



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

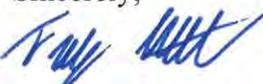
March 11, 2013

SHAILEN P. BHATT
SECRETARY

Mr. Michael Maris
VMI Maris & Associates, Inc.
125 State Street
Suite 105
Hackensack, NJ 07601

Dear Mr. Maris:

The enclosed Traffic Operational Analysis (TOA) review letter for the **Christiana Mall Expansion** 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 TOA to conform to DelDOT's Standards and Regulations for Subdivision Streets and State Highway Access 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. Constance C. Holland, Office of State Planning Coordination
Mr. David Culver, New Castle County Department of Land Use
Mr. Andrew Parker, McCormick Taylor, Inc.
DelDOT Distribution

DelDOT Distribution

John Janowski, New Castle County Department of Land Use
Owen Robatino, New Castle County Department of Land Use
Frederick H. Schranck, Deputy Attorney General
Natalie Barnhart, Director, Transportation Solutions (DOTS)
Drew Boyce, Director, Planning
Mark Luszcz, 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
Thomas E. Meyer, Traffic Studies Manager, Traffic, DOTS
Mark Alexander, Canal District Engineer, Canal District
Kevin Canning, Canal District Public Works Engineer, Canal District
Wayne Henderson, Service Development Planner, Delaware Transit Corporation
Darren O'Neill, Regional Group Engineer, Project Development North, DOTS
John Garcia, New Castle Subdivision Coordinator, Development Coordination
Joshua Schwartz, Subdivision Manager, Development Coordination
Ahmed Abdelmoteleb, New Castle Traffic Engineer, Traffic, DOTS
Marco Boyce, Planning Supervisor, Statewide & Regional Planning



March 11, 2013

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

RE: Agreement No. 1529
Traffic Impact Study Services
Task No. 17A – Christiana Mall Expansion

Dear Mr. Brestel,

McCormick Taylor has completed its review of the Traffic Operational Analysis (TOA) for the Christiana Mall Expansion prepared by VMI Maris & Associates (VMI), dated December 2012. This review was assigned as Task Number 17A. VMI prepared the report in a manner generally consistent with DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*.

The TOA evaluates impacts of the Christiana Mall Expansion including a Cabela's store, an expansion of a proposed multi-plex cinema, and a small expansion of mall retail space. The 100,000 square-foot free-standing Cabela's sporting goods store is proposed to be located at the north end of the Christiana Mall parking lot, north of Nordstrom and on the north side of the ring road, where the Delaware Transit Corporation (DTC) Park & Ride facility is currently located. The Park & Ride facility will need to be relocated before the site is redeveloped with the Cabela's store. The remaining 7,043 square-foot expansion would consist of a 6,193 square-foot expansion of a proposed multi-plex cinema (to be located in the northeast portion of the mall parking lot east of Nordstrom and north of Target) and an 850 square-foot expansion of retail space near the south end of the mall. The proposed cinema would have a total size of 73,850 square feet; 67,457 square feet of which was previously approved (leaving the remaining 6,193 square-foot expansion as part of this TOA). The mall and proposed developments are located in New Castle County, Delaware. The entire Christiana Mall property consists of approximately 122 acres of land. Construction is anticipated to be complete by 2014.

Access to Cabela's and the cinema would be provided by multiple parking lot access points along the mall ring road. Analyses of the site access points were not part of the scope of this TOA. Access between the mall ring road and the surrounding roadway network is provided at four intersections. One of these intersections, Mall Ring Road and "Center Boulevard Connector" (aka Center Boulevard (New Castle Road 336A)), was included in the scope of this TOA. Mall Ring Road is privately-owned and maintained, whereas Center Boulevard Connector is State-maintained. For clarification, a TOA Roadway Identification Map is shown on Page 10.

The land is currently zoned as CR (Commercial Regional) within New Castle County, and the developer does not propose to change the zoning.

DelDOT does not currently have any active projects in the immediate area of the intersections analyzed in this TOA. However, there are four relevant projects located nearby. These are:

- SR 1 / I-95 Interchange Improvements Project
- Road A / SR 7 Improvements Project
- Christiana Mall Park & Ride
- Churchmans Crossing Study

The SR 1 / I-95 Interchange Improvements Project (State Contract No. T200809003) is a large, multi-year construction project that will add high-speed connecting ramps from northbound Delaware Route 1 to northbound I-95 and from southbound I-95 to southbound Delaware Route 1. It will separate local traffic movements from high-speed traffic movements. It will modify the alignment of Delaware Route 1 and will include construction of a new ramp (Ramp U) from southbound Center Boulevard at Road A to northbound Delaware Route 7 and I-95. This project has been under construction since 2011 and should be complete by 2014.

The Road A / SR 7 Improvements Project (State Contract No. T201009002) will result in widening of Road A and improvements to surrounding intersections to maintain acceptable levels of service along this section of roadway. Currently, Road A traffic volumes and operations are being monitored as part of an agreement that DelDOT entered into in 2006 with the developer of the planned Christiana Fashion Center (to be located east of the eastern terminus of Road A). DelDOT agreed to monitor and analyze traffic conditions at the intersections on Road A every two years. When conditions reach Level of Service (LOS) E or F, DelDOT will finalize design and construct improvements needed to attain LOS D or better. Preliminarily planned improvements include constructing the aforementioned Ramp U in 2013, adding capacity via lane configuration changes at the intersection of Road A and Center Boulevard (before the Christiana Fashion Center opens), and eventually constructing a second Road A bridge over Delaware Route 1 parallel to the existing span such that Road A would consist of three westbound lanes on the existing bridge and three eastbound lanes on the planned second bridge.

The Christiana Mall Park & Ride Project will entail the development, design and construction of a new DTC Park & Ride facility in a new location most likely outside of the Christiana Mall parking lot. The new facility will need to provide for pedestrians and vehicles as well as buses and other needs of a Park & Ride transit center. The existing Park & Ride facility must be relocated to a temporary location before construction of the Cabela's store begins in 2013, but then this DelDOT project will eventually move the Park & Ride facility to a permanent location. Discussions and initial project development for relocating the Park & Ride to a new long-term location are underway, but the schedule for design and eventual construction is undetermined at this time.

In response to increasing congestion throughout the area, the Churchmans Crossing Study began in the mid-1990's as a joint effort between DelDOT, New Castle County and WILMAPCO to study transportation facilities and operations in the Churchmans Crossing area and to develop

recommendations to alleviate anticipated increased congestion primarily through a transportation and land use plan that would enhance quality of life, plan for sustainable growth and development, and provide opportunity for transportation choices. The Churchmans Crossing Study Area borders on the Christiana Mall property and the location of the subject development of this TOA, and the area functions in some ways like a Transportation Improvement District (TID). The study included traffic counts and analyses, traffic forecasts, and evaluation of transit, bicycle and pedestrian facilities. It provided recommendations regarding land use, intersection improvements, new roadways, bicycle and pedestrian facilities, increased transit options and improved facilities, and Travel Demand Management measures. Over the past 15 years, many improvements developed through the Churchmans Crossing Study program have been planned, designed, and constructed. Conditions are monitored and analyzed on an annual basis to determine the need and timing for potential future improvements. This DelDOT program is anticipated to continue for the foreseeable future.

Regarding DelDOT's Hazard Elimination Program (HEP), a 0.62-mile stretch of Road A / Center Boulevard / Center Boulevard Connector, from Christiana-Stanton Road (New Castle Road 26) to the Christiana Mall Ring Road was within Site G of the 2010 HEP. This included all three of the intersections analyzed in this TOA. The HEP committee recommended remedial improvements consisting of signing and pavement marking changes, replacing crosswalks at the Mall Ring Road intersection, relocating pedestrian signals, and replacing traffic signal indications. The relocation of pedestrian signals and replacement of traffic signal indications have already been implemented. Some of the remaining HEP improvements, such as replacing crosswalks at the Mall Ring Road intersection, may not be applicable if the improvements recommended in this TOA are implemented. The remaining HEP improvements involving signing and pavement marking changes at the intersection of Center Boulevard and Dick's Sporting Goods Driveway have not been completed and are still applicable. The committee recommended no additional studies.

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

In July 2012, the Applicant requested a Traffic Impact Study (TIS) waiver for this development based on provisions in Section 40.11.121 of the New Castle County Unified Development Code (UDC). The applicant then prepared and submitted a TOA in December 2012, which is the subject of this review. The scope of work for the TOA is largely based on a memo from DelDOT, dated May 25, 2012, describing DelDOT's expectation of what would be required for a TOA if a TIS waiver were to be requested. Our understanding is that if the TIS waiver is granted, the proposed development would not be subjected to LOS requirements as stated in the UDC, other than having to demonstrate LOS D at the intersection of Center Boulevard and Center Boulevard Connector. If the TIS waiver is not granted, our review of the TOA has found that the proposed development would meet the New Castle County LOS Standards for a TIS as stated in Section 40.11.210 of the UDC.

However, based on DelDOT’s evaluation criteria, the stop-controlled minor street approaches at the following intersection exhibit LOS deficiencies without the implementation of physical roadway and/or traffic control improvements:

<i>Intersection</i>	<i>Existing Traffic Control</i>	<i>Situations for which deficiencies occur</i>
Mall Ring Road and Center Boulevard Connector	Unsignalized	2012 Existing Saturday; 2014 Saturday without and with Christiana Mall Expansion;

Should the County choose to approve the proposed development, the following items should be incorporated into the site design and reflected on the record plan. 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 improve the intersection of Mall Ring Road and Center Boulevard Connector to provide for one through lane and one channelized right-turn lane on the northbound approach, one left-turn lane and one channelized right-turn lane on the westbound approach and one left-turn lane and one through lane on the southbound approach. Further, the crosswalks on the north and east legs of the intersection should be removed, and the channelizing islands on the northeast quadrant should be shaped to facilitate operation of the westbound approach as a double right-turn during peak traffic periods.
2. When determined by the Mall management in its sound judgment, the developer should provide traffic control personnel (off-duty police) to direct traffic at the intersection of Mall Ring Road and Center Boulevard Connector to provide improved traffic flow during the holiday shopping season and as necessary on weekends and during special events.
3. While the intent is to keep the intersection of Mall Ring Road and Center Boulevard Connector unsignalized for the time being, installing a traffic signal may become desirable at some point in the future. As such, the developer should enter into a traffic signal agreement with DelDOT for the intersection of Mall Ring Road and Center Boulevard Connector. The agreement should include pedestrian signals, crosswalks, interconnection, and ITS equipment such as CCTV cameras at DelDOT’s discretion. The developer should coordinate with DelDOT on the potential future implementation of the traffic signal.
4. The developer should work with DelDOT’s Traffic Section to evaluate Saturday midday and weekday evening traffic conditions at the Mall Ring Road/Center Boulevard Connector and Center Boulevard/Center Boulevard Connector intersections and on the segment of the Center Boulevard Connector between the two intersections following the completion of the SR 1 / I-95 Interchange Improvements Project and the opening of the subject sporting goods store in order to determine whether additional improvements will be necessary. The evaluation should be done based on traffic counts performed during

average traffic conditions at the Mall, between September 4 and October 31, 2014, except that DelDOT's Traffic Section may require that the counts be postponed if necessary to obtain representative results.

5. The developer should coordinate with DelDOT regarding an equitable share contribution toward potential future transportation improvements associated with DelDOT's Churchmans Crossing Study.
6. The developer should coordinate with DelDOT regarding a possible contribution toward DelDOT's Road A / SR 7 Improvements Project. The Contribution should be limited to an equitable share of any additional improvements required by the sporting goods store project and over and above the improvements that DelDOT is already obligated to make.
7. The developer should make the following transit and pedestrian improvements:
 - a. The developer will demarcate the relocated Park and Ride spaces with yellow paint to dissuade commuters from parking in the Target parking area (see attached signage plan on Page 9).
 - b. The developer shall extend the bus stop staging area adjacent to the relocated Park and Ride, and shall widen the proposed sidewalk, from the bus stop to the theater, to eight feet.
 - c. The developer shall install a seasonal bus stop adjacent to the movie theater, in accordance with DTC's standards for seasonal bus stops.
 - d. The developer will provide for a space adjacent to the relocated Park and Ride for a portable bathroom facility. The cost and maintenance will be the responsibility of DTC.

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



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

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

Sincerely,

McCormick Taylor, Inc.

A handwritten signature in black ink, appearing to read "Andrew J. Parker".

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

Enclosure

General Information

Report date: December 2012

Prepared by: VMI Maris & Associates (VMI)

Prepared for: Christiana Mall, LLC

Tax parcels: 09-024.00-010, 019, 020, 021, 022, 023, 024, 025, 028, 034, and 035

Generally consistent with DeIDOT's Standards and Regulations for Subdivision Streets and State Highway Access: Yes

Project Description and Background

Description: The proposed development would consist of a 100,000 square-foot Cabela's sporting goods store along with a 7,043 square-foot expansion of the Christiana Mall. Currently, the Delaware Transit Corporation (DTC) operates a Park & Ride facility at the north end of the mall parking lot where the Cabela's store is proposed to be located. The Park & Ride facility will need to be relocated before the site is redeveloped with the Cabela's store.

Location: Cabela's is proposed to be located at the north end of the Christiana Mall parking lot, north of Nordstrom and on the north side of the ring road, where the DTC Park & Ride facility is currently located. The remaining 7,043 square-foot expansion would consist of a 6,193 square-foot expansion of the proposed multi-plex cinema (to be located in the northeast portion of the mall parking lot east of Nordstrom and north of Target) and an 850 square-foot expansion of retail space near the south end of the mall. The proposed cinema would have a total size of 73,850 square feet; 67,457 square feet of which was previously approved (leaving the remaining 6,193 square-foot expansion as part of this TOA). The mall and proposed developments are located in New Castle County, Delaware. A site location map is included on Page 8.

Amount of land to be developed: The total acreage of the 11 parcels making up the entire Christiana Mall property is 122.4 acres.

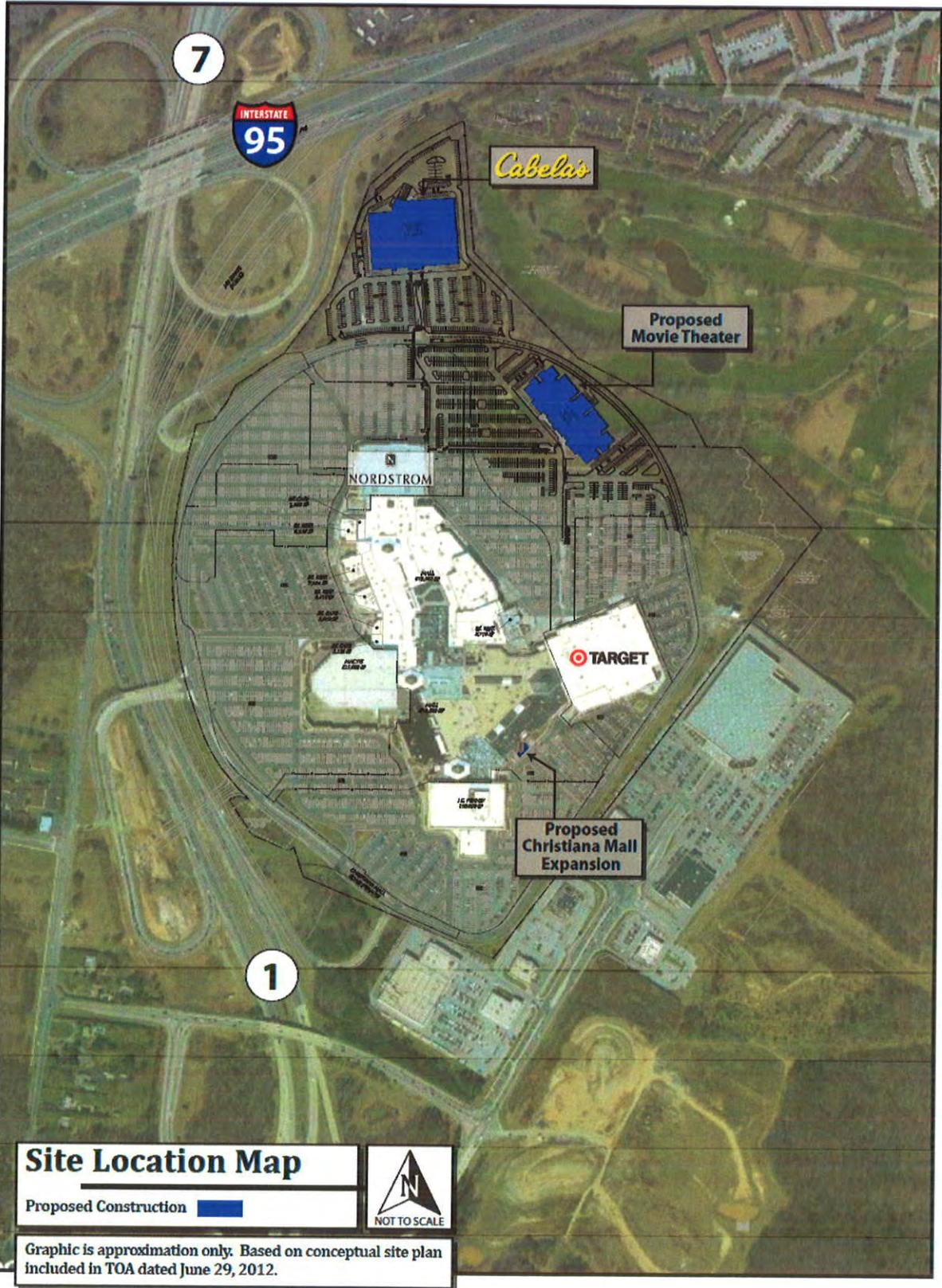
Land use approval(s) needed: Subdivision approval. The land is currently zoned as CR (Commercial Regional) within New Castle County, and the developer does not propose to change the zoning.

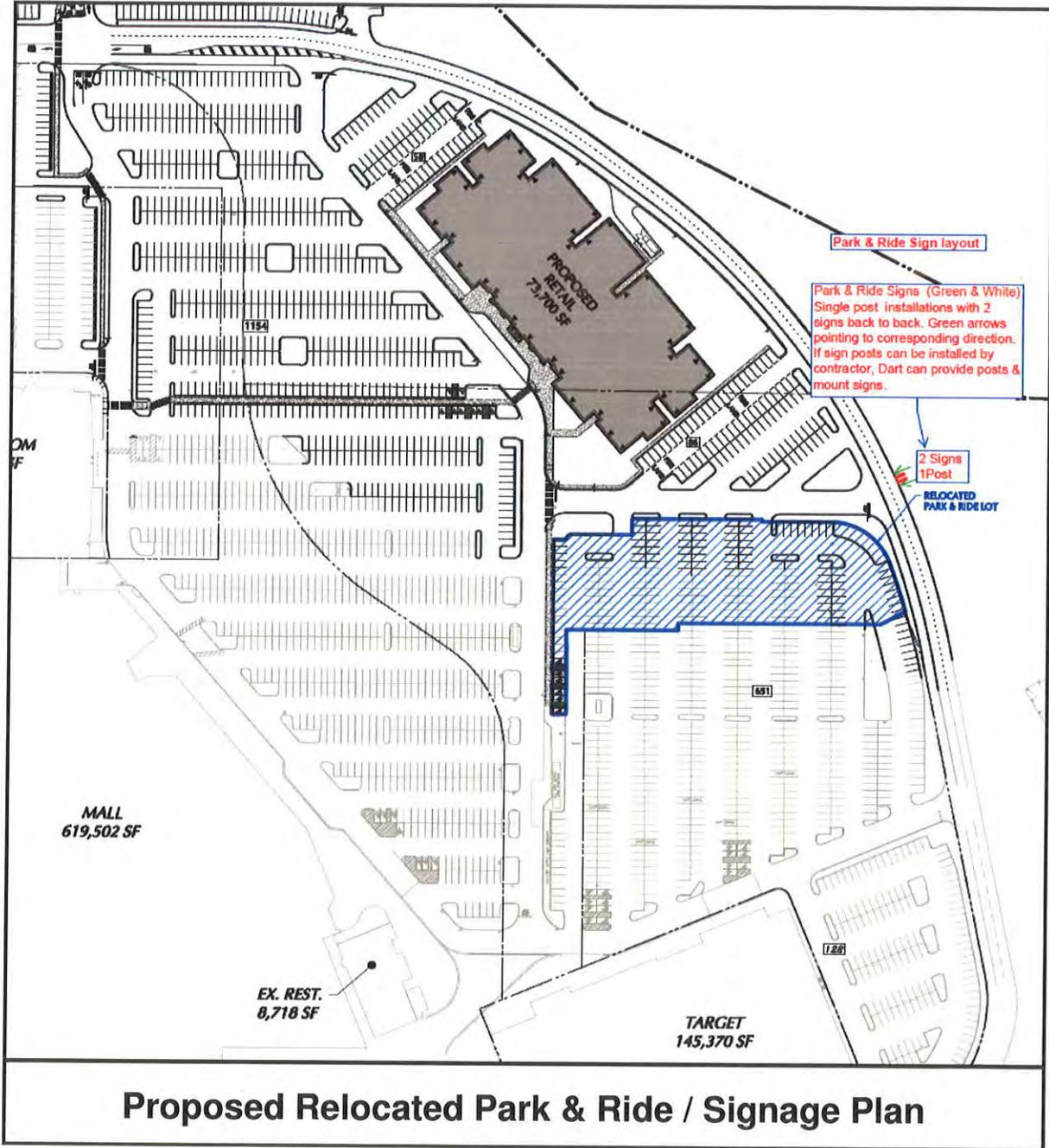
Proposed completion date: 2014

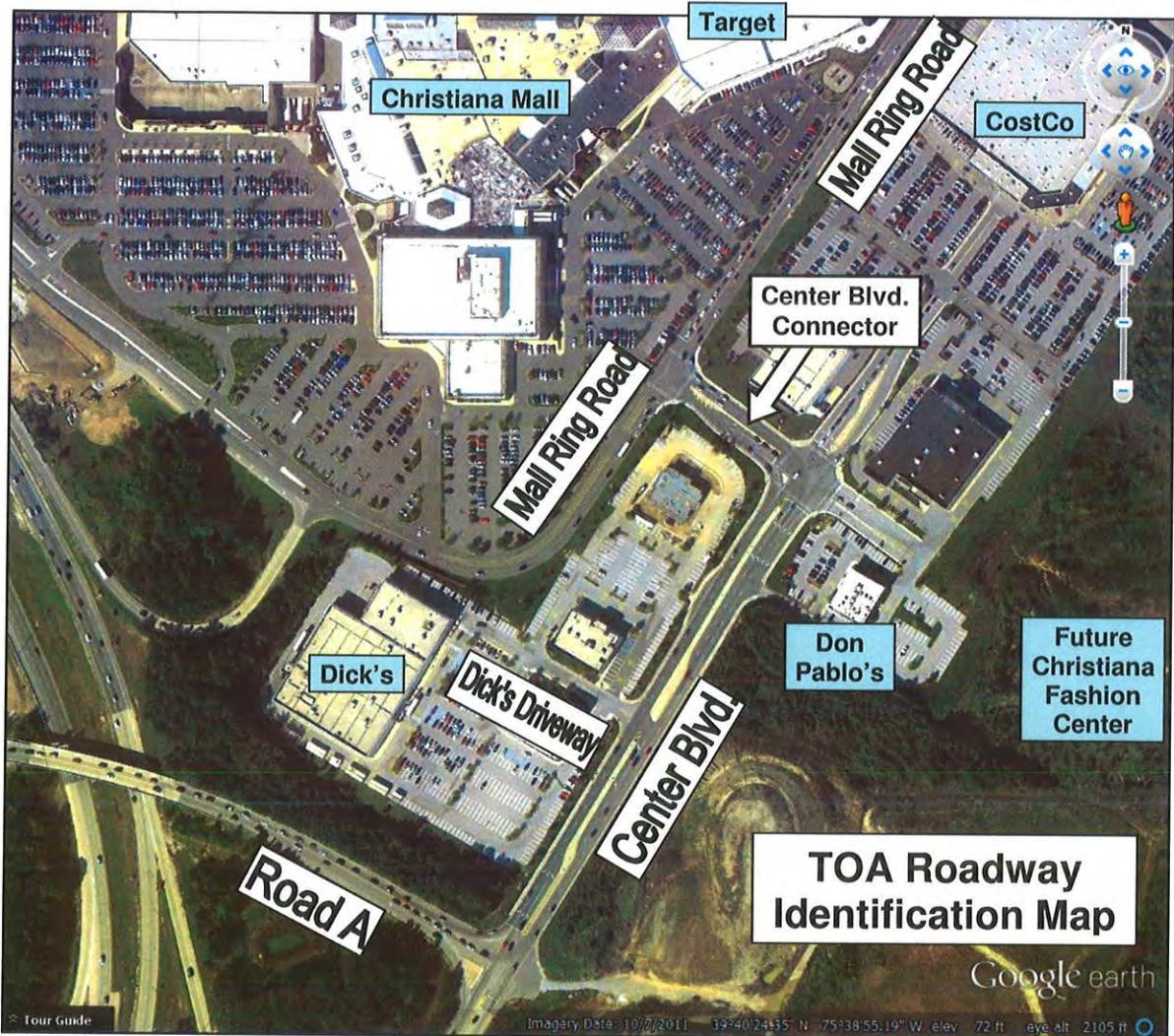
Proposed access locations: Access to Cabela's and the cinema would be provided by multiple parking lot access points along the mall ring road. Analyses of the site access points were not part of the scope of this TOA. Access between the mall ring road and the surrounding roadway network is provided at four intersections. One of these intersections, Mall Ring Road & "Center Boulevard Connector" (aka Center Boulevard (New Castle Road 336A)), was included in the scope of this TOA. Mall Ring Road is privately-owned and maintained, whereas Center Boulevard Connector is State-maintained. For clarification, a TOA Roadway Identification Map is shown on Page 10.

Daily Traffic Volumes (per DeIDOT Traffic Summary 2011):

- 2011 Average Annual Daily Traffic on Center Boulevard: 1,978 vpd







Delaware Strategies for State Policies and Spending – 2010 Update

Location with respect to the Strategies for State Policies and Spending Map of Delaware:
The Christiana Mall Expansion site is located within Investment Level 1.

Investment Level 1

Investment Level 1 Areas are areas of the state that are most prepared for growth and where the state can make cost-effective infrastructure investments for schools, roads, and public safety. In these areas, state investments and policies should support and encourage a wide range of uses and densities, promote other transportation options, foster efficient use of existing public and private investments, and enhance community identity and integrity. Investment Level 1 Areas are often municipalities, towns, or urban/urbanizing places in counties. Density is generally higher than in the surrounding areas. 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.

Proposed Development's Compatibility with Strategies for State Policies and Spending:

The Christiana Mall Expansion site is located within Investment Level 1 and is to be expanded to include retail space and a multi-plex cinema. The *Strategies* document generally encourages efficient new growth and redevelopment in Investment Level 1 areas, and the proposed development is consistent with those goals. It is therefore concluded that the proposed development generally complies with the policies stated in the 2010 update of the "Strategies for State Policies and Spending."

Relevant Projects in the DelDOT Capital Transportation Program (FY 2013 – FY 2018)

DelDOT does not currently have any active projects in the immediate area of the intersections analyzed in this TOA. However, there are four relevant projects located nearby. These are:

- SR 1 / I-95 Interchange Improvements Project
- Road A / SR 7 Improvements Project
- Christiana Mall Park & Ride
- Churchmans Crossing Study

The SR 1 / I-95 Interchange Improvements Project (State Contract No. T200809003) is a large, multi-year construction project that will add high-speed connecting ramps from northbound Delaware Route 1 to northbound I-95 and from southbound I-95 to southbound Delaware Route 1. It will separate local traffic movements from high-speed traffic movements. It will modify the alignment of Delaware Route 1 and will include construction of a new ramp (Ramp U) from southbound Center Boulevard at Road A to northbound Delaware Route 7 and I-95. This project has been under construction since 2011 and should be complete by 2014.

The Road A / SR 7 Improvements Project (State Contract No. T201009002) will result in widening of Road A and improvements to surrounding intersections to maintain acceptable levels of service along this section of roadway. Currently, Road A traffic volumes and operations are being monitored as part of an agreement that DelDOT entered into in 2006 with

the developer of the planned Christiana Fashion Center (to be located east of the eastern terminus of Road A). DelDOT agreed to monitor and analyze traffic conditions at the intersections on Road A every two years. When conditions reach Level of Service (LOS) E or F, DelDOT will finalize design and construct improvements needed to attain LOS D or better. Preliminarily planned improvements include constructing the aforementioned Ramp U in 2013, adding capacity via lane configuration changes at the intersection of Road A and Center Boulevard (before the Christiana Fashion Center opens), and eventually constructing a second Road A bridge over Delaware Route 1 parallel to the existing span such that Road A would consist of three westbound lanes on the existing bridge and three eastbound lanes on the planned second bridge.

The Christiana Mall Park & Ride Project will entail the development, design and construction of a new DTC Park & Ride facility in a new location most likely outside of the Christiana Mall parking lot. The new facility will need to provide for pedestrians and vehicles as well as buses and other needs of a Park & Ride transit center. The existing Park & Ride facility must be relocated to a temporary location before construction of the Cabela's store begins in 2013, but then this DelDOT project will eventually move the Park & Ride facility to a permanent location. Discussions and initial project development for relocating the Park & Ride to a new long-term location are underway, but the schedule for design and eventual construction is undetermined at this time.

In response to increasing congestion throughout the area, the Churchmans Crossing Study began in the mid-1990's as a joint effort between DelDOT, New Castle County and WILMAPCO to study transportation facilities and operations in the Churchmans Crossing area and to develop recommendations to alleviate anticipated increased congestion primarily through a transportation and land use plan that would enhance quality of life, plan for sustainable growth and development, and provide opportunity for transportation choices. The Churchmans Crossing Study Area borders on the Christiana Mall property and the location of the subject development of this TOA, and the area functions in some ways like a Transportation Improvement District (TID). The study included traffic counts and analyses, traffic forecasts, and evaluation of transit, bicycle and pedestrian facilities. It provided recommendations regarding land use, intersection improvements, new roadways, bicycle and pedestrian facilities, increased transit options and improved facilities, and Travel Demand Management measures. Over the past 15 years, many improvements developed through the Churchmans Crossing Study program have been planned, designed, and constructed. Conditions are monitored and analyzed on an annual basis to determine the need and timing for potential future improvements. This DelDOT program is anticipated to continue for the foreseeable future.

Regarding DelDOT's Hazard Elimination Program (HEP), a 0.62-mile stretch of Road A / Center Boulevard / Center Boulevard Connector, from Christiana-Stanton Road (New Castle Road 26) to the Christiana Mall Ring Road was within Site G of the 2010 HEP. This included all three of the intersections analyzed in this TOA. The HEP committee recommended remedial improvements consisting of signing and pavement marking changes, replacing crosswalks at the Mall Ring Road intersection, relocating pedestrian signals, and replacing traffic signal indications. The relocation of pedestrian signals and replacement of traffic signal indications have already been implemented. Some of the remaining HEP improvements, such as replacing

crosswalks at the Mall Ring Road intersection, may not be applicable if the improvements recommended in this TOA are implemented. The remaining HEP improvements involving signing and pavement marking changes at the intersection of Center Boulevard and Dick's Sporting Goods Driveway have not been completed and are still applicable. The committee recommended no additional studies.

Trip Generation

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

- 100,000 square-foot sporting goods store (ITE Land Use Code 820)
- 6,193 square-foot expansion of proposed multi-use cinema (ITE Land Use Code 445)
- 850 square-foot expansion of retail space (ITE Land Use Code 820)

Table 1
CHRISTIANA MALL EXPANSION PEAK HOUR TRIP GENERATION

Land Use	Saturday Mid-Day		
	In	Out	Total
100,850 square-foot sporting goods store plus expansion of retail space	120	111	231
Pass-by Trips	22	20	42
Net External Trips	98	91	189
6,193 square-foot expansion of proposed multi-plex cinema ¹	22	7	29
Primary Trips	22	7	29
TOTAL NEW TRIPS	120	98	218

Overview of TOA

Intersections examined:

- 1) Mall Ring Road & Center Boulevard Connector (aka Center Boulevard)
- 2) Center Boulevard & Center Boulevard Connector (aka Center Boulevard)
- 3) Center Boulevard & Dick's Sporting Goods Driveway

Note: For clarification, see TOA Roadway Identification Map on Page 10.

¹ The remaining portion of the proposed multi-plex cinema (67,457 square feet) was previously approved and is included in the analysis as a committed development. According to the TOA, the previously approved portion of the cinema would generate 317 trips during the Saturday peak hour (238 entering and 79 exiting). With the 6,193 square-foot expansion, the total size of the cinema is proposed to be 73,850 square feet.

Conditions examined:

- 1) 2012 existing conditions (Case 1)
- 2) 2014 without Christiana Mall Expansion (Case 2)
- 3) 2014 with Christiana Mall Expansion (Case 3)

Peak hours evaluated: Saturday mid-day peak hour

Committed developments considered:

- 1) Christiana Fashion Center (915,000 square feet of retail space)
- 2) Macy's Expansion (85,000 square feet expansion of retail space)
- 3) Mall Expansion – cinema (67,457 square-foot multi-plex cinema)

Intersection Descriptions

- 1) **Mall Ring Road & Center Boulevard Connector**
Type of Control: two-way stop-controlled (T-intersection)
Northbound approach: (Mall Ring Road) one exclusive through lane and one shared through/right-turn lane, stop-controlled
Southbound approach: (Mall Ring Road) one left-turn lane and one through lane, stop-controlled
Westbound approach: (Center Boulevard Connector) one left-turn lane and one right-turn lane

- 2) **Center Boulevard & Center Boulevard Connector**
Type of Control: signalized four-leg intersection
Northbound approach: (Center Boulevard) two left-turn lanes, one through lane and one right-turn lane
Southbound approach: (Costco access) one left-turn lane, one through lane and one right-turn lane
Eastbound approach: (Center Boulevard Connector) one left-turn lane, one through lane and one right-turn lane
Westbound approach: (Don Pablo's access and future Christiana Fashion Center access) one left-turn lane, one exclusive through lane and one shared through/right-turn lane

- 3) **Center Boulevard & Dick's Sporting Goods Driveway**
Type of Control: two-way stop-controlled (right-in/right-out/left-in T-intersection)
Northbound approach: (Center Boulevard) one left-turn lane and two through lanes
Southbound approach: (Center Boulevard) one exclusive through lane and one shared through/right-turn lane
Eastbound approach: (Dick's Driveway) one right-turn-only lane, stop controlled

Safety Evaluation

Crash Data: Crash data was obtained for June 2009 through June 2012 for the intersections and roadway segments within the study area. This included a total of 26 crashes. There were five

injuries but no fatal crashes reported in the study area during this three-year period. The crashes at or near each intersection are as follows:

- Mall Ring Road & Center Boulevard Connector and vicinity
 - 11 crashes reported. Of these, 4 were angle crashes and 3 were sideswipe crashes.
- Center Boulevard & Center Boulevard Connector (signalized intersection) and vicinity
 - Eight crashes reported. Of these, 3 were angle crashes and 2 were rear-end crashes.
- Center Boulevard & Dick's Sporting Goods Driveway and vicinity
 - Eight crashes reported. Of these, 4 were rear-end crashes and 3 were angle crashes.

Sight Distance: With generally straight and flat roadways, sight distance is adequate throughout the study area. No problematic sight distance issues have been reported, and none were observed during field observations in the area.

Transit, Pedestrian, and Bicycle Facilities

Existing transit service: The DTC currently operates 12 transit routes offering year-round service to the Christiana Mall Park & Ride. Of these 12 routes, 10 also serve the bus stop in front of Target. Four of the routes serve the Park & Ride, the Target bus stop, and bus stops located on Center Boulevard between the Center Boulevard Connector intersection and the Dick's Sporting Goods Driveway intersection (one inbound stop and one outbound stop adjacent to the Pier 1 Imports store). Of these 12 routes, 3 provide service on weekdays only, 7 provide service on weekdays and Saturdays, and 2 provide service on weekdays, Saturdays and Sundays. Additionally, Seasonal Route 305, which connects New Castle County with Delaware's beach resort area, stops at the Park & Ride during the summer months. Both the Park & Ride facility and the Target bus stop facility are equipped with a shelter and benches. There is no shelter or bench at either of the Center Boulevard stops, but there is a bus-pull off area in the outbound direction (along southbound Center Boulevard).

Planned transit service: The existing DTC Park & Ride facility will need to be relocated before construction of the Cabela's store begins. Prior to that, the public should be notified of the change and trailblazing signs should be installed at least three weeks before the relocation is implemented. The Park & Ride relocation will likely occur as an immediate move to a temporary location within the Christiana Mall parking lot and then eventually as a permanent move to a location outside of the mall parking lot. The relocated Park & Ride facility must include at least 200 dedicated parking spaces. It must be ADA compliant and include space for a discrete transit operator restroom facility. If the temporarily relocated Park & Ride facility is consolidated with the existing bus stop near Target, modifications must be made at that site to extend the bus stop staging area adjacent to the relocated Park & Ride facility, to widen the sidewalk leading from the bus stop to the theater to support passenger activity, and to provide a seasonal bus stop so buses would not need to travel the congested Target aisle way during the busy holiday season. The location of the proposed Park & Ride relocation to the Target site is identified on the signage plan on Page 9.

Existing bicycle and pedestrian facilities: According to the bicycle level of service (BLOS) calculator developed by the *League of Illinois Bicyclists*, Center Boulevard operates at BLOS C. There are currently no designated bicycle lanes within the study area. There are sidewalks along

both sides of Center Boulevard Connector, along the west side of Center Boulevard from Center Boulevard Connector to south of the Dick's Sporting Goods Driveway, and along the east side of Center Boulevard from Center Boulevard Connector to the DART bus stop across from the Pier 1 Imports store. There are no sidewalks along the Mall Ring Road. There are crosswalks with pedestrian pushbuttons and pedestrian countdown signals across all four legs of the intersection of Center Boulevard & Center Boulevard Connector. There are crosswalks across all three legs of the intersection of Mall Ring Road & Center Boulevard Connector.

Planned bicycle and pedestrian facilities: To be determined during site plan review process.

Previous Comments

All comments from DelDOT's Scoping Letter, Traffic Count Review, and Preliminary TOA (PTOA) Review were addressed in the Final TOA submission, with the following exception:

- There were no indications that the applicant contacted DelDOT's Statewide and Regional Planning Section for bicycle and pedestrian comments.

General HCS Analysis Comments

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

- 1) For all intersections for existing and future conditions, the TOA assumed a heavy vehicle (HV) percentage of 2% for all movements. For existing conditions, McCormick Taylor applied HV by movement for unsignalized intersections and HV by lane group for signalized intersections. McCormick Taylor assumed future HV to be the same as existing HV.
- 2) For existing conditions, the TOA and McCormick Taylor determined, for each intersection, overall intersection peak hour factors (PHF). For future conditions, the TOA and McCormick Taylor assumed future PHF to be the same as existing PHF.
- 3) For analyses of signalized intersections, the TOA and McCormick Taylor both used a base saturation flow rate of 1,900 pephgpl because the study area is north of the C&D Canal.
- 4) The HCS analyses included in the TOA did not always reflect the lane widths observed in the field by McCormick Taylor. McCormick Taylor's HCS analyses incorporated the field-measured lane widths.
- 5) The TOA and McCormick Taylor used different signal timings when analyzing the signalized intersections in some cases.
- 6) The TOA input Right-Turn-on-Red (RTOR) volumes for signalized intersection analyses. McCormick Taylor input no RTOR volumes, but did analyze right-turn movements from signalized, exclusive right-turn lanes as overlapping the protected left-turn phases.

Table 2
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Operational Analysis for Christiana Mall Expansion
Report dated December 2012
Prepared by VMI Maris & Associates

Unsignalized Intersection ² Two-Way Stop Control (T-intersection)	LOS per TOA ³	LOS per McCormick Taylor ³
Mall Ring Road & Center Boulevard Connector	Saturday Mid-day	Saturday Mid-day
2012 Existing (Case 1)		
Northbound Mall Ring Road	E (44.2)	F (*)
Southbound Mall Ring Road	F (*)	F (*)
2014 without Christiana Mall Expansion (Case 2)		
Northbound Mall Ring Road	F (311.4)	F (*)
Southbound Mall Ring Road	F (*)	F (*)
2014 with Christiana Mall Expansion (Case 3)		
Northbound Mall Ring Road	F (321.5)	F (*)
Southbound Mall Ring Road	F (*)	F (*)
2014 with Christiana Mall Expansion (Case 3) With Improvement Option 1 ⁴		
Northbound Mall Ring Road	N/A	F (*)
Southbound Mall Ring Road	N/A	F (*)
2014 with Christiana Mall Expansion (Case 3) With Improvement Option 2 ⁵		
Southbound Mall Ring Road – Left	N/A	A (8.6) ⁶

* HCS could not generate a result due to excessive delay

² For both unsignalized and signalized intersection analyses, the numbers in parentheses following levels of service (LOS) are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

³ VMI analyzed this intersection without inputting upstream signal data. VMI also input a median storage value of one vehicle. McCormick Taylor input upstream signal data for the westbound approach due to the proximity and influence of the signal at Center Boulevard, and input a median storage value of zero vehicles since drivers from the minor street do not utilize two-stage gap acceptance under the existing configuration of this intersection. These two parameters have a significant effect on analysis results.

⁴ Improvement Option 1 consists of converting the northbound Mall Ring Road approach to one through lane and one right-turn lane (right-turn lane to be channelized) and channelizing the westbound Center Boulevard Connector right-turn lane. The westbound approach would be free-flow and the Mall Ring Road approaches stop-controlled.

⁵ Improvement Option 2 consists of converting the northbound Mall Ring Road approach to one through lane and one right-turn lane (right-turn lane to be channelized), converting the westbound Center Blvd Connector approach to two free-flow right-turn lanes (westbound left-turn movement would be prohibited), adding a third receiving lane on the northbound Mall Ring Road, and removing the stop signs from the Mall Ring Road approaches.

⁶ The 95th percentile queue length for the southbound Mall Ring Road left-turn lane during the Case 3 Saturday peak hour (with Improvement Option 2) is less than 2 vehicles. This queue length is based on no downstream blocking due to queues on the eastbound Center Boulevard Connector approach to Center Boulevard.

Table 2 (continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Operational Analysis for Christiana Mall Expansion
Report dated December 2012
Prepared by VMI Maris & Associates

Signalized Intersection ⁷	LOS per TOA	LOS per McCormick Taylor
Mall Ring Road & Center Boulevard Connector	Saturday Mid-day	Saturday Mid-day
2014 with Christiana Mall Expansion (Case 3) With Improvement Option 3 ⁸	N/A	C (21.5) ⁹
2014 with Christiana Mall Expansion (Case 3) With Improvement Option 4 ¹⁰	N/A	D (54.8) ¹¹
2014 with Christiana Mall Expansion (Case 3) With Improvement Option 5 ¹²	N/A	B (12.0) ¹³

⁷ For both unsignalized and signalized intersection analyses, the numbers in parentheses following levels of service (LOS) are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

⁸ Improvement Option 3 consists of signalizing the intersection and converting the northbound Mall Ring Road approach to one through lane and one right-turn lane. The westbound Center Boulevard Connector approach would consist of one left-turn lane and one free-flow right-turn lane.

⁹ The key 95th percentile queue lengths for the Case 3 Saturday peak hour (with Improvement Option 3) are approximately 27 vehicles for the northbound right-turn lane, 18 vehicles for the southbound left-turn lane, and 24 vehicles for the westbound left-turn lane. These queue lengths are based on no downstream blocking due to queues on the eastbound Center Boulevard Connector approach to Center Boulevard.

¹⁰ Improvement Option 4 consists of signalizing the intersection, converting the northbound Mall Ring Road approach to one through lane and one right-turn lane, and converting the westbound Center Boulevard Connector approach to two right-turn lanes (westbound left-turn movement would be prohibited). The two westbound right-turn lanes would be signal-controlled (as opposed to free-flow).

¹¹ The key 95th percentile queue lengths for the Case 3 Saturday peak hour (with Improvement Option 4) are approximately 57 vehicles for the northbound right-turn lane, 3 vehicles for the southbound left-turn lane, and 40 vehicles for the westbound right-turn lanes. These queue lengths are based on no downstream blocking due to queues on the eastbound Center Boulevard Connector approach to Center Boulevard.

¹² Improvement Option 5 consists of signalizing the intersection, converting the northbound Mall Ring Road approach to one through lane and one right-turn lane, converting the westbound Center Boulevard Connector approach to two free-flow right-turn lanes (westbound left-turn movement would be prohibited), and adding a third receiving lane on the northbound Mall Ring Road.

¹³ The key 95th percentile queue lengths for the Case 3 Saturday peak hour (with Improvement Option 5) are approximately 32 vehicles for the northbound right-turn lane and 2 vehicles for the southbound left-turn lane. These queue lengths are based on no downstream blocking due to queues on the eastbound Center Boulevard Connector approach to Center Boulevard.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Operational Analysis for Christiana Mall Expansion
Report dated December 2012
Prepared by VMI Maris & Associates

Signalized Intersection ¹⁴	LOS per TOA ¹⁵	LOS per McCormick Taylor ¹⁵
Center Boulevard & Center Boulevard Connector	Saturday Mid-day	Saturday Mid-day
2012 Existing (Case 1)	D (47.4)	C (28.2)
2014 without Christiana Mall Expansion (Case 2)	D (52.2)	D (51.3)
2014 with Christiana Mall Expansion (Case 3)	D (54.8)	D (53.3) ¹⁶
2014 with Christiana Mall Expansion (Case 3) <i>With Improvement Option 1</i> ¹⁷	N/A	D (46.6) ¹⁸

¹⁴ For both unsignalized and signalized intersection analyses, the numbers in parentheses following levels of service (LOS) are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

¹⁵ VMI analyzed this intersection using split phasing for the northbound and southbound approaches, and with no protected left-turn phase for the eastbound left-turn movement. McCormick Taylor, in a manner consistent with DelDOT signal timing information for this intersection and verified by our field visit, analyzed the intersection with concurrent phasing. The northbound left-turn movement has protected-prohibited phasing and the other left-turn movements have protected-permitted phasing.

¹⁶ The key 95th percentile queue lengths for the Case 3 Saturday peak hour are approximately 31 vehicles for the northbound left-turn lanes, 31 vehicles for the southbound through lane, 27 vehicles for the eastbound through lane, and 17 vehicles for the westbound left-turn lane.

¹⁷ Improvement Option 1 consists of adding a second through lane on the eastbound approach of Center Boulevard Connector. This would also require a second receiving lane on the eastbound Center Boulevard Connector (heading toward Don Pablo's and the future Christiana Fashion Center).

¹⁸ The key 95th percentile queue lengths for the Case 3 Saturday peak hour (with Improvement Option 1) are approximately 31 vehicles for the northbound left-turn lanes, 31 vehicles for the southbound through lane, 12 vehicles for the eastbound through lanes, and 12 vehicles for the westbound left-turn lane.

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Operational Analysis for Christiana Mall Expansion
Report dated December 2012
Prepared by VMI Maris & Associates

Unsignalized Intersection ¹⁹ Two-Way Stop Control (T-intersection)	LOS per TOA ²⁰	LOS per McCormick Taylor ²⁰
Center Boulevard & Dick's Sporting Goods Driveway	Saturday Mid-day	Saturday Mid-day
2012 Existing (Case 1)		
Northbound Center Boulevard – Left	B (12.4)	B (11.8)
Eastbound Dick's Driveway – Right	C (16.8)	B (14.0)
2014 without Christiana Mall Expansion (Case 2)		
Northbound Center Boulevard – Left	B (13.8)	B (12.8)
Eastbound Dick's Driveway – Right	C (19.0)	B (14.0)
2014 with Christiana Mall Expansion (Case 3)		
Northbound Center Boulevard – Left	B (13.8)	B (12.8)
Eastbound Dick's Driveway – Right	C (19.0)	B (14.0)

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

²⁰ VMI analyzed this intersection without inputting upstream signal data. McCormick Taylor input upstream signal data for the southbound approach due to the proximity and influence of the signal at Center Boulevard Connector.