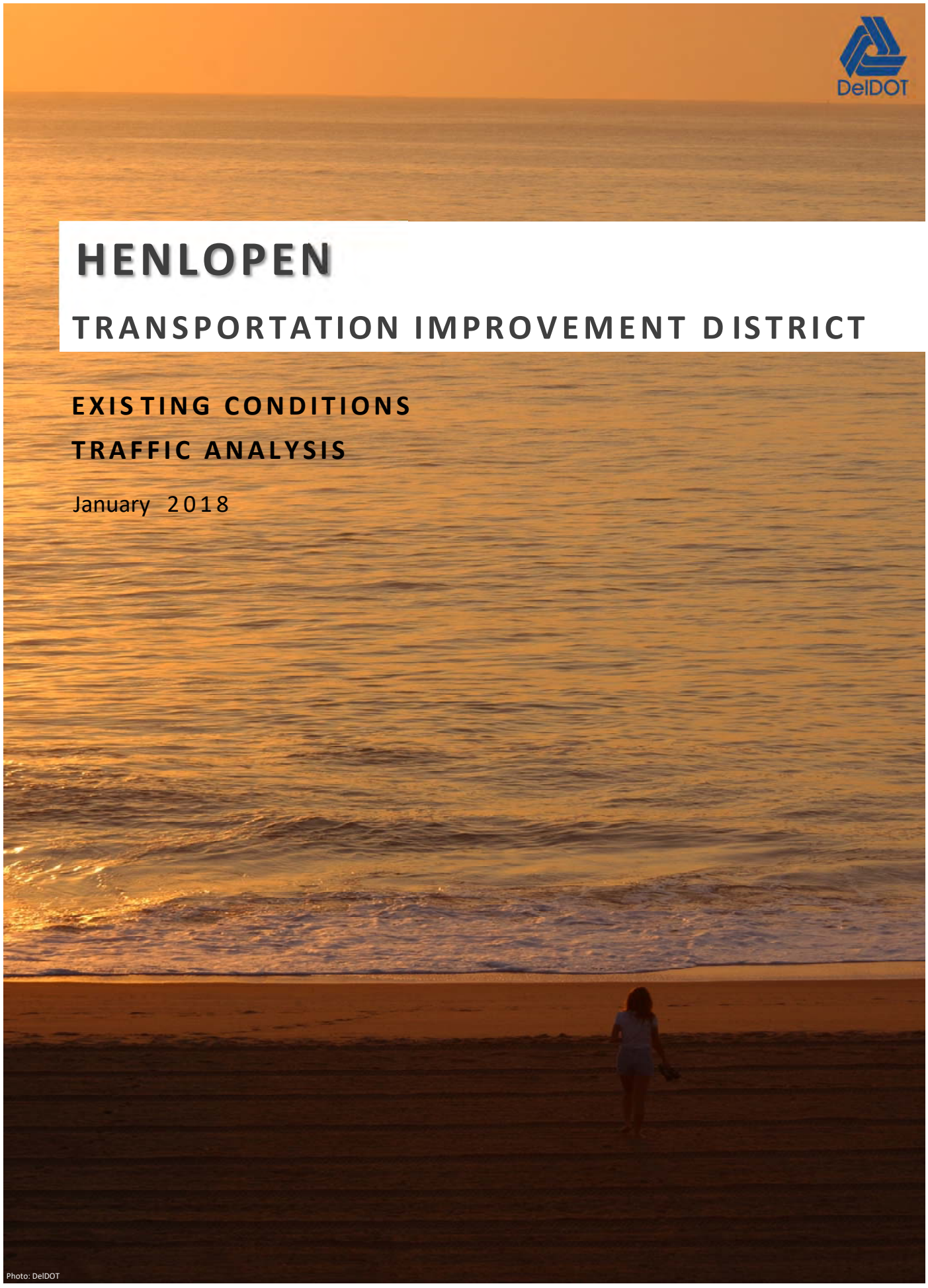


HENLOPEN

TRANSPORTATION IMPROVEMENT DISTRICT

EXISTING CONDITIONS

TRAFFIC ANALYSIS

January 2018

Photo: DelDOT

EXECUTIVE SUMMARY

The purpose of this traffic study was to evaluate existing traffic and other network conditions for the Henlopen Transportation Improvement District (TID) study area. This study is reflective of a revised study area boundary as compared to the previous February, 2017 Study. The Henlopen TID seeks to comprehensively coordinate land use and transportation within the study area which will allow the Delaware Department of Transportation (DelDOT) and Sussex County to proactively approach and plan for future development in partnership.

Efficient traffic movement throughout the study area continues to be a challenge for both residents and visitors to the Henlopen study area. As the area continues to grow it is expected that traffic congestion will increase both in the summer peak season and throughout the remaining months of each year.

Several key findings were identified from the report:

- AM Peak Hour: 24% of intersections in the study area have at least one approach operating at Level of Service D or greater.

- PM Peak Hour: 32% of intersections in the study area have at least one approach operating at Level of Service D or greater.

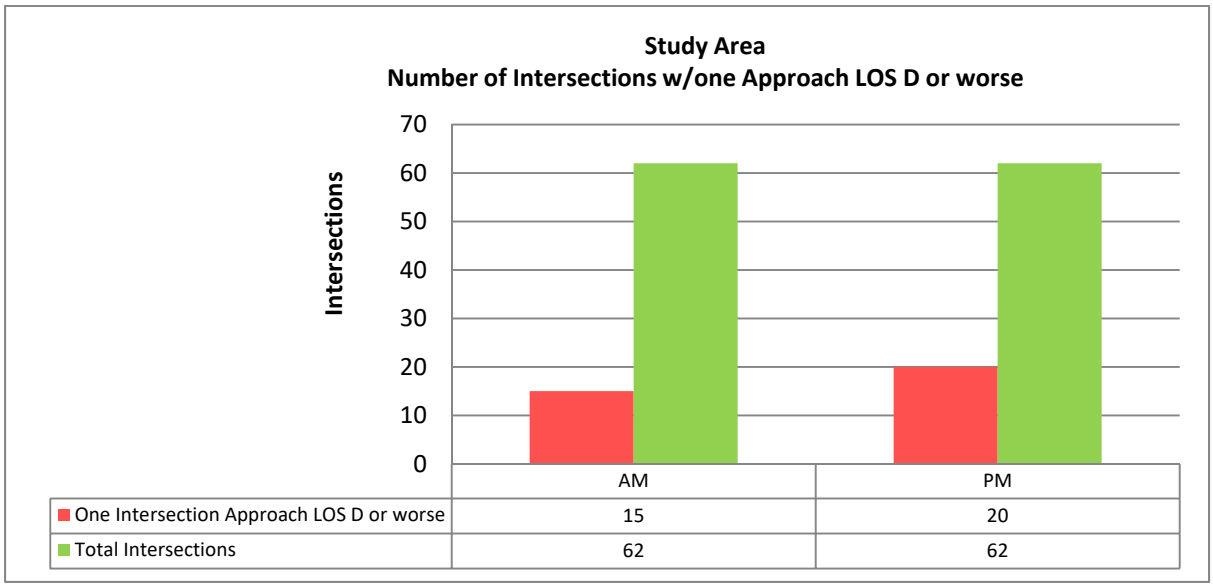


Figure 1. Study Area Level of Service (LOS)

For the major corridors within the study area, the percentage of intersections with at least one movement at Level of Service D or greater is significantly higher.

- SR 24 (AM Peak Hour): 66% of intersections in the study area have at least one approach operating at Level of Service D or greater.
- SR 24 (PM Peak Hour): 66% of intersections in the study area have at least one approach operating at Level of Service D or greater.

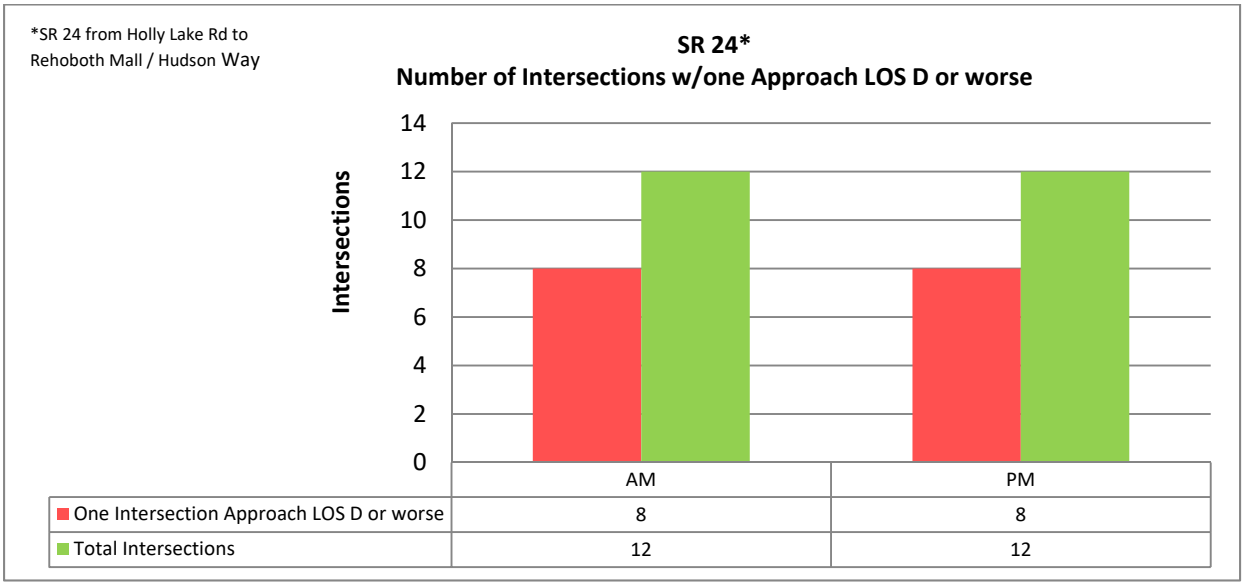


Figure 2. SR 24 Level of Service (LOS)

- US 9 (AM Peak Hour): 80% of intersections in the study area have at least one approach operating at Level of Service D or greater.
- US 9 (PM Peak Hour): 100% of intersections in the study area have at least one approach operating at Level of Service D or greater.

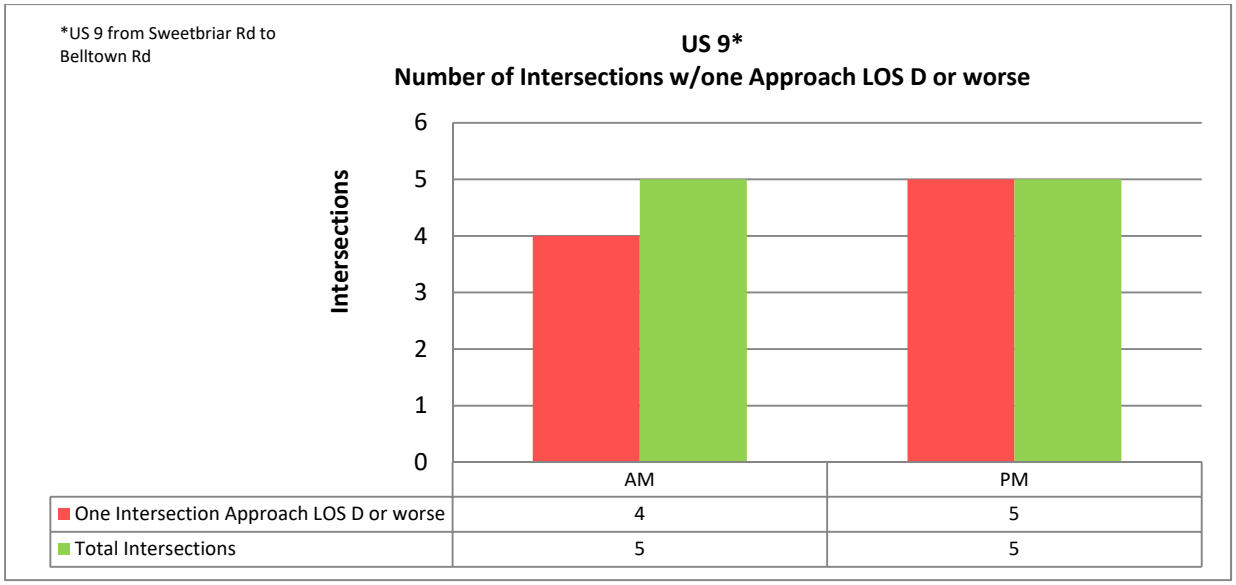


Figure 3. US 9 Level of Service (LOS)

DelDOT has made and continues to make significant investments along the major corridors within the study area. Population and employment projections indicate, however, that the study area will continue to grow as eastern Sussex County attracts more tourism related trips in addition to the growing establishment of a year round community of permanent residents.

These trends present both a challenge and an opportunity for Sussex County and DelDOT. It is anticipated that, similar to current trends, future residential growth will continue to move to undeveloped properties outside and to the south and west of the SR 1 corridor. Although this report did not look at the impact of projected future growth (to be addressed in the next phase of the Land Use and Transportation Study), it is reasonable to conclude that many of the intersections and roadways that will serve this growth are not adequate to handle future traffic demands.

The establishment of the Henlopen TID will provide the County and DelDOT with a mechanism for the orderly funding and prioritization of new transportation infrastructure projects to meet predicted future growth. In addition, the Department is confident that the development community will also respond positively to the establishment of the Henlopen TID which will provide the private sector with a measure of predictability in regard to its investments. A systematic and holistic approach for mitigating traffic challenges both now and in the future is needed to ensure that the Study area can continue as an economically attractive location for both its citizens and visitors. DelDOT believes that the adoption of the Henlopen Transportation Improvement District (TID) is that mechanism for achieving these goals.

TID DESCRIPTION

The Henlopen TID is located in Sussex County (see Figure 4), with project limits generally extending from State Route 5 in the west, Rehoboth Bay in the south, Minos Conaway Road in the north and State Route 1 in the east. Included within the boundaries of the TID are 62 intersections (9 signalized, 52 unsignalized, and 1 all-way stop with a flashing signal) with a total participant boundary area of 24.21 square miles.

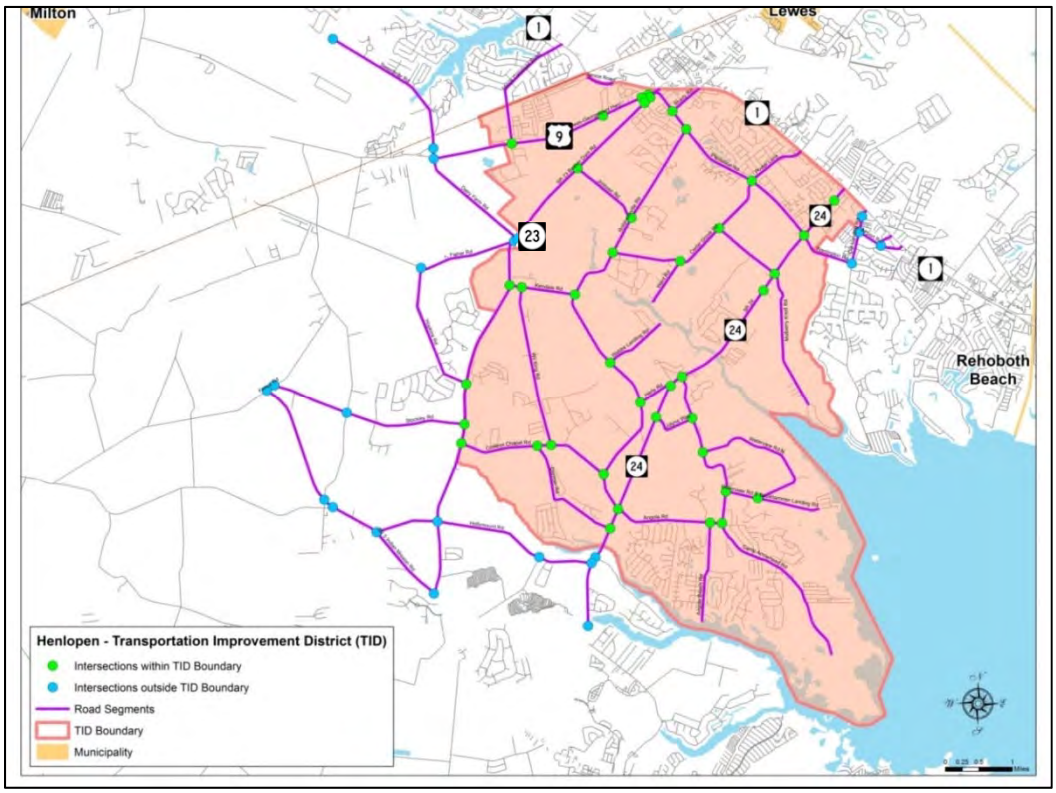


Figure 4 - Location Map

EXISTING TRAFFIC

Traffic count data for the Henlopen TID existing conditions analysis originated from a variety of sources including previously published Traffic Impact Studies (TIS), Traffic Operations Analyses (TOA) and new counts collected as part of the original Henlopen TID analysis in 2017. New counts were collected in the Fall of 2017 at 41 locations within the study area.

Table 1.
2017 - New Counts

Street 1	Street 2	Inside/Outside Participant Boundary
Camp Arrowhead Rd	Jolyns Way	In
Camp Arrowhead Rd	Waterview Rd North	In
Camp Arrowhead Rd	Waterview Rd South	In
Conleys Chapel Rd	Wil King Rd	In
Conleys Chapel Rd	Dorman Rd	In
Fisher Rd	Hopkins Rd	Out
Forest Rd	Stockley Rd	Out
Hollymount Rd	Phillips Branch Rd	Out
Kendale Rd	Wil King Rd	In
Old Landing Rd	Warrington Rd/Strawberry Way	Out
Old Landing Rd	Airport Rd	Out
Robinsonville Rd	Webbs Landing Rd	In
Robinsonville Rd	Harts Rd	In
Robinsonville Rd	Conleys Chapel Rd	In
SR 23 Beaver Dam Rd	Hollymount Rd	Out
SR 23 Beaver Dam Rd	Conleys Chapel Rd	In
SR 23 Beaver Dam Rd	Stockley Rd	In
SR 23 Beaver Dam Rd	Hopkins Rd	In
SR 23 Beaver Dam Rd	Church St/Saltmarsh Blvd	In
SR 23 Beaver Dam Rd	DE Route 1D (aka Belltown Rd)/Plantation Rd	In
SR 24	Holly Lake Rd	Out
SR 24	Hollymount Rd	Out
SR 24	Sloan Rd	Out
SR 24	Dorman Rd	In
SR 24	Robinsonville Rd / Angola Rd	Out
SR 24	Harts Rd	In
SR 24	Camp Arrowhead Rd	Out
SR 24	Beacon Middle School/Love Creek Elem School	In
SR 24	Mulberry Knoll Rd	In
SR 24	Plantation Rd/Warrington Road	In

Table 1. (Continued)
2017 - New Counts

SR 5 Indian Mission Rd	Forest Rd	Out
SR 5 Indian Mission Rd	Johnson Rd	Out
SR 5 Indian Mission Rd	Cool Spring Rd	Out
SR 5 Indian Mission Rd	Hollymount Rd	Out
SR 5 Indian Mission Rd	SR 23 Beaver Dam Rd	Out
Stockley Rd	Cool Spring Rd	Out
Sweetbriar Rd	Log Cabin Hill Rd	Out
US 9	Sweetbriar Rd/Dairy Farm Rd	Out
US 9	Church St	In
US 9	Belltown Rd/SR 1D	In
Waterview Rd	Bookhammer Landing Rd	In

METHODOLOGY

Traffic Count Adjustment

Given the various sources of data described above, one of the challenges for the Department was to develop a consistent set of existing condition data. Four types of adjustments were identified and applied to all of the count data utilized within this report:

(1) Seasonal Adjustment Factors - DelDOT Electronic Operations Management Application (EOPS) was employed to develop factors that took into account localized time of year traffic data within the study area for the purpose of helping to normalize the traffic counts which were, in some cases, collected in different seasons and in different years.
(2) One-time Summary Adjustments – Single adjustments made to account for specific developments in the study area that have occurred since any of newest counts were collected.
(3) Growth Factors – EOPS data was again employed to provide localized data.
(4) Intersection Count Balancing – Only applied after adjustments 1-3 were completed. Balancing helps to mitigate the effects of outliers (such as counts collected on non-representative days) and counting errors (such as counts affected by equipment problems).

LEVEL OF SERVICE (LOS) ANALYSIS

Following the traffic count adjustment procedures previously described the study area intersection were analyzed for capacity and delay through the use of Synchro/SimTraffic software which implements the 2010 Highway Capacity Manual (Transportation Research Board, 2010). A supplemental review was also performed using the official Highway Capacity Software (HCS) for the purpose of identifying any discrepancies between Synchro and HCS outputs. Tables 2 and 3 provide a description of level-of-service (LOS) for both signalized and unsignalized intersections.

Table 2.
Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	≤10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

Source: Highway Capacity Manual 2010. Transportation Research Board
Transportation Research Board

A qualitative description of the Level of Service criteria for signalized intersections as found in Table 2 is shown below.

Table 3.
Level of Service – Qualitative Descriptions

Level of Service A - The volume-to-capacity ratio is low and progression is extremely favorable or the cycle length is very short.

Level of Service B - The volume-to-capacity ratio typically is low and progression is highly is favorable or the cycle length is short. More vehicles stop than at LOS A.

Level of Service C - Progression is favorable and cycle lengths are moderate. Occasionally some vehicles will be unable to clear the intersection on the first signal cycle.

Level of Service D - Progression is ineffective or the cycle length is long. Many vehicles stop and there is noticeable difficulty with vehicles being unable to clear the intersection on the first signal cycle.

Level of Service E - The volume-to-capacity ratio is high, progression is unfavorable and the cycle length is long. Vehicles are frequently unable to clear the intersection on the first signal cycle.

Level of Service F - The volume-to-capacity ratio is very high, progression is very poor and the cycle length is long. Most vehicles are unable to clear the intersection on the first signal cycle.

Many complex factors serve as inputs and variables that result in a measure of control delay for each vehicle at a signalized intersection. Those factors include signal phasing, coordination, signal cycle length, and traffic volumes.

Table 4.
Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F[1]	>50

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.
1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

All-way stop, two-way stop, and roundabout control constitute the three intersection types defined as unsignalized intersections. All-way stop and roundabout LOS is the weighted average control delay of the overall intersection or by individual approach. Two-way stop control LOS is the average control delay for each minor street movement (or shared movement) as well as major street left-turns. This methodology recognizes that major street vehicles are assumed to experience zero delay which could mask deficiencies of minor movements if a weighted average was employed for of all movements.

Unmet Demand and Oversaturated Intersections

Additional DelDOT analysis of "oversaturated" intersections which exhibited unmet vehicle demand characteristics as distinguished from other intersections within the study area was undertaken in the Fall of 2017. The findings of this supplemental analysis are reflected within the remainder of this report.

Arrival/departure and maximum queue length data were collected at signalized intersections identified as operating with oversaturated conditions. Recently updated intersection traffic volumes were then analyzed utilizing Highway Capacity Software (HCS 2010) to arrive at multi-period capacity/Level of Service and queue analysis. Multi-period queue analysis was employed because of its usefulness in the consideration of unmet demand and the ability to compute more accurate delay associated with residual queues. The following three intersections were analyzed with the aforementioned methodology:

(1) SR 24 & Camp Arrowhead Rd/Fairfield Rd – AM & PM Peak Period
(2) SR 24 & Beacon Middle School – AM & PM Peak Period
(3) SR 24 & Plantation/Warrington Rd – AM & PM Peak Period

LEVEL OF SERVICE (LOS)

Traffic analysis was conducted utilizing Synchro/HCM2010 for sixty two intersections within the study area. The intersections evaluated in this TID analysis are as follows:

Table 5.
Henlopen TID Intersections

No.	Street 1	Street 2	Inside/Outside Participant Boundary
1	Airport Rd	Miller Rd	Out
2	Angola Rd	Angola Beach Rd	In
3	Camp Arrowhead Rd	Angola Rd	In
4	Camp Arrowhead Rd	Jolyns Way	In
5	Camp Arrowhead Rd	Waterview Rd North	In
6	Camp Arrowhead Rd	Waterview Rd South	In
7	Cave Neck Rd	Sweetbriar Rd	Out
8	Cedar Grove Rd	Ward Rd	In
9	Cedar Grove Rd	Mulberry Knoll Rd	In
10	Conleys Chapel Rd	Wil King Rd	In
11	Conleys Chapel Rd	Dorman Rd	In
12	Fisher Rd	Hopkins Rd	Out
13	Forest Rd	Stockley Rd	Out
14	Hollymount Rd	Phillips Branch Rd	Out
15	Kendale Rd	Wil King Rd	In
16	Old Landing Rd	Warrington Rd/Strawberry Way	Out
17	Old Landing Rd	Airport Rd	Out
18	Old Landing Rd	Rehoboth Mall	Out
19	Plantation Rd	Shady Rd/Salt Marsh Blvd	In
20	Plantation Rd	Robinsonville Rd	In
21	Plantation Rd	Cedar Grove Rd/Postal Lane	In
22	Robinsonville Rd	Jimtown Rd	In
23	Robinsonville Rd	Cedar Grove Rd	In
24	Robinsonville Rd	Kendale Rd	Out
25	Robinsonville Rd	Webbs Landing Rd	In
26	Robinsonville Rd	Harts Rd	In
27	Robinsonville Rd	Conleys Chapel Rd	In
28	SR 23 Beaver Dam Rd	Hollymount Rd	Out
29	SR 23 Beaver Dam Rd	Conleys Chapel Rd	In
30	SR 23 Beaver Dam Rd	Stockley Rd	In
31	SR 23 Beaver Dam Rd	Hopkins Rd	In
32	SR 23 Beaver Dam Rd	Kendale Rd	Out

Table 5. (Continued)
Henlopen TID Intersections

No.	Street 1	Street 2	Inside/Outside Participant Boundary
33	SR 23 Beaver Dam Rd	Fisher Rd	Out
34	SR 23 Beaver Dam Rd	Dairy Farm Rd	Out
35	SR 23 Beaver Dam Rd	Jimtown Rd	In
36	SR 23 Beaver Dam Rd	Church St/Saltmarsh Blvd	In
37	SR 23 Beaver Dam Rd	DE Route 1D (aka Belltown Rd)/Plantation Rd	In
38	SR 24	Holly Lake Rd	Out
39	SR 24	Hollymount Rd	Out
40	SR 24	Sloan Rd	Out
41	SR 24	Dorman Rd	In
42	SR 24	Robinsonville Rd / Angola Rd	Out
43	SR 24	Jolyns Way	Out
44	SR 24	Harts Rd	In
45	SR 24	Camp Arrowhead Rd	Out
46	SR 24	Beacon Middle School/Love Creek Elem School	In
47	SR 24	Mulberry Knoll Rd	In
48	SR 24	Plantation Rd/Warrington Road	In
49	SR 24	Rehoboth Mall Service Rd/Hudson Way	In
50	SR 5 Indian Mission Rd	Forest Rd	Out
51	SR 5 Indian Mission Rd	Johnson Rd	Out
52	SR 5 Indian Mission Rd	Cool Spring Rd	Out
53	SR 5 Indian Mission Rd	Hollymount Rd	Out
54	SR 5 Indian Mission Rd	SR 23 Beaver Dam Rd	Out
55	Stockley Rd	Cool Spring Rd	Out
56	Sweetbriar Rd	Log Cabin Hill Rd	Out
57	US 9	Sweetbriar Rd/Dairy Farm Rd	Out
58	US 9	Minos Conaway Rd/Lakeview Blvd	In
59	US 9	Nassau Commons Blvd	In
60	US 9	Church St	In
61	US 9	Belltown Rd/SR 1D	In
62	Waterview Rd	Bookhammer Landing Rd	In

LEVEL OF SERVICE (LOS) – RESULTS

The following table summarizes the AM and PM LOS results for intersections within the study area.

Table 6.
AM & PM Level of Service Results

ID	Street 1	Street 2	Inside/Outside Participant Boundary	Control Type	Intersection Level of Service				Map Grid Reference
					AM		PM		
					Overall LOS	Approach LOS	Overall LOS	Approach LOS	
1	Cave Neck Rd	Sweetbriar Rd	Out	TWSC		SE-C; NW-C		SE-B; NW-B	A1
2	Sweetbriar Rd	Log Cabin Hill Rd	Out	TWSC		EB-A		EB-B	B2
3	US 9	Sweetbriar Rd/Dairy Farm Rd	Out	Signal	C	EB-D; WB-C; NB-D; SB-C	C	EB-C; WB-C; NB-D; SB-D	B2
4	US 9	Minos Conaway Rd/Lakeview Blvd	In	TWSC		NB-C; SB-D		NB-C; SB-D	B3
5	US 9	Nassau Commons Blvd	In	TWSC		SB-C		SB-E	A3
6	US 9	Church St	In	TWSC		NB-D		NB-F	A4
7	US 9	Belltown Rd/SR 1D	In	Signal	F	EB-B; WB-A; NB-F; SB-D	C	EB-B; WB-C; NB-F; SB-D	A4
8	Fisher Rd	Hopkins Rd	Out	TWSC		NB-A		NB-A	B2
9	Forest Rd	Stockley Rd	Out	TWSC		WB-A		WB-B	C1
10	Stockley Rd	Cool Spring Rd	Out	TWSC		NB-B; SB-B		NB-B; SB-B	D2
11	SR 5 Harbeson Rd	Forest Rd	Out	TWSC		NB-C; SB-C		NB-C; SB-C	C1
12	SR 5 Harbeson Rd	Cool Spring Rd	Out	TWSC		NB-B; SB-B		NB-B; SB-B	D1
13	SR 5 Harbeson Rd	Johnson Rd	Out	TWSC		NE-A		NE-B	D1
14	SR 5 Indian Mission Rd	Hollymount Rd	Out	Signal		EB-B; WB-B; SE-B; NW-B		EB-C; WB-E; SE-C; NW-C	E2
15	SR 5 Indian Mission Rd	SR 23 Beaver Dam Rd	Out	TWSC		SB-B		SB-C	E2
16	SR 23 Beaver Dam Rd	Hollymount Rd	Out	TWSC		EB-C; WB-B; NB-B; SB-C		EB-C; WB-B; NB-B; SB-C	D2
17	SR 23 Beaver Dam Rd	Conleys Chapel Rd	In	TWSC		WB-C		WB-B	D2
18	SR 23 Beaver Dam Rd	Stockley Rd	In	TWSC		EB-C		EB-C	D2
19	SR 23 Beaver Dam Rd	Hopkins Rd	In	TWSC		EB-C		EB-C	C2
20	SR 23 Beaver Dam Rd	Kendale Rd	Out	TWSC		WB-C		WB-F	C3
21	SR 23 Beaver Dam Rd	Fisher Rd	Out	TWSC		EB-C		EB-C	B3
22	SR 23 Beaver Dam Rd	Dairy Farm Rd	Out	TWSC		SE-C		SE-D	B3
23	SR 23 Beaver Dam Rd	Jimtown Rd	In	TWSC		NW-B		NW-C	B3
24	SR 23 Beaver Dam Rd	Church St/Saltmarsh Blvd	In	TWSC		NB-C; SB-B		NB-D; SB-B	A4
25	SR 23 Beaver Dam Rd	DE Route 1D (aka Belltown Rd)/Plantation Rd	In	TWSC		No HCM LOS given[1]		No HCM LOS given[1]	A4
26	Plantation Rd	Shady Rd/Salt Marsh Blvd	In	Signal	B	SE-C; NW-C; NE-B; SW-C	E	SE-C; NW-B; NE-B; SW-F	A4
27	Plantation Rd	Robinsonville Rd	In	TWSC		NB-D		NB-C	A4
28	Plantation Rd	Cedar Grove Rd/Postal Lane	In	Signal	B	SE-B; NW-B; NE-D; SW-C	B	SE-B; NW-B; NE-C; SW-C	B5
29	Kendale Rd	Wil King Rd	In	TWSC		NB-B		NB-B	C3
30	Conleys Chapel Rd	Wil King Rd	In	TWSC		SB-A		SB-B	D3
31	Conleys Chapel Rd	Dorman Rd	In	TWSC		NW-A		NW-A	D3
32	Robinsonville Rd	Jimtown Rd	In	TWSC		EB-A		EB-A	B4
33	Robinsonville Rd	Cedar Grove Rd	In	TWSC		WB-B		WB-B	B4
34	Robinsonville Rd	Kendale Rd	Out	TWSC		EB-B		EB-B	C3
35	Robinsonville Rd	Webbs Landing Rd	In	TWSC		SW-B		SW-B	C4
36	Robinsonville Rd	Harts Rd	In	TWSC		WB-B		WB-B	D4
37	Robinsonville Rd	Conleys Chapel Rd	In	TWSC		SE-B		SE-B	D4
38	Cedar Grove Rd	Ward Rd	In	TWSC		NE-B		NE-A	B4
39	Cedar Grove Rd	Mulberry Knoll Rd	In	TWSC		NW-B		NW-B	B4
40	Hollymount Rd	Phillips Branch Rd	Out	TWSC		NB-A		NB-A	E3
41	SR 24	Holly Lake Rd	Out	TWSC		EB-C		EB-D	E3
42	SR 24	Hollymount Rd	Out	TWSC		EB-F		EB-F	E3
43	SR 24	Sloan Rd	Out	TWSC		NW-C		NW-C	E3
44	SR 24	Dorman Rd	In	TWSC		EB-C		EB-C	E4
45	SR 24	Robinsonville Rd/Angola Rd	Out	Signal	F	NB-B; SB-B; SE-D; NW-F	E	NB-B; SB-C; SE-C; NW-F	D4
46	SR 24	Jolyns Way	Out	TWSC		WB-C		WB-C	D4
47	SR 24	Harts Rd	In	TWSC		SB-D		SB-E	C4
48	SR 24	Camp Arrowhead Rd	Out	Signal	F	EB-F; WB-B; NB-D; SB-D	F	EB-C; WB-F; NB-D; SB-D	C4
49	SR 24	Beacon Middle School/Love Creek Elem School	In	Signal	E	NE-F; SW-B; NW-C; SE-D	F	NE-C; SW-F; NW-C; SE-C	C5
50	SR 24	Mulberry Knoll Rd	In	TWSC		SE-D; NW-F		SE-F; NW-F	C5
51	SR 24	Plantation Rd/Warrington Road	In	Signal	F	NE-F; SW-E; NW-D; SE-D	F	NE-D; SW-F; NW-E; SE-D	B5
52	SR 24	Rehoboth Mall Service Rd/Hudson Way	In	Signal	A	SE-F; NW-F; NE-A; SW-A	B	SE-C; NW-C; NE-B; SW-B	B5
53	Camp Arrowhead Rd	Jolyns Way	In	TWSC		EB-B		EB-B	D4
54	Camp Arrowhead Rd	Waterview Rd North	In	TWSC		WB-A		WB-A	D4
55	Camp Arrowhead Rd	Waterview Rd South	In	TWSC		WB-A		WB-A	D4
56	Camp Arrowhead	Angola Rd	In	TWSC		EB-B; WB-A		EB-B; WB-B	D4
57	Angola Rd	Angola Beach Rd	In	TWSC		NB-A		NB-B	D4
58	Waterview Rd	Bookhammer Landing Rd	In	TWSC		NW-A		NW-A	D5
59	Old Landing Rd	Warrington Rd/Strawberry Way	Out	AWSC		EB-D; WB-A; NB-B; SB-B		EB-C; WB-B; NB-B; SB-C	B5
60	Old Landing Rd	Airport Rd	Out	TWSC		WB-C		WB-D	B6
61	Old Landing Rd	Rehoboth Mall Entrance	Out	TWSC		SE-B; NW-B		SE-F; NW-B	B6
62	Airport Rd	Miller Rd	Out	TWSC		NB-B; SB-B		NB-B; SB-B	B6
			Total = 62; 35 In (56%) 27 Out (44%)		1) HCM cannot produce a LOS for the geometric configuration of this intersection.				

Level of Service Analysis Maps

Individual study area maps were created for twenty three study sub-areas using a symmetrical grid system. The following maps identify the intersections that were analyzed in the traffic model and associated Levels of Service (LOS) as described in Table 7 below.

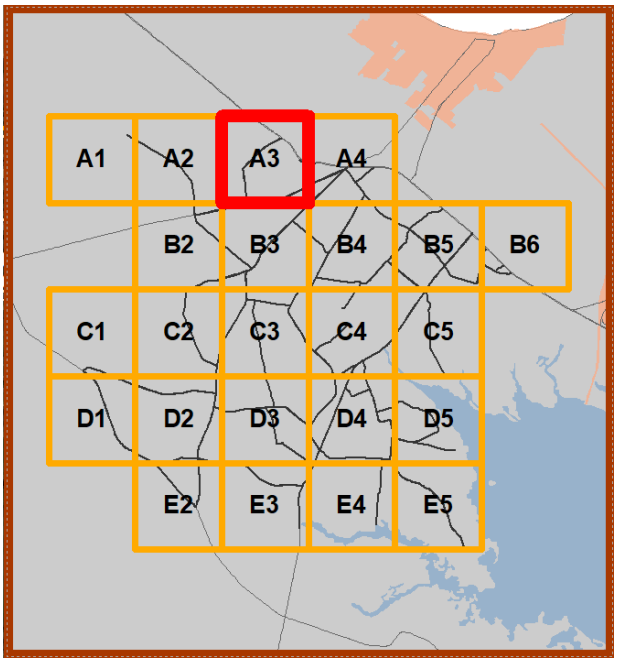


Figure 5. Study Area Grid

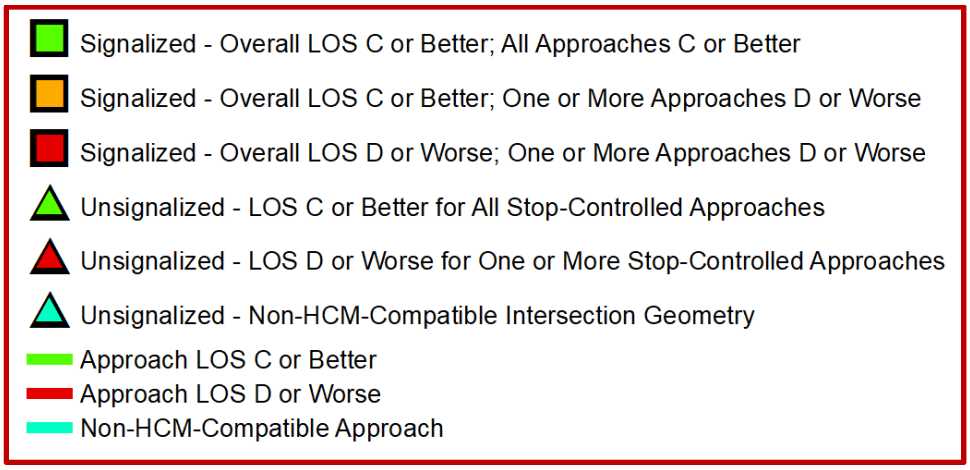


Figure 6. Map Intersection Level of Service Legend

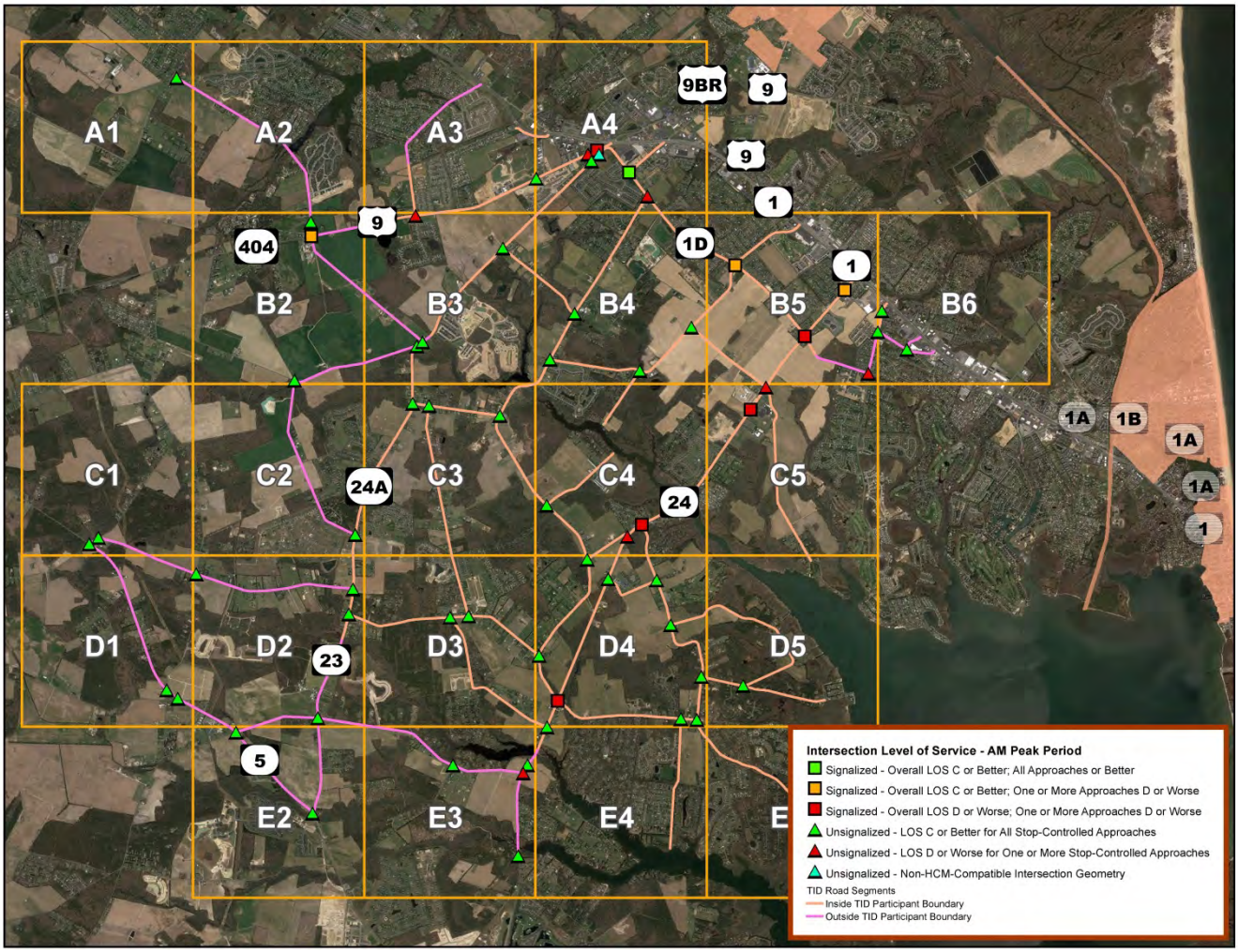


Figure 7. AM – Study Area Intersection Level of Service

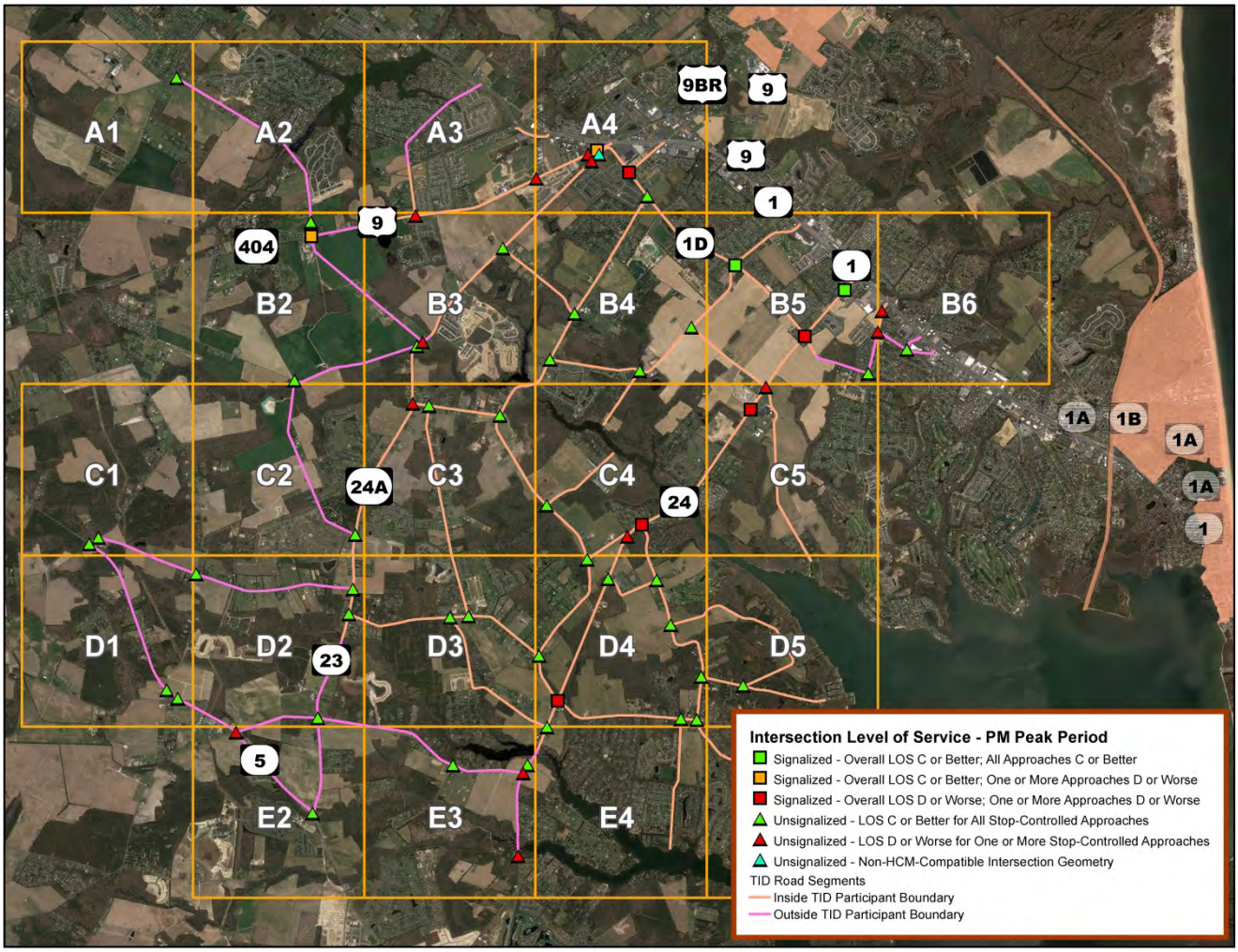


Figure 8. PM – Study Area Intersection Level of Service

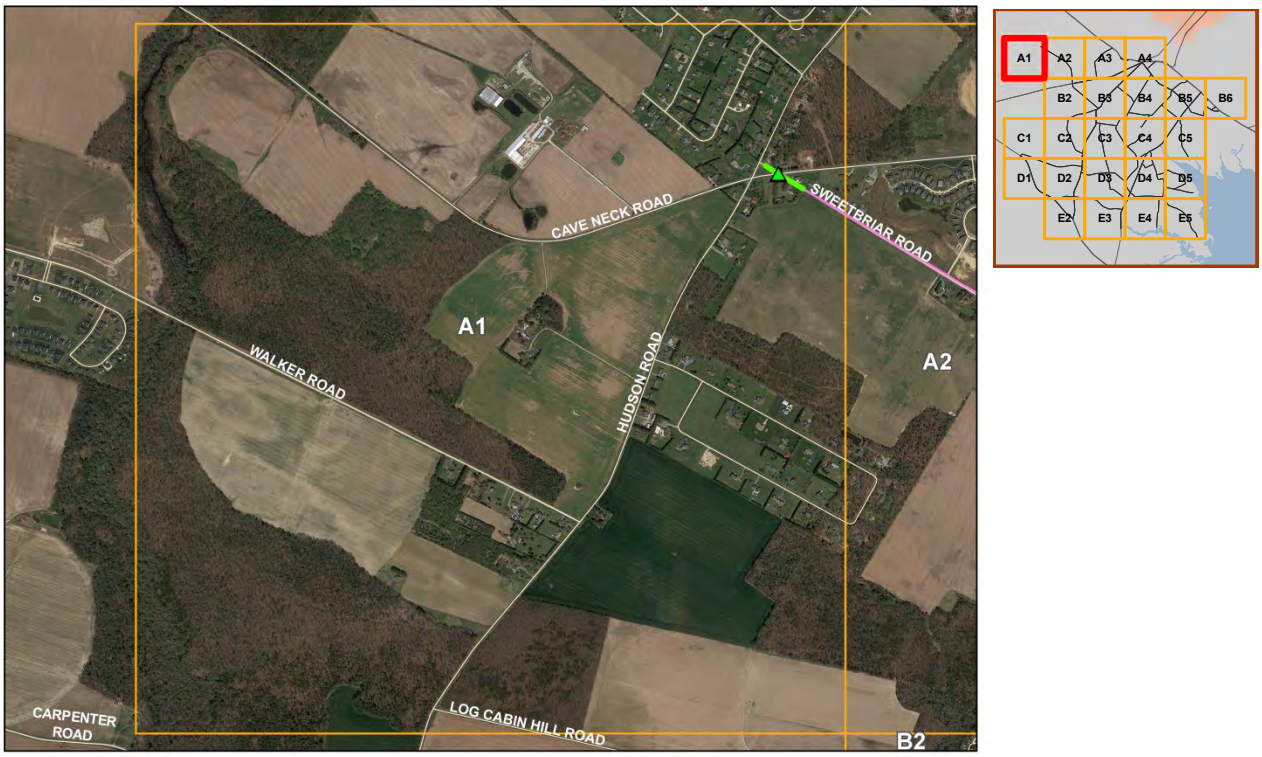


Figure 9. AM Level of Service (Grid A1)

Figure 10. PM Level of Service (Grid A1)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

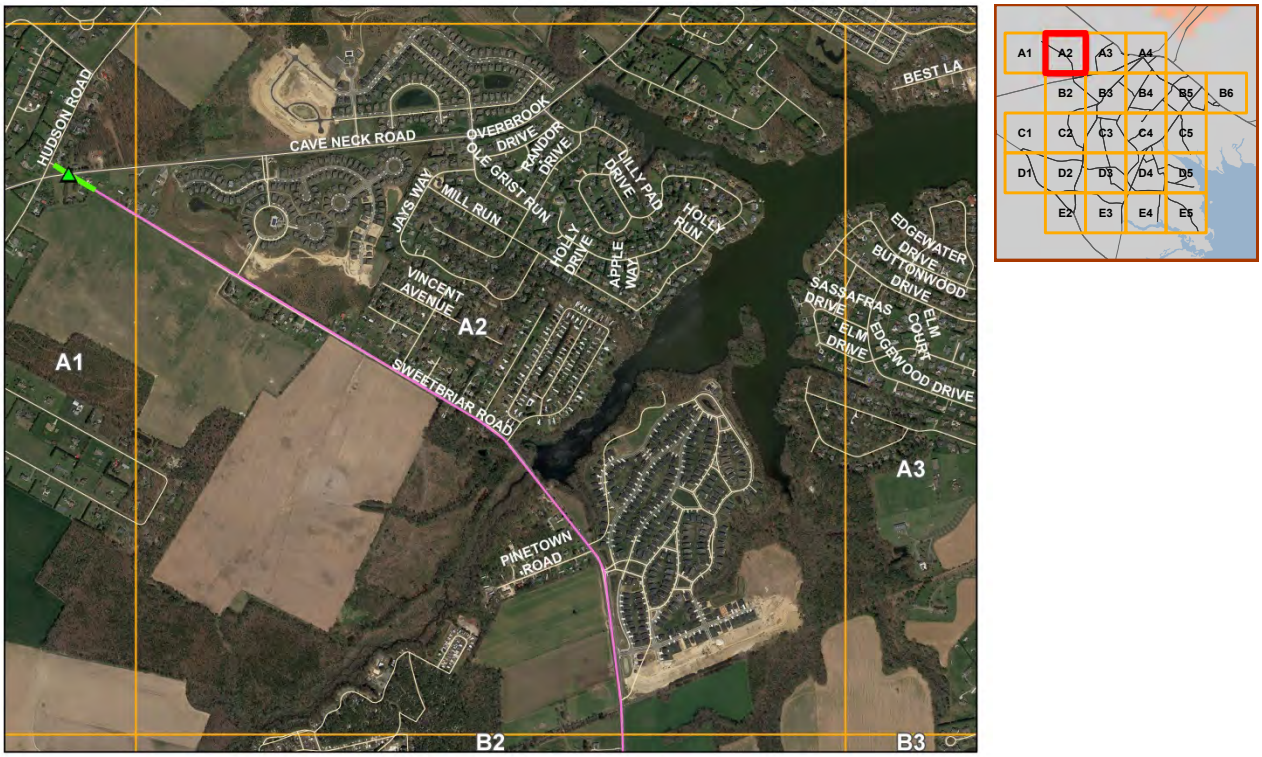


Figure 11. AM Level of Service (Grid A2)

Figure 12. PM Level of Service (Grid A2)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

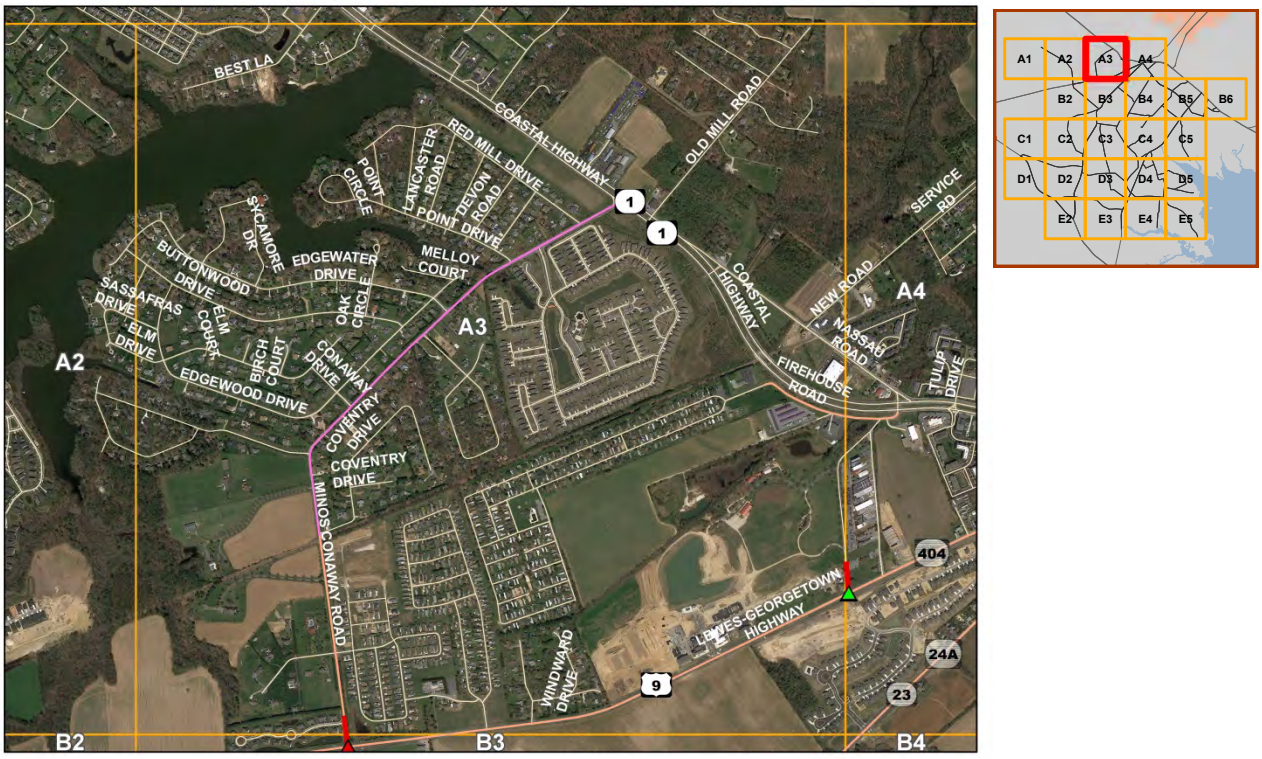


Figure 13. AM Level of Service (Grid A3)

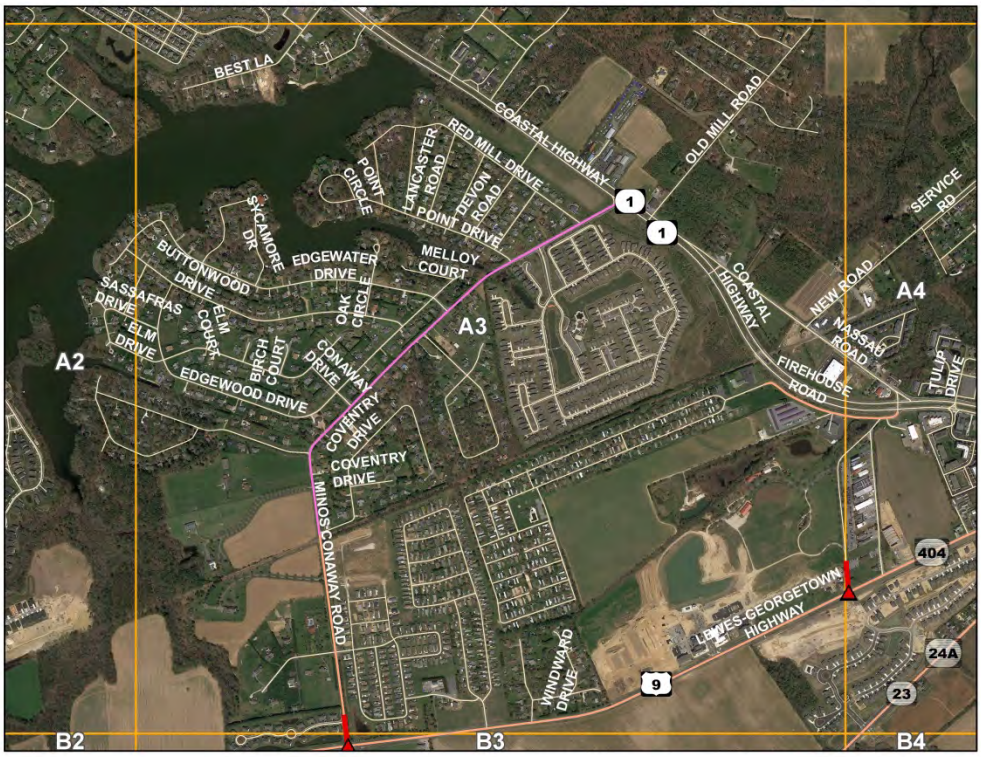


Figure 14. PM Level of Service (Grid A3)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

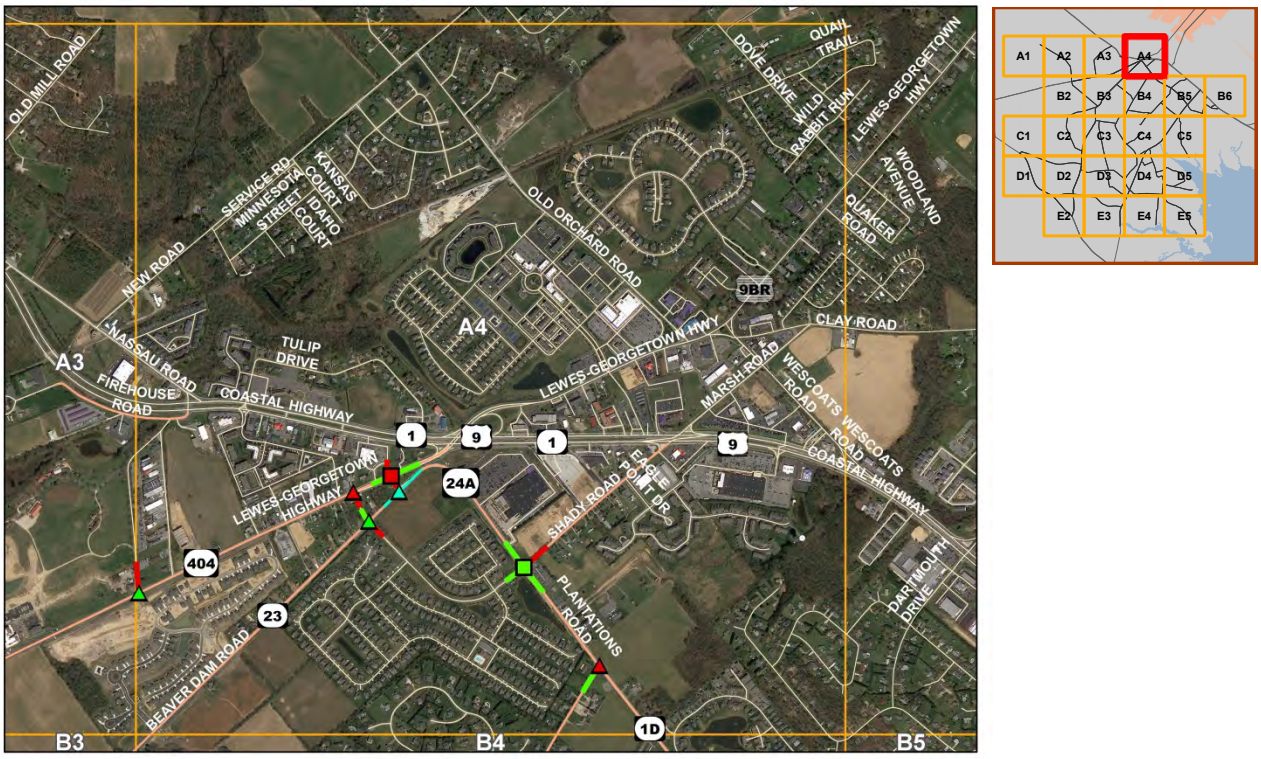


Figure 15. AM Level of Service (Grid A4)

Figure 16. PM Level of Service (Grid A4)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

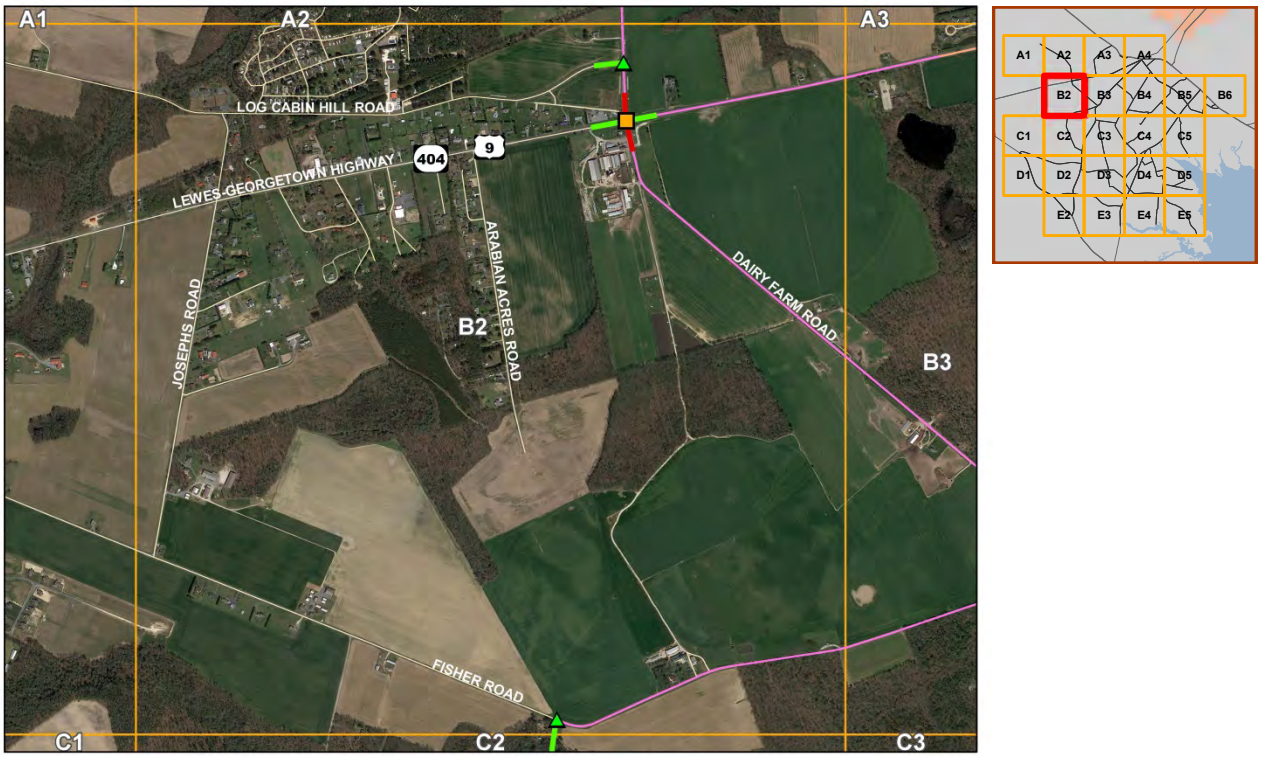


Figure 17. AM Level of Service (Grid B2)

Figure 18. PM Level of Service (Grid B2)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

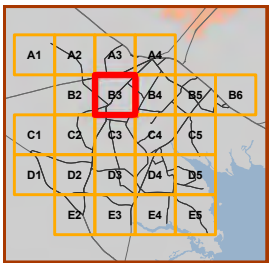


Figure 19. AM Level of Service (Grid B3)

Figure 20. PM Level of Service (Grid B3)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

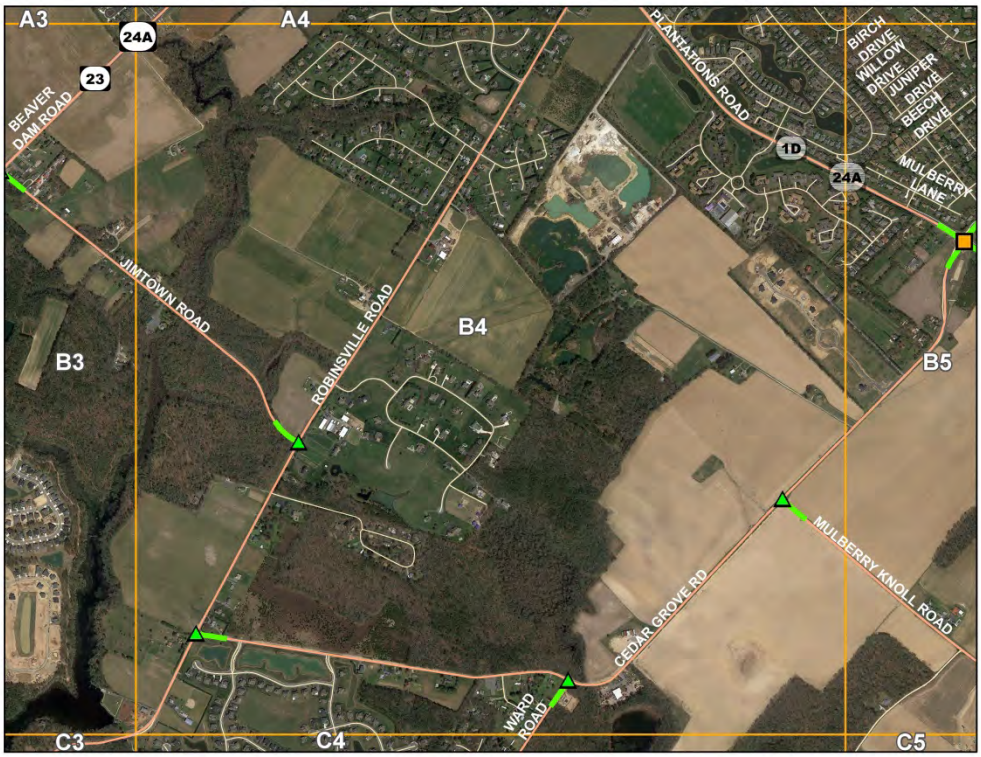
Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach



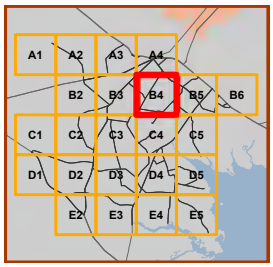


Figure 21. AM Level of Service (Grid B4)

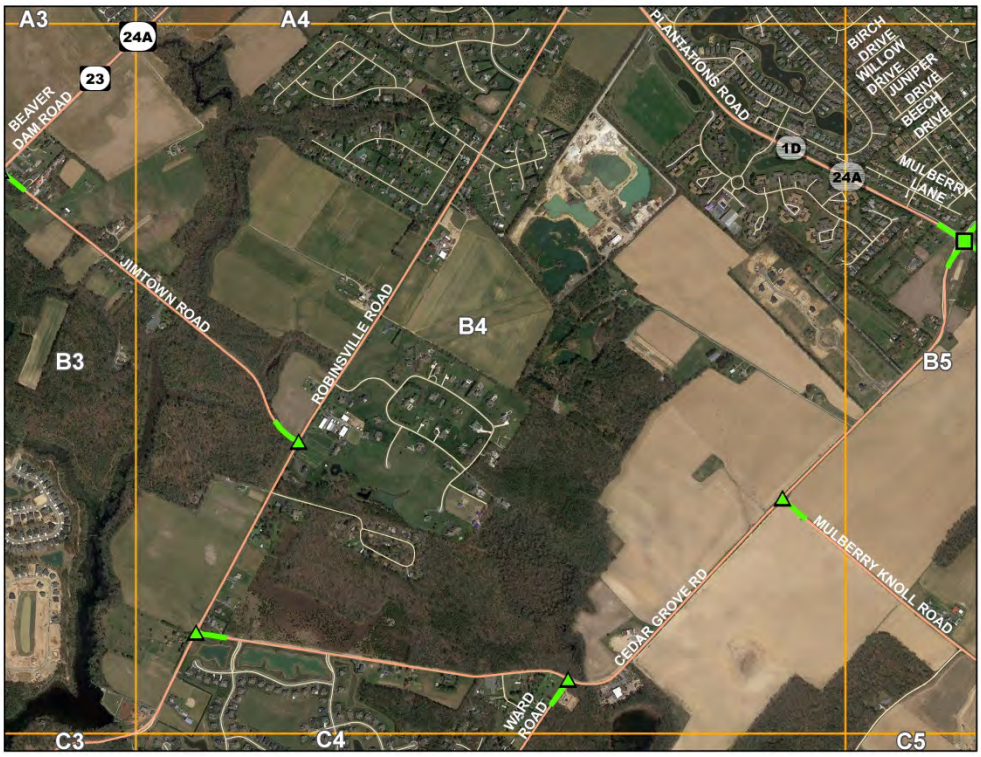


Figure 22. PM Level of Service (Grid B4)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

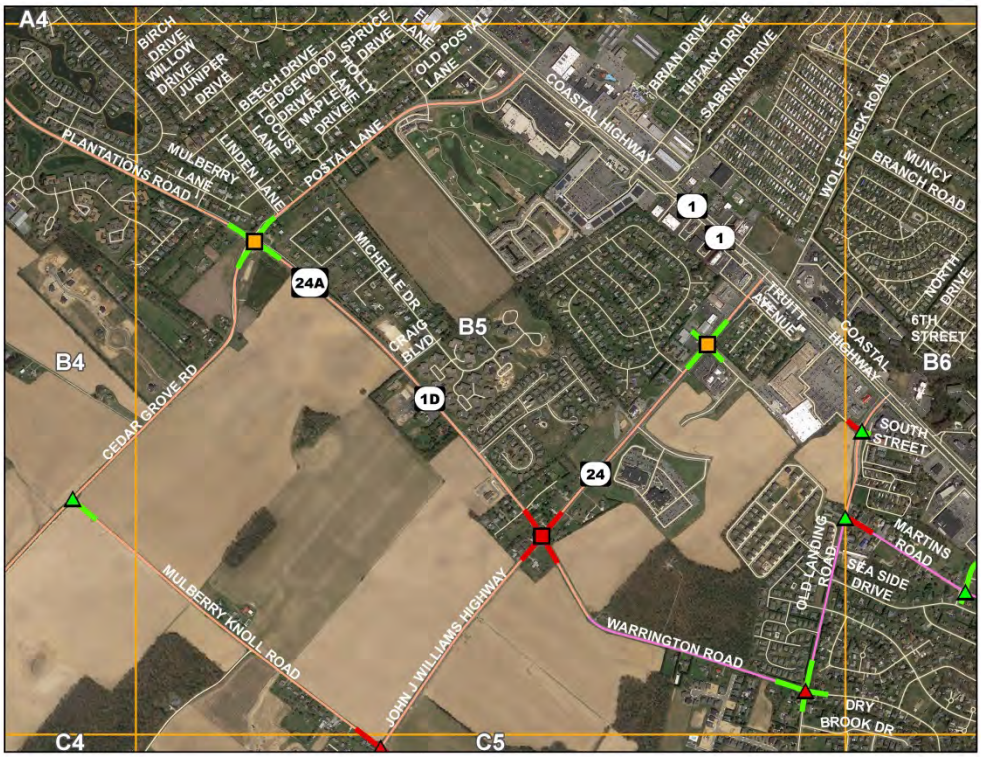
Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach



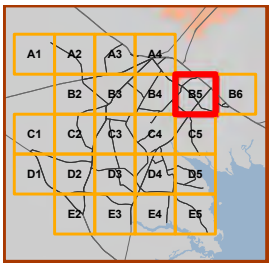


Figure 23. AM Level of Service (Grid B5)

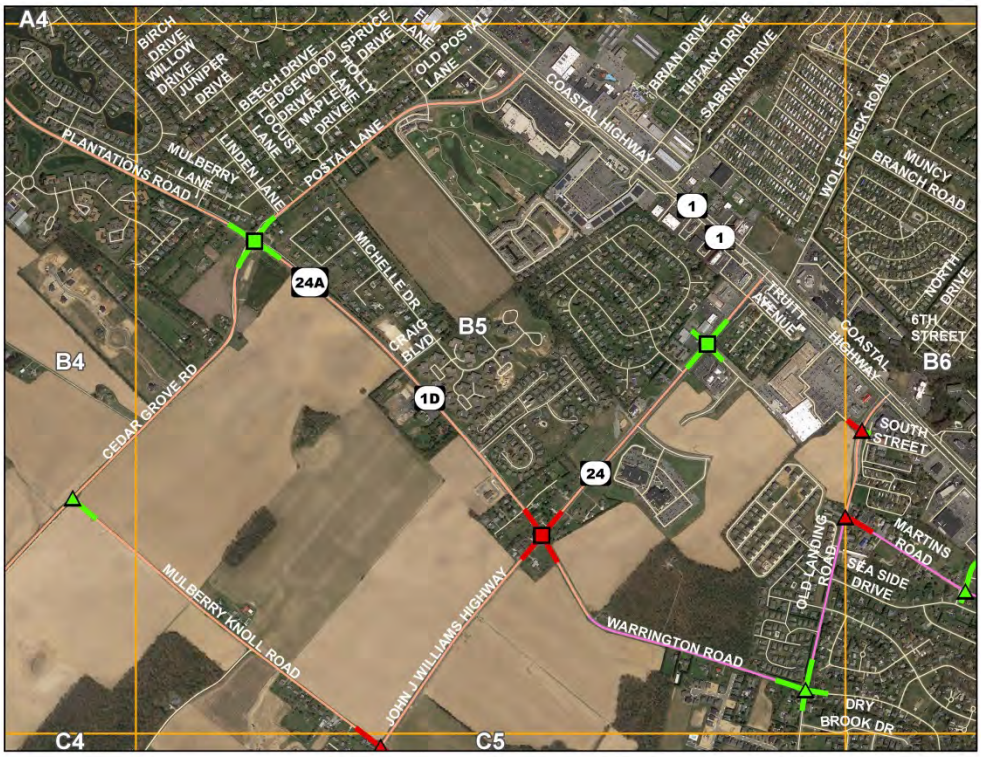


Figure 24. PM Level of Service (Grid B5)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

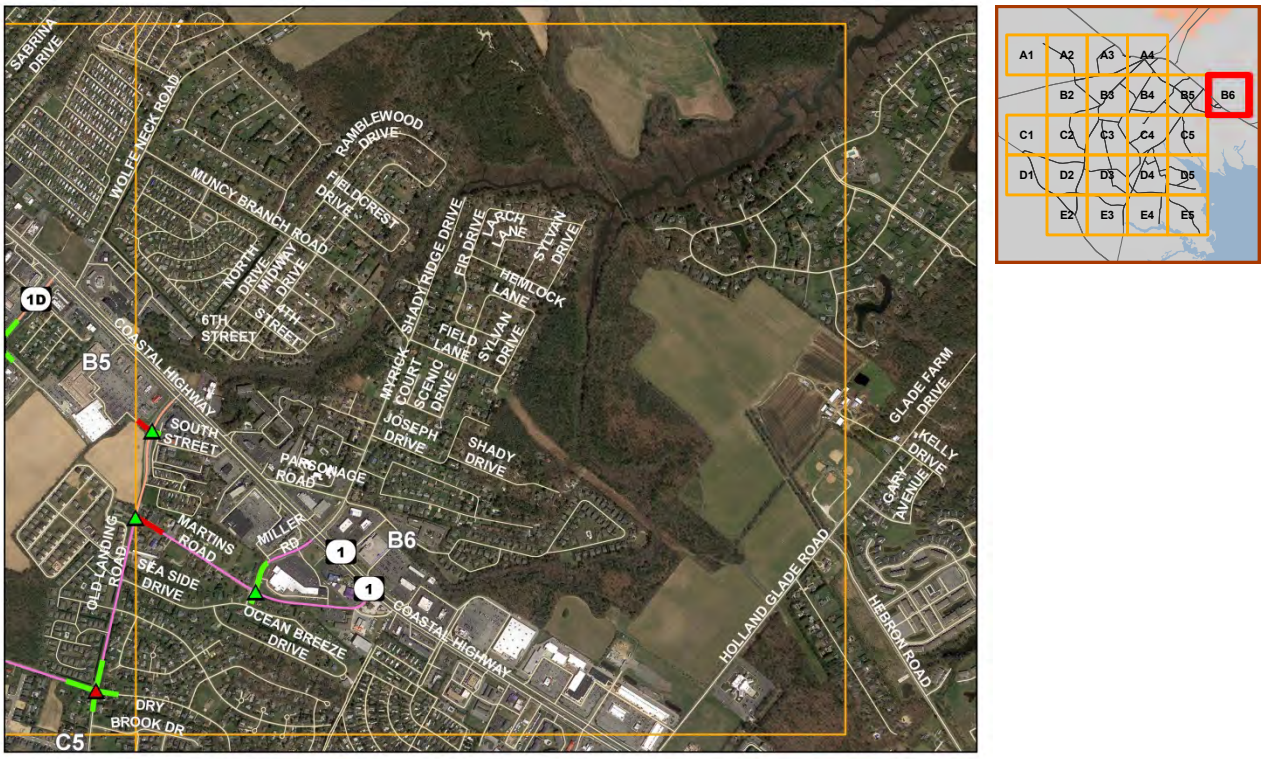


Figure 25. AM Level of Service (Grid B6)

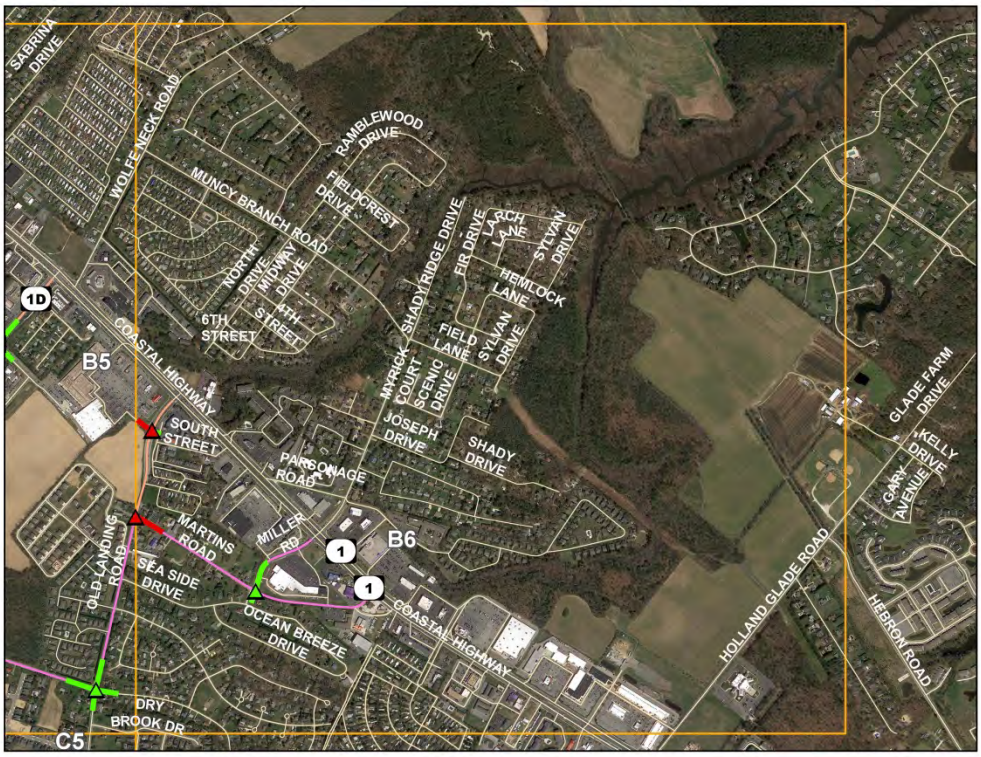


Figure 26. PM Level of Service (Grid B6)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

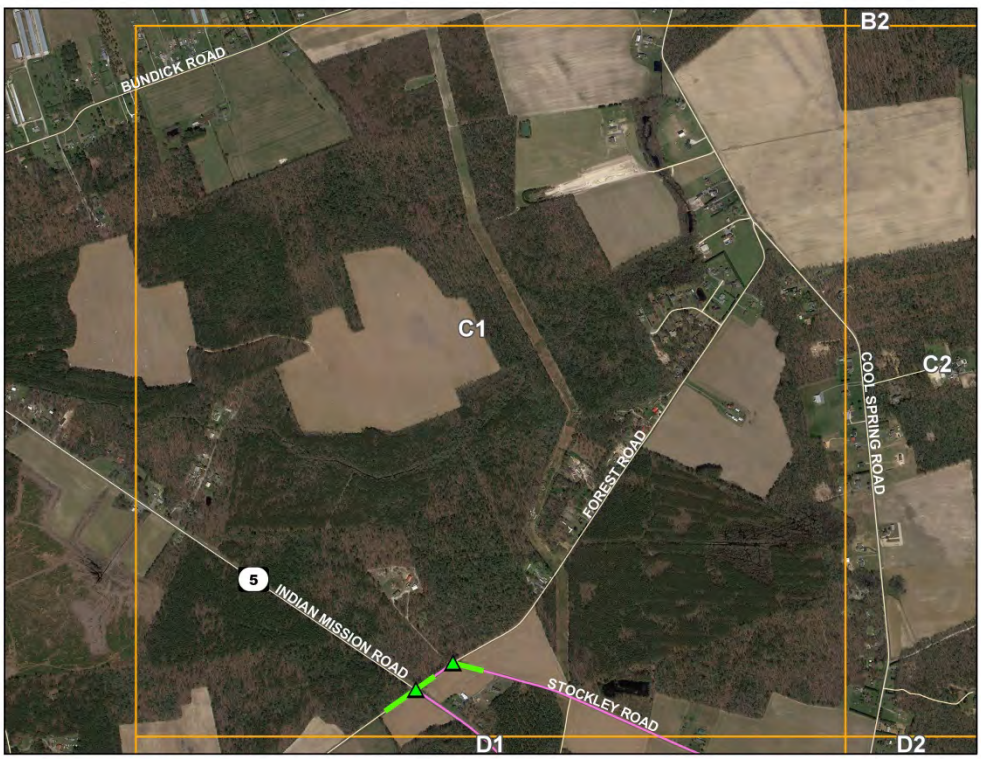
Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach



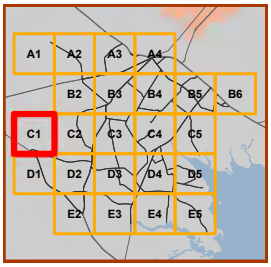


Figure 27. AM Level of Service (Grid C1)

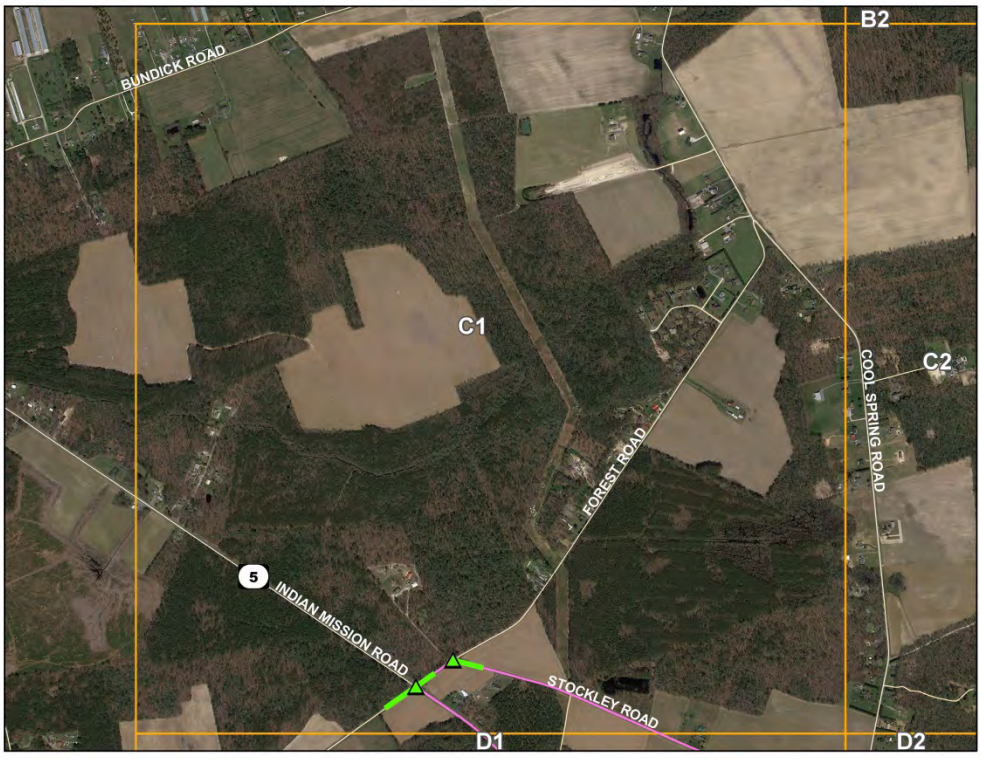


Figure 28. PM Level of Service (Grid C1)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

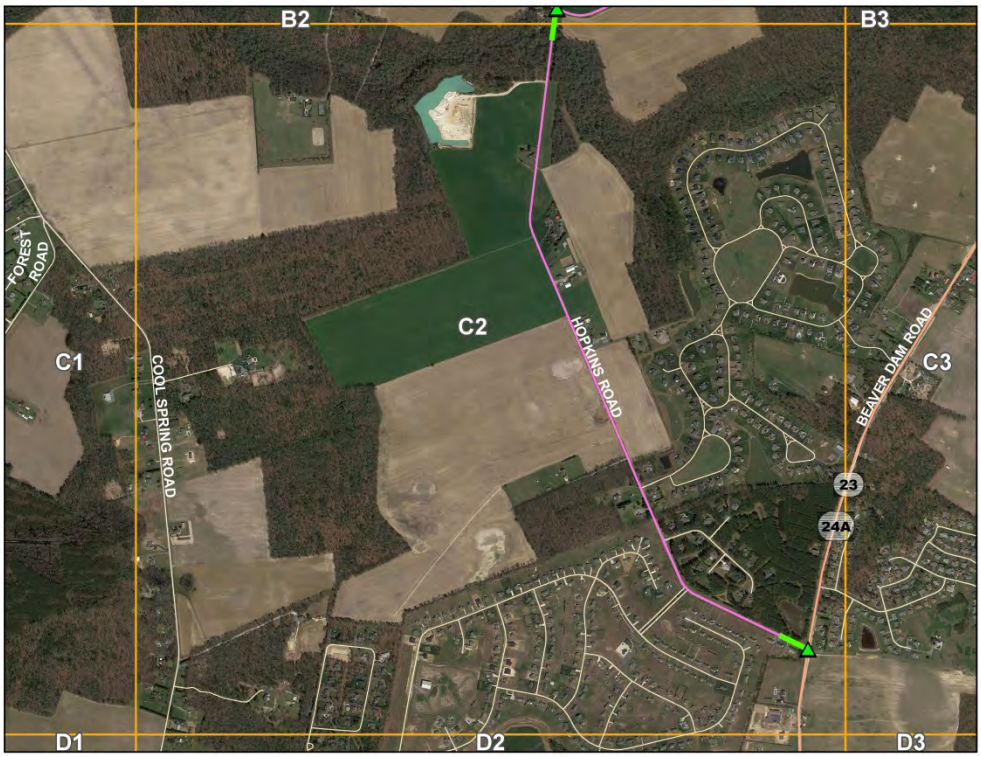
Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach



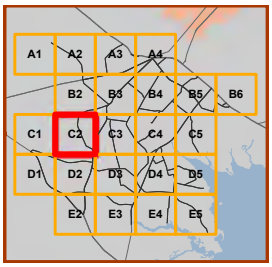


Figure 29. AM Level of Service (Grid C2)

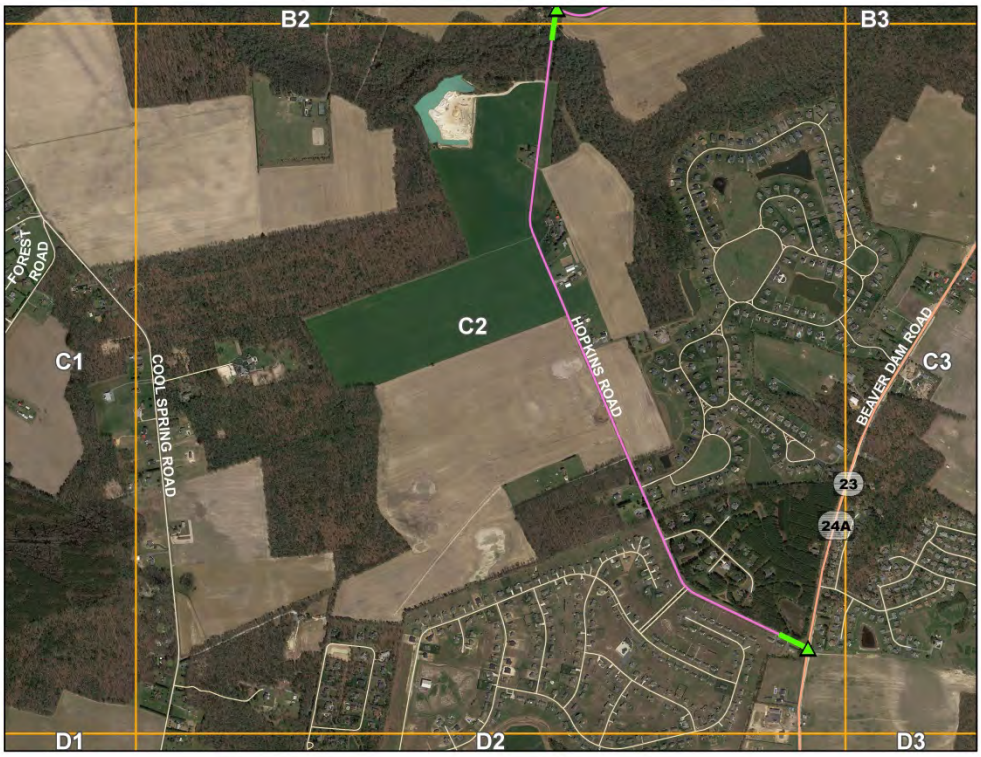
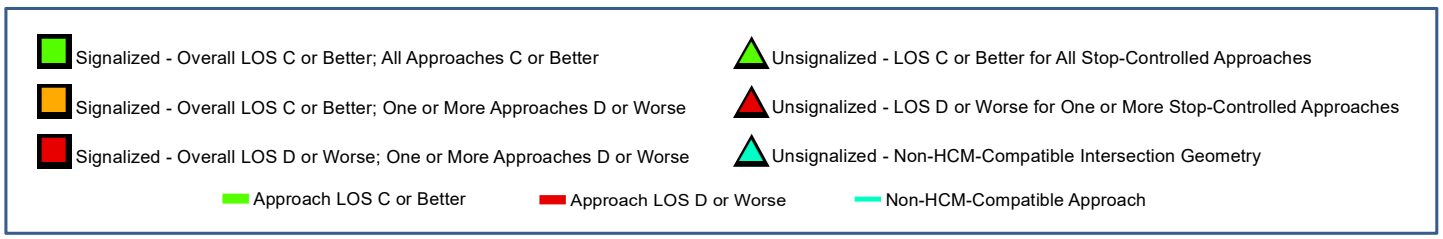
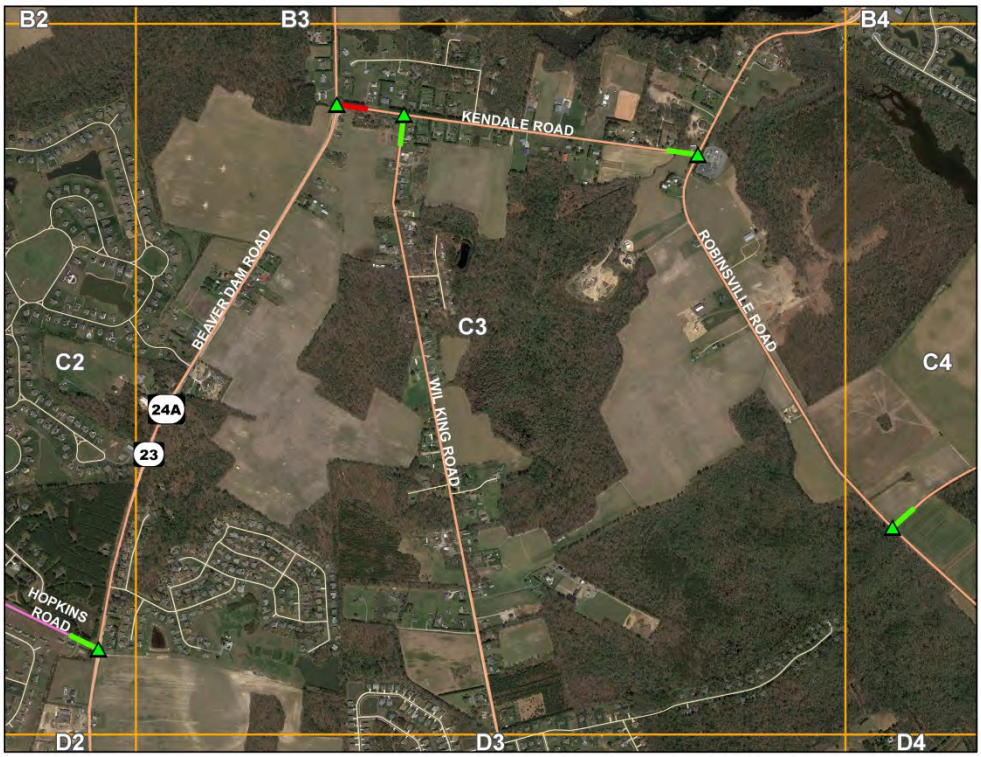


Figure 30. PM Level of Service (Grid C2)





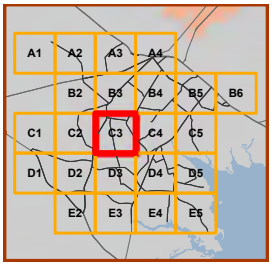


Figure 31. AM Level of Service (Grid C3)

Figure 32. PM Level of Service (Grid C3)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

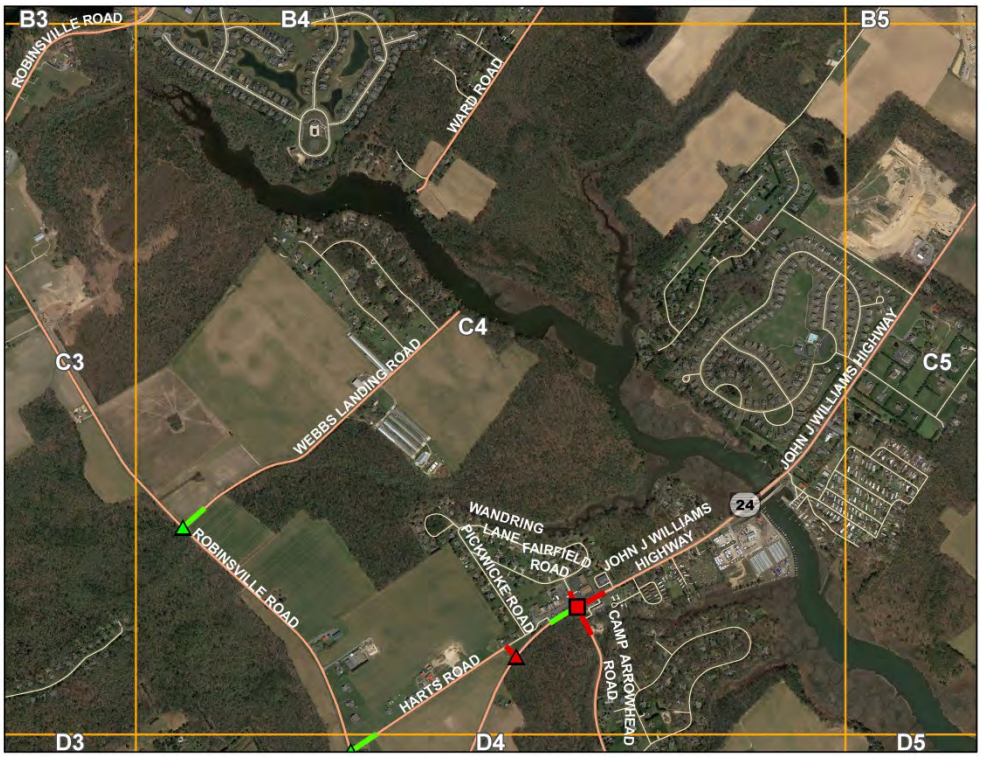
Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach



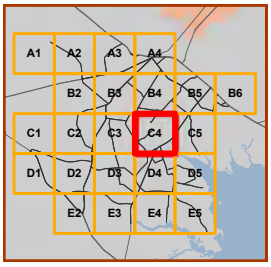


Figure 33. AM Level of Service (Grid C4)

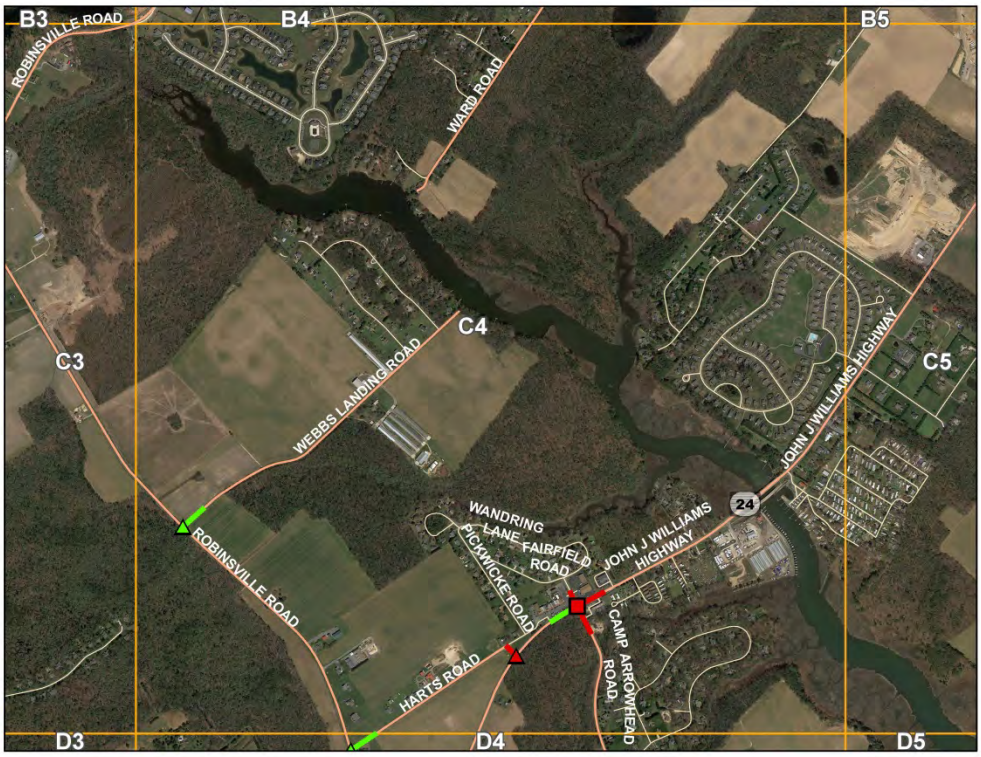


Figure 34. PM Level of Service (Grid C4)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

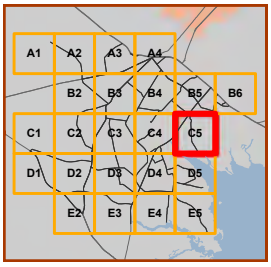


Figure 35. AM Level of Service (Grid C5)

Figure 36. PM Level of Service (Grid C5)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

Figure 37. AM Level of Service (Grid D1)

Figure 38. PM Level of Service (Grid D1)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

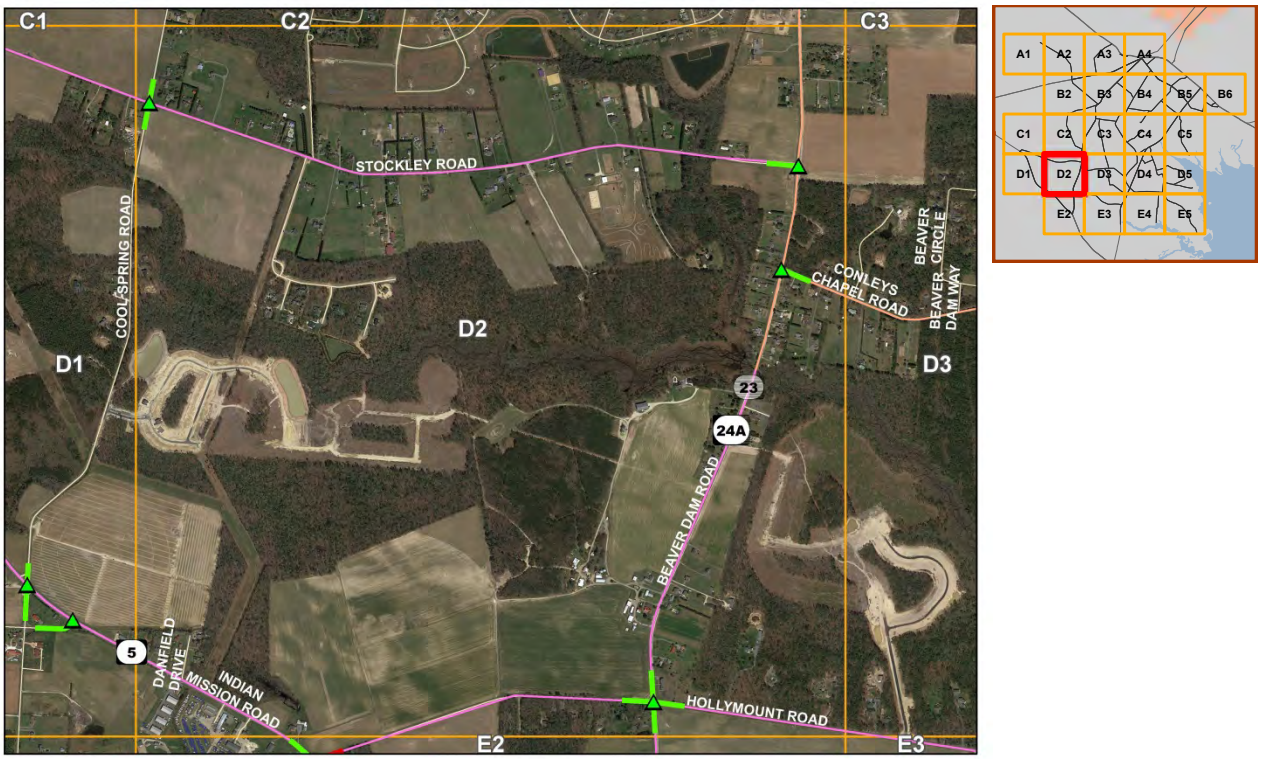


Figure 39. AM Level of Service (Grid D2)

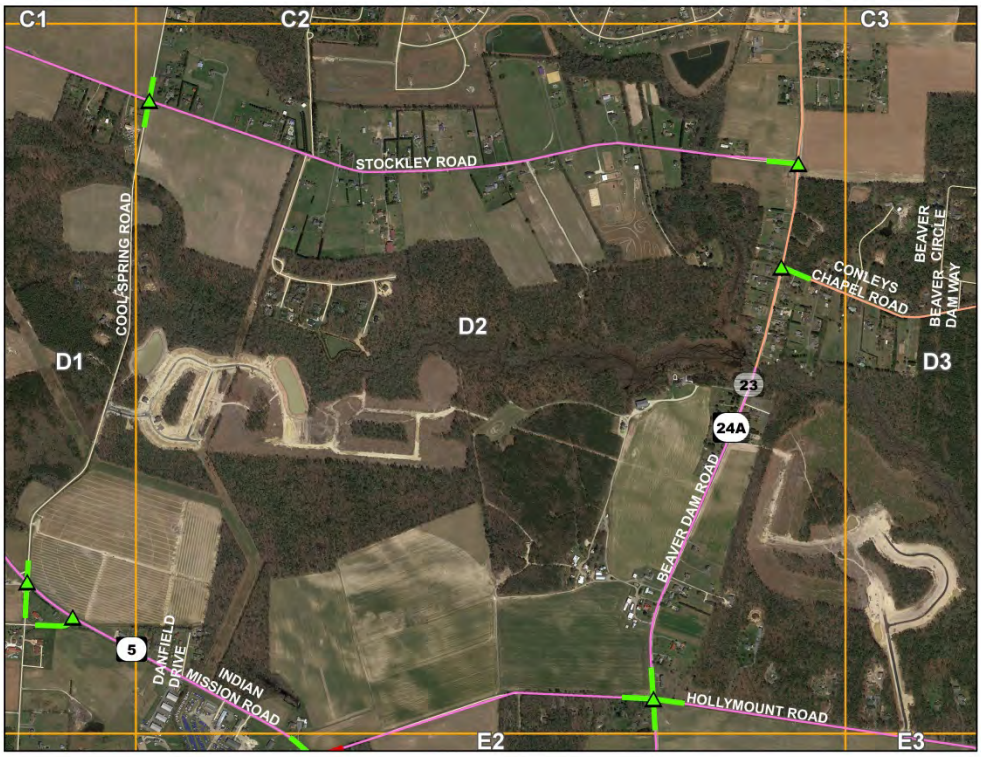


Figure 40. PM Level of Service (Grid D2)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

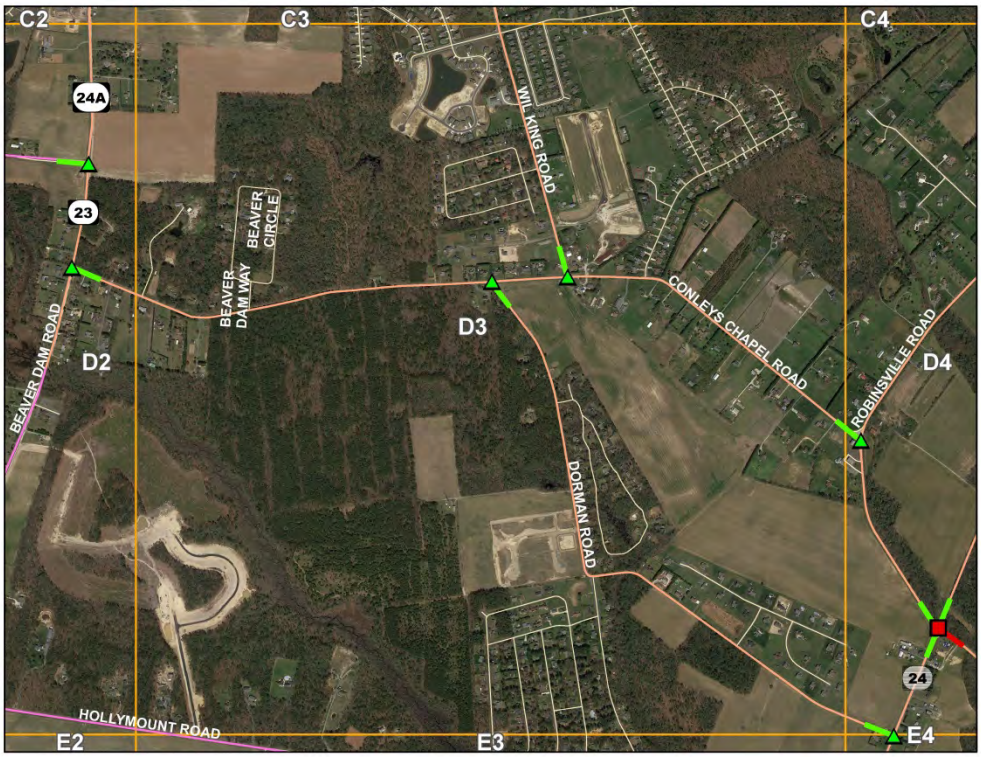
Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach



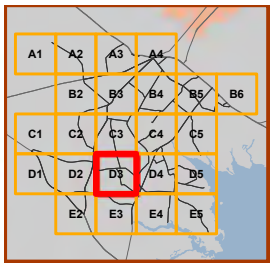


Figure 41. AM Level of Service (Grid D3)

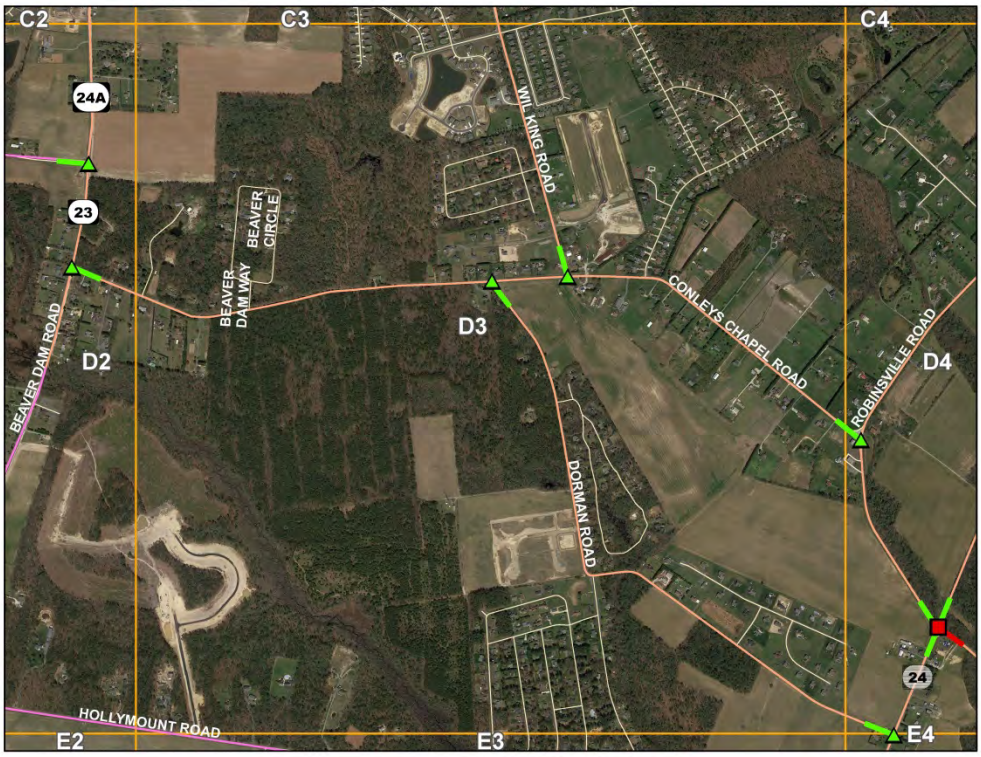


Figure 42. PM Level of Service (Grid D3)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

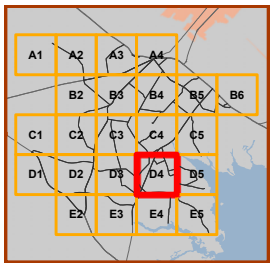


Figure 43. AM Level of Service (Grid D4)

Figure 44. PM Level of Service (Grid D4)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

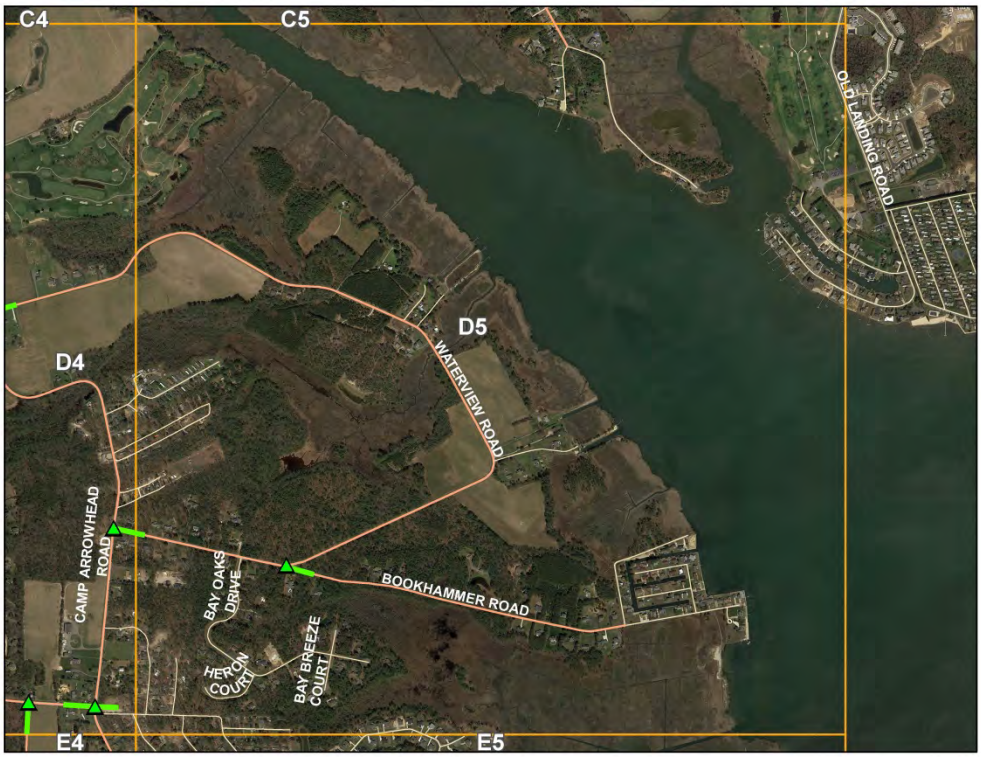
Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach



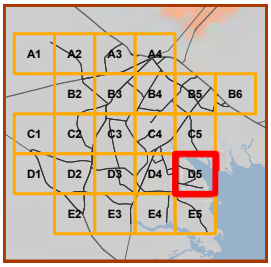


Figure 45. AM Level of Service (Grid D5)

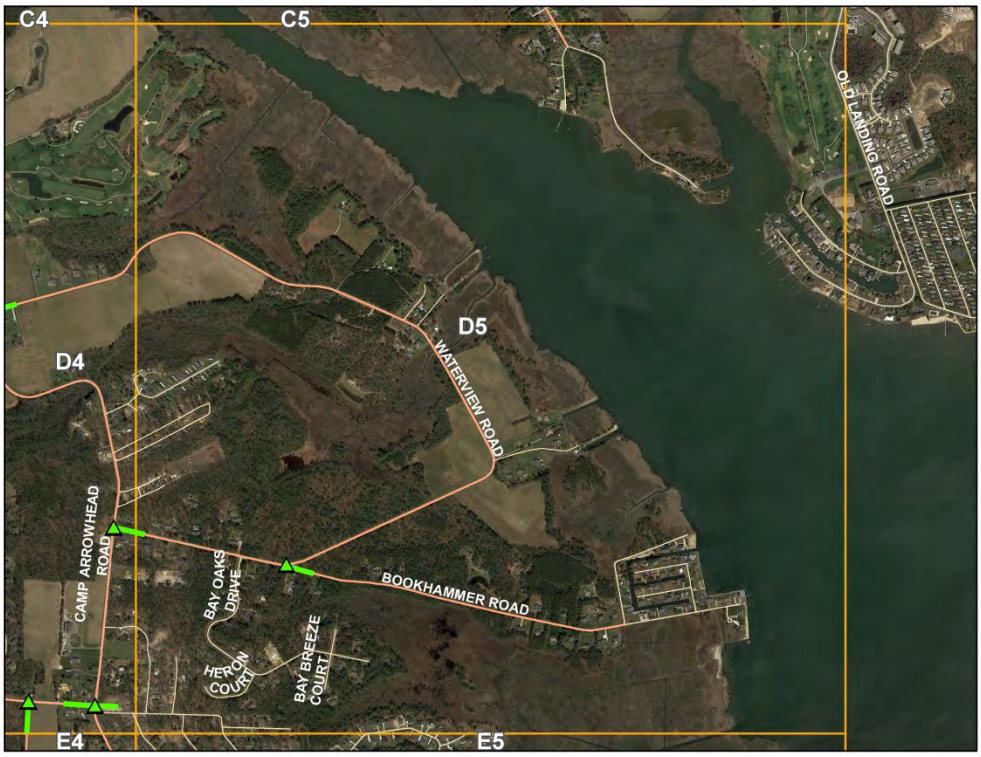


Figure 46. PM Level of Service (Grid D5)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

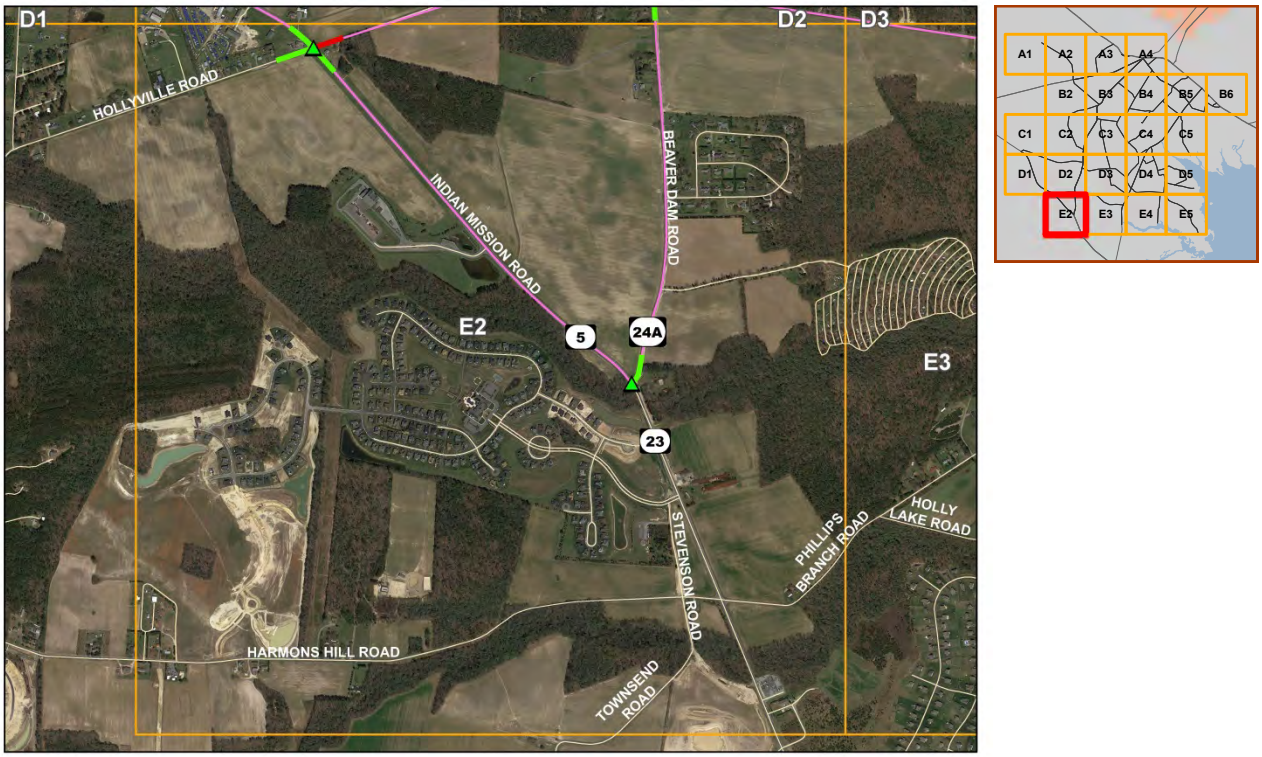


Figure 47. AM Level of Service (Grid E2)

Figure 48. PM Level of Service (Grid E2)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

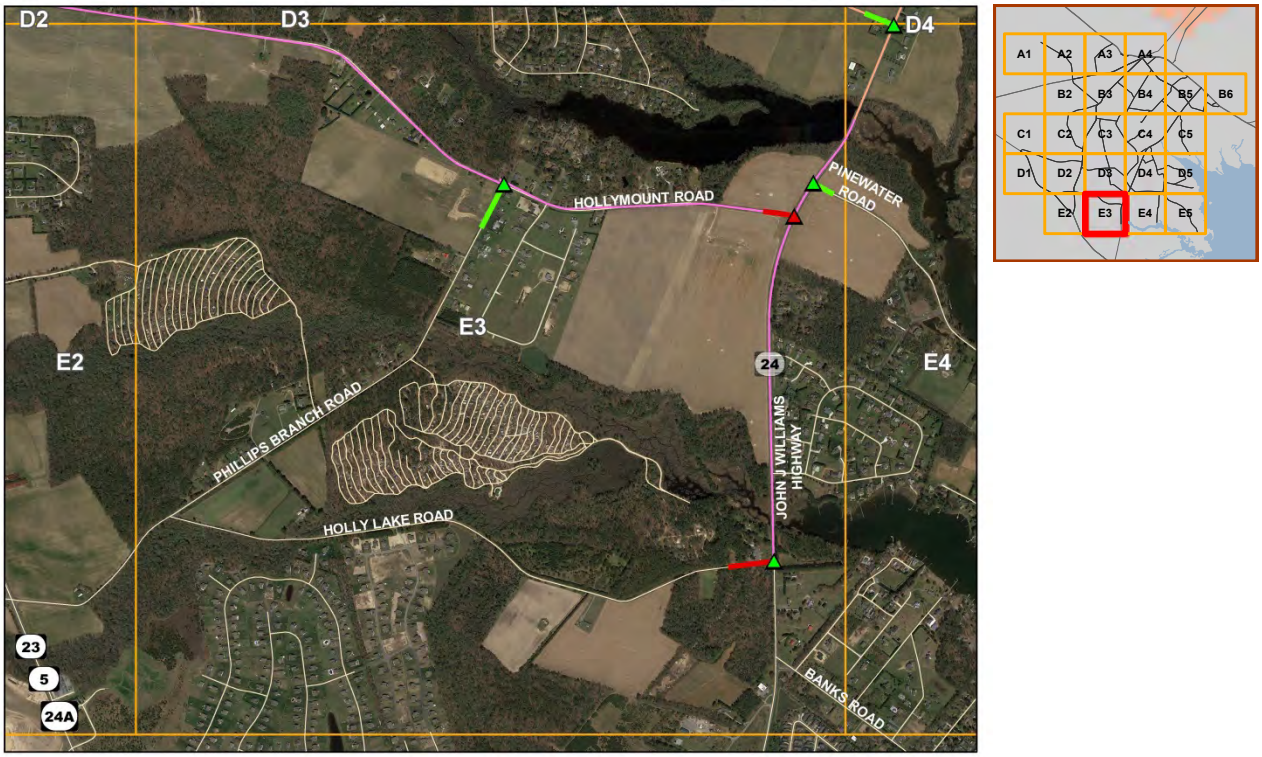


Figure 49. AM Level of Service (Grid E3)

Figure 50. PM Level of Service (Grid E3)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach

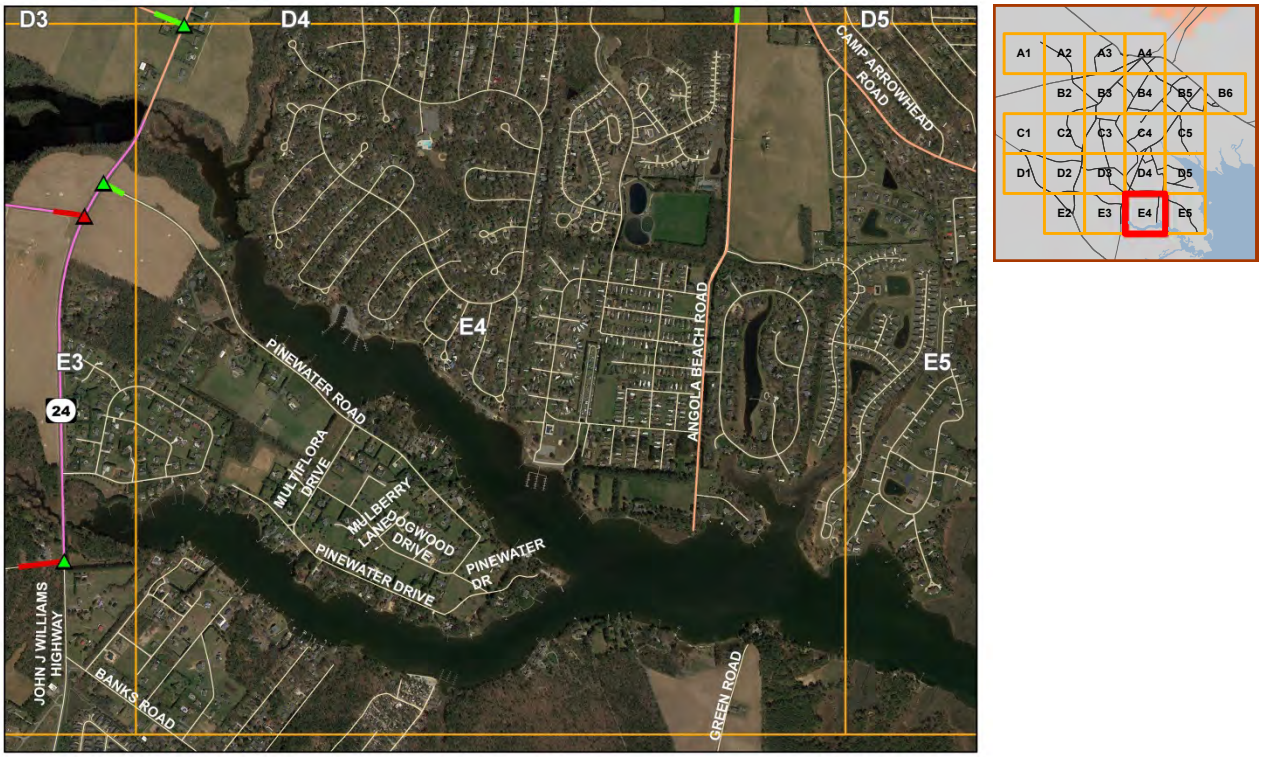


Figure 51. AM Level of Service (Grid E4)

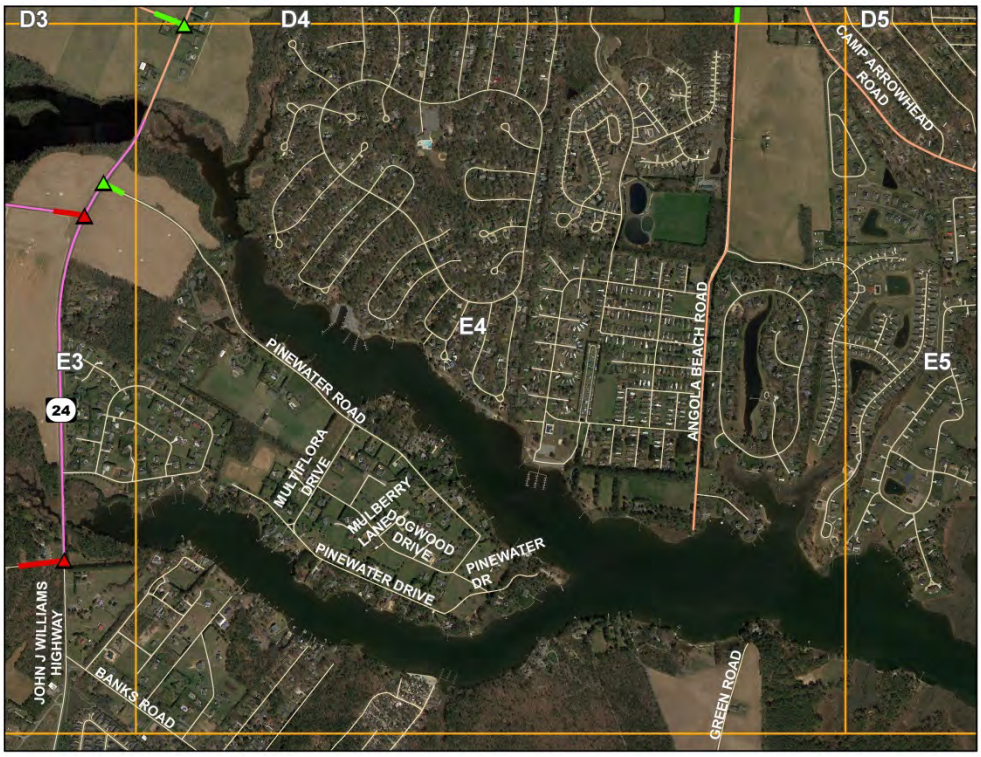


Figure 52. PM Level of Service (Grid E4)

Signalized - Overall LOS C or Better; All Approaches C or Better

Signalized - Overall LOS C or Better; One or More Approaches D or Worse

Signalized - Overall LOS D or Worse; One or More Approaches D or Worse

Unsignalized - LOS C or Better for All Stop-Controlled Approaches

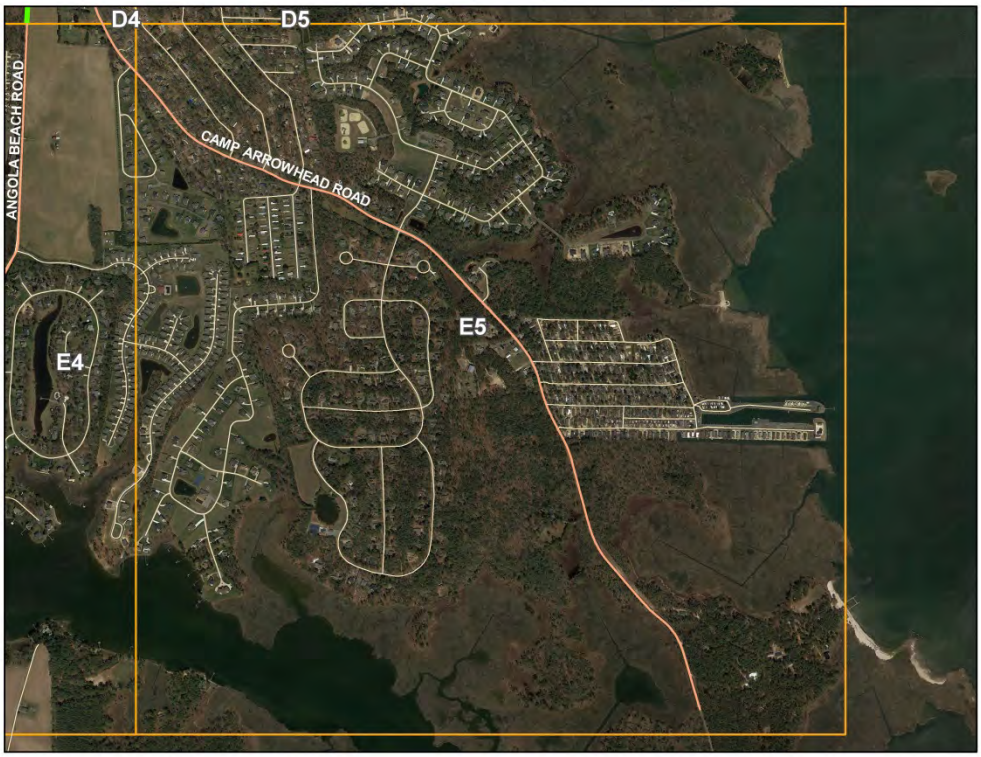
Unsignalized - LOS D or Worse for One or More Stop-Controlled Approaches

Unsignalized - Non-HCM-Compatible Intersection Geometry

Approach LOS C or Better

Approach LOS D or Worse

Non-HCM-Compatible Approach



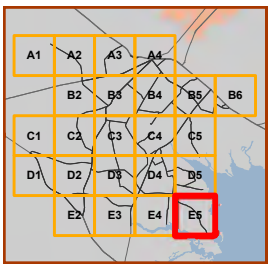


Figure 53. AM Level of Service (Grid E5)

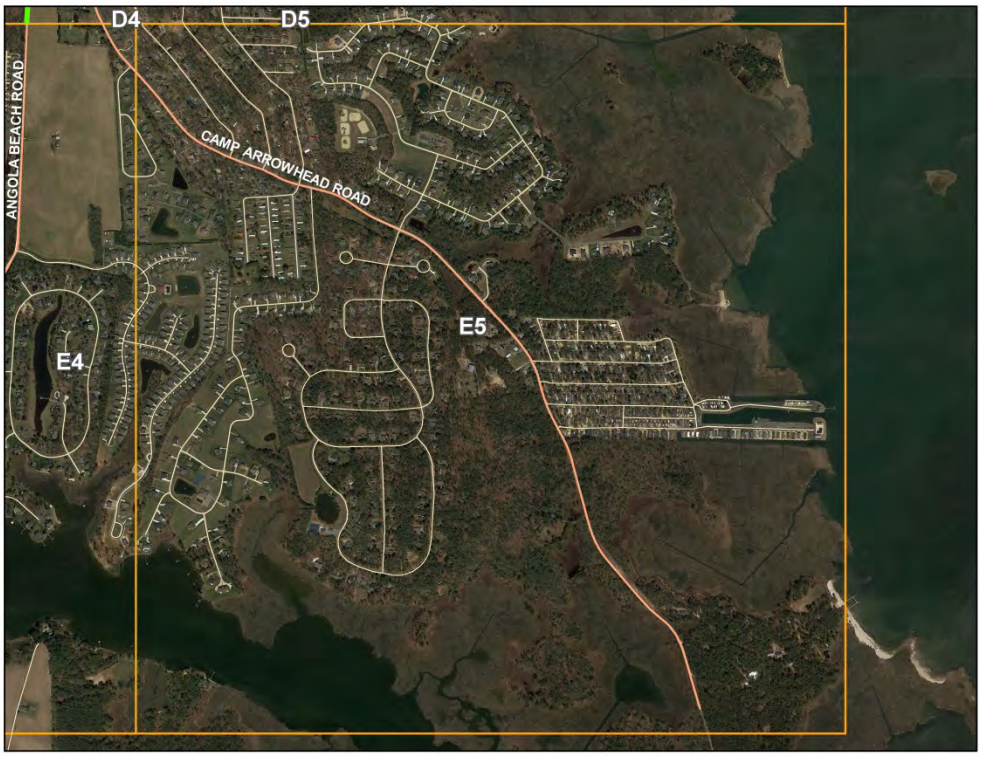
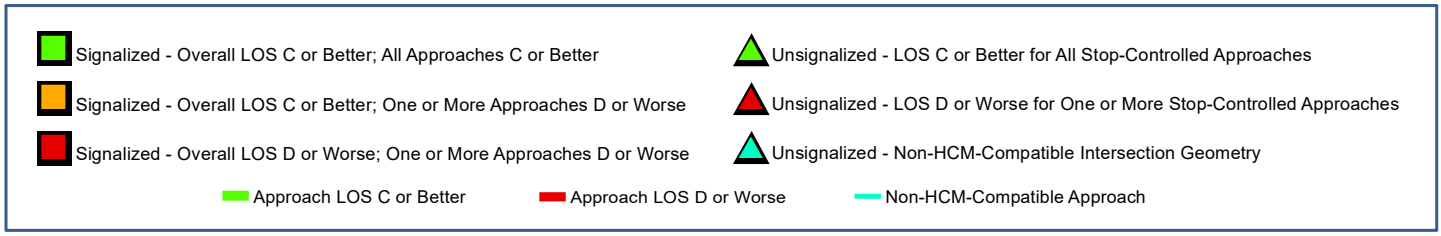


Figure 55. PM Level of Service (Grid E5)



Roadway Deficiency Analysis

DelDOT is currently in the process of conducting an extensive inventory of existing transportation infrastructure within the study area for the purpose of developing preliminary project concept recommendations. The inventory consists of the following sample components and selected data categories:

(1) Roadway Data
- DelDOT Road Rating (pavement condition)
- Functional Classification
- Average Annual Daily Traffic

(2) Roadway Conditions
- Presence or absence of shoulders and shoulder material
- Shoulder width
- Sidewalks
- Americans with Disabilities Act (ADA) ramp condition
- Drainage
- Lighting
- Above ground utility conflicts
- Intersection geometry

(3) Design Elements
- Assessment of existing roadway curvatures for compatibility with the American Association of State Highway and Transportation Officials (AASHTO) guidance as found in the "A Policy on the Geometric Design of Highways and Streets".

(4) Potential for Future Development
- Identification of tax parcels and properties that contain existing site plans or appear to be amenable for future development activity.

Bikeability

Biking Level of Traffic Stress (LTS) was analyzed on the roads, taking into account the number of lanes, size of the shoulder, traffic volume, and the speed limit. LTS shows how comfortable a biker would be traveling on a road. A LTS of Level 1 would be very comfortable for a biker, and they may feel comfortable enough to include their children. Level 2 would be used by about 60% of bikers, and parents would probably not allow their children to ride. Level 3 and 4 are used by experienced bikers who are comfortable with traffic conflicts. The Biking Level of Traffic Stress image below shows these level 1 and 2 areas, and as can be seen, the majority of the TID contains roads that are best reserved for experienced bikers. It's important to recognize that the majority of bike lanes are on roads considered level 3 or 4.

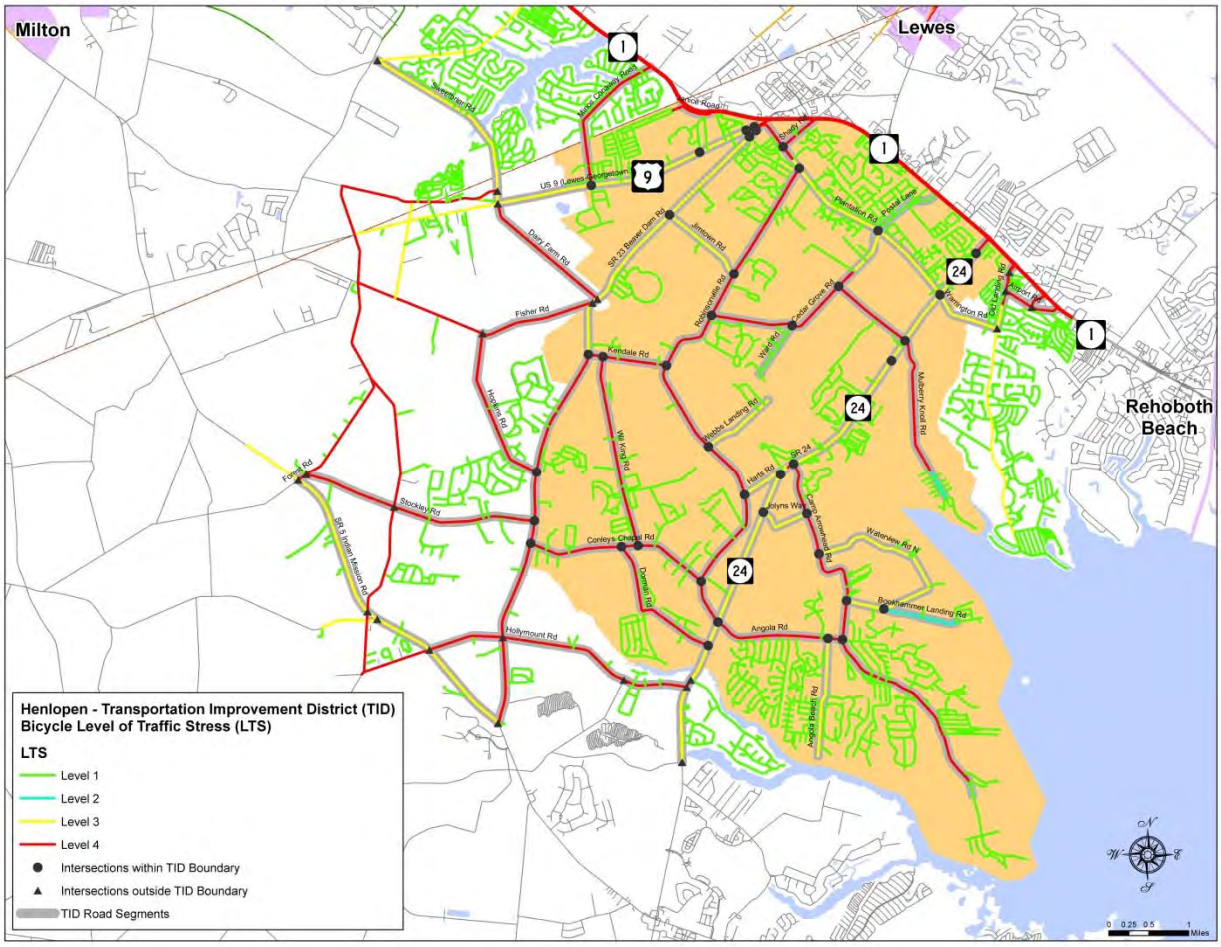


Figure 56. Bicycle Level of Traffic Stress (LTS)

Figure 57. Bicycle Level of Traffic Stress (LTS) - Definition

Public Transit Facilities

Within the TID, there are two bus routes that service Rt. 1, US Rt. 9, Rt. 24., and the City of Lewes. These lines are 215 and 206, and they total 40 bus stops between them. The Lewes Transit Center serves as the sole Park and Ride facility within the study area.

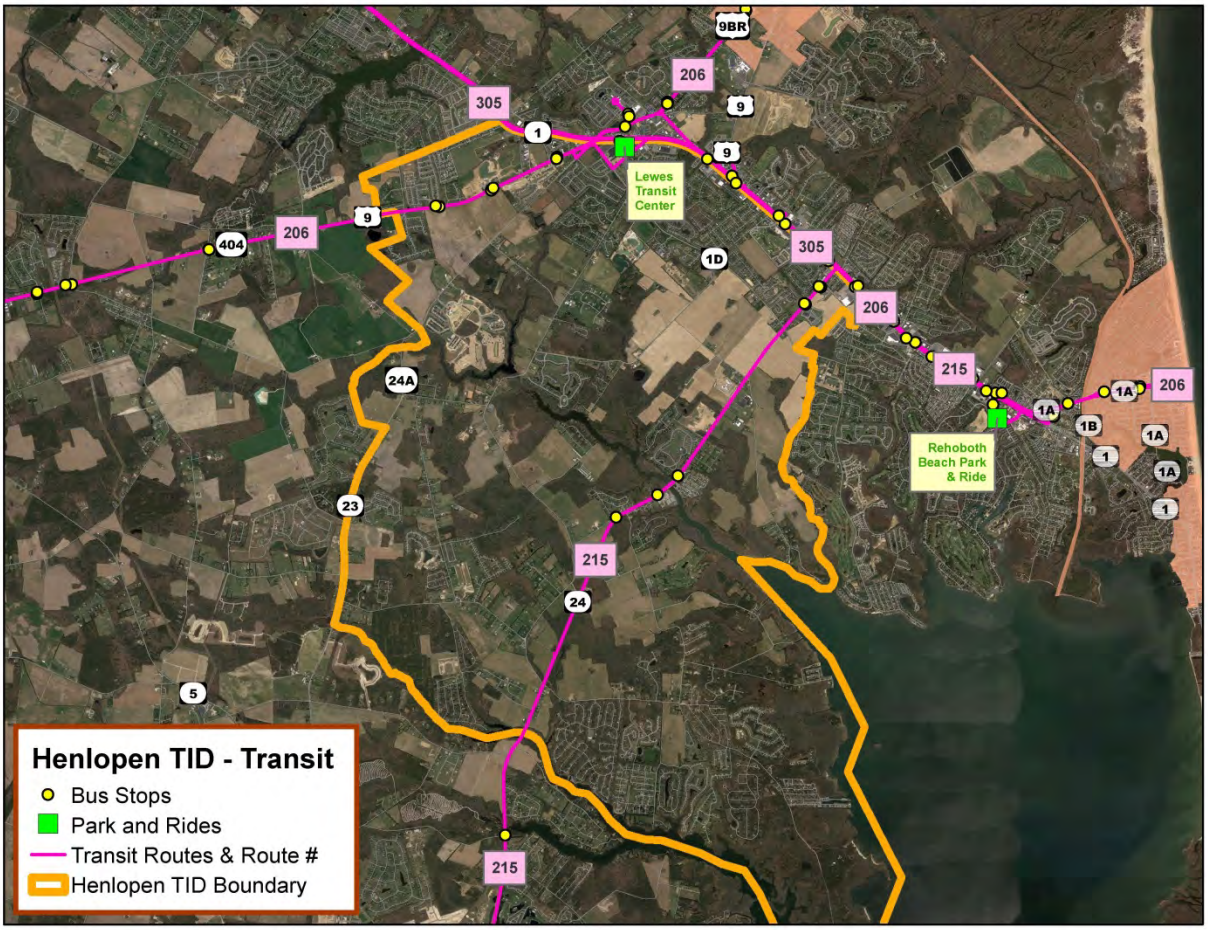


Figure 58. Public Transit Facilities

Henlopen TID - Existing Conditions Conclusions

The traffic network encompassed by the Henlopen TID faces several challenges as land use continues to develop in the future coupled with DelDOT' s fiscal and geometric constraints for adding additional capacity along SR 1. As the leading edge of development continues to shift farther away from the SR 1 it is imperative that both the County and DelDOT collaboratively work together to craft a unified vision of how future land use and transportation will work together to mitigate the impacts of the additional growth in the study area.

As shown in this report, two corridors (US 9 and SR 24) are already experiencing congestion and level of service challenges, yet, many intersections within the revised study area are currently operating adequately which provides both DelDOT and the County with an opportunity to actively plan for any future traffic and demands that will likely be placed on these intersections. The mechanism for that Planning effort will be the final Henlopen TID agreement. DelDOT is currently working with study area

land use projections provided by Sussex County and will be analyzing the transportation network impacts of those projections in the next phase of the Henlopen TID study.

The inventory of transportation assets and constraints and the development of preliminary project concepts is proceeding as a separate effort and is not addressed in this report. Preliminarily, however, it appears that improving the local road network within the study area to meet standards for road geometry and bicycle and pedestrian facilities could be a greater part of the effort needed in the TID than providing for adequate highway capacity.

Next Steps

This report provides an overall view of existing operating conditions within the revised Henlopen TID boundary. The following provides a list and status of next steps as they relate to the Department and the County's respective responsibilities:

1. DelDOT and Sussex County agree on an initial set of service standards, including Levels of Service that can be used to identify facilities as adequate or inadequate and determine where improvements need to be made.
   Status: Complete

2. Sussex County provides DelDOT with parcel based land use data inventory, including estimated future households and/or employment square footage, within the study area.
   Status: Complete

3. Sussex County provides DelDOT with any anticipated comprehensive plan update policies or initiatives relating to access management or zoning revisions within the study area.
   Status: Near Completion

4. DelDOT technical team conducts physical inventory of study area transportation assets/constraints and provides preliminary project concepts in advance of final future year-build-out land scenario modeling analysis.
   Status: In Progress

5. DelDOT technical team completes transportation modeling and analysis of future year build-out land use scenarios and develops project recommendations and financial implementation plan for TID.
   Status: In Progress