STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

JENNIFER COHAN
SECRETARY

June 23, 2016

Ms. Betty Tustin
The Traffic Group, Inc.
104 Kenwood Court
Berlin, MD 21811

Dear Ms. Tustin

The enclosed Traffic Impact Study (TIS) review letter for the **Belle Terre** residential development (Tax Parcels 334-12.00-17.00, 18.00, 19.00 and 20.00) has been completed under the responsible charge of a registered professional engineer whose firm is authorized to work in the State of Delaware. They have found the TIS to conform to DelDOT's Development Coordination Manual and other accepted practices and procedures for such studies. DelDOT accepts this review letter and concurs with the recommendations. If you have any questions concerning this letter or the enclosed review letter, please contact me at (302) 760-2167.

Sincerely,

Troy Brestel
Project Engineer

TEB:km
Enclosures
cc with enclosures: Mr. Frank Kea, Solutions IPEM
Ms. Constance C. Holland, Office of State Planning Coordination
Mr. Lawrence Lank, Sussex County Planning and Zoning
Ms. Janelle Cornwell, Sussex County Planning and Zoning
Mr. Andrew Parker, McCormick Taylor, Inc.
DelDOT Distribution

DelDOT

DelDOT Distribution

Annie Cordo, Deputy Attorney General
Robert McCleary, Director, Transportation Solutions (DOTS)
Drew Boyce, Director, Planning
Mark Luszcz, Chief Traffic Engineer, Traffic, DOTS
Michael Simmons, Assistant Director, Project Development South, DOTS
J. Marc Coté, Assistant Director, Development Coordination
T. William Brockenbrough, Jr., County Coordinator, Development Coordination
Peter Haag, Traffic Studies Manager, Traffic, DOTS
Alastair Probert, South District Engineer, South District
Gemez Norwood, South District Public Works Manager, South District
Jay Sammons, South District Permit Supervisor, South District
Steve Sisson, Sussex Subdivision Coordinator, Development Coordination
David Dooley, Service Development Planner, Delaware Transit Corporation
Mark Galipo, Traffic Engineer, Traffic, DOTS
Anthony Aglio, Planning Supervisor, Statewide & Regional Planning
Claudy Joinville, Project Engineer, Development Coordination
Scott Johnson, Subdivision Manager, Development Coordination

McCORMICK TAYLOR

June 23, 2016

Mr. Troy E. Brestel
Project Engineer
DelDOT Division of Planning
P.O. Box 778
Dover, DE 19903

RE: Agreement No. 1655
Traffic Impact Study Services
Task No. 1 Subtask 16A – Belle Terre

Dear Mr. Brestel:

McCormick Taylor has completed its review of the Traffic Impact Study (TIS) for the Belle Terre residential development prepared by The Traffic Group, Inc. (TTG), dated February 2016. This review was assigned as Task Number 1 (Subtask 16A). TTG prepared the report in a manner generally consistent with DelDOT's *Development Coordination Manual*.

The TIS evaluates the impacts of the Belle Terre residential development, proposed to be located south of Mulberry Knoll Road (Sussex Road 284) and west of Delaware Route 24 (John J. Williams Highway / Sussex Road 24) in Sussex County, Delaware. The proposed development would include 200 single-family detached houses and 178 townhouses on approximately 124 acres of land. One full access point is proposed on Mulberry Knoll Road, which will require use of an existing easement through the property on the northeast side of the proposed development. No direct access to the parcel currently exists. Construction is anticipated to be complete by 2023.

The land is currently zoned as AR-1 (Agricultural Residential) within Sussex County, and the developer proposes to rezone the land to MR (Multi-Density Residential District) with an RPC (Residential Planned Community) overlay.

DelDOT currently has five relevant projects in the study area. The first project is the Cedar Grove/Postal Lane Intersection Realignment Project at Plantation Road, which was recently completed and opened to traffic. Prior to this project, Postal Lane (Sussex Road 283) intersected Plantation Road (Sussex Road 275) approximately 150' north of the intersection with Cedar Grove Road (also Sussex Road 283). This project realigned the two offset stop-controlled T-intersections to create one four-leg intersection controlled by a traffic signal. The project included separate left-turn, through and right-turn lanes on each leg of the intersection, bicycle lanes, sidewalks, and street lighting. Construction of this project was completed in early 2015.

The next two projects described below involve improvements on Delaware Route 24, with one project from Love Creek to Mulberry Knoll Road and the other from Mulberry Knoll Road to Delaware Route 1 (Sussex Road 14).

The SR 24, Mulberry Knoll Road to SR 1 Improvement Project (State Contract No. T200411209) involves the widening of Delaware Route 24 to facilitate the continuation of the existing four-lane section with auxiliary turn lanes to west of Plantation Road, where it will tie in to the existing roadway section. The southbound Plantation Road approach and northbound Warrington Road approach will also be widened to provide one left turn-lane, one shared through/left-turn lane, one through lane, and one right-turn lane on each approach. The project also includes the addition of a third left-turn lane on the eastbound approach of Delaware Route 24 at the Delaware Route 1 intersection. For this project, preliminary engineering is complete, right-of-way acquisition is currently underway, and construction is scheduled for FY 18 and 19.

The SR 24, Love Creek Bridge to Mulberry Knoll Road Improvements Project (State Contract No. T201212201) consists of safety and operational improvements on Delaware Route 24, including but not limited to the addition of separate left-turn lanes along the Delaware Route 24 approaches to the Mulberry Knoll Road intersection, turn lane modifications at the Beacon Middle School entrance, and adding bike lanes in along some sections. Earlier versions of this project had included widening Delaware Route 24 to include two through lanes in each direction, but the widening is no longer proposed. Based on previous traffic studies at the Mulberry Knoll Road intersection, DelDOT had determined that a traffic signal was not warranted at that time and a signal was not included as part of the DelDOT improvements project. This project is currently in the conceptual design phase with right-of-way acquisition scheduled for FY 18 and 19 and construction scheduled for FY 20 and 21.

The SR 1, Rehoboth Canal to North of Five Points, Pedestrian Improvements project (State Contract No. T200612501) has enhanced pedestrian safety in the beach area by providing sidewalks along Delaware Route 1 along with new pedestrian crossings of Delaware Route 1 at numerous locations. At the Delaware Route 24 intersection, the SR 1 Pedestrian Improvements project includes adding sidewalk along northbound and southbound Delaware Route 1, along with a new crosswalk and pedestrian signals across the west leg (SR 24) of the intersection. This project was just completed in June 2016.

The Plantation Road Improvements, SR 24 to US 9 Project (State Contract No. T201111201) will provide operational improvements along Plantation Road from Delaware Route 24 to US Route 9. The project will include adding and modifying turn lanes, bypass lanes, and various intersection improvements and safety improvements. The preliminary engineering phase is scheduled to begin in FY 17 with construction to begin in FY 22 at the earliest.

Based on our review, we have the following comments and recommendations:

The following intersections exhibit level of service (LOS) deficiencies without the implementation of physical roadway and/or traffic control improvements:

Intersection	*Existing Traffic Control*	*Situations for which deficiencies occur*
Delaware Route 24 & Mulberry Knoll Road	Unsignalized	2015 Existing AM & Saturday (Case 1); 2023 AM, PM & Saturday without and with Belle Terre (Case 2 & 3); 2023 AM, PM & Saturday with Belle Terre and DelDOT Improvements (Case 3)
Delaware Route 24 & Plantation Road / Warrington Road	Signalized	2023 PM & Saturday without and with Belle Terre (Case 2 & 3)

The unsignalized intersection of Delaware Route 24 and Mulberry Knoll Road exhibits LOS deficiencies during existing and future conditions, even with the improvements planned as part of DelDOT's SR 24, Love Creek to Mulberry Knoll Road Project. These planned improvements consist of adding separate left-turn lanes on the Delaware Route 24 approaches. Without Belle Terre or any roadway improvements, the anticipated LOS deficiencies would occur on the northbound and southbound Mulberry Knoll Road approaches, and the expected worst-case 95th percentile queue length is 170 feet for the southbound approach during the future summer Saturday peak hour.

Analysis of the intersection of Delaware Route 24 and Mulberry Knoll Road with the proposed Belle Terre development traffic included (but without any intersection improvements) indicates that delays and queue lengths for the southbound Mulberry Knoll Road approach would increase significantly. Under this scenario, the projected 95th percentile queue lengths for southbound Mulberry Knoll Road are 635 feet during the AM peak hour, 415 feet during the PM peak hour, and 500 feet during the summer Saturday peak hour. Analyzed with the improvements included in DelDOT's SR 24, Love Creek to Mulberry Knoll Road project, significant delays on the southbound Mulberry Knoll Road approach would persist and the projected 95th percentile queue lengths for the southbound approach would be 600 feet, 395 feet, and 455 feet during those same three peak hours.

Based on previous traffic studies at the intersection of Delaware Route 24 and Mulberry Knoll Road, DelDOT had determined that a traffic signal was not warranted at that time and a signal was not included as part of the DelDOT improvements project. However, based on the capacity analysis included in the TIS, it appears that the installation of a traffic signal at the intersection of Delaware Route 24 and Mulberry Knoll Road would mitigate the LOS deficiencies that would occur with the Belle Terre development traffic included. To address these LOS deficiencies, the developer should improve the intersection, and should enter into a traffic signal agreement with DelDOT regarding the design and construction of a traffic signal at this intersection, as described below in Item Nos. 2 and 3.

The signalized intersection of Delaware Route 24 and Plantation Road/Warrington Road exhibits LOS deficiencies during future conditions with and without Belle Terre during the PM and summer Saturday peak hours. Acceptable LOS would be achieved for all future cases with the improvements planned as part of DelDOT's SR 24, Mulberry Knoll Road to SR 1 Project. These planned improvements include the addition of a second through lane along both directions of Delaware Route 24 and the addition of a shared through/left-turn lane on both the northbound Warrington Road approach and the southbound Plantation Road approach. The SR 24, Mulberry Knoll Road to SR 1 Project is scheduled for construction in FY 18 and 19.

Per the State of Delaware Preliminary Land Use Service (PLUS) comments dated September 22, 2015, DelDOT recommends that the developer obtain a right-of-way to replace the existing easement for the driveway by which the site would have access to Mulberry Knoll Road.

Should the County choose to approve the proposed development, the following items should be incorporated into the site design and reflected on the record plan by note or illustration. All applicable agreements (i.e. letter agreements for off-site improvements and traffic signal agreements) should be executed prior to entrance plan approval for the proposed development.

1. The developer should construct the site entrance on Mulberry Knoll Road. This proposed entrance driveway would replace the existing unpaved residential driveway located approximately 1,800 feet northwest of the intersection of Delaware Route 24 and Mulberry Knoll Road, labeled as Dorman Farm Lane in the Site Location Map on Page 10. The proposed configuration is shown in the table below:

Approach	Current Configuration	Proposed Configuration
Northbound Mulberry Knoll Road	One through lane (allowing left turns onto unpaved driveway)	One shared through/left-turn lane and one bypass lane
Southbound Mulberry Knoll Road	One through lane (allowing right turns onto unpaved driveway)	One through lane and one right-turn lane
Eastbound Site Entrance	Approach does not exist (except for unpaved driveway)	One shared left/right-turn lane

Based on earlier coordination between the developer and DelDOT, the initial recommended minimum turn-lane lengths (excluding tapers) of the separate turn lanes / bypass lanes are listed below. The developer should coordinate with DelDOT's Development Coordination Section to determine final turn-lane lengths during the site plan review process.

Approach	Left-Turn or Bypass Lane	Right-Turn Lane
Northbound Mulberry Knoll Road	105-foot full-width bypass lane, plus 75-foot tapers	N/A
Southbound Mulberry Knoll Road	N/A	190 feet
Eastbound Site Entrance	N/A	N/A

It is noted that the construction and use of the proposed site entrance driveway providing access to Mulberry Knoll Road will require use of an existing easement through the property on the northeast side of the proposed development. DelDOT recommends that the developer obtain a right-of-way to replace this existing easement. This driveway could also have an impact on access to the proposed Delaware State Police (DSP) Troop 7 site, to be located just to the south on Mulberry Knoll Road. The Belle Terre developer must coordinate with DelDOT's Development Coordination Section and the owner of the adjacent property (DSP site), as the design details for access to both the Belle Terre site and the DSP site will need to be determined during the site plan review process.

2. The developer should improve the intersection of Delaware Route 24 and Mulberry Knoll Road. The proposed configuration is shown in the table below.

Approach	Current Configuration	Proposed Configuration
Northbound Mulberry Knoll Road	One shared left/through/right-turn lane	One shared left/through/right-turn lane
Southbound Mulberry Knoll Road	One shared left/through/right-turn lane	One shared through/left-turn lane and one right-turn lane
Eastbound Delaware Route 24	One shared through/left-turn lane and one right-turn lane	One left-turn lane, one through lane and one right-turn lane
Westbound Delaware Route 24	One shared through/left-turn lane and one right-turn lane	One left-turn lane, one through lane and one right-turn lane

Initial recommended minimum turn-lane lengths (excluding tapers) of the separate turn lanes are listed below. The developer should coordinate with DelDOT's Development Coordination Section to determine final design details including final turn-lane lengths during the site plan review process. The design of this intersection must accommodate DelDOT's *SR 24, Mulberry Knoll Road to SR 1 Improvement Project.*

Approach	Left-Turn Lane	Right-Turn Lane
Northbound Mulberry Knoll Road	N/A	N/A
Southbound Mulberry Knoll Road	N/A	TBD *
Eastbound Delaware Route 24	400 feet **	125 feet ***
Westbound Delaware Route 24	125 feet **	125 feet ***

* Due to existing constraints including buildings on the northwest corner of the intersection, no initial turn-lane length is provided. Design details and length of the southbound right-turn lane must be determined during the site plan review process.

** turn-lane length per concept plans for DelDOT's *SR 24, Love Creek Bridge to Mulberry Knoll Road Improvements Project.*

*** indicates existing turn lane length; final length to be determined by DelDOT during site plan review process

Should DelDOT's *SR 24, Mulberry Knoll Road to SR 1 Improvement Project* advance to construction prior to improvements being made by the developer at the intersection of Delaware Route 24 and Mulberry Knoll Road, the developer should coordinate with DelDOT regarding an equitable share contribution toward the DelDOT project. The amount of the contribution should be determined through coordination with DelDOT's Development Coordination Section. In this situation, there could still be additional improvements that the developer would be responsible for at this intersection after the DelDOT project is constructed (possibly including but not limited to signalization of the intersection if a traffic signal is not included as part of the DelDOT project).

3. The developer should enter into a traffic signal agreement with DelDOT regarding the design and construction of a traffic signal for the intersection of Delaware Route 24 and Mulberry Knoll Road. The agreement should include pedestrian signals, crosswalks, interconnection, and ITS equipment such as CCTV cameras at DelDOT's discretion. The developer should coordinate with DelDOT regarding design details and implementation of the traffic signal. The agreement should provide for installation and activation of the signal at DelDOT's discretion. One or more other developers may enter into a traffic signal agreement for this intersection as well.

4. The following bicycle and pedestrian improvements should be included:

   a. A right-turn yield to bikes sign (MUTCD R4-4) should be added at the start of the right-turn lane added to southbound Mulberry Knoll Road at the site entrance.
   b. Adjacent to the right-turn lane added to southbound Mulberry Knoll Road at the site entrance, a minimum of a five foot bicycle lane should be dedicated and striped with appropriate markings for bicyclists through the turn lane in order to facilitate safe and unimpeded bicycle travel.

c. Appropriate bicycle symbols, directional arrows, striping (including stop bars), and signing should be included along bicycle facilities and right-turn lanes within the project limits.
d. Utility covers should be made flush with the pavement.
e. If a clubhouse or other community facility is constructed as shown on the conceptual site plan, bike parking should be provided near the building entrances. Where the building architecture provides for an awning or other overhang, the bike parking should be covered.
f. Internal sidewalks for pedestrian safety and to promote walking as a viable transportation alternative should be considered within the development. These sidewalks should each be a minimum of five feet wide (with a minimum of a five-foot buffer from the roadway) and should meet current AASHTO and ADA standards.
g. Where internal sidewalks are located alongside of parking spaces, a buffer should be added to eliminate vehicular overhang onto the sidewalk.
h. ADA compliant curb ramps and crosswalks should be provided at all pedestrian crossings within the development. Type 3 curb ramps are discouraged.
i. A multi-use pedestrian/bicycle connection should be constructed between the proposed Belle Terre development and the proposed Love Creek Elementary School. The developer should coordinate with DelDOT and representatives of the Love Creek Elementary School and the adjacent Saddle Ridge residential development regarding the potential for direct pedestrian/bicycle connections between the developments and the proposed elementary school. The pedestrian/bicycle connection(s) between these properties should not be adjacent to Mulberry Knoll Road or Delaware Route 24.

Improvements in this TIS may be considered "significant" under DelDOT's *Work Zone Safety and Mobility Procedures and Guidelines*. These guidelines are available on DelDOT's website at http://www.deldot.gov/information/pubs_forms/manuals/de_mutcd/index.shtml. For any additional information regarding the work zone impact and mitigation procedures during construction please contact Mr. Adam Weiser of DelDOT's Traffic Section. Mr. Weiser can be reached at (302) 659-4073 or by email at Adam.Weiser@state.de.us.

Please note that this review generally focuses on capacity and level of service issues; additional safety and operational issues will be further addressed through DelDOT's subdivision review process.

Additional details on our review of this TIS are attached. Please contact me at (302) 738-0203 or through e-mail at ajparker@mtmail.biz if you have any questions concerning this review.

Sincerely,

McCormick Taylor, Inc.

Andrew J. Parker, P.E., PTOE
Project Manager

Enclosure

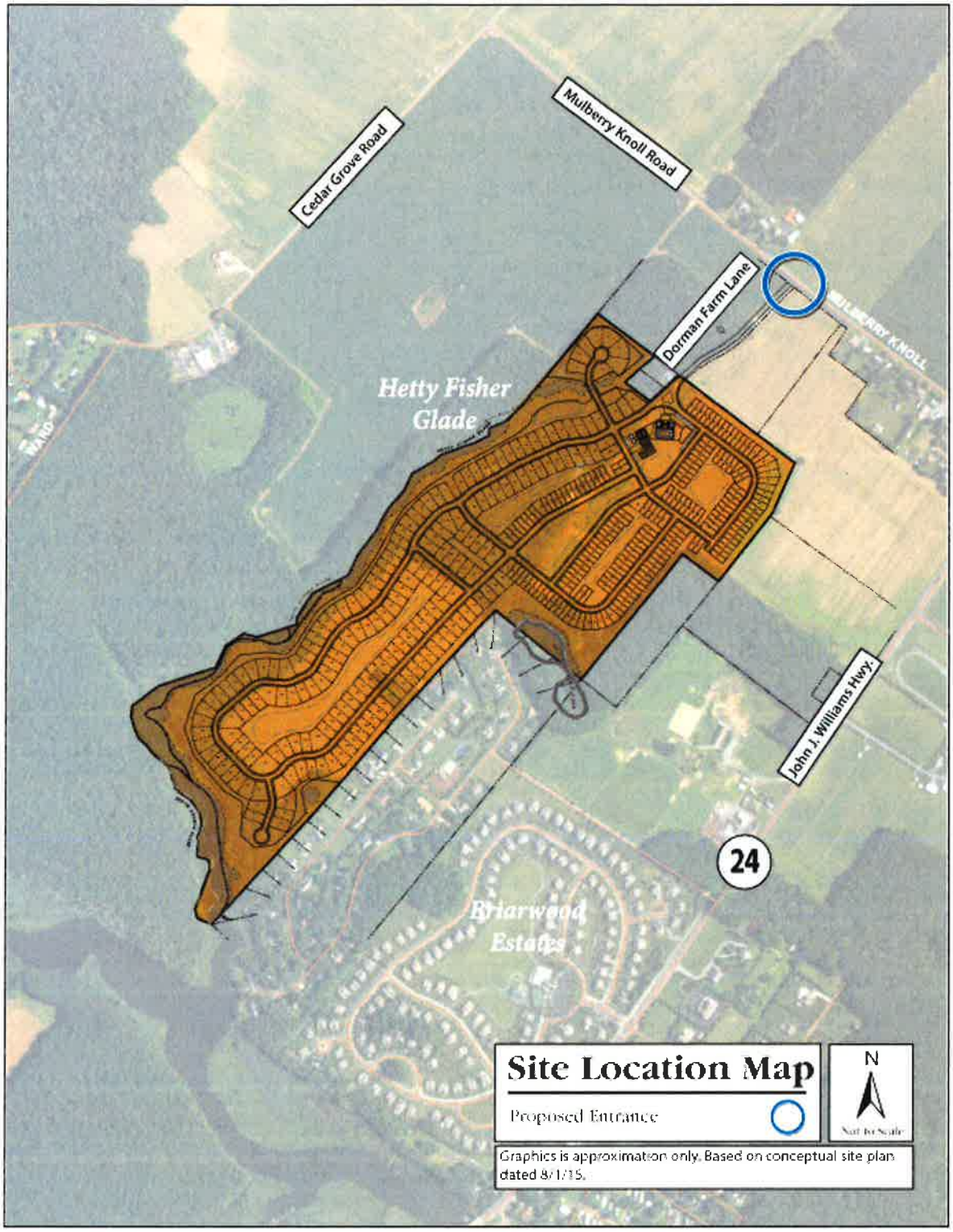
General Information

Report date: February 2016
Prepared by: The Traffic Group, Inc. (TTG)
Prepared for: Arcaro Ventures D., LLC
Tax parcel: 334-12.00-17.00, 18.00, 19.00 and 20.00
Generally consistent with DelDOT's *Development Coordination Manual*: Yes

Project Description and Background

Description: The proposed residential development would include 200 single-family detached houses and 178 townhouses.
Location: The Belle Terre residential development is proposed to be located south of Mulberry Knoll Road (Sussex Road 284) and west of Delaware Route 24 (John J. Williams Highway / Sussex Road 24) in Sussex County, Delaware. A site location map is included on Page 10.
Amount of land to be developed: approximately 123.75 acres of land
Land use approval(s) needed: Subdivision approval. The land is currently zoned as AR-1 (Agricultural Residential) within Sussex County, and the developer proposes to rezone the land to MR (Multi-Density Residential District) with an RPC (Residential Planned Community) overlay.
Proposed completion date: 2023
Proposed access locations: One full access point is proposed on Mulberry Knoll Road. The proposed access will require use of an existing easement through the property on the northeast side of the proposed development. No direct access to the parcel currently exists.
Daily Traffic Volumes (per DelDOT Traffic Summary 2014):

- 2014 Average Annual Daily Traffic on Mulberry Knoll Road: 668 vpd


Cedar Grove Road
Mulberry Knoll Road
Dorman Farm Lane
MULBERRY KNOLL
Hetty Fisher Glade
John J. Williams Hwy.
24
Briarwood Estates
Site Location Map
Proposed Entrance
N
Not to Scale
Graphics is approximation only. Based on conceptual site plan dated 8/1/15.

2015 Delaware Strategies for State Policies and Spending

Location with respect to the Strategies for State Policies and Spending Map of Delaware:
The proposed Belle Terre development is located within an Investment Level 2 area.

Investment Level 2

Investment Level 2 Areas are areas prepared for growth and where the state can make cost-effective infrastructure investments for schools, roads, and public safety. In these areas, state investments and policies should support and encourage a wide range of uses and densities, promote other transportation options, foster efficient use of existing public and private investments, and enhance community identity and integrity. Investment Level 2 Areas serve as transition areas between Level 1 and the state's more open, less populated areas.

Proposed Development's Compatibility with Strategies for State Policies and Spending:
The proposed Belle Terre residential development is located within an Investment Level 2 area, and is to be developed as 200 single-family detached homes and 178 townhomes. This type of development is generally consistent with the character of Investment Level 2 areas, where a mix of housing options is encouraged. The Delaware Route 24 corridor is becoming increasingly developed and is characteristic of Investment Level 2 areas, as it links the commercial SR 1 corridor and beach resort area with rural Sussex County. DelDOT plans to make improvements along the Delaware Route 24 corridor and DART recently added a new year-round bus route to accommodate the continuing growth. A new elementary school is also proposed adjacent to the Belle Terre development to serve the growing area, which is another sign of Investment Level 2 type development. The proposed development appears to generally comply with the policies stated in the 2015 "Strategies for State Policies and Spending."

Comprehensive Plan

Sussex County Comprehensive Plan:
(Source: Sussex County Comprehensive Plan Update, June 2008)

The Sussex County Comprehensive Plan Future Land Use Map indicates that the proposed development parcel is within the Environmentally Sensitive Developing Area (categorized as a Growth Area).

Growth Areas, including the Environmentally Sensitive Developing Area, are designed to accommodate concentrated levels of development. The Environmentally Sensitive Developing Area has been designated by Sussex County for large areas around Rehoboth Bay, Indian River Bay, and Little Assawoman Bay (the inland bays). This designation recognizes two characteristics of these areas. First, these regions are among the most desirable locations in Sussex County for new housing, as reflected in new construction data and real estate prices. Second, these regions contain ecologically important wetlands and other coastal lands that help absorb floodwaters and provide extensive habitat for native flora and fauna. These areas also have great impacts upon the water quality of the bays and inlets and upon natural habitats.

The challenge in these regions is to safeguard genuine natural areas and mitigate roadway congestion without stifling the tourism and real estate markets that: a) provide many jobs; b) create business for local entrepreneurs; and c) help keep local tax rates reasonable. The County has major initiatives to extend public sewer service to replace failing on-site systems in many of these areas. Very careful control of stormwater runoff is an extremely important concern to keep sediment and other pollutants out of the inland bays.

The following major guidelines should apply to future growth in Environmentally Sensitive Developing Areas:

Permitted Uses – Environmentally Sensitive Developing Areas are areas that can accommodate development provided special environmental concerns are addressed. A range of housing types should be permitted in Environmentally Sensitive Areas, including single-family homes, townhouses and multi-family units. Retail and office uses are appropriate but larger shopping centers and office parks should be confined to selected locations with access to arterial roads. Careful mixtures of homes with light commercial and institutional uses can be appropriate to provide for convenient services and to allow people to work close to home. Major new industrial uses are not proposed in these areas. Industrial zones are regulated by the Delaware Coastal Zone Act, which restrict heavy industry and bulk transfer.

Densities – The Environmentally Sensitive Developing Areas function as an "overlay" area to several underlying zoning districts. It may be advisable for legal reasons to convert this overlay area into regular zoning districts, while maintaining the current standards. Most of the Environmental Sensitive Developing Areas should continue to allow 2 homes per acre. The option should exist to go up to 4 units per acre if the developer uses optional density bonuses. Smaller lots and flexibility in dimensional standards should be allowed if the developer uses a cluster option that results in permanent preservation of a substantial percentage of the tract.

The County may also consider an additional layer of protection in the Environmentally Sensitive Developing Areas. Tidal wetland area could be subtracted from the total tract size so that "net" tract size is used as the basis for calculating how much development is allowed.

All applicants for developments of a minimum size (as specified in zoning) should continue to be required to provide information that analyzes the development's potential environmental impacts, including effects on stormwater runoff, nitrogen and phosphorous loading, wetlands, woodlands, wastewater treatment, water systems, and other matters that affect the ecological sensitivity of the inland bays.

Infrastructure – Central water and sewer facilities are strongly encouraged. If central utilities are not possible, permitted densities should be limited to 2 units per acre.

Proposed Development's Compatibility with Comprehensive Plan: The proposed Belle Terre residential development is planned to be developed as a mix of housing with 200 single-family detached homes and 178 townhomes. The proposed development appears to comply with the characteristics of Growth Areas in general as well as the *Permitted Uses* for the Environmentally Sensitive Developing Area.

The site is currently zoned AR-1 (Agricultural Residential) within Sussex County, and the developer proposes to rezone the land to MR (Multi-Density Residential District) with an RPC (Residential Planned Community) overlay. The purpose of the Medium-Density Residential District is to provide for medium-density residential development in areas which are or which are expected to become generally urban in character, but where sanitary sewers and public water supplies may or may not be available at the time of construction, together with such churches, recreational facilities and accessory uses as may be necessary or are normally compatible with residential surroundings. The district is located to protect existing development of this character and contains vacant land considered appropriate for such development in the future. Permitted uses include detached single family dwellings but not manufactured homes. Multifamily dwelling structures and townhomes may be permitted as conditional uses, pending approval through the Sussex County site plan review process.

While the uses proposed for this site appear to be permitted in the Multi-Density Residential District, there are specific regulations that must be followed for each type of use. In particular, there are regulations and densities pertaining to the proposed housing that need to be met and/or approved through the Sussex County site plan review process. As such, this development raises questions regarding consistency with the Sussex County Comprehensive Plan, and thus requires additional discussion.

Relevant Projects in the DelDOT Capital Transportation Program

DelDOT currently has five relevant projects in the study area. The first project is the Cedar Grove/Postal Lane Intersection Realignment Project at Plantation Road, which was recently completed and opened to traffic. Prior to this project, Postal Lane (Sussex Road 283) intersected Plantation Road (Sussex Road 275) approximately 150' north of the intersection with Cedar Grove Road (also Sussex Road 283). This project realigned the two offset stop-controlled T-intersections to create one four-leg intersection controlled by a traffic signal. The project included separate left-turn, through and right-turn lanes on each leg of the intersection, bicycle lanes, sidewalks, and street lighting. Construction of this project was completed in early 2015.

The next two projects described below involve improvements on Delaware Route 24, with one project from Love Creek to Mulberry Knoll Road and the other from Mulberry Knoll Road to Delaware Route 1 (Sussex Road 14).

The SR 24, Mulberry Knoll Road to SR 1 Improvement Project (State Contract No. T200411209) involves the widening of Delaware Route 24 to facilitate the continuation of the existing four-lane section with auxiliary turn lanes to west of Plantation Road, where it will tie in to the existing roadway section. The southbound Plantation Road approach and northbound Warrington Road approach will also be widened to provide one left turn-lane, one shared through/left-turn lane, one through lane, and one right-turn lane on each approach. The project also includes the addition of a third left-turn lane on the eastbound approach of Delaware Route 24 at the Delaware Route 1 intersection. For this project, preliminary engineering is complete, right-of-way acquisition is currently underway, and construction is scheduled for FY 18 and 19.

The SR 24, Love Creek Bridge to Mulberry Knoll Road Improvements Project (State Contract No. T201212201) consists of safety and operational improvements on Delaware Route 24, including but not limited to the addition of separate left-turn lanes along the Delaware Route 24 approaches to the Mulberry Knoll Road intersection, turn lane modifications at the Beacon Middle School entrance, and adding bike lanes in along some sections. Earlier versions of this project had included widening Delaware Route 24 to include two through lanes in each direction, but the widening is no longer proposed. Based on previous traffic studies at the Mulberry Knoll Road intersection, DelDOT had determined that a traffic signal was not warranted at that time and a signal was not included as part of the DelDOT improvements project. This project is currently in the conceptual design phase with right-of-way acquisition scheduled for FY 18 and 19 and construction scheduled for FY 20 and 21.

The SR 1, Rehoboth Canal to North of Five Points, Pedestrian Improvements project (State Contract No. T200612501) has enhanced pedestrian safety in the beach area by providing sidewalks along Delaware Route 1 along with new pedestrian crossings of Delaware Route 1 at numerous locations. At the Delaware Route 24 intersection, the SR 1 Pedestrian Improvements project includes adding sidewalk along northbound and southbound Delaware Route 1, along with a new crosswalk and pedestrian signals across the west leg (SR 24) of the intersection. This project was just completed in June 2016.

The Plantation Road Improvements, SR 24 to US 9 Project (State Contract No. T201111201) will provide operational improvements along Plantation Road from Delaware Route 24 to US Route 9. The project will include adding and modifying turn lanes, bypass lanes, and various intersection improvements and safety improvements. The preliminary engineering phase is scheduled to begin in FY 17 with construction to begin in FY 22 at the earliest.

Trip Generation

Trip generation for the proposed development was computed using comparable land uses and equations contained in Trip Generation, Ninth Edition, published by the Institute of Transportation Engineers (ITE). The following land uses were utilized to estimate the amount of new traffic generated for this development:

- 200 Single-Family Detached Homes (ITE Land Use Code 210)
- 178 Townhouses/Condominiums (ITE Land Use Code 230)

Table 1
BELLE TERRE PEAK HOUR TRIP GENERATION

Land Use	Weekday AM Peak Hour			Weekday PM Peak Hour			SAT Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
200 single-family detached houses	38	112	150	123	73	196	101	86	187
178 townhouses/condominiums	14	68	82	64	32	96	51	43	94
TOTAL TRIPS	**52**	**180**	**232**	**187**	**105**	**292**	**152**	**129**	**281**

Table 2
BELLE TERRE DAILY TRIP GENERATION

Land Use	Weekday Daily			Saturday Daily		
	In	Out	Total	In	Out	Total
200 single-family detached houses	994	994	1988	967	967	1934
178 townhouses/condominiums	531	531	1062	536	536	1072
TOTAL TRIPS	**1525**	**1525**	**3050**	**1503**	**1503**	**3006**

Overview of TIS

Intersections examined:

1) Mulberry Knoll Road & Proposed Site Access
2) Delaware Route 24 & Mulberry Knoll Road
3) Delaware Route 24 & Warrington Road / Plantation Road
4) Delaware Route 24 & Bryn Mawr Drive
5) Delaware Route 24 & & Rehoboth Mall Back Entrance
6) Delaware Route 24 & Delaware Route 1
7) Mulberry Knoll Road & Cedar Grove Road
8) Plantation Road & Cedar Grove Road / Postal Lane
9) Postal Lane & Oak Lane / Bethpage Drive

10) Delaware Route 1 & Postal Lane / Melson Road

Conditions examined:

1) 2015 existing conditions (Case 1)
2) 2023 without Belle Terre residential development (Case 2)
3) 2023 with Belle Terre residential development (Case 3)

Peak hours evaluated: Weekday morning and evening and Saturday mid-day peak hours

Committed developments considered:

1) Love Creek Elementary School (720 student elementary school)
2) Pelican Landing (87,800 square-foot shopping center)
3) Saddle Ridge a.k.a. Windswept (81 single-family detached homes)
4) Osprey Point (170 single-family detached homes, 180 townhomes)
5) Arbor-Lyn (80 townhomes, 60 apartments, 60 single-family detached homes)
6) Redden Ridge (84 single-family detached homes)
7) Delaware State Police Troop 7

Intersection Descriptions

1) **Mulberry Knoll Road & Proposed Site Access**
Type of Control: proposed two-way stop-controlled (T-intersection)
Northbound approach: (Mulberry Knoll Road) existing one through lane, proposed one shared through/left-turn lane
Southbound approach: (Mulberry Knoll Road) existing one through lane, proposed one shared through/right-turn lane
Eastbound approach: (Proposed Site Access) existing residential driveway (gravel), proposed one shared left/right-turn lane, stop-controlled

2) **Delaware Route 24 & Mulberry Knoll Road**
Type of Control: two-way stop-controlled (four-leg intersection)
Northbound approach: (Mulberry Knoll Road) one shared left/through/right-turn lane, stop-controlled
Southbound approach: (Mulberry Knoll Road) one shared left/through/right-turn lane, stop-controlled
Eastbound approach: (DE Route 24) one shared through/left-turn lane and one right-turn lane
Westbound approach: (DE Route 24) one shared through/left-turn lane and one right-turn lane

3) **Delaware Route 24 & Plantation Road/Warrington Road**
Type of Control: signalized four-leg intersection
Northbound approach: (Warrington Road) one left-turn lane, one through lane and one right-turn lane
Southbound approach: (Plantation Road) one left-turn lane, one through lane and one right-turn lane
Eastbound approach: (DE Route 24) one left-turn lane, one through lane and one right-turn lane
Westbound approach: (DE Route 24) one left-turn lane, one through lane and one right-turn lane

4) **Delaware Route 24 and Bryn Mawr Drive**
Type of Control: two-way stop-controlled (T-intersection)
Southbound approach: (Bryn Mawr Drive) one shared left/right-turn lane, stop-controlled
Eastbound approach: (DE Route 24) one left-turn lane and two through lanes
Westbound approach: (DE Route 24) two through lanes and one right-turn lane

5) **Delaware Route 24 & Rehoboth Mall Back Entrance**
Type of Control: signalized four-leg intersection
Northbound approach: (Rehoboth Mall) one shared through/left-turn lane and one right-turn lane
Southbound approach: (Hudson Way) one shared through/left-turn lane and one right-turn lane
Eastbound approach: (DE Route 24) one left-turn lane, two through lanes, and one right-turn lane
Westbound approach: (DE Route 24) one left-turn lane, two through lanes, and one right-turn lane

6) **Delaware Route 24 & Delaware Route 1**
Type of Control: signalized three-leg intersection
Northbound approach: (DE Route 1) two left-turn lanes, three through lanes, and one bus/bike/downstream-right-turn lane
Southbound approach: (DE Route 1) one u-turn lane, three through lanes, and one bus/bike/right-turn lane
Eastbound approach: (DE Route 24) two left-turn lanes and two right-turn lanes

7) **Mulberry Knoll Road & Cedar Grove Road**
Type of Control: two-way stop-controlled (T-intersection)
Northbound approach: (Mulberry Knoll Road) one shared left/right-turn lane, stop-controlled
Eastbound approach: (Cedar Grove Road) one shared through/right-turn lane
Westbound approach: (Cedar Grove Road) one shared through/left-turn lane

8) **Plantation Road & Cedar Grove Road / Postal Lane**
Type of Control: signalized four-leg intersection
Northbound approach: (Plantation Road) one left-turn lane, one through lane, and one right-turn lane
Southbound approach: (Plantation Road) one left-turn lane, one through lane, and one right-turn lane
Eastbound approach: (Cedar Grove Road) one left-turn lane, one through lane, and one right-turn lane
Westbound approach: (Postal Lane) one left-turn lane, one through lane, and one right-turn lane

9) **Postal Lane & Oak Lane / Bethpage Drive**
Type of Control: two-way stop-controlled (four-leg intersection)
Northbound approach: (Bethpage Drive) one shared through/left-turn and one right-turn lane, stop-controlled
Southbound approach: (Oak Lane) one shared left/through/right-turn lane, stop-controlled
Eastbound approach: (Postal Lane) one left-turn lane, one through lane, and one right-turn lane
Westbound approach: (Postal Lane) one left-turn lane, one through lane, and one right-turn lane

10) **Delaware Route 1 & Postal Lane / Melson Road**
Type of Control: signalized four-leg intersection
Northbound approach: (DE Route 1) two left-turn lanes, three through lanes, and one right-turn lane
Southbound approach: (DE Route 1) one left-turn lane, three through lanes, and one right-turn lane
Eastbound approach: (Postal Lane) two left-turn lanes, one through lane and one right-turn lane
Westbound approach: (Melson Road) two left-turn lanes, one through lane and one right-turn lane

Safety Evaluation

Crash Data: Crash data was obtained for November 5, 2012 through November 5, 2015 for Delaware Route 24 from Mulberry Knoll Road to SR 1 and for Cedar Grove Road/Postal Lane from Mulberry Knoll Road to SR 1.

Along the Cedar Grove Road/Postal Lane corridor, the crash data request returned a total of 55 crashes for the three-year period. Of the 55 total crashes, 10 crashes (18%) resulted in personal injury. There were no fatal crashes and two alcohol-related crashes, one of which resulted in personal injury. There was one crash involving a motorcycle and zero crashes involving pedestrians/bicyclists. The most common types of crashes were rear-end crashes (36%), angle crashes (25%) and single-vehicle crashes (18%). The majority of crashes occurred during daylight (76%) with dry pavement conditions (52%). The primary contributing circumstances

include driver inattention/distraction/fatigue (24%), following too close (15%) and failure to yield the right-of-way (13%). 22 of the 55 total crashes (40%) occurred at the dog-leg intersection at Plantation Road. This intersection has since been realigned to a signalized four-leg intersection, which should improve safety at the intersection.

Along the Delaware Route 24 corridor, the crash data request returned a total of 123 crashes for the three-year period. Of the 123 total crashes, 23 crashes (19%) resulted in personal injury. There was one fatal crash that was alcohol-related. The most common types of crashes were rear-end crashes (49%) and angle crashes (27%), and 7% of crashes involved a single vehicle. The majority of crashes occurred during daylight (68%) with dry pavement conditions (78%). The primary contributing circumstances include driver inattention/distraction/fatigue (40%), failure to yield the right-of-way (14%), following too close (13%), and disregarding a traffic signal (8%). Of the 123 total crashes, 103 (84%) occurred at intersections along the study corridor. A breakdown of crashes by intersection along Delaware Route 24 is as follows:

- Delaware Route 24 & Mulberry Knoll Road
  - 14 crashes reported (including 1 fatality)
- Delaware Route 24 & Plantation Road / Warrington Road
  - 32 crashes reported
- Delaware Route 24 & Rehoboth Mall Back Entrance
  - 14 crashes reported
- Delaware Route 24 & Delaware Route 1
  - 43 crashes reported

Sight Distance: With generally straight and flat roadways, and few potential visual obstructions, sight distance is adequate throughout the study area. No problematic sight distance issues have been reported or indicated by crash data, and no major problems were observed during field observations in the area.

Transit, Pedestrian, and Bicycle Facilities

Existing transit service: The Delaware Transit Corporation (DTC) operates a seasonal DART bus route (Route 207) and a new year-round bus route (Route 215), effective February 2016, in the study area. Route 207 serves Rehoboth / Long Neck / Pot-Nets from mid-May to mid-September. Route 215 runs between Rehoboth/Lewes and Millsboro via Delaware Route 24 with two round-trips in the morning and three in the afternoon. The nearest bus stops are at the Beebe Medical Center to the east and near the Love Creek Bridge to the west.

Planned transit service: TTG stated that a representative from the DTC was contacted regarding existing and planned service in the area, and that no transit related facilities were requested.

Existing bicycle and pedestrian facilities: According to DelDOT's Sussex County Bicycle Map, Mulberry Knoll Road is not identified as a bicycle route. Mulberry Knoll Road is a local road with 11' travel lanes and no shoulders. Nearby, Delaware Route 24 is designated as a High-Traffic Regional Bicycle Route with a Bikeway, but it has no designated bike lanes near the

proposed development. According to the bicycle level of service (BLOS) calculator developed by the *League of Illinois Bicyclists*, Mulberry Knoll Road operates at BLOS F, while Delaware Route 24 operates at BLOS A. Statewide Bicycle Route 1 runs along Plantation Road and Warrington Road, crossing Delaware Route 24. Delaware Route 1 is a High-Traffic Connector Bicycle Route that includes a shared bus/bike/right-turn lane in both directions.

There are no existing pedestrian facilities at or near the proposed development. Mulberry Knoll Road is a local road with 11' lanes, no shoulders, and no sidewalks. Delaware Route 24 is a major collector with 12' lanes, 10' shoulders and no sidewalks near the proposed development. East of Mulberry Knoll Road, there is a section of disconnected sidewalks and bike lanes on either side of Delaware Route 24 near the Beebe Health Campus. The SR 1 Pedestrian Improvements Project has connected pre-existing sidewalk segments in the study area along both sides of Delaware Route 1, and a new crosswalk was installed across the Delaware Route 24 approach to the intersection with Delaware Route 1. The proposed development and internal roadway system is located in an existing farm field and wooded area.

Planned bicycle and pedestrian facilities: TTG contacted Mr. Anthony Aglio with DelDOT's Division of Planning via email on November 19, 2015 regarding planned or requested bicycle and pedestrian facilities in the area of this proposed development. Mr. Agilo requested that Mulberry Knoll Road be reconstructed in accordance with DelDOT's local road standards, and for a pedestrian connection from the proposed Belle Terre residential development to the proposed Love Creek Elementary School that is not adjacent to the roadway. The proposed elementary school is located immediately southeast of Belle Terre, with access proposed via Delaware Route 24 across from Beacon Middle School.

It is noted that DelDOT's SR 24, Mulberry Knoll Road to SR 1 Project will include new sidewalk and bike lanes along both sides of Delaware Route 24 from Delaware Route 1 to just west of the intersection with Plantation Road/Warrington Road. Also, concept plans for the SR 24, Love Creek to Mulberry Knoll Road Project show future sidewalk being added along both sides of Delaware Route 24 from Love Creek Pines Lane to Spencer Lane/Williams Way along with bike lanes throughout the project area. DelDOT's SR 1 Pedestrian Improvements Project is anticipated to be complete in the summer of 2016.

Previous Comments

All comments from DelDOT's Scoping Letter, Traffic Count Review, Preliminary TIS (PTIS) Review and other correspondence appear to have been addressed in the Final TIS submission.

General HCS Analysis Comments

(see table footnotes on the following pages for specific comments)

1) For unsignalized intersections, the TIS and McCormick Taylor applied heavy vehicle factors (HV) by movement using existing data. For signalized intersections, the TIS and McCormick Taylor applied HV by lane group using existing data (using 3% HV where actual HV percentages were not available). For future conditions, the TIS assumed future HV equal to existing HV at some intersections. At other intersections, they assumed

future HV equal to existing HV or 3%, whichever was greater. The TIS also assumed 3% HV for future movements to and from the proposed site access points. McCormick Taylor assumed future HV to be the same as existing HV at all intersections, unless existing HV% for a particular movement was less than 3%, in which case 3% was used. McCormick Taylor assumed 3% HV for future movements to and from the proposed site access point.

2) For existing conditions, the TIS and McCormick Taylor determined, for each intersection, overall intersection peak hour factors (PHF). For future conditions, the TIS and McCormick Taylor assumed existing PHF for all intersections other than the proposed site entrance. At that location, the TIS assumed a PHF of 0.80 while McCormick Taylor assumed a PHF of 0.88.

3) For analyses of all signalized intersections, the TIS and McCormick Taylor used a base saturation flow rate of 1,750 pcphpl per DelDOT's Development Coordination Manual.

4) The HCS analyses included in the TIS did not always reflect the lane widths observed in the field by McCormick Taylor. McCormick Taylor's HCS analyses incorporated our field-measured lane widths.

5) The TIS and McCormick Taylor used different signal timings when analyzing the signalized intersections in some cases.

6) The TIS generally input Right-Turn-on-Red (RTOR) volumes for signalized intersection analyses, using existing RTOR volumes for existing and future analyses. In most cases, McCormick Taylor conservatively input no RTOR volumes for existing and future conditions analyses, but did analyze right-turn movements as overlapping protected left-turn phases. McCormick Taylor did input RTOR volumes for the intersection of SR 1 and Postal Lane, where a majority of right turns were made on red.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Unsignalized Intersection [1] Two-Way Stop Control (T-intersection)	**LOS per TIS**			**LOS per McCormick Taylor**		
Mulberry Knoll Road & Proposed Site Access	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2023 without Belle Terre (Case 2)						
Eastbound Site Entrance	A (9.7)	A (9.4)	A (9.3)	A (9.5)	A (9.3)	A (9.3)
Northbound Mulberry Knoll Road - Left	A (7.5)	A (7.5)	A (7.4)	A (7.5)	A (7.4)	B (7.4)
2023 with Belle Terre (Case 3) [2]						
Eastbound Site Entrance	B (12.0)	B (12.7)	B (12.3)	B (11.2)	B (11.4)	B (11.2)
Northbound Mulberry Knoll Road - Left	A (7.7)	A (8.0)	A (7.8)	A (7.6)	A (7.9)	A (7.8)

[1] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.
[2] For Case 3, the TIS assumed the intersection would have a shared lane on all three approaches. McCormick Taylor assumed separate turn lanes on the northbound and southbound Mulberry Knoll Road approaches, as warranted by DelDOT's *Auxiliary Lane Worksheet.*

Table 4A
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Unsignalized Intersection [3] Two-Way Stop Control (four-leg intersection)	**LOS per TIS**			**LOS per McCormick Taylor**		
Delaware Route 24 & Mulberry Knoll Road	Weekday AM	Weekday PM	Saturday Mid-Day [4]	Weekday AM	Weekday PM	Saturday Mid-Day [4]
2015 Existing (Case 1)						
Eastbound DE Route 24 – Left	A (8.9)	B (10.5)	A (9.5)	A (8.9)	B (10.5)	A (9.6)
Westbound DE Route 24 – Left	B (11.4)	A (9.7)	B (10.7)	A (11.5)	A (9.3)	B (10.9)
Northbound Mulberry Road	E (37.1)	D (29.6)	C (24.1)	E (38.4)	D (29.7)	D (25.6)
Southbound Mulberry Road	C (21.0)	C (24.0)	E (39.7)	C (21.6)	C (24.9)	E (49.1)
2023 without Belle Terre (Case 2)						
Eastbound DE Route 24 – Left	A (9.6)	B (11.7)	B (10.6)	A (9.7)	B (12.0)	B (10.8)
Westbound DE Route 24 – Left	B (12.1)	B (10.5)	B (11.7)	B (12.2)	B (10.1)	B (12.0)
Northbound Mulberry Road	F (76.8)	F (61.4)	E (38.4)	F (84.5)	F (61.5)	E (46.3)
Southbound Mulberry Road	E (47.4)	F (69.7)	F (134.7)	F (53.1)	F (77.4)	F (305.9)
2023 with Belle Terre (Case 3)						
Eastbound DE Route 24 – Left	A (9.8)	B (12.7)	B (11.2)	A (9.8)	B (13.0)	B (11.5)
Westbound DE Route 24 – Left	B (12.1)	B (10.5)	B (11.7)	B (12.2)	B (10.1)	B (12.0)
Northbound Mulberry Road	F (92.9)	F (84.3)	E (45.9)	F (104.5)	F (87.9)	F (64.9)
Southbound Mulberry Road [5]	F (1757.5)	F (1178.1)	F (2492.0)	F (1981.4)	F (1260.4)	F (4146.1)
2023 with Belle Terre (Case 3) *With DelDOT Improvements* [6]						
Eastbound DE Route 24 – Left	A (9.8)	B (12.7)	B (11.2)	A (9.8)	B (13.0)	B (11.5)
Westbound DE Route 24 – Left	B (12.1)	B (10.5)	B (11.7)	B (12.2)	B (10.1)	B (12.0)
Northbound Mulberry Road	F (74.1)	F (69.5)	D (33.8)	F (79.1)	F (69.1)	E (36.7)
Southbound Mulberry Road [7]	F (1347.0)	F (954.2)	F (1418.9)	F (1452.3)	F (977.7)	F (1808.2)

[3] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.
[4] Manual count data was not provided for summer Saturday. The TIS assumed PHF = 0.95; McCormick Taylor used the default PHF = 0.92.
[5] For Case 3, the 95th percentile queue lengths for SB Mulberry Knoll Rd. are as follows: approx. 25 vehicles during the AM peak hour, 16 vehicles during the PM peak hour, and 20 vehicles during the summer Saturday peak hour.
[6] Improvements planned as part of DelDOT's SR 24, Love Creek to Mulberry Knoll Road Project (State Contract No. T201212201) include the addition of exclusive left-turn lanes along the eastbound and westbound DE Route 24 approaches.
[7] For Case 3 with DelDOT improvements, the 95th percentile queue lengths for SB Mulberry Knoll Road are as follows: approx. 24 vehicles during the AM peak hour, 16 vehicles during the PM peak hour, and 18 vehicles during the summer Saturday peak hour.

Table 4B
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Unsignalized Intersection [8] **Two-Way Stop Control (four-leg intersection)**	**LOS per TIS**			**LOS per McCormick Taylor**		
Delaware Route 24 & Mulberry Knoll Road	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day [9]
2023 with Belle Terre (Case 3) *With Improvement Option 1* [10]						
Eastbound DE Route 24 – Left	N/A	N/A	N/A	A (9.8)	B (13.0)	B (11.5)
Westbound DE Route 24 – Left	N/A	N/A	N/A	B (12.2)	B (10.1)	B (12.0)
Northbound Mulberry Road	N/A	N/A	N/A	F (79.1)	F (69.1)	E (36.7)
Southbound Mulberry Road [11]	N/A	N/A	N/A	F (568.1)	F (341.2)	F (792.7)

Signalized Intersection [8]	**LOS per TIS**			**LOS per McCormick Taylor**		
Delaware Route 24 & Mulberry Knoll Road	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2023 with Belle Terre (Case 3) *With Improvement Option 2* [12]	C (32.7)	D (38.6)	D (37.1)	C (34.9) [13]	D (38.4) [14]	D (37.0) [15]

[8] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.
[9] Manual count data was not provided for summer Saturday. McCormick Taylor used the default PHF = 0.92.
[10] Improvement Option 1 includes the DelDOT project improvements (State Contract No. T201212201) that would add eastbound and westbound left-turn lanes on Delaware Route 24, plus the addition of a right-turn lane on the southbound Mulberry Knoll Road approach.
[11] For Case 3 with Improvement Option 1, the 95th percentile queue lengths for SB Mulberry Knoll Road are as follows: approx. 10 vehicles during the AM peak hour, 6 vehicles during the PM peak hour, and 9 vehicles during the summer Saturday peak hour.
[12] Improvement Option 2 includes developer-proposed improvements consisting of converting the TWSC intersection to a signal controlled intersection, to go along with the DelDOT project improvements that would add eastbound and westbound left-turn lanes on Delaware Route 24. The TIS and McCormick Taylor assumed protected-permitted phasing for the Delaware Route 24 left-turn phases and permissive phasing for the Mulberry Knoll Road approaches.
[13] AM peak hour 95th percentile queue lengths are as follows: approx. 50 vehicles (1,250 feet) for EB DE Route 24 (adjacent signal at Beacon Middle School is approximately 1250 feet west of Mulberry Knoll Road), 18 vehicles for WB DE Route 24, and 14 vehicles for SB Mulberry Knoll Road.
[14] PM peak hour 95th percentile queue lengths are as follows: approx. 25 vehicles for EB DE Route 24, 59 vehicles (1,475 feet) for WB DE Route 24 (adjacent signal at Plantation Road is approximately 3,000 feet east of Mulberry Knoll Road), and 11 vehicles for SB Mulberry Knoll Road.
[15] Summer Saturday peak hour 95th percentile queue lengths are as follows: approx. 58 vehicles (1,460 feet) for EB DE Route 24 (adjacent signal at Beacon Middle School is approximately 1250 feet west of Mulberry Knoll Road), 25 vehicles for WB DE Route 24, and 11 vehicles for SB Mulberry Knoll Road.

Table 5
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Signalized Intersection [16]	**LOS per TIS**			**LOS per McCormick Taylor**		
Delaware Route 24 & Warrington Road / Plantation Road	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2015 Existing (Case 1)	C (28.1)	D (45.0)	D (50.3)	C (25.6)	D (40.0)	D (46.3)
2023 without Belle Terre (Case 2)	D (38.5)	E (76.9)	F (83.5)	D (35.5)	E (70.7)	E (75.4)
2023 with Belle Terre (Case 3)	D (41.7)	F (87.6)	F (89.9)	D (38.3)	F (80.1)	F (81.4)
2023 with Belle Terre (Case 3) *With DelDOT Improvements* [17]	C (27.3)	D (38.0)	D (45.4)	C (27.6)	D (36.3)	D (43.9)

[16] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

[17] Improvements planned as part of DelDOT's SR 24, Mulberry Knoll Road to SR 1 Project (State Contract No. T200411209) include the addition of a second through lane along both directions of DE Route 24 and the addition of a shared through/left-turn lane on both the northbound Warrington Road approach and the southbound Plantation Road approach. The TIS assumed protected-permitted phasing for the DE Route 24 left-turn phases. McCormick Taylor assumed protected-prohibited phasing for the DE Route 24 left-turn phases due to the dual opposing through lanes.

Table 6
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Unsignalized Intersection [18] **Two-Way Stop Control (T-intersection)**	**LOS per TIS**			**LOS per McCormick Taylor**		
Delaware Route 24 & Bryn Mawr Drive	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2015 Existing (Case 1)						
Eastbound DE Route 24 – Left	A (8.6)	B (9.5)	-	A (9.9)	A (9.5)	-
Southbound Bryn Mawr Drive	A (8.7)	B (11.2)	-	B (12.3)	B (14.8)	-
2023 without Belle Terre (Case 2)						
Eastbound DE Route 24 – Left	A (8.6)	B (9.8)	-	A (10.0)	A (9.9)	-
Southbound Bryn Mawr Drive	A (8.9)	B (11.6)	-	B (12.3)	C (15.8)	-
2023 with Belle Terre (Case 3)						
Eastbound DE Route 24 – Left	A (8.7)	B (10.1)	-	B (10.1)	B (10.1)	-
Southbound Bryn Mawr Drive	A (8.9)	B (12.4)	-	B (12.6)	C (16.7)	-

[18] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 7
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Signalized Intersection [19]	**LOS per TIS**			**LOS per McCormick Taylor**		
Delaware Route 24 & Rehoboth Mall Back Entrance	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2015 Existing (Case 1)	A (7.5)	A (9.8)	A (9.1)	B (11.1)	B (15.4)	B (14.8)
2023 without Belle Terre (Case 2)	A (7.5)	A (9.9)	A (9.1)	B (11.2)	B (15.7)	B (14.9)
2023 with Belle Terre (Case 3)	A (7.6)	A (10.0)	A (9.1)	B (11.3)	B (15.8)	B (15.0)

[19] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 8
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Signalized Intersection [20]	**LOS per TIS**			**LOS per McCormick Taylor**		
Delaware Route 1 & Delaware Route 24 [21, 22]	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2015 Existing (Case 1)	B (19.5)	C (23.5)	C (21.7)	C (25.4)	C (32.3)	C (33.4)
2023 without Belle Terre (Case 2)	B (19.5)	C (25.3)	C (29.0)	C (25.8)	D (35.4)	D (41.5)
2023 with Belle Terre (Case 3)	C (20.2)	C (27.3)	C (31.0)	C (26.4)	D (37.4)	D (43.3)
2023 with Belle Terre (Case 3) *With DelDOT SR 24 Improvements* [23]	B (18.8)	C (24.5)	C (28.6)	C (25.0)	C (34.2)	D (41.0)

[20] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.
[21] A new crosswalk will be installed across the SR 24 leg of the intersection as part of DelDOT's SR 1, Rehoboth Canal to North of Five Points, Pedestrian Improvements Project (State Contract No. T200612501). The pedestrian clearance time for this crossing is less than the southbound SR 1 green time during peak hours, and thus no impact is expected on peak hour traffic operations as a result of the new crosswalk.
[22] The TIS assumed Arrival Type 4 for all SR 1 traffic in their analysis. McCormick Taylor assumed the default Arrival Type 3 for all movements.
[23] Improvements planned as part of DelDOT's SR 24, Mulberry Knoll Road to SR 1 Project (State Contract No. T200411209) include the addition of a third left-turn lane on the eastbound Delaware Route 24 approach.

Table 9
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Unsignalized Intersection [24] Two-Way Stop Control (T-intersection)	**LOS per TIS**			**LOS per McCormick Taylor**		
Cedar Grove Road & Mulberry Knoll Road	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2015 Existing (Case 1)						
Westbound Cedar Grove Road - Left	A (8.1)	A (7.5)	A (7.4)	A (8.1)	A (7.5)	A (7.5)
Northbound Mulberry Knoll Road	A (8.8)	A (8.9)	A (8.0)	A (8.8)	A (9.2)	A (8.3)
2023 without Belle Terre (Case 2)						
Westbound Cedar Grove Road - Left	A (8.3)	A (7.6)	A (7.6)	A (8.4)	A (7.6)	A (7.5)
Northbound Mulberry Knoll Road	A (8.7)	A (8.2)	A (7.7)	A (9.2)	A (8.5)	A (8.3)
2023 with Belle Terre (Case 3)						
Westbound Cedar Grove Road - Left	A (8.5)	A (7.8)	A (7.7)	A (8.5)	A (7.9)	A (7.8)
Northbound Mulberry Knoll Road	B (12.4)	A (8.2)	A (8.4)	B (12.6)	A (8.7)	A (8.5)

[24] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 10
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Signalized Intersection [25]	**LOS per TIS**			**LOS per McCormick Taylor**		
Plantation Road & Cedar Grove Road / Postal Lane	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2015 Existing (Case 1)	B (17.0)	B (16.5)	B (16.1)	B (14.4)	B (13.7)	B (13.8)
2023 without Belle Terre (Case 2)	B (18.9)	B (18.6)	B (17.7)	B (15.9)	B (15.7)	B (15.4)
2023 with Belle Terre (Case 3)	C (20.2)	C (20.3)	B (19.2)	B (16.9)	B (17.1)	B (16.7)

[25] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 11
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Unsignalized Intersection [26] Two-Way Stop Control (four-leg intersection)	**LOS per TIS**			**LOS per McCormick Taylor**		
Postal Lane & Oak Lane / Bethpage Drive	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2015 Existing (Case 1)						
Eastbound Postal Lane – Left	A (7.4)	A (7.8)	-	A (7.4)	A (7.9)	-
Westbound Postal Lane – Left	A (8.1)	A (7.9)	-	A (8.1)	A (7.7)	-
Northbound Bethpage Dr – Left/Thru	B (13.2)	B (14.7)	-	B (13.2)	B (13.8)	-
Northbound Bethpage Dr – Right	A (8.7)	A (8.7)	-	A (8.7)	A (8.6)	-
Southbound Oak Lane	B (12.1)	B (11.9)	-	B (10.5)	A (8.4)	-
2023 without Belle Terre (Case 2)						
Eastbound Postal Lane – Left	A (7.5)	A (7.9)	-	A (7.5)	A (8.0)	-
Westbound Postal Lane – Left	A (8.3)	A (8.0)	-	A (8.3)	A (0.1)	-
Northbound Bethpage Dr – Left/Thru	B (14.2)	C (16.2)	-	B (14.3)	C (15.1)	-
Northbound Bethpage Dr – Right	A (9.2)	A (8.9)	-	A (9.2)	A (8.8)	-
Southbound Oak Lane	B (12.9)	B (12.7)	-	B (11.1)	A (9.0)	-
2023 with Belle Terre (Case 3)						
Eastbound Postal Lane – Left	A (7.5)	A (8.1)	-	A (7.5)	A (8.1)	-
Westbound Postal Lane – Left	A (8.4)	A (8.1)	-	A (8.5)	A (7.9)	-
Northbound Bethpage Dr – Left/Thru	C (15.3)	C (17.9)	-	C (15.4)	C (16.5)	-
Northbound Bethpage Dr – Right	A (9.7)	A (9.0)	-	A (9.7)	A (9.0)	-
Southbound Oak Lane	B (13.7)	B (13.7)	-	B (11.9)	A (9.5)	-

[26] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 12
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Belle Terre
Report dated February 2016
Prepared by The Traffic Group, Inc.

Signalized Intersection [27]	**LOS per TIS**			**LOS per McCormick Taylor**		
Delaware Route 1 & Postal Lane / Melson Road [28]	Weekday AM	Weekday PM	Saturday Mid-Day	Weekday AM	Weekday PM	Saturday Mid-Day
2015 Existing (Case 1)	B (17.5)	B (19.1)	-	C (23.8)	C (29.3)	-
2023 without Belle Terre (Case 2)	B (19.1)	C (21.1)	-	C (25.7)	C (32.7)	-
2023 with Belle Terre (Case 3)	C (22.5)	C (22.3)	-	C (28.9)	C (33.8)	-

[27] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.
[28] The TIS assumed Arrival Type 4 for all SR 1 traffic in their analysis. McCormick Taylor assumed the default Arrival Type 3 for all movements.