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

NICOLE MAJESKI
SECRETARY

February 11, 2021

Mr. Joe Caloggero
The Traffic Group, Inc.
9900 Franklin Square Drive
Suite H
Baltimore, Maryland 21236

Dear Mr. Caloggero:

The enclosed Traffic Impact Study (TIS) review letter for the proposed **Estates at Mulberry Knoll** (Tax Parcel 334-18.00-43.00) development 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 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

Troy Brestel
Project Engineer

TEB:km
Enclosures
cc with enclosures: Mr. Phillip Tolliver, Morris & Ritchie Associates, Inc.
Ms. Constance C. Holland, Office of State Planning Coordination
Mr. Jamie Whitehouse, Sussex County Planning and Zoning
Mr. Mir Wahed, Johnson, Mirmiran & Thompson, Inc.
Ms. Joanne Arellano, Johnson, Mirmiran & Thompson, Inc.
Mr. Kevin Hickman, Johnson, Mirmiran & Thompson, Inc.
DelDOT Distribution

DelDOT

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Brad Eaby, Deputy Attorney General
J. Marc Coté, Director, Planning
Shanté Hastings, Director, Transportation Solutions (DOTS)
Mark Luszcz, Deputy Director, Traffic, DOTS
Michael Simmons, Assistant Director, Project Development South, DOTS
Todd Sammons, Assistant Director, Development Coordination
T. William Brockenbrough, Jr., County Coordinator, Development Coordination
Peter Haag, Chief Traffic Engineer, Traffic, DOTS
Kerry Yost, Traffic Calming and Subdivision Relations Manager, Traffic, DOTS
Alistair Probert, South District Engineer, South District
Gemez Norwood, South District Public Works Manager, South District
Jared Kauffman, Service Development Planner, Delaware Transit Corporation
Tremica Cherry, Service Development Planner, Delaware Transit Corporation
Anthony Aglio, Planning Supervisor, Statewide & Regional Planning
Wendy Polasko, Subdivision Engineer, Development Coordination
Richard McCabe, Sussex Review Coordinator, Development Coordination
Mark Galipo, Traffic Engineer, Traffic, DOTS
Claudy Joinville, Project Engineer, Development Coordination
Annamaria Furmato, Project Engineer, Development Coordination

February 10, 2021

Mr. Troy Brestel
Project Engineer
Development Coordination
DelDOT Division of Planning
800 Bay Road
P O Box 778
Dover, DE 19903

RE:Agreement No. 1945F
Project Number T202069012
Traffic Impact Study Services
Task 13A-Estates at Mulberry Knoll

Dear Mr. Brestel:

Johnson, Mirmiran and Thompson (JMT) has completed the review of the Traffic Impact Study (TIS) for Estates at Mulberry Knoll, prepared by The Traffic Group dated April 1, 2020. This task was assigned as Task Number 13A. The report is prepared in a manner generally consistent with DelDOT's *Development Coordination Manual*.

As discussed later in this letter, Sussex County and DelDOT agreed on October 27, 2020, to create the Henlopen Transportation Improvement District. The developer, MKR Land, LLC, has chosen to set aside their TIS and to participate in the TID. DelDOT has requested this letter to document JMT's review of the TIS and what JMT recommends with regard to off-site improvements considering the developer's participation in the TID.

The TIS evaluates the impacts of a proposed housing development containing 320 single-family detached houses in Sussex County, Delaware. The development is located on both sides of Mulberry Knoll Road (Sussex Road 284) approximately 2/3 of a mile southeast of the intersection of Delaware Route 24 and Mulberry Knoll Road. The subject property is on an approximately 170-acre parcel that is zoned as AR-1 (Agricultural Residential) and the developer does not plan to rezone the land. Two full access points are proposed along Mulberry Knoll Road and construction is anticipated to be complete in 2027.

DelDOT has several relevant and ongoing improvement projects within the study area including the *HSIP SR 24 at Camp Arrowhead Road and SR 24 at Angola Road* project (DelDOT Contract No. T201200902). This project was identified in the *SR 24-SR 30 to Love Creek Bridge Traffic Study* and was identified as a high crash location as part of DelDOT's Hazard Elimination Program (HEP) formally known as the Highway Safety Improvement Program (HSIP). This project would make operational improvements to address safety deficiencies and to accommodate future traffic volumes at these two intersections. Specifically, the improvements associated with the Delaware Route 24/Camp Arrowhead Road/Fairfield Road intersection will include extending the existing left-turn and right-turn lanes to increase capacity and providing bicycle lanes and pedestrian

facilities. Design is currently underway and construction is scheduled to start in 2021 and end in 2022. Additional information can be found on the DelDOT project website at https://deldot.gov/projects/index.shtml?dc=details&projectNumber=T201200902.

The *SR 24, Mulberry Knoll to SR 1* project (DelDOT Contract No. T200411209) involves safety, operational, and capacity improvements along Delaware Route 24 from Mulberry Knoll Road to Delaware Route 1. Delaware Route 24 will be widened to provide two travel lanes in each direction from east of Mulberry Knoll Road to Delaware Route 1. A two-way left-turn lane will be provided between the Delaware Route 24 intersections with Plantation Road/Warrington Road and Lexus Way (Beebe Medical Center Campus)/Colonial Oaks (Residence Inn). The Delaware Route 24 intersection with Lexus Way (Beebe Medical Center Campus)/Colonial Oaks (Residence Inn) will be signalized. Bicycle lanes and pedestrian facilities will be installed as well. Construction is scheduled to begin in 2020 and end in 2022. Additional information can be found on the DelDOT project website at https://deldot.gov/projects/index.shtml?dc=details&projectNumber=T200411209.

The *SR 24, Love Creek to Mulberry Knoll* project (DelDOT Contract No. T201212201) involves safety, operational, and capacity improvements along Delaware Route 24 from the Love Creek bridge to Mulberry Knoll Road. Delaware Route 24 will be widened to provide two travel lanes in each direction from west of the Love Creek Elementary School/Beacon Middle School intersection to east of Mulberry Knoll Road. The Delaware Route 24/Mulberry Knoll Road intersection will be signalized. A two-way left turn lane will be provided from the Love Creek bridge to west of the Love Creek Elementary School/Beacon Middle School intersection. Bicycle lanes and pedestrian facilities will be installed as well. Construction is scheduled to begin in 2021 and end in 2022. Additional information can be found on the DelDOT project website at https://deldot.gov/projects/index.shtml?dc=details&projectNumber=T201212201.

DelDOT has a pavement rehabilitation and resurfacing project proposed along Cedar Grove Road, from Plantation Road to Robinsonville Road. The construction is tentatively scheduled to begin either Fall 2020 or Spring 2021.

DelDOT and Sussex County have developed the Henlopen Transportation Improvement District (TID), the formal creation of which was unanimously approved by Sussex County on October 27, 2020. The TID limits generally extend from the Delaware Coast Line Railroad Company railroad tracks and Delaware Route 1 to the north, Burton Pond and Herring Creek to the south, Arnell Creek and Rehoboth Bay to the east, and Beaver Dam Road to the west. The proposed Estates at Mulberry Knoll site is within the TID. The *Henlopen TID CTP Cost Development Report* was prepared in October 2019 by JMT and contained a summary of the traffic analysis conducted and the associated roadway concept plans and cost estimates for the TID. As part of the report, improvements were recommended at several of the TIS study intersections including the Delaware Route 24 intersections with Lexus Way (Beebe Medical Center)/Colonial Oaks (Residence Inn), Plantation Road/Warrington Road, Mulberry Knoll Road, Camp Arrowhead Road/Fairfield Road, and Jolyns Way, as well as the Mulberry Knoll Road intersection with Cedar Grove Road.

Based on our review of the TIS, 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. The table below incorporates the traffic analysis for the 2027 future conditions (Cases 2 and 3) with the improvements associated with the *SR 24, Mulberry Knoll to SR 1* (DelDOT Contract No. T200411209) and *SR 24, Love Creek to Mulberry Knoll* (DelDOT Contract No. T201212201) projects. Additionally, the table below does not include any signalized intersections that exhibit LOS deficiencies under Cases 1, 2, and 3 due to the utilization of the splits from the DelDOT Timing Plans and can be mitigated with signal timing optimization as the developer would not be recommended to do any additional improvements at those locations.

Intersection	LOS Deficiencies Occur			Year	Case
	AM	PM	SAT		
Mulberry Knoll Road (Sussex Road 284)/Delaware Route 24	X	X	X	2019	1 - Existing
Delaware Route 24/Spencer Lane/Williams Way	X	X	X	2019	1 – Existing
	X	X	X	2027	2 – Without Development
	X	X	X	2027	3 – With Development
Delaware Route 24/Jolyns Way (Sussex Road 289)		X		2027	3 – With Development
Delaware Route 24/Lexus Way (Beebe Medical Center Campus)/Colonial Oaks (Residence Inn)	X	X	X	2019	1 – Existing
	X	X	X	2027	2 – Without Development
	X	X	X	2027	3 – With Development

The unsignalized Mulberry Knoll Road (Sussex Road 284)/Delaware Route 24 intersection exhibits LOS deficiencies under Case 1 conditions during all study peak periods. Specifically, the deficiencies occur along the northbound and southbound Mulberry Knoll Road approaches with delays of over 1,000.0 seconds per vehicle during the Summer Saturday peak. As part of the *SR 24, Love Creek to Mulberry Knoll* project (DelDOT Contract No. T201212201), Delaware Route 24 will be widened at this intersection to provide two travel lanes in each direction. Additionally, the Delaware Route 24/Mulberry Knoll Road intersection will be signalized. The construction for this DelDOT project is anticipated to be complete in 2022. Therefore, for Cases 2 and 3 conditions the intersection as signalized would improve to operate at acceptable LOS C (29.2 seconds of delay or less per vehicle) during all peak periods. Payment of the TID fee will satisfy any obligation the developer would have to improve this intersection.

The unsignalized Delaware Route 24/Spencer Lane/Williams Way intersection exhibits LOS deficiencies under Cases 1, 2, and 3 conditions during all the study peak hours. As part of the *SR 24, Love Creek to Mulberry Knoll* project (DelDOT Contract No. T201212201), a separate right turn lane will be added along eastbound Delaware Route 24. However, this improvement would not mitigate the LOS deficiencies which occur along the northbound Williams Way and

southbound Spencer Lane approaches. Specifically, under Case 3 conditions, the northbound Williams Way and southbound Spencer Lane approaches would operate at LOS F with delays of over 1,000.0 seconds per vehicle during all the study peak hours. The installation of a dual lane roundabout or a traffic signal with one left turn lane, two through lanes, and one right turn lane along eastbound and westbound Delaware Route 24 would improve the intersection to operate at LOS B or better (11.4 seconds of delay or less) during each peak hour. However, the volumes executing turning movements from Williams Way and Spencer Lane during Case 3 (a maximum of 24 left turning vehicles from Spencer Lane and 5 left turning vehicles from Williams Way) would not meet the volume based traffic signal warrants. In addition, the calculated 95th percentile queue lengths along the Williams Way and Spencer Lane approaches are approximately 55 feet and 125 feet, respectively, under Case 3 conditions during the Summer Saturday peak hour.

Utilizing the summary crash data provided within the TIS, JMT reviewed if the Delaware Route 24/Spencer Lane/Williams Way intersection contained any crash trends. It was assumed that any crashes within milepost 38.15 to 38.41 would be at the intersection. Based on the crash data, a total of 9 crashes were assumed to occur during the three-year crash study period. Out of the 9 crashes, 5 were rear end, 2 were angle, 1 was an incident with a deer, and 1 was an incident with a utility pole. The two angle crashes were due to a vehicle failing to yield to right-of-way. One of the angle crashes resulted in injury.

To reduce the delays at the intersection, DelDOT could determine the feasibility of restricting left turning movements from Spencer Lane and Williams Way. Vehicles would then have to execute U-turning movements at the adjacent signalized intersections of Delaware Route 24 with Love Creek Elementary School/Beacon Middle School and Camp Arrowhead Road (Sussex Road 279)/Fairfield Road. A median would have to be constructed along Delaware Route 24 to restrict the left turning movements.

Delays could also be reduced by constructing a median along Delaware Route 24 to restrict the left turning movements from Spencer Lane and Williams Way and providing interconnections to access Mulberry Knoll Road. Williams Way could be extended to the south and connect to Mulberry Knoll Road. For the Harts Landing subdivision which utilizes Spencer Lane to access Delaware Route 24, an interconnection would have to be provided to Briarwood Estates and Belle Terre subdivisions to connect to Mulberry Knoll Road. DelDOT would have to determine the feasibility of providing those roadway connections.

Due to the extensive scope of the improvements and the occurrence of the deficiencies under Cases 1 and 2 conditions (when the proposed development is not built), it would be unreasonable to require the developer to improve the intersection by restricting left-turns, by converting to a roundabout, or by signalization. Payment of the TID fee will satisfy any obligation the developer would have to improve this intersection.

The unsignalized Delaware Route 24/Jolyns Way (Sussex Road 289) intersection would operate with LOS deficiencies under Case 3 conditions during the PM peak period. Specifically, the northbound Jolyns Way approach would operate at LOS E with 36.9 seconds of delay per vehicle.

This could be mitigated to operate at LOS C (23.8 seconds of delay per vehicle) with the provision of an additional through lane along eastbound and westbound Delaware Route 24. However, the total volume executing turning movements from Jolyns Way onto Delaware Route 24 is 5 vehicles during the PM peak period. Additionally, the calculated 95th percentile queue length during the Case 3 PM peak period is approximately 5 feet. As such, we do not recommend any improvements be implemented by the developer at this intersection.

The unsignalized Delaware Route 24/Lexus Way (Beebe Medical Center Campus)/Colonial Oaks (Residence Inn) intersection exhibits LOS deficiencies under Cases 1, 2, and 3 conditions during all the study peak hours. Specifically, the northbound Lexus Way and southbound Colonial Oaks approaches would operate at LOS F (over 1,000 and 674.2 seconds of delay per vehicle, respectively, during the Summer Saturday peak hour). As part of the *SR 24, Mulberry Knoll to SR 1* DelDOT project (Contract No. T200411209), this intersection will be signalized and two through lanes will be provided along Delaware Route 24. With this improvement, the intersection would operate at LOS B or better (10.4 seconds of delay during the Summer Saturday peak hour). Payment of the TID fee will satisfy any obligation the developer would have to improve this intersection.

Should Sussex County approve the proposed development, the following items should be incorporated into the site design and reflected on the record plan. 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 reconstruct Mulberry Knoll Road from the Stardust Drive intersection to the northerly limit of the site frontage to meet DelDOT's local road standards, which include eleven-foot travel lanes and five-foot shoulders. Within the same limits, the developer should provide a bituminous concrete overlay to the existing travel lanes, at DelDOT's discretion. DelDOT should analyze the existing lanes' pavement section and recommend an overlay thickness to the developer's engineer, if necessary.

   To the extent that they are not addressed by the site entrance construction (Items 2 and 3 below), the cost of the work completed here and the shared use path, addressed in Item 5a below, are deductible from the TID fee discussed in Item 4. It may be appropriate for DelDOT to require less than the work contemplated here to adjust the cost of the work with the amount of the TID fee.

2. The developer should construct a full access site entrance (Site Entrance A) for the proposed Estates at Mulberry Knoll Road development on Mulberry Knoll Road, approximately 1,900 feet north of the Mulberry Knoll Road intersection with West Lane/East Lane to be consistent with the lane configurations shown in the table below:

Approach	Current Configuration	Proposed Configuration
Eastbound Site Entrance A	Approach does not exist	One shared left turn/right turn lane
Westbound Site Entrance A	Approach does not exist	One shared left turn/right turn lane
Northbound Mulberry Knoll Road	One through lane	One left turn lane, and a shared through/right turn lane
Southbound Mulberry Knoll Road	One through lane	One left turn lane, one through lane, and one right turn lane

Based on DelDOT's *Development Coordination Manual*, the recommended minimum storage length is 50 feet (excluding taper) for the southbound Mulberry Knoll Road right turn lane and 50 feet (excluding taper) for the southbound and northbound Mulberry Knoll Road left turn lanes. The calculated queue lengths from the HCS analysis can be accommodated within the recommended storage lengths. The recommended storage lengths are based on a posted speed limit of 25 miles per hour per the existing speed resolution. The developer should submit a plan to DelDOT's Development Coordination section depicting the design along the site frontage. Although the northbound left turn lane is not required based on the traffic volumes, it is recommended to shadow the geometry of the southbound left turn lane. The final design of the site entrance should be determined during the Entrance Plan review process.

3. The developer should construct a full access site entrance (Site Entrance B) for the proposed Estates at Mulberry Knoll Road development on Mulberry Knoll Road, approximately 3,200 feet north of the Mulberry Knoll Road intersection with West Lane/East Lane to be consistent with the lane configurations shown in the table below:

Approach	Current Configuration	Proposed Configuration
Westbound Site Entrance B	Approach does not exist	One shared left turn/right turn lane
Northbound Mulberry Knoll Road	One through lane	One shared through/right turn lane
Southbound Mulberry Knoll Road	One through lane	One left turn lane, and one through lane

Based on DelDOT's *Development Coordination Manual*, the recommended minimum storage length is 185 feet (excluding taper) for the southbound Mulberry Knoll Road left turn lane. The calculated queue lengths from the HCS analysis can be accommodated within the recommended storage length. The recommended storage length is based on a posted speed limit of 50 miles per hour as a "Begin Speed Limit 25" sign is located along

southbound Mulberry Knoll Road south of this Site Entrance B location. The developer should confirm with DelDOT the speed limit to utilize for the Site Entrance B design and submit a plan to DelDOT's Development Coordination section depicting the design along the site frontage. The final design of the site entrance should be determined during the Entrance Plan review process.

4. The developer should pay the appropriate portion of the Henlopen TID fee in lieu of making transportation improvements outside their access points and frontage roads. Because this development is occurring during the transition from DelDOT's standard development coordination process to the TID process, the developer has the option making off-site transportation improvements instead of paying the TID fee. The recommendations in this letter are based on DelDOT and JMT's understanding that the developer has chosen to pay the fee. If that is not the case, a revised letter should be requested.

5. The following bicycle, pedestrian, and transit improvements should be included:

    a. A minimum fifteen-foot wide permanent easement from the edge of the right-of-way should be dedicated to DelDOT along both the property frontage along both sides of Mulberry Knoll Road. Within the easement, the developer should construct a ten-foot wide shared-use path (SUP). The SUP should be designed to meet current AASHTO and ADA standards. A minimum five-foot setback should be maintained from the edge of the pavement to the SUP. If feasible, the SUP should be placed behind utility poles and street trees should be provided within the buffer area. The developer should coordinate with DelDOT's Development Coordination section during the plan review process to identify the exact location of the SUP.

    b. An internal connection should be provided from the SUP into the site.

    c. ADA compliant curb ramps and marked crosswalks should be provided along the Site Entrance A and B approaches to Mulberry Knoll Road. The use of diagonal curb ramps is discouraged.

    d. A minimum five-foot wide bicycle lane should be incorporated in the right turn lane and shoulder along the southbound Mulberry Knoll Road approach to Site Entrance A.

    e. Utility covers should be moved outside of any designated bicycle lanes and any proposed sidewalks/shared-use paths or should be flush with the pavement.

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 Plan Review process.

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 https://www.deldot.gov//Publications/manuals/de_mutcd/index.shtml. For any additional information regarding the work zone impact and mitigation procedures during construction please contact Mr. Don Weber, Assistant Director for Traffic Operations and Management. Mr. Weber can be reached at (302) 659-4651 or by email at Don.Weber@delaware.gov.

Additional details on our review of the TIS are attached. Please contact me at (302) 266-9600 if you have any questions concerning this review.

Sincerely,
Johnson, Mirmiran, and Thompson, Inc.

Joanne M. Arellano, P.E., PTOE

cc: Mir Wahed, P.E., PTOE
Enclosure

General Information

Report date: April 1, 2020
Prepared by: The Traffic Group
Prepared for: MKR Land, LLC
Tax Parcel: 334-18.00-43.00
Generally consistent with DelDOT's *Development Coordination Manual (DCM)*: Yes

Project Description and Background

Description: The developer seeks to develop 320 single-family detached houses.
Location: The subject site is located on both sides of Mulberry Knoll Road (Sussex Road 284), approximately 2/3 of a mile southeast of the intersection of Delaware Route 24 and Mulberry Knoll Road.
Amount of Land to be developed: An approximately 170-acre parcel.
Land Use approval(s) needed: Entrance Plan.
Proposed completion date: 2027.
Proposed access location: Two full access points are proposed along Mulberry Knoll Road.

Daily Traffic Volumes:

- 2019 Average Annual Daily Traffic on Mulberry Knoll Road: 280 vehicles per day (non-Summer)

Site Map

**Graphic is an approximation based on the Plus Plan for Estates at Mulberry Knoll prepared by Morris & Ritchie Associates, Inc. dated July 26, 2019.*

Relevant and On-going Projects

DelDOT has several relevant and ongoing improvement projects within the study area including the *HSIP SR 24 at Camp Arrowhead Road and SR 24 at Angola Road* project (DelDOT Contract No. T201200902). This project was identified in the *SR 24-SR 30 to Love Creek Bridge Traffic Study* and was identified as a high crash location as part of DelDOT's Hazard Elimination Program (HEP) formally known as the Highway Safety Improvement Program (HSIP). This project would make operational improvements to address safety deficiencies and to accommodate future traffic volumes at these two intersections. Specifically, the improvements associated with the Delaware Route 24/Camp Arrowhead Road/Fairfield Road intersection will include extending the existing left-turn and right-turn lanes to increase capacity and providing bicycle lanes and pedestrian facilities. Design is currently underway and construction is scheduled to start in 2021 and end in 2022. Additional information can be found on the DelDOT project website at https://deldot.gov/projects/index.shtml?dc=details&projectNumber=T201200902.

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intersection with Lexus Way (Beebe Medical Center Campus)/Colonial Oaks (Residence Inn) will be signalized. Bicycle lanes and pedestrian facilities will be installed as well. Construction is scheduled to begin in 2020 and end in 2022. Additional information can be found on the DelDOT project website at https://deldot.gov/projects/index.shtml?dc=details&projectNumber=T200411209.

The *SR 24, Love Creek to Mulberry Knoll* project (DelDOT Contract No. T201212201) involves safety, operational, and capacity improvements along Delaware Route 24 from the Love Creek bridge to Mulberry Knoll Road. Delaware Route 24 will be widened to provide two travel lanes in each direction from west of the Love Creek Elementary School/Beacon Middle School intersection to east of Mulberry Knoll Road. The Delaware Route 24/Mulberry Knoll Road intersection will be signalized. A two-way left turn lane will be provided from the Love Creek bridge to west of the Love Creek Elementary School/Beacon Middle School intersection. Bicycle lanes and pedestrian facilities will be installed as well. Construction is scheduled to begin in 2021 and end in 2022. Additional information can be found on the DelDOT project website at https://deldot.gov/projects/index.shtml?dc=details&projectNumber=T201212201.

DelDOT has a pavement rehabilitation and resurfacing project proposed along Cedar Grove Road, from Plantation Road to Robinsonville Road. The construction is tentatively scheduled to begin either Fall 2020 or Spring 2021.

DelDOT and Sussex County are developing the Henlopen Transportation Improvement District (TID). The TID limits generally extend from the Delaware Coast Line Railroad Company railroad tracks and Delaware Route 1 to the north, Burton Pond and Herring Creek to the south, Arnell Creek and Rehoboth Bay to the east, and Beaver Dam Road to the west. The proposed Estates at Mulberry Knoll site is within the TID. The *Henlopen TID CTP Cost Development Report* was prepared in October 2019 by JMT and contained a summary of the traffic analysis conducted and the associated roadway concept plans and cost estimates for the TID. As part of the report, improvements were recommended at several of the TIS study intersections including the Delaware Route 24 intersections with Lexus Way (Beebe Medical Center)/Colonial Oaks (Residence Inn), Plantation Road/Warrington Road, Mulberry Knoll Road, Camp Arrowhead Road/Fairfield Road, and Jolyns Way, as well as the Mulberry Knoll Road intersection with Cedar Grove Road. The TID was adopted by Sussex County on October 27, 2020.

Livable Delaware

(Source: Delaware Strategies for State Policies and Spending, 2015)

Location with respect to the Strategies for State Policies and Spending Map of Delaware:
The proposed development is located within Investment Level 3, Investment Level 4, and Out of Play areas.

Investment Level 3

Investment Level 3 Areas generally fall into two categories. The first category covers lands that are in the long-term growth plans of counties or municipalities where development is not necessary to accommodate expected population growth during a five-year planning period (or longer). The second category includes lands that are adjacent to or intermingled with fast-growing areas within counties or municipalities that are otherwise categorized as Investment Levels 1 or 2. Investment Level 3 is further characterized by areas with new development separated from existing development by a substantial amount of vacant land that is not contiguous with existing infrastructure, areas that are experiencing some development pressure, areas with existing but disconnected development, and possible lack of adequate infrastructure.

The state will consider investing in infrastructure within Investment Level 3 Areas once the Investment Level 1 and 2 Areas are substantially built out, or when the infrastructure or facilities are logical extensions of existing systems and deemed appropriate to serve a particular area. The priorities in the Level 3 Areas are for DelDOT to focus on regional movements between towns and other population centers. Local roadway improvements will be made by developers and property owners as development occurs. Lower priority is given to transportation system–capacity improvements and transit-system enhancements.

Investment Level 4

Delaware's Investment Level 4 Areas are rural in nature and are where the bulk of the state's open space/natural areas and agricultural industry is located. These areas contain agribusiness activities, farm complexes, and small settlements. They typically include historic crossroads or points of trade, often with rich cultural ties. Delaware's Investment Level 4 Areas are also the location of scattered residential uses, featuring almost entirely single-family detached residential structures. Delaware's Investment Level 4 Areas also include many unincorporated communities, typically with their own distinctive character and identity. Investment Level 4 Areas depend on a transportation system primarily of secondary roads linked to roadways used as regional thoroughfares for commuting and trucking.

It is the state's intent to discourage additional urban and suburban development in Investment Level 4 Areas unrelated to agriculture and to the areas' needs. In Investment Level 4 Areas, the state's investments and policies should retain the rural landscape and preserve open spaces and farmlands, support farmland-related industries, and establish defined edges to more concentrated development. The focus for the Level 4 Areas will be to preserve and maintain existing facilities in safe working order, corridor-capacity preservation, and the enhancement of transportation facilities to support agricultural business.

Out of Play

These lands which are not available for development include publicly-owned lands, private conservation lands, lands for which serious legal and/or environmental constraints on development are identified, and lands in some form of permanent open-space protection. These areas are generally not expected to be the location of private development activities such as residential

subdivisions or commercial shopping centers. However, government entities, private property owners, and conservation organizations are still expected to invest in these areas for the purposes in which they were acquired and preserved. There may also be times when private property owners could be able to build or redevelop on these lands in accordance with State and local environmental and land use regulations.

Proposed Development's Compatibility with Livable Delaware:
Majority of the site would be in the Investment Level 3 area. According to Livable Delaware, these areas may be desirable for a variety of housing types, styles, and densities in conjunction with local government comprehensive plans. The remaining portion of the site would be in Investment Lever 4 and Out of Play areas. Per Livable Delaware, the state's investments and policies should retain the rural landscape and preserve open spaces and farmlands within Level 4 areas. In addition, construction of new homes is discouraged in Level 4 areas. Out of Play areas are generally not expected to be the location of private development activities such as residential subdivisions. However, there may be times when private property owners could be able to build or redevelop on these out of play lands in accordance with State and local environmental and land use regulations. Therefore, the area of the site within Investment Level 3 is generally consistent with the 2015 update of the Livable Delaware "Strategies for State Policies and Spending" and the areas within Investment Level 4 and Out of Play are not.

Comprehensive Plans

(Source: Sussex County March 2019 Comprehensive Plan)

Sussex County Comprehensive Plan:
Per the *Sussex County Comprehensive Plan 2045 Future Land Use Map,* the proposed development is in an area designated as Coastal Area and Agricultural Preservation District.

Proposed Development's Compatibility with the Sussex County Comprehensive Plan:
Per the *Sussex County Comprehensive Plan,* a range of housing types including single-family homes should be permitted in Coastal Areas. However, areas within the Agricultural Preservation District are not considered as developable land as the County's 2045 vision directs development towards areas most suitable for future development such as Developing Areas, Town Centers, Coastal Areas, and Municipalities. Therefore, the proposed development section that is within the Coastal Area is generally consistent with the *Sussex County March 2019 Comprehensive Plan* but the area within the Agricultural Preservation District is not.

Trip Generation

The trip generation for the proposed development was determined by using the comparable land use and rates/equations contained in the *Trip Generation, 10th Edition: An ITE Informational Report*, published by the Institute of Transportation Engineers (ITE) for ITE Land Use Code 210 (single-family detached). The trip generation was approved by DelDOT during the PTIS review.

Table 1
Estates at Mulberry Knoll Trip Generation

Land Use	ADT	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
320 Single-Family Detached Housing (ITE Code 210)	3,032	58	174	232	195	115	310	155	132	287

Overview of TIS

Intersections examined:

1. Site Entrance A/Mulberry Knoll Road (Sussex Road 284)
2. Site Entrance B/Mulberry Knoll Road
3. Mulberry Knoll Road/Delaware Route 24
4. Mulberry Knoll Road/Cedar Grove Road (Sussex Road 283)
5. Delaware Route 24/Love Creek Elementary School/Beacon Middle School
6. Delaware Route 24/Spencer Lane/Williams Way
7. Delaware Route 24/Camp Arrowhead Road (Sussex Road 279)/Fairfield Road
8. Delaware Route 24/Jolyns Way (Sussex Road 289)
9. Delaware Route 24/Plantation Road/Warrington Road (Sussex Road 275)
10. Delaware Route 24/Lexus Way (Beebe Medical Center Campus)/Colonial Oaks (Residence Inn)
11. Delaware Route 24/Bryn Mawr Drive
12. Delaware Route 24/Rehoboth Mall Service Road/Hudson Way
13. Delaware Route 1/Delaware Route 24

Conditions examined:

1. Case 1 – 2019 Existing Condition
2. Case 2 – 2027 without development
3. Case 3– 2027 with development

Committed Developments considered:

1. Belle Terre (269 single family detached houses)
2. Arbor-Lyn (142 single family detached houses)
3. Redden Ridge (84 single family detached houses)
4. Delaware State Police Troop 7 (35,385 square feet administrative facility)
5. Pelican Landing (84,576 square feet shopping center)
6. Marsh Island (139 single family detached houses)
7. Marsh Farm Estates (134 single family detached houses)
8. Saddle Ridge f.k.a. Windswept (81 single family detached houses)

9. Rehoboth Point Yacht Club f.k.a. Love Creek Marina (180 unit apartments, 5,000 square feet quality restaurant, 500 square feet retail)
10. Middle Creek Preserve (313 single family detached houses)
11. Sawgrass – North (227 single family detached houses, 15 units unbuilt)
12. Sawgrass – South (3 single family detached houses, 46 townhouses)
13. Hailey's Glen a.k.a. Kielbasa Property (68 single family detached houses)
14. Kindleton (90 single family detached houses)

Note: The committed development information listed above is from the April 1, 2020 Traffic Impact Analysis report and supersedes the information contained in the September 4, 2019 DelDOT Scoping Meeting Memorandum.

Peak hours evaluated: Weekday morning, Weekday evening, and Summer Saturday midday peak hours.

Intersection Descriptions

1. **Site Entrance A/Mulberry Knoll Road (Sussex Road 284)**
   Type of Control: Proposed two-way stop-controlled intersection
   Eastbound Approach: (Site Entrance A) Proposed one shared left turn/through/right turn lane, stop-controlled
   Westbound Approach: (Site Entrance A) Proposed one shared left turn/through/right turn lane, stop-controlled
   Northbound Approach: (Mulberry Knoll Road) Proposed one shared left turn/through/right turn lane
   Southbound Approach: (Mulberry Knoll Road) Proposed one shared left turn/through/right turn lane

2. **Site Entrance B/Mulberry Knoll Road**
   Type of Control: Proposed two-way stop-controlled intersection (T-intersection)
   Westbound Approach: (Site Entrance B) Proposed one shared left turn/right turn lane, stop-controlled
   Northbound Approach: (Mulberry Knoll Road) Proposed one shared through/right turn lane
   Southbound Approach: (Mulberry Knoll Road) Proposed one left turn lane and one through lane

3. **Mulberry Knoll Road/Delaware Route 24**
   Type of Control: Existing two-way stop-controlled intersection; Proposed signalized intersection
   Eastbound Approach: (Delaware Route 24) Existing one shared left turn/through lane and one channelized right turn lane; proposed one left turn lane, two through lanes, and one right turn lane

Westbound Approach: (Delaware Route 24) Existing one shared left turn/through lane and one channelized right turn lane; proposed one left turn lane, two through lanes, and one right turn lane
Northbound Approach: (Mulberry Knoll Road) Existing one shared left turn/through/right turn lane, stop-controlled; proposed one left turn lane and one shared through/right turn lane
Southbound Approach: (Mulberry Knoll Road) Existing one shared left turn/through/right turn lane, stop-controlled; proposed one left turn lane and one shared through/right turn lane

Note: As part of the SR 24, Love Creek to Mulberry Knoll DelDOT project (Contract No. T201212201), this intersection will be signalized, two through lanes will be provided along Delaware Route 24, and turn lanes will be added along each approach.

4. **Mulberry Knoll Road/Cedar Grove Road (Sussex Road 283)**
Type of Control: Existing two-way stop-controlled intersection (T-intersection)
Eastbound Approach: (Cedar Grove Road) Existing one shared through/right turn lane
Westbound Approach: (Cedar Grove Road) Existing one shared left turn/through lane
Northbound Approach: (Mulberry Knoll Road) Existing one shared left turn/right turn lane, stop-controlled

5. **Delaware Route 24/Love Creek Elementary School/Beacon Middle School**
Type of Control: Existing signalized intersection
Eastbound Approach: (Delaware Route 24) Existing one left turn lane, one through lane, and one right turn lane; proposed one left turn lane, two through lanes, and one right turn lane
Westbound Approach: (Delaware Route 24) Existing one left turn lane, one through lane, and one right turn lane; proposed one left turn lane, two through lanes, and one right turn lane
Northbound Approach: (Beacon Middle School) Existing one shared left turn/through lane and one right turn lane
Southbound Approach: (Love Creek Elementary School) Existing one shared left turn/through lane and one right turn lane

Note: As part of the SR 24, Love Creek to Mulberry Knoll DelDOT project (Contract No. T201212201), two through lanes will be provided along each direction of Delaware Route 24.

6. **Delaware Route 24/Spencer Lane/Williams Way**
Type of Control: Existing two-way stop-controlled intersection

Eastbound Approach: (Delaware Route 24) Existing one left turn lane and one shared through/right turn lane; proposed one left turn lane, one through lane, and one right turn lane
Westbound Approach: (Delaware Route 24) Existing one left turn lane, one through lane, and one right turn lane
Northbound Approach: (Williams Way) Existing one shared left turn/through/right turn lane, stop-controlled
Southbound Approach: (Spencer Lane) Existing one shared left turn/through lane and one right turn lane, stop-controlled

Note: As part of the SR 24, Love Creek to Mulberry Knoll DelDOT project (Contract No. T201212201), a separate right turn lane will be added along eastbound Delaware Route 24.

7. **Delaware Route 24/Camp Arrowhead Road (Sussex Road 279)/Fairfield Road**
Type of Control: Existing signalized intersection
Eastbound Approach: (Delaware Route 24) Existing one left turn lane, one through lane, and one channelized right turn lane
Westbound Approach: (Delaware Route 24) Existing one left turn lane, one through lane, and one channelized right turn lane
Northbound Approach: (Fairfield Road) Existing one left turn lane, one through lane, and one channelized right turn lane
Southbound Approach: (Camp Arrowhead Road) Existing one left turn lane and one shared through/right turn lane

8. **Delaware Route 24/Jolyns Way (Sussex Road 289)**
Type of Control: Existing two-way stop-controlled intersection (T-intersection)
Eastbound Approach: (Delaware Route 24) Existing one shared through/right turn lane
Westbound Approach: (Delaware Route 24) Existing one shared left turn/through lane
Northbound Approach: (Jolyns Way) Existing one shared left turn/right turn lane, stop-controlled

9. **Delaware Route 24/Plantation Road/Warrington Road (Sussex Road 275)**
Type of Control: Existing signalized intersection
Eastbound Approach: (Delaware Route 24) Existing one left turn lane, one through lane, and one channelized right turn lane; proposed one left turn lane, two through lanes, and one channelized right turn lane
Westbound Approach: (Delaware Route 24) Existing one left turn lane, one through lane, and one channelized right turn lane; proposed one left turn lane, two through lanes, and one right turn lane

Northbound Approach: (Warrington Road) Existing one left turn lane, one through lane, and one channelized right turn lane; proposed one left turn lane, one shared left turn/through lane, one through lane, and one right turn lane
Southbound Approach: (Plantation Road) Existing one left turn lane, one through lane, and one channelized right turn lane; proposed one left turn lane, one shared left turn/through lane, one through lane, and one right turn lane

Note: As part of the SR 24, Mulberry Knoll to SR 1 DelDOT project (Contract No. T200411209), two through lanes will be provided along each direction of Delaware Route 24, and a shared left turn/through lane will be added along northbound Warrington Road and southbound Plantation Road.

10. **Delaware Route 24/Lexus Way (Beebe Medical Center Campus)/Colonial Oaks (Residence Inn)**
Type of Control: Existing two-way stop-controlled intersection; Proposed signalized intersection
Eastbound Approach: (Delaware Route 24) Existing one shared left turn/through lane and one right turn lane; proposed one left turn lane, two through lanes, and one right turn lane
Westbound Approach: (Delaware Route 24) Existing one left turn lane and one shared through/right turn lane; proposed one left turn lane, two through lanes, and one right turn lane
Northbound Approach: (Beebe Medical Center Campus) Existing one shared left turn/through lane and one right turn lane, stop-controlled; proposed one shared left turn/through lane and one right turn lane
Southbound Approach: (Colonial Oaks/Residence Inn) Existing one shared left turn/through/right turn lane, stop-controlled; proposed one shared left turn/through/right turn lane

Note: As part of the SR 24, Mulberry Knoll to SR 1 DelDOT project (Contract No. T200411209), this intersection will be signalized and two through lanes will be provided along Delaware Route 24.

11. **Delaware Route 24/Bryn Mawr Drive**
Type of Control: Existing two-way stop-controlled intersection (T-intersection)
Eastbound Approach: (Delaware Route 24) Existing one left turn lane and two through lanes
Westbound Approach: (Delaware Route 24) Existing two through lanes and one right turn lane

Southbound Approach: (Bryn Mawr Drive) Existing one left turn lane and one channelized right turn lane, stop controlled

12. Delaware Route 24/Rehoboth Mall Service Road/Hudson Way

Type of Control: Existing signalized intersection

Eastbound Approach: (Delaware Route 24) Existing one left turn lane, two through lanes, and one channelized right turn lane

Westbound Approach: (Delaware Route 24) Existing one left turn lane, two through lanes, and one right turn lane

Northbound Approach: (Rehoboth Mall Service Road) Existing one shared left turn/through lane and one channelized right turn lane

Southbound Approach: (Hudson Way) Existing one shared left turn/through lane and one channelized right turn lane

13. Delaware Route 1/Delaware Route 24

Type of Control: Existing signalized intersection (T-intersection)

Westbound Approach: (Delaware Route 24) Existing three left turn lanes and two right turn lanes

Northbound Approach: (Delaware Route 1) Existing two left turn lanes and three through lanes

Southbound Approach: (Delaware Route 1) Existing one U-turn lane, three through lanes, and one right turn lane

Transit, Pedestrian, and Bicycle Facilities

Existing transit service: Per DelDOT Gateway, Delaware Transit Corporation (DTC) currently provides services via DART Routes 201, 203, and 215 within the study area. A designated bus stop for DART Routes 201 and 203 exists adjacent to the Delaware Route 1/Delaware Route 24 intersection. DART Route 201 provides 33 round trips from 6:26 a.m. to 10:57 p.m. Monday through Saturday. DART Route 203 operates during peak resort season and a schedule was not available on the DART website. Designated bus stops for DART Route 215 exist adjacent to the Delaware Route 24 intersections with Bryn Mawr Drive, Lexus Way (Beebe Medical Center Campus)/Colonial Oaks (Residence Inn), and Camp Arrowhead Road (Sussex Road 279)/Fairfield Road. DART Route 215 provides 11 round trips from 5:25 a.m. to 12:43 a.m. Monday through Saturday.

Planned transit service: Per email correspondence on June 19, 2020 from Mr. Jared Kauffman, DART First State Fixed-Route Planner, the DTC does not have any transit specific comments for the project. However, the DTC encourages non-motorized (pedestrian) connections between the on-site cul-de-sacs and the shared-use paths if DelDOT requests it.

Existing bicycle and pedestrian facilities: According to DelDOT's *Sussex County Bicycle Map*, Connector, Regional, and Statewide Bicycle Routes exist within the study area. The Connector

Bicycle Route travels along Camp Arrowhead Road starting at the Delaware Route 24 intersection with Camp Arrowhead Road/Fairfield Road. The Regional Bicycle Route exists along Delaware Route 24 and traverses through six study intersections (Plantation Road/Warrington Road, Mulberry Knoll Road, Love Creek Elementary School/Beacon Middle School, Spencer Lane/Williams Way, Camp Arrowhead Road/Fairfield Road, and Jolyns Way). A Regional Bicycle Route also exists along Delaware Route 1 and traverses through the Delaware Route 1/Delaware Route 24 intersection. The Statewide Bicycle Route exists along Plantation Road and Warrington Road and traverses through the Delaware Route 24 intersection. Pedestrian facilities exist at the Delaware Route 24 intersections with Delaware Route 1, Lexus Way (Beebe Medical Center Campus)/Colonial Oaks (Residence Inn), Love Creek Elementary School/Beacon Middle School, and Spencer Lane/Williams Way.

Planned bicycle and pedestrian facilities: Per email correspondence on June 17, 2020 from Mr. John Fiori, DelDOT's Bicycle Coordinator, the following improvements were recommended:

- Construct a 10-foot wide shared-use path (SUP) along both Mulberry Knoll Road property frontages.
- Due to the increase in traffic, the existing roadway curve just south of "Road G" will need to be analyzed to determine if it meets current DelDOT standards and regulations for safety. If not, then this curve should be improved as part of any roadway improvements required along Mulberry Knoll Road. It would appear any improvements to the curve would be on the development side of the road.
- There could be existing signal agreements at the intersection of Delaware Route 24 and Mulberry Knoll Road. It is assumed this site would have to enter into a signal agreement as well. Recommend contacting DelDOT Traffic for the existence of signal agreements.
- There is a DelDOT project in the area under DelDOT Contract No. T201212201 – *SR 24, Love Creek to Mulberry Knoll*. Recommend contacting DelDOT concerning the status of the project. The site may also have to contribute towards DelDOT Contract No. T201212201. Recommend discussing with DelDOT Development Coordination Section.
- The stormwater management area along Mulberry Knoll Road appears to be within the existing/proposed right-of-way/PE, in which they will need to be revised.
- An internal connection(s) from the non-motorized facility along Mulberry Knoll Road is required.
- Per the Development Coordination Manual (DCM) the site shall dedicate right-of-way per the roadway classification and establish a 15-foot wide permanent easement along the property frontages.
- All entrance, roadway and/or intersection improvements required shall incorporate bicycle and pedestrian facilities. Per the DCM, if the right turn lane is warranted, then a bike lane shall be incorporated along the right turn lane; if a left turn lane is required any roadway improvements shall include a shoulder matching the roadway functional classification or existing conditions.

Bicycle Level of Traffic Stress in Delaware: Researchers with the Mineta Transportation Institute developed a framework to measure low-stress connectivity, which can be used to evaluate and guide bicycle network planning. Bicycle LTS analysis uses factors such as the speed of traffic, volume of traffic, and the number of lanes to rate each roadway segment on a scale of 1 to 4, where

1 is a low-stress place to ride and 4 is a high-stress place to ride. It analyzes the total connectivity of a network to evaluate how many destinations can be accessed using low-stress routes. Developed by planners at the Delaware Department of Transportation (DelDOT), the bicycle Level of Traffic Stress (LTS) model will be applied to bicycle system planning and evaluation throughout the state. The Bicycle LTS for the roadways under existing conditions along the site frontage are summarized below. The Bicycle LTS was determined utilizing the map on the DelDOT Gateway.

- Mulberry Knoll Road – LTS: 4

Crash Evaluation

Per the crash data included in the TIS from October 28, 2016 to November 28, 2019 and provided by the Delaware Crash Analysis Reporting System, a total of 266 crashes were reported within the study area. Of the 266 crashes reported:

- 146 were rear-end, 46 were angle, and 36 were not collisions between two vehicles.
- 40 incidents contained injuries and there was 1 fatality.
- The fatal crash occurred along Delaware Route 24 and involved an angle incident with a vehicle failing to yield to right of way.
- Out of the 36 incidents that were not collisions between two vehicles, 17 involved incidents with a deer.

Previous Comments

Comments provided by DelDOT during the Preliminary TIS review have been addressed in the Final TIS.

General HCS Analysis Comments

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

1. Per DelDOT's *Development Coordination Manual*, JMT used a heavy vehicle percentage of 3% for each movement greater than 100 vph in the Case 2 and Case 3 future scenario analyses, unless the existing heavy vehicle percentage was greater than 3% or there was no significant increase of vehicles along that movement, in which case the existing heavy vehicle percentage was used for analysis of future scenarios. Whereas, the TIS used the existing heavy vehicle percentage for Case 1, Case 2 and Case 3 scenarios.

2. Per DelDOT's *Development Coordination Manual* and coordination with DelDOT Planning, JMT used a heavy vehicle percentage of 5% for each movement less than 100 vph along roadways for Case 1 conditions, whereas the TIS did not.

3. Per DelDOT's *Development Coordination Manual*, JMT utilized the existing PHF for the Case 1 scenario and a future PHF for Cases 2 and 3 scenarios of 0.80 for roadways with less than 500 vph, 0.88 for roadways between 500 and 1,000 vph, and 0.92 for roadways with more than 1,000 vph or the existing PHF, whichever was higher. The TIS utilized the existing PHF for Case 1, Case 2 and Case 3 scenarios.

4. JMT incorporated the unsignalized intersections as access points within the HCS files when conducting the signalized intersection analyses along Delaware Route 24 whereas the TIS did not.

5. JMT incorporated the Proportion of Time Blocked within the unsignalized intersections analyses along Delaware Route 24 whereas the TIS did not.

6. For all signalized intersection analyses along Delaware Route 24, JMT utilized a Arrival Type of 3 consistent with the existing traffic patterns during the AM, PM and Saturday peaks whereas the TIS utilized a Arrival Type of 4.

7. For all the signalized intersections JMT utilized Field-Measured Phase Times whereas the TIS did not.

Table 2
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Site Entrance A/Mulberry Knoll Road (Sussex Road 284)	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 with development (Case 3)						
Eastbound Site Entrance A Approach	B (10.1)	B (11.2)	B (11.0)	B (10.1)	B (11.2)	B (11.0)
Westbound Site Entrance A Approach	A (8.8)	A (8.7)	A (8.8)	A (8.8)	A (8.7)	A (8.8)
Northbound Mulberry Knoll Road Left Turn	A (7.2)	A (7.3)	A (7.3)	A (7.2)	A (7.3)	A (7.3)
Southbound Mulberry Knoll Road Left Turn	A (7.3)	A (7.4)	A (7.4)	A (7.3)	A (7.4)	A (7.4)

Table 3
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control (T-intersection)[1]	**LOS per TIS**			**LOS per JMT**		
Site Entrance B/Mulberry Knoll Road (Sussex Road 284)	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 with development (Case 3)						
Westbound Site Entrance B Approach	A (9.5)	A (9.0)	A (9.2)	A (9.5)	A (9.0)	A (9.2)
Southbound Mulberry Knoll Road Left Turn	A (7.6)	A (7.6)	A (7.6)	A (7.6)	A (7.6)	A (7.6)

[1] For signalized and unsignalized analysis, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 4
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Mulberry Knoll Road (Sussex Road 284)/Delaware Route 24	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)						
Eastbound Delaware Route 24 Left Turn	A (8.7)	A (9.9)	A (8.8)	A (8.8)	B (11.1)	A (8.9)
Westbound Delaware Route 24 Left Turn	B (10.5)	A (9.2)	B (10.3)	B (14.1)	A (9.6)	B (14.2)
Northbound Mulberry Knoll Road Approach	D (29.7)	E (47.3)	D (33.8)	F (666.2)	F (136.5)	*
Southbound Mulberry Knoll Road Approach	B (14.8)	C (23.7)	F (693.2)	F (101.4)	D (27.9)	*
2027 without development (Case 2)						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (9.3)	C (19.6)	B (11.2
Westbound Delaware Route 24 Left Turn	-	-	-	B (12.7)	B (11.3)	C (21.1)
Northbound Mulberry Knoll Road Approach	-	-	-	F (156.1)	*	*
Southbound Mulberry Knoll Road Approach	-	-	-	*	*	*
2027 without development (Case 2) *with Improvement*[2]						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (9.3)	C (13.5)	B (11.2)
Westbound Delaware Route 24 Left Turn	-	-	-	B (12.7)	B (11.3)	C (21.1)
Northbound Mulberry Knoll Road Left Turn/Through Lane	-	-	-	F (669.6)	*	*
Northbound Mulberry Knoll Road Right Turn	-	-	-	D (25.2)	C (17.3)	E (36.7)
Northbound Mulberry Knoll Road Approach	-	-	-	F (121.8)	*	*
Southbound Mulberry Knoll Road Left Turn/Through Lane	-	-	-	*	*	*
Southbound Mulberry Knoll Road Right Turn	-	-	-	C (15.4)	F (110.7)	C (20.3)
Southbound Mulberry Knoll Road Approach	-	-	-	F (902.1)	*	*

*HCS reported delays of 1000 seconds per vehicle or more

[2] The improvement scenario includes to providing a shared left turn/ through lane and a channelized right turn along the northbound and southbound Mulberry Knoll Road.

Table 4 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Mulberry Knoll Road (Sussex Road 284)/Delaware Route 24	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 with development (Case 3)						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (9.3)	C (19.6)	B (11.3)
Westbound Delaware Route 24 Left Turn	-	-	-	B (13.6)	B (12.6)	D (29.6)
Northbound Mulberry Knoll Road Approach	-	-	-	*	*	*
Southbound Mulberry Knoll Road Approach	-	-	-	*	*	*
2027 with development (Case 3) *with Improvement* [2]						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (9.3)	B (19.6)	B (11.3)
Westbound Delaware Route 24 Left Turn	-	-	-	B (13.6)	B (12,6)	D (29.6)
Northbound Mulberry Knoll Road Left Turn/Through Lane	-	-	-	*	*	*
Northbound Mulberry Knoll Road Right Turn	-	-	-	E (47.8)	C (20.5)	E (73.7)
Northbound Mulberry Knoll Road Approach	-	-	-	*	*	*
Southbound Mulberry Knoll Road Left Turn/Through Lane	-	-	-	*	*	*
Southbound Mulberry Knoll Road Right Turn	-	-	-	C (15.3)	F (110.7)	C (19.9)
Southbound Mulberry Knoll Road Approach	-	-	-	*	*	*

*HCS reported delays of 1000 seconds per vehicle or more

Table 4 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Signalized Intersection [1]	**LOS per TIS**			**LOS per JMT**		
Mulberry Knoll Road (Sussex Road 284)/Delaware Route 24	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 without development (Case 2) *with Improvement Option I* [3]	B (20.0)	B (19.1)	C (20.4)	C (23.1)	C (28.3)	C (23.2)
2027 with development (Case 3) *with Improvement Option I* [3]	C (27.9)	C (26.6)	D (35.7)	C (25.1)	C (29.2)	C (26.5)

[3] This scenario includes the improvements associated with the *SR 24, Love Creek to Mulberry Knoll* project (DelDOT Contract No. T201212201). The improvements include signalization of the intersection with a cycle length of 150 seconds during the AM, PM and Saturday peaks and a protected/permissive left turn phase along each approach, the provision of two through lanes along eastbound and westbound Delaware Route 24, and the addition of a separate left turn lane and a shared through/right turn lane along northbound and southbound Mulberry Knoll Road.

Table 5
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control (T-intersection)[1]	**LOS per TIS**			**LOS per JMT**		
Mulberry Knoll Road (Sussex Road 284)/Cedar Grove Road (Sussex Road 283)	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)						
Westbound Cedar Grove Road Left Turn	A (8.3)	A (7.7)	A (8.1)	A (8.3)	A (7.8)	A (8.1)
Northbound Mulberry Knoll Road Approach	B (13.1)	B (11.0)	B (12.4)	B (12.7)	B (11.1)	B (12.6)
2027 without development (Case 2)						
Westbound Cedar Grove Road Left Turn	A (8.7)	A (8.1)	A (8.7)	A (8.6)	A (8.1)	A (8.8)
Northbound Mulberry Knoll Road Approach	C (17.9)	B (13.8)	C (18.5)	C (16.2)	B (14.0)	C (18.9)
2027 with development (Case 3)						
Westbound Cedar Grove Road Left Turn	A (8.8)	A (8.3)	A (8.9)	A (8.7)	A (8.3)	A (9.0)
Northbound Mulberry Knoll Road Approach	C (24.2)	C (17.3)	D (28.2)	C (20.3)	C (17.7)	D (29.4)

Table 6
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Signalized Intersection [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Love Creek Elementary School/Beacon Middle School [4, 5]	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)	C (26.3)	B (15.6)	A (8.4)	D (39.9)	C (28.3)	D (39.8)
2019 Existing (Case 1) *with signal timing optimization [6]*	-	-	-	C (20.9)	B (14.1)	A (9.4)
2027 without development (Case 2)	B (19.4)	B (12.7)	A (2.4)	C (25.3)	E (62.4)	E (70.2)
2027 without development (Case 2) *with signal timing optimization [7]*	-	-	-	B (19.4)	B (17.9)	C (31.6)
2027 without development (Case 2) *with Improvement [7]*	-	-	-	B (16.6)	B (11.1)	A (6.3)
2027 with development (Case 3)	B (18.0)	B (12.2)	A (2.4)	C (27.8)	E (59.5)	E (70.0)
2027 with development (Case 3) *with signal timing optimization [6]*	-	-	-	B (20.7)	B (16.3)	C (33.4)
2027 with development (Case 3) *with Improvement [7]*	-	-	-	B (16.6)	B (11.8)	A (6.8)

[4] JMT utilized a cycle length of 150 seconds for AM and Saturday peaks consistent with DelDOT Timing plan whereas the TIS utilized a cycle length of 120 seconds.
[5] Both the TIS and JMT incorporated this intersection with the other signalized intersections along Delaware Route 24 (with the exception of the Delaware Route 1 intersection) due to the signals operating with the same cycle lengths during the peak hours for Cases 2 and 3 conditions. JMT also did this for Case 1 conditions whereas the TIS did not.
[6] Signal timing optimization scenario include optimized splits while maintaining the existing cycle lengths.
[7] This scenario incorporates the *SR 24, Love Creek to Mulberry Knoll DelDOT Improvement project* (project no. T200411209) which adds an additional through lane along eastbound and westbound Delaware Route 24.

Table 7
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Spencer Lane/Williams Way [8]	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)						
Eastbound Delaware Route 24 Left Turn	A (8.2)	B (10.4)	A (8.8)	A (8.3)	B (12.9)	A (8.7)
Westbound Delaware Route 24 Left Turn	B (13.4)	A (8.8)	B (10.7)	B (11.4)	A (9.0)	B (12.6)
Northbound Williams Way Approach	D (27.3)	D (32.2)	D (30.8)	D (33.1)	F (561.9)	F (50.3)
Southbound Spencer Lane Left Turn	E (43.3)	F (55.5)	F (79.8)	F (81.8)	*	F (232.7)
Southbound Spencer Lane Right Turn	B (11.1)	C (18.2)	B (11.9)	B (10.7)	C (16.7)	B (10.5)
Southbound Spencer Lane Approach	E (35.3)	E (46.2)	F (57.2)	F (64.1)	*	F (158.6)
2027 without development (Case 2)						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (8.9)	C (20.2)	B (10.5)
Westbound Delaware Route 24 Left Turn	-	-	-	B (13.2)	B (10.5)	D (25.1)
Northbound Williams Way Approach	-	-	-	F (83.8)	*	*
Southbound Spencer Lane Left Turn	-	-	-	F (416.7)	*	*
Southbound Spencer Lane Right Turn	-	-	-	B (12.1)	D (31.7)	C (15.2)
Southbound Spencer Lane Approach	-	-	-	F (315.5)	*	*

*HCS reported delays of 1000 seconds per vehicle or more

[8] JMT modeled the southbound Spencer Lane approach as a left turn and right turn lane consistent with the existing conditions whereas the TIS did not.

Table 7 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Spencer Lane/Williams Way	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 with development (Case 2) *with Improvement Option I* [9]						
Eastbound Delaware Route 24 Left Turn	A (8.7)	B (12.0)	A (9.9)	A (8.9)	C (20.2)	B (10.5)
Westbound Delaware Route 24 Left Turn	C (15.8)	A (9.7)	B (12.3)	B (13.2)	B (10.5)	D (25.1)
Northbound Williams Way Approach	E (46.1)	F (68.2)	F (65.3)	F (83.6)	*	*
Southbound Spencer Lane Left Turn	F (95.1)	F (151.2)	F (359.9)	F (416.6)	*	*
Southbound Spencer Lane Right Turn	B (12.7)	D (25.2)	C (15.3)	B (12.1)	D (31.7)	C (15.2)
Southbound Spencer Lane Approach	F (74.5)	F (119.7)	F (245.0)	F (315.5)	*	*
2027 with development (Case 2) *with Improvement Option II* [10]						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (8.2)	B (13.5)	A (8.5)
Westbound Delaware Route 24 Left Turn	-	-	-	A (9.7)	A (8.3)	B (12.3)
Northbound Williams Way Shared Left Turn/Through Lane	-	-	-	C (17.4)	D (31.4)	C (16.9)
Northbound Williams Way Right Turn	-	-	-	A (9.8)	A (9.7)	C (16.0)
Northbound Williams Way Approach	-	-	-	B (12.3)	C (20.5)	C (16.2)
Southbound Spencer Lane Left Turn Lane	-	-	-	B (11.5)	D (32.9)	C (17.9)
Southbound Spencer Lane Right Turn	-	-	-	A (8.9)	C (17.5)	B (10.3)
Southbound Spencer Lane Approach	-	-	-	B (10.9)	D (29.1)	C (15.3)

*HCS reported delays of 1000 seconds per vehicle or more

[9] This scenario incorporates the *SR 24, Love Creek to Mulberry Knoll DelDOT improvement project* (project no. T200411209) which includes the addition of a right turn lane along eastbound Delaware Route 24.
[10] This scenario includes providing an additional through lane along the eastbound and westbound Delaware Route 24 approaches and a right turn lane along the eastbound Delaware Route 24 approach and configured northbound Williams Way as a shared left turn/through lane and a right turn lane.

Table 7 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Spencer Lane/Williams Way	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 without development (Case 3)						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (9.1)	C (22.2)	B (14.3)
Westbound Delaware Route 24 Left Turn	-	-	-	B (14.9)	B (11.0))	D (28.7)
Northbound Williams Way Approach	-	-	-	F (252.8)	*	*
Southbound Spencer Lane Left Turn	-	-	-	*	*	*
Southbound Spencer Lane Right Turn	-	-	-	B (12.5)	E (35.5)	C (19.0)
Southbound Spencer Lane Approach	-	-	-	*	*	*
2027 with development (Case 3) *with Improvement Option I* [9]						
Eastbound Delaware Route 24 Left Turn	A (8.8)	B (12.2)	B (10.0)	A (9.1)	C (22.2)	B (14.3)
Westbound Delaware Route 24 Left Turn	C (15.9)	A (9.9)	B (12.6)	B (14.9)	B (11.0)	D (28.7)
Northbound Williams Way Approach	E (49.7)	F (76.6)	F (72.3)	F (251.4)	*	*
Southbound Spencer Lane Shared Left/Through Lane	F (107.9)	F (177.3)	F (430.7)	*	*	*
Southbound Spencer Lane Right Turn	B (13.2)	D (26.0)	C (15.7)	B (12.5)	E (35.5)	C (19.0)
Southbound Spencer Lane Approach	F (84.2)	F (139.5)	F (292.4)	*	*	*

*HCS reported delays of 1000 seconds per vehicle or more

Table 7 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Spencer Lane/Williams Way	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 with development (Case 3) *with Improvement Option II [10]*						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (8.2)	B (14.2)	B (14.3)
Westbound Delaware Route 24 Left Turn	-	-	-	A (9.3)	A (8.5)	B (12.8))
Northbound Williams Way Shared Left Turn/Through Lane	-	-	-	B (14.3)	*	D (31.0)
Northbound Williams Way Right Turn	-	-	-	B (11.4)	B (10.2)	C (16.7)
Northbound Williams Way Approach	-	-	-	B (12.3)	*	C (20.8)
Southbound Spencer Lane Left Turn Lane	-	-	-	B (14.7)	*	D (35.0)
Southbound Spencer Lane Right Turn	-	-	-	A (9.0)	C (18.6)	C (19.1)
Southbound Spencer Lane Approach	-	-	-	B (13.3)	*	D (29.7)

*HCS reported delays of 1000 seconds per vehicle or more

Table 7 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Roundabout [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Spencer Lane/Williams Way [11]	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 without development (Case 2)	-	-	-	A (6.3)	A (6.7)	A (7.3)
2027 without development (Case 3)	-	-	-	A (6.3)	A (6.8)	A (7.4)

Table 7 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Signalized Intersection [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Spencer Lane/Williams Way [12]	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 without development (Case 2)	-	-	-	A (8.1)	B (11.2)	B (10.0)
2027 without development (Case 3)	-	-	-	B (10.9)	B (11.4)	B (11.1)

[11] This scenario includes providing a dual lane roundabout.

[12] This scenario includes providing a signal with a cycle length of 150 seconds during the AM, PM and Saturday peaks with a protected/permissive phase along eastbound and westbound Delaware Route 24 and split phase along northbound and southbound Spencer Lane and Williams Way. Additionally, the scenario configures the eastbound and westbound Delaware Route 24 approaches to contain one left turn lane, two through lanes, and one right turn lane.

Table 8
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Signalized Intersection [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Camp Arrowhead Road (Sussex Road 279)/Fairfield Road	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)	B (13.0)	B (12.1)	B (15.2)	E (61.1)	D (35.5)	E (56.5)
2019 Existing (Case 1) *with signal timing optimization* [13]	-	-	-	B (18.6)	B (15.7)	C (21.9)
2027 without development (Case 2)	B (19.6)	B (16.6)	C (26.4)	E (73.7)	D (48.5)	F (117.5)
2027 without development (Case 2) *with signal timing optimization* [13]	-	-	-	B (19.5)	B (18.9)	C (35.3)
2027 with development (Case 3)	C (24.2)	B (17.7)	C (32.3)	F (108.9)	E (55.6)	F (128.1)
2027 with development (Case 3) *with signal timing optimization* [13]	-	-	-	C (22.2)	C (22.4)	D (38.7)

[13] Signal timing optimization scenario includes optimized offset and splits while maintaining the existing signal cycle length.

Table 9
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control (T-intersection)[1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Jolyns Way (Sussex Road 289)	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)						
Westbound Delaware Route 24 Left Turn	A (9.1)	A (8.4)	A (9.4)	A (9.2)	A (8.5)	A (9.5)
Northbound Jolyns Way Approach	C (16.8)	C (22.9)	C (18.8)	C (17.1)	C (23.4)	C (19.2)
2027 without development (Case 2)						
Westbound Delaware Route 24 Left Turn	A (9.7)	A (9.0)	B (10.3)	A (9.8)	A (9.0)	B (10.4)
Northbound Jolyns Way Approach	C (21.1)	E (35.8)	D (26.8)	C (21.5)	D (33.5)	D (27.4)
2027 without development (Case 2) *with Improvement* [14]						
Westbound Delaware Route 24 Left Turn	-	-	-	A (9.9)	A (9.1)	B (10.5)
Northbound Jolyns Way Approach	-	-	-	C (17.6)	C (22.0)	C (19.5)
2027 with development (Case 3)						
Westbound Delaware Route 24 Left Turn	A (9.7)	A (9.2)	B (10.4)	A (9.8)	A (9.2)	B (10.6)
Northbound Jolyns Way Approach	C (22.1)	E (39.8)	D (28.7)	C (22.5)	E (36.9)	D (29.4)
2027 with development (Case 3) *with Improvement* [14]						
Westbound Delaware Route 24 Left Turn	-	-	-	A (9.9)	A (9.3)	B (10.7)
Northbound Jolyns Way Approach	-	-	-	C (18.1)	C (23.8)	C (20.5)

[14] Improvement scenario includes providing an additional through lane along eastbound and westbound Delaware Route 24.

Table 10
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Signalized Intersection [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Plantation Road (Sussex Road 275)/Warrington Road (Sussex Road 275)	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)	D (45.7)	D (46.8)	E (77.3)	D (39.5)	D (50.6)	D (53.4)
2019 Existing (Case 1) *with signal timing optimization* [15]	-	-	-	D (35.4)	D (44.6)	D (43.9)
2027 without development (Case 2) [16]	-	-	-	D (46.4)	F (81.3)	E (77.0)
2027 without development (Case 2) *with signal timing optimization* [15,16]	-	-	-	D (38.1)	E (69.3)	E (55.5)
2027 without development (Case 2) *with Improvement Option I* [17]	-	-	-	C (34.8)	D (40.1)	D (43.8)
2027 without development (Case 2) *with Improvement Option II* [18]	C (33.4)	D (35.4)	D (38.6)	C (32.9)	D (35.3)	D (37.8)
2027 with development (Case 3) [16]	-	-	-	D (46.9)	F (93.9)	F (78.4)
2027 with development (Case 3) *with signal timing optimization* [15,16]	-	-	-	D (40.2)	F (81.5)	E (60.6)

[15] Signal timing optimization scenario includes optimized offset and splits while maintaining the existing cycle lengths.
[16] JMT conducted an analysis with the existing lane configurations.
[17] Improvement scenario incorporates with part of the DelDOT Henlopen TID (project no. T201769002/T201966001) improvement for Delaware Route 24 intersection with Plantation Road (Sussex Road 275)/Warrington Road (Sussex Road 275) to add an extra through lane along the eastbound and westbound Delaware Route 24.
[18] This scenario incorporates with the *SR 24, Love Creek to Mulberry Knoll DelDOT improvement project* (project no. T200411209) to adding an additional through lane along the eastbound and westbound Delaware Route 24 as well as a shared left turn/through lane along the northbound and southbound of Plantation Road (Sussex Road 275)/Warrington Road (Sussex Road 275).

Table 10 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Signalized Intersection [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Plantation Road (Sussex Road 275)/Warrington Road (Sussex Road 275)	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 with development (Case 3) *with Improvement I* [17]	-	-	-	C (34.6)	D (40.7)	D (42.3)
2027 with development (Case 3) *with Improvement II* [18]	C (33.2)	D (36.2)	D (39.8)	C (31.9)	D (37.6)	D (37.7)

Table 11
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Lexus Way (Beebe Medical Center campus)/Colonial Oaks (Residence Inn) [19]	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)						
Eastbound Delaware Route 24 Left Turn	A (8.0)	A (9.1)	A (8.5)	A (8.0)	A (9.1)	A (8.6)
Westbound Delaware Route 24 Left Turn	B (10.5)	A (8.5)	B (10.3)	B (11.3)	A (8.6)	B (12.0)
Northbound Lexus Way Left Turn	E (46.5)	F (72.2)	E (48.9)	F (66.1)	F (100.7)	F (115.9)
Northbound Lexus Way Right Turn	B (14.5)	B (13.4)	C (18.4)	B (13.5)	B (12.5)	C (19.7)
Northbound Lexus Way Approach	C (24.3)	E (37.1)	C (24.0)	D (29.7)	E (48.1)	E (37.2)
Southbound Colonial Oaks Approach	C (24.0)	A (0.0)	B (11.7)	D (29.6)	A (0.0)	B (11.6)
2027 without development (Case 2)						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (8.2)	A (9.9)	A (9.5)
Westbound Delaware Route 24 Left Turn	-	-	-	B (12.8)	A (9.2)	C (15.8)
Northbound Lexus Way Left Turn	-	-	-	F (135.5)	F (732.6)	*
Northbound Lexus Way Right Turn	-	-	-	C (18.2)	C (15.0)	D (31.4)
Northbound Lexus Way Approach	-	-	-	F (54.1)	F (304.6)	F (322.9)
Southbound Colonial Oaks Approach	-	-	-	E (46.9)	A (0.0)	B (13.7)

*HCS reported delays of 1000 seconds per vehicle or more

[19] JMT modeled the eastbound Delaware Route 24 as a shared left turn/through lane and right turn lane, and northbound Lexus Way as a left turn lane and right turn lane to be consistent with the existing conditions whereas the TIS did not.

Table 11 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Lexus Way (Beebe Medical Center campus)/Colonial Oaks (Residence Inn)	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 without development (Case 2) *with Improvement* [20]						
Eastbound Delaware Route 24 Left Turn	A (8.2)	A (9.9)	A (9.1)	A (8.2)	A (9.9)	A (8.6)
Westbound Delaware Route 24 Left Turn	B (11.9)	A (8.9)	B (11.2)	B (10.9)	A (8.0)	B (10.4)
Northbound Lexus Way Left Turn/Through Lane	F (66.8)	F (64.9)	F (59.6)	E (41.3)	B (14.0)	B (14.9)
Northbound Lexus Way Right Turn	B (12.2)	B (11.7)	B (13.5)	A (9.2)	B (10.1)	B (13.5)
Northbound Lexus Way Approach	D (29.0)	D (32.2)	C (21.9)	C (19.0)	B (11.7)	B (13.8)
Southbound Colonial Oaks Approach	C (20.0)	A (0.0)	B (10.7)	B (14.1)	A (0.0)	A (8.9)

[20] The improvement scenario contains the lane configurations associated with the *SR 24, Mulberry Knoll to Delaware Route 1 DelDOT improvement project* (project no. T200411209). This includes adding an extra through lane along eastbound and westbound Delaware Route 24, adding a left turn lane along eastbound Delaware Route 24 and configuring northbound Lexus Way as a shared left turn/through lane and a right turn lane.

Table 11 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Lexus Way (Beebe Medical Center campus)/Colonial Oaks (Residence Inn)	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 with development (Case 3)						
Eastbound Delaware Route 24 Left Turn	-	-	-	A (8.2)	B (10.3)	A (9.7)
Westbound Delaware Route 24 Left Turn	-	-	-	B (13.7)	A (9.5)	C (17.4)
Northbound Lexus Way Left Turn	-	-	-	F (221.0)	*	*
Northbound Lexus Way Right Turn	-	-	-	C (20.0)	C (15.6)	E (37.3)
Northbound Lexus Way Approach	-	-	-	F (81.6)	F (487.7)	F (674.2)
Southbound Colonial Oaks Approach	-	-	-	F (64.3)	A (0.0)	B (14.5)
2027 with development (Case 3) *with Improvement* [20]						
Eastbound Delaware Route 24 Left Turn	A (8.2)	B (10.3)	A (9.3)	A (8.2)	B (10.3)	A (8.7)
Westbound Delaware Route 24 Left Turn	B (12.4)	A (9.1)	B (11.5)	B (11.2)	A (8.1)	B (10.9)
Northbound Lexus Way Left Turn/Through Lane	F (80.8)	F (86.0)	F (68.2)	E (41.0)	C (15.1)	C (15.5)
Northbound Lexus Way Right Turn	B (12.6)	B (12.0)	B (13.9)	A (9.3)	B (10.6)	B (14.2)
Northbound Lexus Way Approach	D (33.5)	E (41.8)	C (23.7)	C (19.0)	B (12.4)	B (14.4)
Southbound Colonial Oaks Approach	C (21.4)	A (0.0)	B (11.0)	B (13.4)	A (0.0)	A (9.0)

Table 11 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Signalized Intersection [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Lexus Way (Beebe Medical Center campus)/Colonial Oaks (Residence Inn)	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2027 without development (Case 2) *with Improvement Option I* [21]	-	-	-	A (8.1)	B (14.7)	A (8.7)
2027 with development (Case 3) *with Improvement Option I* [21]	-	-	-	A (9.8)	B (15.2)	B (10.4)

[21]This scenario incorporates the *SR 24, Mulberry Knoll to Delaware Route 1 DelDOT improvement project* (project no. T200411209) to signalize the intersection, install an additional through lane along eastbound and westbound Delaware Route 24 as well as a left turn lane along eastbound Delaware Route 24, and configure the northbound approach to have a shared left turn/through lane and right turn lane. The northbound and southbound approaches would operate as split phase with protected and permissive left turn phasing along Delaware Route 24. A cycle length of 150 seconds would be utilized as well.

Table 12
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Unsignalized Intersection Two-Way Stop Control (T-intersection)[1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Bryn Mawr Drive [22]	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)						
Eastbound Delaware Route 24 Left Turn	A (8.6)	A (9.1)	A (8.6)	A (8.3)	A (9.0)	A (8.6)
Southbound Bryn Mawr Drive Approach	B (14.8)	C (19.3)	C (19.3)	B (13.7)	C (17.5)	C (18.6)
2027 without development (Case 2)						
Eastbound Delaware Route 24 Left Turn	A (8.9)	B (10.0)	A (9.3)	A (8.7)	A (9.7)	A (9.1)
Southbound Bryn Mawr Drive Approach	C (17.4)	D (27.1)	D (26.9)	C (15.2)	C (23.1)	D (25.0)
2027 with development (Case 3)						
Eastbound Delaware Route 24 Left Turn	A (9.0)	B (10.3)	A (9.5)	A (8.8)	A (10.0)	A (9.3)
Southbound Bryn Mawr Drive Approach	C (18.4)	D (30.9)	D (30.2)	C (15.9)	D (26.0)	D (27.8)

[22] JMT modeled southbound Mawr Drive approach right turn as a channelized right turn lane to be consistent with existing condition whereas the TIS did not.

Table 13
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Signalized Intersection [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 24/Rehoboth Mall Service Road/Hudson Way	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)	A (5.5)	A (9.9)	A (9.1)	B (11.2)	B (16.5)	B (15.1)
2027 without development (Case 2)	A (5.9)	B (12.7)	A (8.6)	B (13.0)	B (15.7)	B (15.3)
2027 with development (Case 3)	A (5.8)	B (12.4)	A (8.3)	B (13.1)	B (15.5)	B (15.1)

Table 14
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Estates at Mulberry Knoll
Report Dated: April 2020
Prepared By: The Traffic Group, Inc.

Signalized Intersection [1]	**LOS per TIS**			**LOS per JMT**		
Delaware Route 1/Delaware Route 24 [23, 24, 25, 26]	Weekday AM	Weekday PM	Saturday Peak	Weekday AM	Weekday PM	Saturday Peak
2019 Existing (Case 1)	B (15.5)	B (18.4)	B (17.7)	B (16.2)	B (17.5)	B (17.1)
2027 without development (Case 2)	B (18.1)	C (30.2)	C (21.5)	B (17.6)	C (21.6)	B (19.8)
2027 with development (Case 3)	B (19.0)	D (36.6)	C (23.4)	B (18.2)	C (24.7)	C (21.0)

[23] JMT included storage lengths for the left and right turn lanes along the eastbound Delaware Route 24 approaches consistent with the existing storage lengths whereas the TIS did not.
[24] JMT utilized a saturation flow rate of 1,900 to be consistent with existing traffic patterns whereas the TIS utilized a saturation flow rate of 1,750.
[25] JMT utilized the Yellow times, Red Clearance times, and offsets consistent with the DelDOT timing plan whereas the TIS did not.
[26] JMT utilized a cycle length of 150 seconds during the PM peak hour consistent with the DelDOT timing plans whereas the TIS utilized a cycle length of 120 seconds.