Section D

CAPACITY AND OPERATIONAL ANALYSES

1. Level of Service

The following section investigates the Talbot County roadway system in terms of capacity and operational characteristics. The analysis examines the study intersections and study corridors for existing and future year traffic volumes along with existing physical characteristics. The analysis identifies existing and future system deficiencies that can be mitigated by future improvement decisions.

a. Introduction

There are multiple ways to grade/classify the operation of roadways and intersections, each implementing a different set of input factors that result in different measures of effectiveness. The procedures for estimating the traffic-carrying ability of different types of facilities over a range of defined operational conditions is defined as capacity analysis. Traffic engineers implement capacity analysis techniques to assess facility operation and to plan and design improved facilities. Therefore, the principal objective of capacity analysis is to estimate the maximum number of vehicles a facility can accommodate while maintaining prescribed levels of operation. Capacity analyses examine roadway segments or points based on roadway geometric conditions. Therefore, one roadway could have different capacity if the roadway characteristics change throughout the corridor (number of lanes, lane width, shoulder width, etc.).

Once the roadway capacity is known, incorporating traffic volumes into the analysis allows a traffic engineer to quantify how close existing volumes are to the capacity of the facility. Therefore, this quality of service requires quantitative measures to characterize operational conditions within a traffic stream. Level of Service is a quality measure which assigns a letter grade (‘A’ through ‘F’) which quantifies how close a given roadway or intersection is to its respective capacity.

b. Mitigation Recommendations

Level of Service analyses are uniform, meaning that a two lane facility with a 45 mph speed limit and ‘x’ volume in the Baltimore Area would have the same level of service to a facility with similar characteristics in the Talbot County Area. It is this uniformity in analysis which often poses difficulty when analyzing roadway systems in rural areas, versus urban areas. Motorists in the Baltimore area travel roadways and intersections that, on average, operate at levels closer to the capacity of the facility (i.e. motorists in the Baltimore Area are used to congestion). Therefore, the problem arises that a Level of Service ‘C’ in the Baltimore Area is quite acceptable to the motorists, whereas a Level of Service ‘C’ in Talbot County may be unacceptable to the local motoring public.

Both the Maryland State Highway Administration and the Talbot County Department of Public Works recognize that different mitigation thresholds are required for a congested urban area, such as Baltimore City, versus a rural area, such as Talbot County. The SHA, designates that a Level of Service ‘E’ or ‘F’ requires mitigation to bring an analysis site to a Level of Service ‘D’ or better in urban counties. In rural counties SHA designates Level of Service ‘D’ as the level where mitigation is required on state-controlled roadways. Talbot

County Department of Public Works' mitigation requirements match SHA's requirements for county-controlled roadways.

c. Intersection Level of Service

The two most common analysis techniques Traffic Engineers employ to quantify Level of Service for intersections are, one, the nationally recognized Highway Capacity Manual Technique (HCM), and two, the SHA approved Critical Lane Analysis Technique (CLA).

i Highway Capacity Manual Technique

The HCM Technique has been developed by the Transportation Research Board (a subsidiary of the National Academy of Sciences) specifically to standardize Level of Service analyses across the U.S. The Transportation Research Board (TRB) provides level of service analysis methodologies for a multitude of roadway alignments: signalized intersection, unsignalized intersection, roadway links, interchange merge & diverge points, etc. All HCM analysis techniques are extensively detailed that the implementation of computer programs greatly facilitates analysis operations.

A multitude of input parameters are required for the HCM Technique including: number of approach lanes, traffic volumes, lane configuration, saturation flow, approach speeds, shoulder width, lateral obstruction offset, lane widths, signal timing (for signalized intersections only), etc., etc. The HCM Technique calculates a per-vehicle delay (seconds/vehicle) and correlates a level a service by approach. Each approach level of service is combined to determine a total intersection level of service. **Tables 22 and 23** below summarize the signalized and unsignalized intersection delay criteria for each level of service.

Table 22 - HCM LOS Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (s/veh)
A	< 10
B	11 – 20
C	21 – 35
D	36 – 55
E	56 – 80
F	> 80

Control Delay = portion of Total Delay attributable to Traffic Control Device
(Source: 2000 Highway Capacity Manual)

Table 23 - HCM LOS Criteria for Unsignalized Intersections

Level of Service	Control Delay per Vehicle (s/veh)
A	< 10
B	11 – 15
C	16-25
D	26-35
E	36-50
F	> 50

Control Delay = portion of Total Delay attributable to Traffic Control Device
(Source: 2000 Highway Capacity Manual)

ii Critical Lane Analysis Technique

The SHA preferred Critical Lane Analysis Technique is significantly easier to utilize because the number of input parameters are significantly less. The CLA technique requires approach volumes, lane configuration, and signal phasing information, to calculate an analysis volume-to-capacity ratio (v/c). The output is an intersection level of service for the entire intersection. The ease of use of the CLA technique has contributed to the wide-spread implementation of the methodology. The SHA recommends the use of CLA especially for planning level studies as the technique is less labor-intensive, and the results are adequate for planning level decisions. **Table 24** below summarizes the resultant CLA level of service for different thresholds of v/c ratios.

Table 24 - CLA LOS Criteria

Level of Service	Control Delay per Vehicle (s/veh)
A	< 0.63
B	0.64 – 0.72
C	0.73 – 0.81
D	0.81 – 0.91
E	0.91 – 1.0
F	> 1.0

(Source: Maryland State Highway Access Manual)

The CLA analysis was implemented for all study intersections. For the purpose of this study, the results of the Critical Lane Analyses were used along with local knowledge to identify the problem intersections with complex geometric constraints which warranted more detailed study. Once identified, the Highway Capacity intersection analysis was used for a more detailed analysis to understand the underlying intersection deficiencies and flag the intersections that will require recommendations for improvements.

d. Roadway Link/Corridor Level of Service

The HCM is the primary authority for Level of Service analysis of roadway links/corridors. Similar to the signalized and unsignalized methodologies, a multitude of input parameters are required and computer interface greatly facilitates the analysis process. Level of service is assigned based on Average Travel Speeds of links and the percent time-spent-following (a measure of congestion).

2. Intersections

The transportation study analyzed 39 selected intersections throughout Talbot County that were deemed significant locations to capture relevant traffic data to model common travel patterns within the County. Traffic volume counts were taken, future volumes were forecasted, field conditions were noted, and the operations of the intersections were analyzed to validate the deficiencies of the intersections. Existing, short term, and long term needs were determined based on the existing and future conditions for the study intersections to formulate recommendations for future intersection improvements.

a. Existing Conditions

i Intersection Conditions

The study intersections operate either by 2-way stop control or signalization. Fifteen (15) of the 39 study intersections are signalized and are located along the major arterials around Easton: US 50, MD 33 and MD 322. Individual intersection configurations are diagramed in **Appendix B1 – Existing and Future Year (2015 and 2030) Critical Lane Analyses**, and site photographs are provided in **Appendix A1 – Study Intersection Photographs**.

The physical conditions of the study intersections include flat topography, straight and perpendicular roadway approaches, and minimal vegetation and obstructions around the intersections; which creates favorable site distances. The volume density around the “Reach the Beach” and Easton work-related traffic creates congestion around the town of Easton and along US 50, MD 33, and MD 322.

ii Volumes

A 12-hour (7AM to 7PM) vehicular turning movement count was conducted at each study intersection during typical weekdays in the summer of 2004 and 2005. The morning and evening peak periods were measured and used for further evaluation. The turning movement counts can be found in **Appendix A3 – Traffic Turning Movement Counts (TMS)**. High intersection volumes appear around the town of Easton and along US 50, MD 33, and MD 322.

The Study does include two summer weekend turning movement counts along US 50 (US 50 @ Dutchman’s Lane & US 50 @ Barber Road). These counts were used to compare the volume differences during the weekday and weekend along the primary “Reach the Beach” route. US 50 experienced a 9% average increase in volume during the 12-hour count period and a 21% average increase in volume during the highest peak hours at these sites. Most of the US 50 intersections analyzed in the Study already indicate unacceptable levels of service during existing and future analysis conditions. The summer weekend period would show the same unacceptable results; therefore the different design period would not give a distinct advantage to the analysis.

The summer weekend is considered the "worst case", because the highest traffic volumes can be found on certain roadways during a summer weekend. These high traffic volumes are generated from "Reach the Beach" traffic driving through Talbot County, mainly along US 50, to reach their recreational destinations. The Talbot County Transportation Study uses a "typical case" scenario that captures traffic patterns common along all roadways within the County, not just roadways used by tourists visiting or passing through. The more common local traffic patterns occur during normal working hours, meaning morning and evening peak periods during the week.

The summer weekend design period volumes could be misleading and conflict with the decision making agenda. The design period does not place the focus on the entire County and could over-allocate transportation funding. Incorporating capacity improvements to a roadway based on weekend volumes will solve the problem for the weekend days, however the improvements would be underutilized for the other days of the week.

iii Level of Service

Capacity analyses were performed for the morning and evening peak hour volumes for each study intersection in accordance with the SHA preferred Critical Lane Technique (CLA). The CLA technique requires few input parameters and simple calculations to quantify Level of Service based on volume capacity for the entire signalized or unsignalized intersection.

In addition, operational analyses were performed for the signalized study intersections and selected unsignalized intersections in accordance with the nationally recognized *2000 Highway Capacity Manual* (HCM) procedures. The unsignalized intersections were selected based on high volumes and potential to warrant signalization control at the study intersection. The HCM techniques require multiple input parameters and complex calculations to quantify Level of Service based on average delay experienced by each approach intersection movement.

The resulting Level of Service (LOS) for each analysis procedure is summarized in **Table 25 and 26** respectively, detailed in **Appendix B1 – Existing and Future Year (2015 and 2030) Critical Lane** and **Appendix B3 – Highway Capacity Intersection Analyses**, and shown pictorially in **Appendix C2-Existing Condition Intersection Level of Service**.

Table 25 – Existing Intersection Levels of Service – CLA Technique

Site	Intersection	Existing			
		AM		PM	
		LOS	V/C	LOS	V/C
1	MD 404 @ MD 662	A	0.05	A	0.06
2	MD 329 @ Bellevue Rd.	A	0.11	A	0.15
3	MD 333 @ Almshouse Rd.	A	0.14	A	0.16
4	Wrights Mill Rd. @ Koogler/Piney Hill Rd.	A	0.01	A	0.05
5	Koogler Rd. @ Barber Rd.	A	0.03	A	0.05
6	MD 322 @ MD 333	A	0.58	A	0.52
7	MD 322 @ MD 334	A	0.58	A	0.59
8	MD 33 @ MD 322	A	0.58	C	0.78
9	MD 322 @ Glebe Rd.	A	0.43	A	0.46
10	MD 322 @ Centreville Rd./Washington St.	A	0.51	A	0.59
11	Centreville Rd. @ Airpark Dr.	A	0.24	A	0.27
12	US 50 @ MD 322	B	0.67	D	0.86
13	US 50 @ Airport Rd.	B	0.70	C	0.78
14	MD 309 @ Black Dog Alley	A	0.28	A	0.36
15	Black Dog Alley @ Chapel Rd.	A	0.17	A	0.23
16	MD 328 @ Black Dog Alley	A	0.36	A	0.54
17	Black Dog Alley @ Kingston Rd.	A	0.14	A	0.15
18	MD 331 @ Black Dog Alley	A	0.55	A	0.62
19	US 50 @ Dutchman's Ln.	A	0.47	C	0.76
20	Dutchman's Ln. @ Dover Neck Rd.	A	0.08	A	0.09
21	MD 333 @ Llandaff/Baileys Neck Rd.	A	0.17	A	0.22
22	Glebe Rd. @ Goldborough Rd.	A	0.13	A	0.16
23	MD 33 @ MD 370	A	0.42	A	0.59
24	MD 370 @ Glebe Rd.	A	0.14	A	0.19
25	US 50 @ Barber Rd./Main St.	A	0.41	A	0.44
26	MD 33 @ MD 579	A	0.21	A	0.25
27	US 50 @ MD 404	B	0.63	D	0.88
28	MD 303 @ MD 309	A	0.24	A	0.25
29	MD 662 @ Sharp Rd.	A	0.05	A	0.06
30	MD 33 @ Station Rd.	A	0.32	A	0.37
31	MD 329 @ Station Rd.	A	0.04	A	0.07
32	US 50 @ Chapel Rd.	A	0.52	B	0.70
33	US 50 @ MD 328	B	0.65	D	0.87
34	US 50 @ MD 331	D	0.90	F	1.25
35	MD 33 @ Railroad Ave.	A	0.40	A	0.50
36	MD 33 @ Boundary Ln.	A	0.39	A	0.42
37	MD 309 @ Kittys Corner/Skipton Cordova Rd.	A	0.22	A	0.24
38	MD 328 @ Kittys Corner/Matthews Rd.	A	0.28	A	0.29
39	US 50 @ MD 565/Landing Neck Rd.	A	0.42	A	0.61

Current intersection capacity conditions indicate that based on the CLA methodology the deficient intersections (LOS D or worse) include:

- *Site 12 – US 50 at MD 322*: Experiences significant volumes along southbound US 50 through movements (two lanes) and significant eastbound MD 322 left turn movements (one lane) during the evening peak period.
- *Site 27 – US 50 at MD 404*: Experience significant volumes along US 50 (two lanes) through movements and southbound left turn movement during the evening peak period.
- *Site 33 – US 50 at MD 328*: Experiences significant volumes along northbound US 50 through movements (two lanes) and eastbound MD 328 through movements (one lane) during the evening peak period.
- *Site 34 – US 50 at MD 331*: Experiences significant northbound US 50 through movements (two lanes) and heavy westbound MD 331 left and through movements (one lane each) during both morning and evening peak periods.

Table 26 – Existing Intersection Levels of Service - HCM Technique

Site	Intersection	LOS									
		Existing									
		AM					PM				
		Total	NB	SB	EB	WB	Total	NB	SB	EB	WB
6	MD 322 @ MD 333	**C**	C	C	C	D	**C**	C	C	C	D
7	MD 322 @ MD 334	**B**	B	A	C	C	**B**	A	A	C	C
8	MD 33 @ MD 322	**C**	C	C	C	C	**C**	C	C	D	C
9	MD 322 @ Glebe Rd.	**B**	A	A	C	C	**B**	B	B	C	C
10	MD 322 @ Centreville Rd./Washington St.	**B**	B	B	C	C	**B**	B	B	D	C
12	US 50 @ MD 322	**C**	C	C	E	-	**D**	C	C	F	-
13	US 50 @ Airport Rd.	**C**	C	C	D	D	**C**	C	C	D	D
14	MD 309 @ Black Dog Alley	**-**	A	A	B	C	**-**	A	A	C	C
16	MD 328 @ Black Dog Alley	**-**	C	B	A	A	**-**	D	F	A	A
18	MD 331 @ Black Dog Alley	**-**	-	C	B	B	**-**	-	F	A	A
19	US 50 @ Dutchman's Ln.	**C**	C	C	D	D	**D**	C	D	F	D
23	MD 33 @ MD 370	**B**	C	C	A	A	**B**	C	C	B	B
25	US 50 @ Barber Rd./Main St./Howell Point Rd.	**B**	B	B	D	D	**B**	B	B	D	D
27	US 50 @ MD 404	**C**	B	C	E	E	**D**	C	D	E	E
32	US 50 @ Chapel Rd.	**B**	B	B	E	E	**B**	B	B	E	E
33	US 50 @ MD 328	**D**	C	D	D	F	**E**	D	E	F	F
34	US 50 @ MD 331	**F**	F	E	F	F	**F**	F	F	F	F
35	MD 33 @ Railroad Ave.	**-**	C	D	A	A	**-**	D	C	A	A
36	MD 33 @ Boundary Ln	**-**	C	-	A	A	**-**	C	-	A	A
39	US 50 @ MD 565/Landing Neck Rd.	**B**	B	B	D	D	**B**	B	C	D	D

Note: Shaded sites indicate unsignalized intersections.

Current intersection operational conditions indicate that based on the HCM methodology the deficient intersections (LOS D or worse) include:

- *Site 12 – US 50 at MD 322*: Experiences significant delay along eastbound MD 322 left turn movement during both morning and evening peak periods.
- *Site 16 – MD 328 at Black Dog Alley:* Experiences significant delay along Black Dog Alley approaches during the evening peak periods.
- *Site 18 – MD 331 at Black Dog Alley:* Experiences significant delay along southbound Black Dog Alley approach during the morning peak period.
- *Site 19 – US 50 at Dutchman's Lane*: Experiences significant delay along Dutchman's Lane approaches during both morning and evening peak periods.
- *Site 27 – US 50 at MD 404*: Experiences significant delay along MD 404 approaches during both morning and evening peak periods and the southbound US 50 approach during the evening peak period.
- *Site 33 – US 50 at MD 328*: Experiences significant delay along all approaches during both morning and evening peak periods except for the northbound US 50 approach during the morning peak period.
- *Site 34 – US 50 at MD 331*: Experiences significant delay along all approaches during both morning and evening peak periods.
- *Site 35 – MD 33 at Railroad Avenue:* Experiences significant delay along the southbound Cherry Street approach during the morning peak period and northbound Railroad Avenue during the evening peak period.

iv Existing Volume Signal Warrant Analysis

An abbreviated signal warrant analysis was performed on the unsignalized intersections analyzed with the HCS analysis to determine the need and appropriateness of a traffic signal installation at the subject intersection. The analysis was conducted in accordance with the *2003 Manual on Uniform Traffic Control Devices* (MUTCD) Warrant 1 – Eight-Hour Vehicular Volume (See **Appendix B5 – MUTCD Traffic Signal Warrant Summary**). The warrant analyzes the eight highest hourly volumes, and it stipulates three conditions under which the warrant is met:

- Condition A – Minimum Vehicular Volume
- Condition B – Interruption of Continuous Traffic
- Condition C – Combination of Condition A and B

Based on existing volumes, the following unsignalized intersections met the signal warrant criteria:

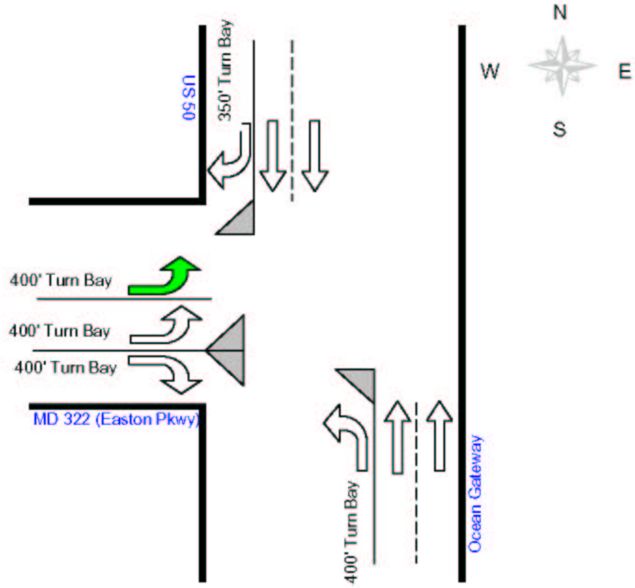
- Site 18 – MD 331 @ Black Dog Alley
- Site 35 – MD 33 @ Railroad Avenue met the signal warrant criteria.

For both cases, the high volumes along the major roadway create significant delay for the minor volumes to cross their respective major roadway. Site 16 (MD 328 @ Black Dog Alley) did not warrant a signal during this design period.

v Existing Conditions Needs Evaluation

Following the analyses of existing conditions, each deficient intersection (LOS D, E or F) was reviewed to determine which mitigation options improved level of service to acceptable levels. The following figures provide solutions to the under existing conditions and resultant level of service for the recommended improvements. **Appendix B7-Conceptual Improvement Critical Lane Analyses and B8-Conceptual Improvement Highway Capacity Analyses** provides details of the analysis (See **Appendix C8-Existing Intersection & Corridor Improvement Needs** for pictorial locations of intersections):

- *Site 12 – US 50 at MD 322*: Address the eastbound MD 322 left turn movement (one lane). Recommend evaluating an additional left turn lane for the eastbound movement or the feasibility for an interchange.

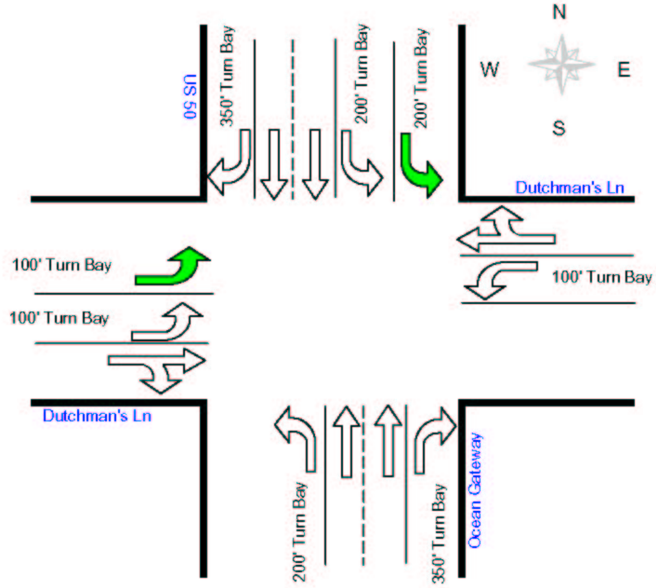


LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	C	C	C	B	D	C	C	C	E	D	D

Figure 8 – Site 12 (US 50 @ MD 322) Existing Needs Proposed Improvements

- *Site 18 – MD 331 at Black Dog Alley*: Recommend a detailed evaluation of traffic signalization improvements (See **Appendix B5-MUTCD Traffic Signal Warrant Summary**).

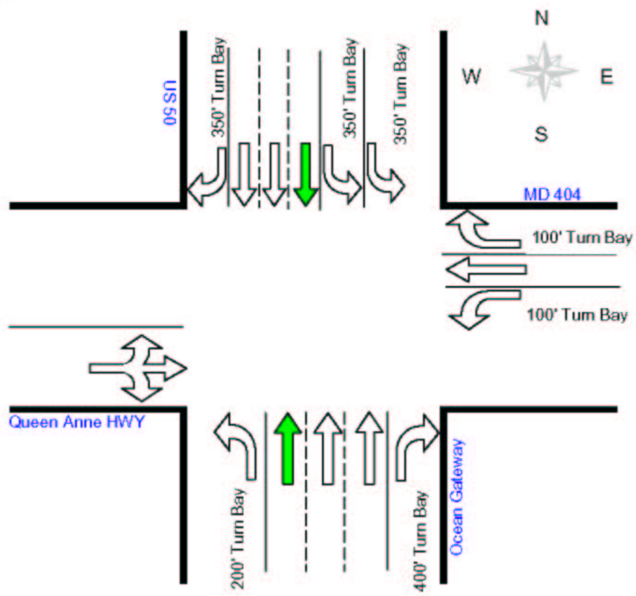
- *Site 19 – US 50 at Dutchman's Lane*: Address the southbound US 50 and eastbound Dutchman's Lane left turn movements (one lane each). Recommend evaluating additional lanes for each movement.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	C	C	C	A	C	C	C	A	C	C	E

Figure 9 – Site 19 (US 50 @ Dutchman's Ln.) Existing Needs Proposed Improvements

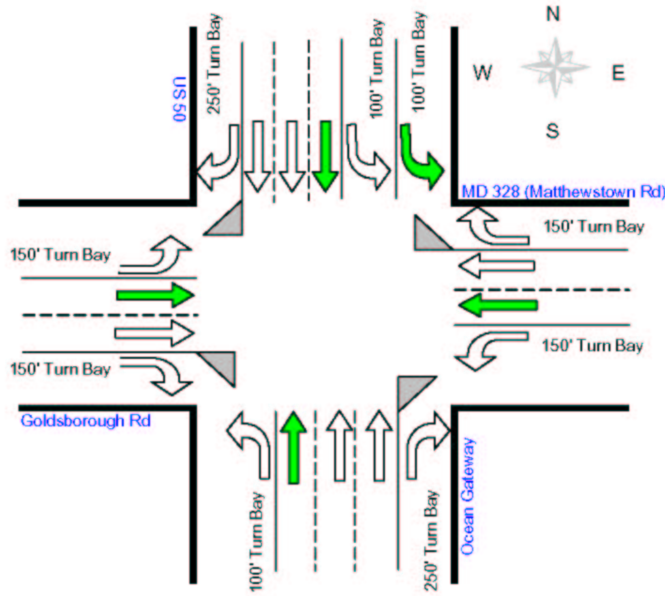
- *Site 27 – US 50 at MD 404*: Address the US 50 through movements (two lanes). Recommend evaluating additional lanes for each movement or the feasibility for an interchange.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	C	C	C	A	C	C	F	B	E	C	F

Figure 10 – Site 27 (US 50 @ MD 404) Existing Needs Proposed Improvements

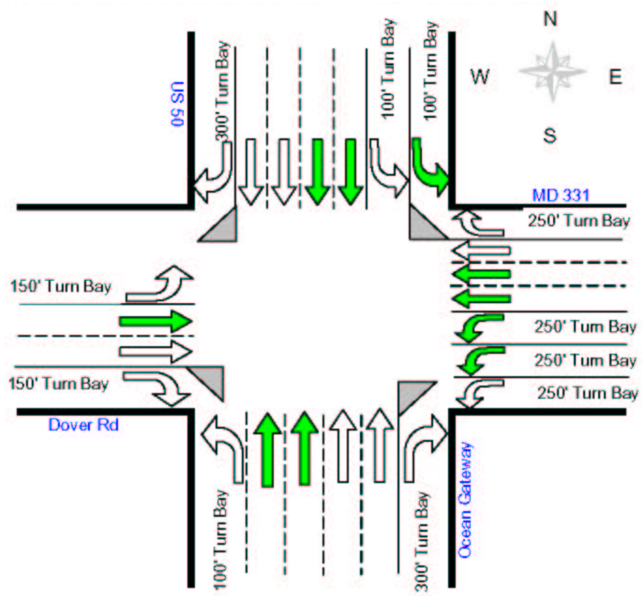
- *Site 33 – US 50 at MD 328*: Address the US 50 through movements (two lanes), US 50 southbound left turn movement (one lane), and MD 328 through movement (one lane). Recommend evaluating additional lanes for each movement or evaluating alternative measures to reduce the volumes at the intersection. Also recommend evaluating alternative measures to reduce the volumes at the intersection, such as trip diversion methodologies.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	C	C	C	A	B	C	C	A	C	C	C

Figure 11 – Site 33 (US 50 @ MD 328) Existing Needs Proposed Improvements

- *Site 34 – US 50 at MD 331*: Address the US 50 through movements (two lanes), MD 331 through movements (one lane), southbound US 50 and westbound MD 331 left turn movements (one lane each). Recommend two additional lanes for the US 50 through movements, MD 331 westbound through movements and westbound left turn movements, and an additional lane for the southbound US 50 left turn movement and eastbound MD 331 through movement. Also recommend evaluating alternative measures to reduce the volumes at the intersection, such as trip diversion methodologies.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	B	C	C	A	C	C	C	A	C	C	C

Figure 12 – Site 34 (US 50 @ MD 331) Existing Needs Proposed Improvements

- *Site 35 – MD 33 at Railroad Avenue*: Recommend a detailed evaluation of traffic signalization improvements (See **Appendix B5-MUTCD Traffic Signal Warrant Summary**).

b. Future Conditions - Short Term (2015) and Long Term (2030)

i Volumes

The existing peak period turning movement count data for each study intersection were utilized to forecast the future year volumes of 2015 and 2030 (see Section C). The projected volumes are summarized in **Appendix A4 – Traffic Forecasting Volume Summary**. Intersections that have significant volumes are located around the town of Easton's main corridors US 50, MD 33, and MD 322.

ii Level of Service

Capacity analyses using the Critical Lane Analysis technique (CLA) and operational analyses using the *2000 Highway Capacity Manual* (HCM) procedures were again performed for the signalized study intersections and selected unsignalized intersections. The resulting Level of Service (LOS) for each analysis procedure is summarized in **Table 27 and 28** respectively, detailed in **Appendix B1 – Existing and Future Year (2015 and 2030) Critical Lane** and **Appendix B3 – Highway Capacity Intersection Analyses**, and shown pictorially in **Appendices C3-Future Conditions 2015 Intersection Level of Service** and **C4-Future Conditions 2030 Intersection Level of Service**.

Table 27 – Future Critical Lane Analysis Intersection Level of Service (Existing Conditions)

Site	Intersection	2015				2030			
		AM		PM		AM		PM	
		LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
1	MD 404 @ MD 662	A	0.13	A	0.18	A	0.21	A	0.23
2	MD 329 @ Bellevue Rd.	A	0.12	A	0.16	A	0.13	A	0.18
3	MD 333 @ Almshouse Rd.	A	0.23	A	0.31	A	0.26	A	0.34
4	Wrights Mill Rd. @ Koogler Rd./Piney Hill Rd.	A	0.08	A	0.26	A	0.10	A	0.53
5	Koogler Rd. @ Barber Rd.	A	0.11	A	0.24	A	0.21	A	0.42
6	MD 322 @ MD 333	B	0.70	A	0.61	C	0.79	B	0.68
7	MD 322 @ MD 334	C	0.72	C	0.72	C	0.79	C	0.78
8	MD 33 @ MD 322	B	0.68	D	0.90	C	0.73	E	0.98
9	MD 322 @ Glebe Rd.	A	0.51	A	0.56	A	0.56	A	0.60
10	MD 322 @ Centreville Rd./Washington St.	A	0.61	B	0.71	B	0.68	C	0.80
11	Centreville Rd. @ Airpark Dr.	A	0.30	A	0.33	A	0.44	A	0.48
12	US 50 @ MD 322	C	0.79	F	1.02	D	0.89	F	1.13
13	US 50 @ Airport Rd.	C	0.75	E	0.93	D	0.87	F	1.08
14	MD 309 @ Black Dog Alley	A	0.32	A	0.42	A	0.35	A	0.49
15	Black Dog Alley @ Chapel Rd.	A	0.20	A	0.28	A	0.25	A	0.33
16	MD 328 @ Black Dog Alley	A	0.45	B	0.63	A	0.50	B	0.71
17	Black Dog Alley @ Kingston Rd.	A	0.21	A	0.20	A	0.34	A	0.29
18	MD 331 @ Black Dog Alley	B	0.65	B	0.69	B	0.69	C	0.79
19	US 50 @ Dutchman's Ln.	A	0.56	D	0.91	B	0.64	F	1.02
20	Dutchman's Ln. @ Dover Neck Rd.	A	0.14	A	0.17	A	0.14	A	0.18
21	MD 333 @ Llandaff/Baileys Neck Rd.	A	0.24	A	0.29	A	0.30	A	0.35
22	Glebe Rd. @ Goldborough Rd.	A	0.19	A	0.24	A	0.21	A	0.27
23	MD 33 @ MD 370	A	0.45	A	0.62	A	0.50	B	0.69
24	MD 370 @ Glebe Rd.	A	0.16	A	0.22	A	0.21	A	0.28
25	US 50 @ Barber Rd./Main St.	A	0.54	A	0.56	C	0.73	C	0.72
26	MD 33 @ MD 579	A	0.23	A	0.26	A	0.25	A	0.28
27	US 50 @ MD 404	C	0.80	F	1.12	F	1.07	F	1.52
28	MD 303 @ MD 309	A	0.32	A	0.32	A	0.39	A	0.38
29	MD 662 @ Sharp Rd.	A	0.08	A	0.11	A	0.13	A	0.18
30	MD 33 @ Station Rd.	A	0.33	A	0.38	A	0.34	A	0.38
31	MD 329 @ Station Rd.	A	0.04	A	0.08	A	0.05	A	0.08
32	US 50 @ Chapel Rd.	A	0.59	C	0.80	B	0.67	E	0.92
33	US 50 @ MD 328	B	0.72	E	0.97	C	0.79	F	1.04
34	US 50 @ MD 331	F	1.00	F	1.38	F	1.06	F	1.46
35	MD 33 @ Railroad Ave.	A	0.46	A	0.59	A	0.49	A	0.62
36	MD 33 @ Boundary Ln.	A	0.44	A	0.47	A	0.45	A	0.51
37	MD 309 @ Kitty's Corner/Skipton Cordova Rd.	A	0.27	A	0.29	A	0.37	A	0.37
38	MD 328 @ Kitty's Corner/Matthews Rd.	A	0.32	A	0.33	A	0.40	A	0.44
39	US 50 @ MD 565/Landing Neck Rd.	A	0.55	C	0.79	C	0.78	F	1.14

The CLA results indicate that future intersections capacity conditions indicate an increase in deficient intersections in Talbot County. The future deficient intersections and movements (LOS D or worse) include:

2015

- *Site 8 – MD 33 at MD 322*: Will experience significant volumes along southbound MD 322 and westbound MD 33 through movements during the evening peak period.
- *Site 12 – US 50 at MD 322*: Will experience significant volumes along US 50 through movements (two lanes) during the evening peak period.
- *Site 13 – US 50 at Airport Rd/MD 309*: Will experience significant volumes along US 50 (two lanes) and westbound MD 309 left turn movement (one lane) during both morning and evening peak periods.
- *Site 19 – US 50 at Dutchman's Lane*: Will experience significant volumes along US 50 (two lanes), southbound US 50 left turn (one lane), and eastbound Dutchman's Lane left turn movements during the evening peak period.
- *Site 27 – US 50 at MD 404*: Will experience significant volumes along westbound MD 404 right turn movement (one lane) during the evening peak period.
- *Site 33 – US 50 at MD 328*: Will experience significant volumes along both directions of US 50 (two lanes) through movements and southbound left turn movement during the evening peak period.
- *Site 34 – US 50 at MD 331*: Will experience significant volumes along both directions of US 50 through movements (two lanes) during both morning and evening peak periods.

2030

- *Site 32 – US 50 at Chapel Road*: Will experience significant volumes along US 50 (two lanes) during the evening peak period.
- *Site 25 – US 50 at Barber Road/Main Street:* Will experience significant US 50 through movement volumes (two lanes) during the evening peak period and significant westbound Barber Road left turn movement volumes (one lane) during both peak periods.
- *Site 39 – US 50 at MD 565/Landing Neck Road*: Will experience significant southbound US 50 through movement volumes (two lanes) during evening peak period.

The improvements completed on the deficient intersections in 2015 eliminate the need for further improvements in 2030.

Table 28 – Future HCM Technique Intersection Levels of Service (Existing Conditions)

Site	Intersection	2015										2030									
		AM					PM					AM					PM				
		Total	NB	SB	EB	WB	Total	NB	SB	EB	WB	Total	NB	SB	EB	WB	Total	NB	SB	EB	WB
6	MD 322 @ MD 333	**D**	D	C	D	E	**C**	C	C	C	D	**D**	D	C	D	E	**D**	D	D	D	E
7	MD 322 @ MD 334	**B**	B	B	C	C	**B**	A	B	C	D	**B**	B	B	D	D	**B**	B	B	D	D
8	MD 33 @ MD 322	**C**	C	C	C	C	**D**	D	E	D	C	**C**	C	C	C	C	**E**	E	E	F	C
9	MD 322 @ Glebe Rd.	**B**	B	B	C	C	**B**	B	B	D	C	**B**	B	B	C	C	**B**	B	B	C	C
10	MD 322 @ Centreville Rd./Washington St.	**B**	B	B	C	C	**B**	B	B	D	D	**B**	B	B	C	C	**C**	B	B	D	C
12	US 50 @ MD 322	**D**	C	D	F	-	**E**	D	D	F	-	**D**	C	D	F	-	**F**	D	E	F	-
13	US 50 @ Airport Rd.	**D**	C	C	D	E	**D**	D	C	D	F	**D**	C	D	D	E	**E**	E	D	E	F
14	MD 309 @ Black Dog Alley	**-**	A	A	B	C	**-**	A	A	C	C	**-**	A	A	B	D	**-**	A	A	E	C
16	MD 328 @ Black Dog Alley	**-**	D	C	A	A	**-**	F	F	A	A	**-**	E	E	A	A	**-**	F	F	A	A
18	MD 331 @ Black Dog Alley	**-**	-	D	B	B	**-**	-	F	A	A	**-**	-	F	B	B	**-**	-	F	A	A
19	US 50 @ Dutchman's Ln.	**D**	D	D	E	E	**E**	D	E	F	F	**D**	D	E	E	E	**F**	D	F	F	F
23	MD 33 @ MD 370	**B**	C	C	A	A	**B**	C	C	B	B	**B**	C	C	A	A	**B**	C	C	A	A
25	US 50 @ Barber Rd./Main St./Howel Point Rd.	**B**	B	B	D	D	**B**	B	B	D	D	**C**	C	B	D	E	**C**	B	C	D	E
27	US 50 @ MD 404	**C**	B	C	E	E	**E**	E	E	F	F	**C**	C	D	E	E	**F**	F	F	F	F
32	US 50 @ Chapel Rd.	**B**	B	B	E	E	**C**	B	C	E	D	**B**	B	B	E	E	**C**	C	C	F	D
33	US 50 @ MD 328	**D**	D	D	E	E	**F**	D	F	F	F	**E**	D	E	E	F	**F**	D	F	F	F
34	US 50 @ MD 331	**F**	F	E	F	F	**F**	F	F	F	F	**F**	F	E	F	F	**F**	F	F	F	F
35	MD 33 @ Railroad Ave.	**-**	C	D	A	A	**-**	F	B	A	A	**-**	C	E	A	A	**-**	F	E	A	A
36	MD 33 @ Boundary Ln	**-**	C	-	A	A	**-**	F	-	A	A	**-**	C	-	A	A	**-**	F	-	A	A
39	US 50 @ MD 565/Landing Neck Rd.	**B**	B	B	D	D	**C**	B	C	E	D	**C**	B	C	D	D	**F**	B	F	F	E

Note: Shaded sites indicate unsignalized intersections.

The HCM analysis results indicate that future intersection operational conditions indicate an increase in deficient intersections and additional movements in Talbot County. The future deficient intersections and approaches (LOS D or worse) include:

2015

- *Site 6 – MD 322 at MD 333*: Will experience significant delay along northbound MD 322 and MD 333 approaches during the morning peak period and westbound MD 333 approach during the evening peak period.
- *Site 8 – MD 33 at MD 322*: Will experience significant delay along MD 322 and eastbound MD during the evening peak period.
- *Site 12 – US 50 at MD 322*: Will experience significant delay along southbound US 50 and MD 322 approaches during both morning and evening peak periods and northbound US 50 approach during the evening peak period.
- *Site 13 – US 50 at Airport Rd/MD 309*: Will experience significant delay along Airport Road/MD 309 approaches during both morning and evening peak periods and northbound US 50 during the evening peak period.
- *Site 16 – MD 328 at Black Dog Alley*: Experiences significant delay along Dog Alley during both morning and evening peak periods.
- *Site 27 – US 50 at MD 404*: Experiences significant delay along MD 404 during both morning and evening peak periods.
- *Site 36 – MD 33 at Boundary Lane*: Experiences significant delay along northbound Boundary Lane during the evening peak period.

2030

- *Site 14 – MD 309 at Black Dog Alley*: Will experience significant delay along westbound MD 309 during the morning peak period and eastbound MD 309 during the evening peak period.
- *Site 19 – US 50 at Dutchman's Lane*: Experiences significant delay along US 50 approaches during both morning and evening peak periods.
- *Site 25 – US 50 at Barber Road/Main Street:* Will experience significant delay along US 50 approaches (two lanes) during the evening peak period, and significant delay along westbound Barber Road approaches (one lane) during both peak periods.
- *Site 39 – US 50 at MD 565/Landing Neck Road*: Experiences significant delay along MD 565/Landing Neck Road during both morning and evening peak periods and southbound US 50 approach during the evening peak period.

The improvements completed on the deficient intersections in 2015 eliminate the need for further improvements in 2030.

iii Future Volume Signal Warrant Analysis

An abbreviated signal warrant analysis using the *2003 Manual on Uniform Traffic Control Devices* (MUTCD) Warrant 1 was again performed on the unsignalized intersections to determine the future need and appropriateness of a traffic signal installation at the subject intersection (See **Appendix B5 – MUTCD Traffic Signal Warrant Summary**).

Based on future 2015 volumes, Site 16 (MD 328 @ Black Dog Alley) met the signal warrant criteria; and Site 14 (MD 309 @ Black Dog Alley) met the signal warrant criteria based on future 2030 volumes. The high volumes along the major roadway create unsatisfactory conditions for the minor volumes to cross their respective major roadway. Site 36 (MD 33 @ Boundary Lane) did not warrant traffic signalization for future volumes.

iv Future Roundabout Analysis

Although distinct criteria or warrants for installing roundabouts are not available, the Federal Highway Administration (FHWY) has created a comprehensive list of guidelines, along with engineering judgment, which should be reviewed to determine the appropriateness of a roundabout at a study intersection. Roundabouts are viable solutions to intersections which experience the following characteristics:

- High left-turn and angle accident rates
- Approach volumes from all directions are relatively equal
- The volume of left-turn traffic is significant
- Delay on the minor street approach is significant.
- SHA stipulate that roundabouts might also be viable solutions for rural intersections (including those in high speed areas) at which there are accidents involving crossing traffic.

Based on the characteristics listed above, the following deficient study intersections are possible candidates for a roundabout:

<u>Short Term (2015)</u>

- *Site 6 – MD 322 at MD 333:* Exhibits relatively equal volumes in all directions, significant left-turn traffic volumes, and significant delay on the minor street approach (MD 333).

- *Site 8 – MD 33 at MD 322:* Exhibits relatively equal volumes in all directions, significant left-turn traffic volumes, and significant delay on the minor street approach (MD 33).

<u>Long Term (2030)</u>

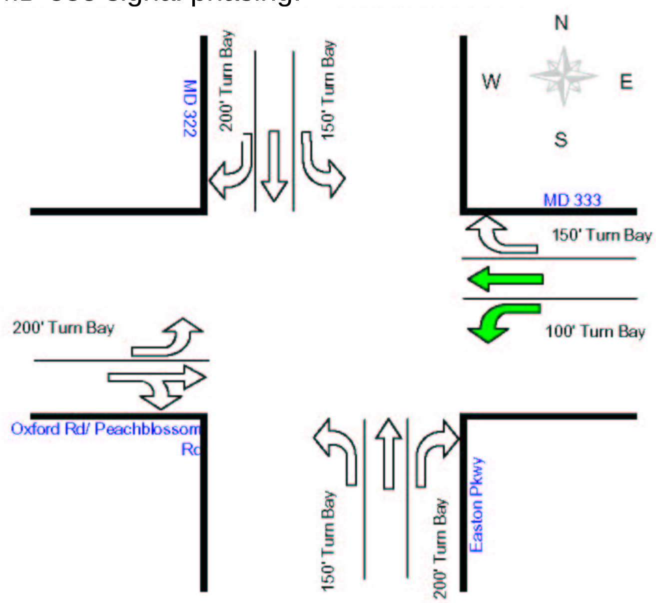
- *Site 14 – MD 309 at Black Dog Alley:* Exhibits significant delay on the minor street approach (MD 309) and has a history of left-turn and angle accidents.

v Short Term (2015) and Long Term (2030) Needs Evaluation

Following the analyses of future conditions, each poor intersection (LOS D, E or F) was reviewed to determine which mitigation options improved level of service to acceptable levels. The following figures provide solutions to the deficiencies among the study intersections under future conditions and the resultant level of service for the recommended improvements. **Appendix B7-Conceptual Improvement Critical Lane Analyses** and **B8-Conceptual Improvement Highway Capacity Analyses** provides details of the analysis (See **Appendix C9-Short Term (2015) Intersection & Corridor Improvement Needs** and **Appendix C10-Long Term (2030) Intersection & Corridor Improvement Needs** for pictorial locations of intersections).

Short Term (2015)

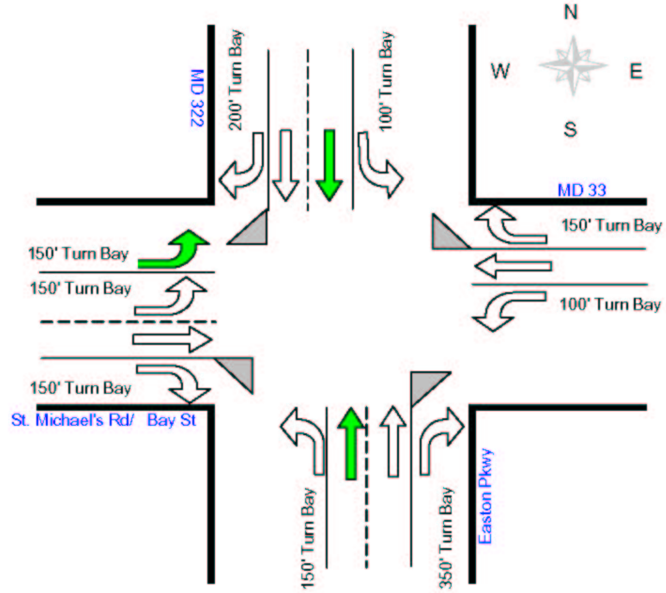
- *Site 6 – MD 322 at MD 333*: Address the westbound MD 333 through and left turn movements. Recommend evaluating separating the movements into exclusive lanes and revise the MD 333 signal phasing.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	A	C	C	A	B	C	C	A	C	C	C

Figure 13 – Site 6 (MD 322 @ MD 333) Short Term Needs Proposed Improvements

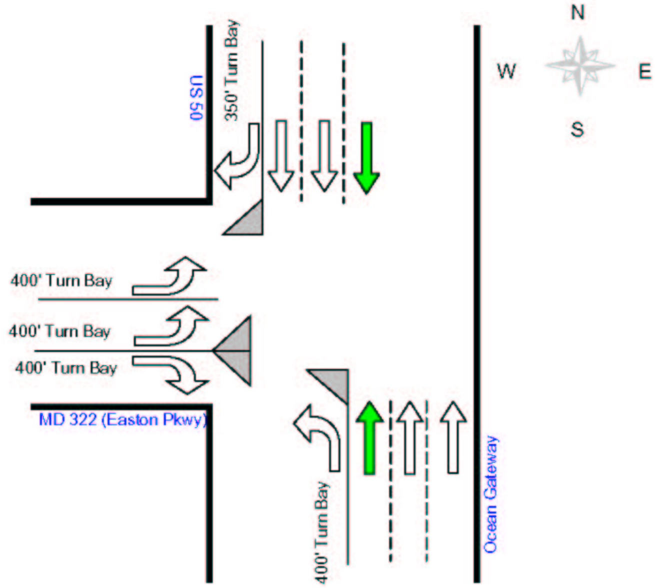
- *Site 8 – MD 33 at MD 322*: Address the MD 322 through movements and eastbound MD 33 left turn movement. Recommend evaluating additional through lanes along MD 322 and an additional left turn lane along eastbound MD 33.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	C	C	C	A	B	C	C	A	C	C	C

Figure 14 – Site 8 (MD 33 @ MD 322) Short Term Needs Proposed Improvements

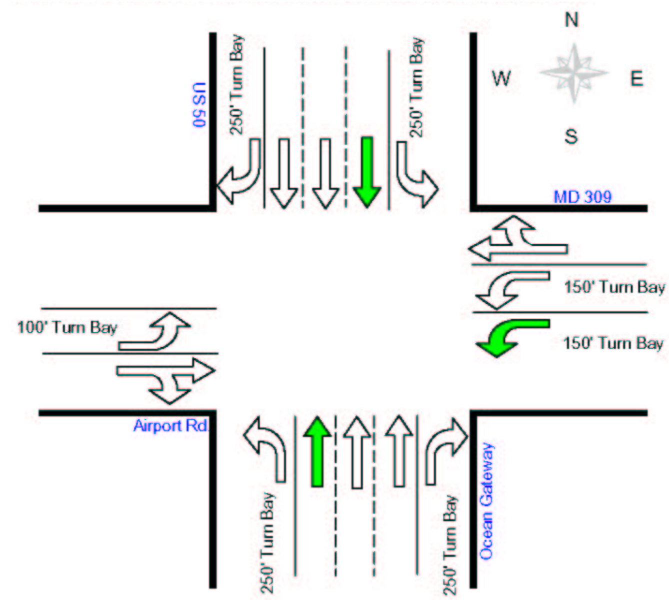
- *Site 12 – US 50 at MD 322*: Address the US 50 through movements (two lanes). Recommend evaluating additional through lanes along US 50.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	A	C	C	A	B	C	C	B	C	C	C

Figure 15 – Site 12 (US 50 @ MD 322) Short Term Needs Proposed Improvements
(Note: Improvements shown assume Existing improvements have been completed.)

- *Site 13 – US 50 at Airport Rd/MD 309*: Address the US 50 through movements (two lanes) and westbound MD 309 left turn movement (one lane). Recommend evaluating additional through lanes along US 50 and an additional left turn lane along westbound MD 309.

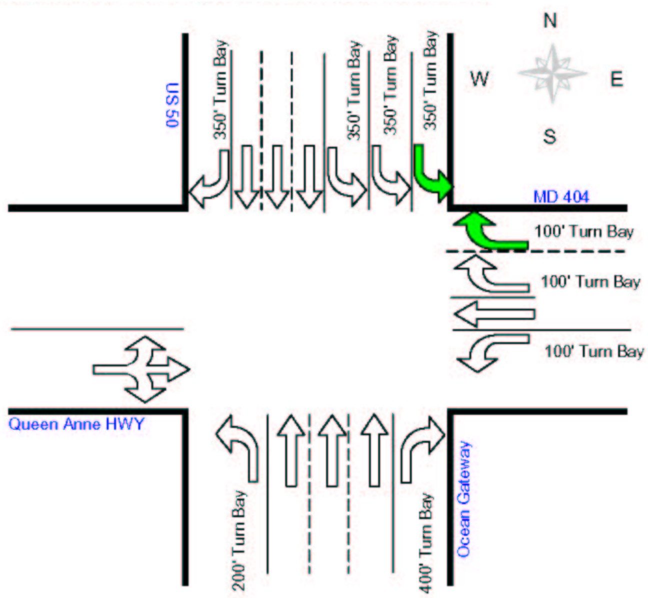


LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
B	C	C	C	A	B	C	C	B	C	C	C

Figure 16 – Site 13 (US 50 @ MD 309/Airport Rd.) Short Term Needs Proposed Improvements

- *Site 16 – MD 328 at Black Dog Alley*: Address the southbound Black Dog Alley movement, and recommend evaluating the need for traffic signalization improvements (See **Appendix B5-MUTCD Traffic Signal Warrant Summary**).

- *Site 27 – US 50 at MD 404*: Address the westbound right turn movement (one lane). Recommend evaluating an additional right turn lane or the feasibility for an interchange.



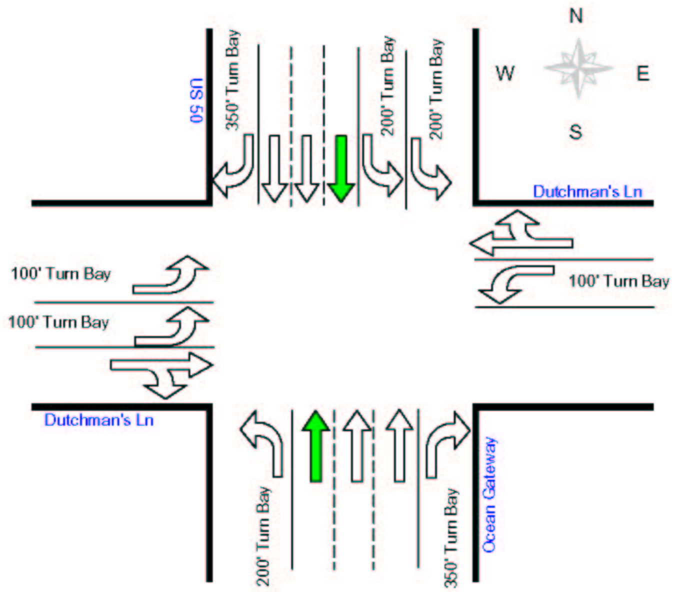
LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	C	C	C	A	C	C	C	B	E	C	E

Figure 17 – Site 27 (US 50 @ MD 404) Short Term Needs Proposed Improvements
(Note: Improvements shown assume Existing improvements have been completed.)

Long Term (2030)

- *Site 14 – MD 309 at Black Dog Alley*: Address the MD 309 movements, and recommend evaluating the need for traffic signalization improvements (See **Appendix B5-MUTCD Traffic Signal Warrant Summary**).

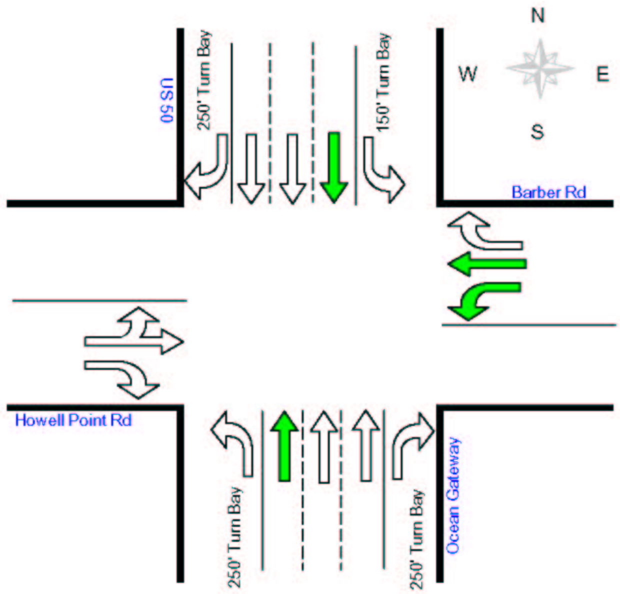
- *Site 19 – US 50 at Dutchman's Lane*: Address the US 50 through movements (two lanes). Recommend evaluating additional through lanes along US 50.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	C	C	C	A	C	C	C	A	C	C	C

Figure 18 – Site 19 (US 50 @ Dutchman's Ln.) Long Term Needs Proposed Improvements
(Note: Improvements shown assume Existing improvements have been completed.)

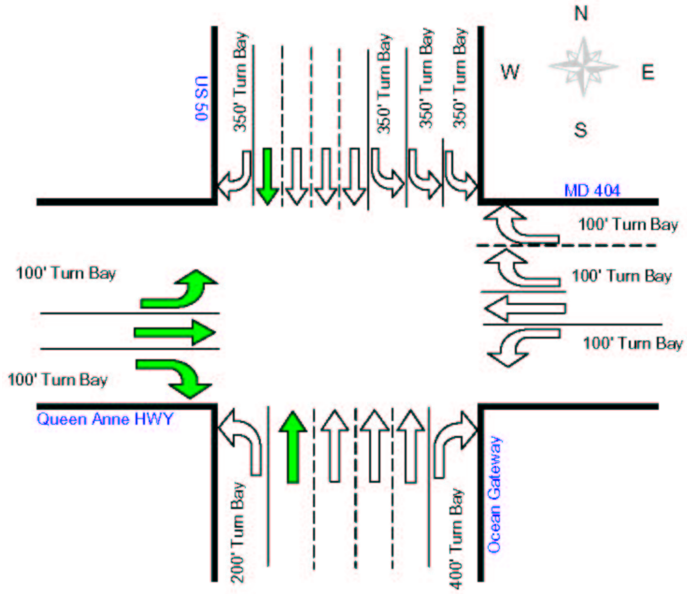
- *Site 25 – US 50 at Barber Road*: Address the US 50 through movements (two lanes) westbound Barber Road left turn movement (one lane). Recommend evaluating an additional through lanes along US 50 and separate through and left turn lanes along westbound Barber Road.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	A	B	B	B	B	C	C	B	B	C	C

Figure 19 – Site 25 (US 50 @ Barber Road) Long Term Needs Proposed Improvements

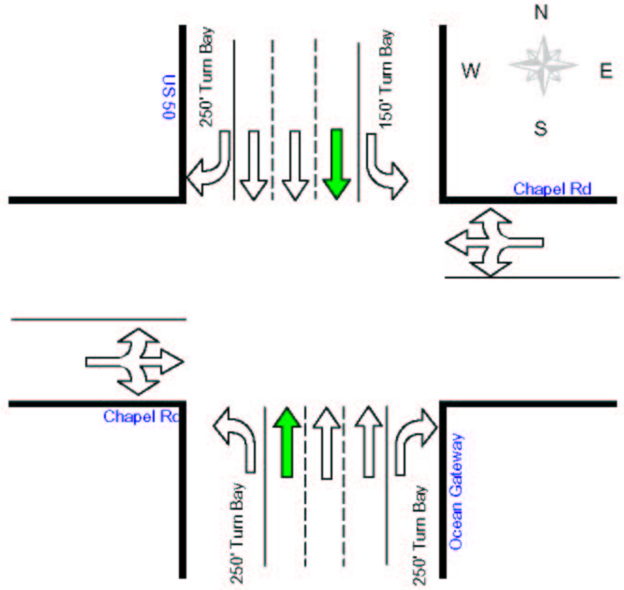
- *Site 27 – US 50 at MD 404*: Address the westbound right turn movement (one lane). Recommend evaluating an additional right turn lane and the feasibility for an interchange.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	C	C	C	A	C	C	C	A	D	C	C

Figure 20 – Site 27 (US 50 @ MD 404) Long Term Needs Proposed Improvements
(Note: Improvements shown assume Short Term improvements have been completed.)

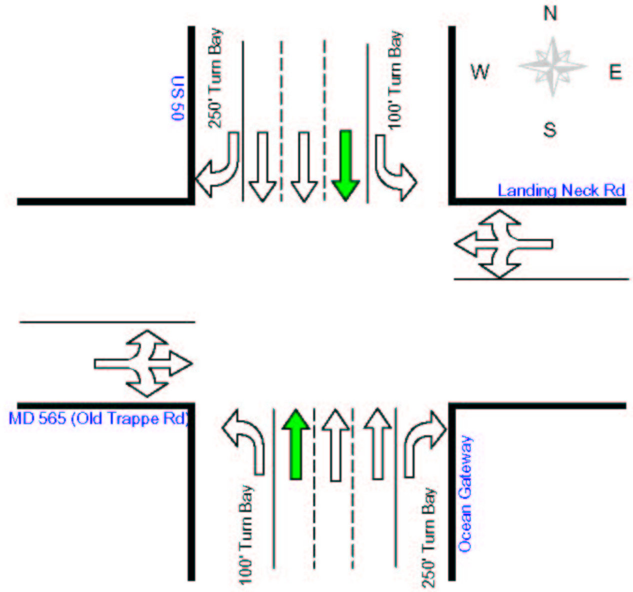
- *Site 32 – US 50 at Chapel Road*: Address the US 50 through movements (two lanes). Recommend evaluating additional through lanes along US 50.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
B	C	B	B	A	C	B	C	A	B	B	C

Figure 21 – Site 32 (US 50 @ Chapel Rd.) Long Term Needs Proposed Improvements

- *Site 39 – US 50 at MD 565/Landing Neck Road*: Address the southbound US 50 through movements (two lanes). Recommend evaluating additional through lanes along US 50.



LEVEL OF SERVICE											
EX.				2015				2030			
CLV		HCS		CLV		HCS		CLV		HCS	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
A	A	B	B	A	C	B	C	A	D	B	C

Figure 22 – Site 39 (US 50 @ MD 565/Landing Neck Rd.) Long Term Needs Proposed Improvements

vi Town of Trappe

The Town of Trappe will experience significant growth in the future with increased residential development anticipated. Although our study locations are limited around Trappe, our future traffic projections do reflect a significant increase in traffic volumes in the area. The higher future volumes do result in unsatisfactory future long-term (2030) levels of service at Site 25 (US 50 @ Main Street/Barber Road) in Trappe. It will be important to perform follow up analyses around the town once the new residential developments have been completed.

vii Commercial Development

The Traffic Impact Study for the Dudrow Farm commercial development, which is located along the southbound side of MD 322 between MD 33 and Marlboro Road, was analyzed to see its impact on traffic volumes for our existing and future peak period volumes. The impacted study intersections were:

- Site 7 – MD 322 @ Port Street
- Site 8 – MD 33 @ MD 322
- Site 9 – MD 322 @ Glebe Road

The volumes generated from the commercial development did not significantly increase the traffic peak period volumes, and therefore did not significantly affect the level of service at these study intersections.

3. Corridors

The transportation planning study analyzed 16 corridors throughout Talbot County that were deemed locations with significant traffic concerns. The study used the existing and future peak period traffic volumes from the study intersections that link to create the study corridor. Noted field conditions and operations of the each corridor were also used to analyze and validate the deficiencies along the study corridors. The study also determined the short and long term needs based on the existing and future conditions.

a. Existing Conditions

i Roadway Conditions

All of the study corridors operate as two-lane roadways with lane widths between 10' to 12', shoulder widths between 0' to 12', flat grades, and few significant horizontal curves. The pavement conditions along the State roadways appeared satisfactory, while the County roads appeared to be in poorer condition. Corridor photographs can be found in **Appendix A2 – Study Corridor Photographs**.

ii Volumes

The corridor volumes used for the analysis originate from the peak period departure and approach volumes from the study intersection turning movement counts. The volumes are summarized in **Table 29** below.

The higher corridor volumes appear along MD 33, MD 328, and MD 331, MD 333, Black Dog Alley, and Glebe Road. The majority of the traffic originates from the US 50, and MD 322 corridors around the town of Easton. The high tourism attraction of St. Michaels also contributes to significant volumes along MD 33.

Table 29 – Existing Corridor Volumes

Corridor Designation	Roadway Name	Site Start	Site Finish	Existing	
				AM	PM
A	Sharp Road	29	West	44	52
B	Goldsborough Neck Road	22	13	257	332
C	Glebe Road	24	22	150	194
		22	9	465	561
		9	East	279	461
D	MD 370	24	North	209	237
E	MD 33	23	8	1295	1703
		30	23	1223	1630
		8	East	646	862
F	MD 329	31	2	130	177
G	MD 33	West	26	293	395
		26	35	953	1096
		35	36	1142	1219
H	MD 333	3	21	413	452
		6	21	533	618
I	Llandaff Road	21	West/East	110	80
J	Barber Road	25	5	198	204
K	Dutchman’s Lane	19	20	490	609
L	MD 331	34	18	1582	1864
		18	East	1062	1315
		34	West	883	1163
M	MD 328	33	16	1034	1379
		16	38	590	692
		33	West	670	948
N	Black Dog Alley	13	14	726	635
		14	15	221	429
		15	16	276	469
		16	17	197	311
		17	18	271	348
O	Chapel Road	32	15	276	342
P	MD 309	37	South/North	449	478

Note: Site numbers indicate the study intersection designation

iii Level of Service

Operational analyses were performed on the morning and evening peak hour volumes for each study corridor in accordance with the *2000 Highway Capacity Manual* (HCM) procedures for two-lane highways. The resulting Level of Service (LOS) is summarized in **Table 30,** detailed in **Appendix B4 – Highway Capacity Corridor Analyses**, and shown pictorially in **Appendix C5 – Existing Conditions Corridor Level of Service**.

Current corridor operational conditions indicate that the deficient corridors (LOS D or worse) include:

- *Corridor E – MD 33 from Station Road to MD 322*: Experiences significant corridor volume.
- *Corridor G – MD 33 from MD 579 to Boundary Lane*: Experiences significant corridor volume, no passing zones, and high a quantity of access points.
- *Corridor L – MD 331 from US 50 to Black Dog Alley*: Experiences significant corridor volume, unequal directional split, and a high quantity of access points.
- *Corridor M – MD 328 from US 50 to Black Dog Alley*: Experiences significant corridor volume, unequal directional split, and a high quantity of access points.

Table 30 – Existing Corridor Levels of Service

Corridor Designation	Roadway Name	Site Start	Site Finish	Existing			
				AM		PM	
				LOS	V/C	LOS	V/C
A	Sharp Road	29	West	A	0.02	A	0.02
B	Goldsborough Neck Road	22	13	A	0.09	B	0.12
C	Glebe Road	24	22	A	0.06	A	0.06
		22	9	B	0.16	B	0.20
		9	East	B	0.09	C	0.13
D	MD 370	24	North	B	0.08	B	0.08
E	MD 33	30	23	D	0.42	D	0.53
		23	8	D	0.43	E	0.56
		8	East	C	0.22	C	0.28
F	MD 329	31	2	A	0.05	A	0.06
G	MD 33	West	26	B	0.10	C	0.13
		26	35	D	0.32	D	0.36
		35	36	E	0.42	E	0.47
H	MD 333	3	21	C	0.12	C	0.19
		6	21	C	0.18	C	0.21
I	Llandaff Road	21	West/East	A	0.04	A	0.03
J	Barber Road	25	5	A	0.07	A	0.07
K	Dutchmans Lane	19	20	C	0.16	C	0.20
L	MD 331	34	18	E	0.53	E	0.66
		18	East	D	0.36	D	0.47
		34	West	D	0.30	D	0.41
M	MD 328	33	16	E	0.35	E	0.45
		16	38	C	0.21	C	0.23
		33	West	C	0.23	D	0.31
N	Black Dog Alley	13	14	C	0.24	C	0.22
		14	15	A	0.08	B	0.15
		15	16	B	0.10	B	0.16
		16	17	A	0.07	A	0.11
		17	18	B	0.10	B	0.12
O	Chapel Road	32	15	B	0.09	B	0.11
P	MD 309	37	South/North	B	0.16	B	0.18

Note: Site numbers indicate the study intersection designation

iv Existing Conditions Needs Evaluation

Following the analyses of existing conditions, each deficient corridor (LOS D, E or F) was reviewed to determine which mitigation options improved level of service to acceptable levels. The following summary provides solutions to the deficiencies among the study corridors under existing conditions and **Table 31** provides the resulting level of service for the recommended improvements, and **Appendix B9-Conceptual Improvement Highway Capacity Corridor Analyses** provides details of the analysis (See **Appendix C8-Existing Intersection & Corridor Improvement Needs** for pictorial locations of corridors):

- *Corridor E – MD 33 from Station Road to MD 322*: Address corridor volume, and recommend evaluating an additional lane each way along MD 33 from MD 322 to St. Michaels town limits.
- *Corridor G – MD 33 from MD 579 to Boundary Lane*: Address corridor volume and access, and recommend evaluating strategies to reduce or bypass traffic volumes within St. Michaels town limits. Additional lanes each way along MD 33 may not be feasible in this area due to the historical, right of way, and parking constraints found within the St. Michaels town limits.
- *Corridor L – MD 331 from US 50 to County Line*: Address corridor volumes, and recommend evaluating additional through lanes along MD 331 within the Easton city limits.
- *Corridor M – MD 328 from US 50 to Black Dog Alley*: Address corridor volumes, and recommend evaluating additional through lanes along MD 328 within the Easton city limits.

The improvements to the Existing Conditions provide sufficient residual capacity so that the corridors do not appear in the Short-Term (2015) and Long-Term (2030) improvement needs.

Table 31 – Proposed Existing Year Conditions Corridor Level of Service after Suggested Improvements

Corridor Designation	Roadway Name	Site Start	Site Finish	Existing							
				AM				PM			
				LOS	Density	LOS	Density	LOS	Density	LOS	Density
E	MD 33	30	23	A	6.3	A	5.7	A	8.3	A	7.5
		23	8	A	6.4	A	6.1	A	8.2	A	7.7
L	MD 331	34	18	A	4.1	B	13.8	A	10.9	A	10.3
		18	E	A	2.0	A	10.2	A	9.9	A	2.4
M	MD 328	33	16	A	4.3	A	8.0	A	9.3	A	7.0

Note: Site numbers indicate the study intersection designation

b. Future Conditions – Short Term (2015) and Long Term (2030)

i Volumes

The future corridor volumes used for the analysis stem from the peak period departure and approach volumes from the forecasted study intersection turning movement volumes. The volumes are summarized in **Table 32**.

Higher corridor volumes will appear along Barber Road, Black Dog Alley, and Dutchman's Lane. The majority of the traffic will originate from the US 50 corridor around the town of Easton and new developments around Easton and Trappe.

Table 32 – Future Corridor Volumes

Corridor Designation	Roadway Name	2015		2030	
		AM	PM	AM	PM
A	Sharp Road	70	90	120	160
B	Goldsborough Neck Road	330	380	410	510
C	Glebe Road	190	230	220	280
		560	690	620	760
		320	510	380	580
D	MD 370	270	300	380	440
E	MD 33	1420	1840	1540	1990
		1250	1650	1310	1720
		740	960	820	1080
F	MD 329	140	185	150	195
G	MD 33	305	410	335	450
		985	1135	1005	1180
		1255	1340	1300	1390
H	MD 333	550	600	560	630
		740	820	820	890
I	Llandaff Road	130	95	145	125
J	Barber Road	330	370	500	630
K	Dutchmans Lane	610	780	650	830
L	MD 331	1720	2030	1640	2060
		1130	1440	1260	1620
		980	1320	1060	1460
M	MD 328	1560	1240	1140	1530
		680	830	790	910
		750	1050	820	1140
N	Black Dog Alley	850	710	930	820
		270	510	330	610
		335	550	390	590
		245	385	290	430
		380	470	580	640
O	Chapel Road	310	390	330	420
P	MD 309	520	550	700	710

Note: See Table 30 for corridor start/finish locations.

ii Level of Service

Operational analyses using the *2000 Highway Capacity Manual* (HCM) procedures for two-lane highways were again performed on the forecasted peak hour volumes for each study corridor. The resulting Level of Service (LOS) is summarized in **Table 33**, detailed in **Appendix B4 – Highway Capacity Corridor Analyses**, and shown pictorially in **Appendices C6-Future Conditions 2015 Corridor Level of Service** and **C7-Future Conditions 2030 Corridor Level of Service**.

Future corridor operational conditions indicate an increase in deficient corridors (LOS D or worse). The additional deficient corridors include:

- *Corridor H – MD 333 from MD 322 to Llandaff/Baileys Neck Road*: Will experience significant corridor volume and unequal directional split.
- *Corridor M – MD 328 from Black Dog Alley to Lewistown Road*: Will experience significant corridor volume and unequal directional split.

Table 33 – Future Corridor Levels of Service (Existing Geometric Conditions)

Corridor Designation	Roadway Name	2015				2030			
		AM		PM		AM		PM	
		LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
A	Sharp Road	A	0.03	A	0.03	A	0.05	A	0.06
B	Goldsborough Neck Road	B	0.11	B	0.13	B	0.14	C	0.18
C	Glebe Road	B	0.07	B	0.07	B	0.09	B	0.09
		B	0.19	B	0.24	B	0.21	C	0.26
		B	0.11	C	0.17	B	0.13	C	0.20
D	MD 370	B	0.11	B	0.1	B	0.15	B	0.15
E	MD 33	D	0.43	D	0.53	D	0.45	E	0.56
		D	0.47	E	0.60	D	0.51	E	0.65
		C	0.25	D	0.31	C	0.27	D	0.35
F	MD 329	A	0.05	A	0.06	A	0.05	A	0.07
G	MD 33	B	0.10	C	0.14	B	0.11	C	0.15
		D	0.33	D	0.38	D	0.34	D	0.39
		E	0.46	E	0.52	E	0.47	E	0.54
H	MD 333	C	0.16	D	0.25	C	0.17	D	0.25
		D	0.25	D	0.28	D	0.27	D	0.30
I	Llandaff Road	A	0.05	A	0.04	A	0.05	A	0.05
J	Barber Road	A	0.11	B	0.12	B	0.17	B	0.21
K	Dutchmans Lane	C	0.20	C	0.25	C	0.21	C	0.27
L	MD 331	E	0.58	E	0.72	E	0.55	E	0.73
		D	0.38	E	0.51	D	0.42	E	0.58
		D	0.33	D	0.47	D	0.36	D	0.52
M	MD 328	E	0.53	E	0.40	E	0.38	E	0.50
		C	0.24	D	0.28	D	0.28	D	0.31
		C	0.25	D	0.34	C	0.28	D	0.37
N	Black Dog Alley	C	0.28	C	0.25	C	0.31	C	0.29
		B	0.10	C	0.18	B	0.12	C	0.22
		B	0.12	C	0.19	B	0.14	C	0.20
		A	0.09	A	0.13	A	0.10	B	0.15
		B	0.13	C	0.16	C	0.20	C	0.22
O	Chapel Road	B	0.11	B	0.13	B	0.11	B	0.14
P	MD 309	B	0.19	B	0.2	B	0.25	C	0.26

Note: See Table 32 for corridor start/finish locations.

iii Short Term (2015) and Long Term (2030) Needs Evaluation

Following the analyses of future conditions, each deficient corridor (LOS D, E or F) was reviewed to determine which mitigation options improved level of service to acceptable levels. The following summary provides suggestions to be considered as improvements to the deficiencies among the study corridors under future short term conditions and **Table 34 and 35** provide the resulting level of service for the recommended improvements, and **Appendix B9-Conceptual Improvement Highway Capacity Corridor Analyses** provides details of the analysis (See **Appendix C9-Short Term (2015) Intersection & Corridor Improvement Needs** and **Appendix 10-Long Term (2030) Intersection & Corridor Improvement Needs** for pictorial locations of corridors):

Short Term (2015)

- *Corridor H – MD 333 from MD 322 to Llandaff/Baileys Neck Road*: Address future corridor volumes, and recommend evaluating additional through lanes along MD 333 within the Easton city limits.
- *Corridor M – MD 328 from Black Dog Alley to Lewistown Road*: Address corridor volumes, and recommend evaluating additional through lanes along MD 328 to the County line.

Long Term (2030)

The analysis indicates that long term (2030) corridor improvements are not needed, because all corridor deficiencies are mitigated with the recommended short term (2015) corridor improvements.

Table 34 – Proposed Future Year 2015 Conditions Corridor Level of Service after Suggested Improvements

Corridor Designation	Roadway Name	2015							
		AM				PM			
		LOS	Density	LOS	Density	LOS	Density	LOS	Density
E	MD 33	A	6.4	A	5.9	A	8.4	A	7.6
		A	6.8	A	6.9	A	9.0	A	8.1
H	MD 333	A	3.1	A	4.8	A	5.3	A	4.4
L	MD 331	A	4.5	B	15	B	12.0	B	11.2
		A	2.1	A	10.9	A	10.9	A	3.6
M	MD 328	A	4.7	A	8.8	A	10.2	A	7.7
		A	2.1	A	6.2	A	6.2	A	3.6

Note: See Table 30 for corridor start/finish locations.

Table 35 – Proposed Future Year 2030 Conditions Corridor Level of Service after Suggested Conditions

Corridor Designation	Roadway Name	2030							
		AM				PM			
		LOS	Density	LOS	Density	LOS	Density	LOS	Density
E	MD 33	A	6.6	A	6.3	A	8.6	A	8.0
		A	7.5	A	7.4	A	9.8	A	8.7
H	MD 333	A	3.3	A	5.5	A	5.8	A	4.8
L	MD 331	A	4.5	B	11.9	B	12.1	B	11.4
		A	2.2	A	10.9	B	12.4	A	4.0
M	MD 328	A	4.7	A	8.9	A	10.3	A	7.8
		A	2.3	A	6.4	A	6.1	A	3.6

Note: See Table 30 for corridor start/finish locations.