



STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION

800 BAY ROAD
P.O. Box 778
DOVER, DELAWARE 19903

CAROLANN WICKS, P.E.
SECRETARY

July 12, 2010

Mr. David S. Hugg, III
Town Manager
Town of Smyrna
27 S. Market Street Plaza
P.O. Box 307
Smyrna, DE 19977

Dear Mr. Hugg:

The attached Traffic Impact Study (TIS) review letter for the **Liborio Commercial (a.k.a. Liborio III)** development has been completed under the responsible charge of a registered professional engineer whose firm is authorized to work in the State of Delaware. They have found the TIS to conform to DelDOT's Standards and Regulations for Subdivision Streets and State Highway Access and other accepted practices and procedures for such studies. DelDOT accepts this TIS review and concurs with the recommendations. We are providing it to you for your information in your review of the plans for the subject development. If you have any questions concerning this letter or the attached review letter, please contact me at (302) 760-2134.

Sincerely,

Todd Sammons
Project Engineer

TS:tsm

Enclosures

cc with enclosures:

DelDOT Distribution
Ms. Constance C. Holland, Office of State Planning Coordination
Mr. Scott Lobdell, Van Cleef Engineering Associates
Mr. Mir Wahed, Johnson, Mirmiran & Thompson
Mr. Brad Herb, Johnson, Mirmiran & Thompson
Mr. Andrew Parker, McCormick Taylor



DelDOT Distribution

Frederick H. Schranck, Deputy Attorney General
Brett Talyor, Chief of Community Relations, Public Relations
Natalie Barnhart, Director, Transportation Solutions (DOTS)
Ralph A. Reeb, Director, Division of Planning
Michael H. Simmons, Assistant Director, Project Development South, DOTS
Donald D. Weber, Chief Traffic Engineer, Traffic, DOTS
Mark Luszcz, Assistant Chief Traffic Engineer, Traffic, DOTS
Thomas E. Meyer, Traffic Studies Manager, Traffic, DOTS
Theodore G. Bishop, Assistant Director, Development Coordination
Thomas Greve, District Engineer, Central District
Jennifer Pinkerton, Deputy Principal Assistant, Pavement Management
William J. Dryden, Transportation Planner, Project Development South, DOTS
Lisa Collins, Service Development Planner, Delaware Transit Corporation
Marc Coté, Subdivision Engineer, Development Coordination
T. William Brockenbrough, Jr., County Coordinator, Development Coordination
Julio Seneus, Subdivision Manager, Development Coordination
Anthony Aglio, Bicycle Coordinator, Statewide & Regional Planning
Richard Sinegar, Pedestrian Coordinator, Statewide & Regional Planning
Troy Brestel, Project Engineer, Development Coordination



July 6, 2010

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

RE: Agreement No. 1406
Traffic Impact Study Services
Task 222A-Liborio Commercial

Dear Mr. Sammons,

Johnson, Mirmiran and Thompson (JMT) has completed the review of the Traffic Impact Study for the Liborio Commercial (a.k.a Liborio III) development, prepared by Van Cleef Engineering Associates dated October 2, 2009. This review was assigned Task Number 222A. Van Cleef Engineering Associates prepared the report in a manner generally consistent with DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*.

The TIS evaluates the impacts of the Liborio Commercial development, which is proposed on the west side of US Route 13 (DuPont Highway/Kent Road 2) and situated on both the north and south sides of South Carter Road (Kent Road 137) in the Town of Smyrna, Kent County. The development would consist of about 399,000 square feet of retail space on a 46.6 acre assemblage of parcels. The parcels, which are currently zoned HC (Highway Commercial), will be developed under the same zoning. The developer is proposing seven access points, consisting of two full access points and one right-in only along Carter Road, three right-in/right-out only access driveways along US Route 13 southbound and one full access point on Bon Ayre Lane. Construction is anticipated to be completed by 2011.

DelDOT currently has one relevant ongoing project in the study area. The Carter Road Project (Project No. 23-016-01) includes improvement to vehicle, pedestrian and bicycle travel along Carter Road from Sunnyside Road (Kent Road 90) to Wheatleys Pond Road (Kent Road 41). The improvements will involve the widening of Carter Road to two eleven-foot travel lanes with two five-foot shoulders, installing curbs and sidewalks and addressing closed drainage, traffic calming, and safety improvements. The existing centerline will be shifted to minimize right-of-way impacts. The intersection of Sunnyside Road and Carter Road, which currently operates as an all-way stop control intersection, is proposed to be signalized as part of this project. The northbound and the southbound Sunnyside Road approaches are each proposed to have a separate left-turn lane and a shared through/right-turn lane. The eastbound Carter Road approach is proposed to have one exclusive left-turn lane, one through lane, and one exclusive right-turn lane. The westbound Carter Road approach is proposed to have a separate left-turn lane with a shared through/right-turn lane. The project is in its semi-final design stage and is scheduled to begin construction in fall of 2011 and be completed by winter of 2012.



A number of study area intersections were studied under DelDOT's 2005 Hazard Elimination Program (HEP) as part of Site P. Site P included a 1.69-mile corridor along US Route 13 south of Smyrna, starting from Big Woods Road (Kent Road 448) to 0.28 miles south of Smyrna-Leipsic Road (Kent Road 12). It included the signalized intersection of US Route 13 and the Delaware Route 1 ramps as well as US Route 13 and Brenford Road/Big Oak Road (Kent Road 42) and, unsignalized intersections along US Route 13 at Carter Road, Holly Hill Drive, Hedgerow Hollow Road and Cathleen Drive. The HEP report noted that significant proposed developments were expected along the US Route 13 corridor from Scarborough Road to the Town of Smyrna limit and would continue to change the characteristics of this area. At the time of the study, the intersection of US Route 13 and the Delaware Route 1 ramps operated with a protected-permitted phasing for the southbound left turns and was noted as a safety issue with most of the crashes occurring during the permissive phase. With the Simons Corner development now forming the west leg of this intersection, the signal has been modified to address this concern and currently operates with protected only left-turn phasing on US Route 13. The report noted that a future traffic signal was expected at the intersection of US Route 13 and Carter Road to accommodate the proposed development traffic. This intersection was signalized in February 2008.

Additionally, developer-funded improvements are currently planned at the intersection of US Route 13 and Brenford Road/Big Oak Road. The improvements include widening the eastbound Brenford Road approach to one left-turn lane, one shared through/left-turn lane and one right-turn lane. The westbound Big Oak Road approach is expected to maintain the current configuration with one shared left-turn/through/right-turn lane due to physical constraints on both sides of the roadway. The developer of the Big Oak Commons development is taking the lead for this project and at least ten other developments are participating in this improvement. In addition, several other developments with site frontage along Brenford Road are expected to improve Brenford Road from east of Massey Millpond Road (Kent Road 148) to US Route 13 in order to meet collector road standards.

In addition to the analyses listed in the scoping letter for this TIS, DelDOT requested additional analysis for the future build scenario without the development of the Wick Commercial Property (referred to as Case 4). The Wick Commercial Property is a 40-acre parcel located on the west side of US Route 13 south of Brenford Road. While the owner has proposed to have it rezoned to GB (General Business) for unspecified commercial uses, it is presently zoned AC (Agricultural Conservation) and no rezoning application has been filed. Based on our review, we have the following comments and recommendations:

The following intersections exhibit LOS deficiencies without the implementation of physical roadway and/or traffic control improvements.

<i>Intersection</i>	<i>Situations for which deficiencies occur</i>
US Route 13 and Delaware Route 1 Ramps	2011 PM and Saturday without Liborio Commercial development (Case 2), 2011 PM and Saturday with Liborio Commercial development (Case 3), 2011 PM and Saturday with Liborio Commercial and without Wick Commercial Property development (Case 4)
US Route 13 and Hedgerow Hollow Road	2011 PM without Liborio Commercial development (Case 2), 2011 AM, PM and Saturday with Liborio Commercial development (Case 3), 2011 PM with Liborio Commercial and without Wick Commercial Property development (Case 4)
US Route 13 and Brenford Road/Big Oak Road	2011 AM, PM and Saturday without Liborio Commercial development (Case 2), 2011 AM, PM and Saturday with Liborio Commercial development (Case 3), 2011 AM and PM with Liborio Commercial and without Wick Commercial Property development (Case 4)
Carter Road and Villanova Drive	2011 PM with Liborio Commercial development (Cases 3)
Carter Road and Sunnyside Road	2011 AM, PM and Saturday without Liborio Commercial development (Case 2), 2011 AM, PM and Saturday with Liborio Commercial development (Case 3)

The LOS deficiencies under future conditions at the intersection of US Route 13 and the Delaware Route 1 ramps cannot be fully corrected without significant changes to the geometry of the intersection. To address the LOS deficiency at the intersection of US Route 13 and the Delaware Route 1 ramps the improvements required to meet DelDOT's LOS standards would include two exclusive left-turn lanes, one through lane and one right-turn lane on the eastbound Simons Corner approach and two exclusive left-turn lanes, one through lane and one right-turn lane on the westbound Delaware Route 1 ramp approach.

However, we do not believe it would be reasonable to assign full responsibility for the improvements required to correct the LOS deficiencies at the intersection of US Route 13 and the Delaware Route 1 ramps to this developer. As such the developer of Liborio Commercial should fund an equitable portion of the identified improvements at this intersection along with any future developments in the area.

The intersection of US Route 13 and Hedgerow Hollow Road would exhibit LOS deficiencies under future conditions even without the development of Liborio Commercial. The LOS deficiencies in future conditions would occur during the left-turn movement from the low volume Hedgerow Hollow Road approach. The 95th percentile queue length on the approach during the typical PM peak hour is expected to be less than 100 feet. The southbound U-turn on US Route 13 also shows a failing LOS during the PM peak hour. The 95th percentile queue in this scenario is about six cars in the left-turn lane, which could be accommodated within the 350 feet of available storage. As such, we do not recommend any improvements be implemented by the developer at this intersection.

The intersection of US Route 13 and Brenford Road/Big Oak Road exhibits LOS deficiencies under all future conditions. However, as discussed earlier these LOS deficiencies will be addressed as part of a planned developer-funded project which includes intersection geometric



improvements. With the implementation of these planned improvements, this intersection would operate at an acceptable level of service.

The intersection of Carter Road and Villanova Drive would exhibit LOS deficiencies under future conditions in the PM peak hour with Liborio Commercial development. However, we do not recommend any improvements be implemented by the developer at this intersection. The LOS deficiencies would exist only at the left-turn movement from Villanova Drive. The 95th percentile queue length on the approach during the typical PM peak hour is expected to be less than 100 feet.

The intersection of Carter Road and Sunnyside Road would exhibit LOS deficiencies under all future conditions. However, these LOS deficiencies will be addressed as part of the planned DelDOT Carter Road improvement project (State Contract No. 23-016-01) which includes intersection geometric improvements as well as signalization. With the implementation of these planned improvements, this intersection will operate at an acceptable level of service.

While the intersection of US Route 13 and Carter Road would operate with acceptable LOS, the eastbound left-turn and the northbound left-turn present a queuing issue. The eastbound left-turn lane currently has approximately 250 feet of storage. Based on the HCS 95th percentile queue analysis, this lane needs to be extended to 375 feet (excluding taper). The northbound dual left-turn lanes currently have 270 feet of storage and are limited by the striping at the crossover. As per the HCS analyses, the northbound left-turn queues will be 425 feet (Case 3). We recommend that the northbound left-turn lanes at this intersection be restriped to provide the maximum storage given the limits of the existing crossover.

Furthermore, the crossover at the intersection of US Route 13 and North Street (Gateway North Boulevard) currently serves as a low volume southbound left-turn movement onto North Street. The northbound U-turns as well as left-turns out of North Street are currently prohibited at this crossover. With the extension of the west leg of Carter Road just north of this crossover, North Street can be accessed through the Carter Road intersection. Thus, all the southbound vehicles that currently turn left into North Street could easily use the signalized left-turn at the intersection of US Route 13 and Carter Road to access North Street. We recommend that DelDOT consider closing this crossover and eliminate the southbound left-turn movement into North Street in order to adequately extend the storage for the dual left-turn lanes at the intersection of US Route 13 and Carter Road.

In addition, the heavy eastbound right-turn movement from Carter Road onto southbound US Route 13 (402 and 324 in the AM and PM peak hour for build conditions) currently operates as a free flow movement with the presence of an acceleration lane. The length of the existing acceleration lane onto southbound US Route 13 approach is approximately 350 feet. However, as per AASHTO guidelines, for a design speed of 50 mph (with a posted speed of 45 mph) and an initial turning speed of 20 mph, the required length of an acceleration lane is about 610 feet. The traffic operations on Carter Road for the eastbound right-turn lane were evaluated with a yield control treatment instead of a free flow right-turn treatment. As per HCS analysis, this intersection would continue to operate at an acceptable level of service with a required eastbound

right-turn storage length of 550 feet. In addition, the proposed Site Entrance 1 across from the Gateway North Boulevard would interfere with the safety and operational efficiency of the existing acceleration lane. We recommend removing the existing acceleration lane and modifying the eastbound right-turn approach from Carter Road to a yield-control treatment. With this modification, the expected queues would extend past the proposed right-in only site entrance on Carter Road (Site Entrance 4). Hence, we do not recommend Site Entrance 4. The recommended conceptual layout for the proposed site entrances are presented in Figure 1 on page 7.

The proposed main site entrance on Carter Road (Site Entrance 5) is currently constructed and located about 525 feet west of the US Route 13 and Carter Road intersection. With the proposed yield-control treatment on the eastbound Carter Road right-turn movement at US Route 13 intersection, the required right-turn storage of 550 feet cannot be accommodated at this location. Furthermore, the eastbound left-turn lane from Carter Road onto US Route 13 is currently back-to-back with the westbound left-turn lane into the proposed site area (south). However, the expected 95th percentile left-turn queues on the eastbound left-turn lane at the intersection of US Route 13 and Carter Road require extending the storage length to about 375 feet. Due to the minimum left-turn storage length requirement at the unsignalized intersection of Carter Road and the main site entrance, two back-to-back left turns cannot be accommodated in this short distance. In order to accommodate the minimum left-turn storage lengths for the back-to-back left-turn lanes and the required right-turn storage length for the proposed yield-controlled eastbound right-turn approach at the US Route 13 and Carter Road intersection, Site Entrance 5 needs to be relocated 100 feet west of the existing location and constructed as described in Item No. 3.

The developer is also proposing three closely spaced right-in/right-out site entrances along southbound US Route 13. With the proposed removal of the existing Carter Road right-turn acceleration lane onto southbound US Route 13, the right-in/right-out Site Entrance 1 can be accommodated as proposed with a 310 feet of storage length. However, based on DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access* manual there is not sufficient space to accommodate two additional right-in/right-out site entrances (Site Entrances 2 and 3) on southbound US Route 13. Hence, proposed Site Entrance 3 on southbound US Route 13 is not recommended. The recommended conceptual layout for the proposed site entrances on southbound US Route 13 are presented in Figure 2 on page 8.

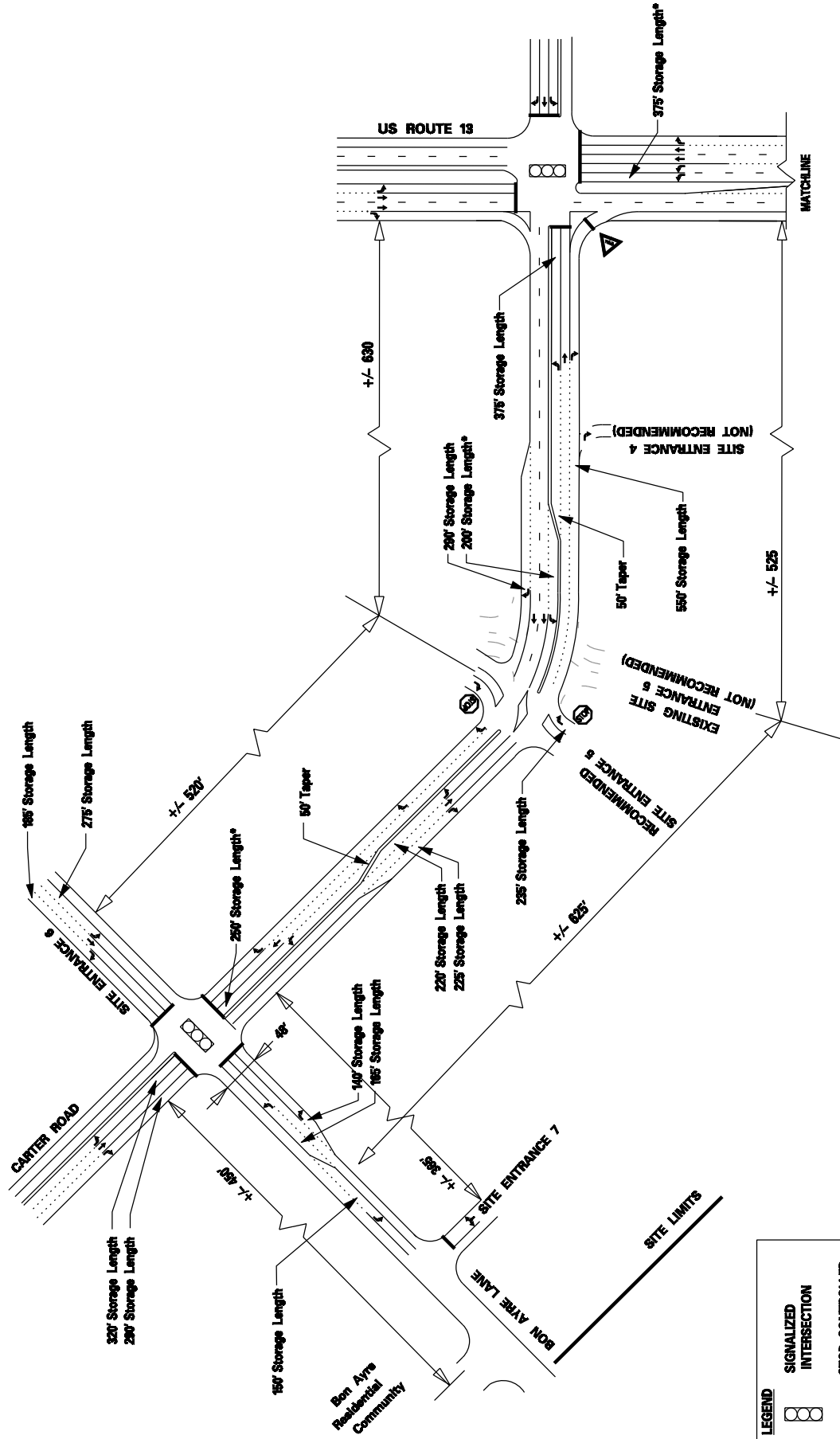
Furthermore, to accommodate the required storage lengths at the site entrances and to encourage better traffic flow through the site, we have included recommended changes to the site plan, as shown in Figure 3 on page 14. The recommendations include: relocating Site Entrance 5 100 feet west as previously discussed; prohibiting northbound and southbound left-turns and through movements from Site Entrance 5; designing Site Entrance 6 as a major site entrance which will accommodate all the left-turn movements from the site and movements between the north and south parts of the site; and shifting Site Entrance 7 south to accommodate a southbound left-turn lane. The intersection of Carter Road and Bon Ayre Lane/Site Entrance 6 would be signalized as part of the new layout. Site Entrances 3 and 4 are not recommended. The proposed modifications also include constructing a connector road across from Bon Ayre Lane to the Simons Corner

development. This improvement will require a redesign of the site plan for the northern section of the proposed development. The proposed roundabout on the northern Liborio Commercial property would need to be relocated. Some modifications to internal site roadways are also proposed to accommodate the storage requirements of the recommended entrances to the site area south of Carter Road. However, very recently after the completion of the TIS study and based on the above recommendation the developer has updated the Liborio Commercial site plan by addressing some of the comments discussed above. The updated conceptual site layout plan is shown in Figure 4 on page 15.

It is to be noted that the Liborio Commercial development was initially proposed as 92,000 square feet of shopping center and has been previously evaluated as part of the Meadows of Smyrna/Liborio III TIS. The previous TIS evaluated the impacts of five developments (The Meadows of Smyrna (Centerville and Graceville), Brookwood Crossing, Stone Gate Apartments, Elementary School and Liborio III) in Smyrna with a proposed completion date of 2010. The corresponding DelDOT TIS review letter dated December 30, 2005 included the proposed improvements at the study intersections of Carter Road at Sunnyside Road, US Route 13 at Carter Road and Carter Road at Villanova Lane. Based on our record, the developer had already participated in funding an equitable portion of the improvements at the intersection of US Route 13 and Carter Road as part of the four developments (Christina Apartments, Liborio III, Cambria Village and Meadows of Smyrna). For these four developments the developer's share of US Route 13 and Carter Road traffic signal installation cost was \$93,680.50, which was paid on September 11, 2007. Hence, an equivalent adjustment for the previous contribution could be applied to the improvements discussed below.

Should the Town of Smyrna 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 mill and overlay to the right-turn travel lane/shoulder along the site frontage on southbound US Route 13 at DelDOT's discretion. DelDOT should analyze the existing lane's 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 existing Carter Road travel lanes along the site frontage, from the westerly limits of the improvements on Bon Ayre Lane to the intersection of US Route 13 and Carter Road, at DelDOT's discretion. DelDOT should analyze the existing pavement section and recommend an overlay thickness to the developer's engineer if necessary.
3. The developer should construct a right-in/right-out/left-in site entrance (Site Entrance 5) on Carter Road approximately 630 feet west of US Route 13 and Carter Road intersection. The entrance should be consistent with the proposed lane configuration shown in the table below. This will include the construction of concrete islands with the appropriate signage at the site entrances to prevent left-turns and through movements out of the site.

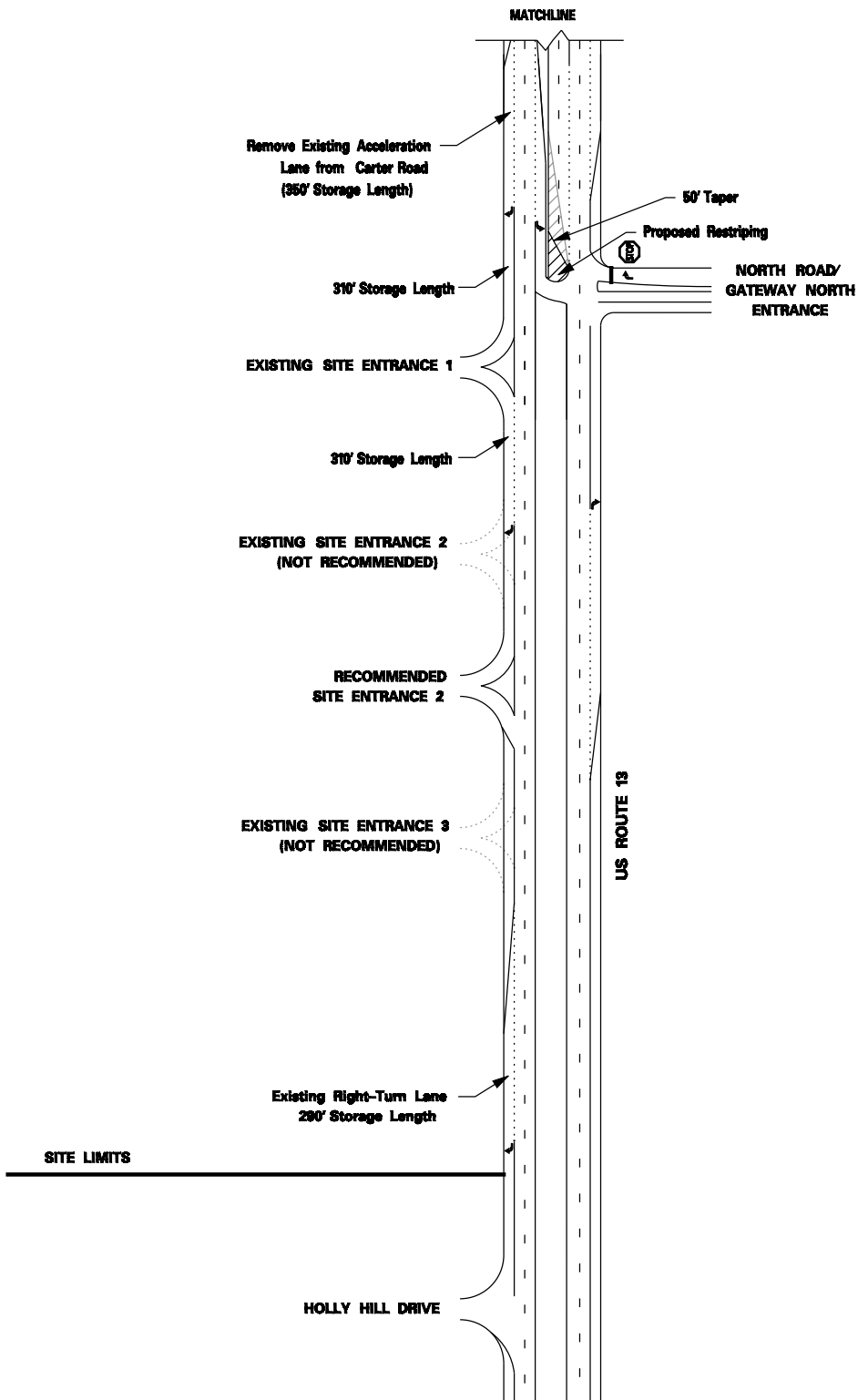


 JOHNSON, MIRMIAN & THOMPSON <i>Engineering A Brighter Future</i>		CONCEPTUAL LAYOUT FOR PROPOSED SITE ENTRANCES ON CARTER ROAD		LIBORIO III TRAFFIC IMPACT STUDY REVIEW SMYRNA, KENT COUNTY, DELAWARE	
				N.T.S	FIGURE 1
				JULY, 2010	

LEGEND

STOP CONTROLLED INTERSECTION

SITE LIMIT



NOTE: BIKE LANES ARE NOT SHOWN ON THIS CONCEPTUAL PLAN.

LIBORIO III		
TRAFFIC IMPACT STUDY REVIEW		
SIMYRNA, KENT COUNTY, DELAWARE		
N.T.S	FIGURE 2	JULY, 2010
CONCEPTUAL LAYOUT FOR PROPOSED SITE ENTRANCES ON US ROUTE 13		
<div> <div> <div>JOHNSON, MIRMIRAN & THOMPSON</div> <div>Engineering A Brighter Future</div> </div> </div>		

Approach	Current Configuration	Proposed Configuration
Northbound Site Approach	Approach does not exist	One right-turn lane
Southbound Site Approach	Approach does not exist	One right-turn lane
Eastbound Carter Road	One left-turn lane, one through lane and one right-turn lane*	No Change
Westbound Carter Road	One left-turn lane and two through lanes*	One left-turn lane, two through lanes and one right-turn lane

*Some of the turn lanes already exist at this intersection. The recommended minimum storage lengths (excluding tapers) for the separate turn lanes are listed below.

- The developer should construct a full access site entrance (Site Entrance 6) on Carter Road across from Bon Ayre Lane to be consistent with the proposed lane configuration shown below:

Approach	Current Configuration	Proposed Configuration
Northbound Bon Ayre Lane	One left-turn lane and one right-turn lane	One left-turn lane, one through lane and one right-turn lane
Southbound Site Approach	Single lane service road	One left-turn lane, one through lane and one right-turn lane
Eastbound Carter Road	One through lane and one right-turn lane	One left-turn lane, one through lane and one right-turn lane
Westbound Carter Road	One left-turn lane and one through lane	One left-turn lane, one through lane and one right-turn lane

The recommended minimum storage lengths (excluding tapers) of the separate turn lanes are listed below.

Approach	Left-Turn Lane	Right-Turn Lane
Northbound Bon Ayre Lane	165 feet*	140 feet**
Southbound Site Entrance	275 feet*	185 feet**
Eastbound Carter Road	320 feet*	290 feet**
Westbound Carter Road	250 feet*	290 feet**

*Left-turn storage length is based as per HCS analysis.

**Right-turn storage length is based on DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*.

- The developer should enter into a traffic signal agreement with DelDOT for the intersection of Carter Road and Bon Ayre Lane/Site Entrance 6. The agreement should include pedestrian signals, crosswalks and interconnection at DelDOT's discretion. The developer will be required to perform a peak hour and a four-hour signal warrant analysis at DelDOT's direction.
- The developer should construct the site entrance (Site Entrance 7) on Bon Ayre Lane to be consistent with the proposed lane configuration shown in the table below:

Approach	Current Configuration	Proposed Configuration
Northbound Bon Ayre Lane	One through lane	One shared through/right-turn lane
Southbound Bon Ayre Lane	One through lane	One left-turn lane and one through lane
Westbound Site Access	Approach does not exist	One shared left-turn/right-turn lane

Based on DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*, the recommended turn-lane length (excluding taper) is 150 feet for the southbound left-turn lane.

- The developer should improve the intersection of Carter Road and US Route 13. This includes extending the eastbound left-turn storage lane on Carter Road to provide 375 feet storage (excluding taper) length. This also includes removing the southbound US Route 13 acceleration lane and providing appropriate signage and striping to modify the operation of the eastbound right-turn movement from a free flow to a yield controlled right-turn movement on Carter Road. The eastbound right-turn lane should be extended to provide 550 feet of storage (excluding taper).
- The developer should construct the two right-in/right-out only site entrances (Site Entrances 1 and 2) on southbound US Route 13 as shown in Figure 2. Based on DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access* manual, the recommended turn-lane lengths (excluding tapers) are 310 feet for the southbound right-turn lanes with a 50-foot right-turn radius. This work should be done in conjunction with the removal of the acceleration lane on southbound US Route 13 as described in Item No. 7 above. The developer should coordinate with DelDOT's Subdivision Section to determine the exact location of the site entrances.
- The developer should enter into an agreement with DelDOT to fund an equitable portion of the improvements required at the intersection of Carter Road and Sunnyside Road. The proposed configuration is shown in the table below. Several other developers are expected to be responsible for part of these improvements as well. The developer should coordinate with DelDOT on the implementation and equitable cost sharing of these improvements.

Approach	Current Configuration	Proposed Configuration
Northbound Sunnyside Road	One shared through/left-turn lane and one right-turn lane	One left-turn lane and one shared through/right-turn lane
Southbound Sunnyside Road	One shared left-turn/through/right-turn lane	One left-turn lane and one shared through/right-turn lane
Eastbound Carter Road	One shared left-turn/through/right-turn lane	One left-turn lane, one through lane and one right-turn lane
Westbound Carter Road	One shared through/left-turn lane and one right-turn lane	One left-turn lane and one shared through/right-turn lane

10. The developer should enter into a traffic signal agreement with DelDOT for the intersection of Carter Road and Sunnyside Road. The agreement should include pedestrian signals, crosswalks and interconnection at DelDOT's discretion. Several other developers are expected to enter into a traffic signal agreement for this intersection as well. The developer should coordinate with DelDOT on the implementation and equitable cost sharing of the traffic signal.
11. The developer should enter into an agreement with DelDOT to fund an equitable portion of the improvements required at the intersection of US Route 13 and Brenford Road/Big Oak Road. The proposed configuration is shown in the table below:

Approach	Current Configuration	Proposed Configuration
Northbound US Route 13	One left-turn lane, two through lanes and one right-turn lane	No Change
Southbound US Route 13	One left-turn lane, two through lanes and one right-turn lane	No Change
Eastbound Brenford Road	One shared left-turn/through/right-turn lane	One left-turn lane, one shared through/left-turn lane and one right-turn lane
Westbound Big Oak Road	One shared left-turn/through/right-turn lane	No Change

Several other developers are expected to be responsible for part of these improvements as well. The developer should coordinate with DelDOT on the implementation and equitable cost sharing of these improvements.

12. The developer should enter into a traffic signal agreement with DelDOT for the intersection of US Route 13 and Brenford Road/Big Oak Road. The agreement will cover the signal head adjustments required by the physical improvements noted in Item No. 11. The agreement should include pedestrian signals, crosswalks and interconnection at DelDOT's discretion. Several other developers are expected to enter into a traffic signal agreement for this intersection as well. The developer should coordinate with DelDOT on the implementation and equitable cost sharing of the traffic signal.
13. If DelDOT decides to close the crossover at North Street, the developer should construct the concrete median required to close the crossover and prohibit the southbound left-turn movement. In lieu of restriping the dual left-turn lanes on the northbound US Route 13 approach to provide 375 feet of storage length as proposed in Item No. 7, the developer should restripe the dual left-turn lanes on the northbound US Route 13 at the intersection of Carter Road and US Route 13 to provide 425 feet of storage length (excluding taper). The developer should coordinate with DelDOT on the implementation and equitable cost sharing of these improvements.

14. The developer should enter into an agreement with DelDOT to fund an equitable portion of improvements of a potential future project at the intersection of US Route 13 and the Delaware Route 1 ramps. This participation should include a monetary contribution funded by the developer and others. The intersection improvements may include some or all of the improvements indicated in the table below:

Approach	Current Configuration	Proposed Configuration
Northbound US Route 13	One left-turn lane, two through lanes and one right-turn lane	No Change
Southbound US Route 13	One left-turn lane, two through lanes and one right-turn lane	No Change
Eastbound Simons Corner approach	One exclusive left-turn lane, one shared through/left-turn lane and one right-turn lane	Two exclusive left-turn lanes, one through lane and one right-turn lane
Westbound Delaware Route 1 ramps	One exclusive left-turn lane, one shared through/left-turn lane and one right-turn lane	Two exclusive left-turn lanes, one through lane and one right-turn lane

The developer should coordinate with DelDOT in order to determine the equitable contribution towards project development and construction of this potential future DelDOT project.

15. The following bicycle, pedestrian, and transit improvements should be included:
- Where right-turn lanes are added on US Route 13 and/or Carter Road a bicycle lane should also be provided through the right-turn lane. A right-turn yield to bikes sign (MUTCD R4-4) should be added at the start of each right-turn lane.
 - A five-foot bicycle lane should be striped along the site frontage on Carter Road in order to facilitate safe and unimpeded bicycle travel to include bicycle symbols and directional arrows.
 - Covered bike parking racks should be provided near the building entrances.
 - Where shoulders are provided on internal streets and interconnecting roadways to adjacent parcels shoulder should be marked for bicycle lanes with bicycle symbols and directional arrows.
 - ADA compliant sidewalks with five-foot buffers from edge of roadway should be provided along the property frontage. The frontage sidewalks should also connect to existing pedestrian facilities on properties adjoining the site on US Route 13, South Carter Road and Bon Ayre Lane.
 - All internal roads should be provided with sidewalks on both sides and should connect the building fronts to the frontage sidewalks.
 - Marked crosswalks with ADA compliant curb ramps should be provided at all site entrances on Carter Road, US Route 13 and on Bon Ayre Lane. The use of Type 3 curb ramps is discouraged.
 - A bus pull off with a 9' x 17' ADA compliant concrete pad and a 5' x 15' bus shelter should be provided along the site frontage on US Route 13 north of the intersection of



US Route 13 and Carter Road. This new bus stop would replace an existing DART bus stop which is located north of the Carter Road intersection near the Relax Inn. The internal and frontage sidewalks should connect to this stop. Parking facilities for bicyclists should be included.

- i. A multi-use path connection from the site to Holly Hill Estates is recommended as shown on Figure 3.

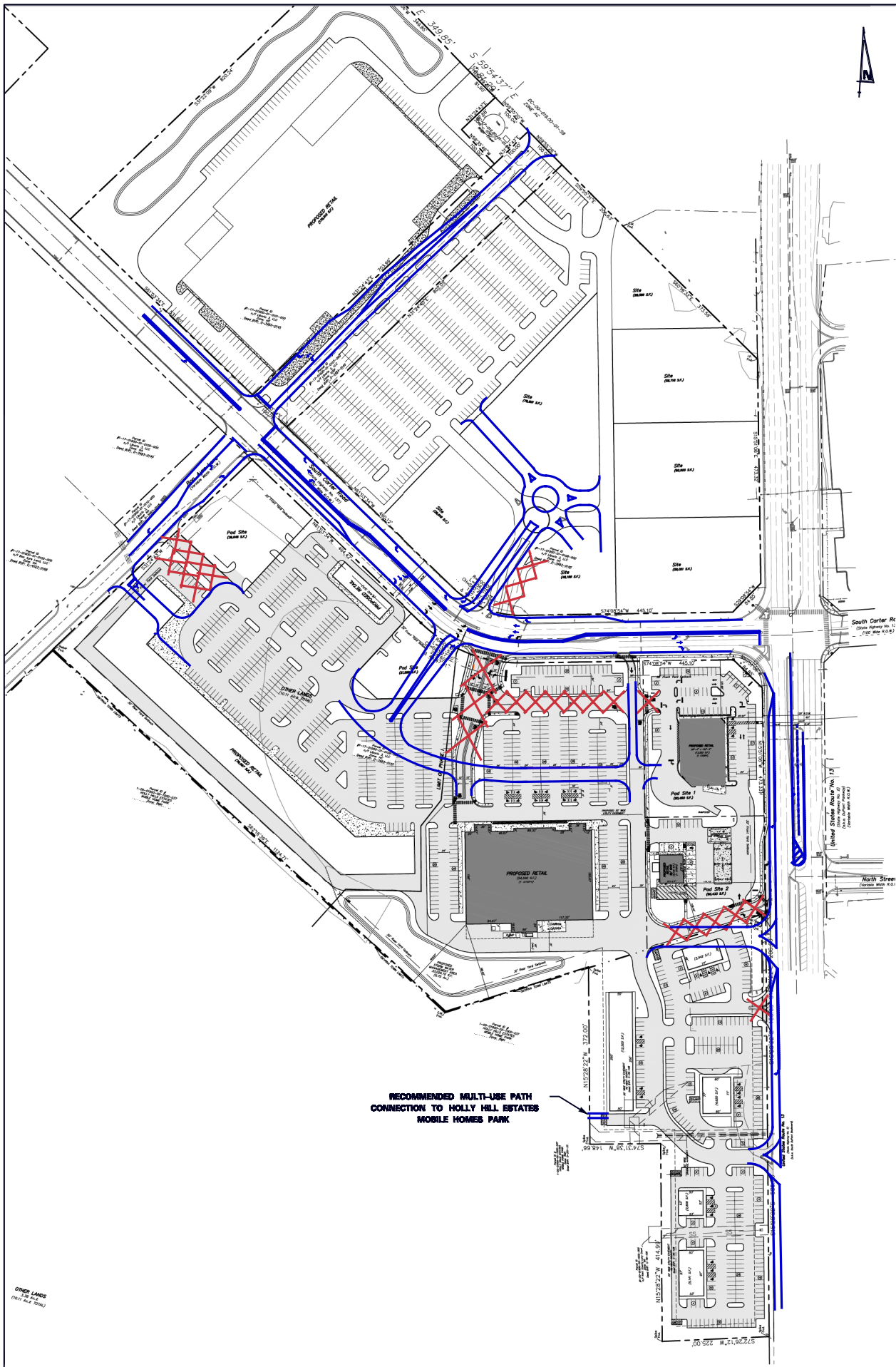
Please note that this review generally focuses on capacity and level of service issues; additional safety and operational issues will be further addressed through DelDOT's subdivision review process.

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.

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



LIBORIO III

TRAFFIC IMPACT STUDY REVIEW

SMYRNA, KENT COUNTY, DELAWARE

CONCEPTUAL

INTERNAL SUBDIVISION

ROADWAY ALIGNMENT

JOHNSON, MIRMIRAN & THOMPSON

Engineering A Brighter Future

N.T.S

FIGURE 3

JULY, 2010

General Information

Report date: October 2, 2009.

Prepared by: Van Cleef Engineering Associates.

Prepared for: Liborio Commercial (a.k.a. Liborio III).

Tax Parcels: DC-17-019.00-01-01.08 and 01.09. The tax parcels DC-17-019.00-02-10-01, DC-17-019.00-02-11.01 and 02, DC-17-019.00-01-01.01 and 07 were included on the site plan after the scoping meeting.

Generally consistent with DelDOT's Rules and Regulations for Subdivision Streets: Yes.

Project Description and Background

Description: 165,659 square feet retail, 13,225 square foot pharmacy and 3,132 square foot convenience market with gas pumps south of Carter Road and 175,515 square feet retail north of Carter Road.

Location: The project is proposed on the west side of US Route 13 (DuPont Highway/Kent Road 2) and situated on both sides of South Carter Road (Kent Road 137) in the Town of Smyrna, Kent County.

Amount of Land to be developed: Approximately 46.6 acres of land.

Land Use approval(s) needed: Commercial Entrance Approval.

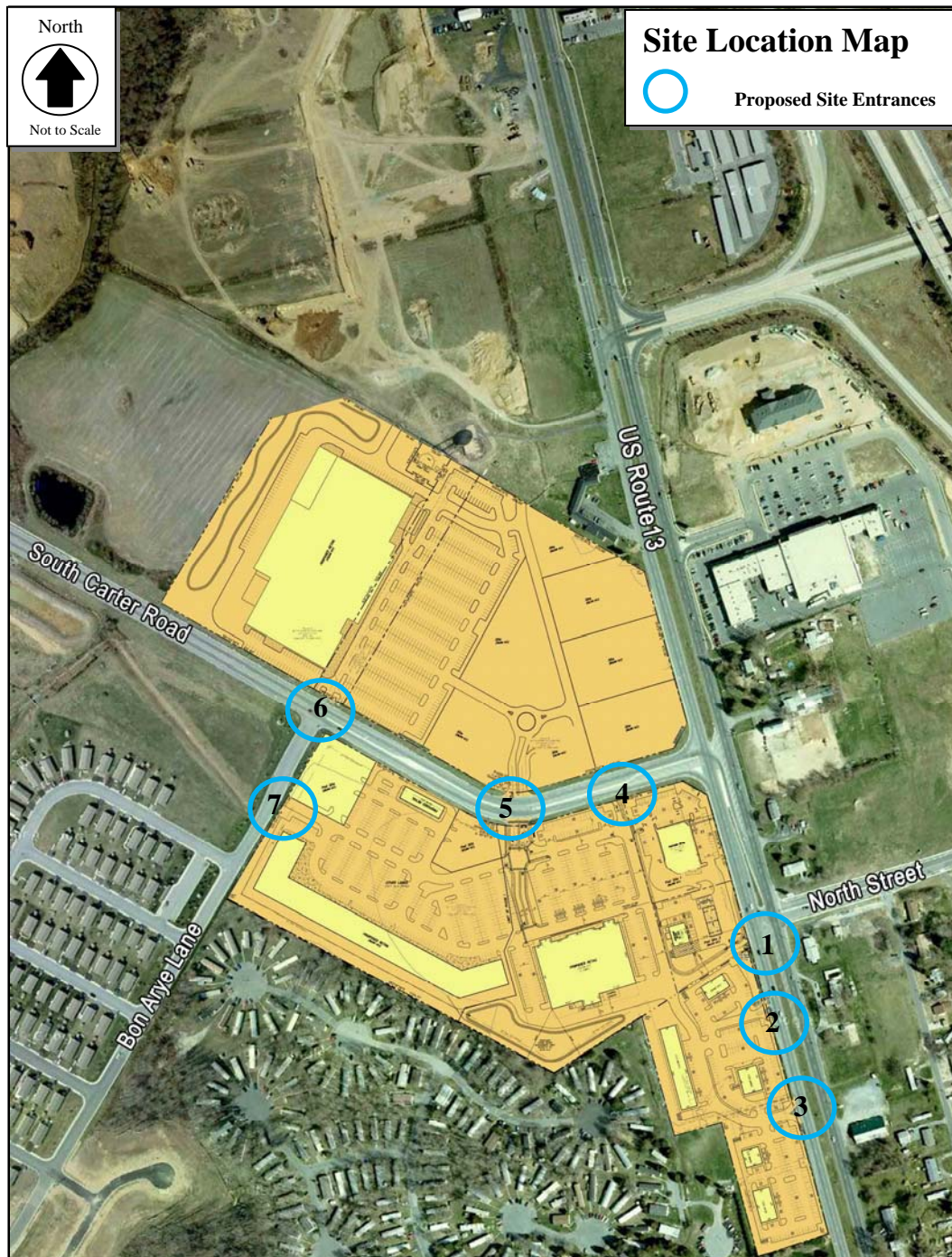
Proposed completion date: 2011.

Proposed access locations: Seven access points are proposed: two full access points and one right-in only along Carter Road, three right-in/right-out only access driveways along US Route 13 southbound and one full access on Bon Ayre Lane.

Daily Traffic Volumes:

- 2008 Average Annual Daily Traffic on US Route 13: 36,455 vehicles per day.
- 2008 Average Annual Daily Traffic on Carter Road: 8,027 vehicles per day.

Site Map



**Graphic is an approximation based on the site plan included in the TIS report dated October 2, 2009. JMT numbered the proposed Site Entrances from 1 through 7 for easy reference.*

Relevant and On-going Projects

The Carter Road Project (Project No. 23-016-01) includes improvement to vehicle, pedestrian and bicycle travel along Carter Road from Sunnyside Road to Wheatleys Pond Road. The

improvements will involve widening Carter Road to two eleven-foot travel lanes with two five-foot shoulders, installing curbs and sidewalks and addressing closed drainage, traffic calming, and safety improvements. The existing centerline will be shifted to minimize right-of-way impacts. The intersection of Sunnyside Road and Carter Road is proposed to be signalized. The DelDOT project manager, Jerry Lovell informed JMT that the project was in its semi-final stage and scheduled to begin construction in the fall of 2011 and be completed in the winter of 2012.

Livable Delaware

(Source: Delaware Strategies for State Policies and Spending, July 2004)

Location with respect to the Strategies for State Policies and Spending Map of Delaware:

The proposed development is located within Investment Level 1.

Investment Level 1

These areas are often municipalities or urban/urbanizing places where density is generally higher than in surrounding areas. Areas classified as Investment Level 1 are population centers built around a traditional central business district, which offers a wide range of opportunities for employment, shopping and recreation. Investment Level 1 Areas are considered to drive Delaware's economy and therefore reinvestment and redevelopment are encouraged.

In Investment Level 1 Areas, state investments and policies 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. Typical transportation projects included new or expanded facilities and services for all modes of transportation, including public transportation facilities and services. Projects will also include those that manage traffic flow and congestion, support economic development and redevelopment efforts, and encourage connections between communities and the use of local streets for local trips.

Proposed Development's Compatibility with Livable Delaware:

The proposed Liborio Commercial development falls within Investment Level 1 and is to be developed with commercial and other services, relatively consistent with the character of existing commercial developments in this area. According to Livable Delaware, uses of the land located within Investment Level 1 include facilities that support economic development and encourage connections between communities, such as shopping centers. As such, this development appears to be generally consistent with the 2004 update of the Livable Delaware "Strategies for State Policies and Spending." Additionally, the proposed internal connection to the Simons Corner Shopping Center encourages the local trips to stay off of US Route 13 and is recommended. The Holly Hills Estates, a mobile home park adjoins this property on the south side. A multi-use path connection to Holly Hill Estates is recommended for the residents that currently walk to the nearby Gateway North shopping center.

Comprehensive Plans

Town Of Smyrna Comprehensive Plan:

The proposed development is situated within the Town of Smyrna. These parcels are classified as Highway Commercial, HC. These parcels were annexed in to the Town of Smyrna around the 1980's with the intention of filling in the enclaves along US Route 13 with commercial uses that would be consistent with the Comprehensive Plan.

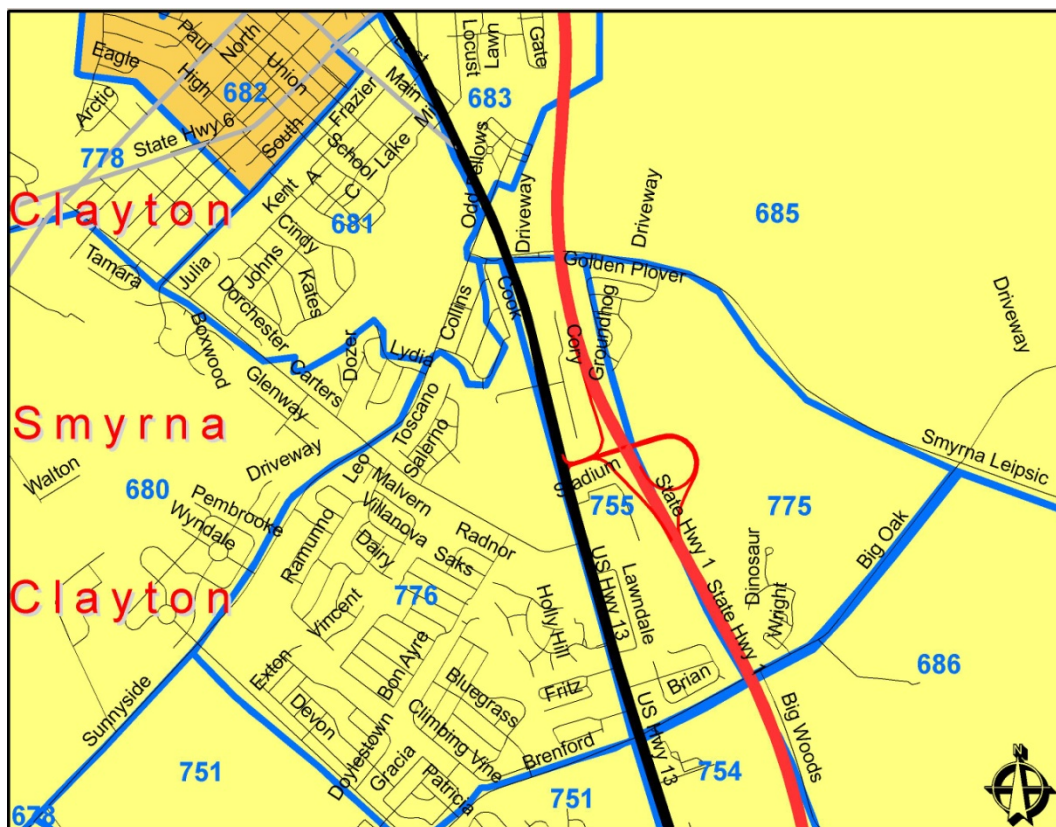
Proposed Development's Compatibility with the Town Comprehensive Plan:

The proposed Liborio Commercial development maintains the same zoning and is generally compatible with the Town's Comprehensive plan.

Transportation Analysis Zones (TAZ)

Transportation Analysis Zones (TAZ) where development would be located: 776

TAZ Boundaries:



Current employment estimate for TAZ: 81 in 2005

Future employment estimate for TAZ: 79 in 2030

Current Population estimate for TAZ: 1790 in 2005

Future Population estimate for TAZ: 2216 in 2030

Liborio Commercial

July 6, 2010

Page 19

Current household estimate for TAZ: 698 in 2005

Future household estimate for TAZ: 890 in 2030

Relevant committed developments in the TAZ: Simon's Corner Shopping Center, Worthington, Cambria Village, Christiana Apartments, Hickory Hollow, Bon Ayre and Sunnyside Village.

Would the addition of committed developments to current estimates exceed future projections: Yes.

Would the addition of committed developments and the proposed development to current estimates exceed future projections: Yes.

Trip Generation

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

South of Carter Road

- 165,659 square feet of Retail - (ITE Land Use code 820)
- 13,225 square foot Pharmacy - (ITE Land Use code 881)
- 3,132 square foot convenience store with gas pumps - (ITE Land Use code 853)

North of Carter Road

- 175,515 square feet of Retail - (ITE Land Use code 820)

The peak period trip generation for Liborio Commercial development is included in Table 1.

Table 1
LIBORIO COMMERCIAL DEVELOPMENT TRIP GENERATION

Proposed Land Use	ADT	AM Peak Hour			PM Peak Hour			Sat Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
175,515 square foot Retail (North of Carter Road)	9,789	134	85	219	436	472	908	649	599	1,248
Internal Capture		0	0	0	39	38	77	47	49	96
Sub-Total (External Trips)		134	85	219	397	434	831	602	550	1,152
Pass-By Trips		0	0	0	131	143	274	210	192	402
Net New Trips		134	85	219	266	291	557	392	358	750
165,659 square foot Retail (South of Carter Road)	9,428	129	82	211	418	452	870	622	575	1,197
Internal Capture		0	0	0	39	39	77	49	47	96
Sub-Total (External Trips)		129	82	211	380	413	793	573	528	1,101
Pass-By Trips		0	0	0	129	140	269	200	185	385
Net New Trips		129	82	211	251	273	524	373	343	716
13,225 square foot Pharmacy	1,166	20	15	35	56	58	114	52	52	104
Internal Capture		0	0	0	12	12	24	9	9	18
Sub-Total (External Trips)		20	15	35	44	46	90	43	43	86
Pass-By Trips		0	0	0	22	23	45	21	21	42
Net New Trips		20	15	35	22	23	45	22	22	44
3,132 square foot Convenience Store with gas pumps	2,469	71	72	143	95	95	190	91	83	174
Internal Capture		0	0	0	16	16	32	15	15	30
Sub-Total (External Trips)		71	72	143	79	79	158	76	68	144
Pass-By Trips		45	46	143	52	52	104	50	45	95
Net New Trips		26	27	53	27	27	54	26	23	49
Total Trips	23,032	309	209	518	566	614	1,180	813	746	1,559

Overview of TIS

Intersections examined:

1. US Route 13 and Site Entrances
2. Carter Road and Site Entrances
3. US Route 13 and Carter Road
4. US Route 13 and Delaware Route 1 Ramps
5. US Route 13 and Gateway North Boulevard/Crossover
6. US Route 13 and Hedgerow Hollow Road/Crossover
7. US Route 13 and Cathleen Drive
8. US Route 13 and Brenford Road/Big Oak Road
9. Carter Road and Bon Ayre Lane
10. Carter Road and Salerno Drive
11. Carter Road and Villanova Drive
12. Carter Road and Sunnyside Road

Conditions examined:

1. Case 1 - Existing 2009 conditions.
2. Case 2 - 2011 No Build conditions without Liborio III development.
3. Case 3 - 2011 Build with Liborio III development.
4. Case 4 - 2011 Build with Liborio III development and without Wick Commercial Property.
5. In addition, 2011 Build with Liborio III development and only two site access points on southbound US Route 13. This case is evaluated for both with and without Wick Commercial Property development.

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

Committed Developments considered:

1. Big Oak Commercial (80,254 square feet of commercial space, 3 commercial outparcels)
2. Big Oak Residential (48 single-family detached houses)
3. Willowwood (498 single-family detached houses)
4. Simon's Corner Shopping Center (324,410 square foot shopping center)
5. Worthington (579 single-family detached houses)
6. Centerville and Graceville (856 single-family detached houses)
7. Cambria Village (280 townhouses, 260 unbuilt)
8. Christiana Apartments (188 apartments)
9. Hickory Hollow (325 single-family detached houses)
10. Brenford Woods (111 single-family detached houses, 15 unbuilt)
11. Auburn Meadows (106 single-family detached houses, 366 townhouses)
12. Greenhill Estates (139 single-family detached houses)
13. Villages of Eastridge (374 single-family detached houses)
14. Garrison Lake Green (313 single-family detached houses)
15. Brenford Station, Phase I (195 single-family detached houses, 84 unbuilt)
16. Brenford Station, Phase II (231 single-family detached houses)
17. Hidden Brook (325 single-family detached houses)

18. Ashland (160 single-family detached houses)
19. Wicksfield (202 single-family detached houses, 153 unbuilt)
20. Masseys Mill (60 single-family detached houses)
21. Warren Property (120 apartments)
22. Heritage Trace (236 single-family detached houses)
23. Southern View (100 single-family detached houses)
24. Bon Ayre (404 single-family detached houses, 202 unbuilt)
25. Sunnyside Village (255 single-family detached houses, 117 unbuilt; 132 townhouses, 60 unbuilt; 235 apartments, 108 unbuilt)
26. Twin Willows (158 single-family detached houses; 69 unbuilt)
27. Spring Meadows (152 single-family detached houses, 31 unbuilt; 94 townhouses, 32 unbuilt)
28. Rite Aid (16,032 square foot pharmacy)
29. Wick Commercial Property (300,000 square feet of retail space)

Intersection Descriptions

1. Southbound US Route 13 and Site Entrance 2

Type of Control: Proposed right-in/right-out only intersection

Eastbound Approach: (Site Entrance) proposed one right-turn only lane

Northbound Approach: (Northbound US Route 13) existing two through lanes

Southbound Approach: (Southbound US Route 13) existing two through lanes, proposed two through lanes and one right-turn lane

2. Southbound US Route 13 and Site Entrance 3

Type of Control: Proposed right-in/right-out only intersection

Eastbound Approach: (Site Entrance) proposed one right-turn only lane

Northbound Approach: (Northbound US Route 13) existing two through lanes

Southbound Approach: (Southbound US Route 13) existing two through lanes, proposed two through lanes and one right-turn lane

3. Carter Road and Site Entrance 5

Type of Control: Proposed right-in/right-out/left-in only intersection

Eastbound Approach: (Carter Road) one left-turn lane, one through lane and one right-turn lane

Westbound Approach: (Carter Road) existing one left-turn lane, two through lanes; proposed one left-turn lane, two through lanes and one right-turn lane

Northbound Approach: (Site Entrance) proposed one right-turn only lane

Southbound Approach: (Site Entrance) proposed one right-turn only lane

Note: The left-turn lanes on Carter Road for this site entrance are already constructed.

4. Carter Road and Site Entrance 4

Type of Control: proposed right-in only intersection

Eastbound Approach: (Carter Road) existing one through lane, proposed one through lane and one right-turn lane

Westbound Approach: (Carter Road) two through lanes

5. US Route 13 and Carter Road

Type of Control: signalized four-legged intersection

Eastbound Approach: (Carter Road) one left-turn lane, one through lane and one channelized right-turn lane

Westbound Approach: (Carter Road) one left-turn lane, one through lane and one right-turn lane

Southbound Approach: (Southbound US Route 13) one left-turn lane, two through lanes and one right-turn lane

Northbound Approach: (Northbound US Route 13) two left-turn lanes, two through lanes and one right-turn lane

Note: The eastbound right-turn from Carter Road operates as a free right-turn and is provided with a 350 feet acceleration lane.

6. US Route 13 and Delaware Route 1 Ramps

Type of Control: signalized four-legged intersection

Eastbound Approach: (Simons Corner Entrance) one left-turn lane, one shared through/left-turn lane and one channelized right-turn lane

Westbound Approach: (Delaware Route 1 Ramps) one left-turn lane, one shared through/left-turn lane and one channelized right-turn lane

Southbound Approach: (Southbound US Route 13) one left-turn lane, two through lanes and one channelized right-turn lane

Northbound Approach: (Northbound US Route 13) one left-turn lane, two through lanes and one channelized right-turn lane

Note: The eastbound right-turn from Simons Corner and the westbound right-turn from Delaware Route 1 ramps operate as free right-turns and are provided with acceleration lanes.

7. US Route 13 and Gateway North Boulevard/ 1st Crossover south of site entrance/Site Entrance 1

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

Eastbound Approach: (Site Entrance) proposed one right-turn only lane. This entrance location is however not recommended

Westbound Approach: (Gateway North Boulevard) one channelized right-turn only lane

Southbound Approach: (Southbound US Route 13) existing two through lanes and one left-turn lane; proposed two through lanes, one left-turn lane and one right-turn lane

Northbound Approach: (Northbound US Route 13) two through lanes and one right-turn lane

Note: The northbound U-turn movement is restricted by pylons and lane striping at this intersection.

8. US Route 13 and Hedgerow Hollow Road/2nd Crossover south of Site Entrance

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

Eastbound Approach: (Hedgerow Hollow Road) one shared through/left-turn/right-turn lane

Southbound Approach: (Southbound US Route 13) two through lanes, one left-turn lane and shoulder used as right-turn lane

Northbound Approach: (Northbound US Route 13) two through lanes and one left-turn lane

9. US Route 13 and Cathleen Drive

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

Westbound Approach: (Cathleen Drive) one channelized right-turn only lane

Northbound Approach: (Northbound US Route 13) two through lanes and one right-turn lane

10. US Route 13 and Brenford Road/Big Oak Road

Type of Control: signalized four-legged intersection

Eastbound Approach: (Brenford Road) existing one shared left-turn/through/right-turn lane; proposed one left-turn lane, one shared through/left-turn lane and one right-turn lane

Westbound Approach: (Big Oak Road) one shared left-turn/through/right-turn lane

Southbound Approach: (Southbound US Route 13) one left-turn lane, two through lanes and one right-turn lane

Northbound Approach: (Northbound US Route 13) one left-turn lane, two through lanes and one right-turn lane

11. Carter Road and Bon Ayre Lane/ Site Entrance 6

Type of Control: existing stop-controlled intersection (T-Intersection); proposed signalized four-legged intersection

Eastbound Approach: (Carter Road) existing one center-turn lane, one through lane and one right-turn lane; proposed one left-turn lane, one through lane and one right-turn lane

Westbound Approach: (Carter Road) existing one left-turn lane and one through lane; proposed one left-turn lane, one through lane and one right-turn lane

Northbound Approach: (Bon Ayre Lane) existing one left-turn lane and one right-turn lane; proposed one left-turn lane and one shared through/right-turn lane

Southbound Approach: (Service Road) existing one lane service road; proposed one left-turn lane and one shared through/right-turn lane

12. Bon Ayre Lane & Site Entrance 7

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

Westbound Approach: (Site Entrance) proposed shared left-turn/right-turn lane

Northbound Approach: (Bon Ayre Lane) existing one through lane; proposed one shared through/right-turn lane

Southbound Approach: (Bon Ayre Lane) existing one through lane; proposed one left-turn lane and one through lane

13. Carter Road and Salerno Drive

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

Eastbound Approach: (Carter Road) one left-turn lane and one through lane

Westbound Approach: (Carter Road) one center-turn lane, one through lane, one bike lane and one right-turn lane

Southbound Approach: (Salerno Drive) one shared left-turn/through/right-turn lane

14. Carter Road and Villanova Drive

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

Eastbound Approach: (Carter Road) one through lane and one right-turn lane

Westbound Approach: (Carter Road) one left-turn lane and one through lane

Northbound Approach: (Villanova Drive) one left-turn lane and one right-turn lane

15. Carter Road and Sunnyside Road

Type of Control: existing all-way stop-controlled intersection; proposed signalized four-legged intersection

Eastbound Approach: (Carter Road) existing one shared left-turn/through/right-turn lane; proposed one left-turn lane, one through lane and one right-turn lane

Westbound Approach: (Carter Road) existing one shared through/left-turn lane and one channelized right-turn lane; proposed one left-turn lane and one shared through/right-turn lane

Southbound Approach: (Sunnyside Road) existing one shared left-turn/through/right-turn lane; proposed one left-turn lane and one shared through/right-turn lane

Northbound Approach: (Sunnyside Road) existing one shared through/left-turn lane and one channelized right-turn lane; proposed two left-turn lanes and one shared through/right-turn lane

Note: This intersection is being improved as part of the planned Carter Road improvement project.

Transit, Pedestrian, and Bicycle Facilities

Existing transit service: Inter-county Route 301 that connects Wilmington and Dover operates along US Route 13 in the project area. There are currently two bus stops on US Route 13 southbound in the vicinity of the project area, one in front of the Relax Inn near the north of the site and one stop near Holly Hill Estates. There is an existing Smyrna Park and Ride near US Route 13 and Delaware Route 1 intersection.

Planned transit service: Van Cleef Associates contacted Lisa Collins, Service Development Planner of DTC. She noted that all the trips currently operated by Route 301 would be provided by a new local Route 120 operating between the Smyrna Rest Stop Park and Ride, Cheswold and Water Street Transfer Center in Dover, starting December 2010. Additionally, Route 301 could indirectly serve the site by connections to the local Route 120 at the Smyrna Park and Ride.

Furthermore, in an email to JMT dated November 4, 2009, Lisa Collins noted that both the bus stops in the project vicinity needed improvements. Based on the site plan, she recommended moving the stop near the Relax Inn further south, in front of the site area and providing a bus pull off with a 9' x 17' ADA compliant concrete pad and a 5' x 15' bus shelter on US Route 13 southbound near the intersection of Carter Road, in the vicinity of the crosswalk to serve this project.

Existing bicycle and pedestrian facilities: According to DelDOT's *Delaware Bicycle Facility Master Plan* (October 2005), US Route 13 is designated as a Recreational Connector.

The *Delaware Bicycle Touring Map* designates US Route 13 as having above average cycling conditions with high traffic volumes (greater than 10,000 vehicles per day). To the east of its intersection with Sunnyside Road, Carter Road has average cycling conditions with moderate traffic volumes (between 2,000 and 10,000 vehicles per day). To the west of its intersection with Sunnyside Road, Carter Road has above average cycling conditions and low traffic volumes (below 2,000 vehicles). Sunnyside Road has average cycling conditions throughout with moderate traffic volumes (between 2,000 and 10,000 vehicles per day) to the north of its intersection with Carter Road and low traffic volumes (below 2,000 vehicles) to the south of this intersection.

There are pedestrian crosswalks and pedestrian signals provided at the intersection of Carter Road and US Route 13. Currently there are no sidewalks on Carter Road from Bon Ayre Lane to US Route 13.

Planned bicycle and pedestrian facilities: JMT contacted Mr. Anthony Aglio, DelDOT's Bicycle Coordinator. In an email dated November 3, 2009 he requested the following bicycle improvements:

- A minimum of five-foot bicycle lane (in addition to required right-turn lanes) should be striped along the site frontage on Carter Road in order to facilitate safe and unimpeded bicycle travel.
- A bicycle lane should also be provided through the right-turn lane on US Route 13 southbound.
- Covered bike parking racks should be provided near the site entrances.
- Bicycle lanes should be provided on interconnecting roads to adjacent parcels.
- The developer of this project should contact DART regarding the addition of transit service and transit facilities at this location. This bus stop should include parking facilities for bicyclists.
- Any intersection improvements planned on S. Carter Road, US Route 13 and Sunnyside Road should include bicycle facilities.

JMT contacted Ms. Jennifer Baldwin, DelDOT's Pedestrian Coordinator. In a letter dated October 28, 2009, she noted that the Liborio Commercial development was in an investment Level 1 area and should include diverse transportation options including walking and bicycling and requested the following bicycle improvements:

- ADA compliant sidewalks with five-foot buffers should be provided along the property frontage. The frontage sidewalks should also extend to connect to existing pedestrian facilities on properties adjoining the site on Jimmy Drive, US Route 13 and Bon Ayre Lane.
- All internal roads should be provided with sidewalks on both sides and should connect the building fronts to the frontage sidewalks.
- Marked Crosswalks with ADA compliant curb ramps should be provided at all site entrances on Carter Road, US Route 13 and on Bon Ayre Lane.

- Marked Crosswalks with ADA compliant pedestrian facilities should be provided at the south leg of the intersection of US Route 13 and Carter Road.
- The developer of this project should contact DART regarding the addition of transit service and transit facilities at this location. Internal and frontage sidewalks should be connected to this stop.

Previous Comments

The following comments noted in the Preliminary TIS Review were not correctly addressed in the Final TIS submission.

- The TIS had erroneously included Figures 45 through 52 for Case 2 and Figures 67 through 72 for Case 3 that were to be discarded from the Final TIS.
- The TIS did not propagate the adjustment made by DelDOT (dated October 23, 2008 and shown in Figures 67, 68 and 69) at the intersection of US Route 13 and Carter Road through the other intersections on Carter Road.
- Further e-mail correspondence from DelDOT on September 3, 2009 supplied new traffic volumes to be used at the intersection of US Route 13 and Brenford Road/Big Oak Road. These numbers superseded all the numbers given at this intersection before. The TIS used the new numbers at Brenford/Big Oak/US Route 13 only and did not adjust volumes at other intersections north of Brenford Road to account for this change.
- As such, JMT adjusted all the volume diagrams for Case 2 (Figures 42, 43 and 44) and Case 3 (Figures 64, 65 and 66).
- The TIS did not receive any comments from DelDOT's Pedestrian or Bike Section and as such did not include copies of any correspondence from DelDOT.

General HCS/Synchro Analysis Comments

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

- 1) The TIS analyses had errors in volume calculations for Case 2 and Case 3. JMT corrected these numbers as directed by DelDOT and used the corrected volumes for Case 2 and Case 3 analyses.
- 2) JMT performed Case 4 analyses for the scenario that Wick Commercial Property would not be developed. TIS did not conduct this analysis.
- 3) The TIS sometimes used incorrect peak hour factors. JMT applied the peak hour factor as per lane groups for existing conditions as per customary DelDOT TIS Review methodology.
- 4) The TIS analysis sometimes used incorrect heavy vehicle percentages. JMT applied the heavy vehicle percentages by lane group as per customary DelDOT TIS Review methodology.
- 5) The TIS analysis sometimes used peak hour factors of 0.92 for future conditions even if volumes remain unchanged. JMT used existing peak hour factors if volumes remained unchanged.

- 6) The TIS did not include the existing pedestrian phases in the signalized analyses at US Route 13 and the Delaware Route 1 ramps and at US Route 13 and Carter Road intersections. JMT included these as per signal timings received from DelDOT in conjunction with the pedestrian counts at these intersections.

Table 2
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection ¹ One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Site Entrance 2²						
2011 with Liborio III development (Case 3)						
Eastbound Site Access-Right	C (15.8)	D (27.7)	C (20.0)	C (15.4)	D (26.2)	C (19.3)
2011 with Liborio III development (Case 4)						
Eastbound Site Access-Right	-	-	-	C (15.4)	D (26.2)	C (19.3)
2011 with Liborio III development (Case 3 with two site entrances on US Route 13) ³						
Eastbound Site Access-Right	-	-	-	C (17.2)	F (54.0)*	D (27.7)
2011 with Liborio III development (Case 4 with two site entrances on US Route 13) ³						
Eastbound Site Access-Right	-	-	-	C (17.2)	F (54.0)*	D (27.7)

*HCS analyses shows 95th percentile queue of 5 cars on the site approach

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

² JMT and TIS analyzed the proposed site entrance as a right-in/right-out only access.

³ JMT analyzed additional cases at this entrance considering two access points on US Route 13 and redistributing the volumes from site entrance 1 to site entrances 2 and 3.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection ⁴ One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Site Entrance 3⁵						
2011 with Liborio III development (Case 3)						
Eastbound Site Access-Right	C (15.9)	D (31.2)	C (21.2)	C (15.5)	D (29.2)	C (20.4)
2011 with Liborio III development (Case 4)						
Eastbound Site Access-Right	-	-	-	C (15.5)	D (29.2)	C (20.4)
2011 with Liborio III development (Case 3 with two site entrances on US Route 13) ⁶						
Eastbound Site Access-Right	-	-	-	C (15.5)	D (29.2)	C (20.4)
2011 with Liborio III development (Case 4 with two site entrances on US Route 13) ⁶						
Eastbound Site Access-Right	-	-	-	C (15.5)	D (29.2)	C (20.4)

⁴ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁵ JMT and TIS analyzed this site entrance as a right-in/right-out only access.

⁶ JMT analyzed additional cases at this entrance considering two access points on US Route 13 and redistributing the volumes from site entrance 1 to site entrances 2 and 3. These volumes are same as Case 3 volumes at this intersection.

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection ⁷ One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Carter Road & Site Entrance 5⁸						
2011 without Liborio III development (Case 2) ⁹						
Northbound Site Entrance-Right	B (12.5)	B (12.3)	B (11.9)	-	-	-
Southbound Site Entrance-Right	A (9.2)	B (10.7)	A (9.8)	-	-	-
Eastbound Carter Road-Left	A (8.0)	A (9.5)	A (8.6)	-	-	-
Westbound Carter Road-Left	A (8.8)	A (8.7)	A (8.6)	-	-	-
2011 with Liborio III development (Cases 3 and 4) ¹⁰						
Northbound Site Entrance	C (22.5)	F (569.1)	F (1130)	B (14.7)	D (26.1)	D (29.2)
Southbound Site Entrance	D (31.9)	F (*)	F (*)	C (16.0)	F (221.9)	F (299.3)
Eastbound Carter Road-Left	A (8.2)	B (10.4)	A (9.7)	A (8.0)	A (9.2)	A (8.4)
Westbound Carter Road-Left	A (9.0)	A (9.1)	A (9.1)	A (8.7)	A (8.2)	A (7.9)

* HCS+ did not generate a result due to excessive delay.

⁷ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁸ JMT and TIS analyzed this site entrance as a full access with a shared through/left-turn lane on the northbound and southbound approaches; one left-turn lane, one through lane and one right-turn lane on the eastbound approach and one left-turn lane and one shared through/right-turn lane on the westbound approach.

⁹ JMT did not analyze Case 2 at this intersection as background traffic cannot be expected to use the proposed site roads before site is built. JMT developed corrected Case 2 volumes and redistributed this traffic to other intersections.

¹⁰ Case 3 and Case 4 volumes are all the same for this intersection.

Table 4 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Carter Road & Site Entrance 5						
2011 with Liborio III development (Case 3, With Improvement Option 1) ^{10,11}						
Northbound Site Entrance-Right	B (13.5)	C (19.3)	C (19.7)	B (12.1)	B (11.0)	A (9.8)
Southbound Site Entrance-Right	A (9.6)	C (17.3)	C (16.9)	A (9.2)	B (11.1)	B (10.1)
Eastbound Carter Road-Left	A (8.2)	B (10.9)	B (10.2)	A (8.0)	A (9.2)	A (8.4)
Westbound Carter Road-Left	A (9.0)	A (9.1)	A (9.1)	A (8.7)	A (8.2)	A (7.9)

¹¹ Improvement Option 1 consists of modifying the northbound and southbound site approaches to rights-out only and restricting the through and left-turns out of the site at this intersection. The through and left-turn volumes on these approaches were redistributed to the other site entrances.

Table 5
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection¹² One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Bon Ayre Lane & Site Entrance 7¹³						
2011 with Liborio III development (Cases 3 and 4) ¹⁴						
Southbound Bon Ayre Lane-Left	A (7.3)	A (7.4)	A (7.5)	A (7.4)	A (7.4)	A (7.5)
Westbound Site Entrance	A (8.6)	A (8.9)	A (9.0)	A (8.6)	A (8.9)	A (9.0)
2011 with Liborio III development (Cases 3 and 4 with improvement) ¹⁵						
Southbound Bon Ayre Lane-Left	-	-	-	A (7.4)	A (7.5)	A (7.6)
Westbound Site Entrance	-	-	-	A (8.8)	A (9.4)	A (9.9)

¹² For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

¹³ JMT and TIS analyzed this site entrance as a shared left-turn/right-turn lane.

¹⁴ Case 3 and Case 4 volumes are all the same for this intersection.

¹⁵ Analysis is based on restricted access on Site Entrance 5.

Table 6
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Signalized Intersection¹⁶ (HCS Analysis)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Carter Road¹⁷						
2007 Existing Conditions (Case 1) ^{18,19}	B (13.1)	B (19.3)	B (16.7)	B (11.8)	C (20.3)	B (14.8)
2011 without Liborio III development (Case 2)	B (16.4)	C (23.5)	B (15.8)	B (16.4)	C (33.9)	B (19.0)
2011 with Liborio III development (Case 3)	B (17.1)	C (32.6)	C (20.1)	B (16.8)	D (38.5)	B (19.7)
2011 with Liborio III development (Case 4)	-	-	-	B (17.6)	D (42.2)	C (25.5)
2011 with Liborio III development (Case 3 with Crossover closed) ²⁰	-	-	-	B (17.0)	D (38.7)	B (19.9)
2011 with Liborio III development (Case 4 with Crossover closed) ²⁰	-	-	-	B (17.9)	D (42.2)	C (25.6)

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

¹⁷ TIS did not incorporate the pedestrian phases in the signalized analyses. JMT incorporated these as per timing received from DelDOT and pedestrian counts from the TIS.

¹⁸ Both TIS and JMT analyzed the eastbound right-turn as a free right-turn lane as a full length acceleration lane is provided for this approach.

¹⁹ JMT and TIS used an existing cycle length of 120 seconds. TIS used Cycle length of 150 seconds for future conditions. JMT used 130 seconds. Arrival type 4 was used for the through traffic on US Route 13 to account for signal coordination.

²⁰ JMT performed additional analyses assuming crossover across from North Street was closed and southbound left-turn movement onto North Street was prohibited. These southbound left-turn movements were added to the southbound left-turn volume at this intersection of US Route 13 and Carter Road.

Table 6 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Signalized Intersection (HCS Analysis)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Carter Road						
2011 with Liborio III development (Case 3 without acceleration lane) ²¹	-	-	-	C (21.2)	D (41.0)	C (23.2)
2011 with Liborio III development (Case 4 without acceleration lane) ²¹	-	-	-	C (22.6)	D (44.8)	C (25.8)
2011 with Liborio III development (Case 3 without acceleration lane and with Crossover closed) ^{20, 21}	-	-	-	C (21.8)	D (41.2)	C (23.4)
2011 with Liborio III development (Case 4 without acceleration lane and with Crossover closed) ^{20, 21}	-	-	-	C (23.1)	D (44.8)	C (26.1)

²¹ JMT analyzed the eastbound right-turn approach as yield controlled instead of free flow right-turn and without the southbound US Route 13 acceleration lane.

Table 7
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Signalized Intersection²² (HCS Analysis)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Delaware Route 1 Ramps²³						
2007 Existing Conditions (Case 1)	B (18.6)	C (33.2)	C (20.6)	B (14.2)	C (25.2)	B (19.4)
2011 without Liborio III development (Case 2)	C (21.6)	F (93.2)	F (97.1)	C (21.3)	E (57.9)	E (57.6)
2011 with Liborio III development (Case 3)	C (23.4)	F (105.0)	F (112.0)	C (26.5)	F (85.5)	F (80.1)
2011 with Liborio III development (Case 4)	-	-	-	C (27.1)	E (76.8)	E (69.1)
2011 with Liborio III development (Case 3 with Improvements) ²⁴	C (22.6)	E (55.5)	E (74.5)	C (22.4)	D (53.1)	D (49.5)
2011 with Liborio III development (Case 4 with Improvements) ²⁴	-	-	-	C (23.0)	D (47.5)	D (43.7)

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

²³ TIS and JMT considered eastbound and westbound right-turns to be free movements as an acceleration lane has been provided on US Route 13 for these approaches.

²⁴ Both JMT and TIS used 150 seconds cycle length. As part of the improvement additional eastbound and westbound left-turn lanes were added to the existing configuration.

Table 8
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection²⁵ One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Gateway North/Site Entrance 1²⁶						
2007 Existing Conditions (Case 1)						
Southbound US Route 13-Left	B (11.9)	B (12.8)	B (12.2)	B (12.2)	B (12.7)	B (12.1)
Westbound Gateway North-Right	B (12.4)	B (13.1)	B (13.1)	B (13.0)	B (13.5)	B (13.3)
2011 without Liborio III development (Case 2)						
Southbound US Route 13-Left	C (18.6)	C (16.1)	B (14.4)	C (18.6)	C (15.3)	B (14.0)
Westbound Gateway North-Right	C (16.8)	C (15.1)	B (14.8)	C (18.1)	C (15.8)	B (15.0)
2011 with Liborio III development (Case 3)						
Southbound US Route 13	C (19.4)	C (18.7)	C (16.3)	C (19.4)	C (17.6)	C (15.8)
Eastbound Site Entrance-Right	C (16.9)	E (35.9)	C (20.7)	C (17.2)	E (37.0)	C (21.0)
Westbound Gateway North-Right	C (17.3)	C (16.7)	C (16.3)	C (18.6)	C (17.5)	C (16.6)

²⁵ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

²⁶ JMT and TIS analyzed this site entrance as a right-in/right-out only access.

Table 8 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Gateway North/Site Entrance 1						
2011 with Liborio III development (Case 4)						
Southbound US Route 13	-	-	-	C (19.8)	C (16.9)	C (16.0)
Eastbound Site Entrance-Right	-	-	-	C (17.1)	E (37.0)	C (21.0)
Westbound Gateway North-Right	-	-	-	C (18.9)	C (17.0)	C (16.8)
2011 with Liborio III development (Case 3 with two site entrances on US Route 13) ²⁷						
Southbound US Route 13	-	-	-	C (19.4)	C (17.6)	C (15.8)
Westbound Gateway North-Right	-	-	-	C (18.7)	C (17.5)	C (16.6)
2011 with Liborio III development (Case 4 with two site entrances on US Route 13) ²⁷						
Southbound US Route 13	-	-	-	C (19.8)	C (16.9)	C (16.0)
Westbound Gateway North-Right	-	-	-	C (18.7)	C (17.0)	C (16.8)

²⁷ JMT analyzed additional cases at this entrance considering two access points on US Route 13 and redistributing the volumes from site entrance 1 to site entrances 2 and 3.

Table 9
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection²⁸ One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
2007 Existing Conditions (Case 1)						
Northbound US Route 13-Left	B (12.3)	B (14.3)	B (12.0)	B (12.6)	B (14.1)	B (11.8)
Southbound US Route 13-Left	B (11.8)	B (12.3)	B (12.1)	B (11.7)	B (12.2)	B (11.9)
Eastbound Hedgerow Hollow Road	C (21.6)	D (33.3)	C (22.1)	C (20.6)	D (28.8)	C (16.4)
2011 without Liborio III development (Case 2)						
Northbound US Route 13-Left	C (15.4)	C (21.9)	B (14.9)	C (15.5)	C (22.6)	B (14.9)
Southbound US Route 13-Left	C (18.8)	C (15.3)	B (14.3)	C (17.3)	C (19.7)	B (14.1)
Eastbound Hedgerow Hollow Road	D (34.9)	F (73.0)	D (32.0)	D (30.3)	F (68.2)	C (21.3)
2011 with Liborio III development (Case 3)						
Northbound US Route 13-Left	C (15.4)	C (21.9)	B (14.9)	C (15.5)	C (22.6)	C (21.0)
Southbound US Route 13-Left	C (23.3)	D (34.2)	D (25.1)	C (20.2)	E (49.5)	D (25.9)
Eastbound Hedgerow Hollow Road	E (49.7)	F (1060)	F (125.6)	E (39.9)	F (896.4)	F (79.6)

²⁸ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 9 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Hedgerow Hollow Road						
2011 with Liborio III development (Case 4)						
Northbound US Route 13-Left	-	-	-	C (15.2)	C (22.0)	C (18.7)
Southbound US Route 13-Left	-	-	-	C (18.1)	C (17.3)	B (14.0)
Eastbound Hedgerow Hollow Road	-	-	-	D (30.5)	F (63.2)	D (26.9)

Table 10
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection²⁹ One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Cathleen Drive						
2007 Existing Conditions (Case 1)						
Westbound Cathleen Drive-Right	B (12.4)	B (13.7)	B (11.5)	B (12.4)	B (13.5)	B (11.4)
2011 without Liborio III development (Case 2)						
Westbound Cathleen Drive-Right	C (17.4)	C (16.3)	B (13.2)	C (17.0)	C (18.0)	B (13.0)
2011 with Liborio III development (Case 3)						
Westbound Cathleen Drive-Right	C (17.4)	C (16.3)	B (13.2)	C (17.0)	C (18.0)	C (15.1)
2011 with Liborio III development (Case 4)						
Westbound Cathleen Drive-Right	-	-	-	C (17.5)	C (17.1)	B (14.4)

²⁹ 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 Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Signalized Intersection ³⁰ (HCS Analysis)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
US Route 13 & Brenford Road/Big Oak Road³¹						
2007 Existing Conditions (Case 1)	C (22.3)	B (17.3)	B (16.9)	B (18.7)	B (15.2)	B (14.0)
2011 without Liborio III development (Case 2)	F (131.0)	F (107.4)	F (93.6)	F (160.2)	F (94.7)	F (97.0)
2011 with Liborio III development (Case 3) ³²	F (131.0)	F (107.4)	F (93.6)	F (160.2)	F (94.7)	F (97.0)
2011 with Liborio III development (Case 3 with Proposed Improvements) ³³	D (46.0)	D (50.7)	D (49.5)	D (41.0)	D (39.0)	C (34.8)
2011 with Liborio III development (Case 4)	-	-	-	F (162.5)	E (61.7)	D (52.7)
2011 with Liborio III development (Case 4 with Proposed Improvements) ³³	-	-	-	D (41.1)	C (32.9)	C (22.3)

³⁰ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

³¹ Both TIS and JMT used a cycle length of 120 seconds for the existing condition and 150 seconds for the future conditions.

³² Volumes at this intersection are same for Case 2 and Case 3.

³³ Intersection configuration is based on proposed improvements from other committed developments (Big Oak Commons, Auburn Meadows etc.) and consists of modifying the eastbound Brenford Road approach to one left-turn, one shared through/left-turn and one right-turn lane.

Table 12
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection ³⁴ One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Carter Road & Bon Ayre Lane/Site Entrance 6						
2007 Existing Conditions (Case 1)						
Northbound Bon Ayre Lane Approach	B (12.3)	B (13.3)	B (11.0)	B (11.5)	B (11.7)	B (10.4)
Westbound Carter Road-Left	A (8.2)	A (8.2)	A (7.8)	A (8.2)	A (8.2)	A (7.8)
2011 without Liborio III development (Case 2)						
Northbound Bon Ayre Lane Approach	C (16.0)	C (23.6)	C (17.6)	B (12.6)	B (11.9)	A (10.0)
Westbound Carter Road-Left	A (8.9)	A (9.0)	A (8.6)	A (8.5)	A (8.2)	A (7.7)
2011 with Liborio III development (Case 3) ^{35, 36,37}						
Northbound Bon Ayre Lane Approach	D (25.8)	F (700.3)	F (613.6)	C (23.4)	F (*)	F (*)
Site Entrance	B (10.4)	F (94.8)	F (93.2)	D (30.4)	F (1554)	F (*)
Eastbound Carter Road-Right	A (8.1)	A (10.0)	A (9.5)	A (8.4)	A (9.6)	A (8.9)
Westbound Carter Road-Left	A (9.1)	A (9.4)	A (9.0)	A (9.3)	A (8.9)	A (8.4)

* HCS+ did not generate a result due to excessive delay.

³⁴ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

³⁵ Site entrance forms the southbound leg at this intersection as analyzed with a separate left-turn lane and a shared through/right-turn lane configuration.

³⁶ Case 3 and Case 4 volumes are all the same for this intersection.

³⁷ JMT analysis includes the redistributed volumes from site entrance 5 when access is restricted to allow a right-in/right-out/left-in only operation at site entrance 5.

Table 13
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Signalized Intersection³⁸ (HCS Analysis)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Carter Road & Bon Ayre Lane/Site Entrance 6						
2011 with Liborio III development (Case 3) ^{39,40,41}	B (13.4)	B (18.5)	C (22.8)	B (18.7)	C (22.0)	C (21.8)

³⁸ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

³⁹ TIS used incorrect volumes for westbound left-turn, northbound left-turn and right-turn movements. JMT used corrected volumes for this analysis.

⁴⁰ TIS used different cycle lengths for different peak hour analyses. JMT used cycle lengths as per customary to DelDOT.

⁴¹ JMT analysis includes the redistributed volumes from site entrance 5 when access is restricted to allow a right-in/right-out/left-in only operation at site entrance 5. Both JMT and TIS assumed separate turn lanes for southbound approach.

Table 14
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection⁴² One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Carter Road & Salerno Drive						
2007 Existing Conditions (Case 1)						
Southbound Salerno Drive - Approach	B (10.1)	B (11.7)	B (10.5)	A (9.9)	B (11.5)	B (10.5)
Eastbound Carter Road-Left	A (7.8)	A (8.0)	A (7.8)	A (7.9)	A (8.0)	A (7.8)
2011 without Liborio III development (Case 2)						
Southbound Salerno Drive - Approach	B (14.7)	C (17.8)	B (14.5)	B (13.1)	B (12.8)	B (10.3)
Eastbound Carter Road-Left	A (8.1)	A (9.3)	A (8.6)	A (8.0)	A (8.3)	A (7.7)
2011 with Liborio III development (Case 3) ⁴³						
Southbound Salerno Drive - Approach	C (16.4)	C (22.7)	C (19.4)	B (14.4)	C (15.6)	B (12.8)
Eastbound Carter Road-Left	A (8.3)	B (10.1)	A (9.4)	A (8.2)	A (8.9)	A (8.3)

⁴² For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁴³ Case 3 and Case 4 volumes are the same for this intersection.

Table 15
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection⁴⁴ One-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Carter Road & Villanova Drive						
2007 Existing Conditions (Case 1)						
Northbound Villanova Drive	B (12.9)	C (15.2)	B (11.3)	B (12.5)	B (14.4)	B (11.0)
Westbound Carter Road-Left	A (8.2)	A (8.2)	A (7.8)	A (8.2)	A (8.2)	A (7.8)
2011 without Liborio III development (Case 2)						
Northbound Villanova Drive	C (20.3)	F (102.0)	D (25.1)	B (14.6)	C (17.9)	B (10.7)
Westbound Carter Road-Left	A (8.4)	B (10.1)	A (8.9)	A (8.1)	A (8.5)	A (7.7)
2011 with Liborio III development (Case 3) ⁴⁵						
Northbound Villanova Drive	D (29.3)	F (327.2)	F (95.6)	C (18.1)	E (36.0)*	C (16.1)
Westbound Carter Road-Left	A (8.8)	B (11.2)	B (10.1)	A (8.4)	A (9.2)	A (8.4)

*HCS analyses shows 95th percentile queue of 4 cars on the Villanova Drive

⁴⁴ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁴⁵ Case 3 and Case 4 volumes are the same for this intersection.

Table 16
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Unsignalized Intersection⁴⁶ All-Way Stop Control (Four-way intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
2007 Existing Conditions (Case 1)						
Northbound Sunnyside Road	B (11.4)	B (11.0)	A (9.5)	B (11.5)	B (11.0)	A (9.5)
Southbound Sunnyside Road	B (11.3)	B (12.3)	A (9.7)	B (11.6)	B (12.1)	A (9.7)
Eastbound Carter Road	C (17.6)	C (22.4)	B (11.4)	C (18.0)	C (22.1)	B (11.4)
Westbound Carter Road	B (12.0)	C (17.8)	B (10.8)	B (12.1)	C (17.7)	B (10.8)
2011 without Liborio III development (Case 2)						
Northbound Sunnyside Road	F (475.6)	F (150.0)	F (238.6)	F (402.2)	F (145.6)	F (84.6)
Southbound Sunnyside Road	E (40.62)	F (499.6)	F (311.0)	D (32.2)	F (489.4)	F (98.6)
Eastbound Carter Road	F (97.23)	F (388.3)	F (172.0)	E (36.4)	F (82.1)	B (14.3)
Westbound Carter Road	E (37.72)	F (233.1)	F (117.3)	C (23.4)	F (59.8)	C (15.9)
2011 with Liborio III development (Case 3) ⁴⁷						
Northbound Sunnyside Road	F (460.5)	F (130.8)	F (206.4)	F (428.4)	F (128.9)	F (157.1)
Southbound Sunnyside Road	E (43.09)	F (499.6)	F (311.0)	E (38.9)	F (494.8)	F (226.0)
Eastbound Carter Road	F (137.1)	F (466.6)	F (273.4)	F (55.0)	F (141.6)	C (23.9)
Westbound Carter Road	F (67.06)	F (411.7)	F (361.5)	E (39.5)	F (233.5)	F (84.7)

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

⁴⁷ Case 3 and Case 4 volumes are the same for this intersection.

Table 17
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Liborio III development
Report dated March, 2009
Prepared by Van Cleef Engineering Associates

Signalized Intersection ^{48,49} (HCS Analysis)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
2011 with Liborio III development (Case 3 with proposed improvements) ^{50,51}	D (37.8)	D (53.0)	D (52.6)	D (36.3)	D (37.5)	D (37.5)

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

⁴⁹ TIS and JMT analyzed as a signalized intersection with the following configuration: northbound left-turn lane, shared through/right-turn lane, southbound left-turn lane, shared through/right-turn lane, eastbound left-turn lane, through lane, right-turn lane, westbound left-turn lane, and shared through/right-turn lane as proposed by DelDOT Carter Road project.

⁵⁰ TIS and JMT used a cycle length of 120 seconds.

⁵¹ Case 3 and Case 4 volumes are the same for this intersection.