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March 7, 2000

By hand-delivery

'00 MAR -7 P2:14
OFFICE OF ZONING
DISTRICT OF COLUMBIA

Ms. Sheila Cross Reid, Chairperson
Board of Zoning Adjustment
441 - 4th Street, N.W.
Room 210
Washington, DC 20001

Re: BZA Application No. 16559
(Field School - Special Exception Request under Sec. 206 of the Zoning Regulations

Dear Chairperson Reid and Members of the Board:

Enclosed is our expert traffic report in this case which concludes that the proposed addition of the Field School to the Foxhall Road neighborhood makes a bad situation worse. The traffic impact of the proposed school was found to be severe, resulting in unacceptable conditions at all 3 intersections analyzed (Whitehaven and Foxhall, W Street and Foxhall, and Foxhall and Garfield).

Also enclosed is the report of our expert planner who concludes that the proposed site for the school is too small and not in character with existing adjacent family homes. Further, he finds the proposal will cause excessive demands on the local road system and negatively impact on the environmental quality of life (noise, lights, fumes) of the neighboring residents. The report notes the need for considerable excavation, soil and tree removal to meet the proposed needs of the school given the steep topographical profile of the site, which drops off more than 100 feet.

I anticipate filing a pre-hearing statement on behalf of parties in opposition to the special exception request later this week.

Finally, I have attached an additional signature page to our request for party status which was executed by Rafic Bizri, President of Raha III Corporation, which owns property within 200 feet of the proposed school site. I ask that Mr. Bizri be included as a party in opposition in the group known as Neighbors Against Foxhall Gridlock.

Sincerely,

Richard L. Aguglia

Richard L. Aguglia

BZA
Case No. 16559
Exhibit No. 62

Board of Zoning Adjustment
District of Columbia
CASE NO.16559
EXHIBIT NO.62A1

cc: Phil Feola, Esq.

ANC 3D
c/o Ann Heuer

Office of Planning

DPW
c/o Abdoulaye Bah

TRAFFIC IMPACT ANALYSIS
FOR
FIELD SCHOOL
on Foxhall Road

Washington, D.C.

'00 MAR -7 P2:15
OFFICE OF ZONING
DISTRICT OF COLUMBIA

Prepared For

Neighbors Against Foxhall Gridlock
Washington, D.C.

Prepared By

MCV Associates, Inc.
4605-C Pinecrest Office Park Drive
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March 6, 2000

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INTRODUCTION

The Field school is proposing to relocate its existing site on Wyoming Avenue to a site off Foxhall Road, just north of W Street. The site location is shown in Exhibit 1. Gorove/Slade Associates, Inc. conducted a traffic impact study for the school relocation and the data and findings are presented in the Traffic Reports dated December 13, 1999 and February 29, 2000[1]. The purpose of this report is to present the study process and findings of an independent traffic study that was prepared by MCV Associates, Inc. The proposed school at Foxhall Road will have a maximum enrollment of 320 students and 74 staff/employees.

The following tasks were conducted to prepare the traffic impact study:

1. Review proposed development plans including access and circulation plans.

2. Collect current turning movement counts at three adjacent intersections. Roadway and neighborhood reconnaissance to develop travel patterns to and from the proposed school site.

3. Identify existing traffic conditions including capacity and levels of service.

4. Identify approved developments in the neighborhood.

5. Determine site traffic during the peak hours.

6. Project future traffic conditions including capacity and levels of service.

EXISTING CONDITIONS

The proposed school site is located off Foxhall Road just north of W Street. Foxhall Road is a two lane north-south roadway in the vicinity of the site, with vertical and horizontal curves that result in inadequate sight distance at several locations on it. W Street is a two lane east-west roadway that serves residential traffic along it. The intersection of Foxhall Road and W Street is unsignalized. Whitehaven Parkway is located just south of W Street. Whitehaven Parkway is a two lane roadway that connects Foxhall Road to MacArthur Boulevard. The intersection of MacArthur Boulevard and Whitehaven Parkway is not signalized. Whitehaven Parkway will become the primary access roadway to the George Washington University Mount

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[1] The traffic data in the two reports are based on counts conducted in March/April of 1999.

Vernon Campus and is presently the main access for St. Patrick's Episcopal Day School. The intersection of Foxhall Road and Whitehaven Parkway is unsignalized. Garfield Street is located north of the school site. Garfield Street is a two lane roadway that connects to W Street via 49th Street on the west side to New Mexico Avenue on the east side. The intersection of Foxhall Road and Garfield Street is signalized.

AM and PM peak period turning movement counts were made on Wednesday, February 23 and Thursday, February 24 of this year. The data collected is presented in the Appendix. The data collected was analyzed to determine the peak hours and the peak hour volumes. The peak hour volumes at the three intersections are presented in Exhibit 2. Capacity and levels of service were estimated using the Highway Capacity Software (Release 3.1b). The existing levels of service are summarized in Exhibit 3.

As noted in Exhibit 3, the signalized intersection of Foxhall Road and Garfield Street is currently operating at LOS F, with 140 seconds of delay per vehicle, during the AM peak hour. During the PM peak hour, this intersection is currently operating at LOS C, with delay of 21.7 seconds per vehicle. The eastbound movement on Whitehaven Parkway at Foxhall Road is currently operating at LOS F, with significant delay during the AM peak hour and LOS E (delay of 37.7 seconds per vehicle) during the PM peak hour. During the AM peak hour, the eastbound and westbound movements on W Street at Foxhall Road are currently operating at LOS F, with delays of 115 and 859 seconds per vehicle, respectively. During the PM peak hour, the eastbound and westbound movements on W Street at Foxhall Road are currently operating at LOS E and LOS F, with delays of 48.9 and 116 seconds per vehicle, respectively.

This shows that the existing traffic conditions on Foxhall Road result in LOS F at all the three intersections analyzed, during one or both time periods.

FUTURE CONDITIONS

The future traffic conditions consist of the existing traffic, the normal growth in through traffic, traffic from other approved developments in the area, and the traffic generated by the proposed development.

Normal Growth in Through Traffic

Traffic data on Foxhall Road was available for two consecutive years (1999 and 2000). A comparison of the data for the two years showed that the traffic has grown 4.9 percent in one year on Foxhall Road. It was conservatively assumed that the Field School will be operational within one year (although the full occupancy of 320

students may not occur for several years). The existing through traffic on Foxhall Road was increased by 4.9 percent resulting in 41/34 trips in the southbound direction during the AM/PM peak hours. The resulting northbound trips were 36/36 during the AM/PM peak hour.

Other Approved Developments

The Spanish Ambassador's residence is currently under construction off Foxhall Road just north of the Field School entranceway. This will include a large full time staff as well as the Ambassador's family. In addition the George Washington Mount Vernon Campus has been approved for a maximum of 1,000 full time equivalent students, which shall not exceed a 1,500 head count. Trips were estimated for these two approved developments and added to the existing traffic.

Field School

The Field School will have a total of 320 students and 74 staff/employees at full occupancy. Field School is proposed to have two driveways in to the school. The northern driveway will allow for a full access in to and out of the school. The southern driveway will allow right in and right out only. Further, the left turns in and left turns out of the northern driveway will be restricted during the AM peak period. Only shuttle buses and emergency vehicles will be permitted to make left turns in to the school during the AM peak period. In other words, all traffic coming to the school during the AM peak period has to enter the school from the south. The Gorove/Slade report, dated February 29, 2000 has 60% of the traffic going eastbound on Whitehaven Parkway from MacArthur Boulevard to Foxhall Road and 40% of the traffic coming north on Foxhall Road from points south of the intersection of Whitehaven Parkway and Foxhall Road. Thus, according to the Gorove/Slade Report 100% of the traffic to the school will pass through the intersection of Foxhall Road and Whitehaven Parkway. The 60% of the traffic going eastbound on Whitehaven Parkway from MacArthur Boulevard to Foxhall Road will conflict with the traffic entering St. Patrick School and the new George Washington Mount Vernon entrance on Whitehaven Parkway. The alternative path for traffic approaching the school from the north proceeding south on Foxhall Road is to turn right on Garfield Street/Fulton Street/Dexter Street and proceed to 49th Street and work their way to W Street and turn left at Foxhall Road to enter the school from the south. Some southbound vehicles will turn right on westbound W Street from Foxhall Road, make a U-turn and then turn left on Foxhall Road to enter the school from the south.

All traffic must turn right on Foxhall Road during the AM peak hour. The traffic exiting the school desiring to go south on Foxhall Road will turn right on Foxhall Road and then left on Garfield/Fulton/Dexter and proceed on to W Street to turn right on to

Foxhall Road. The no left turn restriction in to and out of the school during the AM peak hour will cause the school traffic to use local residential streets such as Dexter, Fulton, W, 49th, etc.

The Gorove/Slade Report indicates that, based on a students residence zip code analysis, 65 percent of the traffic will approach the school from the north and 35 percent will approach the school from the south. The geographic trip distribution pattern from Gorove/Slade Report is presented in Exhibit 4.

The vehicle trips generated by the proposed Field School at Foxhall Road was estimated as follows:

. The existing school site is located off Connecticut Avenue which is served by Metrobus and Metrorail (within walking distance). Based on Gorove/Slade report, a total of 36 percent use public transportation at the existing school site. Since the proposed site is not served by Metrobus or Metrorail and the students will have to wait for the shuttlebus at the Metrorail station and then transfer to the shuttlebus, it was assumed that a maximum of 25 percent of the students will ride the shuttlebus.

. Students who drive were assumed to have one other student with them, resulting in 45 vehicle trips during the AM peak hour. The foregoing is subject to the new D.C. "Safe Teenage Driving Amendment Act of 1999" which limits drivers under 17 from carrying passengers other than siblings.

. The remainder of the students were assumed to be driven to the school.

. The shuttle bus trips were assumed to be 5 during the AM /PM peak hour based on the Gorove/Slade report.

. A conservative estimate of 5 vehicle trips for visitors/maintenance/deliveries/etc. entering during the AM peak hour and leaving during the PM peak hour was assumed.

. The staff/employees were assumed to arrive/depart during the peak hours as per the Gorove/Slade report.

. The PM exiting student trips were based on data provided in Gorove/Slade report and data from other similar schools.

The summary of vehicle trip generation is as follows:

	Stud./ Emp.	AM	Peak	Hour	PM	Peak	Hour
		IN	Out	Total	In	Out	Total
Students Who Drive	90	45	0	45	0	25	25
Students Driven	150	120	120	240	66	66	132
Students - Shuttle Bus	80	5	5	10	5	5	10
Staff/Employees	74	74	0	74	0	74	74
Visitors		5	0	5	0	5	5
Total		249	125	374	71	175	246

These vehicle trips were distributed to the roadway network based on the trip distribution patterns noted in Exhibit 4. The AM/PM peak hour school vehicle trips are shown in Exhibit 5.

Total Trips

The addition of the existing trips, normal growth in through traffic, traffic from other approved developments and trips from the Field School results in total AM and PM peak hour trips. These trips are shown in Exhibit 6.

Capacity/Levels Of Service

As in the existing conditions, the Highway Capacity software was utilized to estimate the capacity and levels of service at the three intersections. It was assumed that the intersection of Foxhall Road and Whitehaven Parkway is signalized. The levels of service results are summarized in Exhibit 7. Results show that the northbound left turns from Foxhall Road on to Whitehaven Parkway is projected to operate at LOS F during the AM peak hour, with the traffic signal. The intersection of Foxhall Road and Garfield Street is projected to operate at LOS F during the AM and PM peak hours. The levels of service at the unsignalized intersection of Foxhall Road and W Street is LOS F on both the eastbound and westbound approaches during the AM and PM peak hours.

CONCLUSIONS

The levels of service results for the existing and future conditions with the Field School in place are presented in Exhibit 8. The results show that the eastbound approach on Whitehaven Parkway at Foxhall Road is currently operating at unacceptable levels of

service. The installation of a traffic signal at this intersection improves the levels of service for the eastbound approach. However, the northbound left turn drops to LOS F.

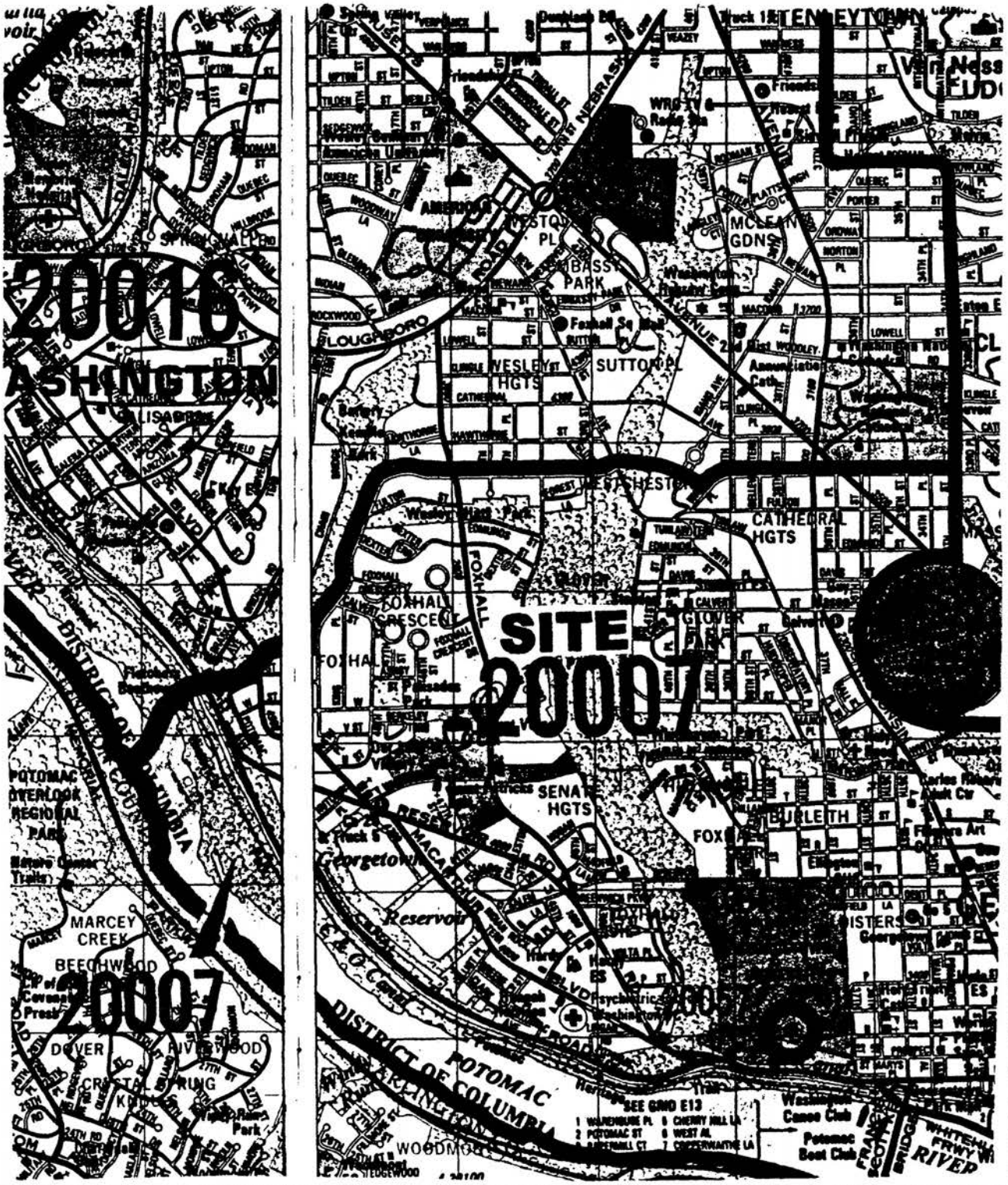
The eastbound and westbound approaches on W Street at Foxhall Road are currently operating at unacceptable levels of service and are projected to operate at severely untolerable conditions during the AM peak hour.

The intersection of Foxhall Road and Garfield Street is currently operating at LOS F during the AM peak hour and becomes worse (in terms of delay to vehicles) with the Field School traffic. The existing acceptable levels of service during the PM peak hour (LOS C) becomes an unacceptable LOS F with the Field School.

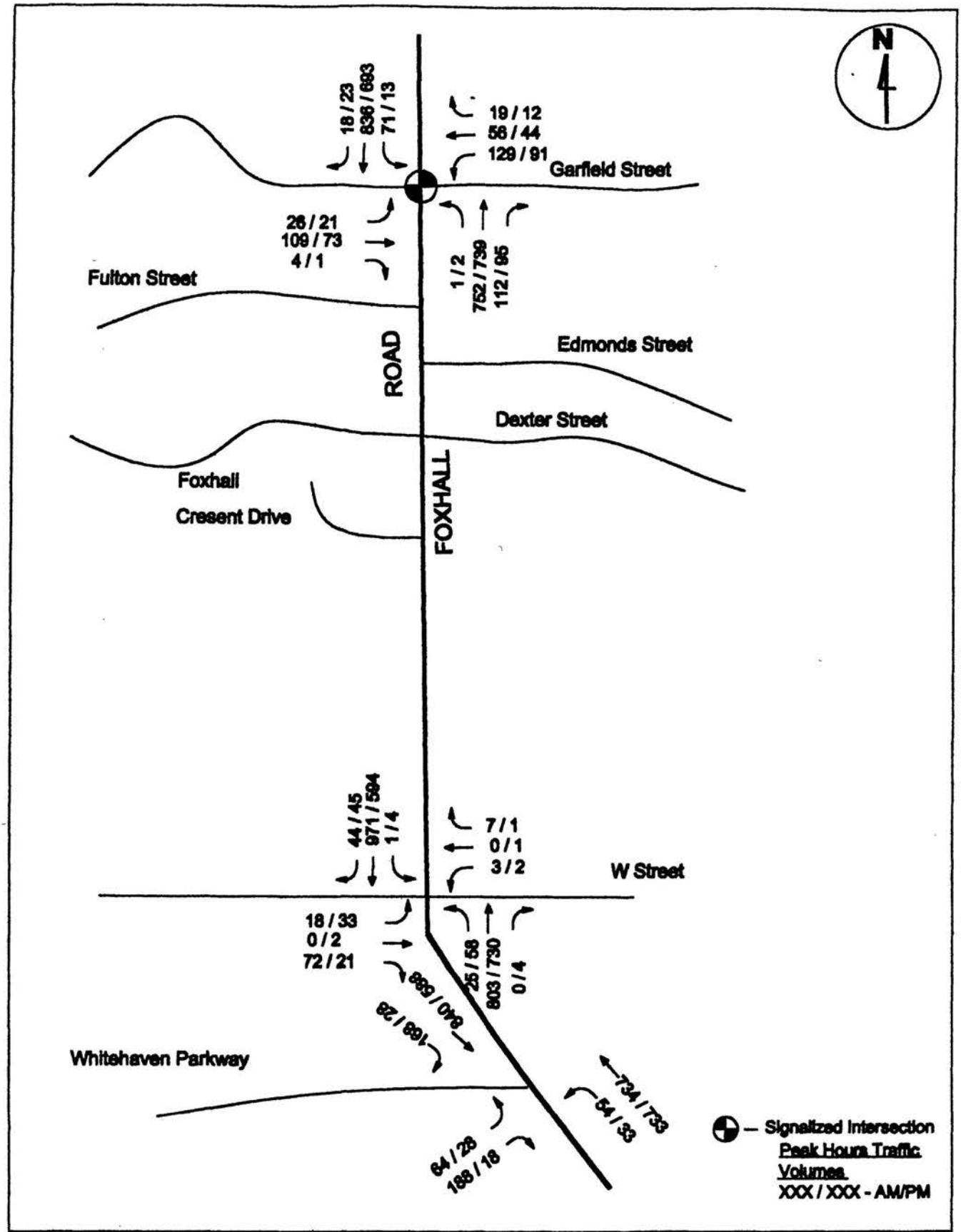
If left turns are permitted from Foxhall Road in to the school during the AM peak hour to prevent traffic from using the local residential streets, it is estimated that a total of approximately 150 vehicles will make this maneuver during one hour. This may require that a separate left turn lane be installed on Foxhall Road. This may not be feasible due to the right-of-way limitations.

This analysis concludes, that from a traffic perspective, the addition of the Field School to the Foxhall Road neighborhood makes a bad situation worse. The traffic impacts of the Field School are very severe resulting in unacceptable conditions at all three intersection analyzed.

APPENDIX



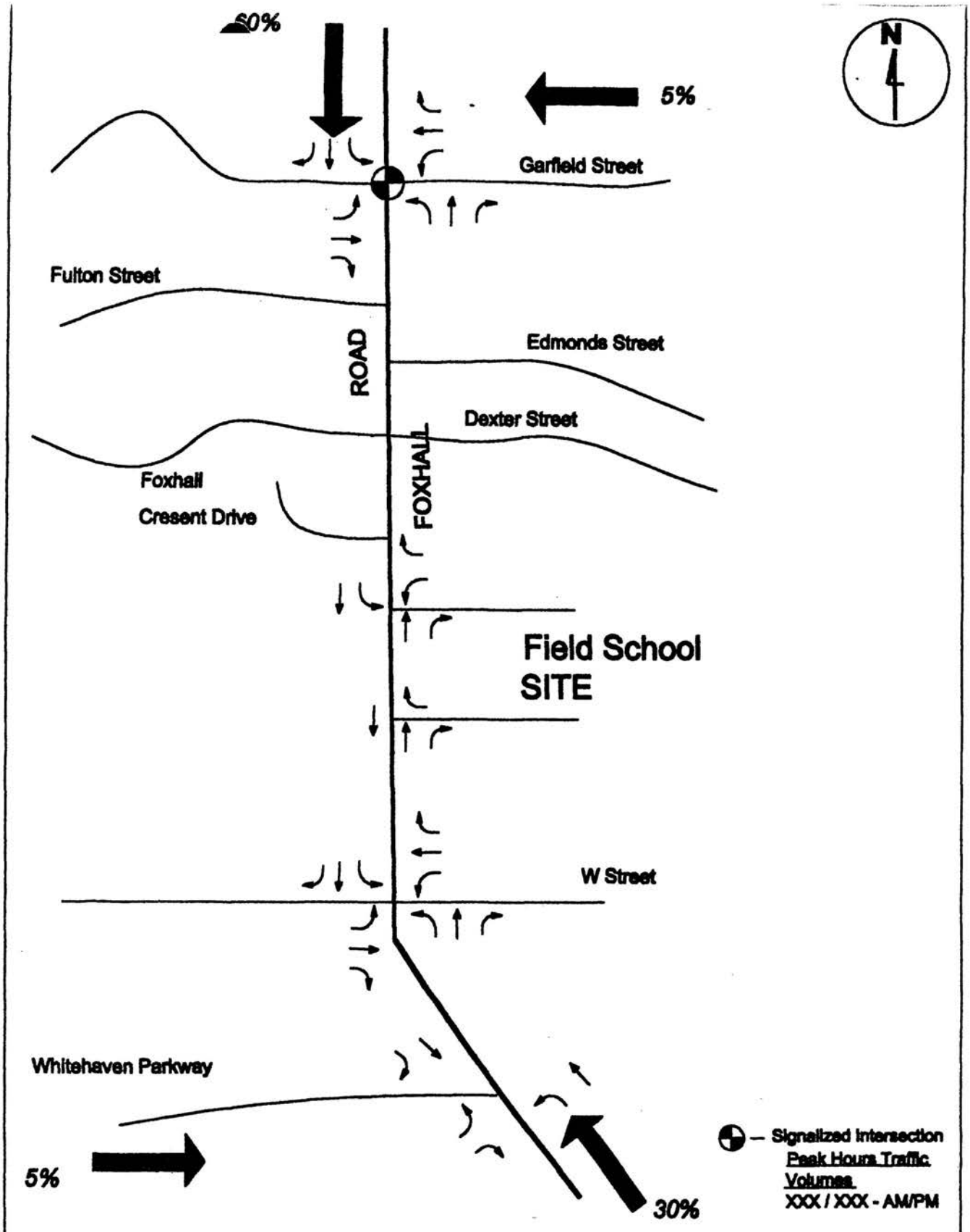
MCV ASSOCIATES, INC. PLANNING. ENGINEERING. INFORMATION TECHNOLOGY	SITE LOCATION	EXIHIBT-1



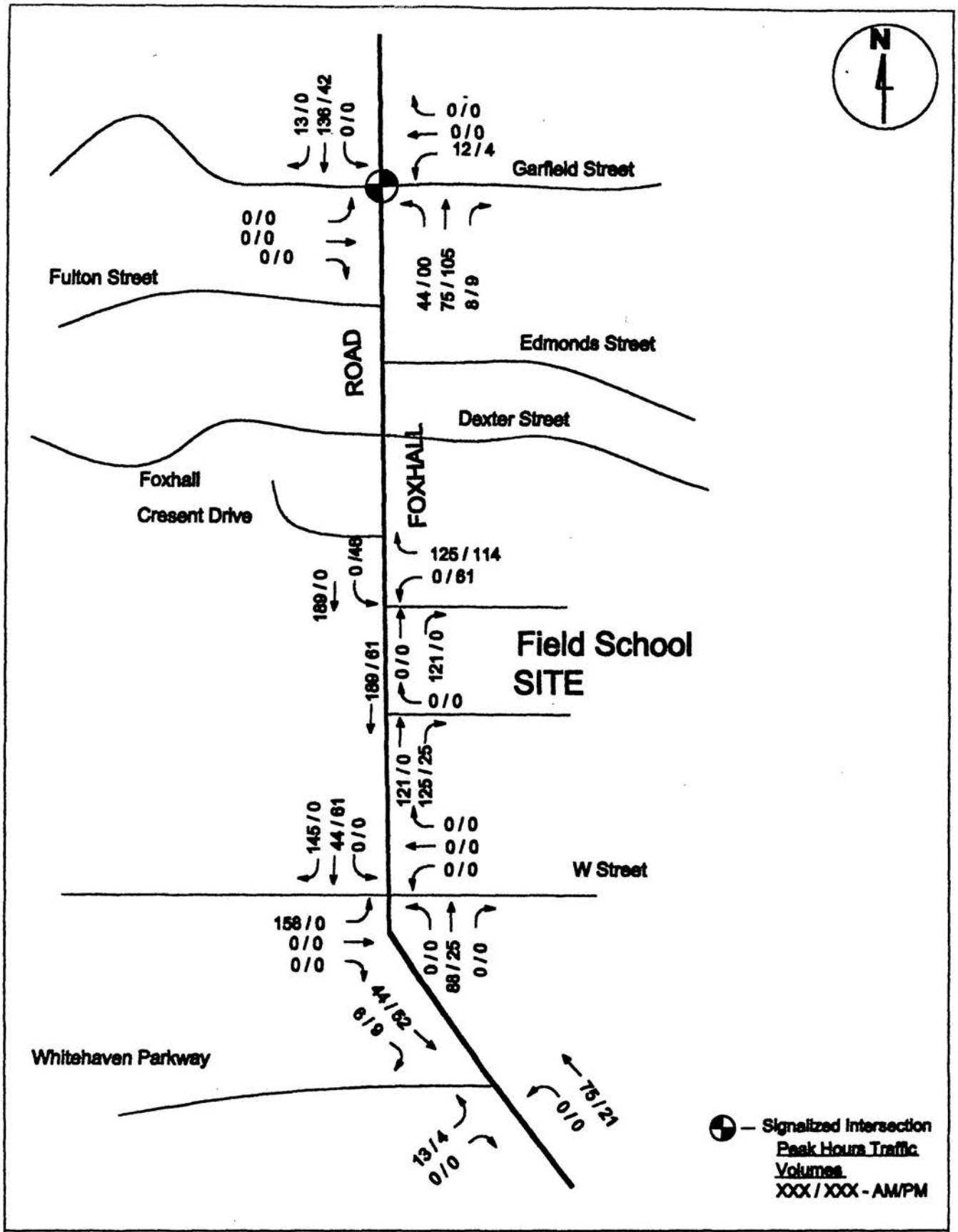
MCV ASSOCIATES, INC. PLANNING, ENGINEERING, INFORMATION TECHNOLOGY	AM / PM Peak Hour Volumes Existing Conditions	EXIHIBT-2



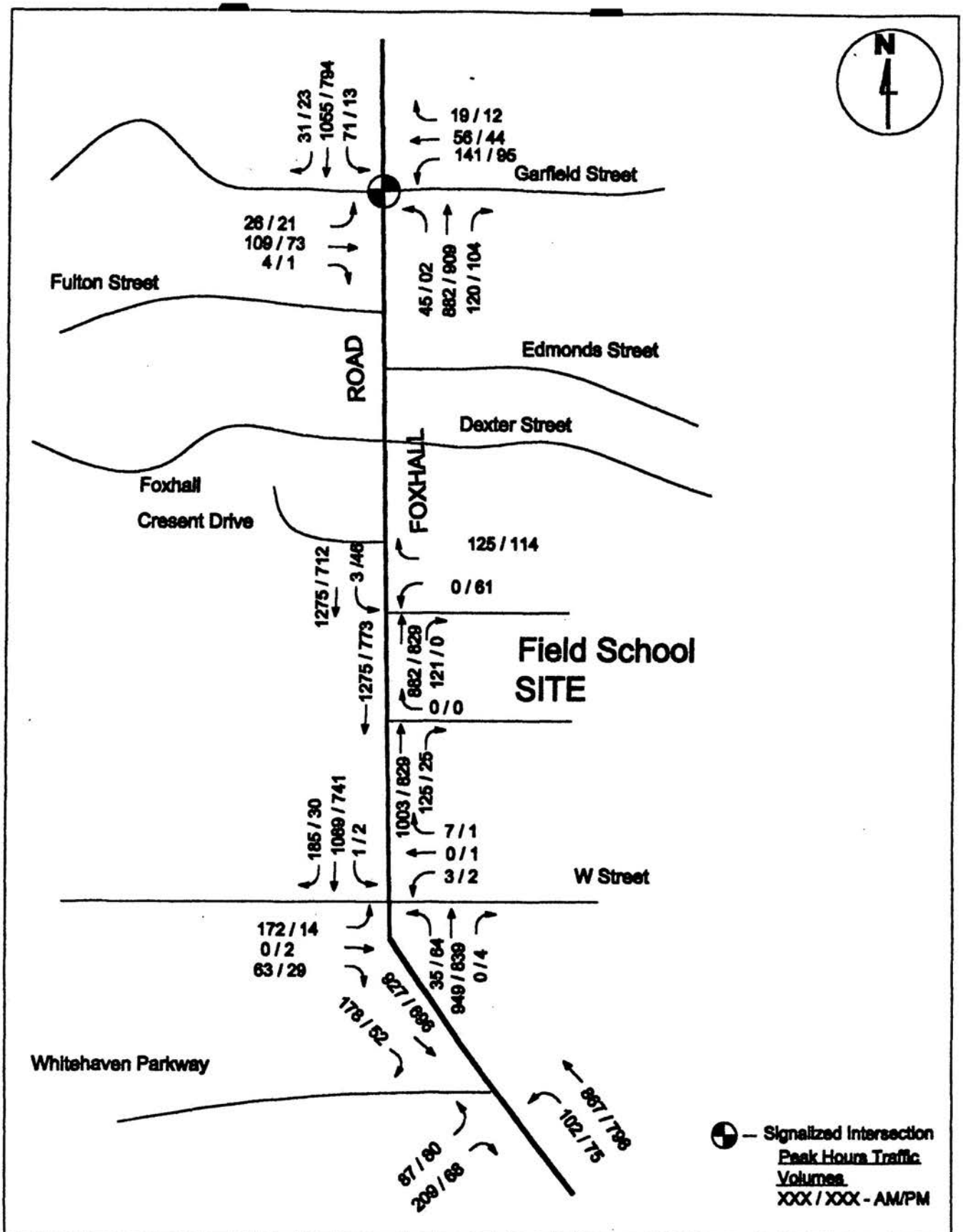
Intersection		Existing Conditions AM Delay	LOS	PM Delay	LOS
Foxhall/Whitehaven	NBL	11.9	B	9	A
	EB	2595	F	37.7	E
Foxhall/W Street	NBL	11.5	B	9.4	A
	SBL	9.5	A	9.3	A
	WB	115	F	48.9	E
	EB	859	F	116.3	F
Foxhall/Garfield St	EB	25.4	C	25.2	C
	WB	87.1	F	41	D
	NB	17.6	B	23	C
	SB	269	F	14.4	B
	Overall	140	F	21.7	C



MCV ASSOCIATES, INC. PLANNING. ENGINEERING. INFORMATION TECHNOLOGY	Trip Distribution Pattern Field School	EXHIBIT-4



MCV Associates, Inc. PLANNING, ENGINEERING, INFORMATION TECHNOLOGY	AM / PM Peak Hour Volumes Site Trips	EXHIBIT-5



MCV ASSOCIATES, INC. PLANNING, ENGINEERING, INFORMATION TECHNOLOGY	AM / PM Peak Hour Volumes Total Trips	EXIHIBIT-6

Intersection		Future Conditions AM Delay	LOS	PM Delay	LOS
Foxhall/Whitehaven	NBL	158	F	19.7	B
	EB	42.3	D	15.6	B
	SB	17.2	B	13.7	B
	Overall	26	C	17.2	B
Foxhall/W Street	NBL	13.8	B	10.1	B
	SBL	10.1	B	9.8	A
	WB	578	F	84.6	F
	EB	***	F	91.7	F
Foxhall/Garfield St	EB	25.5	C	25.3	C
	WB	131	F	161	F
	NB	231	F	169	F
	SB	761	F	21.8	C
	Overall	461	F	105	F

MCV ASSOCIATES, INC.
PLANNING. ENGINEERING. INFORMATION TECHNOLOGY

Levels of Service-

Future Conditions

EXIHIBT-7



Intersection		Existing Conditions				Future Conditions			
		AM		PM		AM		PM	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Foxhall/Whitehaven	NBL	11.9	B	9	A	158	F	19.7	B
	EB	2595	F	37.7	E	42.3	D	15.6	B
	SB					17.2	B	13.7	B
	Overall					26	C	17.2	B
Foxhall/W Street	NBL	11.5	B	9.4	A	13.8	B	10.1	B
	SBL	9.5	A	9.3	A	10.1	B	9.8	A
	WB	115	F	48.9	E	578	F	84.6	F
	EB	859	F	116.3	F	***	F	91.7	F
Foxhall/Garfield St	EB	25.4	C	25.2	C	25.5	C	25.3	C
	WB	87.1	F	41	D	131	F	161	F
	NB	17.6	B	23	C	231	F	169	F
	SB	269	F	14.4	B	761	F	21.8	C
	Overall	140	F	21.7	C	461	F	105	F

APPENDIX

HCS: [redacted]ignalized Intersections Rele[redacted]e 3.1b

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: JM
Intersection: Foxhall Road and White Haven Parkway
Count Date: March 11, 1999
Time Period: AM Peak Hour

Intersection Orientation: North-South Major St.

Vehicle Volume Data:

Movements:	1	2	5	6	10	12
Volume:	54	734	840	168	64	188
HFR:	56	768	1004	201	87	256
PHF:	0.96	0.96	0.84	0.84	0.73	0.73
PHV:	0.02	0.02	0.02	0.02	0.02	0.02

Pedestrian Volume Data:

Movements:

Flow:
Lane width:
Walk speed:
% Blockage:

Median Type: None
# of vehicles: 0

Flared approach Movements:

# of vehicles: Eastbound 0
# of vehicles: Westbound 0

Lane usage for movements 1,2&3 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	N	N	N	Y	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 4,5&6 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
N	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 7,8&9 approach:

	Lane 1		Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
N	N	N	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 10,11&12 approach:

	Lane 1		Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
Y	N	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Data for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
Shared ln volume, major th vehicles:	0	0
Shared ln volume, major rt vehicles:	0	0
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Length of study period, hrs: 1.00

Worksheet 4 Critical Gap and Follow-up time calculation.

Critical Gap Calculations:

Movement	1	10	12
t c,base	4.1	7.1	6.2
t c,hv	1.0	1.0	1.0
P hv	0.02	0.02	0.02
t c,g		0.2	0.1
G	0.00	0.00	0.00
t 3,lt	0.0	0.7	0.0
t c,T:			
1 stage	0.00	0.00	0.00
t c			
1 stage	4.1	6.4	6.2

Follow Up Time Calculations:

Movement	1	10	12
t f,base	2.2	3.5	3.3
t f,HV	0.9	0.9	0.9
P hv	0.02	0.02	0.02
t f	2.2	3.5	3.3

Worksheet 6 Impedance and capacity equations

Step 1: RT from Minor St. 9 12

Conflicting Flows		1104
Potential Capacity		257
Pedestrian Impedance Factor		1.00
Movement Capacity		257
Probability of Queue free St.		0.00

Step 2: LT from Major St.	4	1
Conflicting Flows		1204
Potential Capacity		579
Pedestrian Impedance Factor		1.00
Movement Capacity		579
Probability of Queue free St.		0.90

Step 4: LT from Minor St.	7	10
Conflicting Flows		1985
Potential Capacity		67
Pedestrian Impedance Factor		1.00
Maj. L, Min T Impedance factor		0.90
Maj. L, Min T Adj. Imp Factor.		0.93
Cap. Adj. factor due to Impeding mvmnt		0.93
Movement Capacity		62

Worksheet 8 Shared Lane Calculations

Shared Lane Calculations

Movement	7	8	9	10	11	12
v(vph)				87		256
Movement Capacity				62		257
Shared Lane Capacity				143		

Worksheet 10 delay,queue length, and LOS

Movement	1	4	7	8	9	10	11	12
v(vph)	56					344		
C m(vph)	579					143		
v/c	0.10					2.40		
95% queue length								
Control Delay	11.9					2594.8		
LOS	B					F		
Approach Delay							2594.8	
Approach LOS							F	

HCS: Unsignalized Intersections Release 3.1b

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: JM
Intersection: Foxhall Road and White Haven Parkway
Count Date: March 11, 1999
Time Period: PM Peak Hour

Intersection Orientation: North-South Major St.

Vehicle Volume Data:

Movements:	1	2	5	6	10	12
Volume:	33	733	588	28	28	18
HFR:	37	819	630	30	39	25
PHF:	0.90	0.90	0.93	0.93	0.72	0.72
PHV:	0.02	0.02	0.02	0.02	0.02	0.02

Pedestrian Volume Data:

Movements:

Flow:
Lane width:
Walk speed:
% Blockage:

Median Type: None
# of vehicles: 0

Flared approach Movements:

# of vehicles: Eastbound 0
# of vehicles: Westbound 0

Lane usage for movements 1,2&3 approach:

	Lane 1		Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
Y	N	N	N	Y	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 4,5&6 approach:

	Lane 1		Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
N	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 7,8&9 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
N	N	N	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 10,11&12 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	N	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Data for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
Shared ln volume, major th vehicles:	0	0
Shared ln volume, major rt vehicles:	0	0
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Length of study period, hrs: 1.00

Worksheet 4 Critical Gap and Follow-up time calculation.

Critical Gap Calculations:

Movement	1	10	12
t c,base	4.1	7.1	6.2
t c,hv	1.0	1.0	1.0
P hv	0.02	0.02	0.02
t c,g		0.2	0.1
G	0.00	0.00	0.00
t 3,lt	0.0	0.7	0.0
t c,T:			
1 stage	0.00	0.00	0.00
t c			
1 stage	4.1	6.4	6.2

Follow Up Time Calculations:

Movement	1	10	12
t f,base	2.2	3.5	3.3
t f,HV	0.9	0.9	0.9
P hv	0.02	0.02	0.02
t f	2.2	3.5	3.3

Worksheet 6 Impedance and capacity equations

Step 1: RT from Minor St. 9 12

Conflicting Flows		645
Potential Capacity		472
Pedestrian Impedance Factor		1.00
Movement Capacity		472
Probability of Queue free St.		0.95

Step 2: LT from Major St.	4	1
Conflicting Flows		660
Potential Capacity		928
Pedestrian Impedance Factor		1.00
Movement Capacity		928
Probability of Queue free St.		0.96

Step 4: LT from Minor St.	7	10
Conflicting Flows		1538
Potential Capacity		127
Pedestrian Impedance Factor		1.00
Maj. L, Min T Impedance factor		0.96
Maj. L, Min T Adj. Imp Factor.		0.97
Cap. Adj. factor due to Impeding mvmnt		0.97
Movement Capacity		124

Worksheet 8 Shared Lane Calculations

Shared Lane Calculations

Movement	7	8	9	10	11	12
	|			||------		------|
	|			||		|
	|			||		|
v(vph)				39		25
Movement Capacity				124		472
Shared Lane Capacity				174		

Worksheet 10 delay,queue length, and LOS

Movement	1	4	7	8	9	10	11	12
			|			||------		------|
			|			||		|
			|			||		|
v(vph)	37					64		
C m(vph)	928					174		
v/c	0.04					0.37		
95% queue length								
Control Delay	9.0					37.7		
LOS	A					E		
Approach Delay							37.7	
Approach LOS							E	

HCS: Unsignalized Intersections Release 3.1b

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: JM
Intersection: Foxhall Road and W Street
Count Date: 2-23-00
Time Period: AM Peak Hour

Intersection Orientation: North-South Major St.

Vehicle Volume Data:

Movements:	1	2	3	4	5	6	7	8	9	10	11
Volume:	25	803	0	1	971	44	3	0	7	18	0
HFR:	26	842	0	1	1144	52	5	0	11	31	0
PHF:	0.95	0.95	0.95	0.85	0.85	0.85	0.63	0.63	0.63	0.58	0.58
PHV:	0.02	0.02	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.02	0.00

Pedestrian Volume Data:

Movements:

Flow:
Lane width:
Walk speed:
% Blockage:

Median Type: None
# of vehicles: 0

Flared approach Movements:

# of vehicles: Eastbound 0
# of vehicles: Westbound 0

Lane usage for movements 1,2&3 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 4,5&6 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 7,8&9 approach:

	Lane 1		Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 10,11&12 approach:

	Lane 1		Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Data for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
Shared ln volume, major th vehicles:	803	971
Shared ln volume, major rt vehicles:	0	44
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Length of study period, hrs: 1.00

Worksheet 4 Critical Gap and Follow-up time calculation.

Critical Gap Calculations:

Movement	1	4	7	8	9	10	11	12
t c,base	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t c,hv	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
P hv	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.02
t c,g			0.2	0.2	0.1	0.2	0.2	0.1
G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t 3,lt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t c,T:								
1 stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t c								
1 stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2

Follow Up Time Calculations:

Movement	1	4	7	8	9	10	11	12
t f,base	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3
t f,HV	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
P hv	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.02
t f	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 6 Impedance and capacity equations

Step 1: RT from Minor St. 9 12

95% queue length										
Control Delay	11.5		9.5	114.9			858.7			
LOS	B		A	F			F			
Approach Delay					114.9				858.7	
Approach LOS					F				F	

Worksheet 11 Shared Major LT Impedance and Delay

Rank 1 Delay Calculations

Movement	2	5
P oj	0.96	1.00
V i1	803	971
V i2	0	44
S i1	1700	1700
S i2	1700	1700
P* 0j	0.91	1.00
D maj left	11.5	9.5
N number major st lanes	1	1
Delay, rank 1 mvmts	1.0	0.0

HCS: U[redacted]ignalized Intersections Rele[redacted]e 3.1b

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: JM
Intersection: Foxhall Road and W Street
Count Date: 2-23-00
Time Period: PM Peak Hour

Intersection Orientation: North-South Major St.

Vehicle Volume Data:

Movements:	1	2	3	4	5	6	7	8	9	10	11
Volume:	58	730	4	4	594	45	2	1	1	33	2
HFR:	63	789	4	5	677	51	4	2	2	45	3
PHF:	0.93	0.93	0.93	0.88	0.88	0.88	0.50	0.50	0.50	0.74	0.74
PHV:	0.02	0.02	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.02	0.00

Pedestrian Volume Data:

Movements:

Flow:
Lane width:
Walk speed:
% Blockage:

Median Type: None
# of vehicles: 0

Flared approach Movements:

# of vehicles: Eastbound 0
# of vehicles: Westbound 0

Lane usage for movements 1,2&3 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 4,5&6 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 7,8&9 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 10,11&12 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Data for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
Shared ln volume, major th vehicles:	730	594
Shared ln volume, major rt vehicles:	4	45
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Length of study period, hrs: 1.00

Worksheet 4 Critical Gap and Follow-up time calculation.

Critical Gap Calculations:

Movement	1	4	7	8	9	10	11	12
t c,base	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t c,hv	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
P hv	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.02
t c,g			0.2	0.2	0.1	0.2	0.2	0.1
G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t 3,lt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t c,T:								
1 stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t c								
1 stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2

Follow Up Time Calculations:

Movement	1	4	7	8	9	10	11	12
t f,base	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3
t f,HV	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
P hv	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.02
t f	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 6 Impedance and capacity equations

Step 1: RT from Minor St. 9 12

Conflicting Flows	791	702
Potential Capacity	393	438
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	393	438
Probability of Queue free St.	0.99	0.93
Step 2: LT from Major St.	4	1
Conflicting Flows	794	728
Potential Capacity	836	876
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	836	876
Probability of Queue free St.	0.99	0.93
Maj. L Shared ln. Prob. Queue Free St.	0.99	0.87
Step 3: TH from Minor St.	8	11
Conflicting Flows	1654	1630
Potential Capacity	99	103
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.87	0.87
Movement Capacity	86	89
Probability of Queue free St.	0.98	0.97
Step 4: LT from Minor St.	7	10
Conflicting Flows	1644	1630
Potential Capacity	81	81
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.84	0.85
Maj. L, Min T Adj. Imp Factor.	0.88	0.88
Cap. Adj. factor due to Impeding mvmnt	0.82	0.88
Movement Capacity	66	71

Worksheet 8 Shared Lane Calculations

Shared Lane Calculations

Movement	7	8	9	10	11	12
v(vph)	4	2	2	45	3	28
Movement Capacity	66	86	393	71	89	438
Shared Lane Capacity	90			105		

Worksheet 10 delay,queue length, and LOS

Movement	1	4	7	8	9	10	11	12
v(vph)	63	5	8			76		
C m(vph)	876	836	90			105		
v/c	0.07	0.01	0.09			0.72		

95% queue length										
Control Delay	9.4		9.3		48.9			116.3		
LOS	A		A		E			F		
Approach Delay						48.9			116.3	
Approach LOS						E			F	

Worksheet 11 Shared Major LT Impedance and Delay

Rank 1 Delay Calculations

Movement	2	5
P oj	0.93	0.99
V i1	730	594
V i2	4	45
S i1	1700	1700
S i2	1700	1700
P* 0j	0.87	0.99
D maj left	9.4	9.3
N number major st lanes	1	1
Delay, rank 1 mvmts	1.2	0.1

HCS: Signals Release 3.1b

Inter: Foxhall Road and Garfield St. City/St: Washington, D.C.
Analyst: JM Proj #: J-280
Date: 03/02/2000 Period: AM Peak Hour
E/W St: Garfield Street N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Volume	26	109	4	129	56	19	1	752	112	71	836	18
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 1.00 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0					45.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capcity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	383	1576	0.40	0.243	25.4	C	25.4	C
Westbound								
LTR	282	1163	0.94	0.243	87.1	F	87.1	F
Northbound								
LTR	1056	1643	0.83	0.643	17.6	B	17.6	B
Southbound								
LTR	949	1477	1.13	0.643	268.5	F	268.5	F

Intersection Delay = 139.7 (sec/veh) Intersection LOS = F

HCS: Signals Release 3.1b

MCV
MCV
4605-C Pinecrest Office Park Drive
Alexandria, VA 22312

Phone: 7039144850 Fax: 7039144851
E-Mail: MCVAssoc@aol.com

OPERATIONAL ANALYSIS

Intersection:	Foxhall Road and Garfield St.
City/State:	Washington, D.C.
Analyst:	JM
Project No:	J-280
Time Period Analyzed:	AM Peak Hour
Date:	03/02/2000
East/West Street Name:	Garfield Street
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	26	109	4	129	56	19	1	752	112	71	836	18
PHF	0.89	0.89	0.89	0.77	0.77	0.77	0.99	0.99	0.99	0.86	0.86	0.86
PK 15 Vol	7	31	1	42	18	6	1	190	28	21	243	5
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900			1900			1900	
ParkExist												
NumPark												
% Heavy Veh	0	0	0	0	0	0	0	2	0	0	2	0
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0
Adj Flow		155			264			876			1076	
%InSharedLn												
Prop Turns	0.19		0.03	0.63		0.09	0.00		0.13	0.08		0.02
NumPeds			0			0			0			0
NumBus		0			0			0			0	

Duration 1.00 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0			0.0			0.0			0.0	
Arriv. Type		3			3			3			3	
Unit Ext.		3.0			3.0			3.0			3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time		2.0			2.0			2.0			2.0	
Ext of g		2.0			2.0			2.0			2.0	
Ped Min g		0.0			0.0			0.0			0.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0					45.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	26	0.89	29	0					
Thru	109	0.89	122	1	LTR		155	0.19	0.03
Right	4	0.89	4	0		0			
Westbound									
Left	129	0.77	167	0					
Thru	56	0.77	72	1	LTR		264	0.63	0.09
Right	19	0.77	25	0		0			
Northbound									
Left	1	0.99	1	0					
Thru	752	0.99	762	1	LTR		876	0.00	0.13
Right	112	0.99	113	0		0			
Southbound									
Left	71	0.86	83	0					
Thru	836	0.86	972	1	LTR		1076	0.08	0.02
Right	18	0.86	21	0		0			

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.897	0.925	1576

Westbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.887	0.690	1163

Northbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00	0.883	0.999	1643

Southbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00	0.897	0.883	1477

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left							
Thru	LTR	155	1576	0.10	0.243	383	0.40
Right							
Westbound							
Pri.							
Sec.							
Left							
Thru	LTR	264	1163	# 0.23	0.243	282	0.94
Right							
Northbound							
Pri.							
Sec.							
Left							
Thru	LTR	876	1643	0.53	0.643	1056	0.83
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	LTR	1076	1477	# 0.73	0.643	949	1.13
Right							

Sum (v/s) critical = 0.96

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 1.08

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.40	0.243	22.3	1.000	383	0.50	3.2	0.0	25.4	C	25.4	C
Westbound												
LTR	0.94	0.243	26.0	1.000	282	0.50	61.1	0.0	87.1	F	87.1	F
Northbound												
LTR	0.83	0.643	9.6	1.000	1056	0.50	8.1	0.0	17.6	B	17.6	B
Southbound												
LTR	1.13	0.643	12.5	1.000	949	0.50	256.0	0.0	268.5	F	268.5	F

Intersection Delay = 139.7 (sec/veh) Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}]				
+[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G	17.0	17.0	45.0	45.0
Effective Green Time for Lane Group, g	17.00	17.00	45.00	45.00
Opposing Effective Green Time, go	17.0	17.0	45.0	45.0
Number of Lanes in Lane Group, N	1	1	1	1
Number of Opposing Lanes, No	1	1	1	1
Adjusted Left-Turn Flow Rate, Vlt	29	167	1	83
Proportion of Left Turns in Lane Group, Plt	0.19	0.63	0.00	0.08
Proportion of Left Turns in Opposing Flow, Plto	0.63	0.19	0.08	0.00
Adjusted Opposing Flow Rate, Vo	264	155	1076	876
Lost Time for Lane Group, tl	4.00	4.00	4.00	4.00
Left Turns per Cycle: LTC=VltC/3600	0.56	3.25	0.02	1.61
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo	5.13	3.01	20.92	17.03
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)	1.00	1.00	1.00	1.00
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g	5.3	0.0	37.9	10.1
Opposing Queue Ratio: qro=1-Rpo(go/C)	0.76	0.76	0.36	0.36
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g	8.80	4.53	12.82	10.38
gu =g-gq if gq>=gf, =g-gf if gq<gf	8.20	12.47	7.13	34.62
n=(gq-gf)/2, n>=0	1.73	2.26	0.00	0.15
Ptho=1-Plto	0.37	0.81	0.92	1.00
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24))}	0.19	0.63	0.00	0.08
El1 (Figure 9-7)	1.81	1.62	4.01	3.31
El2=(1-Ptho**n)/Plto, El2>=1.0	1.30	2.00	1.00	1.00
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g	0.14	0.19	0.04	0.05
gdiff=max(gq-gf,0)	3.47	4.53	0.00	0.30
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)	0.93	0.69	1.00	0.88
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary	0.925	0.690	0.999	0.883

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq (From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay		Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
			Unadj. ds	Adj. d1 sec				
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 139.7 sec/veh Intersection LOS F

ERROR MESSAGES

No errors to report.

HCS: Signals Release 3.1b

Inter: Foxhall Road and Garfield St. City/St: Washington, D.C.
Analyst: JM Proj #: J-280
Date: 03/02/2000 Period: PM Peak Hour
E/W St: Garfield Street N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Volume	21	73	1	91	44	12	2	739	95	13	693	23
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 1.00 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	P				NB Left	P		
Thru	P				Thru	P		
Right	P				Right	P		
Peds					Peds			
WB Left	P				SB Left	P		
Thru	P				Thru	P		
Right	P				Right	P		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	17.0					45.0		
Yellow	4.0					4.0		
All Red	0.0					0.0		

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capcity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	380	1566	0.39	0.243	25.2	C	25.2	C
Westbound								
LTR	290	1193	0.73	0.243	41.0	D	41.0	D
Northbound								
LTR	1058	1646	0.89	0.643	23.0	C	23.0	C
Southbound								
LTR	1054	1640	0.77	0.643	14.4	B	14.4	B

Intersection Delay = 21.7 (sec/veh) Intersection LOS = C

HCS: Signals Release 3.1b

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OPERATIONAL ANALYSIS

Intersection:	Foxhall Road and Garfield St.
City/State:	Washington, D.C.
Analyst:	JM
Project No:	J-280
Time Period Analyzed:	PM Peak Hour
Date:	03/02/2000
East/West Street Name:	Garfield Street
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	21	73	1	91	44	12	2	739	95	13	693	23
PHF	0.64	0.64	0.64	0.69	0.69	0.69	0.89	0.89	0.89	0.90	0.90	0.90
PK 15 Vol	8	28	1	33	16	4	1	208	27	4	193	6
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900			1900			1900	
ParkExist												
NumPark												
% Heavy Veh	0	0	0	0	0	0	0	2	0	0	2	0
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0
Adj Flow		149			213			939			810	
%InSharedLn												
Prop Turns	0.22		0.01	0.62		0.08	0.00		0.11	0.02		0.03
NumPeds			0			0			0			0
NumBus		0			0			0			0	

Duration 1.00 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0			0.0			0.0			0.0	
Arriv. Type		3			3			3			3	
Unit Ext.		3.0			3.0			3.0			3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time		2.0			2.0			2.0			2.0	
Ext of g		2.0			2.0			2.0			2.0	
Ped Min g		0.0			0.0			0.0			0.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0					45.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	21	0.64	33	0					
Thru	73	0.64	114	1	LTR		149	0.22	0.01
Right	1	0.64	2	0		0			
Westbound									
Left	91	0.69	132	0					
Thru	44	0.69	64	1	LTR		213	0.62	0.08
Right	12	0.69	17	0		0			
Northbound									
Left	2	0.89	2	0					
Thru	739	0.89	830	1	LTR		939	0.00	0.11
Right	95	0.89	107	0		0			
Southbound									
Left	13	0.90	14	0					
Thru	693	0.90	770	1	LTR		810	0.02	0.03
Right	23	0.90	26	0		0			

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:		----		
									0.898	0.918	
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00		----	1566
Westbound							Sec LT Adj/LT Sat:		----		
									0.889	0.706	
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00		----	1193
Northbound							Sec LT Adj/LT Sat:		----		
									0.885	0.999	
LTR	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00		----	1646
Southbound							Sec LT Adj/LT Sat:		----		
									0.896	0.983	
LTR	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00		----	1640

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left							
Thru	LTR	149	1566	0.10	0.243	380	0.39
Right							
Westbound							
Pri.							
Sec.							
Left							
Thru	LTR	213	1193	# 0.18	0.243	290	0.73
Right							
Northbound							
Pri.							
Sec.							
Left							
Thru	LTR	939	1646	# 0.57	0.643	1058	0.89
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	LTR	810	1640	0.49	0.643	1054	0.77
Right							

Sum (v/s) critical = 0.75

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 0.85

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.39	0.243	22.2	1.000	380	0.50	3.0	0.0	25.2	C	25.2	C
Westbound												
LTR	0.73	0.243	24.4	1.000	290	0.50	16.6	0.0	41.0	D	41.0	D
Northbound												
LTR	0.89	0.643	10.4	1.000	1058	0.50	12.6	0.0	23.0	C	23.0	C
Southbound												
LTR	0.77	0.643	8.8	1.000	1054	0.50	5.6	0.0	14.4	B	14.4	B

Intersection Delay = 21.7 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}]				
+[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G	17.0	17.0	45.0	45.0
Effective Green Time for Lane Group, g	17.00	17.00	45.00	45.00
Opposing Effective Green Time, go	17.0	17.0	45.0	45.0
Number of Lanes in Lane Group, N	1	1	1	1
Number of Opposing Lanes, No	1	1	1	1
Adjusted Left-Turn Flow Rate, Vlt	33	132	2	14
Proportion of Left Turns in Lane Group, Plt	0.22	0.62	0.00	0.02
Proportion of Left Turns in Opposing Flow, Plto	0.62	0.22	0.02	0.00
Adjusted Opposing Flow Rate, Vo	213	149	810	939
Lost Time for Lane Group, tl	4.00	4.00	4.00	4.00
Left Turns per Cycle: LTC=VltC/3600	0.64	2.57	0.04	0.27
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo	4.14	2.90	15.75	18.26
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)	1.00	1.00	1.00	1.00
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g	4.9	0.0	36.2	26.8
Opposing Queue Ratio: qro=1-Rpo(go/C)	0.76	0.76	0.36	0.36
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g	6.87	4.28	9.55	11.16
gu =g-gq if gq>=gf, =g-gf if gq<gf	10.13	12.72	8.75	18.21
n=(gq-gf)/2, n>=0	1.00	2.14	0.00	0.00
Ptho=1-Plto	0.38	0.78	0.98	1.00
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))	0.22	0.62	0.00	0.02
El1 (Figure 9-7)	1.72	1.61	3.11	3.52
El2=(1-Ptho**n)/Plto, El2>=1.0	1.00	1.87	1.00	1.00
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g	0.14	0.19	0.04	0.05
gdiff=max(gq-gf,0)	2.00	4.28	0.00	0.00
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)	0.92	0.71	1.00	0.98
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary	0.918	0.706	0.999	0.983

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq (From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 21.7 sec/veh Intersection LOS C

ERROR MESSAGES

No errors to report.

HCS: Signals Release 3.1b

Inter: Foxhall Road and Whitehaven Pk City/St: Washington, D.C.
Analyst: JM Proj #: J-280
Date: 03/02/2000 Period: AM Peak Hour - Future
E/W St: Whitehaven Parkway N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
LGConfig	L		R				L	T			TR	R
Volume	87		209				102	867			927	178
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
RTOR Vol			0									0

Duration 1.00 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru					Thru	P			
Right	P				Right				
Peds					Peds				
WB Left					SB Left				
Thru					Thru	P			
Right					Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	15.0					47.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capcity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	387	1805	0.31	0.214	25.2	C		
							42.3	D
R	346	1615	0.83	0.214	49.3	D		
Westbound								
Northbound								
L	109	162	0.97	0.671	157.9	F		
T	1251	1863	0.72	0.671	11.0	B	26.5	C
Southbound								
TR	1251	1863	0.88	0.671	19.6	B	17.2	B
R	1084	1615	0.20	0.671	4.8	A		

Intersection Delay = 26.0 (sec/veh) Intersection LOS = C

HCS: Signals Release 3.1b

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OPERATIONAL ANALYSIS

Intersection:	Foxhall Road and Whitehaven Pk
City/State:	Washington, D.C.
Analyst:	JM
Project No:	J-280
Time Period Analyzed:	AM Peak Hour - Future
Date:	03/02/2000
East/West Street Name:	Whitehaven Parkway
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	87		209				102	867			927	178
PHF	0.73		0.73				0.96	0.96			0.84	0.84
PK 15 Vol	30		72				27	226			276	53
Hi Ln Vol												
% Grade		0						0			0	
Ideal Sat	1900		1900				1900	1900			1900	1900
ParkExist												
NumPark												
% Heavy Veh	0		0				0	2			2	0
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
LGConfig	L		R				L	T			TR	R
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
RTOR Vol			0									0
Adj Flow	119		286				106	903			1104	212
%InSharedLn												0
Prop Turns												0.00
NumPeds			0			0						0
NumBus	0		0				0	0			0	0

Duration 1.00 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0		0.0				0.0	0.0			0.0	0.0
Arriv. Type	3		3				3	3			3	3
Unit Ext.	3.0		3.0				3.0	3.0			3.0	3.0
I Factor		1.000						1.000			1.000	
Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Ext of g	2.0		2.0				2.0	2.0			2.0	2.0
Ped Min g		0.0						0.0			0.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru					Thru	P			
Right	P				Right				
Peds					Peds				
WB Left					SB Left				
Thru					Thru	P			
Right					Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	15.0					47.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	87	0.73	119	1	L		119		
Thru				0					
Right	209	0.73	286	1	R	0	286		
Westbound									
Left				0					
Thru				0					
Right				0					
Northbound									
Left	102	0.96	106	1	L		106		
Thru	867	0.96	903	1	T		903		
Right				0					
Southbound									
Left				0					
Thru	927	0.84	1104	1	TR		1104		0.00
Right	178	0.84	212	1	R	0	212		

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.950	1805

R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615
Westbound							Sec LT Adj/LT Sat:				

Northbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.085	162
T	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1863

Southbound							Sec LT Adj/LT Sat:				

TR	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1863
R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left	L	119	1805	0.07	0.214	387	0.31
Thru							
Right	R	286	1615	# 0.18	0.214	346	0.83
Westbound							
Pri.							
Sec.							
Left							
Thru							
Right							
Northbound							
Pri.							
Sec.							
Left	L	106	162	# 0.65	0.671	109	0.97
Thru	T	903	1863	0.48	0.671	1251	0.72
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	TR	1104	1863	0.59	0.671	1251	0.88
Right	R	212	1615	0.13	0.671	1084	0.20

Sum (v/s) critical = 0.83

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 0.94

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.31	0.214	23.1	1.000	387	0.50	2.1	0.0	25.2	C		
											42.3	D
R	0.83	0.214	26.3	1.000	346	0.50	23.1	0.0	49.3	D		
Westbound												
Northbound												
L	0.97	0.671	10.9	1.000	109	0.50	147.0	0.0	157.9	F		
T	0.72	0.671	7.3	1.000	1251	0.50	3.7	0.0	11.0	B	26.5	C
Southbound												
TR	0.88	0.671	9.3	1.000	1251	0.50	10.3	0.0	19.6	B	17.2	B
R	0.20	0.671	4.3	1.000	1084	0.50	0.4	0.0	4.8	A		

Intersection Delay = 26.0 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G			47.0	
Effective Green Time for Lane Group, g			47.00	
Opposing Effective Green Time, go			47.0	
Number of Lanes in Lane Group, N			1	
Number of Opposing Lanes, No			1	
Adjusted Left-Turn Flow Rate, Vlt			106	
Proportion of Left Turns in Opposing Flow, Plto			0.00	
Adjusted Opposing Flow Rate, Vo			1104	
Lost Time for Lane Group, tl			4.00	
Left Turns per Cycle: LTC=VltC/3600			2.06	
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo			21.47	
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)			1.00	
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g			0.0	
Opposing Queue Ratio: qro=1-Rpo(go/C)			0.33	
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g			32.48	
gu =g-gq if gq>=gf, =g-gf if gq<gf			14.52	
n=(gq-gf)/2, n>=0			16.24	
Ptho=1-Plto			1.00	
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))			1.00	
El1 (Figure 9-7)			3.66	
El2=(1-Ptho**n)/Plto, El2>=1.0			1.00	
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g			0.09	
gdiff=max(gq-gf,0)			0.00	
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)			0.09	
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt			0.085	

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Lane Group, Plt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq (From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 26.0 sec/veh Intersection LOS C

ERROR MESSAGES

No errors to report.

HCS: Signals Release 3.1b

Inter: Foxhall Road and Whitehaven Pk City/St: Washington, D.C.
Analyst: JM Proj #: J-280
Date: 03/02/2000 Period: PM Peak Hour - Future
E/W St: Whitehaven Parkway N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
LGConfig	L		R				L	T			TR	R
Volume	28		18				33	733			588	28
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
RTOR Vol			0									0

Duration 1.00 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	P				NB	Left	P			
	Thru						Thru	P			
	Right	P					Right				
	Peds						Peds				
WB	Left					SB	Left				
	Thru						Thru	P			
	Right						Right	P			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		24.0						38.0			
Yellow		4.0						4.0			
All Red		0.0						0.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capcity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	619	1805	0.06	0.343	15.6	B		
							15.6	B
R	554	1615	0.05	0.343	15.5	B		
Westbound								
Northbound								
L	284	524	0.13	0.543	8.8	A		
T	1011	1863	0.81	0.543	20.2	C	19.7	B
Southbound								
TR	1011	1863	0.63	0.543	14.0	B	13.7	B
R	877	1615	0.03	0.543	7.5	A		

Intersection Delay = 17.2 (sec/veh) Intersection LOS = B

HCS: Signals Release 3.1b

MCV
MCV
4605-C Pinecrest Office Park Drive
Alexandria, VA 22312

Phone: 7039144850 Fax: 7039144851
E-Mail: MCVAssoc@aol.com

OPERATIONAL ANALYSIS

Intersection:	Foxhall Road and Whitehaven Pk
City/State:	Washington, D.C.
Analyst:	JM
Project No:	J-280
Time Period Analyzed:	PM Peak Hour - Future
Date:	03/02/2000
East/West Street Name:	Whitehaven Parkway
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	28		18				33	733			588	28
PHF	0.72		0.72				0.90	0.90			0.93	0.93
PK 15 Vol	10		6				9	204			158	8
Hi Ln Vol												
% Grade		0						0			0	
Ideal Sat	1900		1900				1900	1900			1900	1900
ParkExist												
NumPark												
% Heavy Veh	0		0				0	2			2	0
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
LGConfig	L		R				L	T			TR	R
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
RTOR Vol			0									0
Adj Flow	39		25				37	814			632	30
%InSharedLn												0
Prop Turns												0.00
NumPeds			0			0						0
NumBus	0		0				0	0			0	0

Duration 1.00 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0		0.0				0.0	0.0			0.0	0.0
Arriv. Type	3		3				3	3			3	3
Unit Ext.	3.0		3.0				3.0	3.0			3.0	3.0
I Factor		1.000						1.000			1.000	
Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Ext of g	2.0		2.0				2.0	2.0			2.0	2.0
Ped Min g		0.0						0.0			0.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru					Thru	P			
Right	P				Right				
Peds					Peds				
WB Left					SB Left				
Thru					Thru	P			
Right					Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	24.0					38.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	28	0.72	39	1	L		39		
Thru				0					
Right	18	0.72	25	1	R	0	25		
Westbound									
Left				0					
Thru				0					
Right				0					
Northbound									
Left	33	0.90	37	1	L		37		
Thru	733	0.90	814	1	T		814		
Right				0					
Southbound									
Left				0					
Thru	588	0.93	632	1	TR		632		0.00
Right	28	0.93	30	1	R	0	30		

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.950	1805

R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615
Westbound							Sec LT Adj/LT Sat:				

Northbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.276	524
T	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1863

Southbound							Sec LT Adj/LT Sat:				

TR	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1863
R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left	L	39	1805	# 0.02	0.343	619	0.06
Thru							
Right	R	25	1615	0.02	0.343	554	0.05
Westbound							
Pri.							
Sec.							
Left							
Thru							
Right							
Northbound							
Pri.							
Sec.							
Left	L	37	524	0.07	0.543	284	0.13
Thru	T	814	1863	# 0.44	0.543	1011	0.81
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	TR	632	1863	0.34	0.543	1011	0.63
Right	R	30	1615	0.02	0.543	877	0.03

Sum (v/s) critical = 0.46

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 0.52

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.06	0.343	15.4	1.000	619	0.50	0.2	0.0	15.6	B		
											15.6	B
R	0.05	0.343	15.4	1.000	554	0.50	0.2	0.0	15.5	B		
Westbound												
Northbound												
L	0.13	0.543	7.9	1.000	284	0.50	0.9	0.0	8.8	A		
T	0.81	0.543	13.0	1.000	1011	0.50	7.2	0.0	20.2	C	19.7	B
Southbound												
TR	0.63	0.543	11.1	1.000	1011	0.50	3.0	0.0	14.0	B	13.7	B
R	0.03	0.543	7.5	1.000	877	0.50	0.1	0.0	7.5	A		

Intersection Delay = 17.2 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G			38.0	
Effective Green Time for Lane Group, g			38.00	
Opposing Effective Green Time, go			38.0	
Number of Lanes in Lane Group, N			1	
Number of Opposing Lanes, No			1	
Adjusted Left-Turn Flow Rate, Vlt			37	
Proportion of Left Turns in Opposing Flow, Plto			0.00	
Adjusted Opposing Flow Rate, Vo			632	
Lost Time for Lane Group, tl			4.00	
Left Turns per Cycle: LTC=VltC/3600			0.72	
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo			12.29	
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)			1.00	
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g			0.0	
Opposing Queue Ratio: qro=1-Rpo(go/C)			0.46	
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g			13.32	
gu =g-gq if gq>=gf, =g-gf if gq<gf			24.68	
n=(gq-gf)/2, n>=0			6.66	
Ptho=1-Plto			1.00	
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24))}			1.00	
El1 (Figure 9-7)			2.35	
El2=(1-Ptho**n)/Plto, El2>=1.0			1.00	
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g			0.11	
gdiff=max(gq-gf,0)			0.00	
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)			0.28	
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt			0.276	

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Lane Group, Plt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24))}				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq (From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 17.2 sec/veh Intersection LOS B

ERROR MESSAGES

No errors to report.

HCS: U[redacted]gnalized Intersections Relea[redacted] 3.1b

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: JM
Intersection: Foxhall Road and W Street
Count Date: 2-23-00
Time Period: AM Future

Intersection Orientation: North-South Major St.

Vehicle Volume Data:

Movements:	1	2	3	4	5	6	7	8	9	10	11
Volume:	35	949	0	1	1089	185	3	0	7	172	0
HFR:	37	995	0	1	1283	218	5	0	11	298	0
PHF:	0.95	0.95	0.95	0.85	0.85	0.85	0.63	0.63	0.63	0.58	0.58
PHV:	0.02	0.02	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.02	0.00

Pedestrian Volume Data:

Movements:

Flow:
Lane width:
Walk speed:
% Blockage:

Median Type: None
# of vehicles: 0

Flared approach Movements:

# of vehicles: Eastbound 0
# of vehicles: Westbound 0

Lane usage for movements 1,2&3 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 4,5&6 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 7,8&9 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 10,11&12 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Data for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
Shared ln volume, major th vehicles:	949	1089
Shared ln volume, major rt vehicles:	0	185
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Length of study period, hrs: 1.00

Worksheet 4 Critical Gap and Follow-up time calculation.

Critical Gap Calculations:

Movement	1	4	7	8	9	10	11	12
t c,base	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t c,hv	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
P hv	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.02
t c,g			0.2	0.2	0.1	0.2	0.2	0.1
G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t 3,lt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t c,T:								
1 stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t c								
1 stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2

Follow Up Time Calculations:

Movement	1	4	7	8	9	10	11	12
t f,base	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3
t f,HV	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
P hv	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.02
t f	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 6 Impedance and capacity equations

Step 1: RT from Minor St. 9 12

Conflicting Flows	995	1392
Potential Capacity	300	174
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	300	174
Probability of Queue free St.	0.96	0.37
Step 2: LT from Major St.	4	1
Conflicting Flows	995	1501
Potential Capacity	703	447
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	703	447
Probability of Queue free St.	1.00	0.92
Maj. L Shared ln. Prob. Queue Free St.	0.99	0.81
Step 3: TH from Minor St.	8	11
Conflicting Flows	2571	2462
Potential Capacity	26	31
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.81	0.81
Movement Capacity	21	25
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows	2517	2468
Potential Capacity	19	21
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.81	0.81
Maj. L, Min T Adj. Imp Factor.	0.85	0.85
Cap. Adj. factor due to Impeding mvmnt	0.32	0.82
Movement Capacity	6	17

Worksheet 8 Shared Lane Calculations

Shared Lane Calculations

Movement	7	8	9	10	11	12
v(vph)	5	0	11	298	0	109
Movement Capacity	6	21	300	17	25	174
Shared Lane Capacity	19			22		

Worksheet 10 delay,queue length, and LOS

Movement	1	4	7	8	9	10	11	12
v(vph)	37	1	16			407		
C m(vph)	447	703	19			22		
v/c	0.08	0.00	0.82			18.27		

95% queue length										
Control Delay	13.8		10.1		578.0			31422.6		
LOS	B		B		F			F		
Approach Delay						578.0			31422.6	
Approach LOS						F			F	

Worksheet 11 Shared Major LT Impedance and Delay

Rank 1 Delay Calculations

Movement	2	5
P oj	0.92	1.00
V i1	949	1089
V i2	0	185
S i1	1700	1700
S i2	1700	1700
P* 0j	0.81	0.99
D maj left	13.8	10.1
N number major st lanes	1	1
Delay, rank 1 mvmts	2.6	0.1

HCS: Unsignalized Intersections Release 3.1b

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: JM
Intersection: Foxhall Road and W Street
Count Date: 2-23-00
Time Period: PM Future

Intersection Orientation: North-South Major St.

Vehicle Volume Data:

Movements:	1	2	3	4	5	6	7	8	9	10	11
Volume:	64	839	4	2	741	30	2	1	1	14	2
HFR:	69	907	4	2	844	34	4	2	2	19	3
PHF:	0.93	0.93	0.93	0.88	0.88	0.88	0.50	0.50	0.50	0.74	0.74
PHV:	0.02	0.02	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.02	0.00

Pedestrian Volume Data:

Movements:

Flow:
Lane width:
Walk speed:
% Blockage:

Median Type: None
# of vehicles: 0

Flared approach Movements:

# of vehicles: Eastbound 0
# of vehicles: Westbound 0

Lane usage for movements 1,2&3 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 4,5&6 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 7,8&9 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Lane usage for movements 10,11&12 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	Y	N	N	N	N	N	N

Channelized: N
Grade: 0.00

Data for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
Shared ln volume, major th vehicles:	839	741
Shared ln volume, major rt vehicles:	4	30
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Length of study period, hrs: 1.00

Worksheet 4 Critical Gap and Follow-up time calculation.

Critical Gap Calculations:

Movement	1	4	7	8	9	10	11	12
t c,base	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t c,hv	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
P hv	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.02
t c,g			0.2	0.2	0.1	0.2	0.2	0.1
G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t 3,lt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t c,T:								
1 stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t c								
1 stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2

Follow Up Time Calculations:

Movement	1	4	7	8	9	10	11	12
t f,base	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3
t f,HV	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
P hv	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.02
t f	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 6 Impedance and capacity equations

Step 1: RT from Minor St. 9 12

Conflicting Flows	909	861
Potential Capacity	336	355
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	336	355
Probability of Queue free St.	0.99	0.89

Step 2: LT from Major St.	4	1
Conflicting Flows	911	878
Potential Capacity	756	769
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	756	769
Probability of Queue free St.	1.00	0.91
Maj. L Shared ln. Prob. Queue Free St.	0.99	0.82

Step 3: TH from Minor St.	8	11
Conflicting Flows	1930	1915
Potential Capacity	67	68
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.82	0.82
Movement Capacity	55	56
Probability of Queue free St.	0.96	0.95

Step 4: LT from Minor St.	7	10
Conflicting Flows	1934	1915
Potential Capacity	50	51
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.78	0.79
Maj. L, Min T Adj. Imp Factor.	0.83	0.84
Cap. Adj. factor due to Impeding mvmnt	0.74	0.83
Movement Capacity	37	43

Worksheet 8 Shared Lane Calculations

Shared Lane Calculations

Movement	7	8	9	10	11	12
v(vph)	4	2	2	19	3	39
Movement Capacity	37	55	336	43	56	355
Shared Lane Capacity	53			101		

Worksheet 10 delay,queue length, and LOS

Movement	1	4	7	8	9	10	11	12
v(vph)	69	2	8			61		
C m(vph)	769	756	53			101		
v/c	0.09	0.00	0.15			0.61		

95% queue length								
Control Delay	10.1	9.8	84.6			91.7		
LOS	B	A	F			F		
Approach Delay				84.6			91.7	
Approach LOS				F			F	

Worksheet 11 Shared Major LT Impedance and Delay

Rank 1 Delay Calculations

Movement	2	5
P oj	0.91	1.00
V i1	839	741
V i2	4	30
S i1	1700	1700
S i2	1700	1700
P* 0j	0.82	0.99
D maj left	10.1	9.8
N number major st lanes	1	1
Delay, rank 1 mvmts	1.8	0.1

HCS: Signals Release 3.1b

Inter: Foxhall Road and Garfield St. City/St: Washington, D.C.
Analyst: JM Proj #: J-280
Date: 03/02/2000 Period: AM Peak Hour - Future
E/W St: Garfield Street N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Volume	26	109	4	141	56	19	45	882	120	71	1055	31
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 1.00 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0					45.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capcity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	382	1574	0.41	0.243	25.5	C	25.5	C
Westbound								
LTR	280	1153	1.00	0.243	130.7	F	130.7	F
Northbound								
LTR	955	1486	1.11	0.643	231.4	F	231.4	F
Southbound								
LTR	953	1483	1.41	0.643	761.2	F	761.2	F

Intersection Delay = 461.2 (sec/veh) Intersection LOS = F

HCS: Signals Release 3.1b

MCV
MCV
4605-C Pinecrest Office Park Drive
Alexandria, VA 22312

Phone: 7039144850 Fax: 7039144851
E-Mail: MCVAssoc@aol.com

OPERATIONAL ANALYSIS

Intersection:	Foxhall Road and Garfield St.
City/State:	Washington, D.C.
Analyst:	JM
Project No:	J-280
Time Period Analyzed:	AM Peak Hour - Future
Date:	03/02/2000
East/West Street Name:	Garfield Street
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	26	109	4	141	56	19	45	882	120	71	1055	31
PHF	0.89	0.89	0.89	0.77	0.77	0.77	0.99	0.99	0.99	0.86	0.86	0.86
PK 15 Vol	7	31	1	46	18	6	12	223	30	21	307	9
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900			1900			1900	
ParkExist												
NumPark												
% Heavy Veh	0	0	0	0	0	0	0	2	0	0	2	0
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0
Adj Flow		155			279			1062			1346	
%InSharedLn												
Prop Turns	0.19		0.03	0.65		0.09	0.04		0.11	0.06		0.03
NumPeds			0			0			0			0
NumBus		0			0			0			0	

Duration 1.00 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0			0.0			0.0			0.0	
Arriv. Type		3			3			3			3	
Unit Ext.		3.0			3.0			3.0			3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time		2.0			2.0			2.0			2.0	
Ext of g		2.0			2.0			2.0			2.0	
Ped Min g		0.0			0.0			0.0			0.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0					45.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	26	0.89	29	0					
Thru	109	0.89	122	1	LTR		155	0.19	0.03
Right	4	0.89	4	0		0			
Westbound									
Left	141	0.77	182	0					
Thru	56	0.77	72	1	LTR		279	0.65	0.09
Right	19	0.77	25	0		0			
Northbound									
Left	45	0.99	46	0					
Thru	882	0.99	894	1	LTR		1062	0.04	0.11
Right	120	0.99	122	0		0			
Southbound									
Left	71	0.86	83	0					
Thru	1055	0.86	1227	1	LTR		1346	0.06	0.03
Right	31	0.86	36	0		0			

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.897	0.924	1574

Westbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.888	0.683	1153

Northbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00	0.884	0.902	1486

Southbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	0.980	1.000	1.000	1.000	1.00	1.00	0.896	0.888	1483

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left							
Thru	LTR	155	1574	0.10	0.243	382	0.41
Right							
Westbound							
Pri.							
Sec.							
Left							
Thru	LTR	279	1153	# 0.24	0.243	280	1.00
Right							
Northbound							
Pri.							
Sec.							
Left							
Thru	LTR	1062	1486	0.71	0.643	955	1.11
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	LTR	1346	1483	# 0.91	0.643	953	1.41
Right							

Sum (v/s) critical = 1.15

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 1.30

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.41	0.243	22.3	1.000	382	0.50	3.2	0.0	25.5	C	25.5	C
Westbound												
LTR	1.00	0.243	26.5	1.000	280	0.50	104.2	0.0	130.7	F	130.7	F
Northbound												
LTR	1.11	0.643	12.5	1.000	955	0.50	218.9	0.0	231.4	F	231.4	F
Southbound												
LTR	1.41	0.643	12.5	1.000	953	0.50	748.7	0.0	761.2	F	761.2	F

Intersection Delay = 461.2 (sec/veh) Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N** flt				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G	17.0	17.0	45.0	45.0
Effective Green Time for Lane Group, g	17.00	17.00	45.00	45.00
Opposing Effective Green Time, go	17.0	17.0	45.0	45.0
Number of Lanes in Lane Group, N	1	1	1	1
Number of Opposing Lanes, No	1	1	1	1
Adjusted Left-Turn Flow Rate, Vlt	29	182	46	83
Proportion of Left Turns in Lane Group, Plt	0.19	0.65	0.04	0.06
Proportion of Left Turns in Opposing Flow, Plto	0.65	0.19	0.06	0.04
Adjusted Opposing Flow Rate, Vo	279	155	1346	1062
Lost Time for Lane Group, tl	4.00	4.00	4.00	4.00
Left Turns per Cycle: LTC=VltC/3600	0.56	3.54	0.89	1.61
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo	5.43	3.01	26.17	20.65
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)	1.00	1.00	1.00	1.00
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g	5.3	0.0	16.2	10.1
Opposing Queue Ratio: qro=1-Rpo(go/C)	0.76	0.76	0.36	0.36
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g	9.35	4.53	15.95	12.65
gu =g-gq if gq>=gf, =g-gf if gq<gf	7.65	12.47	28.82	32.35
n=(gq-gf)/2, n>=0	2.01	2.26	0.00	1.29
Ptho=1-Plto	0.35	0.81	0.94	0.96
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)})	0.19	0.65	0.04	0.06
El1 (Figure 9-7)	1.84	1.62	5.18	3.96
El2=(1-Ptho**n)/Plto, El2>=1.0	1.35	2.00	1.00	1.28
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g	0.14	0.19	0.05	0.05
gdiff=max(gq-gf,0)	4.02	4.53	0.00	2.58
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)	0.92	0.68	0.90	0.89
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary	0.924	0.683	0.902	0.888

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq (From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 461.2 sec/veh Intersection LOS F

ERROR MESSAGES

No errors to report.

HCS: Signals Release 3.1b

Inter: Foxhall Road and Garfield St. City/St: Washington, D.C.
Analyst: JM Proj #: J-280
Date: 03/02/2000 Period: PM Peak Hour - Future
E/W St: Garfield Street N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Volume	21	73	1	141	44	12	2	909	104	13	794	23
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 1.00 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0					45.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capcity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	378	1556	0.39	0.243	25.3	C	25.3	C
Westbound								
LTR	278	1145	1.03	0.243	160.8	F	160.8	F
Northbound								
LTR	1060	1649	1.08	0.643	169.3	F	169.3	F
Southbound								
LTR	1052	1637	0.88	0.643	21.8	C	21.8	C

Intersection Delay = 105.2 (sec/veh) Intersection LOS = F

HCS: Signals Release 3.1b

MCV
MCV
4605-C Pinecrest Office Park Drive
Alexandria, VA 22312

Phone: 7039144850 Fax: 7039144851
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OPERATIONAL ANALYSIS

Intersection:	Foxhall Road and Garfield St.
City/State:	Washington, D.C.
Analyst:	JM
Project No:	J-280
Time Period Analyzed:	PM Peak Hour - Future
Date:	03/02/2000
East/West Street Name:	Garfield Street
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	21	73	1	141	44	12	2	909	104	13	794	23
PHF	0.64	0.64	0.64	0.69	0.69	0.69	0.89	0.89	0.89	0.90	0.90	0.90
PK 15 Vol	8	28	1	51	16	4	1	255	29	4	221	6
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900			1900			1900	
ParkExist												
NumPark												
% Heavy Veh	0	0	0	0	0	0	0	2	0	0	2	0
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0
Adj Flow		149			285			1140			922	
%InSharedLn												
Prop Turns	0.22		0.01	0.72		0.06	0.00		0.10	0.02		0.03
NumPeds			0			0			0			0
NumBus		0			0			0			0	

Duration 1.00 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0			0.0			0.0			0.0	
Arriv. Type		3			3			3			3	
Unit Ext.		3.0			3.0			3.0			3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time		2.0			2.0			2.0			2.0	
Ext of g		2.0			2.0			2.0			2.0	
Ped Min g		0.0			0.0			0.0			0.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0					45.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	21	0.64	33	0					
Thru	73	0.64	114	1	LTR		149	0.22	0.01
Right	1	0.64	2	0		0			
Westbound									
Left	141	0.69	204	0					
Thru	44	0.69	64	1	LTR		285	0.72	0.06
Right	12	0.69	17	0		0			
Northbound									
Left	2	0.89	2	0					
Thru	909	0.89	1021	1	LTR		1140	0.00	0.10
Right	104	0.89	117	0		0			
Southbound									
Left	13	0.90	14	0					
Thru	794	0.90	882	1	LTR		922	0.02	0.03
Right	23	0.90	26	0		0			

* Value entered by user.