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

CAROLANN WICKS, P.E.
SECRETARY

January 24, 2011

Ms. Sarah Keifer
Director of Planning
Department of Planning Services
Kent County Administrative Complex
555 Bay Road
Dover, DE 19901

Dear Ms. Keifer:

We have received and reviewed an update to the Traffic Impact Study (TIS) for the Twin Willows Shopping Center. Briefly, the original TIS analyzed the effect that a 10,100 square foot specialty retail center and 1,800 square feet of restaurant space would have on the area of influence as defined by the Kent County Adequate Public Facilities Ordinance (APFO). We reviewed the previous TIS and sent our comments in a letter to you dated March 4, 2010 (copy enclosed).

Since then, we have learned that the developer has acquired additional land and now seeks to build a 20,200 square foot specialty retail center and 3,600 square feet of restaurant space instead. For that reason, the developer's engineer submitted an update to the previous TIS in November 2010 to reflect the expansion.

Upon our review of the TIS update, we find that the original comments contained in our March 4 letter to still be sufficient, and that no new comments are necessary. Please find updated level of service (LOS) tables attached to this letter which reflect the impact of the expansion.

DelDOT

Please contact Mr. Troy Brestel at (302) 760-2167 if you have any questions concerning this review.

Sincerely,

T. William Brockenbrough, Jr.
County Coordinator

TWB:tbm
Enclosures
cc with enclosures: Mark Keeley, Traffic Concepts, Inc.
Kelly Crumpley, Kent County Planning and Zoning
Frederick H. Schranck, Deputy Attorney General
Darrel Cole, Chief of Community Relations, Public Relations
Natalie Barnhart, Director, Transportation Solutions (DOTS)
Michael Strange, Acting Director, Division of Planning
Donald D. Weber, Chief Traffic Engineer, Traffic, DOTS
Theodore G. Bishop, Assistant Director, Development Coordination
Mark Luszcz, Assistant Chief Traffic Engineer, Traffic, DOTS
Adam Weiser, Safety Programs Engineer, Traffic, DOTS
Thomas E. Meyer, Traffic Studies Manager, Traffic, DOTS
Jennifer Pinkerton, Deputy Principal Assistant, Pavement Management, M&O
Thomas Greve, Central District Engineer, Central District
Eric Cimo, Public Works Engineer, Central District
Lisa Collins, Service Development Planner, Delaware Transit Corporation
Anthony Aglio, Bicycle Coordinator, Statewide & Regional Planning
Richard Sinegar, Pedestrian Coordinator, Statewide & Regional Planning
Marc Coté, Subdivision Engineer, Development Coordination
Todd Sammons, Coordination Engineer, Development Coordination
Julio Seneus, Subdivision Manager, Development Coordination
Kristen Melendez, Traffic Engineer, Traffic, DOTS
Troy Brestel, Project Engineer, Development Coordination

Table 1
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[1] One-Way Stop Control (T-intersection)	**LOS per TIS**		**LOS per JMT / DelDOT**	
Twin Willows Road & Site Entrance [2,3]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2011 with Twin Willows Shopping Center (Case 3)				
Westbound Twin Willows Road Approach	A (7.9)	A (7.7)	A (7.9)	A (7.7)
Northbound Site Approach	B (11.9)	B (11.6)	B (11.6)	B (11.3)
2013 with Twin Willows Shopping Center (Case 4)				
Westbound Twin Willows Road Approach	A (7.8)	A (7.7)	A (7.8)	A (7.7)
Northbound Site Approach	B (11.8)	B (11.5)	B (11.6)	B (11.3)

[1] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[2] TIS analyzed the proposed site entrance as a shared left-turn/right-turn lane approach.
[3] TIS analyzed eastbound Twin Willows Road approach as a shared through/right-turn lane. JMT / DelDOT analyzed this approach with a through lane and a separate right-turn lane as shown in the site plan.

Table 2
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[4] One-Way Stop Control (T-intersection)	**LOS per TIS**		**LOS per JMT / DelDOT**	
Twin Willows Road & Big Woods Road	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2009 Existing (Case 1)				
Westbound Big Woods Road Approach	A (7.3)	A (7.3)	A (7.2)	A (7.3)
Northbound Twin Willows Approach	A (8.5)	A (8.6)	A (8.5)	A (8.6)
2011 without Twin Willows Shopping Center (Case 2)				
Westbound Big Woods Road Approach	A (7.3)	A (7.3)	A (7.2)	A (7.3)
Northbound Twin Willows Approach	A (8.5)	A (8.6)	A (8.5)	A (8.6)
2011 with Twin Willows Shopping Center (Case 3)[5]				
Westbound Big Woods Road Approach	A (7.3)	A (7.3)	A (7.2)	A (7.3)
Northbound Twin Willows Approach	A (8.5)	A (8.6)	A (8.5)	A (8.6)

[4] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[5] There is no change in volumes between Case 3 (2011) and Case 4 (2013) analyses at this intersection.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[6] Two-Way Stop Control	**LOS per TIS**		**LOS per JMT / DelDOT**	
Big Woods Road & Hurd Road[7]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2009 Existing (Case 1)				
Eastbound Big Woods Road Approach	A (7.2)	A (7.2)	A (7.2)	A (7.2)
Westbound Big Woods Road Approach	A (7.2)	A (7.3)	A (7.2)	A (7.3)
Northbound Hurd Road Approach	A (8.4)	A (8.6)	A (8.4)	A (8.6)
Southbound Hurd Road Approach	-	A (8.8)	-	A (8.8)
2011 without Twin Willows Shopping Center (Case 2)				
Eastbound Big Woods Road Approach	A (7.2)	A (7.2)	A (7.2)	A (7.2)
Westbound Big Woods Road Approach	A (7.2)	A (7.3)	A (7.2)	A (7.3)
Northbound Hurd Road Approach	A (8.4)	A (8.6)	A (8.4)	A (8.6)
Southbound Hurd Road Approach	-	A (8.8)	-	A (8.8)
2011 with Twin Willows Shopping Center (Case 3)[8]				
Eastbound Big Woods Road Approach	A (7.2)	A (7.2)	A (7.2)	A (7.2)
Westbound Big Woods Road Approach	A (7.2)	A (7.3)	A (7.2)	A (7.3)
Northbound Hurd Road Approach	A (8.4)	A (8.6)	A (8.4)	A (8.6)
Southbound Hurd Road Approach	-	A (8.8)	-	A (8.8)

[6] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[7] There were no traffic volumes on southbound Hurd Road in the PM peak hour. Hence, no LOS results are provided for this approach.
[8] There is no change in volumes between Case 3 (2011) and Case 4 (2013) analyses at this intersection.

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[9] Two-Way Stop Control	**LOS per TIS**		**LOS per JMT / DelDOT**	
Big Woods Road & Smyrna-Leipsic Road	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2009 Existing (Case 1)				
Northbound Smyrna-Leipsic Road Approach	A (7.3)	A (7.3)	A (7.3)	A (7.3)
Southbound Smyrna-Leipsic Road Approach	A (7.3)	A (7.3)	A (7.3)	A (7.3)
Westbound Big Woods Road Approach	A (8.6)	A (9.7)	A (8.6)	A (9.7)
Eastbound Big Woods Road Approach	A (8.6)	A (9.0)	A (8.5)	A (8.9)
2011 without Twin Willows Shopping Center (Case 2)				
Northbound Smyrna-Leipsic Road Approach	A (7.3)	A (7.3)	A (7.3)	A (7.3)
Southbound Smyrna-Leipsic Road Approach	A (7.3)	A (7.3)	A (7.3)	A (7.3)
Westbound Big Woods Road Approach	A (8.6)	A (9.8)	A (8.6)	A (9.7)
Eastbound Big Woods Road Approach	A (8.6)	A (9.0)	A (8.6)	A (9.0)
2011 with Twin Willows Shopping Center (Case 3)				
Northbound Smyrna-Leipsic Road Approach	A (7.3)	A (7.3)	A (7.3)	A (7.3)
Southbound Smyrna-Leipsic Road Approach	A (7.3)	A (7.3)	A (7.3)	A (7.3)
Westbound Big Woods Road Approach	A (8.6)	A (9.8)	A (8.6)	A (9.7)
Eastbound Big Woods Road Approach	A (8.6)	A (9.0)	A (8.6)	A (9.0)

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

Table 4 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[10] Two-Way Stop Control	**LOS per TIS**		**LOS per JMT / DelDOT**	
Big Woods Road & Smyrna-Leipsic Road	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2013 with Twin Willows Shopping Center (Case 4)				
Northbound Smyrna-Leipsic Road Approach	-	-	A (7.3)	A (7.3)
Southbound Smyrna-Leipsic Road Approach	-	-	A (7.3)	A (7.3)
Westbound Big Woods Road Approach	-	-	A (8.6)	A (9.7)
Eastbound Big Woods Road Approach	-	-	A (8.6)	A (9.0)

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

Table 5
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[11] One-Way Stop Control (T-intersection)	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & Twin Willows Road[12]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2009 Existing (Case 1)				
Northbound US Route 13-Left	B (11.9)	B (12.2)	B (11.9)	B (12.2)
Southbound US Route 13-Left	B (11.7)	A (9.9)	B (11.7)	A (9.9)
Westbound Twin Willows Road Approach	C (19.6)	B (15.0)	C (22.3)	C (17.1)
2011 without Twin Willows Shopping Center (Case 2)				
Northbound US Route 13-Left	C (15.3)	C (17.4)	C (15.3)	C (17.0)
Southbound US Route 13-Left	D (25.9)	C (16.3)	D (25.9)	C (16.7)
Westbound Twin Willows Road Approach	F (173.7)	F (86.4)	F (312.6)	F (168.3)
2011 with Twin Willows Shopping Center (Case 3)				
Northbound US Route 13-Left	C (15.3)	C (17.4)	C (15.3)	C (17.0)
Southbound US Route 13-Left	D (28.0)	C (17.0)	D (28.0)	C (17.5)
Westbound Twin Willows Road Approach	F (284.8)	F (143.0)	F (468.8)	F (265.0)

[11] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[12] TIS analyzed this intersection with two car storage in the median, while JMT / DelDOT analyzed this intersection with one car storage in the median.

Table 5 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[13] One-Way Stop Control (T-intersection)	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & Twin Willows Road	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2013 with Twin Willows Shopping Center (Case 4)				
Northbound US Route 13-Left	-	-	C (15.5)	C (17.3)
Southbound US Route 13-Left	-	-	D (29.1)	C (17.8)
Westbound Twin Willows Road Approach	-	-	F (503.4)	F (282.1)
2011 with Twin Willows Shopping Center (Case 3 With Proposed Improvement)[14]				
Northbound US Route 13-Left	-	-	C (15.3)	C (17.0)
Southbound US Route 13-Left	-	-	D (28.0)	C (17.5)
Westbound Twin Willows Road Approach	-	-	F (205.1)	F (108.3)
2013 with Twin Willows Shopping Center (Case 4 With Proposed Improvement)[14]				
Northbound US Route 13-Left	-	-	C (15.5)	C (17.3)
Southbound US Route 13-Left	-	-	D (29.1)	C (17.8)
Westbound Twin Willows Road Approach	-	-	F (218.1)	F (113.8)

[13] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[14] Proposed Improvement consists of adding a separate right-turn lane to the westbound Twin Willows Road approach.

Table 6
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Signalized Intersection[15] (HCS Analysis)	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & Twin Willows Road[16,17]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2011 with Twin Willows Shopping Center (Case 3 With Proposed Improvement)[18]	-	-	B (16.5)	B (15.3)
2013 with Twin Willows Shopping Center (Case 4 With Proposed Improvement)[18]	-	-	B (17.1)	B (15.4)

[15] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[16] This intersection is proposed as a future signal location as per the US Route 13 access study. Hence, JMT / DelDOT performed signalized intersection analysis at this location. TIS did not perform these analyses.
[17] JMT / DelDOT assumed a 120 second cycle length with protected-only phasing for the southbound left-turn movement.
[18] Proposed Improvement consists of adding a separate right-turn lane to the westbound Twin Willows Road approach.

Table 7
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Signalized Intersection[19] (HCS Analysis)	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & Brenford Road/Big Oak Road[20,21]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2009 Existing Conditions[22] (Case 1)	B (17.6)	B (11.4)	B (15.7)	B (17.4)
2011 without Twin Willows Shopping Center (Case 2)	F (142.8)	E (56.4)	F (94.7)	F (97.0)
2011 with Twin Willows Shopping Center (Case 3)	-	-	F (94.1)	F (101.5)
2011 with Twin Willows Shopping Center (Case 3 with Proposed Improvements)[23, 24]	-	-	D (39.7)	D (36.5)
2013 with Twin Willows Shopping Center (Case 4 with Proposed Improvements)[23, 24]	-	-	D (40.5)	D (37.2)

[19] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[20] TIS used incorrect phasing showing permitted left-turns instead of split phasing. JMT / DelDOT used split phasing as seen in the field.
[21] TIS used incorrect red times on US Route 13 approaches. JMT / DelDOT used red times as per DelDOT signal timing plans.
[22] TIS used 120 second cycle length for PM peak hour and 100 second cycle length for SAT peak hour. JMT / DelDOT used 120 second cycle length for both PM and SAT peak hour analyses.
[23] Intersection configuration is based on the 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.
[24] TIS used 150 second cycle length for PM peak hour and 100 second cycle length for SAT peak hour. JMT / DelDOT used 150 second cycle length for both PM and SAT peak hour analyses.

Table 8
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Signalized Intersection[25] (HCS Analysis)	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & Carter Road[26]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2007 Existing Conditions (Case 1) [27,28]	D (42.9)	F (88.9)	B (18.9)	B (17.3)
2011 without Twin Willows Shopping Center (Case 2)[29]	F (201.5)	F (137.9)	C (31.3)	B (19.7)
2011 with Twin Willows Shopping Center (Case 3)[30]	-	-	C (31.1)	B (19.8)
2013 with Twin Willows Shopping Center (Case 4)[30]	-	-	C (32.4)	C (20.4)

*NOTE: TIS analysis of this intersection contained numerous errors.

[25] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[26] TIS did not incorporate the pedestrian phases in the signalized analyses. JMT / DelDOT incorporated these as per timing received from DelDOT and pedestrian counts from the TIS.
[27] Both TIS and JMT / DelDOT analyzed the eastbound right-turn as free movement as a full length acceleration lane is provided for this approach.
[28] JMT / DelDOT and TIS used an existing cycle length of 120 seconds.
[29] TIS used cycle length of 120 seconds for PM peak hour and 100 seconds for Sat Peak Hour. JMT / DelDOT used 130 seconds during both peak hours. Arrival type 4 was used for the through traffic on US Route 13 to account for signal coordination.
[30] JMT / DelDOT used 130 seconds cycle length.

Table 9
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[31] Two-Way Stop Control	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & Hickory Ridge Road[32]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2009 Existing (Case 1)				
Northbound US Route 13-Left	B (14.6)	B (13.6)	B (14.6)	B (13.6)
Southbound US Route 13-Left	B (11.5)	A (9.6)	B (11.4)	A (9.6)
Westbound Hickory Ridge Road Approach	E (46.6)	D (25.7)	F (50.4)	D (27.7)
Eastbound Hickory Ridge Road Approach	D (29.3)	C (22.0)	E (37.9)	D (26.0)
2011 without Twin Willows Shopping Center (Case 2)				
Northbound US Route 13-Left	F (274.0)	F (138.6)	F (274.0)	F (138.6)
Southbound US Route 13-Left	C (19.2)	B (13.9)	C (19.2)	B (13.9)
Westbound Hickory Ridge Road Approach	F (*)	F (*)	F (*)	F (*)
Eastbound Hickory Ridge Road Approach	F (*)	F (*)	F (*)	F (*)
2011 with Twin Willows Shopping Center (Case 3)				
Northbound US Route 13-Left	F (282.3)	F (142.9)	F (282.3)	F (142.9)
Southbound US Route 13-Left	C (19.3)	B (14.0)	C (19.3)	B (14.0)
Westbound Hickory Ridge Road Approach	F (*)	F (*)	F (*)	F (*)
Eastbound Hickory Ridge Road Approach	F (*)	F (*)	F (*)	F (*)

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

[31] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[32] TIS analyzed this intersection with two car storage in the median, while JMT / DelDOT analyzed this intersection with one car storage in the median. At the time of the original TIS study this intersection was unsignalized.

Table 9 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[33] Two-Way Stop Control	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & Hickory Ridge Road[34]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2013 with Twin Willows Shopping Center (Case 4)				
Northbound US Route 13-Left	-	-	F (302.3)	F (158.6)
Southbound US Route 13-Left	-	-	C (19.7)	B (14.2)
Westbound Hickory Ridge Road Approach	-	-	F (*)	F (*)
Eastbound Hickory Ridge Road Approach	-	-	F (*)	F (*)

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

[33] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[34] TIS analyzed this intersection with two car storage in the median, while JMT / DelDOT analyzed this intersection with one car storage in the median. At the time of the original TIS study this intersection was unsignalized.

Table 10
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Signalized Intersection[35] (HCS Analysis)	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & Hickory Ridge Road[36,37]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2011 without Twin Willows Shopping Center (Case 2)	-	-	D (40.3)	D (39.5)
2011 with Twin Willows Shopping Center (Case 3)	-	-	D (42.0)	D (39.8)
2013 with Twin Willows Shopping Center (Case 4)	-	-	D (43.5)	D (40.7)

[35] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[36] This intersection has recently been converted to a signal. Hence, JMT / DelDOT performed signalized intersection analyses for Cases 2, 3 and 4. TIS did not perform these analyses.
[37] JMT / DelDOT assumed 150 second cycle length with phasing as per signal plan dated September 23, 2009, with split phasing on the eastbound and westbound approaches and protected-only phasing for the northbound and southbound left-turn movements.

Table 11
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[38] One-Way Stop Control (T-intersection)	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & North Messina Hill Road[39]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2009 Existing (Case 1)				
Northbound US Route 13-Left	B (12.4)	B (13.6)	B (12.5)	B (13.6)
Southbound US Route 13-Left	B (11.4)	A (9.9)	B (11.4)	A (9.9)
Eastbound North Messina Hill Road Approach	D (29.0)	C (15.5)	E (35.3)	C (15.5)
2013 without Twin Willows Shopping Center (Case 2)				
Northbound US Route 13-Left	C (20.0)	D (31.1)	C (20.4)	D (29.0)
Southbound US Route 13-Left	C (22.8)	C (17.1)	C (22.8)	C (17.1)
Eastbound North Messina Hill Road Approach	F (89.6)	D (31.7)	F (138.0)	D (29.6)
2011 with Twin Willows Shopping Center (Case 3)				
Northbound US Route 13-Left	C (20.1)	D (31.3)	C (20.5)	D (29.1)
Southbound US Route 13-Left	C (23.0)	C (17.2)	C (23.0)	C (17.2)
Eastbound North Messina Hill Road Approach	F (89.6)	D (31.9)	F (142.0)	D (29.8)

[38] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[39] TIS analyzed this intersection with two car storage in the median, while JMT / DelDOT analyzed this intersection with one car storage in the median.

Table 11 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Unsignalized Intersection[40] One-Way Stop Control (T-intersection)	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & North Messina Hill Road[41]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2013 with Twin Willows Shopping Center (Case 4)				
Northbound US Route 13-Left	-	-	C (21.0)	D (30.4)
Southbound US Route 13-Left	-	-	C (23.4)	C (17.5)
Eastbound North Messina Hill Road Approach	-	-	F (153.3)	D (30.8)

[40] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[41] TIS analyzed this intersection with two car storage in the median, while JMT / DelDOT analyzed this intersection with one car storage in the median.

Table 12
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Twin Willows Shopping Center
Report dated November, 2010
Prepared by Traffic Concepts, Inc.

Signalized Intersection[42] (HCS Analysis)	**LOS per TIS**		**LOS per JMT / DelDOT**	
US Route 13 & North Messina Hill Road[43,44]	Weekday PM	Saturday Mid-day	Weekday PM	Saturday Mid-day
2011 with Twin Willows Shopping Center (Case 3)	-	-	B (10.9)	B (17.8)
2013 with Twin Willows Shopping Center (Case 4)	-	-	B (11.1)	B (18.5)

[42] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[43] This intersection is proposed as a future signal location in conjunction with three other subdivision developments (Hidden Brook, Saratoga and Stonington) and is consistent with the US Route 13 access study. Hence, JMT / DelDOT performed signalized intersection analysis at this location. The TIS did not include these analyses.
[44] JMT / DelDOT assumed a 120 second cycle length with protected-permitted phasing on the northbound and southbound left-turn movements.