C&S COMMERCIAL PROPERTIES

MALLARD CROSSING

Orangeburg Road & East Butternut Rd

Summerville, SC

LOCATION OVERVIEW

SITE PLAN


NORTH
Not to Scale
Legend
Phase Outlines
Ponds
Proposed Units
Type
Duplex Units
Single Family Units
Townhouse Units
Areas
Type
40' Buffer
Open Space
Boundary
Commercial
Pond
Pocket Park
Road
Right of Way
Wetlands
Trails
Phase 1
Single Family
22 - Units
Phase 2
Single Family
25 - Units
Phase 3
Duplex
34 - Units
Phase 4
Townhomes
19 - Units
Phase 5
Proposed Commercial
4.3 Acres
Driveway #1
Driveway #2
Driveway #3
Driveway #4
East Gwillimbury Road
Old Orangeburg Road
Park
Nature Preserve
Proposed Unit Totals
Phase 1 - Single Family 22 Units
Phase 2 - Single Family 25 Units
Phase 3 - Duplex 34 Units
Phase 4 - Townhouse 19 Units
Phase 5 - Commercial 35,000 sq. ft.
H&H HOMES

PLANNING & ZONING

Mallard Crossing

Orangeburg Road & East Butternut Tract

Summerville, SC

Dorchester
School
District Two

JOSEPH R. PYE
Superintendent

102 GREEN WAVE BOULEVARD • SUMMERVILLE, SC 29483 • (843) 873-2901 • FAX (843) 873-4053

Mike Windham
102 Greenwave Blvd
Summerville, SC 29483
May 2, 2014

Alec Brebner
Director of Planning and Zoning
Dorchester County
500 North Main Street, Box 3
Summerville, SC 29483

Dear Mr. Brebner:

Mr. Joseph Pye, Mrs. Allyson Duke and I met with John Fleming of Hussey, Gay, Bell and DeYoung this afternoon. We discussed a new development they are planning on the corner of Orangeburg and Mallard roads. The development will consist of 135 residential units. We discussed how this development may affect the local schools. The development is estimated to bring approximately 55 new students to Dorchester District 2.

After our discussion Mr. Fleming asked the district to provide a letter of coordination between the District and Hussey, Gay, Bell and DeYoung for your office. Dorchester 2 does not provide letters of coordination to developers or builders. This letter is to inform you that the District has met with the above builder and we have discussed the project and how it may affect Dorchester School District 2.

Sincerely,

Mike Windham
Director of Community Planning

WATER & SEWER

Mallard Crossing

Orangeburg Road & East Butternut Tract

Summerville, SC

Dorchester County Water Authority

P. O. Box 250 P. O. Box 1565 Summerville, SC 29484
(843) 875-0140 Fax (843) 851-6790

ADMINISTRATOR
ROBERT C. HENSLEY

BOARD MEMBERS
LINDA B. EVANS-CHAIR
PAT LADOLCETTA-VICE CHAIR
JOHN WHEELER-SECRETARY/TREASURER
BRAD RAWLINGS-MEMBER
ROBBY ROBBINS-MEMBER

August 22, 2016

John Fleming, PE
Nautilus Engineering, LLC
PO Box 748
Hampton, SC 29924

Reference: Orangeburg Road & East Butternut Tract
TMS 128-00-00-045, 128-00-00-126, 128-00-00-128

Dear Mr. Fleming,

Dorchester County Water Authority is the authorized supplier of water, for the above reference, and is in conformance with its water supply service area. We are willing, able, and have the quantity of water to provide to this development. Dorchester County Water Authority's commitment for the availability of water will expire one year from the date of this letter.

Sincerely,

Richie Murdaugh

Richie Murdaugh, Operations Manager

RM/fb

DORCHESTER COUNTY WATER AND SEWER
235 DEMING WAY
SUMMERVILLE, SC 29483

Jason Coffman, P.E., Engineering Manager
(843) 832-0093 * (843) 563-0093 * Fax (843) 832-0073 * (843) 563-0073

August 26, 2016

John Fleming, P.E.
Nautilus Engineering, LLC
P.O. Box 748
Hampton, SC 29924

RE: Orangeburg Road at East Butternut Road Site PD Coordination Letter
TMS 128-00-00-045, -126, and -128

Dear Mr. Fleming:

The referenced properties are in Dorchester County Water and Sewer's sewer service area. It is our understanding the proposed Planned Development (PD) would allow a maximum 120 residential units and a maximum of 35,000 SF of retail space. At this time, Dorchester County has an 8-inch gravity sewer main along East Butternut Road in front of TMS 128-00-00-126 and the southwest corner of TMS 128-00-00-045. Also, there is an 8-inch force main along Orangeburg Road in front of the property. The location of any proposed connections to the sewer system will be subject to review and approval by Dorchester County Water and Sewer (DCWS). Generally, DCWS requires sewer extensions to be gravity mains except where gravity mains cannot be constructed in accordance with standard regulations and practices. Should it be necessary for a pump station to be built to serve the development, DCWS anticipates it will require the developer to construct a regional pump station and gravity mains with capacity and depth to serve other properties in the vicinity. Should such a request be made by DCWS, the developer may be reimbursed, subject to approval by Dorchester County Council, for increased construction cost beyond what is necessary to provide sewer service to the development. Should all flow go to the East Butternut Road gravity main, DCWS anticipates at least one existing pump station will need to be upgraded. DCWS reserves the right to mandate other requirements of the development. DCWS advises that the engineer prepare a wastewater masterplan for DCWS review prior to beginning detailed engineering design.

DCWS anticipates that it will be necessary in the future to replace the existing 8-inch force with a 10-inch force main to accommodate future growth and road improvements. At that time, DCWS anticipates a need to acquire a sewer easement on TMS 128-00-00-045 and -128 adjacent to the Orangeburg Road right-of-way.

Availability of sewer service and capacity is subject to review and approval by Dorchester County Council. This letter is not a guarantee that sewer system capacity is available or will be available at a later date. Capacity is made available on a first come first served basis at the time impact fees are paid by the developer and accepted by DCWS.

Do not hesitate to call me at (843) 832-0093 if you have any questions or need additional information.

Sincerely,

Jason D. Coffman

Jason D. Coffman, P.E.
Engineering Manager

cc: Larry Harper-Water and Sewer Director
Alec Brebner, AICP-Planning and Zoning Manager

Berkeley Electric Cooperative, Inc.

Your Touchstone Energy® Cooperative

August 23, 2016

Nautilus Engineering, LLC
C/o: John Fleming
PO Box 748
Hampton, SC 29924

Re: Power Availability for Hopper Communities
TMS 128-00-00-045,-126,-12
Dorchester County, SC

Dear John:

Berkeley Electric Cooperative will supply the electrical distribution requirements for the above referenced locations and we look forward to extending our facilities to meet the needs of this development.

All services that are rendered will be under our service rules and regulations at the time of service. If you have any questions, please don't hesitate to give me a call.

Sincerely,

John Hall
Manager of Construction and Design

JH/ts

Cc: Tim Mobley, V.P. of Engineering and Operations
Blake Brown, Goose Creek District Service Planner
File

C&S COMMERCIAL PROPERTIES

DISTRICT GUIDELINES

Mallard Crossing

Orangeburg Road & East Butternut Tract

Summerville, SC

PLANNED DEVELOPMENT DISTRICT GUIDELINES

FOR

MALLARD CROSSING

INTERSECTION OF
ORANGEBURG ROAD & EAST BUTTERNUT ROAD

Dorchester County
South Carolina

Prepared For:
RHH Land Investors, LLC
2919 Breezeway Avenue, Suite 400
Fayetteville, NC 28303

Prepared By:
Nautilus Engineering
P.O. Box 748
Hampton, South Carolina 29924

October 2016

Approved by County Council: March 20, 2017

Version: 3.1

MALLARD CROSSING PDD

TABLE OF CONTENTS

I. Statement of Intent

II. Exhibits

MALLARD CROSSING
PLANNED DEVELOPMENT DISTRICT GUIDELINES

I. STATEMENT OF INTENT

A. Introduction

This Statement of Intent is to describe in detail the proposed Development Plan for a 33.59 acre site located at the Southwest corner of Orangeburg Road and East Butternut Road herein referred to as the "Project" or "Property". The proposed Project is shown on Dorchester County Tax Map Numbers 128-00-00-045, 128-00-00-126 and 128-00-00-128 and is depicted on the survey included as Exhibit A in this document.

The Property is to be developed into a mixed-use master planned community which will include single-family detached homes, single-family attached homes, open space, and a neighborhood commercial area on the corner of the intersection. The property contains approximately 5.1 acres of freshwater wetlands which have been verified by the U.S. Army Corps of Engineers (ACOE). The conceptual site master plan included the delineated wetlands. Additionally the plan allows many of the residential properties to have views of the wetland, existing pond and proposed ponds in the development. The wetlands will also serve to provide natural buffers between areas of the Project. In addition creative design techniques will incorporate these natural and man-made features to create passive recreational amenities, low-impact development techniques and creative land planning. Approximately 8.7 acres (26%) of the Project is green/open space and approximately 3.4 acres (10%) is set aside for social and cultural uses as indicated on the conceptual site master plan development data chart included on Exhibit C in this document.

B. Existing Zoning and Site Conditions

The Property is currently zoned CG (128-00-00-045) and R4 (128-00-00-126 & -128), but no development has commenced relative to the proposed Project. The county future land use recommendation of the area is a commercial & civic node with moderate to high density residential. The Property is wooded, and there are existing freshwater wetlands on the Property which provide surface runoff outfalls for storm water control. These will be incorporated into the storm water management system design for the Project.

C. Transportation

The Project conceptual site master plan proposes to have the primary access to the residential section off Orangeburg Road aligned up with the proposed entrance to Mallard Lakes. The wetlands on the site necessitate a second access from Orangeburg Road approximately 650 feet south of the primary access. Two additional access points to the residential section are planned off East Butternut. Again the second East Butternut entrance is a result of wetland constraints and an existing out parcel which is not a part of the Project. One of these access roads will provide the only access to the Townhome portion of the Project. The Commercial area will also have direct access to both Orangeburg and East Butternut. A connection to the commercial area will be provided from within the primary residential area allowing direct access to the commercial area. This connection will allow residents access to the commercial area without having to exit onto Orangeburg Road or East Butternut Road. Additionally the trail system within the Project will provide pedestrian access to the Commercial area. All intersections of the Project will be stop sign controlled within the Project as well as connections to Orangeburg Road and East Butternut Road.

A Traffic Impact Study (TIS) has been prepared for this property. It should be noted the study assumes 135 residential units while this PDD request a maximum of 120 residential units. The TIS is included as Exhibit H in this document. The developer and Dorchester County mutually agree to a reasonable acceleration of payment for the required per lot Transportation Impact fee.

D. Utilities

Utilities are provided to the Property by various governmental agencies. Water is provided by Dorchester Water Authority and sanitary sewer is provided by Dorchester County Water and Sewer. Power is provided by Berkeley Electric Co-Op. Telephone and Cable TV services are available to the Property. Utility construction will meet the utility supplier requirements at the time of the application.

Coordination letters for Water, Sanitary Sewer and Power are included as Exhibit G. Additionally letters from SCDOT and the School District are also included as Exhibit G.

E. Roads, Sidewalks, Trails and Drainage

Dorchester County will own and maintain the residential roadways and sidewalks within public rights-of-way once constructed, properly dedicated and accepted by the County. Dorchester County will own and maintain the drainage system within

the public rights-of-way and drainage easement (with exception of ponds, pond outfall structures, minor swales and other facilities typically not maintained by the County) once constructed and properly dedicated and accepted by the County. Low Impact Development (LID) drainage facilities (pervious sidewalks, pervious driveway, bioswales, etc.) may be allowed within public right-of-ways on a case by case basis as approved by Dorchester County Engineer. Roadways, drives, parking and storm water management systems within the Commercial Area will be private and will be maintained by the Developer/Owner and/or Property Owner's Association.

A pedestrian trail system will be included throughout the Project and will utilize the existing earth trails on the property. Additional trails (figure 1) will be constructed to connect to the sidewalks in the public rights-of-way and provide a social and cultural amenity to the development. Both the existing and new trails will incorporate existing trees in the final layout and may include additional under story and/or shrub plantings to create a linear park (see figure 2) in appropriate areas. New trails will be a minimum 5' wide with 4" thick pervious walking surface (mulch, pine straw, plantation mix, etc.) with 2.5' of grassed area on both sides unless otherwise approved by the Administrative Officer. A 5' wide wooden boardwalk may be used as a trail in low areas or ditch crossings with no grassing requirement. Benches may be placed along any part of trail system or ponds. The trail system will be built in conjunction with the development phases or as may be allowed by the Administrative Officer. The trail system will be maintained by the Developer and/or Property Owners Association.

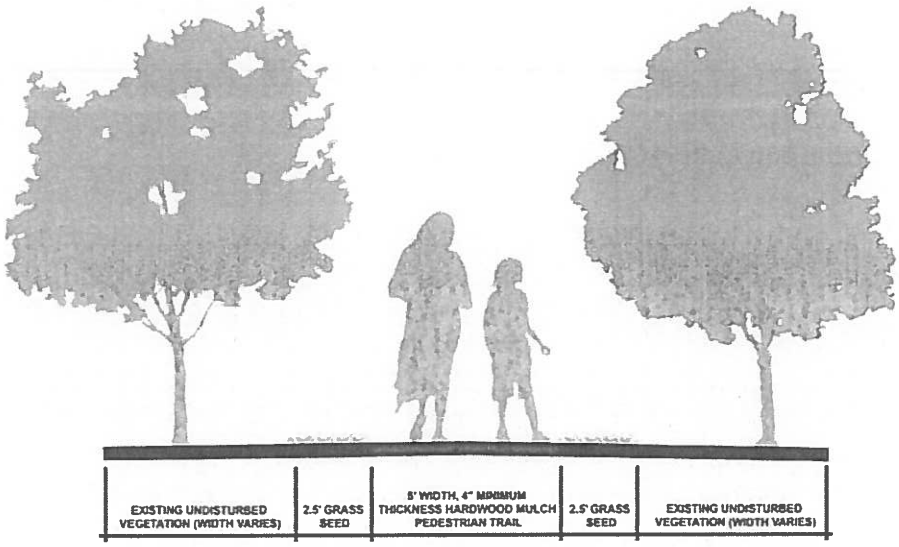


Figure 1

The storm water management system will be designed to meet or exceed local, state and federal regulations involving storm flow, siltation erosion control and water quality. Drainage outlets from the Project will be designed to consider all storm frequencies up to and including the 100-year storm event. The development plan open space accommodates ponds as part of the storm water management system. The Project will consider low-impact discharge techniques as appropriate. Any detention/water quality facilities could be constructed providing an aesthetic amenity including ponds incorporated into the Project's common area. The ponds will be stocked with fish to provide additional social amenity opportunities. The permanent maintenance of any storm water management system (commercial or residential) will be the responsibility of the Property Owner's Association.

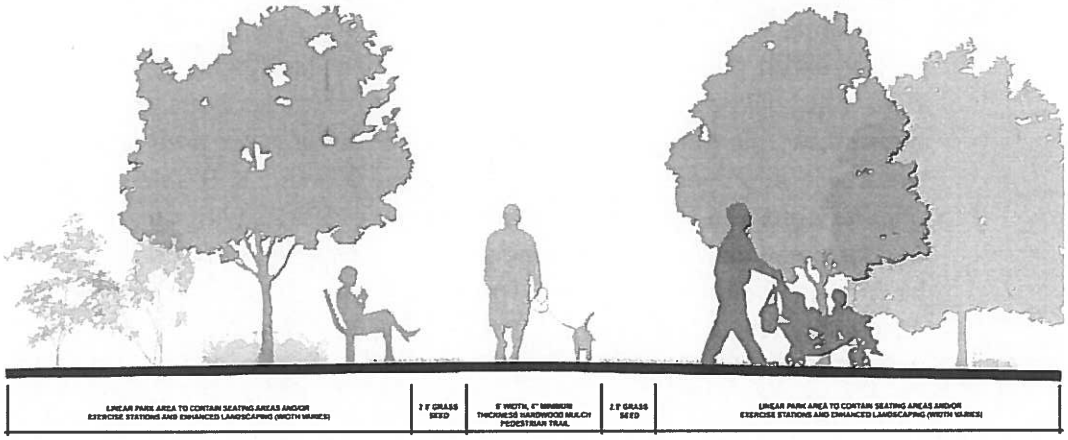


Figure 2

F. Social and Cultural Space

1. Establishment and Dedication of Social / Cultural Space The overall project will provide at least ten (10%) of the project area for social and cultural space. The area may consist of trail system (figure 1), pocket parks (figure 2), linear parks, playgrounds, and stocked ponds. The areas may include cleared open space for active recreation, gazebos, picnic structures, exercise stations, dog park, child play structures, benches, nature view stations along the wetlands, community gardening areas, constructed pond overlooks, fishing in stocked ponds. The existing on-site pond, including any expansion, is considered Social/Cultural space. The social / cultural areas must be constructed during or in advance of the phase of development they are included within. The social / cultural areas will be owned and maintained by the Developer and/or Property Owners Association.

G. Wetlands and Open Space

1. Wetlands

A wetland delineation was completed by a private consultant and verified by the US Army Corps of Engineers (ACOE). The ACOE issued a jurisdictional determination (JD) letter on July 6, 2015 for the Property. A Wetlands Survey is included in Exhibit A. The development has been planned in a way to avoid wetlands impacts.

2. Establishment and Dedication of Open Space.

The overall project shall provide at least twenty (20%) of the project area for open space. There are approximately 5.1 acres of freshwater wetlands to remain within the Project, as determined by the ACOE. The wetlands will remain outside of lot boundaries and will be part of the Project's natural open space. Additional natural open space will include a portion of the 40' road overlay buffers along Butternut and areas along the existing wetlands not being developed. Landscaped open space will include portions of the 40' road overlay buffer, landscaping around certain ponds and trails, and landscaped islands. The trail/sidewalk system will connect and/or run through these landscaped areas.

The total commercial area shall have a minimum of 25% of site area landscaped to meet the Landscaped Open Space requirement. The 40' wide road overlay buffer along Butternut and Orangeburg will count towards this 25% requirement. If multiple buildings are constructed each building will provide a proportional share of landscaped open space to ensure the total commercial area meets the 25% requirement.

The Developer will at all times reserve to itself, its successors and assigns easements for access and infrastructure purposes (roads, walkways, paths, utility easements, drainage easements, rights-of-way, etc.) necessary or desirable for development of the permitted uses set forth in Exhibit E – Permitted Uses Chart.

H. Conveyance of Land for Public Uses

No land within the Project except for public road right-of-ways and drainage and utility easement is to be conveyed for Public Uses. The open space amenities shall be owned and maintained by the Property Owners Association and shall be for the use and enjoyment of the Property Owners and guests only.

I. Property Owners Association

Prior to the sale of any individual platted lot, one or more Property Owners Association (POA) shall be established and such property shall be submitted to the jurisdiction of a POA by recorded Covenants and Restrictions. Membership in the POA will be mandatory for each property owner. Each POA shall be funded by assessments to be established pursuant to its recorded covenants. Each POA shall be responsible for administering its recorded documents and for the maintenance and operation of those common areas, if any, which are designed to the benefit of the properties subject to its jurisdiction. Common Areas for the benefit of residential properties will include passive recreation spaces as well as ponds, and other active amenities. The recorded covenants shall establish architectural controls requiring review and approval of plans for all new construction and any additions or improvements such as fences, pools, etc. prior to commencement of construction. This review will be for aesthetic purposes only and does not replace the building permit or other required reviews by Dorchester County. The recorded covenants shall establish that in the event of a road widening/right-of-way acquisition the POA will not cause Dorchester County or SCDOT to replace or reestablish any natural or planted buffers material lost due to buffer width reduction.

J. Signage Program

Signage requirements are to be in accordance with the Dorchester County Sign Ordinance and adhere to TOD requirements for the Single Family and Commercial area. Larger signs which would include multiple identification signage for the overall development's use may be approved by the Administrative Officer.

K. Street Lighting

Street lighting within the Single Family area shall be provided by the Developer or through the utility provider to meet current County standards. Street lighting/parking area lighting within the Commercial area shall be provided by the Developer or through a lease with the Utility Provider with current standards for this type of use. All street lighting will adhere to TOD standards.

L. Development Program

1. Open Space/ Cultural Area. The Land Use Plan (Exhibit B) indicates a Residential Single Family Area and a Commercial Area. Open Space and

Cultural Uses comprise approximately 12.1 acres and contains wetlands, buffers, ponds, trails, pocket parks, linear parks, green space, and playground area.

2. Developable Area.

   a. Acreage Requirements: The Developable Area is comprised of two development districts: the Residential Area and the Commercial Area as further described below (see Exhibit C):

• Residential	29.3 +/- acres
• Commercial	4.3 +/- acres
• Total	33.59 acres

The Single Family Residential (SFR) Area contains approximately 25.7 acres including wetlands and open/cultural space. Development in this area shall be subject to the Single Family Regulations as defined by the Development Plan. This area will be principally single family detached fee simple units, but may include up to 25 percent single family attached (townhouse or duplex) fee simple units. Typical structures may be slab on grade or raised crawl space with or without garage.

The Townhome Residential (THR) Area contains approximately 3.6 acres including wetlands and open/cultural space. Development in this area shall be subject to the Townhome Regulations as defined by the Development Plan and include single family attached (townhouse or duplex) fee simple units. Typical structures may be slab on grade or raised crawl space with or without garage.

The combined residential areas of SFR and THR will yield a maximum gross density of 4.10 DU/AC and a maximum net density of 4.95 DU/AC. Gross density is total residential land area divided by maximum allowed dwelling units. Net density is total residential land area minus wetlands area divided by maximum allowed dwelling units.

The Commercial Area contains approximately 4.3 acres including open space. Development in the area shall be subject to the Commercial Regulations as defined by the Development Plan. The building(s) design

will have to meet requirements for addressing the building frontage along Orangeburg Road to engage the street. The Commercial Area is subject to the TOD design and architectural review. However, the primary commercial entrance does not have to be on the Orangeburg road side of the building.

b. Permitted Uses within the Development Tracts includes those listed in the Permitted Uses Chart included as Exhibit E. Uses may be located anywhere within the Developable Area, subject to the conditions included in the Permitted Use Chart.

c. Maximum Development Densities within the Development Areas are limited to the following:

Residential Units:	120 Lots
Commercial:	35,000 Gross SF

d. Building Development Standards. The Lot Criteria set forth in Exhibit F shall apply with respect to minimum lot area, width, depth, height, coverage, setback and yard requirements.

e. After approval of a residential site construction phase the Developer may construct one model home using the existing TMS number prior to the recording of a conditional or final plat. The model home can only be used as a sale and marketing office. The model home will not be required to have permanent water or sanitary sewer connections. A residential building permit will be required for the model home. The model home shall not be conveyed until approved permanent water and sanitary sewer are connected and a conditional or final plat is recorded.

f. Proposed Roadway Standards.

   i. Roadway standards shall be in accordance with Dorchester County Road Design Standards and with South Carolina Department of Transportation (SCDOT) design requirements for roads and paving within Orangeburg and East Butternut Road unless modified in this document.

      Paved road sections shall be allowed with a minimum 11' wide asphalt lane for two way traffic on public or private roads and a minimum 14' wide asphalt lane width for one way roads. The minimum centerline radius for road rights-of-way within the Residential area shall be 50'

feet. Maximum cul-de-sac length shall be 650'. Pervious paving systems will be allowed in public rights-of-way upon approval of the Dorchester County Engineer. Pervious paving systems are allowed on any private road or alley. Alleys are not required to be paved.

ii. Concrete sidewalks (5' min width) shall be constructed on both sides of the street within the Single Family area. However, if lots are only constructed on one side of a road only the lot side of the road will require a sidewalk. All sidewalk requirements and locations may be reduced on a case by case basis due to tree or other conflicts as approved by the Administrative Officer.

Sidewalks, including common area walks, will not be required prior to a final plat. Sidewalks will be installed during the home construction process with appropriate financial guarantees to the County.

iii. All roads, drives, paving, curb and gutter, sidewalks and drainage facilities within the Commercial Area shall be privately maintained by the Developer/Owner or POA. All paving and drainage within the Commercial Area shall be constructed in accordance with Dorchester County Design Standards.

iv. Existing wetland ditches may be utilized in their unimproved condition. However, easement widths per standard County requirements for permanent ditches shall be provided for the ditches. Unimproved ditches shall not be maintained by the County. Wetland ditches that remain unimproved and only receive surface runoff are not required to be in drainage easements.

g. Bufferyards / Landscaping

i. Development Bufferyards between adjacent land uses shall apply only between single family detached lots and non-residential land uses. In these cases, a 15' Bufferyard shall be placed on the Commercial side of the common property line between the two uses. This Bufferyard may be reduced to 10' in width if an opaque 6' tall min (max 8' tall) wood, brick or masonry fence is constructed. There will be no Bufferyard required between commercial uses within the Commercial area. A 30' undeveloped perimeter buffer shall remain around TMS 128-00-00-154 to provide visual screening.

ii. Street Bufferyards do not apply to any streets within the Project. The TOD required 40' deep Street Overlay Bufferyards shall remain along Orangeburg Road and East Butternut Road. A portion of the required

TOD buffer will be counted towards the required open space within the Project. The area of the required TOD buffer counted as open space is shown on the Conceptually Master Plan in Exhibit C.

In order to encourage the commercial node development at the intersection, the 40' street buffer yard will allow a reduction of twenty five percent of the required plant material and allow grouping of the required landscaping to encourage visibility in order to promote the commercial development.

iii. Maintenance - Required buffers will not be disturbed for any reason except for permitted signs, roads, driveways, sidewalks, or other pedestrian or bicycle paths, walls, fences, or required landscaping, and landscaping maintenance and replacement. Maintenance removal of damaged or diseased trees or shrubs will require County approval. However, if a current ISA arborist certifies in writing a tree is an immediate hazard it may be removed with a notification to the County Administrator and appropriate replacement.

iv. Utility easements and drainage easements may be allowed within proposed bufferyards if agreed upon by the utility. The utility must provide a written statement indicating its permission to allow plant material in the easement, and the Property Owner must submit an agreement to replant vegetation removed by the utility. For easements that are located in proposed bufferyards, replacement of required buffer landscaping due to utility maintenance will be the responsibility of the POA. Hardwood trees removed inside the buffer that are greater than 8" DBH shall be replaced by native trees that are a minimum size of 2.5" caliper. In no event shall any improvement within the buffer prevent the replacement of trees as contemplated herein.

3. Flexibility of Uses and Tracts, Project Master Plans. The development of the Property must maintain flexibility to accommodate specific soil conditions, environmental concerns, physical constraints, market conditions and design parameters. As such, the exact locations of boundary lines between development tracts, phase lines, the locations and sizes of land uses in the development areas, and the preliminary planning concepts for the tracts and uses are not indicated on the Land Use Plan (Exhibit B). Specific development areas for each development tract within Property will be submitted to the County for review by the Administrative Officer. Based on the same flexibility requirement the Conceptual Site Master Plan (Exhibit C) may be modified without a PUD amendment subject to the approval of the Administrative Officer.

The maximum densities and allowable land uses set forth in this document shall be strictly adhered to.

4. Phasing Plan / Schedule. The Project is planned to be developed in multiple construction phases. Phase 1 is scheduled to begin in mid 2017 and be completed within 24 month. Each subsequent residential phase is expected to take approximately 20 months. However, depending on market conditions multiple phases can be under construction simultaneously. The Commercial Area is identified to be the final development phase of the project; however the commercial component may be built at any time concurrent with or after Phase I residential construction. The phase lines shown on the conceptual master plan are general delineations and may be modified based on final design considerations at the approval of the Administrative Officer.

5. Parking Requirements. In Single Family areas, each dwelling will have minimum of two (2) off-street parking spaces. A garage, if provided, shall be counted as a parking space(s).

   Off-street parking and storage of boats, RV's, etc. and the maximum number of vehicles parked/stored on individual residential lots shall be addressed in the POA Covenants and Restrictions, but shall be equal to or more restrictive than the Dorchester County Zoning Ordinance.

   In Commercial areas the requirements of the Dorchester County Zoning Ordinance shall apply.

6. Street trees. Street tree planting program in the Single Family area, will required approval by the Administrative Officer or County Engineer prior to planting. Final location of trees will be uniform on each street, but location may be determined by the position of utilities. Street trees may be planted within public right-of-way or inside private property provided they are within 5 feet of the street right-of-way.

7. Mail. Kiosks shall be installed in the Project in accordance with Dorchester County requirement and/or U.S. Postal Service requirements.

8. Trash. Private waste collection will be required for both the residential lots and the commercial area.

9. Other Items. All items not addressed by this Development Plan document are subject to the base Dorchester County ordinance requirements in effect at the time of the Plan submittal.

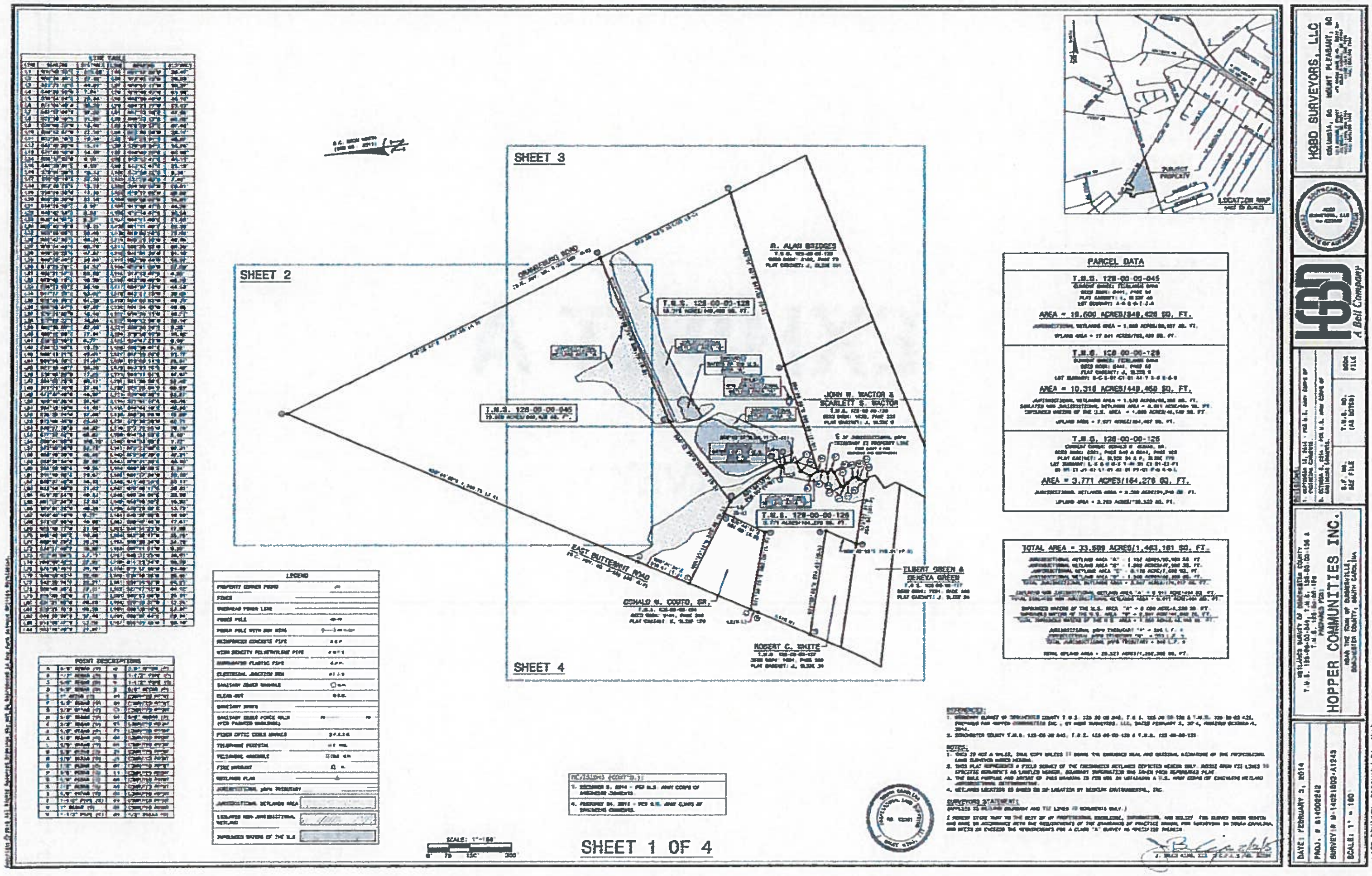
M. Development Plan

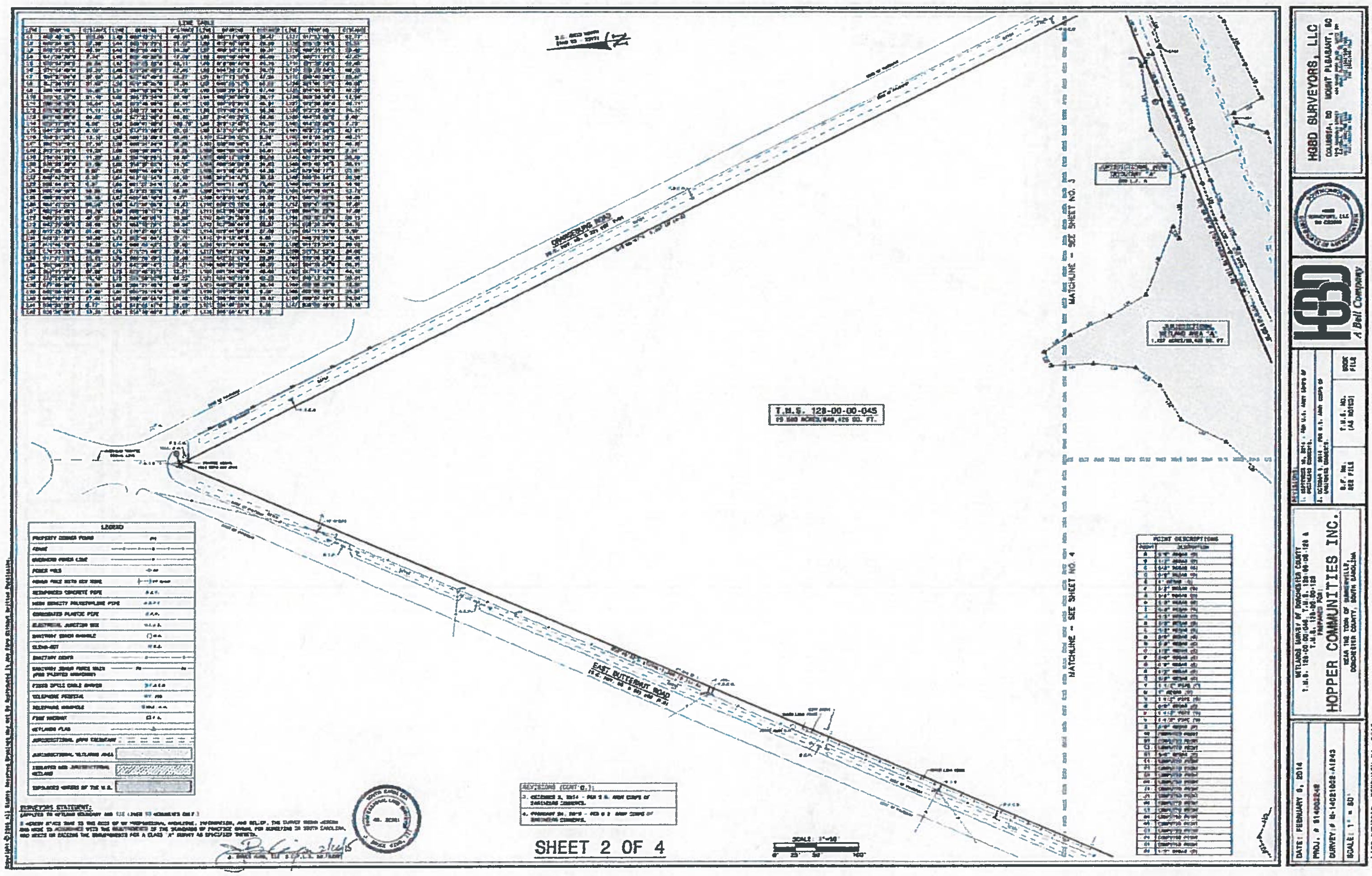
The Conceptual Development Plan is included herein as Exhibit C.

ORANGEBURG AT EAST BUTTERNUT
PLANNED DEVELOPMENT DISTRICT GUIDELINES

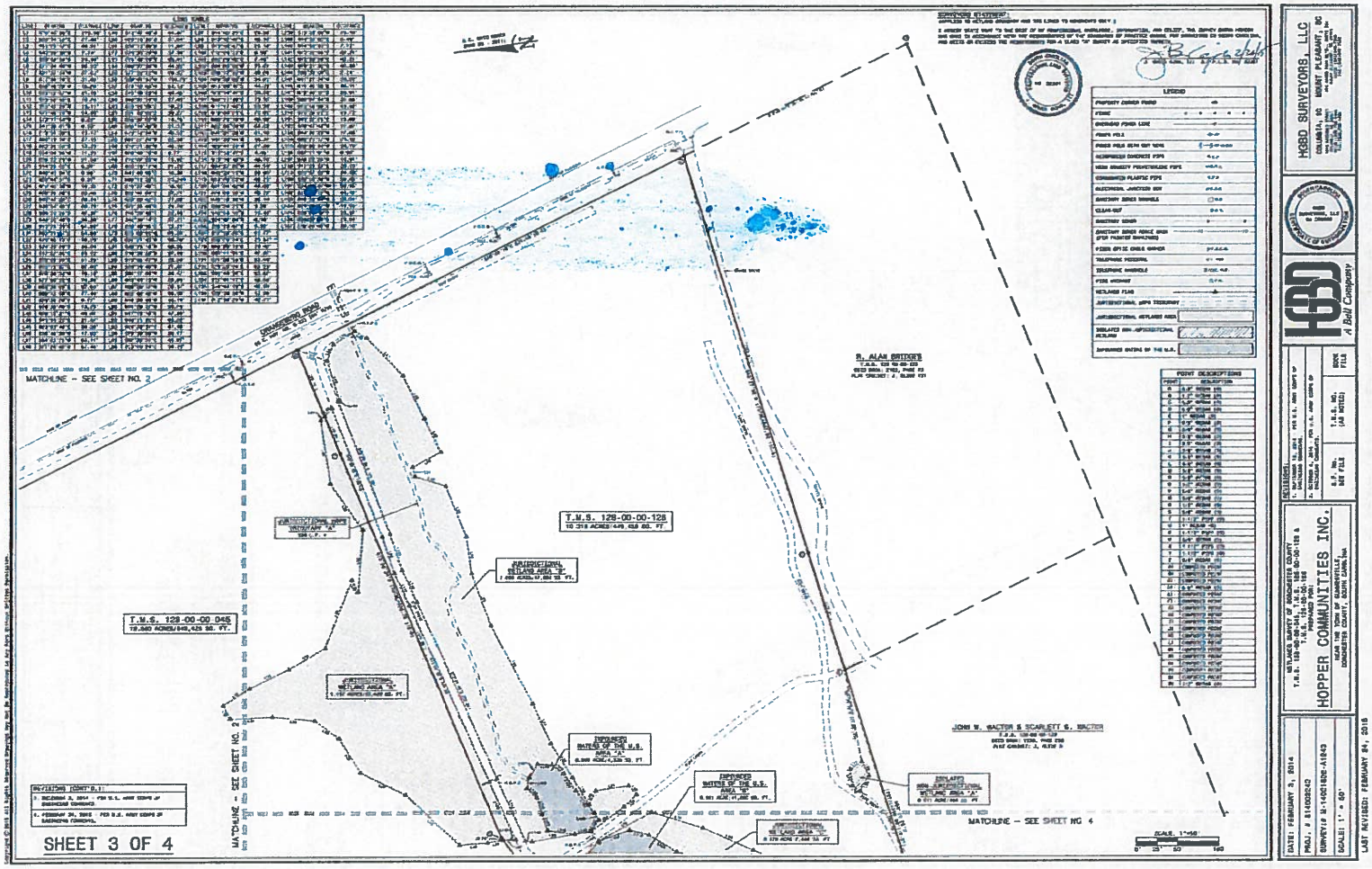
EXHIBIT A

SURVEY


SHEET 2
SHEET 3
SHEET 4
R. ALAN BRIDGES
JOHN W. WACTOR &
SCARLETT S. WACTOR
T.M.S. 128-00-00-126
EAST BUTTERNUT ROAD
ELBERT GREEN &
DENEVA GREEN
ROBERT C. WHITE
LEGEND
POINT DESCRIPTIONS
LOCATION MAP
SUBJECT PROPERTY
PARCEL DATA
T.M.S. 128-00-00-045
AREA = 19.600 ACRES/849,426 SQ. FT.
AREA = 10.318 ACRES/449,450 SQ. FT.
T.M.S. 128-00-00-126
AREA = 3.771 ACRES/164,276 SQ. FT.
TOTAL AREA = 33.689 ACRES/1,463,161 SQ. FT.
REFERENCES:
NOTES:
SURVEYORS STATEMENT:
SHEET 1 OF 4
HGBD SURVEYORS, LLC
HGBD
A Bolt Company
HOPPER COMMUNITIES INC.
DATE: FEBRUARY 3, 2014
SCALE: 1" = 150'
LAST REVISED: FEBRUARY 24, 2015



LINE TABLE
T.M.S. 128-00-00-045
EAST BUTTERNUT ROAD
MATCHLINE - SEE SHEET NO. 3
MATCHLINE - SEE SHEET NO. 4
LEGEND
POINT DESCRIPTIONS
SHEET 2 OF 4
HGBD SURVEYORS, LLC
A Bell Company
HOPPER COMMUNITIES INC.
DATE: FEBRUARY 6, 2014
LAST REVISED: FEBRUARY 24, 2016

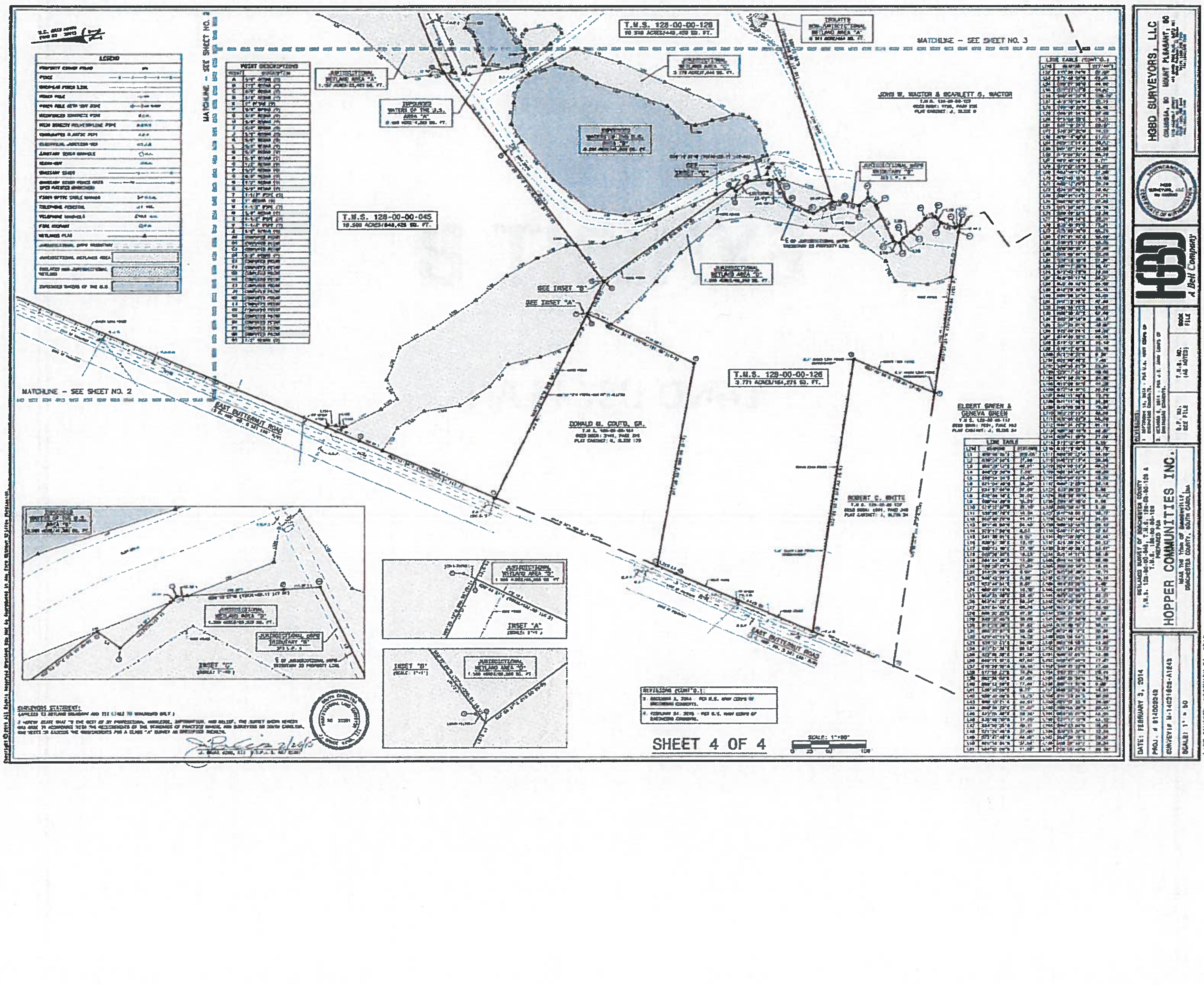


H&BD SURVEYORS, LLC
COLUMBIA, SC MOUNT PLEASANT, SC

WETLANDS SURVEY OF BERKELEY COUNTY
T.M.S. 128-00-00-128 & T.M.S. 128-00-00-045
PREPARED FOR:
HOPPER COMMUNITIES INC.
NEAR THE TOWN OF HANAHANVILLE
BERKELEY COUNTY, SOUTH CAROLINA

DATE: FEBRUARY 3, 2014
PROJ. # 514002042
SURVEY # S-14021606-A1843
SCALE: 1" = 50'

LAST REVISED: FEBRUARY 24, 2016

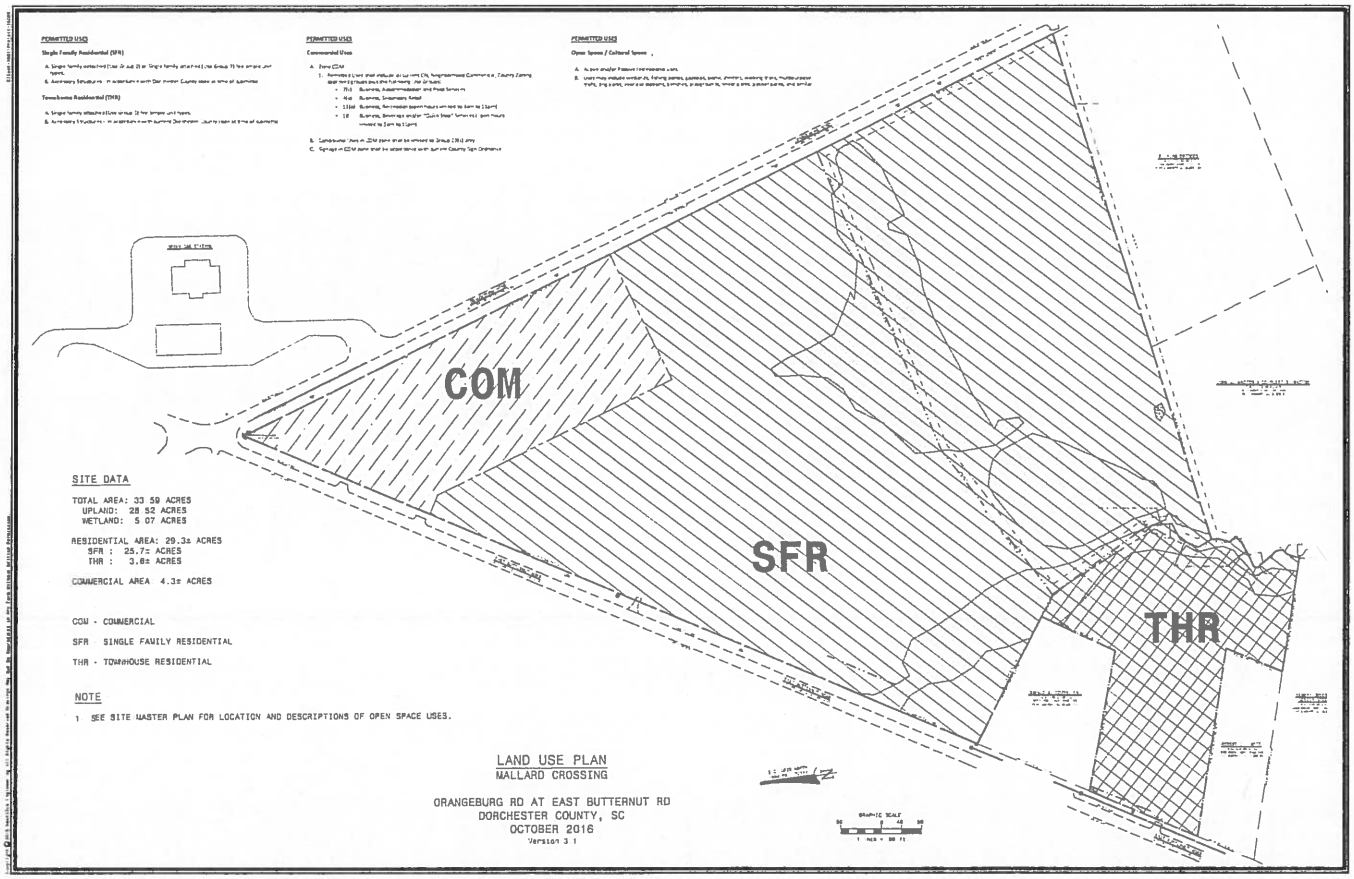


MATCHLINE - SEE SHEET NO. 3
MATCHLINE - SEE SHEET NO. 2
MATCHLINE - SEE SHEET NO. 2
LEGEND
POINT DESCRIPTIONS
LINE TABLE
LINE TABLE (CONT'D.)
T.M.S. 128-00-00-128
T.M.S. 128-00-00-045
T.M.S. 128-00-00-126
JURISDICTIONAL WETLAND AREA "A"
IMPOUNDED WATERS OF THE U.S. AREA "A"
JURISDICTIONAL WETLAND AREA "C"
JURISDICTIONAL WETLAND AREA "B"
ISOLATED NON-JURISDICTIONAL WETLAND AREA "A"
JOHN W. WACTOR & SCARLETT S. WACTOR
DONALD B. COUTO, SR.
ELBERT GREEN & GENEVA GREEN
ROBERT C. WHITE
EAST BUTTERNUT ROAD
SEE INSET "B"
SEE INSET "A"
SEE INSET "C"
INSET "A"
INSET "B"
INSET "C"
SURVEYORS STATEMENT:
REVISIONS (CONT'D.):
SHEET 4 OF 4
HGBD SURVEYORS, LLC
COLUMBIA, SC
MOUNT PLEASANT, SC
HGBD
A Bell Company
HOPPER COMMUNITIES INC.
DORCHESTER COUNTY, SOUTH CAROLINA
DATE: FEBRUARY 3, 2014
SCALE: 1" = 50'
LAST REVISED: FEBRUARY 24, 2016

ORANGEBURG AT EAST BUTTERNUT
PLANNED DEVELOPMENT DISTRICT GUIDELINES

EXHIBIT B

LAND USE PLAN



SITE DATA

TOTAL AREA: 33 59 ACRES
UPLAND: 28 52 ACRES
WETLAND: 5 07 ACRES

RESIDENTIAL AREA: 29.3± ACRES
SFR : 25.7± ACRES
THR : 3.6± ACRES

COMMERCIAL AREA 4.3± ACRES

COM - COMMERCIAL

SFR SINGLE FAMILY RESIDENTIAL

THR - TOWNHOUSE RESIDENTIAL

NOTE

1 SEE SITE MASTER PLAN FOR LOCATION AND DESCRIPTIONS OF OPEN SPACE USES.

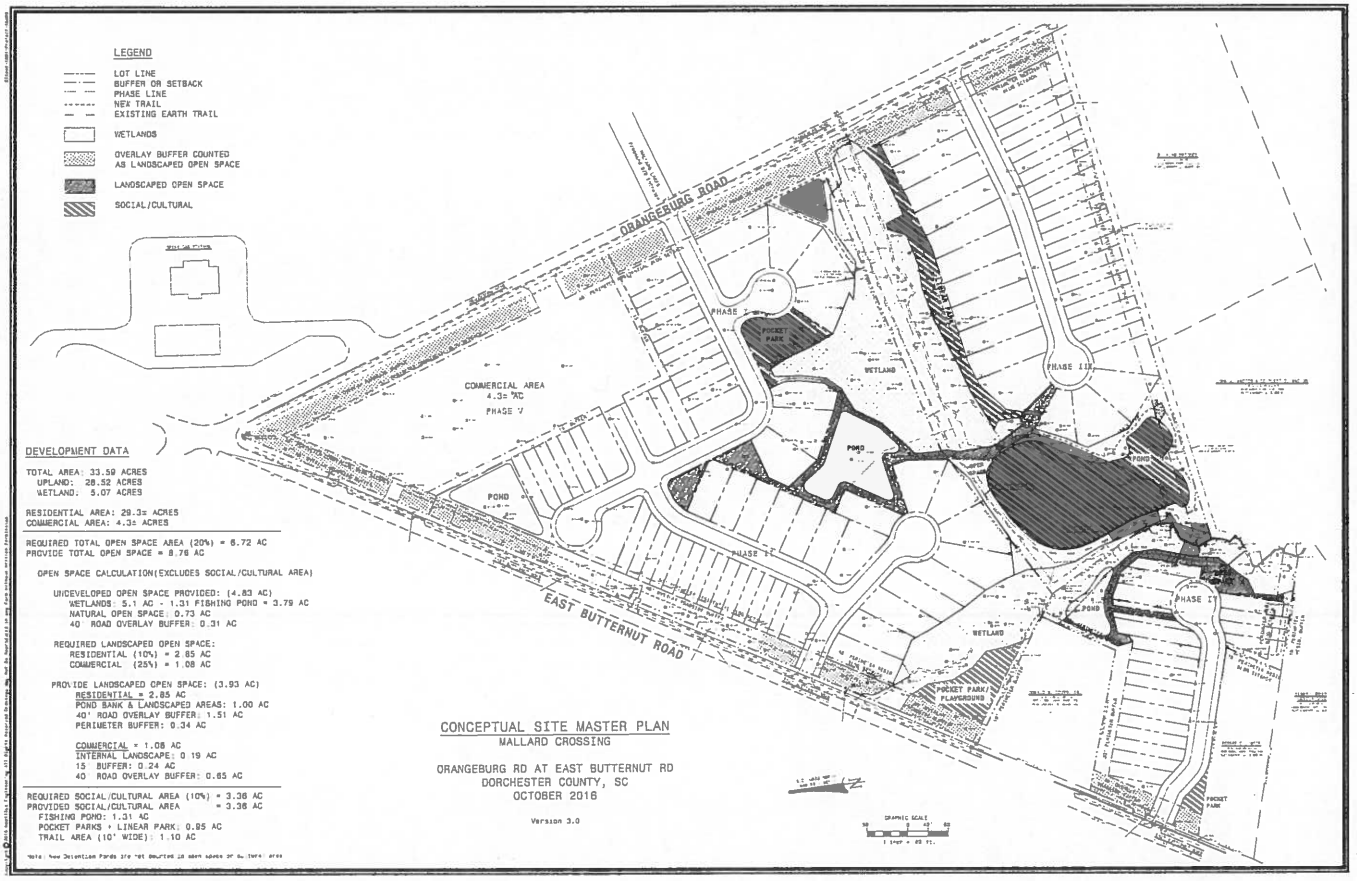
LAND USE PLAN
MALLARD CROSSING

ORANGEBURG RD AT EAST BUTTERNUT RD
DORCHESTER COUNTY, SC
OCTOBER 2016
Version 3 1

ORANGEBURG AT EAST BUTTERNUT
PLANNED DEVELOPMENT DISTRICT GUIDELINES

EXHIBIT C

CONCEPTUAL SITE MASTER PLAN



DEVELOPMENT DATA

TOTAL AREA: 33.59 ACRES
UPLAND: 28.52 ACRES
WETLAND: 5.07 ACRES

RESIDENTIAL AREA: 29.3± ACRES
COMMERCIAL AREA: 4.3± ACRES

REQUIRED TOTAL OPEN SPACE AREA (20%) = 6.72 AC
PROVIDE TOTAL OPEN SPACE = 8.76 AC

OPEN SPACE CALCULATION(EXCLUDES SOCIAL/CULTURAL AREA)

UNDEVELOPED OPEN SPACE PROVIDED: (4.83 AC)
WETLANDS: 5.1 AC - 1.31 FISHING POND = 3.79 AC
NATURAL OPEN SPACE: 0.73 AC
40' ROAD OVERLAY BUFFER: 0.31 AC

REQUIRED LANDSCAPED OPEN SPACE:
RESIDENTIAL (10%) = 2.85 AC
COMMERCIAL (25%) = 1.08 AC

PROVIDE LANDSCAPED OPEN SPACE: (3.93 AC)
RESIDENTIAL = 2.85 AC
POND BANK & LANDSCAPED AREAS: 1.00 AC
40' ROAD OVERLAY BUFFER: 1.51 AC
PERIMETER BUFFER: 0.34 AC

COMMERCIAL = 1.08 AC
INTERNAL LANDSCAPE: 0.19 AC
15' BUFFER: 0.24 AC
40' ROAD OVERLAY BUFFER: 0.65 AC

REQUIRED SOCIAL/CULTURAL AREA (10%) = 3.36 AC
PROVIDED SOCIAL/CULTURAL AREA = 3.36 AC
FISHING POND: 1.31 AC
POCKET PARKS + LINEAR PARK: 0.85 AC
TRAIL AREA (10' WIDE): 1.10 AC

*Note: New Detention Ponds are not counted as open space or social area

CONCEPTUAL SITE MASTER PLAN

MALLARD CROSSING

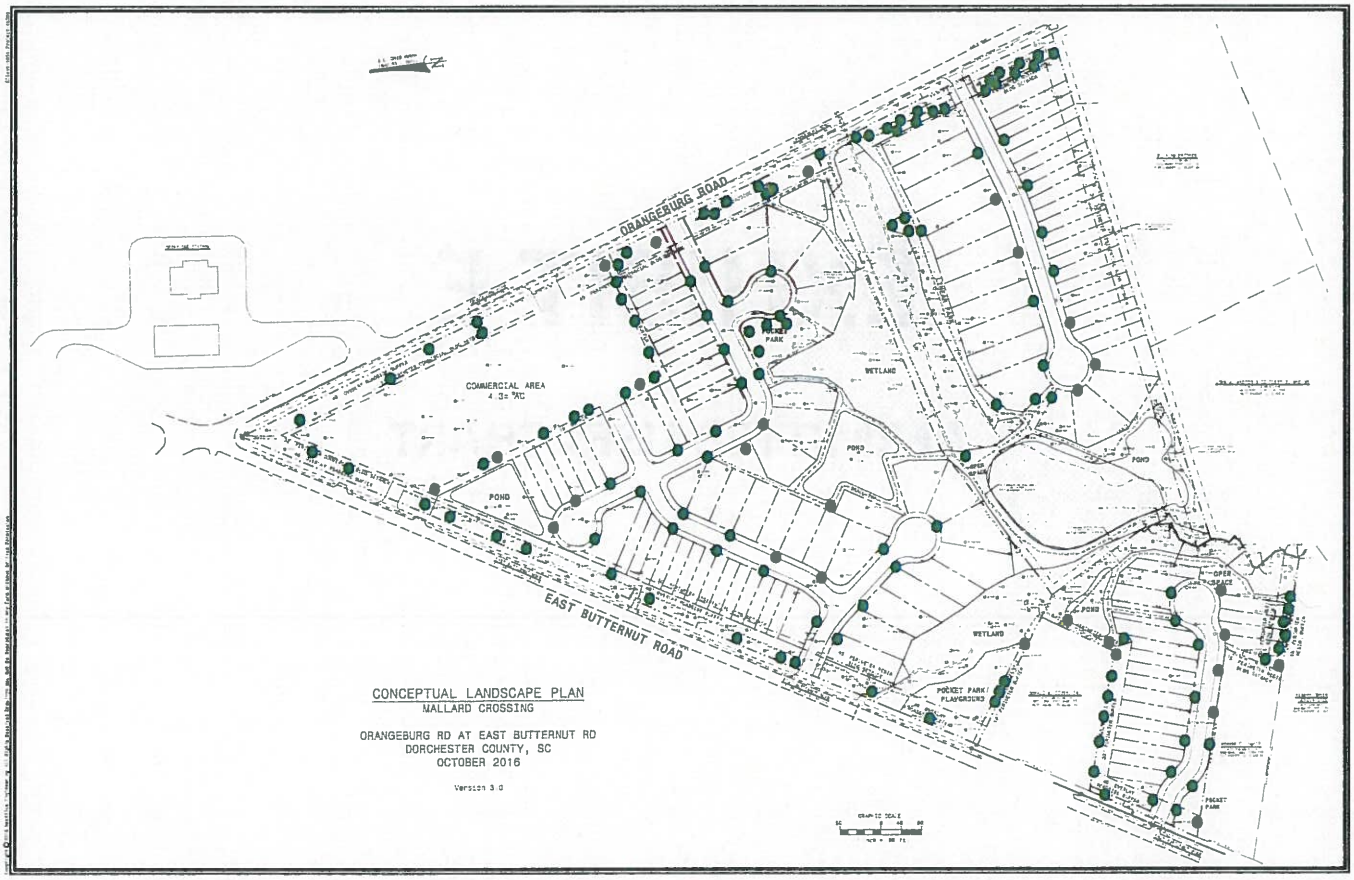
ORANGEBURG RD AT EAST BUTTERNUT RD
DORCHESTER COUNTY, SC
OCTOBER 2016

Version 3.0

ORANGEBURG AT EAST BUTTERNUT
PLANNED DEVELOPMENT DISTRICT GUIDELINES

EXHIBIT D

CONCEPTUAL LANDSCAPE PLAN



CONCEPTUAL LANDSCAPE PLAN
MALLARD CROSSING

ORANGEBURG RD AT EAST BUTTERNUT RD
DORCHESTER COUNTY, SC
OCTOBER 2016

Version 3.0

ORANGEBURG AT EAST BUTTERNUT
PLANNED DEVELOPMENT DISTRICT GUIDELINES

EXHIBIT E

PERMITTED USES CHART

Exhibit E
Permitted Uses Chart

I. PERMITTED USES

1. Single Family Residential (SFR)

a) Single family detached (Use Group 2) or Single family attached (Use Group 3) fee simple unit types.

b) Accessory Structures – In accordance with current Dorchester County code at time of submittal.

2. Townhome Residential (THR)

a) Single family attached (Use Group 3) fee simple unit types.

b) Accessory Structures – In accordance with current Dorchester County code at time of submittal.

3. Commercial Uses

a) Zone COM

1. Permitted Uses shall include all current CN, Neighborhood Commercial, County Zoning approved groups plus the following Use Groups:
   - 7(c) Business, Accommodation and Food Services
   - 9(a) Business, Secondary Retail
   - 13(a) Business, Recreation (open hours limited to 9am to 11pm)
   - 18 Business, Beverage and/or "Quick Stop" Services (open hours limited to 5am to 11pm)

b) Conditional Uses in COM zone shall be limited to Group 23(c) only.

c) Signage in COM zone shall be accordance with current County TOD Sign Ordnance.

4. Open Space / Cultural Space

a) Active and/or Passive recreational uses.

b) Uses may include wetlands, fishing ponds, gazebos, picnic shelters, walking trails, multipurpose trails, dog parks, exercise stations, benches, playgrounds, linear parks, pocket parks, and similar.

ORANGEBURG AT EAST BUTTERNUT
PLANNED DEVELOPMENT DISTRICT GUIDELINES

EXHIBIT F

LOT CRITERIA

Exhibit F
Lot Criteria

Land Use	Min Lot Size	Min Lot Frontage		Building Setbacks						Max Lot Coverage	Max Bldg Height
		Standard Lot	Corner Lot	Min Front Yard (No Front Garage)	Min Front Yard (With Front Garage)	Min Garage Side Entry	Min Side Yard	Min Rear Yard	Min Side Street		
Detached Single Family	4,000 SF	30 ft	40 ft	10 ft	20 ft	20 ft	5 ft	10 ft	10 ft	65%	40 ft
Attached Single Family (Townhome)	1600 SF	18 ft	25 ft	8 ft	20 ft	N/A	5 ft or 0 ft	10 ft	10 ft	85%	35 ft

1. All building separations must meet applicable building codes. Minimum building separation shall be 10 feet.

2. Building setbacks shall be measured to the eave line.

3. Steps may encroach into front and rear minimum building setbacks but may not encroach into easements and rights-of way. No encroachment into side setback allowed.

4. Building heights are measured to the highest point at the structure from the ground. Architectural features such as cupolas, chimneys, etc. shall be exempt from height restrictions.

5. Patios and decks are considered an accessory structure. Accessory structures are not allowed in the front yard. Minimum accessory structure setback from any properly line is 5 feet.

6. Attached sunrooms, screened patios, or similar with a roof are subject to building setback requirements.

7. Maximum impervious coverage applies to the developable area (roads, wetlands and ponds not included) of each subdivided lot.

8. Minimum distance from a road right-of-way centerline to edge of residential driveway shall be 45 feet.

9. There is no lot width to depth ratio requirement.

ORANGEBURG AT EAST BUTTERNUT
PLANNED DEVELOPMENT DISTRICT GUIDELINES

EXHIBIT G

COORDINATION LETTERS

TRAFFIC IMPACT STUDY

Mallard Crossing

Orangeburg Road & East Butternut Tract

Summerville, SC

SCDOT
South Carolina
Department of Transportation

Beaufort County
Berkeley County
Charleston County
Colleton County
Dorchester County
Jasper County

May 15, 2014

Mr. John Fleming, PE
Hussey, Gay, Bell and Deyoung, Inc.
474 Wando Park Boulevard Suite 201
Mount Pleasant, South Carolina 29464

RE: Proposed Hopper Communities on Orangeburg Road

Dear Mr. Fleming:

I have received the conceptual plan set and traffic impact study for the proposed Hopper Communities located on the corner of Orangeburg Road and East Butternut Road. While I know this is a preliminary review, the only comment I have at this time is that a more in-depth traffic impact study detailing the engineering recommendations at each access point would need to be submitted.

I appreciate the opportunity to review and comment on this site. Should you wish to schedule a meeting regarding the site, please do not hesitate to contact me at (843) 746-6718.

Sincerely,

B Holt

Brian M. Holt, PE
Resident Traffic Engineer

ec: David Pilch, Resident Maintenance Engineer
File: D6/Traffic/bmh

HGBD
MAY 19 2014
Received

District Six Engineering
6355 Fain Boulevard
North Charleston, SC 29406-4989

Phone: (843) 740-1665
Fax: (843) 740-1663

ORANGEBURG AT EAST BUTTERNUT
PLANNED DEVELOPMENT DISTRICT GUIDELINES

EXHIBIT H

TRAFFICE IMPACT STUDY

MALLARD CROSSING DEVELOPMENT
TRAFFIC IMPACT ANALYSIS

Dorchester County, South Carolina

Stantec

Prepared for:
RHH Land Investors, LLC

Prepared by:
Stantec Consulting Services Inc.

November 2017

MALLARD CROSSING DEVELOPMENT
TRAFFIC IMPACT ANALYSIS

Dorchester County, South Carolina

Prepared for:
RHH Land Investors, LLC
2919 Breezewood Avenue, Suite 400
Fayetteville, North Carolina

Prepared by:
Stantec Consulting Services Inc.
4969 Centre Pointe Drive, Suite 200
North Charleston, South Carolina
Phone: (843) 740-7700
Fax: (843) 740-7707

November 2017
Project No. 171001927

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 32068 STUART W. [illegible]

Signature 11-8-17 Date

Table of Contents

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Executive Summary

A traffic impact analysis was conducted for the Mallard Crossing Development in accordance with SCDOT and Dorchester County guidelines. The proposed Mallard Crossing Development is located in the southern quadrant of the Orangeburg Road & Mallard Road/East Butternut Road intersection in Dorchester County, South Carolina. The development is to be constructed in two phases. Phase 1 consists of 47 single-family homes, 34 duplex homes, and 19 townhouses. Phase 2 consists of 35,000 square feet of commercial development which will be developed at a later time and will require a separate traffic impact analysis at that time.

Access to the development will be provided through two proposed full access driveways along Orangeburg Road, both of which meet the SCDOT spacing criteria, and two proposed full access driveways along East Butternut Road, one of which meets the SCDOT spacing criteria and one that is 55% of the SCDOT spacing criteria.

The results of the intersection analyses indicate that the study intersections currently operate and are expected to continue to operate at an acceptable LOS with consideration of the Mallard Crossing Development, with one exception. The intersection of Orangeburg Road & Mallard Road/East Butternut Road experiences significant queues today and is anticipated to experience undesirable LOS conditions in the future, with or without the Mallard Crossing Development. Because the intersection currently operates with substantial queues and needs improvement today, and the fact that the project traffic is relatively minor, the intersection is not significantly impacted with or without this development. Therefore, no improvements to the Orangeburg Road & Mallard Road/East Butternut Road intersection are recommended as a result of this development's traffic impact.

Based on the *Highway Design Manual* considerations for the project driveways, exclusive right-turn lanes along Orangeburg Road and East Butternut Road at the project driveways are not recommended at this time. Based on the *Highway Design Manual* considerations for the project driveway, exclusive left-turn lanes along Orangeburg Road and East Butternut Road at the project driveways are not recommended at this time.

1.0 Introduction

The purpose of this report is to document a traffic impact analysis for the Mallard Crossing Development in accordance with SCDOT and Dorchester County guidelines. This report summarizes the procedures and findings of the traffic impact analysis.

1.1 PROJECT BACKGROUND

The proposed Mallard Crossing Development is located in the southern quadrant of the Orangeburg Road & Mallard Road/East Butternut Road intersection in Dorchester County, South Carolina which consists of 47 single-family homes, 34 duplex homes, 19 townhouses in the first phase. Access to the phase 1 development will be provided through two proposed full access driveways along Orangeburg Road and two proposed full access driveways along East Butternut Road.

The traffic impact analysis considers the weekday AM peak hour (between 7:00 AM and 9:00 AM) and the weekday PM peak hour (between 4:00 PM and 6:00 PM) as the study time frames. The extent of the existing roadway network to be studied consists of the intersection of Orangeburg Road & Mallard Road/East Butternut Road for use in the traffic impact analysis.

The buildout date for the proposed development is anticipated prior to 2020; therefore, future-year 2020 conditions were analyzed as the Build scenario. Exhibit 1.1 illustrates the location of the project site, including the adjacent public roadway network, and Exhibit 1.2 illustrates a site plan of the proposed development.


NORTH
Not to Scale
Orangeburg Road
Mallard Road
East Butternut Road
PROJECT SITE

2.0 Driveway Spacing Review

Access to the development will be provided through two proposed full access driveways along Orangeburg Road and two proposed full access driveways along East Butternut Road. The proposed access to the development was driven by existing Jurisdictional Perineal Relatively Permanent Water Tributaries that flow into a Traditional Navigable Water of the United States subject to the jurisdiction of the US Army Corps of Engineers. A review of the driveway spacing of the proposed full access driveway was undertaken based upon information contained in SCDOT's *Access & Roadside Management Standards (ARMS)* manual.

Based upon the 45 mph posted speed limit and the driveway spacing criteria of *ARMS*, a minimum driveway spacing of 325 feet is required for full access along Orangeburg Road and East Butternut Road. The proposed full access Project Driveway #1 along Orangeburg Road is aligned with another development's proposed driveway which is located approximately 700 feet south of the intersection of Orangeburg Road and East Butternut Road, which meets the SCDOT spacing criteria. The proposed full access Project Driveway #2 along Orangeburg Road is located approximately 775 feet south of the proposed Project Driveway #1 and approximately 670 feet north of the Cambridge Road intersection, which meets of the SCDOT spacing criteria. The proposed full access Project Driveway #3 along East Butternut Road is located approximately 180 feet west of an existing indoor/outdoor storage facility driveway, which is 55% of the SCDOT spacing criteria. The proposed full access Project Driveway #4 along East Butternut Road is located approximately 660 feet west of the proposed full access Project Driveway #3 and approximately 710 feet east of the intersection at East Butternut Road & Hazel Lane, which meets the SCDOT spacing criteria.

3.0 Project Traffic

Project traffic used in this analysis is defined as the vehicle trips expected to be generated by the Mallard Crossing Development. These trips were distributed and assigned throughout the study roadway network.

3.1 PROPOSED LAND USES

The Mallard Crossing Development consists of 47 single-family homes, 34 duplex homes, 19 townhouses to be developed in the first phase. The project site is currently vacant.

3.2 TRIP GENERATION ESTIMATES

The trip generation potential for the development was estimated using information contained in ITE's *Trip Generation Manual*, 9th Edition (2012) reference. The estimates utilized lane use code (LUC) 210 – Single-Family Detached Housing, and LUC 230 – Residential Condominiums/Townhomes, and were developed for the weekday daily, the weekday AM peak hour of the adjacent street, and the weekday PM peak hour of the adjacent street time periods.

Due to the nature of the development, internal capture and pass-by trips were not considered. The trip generation estimates for the development is shown in Table 3.1 on the following page and documented in Appendix A.

Table 3.1 – Trip Generation Estimates

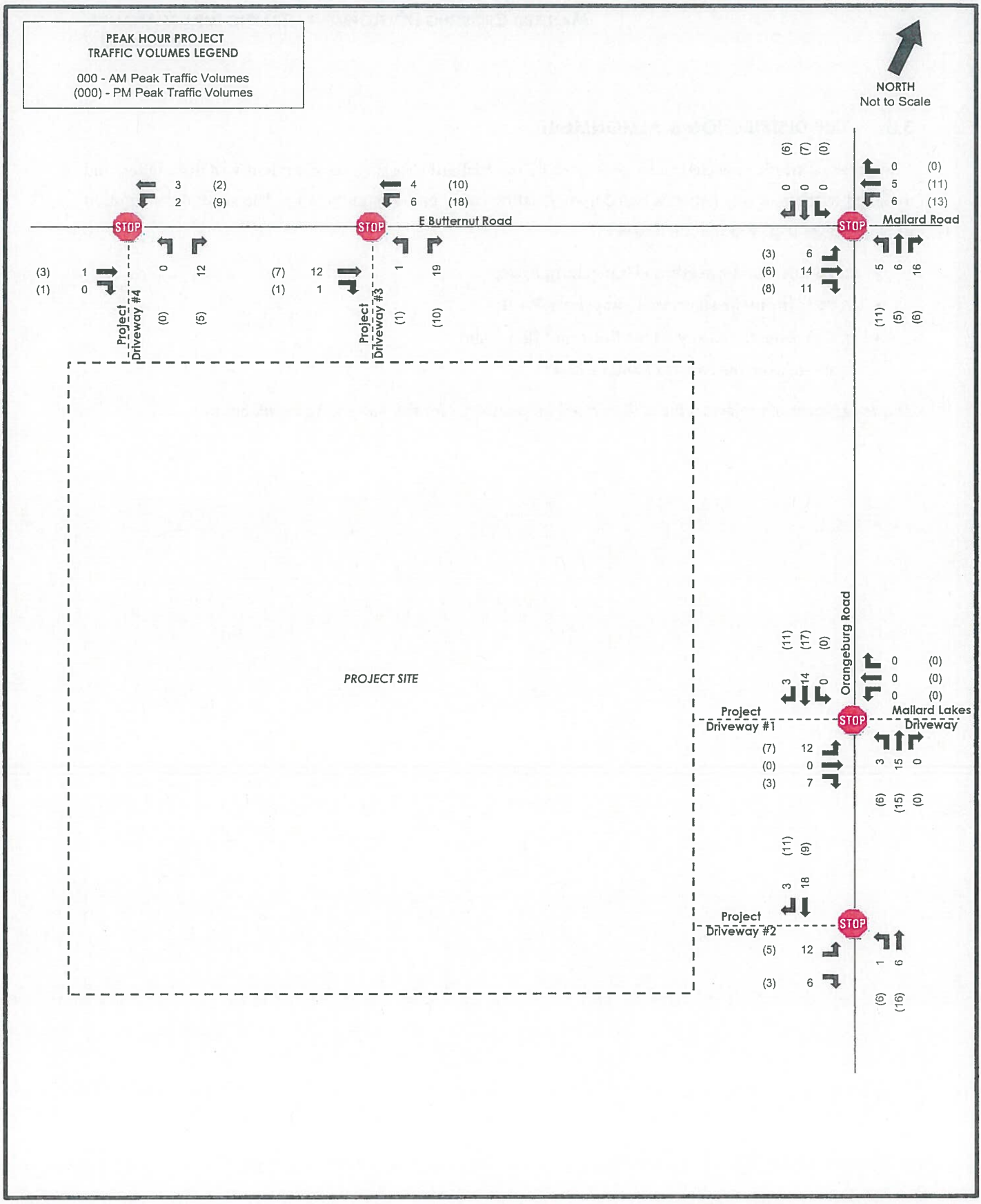
Land Use	ITE LUC	Scale	Daily	Weekday AM Peak Hour		Weekday PM Peak Hour	
				Enter	Exit	Enter	Exit
Single-Family Detached Housing	210	47 Dwelling Units	554	13	39	36	21
Residential Condominium/Townhouse (Duplex)	230	34 Dwelling Units	252	4	18	17	8
Residential Condominium/Townhouse	230	19 Dwelling Units	152	2	12	10	5
		Gross Trips:	958	19	69	63	34
		New, External Trips:	**958**	**19**	**69**	**63**	**34**

3.3 TRIP DISTRIBUTION & ASSIGNMENT

New external traffic expected to be generated by the Mallard Crossing Development was distributed and assigned to the roadway network based upon existing travel patterns in the area. The general distribution of new project trips was assumed to be:

- 20% to/from the north via Orangeburg Road;
- 35% to/from the south via Orangeburg Road;
- 5% to/from the west via East Butternut Road; and
- 40% to/from the east via Mallard Road.

The assignment of project traffic is illustrated in Exhibit 3.1 for the AM and PM peak hours.


PEAK HOUR PROJECT
TRAFFIC VOLUMES LEGEND
000 - AM Peak Traffic Volumes
(000) - PM Peak Traffic Volumes
NORTH
Not to Scale
E Butternut Road
Mallard Road
Orangeburg Road
Project Driveway #4
Project Driveway #3
Project Driveway #1
Project Driveway #2
Mallard Lakes Driveway
PROJECT SITE
STOP

4.0 Traffic Volume Development

Traffic counts at the intersection of Orangeburg Road & Mallard Road/East Butternut Road from a 2016 study were utilized in this study. The existing 2017 and future-year 2020 traffic volumes consisted of the 2016 traffic volumes adjusted by an annual growth rate. The future-year 2020 traffic volumes also considered the projected traffic volumes of the Mallard Crossing Development.

4.1 EXISTING TRAFFIC VOLUMES

This traffic impact analysis considers the weekday AM peak period (from 7:00 AM to 9:00 AM) and the weekday PM peak period (from 4:00 PM to 6:00 PM) at the intersection of Orangeburg Road & Mallard Road/East Butternut Road as the study time frames.

The 2016 raw traffic volume counts are provided in Appendix B. The 2017 traffic volumes developed using the annual background growth of 3.0% discussed in the next section are illustrated in Exhibit 4.1 and documented in Appendix C.

4.2 FUTURE TRAFFIC VOLUME PROJECTIONS

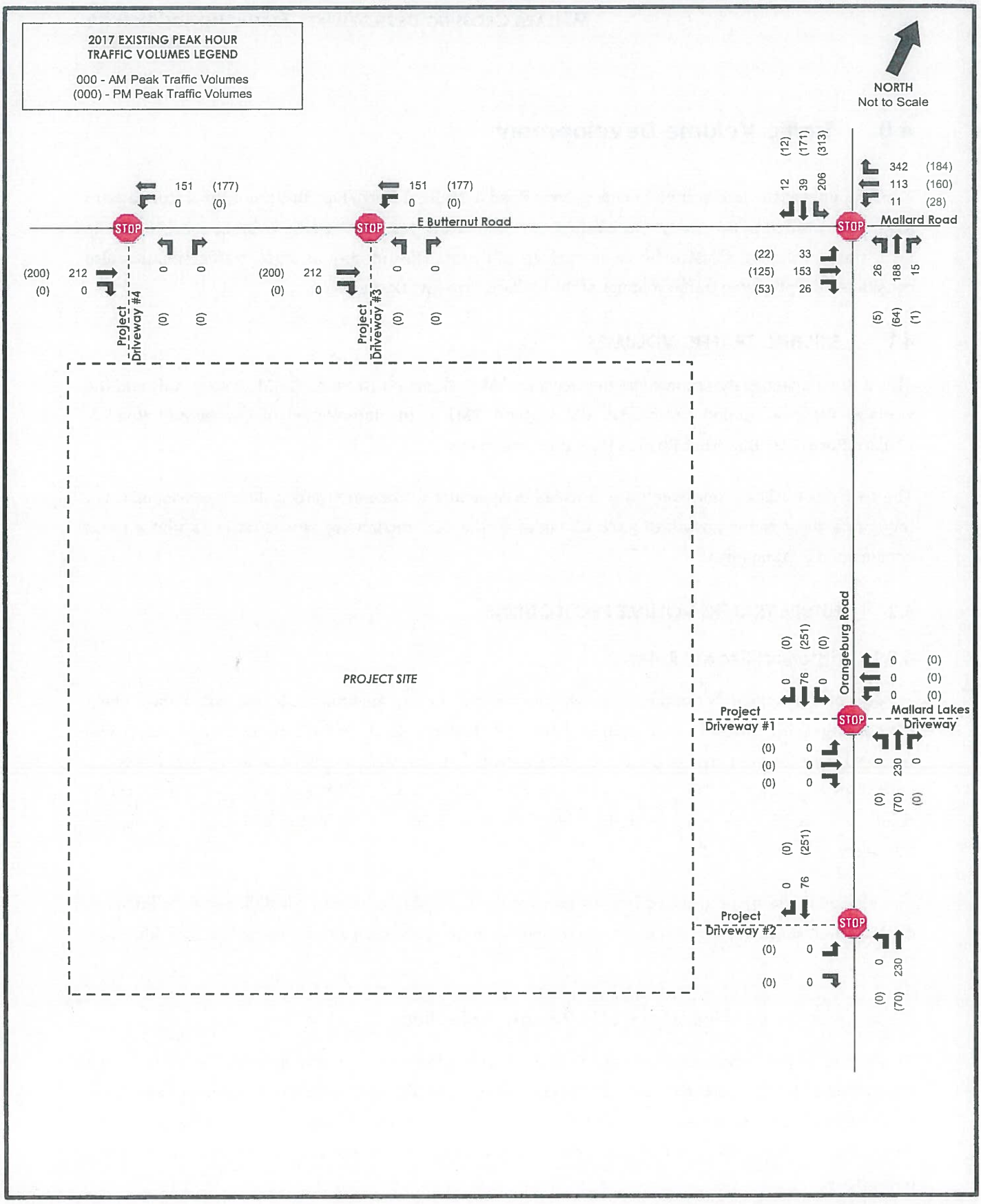
4.2.1 Historical Growth Rates

To develop an annual background growth rate for use in the analysis, historical count data along Orangeburg Road (SCDOT count station #213) and Mallard Road (SCDOT count station #241) was reviewed over the past five years. It was determined that the roadways have collectively experienced annual growth of 3.0%. Therefore, a 3.0% annual growth rate was utilized to develop the 2017 traffic volumes as well as the 2020 No Build traffic volumes, which are illustrated in Exhibit 4.2 and are documented in Appendix C.

The Mallard Crossing project traffic volumes were then added to the 2020 No Build traffic volumes to develop 2020 Build traffic volumes, which are illustrated in Exhibit 4.3 and are documented in Appendix C.

4.2.2 Nearby Development Traffic Volume Projections

In addition to the background growth rates, a separate project is currently proposed adjacent to the Mallard Crossing Development and was considered in the analysis. This project consists of 129 single-family homes and 6.82 acres of commercial development. The traffic volumes from the adjacent project were added to the 2020 No Build and Build traffic volumes for consideration in the future traffic projections.


2017 EXISTING PEAK HOUR
TRAFFIC VOLUMES LEGEND
000 - AM Peak Traffic Volumes
(000) - PM Peak Traffic Volumes
NORTH
Not to Scale
E Butternut Road
Mallard Road
Orangeburg Road
Project Driveway #4
Project Driveway #3
Project Driveway #1
Project Driveway #2
Mallard Lakes Driveway
PROJECT SITE
STOP
151 (177)
0 (0)
(200) 212
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0 0
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12 39 206
342 (184)
113 (160)
11 (28)
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(0) (251) (0)
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0 0 (0)
0 0 (0)
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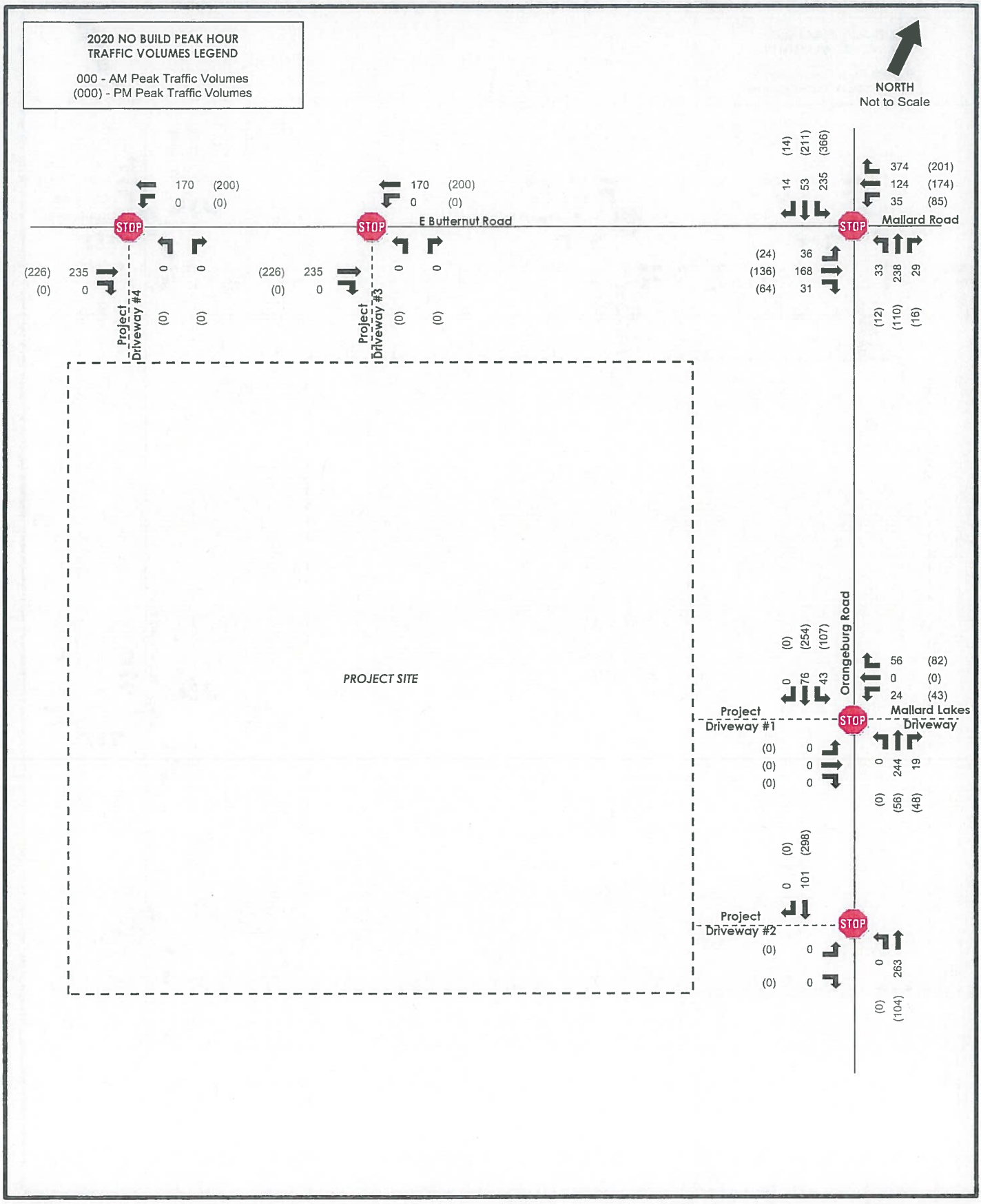
0 230
(0) (70)


2020 NO BUILD PEAK HOUR
TRAFFIC VOLUMES LEGEND
000 - AM Peak Traffic Volumes
(000) - PM Peak Traffic Volumes
NORTH
Not to Scale
E Butternut Road
Mallard Road
Orangeburg Road
Project Driveway #4
Project Driveway #3
Project Driveway #1
Project Driveway #2
Mallard Lakes Driveway
PROJECT SITE
STOP
170 (200)
0 (0)
(226) 235
(0) 0
0 0
(0) (0)
(14) (211) (366)
14 53 235
(24) 36
(136) 168
(64) 31
374 (201)
124 (174)
35 (85)
33 238 29
(12) (110) (16)
(0) (254) (107)
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0 (0)
24 (43)
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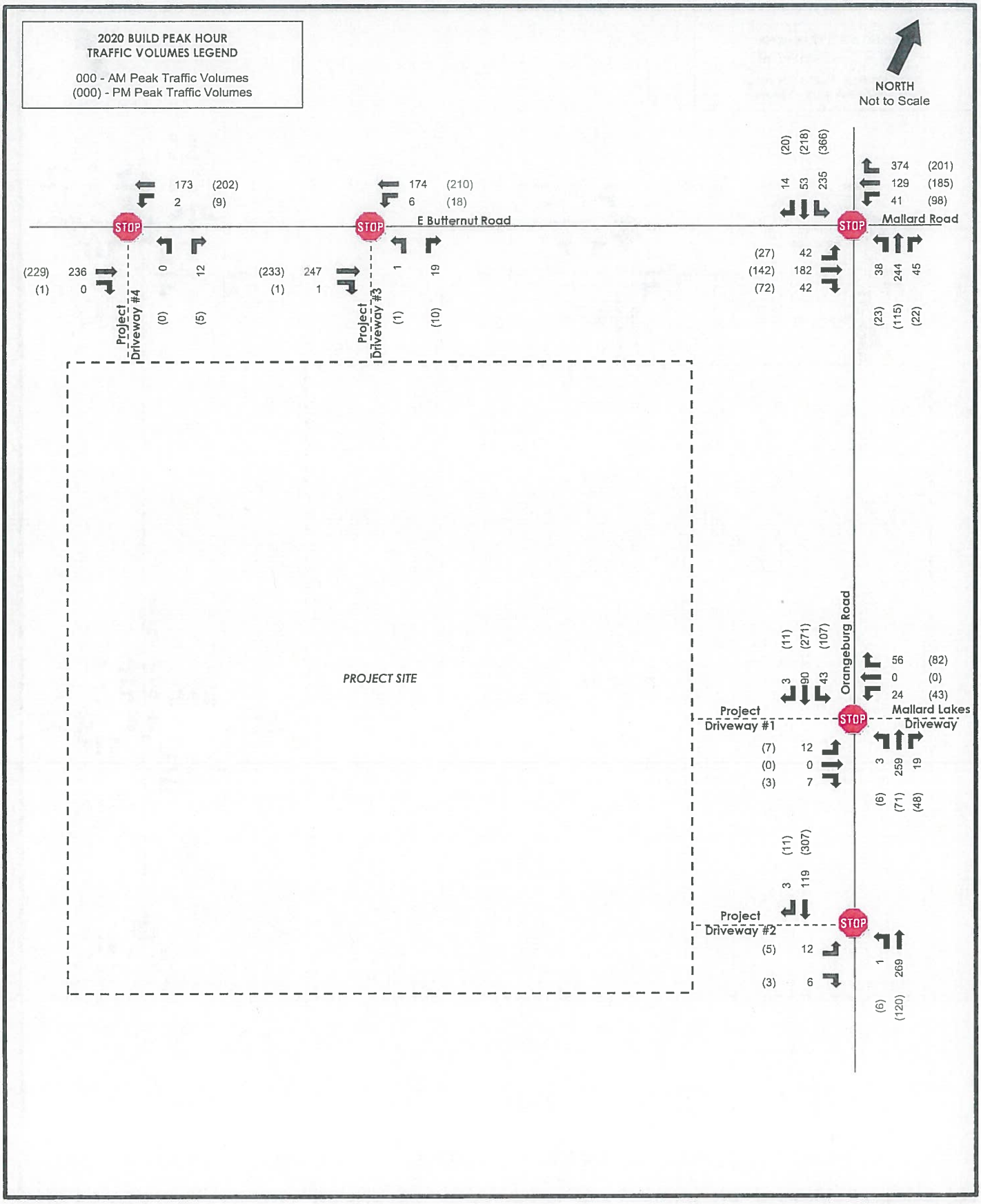
(0) (104)


2020 BUILD PEAK HOUR
TRAFFIC VOLUMES LEGEND
000 - AM Peak Traffic Volumes
(000) - PM Peak Traffic Volumes
NORTH
Not to Scale
E Butternut Road
Mallard Road
Orangeburg Road
Project Driveway #4
Project Driveway #3
Project Driveway #1
Project Driveway #2
Mallard Lakes Driveway
PROJECT SITE
STOP
173 (202)
2 (9)
174 (210)
6 (18)
(20) (218) (366)
14 53 235
374 (201)
129 (185)
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(11) (271) (107)
3 90 43
56 (82)
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24 (43)
(7) 12
(0) 0
(3) 7
3 259 19
(6) (71) (48)
(11) (307)
3 119
(5) 12
(3) 6
1 269
(6) (120)

5.0 Traffic Impact Analysis

Using the existing and projected traffic volumes previously discussed, intersection analyses were conducted for the study and project driveway intersections considering 2017 Existing conditions, 2020 No Build conditions, and 2020 Build conditions. This analysis was conducted using the Transportation Research Board's *Highway Capacity Manual 2010 (HCM 2010)* methodologies of the *Synchro*, Version 9 software for intersection analysis.

Intersection level of service (LOS) grades range from LOS A to LOS F, which are directly related to the level of control delay at the intersection and characterize the operational conditions of the intersection traffic flow. LOS A operations typically represent ideal, free-flow conditions where vehicles experience little to no delays, and LOS F operations typically represent poor, forced-flow (bumper-to-bumper) conditions with high vehicular delays, and are generally considered undesirable. Table 5.1 summarizes the *HCM 2010* control delay thresholds associated with each LOS grade for unsignalized intersections.

Table 5.1 – *HCM 2010* LOS Criteria for Unsignalized Intersections

Unsignalized Intersections	
LOS	**Control Delay Per Vehicle (seconds)**
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

5.1 INTERSECTION LOS ANALYSIS

As part of the intersection analysis, SCDOT's default *Synchro* parameters were utilized. The 2016 traffic counts peak-hour factors (PHF) were utilized in the analysis of the 2017 existing and the 2020 future conditions with a minimum PHF of 0.90 and maximum PHF of 0.95 being considered for future-year conditions. Existing heavy vehicle percentages, as previously discussed, were used in the analysis. The existing lane geometry was also utilized for the analysis of existing and future conditions.

Using the *Synchro* software, intersection analyses were conducted for 2017 Existing conditions, 2020 No Build conditions, and 2020 Build conditions for the weekday AM peak-hour and the weekday PM peak-

hour time periods. The results of the unsignalized intersection analyses for existing and future-year conditions for the weekday AM and PM peak-hour time periods are summarized in Table 5.2. The LOS and delay results are shown for the worst-case minor-street approaches only, as based upon the *HCM 2010* methodologies for two-way stop-controlled intersections.

Table 5.2 – Intersection Analysis Results

Intersection	Intersection Control	LOS/Delay (seconds)					
		2017 Existing Conditions		2020 No Build Conditions		2020 Build Conditions	
						Phase 1	
		AM	PM	AM	PM	AM	PM
Orangeburg Road & Mallard Road/East Butternut Road	All-Way Stop	D/28.4	D/27.1	F/70.2	F/79.8	F/91.8	F/100.8
Orangeburg Road & Project Driveway #1/ Mallard Lakes Proposed Driveway	Two-Way Stop	-	-	B/11.1 (WB)	B/11.6 (WB)	B/12.2 (EB)	C/15.1 (EB)
Orangeburg Road & Project Driveway #2	Two-Way Stop	-	-	-	-	B/10.6 (EB)	B/11.2 (EB)
East Butternut Road & Project Driveway #3	Two-Way Stop	-	-	-	-	A/9.9 (WB)	A/9.9 (WB)
East Butternut Road & Project Driveway #4	Two-Way Stop	-	-	-	-	A/9.7 (WB)	A/9.6 (WB)

Note: LOS/Delay is shown for the worst-case minor-street approach of the two-way stop-controlled intersections.

The results of the intersection analyses indicate that the study intersections currently operate and are expected to continue to operate at an acceptable LOS with consideration of the Mallard Crossing Development, with one exception.

The intersection of Orangeburg Road & Mallard Road/East Butternut Road is anticipated to experience undesirable LOS conditions in the future, with or without the Mallard Crossing Development. Currently this intersection experiences undesirable queueing in both the AM and PM peak hours. During the AM peak hour the northbound approach of Orangeburg Road experiences a maximum queue of approximately 1000 feet. During the PM peak hour the westbound approach of Mallard Road experiences a maximum queue of approximately 550 feet. The queueing observations, performed in 2016, suggest that the actual level of service for the existing conditions is worse than the model suggests due to the fact that the software models the vehicles that travel through the intersection and not the actual demand for service.

In an effort to correct the queueing and existing delay at the intersection, various mitigation strategies were explored. Consideration was given to installing a southbound left turn lane along Orangeburg Road and installing a westbound right turn lane along Mallard Road. While these improvements would help some with the existing queueing and delay, it would not result in the intersection achieving an acceptable LOS in the future – AM – E/43.6 seconds of delay, PM – D/26.5 seconds of delay. In addition to not achieving an acceptable LOS, the turn lanes would require right-of-way that a developer could not acquire.

Additional mitigation was explored to determine what needs to be done at this intersection to achieve an acceptable LOS. If warranted, a traffic signal (which would require the construction of left turn lanes) would result in an acceptable LOS - AM – A/8.8 PM – A/8.2. If the intersection is reconstructed as a roundabout, that treatment would also achieve an acceptable LOS. Both of these mitigation strategies would be acceptable, however they are not feasible for a developer due to right-of-way constraints. In addition, it is estimated that traffic from this development will amount to approximately 5% of the overall intersection volumes in the 2020 Build conditions. Because the intersection currently operates with substantial queues and needs improvement today, and the fact that the project traffic is relatively minor, the intersection is not significantly impacted with or without this development. Therefore, no improvements to the Orangeburg Road & Mallard Road/East Butternut Road intersection are recommended as a result of this development's traffic impact.

Based on the Planned Development District Guidelines between the developer and Dorchester County, the developer has agreed to acceleration of transportation impact fees to assist the county with addressing deficiencies at this intersection. Dorchester County has also reprioritized this intersection in the Capital Improvement Plan for Roadways in Unincorporated Dorchester County to address the deficiencies sooner. This reprioritization can be found in the meeting minutes (item 13) from April 3, 2017, item 13. These meeting minutes are provided in Appendix H.

Worksheets documenting the intersection analyses are provided in Appendix D for 2017 Existing conditions, Appendix E for 2020 No Build conditions and Appendix F for 2020 Build conditions.

5.2 TURN LANE ANALYSIS

An analysis was conducted to determine the potential need for exclusive turn lanes for the proposed ingress movements at the project driveway intersections along Orangeburg Road and East Butternut Road. This analysis was conducted utilizing the criteria documented in SCDOT's *ARMS* manual and *Highway Design Manual* (2003).

The need for exclusive right-turn lane is based upon the criteria documented in Section 15.5.1.1 of the *Highway Design Manual,* which consists of seven considerations. These considerations and applications for the proposed project driveway are listed on the following page.

1) *at a free-flowing leg of any intersection on a two-lane urban or rural highway which satisfies the criteria in Figure 15.5A;*

   Due to the fact that Orangeburg Road and East Butternut Road meet the criteria, the project driveways were analyzed for an exclusive right-turn lanes using Figure 15.5A. The project driveways do not satisfy the criteria during either peak period. Worksheets documenting the turn lane analysis are provided in Appendix G.

2) *at the free-flowing leg of any unsignalized intersection on a high-speed, four-lane urban or rural highway which satisfies the criteria in Figure 15.5B;*

   The criteria are not applicable as Orangeburg Road and East Butternut Road are two-lane roadways.

3) *at any intersection where a capacity analysis determines a right-turn lane is necessary to meet the level-of-service criteria;*

   As shown in Table 5.2, the project driveway intersections are projected to operate at an acceptable LOS without an exclusive right-turn lane.

4) *at any signalized intersection where the projected right-turning volume is greater than 300 vehicles per hour and where there is greater than 300 vehicles per hour per lane on the mainline;*

   The project driveway intersections are not proposed to be signalized and are not anticipated to experience greater than 300 right-turning vehicles per hour; therefore, this consideration is not applicable.

5) *for uniformity of intersection design along the highway if other intersections have right-turn lanes;*

   There is one right-turn lane along Orangeburg Road at Cambridge Road, but not at any other intersections near the project.

6) *at railroad crossings where the railroad is paralleled to the facility and is located close to the intersection and where a right-turn lane would be desirable to store queued vehicles avoiding interference with the movement of through traffic; or*

   The project driveways are not near railroad facilities; therefore, this consideration is not applicable.

7) *at any intersection where the crash experience, existing traffic operations, sight distance restrictions, or engineering judgment indicates a significant conflict related to right turning vehicles.*

   No issues with crashes, traffic operations, or sight distance are known; therefore, this consideration is not applicable.

Based on the *Highway Design Manual* considerations for the project driveways, exclusive right-turn lanes along Orangeburg Road and East Butternut Road at the project driveways are not recommended at this time.

The need for exclusive left-turn lane is based upon the criteria documented in Section 15.5.1.2 of the *Highway Design Manual,* which consists of six considerations. These considerations and applications for the proposed project driveway are listed below.

1) *at any unsignalized intersection on a two-lane urban or rural highway which satisfies the criteria in Figures 15.5C, 15.5D, 15.5E, 15.5F, 15.5G;*

   Due to the fact that Orangeburg Road and East Butternut Road meets the criteria, the project driveway was analyzed for an exclusive left-turn lane using Figure 15.5F. The project driveways do not meet the criteria during either peak period. Worksheets documenting the turn lane analysis are provided in Appendix G.

2) *at any signalized intersection. At locations where you have 300 vehicles per hour, consider a traffic review to determine if dual left-turn lanes are required;*

   The intersections are not signalized; therefore, this consideration is not applicable.

3) *at all entrances to major residential, commercial and industrial developments;*

   The development is not a major residential, commercial, or industrial development; therefore, this consideration is not applicable.

4) *at all median crossovers;*

   There is no median along Orangeburg Road or East Butternut Road; therefore, this consideration is not applicable.

5) *for uniformity of intersection design along the highway if other intersections have left-turn lanes (i.e., to satisfy driver expectancy);or*

   There are left-turn lanes at nearby developments along Orangeburg Road; however, based on the criteria in Figure 15.5F, turn lanes into the development are not recommended at this time.

6) *at any intersection where crash experience, traffic operations, sight distance restrictions (e.g., intersection beyond a crest vertical curve), or engineering judgment indicates a significant conflict related to left-turning vehicles.*

   No issues with crashes, traffic operations, or sight distance are known; therefore, this consideration is not applicable.

Based on the *Highway Design Manual* considerations for the project driveway, exclusive left-turn lanes at the project driveways are not recommended at this time.

6.0 Summary of Findings and Recommendations

A traffic impact analysis was conducted for the Mallard Crossing Development in accordance with SCDOT and Dorchester County guidelines. The proposed Mallard Crossing Development is located in the southern quadrant of the Orangeburg Road & Mallard Road/East Butternut Road intersection in Dorchester County, South Carolina. The development is to be constructed in two phases. Phase 1 consists of 47 single-family homes, 34 duplex homes, and 19 townhouses. Phase 2 consists of 35,000 square feet of commercial development which will be developed at a later time and will require a separate traffic impact analysis at that time.

Access to the development will be provided through two proposed full access driveways along Orangeburg Road, both of which meet the SCDOT spacing criteria, and two proposed full access driveways along East Butternut Road, one of which meets the SCDOT spacing criteria and one that is 55% of the SCDOT spacing criteria.

The results of the intersection analyses indicate that the study intersections currently operate and are expected to continue to operate at an acceptable LOS with consideration of the Mallard Crossing Development, with one exception. The intersection of Orangeburg Road & Mallard Road/East Butternut Road experiences significant queues today and is anticipated to experience undesirable LOS conditions in the future, with or without the Mallard Crossing Development. Because the intersection currently operates with substantial queues and needs improvement today, and the fact that the project traffic is relatively minor, the intersection is not significantly impacted with or without this development. Therefore, no improvements to the Orangeburg Road & Mallard Road/East Butternut Road intersection are recommended as a result of this development's traffic impact.

Based on the *Highway Design Manual* considerations for the project driveways, exclusive right-turn lanes along Orangeburg Road and East Butternut Road at the project driveways are not recommended at this time. Based on the *Highway Design Manual* considerations for the project driveway, exclusive left-turn lanes along Orangeburg Road and East Butternut Road at the project driveways are not recommended at this time.

ENGINEERING STUDY

Mallard Crossing

Orangeburg Road & East Butternut Tract

Summerville, SC

COASTAL
ENGINEERING & TESTING

REPORT OF GEOTECHNICAL ENGINEERING STUDY

33-Acre Site, Orangeburg Road at E. Butternut
Summerville, South Carolina
Dorchester Co. TMS #'s 1280000045, 126, and 128
CETCO Job No. 16-02-126

Prepared for:

Mr. Kerry Avant
RHH Land Investors, LLC
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August 15, 2016

Mr. Kerry Avant
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Subject: **Report of Pre-purchase Soils Exploration**
33-Acre Site, Orangeburg Road at E. Butternut
Summerville, South Carolina
Dorchester Co. TMS #'s 1280000045, 126, and 128
CETCO Job No. 16-02-126

Dear Kerry:

As authorized, Coastal Engineering & Testing Company has completed field work and analysis associated with the above-referenced geotechnical engineering study. The following report presents a description of our understanding of the proposed construction, the procedures and findings of our study, and our engineering evaluations and recommendations.

INTRODUCTION

The purpose of the study was to determine the general subsurface soil conditions across the development tract at representative locations corresponding with planned roads, ponds, and residential lots, and commercial building sites. A lot and road conceptual plan by Hussey Gay Bell was provided by the client. This did not include a topographic plan or grading plan.

The scope of the field exploration included a reconnaissance and visual inspection of the site by our Field Engineering team, clearing access for our mechanical drill rig, and the subsurface exploration consisting of eight (8) soil test borings to a depth of 20 feet and fifteen (15) shallow hand auger borings to a depth of 5 feet at scattered locations illustrated on the appendixed site plan. The findings were reviewed and analyzed by our Senior Geotechnical Engineer to provide evaluations regarding site preparation, suitability of on-site soils for use as structural fill, building foundations, roadway design, and groundwater and surface water control.

This exploration of the subsurface soils and analysis of their condition, composition, and consistency to evaluate the engineering characteristics is considered sufficient in detail to provide reasonable basis for foundation and pavement design and site preparation recommendations. The recommendations provided are based on assumed continuity of the subsurface conditions between exploration locations.

Our recommendations are based on assumptions about structures and associated loads in the absence of actual design information at this time. Our assumptions are based on our past experience with other similar subdivision projects, and observations of the adjacent developed tracts, and are stated in this report.

If conditions are encountered during construction which differ from those reported, or if actual plans and/or specifications vary significantly from our assumptions as stated in this report, they should be brought to our attention immediately so that we may determine if changes in the foundation or site preparation recommendations are required.

It is advisable to include the Project Geotechnical Consultant as part of the development team through construction to confirm that the recommendations contained in this site-specific report are applicable and that they are properly implemented in the field during construction.

The soils engineer warrants that the findings, recommendations, specifications, and professional advice contained herein have been provided after evaluation and preparation in accordance with generally accepted professional engineering practice in the fields of geotechnical engineering and soil mechanics. No other warranties are expressed or implied.

SITE DESCRIPTION

Geological Description

The site is in the Coastal Plain Geologic Province which is characterized by sedimentary Pleistocene deposits of sand, silt, and clay soils of the Quarternary Period. The geology of the specific area includes fairly non-uniform depositions of these soils to depths ranging from 15 to 50 feet, underlaid by the Cooper Marl formation, which is a fossiliforous and calcareous deposit of the late Oligocene to early Miocene Periods, and a thick limestone formation beneath the Cooper. Where encountered, the Cooper Marl is a thick layer of over-consolidated silt, sand, and clay with shell and phosphorus which is commonly recognized as an incompressible basement soil layer.

The South Carolina Coastal Plain region has a seismic history related to several deep faults which are not well-understood. Occasional minor seismic activity is recorded at a monitoring and recording station at Charleston Southern University in the City of North Charleston, Charleston County, South Carolina. The largest recorded event in history was in 1886 when a devastating event occurred, registering approximately VII on the Richter Scale. Major damage and devastation was documented in the surrounding area. Numerous liquefaction sites have been discovered over the years which are related to the 1886 event.

Physical Description

The subject site is located at the south quadrant formed by the intersection of Orangeburg Road and East Butternut Road in Summerville, Dorchester County, South Carolina. The subject site is identified by Dorchester County TMS Numbers 128-00-00-045, 128-00-00-128, and 128-00-00-126.

The site is bordered by Orangeburg Road to the east, East Butternut Road and an existing commercial building to the north/northwest, and single-family residential homes and undeveloped wooded land to the south.

The site is lined by ditches on the eastern and western portions of the site. Four short asphalt-paved driveways allow access to the western portion of the site off of East Butternut Road. A dirt road runs from one of the northernmost driveways to a small house, a large shed, and a small shed. Scattered debris was observed on the southwestern portion of the site and the northwestern portion of the site. Partially buried debris was observed near the central southern property line. A short rutted out trail was observed near the central southern property line.

A ditch surrounded by an apparent wetland area was observed on the southwestern portion of the site and it appears that they drain into the pond that is located on the central southern portion of the site. Another apparent wetland area was observed on the southeastern portion of the site. It appears that this wetland drains into the pond as well.

The site is wooded except for those improvements mentioned above. The site consists of mostly pine trees with oak and hickory trees located in isolated areas. Heavy bamboo growth was observed in the far southeastern portion of the site. Ground cover consists of brush, weeds, grass, and deadfall.

Water was freely flowing from a broken waterline, artesian well, or other source on the far southwestern portion of the site. Areas to the south and east of the free flowing water were saturated and standing water to a depth of up to 5" was observed.

A topographic plan was not available for our use. Visually the site is mostly level with a general slope to the south. The site was firm, stable, and well-drained except for those areas affected by the broken waterline, artesian well, etc., as mentioned below. According to FEMA FIRMs, the site is located in an X-Zone.

PROJECT DESCRIPTION

An Illustrative Site Plan by Hussey Gay Bell was provided for our use in evaluating this site. The intended purpose for the tract is mostly residential development with a commercial site at the corner of Orangeburg and Butternut, with roads, drainage improvements, and utilities.

We assume new residential buildings will be typical two-story residential structures designed using wood frame load-bearing walls on a slab-on-grade, crawl space, or elevated slab, with siding, stucco, or brick exterior veneer. The parcel at the southwest corner appears to be set aside for townhomes which we assume will be similar construction. We assume the commercial site will be single-story pre-engineered steel frame or masonry, metal-stud, or wood-stud frame construction on a slab on grade. We assume the building pads will be leveled and elevated with fill cut from on-site as part of the developer's scope of work to promote positive drainage away from the buildings.

Structural information about planned buildings, or anticipated loads were not provided for use in our analysis, so we have assumed that loads for the wall-loaded structures (slab on grade) will be in the range of 1.5 to 3 kips per linear foot, and that maximum loads for independent piers (crawl space) will be in the range of 20 to 30 kips. Column loads for commercial construction are estimated to be in the range of 25 to 50 kips. Uplift loads could exceed bearing loads and govern in foundation design, but have not been evaluated in this geotechnical study.

EXPLORATION PROCEDURES

Our field exploration began with a visual site inspection to determine the "lay of the land", and identify features to aid in selecting exploration locations. The authorized subsurface exploration included clearing to create assess to representative exploration locations, then eight (8) soil test borings to a depth of 20 feet, and fifteen (15) shallow hand auger borings to a depth of 5 feet at scattered locations illustrated on the site plan corresponding with lots.

Clearing was performed using a trackhoe under the supervision of CETCO's project manager to avoid wetlands and significant trees, and confirm that existing drainage was not altered. The soil test borings were performed in accordance with ASTM D-1586 by an all-terrain-vehicle-mounted drill rig using hollow-stem auger drilling techniques to advance the hole to pre-determined sampling depths. Split-spoon samples and penetration resistance values (N-values) were obtained using a calibrated safety hammer on continuous sampling in the upper 5 feet, on 2.5 foot intervals between 5 and 10 feet, and on 5 foot intervals below 10 feet until boring termination. Hand auger borings were performed in accordance with ASTM D-1452 using an Orchard-Barrel type hand-operated auger. Samples and visual soil descriptions were obtained on 4 to 6 inch depth increments to a total depth of 5 feet.

Assessment of moisture content and strength of materials was performed qualitatively in the field. Description and identification of soil types encountered in the exploration is based on the visual-manual procedure in accordance with ASTM D-2488. Samples were assigned preliminary classifications in the field by the drill crew foreman, and final classifications were assigned following examination in the laboratory by the Project Geotechnical Engineer.

The findings were reviewed and analyzed by our Senior Geotechnical Engineer to provide evaluations and recommendations for construction.

Boring locations were determined and located in the field by our Project Engineer to provide general subsurface soil profiles. Approximate boring locations are illustrated on the attached boring location plan.

FINDINGS

The soil test borings and hand auger borings encountered fairly uniform layering across the site. All borings encountered sandy topsoil with roots to a variable depth of 1 to 4 inches. Below the topsoil layer, a variable thickness of loose to firm silty sand was encountered, in the range of 0 to 4 feet. Some test locations had no near-surface sand layer, but firm to stiff clay instead beneath the topsoil, while other locations had thicker layers of sand and clayey sand. Below the variable near-surface soil layering, the borings encountered firm to stiff sandy clay to a depth of 13 to 14 feet, then mostly loose sand to 19 to 20 feet. An isolated layer of soft clay was encountered at boring location B-5 between 14 and 18 feet in the profile. The Cooper Marl formation consisting of very stiff sandy silt with phosphate gravel was encountered at a depth of 19 feet at location B-1, but not within the 20-foot exploration depth at the other deep boring locations.

The hand auger borings encountered 1/2 to 6 inches of topsoil underlaid by a variable thickness of silty sands to clayey sands as deep as 4 feet, then clay with variable sand content.

Groundwater was encountered at variable depths of 13 feet in the sand layer below the upper clay in the deeper explorations. Note that this study was performed during a dry summer with frequent afternoon thunderstorms. The presence of sand above the clay is conducive to temporary "perched" groundwater following rainy weather. This surface water percolates down into the sand voids to the surface of the impermeable clay layer, then saturates the overlying sand creating soft, unstable conditions until the sand layer drains. Perched groundwater was not observed at the time of our exploration except where a broken water line or other water source had flooded the immediate area as described above.

It is noteworthy that the exploration locations DID NOT encounter:

- Unusually thick topsoil surface deposits
- Apparent fill over organic layers indicating filling prior to proper stripping
- Soft clay in the very shallow profile
- Buried debris or trash

This is a generalized description of soil layering across the site. Of course, specific soil layering at individual exploration locations varies within these described layer limits. Findings at each exploration location are tabulated in the attached boring logs and hand auger logs for use by the client in planning.

EVALUATIONS

We judge the soil layering across the tract to be favorable for development as shown on the conceptual site plan provided. Natural geology is suitable for support of fill and structure loads associated with typical wood-frame residential buildings and pre-engineered commercial buildings on typical shallow spread footing foundations with nominal settlement.

Depending on the grading plan, cut soils in most road areas will consist of sand to clayey sand, but some areas have clay directly below the topsoil layer. This is generally favorable for road construction, except that areas where clay is present beneath the topsoil may require undercutting and replacement with granular fill (sand) for proper road performance. We have successfully overseen construction of many miles of roads in the Tri-County Area where clayey soil of the types encountered at this site is the pavement-supporting soil. But more stringent requirements by County road inspectors for zero deflection during proofrolling have led most developers to avoid the unknowns of building roads on clayey soil which include potential setbacks and delays for dedicated (deeded) roads. The client should budget for undercutting portions of the roads, placing excavated clay in the lots, and reserving sandy fill for road construction. Where at least 1.5 feet of sand is present below the planned subgrade elevation, undercutting and replacement will not be required. Underdrains will be needed to provide drainage into the catch basins for the granular road bed soil where a clay boundary is present.

Site Preparation Recommendations

Site preparation should begin with draining any "perched" groundwater to stabilize the site surface to support logging and stripping. Proceeding with clearing when a perched groundwater table or other standing surface water is present will result in a loss of otherwise-suitable near-surface soil and increased cost.

Once the surface is properly drained, clearing and logging can proceed. Root raking should be performed after logging to remove roots and stumps without taking as much soil. Then, the building areas on each lot and along the roadway should be stripped to remove remaining organic surface soil, revealing clean sand or clay. The organic material stripped from the building pad areas can be pushed up into stockpiles on site for future use in landscaping areas around and between building pads.

Stripping of the topsoil and root layer will expose variable substrate conditions, including sand and clay. Clay and sandy clay will not percolate readily, so it will be important to maintain positive drainage to control surface water and minimize site saturation. Soft, saturated subgrade will need to be undercut and replaced with structural fill.

Where road subgrade elevations are at or below current grade, undercut the road and curb as needed to allow for at least 18 inches of sand bedding. This criteria will be met in many areas of the site due to natural sand, but where clay is present, this should be undercut to replace with sand for improved service life of roadways. Where the stripped site elevation is already at least 18 inches below planned pavement subgrade elevation, indicating fill is needed to elevate the site, or where natural sand deposits are present below subgrade elevation, and the ground surface is relatively firm and stable, undercutting should not be needed.

The stripped or undercut soil substrate should be proofrolled with a rubber-tire vehicle (dump truck, grader, etc.) to identify any soft or unstable areas requiring undercutting prior to placement of fill. This operation should be performed in the presence of the Geotechnical Engineer. Any isolated roots, stumps, or other soft or unstable areas in the shallow subgrade appearing during this operation should be undercut and backfilled with proper structural fill as advised by the engineer.

Following satisfactory completion of undercutting, proofrolling, and seal rolling, sand fill can be placed to form the road subgrade. **Imported fill soils can consist of sand with up to 15 percent fines in the road.** The use of sandy fill in undercut areas with a clay boundary will necessitate below-pavement drainage provisions to allow the sand to drain into the storm sewer.

Any clayey sand to sandy clay soil cut from roads is suitable to be used as structural fill in building pads, but is not preferred as road bed fill.

Fill should be placed in maximum 10 inch loose lifts and compacted to at least 95% of the soil's Modified Proctor Maximum Dry Density (ASTM D-1557). A sufficient number of nuclear density tests (ASTM D-2922) should be performed in each compacted lift to verify compaction prior to placement of subsequent lifts.

Inclement weather creates delays and setbacks to any progress achieved on sites with clayey soils, ultimately requiring undercutting and replacement. We always recommend that the project roadway system not be used for conveyance of construction traffic that can degrade existing soil strength, but this is not always feasible. At this site, good management of construction traffic and surface drainage will be critical to maintain existing strength of native soils, and avoid additional undercutting. Positive drainage off of the site surface should be maintained at all times to avoid costly undercutting and replacement of saturated soils.

Groundwater / Surface Water Control

Based on the groundwater measurements at the time of exploration, and the recent rainfall amounts in the area, we do not foresee groundwater being a major issue for construction of planned residential buildings on shallow foundations. However, the site soils include permeable surface sands underlaid by clays which are generally impermeable, and this will create temporarily-elevated "perched" groundwater during wet weather.

Footing excavations combined with perched groundwater conditions could require groundwater pumping. This could consist of over-excavating the footing to allow for a bedding of gravel that can act as a sump for pumping water and allowing construction in dry conditions. The contractor should maintain positive drainage when rainy weather is forecast, and permanent drainage for the finished lots.

Road Construction

Earthwork for road construction is highly dependent upon planned grades. We have not reviewed road profiles indicating final subgrade elevation with respect to existing grade, but we assume roads will be at or below existing grade. If roads are planned at or below existing grade, anticipate undercutting portions of the roadways to allow for a sub-base of granular soil (sand) for proper road support. We have successfully built many local roads on clay, but the Dorchester County inspection department has a zero-tolerance subgrade deflection policy when proofrolling before placing aggregate base, and this is very difficult to achieve overall in clayey soils present in portions of the site at an assumed subgrade elevation.

Introduction of a granular sand fill into any clayey soil profile will create a subgrade drainage problem that will need to be addressed with under-drains. Highly permeable sand with a less-permeable clayey soil boundary results in trapped water that softens and degrades the pavement layers.

Gravel drains with a slotted pipe extending along the curb lines and discharging into storm sewer inlet boxes are effective at eliminating this problem. Typically, 100-foot under-drain stubs outs are adequate to allow drainage of road bed soils, depending on the grading and drainage plan. The sand fill should be in direct contact with the gravel under-drains so that water can readily move from the sand to the drains and out of the subgrade.

All cut soil surfaces should be rolled, sealed, and compacted prior to placement of structural sand bedding soil.

Building Foundations

Based upon the soil test boring data, our observations in the field during the field exploration, limited project information and assumptions as described in this report, past experience with similar projects and sites, and generally accepted geotechnical engineering practice, **we judge the natural soil layering in the lot areas to be favorable for construction of roads and planned residential and commercial buildings on typical shallow spread footing foundations and floor slabs-on-grade.**

Following a site preparation program at least equivalent to that discussed above, **an allowable bearing pressure of 2,500 pounds per square foot (psf) can be used for dimensioning footings for light-load frame buildings.** Footings for load-bearing wall loads and pier loads can be designed as a monolithic slab / footing system, with a thickened-section of concrete where loads are applied, or as independent strip and pad footings. Footings can bear in compacted engineered fill or in undisturbed natural soil.

Assuming our estimates of applied structural loads are correct, standard footing design for monolithic slabs or pier footings will be adequate for proper bearing.

We assume the developer will engage a soils professional to monitor site preparation to confirm proper procedures are followed and results obtained in building pad preparation. However, one last inspection should be performed prior to pouring concrete. Foundation excavations should be inspected by an agent of the Geotechnical Engineer prior to placing concrete to verify proper shape and dimensions, uniform stability, and test for bearing capacity using the Field Penetrometer penetration test in the footing excavations. If soft, wet soil is discovered in footing excavations at the time of our inspection, it may be necessary to undercut these soils to a firm substrate, and fill and re-compact the footing bottom prior to pouring concrete.

Settlement Evaluations

Our review of the soil test boring logs indicate there are isolated, non-uniform load-sensitive soil layers of concern in the soil profile, but none within the primary load distribution zone which would present the likelihood of excessive settlement.

Borings B-5 encountered soft clay in a depth zone between 14 and 18 feet. This is a settlement-sensitive soil, but the overburden layers have adequate strength to bridge over this soft soil such that this should not be influenced by the anticipated loading scenarios, with the possible exception of very thick fill sections, which we do not anticipate. Where thick fills (greater than 3 feet) are required to elevate and level building pads, this fill should be place well in advance of building construction to allow the soft underlying soil to stabilize and reach an equilibrium point from the new added pressure.

Based on our analysis of assumed loads and loading configurations applied to the site stratigraphy indicated by the soil test borings, with the recommended site preparation procedures completed, and assuming a maximum of 1 to 2 feet of elevating fill in building pads, we estimate maximum settlement potential to be in the range of 1 inch or less, with 50 percent or less of the total settlement in differential settlement. Settlement in this range is typically tolerable by most residential structures. Heavier fill loads where soft clay is present in the shallow soil profile could settle 1 to 2 inches from the fill load, then stabilize and support the load.

Seismic Evaluations

Because of the seismic history of the Charleston, Tri-County area, the International Residential Code (IRBC) 2012 requires seismic design of new buildings, and evaluation of liquefaction potential of building sites. Soil liquefaction is a localized and unpredictable phenomenon caused when ground motion resulting from seismic activity results is total loss of soil strength at specific sites. The 1886 event caused identifiable liquefaction at several dozen sites within the region.

Studies performed in the international engineering community during the past century have resulted in information which indicates the natural site conditions which are more susceptible to liquefaction.

These include saturated layers of "clean" sand in a naturally loose to marginally firm consistency. This suspect condition is not present at this site as most soil layers contain a clay component that renders the soil non-liquefiable.

Reference to the International Residential Code 2012, a Site Class D or D-2 can be used for seismic design at this site.

Slab-On-Grade Recommendations

We assume building pads will be built-up with engineered structural fill consisting of sands to clayey sand and sandy clay soil types. When properly installed, these soils are considered to provide good subgrade support for floor slabs on-grade. For slab design, we recommend a k-value of 150 psi/in. We recommend a polyethelene vapor barrier on compacted native fill and at least 4-inches of high-quality, 3000 psi, air-entrained concrete.

Welded wire mesh can be used for reinforcing provided that flat sheets are used, and proper supports are implemented to maintain specified bottom cover. As an alternative, fiber mesh can be used. Reinforcement in floor slabs has little real value other than to hold hairline shrinkage cracks closer together. There is no structural contribution of wire mesh or fibers in slabs on ground. Hairline cracks are manageable, and a function of a properly proportioned plastic mix, and proper layout and timing of saw joint cutting.

For exposed concrete or painted concrete floors, or any exposed floor where random shrinkage cracks will be undesirable, we recommend a saw joint spacing of 14 feet or less. Assuming proper joint spacing, proper timing of saw joint completion will affect crack control. Sawing joints too late will result in random hairline cracks in concrete slabs. If this occurs, joints should not be sawed because they will be redundant. Sawing joints should be performed as soon as the concrete is set enough to be sawed without raveling.

Concrete for floors and other structures should be inspected and tested by certified professionals during placement to obtain the best results. Addition of water to redi-mix concrete on site should be carefully controlled by the owners testing agency, and not by the concrete finisher. The goals of the two parties are different, and the means to accomplish those goals differs as well. The testing agency is charged with quality assurance, and evaluates addition of water to closely match the design mix for optimal results of the cured concrete product. The finisher desires a more liquid mix to minimize physical effort required to move concrete into place. They are prone to degrade the quality of the concrete by adding excessive water at the site in the interest of reducing physical effort required for placement. The results of this include increased shrinkage cracking, and reduced strength and surface durability.

Pavement Recommendations

The site will require preparation as discussed above to provide adequate uniform support of asphaltic pavements. This will include undercutting soils in roadways and placing a bedding of compacted sandy fill soil in areas where natural clay is present at the subgrade elevation to provide uniform drained pavement support. Portions of the site have a natural sand layer at the surface which is suitable for direct pavement support. Upon completion of any required undercutting, backfilling, and installation of required under-drains and concrete curbing and road utility crossings, pavement construction could proceed.

Based upon past experience with similar soils, and the 2008 SCDOT Pavement Design Guidelines (Based on 1972 Edition of AASHTO Pavement Design Guidelines), we recommend normal-duty pavements consist of a nominal eight-inch layer of Graded Aggregate Base Course (GABC) compacted to at least 98 percent of its Modified Proctor Maximum Dry Density. The wearing surface should consist of 2 inches of SCHD Type I Asphaltic Concrete Surface Course.

This pavement section is appropriate for the end use vehicle wheel loading scenario, consisting predominantly of passenger vehicles (automobiles and light trucks). Of course during the build out period, pavements will be subjected to much heavier construction traffic including concrete trucks and materials delivery trucks. The pavement section described above is likely to support this traffic with nominal damage, but is not designed for permanent application of high-volume heavy-duty traffic. Some isolated failures may occur that will need repair at the end of the build out period. If this is unacceptable, consideration should be given to a heavy-duty pavement section designed for the construction traffic. This would consist of 8 inches of GABC, 2 inches of Type I Asphalt Binder Course, and 1.5 inches of Type I Asphalt Surface Course applied at the end of the construction phase.

All materials and procedures used in constructing pavement subgrades, base, and surface layering should conform to the minimum standards outlined in the SCHD construction manual.

Suitability of On-Site Soils for Use As Fill

The site development concept plan provided indicates a new pond locations within the tract. The test borings were drilled at representative scattered locations through the tract including locations near planned ponds. Also, we assume some cut soil will be generated by undercutting roads to allow for a bedding of sand. We assume the soil excavated from the pond or cut from the site surface will be used in fill scenarios. This should be spread in areas where blending can occur, resulting in a uniform soil with proper moisture content to allow for required compaction parameters to be achieved in lifts.

The borings indicate sand and clay will be encountered when excavating planned detention ponds. The upper sand layer, where present, is considered "good to excellent" for use as structural fill in building pads and roads. The clay is a low-plasticity sandy clay which is categorized as "fair to poor" for use as fill. It is preferable to use clay fill in lots to support static structure loads associated with building foundations, or in deeper sections of road fill. The clay is less desirable in rolling vehicle load scenarios such as road subgrade, but can be used in deeper sections where there is space for a top layer of granular fill for direct road support. Clay is a cohesive soil which is resistant to breaking down into small pieces suitable for grading and compacting. Extra effort is required of the grading contractor to break clay clods down into proper sized pieces for blending and compaction.

Dewatering will be needed to excavate below a depth of approximately 2 feet in a wet season where sandy soils are present above clay. Typically, this is accomplished using mud pumps.

We recommend cutting and filling from on-site sources be done under the supervision of the geotechnical engineer to monitor uniformity of excavated materials and identify any unsuitable soils that should not be placed in fill areas.

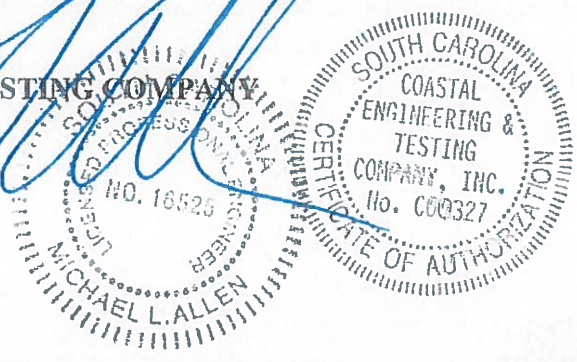
We appreciate the confidence you have placed in **CETCO** by allowing us to provide geotechnical engineering services for your project. If you have any questions regarding our procedures, findings, or recommendations, please contact our office at your convenience.

Very truly yours,

COASTAL ENGINEERING & TESTING COMPANY

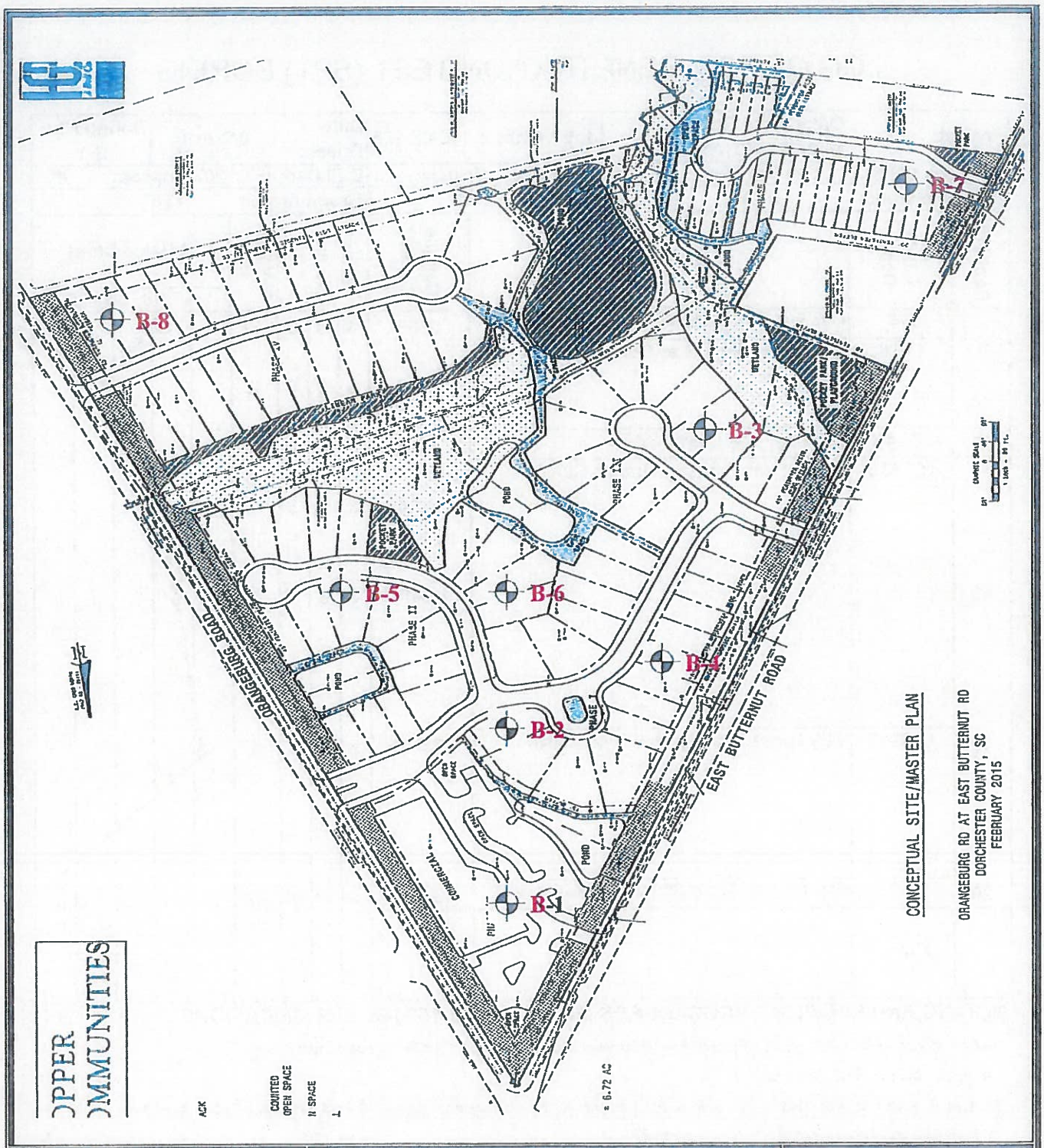
Michael L. Allen, P.E.
Senior Geotechnical Engineer
SC Registration No. 16525

MLA/s



APPENDIX

- Site and Exploration Location Maps
- Soil Boring Logs
- Hand Auger Boring Logs



PROJECT:
33-Acre Tract,
Orangeburg Rd at
Butternut Rd,
Summerville, SC

CETCO Job #: 16-02-126

TITLE: Boring Location Map

North:

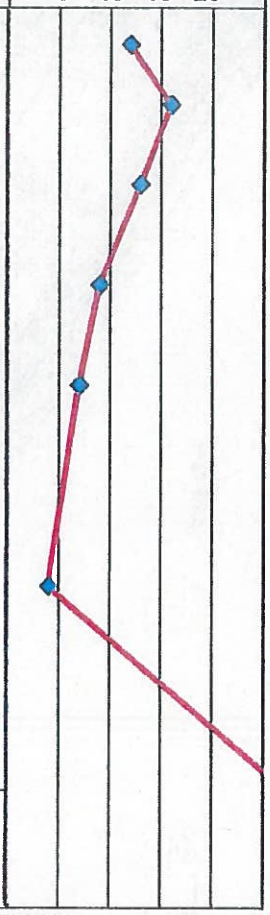
COASTAL ENGINEERING & TESTING

Key: B = SPT Boring

LOG OF SOIL PENETRATION TEST (SPT) BORING

Project:	Orangeburg Road @Butternut Tract	**Job Number:**	16-02-126	**Date Drilled:** 8/9/2016	**Boring No:** B-1
Location (GPS):	See Site Plan	**Ground Elevation:**	Unknown	**Drill Depth:** 20'	**Topsoil:** 4"
Drilling Method:	HSA	**Drill Rig Type:**	ATV	**Groundwater:**	13'6"

Depth (ft)	Layer Depth	Soil Description*	Sample Depth**	Blow Counts ***			N-Value ****
	0-4"	Firm Brown Gray Slightly Silty SAND	0-1.5	4	6	6	12
	4"-3'6"	Stiff Tan Orange Gray CLAY	1.5-3	5	8	8	16
5	3'6"-4'6"	Stiff Gray Tan Clayey SILT	3.5-5	5	6	7	13
	4'6"-13'6"	Stiff to Firm Tan Gray Orange CLAY	6-7.5	3	4	5	9
10			8.5-10	3	3	4	7
15	13'6"-19'	Very Loose Tan Slightly Clayey SAND	13.5-15	2	2	2	4
20	19'-20'	Very Stiff Tan Sandy SILT w/ phosphate gravel	18.5-20	5	13	14	27
	Notes:						



BORING AND SAMPLING PROCEDURES MEET ASTM D-1586-99 SPECIFICATIONS

* In Accordance With ASTM D-2488, Practice For Description and Identification of Soils (Visual-Manual Procedure)

** In Accordance With ASTM D-1586-99

*** Blows Required To Drive 1.4 Inch I.D. Split-Spoon Sampler Per 6-Inch Increment Using 140 Pound Hammer Falling 30 Inches

**** Sum Of Last 2 Driving Increments (blows per foot)

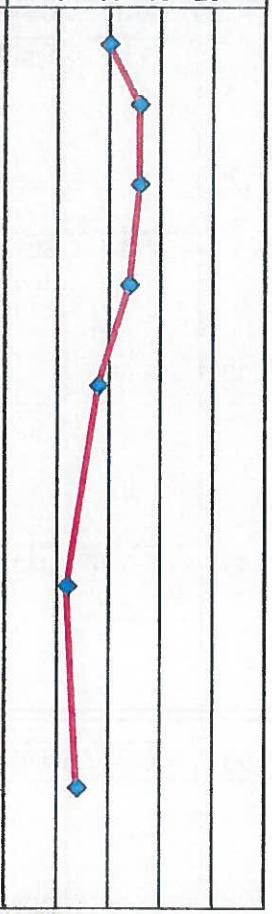
COASTAL ENGINEERING & TESTING

LOG OF SOIL PENETRATION TEST (SPT) BORING

Project:	Orangeburg Road @Butternut Tract	**Job Number:**	16-02-126	**Date Drilled:** 8/9/2016	**Boring No:** B-2
Location (GPS):	See Site Plan	**Ground Elevation:**	Unknown	**Drill Depth:** 20'	**Topsoil:** 4"
Drilling Method:	HSA	**Drill Rig Type:**	ATV	**Groundwater:**	13'6"

Depth (ft)	Layer Depth	Soil Description*	Sample Depth**	Blow Counts ***	N-Value ****
	0-6"	Loose Brown Tan Gray Slightly Silty SAND	0-1.5	3 4 6	10
	6"-9'	Stiff Tan Gray Orange CLAY	1.5-3	5 6 7	13
5			3.5-5	4 6 7	13
			6-7.5	4 5 7	12
10	9'-13'6"	Stiff Gray Tan CLAY	8.5-10	3 4 5	9
15	13'6"-20'	Loose Tan Gray Silty SAND	13.5-15	2 3 3	6
20			18.5-20	3 3 4	7
	Notes:				

N-Value Chart



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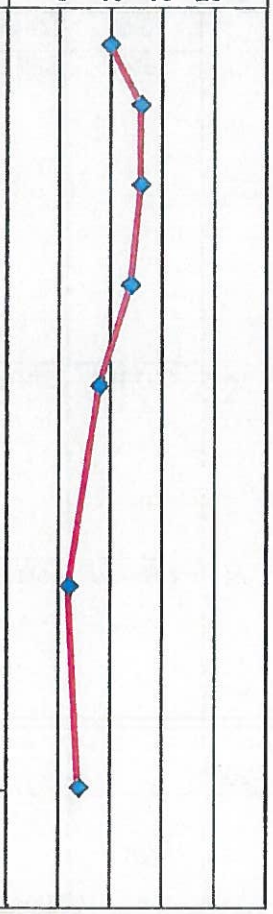
**** Sum Of Last 2 Driving Increments (blows per foot)

COASTAL ENGINEERING & TESTING

LOG OF SOIL PENETRATION TEST (SPT) BORING

Project:	Orangeburg Road @Butternut Tract	Job Number:	16-02-126	Date Drilled:	8/10/2016	Boring No:	B-3
Location (GPS):	See Site Plan	Ground Elevation:	Unknown	Drill Depth:	20'	Topsoil:	4"
Drilling Method:	HSA	Drill Rig Type:	ATV	Groundwater:	13'6"		

Depth (ft)	Layer Depth	Soil Description*	Sample Depth**	Blow Counts ***			N-Value ****
	0-1'	Loose Gray Brown Fine SAND	0-1.5	3	4	6	10
	1'-7'	Stiff Tan Gray Orange CLAY	1.5-3	5	6	7	13
5			3.5-5	4	6	7	13
	7'-14'	Stiff Gray Tan CLAY	6-7.5	4	5	7	12
10			8.5-10	3	4	5	9
15	14'-19'6"	Loose Gray Tan Slightly Clayey SAND	13.5-15	2	3	3	6
20	19'6"-20'	Firm Gray CLAY	18.5-20	3	3	4	7
	Notes:						



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*** Blows Required To Drive 1.4 Inch I.D. Split-Spoon Sampler Per 6-Inch Increment Using 140 Pound Hammer Falling 30 Inches

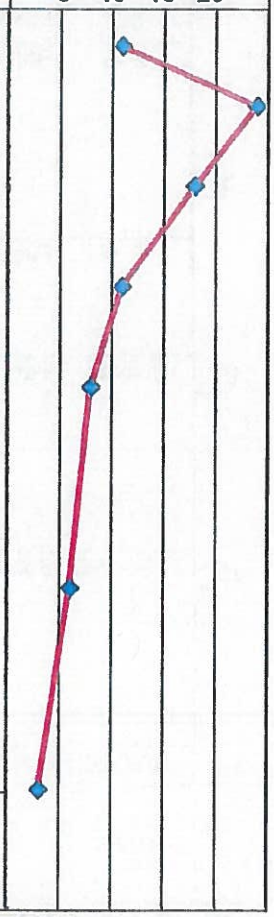
**** Sum Of Last 2 Driving Increments (blows per foot)

COASTAL ENGINEERING & TESTING

LOG OF SOIL PENETRATION TEST (SPT) BORING

Project:	Orangeburg Road @Butternut Tract	**Job Number:**	16-02-126	**Date Drilled:**	8/10/2016	**Boring No:**	B-4
Location (GPS):	See Site Plan	**Ground Elevation:**	Unknown	**Drill Depth:**	20'	**Topsoil:**	4"
Drilling Method:	HSA	**Drill Rig Type:**	ATV	**Groundwater:**	13'6"		

Depth (ft)	Layer Depth	Soil Description*	Sample Depth**	Blow Counts ***			N-Value ****
	0-6"	Loose Brown Tan Gray Slightly Silty SAND	0-1.5	4	5	6	11
	6"-8'6"	Stiff Tan Gray Orange CLAY	1.5-3	10	11	13	24
5			3.5-5	8	10	8	18
			6-7.5	4	5	6	11
10	8'6"'-13'6"	Stiff Gray Tan CLAY	8.5-10	3	4	4	8
15	13'6"-18'6"	Loose Tan Gray Silty SAND	13.5-15	2	3	3	6
20	18'6"-20'	Very Loose Tan Gray Silty SAND	18.5-20	2	1	2	3
	Notes:						



BORING AND SAMPLING PROCEDURES MEET ASTM D-1586-99 SPECIFICATIONS

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** In Accordance With ASTM D-1586-99

*** Blows Required To Drive 1.4 Inch I.D. Split-Spoon Sampler Per 6-Inch Increment Using 140 Pound Hammer Falling 30 Inches

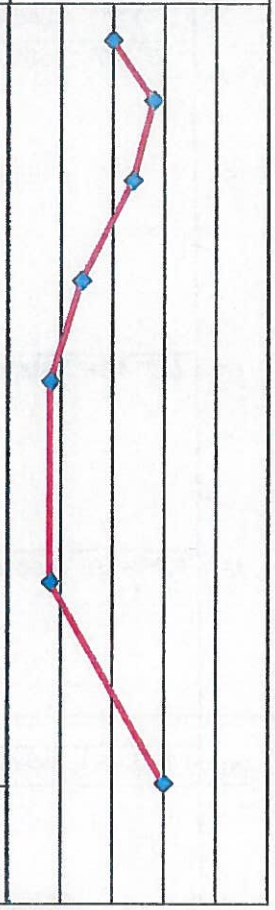
**** Sum Of Last 2 Driving Increments (blows per foot)

COASTAL ENGINEERING & TESTING

LOG OF SOIL PENETRATION TEST (SPT) BORING

Project:	Orangeburg Road @Butternut Tract	Job Number:	16-02-126	Date Drilled:	8/10/2016	Boring No:	B-5
Location (GPS):	See Site Plan	Ground Elevation:	Unknown	Drill Depth:	20'	Topsoil:	4"
Drilling Method:	HSA	Drill Rig Type:	ATV	Groundwater:	9'		

Depth (ft)	Layer Depth	Soil Description*	Sample Depth**	Blow Counts ***			N-Value ****
	0-2"	Loose Brown Fine SAND	0-1.5	2	4	6	10
	2"-6'	Stiff Gray Tan Orange CLAY	1.5-3	6	6	8	14
5			3.5-5	3	5	7	12
	6'-9'	Firm Tan Gray CLAY	6-7.5	2	3	4	7
10	9'-14'6"	Very Loose Tan Gray Clayey SAND	8.5-10	2	2	2	4
15	14'6"-18'6"	Soft Gray CLAY	13.5-15	1	2	2	4
20	18'6"-20'	Firm Tan Gray Fine SAND	18.5-20	4	7	8	15
	Notes:						



BORING AND SAMPLING PROCEDURES MEET ASTM D-1586-99 SPECIFICATIONS

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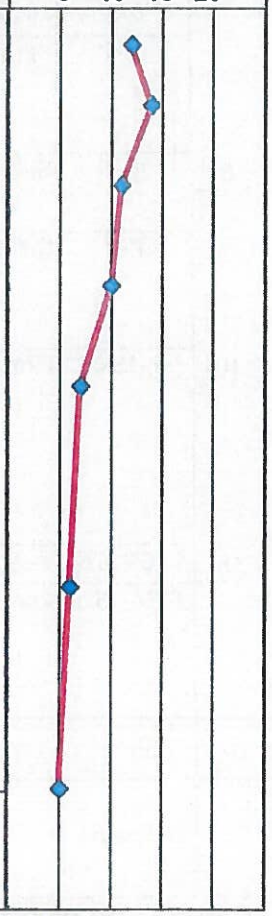
**** Sum Of Last 2 Driving Increments (blows per foot)

COASTAL ENGINEERING & TESTING

LOG OF SOIL PENETRATION TEST (SPT) BORING

Project:	Orangeburg Road @Butternut Tract	Job Number:	16-02-126	Date Drilled:	8/10/2016	Boring No:	B-6
Location (GPS):	See Site Plan	Ground Elevation:	Unknown	Drill Depth:	20'	Topsoil:	4"
Drilling Method:	HSA	Drill Rig Type:	ATV	Groundwater:	13'6"		

Depth (ft)	Layer Depth	Soil Description*	Sample Depth**	Blow Counts ***			N-Value ****
	0-6"	Firm Brown Clayey Fine SAND	0-1.5	2	6	6	12
	6"-4'	Stiff Gray Tan Orange CLAY	1.5-3	5	6	8	14
5	4'-6'6"	Stiff Tan Orange Gray CLAY	3.5-5	4	5	6	11
	6'6"-13'6"	Stiff to Firm Gray Tan CLAY	6-7.5	3	4	6	10
10			8.5-10	2	3	4	7
15	13'6"-20'	Loose Tan Fine SAND	13.5-15	3	3	3	6
20			18.5-20	2	2	3	5
	Notes:						



BORING AND SAMPLING PROCEDURES MEET ASTM D-1586-99 SPECIFICATIONS

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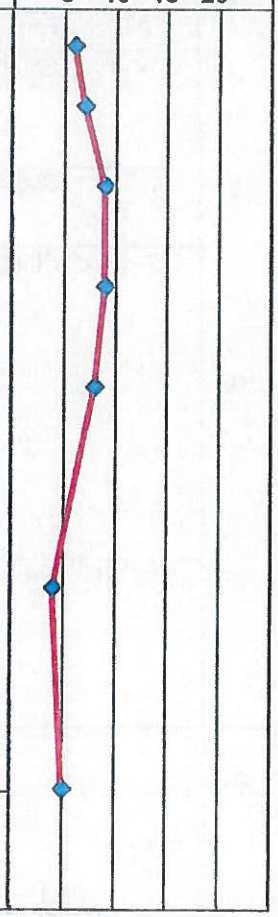
**** Sum Of Last 2 Driving Increments (blows per foot)

COASTAL ENGINEERING & TESTING

LOG OF SOIL PENETRATION TEST (SPT) BORING

Project:	Orangeburg Road @Butternut Tract	**Job Number:** 16-02-126	**Date Drilled:** 8/10/2016	**Boring No:** B-7	
Location (GPS):	See Site Plan	**Ground Elevation:** Unknown	**Drill Depth:** 20'	**Topsoil:** 4"	
Drilling Method:	HSA	**Drill Rig Type:** ATV	**Groundwater:** 13'6"		

Depth (ft)	Layer Depth	Soil Description*	Sample Depth**	Blow Counts ***			N-Value ****
	0-6"	Loose Brown Clayey Fine SAND	0-1.5	3	3	3	6
	6"-4'	Firm Tan CLAY	1.5-3	3	3	4	7
5	4'-7'	Stiff Tan Orange Gray CLAY	3.5-5	4	5	4	9
	7'-9'	Stiff Gray Tan CLAY	6-7.5	3	4	5	9
10	9'-13'6"	Firm Gray Tan Sandy CLAY	8.5-10	2	4	4	8
15	13'6"-14'6"	Very Loose Tan Fine SAND	13.5-15	1	2	2	4
	14'6"-18'6"	Very Loose Gray Tan Fine SAND					
20	18'6"-20'	Firm Gray Sandy CLAY	18.5-20	1	2	3	5
	Notes:						



BORING AND SAMPLING PROCEDURES MEET ASTM D-1586-99 SPECIFICATIONS

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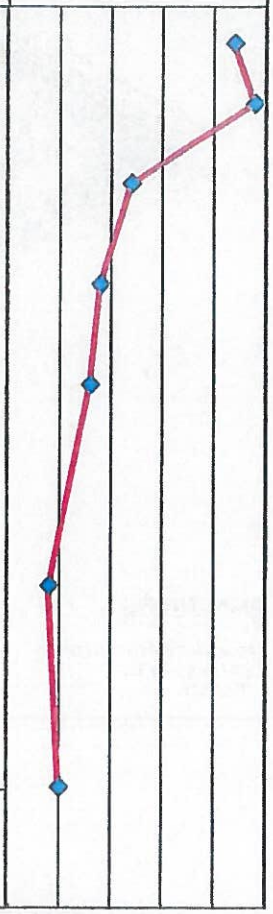
**** Sum Of Last 2 Driving Increments (blows per foot)

COASTAL ENGINEERING & TESTING

LOG OF SOIL PENETRATION TEST (SPT) BORING

Project:	Orangeburg Road @Butternut Tract	**Job Number:** 16-02-126	**Date Drilled:** 8/10/2016	**Boring No:** B-8	
Location (GPS):	See Site Plan	**Ground Elevation:** Unknown	**Drill Depth:** 20'	**Topsoil:** 4"	
Drilling Method:	HSA	**Drill Rig Type:** ATV	**Groundwater:** 13'6"		

Depth (ft)	Layer Depth	Soil Description*	Sample Depth**	Blow Counts ***	N-Value ****
	0-6"	Very Firm Brown Clayey SAND	0-1.5	8 12 10	22
	6"-4'	Very Stiff Tan Gray CLAY	1.5-3	8 12 12	24
5	4'-9'	Stiff Tan Gray Orange CLAY	3.5-5	4 5 7	12
			6-7.5	3 4 5	9
10	9'-13'6"	Firm Gray Tan CLAY	8.5-10	2 4 4	8
15	13'6"-19'	Very Loose Tan Gray Fine SAND	13.5-15	1 2 2	4
20	19'-20'	Loose Gray Fine SAND	18.5-20	2 3 2	5
	Notes:				



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**** Sum Of Last 2 Driving Increments (blows per foot)

COASTAL ENGINEERING & TESTING

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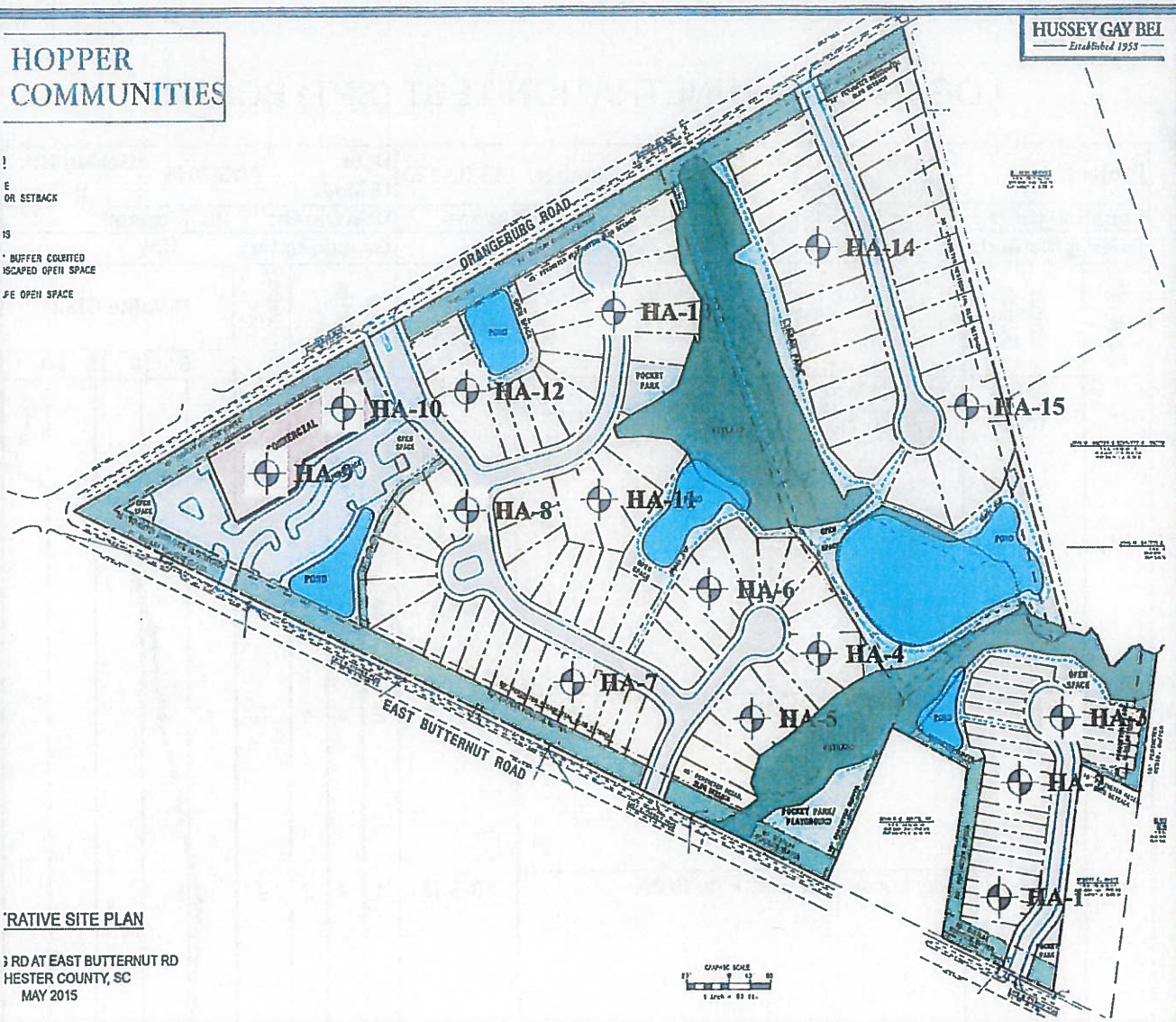

'RATIVE SITE PLAN

RD AT EAST BUTTERNUT RD
HESTER COUNTY, SC
MAY 2015

PROJECT: **33-Acre Tract, Orangeburg Rd at East Butternut Rd, Summerville, SC** **CETCO Job #: 16-02-126**	COASTAL ENGINEERING & TESTING	**TITLE: Hand Auger Boring Location Map**
North: ⇦		**Key:** **HA=Hand Auger Boring**

HAND AUGER BORING LOGS

33-Acre Site
Orangeburg Road at East Butternut Road
Summerville, South Carolina
Job # 16-02-126

BORING NO.	DEPTH	SOIL DESCRIPTION
HA-1	0'0"-0'½"	Gray Slightly Silty Fine SAND w/ roots
	0'½"-2'6"	Gray Slightly Silty Fine SAND
	2'6"-5'0"	Tan Gray Orange Slightly Silty Fine SAND
		Groundwater not encountered
HA-2	0'0"-0'½"	Gray Slightly Silty Fine SAND w/ roots
	0'½"-1'6"	Gray Slightly Silty Fine SAND
	1'6"-3'0"	Tan Gray Orange Sandy Silty CLAY
	3'0"-5'0"	Tan Gray Orange Clayey Silty Fine SAND
		Groundwater not encountered
HA-3	0'0"-0'½"	Gray Slightly Silty Fine SAND w/ roots
	0'½"-0'8"	Gray Slightly Silty Fine SAND
	0'8"-3'0"	Tan Gray Orange Sandy Silty CLAY
	3'0"-5'0"	Tan Gray Orange Clayey Silty Fine SAND
		Groundwater not encountered
HA-4	0'0"-0'½"	Brown Loamy Fine SAND
	0'½"-0'8"	Gray Slightly Silty Fine SAND
	0'8"-3'0"	Tan Gray Orange Sandy Silty CLAY
	3'0"-5'0"	Tan Gray Orange Slightly Sandy CLAY
		Groundwater not encountered
HA-5	0'0"-0'½"	Brown Loamy Fine SAND
	0'½"-0'6"	Gray Slightly Silty Fine SAND
	0'6"-2'0"	Tan Gray Slightly Silty Fine SAND
	2'0"-4'0"	Tan Gray Orange Slightly Silty Clayey Fine SAND
	4'0"-5'0"	Tan Gray Orange Slightly Sandy CLAY
		Groundwater not encountered

HAND AUGER BORING LOGS

33-Acre Site
Orangeburg Road at East Butternut Road
Summerville, South Carolina
Job # 16-02-126

BORING NO.	DEPTH	SOIL DESCRIPTION
HA-6	0'0"-0'½"	Brown Loamy Fine SAND
	0'½"-1'0"	Gray Slightly Silty Fine SAND
	1'0"-2'6"	Tan Gray Orange Slightly Silty Fine SAND
	2'6"-4'0"	Tan Gray Orange Slightly Silty Clayey Fine SAND
	4'0"-5'0"	Tan Gray Orange Slightly Sandy CLAY
		Groundwater not encountered
HA-7	0'0"-0'½"	Gray Slightly Silty Fine SAND w/ roots
	0'½"-0'6"	Gray Slightly Silty Fine SAND
	0'6"-2'0"	Tan Gray Slightly Silty Fine SAND
	2'0"-3'6"	Tan Gray Orange Slightly Silty Clayey Fine SAND
	3'6"-5'0"	Tan Gray Orange Slightly Sandy CLAY
		Groundwater not encountered
HA-8	0'0"-0'1"	Gray Slightly Silty Fine SAND w/ roots
	0'1"-0'4"	Gray Slightly Silty Fine SAND
	0'4"-3'0"	Tan Orange Slightly Silty Fine SAND
	3'0"-5'0"	Tan Orange Gray Slightly Sandy CLAY
		Groundwater not encountered
HA-9	0'0"-0'1"	Gray Slightly Silty Fine SAND w/ roots
	0'1"-0'8"	Gray Slightly Silty Fine SAND
	0'8"-2'8"	Tan Gray Slightly Silty Fine SAND
	2'8"-4'2"	Tan Gray Orange Slightly Silty Clayey Fine SAND
	4'2"-5'0"	Tan Gray Orange Slightly Sandy CLAY
		Groundwater not encountered
HA-10	0'0"-0'1"	Gray Slightly Silty Fine SAND w/ roots
	0'1"-1'0"	Gray Slightly Silty Fine SAND
	1'0"-4'0"	Gray Tan Slightly Silty Fine SAND
	4'0"-5'0"	Gray Tan Orange Slightly Silty Clayey Fine SAND
		Groundwater not encountered

COASTAL ENGINEERING & TESTING

HAND AUGER BORING LOGS

33-Acre Site
Orangeburg Road at East Butternut Road
Summerville, South Carolina
Job # 16-02-126

BORING NO.	DEPTH	SOIL DESCRIPTION
HA-11	0'0"-0'1"	Gray Slightly Silty Fine SAND w/ roots
	0'1"-1'0"	Gray Slightly Silty Fine SAND
	1'0"-4'0"	Tan Gray Orange Slightly Silty Clayey Fine SAND
	4'0"-5'0"	Tan gray Orange Slightly Sandy CLAY
		Groundwater not encountered
HA-12	0'0"-0'2"	Gray Slightly Silty Fine SAND w/ roots
	0'2"-1'0"	Gray Slightly Silty Fine SAND
	1'0"-5'0"	Gray Tan Slightly Silty Fine SAND
		Groundwater not encountered
HA-13	0'0"-0'½"	Brown Loamy Fine SAND
	0'½"-0'2"	Gray Slightly Silty Fine SAND w/ roots
	0'2"-0'6"	Gray Slightly Silty Fine SAND
	0'6"-1'4"	Tan Gray Slightly Silty Fine SAND
	1'4"-2'6"	Tan Orange Gray Slightly Silty Clayey Fine SAND
	2'6"-5'0"	Tan Orange Gray Slightly Sandy CLAY
		Groundwater not encountered
HA-14	0'0"-0'½"	Brown Loamy Fine SAND
	0'½"-0'2"	Gray Slightly Silty Fine SAND w/ roots
	0'2"-1'0"	Gray Slightly Silty Fine SAND
	1'0"-3'0"	Tan Gray Slightly Silty Fine SAND
	3'0"-5'0"	Tan Orange Gray Slightly Silty Clayey Fine SAND
		Groundwater not encountered
HA-15	0'0"-0'2"	Gray Slightly Silty Fine SAND w/ roots
	0'2"-1'0"	Gray Slightly Silty Fine SAND
	1'0"-4'0"	Gray Tan Slightly Silty Fine SAND
	4'0"-5'0"	Tan Gray Orange Slightly Silty Clayey Fine SAND
		Groundwater not encountered