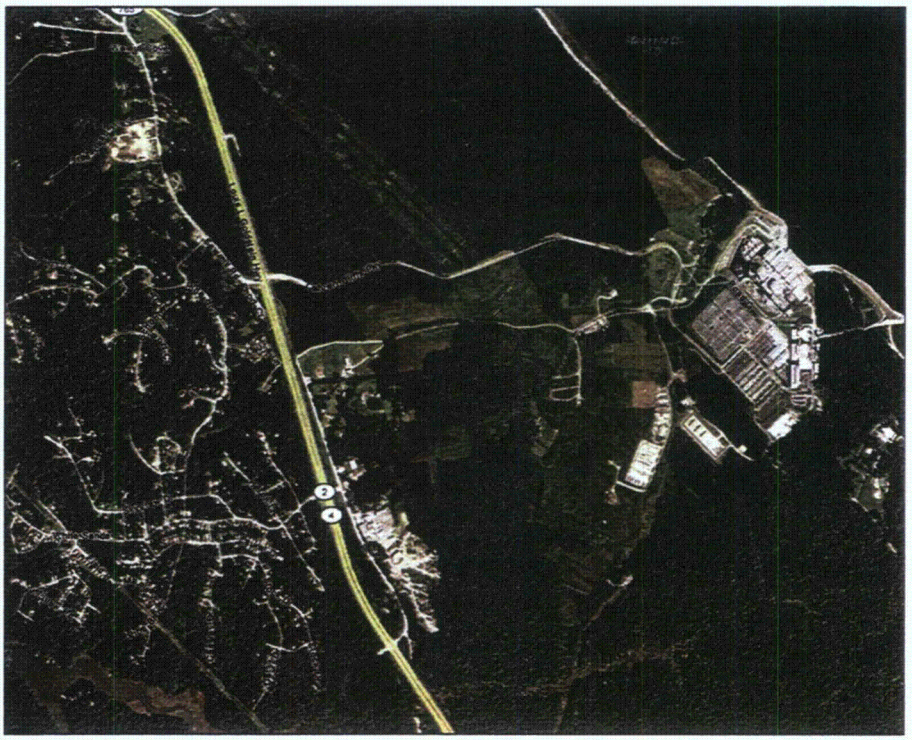
KLD ENGINEERING, P.C.

Traffic Impact Study at the

Calvert Cliffs Nuclear Power Plant

"Post Construction" Conditions



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August 19, 2011
TR-465

Rev. 2

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EXECUTIVE SUMMARY

The construction of a third unit adjacent to Calvert Cliffs Nuclear Power Plant has been in planning for some time, and the Combined License Application (COLA) and the associated Emergency Plan documents have been filed with the Nuclear Regulatory Commission (NRC). The Maryland PSC (Public Services Commission) has issued the CPCN (certificate of public convenience and necessity) related to this proposed unit.

This traffic impact study (TIS) defines the traffic impacts associated with the "post construction" conditions or normal operations of the new unit. This report is a supplement to the TIS submitted to Maryland State Highway Administration (MDSHA) that addressed conditions "during construction" of the new unit. The SHA has approved the June submittal of both reports earlier in the year, with minor comments. This report is a revision of the June "post construction" report addressing those minor comments.

An MOA (memorandum of agreement) or equivalent document between UniStar and SHA will be drafted for planning, engineering and construction of roadway improvements to mitigate the traffic impacts as defined in both these traffic studies. In general, the mitigation concepts defined by the construction peak will be in place during the Future Build year and the performance of the intersections with construction related improvements are included in this report.

KLD has had the advantage of the involvement of the local office of URS in the process, leading to a sequence of discussions and working sessions with SHA that have led to a set of understandings that define the scope and study methodology. These were the basis of the submittal for the impact analysis "during construction" and the present submittal. Table ES-1 presents the study area.

Table ES-1: Intersections in the Study Area

1	MD 2/MD 4 Diverge
2	MD 231 & MD 2/MD 4
3	Calvert Beach Road/Ball Road & MD 2/MD 4
4	Calvert Cliffs Parkway & MD 2/MD 4
5	White Sands Drive & MD 2/MD 4
6	Nursery Road & MD 2/MD 4
7	Pardoe Road/HG Trueman Road & MD 2/MD 4
8	Cove Point Road & MD 2/MD 4

Future Build Conditions

In the "Future Build", 363 additional employees are required on site when the new unit is operational. The background traffic is taken to grow at 2% annually (based upon SHA direction).

Mitigation Alternatives

Intersections 5 through 8 in Table ES-1 did not require mitigation under both "during construction" and "post construction" conditions.

Intersections 2 through 4 required mitigation only in "during construction" and not during "post construction" condition. As indicated by SHA, the proposed mitigation will remain in place during "post construction" conditions.

Intersection 1 (MD 2 and MD 4 diverge) requires mitigation during both the background cases in "post construction and "during construction". The required mitigation treatments are different and are discussed in this report.

The site access road intersection between White Sands Drive and Calvert Cliffs Parkway along MD 2/MD 4, proposed in the "during construction" condition, was a temporary break in access provided by SHA. This will be closed and the access to CC3 during normal operations could be a combination of Calvert Cliffs Parkway, White Sands Drive, and Nursery Road. This report presents ***four*** different alternatives to access the site in the post construction condition, and all of these configurations are sufficient to handle the forecasted traffic demand in the "post construction" condition.

The SHA has stated that the preferred site access alternative would be the usage of Calvert Cliffs Parkway. UniStar agrees this is the preferred option, but recognizes CC1/2 and CC3 are owned by two separate entities. Future discussions between the two owners may result in a desire to have two separate entrances, in which case UniStar would request approval at a later date for an alternative site access.

Summary

The most significant impacts occur in the "during construction" when a large daily construction staff travels to and from the site. The peak level of construction activity significantly overshadows the traffic generated by the CC3 post construction workforce and background growth through the intervening years. Also, the mitigation will already be in place from the "during construction" for the "post construction" conditions.

This report presents the needed mitigation and design configurations for site access that sufficiently meet the forecasted traffic demand under the "post construction" condition. The report forms the basis for discussion with SHA to determine the final configurations of these intersections for the "post construction" conditions and will provide input for the MOA between SHA and UniStar.

1. INTRODUCTION

1.1. Project Objective

UniStar Nuclear Energy, LLC, through its subsidiary, Calvert Cliffs 3 Nuclear Project, LLC (collectively, UniStar), plans to expand the existing power generation site in Lusby which is located in Calvert County, Maryland. Calvert Cliffs Nuclear Power Plant (CCNPP) has 2 units currently operational and UniStar has proposed to construct one more unit (CC3) adjacent to the existing site. The Combined License Application (COLA) and the associated Emergency Plan documents have been filed with the Nuclear Regulatory Commission (NRC) [1]. The Maryland PSC (Public Services Commission) has issued the CPCN (certificate of public convenience and necessity) related to this proposed unit.

Two separate documents have been prepared and submitted to SHA, to analyze the impacts related to CC3 at different points in time. The first TIS addressed the impacts during "construction" and has been submitted to Maryland State Highway Administration (MDSHA) [2]. This report is the second TIS addressing the "post construction" conditions.

The SHA has approved the June submittal of both reports earlier in the year, with minor comments. This report is a revision of the June "post construction" report addressing those minor comments. The approval letter and responses to the comments are included in an appendix.

An MOA (memorandum of agreement) or equivalent document between UniStar and Maryland State Highway Administration (SHA) will be drafted for planning, engineering and construction of roadway improvements to mitigate the traffic impacts as defined in both of these traffic studies. The mitigation concepts defined by the construction peak will be in place during the Future Build year and the performance of the intersections with construction related improvements are also included in this report.

KLD has had the advantage of the involvement of the local office of URS in the process, leading to a sequence of discussions and working sessions with SHA that have led to a set of understandings that define the scope and study methodology, which were the basis of the submittal related to the impact analysis "during construction" conditions and the present submittal.

The TIS study area is shown in Figure 1. A typical TIS includes analysis of the following traffic conditions:

- Existing
- Future No-Build (background),
- Future Build (build-out)

Given the nature and size of the construction effort related to building a nuclear reactor, it is the condition during the peak construction months/years that dominates the situation, and requires the most extensive mitigation. This report addresses the "post construction" conditions and is a supplement to a separate report that addressed the impacts "during construction". The conditions with and without the new plant in the "post construction" conditions are designated as "Future Build" and "Future No-Build" scenarios, respectively, and are shown in Figure 2.

1.2. Study Area

CCNPP is currently accessed via the intersection of Calvert Cliffs Parkway & MD 2/MD 4, the latter being the major thoroughfare in Calvert County.

The study area of this TIS is presented in Figure 1. It includes the following intersections along MD 2/MD 4:

- MD 2 and MD 4 (Signalized Intersection)
- MD 231 (Signalized Intersection)
- Calvert Beach Road (Signalized Intersection)
- Calvert Cliffs Parkway (Signalized Intersection)
- White Sands Drive (Signalized Intersection)
- Nursery Road (Unsignalized Intersection)
- Pardoe Road (Unsignalized Intersection)
- Cove Point Road (Unsignalized Intersection)

These intersections are within twenty miles of the site access road in the north and four miles in the south direction. These locations were selected based on a series of discussions between UniStar, KLD, URS Corporation, and SHA.

Analysis of Level of Service (LOS), and Capacity

The ability of a roadway network to accommodate projected traffic volumes generated by the proposed development during its operation is assessed utilizing techniques to measure capacity and Level of Service (LOS). LOS is an ordinal scale that is defined from A to F with "A" being the best level of service. The different levels are defined in the latest edition of the Highway Capacity Manual (HCM 2000) [3], in terms of average delay for intersections and average travel speed for arterials. Typically, the LOS is determined for the Peak 1-hour within a given period as it represents "worst case" conditions.

Based on SHA guidelines [4]:

- All intersections will be analyzed using the SHA critical lane technique and factors. In certain circumstances other methodologies, including the Highway Capacity Manual (HCM), might be appropriate to identify operational problems;
- Any intersection with a CLV of 1450 vehicles/hour (vph) or less is considered acceptable, this corresponds to (Level of Service) LOS D.

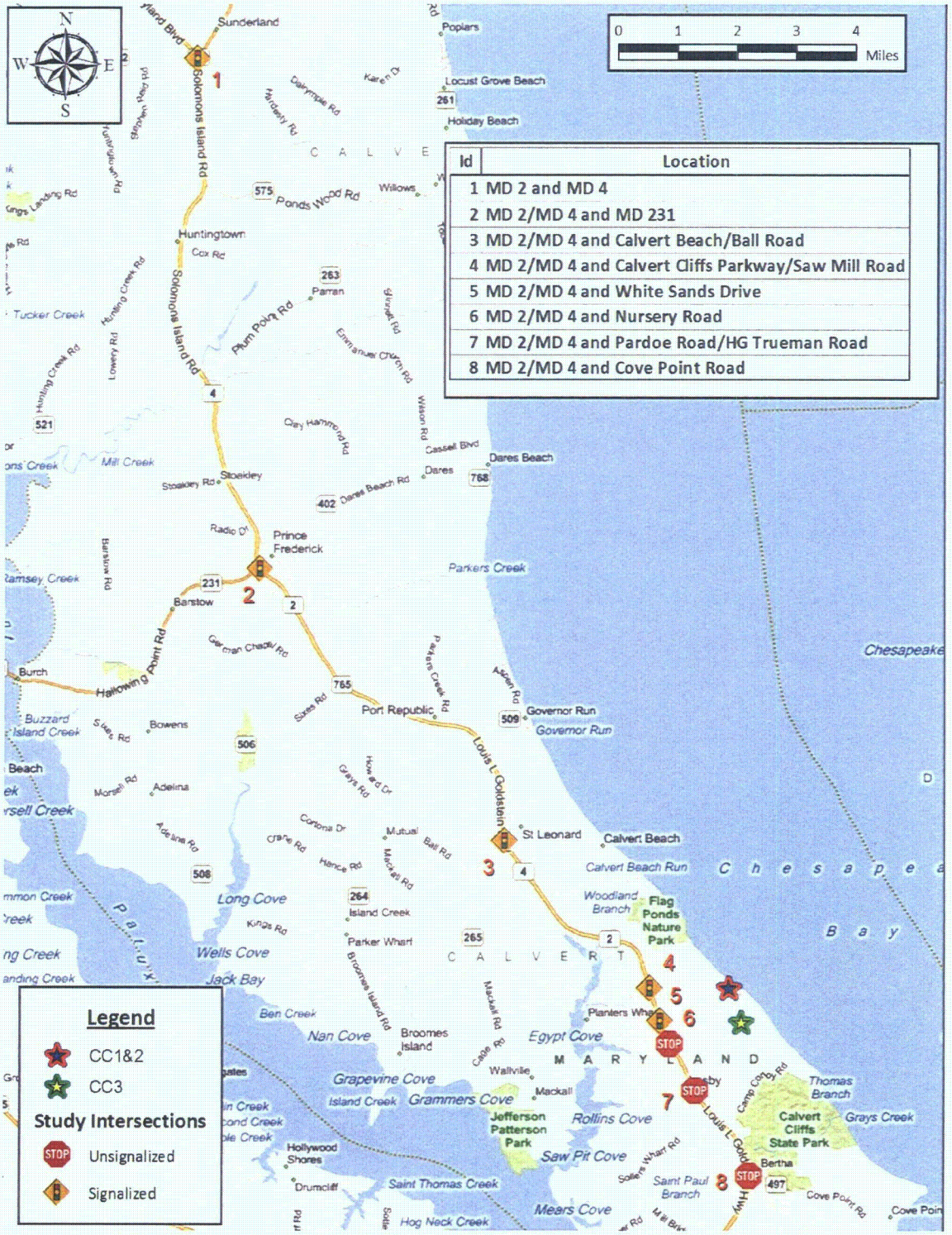


Figure 1 – CCNPP Site and Traffic Impact Study Area

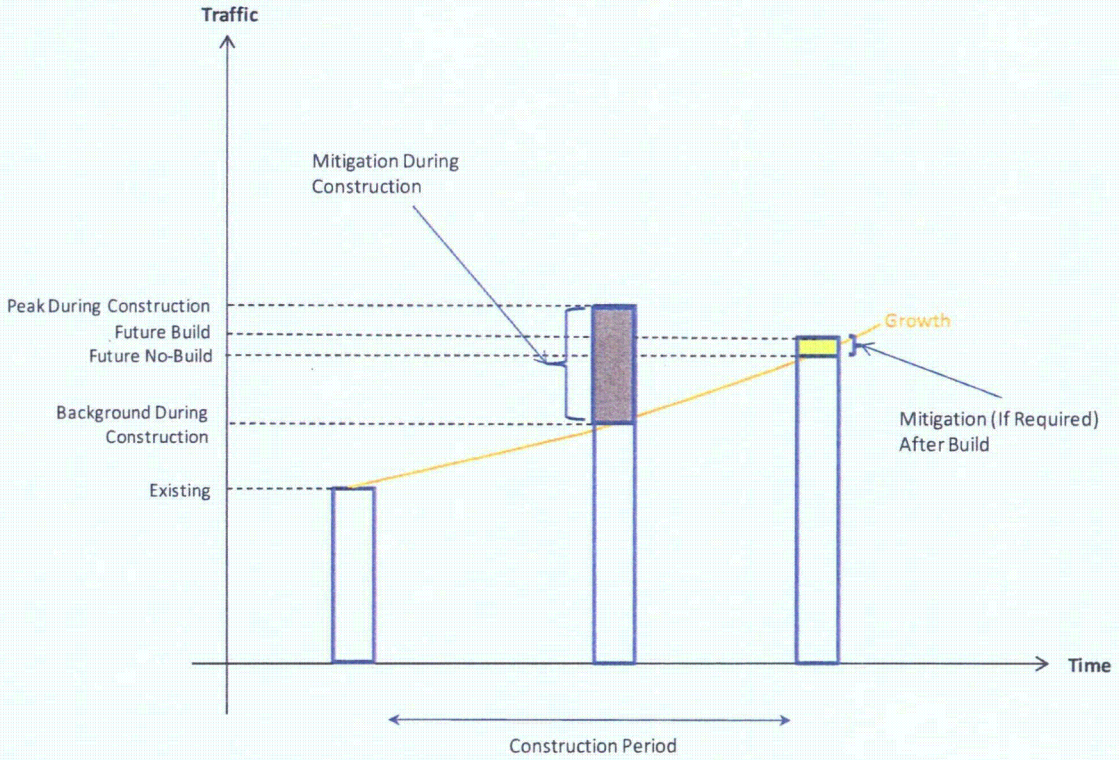


Figure 2 – Traffic Impact Analysis: Approach

The report is organized as follows: Section 2 presents the Future No-Build Conditions. Section 3 is a description of the Future Build Conditions with a discussion of needed mitigation. Section 4 is the summary with the list of references in Section 5. Appendix A has the companion CLV worksheets and Queue estimation for the Future No-Build Condition, Appendix B presents the employee demographics of CC1&2, and Appendix C is the companion for the analysis of the Future Build Conditions. Appendix D is the responses to the responses to the SHA comments on the earlier submittal. Appendix E is the companion for the analysis of the future year conditions with the Outage.

2. BACKGROUND (FUTURE NO-BUILD) CONDITIONS

2.1. Regional Growth and Other Developments

The proposed unit is expected to be operational no later than 2020. This year is selected for the Future Build analyses. Based on the general background growth, SHA has specified an annual growth rate of 2.0%. This report uses this rate, compounded annually.

The traffic data used in the analysis for the "during construction" conditions is also used as part of this submittal.

The Lusby Connector [5] & [6], a project completed in the fall of 2008, south of the study area, has been opened. This includes a connector roadway running east-west between MD 2/MD 4, MD 765 and MD 760. This was considered for its effect on the Future No- Build, Future Build and traffic operations during construction. No major reassignment is anticipated, given the north-south arrival paths anticipated.

As described earlier, the baseline estimated volumes were projected forward from the year collected to 2010 by 2.0%, compounded annually. Figure 3 presents the traffic volumes and turning movements at the study intersections during the AM and PM peak hours, in the Future No- Build conditions.

Table 1 presents the LOS and CLV for the intersections under the future no-build condition.

Table 1 – Intersection LOS: Future No-Build (2020) Conditions

Intersection	*CLV*		*LOS*	
	AM	*PM*	*AM*	*PM*
MD 2/MD 4 diverge	**1639**	1434	**F**	D
MD 2/MD 4 diverge (Concept 1)	1438	1386	D	D
MD 2/MD 4 diverge (Concept 2)	1363	1273	B	C
MD 231 & MD 2/MD 4	1054	1338	B	D
Calvert Beach/Ball Road & MD 2/MD 4	1105	1321	B	D
Calvert Cliffs Parkway & MD 2/MD 4	996	856	A	A
White Sands Drive & MD 2/MD 4	835	1285	A	C
Nursery Road & MD 2/MD 4	873	1153	A	C
Pardoe Road & MD 2/MD 4	1020	1134	B	B
Cove Point Road & MD 2/MD 4	845	1266	A	C

Table 1 indicates that all intersections would be operating acceptably in the Future No-Build, except MD 2 and MD 4 in the AM peak. This is addressed further in Section 3, which discusses the "Future Build" situation in 2020. Appendix A presents the worksheets with the LOS calculations for the Future No-Build conditions.

3. FUTURE BUILD CONDITIONS

Trip Generation and Site Access

The additional traffic expected on the roadways includes the new employees expected on site during normal operations of CC3. However, this traffic will be impacted by the "bi-annual" outage at the existing units CC1&2, the duration of which is typically one month (February). The outage staffs for the existing units access their site using Calvert Cliffs Parkway. The following sections discuss these two elements and the related trip generation.

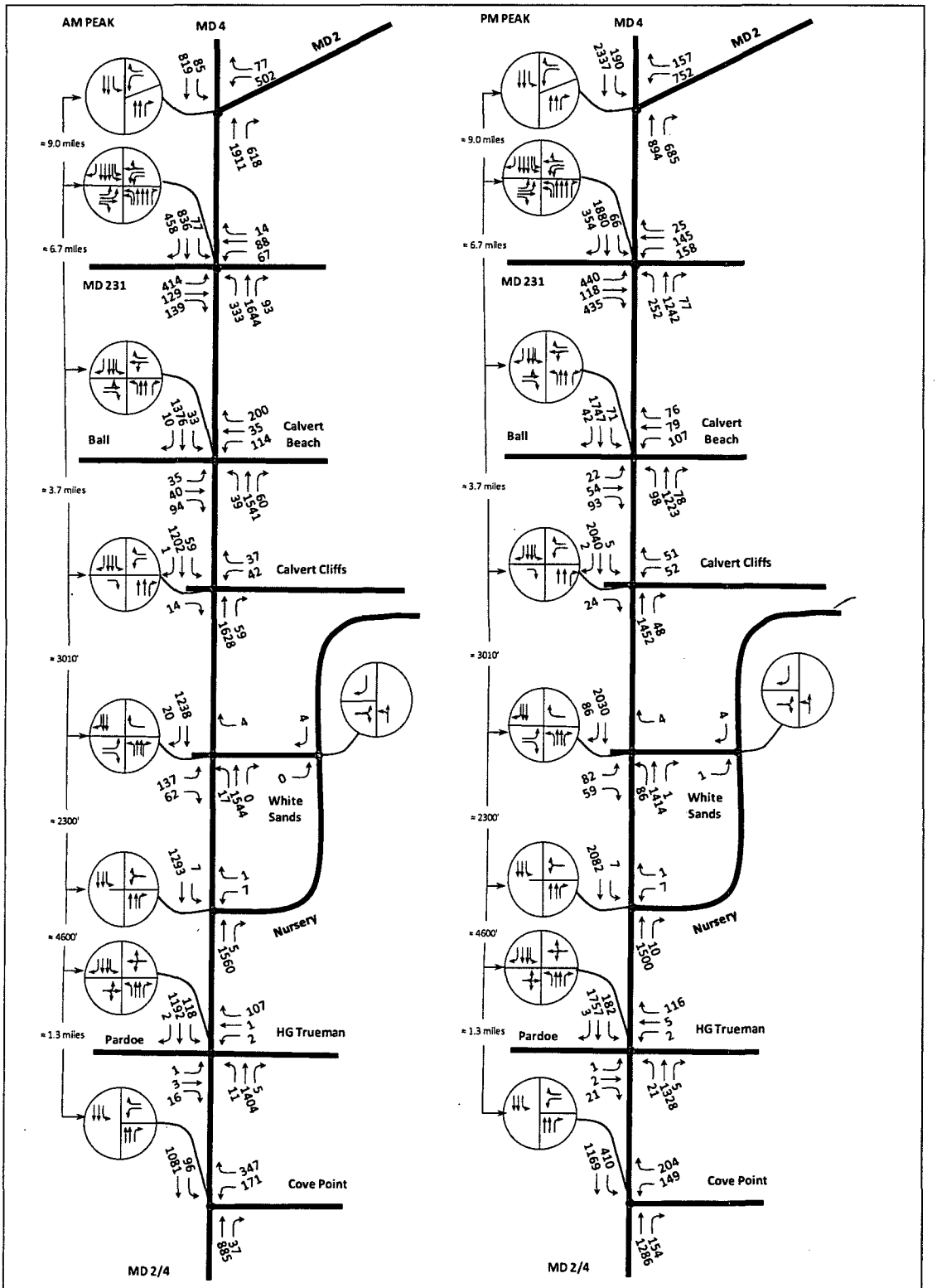


Figure 3 – Peak Hour Traffic Volumes – Future No-Build (2020) Conditions

3.1. Site Trip Generation -- Operational Staff for CC3

The new unit will require 363 additional personnel upon completion. Assuming average vehicle occupancy of 1.0 for these employees, the number of expected number of daily trips generated is 726 (363 arrivals + 363 departures). These employees will be distributed over the day and directionally as discussed in Section 3.3.

3.2. Outage Staff – Maintenance and Refueling

The existing two units currently operate on a 24-month outage schedule, with an outage at each unit lasting a month, and staggered by one year. Outages now begin in February, once per year. They are existing short-term seasonal peaks to the baseline traffic, not included in the existing or post-construction conditions.

Each outage has a workforce of 750 personnel on site. These personnel are in addition to the operations staff and work on a similar shift schedule as the existing employees (2 shifts 6AM-6PM, 6PM-6AM). Outage personnel are taken to have similar patterns to the operational staff. Assuming average vehicle occupancy of 1.0 for these employees, 1500 (750*2) daily trips are expected to be generated each February. If they were considered explicitly, they are easily accommodated within the Concept 2 construction mitigation at the MD 2/MD 4 diverge in the post-construction. If the Concept 1 construction mitigation were used, the CLV would be increased by 20 vph at the diverge. There would be no change in mitigation already in place at other locations specified in this document. Appendix E presents the worksheets for these computations.

3.3. Site Trip Distribution

The staff size for the existing 2 units is 833 employees. The geographic distribution of the current staff by county is presented in Appendix B. This data indicates that approximately 50% of the traffic arrives from the south along MD 2/MD 4 and the remaining 50% arrive from the north along MD 2/MD 4. Figure 4 represents the arrival and departure distribution of the power plant employees across the workday along Calvert Cliffs Parkway (EB – East Bound – Into site, WB – West Bound – From Site). The vehicle trips related to the employees at CC1&2 are part of the background traffic counts.

3.4. Site Trip Assignment

In recognition of the fact that all aspects of future plant operation have not been determined at this time, four site access alternatives have been developed to retain a measure of flexibility in decision making. Each alternative provides access to CC3 from MD 2/4 via a subset of the set of intersections that includes Calvert Cliffs Parkway, White Sands Drive, and Nursery Road. The various routings are governed by how Nursery Road and Calvert Cliffs Parkway are connected with the CC3 parking lot. A description of each alternative is provided below and an illustration of the path

assignments in each alternative is shown in Figure 5. Diagrams showing the peak hour volumes for each alternative are provided below in Figure 6 - Figure 9.

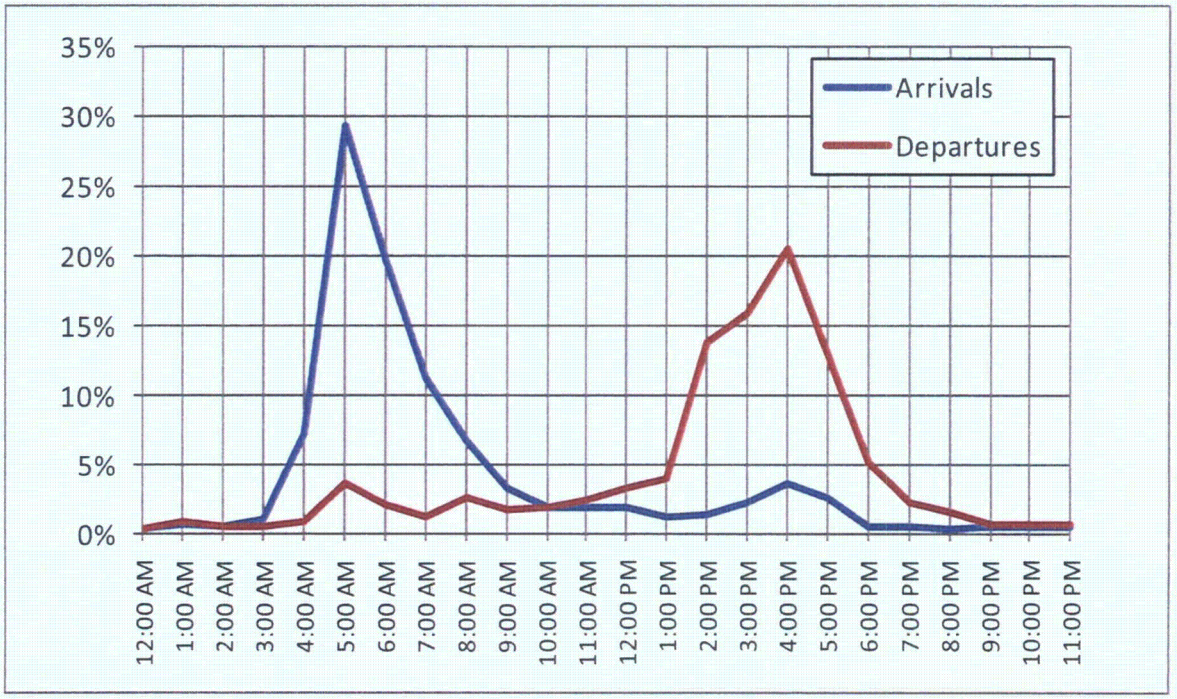


Figure 4 – Temporal Distribution of Power Plant Employees

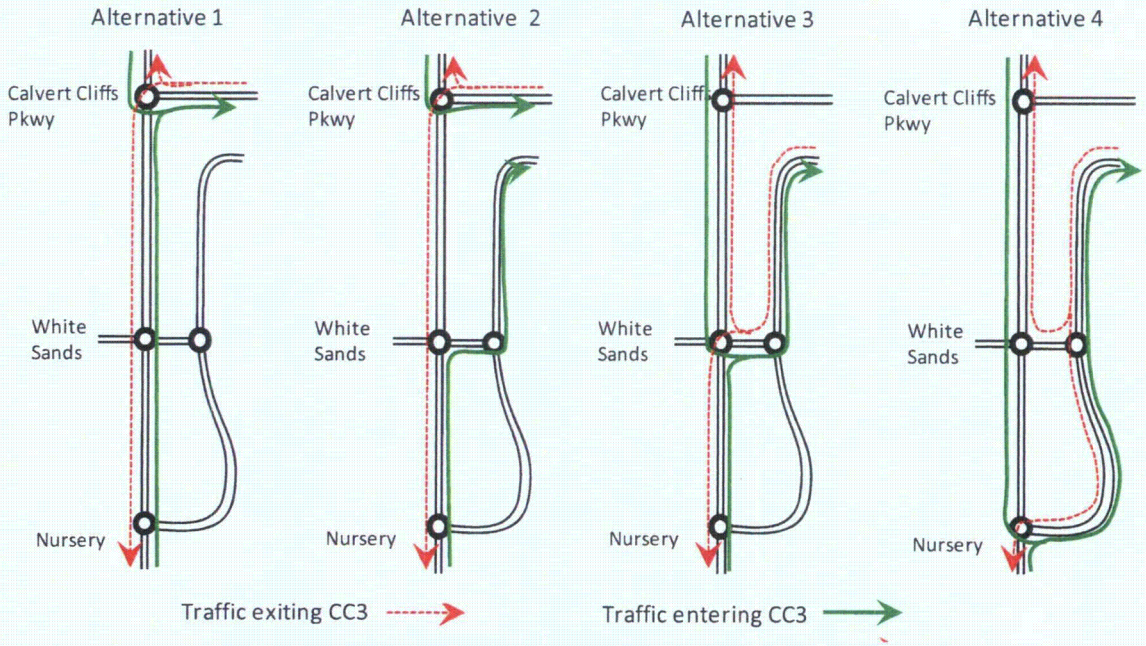


Figure 5 – Illustration of CC3 Access Alternatives

Alternative 1
All CC3 traffic uses Calvert Cliffs Parkway. There is no access from CC3 to Nursery Road.

Alternative 2
CC3 traffic can access both Calvert Cliffs Parkway and Nursery Road via White Sands Drive. There will be no exit from CC3 onto Nursery Road. Traffic entering CC3 from the north must turn left onto Calvert Cliffs Parkway. Traffic entering CC3 from the south turns right at White Sands Drive. All traffic exiting CC3 will use Calvert Cliffs Parkway.

Alternative 3
Calvert Cliffs Parkway is not accessible from CC3. White Sands Drive is converted to a fully signalized intersection, and all traffic enters/exits CC3 via this intersection. Figure 10 shows an illustration of the proposed redesign of this intersection.

Alternative 4
Calvert Cliffs Parkway is not accessible from CC3, and no intersection modifications are made at White Sands Drive. All traffic into/out of CC3 uses Nursery road except for traffic exiting to the north, which turns right at White Sands Drive.

SHA has indicated that they will not support converting partial signals to full signals, for a permanent condition, along the MD2-4 corridor south of the MD2/MD4 split. Therefore Alternative 3, while documented in this report, will only be considered if all other options become infeasible. Also, SHA has stated that the preferred site access alternative would be the usage of Calvert Cliffs Parkway. UniStar agrees this is the preferred option, but recognizes CC1/2 and CC3 are owned by two separate entities. Future discussions between the two owners may result in a desire to have two separate entrances, in which case UniStar would request approval at a later date for an alternative site access. Hence additional alternatives have been presented.

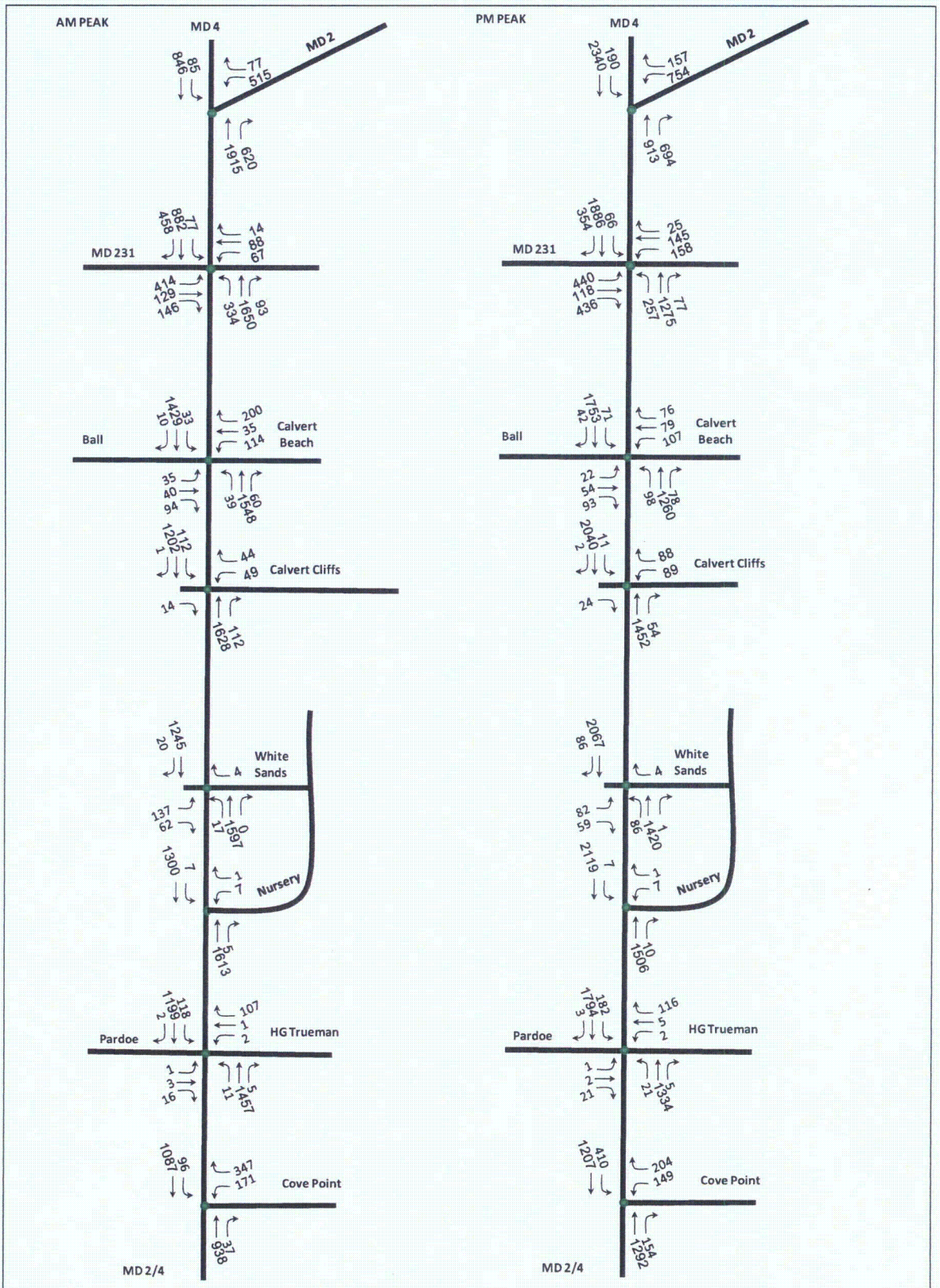


Figure 6 – Peak Hour Traffic Volumes – Future Build Conditions – Alternative 1

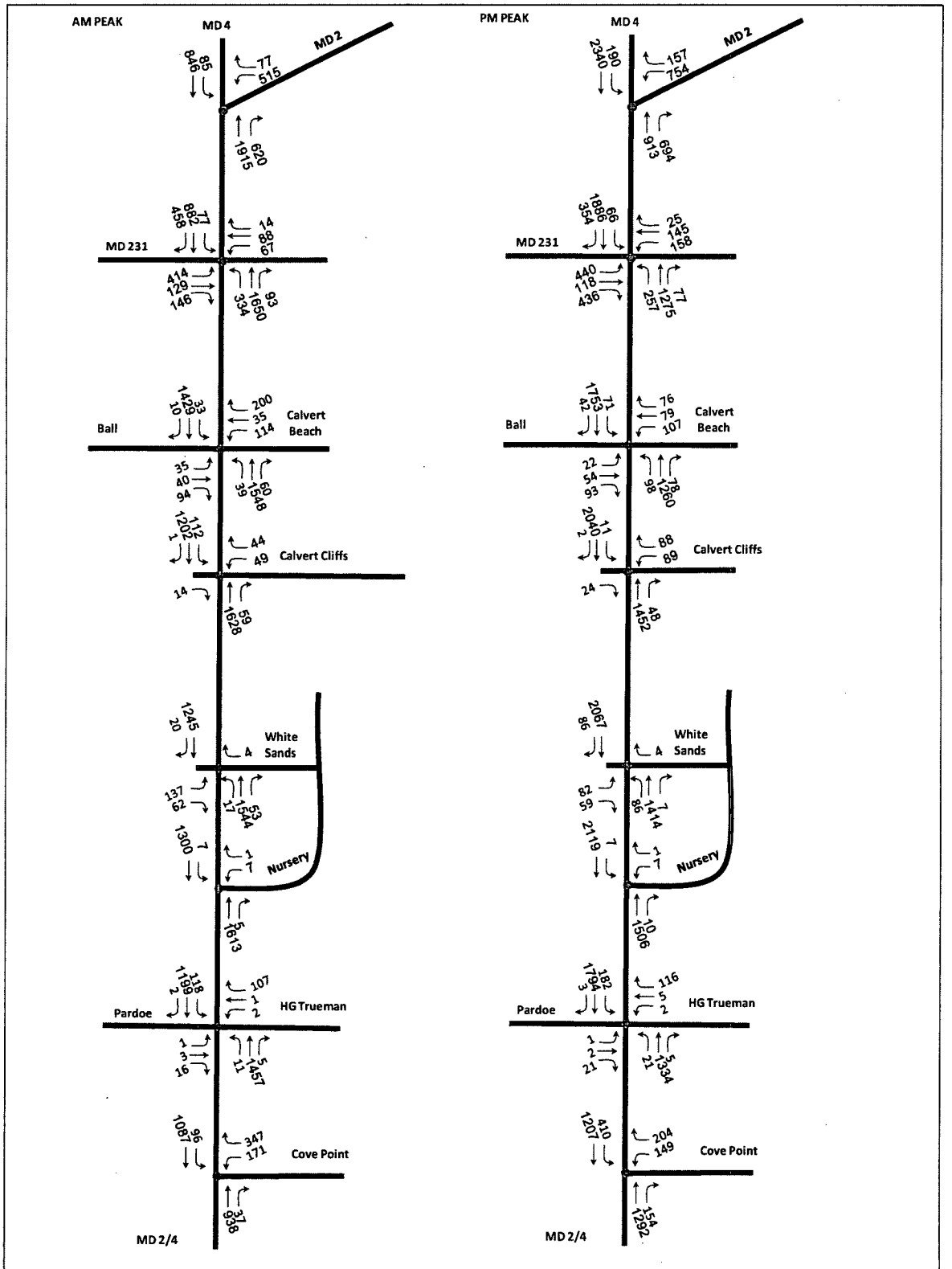


Figure 7 – Peak Hour Traffic Volumes – Future Build Conditions – Alternative 2

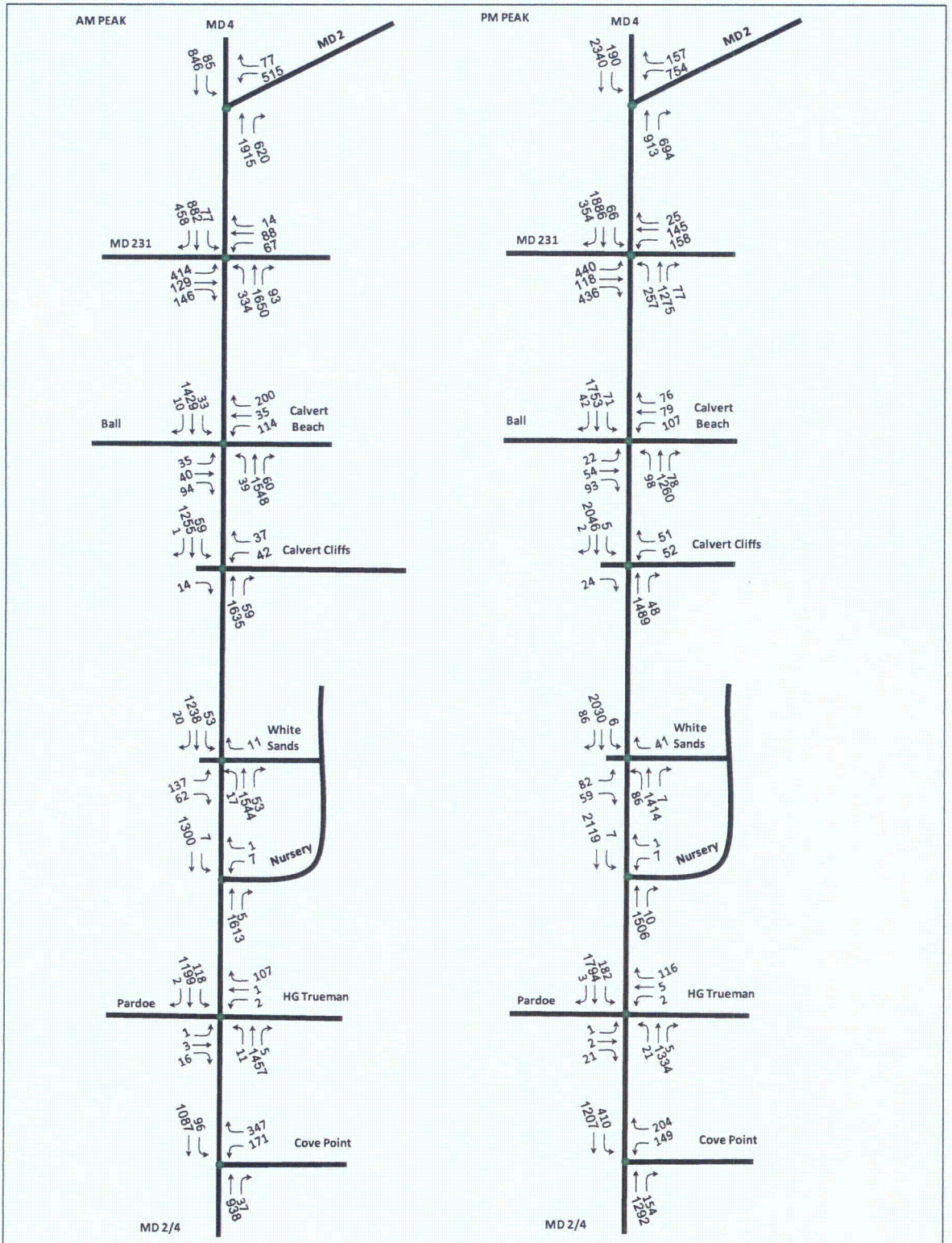


Figure 8 – Peak Hour Traffic Volumes – Future Build Conditions – Alternative 3

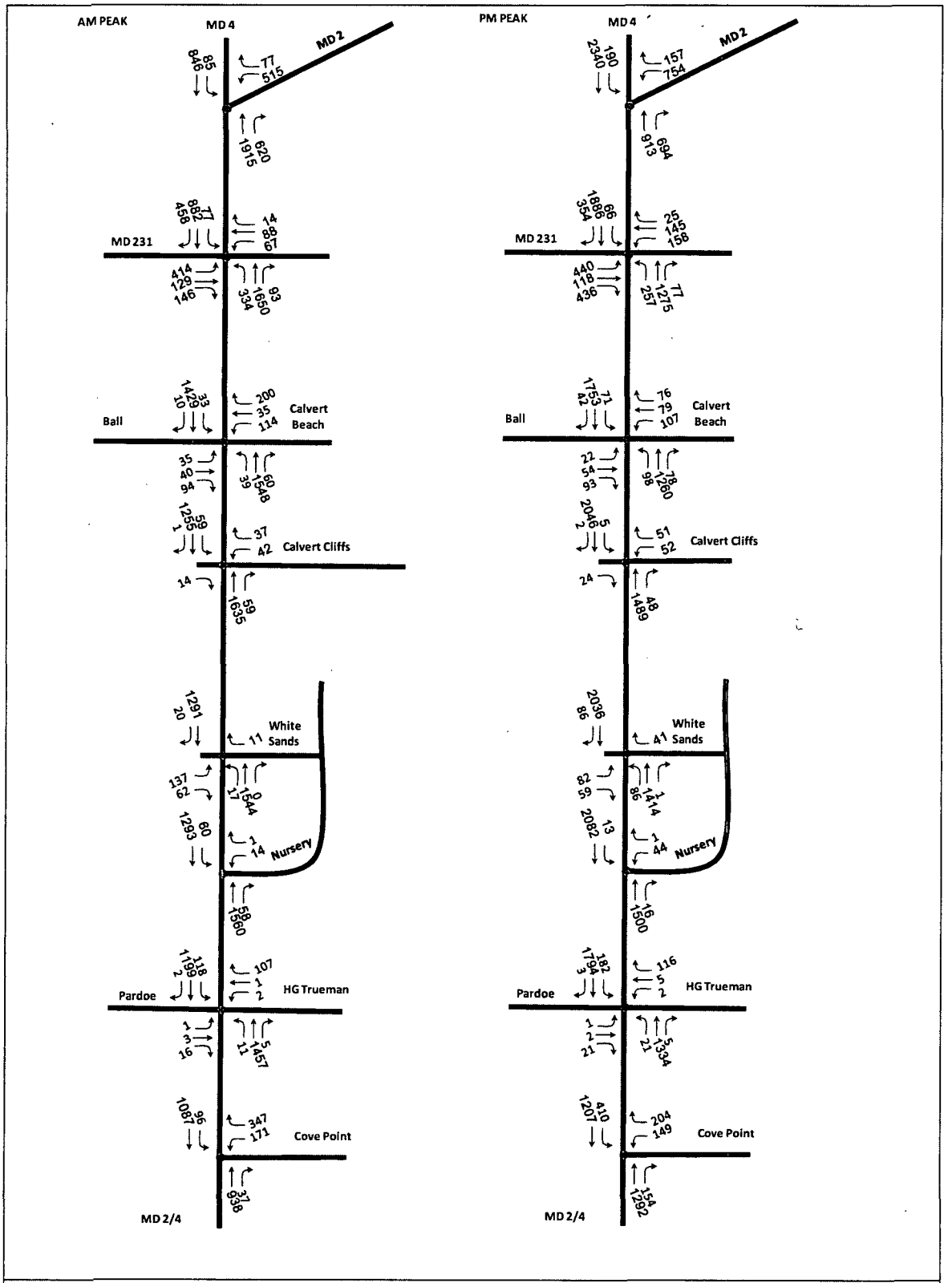


Figure 9 – Peak Hour Traffic Volumes – Future Build Conditions – Alternative 4

Figure 10 - MD 2/MD 4 & White Sands, Future Build (2020), Alternative 3

3.5. LOS by Intersection

Each intersection is analyzed with the existing configuration and also with residual mitigation measures derived from the construction phase when applicable. As discussed earlier, the volumes at the intersections along MD 2/MD 4 at Calvert Cliffs Parkway, White Sands Drive, and Nursery Road are influenced by the differing trip assignments shown in Figure 5. At these locations, the LOS is further broken down by each of the 4 alternatives under the Future Build scenario. Appendix C presents the worksheets with the LOS calculations for the Future Build conditions.

3.5.1.MD 2/MD 4 diverge

Two mitigation options were considered for this intersection for the Construction conditions:

Concept 1, would achieve a LOS E under the 2016 Construction Condition as discussed in the earlier submittal [2]. While Concept 1 does not achieve SHA's goal of LOS D during the construction peak, we believe that it is a viable option to consider for both the construction and operation phase durations. Concept 1 matches the No Build 2016 Condition LOS E in the AM, and it achieves LOS D for the future build 2020 condition while an LOS F arises in the future no-build 2020 Conditions. Concept 1 would also have less environmental and right-of-way impacts and a lower construction cost than Concept 2. Concept 2, would achieve a LOS D under the 2016 construction condition; however the impacts and costs are higher than Concept 1. Concepts 1 or 2 can address the impacts in 2020, both with and without the forecasted traffic demand.

Table 2 – Intersection LOS: MD 2 and MD 4: 2020 Conditions

Mitigation Detail	*CLV*				*LOS*			
	Future No-Build		*Future Build*		*Future No-Build*		*Future Build*	
	AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
None	**1639**	1434	**1654**	1446	**F**	D	**F**	D
Concept 1: Remove Maryland-T, Add 1 SBT and 1 WBL lane	1438	1386	1448	1388	D	D	D	D
Concept 2: Remove Maryland-T, Add 1 SBT and 2 WBL lanes	1363	1273	1370	1275	D	C	D	C

3.5.2.MD 2/MD 4 and MD 231

Three mitigation options were presented at this intersection for the construction phase. Table 3 presents the LOS for all three options under 2020 conditions. As seen in the table, this intersection operates acceptably at all times.

Table 3 – Intersection LOS: MD 2/MD 4 and MD 231: 2020 Conditions

Mitigation Detail	*CLV*				*LOS*			
	Future No-Build		*Future Build*		*Future No-Build*		*Future Build*	
	AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
None	1054	1338	1056	1343	B	D	B	D
Option 1: Restripe EB thru lane as left+thru, add receiver for EB right, add 1 SBT lane, restripe left lane on WB approach as shared thru+left, add an exclusive westbound right turn lane	1018	1103	1021	1108	B	B	B	B
Option 2: Restripe EB thru lane as left+thru, add receiver for EB right, restripe left lane on WB approach as shared thru+left, add an exclusive westbound right turn lane	1018	1291	1021	1296	B	C	B	C
Option 3: Add 1 WBT lane	1009	1262	1011	1267	B	C	B	C

3.5.3.MD 2/MD 4 and Calvert Beach/Ball Road

As is the case above, the intersection of MD 2/MD 4 & Calvert Beach Road operates acceptably at all times of day in both the Future No-Build and Future Build scenarios as seen in Table 4. Additional mitigation was recommended at this intersection for the construction phase. The benefits of continuing operation with each of those mitigation options are provided below.

Table 4 – Intersection LOS: MD 2/MD 4 and Calvert Beach Road: 2020 Conditions

Mitigation Detail	*CLV*				*LOS*			
	Future No-Build		*Future Build*		*Future No-Build*		*Future Build*	
	AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
None	1105	1321	1108	1324	B	D	B	D
Add NBT and SBT	873	1059	876	1061	A	B	A	B

3.5.4.MD 2/MD 4 and Calvert Cliffs Parkway

The intersection of MD 2/MD 4 & Calvert Cliffs Parkway operates acceptably at all times of day during the Future No-Build and under all alternatives in the Future Build scenario as seen in Table 5. Additional mitigation was recommended at this intersection for the Construction scenario. These mitigation measures involved prohibiting the WB

left turn and rerouting this movement to the temporary intersection located at CC3 Site Access Road. In the Future Build 2020 scenario the temporary access will be removed and the access at Calvert Cliffs Parkway will be modified to the current configuration of a Maryland –T with an additional NBT lane. The benefits of continuing operation with the configuration are provided below.

Table 5 – Intersection CLV: MD 2/MD 4 and Calvert Cliffs Parkway: 2020 Conditions

Mitigation Detail	*CLV*									
	Future No-Build		*Future Build*							
			Alternative 1		*Alternative 2*		*Alternative 3*		*Alternative 4*	
	AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
None	996	856	1056	899	1056	899	1000	876	1000	876
Add NBT	752	638	812	682	812	682	755	653	755	653

3.5.5.MD 2/MD 4 and White Sands Drive

The intersection of MD 2/MD 4 & White Sands Drive operates acceptably at all times of day during the Future No-Build. The mitigation listed in Table 6 is that design shown earlier in Figure 10. All alternatives operate acceptably in the Future Build scenario.

Table 6 – Intersection CLV: MD 2/MD 4 and White Sands Drive: 2020 Conditions

Mitigation Detail	*CLV*									
	Future No-Build		*Future Build*							
			Alternative 1		*Alternative 2*		*Alternative 3*		*Alternative 4*	
	AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
None	835	1285	839	1305	839	1305			865	1288
Remove Maryland-T, Signalize intersection, add 1 SBL, 1 WBR	990	1289					1039	1320		

3.5.6.MD 2/MD 4 and Nursery Road

The intersection of MD 2/MD 4 & Nursery Road operates acceptably at all times of day during the Future No-Build and under all alternatives in the Future Build scenario as seen in Table 7.

Table 7 – Intersection CLV: MD 2/MD 4 and Nursery Road: 2020 Conditions

Mitigation Detail	*CLV*									
	Future No-Build		*Future Build*							
			Alternative 1		*Alternative 2*		*Alternative 3*		*Alternative 4*	
	AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
None	873	1153	902	1174	902	1174	902	1174	933	1190

3.5.7.MD 2/MD 4 and Pardoe Road

As shown in Table 8, MD 2/MD 4 & Pardoe Road operates acceptably at all times of day in both the Future No-Build and Future Build scenarios.

Table 8 – Intersection LOS: MD 2/MD 4 and Pardoe Road: 2020 Conditions

Mitigation Detail	*CLV*				*LOS*			
	Future No-Build		*Future Build*		*Future No-Build*		*Future Build*	
	AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
None	1020	1134	1049	1155	B	B	B	C

3.5.8.MD 2/MD 4 and Cove Point Road

As is the case above, MD 2/MD 4 & Cove Point Road operates acceptably at all times of day in both the Future No-Build and Future Build scenarios as seen in Table 9.

Table 9 – Intersection LOS: MD 2/MD 4 and Cove Point Road: 2020 Conditions

Mitigation Detail	*CLV*				*LOS*			
	Future No-Build		*Future Build*		*Future No-Build*		*Future Build*	
	AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
None	845	1266	863	1270	A	C	A	C

4. SUMMARY

A summary of the analysis (LOS, CLV) and mitigation is shown in Table 10.

The most significant impacts occur in the "during construction" when a large daily construction staff travels to and from the site. The peak level of construction activity significantly overshadows the traffic generated by the CC3 post construction workforce and background growth through the intervening years. The mitigation "during construction" will already be in place for the "post construction" conditions.

This report presents the needed mitigation and design configurations for site access that sufficiently meet the forecasted traffic demand under the "post construction" condition. Specifically four different site access alternatives have been analyzed.

The SHA has stated that the preferred site access alternative would be the usage of Calvert Cliffs Parkway. UniStar agrees this is the preferred option, but recognizes CC1/2 and CC3 are owned by two separate entities. Future discussions between the two owners may result in a desire to have two separate entrances, in which case UniStar would request approval at a later date for an alternative site access.

5. REFERENCES

[1] http://www.nrc.gov/reactors/new-reactors/col/calvert-cliffs.html

[2] Traffic Impact Study at the Calvert Cliffs Nuclear Power Plant, Draft Final Report, Rev 3, Feb 2, 2011, KLD Engineering PC, TR#427

[3] HCM 2000, Highway Capacity Manual, Transportation Research Board, Washington DC, July 2005

[4] STATE HIGHWAY ACCESS MANUAL - ENGINEERING ACCESS PERMITS DIVISION - January 2004 http://www.marylandroads.com/OHD/accesspermits.pdf as accessed August 31, 2009

[5] Lusby Traffic Study Report, November 2005, STV / G&O Joint Venture

[6] http://www.marylandroads.com/OPPEN/Lusby_Transportation_Study.pdf As downloaded on October 9, 2009

Table 10 – Summary of Conditions (CLV)

Intersection	*Mitigation Detail*	*Future No-Build*		*Future Build*							
				Alt 1		*Alt 2*		*Alt 3*		*Alt 4*	
		AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
MD 2 and MD 4	None	1639	1434	1654	1446	Same as Alt 1					
	Concept 1: Remove Maryland-T, Add one SBT and one WBL lane	1438	1386	1448	1388						
	Concept 2: Remove Maryland-T, Add SBT and 2 WBL lanes	1363	1273	1370	1275						
MD 2/MD 4 and MD 231	None	1054	1338	1056	1343	Same as Alt 1					
	Option 1: Restripe EB thru lane as left+thru, add receiver for EB right, add 1 SBT lane, restripe left lane on WB approach as shared thru+left, add an exclusive westbound right turn lane	1018	1103	1021	1108						
	Option 2: Restripe EB thru lane as left+thru, add receiver for EB right, restripe left lane on WB approach as shared thru+left, add an exclusive westbound right turn lane	1018	1291	1021	1296						
	Option 3: Add 1 WBT lane	1009	1262	1011	1267						
MD 2/MD 4 and Calvert Beach	None	1105	1321	1108	1324	Same as Alt 1					
	Add one SBT and one NBT lane	873	1059	876	1061						
MD 2/MD 4 and Calvert Cliffs	None	996	856	1056	899	1056	899	1000	876	1000	876
	Add one NBT lane	752	638	812	682	812	682	755	653	755	653
MD 2/MD 4 and White Sands	None	835	1285	839	1305	839	1305			865	1288
	Remove Maryland-T, Add 1 SBL, 1 WBR							1039	1320		
MD 2/MD 4 and Nursery Road	None	873	1153	902	1174	902	1174	902	1174	933	1190
MD 2/MD 4 and Pardoe Road	None	1020	1134	1049	1155	Same as Alt 1					
MD 2/MD 4 and Cove Point Road	None	845	1266	863	1270	Same as Alt 1					

Note: Highlighted cells correspond to locations that have a CLV greater than 1450

Appendix A
Future No-Build Conditions

LOS Analysis Worksheets

This appendix contains CLV worksheets for all calculations shown in Table A-1 as well as queue calculations using SHA methodology. Figure A-1 presents the traffic volumes and turning movements at the study intersections during the AM and PM peak hours.

Table A- 1 – Intersection LOS: Future No-Build (2020) Conditions

Intersection	*Mitigation Detail*	*Future No-Build*	
		AM	*PM*
MD 2 and MD 4	None	1639	1434
	Concept 1: Remove Maryland-T, Add one SBT and one WBL lane	1438	1386
	Concept 2: Remove Maryland-T, Add SBT and 2 WBL lanes	1363	1273
MD 2/MD 4 and MD 231	None	1054	1338
	Option 1: Restripe EB thru lane as left+thru, add receiver for EB right, add 1 SBT lane, restripe left lane on WB approach as shared thru+left, add an exclusive westbound right turn lane	1018	1103
	Option 2: Restripe EB thru lane as left+thru, add receiver for EB right, restripe left lane on WB approach as shared thru+left, add an exclusive westbound right turn lane	1018	1291
	Option 3: Add 1 WBT lane	1009	1262
MD 2/MD 4 and Calvert Beach	None	1105	1321
	Add one SBT and one NBT lane	873	1059
MD 2/MD 4 and Calvert Cliffs	None	996	856
	Add one NBT lane	752	638
MD 2/MD 4 and White Sands	None	835	1285
	Remove Maryland-T, Add 1 SBL, 1 WBR		
MD 2/MD 4 and Nursery Road	None	873	1153
MD 2/MD 4 and Pardoe Road	None	1020	1134
MD 2/MD 4 and Cove Point Road	None	845	1266

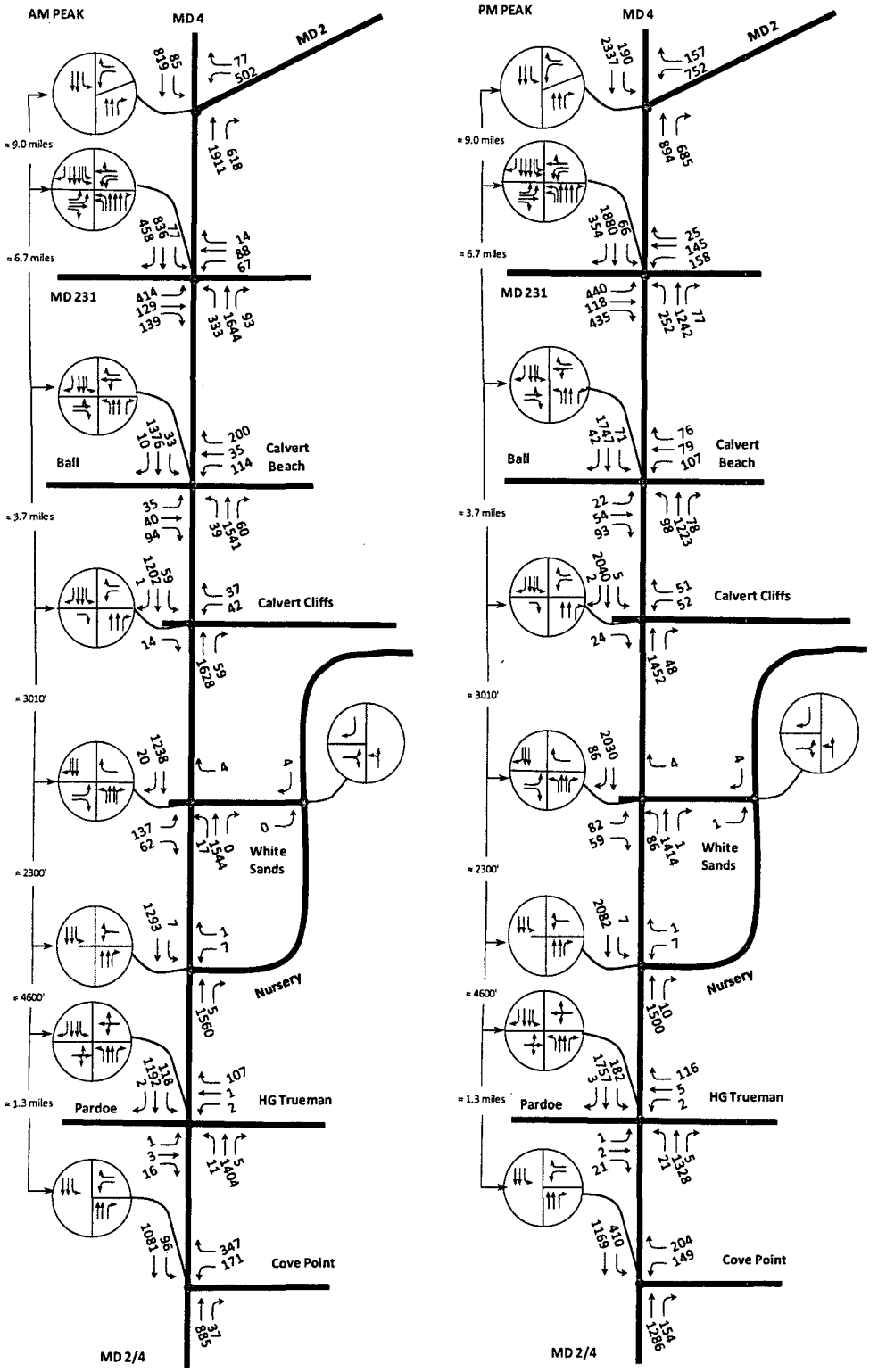
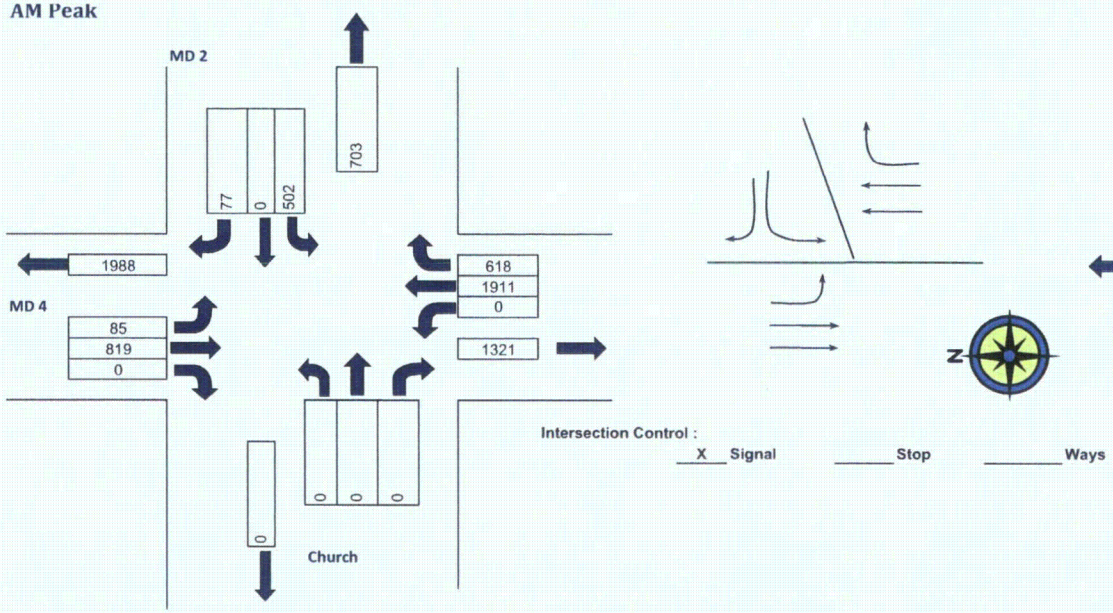
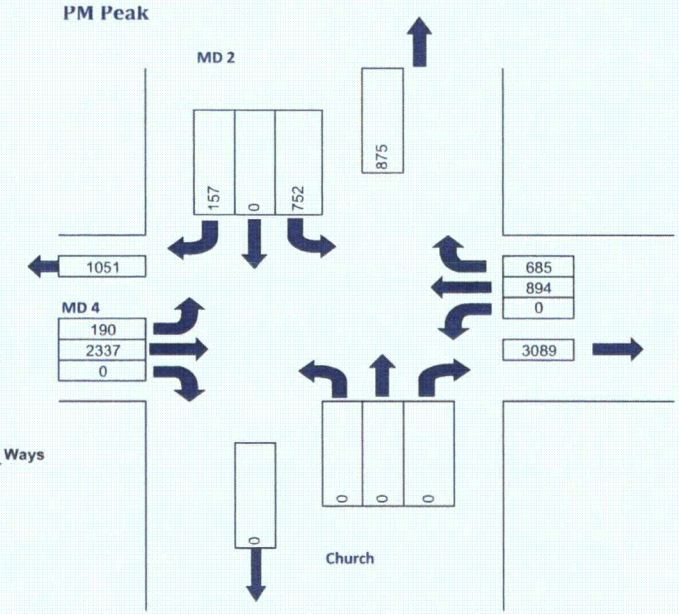


Figure A-1 – Peak Hour Traffic Volumes – Future No-Build (2020) Conditions

AM Peak



PM Peak



Intersection Control :

X Signal _____ Stop _____ Ways

MD 2/MD 4 Diverge

Future No-Build, 2020, No Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

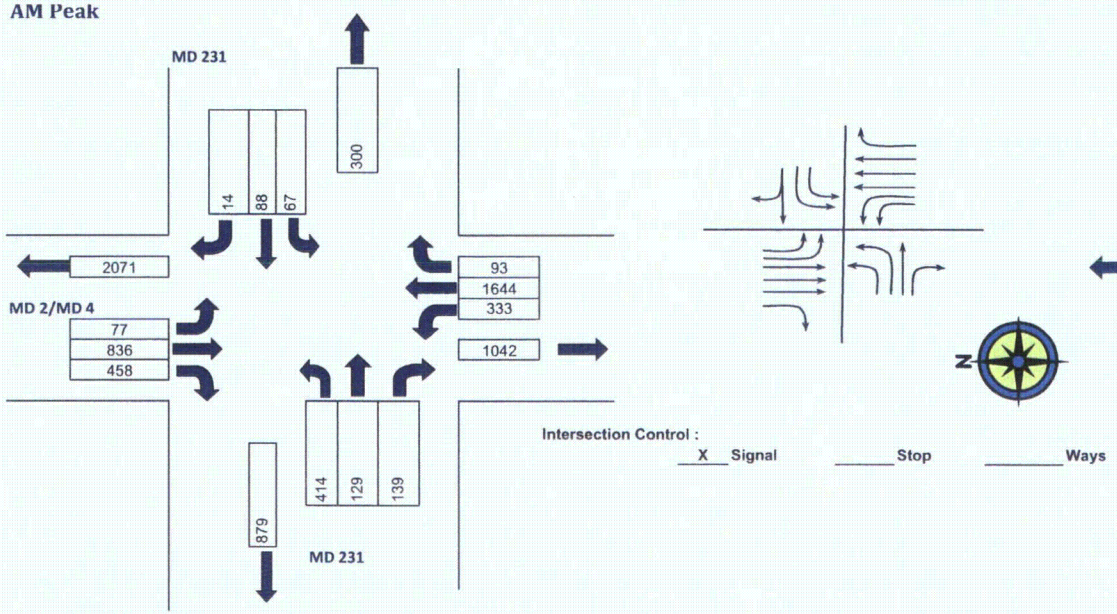
	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,911	0.55	1,051	85	1	85	1,137
	SBT	819	0.55	451				
	WBL	502	1	502	0	1	0	502

Remarks:	Critical Lane Volume	Total	1,639
NBR has RTOR, is concurrent with WBL		LOS	F
SBT not included in CLV calculation due to signal phasing		V/C	1.02

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	894	0.55	491	190	1	190	682
	SBT	2,337	0.55	1285				
	WBL	752	1	752	0	1	0	752

Remarks:	Critical Lane Volume	Total	1,434
NBR has RTOR, is concurrent with WBL		LOS	D
SBT not included in CLV calculation due to signal phasing		V/C	0.90

AM Peak



Intersection Control :

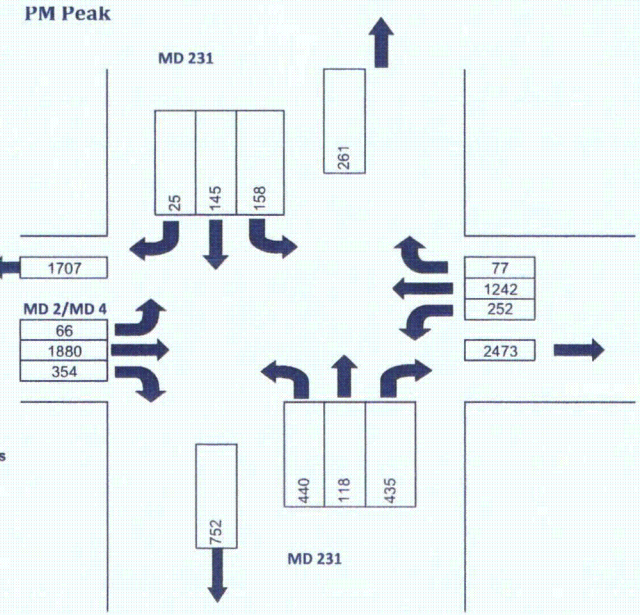
X Signal ____ Stop ____ Ways

MD 231 & MD 2/MD 4

Future No-Build, 2020, No Mitigation

KLD Engineering, P.C.

PM Peak



Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,644	0.40	657	77	0.6	46	704
	SBT	836	0.40	334	333	0.6	200	534
	EBL	414	0.60	248	0	1	0	248
	WBTR	102	1	102	0	1	0	102

Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

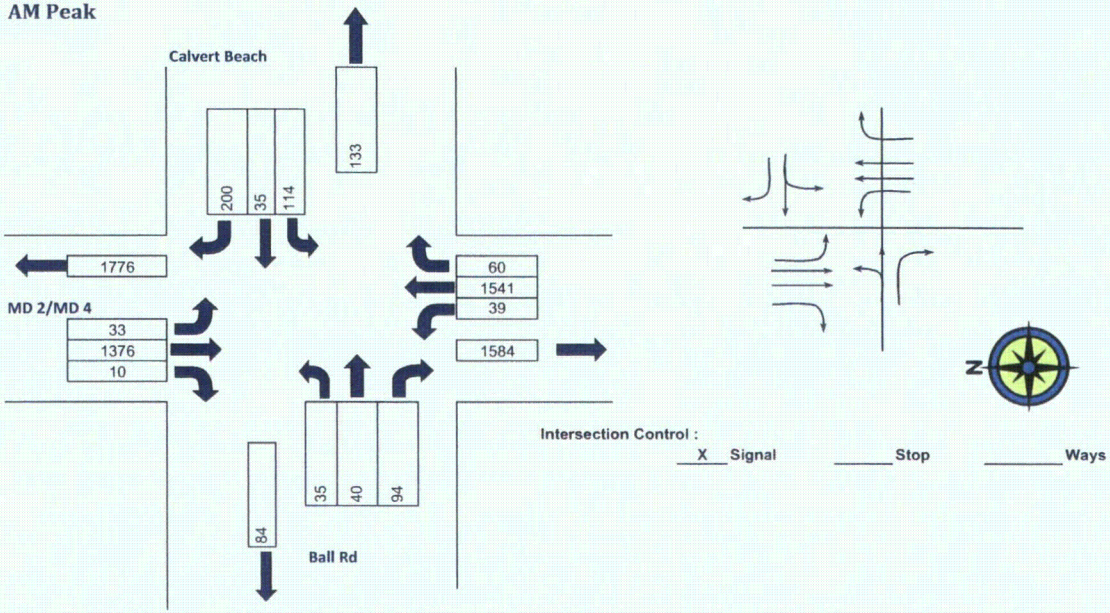
Critical Lane Volume — Total 1,054; LOS B; V/C 0.66

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,242	0.4	497	66	0.6	40	536
	SBT	1,880	0.4	752	252	0.6	151	903
	EBL	440	0.6	264	0	1	0	264
	WBTR	170	1	170	0	1	0	170

Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,338; LOS D; V/C 0.84

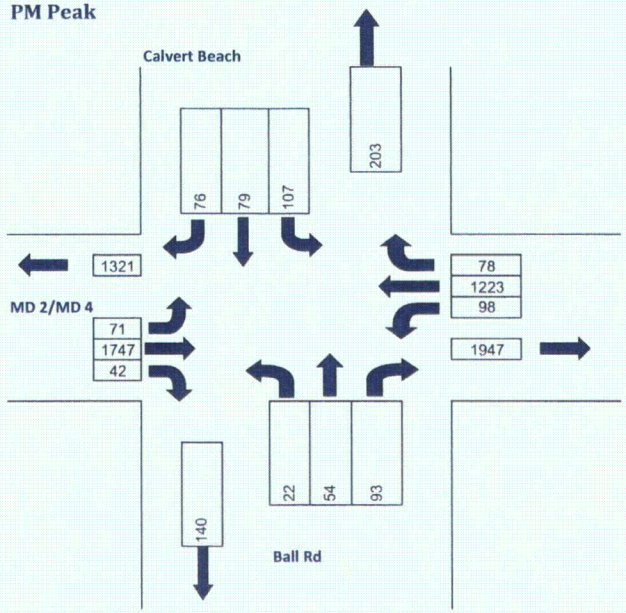
AM Peak



Intersection Control :

X Signal ____ Stop ____ Ways

PM Peak



Calvert Beach/Ball Road &
MD 2/MD 4
Future No-Build, 2020, No Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,541	0.55	848	33	1	33	881
	SBT	1,376	0.55	757	39	1	39	796
	EBTL	75	1.00	75	0	1	0	75
	WBTL	149	1	149	0	1	0	149

Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

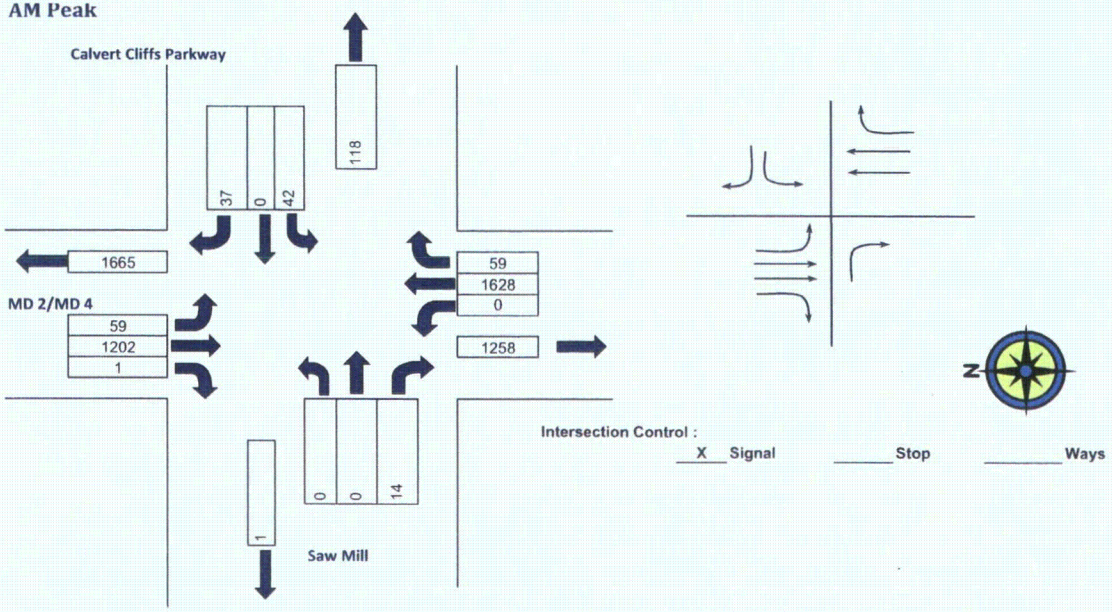
Critical Lane Volume — Total 1,105; LOS B; V/C 0.69

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,223	0.55	673	71	1	71	744
	SBT	1,747	0.55	961	98	1	98	1,059
	EBTL	76	1	76	0	1	0	76
	WBTL	186	1	186	0	1	0	186

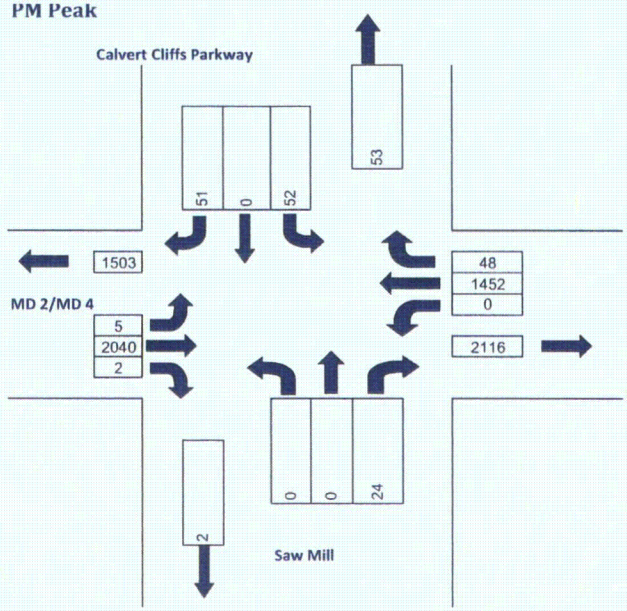
Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,321; LOS D; V/C 0.83

AM Peak



PM Peak



Calvert Cliffs Parkway & MD 2/MD 4

Future No-Build, 2020, No Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,628	0.55	895	59	1	59	954
	WBL	42	1	42	0	1	0	42

Remarks:
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume

Total	996
LOS	A
V/C	0.62

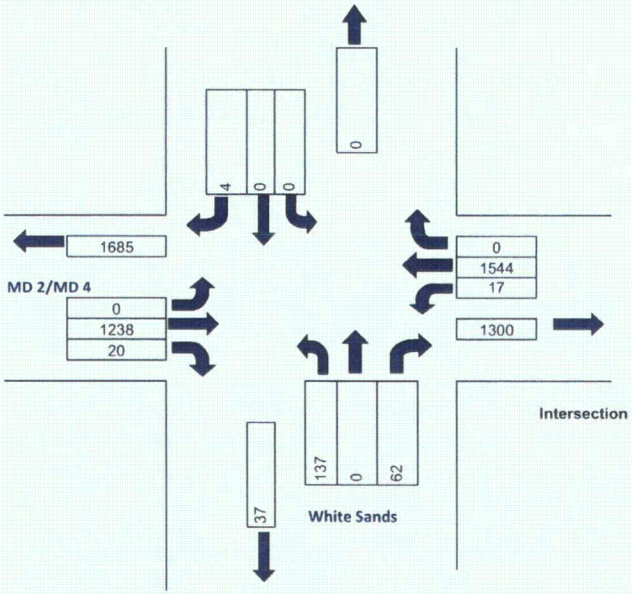
	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,452	0.55	799	5	1	5	804
	WBL	52	1	52	0	1	0	52

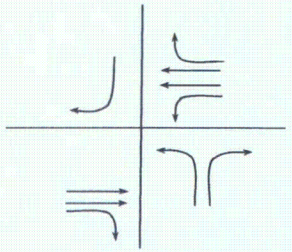
Remarks:
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume

Total	856
LOS	A
V/C	0.53

AM Peak

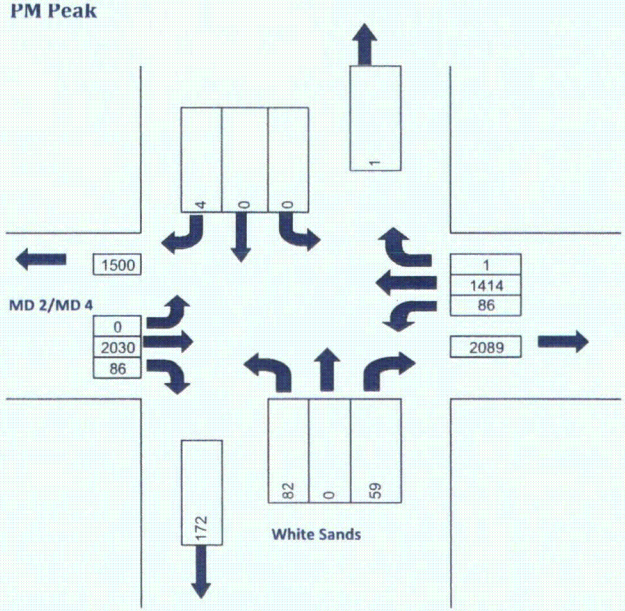




Intersection Control :

X Signal _____ Stop _____ Ways

PM Peak



White Sands Drive & MD 2/MD 4

Future No-Build, 2020, No Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	SBT	1,238	0.55	681	17	1	17	698
	EBTL	137	1.00	137	0	1	0	137

Remarks:
Right turns with a dedicated lane >150 ft are excluded

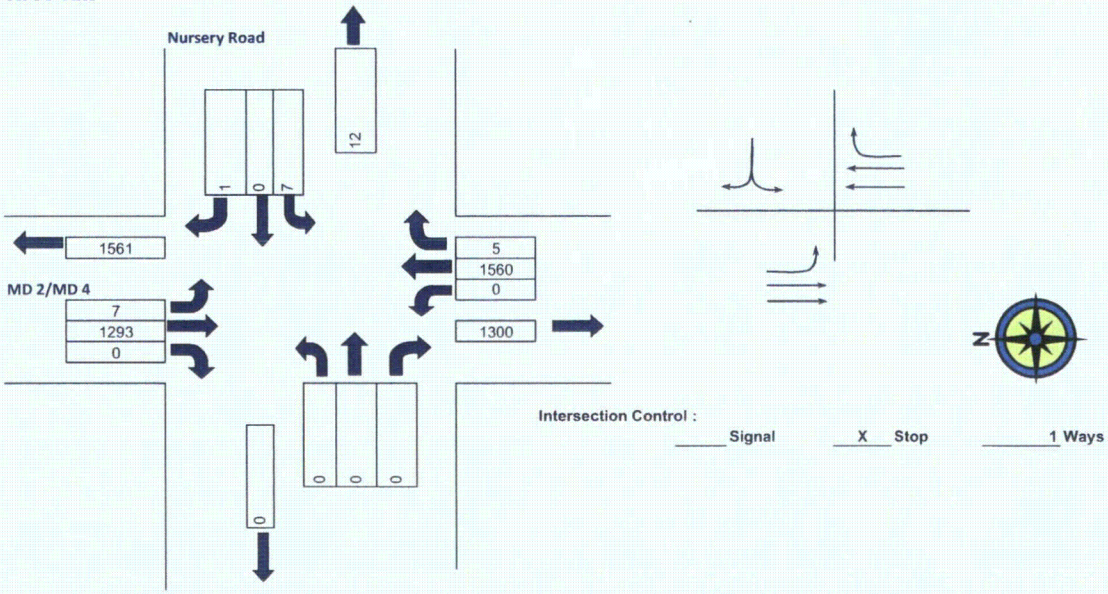
Critical Lane Volume — Total 835, LOS A, V/C 0.52

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	SBT	2,030	0.55	1117	86	1	86	1,203
	EBTL	82	1	82	0	1	0	82

Remarks:
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,285, LOS C, V/C 0.80

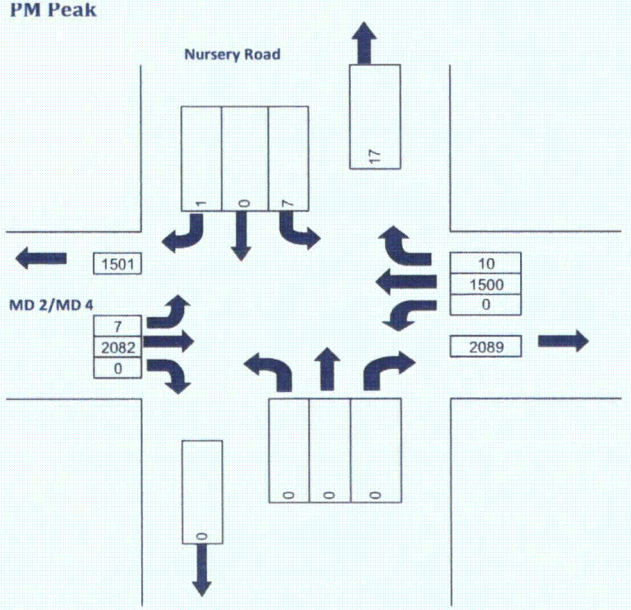
AM Peak



Intersection Control :

____ Signal X Stop ____ 1 Ways

PM Peak



Nursery Road & MD 2/MD 4

Future No-Build, 2020, No Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS	Opposing Volume	PCE
0	A		
1000	B	0	1.1
1150	C	200	2
1300	D	600	3
1450	E	800	4
1600	F	1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,560	0.55	858	7	1	7	865
	SBT	1,293	0.55	711	0	1	0	711
	WBLR	8	1	8	0	1	0	8

Remarks:
Right turns with a dedicated lane >150 ft are excluded

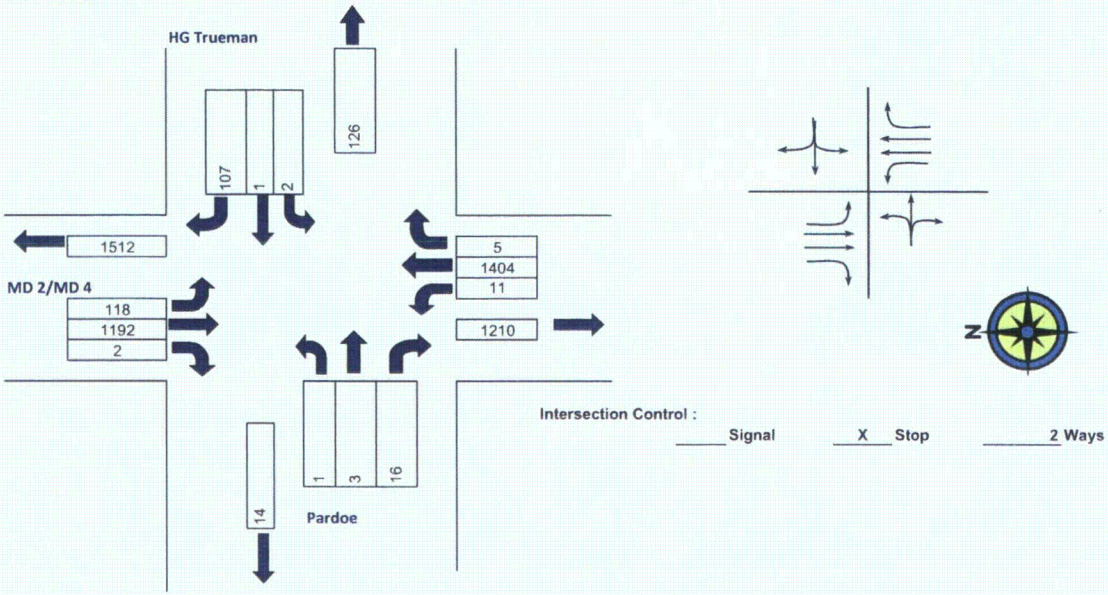
Critical Lane Volume — Total 873, LOS A, V/C 0.55

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,500	0.55	825	7	1	7	832
	SBT	2,082	0.55	1145	0	1	0	1,145
	WBLR	8	1	8	0	1	0	8

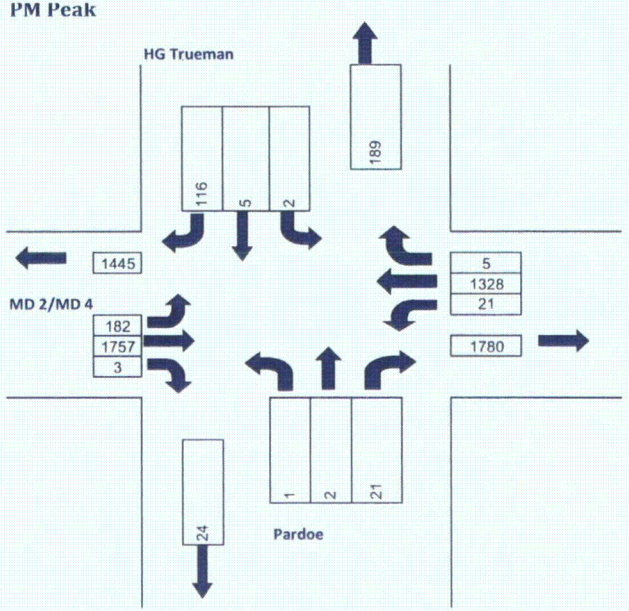
Remarks:
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,153, LOS C, V/C 0.72

AM Peak



PM Peak



Intersection Control :

____ Signal X Stop ____ 2 Ways

HG Trueman/Pardoe & MD 2/MD 4

Future No-Build, 2020, No Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,404	0.55	772	118	1	118	890
	SBT	1,192	0.55	656	11	1	11	667
	EBLTR	20	1	20	0	1	0	20
	WBLTR	110	1	110	0	1	0	110

Remarks:
Right turns with a dedicated lane >150 ft are excluded

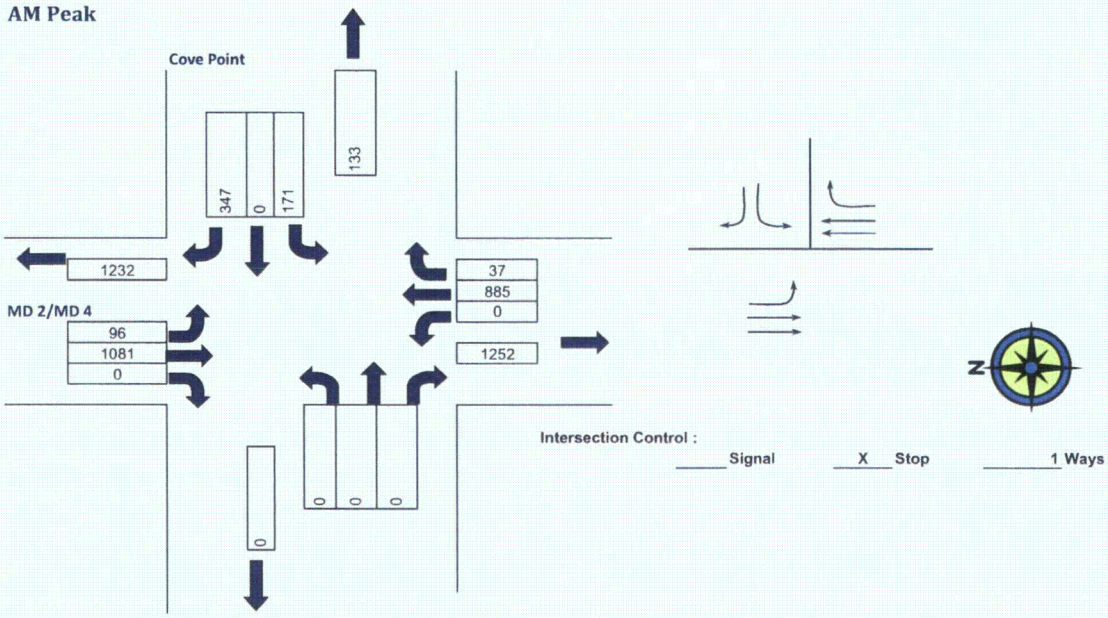
Critical Lane Volume — Total 1,020; LOS B; V/C 0.64

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,328	0.55	730	182	1	182	912
	SBT	1,757	0.55	966	21	1	21	987
	EBLTR	24	1	24				24
	WBLTR	123	1	123	0	1	0	123

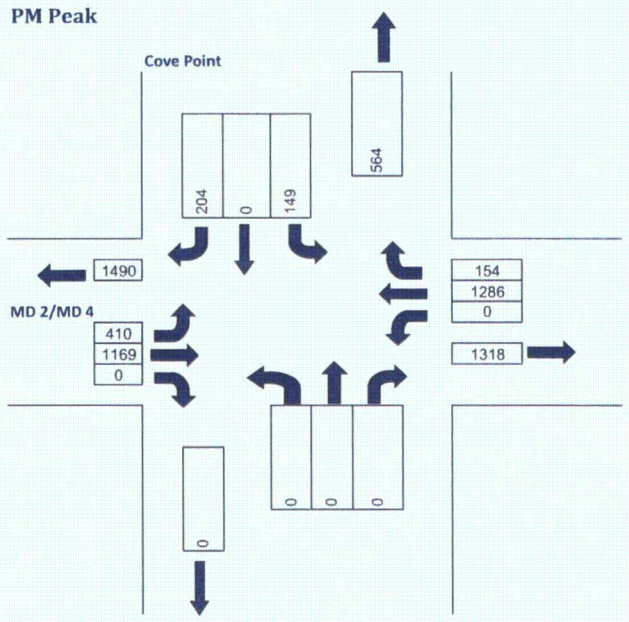
Remarks:
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,134; LOS B; V/C 0.71

AM Peak



PM Peak



Cove Point Road & MD 2/MD 4

Future No-Build, 2020, No Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	885	0.55	487	96	1	96	583
	SBT	1,081	0.55	594	0	1	0	594
	WBL	171	1	171	0	1	0	171
	WBR	251	1	251	0	1	0	251

Remarks:
Some WBR Coincide with SBL
Right turns with a dedicated lane >150 ft are excluded

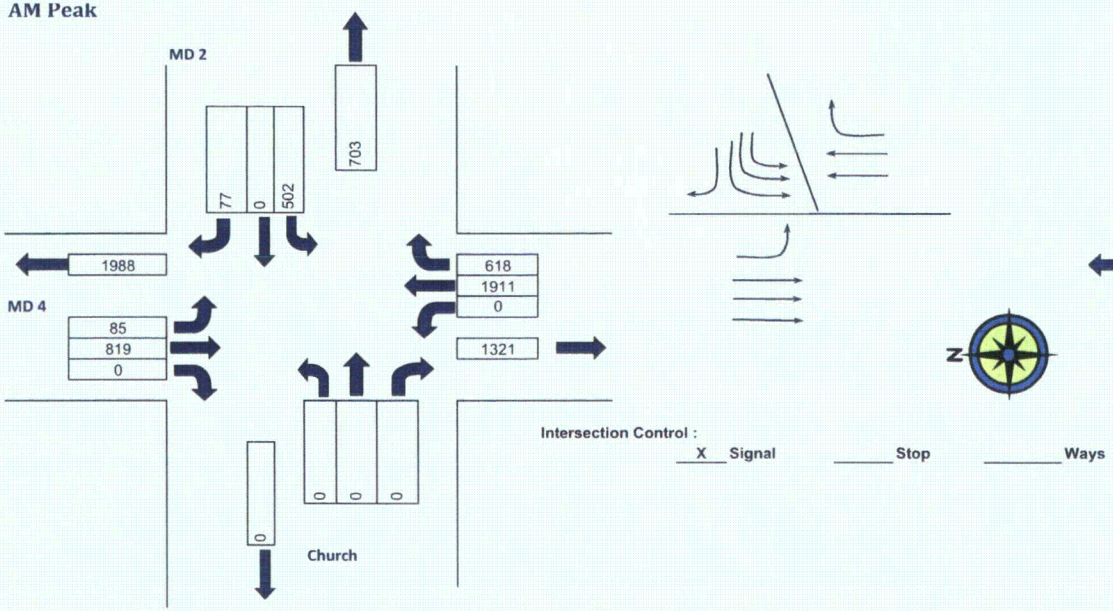
Critical Lane Volume — Total 845, LOS A, V/C 0.53

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,286	0.55	707	410	1	410	1,117
	SBT	1,169	0.55	643	0	1	0	643
	WBL	149	1	149	0	1	0	149
	WBR	0	1	0	0	1	0	0

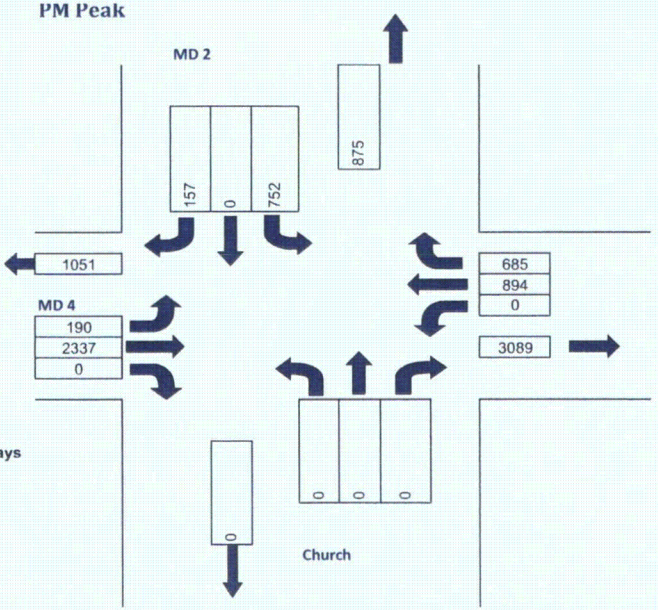
Remarks:
Some WBR Coincide with SBL
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,266, LOS C, V/C 0.79

AM Peak



PM Peak



Intersection Control :

X Signal ____ Stop ____ Ways

MD 2/MD 4 Diverge
(Concept 2)
Future No-Build, 2020, with Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,911	0.55	1,051	85	1.00	85	1,137
	SBT	819	0.40	328	0	1.00	0	328
	WBL	502	0.45	226	0	1.00	0	226

Right turns with a dedicated lane >150 ft are excluded

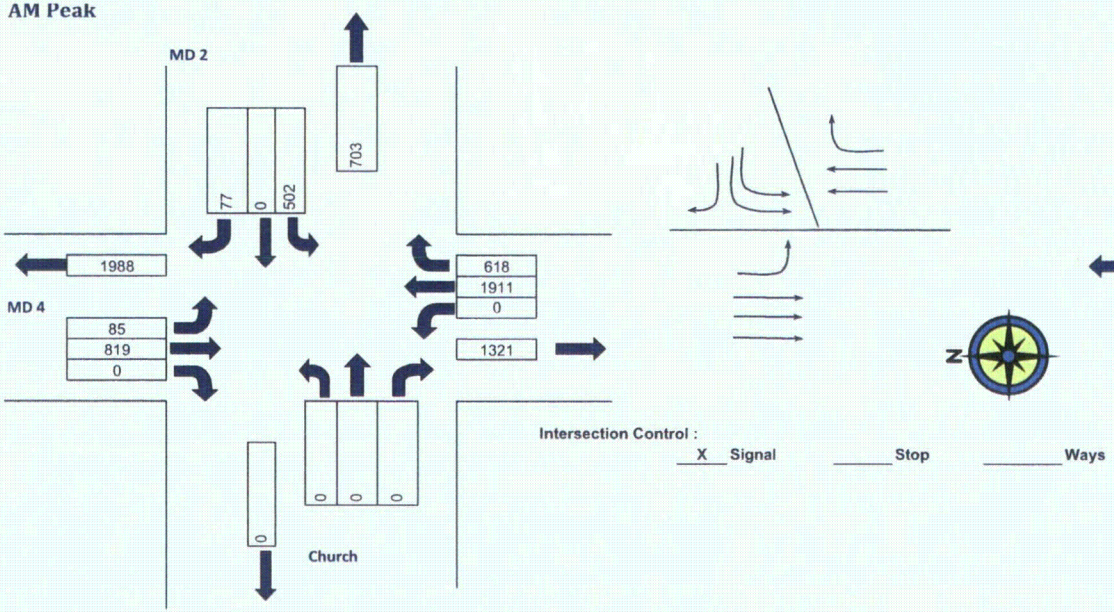
Critical Lane Volume — Total 1,363; LOS D; V/C 0.85

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	894	0.55	491	190	1.00	190	682
	SBT	2,337	0.40	935	0	1.00	0	935
	WBL	752	0.45	338	0	1.00	0	338

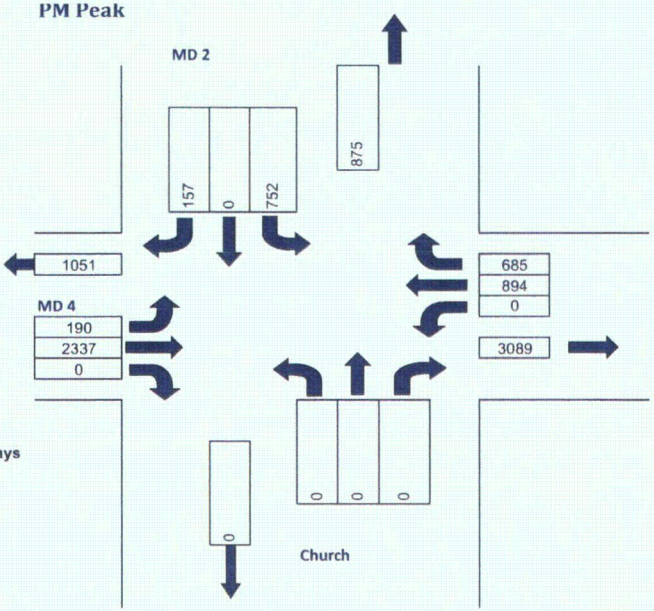
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,273; LOS C; V/C 0.80

AM Peak



PM Peak



Intersection Control :

X Signal ____ Stop ____ Ways

MD 2/MD 4 Diverge
(Concept 1)
Future No-Build, 2020, with Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,911	0.55	1,051	85	1.00	85	1,137
	SBT	819	0.40	328	0	1.00	0	328
	WBL	502	0.60	301	0	1.00	0	301

Right turns with a dedicated lane >150 ft are excluded

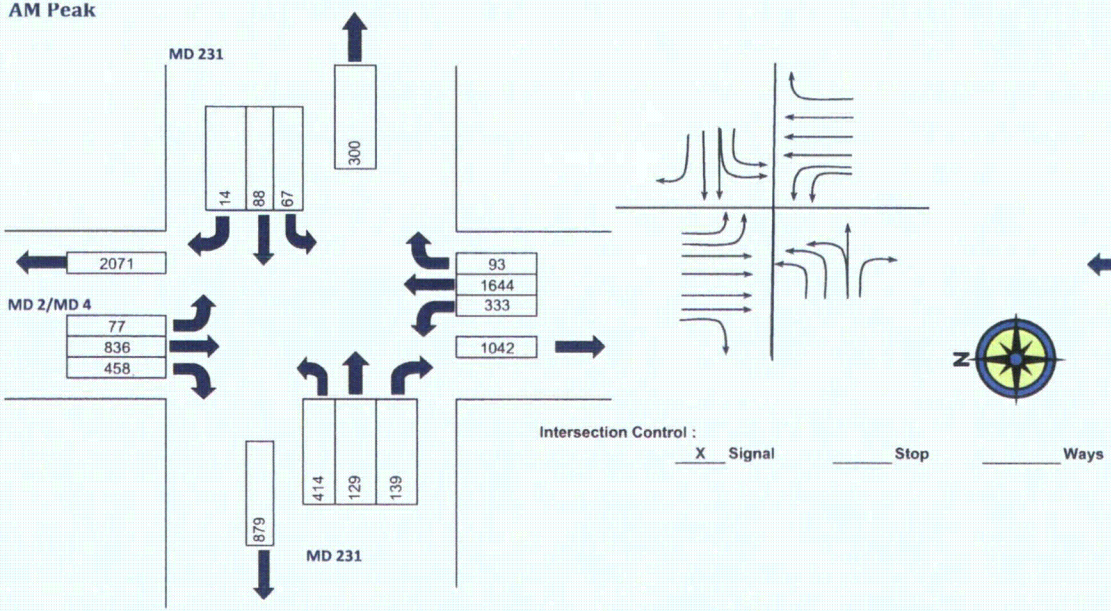
Critical Lane Volume — Total 1,438; LOS D; V/C 0.90

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	894	0.55	491	190	1.00	190	682
	SBT	2,337	0.40	935	0	1.00	0	935
	WBL	752	0.60	451	0	1.00	0	451

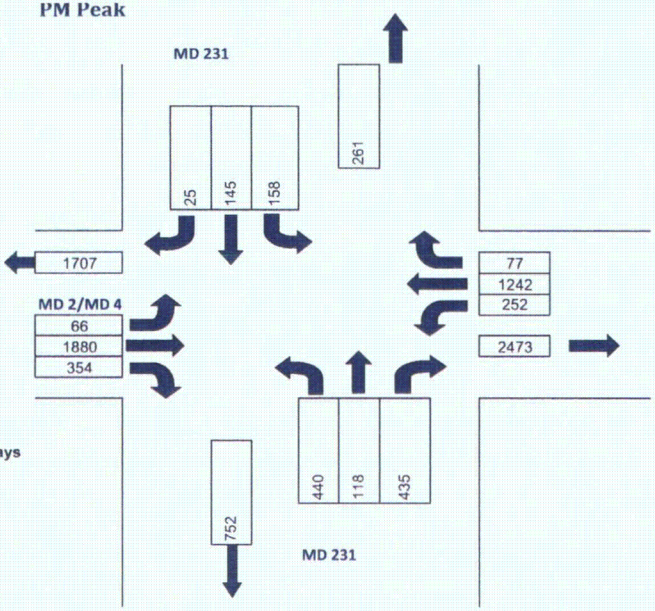
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,386; LOS D; V/C 0.87

AM Peak



PM Peak



MD 231 & MD 2/MD 4
(Option 1)
Future No-Build, 2020, with Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,644	0.40	657	77	0.60	46	704
	SBT	836	0.30	251	333	0.60	200	451
	EBTL	543	0.45	245	0	1.00	0	245
	WBTL	155	0.45	70	0	1.00	0	70

Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

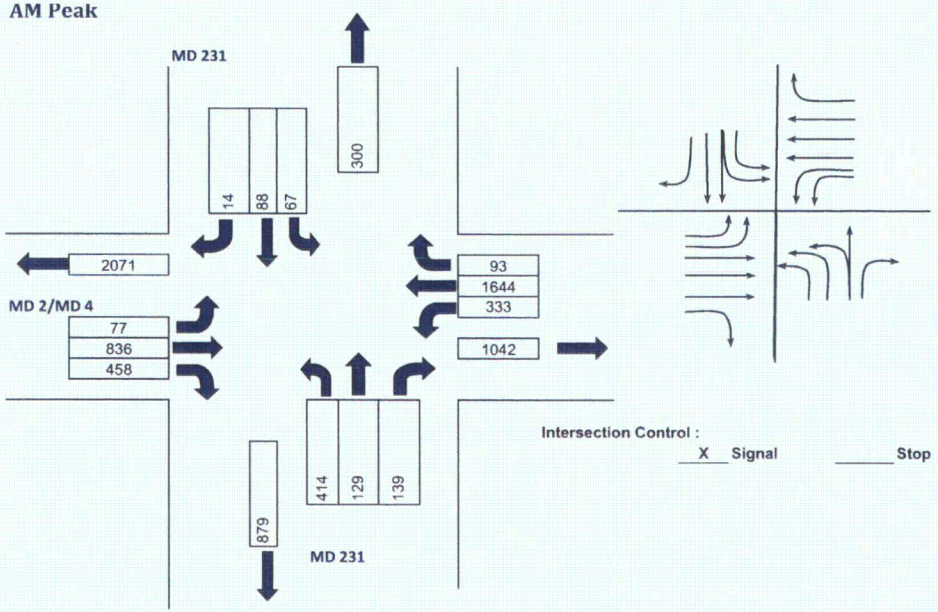
Critical Lane Volume — Total 1,018 | LOS B | V/C 0.64

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,242	0.40	497	66	0.60	40	536
	SBT	1,880	0.30	564	252	0.60	151	715
	EBTL	558	0.45	251	0	1.00	0	251
	WBTL	303	0.45	137	0	1.00	0	137

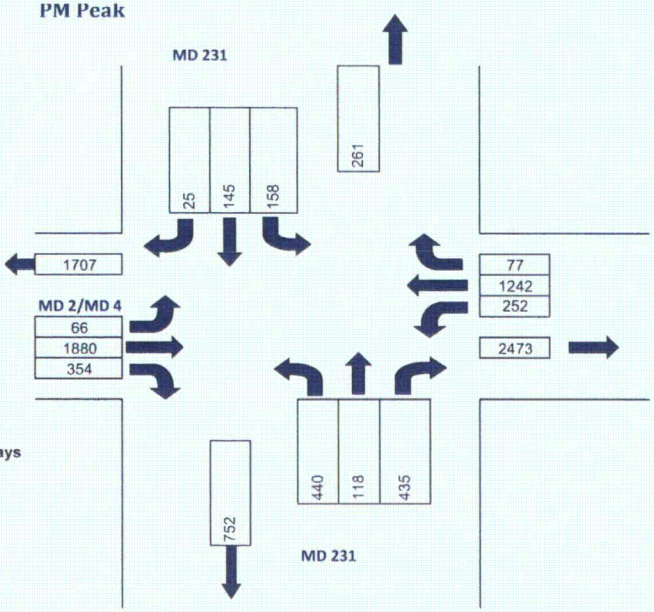
Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,103 | LOS B | V/C 0.69

AM Peak



PM Peak



Intersection Control :

X Signal ____ Stop ____ Ways

MD 231 & MD 2/MD 4
(Option 2)
Future No-Build, 2020, with Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,644	0.40	657	77	0.60	46	704
	SBT	836	0.40	334	333	0.60	200	534
	EBTL	543	0.45	245	0	1.00	0	245
	WBTL	155	0.45	70	0	1.00	0	70

Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

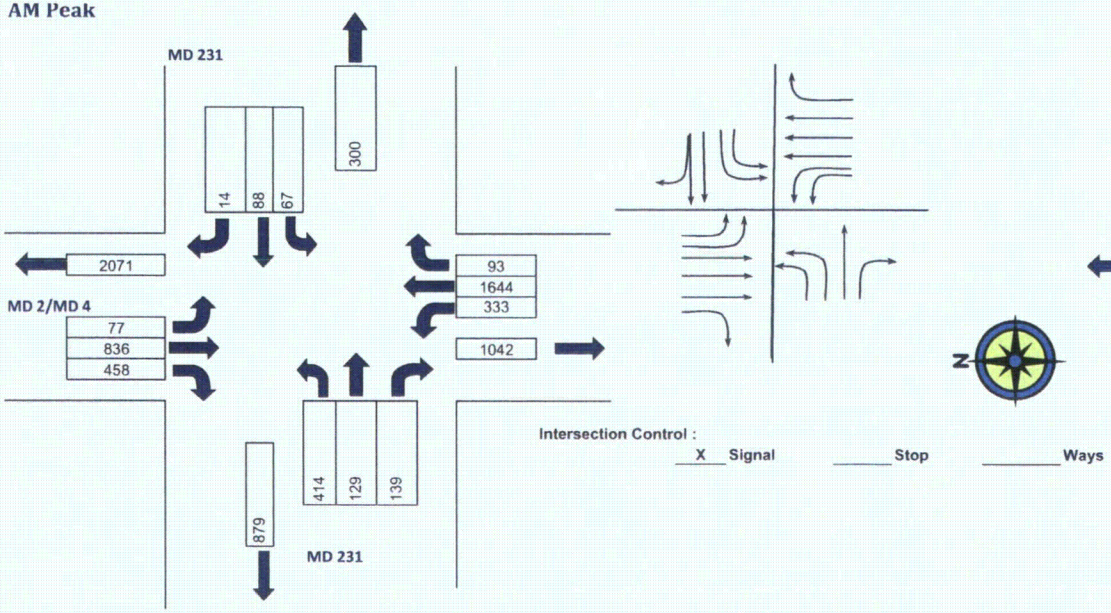
Critical Lane Volume — Total 1,018 / LOS B / V/C 0.64

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,242	0.40	497	66	0.60	40	536
	SBT	1,880	0.40	752	252	0.60	151	903
	EBTL	558	0.45	251	0	1.00	0	251
	WBTL	303	0.45	137	0	1.00	0	137

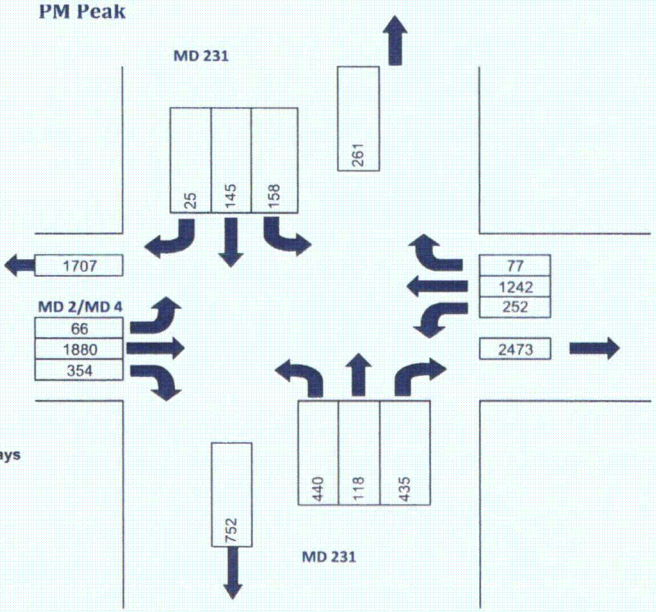
Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,291 / LOS C / V/C 0.81

AM Peak



PM Peak



MD 231 & MD 2/MD 4
(Option 3)
Future No-Build, 2020, with Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS	Opposing Volume	PCE
0	A		
1000	B	0	1.1
1150	C	200	2
1300	D	600	3
1450	E	800	4
1600	F	1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,644	0.40	657	77	0.60	46	704
	SBT	836	0.40	334	333	0.60	200	534
	EBL	414	0.60	248	0	1.00	0	248
	WBTR	102	0.55	56	0	1.00	0	56
	WBL	67	0.60	40	0	1.00	0	40

Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

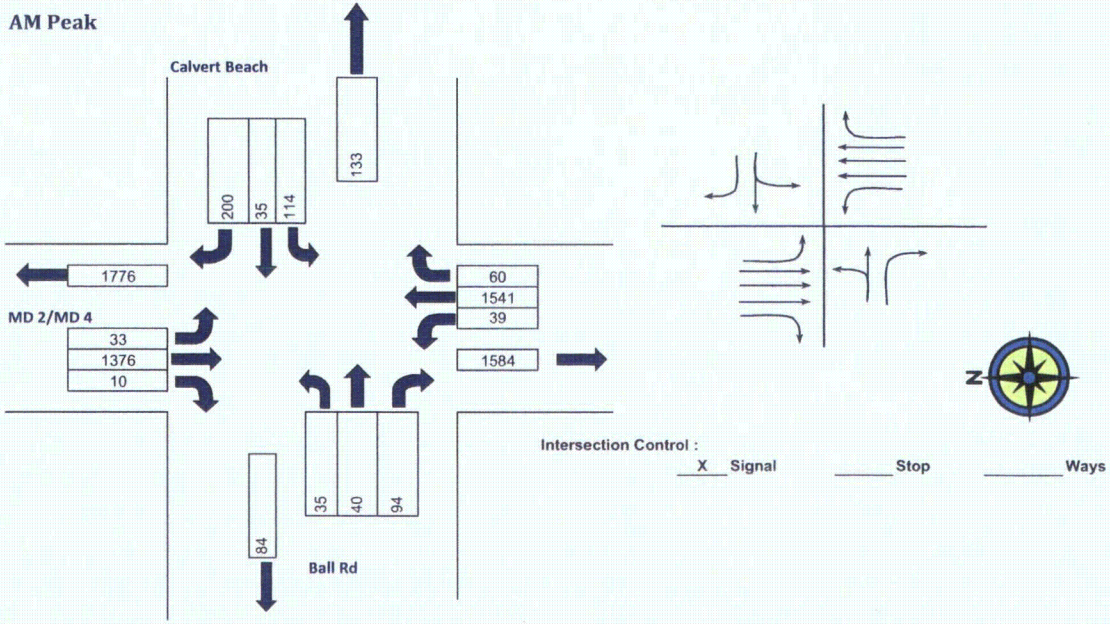
Critical Lane Volume — Total 1,009 | LOS B | V/C 0.63

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,242	0.40	497	66	0.60	40	536
	SBT	1,880	0.40	752	252	0.60	151	903
	EBL	440	0.60	264	0	1.00	0	264
	WBTR	170	0.55	94	0	1.00	0	94
	WBL	158	0.60	95	0	1.00	0	95

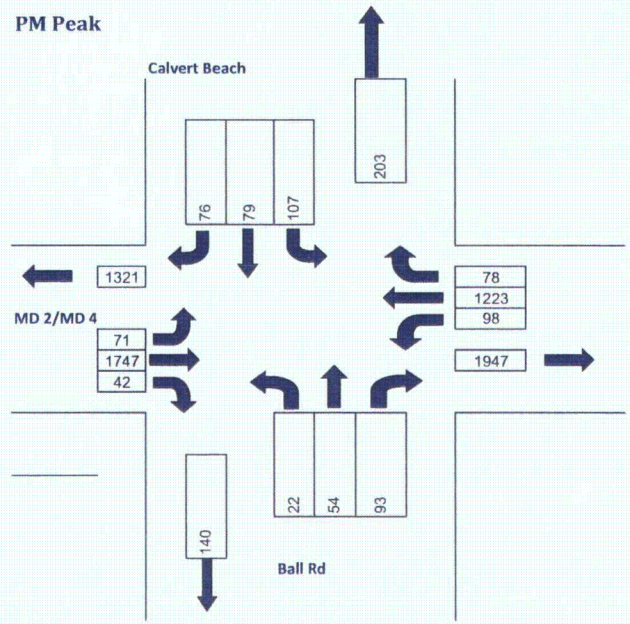
Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,262 | LOS C | V/C 0.79

AM Peak



PM Peak



Calvert Beach/Ball Road &
MD 2/MD 4
Future No-Build, 2020, with Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,541	0.40	616	33	1.00	33	649
	SBT	1,376	0.40	550	39	1.00	39	589
	EBTL	75	1.00	75	0	1.00	0	75
	WBTL	149	1.00	149	0	1.00	0	149

Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

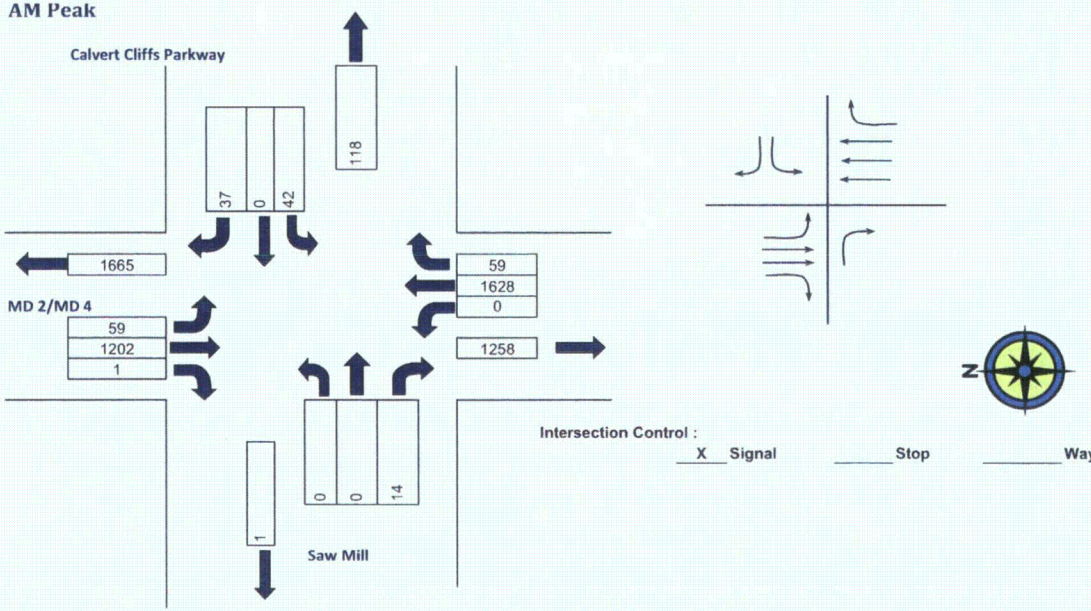
Critical Lane Volume — Total 873, LOS A, V/C 0.55

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,223	0.40	489	71	1.00	71	560
	SBT	1,747	0.40	699	98	1.00	98	797
	EBTL	76	1.00	76	0	1.00	0	76
	WBTL	186	1.00	186	0	1.00	0	186

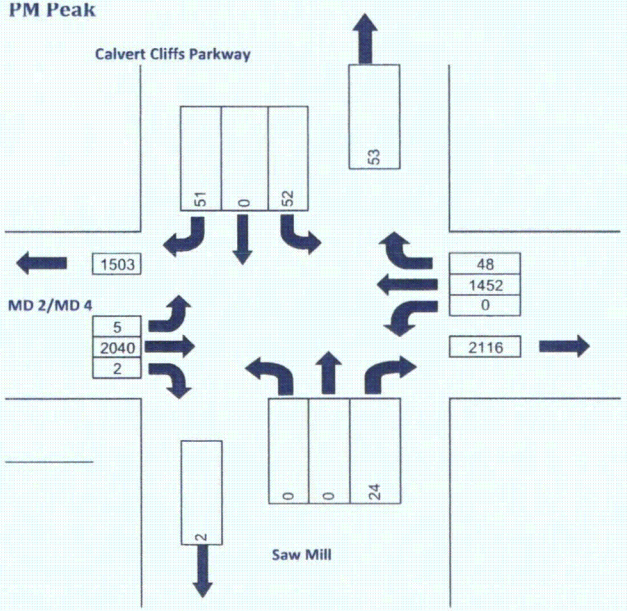
Remarks: Split Phase, EB & WB
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume — Total 1,059, LOS B, V/C 0.66

AM Peak



PM Peak



Intersection Control :

X Signal ____ Stop ____ Ways ____

Calvert Cliffs Parkway &
MD 2/MD 4
Future No-Build, 2020, with Mitigation

KLD Engineering, P.C.

Lanes	LUF
1	1
2	0.55
3	0.4
4	0.3
Dbl LT	0.6

CLV	LOS
0	A
1000	B
1150	C
1300	D
1450	E
1600	F

Opposing Volume	PCE
0	1.1
200	2
600	3
800	4
1000	5

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,628	0.40	651	59	1	59	710
	WBL	42	1.00	42	0	1.00	0	42

Remarks:
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume

Total	752
LOS	A
V/C	0.47

	Movement	Volume (1)	LUF (2)	Lane Volume (1) X (2) = (3)	Opposing Lefts (4)	LUF (5)	Opposing CLV (4)X(5) = (6)	CLV (5)+(6)=(7)
	NBT	1,452	0.4	581	5	1	5	586
	WBL	52	1.00	52	0	1.00	0	52

Remarks:
Right turns with a dedicated lane >150 ft are excluded

Critical Lane Volume

Total	638
LOS	A
V/C	0.40

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 Diverge

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, No Mitigation											
SBL	2020	AM	F	3	165	85	1.00	85	3.9	5.5	137
SBL	2020	PM	D	3	135	190	1.00	190	7.1	10.0	250
800 feet of storage available (approximately)											
WBL	2020	AM	F	3	165	502	1.00	502	23.0	32.2	806
WBL	2020	PM	D	3	135	752	1.00	752	28.2	39.5	987
450 feet of storage available (approximately)											
NBT	2020	AM	F	3	165	1911	0.55	1051	48.2	67.5	1686
NBT	2020	PM	D	3	135	894	0.55	491	18.4	25.8	645
950 feet of storage available (approximately) before NBT blocks NBR bypass lane at the Church Driveway											
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and MD 231

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, No Mitigation											
NBL	2020	AM	B	5	100	333	0.60	200	5.6	7.8	194
NBL	2020	PM	D	5	135	252	0.60	151	5.7	8.0	199
400 feet of storage available (approximately)											
SBL	2020	AM	B	5	100	77	0.60	46	1.3	1.8	45
SBL	2020	PM	D	5	135	66	0.60	40	1.5	2.1	52
400 feet of storage available (approximately)											
EBL	2020	AM	B	5	100	414	0.60	248	6.9	9.7	242
EBL	2020	PM	D	5	135	440	0.60	264	9.9	13.9	347
385 feet of storage available (approximately)											
WBL	2020	AM	B	5	100	67	0.60	40	1.1	1.6	39
WBL	2020	PM	D	5	135	158	0.60	95	3.6	5.0	124
360 feet of storage available (approximately)											
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and Calvert Beach Road

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, No Mitigation											
NBL	2020	AM	B	5	100	39	1.00	39	1.1	1.5	38
NBL	2020	PM	D	5	135	98	1.00	98	3.7	5.1	129
500 feet of storage available (approximately)											
SBL	2020	AM	B	5	100	33	1.00	33	0.9	1.3	32
SBL	2020	PM	D	5	135	71	1.00	71	2.7	3.7	93
575 feet of storage available (approximately)											
EBTL	2020	AM	B	5	100	75	1.00	75	2.1	2.9	73
EBTL	2020	PM	D	5	135	76	1.00	76	2.9	4.0	100
300 feet of storage available (approximately) before EBTL blocks the EBR bypass lane											
WBTL	2020	AM	B	5	100	149	1.00	149	4.1	5.8	145
WBTL	2020	PM	D	5	135	186	1.00	186	7.0	9.8	244
350 feet of storage available (approximately) before WBTL blocks the WBR bypass lane											
NBT	2020	AM	B	5	100	1541	0.55	848	23.5	33.0	824
NBT	2020	PM	D	5	135	1223	0.55	673	25.2	35.3	883
SBT	2020	AM	B	5	100	1376	0.55	757	21.0	29.4	736
SBT	2020	PM	B	5	135	1747	0.55	961	36.0	50.4	1261
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and Calvert Cliffs Parkway

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, No Mitigation											
SBL	2020	AM	A	3	100	59	1.00	59	1.6	2.3	57
SBL	2020	PM	A	3	100	5	1.00	5	0.1	0.2	5
600 feet of storage available (approximately)											
WBL	2020	AM	A	3	100	42	1.00	42	1.2	1.6	41
WBL	2020	PM	A	3	100	52	1.00	52	1.4	2.0	51
400 feet of storage available (approximately) before WBL blocks the WBR bypass lane											
NBT	2020	AM	A	3	100	1628	0.55	895	24.9	34.8	871
NBT	2020	PM	A	3	100	1452	0.55	799	22.2	31.1	776
2950 feet available prior to White Sands Drive (approximately)											
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and White Sands Drive

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, No Mitigation											
NBL	2020	AM	A	3	100	17	1.00	17	0.5	0.7	17
NBL	2020	PM	C	3	120	86	1.00	86	2.9	4.0	100
550 feet of storage available (approximately)											
EBTL	2020	AM	A	3	100	137	1.00	137	3.8	5.3	133
EBTL	2020	PM	C	3	120	82	1.00	82	2.7	3.8	96
80 feet of storage available (approximately)											
SBT	2020	AM	A	3	100	1238	0.55	681	18.9	26.5	662
SBT	2020	PM	C	3	120	2030	0.55	1117	37.2	52.1	1303
2950 feet available prior to Calvert Cliffs Parkway (approximately)											
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and Nursery Road

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, No Mitigation											
SBL	2020	AM	A	3	100	7	1.00	7	0.2	0.3	7
SBL	2020	PM	C	3	120	0	1.00	0	0.0	0.0	0
570 feet of storage available (approximately)											
(yellow)	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and Pardoe Road

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, No Mitigation											
SBL	2020	AM	B	5	100	118	1.00	118	3.3	4.6	115
SBL	2020	PM	B	5	100	182	1.00	182	5.1	7.1	177
570 feet of storage available (approximately)											
NBL	2020	AM	B	5	100	11	1.00	11	0.3	0.4	11
NBL	2020	PM	B	5	100	21	1.00	21	0.6	0.8	20
600 feet of storage available (approximately)											
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and Cove Point Road

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, No Mitigation											
SBL	2020	AM	A	3	100	96	1.00	96	2.7	3.7	93
SBL	2020	PM	C	3	120	410	1.00	410	13.7	19.1	478
550 feet of storage available (approximately)											
WBL	2020	AM	A	3	100	171	1.00	171	4.8	6.7	166
WBL	2020	PM	C	3	120	149	1.00	149	5.0	7.0	174
300 feet of storage available (approximately)											
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2 and MD 4

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, with Mitigation											
Concept 2											
SBL	2020	AM	D	3	135	85	1.00	85	3.2	4.5	112
SBL	2020	PM	C	3	120	190	1.00	190	6.3	8.9	222
800 feet of storage available (approximately)											
WBL	2020	AM	D	3	135	502	0.45	226	8.5	11.9	297
WBL	2020	PM	C	3	120	752	0.45	338	11.3	15.8	395
600 feet of storage available (approximately)											
NBT	2020	AM	D	3	135	1911	0.55	1051	39.4	55.2	1380
NBT	2020	PM	C	3	120	894	0.55	491	16.4	22.9	573
950 feet of storage available (approximately) before NBT blocks NBR bypass lane at the Church Driveway											
SBT	2020	AM	D	3	135	819	0.40	328	12.3	17.2	430
SBT	2020	PM	C	3	120	2337	0.40	935	31.2	43.6	1091
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2 and MD 4

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, with Mitigation											
Concept 1											
SBL	2020	AM	D	3	135	85	1.00	85	3.2	4.5	112
SBL	2020	PM	D	3	135	190	1.00	190	7.1	10.0	250
800 feet of storage available (approximately)											
WBL	2020	AM	D	3	135	502	0.60	301	11.3	15.8	396
WBL	2020	PM	D	3	135	752	0.60	451	16.9	23.7	592
800 feet of storage available (approximately)											
NBT	2020	AM	D	3	135	1911	0.55	1051	39.4	55.2	1380
NBT	2020	PM	D	3	135	894	0.55	491	18.4	25.8	645
950 feet of storage available (approximately) before NBT blocks NBR bypass lane at the Church Driveway											
SBT	2020	AM	D	3	135	819	0.40	328	12.3	17.2	430
SBT	2020	PM	D	3	135	2337	0.40	935	35.1	49.1	1227
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and MD 231

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, with Mitigation											
Option 1											
NBL	2020	AM	B	5	100	333	0.60	200	5.6	7.8	194
NBL	2020	PM	B	5	100	252	0.60	151	4.2	5.9	147
400 feet of storage available (approximately)											
SBL	2020	AM	B	5	100	77	0.60	46	1.3	1.8	45
SBL	2020	PM	B	5	100	66	0.60	40	1.1	1.5	38
400 feet of storage available (approximately)											
EBTL	2020	AM	B	5	100	543	0.45	245	6.8	9.5	238
EBTL	2020	PM	B	5	100	558	0.45	251	7.0	9.8	244
385 feet of storage available (approximately)											
WBTL	2020	AM	B	5	100	155	0.45	70	1.9	2.7	68
WBTL	2020	PM	B	5	100	303	0.45	137	3.8	5.3	133
360 feet of storage available (approximately)											
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and MD 231

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, with Mitigation											
Option 2											
NBL	2020	AM	B	5	100	333	0.60	200	5.6	7.8	194
NBL	2020	PM	C	5	120	252	0.60	151	5.0	7.1	177
400 feet of storage available (approximately)											
SBL	2020	AM	B	5	100	77	0.60	46	1.3	1.8	45
SBL	2020	PM	C	5	120	66	0.60	40	1.3	1.8	46
400 feet of storage available (approximately)											
EBTL	2020	AM	B	5	100	543	0.45	245	6.8	9.5	238
EBTL	2020	PM	C	5	120	558	0.45	251	8.4	11.7	293
385 feet of storage available (approximately)											
WBTL	2020	AM	B	5	100	155	0.45	70	1.9	2.7	68
WBTL	2020	PM	C	5	120	303	0.45	137	4.6	6.4	159
360 feet of storage available (approximately)											
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and MD 231

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, with Mitigation											
Option 3											
NBL	2020	AM	B	5	100	333	0.60	200	5.6	7.8	194
NBL	2020	PM	C	5	120	252	0.60	151	5.0	7.1	177
400 feet of storage available (approximately)											
SBL	2020	AM	B	5	100	77	0.60	46	1.3	1.8	45
SBL	2020	PM	C	5	120	66	0.60	40	1.3	1.8	46
400 feet of storage available (approximately)											
EBL	2020	AM	B	5	100	414	0.60	248	6.9	9.7	242
EBL	2020	PM	C	5	120	440	0.60	264	8.8	12.3	308
385 feet of storage available (approximately)											
WBL	2020	AM	B	5	100	67	0.60	40	1.1	1.6	39
WBL	2020	PM	C	5	120	158	0.60	95	3.2	4.4	111
360 feet of storage available (approximately)											
WBTR	2020	AM	B	5	100	102	0.55	56	1.6	2.2	55
WBTR	2020	PM	C	5	120	170	0.55	94	3.1	4.4	109
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and Calvert Beach Road

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, with Mitigation											
NBL	2020	AM	A	5	100	39	1.00	39	1.1	1.5	38
NBL	2020	PM	B	5	100	98	1.00	98	2.7	3.8	95
500 feet of storage available (approximately)											
SBL	2020	AM	A	5	100	33	1.00	33	0.9	1.3	32
SBL	2020	PM	B	5	100	71	1.00	71	2.0	2.8	69
575 feet of storage available (approximately)											
EBTL	2020	AM	A	5	100	75	1.00	75	2.1	2.9	73
EBTL	2020	PM	B	5	100	76	1.00	76	2.1	3.0	74
300 feet of storage available (approximately) before EBTL blocks the EBR bypass lane											
WBTL	2020	AM	A	5	100	149	1.00	149	4.1	5.8	145
WBTL	2020	PM	B	5	100	186	1.00	186	5.2	7.2	181
350 feet of storage available (approximately) before WBTL blocks the WBR bypass lane											
NBT	2020	AM	A	5	100	1541	0.4	616	17.1	24.0	599
NBT	2020	PM	B	5	100	1223	0.4	489	13.6	19.0	476
											0
SBT	2020	AM	A	5	100	1376	0.4	550	15.3	21.4	535
SBT	2020	PM	B	5	100	1747	0.4	699	19.4	27.2	679
	Queue length exceeds available storage										

Maryland SHA Queuing Analysis

Location: MD 2/MD 4 and Calvert Cliffs Parkway

Scenario	Year	Peak Hour	Level of Service	Number of Phases per Cycle	Cycle Length (sec)	Volume	Lane Use Factor	Critical Lane Volume	Average Vehicles per Cycle per Lane	Maximum Vehicles per Cycle per Lane	Max Queue Length per Cycle per Lane (ft)
Future No-Build, 2020, with Mitigation											
SBL	2020	AM	A	3	100	59	1.00	59	1.6	2.3	57
SBL	2020	PM	A	3	100	5	1.00	5	0.1	0.2	5
600 feet of storage available (approximately)											
WBL	2020	AM	A	3	100	42	1.00	42	1.2	1.6	41
WBL	2020	PM	A	3	100	52	1.00	52	1.4	2.0	51
400 feet of storage available (approximately) before WBL blocks the WBR bypass lane											
NBT	2020	AM	A	3	100	1628	0.4	651	18.1	25.3	633
NBT	2020	PM	A	3	100	1452	0.4	581	16.1	22.6	565
2950 feet available prior to White Sands Drive (approximately)											
	Queue length exceeds available storage										

Appendix B
CCNPP Employee Demographics

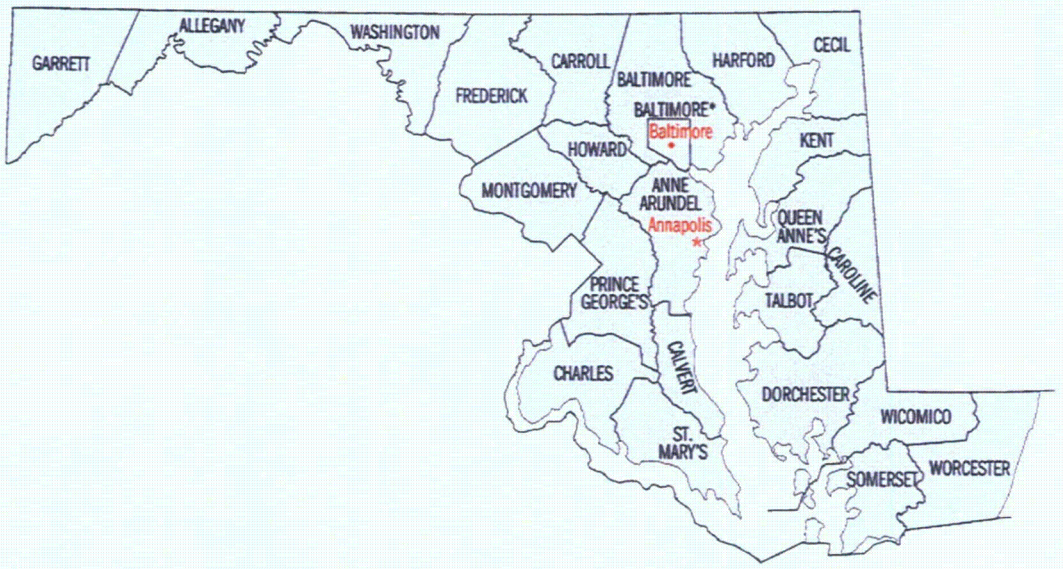


Figure B1 – Maryland County Map

Table B1– Power Plant Employees with Contractors – By County

# Employees	Origin County	Site Approach	
		NB MD 2/4	SB MD 2/4
27	Anne Arundel		27
4	Baltimore		4
562	Calvert	281	281
2	Howard		2
6	Prince Georges		6
1	Alleghany		1
30	Charles		30
198	St Mary	139	59
1	Washington		1
2	Out of State		2
833		420	412
Overall %		**50.4%**	**49.6%**

Table B2– Power Plant Employees Only– By County

# Employees	Origin County	Site Approach	
		NB MD 2/4	SB MD 2/4
24	Anne Arundel		24
3	Baltimore		3
523	Calvert	262	262
2	Howard		2
4	Prince Georges		4
1	Alleghany		1
29	Charles		29
186	St Mary	130	56
1	Washington		1
2	Out of State		2
775		392	382
Overall %		**50.6%**	**49.4%**