



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

JENNIFER COHAN
SECRETARY

April 18, 2016

Ms. Carol Ohm
Apex Engineering, Inc.
27 West Market Street
Newport, DE 19804

Dear Ms. Ohm:

The enclosed Traffic Impact Study (TIS) review letter for the **Wilmington University – Brandywine Campus** (Tax Parcels 06-019.00-004, 06-010.00-025) 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: Ms. Wendie Stabler, Saul Ewing L.L.P.
Ms. Constance C. Holland, Office of State Planning Coordination
Mr. George Haggerty, New Castle County Department of Land Use
Mr. Owen Robatino, New Castle County Department of Land Use
Mr. Marco Boyce, New Castle County Department of Land Use
Mr. Mir Wahed, Johnson, Mirmiran & Thompson, Inc.
Mr. Richard Mishura, Johnson, Mirmiran & Thompson, Inc.
DelDOT Distribution

DelDOT Distribution

Annie Cordo, Deputy Attorney General

Robert McCleary, Director, Transportation Solutions (DOTS)

Drew Boyce, Director, Planning

Mark Luszczyk, Chief Traffic Engineer, Traffic, DOTS

Mark Tudor, Assistant Director, Project Development North, DOTS

J. Marc Coté, Assistant Director, Development Coordination

T. William Brockenbrough, Jr., County Coordinator, Development Coordination

Peter Haag, Traffic Studies Manager, Traffic, DOTS

Don Weber, North District Engineer, North District

Matthew Lichtenstein, Canal District Public Works Engineer, Canal District

David Dooley, Service Development Planner, Delaware Transit Corporation

Jeffrey Van Horn, New Castle Subdivision Coordinator, Development Coordination

Pao Lin, New Castle Subdivision Manager, Development Coordination

Ahmed Abdelmoteleb, New Castle Traffic Engineer, Traffic, DOTS

Anthony Aglio, Planning Supervisor, Statewide & Regional Planning

Claudy Joinville, Project Engineer, Development Coordination



April 18, 2016

Mr. Troy Brestel
Project Engineer
Development Coordination
DeIDOT Division of Planning
P O Box 778
Dover, DE 19903

RE: Agreement No. 1654
Project Number T201469011
Traffic Impact Study Services
Task 9A-Wilmington University Brandywine Campus

Dear Mr. Brestel:

Johnson, Mirmiran and Thompson (JMT) has completed the review of the Traffic Impact Study (TIS) for the Wilmington University Brandywine Campus, prepared by Apex Engineering, Inc. This review was assigned Task Number 9A. Apex Engineering, Inc. prepared the report in a manner generally consistent with DeIDOT's *Development Coordination Manual*.

The TIS evaluates the impacts of a proposed college campus comprised of three buildings, totaling 200,000 square feet, on the southwest corner of the US Route 202/Naamans Road (Delaware Route 92)/Beaver Valley Road (New Castle Road 221) intersection in New Castle County. The campus is proposed on a 41.17-acre assemblage of parcels that is zoned ST (Suburban Transition). Access to the campus will be provided via three proposed entrances; one entrance on US Route 202 by way of North Rocky Run Parkway, one entrance on Beaver Valley Road (New Castle Road 221), and one entrance on Thompson Bridge Road (Delaware Route 92). The site is proposed to be constructed in two phases; Phase 1 will consist of one building (80,000 square feet for 333 students) and the first two entrances with construction anticipated to be completed in 2017, Phase 2 will consist of two buildings (120,000 square feet for 667 students) with construction anticipated to be completed in 2025. Construction of the Thompson Bridge Road entrance will be phased to the construction of the third building.

DeIDOT currently has three relevant projects within the study area: the Hazard Elimination Program (HEP) Site CC US 202 at Naamans Road project; the High Risk Rural Roads Program (HRRRP) Site 2 (Rank 6), N224 (Ramsey Road) project; and the US 202 and Brandywine Parkway Intersection project.

DeIDOT's 2011 HEP identified one location within the project area. The 2011 HEP Site CC is a 1.09-mile corridor located along Naamans Road (Delaware Route 92) from US Route 202 to 0.03 miles west of Paper Lane. The Site CC Task I report included a crash summary as well as a review of the Naamans Road intersection with US Route 202. The report mentioned that the installation



of signalized pedestrian crosswalks is proposed across the north, east, and west legs of the US Route 202 and Naamans Road/Beaver Valley Road intersection. Suggested Task I remedial improvements include installing roadway lighting on the northwest and southwest corners of the intersection, replacing the existing X-span signal head configuration with a box span configuration, installing backplates for the signal heads in all four directions, and increasing the yellow change interval for the westbound Naamans Road through phase to five seconds. Signing improvements include Turn Lane, Directional and Confirming Assemblies, and Yield sign upgrades to 48"x48"x48" installation in compliance with the *Delaware Manual on Uniform Traffic Control Devices (DE MUTCD)* as well as striping a lane line between the two westbound Naamans Road left turn lanes. Field visits confirm the intersection lighting has been installed on the northwest and southwest corners and the yellow change interval has been increased on the westbound Naamans Road approach. The X-span configuration has not been upgraded and most of the signing upgrades have not yet been implemented. As part of DelDOT's pavement rehabilitation and resurfacing project along Naamans Road from US Route 202 to Foulk Road (Contract #T201606103), traffic signal and pedestrian improvements are proposed to the US Route 202 and Naamans Road/Beaver Valley Road intersection. Details of these improvements as part of the pavement rehabilitation and resurfacing project are noted below.

DelDOT's 2010 HRRRP identified one location within the project area, The 2010 HRRRP Site 2 (Rank 6) is a 0.49 mile corridor along Ramsey Road from 0.20-mile east of Creek Road to 0.26 mile west of Thompson Bridge Road/Ramsey Road. The report included a crash, speed data, and ball bank summary along Ramsey Road at the horizontal curve west of Thompson Bridge Road/Ramsey Road. Recommendations included a speed limit sign on westbound Ramsey Road, curve warning signs with advisory speed plates, direction large arrow warning signs, object markers, and removal of trees, boulders and debris within the clear zone and right-of-way. Field visits confirm the signage improvements have been implemented.

The US 202 and Brandywine Parkway Intersection Project (Contract # T201504004) includes recommendations to replace existing span wire and signal heads, replace loop detectors on the southbound and westbound approaches, providing pedestrian facilities (curb ramps, crosswalks, pushbuttons, and countdown signal heads) for the north and east legs of the intersection, and installing opticom for each approach to the intersection. Construction is currently underway and is anticipated to be completed Spring of 2016.

In addition, DelDOT has a future pavement rehabilitation and resurfacing project within the project area. The project is along Naamans Road from US Route 202 to 500 feet east of Foulk Road (Contract #T201606103). The scope of work involves milling, patching, and overlays. In addition, signal upgrades at the US Route 202 and Naamans Road/Beaver Valley Road intersection will be included as part of this project (HEP Site CC, US 202 at Naamans Road project). Signal upgrades include replacement of the X-span signal head configuration with a mast arm configuration, loop detector replacement on the northbound and westbound approaches, signal head replacement with backplate installation, installation of opticom on all four approaches, and providing pedestrian



facilities (curb ramps, crosswalks, pushbuttons, and countdown signal heads) for the east, west, and south legs of the intersection. Construction is scheduled to be started in Spring of 2016.

Based on our review of the traffic impact study, we have the following comments and recommendations:

The New Castle County Level of Service (LOS) Standards, as stated in Section 40.11.210 of the Unified Development Code (UDC), apply to all signalized, all-way-stop, and roundabout intersections. Based on an evaluation of the intersections needed to satisfy the UDC criteria along with the LOS evaluation criteria stated in DelDOT’s *Development Coordination Manual*, the proposed development will not meet the standards at the following signalized intersection without the implementation of physical roadway and/or traffic control improvements:

<i>Signalized Intersection</i>	<i>Situations for which LOS deficiencies occur</i>
US Route 202/ Naamans Road/ Beaver Valley Road	2017 PM with Wilmington University (Case 3) 2025 PM with and without Wilmington University (Case 4 and Case 5)

The signalized intersection of US Route 202/Naamans Road/Beaver Valley Road exhibits LOS deficiencies under 2017 and 2025 future conditions (Cases 3, 4, and 5) during the PM peak hour only. Although this intersection does not exhibit unacceptable LOS during future 2017 (Case 2) conditions, the difference in delay between the future 2017 Case 2 (LOS D with overall delay of 54.7 seconds) and future 2017 Case 3 (LOS E with overall delay of 55.7 seconds) PM peak hour is only 1.4 seconds.

In order to address the LOS deficiencies at the US Route 202/Naamans Road/Beaver Valley Road intersection, an additional westbound Naamans Road left turn lane would need to be constructed. However, due to geometric restrictions on the westbound Naamans Road approach (existing closely spaced driveways and intersections), the provision of adequate left turn lane storage would not be feasible. Due to the poor LOS expected at this intersection and the difficulty of remediating the LOS, it is our understanding that Wilmington University proposes to seek a level of service waiver, and has been discussing with DelDOT a Traffic Mitigation Agreement in support of that waiver.

Additionally, based on the LOS evaluation criteria as stated in DelDOT’s *Development Coordination Manual*, movements at the following stop-controlled intersections exhibit LOS deficiencies without the implementation of physical roadway and/or traffic control improvements:

<i>Unsignalized Intersection</i>	<i>Situations for which LOS deficiencies occur</i>
Beaver Valley Road/ Entrance to ACE Office Complex/Site Entrance	2017 PM with Wilmington University (Case 3) 2025 PM with and without Wilmington University (Case 4 and Case 5)
US Route 202/Rocky Run Parkway (rights-in/rights-out)	2025 PM with and without Wilmington University (Case 4 and Case 5)



The unsignalized intersection of Beaver Valley Road/Entrance to ACE Office Complex/Site Entrance during the PM peak hour would exhibit LOS deficiencies under the 2017 future conditions with Wilmington University Brandywine Campus (Case 3) and the 2025 future conditions with or without the Wilmington University Brandywine Campus development (Case 4 and Case 5). The LOS deficiency occurs along the southbound entrance to the ACE Office Complex with a maximum delay of 103.9 seconds (LOS F) and a projected queue of 10 vehicles during the Case 5 PM peak hour. The installation of a traffic signal at this location would mitigate the LOS deficiencies. However, as the delay in the future conditions is along the southbound entrance to the ACE Office Complex, the traffic queues are minimal, and the intersection is in close proximity (675 feet) to the signalized intersection of US Route 202/Naamans Road/Beaver Valley Road, we do not recommend a traffic signal to be installed.

In addition, the existing lane configurations for the proposed northbound approach Site Driveway includes a shared through/left turn lane and a separate right turn lane, which abruptly dead-ends south of Beaver Valley Road. Additionally, a concrete island for right turns into the site currently exists from eastbound Beaver Valley Road. Although no traffic volume is projected to enter the site from eastbound Beaver Valley Road, a right turn lane with minimum storage length is recommended due to the existence of this right turn island.

The unsignalized intersection of US Route 202/Rocky Run Parkway (rights-in/rights-out) would exhibit LOS deficiencies under 2025 future conditions with or without the Wilmington University Brandywine Campus development (Cases 4 and 5) during the PM peak hour only. The maximum projected 95th percentile queue length will be approximately 100 feet along the right turn lane from Rocky Run Parkway. As the campus is not adding any new trips to the right turn movement from Rocky Run Parkway, we do not recommend any improvements be implemented by this developer.

Should the 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 provide a bituminous concrete overlay to the North Rocky Run Parkway existing travel lanes from US Route 202 to the Site Entrance, at DelDOT's discretion. DelDOT should analyze the existing lanes' pavement section and recommend an overlay thickness to the developer's engineer, if necessary.
2. The developer should provide a bituminous concrete overlay to the Beaver Valley Road existing travel lanes along the site frontage from Ramsey Road to US Route 202, at DelDOT's discretion. DelDOT should analyze the existing lanes' pavement section and recommend an overlay thickness to the developer's engineer, if necessary. Based on DelDOT's assessment, only shoulder paving may be needed.



3. The developer should provide a bituminous concrete overlay to the Thompson Bridge Road existing travel lanes from Beaver Valley Road to the Site Entrance, at DelDOT's discretion. DelDOT should analyze the existing lanes' pavement section and recommend an overlay thickness to the developer's engineer, if necessary.
4. The developer should provide the following lane configurations for the proposed Wilmington University Brandywine Campus development entrance on North Rocky Run Parkway, approximately 400 feet west of the North Rocky Run Parkway/North Concord Mall Entrance with US Route 202 intersection, as shown in the table below:

Approach	Current Configuration	Proposed Configuration
Eastbound Driveway	One shared through/left turn/right turn lane	No Change
Westbound North Rocky Run Parkway	One shared through/left turn/right turn lane	One shared through/left turn lane and one right turn lane
Northbound North Rocky Run Parkway	One shared through/left turn lane and one channelized right turn lane	No Change
Southbound Site Entrance	One shared through/left turn/right turn lane	No Change

Based on DelDOT's *Development Coordination Manual*, the recommended minimum storage length (excluding taper) is 100 feet for the westbound North Rocky Run Parkway right turn lane.

5. The developer should construct a full movement entrance for the proposed Wilmington University Brandywine Campus development on Beaver Valley Road, approximately 675 feet west of the Beaver Valley Road intersection with US Route 202, to be consistent with the proposed lane configurations as shown in the table below:

Approach	Current Configuration	Proposed Configuration
Eastbound Beaver Valley Road	One left turn lane and one through lane	One left turn lane, one through lane, and one right turn lane
Westbound Beaver Valley Road	One left turn lane, two through lanes, and one right turn lane	No Change
Northbound Site Entrance	One shared through/left turn lane, and one right turn lane	No Change
Southbound ACE Office Complex	One shared through/left turn lane, and one right turn lane	No Change



Based on DelDOT’s *Development Coordination Manual*, the recommended minimum storage length (excluding taper) is 110 feet for the eastbound Beaver Valley Road right turn lane.

Left turn lanes currently exist at the intersection for both the eastbound and westbound Beaver Valley Road approaches (145 feet of storage). The left turn lane storage lengths based on the HCS analysis results shows 95th percentile queue lengths less than existing storage lengths. The right turn lane storage length for eastbound Beaver Valley Road are based on the higher value between the HCS analysis results and DelDOT’s *Development Coordination Manual*.

- The developer should construct a full movement entrance for the proposed Wilmington University Brandywine Campus development on Thompson Bridge Road, approximately 865 feet south of the Beaver Valley Road intersection with Ramsey Road (at the apex of the horizontal curve), to be consistent with the proposed lane configurations as shown in the table below:

Approach	Current Configuration	Proposed Configuration
Westbound Site Entrance	Approach does not exist	One shared left/right turn lane
Northbound Thompson Bridge Road	One through lane	One through lane and one right turn lane
Southbound Thompson Bridge Road	One through lane	One shared through/left turn lane

Final location of this Site Entrance along Thompson Bridge Road will be based on sight distance requirements in addition to the site plan review.

Based on DelDOT’s *Development Coordination Manual*, the recommended minimum storage length (excluding taper) is 145 feet for the northbound Thompson Bridge Road right turn lane.

As the Thompson Bridge Road access is needed primarily to support the third building on the campus, it is our understanding that Wilmington University and DelDOT have agreed that the design and construction of this driveway can be postponed to coincide with the construction of the third building. As such, the recommendations provided here are based on our review of Apex Engineering, Inc. TIS. If the construction of the building is significantly delayed, it may be appropriate to revisit these recommendations with regard to this entrance along Thompson Bridge Road.



7. The developer should install the following *DE MUTCD* compliant signing at the North Rocky Run Parkway and Site Driveway intersection:
 - a. Stop sign (R1-1) along with Oncoming Traffic Does Not Stop plaque (W4-4bP) for the eastbound Driveway approach
 - b. Stop sign (R1-1) along with Traffic From Right Does Not Stop plaque (W4-2aP) for the northbound Rocky Run Parkway approach
 - c. Stop sign (R1-1) along with Traffic From Left Does Not Stop plaque (W4-2aP) for the southbound Site Entrance Driveway

All stop signs should be 36" x 36" while all supplemental plaques should be 24" x 12".

8. 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 DeIDOT along the North Rocky Run, Beaver Valley Road, Thompson Bridge Road, and US Route 202 site frontages. This fifteen-foot wide easement can deviate further within the proposed development if the shared-use path is not parallel to the roadway. Within this easement, the developer should construct a ten-foot wide shared-use path that meets current AASHTO and ADA standards. A minimum five-foot setback should be maintained from the edge of the pavement to the shared-use path. If feasible, street trees should be provided within the buffer area, in accordance with New Castle County's Unified Development Code. The developer should coordinate with DeIDOT's Subdivision Section during the plan review process to identify the exact locations of the proposed pathway.
 - b. The developer should extend the proposed shared-use path on the northeast corner of the site to tie-in to the curb ramp being constructed on the southwest corner of the US Route 202 and Naamans Road/Beaver Valley Road intersection.
 - c. The developer should provide curb ramps on the southeast corner and a receiving ramp on the southwest corner of the Beaver Valley Road and Ramsey Road intersection. The developer should tie-in the ten-foot wide shared-use path to the curb ramp on the northwest corner of the site at the Beaver Valley Road/Ramsey Road intersection.
 - d. Where internal sidewalks are located alongside of parking spaces, a buffer, physical barrier or signage should be added to eliminate vehicular overhang onto the sidewalk.
 - e. ADA compliant curb ramps and marked crosswalks should be provided at the site entrance locations on Thompson Bridge Road, Beaver Valley Road, and Rocky Run Parkway. The use of Type 3 curb ramps is discouraged.
 - f. Bike parking should be provided near the building entrances within this development. Where the building architecture provides for an awning or other overhang, the bike parking should be covered.
 - g. Utility covers should be moved outside of any paved shoulders or should be flush with the pavement.



- h. The developer should provide connection of the trail on the west side of the Site Entrance and the proposed shared-use path on the east side of the Site Entrance at the intersection of North Rocky Run Parkway.
- i. Wherever applicable, the developer should provide internal sidewalk within the site campus.
- j. The developer should provide lighting for the shared-use path and trail within the proposed campus.
- k. The developer should coordinate with DART to install a bus stop to be ADA compliant (five-foot by nine-foot bus pad) at the North Rocky Run Parkway Site Entrance to the Wilmington University Brandywine Campus property.
- l. The developer should coordinate with DART to install a bus shelter at the bus stop located approximately 200 feet south of the US Route 202 of Naamans Road/Beaver Valley Road intersection.
- m. For any proposed bus stop pad location, the developer should provide internal connection between the proposed shared-use path (ten-foot wide) and the proposed bus pad.

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.

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.

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.

Mir Wahed,

Mir Wahed, P.E., PTOE

cc: Richard Mishura

Enclosure

General Information

Report date: December 2015

Prepared by: Apex Engineers, Inc.

Prepared for: Wilmington University

Tax Parcels: 06-019.00-004 & 06-010.00-025

Generally consistent with DelDOT's *Development Coordination Manual*: Yes.

Project Description and Background

Description: The proposed development will consist of three academic buildings totaling approximately 200,000 square feet (1,000 students). This development will have two phases with Phase 1 including one building of 80,000 SF (333 students) and Phase 2 including two buildings totaling 120,000 SF (667 students).

Location: The subject site is on the southwest corner of the intersection of US Route 202, Naamans Road (Delaware Route 92) and Beaver Valley Road (New Castle Road 221) in New Castle County.

Amount of Land to be developed: The proposed campus is on a 41.17-acre parcel.

Land Use approval(s) needed: Site plan review.

Proposed completion date: The first building (approximately 80,000 square feet) will be constructed and opened Fall of 2017. The remaining two buildings (approximately 120,000 square feet total) will be phased over the next 10 years with completion proposed for 2025.

Proposed access locations: Access to the property will be accomplished through three access points. A full-access entrance on Rocky Run Parkway west of the intersection of Rocky Run Parkway and US Route 202, a full-access entrance on Beaver Valley Road across from the ACE Office Complex, and a full-access entrance on Thompson Bridge Road.

Daily Traffic Volumes:

- 2014 Average Annual Daily Traffic on US Route 202: 29,641 vehicles per day.
- 2014 Average Annual Daily Traffic on Beaver Valley Road: 8,454 vehicles per day.
- 2014 Average Annual Daily Traffic on Thompson Bridge Road: 8,423 vehicles per day.

Site Map



**Graphic is an approximation based on the Site Plan provided by Apex Engineering, Inc.*

Relevant and On-going Projects

DelDOT currently has three relevant projects within the study area: the Hazard Elimination Program (HEP) Site CC US 202 at Naamans Road project; the High Risk Rural Roads Program (HRRRP) Site 2 (Rank 6), N224 (Ramsey Road) project; and the US 202 and Brandywine Parkway Intersection project.

DelDOT's 2011 HEP identified one location within the project area. The 2011 HEP Site CC is a 1.09-mile corridor located along Naamans Road (Delaware Route 92) from US Route 202 to 0.03 miles west of Paper Lane. The Site CC Task I report included a crash summary as well as a review of the Naamans Road intersection with US Route 202. The report mentioned that the installation of signalized pedestrian crosswalks is proposed across the north, east, and west legs of the US Route 202 and Naamans Road/Beaver Valley Road intersection. Suggested Task I remedial

improvements include installing roadway lighting on the northwest and southwest corners of the intersection, replacing the existing X-span signal head configuration with a box span configuration, installing backplates for the signal heads in all four directions, and increasing the yellow change interval for the westbound Naamans Road through phase to five seconds. Signing improvements include Turn Lane, Directional and Confirming Assemblies, and Yield sign upgrades to 48"x48"x48" installation in compliance with the *Delaware Manual on Uniform Traffic Control Devices (DE MUTCD)* as well as striping a lane line between the two westbound Naamans Road left turn lanes. Field visits confirm the intersection lighting has been installed on the northwest and southwest corners and the yellow change interval has been increased on the westbound Naamans Road approach. The X-span configuration has not been upgraded and most of the signing upgrades have not yet been implemented. As part of DelDOT's pavement rehabilitation and resurfacing project along Naamans Road from US Route 202 to Foulk Road (Contract #T201606103), traffic signal and pedestrian improvements are proposed to the US Route 202 and Naamans Road/Beaver Valley Road intersection. Details of these improvements as part of the pavement rehabilitation and resurfacing project are noted below.

DelDOT's 2010 HRRRP identified one location within the project area, The 2010 HRRRP Site 2 (Rank 6) is a 0.49 mile corridor along Ramsey Road from 0.20-mile east of Creek Road to 0.26 mile west of Thompson Bridge Road/Ramsey Road. The report included a crash, speed data, and ball bank summary along Ramsey Road at the horizontal curve west of Thompson Bridge Road/Ramsey Road. Recommendations included a speed limit sign on westbound Ramsey Road, curve warning signs with advisory speed plates, direction large arrow warning signs, object markers, and removal of trees, boulders and debris within the clear zone and right-of-way. Field visits confirm the signage improvements have been implemented.

The US 202 and Brandywine Parkway Intersection Project (Contract # T201504004) includes recommendations to replace existing span wire and signal heads, replace loop detectors on the southbound and westbound approaches, providing pedestrian facilities (curb ramps, crosswalks, pushbuttons, and countdown signal heads) for the north and east legs of the intersection, and installing opticom for each approach to the intersection. Construction is currently underway and is anticipated to be completed Spring of 2016.

In addition, DelDOT has a future pavement rehabilitation and resurfacing project within the project area. The project is along Naamans Road from US Route 202 to 500 feet east of Foulk Road (Contract #T201606103). The scope of work involves milling, patching, and overlays. In addition, signal upgrades at the US Route 202 and Naamans Road/Beaver Valley Road intersection will be included as part of this project (HEP Site CC, US 202 at Naamans Road project). Signal upgrades include replacement of the X-span signal head configuration with a mast arm configuration, loop detector replacement on the northbound and westbound approaches, signal head replacement with backplate installation, installation of opticom on all four approaches, and providing pedestrian facilities (curb ramps, crosswalks, pushbuttons, and countdown signal heads) for the east, west, and south legs of the intersection. Construction is scheduled to be started in Spring of 2016.

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 Wilmington University Brandywine Campus is located within the Investment Level 1 and 2 areas.

Investment Level 1

These areas are often municipalities, towns, or urban/urbanizing places in counties where density is generally higher than surrounding areas. In Investment Level 1 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. Overall, it is the state's intent to use its spending and management tools to maintain and enhance community character, to promote well-designed and efficient new growth, and to facilitate redevelopment in Investment Level 1 Areas.

In Level 1 Areas the state's first priority will be for preserving existing facilities and making safety improvements. Level 1 areas will also be the highest priority for context sensitive transportation system capacity enhancements, transit-system enhancements, ADA accessibility, and for closing gaps in the pedestrian system, including the Safe Routes to School projects. Furthermore, Level 1 areas are the first priority for planning projects and studies, bicycle facilities, signal-system enhancements, and the promotion of interconnectivity between neighborhoods and public facilities.

Investment Level 2

These areas can be composed of less developed areas within municipalities, rapidly growing areas in the counties that have or will have public water and wastewater services and utilities, areas that are generally adjacent to or near Investment Level 1 Areas, smaller towns and rural villages that should grow consistently with their historic character, and suburban areas with public water, wastewater, and utility services. They serve as transition areas between Level 1 and the state's more open, less populated areas. They generally contain a limited variety of housing types, predominantly detached single-family dwellings.

In Investment Level 2 Areas, like Investment Level 1 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. Investments should encourage departure from the typical single-family-dwelling developments and promote a broader mix of housing types and commercial sites encouraging compact, mixed-use development where applicable. Level 2 Areas share similar priorities as with the Level 1 Areas where the aim remains to: make context sensitive transportation system capacity enhancements, preserve existing facilities, make safety enhancements, make transportation system capacity improvements, create transit system enhancements, ensure ADA accessibility, and close gaps in the pedestrian system, including the Safe Routes to School projects. Other priorities for Level 2 Areas include: Corridor Capacity Preservation, off-alignment multi-use paths, interconnectivity of neighborhoods and public facilities, and signal-system enhancements.

Proposed Development's Compatibility with Livable Delaware:

The proposed campus is located in Investment Level 1 and 2 areas and would encourage a wide range of uses and densities. Therefore, the proposed development is generally consistent with the 2010 update of the Livable Delaware "Strategies for State Policies and Spending."

Comprehensive Plans

(Source: New Castle County, 2012 Comprehensive Plan)

New Castle County Comprehensive Plan:

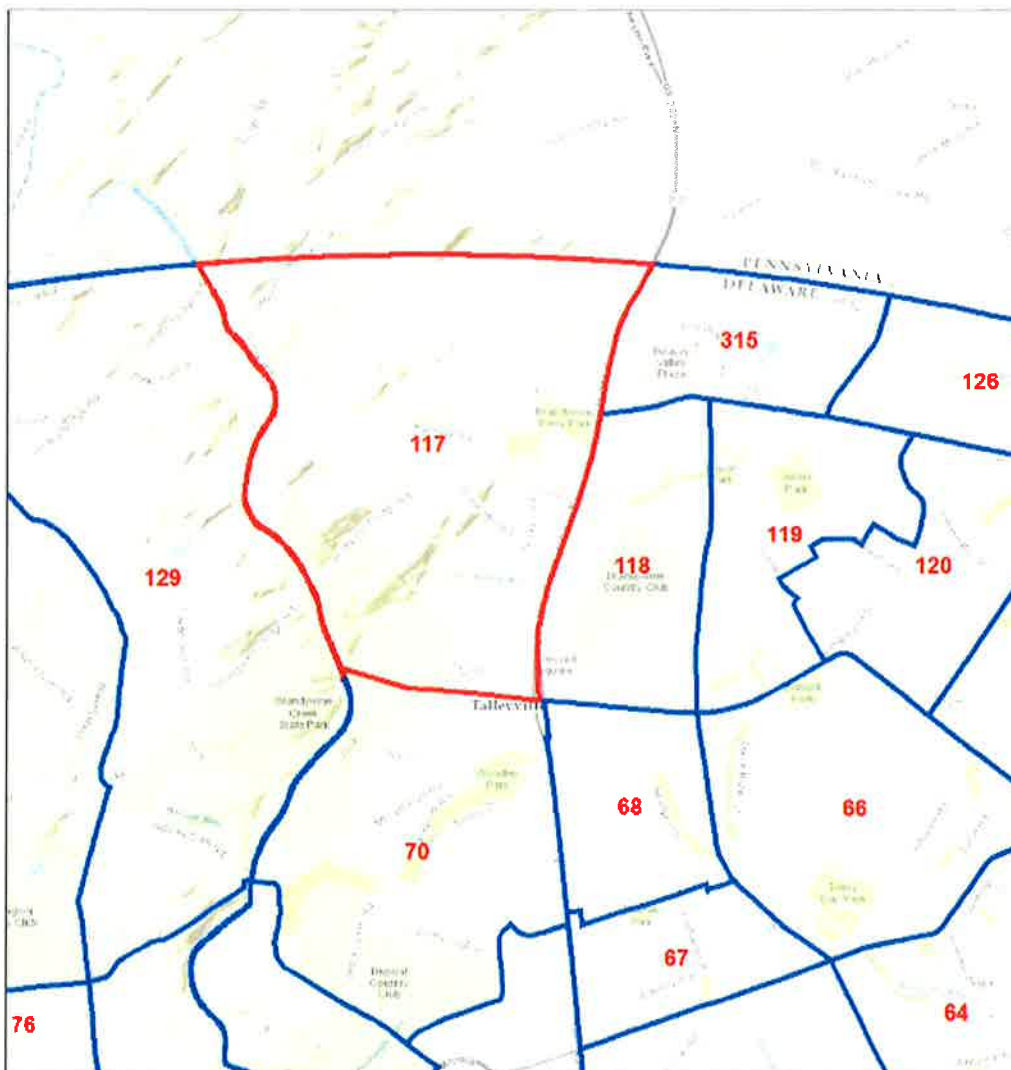
The lands of the subject property are situated within New Castle County and zoned as ST (Suburban Transition). The developer proposes to maintain the existing zoning. According to the New Castle County Comprehensive Plan, the future land use of the property would be within the Medium Density Residential with 3 to 9 dwelling units per acre.

Proposed Expansion's Compatibility with the New Castle County Comprehensive Plan:

Per the New Castle County Comprehensive Plan, a ST zone provides a high quality, moderately high density development with a full range of residential uses (manufactured homes) and limited non-residential uses (neighborhood office, regional office, regional commercial, business park, and industrial). The proposed development would be comprised of a college campus. As such, the development is generally compatible with the New Castle County Comprehensive Plan.

Transportation Analysis Zones (TAZ)

Transportation Analysis Zones (TAZ) where development would be located: 117



Current employment estimate for TAZ: 2,319 in 2010

Future employment estimate for TAZ: 2,637 in 2040

Current Population estimate for TAZ: 263 in 2010

Future Population estimate for TAZ: 754 in 2040

Current household estimate for TAZ: 128 in 2010

Future household estimate for TAZ: 408 in 2040

Relevant committed developments in the TAZ: None

Would the addition of committed developments to current estimates exceed future projections: No.

Would the addition of committed developments and the proposed development to current estimates exceed future projections: No.

Trip Generation

As per the TIS, the trip generation for the proposed development was determined by using the comparable land use and rates/equations contained in the *Trip Generation, 9th Edition: An ITE Informational Report*, published by the Institute of Transportation Engineers (ITE) for ITE Land Use Code 550 (University/College).

The proposed campus is being constructed over two phases, with Phase 1 (One 80,000 SF building for 333 students) being constructed in 2017 and Phase 2 (Two buildings totaling 120,000 SF for 667 students) being constructed in 2025.

The peak period trip generation for the proposed development is included in Table 1.

Table 1
Wilmington University Brandywine Campus

Land Use	ADT	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Phase 1 80,000 Square Feet / 333 Students University/College	1,017	66	18	84	52	109	161
Phase 2 120,000 Square Feet / 667 Students University/College	1,602	107	30	137	63	135	198
Total New Trips	2,619	173	48	221	115	244	359

Overview of TIS

Intersections examined:

1. North Rocky Run Parkway / Site Entrance
2. Beaver Valley Road (New Castle Road 221) / Entrance to ACE Office Complex / Site Entrance
3. Thompson Bridge Road (Delaware Route 92) / Site Entrance
4. Beaver Valley Road / Ramsey Road (New Castle Road 224)
5. Ramsey Road / Thompson Bridge Road
6. Brandywine Creek Road (New Castle Road 222) / Beaver Dam Road (New Castle Road 221C)
7. Brandywine Creek Road / Smith Bridge Road (New Castle Road 221)
8. Thompson Bridge Road / Woodlawn Road (New Castle Road 223)
9. Thompson Bridge Road / Guyencourt Road (New Castle Road 231)
10. Woodlawn Road / Rocky Run Parkway
11. US Route 202 / Naamans Road (Delaware Route 92) / Beaver Valley Road
12. US Route 202 / Entrance to ACE Office Complex
13. US Route 202 / Brandywine Parkway
14. Naamans Road / Entrance to Tally Ho Shopping Center

15. Naamans Road / Perry Place
16. US Route 202 / Washington Avenue
17. US Route 202 / North Rocky Run Parkway / North Entrance to Concord Mall
18. US Route 202 / Rocky Run Parkway (rights-in / rights-out)
19. US Route 202 / Entrance to Concord Mall (English-T intersection)

Note: For intersections 3 and 4; street signs at Beaver Valley Road identify this roadway as Ramsey Road. However, DelDOT functional classification maps and maintenance numbers identify this roadway as Thompson Bridge Road.

Conditions examined:

1. Case 1 – 2015 Existing conditions
2. Case 2 – 2017 No Build conditions without Wilmington University Brandywine Campus development
3. Case 3 – 2017 Build conditions with Wilmington University Brandywine Campus development (Phase 1 – one building 80,000 square feet/333 students)
4. Case 4 – 2025 without Wilmington University Brandywine Campus development
5. Case 5 – 2025 Build conditions with Wilmington University Brandywine Campus development (Phase 2 – three total buildings 200,000 square feet/1,000 students)

Note: In addition to Cases 1, 2, and 3 which was identified in the initial scoping letter dated March 31, 2015, two additional cases were requested to be analyzed in a July 13, 2015 email from DelDOT as the project is expected to have two phases of construction. Due to the second phase of the project being completed in 2025, Cases 4 and 5 were also included as conditions to be studied.

Peak hours evaluated: Weekday morning and weekday evening peak hours.

Committed Developments considered:

1. Pilot School (91,500 square feet/31-classroom school)
2. Village of Brandywine (184 active-adult townhouses/condominiums)
3. Columbia Place (149 active-adult townhouses/condominiums)
4. Concord Mall (378,000 square feet of retail)

Intersection Descriptions

1. North Rocky Run Parkway / Site Entrance

Type of Control: existing stop controlled intersection

Eastbound Approach: (Driveway) existing one shared through/left turn/right turn lane, stop controlled

Westbound Approach: (North Rocky Run Parkway) existing one shared through/left turn/right turn lane; proposed one shared through/left turn lane and one right turn lane

Northbound Approach: (North Rocky Run Parkway) existing one shared through/left turn lane and one channelized right turn lane, stop controlled

Southbound Approach: (Site Entrance) existing one shared through/left turn/right turn lane, stop controlled

2. Beaver Valley Road (New Castle Road 221) / Entrance to ACE Office Complex / Site Entrance

Type of Control: existing stop controlled intersection

Eastbound Approach: (Beaver Valley Road) 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: (Beaver Valley Road) existing one left turn lane, two through lanes, and one channelized right turn lane

Northbound Approach: (Site Entrance) existing one shared through/left turn lane and one channelized right turn lane, stop controlled

Southbound Approach: (Entrance to ACE Office Complex) existing one shared through/left turn lane and one channelized right turn lane, stop controlled

3. Thompson Bridge Road (Delaware Route 92) / Site Entrance

Type of Control: proposed stop controlled intersection (T-intersection)

Westbound Approach: (Site Entrance) existing approach does not exist; proposed one shared left turn/right turn lane, stop controlled

Northbound Approach: (Thompson Bridge Road) existing one through lane; proposed one shared through/right turn lane

Southbound Approach: (Thompson Bridge Road) existing one through lane; proposed one shared through/left turn lane

Note: Street signs at Beaver Valley Road identify this roadway as Ramsey Road. However, DelDOT functional classification maps and maintenance numbers identify this roadway as Thompson Bridge Road.

4. Beaver Valley Road / Ramsey Road (New Castle Road 224)

Type of Control: existing stop controlled intersection (T-intersection)

Eastbound Approach: (Beaver Valley Road) existing one through lane and one right turn lane

Westbound Approach: (Beaver Valley Road) existing one left turn lane and one through lane

Northbound Approach: (Ramsey Road) existing one shared left turn/right turn lane, stop controlled

Note: Street signs at Beaver Valley Road identify this roadway as Ramsey Road. However, DelDOT functional classification maps and maintenance numbers identify this roadway as Thompson Bridge Road.

5. Ramsey Road / Thompson Bridge Road

Type of Control: existing stop controlled intersection (T-intersection)

Eastbound Approach: (Ramsey Road) existing one shared left turn/right turn lane, stop controlled

Northbound Approach: (Thompson Bridge Road) existing one shared through/left turn lane

Southbound Approach: (Thompson Bridge Road) existing one shared through/right turn lane

- 6. Brandywine Creek Road (New Castle 222) / Beaver Dam Road (New Castle Road 221C)**
Type of Control: existing stop controlled intersection (T-intersection)
Westbound Approach: (Beaver Dam Road) existing one shared left turn/right turn lane, stop controlled
Northbound Approach: (Brandywine Creek Road) existing one shared through/right turn lane
Southbound Approach: (Brandywine Creek Road) existing one shared through/left turn lane
- 7. Brandywine Creek Road / Smith Bridge Road (New Castle Road 221)**
Type of Control: existing stop controlled intersection (T-intersection)
Eastbound Approach: (Smith Bridge Road) existing one shared through/right turn lane
Westbound Approach: (Smith Bridge Road) existing one shared through/left turn lane, stop controlled
Northbound Approach: (Brandywine Creek Road) existing one shared left turn/right turn lane, stop controlled
- 8. Thompson Bridge Road / Woodlawn Road (New Castle Road 223)**
Type of control: existing stop controlled intersection (T-intersection)
Westbound Approach: (Woodlawn Road) existing one shared left turn/right turn lane, stop controlled
Northbound Approach: (Thompson Bridge Road) existing one shared through/right turn lane
Southbound Approach: (Thompson Bridge Road) existing one shared through/left turn lane

Note: Woodlawn Road is currently under construction and the east leg is closed to through traffic for the 'Pilot School' committed development site work.
- 9. Thompson Bridge Road / Guyencourt Road (New Castle Road 231)**
Type of Control: existing stop controlled intersection (T-intersection)
Eastbound Approach: (Guyencourt Road) existing one shared left turn/right turn lane, stop controlled
Northbound Approach: (Thompson Bridge Road) existing one shared through/left turn lane
Southbound Approach: (Thompson Bridge Road) existing one shared through/right turn lane
- 10. Woodlawn Road / Rocky Run Parkway**
Type of Control: existing stop controlled intersection
Eastbound Approach: (Woodlawn Road) existing one shared through/left turn/right turn lane
Westbound Approach: (Woodlawn Road) existing one shared through/left turn/right turn lane

Northbound Approach: (Rocky Run Parkway) existing one shared through/left turn/right turn lane, stop controlled

Southbound Approach: (Rocky Run Parkway) existing one shared through/left turn/right turn lane, stop controlled

Note: Woodlawn Road is currently under construction and the west leg is closed to through traffic for the 'Pilot School' committed development site work.

11. US Route 202 / Naamans Road (Delaware Route 92) / Beaver Valley Road

Type of Control: existing signal controlled intersection

Eastbound Approach: (Beaver Valley Road) existing two left turn lanes, two through lanes, and one channelized right turn lane

Westbound Approach: (Naamans Road) existing two left turn lanes, two through lanes, and one channelized right turn lane

Northbound Approach: (US Route 202) existing two left turn lanes, three through lanes, and one channelized right turn lane

Southbound Approach: (US Route 202) existing two left turn lanes, three through lanes, and one channelized right turn lane

12. US Route 202 / Entrance to ACE Office Complex

Type of Control: existing signal controlled intersection

Eastbound Approach: (Entrance to ACE Office Complex) existing one left turn lane and one channelized right turn lane

Northbound Approach: (US Route 202) existing one left turn lane and four through lanes

Southbound Approach: (US Route 202) existing one left turn lane, three through lanes, and one channelized right turn lane

13. US Route 202 / Brandywine Parkway

Type of Control: existing signal controlled intersection

Westbound Approach: (Brandywine Parkway) existing two left turn lanes and two channelized right turn lanes

Northbound Approach: (US Route 202) existing three through lanes and one channelized right turn lane

Southbound Approach: (US Route 202) existing two left turn lanes and three through lanes

14. Naamans Road / Entrance to Tally Ho Shopping Center

Type of Control: existing stop controlled intersection (T-intersection)

Eastbound Approach: (Naamans Road) existing two through lanes and one right turn lane

Westbound Approach: (Naamans Road) existing one left turn lane, stop controlled and two through lanes

Northbound Approach: (Entrance to Tally Ho Shopping Center) existing right turn lane, stop controlled

15. Naamans Road / Perry Place

Type of Control: existing stop controlled intersection (T-intersection)

Eastbound Approach: (Naamans Road) existing one through lane and one shared through/right turn lane

Westbound Approach: (Naamans Road) existing one left turn lane for Entrance to Talley Ho Shopping Center and two through lanes

Northbound Approach: (Perry Place) existing one right turn lane, stop controlled

16. US Route 202 / Washington Avenue

Type of Control: existing stop controlled intersection (T-intersection)

Westbound Approach: (Washington Avenue) existing one right turn lane, stop controlled

Northbound Approach: (US Route 202) existing three through lanes and one right turn lane

Southbound Approach: (US Route 202) existing three through lanes

17. US Route 202 / North Rocky Run Parkway / North Entrance to Concord Mall

Type of Control: existing signal controlled intersection

Eastbound Approach: (North Rocky Run Parkway) existing two left turn lanes and one channelized right turn lane

Westbound Approach: (North Entrance to Concord Mall) existing two left turn lanes and one channelized right turn lane

Northbound Approach: (US Route 202) existing two left turn lanes, three through lanes, and one channelized right turn lane

Southbound Approach: (US Route 202) existing two left turn lanes, three through lanes, and one channelized right turn lane

18. US Route 202 / Rocky Run Parkway (rights-in / rights-out)

Type of Control: existing yield controlled intersection

Eastbound Approach: (Rocky Run Parkway) existing one channelized right turn lane, yield controlled

Northbound Approach: (US Route 202) existing three through lanes

Southbound Approach: (US Route 202) existing three through lanes and one channelized right turn lane

19. US Route 202 / Entrance to Concord Mall (English-T intersection)

Type of Control: existing signal controlled intersection (T-intersection)

Westbound Approach: (Entrance to Concord Mall) existing two left turn lanes and one channelized right turn lane

Northbound Approach: (US Route 202) existing one left turn lane, three through lanes, and one channelized right turn lane

Southbound Approach: (US Route 202) existing one left turn lane and three through lanes

Transit, Pedestrian, and Bicycle Facilities

Existing transit service: Delaware Transit Corporation (DTC) currently provides existing services via DART Routes 2, 35, and 61 which can all be accessed at the Concord Mall, intersection of US Route 202 and Naamans Road, and the Brandywine Town Center Park and Ride Location. The following describes the bus routes and additional stops in the study area:

- The additional designated bus stops for DART Route 2 within the study area are located in the Brandywine Commons at ShopRite and on Naamans Road at Perry Place. DART Route 2 provides 20 round trips on weekdays from 7:09 a.m. to 10:31 p.m., 23 round trips on Saturdays from 6:23 a.m. to 8:02 p.m., and 10 round trips on Sundays from 8:53 a.m. to 7:36 p.m.
- The additional designated bus stops for DART Route 35 within the study area are located along US Route 202 near the ACE Office Complex Driveway and within the ACE Office Complex facility. DART Route 35 provides 12 round trips on weekdays from 5:40 a.m. to 8:01 p.m. This bus service does not run on the weekends.
- The additional designated bus stops for DART Route 61 within the study area are located along US Route 202 near the ACE Office Complex Driveway. DART Route 61 provides 9 round trips on weekdays from 5:16 a.m. to 6:35 p.m. This bus service does not run on the weekends.

Planned transit service: JMT contacted Evan Horgan, Transit Planner at the DTC. In a January 29, 2016 email, Eric Pugliano, Transit Planner at DTC, recommended the following improvements:

- Install a bus stop and a five-foot by nine-foot pad (DelDOT M9 Standard Construction Detail) at the North Rocky Run Parkway Entrance to the Wilmington University Brandywine Campus property.
- Install a bus shelter at the stop located on US Route 202 southbound south of Naamans Road.

Existing bicycle and pedestrian facilities: According to DelDOT's *New Castle County Bicycle Map*, connector bicycle routes exist within the study area. US Route 202 is labeled as a high traffic roadway and includes seven of the project's study intersections (the US Route 202 intersections with Concord Mall South Entrance, Rocky Run Parkway (rights-in/rights-out), North Rocky Run Parkway/Concord Mall North Entrance, Washington Avenue, Naamans Road, ACE Office Complex, and Brandywine Parkway). The regional bicycle route along Naamans Road traverses through two of the project's study intersections (the Naamans Road intersections with Talley Ho Shopping Center and Perry Place). The connector bicycle route along Beaver Valley Road traverses through two of the project's study intersections (the Beaver Valley Road intersections with Entrance to Ace Office Complex/Site Entrance and Thompson Bridge Road). The connector bicycle route along Thompson Bridge Road traverses through four of the project's study intersections (the Thompson Bridge Road intersections with the Site Entrance, Ramsey Road, Woodlawn Road, and Guyencourt Road). The following pedestrian facilities are present at the US Route 202 intersections:

- Pedestrian sidewalks are present at the Concord Mall South Driveway,
- Pedestrian sidewalks, curb ramps, crosswalks, and signal heads with push buttons are present at the Rocky Run Parkway/Concord Mall North Entrance
- Pedestrian sidewalks are present at the Naamans Road/Beaver Valley Road and ACE Office Complex Driveway intersection.

Pedestrian sidewalks are also present at the unsignalized intersections of Rocky Run Parkway/Site Entrance and Woodlawn Road/Rocky Run Parkway.

Planned bicycle and pedestrian facilities: JMT contacted Mr. Anthony Aglio, DeIDOT's Bicycle and Pedestrian Coordinator and Sarah Coakley, DeIDOT's Pedestrian and Safe Routes to School Coordinator. Per a discussion on February 12, 2016 with Mr. Aglio and Ms. Coakley, the following improvements were recommended:

- Ten-foot wide shared-use path along all site frontage roads.
- Install curb ramps on the southeast and southwest corners of Beaver Valley Road and Ramsey Road.
- Connect the shared-use path with the curb ramps on the southwest corner of the intersection of US Route 202 and Naamans Road/Beaver Valley Road and on the southeast corner of the intersection of Beaver Valley Road and Ramsey Road.
- Connect the proposed trail and shared-use path at the North Rocky Run Parkway Site Entrance.
- Provide lighting for the shared-use path and trail within the proposed campus.

Bicycle Level of Service and Bicycle Compatibility Index: According to the League of Illinois Bicyclists (LIB), Bicycle Level of Service (BLOS) is an emerging national standard for quantifying the bike-friendliness of a roadway by measuring on-road bicyclist comfort levels for specific roadway geometries and traffic conditions. Utilizing the 2025 projected AADT along the site frontages, the BLOS with the construction of the proposed development and no bike lanes are summarized below. The BLOS was determined utilizing the calculators published on the LIB website: <http://www.rideillinois.org/blos/blosform.htm>

- US Route 202 – BLOS: C
- Beaver Valley Road – BLOS: B
- Thompson Bridge Road – BLOS: D

Crash Summary

The TIS provides a crash summary that indicates a total of 300 crashes along the study roadways. Below is a breakdown of the crashes per roadway segment from April 2012 to March 2015 for each segment except Naamans Road, which is from December 2011 to December 2014:

- US Route 202 from Concord Mall South Entrance to Zeigler Lane – 199 crashes
- Thompson Bridge Road from Beaver Valley Road to Guyencourt Road – 56 crashes
- Naamans Road from US Route 202 to Perry Place – 21 crashes
- Woodlawn Road from Rocky Run Parkway to Thompson Bridge Road – 9 crashes
- Brandywine Creek Road from Smith Bridge Road to Ramsey Road – 8 crashes
- Beaver Valley Road from US Route 202 to Ramsey Road – 7 crashes

One fatal crash was reported along the study area. The crash involved a pedestrian on the north shoulder along the westbound approach of Naamans Road to US Route 202. This crash occurred at 6:34 a.m. on December 30, 2011 with the police report noting dark lighting and dry surface conditions.

Previous Comments

All comments from the preliminary TIS have been addressed in the final TIS.

General HCS Analysis Comments

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

1. At some intersections, JMT used heavy vehicle percentages consistent with the traffic count data whereas the TIS did not.
2. As all the intersections within the study area experience some increase in volumes, (per the *Development Coordination Manual*) JMT utilized the future intersection PHF 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.
3. Per DelDOT's *Development Coordination Manual*, JMT used a heavy vehicle percentage of 3% for each movement in future scenario analysis, unless the existing heavy vehicle percentage was greater than 3% and 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. The TIS maintained the heavy vehicle percentages utilized in their existing cases throughout the future cases.
4. The TIS utilized approach grades in the analysis, whereas JMT did not.
5. The TIS used a saturation flow rate of 1700 vehicles per hour for unsignalized intersections. JMT used the HCS 2010 Version 6.70 default values of 1800 vehicles per hour for through-movements and 1500 vehicles per hour for right-turns for unsignalized intersections.
6. Differences in critical headways were noticed between the TIS and JMT's analysis. JMT utilized the HCS 2010 Version 6.70 default values, except where otherwise noted.
7. JMT included lane widths obtained from field measurements; it was unclear where the TIS obtained lane widths.
8. JMT incorporated peak hour pedestrian volumes into the analysis based on the existing traffic count data whereas the TIS did not.
9. JMT included storage lengths for turn lanes at signalized intersections, which differed from the measurements in the TIS.
10. JMT analyzed the signalized intersections from US Route 202 and Entrance to Concord Mall (English-T intersection) to US Route 202 and Brandywine Parkway as a corridor which allowed the input of offset data. The TIS did not input offset data as they individually analyzed each intersection as pre-timed (uncoordinated). This analysis difference could cause discrepancies between the TIS and JMT's level of service results.

11. JMT utilized signal timing splits measured in the field (within minimum and maximum times) which differed from the TIS signal timings.
12. JMT utilized Arrival Type 4 along the US Route 202 approaches to each signalized intersection to account for progression along the coordinated corridor, whereas the TIS utilized Arrival Type 3.
13. JMT included passage times within the signal timing consistent with the DeIDOT Timing Plans whereas the TIS did not.
14. At some locations, the TIS modeled right turn movements as permissive within the signal phasing although right turn on red volumes were also included. JMT utilized right turn on red volumes from existing traffic count data.

Table 2
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹ Two-Way Stop Control	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
North Rocky Run Parkway / Site Entrance^{2,3,4}				
Existing (Case 1)				
Eastbound Driveway Approach	A (7.2)	A (7.2)	A (7.2)	A (7.2)
Westbound North Rocky Run Parkway Approach	A (6.7)	A (7.3)	A (6.7)	A (7.3)
Northbound North Rocky Run Parkway Approach	A (8.5)	A (8.8)	A (8.5)	A (8.8)
2017 without development of Wilmington University (Case 2)				
Eastbound Driveway Approach	A (7.2)	A (7.2)	A (7.2)	A (7.2)
Westbound North Rocky Run Parkway Approach	A (6.7)	A (7.3)	A (6.7)	A (7.3)
Northbound North Rocky Run Parkway Approach	A (8.5)	A (8.8)	A (8.5)	A (8.8)
2017 with development of Wilmington University (Case 3)				
Eastbound Driveway Approach	A (7.3)	A (7.3)	A (7.3)	A (7.3)
Westbound North Rocky Run Parkway Approach	A (4.9)	A (6.1)	A (5.0)	A (6.2)
Northbound North Rocky Run Parkway Approach	A (8.5)	A (8.8)	A (8.5)	A (8.8)
Southbound Site Entrance Approach	B (10.6)	C (15.7)	B (10.5)	B (14.2)

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

² JMT analyzed the northbound approach as having one shared left-turn/through lane and one channelized right-turn lane. The TIS analyzed the northbound approach with one shared left-turn/through/right-turn lane.

³ JMT analyzed the westbound approach as having one shared left-turn/through/right-turn lane. The TIS analyzed the westbound approach with one shared left-turn/through lane and one channelized right-turn lane.

⁴ This intersection currently operates with three stop controlled approaches (northbound, southbound, and eastbound) with the westbound approach from US Route 202 as free flow. Per McTrans HCS 2010 technical support, this intersection cannot be analyzed properly in the two-way stop control or all-way stop control methodologies. As the eastbound Driveway approach has low traffic volume, the intersection was analyzed as two-way stop control (northbound and southbound stop-sign control) by the TIS and JMT.

Table 2 (continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹ Two-Way Stop Control	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
North Rocky Run Parkway / Site Entrance^{2,3,4}				
2025 without development of Wilmington University (Case 4)				
Eastbound Driveway Approach	A (7.3)	A (7.3)	A (7.3)	A (7.3)
Westbound North Rocky Run Parkway Approach	A (4.9)	A (6.1)	A (5.1)	A (6.3)
Northbound North Rocky Run Parkway Approach	A (8.6)	A (8.9)	A (8.6)	A (8.9)
Southbound Site Entrance Approach	B (10.9)	C (16.7)	B (10.7)	B (14.9)
2025 with development of Wilmington University (Case 5)				
Eastbound Driveway Approach	A (7.4)	A (7.3)	A (7.4)	A (7.3)
Westbound North Rocky Run Parkway Approach	A (3.5)	A (5.4)	A (3.8)	A (5.7)
Northbound North Rocky Run Parkway Approach	A (8.6)	A (8.9)	A (8.6)	A (8.9)
Southbound Site Entrance Approach	B (11.1)	C (20.2)	B (11.2)	C (17.8)
2025 with development of Wilmington University (Case 5) with Improvements ⁵				
Eastbound Driveway Approach	-	-	A (7.4)	A (7.3)
Westbound North Rocky Run Parkway Approach	-	-	A (3.5)	A (5.4)
Northbound North Rocky Run Parkway Approach	-	-	A (8.6)	A (8.9)
Southbound Site Entrance Approach	-	-	B (10.7)	C (16.9)

⁵ JMT also analyzed the 2025 with development of Wilmington University condition with a westbound right turn lane, due to the results of the auxiliary lane worksheet, whereas the TIS did not.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ⁶ Two-Way Stop Control	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Beaver Valley Road / Entrance to ACE Office Complex / Site Entrance				
Existing (Case 1)				
Eastbound Beaver Valley Road Approach	A (1.4)	A (0.1)	A (1.4)	A (0.1)
Southbound ACE Office Entrance Left	C (16.1)	E (36.2)	C (15.4)	D (31.0)
Southbound ACE Office Entrance Right	A (9.4)	B (10.1)	A (9.4)	A (10.0)
Southbound ACE Office Entrance Approach	C (16.1)	D (33.0)	C (15.4)	D (28.5)
2017 without development of Wilmington University (Case 2)				
Eastbound Beaver Valley Road Approach	A (1.4)	A (0.1)	A (1.4)	A (0.1)
Southbound ACE Office Entrance Left	C (16.3)	E (39.8)	C (15.5)	D (33.6)
Southbound ACE Office Entrance Right	A (9.4)	B (10.2)	A (9.4)	B (10.1)
Southbound ACE Office Entrance Approach	C (16.3)	E (36.2)	C (15.5)	D (30.7)
2017 with development of Wilmington University (Case 3)				
Eastbound Beaver Valley Road Approach	A (1.4)	A (0.1)	A (1.4)	A (0.1)
Westbound Beaver Valley Road Approach	A (0.4)	A (0.3)	A (0.4)	A (0.3)
Northbound Site Entrance Approach	B (10.4)	B (12.1)	B (10.4)	B (11.9)
Southbound ACE Office Entrance Left	C (16.3)	E (39.8)	C (15.8)	E (43.7)
Southbound ACE Office Entrance Right	A (9.4)	B (10.2)	A (9.4)	B (10.1)
Southbound ACE Office Entrance Approach	C (16.3)	E (36.2)	C (15.8)	E (39.6)

⁶ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 3 (continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ⁶ Two-Way Stop Control	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Beaver Valley Road / Entrance to ACE Office Complex / Site Entrance				
2025 without development of Wilmington University (Case 4) ⁷				
Eastbound Beaver Valley Road Approach	A (1.4)	A (0.1)	A (1.4)	A (0.1)
Westbound Beaver Valley Road Approach	A (0.4)	A (0.3)	A (0.3)	A (0.3)
Northbound Site Entrance Approach	B (10.6)	B (12.4)	B (10.6)	B (12.4)
Southbound ACE Office Entrance Left	C (17.6)	F (82.1)	C (16.4)	F (63.2)
Southbound ACE Office Entrance Right	A (9.5)	B (10.4)	A (9.4)	B (10.3)
Southbound ACE Office Entrance Approach	C (17.1)	F (72.5)	C (16.0)	F (56.2)
2025 with development of Wilmington University (Case 5) ⁷				
Eastbound Beaver Valley Road Approach	A (1.4)	A (0.1)	A (1.4)	A (0.1)
Westbound Beaver Valley Road Approach	A (0.9)	A (0.6)	A (0.9)	A (0.6)
Northbound Site Entrance Approach	B (10.7)	B (13.3)	B (10.7)	B (13.3)
Southbound ACE Office Entrance Left	C (19.9)	F (136.5)	C (18.3)	F (103.9)
Southbound ACE Office Entrance Right	A (9.5)	B (10.4)	A (9.4)	B (10.3)
Southbound ACE Office Entrance Approach	C (19.2)	F (119.7)	C (17.7)	F (91.4)

⁷ During the AM peak hour the TIS used a PHF of 0.90, whereas JMT used a PHF of 0.92.

Table 3 (continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Signalized Intersection ⁶	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Beaver Valley Road / Entrance to ACE Office Complex / Site Entrance				
2025 without development of Wilmington University (Case 6) with Mitigation ^{8,9}	-	C (31.4)	A (7.2)	B (18.2)

⁸ Mitigation scenario includes the installation of a traffic signal. JMT analyzed the intersection with a cycle length of 75 seconds, whereas the TIS used a 150 second cycle.

⁹ The TIS analyzed the PM peak hour only, whereas JMT analyzed both peak hours.

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹⁰ Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Thompson Bridge Road / Site Entrance				
2017 with development of Wilmington University (Case 3) ¹¹				
Westbound Site Entrance	-	-	B (14.0)	C (15.6)
Southbound Thompson Bridge Road Approach	-	-	A (8.1)	A (8.1)
2025 with development of Wilmington University (Case 5)				
Westbound Site Entrance	C (15.9)	C (19.3)	B (15.0)	C (17.8)
Southbound Thompson Bridge Road Approach	A (8.2)	A (8.2)	A (8.2)	A (8.2)
2025 with development of Wilmington University (Case 5) <i>with Improvements</i> ¹²				
Westbound Site Entrance	-	-	B (14.8)	C (17.7)
Southbound Thompson Bridge Road Approach	-	-	A (8.2)	A (8.2)

¹⁰ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

¹¹ The TIS did not analyze the Case 3 – 2017 with development of Wilmington University scenario whereas JMT included the analysis.

¹² JMT analyzed the 2025 with development of Wilmington University condition with a northbound right-turn lane, due to the results of the auxiliary lane worksheet, whereas the TIS did not.

Table 5
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹³ Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Beaver Valley Road / Ramsey Road				
Existing (Case 1)				
Westbound Beaver Valley Road Approach	A (6.6)	A (5.4)	A (6.6)	A (5.4)
Northbound Ramsey Road Approach	B (12.0)	B (10.9)	B (11.9)	B (10.9)
2017 without development of Wilmington University (Case 2) ¹⁴				
Westbound Beaver Valley Road Approach	A (6.6)	A (5.5)	A (6.6)	A (5.5)
Northbound Ramsey Road Approach	B (13.1)	B (11.2)	B (12.8)	B (11.2)
2017 with development of Wilmington University (Case 3)				
Westbound Beaver Valley Road Approach	A (6.6)	A (5.5)	A (6.6)	A (5.5)
Northbound Ramsey Road Approach	B (13.1)	B (11.2)	B (12.8)	B (11.2)
2025 without development of Wilmington University (Case 4)				
Westbound Beaver Valley Road Approach	A (6.7)	A (5.6)	A (6.7)	A (5.7)
Northbound Ramsey Road Approach	C (15.3)	B (11.8)	B (14.5)	B (11.8)
2025 with development of Wilmington University (Case 5)				
Westbound Beaver Valley Road Approach	A (6.7)	A (5.6)	A (6.7)	A (5.7)
Northbound Ramsey Road Approach	C (15.3)	B (11.8)	B (14.5)	B (11.8)

¹³ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

¹⁴ During the AM peak hour the TIS used an eastbound right-turn volume of 4, whereas JMT used an eastbound right-turn volume of 14 consistent with the TIS volume figure.

Table 6
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹⁵ Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Ramsey Road / Thompson Bridge Road				
Existing (Case 1)				
Eastbound Ramsey Road Approach	B (10.5)	B (14.4)	B (10.4)	B (13.8)
Northbound Thompson Bridge Road Approach	A (0.0)	A (1.0)	A (0.0)	A (1.0)
2017 without development of Wilmington University (Case 2)				
Eastbound Ramsey Road Approach	B (10.7)	B (14.8)	B (10.5)	B (14.2)
Northbound Thompson Bridge Road Approach	A (0.0)	A (0.9)	A (0.0)	A (0.9)
2017 with development of Wilmington University (Case 3)				
Eastbound Ramsey Road Approach	B (10.7)	B (15.1)	B (10.6)	B (14.4)
Northbound Thompson Bridge Road Approach	A (0.0)	A (0.9)	A (0.0)	A (0.9)
2025 without development of Wilmington University (Case 4)				
Eastbound Ramsey Road Approach	B (11.5)	B (16.5)	B (11.3)	C (15.6)
Northbound Thompson Bridge Road Approach	A (0.1)	A (1.1)	A (0.1)	A (1.1)
2025 with development of Wilmington University (Case 5)				
Eastbound Ramsey Road Approach	B (11.6)	B (16.9)	B (11.4)	C (15.9)
Northbound Thompson Bridge Road Approach	A (0.1)	A (1.1)	A (0.1)	A (1.1)

¹⁵ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 7
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹⁶ Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Brandywine Creek Road / Beaver Dam Road¹⁷				
Existing (Case 1)				
Westbound Beaver Dam Road Approach	A (8.5)	A (9.4)	A (8.6)	A (9.5)
Southbound Brandywine Creek Road Approach	A (6.6)	A (5.6)	A (6.6)	A (5.6)
2017 without development of Wilmington University (Case 2)				
Westbound Beaver Dam Road Approach	A (8.6)	A (9.4)	A (8.6)	A (9.5)
Southbound Brandywine Creek Road Approach	A (6.6)	A (5.7)	A (6.7)	A (5.7)
2017 with development of Wilmington University (Case 3)				
Westbound Beaver Dam Road Approach	A (8.6)	A (9.4)	A (8.6)	A (9.5)
Southbound Brandywine Creek Road Approach	A (6.6)	A (5.7)	A (6.7)	A (5.7)
2025 without development of Wilmington University (Case 4) ¹⁸				
Westbound Beaver Dam Road Approach	A (7.1)	A (8.0)	A (8.7)	A (9.7)
Northbound Brandywine Creek Road Approach	A (7.0)	A (7.6)	-	-
Southbound Brandywine Creek Road Approach	A (8.4)	A (8.5)	A (6.7)	A (5.6)
2025 with development of Wilmington University (Case 5) ¹⁸				
Westbound Beaver Dam Road Approach	A (7.1)	A (8.0)	A (8.7)	A (9.7)
Northbound Brandywine Creek Road Approach	A (7.0)	A (7.6)	-	-
Southbound Brandywine Creek Road Approach	A (8.4)	A (8.5)	A (6.7)	A (5.6)

¹⁶ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

¹⁷ During the AM peak hour the TIS used a PHF of 0.92, whereas JMT used a PHF of 0.93.

¹⁸ The TIS modeled this intersection as all-way stop control whereas JMT modeled the intersection as two-way stop control per existing conditions.

Table 8
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹⁹ Two-Way Stop Control	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Brandywine Creek Road / Smith Bridge Road²⁰ (T-Intersection)				
Existing (Case 1)				
Eastbound Smith Bridge Road Approach	A (8.1)	A (9.2)	-	-
Westbound Smith Bridge Road Approach	A (8.0)	A (8.8)	A (9.9)	A (9.9)
Northbound Brandywine Creek Road Approach	A (8.1)	A (9.7)	A (8.8)	A (9.7)
2017 without development of Wilmington University (Case 2)				
Eastbound Smith Bridge Road Approach	A (8.2)	A (9.2)	-	-
Westbound Smith Bridge Road Approach	A (8.1)	A (8.8)	B (10.0)	A (10.0)
Northbound Brandywine Creek Road Approach	A (8.2)	A (9.8)	A (8.9)	A (9.7)
2017 with development of Wilmington University (Case 3)				
Eastbound Smith Bridge Road Approach	A (8.2)	A (9.2)	-	-
Westbound Smith Bridge Road Approach	A (8.1)	A (8.8)	B (10.0)	A (10.0)
Northbound Brandywine Creek Road Approach	A (8.2)	A (9.8)	A (8.9)	A (9.7)

¹⁹ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

²⁰ As the intersection is an unsignalized intersection with the westbound and northbound approaches with stop-sign control, JMT analyzed the westbound approach as a southbound approach, and modified the headways to maintain the original function of the intersection. JMT analyzed the intersection using two-way stop control, whereas the TIS used all-way stop control with the existing approach layout.

Table 8 (continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹⁹ Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Brandywine Creek Road / Smith Bridge Road²⁰				
2025 without development of Wilmington University (Case 4)				
Eastbound Smith Bridge Road Approach	A (8.5)	A (9.7)	-	-
Westbound Smith Bridge Road Approach	A (8.2)	A (9.3)	B (10.1)	A (9.9)
Northbound Brandywine Creek Road Approach	A (8.4)	B (10.4)	A (9.0)	B (10.2)
2025 with development of Wilmington University (Case 5)				
Eastbound Smith Bridge Road Approach	A (8.5)	A (9.7)	-	-
Westbound Smith Bridge Road Approach	A (8.2)	A (9.3)	B (10.1)	B (10.2)
Northbound Brandywine Creek Road Approach	A (8.4)	B (10.4)	A (9.0)	A (9.9)

Table 9
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ²¹ Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Thompson Bridge Road / Woodlawn Road				
Existing (Case 1)				
Westbound Woodlawn Road Approach	B (13.0)	B (13.8)	B (13.1)	B (13.3)
Southbound Thompson Bridge Road Approach	A (0.5)	A (0.2)	A (0.5)	A (0.2)
2017 without development of Wilmington University (Case 2)				
Westbound Woodlawn Road Approach	B (13.1)	B (15.2)	B (14.3)	B (14.5)
Southbound Thompson Bridge Road Approach	A (0.9)	A (0.2)	A (0.9)	A (0.2)
2017 with development of Wilmington University (Case 3)				
Westbound Woodlawn Road Approach	B (14.3)	B (15.5)	B (14.4)	B (14.7)
Southbound Thompson Bridge Road Approach	A (0.9)	A (0.2)	A (0.9)	A (0.2)
2025 without development of Wilmington University (Case 4)				
Westbound Woodlawn Road Approach	C (15.2)	B (17.2)	C (15.3)	C (16.1)
Southbound Thompson Bridge Road Approach	A (1.0)	A (0.3)	A (1.0)	A (0.3)
2025 with development of Wilmington University (Case 5)				
Westbound Woodlawn Road Approach	C (15.5)	B (18.3)	C (15.6)	C (17.0)
Southbound Thompson Bridge Road Approach	A (1.0)	A (0.3)	A (1.0)	A (0.3)

²¹ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 10
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ²² Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Thompson Bridge Road / Guyencourt Road				
Existing (Case 1)				
Eastbound Guyencourt Road Approach	B (12.0)	B (14.1)	B (11.6)	B (13.3)
Northbound Thompson Bridge Road Approach	A (0.2)	A (0.2)	A (0.2)	A (0.2)
2017 without development of Wilmington University (Case 2)				
Eastbound Guyencourt Road Approach	B (12.4)	B (14.8)	B (11.9)	B (13.9)
Northbound Thompson Bridge Road Approach	A (0.2)	A (0.2)	A (0.2)	A (0.2)
2017 with development of Wilmington University (Case 3)				
Eastbound Guyencourt Road Approach	B (12.4)	C (15.1)	B (12.0)	B (14.1)
Northbound Thompson Bridge Road Approach	A (0.2)	A (0.2)	A (0.2)	A (0.2)
2025 without development of Wilmington University (Case 4)				
Eastbound Guyencourt Road Approach	B (13.1)	C (16.7)	B (12.6)	C (15.4)
Northbound Thompson Bridge Road Approach	A (0.2)	A (0.3)	A (0.2)	A (0.3)
2025 with development of Wilmington University (Case 5)				
Eastbound Guyencourt Road Approach	B (13.3)	C (17.1)	B (12.8)	C (15.8)
Northbound Thompson Bridge Road Approach	A (0.2)	A (0.3)	A (0.2)	A (0.3)

²² For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 11
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ²³ Two-Way Stop Control	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Woodlawn Road / Rocky Run Parkway^{24,25}				
Existing (Case 1)				
Eastbound Woodlawn Road Approach	A (7.0)	A (7.1)	A (0.4)	A (1.8)
Westbound Woodlawn Road Approach	A (7.6)	A (7.3)	A (4.9)	A (2.6)
Northbound Rocky Run Parkway Approach	A (7.6)	A (7.4)	A (9.5)	A (9.6)
Southbound Rocky Run Parkway Approach	A (6.7)	A (6.8)	A (8.5)	A (9.0)
2017 without development of Wilmington University (Case 2)				
Eastbound Woodlawn Road Approach	A (8.2)	A (7.2)	A (0.2)	A (1.3)
Westbound Woodlawn Road Approach	A (8.8)	A (7.4)	A (1.3)	A (1.9)
Northbound Rocky Run Parkway Approach	A (8.7)	A (7.6)	B (11.9)	A (9.8)
Southbound Rocky Run Parkway Approach	A (7.4)	A (6.9)	A (9.2)	A (9.1)
2017 with development of Wilmington University (Case 3)				
Eastbound Woodlawn Road Approach	A (8.2)	A (7.2)	A (0.2)	A (1.3)
Westbound Woodlawn Road Approach	A (8.8)	A (7.4)	A (1.3)	A (1.9)
Northbound Rocky Run Parkway Approach	A (8.7)	A (7.6)	B (11.9)	A (9.8)
Southbound Rocky Run Parkway Approach	A (7.4)	A (6.9)	A (9.2)	A (9.1)

²³ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

²⁴ The TIS modeled this location as an all-way stop control intersection whereas JMT modeled as a two-way stop control intersection per existing field conditions.

²⁵ During the AM peak hour the TIS used a PHF of 0.79, whereas JMT used a PHF of 0.80.

Table 11 (continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ²³ Two-Way Stop Control	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Woodlawn Road / Rocky Run Parkway^{24,25,26}				
2025 without development of Wilmington University (Case 4)				
Eastbound Woodlawn Road Approach	A (8.4)	A (7.3)	A (0.3)	A (1.4)
Westbound Woodlawn Road Approach	A (9.0)	A (7.5)	A (1.7)	A (2.2)
Northbound Rocky Run Parkway Approach	A (8.9)	A (7.6)	B (12.6)	B (10.1)
Southbound Rocky Run Parkway Approach	A (8.2)	A (7.0)	A (9.4)	A (9.3)
2025 with development of Wilmington University (Case 5)				
Eastbound Woodlawn Road Approach	A (8.4)	A (7.3)	A (0.3)	A (1.4)
Westbound Woodlawn Road Approach	A (9.0)	A (7.5)	A (1.7)	A (2.2)
Northbound Rocky Run Parkway Approach	A (8.9)	A (7.6)	B (12.6)	B (10.1)
Southbound Rocky Run Parkway Approach	A (8.2)	A (7.0)	A (9.4)	A (9.3)

²⁶ During the AM peak hour the TIS used a southbound right-turn volume of 0, whereas JMT used a southbound right-turn volume of 6 consistent with the TIS volume figures/spreadsheets.

Table 12
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Signalized Intersection ²⁷	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
US Route 202 / Naamans Road / Beaver Valley Road^{28,29}				
Existing (Case 1)	D (47.7)	D (54.2)	D (39.9)	D (50.6)
2017 without development of Wilmington University (Case 2)	D (48.2)	E (56.6)	D (40.1)	D (54.3)
2017 with development of Wilmington University (Case 3)	D (48.7)	E (58.2)	D (40.5)	E (55.7)
2025 without development of Wilmington University (Case 4)	D (51.4)	E (65.8)	D (43.7)	E (62.5)
2025 with development of Wilmington University (Case 5)	E (56.9)	E (69.6)	D (45.6)	E (64.9)
2025 with development of Wilmington University (Case 5) <i>with Mitigation</i> ³⁰	-	-	D (44.1)	D (54.8)

²⁷ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

²⁸ For the northbound and US Route 202 left turn phasing, the TIS utilized a 2 second all red time whereas JMT utilized a 3 second all red time consistent with the DelDOT Timing Plan.

²⁹ JMT omitted the southbound US Route 202 approach and the eastbound Beaver Valley Road right turn movements from the analysis due to the provision of channelization with an acceleration lane. However, the TIS included these right turn movements in the analysis.

³⁰ Mitigation scenario includes the modification of the westbound Naamans Road approach to provide three left turn lanes, two through lanes, and one right turn lane.

Table 13
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Signalized Intersection³¹ (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
US Route 202 / Entrance to ACE Office Complex^{32,33,34,35}				
Existing (Case 1)	C (21.8)	C (26.5)	A (1.9)	A (4.8)
2017 without development of Wilmington University (Case 2)	C (22.3)	C (27.4)	A (2.2)	A (4.9)
2017 with development of Wilmington University (Case 3)	C (22.3)	C (27.5)	A (2.2)	A (4.9)
2025 without development of Wilmington University (Case 4)	C (23.9)	C (29.8)	A (2.5)	A (5.3)
2025 with development of Wilmington University (Case 5)	C (23.9)	C (29.9)	A (2.5)	A (5.3)

³¹ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

³² JMT omitted the eastbound ACE Office Complex approach right turn movement from the analysis due to the provision of channelization with an acceleration lane. However, the TIS included this right turn movement in the analysis.

³³ Although through movements are not provided along the eastbound ACE Office Complex approach, JMT modeled this approach with a through movement since side street approaches with only left and/or right movements must be coded with through movements having a zero volume to be computed properly per McTrans HCS 2010 technical support.

³⁴ For the northbound and southbound US Route 202 approaches, the TIS utilized protected only left turn phasing, whereas JMT utilized protected and permitted left turn phasing consistent with field observations.

³⁵ For the northbound approach of US Route 202, the TIS modeled three through lanes and one separate right turn lane, whereas JMT modeled four through lanes, consistent with field observations.

Table 14
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Signalized Intersection³⁶ (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
US Route 202 / Brandywine Parkway^{37,38,39,40}				
Existing (Case 1)	B (17.4)	C (26.5)	A (7.6)	B (18.1)
2017 without development of Wilmington University (Case 2)	B (17.6)	C (27.2)	A (4.5)	B (16.7)
2017 with development of Wilmington University (Case 3)	B (17.6)	C (26.7)	A (4.5)	B (16.7)
2025 without development of Wilmington University (Case 4)	B (18.4)	C (29.3)	A (4.8)	B (17.6)
2025 with development of Wilmington University (Case 5)	B (18.5)	C (29.4)	A (4.8)	B (17.6)

³⁶ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

³⁷ JMT omitted the southbound US Route 202 approach right turn movement from the analysis as this is a free movement north of the traffic signal. However, the TIS included this right turn movements in the analysis.

³⁸ The TIS modeled the westbound Brandywine Parkway approach with two left turn lanes and one separate right turn lane, whereas the JMT modeled this approach with two left turn lane and two right turn lanes consistent with field conditions.

³⁹ For the Existing Conditions (Case 1) scenario, both the TIS and JMT modeled the westbound Brandywine Parkway green time with 30 seconds, consistent with field measured timings as this approach received this green time regardless of traffic demand. For future conditions JMT optimized these timings consistent with minimum/maximum timings provided from DelDOT timing sheets.

⁴⁰ For future northbound and southbound US Route 202 approaches, the TIS utilized a 3 and 4 second yellow time, whereas JMT utilized a 6 second yellow time consistent with the DelDOT Timing Plan.

Table 15
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection⁴¹ Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Naamans Road / Entrance to Tally Ho Shopping Center⁴²				
Existing (Case 1)				
Westbound Naamans Road Approach	A (0.6)	A (1.2)	A (0.6)	A (1.2)
Northbound Tally Ho Entrance Approach	B (11.2)	C (20.5)	B (11.3)	C (20.2)
2017 without development of Wilmington University (Case 2)				
Westbound Naamans Road Approach	A (0.6)	A (1.1)	A (0.6)	A (1.2)
Northbound Tally Ho Entrance Approach	B (11.2)	C (20.5)	B (11.3)	C (21.0)
2017 with development of Wilmington University (Case 3)				
Westbound Naamans Road Approach	A (0.6)	A (1.2)	A (0.6)	A (1.2)
Northbound Tally Ho Entrance Approach	B (11.3)	C (22.3)	B (11.3)	C (22.0)
2025 without development of Wilmington University (Case 4)				
Westbound Naamans Road Approach	A (0.6)	A (1.4)	A (0.6)	A (1.5)
Northbound Tally Ho Entrance Approach	B (11.7)	D (28.5)	B (11.7)	D (27.8)
2025 with development of Wilmington University (Case 5)				
Westbound Naamans Road Approach	A (0.5)	A (1.5)	A (0.6)	A (1.5)
Northbound Tally Ho Entrance Approach	B (11.8)	D (30.9)	B (11.8)	D (30.0)

⁴¹ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁴² The TIS analyzed the intersection using a major-street median type of Left+Thru with 1 car of storage. JMT analyzed the intersection with no median, due to the nature of the left-turn lane and lack of northbound through and left turn movements.

Table 16
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ⁴³ Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Naamans Road / Perry Place^{44,45}				
Existing (Case 1)				
Northbound Perry Place Approach	B (10.5)	B (14.9)	B (10.4)	B (14.7)
2017 without development of Wilmington University (Case 2)				
Northbound Perry Place Approach	B (10.5)	C (15.2)	B (10.5)	C (15.0)
2017 with development of Wilmington University (Case 3)				
Northbound Perry Place Approach	B (10.6)	C (15.5)	B (10.5)	C (15.4)
2025 without development of Wilmington University (Case 4)				
Northbound Perry Place Approach	B (10.8)	C (16.8)	B (10.8)	C (16.6)
2025 with development of Wilmington University (Case 5)				
Northbound Perry Place Approach	B (10.9)	C (17.3)	B (10.8)	C (17.1)

⁴³ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁴⁴ The TIS modeled the intersection using a major-street median type of Left+Thru with 1 car of storage. JMT modeled the intersection with no median, since the westbound approach of Naamans Road is not part of the intersection.

⁴⁵ JMT modeled the eastbound approach as one through lane and a shared through/right-turn lane whereas the TIS modeled the eastbound approach as two through lanes and a right turn lane.

Table 17
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ⁴⁶ Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
US Route 202 / Washington Avenue⁴⁷				
Existing (Case 1)				
Westbound Washington Avenue Approach	B (13.2)	C (21.2)	B (12.7)	B (14.4)
2017 without development of Wilmington University (Case 2)				
Westbound Washington Avenue Approach	B (13.5)	C (23.1)	B (12.8)	B (13.5)
2017 with development of Wilmington University (Case 3)				
Westbound Washington Avenue Approach	B (13.5)	C (23.2)	B (12.8)	B (13.6)
2025 without development of Wilmington University (Case 4)				
Westbound Washington Avenue Approach	B (14.3)	D (25.4)	B (13.1)	B (12.5)
2025 with development of Wilmington University (Case 5)				
Westbound Washington Avenue Approach	B (14.3)	D (25.6)	B (13.2)	B (12.6)

⁴⁶ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁴⁷ JMT modeled US Route 202 as a corridor; therefore the proportion of time blocked was included. The TIS did not include proportion of time blocked in their analysis.

Table 18
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Signalized Intersection ⁴⁸	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
US Route 202 / North Rocky Run Parkway / North Entrance to Concord Mall^{49,50,51}				
Existing (Case 1)	F (104.6)	F (154.8)	B (13.0)	B (16.8)
2017 without development of Wilmington University (Case 2)	F (110.8)	F (152.4)	B (14.0)	C (20.3)
2017 with development of Wilmington University (Case 3)	F (110.0)	F (102.1)	B (14.6)	C (20.8)
2025 without development of Wilmington University (Case 4)	F (140.1)	F (130.1)	B (14.6)	C (21.2)
2025 with development of Wilmington University (Case 5)	F (138.4)	F (128.7)	B (16.6)	C (21.7)

⁴⁸ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁴⁹ The TIS included an exclusive pedestrian phase crossing the south leg of the intersection, as was summarized in the TIS report. Based on zero pedestrians crossing this leg and existing field timings noting no usage of the exclusive pedestrian phase, JMT analyzed this intersection without an exclusive pedestrian phase occurring during the AM and PM peak hours.

⁵⁰ JMT omitted the westbound North Entrance to the Concord Mall approach right turn movement from the analysis due to the provision of channelization with an acceleration lane. However, the TIS included this right turn movements in the analysis.

⁵¹ Although through movements are not provided along the westbound Concord Mall North Driveway approach, JMT modeled this approach with a through movement since side street approaches with only left and/or right movements must be coded with a through movement having a zero volume to be computed properly per McTrans HCS 2010 technical support.

Table 19
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ⁵² Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
US Route 202 / Rocky Run Parkway (rights-in / rights-out)⁵³				
Existing (Case 1)				
Eastbound Rocky Run Parkway Approach	D (28.9)	E (37.1)	B (10.5)	D (31.6)
2017 without development of Wilmington University (Case 2)				
Eastbound Rocky Run Parkway Approach	D (30.3)	E (42.1)	B (10.6)	D (31.6)
2017 with development of Wilmington University (Case 3)				
Eastbound Rocky Run Parkway Approach	D (30.5)	E (45.0)	B (10.6)	D (31.4)
2025 without development of Wilmington University (Case 4) ⁵⁴				
Eastbound Rocky Run Parkway Approach	E (37.7)	F (88.9)	B (10.8)	E (47.2)
2025 with development of Wilmington University (Case 5) ⁵⁴				
Eastbound Rocky Run Parkway Approach	E (38.2)	F (100.8)	B (10.9)	F (52.5)

⁵² For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁵³ JMT modeled US Route 202 as a corridor; therefore the proportion of time blocked was included. The TIS did not include proportion of time blocked in their analysis.

⁵⁴ As this intersection is a right-in/right-out driveway, no mitigation scenario was analyzed.

Table 20
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Wilmington University Brandywine Campus
Report Dated December 2015
Prepared by Apex Engineering, Inc.

Signalized Intersection ⁵⁵ (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
US Route 202 / Entrance to Concord Mall (English-T Intersection)^{56,57,58,59}				
Existing (Case 1)	C (20.7)	C (31.2)	A (3.2)	A (7.3)
2017 without development of Wilmington University (Case 2)	C (21.9)	C (32.3)	A (3.7)	B (11.6)
2017 with development of Wilmington University (Case 3)	C (22.0)	C (32.6)	A (3.7)	B (11.7)
2025 without development of Wilmington University (Case 4)	C (23.2)	C (34.9)	A (3.8)	B (12.7)
2025 with development of Wilmington University (Case 5)	C (23.4)	D (35.5)	A (3.8)	B (12.9)

⁵⁵ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁵⁶ The TIS analyzed this English-T intersection as one intersection with exclusive northbound and southbound US Route 202 left turn phasing and a separate Concord Mall phase while JMT analyzed this location as two intersections to match existing signal phasing (northbound US Route 202 advance, southbound US Route 202 exclusive left turn/WB Concord Mall overlap phase, and US Route 202 northbound and southbound phase (with permissive left turns)).

⁵⁷ For the AM peak hour, the TIS utilized a PHF of 0.94 while JMT utilized a PHF of 0.95, consistent with the traffic count data.

⁵⁸ JMT omitted the northbound US Route 202 right turn movement from the analysis as this is a free movement into the mall. However, the TIS included this right turn movements in the analysis.

⁵⁹ For the northbound and southbound US Route 202 approaches, the TIS utilized protected only left turn phasing whereas JMT utilized protected and permitted left turn phasing consistent with field observations.