAK\21"TWIN
53	POPLAR\20"	154	MAPLE\20"	255	GUM\24.2"	353	PINE\22.7"	454	OAK\24.3"	554	PINE\18.8"
54	OAK\24.2"	155	POPLAR\31"	256	GUM\23"	354	OAK\21.5"	455	POPLAR\18"	555	SWEETGUM\22.4"TWIN
55	POPLAR\23"	156	POPLAR\19.8"	257	POPLAR\21"	355	PINE\18.7"	456	PINE\20.7"	556	PINE\22.8"
56	POPLAR\20.4"	157	MAPLE\23.8"	258	POPLAR\22.5"	356	PINE\23.9"	457	MAPLE\18.4"	557	PINE\20"
57	POPLAR\24.3"	158	OAK\25.5"	259	PINE\24"	357	GUM\36.9"	458	OAK\22"	558	PINE\25.5"
58	MAPLE\20.6	159	GUM\39.4"TWIN	260	OAK\36.5"	358	OAK\18.7"	459	OAK\18.9"	559	SWEETGUM\20"
59	GUM\21.2"	160	GUM\19.5"	261	GUM\23.2"	359	GUM\19.5"	460	OAK\31.5"	560	POPLAR\19"
60	GUM\19.7"	161	GUM\24"	262	MAPLE\20"	360	OAK\19.8"	461	GUM\19.6"	561	POPLAR\23"
61	SYCAMORE\25"	162	OAK\32.7"	263	GUM\21"	361	PINE\24"	462	OAK\26.3"	562	MAPLE\25.2"
62	MAPLE\22"	163	POPLAR\19.2"	264	GUM\41.8"TRIPLE	362	OAK\22.5"	463	OAK\22"	563	POPLAR\21.8"
63	POPLAR\20"	164	GUM\23.7"	265	GUM\21"	363	PINE\18.5"	464	OAK\19.3"	564	PINE\21"
64	POPLAR\24.8"	165	GUM\19"	266	GUM\20"	364	PINE\23.6"	465	OAK\21.7"	565	PINE\19.5"
65	MAPLE\21.3"	166	GUM\22.6"	267	POPLAR\24"	365	POPLAR\23"	466	OAK\22.6"	566	PINE\18"
66	POPLAR\21.7"	167	MAPLE\22.6	268	POPLAR\25"	366	PINE\21.5"	467	GUM\23.3"	567	PINE\23.5"
67	OAK\19.5"	168	GUM\26.3"	269	PINE\24"	367	OAK\18.5"	468	OAK\22"	568	PINE\25"
68	MAPLE\23.3"	169	GUM\22.2"	270	GUM\24"	368	OAK\22.9"	469	OAK\29.5"	569	PINE\21.3"
69	GUM\22.3"	170	POPLAR\20.5"	271	OAK\20"	369	MAPLE\30"TWIN	470	OAK\34.7"TWIN	570	PINE\20.5"
70	GUM\22.5"	171	POPLAR\22.2"	272	GUM\27"	370	MAPLE\25"	471	OAK\21"	571	OAK\20.7"
71	HORNBEAM\28"	172	POPLAR\26"	273	POPLAR\26.5"	371	GUM\19.5"	472	OAK\21"	572	POPLAR\24"
72	POPLAR\31"	173	POPLAR\21"	274	GUM\19.5"	372	GUM\19.1"	473	OAK\23.5"	573	POPLAR\20.3"
73	HORNBEAM\25"	174	MAPLE\44.8TWIN	275	GUM\19.3"	373	GUM\20.9"	474	PINE\23.4"	574	PINE\32"
74	OAK\19.8"	175	GUM\19.2"	276	MAPLE\27"	374	POPLAR\29.2"	475	OAK\20"		
75	GUM\19.5"	176	MAPLE\21.2"	277	GUM\25"	375	OAK\23.4"	476	OAK\20.3"		
76	OAK\19.3"	177	POPLAR\32"	278	OAK\27.3"	376	GUM\19.5"	477	POPLAR\21.5"		
77	GUM\19.8"	178	MAPLE\19"	279	POPLAR\28"	377	POPLAR\22"	478	OAK\27.5"TWIN		
78	POPLAR\27"	179	POPLAR\36"	280	POPLAR\22.7"	378	GUM\24"	479	OAK\19.5"		
79	POPLAR\22"	180	POPLAR\19.5"	281	OAK\23.5"	379	OAK\20"	480	OAK\19.3"		
80	MAPLE\37"	181	POPLAR\26"	282	GUM\24.3"	380	MAPLE\23"	481	OAK\47"TWIN		
81	POPLAR\25.3"	182	GUM\23.2"	283	OAK\43.1"	381	OAK\18.5"	482	OAK\22.1"		
82	OAK\21.7"	183	POPLAR\24"	284	OAK\33.1"	382	POPLAR\18.1"	483	OAK\19.4"		
83	OAK\20.5"	184	POPLAR\27"	285	POPLAR\28"	383	OAK\19"	484	OAK\18.5"		
84	POPLAR\31"	185	POPLAR\23"	286	MAPLE\19.1"	384	POPLAR\20.2"	485	OAK\19.3"		
85	OAK\22.2"	186	POPLAR\24"	287	MAPLE\19"	385	GUM\19.8"	486	OAK\23.5"		
86	POPLAR\22.5"	187	MAPLE\20.1"	288	MAPLE\20.2"	386	OAK\23.9"	487	OAK\18.7"		
87	OAK\25.8"	188	GUM\21"	289	OAK\29"	387	OAK\21.8"	488	OAK\18.7"		
88	OAK\23.5"	189	POPLAR\19"	290	OAK\19.7"	388	PINE\19.3"	489	OAK\18.5"		
89	POPLAR\24"	190	POPLAR\25.6"	291	GUM\21"	389	OAK\25.6"	490	OAK\24.1"		
90	POPLAR\24.9"	191	POPLAR\29"	292	MAPLE\32.5"TWIN	390	OAK\19.5"	491	OAK\24.1"		
91	MAPLE\24"	192	GUM\24.5"	293	OAK\33"	391	POPLAR\22.2"	492	OAK\19.4"		
92	MAPLE\24"	193	POPLAR\30.9"	294	GUM\25"	392	POPLAR\26"	493	OAK\25"		
93	POPLAR\27"	194	GUM\19.2"	295	PINE\28.4"	393	POPLAR\23"	494	OAK\21.5"		
94	POPLAR\24.5"	195	GUM\22.6"	296	POPLAR\21"	394	PINE\21.8"	495	POPLAR\26"		
95	OAK\31.1"	196	MAPLE\27.6"	297	OAK\18.2"	395	POPLAR\30"TWIN	496	PINE\25.7"		
96	OAK\27.3"	197	POPLAR\19.1"	298	PINE\18.5"	396	POPLAR\25.3"	497	PINE\22"		
97	POPLAR\20.2"	198	POPLAR\20.5"	299	POPLAR\28.2"	397	GUM\20.7"	498	OAK\23"		
98	POPLAR\19.3"	199	POPLAR\24.5"			398	PINE\25.5"	499	OAK\26.3"		
99	GUM\19.2"	200	GUM\22.5"			399	OAK\20.1"	500	PINE\23.4"		
100	GUM\19.4"	201	POPLAR\25"			400	POPLAR\20"				



PRELIMINARY PLANS
NOT FOR CONSTRUCTION

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FOR REVIEW ONLY

HEELAN PROPERTY PUD
PD PLANS

TOWN OF APEX   WAKE COUNTY, NORTH CAROLINA

EXISTING CONDITIONS PLAN

SCALE	DRAWN
1"=200'	PDC

DATE: OCTOBER 1, 2019

REVISION	
11/07/19	1st TRC REVIEW
12/05/19	2nd TRC REVIEW
01/09/19	3rd TRC REVIEW
01/27/20	4th TRC REVIEW

SHEET: 3

PROJECT: 1910

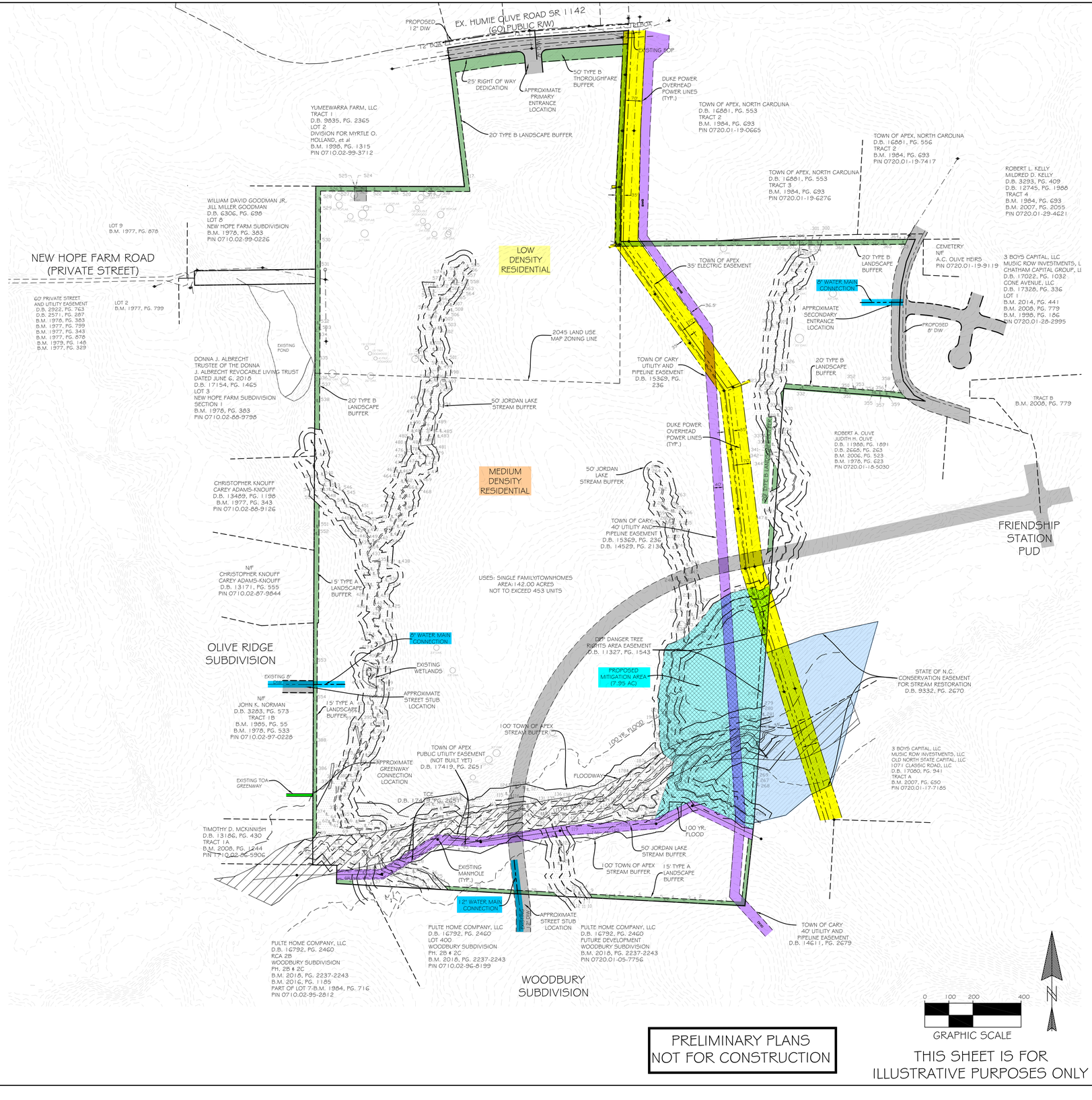
TOWN REQUIRED PUD NOTES:

1. PROTECTION FENCING MUST BE PLACED AWAY FROM ANY SAVED TREE ONE FOOT FOR EACH INCH OF TREE CALIPER. PROTECTION FENCING MUST BE PLACED AT LEAST 10 FEET AWAY FROM ANY OTHER DESIGNATED RESOURCE CONSERVATION AREA, SUCH AS BUT NOT LIMITED TO HISTORIC BUILDINGS AND STRUCTURES, WETLANDS, AND PONDS. PROTECTION FENCING MUST BE PLACED ALONG THE OUTSIDE LINE OF THE 100-YEAR FLOODPLAIN, AND THE OUTSIDE EDGE OF ANY RIPARIAN BUFFER. ADDITIONAL PROTECTION FENCING MAY BE REQUIRED IN OTHER LOCATIONS CLOSE TO CONSTRUCTION ACTIVITY WHERE IT IS DEEMED NECESSARY BY THE ZONING ENFORCEMENT OFFICER; SUCH AREAS MAY INCLUDE BUT ARE NOT LIMITED TO COMMON PROPERTY LINES OR NEAR PUBLIC AREAS (SIDEWALKS, ETC.).
2. SITE ELEMENTS REQUIRED TO SATISFY RECREATIONAL REQUIREMENTS SUCH AS BUT NOT LIMITED TO PLAY FIELDS AND GREENWAY TRAILS AND ITEMS TYPICALLY ASSOCIATED WITH THEM (BENCHES, TRASH CONTAINERS, SIGNS, ETC.) MUST MEET ANY APPLICABLE STANDARDS FOUND IN THE TOWN OF APEX STANDARD SPECIFICATIONS AND CONSTRUCTION DETAILS AND THE REQUIREMENTS OF THE TOWN OF APEX PARKS AND RECREATION DEPARTMENT.
3. ALL REQUIRED SITE ELEMENTS SHOWN WITHIN A PARTICULAR PHASE MUST BE INSTALLED BEFORE A FINAL CERTIFICATE OF OCCUPANCY MAY BE ISSUED FOR ANY BUILDING WITHIN THAT PHASE.
4. NO SIGNS ARE APPROVED AS PART OF A PUD-CZ PLAN APPROVAL. A SEPARATE SIGN PERMIT MUST BE OBTAINED.

- WETLANDS
- PROPOSED MITIGATION AREA
- RCA

NOTES:

1. BOUNDARY AND EXISTING CONDITIONS INFORMATION WAS TAKEN FROM A SURVEY BY ROBINSON & PLANTE SURVEYORS.
2. TOPOGRAPHIC INFORMATION FOR THE SITE WAS TAKEN FROM NORTH CAROLINA SPACIAL DATA LIDAR.
3. THE SITE HAS BEEN EVALUATED FOR THE EXISTENCE OF WETLANDS AND STREAMS BY SPANGLER ENVIRONMENTAL, INC. THE LOCATION OF THESE ENVIRONMENTAL FEATURES INCLUDING STREAM BUFFERS ARE SHOWN AS SURVEYED.
4. CONSTRUCTION VEHICLE PARKING SHALL BE LIMITED TO ONE SIDE OF THE ROAD (OPPOSITE OF FIRE HYDRANTS). SIGNS INDICATING "NO CONSTRUCTION VEHICLES THIS SIDE OF STREET" IN ENGLISH AND SPANISH.
5. ONCE THE FIRST LIFT OF ASPHALT IS PASSABLE BY VEHICLES, TEMPORARY STREET SIGNS ARE REQUIRED.
6. INSTALLATION OF SILT FENCE SHALL MAINTAIN 3' OF CLEARANCE AROUND FIRE HYDRANTS.
7. THE FUTURE LOCATIONS FOR WATER AND SEWER MAINS ARE APPROXIMATE AND SHALL BE DESCRIBED IN MORE DETAIL AT THE TIME OF MASTER PLANS. THESE UTILITY LOCATIONS ARE ILLUSTRATIVE TO SHOW CONNECTIONS AND SIZING.
8. ANY REQUIRED UTILITY CONNECTIONS TO SURROUNDING PROPERTIES AND PUBLIC R/W SHALL BE ALLOWED THROUGH ALL PERIMETER BUFFERS.
9. CONTACT FOR TOWN OF APEX ELECTRIC UTILITIES IS RODNEY SMITH AT 919-249-3342.
10. THIS DEVELOPMENT SHALL USE FULL TOWN OF APEX SERVICES INCLUDING WATER, SEWER AND ELECTRICITY.
11. ALL UTILITY INFRASTRUCTURE SHALL MEET CURRENT TOWN OF APEX WATER AND SEWER MASTER PLANS.



PRELIMINARY PLANS NOT FOR CONSTRUCTION

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FOR REVIEW ONLY

HEELAN PROPERTY PUD
PD PLANS
TOWN OF APEX | WAKE COUNTY, NORTH CAROLINA

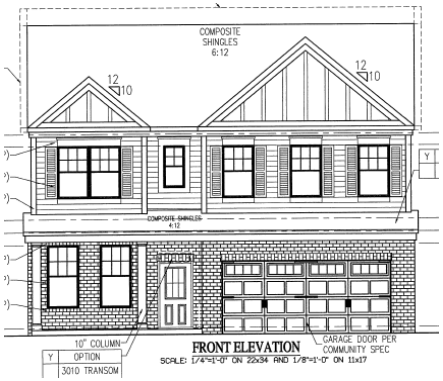
PRELIMINARY UTILITY PLAN

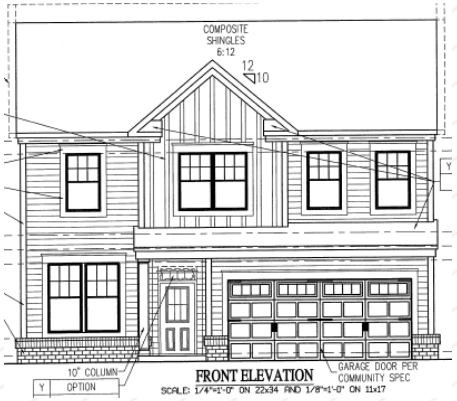
SCALE	1"=200'
DRAWN	PDC
DATE	OCTOBER 1, 2019

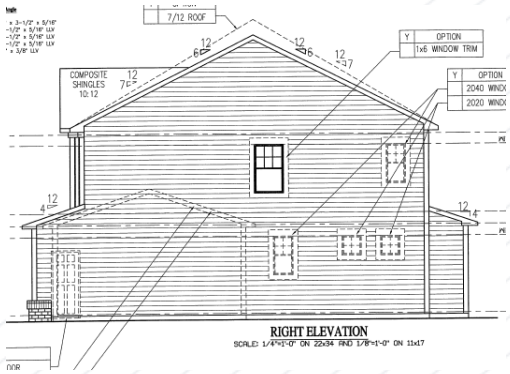
REVISION	
11/07/19	1st TRC REVIEW
12/05/19	2nd TRC REVIEW
01/09/20	3rd TRC REVIEW
01/27/20	4th TRC REVIEW
08/13/20	8th TRC REVIEW

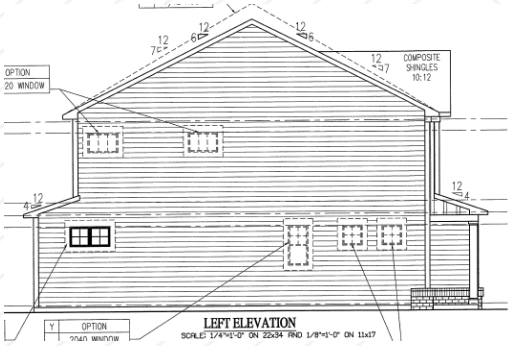
SHEET	4
PROJECT	1910

Single Family Elevations, Illustrative



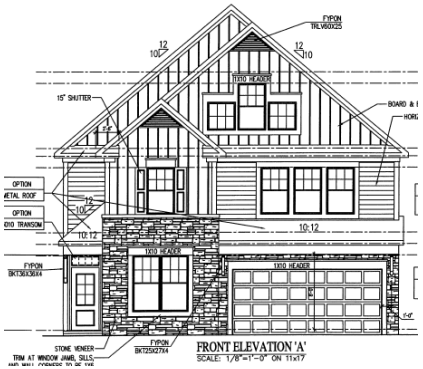


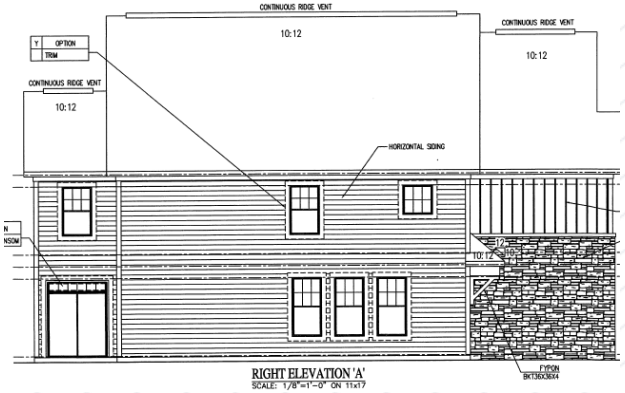


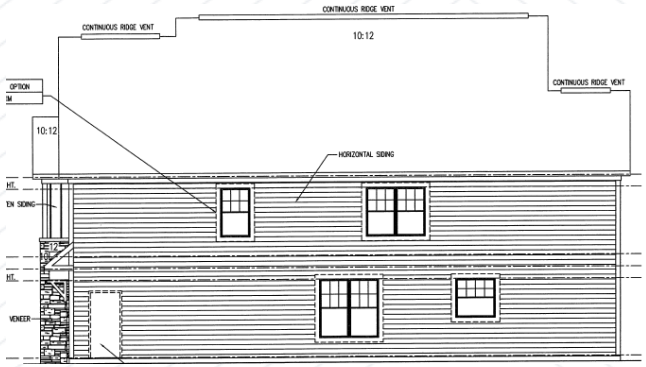


M/I HOMES

Single Family Elevations, Illustrative

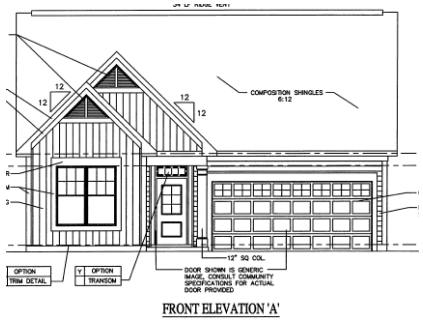




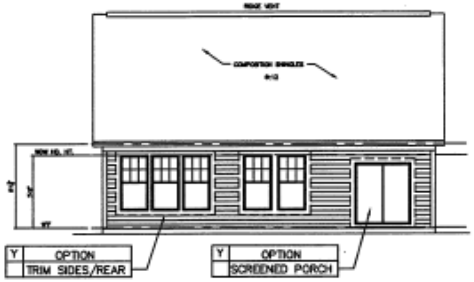


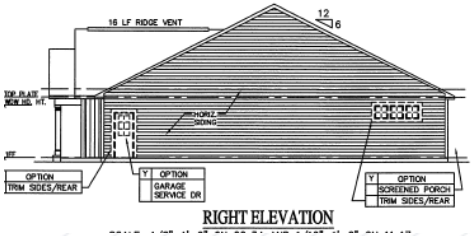
M/I HOMES

Single Family Elevations, Illustrative

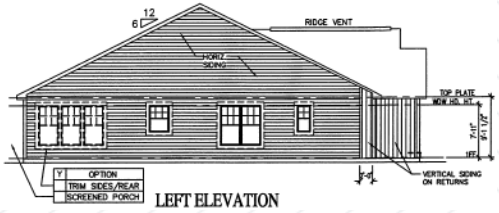


FRONT ELEVATION 'A'





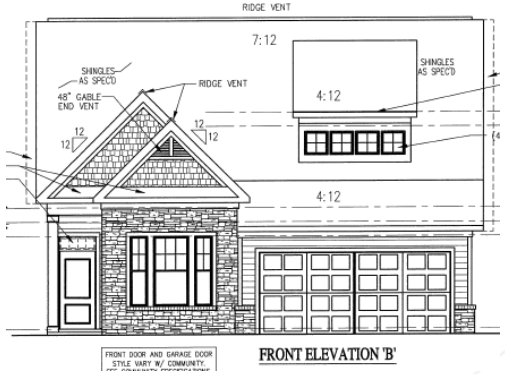
RIGHT ELEVATION



LEFT ELEVATION

M/I HOMES

Single Family Elevations, Illustrative



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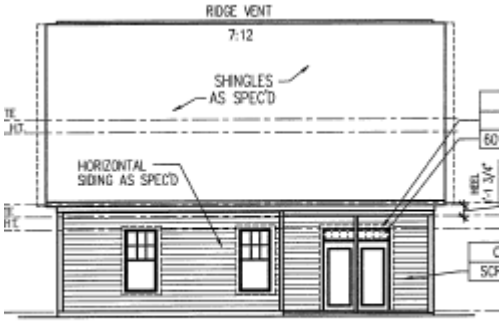

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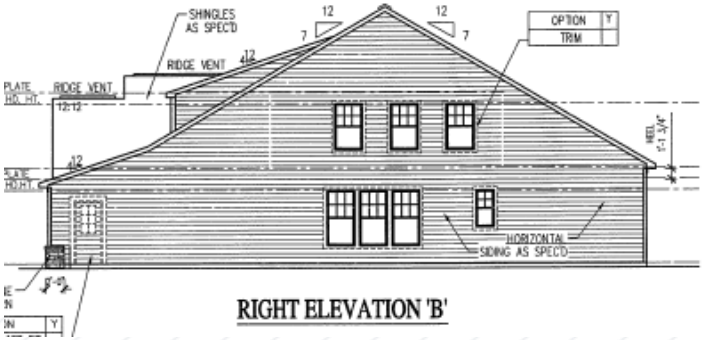

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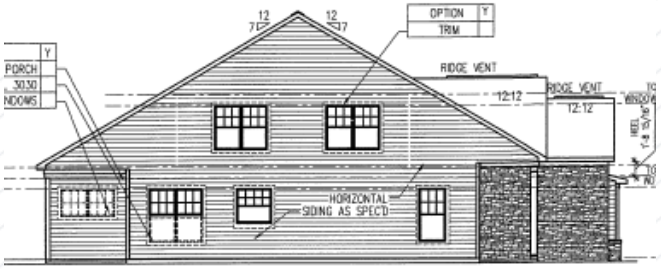
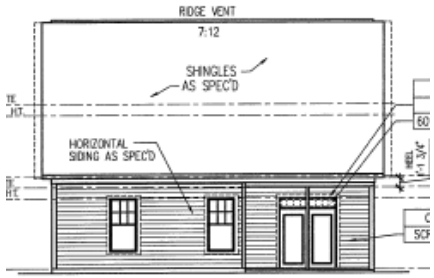


LEFT ELEVATION 'B'

M/I HOMES

Single Family Elevations, Illustrative

REAR ELEVATION 'B'
SCALE: 1/8"=1'-0" ON 11x17



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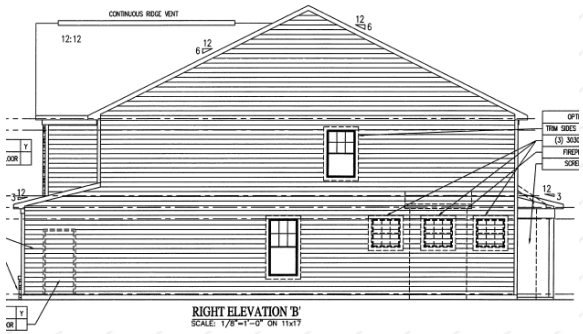

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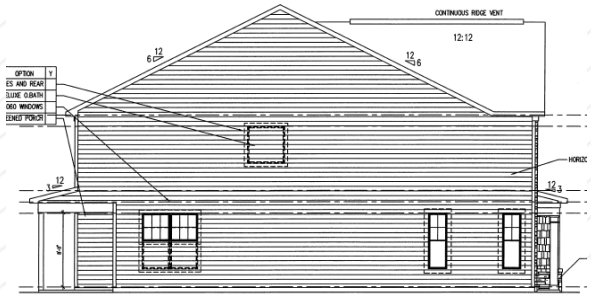
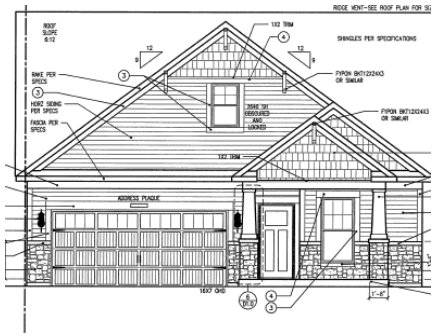
SCALE: 1/8"=1'-0" ON 11x17



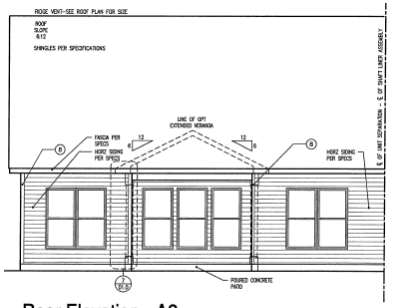
LEFT ELEVATION 'B'
SCALE: 1/8"=1'-0" ON 11x17

M/I HOMES

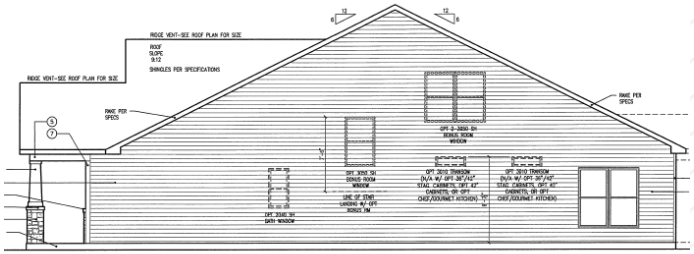
Single Family Elevations, Illustrative



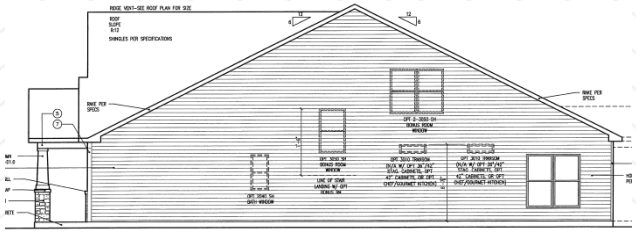
Front Elevation - A2



Rear Elevation - A2



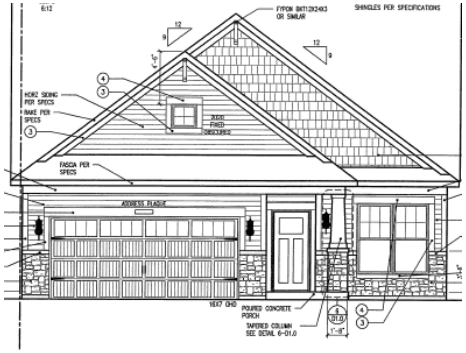
Side Elevation - A1



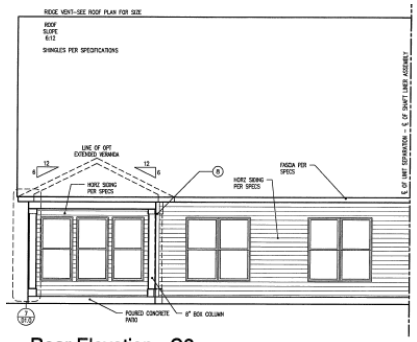
Side Elevation - A2

M/I HOMES

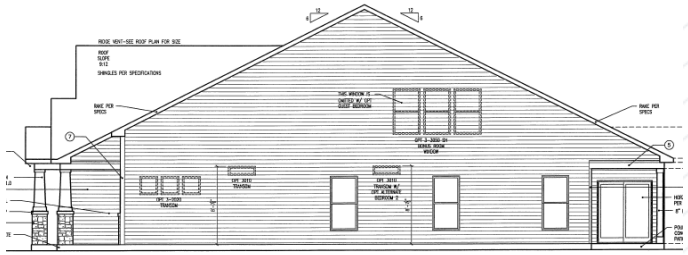
Single Family Elevations, Illustrative



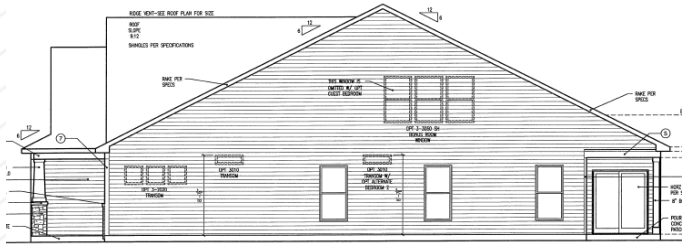
Front Elevation - C2



Rear Elevation - C2



Side Elevation - C1

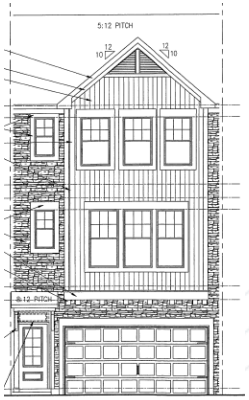


Side Elevation - C2

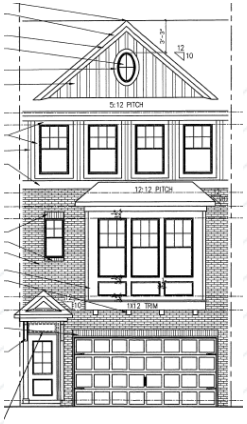
M/I HOMES

Townhome Elevations, Illustrative

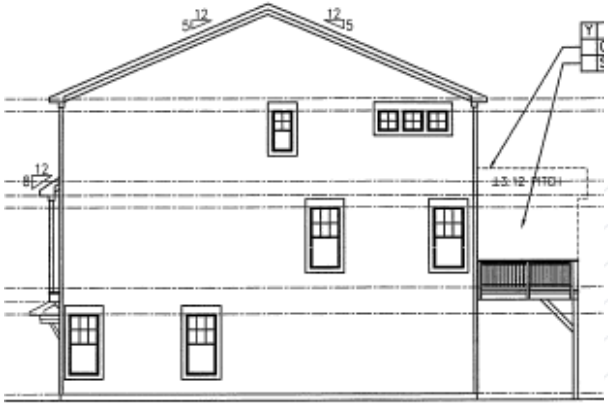
ELEVATION-A
SCALE: 1/4"=1'-0" ON 22x34 AND 1/8"=1'-0" ON 11x17



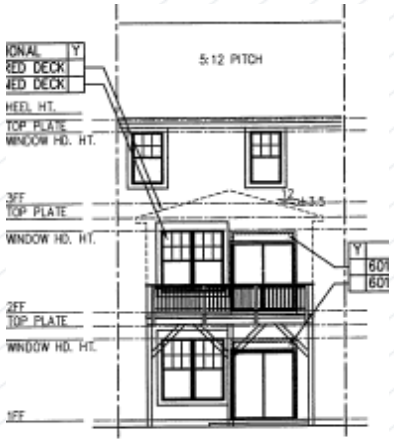
ELEVATION-C



ELEVATION-C



END UNIT -A ☐
SCALE: 1/8"=1'-0" ON 22x34 AND 1/16"=1'-0" ON 11x17



REAR ELEVATION-A
/8"=1'-0" ON 22x34 AND 1/16"=1'-0" ON 11x

M/I HOMES

Traffic Impact Analysis
Heelan Property
Apex, North Carolina

RAMEY KEMP & ASSOCIATES

TRAFFIC IMPACT ANALYSIS

FOR

HEELAN PROPERTY

LOCATED

IN

Apex, North Carolina

Prepared For:
M/I Homes of Raleigh, LLC
1511 Sunday Drive, 100
Raleigh, NC 27607

Prepared By:
Ramey Kemp & Associates, Inc.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609
License #C-0910

September 2019

RKA Project No. 19273

Prepared By: MLS

Reviewed By: JTR

TRAFFIC IMPACT ANALYSIS
HEELAN PROPERTY
APEX, NORTH CAROLINA

EXECUTIVE SUMMARY

1. Development Overview

A Traffic Impact Analysis (TIA) was conducted for the proposed Heelan Property development in accordance with the Apex (Town) Unified Development Ordinance (UDO) and North Carolina Department of Transportation (NCDOT) capacity analysis guidelines. The proposed development is to be located in the southeast quadrant at the intersection of Humie Olive Road and New Hill Olive Chapel Road in Apex, North Carolina. The proposed development is expected to be a residential development and estimated to be built out in 2026. Site access will also be provided via one (1) full movement connection to Olive Farm Road to the east of the proposed site, one (1) connection to the Olive Ridge development to the west of the site, and via interconnectivity through Horton Ridge Boulevard. It should be noted that there is additionally a stubbed access at the northwestern quadrant of the site that may have future connectivity to New Hill Olive Chapel Road based on potential future development.

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- Existing (2019) Traffic Conditions
- Background (2026) Traffic Conditions – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Background (2026) Traffic Conditions – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

- Combined (2026) Traffic Conditions with Improvements – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions with Improvements – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

2. Existing Traffic Conditions

The study area for the TIA was determined through coordination with the Town and NCDOT and consists of the following existing intersections:

- Evans Road and Humie Olive Road
- Humie Olive Road and Richardson Road
- Olive Farm Road (Site Access) and Humie Olive Road
- Humie Olive Road and New Hill Olive Chapel Road
- New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Horton Ridge Boulevard (Site Access) and New Hill Chapel Road
- New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive (Site Access)
- Humie Olive Road and Site Drive

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below, in September of 2019 by RKA during typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods, while schools were in session:

- Evans Road and Humie Olive Road
- Olive Farm Road and Humie Olive Road
- New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

Traffic counts were collected at the following intersections in November of 2018 by RKA during typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods, while schools were in session, and grown one year to 2019 utilizing a 2% growth rate:

- Horton Ridge Boulevard and New Hill Chapel Road
- Humie Olive Road and Richardson Road
- Humie Olive Road and New Hill Olive Chapel Road

Volumes were balanced to account for any variance between intersections due to the different data collection dates. The intersection of New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive will be analyzed in all future conditions (background and combined conditions). Counts were not conducted at this study intersection because the Jordan Manors and Olive Ridge developments are currently under construction and trips from their respective TIA reports will be applied to the network, including this study intersection, in future conditions.

3. Site Trip Generation

The proposed development is assumed to consist of a maximum of 250 single-family homes and 268 townhomes. Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE Trip Generation Manual, 10th Edition. Table E-1 provides a summary of the trip generation potential for the site.

Table E-1: Site Trip Generation

LAND USE (ITE Code)	INTENSITY	DAILY TRIPS (VPD)	WEEKDAY AM PEAK HOUR (VPH)		WEEKDAY PM PEAK HOUR (VPH)	
			Enter	Exit	Enter	Exit
Single Family Detached Housing (210)	250 dwellings	2,420	45	137	154	91
Low-Rise Multi-Family Housing (220)	268 dwellings	1,990	28	94	89	53
Total Trips		**4,410**	**73**	**231**	**243**	**144**

It is estimated that the proposed development will generate approximately 4,410 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 304 trips (73 entering and 231 exiting) will occur during the weekday AM peak hour and 387 (243 entering and 144 exiting) will occur during the weekday PM peak hour.

4. Future Traffic Conditions

Through coordination with the Town and NCDOT, it was determined that an annual growth rate of 2% would be used to generate projected (2026) weekday AM and PM peak hour traffic

volumes. The following adjacent developments were identified to be considered under future conditions:

- Jordan Manors
- Jordan Pointe
- Woodbury
- Friendship Station PUD
- New Hill Assembly
- Olive Ridge

Based on the driveway locations of the adjacent developments, future traffic volumes may not balance between study intersections.

5. Capacity Analysis Summary

The analysis considered weekday AM and PM peak hour traffic for existing (2019), background (2026), and combined (2026) conditions. Refer to Section 7 of the report for the capacity analysis summary performed at each study intersection.

6. Recommendations

Based on the findings of this study, specific geometric and traffic control improvements have been identified at study intersections. The improvements are summarized below and are illustrated in Figure E-1.

Committed Improvements by Woodbury

<u>New Hill Olive Chapel Road and Humie Olive Road</u>

- Construct an exclusive westbound left-turn lane with a minimum of 100 feet of storage and appropriate deceleration and taper length.

Committed Improvements by Friendship Station

Humie Olive Road and Olive Farm Road

- Construct an exclusive westbound left-turn lane with a minimum of 50 feet of storage and appropriate deceleration and taper length.

New Hill Olive Chapel Road and Humie Olive Road:

- Extend the westbound left-turn lane to a minimum of 250 feet of storage and appropriate deceleration and taper length.
- Construct an exclusive southbound left-turn lane with a minimum of 150 feet of storage and appropriate deceleration and taper length.

Richardson Road and Humie Olive Road:

- Monitor for signalization.
- If warranted and required by NCDOT, install a traffic signal.

Committed Improvements by Jordan Pointe

New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

- Monitor for signalization.
- If warranted and required by NCDOT, install a traffic signal.

Committed Improvements by Olive Ridge

New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive

- Construct the westbound approach (Olive Ridge Drive) with one (1) ingress lane and one (1) egress lane.
- Provide stop control for the westbound approach (Olive Ridge Drive).
- Provide an exclusive southbound left-turn lane with a minimum of 50 feet of storage and appropriate taper and deceleration length.

Recommended Improvements by Developer

Humie Olive Road and Richardson Road

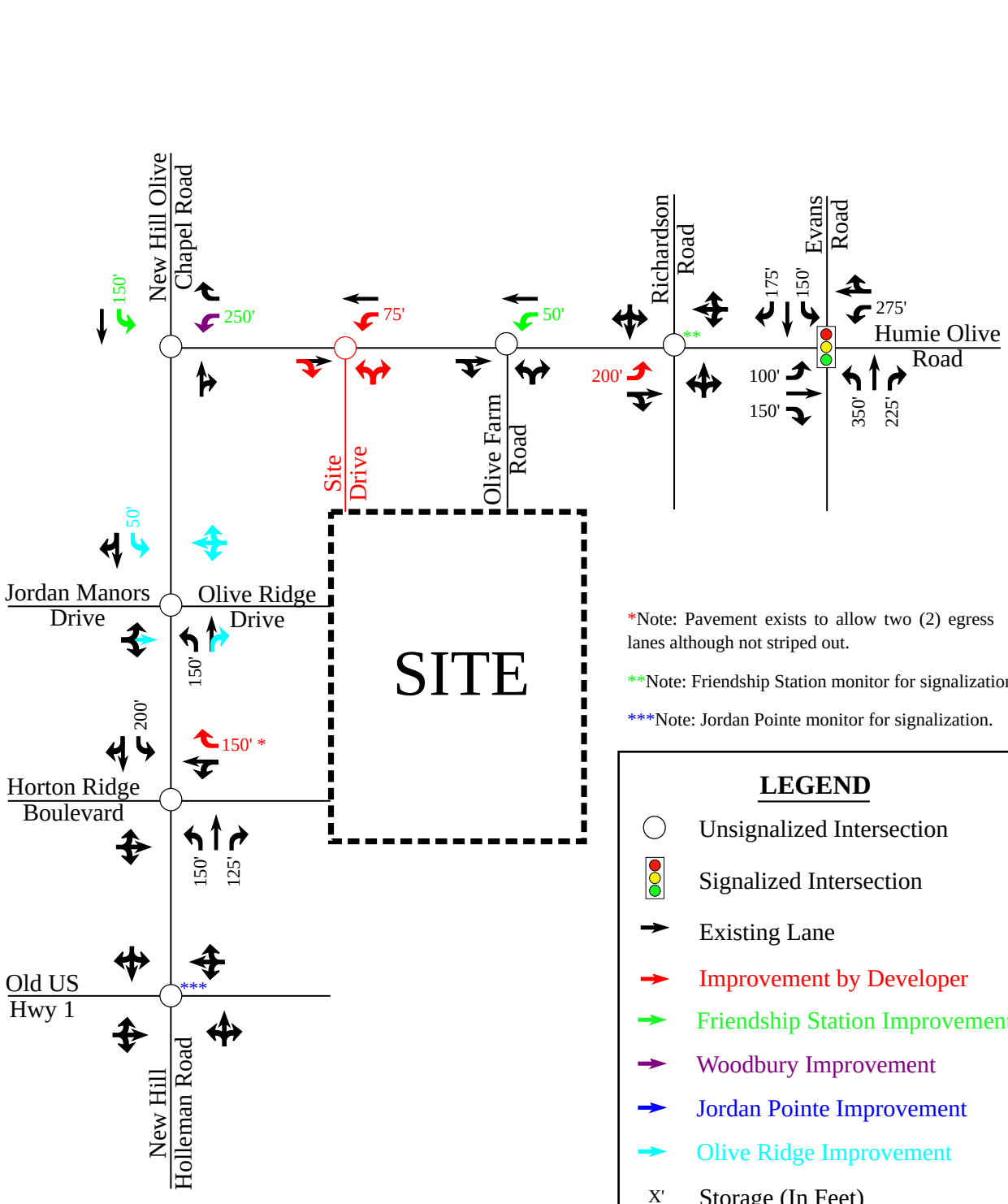
- Construct an exclusive eastbound left-turn lane with a minimum of 200 feet of storage and appropriate deceleration and taper length.

Horton Ridge Boulevard (Site Access) and New Hill Chapel Road

- Restripe the existing westbound approach to include an exclusive westbound right-turn lane and shared through/left-turn lane. It should be noted that pavement currently exists to accommodate this laneage.

Humie Olive Road and Site Drive

- Construct the northbound approach (Site Drive) with one (1) ingress and one (1) egress lane.
- Provide stop control for the northbound approach (Site Drive).
- Construct an exclusive westbound left-turn lane with a minimum of 75 feet of storage and appropriate deceleration and taper length.



RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Recommended Lane Configurations

Scale: Not to Scale

Figure E-1

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TRAFFIC IMPACT ANALYSIS
HEELAN PROPERTY
APEX, NORTH CAROLINA

1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed Heelan Property development to be located in the southeast quadrant at the intersection of Humie Olive Road and New Hill Olive Chapel Road in Apex, North Carolina. The purpose of this study is to determine the potential impacts to the surrounding transportation system created by traffic generated by the proposed development, as well as recommend improvements to mitigate the impacts.

The proposed development, anticipated to be completed in 2026, is assumed to consist of the following uses:

- 250 single-family detached homes
- 268 townhomes

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- Existing (2019) Traffic Conditions
- Background (2026) Traffic Conditions – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Background (2026) Traffic Conditions – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions with Improvements – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

- Combined (2026) Traffic Conditions with Improvements – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

1.1. Site Location and Study Area

The development is proposed to be located in the southeast quadrant at the intersection of Humie Olive Road and New Hill Olive Chapel Road in Apex, North Carolina. Refer to Figure 1 for the site location map.

The study area for the TIA was determined through coordination with the North Carolina Department of Transportation (NCDOT) and the Town of Apex (Town) and consists of the following intersections:

- Evans Road and Humie Olive Road
- Humie Olive Road and Richardson Road
- Olive Farm Road (Site Access) and Humie Olive Road
- Humie Olive Road and New Hill Olive Chapel Road
- New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Horton Ridge Boulevard (Site Access) and New Hill Chapel Road
- New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive (Site Access)
- Humie Olive Road and Site Drive

1.2. Proposed Land Use and Site Access

The proposed development, anticipated to be completed in 2026, is assumed to consist of the following uses:

- 250 single-family detached homes
- 268 townhomes

Site access will be provided via one (1) full movement site driveway along Humie Olive Road. Site access will also be provided via one (1) full movement connection to Olive Farm Road to the east of the proposed site, one (1) connection to the Olive Ridge development to the west of the site, and via interconnectivity through Horton Ridge Boulevard. It should be noted that,

additionally, there is a stubbed access at the northwestern quadrant of the site that may have future connectivity to New Hill Olive Chapel Road based on potential future development. Refer to Figure 2 for a copy of the preliminary site plan.

1.3. Adjacent Land Uses

The proposed development is located in an area consisting primarily of undeveloped land and residential development. Based on coordination with the Town and NCDOT, six (6) adjacent developments were identified to be included in the study. Refer to Section 3 of the report for more information.

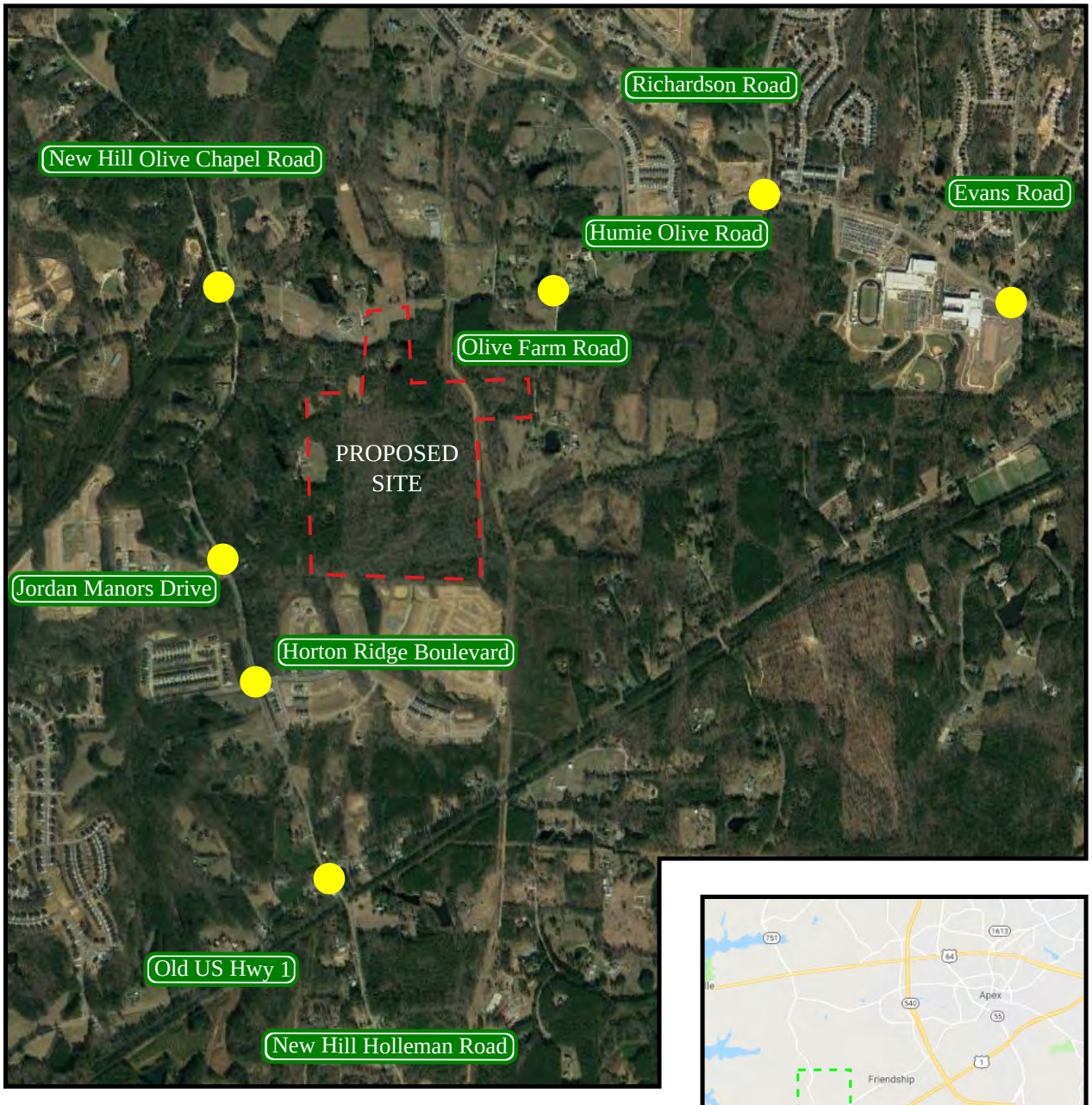
1.4. Existing Roadways

Existing lane configurations (number of traffic lanes on each intersection approach), lane widths, storage capacities, and other intersection and roadway information was collected by Ramey Kemp & Associates, Inc. (RKA). Table 1 on the following page provides a summary of the field data collected. Refer to Figure 3 for an illustration of the existing lane configurations within the study area.

Table 1: Existing Roadway Inventory

Road Name	Route Number	Typical Cross Section	Speed Limit	Maintained By	AADT (vpd)
Old US 1	SR 1011	2-lane undivided	35 mph	NCDOT	3,000[1]
Humie Olive Road	SR 1142	2-lane undivided	45 mph	NCDOT	780[2]
Evans Road	SR 1147	2-lane undivided	35 mph	NCDOT	3,100[3]
Richardson Road	SR 1145	2-lane undivided	45 mph (assumed)	NCDOT	700[2]
Olive Farm Road	SR 1178	2-lane undivided	25 mph (assumed)	NCDOT	50[3]
New Hill Olive Chapel Road / New Hill Holleman Road	SR 1141	2-lane undivided	45 mph	NCDOT	3,700[1]
Horton Ridge Boulevard	N/A	2-lane undivided	35 mph (assumed)	Town	550[3]

1. NCDOT 2017 AADT Information
2. NCDOT 2015 AADT Information
3. ADT based on the traffic counts from 2019 and assuming the weekday PM peak hour volume is 10% of the average daily traffic.



LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

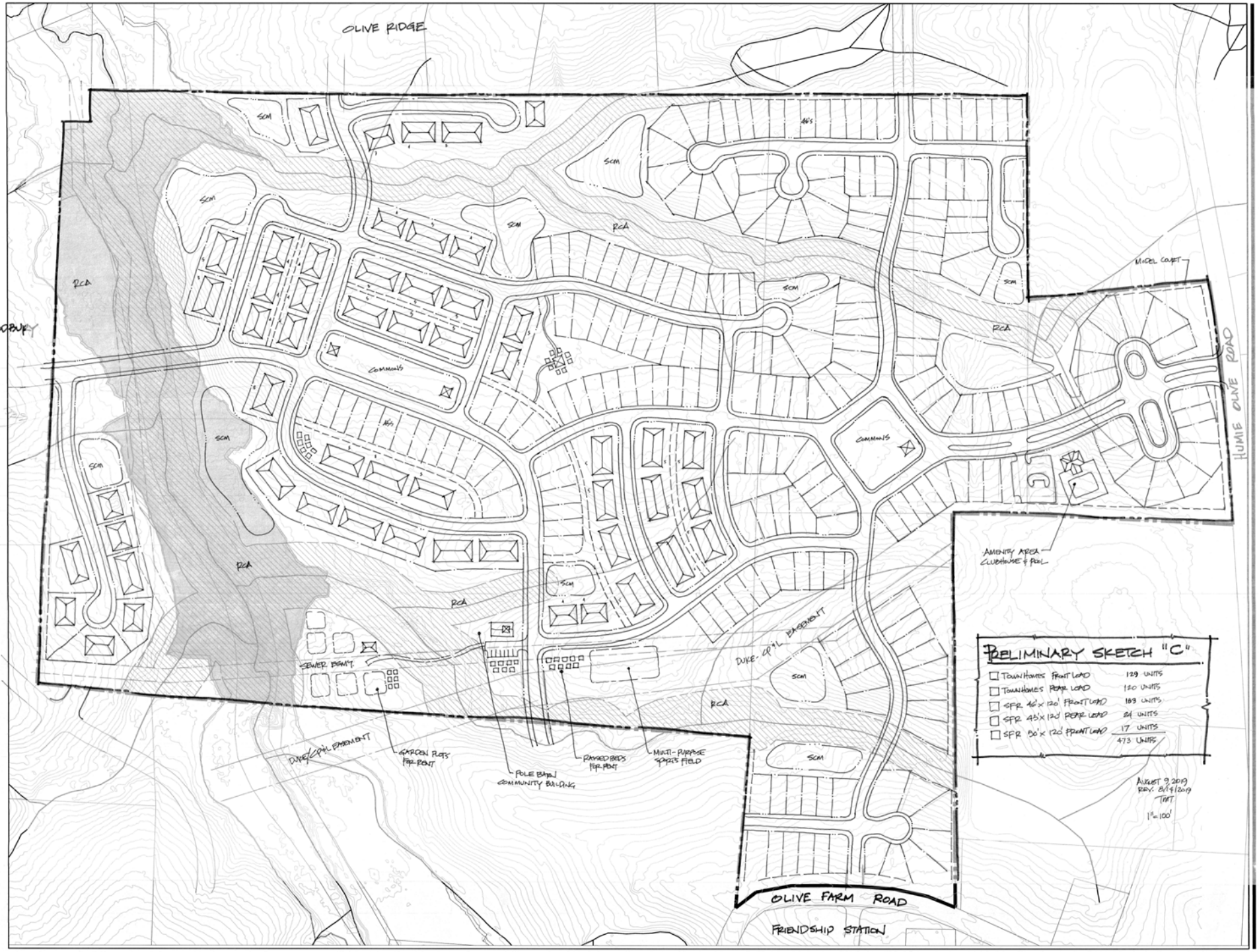
N

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Site Location Map

Scale: Not to Scale | Figure 1



TMTLA ASSOCIATES
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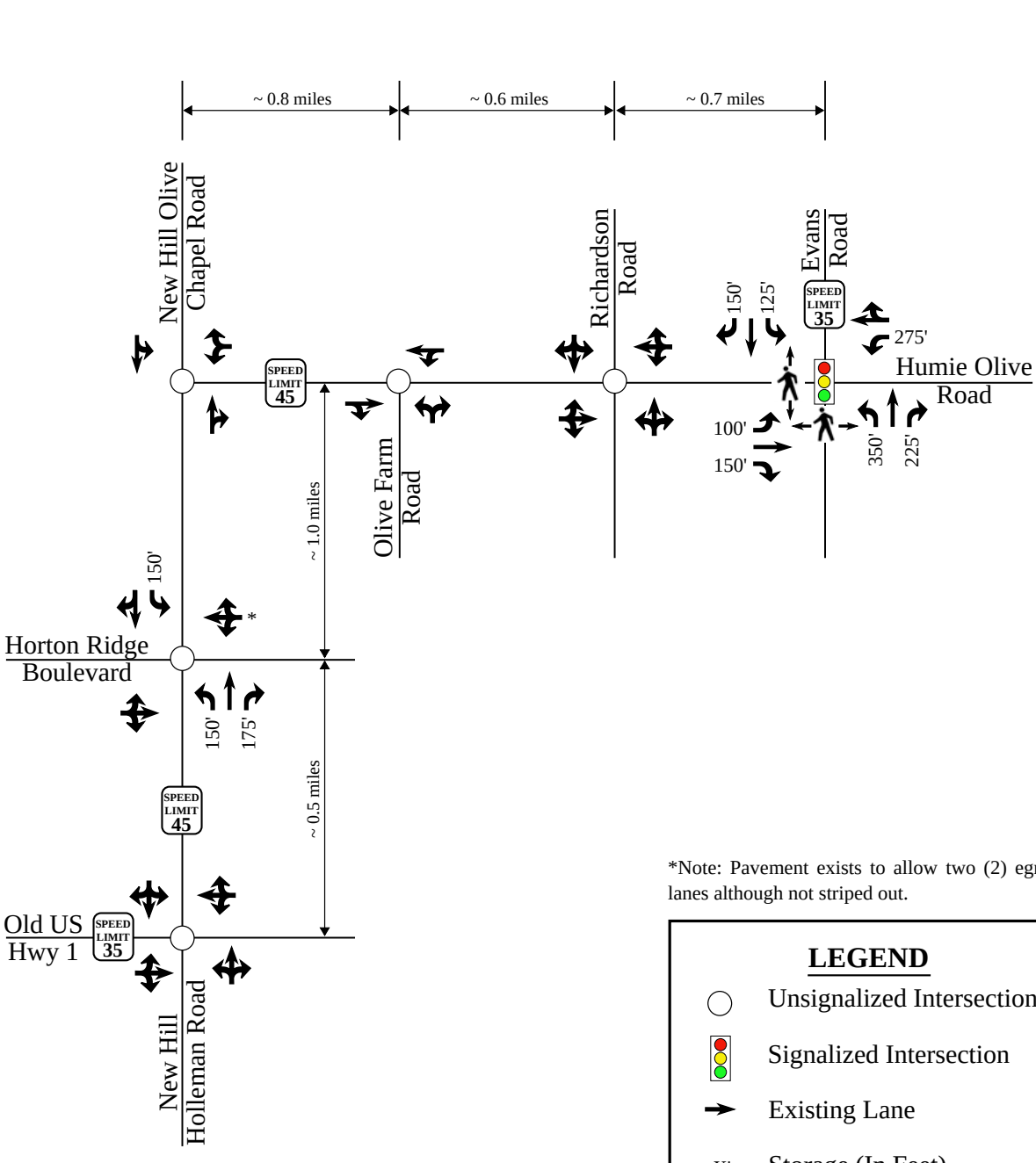
p: (919) 484-8887 e: info@tmtla.com

NORTH CAROLINA REGISTERED LANDSCAPE ARCHITECTURE No. C-126

HEELAN PROPERTY
M/I HOMES

SCALE:
DRAWN BY:
PROJECT #
DATE:
SHEET
OF



*Note: Pavement exists to allow two (2) egress lanes although not striped out.

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Existing
Lane Configurations

Scale: Not to Scale | Figure 3

2. EXISTING (2019) PEAK HOUR CONDITIONS

2.1. Existing (2019) Peak Hour Traffic

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below, in September of 2019 by RKA during typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods, while schools were in session:

- Evans Road and Humie Olive Road
- Olive Farm Road and Humie Olive Road
- New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

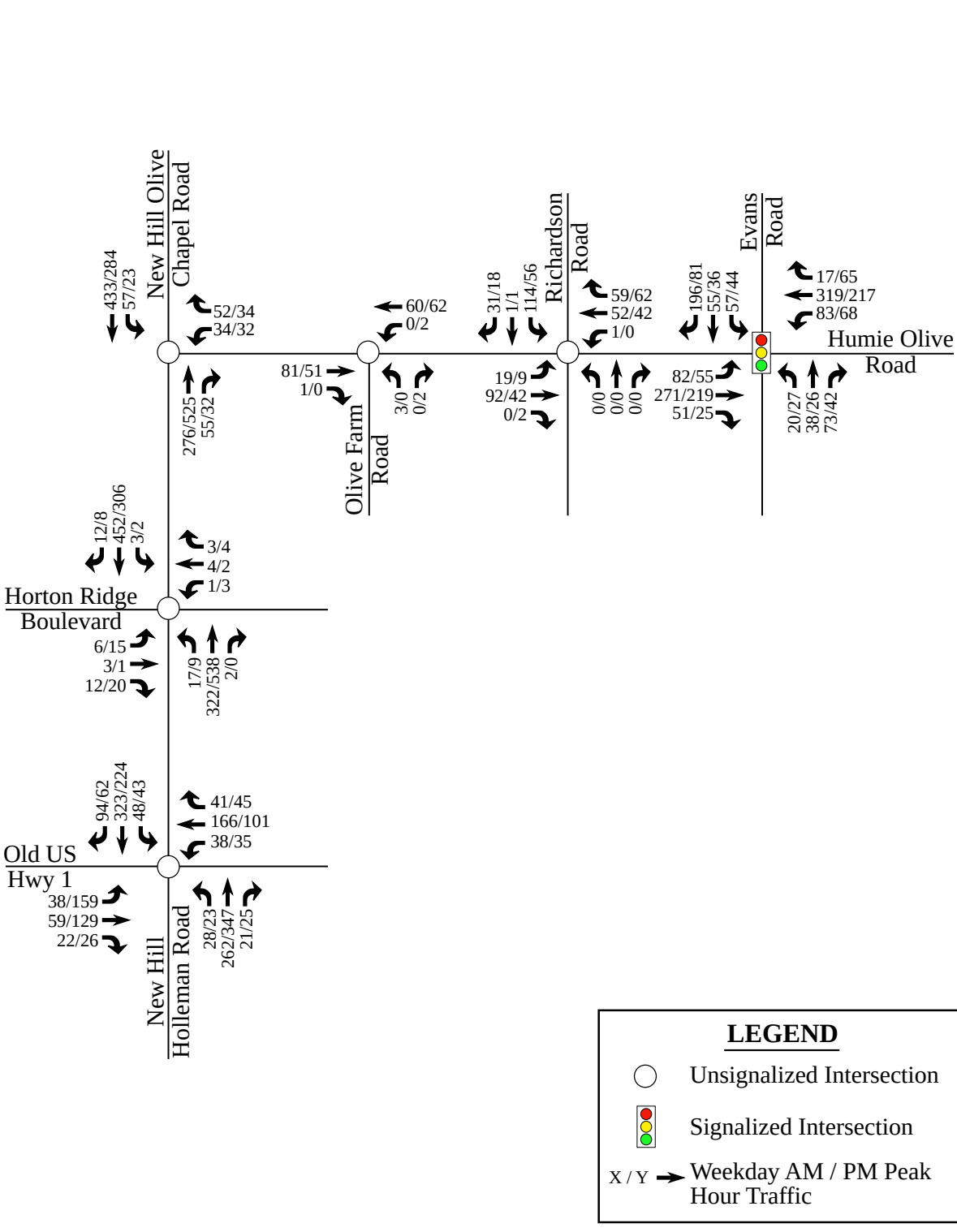
Traffic counts were collected at the following intersections in November of 2018 by RKA during typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods, while schools were in session, and grown one year to 2019 utilizing a 2% growth rate:

- Horton Ridge Boulevard and New Hill Chapel Road
- Humie Olive Road and Richardson Road
- Humie Olive Road and New Hill Olive Chapel Road

Volumes were balanced to account for any variance between intersections due to the different data collection dates. The intersection of New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive will be analyzed in all future conditions (background and combined conditions). Counts were not conducted at this study intersection because the Jordan Manors and Olive Ridge developments are currently under construction and trips from their respective TIA reports will be applied to the network, including this study intersection, in future conditions. Refer to Figure 4 for existing (2019) weekday AM and PM peak hour traffic volumes. A copy of the count data is located in Appendix B of this report.

2.2. Analysis of Existing (2019) Peak Hour Traffic

The existing (2019) weekday AM and PM peak hour traffic volumes were analyzed to determine the current levels of service at the study intersections under existing roadway conditions. Signal information was obtained from NCDOT and is included in Appendix C. The results of the analysis are presented in Section 7 of this report.



RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Existing (2019)
Peak Hour Traffic

Scale: Not to Scale

Figure 4

3. BACKGROUND (2026) PEAK HOUR CONDITIONS

In order to account for growth of traffic and subsequent traffic conditions at a future year, background traffic projections are needed. Background traffic is the component of traffic due to the growth of the community and surrounding area that is anticipated to occur regardless of whether or not the proposed development is constructed. Background traffic is comprised of existing traffic growth within the study area and additional traffic created as a result of adjacent approved developments.

3.1. Ambient Traffic Growth

Through coordination with the Town and NCDOT, it was determined that an annual growth rate of 2% would be used to generate projected (2026) weekday AM and PM peak hour traffic volumes. Refer to Figure 5 for projected (2026) peak hour traffic.

3.2. Adjacent Development Traffic

Through coordination with the NCDOT and Town, the following developments were identified to be included in future conditions:

- Jordan Manors
- Jordan Pointe
- Woodbury
- Friendship Station PUD
- New Hill Assembly
- Olive Ridge

Table 2 on the following page provides a summary of the adjacent developments. Additional adjacent development information can be found in Appendix D.

Table 2: Adjacent Development Information

Development Name	Percent Built-Out	Location	Build-Out Year	Land Use / Intensity	TIA Performed
Jordan Manors	40%	West of New Hill Olive Chapel Road, adjacent to Olive Ridge	Prior to Heelan Property	240 single-family homes	May of 2015 by KHA
Jordan Pointe	65%	Along Old US 1, east of Horton Road	Prior to Heelan Property	240 single-family homes	October 2013 by KHA
Woodbury	25%	Along Horton Ridge Boulevard, east of New Hill Holleman Road	Prior to Heelan Property	311 single-family homes and 89 townhomes	May of 2016 by VHB
Friendship Station PUD	--*	Along Honeycutt Road between Cass Holt Road and Piney Grove-Wilbon Road	2021	316 single-family homes, 185 apartment units, 337 townhomes, and 44,000 sq. ft. of retail space	March of 2017 by RKA
New Hill Assembly	--*	West of New Hill Olive Chapel Road, north of Old US 1	2022	152 single-family homes	April of 2018 by RKA
Olive Ridge	--*	East of New Hill Chapel Road, across from Jordan Manors	2022	150 single-family homes	December of 2018 by RKA

*None of the development has been constructed/occupied.

It is assumed that a portion of the Jordan Manors, Jordan Pointe, and Woodbury developments are built-out and are expected to have been captured in counts; therefore, only the remaining percentage in trip generation potential for this site was applied to the proposed Heelan Property study network based on coordination with the Town and NCDOT.

The intersection of New Hill Chapel Road and Jordan Manors Drive currently exists as a three-leg intersection with Jordan Manors Drive tying into New Hill Olive Chapel Road approximately a third of a mile north of the intersection of New Hill Olive Chapel Road and

Horton Ridge Boulevard; however, the intersection was not analyzed in existing (2019) conditions because Jordan Manors is only partially built and few homes are occupied. Based on the build-out of Jordan Manors, minimal turning vehicles are expected to currently occur at the study intersection. 100% of the trips associated with the Jordan Manors and Olive Ridge developments from their respective TIA reports were applied to the study intersection in future conditions. This methodology was approved as part of the MOU.

The Jordan Pointe development is committed to a traffic signal at the intersection of New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1. The study for the Heelan Property development includes analyzing this intersection both with and without a traffic signal at this study intersection under future analysis scenarios to determine the impacts of the proposed development on the intersection and to determine if the proposed development contributes to the need for a traffic signal.

Overall, the adjacent developments are expected to account for much of the background growth within the vicinity of the site and a 2% annually compounded growth rate in addition to the adjacent development trips is expected to provide a conservative estimation of traffic volumes in background (2026) conditions.

Based on the driveway locations of the adjacent developments, future traffic volumes may not balance between study intersections. Adjacent development trips are shown in Figure 6. Adjacent development information can be found in Appendix D.

3.3. Future Roadway Improvements

The Jordan Pointe development is committed to a traffic signal at the intersection of New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1. The study for the Heelan Property development includes analysis of this intersection with and without a traffic signal under future analysis scenarios to determine the impacts of the proposed development on the intersection and to determine if the proposed development contributes to the need for a traffic signal.

The Woodbury development is committed to the following improvement at the intersection of New Hill Olive Chapel Road and Humie Olive Road:

- A westbound left-turn lane with a minimum of 100 feet of storage.

The Friendship Station development is committed to the following improvement at the intersection of Humie Olive Road and Olive Farm Road:

- A westbound left-turn lane with a minimum of 50 feet of storage.

The Friendship Station development is committed to the following improvements at the intersection of New Hill Olive Chapel Road and Humie Olive Road:

- Extend the westbound left-turn lane to a minimum of 250 feet of storage.
- A southbound left-turn lane with a minimum of 150 feet of storage.

The Friendship Station development is committed to the following improvement at the intersection of Richardson Road and Humie Olive Road:

- Monitor for signalization.
- If warranted and required by NCDOT, install a traffic signal.

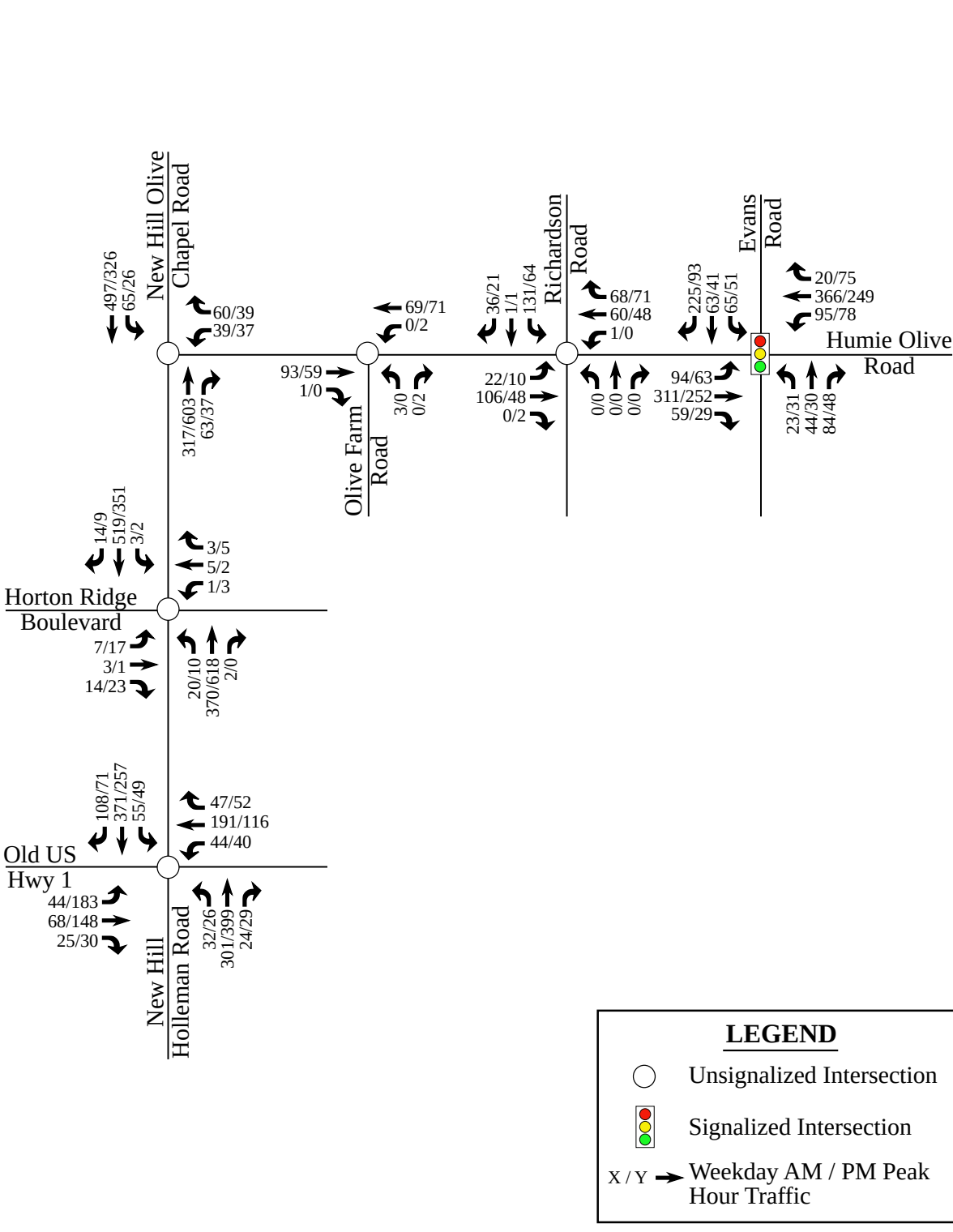
The above roadway improvements were included in future traffic conditions. Refer to Appendix D for more information.

3.4. Background (2026) Peak Hour Traffic Volumes

The background (2026) traffic volumes were determined by projecting the existing (2019) peak hour traffic to the year 2026 and adding the adjacent development trips. Refer to Figure 7 for an illustration of the background (2026) peak hour traffic volumes at the study intersections.

3.5. Analysis of Background (2026) Peak Hour Traffic Conditions

The background (2026) AM and PM peak hour traffic volumes at the study intersections were analyzed with future geometric roadway conditions and traffic control. The analysis results are presented in Section 7 of this report.



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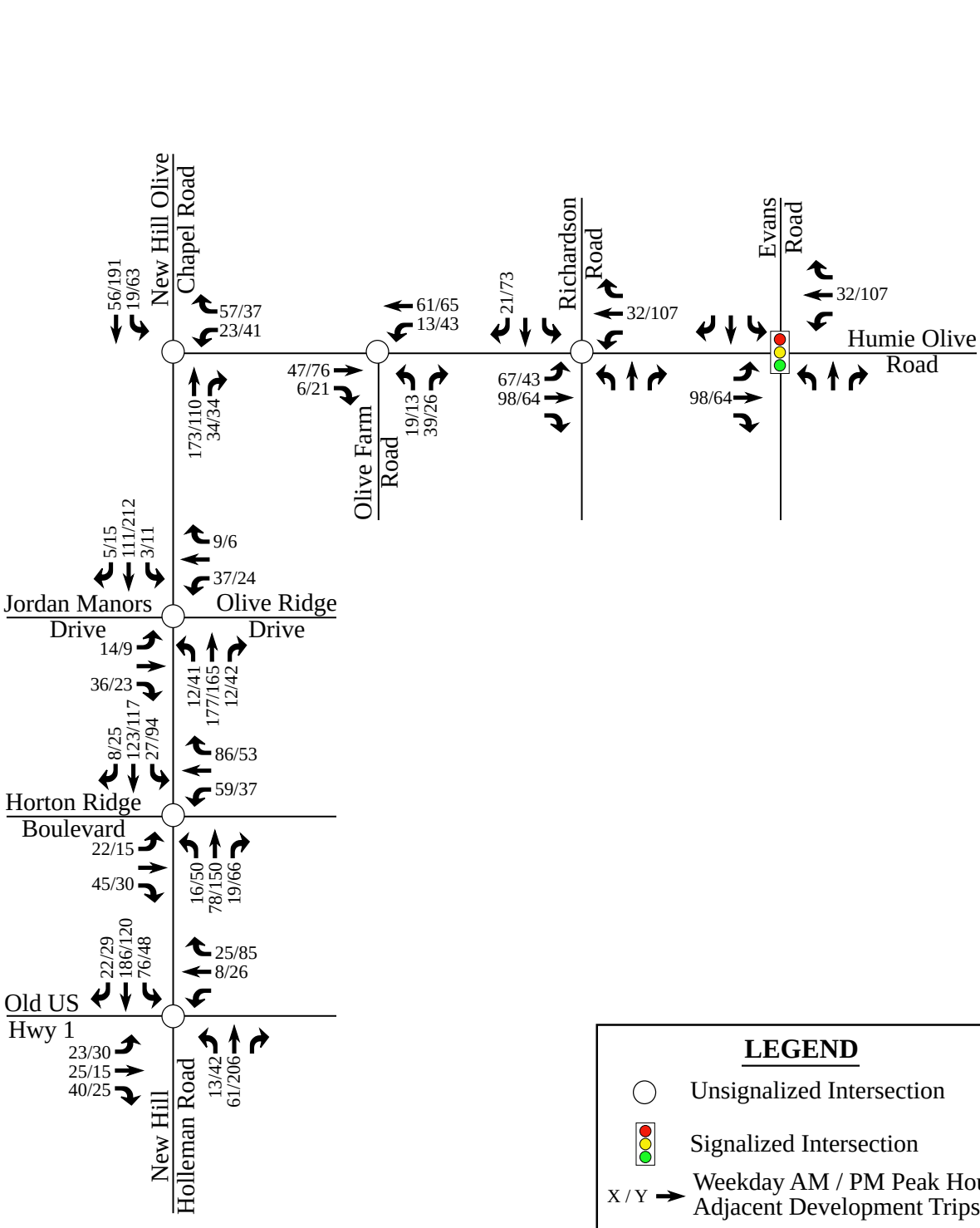
Heelan Property
Apex, NC

Projected (2026)
Peak Hour Traffic

Scale: Not to Scale | Figure 5



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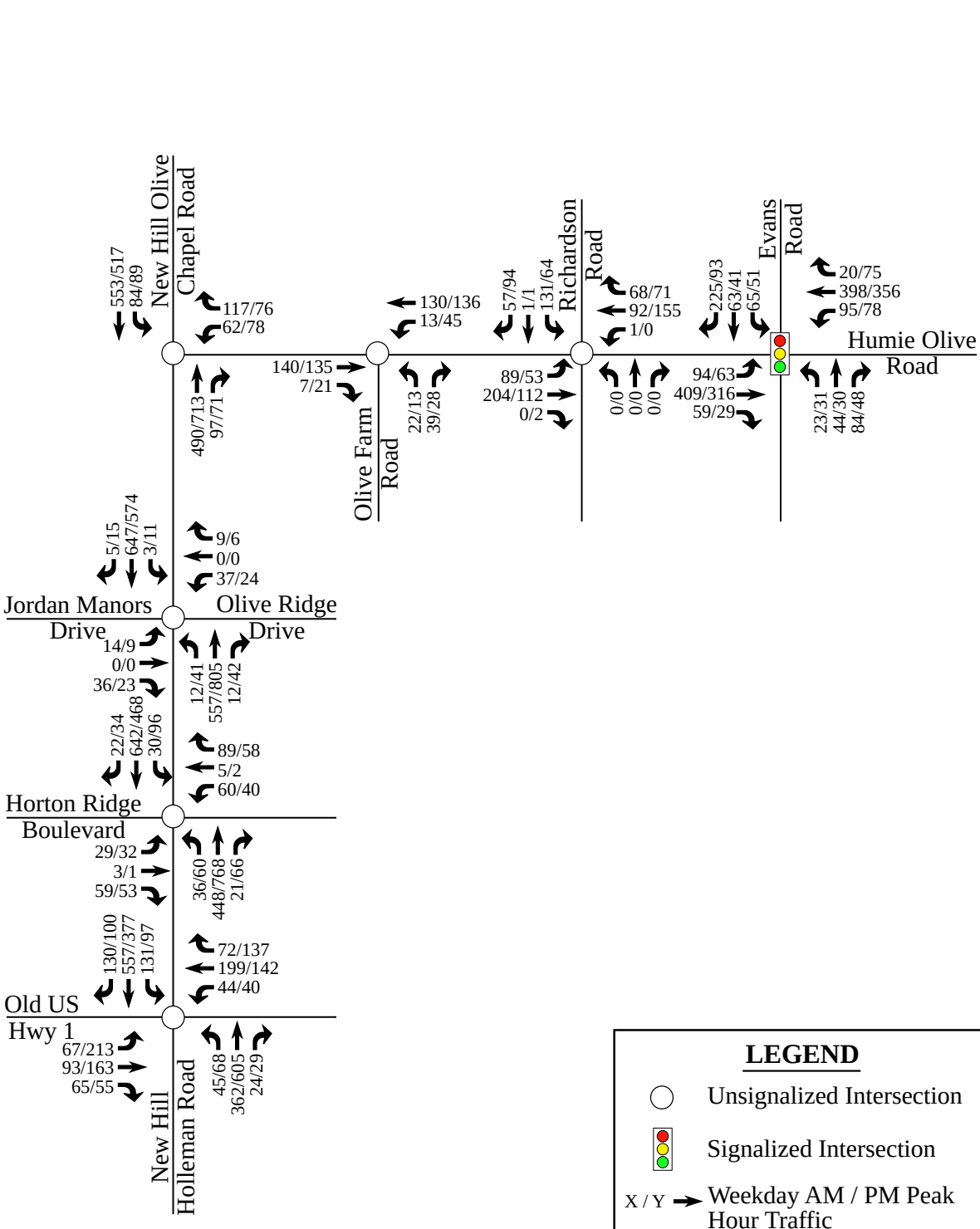
Heelan Property
Apex, NC

Peak Hour Adjacent Development Trips

Scale: Not to Scale | Figure 6



RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Background (2026)
Peak Hour Traffic

Scale: Not to Scale

Figure 7

4. SITE TRIP GENERATION AND DISTRIBUTION

4.1. Trip Generation

The proposed development is assumed to consist of approximately 250 single-family homes and 268 townhomes. Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 10th Edition. Table 3 provides a summary of the trip generation potential for the site.

Table 3: Trip Generation Summary

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	AM Peak Hour Trips (vph)		PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single Family Detached Housing (210)	250 dwellings	2,420	45	137	154	91
Low-Rise Multi-Family Housing (220)	268 dwellings	1,990	28	94	89	53
Total Trips		**4,410**	**73**	**231**	**243**	**144**

It is estimated that the proposed development will generate approximately 4,410 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 304 trips (73 entering and 231 exiting) will occur during the weekday AM peak hour and 387 (243 entering and 144 exiting) will occur during the weekday PM peak hour.

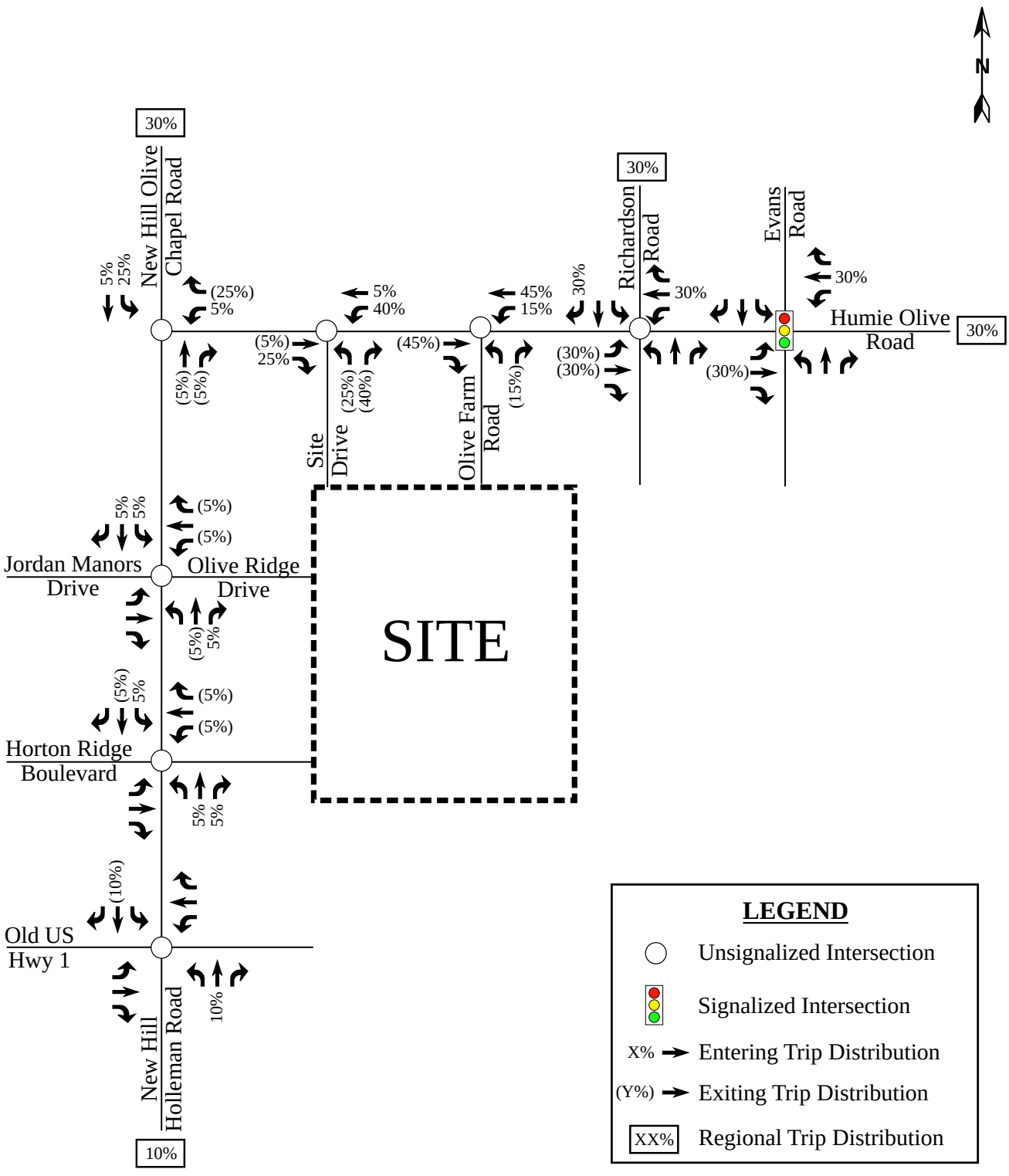
4.2. Site Trip Distribution and Assignment

Trip distribution percentages used in assigning site traffic for this development were estimated based on a combination of existing traffic patterns, population centers adjacent to the study area, and engineering judgment. Overall trip distributions were approved as part of the Memorandum of Understanding (MOU). It is estimated that trips will be distributed as follows:

- 30% to/from the north via New Hill Olive Chapel Road
- 10% to/from the south via New Hill Holleman Road
- 30% to/from the east via Humie Olive Road

- 30% to/from the north via Richardson Road

The site trip distribution is shown in Figure 8. Refer to Figure 9 for the site trip assignment. Refer to Appendix A for the approved MOU.



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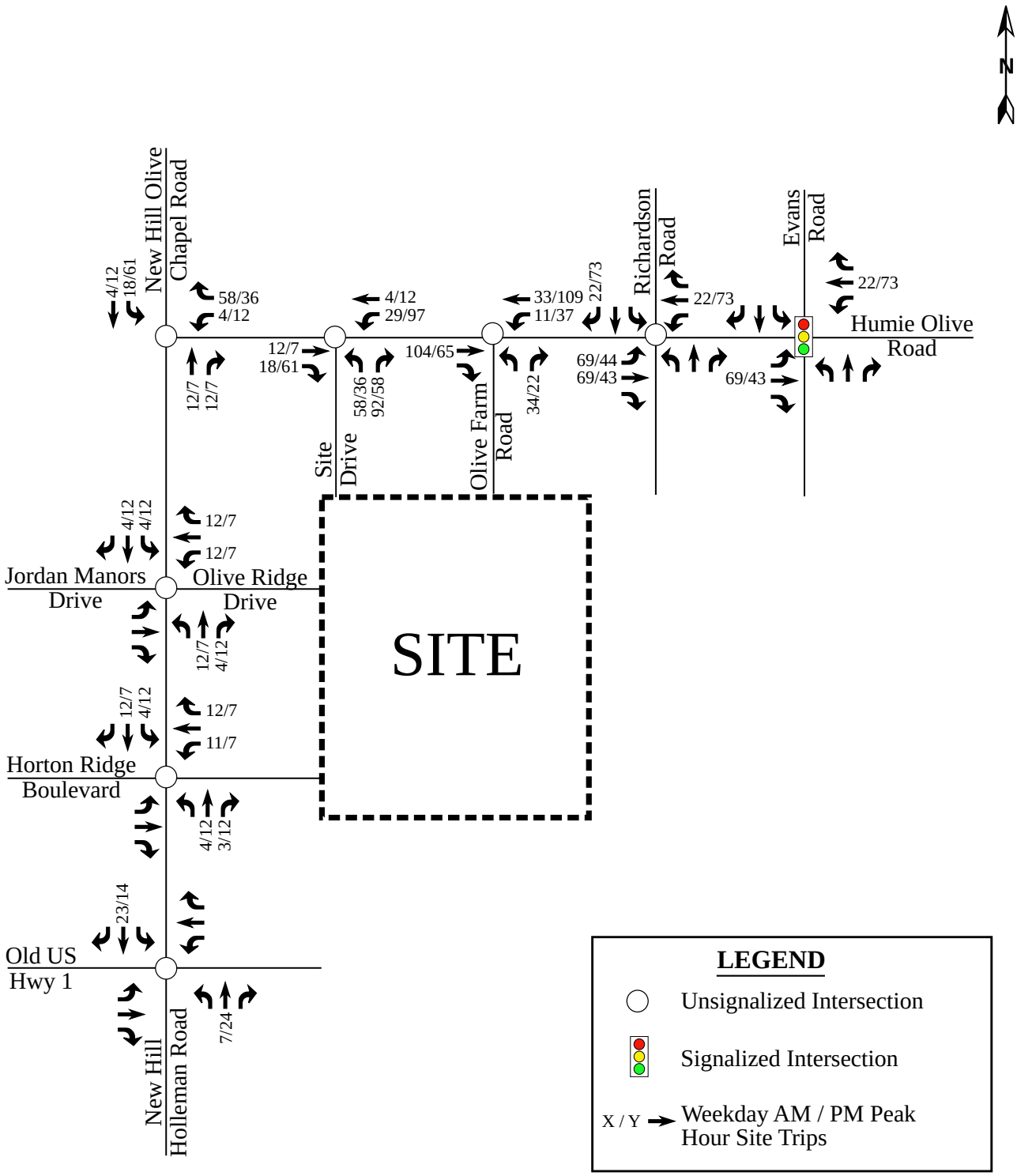
Site Trip Distribution

Scale: Not to Scale | Figure 8



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TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Site Trip Assignment

Scale: Not to Scale | Figure 9

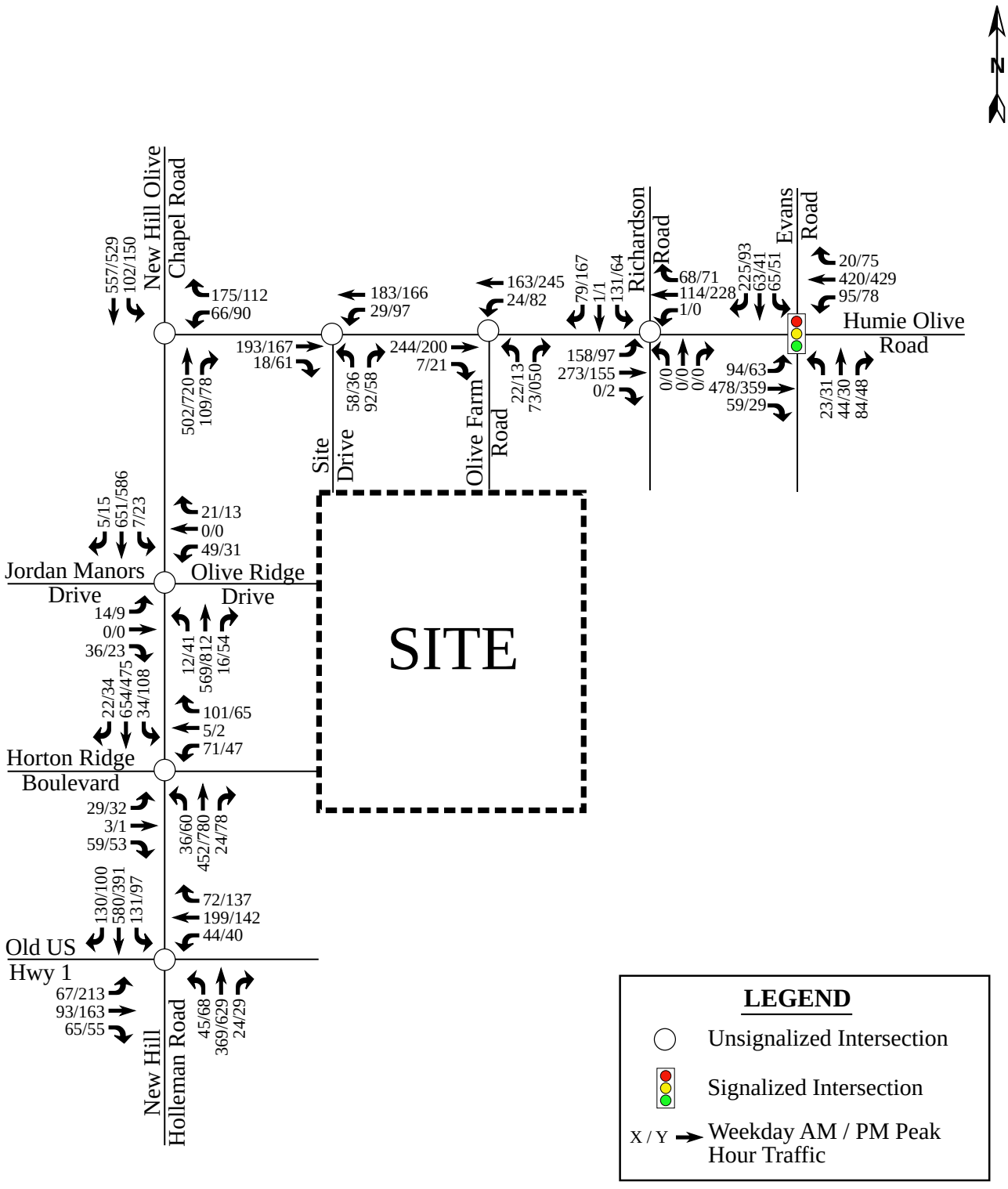
5. COMBINED (2026) TRAFFIC CONDITIONS

5.1. Combined (2026) Peak Hour Traffic Volumes

To estimate traffic conditions with the site fully built-out, the total site trips were added to the background (2026) traffic volumes to determine the combined (2026) traffic volumes. Refer to Figure 10 for an illustration of the combined (2026) peak hour traffic volumes with the proposed site fully developed.

5.2. Analysis of Combined (2026) Peak Hour Traffic

Study intersections were analyzed with the combined (2026) traffic volumes using the same methodology previously discussed for existing and background traffic conditions. Intersections were analyzed with improvements necessary to accommodate future traffic volumes. The results of the capacity analysis for each intersection are presented in Section 7 of this report.



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TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Combined (2026)
Peak Hour Traffic

Scale: Not to Scale

Figure 10

6. TRAFFIC ANALYSIS PROCEDURE

Study intersections were analyzed using the methodology outlined in the *Highway Capacity Manual, 6th Edition* (HCM) published by the Transportation Research Board. Capacity and level of service are the design criteria for this traffic study. A computer software package, Synchro (Version 10.3), was used to complete the analyses for most of the study area intersections. Please note that the unsignalized capacity analysis does not provide an overall level of service for an intersection; only delay for an approach with a conflicting movement.

The HCM defines capacity as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions." Level of service (LOS) is a term used to represent different driving conditions and is defined as a "qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers." Level of service varies from Level "A" representing free flow, to Level "F" where breakdown conditions are evident. Refer to Table 4 for HCM levels of service and related average control delay per vehicle for both signalized and unsignalized intersections. Control delay as defined by the HCM includes "initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay". An average control delay of 50 seconds at a signalized intersection results in LOS "D" operation at the intersection.

Table 4: Highway Capacity Manual – Levels-of-Service and Delay

UNSIGNALIZED INTERSECTION		SIGNALIZED INTERSECTION	
LEVEL OF SERVICE	**AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)**	**LEVEL OF SERVICE**	**AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)**
A	0-10	A	0-10
B	10-15	B	10-20
C	15-25	C	20-35
D	25-35	D	35-55
E	35-50	E	55-80
F	>50	F	>80

6.1. Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to the NCDOT Congestions Management Guidelines.

7. CAPACITY ANALYSIS

7.1. Evans Road and Humie Olive Road

The existing signalized intersection of Evans Road and Humie Olive Road was analyzed under existing (2019), background (2026), and combined (2026) traffic conditions with existing lane configurations and traffic control. Refer to Table 5 for a summary of the analysis results. Refer to Appendix E for the Synchro capacity analysis reports.

Table 5: Analysis Summary of Evans Road and Humie Olive Road

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	A A E C	B (19)	A A E D	B (19)
Background (2026) Conditions	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	B B E C	B (20)	A A E D	B (18)
Combined (2026) Conditions	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	B B E C	B (20)	B A E D	B (18)

Capacity analysis of existing (2019), background (2026), and combined (2026) traffic conditions indicates the intersection of Evans Road and Humie Olive Road is expected to operate at an overall LOS B during the weekday AM and PM peak hours.

It should be noted that overall delay is expected to decrease between existing (2019) and background (2026) conditions during the weekday PM peak hour by one (1) second. This is expected due to the increase in the westbound right-turn volume, which operates free to the traffic signal and, therefore, experiences no delay.

7.2. Humie Olive Road and Richardson Road

The existing unsignalized intersection of Humie Olive Road and Richardson Road was analyzed under existing (2019), background (2026), and combined (2026) traffic conditions with existing lane configurations and traffic control. It should be noted that the Friendship Station development is committed to monitor the study intersection for signalization and install a traffic signal once warranted. Refer to Table 6 for a summary of the analysis results. Refer to Appendix F for the Synchro capacity analysis reports.

Table 6: Analysis Summary of Humie Olive Road and Richardson Road

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] B[2] B[2]	N/A	A[1] A[1] A[2] A[2]	N/A
Background (2026) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] B[2] C[2]	N/A	A[1] A[1] B[2] B[2]	N/A
Combined (2026) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] C[2] E[2]	N/A	A[1] A[1] C[2] C[2]	N/A
Combined (2026) Conditions – **With Improvements**	EB WB NB SB	**1 LT**, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] C[2] D[2]	N/A	A[1] A[1] C[2] C[2]	N/A

1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Improvements to lane configurations are shown in bold.

Capacity analysis of existing (2019) and background (2026) traffic conditions indicates the minor-street approaches and major-street left-turn movements at the intersection of Humie Olive Road and Richardson Road are expected to operate at LOS C or better during the weekday AM and PM peak hours. Under combined (2026) traffic conditions, the southbound approach is expected to operate at LOS E during the weekday AM peak hour. All other approaches are expected to operate at LOS C or better during the weekday AM and PM peak

hours.

A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was not warranted during the weekday peak hours under combined traffic conditions, and due to the high volume of residential and school development, which typically generate trips during two peak hours each day, it is anticipated that a 4- or 8-hour signal warrant would not be met. It should be noted that the Friendship Station development is committed to monitor the study intersection for signalization and install a traffic signal once warranted.

An exclusive eastbound left-turn lane was considered due to heavy southbound approach and eastbound left-turn volumes. With an exclusive eastbound left-turn lane, the minor-street approaches and major-street left-turn movements are expected to operate at acceptable levels-of-service.

7.3. Olive Farm Road (Site Access) and Humie Olive Road

The existing unsignalized intersection of Olive Farm Road (Site Access) and Humie Olive Road was analyzed under existing (2019), background (2026), and combined (2026) traffic conditions with existing lane configurations and traffic control. It should be noted that the proposed Heelan Property development is expected to tie into the existing Olive Farm Road and site related trips may utilize this road to enter/exit the proposed site. The Friendship Station development is committed to an exclusive westbound left-turn lane with a minimum of 50 feet of full width storage. Refer to Table 7 for a summary of the analysis results. Refer to Appendix G for the Synchro capacity analysis reports.

Table 7: Analysis Summary of Olive Farm Road (Site Access) and Humie Olive Road

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A[1] A[2]	N/A	-- A[1] A[2]	N/A
Background (2026) Conditions	EB WB NB	1 TH-RT **1 LT,** 1 TH 1 LT-RT	-- A[1] B[2]	N/A	-- A[1] B[2]	N/A
Combined (2026) Conditions	EB WB NB	1 TH-RT **1 LT,** 1 TH 1 LT-RT	-- A[1] B[2]	N/A	-- A[1] B[2]	N/A

1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Improvements by the Friendship Station development are included in **green**.

Capacity analysis of existing (2019), background (2026), and combined (2026) traffic conditions indicates the minor-street approach and minor-street left-turn movement at the intersection of Olive Farm Road and Humie Olive Road are expected to operate at LOS B or better during the weekday AM and PM peak hours.

7.4. Humie Olive Road and New Hill Olive Chapel Road

The existing unsignalized intersection of Humie Olive Road and New Hill Olive Chapel Road was analyzed under existing (2019), background (2026), and combined (2026) traffic conditions with existing lane configurations and traffic control. The Woodbury development is committed to an exclusive westbound left-turn lane with a minimum of 100 feet of full width storage. The Friendship Station development is committed to extending the westbound left-turn lane to a minimum of 250 feet of full width storage and provide an exclusive southbound left-turn lane with a minimum of 150 feet of full width storage. Refer to Table 8 for a summary of the analysis results. Refer to Appendix H for the Synchro capacity analysis reports. Refer to Appendix M for SimTraffic queuing reports.

Table 8: Analysis Summary of Humie Olive Road and New Hill Olive Chapel Road

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	WB NB SB	1 LT-RT 1 TH-RT 1 LT-TH	C[2] -- A[1]	N/A	C[2] -- A[1]	N/A
Background (2026) Conditions	WB NB SB	**1 LT**, 1 RT 1 TH-RT **1 LT,** 1 TH	D[2] -- A[1]	N/A	F[2] -- B[1]	N/A
Combined (2026) Conditions	WB NB SB	**1 LT**, 1 RT 1 TH-RT **1 LT,** 1 TH	D[2] -- A[1]	N/A	F[2] -- B[1]	N/A
Combined (2026) Conditions - **Signalized**	WB NB SB	**1 LT**, 1 RT 1 TH-RT **1 LT,** 1 TH	C C A	B (17)	D C B	C (22)

1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Improvements by the Woodbury development are included in **purple**.
Improvements by the Friendship Station development are included in **green**.
Improvements by the developer are included in **bold**.

Capacity analysis of existing (2019) traffic conditions indicates that the minor-street approach at the intersection of Humie Olive Road and New Hill Olive Chapel Road currently operates at LOS C during the weekday AM and PM peak hours. Under background (2026) and combined

(2026) traffic conditions, the minor-street approach is expected to operate at LOS D during the weekday AM peak hour and at LOS F during the weekday PM peak hour. Under all analysis scenarios, the major-street left-turn movement is expected to operate at LOS B or better during the weekday AM and PM peak hours.

A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was warranted during the weekday PM peak hour under combined traffic conditions, but due to the high volume of residential and school development, which typically generate trips during two peak hours each day, it is anticipated that a 4- or 8-hour signal warrant would not be met.

Although the weekday AM peak hour warrant and the 4- and 8- hour warrants are not expected to be met, improvements are required by the Town's UDO to decrease the overall delay back to what is expected in background (2026) conditions for intersections projected to operate worse than LOS D under background (2026) conditions in which the proposed development is at least 10% of the projected peak hour traffic at the intersection. With a traffic signal, the intersection is expected to operate at an overall LOS B during the weekday AM peak hour and LOS C during the weekday PM peak hour. It should be noted that an exclusive northbound right-turn lane would be expected to have minimal impact on the level-of-service.

Based on SimTraffic simulations, the turn lane storages as committed by the Woodbury and Friendship Station developments provide ample storage for turning vehicles. It should be noted that adjacent developments account for much of the background (2026) growth within the study area. The proposed development is only expected to account for 8% of the total traffic at this study intersection during the weekday AM peak hour and 9% of the total traffic at this study intersection during the weekday PM peak hour under background (2026) conditions. Due to the low contribution of traffic by the proposed Heelan Property development, the available turn bay storages, and the nature of residential development, no improvements are recommended by the developer at the study intersection.

7.5. New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

The existing unsignalized intersection of New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1 was analyzed under existing (2019), background (2026), and combined (2026) traffic conditions with existing lane configurations and traffic control. The Jordan Pointe development is committed to a traffic signal at the intersection of New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1. This study analyzes this intersection both with and without a traffic signal under future analysis scenarios to determine the impacts of the proposed development on the intersection and to determine if the proposed development contributes to the need for a traffic signal. Refer to Table 9 for a summary of the analysis results. Refer to Appendix I for the Synchro capacity analysis reports.

Table 9: Analysis Summary of New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	B[3] C[3] C[3] E[3]	N/A	D[3] C[3] E[3] D[3]	N/A
Background (2026) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	D[3] F[3] F[3] F[3]	N/A	F[3] F[3] F[3] F[3]	N/A
Background (2026) Conditions **– with Traffic Signal**	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	D D B D	C (35)	F C D D	E (61)
Combined (2026) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	D[3] F[3] F[3] F[3]	N/A	F[3] F[3] F[3] F[3]	N/A
Combined (2026) Conditions **– with Traffic Signal**	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	E D B D	D (37)	F C D D	E (65)

3. Level of service for stop-controlled approach.

Improvements by the Jordan Pointe development are included in **blue**.

Capacity analysis of existing (2019) traffic conditions indicates that the approaches at the intersection of New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1 currently operates at LOS E or better during the weekday AM and PM peak hours. Under background (2026) and combined (2026) traffic conditions, the eastbound approach is expected to operate at LOS D during the weekday AM peak hour and LOS F during the weekday PM peak hour. The remaining approaches are expected to operate at LOS F during the weekday AM and PM peak hour.

The Jordan Pointe development is committed to a traffic signal at the intersection of New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1. With signalization, the intersection is expected to operate at an overall LOS D or better during the weekday AM peak hour and LOS E during the weekday PM peak hour under background (2026) and combined (2026) conditions.

The proposed development is expected to account for approximately 2% of the total traffic during the weekday AM peak hour and 3% of the total traffic during the weekday PM peak hour of projected (2026) conditions. Based on SimTraffic simulations, heavy queuing is expected on the southbound approach that is expected to spill back through surrounding intersections within the roadway network. Sufficient time should be allotted for the southbound approach to allow southbound traffic to clear each intersection cycle. Based on the low site related traffic volumes and the committed signal by Jordan Pointe, no improvements are recommended by the developer at the study intersection.

7.6. Horton Ridge Boulevard (Site Access) and New Hill Chapel Road

The existing unsignalized intersection of Horton Ridge Boulevard (Site Access) and New Hill Chapel Road was analyzed under existing (2019), background (2026), and combined (2026) traffic conditions with existing lane configurations and traffic control. Refer to Table 10 for a summary of the analysis results. Refer to Appendix J for the Synchro capacity analysis reports.

Table 10: Analysis Summary of Horton Ridge Boulevard (Site Access) and New Hill Chapel Road

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT* 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT	C[2] C[2] A[1] A[1]	N/A	C[2] C[2] A[1] A[1]	N/A
Background (2026) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT* 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT	E[2] F[2] A[1] A[1]	N/A	F[2] F[2] A[1] B[1]	N/A
Combined (2026) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT* 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT	F[2] F[2] A[1] A[1]	N/A	F[2] F[2] A[1] B[1]	N/A

1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

*Pavement exists to allow two (2) egress lanes although not striped out.

Capacity analysis of existing (2019) traffic conditions indicates the minor-street approaches and major-street left-turn movements at the intersection of Horton Ridge Boulevard (Site Access) and New Hill Chapel Road are expected to operate at LOS C or better during the weekday AM and PM peak hours. Under background (2026) conditions, the eastbound minor-street approach is expected to operate at LOS E during the weekday AM peak hour and LOS F during the weekday PM peak hour. The westbound minor-street approach is expected to operate at LOS F during both the weekday AM and PM peak hour. Under combined (2026) conditions, all of the minor-street approaches are expected to operate at LOS F during the weekday AM and PM peak hours. The major-street left-turn movements are expected to operate at LOS B or better under all analysis scenarios during the weekday AM and PM peak

hours. These levels-of-service are not uncommon for minor street approaches with heavy mainline volumes, especially when serving residential uses.

A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was not warranted during the weekday AM and PM peak hours under combined traffic conditions. Additionally, due to the high volume of residential development, which typically generate trips during two peak hours each day, it is anticipated that a 4- or 8-hour signal warrant would not be met.

The proposed development is expected to account for approximately 5% of the total traffic during the weekday AM and PM peak hours of projected (2026) conditions. It should be noted that exclusive turn lanes are available for expected site-related traffic. Based on SimTraffic simulations, heavy queuing is expected on the westbound approach. It should be noted that current pavement exists to allow two (2) egress lanes. It is recommended that this approach be restriped to include an exclusive westbound right-turn lane and shared through/left-turn lane. No changes in level-of-service are expected with this restriping.

7.7. New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive (Site Access)

The future unsignalized intersection of New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive (Site Access) was analyzed under background (2026) and combined (2026) traffic conditions with the lane configurations and traffic control shown in Table 11.

The intersection currently exists as a three-leg intersection with Jordan Manors Drive tying into New Hill Olive Chapel Road approximately a third of a mile north of the intersection of New Hill Olive Chapel Road and Horton Ridge Boulevard; however, the intersection was not analyzed in existing (2019) conditions because Jordan Manors is only partially built and few homes are occupied. Based on the build-out of Jordan Manors, minimal turning vehicles are expected to currently occur at the study intersection. Trips associated with the Jordan Manors and Olive Ridge developments from their respective TIA reports were applied to the network, including this study intersection, in future conditions.

This methodology is expected to provide a conservative estimation of trips at all intersections in the study area, because the through volumes at this study intersection include a portion of the Jordan Manors trip potential, based on the multiple driveways, and 100% of the Jordan Manors site-related trips were applied at this study intersection. The proposed Heelan Property development is expected to tie into the future Olive Ridge development via Olive Ridge Drive and site related trips may utilize this road to enter/exit the proposed site. Refer to Table 11 on the following page for a summary of the analysis results. Refer to Appendix K for the Synchro capacity analysis reports.

Table 11: Analysis Summary of New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive (Site Access)

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Background (2026) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	D[2] F[2] A[1] A[1]	N/A	E[2] F[2] A[1] B[1]	N/A
Combined (2026) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	D[2] F[2] A[1] A[1]	N/A	E[2] F[2] A[1] B[1]	N/A

1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Capacity analysis of background (2026) and combined (2026) traffic conditions indicates the major-street left-turn movements at the intersection of New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive (Site Access) are expected to operate at LOS B or better during both weekday AM and PM peak hours. The eastbound minor-street approach is expected to operate at LOS D during the weekday AM peak hour and LOS E during the weekday PM peak hour under both analysis scenarios. The westbound minor-street approach is expected to operate at LOS F during both the weekday AM and PM peak hour.

A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was not warranted during the weekday AM and PM peak hours under combined traffic conditions. Additionally, due to the high volume of residential development, which typically generate trips during two peak hours each day, it is anticipated that a 4- or 8-hour signal warrant would not be met.

The proposed development is expected to account for approximately 4% of the total traffic during the weekday AM and PM peak hours of background (2026) conditions. Based on SimTraffic simulations, the turn lane storages as provided by the Jordan Manors and Olive

Ridge developments are expected to provide ample storage for future turning volumes. Due to the low amount of site related traffic and poor background (2026) conditions, no improvements are recommended by the proposed Heelan Property development.

7.8. Humie Olive Road and Site Drive

The unsignalized intersection of Humie Olive Road and Site Drive was analyzed under combined (2026) traffic conditions with proposed lane configurations and traffic control. Refer to Table 12 for a summary of the analysis results. Refer to Appendix L for the Synchro capacity analysis reports.

Table 12: Analysis Summary of Humie Olive Road and Site Drive

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Combined (2026) Conditions	EB WB **NB**	1 TH-**RT** **1 LT**, 1 TH **1 LT-RT**	-- A[1] B[2]	N/A	-- A[1] B[2]	N/A

1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Improvements to lane configurations are shown in bold.

Capacity analysis of combined (2026) traffic conditions indicates the minor-street approach and major-street left-turn movement at the intersection of Humie Olive Road and Site Drive is expected to operate at LOS B or better during the weekday AM and PM peak hours.

An exclusive left-turn lane was considered at this intersection based on the methodology outlined in the *Policy on Street and Driveway Access to North Carolina Highways* (published by the NCDOT). Based on the findings from the turn lane warrant analysis, the intersection meets the criteria to warrant an exclusive westbound left-turn lane with a minimum of 75 feet of storage and appropriate deceleration and taper length.

8. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed Heelan Property, located in the southeast quadrant at the intersection of Humie Olive Road and New Hill Olive Chapel Road in Apex, North Carolina. The proposed development is expected to be a residential development and be built out in 2026. Site access will be provided via one (1) full movement site driveway along Humie Olive Road. Site access will also be provided via one (1) full movement connection to Olive Farm Road to the east of the proposed site, one (1) connection to the Olive Ridge development to the west of the site, and via interconnectivity through Horton Ridge Boulevard. It should be noted that there is additionally a stubbed access at the northwestern quadrant of the site that may have future connectivity to New Hill Olive Chapel Road based on potential future development.

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- Existing (2019) Traffic Conditions
- Background (2026) Traffic Conditions – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Background (2026) Traffic Conditions – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions with Improvements – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions with Improvements – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

Trip Generation

It is estimated that the proposed development will generate approximately 4,410 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume,

it is anticipated that 304 trips (73 entering and 231 exiting) will occur during the weekday AM peak hour and 387 (243 entering and 144 exiting) will occur during the weekday PM peak hour.

Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to the Town's UDO and NCDOT Congestion Management Guidelines. Refer to section 6.1 of this report for a detailed description of any adjustments to these guidelines made throughout the analysis.

Intersection Capacity Analysis Summary

All the study area intersections (including the proposed site driveways) are expected to operate at acceptable levels-of-service under existing and future year conditions with the exception of the intersections listed below. A summary of the study area intersections that are expected to need improvements are as follows:

Humie Olive Road and Richardson Road

Under combined (2026) traffic conditions, the southbound approach is expected to operate at LOS E during the weekday AM peak hour. All other approaches are expected to operate at LOS C or better during the weekday AM and PM peak hours. A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was not warranted during the weekday peak hours under combined traffic conditions, and due to the high volume of residential and school development, which typically generate trips during two peak hours each day, it is anticipated that a 4- or 8-hour signal warrant would not be met. It should be noted that the Friendship Station development is committed to monitor the study intersection for signalization and install a traffic signal once warranted. An exclusive eastbound left-turn lane was considered due to heavy southbound approach and eastbound left-turn volumes. With an exclusive eastbound left-turn lane, the minor-street approaches and major-street left-turn movements are expected to operate at acceptable levels-of-service.

Humie Olive Road and New Hill Olive Chapel Road

Under background (2026) and combined (2026) traffic conditions, the minor-street approach is expected to operate at LOS D during the weekday AM peak hour and at LOS F during the weekday PM peak hour. Under all analysis scenarios, the major-street left-turn movement is expected to operate at LOS B or better during the weekday AM and PM peak hours. A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was warranted during the weekday PM peak hour under combined traffic conditions, but due to the high volume of residential and school development, which typically generate trips during two peak hours each day, it is anticipated that a 4- or 8-hour signal warrant would not be met.

Although the weekday AM peak hour warrant and the 4- and 8- hour warrants are not expected to be met, improvements are required by the Town's UDO to decrease the overall delay back to what is expected in background (2026) conditions for intersections projected to operate worse than LOS D under background (2026) conditions in which the proposed development is at least 10% of the projected peak hour traffic at the intersection. With a traffic signal, the intersection is expected to operate at an overall LOS B during the weekday AM peak hour and LOS C during the weekday PM peak hour. It should be noted that an exclusive northbound right-turn lane was considered, but would be expected to have minimal impact on the level-of-service.

Based on SimTraffic simulations, the turn lane storages as committed by the Woodbury and Friendship Station developments provide adequate storage for turning vehicles. It should be noted that adjacent developments account for much of the background (2026) growth within the study area. The proposed development is only expected to account for 8% of the total traffic at this study intersection during the weekday AM peak hour and 9% of the total traffic at this study intersection during the weekday PM peak hour under background (2026) conditions. Due to the low contribution of traffic by the proposed Heelan Property development, the available turn bay storages, and the nature of residential development, no improvements are recommended by the developer at the study intersection.

New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

Under background (2026) and combined (2026) traffic conditions, the eastbound approach is expected to operate at LOS D during the weekday AM peak hour and LOS F during the weekday PM peak hour. The remaining approaches are expected to operate at LOS F during the weekday AM and PM peak hour. The Jordan Pointe development is committed to a traffic signal at the intersection of New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1. With signalization, the intersection is expected to operate at an overall LOS D or better during the weekday AM peak hour and LOS E during the weekday PM peak hour under background (2026) and combined (2026) conditions.

The proposed development is expected to account for approximately 2% of the total traffic during the weekday AM peak hour and 3% of the total traffic during the weekday PM peak hour of projected (2026) conditions. Based on SimTraffic simulations, heavy queuing is expected on the southbound approach that is expected to spill back through surrounding intersections within the roadway network. Sufficient time should be allotted for the southbound approach to allow southbound traffic to clear each intersection cycle. Based on the low site related traffic volumes and the committed signal by Jordan Pointe, no improvements are recommended by the developer at the study intersection.

Horton Ridge Boulevard (Site Access) and New Hill Chapel Road

Under combined (2026) conditions, all of the minor-street approaches are expected to operate at LOS F during the weekday AM and PM peak hours. These levels-of-service are not uncommon for minor street approaches with heavy mainline volumes, especially when serving residential uses. A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was not warranted during the weekday AM and PM peak hours under combined traffic conditions. Additionally, due to the high volume of residential development, which typically generate trips during two peak hours each day, it is anticipated that a 4- or 8-hour signal warrant would not be met.

The proposed development is expected to account for approximately 5% of the total traffic

during the weekday AM and PM peak hours of projected (2026) conditions. It should be noted that exclusive turn lanes are available for expected site-related traffic. Based on SimTraffic simulations, heavy queuing is expected on the westbound approach. It should additionally be noted that current pavement exists to allow two (2) egress lanes. It is recommended that this approach be restriped to include an exclusive westbound right-turn lane and shared through/left-turn lane. No changes in level-of-service are expected with this restriping.

New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive (Site Access)

The eastbound minor-street approach is expected to operate at LOS D during the weekday AM peak hour and LOS E during the weekday PM peak hour under both analysis scenarios. The westbound minor-street approach is expected to operate at LOS F during both the weekday AM and PM peak hour. A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was not warranted during the weekday AM and PM peak hours under combined traffic conditions. Additionally, due to the high volume of residential development, which typically generate trips during two peak hours each day, it is anticipated that a 4- or 8-hour signal warrant would not be met.

The proposed development is expected to account for approximately 4% of the total traffic during the weekday AM and PM peak hours of background (2026) conditions. Based on SimTraffic simulations, the turn lane storages as provided by the Jordan Manors and Olive Ridge developments are expected to provide ample storage for future turning volumes. Due to the low amount of site related traffic and poor background (2026) conditions, no improvements are recommended by the proposed Heelan Property development.

9. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 11 for an illustration of the recommended lane configurations for the proposed development.

Committed Improvements by Woodbury

New Hill Olive Chapel Road and Humie Olive Road

- Construct an exclusive westbound left-turn lane with a minimum of 100 feet of storage and appropriate deceleration and taper length.

Committed Improvements by Friendship Station

Humie Olive Road and Olive Farm Road

- Construct an exclusive westbound left-turn lane with a minimum of 50 feet of storage and appropriate deceleration and taper length.

New Hill Olive Chapel Road and Humie Olive Road:

- Extend the westbound left-turn lane to a minimum of 250 feet of storage and appropriate deceleration and taper length.
- Construct an exclusive southbound left-turn lane with a minimum of 150 feet of storage and appropriate deceleration and taper length.

Richardson Road and Humie Olive Road:

- Monitor for signalization.
- If warranted and required by NCDOT, install a traffic signal.

Committed Improvements by Jordan Pointe

New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

- Monitor for signalization.
- If warranted and required by NCDOT, install a traffic signal.

Committed Improvements by Olive Ridge

New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive

- Construct the westbound approach (Olive Ridge Drive) with one (1) ingress lane and one (1) egress lane.
- Provide stop control for the westbound approach (Olive Ridge Drive).
- Provide an exclusive southbound left-turn lane with a minimum of 50 feet of storage and appropriate taper and deceleration length.

Recommended Improvements by Developer

Humie Olive Road and Richardson Road

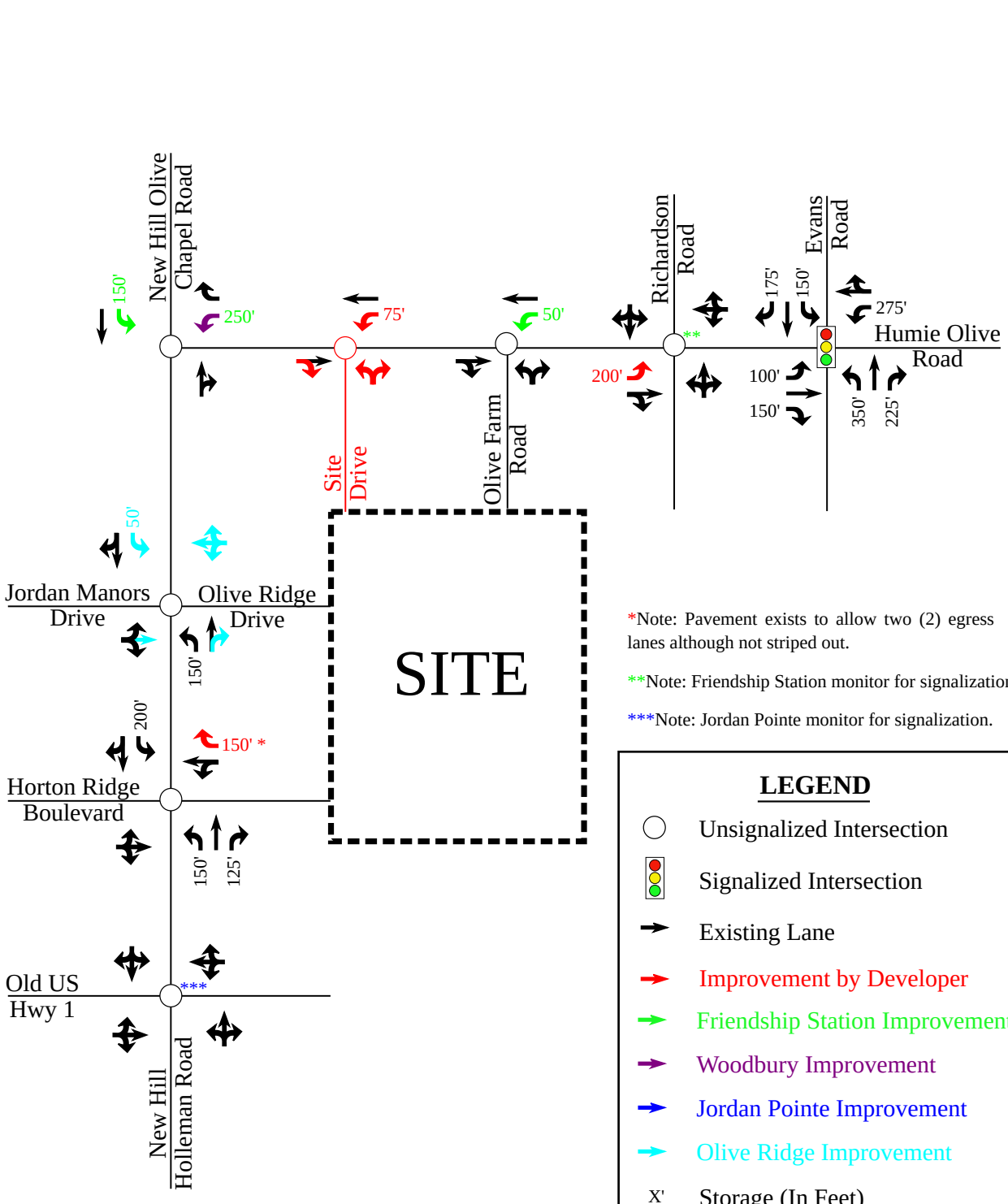
- Construct an exclusive eastbound left-turn lane with a minimum of 200 feet of storage and appropriate deceleration and taper length.

Horton Ridge Boulevard (Site Access) and New Hill Chapel Road

- Restripe the existing westbound approach to include an exclusive westbound right-turn lane and shared through/left-turn lane. It should be noted that pavement currently exists to accommodate this laneage.

Humie Olive Road and Site Drive

- Construct the northbound approach (Site Drive) with one (1) ingress and one (1) egress lane.
- Provide stop control for the northbound approach (Site Drive).
- Construct an exclusive westbound left-turn lane with a minimum of 75 feet of storage and appropriate deceleration and taper length.



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure 11

RAMEY KEMP & ASSOCIATES

Charleston, SC - Charlotte, NC - Columbia, SC - Raleigh, NC - Richmond, VA - Winston-Salem, NC

TECHNICAL APPENDIX

APPENDIX A

SCOPING INFORMATION

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

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September 16, 2019

Serge Grebenschikov, PE
Public Works & Transportation
73 Hunter Street, 3rd Fl
Apex, NC 27607
P (919) 372-7448

Reference: Heelan Property
Apex, North Carolina

Subject: Memorandum of Understanding for TIA Report

Mr. Grebenschikov:

The following is a Memorandum of Understanding (MOU) outlining the proposed scope of work and assumptions related to the Traffic Impact Analysis (TIA) for the proposed Heelan Property development, to be located in the southeast quadrant at the intersection of Humie Olive Road and New Hill Olive Chapel Road in Apex, North Carolina. Refer to the attached site location map.

The proposed development is expected to consist of a maximum of 250 single-family homes and 268 townhomes and is expected to be built-out in 2026. It should be noted that the current site plan shows 224 single-family homes and 249 townhomes; therefore, the analysis is expected to provide a conservative estimation of future conditions with the site fully built.

Site access will be provided via one (1) full movement site driveway along Humie Olive Road. Site access will also be provided via one (1) full movement connection to Olive Farm Road to the east of the proposed site, one (1) connection to the Olive Ridge development to the west of the site, and via interconnectivity through Horton Ridge Boulevard. The Woodbury / Bristol Assemblage, Jordan Pointe, Jordan Manors, and Friendship Station developments are committed to the construction of Horton Ridge Boulevard. The remaining section connecting Humie Olive Road and New Hill Olive Chapel Road includes the section of the proposed Heelan Property development. It should be noted that there is additionally a stubbed access at the northwestern quadrant of the site that may have future connectivity to New Hill Olive Chapel Road based on potential future development. Refer to the attached site plan.

Study Area

Based on coordination with the Town of Apex (Town) and the North Carolina Department of Transportation (NCDOT), the study area is proposed to consist of the following intersections:

- Evans Road and Humie Olive Road
- *Humie Olive Road and Richardson Road*
- Olive Farm Road and Humie Olive Road (Site Access A)
- *Humie Olive Road and New Hill Olive Chapel Road*

- New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- *Horton Ridge Boulevard and New Hill Chapel Road* (Site Access B)
- New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive (Site Access C)
- Humie Olive Road and Site Drive (Site Access D)

The intersection of New Hill Olive Chapel Road and Jordan Manors Drive / Olive Ridge Drive will be analyzed in all future conditions (background and combined conditions). Counts were not conducted at this study intersection because the Jordan Manors and Olive Ridge developments are currently under construction and trips from their respective TIA reports will be applied to the network, including this study intersection, in future conditions. Site access point(s) will be analyzed under all future conditions with the site fully built (combined conditions). It should be noted that Horton Ridge Boulevard is internal to the site and the breakdown of site related trips may be diluted if considering internal access; therefore, site access points along Horton Ridge Boulevard are not proposed to be considered in the analysis.

Existing Traffic Volumes

Peak hour turning movement counts were conducted by Ramey Kemp & Associates, Inc. at the *italicized* existing study intersections above in November of 2018 during weekday AM (7:00 to 9:00) and weekday PM (4:00 to 6:00) peak hours, while schools were in session. These counts were grown one year to 2019 with a 2% growth rate.

Peak hour turning movement counts were conducted by Ramey Kemp & Associates, Inc. at the remaining study intersections above in September of 2019 during weekday AM (7:00 to 9:00) and weekday PM (4:00 to 6:00) peak hours, while schools were in session. Volumes were balanced along New Hill Olive Chapel Road and Humie Olive Road, between Richardson Road and New Hill Olive Chapel Road, to account for any variance between intersections due to the discrepancy in data collection dates. Existing volumes were not balanced along Humie Olive Road between Evans Road and Richardson Road due to the Apex Friendship Middle and High School Campus. Signal information was obtained from the NCDOT. Refer to the attached existing (2019) traffic volumes figure.

Trip Generation

Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 10th Edition. Refer to Table 1 on the following page for a detailed breakdown of the proposed site trip generation.

Table 1: Trip Generation Summary

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	Weekday AM Peak Hour Trips (vph)		Weekday PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single-Family Detached Housing (210)	250 dwellings	2,420	45	137	154	91
Low-Rise Multi-Family Housing (220)	268 dwellings	1,990	28	94	89	53
Total	**518 dwellings**	**4,410**	**73**	**231**	**243**	**144**

It is estimated that the proposed development will generate approximately 4,410 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 304 trips (73 entering and 231 exiting) will occur during the weekday AM peak hour and 387 trips (243 entering and 144 exiting) will occur during the weekday PM peak hour.

Trip Distribution and Assignment

The primary site trips are distributed based on the locations of existing traffic patterns, previous studies within the vicinity of the site, population centers adjacent to the study area, and engineering judgment. A summary of the overall proposed distributions is below:

- 30% to/from the north via New Hill Olive Chapel Road
- 10% to/from the south via New Hill Holleman Road
- 30% to/from the east via Humie Olive Road
- 30% to/from the north via Richardson Road

Refer to the attached Site Trip Distribution figure.

Analysis Scenarios

All capacity analyses will be performed utilizing Synchro (Version 10.3) and analyzed using the methodology outlined in the *Highway Capacity Manual, 6th Edition* (HCM) published by the Transportation Research Board. All study intersections will be analyzed during the weekday AM and PM peak hours under the following traffic scenarios:

- Existing (2019) Traffic Conditions
- Background (2026) Traffic Conditions – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Background (2026) Traffic Conditions – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

- Combined (2026) Traffic Conditions **with Improvements** – without traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1
- Combined (2026) Traffic Conditions **with Improvements** – with traffic signal at New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1

Background Traffic Volumes

Based on a review of traffic growth patterns and adjacent development information, background traffic volumes will be determined by projecting existing (2019) traffic volumes to the future analysis year using a proposed 2% annual growth rate and including any adjacent development traffic in the area.

Through coordination with the NCDOT and Town, the following developments were identified to be included in future conditions:

- Jordan Manors → 40% built out. Assume 60% of development traffic
- Jordan Pointe → 65% built out. Assume 35% of development traffic
- Woodbury / Bristol Assemblage → 25% built out. Assume 75% of development traffic
- ~~Peak Landing~~ → too small. no TIAs
- ~~Holleman Hills~~ →
- Friendship Station PUD
- New Hill Assembly
- Olive Ridge
- ~~Gracewood PUD~~ → assume not moving forward

~~It is assumed that approximately half of the Gracewood development is built-out and is expected to have been captured in counts; therefore, only half of the trip generation potential for this site is proposed to be applied to the proposed Heelan Property study network. The development is responsible improvements at the intersection of Old US 1 and New Hill Olive Chapel Road that are proposed to be included in future analysis. These improvements consist of:~~

- ~~An eastbound left-turn lane with a minimum of 200 feet of storage.~~
- ~~A westbound left-turn lane with a minimum of 200 feet of storage.~~
- ~~A northbound left-turn lane with a minimum of 100 feet of storage.~~
- ~~A southbound left-turn lane with a minimum of 100 feet of storage.~~
- ~~A southbound right-turn lane with a minimum of 100 feet of storage.~~

The Woodbury development is required to provide the following improvements at the intersection of New Hill Olive Chapel Road and Humie Olive Road that are proposed to be included in future analysis:

- A westbound left-turn lane with a minimum of 250 feet of storage.
- A southbound left-turn lane with a minimum of 150 feet of storage.

The Jordan Pointe development is tied into a traffic signal at the intersection of New Hill Holleman Road / New Hill Olive Chapel Road and Old US 1. The proposed study for the Heelan Property development includes analyzing this intersection both with and without a traffic signal at this study intersection under future analysis scenarios to determine the impacts of the proposed development on the intersection and to determine if the proposed development contributes to the need for a traffic signal.

Please remove this assumption out of your analysis. Per latest traffic assessment Friendship station will not be connecting Horton Ridge Blvd to the southern leg of Richardson Road before assumed build out year.

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constru
Olive C
collector street that is expected to add interconnectivity to neighborhoods within the vicinity of the site and ultimately connect to Richardson Road. Based on the anticipated connection, background traffic was diverted to utilize Horton Ridge Boulevard. Approximately 30% of the vehicles completing the eastbound left-turn movement at the intersection of Richardson Road and Humie Olive Road are expected to utilize the Horton Ridge Boulevard connection at New Hill Olive Chapel Road and approximately 10% of the vehicles completing the southbound left-turn movement at the intersection of New Hill Olive Chapel Road and Horton Ridge Boulevard are expected to utilize the Horton Ridge Boulevard connection at Humie Olive Road. The diverted trips will be applied to combined (2026) conditions, as this section of Horton Ridge Boulevard is expected to be complete at the build-out of the proposed development. Refer to the attached diverted trips figure.

Overall, the adjacent developments are expected to account for much of the background growth within the vicinity of the site and a 2% annually compounded growth rate (in addition to the adjacent development trips) is expected to provide a conservative estimation of traffic volumes in background (2026) conditions.

Based on the driveway locations of the adjacent developments, future traffic volumes may not balance between study intersections. Refer to the attached adjacent development figure.

Report

The TIA report will be prepared based on the Town and NCDOT requirements.

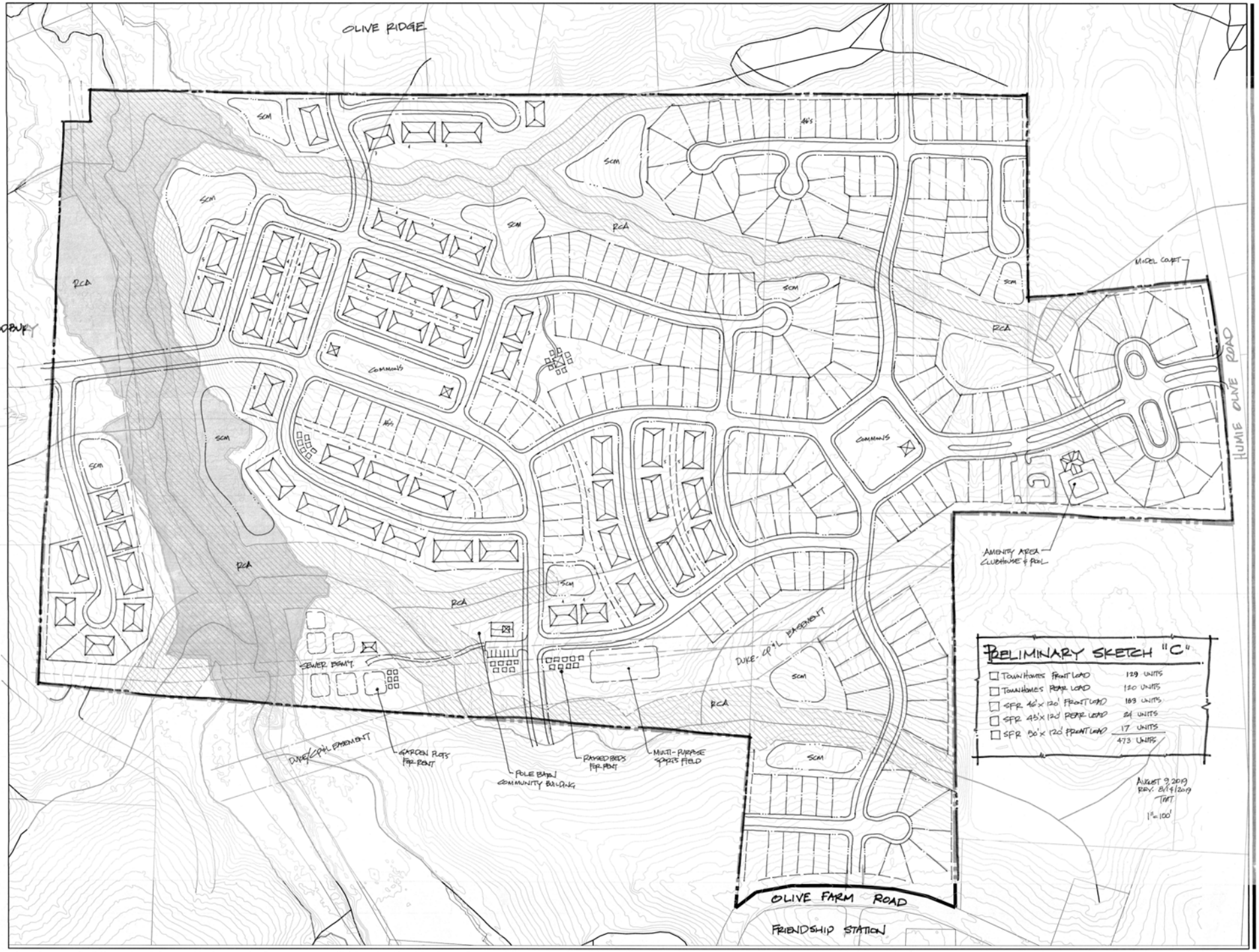
If you find this memorandum of understanding acceptable, please let me know so that we may include it in the TIA report. If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,
Ramey Kemp & Associates, Inc.

Joshua Reinke, P.E.
Transportation Engineer

Attachments: Site Plan
Site Location Map
Existing (2019) Traffic Volumes Figure
Site Trip Distribution Figure
Adjacent Development Figure
Adjacent Development Information
Diverted Trips Figure

cc: Russell Dalton, Town of Apex
NCDOT

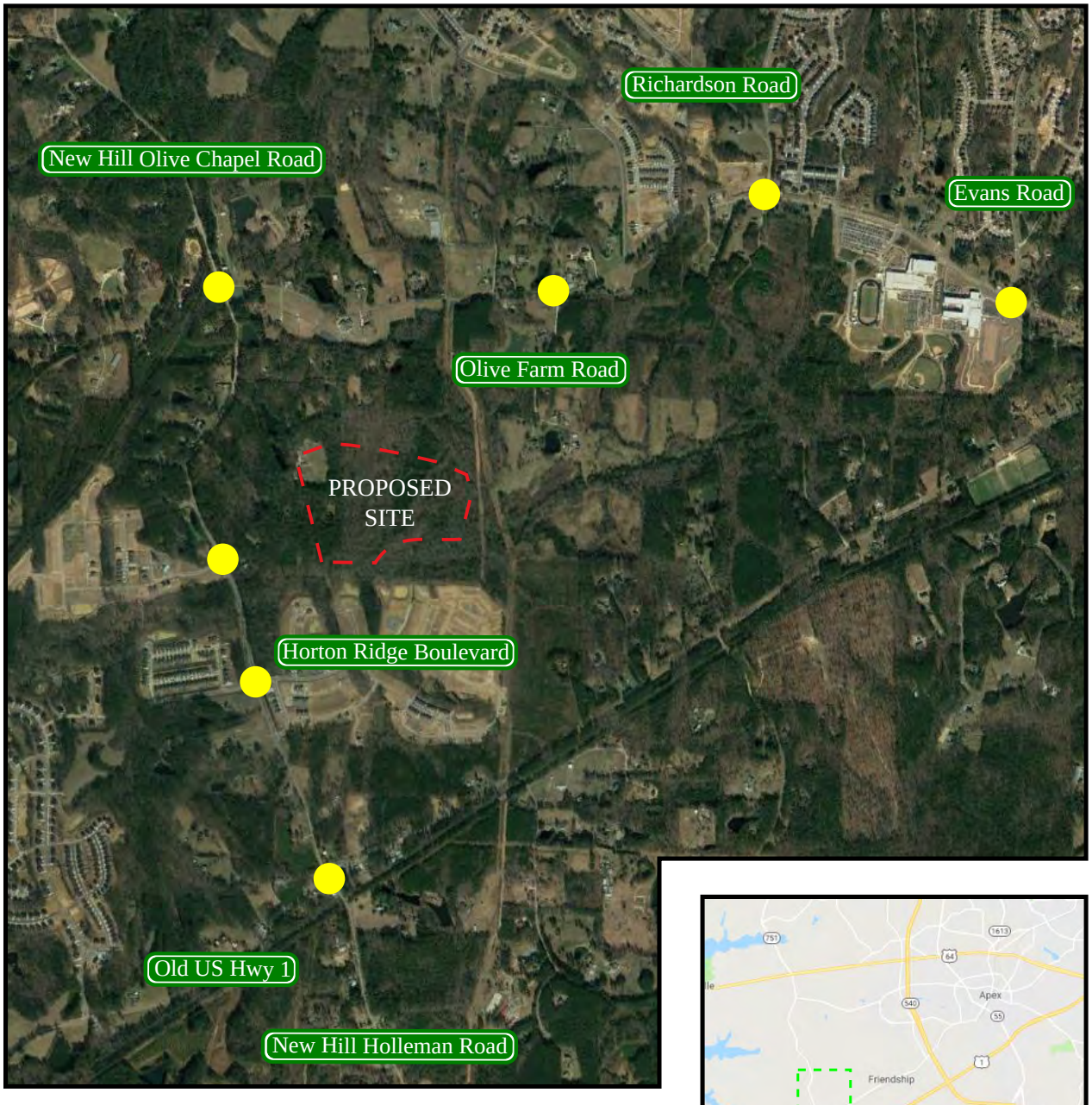


TMTLA ASSOCIATES
5011 SOUTHPARK DRIVE, STE. 200 - DURHAM, NC 27713
p: (919) 484-8887 e: info@tmtla.com

NORTH CAROLINA REGISTERED LANDSCAPE ARCHITECTURE No. C-126

HEELAN PROPERTY
M/I HOMES

SCALE:
DRAWN BY:
PROJECT #
DATE:
SHEET
OF



LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

N

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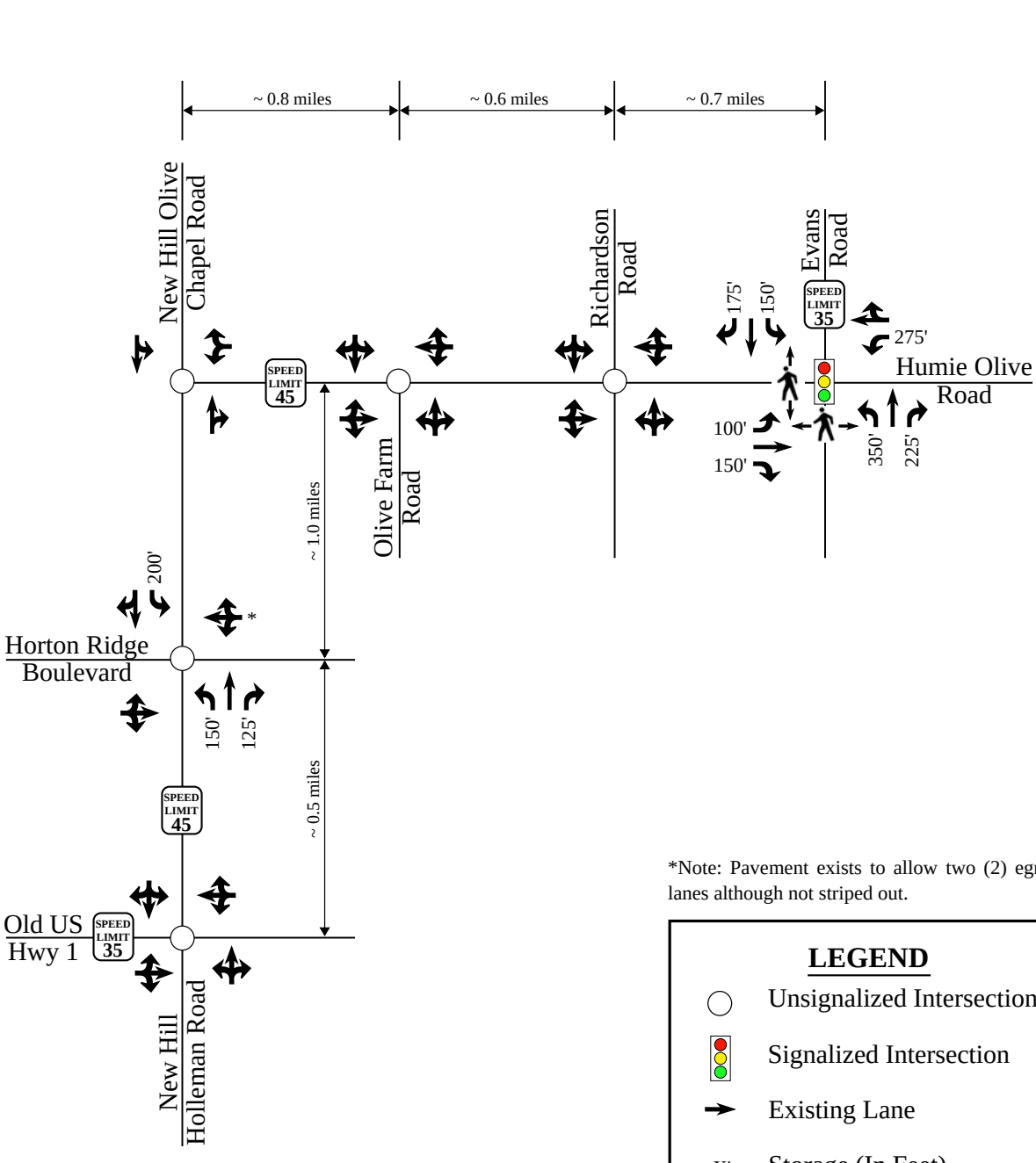
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Site Location Map

Scale: Not to Scale



*Note: Pavement exists to allow two (2) egress lanes although not striped out.

LEGEND

- Unsignalized Intersection
- Signalized Intersection
- Existing Lane
- X' Storage (In Feet)
- Pedestrian Crosswalk
- Posted Speed Limit

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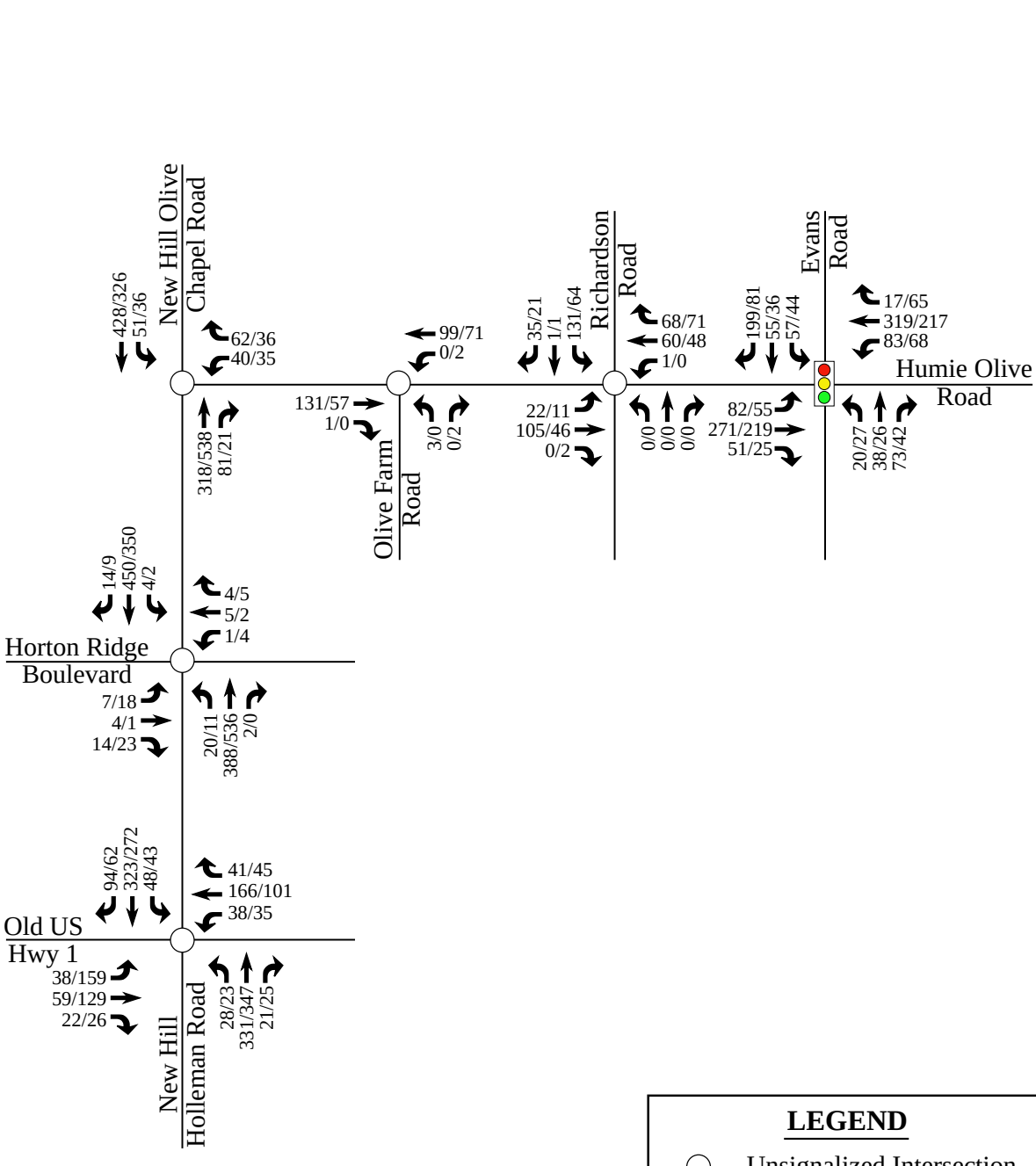
Heelan Property
Apex, NC

Existing
Lane Configurations

Scale: Not to Scale



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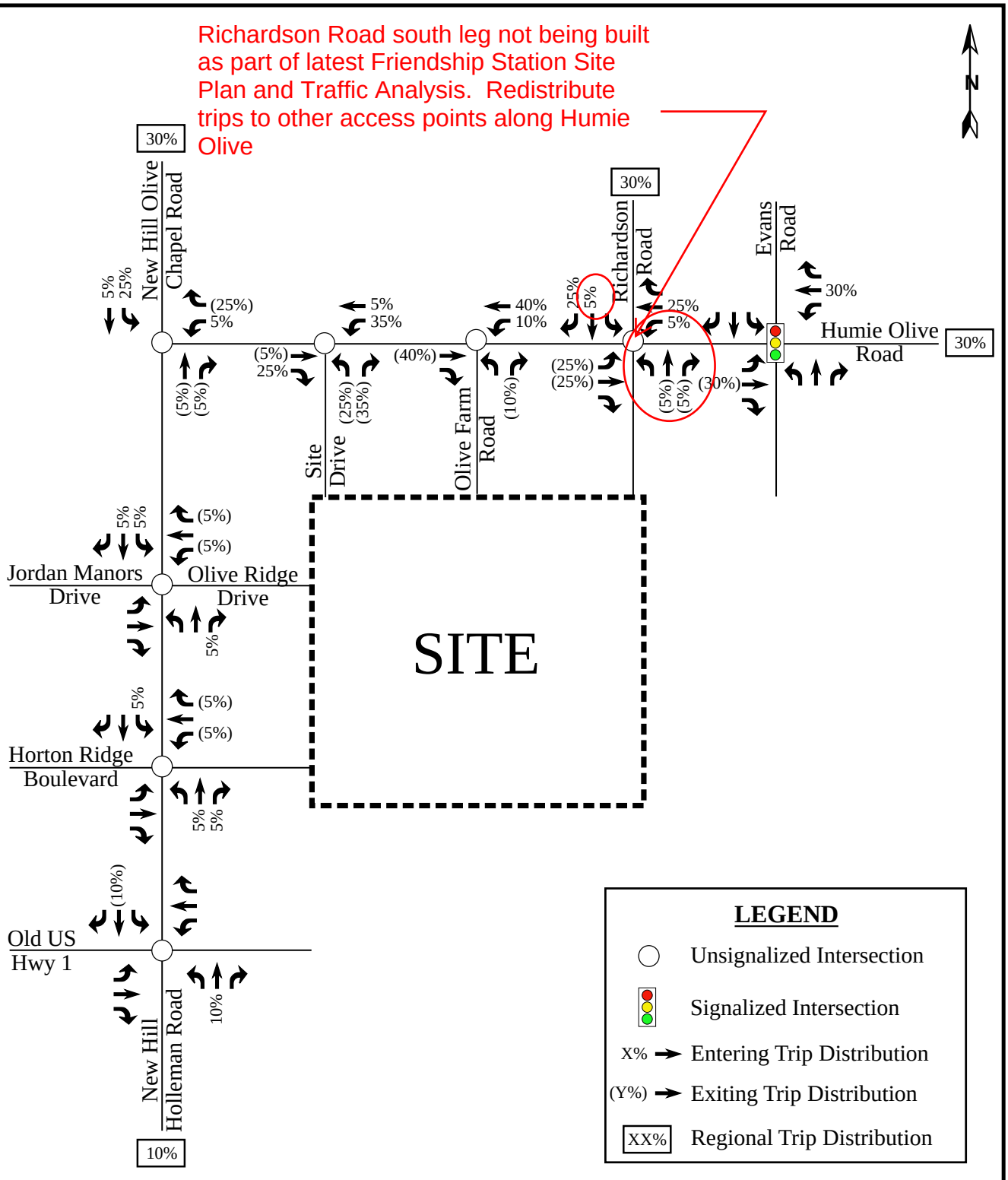
Heelan Property
Apex, NC

Existing (2019)
Peak Hour Traffic

Scale: Not to Scale

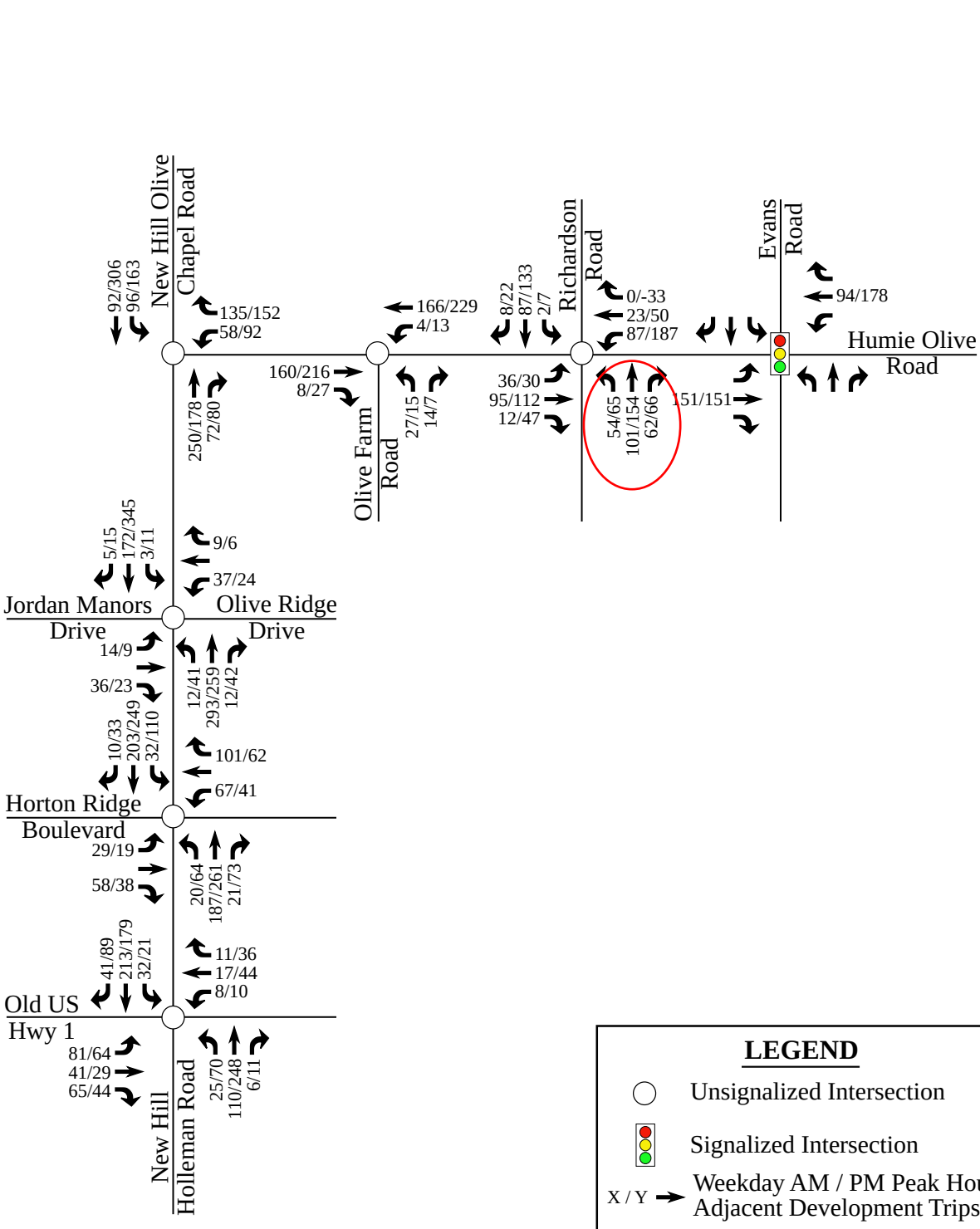


RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Site Trip Distribution

Scale: Not to Scale



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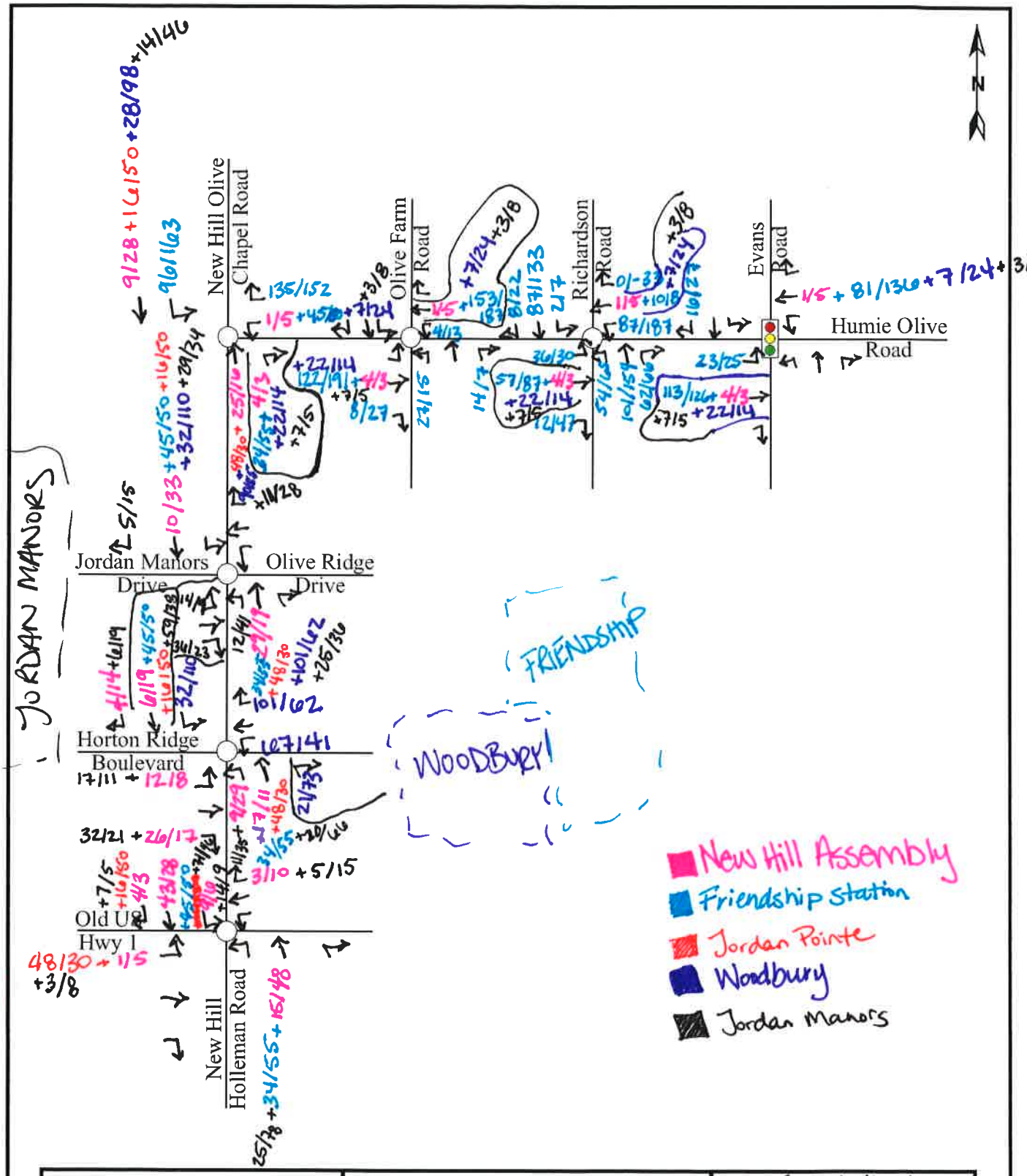
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Peak Hour Adjacent Development Trips

Scale: Not to Scale



RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

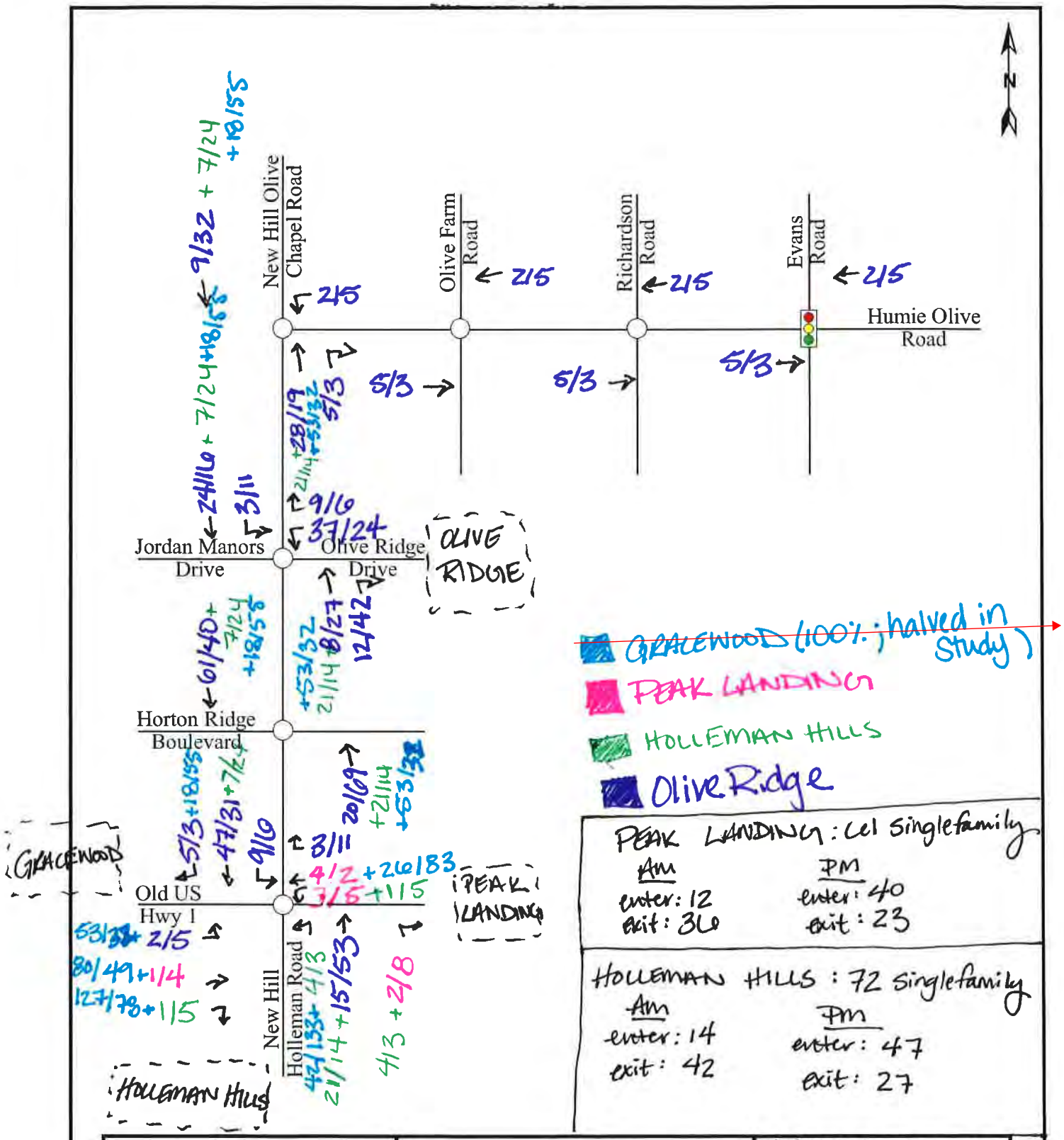
HEELAN ADJACENT DEVELOPMENT

Scale: Not to Scale

NEW HILL ASSEMBLY ✓
FRIENDSHIP STATION ✓
JORDAN POINTE ✓

WOODBURY ✓
JORDAN MANORS ✓
PEAK LANDING ✓

HOLLEMAN HILLS ✓
OLIVE RIDGE ✓
GRACEWOOD ✓



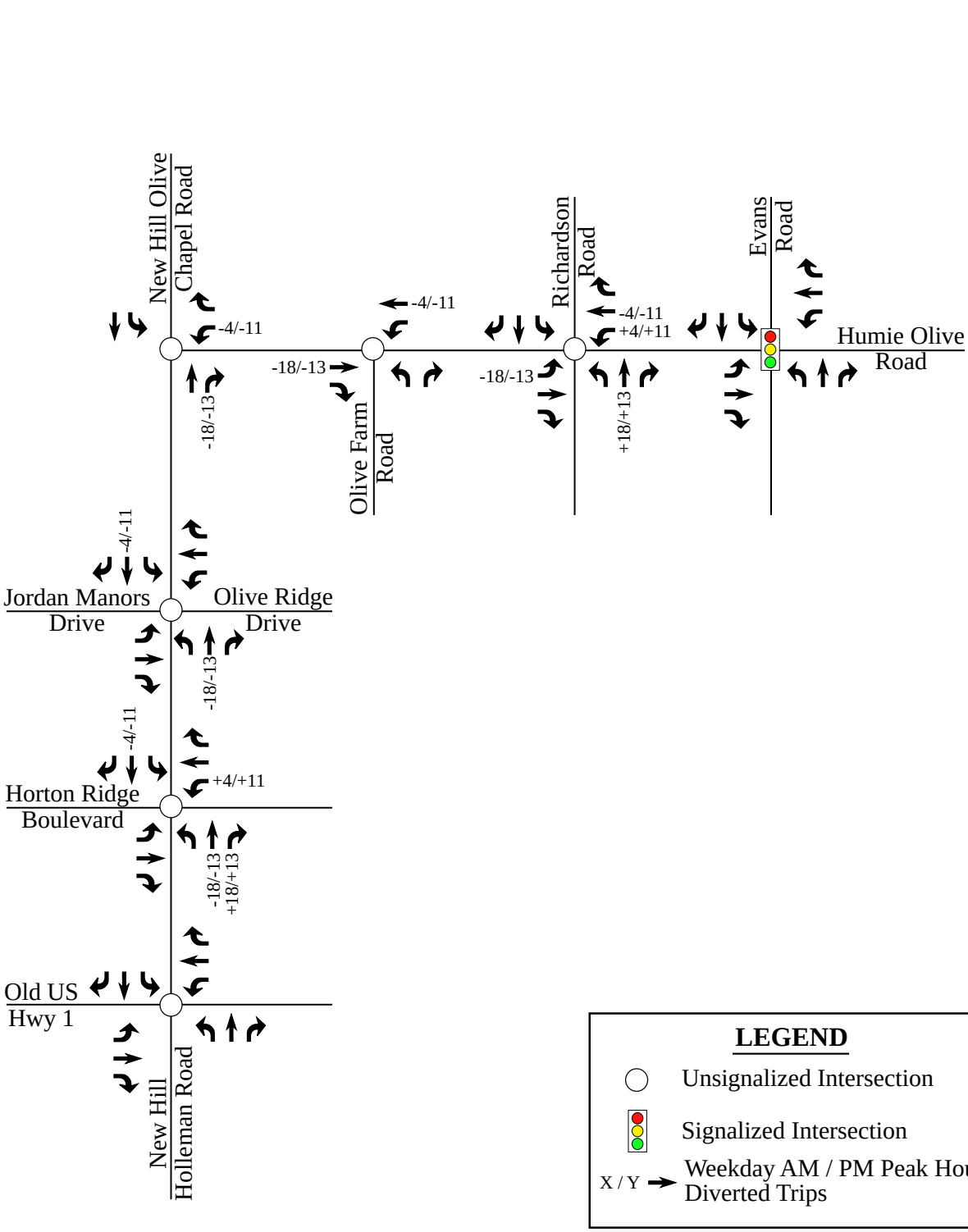
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

HEELAN ADJACENT DEVELOPMENT

Scale: Not to Scale

PAGE 2



RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Heelan Property
Apex, NC

Diverted Trips

Scale: Not to Scale

APPENDIX B

COUNT DATA

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

5808 Faringdon Place, Suite 100
Raleigh, NC 27609
PH: 919 872-5115

File Name : New Hill Olive Chapel Road and Horton Ridge Road
Site Code : 00111418
Start Date : 11/14/2018
Page No : 1

Groups Printed- Cars & Trucks

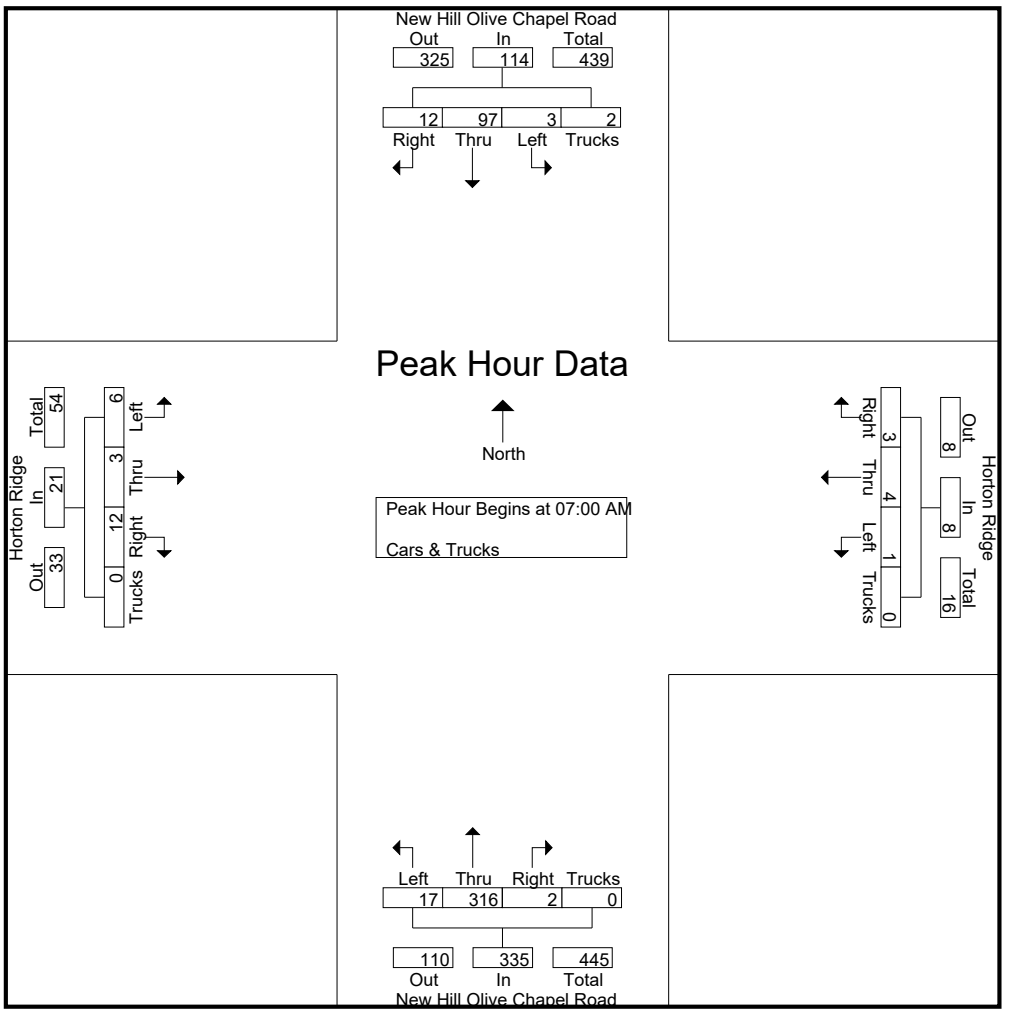
	New Hill Olive Chapel Road From North					Horton Ridge From East					New Hill Olive Chapel Road From South					Horton Ridge From West					
Start Time	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Int. Total
07:00 AM	2	20	1	1	24	0	0	0	0	0	1	92	6	0	99	2	1	3	0	6	129
07:15 AM	4	18	0	0	22	1	2	0	0	3	0	84	4	0	88	6	0	0	0	6	119
07:30 AM	4	36	1	0	41	0	2	1	0	3	0	62	1	0	63	2	0	2	0	4	111
07:45 AM	2	23	1	1	27	2	0	0	0	2	1	78	6	0	85	2	2	1	0	5	119
Total	12	97	3	2	114	3	4	1	0	8	2	316	17	0	335	12	3	6	0	21	478
08:00 AM	1	22	1	1	25	0	0	0	0	0	2	54	5	1	62	3	5	2	0	10	97
08:15 AM	3	24	1	1	29	0	3	0	0	3	1	54	5	1	61	2	1	2	0	5	98
08:30 AM	5	16	3	0	24	0	0	1	0	1	0	52	1	0	53	3	3	5	0	11	89
08:45 AM	1	4	1	0	6	1	0	1	0	2	1	23	5	3	32	0	1	0	0	1	41
Total	10	66	6	2	84	1	3	2	0	6	4	183	16	5	208	8	10	9	0	27	325
*** BREAK ***																					
04:00 PM	0	41	1	0	42	2	1	2	0	5	1	23	3	0	27	5	0	2	0	7	81
04:15 PM	2	52	3	0	57	3	3	3	0	9	0	25	6	1	32	2	1	1	0	4	102
04:30 PM	1	55	0	0	56	2	0	2	0	4	1	36	1	0	38	5	2	1	0	8	106
04:45 PM	3	69	0	0	72	2	0	0	0	2	0	33	2	0	35	4	1	3	2	10	119
Total	6	217	4	0	227	9	4	7	0	20	2	117	12	1	132	16	4	7	2	29	408
05:00 PM	2	77	1	2	82	0	1	2	0	3	0	30	2	0	32	3	0	4	0	7	124
05:15 PM	1	62	1	0	64	0	1	1	0	2	0	37	1	0	38	8	0	3	0	11	115
05:30 PM	2	72	0	1	75	2	0	0	0	2	0	32	4	0	36	5	0	5	0	10	123
05:45 PM	4	86	0	1	91	0	0	0	0	0	0	18	0	0	18	4	0	2	0	6	115
Total	9	297	2	4	312	2	2	3	0	7	0	117	7	0	124	20	0	14	0	34	477
Grand Total	37	677	15	8	737	15	13	13	0	41	8	733	52	6	799	56	17	36	2	111	1688
Apprch %	5	91.9	2	1.1		36.6	31.7	31.7	0		1	91.7	6.5	0.8		50.5	15.3	32.4	1.8		
Total %	2.2	40.1	0.9	0.5	43.7	0.9	0.8	0.8	0	2.4	0.5	43.4	3.1	0.4	47.3	3.3	1	2.1	0.1	6.6	

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

5808 Faringdon Place, Suite 100
Raleigh, NC 27609
PH: 919 872-5115

File Name : New Hill Olive Chapel Road and Horton Ridge Road
Site Code : 00111418
Start Date : 11/14/2018
Page No : 2

	New Hill Olive Chapel Road From North					Horton Ridge From East					New Hill Olive Chapel Road From South					Horton Ridge From West					
Start Time	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Int. Total
Peak Hour Analysis From 7:00:00 AM to 11:45:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 7:00:00 AM																					
7:00:00 AM	2	20	**1**	**1**	24	0	0	0	0	0	**1**	**92**	**6**	0	**99**	2	1	**3**	0	**6**	**129**
7:15:00 AM	**4**	18	0	0	22	1	**2**	0	0	**3**	0	84	4	0	88	**6**	0	0	0	6	119
7:30:00 AM	4	**36**	1	0	**41**	0	2	**1**	0	3	0	62	1	0	63	2	0	2	0	4	111
7:45:00 AM	2	23	1	1	27	**2**	0	0	0	2	1	78	6	0	85	2	**2**	1	0	5	119
Total Volume	12	97	3	2	114	3	4	1	0	8	2	316	17	0	335	12	3	6	0	21	478
% App. Total	10.5	85.1	2.6	1.8		37.5	50	12.5	0		0.6	94.3	5.1	0		57.1	14.3	28.6	0		
PHF	.750	.674	.750	.500	.695	.375	.500	.250	.000	.667	.500	.859	.708	.000	.846	.500	.375	.500	.000	.875	.926



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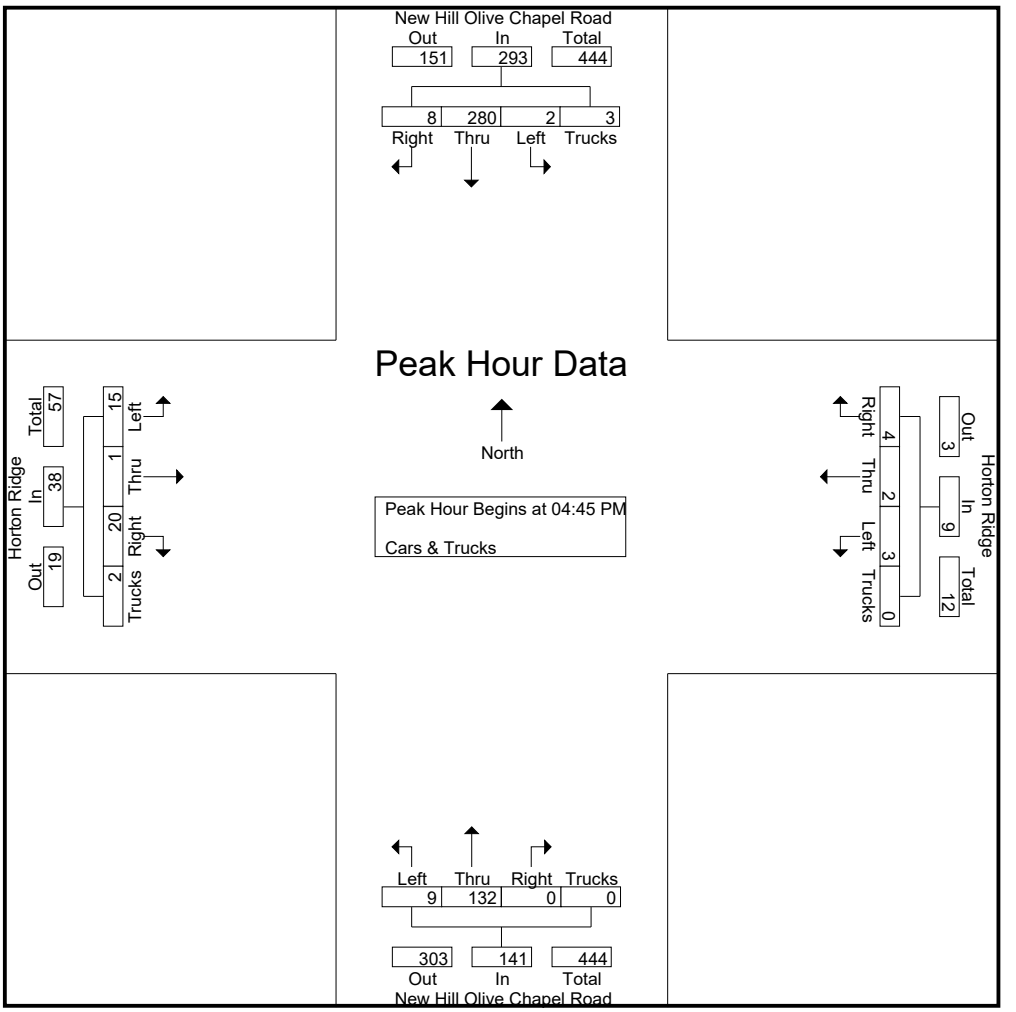
Start Time	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Int. Total
Peak Hour Analysis From 12:00:00 PM to 5:45:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 4:45:00 PM																					
4:45:00 PM	**3**	69	0	0	72	**2**	0	0	0	2	0	33	2	0	35	4	**1**	3	**2**	10	119
5:00:00 PM	2	**77**	**1**	**2**	**82**	0	**1**	**2**	0	**3**	0	30	2	0	32	3	0	4	0	7	**124**
5:15:00 PM	1	62	1	0	64	0	1	1	0	2	0	**37**	1	0	**38**	**8**	0	3	0	**11**	115
5:30:00 PM	2	72	0	1	75	2	0	0	0	2	0	32	**4**	0	36	5	0	**5**	0	10	123
Total Volume	8	280	2	3	293	4	2	3	0	9	0	132	9	0	141	20	1	15	2	38	481
% App. Total	2.7	95.6	0.7	1		44.4	22.2	33.3	0		0	93.6	6.4	0		52.6	2.6	39.5	5.3		
PHF	.667	.909	.500	.375	.893	.500	.500	.375	.000	.750	.000	.892	.563	.000	.928	.625	.250	.750	.250	.864	.970



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Raleigh, NC 27609
PH: 919 872-5115

File Name : Humie Olive Chapel Road and Richardson Road
Site Code : 00111318
Start Date : 11/13/2018
Page No : 1

Groups Printed- Cars & Trucks

	Richardson Road From North					Humie Olive Chapel ROad From East					Richardson Road From South					Humie Olive Chapel ROad From West					
Start Time	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Int. Total
07:00 AM	4	1	34	0	39	14	8	1	1	24	0	0	0	0	0	0	56	7	0	63	126
07:15 AM	10	0	22	0	32	25	21	0	1	47	0	0	0	0	0	0	8	4	0	12	91
07:30 AM	8	0	29	1	38	6	3	0	0	9	0	0	0	0	0	0	9	5	0	14	61
07:45 AM	8	0	27	1	36	13	19	0	0	32	0	0	0	0	0	0	17	3	0	20	88
Total	30	1	112	2	145	58	51	1	2	112	0	0	0	0	0	0	90	19	0	109	366
08:00 AM	10	0	27	0	37	19	12	0	1	32	0	0	0	0	0	0	15	3	0	18	87
08:15 AM	4	0	28	0	32	16	17	0	0	33	0	1	0	0	1	0	6	2	0	8	74
08:30 AM	4	0	34	0	38	8	12	0	2	22	0	0	0	0	0	0	10	3	0	13	73
08:45 AM	2	0	17	0	19	5	8	0	0	13	0	0	0	0	0	0	7	2	0	9	41
Total	20	0	106	0	126	48	49	0	3	100	0	1	0	0	1	0	38	10	0	48	275
*** BREAK ***																					
04:00 PM	4	0	12	0	16	17	9	0	0	26	0	0	0	0	0	2	12	1	0	15	57
04:15 PM	5	0	13	1	19	16	8	0	0	24	0	0	0	0	0	0	7	2	0	9	52
04:30 PM	6	0	14	0	20	16	14	0	1	31	0	0	0	0	0	0	11	3	0	14	65
04:45 PM	3	1	16	0	20	12	10	0	0	22	0	0	0	0	0	0	9	3	0	12	54
Total	18	1	55	1	75	61	41	0	1	103	0	0	0	0	0	2	39	9	0	50	228
05:00 PM	1	0	11	0	12	21	10	0	0	31	0	0	0	0	0	0	3	3	0	6	49
05:15 PM	6	0	10	0	16	11	11	0	0	22	0	0	0	0	0	0	11	4	0	15	53
05:30 PM	2	0	3	0	5	11	7	0	2	20	0	0	0	0	0	0	6	1	0	7	32
05:45 PM	3	1	11	0	15	14	8	0	1	23	0	0	0	0	0	0	16	5	0	21	59
Total	12	1	35	0	48	57	36	0	3	96	0	0	0	0	0	0	36	13	0	49	193
Grand Total	80	3	308	3	394	224	177	1	9	411	0	1	0	0	1	2	203	51	0	256	1062
Apprch %	20.3	0.8	78.2	0.8		54.5	43.1	0.2	2.2		0	100	0	0		0.8	79.3	19.9	0		
Total %	7.5	0.3	29	0.3	37.1	21.1	16.7	0.1	0.8	38.7	0	0.1	0	0	0.1	0.2	19.1	4.8	0	24.1	

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

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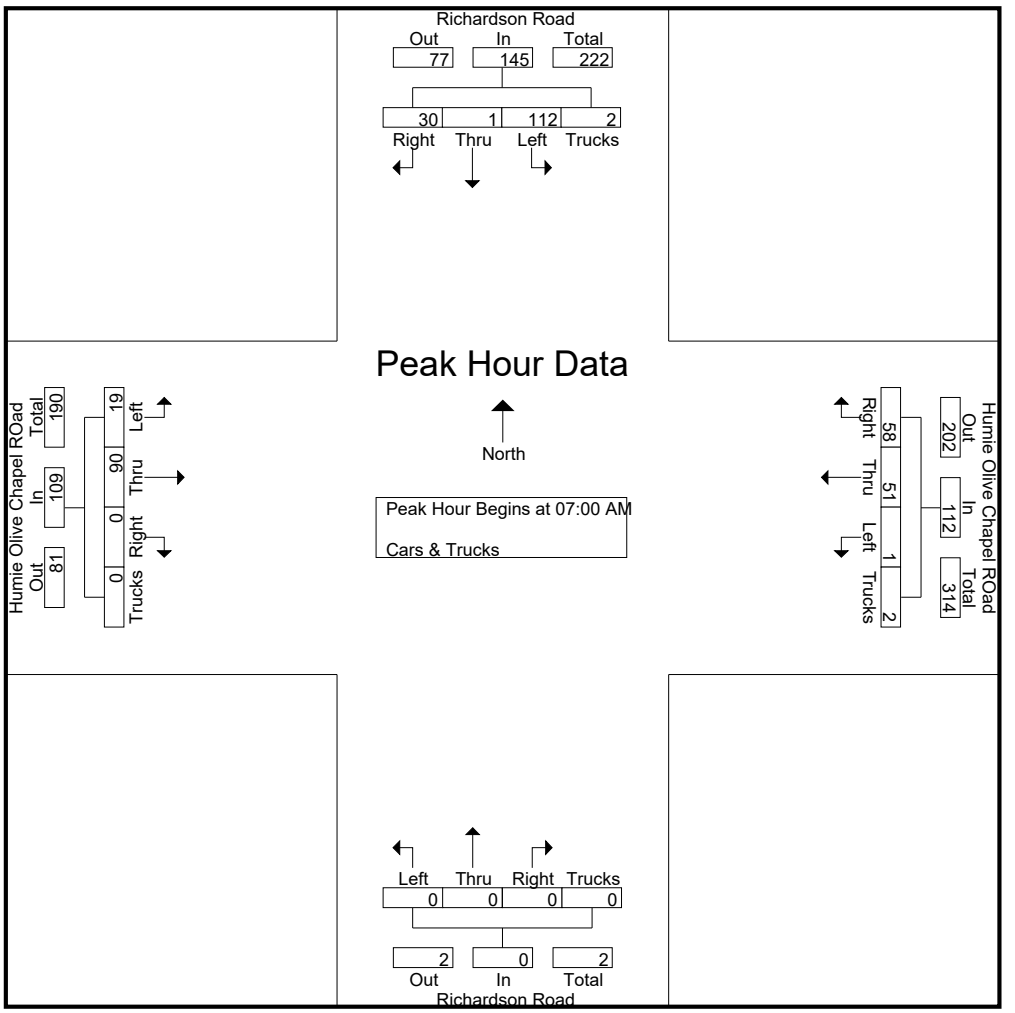
Peak Hour Analysis From 7:00:00 AM to 11:45:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 7:00:00 AM																					
7:00:00 AM	4	**1**	**34**	0	**39**	14	8	**1**	**1**	24	0	0	0	0	0	0	**56**	**7**	0	**63**	**126**
7:15:00 AM	**10**	0	22	0	32	**25**	**21**	0	1	**47**	0	0	0	0	0	0	8	4	0	12	91
7:30:00 AM	8	0	29	**1**	38	6	3	0	0	9	0	0	0	0	0	0	9	5	0	14	61
7:45:00 AM	8	0	27	1	36	13	19	0	0	32	0	0	0	0	0	0	17	3	0	20	88
Total Volume	30	1	112	2	145	58	51	1	2	112	0	0	0	0	0	0	90	19	0	109	366
% App. Total	20.7	0.7	77.2	1.4		51.8	45.5	0.9	1.8		0	0	0	0		0	82.6	17.4	0		
PHF	.750	.250	.824	.500	.929	.580	.607	.250	.500	.596	.000	.000	.000	.000	.000	.000	.402	.679	.000	.433	.726



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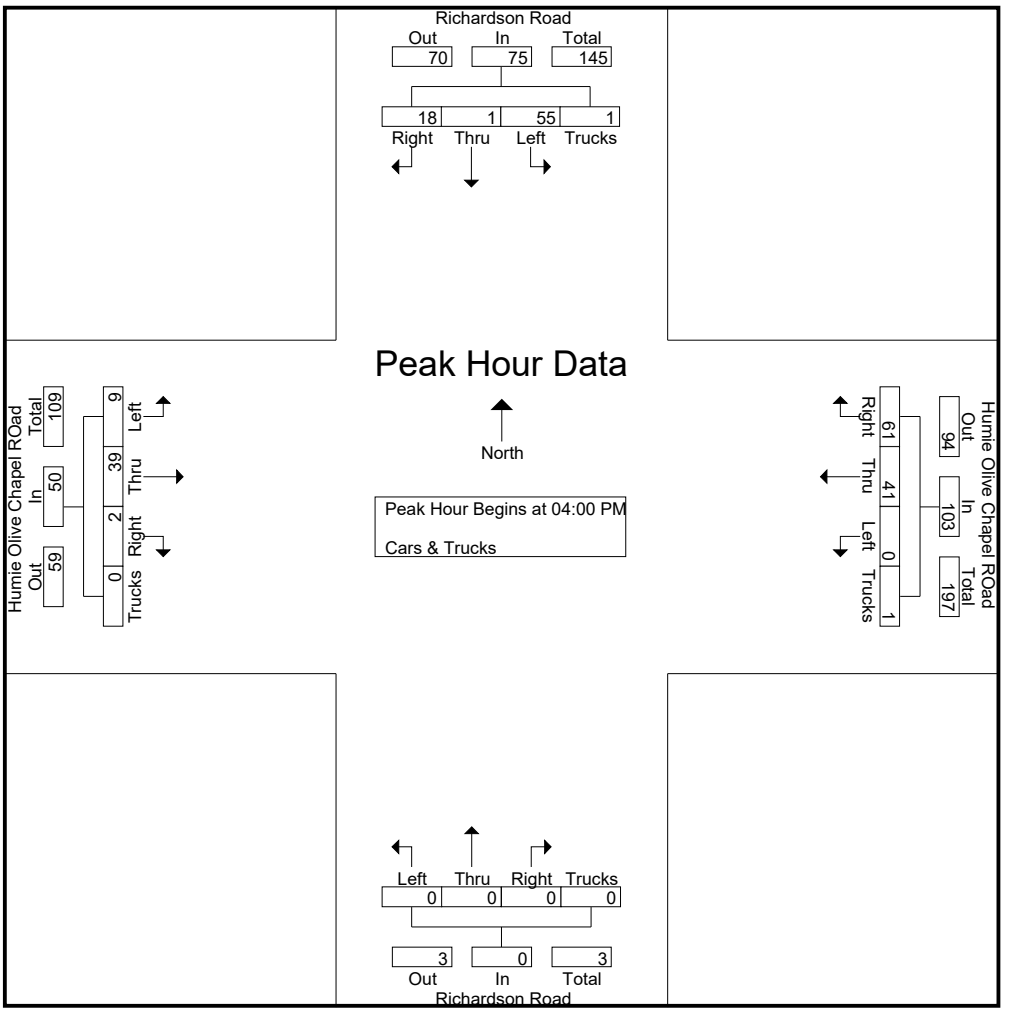
Peak Hour Analysis From 12:00:00 PM to 5:45:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 4:00:00 PM																					
4:00:00 PM	4	0	12	0	16	**17**	9	0	0	26	0	0	0	0	0	**2**	**12**	1	0	**15**	57
4:15:00 PM	5	0	13	**1**	19	16	8	0	0	24	0	0	0	0	0	0	7	2	0	9	52
4:30:00 PM	**6**	0	14	0	**20**	16	**14**	0	**1**	**31**	0	0	0	0	0	0	11	**3**	0	14	**65**
4:45:00 PM	3	**1**	**16**	0	20	12	10	0	0	22	0	0	0	0	0	0	9	3	0	12	54
Total Volume	18	1	55	1	75	61	41	0	1	103	0	0	0	0	0	2	39	9	0	50	228
% App. Total	24	1.3	73.3	1.3		59.2	39.8	0	1		0	0	0	0		4	78	18	0		
PHF	.750	.250	.859	.250	.938	.897	.732	.000	.250	.831	.000	.000	.000	.000	.000	.250	.813	.750	.000	.833	.877



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File Name : Humie Olive Chapel Road and New Hill Olive Chapel Road
Site Code : 00111418
Start Date : 11/14/2018
Page No : 1

Groups Printed- Cars & Trucks

	New Hill Olive Chapel Road From North					Humie Olive Chapel Road From East					New Hill Olive Chapel Road From South					Driveway From West					
Start Time	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Int. Total
07:00 AM	0	19	13	1	33	5	0	2	0	7	30	68	1	0	99	0	0	0	0	0	139
07:15 AM	0	16	3	0	19	6	0	9	0	15	8	66	0	0	74	0	0	0	0	0	108
07:30 AM	0	34	10	0	44	9	0	5	0	14	4	60	0	0	64	0	0	0	0	0	122
07:45 AM	0	24	5	1	30	7	0	2	0	9	7	77	0	0	84	0	0	0	0	0	123
Total	0	93	31	2	126	27	0	18	0	45	49	271	1	0	321	0	0	0	0	0	492
08:00 AM	0	21	3	1	25	6	0	3	0	9	4	73	0	0	77	0	0	0	0	0	111
08:15 AM	0	27	3	1	31	5	0	0	0	5	3	54	0	1	58	0	0	0	0	0	94
08:30 AM	0	20	1	1	22	5	0	3	1	9	3	51	0	0	54	0	0	0	0	0	85
08:45 AM	0	8	4	0	12	5	0	0	0	5	1	26	0	1	28	0	0	0	0	0	45
Total	0	76	11	3	90	21	0	6	1	28	11	204	0	2	217	0	0	0	0	0	335
*** BREAK ***																					
04:00 PM	0	39	6	0	45	9	0	1	0	10	2	22	0	0	24	0	0	0	0	0	79
04:15 PM	0	38	13	0	51	8	0	7	0	15	2	26	0	0	28	0	0	0	0	0	94
04:30 PM	0	60	3	0	63	8	0	0	1	9	1	32	0	0	33	0	0	0	0	0	105
04:45 PM	0	73	2	0	75	2	0	3	0	5	2	34	0	0	36	0	0	0	0	0	116
Total	0	210	24	0	234	27	0	11	1	39	7	114	0	0	121	0	0	0	0	0	394
05:00 PM	0	74	4	1	79	4	0	4	1	9	2	36	0	2	40	0	0	0	0	0	128
05:15 PM	0	54	3	0	57	3	0	2	0	5	4	36	0	0	40	0	0	0	0	0	102
05:30 PM	0	63	6	1	70	11	0	8	0	19	5	36	0	0	41	0	0	0	0	0	130
05:45 PM	0	87	10	1	98	1	0	4	1	6	3	20	0	1	24	0	0	0	0	0	128
Total	0	278	23	3	304	19	0	18	2	39	14	128	0	3	145	0	0	0	0	0	488
Grand Total	0	657	89	8	754	94	0	53	4	151	81	717	1	5	804	0	0	0	0	0	1709
Apprch %	0	87.1	11.8	1.1		62.3	0	35.1	2.6		10.1	89.2	0.1	0.6		0	0	0	0		
Total %	0	38.4	5.2	0.5	44.1	5.5	0	3.1	0.2	8.8	4.7	42	0.1	0.3	47	0	0	0	0	0	

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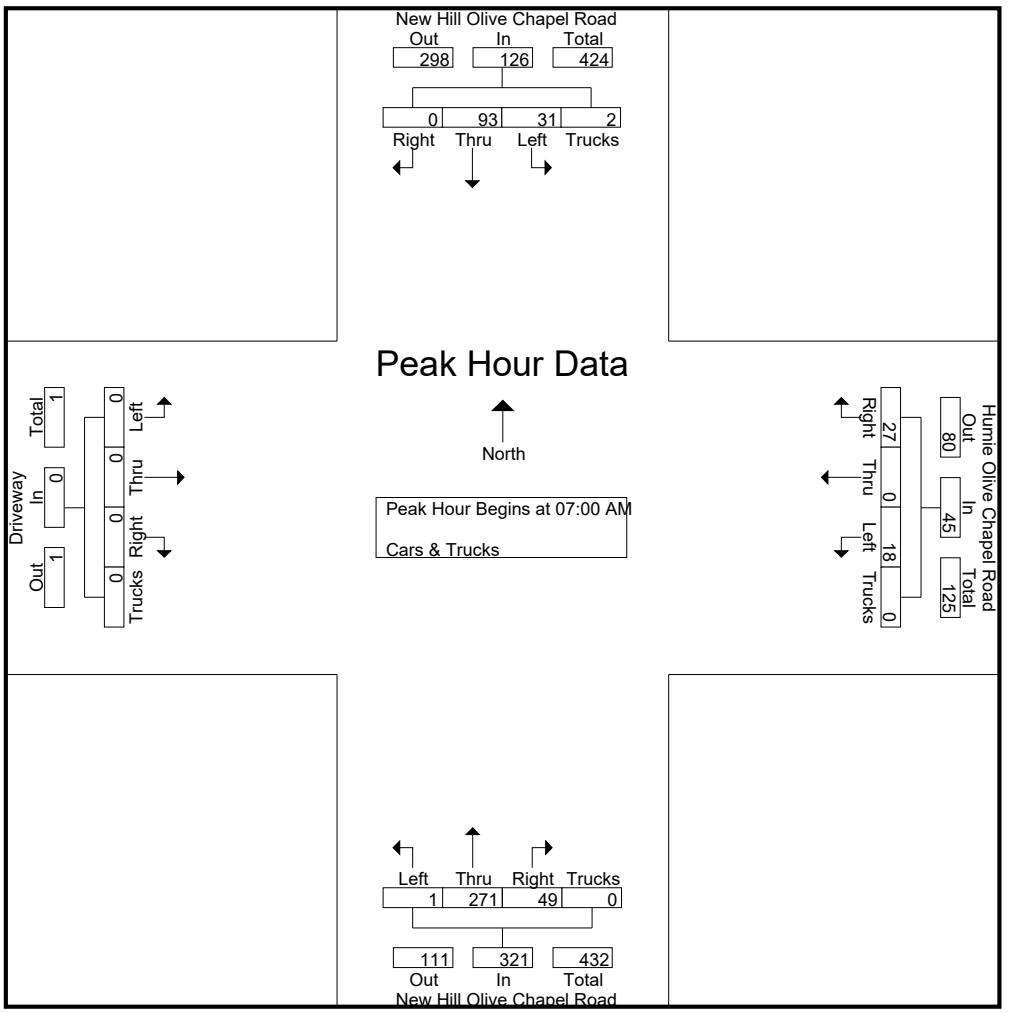
File Name : Humie Olive Chapel Road and New Hill Olive Chapel Road
Site Code : 00111418
Start Date : 11/14/2018
Page No : 2

	New Hill Olive Chapel Road From North					Humie Olive Chapel Road From East					New Hill Olive Chapel Road From South					Driveway From West					
Start Time	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Int. Total
Peak Hour Analysis From 7:00:00 AM to 11:45:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 7:00:00 AM																					
7:00:00 AM	0	19	**13**	**1**	33	5	0	2	0	7	**30**	68	**1**	0	**99**	0	0	0	0	0	**139**
7:15:00 AM	0	16	3	0	19	6	0	**9**	0	**15**	8	66	0	0	74	0	0	0	0	0	108
7:30:00 AM	0	**34**	10	0	**44**	**9**	0	5	0	14	4	60	0	0	64	0	0	0	0	0	122
7:45:00 AM	0	24	5	1	30	7	0	2	0	9	7	**77**	0	0	84	0	0	0	0	0	123
Total Volume	0	93	31	2	126	27	0	18	0	45	49	271	1	0	321	0	0	0	0	0	492
% App. Total	0	73.8	24.6	1.6		60	0	40	0		15.3	84.4	0.3	0		0	0	0	0		
PHF	.000	.684	.596	.500	.716	.750	.000	.500	.000	.750	.408	.880	.250	.000	.811	.000	.000	.000	.000	.000	.885



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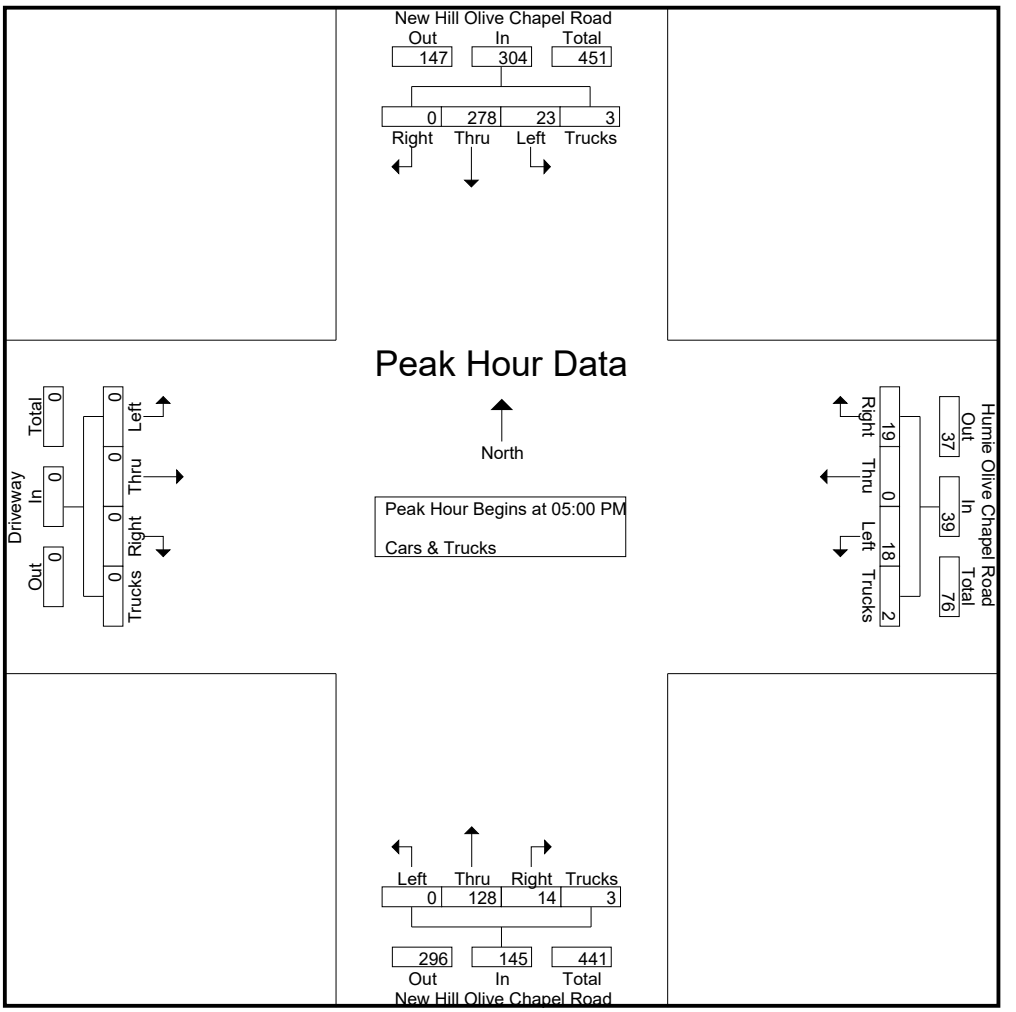
File Name : Humie Olive Chapel Road and New Hill Olive Chapel Road
Site Code : 00111418
Start Date : 11/14/2018
Page No : 3

	New Hill Olive Chapel Road From North					Humie Olive Chapel Road From East					New Hill Olive Chapel Road From South					Driveway From West					
Start Time	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Right	Thru	Left	Trucks	App. Total	Int. Total
Peak Hour Analysis From 12:00:00 PM to 5:45:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 5:00:00 PM																					
5:00:00 PM	0	74	4	**1**	79	4	0	4	**1**	9	2	**36**	0	**2**	40	0	0	0	0	0	128
5:15:00 PM	0	54	3	0	57	3	0	2	0	5	4	36	0	0	40	0	0	0	0	0	102
5:30:00 PM	0	63	6	1	70	**11**	0	**8**	0	**19**	**5**	36	0	0	**41**	0	0	0	0	0	**130**
5:45:00 PM	0	**87**	**10**	1	**98**	1	0	4	1	6	3	20	0	1	24	0	0	0	0	0	128
Total Volume	0	278	23	3	304	19	0	18	2	39	14	128	0	3	145	0	0	0	0	0	488
% App. Total	0	91.4	7.6	1		48.7	0	46.2	5.1		9.7	88.3	0	2.1		0	0	0	0		
PHF	.000	.799	.575	.750	.776	.432	.000	.563	.500	.513	.700	.889	.000	.375	.884	.000	.000	.000	.000	.000	.938



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File Name : Apex(New Hill Hollerman and Old US 1)PM
Site Code :
Start Date : 9/11/2019
Page No : 1

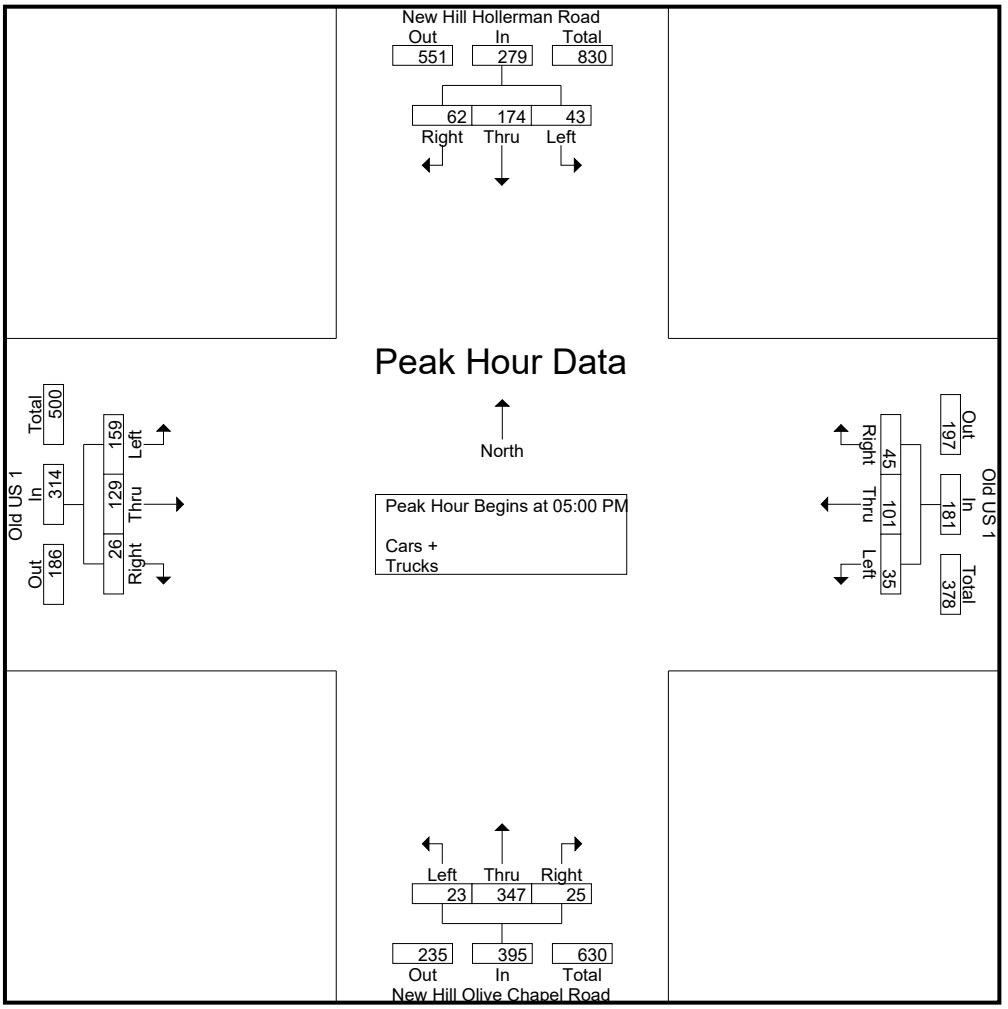
Groups Printed- Cars + - Trucks

	New Hill Hollerman Road Southbound				Old US 1 Westbound				New Hill Olive Chapel Road Northbound				Old US 1 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
04:00 PM	15	25	12	52	6	14	6	26	11	57	8	76	16	26	13	55	209
04:15 PM	12	34	12	58	9	20	6	35	10	65	6	81	8	27	20	55	229
04:30 PM	20	34	11	65	8	35	11	54	10	65	5	80	6	31	18	55	254
04:45 PM	17	35	17	69	11	20	7	38	7	58	3	68	6	36	29	71	246
Total	64	128	52	244	34	89	30	153	38	245	22	305	36	120	80	236	938
05:00 PM	14	32	9	55	12	19	8	39	7	71	6	84	4	25	29	58	236
05:15 PM	17	50	9	76	9	24	13	46	8	98	6	112	6	44	43	93	327
05:30 PM	15	50	13	78	16	33	9	58	3	85	7	95	9	32	51	92	323
05:45 PM	16	42	12	70	8	25	5	38	7	93	4	104	7	28	36	71	283
Total	62	174	43	279	45	101	35	181	25	347	23	395	26	129	159	314	1169
Grand Total	126	302	95	523	79	190	65	334	63	592	45	700	62	249	239	550	2107
Apprch %	24.1	57.7	18.2		23.7	56.9	19.5		9	84.6	6.4		11.3	45.3	43.5		
Total %	6	14.3	4.5	24.8	3.7	9	3.1	15.9	3	28.1	2.1	33.2	2.9	11.8	11.3	26.1	
Cars +	124	297	92	513	74	185	62	321	55	577	45	677	61	248	237	546	2057
% Cars +	98.4	98.3	96.8	98.1	93.7	97.4	95.4	96.1	87.3	97.5	100	96.7	98.4	99.6	99.2	99.3	97.6
Trucks	2	5	3	10	5	5	3	13	8	15	0	23	1	1	2	4	50
% Trucks	1.6	1.7	3.2	1.9	6.3	2.6	4.6	3.9	12.7	2.5	0	3.3	1.6	0.4	0.8	0.7	2.4

TRAFFIC DATA COLLECTION

File Name : Apex(New Hill Hollerman and Old US 1)PM
Site Code :
Start Date : 9/11/2019
Page No : 2

	New Hill Hollerman Road Southbound				Old US 1 Westbound				New Hill Olive Chapel Road Northbound				Old US 1 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	14	32	9	55	12	19	8	39	7	71	6	84	4	25	29	58	236
05:15 PM	**17**	**50**	9	76	9	24	**13**	46	**8**	**98**	6	**112**	6	**44**	43	**93**	**327**
05:30 PM	15	50	**13**	**78**	**16**	**33**	9	**58**	3	85	**7**	95	**9**	32	**51**	92	323
05:45 PM	16	42	12	70	8	25	5	38	7	93	4	104	7	28	36	71	283
Total Volume	62	174	43	279	45	101	35	181	25	347	23	395	26	129	159	314	1169
% App. Total	22.2	62.4	15.4		24.9	55.8	19.3		6.3	87.8	5.8		8.3	41.1	50.6		
PHF	.912	.870	.827	.894	.703	.765	.673	.780	.781	.885	.821	.882	.722	.733	.779	.844	.894



File Name : Apex(New Hill Hollerman and Old US 1)AM
Site Code :
Start Date : 9/11/2019
Page No : 1

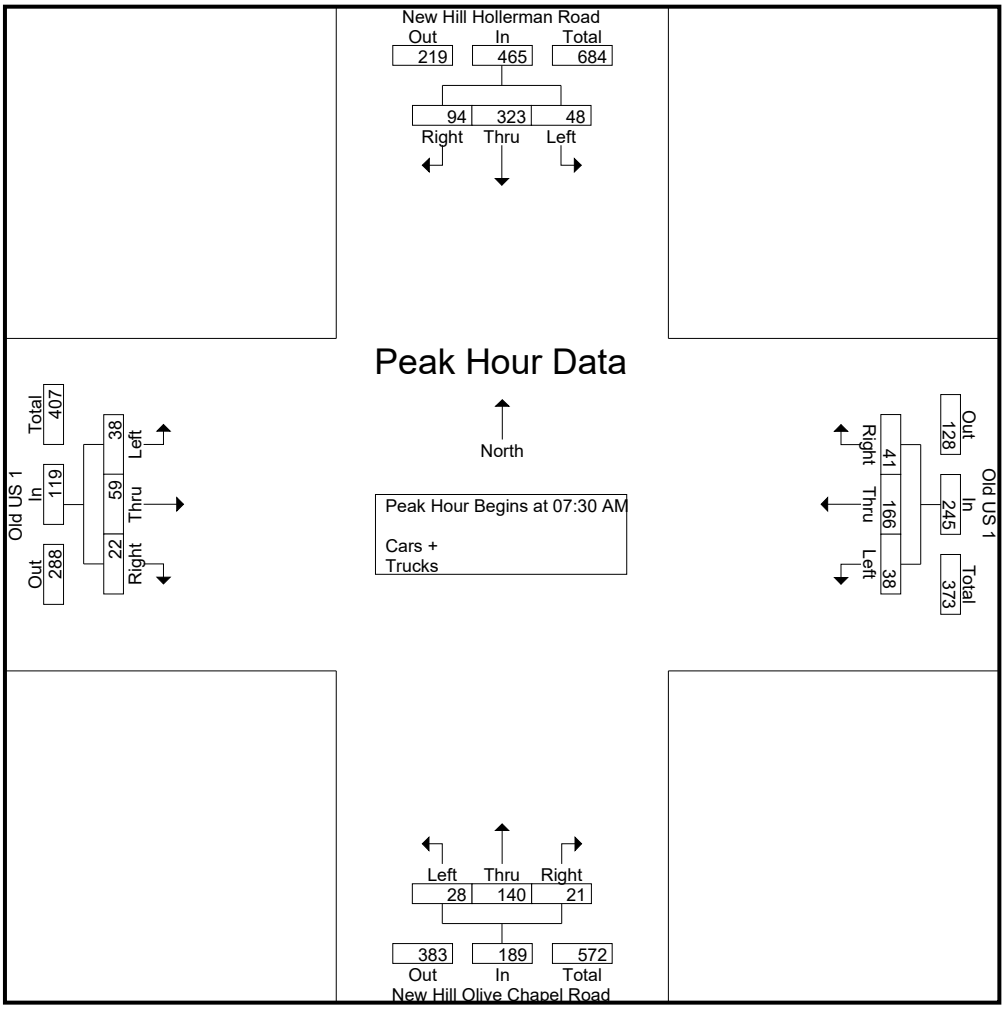
Groups Printed- Cars + - Trucks

	New Hill Hollerman Road Southbound				Old US 1 Westbound				New Hill Olive Chapel Road Northbound				Old US 1 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
07:00 AM	21	85	8	114	14	30	22	66	3	21	10	34	6	7	12	25	239
07:15 AM	18	74	7	99	17	44	13	74	4	38	8	50	4	9	12	25	248
07:30 AM	26	90	8	124	9	57	11	77	4	38	6	48	6	13	9	28	277
07:45 AM	23	81	13	117	7	39	10	56	5	30	7	42	8	18	11	37	252
Total	88	330	36	454	47	170	56	273	16	127	31	174	24	47	44	115	1016
08:00 AM	21	71	8	100	8	35	8	51	5	35	7	47	6	13	8	27	225
08:15 AM	24	81	19	124	17	35	9	61	7	37	8	52	2	15	10	27	264
08:30 AM	17	64	10	91	6	44	4	54	8	19	10	37	3	10	17	30	212
08:45 AM	26	35	12	73	11	38	6	55	3	21	5	29	10	15	9	34	191
Total	88	251	49	388	42	152	27	221	23	112	30	165	21	53	44	118	892
Grand Total	176	581	85	842	89	322	83	494	39	239	61	339	45	100	88	233	1908
Apprch %	20.9	69	10.1		18	65.2	16.8		11.5	70.5	18		19.3	42.9	37.8		
Total %	9.2	30.5	4.5	44.1	4.7	16.9	4.4	25.9	2	12.5	3.2	17.8	2.4	5.2	4.6	12.2	
Cars +	170	567	78	815	86	320	80	486	39	226	61	326	45	95	81	221	1848
% Cars +	96.6	97.6	91.8	96.8	96.6	99.4	96.4	98.4	100	94.6	100	96.2	100	95	92	94.8	96.9
Trucks	6	14	7	27	3	2	3	8	0	13	0	13	0	5	7	12	60
% Trucks	3.4	2.4	8.2	3.2	3.4	0.6	3.6	1.6	0	5.4	0	3.8	0	5	8	5.2	3.1

TRAFFIC DATA COLLECTION

File Name : Apex(New Hill Hollerman and Old US 1)AM
Site Code :
Start Date : 9/11/2019
Page No : 2

	New Hill Hollerman Road Southbound				Old US 1 Westbound				New Hill Olive Chapel Road Northbound				Old US 1 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	**26**	**90**	8	**124**	9	**57**	**11**	**77**	4	**38**	6	48	6	13	9	28	**277**
07:45 AM	23	81	13	117	7	39	10	56	5	30	7	42	**8**	**18**	**11**	**37**	252
08:00 AM	21	71	8	100	8	35	8	51	5	35	7	47	6	13	8	27	225
08:15 AM	24	81	**19**	124	**17**	35	9	61	**7**	37	**8**	**52**	2	15	10	27	264
Total Volume	94	323	48	465	41	166	38	245	21	140	28	189	22	59	38	119	1018
% App. Total	20.2	69.5	10.3		16.7	67.8	15.5		11.1	74.1	14.8		18.5	49.6	31.9		
PHF	.904	.897	.632	.938	.603	.728	.864	.795	.750	.921	.875	.909	.688	.819	.864	.804	.919



File Name : Apex(Humie Olive and Olive Farm)PM
Site Code :
Start Date : 9/11/2019
Page No : 1

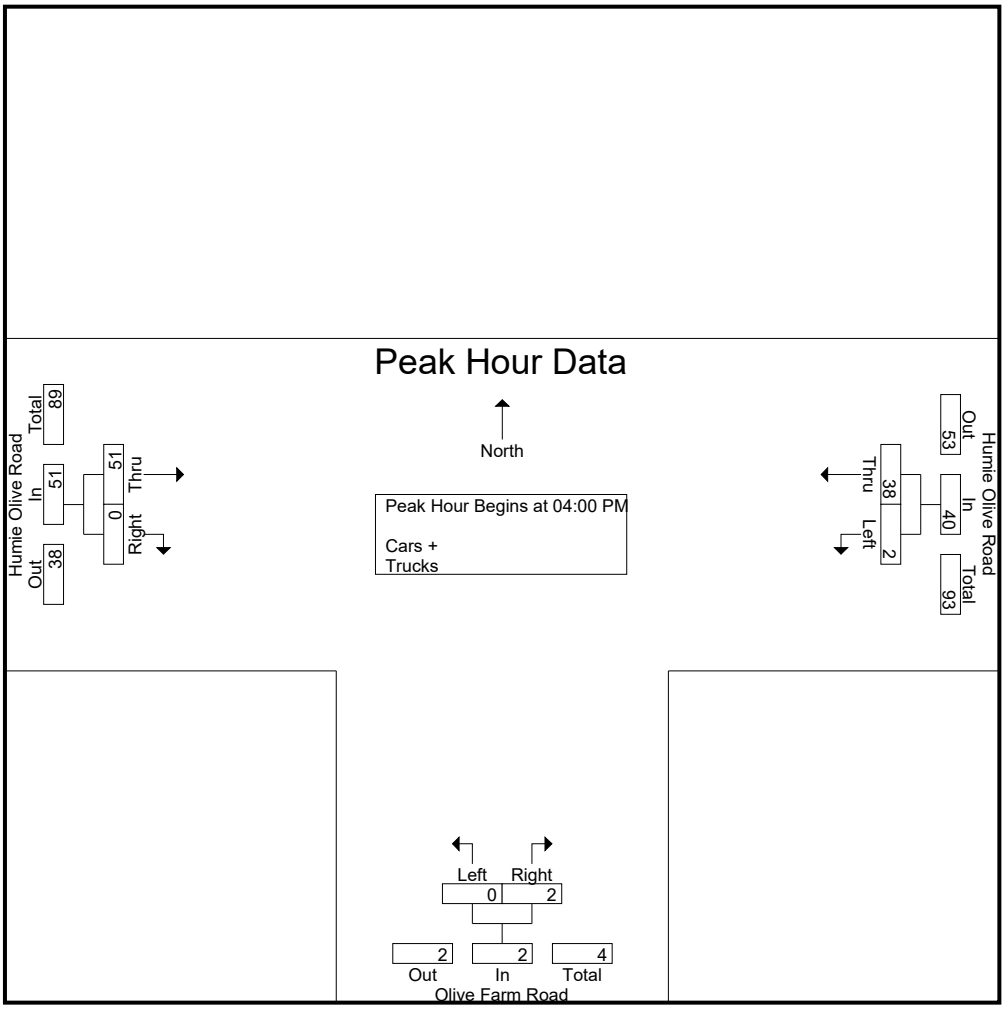
Groups Printed- Cars + - Trucks

	Humie Olive Road Westbound			Olive Farm Road Northbound			Humie Olive Road Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
04:00 PM	8	1	9	0	0	0	0	5	5	14
04:15 PM	8	0	8	1	0	1	0	13	13	22
04:30 PM	19	1	20	1	0	1	0	14	14	35
04:45 PM	3	0	3	0	0	0	0	19	19	22
Total	38	2	40	2	0	2	0	51	51	93
05:00 PM	4	0	4	0	0	0	0	6	6	10
05:15 PM	12	0	12	0	1	1	0	12	12	25
05:30 PM	12	1	13	0	0	0	2	13	15	28
05:45 PM	13	0	13	0	0	0	0	17	17	30
Total	41	1	42	0	1	1	2	48	50	93
Grand Total	79	3	82	2	1	3	2	99	101	186
Apprch %	96.3	3.7		66.7	33.3		2	98		
Total %	42.5	1.6	44.1	1.1	0.5	1.6	1.1	53.2	54.3	
Cars +	74	3	77	2	1	3	2	97	99	179
% Cars +	93.7	100	93.9	100	100	100	100	98	98	96.2
Trucks	5	0	5	0	0	0	0	2	2	7
% Trucks	6.3	0	6.1	0	0	0	0	2	2	3.8

TRAFFIC DATA COLLECTION

File Name : Apex(Humie Olive and Olive Farm)PM
Site Code :
Start Date : 9/11/2019
Page No : 2

	Humie Olive Road Westbound			Olive Farm Road Northbound			Humie Olive Road Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	8	**1**	9	0	0	0	0	5	5	14
04:15 PM	8	0	8	**1**	0	**1**	0	13	13	22
04:30 PM	**19**	1	**20**	1	0	1	0	14	14	**35**
04:45 PM	3	0	3	0	0	0	0	**19**	**19**	22
Total Volume	38	2	40	2	0	2	0	51	51	93
% App. Total	95	5		100	0		0	100		
PHF	.500	.500	.500	.500	.000	.500	.000	.671	.671	.664



File Name : Apex(Humie Olive and Olive Farm)AM
Site Code :
Start Date : 9/11/2019
Page No : 1

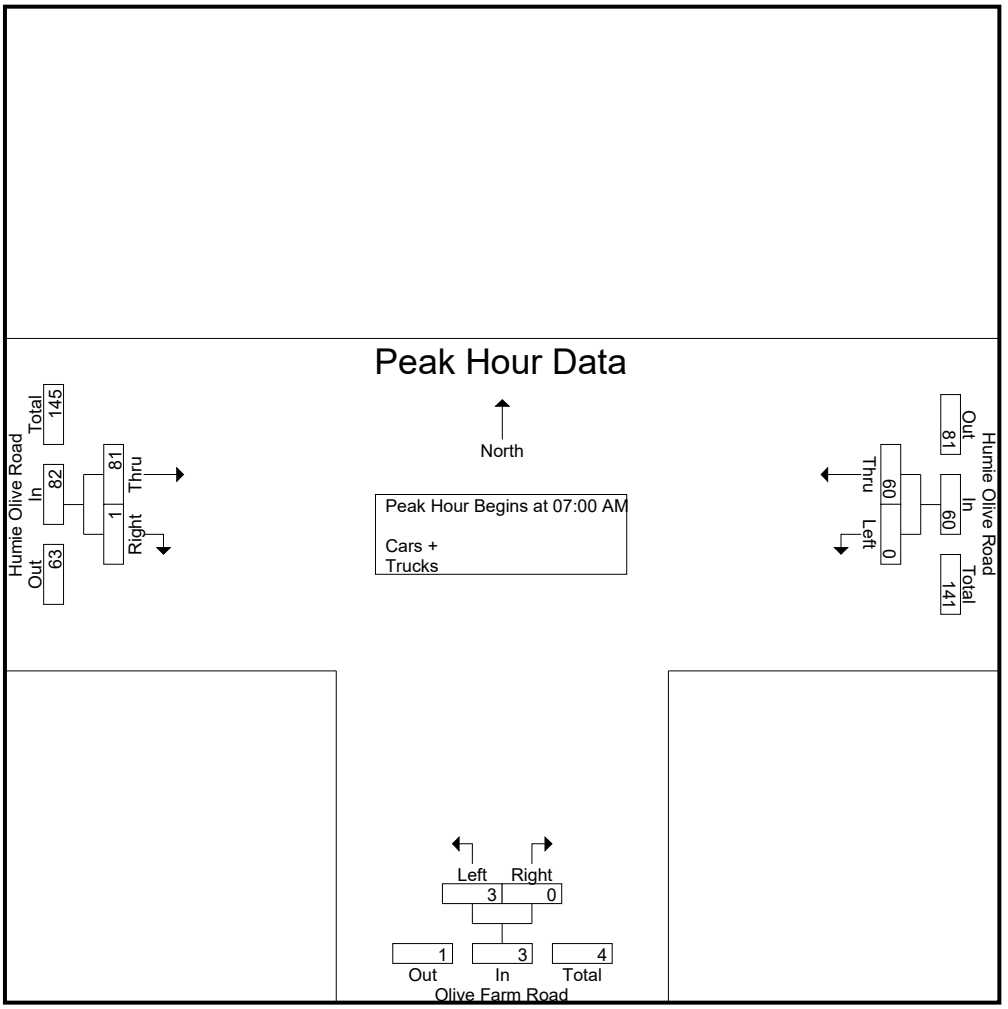
Groups Printed- Cars + - Trucks

	Humie Olive Road Westbound			Olive Farm Road Northbound			Humie Olive Road Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
07:00 AM	17	0	17	0	0	0	1	33	34	51
07:15 AM	21	0	21	0	2	2	0	11	11	34
07:30 AM	9	0	9	0	1	1	0	15	15	25
07:45 AM	13	0	13	0	0	0	0	22	22	35
Total	60	0	60	0	3	3	1	81	82	145
08:00 AM	25	0	25	0	0	0	0	9	9	34
08:15 AM	7	0	7	0	0	0	0	8	8	15
08:30 AM	7	0	7	0	0	0	0	15	15	22
08:45 AM	8	0	8	0	0	0	0	4	4	12
Total	47	0	47	0	0	0	0	36	36	83
Grand Total	107	0	107	0	3	3	1	117	118	228
Apprch %	100	0		0	100		0.8	99.2		
Total %	46.9	0	46.9	0	1.3	1.3	0.4	51.3	51.8	
Cars +	99	0	99	0	3	3	1	112	113	215
% Cars +	92.5	0	92.5	0	100	100	100	95.7	95.8	94.3
Trucks	8	0	8	0	0	0	0	5	5	13
% Trucks	7.5	0	7.5	0	0	0	0	4.3	4.2	5.7

TRAFFIC DATA COLLECTION

File Name : Apex(Humie Olive and Olive Farm)AM
Site Code :
Start Date : 9/11/2019
Page No : 2

	Humie Olive Road Westbound			Olive Farm Road Northbound			Humie Olive Road Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	17	0	17	0	0	0	**1**	**33**	**34**	**51**
07:15 AM	**21**	0	**21**	0	**2**	**2**	0	11	11	34
07:30 AM	9	0	9	0	1	1	0	15	15	25
07:45 AM	13	0	13	0	0	0	0	22	22	35
Total Volume	60	0	60	0	3	3	1	81	82	145
% App. Total	100	0		0	100		1.2	98.8		
PHF	.714	.000	.714	.000	.375	.375	.250	.614	.603	.711



File Name : Apex(Evans and Humie Olive)PM
Site Code :
Start Date : 9/11/2019
Page No : 1

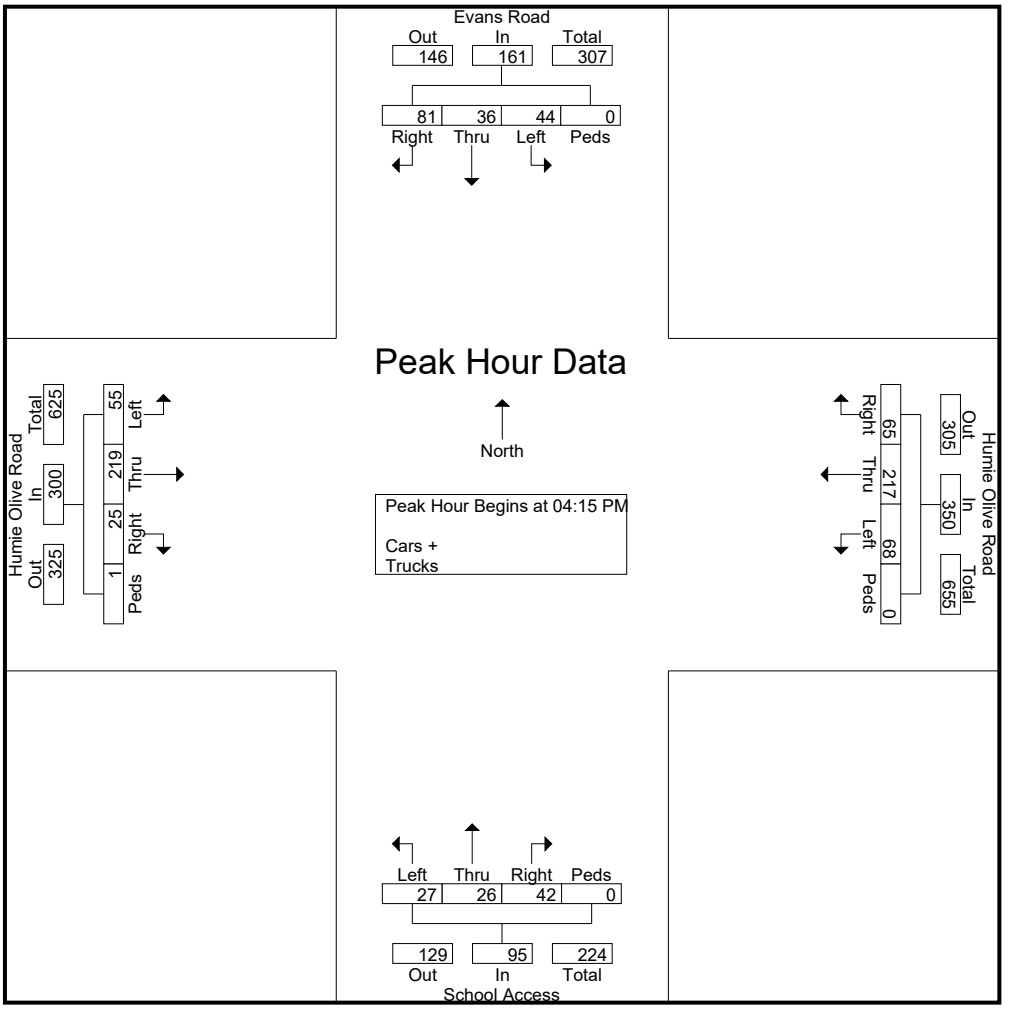
Groups Printed- Cars + - Trucks

	Evans Road Southbound					Humie Olive Road Westbound					School Access Northbound					Humie Olive Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	13	2	7	0	22	11	48	7	0	66	6	3	3	0	12	3	48	11	0	62	162
04:15 PM	31	6	11	0	48	14	54	13	0	81	3	5	6	0	14	2	48	8	0	58	201
04:30 PM	22	9	12	0	43	15	66	28	0	109	16	10	7	0	33	8	78	24	0	110	295
04:45 PM	10	18	11	0	39	15	52	21	0	88	19	7	10	0	36	15	46	12	1	74	237
Total	76	35	41	0	152	55	220	69	0	344	44	25	26	0	95	28	220	55	1	304	895
05:00 PM	18	3	10	0	31	21	45	6	0	72	4	4	4	0	12	0	47	11	0	58	173
05:15 PM	16	1	8	0	25	18	51	3	0	72	1	0	1	0	2	0	43	8	0	51	150
05:30 PM	15	0	6	0	21	20	86	1	0	107	20	18	8	0	46	2	42	15	2	61	235
05:45 PM	15	2	4	0	21	11	68	5	0	84	4	5	2	0	11	3	79	28	0	110	226
Total	64	6	28	0	98	70	250	15	0	335	29	27	15	0	71	5	211	62	2	280	784
Grand Total	140	41	69	0	250	125	470	84	0	679	73	52	41	0	166	33	431	117	3	584	1679
Apprch %	56	16.4	27.6	0		18.4	69.2	12.4	0		44	31.3	24.7	0		5.7	73.8	20	0.5		
Total %	8.3	2.4	4.1	0	14.9	7.4	28	5	0	40.4	4.3	3.1	2.4	0	9.9	2	25.7	7	0.2	34.8	
Cars +	140	41	69	0	250	125	462	84	0	671	73	52	41	0	166	33	425	117	3	578	1665
% Cars +	100	100	100	0	100	100	98.3	100	0	98.8	100	100	100	0	100	100	98.6	100	100	99	99.2
Trucks	0	0	0	0	0	0	8	0	0	8	0	0	0	0	0	0	6	0	0	6	14
% Trucks	0	0	0	0	0	0	1.7	0	0	1.2	0	0	0	0	0	0	1.4	0	0	1	0.8

TRAFFIC DATA COLLECTION

File Name : Apex(Evans and Humie Olive)PM
Site Code :
Start Date : 9/11/2019
Page No : 2

	Evans Road Southbound					Humie Olive Road Westbound					School Access Northbound					Humie Olive Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	**31**	6	11	0	**48**	14	54	13	0	81	3	5	6	0	14	2	48	8	0	58	201
04:30 PM	22	9	**12**	0	43	15	**66**	**28**	0	**109**	16	**10**	7	0	33	8	**78**	**24**	0	**110**	**295**
04:45 PM	10	**18**	11	0	39	15	52	21	0	88	**19**	7	**10**	0	**36**	**15**	46	12	**1**	74	237
05:00 PM	18	3	10	0	31	**21**	45	6	0	72	4	4	4	0	12	0	47	11	0	58	173
Total Volume	81	36	44	0	161	65	217	68	0	350	42	26	27	0	95	25	219	55	1	300	906
% App. Total	50.3	22.4	27.3	0		18.6	62	19.4	0		44.2	27.4	28.4	0		8.3	73	18.3	0.3		
PHF	.653	.500	.917	.000	.839	.774	.822	.607	.000	.803	.553	.650	.675	.000	.660	.417	.702	.573	.250	.682	.768



File Name : Apex(Evans and Humie Olive)AM
Site Code :
Start Date : 9/11/2019
Page No : 1

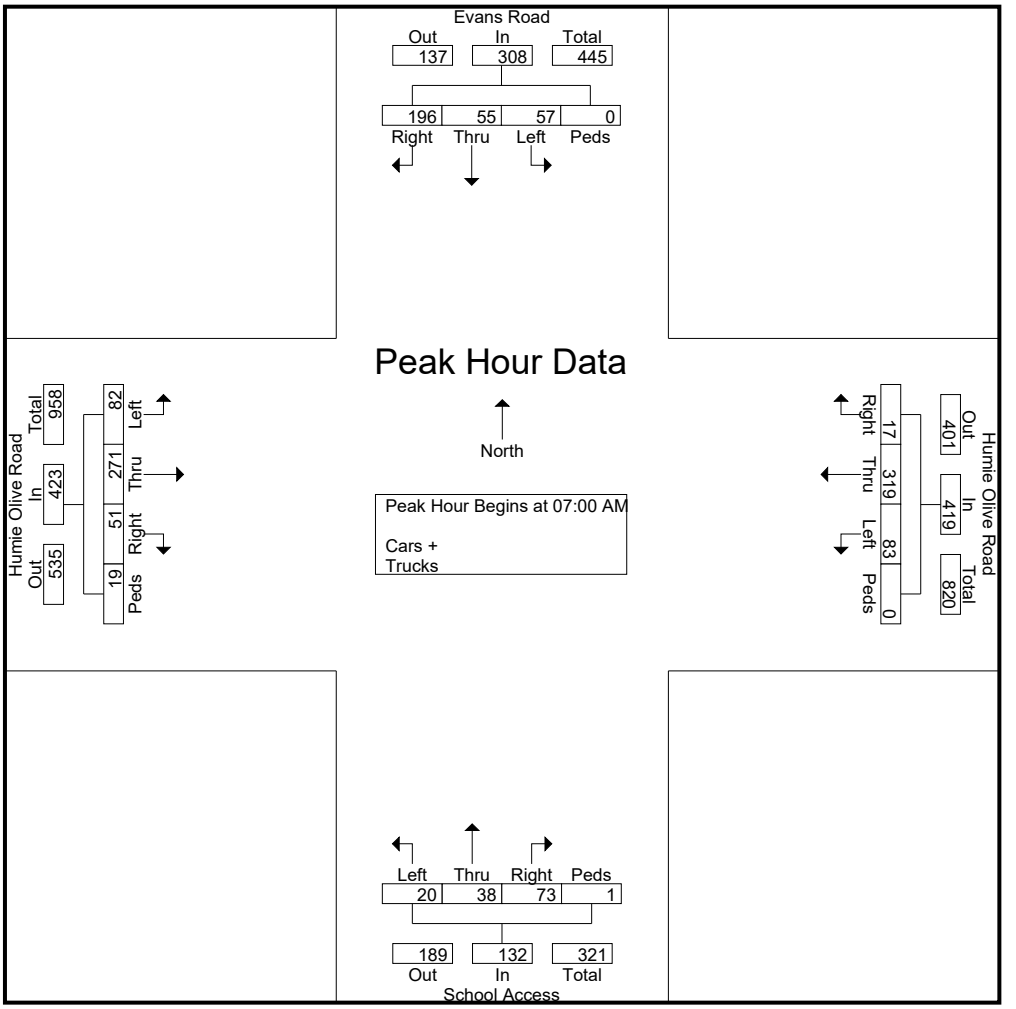
Groups Printed- Cars + - Trucks

	Evans Road Southbound					Humie Olive Road Westbound					School Access Northbound					Humie Olive Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	149	3	12	0	164	2	175	5	0	182	1	2	1	0	4	1	90	34	4	129	479
07:15 AM	20	1	16	0	37	5	49	4	0	58	1	0	0	0	1	7	109	37	1	154	250
07:30 AM	19	14	20	0	53	6	49	18	0	73	1	0	1	1	3	13	32	8	2	55	184
07:45 AM	8	37	9	0	54	4	46	56	0	106	70	36	18	0	124	30	40	3	12	85	369
Total	196	55	57	0	308	17	319	83	0	419	73	38	20	1	132	51	271	82	19	423	1282
08:00 AM	9	14	14	0	37	4	29	26	0	59	41	18	25	0	84	15	48	4	1	68	248
08:15 AM	4	3	7	0	14	6	33	1	0	40	5	2	1	0	8	2	44	9	1	56	118
08:30 AM	11	2	14	0	27	5	30	6	0	41	3	2	0	2	7	0	52	6	3	61	136
08:45 AM	13	0	19	0	32	5	42	2	0	49	5	4	0	1	10	1	63	9	0	73	164
Total	37	19	54	0	110	20	134	35	0	189	54	26	26	3	109	18	207	28	5	258	666
Grand Total	233	74	111	0	418	37	453	118	0	608	127	64	46	4	241	69	478	110	24	681	1948
Apprch %	55.7	17.7	26.6	0		6.1	74.5	19.4	0		52.7	26.6	19.1	1.7		10.1	70.2	16.2	3.5		
Total %	12	3.8	5.7	0	21.5	1.9	23.3	6.1	0	31.2	6.5	3.3	2.4	0.2	12.4	3.5	24.5	5.6	1.2	35	
Cars +	233	74	111	0	418	37	439	118	0	594	127	64	46	4	241	69	468	110	24	671	1924
% Cars +	100	100	100	0	100	100	96.9	100	0	97.7	100	100	100	100	100	100	97.9	100	100	98.5	98.8
Trucks	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	0	10	0	0	10	24
% Trucks	0	0	0	0	0	0	3.1	0	0	2.3	0	0	0	0	0	0	2.1	0	0	1.5	1.2

TRAFFIC DATA COLLECTION

File Name : Apex(Evans and Humie Olive)AM
Site Code :
Start Date : 9/11/2019
Page No : 2

	Evans Road Southbound					Humie Olive Road Westbound					School Access Northbound					Humie Olive Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	**149**	3	12	0	**164**	2	**175**	5	0	**182**	1	2	1	0	4	1	90	34	4	129	**479**
07:15 AM	20	1	16	0	37	5	49	4	0	58	1	0	0	0	1	7	**109**	**37**	1	**154**	250
07:30 AM	19	14	**20**	0	53	**6**	49	18	0	73	1	0	1	**1**	3	13	32	8	2	55	184
07:45 AM	8	**37**	9	0	54	4	46	**56**	0	106	**70**	**36**	**18**	0	**124**	**30**	40	3	**12**	85	369
Total Volume	196	55	57	0	308	17	319	83	0	419	73	38	20	1	132	51	271	82	19	423	1282
% App. Total	63.6	17.9	18.5	0		4.1	76.1	19.8	0		55.3	28.8	15.2	0.8		12.1	64.1	19.4	4.5		
PHF	.329	.372	.713	.000	.470	.708	.456	.371	.000	.576	.261	.264	.278	.250	.266	.425	.622	.554	.396	.687	.669

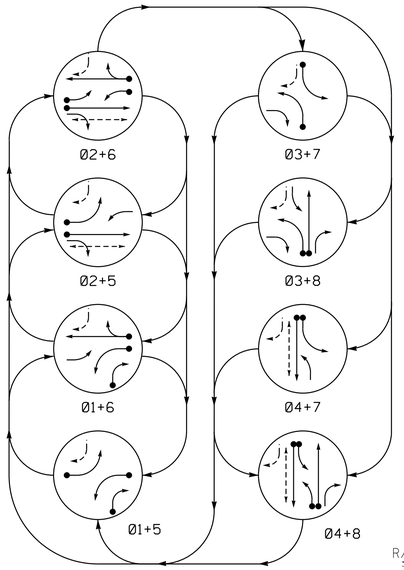


APPENDIX C

SIGNAL INFORMATION

PROJECT REFERENCE NO.	SHEET NO.
36249.3588	Sig-1

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

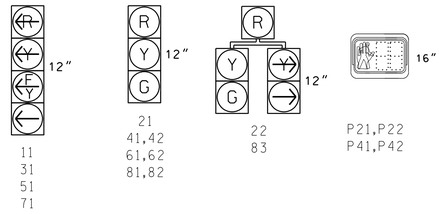
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	04+7	04+8	FLASH
11	←R	←R	←FY	←FY	←R	←R	←R	←Y
21	R	R	G	G	R	R	R	Y
22	R	R	G	G	R/→R	R	R	Y
31	←R	←R	←R	←R	←	←FY	←FY	←R
41,42	R	R	R	R	R	G	G	R
51	←FY	←FY	←	←FY	←R	←R	←R	←Y
61,62	R	G	R	G	R	R	R	Y
71	←R	←R	←R	←R	←FY	←FY	←FY	←R
81,82	R	R	R	R	R	G	R	G	R
83	R/→R	R/→R	R	R	R	G	R	G	R
P21,P22	DW	DW	W	W	DW	DW	DW	DW	DRK
P41,P42	DW	DW	DW	DW	DW	DW	W	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



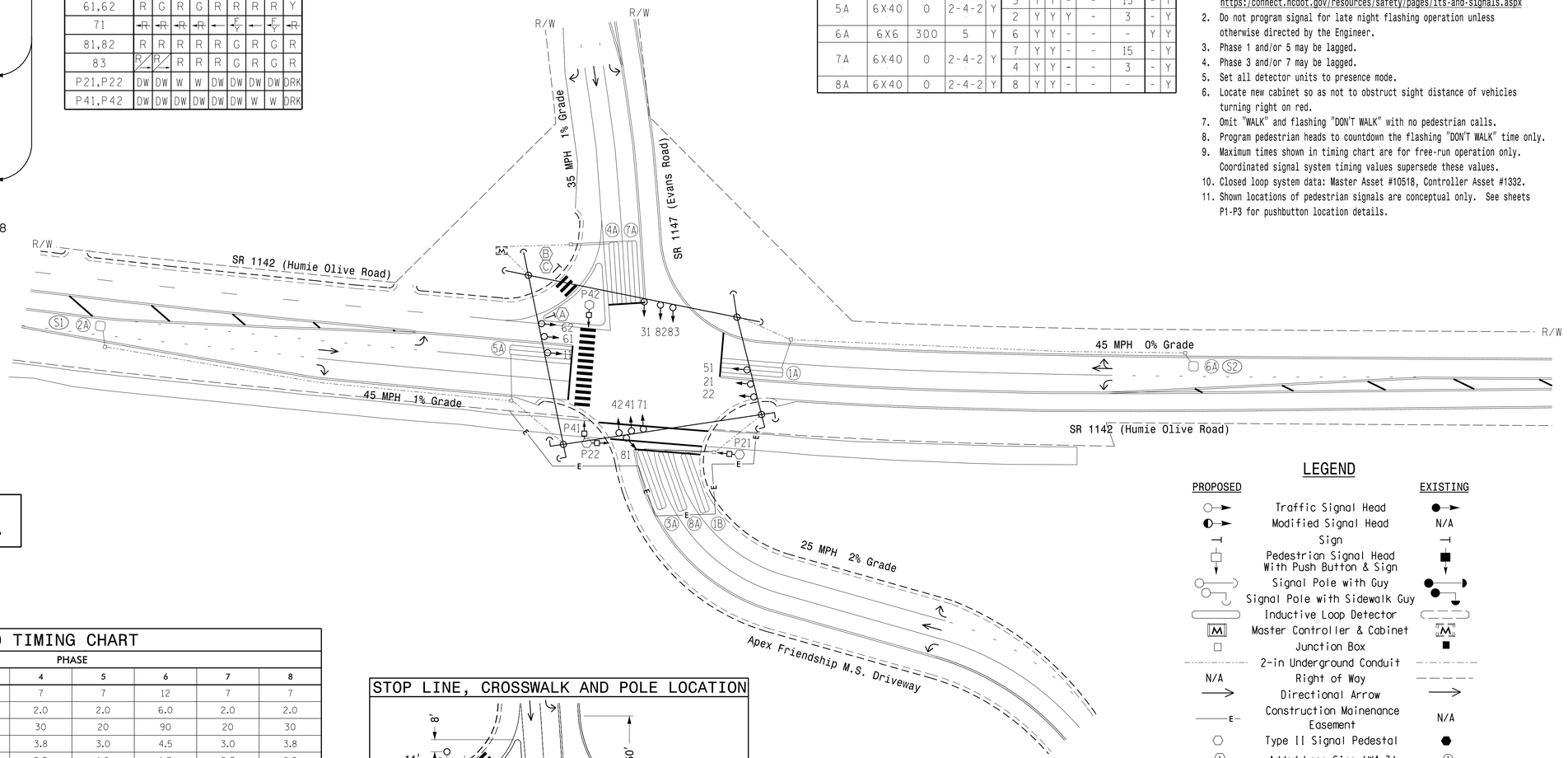
OASIS 2070 LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
					6	Y	Y	Y	-	3	-	Y
1B	6X40	0	2-4-2	Y	1	Y	Y	-	-	10	-	Y
2A	6X6	300	5	Y	2	Y	Y	-	-	-	Y	Y
3A	6X40	0	2-4-2	Y	3	Y	Y	-	-	15	-	Y
					8	Y	Y	-	-	3	-	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
					2	Y	Y	Y	-	3	-	Y
6A	6X6	300	5	Y	6	Y	Y	-	-	-	Y	Y
7A	6X40	0	2-4-2	Y	7	Y	Y	-	-	15	-	Y
					4	Y	Y	-	-	3	-	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	-	-	Y

8 Phase Fully Actuated (Humie Olive Road CLS)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012, and all applicable sections of the latest version of the generic Project Special Provisions. The PSP can be accessed at the following website: https://connect.ncdot.gov/resources/safety/pages/its-and-signals.aspx
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or 5 may be lagged.
4. Phase 3 and/or 7 may be lagged.
5. Set all detector units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "DON'T WALK" time only.
9. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
10. Closed loop system data: Master Asset #10518, Controller Asset #1332.
11. Shown locations of pedestrian signals are conceptual only. See sheets P1-P3 for pushbutton location details.



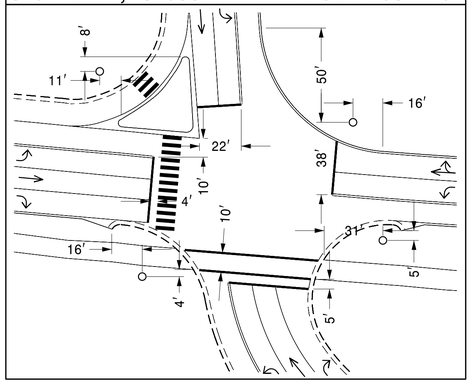
This plan supersedes the plan signed and sealed on 07-20-16.

OASIS 2070 TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green 1 *	7	12	7	7	7	12	7	7
Extension 1 *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max Green 1 *	20	90	20	30	20	90	20	30
Yellow Clearance	3.0	4.5	3.0	3.8	3.0	4.5	3.0	3.8
Red Clearance	2.6	1.3	2.6	2.5	1.9	1.3	2.3	2.5
Walk 1 *	-	7	-	7	-	-	-	-
Don't Walk 1	-	15	-	12	-	-	-	-
Seconds Per Actuation *	-	2.5	-	-	-	2.5	-	-
Max Variable Initial *	-	34	-	-	-	34	-	-
Time Before Reduction *	-	15	-	-	-	15	-	-
Time To Reduce *	-	40	-	-	-	40	-	-
Minimum Gap	-	3.2	-	-	-	3.2	-	-
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW	-	-
Dual Entry	-	-	-	ON	-	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

STOP LINE, CROSSWALK AND POLE LOCATION



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
○↓	Pedestrian Signal Head With Push Button & Sign	■↓
○ ○	Signal Pole with Guy	● ●
○ ○	Signal Pole with Sidewalk Guy	● ■
▭	Inductive Loop Detector	▭
M	Master Controller & Cabinet	M
□	Junction Box	■
····	2-in Underground Conduit	····
N/A	Right of Way	----
→	Directional Arrow	→
E	Construction Maintenance Easement	N/A
⬡	Type II Signal Pedestal	⬢
A	Added Lane Sign (W4-3)	A
B	Pedestrian Sign (W11-2)	B
C	Diagonal Downward Arrow Sign (W16-7P)	C

NC Dept of Transportation
Division of Highways

Final Drawing Date: 8/8/2016

DocuSigned by: [signature]
ITS & Signals Unit

Prepared in the offices of:

RAMEY KEMP ASSOCIATES, INC.
Transportation Engineers
5808 Faringdon Place, Suite 100
Raleigh, North Carolina 27609
919-872-5115 Tel. 919-878-6416 Fax.
www.rameykemp.com

New Installation

Prepared for: Transportation Mobility and Safety Division, NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

SR 1142 (Humie Olive Road) at SR 1147 (Evans Road)/ Apex Friendship M.S. Driveway

Division 5 Wake County Apex

PLAN DATE:	August 2016	REVIEWED BY:	WJ Hamilton
PREPARED BY:	TS Popelka	RKA PROJ. NO:	15273 (040)

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 32396 ENGINEER WILLIAM J. HAMILTON

DocuSigned by: William J. Hamilton 8/3/2016
SIGNATURE DATE

SIG. INVENTORY NO. 05-1332

LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 AND 12.

2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```
LOGICAL I/O COMMAND #1  (+/-COMMAND#)
IF  ACTIVE PHASE       #1  IS ON
AND RED CLEAR ON PHASE #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #50 ON
SET OUTPUT  ASSIGNMENT #51 OFF
```
PRESS '+'

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

```
LOGICAL I/O COMMAND #2  (+/-COMMAND#)
IF  ACTIVE PHASE       #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #52 OFF
```
PRESS '+'

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

```
LOGICAL I/O COMMAND #3  (+/-COMMAND#)
IF  YELLOW ON PHASE    #1  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #51 ON
```
PRESS '+'

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

```
LOGICAL I/O COMMAND #4  (+/-COMMAND#)
IF  ACTIVE PHASE       #5  IS ON
AND RED CLEAR ON PHASE #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #42 ON
SET OUTPUT  ASSIGNMENT #43 OFF
```
PRESS '+'

NOTE: LOGIC FOR PHASE 5 RED CLEAR WHEN TRANSITIONING FROM PHASE 5 TO PHASE 6 (HEAD 51).

```
LOGICAL I/O COMMAND #5  (+/-COMMAND#)
IF  ACTIVE PHASE       #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #44 OFF
```
PRESS '+'

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 5 (HEAD 51).

```
LOGICAL I/O COMMAND #6  (+/-COMMAND#)
IF  YELLOW ON PHASE    #5  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #43 ON
```
PRESS '+'

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 5 (HEAD 51).

```
LOGICAL I/O COMMAND #7  (+/-COMMAND#)
IF  ACTIVE PHASE       #3  IS ON
AND RED CLEAR ON PHASE #3  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #47 ON
SET OUTPUT  ASSIGNMENT #48 OFF
```
PRESS '+'

NOTE: LOGIC FOR PHASE 3 RED CLEAR WHEN TRANSITIONING FROM PHASE 3 TO PHASE 4 (HEAD 31).

```
LOGICAL I/O COMMAND #8  (+/-COMMAND#)
IF  ACTIVE PHASE       #3  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #49 OFF
```
PRESS '+'

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 3 (HEAD 31).

```
LOGICAL I/O COMMAND #9  (+/-COMMAND#)
IF  YELLOW ON PHASE    #3  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #48 ON
```
PRESS '+'

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 3 (HEAD 31).

```
LOGICAL I/O COMMAND #10  (+/-COMMAND#)
IF  ACTIVE PHASE       #7  IS ON
AND RED CLEAR ON PHASE #7  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #39 ON
SET OUTPUT  ASSIGNMENT #40 OFF
```
PRESS '+'

NOTE: LOGIC FOR PHASE 7 RED CLEAR WHEN TRANSITIONING FROM PHASE 7 TO PHASE 8 (HEAD 71).

```
LOGICAL I/O COMMAND #11  (+/-COMMAND#)
IF  ACTIVE PHASE       #7  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #41 OFF
```
PRESS '+'

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 7 (HEAD 71).

```
LOGICAL I/O COMMAND #12  (+/-COMMAND#)
IF  YELLOW ON PHASE    #7  IS ON

SCROLL DOWN

THEN:
SET OUTPUT  ASSIGNMENT #40 ON
```
PRESS '+'

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 7 (HEAD 71).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

PROJECT REFERENCE NO.	SHEET NO.
36249.3588	Sig-3

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
PHASE:          :1234567891011121314151 6
VEH OVL PARENTS::XX
VEH OVL NOT VEH::
VEH OVL NOT PED::
VEH OVL GRN EXT::
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:  (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```
← NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'B' SETTINGS
PHASE:          :1234567891011121314151 6
VEH OVL PARENTS:: XX
VEH OVL NOT VEH:
VEH OVL NOT PED:
VEH OVL GRN EXT:
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:  (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```
← NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'C' SETTINGS
PHASE:          :1234567891011121314151 6
VEH OVL PARENTS:      XX
VEH OVL NOT VEH:
VEH OVL NOT PED:
VEH OVL GRN EXT:
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:  (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```
← NOTICE GREEN FLASH

PRESS '+'

```
PAGE 1: VEHICLE OVERLAP 'D' SETTINGS
PHASE:          :1234567891011121314151 6
VEH OVL PARENTS:      XX
VEH OVL NOT VEH:
VEH OVL NOT PED:
VEH OVL GRN EXT:
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:  (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```
← NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROUACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

OUTPUT REFERENCE SCHEDULE

USE TO INTERPRET LOGIC PROCESSOR

OUTPUT 39 = Overlap D Red
OUTPUT 40 = Overlap D Yellow
OUTPUT 41 = Overlap D Green
OUTPUT 42 = Overlap C Red
OUTPUT 43 = Overlap C Yellow
OUTPUT 44 = Overlap C Green
OUTPUT 47 = Overlap B Red
OUTPUT 48 = Overlap B Yellow
OUTPUT 49 = Overlap B Green
OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

NC Dept of Transportation
Division of Highways
Final Drawing Date: 8/8/2016
DocuSigned by: Brett J. Bush
ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1332
DESIGNED: Aug 2016
SEALED: 8/3/2016
REVISED:

This plan supersedes the plan signed and sealed on 07-20-16.

Electrical Detail
Sheet 2 of 2

New Installation

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1142 (Humie Olive Road)
at
SR 1147 (Evans Road)/
Apex Friendship M.S. Driveway

Division 5 | Wake County | Apex

PLAN DATE: August 2016	REVIEWED BY:	WJ Hamilton	
PREPARED BY: TS Popelka	RKA PROJ. NO:	15273 (040)	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 32396 ENGINEER WILLIAM J. HAMILTON
DocuSigned by: William J. Hamilton A0560D27464A4A4...
8/3/2016
SIGNATURE DATE
SIG. INVENTORY NO. 05-1332

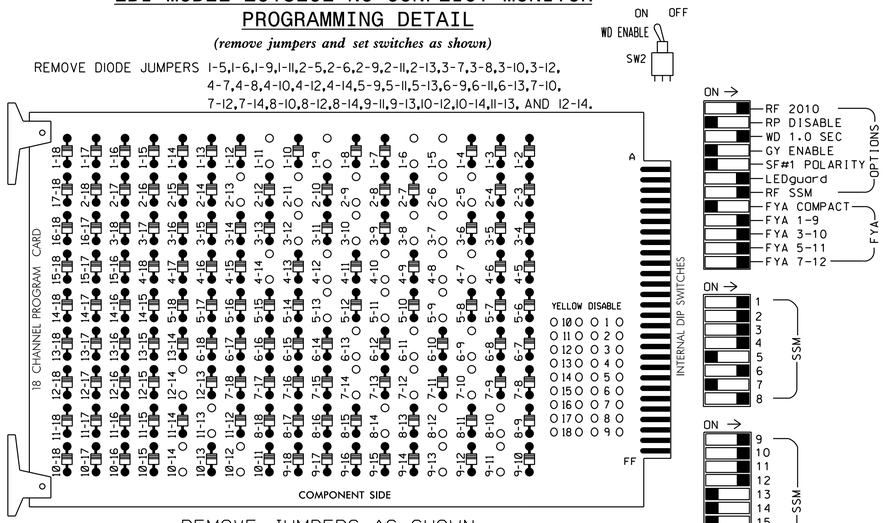
Prepared in the offices of:
RAMEY KEMP & ASSOCIATES, INC.
Transportation Engineers
5808 Faringdon Place, Suite 100
Raleigh, North Carolina 27609
919-872-5115 Tel. 919-878-5416 Fax.
www.rameykemp.com, NC License No. C-0910

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 Greenfield Parkway, Garner, NC 27529

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5,1-6,1-9,1-11,2-5,2-6,2-9,2-11,2-13,3-7,3-8,3-10,3-12, 4-7,4-8,4-10,4-12,4-14,5-9,5-11,5-13,6-9,6-11,6-13,7-10, 7-12,7-14,8-10,8-12,8-14,9-11,9-13,10-12,10-14,11-13, AND 12-14.



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

INPUT FILE POSITION LAYOUT

(front view)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I" U	Ø1 1A	Ø1 1B	Ø2 2A	WIRED INPUT ⊗	Ø3 3A	Ø4 4A	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	SLOT EMPTY	FS DC ISOLATOR
FILE "I" L	NOT USED	NOT USED	NOT USED		NOT USED	NOT USED						Ø4 PED DC ISOLATOR		ST DC ISOLATOR
FILE "J" U	Ø5 5A	Ø6 6A	SLOT EMPTY	WIRED INPUT ⊗	Ø7 7A	Ø8 8A	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
FILE "J" L	NOT USED	NOT USED			NOT USED	NOT USED								

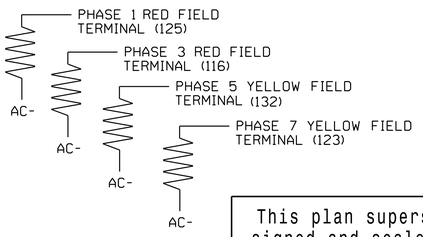
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

⊗ Wired Input - Do not populate slot with detector card

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES	
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



This plan supersedes the plan signed and sealed on 07-20-16.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Program phases 4 and 8 for Dual Entry.
3. Enable Simultaneous Gap-Out for all phases.
4. Program phases 2 and 6 for Variable Initial and Gap Reduction.
5. Program phases 2 and 6 for Start Up In Green.
6. Program phases 2 and 4 for 'STARTUP PED CALL'.
7. Program phases 2 and 6 for Yellow Flash and overlaps 1 and 2 as WAG Overlaps.
8. The cabinet and controller are part of the Humie Olive Road CLS.

EQUIPMENT INFORMATION

CONTROLLER.....2070
CABINET.....332 /W/ AUX
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S7,S8,S10,S11, AUXS1,AUXS2,AUXS4,AUXS5
PHASES USED.....1,2,2PED,3,4,4PED,5,6,7,8
OVERLAP "A".....1+2
OVERLAP "B".....3+4
OVERLAP "C".....5+6
OVERLAP "D".....7+8

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
1B	TB2-5,6	I2U	39	1	2	1	Y	Y			10
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
3A[2]	TB4-5,6	I5U	58	20	3	3	Y	Y			15
	-	J8U	50	12	28	8	Y	Y			3
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
5A[3]	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9	22	2	Y	Y	Y		3
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
7A[4]	TB5-5,6	J5U	57	19	7	7	Y	Y			15
	-	I8U	49	11	24	4	Y	Y			3
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	29	PED 2	2 PED					
P41,P42	TB8-5,6	I12L	69	31	PED 4	4 PED					

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT I12.

[1] Add jumper from I1-W to J4-W, on rear of input file.
[2] Add jumper from I5-W to J8-W, on rear of input file.
[3] Add jumper from J1-W to I4-W, on rear of input file.
[4] Add jumper from J5-W to I8-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

NC Dept of Transportation
Division of Highways
Final Drawing Date: 8/8/2016
DocuSigned by:
ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1332
DESIGNED: Aug 2016
SEALED: 8/3/2016
REVISED:

Prepared in the offices of:
RAMEY KEMP & ASSOCIATES, INC.
Transportation Engineers
5808 Faringdon Place, Suite 100
Raleigh, North Carolina 27609
919-872-5115 Tel. 919-878-5416 Fax.
www.rameykemp.com, NC License No. C-0910

PROJECT REFERENCE NO.	SHEET NO.
36249.3588	Sig-2

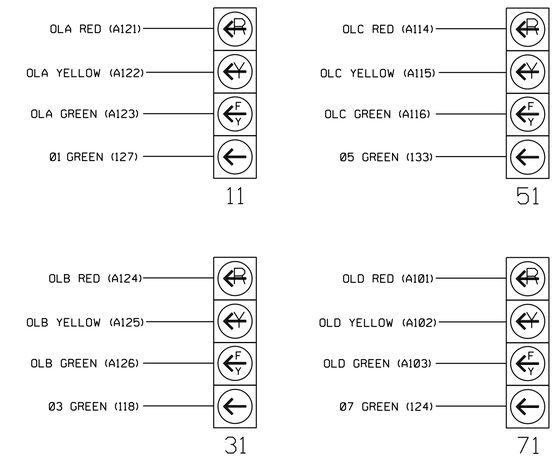
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S3	S4		S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3		4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3		4	4 PED	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	11 ★	83	21,22	P21, P22	22	31 ★	41,42	P41, P42	51 ★	61,62	NU	71 ★	81,82, 83	NU	11 ★	31 ★	NU	51 ★	71 ★	NU
RED		✳	128		✳		101			134			107							
YELLOW			129				102		✳	135		✳	108							
GREEN			130				103			136			109							
RED ARROW															A121	A124		A114	A101	
YELLOW ARROW		126			117										A122	A125		A115	A102	
FLASHING YELLOW ARROW															A123	A126		A116	A103	
GREEN ARROW	127	127			118	118			133			124								
✋				113				104												
🚶				115				106												

NU = Not Used
★ Denotes see pictorial of head wiring in detail below.
✳ Denotes install load resistor. See load resistor installation detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

1. The sequence display for these signal heads requires special programming. See sheet 2 of 2 for programming instructions.

Electrical Detail
Sheet 1 of 2

New Installation

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1142 (Humie Olive Road)
at
SR 1147 (Evans Road)/
Apex Friendship M.S. Driveway
Division 5 Wake County Apex

PLAN DATE:	August 2016	REVIEWED BY:	WJ Hamilton
PREPARED BY:	TS Popelka	REVIEWED BY:	15273 (040)

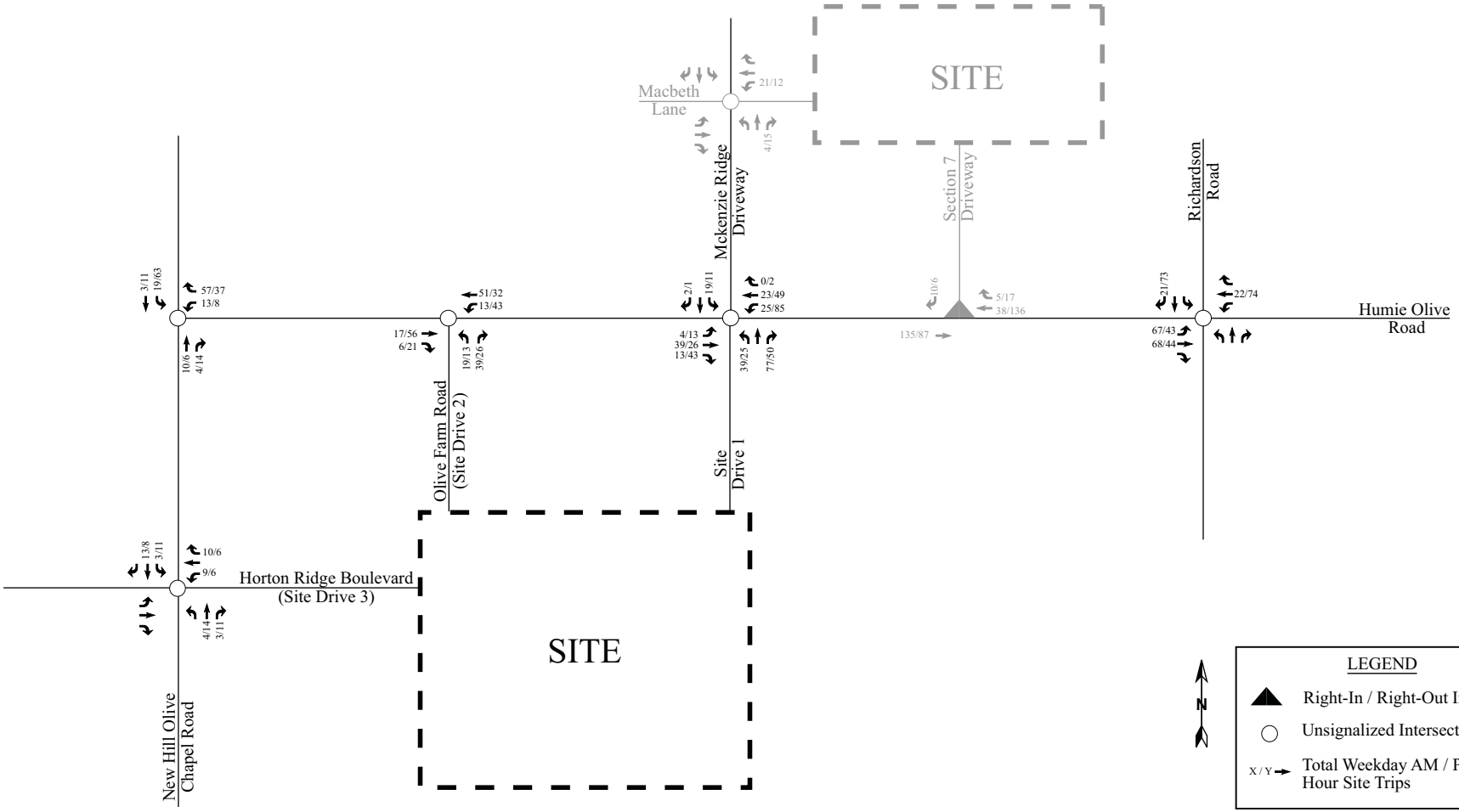
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 32396 ENGINEER WILLIAM J. HAMILTON
DocuSigned by: William J. Hamilton 8/3/2016
SIGNATURE DATE
SIG. INVENTORY NO. 05-1332

750 Greenfield Parkway, Garner, NC 27529

APPENDIX D

ADJACENT DEVELOPMENT INFORMATION



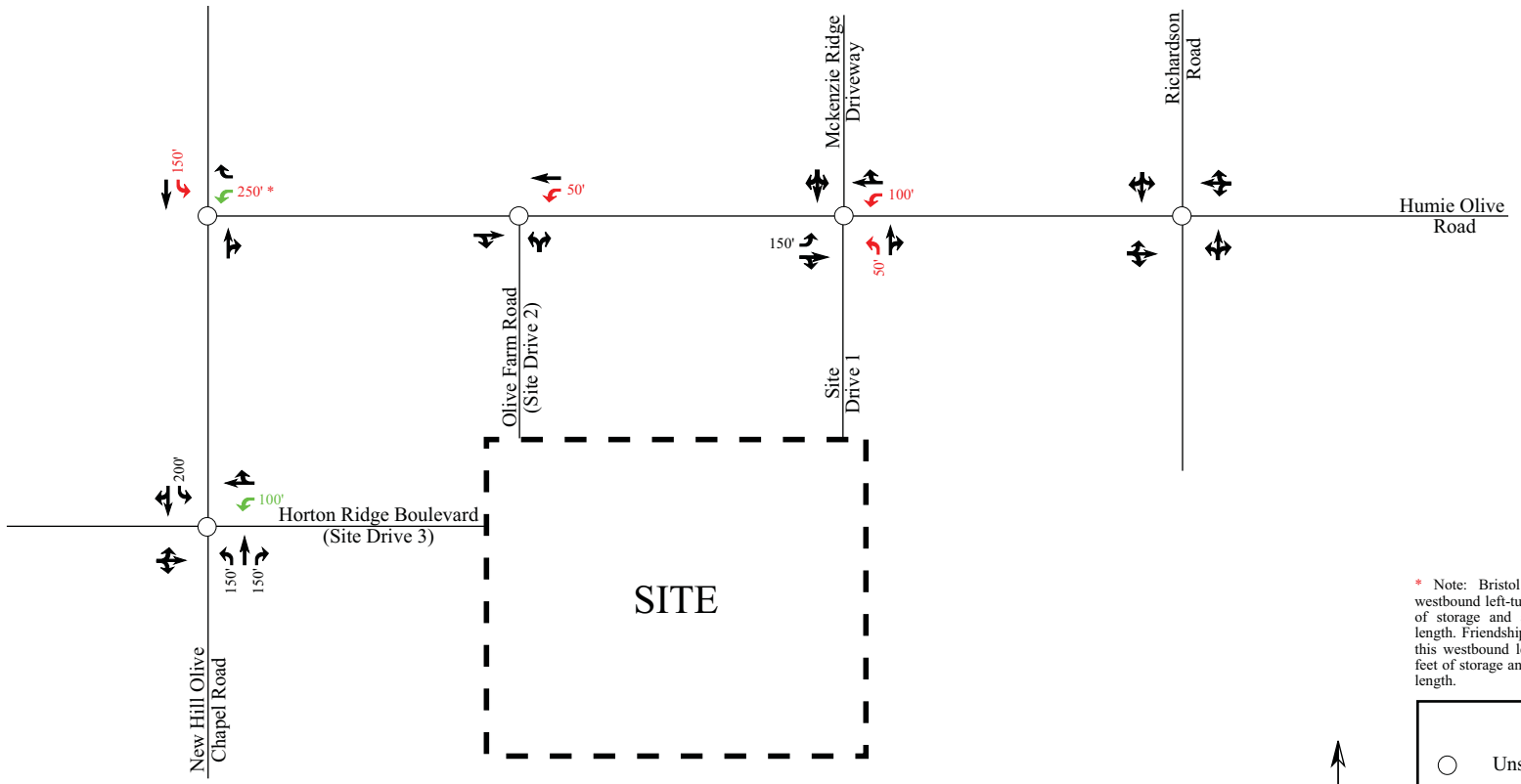
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Friendship Station Update
Apex, NC

Total Site Trip Assignment

Scale: Not to Scale

Figure 9c



* Note: Bristol Assemblage is committed to a westbound left-turn lane with a minimum of 100 feet of storage and appropriate deceleration and taper length. Friendship Station is recommended to extend this westbound left-turn lane to a minimum of 250 feet of storage and appropriate deceleration and taper length.

LEGEND

- ○ Unsignalized Intersection
- → Existing Lane
- → Improvement by Developer
- → Background Improvement
- X' Storage (In Feet)

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Friendship Station Update
Apex, NC

Recommended Lane Configurations

Scale: Not to Scale

Figure 11

Bristol Property Update

Apex, NC

PREPARED FOR

Pulte Homes
c/o Randy King
1225 Crescent Green Drive
Suite 250
Cary, NC 27518

PREPARED BY

VHB Engineering NC, PC (C-3705)
4000 WestChase Boulevard, Suite 530
Raleigh, NC 27607
919.829.0328

May 18, 2016

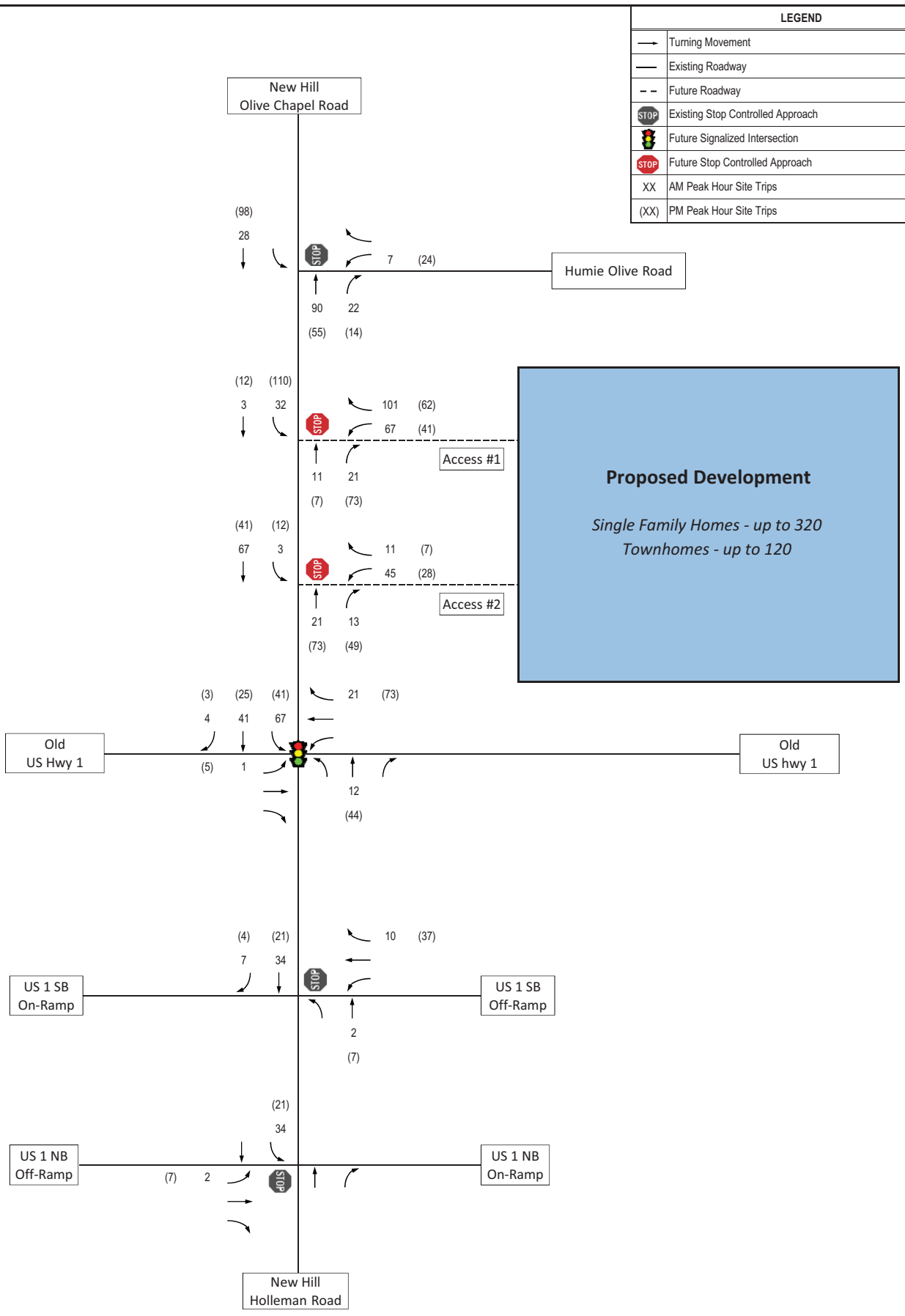


Figure 7
AM and PM Peak Hour Site Trips

Bristol Property
Apex, NC

TRAFFIC ANALYSIS REPORT

Goodwin-MacNair Property

Apex, NC

PREPARED FOR

Benchmark Communities
c/o Kirby LaForce
5580 Centerview Drive
Suite 115
Raleigh, NC 27606

PREPARED BY

VHB Engineering NC, PC (C-3705)
4000 WestChase Boulevard, Suite 530
Raleigh, NC 27607
919.829.0328

June 26, 2015

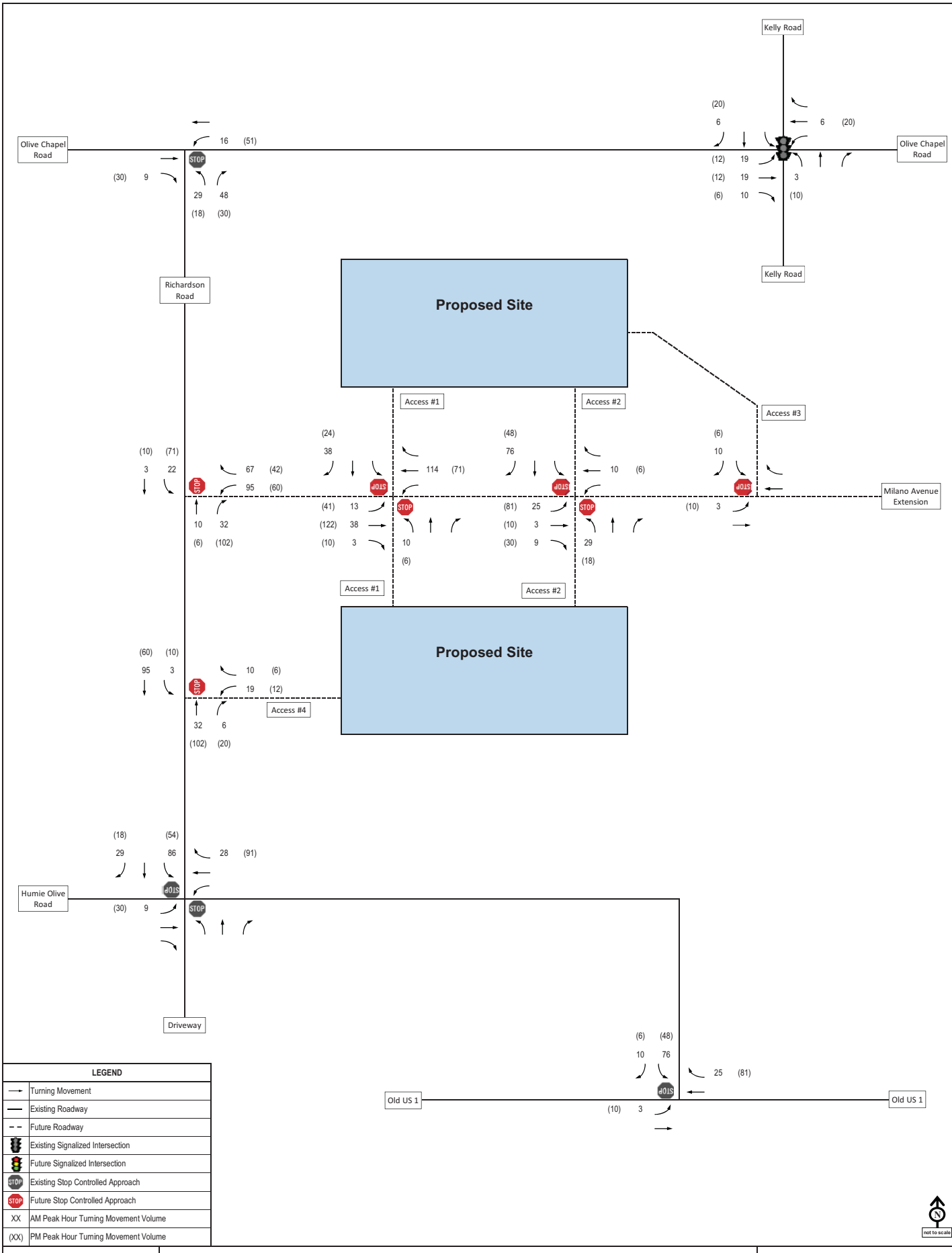


Figure 7
AM and PM Peak Hour Site Trips

Goodwin-MacNair Property
Apex, NC

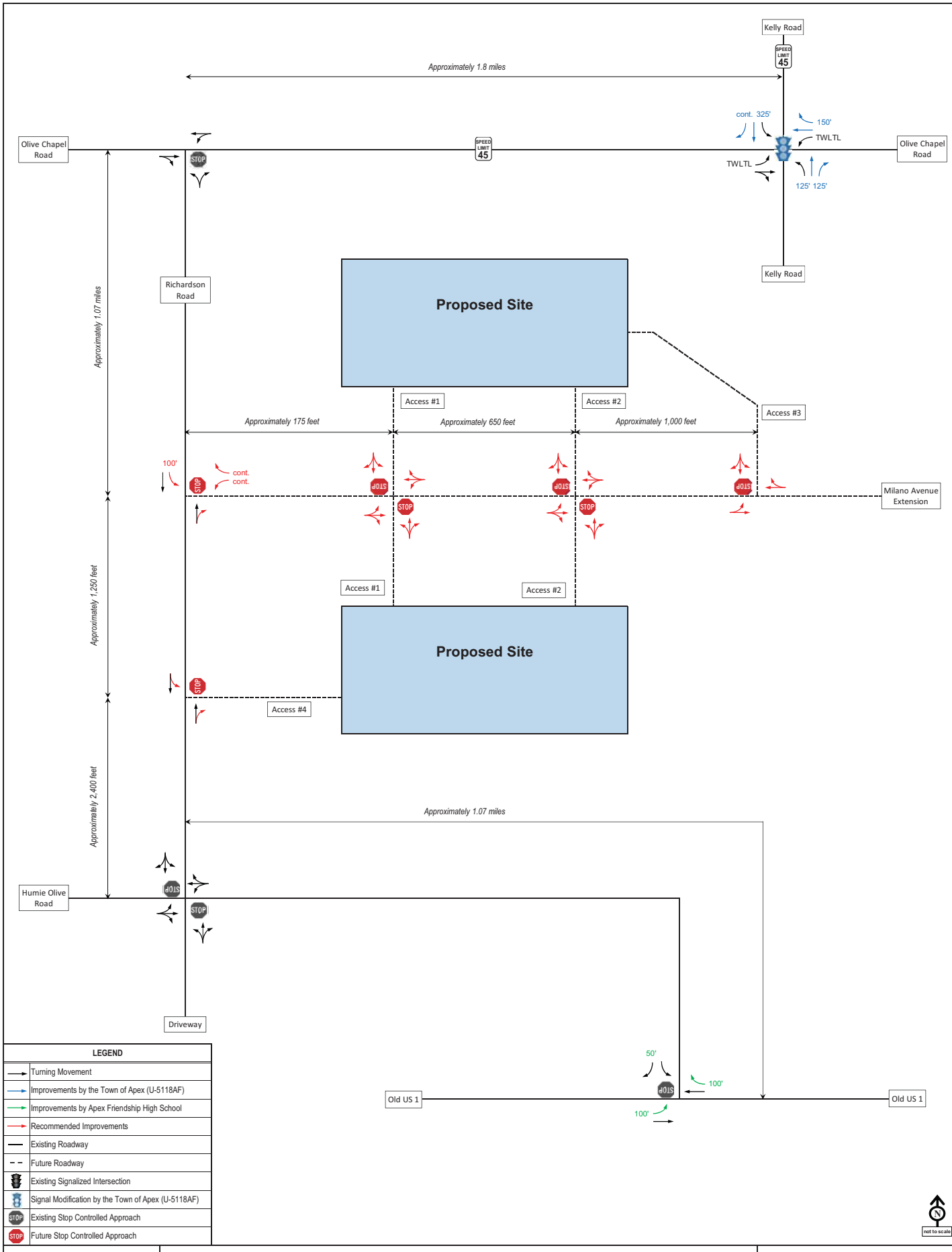


Figure 9
Future (2020) Lane Configurations and Traffic Control

Goodwin-MacNair Property
Apex, NC

KIMLEY-HORN AND ASSOCIATES, INC
NC License #F-0102

May 29, 2015

Mr. Colen Davidson
Milestone Developments, LLC.
140 Towerview Ct.
Cary, NC 27513

DocuSigned by:
E9D325BFBC3E429...
5/29/2015

RE: *Finkle and Haus Assemblage – Traffic Impact Analysis*

Dear Mr. Davidson:

Kimley-Horn and Associates, Inc. has revised the Traffic Impact Analysis (originally dated February 27, 2015) for the proposed residential development located on the west side of New Hill Olive Chapel Road in Apex, NC. The proposed development will consist of approximately 240 single-family homes split between 2 parcels (approximately 160 units in the northern parcel and 80 units in the southern parcel) and is expected to be completed (built-out) by the year 2018. The northern parcel is proposed to be accessed by two full-movement driveways on New Hill Olive Chapel Road, and the southern parcel is proposed to be access by two full-movement driveways on the Proposed Collector Road that will tie to New Hill Olive Chapel Road along the south end of the site. Figure 1 shows the site location, and Figure 2 shows the proposed site plan.

This report presents trip generation, distribution, traffic analyses, and recommendations for transportation improvements required to meet anticipated traffic demands in conjunction with the development. The three traffic conditions studied include the existing (2015) traffic condition, the projected (2018) background traffic condition, and the projected (2018) build-out traffic condition. Analyses were performed for the weekday AM and PM peak hours. The study area consists of the following intersections:

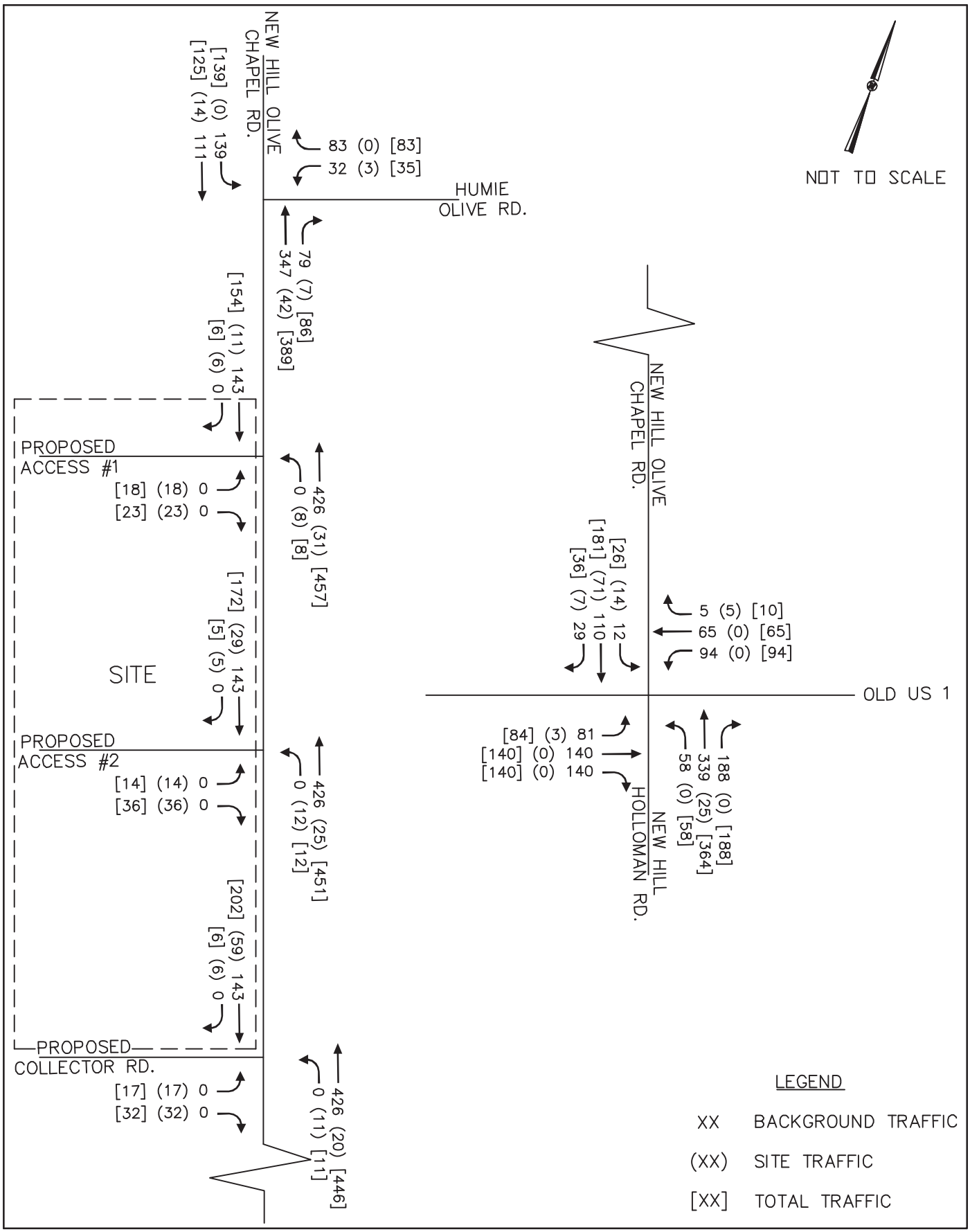
- New Hill Olive Chapel Road & Old US Hwy 1
- New Hill Olive Chapel Road & Humie Olive Road
- New Hill Olive Chapel Road & Proposed Site Access 1
- New Hill Olive Chapel Road & Proposed Site Access 2
- New Hill Olive Chapel Road & Proposed Collector Road (to connect with Site Access 3, 4)

Background Traffic

AM and PM peak hour traffic counts were performed at the following intersections on January 22, 2015:

- New Hill Olive Chapel Road & Old US Hwy 1
- New Hill Olive Chapel Road & Humie Olive Road

The existing AM and PM peak hour turning movement volumes are shown on Figures 3 and 4, respectively. A 3% annual growth factor was applied to the existing volumes to account for ambient

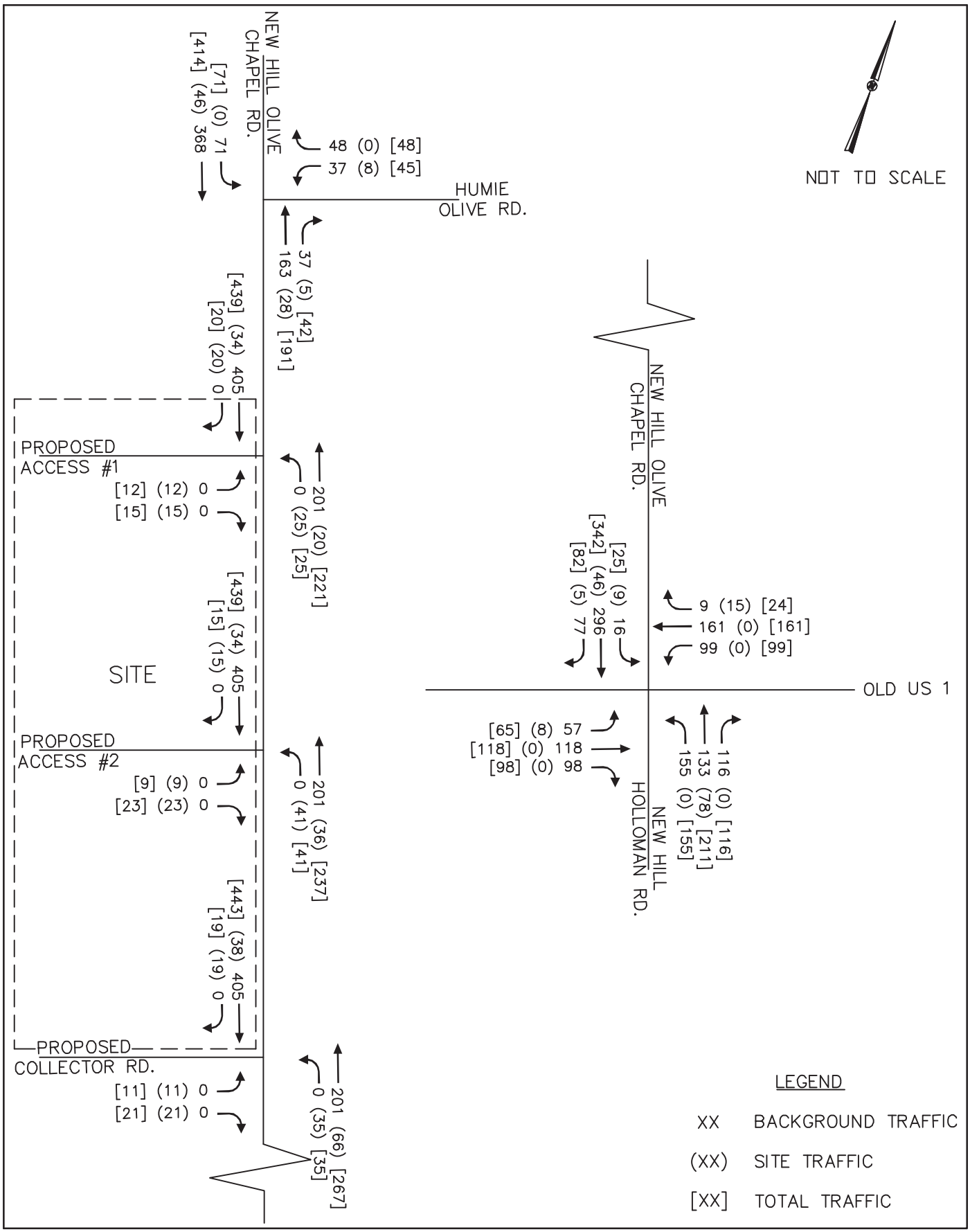


Kimley»Horn

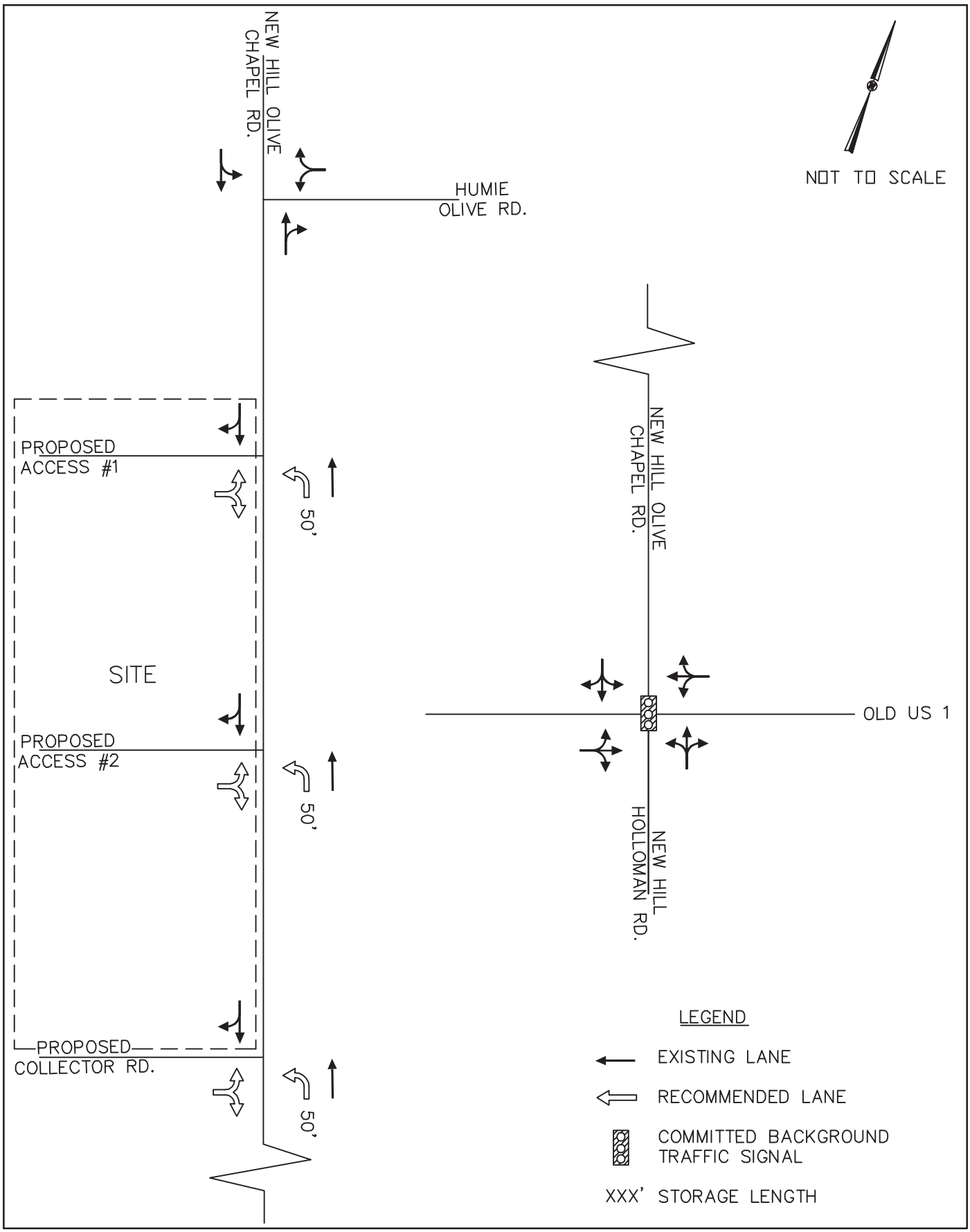
FINKLE & HAUS ASSEMBLAGE
APEX, NC
TRAFFIC IMPACT ANALYSIS

PROJECTED (2018)
BUILD-OUT AM PEAK HOUR
TRAFFIC VOLUMES

FIGURE
6



Kimley»Horn	FINKLE & HAUS ASSEMBLAGE APEX, NC TRAFFIC IMPACT ANALYSIS	PROJECTED (2018) BUILD-OUT PM PEAK HOUR TRAFFIC VOLUMES	FIGURE 7



Kimley»Horn	FINKLE & HAUS ASSEMBLAGE APEX, NC TRAFFIC IMPACT ANALYSIS	RECOMMENDED ROADWAY LANEAGE	FIGURE 8

Kimley-Horn
and Associates, Inc.

October 2, 2013

3001 Weston Parkway
Cary, NC 27513

Mr. Colen Davidson
Impact Homes, LLC
140 Towerview Court
Cary, North Carolina 27513

Re: Proposed Lawrence Assemblage Residential Development
Apex, North Carolina – Traffic Impact Analysis

Dear Mr. Davidson:

Kimley-Horn and Associates, Inc. has performed a Traffic Impact Analysis for the proposed Lawrence Assemblage residential development located north of Old US 1 and east of Horton Road in Apex, North Carolina. The proposed development will consist of 440 single-family homes. The development is proposed to be accessed by two project driveways on Horton Road and one project driveway on Old US 1. The development is expected to be completed (built-out) in 2016.

This report presents existing conditions, trip generation, distribution, traffic analyses, and recommendations for transportation improvements. The three traffic conditions studied include the existing (2013) traffic condition, the background (2016) traffic condition, and the projected (2016) build-out traffic condition. The study intersections consist of two existing unsignalized intersections and three proposed unsignalized intersections.

Existing Conditions

The surrounding land uses are agricultural and residential uses. Major roadways in the vicinity of the site include Old US 1 and New Hill Olive Chapel Road / New Hill Holleman Road. AM and PM peak hour traffic counts were performed at the intersections of Old US 1 at New Hill Olive Chapel Road / New Hill Holleman Road and Old US 1 at Horton Road on August 28, 2013. The existing AM and PM peak hour turning movement volumes are shown on **Figure 1** and **Figure 2**, respectively.

Trip Generation

The traffic generation potential of the development was determined using the traffic generation rates published in the *ITE Trip Generation Handbook* (Institute of Transportation Engineers, Ninth Edition, 2012) and is summarized in **Table 1**. Detailed trip generation calculations are attached.

TEL 919 677 2000
FAX 919 677 2050

Table 1 ITE Trip Generation							
Land Use	Size	Daily		AM		PM	
		In	Out	In	Out	In	Out
Single Family Detached Housing	440 d.u.	2,052	2,052	80	238	251	148

Table 1 shows that the site has the potential to generate approximately 2,052 new daily trips in and 2,052 new daily trips out with 80 new trips entering and 238 new trips exiting in the AM peak hour and 251 new trips entering and 148 new trips exiting in the PM peak hour.

Background Traffic

Based upon discussions with Town of Apex staff, there are no approved developments within the study area. Based on historical traffic volumes along the roadways in the study area, a 3.0% growth rate was applied to existing traffic to calculate the 2016 background traffic. The traffic growth and total background volumes for the AM and PM peak hours are shown in **Figure 1** and **Figure 2**, respectively.

Distribution and Assignment

Based on surrounding land uses and existing travel patterns, the proposed development site trips were assigned to the study intersections as follows:

- 48% to/from the south on New Hill Holleman Road
- 30% to/from the east on Old US 1
- 20% to/from the north on New Hill Olive Chapel Road
- 2% to/from the west on Old US 1

Figure 3 shows the site traffic distribution and percent assignment at the study intersections. Site traffic was assigned to the network based on the distributions shown above and added to the background traffic to obtain total traffic volumes. **Figure 4** and **Figure 5** show the AM and PM peak hour site and total build-out traffic volumes respectively at the five study intersections.

Capacity Analysis

Capacity analyses were performed for the five study intersections using Synchro Version 7 software. Synchro intersection LOS reports are attached. The level-of-service at each of the study intersections is summarized on **Table 2**.

Table 2 Level-of-Service Summary		
Condition	**AM Peak Hour LOS (Delay in seconds)**	**PM Peak Hour LOS (Delay in seconds)**
Horton Road at Site Driveway #1 (Unsignalized)		
Build-out (2016) Traffic	Short delays for side-street approach	
Horton Road at Site Driveway #2 (Unsignalized)		
Build-out (2016) Traffic	Short delays for side-street approach	
Old US 1 at Horton Road (Unsignalized)		
Existing (2013) Traffic	Short delays for side-street approach	
Background (2016) Traffic		
Build-out (2016) Traffic		
Old US 1 at Site Driveway #3 (Unsignalized)		
Build-out (2016)	Short delays for side-street approach	
Old US 1 at New Hill Olive Chapel Road / New Hill Holleman Road (Unsignalized)		
Existing (2013) Traffic	Short delays for side-street approaches	Moderate delays for side-street approaches
Background (2016) Traffic		
Build-out (2016) Traffic	Long delays for side-street approaches	
Build-out (2016) Traffic with Signal	B (15.2)	B (18.6)

Analysis indicates the side-street approaches for the three proposed unsignalized site driveways are expected to operate with short delays in the AM and PM peak hours for the build-out traffic condition.

Analysis indicates the southbound side-street approach for the unsignalized intersection of Old US 1 at Horton Road is currently operating with short delays in the AM and PM peak hours and is expected to continue operating with short delays in the AM and PM peak hours for the background and build-out traffic conditions.

Analysis indicates the side-street approaches for the unsignalized intersection of Old US 1 at New Hill Olive Chapel Road / New Hill Holleman Road is currently operating with short delays in the AM peak hour and moderate delays in the PM peak hour and is expected to continue operating with short delays in the AM peak hour and moderate delays in the PM peak hour for the background condition. The side-street approaches are expected to operate with long delays in both the AM and PM peak hours for the build-out traffic condition.

Upon build-out of the proposed development, volumes at the intersection of Old US 1 at New Hill Olive Chapel Road / New Hill Holleman Road are expected to meet traffic signal warrants. With signalization, the intersection is expected to operate at LOS B in both the AM and PM peak hours for the build-out traffic condition.

Recommendations

Based on the capacity analyses and criteria from NCDOT, the following roadway improvements are recommended:

Old US 1 at Horton Road

- Construct an eastbound right-turn lane with 75' of full-width storage on Old US 1

Old US 1 at Site Driveway #3

- Construct an eastbound right-turn lane with 125' of full-width storage on Old US 1
- Construct a westbound left-turn lane with 50' of full-width storage on Old US 1

Old US 1 at New Hill Olive Chapel Road / New Hill Holleman Road

- Signalize when warrants are met

The existing roadway network and recommended roadway improvements are shown on **Figure 6**. If you have any further questions or comments please do not hesitate to call me at 919-677-2062.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.
NC License # F-0102

R. Michael Horn

R. Michael Horn, P.E.
Principal

NORTH CAROLINA PROFESSIONAL SEAL 14510 ENGINEER ROSS MICHAEL HORN

Attachments: Site Plan, Trip Generation Table, Traffic Counts, Intersection Worksheets, Signal Warrant Spreadsheet, Figures 1-6, Synchro LOS Reports

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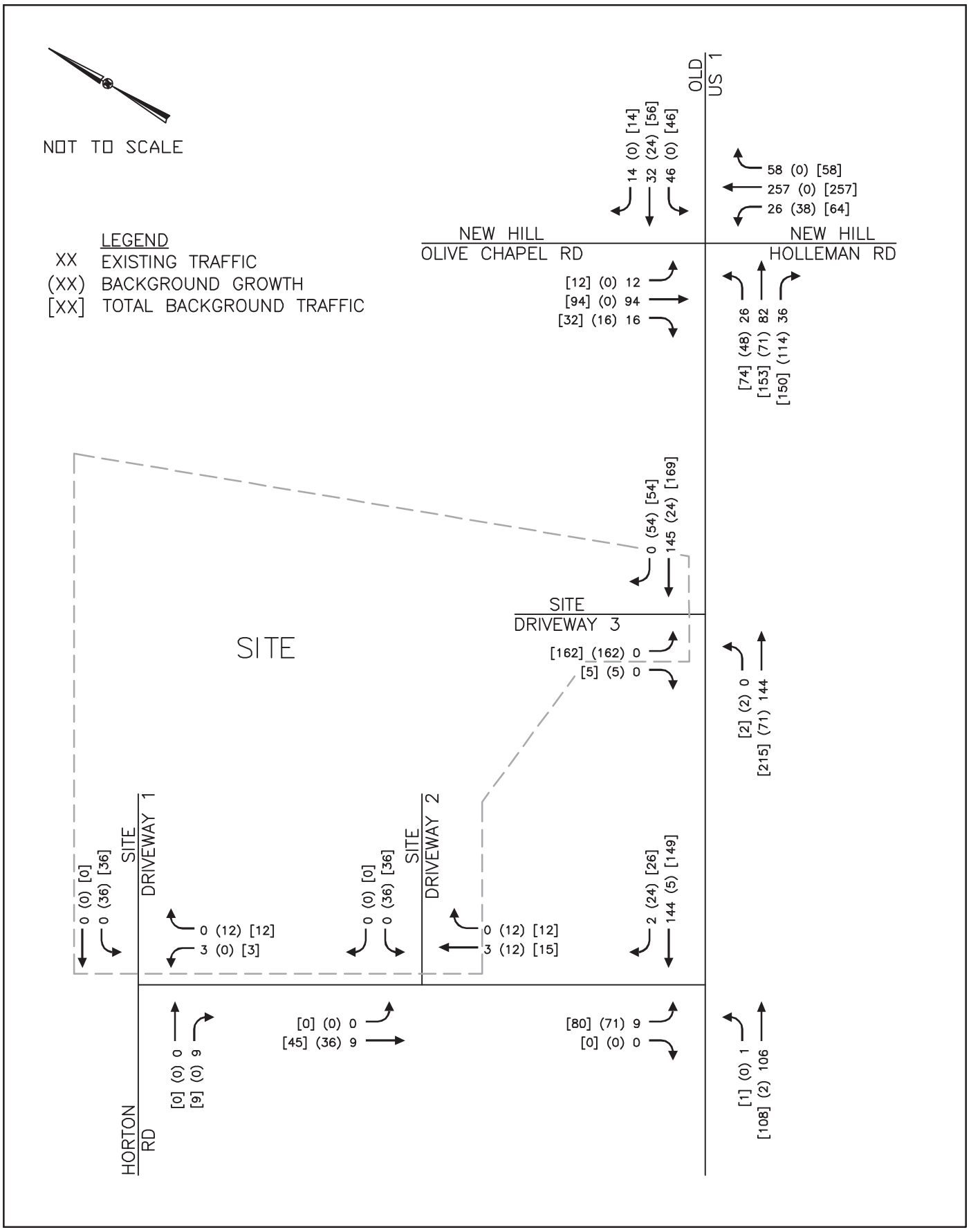

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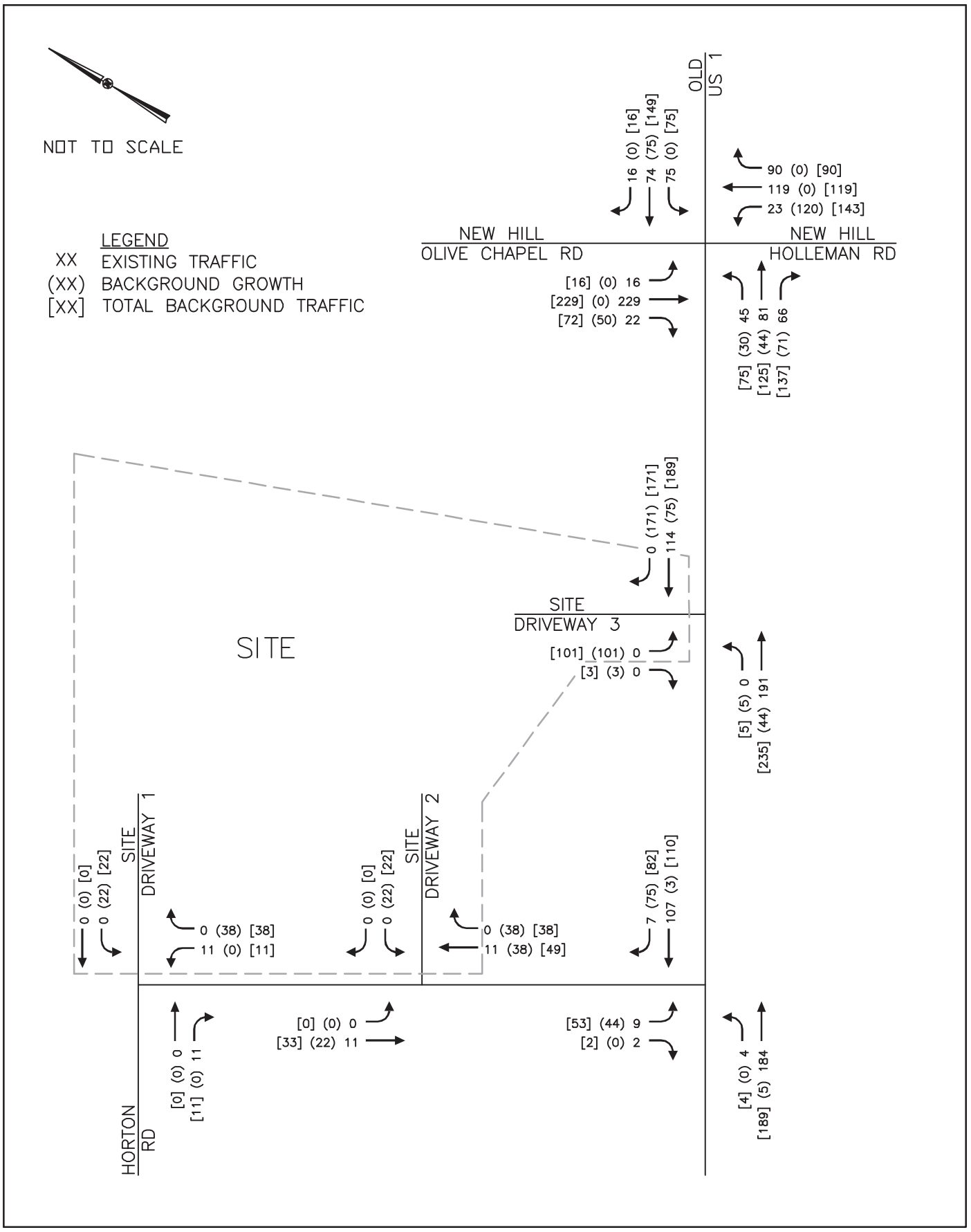
Kimley-Horn and Associates, Inc.	LAWRENCE ASSEMBLAGE TRAFFIC IMPACT ANALYSIS	PROJECTED (2016) AM PEAK HOUR BUILDOUT TRAFFIC VOLUMES	FIGURE 4



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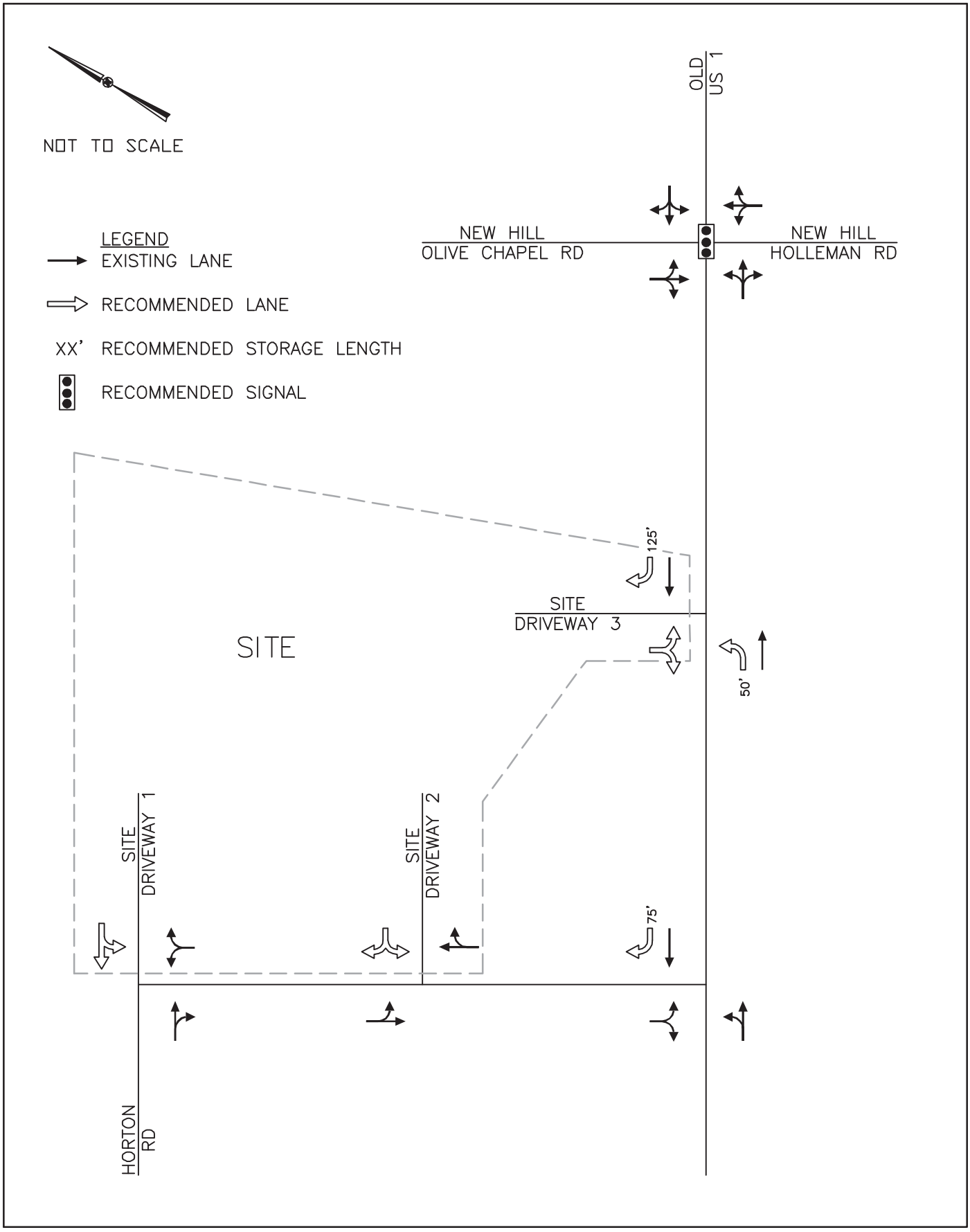
Kimley-Horn and Associates, Inc.	LAWRENCE ASSEMBLAGE TRAFFIC IMPACT ANALYSIS	PROJECTED (2016) PM PEAK HOUR BUILDOUT TRAFFIC VOLUMES	FIGURE 5



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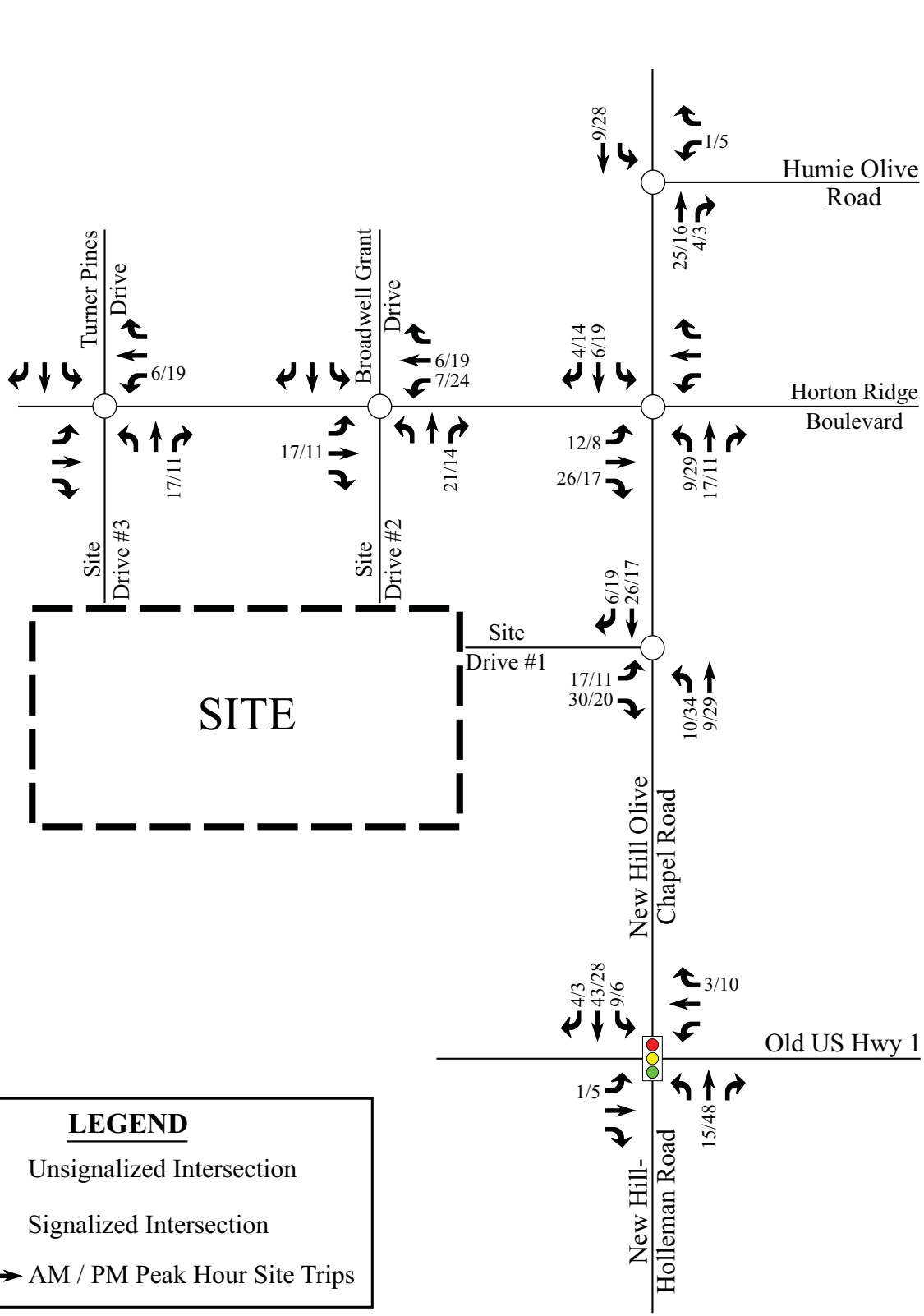
Kimley-Horn and Associates, Inc.	LAWRENCE ASSEMBLAGE TRAFFIC IMPACT ANALYSIS	RECOMMENDED ROADWAY IMPROVEMENTS	FIGURE 6



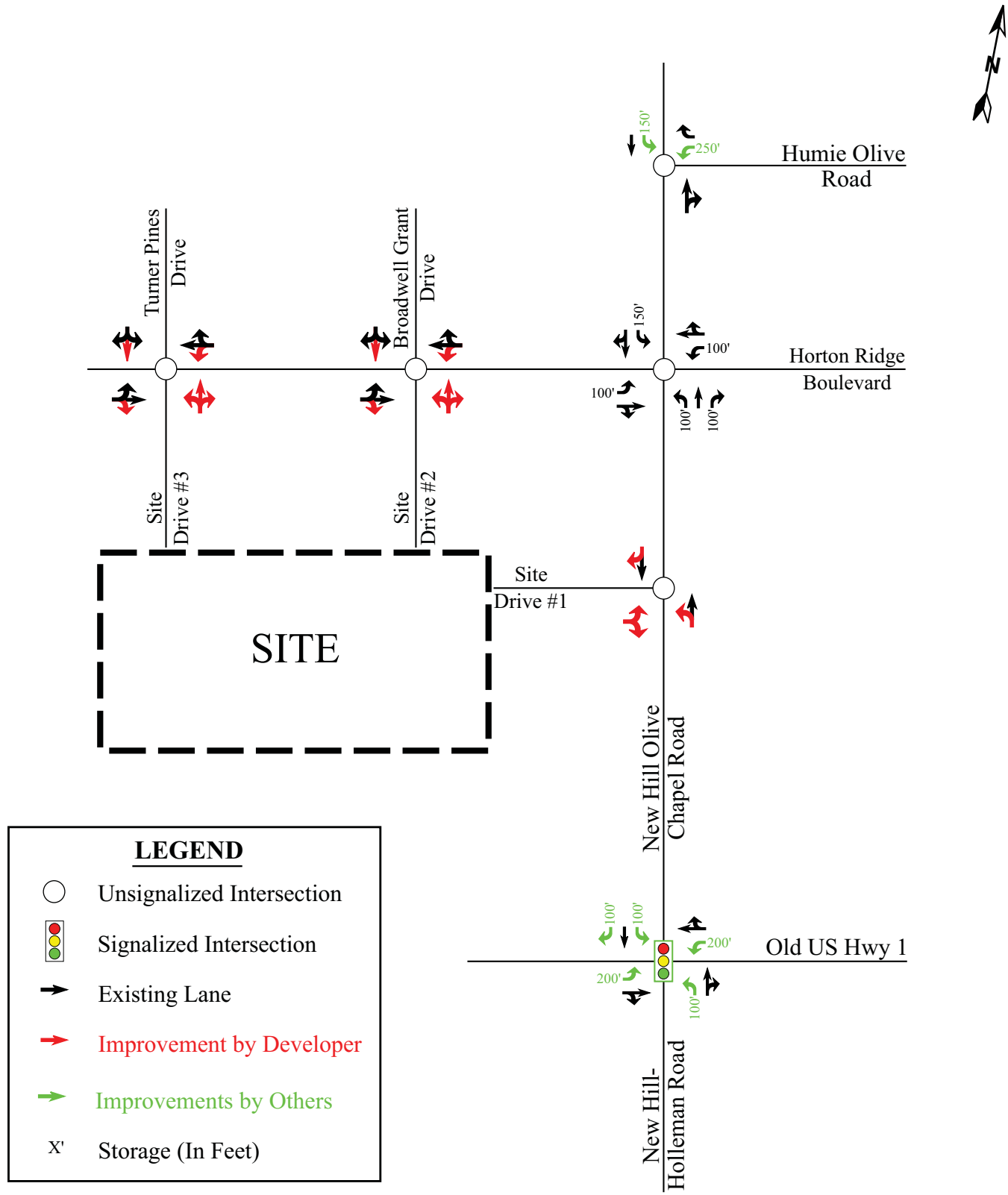
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

New Hill Assembly
Apex, NC

Site
Trip Assignment

Scale: Not to Scale

Figure 9

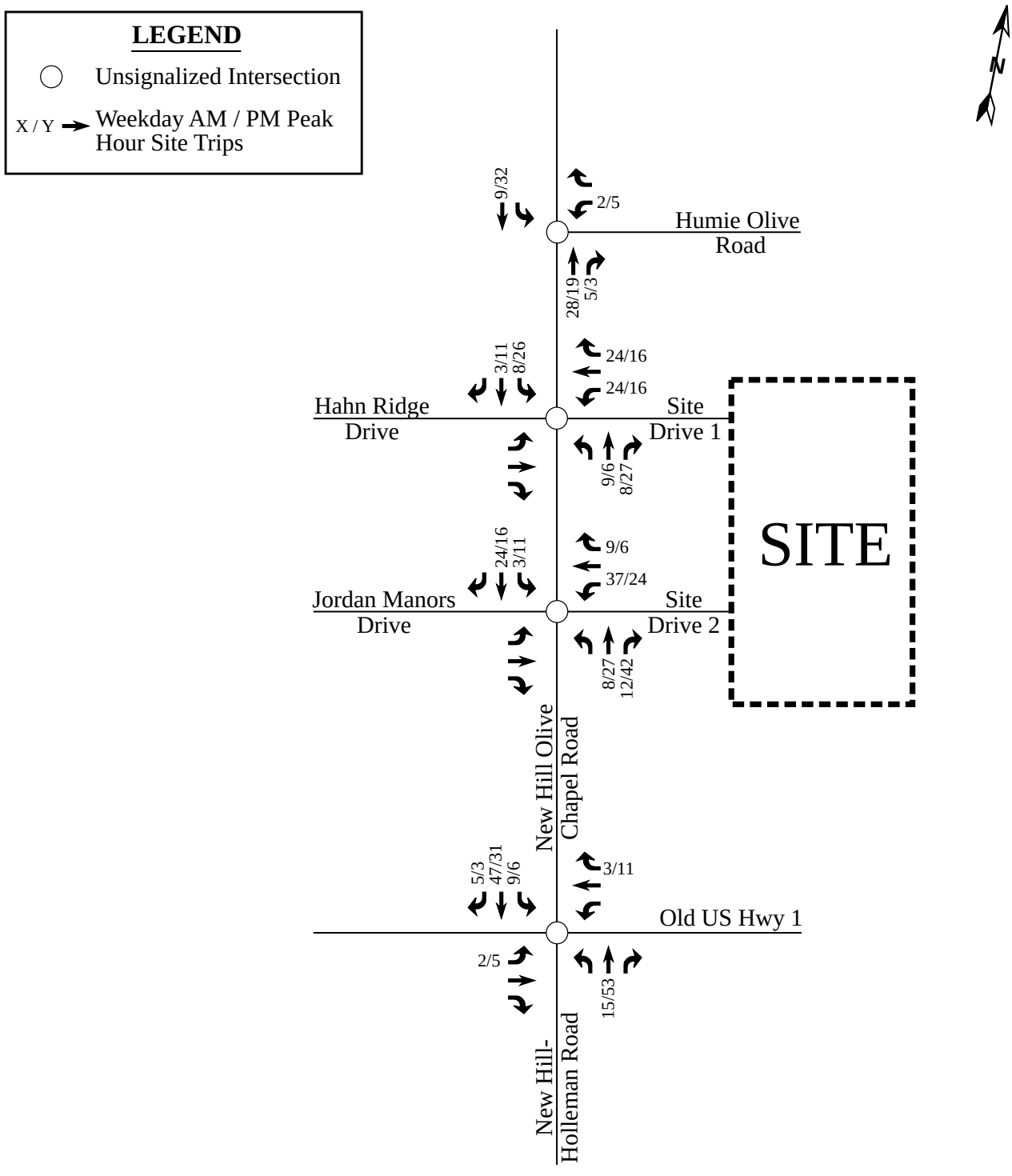


RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

New Hill Assembly
Apex, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure 11



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Olive Ridge Residential Apex, NC	Site Trip Assignment Scale: Not to Scale | Figure 9

APPENDIX E

CAPACITY ANALYSIS CALCULATIONS

EVANS ROAD

&

HUMIE OLIVE ROAD

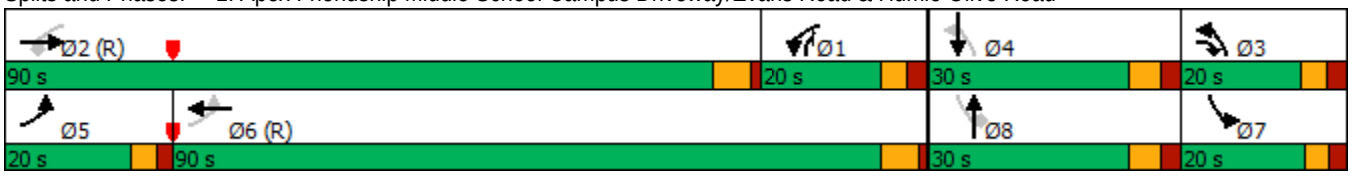
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	271	51	83	319	17	20	38	73	57	55	196
Future Volume (vph)	82	271	51	83	319	17	20	38	73	57	55	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	275		0	350		225	125		150
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.992				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1848	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.508			0.547			0.700			0.730		
Satd. Flow (perm)	946	1863	1583	1019	1848	0	1304	1863	1583	1360	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			10			35	
Link Distance (ft)		888			1819			705			1540	
Travel Time (s)		13.5			27.6			48.1			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	91	301	57	92	354	19	22	42	81	63	61	218
Shared Lane Traffic (%)												
Lane Group Flow (vph)	91	301	57	92	373	0	22	42	81	63	61	218
Turn Type	D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	Free
Protected Phases	5	2	3	1	6		3	8	1	7	4	
Permitted Phases	6		2	2			4		8	8		Free
Detector Phase	5	2	3	1	6		3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	7.0	12.0	7.0	7.0	12.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	11.9	17.8	12.6	12.6	17.8		12.6	13.3	12.6	12.3	13.3	
Total Split (s)	20.0	90.0	20.0	20.0	90.0		20.0	30.0	20.0	20.0	30.0	
Total Split (%)	12.5%	56.3%	12.5%	12.5%	56.3%		12.5%	18.8%	12.5%	12.5%	18.8%	
Maximum Green (s)	15.1	84.2	14.4	14.4	84.2		14.4	23.7	14.4	14.7	23.7	
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	3.8	3.0	3.0	3.8	
All-Red Time (s)	1.9	1.3	2.6	2.6	1.3		2.6	2.5	2.6	2.3	2.5	
Lost Time Adjust (s)	0.1	-0.8	-0.6	-0.6	-0.8		-0.6	-1.3	-0.6	-0.3	-1.3	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead	Lag	Lag	Lag		Lag	Lead	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	6.0	3.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.2	3.0	3.0	3.2		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	15.0	0.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	40.0	0.0	0.0	40.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None	None	None	None	
Act Effct Green (s)	125.2	110.2	120.7	125.2	117.6		18.4	10.6	27.9	18.3	12.0	160.0
Actuated g/C Ratio	0.78	0.69	0.75	0.78	0.74		0.12	0.07	0.17	0.11	0.08	1.00
v/c Ratio	0.12	0.23	0.05	0.11	0.27		0.13	0.34	0.29	0.35	0.44	0.14
Control Delay	4.6	11.4	6.2	4.8	9.2		58.1	78.4	58.5	65.0	79.9	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.6	11.4	6.2	4.8	9.2		58.1	78.4	58.5	65.0	79.9	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	A	A		E	E	E	E	E	A
Approach Delay		9.4			8.3			64.2			26.3	
Approach LOS		A			A			E			C	
Queue Length 50th (ft)	19	121	15	19	132		20	43	73	59	62	0
Queue Length 95th (ft)	39	187	31	39	212		47	86	124	104	112	0
Internal Link Dist (ft)		808			1739			625			1460	
Turn Bay Length (ft)	100		150	275			350		225	125		150
Base Capacity (vph)	846	1282	1193	867	1358		249	291	275	241	291	1583
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.23	0.05	0.11	0.27		0.09	0.14	0.29	0.26	0.21	0.14

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:EBWB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.44
Intersection Signal Delay: 18.8 Intersection LOS: B
Intersection Capacity Utilization 46.0% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road



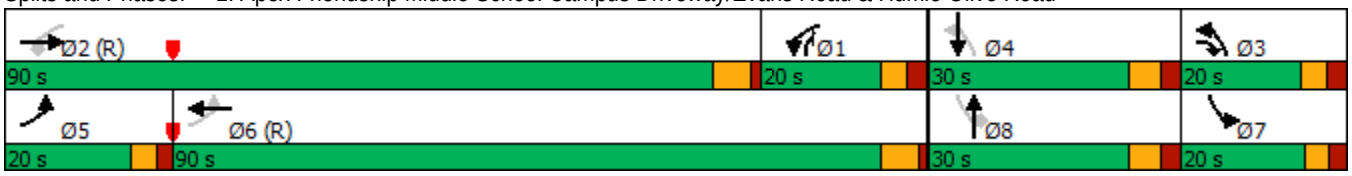
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	219	25	68	217	65	27	26	42	44	36	81
Future Volume (vph)	55	219	25	68	217	65	27	26	42	44	36	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	275		0	350		225	125		150
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.965				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1798	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.553			0.591			0.731			0.738		
Satd. Flow (perm)	1030	1863	1583	1101	1798	0	1362	1863	1583	1375	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			10			35	
Link Distance (ft)		911			1819			705			1540	
Travel Time (s)		13.8			27.6			48.1			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	61	243	28	76	241	72	30	29	47	49	40	90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	243	28	76	313	0	30	29	47	49	40	90
Turn Type	D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	Free
Protected Phases	5	2	3	1	6		3	8	1	7	4	
Permitted Phases	6		2	2			4		8	8		Free
Detector Phase	5	2	3	1	6		3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	7.0	12.0	7.0	7.0	12.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	11.9	17.8	12.6	12.6	17.8		12.6	13.3	12.6	12.3	13.3	
Total Split (s)	20.0	90.0	20.0	20.0	90.0		20.0	30.0	20.0	20.0	30.0	
Total Split (%)	12.5%	56.3%	12.5%	12.5%	56.3%		12.5%	18.8%	12.5%	12.5%	18.8%	
Maximum Green (s)	15.1	84.2	14.4	14.4	84.2		14.4	23.7	14.4	14.7	23.7	
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	3.8	3.0	3.0	3.8	
All-Red Time (s)	1.9	1.3	2.6	2.6	1.3		2.6	2.5	2.6	2.3	2.5	
Lost Time Adjust (s)	0.1	-0.8	-0.6	-0.6	-0.8		-0.6	-1.3	-0.6	-0.3	-1.3	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead	Lag	Lag	Lag		Lag	Lead	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	6.0	3.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.2	3.0	3.0	3.2		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	15.0	0.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	40.0	0.0	0.0	40.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None	None	None	None	
Act Effct Green (s)	128.1	112.1	122.3	127.1	123.4		16.4	9.6	27.0	16.3	10.4	160.0
Actuated g/C Ratio	0.80	0.70	0.76	0.79	0.77		0.10	0.06	0.17	0.10	0.06	1.00
v/c Ratio	0.07	0.19	0.02	0.08	0.23		0.19	0.26	0.18	0.31	0.33	0.06
Control Delay	3.9	10.0	5.6	4.0	7.6		62.2	77.0	56.4	65.9	78.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.9	10.0	5.6	4.0	7.6		62.2	77.0	56.4	65.9	78.3	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	A	A		E	E	E	E	E	A
Approach Delay		8.5			6.9			63.7			35.6	
Approach LOS		A			A			E			D	
Queue Length 50th (ft)	12	91	7	15	102		28	30	42	46	41	0
Queue Length 95th (ft)	25	139	17	29	156		61	65	81	88	82	0
Internal Link Dist (ft)		831			1739			625			1460	
Turn Bay Length (ft)	100		150	275			350		225	125		150
Base Capacity (vph)	919	1305	1209	937	1387		240	291	266	234	291	1583
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.19	0.02	0.08	0.23		0.13	0.10	0.18	0.21	0.14	0.06

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:EBWB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.33
Intersection Signal Delay: 18.5 Intersection LOS: B
Intersection Capacity Utilization 42.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road



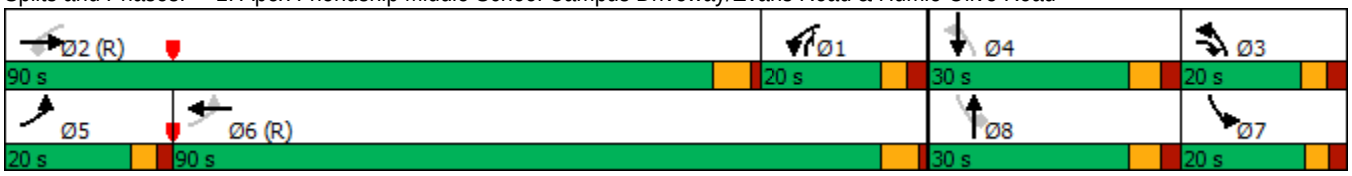
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	94	409	59	95	398	20	23	44	84	65	63	225
Future Volume (vph)	94	409	59	95	398	20	23	44	84	65	63	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	275		0	350		225	125		150
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.993				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1850	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.440			0.431			0.654			0.725		
Satd. Flow (perm)	820	1863	1583	803	1850	0	1218	1863	1583	1350	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			10			35	
Link Distance (ft)		888			1819			705			1540	
Travel Time (s)		13.5			27.6			48.1			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	104	454	66	106	442	22	26	49	93	72	70	250
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	454	66	106	464	0	26	49	93	72	70	250
Turn Type	D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	Free
Protected Phases	5	2	3	1	6		3	8	1	7	4	
Permitted Phases	6		2	2			4		8	8		Free
Detector Phase	5	2	3	1	6		3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	7.0	12.0	7.0	7.0	12.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	11.9	17.8	12.6	12.6	17.8		12.6	13.3	12.6	12.3	13.3	
Total Split (s)	20.0	90.0	20.0	20.0	90.0		20.0	30.0	20.0	20.0	30.0	
Total Split (%)	12.5%	56.3%	12.5%	12.5%	56.3%		12.5%	18.8%	12.5%	12.5%	18.8%	
Maximum Green (s)	15.1	84.2	14.4	14.4	84.2		14.4	23.7	14.4	14.7	23.7	
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	3.8	3.0	3.0	3.8	
All-Red Time (s)	1.9	1.3	2.6	2.6	1.3		2.6	2.5	2.6	2.3	2.5	
Lost Time Adjust (s)	0.1	-0.8	-0.6	-0.6	-0.8		-0.6	-1.3	-0.6	-0.3	-1.3	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead	Lag	Lag	Lag		Lag	Lead	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	6.0	3.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.2	3.0	3.0	3.2		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	15.0	0.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	40.0	0.0	0.0	40.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None	None	None	None	
Act Effct Green (s)	119.0	104.0	117.3	119.0	111.2		21.0	11.1	28.4	22.0	12.7	160.0
Actuated g/C Ratio	0.74	0.65	0.73	0.74	0.70		0.13	0.07	0.18	0.14	0.08	1.00
v/c Ratio	0.16	0.37	0.06	0.15	0.36		0.14	0.38	0.33	0.33	0.48	0.16
Control Delay	5.4	14.5	6.6	5.9	11.5		57.4	79.0	59.0	62.6	80.4	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.4	14.5	6.6	5.9	11.5		57.4	79.0	59.0	62.6	80.4	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	A	B		E	E	E	E	F	A
Approach Delay		12.2			10.4			64.6			26.0	
Approach LOS		B			B			E			C	
Queue Length 50th (ft)	23	207	18	23	182		24	50	84	67	71	0
Queue Length 95th (ft)	46	308	36	46	288		52	96	139	113	124	0
Internal Link Dist (ft)		808			1739			625			1460	
Turn Bay Length (ft)	100		150	275			350		225	125		150
Base Capacity (vph)	724	1211	1160	687	1285		262	291	281	258	291	1583
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.37	0.06	0.15	0.36		0.10	0.17	0.33	0.28	0.24	0.16

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:EBWB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.48
Intersection Signal Delay: 19.7 Intersection LOS: B
Intersection Capacity Utilization 50.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road



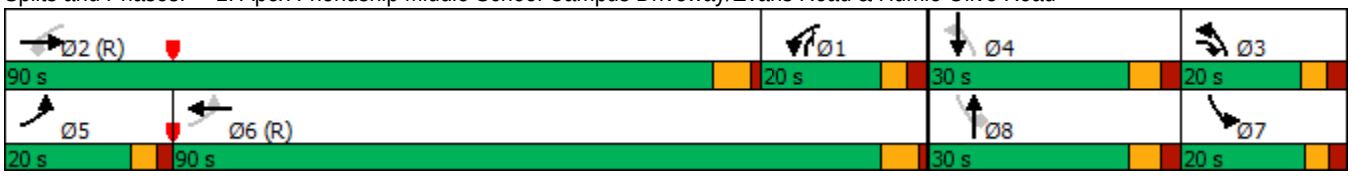
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	316	29	78	356	75	31	30	48	51	41	93
Future Volume (vph)	63	316	29	78	356	75	31	30	48	51	41	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	275		0	350		225	125		150
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.974				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1814	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.445			0.514			0.727			0.736		
Satd. Flow (perm)	829	1863	1583	957	1814	0	1354	1863	1583	1371	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			10			35	
Link Distance (ft)		888			1819			705			1540	
Travel Time (s)		13.5			27.6			48.1			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	70	351	32	87	396	83	34	33	53	57	46	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	70	351	32	87	479	0	34	33	53	57	46	103
Turn Type	D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	Free
Protected Phases	5	2	3	1	6		3	8	1	7	4	
Permitted Phases	6		2	2			4		8	8		Free
Detector Phase	5	2	3	1	6		3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	7.0	12.0	7.0	7.0	12.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	11.9	17.8	12.6	12.6	17.8		12.6	13.3	12.6	12.3	13.3	
Total Split (s)	20.0	90.0	20.0	20.0	90.0		20.0	30.0	20.0	20.0	30.0	
Total Split (%)	12.5%	56.3%	12.5%	12.5%	56.3%		12.5%	18.8%	12.5%	12.5%	18.8%	
Maximum Green (s)	15.1	84.2	14.4	14.4	84.2		14.4	23.7	14.4	14.7	23.7	
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	3.8	3.0	3.0	3.8	
All-Red Time (s)	1.9	1.3	2.6	2.6	1.3		2.6	2.5	2.6	2.3	2.5	
Lost Time Adjust (s)	0.1	-0.8	-0.6	-0.6	-0.8		-0.6	-1.3	-0.6	-0.3	-1.3	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead	Lag	Lag	Lag		Lag	Lead	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	6.0	3.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.2	3.0	3.0	3.2		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	15.0	0.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	40.0	0.0	0.0	40.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None	None	None	None	
Act Effct Green (s)	126.6	111.6	121.8	126.6	119.4		16.9	9.9	27.2	16.8	10.9	160.0
Actuated g/C Ratio	0.79	0.70	0.76	0.79	0.75		0.11	0.06	0.17	0.10	0.07	1.00
v/c Ratio	0.10	0.27	0.03	0.10	0.35		0.21	0.29	0.20	0.35	0.37	0.07
Control Delay	4.2	11.0	5.8	4.3	9.2		62.1	77.6	56.6	66.6	78.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.2	11.0	5.8	4.3	9.2		62.1	77.6	56.6	66.6	78.7	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	A	A		E	E	E	E	E	A
Approach Delay		9.6			8.4			63.9			36.1	
Approach LOS		A			A			E			D	
Queue Length 50th (ft)	14	142	8	17	177		32	34	47	53	47	0
Queue Length 95th (ft)	28	209	19	34	265		65	71	89	97	91	0
Internal Link Dist (ft)		808			1739			625			1460	
Turn Bay Length (ft)	100		150	275			350		225	125		150
Base Capacity (vph)	770	1299	1205	833	1354		243	291	269	236	291	1583
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.27	0.03	0.10	0.35		0.14	0.11	0.20	0.24	0.16	0.07

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:EBWB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.37
Intersection Signal Delay: 18.0 Intersection LOS: B
Intersection Capacity Utilization 51.1% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road



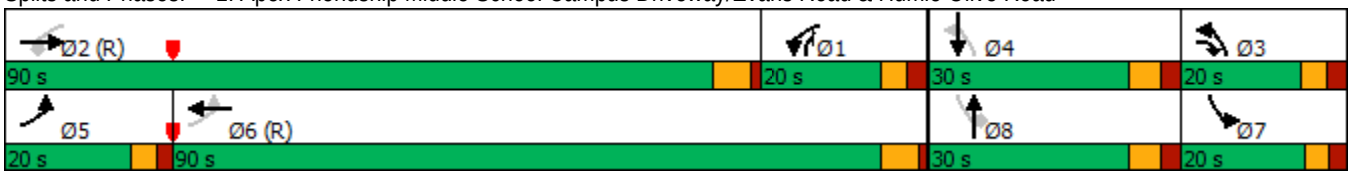
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	94	478	59	95	420	20	23	44	84	65	63	225
Future Volume (vph)	94	478	59	95	420	20	23	44	84	65	63	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	275		0	350		225	125		150
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.993				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1850	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.424			0.380			0.654			0.725		
Satd. Flow (perm)	790	1863	1583	708	1850	0	1218	1863	1583	1350	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			10			35	
Link Distance (ft)		888			1819			705			1540	
Travel Time (s)		13.5			27.6			48.1			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	104	531	66	106	467	22	26	49	93	72	70	250
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	531	66	106	489	0	26	49	93	72	70	250
Turn Type	D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	Free
Protected Phases	5	2	3	1	6		3	8	1	7	4	
Permitted Phases	6		2	2			4		8	8		Free
Detector Phase	5	2	3	1	6		3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	7.0	12.0	7.0	7.0	12.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	11.9	17.8	12.6	12.6	17.8		12.6	13.3	12.6	12.3	13.3	
Total Split (s)	20.0	90.0	20.0	20.0	90.0		20.0	30.0	20.0	20.0	30.0	
Total Split (%)	12.5%	56.3%	12.5%	12.5%	56.3%		12.5%	18.8%	12.5%	12.5%	18.8%	
Maximum Green (s)	15.1	84.2	14.4	14.4	84.2		14.4	23.7	14.4	14.7	23.7	
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	3.8	3.0	3.0	3.8	
All-Red Time (s)	1.9	1.3	2.6	2.6	1.3		2.6	2.5	2.6	2.3	2.5	
Lost Time Adjust (s)	0.1	-0.8	-0.6	-0.6	-0.8		-0.6	-1.3	-0.6	-0.3	-1.3	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead	Lag	Lag	Lag		Lag	Lead	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	6.0	3.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.2	3.0	3.0	3.2		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	15.0	0.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	40.0	0.0	0.0	40.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None	None	None	None	
Act Effct Green (s)	119.0	104.0	117.3	119.0	111.2		21.0	11.1	28.4	22.0	12.7	160.0
Actuated g/C Ratio	0.74	0.65	0.73	0.74	0.70		0.13	0.07	0.18	0.14	0.08	1.00
v/c Ratio	0.16	0.44	0.06	0.17	0.38		0.14	0.38	0.33	0.33	0.48	0.16
Control Delay	5.4	15.6	6.6	6.1	11.8		57.4	79.0	59.0	62.6	80.4	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.4	15.6	6.6	6.1	11.8		57.4	79.0	59.0	62.6	80.4	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	A	B		E	E	E	E	F	A
Approach Delay		13.2			10.8			64.6			26.0	
Approach LOS		B			B			E			C	
Queue Length 50th (ft)	23	256	18	23	195		24	50	84	67	71	0
Queue Length 95th (ft)	46	377	36	46	308		52	96	139	113	124	0
Internal Link Dist (ft)		808			1739			625			1460	
Turn Bay Length (ft)	100		150	275			350		225	125		150
Base Capacity (vph)	704	1211	1160	626	1285		262	291	281	258	291	1583
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.44	0.06	0.17	0.38		0.10	0.17	0.33	0.28	0.24	0.16

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:EBWB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.48
Intersection Signal Delay: 19.8 Intersection LOS: B
Intersection Capacity Utilization 53.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road



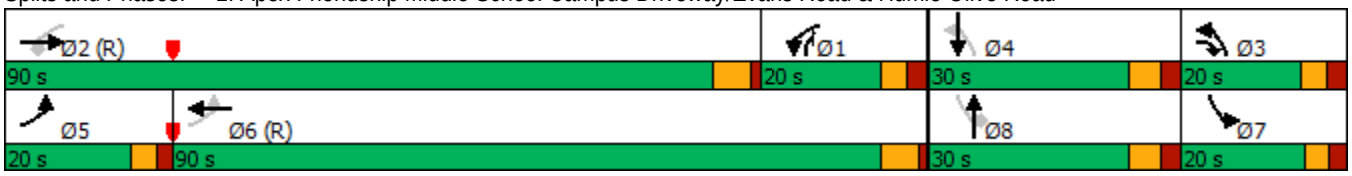
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	359	29	78	429	75	31	30	48	51	41	93
Future Volume (vph)	63	359	29	78	429	75	31	30	48	51	41	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	275		0	350		225	125		150
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.978				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1822	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.398			0.481			0.727			0.736		
Satd. Flow (perm)	741	1863	1583	896	1822	0	1354	1863	1583	1371	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			10			35	
Link Distance (ft)		888			1819			705			1540	
Travel Time (s)		13.5			27.6			48.1			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	70	399	32	87	477	83	34	33	53	57	46	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	70	399	32	87	560	0	34	33	53	57	46	103
Turn Type	D.P+P	NA	pm+ov	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	Free
Protected Phases	5	2	3	1	6		3	8	1	7	4	
Permitted Phases	6		2	2			4		8	8		Free
Detector Phase	5	2	3	1	6		3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	7.0	12.0	7.0	7.0	12.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	11.9	17.8	12.6	12.6	17.8		12.6	13.3	12.6	12.3	13.3	
Total Split (s)	20.0	90.0	20.0	20.0	90.0		20.0	30.0	20.0	20.0	30.0	
Total Split (%)	12.5%	56.3%	12.5%	12.5%	56.3%		12.5%	18.8%	12.5%	12.5%	18.8%	
Maximum Green (s)	15.1	84.2	14.4	14.4	84.2		14.4	23.7	14.4	14.7	23.7	
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	3.8	3.0	3.0	3.8	
All-Red Time (s)	1.9	1.3	2.6	2.6	1.3		2.6	2.5	2.6	2.3	2.5	
Lost Time Adjust (s)	0.1	-0.8	-0.6	-0.6	-0.8		-0.6	-1.3	-0.6	-0.3	-1.3	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead	Lag	Lag	Lag		Lag	Lead	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	6.0	3.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.2	3.0	3.0	3.2		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	15.0	0.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	40.0	0.0	0.0	40.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None	None	None	None	
Act Effct Green (s)	126.6	111.6	121.8	126.6	119.4		16.9	9.9	27.2	16.8	10.9	160.0
Actuated g/C Ratio	0.79	0.70	0.76	0.79	0.75		0.11	0.06	0.17	0.10	0.07	1.00
v/c Ratio	0.11	0.31	0.03	0.11	0.41		0.21	0.29	0.20	0.35	0.37	0.07
Control Delay	4.2	11.4	5.8	4.4	9.9		62.1	77.6	56.6	66.6	78.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.2	11.4	5.8	4.4	9.9		62.1	77.6	56.6	66.6	78.7	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	A	A		E	E	E	E	E	A
Approach Delay		10.1			9.2			63.9			36.1	
Approach LOS		B			A			E			D	
Queue Length 50th (ft)	14	166	8	17	220		32	34	47	53	47	0
Queue Length 95th (ft)	28	243	19	34	326		65	71	89	97	91	0
Internal Link Dist (ft)		808			1739			625			1460	
Turn Bay Length (ft)	100		150	275			350		225	125		150
Base Capacity (vph)	706	1299	1205	791	1360		243	291	269	236	291	1583
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.31	0.03	0.11	0.41		0.14	0.11	0.20	0.24	0.16	0.07

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:EBWB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.41
Intersection Signal Delay: 17.7 Intersection LOS: B
Intersection Capacity Utilization 55.0% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road



APPENDIX F

CAPACITY ANALYSIS CALCULATIONS

HUMIE OLIVE ROAD

&

RICHARDSON ROAD

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	19	92	4	1	52	59	4	4	4	114	1	31
Future Vol, veh/h	19	92	4	1	52	59	4	4	4	114	1	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	102	4	1	58	66	4	4	4	127	1	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	124	0	0	106	0	0	257	272	104	243	241	91
Stage 1	-	-	-	-	-	-	146	146	-	93	93	-
Stage 2	-	-	-	-	-	-	111	126	-	150	148	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1463	-	-	1485	-	-	696	635	951	711	660	967
Stage 1	-	-	-	-	-	-	857	776	-	914	818	-
Stage 2	-	-	-	-	-	-	894	792	-	853	775	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1463	-	-	1485	-	-	662	625	951	695	649	967
Mov Cap-2 Maneuver	-	-	-	-	-	-	662	625	-	695	649	-
Stage 1	-	-	-	-	-	-	844	764	-	900	817	-
Stage 2	-	-	-	-	-	-	860	791	-	831	763	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.2	0.1	10.1	11.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	721	1463	-	-	1485	-	-	739
HCM Lane V/C Ratio	0.018	0.014	-	-	0.001	-	-	0.22
HCM Control Delay (s)	10.1	7.5	0	-	7.4	0	-	11.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.8

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	42	2	4	42	62	4	4	4	56	1	18
Future Vol, veh/h	9	42	2	4	42	62	4	4	4	56	1	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	47	2	4	47	69	4	4	4	62	1	20

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	116	0	0	49	0	0	168	192	48	162	159	82
Stage 1	-	-	-	-	-	-	68	68	-	90	90	-
Stage 2	-	-	-	-	-	-	100	124	-	72	69	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1473	-	-	1558	-	-	796	703	1021	803	733	978
Stage 1	-	-	-	-	-	-	942	838	-	917	820	-
Stage 2	-	-	-	-	-	-	906	793	-	938	837	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1473	-	-	1558	-	-	773	696	1021	789	726	978
Mov Cap-2 Maneuver	-	-	-	-	-	-	773	696	-	789	726	-
Stage 1	-	-	-	-	-	-	935	832	-	911	818	-
Stage 2	-	-	-	-	-	-	884	791	-	922	831	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	0.3	9.5	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	809	1473	-	-	1558	-	-	826
HCM Lane V/C Ratio	0.016	0.007	-	-	0.003	-	-	0.101
HCM Control Delay (s)	9.5	7.5	0	-	7.3	0	-	9.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	89	204	4	1	92	68	4	4	4	131	1	57
Future Vol, veh/h	89	204	4	1	92	68	4	4	4	131	1	57
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	99	227	4	1	102	76	4	4	4	146	1	63

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	178	0	0	231	0	0	601	607	229	573	571	140
Stage 1	-	-	-	-	-	-	427	427	-	142	142	-
Stage 2	-	-	-	-	-	-	174	180	-	431	429	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1398	-	-	1337	-	-	412	411	810	430	431	908
Stage 1	-	-	-	-	-	-	606	585	-	861	779	-
Stage 2	-	-	-	-	-	-	828	750	-	603	584	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1398	-	-	1337	-	-	358	377	810	397	396	908
Mov Cap-2 Maneuver	-	-	-	-	-	-	358	377	-	397	396	-
Stage 1	-	-	-	-	-	-	557	538	-	791	778	-
Stage 2	-	-	-	-	-	-	768	749	-	547	537	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	0	13.3	18.3
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	449	1398	-	-	1337	-	-	478
HCM Lane V/C Ratio	0.03	0.071	-	-	0.001	-	-	0.439
HCM Control Delay (s)	13.3	7.8	0	-	7.7	0	-	18.3
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	2.2

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	53	112	2	4	155	71	4	4	4	64	1	94
Future Vol, veh/h	53	112	2	4	155	71	4	4	4	64	1	94
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	59	124	2	4	172	79	4	4	4	71	1	104

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	251	0	0	126	0	0	515	502	125	467	464	212
Stage 1	-	-	-	-	-	-	243	243	-	220	220	-
Stage 2	-	-	-	-	-	-	272	259	-	247	244	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1314	-	-	1460	-	-	470	471	926	506	495	828
Stage 1	-	-	-	-	-	-	761	705	-	782	721	-
Stage 2	-	-	-	-	-	-	734	694	-	757	704	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1314	-	-	1460	-	-	394	447	926	480	470	828
Mov Cap-2 Maneuver	-	-	-	-	-	-	394	447	-	480	470	-
Stage 1	-	-	-	-	-	-	724	671	-	744	719	-
Stage 2	-	-	-	-	-	-	639	692	-	712	670	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.5	0.1	12.2	12.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	512	1314	-	-	1460	-	-	639
HCM Lane V/C Ratio	0.026	0.045	-	-	0.003	-	-	0.276
HCM Control Delay (s)	12.2	7.9	0	-	7.5	0	-	12.8
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	1.1

Intersection	
Int Delay, s/veh	10.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	158	273	4	1	114	68	4	4	4	131	1	79
Future Vol, veh/h	158	273	4	1	114	68	4	4	4	131	1	79
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	176	303	4	1	127	76	4	4	4	146	1	88

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	203	0	0	307	0	0	869	862	305	828	826	165
Stage 1	-	-	-	-	-	-	657	657	-	167	167	-
Stage 2	-	-	-	-	-	-	212	205	-	661	659	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1369	-	-	1254	-	-	272	293	735	290	307	879
Stage 1	-	-	-	-	-	-	454	462	-	835	760	-
Stage 2	-	-	-	-	-	-	790	732	-	452	461	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1369	-	-	1254	-	-	215	247	735	250	259	879
Mov Cap-2 Maneuver	-	-	-	-	-	-	215	247	-	250	259	-
Stage 1	-	-	-	-	-	-	384	390	-	706	759	-
Stage 2	-	-	-	-	-	-	709	731	-	375	390	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.9	0	17.6	35.6
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	298	1369	-	-	1254	-	-	342
HCM Lane V/C Ratio	0.045	0.128	-	-	0.001	-	-	0.686
HCM Control Delay (s)	17.6	8	0	-	7.9	0	-	35.6
HCM Lane LOS	C	A	A	-	A	A	-	E
HCM 95th %tile Q(veh)	0.1	0.4	-	-	0	-	-	4.8

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	97	155	2	4	228	71	4	4	4	64	1	167
Future Vol, veh/h	97	155	2	4	228	71	4	4	4	64	1	167
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	108	172	2	4	253	79	4	4	4	71	1	186

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	332	0	0	174	0	0	783	729	173	694	691	293
Stage 1	-	-	-	-	-	-	389	389	-	301	301	-
Stage 2	-	-	-	-	-	-	394	340	-	393	390	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1227	-	-	1403	-	-	311	350	871	357	368	746
Stage 1	-	-	-	-	-	-	635	608	-	708	665	-
Stage 2	-	-	-	-	-	-	631	639	-	632	608	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1227	-	-	1403	-	-	215	315	871	325	331	746
Mov Cap-2 Maneuver	-	-	-	-	-	-	215	315	-	325	331	-
Stage 1	-	-	-	-	-	-	573	549	-	639	662	-
Stage 2	-	-	-	-	-	-	471	636	-	563	549	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.1	0.1	16.2	17.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	334	1227	-	-	1403	-	-	547
HCM Lane V/C Ratio	0.04	0.088	-	-	0.003	-	-	0.471
HCM Control Delay (s)	16.2	8.2	0	-	7.6	0	-	17.3
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0.3	-	-	0	-	-	2.5

Intersection	
Int Delay, s/veh	10.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	158	273	4	1	114	68	4	4	4	131	1	79
Future Vol, veh/h	158	273	4	1	114	68	4	4	4	131	1	79
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	176	303	4	1	127	76	4	4	4	146	1	88

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	203	0	0	307	0	0	869	862	305	828	826	165
Stage 1	-	-	-	-	-	-	657	657	-	167	167	-
Stage 2	-	-	-	-	-	-	212	205	-	661	659	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1369	-	-	1254	-	-	272	293	735	290	307	879
Stage 1	-	-	-	-	-	-	454	462	-	835	760	-
Stage 2	-	-	-	-	-	-	790	732	-	452	461	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1369	-	-	1254	-	-	220	255	735	256	267	879
Mov Cap-2 Maneuver	-	-	-	-	-	-	220	255	-	256	267	-
Stage 1	-	-	-	-	-	-	395	402	-	727	759	-
Stage 2	-	-	-	-	-	-	709	731	-	387	402	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.9	0	17.3	34.1
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	305	1369	-	-	1254	-	-	349
HCM Lane V/C Ratio	0.044	0.128	-	-	0.001	-	-	0.672
HCM Control Delay (s)	17.3	8	-	-	7.9	0	-	34.1
HCM Lane LOS	C	A	-	-	A	A	-	D
HCM 95th %tile Q(veh)	0.1	0.4	-	-	0	-	-	4.6

Intersection	
Int Delay, s/veh	6.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	97	155	2	4	228	71	4	4	4	64	1	167
Future Vol, veh/h	97	155	2	4	228	71	4	4	4	64	1	167
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	108	172	2	4	253	79	4	4	4	71	1	186

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	332	0	0	174	0	0	783	729	173	694	691	293
Stage 1	-	-	-	-	-	-	389	389	-	301	301	-
Stage 2	-	-	-	-	-	-	394	340	-	393	390	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1227	-	-	1403	-	-	311	350	871	357	368	746
Stage 1	-	-	-	-	-	-	635	608	-	708	665	-
Stage 2	-	-	-	-	-	-	631	639	-	632	608	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1227	-	-	1403	-	-	217	318	871	327	334	746
Mov Cap-2 Maneuver	-	-	-	-	-	-	217	318	-	327	334	-
Stage 1	-	-	-	-	-	-	579	554	-	646	662	-
Stage 2	-	-	-	-	-	-	471	636	-	569	554	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.1	0.1	16.1	17.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	337	1227	-	-	1403	-	-	549
HCM Lane V/C Ratio	0.04	0.088	-	-	0.003	-	-	0.47
HCM Control Delay (s)	16.1	8.2	-	-	7.6	0	-	17.2
HCM Lane LOS	C	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0.3	-	-	0	-	-	2.5

APPENDIX G

CAPACITY ANALYSIS CALCULATIONS

OLIVE FARM ROAD (SITE ACCESS)

&

HUMIE OLIVE ROAD

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	111	1	4	83	3	4
Future Vol, veh/h	111	1	4	83	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	123	1	4	92	3	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	124	0	224	124
Stage 1	-	-	-	-	124	-
Stage 2	-	-	-	-	100	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1463	-	764	927
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	924	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1463	-	762	927
Mov Cap-2 Maneuver	-	-	-	-	762	-
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	921	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	848	-	-	1463	-
HCM Lane V/C Ratio	0.009	-	-	0.003	-
HCM Control Delay (s)	9.3	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	51	4	2	62	4	2
Future Vol, veh/h	51	4	2	62	4	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	57	4	2	69	4	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	61	0	132	59
Stage 1	-	-	-	-	59	-
Stage 2	-	-	-	-	73	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1542	-	862	1007
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	950	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1542	-	861	1007
Mov Cap-2 Maneuver	-	-	-	-	861	-
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	949	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	905	-	-	1542	-
HCM Lane V/C Ratio	0.007	-	-	0.001	-
HCM Control Delay (s)	9	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	140	7	13	130	22	39
Future Vol, veh/h	140	7	13	130	22	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	156	8	14	144	24	43

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	164	0	332	160
Stage 1	-	-	-	-	160	-
Stage 2	-	-	-	-	172	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1414	-	663	885
Stage 1	-	-	-	-	869	-
Stage 2	-	-	-	-	858	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1414	-	656	885
Mov Cap-2 Maneuver	-	-	-	-	656	-
Stage 1	-	-	-	-	869	-
Stage 2	-	-	-	-	849	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	786	-	-	1414	-
HCM Lane V/C Ratio	0.086	-	-	0.01	-
HCM Control Delay (s)	10	-	-	7.6	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	135	21	45	136	13	28
Future Vol, veh/h	135	21	45	136	13	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	150	23	50	151	14	31

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	173	0	413	162
Stage 1	-	-	-	-	162	-
Stage 2	-	-	-	-	251	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1404	-	595	883
Stage 1	-	-	-	-	867	-
Stage 2	-	-	-	-	791	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1404	-	574	883
Mov Cap-2 Maneuver	-	-	-	-	574	-
Stage 1	-	-	-	-	867	-
Stage 2	-	-	-	-	763	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.9	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	754	-	-	1404	-
HCM Lane V/C Ratio	0.06	-	-	0.036	-
HCM Control Delay (s)	10.1	-	-	7.7	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	244	7	24	163	22	73
Future Vol, veh/h	244	7	24	163	22	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	271	8	27	181	24	81

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	279	0	510	275
Stage 1	-	-	-	-	275	-
Stage 2	-	-	-	-	235	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1284	-	523	764
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	804	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1284	-	512	764
Mov Cap-2 Maneuver	-	-	-	-	512	-
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	787	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	11.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	686	-	-	1284	-
HCM Lane V/C Ratio	0.154	-	-	0.021	-
HCM Control Delay (s)	11.2	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	200	21	82	245	13	50
Future Vol, veh/h	200	21	82	245	13	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	222	23	91	272	14	56

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	245	0	688	234
Stage 1	-	-	-	-	234	-
Stage 2	-	-	-	-	454	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1321	-	412	805
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	640	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1321	-	384	805
Mov Cap-2 Maneuver	-	-	-	-	384	-
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	596	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2	11.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	656	-	-	1321	-
HCM Lane V/C Ratio	0.107	-	-	0.069	-
HCM Control Delay (s)	11.1	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	0.2	-

APPENDIX H

CAPACITY ANALYSIS CALCULATIONS

HUMIE OLIVE ROAD

&

NEW HILL OLIVE CHAPEL ROAD

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	34	52	276	55	57	433
Future Vol, veh/h	34	52	276	55	57	433
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	58	307	61	63	481

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	945	338	0	0	368	0
Stage 1	338	-	-	-	-	-
Stage 2	607	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	291	704	-	-	1191	-
Stage 1	722	-	-	-	-	-
Stage 2	544	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	270	704	-	-	1191	-
Mov Cap-2 Maneuver	270	-	-	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	505	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.7	0	1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	430	1191	-
HCM Lane V/C Ratio	-	-	0.222	0.053	-
HCM Control Delay (s)	-	-	15.7	8.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.2	-

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	34	525	32	23	284
Future Vol, veh/h	32	34	525	32	23	284
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	38	583	36	26	316

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	969	601	0	0	619	0
Stage 1	601	-	-	-	-	-
Stage 2	368	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	281	500	-	-	961	-
Stage 1	547	-	-	-	-	-
Stage 2	700	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	272	500	-	-	961	-
Mov Cap-2 Maneuver	272	-	-	-	-	-
Stage 1	547	-	-	-	-	-
Stage 2	677	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.7	0	0.7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	356	961	-
HCM Lane V/C Ratio	-	-	0.206	0.027	-
HCM Control Delay (s)	-	-	17.7	8.8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	-

Intersection	
Int Delay, s/veh	4.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	62	117	490	97	84	553
Future Vol, veh/h	62	117	490	97	84	553
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	250	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	69	130	544	108	93	614

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1398	598	0	0	652	0
Stage 1	598	-	-	-	-	-
Stage 2	800	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	155	502	-	-	935	-
Stage 1	549	-	-	-	-	-
Stage 2	442	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	140	502	-	-	935	-
Mov Cap-2 Maneuver	140	-	-	-	-	-
Stage 1	549	-	-	-	-	-
Stage 2	398	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28.1	0	1.2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	140	502	935	-
HCM Lane V/C Ratio	-	-	0.492	0.259	0.1	-
HCM Control Delay (s)	-	-	53.4	14.7	9.3	-
HCM Lane LOS	-	-	F	B	A	-
HCM 95th %tile Q(veh)	-	-	2.3	1	0.3	-

Intersection	
Int Delay, s/veh	8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	78	76	713	71	89	517
Future Vol, veh/h	78	76	713	71	89	517
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	250	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	87	84	792	79	99	574

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1604	832	0	0	871	0
Stage 1	832	-	-	-	-	-
Stage 2	772	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	116	369	-	-	774	-
Stage 1	427	-	-	-	-	-
Stage 2	456	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	101	369	-	-	774	-
Mov Cap-2 Maneuver	101	-	-	-	-	-
Stage 1	427	-	-	-	-	-
Stage 2	398	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	74.7	0	1.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	101	369	774	-
HCM Lane V/C Ratio	-	-	0.858	0.229	0.128	-
HCM Control Delay (s)	-	-	130.3	17.6	10.3	-
HCM Lane LOS	-	-	F	C	B	-
HCM 95th %tile Q(veh)	-	-	4.9	0.9	0.4	-

Intersection	
Int Delay, s/veh	5.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	66	175	502	109	102	557
Future Vol, veh/h	66	175	502	109	102	557
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	250	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	73	194	558	121	113	619

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1464	619	0	0	679	0
Stage 1	619	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	141	489	-	-	913	-
Stage 1	537	-	-	-	-	-
Stage 2	421	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	124	489	-	-	913	-
Mov Cap-2 Maneuver	124	-	-	-	-	-
Stage 1	537	-	-	-	-	-
Stage 2	369	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	31.4	0	1.5
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	124	489	913	-
HCM Lane V/C Ratio	-	-	0.591	0.398	0.124	-
HCM Control Delay (s)	-	-	69.3	17.1	9.5	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	3	1.9	0.4	-

Intersection	
Int Delay, s/veh	20.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	90	112	720	78	150	529
Future Vol, veh/h	90	112	720	78	150	529
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	250	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	100	124	800	87	167	588

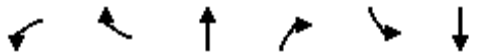
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1766	844	0	0	887	0
Stage 1	844	-	-	-	-	-
Stage 2	922	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 92	363	-	-	763	-
Stage 1	422	-	-	-	-	-
Stage 2	387	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 72	363	-	-	763	-
Mov Cap-2 Maneuver	~ 72	-	-	-	-	-
Stage 1	422	-	-	-	-	-
Stage 2	302	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	162.4	0	2.4
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	72	363	763	-
HCM Lane V/C Ratio	-	-	1.389	0.343	0.218	-
HCM Control Delay (s)	-	-	$ 339.7	20	11	-
HCM Lane LOS	-	-	F	C	B	-
HCM 95th %tile Q(veh)	-	-	8.1	1.5	0.8	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon



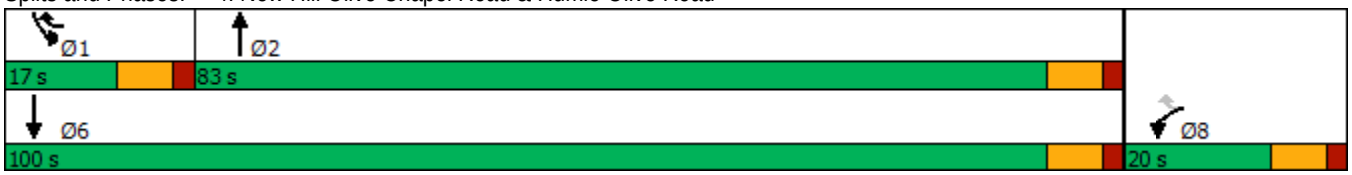
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	66	175	502	109	102	557
Future Volume (vph)	66	175	502	109	102	557
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	0		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	100				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850	0.976			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1818	0	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1583	1818	0	1770	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	45		45			45
Link Distance (ft)	2489		1868			2285
Travel Time (s)	37.7		28.3			34.6
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	73	194	558	121	113	619
Shared Lane Traffic (%)						
Lane Group Flow (vph)	73	194	679	0	113	619
Turn Type	Prot	pm+ov	NA		Prot	NA
Protected Phases	8	1	2		1	6
Permitted Phases		8				
Detector Phase	8	1	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0		7.0	7.0
Minimum Split (s)	20.0	14.0	20.0		14.0	20.0
Total Split (s)	20.0	17.0	83.0		17.0	100.0
Total Split (%)	16.7%	14.2%	69.2%		14.2%	83.3%
Maximum Green (s)	13.0	10.0	76.0		10.0	93.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		None	Min
Act Effct Green (s)	11.4	24.0	34.6		12.1	54.0
Actuated g/C Ratio	0.16	0.35	0.50		0.17	0.78
v/c Ratio	0.25	0.36	0.75		0.37	0.43
Control Delay	33.6	21.2	20.7		35.7	5.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	33.6	21.2	20.7		35.7	5.2
LOS	C	C	C		D	A
Approach Delay	24.6		20.7			9.9
Approach LOS	C		C			A

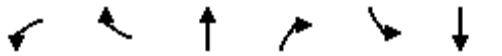
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Queue Length 50th (ft)	29	59	237		45	93
Queue Length 95th (ft)	79	144	392		117	172
Internal Link Dist (ft)	2409		1788			2205
Turn Bay Length (ft)	250				150	
Base Capacity (vph)	417	568	1750		334	1863
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.18	0.34	0.39		0.34	0.33

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 69.5
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 16.6 Intersection LOS: B
Intersection Capacity Utilization 57.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 4: New Hill Olive Chapel Road & Humie Olive Road





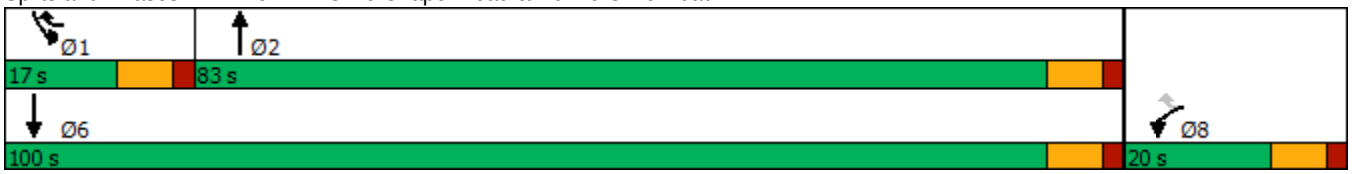
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	90	112	720	78	150	529
Future Volume (vph)	90	112	720	78	150	529
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	0		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	100				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850	0.987			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1839	0	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1583	1839	0	1770	1863
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	45		45			45
Link Distance (ft)	2489		1868			2285
Travel Time (s)	37.7		28.3			34.6
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	100	124	800	87	167	588
Shared Lane Traffic (%)						
Lane Group Flow (vph)	100	124	887	0	167	588
Turn Type	Prot	pm+ov	NA		Prot	NA
Protected Phases	8	1	2		1	6
Permitted Phases		8				
Detector Phase	8	1	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0		7.0	7.0
Minimum Split (s)	20.0	14.0	20.0		14.0	20.0
Total Split (s)	20.0	17.0	83.0		17.0	100.0
Total Split (%)	16.7%	14.2%	69.2%		14.2%	83.3%
Maximum Green (s)	13.0	10.0	76.0		10.0	93.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		None	Min
Act Effct Green (s)	12.7	26.3	53.1		12.9	73.1
Actuated g/C Ratio	0.14	0.29	0.59		0.14	0.81
v/c Ratio	0.40	0.27	0.82		0.66	0.39
Control Delay	47.1	29.9	22.7		56.9	4.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.1	29.9	22.7		56.9	4.5
LOS	D	C	C		E	A
Approach Delay	37.6		22.7			16.1
Approach LOS	D		C			B

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Queue Length 50th (ft)	54	52	399		94	99
Queue Length 95th (ft)	130	132	599		#268	157
Internal Link Dist (ft)	2409		1788			2205
Turn Bay Length (ft)	250				150	
Base Capacity (vph)	316	461	1551		253	1751
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.32	0.27	0.57		0.66	0.34

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 90.2
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 21.8 Intersection LOS: C
Intersection Capacity Utilization 69.3% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: New Hill Olive Chapel Road & Humie Olive Road



APPENDIX I

CAPACITY ANALYSIS CALCULATIONS

NEW HILL HOLLEMAN ROAD / NEW HILL CHAPEL ROAD

&

OLD US 1

Intersection	
Intersection Delay, s/veh	25.1
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	38	59	22	38	166	41	28	262	21	48	323	94
Future Vol, veh/h	38	59	22	38	166	41	28	262	21	48	323	94
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	42	66	24	42	184	46	31	291	23	53	359	104
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	13.2	17.2	19.4	36
HCM LOS	B	C	C	E

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	9%	32%	16%	10%
Vol Thru, %	84%	50%	68%	69%
Vol Right, %	7%	18%	17%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	311	119	245	465
LT Vol	28	38	38	48
Through Vol	262	59	166	323
RT Vol	21	22	41	94
Lane Flow Rate	346	132	272	517
Geometry Grp	1	1	1	1
Degree of Util (X)	0.616	0.274	0.518	0.864
Departure Headway (Hd)	6.415	7.45	6.851	6.019
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	560	485	523	599
Service Time	4.502	5.45	4.942	4.096
HCM Lane V/C Ratio	0.618	0.272	0.52	0.863
HCM Control Delay	19.4	13.2	17.2	36
HCM Lane LOS	C	B	C	E
HCM 95th-tile Q	4.2	1.1	2.9	9.7

Intersection	
Intersection Delay, s/veh	32.6
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	159	129	26	35	101	45	23	347	25	43	224	62
Future Vol, veh/h	159	129	26	35	101	45	23	347	25	43	224	62
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	177	143	29	39	112	50	26	386	28	48	249	69
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	30	17.8	44	29.4
HCM LOS	D	C	E	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	51%	19%	13%
Vol Thru, %	88%	41%	56%	68%
Vol Right, %	6%	8%	25%	19%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	395	314	181	329
LT Vol	23	159	35	43
Through Vol	347	129	101	224
RT Vol	25	26	45	62
Lane Flow Rate	439	349	201	366
Geometry Grp	1	1	1	1
Degree of Util (X)	0.884	0.745	0.452	0.748
Departure Headway (Hd)	7.247	7.686	8.1	7.371
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	500	471	442	490
Service Time	5.276	5.715	6.185	5.442
HCM Lane V/C Ratio	0.878	0.741	0.455	0.747
HCM Control Delay	44	30	17.8	29.4
HCM Lane LOS	E	D	C	D
HCM 95th-tile Q	9.7	6.2	2.3	6.3

Intersection	
Intersection Delay, s/veh	266
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	67	93	65	44	199	72	45	362	24	131	557	130
Future Vol, veh/h	67	93	65	44	199	72	45	362	24	131	557	130
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	103	72	49	221	80	50	402	27	146	619	144
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	33.1	50.4	106.1	497.4
HCM LOS	D	F	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	10%	30%	14%	16%
Vol Thru, %	84%	41%	63%	68%
Vol Right, %	6%	29%	23%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	431	225	315	818
LT Vol	45	67	44	131
Through Vol	362	93	199	557
RT Vol	24	65	72	130
Lane Flow Rate	479	250	350	909
Geometry Grp	1	1	1	1
Degree of Util (X)	1.084	0.626	0.827	2.044
Departure Headway (Hd)	10.424	11.985	11.123	8.487
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	354	305	329	436
Service Time	8.424	9.985	9.123	6.487
HCM Lane V/C Ratio	1.353	0.82	1.064	2.085
HCM Control Delay	106.1	33.1	50.4	497.4
HCM Lane LOS	F	D	F	F
HCM 95th-tile Q	13.8	3.9	7.1	60.7

Intersection	
Intersection Delay, s/veh	320.3
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	213	163	55	40	142	137	68	605	29	97	377	100
Future Vol, veh/h	213	163	55	40	142	137	68	605	29	97	377	100
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	237	181	61	44	158	152	76	672	32	108	419	111
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	178.2	84.1	500.6	337.7
HCM LOS	F	F	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	10%	49%	13%	17%
Vol Thru, %	86%	38%	45%	66%
Vol Right, %	4%	13%	43%	17%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	702	431	319	574
LT Vol	68	213	40	97
Through Vol	605	163	142	377
RT Vol	29	55	137	100
Lane Flow Rate	780	479	354	638
Geometry Grp	1	1	1	1
Degree of Util (X)	2.028	1.249	0.925	1.647
Departure Headway (Hd)	12.147	14.062	15.613	13.177
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	304	263	237	281
Service Time	10.147	12.062	13.613	11.177
HCM Lane V/C Ratio	2.566	1.821	1.494	2.27
HCM Control Delay	500.6	178.2	84.1	337.7
HCM Lane LOS	F	F	F	F
HCM 95th-tile Q	43.3	15.6	7.9	28.1

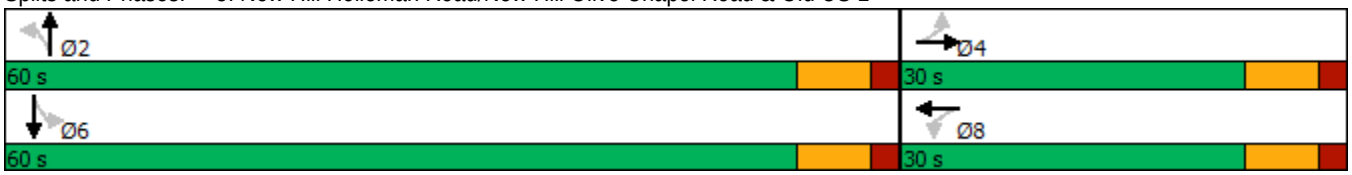
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	93	65	44	199	72	45	362	24	131	557	130
Future Volume (vph)	67	93	65	44	199	72	45	362	24	131	557	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.961			0.969			0.992			0.979	
Flt Protected		0.985			0.993			0.995			0.992	
Satd. Flow (prot)	0	1763	0	0	1792	0	0	1839	0	0	1809	0
Flt Permitted		0.648			0.904			0.853			0.845	
Satd. Flow (perm)	0	1160	0	0	1632	0	0	1576	0	0	1541	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		1767			2390			2570			2674	
Travel Time (s)		34.4			46.6			38.9			40.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	74	103	72	49	221	80	50	402	27	146	619	144
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	249	0	0	350	0	0	479	0	0	909	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	23.0	23.0		23.0	23.0		53.0	53.0		53.0	53.0	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0			-2.0			-2.0			-2.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		22.9			22.9			53.3			53.3	
Actuated g/C Ratio		0.27			0.27			0.62			0.62	
v/c Ratio		0.81			0.81			0.49			0.96	
Control Delay		51.6			45.9			11.5			38.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		51.6			45.9			11.5			38.1	
LOS		D			D			B			D	
Approach Delay		51.6			45.9			11.5			38.1	
Approach LOS		D			D			B			D	
Queue Length 50th (ft)		130			183			139			447	
Queue Length 95th (ft)		#252			#316			215			#753	
Internal Link Dist (ft)		1687			2310			2490			2594	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)												
Base Capacity (vph)		338			475			1010			987	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.74			0.74			0.47			0.92	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 86.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 34.8 Intersection LOS: C
Intersection Capacity Utilization 99.9% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: New Hill Holleman Road/New Hill Olive Chapel Road & Old US 1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	213	163	55	40	142	137	68	605	29	97	377	100
Future Volume (vph)	213	163	55	40	142	137	68	605	29	97	377	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.983			0.942			0.994			0.977	
Flt Protected		0.976			0.994			0.995			0.992	
Satd. Flow (prot)	0	1787	0	0	1744	0	0	1842	0	0	1805	0
Flt Permitted		0.588			0.905			0.881			0.718	
Satd. Flow (perm)	0	1077	0	0	1588	0	0	1631	0	0	1307	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		1767			2390			2570			2674	
Travel Time (s)		34.4			46.6			38.9			40.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	237	181	61	44	158	152	76	672	32	108	419	111
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	479	0	0	354	0	0	780	0	0	638	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	39.0	39.0		39.0	39.0		51.0	51.0		51.0	51.0	
Total Split (%)	43.3%	43.3%		43.3%	43.3%		56.7%	56.7%		56.7%	56.7%	
Maximum Green (s)	32.0	32.0		32.0	32.0		44.0	44.0		44.0	44.0	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0			-2.0			-2.0			-2.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		34.0			34.0			45.0			45.0	
Actuated g/C Ratio		0.38			0.38			0.51			0.51	
v/c Ratio		1.17			0.58			0.95			0.97	
Control Delay		127.0			27.0			43.3			50.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		127.0			27.0			43.3			50.8	
LOS		F			C			D			D	
Approach Delay		127.0			27.0			43.3			50.8	
Approach LOS		F			C			D			D	
Queue Length 50th (ft)		~329			158			395			329	
Queue Length 95th (ft)		#517			250			#654			#570	
Internal Link Dist (ft)		1687			2310			2490			2594	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)												
Base Capacity (vph)		411			606			842			675	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		1.17			0.58			0.93			0.95	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 89
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.17
Intersection Signal Delay: 60.6 Intersection LOS: E
Intersection Capacity Utilization 104.7% ICU Level of Service G
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: New Hill Holleman Road/New Hill Olive Chapel Road & Old US 1

Intersection	
Intersection Delay, s/veh	283.5
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	67	93	65	44	199	72	45	369	24	131	580	130
Future Vol, veh/h	67	93	65	44	199	72	45	369	24	131	580	130
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	103	72	49	221	80	50	410	27	146	644	144
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	33.7	51.2	113.4	525.9
HCM LOS	D	F	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	10%	30%	14%	16%
Vol Thru, %	84%	41%	63%	69%
Vol Right, %	5%	29%	23%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	438	225	315	841
LT Vol	45	67	44	131
Through Vol	369	93	199	580
RT Vol	24	65	72	130
Lane Flow Rate	487	250	350	934
Geometry Grp	1	1	1	1
Degree of Util (X)	1.105	0.627	0.828	2.108
Departure Headway (Hd)	10.557	12.198	11.307	8.535
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	350	300	322	439
Service Time	8.557	10.198	9.307	6.535
HCM Lane V/C Ratio	1.391	0.833	1.087	2.128
HCM Control Delay	113.4	33.7	51.2	525.9
HCM Lane LOS	F	D	F	F
HCM 95th-tile Q	14.3	3.9	7.1	63.7

Intersection	
Intersection Delay, s/veh	339.3
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	213	163	55	40	142	137	68	629	29	97	391	100
Future Vol, veh/h	213	163	55	40	142	137	68	629	29	97	391	100
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	237	181	61	44	158	152	76	699	32	108	434	111
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	179.7	85.5	532.2	355.9
HCM LOS	F	F	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	9%	49%	13%	16%
Vol Thru, %	87%	38%	45%	66%
Vol Right, %	4%	13%	43%	17%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	726	431	319	588
LT Vol	68	213	40	97
Through Vol	629	163	142	391
RT Vol	29	55	137	100
Lane Flow Rate	807	479	354	653
Geometry Grp	1	1	1	1
Degree of Util (X)	2.099	1.25	0.925	1.688
Departure Headway (Hd)	12.269	14.366	16.001	13.387
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	307	259	230	281
Service Time	10.269	12.366	14.001	11.387
HCM Lane V/C Ratio	2.629	1.849	1.539	2.324
HCM Control Delay	532.2	179.7	85.5	355.9
HCM Lane LOS	F	F	F	F
HCM 95th-tile Q	45.4	15.4	7.8	29

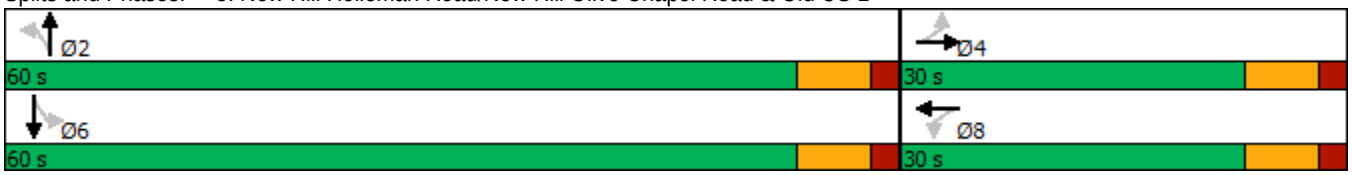
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	93	65	44	199	72	45	369	24	131	580	130
Future Volume (vph)	67	93	65	44	199	72	45	369	24	131	580	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.961			0.969			0.993			0.979	
Flt Protected		0.985			0.993			0.995			0.992	
Satd. Flow (prot)	0	1763	0	0	1792	0	0	1840	0	0	1809	0
Flt Permitted		0.639			0.901			0.851			0.847	
Satd. Flow (perm)	0	1144	0	0	1626	0	0	1574	0	0	1545	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		1767			2390			2570			2674	
Travel Time (s)		34.4			46.6			38.9			40.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	74	103	72	49	221	80	50	410	27	146	644	144
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	249	0	0	350	0	0	487	0	0	934	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	23.0	23.0		23.0	23.0		53.0	53.0		53.0	53.0	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0			-2.0			-2.0			-2.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		23.1			23.1			55.0			55.0	
Actuated g/C Ratio		0.26			0.26			0.62			0.62	
v/c Ratio		0.83			0.82			0.50			0.97	
Control Delay		55.3			48.0			11.6			40.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		55.3			48.0			11.6			40.6	
LOS		E			D			B			D	
Approach Delay		55.3			48.0			11.6			40.6	
Approach LOS		E			D			B			D	
Queue Length 50th (ft)		130			183			142			476	
Queue Length 95th (ft)		#255			#317			221			#783	
Internal Link Dist (ft)		1687			2310			2490			2594	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)												
Base Capacity (vph)		324			461			982			965	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.77			0.76			0.50			0.97	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 88.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 36.7 Intersection LOS: D
Intersection Capacity Utilization 101.4% ICU Level of Service G
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: New Hill Holleman Road/New Hill Olive Chapel Road & Old US 1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	213	163	55	40	142	137	68	629	29	97	391	100
Future Volume (vph)	213	163	55	40	142	137	68	629	29	97	391	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.983			0.942			0.995			0.977	
Flt Protected		0.976			0.994			0.995			0.992	
Satd. Flow (prot)	0	1787	0	0	1744	0	0	1844	0	0	1805	0
Flt Permitted		0.584			0.905			0.882			0.715	
Satd. Flow (perm)	0	1069	0	0	1588	0	0	1635	0	0	1301	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		1767			2390			2570			2674	
Travel Time (s)		34.4			46.6			38.9			40.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	237	181	61	44	158	152	76	699	32	108	434	111
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	479	0	0	354	0	0	807	0	0	653	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	39.0	39.0		39.0	39.0		51.0	51.0		51.0	51.0	
Total Split (%)	43.3%	43.3%		43.3%	43.3%		56.7%	56.7%		56.7%	56.7%	
Maximum Green (s)	32.0	32.0		32.0	32.0		44.0	44.0		44.0	44.0	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0			-2.0			-2.0			-2.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		34.0			34.0			46.0			46.0	
Actuated g/C Ratio		0.38			0.38			0.51			0.51	
v/c Ratio		1.19			0.59			0.97			0.98	
Control Delay		135.7			27.4			47.1			54.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		135.7			27.4			47.1			54.9	
LOS		F			C			D			D	
Approach Delay		135.7			27.4			47.1			54.9	
Approach LOS		F			C			D			D	
Queue Length 50th (ft)		~331			158			421			346	
Queue Length 95th (ft)		#519			250			#687			#591	
Internal Link Dist (ft)		1687			2310			2490			2594	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)												
Base Capacity (vph)		403			599			835			664	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		1.19			0.59			0.97			0.98	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.19
Intersection Signal Delay: 64.8 Intersection LOS: E
Intersection Capacity Utilization 105.9% ICU Level of Service G
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: New Hill Holleman Road/New Hill Olive Chapel Road & Old US 1

APPENDIX J

CAPACITY ANALYSIS CALCULATIONS
HORTON RIDGE BOULEVARD (SITE ACCESS)
&
NEW HILL CHAPEL ROAD

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	3	12	1	4	3	17	322	2	3	452	12
Future Vol, veh/h	6	3	12	1	4	3	17	322	2	3	452	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	175	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	3	13	1	4	3	19	358	2	3	502	13

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	916	913	509	919	917	358	515	0	0	360	0	0
Stage 1	515	515	-	396	396	-	-	-	-	-	-	-
Stage 2	401	398	-	523	521	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	253	273	564	252	272	686	1051	-	-	1199	-	-
Stage 1	543	535	-	629	604	-	-	-	-	-	-	-
Stage 2	626	603	-	537	532	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	245	267	564	240	266	686	1051	-	-	1199	-	-
Mov Cap-2 Maneuver	245	267	-	240	266	-	-	-	-	-	-	-
Stage 1	533	533	-	618	593	-	-	-	-	-	-	-
Stage 2	607	592	-	520	530	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.4	15.9	0.4	0.1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1051	-	-	368	339	1199	-	-
HCM Lane V/C Ratio	0.018	-	-	0.063	0.026	0.003	-	-
HCM Control Delay (s)	8.5	-	-	15.4	15.9	8	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.1	0	-	-

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	1	20	3	2	4	9	538	4	2	306	8
Future Vol, veh/h	15	1	20	3	2	4	9	538	4	2	306	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	175	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	1	22	3	2	4	10	598	4	2	340	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	972	971	345	978	971	598	349	0	0	602	0	0
Stage 1	349	349	-	618	618	-	-	-	-	-	-	-
Stage 2	623	622	-	360	353	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	232	253	698	230	253	502	1210	-	-	975	-	-
Stage 1	667	633	-	477	481	-	-	-	-	-	-	-
Stage 2	474	479	-	658	631	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	227	250	698	220	250	502	1210	-	-	975	-	-
Mov Cap-2 Maneuver	227	250	-	220	250	-	-	-	-	-	-	-
Stage 1	662	632	-	473	477	-	-	-	-	-	-	-
Stage 2	464	475	-	635	630	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.1	17.2	0.1	0.1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1210	-	-	365	304	975	-	-
HCM Lane V/C Ratio	0.008	-	-	0.11	0.033	0.002	-	-
HCM Control Delay (s)	8	-	-	16.1	17.2	8.7	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.1	0	-	-

Intersection	
Int Delay, s/veh	14.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	3	59	60	5	89	36	448	21	30	642	22
Future Vol, veh/h	29	3	59	60	5	89	36	448	21	30	642	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	175	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	32	3	66	67	6	99	40	498	23	33	713	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1433	1392	725	1404	1381	498	737	0	0	521	0	0
Stage 1	791	791	-	578	578	-	-	-	-	-	-	-
Stage 2	642	601	-	826	803	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	112	142	425	117	144	572	869	-	-	1045	-	-
Stage 1	383	401	-	501	501	-	-	-	-	-	-	-
Stage 2	463	489	-	366	396	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	84	131	425	91	133	572	869	-	-	1045	-	-
Mov Cap-2 Maneuver	84	131	-	91	133	-	-	-	-	-	-	-
Stage 1	365	388	-	478	478	-	-	-	-	-	-	-
Stage 2	361	467	-	297	383	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	48	105.4	0.7	0.4
HCM LOS	E	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	869	-	-	180	181	1045	-	-
HCM Lane V/C Ratio	0.046	-	-	0.562	0.945	0.032	-	-
HCM Control Delay (s)	9.3	-	-	48	105.4	8.6	-	-
HCM Lane LOS	A	-	-	E	F	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	3	7.4	0.1	-	-

Intersection	
Int Delay, s/veh	22.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	32	1	53	40	2	58	60	768	66	96	468	34
Future Vol, veh/h	32	1	53	40	2	58	60	768	66	96	468	34
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	175	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	1	59	44	2	64	67	853	73	107	520	38

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1810	1813	539	1770	1759	853	558	0	0	926	0	0
Stage 1	753	753	-	987	987	-	-	-	-	-	-	-
Stage 2	1057	1060	-	783	772	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	61	78	542	65	85	359	1013	-	-	738	-	-
Stage 1	402	417	-	298	325	-	-	-	-	-	-	-
Stage 2	272	301	-	387	409	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	41	62	542	48	68	359	1013	-	-	738	-	-
Mov Cap-2 Maneuver	41	62	-	48	68	-	-	-	-	-	-	-
Stage 1	375	357	-	278	304	-	-	-	-	-	-	-
Stage 2	207	281	-	294	350	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	171.1	212	0.6	1.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1013	-	-	96	98	738	-	-
HCM Lane V/C Ratio	0.066	-	-	0.995	1.134	0.145	-	-
HCM Control Delay (s)	8.8	-	-	171.1	212	10.7	-	-
HCM Lane LOS	A	-	-	F	F	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-	6	7.3	0.5	-	-

Intersection	
Int Delay, s/veh	24

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	3	59	71	5	101	36	452	24	34	654	22
Future Vol, veh/h	29	3	59	71	5	101	36	452	24	34	654	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	175	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	32	3	66	79	6	112	40	502	27	38	727	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1470	1424	739	1432	1409	502	751	0	0	529	0	0
Stage 1	815	815	-	582	582	-	-	-	-	-	-	-
Stage 2	655	609	-	850	827	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	105	136	417	112	139	569	858	-	-	1038	-	-
Stage 1	371	391	-	499	499	-	-	-	-	-	-	-
Stage 2	455	485	-	355	386	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	76	125	417	87	128	569	858	-	-	1038	-	-
Mov Cap-2 Maneuver	76	125	-	87	128	-	-	-	-	-	-	-
Stage 1	354	377	-	476	476	-	-	-	-	-	-	-
Stage 2	344	462	-	286	372	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	55.7	169.5	0.7	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	858	-	-	166	171	1038	-	-
HCM Lane V/C Ratio	0.047	-	-	0.609	1.15	0.036	-	-
HCM Control Delay (s)	9.4	-	-	55.7	169.5	8.6	-	-
HCM Lane LOS	A	-	-	F	F	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	3.3	10.3	0.1	-	-

Intersection

Int Delay, s/veh	34.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	32	1	53	47	2	65	60	780	78	108	475	34
Future Vol, veh/h	32	1	53	47	2	65	60	780	78	108	475	34
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	175	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	1	59	52	2	72	67	867	87	120	528	38

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1869	1875	547	1818	1807	867	566	0	0	954	0	0
Stage 1	787	787	-	1001	1001	-	-	-	-	-	-	-
Stage 2	1082	1088	-	817	806	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	55	72	537	60	79	352	1006	-	-	720	-	-
Stage 1	385	403	-	293	321	-	-	-	-	-	-	-
Stage 2	263	292	-	370	395	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 35	56	537	~ 44	61	352	1006	-	-	720	-	-
Mov Cap-2 Maneuver	~ 35	56	-	~ 44	61	-	-	-	-	-	-	-
Stage 1	359	336	-	273	299	-	-	-	-	-	-	-
Stage 2	194	272	-	274	329	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	236.1	$ 327.7	0.6	1.9
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1006	-	-	83	89	720	-	-
HCM Lane V/C Ratio	0.066	-	-	1.151	1.423	0.167	-	-
HCM Control Delay (s)	8.8	-	-	236.1	$ 327.7	11	-	-
HCM Lane LOS	A	-	-	F	F	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-	6.8	9.6	0.6	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

APPENDIX K

CAPACITY ANALYSIS CALCULATIONS

NEW HILL OLIVE CHAPEL ROAD

&

JORDAN MANORS DRIVE / OLIVE RIDGE DRIVE (SITE ACCESS)

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	4	36	37	4	9	12	557	12	3	647	5
Future Vol, veh/h	14	4	36	37	4	9	12	557	12	3	647	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	4	40	41	4	10	13	619	13	3	719	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1387	1386	722	1402	1383	626	725	0	0	632	0	0
Stage 1	728	728	-	652	652	-	-	-	-	-	-	-
Stage 2	659	658	-	750	731	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	120	143	427	117	144	484	878	-	-	951	-	-
Stage 1	415	429	-	457	464	-	-	-	-	-	-	-
Stage 2	453	461	-	403	427	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	113	140	427	102	141	484	878	-	-	951	-	-
Mov Cap-2 Maneuver	113	140	-	102	141	-	-	-	-	-	-	-
Stage 1	409	428	-	450	457	-	-	-	-	-	-	-
Stage 2	433	454	-	360	426	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.3	57.1	0.2	0
HCM LOS	D	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	878	-	-	228	122	951	-	-
HCM Lane V/C Ratio	0.015	-	-	0.263	0.455	0.004	-	-
HCM Control Delay (s)	9.2	-	-	26.3	57.1	8.8	-	-
HCM Lane LOS	A	-	-	D	F	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1	2	0	-	-

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	4	23	24	4	6	41	805	42	11	574	15
Future Vol, veh/h	9	4	23	24	4	6	41	805	42	11	574	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	4	26	27	4	7	46	894	47	12	638	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1686	1704	647	1696	1689	918	655	0	0	941	0	0
Stage 1	671	671	-	1010	1010	-	-	-	-	-	-	-
Stage 2	1015	1033	-	686	679	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	74	91	471	73	93	329	932	-	-	729	-	-
Stage 1	446	455	-	289	317	-	-	-	-	-	-	-
Stage 2	287	310	-	438	451	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	66	85	471	63	87	329	932	-	-	729	-	-
Mov Cap-2 Maneuver	66	85	-	63	87	-	-	-	-	-	-	-
Stage 1	424	448	-	275	301	-	-	-	-	-	-	-
Stage 2	263	295	-	403	444	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	36.1	92.2	0.4	0.2
HCM LOS	E	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	932	-	-	155	76	729	-	-
HCM Lane V/C Ratio	0.049	-	-	0.258	0.497	0.017	-	-
HCM Control Delay (s)	9.1	-	-	36.1	92.2	10	-	-
HCM Lane LOS	A	-	-	E	F	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-	1	2.1	0.1	-	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	4	36	49	4	21	12	569	16	7	651	5
Future Vol, veh/h	14	4	36	49	4	21	12	569	16	7	651	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	4	40	54	4	23	13	632	18	8	723	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1423	1418	726	1431	1412	641	729	0	0	650	0	0
Stage 1	742	742	-	667	667	-	-	-	-	-	-	-
Stage 2	681	676	-	764	745	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	114	137	425	112	138	475	875	-	-	936	-	-
Stage 1	408	422	-	448	457	-	-	-	-	-	-	-
Stage 2	440	453	-	396	421	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	104	134	425	97	135	475	875	-	-	936	-	-
Mov Cap-2 Maneuver	104	134	-	97	135	-	-	-	-	-	-	-
Stage 1	402	418	-	441	450	-	-	-	-	-	-	-
Stage 2	408	446	-	352	417	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	27.8	73.5	0.2	0.1
HCM LOS	D	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	875	-	-	217	128	936	-	-
HCM Lane V/C Ratio	0.015	-	-	0.276	0.642	0.008	-	-
HCM Control Delay (s)	9.2	-	-	27.8	73.5	8.9	-	-
HCM Lane LOS	A	-	-	D	F	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.1	3.4	0	-	-

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	4	23	31	4	13	41	812	54	23	586	15
Future Vol, veh/h	9	4	23	31	4	13	41	812	54	23	586	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	4	26	34	4	14	46	902	60	26	651	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1745	1766	660	1751	1744	932	668	0	0	962	0	0
Stage 1	712	712	-	1024	1024	-	-	-	-	-	-	-
Stage 2	1033	1054	-	727	720	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	68	84	463	67	86	323	922	-	-	715	-	-
Stage 1	423	436	-	284	313	-	-	-	-	-	-	-
Stage 2	281	303	-	415	432	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	58	77	463	57	79	323	922	-	-	715	-	-
Mov Cap-2 Maneuver	58	77	-	57	79	-	-	-	-	-	-	-
Stage 1	402	420	-	270	297	-	-	-	-	-	-	-
Stage 2	251	288	-	374	416	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	40.7	124.8	0.4	0.4
HCM LOS	E	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	922	-	-	140	76	715	-	-
HCM Lane V/C Ratio	0.049	-	-	0.286	0.702	0.036	-	-
HCM Control Delay (s)	9.1	-	-	40.7	124.8	10.2	-	-
HCM Lane LOS	A	-	-	E	F	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-	1.1	3.3	0.1	-	-

APPENDIX L

CAPACITY ANALYSIS CALCULATIONS

HUMIE OLIVE ROAD

&

SITE DRIVE

Intersection	
Int Delay, s/veh	3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	193	18	29	183	58	92
Future Vol, veh/h	193	18	29	183	58	92
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	214	20	32	203	64	102

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	234	0	491	224
Stage 1	-	-	-	-	224	-
Stage 2	-	-	-	-	267	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1333	-	537	815
Stage 1	-	-	-	-	813	-
Stage 2	-	-	-	-	778	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1333	-	524	815
Mov Cap-2 Maneuver	-	-	-	-	524	-
Stage 1	-	-	-	-	813	-
Stage 2	-	-	-	-	759	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	12.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	671	-	-	1333	-
HCM Lane V/C Ratio	0.248	-	-	0.024	-
HCM Control Delay (s)	12.1	-	-	7.8	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1	-	-	0.1	-

Intersection	
Int Delay, s/veh	3.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	167	61	97	166	36	58
Future Vol, veh/h	167	61	97	166	36	58
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	186	68	108	184	40	64

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	254	0	620	220
Stage 1	-	-	-	-	220	-
Stage 2	-	-	-	-	400	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1311	-	452	820
Stage 1	-	-	-	-	817	-
Stage 2	-	-	-	-	677	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1311	-	415	820
Mov Cap-2 Maneuver	-	-	-	-	415	-
Stage 1	-	-	-	-	817	-
Stage 2	-	-	-	-	621	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.9	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	597	-	-	1311	-
HCM Lane V/C Ratio	0.175	-	-	0.082	-
HCM Control Delay (s)	12.3	-	-	8	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.6	-	-	0.3	-

APPENDIX M

SIMTRAFFIC QUEUING RESULTS

Intersection: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	T
Maximum Queue (ft)	199	242	238	110	142	112	93	159	160	113
Average Queue (ft)	54	119	21	51	38	29	38	76	72	56
95th Queue (ft)	158	235	101	99	93	66	88	139	132	113
Link Distance (ft)		818			1758		654			1496
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		150	275		350		225	125	
Storage Blk Time (%)	0	13							4	0
Queuing Penalty (veh)	2	21							13	0

Intersection: 2: Richardson Road & Humie Olive Road

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	88	24	94
Average Queue (ft)	24	10	44
95th Queue (ft)	59	27	74
Link Distance (ft)	1897	750	1530
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Olive Farm Road & Humie Olive Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	28	66
Average Queue (ft)	2	32
95th Queue (ft)	13	52
Link Distance (ft)		811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: New Hill Olive Chapel Road & Humie Olive Road

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	129	80	71
Average Queue (ft)	33	32	30
95th Queue (ft)	74	72	62
Link Distance (ft)		2396	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	250		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: New Hill Holleman Road/New Hill Olive Chapel Road & Old US 1

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	157	210	318	2632
Average Queue (ft)	78	93	143	2572
95th Queue (ft)	136	171	261	2833
Link Distance (ft)	1733	2343	2527	2620
Upstream Blk Time (%)				21
Queuing Penalty (veh)				163
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: New Hill Olive Chapel Road & Horton Ridge Boulevard

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	L	L	TR
Maximum Queue (ft)	1339	1411	30	250	1542
Average Queue (ft)	572	958	10	83	709
95th Queue (ft)	1314	1812	32	272	1731
Link Distance (ft)	1324	1358			1523
Upstream Blk Time (%)	5	54			17
Queuing Penalty (veh)	0	0			128
Storage Bay Dist (ft)			150	150	
Storage Blk Time (%)					71
Queuing Penalty (veh)					25

Intersection: 7: New Hill Olive Chapel Road & Jordan Manors Drive/Olive Ridge Drive

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	L	L	TR
Maximum Queue (ft)	96	701	21	30	1599
Average Queue (ft)	42	154	2	1	317
95th Queue (ft)	77	537	11	10	1169
Link Distance (ft)	956	822			1969
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			150	50	
Storage Blk Time (%)				0	30
Queuing Penalty (veh)				0	2

Intersection: 8: Site Drive & Humie Olive Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	31	50
Average Queue (ft)	9	36
95th Queue (ft)	29	55
Link Distance (ft)		893
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 355

Intersection: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	T
Maximum Queue (ft)	200	286	51	65	162	111	90	93	91	106
Average Queue (ft)	36	88	7	21	66	35	33	38	41	46
95th Queue (ft)	117	206	31	51	142	71	71	80	80	97
Link Distance (ft)		818			1758		654			1496
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		150	275		350		225	125	
Storage Blk Time (%)		7								0
Queuing Penalty (veh)		7								0

Intersection: 2: Richardson Road & Humie Olive Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	68	25	23	152
Average Queue (ft)	23	1	5	53
95th Queue (ft)	57	8	20	105
Link Distance (ft)	1897	2503	750	1530
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Olive Farm Road & Humie Olive Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	52	74
Average Queue (ft)	15	30
95th Queue (ft)	40	54
Link Distance (ft)		811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 4: New Hill Olive Chapel Road & Humie Olive Road

Movement	WB	WB	NB	SB
Directions Served	L	R	TR	L
Maximum Queue (ft)	149	36	49	74
Average Queue (ft)	42	15	3	46
95th Queue (ft)	100	33	19	72
Link Distance (ft)		2396	1789	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	250			150
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: New Hill Holleman Road/New Hill Olive Chapel Road & Old US 1

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	538	229	2579	2629
Average Queue (ft)	262	116	2491	1827
95th Queue (ft)	464	196	2779	2878
Link Distance (ft)	1733	2343	2527	2620
Upstream Blk Time (%)			85	8
Queuing Penalty (veh)			0	43
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: New Hill Olive Chapel Road & Horton Ridge Boulevard

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	L	L	TR
Maximum Queue (ft)	198	267	31	250	878
Average Queue (ft)	59	86	11	73	132
95th Queue (ft)	134	228	33	211	573
Link Distance (ft)	1324	1358			1523
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			150	150	
Storage Blk Time (%)					19
Queuing Penalty (veh)					20

Intersection: 7: New Hill Olive Chapel Road & Jordan Manors Drive/Olive Ridge Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	49	47	25	50
Average Queue (ft)	22	19	8	10
95th Queue (ft)	46	41	26	35
Link Distance (ft)	956	822		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			150	50
Storage Blk Time (%)				0
Queuing Penalty (veh)				2

Intersection: 8: Site Drive & Humie Olive Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	53	70
Average Queue (ft)	18	31
95th Queue (ft)	47	45
Link Distance (ft)		893
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 72

Intersection: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	T
Maximum Queue (ft)	199	264	73	130	192	68	128	152	142	130
Average Queue (ft)	39	125	20	46	52	23	49	87	70	53
95th Queue (ft)	119	263	62	103	137	55	107	137	125	110
Link Distance (ft)		818			1758		654			1496
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		150	275		350		225	125	
Storage Blk Time (%)		14							5	1
Queuing Penalty (veh)		21							13	5

Intersection: 2: Richardson Road & Humie Olive Road

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	89	47	189
Average Queue (ft)	32	8	60
95th Queue (ft)	75	29	124
Link Distance (ft)	1897	750	1530
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Olive Farm Road & Humie Olive Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	31	54
Average Queue (ft)	4	38
95th Queue (ft)	20	59
Link Distance (ft)		811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 4: New Hill Olive Chapel Road & Humie Olive Road

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	125	142	300	139	193
Average Queue (ft)	36	51	175	60	65
95th Queue (ft)	79	108	255	112	152
Link Distance (ft)		2396	1789		2256
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	250			150	
Storage Blk Time (%)				0	0
Queuing Penalty (veh)				3	0

Intersection: 5: New Hill Holleman Road/New Hill Olive Chapel Road & Old US 1

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	905	584	387	1696
Average Queue (ft)	338	322	160	821
95th Queue (ft)	658	553	322	1673
Link Distance (ft)	1733	2343	2527	2620
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: New Hill Olive Chapel Road & Horton Ridge Boulevard

Movement	EB	WB	WB	NB	SB	SB
Directions Served	LTR	LT	R	L	L	TR
Maximum Queue (ft)	92	112	64	50	27	13
Average Queue (ft)	40	44	32	15	5	0
95th Queue (ft)	71	81	55	40	21	4
Link Distance (ft)	1324	1359				1515
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			150	150	150	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 7: New Hill Olive Chapel Road & Jordan Manors Drive/Olive Ridge Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	55	71	25	30
Average Queue (ft)	30	30	3	3
95th Queue (ft)	55	57	15	17
Link Distance (ft)	956	822		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			150	50
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 8: Site Drive & Humie Olive Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	28	65
Average Queue (ft)	6	34
95th Queue (ft)	24	54
Link Distance (ft)		893
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 42

Intersection: 1: Apex Friendship Middle School Campus Driveway/Evans Road & Humie Olive Road

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	T
Maximum Queue (ft)	50	224	31	103	293	64	91	140	111	113
Average Queue (ft)	22	96	9	22	78	26	32	48	48	32
95th Queue (ft)	51	184	30	57	180	55	73	100	93	76
Link Distance (ft)		818			1758		654			1496
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	100		150	275		350		225	125	
Storage Blk Time (%)		8			0				0	0
Queuing Penalty (veh)		7			0				0	0

Intersection: 2: Richardson Road & Humie Olive Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	49	31	23	125
Average Queue (ft)	15	2	6	48
95th Queue (ft)	45	14	20	90
Link Distance (ft)	1897	2503	750	1530
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Olive Farm Road & Humie Olive Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	28	52
Average Queue (ft)	8	28
95th Queue (ft)	27	54
Link Distance (ft)		811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: New Hill Olive Chapel Road & Humie Olive Road

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	139	74	326	197	201
Average Queue (ft)	47	35	190	111	64
95th Queue (ft)	104	70	295	172	152
Link Distance (ft)		2396	1789		2256
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	250			150	
Storage Blk Time (%)				4	0
Queuing Penalty (veh)				20	1

Intersection: 5: New Hill Holleman Road/New Hill Olive Chapel Road & Old US 1

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	1767	936	1431	1468
Average Queue (ft)	1687	590	600	569
95th Queue (ft)	1942	953	1227	1103
Link Distance (ft)	1733	2343	2527	2620
Upstream Blk Time (%)	85			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: New Hill Olive Chapel Road & Horton Ridge Boulevard

Movement	EB	WB	WB	NB	NB	SB
Directions Served	LTR	LT	R	L	R	L
Maximum Queue (ft)	198	48	65	55	52	112
Average Queue (ft)	44	26	30	15	2	32
95th Queue (ft)	110	51	55	40	18	77
Link Distance (ft)	1324	1359				
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			150	150	175	150
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 7: New Hill Olive Chapel Road & Jordan Manors Drive/Olive Ridge Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	50	87	47	50
Average Queue (ft)	25	27	7	14
95th Queue (ft)	48	57	24	38
Link Distance (ft)	956	822		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			150	50
Storage Blk Time (%)				0
Queuing Penalty (veh)				1

Intersection: 8: Site Drive & Humie Olive Road

Movement	EB	WB	NB
Directions Served	TR	L	LR
Maximum Queue (ft)	22	53	44
Average Queue (ft)	1	11	26
95th Queue (ft)	7	38	36
Link Distance (ft)	2396		893
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 29

PLANNING BOARD REPORT TO TOWN COUNCIL

Rezoning Case: 19CZ21 Heelan PUD

Planning Board Meeting Date: September 14 and 16, 2020

Report Requirements:

Per NCGS 160A-387, all proposed amendments to the zoning ordinance or zoning map shall have a written report provided from the Planning Board to the Town Council within 30 days of referral of the amendment to the Planning Board, or the Town Council may proceed in its consideration of the amendment without the Planning Board report. Furthermore, in no case is the Town Council bound by the recommendations, if any, of the Planning Board.

Per NCGS 160A-383, the Planning Board shall advise and comment on whether the proposed zoning amendment is consistent with all applicable officially adopted plans, and provide a written recommendation to the Town Council that addresses plan consistency and other matters as deemed appropriate by the Planning Board, but a comment by the Planning Board that a proposed amendment is inconsistent with the officially adopted plans shall not preclude consideration or approval of the proposed amendment by the Town Council.

PROJECT DESCRIPTION:

Acreage:	+/- 141.732 acres
PIN(s):	0710986889 (portion of), 0720093139 (portion of), 0720181967, 0720075965, 072
Current Zoning:	Wake County Residential-40W (R-40W)
Proposed Zoning:	Planned Unit Development-Conditional Zoning (PUD-CZ)
2045 Land Use Map:	Low Density Residential/Medium Density Residential
Town Limits:	In Wake County (Annexation required at the time of rezoning)

Applicable Officially Adopted Plans:

The Board must state whether the project is consistent or inconsistent with the following officially adopted plans, if applicable. Applicable plans have a check mark next to them.

☑ 2045 Land Use Map
☑ Consistent ☐ Inconsistent Reason: _____

☑ Apex Transportation Plan
☑ Consistent ☐ Inconsistent Reason: _____

☑ Parks, Recreation, Open Space, and Greenways Plan
☑ Consistent ☐ Inconsistent Reason: _____

Legislative Considerations:

The applicant shall propose site-specific standards and conditions that take into account the following considerations, which are considerations that are relevant to the legislative determination of whether or not the proposed conditional zoning district rezoning request is in the public interest. These considerations do not exclude the legislative consideration of any other factor that is relevant to the public interest.

1. *Consistency with 2045 Land Use Plan*. The proposed Conditional Zoning (CZ) District use's appropriateness for its proposed location and consistency with the purposes, goals, objectives, and policies of the 2045 Land Use Plan.
   ☑ Consistent ☐ Inconsistent Reason: _____

2. *Compatibility.* The proposed Conditional Zoning (CZ) District use's appropriateness for its proposed location and compatibility with the character of surrounding land uses.
   ☑ Consistent ☐ Inconsistent Reason: _____

3. *Zoning district supplemental standards*. The proposed Conditional Zoning (CZ) District use's compliance with Sec. 4.4 *Supplemental Standards*, if applicable.
   ☑ Consistent ☐ Inconsistent Reason: _____

4. *Design minimizes adverse impact.* The design of the proposed Conditional Zoning (CZ) District use's minimization of adverse effects, including visual impact of the proposed use on adjacent lands; and avoidance of significant adverse impacts on surrounding lands regarding trash, traffic, service delivery, parking and loading, odors, noise, glare, and vibration and not create a nuisance.
   ☑ Consistent ☐ Inconsistent Reason: _____

5. *Design minimizes environmental impact.* The proposed Conditional Zoning District use's minimization of environmental impacts and protection from significant deterioration of water and air resources, wildlife habitat, scenic resources, and other natural resources.
   ☑ Consistent ☐ Inconsistent Reason: _____

6. *Impact on public facilities.* The proposed Conditional Zoning (CZ) District use's avoidance of having adverse impacts on public facilities and services, including roads, potable water and wastewater facilities, parks, schools, police, fire and EMS facilities.
☑ Consistent ☐ Inconsistent Reason: _____

7. *Health, safety, and welfare.* The proposed Conditional Zoning (CZ) District use's effect on the health, safety, or welfare of the residents of the Town or its ETJ.
☑ Consistent ☐ Inconsistent Reason: _____

8. *Detrimental to adjacent properties.* Whether the proposed Conditional Zoning (CZ) District use is substantially detrimental to adjacent properties.
☑ Consistent ☐ Inconsistent Reason: _____

9. *Not constitute nuisance or hazard.* Whether the proposed Conditional Zoning (CZ) District use constitutes a nuisance or hazard due to traffic impact or noise, or because of the number of persons who will be using the Conditional Zoning (CZ) District use.
☑ Consistent ☐ Inconsistent Reason: _____

10. *Other relevant standards of this Ordinance.* Whether the proposed Conditional Zoning (CZ) District use complies with all standards imposed on it by all other applicable provisions of this Ordinance for use, layout, and general development characteristics.
☑ Consistent ☐ Inconsistent Reason: _____

Planning Board Recommendation:

Motion: Motion to recommend approval as presented by the staff.

Introduced by Planning Board member: Mark Steele

Seconded by Planning Board member: Tim Royal

☐ *Approval*: the project is consistent with all applicable officially adopted plans and the applicable legislative considerations listed above.

☑ *Approval with conditions*: the project is not consistent with all applicable officially adopted plans and/or the applicable legislative considerations as noted above, so the following conditions are recommended to be included in the project in order to make it fully consistent:

Conditions as offered by applicant.

☐ *Denial*: the project is not consistent with all applicable officially adopted plans and/or the applicable legislative considerations as noted above.

With 6 Planning Board Member(s) voting "aye"

With 0* Planning Board Member(s) voting "no"

Reasons for dissenting votes:

* One abstention due to technical difficulties (Keith Braswell)

This report reflects the recommendation of the Planning Board, this the 16th day of September 2020.

Attest:

Michael Marks Digitally signed by Michael Marks Date: 2020.09.25 08:11:15 -04'00'

Michael Marks, Planning Board Chair

Dianne Khin Digitally signed by Dianne Khin Date: 2020.09.16 17:45:00 -04'00'

Dianne Khin, Planning Director

TOWN OF APEX
POST OFFICE BOX 250
APEX, NORTH CAROLINA 27502
PHONE 919-249-3426

PUBLIC NOTIFICATION
OF PUBLIC HEARINGS
CONDITIONAL ZONING #19CZ21
Heelan PUD

Pursuant to the provisions of North Carolina General Statutes §160A-364 and to the Town of Apex Unified Development Ordinance (UDO) Section 2.2.11, notice is hereby given of public hearings before the Planning Board of the Town of Apex. The purpose of these hearings is to consider the following:

Applicant: Jason Barron, Morningstar Law Group
Authorized Agent: Erica Leatham, M/I Homes of Raleigh, LLC
Property Addresses: 8824 & 8829 New Hope Farm Road; 3108 & 3120 Olive Farm Road; 0 Humie Olive Road
Acreage: ±141.732 acres
Property Identification Numbers (PINs): 0710986889 (portion of), 0720093139 (portion of), 0720181967, 0720075965, 0720092779
Current 2045 Land Use Map Designation: Low Density Residential and Medium Density Residential
Existing Zoning of Properties: Wake County Residential-40W (R-40W)
Proposed Zoning of Properties: Planned Unit Development-Conditional Zoning (PUD-CZ)

Planning Board Remote Public Hearing Date and Time: September 14, 2020 4:30 PM

Watch and listen to the livestream here: https://bit.ly/2YtxLPn or http://www.apexnc.org/calendar.aspx (click on the Planning Board link for this day in the calendar)
Call in using the phone number to listen only: 828-552-5717 Conference ID: 498 514 647#
Follow along with the presentation by viewing a copy of the meeting materials posted the day of the meeting at: http://www.apexnc.org/182.

Comments may be shared following instructions in the Remote Participation Policy. The policy includes options to provide comments by email (public.hearing@apexnc.org, 350-word limit) or voicemail (919-372-7300, 3-minute limit). Comments shared by noon on Friday, September 11, 2020, will be read during the Planning Board meeting.

***Planning Board Remote Review of Additional Comments and Vote Date and Time: September 16, 2020 5:00 PM**

**According to NCGS §166A-19.24, when a public hearing is held with at least one member attending virtually, written comments on the subject of the public hearing may be submitted between publication of any required notice and 24 hours after the public hearing.*

Watch and listen to the livestream here: https://bit.ly/3gwILD2 or http://www.apexnc.org/calendar.aspx (click on the Planning Board link for this day in the calendar)
Call in using the phone number to listen only: 828-552-5717 Conference ID: 270 333 286#
Follow along with the presentation by viewing a copy of the meeting materials posted the day of the meeting at: http://www.apexnc.org/182.

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A separate notice of the Town Council public hearing on this project will be mailed and posted in order to comply with State public notice requirements.

Vicinity Map:

Property owners within 300 feet of the proposed conditional zoning have been sent this notice via first class mail. All interested parties may appear at the public hearing and be heard with respect to the application. Maps showing the location for the above site(s) to be considered in addition to a copy of the 2045 Land Use Map can be inspected at the Apex Town Hall or call 919-249-3426, Department of Planning and Community Development, for further information. To view the petition and related documents on-line: https://www.apexnc.org/DocumentCenter/View/29295.

Dianne F. Khin, AICP
Director of Planning and Community Development

Published Dates: September 2, 2020 – September 14, 2020

TOWN OF APEX
POST OFFICE BOX 250
APEX, NORTH CAROLINA 27502
PHONE 919-249-3426

PUBLIC NOTIFICATION
OF PUBLIC HEARINGS
CONDITIONAL ZONING #19CZ21
Heelan PUD

This notice replaces the previous notice that was posted and mailed.

Pursuant to the provisions of North Carolina General Statutes §160A-364 and to the Town of Apex Unified Development Ordinance (UDO) Section 2.2.11, notice is hereby given of public hearings before the Planning Board and Town Council of the Town of Apex. The purpose of these hearings is to consider the following:

Applicant: Jason Barron, Morningstar Law Group
Authorized Agent: Erica Leatham, M/I Homes of Raleigh, LLC
Property Addresses: 8824 & 8829 New Hope Farm Road; 3108 & 3120 Olive Farm Road; 0 Humie Olive Road
Acreage: ±141.732 acres
Property Identification Numbers (PINs): 0710986889 (portion of), 0720093139 (portion of), 0720181967, 0720075965, 0720092779
Current 2045 Land Use Map Designation: Low Density Residential and Medium Density Residential
Existing Zoning of Properties: Wake County Residential-40W (R-40W)
Proposed Zoning of Properties: Planned Unit Development-Conditional Zoning (PUD-CZ)

Planning Board Remote Public Hearing Date and Time: September 14, 2020 4:30 PM

Watch and listen to the livestream here: https://bit.ly/2YtxLPn or http://www.apexnc.org/calendar.aspx (click on the Planning Board link for this day in the calendar)
Call in using the phone number to listen only: 828-552-5717 Conference ID: 498 514 647#
Follow along with the presentation by viewing a copy of the meeting materials posted the day of the meeting at: http://www.apexnc.org/182.

Comments may be provided by email (public.hearing@apexnc.org, 350-word limit) or voicemail (919-362-7300, 3-minute limit) according to the Remote Participation Policy at: http://www.apexnc.org/DocumentCenter/View/31397/. You must provide your name and address for the record. Comments shared by noon on Friday, September 11, 2020 will be read during the Planning Board meeting.

***Planning Board Remote Review of Additional Comments and Vote: September 16, 2020 5:00 PM**

**According to NCGS §166A-19.24, when a public hearing is held with at least one member attending virtually, written comments on the subject of the public hearing may be submitted between publication of any required notice and 24 hours after the public hearing.*

Watch and listen to the livestream here: https://bit.ly/3gwlLD2 or http://www.apexnc.org/calendar.aspx (click on the Planning Board link for this day in the calendar)
Call in using the phone number to listen only: 828-552-5717 Conference ID: 270 333 286#
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- CONTINUED -

Town Council Public Hearing Date and Time: October 6, 2020 6:00 PM

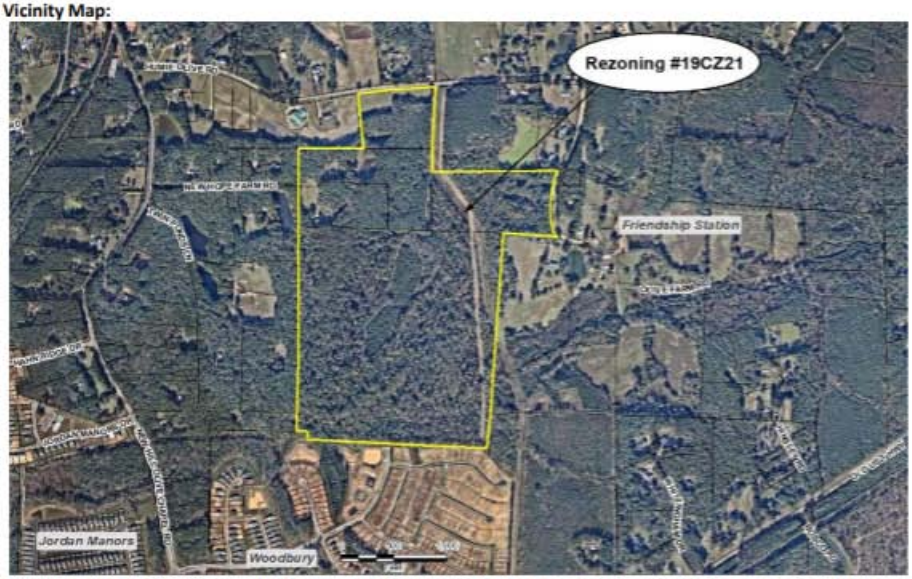
Public Hearing Location: Apex Town Hall
Council Chambers, 2nd Floor
73 Hunter Street, Apex, North Carolina

You may attend the meeting in person or view the meeting through the Town's YouTube livestream at: https://www.youtube.com/c/townofapexgov.

If you are unable to attend, you may provide comments no later than noon on Monday, October 5, 2020 by email (public.hearing@apexnc.org, 350-word limit) or voicemail (919-362-7300, 3-minute limit) according to the Remote Participation Policy at: http://www.apexnc.org/DocumentCenter/View/31397/. You must provide your name and address for the record. These comments will be read during the Town Council meeting.

If the Council meeting is held with at least one member attending virtually, written comments on the subject of the public hearing may be submitted between publication of any required notice and 24 hours after the public hearing and the Council's vote will occur at the Council's next regularly scheduled meeting.

Vicinity Map:



Property owners within 300 feet of the proposed conditional zoning have been sent this notice via first class mail. All interested parties may appear at the public hearing and be heard with respect to the application. Maps showing the location for the above site(s) to be considered in addition to a copy of the 2045 Land Use Map can be inspected at the Apex Town Hall or call 919-249-3426, Department of Planning and Community Development, for further information. To view the petition and related documents on-line: https://www.apexnc.org/DocumentCenter/View/29295.

Dianne F. Khin, AICP
Director of Planning and Community Development

Published Dates: September 11, 2020 – October 6, 2020

TOWN OF APEX
POST OFFICE BOX 250
APEX, NORTH CAROLINA 27502
PHONE 919-249-3426

PUBLIC NOTIFICATION OF PUBLIC HEARINGS

CONDITIONAL ZONING #19CZ21
Heelan PUD

Pursuant to the provisions of North Carolina General Statutes §160A-364 and to the Town of Apex Unified Development Ordinance (UDO) Section 2.2.11, notice is hereby given of public hearings before the Planning Board of the Town of Apex. The purpose of these hearings is to consider the following:

Applicant: Jason Barron, Morningstar Law Group
Authorized Agent: Erica Leatham, M/I Homes of Raleigh, LLC
Property Addresses: 8824 & 8829 New Hope Farm Road; 3108 & 3120 Olive Farm Road; 0 Humie Olive Road
Acreage: ±141.732 acres
Property Identification Numbers (PINs): 0710986889 (portion of), 0720093139 (portion of), 0720181967, 0720075965, 0720092779
Current 2045 Land Use Map Designation: Low Density Residential and Medium Density Residential
Existing Zoning of Properties: Wake County Residential-40W (R-40W)
Proposed Zoning of Properties: Planned Unit Development-Conditional Zoning (PUD-CZ)

Planning Board Remote Public Hearing Date and Time: September 14, 2020 4:30 PM

Watch and listen to the livestream here: https://bit.ly/2YtxLPn or http://www.apexnc.org/calendar.aspx (click on the Planning Board link for this day in the calendar)
Call in using the phone number to listen only: 828-552-5717 Conference ID: 498 514 647#
Follow along with the presentation by viewing a copy of the meeting materials posted the day of the meeting at: http://www.apexnc.org/182.

Comments may be shared following instructions in the Remote Participation Policy. The policy includes options to provide comments by email (public.hearing@apexnc.org, 350-word limit) or voicemail (919-372-7300, 3-minute limit). Comments shared by noon on Friday, September 11, 2020, will be read during the Planning Board meeting.

***Planning Board Remote Review of Additional Comments and Vote Date and Time: September 16, 2020 5:00 PM**

**According to NCGS §166A-19.24, when a public hearing is held with at least one member attending virtually, written comments on the subject of the public hearing may be submitted between publication of any required notice and 24 hours after the public hearing.*

Watch and listen to the livestream here: https://bit.ly/3gwlLD2 or http://www.apexnc.org/calendar.aspx (click on the Planning Board link for this day in the calendar)
Call in using the phone number to listen only: 828-552-5717 Conference ID: 270 333 286#
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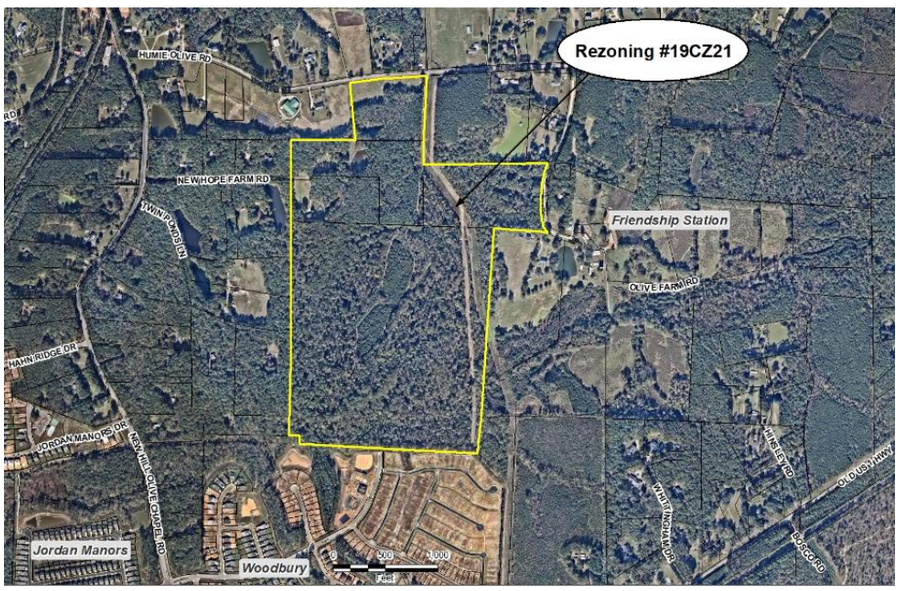
Comments may be shared following instructions in the Remote Participation Policy. The policy includes options to provide comments by email (public.hearing@apexnc.org, 350-word limit) or voicemail (919-372-7300, 3-minute limit). Comments shared between noon on Friday, September 11, 2020, and 24 hours after the end of the first Planning Board meeting will be read during this meeting.

A separate notice of the Town Council public hearing on this project will be mailed and posted in order to comply with State public notice requirements.

Vicinity Map:



Property owners within 300 feet of the proposed conditional zoning have been sent this notice via first class mail. All interested parties may appear at the public hearing and be heard with respect to the application. Maps showing the location for the above site(s) to be considered in addition to a copy of the 2045 Land Use Map can be inspected at the Apex Town Hall or call 919-249-3426, Department of Planning and Community Development, for further information. To view the petition and related documents on-line: https://www.apexnc.org/DocumentCenter/View/29295.

Dianne F. Khin, AICP
Director of Planning and Community Development

Published Dates: September 2, 2020 – September 14, 2020

TOWN OF APEX
POST OFFICE BOX 250
APEX, NORTH CAROLINA 27502
PHONE 919-249-3426

PUBLIC NOTIFICATION OF PUBLIC HEARINGS

CONDITIONAL ZONING #19CZ21
Heelan PUD

This notice replaces the previous notice that was posted and mailed.

Pursuant to the provisions of North Carolina General Statutes §160A-364 and to the Town of Apex Unified Development Ordinance (UDO) Section 2.2.11, notice is hereby given of public hearings before the Planning Board and Town Council of the Town of Apex. The purpose of these hearings is to consider the following:

Applicant: Jason Barron, Morningstar Law Group
Authorized Agent: Erica Leatham, M/I Homes of Raleigh, LLC
Property Addresses: 8824 & 8829 New Hope Farm Road; 3108 & 3120 Olive Farm Road; 0 Humie Olive Road
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Planning Board Remote Public Hearing Date and Time: September 14, 2020 4:30 PM

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- CONTINUED -

Town Council Public Hearing Date and Time: October 6, 2020 6:00 PM

Public Hearing Location: Apex Town Hall
Council Chambers, 2nd Floor
73 Hunter Street, Apex, North Carolina

You may attend the meeting in person or view the meeting through the Town's YouTube livestream at: https://www.youtube.com/c/townofapexgov.

If you are unable to attend, you may provide comments no later than noon on Monday, October 5, 2020 by email (public.hearing@apexnc.org, 350-word limit) or voicemail (919-362-7300, 3-minute limit) according to the Remote Participation Policy at: http://www.apexnc.org/DocumentCenter/View/31397/. You must provide your name and address for the record. These comments will be read during the Town Council meeting.

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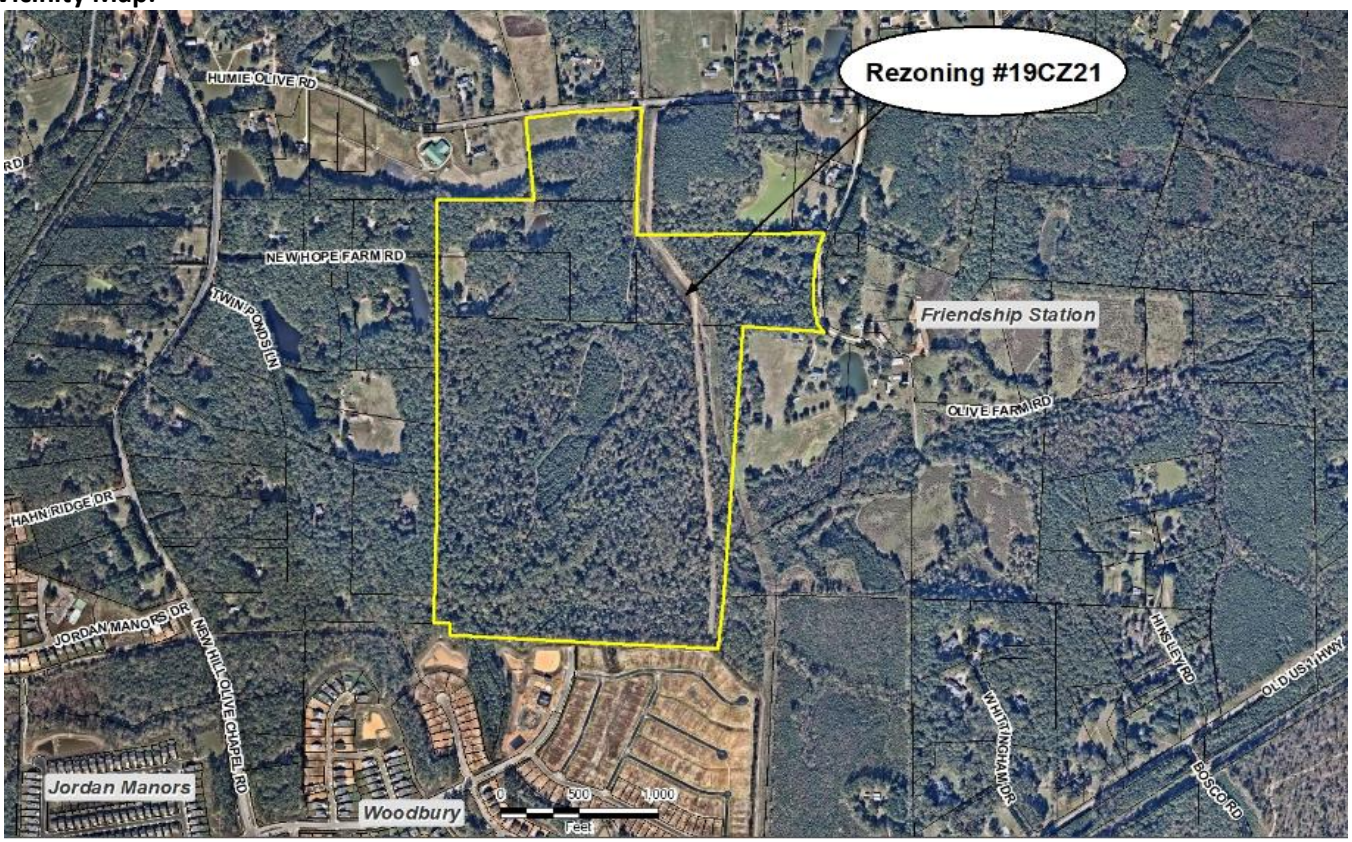

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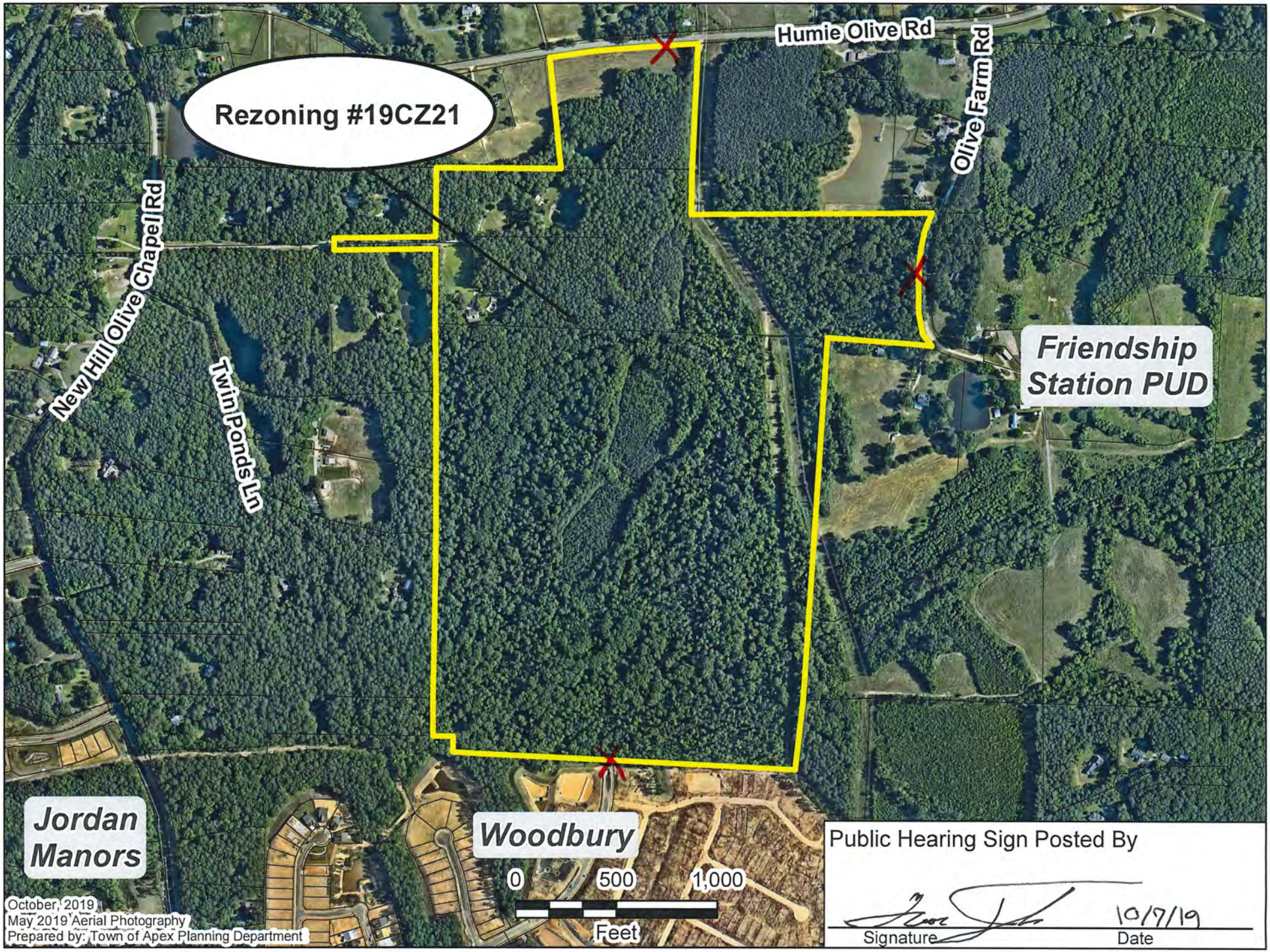
Dianne F. Khin, AICP
Director of Planning and Community Development

Published Dates: September 11, 2020 – October 6, 2020


Rezoning #19CZ21
Humie Olive Rd
Olive Farm Rd
New Hill Olive Chapel Rd
Twin Ponds Ln
Friendship Station PUD
Jordan Manors
Woodbury
0
500
1,000
Feet
October, 2019
May 2019 Aerial Photography
Prepared by: Town of Apex Planning Department
Public Hearing Sign Posted By
Signature
10/7/19
Date

TOWN OF APEX
POST OFFICE BOX 250
APEX, NORTH CAROLINA 27502
PHONE 919-249-3426

AFFIDAVIT CERTIFYING
Public Notification – Written (Mailed) Notice

Section 2.2.11
Town of Apex Unified Development Ordinance

Project Number and/or Name:	Conditional Zoning #19CZ21 Heelan PUD
Project Location:	8824 & 8829 New Hope Farm Road; 3108 & 3120 Olive Farm Road; 0 Humie Olive Road
Applicant:	Jason Barron
Firm:	Morningstar Law Group

This is to certify that I as Planning Director, mailed or caused to have mailed by first class postage for the above mentioned project on September 2, 2020, a notice containing the time and place, location, nature and scope of the application, where additional information may be obtained, and the opportunity for interested parties to be heard, to the property owners within 300' of the land subject to notification. I further certify that I relied on information provided to me by the above-mentioned person as to accuracy and mailing addresses of property owners within 300' of the land subject to notification.

9/2/2020
Date

Planning Director

STATE OF NORTH CAROLINA
COUNTY OF WAKE

Sworn and subscribed before me, Jeri Chastain Pederson a Notary Public for the above State and County, this the 2 day of September, 2020.

JERI CHASTAIN PEDERSON
Notary Public
Wake County, North Carolina
My Commission Expires
SEAL March 10, 2024

Jeri Chastain Pederson
Notary Public

My Commission Expires: 3/10/2024

TOWN OF APEX
POST OFFICE BOX 250
APEX, NORTH CAROLINA 27502
PHONE 919-249-3426

AFFIDAVIT CERTIFYING
Public Notification – Written (Mailed) Notice

Section 2.2.11
Town of Apex Unified Development Ordinance

Project Number and/or Name:	Conditional Zoning #19CZ21 Heelan PUD
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Applicant:	Jason Barron
Firm:	Morningstar Law Group

This is to certify that I as Planning Director, mailed or caused to have mailed by first class postage for the above mentioned project on September 11, 2020, a notice containing the time and place, location, nature and scope of the application, where additional information may be obtained, and the opportunity for interested parties to be heard, to the property owners within 300' of the land subject to notification. I further certify that I relied on information provided to me by the above-mentioned person as to accuracy and mailing addresses of property owners within 300' of the land subject to notification.

9/15/2020
Date

Planning Director

STATE OF NORTH CAROLINA
COUNTY OF WAKE

Sworn and subscribed before me, Jeri Chastain Pederson, a Notary Public for the above State and County, this the 15 day of September, 2020.

JERI CHASTAIN PEDERSON
Notary Public
Wake County, North Carolina
My Commission Expires
SEAL March 10, 2024

Jeri Chastain Pederson
Notary Public

My Commission Expires: 03/10/2024

Attachment 9a:

Richardson Road Future Southern Extension

Environmental Constraints

- Conservation Easement
- 50' Stream Buffer
- 100' Stream Buffer
- 100-Year Flood Hazard (Future)
- 100-Year Floodplain

Additional Constraints

- Proposed Public Greenway
- Existing Side Path
- Proposed Side Path
- Duke Energy 115KV Easement — 70'
- Town of Cary Force Main Easement — 40'
- Town of Apex Sewer Easement/Pump Station — 30'-50'
- Proposed Town of Apex Sewer Easement — 40'-50'
- Potential Town of Apex Sewer Easement — 40'
- Town of Apex Electric Easement — 35'
- Historic Welch-Hearn House (Circa 1930)

Friendship Station PUD (Approved)

Heelan PUD (Proposed)

Peak Landing Master Subdivision Plan (Approved)

Apex Friendship Elementary School (Under Review)

HORTON RIDGE BLVD (PLANNED ALIGNMENT)

RICHARDSON ROAD (PLANNED ALIGNMENT)

EXISTING 60' ACCESS EASEMENT

STRUCTURES

4.4 Acres

10.31 Acres

3.02 Acres

Little Beaver Creek

Humie Olive Rd

New Hope Farm Rd

Olive Farm Rd

Fairfield Rd

Old US 1 Hwy

CSX RAILROAD

Cross Country Ln

Ragan Rd

Gregor Overlook Ln

Macbeth Ln

Mckenzie Ridge Ln

Malvina Ter

Yellow Rose Ln

Dallas Valley Ln

Butterfinger Ln

Richardson Rd

Masonboro Ferry Dr

Blazing Trail Dr

Whistling Quail Run

Tordelo Pl

Madison Creek Dr

Flora View Ct

Evans Rd

Whittingham Dr

Hinsley Rd

Bosco Rd

Kylewynd Pl

Horton Ridge Blvd

Intuition Dr

Zebroid Way

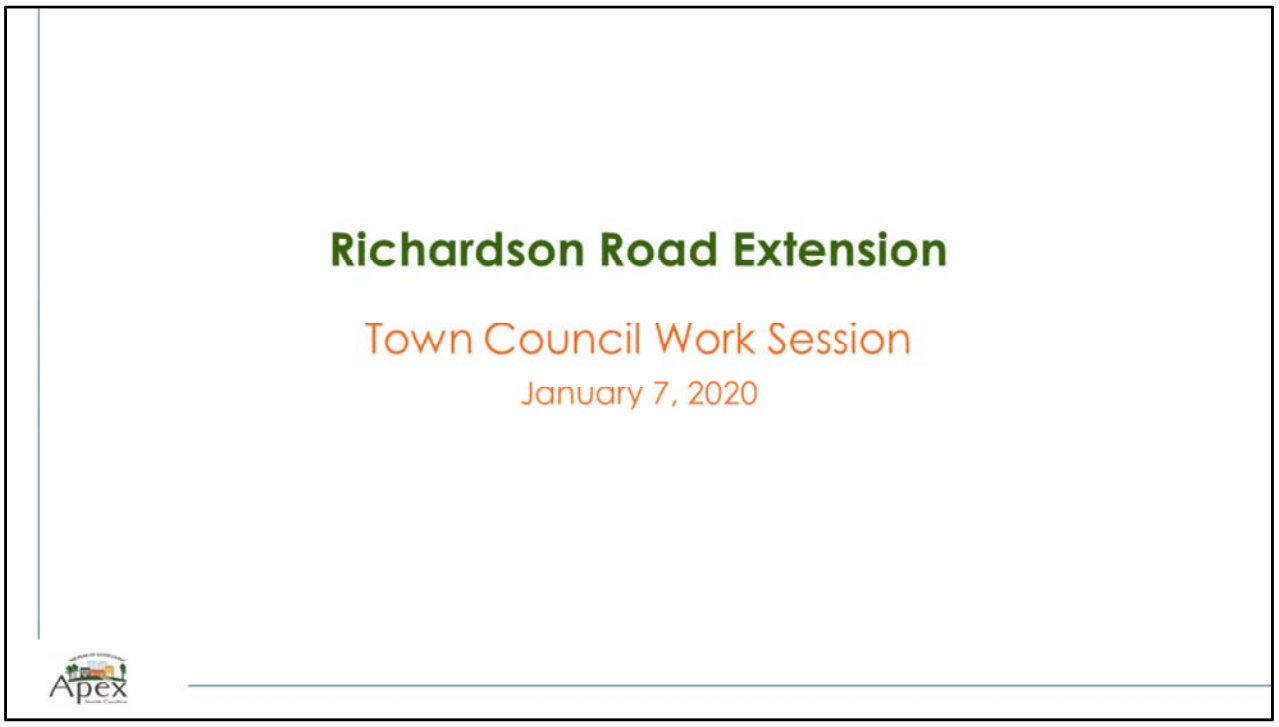
0 200 400 800 1,200 1,600 2,000 2,400 Feet

0 ⅛ ¼ ½ Miles

1 inch = 400 feet @ 18' x 24' print size

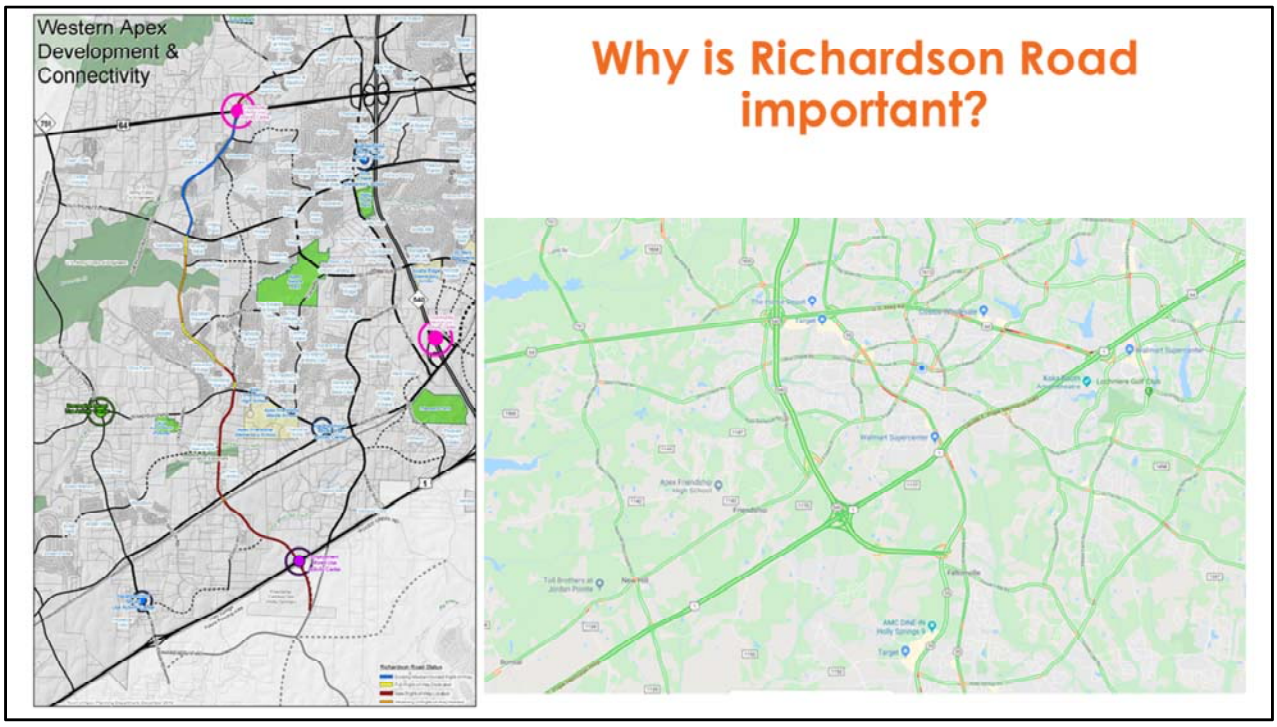
Town of Apex Planning Department, January 2020
November 1, 2019 Aerial Photography

Attachment 9b:



Shannon

Good evening. The purpose of this work session is to discuss the future of Richardson Road. There is a conservation easement along the planned alignment of this critical roadway in the Town's transportation plan. We will explain what we have already done to address this issue, discuss possible options, and request your guidance regarding next steps.

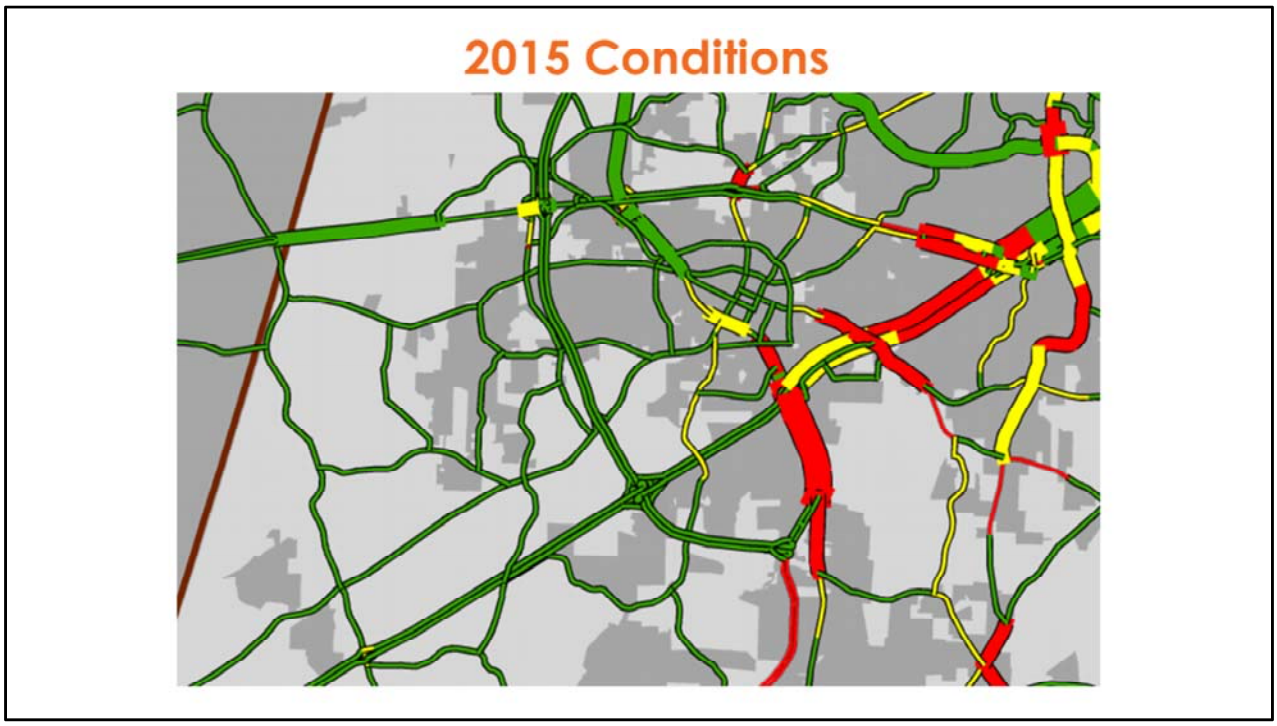


Shannon
Let's start by considering why Richardson Road is an important part of our transportation network.

The map on the left of the screen, and included in the information in front of you, shows that Richardson Road is planned to be a 4-lane, median-divided roadway extending all the way from US 64 to south of US 1 in Holly Springs. The blue along the corridor represents where Richardson Road exists today as a median-divided roadway. Yellow represents where full right-of-way has been dedicated and orange where some right of way has been dedicated. Red represents the portions of the corridor where new right-of-way is needed.

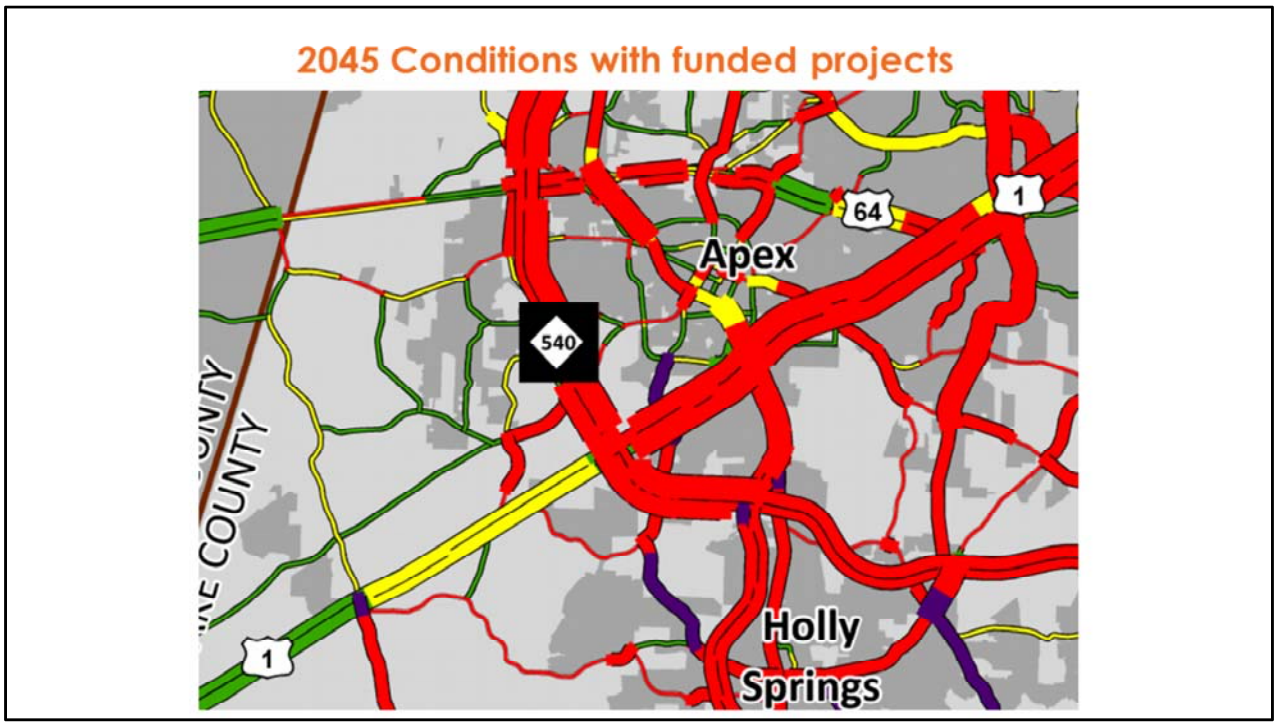
If you look at the Google map image on the right, Richardson Road doesn't stand out. What might stand out is the lack of roadway connections running north and south in western Apex. New Hill Olive Chapel/New Hill Holleman Road and NC 55 are the two main routes serving both local and regional traffic that extend from US 64 to US 1. Everyone has experienced the congestion on NC 55. New Hill Olive Chapel is also experiencing increases in volume with need for a interchange at US 64 already apparent.

The purpose of these two exhibits is to begin to demonstrate why Richardson Road is important to the Town of Apex.



Shannon

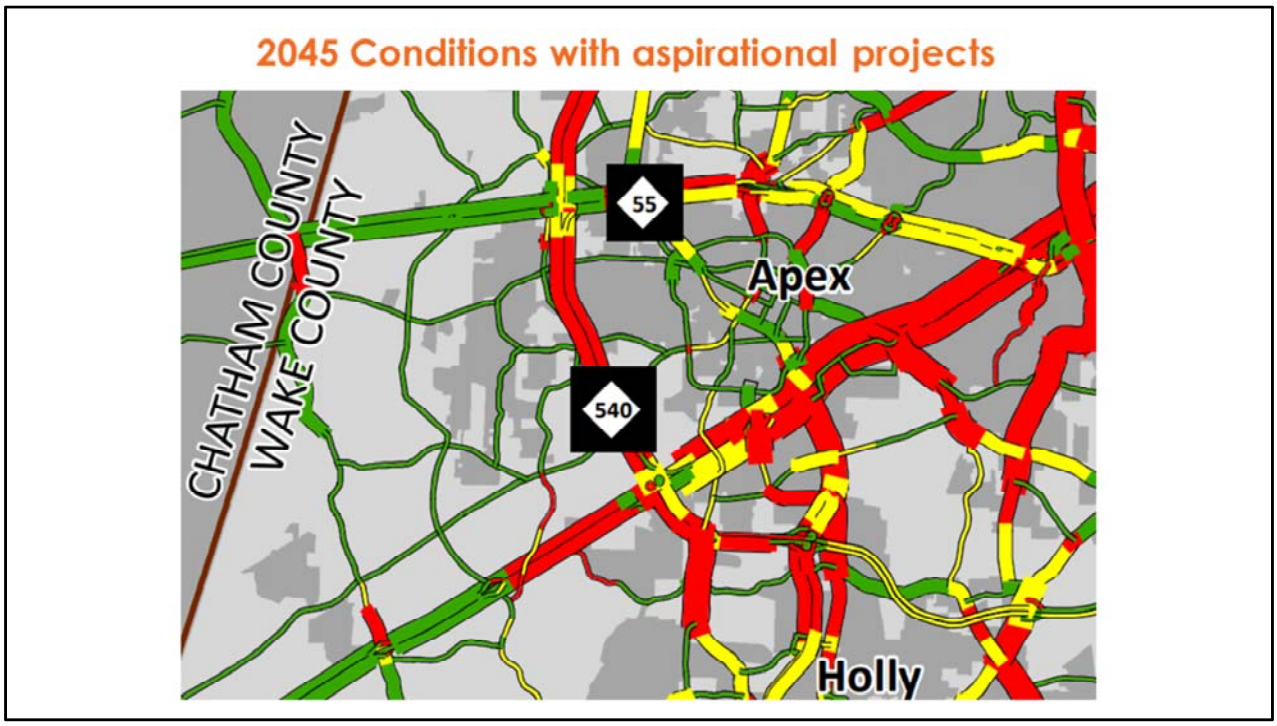
Every couple of years our MPO updates the regional transportation model. The image here is a snapshot from the regional model showing 2015 conditions. The thicker lines depict higher traffic volumes, thinner lines depict lower volumes. The colors correspond to congestion. Green indicates relatively little congestion. Red represents roadways that are consistently congested throughout and beyond peak travel hours.



Shannon

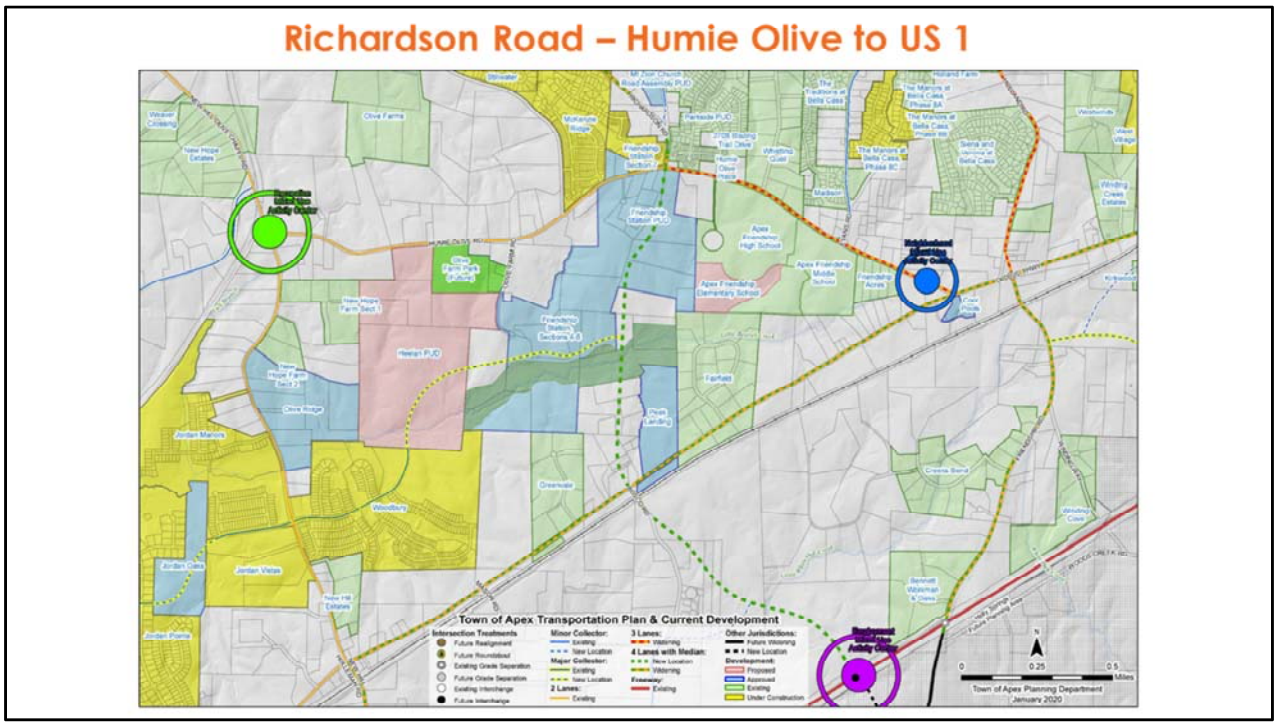
This is a view of the regional model with projections for year 2045. This view shows 2045 conditions assuming that projects that have committed funding are built. So this view assumes NC 540 is complete, NC 55 and Ten Ten Road are widened, and US 64 is improved. You can see that Kelly Road, NC 540, and NC 55 are now showing as heavily congested along with segments of New Hill Holleman/New Hill Olive Chapel Road. By the way, purple in this case, is worse than red.

Based on all of the public input I've heard over the last several years, this is not the future the public wants for Apex.



Shannon

This is another view of 2045. This is where Richardson Road shows up along with other projects that are in our plan. You can see that the interstates and highways are still busy, but a lot of our local thoroughfares are now green, showing an improvement over the previous conditions due to the interconnectivity of roadways. This comparison of future scenarios demonstrates why it is so important to look beyond what we can imagine in the next few years and to think about Richardson Road as a complete, median-divided thoroughfare connecting two highways in Apex, serving both local and regional traffic, and helping to relieve congestion on routes like New Hill Holleman Road, Kelly Road, NC 55 and east-west connections like Olive Chapel Road and Old US 1.



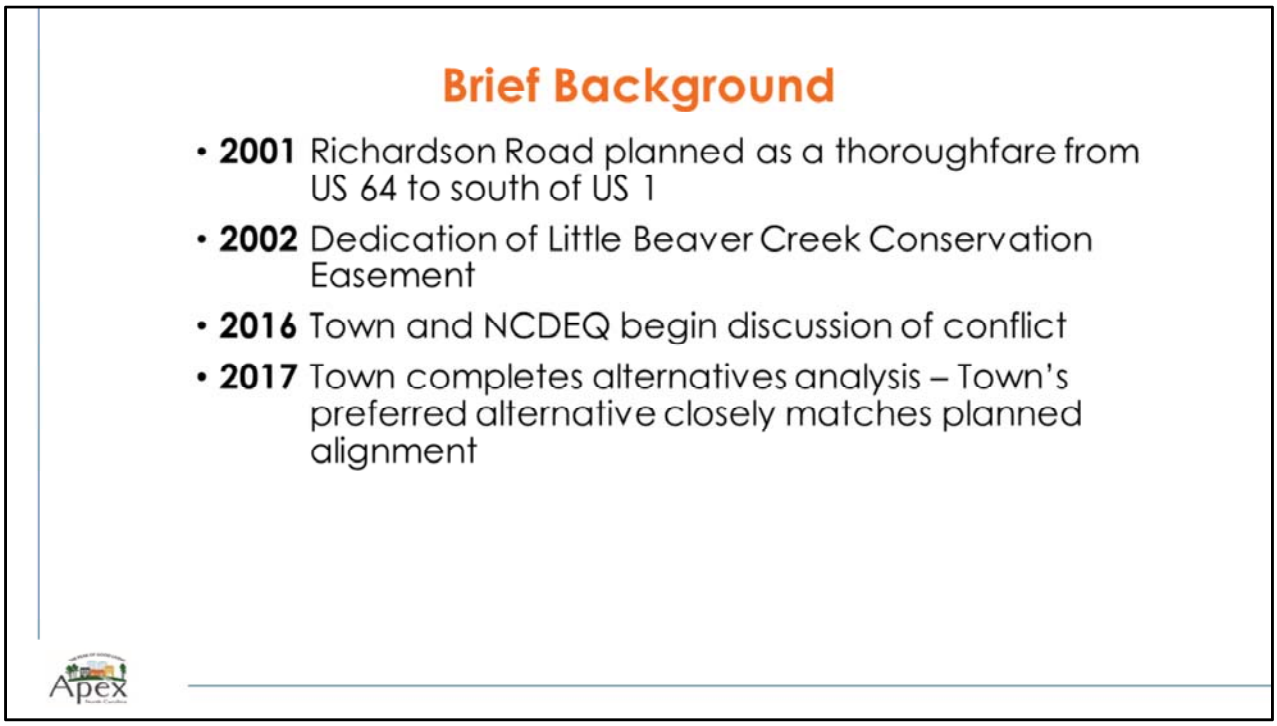
Shannon

The particular section of Richardson Road that we will focus on this evening is between Humie Olive Road and Old US 1 Highway. This map shows the planned alignment as a green dotted line beginning at the existing terminus of Richardson Road and crossing the CSX rail line at Bosco Road. Development is depicted as existing in light green, under construction in yellow, approved in blue, and proposed in pink. The Little Beaver Creek Conservation Easement is shown as dark green.

The proposed crossing of the conservation easement is a substantial issue. This is land that has been dedicated to the state where no disturbances are allowed. It is the site of a completed 10-year stream restoration project. Our ability to build Richardson Road in the future along this alignment requires two hurdles:

- Agreement from the US Army Corps of Engineers that the planned alignment is the Least Environmentally Damaging Practicable Alternative (LEDPA)
- Release of the right-of-way through the conservation easement from an Interagency Review Team, or IRT, of state and federal agencies

Russell is going to walk you through our efforts to satisfy these two requirements.



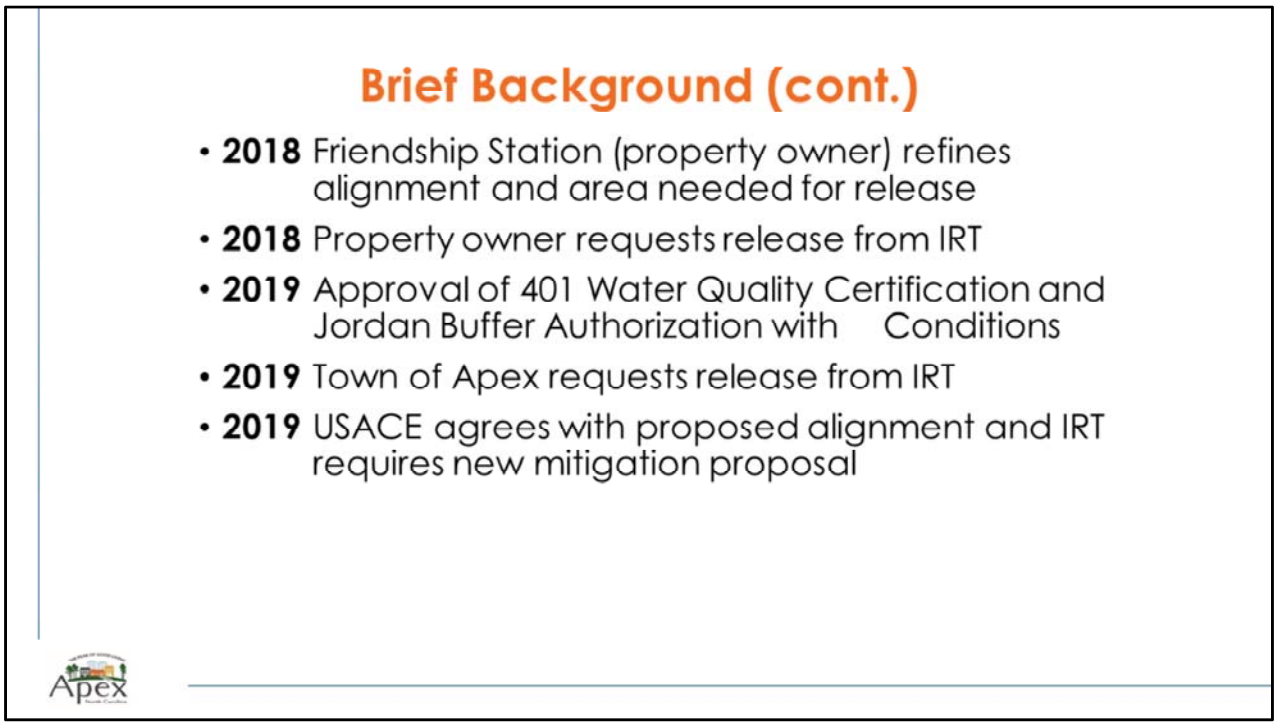
Russell

The location of the Conservation Easement has posed a difficult challenge to avoiding and minimizing impacts for extension of a major thoroughfare with constrained beginning and ending points. A brief timeline of our work to resolve the issue is shown on this slide.

Richardson was shown as a thoroughfare in the Apex Transportation Plan in 2001. Shortly thereafter, private property owners dedicated the Little Beaver Creek Conservation Easement that overlapped the planned road alignment.

Since becoming aware of the conflict between the planned road corridor and dedicated conservation easement, the Town has been working with the North Carolina Department of Environmental Quality to ensure that the Richardson Road extension is planned in the most environmentally conscious way.

In 2017 the Town completed an alternatives analysis to determine if there is a practical way to avoid the conservation easement. Based on that analysis the Town's preferred alignment closely matched the plan. Other alignments have increased impacts outside of the easement.



Russell

In 2018, Friendship Station, the developer that will build a section of Richardson Road north of the conservation easement, requested the release of the right-of-way from the easement.

The IRT responded that the permitting process should be completed first to determine the LEDPA and that the Town should be the applicant for the release.

The Town, working with Friendship Station, submitted the permit applications and request for release of the right-of-way including the proposed mitigation fees to be paid by the Town and proposed mitigation land to be provided by Friendship Station.

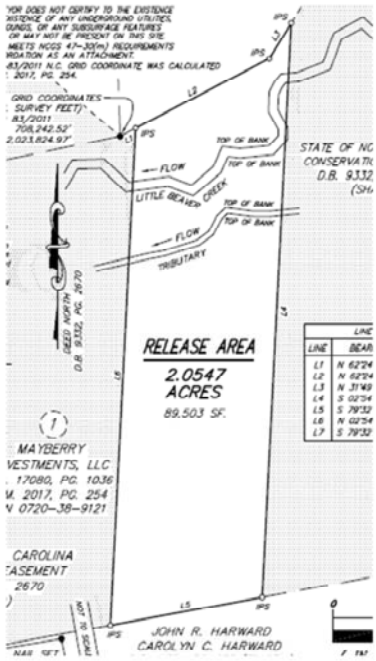
The USACE agreed that the proposed alignment is the LEDPA.

However, the IRT was not satisfied with the mitigation proposed, which I'll explain through the next several slides.

Release Area

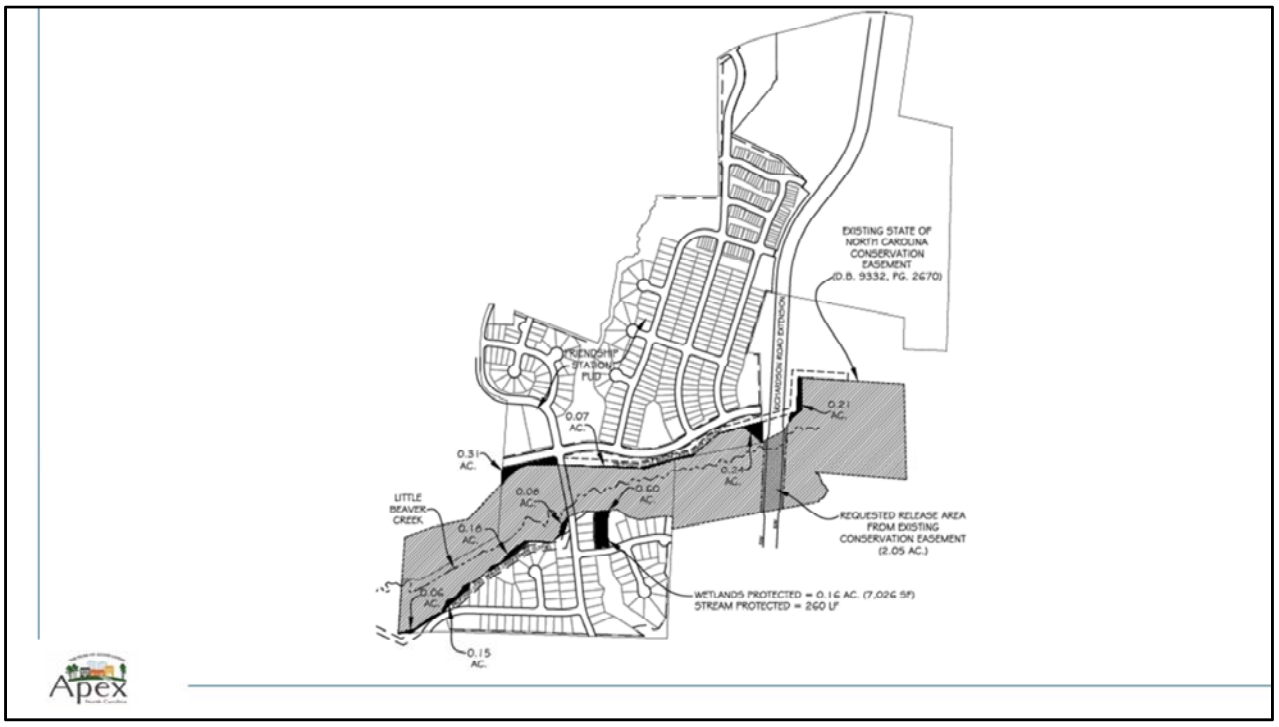
120' right-of-way
+
40' easements

160' wide area



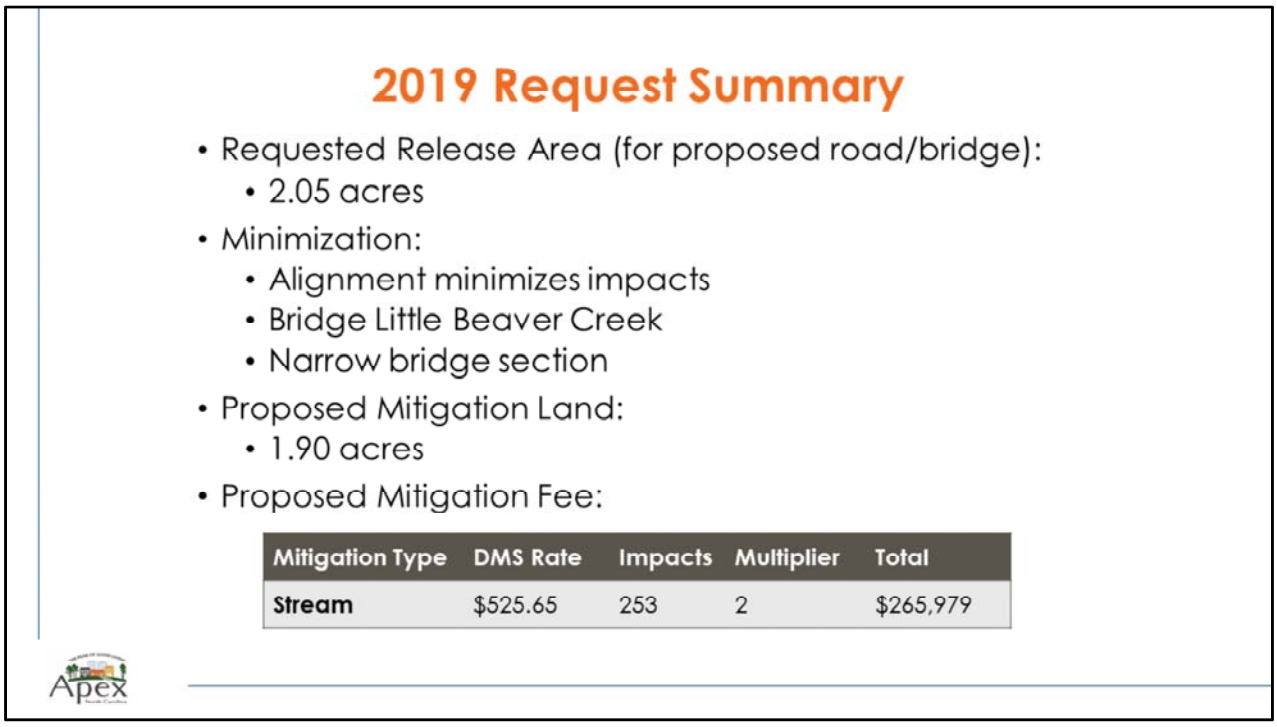
Russell

This exhibit reflects the requested Release Area of slightly more than two acres based on the design shown for the preferred alignment of Richardson Road. It is a total width of 160 feet, accounting for the 120-foot right-of-way plus 20-foot easements on both sides, the minimum recommended in an analysis of potential impacts for the construction and maintenance of a four-lane bridge. Bridging Richardson Road over Little Beaver Creek with a narrow four-lane bridge section helps to minimize impacts and minimize the requested Release Area acreage.



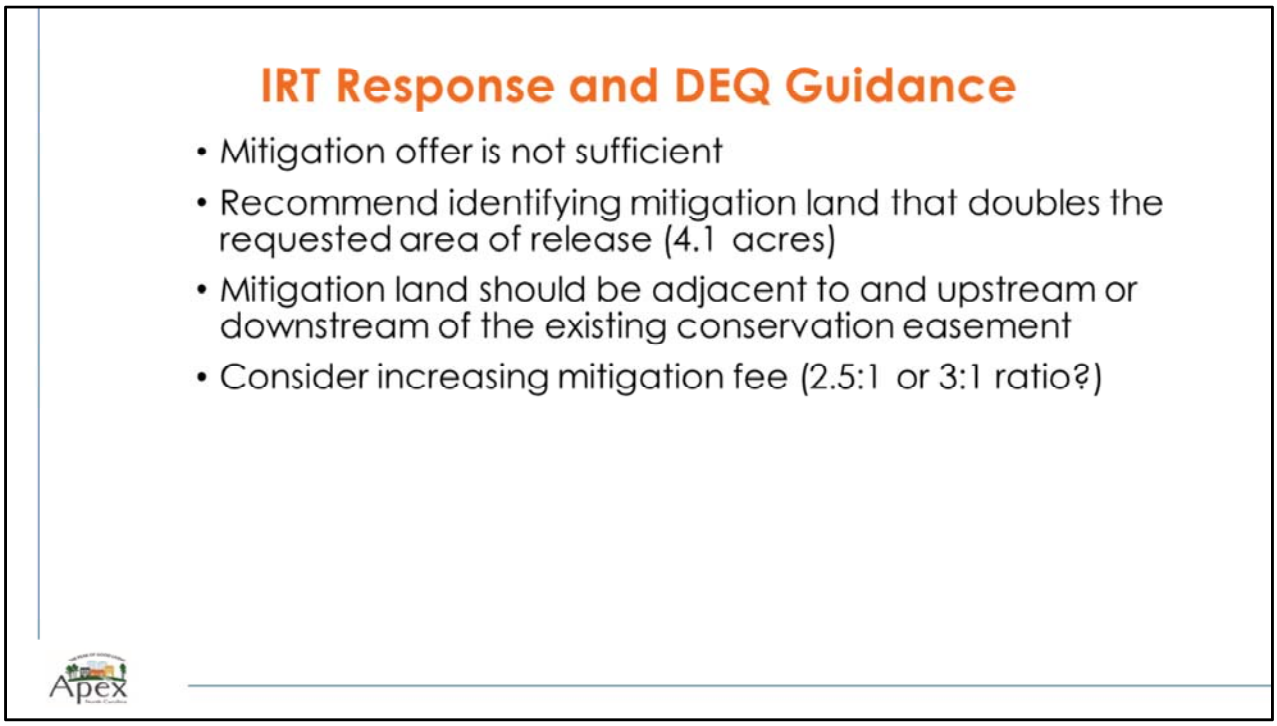
Russell

This exhibit shows the offer of mitigation land in various pockets of the Friendship Station Phase 4-6 subdivision plan as proposed by the developer, a total of 1.90 acres, indicated by dark shaded areas adjacent to the existing conservation easement.



Russell

As noted previously, the requested Release Area within the Conservation Easement is slightly over two acres. The developer of Friendship Station proposed a total of 1.90 acres of Mitigation Land as displayed in the previous slide in exchange for the proposed Release Area. Additionally, the Town proposed mitigation fees for 253 lf of stream impact at 2:1 ratio, totaling $265,979.



Russell

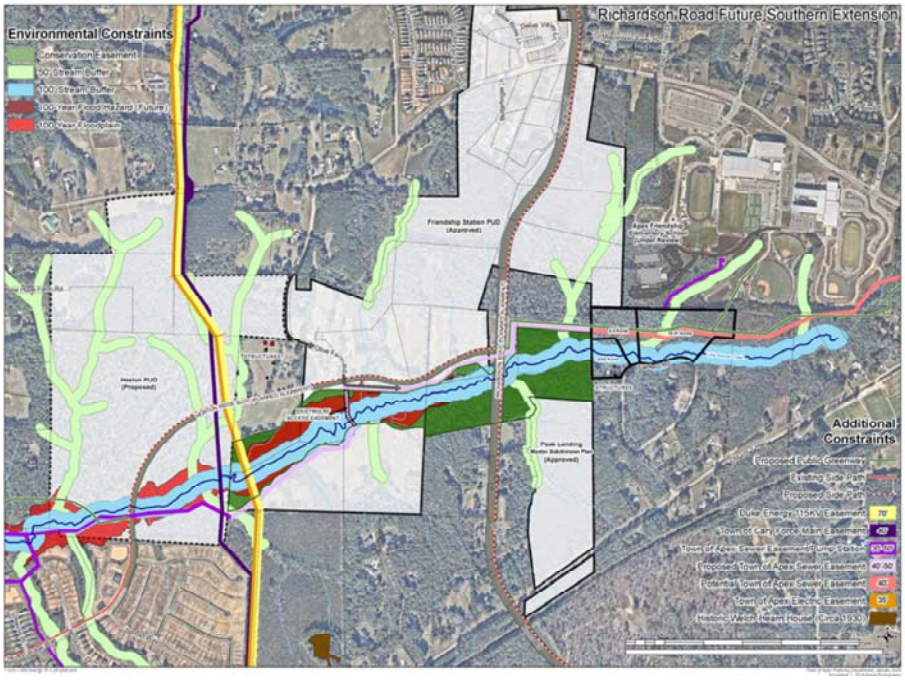
While the USACE agreed that the proposed alignment represents the LEDPA, the IRT responded that the mitigation offer was not sufficient.

The IRT has refused to provide us with specific guidance for what will be sufficient, but our liaison with NCDEQ has recommended providing land that doubles the area requested for release (4.1 acres) while ensuring that the land is contiguous to and upstream or downstream of the conservation easement.

DEQ also suggested increasing the ratio to calculate the mitigation fee.

The IRT needs a figure showing: (1) the exact location of proposed mitigation land, (2) its relation to the existing conservation easement, (3) the best available wetland and stream data, and (4) quantities for the linear feet of stream and acres of wetland that would be newly protected.

The release will occur as a real estate transaction and is not approved until that transaction is complete along with payment of the mitigation fee.



Shannon

We are now seeking further guidance from Town Council. Staff have discussed three possible options related to the mitigation land.

(1) Pursue the mitigation as part of proposed development

The Town Council will consider the proposed Heelan PUD in coming months. This PUD could present an opportunity to provide the needed 4.1 acres (or more) of contiguous mitigation land as a condition of zoning approval. The Town still needs to pay the mitigation fee for the Release Area, and we need guidance on how much we can offer.

(2) Pursue the mitigation as a land purchase

Town staff could reach out to property owners adjacent to the conservation easement to determine their interest in selling land to the Town, and in turn the Town would dedicate the mitigation land as new conservation easement. We would want to make sure that the land is not needed for future infrastructure or encroachments. The Town still needs to pay the mitigation fee for the Release Area, and we need guidance on how much we can offer.

(3) Do not actively pursue mitigation

The Town could wait, and not complete the process with the IRT that we have been working toward. This decision would mean that the future of Richardson Road is in jeopardy and this critical thoroughfare on our transportation plan may never be built. Agency staff turnover will eventually result in new or increased requirements, and further fee increases, and potentially outright denial of the roadway alignment as proposed.

This concludes the presentation and I would like to invite questions and open discussion.

Attachment 9c:

Meeting Topic: Little Beaver Creek [221] conservation easement, Wake County - Town of Apex request for partial release of easement area

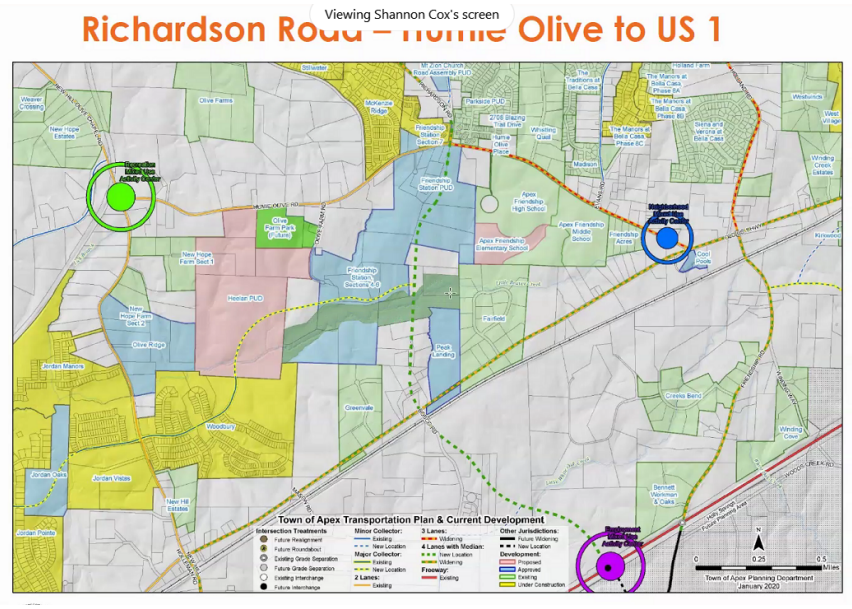
Date/Time: Monday, August 17, 2020 @ 1:00pm

Location: WebEx meeting

Participants

Todd Tugwell, USACE, Todd.J.Tugwell@usace.army.mil
Erin Davis, NCDEQ Water Resources Division, erin.davis@ncdenr.gov
Casey Haywood, USACE, Casey.M.Haywood@usace.army.mil
Travis Wilson, NCWRC, travis.wilson@ncwildlife.org
Todd Bowers, EPA, bowers.todd@epa.gov
Kathy Matthews, USFWS, kathryn_matthews@fws.gov
Ed Hajnos, NCDEQ Stewardship Program, Edward.hajnos@ncdenr.gov
Shannon Cox (Presenter), Town of Apex, Shannon.cox@apexnc.org
Marty Stone, Town of Apex, marty.stone@apexnc.org
Russell Dalton, Town of Apex, Russell.dalton@apexnc.org
Dianne Khin, Town of Apex, Dianne.khin@apexnc.org
Erica Leatham, M/I Homes, eleatham@MIHOMES.com
Jason Barron, Morningstar Law Group, jbarron@morningstarlawgroup.com
Peter Cnossen, Jones & Cnossen Engineering, peter@jonescnossen.com
Patrick Adams, M/I Homes, padams@MIHOMES.com
Jim Spangler, Spangler Environmental, jspangler@spanglerenvironmental.com
Patrick Kiernan, Jones & Cnossen Engineering, patrick@jonescnossen.com

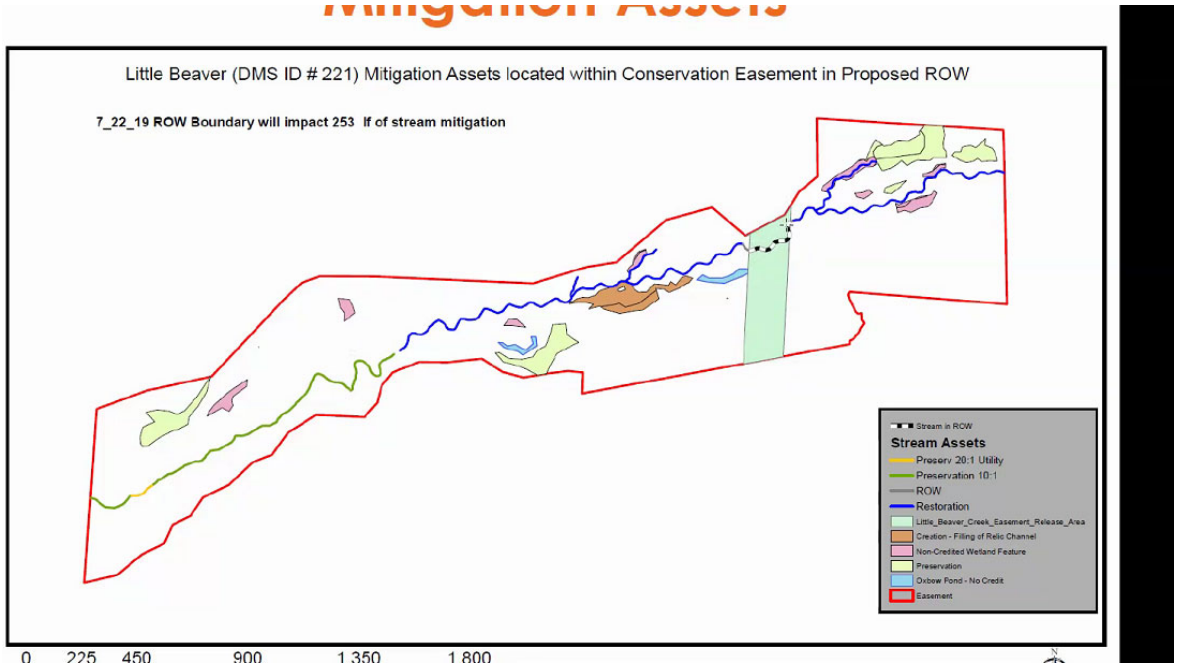
Purpose: Request from the Town of Apex request for partial release of conservation easement area for the installation of Richardson Road.



Dark green is easement. Blue is approved development.

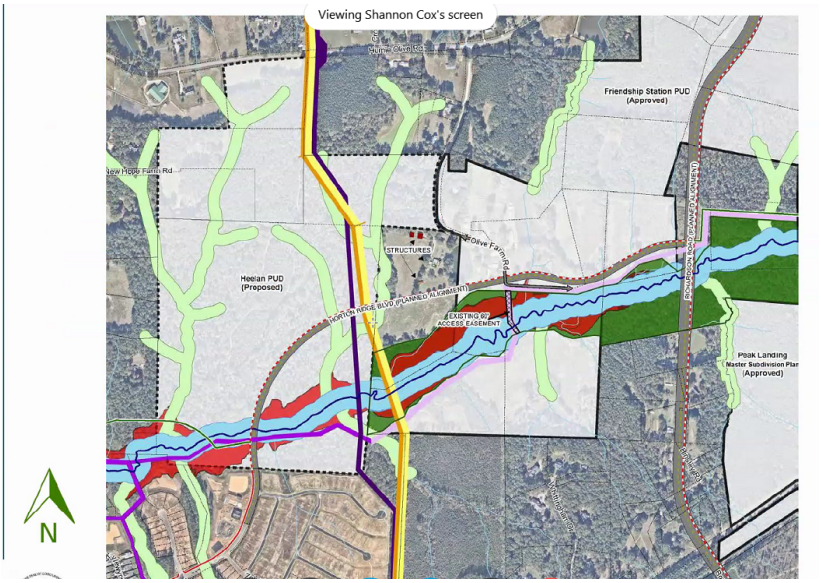
Town of Apex looked at alternatives, all of which would have larger environmental impacts. Timeline of background is provided in the PowerPoint. Mitigation presented initially was not deemed as satisfactory; this presentation proposes a different approach.

2.05 acres requesting for release. 253 LF proposed to bridge.



Request for release area has not changed. Initially proposed 1.9 acres of additional buffer. However, IRT recommended identifying mitigation land that doubles the requested area of release (4.1 acres).

What they have been working on… Proposing an additional 7.95 acres of easement.

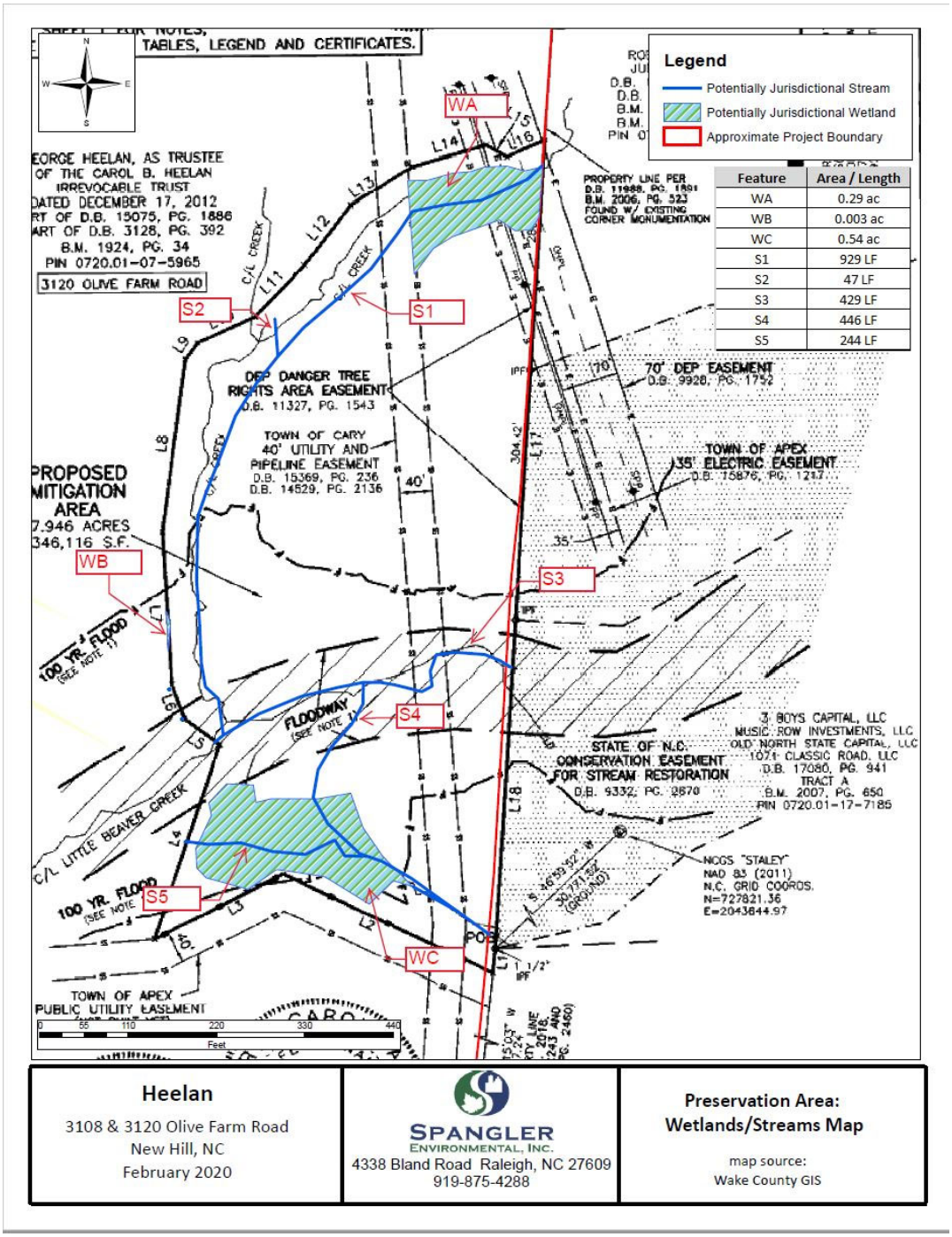


2019 - 2020 Request Comparison

Factor	2019	2020
Release Area	2.05 acres	
Minimization	Alignment minimizes impacts Bridge Little Beaver Creek Narrow bridge section	
Mitigation Fees	$265,979	$332,474
Mitigation Land	1.90 acres	7.95 acres

Proposed Heelan Tract Conservation Easement exhibit

Important note: *The streams and wetlands identified in the exhibit are estimates and are not based upon surveys.*



-End of Presentation-

Questions and comments:

Todd Tugwell: The length of stream that will be removed from the easement within the release is 253 LF at a 2.5:1 ratio. Did you arrive at the cost based on DMS prices? Shannon: Yes, latest information available as of June. Can DMS verify? Ed: Stewardship has verified and will follow up after the meeting to confirm. Ed would like to note that approximately 1600 LF of stream will be protected with this new acquisition. This information will be confirmed.

Erin (DWR): Regarding town utility easement, what is the current condition of the new easement and crossing? Are there plans to use this as future encroachments? The total easement would then be consider 6.8 acres due to utility areas that need to be maintained and extend into the existing easement. 35 ft for Town of Apex and 75 ft for Duke as internal easement breaks. Would IRT want to keep these? Would this easement be fenced or signage place? Shannon: nothing has been proposed and would need to be discussed with applicants. Ed: at minimum signage would be done, fencing is not recommended by Kathy.

The intent is to identify the area that will not be encroached on. Jason (attorney): When this is dedicated this area will not be developed.

Todd Bowers: buffers look thin according to the map. Patrick: 7.96 acres, streams have 50 ft buffers as a fail-safe to protect the easement. Todd Tugwell: We did not specify streams in the easement and it is a benefit to us. Currently being retained by the landowner.

Lyle or James: any concerns from a permitting standpoint? James: The subdivision itself was permitted by Lyle. Not sure if an application was put in because they decided to bridge everything. Where would the credits come from? Ed and Melonie will follow-up regarding this. Little Beaver Creek is fully debited. DMS would draw credit from a different site in the same CU.

Any wetlands at this site? Ed: no nothing that he recalls- possibly small pockets of vernal pools. Yes, mainly riparian along the stream- small and less than 1/10 of an acre in total within the buffer.

Regarding the new proposal. The previous proposal of 1.9 acres, is that included in this? This is no longer part of this new proposal. This is new acreage to the west. Given this proposal Todd Tugwell is not opposed to approving this; Kathy, Erin, Travis, Todd Bowers are also not opposed to approving. IRT appreciates the effort to obtain an area that provides additional resources to the current easement.