



symmetra design

Matthews Memorial Terrace Project

Washington, DC

Traffic Impact Study

December 5, 2008



1152 15th Street, NW
Suite 935
Washington, D.C 20005
Phone: 202-370-6000
Fax: 202-370-6001
www.symmetradesign.com

ZONING COMMISSION
District of Columbia
CASE NO.08-25
EXHIBIT NO.14B

INTRODUCTION

The following report is a Traffic Impact Study for the proposed Matthews Memorial Terrace Project located at 2616 Martin Luther King Jr. Avenue (MLK Avenue), Southeast Washington, D.C. Figure 1 shows the project Site Location Map.

The proposed Matthews Memorial Terrace project is planned to be located on a portion of the Matthews Memorial Church existing parking lot and the site of the existing vacant dilapidated rowhouses. Figure 2 shows the Aerial Site Map.

The Matthews Memorial Terrace is planned to include a 99 unit residential building (32 senior units and 67 affordable units) and a 13,086 square foot Community Building with spaces for a bookstore/coffee shop, restaurant, church outreach, social and health services. The project will also include 61 parking spaces (50 garage and 11 surface parking spaces). The project is planned to be complete in 2010.

Scope of Study

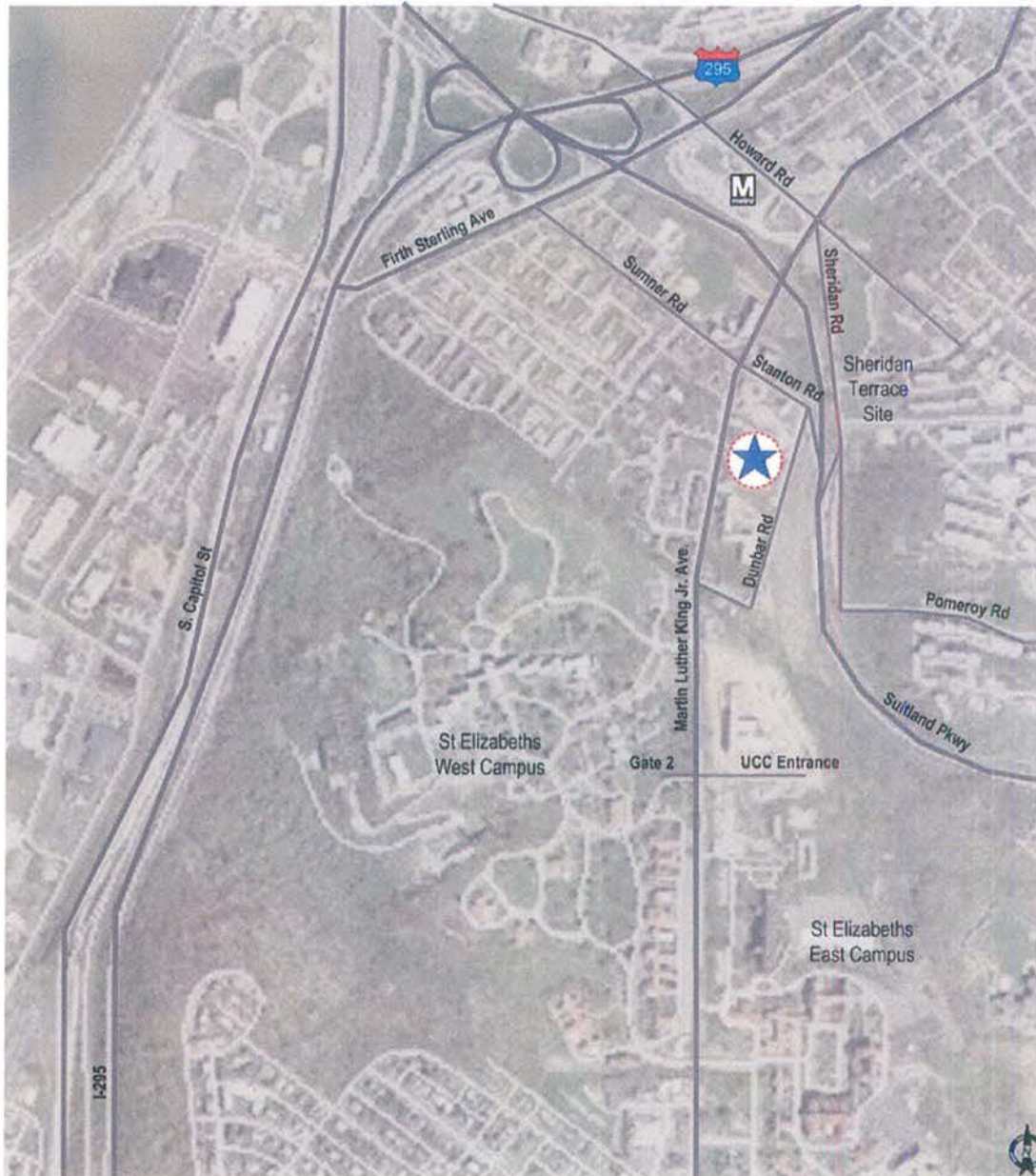
This study includes an assessment of existing and future traffic conditions for AM and PM peak hours. The study area for this project was confirmed by the District Department of Transportation (DDOT) and includes the following intersections:

- MLK Avenue)/ Howard / Sheridan Roads
- MLK Avenue/ Stanton / Sumner Roads
- MLK Avenue/ Unified Communication Center (UCC)/ St Elizabeths West Campus Gate 2

This study also includes report sections on parking, loading operations, transportation management, transit, pedestrian and bicycle conditions.



Figure 1
Site Location



SITE LOCATION

LEGEND: — Road Network ★ Matthews Memorial Terrace

Figure 2
Aerial Site Map



AERIAL SITE MAP

EXISTING CONDITIONS

Roadway Network

The roadways included as part of the Matthews Memorial Terrace study area are described below:

- **Martin Luther King Junior Avenue (MLK Jr. Ave)** is a four-lane urban minor arterial that runs north-south from the 11th Street Bridge to South Capitol Street. The speed limit is 30 miles per hour within the study area. Adjacent to the site, parking is prohibited along the northbound side of the street from 7:00am to 9:30am and along the southbound side of the street from 4:00pm to 6:30pm.

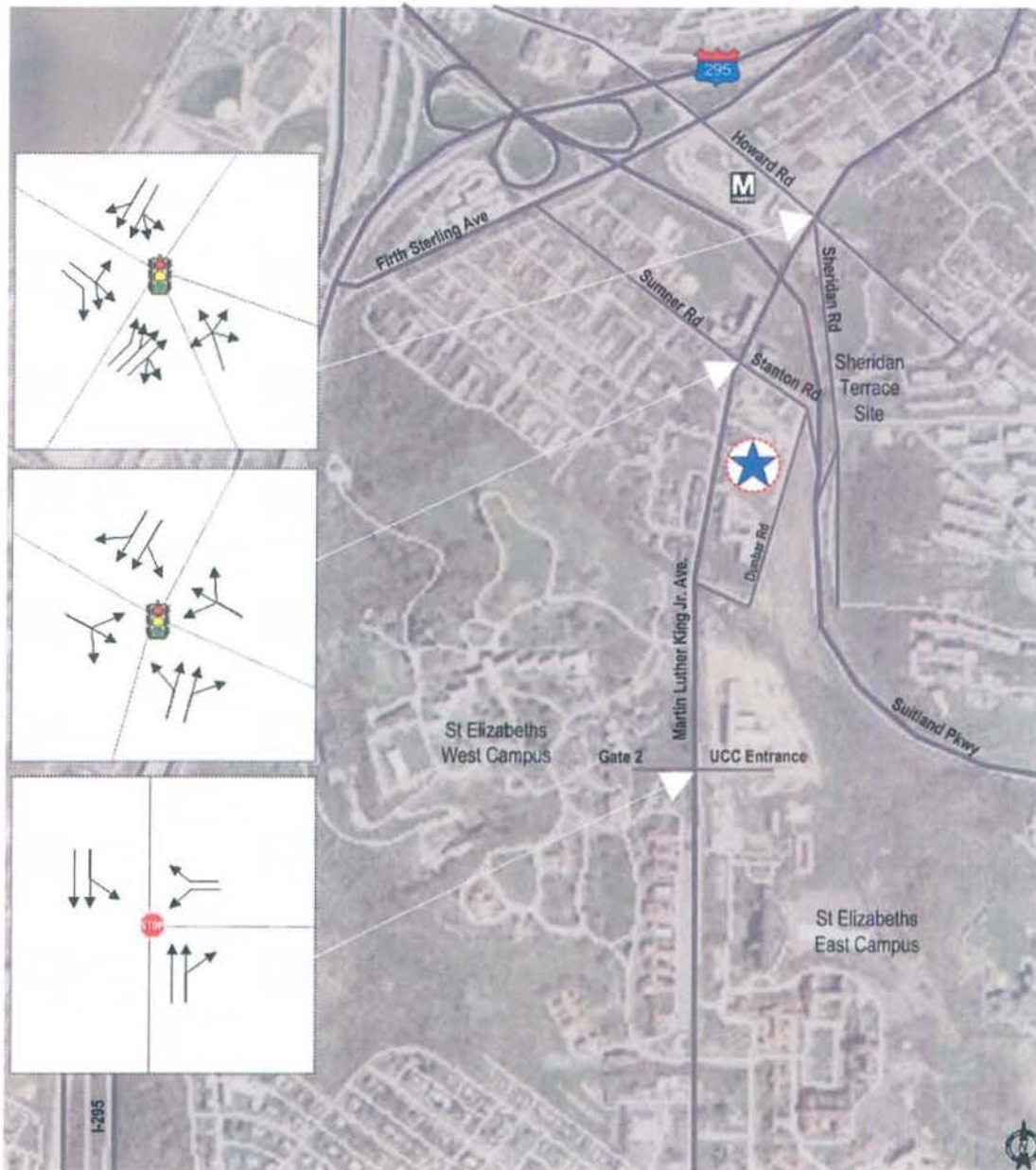
- **Howard Road** is a four-lane collector road that runs east-west from Bowen Road to South Capitol Street. Howard Road is one-way (eastbound direction) east of MLK Jr. Avenue. Howard Road provides access to the Anacostia Metrorail station and garage. The speed limit along Howard Road is 25 miles per hour.
- **Sheridan Road** is a two-lane, two-way collector road that runs east-west from Pomeroy Road to MLK Jr. Avenue and Howard Road. In the study area Sheridan Road provides access for westbound traffic going to MLK Jr. Avenue and Howard Road.
- **Sumner Road** is a two lane, two-way local road that runs east-west from MLK Jr. Avenue to Firth Sterling Avenue.
- **Stanton Road** is a two-lane, two-way collector road that runs east-west from Suitland Parkway to MLK Jr. Avenue. In the study area Stanton Road provides direct access from the site for eastbound traffic going to Suitland Parkway.
- **Dunbar Road** is a local road that runs north-south from Stanton Road to Pomeroy Road. Dunbar Road provides alternate access (in addition to MLK Jr. Ave) to Matthews Memorial Church via a controlled¹ gate (See Figure 2). Just south of the controlled gate the road is blocked to vehicular traffic with a DDOT installed jersey wall (See Figure 2 for approximate road block location).

The roadway network and intersection lane configurations are shown schematically in Figure 3.

¹ Matthews Memorial Church controls the gate access. The gate is typically only open during church events.



Figure 3
Existing Roadway Network and Lane Configuration



EXISTING ROADWAY NETWORK LANE CONFIGURATION

LEGEND: — Road Network ★ Matthews Memorial Terrace ↑↑ Lane Configuration

Traffic Volumes and Field Observations

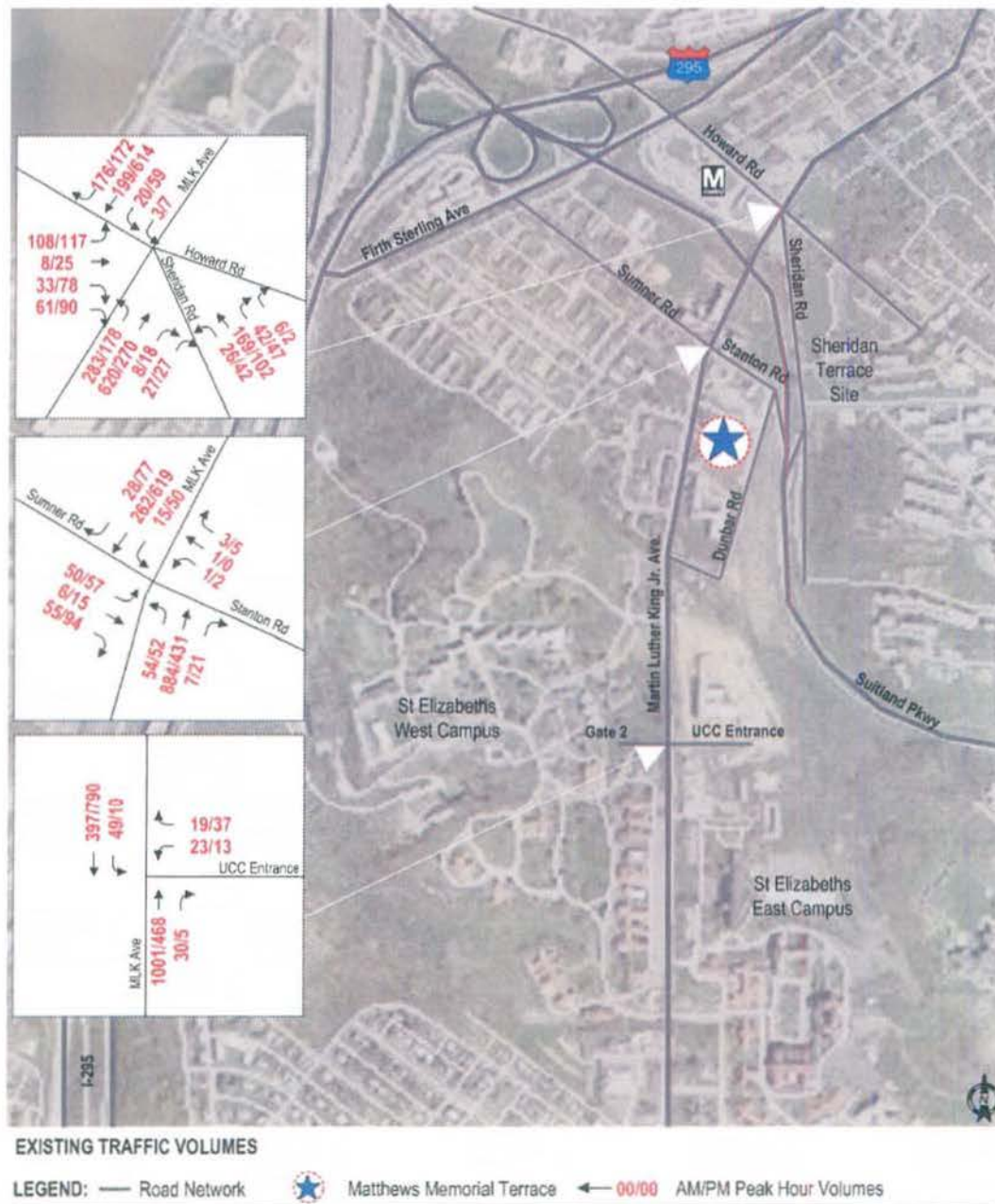
Traffic data at the MLK Jr. Avenue/ UCC Daycare Entrance/ Gate 1 was counted in March 2008. Previous existing traffic data counted in May 2005 at the other two study area intersections were comparable² to the 2008 data and were used as existing conditions data.

Existing turning movement traffic data for the study area intersections during the AM and PM peak hours is shown on Figure 4. Field observations revealed traffic operated under good conditions during both the AM and PM peak periods at the study area intersections. The peak hours of traffic were found to be 7:00 to 8:00 AM and 4:45 to 5:45 PM for the study area intersections.

² 2008 Through traffic volumes were actually less than the 2005 volumes



Figure 4
Existing Traffic Volumes



Capacity Analysis

Existing conditions Level of Service (LOS) capacity analyses were conducted for the three study-area intersections using SYNCHRO 6 software. Capacity analyses results can range from LOS "A" (best) to LOS "F" (worst) based on the average delay experienced by motorists. LOS "D" and "E" are typically accepted by the District Department of Transportation (DDOT) as the delay threshold limits for intersections.

The results of the LOS analyses are summarized in Table 1 below:

Table 1
Existing Conditions Level of Service

	AM Peak		PM Peak	
	Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
MLK Jr. Ave/ Howard Rd/ Sheridan Rd	C	32.1	E	56.1
MLK Jr. Ave/ Stanton Rd/ Sumner Rd	A	8.5	B	11.5
MLK Jr. Ave/ UCC Daycare Entrance*	D	30.3	B	12.7

* Unsignalized intersection - LOS reflects worst minor approach

As Table 1 indicates, all the study area intersections operate at acceptable Levels of Service during both the AM and PM peak hours.

Pedestrian and Bicycle Access

Martin Luther King Jr. Avenue provides direct pedestrian access to the proposed site. There are crosswalks at each of the intersections and sidewalks along the roadways in the study area, providing access to and from the proposed site.

The District Department of Transportation's (DDOT) January 2008 Bicycle Map shows signed bicycle routes along Howard and Sheridan Roads and along MLK Jr. Avenue, north of Howard Road/ Sheridan Road intersection.

Local Transit

The study area is served by eleven Metrobus routes, the Anacostia – Congress Heights Lines (A2, 6, 7, 8, 42, 46, 48), the Anacostia – Fort Drum Lines (A4, 5), and the Southeast Community Hospital – Anacostia Lines (W2, 3).



The origin and destination of the nine Metrobus routes that serve the area are as follows:

- A2 – Southern Ave Metro Station to Anacostia Metro Station
- A4, 5 – DC Village to Anacostia Metro Station
- A6 – 6th St & Galveston Pl SE to Anacostia Metro Station
- A7, 8 – Southern Ave & South Capitol St to Anacostia Metro Station
- A42 – Southern Ave Metro Station to 10th St & Pennsylvania Ave NW (Archives)
- A48 – 6th St & Galveston Pl SE to 10th St & Pennsylvania Ave NW (Archives)
- A48 – Southern Ave & South Capitol St to 10th St & Pennsylvania Ave NW (Archives)
- W2, 3 – Southeast Community Hospital to Washington Overlook

The A2, 4, 6, 8, 42, 46, 48 and W2 buses serve the area seven days a week, the W3 bus serves the area from Monday to Saturdays and the A5 and 7 buses serve the area only on weekdays.

The closest metrorail station within the site vicinity is the Anacostia Station on the Washington Metropolitan Area Transit Authority (WMATA) green line. The Anacostia Station is located on Howard Road between MLK Jr. Avenue and Firth Sterling Avenues approximately a third of a mile away from the Matthews Memorial Terrace.

BACKGROUND CONDITIONS

Background Conditions traffic analyses include traffic associated with other planned and approved developments in the vicinity of the project site and does not include traffic associated with the Matthews Memorial Terrace project.

The Sheridan Terrace was considered as a background project for this study. The Sheridan Terrace Project is located on Sheridan Road, SE between Howard and Pomeroy Roads, SE (See Figure 1). The Sheridan Terrace project is a mixed-income residential development with a total of 342 units including 56 Single Family Units (SF), 182 Townhouse units (TH), and 104 Apartment Units (APT).

Traffic associated with the Sheridan Terrace development was generated by using the trip generation rates presented in *The Institute of Transportation Engineers' Trip generation Manual, 7th Edition* (Land Use Codes 210 – Single Family, 220 – Apartment and 230 – Residential Condominiums/Townhouse). These trips were reduced by applying a 42 percent transit factor based on percentage calculations presented in the *Washington Metropolitan Area Transit Authority's (WMATA) Development Related Ridership Survey* due to its proximity to the Anacostia Metro Station on the Green Line. Trips associated with this development are listed in Table 2.



Table 2
Trips Generated by Background Developments

	Development Type	AM Peak			PM Peak		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Sheridan Terrace	56 SF/ 182 TH/ 104 APT	24	78	102	96	58	154

In addition to traffic associated with the Sheridan Terrace project, existing traffic volumes are also expected to increase in the future as a result of regional growth. A conservative growth rate of one percent (1%) per annum was applied to through traffic volumes on MLK Jr. Avenue.

In addition to the Sheridan Terrace project (included in background conditions), a number of long-term development projects are currently being planned in the Anacostia/Congress Heights areas. These projects include the proposed Barry Farm Redevelopment scheduled to be completed by 2018, the St. Elizabeths West Campus project expected to be fully occupied by 2016 and the Riverview Plaza (Phase 1) planned to be completed by 2012. Additionally, DDOT is planning a number of transportation infrastructure projects in the area that will improve traffic capacity and accessibility. These projects include a new interchange at MLK Avenue and Suitland Parkway (planned to be complete in 2010) which would provide more direct regional access to the project in future.

DDOT is examining the cumulative impacts of these and other projects as part of its Anacostia Waterfront Initiative Transportation Master Plan

Future background traffic volumes for 2010 are shown in Figure 5. Future Background traffic analysis results are summarized in Table 3.

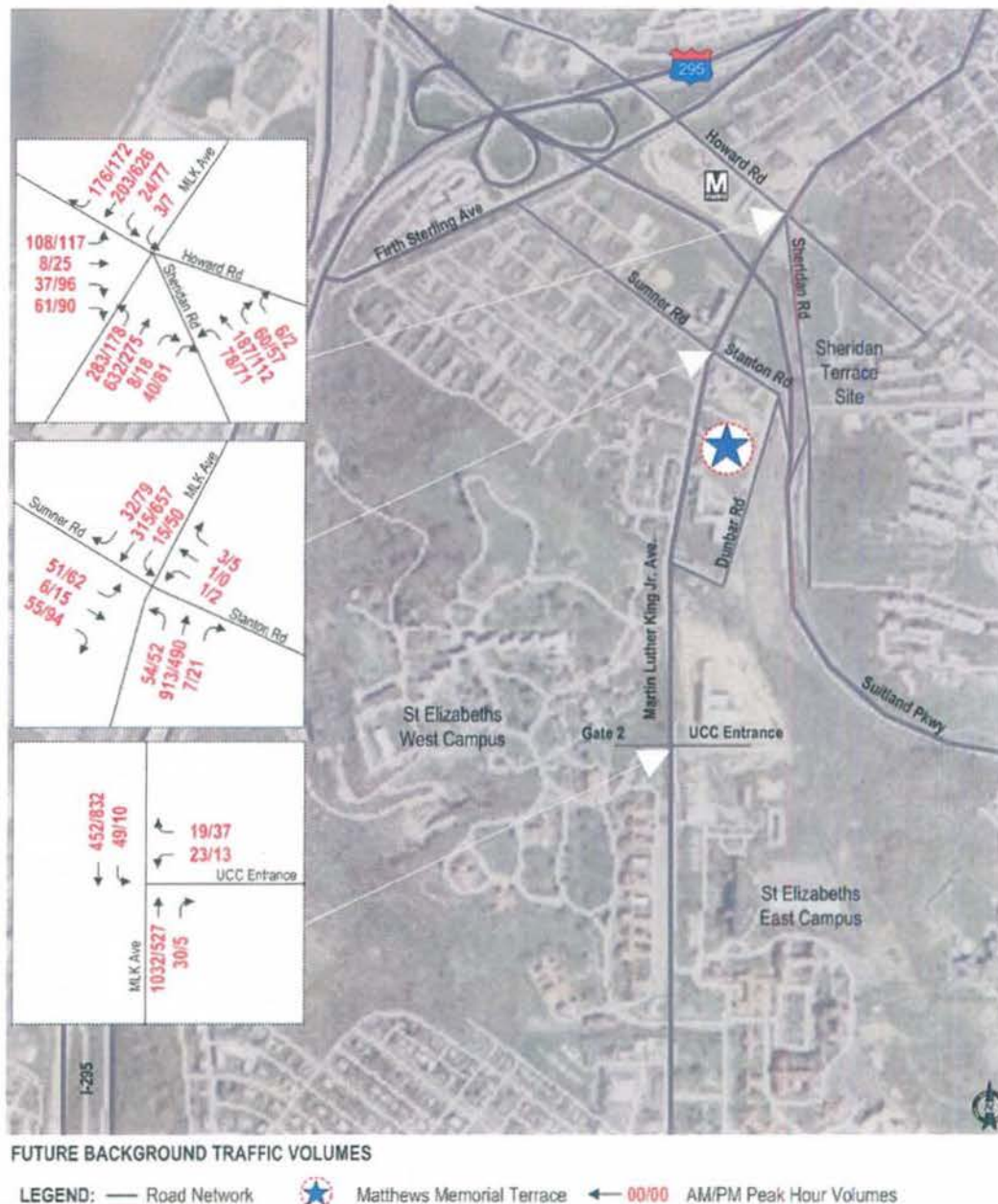
Table 3
Future Background Conditions Level of Service

	AM Peak		PM Peak	
	Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
MLK Jr. Ave/ Howard Rd/ Sheridan Rd	D	43.0	E	75.5
MLK Jr. Ave/ Stanton Rd/ Sumner Rd	A	8.4	B	11.6
MLK Jr. Ave/ UCC Entrance*	D	33.4	B	13.5

* Unsignalized intersection - LOS reflects worst minor approach

As Table 3 indicates, all the study area intersections are projected to operate at acceptable Levels of Service during both the AM and PM peak hours.

Figure 5
Future Background Traffic Volumes



FUTURE CONDITIONS

Site Access and Circulation

Primary access to the Matthews Memorial Terrace project will be provided via MLK Jr. Avenue. The access would provide two-way operations for both residents and community building users. As a result the existing 12 foot driveway would need to be widened to 20 feet. It should be noted that the project would eliminate two existing curb cuts on MLK Jr. Avenue that currently serve the vacant homes.

Currently, the MLK Jr. Avenue driveway to the Matthews Memorial Terrace project serves as the one-way outbound driveway from the church parking lot. The project proposes widening the driveway to two-way operations. In the future, the driveway would serve the Matthews Memorial Terrace project as well as the Matthews Memorial Church. The one-way inbound driveway located just north on MLK Jr. Avenue would also continue to provide one-way inbound access to the church in the future. All church egress would occur at the newly widened southern MLK Jr. Avenue driveway.

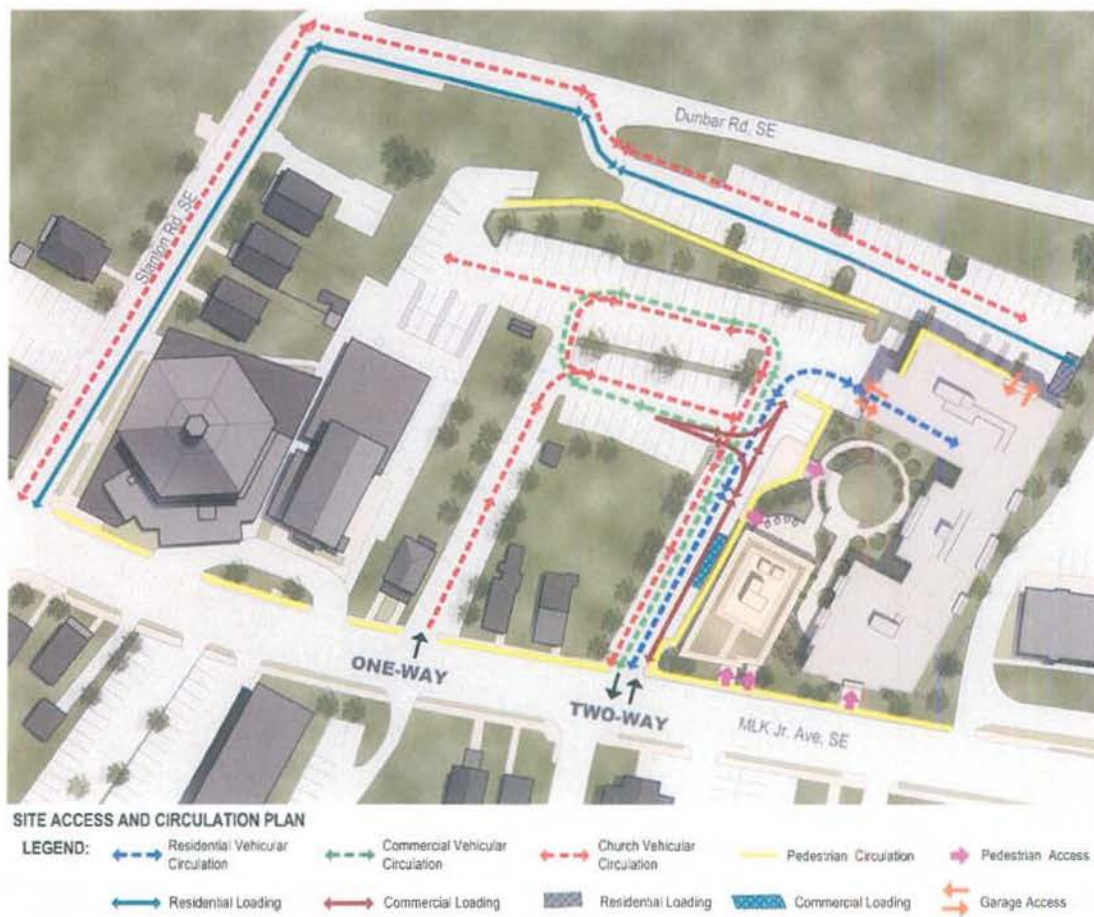
The MLK Jr. Avenue driveway will also serve as the point of access for delivery and trash trucks associated with the community building. Delivery and trash trucks serving the residential portion of the project will access the site from Dunbar Road via a gated driveway³. Figure 6 shows the Site Access and Circulation Plan.

NOTE: It is assumed that Dunbar Road would continue to be blocked by DDOT in the future. The road block would not impact the planned residential delivery access that would be controlled by the property manager.

³ The Dunbar Road driveway will be secured with a roll down door and controlled by the property management.



Figure 6
Site Access and Circulation Plan



Future Traffic Conditions

Future Conditions traffic analyses include traffic associated with the Matthews Memorial Terrace project plus other planned projects in the area (i.e. Background Conditions). *The Institute of Transportation Engineers' Trip Generation Manual, 7th Edition* (Land Use Codes 220 - Apartment, 252 - Senior Adult Housing -Attached, 560 - Church, 715 - Single Tenant Office Building and 932 - High-Turnover, Sit-Down Restaurant) was used to generate traffic associated with the proposed development. Since the Matthews Memorial Terrace project will be located approximately 0.3 miles from the Anacostia Metro Station on the Green Line, 40 percent transit reduction was applied to residential vehicular trips and 20 percent to office building vehicular trips. The transit reduction factor is based on percentage calculations

presented in the *Washington Metropolitan Area Transit Authority's (WMATA) Development Related Ridership Survey II*. Table 4 shows the trips associated with the Matthews Memorial Terrace project.

Table 4
Trips Generated by Matthews Memorial Terrace

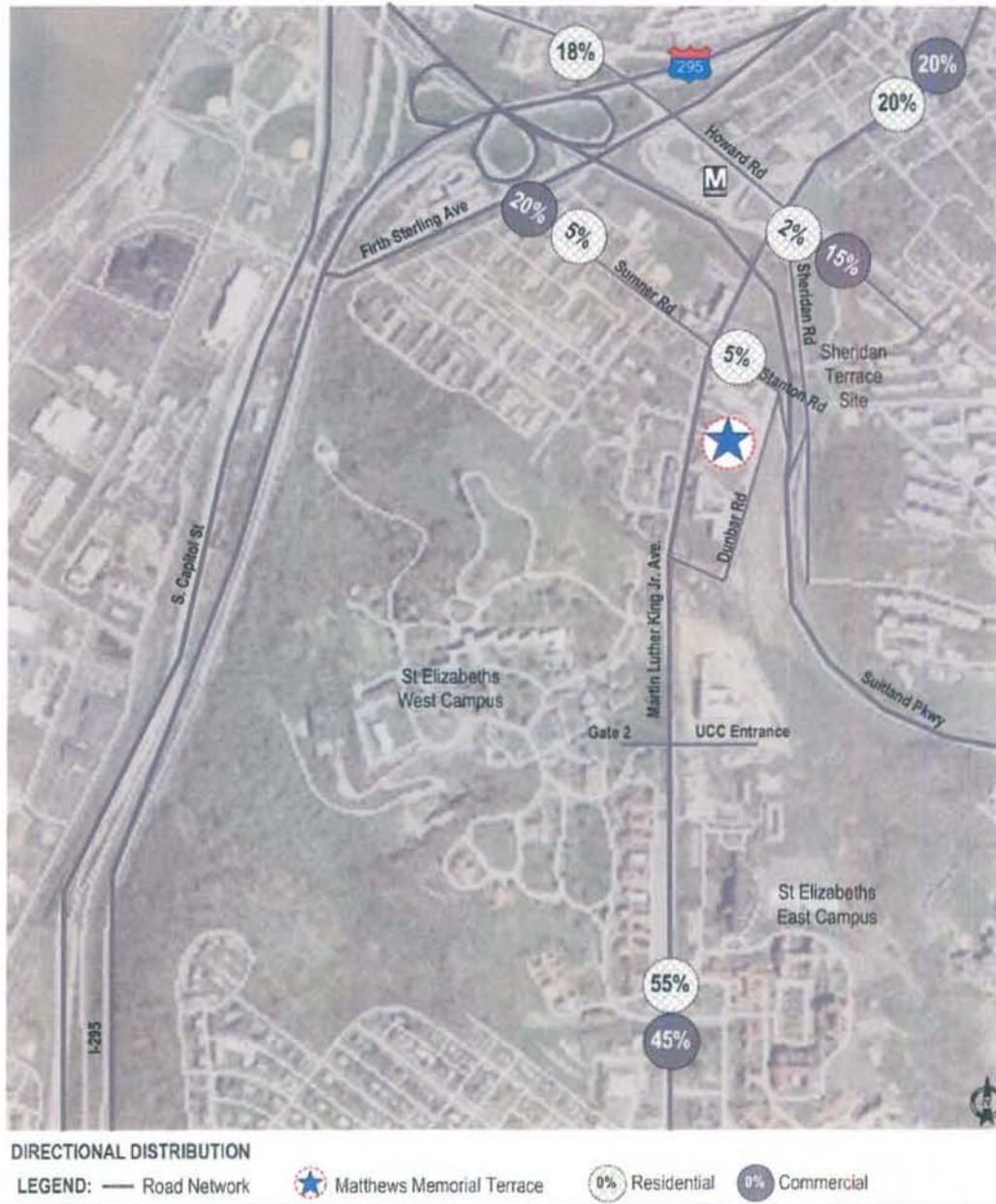
	AM Peak Generation			PM Peak Generation		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Residential Building						
67 Apartment Units - Code 220	8	32	40	38	21	59
32 Senior Adult Units – Code 252						
40% Residential Transit Reduction	-3	-13	-16	-15	-9	-24
Subtotal Trips w/ 40% transit reduction	5	19	24	23	12	35
Community Building (13,086 square feet)						
4362 SF: Restaurant/Kitchen/Private Room - Code 932,						
2700 SF: Community Center - Code 560 and	56	29	85	37	57	94
6024 SF: Clinic/Social Services/Bookstore - Code 715 (w/ 20% transit reduction)						
Transit Reduction	-6	-1	-7	-2	-7	-9
Subtotal Trips w/ transit reduction	50	28	78	35	50	85
Total	55	47	102	58	62	120

Note: Square footage used to calculate trip generation is based on calculated GFA (including pro-rated share of common areas and demising walls) and therefore does not exactly match the square footage shown for each individual use in the site plan

As Table 4 indicates, the Matthews Memorial Terrace project would generate 102 AM and 120 PM total peak hour trips. The trips were distributed throughout the road network using the directional distribution shown in Figure 7. This directional distribution is based on existing traffic patterns and engineering judgment.

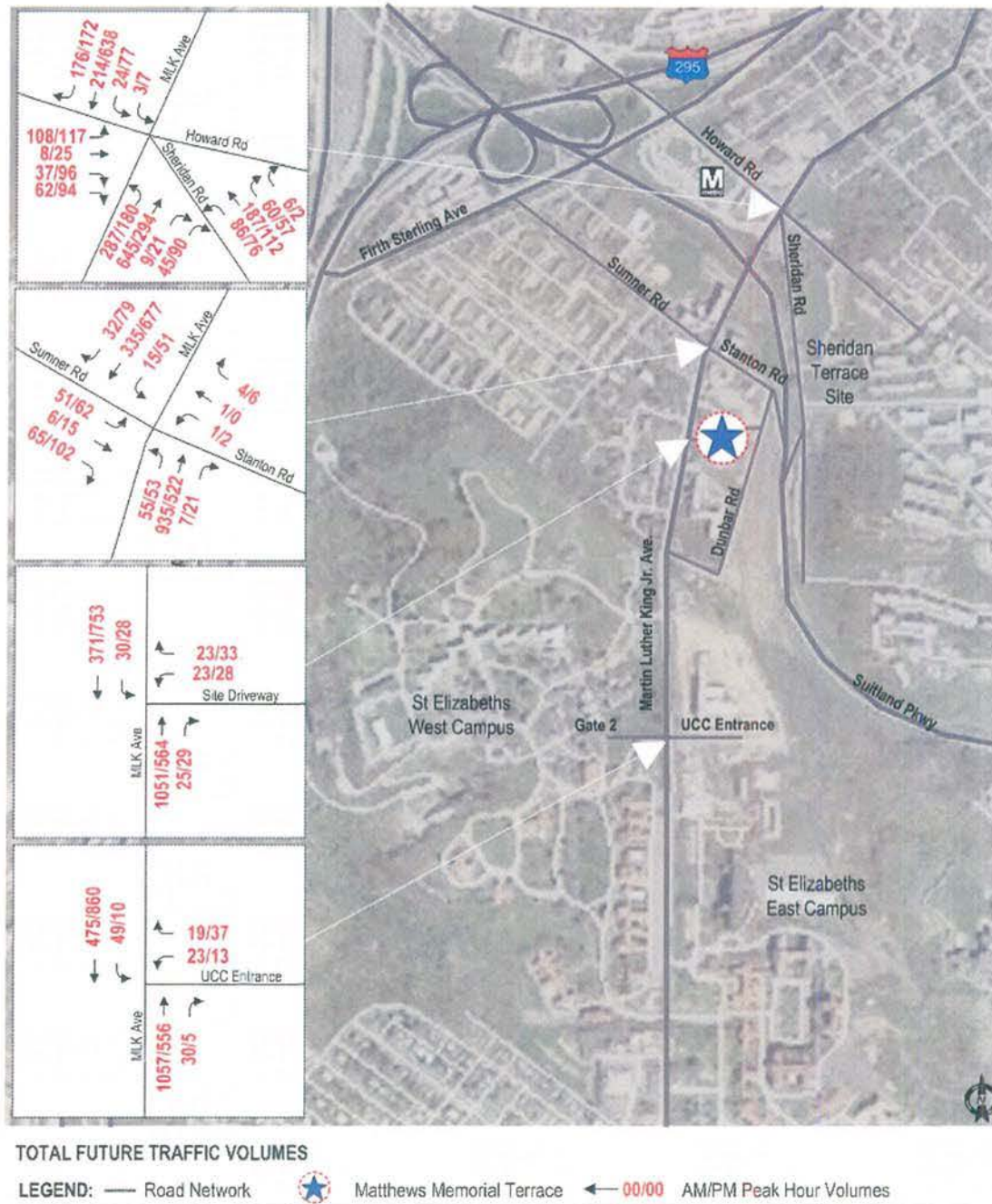


Figure 7
Directional Distribution Percentages



The Site Traffic assignments were added to the Future Background traffic volumes shown on Figure 5 to obtain the Total Future traffic volumes shown on Figure 8.

Figure 8
Total Future Traffic Volumes



Capacity Analysis

Total Future traffic volumes were analyzed using SYNCHRO 6 Software. The results of the analysis are summarized in Table 5.

Table 5
Total Future Conditions Level of Service

	AM Peak		PM Peak	
	Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
MLK Jr. Ave/ Howard Rd/ Sheridan Rd	D	44.8	E	79.7
MLK Jr. Ave/ Stanton Rd/ Sumner Rd	A	8.9	B	12.0
MLK Jr. Ave/ Site Driveway*	D	28.1	C	17.8
MLK Jr. Ave/ UCC Entrance*	E	35.6	B	14.0

* *Unsignalized intersection - LOS reflects worst minor approach*

As Table 5 indicates, all the study area intersections are projected to operate at acceptable Levels of Service during both the AM and PM peak hours.

As part of the St. Elizabeths West Campus EIS improvements the MLK Jr. Avenue/ UCC Entrance would be signalized and MLK Jr. Avenue will be widened to allow for left turn lanes on to the St. West Elizabeths Campus and into UCC. The proposed signal and turn lane will improve operations at this intersection in the future.

Parking

The Matthews Memorial Terrace project will provide 50 underground parking spaces for the residential units and 11 surface parking spaces for the community building. The project will displace nine church parking spaces. The project will require relief from the required number of parking spaces.

Transportation Management

The Matthews Memorial Terrace project is in close proximity to the Anacostia Station on the WMATA green line and is located along several bus routes. The project will also provide 19 bicycle spaces for potential bikers as indicated in Figure 6. Residents of the new building will be able to walk to the community building.



Loading Operations

The Matthews Memorial Terrace project will provide two 30 foot deep delivery berths and one 200 square foot combined loading and delivery platform. The residential loading area is located to the southeast side of the building and the commercial loading area is located to the north side of the building as shown in Figure 6.

The MLK Jr. Avenue driveway will serve as the point of access for delivery and trash trucks associated with the community building. Delivery and trash trucks serving the residential portion of the project will access the site from Dunbar Road via a gated driveway.

NOTE: It is assumed that Dunbar Road would continue to be blocked by DDOT in the future. The road block would not impact the planned residential delivery access that would be controlled by the property manager.

CONCLUSIONS

The primary conclusions reported in this study are summarized below:

- All the study area intersections operate at acceptable Levels of Service under Existing Conditions during both the AM and PM peak hours.
- All of the study area intersections will continue to operate at acceptable Level of Service with the addition of Sheridan Terrace and regional background growth (i.e. Background Conditions).
- All of the study area intersections will continue to operate at acceptable Levels of Service with the addition of the proposed Matthews Memorial Terrace project.
- The project will provide 61 parking spaces (50 garage and 11 surface parking spaces). The project will require relief from the required number of parking spaces.
- The project will provide two 30 foot deep delivery berths and one 200 square foot combined loading and delivery platform. The project will require relief from the current Zoning requirement of a 55 foot deep berth.
- The project is located within 0.3 miles from the Anacostia Metrorail Station and will provide convenient access for future residents and community building users. Also the project will provide 19 bicycle spaces to encourage alternative transportation.
- The project will not create adverse impacts with respect to traffic and transportation.



TECHNICAL APPENDIX

Synchro Version 6 Report



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**Existing Conditions
AM and PM Peak Hours**



Signalized Intersection Capacity Analysis - AM Peak Hour
1: Howard Rd & MLK Jr Ave

Existing Conditions
12/2/2008

												
Lane Group	EBL	EBT	EBR	EBR2	NBL2	NBL	NBR	NBR2	NEL	NET	NER	NER2
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	0.95	0.95
Fr _t		0.969		0.850		0.973				0.994		
Flt Protected		0.964				0.962			0.950	0.996		
Satd. Flow (prot)	0	1566	0	1425	0	1569	0	0	1449	3021	0	0
Flt Permitted		0.964				0.962			0.294	0.789		
Satd. Flow (perm)	0	1566	0	1425	0	1569	0	0	449	2393	0	0
Satd. Flow (RTOR)										4		
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Volume (vph)	108	8	33	61	26	169	42	6	283	620	8	27
Adj. Flow (vph)	130	10	36	77	28	184	46	7	337	838	12	29
Lane Group Flow (vph)	0	176	0	77	0	265	0	0	262	954	0	0
Turn Type	Split			pm+ov	Split				pm+pt			
Protected Phases	4	4		5	8	8			5	2		
Permitted Phases				4					2			
Total Split (s)	27.0	27.0	0.0	27.0	29.0	29.0	0.0	0.0	27.0	64.0	0.0	0.0
Act Effct Green (s)		23.0		46.0		25.0			60.0	60.0		
Actuated g/C Ratio		0.19		0.38		0.21			0.50	0.50		
v/c Ratio		0.59		0.14		0.81			0.63	0.72		
Control Delay		53.1		13.0		65.3			25.8	25.9		
Queue Delay		0.0		0.0		0.0			0.0	0.0		
Total Delay		53.1		13.0		65.3			25.8	25.9		
LOS		D		B		E			C	C		
Approach Delay		40.9				65.3				25.9		
Approach LOS		D				E				C		

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 32.1

Intersection LOS: C

Intersection Capacity Utilization 70.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Howard Rd & MLK Jr Ave

 ø2	 ø4	 ø8
64 s	27 s	29 s
 ø5	 ø6	
27 s	37 s	

Signalized Intersection Capacity Analysis - PM Peak Hour
1: Howard Rd & MLK Jr Ave

Existing Conditions
12/2/2008

												
Lane Group	EBL	EBT	EBR	EBR2	NBL2	NBL	NBR	NBR2	NEL	NET	NER	NER2
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	0.95	0.95
Fr _t		0.950		0.850		0.966				0.984		
Fl _t Protected		0.973				0.964			0.950	0.990		
Satd. Flow (prot)	0	1550	0	1425	0	1561	0	0	1449	2972	0	0
Fl _t Permitted		0.973				0.964			0.105	0.539		
Satd. Flow (perm)	0	1550	0	1425	0	1561	0	0	160	1618	0	0
Satd. Flow (RTOR)									8			
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Volume (vph)	117	25	78	90	42	102	47	2	178	270	18	27
Adj. Flow (vph)	141	30	85	114	46	111	51	2	212	365	28	29
Lane Group Flow (vph)	0	256	0	114	0	210	0	0	106	528	0	0
Turn Type	Split			pm+ov	Split				pm+pt			
Protected Phases	4	4		5	8	8			5	2		
Permitted Phases				4					2			
Total Split (s)	25.0	25.0	0.0	16.0	21.0	21.0	0.0	0.0	16.0	54.0	0.0	0.0
Act Effct Green (s)		21.0		33.0		17.0			50.0	50.0		
Actuated g/C Ratio		0.21		0.33		0.17			0.50	0.50		
v/c Ratio		0.79		0.24		0.79			0.45	0.54		
Control Delay		55.8		14.5		62.3			21.3	17.4		
Queue Delay		0.0		0.0		0.0			0.0	0.0		
Total Delay		55.8		14.5		62.3			21.3	17.4		
LOS		E		B		E			C	B		
Approach Delay		43.1				62.3				18.0		
Approach LOS		D				E				B		

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 56.1

Intersection LOS: E

Intersection Capacity Utilization 77.0%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Howard Rd & MLK Jr Ave

 ø2	 ø4	 ø8
54 s	25 s	21 s
 ø5	 ø6	
16 s	38 s	

Signalized Intersection Capacity Analysis - AM Peak Hour
2: Sumner Road & MLK Jr Ave

Existing Conditions
12/2/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								 			 	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.933			0.923			0.998			0.985	
Flt Protected		0.978			0.986			0.997			0.997	
Satd. Flow (prot)	0	1700	0	0	1695	0	0	3522	0	0	3244	0
Flt Permitted		0.866			0.953			0.906			0.860	
Satd. Flow (perm)	0	1505	0	0	1639	0	0	3200	0	0	2798	0
Satd. Flow (RTOR)								3			30	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	1.00	1.00	1.09	1.09	1.00
Volume (vph)	50	6	55	1	1	3	54	884	7	15	262	28
Adj. Flow (vph)	60	6	65	2	1	4	62	1028	14	23	291	35
Lane Group Flow (vph)	0	131	0	0	7	0	0	1104	0	0	349	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	76.0	76.0	0.0	76.0	76.0	0.0
Act Effct Green (s)		13.7			13.7			78.3			78.3	
Actuated g/C Ratio		0.14			0.14			0.78			0.78	
v/c Ratio		0.64			0.03			0.44			0.16	
Control Delay		53.9			34.6			4.7			3.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		53.9			34.6			4.7			3.0	
LOS		D			C			A			A	
Approach Delay		53.9			34.6			4.7			3.0	
Approach LOS		D			C			A			A	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 8.5

Intersection LOS: A

Intersection Capacity Utilization 57.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sumner Road & MLK Jr Ave

↑ ø2	→ ø4
76 s	24 s
↓ ø6	← ø8
76 s	24 s

Signalized Intersection Capacity Analysis - PM Peak Hour
2: Sumner Road & MLK Jr Ave

Existing Conditions
12/2/2008

	↖	→	↗	↖	←	↗	↖	↑	↗	↘	↓	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.923			0.919			0.990			0.983	
Flt Protected		0.983			0.980			0.995			0.996	
Satd. Flow (prot)	0	1690	0	0	1678	0	0	3486	0	0	3234	0
Flt Permitted		0.890			0.915			0.794			0.834	
Satd. Flow (perm)	0	1530	0	0	1566	0	0	2782	0	0	2708	0
Satd. Flow (RTOR)								20			35	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	1.00	1.00	1.09	1.09	1.00
Volume (vph)	57	15	94	2	0	5	52	431	21	50	619	77
Adj. Flow (vph)	68	16	111	4	0	6	60	501	42	76	688	97
Lane Group Flow (vph)	0	195	0	0	10	0	0	603	0	0	861	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	76.0	76.0	0.0	76.0	76.0	0.0
Act Effct Green (s)		16.6			16.6			75.4			75.4	
Actuated g/C Ratio		0.17			0.17			0.75			0.75	
v/c Ratio		0.77			0.04			0.29			0.42	
Control Delay		59.1			33.1			4.5			5.3	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		59.1			33.1			4.5			5.3	
LOS		E			C			A			A	
Approach Delay		59.1			33.1			4.5			5.3	
Approach LOS		E			C			A			A	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 11.5

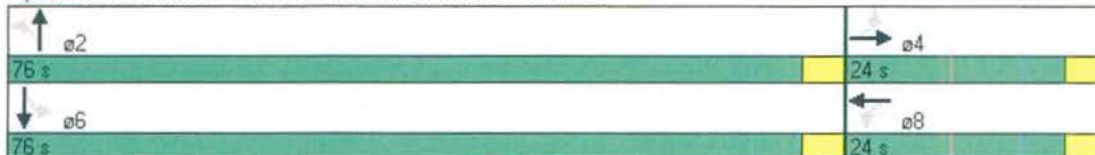
Intersection LOS: B

Intersection Capacity Utilization 58.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sumner Road & MLK Jr Ave



HCM Unsignalized Intersection Capacity Analysis - AM Peak Hour
4: UCC Entrance & MLK Jr Ave

Existing Conditions
12/2/2008

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	23	19	1001	30	49	397
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	21	1088	33	53	432
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1427	560			1121	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1427	560			1121	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	78	96			91	
cM capacity (veh/h)	115	471			619	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	21	725	395	197	288
Volume Left	25	0	0	0	53	0
Volume Right	0	21	0	33	0	0
cSH	115	471	1700	1700	619	1700
Volume to Capacity	0.22	0.04	0.43	0.23	0.09	0.17
Queue Length 95th (ft)	19	3	0	0	7	0
Control Delay (s)	44.7	13.0	0.0	0.0	3.8	0.0
Lane LOS	E	B			A	
Approach Delay (s)	30.3		0.0		1.6	
Approach LOS	D					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			54.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis - PM Peak Hour
4: UCC Entrance & MLK Jr Ave

Existing Conditions
12/2/2008



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	←	→	↑↓			↑↓
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	13	37	468	5	10	790
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	40	509	5	11	859
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	962	257			514	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	962	257			514	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	95			99	
cM capacity (veh/h)	251	742			1048	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	14	40	339	175	297	572
Volume Left	14	0	0	0	11	0
Volume Right	0	40	0	5	0	0
cSH	251	742	1700	1700	1048	1700
Volume to Capacity	0.06	0.05	0.20	0.10	0.01	0.34
Queue Length 95th (ft)	4	4	0	0	1	0
Control Delay (s)	20.2	10.1	0.0	0.0	0.4	0.0
Lane LOS	C	B			A	
Approach Delay (s)	12.7		0.0		0.1	
Approach LOS	B					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			38.9%		ICU Level of Service	A
Analysis Period (min)			15			

**Future Background Conditions
AM and PM Peak Hours**



Signalized Intersection Capacity Analysis - AM Peak Hour
1: Howard Rd & MLK Jr Ave

Background Conditions
12/2/2008

	EBL	EBT	EBR	EBR2	NBL2	NBL	NBR	NBR2	NEL	NET	NER	NER2
Lane Group												
Lane Configurations		↕		↕		↕			↕	↕		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	0.95	0.95
Fr _t		0.967		0.850		0.973				0.992		
Flt Protected		0.965				0.962			0.950	0.996		
Satd. Flow (prot)	0	1564	0	1425	0	1569	0	0	1449	3015	0	0
Flt Permitted		0.965				0.962			0.288	0.803		
Satd. Flow (perm)	0	1564	0	1425	0	1569	0	0	439	2430	0	0
Satd. Flow (RTOR)										5		
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Volume (vph)	108	8	37	61	78	187	60	6	283	632	8	40
Adj. Flow (vph)	130	10	40	77	85	203	65	7	337	854	12	43
Lane Group Flow (vph)	0	180	0	77	0	360	0	0	267	979	0	0
Turn Type	Split		pm+ov		Split				pm+pt			
Protected Phases	4	4		5	8	8			5	2		
Permitted Phases				4					2			
Total Split (s)	27.0	27.0	0.0	27.0	29.0	29.0	0.0	0.0	27.0	64.0	0.0	0.0
Act Effct Green (s)		23.0		46.0		25.0			60.0	60.0		
Actuated g/C Ratio		0.19		0.38		0.21			0.50	0.50		
v/c Ratio		0.60		0.14		1.10			0.65	0.74		
Control Delay		53.7		13.0		124.1			26.4	26.4		
Queue Delay		0.0		0.0		0.0			0.0	0.0		
Total Delay		53.7		13.0		124.1			26.4	26.4		
LOS		D		B		F			C	C		
Approach Delay		41.5				124.1				26.4		
Approach LOS		D				F				C		

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 43.0

Intersection LOS: D

Intersection Capacity Utilization 77.3%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Howard Rd & MLK Jr Ave

↖ ø2	↗ ø4	↖ ø8
64 s	27 s	29 s
↖ ø5	↖ ø6	
27 s	37 s	

Signalized Intersection Capacity Analysis - PM Peak Hour
1: Howard Rd & MLK Jr Ave

Background Conditions
12/2/2008

	EBL	EBT	EBR	EBR2	NBL2	NBL	NBR	NBR2	NEL	NET	NER	NER2
Lane Group												
Lane Configurations		↖		↗		↖			↗	↖	↗	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	0.95	0.95
Fr _t		0.943		0.850		0.967				0.971		
Fl _t Protected		0.975				0.964			0.950	0.991		
Satd. Flow (prot)	0	1541	0	1425	0	1563	0	0	1449	2936	0	0
Fl _t Permitted		0.975				0.964			0.105	0.535		
Satd. Flow (perm)	0	1541	0	1425	0	1563	0	0	160	1585	0	0
Satd. Flow (RTOR)										27		
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Volume (vph)	117	25	96	90	71	112	57	2	178	275	18	81
Adj. Flow (vph)	141	30	104	114	77	122	62	2	212	372	28	88
Lane Group Flow (vph)	0	275	0	114	0	263	0	0	106	594	0	0
Turn Type	Split		pm+ov		Split			pm+pt				
Protected Phases	4	4		5	8	8			5	2		
Permitted Phases				4					2			
Total Split (s)	25.0	25.0	0.0	16.0	21.0	21.0	0.0	0.0	16.0	54.0	0.0	0.0
Act Effct Green (s)		21.0		33.0		17.0			50.0	50.0		
Actuated g/C Ratio		0.21		0.33		0.17			0.50	0.50		
v/c Ratio		0.85		0.24		0.99			0.45	0.61		
Control Delay		62.6		14.5		95.6			21.3	18.2		
Queue Delay		0.0		0.0		0.0			0.0	0.0		
Total Delay		62.6		14.5		95.6			21.3	18.2		
LOS		E		B		F			C	B		
Approach Delay		48.5				95.6				18.6		
Approach LOS		D				F				B		

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 75.5

Intersection LOS: E

Intersection Capacity Utilization 83.6%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Howard Rd & MLK Jr Ave

↖ ø2	↗ ø4	↖ ø8
54 s	25 s	21 s
↖ ø5	↗ ø6	
16 s	38 s	

Signalized Intersection Capacity Analysis - AM Peak Hour
2: Sumner Road & MLK Jr Ave

Background Conditions
12/2/2008

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Lane Configurations		↔			↔			↔			↔	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Fr _t		0.934			0.923			0.998			0.985	
Fl _t Protected		0.977			0.986			0.997			0.997	
Satd. Flow (prot)	0	1700	0	0	1695	0	0	3522	0	0	3244	0
Fl _t Permitted		0.864			0.953			0.900			0.868	
Satd. Flow (perm)	0	1503	0	0	1639	0	0	3179	0	0	2824	0
Satd. Flow (RTOR)								3			30	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	1.00	1.00	1.09	1.09	1.00
Volume (vph)	51	6	55	1	1	3	54	913	7	15	315	32
Adj. Flow (vph)	61	6	65	2	1	4	62	1062	14	23	350	41
Lane Group Flow (vph)	0	132	0	0	7	0	0	1138	0	0	414	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	76.0	76.0	0.0	76.0	76.0	0.0
Act Effct Green (s)		13.8			13.8			78.2			78.2	
Actuated g/C Ratio		0.14			0.14			0.78			0.78	
v/c Ratio		0.64			0.03			0.46			0.19	
Control Delay		53.9			34.6			4.8			3.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		53.9			34.6			4.8			3.2	
LOS		D			C			A			A	
Approach Delay		53.9			34.6			4.8			3.2	
Approach LOS		D			C			A			A	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 8.4

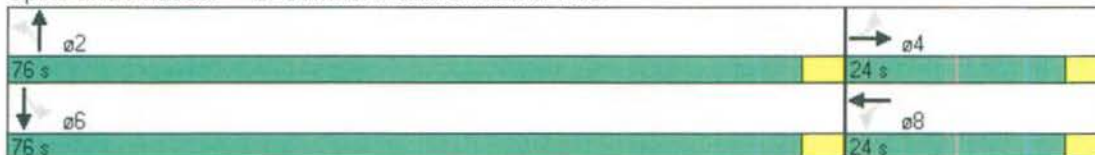
Intersection LOS: A

Intersection Capacity Utilization 60.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sumner Road & MLK Jr Ave



Signalized Intersection Capacity Analysis - PM Peak Hour
2: Sumner Road & MLK Jr Ave

Background Conditions
12/2/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.925			0.919			0.991			0.983	
Flt Protected		0.982			0.980			0.996			0.996	
Satd. Flow (prot)	0	1692	0	0	1678	0	0	3493	0	0	3234	0
Flt Permitted		0.882			0.914			0.797			0.827	
Satd. Flow (perm)	0	1520	0	0	1565	0	0	2795	0	0	2685	0
Satd. Flow (RTOR)								17			34	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	1.00	1.00	1.09	1.09	1.00
Volume (vph)	62	15	94	2	0	5	52	490	21	50	657	79
Adj. Flow (vph)	74	16	111	4	0	6	60	570	42	76	730	100
Lane Group Flow (vph)	0	201	0	0	10	0	0	672	0	0	906	0
Turn Type	Perm		Perm			Perm			Perm			
Protected Phases	4		8			2			6			
Permitted Phases	4		8			2			6			
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	76.0	76.0	0.0	76.0	76.0	0.0
Act Effct Green (s)	16.9		16.9			75.1			75.1			
Actuated g/C Ratio	0.17		0.17			0.75			0.75			
v/c Ratio	0.78		0.04			0.32			0.45			
Control Delay	60.2		33.0			4.8			5.6			
Queue Delay	0.0		0.0			0.0			0.0			
Total Delay	60.2		33.0			4.8			5.6			
LOS	E		C			A			A			
Approach Delay	60.2		33.0			4.8			5.6			
Approach LOS	E		C			A			A			

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 11.6

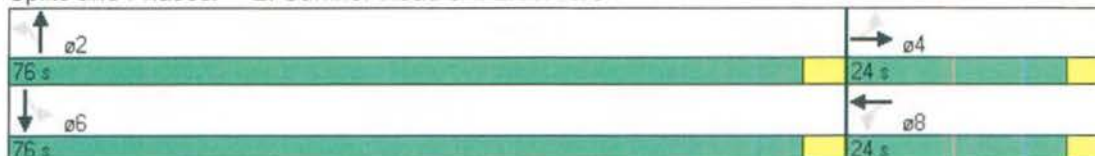
Intersection LOS: B

Intersection Capacity Utilization 62.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sumner Road & MLK Jr Ave



HCM Unsignalized Intersection Capacity Analysis - AM Peak Hour
3: UCC Entrance & MLK Jr Ave

Background Conditions
12/2/2008

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	23	19	1032	30	49	452
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	21	1122	33	53	491
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1490	577			1154	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1490	577			1154	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	76	96			91	
cM capacity (veh/h)	104	460			601	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	21	748	407	217	328
Volume Left	25	0	0	0	53	0
Volume Right	0	21	0	33	0	0
cSH	104	460	1700	1700	601	1700
Volume to Capacity	0.24	0.04	0.44	0.24	0.09	0.19
Queue Length 95th (ft)	22	4	0	0	7	0
Control Delay (s)	50.1	13.2	0.0	0.0	3.7	0.0
Lane LOS	F	B			A	
Approach Delay (s)	33.4		0.0		1.5	
Approach LOS	D					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			56.7%		ICU Level of Service	B
Analysis Period (min)			15			

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	13	37	527	5	10	832
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	40	573	5	11	904
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1049	289			578	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1049	289			578	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	94			99	
cM capacity (veh/h)	220	707			991	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	14	40	382	196	312	603
Volume Left	14	0	0	0	11	0
Volume Right	0	40	0	5	0	0
cSH	220	707	1700	1700	991	1700
Volume to Capacity	0.06	0.06	0.22	0.12	0.01	0.35
Queue Length 95th (ft)	5	5	0	0	1	0
Control Delay (s)	22.5	10.4	0.0	0.0	0.4	0.0
Lane LOS	C	B			A	
Approach Delay (s)	13.5		0.0		0.1	
Approach LOS	B					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			40.0%		ICU Level of Service	A
Analysis Period (min)			15			

**Future Conditions
AM and PM Peak Hours**



Signalized Intersection Capacity Analysis - AM Peak Hour
1: Howard Rd & MLK Jr Ave

Future Conditions
12/2/2008

	EBL	EBT	EBR	EBR2	NBL2	NBL	NBR	NBR2	NEL	NET	NER	NER2
Lane Group												
Lane Configurations		↕		↕		↕			↕	↕		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	0.95	0.95
Ped Bike Factor												
Frt		0.967		0.850		0.974				0.991		
Flt Protected		0.965				0.961			0.950	0.997		
Satd. Flow (prot)	0	1564	0	1425	0	1569	0	0	1449	3015	0	0
Flt Permitted		0.965				0.961			0.279	0.798		
Satd. Flow (perm)	0	1564	0	1425	0	1569	0	0	426	2413	0	0
Satd. Flow (RTOR)										6		
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Volume (vph)	108	8	37	62	86	187	60	6	287	645	9	45
Adj. Flow (vph)	130	10	40	78	93	203	65	7	342	872	14	49
Lane Group Flow (vph)	0	180	0	78	0	368	0	0	272	1005	0	0
Turn Type	Split			pm+ov	Split				pm+pt			
Protected Phases	4	4		5	8	8			5	2		
Permitted Phases				4					2			
Total Split (s)	27.0	27.0	0.0	27.0	29.0	29.0	0.0	0.0	27.0	64.0	0.0	0.0
Act Effct Green (s)		23.0		46.0		25.0			60.0	60.0		
Actuated g/C Ratio		0.19		0.38		0.21			0.50	0.50		
v/c Ratio		0.60		0.14		1.13			0.67	0.76		
Control Delay		53.7		13.0		131.7			27.2	27.2		
Queue Delay		0.0		0.0		0.0			0.0	0.0		
Total Delay		53.7		13.0		131.7			27.2	27.2		
LOS		D		B		F			C	C		
Approach Delay		41.4				131.7				27.2		
Approach LOS		D				F				C		

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.13

Intersection Signal Delay: 44.8

Intersection LOS: D

Intersection Capacity Utilization 78.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Howard Rd & MLK Jr Ave

↖ ø2 64 s	↗ ø4 27 s	↘ ø8 29 s
↙ ø5 27 s	↖ ø6 37 s	

Signalized Intersection Capacity Analysis - PM Peak Hour
1: Howard Rd & MLK Jr Ave

Future Conditions
12/2/2008

												
Lane Group	EBL	EBT	EBR	EBR2	NBL2	NBL	NBR	NBR2	NEL	NET	NER	NER2
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	0.95	0.95
Fr _t		0.943		0.850		0.968				0.969		
Flt Protected		0.975				0.963			0.950	0.992		
Satd. Flow (prot)	0	1541	0	1425	0	1563	0	0	1449	2933	0	0
Flt Permitted		0.975				0.963			0.105	0.532		
Satd. Flow (perm)	0	1541	0	1425	0	1563	0	0	160	1573	0	0
Satd. Flow (RTOR)										28		
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Volume (vph)	117	25	96	94	76	112	57	2	180	294	21	90
Adj. Flow (vph)	141	30	104	119	83	122	62	2	214	397	32	98
Lane Group Flow (vph)	0	275	0	119	0	269	0	0	107	634	0	0
Turn Type	Split			pm+ov	Split				pm+pt			
Protected Phases	4	4		5	8	8			5	2		
Permitted Phases				4					2			
Total Split (s)	25.0	25.0	0.0	16.0	21.0	21.0	0.0	0.0	16.0	54.0	0.0	0.0
Act Effct Green (s)		21.0		33.0		17.0			50.0	50.0		
Actuated g/C Ratio		0.21		0.33		0.17			0.50	0.50		
v/c Ratio		0.85		0.25		1.01			0.46	0.66		
Control Delay		62.6		14.6		101.0			21.5	19.2		
Queue Delay		0.0		0.0		0.0			0.0	0.0		
Total Delay		62.6		14.6		101.0			21.5	19.2		
LOS		E		B		F			C	B		
Approach Delay		48.1				101.0				19.5		
Approach LOS		D				F				B		

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.19

Intersection Signal Delay: 79.7

Intersection LOS: E

Intersection Capacity Utilization 85.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Howard Rd & MLK Jr Ave

 ø2	 ø4	 ø8
54 s	25 s	21 s
 ø5	 ø6	
16 s	38 s	

Signalized Intersection Capacity Analysis - AM Peak Hour
2: Sumner Road & MLK Jr Ave

Future Conditions
12/2/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Fr _t		0.928			0.916			0.998			0.986	
Fl _t Protected		0.979			0.988			0.997			0.997	
Satd. Flow (prot)	0	1692	0	0	1686	0	0	3522	0	0	3247	0
Fl _t Permitted		0.873			0.957			0.898			0.868	
Satd. Flow (perm)	0	1509	0	0	1633	0	0	3172	0	0	2827	0
Satd. Flow (RTOR)								3			28	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	1.00	1.00	1.09	1.09	1.00
Volume (vph)	51	6	65	1	1	4	55	935	7	15	335	32
Adj. Flow (vph)	61	6	76	2	1	5	63	1087	14	23	372	41
Lane Group Flow (vph)	0	143	0	0	8	0	0	1164	0	0	436	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	76.0	76.0	0.0	76.0	76.0	0.0
Act Effct Green (s)		14.3			14.3			77.7			77.7	
Actuated g/C Ratio		0.14			0.14			0.78			0.78	
v/c Ratio		0.66			0.03			0.47			0.20	
Control Delay		54.6			34.2			5.1			3.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		54.6			34.2			5.1			3.4	
LOS		D			C			A			A	
Approach Delay		54.6			34.2			5.1			3.4	
Approach LOS		D			C			A			A	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 8.9

Intersection LOS: A

Intersection Capacity Utilization 62.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sumner Road & MLK Jr Ave

 ø2	 ø4
76 s	24 s
 ø6	 ø8
76 s	24 s

Signalized Intersection Capacity Analysis - PM Peak Hour
2: Sumner Road & MLK Jr Ave

Future Conditions
12/2/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.923			0.910			0.991			0.984	
Flt Protected		0.983			0.984			0.996			0.996	
Satd. Flow (prot)	0	1690	0	0	1668	0	0	3493	0	0	3237	0
Flt Permitted		0.885			0.924			0.796			0.820	
Satd. Flow (perm)	0	1522	0	0	1566	0	0	2792	0	0	2665	0
Satd. Flow (RTOR)								16			33	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	1.00	1.00	1.09	1.09	1.00
Volume (vph)	62	15	102	2	0	6	53	522	21	51	677	79
Adj. Flow (vph)	74	16	120	4	0	8	61	607	42	77	752	100
Lane Group Flow (vph)	0	210	0	0	12	0	0	710	0	0	929	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	76.0	76.0	0.0	76.0	76.0	0.0
Act Effct Green (s)		17.4			17.4			74.6			74.6	
Actuated g/C Ratio		0.17			0.17			0.75			0.75	
v/c Ratio		0.80			0.04			0.34			0.47	
Control Delay		61.0			33.1			5.0			5.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		61.0			33.1			5.0			5.9	
LOS		E			C			A			A	
Approach Delay		61.0			33.1			5.0			5.9	
Approach LOS		E			C			A			A	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 12.0

Intersection LOS: B

Intersection Capacity Utilization 65.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: Sumner Road & MLK Jr Ave

↑ ø2	→ ø4
76 s	24 s
↓ ø6	← ø8
76 s	24 s

HCM Unsignalized Intersection Capacity Analysis - AM Peak Hour
3: Matthews Driveway & MLK Jr Ave

Future Conditions
12/2/2008

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	23	23	1051	25	30	371
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	25	1142	27	33	403
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1423	585			1170	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1423	585			1170	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	94			95	
cM capacity (veh/h)	120	454			593	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	25	762	408	167	269
Volume Left	25	0	0	0	33	0
Volume Right	0	25	0	27	0	0
cSH	120	454	1700	1700	593	1700
Volume to Capacity	0.21	0.06	0.45	0.24	0.05	0.16
Queue Length 95th (ft)	19	4	0	0	4	0
Control Delay (s)	42.8	13.4	0.0	0.0	2.8	0.0
Lane LOS	E	B			A	
Approach Delay (s)	28.1		0.0		1.1	
Approach LOS	D					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			43.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis - PM Peak Hour
 3: Matthews Driveway & MLK Jr Ave

Future Conditions
 12/2/2008

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	28	33	564	29	28	753
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	36	613	32	30	818
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1099	322			645	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1099	322			645	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	85	95			97	
cM capacity (veh/h)	200	673			936	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	30	36	409	236	303	546
Volume Left	30	0	0	0	30	0
Volume Right	0	36	0	32	0	0
cSH	200	673	1700	1700	936	1700
Volume to Capacity	0.15	0.05	0.24	0.14	0.03	0.32
Queue Length 95th (ft)	13	4	0	0	3	0
Control Delay (s)	26.2	10.6	0.0	0.0	1.2	0.0
Lane LOS	D	B			A	
Approach Delay (s)	17.8		0.0		0.4	
Approach LOS	C					
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			51.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis - AM Peak Hour
4: UCC Entrance & MLK Jr Ave

Future Conditions
12/2/2008

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	23	19	1057	30	49	475
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	21	1149	33	53	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1530	591			1182	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1530	591			1182	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	74	95			91	
cM capacity (veh/h)	98	450			587	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	21	766	416	225	344
Volume Left	25	0	0	0	53	0
Volume Right	0	21	0	33	0	0
cSH	98	450	1700	1700	587	1700
Volume to Capacity	0.26	0.05	0.45	0.24	0.09	0.20
Queue Length 95th (ft)	23	4	0	0	7	0
Control Delay (s)	53.9	13.4	0.0	0.0	3.7	0.0
Lane LOS	F	B			A	
Approach Delay (s)	35.6		0.0		1.5	
Approach LOS	E					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			58.1%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis - PM Peak Hour
4: UCC Entrance & MLK Jr Ave

Future Conditions
12/2/2008

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	13	37	556	5	10	860
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	40	604	5	11	935
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1096	305			610	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1096	305			610	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	94			99	
cM capacity (veh/h)	205	691			965	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	14	40	403	207	322	623
Volume Left	14	0	0	0	11	0
Volume Right	0	40	0	5	0	0
cSH	205	691	1700	1700	965	1700
Volume to Capacity	0.07	0.06	0.24	0.12	0.01	0.37
Queue Length 95th (ft)	5	5	0	0	1	0
Control Delay (s)	23.8	10.5	0.0	0.0	0.4	0.0
Lane LOS	C	B			A	
Approach Delay (s)	14.0		0.0		0.1	
Approach LOS	B					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			40.8%		ICU Level of Service	A
Analysis Period (min)			15			