

TECHNICAL APPENDIX
MARPLE ASSOCIATES DEVELOPMENT
Marple Township, Delaware County

Prepared for
Marple Associates

July 11, 2011
Revised January 6, 2014

Prepared by
Orth-Rodgers & Associates Inc.



Content

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C – Traffic Count Data

D – Crash Data & Analysis

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I – Synchro Calibration Memo

J – Langford Run Road and Lawrence Road Signalization Study

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L – Capacity and Queue Analysis Output “Year 2015 No Build”

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N – Capacity and Queue Analysis Output “Year 2015 Build”

O – Capacity and Queue Analysis Output “Year 2020 Build”

P – Concept Plan

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A – Site Photographs:

West Chester Pike and New Ardmore Avenue



WB West Chester Pike at New Ardmore



EB West Chester Pike at New Ardmore



NB New Ardmore at West Chester Pike



SB New Ardmore at West Chester Pike

West Chester Pike and Mather Avenue



WB West Chester Pike at Mather Avenue



SB Mather Avenue at West Chester Pike

West Chester Pike and I-476 SB Ramps



WB West Chester Pike at I-476 SB Ramps



EB West Chester Pike at I-476 SB Ramps



SB I-476 Ramp to EB West Chester Pike (signalized)



SB I-476 Ramp to WB West Chester Pike (unsignalized)

West Chester Pike and I-476 NB Ramps



WB West Chester Pike at I-476 NB Ramps



EB West Chester Pike at I-476 NB Ramps



NB I-476 NB Ramp at West Chester Pike

West Chester Pike and South Lawrence Road



WB West Chester Pike at South Lawrence Road



EB West Chester Pike at South Lawrence Road



NB South Lawrence Road at West Chester Pike

West Chester Pike and North Lawrence Road



WB West Chester Pike at North Lawrence Road



EB West Chester Pike at North Lawrence Road



SB North Lawrence Road at West Chester Pike



SB North Lawrence Road at West Chester Pike

West Chester Pike and Old West Chester Pike



WB West Chester Pike at Old West Chester Pike



WB West Chester Pike at Old West Chester Pike



NB Old West Chester Pike at West Chester Pike



SB Hollow Run Apartments at West Chester Pike

South Lawrence Road and Langford Run Road



NB South Lawrence Road at Langford Run Road



SB North Lawrence Road at Langford Run Road



EB Langford Run Road at South Lawrence Road



EB Langford Run Road at South Lawrence Road

South Lawrence Road and Sussex Boulevard



NB South Lawrence Road at Sussex Boulevard



SB South Lawrence Road at Sussex Boulevard



EB Sussex Boulevard at South Lawrence Road



WB Sussex Boulevard at South Lawrence Road

B – Signal Plans:

EMERGENCY PRE-EMPTION NOTES:

CONTROLLER TO BE EQUIPPED WITH EMERGENCY PRE-EMPTION FOR THE NORTHBOUND AND SOUTHBOUND APPROACHES OF NEW ARDMORE AVENUE AND THE EASTBOUND AND WESTBOUND APPROACHES OF WEST CHESTER PIKE WITH A FAIL SAFE DEVICE FOR EACH DIRECTION OF OPERATION. THIS FAIL SAFE DEVICE SHALL CONSIST OF A FLASHING WHITE FLOOD LIGHT, AND SHALL BEGIN FLASHING WHEN THE PREEMPTION PHASE DISPLAYS PREEMPTION GREEN FOR THE EMERGENCY VEHICLE APPROACH.

THE SIGNALS, WHEN ACTIVATED BY EMERGENCY VEHICLE, SHALL TERMINATE ALL GREEN INDICATIONS, EXCEPT THE GREEN INDICATIONS FOR THE PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE, FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PRE-EMPTION OCCURS. THE "GREEN" INDICATIONS FOR THE PRE-EMPTED PHASE SHALL REMAIN "GREEN" FOR THE DURATION OF SIGNAL PRE-EMPTION AND "RED" INDICATIONS DISPLAYED FOR ALL OTHER PHASES.

IF THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, ARE FLASHING ALL SIGNALS SHALL REMAIN FLASHING.

THE SIGNALS, WHEN ACTIVATED BY EMERGENCY VEHICLE, SHALL TIME OUT ALL YELLOW AND RED INDICATIONS, FOLLOWED BY THE GREEN INTERVAL OF THE PRE-EMPTION PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE.

IF SIGNALS HAVE BEEN ACTUATED BY PEDESTRIAN PUSHBUTTON, AND THE SIGNAL IS PRE-EMPTED DURING THE MAIN INTERVAL, THE MAIN INTERVAL SHALL TERMINATE IMMEDIATELY, FOLLOWED BY THE FLASHING HAND INTERVAL. THIS INTERVAL SHALL TIME OUT FOLLOWED BY THE APPROPRIATE SELECTIVE CLEARANCES, BEFORE GOING INTO EMERGENCY PRE-EMPTION.

UPON COMPLETION OF PRE-EMPTION PHASE A,B,C OR D IN RETURNING TO NORMAL OPERATION, PHASE 2+6 INTERVAL 10 SHALL FOLLOW.

IN EMERGENCY PRE-EMPTION, NO PRIORITY SHALL BE ESTABLISHED. PRE-EMPTION SHALL BE A "FIRST COME, FIRST SERVE" OPERATION.

IF PREEMPTION EQUIPMENT HAS ENCODING CAPABILITIES FOR THE IDENTIFICATION OF VEHICLES, IT IS RECOMMENDED TO HAVE THE ZERO "00" FEATURE ON, TO GIVE UNCODED EMITTERS THE ABILITY TO ACTIVATE THE EMERGENCY PREEMPTION.

COORDINATION NOTES:

THIS INTERSECTION TO BE COORDINATED WITH ADJACENT INTERSECTION AT I-476 SOUTHBOUND OFF RAMP ON WEST CHESTER PIKE USING A TIME BASED COORDINATOR. THE ON-STREET MASTER CONTROLLER LOCATED AT SOUTH LAWRENCE ROAD SHALL SUPPLY A TBC CLOCK SYNCHRONIZING PULSE BY MEANS OF A CLOSED LOOP CAPABLE SYSTEM.

SIGN TABULATION			
PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
B	R3-9	18"x18"	NO PEDESTRIAN CROSSING
C	R10-3B	9"x12"	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON SIGNAL SIGN
E	R10-11	30"x36"	NO TURN ON RED
F	R10-10L	30"x36"	LEFT TURN SIGNAL
G	R3-7L	30"x30"	LEFT LANE MUST TURN LEFT
K	R3-7R	30"x30"	RIGHT LANE MUST TURN RIGHT
H	W16-1	18"x18"	HAZARD MARKER
J	R4-7	24"x30"	KEEP RIGHT

GENERAL NOTES

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ALL MAINTENANCE WORK INCLUDING TRIMMING OF TREES, NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS IS THE RESPONSIBILITY OF THE PERMITEE.

ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH PUBLICATION NO. 68.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF CURB OR THE EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM CLEARANCE HORIZONTALLY OF 2 FEET.

SIGNALS ERECTED OVER THE ROADWAY SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 16 FT. ABOVE THE ROADWAY. POST MOUNTED SIGNALS SHALL BE A MINIMUM OF 8 FT. ABOVE THE SIDEWALK OR PAVEMENT.

ALL OVERHEAD SIGNALS MUST BE RIDGELY MOUNTED, TOP AND BOTTOM, AND EQUIPPED WITH BACKPLATES.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNALS MEASURED AT RIGHT ANGLES TO THE APPROACH SHALL BE 8 FEET.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PENNDOT.

CURBING TO BE INSTALLED BY MUNICIPALITY AND WHERE NOTED, SHALL BE PLAIN CEMENT CONCRETE CURB OR GRANITE CURB, INSTALLED IN ACCORDANCE WITH DEPARTMENT SPECIFICATIONS FORM 408.

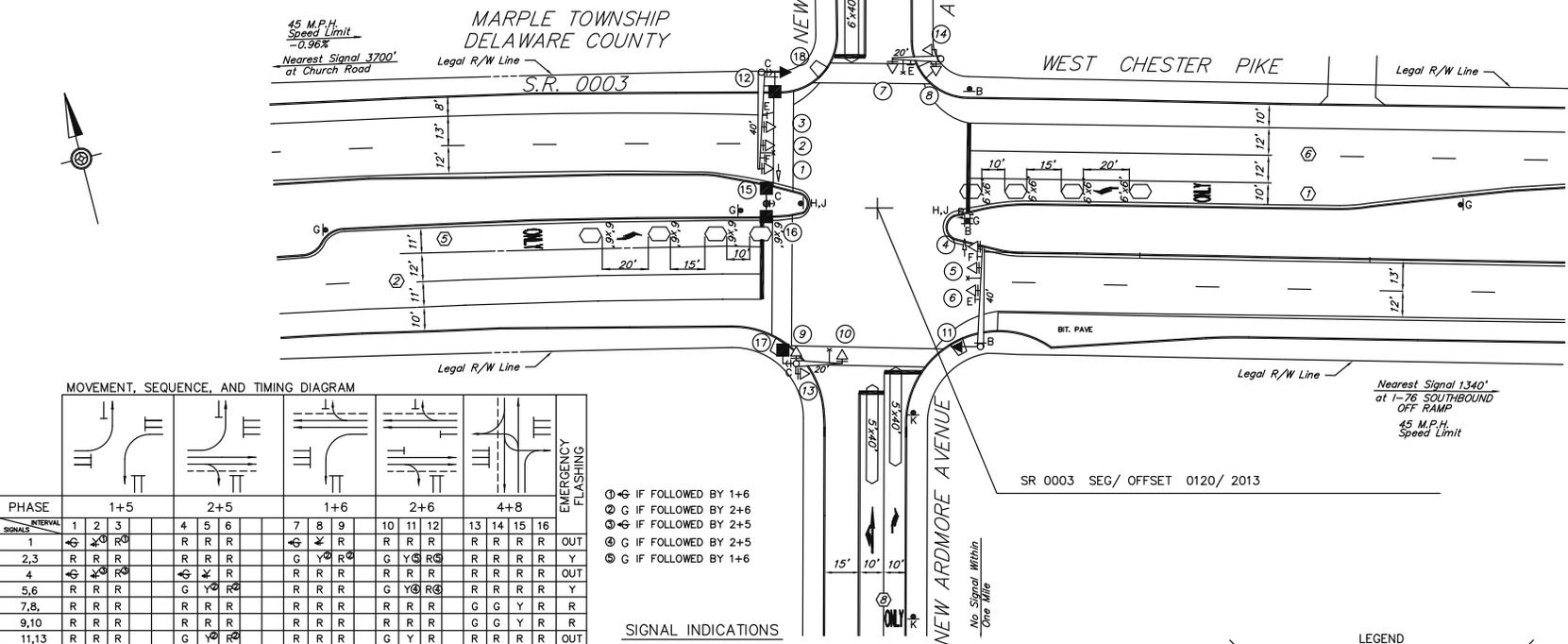
PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITEE COMPLIES WITH THE PROVISIONS OF ACT 187, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, EFFECTIVE DATE DECEMBER 19, 1996.

WHEN LIQUID FUELS MONEY IS USED, SIGNAL INSTALLATION MUST CONFORM TO FORM 408 AND A COPY OF THE PROPOSED SPECIFICATIONS MUST BE SUBMITTED TO THE DISTRICT TRAFFIC UNIT, FOR REVIEW, PRIOR TO BIDDING.

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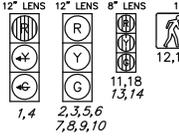


MOVEMENT, SEQUENCE, AND TIMING DIAGRAM

PHASE	1+5	2+5	1+6	2+6	4+8	EMERGENCY FLASHING
1	1	2,3	4,5,6	7,8,9	10,11,12	13,14,15,16
2,3	R	R	R	R	R	R
4	R	R	R	R	R	R
5,6	R	R	R	R	R	R
7,8	R	R	R	R	R	R
9,10	R	R	R	R	R	R
11,13	R	R	R	R	R	R
14,18	R	R	R	R	R	R
12,15,16,17	H	H	H	H	H	H

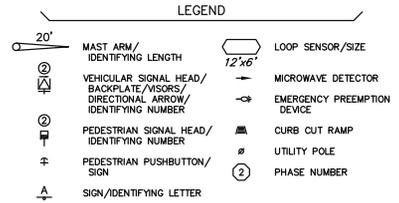
- ① IF FOLLOWED BY 1+6
- ② G IF FOLLOWED BY 2+6
- ③ G IF FOLLOWED BY 2+5
- ④ G IF FOLLOWED BY 2+5
- ⑤ G IF FOLLOWED BY 1+6

SIGNAL INDICATIONS



RED SIGNAL INDICATION ON SIGNAL HEADS 1 & 4 SHALL BE EQUIPPED WITH TUNNEL VISORS AND LOUVERS

SIGNAL HEADS 11, 13, 14 & 18 SHALL BE EQUIPPED WITH FULL TUNNEL VISORS AND LOUVERS



FIXED	4	2	4	2	4	2	4	2	4	2
MINIMUM	3				3				3	
PASSAGE	3				3				3	
MAXIMUM 1	7				7				7	
MAXIMUM 2	7				7				7	
PEDESTRIAN *									7	8
MEMORY	NL				NL				NL	

* ON PEDESTRIAN ACTUATION ONLY

NOTE: REFER TO SYSTEM PERMIT # I-0097 FOR PROGRAM TIMING & WEEKLY PROGRAM CHART

SYSTEM PERMIT # I-0097

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6-0

COUNTY: DELAWARE
MUNICIPALITY: MARPLE TOWNSHIP
INTERSECTION: WEST CHESTER PIKE (SR 0003)
AND NEW ARDMORE ROAD

REVIEWED: _____ DATE _____

MUNICIPAL OFFICIAL _____ DATE _____

RECOMMENDED: _____ DATE _____

DISTRICT TRAFFIC ENGINEER _____ DATE _____

NO.	REVISION	DES/REV.	DATE	REV.	DATE	RECORD	DATE
1	Modernization						
2							
3							
4							
5							
6							
7							
8							

EMERGENCY PRE-EMPTION PHASING MOVEMENT, SEQUENCE AND TIMING DIAGRAM

PHASE	INTERVAL	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
SIGNALS	1,2	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R
	3,4	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R
	5,6	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	7	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	8	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R
	9, 10	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
FIXED TIME		**	5	2				**	5	2			**	4	2	

EMERGENCY PRE-EMPTION NOTES:

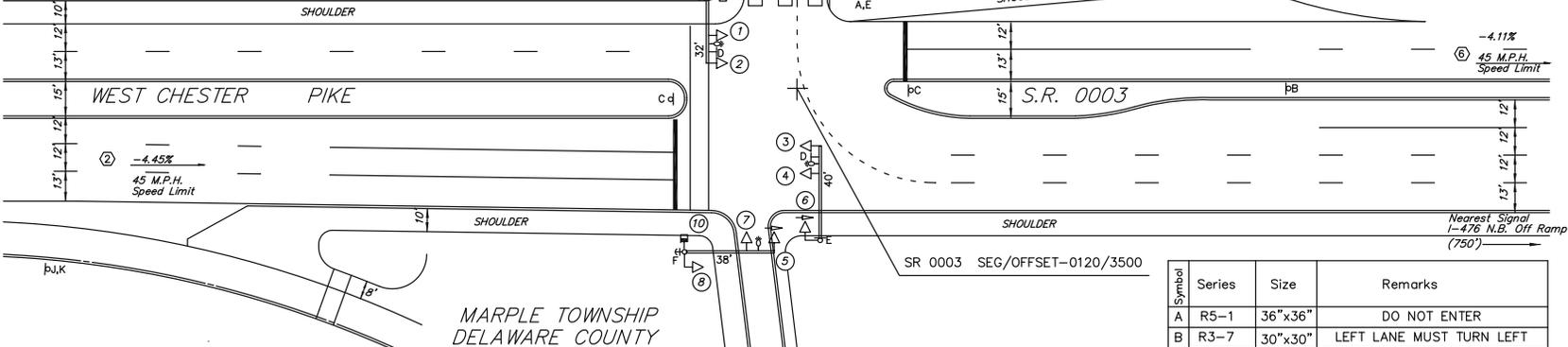
CONTROLLER TO BE EQUIPPED WITH EMERGENCY PRE-EMPTION FOR THE EASTBOUND AND WESTBOUND APPROACHES OF WEST CHESTER PIKE WITH A FAIL DSAFE DEVICE FOR EACH DIRECTION OF OPERATION.

THIS FAIL SAFE DEVICE SHALL CONSIST OF A FLASHING WHITE FLOOD LIGHT, AND SHALL BEGIN FLASHING WHEN THE PREEMPTION PHASE DISPLAYS PREEMPTION GREEN FOR THE EMERGENCY VEHICLE APPROACH.

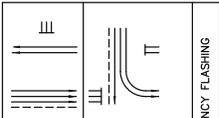
SHALL TERMINATE ALL GREEN INDICATIONS, EXCEPT THE GREEN INDICATIONS FOR THE PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE, FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PRE-EMPTION OCCURS. THE "GREEN" INDICATIONS FOR THE PRE-EMPTED PHASE SHALL REMAIN "GREEN" FOR THE DURATION OF SIGNAL PRE-EMPTION AND "RED" INDICATIONS DISPLAYED FOR ALL OTHER PHASES.

IF THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, ARE FLASHING ALL SIGNALS SHALL REMAIN FLASHING.

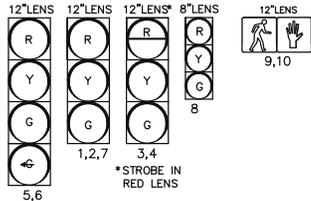
Nearest Signal
New Ardmore Avenue
(1340')



MOVEMENT, SEQUENCE AND TIMING DIAGRAM



SIGNAL INDICATIONS



PHASE	INTERVAL	2+6	4	EMERGENCY FLASHING
SIGNAL	1,2	G	Y	R
	3,4	G	Y	R
	5,6	R	R	R
	7	R	R	R
	8	G	Y	R
	9,10	H	H	H
FIXED		5	2	4
MINIMUM	29		3	
PASSAGE			3	
MAXIMUM 1	47		26	
MAXIMUM 2	59		36	
PEDESTRIAN *		7	19	
MEMORY	MR		NL	

*UPON PEDESTRIAN ACTUATION ONLY
NOTE: REFER TO SYSTEM PERMIT # I-0097 FOR PROGRAM TIMING & WEEKLY PROGRAM CHART

THE SIGNALS, WHEN ACTIVATED BY EMERGENCY VEHICLE, SHALL TIME OUT ALL YELLOW AND RED INDICATIONS, FOLLOWED BY THE GREEN INTERVAL OF THE PRE-EMPTION PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE.

IF SIGNALS HAVE BEEN ACTUATED BY PEDESTRIAN PUSHBUTTON, AND THE SIGNAL IS PRE-EMPTED, THE PEDESTRIAN TIME SHALL BE SPLIT BETWEEN PED WALK(MAN) AND PED CLEAR(HAND) INTERVAL. THE PED WALK(MAN) INTERVAL SHALL TERMINATE IMMEDIATELY, FOLLOWED BY THE PED CLEAR(HAND) INTERVAL. THIS INTERVAL SHALL TIME OUT FOLLOWED BY THE APPROPRIATE SELECTIVE CLEARANCES, BEFORE GOING INTO EMERGENCY PRE-EMPTION.

UPON COMPLETION OF PRE-EMPTION PHASE A OR B IN RETURNING TO NORMAL OPERATION, PHASE 2+6 INTERVAL 1 SHALL FOLLOW.

IN EMERGENCY PRE-EMPTION, NO PRIORITY SHALL BE ESTABLISHED. PRE-EMPTION SHALL BE A "FIRST COME, FIRST SERVE" OPERATION.

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GENERAL NOTES

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ALL MAINTENANCE WORK INCLUDING TRIMMING OF TREES, NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH PUBLICATION NO. 68.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF CURB OR THE EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM CLEARANCE HORIZONTALLY OF 2 FEET.

SIGNALS ERECTED OVER THE ROADWAY SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 16 FT. ABOVE THE ROADWAY. POST MOUNTED SIGNALS SHALL BE A MINIMUM OF 8 FT. ABOVE THE SIDEWALK OR PAVEMENT.

ALL OVERHEAD SIGNALS MUST BE RIGIDLY MOUNTED, TOP AND BOTTOM, AND EQUIPPED WITH BACKPLATES.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNALS MEASURED AT RIGHT ANGLES TO THE APPROACH SHALL BE 8 FEET.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PENNDOT.

CURBING TO BE INSTALLED BY MUNICIPALITY AND WHERE NOTED, SHALL BE PLAIN CEMENT CONCRETE CURB OR GRANITE CURB, INSTALLED IN ACCORDANCE WITH DEPARTMENT SPECIFICATIONS FORM 40B.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

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PERMITEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION.

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SYSTEM PERMIT # I-0097

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6-0

COUNTY: DELAWARE

MUNICIPALITY: MARPLE TOWNSHIP

INTERSECTION: WEST CHESTER PIKE (SR 0003)

AND I-476 SOUTHBOUND OFF RAMP

REVIEWED: _____ DATE _____

MUNICIPAL OFFICIAL _____ DATE _____

RECOMMENDED: _____ DATE _____

DISTRICT TRAFFIC ENGINEER _____ DATE _____

NO. REVISION _____ DATE _____

1 Modernization _____ DATE _____

2 _____ DATE _____

3 _____ DATE _____

4 _____ DATE _____

5 _____ DATE _____

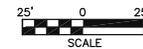
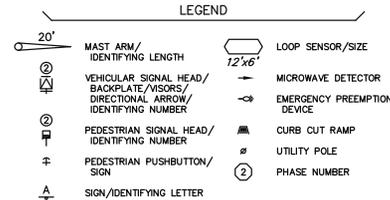
6 _____ DATE _____

7 _____ DATE _____

8 _____ DATE _____

SHEET 2 OF 2 PERMIT # 63-2418 FILE # 2418

Symbol	Series	Size	Remarks
	A	R5-1	36"x36" DO NOT ENTER
	B	R3-7	30"x30" LEFT LANE MUST TURN LEFT
	C	R3-3	24"x24" (24"x24") NO TURNS
	D	R3-3	36"x36" (36"x36") NO TURNS
	E	R3-9	18"x18" NO PEDESTRIAN CROSSING
	F	R10-3(R)	9"x12" PUSH BUTTON FOR GREEN LIGHT
	G	R3-5L	30"x36" LEFT TURN SIGN
	H	R3-5S	30"x36" STRAIGHT THRU SIGN
	J	R1-5	24"x18" YIELD TO PEDESTRIAN SIGN
	K	W11-2	36"x36" PEDESTRIAN CROSSING SIGN
	L	R5-9	36"x24" WRONG WAY SIGN



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EMERGENCY PRE-EMPTION PHASING

MOVEMENT, SEQUENCE AND TIMING DIAGRAM

PHASE	INTERVAL	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1,2,15	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R
3,4	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
5	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R
6	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
8	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
9	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
10,11	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R
7,12,13,14	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
FIXED TIME	**	4	2				**	4	2			**	4	2		

** FOR DURATION OF PREEMPTION

COUNT DATE

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOTAL
1																										
2																										
3																										
4																										
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25																										
TOTAL																										

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POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF CURB OR THE EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM CLEARANCE HORIZONTALLY OF 2 FEET.

SIGNALS ERECTED OVER THE ROADWAY SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 16 FT. ABOVE THE ROADWAY. POST MOUNTED SIGNALS SHALL BE A MINIMUM OF 8 FT. ABOVE THE SIDEWALK OR PAVEMENT.

ALL OVERHEAD SIGNALS MUST BE RIGIDLY MOUNTED, TOP AND BOTTOM, AND EQUIPPED WITH BACKPLATES.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNALS MEASURED AT RIGHT ANGLES TO THE APPROACH SHALL BE 8 FEET.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PERMITS.

CURBING TO BE INSTALLED BY MUNICIPALITY AND WHERE NOTED, SHALL BE PLAIN CEMENT CONCRETE CURB OR GRANITE CURB, INSTALLED IN ACCORDANCE WITH DEPARTMENT SPECIFICATIONS FORM 408.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

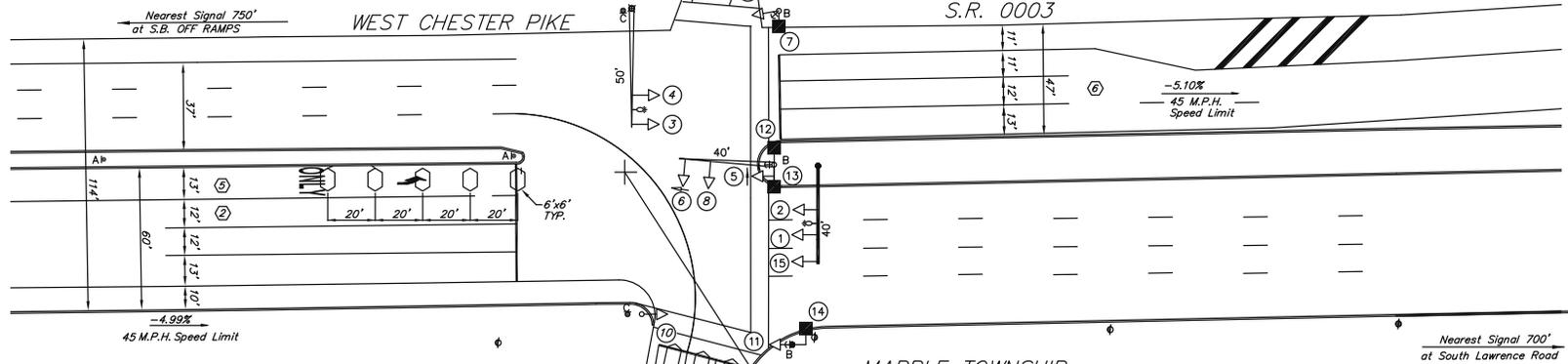
THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITEE COMPLIES WITH THE PROVISIONS OF ACT 36, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, EFFECTIVE DATE DECEMBER 12, 1991.

WHEN LIQUID FUELS MONEY IS USED, SIGNAL INSTALLATION MUST CONFORM TO FORM 408 AND A COPY OF THE PROPOSED SPECIFICATIONS MUST BE SUBMITTED TO THE DISTRICT TRAFFIC UNIT FOR REVIEW PRIOR TO BIDDING.

PERMITEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION.

CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-7800 SERIES.

SYSTEM PERMIT # 1-0097

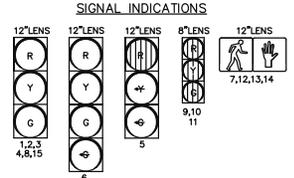


MOVEMENT, SEQUENCE AND TIMING DIAGRAM

PHASE	INTERVAL	1	2	3	4	5	6	7	8	9	10	EMERGENCY FLASHING
1,2,15	G	Y	R	R	G	Y	R	R	R	R	R	Y
3,4	R	R	R	R	G	Y	R	R	R	R	R	Y
5	G	Y	R	R	R	R	R	R	R	R	R	OFF
6	R	R	R	R	R	R	R	R	R	R	R	OFF
8	R	R	R	R	R	R	R	G	G	Y	R	R
9	R	R	R	R	G	Y	R	R	R	R	R	OFF
10,11	G	Y	R	R	G	Y	R	R	R	R	R	OFF
7,12,13,14	H	H	H	H	H	H	H	M	FH	H	H	OFF

FIXED	3	4	2	3	4	2	3	4	2
MINIMUM	3			3			3		
PASSAGE	3								
MAXIMUM I	25			30			25		
MAXIMUM II	25			30			25		
PEDESTRIAN #							7	12	
MEMORY	NL			MR				NL	

*UPON PEDESTRIAN ACTUATION ONLY
NOTE: REFER TO SYSTEM PERMIT # 1-0097 FOR PROGRAM
TIMING & WEEKLY PROGRAM CHART



SIGNALS TO BE EQUIPPED WITH STROBE IN RED LENSES 1,2,15
SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS & LOUVERS 9,10,11 & 3(RD ONLY)

Symbol	Series	Size	Remarks
A	R3-7L	30"x30"	LEFT LANE MUST TURN LEFT
B	R10-3B	9"x12"	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON SIGNAL SIGN
C	R9-3	18"x18"	NO PEDESTRIAN CROSSING
D	W3-3	48"x48"	SIGNAL AHEAD
E	R3-5L	30"x36"	LEFT TURN ONLY
F	R3-6LS	30"x36"	LEFT- STRAIGHT OPTION
G	R3-5R	30"x36"	RIGHT TURN ONLY



LEGEND

20'	MAST ARM/ IDENTIFYING LENGTH	12"x6"	LOOP SENSOR/ SIZE
②	VEHICULAR SIGNAL HEAD/ BACKPLATE/ VISORS/ DIRECTIONAL ARROW/ IDENTIFYING NUMBER	⊖	MICROWAVE DETECTOR
⊖	PEDESTRIAN SIGNAL HEAD/ IDENTIFYING NUMBER	⊖	EMERGENCY PREEMPTION DEVICE
⊖	PEDESTRIAN PUSHBUTTON/ SIGN	⊖	CURB CUT RAMP
⊖	SIGN/IDENTIFYING LETTER	⊖	UTILITY POLE
		②	PHASE NUMBER

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6-0

COUNTY: DELAWARE
MUNICIPALITY: MARPLE TOWNSHIP
INTERSECTION: WEST CHESTER PIKE (SR 0003)
AND I-476 NORTHBOUND OFF RAMP

REVIEWED: _____ DATE _____
MUNICIPAL OFFICIAL _____ DATE _____
RECOMMENDED: _____ DATE _____
MUNICIPAL SIGNALS ENGINEER _____ DATE _____
DISTRICT TRAFFIC ENGINEER _____ DATE _____

NO.	REVISION	DES/ REVW.	DATE	REVW.	DATE	RECOM.	DATE
1	MODERNIZATION						
NO	DESCR						
NO	DESCR						
NO	DESCR						
NO	DESCR						
NO	DESCR						
NO	DESCR						
NO	DESCR						

EMERGENCY PRE-EMPTION NOTES:

CONTROLLER TO BE EQUIPPED WITH EMERGENCY PRE-EMPTION FOR THE NORTHBOUND AND SOUTHBOUND APPROACHES OF NORTH LAWRENCE ROAD AND THE EASTBOUND AND WESTBOUND APPROACHES OF WEST CHESTER PIKE WITH A FAIL-SAFE DEVICE FOR EACH DIRECTION OF OPERATION. THIS FAIL-SAFE DEVICE SHALL CONSIST OF A FLASHING WHITE FLOOD LIGHT, AND SHALL BEGIN FLASHING WHEN THE PREEMPTION PHASE DISPLAYS PREEMPTION GREEN FOR THE EMERGENCY VEHICLE APPROACH.

THE SIGNALS, WHEN ACTIVATED BY EMERGENCY VEHICLE, SHALL TERMINATE ALL GREEN INDICATIONS, EXCEPT THE GREEN INDICATIONS FOR THE PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE, FOLLOWED BY SELECTIVE CHANGE AND CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PRE-EMPTION OCCURS. THE "GREEN" INDICATIONS FOR THE PRE-EMPTED PHASE SHALL REMAIN "GREEN" FOR THE DURATION OF SIGNAL PRE-EMPTION AND "RED" INDICATIONS DISPLAYED FOR ALL OTHER PHASES.

THE SIGNALS, WHEN ACTIVATED BY EMERGENCY VEHICLE SHALL TIME OUT ALL YELLOW AND RED INDICATIONS, FOLLOWED BY THE GREEN INTERVAL OF THE PRE-EMPTION PHASE COVERED BY THE APPROACHING EMERGENCY VEHICLE.

IF THE SIGNAL IS PREEMPTED DURING THE "MAY" INTERVAL, THE INTERVAL SHALL TERMINATE IMMEDIATELY FOLLOWED BY THE "FLASHING HAND" INDICATION IN ITS ENTIRETY, FOLLOWED BY THE APPROPRIATE SELECTIVE CLEARANCES BEFORE GOING INTO EMERGENCY PRE-EMPTION.

IF THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, ARE FLASHING ALL SIGNALS SHALL REMAIN FLASHING. UPON COMPLETION OF PREEMPTION IN RETURNING TO NORMAL OPERATION, PHASE 2+6 INTERVAL 4 SHALL FOLLOW. IN EMERGENCY PREEMPTION, NO INTERVAL SHALL BE ESTABLISHED. PREEMPTION SHALL BE A "FIRST COME, FIRST SERVE" OPERATION.

EMERGENCY PRE-EMPTION PHASING MOVEMENT, SEQUENCE AND TIMING DIAGRAM

PHASE	INTERVAL	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
SELECTIVE YELLOW	1,2															
SELECTIVE RED	3,4															
	5,6															
	8,13															
	9															
	7,10,11,12															
FIXED TIME		3	2	3	2	3	2	3	2	3	2	3	2	3	2	3

- ① AS SHOWN IN MOVEMENT, SEQUENCE AND TIMING DIAGRAM
- ② FOR DURATION OF PRE-EMPTION
- ③ TO REMAIN GREEN WHEN RETURNING TO NORMAL OPERATION

NOTE: IF PRE-EMPTION EQUIPMENT HAS ENCODING CAPABILITIES FOR VEHICLE IDENTIFICATION, IT IS RECOMMENDED TO HAVE THE ZERO "00" FEATURE ON TO GIVE UNCODED EMITTERS THE ABILITY TO ACTIVATE THE EMERGENCY PRE-EMPTION.

GENERAL NOTES

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ALL MAINTENANCE WORK INCLUDING TRIMMING OF TREES, NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH PUBLICATION NO. 68.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF CURB OR THE EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM CLEARANCE HORIZONTALLY OF 2 FEET.

SIGNALS ERECTED OVER THE ROADWAY SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 16 FT. ABOVE THE ROADWAY. POST MOUNTED SIGNALS SHALL BE A MINIMUM OF 8 FT. ABOVE THE SIDEWALK OR PAVEMENT.

ALL OVERHEAD SIGNALS MUST BE RIGIDLY MOUNTED, TOP AND BOTTOM, AND EQUIPPED WITH BACKPLATES.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNALS MEASURED AT RIGHT ANGLES TO THE APPROACH SHALL BE 8 FEET.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PENNDOT.

CURBING TO BE INSTALLED BY MUNICIPALITY AND WHERE NOTED, SHALL BE PLAIN CEMENT CONCRETE CURB OR GRANITE CURB, INSTALLED IN ACCORDANCE WITH DEPARTMENT SPECIFICATIONS FORM 408.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 187, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, EFFECTIVE DATE DECEMBER 19, 1996.

WHEN LIQUID FUELS MONEY IS USED, SIGNAL INSTALLATION MUST CONFORM TO FORM 408 AND A COPY OF THE PROPOSED SPECIFICATIONS MUST BE SUBMITTED TO THE DISTRICT TRAFFIC UNIT, FOR REVIEW, PRIOR TO BIDDING.

PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION.

CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-7800 SERIES.

SYSTEM PERMIT # 1-0084

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6-0

COUNTY: DELAWARE
MUNICIPALITY: HAVERFORD TOWNSHIP
INTERSECTION: WEST CHESTER PIKE (SR 0003)
AND NORTH LAWRENCE ROAD (SR 1016)

REVIEWED: _____ DATE _____
MUNICIPAL OFFICIAL _____ DATE _____
RECOMMENDED: _____ DATE _____
WARNER J. EICHORN 5-27-87
DISTRICT TRAFFIC ENGINEER

NO.	REVISION	DES/REV.	DATE	REV.	DATE	RECOM.	DATE
1	H/M Heads, Preemp, Coordinat						
2							
3							
4							
5							
6							
7							
8							

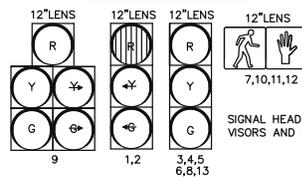
MOVEMENT, SEQUENCE AND TIMING DIAGRAM

PHASE	INTERVAL	1+6	2+6	4	EMERGENCY FLASHING
SIGNAL		1 2 3 4 5 6 7 8 9 10			
1,2		R R R R R R R R R R			
3,4		G Y G Y R R R R R R			
5,6		R R R R G Y R R R R R Y			
8,13		R R R R R R R R G G Y R			
9		R R R R R R R R R R R R			
7,10,11,12		H H H H H H H H M FH H H			
FIXED		3 2 3 4 2 2 3 3 3			
MINIMUM		3 2 3 4 2 2 3 3 3			
PASSAGE		3 2 3 4 2 2 3 3 3			
MAXIMUM		18 10 8 10			
PEDESTRIAN *					
MEMORY		NL MN NL			

- ① G IF FOLLOWED BY 2+6
- ② Y IF FOLLOWED BY 1+6
- ③ M IF FOLLOWED BY 1+6

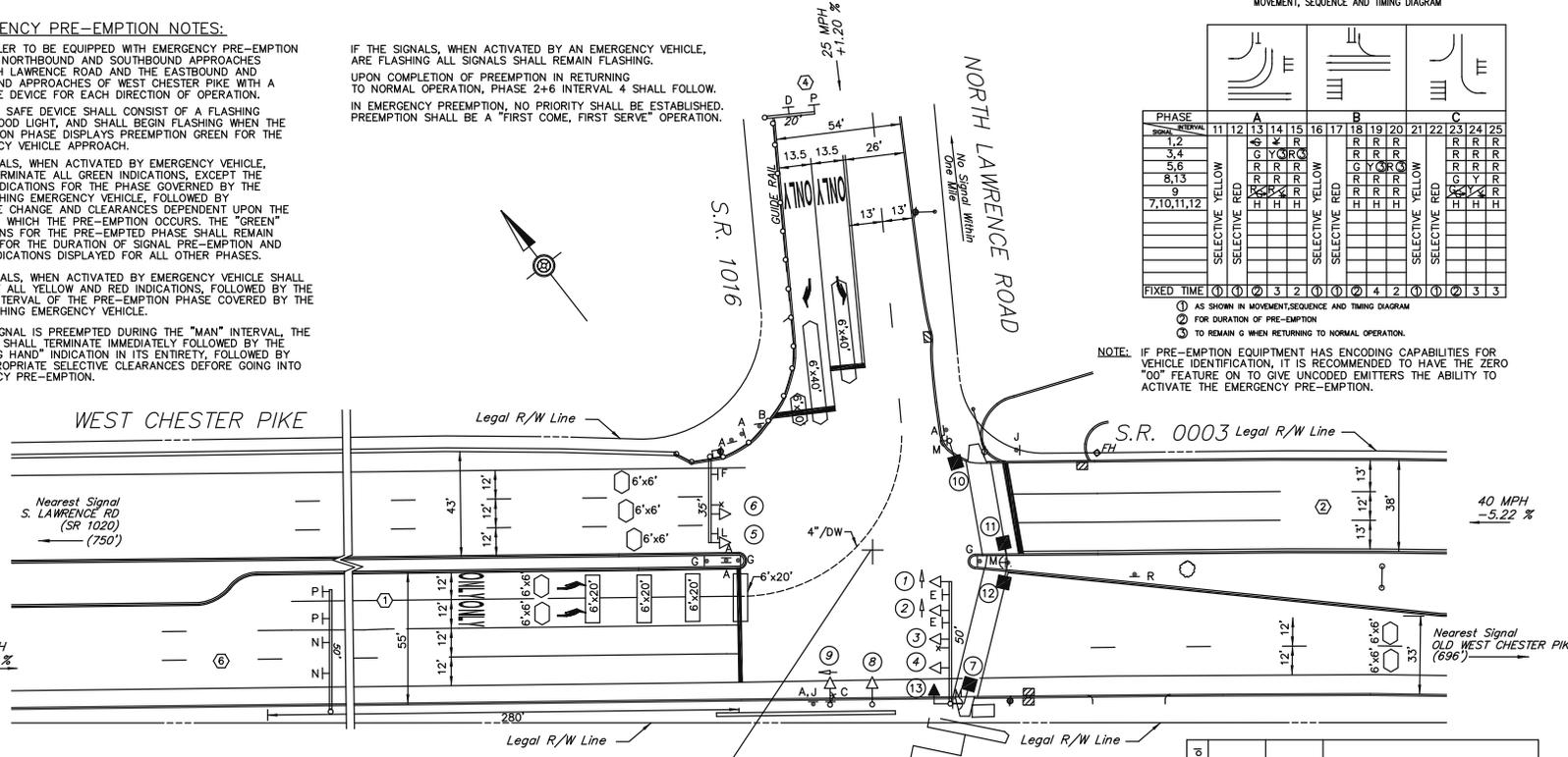
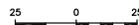
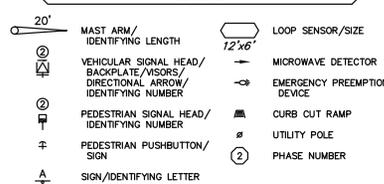
* UPON PEDESTRIAN ACTUATION ONLY
NOTE: REFER TO SYSTEM PERMIT # 1-0084 FOR PROGRAM TIMING & WEEKLY PROGRAM CHART

SIGNAL INDICATIONS



SIGNAL HEADS 1 AND 2 HAVE FULL CIRCLE VISORS AND LOUVERS ON RED INDICATORS.

LEGEND



EMERGENCY PRE-EMPTION NOTES:

CONTROLLER TO BE EQUIPPED WITH EMERGENCY PRE-EMPTION FOR THE NORTHBOUND AND SOUTHBOUND APPROACHES OF OLD WEST CHESTER PIKE AND THE EASTBOUND AND WESTBOUND APPROACHES OF WEST CHESTER PIKE WITH A FAIL SAFE DEVICE FOR EACH DIRECTION OF OPERATION.

THIS FAIL SAFE DEVICE SHALL CONSIST OF A FLASHING WHITE FLOOD LIGHT, AND SHALL BEGIN FLASHING WHEN THE PREEMPTION PHASE DISPLAYS PREEMPTION GREEN FOR THE EMERGENCY VEHICLE APPROACH.

THE SIGNALS, WHEN ACTIVATED BY EMERGENCY VEHICLE, SHALL TERMINATE ALL GREEN INDICATIONS, EXCEPT THE GREEN INDICATIONS FOR THE PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE, FOLLOWED BY SELECTIVE CHANGE AND CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PRE-EMPTION OCCURS. THE "GREEN" INDICATIONS FOR THE PRE-EMPTED PHASE SHALL REMAIN "GREEN" FOR THE DURATION OF SIGNAL PRE-EMPTION AND "RED" INDICATIONS DISPLAYED FOR ALL OTHER PHASES.

THE SIGNALS, WHEN ACTIVATED BY EMERGENCY VEHICLE SHALL TIME OUT AT YELLOW AND RED INDICATIONS, FOLLOWED BY THE GREEN INTERVAL OF THE PRE-EMPTION PHASE COVERED BY THE APPROACHING EMERGENCY VEHICLE.

IF SIGNALS HAVE BEEN ACTUATED BY PEDESTRIAN PUSH BUTTON AND THE SIGNAL IS PREEMPTED DURING THE "MAIN" INTERVAL, THE MAIN INTERVAL SHALL TERMINATE IMMEDIATELY FOLLOWED BY THE "FLASHING HAND" INDICATION. THIS INTERVAL SHALL TIME OUT FOLLOWED BY THE APPROPRIATE SELECTIVE CLEARANCES BEFORE GOING INTO EMERGENCY PRE-EMPTION.

IF THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, ARE FLASHING, ALL SIGNALS SHALL REMAIN FLASHING.

UPON COMPLETION OF PREEMPTION PHASE A,B OR C IN RETURNING TO NORMAL OPERATION, PHASE 2+6 INTERVAL 4 SHALL FOLLOW.

IN EMERGENCY PREEMPTION, NO PRIORITY SHALL BE ESTABLISHED. PREEMPTION SHALL BE A "FIRST COME, FIRST SERVE" OPERATION.

EMERGENCY PRE-EMPTION PHASING MOVEMENT, SEQUENCE AND TIMING DIAGRAM

PHASE	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1,2	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R
3	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R
4,5	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R
6,22	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R
8,9,23	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
10,11	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
12,13	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R
14,18,19,20	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
15,16,17,21	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
FIXED TIME	①	②	4	2	①	②	②	4	2	①	②	①	②	③	3

Symbol	Series	Size	Remarks
A	D3-4	96"x16"	OLD WCHESTER PK
B	D3-4	84"x16"	WCHESTER PK
C	R3-2	24"x24"	NO LEFT TURN SIGN
E	R10-6L	24"x30"	STOP HERE ON RED
F	R3-2	30"x30"	NO LEFT TURN SIGN
G	R10-3B	9"x12"	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON SIGNAL SIGN
J	R3-7L	30"x30"	LEFT LANE MUST TURN LEFT
K	R3-7R	30"x30"	RIGHT LANE MUST TURN RIGHT
M	R10-10L	24"x30"	LEFT TURN SIGNAL

GENERAL NOTES

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ALL MAINTENANCE WORK INCLUDING TRIMMING OF TREES, NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH PUBLICATION NO. 68.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF CURB OR THE EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM CLEARANCE HORIZONTALLY OF 2 FEET.

SIGNALS ERECTED OVER THE ROADWAY SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 16 FT. ABOVE THE ROADWAY. POST MOUNTED SIGNALS SHALL BE A MINIMUM OF 8 FT. ABOVE THE SIDEWALK OR PAVEMENT.

ALL OVERHEAD SIGNALS MUST BE RIDGELY MOUNTED, TOP AND BOTTOM, AND EQUIPPED WITH BACKPLATES.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNALS MEASURED AT RIGHT ANGLES TO THE APPROACH SHALL BE 8 FEET.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PENNDOT.

CURBING TO BE INSTALLED BY MUNICIPALITY AND WHERE NOTED, SHALL BE PLAIN CEMENT CONCRETE CURB OR GRANITE CURB, INSTALLED IN ACCORDANCE WITH DEPARTMENT SPECIFICATIONS FORM 408.

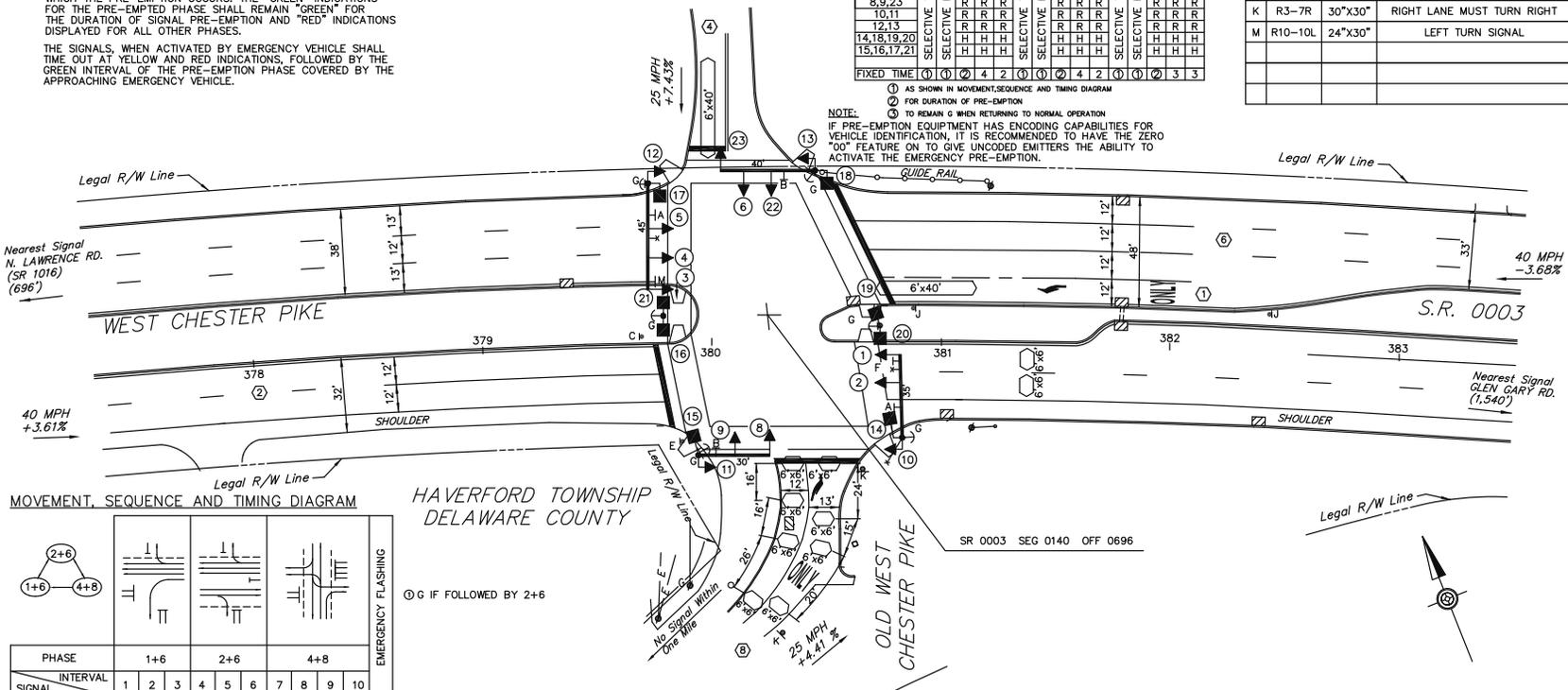
PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 187, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, EFFECTIVE DATE DECEMBER 19, 1996.

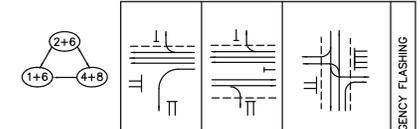
WHEN LIQUID FUELS MONEY IS USED, SIGNAL INSTALLATION MUST CONFORM TO FORM 408 AND A COPY OF THE PROPOSED SPECIFICATIONS MUST BE SUBMITTED TO THE DISTRICT TRAFFIC UNIT, FOR REVIEW, PRIOR TO BIDDING.

PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION.

CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-7800 SERIES.



MOVEMENT, SEQUENCE AND TIMING DIAGRAM

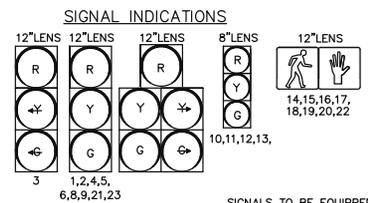


PHASE	1+6	2+6	4+8	EMERGENCY FLASHING
INTERVAL	1 2 3 4 5 6 7 8 9 10			
1,2	R	R	G	Y
3	R	R	R	R
4,5	G	Y	R	R
6,22	R	R	R	R
8,9,23	R	R	R	R
10,11	R	R	R	R
12,13	G	Y	R	R
14,18,19,20	H	H	H	H
15,16,17,21	H	H	H	H

FIXED	3	2	4	2	3	3
MINIMUM	3	30		3		
PASSAGE	3			3		
MAXIMUM	7			17		
PEDESTRIAN *				7	10	
MEMORY	NL		MN	NL		

Haverford Township Delaware County

① G IF FOLLOWED BY 2+6



SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS AND LOUVERS (RED ONLY) 3
 SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS AND LOUVERS 10,11,12,13

* UPON PEDESTRIAN ACTUATION ONLY, OTHERWISE REST IN HAND.
 NOTE: REFER TO SYSTEM PERMIT # I-0084 FOR PROGRAM TIMING & WEEKLY PROGRAM CHART

SYSTEM PERMIT # I-0084

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
 ENGINEERING DISTRICT 6-0

COUNTY: DELAWARE
 MUNICIPALITY: HAVERFORD TOWNSHIP
 INTERSECTION: WEST CHESTER PIKE (SR 0003)
 AND OLD WEST CHESTER PIKE

REVIEWED: _____ DATE _____

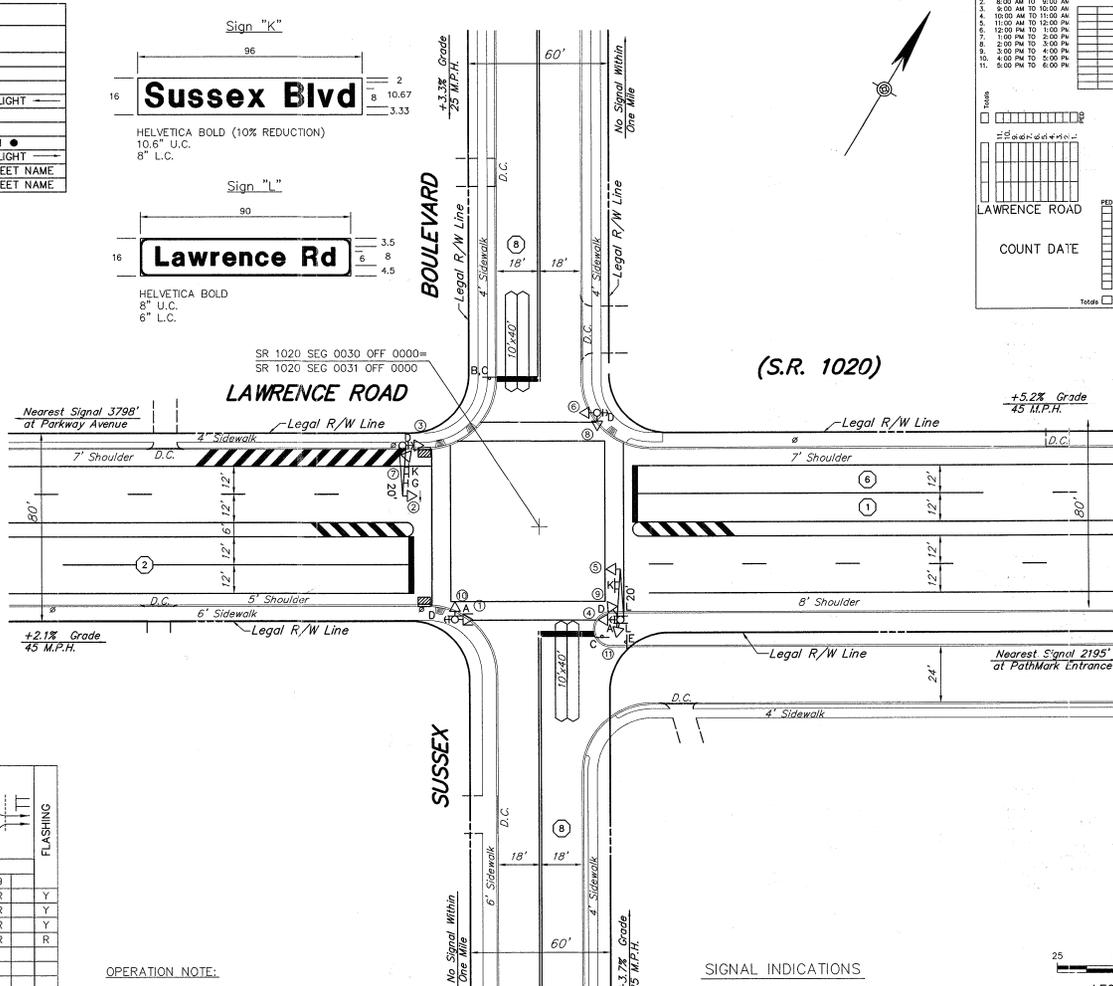
MUNICIPAL OFFICIAL _____ DATE _____

RECOMMENDED: MARK L. KRAY 2-12-97
 DATE
 DOUCLAS MAY 2-12-97
 DISTRICT TRAFFIC ENGINEER DATE

NO.	REVISION	DES./REV.	DATE	REV.	DATE	RECOM.	DATE
1	MODERNIZATION						
2	REMOVE NO TURN ON RED SIGN	WDF	1/30/99				
3							
4							
5							
6							
7							
8							

SHEET 2 OF 2 PERMIT # 63-0639 FILE # 0639

SIGN TABULATION			
PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
A	R10-11	30"x36"	NO TURN ON RED
B	R10-11	24"x30"	NO TURN ON RED
C	R10-6L	24"x30"	STOP HERE ON RED
D	R10-3	9"x12"	PUSH BUTTON FOR GREEN LIGHT
E	R1-1	30"x30"	STOP
F	R9-3	18"x18"	NO PEDESTRIAN CROSSING
G	R10-12	30"x36"	LEFT TURN YIELD ON GREEN
J	R10-3	9"x12"	PUSH BUTTON FOR GREEN LIGHT
K	D3-4	96"x16"	SINGLE LINE OVERHEAD STREET NAME
L	D3-4	90"x16"	SINGLE LINE OVERHEAD STREET NAME



Time	12-7	7:00 AM TO 8:00 AM	8:00 AM TO 9:00 AM	9:00 AM TO 10:00 AM	10:00 AM TO 11:00 AM	11:00 AM TO 12:00 PM	12:00 PM TO 1:00 PM	1:00 PM TO 2:00 PM	2:00 PM TO 3:00 PM	3:00 PM TO 4:00 PM	4:00 PM TO 5:00 PM	5:00 PM TO 6:00 PM	6:00 PM TO 7:00 PM	7:00 PM TO 8:00 PM	8:00 PM TO 9:00 PM	9:00 PM TO 10:00 PM	10:00 PM TO 11:00 PM	11:00 PM TO 12:00 AM
Count																		
Total																		

GENERAL NOTES

NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS PRIOR APPROVAL IS GRANTED IN WRITING BY A REPRESENTATIVE OF THE DEPARTMENT OF TRANSPORTATION.

ALL MAINTENANCE WORK INCLUDING TRIMMING OF TREES, NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH PUBLICATION NO. 68.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF CURB OR THE EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM CLEARANCE HORIZONTALLY OF 2 FEET.

SIGNALS ERECTED OVER THE ROADWAY SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 16 FT. ABOVE THE ROADWAY. POST MOUNTED SIGNALS SHALL BE A MINIMUM OF 8 FT. ABOVE THE SIDEWALK OR PAVEMENT.

ALL OVERHEAD SIGNALS MUST BE RIGIDLY MOUNTED, TOP AND BOTTOM, AND EQUIPPED WITH BACKPLATES.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNALS MEASURED AT RIGHT ANGLES TO THE APPROACH SHALL BE 8 FEET.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PERMITS.

CURBS TO BE INSTALLED BY MUNICIPALITY AND WHERE NOTED, SHALL BE PLAIN CEMENT CONCRETE CURB OR GRANITE CURB, INSTALLED IN ACCORDANCE WITH DEPARTMENT SPECIFICATIONS FORM 408.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLETES WITH THE PROVISIONS OF ACT 187, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, EFFECTIVE DATE DECEMBER 19, 1996.

WHEN LIQUID FUELS MONEY IS USED, SIGNAL INSTALLATION MUST CONFORM TO FORM 408 AND A COPY OF THE PROPOSED SPECIFICATIONS MUST BE SUBMITTED TO THE DISTRICT TRAFFIC UNIT, FOR REVIEW, PRIOR TO BIDDING.

PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION.

CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-7800 SERIES.

MOVEMENT, SEQUENCE AND TIMING DIAGRAM

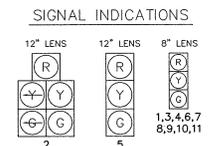
PHASE	1+6	2+6	4+8	FLASHING
SIGNALS	1 2 3	4 5 6	7 8 9	
1,3	G G G	G Y R	R R R	Y
2	G G G	G Y R	R R R	Y
4,5,6	R R R	G Y R	R R R	Y
7,8,9,10,11	R R R	R R R	G Y R	R

OPERATION NOTE:

- MAX 2 TO OPERATE FROM 7:00 AM - 9:00 AM AND FROM 4:00 PM - 6:00 PM
- MAX 1 TO OPERATE AT ALL OTHER TIMES
- SIGNAL TO DWELL IN PHASE 2+6, UNTIL ACTUATED BY PHASE 4+8

FIXED	7	3	2	4	2	3	2
MINIMUM				30			4
PASSAGE							4
MAXIMUM 1				30			20
MAXIMUM 2				30			25
PEDESTRIAN*							18
MEMORY				MX			NL

* UPON PEDESTRIAN ACTUATION ONLY



LEGEND

①	MAST ARM/IDENTIFYING LENGTH	➔	MICROWAVE DETECTOR
②	VEHICULAR SIGNAL HEAD/BACKPLATE/VISORS/DIRECTIONAL ARROW/IDENTIFYING NUMBER	⚡	EMERGENCY PREEMPTION BEACON
③	PEDESTRIAN SIGNAL HEAD/IDENTIFYING NUMBER	⚡	EMERGENCY PREEMPTION DETECTOR
④	PEDESTRIAN PUSHBUTTON/SIGN	⚡	CURB CUT RAMP
⑤	SIGN/IDENTIFYING LETTER	⚡	UTILITY POLE
⑥	LOOP SENSOR/SIZE	⑦	PHASE NUMBER
		⑧	INLET

SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS _____

SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS & LOUVERS _____

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION ENGINEERING DISTRICT 6-0

COUNTY: DELAWARE

MUNICIPALITY: MARPLE TOWNSHIP

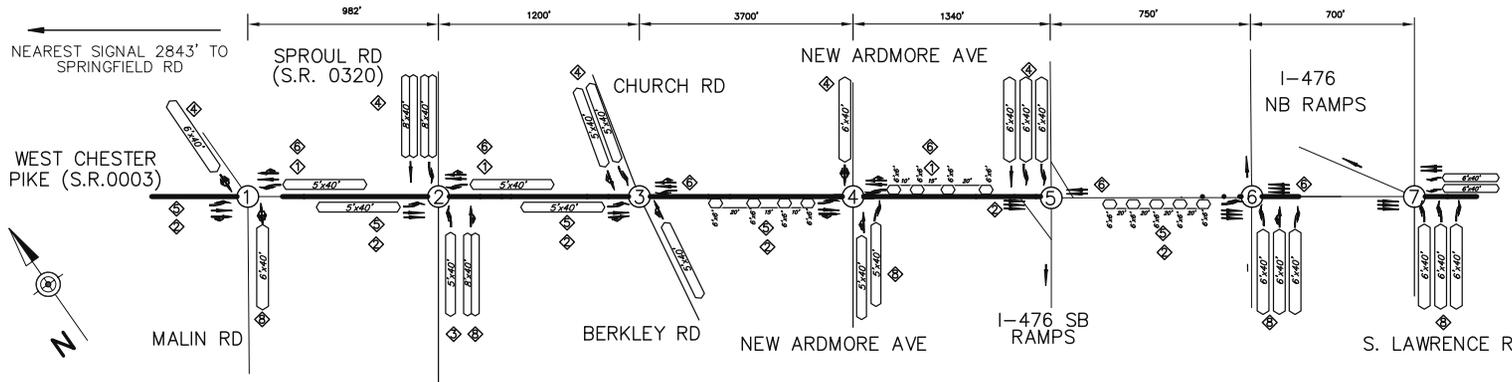
INTERSECTION: LAWRENCE ROAD (S.R. 1020) AND SUSSEX BOULEVARD

REVIEWED:	DATE
MUNICIPAL OFFICIAL	
RECOMMENDED:	
Mark L. Kroy	09/18/95
Douglas May	09/18/95
DISTRICT TRAFFIC ENGINEER	

NO.	REVISION	REV.	DATE	REV.	DATE	RECOM.	DATE
1	Added Loops	PML	9/18/95	MK	9/18/95	DWM	9/18/95
2	New Drawing, Added Street Name Signs, 8-Section Signal Head	PAJ	9/18/95	MK	9/18/95	YPP	9/18/95
3							
4							
5							
6							
7							
8							

SHEET 2 OF 2 PERMIT # 63-0370 FILE # 0370

NEAREST SIGNAL 780'
INTERCONNECTED TO
NORTH LAWRENCE RD
REFER TO 10084 FOR
ADDITIONAL INFORMATION



GENERAL NOTES

- NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS PRIOR APPROVAL IS OBTAINED IN WRITING BY A REPRESENTATIVE OF THE DEPARTMENT OF TRANSPORTATION.
- REFER TO TRAFFIC SIGNAL PERMIT DRAWING FOR INDIVIDUAL INTERSECTION OPERATION, GEOMETRY, PHASING AND CRITICAL TIMES.
- FOR CONSTRUCTION AND INSPECTION THE SYSTEM PERMIT SHOULD ALWAYS BE ACCOMPANIED WITH TRAFFIC SIGNAL PERMIT DRAWING.
- TEST THE SYSTEM AT LOCAL INTERSECTION LEVEL. SUBSYSTEM LEVEL MASTER CONTROLLER LEVEL AND PERSONAL COMPUTER REMOTE DIAL UP LEVEL.
- GATHER THE SYSTEM FAILURE CRITICAL ALARMS REPORT AND ARCHIVE THEM WHERE APPLICABLE.
- SET UP PENNDOT DISTRICT 6-0 COMPUTER WITH THE SYSTEM DATABASE AND GRAPHICS. MODIFY THE DATABASE AND GRAPHICS FOR SYSTEMS REVISIONS.
- ASSIGN LOOP DETECTORS AND PROGRAM THE CONTROLLERS TO GATHER TRAFFIC VOLUMES IN 15 MINUTE INTERVAL, WHERE APPLICABLE.
- INSTALLATION OF OPERATORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PENNDOT.
- OBTAIN POLE ATTACHMENT PERMIT FOR AERIAL FIBER OPTIC INSTALLATION.
- MAINTAIN MASTER CONTROLLER COMMUNICATION SUCH AS PHONE DROPS.
- PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.
- THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITEE COMPLETES WITH THE PROVISIONS OF EFFECTIVE PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES EFFECTIVE DATE DECEMBER 15, 1995.
- WHEN LIQUID FUEL'S MONEY IS USED, SIGNAL INSTALLATION MUST CONFORM TO FORM 408 AND A COPY OF THE PROPOSED SPECIFICATIONS MUST BE SUBMITTED TO THE DISTRICT TRAFFIC UNIT FOR REVIEW PRIOR TO BIDDING.
- PERMITEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION.
- CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-7800 SERIES.

WEEKLY PROGRAM CHART						
EVENT	DAY*	TIME	CYCLE	OFFSET	PROGRAM	REMARKS
1	1-5	0000	---	---	---	FREE
2	1-5	0600	100	---	1	AM PEAK
3	1-5	0900	100	---	2	MD PEAK
4	1-5	1500	120	---	3	PM PEAK
5	1-5	1900	---	---	---	FREE
6	6,7	0000	---	---	---	FREE
6	6,7	0900	100	---	2	MD PEAK
6	6,7	1900	---	---	---	FREE

- * DAY 1 = MONDAY
- * MAX 1 / FREE WHERE NOTED IN CYCLE/SPLIT/OFFSET MATRIX.

SYSTEM NOTES

1. THE SIGNALS ALONG WEST CHESTER PIKE (S.R. 0003) SHOWN ON THIS PLAN ARE TO BE INTERCONNECTED AND COORDINATED.
2. PROGRAM TO BE SELECTED BY CLOSED LOOP SYSTEM (TIME OF DAY) OR TBC BACKUP.
3. OFFSETS ARE REFERENCED TO TS2 FIRST GREEN (PHASE 2+6), ON WEST CHESTER PIKE.
4. SYSTEM LIMITS:
WEST CHESTER PIKE - FROM MALIN RD TO SOUTH LAWRENCE RD
MASTER CONTROLLER:
ON STREET MASTER AT: SPROUL RD
5. PRIMARY COORDINATION: CLOSED LOOP SYSTEM - FIBER OPTIC COMMUNICATION CABLE.
SECONDARY COORDINATION: TBC (DEFAULT TO BACKUP TBC).
6. SYSTEM IS DESIGNED FOR THE SYSTEM SOFTWARE: ARIES.
7. CYCLES, SPLITS & OFFSETS ARE IN SECONDS.

- LEGEND**
- ⊙ INTERSECTION ADDRESS
 - S## IDENTIFYING NUMBER
 - LOOP SENSOR
 - ◇ PHASE NUMBER
- NOT TO SCALE**

Program 1 =													
FILE #	Intersections	Phase								Cycle	Offsets		DR1(EB)
		1	2	3	4	5	6	7	8		Bd	DR2(WB)	
0433	1 Malin Rd	13(LEAD)	61		26		74		26	100	91(58)		
0432	2 Sproul Rd	13(LEAD)	37	13(LEAD)	27	23(LEAD)	37		40	100	83(47)		
0480	3 Church Rd/Berkley Rd	13(LEAD)	61		26	13(LEAD)	61		26	100			
0002	4 New Ardmore Ave	13(LEAD)	62		25	13(LEAD)	62		25	100	70		
2418	5 I-476 Southbound Ramps		53		47		53			100	34		
2419	6 I-476 Northbound Ramps		67		29(LEAD)		38		33	100	23		
0827	7 South Lawrence Rd	21(LEAD)	46				67		33	100	45		

Program 2 =													
FILE #	Intersections	Phase								Cycle	Offsets		DR1(EB)
		1	2	3	4	5	6	7	8		Bd	DR2(WB)	
0433	1 Malin Rd	13(LEAD)	50		37		63		37	100	12		
0432	2 Sproul Rd	13(LEAD)	46	13(LEAD)	27	14(LEAD)	46		40	100	12		
0480	3 Church Rd/Berkley Rd	13(LEAD)	41		46	13(LEAD)	41		46	100	69		
0002	4 New Ardmore Ave	13(LEAD)	66		21	13(LEAD)	66		21	100	99		
2418	5 I-476 Southbound Ramps		58		42		58			100	28		
2419	6 I-476 Northbound Ramps		69		42		39		31	100	28		
0827	7 South Lawrence Rd	27(LEAD)	42				69		31	100	58		

Program 3 =													
FILE #	Intersections	Phase								Cycle	Offsets		DR1(EB)
		1	2	3	4	5	6	7	8		Bd	DR2(WB)	
0433	1 Malin Rd	13(LEAD)	42		31		89		31	120	55		
0432	2 Sproul Rd	13(LEAD)	42	13(LEAD)	41	24(LEAD)	41		54	120	79		
0480	3 Church Rd/Berkley Rd	13(LEAD)	75		32	13(LEAD)	75		32	120	115		
0002	4 New Ardmore Ave	13(LEAD)	81		21	13(LEAD)	81		21	120	39		
2418	5 I-476 Southbound Ramps		59		31		59			120	15		
2419	6 I-476 Northbound Ramps		78		42		78		42	120	106		
0827	7 South Lawrence Rd	27(LEAD)	49				76		44	120	118		

Notes:
- ALL SPLIT TIMES INCLUDE YELLOW AND RED TIMES FOR A GIVEN PHASE.
- REFER TO SIGNAL PERMIT PLAN FOR MAX 1, MAX 2 AND CLEARANCE AND PED TIMES.

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6-0

COUNTY: DELAWARE

MUNICIPALITY: MARPLE TOWNSHIP

INTERSECTION: WEST CHESTER PIKE (S.R. 0003) CORRIDOR
BETWEEN MALIN RD AND S. LAWRENCE RD

REVIEWED: _____ DATE _____

MUNICIPAL OFFICIAL _____ DATE _____

RECOMMENDED: _____

DISTRICT TRAFFIC ENGINEER _____ DATE _____

NO	REVISION	DES/REVW	DATE	REVW	DATE	RECOM	DATE
1	TIMING AND OFFSETS	SM	3/16/06				
2							
3							
4							
5							
6							
7							
8							

SHEET 2 OF 2 INTERCONNECT PERMIT # 10097



GENERAL NOTES

- NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS PRIOR APPROVAL IS OBTAINED IN WRITING BY A REPRESENTATIVE OF THE DEPARTMENT OF TRANSPORTATION.
- REFER TO TRAFFIC SIGNAL PERMIT DRAWING FOR INDIVIDUAL INTERSECTION OPERATION, GEOMETRY, PHASING AND CRITICAL TIMES.
- FOR CONSTRUCTION AND INSPECTION THE SYSTEM PERMIT SHOULD ALWAYS BE ACCOMPANIED WITH TRAFFIC SIGNAL PERMIT DRAWING.
- TEST THE SYSTEM AT LOCAL INTERSECTION LEVEL, SUBSYSTEM LEVEL, MASTER CONTROLLER LEVEL AND PERSONAL COMPUTER REMOTE DIAL UP LEVEL.
- GATHER THE SYSTEM FAILURE CRITICAL ALARMS REPORT AND ARCHIVE THEM WHERE APPLICABLE.
- SET UP PENNDOT DISTRICT 6-0 COMPUTER WITH THE SYSTEM DATABASE AND GRAPHICS. MODIFY THE DATABASE AND GRAPHICS FOR SYSTEMS REVISIONS.
- ASSIGN LOOP DETECTORS AND PROGRAM THE CONTROLLERS TO GATHER TRAFFIC VOLUMES IN 15 MINUTE INTERVAL, WHERE APPLICABLE.
- INSTALLATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PENNDOT.
- OBTAIN POLE ATTACHMENT PERMIT FOR AERIAL FIBER OPTIC INSTALLATION.
- MAINTAIN MASTER CONTROLLER COMMUNICATION SUCH AS PHONE DROPS.
- PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.
- THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITEE COMPLETES WITH THE PROVISIONS OF ARTICLE 11 PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES EFFECTIVE DATE DECEMBER 15, 1995.
- WHEN LIQUID FUEL'S MONEY IS USED, SIGNAL INSTALLATION MUST CONFORM TO FORM 108 AND A COPY OF THE PROPOSED SPECIFICATIONS MUST BE SUBMITTED TO THE DISTRICT TRAFFIC UNIT FOR REVIEW PRIOR TO BIDDING.
- PERMITEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION.
- CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-7800 SERIES.

NEAREST SIGNAL 750'
INTERCONNECTED TO
S. LAWRENCE RD
REFER TO 10097 FOR
ADDITIONAL INFORMATION

WEST CHESTER
PIKE (S.R.0003)

NORTH
LAWRENCE RD

WEST CHESTER
PIKE (S.R. 0003)

NEAREST SIGNAL 1504' TO
GLENDALE RD

MATCHLINE A-A

S1
S2
S3

S7
S8

S4

S5

S6

S9

S10

S11

720'

1560'

GLEN
GARY DR

OLD WEST
CHESTER
PIKE

LINCOLN AVE

MANOA RD

MANOA RD

NAYLORS RUN RD

COUNTRY
CLUB LN

STEEL RD

DJ
MUNICIPAL RD

KOHL'S DRIVEWAY

WEST CHESTER
PIKE
(SR 0003)

NEAREST SIGNAL 923'
INTERCONNECTED TO DARRY RD
REFER TO 10093 FOR
ADDITIONAL INFORMATION

NEAREST SIGNAL 1504' TO
GLEN GARY RD

MANOA
SHOPPING
CENTER

GLENDALE RD

EAGLE
RD

MANOA RD

S14
S15
S16

S17

S18

S19

S20

S21

S22

S13

S12

S23

S24

S25

S26

S27

S28

S29

S30

S31

S32

S33

S34

S35

S36

S37

S38

S39

S40

S41

S42

S43

S44

S45

S46

S47

S48

S49

S50

686'

1743'

609'

1861'

179'

506'

648'

MATCHLINE A-A

- LEGEND**
- ⊙ INTERSECTION ADDRESS
 - S## □ SYSTEM LOOP / IDENTIFYING NUMBER
 - LOOP SENSOR
 - ◇ PHASE NUMBER
- NOT TO SCALE**

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6-0

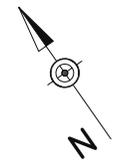
COUNTY: DELAWARE
MUNICIPALITY: HAVERFORD TOWNSHIP
INTERSECTION: WEST CHESTER PIKE (S.R. 0003) CORRIDOR
BETWEEN MALIN RD AND DARRY RD (SR 2005)

REVIEWED: _____ DATE _____
MUNICIPAL OFFICIAL _____ DATE _____

RECOMMENDED: _____
DISTRICT TRAFFIC ENGINEER _____ DATE _____

NO	REVISION	DES/REVW	DATE	REVW	DATE	RECOM	DATE
1							
2							
3							
4							
5							
6							
7							
8							

SHEET 1 OF 2 INTERCONNECT PERMIT # 10084



GENERAL NOTES

NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS PRIOR APPROVAL IS OBTAINED IN WRITING BY A REPRESENTATIVE OF THE DEPARTMENT OF TRANSPORTATION.

REFER TO TRAFFIC SIGNAL PERMIT DRAWING FOR INDIVIDUAL INTERSECTION OPERATION, GEOMETRY, PHASING AND CRITICAL TIMES.

FOR CONSTRUCTION AND INSPECTION THE SYSTEM PERMIT SHOULD ALWAYS BE ACCOMPANIED WITH TRAFFIC SIGNAL PERMIT DRAWING.

TEST THE SYSTEM AT LOCAL INTERSECTION LEVEL, SUBSYSTEM LEVEL, MASTER CONTROLLER LEVEL AND PERSONAL COMPUTER REMOTE DIAL UP LEVEL.

GATHER THE SYSTEM FAILURE CRITICAL ALARMS REPORT AND ARCHIVE THEM WHERE APPLICABLE.

SET UP PENNDOT DISTRICT 6-0 COMPUTER WITH THE SYSTEM DATABASE AND GRAPHICS. MODIFY THE DATABASE AND GRAPHICS FOR SYSTEMS REVISIONS.

ASSIGN LOOP DETECTORS AND PROGRAM THE CONTROLLERS TO GATHER TRAFFIC VOLUMES IN 15 MINUTE INTERVAL, WHERE APPLICABLE.

INSTALLATION BY A REPRESENTATIVE OF PENNDOT.

OBTAIN POLE ATTACHMENT PERMIT FOR AERIAL FIBER OPTIC INSTALLATION.

MAINTAIN MASTER CONTROLLER COMMUNICATION SUCH AS PHONE DROPS.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITEE COMPLETES WITH THE PROVISIONS OF EFFECTIVE DATE DECEMBER 19, 1995.

WHEN LIQUID FUELS MONEY IS USED, SIGNAL INSTALLATION MUST CONFORM TO FORM 408 AND A COPY OF THE PROPOSED CONSTRUCTION MUST BE SUBMITTED TO THE DISTRICT TRAFFIC UNIT FOR REVIEW PRIOR TO BIDDING.

PERMITEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION.

CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-7800 SERIES.

EVENT	DAY*	TIME	CYCLE	OFFSET	PROGRAM	REMARKS
1	1-5	0000	---	---	---	FREE
2	1-5	0600	100	---	1	AM PEAK
3	1-5	0900	100/90	---	2	MD PEAK
4	1-5	1500	120	---	3	PM PEAK
5	1-5	1900	---	---	---	FREE
6	6,7	0000	---	---	---	FREE
6	6,7	0900	100/90	---	2	MD PEAK
6	6,7	1900	---	---	---	FREE

* DAY 1 = MONDAY
 * MAX 1 / FREE WHERE NOTED IN CYCLE/SPLIT/OFFSET MATRIX.

FILE #	Intersections	Phase						Cycle	Offset # 1	Offset # 2	Offset # 3
		1	2	3	4	5	6				
0384	North Lawrence Rd	85	15(LEAD)	42(LEAD)	43		100	19	DR2(WB)	DR1(EB)	
0639	Old West Chester Pike	21(LEAD)	57	22	78		22	100			
0420	Gen Gary Drive	22(LEAD)	58	22	78		22	100			
0818	Glendale Rd/Monaco Shopping Center	12(LEAD)	38	22(SPLIT)	12(LEAD)	58	28(SPLIT)	100			
1743	Eagle Rd and Lincoln Avenue								Free		
0809	Eagle Rd	12(LEAD)	39	28(LEAD)	22	13(LEAD)	39	12(LEAD)	36	100	
0808	Manoa Rd	12(LEAD)	55	32	21(LEAD)	47	39	100	39	0	
0820	Country Club Ln	41	61	61	61	61	39	100	53	0	
2833	Naylors Run Rd	63	37	63	37	63	37	100	23	0	
0823	Steel Rd	18(LEAD)	54	28	100	15	28	100	15	0	
0824	Gilmore Rd	63	37	63	37	100	29	100	29	0	
2234	Kohl's Driveway	20(LEAD)	50	30	70	30	100	5			

FILE #	Intersections	Phase						Cycle	Offset # 1	Offset # 2	Offset # 3
		1	2	3	4	5	6				
0384	North Lawrence Rd	88	12	45(LEAD)	43		100	71			
0639	Old West Chester Pike	21(LEAD)	57	22	78		22	100	68		
0420	Gen Gary Drive	22(LEAD)	58	22	78		22	100	68		
0818	Glendale Rd/Monaco Shopping Center	12(LEAD)	38	22(SPLIT)	12(LEAD)	58	28(SPLIT)	100	39		
1743	Eagle Rd and Lincoln Avenue								Free		
0809	Eagle Rd	12(LEAD)	40	28(LEAD)	22	13(LEAD)	39	12(LEAD)	36	100	
0808	Manoa Rd	12(LEAD)	59	28	19(LEAD)	43	28	90	42	0	
0820	Country Club Ln	54	36	54	36	54	36	90	67	0	
2833	Naylors Run Rd	58	34	58	34	58	34	90	22	0	
0823	Steel Rd	18(LEAD)	48	64	64	64	28	90	19	0	
0824	Gilmore Rd	18(LEAD)	56	34	56	34	90	19	38	0	
2234	Kohl's Driveway	18(LEAD)	44	28	62	28	90	38			

FILE #	Intersections	Phase						Cycle	Offset # 1	Offset # 2	Offset # 3
		1	2	3	4	5	6				
0384	North Lawrence Rd	101	19	58(LEAD)	43		120	108			
0639	Old West Chester Pike	21(LEAD)	77	22	98		22	120	111		
0420	Gen Gary Drive	22(LEAD)	76	22	98		22	120	111		
0818	Glendale Rd/Monaco Shopping Center	16(LEAD)	54	22(SPLIT)	16(LEAD)	54	28(SPLIT)	120	111		
1743	Eagle Rd and Lincoln Avenue								Free		
0809	Eagle Rd	12(LEAD)	53	21(LEAD)	34	14(LEAD)	51	24(LEAD)	31	120	
0808	Manoa Rd	12(LEAD)	57	51	18(LEAD)	51	51	120	51	0	
0820	Country Club Ln	82	40	82	40	82	40	120	51	0	
2833	Naylors Run Rd	80	40	80	40	80	40	120	3	0	
0823	Steel Rd	18(LEAD)	74	29	91	29	120	111	111	0	
0824	Gilmore Rd	91	29	91	29	120	112	112	112	0	
2234	Kohl's Driveway	20(LEAD)	70	30	90	30	120	111			

Notes:
 - ALL SPLIT TIMES INCLUDE YELLOW AND RED TIMES FOR A GIVEN PHASE.
 - REFER TO SIGNAL PERMIT PLAN FOR MAX 1, MAX 2 AND CLEARANCE AND PED TIMES.

SYSTEM NOTES

- THE SIGNALS ALONG WEST CHESTER PIKE (S.R. 0003) SHOWN ON THIS PLAN ARE TO BE INTERCONNECTED AND COORDINATED.
- PROGRAM TO BE SELECTED BY CLOSED LOOP SYSTEM (TIME OF DAY) OR TBC BACKUP.
- OFFSETS ARE REFERENCED TO TS2 FIRST GREEN (PHASE 2+6), ON WEST CHESTER PIKE.
- SYSTEM LIMITS:
 WEST CHESTER PIKE - FROM N. LAWRENCE RD TO KOHL'S DRIVEWAY
 MASTER CONTROLLER:
 ON STREET MASTER AT: EAGLE RD
- PRIMARY COORDINATION: CLOSED LOOP SYSTEM - FIBER OPTIC COMMUNICATION CABLE.
 SECONDARY COORDINATION: TBC (DEFAULT TO BACKUP TBC).
- SYSTEM IS DESIGNED FOR THE SYSTEM SOFTWARE: ARIES.
- CYCLES, SPLITS & OFFSETS ARE IN SECONDS.

LEGEND

- INTERSECTION ADDRESS
- SYSTEM LOOP/IDENTIFYING NUMBER
- LOOP SENSOR
- PHASE NUMBER

NOT TO SCALE

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
 ENGINEERING DISTRICT 6-0

COUNTY: DELAWARE
 MUNICIPALITY: HAVERFORD TOWNSHIP
 INTERSECTION: WEST CHESTER PIKE (S.R. 0003) CORRIDOR
 BETWEEN MALIN RD AND DARBY RD (SR 2005)

REVIEWED: _____ DATE _____
 MUNICIPAL OFFICIAL _____ DATE _____

RECOMMENDED: _____
 DISTRICT TRAFFIC ENGINEER _____ DATE _____

NO	REVISION	DES/REVW	DATE	REVW	DATE	RECOM	DATE
1							
2							
3							
4							
5							
6							
7							
8							

C – Traffic Count Data:



Note:
WB WCP thru volume
counted @ Mather Ave

File Name : 01-WCP&NewArdmore_AM
Site Code : 00000000
Start Date : 1/26/2010
Page No : 1

Groups Printed- Unshifted - HV - Turn/RTOR

Start Time	New Ardmore Ave From North					West Chester Pike From East					New Ardmore Ave From South					West Chester Pike From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	9	0	3	0	12	3	0	3	0	6	5	2	15	0	22	0	287	2	0	289	329
07:15 AM	28	10	4	0	42	10	0	3	0	13	8	4	17	0	29	3	327	5	0	335	419
07:30 AM	25	7	6	0	38	3	0	4	0	7	8	4	16	0	28	2	322	3	0	327	400
07:45 AM	26	8	1	0	35	4	0	4	0	8	5	4	15	0	24	6	280	2	0	288	355
Total	88	25	14	0	127	20	0	14	0	34	26	14	63	0	103	11	1216	12	0	1239	1503
08:00 AM	23	7	2	0	32	9	0	4	0	13	8	6	19	0	33	2	300	7	0	309	387
08:15 AM	20	6	3	0	29	5	0	3	0	8	7	2	19	2	30	1	315	5	0	321	388
08:30 AM	24	4	3	0	31	7	0	3	0	10	4	5	17	1	27	2	288	5	0	295	363
08:45 AM	19	5	2	0	26	5	0	8	0	13	4	4	11	0	19	4	296	3	0	303	361
Total	86	22	10	0	118	26	0	18	0	44	23	17	66	3	109	9	1199	20	0	1228	1499
Grand Total	174	47	24	0	245	46	0	32	0	78	49	31	129	3	212	20	2415	32	0	2467	3002
Apprch %	71	19.2	9.8	0		59	0	41	0		23.1	14.6	60.8	1.4		0.8	97.9	1.3	0		
Total %	5.8	1.6	0.8	0	8.2	1.5	0	1.1	0	2.6	1.6	1	4.3	0.1	7.1	0.7	80.4	1.1	0	82.2	
Unshifted	171	45	17	0	233	29	0	32	0	61	46	30	119	3	198	16	2325	29	0	2370	2862
% Unshifted	98.3	95.7	70.8	0	95.1	63	0	100	0	78.2	93.9	96.8	92.2	100	93.4	80	96.3	90.6	0	96.1	95.3
HV	3	2	0	0	5	1	0	0	0	1	3	1	2	0	6	2	90	3	0	95	107
% HV	1.7	4.3	0	0	2	2.2	0	0	0	1.3	6.1	3.2	1.6	0	2.8	10	3.7	9.4	0	3.9	3.6
U-Turn/RTOR	0	0	7	0	7	16	0	0	0	16	0	0	8	0	8	2	0	0	0	2	33
% U-Turn/RTOR	0	0	29.2	0	2.9	34.8	0	0	0	20.5	0	0	6.2	0	3.8	10	0	0	0	0.1	1.1

Start Time	New Ardmore Ave From North				West Chester Pike From East				New Ardmore Ave From South				West Chester Pike From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	28	10	4	42	10	0	3	13	8	4	17	29	3	327	5	335	419
07:30 AM	25	7	6	38	3	0	4	7	8	4	16	28	2	322	3	327	400
07:45 AM	26	8	1	35	4	0	4	8	5	4	15	24	6	280	2	288	355
08:00 AM	23	7	2	32	9	0	4	13	8	6	19	33	2	300	7	309	387
Total Volume	102	32	13	147	26	0	15	41	29	18	67	114	13	1229	17	1259	1561
% App. Total	69.4	21.8	8.8		63.4	0	36.6		25.4	15.8	58.8		1	97.6	1.4		
PHF	.911	.800	.542	.875	.650	.000	.938	.788	.906	.750	.882	.864	.542	.940	.607	.940	.931
Unshifted	101	30	9	140	16	0	15	31	27	17	62	106	11	1189	16	1216	1493
% Unshifted	99.0	93.8	69.2	95.2	61.5	0	100	75.6	93.1	94.4	92.5	93.0	84.6	96.7	94.1	96.6	95.6
HV	1	2	0	3	0	0	0	0	2	1	2	5	1	40	1	42	50
% HV	1.0	6.3	0	2.0	0	0	0	0	6.9	5.6	3.0	4.4	7.7	3.3	5.9	3.3	3.2
U-Turn/RTOR	0	0	4	4	10	0	0	10	0	0	3	3	1	0	0	1	18
% U-Turn/RTOR	0	0	30.8	2.7	38.5	0	0	24.4	0	0	4.5	2.6	7.7	0	0	0.1	1.2



Groups Printed- Unshifted - HV

Start Time	Mather Ave From North		West Chester Pike From East			Int. Total
	Right	App. Total	Thru	Right	App. Total	
07:00 AM	1	1	308	0	308	309
07:15 AM	5	5	321	2	323	328
07:30 AM	5	5	350	1	351	356
07:45 AM	2	2	331	3	334	336
Total	13	13	1310	6	1316	1329
08:00 AM	4	4	290	2	292	296
08:15 AM	2	2	260	4	264	266
08:30 AM	5	5	298	1	299	304
08:45 AM	8	8	283	9	292	300
Total	19	19	1131	16	1147	1166
Grand Total	32	32	2441	22	2463	2495
Apprch %	100		99.1	0.9		
Total %	1.3	1.3	97.8	0.9	98.7	
Unshifted	31	31	2350	19	2369	2400
% Unshifted	96.9	96.9	96.3	86.4	96.2	96.2
HV	1	1	91	3	94	95
% HV	3.1	3.1	3.7	13.6	3.8	3.8

Start Time	Mather Ave From North		West Chester Pike From East			Int. Total
	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1						
Peak Hour for Entire Intersection Begins at 07:00 AM						
07:00 AM	1	1	308	0	308	309
07:15 AM	5	5	321	2	323	328
07:30 AM	5	5	350	1	351	356
07:45 AM	2	2	331	3	334	336
Total Volume	13	13	1310	6	1316	1329
% App. Total	100		99.5	0.5		
PHF	.650	.650	.936	.500	.937	.933
Unshifted	13	13	1266	5	1271	1284
% Unshifted	100	100	96.6	83.3	96.6	96.6
HV	0	0	44	1	45	45
% HV	0	0	3.4	16.7	3.4	3.4



Orth-Rodgers & Associates

File Name : 03-WCP&I-476 South Off Ramp_AM

Site Code : 00000000

Start Date : 1/21/2010

Page No : 1

Groups Printed- Unshifted - HV

Start Time	I-476 SB Off Ramp From North					West Chester Pike From East			West Chester Pike From West			Int. Total
	Left	Thru	R @ light	R @ ramp	App. Total	Thru	R to 476 S	App. Total	Thru	Right	App. Total	
07:00 AM	103	0	2	51	156	207	86	293	236	70	306	755
07:15 AM	147	0	0	57	204	250	154	404	274	91	365	973
07:30 AM	179	1	1	51	232	240	95	335	259	83	342	909
07:45 AM	175	0	1	74	250	231	98	329	321	52	373	952
Total	604	1	4	233	842	928	433	1361	1090	296	1386	3589
08:00 AM	173	0	0	66	239	225	80	305	326	49	375	919
08:15 AM	168	1	0	74	243	252	66	318	340	51	391	952
08:30 AM	169	1	0	76	246	230	91	321	298	46	344	911
08:45 AM	119	2	2	50	173	200	40	240	248	49	297	710
Total	629	4	2	266	901	907	277	1184	1212	195	1407	3492
Grand Total	1233	5	6	499	1743	1835	710	2545	2302	491	2793	7081
Apprch %	70.7	0.3	0.3	28.6		72.1	27.9		82.4	17.6		
Total %	17.4	0.1	0.1	7	24.6	25.9	10	35.9	32.5	6.9	39.4	
Unshifted	1163	3	6	475	1647	1750	698	2448	2213	480	2693	6788
% Unshifted	94.3	60	100	95.2	94.5	95.4	98.3	96.2	96.1	97.8	96.4	95.9
HV	70	2	0	24	96	85	12	97	89	11	100	293
% HV	5.7	40	0	4.8	5.5	4.6	1.7	3.8	3.9	2.2	3.6	4.1

Start Time	I-476 SB Off Ramp From North					West Chester Pike From East			West Chester Pike From West			Int. Total
	Left	Thru	R @ light	R @ ramp	App. Total	Thru	R to 476 S	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 07:15 AM												
07:15 AM	147	0	0	57	204	250	154	404	274	91	365	973
07:30 AM	179	1	1	51	232	240	95	335	259	83	342	909
07:45 AM	175	0	1	74	250	231	98	329	321	52	373	952
08:00 AM	173	0	0	66	239	225	80	305	326	49	375	919
Total Volume	674	1	2	248	925	946	427	1373	1180	275	1455	3753
% App. Total	72.9	0.1	0.2	26.8		68.9	31.1		81.1	18.9		
PHF	.941	.250	.500	.838	.925	.946	.693	.850	.905	.755	.970	.964
Unshifted	635	0	2	236	873	904	418	1322	1141	266	1407	3602
% Unshifted	94.2	0	100	95.2	94.4	95.6	97.9	96.3	96.7	96.7	96.7	96.0
HV	39	1	0	12	52	42	9	51	39	9	48	151
% HV	5.8	100	0	4.8	5.6	4.4	2.1	3.7	3.3	3.3	3.3	4.0



Orth-Rodgers & Associates

Note:
WB WCP thru volume
counted @ N Lawrence

File Name : 04-WCP&I-476 North Off Ramp_AM
Site Code : 00000000
Start Date : 1/20/2010
Page No : 1

Groups Printed- Unshifted - HV - RTOR

Start Time	West Chester Pike From East		I-476 NB Off-Ramp From South				West Chester Pike From West			Int. Total
	R to 476 N	App. Total	Left	Thru	Right	App. Total	Left	Thru	App. Total	
07:00 AM	1	1	68	2	56	126	83	313	396	523
07:15 AM	1	1	43	0	76	119	78	270	348	468
07:30 AM	9	9	38	0	57	95	83	353	436	540
07:45 AM	24	24	30	0	43	73	92	383	475	572
Total	35	35	179	2	232	413	336	1319	1655	2103
08:00 AM	77	77	37	0	39	76	118	412	530	683
08:15 AM	70	70	43	0	51	94	93	440	533	697
08:30 AM	24	24	35	0	71	106	91	406	497	627
08:45 AM	6	6	30	10	78	118	79	423	502	626
Total	177	177	145	10	239	394	381	1681	2062	2633
Grand Total	212	212	324	12	471	807	717	3000	3717	4736
Apprch %	100		40.1	1.5	58.4		19.3	80.7		
Total %	4.5	4.5	6.8	0.3	9.9	17	15.1	63.3	78.5	
Unshifted	212	212	316	12	343	671	707	2834	3541	4424
% Unshifted	100	100	97.5	100	72.8	83.1	98.6	94.5	95.3	93.4
HV	0	0	8	0	15	23	10	166	176	199
% HV	0	0	2.5	0	3.2	2.9	1.4	5.5	4.7	4.2
RTOR	0	0	0	0	113	113	0	0	0	113
% RTOR	0	0	0	0	24	14	0	0	0	2.4

Start Time	West Chester Pike From East		I-476 NB Off-Ramp From South				West Chester Pike From West			Int. Total
	R to 476 N	App. Total	Left	Thru	Right	App. Total	Left	Thru	App. Total	
08:00 AM	77	77	37	0	39	76	118	412	530	683
08:15 AM	70	70	43	0	51	94	93	440	533	697
08:30 AM	24	24	35	0	71	106	91	406	497	627
08:45 AM	6	6	30	10	78	118	79	423	502	626
Total Volume	177	177	145	10	239	394	381	1681	2062	2633
% App. Total	100		36.8	2.5	60.7		18.5	81.5		
PHF	.575	.575	.843	.250	.766	.835	.807	.955	.967	.944
Unshifted	177	177	143	10	192	345	378	1573	1951	2473
% Unshifted	100	100	98.6	100	80.3	87.6	99.2	93.6	94.6	93.9
HV	0	0	2	0	7	9	3	108	111	120
% HV	0	0	1.4	0	2.9	2.3	0.8	6.4	5.4	4.6
RTOR	0	0	0	0	40	40	0	0	0	40
% RTOR	0	0	0	0	16.7	10.2	0	0	0	1.5

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00 AM



Note:
 Thru volumes counted @
 N Lawrence (WB) and
 476 NB ramps (EB)

File Name : 05-WCP&SLawrence_AM
 Site Code : 00000000
 Start Date : 1/20/2010
 Page No : 1

Groups Printed- Unshifted - HV

Start Time	West Chester Pike From East			S Lawrence Rd From South				West Chester Pike From West		Int. Total
	Left	R to 476 N	App. Total	L to WCP	L to 476 N	Right	App. Total	Right	App. Total	
07:00 AM	15	128	143	6	28	27	61	9	9	213
07:15 AM	36	298	334	22	103	81	206	39	39	579
07:30 AM	58	319	377	28	84	104	216	59	59	652
07:45 AM	81	277	358	36	98	111	245	108	108	711
Total	190	1022	1212	92	313	323	728	215	215	2155
08:00 AM	63	240	303	41	121	94	256	118	118	677
08:15 AM	74	228	302	52	87	108	247	142	142	691
08:30 AM	71	251	322	26	97	104	227	135	135	684
08:45 AM	59	193	252	36	68	69	173	122	122	547
Total	267	912	1179	155	373	375	903	517	517	2599
Grand Total	457	1934	2391	247	686	698	1631	732	732	4754
Apprch %	19.1	80.9		15.1	42.1	42.8		100		
Total %	9.6	40.7	50.3	5.2	14.4	14.7	34.3	15.4	15.4	
Unshifted	434	1888	2322	238	680	678	1596	697	697	4615
% Unshifted	95	97.6	97.1	96.4	99.1	97.1	97.9	95.2	95.2	97.1
HV	23	46	69	9	6	20	35	35	35	139
% HV	5	2.4	2.9	3.6	0.9	2.9	2.1	4.8	4.8	2.9

Start Time	West Chester Pike From East			S Lawrence Rd From South				West Chester Pike From West		Int. Total
	Left	R to 476 N	App. Total	L to WCP	L to 476 N	Right	App. Total	Right	App. Total	
07:45 AM	81	277	358	36	98	111	245	108	108	711
08:00 AM	63	240	303	41	121	94	256	118	118	677
08:15 AM	74	228	302	52	87	108	247	142	142	691
08:30 AM	71	251	322	26	97	104	227	135	135	684
Total Volume	289	996	1285	155	403	417	975	503	503	2763
% App. Total	22.5	77.5		15.9	41.3	42.8		100		
PHF	.892	.899	.897	.745	.833	.939	.952	.886	.886	.972
Unshifted	274	969	1243	151	399	404	954	476	476	2673
% Unshifted	94.8	97.3	96.7	97.4	99.0	96.9	97.8	94.6	94.6	96.7
HV	15	27	42	4	4	13	21	27	27	90
% HV	5.2	2.7	3.3	2.6	1.0	3.1	2.2	5.4	5.4	3.3

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 07:45 AM



Note:
EB thru volume counted
at 476 NB ramps

File Name : 06-WCP&NLawrence_AM
Site Code : 00000000
Start Date : 1/20/2010
Page No : 1

Groups Printed- Unshifted - HV

Start Time	N Lawrence Road From North			West Chester Pike From East			West Chester Pike From West		Int. Total
	Left	Right	App. Total	Thru	Right	App. Total	Left	App. Total	
07:00 AM	10	210	220	363	39	402	120	120	742
07:15 AM	12	218	230	474	7	481	146	146	857
07:30 AM	12	229	241	475	9	484	143	143	868
07:45 AM	15	218	233	420	20	440	134	134	807
Total	49	875	924	1732	75	1807	543	543	3274
08:00 AM	12	184	196	479	4	483	125	125	804
08:15 AM	22	185	207	439	8	447	131	131	785
08:30 AM	19	191	210	452	20	472	127	127	809
08:45 AM	20	203	223	364	15	379	96	96	698
Total	73	763	836	1734	47	1781	479	479	3096
Grand Total	122	1638	1760	3466	122	3588	1022	1022	6370
Apprch %	6.9	93.1		96.6	3.4		100		
Total %	1.9	25.7	27.6	54.4	1.9	56.3	16	16	
Unshifted	104	1611	1715	3366	112	3478	985	985	6178
% Unshifted	85.2	98.4	97.4	97.1	91.8	96.9	96.4	96.4	97
HV	18	27	45	100	10	110	37	37	192
% HV	14.8	1.6	2.6	2.9	8.2	3.1	3.6	3.6	3

Start Time	N Lawrence Road From North			West Chester Pike From East			West Chester Pike From West		Int. Total
	Left	Right	App. Total	Thru	Right	App. Total	Left	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1									
Peak Hour for Entire Intersection Begins at 07:15 AM									
07:15 AM	12	218	230	474	7	481	146	146	857
07:30 AM	12	229	241	475	9	484	143	143	868
07:45 AM	15	218	233	420	20	440	134	134	807
08:00 AM	12	184	196	479	4	483	125	125	804
Total Volume	51	849	900	1848	40	1888	548	548	3336
% App. Total	5.7	94.3		97.9	2.1		100		
PHF	.850	.927	.934	.965	.500	.975	.938	.938	.961
Unshifted	47	833	880	1809	35	1844	527	527	3251
% Unshifted	92.2	98.1	97.8	97.9	87.5	97.7	96.2	96.2	97.5
HV	4	16	20	39	5	44	21	21	85
% HV	7.8	1.9	2.2	2.1	12.5	2.3	3.8	3.8	2.5



Groups Printed- Unshifted - HV - school buses

Start Time	Apartments From North					West Chester Pike From East					Old West Chester Pike From South					West Chester Pike From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	1	0	7	0	8	10	456	2	4	472	5	0	16	0	21	1	325	6	0	332	833
07:15 AM	3	0	5	2	10	16	480	3	2	501	6	0	6	0	12	0	294	13	0	307	830
07:30 AM	0	0	4	0	4	18	501	2	0	521	5	0	8	0	13	0	324	12	0	336	874
07:45 AM	0	0	2	0	2	17	458	2	2	479	4	0	5	0	9	0	287	15	0	302	792
Total	4	0	18	2	24	61	1895	9	8	1973	20	0	35	0	55	1	1230	46	0	1277	3329
08:00 AM	1	0	0	0	1	18	416	1	1	436	4	0	8	0	12	0	312	11	1	324	773
08:15 AM	0	0	3	0	3	22	441	1	3	467	11	0	13	0	24	0	300	20	0	320	814
08:30 AM	0	0	6	0	6	20	410	1	0	431	10	0	6	0	16	0	276	19	1	296	749
08:45 AM	4	0	8	0	12	38	379	2	1	420	22	0	14	0	36	0	303	38	0	341	809
Total	5	0	17	0	22	98	1646	5	5	1754	47	0	41	0	88	0	1191	88	2	1281	3145
Grand Total	9	0	35	2	46	159	3541	14	13	3727	67	0	76	0	143	1	2421	134	2	2558	6474
Apprch %	19.6	0	76.1	4.3		4.3	95	0.4	0.3		46.9	0	53.1	0		0	94.6	5.2	0.1		
Total %	0.1	0	0.5	0	0.7	2.5	54.7	0.2	0.2	57.6	1	0	1.2	0	2.2	0	37.4	2.1	0	39.5	
Unshifted	9	0	34	2	45	137	3423	13	13	3586	52	0	51	0	103	1	2261	105	2	2369	6103
% Unshifted	100	0	97.1	100	97.8	86.2	96.7	92.9	100	96.2	77.6	0	67.1	0	72	100	93.4	78.4	100	92.6	94.3
HV	0	0	1	0	1	12	104	1	0	117	9	0	13	0	22	0	139	9	0	148	288
% HV	0	0	2.9	0	2.2	7.5	2.9	7.1	0	3.1	13.4	0	17.1	0	15.4	0	5.7	6.7	0	5.8	4.4
school buses	0	0	0	0	0	10	14	0	0	24	6	0	12	0	18	0	21	20	0	41	83
% school buses	0	0	0	0	0	6.3	0.4	0	0	0.6	9	0	15.8	0	12.6	0	0.9	14.9	0	1.6	1.3

Start Time	Apartments From North				West Chester Pike From East				Old West Chester Pike From South				West Chester Pike From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	1	0	7	8	10	456	2	468	5	0	16	21	1	325	6	332	829
07:15 AM	3	0	5	8	16	480	3	499	6	0	6	12	0	294	13	307	826
07:30 AM	0	0	4	4	18	501	2	521	5	0	8	13	0	324	12	336	874
07:45 AM	0	0	2	2	17	458	2	477	4	0	5	9	0	287	15	302	790
Total Volume	4	0	18	22	61	1895	9	1965	20	0	35	55	1	1230	46	1277	3319
% App. Total	18.2	0	81.8		3.1	96.4	0.5		36.4	0	63.6		0.1	96.3	3.6		
PHF	.333	.000	.643	.688	.847	.946	.750	.943	.833	.000	.547	.655	.250	.946	.767	.950	.949
Unshifted	4	0	17	21	56	1841	8	1905	15	0	25	40	1	1165	42	1208	3174
% Unshifted	100	0	94.4	95.5	91.8	97.2	88.9	96.9	75.0	0	71.4	72.7	100	94.7	91.3	94.6	95.6
HV	0	0	1	1	5	47	1	53	3	0	3	6	0	58	4	62	122
% HV	0	0	5.6	4.5	8.2	2.5	11.1	2.7	15.0	0	8.6	10.9	0	4.7	8.7	4.9	3.7
school buses	0	0	0	0	0	7	0	7	2	0	7	9	0	7	0	7	23
% school buses	0	0	0	0	0	0.4	0	0.4	10.0	0	20.0	16.4	0	0.6	0	0.5	0.7



Groups Printed- Unshifted - HV

Start Time	S Lawrence Rd From North					S Lawrence Rd From South				Langford Rd From West				Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
07:00 AM	0	65	1	0	66	1	211	0	212	1	0	0	1	279
07:15 AM	0	77	1	0	78	2	200	0	202	1	2	0	3	283
07:30 AM	0	118	0	0	118	3	258	0	261	3	2	0	5	384
07:45 AM	0	141	0	0	141	1	262	0	263	1	2	0	3	407
Total	0	401	2	0	403	7	931	0	938	6	6	0	12	1353
08:00 AM	0	124	0	0	124	0	255	0	255	0	0	0	0	379
08:15 AM	1	129	0	0	130	0	259	0	259	0	0	0	0	389
08:30 AM	0	150	0	0	150	0	247	0	247	0	0	0	0	397
08:45 AM	2	133	1	0	136	1	224	0	225	1	1	0	2	363
Total	3	536	1	0	540	1	985	0	986	1	1	0	2	1528
Grand Total	3	937	3	0	943	8	1916	0	1924	7	7	0	14	2881
Apprch %	0.3	99.4	0.3	0		0.4	99.6	0		50	50	0		
Total %	0.1	32.5	0.1	0	32.7	0.3	66.5	0	66.8	0.2	0.2	0	0.5	
Unshifted	3	869	3	0	875	2	1851	0	1853	3	4	0	7	2735
% Unshifted	100	92.7	100	0	92.8	25	96.6	0	96.3	42.9	57.1	0	50	94.9
HV	0	68	0	0	68	6	65	0	71	4	3	0	7	146
% HV	0	7.3	0	0	7.2	75	3.4	0	3.7	57.1	42.9	0	50	5.1

Start Time	S Lawrence Rd From North				S Lawrence Rd From South			Langford Rd From West			Int. Total
	Left	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 07:45 AM											
07:45 AM	0	141	0	141	1	262	263	1	2	3	407
08:00 AM	0	124	0	124	0	255	255	0	0	0	379
08:15 AM	1	129	0	130	0	259	259	0	0	0	389
08:30 AM	0	150	0	150	0	247	247	0	0	0	397
Total Volume	1	544	0	545	1	1023	1024	1	2	3	1572
% App. Total	0.2	99.8	0		0.1	99.9		33.3	66.7		
PHF	.250	.907	.000	.908	.250	.976	.973	.250	.250	.250	.966
Unshifted	1	504	0	505	0	986	986	0	1	1	1492
% Unshifted	100	92.6	0	92.7	0	96.4	96.3	0	50.0	33.3	94.9
HV	0	40	0	40	1	37	38	1	1	2	80
% HV	0	7.4	0	7.3	100	3.6	3.7	100	50.0	66.7	5.1



Groups Printed- Unshifted - HV - School Buses - RTOR

Start Time	South Lawrence Rd From North					Sussex Rd From East					South Lawrence Rd From South					Sussex Rd From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	5	54	1	0	60	7	0	41	1	49	0	160	4	0	164	2	0	0	0	2	275
07:15 AM	5	75	1	0	81	10	1	34	0	45	0	180	1	0	181	1	0	0	0	1	308
07:30 AM	7	109	2	0	118	6	0	36	1	43	0	209	2	0	211	3	0	4	1	8	380
07:45 AM	12	131	3	0	146	7	1	29	0	37	0	238	0	0	238	0	0	1	0	1	422
Total	29	369	7	0	405	30	2	140	2	174	0	787	7	0	794	6	0	5	1	12	1385
08:00 AM	15	113	4	0	132	6	1	39	1	47	3	217	0	0	220	9	3	6	0	18	417
08:15 AM	16	124	3	0	143	4	1	43	0	48	2	192	1	0	195	9	3	8	0	20	406
08:30 AM	15	136	1	0	152	4	0	44	0	48	3	191	3	1	198	14	8	10	0	32	430
08:45 AM	26	112	2	0	140	1	0	37	2	40	1	188	4	2	195	3	3	1	0	7	382
Total	72	485	10	0	567	15	2	163	3	183	9	788	8	3	808	35	17	25	0	77	1635
Grand Total	101	854	17	0	972	45	4	303	5	357	9	1575	15	3	1602	41	17	30	1	89	3020
Apprch %	10.4	87.9	1.7	0		12.6	1.1	84.9	1.4		0.6	98.3	0.9	0.2		46.1	19.1	33.7	1.1		
Total %	3.3	28.3	0.6	0	32.2	1.5	0.1	10	0.2	11.8	0.3	52.2	0.5	0.1	53	1.4	0.6	1	0	2.9	
Unshifted	98	801	15	0	914	40	4	191	4	239	9	1522	14	3	1548	39	17	22	0	78	2779
% Unshifted	97	93.8	88.2	0	94	88.9	100	63	80	66.9	100	96.6	93.3	100	96.6	95.1	100	73.3	0	87.6	92
HV	3	44	2	0	49	0	0	8	1	9	0	47	0	0	47	0	0	1	1	2	107
% HV	3	5.2	11.8	0	5	0	0	2.6	20	2.5	0	3	0	0	2.9	0	0	3.3	100	2.2	3.5
School Buses																					
% School Buses	0	1.1	0	0	0.9	11.1	0	0.3	0	1.7	0	0.4	6.7	0	0.4	4.9	0	13.3	0	6.7	0.9
RTOR	0	0	0	0	0	0	0	103	0	103	0	0	0	0	0	0	0	3	0	3	106
% RTOR	0	0	0	0	0	0	0	34	0	28.9	0	0	0	0	0	0	0	10	0	3.4	3.5

Start Time	South Lawrence Rd From North				Sussex Rd From East				South Lawrence Rd From South				Sussex Rd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	12	131	3	146	7	1	29	37	0	238	0	238	0	0	1	1	422
08:00 AM	15	113	4	132	6	1	39	46	3	217	0	220	9	3	6	18	416
08:15 AM	16	124	3	143	4	1	43	48	2	192	1	195	9	3	8	20	406
08:30 AM	15	136	1	152	4	0	44	48	3	191	3	197	14	8	10	32	429
Total Volume	58	504	11	573	21	3	155	179	8	838	4	850	32	14	25	71	1673
% App. Total	10.1	88	1.9		11.7	1.7	86.6		0.9	98.6	0.5		45.1	19.7	35.2		
PHF	.906	.926	.688	.942	.750	.750	.881	.932	.667	.880	.333	.893	.571	.438	.625	.555	.975
Unshifted	55	480	10	545	19	3	105	127	8	816	4	828	30	14	18	62	1562
% Unshifted	94.8	95.2	90.9	95.1	90.5	100	67.7	70.9	100	97.4	100	97.4	93.8	100	72.0	87.3	93.4
HV	3	17	1	21	0	0	5	5	0	21	0	21	0	0	1	1	48
% HV	5.2	3.4	9.1	3.7	0	0	3.2	2.8	0	2.5	0	2.5	0	0	4.0	1.4	2.9
School Buses	0	7	0	7	2	0	0	2	0	1	0	1	2	0	4	6	16
% School Buses	0	1.4	0	1.2	9.5	0	0	1.1	0	0.1	0	0.1	6.3	0	16.0	8.5	1.0
RTOR	0	0	0	0	0	0	45	45	0	0	0	0	0	0	2	2	47
% RTOR	0	0	0	0	0	0	29.0	25.1	0	0	0	0	0	0	8.0	2.8	2.8



Groups Printed- Unshifted - HV - Turns

Start Time	New Ardmore Rd From North					West Chester Pike From East					New Ardmore Rd From South					West Chester Pike From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	2	4	7	0	13	2	333	2	1	338	13	3	5	0	21	15	229	4	0	248	620
04:15 PM	1	4	3	0	8	4	357	7	0	368	13	5	0	0	18	28	293	9	0	330	724
04:30 PM	0	4	3	0	7	4	301	4	0	309	10	6	2	0	18	25	288	9	0	322	656
04:45 PM	8	5	7	0	20	4	323	3	0	330	13	5	1	0	19	28	307	11	0	346	715
Total	11	17	20	0	48	14	1314	16	1	1345	49	19	8	0	76	96	1117	33	0	1246	2715
05:00 PM	6	2	4	0	12	4	387	5	0	396	13	2	1	0	16	32	272	6	0	310	734
05:15 PM	6	5	5	0	16	1	263	2	0	266	10	4	1	0	15	12	227	6	0	245	542
05:30 PM	8	6	7	0	21	4	338	5	0	347	19	3	4	0	26	17	271	13	0	301	695
05:45 PM	4	4	4	0	12	2	260	8	0	270	4	3	5	0	12	19	187	5	0	211	505
Total	24	17	20	0	61	11	1248	20	0	1279	46	12	11	0	69	80	957	30	0	1067	2476
Grand Total	35	34	40	0	109	25	2562	36	1	2624	95	31	19	0	145	176	2074				
Unshifted	35	34	40	0	109	23	2532	34	1	2590	94	31	16	0	141	152	2046	62	0	2260	5100
% Unshifted	100	100	100	0	100	92	98.8	94.4	100	98.7	98.9	100	84.2	0	97.2	86.4	98.6	98.4	0	97.7	98.2
HV	0	0	0	0	0	0	29	2	0	31	1	0	3	0	4	4	28	1	0	33	68
% HV	0	0	0	0	0	0	1.1	5.6	0	1.2	1.1	0	15.8	0	2.8	2.3	1.4	1.6	0	1.4	1.3
U-Turns	0	0	0	0	0	2	1	0	0	3	0	0	0	0	0	20	0	0	0	20	23
% U-Turns	0	0	0	0	0	8	0	0	0	0.1	0	0	0	0	0	11.4	0	0	0	0.9	0.4

Start Time	New Ardmore Rd From North				West Chester Pike From East				New Ardmore Rd From South				West Chester Pike From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
4:15:00 PM	1	4	3	8	4	357	7	368	13	5	0	18	28	293	9	330	724
4:30:00 PM	0	4	3	7	4	301	4	309	10	6	2	18	25	288	9	322	656
4:45:00 PM	8	5	7	20	4	323	3	330	13	5	1	19	28	307	11	346	715
5:00:00 PM	6	2	4	12	4	387	5	396	13	2	1	16	32	272	6	310	734
Total Volume	15	15	17	47	16	1368	19	1403	49	18	4	71	113	1160	35	1308	2829
% App. Total	31.9	31.9	36.2		1.1	97.5	1.4		69	25.4	5.6		8.6	88.7	2.7		
PHF	.469	.750	.607	.588	1.000	.884	.679	.886	.942	.750	.500	.934	.883	.945	.795	.945	.964
Unshifted	15	15	17	47	15	1349	18	1382	48	18	4	70	95	1142	34	1271	2770
% Unshifted	100	100	100	100	93.8	98.6	94.7	98.5	98.0	100	100	98.6	84.1	98.4	97.1	97.2	97.9
HV	0	0	0	0	0	18	1	19	1	0	0	1	4	18	1	23	43
% HV	0	0	0	0	0	1.3	5.3	1.4	2.0	0	0	1.4	3.5	1.6	2.9	1.8	1.5
U-Turns	0	0	0	0	1	1	0	2	0	0	0	0	14	0	0	14	16
% U-Turns	0	0	0	0	6.3	0.1	0	0.1	0	0	0	0	12.4	0	0	1.1	0.6

Peak Hour Analysis From 4:00:00 PM to 5:45:00 PM - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 4:15:00 PM



Groups Printed- Unshifted - HV

Start Time	Mather Ave From North		West Chester Pike From East			Int. Total
	Right	App. Total	Thru	Right	App. Total	
04:00 PM	1	1	321	7	328	329
04:15 PM	9	9	348	12	360	369
04:30 PM	5	5	336	7	343	348
04:45 PM	1	1	338	9	347	348
Total	16	16	1343	35	1378	1394
05:00 PM	1	1	362	8	370	371
05:15 PM	2	2	310	10	320	322
05:30 PM	0	0	350	6	356	356
05:45 PM	4	4	319	5	324	328
Total	7	7	1341	29	1370	1377
Grand Total	23	23	2684	64	2748	2771
Apprch %	100		97.7	2.3		
Total %	0.8	0.8	96.9	2.3	99.2	
Unshifted	19	19	2644	64	2708	2727
% Unshifted	82.6	82.6	98.5	100	98.5	98.4
HV	4	4	40	0	40	44
% HV	17.4	17.4	1.5	0	1.5	1.6

Start Time	Mather Ave From North		West Chester Pike From East			Int. Total
	Right	App. Total	Thru	Right	App. Total	
04:15 PM	9	9	348	12	360	369
04:30 PM	5	5	336	7	343	348
04:45 PM	1	1	338	9	347	348
05:00 PM	1	1	362	8	370	371
Total Volume	16	16	1384	36	1420	1436
% App. Total	100		97.5	2.5		
PHF	.444	.444	.956	.750	.959	.968
Unshifted	13	13	1361	36	1397	1410
% Unshifted	81.3	81.3	98.3	100	98.4	98.2
HV	3	3	23	0	23	26
% HV	18.8	18.8	1.7	0	1.6	1.8

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 04:15 PM



Orth-Rodgers & Associates

Note:
WB WCP thru volume
counted @ N Lawrence

File Name : 04-WCP&I-476 North Off Ramp_PM
Site Code : 00000000
Start Date : 4/2/2009
Page No : 1

Groups Printed- Unshifted - HV

Start Time	I-476 NB Off-Ramp From South				West Chester Pike From West			Int. Total
	Left	Thru	Right	App. Total	Left	Thru	App. Total	
04:00 PM	49	2	82	133	50	448	498	631
04:15 PM	49	0	97	146	62	544	606	752
04:30 PM	67	0	111	178	53	552	605	783
04:45 PM	62	0	83	145	52	611	663	808
Total	227	2	373	602	217	2155	2372	2974
05:00 PM	59	0	130	189	60	628	688	877
05:15 PM	68	0	125	193	86	590	676	869
05:30 PM	64	0	120	184	90	589	679	863
05:45 PM	62	0	113	175	63	586	649	824
Total	253	0	488	741	299	2393	2692	3433
Grand Total	480	2	861	1343	516	4548	5064	6407
Apprch %	35.7	0.1	64.1		10.2	89.8		
Total %	7.5	0	13.4	21	8.1	71	79	
Unshifted	476	2	857	1335	509	4505	5014	6349
% Unshifted	99.2	100	99.5	99.4	98.6	99.1	99	99.1
HV	4	0	4	8	7	43	50	58
% HV	0.8	0	0.5	0.6	1.4	0.9	1	0.9

Start Time	I-476 NB Off-Ramp From South				West Chester Pike From West			Int. Total
	Left	Thru	Right	App. Total	Left	Thru	App. Total	
05:00 PM	59	0	130	189	60	628	688	877
05:15 PM	68	0	125	193	86	590	676	869
05:30 PM	64	0	120	184	90	589	679	863
05:45 PM	62	0	113	175	63	586	649	824
Total Volume	253	0	488	741	299	2393	2692	3433
% App. Total	34.1	0	65.9		11.1	88.9		
PHF	.930	.000	.938	.960	.831	.953	.978	.979
Unshifted	251	0	486	737	297	2369	2666	3403
% Unshifted	99.2	0	99.6	99.5	99.3	99.0	99.0	99.1
HV	2	0	2	4	2	24	26	30
% HV	0.8	0	0.4	0.5	0.7	1.0	1.0	0.9

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 05:00 PM



Note:
 Thru volumes counted @
 N Lawrence (WB) and
 476 NB ramps (EB)

File Name : 05-WCP&SLawrence_PM
 Site Code : 00000000
 Start Date : 4/2/2009
 Page No : 1

Groups Printed- Unshifted - HV - RTOR

Start Time	West Chester Pike From East			S Lawrence Road From South				West Chester Pike From West		Int. Total
	Left	R to 476	App. Total	L to WCP	L to 476 N	Right	App. Total	Right	App. Total	
04:00 PM	101	118	219	27	29	93	149	87	87	455
04:15 PM	115	139	254	15	33	94	142	128	128	524
04:30 PM	141	109	250	18	52	100	170	131	131	551
04:45 PM	107	133	240	28	37	92	157	142	142	539
Total	464	499	963	88	151	379	618	488	488	2069
05:00 PM	142	151	293	36	50	103	189	139	139	621
05:15 PM	128	138	266	22	30	99	151	165	165	582
05:30 PM	130	121	251	42	37	114	193	122	122	566
05:45 PM	138	112	250	32	34	107	173	124	124	547
Total	538	522	1060	132	151	423	706	550	550	2316
Grand Total	1002	1021	2023	220	302	802	1324	1038	1038	4385
Apprch %	49.5	50.5		16.6	22.8	60.6		100		
Total %	22.9	23.3	46.1	5	6.9	18.3	30.2	23.7	23.7	
Unshifted	985	998	1983	212	295	783	1290	927	927	4200
% Unshifted	98.3	97.7	98	96.4	97.7	97.6	97.4	89.3	89.3	95.8
HV	17	23	40	8	7	19	34	13	13	87
% HV	1.7	2.3	2	3.6	2.3	2.4	2.6	1.3	1.3	2
RTOR	0	0	0	0	0	0	0	98	98	98
% RTOR	0	0	0	0	0	0	0	9.4	9.4	2.2

Start Time	West Chester Pike From East			S Lawrence Road From South				West Chester Pike From West		Int. Total
	Left	R to 476	App. Total	L to WCP	L to 476 N	Right	App. Total	Right	App. Total	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 05:00 PM

05:00 PM	142	151	293	36	50	103	189	139	139	621
05:15 PM	128	138	266	22	30	99	151	165	165	582
05:30 PM	130	121	251	42	37	114	193	122	122	566
05:45 PM	138	112	250	32	34	107	173	124	124	547
Total Volume	538	522	1060	132	151	423	706	550	550	2316
% App. Total	50.8	49.2		18.7	21.4	59.9		100		
PHF	.947	.864	.904	.786	.755	.928	.915	.833	.833	.932
Unshifted	530	513	1043	129	150	413	692	498	498	2233
% Unshifted	98.5	98.3	98.4	97.7	99.3	97.6	98.0	90.5	90.5	96.4
HV	8	9	17	3	1	10	14	9	9	40
% HV	1.5	1.7	1.6	2.3	0.7	2.4	2.0	1.6	1.6	1.7
RTOR	0	0	0	0	0	0	0	43	43	43
% RTOR	0	0	0	0	0	0	0	7.8	7.8	1.9



Note:
EB thru volume counted
at 476 NB ramps

File Name : 06-WCP&NLawrence_PM
Site Code : 00000000
Start Date : 4/2/2009
Page No : 1

Groups Printed- Unshifted - HV - Buses

Start Time	N Lawrence Road From North			West Chester Pike From East			West Chester Pike From West		Int. Total
	Left	Right	App. Total	Thru	Right	App. Total	Left	App. Total	
04:00 PM	28	209	237	361	26	387	204	204	828
04:15 PM	39	210	249	358	22	380	238	238	867
04:30 PM	14	173	187	347	22	369	224	224	780
04:45 PM	26	178	204	357	28	385	216	216	805
Total	107	770	877	1423	98	1521	882	882	3280
05:00 PM	20	209	229	417	13	430	269	269	928
05:15 PM	28	203	231	356	25	381	280	280	892
05:30 PM	19	186	205	367	23	390	276	276	871
05:45 PM	34	198	232	302	25	327	272	272	831
Total	101	796	897	1442	86	1528	1097	1097	3522
Grand Total	208	1566	1774	2865	184	3049	1979	1979	6802
Apprch %	11.7	88.3		94	6		100		
Total %	3.1	23	26.1	42.1	2.7	44.8	29.1	29.1	
Unshifted	187	1534	1721	2803	178	2981	1966	1966	6668
% Unshifted	89.9	98	97	97.8	96.7	97.8	99.3	99.3	98
HV	0	26	26	37	2	39	8	8	73
% HV	0	1.7	1.5	1.3	1.1	1.3	0.4	0.4	1.1
Buses	21	6	27	25	4	29	5	5	61
% Buses	10.1	0.4	1.5	0.9	2.2	1	0.3	0.3	0.9

Start Time	N Lawrence Road From North			West Chester Pike From East			West Chester Pike From West		Int. Total
	Left	Right	App. Total	Thru	Right	App. Total	Left	App. Total	
05:00 PM	20	209	229	417	13	430	269	269	928
05:15 PM	28	203	231	356	25	381	280	280	892
05:30 PM	19	186	205	367	23	390	276	276	871
05:45 PM	34	198	232	302	25	327	272	272	831
Total Volume	101	796	897	1442	86	1528	1097	1097	3522
% App. Total	11.3	88.7		94.4	5.6		100		
PHF	.743	.952	.967	.865	.860	.888	.979	.979	.949
Unshifted	100	779	879	1417	86	1503	1091	1091	3473
% Unshifted	99.0	97.9	98.0	98.3	100	98.4	99.5	99.5	98.6
HV	0	14	14	12	0	12	4	4	30
% HV	0	1.8	1.6	0.8	0	0.8	0.4	0.4	0.9
Buses	1	3	4	13	0	13	2	2	19
% Buses	1.0	0.4	0.4	0.9	0	0.9	0.2	0.2	0.5

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 05:00 PM



Groups Printed- Unshifted - HV

Start Time	Apartments From North					West Chester Pike From East					Old West Chester Pike From South					West Chester Pike From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	0	0	0	0	0	24	294	1	1	320	26	0	15	0	41	0	430	22	0	452	813
04:15 PM	1	0	2	0	3	18	318	5	0	341	30	0	15	0	45	0	433	19	1	453	842
04:30 PM	1	0	0	0	1	20	336	5	1	362	42	1	24	1	68	0	490	16	0	506	937
04:45 PM	0	0	0	0	0	20	334	4	0	358	39	0	22	0	61	0	404	14	0	418	837
Total	2	0	2	0	4	82	1282	15	2	1381	137	1	76	1	215	0	1757	71	1	1829	3429
05:00 PM	0	0	0	0	0	6	311	3	0	320	28	0	31	0	59	0	486	11	0	497	876
05:15 PM	4	0	1	0	5	19	295	3	0	317	26	0	7	0	33	0	448	8	0	456	811
05:30 PM	3	0	2	0	5	9	271	6	0	286	24	0	5	0	29	0	476	14	0	490	810
05:45 PM	4	0	0	0	4	12	313	6	0	331	30	0	6	0	36	0	405	17	0	422	793
Total	11	0	3	0	14	46	1190	18	0	1254	108	0	49	0	157	0	1815	50	0	1865	3290
Grand Total	13	0	5	0	18	128	2472	33	2	2635	245	1	125	1	372	0	3572	121	1	3694	6719
Apprch %	72.2	0	27.8	0		4.9	93.8	1.3	0.1		65.9	0.3	33.6	0.3		0	96.7	3.3	0		
Total %	0.2	0	0.1	0	0.3	1.9	36.8	0.5	0	39.2	3.6	0	1.9	0	5.5	0	53.2	1.8	0	55	
Unshifted	13	0	4	0	17	98	2410	33	2	2543	242	1	125	1	369	0	3523	100	1	3624	6553
% Unshifted	100	0	80	0	94.4	76.6	97.5	100	100	96.5	98.8	100	100	100	99.2	0	98.6	82.6	100	98.1	97.5
HV	0	0	1	0	1	30	62	0	0	92	3	0	0	0	3	0	49	21	0	70	166
% HV	0	0	20	0	5.6	23.4	2.5	0	0	3.5	1.2	0	0	0	0.8	0	1.4	17.4	0	1.9	2.5

Start Time	Apartments From North				West Chester Pike From East				Old West Chester Pike From South				West Chester Pike From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	1	0	2	3	18	318	5	341	30	0	15	45	0	433	19	452	841
04:30 PM	1	0	0	1	20	336	5	361	42	1	24	67	0	490	16	506	935
04:45 PM	0	0	0	0	20	334	4	358	39	0	22	61	0	404	14	418	837
05:00 PM	0	0	0	0	6	311	3	320	28	0	31	59	0	486	11	497	876
Total Volume	2	0	2	4	64	1299	17	1380	139	1	92	232	0	1813	60	1873	3489
% App. Total	50	0	50		4.6	94.1	1.2		59.9	0.4	39.7		0	96.8	3.2		
PHF	.500	.000	.250	.333	.800	.967	.850	.956	.827	.250	.742	.866	.000	.925	.789	.925	.933
Unshifted	2	0	2	4	49	1266	17	1332	136	1	92	229	0	1792	49	1841	3406
% Unshifted	100	0	100	100	76.6	97.5	100	96.5	97.8	100	100	98.7	0	98.8	81.7	98.3	97.6
HV	0	0	0	0	15	33	0	48	3	0	0	3	0	21	11	32	83
% HV	0	0	0	0	23.4	2.5	0	3.5	2.2	0	0	1.3	0	1.2	18.3	1.7	2.4



Groups Printed- Unshifted - HV

Start Time	S Lawrence Rd From North				S Lawrence Rd From South				Lanford Rd From West				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
04:00 PM	194	0	0	194	1	127	0	128	0	1	0	1	323
04:15 PM	227	0	0	227	1	161	0	162	0	0	0	0	389
04:30 PM	265	0	0	265	0	142	0	142	0	0	0	0	407
04:45 PM	253	2	0	255	0	132	0	132	0	0	0	0	387
Total	939	2	0	941	2	562	0	564	0	1	0	1	1506
05:00 PM	246	2	0	248	1	144	0	145	2	0	0	2	395
05:15 PM	301	0	0	301	0	156	0	156	0	2	0	2	459
05:30 PM	264	0	0	264	0	119	0	119	0	0	0	0	383
05:45 PM	235	0	0	235	0	107	0	107	0	0	0	0	342
Total	1046	2	0	1048	1	526	0	527	2	2	0	4	1579
Grand Total	1985	4	0	1989	3	1088	0	1091	2	3	0	5	3085
Apprch %	99.8	0.2	0		0.3	99.7	0		40	60	0		
Total %	64.3	0.1	0	64.5	0.1	35.3	0	35.4	0.1	0.1	0	0.2	
Unshifted	1964	2	0	1966	3	1067	0	1070	2	3	0	5	3041
% Unshifted	98.9	50	0	98.8	100	98.1	0	98.1	100	100	0	100	98.6
HV	21	2	0	23	0	21	0	21	0	0	0	0	44
% HV	1.1	50	0	1.2	0	1.9	0	1.9	0	0	0	0	1.4

Start Time	S Lawrence Rd From North			S Lawrence Rd From South			Lanford Rd From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
04:30 PM	265	0	265	0	142	142	0	0	0	407
04:45 PM	253	2	255	0	132	132	0	0	0	387
05:00 PM	246	2	248	1	144	145	2	0	2	395
05:15 PM	301	0	301	0	156	156	0	2	2	459
Total Volume	1065	4	1069	1	574	575	2	2	4	1648
% App. Total	99.6	0.4		0.2	99.8		50	50		
PHF	.885	.500	.888	.250	.920	.921	.250	.250	.500	.898
Unshifted	1057	2	1059	1	565	566	2	2	4	1629
% Unshifted	99.2	50.0	99.1	100	98.4	98.4	100	100	100	98.8
HV	8	2	10	0	9	9	0	0	0	19
% HV	0.8	50.0	0.9	0	1.6	1.6	0	0	0	1.2

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 04:30 PM



Groups Printed- Unshifted - HV - RTOR

Start Time	S Lawrence Rd From North					Sussex Blvd From East					S Lawrence Rd From South					Sussex Blvd From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	34	215	10	0	259	17	1	13	2	33	4	110	2	1	117	16	3	10	0	29	438
04:15 PM	28	188	7	0	223	5	1	22	0	28	4	122	8	0	134	15	2	11	0	28	413
04:30 PM	39	172	8	0	219	6	0	21	0	27	2	130	3	1	136	3	2	5	0	10	392
04:45 PM	34	199	12	0	245	1	1	31	0	33	3	126	6	0	135	4	2	6	0	12	425
Total	135	774	37	0	946	29	3	87	2	121	13	488	19	2	522	38	9	32	0	79	1668
05:00 PM	34	207	8	0	249	4	2	28	0	34	2	134	10	0	146	3	1	8	0	12	441
05:15 PM	41	264	16	0	321	11	3	14	0	28	3	138	8	0	149	2	0	3	0	5	503
05:30 PM	23	208	8	0	239	4	1	17	0	22	0	147	7	0	154	34	15	15	1	65	480
05:45 PM	32	183	6	0	221	7	1	14	0	22	1	104	7	0	112	3	4	3	0	10	365
Total	130	862	38	0	1030	26	7	73	0	106	6	523	32	0	561	42	20	29	1	92	1789
Grand Total	265	1636	75	0	1976	55	10	160	2	227	19	1011	51	2	1083	80	29	61	1	171	3457
Apprch %	13.4	82.8	3.8	0		24.2	4.4	70.5	0.9		1.8	93.4	4.7	0.2		46.8	17	35.7	0.6		
Total %	7.7	47.3	2.2	0	57.2	1.6	0.3	4.6	0.1	6.6	0.5	29.2	1.5	0.1	31.3	2.3	0.8	1.8	0	4.9	
Unshifted	261	1629	60	0	1950	55	10	127	2	194	19	993	33	2	1047	80	29	47	1	157	3348
% Unshifted	98.5	99.6	80	0	98.7	100	100	79.4	100	85.5	100	98.2	64.7	100	96.7	100	100	77	100	91.8	96.8
HV	4	7	0	0	11	0	0	0	0	0	0	18	0	0	18	0	0	0	0	0	29
% HV	1.5	0.4	0	0	0.6	0	0	0	0	0	0	1.8	0	0	1.7	0	0	0	0	0	0.8
RTOR	0	0	15	0	15	0	0	33	0	33	0	0	18	0	18	0	0	14	0	14	80
% RTOR	0	0	20	0	0.8	0	0	20.6	0	14.5	0	0	35.3	0	1.7	0	0	23	0	8.2	2.3

Start Time	S Lawrence Rd From North				Sussex Blvd From East				S Lawrence Rd From South				Sussex Blvd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	34	199	12	245	1	1	31	33	3	126	6	135	4	2	6	12	425
05:00 PM	34	207	8	249	4	2	28	34	2	134	10	146	3	1	8	12	441
05:15 PM	41	264	16	321	11	3	14	28	3	138	8	149	2	0	3	5	503
05:30 PM	23	208	8	239	4	1	17	22	0	147	7	154	34	15	15	64	479
Total Volume	132	878	44	1054	20	7	90	117	8	545	31	584	43	18	32	93	1848
% App. Total	12.5	83.3	4.2		17.1	6	76.9		1.4	93.3	5.3		46.2	19.4	34.4		
PHF	.805	.831	.688	.821	.455	.583	.726	.860	.667	.927	.775	.948	.316	.300	.533	.363	.918
Unshifted	130	876	34	1040	20	7	70	97	8	536	19	563	43	18	23	84	1784
% Unshifted	98.5	99.8	77.3	98.7	100	100	77.8	82.9	100	98.3	61.3	96.4	100	100	71.9	90.3	96.5
HV	2	2	0	4	0	0	0	0	0	9	0	9	0	0	0	0	13
% HV	1.5	0.2	0	0.4	0	0	0	0	0	1.7	0	1.5	0	0	0	0	0.7
RTOR	0	0	10	10	0	0	20	20	0	0	12	12	0	0	9	9	51
% RTOR	0	0	22.7	0.9	0	0	22.2	17.1	0	0	38.7	2.1	0	0	28.1	9.7	2.8



Note
WB WCP thru volume
counted @ Mather Ave

File Name : 01-WCP&NewArdmore_SAT
Site Code : 00000000
Start Date : 8/14/2010
Page No : 1

Groups Printed- Unshifted - HV

Start Time	New Ardmore Rd From North					West Chester Pike From East					New Ardmore Rd From South					West Chester Pike From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
01:00 PM	13	0	5	0	18	17	0	6	0	23	2	0	4	0	6	0	246	2	0	248	295
01:15 PM	8	4	1	0	13	6	0	1	0	7	4	1	8	0	13	0	242	1	0	243	276
01:30 PM	7	2	1	0	10	13	0	1	0	14	2	3	11	0	16	1	247	3	0	251	291
01:45 PM	13	1	0	0	14	11	0	2	0	13	1	0	5	0	6	2	196	2	0	200	233
Total	41	7	7	0	55	47	0	10	0	57	9	4	28	0	41	3	931	8	0	942	1095
02:00 PM	12	2	1	0	15	4	0	4	0	8	4	3	5	0	12	3	289	0	0	292	327
02:15 PM	2	2	3	0	7	13	0	0	0	13	5	2	8	0	15	1	231	1	0	233	268
02:30 PM	6	3	0	0	9	10	0	2	0	12	3	0	8	0	11	1	196	0	0	197	229
02:45 PM	10	3	3	0	16	14	0	1	0	15	1	1	7	0	9	3	243	3	0	249	289
Total	30	10	7	0	47	41	0	7	0	48	13	6	28	0	47	8	959	4	0	971	1113
03:00 PM	20	1	4	0	25	19	0	2	0	21	3	0	5	0	8	1	247	1	0	249	303
03:15 PM	8	1	0	0	9	11	0	2	0	13	2	0	7	0	9	2	250	1	0	253	284
03:30 PM	14	2	2	0	18	10	0	3	0	13	0	0	6	0	6	2	309	3	0	314	351
03:45 PM	6	3	2	0	11	9	0	4	0	13	1	2	1	0	4	3	244	3	0	250	278
Total	48	7	8	0	63	49	0	11	0	60	6	2	19	0	27	8	1050	8	0	1066	1216
Grand Total	119	24	22	0	165	137	0	28	0	165	28	12	75	0	115	19	2940	20	0	2979	3424
Apprch %	72.1	14.5	13.3	0		83	0	17	0		24.3	10.4	65.2	0		0.6	98.7	0.7	0		
Total %	3.5	0.7	0.6	0	4.8	4	0	0.8	0	4.8	0.8	0.4	2.2	0	3.4	0.6	85.9	0.6	0	87	
Unshifted	119	24	22	0	165	137	0	28	0	165	28	12	74	0	114	19	2912	20	0	2951	3395
% Unshifted	100	100	100	0	100	100	0	100	0	100	100	100	98.7	0	99.1	100	99	100	0	99.1	99.2
HV	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	28	0	0	28	29
% HV	0	0	0	0	0	0	0	0	0	0	0	0	1.3	0	0.9	0	1	0	0	0.9	0.8

Start Time	New Ardmore Rd From North				West Chester Pike From East				New Ardmore Rd From South				West Chester Pike From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
02:30 PM	6	3	0	9	10	0	2	12	3	0	8	11	1	196	0	197	229
02:45 PM	10	3	3	16	14	0	1	15	1	1	7	9	3	243	3	249	289
03:00 PM	20	1	4	25	19	0	2	21	3	0	5	8	1	247	1	249	303
03:15 PM	8	1	0	9	11	0	2	13	2	0	7	9	2	250	1	253	284
Total Volume	44	8	7	59	54	0	7	61	9	1	27	37	7	936	5	948	1105
% App. Total	74.6	13.6	11.9		88.5	0	11.5		24.3	2.7	73		0.7	98.7	0.5		
PHF	.550	.667	.438	.590	.711	.000	.875	.726	.750	.250	.844	.841	.583	.936	.417	.937	.912
Unshifted	44	8	7	59	54	0	7	61	9	1	27	37	7	926	5	938	1095
% Unshifted	100	100	100	100	100	0	100	100	100	100	100	100	100	98.9	100	98.9	99.1
HV	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	10	10
% HV	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	0	1.1	0.9

Peak Hour Analysis From 02:30 PM to 03:15 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 02:30 PM



Groups Printed- Unshifted - HV

Start Time	Mather Ave From North		West Chester Pike From East			Int. Total
	Right	App. Total	Thru	Right	App. Total	
01:00 PM	1	1	244	1	245	246
01:15 PM	1	1	231	6	237	238
01:30 PM	4	4	275	7	282	286
01:45 PM	2	2	252	4	256	258
Total	8	8	1002	18	1020	1028
02:00 PM	5	5	240	7	247	252
02:15 PM	3	3	242	2	244	247
02:30 PM	1	1	314	5	319	320
02:45 PM	4	4	246	3	249	253
Total	13	13	1042	17	1059	1072
03:00 PM	0	0	229	3	232	232
03:15 PM	2	2	222	4	226	228
03:30 PM	2	2	278	7	285	287
03:45 PM	0	0	262	3	265	265
Total	4	4	991	17	1008	1012
Grand Total	25	25	3035	52	3087	3112
Apprch %	100		98.3	1.7		
Total %	0.8	0.8	97.5	1.7	99.2	
Unshifted	25	25	3014	52	3066	3091
% Unshifted	100	100	99.3	100	99.3	99.3
HV	0	0	21	0	21	21
% HV	0	0	0.7	0	0.7	0.7

Start Time	Mather Ave From North		West Chester Pike From East			Int. Total
	Right	App. Total	Thru	Right	App. Total	
02:30 PM	1	1	314	5	319	320
02:45 PM	4	4	246	3	249	253
03:00 PM	0	0	229	3	232	232
03:15 PM	2	2	222	4	226	228
Total Volume	7	7	1011	15	1026	1033
% App. Total	100		98.5	1.5		
PHF	.438	.438	.805	.750	.804	.807
Unshifted	7	7	1007	15	1022	1029
% Unshifted	100	100	99.6	100	99.6	99.6
HV	0	0	4	0	4	4
% HV	0	0	0.4	0	0.4	0.4

Peak Hour Analysis From 02:30 PM to 03:15 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 02:30 PM



Orth-Rodgers & Associates

Note:
WB WCP thru volume
counted @ N Lawrence

File Name : 04-WCP&I-476 North Off Ramp_SAT
Site Code : 00000000
Start Date : 9/11/2010
Page No : 1

Groups Printed- Unshifted - HV

Start Time	West Chester Pike From East		I-476 NB off-ramp From South				West Chester Pike From West			Int. Total
	R to 476	App. Total	Left	Thru	Right	App. Total	Left	Thru	App. Total	
01:00 PM	0	0	47	1	93	141	50	330	380	521
01:15 PM	0	0	41	2	101	144	55	350	405	549
01:30 PM	1	1	42	0	107	149	52	311	363	513
01:45 PM	0	0	35	0	91	126	51	322	373	499
Total	1	1	165	3	392	560	208	1313	1521	2082
02:00 PM	0	0	46	0	76	122	44	330	374	496
02:15 PM	0	0	37	0	95	132	45	369	414	546
02:30 PM	0	0	39	0	83	122	50	374	424	546
02:45 PM	0	0	34	0	86	120	53	375	428	548
Total	0	0	156	0	340	496	192	1448	1640	2136
03:00 PM	0	0	47	0	83	130	42	344	386	516
03:15 PM	0	0	41	0	84	125	53	431	484	609
03:30 PM	0	0	41	0	77	118	48	320	368	486
03:45 PM	1	1	42	0	73	115	48	378	426	542
Total	1	1	171	0	317	488	191	1473	1664	2153
Grand Total	2	2	492	3	1049	1544	591	4234	4825	6371
Apprch %	100		31.9	0.2	67.9		12.2	87.8		
Total %	0	0	7.7	0	16.5	24.2	9.3	66.5	75.7	
Unshifted	2	2	484	3	1041	1528	578	4186	4764	6294
% Unshifted	100	100	98.4	100	99.2	99	97.8	98.9	98.7	98.8
HV	0	0	8	0	8	16	13	48	61	77
% HV	0	0	1.6	0	0.8	1	2.2	1.1	1.3	1.2

Start Time	West Chester Pike From East		I-476 NB off-ramp From South				West Chester Pike From West			Int. Total
	R to 476	App. Total	Left	Thru	Right	App. Total	Left	Thru	App. Total	
02:30 PM	0	0	39	0	83	122	50	374	424	546
02:45 PM	0	0	34	0	86	120	53	375	428	548
03:00 PM	0	0	47	0	83	130	42	344	386	516
03:15 PM	0	0	41	0	84	125	53	431	484	609
Total Volume	0	0	161	0	336	497	198	1524	1722	2219
% App. Total	0		32.4	0	67.6		11.5	88.5		
PHF	.000	.000	.856	.000	.977	.956	.934	.884	.889	.911
Unshifted	0	0	158	0	332	490	192	1514	1706	2196
% Unshifted	0	0	98.1	0	98.8	98.6	97.0	99.3	99.1	99.0
HV	0	0	3	0	4	7	6	10	16	23
% HV	0	0	1.9	0	1.2	1.4	3.0	0.7	0.9	1.0

Peak Hour Analysis From 02:30 PM to 03:15 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 02:30 PM



Note:
Thru volumes counted @
N Lawrence (WB) and
476 NB ramps (EB)

File Name : 05-WCP&SLawrence_SAT
Site Code : 00000000
Start Date : 9/11/2010
Page No : 1

Groups Printed- Unshifted - HV

Start Time	West Chester Pike From East			S Lawrence Rd From South				West Chester Pike From West		Int. Total
	Left	R to 476	App. Total	L to WCP	L to 476 N	Right	App. Total	Right	App. Total	
01:00 PM	106	165	271	35	29	83	147	51	51	469
01:15 PM	82	169	251	26	34	101	161	51	51	463
01:30 PM	109	161	270	21	32	83	136	69	69	475
01:45 PM	130	176	306	18	30	86	134	39	39	479
Total	427	671	1098	100	125	353	578	210	210	1886
02:00 PM	98	165	263	19	32	101	152	57	57	472
02:15 PM	114	152	266	21	42	104	167	52	52	485
02:30 PM	87	128	215	24	37	115	176	35	35	426
02:45 PM	82	166	248	31	38	94	163	62	62	473
Total	381	611	992	95	149	414	658	206	206	1856
03:00 PM	96	171	267	24	32	98	154	52	52	473
03:15 PM	85	161	246	21	29	96	146	57	57	449
03:30 PM	89	124	213	23	25	83	131	79	79	423
03:45 PM	92	142	234	37	26	100	163	38	38	435
Total	362	598	960	105	112	377	594	226	226	1780
Grand Total	1170	1880	3050	300	386	1144	1830	642	642	5522
Apprch %	38.4	61.6		16.4	21.1	62.5		100		
Total %	21.2	34	55.2	5.4	7	20.7	33.1	11.6	11.6	
Unshifted	1160	1853	3013	294	378	1137	1809	638	638	5460
% Unshifted	99.1	98.6	98.8	98	97.9	99.4	98.9	99.4	99.4	98.9
HV	10	27	37	6	8	7	21	4	4	62
% HV	0.9	1.4	1.2	2	2.1	0.6	1.1	0.6	0.6	1.1

Start Time	West Chester Pike From East			S Lawrence Rd From South				West Chester Pike From West		Int. Total
	Left	R to 476	App. Total	L to WCP	L to 476 N	Right	App. Total	Right	App. Total	
Peak Hour Analysis From 02:30 PM to 03:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 02:30 PM										
02:30 PM	87	128	215	24	37	115	176	35	35	426
02:45 PM	82	166	248	31	38	94	163	62	62	473
03:00 PM	96	171	267	24	32	98	154	52	52	473
03:15 PM	85	161	246	21	29	96	146	57	57	449
Total Volume	350	626	976	100	136	403	639	206	206	1821
% App. Total	35.9	64.1		15.6	21.3	63.1		100		
PHF	.911	.915	.914	.806	.895	.876	.908	.831	.831	.962
Unshifted	345	615	960	98	135	401	634	205	205	1799
% Unshifted	98.6	98.2	98.4	98.0	99.3	99.5	99.2	99.5	99.5	98.8
HV	5	11	16	2	1	2	5	1	1	22
% HV	1.4	1.8	1.6	2.0	0.7	0.5	0.8	0.5	0.5	1.2



Groups Printed- Unshifted - HV

Start Time	N Lawrence Rd From North				West Chester Pike From East				West Chester Pike From West				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
01:00 PM	26	139	0	165	261	12	0	273	181	281	0	462	900
01:15 PM	17	136	0	153	350	20	0	370	165	276	0	441	964
01:30 PM	21	148	0	169	333	20	0	353	141	255	0	396	918
01:45 PM	13	143	4	160	333	27	0	360	152	255	0	407	927
Total	77	566	4	647	1277	79	0	1356	639	1067	0	1706	3709
02:00 PM	17	142	0	159	323	21	0	344	175	286	0	461	964
02:15 PM	14	141	0	155	351	14	0	365	151	336	0	487	1007
02:30 PM	22	150	0	172	353	11	0	364	166	304	0	470	1006
02:45 PM	22	143	0	165	324	26	0	350	154	325	0	479	994
Total	75	576	0	651	1351	72	0	1423	646	1251	0	1897	3971
03:00 PM	21	166	0	187	279	28	0	307	152	322	0	474	968
03:15 PM	25	142	0	167	314	25	0	339	173	309	0	482	988
03:30 PM	22	142	0	164	273	26	0	299	131	297	0	428	891
03:45 PM	22	149	0	171	328	25	0	353	166	314	0	480	1004
Total	90	599	0	689	1194	104	0	1298	622	1242	0	1864	3851
Grand Total	242	1741	4	1987	3822	255	0	4077	1907	3560	0	5467	11531
Apprch %	12.2	87.6	0.2		93.7	6.3	0		34.9	65.1	0		
Total %	2.1	15.1	0	17.2	33.1	2.2	0	35.4	16.5	30.9	0	47.4	
Unshifted	242	1739	4	1985	3813	254	0	4067	1905	3552	0	5457	11509
% Unshifted	100	99.9	100	99.9	99.8	99.6	0	99.8	99.9	99.8	0	99.8	99.8
HV	0	2	0	2	9	1	0	10	2	8	0	10	22
% HV	0	0.1	0	0.1	0.2	0.4	0	0.2	0.1	0.2	0	0.2	0.2

Start Time	N Lawrence Rd From North				West Chester Pike From East				West Chester Pike From West				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
02:30 PM	22	150	0	172	353	11	0	364	166	304	0	470	1006
02:45 PM	22	143	0	165	324	26	0	350	154	325	0	479	994
03:00 PM	21	166	0	187	279	28	0	307	152	322	0	474	968
03:15 PM	25	142	0	167	314	25	0	339	173	309	0	482	988
Total Volume	90	601	0	691	1270	90	0	1360	645	1260	0	1905	3956
% App. Total	13	87	0		93.4	6.6	0		33.9	66.1	0		
PHF	.900	.905	.000	.924	.899	.804	.000	.934	.932	.969	.000	.988	.983
Unshifted	90	601	0	691	1264	90	0	1354	645	1259	0	1904	3949
% Unshifted	100	100	0	100	99.5	100	0	99.6	100	99.9	0	99.9	99.8
HV	0	0	0	0	6	0	0	6	0	1	0	1	7
% HV	0	0	0	0	0.5	0	0	0.4	0	0.1	0	0.1	0.2

Peak Hour Analysis From 02:30 PM to 03:15 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 02:30 PM



Groups Printed- Unshifted - HV - RTOR

Start Time	Apartments From North					West Chester Pike From East					Old West Chester Pike From South					West Chester Pike From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
01:15 PM	0	0	0	2	2	7	355	0	0	362	9	0	11	0	20	0	292	7	1	300	684
01:30 PM	1	0	0	0	1	8	368	9	0	385	20	0	3	2	25	0	326	11	0	337	748
01:45 PM	3	0	0	1	4	8	344	5	0	357	20	0	6	0	26	0	310	14	2	326	713
Total	4	0	0	3	7	23	1067	14	0	1104	49	0	20	2	71	0	928	32	3	963	2145
02:00 PM	2	0	0	0	2	7	358	4	1	370	6	2	6	0	14	1	341	10	0	352	738
02:15 PM	0	0	1	0	1	10	356	4	1	371	16	0	9	1	26	0	345	16	0	361	759
02:30 PM	1	0	1	0	2	16	368	4	0	388	12	0	10	0	22	0	351	15	0	366	778
02:45 PM	3	0	1	0	4	13	312	4	0	329	17	0	15	2	34	0	346	12	0	358	725
Total	6	0	3	0	9	46	1394	16	2	1458	51	2	40	3	96	1	1383	53	0	1437	3000
03:00 PM	2	0	1	0	3	9	335	7	0	351	15	0	14	0	29	0	378	15	0	393	776
03:15 PM	1	0	0	1	2	11	299	6	2	318	16	0	18	8	42	0	342	12	0	354	716
03:30 PM	1	0	0	0	1	13	332	5	0	350	16	0	5	0	21	0	355	6	0	361	733
03:45 PM	1	0	0	0	1	4	297	2	0	303	15	0	6	0	21	0	384	3	0	387	712
Total	5	0	1	1	7	37	1263	20	2	1322	62	0	43	8	113	0	1459	36	0	1495	2937
Grand Total	15	0	4	4	23	106	3724	50	4	3884	162	2	103	13	280	1	3770				
Unshifted	15	0	4	4	23	105	3669	50	4	3828	162	2	53	13	230	1	3714	113	3	3831	7912
% Unshifted	100	0	100	100	100	99.1	98.5	100	100	98.6	100	100	51.5	100	82.1	100	98.5	93.4	100	98.4	97.9
HV	0	0	0	0	0	1	55	0	0	56	0	0	1	0	1	0	56	2	0	58	115
% HV	0	0	0	0	0	0.9	1.5	0	0	1.4	0	0	1	0	0.4	0	1.5	1.7	0	1.5	1.4
RTOR	0	0	0	0	0	0	0	0	0	0	0	0	49	0	49	0	0	6	0	6	55
% RTOR	0	0	0	0	0	0	0	0	0	0	0	0	47.6	0	17.5	0	0	5	0	0.2	0.7

Start Time	Apartments From North					West Chester Pike From East					Old West Chester Pike From South					West Chester Pike From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 01:15 PM to 03:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:15 PM																					
02:15 PM	0	0	1	0	1	10	356	4	1	371	16	0	9	1	26	0	345	16	0	361	759
02:30 PM	1	0	1	0	2	16	368	4	0	388	12	0	10	0	22	0	351	15	0	366	778
02:45 PM	3	0	1	0	4	13	312	4	0	329	17	0	15	2	34	0	346	12	0	358	725
03:00 PM	2	0	1	0	3	9	335	7	0	351	15	0	14	0	29	0	378	15	0	393	776
Total Volume	6	0	4	0	10	48	1371	19	1	1439	60	0	48	3	111	0	1420	58	0	1478	3038
% App. Total	60	0	40	0		3.3	95.3	1.3	0.1		54.1	0	43.2	2.7		0	96.1	3.9	0		
PHF	.500	.000	1.000	.000	.625	.750	.931	.679	.250	.927	.882	.000	.800	.375	.816	.000	.939	.906	.000	.940	.976
Unshifted	6	0	4	0	10	47	1346	19	1	1413	60	0	21	3	84	0	1406				
% Unshifted	100	0	100	0	100	97.9	98.2	100	100	98.2	100	0	43.8	100	75.7	0	99.0	87.9	0	98.6	97.6
HV	0	0	0	0	0	1	25	0	0	26	0	0	1	0	1	0	14	2	0	16	43
% HV	0	0	0	0	0	2.1	1.8	0	0	1.8	0	0	2.1	0	0.9	0	1.0	3.4	0	1.1	1.4
RTOR	0	0	0	0	0	0	0	0	0	0	0	0	26	0	26	0	0	5	0	5	31
% RTOR	0	0	0	0	0	0	0	0	0	0	0	0	54.2	0	23.4	0	0	8.6	0	0.3	1.0



Groups Printed- Unshifted - HV

Start Time	S Lawrence Rd From North				S Lawrence Rd From South				Langford Rd From West				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
01:15 PM	142	0	0	142	0	133	0	133	0	0	0	0	275
01:30 PM	97	1	0	98	0	103	0	103	1	0	0	1	202
01:45 PM	135	0	0	135	1	142	0	143	0	0	0	0	278
Total	374	1	0	375	1	378	0	379	1	0	0	1	755
02:00 PM	123	0	0	123	0	118	0	118	0	0	0	0	241
02:15 PM	155	0	0	155	0	130	0	130	1	0	0	1	286
02:30 PM	112	0	0	112	0	135	0	135	0	1	0	1	248
02:45 PM	116	1	0	117	0	123	0	123	0	0	0	0	240
Total	506	1	0	507	0	506	0	506	1	1	0	2	1015
03:00 PM	130	0	0	130	1	138	1	140	0	0	0	0	270
03:15 PM	158	0	0	158	0	145	0	145	0	0	0	0	303
03:30 PM	135	0	0	135	0	109	0	109	0	0	0	0	244
03:45 PM	119	0	0	119	1	99	0	100	0	0	0	0	219
Total	542	0	0	542	2	491	1	494	0	0	0	0	1036
04:00 PM	104	0	0	104	1	134	0	135	1	0	0	1	240
Grand Total	1526	2	0	1528	4	1509	1	1514	3	1	0	4	3046
Apprch %	99.9	0.1	0		0.3	99.7	0.1		75	25	0		
Total %	50.1	0.1	0	50.2	0.1	49.5	0	49.7	0.1	0	0	0.1	
Unshifted	1518	2	0	1520	4	1499	1	1504	3	1	0	4	3028
% Unshifted	99.5	100	0	99.5	100	99.3	100	99.3	100	100	0	100	99.4
HV	8	0	0	8	0	10	0	10	0	0	0	0	18
% HV	0.5	0	0	0.5	0	0.7	0	0.7	0	0	0	0	0.6

Start Time	S Lawrence Rd From North			S Lawrence Rd From South			Langford Rd From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 01:15 PM to 02:00 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 01:15 PM										
01:15 PM	142	0	142	0	133	133	0	0	0	275
01:30 PM	97	1	98	0	103	103	1	0	1	202
01:45 PM	135	0	135	1	142	143	0	0	0	278
02:00 PM	123	0	123	0	118	118	0	0	0	241
Total Volume	497	1	498	1	496	497	1	0	1	996
% App. Total	99.8	0.2		0.2	99.8		100	0		
PHF	.875	.250	.877	.250	.873	.869	.250	.000	.250	.896
Unshifted	494	1	495	1	493	494	1	0	1	990
% Unshifted	99.4	100	99.4	100	99.4	99.4	100	0	100	99.4
HV	3	0	3	0	3	3	0	0	0	6
% HV	0.6	0	0.6	0	0.6	0.6	0	0	0	0.6



Groups Printed- Unshifted - HV

Start Time	S Lawrence Rd From South					S Lawrence Rd From North					Sussex Blvd From West					Sussex Blvd From East					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
01:00 PM	2	122	3	0	127	14	132	1	0	147	0	0	3	0	3	6	0	14	0	20	297
01:15 PM	0	126	3	0	129	22	120	2	0	144	1	0	1	0	2	3	0	18	0	21	296
01:30 PM	2	123	2	0	127	15	102	2	0	119	0	0	0	0	0	3	1	19	0	23	269
01:45 PM	1	101	3	0	105	25	116	1	0	142	1	2	2	0	5	5	1	14	0	20	272
Total	5	472	11	0	488	76	470	6	0	552	2	2	6	0	10	17	2	65	0	84	1134
02:00 PM	1	113	6	0	120	15	136	4	0	155	1	0	0	0	1	3	0	10	0	13	289
02:15 PM	3	134	5	0	142	9	101	0	0	110	2	0	2	0	4	3	1	10	0	14	270
02:30 PM	0	114	2	0	116	6	113	1	0	120	0	1	1	0	2	6	1	9	0	16	254
02:45 PM	1	101	5	0	107	19	123	3	0	145	1	2	0	0	3	2	1	17	0	20	275
Total	5	462	18	0	485	49	473	8	0	530	4	3	3	0	10	14	3	46	0	63	1088
03:00 PM	1	133	3	0	137	13	134	2	0	149	3	1	0	0	4	2	0	20	0	22	312
03:15 PM	0	93	2	0	95	8	126	1	0	135	4	0	0	0	4	4	0	9	0	13	247
03:30 PM	1	103	4	0	108	18	104	1	0	123	4	1	1	0	6	3	0	14	0	17	254
03:45 PM	1	98	3	0	102	15	86	2	0	103	3	0	1	0	4	3	2	13	0	18	227
Total	3	427	12	0	442	54	450	6	0	510	14	2	2	0	18	12	2	56	0	70	1040
Grand Total	13	1361	41	0	1415	179	1393	20	0	1592	20	7	11	0	38	43	7	167	0	217	3262
Apprch %	0.9	96.2	2.9	0		11.2	87.5	1.3	0		52.6	18.4	28.9	0		19.8	3.2	77	0		
Total %	0.4	41.7	1.3	0	43.4	5.5	42.7	0.6	0	48.8	0.6	0.2	0.3	0	1.2	1.3	0.2	5.1	0	6.7	
Unshifted	13	1353	41	0	1407	179	1387	20	0	1586	19	7	11	0	37	43	7	166	0	216	3246
% Unshifted	100	99.4	100	0	99.4	100	99.6	100	0	99.6	95	100	100	0	97.4	100	100	99.4	0	99.5	99.5
HV	0	8	0	0	8	0	6	0	0	6	1	0	0	0	1	0	0	1	0	1	16
% HV	0	0.6	0	0	0.6	0	0.4	0	0	0.4	5	0	0	0	2.6	0	0	0.6	0	0.5	0.5

Start Time	S Lawrence Rd From South				S Lawrence Rd From North				Sussex Blvd From West				Sussex Blvd From East				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 01:00 PM to 03:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 01:00 PM																	
01:00 PM	2	122	3	127	14	132	1	147	0	0	3	3	6	0	14	20	297
01:15 PM	0	126	3	129	22	120	2	144	1	0	1	2	3	0	18	21	296
01:30 PM	2	123	2	127	15	102	2	119	0	0	0	0	3	1	19	23	269
01:45 PM	1	101	3	105	25	116	1	142	1	2	2	5	5	1	14	20	272
Total Volume	5	472	11	488	76	470	6	552	2	2	6	10	17	2	65	84	1134
% App. Total	1	96.7	2.3		13.8	85.1	1.1		20	20	60		20.2	2.4	77.4		
PHF	.625	.937	.917	.946	.760	.890	.750	.939	.500	.250	.500	.500	.708	.500	.855	.913	.955
Unshifted	5	467	11	483	76	468	6	550	2	2	6	10	17	2	64	83	1126
% Unshifted	100	98.9	100	99.0	100	99.6	100	99.6	100	100	100	100	100	100	98.5	98.8	99.3
HV	0	5	0	5	0	2	0	2	0	0	0	0	0	0	1	1	8
% HV	0	1.1	0	1.0	0	0.4	0	0.4	0	0	0	0	0	0	1.5	1.2	0.7

Orth-Rodgers & Associates

total vehicles SB Off ramp
before EB/WB split

476SBOFFRAMP_TOTAL(1)

Thursday

Start Time	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Classed	Not Classed	Total
01/28/10	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	0	622	7	29	3	0	10	1	0	0	0	0	0	2	796
09:00	0	510	14	35	6	8	12	4	0	0	0	0	0	7	710
10:00	0	475	13	35	2	6	11	7	1	0	0	1	0	4	689
11:00	0	462	14	37	6	7	5	5	0	0	0	0	0	0	655
12 PM	0	508	15	26	6	3	8	3	1	0	0	0	0	0	696
13:00	0	530	6	38	9	5	5	2	0	0	0	1	0	0	735
14:00	0	666	10	47	1	4	8	5	1	0	0	0	2	0	930
15:00	0	1042	3	44	0	0	14	0	0	0	1	0	0	1	1303
16:00	2	1265	6	37	1	0	17	4	2	0	0	0	10	1577	
17:00	0	1560	3	27	0	0	15	2	0	0	0	0	5	1785	
18:00	0	1252	3	24	0	0	6	4	1	0	0	0	10	1449	
19:00	0	748	4	10	0	0	6	0	0	0	0	0	0	0	875
20:00	0	611	5	11	0	0	1	2	0	0	0	0	0	0	697
21:00	0	530	3	13	0	0	1	3	0	0	0	0	0	0	643
22:00	0	341	1	8	0	0	1	2	0	0	0	0	0	1	413
23:00	0	231	1	3	0	0	1	2	0	0	0	0	0	1	274
Total	2	11353	108	424	34	33	121	46	6	0	1	2	2	43	14227
Percent	0.0%	79.8%	0.8%	3.0%	0.2%	0.2%	0.9%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	
AM Peak		08:00	09:00	11:00	09:00	09:00	09:00	10:00	10:00	09:00	09:00	10:00	09:00	09:00	
Vol.		622	14	37	6	8	12	7	1	1	1	1	1	7	
PM Peak		17:00	12:00	14:00	13:00	13:00	16:00	14:00	16:00	13:00	15:00	13:00	16:00	16:00	
Vol.		1560	15	47	9	5	17	5	2	1	1	1	10	10	

Orth-Rodgers & Associates

Friday

total vehicles SB Off ramp before EB/WB split

476SBOFFRAMP_TOTAL(1)

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Ax Double	5 Axle Double	>6 Ax Double	<6 Ax Multi	6 Axle Multi	>6 Ax Multi	Classed	Not Classed	Total
01/29/10	0	118	30	2	4	0	0	0	1	0	0	0	0	0	0	155
01:00	0	56	14	0	3	0	0	0	0	0	0	0	0	0	0	73
02:00	0	44	9	3	3	0	0	1	3	0	0	0	0	0	0	63
03:00	0	30	5	3	7	0	0	1	4	0	0	0	0	0	0	50
04:00	0	28	9	2	3	0	0	0	0	0	0	0	0	0	0	42
05:00	0	82	29	5	5	1	0	0	4	0	0	0	0	0	0	126
06:00	0	365	108	6	36	4	2	6	4	1	0	0	0	0	1	533
07:00	0	678	136	13	38	7	1	21	6	1	1	0	0	0	5	907
08:00	0	561	121	10	36	2	2	22	5	1	0	0	1	7	7	768
09:00	0	472	146	16	41	3	4	7	9	0	0	0	0	0	1	699
10:00	0	445	135	15	29	2	7	8	5	1	0	0	0	0	2	649
11:00	0	458	132	11	43	6	4	7	3	0	0	0	1	2	2	667
12 PM	0	557	138	11	35	5	3	6	2	0	0	0	0	4	4	761
13:00	0	594	133	11	44	5	3	3	1	0	0	0	0	0	0	794
14:00	0	793	190	6	46	2	1	9	7	0	0	0	0	0	0	1054
15:00	0	977	206	5	44	1	0	6	5	1	0	0	0	0	6	1251
16:00	0	1367	218	3	50	1	1	13	2	1	0	0	0	0	5	1661
17:00	0	1409	180	3	23	0	0	12	0	2	0	0	0	4	4	1633
18:00	0	1053	151	4	14	0	0	6	1	1	0	0	0	3	3	1233
19:00	0	735	111	6	10	0	0	1	1	0	0	0	0	1	1	865
20:00	0	527	73	6	11	1	0	4	1	0	0	0	0	0	0	623
21:00	0	512	81	4	5	0	0	0	2	0	0	0	0	0	0	604
22:00	0	456	84	3	8	0	0	0	0	0	0	0	0	0	0	551
23:00	0	324	45	3	6	0	0	3	1	0	0	0	0	0	0	382
Total	0	12641	2484	151	544	40	28	136	67	9	1	0	2	41	0	16144
Percent	0.0%	78.3%	15.4%	0.9%	3.4%	0.2%	0.2%	0.8%	0.4%	0.1%	0.0%	0.0%	0.0%	0.3%	0.0%	
AM Peak Vol.	07:00	678	09:00	09:00	11:00	07:00	10:00	08:00	09:00	06:00	07:00	08:00	08:00	08:00	08:00	
PM Peak Vol.	17:00	1409	16:00	12:00	16:00	12:00	12:00	16:00	14:00	17:00	15:00	15:00	15:00	15:00	15:00	

Orth-Rodgers & Associates

total vehicles SB Off ramp before EB/WB split

476SBOFFRAMP_TOTAL(1)

Saturday

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Classed	Not Classed	Total
01/30/10	0	214	29	2	6	0	0	2	0	1	0	0	0	0	1	255
01:00	0	117	14	0	2	0	0	0	2	0	0	0	0	0	1	136
02:00	0	91	13	1	2	0	0	0	3	0	0	0	0	0	0	110
03:00	0	38	7	2	3	0	0	0	0	0	0	0	0	0	0	50
04:00	0	30	10	0	3	0	0	2	1	0	0	0	0	0	0	46
05:00	0	43	11	0	10	0	0	0	2	0	0	0	0	0	0	66
06:00	0	88	27	2	5	1	0	1	1	0	0	0	0	0	0	124
07:00	0	187	68	1	16	0	0	2	0	0	0	0	0	0	0	274
08:00	0	295	77	8	13	1	0	3	2	0	0	0	1	1	1	401
09:00	0	387	93	6	25	2	0	1	1	0	0	0	0	5	5	520
10:00	0	443	117	7	16	0	0	4	1	0	0	0	0	2	2	590
11:00	0	586	111	2	27	1	0	4	0	0	0	0	0	0	0	731
12 PM	0	614	139	3	25	0	0	3	0	1	0	0	0	0	0	785
13:00	0	648	127	4	20	0	0	3	1	0	0	0	0	0	0	803
14:00	0	752	149	6	20	0	0	3	0	2	0	0	0	1	1	933
15:00	0	683	146	5	25	0	0	3	2	0	0	0	0	2	2	866
16:00	0	610	141	2	25	0	0	1	0	0	0	0	0	0	0	779
17:00	0	638	148	3	16	0	0	3	1	0	0	0	0	0	0	809
18:00	0	591	121	4	17	2	0	0	0	0	0	0	0	1	1	736
19:00	0	386	56	1	9	2	0	1	2	0	0	0	0	1	1	458
20:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	7441	1604	59	285	9	0	36	18	4	0	0	1	15	15	9472
Percent	0.0%	78.6%	16.9%	0.6%	3.0%	0.1%	0.0%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	
AM Peak Vol.	11:00	586	117	8	27	2	0	10:00	02:00	00:00	08:00	08:00	08:00	09:00	09:00	
PM Peak Vol.	14:00	752	149	6	25	2	0	12:00	15:00	14:00	15:00	15:00	15:00	15:00	15:00	

Start Time	14-Jun-10		Tue		Wed		Thu		Fri		Sat		Sun		Average Day		
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	
12:00	*	*	*	*	*	*	*	140	14	148	26	153	18	128	19	142	
12:15	*	*	*	*	*	*	*	157	13	168	16	111	11	160	13	149	
12:30	*	*	*	*	*	*	*	161	15	150	16	166	11	199	14	169	
12:45	*	*	*	*	*	*	*	179	14	149	11	160	9	133	11	155	
01:00	*	*	*	*	*	*	*	141	14	115	12	130	6	138	11	131	
01:15	*	*	*	*	*	*	*	134	6	134	12	170	13	138	10	144	
01:30	*	*	*	*	*	*	*	165	5	154	9	148	4	143	6	152	
01:45	*	*	*	*	*	*	*	156	7	134	11	138	6	143	8	143	
02:00	*	*	*	*	*	*	*	172	7	135	6	129	8	155	7	148	
02:15	*	*	*	*	*	*	*	135	7	169	6	124	5	116	6	136	
02:30	*	*	*	*	*	*	*	152	3	141	6	158	4	119	4	142	
02:45	*	*	*	*	*	*	*	151	1	137	6	133	1	121	3	136	
03:00	*	*	*	*	*	*	*	133	4	158	4	142	6	125	5	140	
03:15	*	*	*	*	*	*	*	127	3	157	3	125	7	143	4	138	
03:30	*	*	*	*	*	*	*	165	2	145	2	135	3	119	2	141	
03:45	*	*	*	*	*	*	*	133	2	172	6	123	7	106	5	134	
04:00	*	*	*	*	*	*	*	146	5	150	4	116	6	110	5	130	
04:15	*	*	*	*	*	*	*	183	9	153	5	115	5	80	6	133	
04:30	*	*	*	*	*	*	*	180	11	145	5	102	5	123	7	138	
04:45	*	*	*	*	*	*	*	160	9	150	9	128	2	108	7	136	
05:00	*	*	*	*	*	*	*	183	17	175	5	111	11	123	11	148	
05:15	*	*	*	*	*	*	*	168	33	166	9	125	10	123	17	146	
05:30	*	*	*	*	*	*	*	163	27	139	21	108	9	124	19	134	
05:45	*	*	*	*	*	*	*	173	50	141	13	115	10	102	24	133	
06:00	*	*	*	*	*	*	*	147	58	129	20	155	15	192	31	156	
06:15	*	*	*	*	*	*	*	123	72	109	33	99	18	98	41	107	
06:30	*	*	*	*	*	*	*	127	108	132	42	94	23	81	58	108	
06:45	*	*	*	*	*	*	*	112	128	100	45	95	34	93	69	100	
07:00	*	*	*	*	*	*	*	154	177	103	46	77	17	136	80	118	
07:15	*	*	*	*	*	*	*	206	130	196	50	97	29	113	120	112	
07:30	*	*	*	*	*	*	*	235	108	212	57	91	31	127	134	107	
07:45	*	*	*	*	*	*	*	245	109	178	68	70	48	106	135	98	
08:00	*	*	*	*	*	*	*	253	107	227	77	92	100	92	164	102	
08:15	*	*	*	*	*	*	*	220	126	234	95	85	65	99	154	101	
08:30	*	*	*	*	*	*	*	237	96	229	93	74	65	95	156	92	
08:45	*	*	*	*	*	*	*	202	94	174	104	73	66	79	136	82	
09:00	*	*	*	*	*	*	*	175	131	159	91	79	90	78	129	98	
09:15	*	*	*	*	*	*	*	154	73	141	97	85	84	55	119	74	
09:30	*	*	*	*	*	*	*	153	85	129	121	87	65	53	117	77	
09:45	*	*	*	*	*	*	*	129	62	116	111	68	88	35	111	58	
10:00	*	*	*	*	*	*	*	133	58	150	122	62	110	25	129	54	
10:15	*	*	*	*	*	*	*	140	63	145	100	64	167	23	138	50	
10:30	*	*	*	*	*	*	*	125	61	137	119	80	113	35	124	56	
10:45	*	*	*	*	*	*	*	131	40	177	135	46	112	20	139	42	
11:00	*	*	*	*	*	*	*	132	35	153	140	48	107	20	133	37	
11:15	*	*	*	*	*	*	*	155	19	151	149	43	126	15	145	27	
11:30	*	*	*	*	*	*	*	151	15	168	139	25	112	13	142	20	
11:45	*	*	*	*	*	*	*	144	16	143	161	30	114	12	140	20	
Total	0	0	0	0	0	0	0	3320	5848	4040	5567	2438	4984	1976	4774	3068	5294
Day Total	0		0		0			9168		9607		7422		6750		8362	
% Splits	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	36.2%	63.8%	42.1%	57.9%	32.8%	67.2%	29.3%	70.7%	36.7%	63.3%
Peak Vol.								07:45	04:15	07:45	04:30	11:00	00:30	10:00	00:15	08:00	12:00
P.H.F.								0.944	0.964	0.927	0.909	0.915	0.921	0.751	0.791	0.930	0.910

Start Time	21-Jun-10		Tue		Wed		Thu		Fri		Sat		Sun		Average Day	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	7	146	9	143	8	145	10	149	19	161	19	139	26	156	14	148
12:15	10	141	4	120	11	126	4	119	12	153	21	154	14	130	11	135
12:30	7	145	6	118	6	125	8	134	7	149	15	147	10	119	8	134
12:45	11	141	2	144	9	122	5	132	7	144	13	150	19	119	9	136
01:00	4	129	10	125	5	121	7	124	14	169	11	169	13	138	9	139
01:15	5	142	5	114	9	116	10	128	8	128	12	127	12	124	9	126
01:30	1	127	4	140	4	120	6	103	3	119	8	145	6	157	5	130
01:45	2	162	4	134	3	117	2	117	8	128	4	151	4	158	4	138
02:00	3	155	3	123	3	119	2	125	3	127	5	148	7	159	4	137
02:15	3	131	2	117	1	130	1	114	9	133	3	134	12	127	4	127
02:30	2	132	4	117	3	115	4	128	2	136	3	126	3	125	3	126
02:45	9	136	0	120	6	123	1	132	4	127	4	138	4	146	4	132
03:00	3	170	2	139	0	118	1	149	4	128	2	123	2	111	2	134
03:15	5	135	4	138	4	109	5	101	3	134	1	160	3	132	4	130
03:30	3	117	4	123	4	126	1	137	3	145	3	133	4	113	3	128
03:45	2	129	1	112	1	120	4	180	5	155	7	130	3	114	3	134
04:00	1	154	1	143	7	149	8	176	5	134	6	135	9	116	5	144
04:15	13	139	5	122	4	124	10	163	4	158	6	134	3	123	6	138
04:30	10	138	6	113	16	144	10	193	5	144	5	144	3	135	8	144
04:45	15	142	12	131	13	146	12	195	14	134	7	118	5	110	11	139
05:00	17	177	23	158	21	156	21	151	9	171	3	136	7	120	14	153
05:15	20	173	26	148	32	158	30	178	36	136	9	122	6	104	23	146
05:30	34	124	34	143	37	134	30	144	42	123	16	124	12	121	29	130
05:45	51	144	41	148	40	127	36	146	57	131	17	141	11	170	36	144
06:00	53	123	77	115	59	116	63	137	63	140	28	128	14	138	51	128
06:15	79	133	76	135	85	121	72	147	78	144	36	95	20	111	64	127
06:30	100	113	88	110	103	113	86	154	119	117	41	111	27	104	81	117
06:45	127	102	139	88	131	124	133	151	121	116	41	91	25	96	102	110
07:00	184	102	175	99	164	115	159	151	144	125	50	98	29	106	129	114
07:15	178	110	188	98	170	103	176	120	150	111	62	96	27	66	136	101
07:30	218	91	189	77	185	100	203	125	174	116	65	83	34	80	153	96
07:45	228	91	202	96	189	111	190	114	196	107	79	92	60	97	163	101
08:00	236	121	176	82	187	88	208	140	185	105	80	82	99	82	167	100
08:15	237	97	202	92	215	87	195	167	206	101	103	98	62	75	174	102
08:30	205	86	182	75	207	88	186	176	198	98	112	75	66	70	165	95
08:45	203	70	172	77	185	91	177	147	208	107	100	101	62	76	158	96
09:00	164	80	157	74	149	64	155	139	162	102	98	80	65	78	136	88
09:15	142	62	123	80	127	80	131	158	161	91	88	70	77	66	121	87
09:30	151	67	122	71	115	49	132	173	147	84	103	54	82	41	122	77
09:45	119	61	110	59	101	66	106	88	162	62	108	68	104	36	116	63
10:00	140	55	120	57	114	59	136	74	161	54	120	63	140	46	133	58
10:15	113	49	104	56	115	47	111	48	122	42	121	60	108	37	113	48
10:30	114	40	125	37	118	40	113	52	146	40	137	43	94	22	121	39
10:45	124	33	126	31	132	33	115	34	144	62	138	42	110	29	127	38
11:00	123	12	122	32	105	27	122	24	145	39	146	47	111	21	125	29
11:15	156	15	110	23	138	23	140	28	148	27	143	29	122	18	137	23
11:30	123	15	123	12	112	23	117	32	154	22	142	29	121	20	127	22
11:45	128	20	107	14	115	11	127	13	158	16	133	23	150	19	131	17
Total	3883	5177	3527	4823	3568	4869	3581	6010	3935	5395	2474	5086	2007	4661	3280	5148
Day Total	9060		8350		8437		9591		9330		7560		6668		8428	
% Splits	42.9%	57.1%	42.2%	57.8%	42.3%	57.7%	37.3%	62.7%	42.2%	57.8%	32.7%	67.3%	30.1%	69.9%	38.9%	61.1%
Peak	07:30	04:30	07:30	05:00	07:45	04:30	07:30	04:00	08:00	00:15	10:45	00:15	11:00	01:30	07:45	04:30
Vol.	919	630	769	597	798	604	796	727	797	615	569	620	504	601	669	582
P.H.F.	0.969	0.890	0.952	0.945	0.928	0.956	0.957	0.932	0.958	0.910	0.974	0.917	0.840	0.945	0.961	0.951

Start Time	28-Jun-10		Tue		Wed		Thu		Fri		Sat		Sun		Average Day	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	8	155	13	*	*	*	*	*	*	*	*	*	*	*	10	155
12:15	4	131	9	*	*	*	*	*	*	*	*	*	*	*	6	131
12:30	8	132	7	*	*	*	*	*	*	*	*	*	*	*	8	132
12:45	6	135	1	*	*	*	*	*	*	*	*	*	*	*	4	135
01:00	6	121	10	*	*	*	*	*	*	*	*	*	*	*	8	121
01:15	4	125	3	*	*	*	*	*	*	*	*	*	*	*	4	125
01:30	5	131	7	*	*	*	*	*	*	*	*	*	*	*	6	131
01:45	5	121	2	*	*	*	*	*	*	*	*	*	*	*	4	121
02:00	2	148	3	*	*	*	*	*	*	*	*	*	*	*	2	148
02:15	2	136	1	*	*	*	*	*	*	*	*	*	*	*	2	136
02:30	3	135	4	*	*	*	*	*	*	*	*	*	*	*	4	135
02:45	2	124	2	*	*	*	*	*	*	*	*	*	*	*	2	124
03:00	2	132	2	*	*	*	*	*	*	*	*	*	*	*	2	132
03:15	3	108	2	*	*	*	*	*	*	*	*	*	*	*	2	108
03:30	6	164	1	*	*	*	*	*	*	*	*	*	*	*	4	164
03:45	1	126	5	*	*	*	*	*	*	*	*	*	*	*	3	126
04:00	3	103	6	*	*	*	*	*	*	*	*	*	*	*	4	103
04:15	11	143	8	*	*	*	*	*	*	*	*	*	*	*	10	143
04:30	7	124	6	*	*	*	*	*	*	*	*	*	*	*	6	124
04:45	12	134	12	*	*	*	*	*	*	*	*	*	*	*	12	134
05:00	22	159	21	*	*	*	*	*	*	*	*	*	*	*	22	159
05:15	21	140	23	*	*	*	*	*	*	*	*	*	*	*	22	140
05:30	35	157	38	*	*	*	*	*	*	*	*	*	*	*	36	157
05:45	42	115	45	*	*	*	*	*	*	*	*	*	*	*	44	115
06:00	63	98	66	*	*	*	*	*	*	*	*	*	*	*	64	98
06:15	77	117	*	*	*	*	*	*	*	*	*	*	*	*	77	117
06:30	92	82	*	*	*	*	*	*	*	*	*	*	*	*	92	82
06:45	119	101	*	*	*	*	*	*	*	*	*	*	*	*	119	101
07:00	157	107	*	*	*	*	*	*	*	*	*	*	*	*	157	107
07:15	185	81	*	*	*	*	*	*	*	*	*	*	*	*	185	81
07:30	211	102	*	*	*	*	*	*	*	*	*	*	*	*	211	102
07:45	202	89	*	*	*	*	*	*	*	*	*	*	*	*	202	89
08:00	195	99	*	*	*	*	*	*	*	*	*	*	*	*	195	99
08:15	208	83	*	*	*	*	*	*	*	*	*	*	*	*	208	83
08:30	203	74	*	*	*	*	*	*	*	*	*	*	*	*	203	74
08:45	170	81	*	*	*	*	*	*	*	*	*	*	*	*	170	81
09:00	148	71	*	*	*	*	*	*	*	*	*	*	*	*	148	71
09:15	131	54	*	*	*	*	*	*	*	*	*	*	*	*	131	54
09:30	121	69	*	*	*	*	*	*	*	*	*	*	*	*	121	69
09:45	129	44	*	*	*	*	*	*	*	*	*	*	*	*	129	44
10:00	125	41	*	*	*	*	*	*	*	*	*	*	*	*	125	41
10:15	131	49	*	*	*	*	*	*	*	*	*	*	*	*	131	49
10:30	113	49	*	*	*	*	*	*	*	*	*	*	*	*	113	49
10:45	116	31	*	*	*	*	*	*	*	*	*	*	*	*	116	31
11:00	117	19	*	*	*	*	*	*	*	*	*	*	*	*	117	19
11:15	139	31	*	*	*	*	*	*	*	*	*	*	*	*	139	31
11:30	117	19	*	*	*	*	*	*	*	*	*	*	*	*	117	19
11:45	128	13	*	*	*	*	*	*	*	*	*	*	*	*	128	13
Total	3617	4803	297	0	0	0	0	0	0	0	0	0	0	0	3625	4803
Day Total	8420		297		0		0		0		0		0		8428	
% Splits	43.0%	57.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	43.0%	57.0%
Peak Vol.	07:30 816	04:45 590	05:15 172												07:30 816	04:45 590
P.H.F.	0.967	0.928	0.652												0.967	0.928

ADT ADT 8,210 AADT 8,210

Start Time	14-Jun-10		Tue		Wed		Thu		Fri		Sat		Sun		Average Day		
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	
12:00	*	*	*	*	*	*	*	136	25	169	28	158	20	144	24	152	
12:15	*	*	*	*	*	*	*	156	18	170	18	173	30	145	22	161	
12:30	*	*	*	*	*	*	*	184	17	178	21	139	21	150	20	163	
12:45	*	*	*	*	*	*	*	168	8	166	22	162	19	160	16	164	
01:00	*	*	*	*	*	*	*	154	10	149	20	150	21	153	17	152	
01:15	*	*	*	*	*	*	*	170	7	144	17	168	8	168	11	162	
01:30	*	*	*	*	*	*	*	164	8	197	9	131	12	206	10	174	
01:45	*	*	*	*	*	*	*	146	6	188	16	150	15	216	12	175	
02:00	*	*	*	*	*	*	*	180	9	220	14	164	15	162	13	182	
02:15	*	*	*	*	*	*	*	159	6	208	5	134	16	150	9	163	
02:30	*	*	*	*	*	*	*	152	9	234	11	124	8	128	9	160	
02:45	*	*	*	*	*	*	*	162	7	256	7	174	5	162	6	188	
03:00	*	*	*	*	*	*	*	168	4	230	7	186	6	132	6	179	
03:15	*	*	*	*	*	*	*	194	8	234	4	161	9	116	7	176	
03:30	*	*	*	*	*	*	*	244	6	252	5	194	9	132	7	206	
03:45	*	*	*	*	*	*	*	240	4	269	3	179	10	106	6	198	
04:00	*	*	*	*	*	*	*	265	2	262	6	211	5	125	4	216	
04:15	*	*	*	*	*	*	*	254	4	259	4	172	3	110	4	199	
04:30	*	*	*	*	*	*	*	276	6	291	2	150	5	102	4	205	
04:45	*	*	*	*	*	*	*	289	10	300	5	141	5	120	7	212	
05:00	*	*	*	*	*	*	*	282	2	262	10	164	4	138	5	212	
05:15	*	*	*	*	*	*	*	252	14	292	4	131	1	146	6	205	
05:30	*	*	*	*	*	*	*	302	15	294	9	88	5	101	10	196	
05:45	*	*	*	*	*	*	*	271	18	263	12	106	5	67	12	177	
06:00	*	*	*	*	*	*	*	251	23	211	16	118	13	78	17	164	
06:15	*	*	*	*	*	*	*	244	30	246	16	106	6	108	17	176	
06:30	*	*	*	*	*	*	*	216	39	239	18	126	14	78	24	165	
06:45	*	*	*	*	*	*	*	160	64	182	28	112	27	86	40	135	
07:00	*	*	*	*	*	*	*	137	76	206	32	112	33	78	47	133	
07:15	*	*	*	*	*	*	*	92	128	106	178	40	100	82	82	80	122
07:30	*	*	*	*	*	*	*	108	158	124	124	52	100	50	94	84	119
07:45	*	*	*	*	*	*	*	132	156	133	94	67	112	44	76	94	110
08:00	*	*	*	*	*	*	*	116	122	121	94	56	108	33	84	82	102
08:15	*	*	*	*	*	*	*	102	112	116	104	68	90	63	68	87	94
08:30	*	*	*	*	*	*	*	114	108	169	87	72	94	41	60	99	87
08:45	*	*	*	*	*	*	*	168	104	166	79	97	89	51	68	120	85
09:00	*	*	*	*	*	*	*	138	77	134	82	111	67	82	72	116	74
09:15	*	*	*	*	*	*	*	140	68	132	69	110	70	135	69	129	69
09:30	*	*	*	*	*	*	*	146	92	144	72	117	71	105	52	128	72
09:45	*	*	*	*	*	*	*	156	77	146	72	134	57	109	48	136	64
10:00	*	*	*	*	*	*	*	142	74	140	64	128	67	88	41	124	62
10:15	*	*	*	*	*	*	*	138	55	156	44	128	60	98	31	130	48
10:30	*	*	*	*	*	*	*	160	41	128	38	125	55	128	47	135	45
10:45	*	*	*	*	*	*	*	138	57	136	50	162	44	118	28	138	45
11:00	*	*	*	*	*	*	*	151	31	134	48	124	46	116	28	131	38
11:15	*	*	*	*	*	*	*	138	20	144	55	164	38	156	30	150	36
11:30	*	*	*	*	*	*	*	164	20	166	38	156	32	202	23	172	28
11:45	*	*	*	*	*	*	*	162	30	160	30	159	20	138	19	155	25
Total	0	0	0	0	0	0	0	2605	7506	3110	7993	2439	5604	2189	4787	2682	6475
Day Total	0	0	0	0	0	0	0	10111	11103	8043	6976	9157					
% Splits	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.8%	74.2%	28.0%	72.0%	30.3%	69.7%	31.4%	68.6%	29.3%	70.7%
Peak Vol.								11:00	04:45	11:00	04:45	10:45	03:30	11:00	01:15	11:00	04:30
P.H.F.								0.938	0.931	0.910	0.957	0.924	0.896	0.757	0.870	0.884	0.983

Start Time	21-Jun-10		Tue		Wed		Thu		Fri		Sat		Sun		Average Day	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	15	160	19	189	17	169	24	208	30	152	35	167	29	163	24	173
12:15	14	149	4	157	15	155	18	204	20	180	36	180	22	173	18	171
12:30	15	128	9	191	10	164	6	188	11	173	14	184	13	183	11	173
12:45	10	175	12	176	14	163	10	206	18	190	20	163	21	216	15	184
01:00	6	140	9	139	12	136	5	191	12	175	23	179	16	178	12	163
01:15	7	116	13	162	11	143	12	190	8	142	12	153	18	153	12	151
01:30	3	133	9	174	3	153	7	206	12	179	11	161	12	148	8	165
01:45	4	176	1	162	3	148	3	167	8	207	13	174	19	142	7	168
02:00	7	142	7	157	8	136	3	154	8	186	14	178	7	154	8	158
02:15	8	158	4	168	5	161	4	146	7	206	10	179	10	154	7	167
02:30	6	154	6	156	7	155	3	160	10	211	10	202	8	148	7	169
02:45	6	173	3	170	7	166	8	161	8	225	12	213	6	142	7	179
03:00	4	176	6	171	3	141	7	167	6	211	7	203	7	146	6	174
03:15	0	176	3	186	2	185	2	147	5	296	3	213	5	151	3	193
03:30	1	182	1	220	4	187	3	194	3	268	7	169	6	117	4	191
03:45	5	200	3	187	2	220	5	239	5	274	3	129	4	135	4	198
04:00	2	226	1	209	2	214	4	241	7	314	1	140	6	133	3	211
04:15	3	196	3	216	3	226	4	195	9	256	1	135	3	137	4	194
04:30	1	232	5	273	5	253	5	247	9	231	3	135	1	133	4	215
04:45	11	248	11	241	6	288	12	225	14	278	12	121	7	149	10	221
05:00	6	262	6	292	4	220	6	251	8	240	6	153	4	185	6	229
05:15	10	248	7	260	8	273	7	259	18	289	9	156	7	143	9	233
05:30	14	276	21	271	15	308	23	356	20	231	10	128	10	106	16	239
05:45	30	189	22	248	23	238	17	369	39	237	13	111	10	89	22	212
06:00	20	204	21	272	23	263	26	371	35	223	14	118	10	110	21	223
06:15	46	156	47	230	43	221	47	335	57	200	20	116	19	96	40	193
06:30	38	156	52	243	49	201	35	290	57	193	59	113	21	95	44	184
06:45	66	139	79	202	61	140	60	300	79	156	47	110	38	121	61	167
07:00	76	115	68	188	67	163	78	288	96	187	61	108	69	85	74	162
07:15	73	131	98	149	89	126	75	234	120	131	62	101	95	94	87	138
07:30	124	130	104	120	118	139	103	185	104	145	61	93	50	83	95	128
07:45	125	127	128	104	142	114	126	240	142	131	81	97	64	70	115	126
08:00	116	99	116	108	117	107	100	252	121	120	95	91	61	87	104	123
08:15	102	96	109	96	131	111	123	163	157	108	99	81	61	81	112	105
08:30	124	103	131	83	151	92	159	130	146	111	93	71	56	73	123	95
08:45	153	62	146	77	163	92	165	133	158	86	106	105	87	77	140	90
09:00	128	60	121	67	141	93	143	124	146	96	119	65	105	73	129	83
09:15	110	74	119	63	137	90	129	124	171	84	137	72	138	59	134	81
09:30	122	65	119	59	119	65	126	120	148	68	140	71	85	39	123	70
09:45	133	66	150	64	134	62	138	88	159	93	147	61	125	44	141	68
10:00	116	45	114	58	145	59	125	87	144	71	129	68	92	44	124	62
10:15	118	56	99	57	132	35	134	52	167	73	160	49	106	40	131	52
10:30	159	41	127	43	132	49	145	73	174	55	162	69	125	33	146	52
10:45	122	36	134	38	142	40	143	71	168	58	152	38	118	32	140	45
11:00	112	16	127	39	121	28	114	53	169	49	171	53	154	33	138	39
11:15	141	23	137	27	125	25	138	48	170	37	161	42	199	25	153	32
11:30	146	16	131	20	137	28	147	36	174	42	139	33	188	18	152	28
11:45	142	11	137	17	149	24	177	30	176	42	154	37	168	19	158	26
Total	2800	6442	2799	7199	2957	6969	2954	8898	3533	7910	2854	5788	2485	5109	2912	6903
Day Total	9242		9998		9926		11852		11443		8642		7594		9815	
% Splits	30.3%	69.7%	28.0%	72.0%	29.8%	70.2%	24.9%	75.1%	30.9%	69.1%	33.0%	67.0%	32.7%	67.3%	29.7%	70.3%
Peak	11:00	04:45	11:00	05:00	08:30	04:45	08:30	05:30	11:00	03:15	10:30	02:30	11:00	00:15	11:00	04:45
Vol.	541	1034	532	1071	592	1089	596	1431	689	1152	646	831	709	750	601	922
P.H.F.	0.926	0.937	0.971	0.917	0.908	0.884	0.903	0.964	0.979	0.917	0.944	0.975	0.891	0.868	0.951	0.964

Start Time	28-Jun-10		Tue		Wed		Thu		Fri		Sat		Sun		Average Day	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	16	163	22	*	*	*	*	*	*	*	*	*	*	*	19	163
12:15	11	161	17	*	*	*	*	*	*	*	*	*	*	*	14	161
12:30	12	149	5	*	*	*	*	*	*	*	*	*	*	8	149	
12:45	14	143	6	*	*	*	*	*	*	*	*	*	*	10	143	
01:00	11	138	10	*	*	*	*	*	*	*	*	*	*	10	138	
01:15	5	169	7	*	*	*	*	*	*	*	*	*	*	6	169	
01:30	10	151	8	*	*	*	*	*	*	*	*	*	*	9	151	
01:45	6	155	8	*	*	*	*	*	*	*	*	*	*	7	155	
02:00	0	150	5	*	*	*	*	*	*	*	*	*	*	2	150	
02:15	4	159	4	*	*	*	*	*	*	*	*	*	*	4	159	
02:30	6	186	4	*	*	*	*	*	*	*	*	*	*	5	186	
02:45	5	172	2	*	*	*	*	*	*	*	*	*	*	4	172	
03:00	4	188	6	*	*	*	*	*	*	*	*	*	*	5	188	
03:15	4	191	1	*	*	*	*	*	*	*	*	*	*	2	191	
03:30	6	175	1	*	*	*	*	*	*	*	*	*	*	4	175	
03:45	3	242	1	*	*	*	*	*	*	*	*	*	*	2	242	
04:00	6	258	6	*	*	*	*	*	*	*	*	*	*	6	258	
04:15	1	220	2	*	*	*	*	*	*	*	*	*	*	2	220	
04:30	1	224	3	*	*	*	*	*	*	*	*	*	*	2	224	
04:45	7	204	10	*	*	*	*	*	*	*	*	*	*	8	204	
05:00	10	227	7	*	*	*	*	*	*	*	*	*	*	8	227	
05:15	9	269	11	*	*	*	*	*	*	*	*	*	*	10	269	
05:30	19	248	14	*	*	*	*	*	*	*	*	*	*	16	248	
05:45	24	232	25	*	*	*	*	*	*	*	*	*	*	24	232	
06:00	25	177	25	*	*	*	*	*	*	*	*	*	*	25	177	
06:15	58	160	*	*	*	*	*	*	*	*	*	*	*	58	160	
06:30	60	159	*	*	*	*	*	*	*	*	*	*	*	60	159	
06:45	80	143	*	*	*	*	*	*	*	*	*	*	*	80	143	
07:00	67	124	*	*	*	*	*	*	*	*	*	*	*	67	124	
07:15	109	125	*	*	*	*	*	*	*	*	*	*	*	109	125	
07:30	123	126	*	*	*	*	*	*	*	*	*	*	*	123	126	
07:45	133	102	*	*	*	*	*	*	*	*	*	*	*	133	102	
08:00	94	101	*	*	*	*	*	*	*	*	*	*	*	94	101	
08:15	119	91	*	*	*	*	*	*	*	*	*	*	*	119	91	
08:30	138	123	*	*	*	*	*	*	*	*	*	*	*	138	123	
08:45	141	84	*	*	*	*	*	*	*	*	*	*	*	141	84	
09:00	164	72	*	*	*	*	*	*	*	*	*	*	*	164	72	
09:15	118	74	*	*	*	*	*	*	*	*	*	*	*	118	74	
09:30	141	75	*	*	*	*	*	*	*	*	*	*	*	141	75	
09:45	141	47	*	*	*	*	*	*	*	*	*	*	*	141	47	
10:00	139	53	*	*	*	*	*	*	*	*	*	*	*	139	53	
10:15	116	46	*	*	*	*	*	*	*	*	*	*	*	116	46	
10:30	163	38	*	*	*	*	*	*	*	*	*	*	*	163	38	
10:45	145	28	*	*	*	*	*	*	*	*	*	*	*	145	28	
11:00	141	27	*	*	*	*	*	*	*	*	*	*	*	141	27	
11:15	170	30	*	*	*	*	*	*	*	*	*	*	*	170	30	
11:30	169	24	*	*	*	*	*	*	*	*	*	*	*	169	24	
11:45	149	16	*	*	*	*	*	*	*	*	*	*	*	149	16	
Total	3097	6619	210	0	0	0	0	0	0	0	0	0	0	3090	6619	
Day Total	9716		210		0		0		0		0		0	9709		
% Splits	31.9%	68.1%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	31.8%	68.2%	
Peak	11:00	05:00	05:15											11:00	05:00	
Vol.	629	976	75											629	976	
P.H.F.	0.925	0.907	0.750											0.925	0.907	

ADT ADT 8,841 AADT 8,841

D – Crash Data & Analysis:

CRASH ANALYSIS REPORT

for Roadways in Vicinity of MARPLE ASSOCIATES

West Chester Pike (S.R. 0003) between Edgewood Road and Robinson Avenue
&
Lawrence Road (S.R. 1020) between Hillside Lane and Brighton Village Road

MARPLE and HAVERFORD TOWNSHIPS DELAWARE COUNTY, PA



Prepared for

Pennsylvania Department of Transportation
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

September 2010

ORA Job No. 1984052

IMPORTANT: This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. §3754 and 23 U.S.C. §409 and may not be disclosed or used in litigation without written permission from PennDOT.

CRASH DATA SUMMARY

Orth-Rodgers & Associates, Inc. (ORA) has prepared a crash analysis in conjunction with the Traffic Impact Study for the proposed Marple Associates development on West Chester Pike at I-476. Specifically, ORA reviewed intersection and midblock collisions along West Chester Pike (S.R. 0003) between Edgewood Road and Robinson Avenue and on Lawrence Road (S.R. 1020) between Hillside Lane/Canterbury Drive and Brighton Village Road in Marple Township, Delaware County, Pennsylvania.

Below please find a summary of the findings.

Crash data along the study area roadways was obtained for calendar years 2005 to 2009 from the PennDOT Bureau of Highway Safety and Traffic Engineering (BHSTE) Crash Records System. PennDOT defines a crash as a motor vehicle collision that involves a fatality, an injury, or requires towing of one or more vehicles. The crash system includes data from those “reportable” incidents. Review of the data revealed that a total of 142 reported motor vehicle collisions occurred within the five-year analysis period. One-hundred eight crashes (76%) occurred at intersections, and 34 collisions (24%) occurred at midblock locations. Pedestrians were involved in four of the 142 crashes, and there were no fatalities. The crash data was examined to determine trends for the study roadways.

As previously noted, a total of one-hundred forty-two (142) reportable crashes occurred within the five-year analysis period. Eighty-three collisions (58%) occurred during daylight conditions, fifty-two crashes (37%) occurred while the street lights were on, and the remaining seven crashes (5%) occurred at dawn, dusk, or under unknown lighting conditions. One hundred ten crashes (78%) were on dry road surfaces, 29 crashes (20%) were on wet road surfaces, and three crashes (2%) occurred under slushy and icy road surface conditions. Sixty-eight (48%) of the collisions were rear-end crashes, 36 crashes (25%) were angle crashes, 19 crashes (13%) involved vehicles hitting a fixed object, eight crashes (5%) were sideswipe collisions, five head-on collisions (4%), four (3%) pedestrian collisions, two crashes (2%) whose collision type was unknown.

Evaluation of the data indicated that the following locations had more than five reported crashes within the five-year analysis period):

- West Chester Pike (S.R. 0003) & Old West Chester Pike (S.R. 1033)

Seven crashes occurred at the signalized intersection of West Chester Pike and Old West Chester Pike during the study years. Four of the collisions were rear end crashes, and two crashes involved vehicles hitting a pedestrian. Both of the pedestrian crashes occurred in the rain with wet road surface conditions.

- West Chester Pike (S.R. 0003) & North Lawrence Road (S.R. 1016)

Thirty-four motored vehicle collisions occurred at the signalized T-intersection of West Chester Pike (S.R. 0003) and Lawrence Road (S.R. 1016) within the analysis period. Fifteen of the thirty-four collisions (44%) occurred under evening conditions with the street lights on. Collision types included fourteen (41%) angle collision, fifteen (44%) rear end crashes, two head-on collisions (6%), and two crashes (6%) involving a vehicle hitting a fixed object, and one sideswipe (3%). As with the other Lawrence Road intersection, a number of crashes were attributed to red light running. Specifically, thirteen out of twenty-seven crashes (48%) had red light running as either a top or secondary contributing factor to the crash. Other contributing factors included driver distraction and improper driving actions.

- West Chester Pike (S.R. 0003) & South Lawrence Road (S.R. 1020)

Nineteen reportable motor vehicle crashes occurred at the signalized T-intersection of West Chester Pike (S.R. 0003) and Lawrence Road (S.R. 1020). Twelve of the nineteen crashes occurred during daylight conditions. Eleven crashes (58%) involved vehicles being rear-ended, six (32%) were angle crashes, and two (10%) crashes involved vehicles hitting a fixed object. Six (32%) of the crashes were attributed to red light running. Tailgating, sudden slowing/stopping, and driving too fast for conditions were the other key contributing factors.

- West Chester Pike & I-476 NB Off Ramp Intersection

Eleven reported motor vehicle collisions occurred at the intersection of West Chester Pike and the I-476 northbound off ramp during the study period. Six of the eleven crashes occurred with the street lights on. The collision types include: five angle crashes (46%), two head-on collisions (18%), two rear end collisions (18%), and two collisions (18%) involving a vehicle hitting a fixed object. Red light running was the key contributing factor in six (55%) of the eleven crashes. The remaining crashes were the result of improper driving actions and speeding. Nine of the eleven crashes occurred either at dusk or when the street lights were turned on.

- West Chester Pike & I-476 SB On-Off Ramps Intersection

Four crashes occurred at this intersection, and one occurred within 170 feet of the intersection within the analysis period. There were specifically three rear-end crashes, one angle collision, and one crash that involved hitting a deer. The angle crash occurred as a result of red light running, and the remaining crashes appear to be the result of improper driving actions.

- West Chester Pike (S.R. 0003) & New Ardmore Avenue

A total of nine reportable crashes occurred at the four-way signalized intersection of West Chester Pike (S.R. 0003) and New Ardmore Avenue during the study period. Five of the crashes occurred during daylight conditions, and four crashes occurred while the street lights

were on. Four rear-end collisions, three angle crashes, one collision involving a vehicle hitting a fixed object, and one opposite direction sideswipe occurred within the analysis period. Driver distraction, tailgating, and sudden slowing/stopping were driving factors contributing to these collisions. One of the nine crashes was attributed to red light running.

- Lawrence Road (S.R. 1020) & Sussex Boulevard

Six recorded collisions occurred at the four-way signalized intersection of Lawrence Road (S.R. 1020) and Sussex Boulevard within the analysis period. Four of the crashes occurred during daylight hours, and two crashes occurred with the street lights on. The types of collisions included three angle crashes, one rear-end collision, one same direction sideswipe, and one head-on collision. Improper/careless turning and driving actions contributed to five of the six collisions.

- Lawrence Road (S.R. 1020) & Hillside Lane/Canterbury Drive

There were five recorded crashes at this four-way unsignalized intersection located approximately 1,350 feet south of Sussex Boulevard within the five-year analysis period. The types of collisions included two rear-end crashes, two angle crashes, and one opposite direction sideswipe. Driving actions varied from driver distraction, to improper/careless turning, to driving too fast for conditions and proceeding without clearance. No specific patterns to the crashes were identified at this location.

A crash summary for the combined study area is provided in table format on the following page.

**Table – Crash Data Summary:
West Chester Pike (S.R. 0003) between Edgewood Road and Robinson Avenue
&
Lawrence Road (S.R. 1020) between Hillside Lane and Brighton Village Road**

YEAR	Total
2006	35
2009	31
2008	27
2007	25
2005	24
Grand Total	142

ILLUMINATION	Total
Daylight	83
Street Lights	52
Dusk	4
Dawn	2
Unknown Lighting	1
Grand Total	142

ROAD SURFACE	Total
Dry	110
Wet	29
Slush	2
Ice	1
Grand Total	142

WEATHER	Total
Clear	116
Rain	25
Snow	1
Grand Total	142

COLLISION TYPE	Total
Rear-End	68
Angle	36
Hit Fixed Object	19
Same Direction Sideswipe	5
Head-On	5
Pedestrian	4
Opposite Direction Sideswipe	3
Non-collision	1
Unknown	1
Grand Total	142

SEVERITY	Total
Property Damage Only	59
Unknown Severity	36
Minor Injury	34
Moderate Injury	12
Major Injury	1
Grand Total	142

DRIVING ACTIONS	Total
Driver Distraction	30
Other Improper Driving Actions	24
Running Red Light	24
Too Fast For Conditions	11
Affected by Physical Conditions	10
Improper/Careless Turn	10
No Contributing Action	9
Tailgating	9
Sudden Slowing/Stopping	8
Proceed without Clearance	2
Careless Pass or Lane Change	1
Improper Exit from Highway	1
Driver Inexperienced	1
Over/Under Compensate Curve	1
Speeding	1
Making Illegal U-Turn	1
Grand Total	142

E – Planned Development

Information:

As described below, three other new developments are being planned in the vicinity of the proposed Marple Associates site.

- A new “Outpatient Center” operated by Crozer Keystone is proposed to be constructed on South Lawrence Road at the site currently occupied by the Pathmark supermarket. The proposed new “Outpatient Center” will provide a total of about 38,000 SF of floor space in a two-story building. Access to the site will be using the existing signalized intersection of Pathmark Drive. The proposed opening year is 2012. Trip generation information from a draft study conducted by Orth-Rodgers & Assoc. is attached and the trip distribution of this development is illustrated in Figure E1. Since the Pathmark supermarket is scheduled to close in October 2010, the existing trips generated by Pathmark should be discounted from the future traffic volumes. However, the discount, as illustrated in Figure E2, was only applied to the PM peak hour that was counted in January 2010, since the Saturday counts were conducted in September after the announced closing of the store.
- The Havertown YMCA is proposed to be built on Eagle Road at N. Lawrence Road in Haverford Township. The proposed opening year is 2012. Information for the intersection of West Chester Pike and N. Lawrence Road provided by McMahon Associates, the traffic engineer for this development, is attached. No adjustment was made to traffic volumes since the projected YMCA volume through the intersection is low and would be further dispersed through the study area, ORA’s PM existing counts are significantly higher than McMahon Associates’, and no Saturday information was provided.
- There is one other potential development at the former Gamma Swim Club property located within the residential area north of West Chester Pike and between Brookthorpe Avenue and the I-476 southbound off ramp right of way. This property has been proposed for development with a 52,000 sq. ft. synagogue. The proposed development is going through the Marple Township review process. Access to the synagogue from the west on West Chester Pike would be via the signalized intersection of New Ardmore Avenue; access from the east would be via Mather Avenue. It is expected that the peak hour new trips generated by this development will be minor and no other information about this development is attached.

“OUTPATIENT CENTER” TRAFFIC

Traffic generated by the proposed “Outpatient Center” will depend upon the number of staff/ employees/ physicians who are working at the “Center” and the number of patients served. It is understood that a total of 30 staff/ employees and as many as 10 physicians will be on-site each day. The “Center” will be open from 8:00 AM to 5:00 PM on weekdays and from 8:00 AM until 12:00 Noon on Saturdays. It is anticipated that about 600-700 patients per week [i.e., about 130 per weekday (i.e., 15-20 per hour) and 60-70 on Saturday] will be served at the “Outpatient Center”.

Review of these projected activity levels suggests the following estimates of traffic which will be generated by the proposed “Outpatient Center”:

	<u>IN</u>	<u>OUT</u>	<u>TOTAL</u>
AM Peak Hour	50	10	60
PM Peak Hour	20	50	70
Daily	170	170	340
Saturday Mid-day Peak Hour	30	30	60
Saturday 24-Hour	90	90	180

“Outpatient Center” traffic will approach and depart the site via various routes. As noted earlier, access from South Lawrence Road will be available via both left turn (from the south) and right turn (from the north). As also noted earlier, under existing conditions, only right-turn exit to the south is permitted. However, by opening of the “Outpatient Center” in 2012, the extension of Langford Road to West Chester Pike, which is now under construction, will be completed. As a result, traffic from the west via West Chester Pike will be able to turn right onto Langford Road to approach the site. Traffic exiting the “Outpatient Center” and oriented to the east on West Chester Pike or to the I-476 interchange will be able to turn left out of the site onto Langford Road and proceed northwest to the intersection with West Chester Pike to reach those routes via a right turn.

A review of population patterns in the area and the configuration of the regional highway network yields the following estimates of distribution of “Outpatient Center” traffic:

• To/from the east on West Chester Pike	38%
• To/from the west on West Chester Pike	16%
• To/from the I-476 interchange on West Chester Pike	
I-476 (North)	15%
I-476 (South)	15%
• To/from the south on South Lawrence Road	<u>16%</u>
	100%

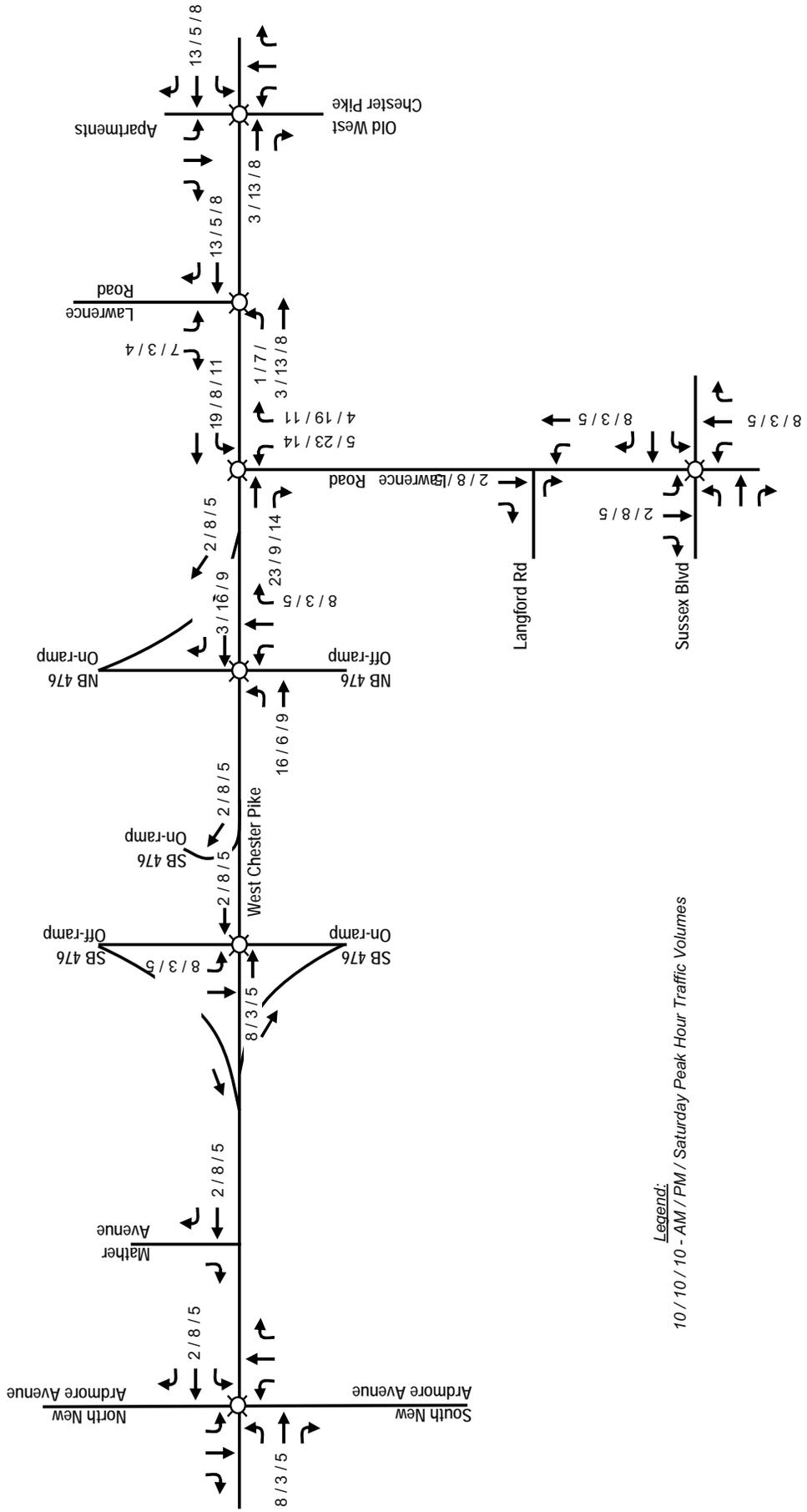
A review of the estimated distribution of “Outpatient Center” traffic suggests that 68% will approach from the north on South Lawrence Road, turn right into Langford Road and then turn left into the site, 16% will approach from the south and turn left into Langford Road and then left into the site, and 16% will approach from the west on West Chester Pike, turn right onto Langford Road (extended) and then turn right into the site (Figure 4). Upon exit from the site, 68% will turn left onto Langford Road and proceed to the intersection with West Chester Pike and turn right – with 30% entering I-476 (north or south) and 48% continuing east. Motorists oriented to the west on West Chester Pike (16%) are assumed to turn right out of the site, right onto South Lawrence Road, and then right onto Sproul Road to continue to the northwest and West Chester Pike. Another 16% of “Outpatient Center” traffic will turn right onto South Lawrence Road and then east onto Sproul Road or other intersecting street.

Application of this projected distribution of “Outpatient Center” traffic to the estimates of peak hour traffic demand to be generated by the “Outpatient Center” yields the projections of AM and PM peak hour traffic volumes shown in Figure 5.

Other Development - Proposed MOB Peak Hour Traffic Volumes

Traffic Impact Study - I-476 and West Chester Pike

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA

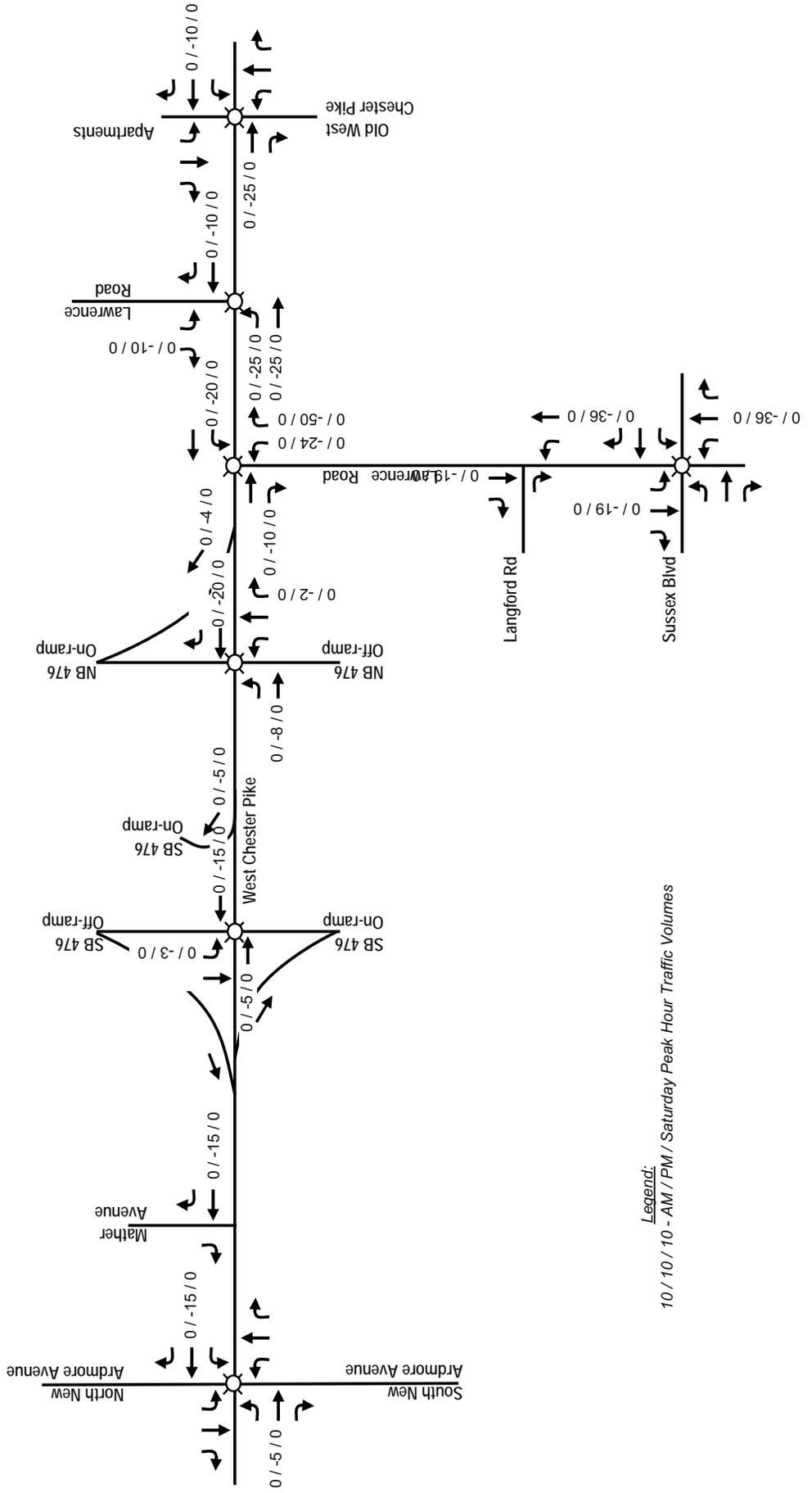


Legend:
10 / 10 / 10 - AM / PM / Saturday Peak Hour Traffic Volumes

Adjustment of Pathmark Traffic

Traffic Impact Study - I-476 and West Chester Pike

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA



Legend:
10 / 10 / 10 - AM / PM / Saturday Peak Hour Traffic Volumes

Adrienne Eiss

From: Koza, Sandy [sandy.koza@mcmtrans.com]
Sent: Monday, October 04, 2010 4:17 PM
To: Adrienne Eiss
Cc: Walsh, Jennifer
Subject: Havertown YMCA
Attachments: Trip Asgmt.pdf; ExVolumes.pdf

Adrienne,

Attached are the existing 2010 volumes that we have at the West Chester Pike/Lawrence Road intersection along with the preliminary trip generation and assignment, which could be modified depending upon the final size of the YMCA. If you have any questions, please feel free to contact myself or Jennifer Walsh.

Thanks.

Sandy Koza, P.E.
Project Manager

McMahon Associates, Inc.
425 Commerce Drive, Suite 200
Fort Washington, Pennsylvania 19034
p: 215.283.9444 x 225
f: 215.283.9445
sandy.koza@mcmtrans.com

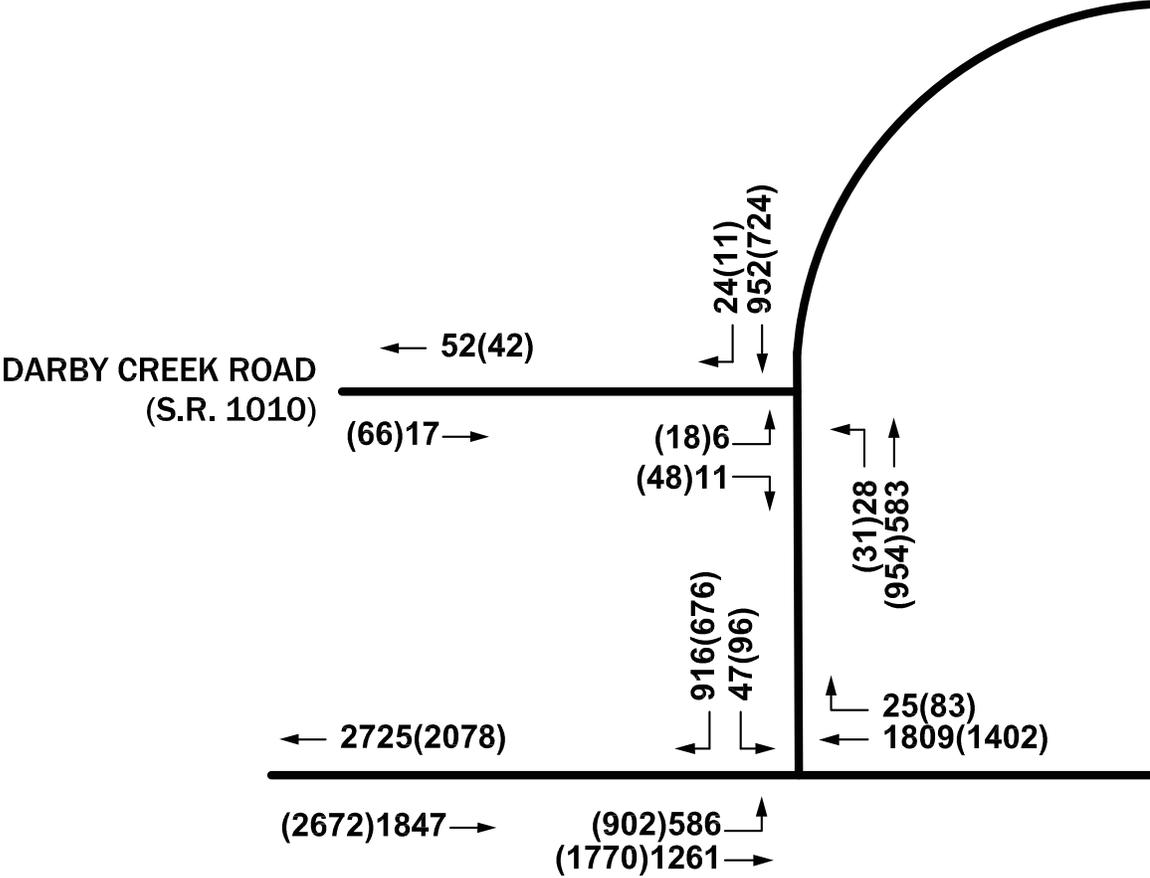


New England | Mid-Atlantic | Florida

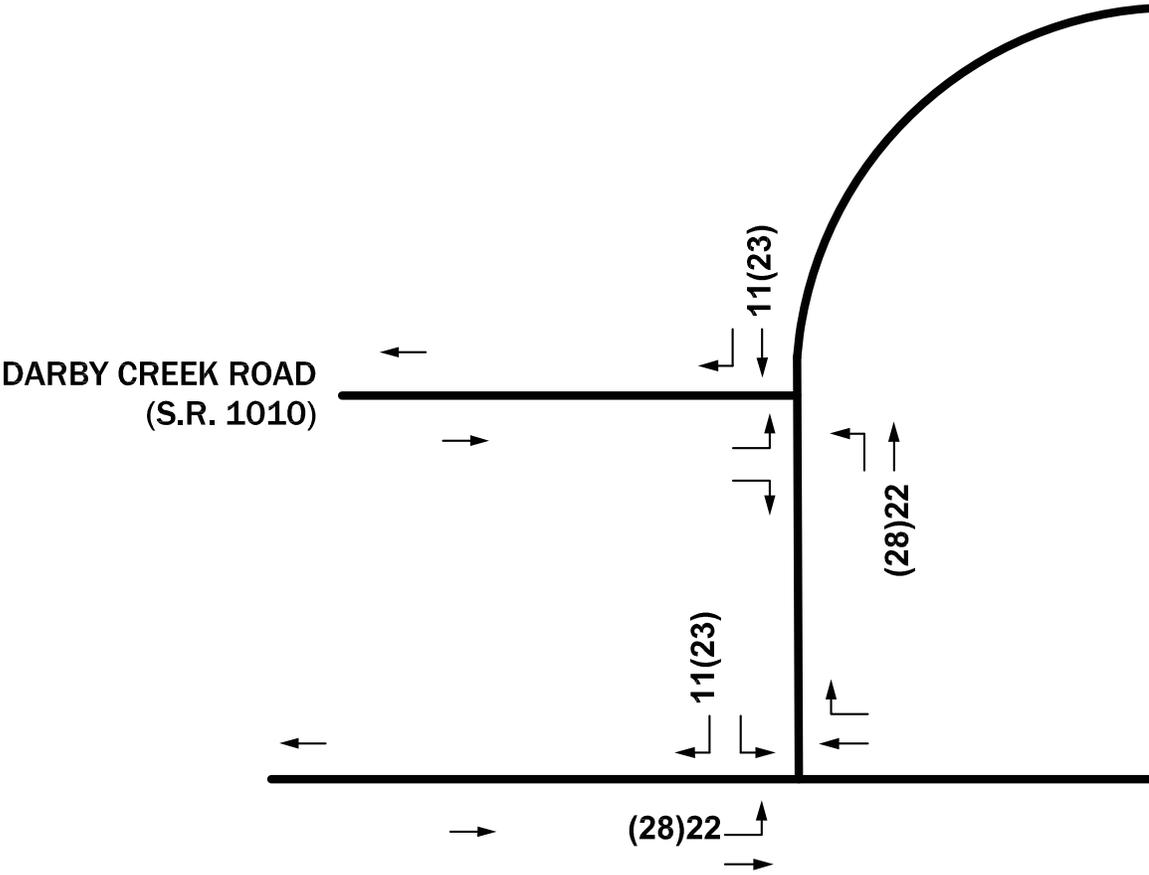
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LEGEND:
10 WEEKDAY AM PEAK HOUR
(10) WEEKDAY PM PEAK HOUR



TIME PERIOD	IN	OUT
AM	144	76
(PM)	187	154



F – Trip Generation Worksheets:

AM Peak Hour Trip Generation

Marple Associates Development

AM TRIP GENERATION

Use	ITE LUC	Trip Generation Rate %in %out	Size	Unit	In	Out	Total
Drive-in Bank	912	Avg. rate = 12.35 Ln(T) = 1.24 Ln(X) - 2.00	4,000	sf GFA	28	22	50
Hotel	310	Avg. rate = 1.38	150	rooms	41	27	68
Health-fitness center	492	Avg. rate = 12.26	16,000	sf GFA	10	12	22
Day Care	565	Avg. rate = 0.80Ln(X) + 1.55	4,000	sf GFA	26	23	49
General Office	710	Avg. rate = 1.00	40,000	sf GFA	79	11	90
Retail (Shopping Center)	820	Ln(T) = 0.80Ln(X) + 0.26	260,000	sf GLA	159	101	260
Residential Condo-Townhouse	230	Ln(T) = 0.80Ln(X) + 0.26	147	D.U.	12	58	70
Total AM Trip Generation					355	254	609
AM Passby - Drive-in Bank - 0%					0	0	0
AM Passby - Shopping Center - 0%					0	0	0
Total Passby					0	0	0
Retail 'Internal' Trips							
AM Trips in-out of Langford Run Road (Total minus retail 'internal')					355	254	609
New AM Trips (Total minus Passby)					355	254	609

PM Peak Hour Trip Generation

Marple Associates Development

1/25/2010

PM TRIP GENERATION

Use	ITE LUC	Trip Generation Rate %in %out	Size	Unit	In	Out	Total
Drive-in Bank	912	Avg. rate = 25.82 0.50 0.50	4,000	sf GFA	52	52	103
Hotel	310	Avg. rate = 0.59 0.53 0.47	150	rooms	47	42	89
Health-fitness center	492	Avg. rate = 3.53 0.57 0.43	16,000	sf GFA	33	24	56
Day Care	565	Avg. rate + 12.46 0.47 0.53	4,000	sf GFA	23	26	50
General Office	710	$T = 1.12(X) + 78.81$ 0.17 0.83	40,000	sf GFA	21	103	124
Retail (Shopping Center)	820	$\ln(T) = 0.67\ln(X) + 3.37$ 0.49 0.51	260,000	sf GLA	591	616	1207
Residential Condo-Townhouse	230	$\ln(T) = 0.82 \ln(X) + 0.32$ 0.67 0.33	147	D.U.	55	27	82
Total PM Trip Generation					822	889	1711
PM Passby - Drive-in Bank - 47%					24	24	49
PM Passby - Shopping Center - 34%					201	209	410
Total Passby					225	234	459
Retail 'Internal' Trips					50	39	89
PM Trips in-out of Langford Run Road (Total minus 'retail internal')					772	850	1622
New PM Trips (Total minus Passby)					597	656	1253

Saturday Midday Peak Hour Trip Generation

Marple Associates Development

6/15/2010

SAT TRIP GENERATION

Use	ITE LUC	Trip Generation Rate		Size	Unit	SAT Trips		Total
		%in	%out			In	Out	
Drive-in Bank	912	Avg. rate = 26.53	0.51 0.49	4,000	sf GFA	54	52	106
Hotel	310	Avg. rate = 0.72	0.56 0.44	150	rooms	60	48	108
Health-fitness center	492	Avg. rate = 2.78	0.45 0.55	16,000	sf GFA	21	24	44
Day Care	565	Avg. rate = 0	0.00 0	4,000	sf GFA	0	0	0
General Office	710	Avg. rate = 0.41	0.54 0.46	40,000	sf GFA	9	8	16
Retail (Shopping Center)	820	$\ln(T) = 0.65 * \ln(X) + 3.76$	0.52 0.48	260,000	sf GLA	829	766	1595
Residential Condo-Townhouse	230	$T = 0.29(X) + 42.63$	0.54 0.46	147	D.U.	46	39	85
Total SAT Trip Generation						1020	936	1955
SAT Passby - Drive-in Bank - 0%						0	0	0
SAT Passby - Shopping Center - 33.39%						277	256	533
Total Passby						277	256	533
Retail 'Internal' Trips						34	36	70
SAT Trips in-out of Langford Run Road (Total minus 'retail internal')						986	900	1885
New SAT Trips (Total minus Passby)						743	681	1423

Weekday midday peak hour rates were used to calculate the "internal captured trips".

Analyst: AE
Date: 1/25/2010

**PM MULTI-USE DEVELOPMENT TRIP GENERATION AND
INTERNAL CAPTURE SUMMARY**
Scenario A

Marple Associates :Development
PM :Peak Period

LAND USE A Residential

ITE LU Code 230, 310 Size: 147 du, 150 rooms			
Total	Internal	External	
Enter	34	68	
Exit	37	32	
Total	71	100	
%	41.5%	58.5%	

LAND USE B Office

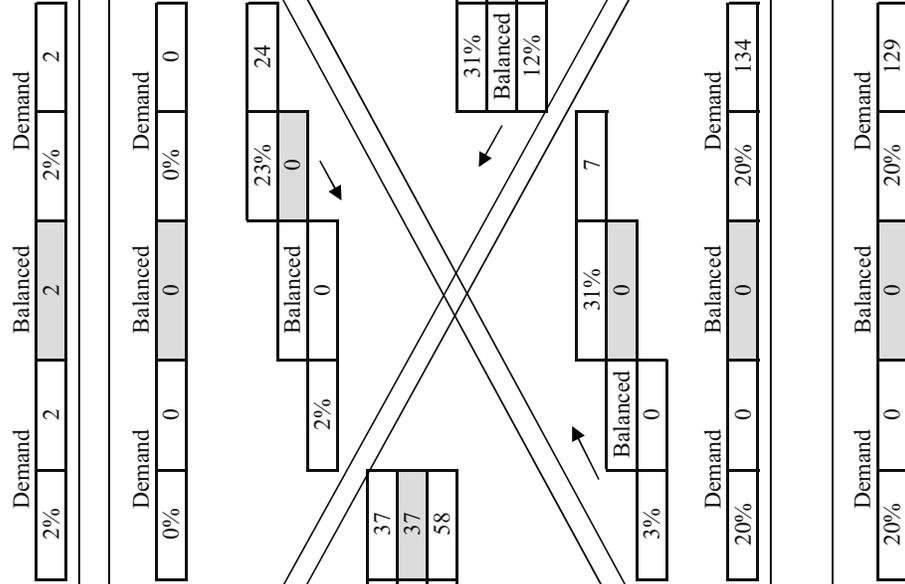
ITE LU Code 710 Size: 40k sf			
Total	Internal	External	
Enter	7	14	
Exit	15	88	
Total	22	102	
%	17.7%	82.3%	

LAND USE C Retail

ITE LU Code xxx Size: xxx k sf			
Total	Internal	External	
Enter	0	0	
Exit	0	0	
Total	0	0	
%	#DIV/0!	#DIV/0!	

LAND USE D Retail

ITE LU Code 820 and 912 Size 260k sf and 4 ksf			
Total	Internal	External	
Enter	50	593	
Exit	39	629	
Total	89	1222	
%	6.8%	93.2%	



Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Land Use D	Total
Enter	68	14	0	593	675
Exit	32	88	0	629	749
Total	100	102	0	1222	1424
Single-use Trip Gen. Est.	171	124	0	1311	1606
					Internal Capture 11.3%

Analyst: JZ
Date: 6/15/2010

SAT MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY
Scenario A

Marple Associates :Development
SAT :Peak Period

LAND USE A Residential

ITE LU Code 230, 310 Size: 147 du, 150 rooms			
Total	Internal	External	
Enter	33	73	
Exit	32	55	
Total	65	128	
%	33.7%	66.3%	

Demand	Balanced	Demand
2%	0	0%
	0	0

Demand	Balanced	Demand
0%	0	0%
	0	0

Balanced	Demand
0	2
23%	0

53%	46
Balanced	0
9%	0

31%	33
Balanced	0
12%	0

37%	32
Balanced	32
5%	44

31%	33
Balanced	33
7%	57

Balanced	Demand
0	3
31%	0

LAND USE C Retail

ITE LU Code xxx Size: xxx k sf			
Total	Internal	External	
Enter	0	0	
Exit	0	0	
Total	0	0	
%	100%	#DIV/0!	#DIV/0!

Demand	Balanced	Demand
20%	0	20%
	0	164

Demand	Balanced	Demand
20%	0	20%
	0	177

LAND USE B Office

ITE LU Code 710 Size: 40k sf			
Total	Internal	External	
Enter	9	3	6
Exit	8	2	6
Total	17	5	12
%	100%	29.4%	70.6%

20%	2
Balanced	2
4%	35

38%	3
Balanced	3
3%	25

LAND USE D Retail

ITE LU Code 820 and 912 Size 260k sf and 4 ksf			
Total	Internal	External	
Enter	884	34	850
Exit	818	36	782
Total	1702	70	1632
%	100%	4.1%	95.9%

Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Land Use D	Total
Enter	73	6	0	850	929
Exit	55	6	0	782	843
Total	128	12	0	1632	1772
Single-use Trip Gen. Est.	193	17	0	1702	1912
					Internal Capture 7.3%

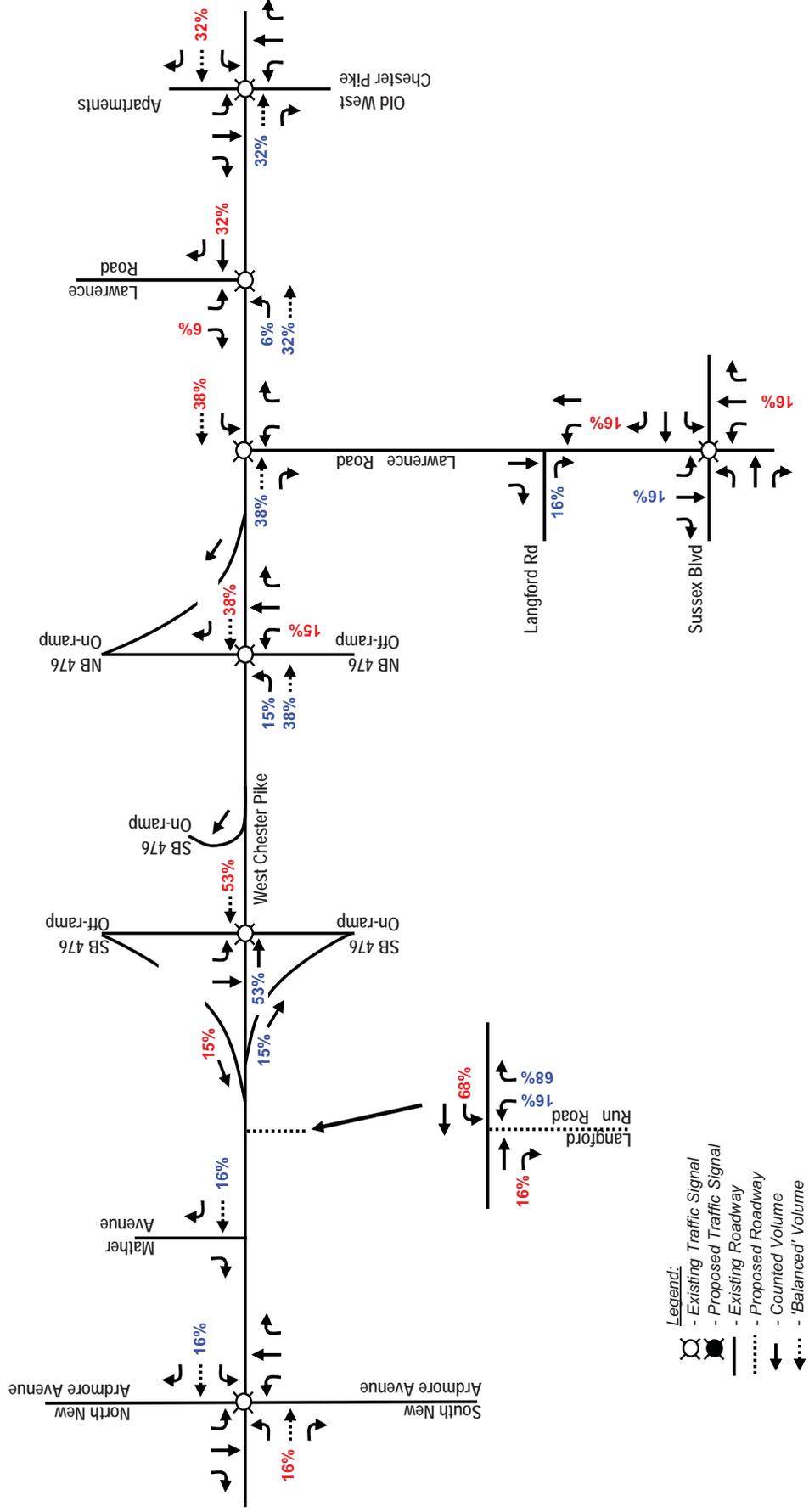
G – Trip Distribution & Future Volume

Spreadsheet:

New Retail Traffic Trip Distribution

Traffic Impact Study - I-476 and West Chester Pike

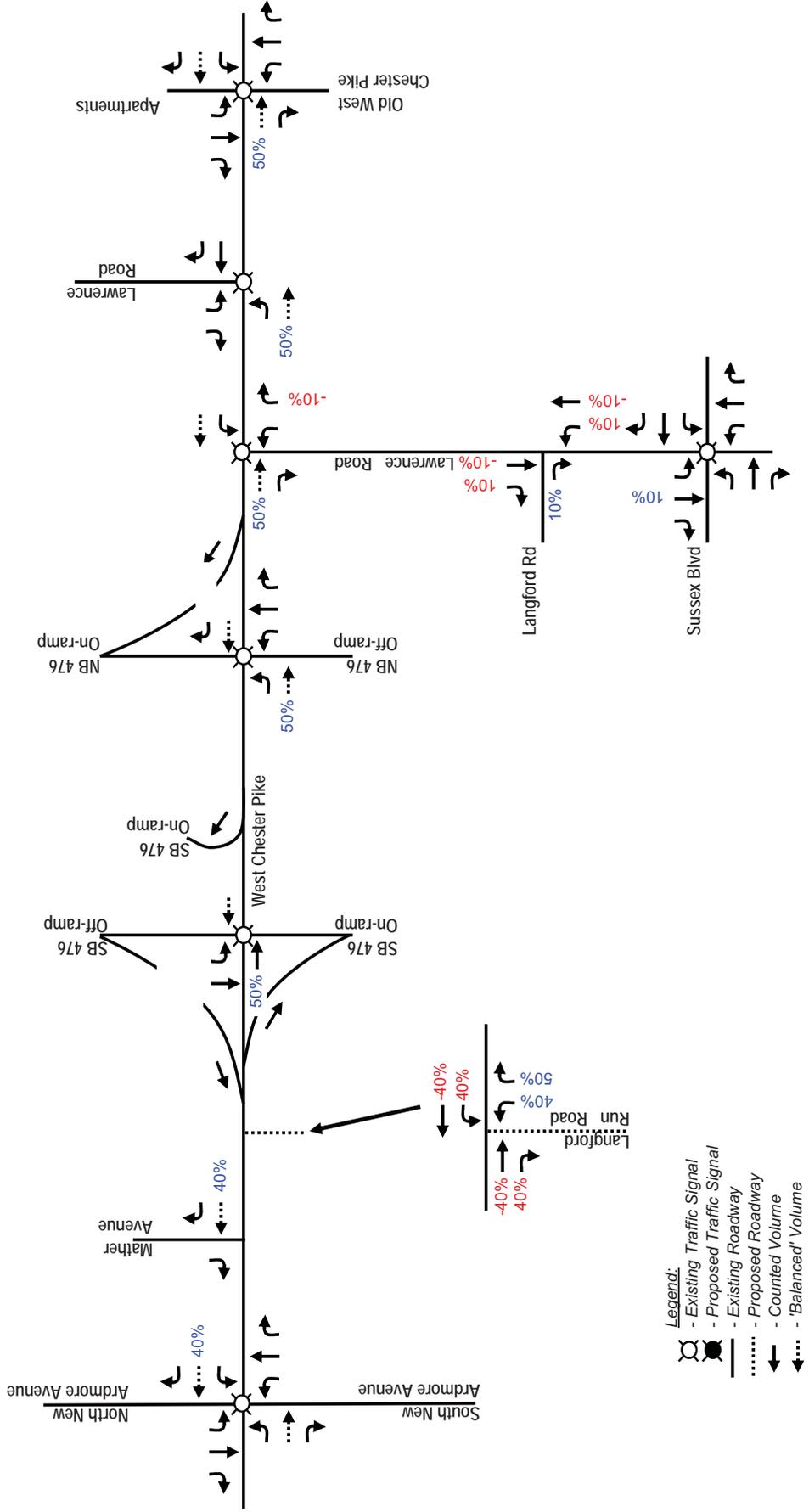
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Retail Passby Traffic Trip Distribution

Traffic Impact Study - I-476 and West Chester Pike

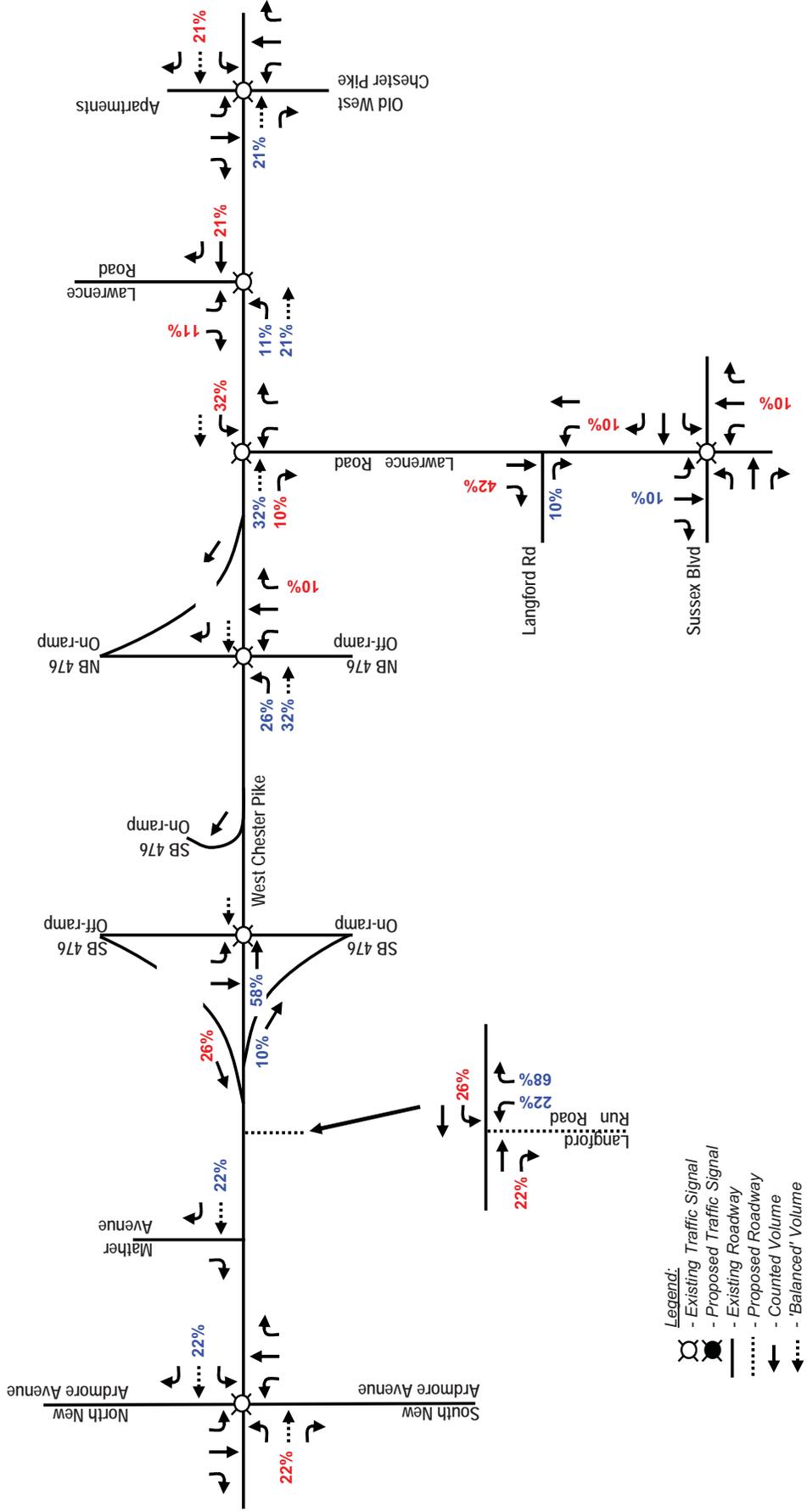
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Residential and Office Traffic Trip Distribution

Traffic Impact Study - I-476 and West Chester Pike

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA



- Legend:**
- Existing Traffic Signal
 - Proposed Traffic Signal
 - Existing Roadway
 - Proposed Roadway
 - Counted Volume
 - 'Balanced' Volume

H – Public Diversion Memo:

MEMORANDUM

TO: Mahmood Shehata

FROM: Adrienne Eiss

RE: HOP Application No. PRE689
Marple Associates Site
Traffic Log No. D09-039XP
Marple Township, Delaware County

Diversion of Public Traffic to Langford Run Road

DATE: February 9, 2010

On February 4 we discussed ORA's calculation of the number of trips that could potentially divert to Langford Run Road, based solely on origin and destination. That calculation, of "Maximum Diversion", was deemed acceptable. The remaining question is how many of those motorists will actually divert to Langford Run Road.

This memo responds to your request for documentation to back up the assumption of diversion.

Our initial estimate was that 67% of the motorists whose trip O-D could be served by using Langford Run Road will actually divert to Langford Run Road. That judgment was based on the much shorter distance and 4 fewer traffic signals on the diversion route.

We have now performed travel time estimates for both the existing route and the diversion route, for the eastbound and westbound directions, in the AM and PM peak hours. Summary tables for the AM peak hour and for the PM peak hour are attached comparing the travel times of the two routes. The source/assumptions are noted, and references to where the travel time is found in the attached backup analysis are provided.

For the existing route on West Chester Pike, travel time is from SimTraffic runs (average of 5 runs) based on Synchro model for year 2012 projected traffic. The Existing Conditions Synchro model was first corrected based on the comments in your review letter of January 5, 2010. The year 2012 traffic projections were updated based on approved development trip generation and distribution, background growth rate, etc. For 'Diverted' non-development traffic, the Synchro model used a starting assumption of 50% of the motorists whose trip O-D could be served using Langford Run Road.

The Year 2012 'Build' Synchro model used the same lane configuration as previously submitted. While the lane configuration may be further refined as we complete the POA and TIS studies,

the model is adequate for the limited purpose of comparing the travel times of the Existing Route and the Diversion Route.

For the existing route segment on Lawrence Road, we used travel time at the 45 mph speed limit to cover the distance between West Chester Pike and Langford Run Road, plus delay at the Pathmark signal. Delay at the Pathmark signal was from HCS using the Lawrence Road volumes projected from the Lawrence Road/ West Chester Pike intersection and maximum side street and left turn signal time. For the westbound direction, the travel time on Lawrence Road also includes the signal delay exiting northbound Lawrence Road to West Chester Pike.

For the diversion route, the travel time on the segment of West Chester Pike between New Ardmore Avenue and Langford Run Road is from the SimTraffic runs. The travel time on Langford Run Road is based on the distance at speed of 30 mph. The delay at the unsignalized intersection of Langford Run Road and Lawrence Road is from HCS. For the westbound direction, the delay exiting Langford Run Road to West Chester Pike at the new signal is from Synchro HCS report.

RESULTS:

The diversion route is about 0.35 mile shorter than the existing route.

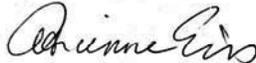
The Eastbound travel time on the diversion route is 42 seconds (33%) shorter in the AM and 133 seconds (50%) shorter in the PM than the route using West Chester Pike to Lawrence Road.

The Westbound travel time on the diversion route is 36 seconds (24%) shorter in the AM and 39 seconds (20%) shorter in the PM than the route using Lawrence Road to West Chester Pike.

These results, using a 50% diversion, indicate that the initial assumption of 67% diversion is not unreasonable. We judge that regular commuters (and anyone navigating by GPS) will use the diversion route; infrequent travelers will tend to stay on the main roads.

The approval of the diversion percentage is the last remaining item before we can proceed with future traffic analysis. Therefore your prompt review is appreciated. Please call me to discuss. Thanks very much.

ORTH-RODGERS & ASSOCIATES, INC.



ADRIENNE EISS, PTP
Senior Project Manager

Cc: H. Richard Orth
Fran Hanney
Susan LaPenta
Andrew Hartline
John Nawn

AM TRAVEL TIME BETWEEN NEW ARDMORE AVE./WEST CHESTER PIKE and LAWRENCE RD./LANGFORD RD.
Comparison Between Existing Route and Route Using Proposed Langford Run Road
 Marple Associates

AM Peak Hour

Direction	Route	Segment / Intersection	Travel Time / Delay (sec.)	Distance (ft)	Source / Assumptions	Reference	
EB	Existing Route - WCP to S. Lawrence	from New Ardmore to I-476 NB off ramp along WCP	69	2100	2012 AM Build SimTraffic (average of five runs)	1	
		from I-476 NB off ramp to S. Lawrence	11	650	Existing travel time		
		from WCP to Langford along Lawrence	27	1780	Travel time at 45 mph speed limit 66 fps	2	
		signalized intersection of Pathmark & Lawrence	19		signal plan & HCS delay of SB thru		
	Total	126	4530				
EB	Diversion Route - WCP to Langford	from New Ardmore to Langford along WCP	25	645	2012 AM Build SimTraffic (average of five runs)	3	
		from WCP to Lawrence along Langford	45	2000	Travel time at 30 mph 44 fps		
		Unsignalized intersection of Langford and Lawrence	14		projected future traffic volumes - HCS delay of EB right turn	4	
		Total	84	2645			
WB	Existing Route - S. Lawrence to WCP	from Langford to WCP along Lawrence	27	1780	speed limit 45mph = 66fps	5	
		signalized intersection of Pathmark & Lawrence	10		signal plan & HCS delay of NB thru	6	
		signalized intersection of WCP & Lawrence	35		2012 AM Build Synchro (HCS Report) NB left	7	
		from Lawrence to New Ardmore along WCP	79	2750	2012 AM Build SimTraffic (average of five runs)		
		Total	151	4530			
	WB	Diversion Route - Langford to WCP	Unsignalized intersection of Langford and Lawrence	12		projected future traffic volumes - HCS delay of NB left turn	8
			from Lawrence to WCP along Langford	45	2000	Travel time at 30 mph 44 fps	9
signalized intersection of WCP & Langford			42		2012 AM Build Synchro (HCS Report) NB left	10	
		from Langford to New Ardmore along WCP	16	645	2012 AM Build SimTraffic (average of five runs)		
	Total	115	2645				

PM TRAVEL TIME BETWEEN NEW ARDMORE AVE./WEST CHESTER PIKE and LAWRENCE RD./LANGFORD RD.
Comparison Between Existing Route and Route Using Proposed Langford Run Road
 Marple Associates

PM Peak Hour

Direction	Route	Segment / Intersection	Travel Time / Delay (sec.)	Distance (ft)	Source / Assumptions	Reference
EB	Existing Route - WCP to S. Lawrence	from New Ardmore to I-476 NB off ramp along WCP	205	2100	2012 PM Build SimTraffic (average of five runs)	11
		from I-476 NB off ramp to S. Lawrence	15	650	Existing time from travel time runs	
		from WCP to Langford along Lawrence	27	1780	Travel time at 45 mph speed limit 66 fps	
		signalized intersection of Pathmark & Lawrence	21		signal plan & HCS delay of SB thru	12
	Total		268	4530		
EB	Diversion Route - WCP to Langford	from New Ardmore to Langford along WCP	69	645	2012 PM Build SimTraffic (average of five runs)	13
		from WCP to Lawrence along Langford	45	2000	Travel time at 30 mph 44 fps	
		Unsignalized intersection of Langford and Lawrence	21		projected future traffic volumes - HCS delay of EB right turn	
		Total		135	2645	
WB	Existing Route - S. Lawrence to WCP	from Langford to WCP along Lawrence	27	1780	Travel time at 45 mph speed limit 66 fps	15
		signalized intersection of Pathmark & Lawrence	10		signal plan & HCS delay of NB thru	
		signalized intersection of WCP & Lawrence	57		2012 PM Build Synchro (HCS Report) NB left	
		from Lawrence to New Ardmore along WCP	101	2750	2012 PM Build SimTraffic (average of five runs)	17
	Total		195	4530		
WB	Diversion Route - Langford to WCP	Unsignalized intersection of Langford and Lawrence	15		projected future traffic volumes - HCS delay of NB left turn	18
		from Lawrence to WCP along Langford	45	2000	Travel time at 30 mph 44 fps	
		signalized intersection of WCP & Langford	76		2012 PM Build Synchro (HCS Report) NB left	
		from Langford to New Ardmore along WCP	20	645	2012 PM Build SimTraffic (average of five runs)	20
	Total		156	2645		

Adrienne Eiss

From: Shehata, Mahmood [MShehata@mccormicktaylor.com]
Sent: Friday, February 12, 2010 11:52 AM
To: Adrienne Eiss
Subject: RE: Marple Associates

Adrienne:

Thank you for sending us this documentation. Based on this material, the percentage of diverted trips appears reasonable. As a reminder, if the analysis and/or simulation results vary widely from these materials, the diverted percentage may have to be recalculated. Otherwise, I concur.

Thanks,
Mahmood

Mahmood Shehata, P.E., PTOE
Project Engineer
McCormick Taylor, Inc.

From: Adrienne Eiss [<mailto:aeiss@orth-rodgers.com>]
Sent: Thursday, February 11, 2010 11:21 AM
To: Shehata, Mahmood
Subject: Marple Associates

Mahmood,

Attached please find documentation for relative travel times on west Chester Pike/Lawrence Road vs a diversion route on Langford Run Road, as a basis for estimating the percent of trips that would divert to Langford Run Road.

I am in the office today so you can reach me at 610-407-9700 ext 12

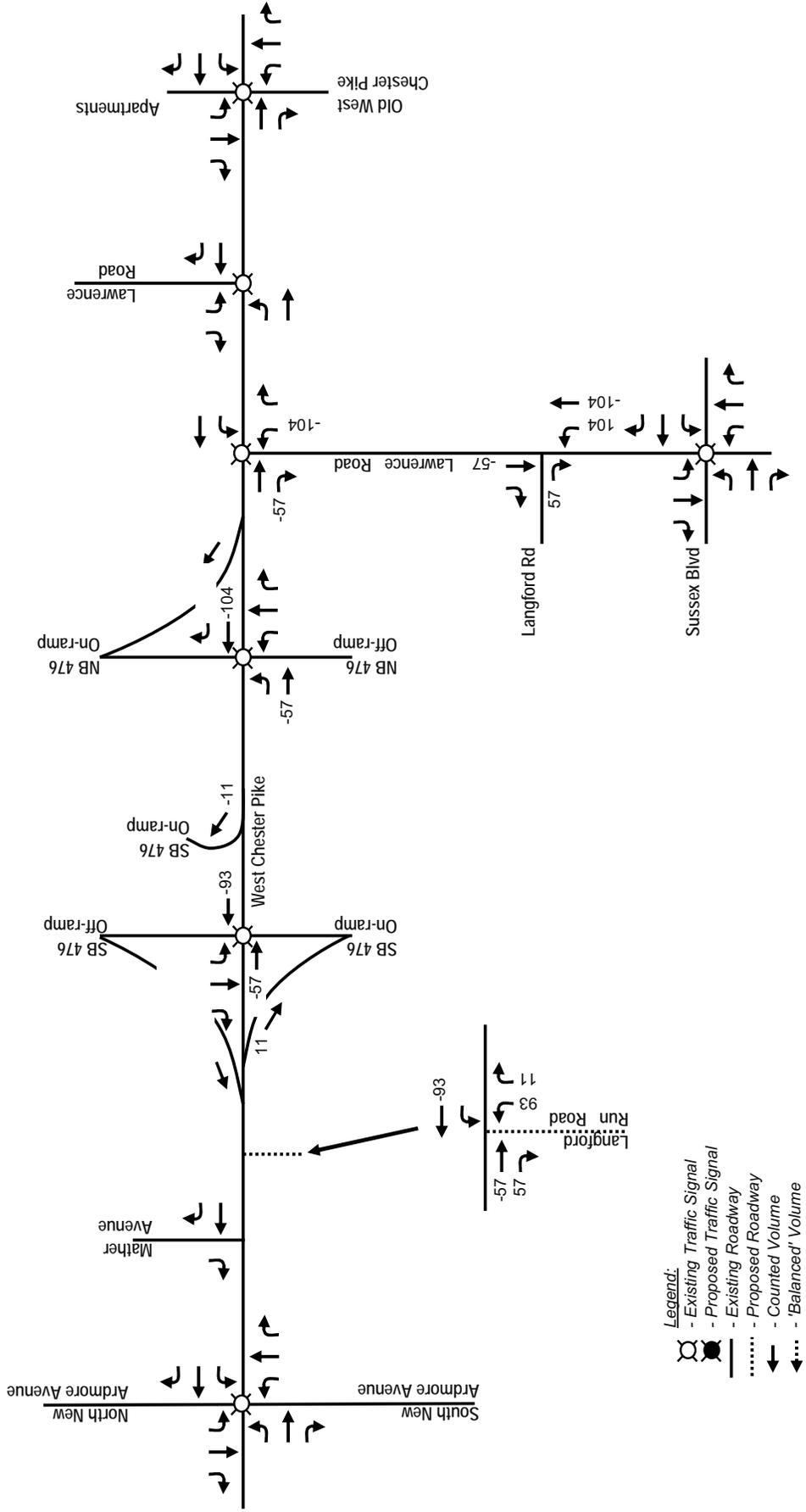
Adrienne

Adrienne Eiss, PTP
Senior Project Manager
Orth-Rodgers & Associates, Inc.
301 Lindenwood Drive, Suite 130
Malvern, PA 19355
Phone: (610) 407-9700 Ext. 12
Fax: (610) 407-9600
aeiss@orth-rodgers.com

AM Peak Hour Diversion of Public Traffic to Langford Run Road

Traffic Impact Study - I-476 and West Chester Pike

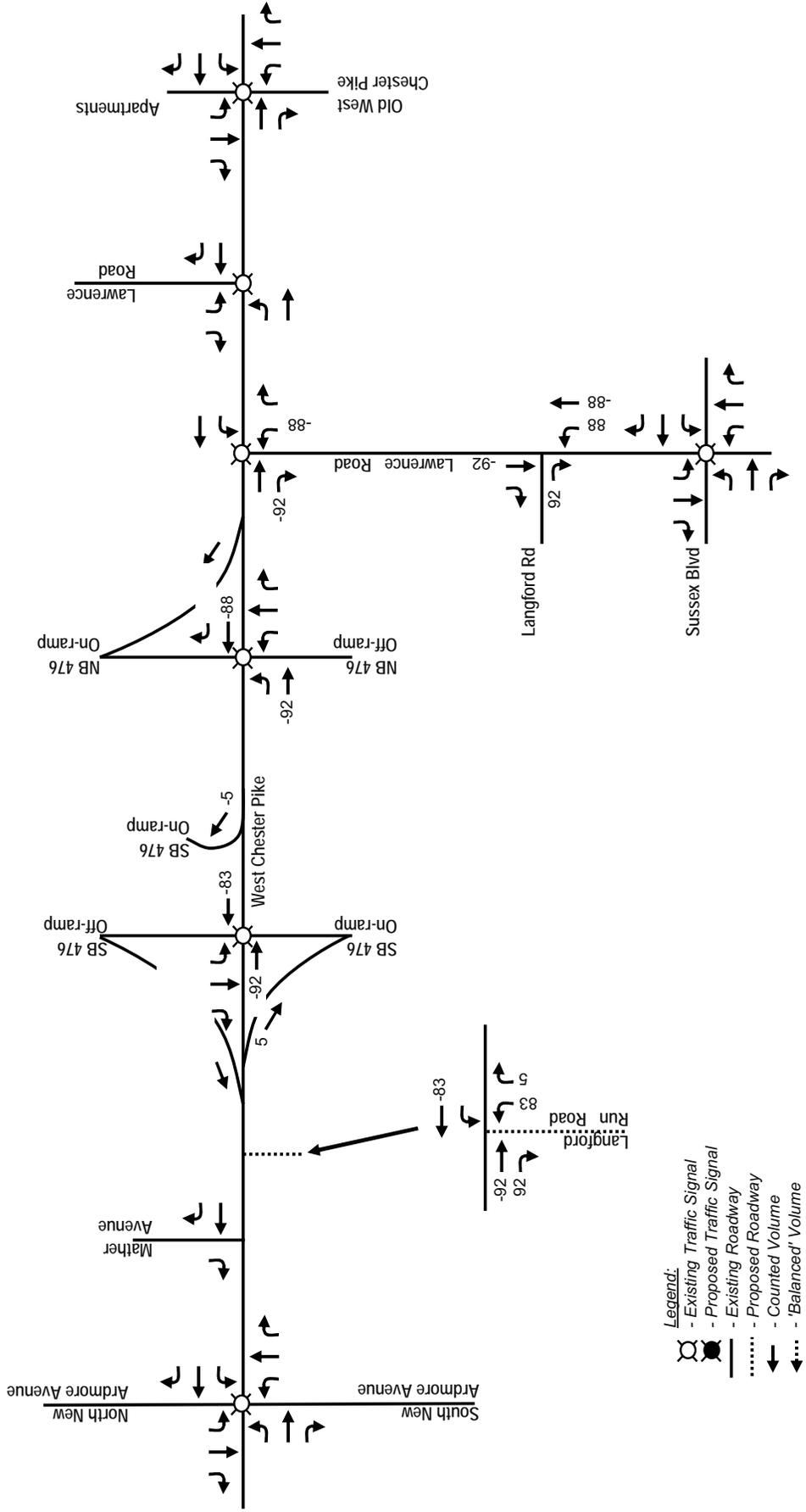
MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA



PM Peak Hour Diversion of Public Traffic to Langford Run Road

Traffic Impact Study - I-476 and West Chester Pike

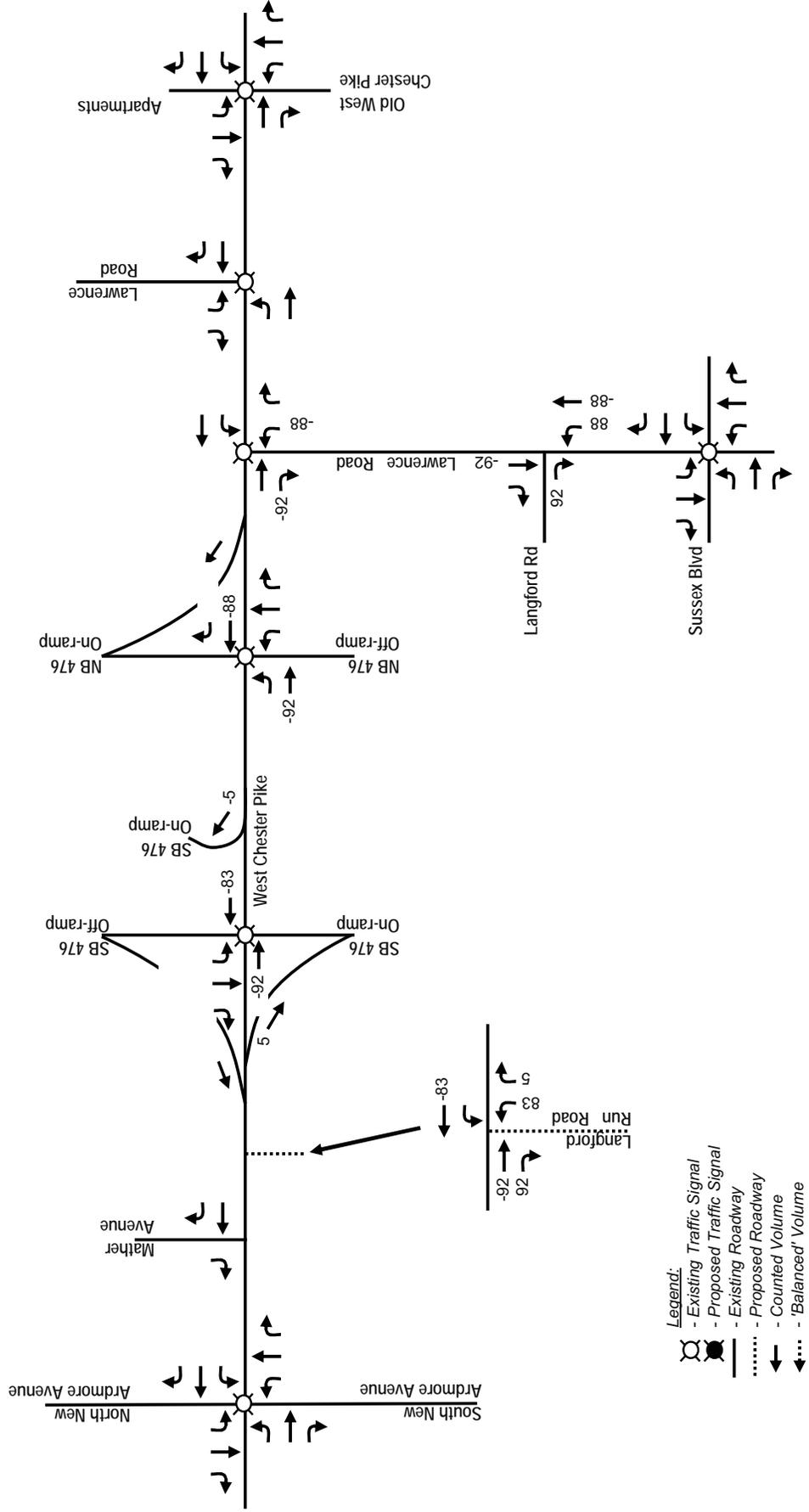
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Saturday Peak Hour Diversion of Public Traffic to Langford Run Road

Traffic Impact Study - I-476 and West Chester Pike

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA



I – Synchro Calibration Memo:

MEMORANDUM

TO:

FROM: Adrienne Eiss

RE: Marple Township, Delaware County
SR 0003 (West Chester Pike at I-476)
Marple Associates site
Traffic Log No. D09-039XP

DATE: September 19, 2010

This memo is to address the comment 4.e in PennDOT's POA Application Reviewing Letter dated June 7, 2010 which states that:

"The Synchro model should be calibrated to the field observed travel time, using the Synchro Arterial Travel Time output. There may be some Synchro only parameters, such as the Lost Time Adjustment factor, that may need to be adjusted to match the existing travel times."

This letter describes the procedure on calibrating the Synchro model for existing conditions using the corridor travel time runs along West Chester Pike.

Synchro Arterial Travel Time

Synchro arterial travel time is composed of two elements, arterial running time and signal delays. Arterial running time is calculated by dividing the arterial length by the arterial free-flow speed and the signal delay is determined by intersection traffic volumes and the intersection capacity. The sum of the arterial running time and the signal delays is the arterial travel time in Synchro.

The arterial free-flow speed can be observed and measured in the field. The intersection capacity is determined mainly by the intersection configuration, signal timings, traffic pattern and composition, and drivers' characteristics. With most of these parameters obtained from field measurements or official PennDOT plans, the most relevant parameters in Synchro that can affect the calculation of an intersection capacity are "Ideal Saturation Flow Rate" and "Lost Time Adjustment". In general, the "Ideal Saturation Flow Rate" brings more significant impact in capacity calculation than the "Lost Time Adjustment". The calibration process is to find out the proper values of these parameters so that the calculated results in Synchro can match what was illustrated by the measurements conducted in the field.

Field Travel Time Runs

Field travel time runs were conducted along West Chester Pike between the intersection of New Ardmore Avenue and the intersection of North Lawrence Road during evening hours on Thursday, January 28, 2010. A total of eight runs were recorded for each direction and the detailed results are attached in the end of this letter. On average of eight runs, it takes 203 seconds to travel eastbound from New Ardmore Avenue to North Lawrence Road on West Chester Pike and it takes 137 seconds to travel the opposite direction. Besides corridor travel time, vehicle travel speed was observed during the runs. It is believed that the posted speed limit 45 mph represents the current prevailing free-flow speed on West Chester Pike and therefore is being set as such accordingly in the existing Synchro models.

Calibration

The existing base model was set up on top of a scaled aerial map to make sure the network geometry, e.g. the distance between intersections, is correct. In addition, the lane geometry parameters, measured either in the field or from a scaled aerial map, were input properly. These parameters include the number of lanes, storage length of turn lanes, and lane widths. Signal plans provided by PennDOT District 6 were used to obtain the signalized intersections' phasing, timing, coordination information, detector type and locations, as well as grades. Evening peak hour intersection traffic volume data counted back in March and April 2009 were in input and balanced. With all other parameters set to default values, the preliminary results of Aerial Travel Time during evening peak hour from Synchro were obtained and compared to the field results in the following tables.

Table 1 – Travel Time Comparison: Field Run vs. Synchro w/ Default Values
 Evening Eastbound Travel Time Runs on West Chester Pike (seconds)

From	New Ardmore Ave	I-476 SB Off Ramp	I-476 NB Off Ramp	S. Lawrence Rd	Total
To	I-476 SB Off Ramp	I-476 NB Off Ramp	S. Lawrence Rd	N. Lawrence Rd	
Field Run (Avg.)	56	62	49	36	203
Synchro Output	65	30	138	24	257

Table 2 – Travel Time Comparison: Field Run vs. Synchro w/ Default Values
 Evening Westbound Travel Time Runs on West Chester Pike (seconds)

From	N. Lawrence Rd	S. Lawrence Rd	I-476 NB Off Ramp	I-476 SB Off Ramp	Total
To	S. Lawrence Rd	I-476 NB Off Ramp	I-476 SB Off Ramp	New Ardmore Ave	
Field Run (Avg.)	17	58	32	30	137
Synchro Output	40	51	37	51	179

The comparisons above show that the overall Synchro calculated travel time results are about 30 percent higher than the average travel time measured in the field.

For the eastbound direction, the biggest discrepancy occurs in the segment between I-476 Northbound Off Ramp and South Lawrence Road. A closer look at the intersection of South Lawrence Road reveals that the Synchro-calculated signal delay for the eastbound movement is 124 seconds. Compared to the field measured delay, the calculated signal delay seems to be high and the capacity for that approach should be increased. Therefore, the “Ideal Saturation Flow Rate” for the eastbound approach was increased 10 percent from default value 1,900 vphpl to 2,100 vphpl. The reasons to go with the “Ideal Saturation Flow Rate” instead of “Lost Time Adjustment” are because:

- Adjusting “Ideal Saturation Flow Rate” has more impact in capacity calculation. To achieve the same effect, a quite dramatic value would have to be assigned to “Lost Time Adjustment”. In this case, a value of “-5” for “Lost Time Adjustment” will need to be used to achieve the same impact in capacity calculation, which we do not think is proper and realistic.
- “Lost Time Adjustment” also illustrates the aggressiveness of the driver population on the corridor, which we regard somewhat as a global parameter. If we make a change to this parameter at this location, similar changes should be also made to other locations in the network. Since we are dealing with one movement here, “Ideal Saturation Flow Rate” is a better choice to adjust with.

The calculated travel time for the segment is then reduced from 138 seconds to 89 seconds and the resultant overall travel time on the eastbound direction is 208 seconds which matches well with the average field run result of 203 seconds.

For the westbound direction, the biggest discrepancy occurs at two segments: between North Lawrence Road and South Lawrence Road, and between I-476 Southbound Off Ramp and New Ardmore Avenue. The average run time on these two segments are 17 and 30 seconds. Based on lengths of these two segments, it should take a vehicle 15 and 27 seconds to travel through these two segments with a speed of 45 mph which is confirmed to

be the free-flow speed on West Chester Pike. Comparing these numbers to the field results, it can be seen that minimal delays were experienced by the vehicle conducting the field runs at the signalized intersections of New Ardmore Avenue and at South Lawrence Road. As shown in the detailed field run records attached, the field vehicle was not delayed by the signal at these two signalized intersections during almost all its eight runs. In this case, the westbound field runs on West Chester Pike were riding on the corridor progression through these two segments. However, Synchro results are more of an average delay experienced by all the vehicles going through the intersection and realistically the average delay at a major signalized intersection like these on West Chester Pike will certainly be much higher than the couple seconds encountered by the field vehicle. At the both signalized intersections of New Ardmore Avenue and South Lawrence Road on West Chester Pike, the westbound through movements are calculated to be at LOS 'C' with about 25 seconds delay during the PM peak hour. These numbers are reasonable and consistent with our field observations. Therefore, with the official signal timings and intersection configurations from plans and field measurements input into the Synchro model, we consider the westbound direction on West Chester Pike is yielding realistic results and calibrated without the need of further tweaking.

Summary and Conclusion

During the calibration process, the Synchro-calculated travel time along West Chester Pike was compared to the average results of eight runs between intersection of New Ardmore Avenue and North Lawrence Road on both directions for the evening peak hour. For the eastbound direction, the "Ideal Saturation Flow Rate" for the eastbound approach at the intersection of South Lawrence Road was increased 10 percent from default value 1,900 vphpl to 2,100 vphpl. This adjustment brings the calculated Synchro result to be very comparable to the average field results. For the westbound direction, in the two segments where the average field run time differed significantly from the Synchro-calculated travel time, it is assumed that the field runs were riding on the corridor progression and that the Synchro-calculated results are a realistic average delay that a random driver would experience going through these intersections. Therefore, no change in default values is proposed for the westbound direction.

By going through the above process, we consider the existing PM Synchro model is calibrated. Since the change is made to the "Ideal Saturation Flow Rate", this change will be carried over to all the other PM models only (No Build and Build) but NOT the models for other periods (AM and SAT).

WEST CHESTER PIKE TRAVEL TIME
Marple Associates

Direction - EASTBOUND

by: T. Lucas Thursday 1/28/2010

Day	Date	Clock Time	New Ardmore	TIME PASSED THRU SIGNAL							
				I-476 S ramp	I-476 N ramp	S Lawrence	N Lawrence	I-476 S ramp	I-476 N ramp		
Thursday	1/28/2010	15:54	0	delay	0:21 (red)						1:58 (red)
				cleared intersection	0:51	1:14	1:36	2:10			
		16:05	0	delay	0:16 (green q)	0:43 (red)	1:48 (red)	2:55 (red)			
				cleared intersection	0:36	1:39	2:32	3:19			
		16:18	0	delay	0:26 (red)	1:36 (red)		2:35 (green q)			
				cleared intersection	1:20	2:08	2:23	2:46			
		16:33	0	delay	0:19 (green q)	0:46 (red)	1:56 (red)	3:17 (red)			
				cleared intersection	0:33	1:43	2:58	3:40			
		16:52	0	delay	0:17 (red)		1:52 (red)				
				cleared intersection	1:04	1:40	2:42	3:05			
		17:02	0	delay	0:26 (red)	1:20 (red)	2:48 (red)	3:44 (red)			
				cleared intersection	1:05	2:38	3:30	4:16			
17:21	0	delay	0:23 (red)	1:24 (red)	2:39 (red)	3:31 (red)					
		cleared intersection	1:04	2:28	3:18	4:08					
17:32	0	delay	0:19 (red)		2:39 (red)						
		cleared intersection	0:58	2:18	3:21	3:46					

NOTE: 'delay' time is time first stopped at back of queue

Travel Time (seconds) between Intersections

From	New Ardmore Ave	I-476 SB Off Ramp	I-476 NB Off Ramp	S. Lawrence Rd	S. Lawrence Rd	N. Lawrence Rd	Total
To	I-476 SB Off Ramp	I-476 NB Off Ramp	S. Lawrence Rd	S. Lawrence Rd	N. Lawrence Rd		
Run 1	51	23	22	34			130
Run 2	36	63	53	47			199
Run 3	80	48	15	23			166
Run 4	33	70	75	42			220
Run 5	64	36	62	23			185
Run 6	65	93	52	46			256
Run 7	64	84	50	50			248
Run 8	58	80	63	25			226
Average	56	62	49	36			203

WEST CHESTER PIKE TRAVEL TIME

Marple Associates

Direction - WESTBOUND

by: T. Lucas Thursday 1/28/2010

Day	Date	Clock Time	TIME PASSED THRU SIGNAL				
			N Lawrence	S Lawrence	I-476 N ramp	I-476 S ramp	New Ardmore
Thursday 1/28/2010		15:49	0	0:15	0:24 (red)	1:19 (red)	
				delay	1:10	1:49	2:20
		16:00	0	0:17	0:27 (red)		
				delay	1:35	1:52	2:21
		16:11	0	0:16	0:28 (red)		
				delay	1:20	1:38	2:08
		16:25	0	0:17	0:30 (red)	1:27 (green q)	
				delay	1:12	1:48	2:19
		16:44	0	0:18	0:26 (red)	1:39 (green q)	
				delay	1:24	1:50	2:17
		16:56	0	0:13	0:26 (red)	1:17 (red)	
				delay	0:57	1:30	1:57
		17:08	0	0:16	0:28 (red)	1:18 (red)	
				delay	1:01	1:41	2:10
		17:29	0	0:25	0:36 (red)	1:48 (red)	2:34 (green q)
				delay	1:24	2:18	2:54

NOTE: 'delay' time is time first stopped at back of queue

Travel Time (seconds) between Intersections

From	N. Lawrence Rd	S. Lawrence Rd	I-476 NB Off Ramp	I-476 SB Off Ramp	Total
To	S. Lawrence Rd	I-476 NB Off Ramp	I-476 SB Off Ramp	New Ardmore Ave	
Run 1	15	55	39	31	140
Run 2	17	78	17	29	141
Run 3	16	64	18	30	128
Run 4	17	55	36	31	139
Run 5	18	66	26	27	137
Run 6	13	44	33	27	117
Run 7	16	45	40	29	130
Run 8	25	59	54	36	174
Average	<u>17</u>	<u>58</u>	<u>32</u>	<u>30</u>	<u>137</u>

Arterial Level of Service: EB West Chester Pike

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
S New Ardmore Ave	II	45	15.5	9.3	24.8	0.14	20.7	D
	II	45	27.3	37.5	64.8	0.26	14.6	E
I-476 NB Off-Ramp	II	45	15.3	15.0	30.3	0.14	16.7	E
S Lawrence Rd	II	45	14.2	124.0	138.2	0.13	3.4	F
N Lawrence Rd	II	45	15.4	8.8	24.2	0.14	21.0	D
Old West Chester Pik	II	45	14.5	40.7	55.2	0.13	8.7	F
Total	II		102.2	235.3	337.5	0.95	10.1	F

Arterial Level of Service: WB West Chester Pike

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
	II	45	25.6	7.3	32.9	0.25	26.9	C
N Lawrence Rd	II	45	14.5	49.1	63.6	0.13	7.5	F
S Lawrence Rd	II	45	15.4	24.6	40.0	0.14	12.7	F
I-476 NB	II	45	14.2	36.6	50.8	0.13	9.2	F
I-476 SB Off-Ramp	II	45	15.3	21.7	37.0	0.14	13.7	E
N New Ardmore Ave	II	45	27.3	23.8	51.1	0.26	18.5	D
Total	II		112.3	163.1	275.4	1.05	13.8	E

**J – Langford Run Road and Lawrence
Road Signalization Study:**

August 26, 2010

Mr. Francis J. Hanney
District Traffic Services Manager
PennDOT, Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

Re: HOP Application No. pre689
Traffic Log No. D09-039XQ
Marple Associates Site
Delaware County, Marple Township

Investigation of Alternative Control at Lawrence Road and Langford Road

Dear Fran:

Your review letter dated June 7, 2010 to Anthony Hamaday, Marple Township Manager, regarding the Point of Access Study for the above application outlined requirements for the traffic impact study for the project. Comment 2.a. of the letter states:

2. *As a reminder, the scope of the Transportation Impact Study (TIS) should be expanded to include the following intersections:*
 - a. *South Lawrence Road (SR 1020) and Langford Road. Please note that all options at this intersection must be fully investigated, including allowing full movement and signalization. The possibilities and challenges associated with this evaluation must be included in the TIS. This investigation must include a conceptual design.*

We would like to resolve the issue of permitted movements and traffic control at the intersection of Lawrence Road and Langford Road before completing the full traffic impact study analysis. The site trip assignment will be altered if the intersection is signalized and left turn movements are permitted out of Langford Road to northbound Lawrence Road. Some trips will be shifted away from the West Chester Pike access. A change in trip assignment therefore will affect volume at most of the West Chester Pike study intersections.

This letter includes our analysis of the South Lawrence Road/Langford Road intersection. The analysis includes:

- Review to determine any other potential outlet locations for Langford Road
- ATR count of Lawrence Road
- Speed measurement on Lawrence Road
- Projected intersection volumes with existing movement restriction and with full movement
- Signal warrant analysis
- Potential signal operation

- Projected queue lengths on Lawrence Road if signalized
- Stopping sight distance
- Crash history

The analysis concludes that it may be feasible to signalize the intersection and provide all movements. I would appreciate your review and comments.

It had been the longstanding position of PennDOT that the left turn exit from Langford Road should be prohibited and that the intersection remain unsignalized. That position was affirmed at our January 7, 2010 preliminary meeting for the project. Marple Associates would be in favor of a full movement intersection. The Township would need to be willing to apply for the signal permit. At this point we have not contacted the Township with regard to this issue.

Other Potential Outlets

The intersection of South Lawrence Road and Langford Road provides all movements except the left turn exit from Langford Road to northbound Lawrence Road. Township maps and aerial photos were examined to determine whether there are any potential connections from Langford Road to another location at which the left turn exit can be provided to Lawrence Road.

A connection to Lawrence Road to the north would involve a new bridge over I-476. This is judged to be infeasible.

To the south, the local road of Cypress Drive extends toward the Marple Associates property and stops at a dead end. Cypress Drive connects with Sussex Boulevard, which is signalized at Lawrence Road. However, Cypress Drive is a local residential street, and a connection that would add commercial traffic on this street would not be approved by the Township. In any event, a routing south to Sussex Boulevard to return north on Lawrence Road would add over 1,800 feet of travel distance, so that site traffic would probably elect to travel north on Langford Road to the West Chester Pike site access.

No other reasonable alternative outlets were found.

Projected Intersection Traffic Volumes

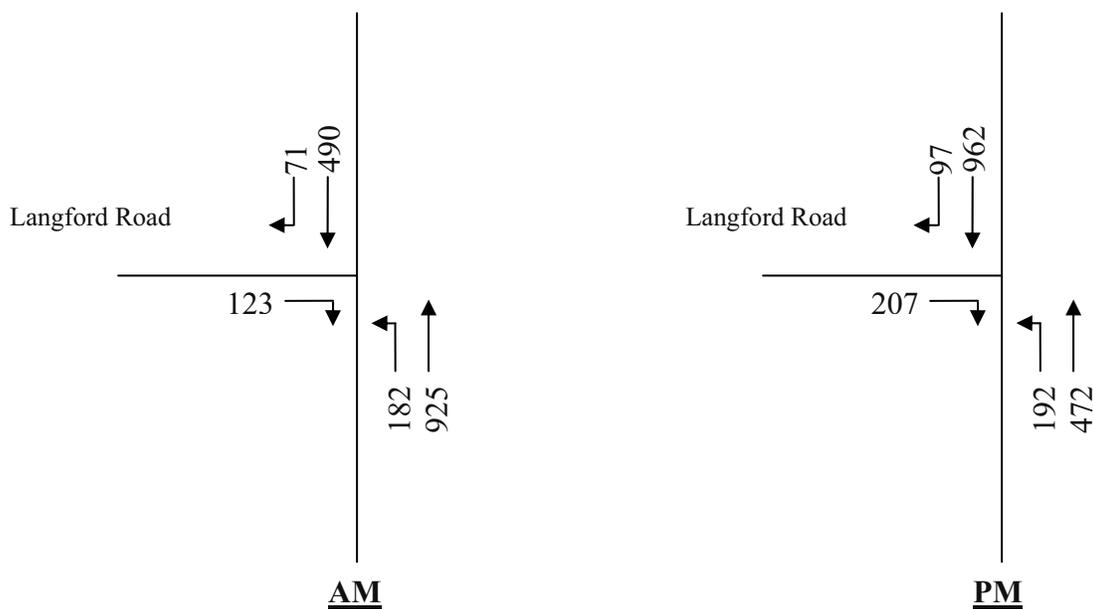
Intersection traffic volumes were projected with development of the Marple Associates site both without a signal and with a signal in order to assess the warrants for signalization.

On weekdays under existing conditions, hourly two-way volumes on Lawrence Road at Langford Road typically range from 1,100 to 1,600 vehicles per hour during all hours between 7:00 am and 6:00 pm. ATR counts for a 10-day period in June, 2010 are attached.

○ Intersection Peak Hour Volumes without a Signal

If the intersection of Langford Run Road and Lawrence Road remains unsignalized as in the existing conditions, then only the right turns will be allowed to exit from Langford Run Road. The future intersection traffic volumes at the opening year of 2012 consist of the existing volumes (background growth adjusted), public diversion trips (due to the completion of Langford Run Road between West Chester Pike and Lawrence Road), newly generated site traffic (16% of retail trips and 10% of office/residential trips), and retail pass-by trips. For the retail pass-by trips coming from the northbound traffic on Lawrence Road, these trips will exit via the proposed driveway on West Chester Pike since the left out is prohibited on Langford Run Road at Lawrence Road. The projected traffic volumes for the unsignalized intersection of Langford Run Road and Lawrence Road are illustrated in the figure below:

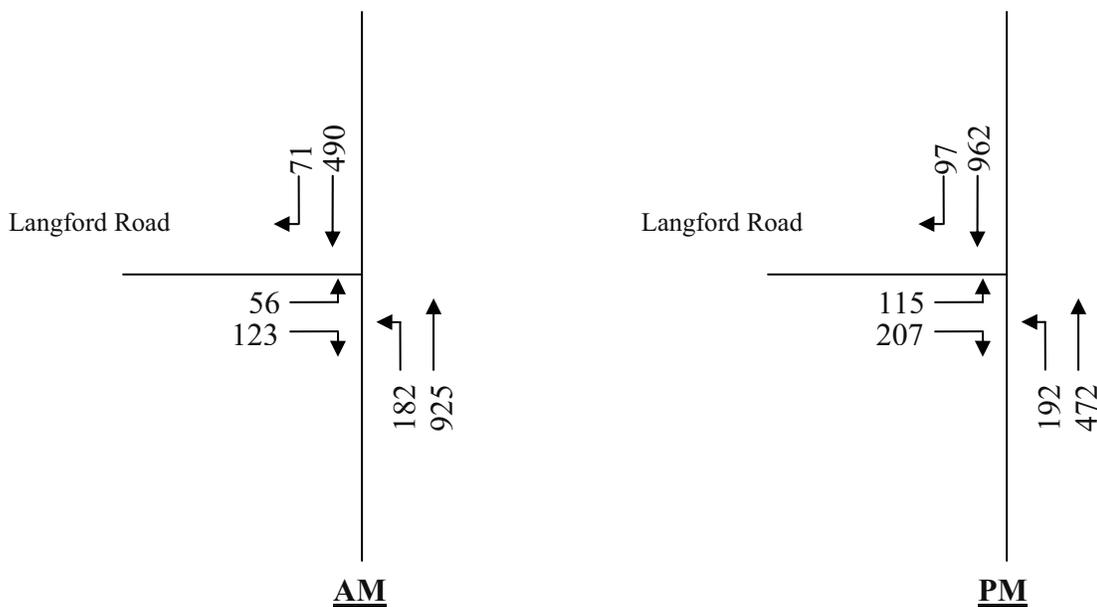
Projected Peak Hour Volumes with Development, No Left Turn Exit



○ Intersection Peak Hour Volumes with a Signal

With a signal installed, the left turn out of Langford Run Road will be allowed. Some site generated traffic will make this movement to travel north on Lawrence Road. According to the trip distribution used in the Point of Access (POA) study dated March 29, 2010, 42 percent of new trips generated by the office and residential components of the development will enter Langford Run Road from the southbound Lawrence Road approach (the retail trips have a different distribution due to the retail location within the site). Therefore, it is assumed that 42 percent of exiting trips from the office and residential developments will be making the left turn out of Langford Run Road to travel north to Lawrence Road if a signal is provided. In addition, the retail pass-by trips from northbound traffic on Lawrence Road will exit at the same intersection to continue north on Lawrence Road. With these assumptions, the projected traffic volumes for a signalized intersection of Langford Run Road and Lawrence Road are illustrated in the figure below:

Projected Peak Hour Volumes with Development, Left Turn Exit Permitted



The left turning volume from Langford Road would be subtracted from the right turn volume exiting the West Chester Pike site access in the Point of Access Study.

Signal Warrant Analysis

Signal warrant analysis was conducted for the intersection following MUTCD’s guidelines. The warrant tables from the MUTCD are attached to this memo.

On weekdays under existing conditions, hourly two-way volumes on Lawrence Road at Langford Road typically range from 1,100 to 1,600 vehicles per hour during all hours between 7:00 am and 6:00 pm. Lawrence Road volumes with development are high enough to meet the 100% criteria for 2-lane major street approaches for all warrants. However, a 70% factor applies, since the speed limit as well as the 85th percentile speed on the major street is 45 mph. A two-lane minor street approach was used (assuming separate left and right turn lanes on Langford Run Road). The total volume exiting Langford Road is 179 vehicles in the AM peak hour and 322 vehicles in the PM peak hour. Right turns out of Langford Road include 16% of all exiting trips from the 260,000 s.f. of retail. This by itself results in over 70 trips per hour between 11:00 am and 7:00 pm, using hourly variation data for shopping centers from ITE’s “Trip Generation, 8th Edition”. The intersection will clearly meet criteria for Warrants 1-B, 2 and 3.

MUTCD Signal Warrant Criteria – 2 lane Minor Street

Warrant		Major Street (2 lanes) 70% factor	Minor Street (2 lanes) 70% factor
1 – B	Eight Hour Interruption of Continuous Traffic	630	70
2	Four Hour	925	80
3	Peak Hour	1,250	100

It is known from conducting unsignalized HCS analysis that if only the right turn exit is allowed from Langford Run Road, the minor street will operate acceptably as unsignalized. If left turns are allowed, the unsignalized level of service will be Level F. Therefore, the left turn volumes from Langford Run Road are the determinative factor. Using only the left turn volume and a 1-lane minor street approach in the warrant analysis, the required minor street volume is as shown below.

MUTCD Signal Warrant Criteria – 1-lane Minor Street

Warrant		Major Street (2 lanes) 70% factor	Minor Street (1 lane) 70% factor
1 – B	Eight Hour Interruption of Continuous Traffic	630	53
2	Four Hour	800	60
3	Peak Hour	1,250	75

Langford Road left turn volume is projected to total 56 vehicles in the AM peak hour and 115 vehicles in the PM peak hour. Langford Road left turn volume meets Warrant 3, the Peak Hour Warrant, in the PM peak hour. There is no method of projecting the hourly left turns throughout the day since left turns are largely residential and office trips. However, we believe that there will be at least four hours with a left turn volume exceeding 60 vehicles and that Warrant 2 will be met, due to the typical increase in number of office and retail exits during the later morning and afternoon hours.

Therefore, a traffic signal is justified based on volumes at the intersection of Lawrence Road and Langford Road with development of the Marple Associates site.

Stopping Sight Distance Investigation

Assuming a new signal would be installed at the intersection of Langford Run Road and Lawrence Road, it is important from a safety standpoint that sufficient sight distances are available for drivers approaching the signalized intersection. For vehicles traveling along Lawrence Road, the drivers should be able to see the new signal as well as the stopped vehicles at the intersection well ahead so that they will have enough time to react and stop their vehicles if needed. In order to evaluate the sight distance, two steps are required:

- first, to determine the signal operation and the lengths of possible queuing on Lawrence Road, and then,
- to measure the available stopping sight distance for an oncoming vehicle to the back of the queue.

○ Proposed Signal Operation

There are two existing signals on Lawrence Road near the intersection of Langford Run Road. A signal at the Pathmark Drive is located about 1,200 feet in the north. The Pathmark Drive signal is coordinated with the signal at the intersection of West Chester Pike and S. Lawrence Road. We have determined that a signal at Langford Road should not be tied to the long cycle length of West Chester Pike.

Another signal is located about 1,000 feet south at the intersection of Sussex Boulevard. This signal is currently operating isolated at a 78-second maximum cycle during AM and PM peak hours.

Within the analysis, it is assumed that a new signal at Langford Road would be semi-actuated and coordinated with the signal at Sussex Boulevard and therefore will have a cycle length of 78 seconds. It is also assumed that a protected/permitted phase will be provided for the northbound left turn vehicles on Lawrence Road. The proposed phasing and timing programs for the new signal are summarized in the table below.

Proposed Signal Operation – Intersection of Lawrence Road and Langford Road

Peak Hour	Scenario	Lawrence Road						Langford Run Road			Cycle Length
		NB Protected Left			NB/SB Movements			EB Left/Right			
		G	Y	R	G	Y	R	G	Y	R	
AM	w/o Ped Actuation	6	3	2	43	6	2	11	3	2	78
	w/ Ped Actuation	6	3	2	29	6	2	25	3	2	78
PM	w/o Ped Actuation	6	3	2	36	6	2	18	3	2	78
	w/ Ped Actuation	6	3	2	29	6	2	25	3	2	78

Intersection to be coordinated with adjacent intersection of Lawrence Road and Sussex Boulevard

The 6 seconds amber time for the northbound/southbound movements on Lawrence Road was calculated using the formula provided in PennDOT Pub 149 (published March 16, 2009) with the prevailing speed and a 10% downgrade. For a pedestrian to cross the 70-foot wide Lawrence Road at the intersection of Langford Road, 20 seconds will be needed assuming a walking speed of 3.5 feet per second. Therefore, a 20 second flashing DON'T WALK time is used. With five seconds WALK time, this puts a total of 25 seconds green time for the Langford Run Road approach when a pedestrian actuates the pedestrian crossing signal.

The Lawrence and Langford Road intersection was analyzed in HCS with the projected traffic volumes and the signal timings illustrated above. Because of the coordination with Sussex Boulevard, the arrival type value for the northbound through traffic was conservatively changed from the default '3' (random arrival pattern) to '4' (modest traffic progression). This value can be set as high as '6', which represents a perfect progression. The results reveal that all the movements will operate at LOS 'D' or better with or without the pedestrian actuation. The HCS also provides 95th percentile queue lengths of both approaches on Lawrence Road that were used for the sight distance study. The HCS analysis is attached at the end of this memo.

o Northbound Approach Queue Lengths

In the northbound direction, the vertical alignment limits sight distance. A driver traveling northbound at the intersection of Sussex Boulevard cannot see the intersection of Langford Run Road.

The peak hour queue lengths of the northbound Lawrence Road movements at the intersection of Langford Run Road are calculated during the HCS volume/capacity analysis and are summarized below.

Table – 95th Percentile Queue Length for the NB Left Turn (ft) – Available storage 158 feet

Traffic Control	AM	PM
Signalized (without ped actuation)	75 ft	135 ft
Signalized (with ped actuation)	120 ft	180 ft
Unsignalized	20 ft	40 ft

Table – 95th Percentile Queue Length for the NB Through Movements (ft)

Traffic Control	AM	PM
Signalized (without ped actuation)	130 ft	105 ft
Signalized (with ped actuation)	330 ft	150 ft

It can be seen that the longest northbound queue will appear during the AM peak hour if the pedestrian actuation occurs every cycle during the whole hour.

- Available Northbound Stopping Sight Distance

Lawrence Road slopes down from south to north between Sussex Boulevard and Langford Run Creek located 440 feet north of Langford Road. Because of the vertical alignment, a driver at the intersection of Sussex Boulevard going northbound will not be able to see the intersection of Langford Run Road.

A road profile survey conducted by Chester Valley Engineers was used to determine the available stopping sight distance for a driver traveling northbound on Lawrence Road. The survey started at the centerline of Sussex Boulevard and continued to a point 50 feet north of Langford Road. The average downgrade from Sussex Boulevard to Langford Road is -8.2%. The grade of the last 500 feet approaching Langford Road is -10.3%.

The available stopping sight distance was measured assuming the driver’s eye height at 3.5 feet and an object height of 2 feet, in accordance with PennDOT Pub. 13M Design Manual Part 2 section 2.17 and PennDOT guidelines for Local Roads (Pub. 70M). The stop line for the northbound approach to Langford Road was drawn 30 feet from center of the future signalized intersection. The available sight distance ahead for oncoming northbound traffic to see the back of a 180-foot long northbound left turn queue is 565 feet. The sight distance to see the back of a 330-foot long northbound through movement queue is 490 feet. The measurements are illustrated in Figures 1 and 2.

In addition, the sight distance for a northbound driver to see the overhead signal indications at the intersection of Langford Road was measured. The signal head height above the roadway is assumed to be the minimum clearance of 16 feet; the signals were assumed to be located 50 feet north from centerline of the intersection. Based on the measurement conducted on the road profile survey, the available sight distance for the northbound driver to see the signal heads at the intersection of Lawrence Road and Langford Run Road is 970 feet (Figure 3).

○ Comparison of Available and Required Northbound Sight Distance

The minimum stopping sight distance is calculated in accordance with PennDOT Pub. 13M Design Manual Part 2 section 2.17. The formula used is $1.47Vt + V^2/(30 * ((a/32.2)+G))$, where V is the initial travel speed, t is a driver's brake reaction time (2.5 seconds), a is the deceleration rate and G is the roadway grade. A deceleration rate of 11.2 feet/sec² is used in accordance with AASHTO Green Book. For northbound Lawrence Road, using the 85th percentile speed of 45 mph and downgrade of 10 percent, the minimum stopping sight distance is 438 feet. According to the sight distance measurement of 490 feet on Figure 2, the available stopping sight distance on Lawrence Road meets the minimum requirement. It should be noted that the 330-foot northbound through lane queues in HCS assume that pedestrian actuations occur during every cycle. The northbound queue lengths can actually be shorter and therefore even longer sight distances will be available. In addition, the intersection of Langford Road was analyzed conservatively in HCS with a progression factor of 4. With the coordination between two signals at Langford Road and at Sussex Boulevard, it is possible to achieve a good northbound traffic progression, which will in turn reduce vehicular stopping and shorten the northbound queue length at the intersection of Langford Run Road. Therefore realistically, the 95th percent northbound queue length can be much shorter than 330 feet. A Synchro analysis of the intersections of Lawrence Road/Sussex Boulevard and Lawrence Road/Langford Road was performed with the split timings used for the HCS analysis, which shows shorter queues. The Synchro analysis is attached.

○ Southbound Approach Queue Lengths

In the southbound direction, the higher traffic volume occurs during the PM peak hour. The southbound queue lengths with and without pedestrian actuation are summarized in the table below.

Table – 95th Percentile Queue Length for the SB Movements (ft)

Traffic Control	AM	PM
Signalized (w/o ped)	225 ft	550 ft
Signalized (w/ ped)	300 ft	700 ft

○ Available Southbound Stopping Sight Distance

Sight distance along Lawrence Road is unrestricted in the southbound direction. Southbound vehicles on Lawrence Road travel on a downgrade from Pathmark Drive to the crossing of Langford Run Creek, and then upgrade for 440 feet approaching the intersection of Langford Road. Southbound drivers will be able to see clearly into the intersection of Langford Road all the way from the intersection of Pathmark Drive, for an available southbound sight distance is at least 1,200 feet. Although the southbound queue length at the intersection of Langford Run Road can be as long as 700 feet, sufficient stopping sight distance is available for the southbound vehicles traveling on Lawrence Road.

Sight Distance for Trucks

The above sight distance measurements are based on passenger car operation. Trucks need longer stopping distances at a given speed than passenger cars. There are factors which tend to balance out the additional braking lengths for trucks according to the AASHTO Green Book. The truck driver is able to see substantially farther than a passenger car driver because of the higher seating position in the vehicle. In design, the eye height of a truck driver is normally 7.6 feet above the roadway compared to 3.5 feet for a passenger car driver. In addition, the truck drivers are generally more experienced than the passenger drivers to recognize potential risks and react quicker. *“Separate stopping sight distances for trucks and passenger cars, therefore, are not generally used in highway design.”*¹ However, it is essential that sufficient sight distance is available for the truck drivers. In the case of Lawrence Road, available sight distance for truck drivers in the northbound direction was investigated using the road profile survey file. The measurement reveals that the shortest sight distance for a northbound truck driver occurs when the truck is in the middle of the intersection of Sussex Boulevard. The available sight distance at that location looking ahead to an object 2 feet above the roadway is 610 feet. At a point 100 feet north of Sussex Boulevard, the available sight distance increases to 815 feet. These are illustrated in Figure 4.

Crash History

Crash records on Lawrence Road for the last five years were requested from PennDOT for the segment between the Canterbury Drive/Hillside Lane and Brighton Village Drive. The records show that a total of ten reportable crashes occurred in this segment of Lawrence Road from Year 2005 to Year 2009. None of the crashes occurred at the currently unsignalized intersection of Langford Road or its immediate vicinity. This is not surprising, because of the extremely low volumes currently turning into and out of Langford Road. Research has shown that, in general, when an intersection is signalized it increases the chance of rear end type crashes.

¹ AASHTO Green Book, Fourth Edition, p. 114

Conclusion and Recommendation

It is concluded that the future intersection volumes will meet warrants for a signal. Furthermore, the sight distance is ample in the southbound direction, and meets the minimum safe stopping sight distance in the northbound direction for normal and wet road conditions. The analysis incorporated the following assumptions in the intersection layout and signal operation, which serve to minimize queuing in the northbound direction.

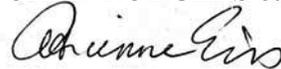
- The signal would be coordinated with the adjacent signal at Sussex Boulevard
- The signal would provide a leading protected-permitted left turn phase on northbound Lawrence Road
- Langford Road would provide separate left and right turn lanes
- The northbound left turn lane on Lawrence Road would be lengthened to provide 200 feet of full width storage.

One factor that needs to be considered is the ability to stop on the northbound downgrade under icy conditions. Vehicles may not be able to stop in time, and attempting to stop may result in spinouts. Therefore the following actions should be considered with installation of a signal:

- Downgrade warning sign for trucks in northbound direction
- An ITS ice detection system that notifies PENNDOT maintenance of the condition so that the road can be salted promptly
- Turning the traffic signal on flash (red on Langford Road, yellow on Lawrence) while icing exists so that vehicles are not required to stop on the downgrade. The Township would need to agree to be responsible for that action, or some automatic interface between the ice detection system and the traffic signal would be needed.

Your review and comments are appreciated. If you concur with the conclusions of the analysis, it would be appropriate to have a meeting of PennDOT, the Township, Marple Associates and ORA to get the Township's input and determine if the full movement intersection should be incorporated into the plan for the project and in the Traffic Impact Study.

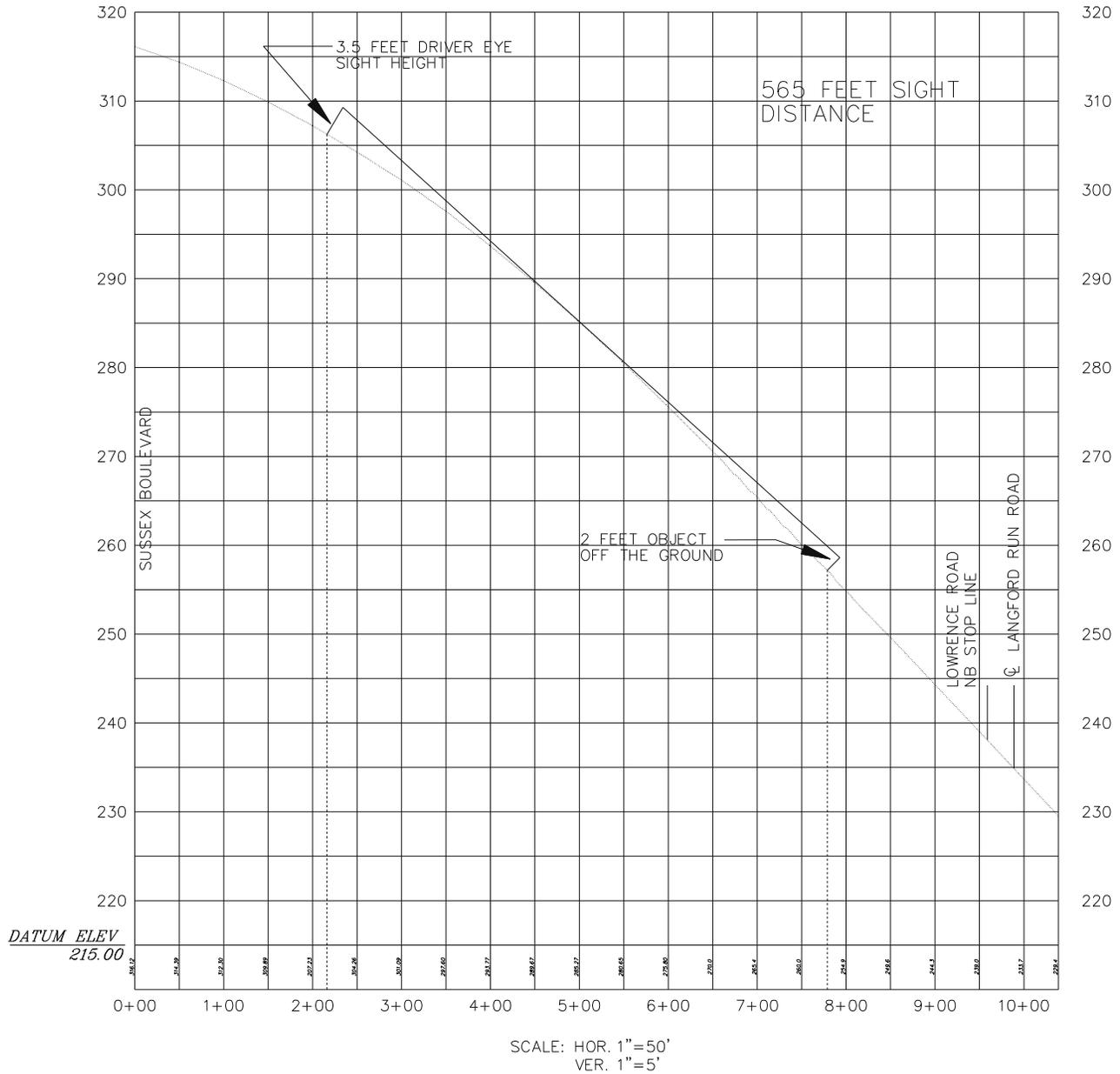
Very truly yours,
ORTH-RODGERS & ASSOCIATES, INC.



ADRIENNE EISS, PTP
Senior Project Manager

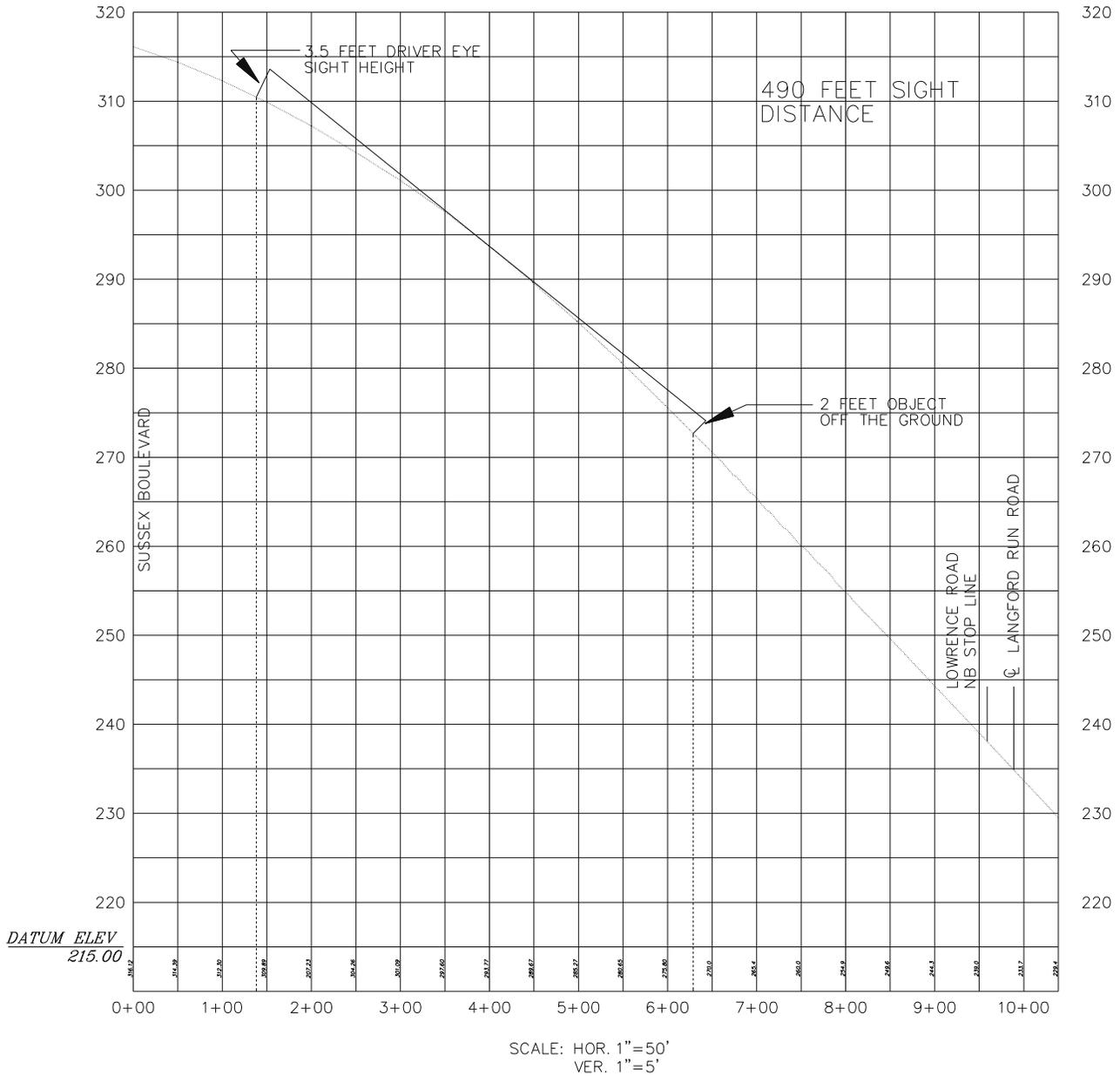
cc: Susan LaPenta
Claude DeBotton
Paul DeBotton
Joseph A. Damico
Dick Orth

FIGURE 1. AVAILABLE NORTHBOUND SIGHT DISTANCE
 LOOKING AT THE BACK OF 180 FEET QUEUE
 AT THE INTERSECTION OF LANGFORD RUN ROAD



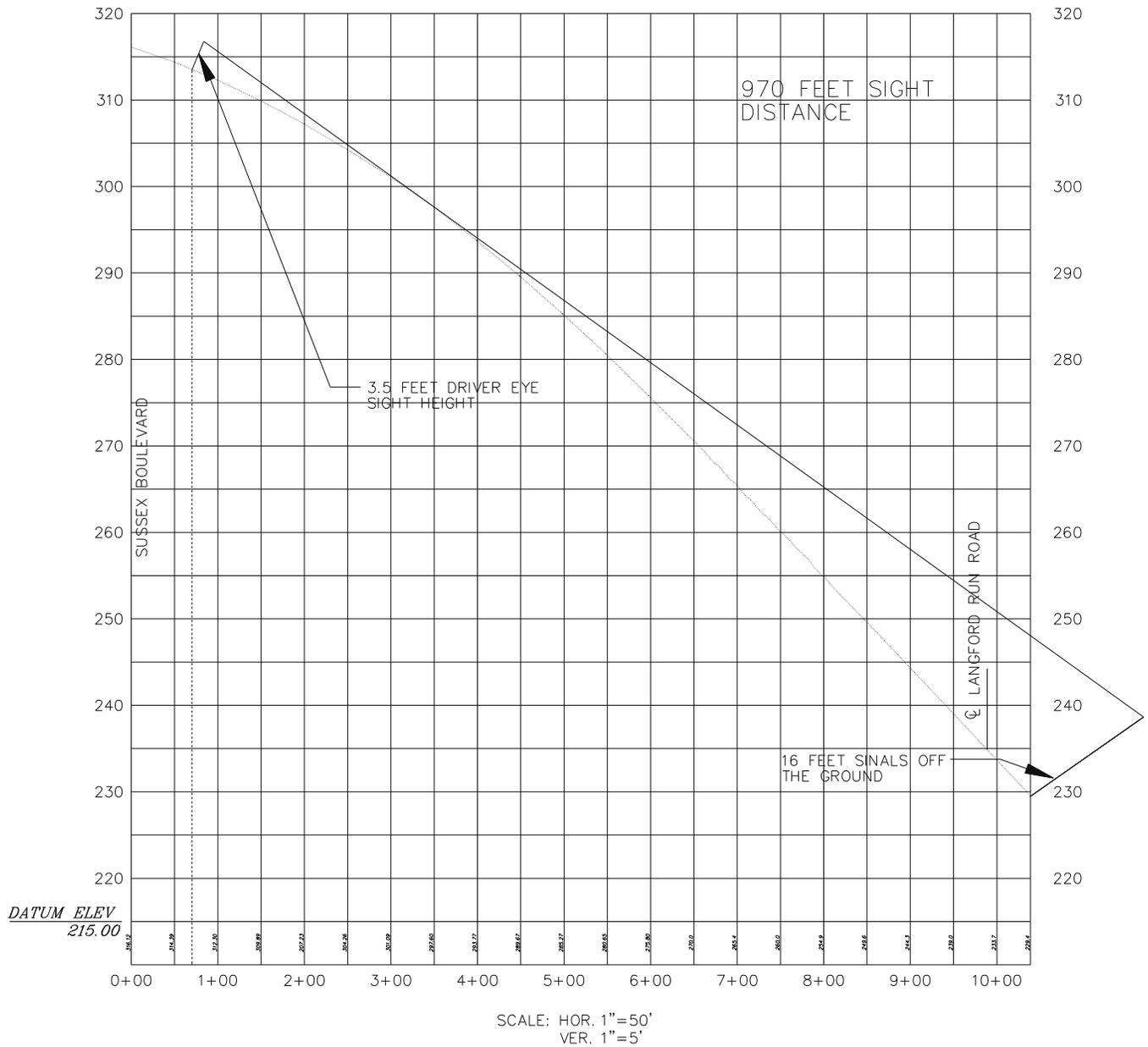
**LAWRENCE ROAD PROFILE
 FROM STA. 0+00 TO 10+38.89**

FIGURE 2. AVAILABLE NORTHBOUND SIGHT DISTANCE
 LOOKING AT THE BACK OF 330 FEET QUEUE
 AT THE INTERSECTION OF LANGFORD RUN ROAD



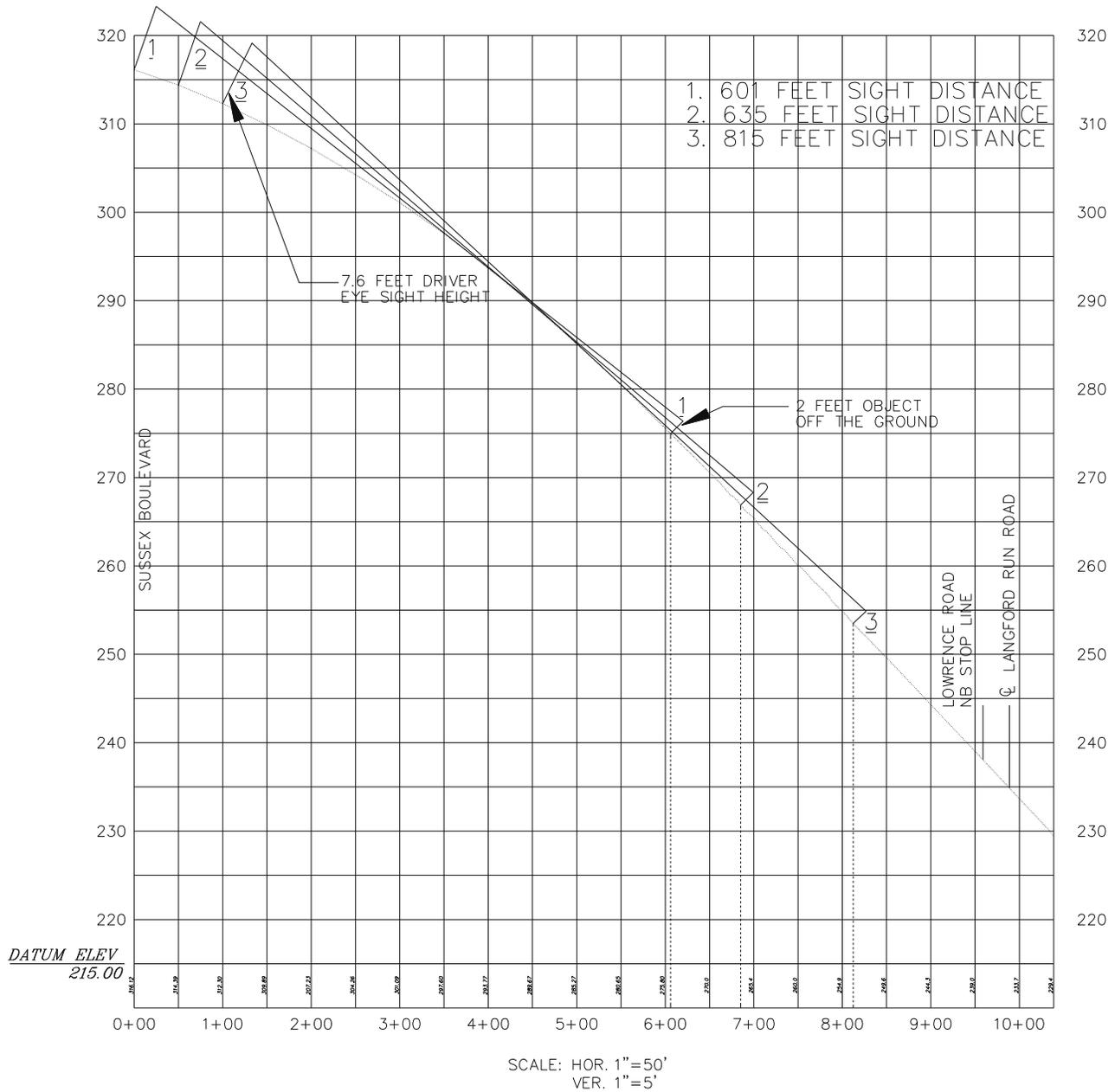
**LAWRENCE ROAD PROFILE
 FROM STA. 0+00 TO 10+38.9**

FIGURE 3. AVAILABLE NORTHBOUND SIGHT DISTANCE
LOOKING INTO THE LANGFORD RUN ROAD SIGNALS



**LAWRENCE ROAD PROFILE
FROM STA. 0+00 TO 10+38.89**

FIGURE 4. AVAILABLE NORTHBOUND SIGHT DISTANCE FOR TRUCK DRIVERS



**LAWRENCE ROAD PROFILE
 FROM STA. 0+00 TO 10+38.9**

From: Federico, Al P. [mailto:APFederico@mccormicktaylor.com]
Sent: Friday, October 01, 2010 4:04 PM
To: Adrienne Eiss
Cc: Dick Orth
Subject: RE: Marple Associates - Lawrence & Langford Rd

The Traffic Signal Section reviewed the alternative analysis of traffic control for the intersection of Lawrence Rd and Langford Rd submitted by OR&A dated August 26th, 2010 and has following comments:

- Due to the steep downgrade of 10 %, it not desirable to stop the northbound traffic on Lawrence Rd with traffic signal to allow left out of Langford Rd.
- Evaluate the warrants as well as feasibility to provide half signal to allow left in/right in-out of Langford Rd. This will eliminate the need to stop traffic on steep downgrade.
- Motorists destined to make left out of Langford Rd can make right out of site driveway at West Chester Pike. This will not degrade the levels of service significantly since all the diverted traffic will be making right out which can be overlapping heavy movement of left in.

In conclusion, we do not recommend full movement signalized intersection of Lawrence Rd and Langford rd.

Albert Federico, P.E., PTOE
McCormick Taylor
Phone: 610.640.3500
Fax: 610.640.3503

From: Adrienne Eiss [mailto:aeiss@orth-rodgers.com]
Sent: Friday, October 01, 2010 4:02 PM
To: Federico, Al P.
Cc: Dick Orth
Subject: Marple Associates - Lawrence & Langford Rd

Al, could you please call me regarding the review of our 8-26-10 submission? We are looking forward to receiving the review so that we can complete the TIS.

Thank you
Adrienne

Adrienne Eiss, PTP
Senior Project Manager
Orth-Rodgers & Associates, Inc.
301 Lindenwood Drive, Suite 130
Malvern, PA 19355
Phone: (610) 407-9700 Ext. 12
Fax: (610) 407-9600
aeiss@orth-rodgers.com

K – Capacity and Queue Analysis

Output “Existing Conditions”:

HCM Signalized Intersection Capacity Analysis

2: West Chester Pike & N Lawrence Rd

Existing AM
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	548	1286	1848	40	51	849
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3283	3451	5158		1718	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3283	3451	5158		1718	1628
Peak-hour factor, PHF	0.94	0.96	0.97	0.50	0.85	0.93
Adj. Flow (vph)	583	1340	1905	80	60	913
RTOR Reduction (vph)	0	0	3	0	0	1
Lane Group Flow (vph)	583	1340	1982	0	60	912
Heavy Vehicles (%)	4%	2%	2%	13%	8%	2%
Turn Type	Prot			custom		
Protected Phases	5	2	6		4	4 5
Permitted Phases						4
Actuated Green, G (s)	22.4	79.0	51.6		9.0	37.4
Effective Green, g (s)	22.4	79.0	51.6		9.0	37.4
Actuated g/C Ratio	0.22	0.79	0.52		0.09	0.37
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	735	2726	2662		155	609
v/s Ratio Prot	0.18	0.39	c0.38		0.03	c0.56
v/s Ratio Perm						
v/c Ratio	0.79	0.49	0.74		0.39	1.50
Uniform Delay, d1	36.6	3.6	19.0		42.9	31.3
Progression Factor	0.98	1.22	0.87		1.00	1.00
Incremental Delay, d2	4.5	0.5	1.8		1.6	232.7
Delay (s)	40.4	4.9	18.4		44.5	264.0
Level of Service	D	A	B		D	F
Approach Delay (s)		15.7	18.4		250.5	
Approach LOS		B	B		F	

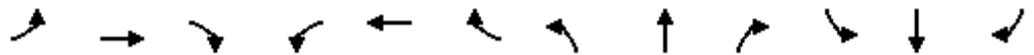
Intersection Summary

HCM Average Control Delay	63.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

Existing AM
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	1406	17	26	1254	15	27	18	67	102	32	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%			0%	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.97	
Satd. Flow (prot)	1736	3548		1676	3482			1619	1463		1772	
Flt Permitted	0.95	1.00		0.95	1.00			0.77	1.00		0.77	
Satd. Flow (perm)	1736	3548		1676	3482			1289	1463		1417	
Peak-hour factor, PHF	0.54	0.94	0.61	0.65	0.94	0.94	0.91	0.75	0.88	0.91	0.80	0.54
Adj. Flow (vph)	24	1496	28	40	1334	16	30	24	76	112	40	24
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	64	0	6	0
Lane Group Flow (vph)	24	1523	0	40	1349	0	0	54	12	0	170	0
Heavy Vehicles (%)	1%	2%	0%	0%	3%	0%	7%	6%	3%	1%	6%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)	2.8	61.7		4.4	63.3			15.9	15.9		15.9	
Effective Green, g (s)	2.8	61.7		4.4	63.3			15.9	15.9		15.9	
Actuated g/C Ratio	0.03	0.62		0.04	0.63			0.16	0.16		0.16	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	49	2189		74	2204			205	233		225	
v/s Ratio Prot	0.01	c0.43		c0.02	0.39							
v/s Ratio Perm								0.04	0.01		c0.12	
v/c Ratio	0.49	0.70		0.54	0.61			0.26	0.05		0.76	
Uniform Delay, d1	47.9	12.9		46.8	11.0			36.9	35.7		40.2	
Progression Factor	1.00	1.00		0.96	0.98			1.00	1.00		1.00	
Incremental Delay, d2	7.5	1.9		7.2	1.2			0.7	0.1		13.5	
Delay (s)	55.4	14.7		51.9	12.0			37.6	35.8		53.7	
Level of Service	E	B		D	B			D	D		D	
Approach Delay (s)		15.3			13.1			36.5			53.7	
Approach LOS		B			B			D			D	

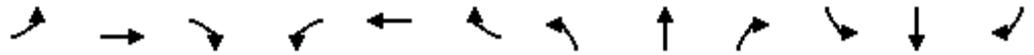
Intersection Summary

HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

Existing AM
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↗				↖↖	↑	
Volume (vph)	0	1300	0	0	1040	0	0	0	0	762	1	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	
Lane Util. Factor		0.91			0.95					0.97	1.00	
Frt		1.00			1.00					1.00	1.00	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		5137			3435					3414	887	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		5137			3435					3414	887	
Peak-hour factor, PHF	0.94	0.91	0.94	0.93	0.95	0.69	0.92	0.92	0.92	0.94	0.25	0.94
Adj. Flow (vph)	0	1429	0	0	1095	0	0	0	0	811	4	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1429	0	0	1095	0	0	0	0	811	4	0
Heavy Vehicles (%)	2%	3%	3%	2%	3%	2%	2%	2%	2%	6%	100%	1%
Turn Type						custom					Perm	
Protected Phases		2			6	4 6						4
Permitted Phases										4		
Actuated Green, G (s)		57.6			57.6					30.4	30.4	
Effective Green, g (s)		57.6			57.6					30.4	30.4	
Actuated g/C Ratio		0.58			0.58					0.30	0.30	
Clearance Time (s)		6.0			6.0					6.0	6.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		2959			1979					1038	270	
v/s Ratio Prot		0.28			c0.32						0.00	
v/s Ratio Perm										c0.24		
v/c Ratio		0.48			0.55					0.78	0.01	
Uniform Delay, d1		12.5			13.2					31.8	24.3	
Progression Factor		1.44			1.38					1.00	1.00	
Incremental Delay, d2		0.5			0.1					3.9	0.0	
Delay (s)		18.4			18.3					35.7	24.4	
Level of Service		B			B					D	C	
Approach Delay (s)		18.4			18.3			0.0			35.6	
Approach LOS		B			B			A			D	

Intersection Summary

HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: West Chester Pike & I-476 NB

Existing AM
6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	381	1681	0	0	1390	177	145	10	239	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.97		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.97	1.00			
Satd. Flow (prot)	1893	5016			4830		1754	1791	1568			
Flt Permitted	0.95	1.00			1.00		0.95	0.97	1.00			
Satd. Flow (perm)	1893	5016			4830		1754	1791	1568			
Peak-hour factor, PHF	0.81	0.96	0.98	0.93	0.95	0.58	0.84	0.25	0.77	0.92	0.92	0.92
Adj. Flow (vph)	470	1751	0	0	1463	305	173	40	310	0	0	0
RTOR Reduction (vph)	0	0	0	0	32	0	0	0	17	0	0	0
Lane Group Flow (vph)	470	1751	0	0	1736	0	106	107	293	0	0	0
Heavy Vehicles (%)	1%	6%	2%	2%	2%	2%	1%	1%	3%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	27.3	65.3			32.0		22.7	22.7	22.7			
Effective Green, g (s)	27.3	65.3			32.0		22.7	22.7	22.7			
Actuated g/C Ratio	0.27	0.65			0.32		0.23	0.23	0.23			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	517	3275			1546		398	407	356			
v/s Ratio Prot	c0.25	0.35			c0.36							
v/s Ratio Perm							0.06	0.06	c0.19			
v/c Ratio	0.91	0.53			1.12		0.27	0.26	0.82			
Uniform Delay, d1	35.2	9.2			34.0		31.8	31.8	36.7			
Progression Factor	1.21	0.94			1.00		1.00	1.00	1.00			
Incremental Delay, d2	18.1	0.5			61.3		0.4	0.3	14.2			
Delay (s)	60.6	9.2			95.2		32.2	32.1	50.9			
Level of Service	E	A			F		C	C	D			
Approach Delay (s)		20.1			95.2			43.3			0.0	
Approach LOS		C			F			D			A	
Intersection Summary												
HCM Average Control Delay			52.2			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.97									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			71.2%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: West Chester Pike & S Lawrence Rd

Existing AM
6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↑↑	↑↑	↑↑	↑
Volume (vph)	1417	503	289	2408	558	417
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5212	1577	3318	3487	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5212	1577	3318	3487	3433	1568
Peak-hour factor, PHF	0.96	0.89	0.90	0.95	0.86	0.94
Adj. Flow (vph)	1476	565	321	2535	649	444
RTOR Reduction (vph)	0	15	0	0	0	4
Lane Group Flow (vph)	1476	550	321	2535	649	440
Heavy Vehicles (%)	2%	5%	5%	3%	2%	3%
Turn Type		pt+ov	Prot			pt+ov
Protected Phases	2	2 8	1	6	8	8 1
Permitted Phases						
Actuated Green, G (s)	44.0	75.6	12.4	62.4	25.6	44.0
Effective Green, g (s)	44.0	75.6	12.4	62.4	25.6	44.0
Actuated g/C Ratio	0.44	0.76	0.12	0.62	0.26	0.44
Clearance Time (s)	6.0		6.0	6.0	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	2293	1192	411	2176	879	690
v/s Ratio Prot	0.28	0.35	0.10	c0.73	c0.19	0.28
v/s Ratio Perm						
v/c Ratio	0.64	0.46	0.78	1.16	0.74	0.64
Uniform Delay, d1	21.9	4.6	42.5	18.8	34.1	21.8
Progression Factor	1.26	2.86	1.22	0.70	1.00	1.00
Incremental Delay, d2	1.2	0.2	2.4	75.7	3.3	1.9
Delay (s)	28.8	13.3	54.3	88.8	37.4	23.7
Level of Service	C	B	D	F	D	C
Approach Delay (s)	24.5			85.0	31.9	
Approach LOS	C			F	C	

Intersection Summary

HCM Average Control Delay	54.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

Existing AM
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1291	46	61	1850	9	20	0	35	4	0	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.91	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)		3312		1705	5129			1415	1227		1570	
Flt Permitted		1.00		0.95	1.00			0.73	1.00		0.89	
Satd. Flow (perm)		3312		1705	5129			1089	1227		1418	
Peak-hour factor, PHF	0.92	0.95	0.77	0.85	0.95	0.75	0.83	0.25	0.55	0.33	0.25	0.64
Adj. Flow (vph)	0	1359	60	72	1947	12	24	0	64	12	0	28
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	60	0	26	0
Lane Group Flow (vph)	0	1417	0	72	1959	0	0	24	4	0	14	0
Heavy Vehicles (%)	2%	6%	9%	8%	3%	11%	25%	0%	29%	0%	0%	6%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		67.8		8.4	81.2			6.8	6.8		6.8	
Effective Green, g (s)		67.8		8.4	81.2			6.8	6.8		6.8	
Actuated g/C Ratio		0.68		0.08	0.81			0.07	0.07		0.07	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2246		143	4165			74	83		96	
v/s Ratio Prot		c0.43		0.04	c0.38							
v/s Ratio Perm								c0.02	0.00		0.01	
v/c Ratio		0.63		0.50	0.47			0.32	0.05		0.14	
Uniform Delay, d1		9.1		43.8	2.9			44.4	43.6		43.9	
Progression Factor		1.23		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.2		2.8	0.4			2.5	0.3		0.7	
Delay (s)		12.4		46.6	3.2			47.0	43.9		44.6	
Level of Service		B		D	A			D	D		D	
Approach Delay (s)		12.4			4.8			44.7			44.6	
Approach LOS		B			A			D			D	

Intersection Summary

HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

3: Langford Run Road & Lawrence Road

Existing AM
6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕↕	↗↖	
Volume (veh/h)	0	2	1	1024	571	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.25	0.25	0.98	0.91	0.25
Hourly flow rate (vph)	0	8	4	1045	627	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.80					
vC, conflicting volume	1160	316	631			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	694	316	631			
tC, single (s)	6.8	7.9	6.1			
tC, 2 stage (s)						
tF (s)	3.5	3.8	3.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	298	557	504			
Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	8	4	522	522	418	213
Volume Left	0	4	0	0	0	0
Volume Right	8	0	0	0	0	4
cSH	557	504	1700	1700	1700	1700
Volume to Capacity	0.01	0.01	0.31	0.31	0.25	0.13
Queue Length 95th (ft)	1	1	0	0	0	0
Control Delay (s)	11.6	12.2	0.0	0.0	0.0	0.0
Lane LOS	B	B				
Approach Delay (s)	11.6	0.0			0.0	
Approach LOS	B					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			31.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

5: Sussex Blvd & Lawrence Road

Existing AM
6/22/2011



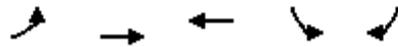
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔			↔↔			↔↔	
Volume (vph)	32	14	25	21	3	155	8	838	4	58	504	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.89			1.00			1.00	
Flt Protected		0.98			0.99			1.00			0.99	
Satd. Flow (prot)		1854			1824			3499			3428	
Flt Permitted		0.54			0.93			0.94			0.77	
Satd. Flow (perm)		1023			1715			3307			2656	
Peak-hour factor, PHF	0.57	0.44	0.63	0.75	0.75	0.88	0.67	0.88	0.33	0.91	0.93	0.67
Adj. Flow (vph)	56	32	40	28	4	176	12	952	12	64	542	16
RTOR Reduction (vph)	0	27	0	0	153	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	101	0	0	55	0	0	975	0	0	621	0
Heavy Vehicles (%)	6%	0%	20%	10%	0%	3%	0%	3%	0%	0%	5%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		10.3			10.3			30.0			56.7	
Effective Green, g (s)		10.3			10.3			30.0			56.7	
Actuated g/C Ratio		0.13			0.13			0.38			0.73	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		135			226			1272			2145	
v/s Ratio Prot											c0.08	
v/s Ratio Perm		c0.10			0.03			c0.29			0.13	
v/c Ratio		0.75			0.24			0.77			0.29	
Uniform Delay, d1		32.6			30.4			20.9			3.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		20.1			0.6			4.5			0.3	
Delay (s)		52.7			30.9			25.4			4.0	
Level of Service		D			C			C			A	
Approach Delay (s)		52.7			30.9			25.4			4.0	
Approach LOS		D			C			C			A	

Intersection Summary

HCM Average Control Delay	20.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Queues
2: West Chester Pike & N Lawrence Rd

Existing AM
6/22/2011



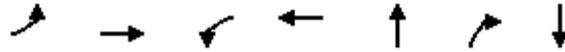
Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	583	1340	1985	60	913
v/c Ratio	0.79	0.49	0.74	0.39	1.54
Control Delay	42.1	5.0	19.2	50.8	278.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.1	5.0	19.2	50.8	278.4
Queue Length 50th (ft)	187	87	350	37	-831
Queue Length 95th (ft)	243	184	465	73	#1006
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290				
Base Capacity (vph)	1215	2726	2666	155	593
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.48	0.49	0.74	0.39	1.54

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: West Chester Pike & N New Ardmore Ave

Existing AM
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	24	1524	40	1350	54	76	176
v/c Ratio	0.21	0.67	0.35	0.58	0.26	0.26	0.76
Control Delay	48.8	15.1	48.8	12.6	38.9	10.5	58.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.8	15.1	48.8	12.6	38.9	10.5	58.9
Queue Length 50th (ft)	15	360	20	257	30	0	103
Queue Length 95th (ft)	24	462	35	537	53	37	150
Internal Link Dist (ft)		672		282	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	122	2276	120	2330	245	340	275
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.67	0.33	0.58	0.22	0.22	0.64

Intersection Summary

Queues
10: West Chester Pike & I-476 SB Off-Ramp

Existing AM
6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT
Lane Group Flow (vph)	1429	1095	717	811	4
v/c Ratio	0.48	0.55	0.46	0.78	0.01
Control Delay	19.5	19.6	4.3	37.2	21.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	19.5	19.6	4.3	37.2	21.0
Queue Length 50th (ft)	306	195	66	242	2
Queue Length 95th (ft)	368	m177	m0	281	2
Internal Link Dist (ft)	564	662			574
Turn Bay Length (ft)				415	
Base Capacity (vph)	2960	1979	1552	1400	364
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.48	0.55	0.46	0.58	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

Existing AM
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	470	1751	1768	106	107	310
v/c Ratio	0.91	0.53	1.12	0.27	0.26	0.83
Control Delay	64.9	9.9	90.6	32.2	32.1	52.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.9	9.9	90.6	32.2	32.1	52.8
Queue Length 50th (ft)	192	206	323	57	58	174
Queue Length 95th (ft)	#419	228	m231	95	26	213
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	517	3276	1577	474	484	439
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.53	1.12	0.22	0.22	0.71

Intersection Summary

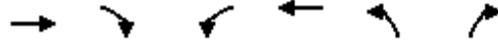
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
18: West Chester Pike & S Lawrence Rd

Existing AM
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1476	565	321	2535	649	444
v/c Ratio	0.64	0.47	0.78	1.16	0.74	0.64
Control Delay	29.9	13.8	55.3	92.9	39.7	25.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.9	13.8	55.3	92.9	39.7	25.7
Queue Length 50th (ft)	354	229	111	~1051	191	204
Queue Length 95th (ft)	408	350	m121	m#912	239	296
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2295	1208	498	2177	927	678
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.47	0.64	1.16	0.70	0.65

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues
26: West Chester Pike & Old West Chester Pike

Existing AM
6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1419	72	1959	24	64	40
v/c Ratio	0.60	0.44	0.46	0.28	0.41	0.29
Control Delay	13.9	50.3	3.4	50.6	19.3	26.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.9	50.3	3.4	50.6	19.3	26.3
Queue Length 50th (ft)	298	44	109	15	0	7
Queue Length 95th (ft)	417	81	160	11	9	0
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2363	273	4290	174	250	251
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.26	0.46	0.14	0.26	0.16

Intersection Summary

Queues
5: Sussex Blvd & Lawrence Road

Existing AM
6/22/2011

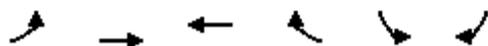


Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	128	208	976	622
v/c Ratio	0.79	0.55	0.77	0.29
Control Delay	55.3	13.1	25.8	4.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	55.3	13.1	25.8	4.3
Queue Length 50th (ft)	46	14	212	42
Queue Length 95th (ft)	35	42	275	78
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	349	669	1274	2135
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.37	0.31	0.77	0.29
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

2: West Chester Pike & N Lawrence Rd

Existing PM
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1097	1798	1442	86	101	796
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3347	3451	5168		1819	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3347	3451	5168		1819	1628
Peak-hour factor, PHF	0.98	0.95	0.87	0.86	0.74	0.95
Adj. Flow (vph)	1119	1893	1657	100	136	838
RTOR Reduction (vph)	0	0	5	0	0	1
Lane Group Flow (vph)	1119	1893	1752	0	136	837
Turn Type	Prot			custom		
Protected Phases	5	2	6		4	4
Permitted Phases						5
Actuated Green, G (s)	46.3	95.0	43.7		13.0	59.3
Effective Green, g (s)	46.3	95.0	43.7		13.0	59.3
Actuated g/C Ratio	0.39	0.79	0.36		0.11	0.49
Clearance Time (s)	5.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	1291	2732	1882		197	886
v/s Ratio Prot	0.33	0.55	c0.34		0.07	c0.10
v/s Ratio Perm						0.41
v/c Ratio	0.87	0.69	0.93		0.69	0.95
Uniform Delay, d1	34.0	5.8	36.7		51.6	28.8
Progression Factor	1.76	1.71	0.99		1.00	1.00
Incremental Delay, d2	0.6	0.1	9.3		10.0	18.2
Delay (s)	60.3	10.0	45.7		61.5	47.0
Level of Service	E	B	D		E	D
Approach Delay (s)		28.7	45.7		49.1	
Approach LOS		C	D		D	

Intersection Summary

HCM Average Control Delay	37.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

3: West Chester Pike & N New Ardmore Ave

Existing PM
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	1559	35	16	1635	19	49	18	4	15	15	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%				0%
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85			0.95
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00			0.98
Satd. Flow (prot)	1702	3509		1643	3514			1698	1492			1757
Flt Permitted	0.95	1.00		0.95	1.00			0.75	1.00			0.84
Satd. Flow (perm)	1702	3509		1643	3514			1315	1492			1498
Peak-hour factor, PHF	0.88	0.95	0.80	1.00	0.88	0.68	0.94	0.75	0.50	0.47	0.75	0.61
Adj. Flow (vph)	128	1641	44	16	1858	28	52	24	8	32	20	28
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	7	0	16	0
Lane Group Flow (vph)	128	1684	0	16	1885	0	0	76	1	0	64	0
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	12.3	88.5		3.2	79.4			10.3	10.3			10.3
Effective Green, g (s)	12.3	88.5		3.2	79.4			10.3	10.3			10.3
Actuated g/C Ratio	0.10	0.74		0.03	0.66			0.09	0.09			0.09
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Grp Cap (vph)	174	2588		44	2325			113	128			129
v/s Ratio Prot	c0.08	c0.48		0.01	c0.54							
v/s Ratio Perm								c0.06	0.00			0.04
v/c Ratio	0.74	0.65		0.36	0.81			0.67	0.01			0.49
Uniform Delay, d1	52.3	7.9		57.4	14.8			53.2	50.2			52.4
Progression Factor	1.00	1.00		1.28	1.32			1.00	1.00			1.00
Incremental Delay, d2	14.9	1.3		4.0	2.5			14.6	0.0			2.9
Delay (s)	67.2	9.2		77.4	22.1			67.9	50.2			55.3
Level of Service	E	A		E	C			E	D			E
Approach Delay (s)		13.3			22.6			66.2				55.3
Approach LOS		B			C			E				E

Intersection Summary

HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

Existing PM
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↗				↖↖	↑	
Volume (vph)	0	1393	0	0	1299	0	0	0	0	1458	1	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	
Lane Util. Factor		0.91			0.95					0.97	1.00	
Frt		1.00			1.00					1.00	1.00	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		5187			3468					3583	1756	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		5187			3468					3583	1756	
Peak-hour factor, PHF	0.94	0.94	0.94	0.93	0.94	0.90	0.92	0.92	0.92	0.94	0.25	0.94
Adj. Flow (vph)	0	1482	0	0	1382	0	0	0	0	1551	4	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1482	0	0	1382	0	0	0	0	1551	4	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Turn Type						custom					Perm	
Protected Phases		2			6	4 6						4
Permitted Phases										4		
Actuated Green, G (s)		53.4			53.4					54.6	54.6	
Effective Green, g (s)		53.4			53.4					54.6	54.6	
Actuated g/C Ratio		0.44			0.44					0.46	0.46	
Clearance Time (s)		6.0			6.0					6.0	6.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		2308			1543					1630	799	
v/s Ratio Prot		0.29			c0.40						0.00	
v/s Ratio Perm										c0.43		
v/c Ratio		0.64			0.90					0.95	0.01	
Uniform Delay, d1		25.9			30.7					31.4	17.9	
Progression Factor		1.39			0.43					1.00	1.00	
Incremental Delay, d2		1.1			5.3					12.6	0.0	
Delay (s)		37.1			18.5					44.1	17.9	
Level of Service		D			B					D	B	
Approach Delay (s)		37.1			18.5			0.0			44.0	
Approach LOS		D			B			A			D	

Intersection Summary

HCM Average Control Delay	33.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

Existing PM
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  							
Volume (vph)	317	2534	0	0	1310	0	253	0	488	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			1.00		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1874	5212			4958		1754	1754	1599			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1874	5212			4958		1754	1754	1599			
Peak-hour factor, PHF	0.83	0.95	0.98	0.93	0.87	0.93	0.93	0.25	0.94	0.92	0.92	0.92
Adj. Flow (vph)	382	2667	0	0	1506	0	272	0	519	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	1	0	0	0
Lane Group Flow (vph)	382	2667	0	0	1506	0	136	136	518	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	25.0	72.0			41.0		36.0	36.0	36.0			
Effective Green, g (s)	25.0	72.0			41.0		36.0	36.0	36.0			
Actuated g/C Ratio	0.21	0.60			0.34		0.30	0.30	0.30			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	390	3127			1694		526	526	480			
v/s Ratio Prot	c0.20	c0.51			0.30							
v/s Ratio Perm							0.08	0.08	c0.32			
v/c Ratio	0.98	0.85			0.89		0.26	0.26	1.08			
Uniform Delay, d1	47.2	19.7			37.3		31.9	31.9	42.0			
Progression Factor	1.54	0.71			0.93		1.00	1.00	1.00			
Incremental Delay, d2	34.5	1.8			4.9		0.3	0.3	63.8			
Delay (s)	107.2	15.7			39.7		32.1	32.1	105.8			
Level of Service	F	B			D		C	C	F			
Approach Delay (s)		27.2			39.7			80.5			0.0	
Approach LOS		C			D			F			A	
Intersection Summary												
HCM Average Control Delay			38.6				HCM Level of Service				D	
HCM Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)				12.0	
Intersection Capacity Utilization			89.2%				ICU Level of Service				E	
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

Existing PM
 6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↙↘	↑↑	↙↘	↗
Volume (vph)	2472	550	538	1700	283	423
Ideal Flow (vphpl)	2100	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5761	1623	3416	3522	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5761	1623	3416	3522	3433	1583
Peak-hour factor, PHF	0.95	0.83	0.95	0.87	0.82	0.93
Adj. Flow (vph)	2602	663	566	1954	345	455
RTOR Reduction (vph)	0	6	0	0	0	0
Lane Group Flow (vph)	2602	657	566	1954	345	455
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	48.6	84.7	23.3	77.9	30.1	53.4
Effective Green, g (s)	48.6	84.7	23.3	77.9	30.1	53.4
Actuated g/C Ratio	0.41	0.71	0.19	0.65	0.25	0.44
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		4.0	3.0	2.0	2.0
Lane Grp Cap (vph)	2333	1146	663	2286	861	784
v/s Ratio Prot	c0.45	0.40	0.17	c0.55	0.10	c0.15
v/s Ratio Perm						0.14
v/c Ratio	1.12	0.57	0.85	0.85	0.40	0.58
Uniform Delay, d1	35.7	8.7	46.7	16.6	37.4	24.9
Progression Factor	0.70	1.39	1.03	1.43	1.00	1.00
Incremental Delay, d2	55.2	0.2	4.2	1.6	0.1	0.7
Delay (s)	80.1	12.4	52.4	25.3	37.5	25.6
Level of Service	F	B	D	C	D	C
Approach Delay (s)	66.4			31.4	30.8	
Approach LOS	E			C	C	

Intersection Summary

HCM Average Control Delay	48.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

Existing PM
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1839	60	64	1386	17	139	1	122	2	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.94	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.97	
Satd. Flow (prot)		3462		1497	5128			1741	1583		1679	
Flt Permitted		1.00		0.95	1.00			0.72	1.00		0.81	
Satd. Flow (perm)		3462		1497	5128			1317	1583		1407	
Peak-hour factor, PHF	0.92	0.93	0.79	0.80	0.97	0.85	0.83	0.25	0.74	0.25	0.25	0.50
Adj. Flow (vph)	0	1977	76	80	1429	20	167	4	165	8	0	6
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	110	0	5	0
Lane Group Flow (vph)	0	2051	0	80	1448	0	0	171	55	0	9	0
Heavy Vehicles (%)	2%	1%	18%	23%	3%	0%	2%	0%	0%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		76.8		10.2	92.0			16.0	16.0		16.0	
Effective Green, g (s)		76.8		10.2	92.0			16.0	16.0		16.0	
Actuated g/C Ratio		0.64		0.08	0.77			0.13	0.13		0.13	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2216		127	3931			176	211		188	
v/s Ratio Prot		c0.59		c0.05	0.28							
v/s Ratio Perm								c0.13	0.03		0.01	
v/c Ratio		0.93		0.63	0.37			0.97	0.26		0.05	
Uniform Delay, d1		19.1		53.1	4.6			51.8	46.7		45.3	
Progression Factor		0.68		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		6.1		9.4	0.3			59.2	0.7		0.1	
Delay (s)		19.2		62.5	4.8			110.9	47.3		45.5	
Level of Service		B		E	A			F	D		D	
Approach Delay (s)		19.2			7.8			79.7			45.5	
Approach LOS		B			A			E			D	

Intersection Summary

HCM Average Control Delay	20.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

3: Langford Run Road & Lawrence Road

Existing PM
6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕↕	↗↖	
Volume (veh/h)	0	2	1	677	1052	4
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.50	0.25	0.92	0.89	0.50
Hourly flow rate (vph)	0	4	4	736	1182	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.93					
vC, conflicting volume	1562	595	1190			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1459	595	1190			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	111	452	594			
Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	4	4	368	368	788	402
Volume Left	0	4	0	0	0	0
Volume Right	4	0	0	0	0	8
cSH	452	594	1700	1700	1700	1700
Volume to Capacity	0.01	0.01	0.22	0.22	0.46	0.24
Queue Length 95th (ft)	1	1	0	0	0	0
Control Delay (s)	13.0	11.1	0.0	0.0	0.0	0.0
Lane LOS	B	B				
Approach Delay (s)	13.0	0.1			0.0	
Approach LOS	B					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			39.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

5: Sussex Blvd & Lawrence Road

Existing PM
6/22/2011



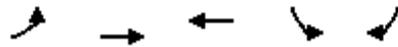
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	43	18	32	20	7	90	8	545	31	132	878	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.97			0.91			0.99			0.99	
Flt Protected		0.97			0.99			1.00			0.99	
Satd. Flow (prot)		2031			1929			3508			3531	
Flt Permitted		0.70			0.87			0.92			0.65	
Satd. Flow (perm)		1454			1694			3220			2327	
Peak-hour factor, PHF	0.32	0.30	0.53	0.46	0.58	0.73	0.67	0.93	0.78	0.81	0.83	0.69
Adj. Flow (vph)	134	60	60	43	12	123	12	586	40	163	1058	64
RTOR Reduction (vph)	0	16	0	0	96	0	0	6	0	0	4	0
Lane Group Flow (vph)	0	238	0	0	82	0	0	632	0	0	1281	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		17.2			17.2			30.0			49.8	
Effective Green, g (s)		17.2			17.2			30.0			49.8	
Actuated g/C Ratio		0.22			0.22			0.38			0.64	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		321			374			1238			1714	
v/s Ratio Prot											c0.14	
v/s Ratio Perm		c0.16			0.05			0.20			c0.34	
v/c Ratio		0.74			0.22			0.51			0.75	
Uniform Delay, d1		28.3			24.9			18.4			9.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		8.9			0.3			1.5			3.0	
Delay (s)		37.2			25.2			19.9			12.8	
Level of Service		D			C			B			B	
Approach Delay (s)		37.2			25.2			19.9			12.8	
Approach LOS		D			C			B			B	

Intersection Summary

HCM Average Control Delay	18.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Queues
2: West Chester Pike & N Lawrence Rd

Existing PM
6/22/2011



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	1119	1893	1757	136	838
v/c Ratio	0.87	0.69	0.93	0.69	0.96
Control Delay	60.0	10.3	46.3	70.3	49.0
Queue Delay	0.0	0.1	0.0	0.0	40.1
Total Delay	60.0	10.4	46.3	70.3	89.1
Queue Length 50th (ft)	456	156	483	103	592
Queue Length 95th (ft)	m414	m151	m#624	139	#818
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290				
Base Capacity (vph)	1478	2732	1888	197	872
Starvation Cap Reductn	0	106	0	0	0
Spillback Cap Reductn	0	0	0	0	107
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.76	0.72	0.93	0.69	1.10

Intersection Summary

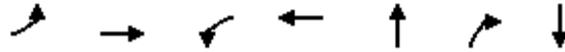
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

Existing PM
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	128	1685	16	1886	76	8	80
v/c Ratio	0.73	0.61	0.17	0.80	0.60	0.05	0.51
Control Delay	76.1	9.3	71.7	24.1	70.3	25.8	50.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	76.1	9.3	71.7	24.1	70.3	25.8	50.2
Queue Length 50th (ft)	95	214	12	783	57	0	46
Queue Length 95th (ft)	#188	508	m18	843	88	6	76
Internal Link Dist (ft)		672		282	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	182	2765	164	2361	164	194	203
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.61	0.10	0.80	0.46	0.04	0.39

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
10: West Chester Pike & I-476 SB Off-Ramp

Existing PM
6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT
Lane Group Flow (vph)	1482	1382	293	1551	4
v/c Ratio	0.64	0.90	0.19	0.95	0.01
Control Delay	37.5	19.5	0.1	45.3	18.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	37.5	19.5	0.1	45.3	18.0
Queue Length 50th (ft)	353	111	0	578	2
Queue Length 95th (ft)	499	#178	m0	#742	3
Internal Link Dist (ft)	564	662			574
Turn Bay Length (ft)				415	
Base Capacity (vph)	2309	1544	1552	1642	805
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	54	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.66	0.90	0.19	0.94	0.00

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

Existing PM
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	382	2667	1506	136	136	519
v/c Ratio	0.98	0.85	0.89	0.26	0.26	1.08
Control Delay	105.9	16.0	40.1	33.5	33.5	104.2
Queue Delay	0.0	0.9	0.0	0.0	0.0	0.0
Total Delay	105.9	16.9	40.1	33.5	33.5	104.2
Queue Length 50th (ft)	314	541	431	84	84	~449
Queue Length 95th (ft)	#427	574	396	141	35	#667
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	390	3127	1694	526	526	481
Starvation Cap Reductn	0	210	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.91	0.89	0.26	0.26	1.08

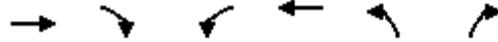
Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
18: West Chester Pike & S Lawrence Rd

Existing PM
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	2602	663	566	1954	345	455
v/c Ratio	1.11	0.58	0.85	0.85	0.40	0.58
Control Delay	81.3	13.6	53.5	26.9	38.1	24.0
Queue Delay	0.0	2.0	0.0	2.0	0.0	0.0
Total Delay	81.3	15.6	53.5	29.0	38.1	24.0
Queue Length 50th (ft)	~896	390	226	570	115	236
Queue Length 95th (ft)	m#1020	m462	m248	m753	130	301
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2335	1152	692	2287	1087	783
Starvation Cap Reductn	0	326	0	200	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.11	0.80	0.82	0.94	0.32	0.58

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
 26: West Chester Pike & Old West Chester Pike

Existing PM
 6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	2053	80	1449	171	165	14
v/c Ratio	0.91	0.55	0.37	0.97	0.51	0.07
Control Delay	20.0	65.3	4.8	113.2	19.9	34.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	65.3	4.8	113.2	19.9	34.8
Queue Length 50th (ft)	386	60	112	134	27	5
Queue Length 95th (ft)	#996	96	131	52	58	4
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2245	200	3933	176	321	193
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.40	0.37	0.97	0.51	0.07

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Queues
5: Sussex Blvd & Lawrence Road

Existing PM
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	254	178	638	1285
v/c Ratio	0.75	0.38	0.51	0.75
Control Delay	39.5	10.7	19.9	14.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	39.5	10.7	19.9	14.3
Queue Length 50th (ft)	106	22	120	163
Queue Length 95th (ft)	39	23	168	#244
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	480	627	1245	1703
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.53	0.28	0.51	0.75

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

2: West Chester Pike & N Lawrence Rd

Existing Saturday
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔↔	↑↑	↑↑↑↔		↔	↔
Volume (vph)	645	1488	1345	90	90	601
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3414	3485	5213		1856	1660
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3414	3485	5213		1856	1660
Peak-hour factor, PHF	0.93	0.91	0.90	0.80	0.90	0.91
Adj. Flow (vph)	694	1635	1494	112	100	660
RTOR Reduction (vph)	0	0	6	0	0	3
Lane Group Flow (vph)	694	1635	1600	0	100	657
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	Prot				custom	
Protected Phases	5	2	6		4	4 5
Permitted Phases						4
Actuated Green, G (s)	25.3	82.0	51.7		6.0	37.3
Effective Green, g (s)	25.3	82.0	51.7		6.0	37.3
Actuated g/C Ratio	0.25	0.82	0.52		0.06	0.37
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	864	2858	2695		111	619
v/s Ratio Prot	0.20	c0.47	0.31		0.05	c0.40
v/s Ratio Perm						
v/c Ratio	0.80	0.57	0.59		0.90	1.06
Uniform Delay, d1	35.0	3.1	16.8		46.7	31.4
Progression Factor	1.43	0.56	1.07		1.00	1.00
Incremental Delay, d2	2.9	0.4	0.9		55.3	53.8
Delay (s)	52.9	2.2	18.9		102.0	85.2
Level of Service	D	A	B		F	F
Approach Delay (s)		17.3	18.9		87.4	
Approach LOS		B	B		F	

Intersection Summary

HCM Average Control Delay	29.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: West Chester Pike & N New Ardmore Ave

Existing Saturday
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	1179	5	54	1043	7	9	1	27	44	8	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%			0%	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.96	
Satd. Flow (prot)	1754	3587		1676	3553			1709	1507		1796	
Flt Permitted	0.95	1.00		0.95	1.00			0.80	1.00		0.77	
Satd. Flow (perm)	1754	3587		1676	3553			1417	1507		1437	
Peak-hour factor, PHF	0.58	0.94	0.42	0.71	0.81	0.88	0.75	0.25	0.84	0.55	0.67	0.44
Adj. Flow (vph)	12	1254	12	76	1288	8	12	4	32	80	12	16
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	28	0	6	0
Lane Group Flow (vph)	12	1265	0	76	1296	0	0	16	4	0	102	0
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)	1.4	63.6		6.6	68.8			11.8	11.8		11.8	
Effective Green, g (s)	1.4	63.6		6.6	68.8			11.8	11.8		11.8	
Actuated g/C Ratio	0.01	0.64		0.07	0.69			0.12	0.12		0.12	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	25	2281		111	2444			167	178		170	
v/s Ratio Prot	0.01	c0.35		c0.05	c0.36							
v/s Ratio Perm								0.01	0.00		c0.07	
v/c Ratio	0.48	0.55		0.68	0.53			0.10	0.02		0.60	
Uniform Delay, d1	48.9	10.2		45.7	7.7			39.3	39.0		41.9	
Progression Factor	1.00	1.00		1.10	1.35			1.00	1.00		1.00	
Incremental Delay, d2	13.8	1.0		15.3	0.8			0.3	0.0		5.6	
Delay (s)	62.7	11.2		65.7	11.2			39.6	39.0		47.4	
Level of Service	E	B		E	B			D	D		D	
Approach Delay (s)		11.7			14.2			39.2			47.4	
Approach LOS		B			B			D			D	

Intersection Summary

HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

Existing Saturday
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↗				↖↖	↑	
Volume (vph)	0	1100	0	0	925	0	0	0	0	698	1	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	
Lane Util. Factor		0.91			0.95					0.97	1.00	
Frt		1.00			1.00					1.00	1.00	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		5238			3503					3583	887	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		5238			3503					3583	887	
Peak-hour factor, PHF	0.94	0.97	0.89	0.93	0.90	0.81	0.92	0.92	0.92	0.89	0.25	0.94
Adj. Flow (vph)	0	1134	0	0	1028	0	0	0	0	784	4	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1134	0	0	1028	0	0	0	0	784	4	0
Heavy Vehicles (%)	2%	1%	2%	2%	1%	1%	2%	2%	2%	1%	100%	1%
Turn Type						custom					Perm	
Protected Phases		2			6	4 6						4
Permitted Phases										4		
Actuated Green, G (s)		59.9			59.9					28.1	28.1	
Effective Green, g (s)		59.9			59.9					28.1	28.1	
Actuated g/C Ratio		0.60			0.60					0.28	0.28	
Clearance Time (s)		6.0			6.0					6.0	6.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		3138			2098					1007	249	
v/s Ratio Prot		0.22			c0.29						0.00	
v/s Ratio Perm										c0.22		
v/c Ratio		0.36			0.49					0.78	0.02	
Uniform Delay, d1		10.3			11.4					33.1	26.0	
Progression Factor		1.46			0.47					1.00	1.00	
Incremental Delay, d2		0.3			0.7					3.9	0.0	
Delay (s)		15.2			6.1					36.9	26.0	
Level of Service		B			A					D	C	
Approach Delay (s)		15.2			6.1			0.0			36.9	
Approach LOS		B			A			A			D	

Intersection Summary

HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

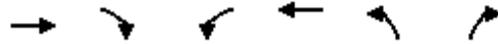
Existing Saturday
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	198	1600	0	0	1041	0	161	0	336	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			1.00		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1856	5264			5007		1737	1737	1599			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1856	5264			5007		1737	1737	1599			
Peak-hour factor, PHF	0.93	0.88	0.97	0.90	0.90	0.93	0.86	0.25	0.98	0.92	0.92	0.92
Adj. Flow (vph)	213	1818	0	0	1157	0	187	0	343	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	17	0	0	0
Lane Group Flow (vph)	213	1818	0	0	1157	0	93	94	326	0	0	0
Heavy Vehicles (%)	3%	1%	0%	2%	1%	2%	2%	0%	1%	2%	2%	2%
Turn Type	Prot						Perm		Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	16.7	64.9			42.2		23.1	23.1	23.1			
Effective Green, g (s)	16.7	64.9			42.2		23.1	23.1	23.1			
Actuated g/C Ratio	0.17	0.65			0.42		0.23	0.23	0.23			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	310	3416			2113		401	401	369			
v/s Ratio Prot	c0.11	c0.35			0.23							
v/s Ratio Perm							0.05	0.05	c0.20			
v/c Ratio	0.69	0.53			0.55		0.23	0.23	0.88			
Uniform Delay, d1	39.2	9.4			21.7		31.2	31.3	37.2			
Progression Factor	1.44	0.19			1.08		1.00	1.00	1.00			
Incremental Delay, d2	6.0	0.6			0.7		0.3	0.3	21.3			
Delay (s)	62.4	2.4			24.1		31.5	31.6	58.4			
Level of Service	E	A			C		C	C	E			
Approach Delay (s)		8.7			24.1			49.0			0.0	
Approach LOS		A			C			D			A	
Intersection Summary												
HCM Average Control Delay			19.2			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			61.7%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

Existing Saturday
 6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↙↙	↑↑	↙↙	↗
Volume (vph)	1730	206	379	1567	236	403
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5264	1639	3450	3556	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5264	1639	3450	3556	3433	1568
Peak-hour factor, PHF	0.88	0.83	0.91	0.90	0.86	0.88
Adj. Flow (vph)	1966	248	416	1741	274	458
RTOR Reduction (vph)	0	21	0	0	0	0
Lane Group Flow (vph)	1966	227	416	1741	274	458
Heavy Vehicles (%)	1%	1%	1%	1%	2%	3%
Turn Type		pt+ov	Prot			pt+ov
Protected Phases	2	2 8	1	6	8	8 1
Permitted Phases						
Actuated Green, G (s)	42.6	72.8	15.2	63.8	24.2	45.4
Effective Green, g (s)	42.6	72.8	15.2	63.8	24.2	45.4
Actuated g/C Ratio	0.43	0.73	0.15	0.64	0.24	0.45
Clearance Time (s)	6.0		6.0	6.0	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	2242	1193	524	2269	831	712
v/s Ratio Prot	c0.37	0.14	0.12	c0.49	0.08	c0.29
v/s Ratio Perm						
v/c Ratio	0.88	0.19	0.79	0.77	0.33	0.64
Uniform Delay, d1	26.3	4.3	40.9	12.8	31.2	21.1
Progression Factor	1.14	0.89	1.05	1.52	1.00	1.00
Incremental Delay, d2	4.5	0.1	5.4	1.7	0.2	2.0
Delay (s)	34.5	3.9	48.3	21.1	31.5	23.1
Level of Service	C	A	D	C	C	C
Approach Delay (s)	31.1			26.3	26.2	
Approach LOS	C			C	C	

Intersection Summary

HCM Average Control Delay	28.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
26: West Chester Pike & Old West Chester Pike

Existing Saturday
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1520	58	48	1371	19	60	0	48	6	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%				7%
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.97	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.96	
Satd. Flow (prot)		3480		1805	5174			1769	1552		1708	
Flt Permitted		1.00		0.95	1.00			0.75	1.00		0.74	
Satd. Flow (perm)		3480		1805	5174			1391	1552		1303	
Peak-hour factor, PHF	0.94	0.94	0.91	0.75	0.93	0.68	0.88	0.25	0.80	0.50	0.25	1.00
Adj. Flow (vph)	0	1617	64	64	1474	28	68	0	60	12	0	4
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	55	0	4	0
Lane Group Flow (vph)	0	1679	0	64	1501	0	0	68	5	0	12	0
Heavy Vehicles (%)	1%	1%	3%	2%	2%	0%	0%	0%	2%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		66.2		7.8	79.0			9.0	9.0		9.0	
Effective Green, g (s)		66.2		7.8	79.0			9.0	9.0		9.0	
Actuated g/C Ratio		0.66		0.08	0.79			0.09	0.09		0.09	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2304		141	4087			125	140		117	
v/s Ratio Prot		c0.48		0.04	c0.29							
v/s Ratio Perm								c0.05	0.00		0.01	
v/c Ratio		0.73		0.45	0.37			0.54	0.04		0.11	
Uniform Delay, d1		11.0		44.1	3.1			43.5	41.5		41.8	
Progression Factor		0.53		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.7		2.3	0.3			4.8	0.1		0.4	
Delay (s)		7.6		46.4	3.4			48.3	41.7		42.2	
Level of Service		A		D	A			D	D		D	
Approach Delay (s)		7.6			5.1			45.2			42.2	
Approach LOS		A			A			D			D	

Intersection Summary

HCM Average Control Delay	8.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

Existing Saturday
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕↕	↗↖	
Volume (veh/h)	0	1	1	538	551	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.25	0.25	0.25	0.87	0.88	0.25
Hourly flow rate (vph)	0	4	4	618	626	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.94					
vC, conflicting volume	945	315	630			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	814	315	630			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	300	687	962			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	4	4	309	309	417	213
Volume Left	0	4	0	0	0	0
Volume Right	4	0	0	0	0	4
cSH	687	962	1700	1700	1700	1700
Volume to Capacity	0.01	0.00	0.18	0.18	0.25	0.13
Queue Length 95th (ft)	0	0	0	0	0	0
Control Delay (s)	10.3	8.8	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	10.3	0.1			0.0	
Approach LOS	B					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization		25.3%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

Existing Saturday
6/22/2011



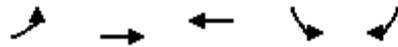
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	2	2	6	17	2	65	5	472	11	76	470	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.93			0.90			1.00			1.00	
Flt Protected		0.99			0.99			1.00			0.99	
Satd. Flow (prot)		1991			1891			3561			3546	
Flt Permitted		0.93			0.91			0.94			0.81	
Satd. Flow (perm)		1871			1747			3363			2902	
Peak-hour factor, PHF	0.50	0.25	0.50	0.71	0.50	0.86	0.63	0.94	0.92	0.76	0.89	0.75
Adj. Flow (vph)	4	8	12	24	4	76	8	502	12	100	528	8
RTOR Reduction (vph)	0	11	0	0	70	0	0	2	0	0	1	0
Lane Group Flow (vph)	0	13	0	0	34	0	0	520	0	0	635	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		6.1			6.1			29.0			55.9	
Effective Green, g (s)		6.1			6.1			29.0			55.9	
Actuated g/C Ratio		0.08			0.08			0.40			0.77	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		156			146			1336			2415	
v/s Ratio Prot											c0.08	
v/s Ratio Perm		0.01			c0.02			c0.15			0.12	
v/c Ratio		0.08			0.24			0.39			0.26	
Uniform Delay, d1		30.9			31.3			15.7			2.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.8			0.9			0.3	
Delay (s)		31.1			32.1			16.5			2.8	
Level of Service		C			C			B			A	
Approach Delay (s)		31.1			32.1			16.5			2.8	
Approach LOS		C			C			B			A	

Intersection Summary

HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues
2: West Chester Pike & N Lawrence Rd

Existing Saturday
6/22/2011



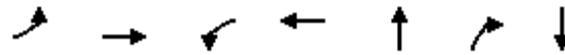
Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	694	1635	1606	100	660
v/c Ratio	0.80	0.57	0.59	0.90	1.09
Control Delay	53.4	2.2	19.7	110.7	94.3
Queue Delay	0.0	0.3	0.0	0.0	16.7
Total Delay	53.4	2.5	19.7	110.7	111.0
Queue Length 50th (ft)	217	37	279	65	-478
Queue Length 95th (ft)	m235	66	374	#165	#622
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290				
Base Capacity (vph)	1366	2858	2700	111	606
Starvation Cap Reductn	0	572	0	0	0
Spillback Cap Reductn	0	0	0	0	22
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.51	0.72	0.59	0.90	1.13

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

Existing Saturday
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	12	1266	76	1296	16	32	108
v/c Ratio	0.11	0.54	0.58	0.50	0.10	0.16	0.62
Control Delay	46.3	11.8	63.7	10.9	38.8	15.0	53.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.3	11.8	63.7	10.9	38.8	15.0	53.8
Queue Length 50th (ft)	7	242	38	281	9	0	62
Queue Length 95th (ft)	17	303	71	448	8	24	81
Internal Link Dist (ft)		672		282	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	123	2328	134	2617	213	253	222
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.54	0.57	0.50	0.08	0.13	0.49

Intersection Summary

Queues
10: West Chester Pike & I-476 SB Off-Ramp

Existing Saturday
6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT
Lane Group Flow (vph)	1134	1028	342	784	4
v/c Ratio	0.36	0.49	0.22	0.78	0.02
Control Delay	16.2	8.0	0.4	38.5	23.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	16.2	8.0	0.4	38.5	23.0
Queue Length 50th (ft)	209	69	0	236	2
Queue Length 95th (ft)	275	81	0	274	3
Internal Link Dist (ft)	564	662			574
Turn Bay Length (ft)				415	
Base Capacity (vph)	3137	2098	1567	1290	319
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.36	0.49	0.22	0.61	0.01

Intersection Summary

Queues
15: West Chester Pike & I-476 NB

Existing Saturday
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	213	1818	1157	93	94	343
v/c Ratio	0.69	0.53	0.55	0.23	0.23	0.89
Control Delay	66.9	2.5	25.7	32.0	32.1	60.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.9	2.5	25.7	32.0	32.1	60.0
Queue Length 50th (ft)	133	22	171	49	50	195
Queue Length 95th (ft)	182	26	223	90	25	#344
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	445	3415	2113	434	434	416
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.53	0.55	0.21	0.22	0.82

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
18: West Chester Pike & S Lawrence Rd

Existing Saturday
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1966	248	416	1741	274	458
v/c Ratio	0.88	0.20	0.79	0.77	0.33	0.64
Control Delay	35.8	3.3	50.2	22.0	32.2	25.2
Queue Delay	0.0	0.0	0.0	0.3	0.0	0.0
Total Delay	35.8	3.3	50.2	22.4	32.2	25.2
Queue Length 50th (ft)	448	20	145	396	73	215
Queue Length 95th (ft)	#564	m29	m170	m562	104	284
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2241	1214	725	2269	858	706
Starvation Cap Reductn	0	0	0	136	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.20	0.57	0.82	0.32	0.65

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues

Existing Saturday

26: West Chester Pike & Old West Chester Pike

6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1681	64	1502	68	60	16
v/c Ratio	0.69	0.40	0.36	0.48	0.28	0.12
Control Delay	8.5	49.4	3.6	52.6	14.0	34.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.5	49.4	3.6	52.6	14.0	34.3
Queue Length 50th (ft)	107	39	86	42	0	7
Queue Length 95th (ft)	m234	65	131	21	28	6
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2422	289	4210	223	299	212
Starvation Cap Reductn	12	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.22	0.36	0.30	0.20	0.08

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
5: Sussex Blvd & Lawrence Road

Existing Saturday
6/22/2011



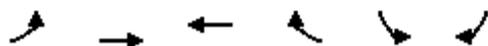
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	24	104	522	636
v/c Ratio	0.12	0.43	0.38	0.26
Control Delay	21.2	17.7	15.9	3.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.2	17.7	15.9	3.0
Queue Length 50th (ft)	5	12	82	32
Queue Length 95th (ft)	3	14	120	60
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	521	534	1385	2445
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.05	0.19	0.38	0.26
Intersection Summary				

L – Capacity and Queue Analysis

Output “Year 2015 No Build”:

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2015 AM No Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	556	1306	1884	41	52	867
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3283	3451	5158		1718	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3283	3451	5158		1718	1628
Peak-hour factor, PHF	0.94	0.96	0.97	0.50	0.85	0.93
Adj. Flow (vph)	591	1360	1942	82	61	932
RTOR Reduction (vph)	0	0	4	0	0	0
Lane Group Flow (vph)	591	1360	2020	0	61	932
Heavy Vehicles (%)	4%	2%	2%	13%	8%	2%
Turn Type	Prot			custom		
Protected Phases	5	2	6		4	4 5
Permitted Phases						4
Actuated Green, G (s)	22.3	69.0	41.7		19.0	47.3
Effective Green, g (s)	22.3	69.0	41.7		19.0	47.3
Actuated g/C Ratio	0.22	0.69	0.42		0.19	0.47
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	732	2381	2151		326	770
v/s Ratio Prot	0.18	0.39	c0.39		0.04	c0.57
v/s Ratio Perm						
v/c Ratio	0.81	0.57	0.94		0.19	1.21
Uniform Delay, d1	36.8	7.9	27.9		34.0	26.4
Progression Factor	1.12	1.07	0.90		1.00	1.00
Incremental Delay, d2	5.1	0.8	8.8		0.3	106.6
Delay (s)	46.3	9.3	34.1		34.3	133.0
Level of Service	D	A	C		C	F
Approach Delay (s)		20.5	34.1		126.9	
Approach LOS		C	C		F	

Intersection Summary

HCM Average Control Delay	47.3	HCM Level of Service	D
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2015 AM No Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑		↙	↑↑			↑	↗		↕	
Volume (vph)	13	1434	17	26	1272	15	27	18	67	102	32	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%			0%	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.97	
Satd. Flow (prot)	1736	3549		1676	3482			1619	1463		1772	
Flt Permitted	0.95	1.00		0.95	1.00			0.78	1.00		0.77	
Satd. Flow (perm)	1736	3549		1676	3482			1293	1463		1417	
Peak-hour factor, PHF	0.54	0.94	0.61	0.65	0.94	0.94	0.91	0.75	0.88	0.91	0.80	0.54
Adj. Flow (vph)	24	1526	28	40	1353	16	30	24	76	112	40	24
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	64	0	6	0
Lane Group Flow (vph)	24	1553	0	40	1368	0	0	54	12	0	170	0
Heavy Vehicles (%)	1%	2%	0%	0%	3%	0%	7%	6%	3%	1%	6%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	2.4	61.7		4.0	63.3			16.3	16.3		16.3	
Effective Green, g (s)	2.4	61.7		4.0	63.3			16.3	16.3		16.3	
Actuated g/C Ratio	0.02	0.62		0.04	0.63			0.16	0.16		0.16	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	42	2190		67	2204			211	238		231	
v/s Ratio Prot	0.01	c0.44		c0.02	0.39							
v/s Ratio Perm								0.04	0.01		c0.12	
v/c Ratio	0.57	0.71		0.60	0.62			0.26	0.05		0.74	
Uniform Delay, d1	48.3	13.0		47.2	11.1			36.6	35.3		39.8	
Progression Factor	1.00	1.00		1.11	0.33			1.00	1.00		1.00	
Incremental Delay, d2	17.4	2.0		12.4	1.2			0.6	0.1		11.6	
Delay (s)	65.7	15.0		65.0	4.9			37.2	35.4		51.4	
Level of Service	E	B		E	A			D	D		D	
Approach Delay (s)		15.8			6.6			36.2			51.4	
Approach LOS		B			A			D			D	

Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2015 AM No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↗				↖↖	↑	
Volume (vph)	0	1324	0	0	1055	0	0	0	0	780	1	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	
Lane Util. Factor		0.91			0.95					0.97	1.00	
Frt		1.00			1.00					1.00	1.00	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		5137			3435					3414	887	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		5137			3435					3414	887	
Peak-hour factor, PHF	0.94	0.91	0.94	0.93	0.95	0.69	0.92	0.92	0.92	0.94	0.25	0.94
Adj. Flow (vph)	0	1455	0	0	1111	0	0	0	0	830	4	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1455	0	0	1111	0	0	0	0	830	4	0
Heavy Vehicles (%)	2%	3%	3%	2%	3%	2%	2%	2%	2%	6%	100%	1%
Turn Type						custom					Perm	
Protected Phases		2			6	4 6						4
Permitted Phases										4		
Actuated Green, G (s)		57.3			57.3					30.7	30.7	
Effective Green, g (s)		57.3			57.3					30.7	30.7	
Actuated g/C Ratio		0.57			0.57					0.31	0.31	
Clearance Time (s)		6.0			6.0					6.0	6.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		2944			1968					1048	272	
v/s Ratio Prot		0.28			c0.32						0.00	
v/s Ratio Perm										c0.24		
v/c Ratio		0.49			0.56					0.79	0.01	
Uniform Delay, d1		12.7			13.5					31.7	24.1	
Progression Factor		0.93			0.43					1.00	1.00	
Incremental Delay, d2		0.5			0.3					4.2	0.0	
Delay (s)		12.3			6.1					35.9	24.1	
Level of Service		B			A					D	C	
Approach Delay (s)		12.3			6.1			0.0			35.8	
Approach LOS		B			A			A			D	
Intersection Summary												
HCM Average Control Delay			16.1			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			61.4%			ICU Level of Service				B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

2015 AM No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  							
Volume (vph)	386	1718	0	0	1411	179	147	10	250	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.97		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.97	1.00			
Satd. Flow (prot)	1893	5016			4830		1754	1790	1568			
Flt Permitted	0.95	1.00			1.00		0.95	0.97	1.00			
Satd. Flow (perm)	1893	5016			4830		1754	1790	1568			
Peak-hour factor, PHF	0.81	0.96	0.98	0.93	0.95	0.58	0.84	0.25	0.77	0.92	0.92	0.92
Adj. Flow (vph)	477	1790	0	0	1485	309	175	40	325	0	0	0
RTOR Reduction (vph)	0	0	0	0	32	0	0	0	19	0	0	0
Lane Group Flow (vph)	477	1790	0	0	1762	0	107	108	306	0	0	0
Heavy Vehicles (%)	1%	6%	2%	2%	2%	2%	1%	1%	3%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	25.8	65.8			34.0		22.2	22.2	22.2			
Effective Green, g (s)	25.8	65.8			34.0		22.2	22.2	22.2			
Actuated g/C Ratio	0.26	0.66			0.34		0.22	0.22	0.22			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	488	3301			1642		389	397	348			
v/s Ratio Prot	c0.25	0.36			c0.36							
v/s Ratio Perm							0.06	0.06	c0.19			
v/c Ratio	0.98	0.54			1.07		0.28	0.27	0.88			
Uniform Delay, d1	36.8	9.1			33.0		32.2	32.2	37.6			
Progression Factor	0.72	0.94			0.77		1.00	1.00	1.00			
Incremental Delay, d2	32.2	0.5			40.9		0.4	0.4	21.3			
Delay (s)	58.8	9.1			66.3		32.6	32.6	58.8			
Level of Service	E	A			E		C	C	E			
Approach Delay (s)		19.5			66.3			48.4			0.0	
Approach LOS		B			E			D			A	
Intersection Summary												
HCM Average Control Delay			41.2			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.99									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			72.0%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2015 AM No Build
 6/22/2011

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↑↑	↑↑	↑↑	↑
Volume (vph)	1436	532	312	2439	570	426
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5212	1577	3318	3487	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5212	1577	3318	3487	3433	1568
Peak-hour factor, PHF	0.96	0.89	0.89	0.94	0.86	0.94
Adj. Flow (vph)	1496	598	351	2595	663	453
RTOR Reduction (vph)	0	18	0	0	0	5
Lane Group Flow (vph)	1496	580	351	2595	663	448
Heavy Vehicles (%)	2%	5%	5%	3%	2%	3%
Turn Type		pt+ov	Prot			pt+ov
Protected Phases	2	2 8	1	6	8	8 1
Permitted Phases						
Actuated Green, G (s)	45.9	74.5	13.5	65.4	22.6	42.1
Effective Green, g (s)	45.9	74.5	13.5	65.4	22.6	42.1
Actuated g/C Ratio	0.46	0.74	0.14	0.65	0.23	0.42
Clearance Time (s)	6.0		6.0	6.0	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	2392	1175	448	2280	776	660
v/s Ratio Prot	0.29	0.37	0.11	c0.74	c0.19	0.29
v/s Ratio Perm						
v/c Ratio	0.63	0.49	0.78	1.14	0.85	0.68
Uniform Delay, d1	20.5	5.1	41.8	17.3	37.1	23.5
Progression Factor	0.59	0.60	1.13	0.67	1.00	1.00
Incremental Delay, d2	1.0	0.3	0.8	62.8	9.1	2.8
Delay (s)	13.1	3.4	48.2	74.3	46.2	26.3
Level of Service	B	A	D	E	D	C
Approach Delay (s)	10.3			71.2	38.1	
Approach LOS	B			E	D	

Intersection Summary			
HCM Average Control Delay	44.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
26: West Chester Pike & Old West Chester Pike

2015 AM No Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1311	47	62	1887	9	20	0	35	4	0	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.91	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)		3312		1705	5130			1415	1227		1570	
Flt Permitted		1.00		0.95	1.00			0.73	1.00		0.89	
Satd. Flow (perm)		3312		1705	5130			1089	1227		1418	
Peak-hour factor, PHF	0.92	0.95	0.77	0.85	0.95	0.75	0.83	0.25	0.55	0.33	0.25	0.64
Adj. Flow (vph)	0	1380	61	73	1986	12	24	0	64	12	0	28
RTOR Reduction (vph)	0	3	0	0	1	0	0	0	60	0	26	0
Lane Group Flow (vph)	0	1438	0	73	1997	0	0	24	4	0	14	0
Heavy Vehicles (%)	2%	6%	9%	8%	3%	11%	25%	0%	29%	0%	0%	6%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		69.0		7.4	81.4			6.6	6.6		6.6	
Effective Green, g (s)		69.0		7.4	81.4			6.6	6.6		6.6	
Actuated g/C Ratio		0.69		0.07	0.81			0.07	0.07		0.07	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2285		126	4176			72	81		94	
v/s Ratio Prot		c0.43		0.04	c0.39							
v/s Ratio Perm								c0.02	0.00		0.01	
v/c Ratio		0.63		0.58	0.48			0.33	0.05		0.15	
Uniform Delay, d1		8.5		44.8	2.8			44.6	43.8		44.0	
Progression Factor		0.60		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.1		6.3	0.4			2.7	0.3		0.7	
Delay (s)		6.2		51.1	3.2			47.3	44.0		44.8	
Level of Service		A		D	A			D	D		D	
Approach Delay (s)		6.2			4.9			44.9			44.8	
Approach LOS		A			A			D			D	

Intersection Summary

HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2015 AM No Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕	↗↖	
Volume (veh/h)	0	2	1	1043	579	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.25	0.25	0.98	0.91	0.25
Hourly flow rate (vph)	0	8	4	1064	636	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.79					
vC, conflicting volume	1178	320	640			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	692	320	640			
tC, single (s)	6.8	7.9	6.1			
tC, 2 stage (s)						
tF (s)	3.5	3.8	3.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	296	553	499			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	8	4	532	532	424	216
Volume Left	0	4	0	0	0	0
Volume Right	8	0	0	0	0	4
cSH	553	499	1700	1700	1700	1700
Volume to Capacity	0.01	0.01	0.31	0.31	0.25	0.13
Queue Length 95th (ft)	1	1	0	0	0	0
Control Delay (s)	11.6	12.3	0.0	0.0	0.0	0.0
Lane LOS	B	B				
Approach Delay (s)	11.6	0.0			0.0	
Approach LOS	B					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			32.2%	ICU Level of Service		A
Analysis Period (min)			15			

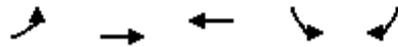
HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2015 AM No Build
6/22/2011

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	32	14	25	21	3	155	8	857	4	58	512	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.89			1.00			1.00	
Flt Protected		0.98			0.99			1.00			0.99	
Satd. Flow (prot)		1854			1824			3499			3428	
Flt Permitted		0.54			0.93			0.94			0.76	
Satd. Flow (perm)		1023			1715			3307			2634	
Peak-hour factor, PHF	0.57	0.44	0.63	0.75	0.75	0.88	0.67	0.88	0.33	0.91	0.93	0.67
Adj. Flow (vph)	56	32	40	28	4	176	12	974	12	64	551	16
RTOR Reduction (vph)	0	27	0	0	153	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	101	0	0	55	0	0	997	0	0	630	0
Heavy Vehicles (%)	6%	0%	20%	10%	0%	3%	0%	3%	0%	0%	5%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		10.3			10.3			30.0			56.7	
Effective Green, g (s)		10.3			10.3			30.0			56.7	
Actuated g/C Ratio		0.13			0.13			0.38			0.73	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		135			226			1272			2136	
v/s Ratio Prot											c0.08	
v/s Ratio Perm		c0.10			0.03			c0.30			0.13	
v/c Ratio		0.75			0.24			0.78			0.29	
Uniform Delay, d1		32.6			30.4			21.1			3.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		20.1			0.6			4.9			0.4	
Delay (s)		52.7			30.9			26.0			4.1	
Level of Service		D			C			C			A	
Approach Delay (s)		52.7			30.9			26.0			4.1	
Approach LOS		D			C			C			A	
Intersection Summary												
HCM Average Control Delay			21.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			78.0			Sum of lost time (s)			17.0			
Intersection Capacity Utilization			65.6%			ICU Level of Service				C		
Analysis Period (min)			15									
c	Critical Lane Group											

Queues
2: West Chester Pike & N Lawrence Rd

2015 AM No Build
6/22/2011



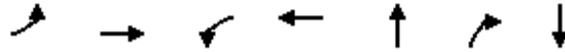
Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	591	1360	2024	61	932
v/c Ratio	0.81	0.57	0.94	0.19	1.24
Control Delay	48.1	9.5	35.4	35.8	145.0
Queue Delay	0.0	0.0	0.6	0.0	0.0
Total Delay	48.1	9.5	36.0	35.8	145.0
Queue Length 50th (ft)	200	168	442	33	-741
Queue Length 95th (ft)	247	190	#630	65	#918
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290				
Base Capacity (vph)	985	2381	2157	326	753
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	23	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.60	0.57	0.95	0.19	1.24

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: West Chester Pike & N New Ardmore Ave

2015 AM No Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	24	1554	40	1369	54	76	176
v/c Ratio	0.23	0.68	0.37	0.59	0.26	0.25	0.74
Control Delay	50.2	15.4	59.8	5.6	38.1	10.2	56.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.2	15.4	59.8	5.6	38.1	10.2	56.7
Queue Length 50th (ft)	15	372	27	47	30	0	103
Queue Length 95th (ft)	24	479	45	104	53	36	148
Internal Link Dist (ft)		672		282	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	107	2277	109	2331	259	353	289
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.68	0.37	0.59	0.21	0.22	0.61

Intersection Summary

Queues
10: West Chester Pike & I-476 SB Off-Ramp

2015 AM No Build
6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT
Lane Group Flow (vph)	1455	1111	729	830	4
v/c Ratio	0.49	0.56	0.47	0.79	0.01
Control Delay	13.1	5.9	4.1	37.4	21.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	13.1	5.9	4.1	37.4	21.0
Queue Length 50th (ft)	129	76	403	248	2
Queue Length 95th (ft)	204	m175	m0	288	2
Internal Link Dist (ft)	564	662			574
Turn Bay Length (ft)				415	
Base Capacity (vph)	2943	1968	1552	1331	346
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.49	0.56	0.47	0.62	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

2015 AM No Build
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	477	1790	1794	107	108	325
v/c Ratio	0.98	0.54	1.07	0.28	0.27	0.89
Control Delay	63.2	9.4	63.8	33.5	33.5	60.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.2	9.4	63.8	33.5	33.5	60.7
Queue Length 50th (ft)	~346	152	341	57	58	183
Queue Length 95th (ft)	#460	268	m252	100	28	232
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	489	3301	1674	421	429	395
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.54	1.07	0.25	0.25	0.82

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues
18: West Chester Pike & S Lawrence Rd

2015 AM No Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1496	598	351	2595	663	453
v/c Ratio	0.63	0.50	0.78	1.14	0.86	0.68
Control Delay	13.6	4.3	48.3	78.0	49.3	28.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	4.3	48.3	78.0	49.3	28.6
Queue Length 50th (ft)	124	49	117	~1004	208	223
Queue Length 95th (ft)	198	m64	m114	m#970	260	316
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2393	1192	564	2282	790	652
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.50	0.62	1.14	0.84	0.69

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues

26: West Chester Pike & Old West Chester Pike



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1441	73	1998	24	64	40
v/c Ratio	0.60	0.50	0.46	0.29	0.42	0.30
Control Delay	6.6	55.7	3.3	51.6	19.8	26.9
Queue Delay	0.2	0.0	0.0	0.0	0.0	0.0
Total Delay	6.8	55.7	3.3	51.6	19.8	26.9
Queue Length 50th (ft)	220	45	112	15	0	7
Queue Length 95th (ft)	290	85	156	11	9	0
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2404	159	4301	109	180	167
Starvation Cap Reductn	287	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.46	0.46	0.22	0.36	0.24

Intersection Summary

Queues
5: Sussex Blvd & Lawrence Road

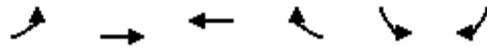
2015 AM No Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	128	208	998	631
v/c Ratio	0.79	0.55	0.78	0.30
Control Delay	55.3	13.1	26.4	4.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	55.3	13.1	26.4	4.4
Queue Length 50th (ft)	46	14	218	43
Queue Length 95th (ft)	35	42	284	79
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	349	669	1274	2124
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.37	0.31	0.78	0.30
Intersection Summary				

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2015 PM No Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1093	1807	1456	87	102	799
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3347	3451	5168		1819	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3347	3451	5168		1819	1628
Peak-hour factor, PHF	0.98	0.95	0.87	0.86	0.74	0.95
Adj. Flow (vph)	1115	1902	1674	101	138	841
RTOR Reduction (vph)	0	0	6	0	0	1
Lane Group Flow (vph)	1115	1902	1769	0	138	840
Turn Type	Prot			custom		
Protected Phases	5	2	6		4	4
Permitted Phases						5
Actuated Green, G (s)	43.5	95.0	46.5		13.0	56.5
Effective Green, g (s)	43.5	95.0	46.5		13.0	56.5
Actuated g/C Ratio	0.36	0.79	0.39		0.11	0.47
Clearance Time (s)	5.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	1213	2732	2003		197	848
v/s Ratio Prot	0.33	0.55	c0.34		0.08	c0.11
v/s Ratio Perm						0.41
v/c Ratio	0.92	0.70	0.88		0.70	0.99
Uniform Delay, d1	36.6	5.8	34.2		51.6	31.5
Progression Factor	0.52	0.89	1.16		1.00	1.00
Incremental Delay, d2	3.7	0.4	5.8		10.7	28.4
Delay (s)	22.8	5.6	45.5		62.3	59.9
Level of Service	C	A	D		E	E
Approach Delay (s)		12.0	45.5		60.3	
Approach LOS		B	D		E	

Intersection Summary			
HCM Average Control Delay		30.5	HCM Level of Service C
HCM Volume to Capacity ratio		0.95	
Actuated Cycle Length (s)		120.0	Sum of lost time (s) 12.0
Intersection Capacity Utilization		89.5%	ICU Level of Service E
Analysis Period (min)		15	
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2015 PM No Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	1577	35	16	1649	19	49	18	4	15	15	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%				0%
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85			0.95
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00			0.98
Satd. Flow (prot)	1702	3509		1643	3514			1698	1492			1757
Flt Permitted	0.95	1.00		0.95	1.00			0.75	1.00			0.84
Satd. Flow (perm)	1702	3509		1643	3514			1311	1492			1498
Peak-hour factor, PHF	0.88	0.95	0.80	1.00	0.88	0.68	0.94	0.75	0.50	0.47	0.75	0.61
Adj. Flow (vph)	128	1660	44	16	1874	28	52	24	8	32	20	28
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	7	0	17	0
Lane Group Flow (vph)	128	1703	0	16	1901	0	0	76	1	0	63	0
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	11.5	90.5		2.0	81.0			9.5	9.5			9.5
Effective Green, g (s)	11.5	90.5		2.0	81.0			9.5	9.5			9.5
Actuated g/C Ratio	0.10	0.75		0.02	0.68			0.08	0.08			0.08
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Grp Cap (vph)	163	2646		27	2372			104	118			119
v/s Ratio Prot	c0.08	0.49		0.01	c0.54							
v/s Ratio Perm								c0.06	0.00			0.04
v/c Ratio	0.79	0.64		0.59	0.80			0.73	0.01			0.53
Uniform Delay, d1	53.0	7.0		58.6	13.8			54.0	50.9			53.1
Progression Factor	1.00	1.00		0.83	0.72			1.00	1.00			1.00
Incremental Delay, d2	21.5	1.2		24.2	2.3			23.0	0.0			4.5
Delay (s)	74.6	8.3		73.0	12.3			77.0	50.9			57.6
Level of Service	E	A		E	B			E	D			E
Approach Delay (s)		12.9			12.8			74.5				57.6
Approach LOS		B			B			E				E

Intersection Summary

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2015 PM No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↗				↑↑	↑	
Volume (vph)	0	1409	0	0	1308	0	0	0	0	1476	1	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	
Lane Util. Factor		0.91			0.95					0.97	1.00	
Frt		1.00			1.00					1.00	1.00	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		5187			3468					3583	1756	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		5187			3468					3583	1756	
Peak-hour factor, PHF	0.94	0.94	0.94	0.93	0.94	0.90	0.92	0.92	0.92	0.94	0.25	0.94
Adj. Flow (vph)	0	1499	0	0	1391	0	0	0	0	1570	4	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1499	0	0	1391	0	0	0	0	1570	4	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Turn Type						custom					Perm	
Protected Phases		2			6	4 6						4
Permitted Phases										4		
Actuated Green, G (s)		52.5			52.5					55.5	55.5	
Effective Green, g (s)		52.5			52.5					55.5	55.5	
Actuated g/C Ratio		0.44			0.44					0.46	0.46	
Clearance Time (s)		6.0			6.0					6.0	6.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		2269			1517					1657	812	
v/s Ratio Prot		0.29			c0.40						0.00	
v/s Ratio Perm										c0.44		
v/c Ratio		0.66			0.92					0.95	0.00	
Uniform Delay, d1		26.7			31.7					30.9	17.4	
Progression Factor		0.78			0.78					1.00	1.00	
Incremental Delay, d2		1.2			6.5					11.8	0.0	
Delay (s)		22.1			31.4					42.7	17.4	
Level of Service		C			C					D	B	
Approach Delay (s)		22.1			31.4			0.0			42.6	
Approach LOS		C			C			A			D	
Intersection Summary												
HCM Average Control Delay			32.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			88.3%			ICU Level of Service				E		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

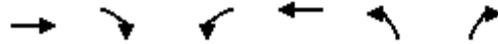
2015 PM No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  							
Volume (vph)	321	2564	0	0	1322	0	256	0	495	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			1.00		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1874	5212			4958		1754	1754	1599			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1874	5212			4958		1754	1754	1599			
Peak-hour factor, PHF	0.83	0.95	0.98	0.93	0.92	0.93	0.93	0.25	0.94	0.92	0.92	0.92
Adj. Flow (vph)	387	2699	0	0	1437	0	275	0	527	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	1	0	0	0
Lane Group Flow (vph)	387	2699	0	0	1437	0	137	138	526	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	27.0	72.0			39.0		36.0	36.0	36.0			
Effective Green, g (s)	27.0	72.0			39.0		36.0	36.0	36.0			
Actuated g/C Ratio	0.22	0.60			0.32		0.30	0.30	0.30			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	422	3127			1611		526	526	480			
v/s Ratio Prot	0.21	c0.52			0.29							
v/s Ratio Perm							0.08	0.08	c0.33			
v/c Ratio	0.92	0.86			0.89		0.26	0.26	1.09			
Uniform Delay, d1	45.4	19.9			38.5		31.9	31.9	42.0			
Progression Factor	0.75	0.83			0.80		1.00	1.00	1.00			
Incremental Delay, d2	20.0	1.9			5.4		0.3	0.3	69.4			
Delay (s)	54.1	18.4			36.3		32.2	32.2	111.4			
Level of Service	D	B			D		C	C	F			
Approach Delay (s)		22.9			36.3			84.2			0.0	
Approach LOS		C			D			F			A	
Intersection Summary												
HCM Average Control Delay			35.7				HCM Level of Service				D	
HCM Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)				12.0	
Intersection Capacity Utilization			90.2%				ICU Level of Service				E	
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2015 PM No Build
 6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↑↑	↑↑	↑↑	↑
Volume (vph)	2503	556	533	1722	286	397
Ideal Flow (vphpl)	2100	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5761	1623	3416	3522	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5761	1623	3416	3522	3433	1583
Peak-hour factor, PHF	0.95	0.83	0.95	0.92	0.82	0.93
Adj. Flow (vph)	2635	670	561	1872	349	427
RTOR Reduction (vph)	0	6	0	0	0	0
Lane Group Flow (vph)	2635	664	561	1872	349	427
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	53.4	85.8	22.2	81.6	26.4	48.6
Effective Green, g (s)	53.4	85.8	22.2	81.6	26.4	48.6
Actuated g/C Ratio	0.44	0.71	0.18	0.68	0.22	0.41
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		4.0	3.0	2.0	2.0
Lane Grp Cap (vph)	2564	1160	632	2395	755	720
v/s Ratio Prot	c0.46	0.41	0.16	c0.53	0.10	c0.13
v/s Ratio Perm						0.14
v/c Ratio	1.03	0.57	0.89	0.78	0.46	0.59
Uniform Delay, d1	33.3	8.3	47.7	13.1	40.6	28.0
Progression Factor	0.64	0.54	0.66	1.40	1.00	1.00
Incremental Delay, d2	19.9	0.2	6.2	1.0	0.2	0.9
Delay (s)	41.1	4.7	37.4	19.4	40.8	28.8
Level of Service	D	A	D	B	D	C
Approach Delay (s)	33.7			23.6	34.2	
Approach LOS	C			C	C	

Intersection Summary			
HCM Average Control Delay	30.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

2015 PM No Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1848	61	65	1399	17	141	1	124	2	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.94	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.97	
Satd. Flow (prot)		3461		1497	5128			1741	1583		1679	
Flt Permitted		1.00		0.95	1.00			0.72	1.00		0.83	
Satd. Flow (perm)		3461		1497	5128			1317	1583		1425	
Peak-hour factor, PHF	0.92	0.93	0.79	0.80	0.97	0.85	0.83	0.25	0.74	0.25	0.25	0.50
Adj. Flow (vph)	0	1987	77	81	1442	20	170	4	168	8	0	6
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	99	0	5	0
Lane Group Flow (vph)	0	2062	0	81	1461	0	0	174	69	0	9	0
Heavy Vehicles (%)	2%	1%	18%	23%	3%	0%	2%	0%	0%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		76.9		8.0	89.9			18.1	18.1		18.1	
Effective Green, g (s)		76.9		8.0	89.9			18.1	18.1		18.1	
Actuated g/C Ratio		0.64		0.07	0.75			0.15	0.15		0.15	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2218		100	3842			199	239		215	
v/s Ratio Prot		c0.60		c0.05	0.28							
v/s Ratio Perm								c0.13	0.04		0.01	
v/c Ratio		0.93		0.81	0.38			0.87	0.29		0.04	
Uniform Delay, d1		19.1		55.3	5.3			49.8	45.2		43.5	
Progression Factor		0.26		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		6.4		37.2	0.3			31.9	0.7		0.1	
Delay (s)		11.4		92.5	5.6			81.7	45.9		43.6	
Level of Service		B		F	A			F	D		D	
Approach Delay (s)		11.4			10.1			64.1			43.6	
Approach LOS		B			B			E			D	

Intersection Summary

HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2015 PM No Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↖	↗	↕	↕	↕
Volume (veh/h)	0	2	1	651	1052	4
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.50	0.25	0.92	0.89	0.50
Hourly flow rate (vph)	0	4	4	708	1182	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.94					
vC, conflicting volume	1548	595	1190			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1463	595	1190			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	112	452	594			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	4	4	354	354	788	402
Volume Left	0	4	0	0	0	0
Volume Right	4	0	0	0	0	8
cSH	452	594	1700	1700	1700	1700
Volume to Capacity	0.01	0.01	0.21	0.21	0.46	0.24
Queue Length 95th (ft)	1	1	0	0	0	0
Control Delay (s)	13.0	11.1	0.0	0.0	0.0	0.0
Lane LOS	B	B				
Approach Delay (s)	13.0	0.1			0.0	
Approach LOS	B					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			39.2%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2015 PM No Build
6/22/2011



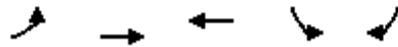
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	43	18	32	20	7	90	8	519	31	132	878	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.97			0.91			0.99			0.99	
Flt Protected		0.97			0.99			1.00			0.99	
Satd. Flow (prot)		2031			1929			3507			3531	
Flt Permitted		0.70			0.87			0.92			0.67	
Satd. Flow (perm)		1454			1694			3214			2366	
Peak-hour factor, PHF	0.32	0.30	0.53	0.46	0.58	0.73	0.67	0.93	0.78	0.81	0.83	0.69
Adj. Flow (vph)	134	60	60	43	12	123	12	558	40	163	1058	64
RTOR Reduction (vph)	0	16	0	0	96	0	0	7	0	0	4	0
Lane Group Flow (vph)	0	238	0	0	82	0	0	603	0	0	1281	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		17.2			17.2			30.0			49.8	
Effective Green, g (s)		17.2			17.2			30.0			49.8	
Actuated g/C Ratio		0.22			0.22			0.38			0.64	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		321			374			1236			1732	
v/s Ratio Prot											c0.14	
v/s Ratio Perm		c0.16			0.05			0.19			c0.33	
v/c Ratio		0.74			0.22			0.49			0.74	
Uniform Delay, d1		28.3			24.9			18.2			9.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		8.9			0.3			1.4			2.9	
Delay (s)		37.2			25.2			19.6			12.5	
Level of Service		D			C			B			B	
Approach Delay (s)		37.2			25.2			19.6			12.5	
Approach LOS		D			C			B			B	

Intersection Summary

HCM Average Control Delay	18.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Queues
2: West Chester Pike & N Lawrence Rd

2015 PM No Build
6/22/2011



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	1115	1902	1775	138	841
v/c Ratio	0.92	0.70	0.88	0.70	1.01
Control Delay	23.7	5.8	46.0	71.1	62.3
Queue Delay	0.0	19.7	0.2	0.0	43.7
Total Delay	23.7	25.5	46.2	71.1	106.0
Queue Length 50th (ft)	183	87	516	105	612
Queue Length 95th (ft)	m160	m78	557	141	#901
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290				
Base Capacity (vph)	1283	2732	2007	197	835
Starvation Cap Reductn	0	885	0	0	0
Spillback Cap Reductn	0	0	18	0	88
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.87	1.03	0.89	0.70	1.13

Intersection Summary

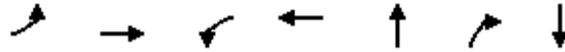
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

2015 PM No Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	128	1704	16	1902	76	8	80
v/c Ratio	0.79	0.62	0.23	0.80	0.74	0.06	0.59
Control Delay	84.1	7.4	52.7	12.8	91.4	28.5	59.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.1	7.4	52.7	12.8	91.4	28.5	59.6
Queue Length 50th (ft)	98	193	13	201	58	0	47
Queue Length 95th (ft)	#188	393	m22	260	#99	7	80
Internal Link Dist (ft)		672		282	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	170	2753	69	2374	109	132	141
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.62	0.23	0.80	0.70	0.06	0.57

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
 10: West Chester Pike & I-476 SB Off-Ramp

2015 PM No Build
 6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT
Lane Group Flow (vph)	1499	1391	300	1570	4
v/c Ratio	0.66	0.92	0.19	0.95	0.00
Control Delay	22.4	31.4	0.1	43.9	17.0
Queue Delay	0.0	0.0	0.0	1.9	0.0
Total Delay	22.4	31.4	0.1	45.9	17.0
Queue Length 50th (ft)	335	599	0	580	2
Queue Length 95th (ft)	252	#699	m0	#745	2
Internal Link Dist (ft)	564	662			574
Turn Bay Length (ft)				415	
Base Capacity (vph)	2270	1517	1552	1672	819
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	41	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.66	0.92	0.19	0.96	0.00

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

2015 PM No Build
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	387	2699	1437	137	138	527
v/c Ratio	0.92	0.86	0.89	0.26	0.26	1.10
Control Delay	57.4	18.7	36.9	33.6	33.6	109.4
Queue Delay	0.0	10.0	0.0	0.1	0.2	0.0
Total Delay	57.4	28.7	36.9	33.7	33.8	109.4
Queue Length 50th (ft)	318	432	414	85	85	~462
Queue Length 95th (ft)	#396	502	#486	142	35	#681
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	437	3127	1610	526	526	481
Starvation Cap Reductn	0	252	0	0	0	0
Spillback Cap Reductn	0	445	0	72	72	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.89	1.01	0.89	0.30	0.30	1.10

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
18: West Chester Pike & S Lawrence Rd

2015 PM No Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	2635	670	561	1872	349	427
v/c Ratio	1.03	0.57	0.89	0.78	0.46	0.59
Control Delay	43.6	5.6	39.1	20.7	42.3	27.8
Queue Delay	10.1	1.0	0.0	10.5	0.0	0.0
Total Delay	53.7	6.5	39.1	31.1	42.3	27.8
Queue Length 50th (ft)	~847	158	194	665	120	228
Queue Length 95th (ft)	m#893	m151	m216	m742	147	329
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2561	1166	664	2394	830	703
Starvation Cap Reductn	64	253	0	521	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.06	0.73	0.84	1.00	0.42	0.61

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

26: West Chester Pike & Old West Chester Pike

6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	2064	81	1462	174	168	14
v/c Ratio	0.93	0.81	0.38	0.87	0.50	0.06
Control Delay	12.5	104.1	5.7	88.0	21.2	32.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.5	104.1	5.7	88.0	21.2	32.8
Queue Length 50th (ft)	137	63	129	132	35	5
Queue Length 95th (ft)	#328	#129	150	51	66	4
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2219	100	3843	209	349	231
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.81	0.38	0.83	0.48	0.06

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
5: Sussex Blvd & Lawrence Road

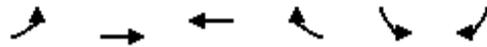
2015 PM No Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	254	178	610	1285
v/c Ratio	0.75	0.38	0.49	0.75
Control Delay	39.5	10.7	19.5	14.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	39.5	10.7	19.5	14.0
Queue Length 50th (ft)	106	22	113	163
Queue Length 95th (ft)	39	23	160	243
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	480	627	1243	1721
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.53	0.28	0.49	0.75
Intersection Summary				

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2015 Sat No Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	657	1514	1371	91	91	613
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3414	3485	5213		1856	1660
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3414	3485	5213		1856	1660
Peak-hour factor, PHF	0.93	0.91	0.90	0.80	0.90	0.91
Adj. Flow (vph)	706	1664	1523	114	101	674
RTOR Reduction (vph)	0	0	6	0	0	2
Lane Group Flow (vph)	706	1664	1631	0	101	672
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	Prot			custom		
Protected Phases	5	2	6		4	4 5
Permitted Phases						4
Actuated Green, G (s)	25.7	82.0	51.3		6.0	37.7
Effective Green, g (s)	25.7	82.0	51.3		6.0	37.7
Actuated g/C Ratio	0.26	0.82	0.51		0.06	0.38
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	877	2858	2674		111	626
v/s Ratio Prot	0.21	c0.48	0.31		0.05	c0.40
v/s Ratio Perm						
v/c Ratio	0.81	0.58	0.61		0.91	1.07
Uniform Delay, d1	34.8	3.1	17.3		46.7	31.1
Progression Factor	0.61	1.85	0.94		1.00	1.00
Incremental Delay, d2	2.9	0.5	1.0		57.1	57.0
Delay (s)	24.1	6.2	17.1		103.8	88.2
Level of Service	C	A	B		F	F
Approach Delay (s)		11.5	17.1		90.2	
Approach LOS		B	B		F	

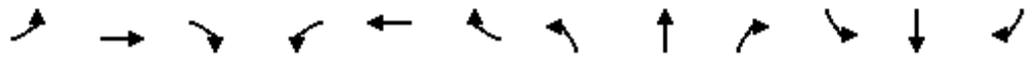
Intersection Summary

HCM Average Control Delay	26.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 3: West Chester Pike & N New Ardmore Ave

2015 Sat No Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷			↶	↷		↷	↶
Volume (vph)	7	1200	5	54	1061	7	9	1	27	44	8	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%				0%
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85			0.98
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00			0.96
Satd. Flow (prot)	1754	3587		1676	3553			1709	1507			1796
Flt Permitted	0.95	1.00		0.95	1.00			0.79	1.00			0.77
Satd. Flow (perm)	1754	3587		1676	3553			1401	1507			1437
Peak-hour factor, PHF	0.58	0.94	0.42	0.71	0.81	0.88	0.75	0.25	0.84	0.55	0.67	0.44
Adj. Flow (vph)	12	1277	12	76	1310	8	12	4	32	80	12	16
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	28	0	6	0
Lane Group Flow (vph)	12	1288	0	76	1318	0	0	16	4	0	102	0
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	1.5	63.7		7.2	69.4			11.1	11.1			11.1
Effective Green, g (s)	1.5	63.7		7.2	69.4			11.1	11.1			11.1
Actuated g/C Ratio	0.02	0.64		0.07	0.69			0.11	0.11			0.11
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Grp Cap (vph)	26	2285		121	2466			156	167			160
v/s Ratio Prot	0.01	c0.36		c0.05	c0.37							
v/s Ratio Perm								0.01	0.00			c0.07
v/c Ratio	0.46	0.56		0.63	0.53			0.10	0.02			0.64
Uniform Delay, d1	48.8	10.3		45.1	7.4			40.0	39.6			42.5
Progression Factor	1.00	1.00		1.04	0.49			1.00	1.00			1.00
Incremental Delay, d2	12.4	1.0		9.3	0.8			0.3	0.1			8.0
Delay (s)	61.3	11.3		56.2	4.5			40.3	39.7			50.5
Level of Service	E	B		E	A			D	D			D
Approach Delay (s)		11.8			7.3			39.9				50.5
Approach LOS		B			A			D				D

Intersection Summary		
HCM Average Control Delay	11.5	HCM Level of Service B
HCM Volume to Capacity ratio	0.63	
Actuated Cycle Length (s)	100.0	Sum of lost time (s) 24.0
Intersection Capacity Utilization	68.3%	ICU Level of Service C
Analysis Period (min)	15	

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

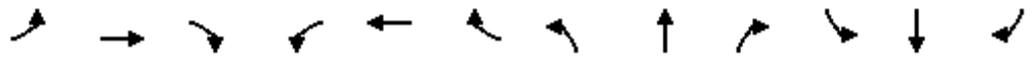
2015 Sat No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↑				↑↑	↑	
Volume (vph)	0	1119	0	0	942	0	0	0	0	712	1	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	
Lane Util. Factor		0.91			0.95					0.97	1.00	
Frt		1.00			1.00					1.00	1.00	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		5238			3503					3583	887	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		5238			3503					3583	887	
Peak-hour factor, PHF	0.94	0.97	0.94	0.93	0.90	0.81	0.92	0.92	0.92	0.89	0.25	0.94
Adj. Flow (vph)	0	1154	0	0	1047	0	0	0	0	800	4	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1154	0	0	1047	0	0	0	0	800	4	0
Heavy Vehicles (%)	2%	1%	2%	2%	1%	1%	2%	2%	2%	1%	100%	1%
Turn Type						custom					Perm	
Protected Phases		2			6	4 6						4
Permitted Phases										4		
Actuated Green, G (s)		59.2			59.2					28.8	28.8	
Effective Green, g (s)		59.2			59.2					28.8	28.8	
Actuated g/C Ratio		0.59			0.59					0.29	0.29	
Clearance Time (s)		6.0			6.0					6.0	6.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		3101			2074					1032	255	
v/s Ratio Prot		0.22			c0.30						0.00	
v/s Ratio Perm										c0.22		
v/c Ratio		0.37			0.50					0.78	0.02	
Uniform Delay, d1		10.7			11.9					32.6	25.5	
Progression Factor		0.77			0.14					1.00	1.00	
Incremental Delay, d2		0.3			0.8					3.7	0.0	
Delay (s)		8.5			2.4					36.3	25.5	
Level of Service		A			A					D	C	
Approach Delay (s)		8.5			2.4			0.0			36.3	
Approach LOS		A			A			A			D	
Intersection Summary												
HCM Average Control Delay			13.8			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			56.4%			ICU Level of Service				B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

2015 Sat No Build
 6/22/2011



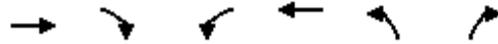
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑			↑↑↑		↘	↙	↗			
Volume (vph)	201	1630	0	0	1065	0	163	0	345	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			1.00		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1856	5264			5007		1737	1737	1599			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1856	5264			5007		1737	1737	1599			
Peak-hour factor, PHF	0.93	0.88	0.97	0.90	0.90	0.93	0.86	0.25	0.98	0.92	0.92	0.92
Adj. Flow (vph)	216	1852	0	0	1183	0	190	0	352	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	15	0	0	0
Lane Group Flow (vph)	216	1852	0	0	1183	0	95	95	337	0	0	0
Heavy Vehicles (%)	3%	1%	0%	2%	1%	2%	2%	0%	1%	2%	2%	2%
Turn Type	Prot						Perm		Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	16.8	64.5			41.7		23.5	23.5	23.5			
Effective Green, g (s)	16.8	64.5			41.7		23.5	23.5	23.5			
Actuated g/C Ratio	0.17	0.64			0.42		0.24	0.24	0.24			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	312	3395			2088		408	408	376			
v/s Ratio Prot	c0.12	c0.35			0.24							
v/s Ratio Perm							0.05	0.05	c0.21			
v/c Ratio	0.69	0.55			0.57		0.23	0.23	0.90			
Uniform Delay, d1	39.2	9.7			22.3		31.0	31.0	37.1			
Progression Factor	0.98	1.00			0.64		1.00	1.00	1.00			
Incremental Delay, d2	6.3	0.6			0.8		0.3	0.3	22.8			
Delay (s)	44.8	10.3			15.0		31.2	31.2	59.8			
Level of Service	D	B			B		C	C	E			
Approach Delay (s)		13.9			15.0			49.8			0.0	
Approach LOS		B			B			D			A	

Intersection Summary			
HCM Average Control Delay	19.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2015 Sat No Build
 6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↑↓	↑↑	↑↓	↑
Volume (vph)	1752	223	395	1589	253	419
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5264	1639	3450	3556	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5264	1639	3450	3556	3433	1568
Peak-hour factor, PHF	0.88	0.83	0.91	0.90	0.86	0.88
Adj. Flow (vph)	1991	269	434	1766	294	476
RTOR Reduction (vph)	0	14	0	0	0	1
Lane Group Flow (vph)	1991	255	434	1766	294	475
Heavy Vehicles (%)	1%	1%	1%	1%	2%	3%
Turn Type		pt+ov	Prot			pt+ov
Protected Phases	2	2 8	1	6	8	8 1
Permitted Phases						
Actuated Green, G (s)	43.9	72.6	15.4	65.3	22.7	44.1
Effective Green, g (s)	43.9	72.6	15.4	65.3	22.7	44.1
Actuated g/C Ratio	0.44	0.73	0.15	0.65	0.23	0.44
Clearance Time (s)	6.0		6.0	6.0	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	2311	1190	531	2322	779	691
v/s Ratio Prot	c0.38	0.16	0.13	c0.50	0.09	c0.30
v/s Ratio Perm						
v/c Ratio	0.86	0.21	0.82	0.76	0.38	0.69
Uniform Delay, d1	25.3	4.4	40.9	12.0	32.7	22.4
Progression Factor	0.63	0.60	0.75	1.40	1.00	1.00
Incremental Delay, d2	3.8	0.1	6.2	1.5	0.3	2.9
Delay (s)	19.8	2.7	37.0	18.3	33.0	25.3
Level of Service	B	A	D	B	C	C
Approach Delay (s)	17.8			22.0	28.2	
Approach LOS	B			C	C	

Intersection Summary			
HCM Average Control Delay	21.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

2015 Sat No Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1546	59	49	1397	19	61	0	49	6	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.97	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.96	
Satd. Flow (prot)		3480		1805	5175			1769	1552		1708	
Flt Permitted		1.00		0.95	1.00			0.75	1.00		0.74	
Satd. Flow (perm)		3480		1805	5175			1391	1552		1302	
Peak-hour factor, PHF	0.94	0.94	0.91	0.75	0.93	0.68	0.88	0.25	0.80	0.50	0.25	1.00
Adj. Flow (vph)	0	1645	65	65	1502	28	69	0	61	12	0	4
RTOR Reduction (vph)	0	3	0	0	2	0	0	0	56	0	4	0
Lane Group Flow (vph)	0	1707	0	65	1528	0	0	69	5	0	12	0
Heavy Vehicles (%)	1%	1%	3%	2%	2%	0%	0%	0%	2%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		68.3		6.1	79.4			8.6	8.6		8.6	
Effective Green, g (s)		68.3		6.1	79.4			8.6	8.6		8.6	
Actuated g/C Ratio		0.68		0.06	0.79			0.09	0.09		0.09	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2377		110	4109			120	133		112	
v/s Ratio Prot		c0.49		c0.04	0.30							
v/s Ratio Perm								c0.05	0.00		0.01	
v/c Ratio		0.72		0.59	0.37			0.57	0.04		0.11	
Uniform Delay, d1		9.9		45.7	3.0			43.9	41.9		42.2	
Progression Factor		0.34		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.5		8.2	0.3			6.5	0.1		0.4	
Delay (s)		4.9		54.0	3.3			50.5	42.0		42.6	
Level of Service		A		D	A			D	D		D	
Approach Delay (s)		4.9			5.3			46.5			42.6	
Approach LOS		A			A			D			D	

Intersection Summary

HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2015 Sat No Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↑↑	↑↗	
Volume (veh/h)	0	1	1	549	562	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.25	0.25	0.25	0.87	0.88	0.25
Hourly flow rate (vph)	0	4	4	631	639	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.94					
vC, conflicting volume	964	321	643			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	824	321	643			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	294	680	952			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	4	4	316	316	426	217
Volume Left	0	4	0	0	0	0
Volume Right	4	0	0	0	0	4
cSH	680	952	1700	1700	1700	1700
Volume to Capacity	0.01	0.00	0.19	0.19	0.25	0.13
Queue Length 95th (ft)	0	0	0	0	0	0
Control Delay (s)	10.3	8.8	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	10.3	0.1			0.0	
Approach LOS	B					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			25.6%		ICU Level of Service	A
Analysis Period (min)			15			

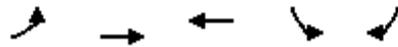
HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2015 Sat No Build
6/22/2011

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	2	2	6	17	2	65	5	483	11	76	481	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.93			0.90			1.00			1.00	
Flt Protected		0.99			0.99			1.00			0.99	
Satd. Flow (prot)		1991			1891			3561			3546	
Flt Permitted		0.93			0.91			0.94			0.81	
Satd. Flow (perm)		1871			1747			3364			2892	
Peak-hour factor, PHF	0.50	0.25	0.50	0.71	0.50	0.86	0.63	0.94	0.92	0.76	0.89	0.75
Adj. Flow (vph)	4	8	12	24	4	76	8	514	12	100	540	8
RTOR Reduction (vph)	0	11	0	0	70	0	0	2	0	0	1	0
Lane Group Flow (vph)	0	13	0	0	34	0	0	532	0	0	647	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		6.1			6.1			29.0			55.9	
Effective Green, g (s)		6.1			6.1			29.0			55.9	
Actuated g/C Ratio		0.08			0.08			0.40			0.77	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		156			146			1336			2411	
v/s Ratio Prot											c0.08	
v/s Ratio Perm		0.01			c0.02			c0.16			0.13	
v/c Ratio		0.08			0.24			0.40			0.27	
Uniform Delay, d1		30.9			31.3			15.7			2.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.8			0.9			0.3	
Delay (s)		31.1			32.1			16.6			2.8	
Level of Service		C			C			B			A	
Approach Delay (s)		31.1			32.1			16.6			2.8	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM Average Control Delay			11.3			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			73.0			Sum of lost time (s)		17.0				
Intersection Capacity Utilization			50.5%			ICU Level of Service				A		
Analysis Period (min)			15									
c	Critical Lane Group											

Queues
2: West Chester Pike & N Lawrence Rd

2015 Sat No Build
6/22/2011



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	706	1664	1637	101	674
v/c Ratio	0.81	0.58	0.61	0.91	1.10
Control Delay	25.2	6.4	17.8	112.6	98.5
Queue Delay	0.0	0.6	0.0	0.0	6.0
Total Delay	25.2	6.9	17.8	112.6	104.4
Queue Length 50th (ft)	146	427	267	65	-492
Queue Length 95th (ft)	m132	561	360	#166	#637
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290				
Base Capacity (vph)	1366	2858	2683	111	611
Starvation Cap Reductn	0	699	0	0	0
Spillback Cap Reductn	0	12	0	0	8
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.52	0.77	0.61	0.91	1.12

Intersection Summary

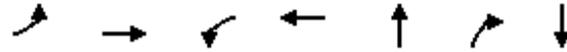
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

2015 Sat No Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	12	1289	76	1318	16	32	108
v/c Ratio	0.11	0.55	0.54	0.50	0.10	0.16	0.65
Control Delay	45.9	11.9	59.2	4.5	40.3	15.8	58.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.9	11.9	59.2	4.5	40.3	15.8	58.1
Queue Length 50th (ft)	7	249	51	87	9	0	62
Queue Length 95th (ft)	16	312	78	102	8	24	83
Internal Link Dist (ft)		672		282	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	158	2331	153	2637	182	224	193
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.55	0.50	0.50	0.09	0.14	0.56

Intersection Summary

Queues
 10: West Chester Pike & I-476 SB Off-Ramp

2015 Sat No Build
 6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT
Lane Group Flow (vph)	1154	1047	353	800	4
v/c Ratio	0.37	0.51	0.23	0.77	0.02
Control Delay	9.0	2.4	0.5	37.8	23.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	9.0	2.4	0.5	37.8	23.0
Queue Length 50th (ft)	94	15	0	240	2
Queue Length 95th (ft)	113	27	0	276	2
Internal Link Dist (ft)	564	662			574
Turn Bay Length (ft)				415	
Base Capacity (vph)	3100	2073	1567	1397	346
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.37	0.51	0.23	0.57	0.01

Intersection Summary

Queues
15: West Chester Pike & I-476 NB

2015 Sat No Build
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	216	1852	1183	95	95	352
v/c Ratio	0.69	0.55	0.57	0.23	0.23	0.90
Control Delay	49.3	10.7	15.9	31.9	31.9	61.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.3	10.7	15.9	31.9	31.9	61.7
Queue Length 50th (ft)	136	222	208	50	50	203
Queue Length 95th (ft)	187	206	264	91	25	#359
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	445	3394	2085	434	434	415
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.55	0.57	0.22	0.22	0.85

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
18: West Chester Pike & S Lawrence Rd

2015 Sat No Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1991	269	434	1766	294	476
v/c Ratio	0.86	0.22	0.81	0.76	0.38	0.69
Control Delay	21.0	2.7	39.0	18.9	34.3	27.9
Queue Delay	0.0	0.0	0.0	0.9	0.0	0.0
Total Delay	21.0	2.7	39.0	19.8	34.3	27.9
Queue Length 50th (ft)	422	14	144	500	81	234
Queue Length 95th (ft)	#540	m17	m138	m548	114	317
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2310	1203	656	2322	790	678
Starvation Cap Reductn	0	0	0	279	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.22	0.66	0.86	0.37	0.70

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
5: Sussex Blvd & Lawrence Road

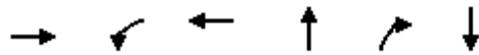
2015 Sat No Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	24	104	534	648
v/c Ratio	0.12	0.43	0.39	0.27
Control Delay	21.2	17.7	16.0	3.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.2	17.7	16.0	3.0
Queue Length 50th (ft)	5	12	85	33
Queue Length 95th (ft)	3	14	123	61
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	521	534	1385	2440
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.05	0.19	0.39	0.27
Intersection Summary				

26: West Chester Pike & Old West Chester Pike

6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1710	65	1530	69	61	16
v/c Ratio	0.68	0.50	0.36	0.51	0.30	0.12
Control Delay	5.0	58.5	3.4	55.5	14.8	35.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.0	58.5	3.4	55.5	14.8	35.6
Queue Length 50th (ft)	77	40	89	42	0	7
Queue Length 95th (ft)	m101	70	117	22	29	6
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2499	134	4235	167	240	160
Starvation Cap Reductn	15	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.49	0.36	0.41	0.25	0.10

Intersection Summary

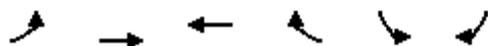
m Volume for 95th percentile queue is metered by upstream signal.

M – Capacity and Queue Analysis

Output “Year 2020 No Build”:

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2020 AM No Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	562	1319	1905	41	52	876
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3283	3451	5159		1718	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3283	3451	5159		1718	1628
Peak-hour factor, PHF	0.94	0.96	0.97	0.50	0.85	0.93
Adj. Flow (vph)	598	1374	1964	82	61	942
RTOR Reduction (vph)	0	0	4	0	0	0
Lane Group Flow (vph)	598	1374	2042	0	61	942
Heavy Vehicles (%)	4%	2%	2%	13%	8%	2%
Turn Type	Prot			custom		
Protected Phases	5	2	6		4	4 5
Permitted Phases						4
Actuated Green, G (s)	22.5	69.0	41.5		19.0	47.5
Effective Green, g (s)	22.5	69.0	41.5		19.0	47.5
Actuated g/C Ratio	0.22	0.69	0.42		0.19	0.48
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	739	2381	2141		326	773
v/s Ratio Prot	0.18	0.40	c0.40		0.04	c0.58
v/s Ratio Perm						
v/c Ratio	0.81	0.58	0.95		0.19	1.22
Uniform Delay, d1	36.7	8.0	28.3		34.0	26.2
Progression Factor	1.12	1.07	0.90		1.00	1.00
Incremental Delay, d2	5.0	0.8	10.4		0.3	110.0
Delay (s)	46.3	9.3	36.0		34.3	136.2
Level of Service	D	A	D		C	F
Approach Delay (s)		20.5	36.0		130.0	
Approach LOS		C	D		F	

Intersection Summary

HCM Average Control Delay	48.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	102.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2020 AM No Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑		↙	↑↑			↑	↗		↕	
Volume (vph)	13	1450	17	26	1286	15	27	18	67	102	32	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%			0%	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.97	
Satd. Flow (prot)	1736	3549		1676	3482			1619	1463		1772	
Flt Permitted	0.95	1.00		0.95	1.00			0.78	1.00		0.77	
Satd. Flow (perm)	1736	3549		1676	3482			1293	1463		1417	
Peak-hour factor, PHF	0.54	0.94	0.61	0.65	0.94	0.94	0.91	0.75	0.88	0.91	0.80	0.54
Adj. Flow (vph)	24	1543	28	40	1368	16	30	24	76	112	40	24
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	64	0	6	0
Lane Group Flow (vph)	24	1570	0	40	1383	0	0	54	12	0	170	0
Heavy Vehicles (%)	1%	2%	0%	0%	3%	0%	7%	6%	3%	1%	6%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	2.4	61.7		4.0	63.3			16.3	16.3		16.3	
Effective Green, g (s)	2.4	61.7		4.0	63.3			16.3	16.3		16.3	
Actuated g/C Ratio	0.02	0.62		0.04	0.63			0.16	0.16		0.16	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	42	2190		67	2204			211	238		231	
v/s Ratio Prot	0.01	c0.44		c0.02	0.40							
v/s Ratio Perm								0.04	0.01		c0.12	
v/c Ratio	0.57	0.72		0.60	0.63			0.26	0.05		0.74	
Uniform Delay, d1	48.3	13.2		47.2	11.2			36.6	35.3		39.8	
Progression Factor	1.00	1.00		1.10	0.35			1.00	1.00		1.00	
Incremental Delay, d2	17.4	2.0		12.4	1.2			0.6	0.1		11.6	
Delay (s)	65.7	15.2		64.5	5.2			37.2	35.4		51.4	
Level of Service	E	B		E	A			D	D		D	
Approach Delay (s)		16.0			6.9			36.2			51.4	
Approach LOS		B			A			D			D	

Intersection Summary

HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2020 AM No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↗				↖↖	↑	
Volume (vph)	0	1338	0	0	1066	0	0	0	0	788	1	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	
Lane Util. Factor		0.91			0.95					0.97	1.00	
Frt		1.00			1.00					1.00	1.00	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		5137			3435					3414	887	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		5137			3435					3414	887	
Peak-hour factor, PHF	0.94	0.91	0.94	0.93	0.95	0.69	0.92	0.92	0.92	0.94	0.25	0.94
Adj. Flow (vph)	0	1470	0	0	1122	0	0	0	0	838	4	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1470	0	0	1122	0	0	0	0	838	4	0
Heavy Vehicles (%)	2%	3%	3%	2%	3%	2%	2%	2%	2%	6%	100%	1%
Turn Type						custom					Perm	
Protected Phases		2			6	4 6						4
Permitted Phases										4		
Actuated Green, G (s)		57.0			57.0					31.0	31.0	
Effective Green, g (s)		57.0			57.0					31.0	31.0	
Actuated g/C Ratio		0.57			0.57					0.31	0.31	
Clearance Time (s)		6.0			6.0					6.0	6.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		2928			1958					1058	275	
v/s Ratio Prot		0.29			c0.33						0.00	
v/s Ratio Perm										c0.25		
v/c Ratio		0.50			0.57					0.79	0.01	
Uniform Delay, d1		13.0			13.7					31.6	23.9	
Progression Factor		0.94			0.45					1.00	1.00	
Incremental Delay, d2		0.5			0.3					4.1	0.0	
Delay (s)		12.6			6.5					35.7	23.9	
Level of Service		B			A					D	C	
Approach Delay (s)		12.6			6.5			0.0			35.6	
Approach LOS		B			A			A			D	
Intersection Summary												
HCM Average Control Delay			16.2			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			61.9%			ICU Level of Service				B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

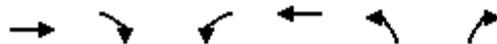
2020 AM No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  							
Volume (vph)	390	1736	0	0	1427	181	148	10	253	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.97		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.97	1.00			
Satd. Flow (prot)	1893	5016			4830		1754	1790	1568			
Flt Permitted	0.95	1.00			1.00		0.95	0.97	1.00			
Satd. Flow (perm)	1893	5016			4830		1754	1790	1568			
Peak-hour factor, PHF	0.81	0.96	0.98	0.93	0.95	0.58	0.84	0.25	0.77	0.92	0.92	0.92
Adj. Flow (vph)	481	1808	0	0	1502	312	176	40	329	0	0	0
RTOR Reduction (vph)	0	0	0	0	32	0	0	0	19	0	0	0
Lane Group Flow (vph)	481	1808	0	0	1782	0	107	109	310	0	0	0
Heavy Vehicles (%)	1%	6%	2%	2%	2%	2%	1%	1%	3%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	25.6	65.6			34.0		22.4	22.4	22.4			
Effective Green, g (s)	25.6	65.6			34.0		22.4	22.4	22.4			
Actuated g/C Ratio	0.26	0.66			0.34		0.22	0.22	0.22			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	485	3290			1642		393	401	351			
v/s Ratio Prot	c0.25	0.36			c0.37							
v/s Ratio Perm							0.06	0.06	c0.20			
v/c Ratio	0.99	0.55			1.09		0.27	0.27	0.88			
Uniform Delay, d1	37.1	9.3			33.0		32.1	32.1	37.5			
Progression Factor	0.72	0.95			0.77		1.00	1.00	1.00			
Incremental Delay, d2	36.0	0.6			45.8		0.4	0.4	22.2			
Delay (s)	62.8	9.3			71.3		32.4	32.4	59.7			
Level of Service	E	A			E		C	C	E			
Approach Delay (s)		20.6			71.3			48.9			0.0	
Approach LOS		C			E			D			A	
Intersection Summary												
HCM Average Control Delay			43.7			HCM Level of Service			D			
HCM Volume to Capacity ratio			1.00									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			72.6%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: West Chester Pike & S Lawrence Rd

2020 AM No Build
6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↙↘	↑↑	↙↘	↑
Volume (vph)	1450	539	315	2466	576	431
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5212	1577	3318	3487	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5212	1577	3318	3487	3433	1568
Peak-hour factor, PHF	0.96	0.89	0.89	0.95	0.86	0.94
Adj. Flow (vph)	1510	606	354	2596	670	459
RTOR Reduction (vph)	0	17	0	0	0	5
Lane Group Flow (vph)	1510	589	354	2596	670	454
Heavy Vehicles (%)	2%	5%	5%	3%	2%	3%
Turn Type		pt+ov	Prot			pt+ov
Protected Phases	2	2 8	1	6	8	8 1
Permitted Phases						
Actuated Green, G (s)	45.9	74.5	13.5	65.4	22.6	42.1
Effective Green, g (s)	45.9	74.5	13.5	65.4	22.6	42.1
Actuated g/C Ratio	0.46	0.74	0.14	0.65	0.23	0.42
Clearance Time (s)	6.0		6.0	6.0	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	2392	1175	448	2280	776	660
v/s Ratio Prot	0.29	0.37	0.11	c0.74	c0.20	0.29
v/s Ratio Perm						
v/c Ratio	0.63	0.50	0.79	1.14	0.86	0.69
Uniform Delay, d1	20.6	5.2	41.9	17.3	37.2	23.6
Progression Factor	0.59	0.60	1.13	0.68	1.00	1.00
Incremental Delay, d2	1.0	0.3	0.9	62.9	9.8	3.0
Delay (s)	13.2	3.4	48.4	74.7	47.0	26.6
Level of Service	B	A	D	E	D	C
Approach Delay (s)	10.4			71.5	38.7	
Approach LOS	B			E	D	

Intersection Summary

HCM Average Control Delay	44.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	94.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

2020 AM No Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1324	47	62	1908	9	20	0	35	4	0	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.91	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)		3313		1705	5130			1415	1227		1570	
Flt Permitted		1.00		0.95	1.00			0.73	1.00		0.89	
Satd. Flow (perm)		3313		1705	5130			1089	1227		1418	
Peak-hour factor, PHF	0.95	0.95	0.77	0.85	0.95	0.75	0.83	0.25	0.55	0.33	0.25	0.64
Adj. Flow (vph)	0	1394	61	73	2008	12	24	0	64	12	0	28
RTOR Reduction (vph)	0	3	0	0	1	0	0	0	60	0	26	0
Lane Group Flow (vph)	0	1452	0	73	2019	0	0	24	4	0	14	0
Heavy Vehicles (%)	2%	6%	9%	8%	3%	11%	25%	0%	29%	0%	0%	6%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		69.0		7.4	81.4			6.6	6.6		6.6	
Effective Green, g (s)		69.0		7.4	81.4			6.6	6.6		6.6	
Actuated g/C Ratio		0.69		0.07	0.81			0.07	0.07		0.07	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2286		126	4176			72	81		94	
v/s Ratio Prot		c0.44		0.04	c0.39							
v/s Ratio Perm								c0.02	0.00		0.01	
v/c Ratio		0.64		0.58	0.48			0.33	0.05		0.15	
Uniform Delay, d1		8.6		44.8	2.9			44.6	43.8		44.0	
Progression Factor		0.59		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.1		6.3	0.4			2.7	0.3		0.7	
Delay (s)		6.2		51.1	3.3			47.3	44.0		44.8	
Level of Service		A		D	A			D	D		D	
Approach Delay (s)		6.2			4.9			44.9			44.8	
Approach LOS		A			A			D			D	

Intersection Summary

HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2020 AM No Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕	↕↗	
Volume (veh/h)	0	2	1	1052	585	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.25	0.25	0.98	0.91	0.25
Hourly flow rate (vph)	0	8	4	1073	643	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.79					
vC, conflicting volume	1190	323	647			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	695	323	647			
tC, single (s)	6.8	7.9	6.1			
tC, 2 stage (s)						
tF (s)	3.5	3.8	3.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	293	550	494			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	8	4	537	537	429	218
Volume Left	0	4	0	0	0	0
Volume Right	8	0	0	0	0	4
cSH	550	494	1700	1700	1700	1700
Volume to Capacity	0.01	0.01	0.32	0.32	0.25	0.13
Queue Length 95th (ft)	1	1	0	0	0	0
Control Delay (s)	11.6	12.3	0.0	0.0	0.0	0.0
Lane LOS	B	B				
Approach Delay (s)	11.6	0.0			0.0	
Approach LOS	B					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			32.4%	ICU Level of Service		A
Analysis Period (min)			15			

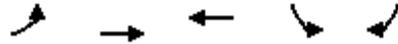
HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2020 AM No Build
6/22/2011

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	32	14	25	21	3	155	8	866	4	58	518	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.89			1.00			1.00	
Flt Protected		0.98			0.99			1.00			1.00	
Satd. Flow (prot)		1854			1824			3499			3429	
Flt Permitted		0.54			0.93			0.94			0.76	
Satd. Flow (perm)		1023			1715			3307			2625	
Peak-hour factor, PHF	0.57	0.44	0.63	0.75	0.75	0.88	0.67	0.88	0.33	0.91	0.93	0.67
Adj. Flow (vph)	56	32	40	28	4	176	12	984	12	64	557	16
RTOR Reduction (vph)	0	27	0	0	153	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	101	0	0	55	0	0	1007	0	0	636	0
Heavy Vehicles (%)	6%	0%	20%	10%	0%	3%	0%	3%	0%	0%	5%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		10.3			10.3			30.0			56.7	
Effective Green, g (s)		10.3			10.3			30.0			56.7	
Actuated g/C Ratio		0.13			0.13			0.38			0.73	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		135			226			1272			2132	
v/s Ratio Prot											c0.08	
v/s Ratio Perm		c0.10			0.03			c0.30			0.13	
v/c Ratio		0.75			0.24			0.79			0.30	
Uniform Delay, d1		32.6			30.4			21.2			3.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		20.1			0.6			5.1			0.4	
Delay (s)		52.7			30.9			26.3			4.1	
Level of Service		D			C			C			A	
Approach Delay (s)		52.7			30.9			26.3			4.1	
Approach LOS		D			C			C			A	
Intersection Summary												
HCM Average Control Delay			21.4			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			78.0			Sum of lost time (s)			17.0			
Intersection Capacity Utilization			66.0%			ICU Level of Service				C		
Analysis Period (min)			15									
c	Critical Lane Group											

Queues
2: West Chester Pike & N Lawrence Rd

2020 AM No Build
6/22/2011



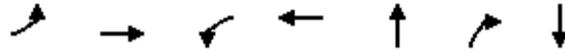
Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	598	1374	2046	61	942
v/c Ratio	0.81	0.58	0.95	0.19	1.25
Control Delay	48.1	9.5	37.4	35.8	148.0
Queue Delay	0.0	0.0	0.9	0.0	0.7
Total Delay	48.1	9.5	38.2	35.8	148.8
Queue Length 50th (ft)	202	169	452	33	-752
Queue Length 95th (ft)	250	195	#644	65	#931
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290				
Base Capacity (vph)	985	2381	2147	326	756
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	23	0	1
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.58	0.96	0.19	1.25

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: West Chester Pike & N New Ardmore Ave

2020 AM No Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	24	1571	40	1384	54	76	176
v/c Ratio	0.23	0.69	0.37	0.59	0.26	0.25	0.74
Control Delay	50.2	15.6	59.5	5.9	38.1	10.2	56.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.2	15.6	59.5	5.9	38.1	10.2	56.7
Queue Length 50th (ft)	15	380	27	47	30	0	103
Queue Length 95th (ft)	24	487	45	118	53	36	148
Internal Link Dist (ft)		672		282	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	107	2277	109	2331	259	353	289
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.69	0.37	0.59	0.21	0.22	0.61

Intersection Summary

Queues
10: West Chester Pike & I-476 SB Off-Ramp

2020 AM No Build
6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT
Lane Group Flow (vph)	1470	1122	738	838	4
v/c Ratio	0.50	0.57	0.48	0.79	0.01
Control Delay	13.4	6.3	4.3	37.1	21.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	13.4	6.3	4.3	37.1	21.0
Queue Length 50th (ft)	133	84	406	250	2
Queue Length 95th (ft)	208	m192	m0	288	2
Internal Link Dist (ft)	564	662			574
Turn Bay Length (ft)				415	
Base Capacity (vph)	2927	1957	1552	1331	346
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.50	0.57	0.48	0.63	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB



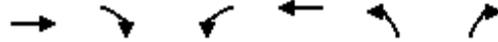
Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	481	1808	1814	107	109	329
v/c Ratio	0.99	0.55	1.08	0.27	0.27	0.89
Control Delay	66.8	9.7	68.5	33.4	33.4	61.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.8	9.7	68.5	33.4	33.4	61.4
Queue Length 50th (ft)	~351	158	345	57	58	186
Queue Length 95th (ft)	#466	272	m254	100	28	236
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	485	3292	1674	421	429	395
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.55	1.08	0.25	0.25	0.83

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues
18: West Chester Pike & S Lawrence Rd

2020 AM No Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1510	606	354	2596	670	459
v/c Ratio	0.63	0.51	0.79	1.14	0.86	0.69
Control Delay	13.6	4.4	48.4	78.6	49.9	28.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	4.4	48.4	78.6	49.9	28.9
Queue Length 50th (ft)	125	50	118	~1006	211	226
Queue Length 95th (ft)	205	m66	m112	m#946	#266	322
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2389	1192	564	2280	790	653
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.51	0.63	1.14	0.85	0.70

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues

2020 AM No Build

26: West Chester Pike & Old West Chester Pike

6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1455	73	2020	24	64	40
v/c Ratio	0.61	0.50	0.47	0.29	0.42	0.30
Control Delay	6.6	55.7	3.3	51.6	19.8	26.9
Queue Delay	0.2	0.0	0.0	0.0	0.0	0.0
Total Delay	6.8	55.7	3.3	51.6	19.8	26.9
Queue Length 50th (ft)	221	45	115	15	0	7
Queue Length 95th (ft)	296	85	159	11	9	0
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2404	159	4301	109	180	167
Starvation Cap Reductn	288	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.46	0.47	0.22	0.36	0.24

Intersection Summary

Queues
5: Sussex Blvd & Lawrence Road

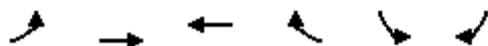
2020 AM No Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	128	208	1008	637
v/c Ratio	0.79	0.55	0.79	0.30
Control Delay	55.3	13.1	26.8	4.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	55.3	13.1	26.8	4.4
Queue Length 50th (ft)	46	14	222	43
Queue Length 95th (ft)	35	42	288	80
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	349	669	1274	2121
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.37	0.31	0.79	0.30
Intersection Summary				

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2020 PM No Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1105	1827	1471	88	103	808
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3347	3451	5168		1819	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3347	3451	5168		1819	1628
Peak-hour factor, PHF	0.98	0.95	0.87	0.86	0.74	0.95
Adj. Flow (vph)	1128	1923	1691	102	139	851
RTOR Reduction (vph)	0	0	6	0	0	1
Lane Group Flow (vph)	1128	1923	1787	0	139	850
Turn Type	Prot			custom		
Protected Phases	5	2	6		4	4
Permitted Phases						5
Actuated Green, G (s)	43.8	95.0	46.2		13.0	56.8
Effective Green, g (s)	43.8	95.0	46.2		13.0	56.8
Actuated g/C Ratio	0.36	0.79	0.39		0.11	0.47
Clearance Time (s)	5.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	1222	2732	1990		197	852
v/s Ratio Prot	0.34	0.56	c0.35		0.08	c0.11
v/s Ratio Perm						0.41
v/c Ratio	0.92	0.70	0.90		0.71	1.00
Uniform Delay, d1	36.5	5.9	34.7		51.7	31.5
Progression Factor	0.52	0.91	1.16		1.00	1.00
Incremental Delay, d2	3.6	0.4	6.5		10.9	30.0
Delay (s)	22.5	5.7	46.7		62.6	61.5
Level of Service	C	A	D		E	E
Approach Delay (s)		11.9	46.7		61.7	
Approach LOS		B	D		E	

Intersection Summary

HCM Average Control Delay	31.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2020 PM No Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑		↙	↑↑			↑	↗		↕	
Volume (vph)	113	1594	35	16	1667	19	49	18	4	15	15	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%				0%
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85			0.95
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00			0.98
Satd. Flow (prot)	1702	3509		1643	3514			1698	1492			1757
Flt Permitted	0.95	1.00		0.95	1.00			0.75	1.00			0.84
Satd. Flow (perm)	1702	3509		1643	3514			1311	1492			1498
Peak-hour factor, PHF	0.88	0.95	0.80	1.00	0.88	0.68	0.94	0.75	0.50	0.47	0.75	0.61
Adj. Flow (vph)	128	1678	44	16	1894	28	52	24	8	32	20	28
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	7	0	17	0
Lane Group Flow (vph)	128	1721	0	16	1921	0	0	76	1	0	63	0
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	11.5	90.5		2.0	81.0			9.5	9.5			9.5
Effective Green, g (s)	11.5	90.5		2.0	81.0			9.5	9.5			9.5
Actuated g/C Ratio	0.10	0.75		0.02	0.68			0.08	0.08			0.08
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Grp Cap (vph)	163	2646		27	2372			104	118			119
v/s Ratio Prot	c0.08	0.49		0.01	c0.55							
v/s Ratio Perm								c0.06	0.00			0.04
v/c Ratio	0.79	0.65		0.59	0.81			0.73	0.01			0.53
Uniform Delay, d1	53.0	7.1		58.6	14.0			54.0	50.9			53.1
Progression Factor	1.00	1.00		0.83	0.74			1.00	1.00			1.00
Incremental Delay, d2	21.5	1.3		24.0	2.4			23.0	0.0			4.5
Delay (s)	74.6	8.4		72.8	12.8			77.0	50.9			57.6
Level of Service	E	A		E	B			E	D			E
Approach Delay (s)		13.0			13.3			74.5				57.6
Approach LOS		B			B			E				E

Intersection Summary

HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2020 PM No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↑				↑↑	↑	
Volume (vph)	0	1424	0	0	1322	0	0	0	0	1492	1	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	
Lane Util. Factor		0.91			0.95					0.97	1.00	
Frt		1.00			1.00					1.00	1.00	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		5187			3468					3583	1756	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		5187			3468					3583	1756	
Peak-hour factor, PHF	0.94	0.94	0.94	0.93	0.94	0.90	0.92	0.92	0.92	0.94	0.25	0.88
Adj. Flow (vph)	0	1515	0	0	1406	0	0	0	0	1587	4	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1515	0	0	1406	0	0	0	0	1587	4	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Turn Type						custom					Perm	
Protected Phases		2			6	4 6						4
Permitted Phases										4		
Actuated Green, G (s)		52.4			52.4					55.6	55.6	
Effective Green, g (s)		52.4			52.4					55.6	55.6	
Actuated g/C Ratio		0.44			0.44					0.46	0.46	
Clearance Time (s)		6.0			6.0					6.0	6.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		2265			1514					1660	814	
v/s Ratio Prot		0.29			c0.41						0.00	
v/s Ratio Perm										c0.44		
v/c Ratio		0.67			0.93					0.96	0.00	
Uniform Delay, d1		26.9			32.0					31.0	17.3	
Progression Factor		0.78			0.78					1.00	1.00	
Incremental Delay, d2		1.3			7.2					13.1	0.0	
Delay (s)		22.3			32.2					44.1	17.3	
Level of Service		C			C					D	B	
Approach Delay (s)		22.3			32.2			0.0			44.0	
Approach LOS		C			C			A			D	
Intersection Summary												
HCM Average Control Delay			33.0			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			89.1%			ICU Level of Service				E		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

2020 PM No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	324	2592	0	0	1336	0	259	0	500	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			1.00		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1874	5212			4958		1754	1754	1599			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1874	5212			4958		1754	1754	1599			
Peak-hour factor, PHF	0.83	0.95	0.98	0.93	0.92	0.93	0.93	0.25	0.94	0.92	0.92	0.92
Adj. Flow (vph)	390	2728	0	0	1452	0	278	0	532	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	1	0	0	0
Lane Group Flow (vph)	390	2728	0	0	1452	0	139	139	531	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type	Prot						Perm		Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	27.1	72.0			38.9		36.0	36.0	36.0			
Effective Green, g (s)	27.1	72.0			38.9		36.0	36.0	36.0			
Actuated g/C Ratio	0.23	0.60			0.32		0.30	0.30	0.30			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	423	3127			1607		526	526	480			
v/s Ratio Prot	0.21	c0.52			0.29							
v/s Ratio Perm							0.08	0.08	c0.33			
v/c Ratio	0.92	0.87			0.90		0.26	0.26	1.11			
Uniform Delay, d1	45.4	20.1			38.8		31.9	31.9	42.0			
Progression Factor	0.75	0.82			0.80		1.00	1.00	1.00			
Incremental Delay, d2	20.7	2.0			5.9		0.3	0.3	73.0			
Delay (s)	54.7	18.6			36.8		32.2	32.2	115.0			
Level of Service	D	B			D		C	C	F			
Approach Delay (s)		23.1			36.8			86.6			0.0	
Approach LOS		C			D			F			A	
Intersection Summary												
HCM Average Control Delay			36.3				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			91.0%				ICU Level of Service			F		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2020 PM No Build
 6/22/2011

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↑↓	↑↑	↑↓	↑
Volume (vph)	2530	562	539	1740	289	402
Ideal Flow (vphpl)	2100	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5761	1623	3416	3522	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5761	1623	3416	3522	3433	1583
Peak-hour factor, PHF	0.95	0.83	0.95	0.92	0.82	0.93
Adj. Flow (vph)	2663	677	567	1891	352	432
RTOR Reduction (vph)	0	5	0	0	0	0
Lane Group Flow (vph)	2663	672	567	1891	352	432
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	53.1	85.7	22.3	81.4	26.6	48.9
Effective Green, g (s)	53.1	85.7	22.3	81.4	26.6	48.9
Actuated g/C Ratio	0.44	0.71	0.19	0.68	0.22	0.41
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		4.0	3.0	2.0	2.0
Lane Grp Cap (vph)	2549	1159	635	2389	761	724
v/s Ratio Prot	c0.46	0.41	0.17	c0.54	0.10	c0.13
v/s Ratio Perm						0.14
v/c Ratio	1.04	0.58	0.89	0.79	0.46	0.60
Uniform Delay, d1	33.5	8.4	47.7	13.4	40.5	27.8
Progression Factor	0.64	0.54	0.65	1.39	1.00	1.00
Incremental Delay, d2	25.8	0.2	6.1	1.0	0.2	0.9
Delay (s)	47.3	4.7	37.3	19.6	40.7	28.7
Level of Service	D	A	D	B	D	C
Approach Delay (s)	38.7			23.7	34.1	
Approach LOS	D			C	C	

Intersection Summary

HCM Average Control Delay	32.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

2020 PM No Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1869	61	65	1414	17	142	1	125	2	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.94	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.97	
Satd. Flow (prot)		3462		1497	5128			1741	1583		1679	
Flt Permitted		1.00		0.95	1.00			0.72	1.00		0.82	
Satd. Flow (perm)		3462		1497	5128			1317	1583		1425	
Peak-hour factor, PHF	0.92	0.93	0.79	0.80	0.97	0.85	0.83	0.25	0.74	0.25	0.25	0.50
Adj. Flow (vph)	0	2010	77	81	1458	20	171	4	169	8	0	6
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	99	0	5	0
Lane Group Flow (vph)	0	2085	0	81	1477	0	0	175	70	0	9	0
Heavy Vehicles (%)	2%	1%	18%	23%	3%	0%	2%	0%	0%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		76.9		8.0	89.9			18.1	18.1		18.1	
Effective Green, g (s)		76.9		8.0	89.9			18.1	18.1		18.1	
Actuated g/C Ratio		0.64		0.07	0.75			0.15	0.15		0.15	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2219		100	3842			199	239		215	
v/s Ratio Prot		c0.60		c0.05	0.29							
v/s Ratio Perm								c0.13	0.04		0.01	
v/c Ratio		0.94		0.81	0.38			0.88	0.29		0.04	
Uniform Delay, d1		19.5		55.3	5.3			49.9	45.3		43.5	
Progression Factor		0.27		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		7.1		37.2	0.3			32.6	0.7		0.1	
Delay (s)		12.4		92.5	5.6			82.5	45.9		43.6	
Level of Service		B		F	A			F	D		D	
Approach Delay (s)		12.4			10.1			64.5			43.6	
Approach LOS		B			B			E			D	

Intersection Summary

HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	79.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2020 PM No Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕↕	↕↕↗	
Volume (veh/h)	0	2	1	657	1061	4
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.50	0.25	0.92	0.89	0.50
Hourly flow rate (vph)	0	4	4	714	1192	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.94					
vC, conflicting volume	1561	600	1200			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1473	600	1200			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	110	449	589			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	4	4	357	357	795	405
Volume Left	0	4	0	0	0	0
Volume Right	4	0	0	0	0	8
cSH	449	589	1700	1700	1700	1700
Volume to Capacity	0.01	0.01	0.21	0.21	0.47	0.24
Queue Length 95th (ft)	1	1	0	0	0	0
Control Delay (s)	13.1	11.2	0.0	0.0	0.0	0.0
Lane LOS	B	B				
Approach Delay (s)	13.1	0.1			0.0	
Approach LOS	B					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			39.5%		ICU Level of Service	A
Analysis Period (min)			15			

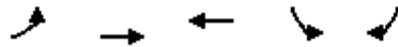
HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2020 PM No Build
6/22/2011

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	43	18	32	20	7	90	8	525	31	132	887	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.97			0.91			0.99			0.99	
Flt Protected		0.97			0.99			1.00			0.99	
Satd. Flow (prot)		2031			1929			3507			3532	
Flt Permitted		0.70			0.87			0.92			0.66	
Satd. Flow (perm)		1454			1694			3214			2359	
Peak-hour factor, PHF	0.32	0.30	0.53	0.46	0.58	0.73	0.67	0.93	0.78	0.81	0.83	0.69
Adj. Flow (vph)	134	60	60	43	12	123	12	565	40	163	1069	64
RTOR Reduction (vph)	0	16	0	0	96	0	0	7	0	0	4	0
Lane Group Flow (vph)	0	238	0	0	82	0	0	610	0	0	1292	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		17.2			17.2			30.0			49.8	
Effective Green, g (s)		17.2			17.2			30.0			49.8	
Actuated g/C Ratio		0.22			0.22			0.38			0.64	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		321			374			1236			1729	
v/s Ratio Prot											c0.14	
v/s Ratio Perm		c0.16			0.05			0.19			c0.34	
v/c Ratio		0.74			0.22			0.49			0.75	
Uniform Delay, d1		28.3			24.9			18.2			9.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		8.9			0.3			1.4			3.0	
Delay (s)		37.2			25.2			19.6			12.8	
Level of Service		D			C			B			B	
Approach Delay (s)		37.2			25.2			19.6			12.8	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM Average Control Delay			18.2			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			78.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			71.5%			ICU Level of Service				C		
Analysis Period (min)			15									
c	Critical Lane Group											

Queues
2: West Chester Pike & N Lawrence Rd

2020 PM No Build
6/22/2011



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	1128	1923	1793	139	851
v/c Ratio	0.92	0.70	0.90	0.71	1.01
Control Delay	23.3	5.9	47.3	71.5	63.6
Queue Delay	0.0	23.7	0.3	0.0	53.0
Total Delay	23.3	29.6	47.6	71.5	116.7
Queue Length 50th (ft)	169	95	528	106	618
Queue Length 95th (ft)	m161	m77	563	141	#919
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290				
Base Capacity (vph)	1283	2732	1993	197	840
Starvation Cap Reductn	0	885	0	0	0
Spillback Cap Reductn	0	0	21	0	101
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.88	1.04	0.91	0.71	1.15

Intersection Summary

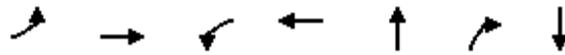
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

2020 PM No Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	128	1722	16	1922	76	8	80
v/c Ratio	0.79	0.63	0.23	0.81	0.74	0.06	0.59
Control Delay	84.1	7.5	52.7	13.3	91.4	28.5	59.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.1	7.5	52.7	13.3	91.4	28.5	59.6
Queue Length 50th (ft)	98	196	13	211	58	0	47
Queue Length 95th (ft)	#188	401	m22	270	#99	7	80
Internal Link Dist (ft)		672		282	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	170	2753	69	2374	109	132	141
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.63	0.23	0.81	0.70	0.06	0.57

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
 10: West Chester Pike & I-476 SB Off-Ramp

2020 PM No Build
 6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT
Lane Group Flow (vph)	1515	1406	303	1587	4
v/c Ratio	0.67	0.93	0.20	0.96	0.00
Control Delay	22.5	32.4	0.1	45.2	17.0
Queue Delay	0.0	0.0	0.0	3.1	0.0
Total Delay	22.5	32.4	0.1	48.3	17.0
Queue Length 50th (ft)	339	606	0	591	2
Queue Length 95th (ft)	254	m#704	m0	#760	2
Internal Link Dist (ft)	564	662			574
Turn Bay Length (ft)				415	
Base Capacity (vph)	2264	1514	1552	1672	819
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	49	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.67	0.93	0.20	0.98	0.00

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

2020 PM No Build
6/22/2011

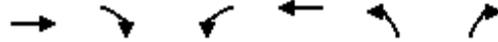


Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	390	2728	1452	139	139	532
v/c Ratio	0.92	0.87	0.90	0.26	0.26	1.11
Control Delay	57.9	18.9	37.4	33.6	33.6	112.7
Queue Delay	0.0	15.6	0.0	0.2	0.2	0.0
Total Delay	57.9	34.5	37.4	33.8	33.8	112.7
Queue Length 50th (ft)	321	445	420	86	86	~470
Queue Length 95th (ft)	#401	m517	#495	144	35	#690
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	437	3127	1608	526	526	481
Starvation Cap Reductn	0	252	0	0	0	0
Spillback Cap Reductn	0	465	0	74	74	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.89	1.02	0.90	0.31	0.31	1.11

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues
18: West Chester Pike & S Lawrence Rd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	2663	677	567	1891	352	432
v/c Ratio	1.04	0.58	0.89	0.79	0.46	0.60
Control Delay	48.7	5.6	39.1	20.8	42.3	27.8
Queue Delay	10.9	1.0	0.0	13.0	0.0	0.0
Total Delay	59.6	6.6	39.1	33.8	42.3	27.8
Queue Length 50th (ft)	~863	157	193	680	121	231
Queue Length 95th (ft)	m#908	m152	m215	m751	148	334
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2553	1165	662	2390	830	704
Starvation Cap Reductn	64	254	0	517	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.07	0.74	0.86	1.01	0.42	0.61

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	2087	81	1478	175	169	14
v/c Ratio	0.94	0.81	0.38	0.88	0.50	0.06
Control Delay	13.8	104.1	5.7	88.5	21.4	32.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.8	104.1	5.7	88.5	21.4	32.8
Queue Length 50th (ft)	139	63	131	133	36	5
Queue Length 95th (ft)	#963	#129	153	52	67	4
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2218	100	3841	209	349	231
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.81	0.38	0.84	0.48	0.06

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
5: Sussex Blvd & Lawrence Road

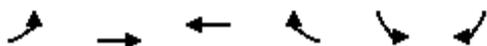
2020 PM No Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	254	178	617	1296
v/c Ratio	0.75	0.38	0.50	0.75
Control Delay	39.5	10.7	19.6	14.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	39.5	10.7	19.6	14.3
Queue Length 50th (ft)	106	22	114	165
Queue Length 95th (ft)	39	23	162	246
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	480	627	1243	1718
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.53	0.28	0.50	0.75
Intersection Summary				

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2020 Sat No Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	664	1530	1384	92	92	619
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3414	3485	5213		1856	1660
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3414	3485	5213		1856	1660
Peak-hour factor, PHF	0.93	0.91	0.90	0.80	0.90	0.91
Adj. Flow (vph)	714	1681	1538	115	102	680
RTOR Reduction (vph)	0	0	6	0	0	2
Lane Group Flow (vph)	714	1681	1647	0	102	678
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	Prot				custom	
Protected Phases	5	2	6		4	4 5
Permitted Phases						4
Actuated Green, G (s)	25.9	82.0	51.1		6.0	37.9
Effective Green, g (s)	25.9	82.0	51.1		6.0	37.9
Actuated g/C Ratio	0.26	0.82	0.51		0.06	0.38
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	884	2858	2664		111	629
v/s Ratio Prot	0.21	0.48	c0.32		0.05	c0.41
v/s Ratio Perm						
v/c Ratio	0.81	0.59	0.62		0.92	1.08
Uniform Delay, d1	34.7	3.1	17.5		46.8	31.1
Progression Factor	0.61	1.83	0.93		1.00	1.00
Incremental Delay, d2	2.9	0.5	1.0		59.7	58.8
Delay (s)	24.0	6.2	17.4		106.4	89.8
Level of Service	C	A	B		F	F
Approach Delay (s)		11.5	17.4		92.0	
Approach LOS		B	B		F	

Intersection Summary

HCM Average Control Delay	26.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2020 Sat No Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑		↙	↑↑			↑	↗		↕	
Volume (vph)	7	1214	5	54	1074	7	9	1	27	44	8	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%			0%	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.96	
Satd. Flow (prot)	1754	3587		1676	3553			1709	1507		1796	
Flt Permitted	0.95	1.00		0.95	1.00			0.79	1.00		0.77	
Satd. Flow (perm)	1754	3587		1676	3553			1401	1507		1437	
Peak-hour factor, PHF	0.58	0.94	0.42	0.71	0.81	0.88	0.75	0.25	0.84	0.55	0.67	0.44
Adj. Flow (vph)	12	1291	12	76	1326	8	12	4	32	80	12	16
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	28	0	6	0
Lane Group Flow (vph)	12	1302	0	76	1334	0	0	16	4	0	102	0
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)	1.5	63.7		7.2	69.4			11.1	11.1		11.1	
Effective Green, g (s)	1.5	63.7		7.2	69.4			11.1	11.1		11.1	
Actuated g/C Ratio	0.02	0.64		0.07	0.69			0.11	0.11		0.11	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	26	2285		121	2466			156	167		160	
v/s Ratio Prot	0.01	c0.36		c0.05	c0.38							
v/s Ratio Perm								0.01	0.00		c0.07	
v/c Ratio	0.46	0.57		0.63	0.54			0.10	0.02		0.64	
Uniform Delay, d1	48.8	10.3		45.1	7.5			40.0	39.6		42.5	
Progression Factor	1.00	1.00		1.04	0.49			1.00	1.00		1.00	
Incremental Delay, d2	12.4	1.0		9.2	0.8			0.3	0.1		8.0	
Delay (s)	61.3	11.4		56.0	4.5			40.3	39.7		50.5	
Level of Service	E	B		E	A			D	D		D	
Approach Delay (s)		11.8			7.3			39.9			50.5	
Approach LOS		B			A			D			D	

Intersection Summary

HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2020 Sat No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↑				↑↑	↑	
Volume (vph)	0	1131	0	0	952	0	0	0	0	719	1	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	
Lane Util. Factor		0.91			0.95					0.97	1.00	
Frt		1.00			1.00					1.00	1.00	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		5238			3503					3583	887	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		5238			3503					3583	887	
Peak-hour factor, PHF	0.94	0.97	0.94	0.93	0.90	0.81	0.92	0.92	0.92	0.89	0.25	0.94
Adj. Flow (vph)	0	1166	0	0	1058	0	0	0	0	808	4	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1166	0	0	1058	0	0	0	0	808	4	0
Heavy Vehicles (%)	2%	1%	2%	2%	1%	1%	2%	2%	2%	1%	100%	1%
Turn Type						custom					Perm	
Protected Phases		2			6	4 6						4
Permitted Phases										4		
Actuated Green, G (s)		59.0			59.0					29.0	29.0	
Effective Green, g (s)		59.0			59.0					29.0	29.0	
Actuated g/C Ratio		0.59			0.59					0.29	0.29	
Clearance Time (s)		6.0			6.0					6.0	6.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		3090			2067					1039	257	
v/s Ratio Prot		0.22			c0.30						0.00	
v/s Ratio Perm										c0.23		
v/c Ratio		0.38			0.51					0.78	0.02	
Uniform Delay, d1		10.8			12.0					32.5	25.3	
Progression Factor		0.77			0.14					1.00	1.00	
Incremental Delay, d2		0.3			0.8					3.7	0.0	
Delay (s)		8.6			2.4					36.3	25.3	
Level of Service		A			A					D	C	
Approach Delay (s)		8.6			2.4			0.0			36.2	
Approach LOS		A			A			A			D	
Intersection Summary												
HCM Average Control Delay			13.8			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			56.8%			ICU Level of Service				B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

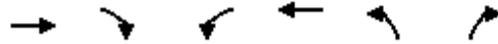
2020 Sat No Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	203	1647	0	0	1075	0	165	0	349	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			1.00		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1856	5264			5007		1737	1737	1599			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1856	5264			5007		1737	1737	1599			
Peak-hour factor, PHF	0.93	0.88	0.97	0.90	0.90	0.93	0.86	0.25	0.98	0.92	0.92	0.92
Adj. Flow (vph)	218	1872	0	0	1194	0	192	0	356	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	14	0	0	0
Lane Group Flow (vph)	218	1872	0	0	1194	0	96	96	342	0	0	0
Heavy Vehicles (%)	3%	1%	0%	2%	1%	2%	2%	0%	1%	2%	2%	2%
Turn Type	Prot						Perm		Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	16.9	64.3			41.4		23.7	23.7	23.7			
Effective Green, g (s)	16.9	64.3			41.4		23.7	23.7	23.7			
Actuated g/C Ratio	0.17	0.64			0.41		0.24	0.24	0.24			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	314	3385			2073		412	412	379			
v/s Ratio Prot	c0.12	c0.36			0.24							
v/s Ratio Perm							0.06	0.06	c0.21			
v/c Ratio	0.69	0.55			0.58		0.23	0.23	0.90			
Uniform Delay, d1	39.1	9.9			22.5		30.8	30.8	37.0			
Progression Factor	0.99	1.00			0.63		1.00	1.00	1.00			
Incremental Delay, d2	6.3	0.6			0.8		0.3	0.3	23.7			
Delay (s)	44.9	10.5			14.9		31.1	31.1	60.7			
Level of Service	D	B			B		C	C	E			
Approach Delay (s)		14.1			14.9			50.3			0.0	
Approach LOS		B			B			D			A	
Intersection Summary												
HCM Average Control Delay			19.5			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			63.4%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2020 Sat No Build
 6/22/2011

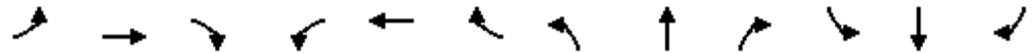


Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↙↘	↑↑	↙↘	↑
Volume (vph)	1771	225	399	1604	256	423
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5264	1639	3450	3556	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5264	1639	3450	3556	3433	1568
Peak-hour factor, PHF	0.88	0.83	0.91	0.90	0.86	0.88
Adj. Flow (vph)	2012	271	438	1782	298	481
RTOR Reduction (vph)	0	14	0	0	0	1
Lane Group Flow (vph)	2012	257	438	1782	298	480
Heavy Vehicles (%)	1%	1%	1%	1%	2%	3%
Turn Type		pt+ov	Prot			pt+ov
Protected Phases	2	2 8	1	6	8	8 1
Permitted Phases						
Actuated Green, G (s)	43.8	72.5	15.5	65.3	22.7	44.2
Effective Green, g (s)	43.8	72.5	15.5	65.3	22.7	44.2
Actuated g/C Ratio	0.44	0.72	0.16	0.65	0.23	0.44
Clearance Time (s)	6.0		6.0	6.0	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	2306	1188	535	2322	779	693
v/s Ratio Prot	c0.38	0.16	0.13	c0.50	0.09	c0.31
v/s Ratio Perm						
v/c Ratio	0.87	0.22	0.82	0.77	0.38	0.69
Uniform Delay, d1	25.6	4.5	40.9	12.1	32.7	22.4
Progression Factor	0.63	0.60	0.75	1.39	1.00	1.00
Incremental Delay, d2	4.1	0.1	6.1	1.6	0.3	3.0
Delay (s)	20.3	2.8	36.9	18.4	33.0	25.5
Level of Service	C	A	D	B	C	C
Approach Delay (s)	18.2			22.0	28.4	
Approach LOS	B			C	C	

Intersection Summary			
HCM Average Control Delay	21.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

2020 Sat No Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↙	↑↑↑			↑	↗		↕	
Volume (vph)	0	1563	59	49	1411	19	61	0	49	6	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.97	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.96	
Satd. Flow (prot)		3480		1805	5175			1769	1552		1708	
Flt Permitted		1.00		0.95	1.00			0.75	1.00		0.74	
Satd. Flow (perm)		3480		1805	5175			1391	1552		1302	
Peak-hour factor, PHF	0.94	0.94	0.91	0.75	0.93	0.68	0.88	0.25	0.80	0.50	0.25	1.00
Adj. Flow (vph)	0	1663	65	65	1517	28	69	0	61	12	0	4
RTOR Reduction (vph)	0	3	0	0	2	0	0	0	56	0	4	0
Lane Group Flow (vph)	0	1725	0	65	1543	0	0	69	5	0	12	0
Heavy Vehicles (%)	1%	1%	3%	2%	2%	0%	0%	0%	2%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		68.3		6.1	79.4			8.6	8.6		8.6	
Effective Green, g (s)		68.3		6.1	79.4			8.6	8.6		8.6	
Actuated g/C Ratio		0.68		0.06	0.79			0.09	0.09		0.09	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2377		110	4109			120	133		112	
v/s Ratio Prot		c0.50		c0.04	0.30							
v/s Ratio Perm								c0.05	0.00		0.01	
v/c Ratio		0.73		0.59	0.38			0.57	0.04		0.11	
Uniform Delay, d1		10.0		45.7	3.0			43.9	41.9		42.2	
Progression Factor		0.35		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.6		8.2	0.3			6.5	0.1		0.4	
Delay (s)		5.0		54.0	3.3			50.5	42.0		42.6	
Level of Service		A		D	A			D	D		D	
Approach Delay (s)		5.0			5.3			46.5			42.6	
Approach LOS		A			A			D			D	

Intersection Summary		
HCM Average Control Delay	6.9	HCM Level of Service
HCM Volume to Capacity ratio	0.70	A
Actuated Cycle Length (s)	100.0	Sum of lost time (s)
Intersection Capacity Utilization	66.7%	17.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		C

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2020 Sat No Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↑↑	↑↗	
Volume (veh/h)	0	1	1	554	567	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.25	0.25	0.25	0.87	0.88	0.25
Hourly flow rate (vph)	0	4	4	637	644	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.93					
vC, conflicting volume	973	324	648			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	829	324	648			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	291	677	947			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	4	4	318	318	430	219
Volume Left	0	4	0	0	0	0
Volume Right	4	0	0	0	0	4
cSH	677	947	1700	1700	1700	1700
Volume to Capacity	0.01	0.00	0.19	0.19	0.25	0.13
Queue Length 95th (ft)	0	0	0	0	0	0
Control Delay (s)	10.3	8.8	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	10.3	0.1			0.0	
Approach LOS	B					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			25.7%		ICU Level of Service	A
Analysis Period (min)			15			

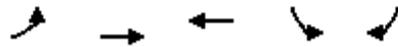
HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2020 Sat No Build
6/22/2011

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	2	2	6	17	2	65	5	488	11	76	486	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.93			0.90			1.00			1.00	
Flt Protected		0.99			0.99			1.00			0.99	
Satd. Flow (prot)		1991			1891			3561			3546	
Flt Permitted		0.93			0.91			0.94			0.81	
Satd. Flow (perm)		1871			1747			3364			2888	
Peak-hour factor, PHF	0.50	0.25	0.50	0.71	0.50	0.86	0.63	0.94	0.92	0.76	0.89	0.75
Adj. Flow (vph)	4	8	12	24	4	76	8	519	12	100	546	8
RTOR Reduction (vph)	0	11	0	0	70	0	0	2	0	0	1	0
Lane Group Flow (vph)	0	13	0	0	34	0	0	537	0	0	653	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		6.1			6.1			29.0			55.9	
Effective Green, g (s)		6.1			6.1			29.0			55.9	
Actuated g/C Ratio		0.08			0.08			0.40			0.77	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		156			146			1336			2409	
v/s Ratio Prot											c0.08	
v/s Ratio Perm		0.01			c0.02			c0.16			0.13	
v/c Ratio		0.08			0.24			0.40			0.27	
Uniform Delay, d1		30.9			31.3			15.8			2.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.8			0.9			0.3	
Delay (s)		31.1			32.1			16.7			2.8	
Level of Service		C			C			B			A	
Approach Delay (s)		31.1			32.1			16.7			2.8	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM Average Control Delay			11.3			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			73.0			Sum of lost time (s)			17.0			
Intersection Capacity Utilization			50.8%			ICU Level of Service				A		
Analysis Period (min)			15									
c	Critical Lane Group											

Queues
2: West Chester Pike & N Lawrence Rd

2020 Sat No Build
6/22/2011



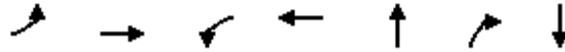
Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	714	1681	1653	102	680
v/c Ratio	0.81	0.59	0.62	0.92	1.11
Control Delay	25.0	6.4	18.1	114.7	99.6
Queue Delay	0.0	0.6	0.0	0.0	9.1
Total Delay	25.0	7.0	18.1	114.7	108.6
Queue Length 50th (ft)	149	432	272	66	-498
Queue Length 95th (ft)	m129	566	367	#169	#643
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290				
Base Capacity (vph)	1366	2858	2669	111	615
Starvation Cap Reductn	0	699	0	0	0
Spillback Cap Reductn	0	14	0	0	12
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.52	0.78	0.62	0.92	1.13

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

2020 Sat No Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	12	1303	76	1334	16	32	108
v/c Ratio	0.11	0.56	0.54	0.51	0.10	0.16	0.65
Control Delay	45.9	12.0	58.9	4.5	40.3	15.8	58.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.9	12.0	58.9	4.5	40.3	15.8	58.1
Queue Length 50th (ft)	7	253	51	88	9	0	62
Queue Length 95th (ft)	16	317	78	103	8	24	83
Internal Link Dist (ft)		672		282	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	158	2331	153	2637	182	224	193
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.56	0.50	0.51	0.09	0.14	0.56

Intersection Summary

Queues
10: West Chester Pike & I-476 SB Off-Ramp

2020 Sat No Build
6/22/2011

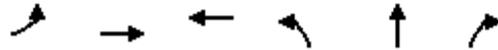


Lane Group	EBT	WBT	WBR	SBL	SBT
Lane Group Flow (vph)	1166	1058	356	808	4
v/c Ratio	0.38	0.51	0.23	0.78	0.02
Control Delay	9.1	2.4	0.5	37.8	23.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	2.4	0.5	37.8	23.0
Queue Length 50th (ft)	95	15	0	242	2
Queue Length 95th (ft)	114	27	0	278	2
Internal Link Dist (ft)	564	662			574
Turn Bay Length (ft)				415	
Base Capacity (vph)	3089	2066	1567	1397	346
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.38	0.51	0.23	0.58	0.01

Intersection Summary

Queues
15: West Chester Pike & I-476 NB

2020 Sat No Build
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	218	1872	1194	96	96	356
v/c Ratio	0.69	0.55	0.58	0.23	0.23	0.90
Control Delay	49.3	10.8	15.8	31.9	31.9	62.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.3	10.8	15.8	31.9	31.9	62.4
Queue Length 50th (ft)	136	228	208	51	51	207
Queue Length 95th (ft)	186	210	265	92	25	#367
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	445	3384	2070	434	434	414
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.55	0.58	0.22	0.22	0.86

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
18: West Chester Pike & S Lawrence Rd

2020 Sat No Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	2012	271	438	1782	298	481
v/c Ratio	0.87	0.23	0.82	0.77	0.38	0.69
Control Delay	21.6	2.8	39.0	19.0	34.3	28.0
Queue Delay	0.0	0.0	0.0	1.0	0.0	0.0
Total Delay	21.6	2.8	39.0	20.0	34.3	28.0
Queue Length 50th (ft)	427	14	145	505	82	237
Queue Length 95th (ft)	#552	m17	m140	m553	115	321
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2304	1201	656	2321	790	680
Starvation Cap Reductn	0	0	0	279	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.23	0.67	0.87	0.38	0.71

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues

2020 Sat No Build

26: West Chester Pike & Old West Chester Pike

6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1728	65	1545	69	61	16
v/c Ratio	0.69	0.50	0.36	0.51	0.30	0.12
Control Delay	5.1	58.5	3.4	55.5	14.8	35.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.1	58.5	3.4	55.5	14.8	35.6
Queue Length 50th (ft)	78	40	90	42	0	7
Queue Length 95th (ft)	m102	70	119	22	29	6
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2499	134	4235	167	240	160
Starvation Cap Reductn	15	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.49	0.36	0.41	0.25	0.10

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
5: Sussex Blvd & Lawrence Road

2020 Sat No Build
6/22/2011



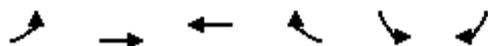
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	24	104	539	654
v/c Ratio	0.12	0.43	0.39	0.27
Control Delay	21.2	17.7	16.0	3.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.2	17.7	16.0	3.0
Queue Length 50th (ft)	5	12	86	33
Queue Length 95th (ft)	3	14	124	62
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	521	534	1385	2438
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.05	0.19	0.39	0.27
Intersection Summary				

N – Capacity and Queue Analysis

Output “Year 2015 Build”:

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2015 AM Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↙↘	↑↑	↑↑↑		↙	↘
Volume (vph)	578	1373	1979	41	52	897
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3283	3451	5161		1718	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3283	3451	5161		1718	1628
Peak-hour factor, PHF	0.94	0.96	0.97	0.50	0.85	0.93
Adj. Flow (vph)	615	1430	2040	82	61	965
RTOR Reduction (vph)	0	0	4	0	0	0
Lane Group Flow (vph)	615	1430	2118	0	61	965
Heavy Vehicles (%)	4%	2%	2%	13%	8%	2%
Turn Type	Prot					pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases						
Actuated Green, G (s)	23.1	69.0	40.9		19.0	48.1
Effective Green, g (s)	23.1	69.0	40.9		19.0	48.1
Actuated g/C Ratio	0.23	0.69	0.41		0.19	0.48
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	758	2381	2111		326	783
v/s Ratio Prot	0.19	0.41	c0.41		0.04	c0.59
v/s Ratio Perm						
v/c Ratio	0.81	0.60	1.00		0.19	1.23
Uniform Delay, d1	36.4	8.2	29.6		34.0	25.9
Progression Factor	1.07	1.15	0.90		1.00	1.00
Incremental Delay, d2	5.0	0.8	19.3		0.3	115.6
Delay (s)	43.8	10.3	46.0		34.3	141.6
Level of Service	D	B	D		C	F
Approach Delay (s)		20.4	46.0		135.2	
Approach LOS		C	D		F	

Intersection Summary

HCM Average Control Delay	53.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	104.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2015 AM Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	1501	17	26	1321	15	27	18	67	102	32	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%			0%	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.97	
Satd. Flow (prot)	1736	3549		1676	3483			1619	1463		1772	
Flt Permitted	0.95	1.00		0.95	1.00			0.77	1.00		0.77	
Satd. Flow (perm)	1736	3549		1676	3483			1278	1463		1417	
Peak-hour factor, PHF	0.54	0.94	0.61	0.65	0.94	0.94	0.91	0.75	0.88	0.91	0.80	0.54
Adj. Flow (vph)	24	1597	28	40	1405	16	30	24	76	112	40	24
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	65	0	6	0
Lane Group Flow (vph)	24	1624	0	40	1420	0	0	54	11	0	170	0
Heavy Vehicles (%)	1%	2%	0%	0%	3%	0%	7%	6%	3%	1%	6%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	2.4	63.6		3.6	64.8			14.8	14.8		14.8	
Effective Green, g (s)	2.4	63.6		3.6	64.8			14.8	14.8		14.8	
Actuated g/C Ratio	0.02	0.64		0.04	0.65			0.15	0.15		0.15	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	42	2257		60	2257			189	217		210	
v/s Ratio Prot	0.01	c0.46		c0.02	0.41							
v/s Ratio Perm								0.04	0.01		c0.12	
v/c Ratio	0.57	0.72		0.67	0.63			0.29	0.05		0.81	
Uniform Delay, d1	48.3	12.2		47.6	10.5			37.9	36.6		41.2	
Progression Factor	1.00	1.00		0.97	0.78			1.00	1.00		1.00	
Incremental Delay, d2	17.4	2.0		22.5	1.2			0.8	0.1		20.1	
Delay (s)	65.7	14.2		68.6	9.4			38.7	36.7		61.3	
Level of Service	E	B		E	A			D	D		E	
Approach Delay (s)		15.0			11.0			37.5			61.3	
Approach LOS		B			B			D			E	

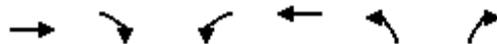
Intersection Summary

HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: West Chester Pike & Langford

2015 AM Build
6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↓	↑↑	↓↓	↑
Volume (vph)	1546	124	171	1213	142	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%			3%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5162	1607	1743	3486	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5162	1607	1743	3486	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1680	135	186	1318	154	200
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1680	135	186	1318	154	200
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	52.2	68.0	20.0	78.2	9.8	29.8
Effective Green, g (s)	52.2	68.0	20.0	78.2	9.8	29.8
Actuated g/C Ratio	0.52	0.68	0.20	0.78	0.10	0.30
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2695	1093	349	2726	336	567
v/s Ratio Prot	c0.33	0.08	0.11	c0.38	c0.04	0.03
v/s Ratio Perm						0.09
v/c Ratio	0.62	0.12	0.53	0.48	0.46	0.35
Uniform Delay, d1	16.9	5.6	35.8	3.8	42.6	27.5
Progression Factor	1.48	1.74	0.65	0.40	1.00	1.00
Incremental Delay, d2	0.8	0.0	1.3	0.5	1.0	0.4
Delay (s)	25.8	9.8	24.5	2.0	43.6	27.9
Level of Service	C	A	C	A	D	C
Approach Delay (s)	24.6			4.8	34.7	
Approach LOS	C			A	C	

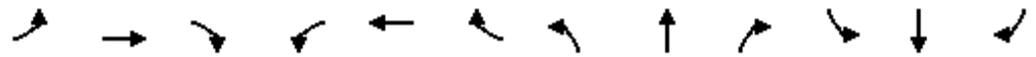
Intersection Summary

HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2015 AM Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↑				↑↑	↑	↑
Volume (vph)	0	1409	321	0	1061	0	0	0	0	780	1	323
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	6.0
Lane Util. Factor		0.91			0.95					0.97	1.00	1.00
Frt		0.97			1.00					1.00	1.00	0.85
Flt Protected		1.00			1.00					0.95	1.00	1.00
Satd. Flow (prot)		4972			3435					3414	887	1599
Flt Permitted		1.00			1.00					0.95	1.00	1.00
Satd. Flow (perm)		4972			3435					3414	887	1599
Peak-hour factor, PHF	0.94	0.91	0.76	0.93	0.95	0.69	0.92	0.92	0.92	0.94	0.25	0.84
Adj. Flow (vph)	0	1548	422	0	1117	0	0	0	0	830	4	385
RTOR Reduction (vph)	0	43	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1927	0	0	1117	0	0	0	0	830	4	385
Heavy Vehicles (%)	2%	3%	3%	2%	3%	2%	2%	2%	2%	6%	100%	1%
Turn Type						custom					Perm	Perm
Protected Phases		2			6	4 6					4	4
Permitted Phases										4		4
Actuated Green, G (s)		56.2			56.2					31.8	31.8	31.8
Effective Green, g (s)		56.2			56.2					31.8	31.8	31.8
Actuated g/C Ratio		0.56			0.56					0.32	0.32	0.32
Clearance Time (s)		6.0			6.0					6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		2794			1930					1086	282	508
v/s Ratio Prot		c0.39			0.33						0.00	
v/s Ratio Perm										c0.24		0.24
v/c Ratio		0.69			0.58					0.76	0.01	0.76
Uniform Delay, d1		15.7			14.2					30.7	23.4	30.6
Progression Factor		1.00			0.35					1.00	1.00	1.00
Incremental Delay, d2		1.2			0.1					3.3	0.0	6.4
Delay (s)		16.8			5.1					34.0	23.4	37.0
Level of Service		B			A					C	C	D
Approach Delay (s)		16.8			5.1			0.0			34.9	
Approach LOS		B			A			A			C	

Intersection Summary

HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

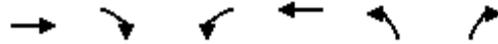
2015 AM Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	439	1750	0	0	1378	179	175	10	267	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.91	0.95			
Frt	1.00	1.00			0.97		1.00	0.89	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (prot)	1893	5016			4828		1754	1552	1490			
Flt Permitted	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (perm)	1893	5016			4828		1754	1552	1490			
Peak-hour factor, PHF	0.81	0.98	0.98	0.93	0.95	0.58	0.84	0.25	0.77	0.92	0.92	0.92
Adj. Flow (vph)	542	1786	0	0	1451	309	208	40	347	0	0	0
RTOR Reduction (vph)	0	0	0	0	33	0	0	0	0	0	0	0
Lane Group Flow (vph)	542	1786	0	0	1727	0	187	207	201	0	0	0
Heavy Vehicles (%)	1%	6%	2%	2%	2%	2%	1%	1%	3%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	31.0	70.0			33.0		18.0	18.0	18.0			
Effective Green, g (s)	31.0	70.0			33.0		18.0	18.0	18.0			
Actuated g/C Ratio	0.31	0.70			0.33		0.18	0.18	0.18			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	587	3511			1593		316	279	268			
v/s Ratio Prot	c0.29	0.36			c0.36							
v/s Ratio Perm							0.11	0.13	c0.13			
v/c Ratio	0.92	0.51			1.08		0.59	0.74	0.75			
Uniform Delay, d1	33.4	7.0			33.5		37.6	38.8	38.9			
Progression Factor	0.85	1.27			0.72		1.00	1.00	1.00			
Incremental Delay, d2	15.7	0.4			39.2		3.0	10.2	11.2			
Delay (s)	44.0	9.3			63.4		40.6	49.0	50.0			
Level of Service	D	A			E		D	D	D			
Approach Delay (s)		17.4			63.4			46.7			0.0	
Approach LOS		B			E			D			A	
Intersection Summary												
HCM Average Control Delay			38.4			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			77.8%			ICU Level of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2015 AM Build
 6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↑↑	↑↑	↑↑	↑
Volume (vph)	1525	492	366	2510	466	426
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5212	1577	3318	3487	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	8000	1577	3318	3487	3433	1568
Peak-hour factor, PHF	0.96	0.89	0.89	0.92	0.86	0.94
Adj. Flow (vph)	1589	553	411	2728	542	453
RTOR Reduction (vph)	0	17	0	0	0	5
Lane Group Flow (vph)	1589	536	411	2728	542	448
Heavy Vehicles (%)	2%	5%	5%	3%	2%	3%
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	47.0	72.0	16.0	69.0	19.0	35.0
Effective Green, g (s)	47.0	72.0	16.0	69.0	19.0	35.0
Actuated g/C Ratio	0.47	0.72	0.16	0.69	0.19	0.35
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		4.0	3.0	2.0	2.0
Lane Grp Cap (vph)	2450	1135	531	2406	652	643
v/s Ratio Prot	0.30	0.34	0.12	c0.78	c0.16	0.13
v/s Ratio Perm						0.15
v/c Ratio	0.65	0.47	0.77	1.13	0.83	0.70
Uniform Delay, d1	20.2	5.9	40.3	15.5	39.0	27.9
Progression Factor	0.61	0.88	1.16	0.71	1.00	1.00
Incremental Delay, d2	1.2	0.1	0.7	60.8	8.5	2.7
Delay (s)	13.5	5.3	47.4	71.8	47.4	30.6
Level of Service	B	A	D	E	D	C
Approach Delay (s)	11.4			68.6	39.8	
Approach LOS	B			E	D	

Intersection Summary			
HCM Average Control Delay		44.5	HCM Level of Service D
HCM Volume to Capacity ratio		1.07	
Actuated Cycle Length (s)		100.0	Sum of lost time (s) 12.0
Intersection Capacity Utilization		92.7%	ICU Level of Service F
Analysis Period (min)		15	
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
26: West Chester Pike & Old West Chester Pike

2015 AM Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1378	47	62	1982	9	20	1	35	4	0	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.91	
Flt Protected		1.00		0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)		3344		1705	5130			1470	1227		1570	
Flt Permitted		1.00		0.95	1.00			0.73	1.00		0.89	
Satd. Flow (perm)		3344		1705	5130			1117	1227		1416	
Peak-hour factor, PHF	0.92	0.95	0.77	0.85	0.95	0.75	0.83	0.25	0.55	0.33	0.25	0.64
Adj. Flow (vph)	0	1451	61	73	2086	12	24	4	64	12	0	28
RTOR Reduction (vph)	0	3	0	0	1	0	0	0	60	0	26	0
Lane Group Flow (vph)	0	1509	0	73	2097	0	0	28	4	0	14	0
Heavy Vehicles (%)	2%	5%	9%	8%	3%	11%	25%	0%	29%	0%	0%	6%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		69.4		7.1	81.5			6.5	6.5		6.5	
Effective Green, g (s)		69.4		7.1	81.5			6.5	6.5		6.5	
Actuated g/C Ratio		0.69		0.07	0.82			0.06	0.06		0.06	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2321		121	4181			73	80		92	
v/s Ratio Prot		c0.45		0.04	c0.41							
v/s Ratio Perm								c0.03	0.00		0.01	
v/c Ratio		0.65		0.60	0.50			0.38	0.05		0.15	
Uniform Delay, d1		8.5		45.1	2.9			44.8	43.9		44.1	
Progression Factor		0.69		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.2		8.2	0.4			3.3	0.3		0.8	
Delay (s)		7.1		53.3	3.3			48.2	44.1		44.9	
Level of Service		A		D	A			D	D		D	
Approach Delay (s)		7.1			5.0			45.4			44.9	
Approach LOS		A			A			D			D	

Intersection Summary

HCM Average Control Delay	7.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	62.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

3: Langford Run Road & Lawrence Road

2015 AM Build
6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕	↕	↗
Volume (veh/h)	0	92	152	939	522	72
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.92	0.92	0.98	0.91	0.92
Hourly flow rate (vph)	0	100	165	958	574	78
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)	992					
pX, platoon unblocked	0.81					
vC, conflicting volume	1422	326	652			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1059	326	652			
tC, single (s)	6.8	7.9	6.1			
tC, 2 stage (s)						
tF (s)	3.5	3.8	3.2			
p0 queue free %	100	82	66			
cM capacity (veh/h)	118	548	491			
Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	100	165	479	479	382	269
Volume Left	0	165	0	0	0	0
Volume Right	100	0	0	0	0	78
cSH	548	491	1700	1700	1700	1700
Volume to Capacity	0.18	0.34	0.28	0.28	0.22	0.16
Queue Length 95th (ft)	17	37	0	0	0	0
Control Delay (s)	13.0	16.0	0.0	0.0	0.0	0.0
Lane LOS	B	C				
Approach Delay (s)	13.0	2.4	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			31.8%	ICU Level of Service	A	
Analysis Period (min)			15			

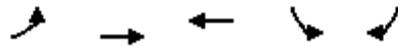
HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2015 AM Build
6/22/2011

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	32	14	25	21	3	155	8	904	4	58	545	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.89			1.00			1.00	
Flt Protected		0.98			0.99			1.00			1.00	
Satd. Flow (prot)		1854			1824			3499			3429	
Flt Permitted		0.54			0.93			0.94			0.75	
Satd. Flow (perm)		1023			1715			3307			2586	
Peak-hour factor, PHF	0.57	0.44	0.63	0.75	0.75	0.88	0.67	0.88	0.33	0.91	0.93	0.67
Adj. Flow (vph)	56	32	40	28	4	176	12	1027	12	64	586	16
RTOR Reduction (vph)	0	27	0	0	153	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	101	0	0	55	0	0	1050	0	0	665	0
Heavy Vehicles (%)	6%	0%	20%	10%	0%	3%	0%	3%	0%	0%	5%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		10.3			10.3			30.0			56.7	
Effective Green, g (s)		10.3			10.3			30.0			56.7	
Actuated g/C Ratio		0.13			0.13			0.38			0.73	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		135			226			1272			2114	
v/s Ratio Prot											c0.09	
v/s Ratio Perm		c0.10			0.03			c0.32			0.14	
v/c Ratio		0.75			0.24			0.83			0.31	
Uniform Delay, d1		32.6			30.4			21.6			3.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		20.1			0.6			6.2			0.4	
Delay (s)		52.7			30.9			27.8			4.2	
Level of Service		D			C			C			A	
Approach Delay (s)		52.7			30.9			27.8			4.2	
Approach LOS		D			C			C			A	
Intersection Summary												
HCM Average Control Delay			22.0			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			78.0			Sum of lost time (s)			17.0			
Intersection Capacity Utilization			67.8%			ICU Level of Service				C		
Analysis Period (min)			15									
c	Critical Lane Group											

Queues
2: West Chester Pike & N Lawrence Rd

2015 AM Build
6/22/2011



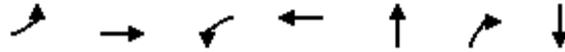
Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	615	1430	2122	61	965
v/c Ratio	0.81	0.60	1.00	0.19	1.26
Control Delay	45.3	10.5	47.7	35.8	153.2
Queue Delay	0.0	0.0	3.1	0.0	1.5
Total Delay	45.3	10.5	50.8	35.8	154.6
Queue Length 50th (ft)	201	176	~487	33	~777
Queue Length 95th (ft)	255	253	#698	65	#950
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290			325	
Base Capacity (vph)	985	2381	2114	326	767
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	23	0	2
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.62	0.60	1.01	0.19	1.26

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: West Chester Pike & N New Ardmore Ave

2015 AM Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	24	1625	40	1421	54	76	176
v/c Ratio	0.24	0.69	0.40	0.60	0.29	0.27	0.81
Control Delay	50.6	14.1	54.7	9.0	41.6	11.4	68.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.6	14.1	54.7	9.0	41.6	11.4	68.1
Queue Length 50th (ft)	15	372	25	185	31	0	104
Queue Length 95th (ft)	24	464	42	255	56	38	#169
Internal Link Dist (ft)		672		286	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	104	2342	103	2382	204	298	233
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.69	0.39	0.60	0.26	0.26	0.76

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
6: West Chester Pike & Langford

2015 AM Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1680	135	186	1318	154	200
v/c Ratio	0.62	0.12	0.53	0.48	0.46	0.35
Control Delay	26.5	10.1	29.4	2.3	46.6	25.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.5	10.1	29.4	2.3	46.6	25.3
Queue Length 50th (ft)	354	53	106	46	48	92
Queue Length 95th (ft)	416	m73	147	64	77	146
Internal Link Dist (ft)	264			598	750	
Turn Bay Length (ft)			450		200	400
Base Capacity (vph)	2695	1093	349	2726	549	665
Starvation Cap Reductn	0	0	0	145	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.12	0.53	0.51	0.28	0.30

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
10: West Chester Pike & I-476 SB Off-Ramp

2015 AM Build
6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT	SBR
Lane Group Flow (vph)	1970	1117	713	830	4	385
v/c Ratio	0.69	0.58	0.46	0.77	0.01	0.76
Control Delay	17.0	5.3	3.6	35.5	21.0	40.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.0	5.3	3.6	35.5	21.0	40.3
Queue Length 50th (ft)	379	47	45	243	2	218
Queue Length 95th (ft)	491	m156	m0	284	2	272
Internal Link Dist (ft)	598	662			574	
Turn Bay Length (ft)						
Base Capacity (vph)	2839	1932	1552	1297	337	608
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.58	0.46	0.64	0.01	0.63

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

2015 AM Build
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	542	1786	1760	187	207	201
v/c Ratio	0.92	0.51	1.08	0.59	0.74	0.75
Control Delay	48.7	10.0	63.1	45.0	54.7	55.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.7	10.0	63.1	45.0	54.7	55.9
Queue Length 50th (ft)	374	206	~453	115	137	128
Queue Length 95th (ft)	#506	269	m347	167	50	168
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	587	3513	1626	386	341	328
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.92	0.51	1.08	0.48	0.61	0.61

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
18: West Chester Pike & S Lawrence Rd

2015 AM Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1589	553	411	2728	542	453
v/c Ratio	0.65	0.48	0.77	1.13	0.83	0.70
Control Delay	13.9	6.3	47.4	75.7	51.4	30.4
Queue Delay	0.0	0.0	0.0	5.0	0.0	0.0
Total Delay	13.9	6.3	47.4	80.7	51.4	30.4
Queue Length 50th (ft)	228	55	136	~1062	172	229
Queue Length 95th (ft)	256	71	m126	m#536	#226	330
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2450	1152	630	2406	652	647
Starvation Cap Reductn	0	0	0	24	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.48	0.65	1.15	0.83	0.70

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

26: West Chester Pike & Old West Chester Pike

6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1512	73	2098	28	64	40
v/c Ratio	0.62	0.52	0.49	0.33	0.42	0.30
Control Delay	7.5	56.9	3.4	54.0	20.1	27.3
Queue Delay	0.3	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	56.9	3.4	54.0	20.1	27.3
Queue Length 50th (ft)	246	45	125	17	0	7
Queue Length 95th (ft)	348	85	158	12	9	0
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2437	155	4306	100	169	153
Starvation Cap Reductn	346	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.47	0.49	0.28	0.38	0.26

Intersection Summary

Queues
5: Sussex Blvd & Lawrence Road

2015 AM Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	128	208	1051	666
v/c Ratio	0.79	0.55	0.83	0.32
Control Delay	55.3	13.1	28.6	4.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	55.3	13.1	28.6	4.5
Queue Length 50th (ft)	46	14	236	45
Queue Length 95th (ft)	35	42	305	84
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	349	669	1272	2103
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.37	0.31	0.83	0.32
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

2: West Chester Pike & N Lawrence Rd

2015 PM Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1143	2003	1627	87	102	844
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3347	3451	5172		1819	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3347	3451	5172		1819	1628
Peak-hour factor, PHF	0.98	0.95	0.87	0.86	0.74	0.95
Adj. Flow (vph)	1166	2108	1870	101	138	888
RTOR Reduction (vph)	0	0	5	0	0	1
Lane Group Flow (vph)	1166	2108	1966	0	138	887
Turn Type	Prot			custom		
Protected Phases	5	2	6		4	4
Permitted Phases						5
Actuated Green, G (s)	42.8	95.0	47.2		13.0	55.8
Effective Green, g (s)	42.8	95.0	47.2		13.0	55.8
Actuated g/C Ratio	0.36	0.79	0.39		0.11	0.46
Clearance Time (s)	5.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	1194	2732	2034		197	838
v/s Ratio Prot	0.35	0.61	c0.38		0.08	c0.11
v/s Ratio Perm						0.43
v/c Ratio	0.98	0.77	0.97		0.70	1.06
Uniform Delay, d1	38.1	6.7	35.6		51.6	32.1
Progression Factor	0.79	0.55	1.13		1.00	1.00
Incremental Delay, d2	8.6	0.6	12.8		10.7	47.9
Delay (s)	38.6	4.3	53.0		62.3	80.0
Level of Service	D	A	D		E	F
Approach Delay (s)		16.5	53.0		77.6	
Approach LOS		B	D		E	

Intersection Summary

HCM Average Control Delay	38.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2015 PM Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	1683	35	16	1775	19	49	18	4	15	15	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%				0%
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85			0.95
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00			0.98
Satd. Flow (prot)	1702	3510		1643	3514			1698	1492			1757
Flt Permitted	0.95	1.00		0.95	1.00			0.75	1.00			0.84
Satd. Flow (perm)	1702	3510		1643	3514			1311	1492			1498
Peak-hour factor, PHF	0.88	0.95	0.80	1.00	0.88	0.68	0.94	0.75	0.50	0.47	0.75	0.61
Adj. Flow (vph)	128	1772	44	16	2017	28	52	24	8	32	20	28
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	7	0	17	0
Lane Group Flow (vph)	128	1815	0	16	2044	0	0	76	1	0	63	0
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	11.5	90.5		2.0	81.0			9.5	9.5			9.5
Effective Green, g (s)	11.5	90.5		2.0	81.0			9.5	9.5			9.5
Actuated g/C Ratio	0.10	0.75		0.02	0.68			0.08	0.08			0.08
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Grp Cap (vph)	163	2647		27	2372			104	118			119
v/s Ratio Prot	c0.08	c0.52		0.01	c0.58							
v/s Ratio Perm								c0.06	0.00			0.04
v/c Ratio	0.79	0.69		0.59	0.86			0.73	0.01			0.53
Uniform Delay, d1	53.0	7.5		58.6	15.2			54.0	50.9			53.1
Progression Factor	1.00	1.00		0.90	0.55			1.00	1.00			1.00
Incremental Delay, d2	21.5	1.5		25.9	3.7			23.0	0.0			4.5
Delay (s)	74.6	9.0		78.5	12.1			77.0	50.9			57.6
Level of Service	E	A		E	B			E	D			E
Approach Delay (s)		13.3			12.6			74.5				57.6
Approach LOS		B			B			E				E

Intersection Summary

HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: West Chester Pike & Langford

2015 PM Build
6/22/2011

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↓	↑↑	↓↓	↑
Volume (vph)	1434	268	401	1551	279	549
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%			3%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5162	1607	1743	3486	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5162	1607	1743	3486	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1559	291	436	1686	303	597
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1559	291	436	1686	303	597
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	47.9	71.0	37.0	90.9	17.1	54.1
Effective Green, g (s)	47.9	71.0	37.0	90.9	17.1	54.1
Actuated g/C Ratio	0.40	0.59	0.31	0.76	0.14	0.45
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2060	951	537	2641	489	793
v/s Ratio Prot	c0.30	0.18	0.25	0.48	0.09	c0.11
v/s Ratio Perm						0.27
v/c Ratio	0.76	0.31	0.81	0.64	0.62	0.75
Uniform Delay, d1	31.0	12.2	38.3	6.8	48.4	27.4
Progression Factor	0.81	0.64	0.96	0.55	1.00	1.00
Incremental Delay, d2	2.1	0.1	3.3	0.4	2.3	4.1
Delay (s)	27.1	8.0	40.1	4.1	50.7	31.5
Level of Service	C	A	D	A	D	C
Approach Delay (s)	24.1			11.5	37.9	
Approach LOS	C			B	D	

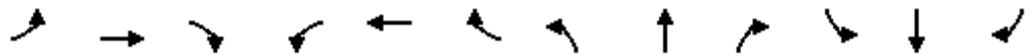
Intersection Summary

HCM Average Control Delay	21.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2015 PM Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↑				↑↑	↑	↑
Volume (vph)	0	1704	279	0	1447	0	0	0	0	1476	1	505
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	6.0
Lane Util. Factor		0.91			0.95					0.97	1.00	1.00
Frt		0.98			1.00					1.00	1.00	0.85
Flt Protected		1.00			1.00					0.95	1.00	1.00
Satd. Flow (prot)		5079			3468					3583	1756	1599
Flt Permitted		1.00			1.00					0.95	1.00	1.00
Satd. Flow (perm)		5079			3468					3583	1756	1599
Peak-hour factor, PHF	0.94	0.94	0.96	0.93	0.94	0.90	0.92	0.92	0.92	0.94	0.25	0.88
Adj. Flow (vph)	0	1813	291	0	1539	0	0	0	0	1570	4	574
RTOR Reduction (vph)	0	18	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2086	0	0	1539	0	0	0	0	1570	4	574
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Turn Type						custom					Perm	Perm
Protected Phases		2			6	4 6					4	
Permitted Phases										4		4
Actuated Green, G (s)		53.0			53.0					55.0	55.0	55.0
Effective Green, g (s)		53.0			53.0					55.0	55.0	55.0
Actuated g/C Ratio		0.44			0.44					0.46	0.46	0.46
Clearance Time (s)		6.0			6.0					6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		2243			1532					1642	805	733
v/s Ratio Prot		0.41			c0.44						0.00	
v/s Ratio Perm										c0.44		0.36
v/c Ratio		0.93			1.00					0.96	0.00	0.78
Uniform Delay, d1		31.7			33.5					31.3	17.6	27.5
Progression Factor		0.56			0.61					1.00	1.00	1.00
Incremental Delay, d2		5.9			15.2					13.2	0.0	5.5
Delay (s)		23.7			35.7					44.5	17.6	32.9
Level of Service		C			D					D	B	C
Approach Delay (s)		23.7			35.7			0.0			41.4	
Approach LOS		C			D			A			D	

Intersection Summary

HCM Average Control Delay	33.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

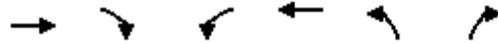
2015 PM Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	444	2736	0	0	1393	0	319	0	513	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.91	0.95			
Frt	1.00	1.00			1.00		1.00	0.87	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (prot)	1874	5212			4958		1754	1526	1519			
Flt Permitted	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (perm)	1874	5212			4958		1754	1526	1519			
Peak-hour factor, PHF	0.83	0.95	0.98	0.93	0.92	0.93	0.93	0.25	0.94	0.92	0.92	0.92
Adj. Flow (vph)	535	2880	0	0	1514	0	343	0	546	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	535	2880	0	0	1514	0	309	291	289	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	37.0	80.5			37.5		27.5	27.5	27.5			
Effective Green, g (s)	37.0	80.5			37.5		27.5	27.5	27.5			
Actuated g/C Ratio	0.31	0.67			0.31		0.23	0.23	0.23			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	578	3496			1549		402	350	348			
v/s Ratio Prot	c0.29	0.55			c0.31							
v/s Ratio Perm							0.18	0.19	0.19			
v/c Ratio	0.93	0.82			0.98		0.77	0.83	0.83			
Uniform Delay, d1	40.2	14.5			40.8		43.3	44.0	44.0			
Progression Factor	0.71	0.88			0.79		1.00	1.00	1.00			
Incremental Delay, d2	10.7	0.9			13.3		8.6	15.4	15.4			
Delay (s)	39.4	13.6			45.5		51.9	59.4	59.4			
Level of Service	D	B			D		D	E	E			
Approach Delay (s)		17.7			45.5			56.8			0.0	
Approach LOS		B			D			E			A	
Intersection Summary												
HCM Average Control Delay			30.9				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			84.0%				ICU Level of Service			E		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2015 PM Build
 6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↑↓	↑↑	↑↓	↑
Volume (vph)	2767	482	590	1881	198	379
Ideal Flow (vphpl)	2100	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5761	1623	3416	3522	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5761	1623	3416	3522	3433	1583
Peak-hour factor, PHF	0.95	0.83	0.95	0.92	0.82	0.93
Adj. Flow (vph)	2913	581	621	2045	241	408
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	2913	579	621	2045	241	408
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	59.0	86.4	21.6	86.6	21.4	43.0
Effective Green, g (s)	59.0	86.4	21.6	86.6	21.4	43.0
Actuated g/C Ratio	0.49	0.72	0.18	0.72	0.18	0.36
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		4.0	3.0	2.0	2.0
Lane Grp Cap (vph)	2832	1169	615	2542	612	646
v/s Ratio Prot	c0.51	0.36	c0.18	0.58	0.07	c0.11
v/s Ratio Perm						0.15
v/c Ratio	1.03	0.50	1.01	0.80	0.39	0.63
Uniform Delay, d1	30.5	7.3	49.2	11.1	43.6	31.9
Progression Factor	0.68	0.65	0.67	1.81	1.00	1.00
Incremental Delay, d2	21.2	0.1	13.4	0.3	0.2	1.5
Delay (s)	41.8	4.8	46.4	20.3	43.7	33.4
Level of Service	D	A	D	C	D	C
Approach Delay (s)	35.7			26.4	37.2	
Approach LOS	D			C	D	

Intersection Summary

HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

2015 PM Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	2044	61	65	1570	17	141	1	124	2	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.94	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.97	
Satd. Flow (prot)		3465		1497	5129			1741	1583		1679	
Flt Permitted		1.00		0.95	1.00			0.72	1.00		0.82	
Satd. Flow (perm)		3465		1497	5129			1317	1583		1415	
Peak-hour factor, PHF	0.92	0.93	0.79	0.80	0.97	0.85	0.83	0.25	0.74	0.25	0.25	0.50
Adj. Flow (vph)	0	2198	77	81	1619	20	170	4	168	8	0	6
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	95	0	5	0
Lane Group Flow (vph)	0	2273	0	81	1638	0	0	174	73	0	9	0
Heavy Vehicles (%)	2%	1%	18%	23%	3%	0%	2%	0%	0%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		78.0		8.0	91.0			17.0	17.0		17.0	
Effective Green, g (s)		78.0		8.0	91.0			17.0	17.0		17.0	
Actuated g/C Ratio		0.65		0.07	0.76			0.14	0.14		0.14	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2252		100	3889			187	224		200	
v/s Ratio Prot		c0.66		c0.05	0.32							
v/s Ratio Perm								c0.13	0.05		0.01	
v/c Ratio		1.01		0.81	0.42			0.93	0.32		0.04	
Uniform Delay, d1		21.0		55.3	5.1			50.9	46.3		44.5	
Progression Factor		0.34		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		17.4		37.2	0.3			46.2	0.8		0.1	
Delay (s)		24.5		92.5	5.5			97.1	47.2		44.6	
Level of Service		C		F	A			F	D		D	
Approach Delay (s)		24.5			9.6			72.6			44.6	
Approach LOS		C			A			E			D	

Intersection Summary

HCM Average Control Delay	22.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2015 PM Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕↕	↗↖	
Volume (veh/h)	0	206	192	545	942	97
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.92	0.92	0.92	0.89	0.92
Hourly flow rate (vph)	0	224	209	592	1058	105
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked						
vC, conflicting volume	1825	582	1164			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1825	582	1164			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	51	66			
cM capacity (veh/h)	45	461	608			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	224	209	296	296	706	458
Volume Left	0	209	0	0	0	0
Volume Right	224	0	0	0	0	105
cSH	461	608	1700	1700	1700	1700
Volume to Capacity	0.49	0.34	0.17	0.17	0.42	0.27
Queue Length 95th (ft)	65	38	0	0	0	0
Control Delay (s)	19.9	14.0	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	19.9	3.6			0.0	
Approach LOS	C					

Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			48.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2015 PM Build
6/22/2011



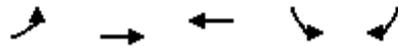
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	43	18	32	20	7	90	8	604	31	132	972	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.97			0.91			0.99			0.99	
Flt Protected		0.97			0.99			1.00			0.99	
Satd. Flow (prot)		2031			1929			3511			3535	
Flt Permitted		0.70			0.87			0.92			0.64	
Satd. Flow (perm)		1454			1694			3217			2267	
Peak-hour factor, PHF	0.32	0.30	0.53	0.46	0.58	0.73	0.67	0.93	0.78	0.81	0.83	0.69
Adj. Flow (vph)	134	60	60	43	12	123	12	649	40	163	1171	64
RTOR Reduction (vph)	0	16	0	0	96	0	0	6	0	0	4	0
Lane Group Flow (vph)	0	238	0	0	82	0	0	695	0	0	1394	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		17.2			17.2			30.0			49.8	
Effective Green, g (s)		17.2			17.2			30.0			49.8	
Actuated g/C Ratio		0.22			0.22			0.38			0.64	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		321			374			1237			1688	
v/s Ratio Prot											c0.16	
v/s Ratio Perm		c0.16			0.05			0.22			c0.37	
v/c Ratio		0.74			0.22			0.56			0.83	
Uniform Delay, d1		28.3			24.9			18.8			10.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		8.9			0.3			1.9			4.8	
Delay (s)		37.2			25.2			20.7			15.6	
Level of Service		D			C			C			B	
Approach Delay (s)		37.2			25.2			20.7			15.6	
Approach LOS		D			C			C			B	

Intersection Summary

HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues
2: West Chester Pike & N Lawrence Rd

2015 PM Build
6/22/2011



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	1166	2108	1971	138	888
v/c Ratio	0.98	0.77	0.97	0.70	1.08
Control Delay	39.7	4.4	53.0	71.1	83.4
Queue Delay	0.0	27.1	1.1	0.0	102.1
Total Delay	39.7	31.5	54.1	71.1	185.5
Queue Length 50th (ft)	360	66	581	105	-765
Queue Length 95th (ft)	m352	m53	#635	141	#1014
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290			325	
Base Capacity (vph)	1199	2732	2038	197	826
Starvation Cap Reductn	0	727	0	0	0
Spillback Cap Reductn	0	0	19	0	149
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.97	1.05	0.98	0.70	1.31

Intersection Summary

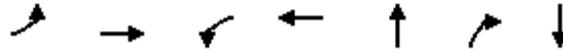
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

2015 PM Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	128	1816	16	2045	76	8	80
v/c Ratio	0.79	0.66	0.23	0.86	0.74	0.06	0.59
Control Delay	84.1	8.1	56.8	12.6	91.4	28.5	59.6
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	84.1	8.1	56.8	12.7	91.4	28.5	59.6
Queue Length 50th (ft)	98	219	12	364	58	0	47
Queue Length 95th (ft)	#188	447	m23	449	#99	7	80
Internal Link Dist (ft)		672		264	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	170	2753	69	2373	109	132	141
Starvation Cap Reductn	0	0	0	20	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.66	0.23	0.87	0.70	0.06	0.57

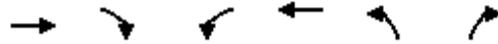
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
6: West Chester Pike & Langford



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1559	291	436	1686	303	597
v/c Ratio	0.76	0.31	0.81	0.64	0.62	0.75
Control Delay	27.9	8.6	42.4	4.5	53.5	30.6
Queue Delay	0.0	0.0	0.0	2.1	0.0	0.0
Total Delay	27.9	8.6	42.4	6.6	53.5	30.6
Queue Length 50th (ft)	380	73	327	62	114	356
Queue Length 95th (ft)	469	64	m365	m332	155	467
Internal Link Dist (ft)	264			598	672	
Turn Bay Length (ft)			450		200	400
Base Capacity (vph)	2059	951	537	2640	629	857
Starvation Cap Reductn	0	0	0	765	0	0
Spillback Cap Reductn	0	0	0	13	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.31	0.81	0.90	0.48	0.70

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
 10: West Chester Pike & I-476 SB Off-Ramp

2015 PM Build
 6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT	SBR
Lane Group Flow (vph)	2104	1539	294	1570	4	574
v/c Ratio	0.93	1.00	0.19	0.96	0.00	0.78
Control Delay	24.0	36.3	0.1	45.8	18.0	36.6
Queue Delay	0.1	19.0	0.0	8.1	0.0	0.0
Total Delay	24.1	55.4	0.1	53.9	18.0	36.6
Queue Length 50th (ft)	220	-673	0	590	2	367
Queue Length 95th (ft)	#338	m#713	m0	#758	3	504
Internal Link Dist (ft)	598	662			574	
Turn Bay Length (ft)						
Base Capacity (vph)	2261	1532	1552	1642	805	733
Starvation Cap Reductn	4	0	0	0	0	0
Spillback Cap Reductn	0	81	0	80	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.93	1.06	0.19	1.01	0.00	0.78

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

2015 PM Build
6/22/2011



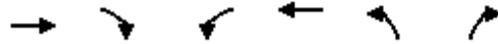
Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	535	2880	1514	309	291	289
v/c Ratio	0.93	0.82	0.98	0.77	0.83	0.83
Control Delay	42.7	14.7	46.9	55.9	63.7	63.5
Queue Delay	0.0	1.6	0.0	1.7	3.1	0.0
Total Delay	42.7	16.4	46.9	57.6	66.7	63.5
Queue Length 50th (ft)	437	478	~461	231	231	220
Queue Length 95th (ft)	m#480	m596	#558	331	74	323
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	578	3495	1547	468	407	405
Starvation Cap Reductn	0	409	0	0	0	0
Spillback Cap Reductn	0	417	0	59	51	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.94	0.98	0.76	0.82	0.71

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues
18: West Chester Pike & S Lawrence Rd

2015 PM Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	2913	581	621	2045	241	408
v/c Ratio	1.03	0.50	1.01	0.80	0.39	0.63
Control Delay	42.9	5.7	47.9	21.3	45.6	33.7
Queue Delay	24.9	0.6	0.0	35.9	0.0	0.0
Total Delay	67.8	6.3	47.9	57.2	45.6	33.7
Queue Length 50th (ft)	~882	99	~265	728	85	248
Queue Length 95th (ft)	#961	103	m#261	m730	112	361
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2832	1170	616	2543	629	639
Starvation Cap Reductn	159	271	0	638	0	0
Spillback Cap Reductn	114	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.09	0.65	1.01	1.07	0.38	0.64

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

26: West Chester Pike & Old West Chester Pike

6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	2275	81	1639	174	168	14
v/c Ratio	1.01	0.81	0.42	0.94	0.53	0.07
Control Delay	26.4	104.1	5.5	102.1	24.2	34.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.4	104.1	5.5	102.1	24.2	34.2
Queue Length 50th (ft)	~166	63	140	135	40	5
Queue Length 95th (ft)	#1098	#129	163	52	73	4
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2255	100	3892	187	320	206
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.01	0.81	0.42	0.93	0.53	0.07

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Queues
5: Sussex Blvd & Lawrence Road

2015 PM Build
6/22/2011



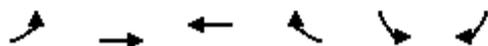
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	254	178	701	1398
v/c Ratio	0.75	0.38	0.56	0.83
Control Delay	39.5	10.7	20.8	17.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	39.5	10.7	20.8	17.7
Queue Length 50th (ft)	106	22	135	187
Queue Length 95th (ft)	39	23	188	#345
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	480	627	1242	1675
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.53	0.28	0.56	0.83

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2015 Sat Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	704	1708	1595	91	91	664
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3414	3485	5219		1856	1660
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3414	3485	5219		1856	1660
Peak-hour factor, PHF	0.93	0.91	0.90	0.80	0.90	0.91
Adj. Flow (vph)	757	1877	1772	114	101	730
RTOR Reduction (vph)	0	0	6	0	0	1
Lane Group Flow (vph)	757	1877	1880	0	101	729
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	Prot					pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases						
Actuated Green, G (s)	27.4	82.0	49.6		6.0	39.4
Effective Green, g (s)	27.4	82.0	49.6		6.0	39.4
Actuated g/C Ratio	0.27	0.82	0.50		0.06	0.39
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	935	2858	2589		111	654
v/s Ratio Prot	0.22	0.54	c0.36		0.05	c0.44
v/s Ratio Perm						
v/c Ratio	0.81	0.66	0.73		0.91	1.12
Uniform Delay, d1	33.9	3.5	19.9		46.7	30.3
Progression Factor	0.69	4.04	0.93		1.00	1.00
Incremental Delay, d2	1.9	0.4	1.7		57.1	71.3
Delay (s)	25.2	14.6	20.1		103.8	101.6
Level of Service	C	B	C		F	F
Approach Delay (s)		17.6	20.1		101.8	
Approach LOS		B	C		F	

Intersection Summary

HCM Average Control Delay	31.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2015 Sat Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕		↖	↕			↕	↗		↕	
Volume (vph)	7	1327	5	54	1169	7	9	1	27	44	8	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%			0%	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.96	
Satd. Flow (prot)	1754	3588		1676	3554			1709	1507		1796	
Flt Permitted	0.95	1.00		0.95	1.00			0.79	1.00		0.77	
Satd. Flow (perm)	1754	3588		1676	3554			1401	1507		1437	
Peak-hour factor, PHF	0.58	0.94	0.42	0.71	0.81	0.88	0.75	0.25	0.84	0.55	0.67	0.44
Adj. Flow (vph)	12	1412	12	76	1443	8	12	4	32	80	12	16
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	28	0	6	0
Lane Group Flow (vph)	12	1424	0	76	1451	0	0	16	4	0	102	0
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	1.5	63.7		7.2	69.4			11.1	11.1		11.1	
Effective Green, g (s)	1.5	63.7		7.2	69.4			11.1	11.1		11.1	
Actuated g/C Ratio	0.02	0.64		0.07	0.69			0.11	0.11		0.11	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	26	2286		121	2466			156	167		160	
v/s Ratio Prot	0.01	c0.40		c0.05	c0.41							
v/s Ratio Perm								0.01	0.00		c0.07	
v/c Ratio	0.46	0.62		0.63	0.59			0.10	0.02		0.64	
Uniform Delay, d1	48.8	10.9		45.1	7.9			40.0	39.6		42.5	
Progression Factor	1.00	1.00		0.98	0.83			1.00	1.00		1.00	
Incremental Delay, d2	12.4	1.3		9.2	1.0			0.3	0.1		8.0	
Delay (s)	61.3	12.2		53.4	7.6			40.3	39.7		50.5	
Level of Service	E	B		D	A			D	D		D	
Approach Delay (s)		12.6			9.8			39.9			50.5	
Approach LOS		B			A			D			D	

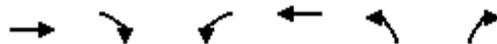
Intersection Summary

HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: West Chester Pike & Langford

2015 Sat Build
6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↖	↑↑	↖↗	↗
Volume (vph)	1082	316	545	951	287	578
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%			3%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5162	1607	1743	3486	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5162	1607	1743	3486	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1176	343	592	1034	312	628
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1176	343	592	1034	312	628
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	23.6	44.0	44.0	73.6	14.4	58.4
Effective Green, g (s)	23.6	44.0	44.0	73.6	14.4	58.4
Actuated g/C Ratio	0.24	0.44	0.44	0.74	0.14	0.58
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1218	707	767	2566	494	1019
v/s Ratio Prot	c0.23	0.21	c0.34	0.30	0.09	c0.09
v/s Ratio Perm						0.31
v/c Ratio	0.97	0.49	0.77	0.40	0.63	0.62
Uniform Delay, d1	37.8	19.9	23.7	5.0	40.3	13.5
Progression Factor	0.76	0.53	0.79	0.58	1.00	1.00
Incremental Delay, d2	16.4	0.4	3.6	0.3	2.6	1.1
Delay (s)	45.3	11.0	22.2	3.2	42.9	14.6
Level of Service	D	B	C	A	D	B
Approach Delay (s)	37.6			10.1	24.0	
Approach LOS	D			B	C	

Intersection Summary

HCM Average Control Delay	23.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2015 Sat Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↑				↑↑	↑	↑
Volume (vph)	0	1407	253	0	1181	0	0	0	0	712	1	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	6.0
Lane Util. Factor		0.91			0.95					0.97	1.00	1.00
Frt		0.98			1.00					1.00	1.00	0.85
Flt Protected		1.00			1.00					0.95	1.00	1.00
Satd. Flow (prot)		5101			3503					3583	887	1599
Flt Permitted		1.00			1.00					0.95	1.00	1.00
Satd. Flow (perm)		5101			3503					3583	887	1599
Peak-hour factor, PHF	0.94	0.97	0.89	0.93	0.90	0.81	0.92	0.92	0.92	0.89	0.25	0.75
Adj. Flow (vph)	0	1451	284	0	1312	0	0	0	0	800	4	420
RTOR Reduction (vph)	0	26	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1709	0	0	1312	0	0	0	0	800	4	420
Heavy Vehicles (%)	2%	1%	2%	2%	1%	1%	2%	2%	2%	1%	100%	1%
Turn Type						custom					Perm	Perm
Protected Phases		2			6	4 6					4	
Permitted Phases										4		4
Actuated Green, G (s)		56.1			56.1					31.9	31.9	31.9
Effective Green, g (s)		56.1			56.1					31.9	31.9	31.9
Actuated g/C Ratio		0.56			0.56					0.32	0.32	0.32
Clearance Time (s)		6.0			6.0					6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		2862			1965					1143	283	510
v/s Ratio Prot		0.34			c0.37						0.00	
v/s Ratio Perm										0.22		c0.26
v/c Ratio		0.60			0.67					0.70	0.01	0.82
Uniform Delay, d1		14.5			15.4					29.9	23.3	31.5
Progression Factor		0.52			0.40					1.00	1.00	1.00
Incremental Delay, d2		0.5			1.4					1.9	0.0	10.4
Delay (s)		8.1			7.5					31.8	23.3	41.8
Level of Service		A			A					C	C	D
Approach Delay (s)		8.1			7.5			0.0			35.2	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

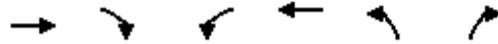
2015 Sat Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	316	1803	0	0	1208	0	254	0	359	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.91	0.95			
Frt	1.00	1.00			1.00		1.00	0.89	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (prot)	1856	5264			5007		1737	1555	1519			
Flt Permitted	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (perm)	1856	5264			5007		1737	1555	1519			
Peak-hour factor, PHF	0.93	0.88	0.97	0.90	0.90	0.93	0.86	0.25	0.98	0.92	0.92	0.92
Adj. Flow (vph)	340	2049	0	0	1342	0	295	0	366	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	340	2049	0	0	1342	0	230	219	212	0	0	0
Heavy Vehicles (%)	3%	1%	0%	2%	1%	2%	2%	0%	1%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	22.3	69.9			41.6		18.1	18.1	18.1			
Effective Green, g (s)	22.3	69.9			41.6		18.1	18.1	18.1			
Actuated g/C Ratio	0.22	0.70			0.42		0.18	0.18	0.18			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	414	3680			2083		314	281	275			
v/s Ratio Prot	c0.18	0.39			c0.27							
v/s Ratio Perm							0.13	0.14	0.14			
v/c Ratio	0.82	0.56			0.64		0.73	0.78	0.77			
Uniform Delay, d1	37.0	7.4			23.3		38.7	39.0	39.0			
Progression Factor	1.12	0.75			1.07		1.00	1.00	1.00			
Incremental Delay, d2	11.0	0.5			0.9		8.5	12.8	12.5			
Delay (s)	52.6	6.1			25.7		47.2	51.8	51.5			
Level of Service	D	A			C		D	D	D			
Approach Delay (s)		12.7			25.7			50.1			0.0	
Approach LOS		B			C			D			A	
Intersection Summary												
HCM Average Control Delay			22.3			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				18.0		
Intersection Capacity Utilization			66.5%			ICU Level of Service				C		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2015 Sat Build
 6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↖↗	↑↑	↖↗	↗
Volume (vph)	2017	145	439	1820	165	395
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5264	1639	3450	3556	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	8000	1639	3450	3556	3433	1568
Peak-hour factor, PHF	0.88	0.83	0.91	0.90	0.86	0.88
Adj. Flow (vph)	2292	175	482	2022	192	449
RTOR Reduction (vph)	0	5	0	0	0	1
Lane Group Flow (vph)	2292	170	482	2022	192	448
Heavy Vehicles (%)	1%	1%	1%	1%	2%	3%
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	44.3	72.2	15.8	66.1	21.9	37.7
Effective Green, g (s)	44.3	72.2	15.8	66.1	21.9	37.7
Actuated g/C Ratio	0.44	0.72	0.16	0.66	0.22	0.38
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		4.0	3.0	2.0	2.0
Lane Grp Cap (vph)	2332	1183	545	2351	752	685
v/s Ratio Prot	c0.44	0.10	0.14	c0.57	0.06	c0.14
v/s Ratio Perm						0.14
v/c Ratio	0.98	0.14	0.88	0.86	0.26	0.65
Uniform Delay, d1	27.5	4.3	41.2	13.3	32.3	25.8
Progression Factor	0.71	0.92	1.04	0.97	1.00	1.00
Incremental Delay, d2	13.6	0.0	9.0	2.3	0.1	1.7
Delay (s)	33.2	4.0	51.9	15.2	32.4	27.5
Level of Service	C	A	D	B	C	C
Approach Delay (s)	31.1			22.3	29.0	
Approach LOS	C			C	C	

Intersection Summary			
HCM Average Control Delay	26.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

2015 Sat Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1740	59	49	1621	19	61	0	49	6	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.97	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.96	
Satd. Flow (prot)		3483		1805	5176			1769	1552		1708	
Flt Permitted		1.00		0.95	1.00			0.75	1.00		0.74	
Satd. Flow (perm)		3483		1805	5176			1391	1552		1302	
Peak-hour factor, PHF	0.94	0.94	0.91	0.75	0.93	0.68	0.88	0.25	0.80	0.50	0.25	1.00
Adj. Flow (vph)	0	1851	65	65	1743	28	69	0	61	12	0	4
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	56	0	4	0
Lane Group Flow (vph)	0	1914	0	65	1770	0	0	69	5	0	12	0
Heavy Vehicles (%)	1%	1%	3%	2%	2%	0%	0%	0%	2%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		68.3		6.1	79.4			8.6	8.6		8.6	
Effective Green, g (s)		68.3		6.1	79.4			8.6	8.6		8.6	
Actuated g/C Ratio		0.68		0.06	0.79			0.09	0.09		0.09	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2379		110	4110			120	133		112	
v/s Ratio Prot		c0.55		0.04	c0.34							
v/s Ratio Perm								c0.05	0.00		0.01	
v/c Ratio		0.80		0.59	0.43			0.57	0.04		0.11	
Uniform Delay, d1		11.2		45.7	3.2			43.9	41.9		42.2	
Progression Factor		0.50		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		2.2		8.2	0.3			6.5	0.1		0.4	
Delay (s)		7.8		54.0	3.6			50.5	42.0		42.6	
Level of Service		A		D	A			D	D		D	
Approach Delay (s)		7.8			5.3			46.5			42.6	
Approach LOS		A			A			D			D	

Intersection Summary

HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2015 Sat Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕	↕↗	
Volume (veh/h)	0	217	224	437	446	82
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.25	0.92	0.92	0.87	0.88	0.92
Hourly flow rate (vph)	0	236	243	502	507	89
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked						
vC, conflicting volume	1289	298	596			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1289	298	596			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	67	75			
cM capacity (veh/h)	119	704	990			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	236	243	251	251	338	258
Volume Left	0	243	0	0	0	0
Volume Right	236	0	0	0	0	89
cSH	704	990	1700	1700	1700	1700
Volume to Capacity	0.33	0.25	0.15	0.15	0.20	0.15
Queue Length 95th (ft)	37	24	0	0	0	0
Control Delay (s)	12.7	9.8	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	12.7	3.2			0.0	
Approach LOS	B					

Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			35.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2015 Sat Build
6/22/2011



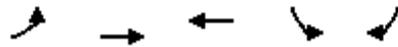
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	2	2	6	17	2	65	5	594	11	76	581	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.93			0.90			1.00			1.00	
Flt Protected		0.99			0.99			1.00			0.99	
Satd. Flow (prot)		1991			1891			3563			3550	
Flt Permitted		0.93			0.91			0.94			0.78	
Satd. Flow (perm)		1871			1747			3366			2788	
Peak-hour factor, PHF	0.50	0.25	0.50	0.71	0.50	0.86	0.63	0.94	0.92	0.76	0.89	0.75
Adj. Flow (vph)	4	8	12	24	4	76	8	632	12	100	653	8
RTOR Reduction (vph)	0	11	0	0	70	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	13	0	0	34	0	0	650	0	0	761	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		6.1			6.1			29.0			55.9	
Effective Green, g (s)		6.1			6.1			29.0			55.9	
Actuated g/C Ratio		0.08			0.08			0.40			0.77	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		156			146			1337			2364	
v/s Ratio Prot											c0.10	
v/s Ratio Perm		0.01			c0.02			c0.19			0.15	
v/c Ratio		0.08			0.24			0.49			0.32	
Uniform Delay, d1		30.9			31.3			16.4			2.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.8			1.3			0.4	
Delay (s)		31.1			32.1			17.7			3.0	
Level of Service		C			C			B			A	
Approach Delay (s)		31.1			32.1			17.7			3.0	
Approach LOS		C			C			B			A	

Intersection Summary

HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues
2: West Chester Pike & N Lawrence Rd

2015 Sat Build
6/22/2011



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	757	1877	1886	101	730
v/c Ratio	0.81	0.66	0.73	0.91	1.14
Control Delay	25.8	15.1	21.0	112.6	112.7
Queue Delay	0.0	0.8	0.1	0.0	0.0
Total Delay	25.8	15.9	21.0	112.6	112.7
Queue Length 50th (ft)	242	534	340	65	-553
Queue Length 95th (ft)	m254	m543	454	#166	#702
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290			325	
Base Capacity (vph)	1366	2858	2597	111	638
Starvation Cap Reductn	0	592	0	0	0
Spillback Cap Reductn	0	62	56	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.55	0.83	0.74	0.91	1.14

Intersection Summary

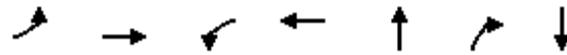
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

2015 Sat Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	12	1424	76	1451	16	32	108
v/c Ratio	0.11	0.61	0.54	0.55	0.10	0.16	0.65
Control Delay	45.9	12.9	55.7	6.6	40.3	15.8	58.1
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	45.9	12.9	55.7	6.7	40.3	15.8	58.1
Queue Length 50th (ft)	7	293	43	154	9	0	62
Queue Length 95th (ft)	16	365	71	307	8	24	83
Internal Link Dist (ft)		672		286	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	158	2331	153	2637	182	224	193
Starvation Cap Reductn	0	0	0	228	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.61	0.50	0.60	0.09	0.14	0.56

Intersection Summary

Queues
6: West Chester Pike & Langford

2015 Sat Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1176	343	592	1034	312	628
v/c Ratio	0.96	0.49	0.77	0.40	0.63	0.62
Control Delay	47.4	12.8	25.8	3.7	46.1	13.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.4	12.8	25.8	3.7	46.1	13.5
Queue Length 50th (ft)	~298	92	397	83	95	203
Queue Length 95th (ft)	#391	146	441	66	139	306
Internal Link Dist (ft)	264			598	750	
Turn Bay Length (ft)			450		200	400
Base Capacity (vph)	1219	707	767	2566	549	1045
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.49	0.77	0.40	0.57	0.60

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
10: West Chester Pike & I-476 SB Off-Ramp

2015 Sat Build
6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT	SBR
Lane Group Flow (vph)	1735	1312	347	800	4	420
v/c Ratio	0.60	0.67	0.22	0.70	0.01	0.82
Control Delay	8.3	9.3	0.3	32.9	21.0	44.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.3	9.3	0.3	32.9	21.0	44.8
Queue Length 50th (ft)	52	71	0	222	2	239
Queue Length 95th (ft)	m377	95	0	267	2	261
Internal Link Dist (ft)	598	662			574	
Turn Bay Length (ft)						
Base Capacity (vph)	2884	1964	1567	1326	328	592
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.67	0.22	0.60	0.01	0.71

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

2015 Sat Build
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	340	2049	1342	230	219	212
v/c Ratio	0.82	0.56	0.65	0.73	0.78	0.77
Control Delay	55.9	6.4	27.5	52.2	57.5	57.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.9	6.4	27.5	52.2	57.5	57.4
Queue Length 50th (ft)	212	108	320	143	143	132
Queue Length 95th (ft)	269	164	371	214	53	#217
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	483	3678	2080	365	327	319
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.56	0.65	0.63	0.67	0.66

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
18: West Chester Pike & S Lawrence Rd

2015 Sat Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	2292	175	482	2022	192	449
v/c Ratio	0.98	0.15	0.89	0.86	0.25	0.65
Control Delay	34.9	3.9	54.1	16.2	32.9	27.3
Queue Delay	0.0	0.0	0.0	11.2	0.0	0.1
Total Delay	34.9	3.9	54.1	27.4	32.9	27.3
Queue Length 50th (ft)	~509	19	135	665	51	214
Queue Length 95th (ft)	#617	22	m#186	m208	78	312
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2331	1189	558	2349	790	665
Starvation Cap Reductn	0	0	0	340	0	0
Spillback Cap Reductn	0	0	0	0	0	5
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.15	0.86	1.01	0.24	0.68

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

26: West Chester Pike & Old West Chester Pike

6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1916	65	1771	69	61	16
v/c Ratio	0.77	0.50	0.42	0.51	0.30	0.12
Control Delay	8.1	58.5	3.7	55.5	14.8	35.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.1	58.5	3.7	55.5	14.8	35.6
Queue Length 50th (ft)	127	40	110	42	0	7
Queue Length 95th (ft)	126	70	145	22	29	6
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2502	134	4239	167	240	160
Starvation Cap Reductn	16	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.49	0.42	0.41	0.25	0.10

Intersection Summary

Queues
5: Sussex Blvd & Lawrence Road

2015 Sat Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	24	104	652	761
v/c Ratio	0.12	0.43	0.47	0.32
Control Delay	21.2	17.7	17.0	3.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.2	17.7	17.0	3.2
Queue Length 50th (ft)	5	12	108	41
Queue Length 95th (ft)	3	14	153	74
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	521	534	1385	2389
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.05	0.19	0.47	0.32
Intersection Summary				

O – Capacity and Queue Analysis

Output “Year 2020 Build”:

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2020 AM Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	584	1387	2000	41	52	906
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3283	3451	5161		1718	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3283	3451	5161		1718	1628
Peak-hour factor, PHF	0.94	0.96	0.97	0.50	0.85	0.93
Adj. Flow (vph)	621	1445	2062	82	61	974
RTOR Reduction (vph)	0	0	4	0	0	0
Lane Group Flow (vph)	621	1445	2140	0	61	974
Heavy Vehicles (%)	4%	2%	2%	13%	8%	2%
Turn Type	Prot					pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases						
Actuated Green, G (s)	23.3	69.0	40.7		19.0	48.3
Effective Green, g (s)	23.3	69.0	40.7		19.0	48.3
Actuated g/C Ratio	0.23	0.69	0.41		0.19	0.48
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	765	2381	2101		326	786
v/s Ratio Prot	0.19	0.42	c0.41		0.04	c0.60
v/s Ratio Perm						
v/c Ratio	0.81	0.61	1.02		0.19	1.24
Uniform Delay, d1	36.3	8.3	29.6		34.0	25.9
Progression Factor	1.07	1.16	0.90		1.00	1.00
Incremental Delay, d2	4.9	0.9	23.4		0.3	118.4
Delay (s)	43.6	10.4	50.2		34.3	144.3
Level of Service	D	B	D		C	F
Approach Delay (s)		20.4	50.2		137.8	
Approach LOS		C	D		F	

Intersection Summary

HCM Average Control Delay	55.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	105.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2020 AM Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↕		↙	↕			↕	↗		↕	
Volume (vph)	13	1518	17	26	1335	15	27	18	67	102	32	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%			0%	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.97	
Satd. Flow (prot)	1736	3549		1676	3483			1619	1463		1772	
Flt Permitted	0.95	1.00		0.95	1.00			0.77	1.00		0.77	
Satd. Flow (perm)	1736	3549		1676	3483			1278	1463		1417	
Peak-hour factor, PHF	0.54	0.94	0.61	0.65	0.94	0.94	0.91	0.75	0.88	0.91	0.80	0.54
Adj. Flow (vph)	24	1615	28	40	1420	16	30	24	76	112	40	24
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	65	0	6	0
Lane Group Flow (vph)	24	1642	0	40	1435	0	0	54	11	0	170	0
Heavy Vehicles (%)	1%	2%	0%	0%	3%	0%	7%	6%	3%	1%	6%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)	2.4	63.6		3.6	64.8			14.8	14.8		14.8	
Effective Green, g (s)	2.4	63.6		3.6	64.8			14.8	14.8		14.8	
Actuated g/C Ratio	0.02	0.64		0.04	0.65			0.15	0.15		0.15	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	42	2257		60	2257			189	217		210	
v/s Ratio Prot	0.01	c0.46		c0.02	0.41							
v/s Ratio Perm								0.04	0.01		c0.12	
v/c Ratio	0.57	0.73		0.67	0.64			0.29	0.05		0.81	
Uniform Delay, d1	48.3	12.3		47.6	10.5			37.9	36.6		41.2	
Progression Factor	1.00	1.00		0.96	0.77			1.00	1.00		1.00	
Incremental Delay, d2	17.4	2.1		22.4	1.2			0.8	0.1		20.1	
Delay (s)	65.7	14.4		68.3	9.4			38.7	36.7		61.3	
Level of Service	E	B		E	A			D	D		E	
Approach Delay (s)		15.2			11.0			37.5			61.3	
Approach LOS		B			B			D			E	

Intersection Summary

HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: West Chester Pike & Langford

2020 AM Build
6/22/2011

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↓	↑↑	↓↓	↑
Volume (vph)	1563	124	171	1227	142	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%			3%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5162	1607	1743	3486	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5162	1607	1743	3486	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1699	135	186	1334	154	200
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1699	135	186	1334	154	200
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	52.2	68.0	20.0	78.2	9.8	29.8
Effective Green, g (s)	52.2	68.0	20.0	78.2	9.8	29.8
Actuated g/C Ratio	0.52	0.68	0.20	0.78	0.10	0.30
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2695	1093	349	2726	336	567
v/s Ratio Prot	c0.33	0.08	0.11	c0.38	c0.04	0.03
v/s Ratio Perm						0.09
v/c Ratio	0.63	0.12	0.53	0.49	0.46	0.35
Uniform Delay, d1	17.0	5.6	35.8	3.8	42.6	27.5
Progression Factor	1.47	1.73	0.65	0.40	1.00	1.00
Incremental Delay, d2	0.8	0.0	1.3	0.5	1.0	0.4
Delay (s)	25.9	9.7	24.5	2.1	43.6	27.9
Level of Service	C	A	C	A	D	C
Approach Delay (s)	24.7			4.8	34.7	
Approach LOS	C			A	C	

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2020 AM Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↗				↖↖	↑	↗
Volume (vph)	0	1423	324	0	1072	0	0	0	0	788	1	326
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	6.0
Lane Util. Factor		0.91			0.95					0.97	1.00	1.00
Frt		0.97			1.00					1.00	1.00	0.85
Flt Protected		1.00			1.00					0.95	1.00	1.00
Satd. Flow (prot)		4972			3435					3414	887	1599
Flt Permitted		1.00			1.00					0.95	1.00	1.00
Satd. Flow (perm)		4972			3435					3414	887	1599
Peak-hour factor, PHF	0.94	0.91	0.76	0.93	0.95	0.69	0.92	0.92	0.92	0.94	0.25	0.84
Adj. Flow (vph)	0	1564	426	0	1128	0	0	0	0	838	4	388
RTOR Reduction (vph)	0	43	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1947	0	0	1128	0	0	0	0	838	4	388
Heavy Vehicles (%)	2%	3%	3%	2%	3%	2%	2%	2%	2%	6%	100%	1%
Turn Type						custom					Perm	Perm
Protected Phases		2			6	4 6					4	4
Permitted Phases										4		4
Actuated Green, G (s)		56.1			56.1					31.9	31.9	31.9
Effective Green, g (s)		56.1			56.1					31.9	31.9	31.9
Actuated g/C Ratio		0.56			0.56					0.32	0.32	0.32
Clearance Time (s)		6.0			6.0					6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		2789			1927					1089	283	510
v/s Ratio Prot		c0.39			0.33						0.00	
v/s Ratio Perm										c0.25		0.24
v/c Ratio		0.70			0.59					0.77	0.01	0.76
Uniform Delay, d1		15.8			14.3					30.7	23.3	30.6
Progression Factor		1.00			0.36					1.00	1.00	1.00
Incremental Delay, d2		1.2			0.1					3.3	0.0	6.6
Delay (s)		17.0			5.3					34.1	23.3	37.2
Level of Service		B			A					C	C	D
Approach Delay (s)		17.0			5.3			0.0			35.0	
Approach LOS		B			A			A			D	

Intersection Summary

HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: West Chester Pike & I-476 NB

2020 AM Build
6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	443	1768	0	0	1394	181	176	10	270	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.91	0.95			
Frt	1.00	1.00			0.97		1.00	0.89	0.85			
Flt Protected	0.95	1.00			1.00		0.95	1.00	1.00			
Satd. Flow (prot)	1893	5016			4828		1754	1550	1490			
Flt Permitted	0.95	1.00			1.00		0.95	1.00	1.00			
Satd. Flow (perm)	1893	5016			4828		1754	1550	1490			
Peak-hour factor, PHF	0.81	0.96	0.98	0.93	0.95	0.58	0.84	0.25	0.77	0.92	0.92	0.92
Adj. Flow (vph)	547	1842	0	0	1467	312	210	40	351	0	0	0
RTOR Reduction (vph)	0	0	0	0	33	0	0	0	0	0	0	0
Lane Group Flow (vph)	547	1842	0	0	1746	0	189	212	200	0	0	0
Heavy Vehicles (%)	1%	6%	2%	2%	2%	2%	1%	1%	3%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	30.9	69.9			33.0		18.1	18.1	18.1			
Effective Green, g (s)	30.9	69.9			33.0		18.1	18.1	18.1			
Actuated g/C Ratio	0.31	0.70			0.33		0.18	0.18	0.18			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	585	3506			1593		317	281	270			
v/s Ratio Prot	c0.29	0.37			c0.36							
v/s Ratio Perm							0.11	0.14	0.13			
v/c Ratio	0.94	0.53			1.10		0.60	0.75	0.74			
Uniform Delay, d1	33.6	7.2			33.5		37.6	38.8	38.7			
Progression Factor	0.84	1.27			0.72		1.00	1.00	1.00			
Incremental Delay, d2	17.3	0.4			44.4		3.0	10.9	10.4			
Delay (s)	45.6	9.5			68.6		40.6	49.8	49.2			
Level of Service	D	A			E		D	D	D			
Approach Delay (s)		17.8			68.6			46.7			0.0	
Approach LOS		B			E			D			A	
Intersection Summary												
HCM Average Control Delay			40.4			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			78.4%			ICU Level of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2020 AM Build
 6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↙	↑↑	↙	↗
Volume (vph)	1540	498	369	2537	472	431
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5212	1577	3318	3487	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	8000	1577	3318	3487	3433	1568
Peak-hour factor, PHF	0.96	0.89	0.89	0.92	0.86	0.94
Adj. Flow (vph)	1604	560	415	2758	549	459
RTOR Reduction (vph)	0	17	0	0	0	5
Lane Group Flow (vph)	1604	543	415	2758	549	454
Heavy Vehicles (%)	2%	5%	5%	3%	2%	3%
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	46.9	71.9	16.1	69.0	19.0	35.1
Effective Green, g (s)	46.9	71.9	16.1	69.0	19.0	35.1
Actuated g/C Ratio	0.47	0.72	0.16	0.69	0.19	0.35
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		4.0	3.0	2.0	2.0
Lane Grp Cap (vph)	2444	1134	534	2406	652	644
v/s Ratio Prot	0.31	0.34	0.13	c0.79	c0.16	0.13
v/s Ratio Perm						0.16
v/c Ratio	0.66	0.48	0.78	1.15	0.84	0.71
Uniform Delay, d1	20.4	6.0	40.2	15.5	39.1	28.0
Progression Factor	0.60	0.85	1.16	0.71	1.00	1.00
Incremental Delay, d2	1.2	0.1	0.7	66.4	9.3	2.9
Delay (s)	13.3	5.2	47.4	77.4	48.3	30.9
Level of Service	B	A	D	E	D	C
Approach Delay (s)	11.2			73.5	40.4	
Approach LOS	B			E	D	

Intersection Summary

HCM Average Control Delay	47.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
26: West Chester Pike & Old West Chester Pike

2020 AM Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	1392	47	62	2003	9	20	1	35	4	0	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.91	
Flt Protected		1.00		0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)		3344		1705	5130			1470	1227		1570	
Flt Permitted		1.00		0.95	1.00			0.73	1.00		0.89	
Satd. Flow (perm)		3344		1705	5130			1117	1227		1416	
Peak-hour factor, PHF	0.92	0.95	0.77	0.85	0.95	0.75	0.83	0.25	0.55	0.33	0.25	0.64
Adj. Flow (vph)	0	1465	61	73	2108	12	24	4	64	12	0	28
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	60	0	26	0
Lane Group Flow (vph)	0	1524	0	73	2119	0	0	28	4	0	14	0
Heavy Vehicles (%)	2%	5%	9%	8%	3%	11%	25%	0%	29%	0%	0%	6%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		69.4		7.1	81.5			6.5	6.5		6.5	
Effective Green, g (s)		69.4		7.1	81.5			6.5	6.5		6.5	
Actuated g/C Ratio		0.69		0.07	0.82			0.06	0.06		0.06	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2321		121	4181			73	80		92	
v/s Ratio Prot		c0.46		0.04	c0.41							
v/s Ratio Perm								c0.03	0.00		0.01	
v/c Ratio		0.66		0.60	0.51			0.38	0.05		0.15	
Uniform Delay, d1		8.6		45.1	2.9			44.8	43.9		44.1	
Progression Factor		0.69		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.2		8.2	0.4			3.3	0.3		0.8	
Delay (s)		7.1		53.3	3.4			48.2	44.1		44.9	
Level of Service		A		D	A			D	D		D	
Approach Delay (s)		7.1			5.0			45.4			44.9	
Approach LOS		A			A			D			D	

Intersection Summary

HCM Average Control Delay	7.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2020 AM Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕	↕	↖
Volume (veh/h)	0	92	152	948	528	72
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.92	0.92	0.98	0.91	0.92
Hourly flow rate (vph)	0	100	165	967	580	78
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked	0.81					
vC, conflicting volume	1433	329	658			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1062	329	658			
tC, single (s)	6.8	7.9	6.1			
tC, 2 stage (s)						
tF (s)	3.5	3.8	3.2			
p0 queue free %	100	82	66			
cM capacity (veh/h)	117	545	487			
Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	100	165	484	484	387	272
Volume Left	0	165	0	0	0	0
Volume Right	100	0	0	0	0	78
cSH	545	487	1700	1700	1700	1700
Volume to Capacity	0.18	0.34	0.28	0.28	0.23	0.16
Queue Length 95th (ft)	17	37	0	0	0	0
Control Delay (s)	13.1	16.1	0.0	0.0	0.0	0.0
Lane LOS	B	C				
Approach Delay (s)	13.1	2.4			0.0	
Approach LOS	B					
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			32.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2020 AM Build
6/22/2011



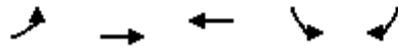
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	32	14	25	21	3	155	8	913	4	58	551	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.89			1.00			1.00	
Flt Protected		0.98			0.99			1.00			1.00	
Satd. Flow (prot)		1854			1824			3499			3429	
Flt Permitted		0.54			0.93			0.94			0.75	
Satd. Flow (perm)		1023			1715			3307			2576	
Peak-hour factor, PHF	0.57	0.44	0.63	0.75	0.75	0.88	0.67	0.88	0.33	0.91	0.93	0.67
Adj. Flow (vph)	56	32	40	28	4	176	12	1038	12	64	592	16
RTOR Reduction (vph)	0	27	0	0	153	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	101	0	0	55	0	0	1061	0	0	671	0
Heavy Vehicles (%)	6%	0%	20%	10%	0%	3%	0%	3%	0%	0%	5%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		10.3			10.3			30.0			56.7	
Effective Green, g (s)		10.3			10.3			30.0			56.7	
Actuated g/C Ratio		0.13			0.13			0.38			0.73	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		135			226			1272			2110	
v/s Ratio Prot											c0.09	
v/s Ratio Perm		c0.10			0.03			c0.32			0.14	
v/c Ratio		0.75			0.24			0.83			0.32	
Uniform Delay, d1		32.6			30.4			21.7			3.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		20.1			0.6			6.5			0.4	
Delay (s)		52.7			30.9			28.3			4.2	
Level of Service		D			C			C			A	
Approach Delay (s)		52.7			30.9			28.3			4.2	
Approach LOS		D			C			C			A	

Intersection Summary

HCM Average Control Delay	22.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Queues
2: West Chester Pike & N Lawrence Rd

2020 AM Build
6/22/2011



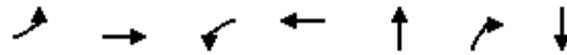
Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	621	1445	2144	61	974
v/c Ratio	0.81	0.61	1.02	0.19	1.26
Control Delay	45.2	10.7	51.7	35.8	156.1
Queue Delay	0.0	0.0	3.8	0.0	6.6
Total Delay	45.2	10.7	55.4	35.8	162.7
Queue Length 50th (ft)	203	177	~512	33	~787
Queue Length 95th (ft)	258	259	#712	65	#960
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290			325	
Base Capacity (vph)	985	2381	2105	326	770
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	23	0	9
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.63	0.61	1.03	0.19	1.28

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: West Chester Pike & N New Ardmore Ave

2020 AM Build
6/22/2011

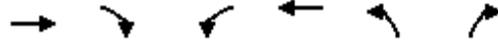


Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	24	1643	40	1436	54	76	176
v/c Ratio	0.24	0.70	0.40	0.60	0.29	0.27	0.81
Control Delay	50.6	14.3	54.7	9.0	41.6	11.4	68.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.6	14.3	54.7	9.0	41.6	11.4	68.1
Queue Length 50th (ft)	15	380	25	188	31	0	104
Queue Length 95th (ft)	24	473	42	257	56	38	#169
Internal Link Dist (ft)		672		286	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	104	2342	103	2382	204	298	233
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.70	0.39	0.60	0.26	0.26	0.76

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
6: West Chester Pike & Langford



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1699	135	186	1334	154	200
v/c Ratio	0.63	0.12	0.53	0.49	0.46	0.35
Control Delay	26.6	10.0	29.4	2.3	46.6	25.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.6	10.0	29.4	2.3	46.6	25.3
Queue Length 50th (ft)	360	53	106	47	48	92
Queue Length 95th (ft)	420	m71	147	65	77	146
Internal Link Dist (ft)	264			598	750	
Turn Bay Length (ft)			450		200	400
Base Capacity (vph)	2695	1093	349	2726	549	665
Starvation Cap Reductn	0	0	0	143	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.12	0.53	0.52	0.28	0.30

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
10: West Chester Pike & I-476 SB Off-Ramp

2020 AM Build
6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT	SBR
Lane Group Flow (vph)	1990	1128	722	838	4	388
v/c Ratio	0.70	0.59	0.47	0.77	0.01	0.76
Control Delay	17.3	5.4	3.8	35.5	20.0	40.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	5.4	3.8	35.5	20.0	40.3
Queue Length 50th (ft)	384	53	51	245	2	220
Queue Length 95th (ft)	498	m155	m0	288	2	274
Internal Link Dist (ft)	598	662			574	
Turn Bay Length (ft)						
Base Capacity (vph)	2831	1927	1552	1297	337	608
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.59	0.47	0.65	0.01	0.64

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

2020 AM Build
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	547	1842	1779	189	212	200
v/c Ratio	0.94	0.53	1.09	0.59	0.76	0.74
Control Delay	50.3	10.2	68.2	44.9	55.6	55.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.3	10.2	68.2	44.9	55.6	55.0
Queue Length 50th (ft)	378	216	~463	116	140	127
Queue Length 95th (ft)	#516	278	m348	170	51	167
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	585	3506	1626	386	341	328
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.53	1.09	0.49	0.62	0.61

Intersection Summary

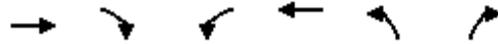
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
18: West Chester Pike & S Lawrence Rd

2020 AM Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1604	560	415	2758	549	459
v/c Ratio	0.66	0.49	0.78	1.15	0.84	0.71
Control Delay	13.7	6.3	47.5	81.5	52.2	30.7
Queue Delay	0.0	0.0	0.0	5.1	0.0	0.0
Total Delay	13.7	6.3	47.5	86.6	52.2	30.7
Queue Length 50th (ft)	220	55	137	~1082	175	233
Queue Length 95th (ft)	249	70	m127	m#536	#237	336
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2447	1151	630	2406	652	648
Starvation Cap Reductn	0	0	0	24	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.49	0.66	1.16	0.84	0.71

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues
 26: West Chester Pike & Old West Chester Pike

2020 AM Build
 6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1526	73	2120	28	64	40
v/c Ratio	0.63	0.52	0.49	0.33	0.42	0.30
Control Delay	7.6	56.9	3.4	54.0	20.1	27.3
Queue Delay	0.3	0.0	0.0	0.0	0.0	0.0
Total Delay	7.9	56.9	3.4	54.0	20.1	27.3
Queue Length 50th (ft)	247	45	127	17	0	7
Queue Length 95th (ft)	355	85	161	12	9	0
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2436	155	4306	100	169	153
Starvation Cap Reductn	345	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.47	0.49	0.28	0.38	0.26

Intersection Summary

Queues
5: Sussex Blvd & Lawrence Road

2020 AM Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	128	208	1062	672
v/c Ratio	0.79	0.55	0.83	0.32
Control Delay	55.3	13.1	29.1	4.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	55.3	13.1	29.1	4.5
Queue Length 50th (ft)	46	14	239	46
Queue Length 95th (ft)	35	42	310	85
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	349	669	1272	2098
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.37	0.31	0.83	0.32
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

2: West Chester Pike & N Lawrence Rd

2020 PM Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1155	2023	1642	88	103	853
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3347	3451	5172		1819	1628
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3347	3451	5172		1819	1628
Peak-hour factor, PHF	0.98	0.95	0.87	0.86	0.74	0.95
Adj. Flow (vph)	1179	2129	1887	102	139	898
RTOR Reduction (vph)	0	0	5	0	0	1
Lane Group Flow (vph)	1179	2129	1984	0	139	897
Turn Type	Prot			custom		
Protected Phases	5	2	6		4	4
Permitted Phases						5
Actuated Green, G (s)	43.0	95.0	47.0		13.0	56.0
Effective Green, g (s)	43.0	95.0	47.0		13.0	56.0
Actuated g/C Ratio	0.36	0.79	0.39		0.11	0.47
Clearance Time (s)	5.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	1199	2732	2026		197	841
v/s Ratio Prot	0.35	0.62	c0.38		0.08	c0.12
v/s Ratio Perm						0.44
v/c Ratio	0.98	0.78	0.98		0.71	1.07
Uniform Delay, d1	38.1	6.8	36.0		51.7	32.0
Progression Factor	0.79	0.57	1.13		1.00	1.00
Incremental Delay, d2	9.3	0.6	14.9		10.9	50.5
Delay (s)	39.3	4.4	55.5		62.6	82.5
Level of Service	D	A	E		E	F
Approach Delay (s)		16.9	55.5		79.9	
Approach LOS		B	E		E	

Intersection Summary

HCM Average Control Delay	39.3	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

3: West Chester Pike & N New Ardmore Ave

2020 PM Build

6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	1700	35	16	1793	19	49	18	4	15	15	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%				0%
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85			0.95
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00			0.98
Satd. Flow (prot)	1702	3510		1643	3514			1698	1492			1757
Flt Permitted	0.95	1.00		0.95	1.00			0.75	1.00			0.84
Satd. Flow (perm)	1702	3510		1643	3514			1311	1492			1498
Peak-hour factor, PHF	0.88	0.95	0.80	1.00	0.88	0.68	0.94	0.75	0.50	0.47	0.75	0.61
Adj. Flow (vph)	128	1789	44	16	2038	28	52	24	8	32	20	28
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	7	0	17	0
Lane Group Flow (vph)	128	1832	0	16	2065	0	0	76	1	0	63	0
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)	11.5	90.5		2.0	81.0			9.5	9.5			9.5
Effective Green, g (s)	11.5	90.5		2.0	81.0			9.5	9.5			9.5
Actuated g/C Ratio	0.10	0.75		0.02	0.68			0.08	0.08			0.08
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Grp Cap (vph)	163	2647		27	2372			104	118			119
v/s Ratio Prot	c0.08	c0.52		0.01	c0.59							
v/s Ratio Perm								c0.06	0.00			0.04
v/c Ratio	0.79	0.69		0.59	0.87			0.73	0.01			0.53
Uniform Delay, d1	53.0	7.6		58.6	15.4			54.0	50.9			53.1
Progression Factor	1.00	1.00		0.90	0.56			1.00	1.00			1.00
Incremental Delay, d2	21.5	1.5		25.8	4.0			23.0	0.0			4.5
Delay (s)	74.6	9.1		78.5	12.6			77.0	50.9			57.6
Level of Service	E	A		E	B			E	D			E
Approach Delay (s)		13.4			13.1			74.5				57.6
Approach LOS		B			B			E				E

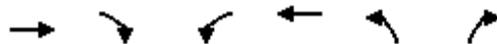
Intersection Summary

HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: West Chester Pike & Langford

2020 PM Build
6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↖	↑↑	↖↗	↗
Volume (vph)	1451	268	401	1569	279	549
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%			3%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5162	1607	1743	3486	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5162	1607	1743	3486	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1577	291	436	1705	303	597
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1577	291	436	1705	303	597
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	47.9	71.0	37.0	90.9	17.1	54.1
Effective Green, g (s)	47.9	71.0	37.0	90.9	17.1	54.1
Actuated g/C Ratio	0.40	0.59	0.31	0.76	0.14	0.45
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2060	951	537	2641	489	793
v/s Ratio Prot	c0.31	0.18	0.25	0.49	0.09	c0.11
v/s Ratio Perm						0.27
v/c Ratio	0.77	0.31	0.81	0.65	0.62	0.75
Uniform Delay, d1	31.2	12.2	38.3	6.9	48.4	27.4
Progression Factor	0.81	0.64	0.96	0.56	1.00	1.00
Incremental Delay, d2	2.1	0.1	3.2	0.4	2.3	4.1
Delay (s)	27.3	7.9	40.0	4.2	50.7	31.5
Level of Service	C	A	D	A	D	C
Approach Delay (s)	24.3			11.5	37.9	
Approach LOS	C			B	D	

Intersection Summary

HCM Average Control Delay	21.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2020 PM Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↑				↑↑	↑	↑
Volume (vph)	0	1719	281	0	1461	0	0	0	0	1492	1	509
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	6.0
Lane Util. Factor		0.91			0.95					0.97	1.00	1.00
Frt		0.98			1.00					1.00	1.00	0.85
Flt Protected		1.00			1.00					0.95	1.00	1.00
Satd. Flow (prot)		5080			3468					3583	1756	1599
Flt Permitted		1.00			1.00					0.95	1.00	1.00
Satd. Flow (perm)		5080			3468					3583	1756	1599
Peak-hour factor, PHF	0.94	0.94	0.96	0.93	0.94	0.90	0.92	0.92	0.92	0.94	0.25	0.88
Adj. Flow (vph)	0	1829	293	0	1554	0	0	0	0	1587	4	578
RTOR Reduction (vph)	0	18	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2104	0	0	1554	0	0	0	0	1587	4	578
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Turn Type						custom					Perm	Perm
Protected Phases		2			6	4 6					4	
Permitted Phases										4		4
Actuated Green, G (s)		53.0			53.0					55.0	55.0	55.0
Effective Green, g (s)		53.0			53.0					55.0	55.0	55.0
Actuated g/C Ratio		0.44			0.44					0.46	0.46	0.46
Clearance Time (s)		6.0			6.0					6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		2244			1532					1642	805	733
v/s Ratio Prot		0.41			c0.45						0.00	
v/s Ratio Perm										c0.44		0.36
v/c Ratio		0.94			1.01					0.97	0.00	0.79
Uniform Delay, d1		31.9			33.5					31.6	17.6	27.6
Progression Factor		0.57			0.61					1.00	1.00	1.00
Incremental Delay, d2		6.3			17.3					14.9	0.0	5.6
Delay (s)		24.4			37.6					46.5	17.6	33.2
Level of Service		C			D					D	B	C
Approach Delay (s)		24.4			37.6			0.0			42.9	
Approach LOS		C			D			A			D	

Intersection Summary

HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

2020 PM Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	447	2764	0	0	1407	0	322	0	518	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.91	0.95			
Frt	1.00	1.00			1.00		1.00	0.87	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (prot)	1874	5212			4958		1754	1526	1519			
Flt Permitted	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (perm)	1874	5212			4958		1754	1526	1519			
Peak-hour factor, PHF	0.83	0.95	0.98	0.93	0.92	0.93	0.93	0.93	0.94	0.92	0.92	0.92
Adj. Flow (vph)	539	2909	0	0	1529	0	346	0	551	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	539	2909	0	0	1529	0	311	294	292	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	37.1	80.3			37.2		27.7	27.7	27.7			
Effective Green, g (s)	37.1	80.3			37.2		27.7	27.7	27.7			
Actuated g/C Ratio	0.31	0.67			0.31		0.23	0.23	0.23			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	579	3488			1537		405	352	351			
v/s Ratio Prot	c0.29	0.56			c0.31							
v/s Ratio Perm							0.18	0.19	0.19			
v/c Ratio	0.93	0.83			0.99		0.77	0.84	0.83			
Uniform Delay, d1	40.2	14.9			41.3		43.1	44.0	43.9			
Progression Factor	0.72	0.88			0.79		1.00	1.00	1.00			
Incremental Delay, d2	11.1	0.9			16.6		8.5	15.6	15.4			
Delay (s)	39.9	13.9			49.1		51.6	59.6	59.3			
Level of Service	D	B			D		D	E	E			
Approach Delay (s)		18.0			49.1			56.7			0.0	
Approach LOS		B			D			E			A	
Intersection Summary												
HCM Average Control Delay			32.0				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			84.8%				ICU Level of Service			E		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: West Chester Pike & S Lawrence Rd

2020 PM Build
6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↙↙	↑↑	↙↙	↗
Volume (vph)	2794	488	596	1899	201	384
Ideal Flow (vphpl)	2100	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5761	1623	3416	3522	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5761	1623	3416	3522	3433	1583
Peak-hour factor, PHF	0.95	0.83	0.95	0.92	0.82	0.93
Adj. Flow (vph)	2941	588	627	2064	245	413
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	2941	586	627	2064	245	413
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	59.0	86.4	21.6	86.6	21.4	43.0
Effective Green, g (s)	59.0	86.4	21.6	86.6	21.4	43.0
Actuated g/C Ratio	0.49	0.72	0.18	0.72	0.18	0.36
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		4.0	3.0	2.0	2.0
Lane Grp Cap (vph)	2832	1169	615	2542	612	646
v/s Ratio Prot	c0.51	0.36	c0.18	0.59	0.07	c0.11
v/s Ratio Perm						0.15
v/c Ratio	1.04	0.50	1.02	0.81	0.40	0.64
Uniform Delay, d1	30.5	7.4	49.2	11.2	43.6	32.0
Progression Factor	0.68	0.64	0.67	1.79	1.00	1.00
Incremental Delay, d2	24.4	0.1	16.2	0.3	0.2	1.5
Delay (s)	45.3	4.8	49.1	20.4	43.8	33.6
Level of Service	D	A	D	C	D	C
Approach Delay (s)	38.5			27.0	37.4	
Approach LOS	D			C	D	

Intersection Summary

HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	86.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

2020 PM Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑			↑	↗		↕	
Volume (vph)	0	2065	61	65	1586	17	141	1	124	2	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.94	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.97	
Satd. Flow (prot)		3466		1497	5129			1741	1583		1679	
Flt Permitted		1.00		0.95	1.00			0.72	1.00		0.82	
Satd. Flow (perm)		3466		1497	5129			1317	1583		1415	
Peak-hour factor, PHF	0.92	0.93	0.79	0.80	0.97	0.85	0.83	0.25	0.74	0.25	0.25	0.50
Adj. Flow (vph)	0	2220	77	81	1635	20	170	4	168	8	0	6
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	95	0	5	0
Lane Group Flow (vph)	0	2295	0	81	1654	0	0	174	73	0	9	0
Heavy Vehicles (%)	2%	1%	18%	23%	3%	0%	2%	0%	0%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		78.0		8.0	91.0			17.0	17.0		17.0	
Effective Green, g (s)		78.0		8.0	91.0			17.0	17.0		17.0	
Actuated g/C Ratio		0.65		0.07	0.76			0.14	0.14		0.14	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2253		100	3889			187	224		200	
v/s Ratio Prot		c0.66		c0.05	0.32							
v/s Ratio Perm								c0.13	0.05		0.01	
v/c Ratio		1.02		0.81	0.43			0.93	0.32		0.04	
Uniform Delay, d1		21.0		55.3	5.2			50.9	46.3		44.5	
Progression Factor		0.35		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		19.8		37.2	0.3			46.2	0.8		0.1	
Delay (s)		27.2		92.5	5.5			97.1	47.2		44.6	
Level of Service		C		F	A			F	D		D	
Approach Delay (s)		27.2			9.6			72.6			44.6	
Approach LOS		C			A			E			D	

Intersection Summary

HCM Average Control Delay	23.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	85.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2020 PM Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕	↕	↕
Volume (veh/h)	0	206	192	551	951	97
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.92	0.92	0.92	0.89	0.92
Hourly flow rate (vph)	0	224	209	599	1069	105
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked						
vC, conflicting volume	1838	587	1174			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1838	587	1174			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	51	65			
cM capacity (veh/h)	44	458	602			
Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	224	209	299	299	712	462
Volume Left	0	209	0	0	0	0
Volume Right	224	0	0	0	0	105
cSH	458	602	1700	1700	1700	1700
Volume to Capacity	0.49	0.35	0.18	0.18	0.42	0.27
Queue Length 95th (ft)	66	39	0	0	0	0
Control Delay (s)	20.2	14.1	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	20.2	3.6			0.0	
Approach LOS	C					
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			48.8%		ICU Level of Service	A
Analysis Period (min)			15			

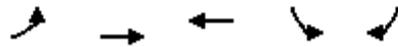
HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2020 PM Build
6/22/2011

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	43	18	32	20	7	90	8	610	31	132	981	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.97			0.91			0.99			0.99	
Flt Protected		0.97			0.99			1.00			0.99	
Satd. Flow (prot)		2031			1929			3511			3535	
Flt Permitted		0.70			0.87			0.92			0.64	
Satd. Flow (perm)		1454			1694			3217			2260	
Peak-hour factor, PHF	0.32	0.30	0.53	0.46	0.58	0.73	0.67	0.93	0.78	0.81	0.83	0.69
Adj. Flow (vph)	134	60	60	43	12	123	12	656	40	163	1182	64
RTOR Reduction (vph)	0	16	0	0	96	0	0	6	0	0	3	0
Lane Group Flow (vph)	0	238	0	0	82	0	0	702	0	0	1406	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		17.2			17.2			30.0			49.8	
Effective Green, g (s)		17.2			17.2			30.0			49.8	
Actuated g/C Ratio		0.22			0.22			0.38			0.64	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		321			374			1237			1685	
v/s Ratio Prot											c0.16	
v/s Ratio Perm		c0.16			0.05			0.22			c0.37	
v/c Ratio		0.74			0.22			0.57			0.83	
Uniform Delay, d1		28.3			24.9			18.9			10.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		8.9			0.3			1.9			5.0	
Delay (s)		37.2			25.2			20.8			15.9	
Level of Service		D			C			C			B	
Approach Delay (s)		37.2			25.2			20.8			15.9	
Approach LOS		D			C			C			B	
Intersection Summary												
HCM Average Control Delay			20.1			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			78.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			76.4%			ICU Level of Service				D		
Analysis Period (min)			15									
c	Critical Lane Group											

Queues
2: West Chester Pike & N Lawrence Rd

2020 PM Build
6/22/2011



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	1179	2129	1989	139	898
v/c Ratio	0.98	0.78	0.98	0.71	1.08
Control Delay	40.4	4.6	55.4	71.5	86.3
Queue Delay	0.0	31.2	2.0	0.0	109.4
Total Delay	40.4	35.8	57.4	71.5	195.7
Queue Length 50th (ft)	371	74	590	106	-782
Queue Length 95th (ft)	m356	m54	#646	141	#1032
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290			325	
Base Capacity (vph)	1199	2732	2030	197	828
Starvation Cap Reductn	0	727	0	0	0
Spillback Cap Reductn	0	0	24	0	156
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.98	1.06	0.99	0.71	1.34

Intersection Summary

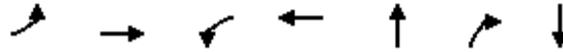
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

2020 PM Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	128	1833	16	2066	76	8	80
v/c Ratio	0.79	0.67	0.23	0.87	0.74	0.06	0.59
Control Delay	84.1	8.2	56.9	13.2	91.4	28.5	59.6
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	84.1	8.2	56.9	13.3	91.4	28.5	59.6
Queue Length 50th (ft)	98	223	12	367	58	0	47
Queue Length 95th (ft)	#188	456	m23	459	#99	7	80
Internal Link Dist (ft)		672		264	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	170	2753	69	2373	109	132	141
Starvation Cap Reductn	0	0	0	19	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.67	0.23	0.88	0.70	0.06	0.57

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
6: West Chester Pike & Langford



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1577	291	436	1705	303	597
v/c Ratio	0.77	0.31	0.81	0.65	0.62	0.75
Control Delay	28.0	8.6	42.1	4.6	53.5	30.6
Queue Delay	0.0	0.0	0.0	2.3	0.0	0.0
Total Delay	28.0	8.6	42.1	6.9	53.5	30.6
Queue Length 50th (ft)	386	72	327	64	114	356
Queue Length 95th (ft)	475	64	m361	m336	155	467
Internal Link Dist (ft)	264			598	672	
Turn Bay Length (ft)			450		200	400
Base Capacity (vph)	2059	951	537	2640	629	857
Starvation Cap Reductn	0	0	0	763	0	0
Spillback Cap Reductn	0	0	0	21	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.31	0.81	0.91	0.48	0.70

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
10: West Chester Pike & I-476 SB Off-Ramp

2020 PM Build
6/22/2011



Lane Group	EBT	WBT	WBR	SBL	SBT	SBR
Lane Group Flow (vph)	2122	1554	298	1587	4	578
v/c Ratio	0.94	1.01	0.19	0.97	0.00	0.79
Control Delay	24.8	38.4	0.1	47.6	18.0	37.0
Queue Delay	0.1	22.0	0.0	11.7	0.0	0.0
Total Delay	24.9	60.4	0.1	59.3	18.0	37.0
Queue Length 50th (ft)	221	-686	0	602	2	371
Queue Length 95th (ft)	#347	m#707	m0	#772	3	511
Internal Link Dist (ft)	598	662			574	
Turn Bay Length (ft)						
Base Capacity (vph)	2261	1532	1552	1642	805	733
Starvation Cap Reductn	4	0	0	0	0	0
Spillback Cap Reductn	0	86	0	88	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.94	1.07	0.19	1.02	0.00	0.79

Intersection Summary

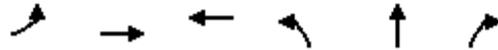
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

2020 PM Build
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	539	2909	1529	311	294	292
v/c Ratio	0.93	0.83	1.00	0.77	0.84	0.83
Control Delay	43.0	15.0	50.4	55.8	63.9	63.7
Queue Delay	0.0	2.3	0.0	1.9	3.6	0.0
Total Delay	43.0	17.2	50.4	57.7	67.5	63.7
Queue Length 50th (ft)	440	498	~469	232	234	222
Queue Length 95th (ft)	m#479	m603	#563	333	342	326
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	580	3488	1536	468	407	405
Starvation Cap Reductn	0	406	0	0	0	0
Spillback Cap Reductn	0	431	0	62	54	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.95	1.00	0.77	0.83	0.72

Intersection Summary

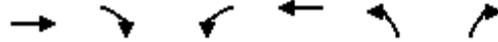
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
18: West Chester Pike & S Lawrence Rd

2020 PM Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	2941	588	627	2064	245	413
v/c Ratio	1.04	0.50	1.02	0.81	0.40	0.64
Control Delay	46.4	5.6	51.2	21.4	45.6	34.0
Queue Delay	25.8	0.7	0.0	40.7	0.0	0.0
Total Delay	72.1	6.3	51.2	62.2	45.6	34.0
Queue Length 50th (ft)	~899	99	~269	739	87	252
Queue Length 95th (ft)	#978	104	m#260	m726	114	366
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2832	1171	614	2541	629	638
Starvation Cap Reductn	159	270	0	639	0	0
Spillback Cap Reductn	119	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.10	0.65	1.02	1.09	0.39	0.65

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	2297	81	1655	174	168	14
v/c Ratio	1.02	0.81	0.43	0.94	0.53	0.07
Control Delay	29.4	104.1	5.5	102.1	24.2	34.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.4	104.1	5.5	102.1	24.2	34.2
Queue Length 50th (ft)	~177	63	142	135	40	5
Queue Length 95th (ft)	#1117	#129	164	52	73	4
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2255	100	3892	187	320	206
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.02	0.81	0.43	0.93	0.53	0.07

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Queues
5: Sussex Blvd & Lawrence Road

2020 PM Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	254	178	708	1409
v/c Ratio	0.75	0.38	0.57	0.84
Control Delay	39.5	10.7	20.9	18.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	39.5	10.7	20.9	18.2
Queue Length 50th (ft)	106	22	137	190
Queue Length 95th (ft)	39	23	191	#355
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	480	627	1243	1671
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.53	0.28	0.57	0.84

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
2: West Chester Pike & N Lawrence Rd

2020 Sat Build
6/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖↗	↑↑	↑↑↑↔		↖	↗
Volume (vph)	711	1723	1608	92	92	670
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13
Grade (%)		5%	-5%		1%	
Total Lost time (s)	5.0	6.0	6.0		6.0	6.0
Lane Util. Factor	0.97	0.95	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3414	3485	5219		1856	1660
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3414	3485	5219		1856	1660
Peak-hour factor, PHF	0.93	0.91	0.90	0.80	0.90	0.91
Adj. Flow (vph)	765	1893	1787	115	102	736
RTOR Reduction (vph)	0	0	6	0	0	1
Lane Group Flow (vph)	765	1893	1896	0	102	735
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	Prot					pt+ov
Protected Phases	5	2	6		4	4 5
Permitted Phases						
Actuated Green, G (s)	27.6	82.0	49.4		6.0	39.6
Effective Green, g (s)	27.6	82.0	49.4		6.0	39.6
Actuated g/C Ratio	0.28	0.82	0.49		0.06	0.40
Clearance Time (s)	5.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	942	2858	2578		111	657
v/s Ratio Prot	0.22	0.54	c0.36		0.05	c0.44
v/s Ratio Perm						
v/c Ratio	0.81	0.66	0.74		0.92	1.12
Uniform Delay, d1	33.8	3.5	20.1		46.8	30.2
Progression Factor	0.69	4.05	0.93		1.00	1.00
Incremental Delay, d2	1.9	0.4	1.8		59.7	72.7
Delay (s)	25.1	14.8	20.4		106.4	102.9
Level of Service	C	B	C		F	F
Approach Delay (s)		17.7	20.4		103.3	
Approach LOS		B	C		F	

Intersection Summary

HCM Average Control Delay	32.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: West Chester Pike & N New Ardmore Ave

2020 Sat Build
6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑		↙	↑↑			↑	↗		↕	
Volume (vph)	7	1340	5	54	1181	7	9	1	27	44	8	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	10	12	12	10	10	10	12	12	12
Grade (%)		-1%			1%			0%			0%	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.96	
Satd. Flow (prot)	1754	3588		1676	3554			1709	1507		1796	
Flt Permitted	0.95	1.00		0.95	1.00			0.79	1.00		0.77	
Satd. Flow (perm)	1754	3588		1676	3554			1401	1507		1437	
Peak-hour factor, PHF	0.58	0.94	0.42	0.71	0.81	0.88	0.75	0.25	0.84	0.55	0.67	0.44
Adj. Flow (vph)	12	1426	12	76	1458	8	12	4	32	80	12	16
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	28	0	6	0
Lane Group Flow (vph)	12	1438	0	76	1466	0	0	16	4	0	102	0
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)	1.5	63.7		7.2	69.4			11.1	11.1		11.1	
Effective Green, g (s)	1.5	63.7		7.2	69.4			11.1	11.1		11.1	
Actuated g/C Ratio	0.02	0.64		0.07	0.69			0.11	0.11		0.11	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	26	2286		121	2466			156	167		160	
v/s Ratio Prot	0.01	c0.40		c0.05	c0.41							
v/s Ratio Perm								0.01	0.00		c0.07	
v/c Ratio	0.46	0.63		0.63	0.59			0.10	0.02		0.64	
Uniform Delay, d1	48.8	11.0		45.1	8.0			40.0	39.6		42.5	
Progression Factor	1.00	1.00		0.98	0.83			1.00	1.00		1.00	
Incremental Delay, d2	12.4	1.3		9.2	1.0			0.3	0.1		8.0	
Delay (s)	61.3	12.3		53.4	7.6			40.3	39.7		50.5	
Level of Service	E	B		D	A			D	D		D	
Approach Delay (s)		12.7			9.9			39.9			50.5	
Approach LOS		B			A			D			D	

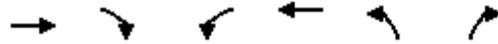
Intersection Summary

HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: West Chester Pike & Langford

2020 Sat Build
6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↖	↑↑	↖↗	↗
Volume (vph)	1095	316	545	963	287	578
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-3%			3%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5162	1607	1743	3486	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5162	1607	1743	3486	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1190	343	592	1047	312	628
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1190	343	592	1047	312	628
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	23.6	44.0	44.0	73.6	14.4	58.4
Effective Green, g (s)	23.6	44.0	44.0	73.6	14.4	58.4
Actuated g/C Ratio	0.24	0.44	0.44	0.74	0.14	0.58
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1218	707	767	2566	494	1019
v/s Ratio Prot	c0.23	0.21	c0.34	0.30	0.09	c0.09
v/s Ratio Perm						0.31
v/c Ratio	0.98	0.49	0.77	0.41	0.63	0.62
Uniform Delay, d1	37.9	19.9	23.7	5.0	40.3	13.5
Progression Factor	0.76	0.53	0.78	0.57	1.00	1.00
Incremental Delay, d2	18.3	0.4	3.5	0.3	2.6	1.1
Delay (s)	47.2	10.9	22.0	3.2	42.9	14.6
Level of Service	D	B	C	A	D	B
Approach Delay (s)	39.1			10.0	24.0	
Approach LOS	D			A	C	

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: West Chester Pike & I-476 SB Off-Ramp

2020 Sat Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑	↑				↑↑	↑	↑
Volume (vph)	0	1418	255	0	1191	0	0	0	0	719	1	317
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	10	12
Grade (%)		-4%			4%			0%			0%	
Total Lost time (s)		6.0			6.0					6.0	6.0	6.0
Lane Util. Factor		0.91			0.95					0.97	1.00	1.00
Frt		0.98			1.00					1.00	1.00	0.85
Flt Protected		1.00			1.00					0.95	1.00	1.00
Satd. Flow (prot)		5101			3503					3583	887	1599
Flt Permitted		1.00			1.00					0.95	1.00	1.00
Satd. Flow (perm)		5101			3503					3583	887	1599
Peak-hour factor, PHF	0.94	0.97	0.89	0.93	0.90	0.81	0.92	0.92	0.92	0.89	0.25	0.75
Adj. Flow (vph)	0	1462	287	0	1323	0	0	0	0	808	4	423
RTOR Reduction (vph)	0	26	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1723	0	0	1323	0	0	0	0	808	4	423
Heavy Vehicles (%)	2%	1%	2%	2%	1%	1%	2%	2%	2%	1%	100%	1%
Turn Type						custom					Perm	Perm
Protected Phases		2			6	4 6					4	4
Permitted Phases										4		4
Actuated Green, G (s)		56.0			56.0					32.0	32.0	32.0
Effective Green, g (s)		56.0			56.0					32.0	32.0	32.0
Actuated g/C Ratio		0.56			0.56					0.32	0.32	0.32
Clearance Time (s)		6.0			6.0					6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		2857			1962					1147	284	512
v/s Ratio Prot		0.34			c0.38						0.00	
v/s Ratio Perm										0.23		c0.26
v/c Ratio		0.60			0.67					0.70	0.01	0.83
Uniform Delay, d1		14.6			15.6					29.8	23.2	31.4
Progression Factor		0.52			0.40					1.00	1.00	1.00
Incremental Delay, d2		0.5			1.4					2.0	0.0	10.5
Delay (s)		8.1			7.6					31.8	23.2	41.9
Level of Service		A			A					C	C	D
Approach Delay (s)		8.1			7.6			0.0			35.3	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: West Chester Pike & I-476 NB

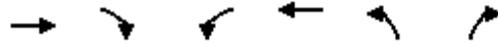
2020 Sat Build
 6/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 				
Volume (vph)	318	1819	0	0	1218	0	256	0	363	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	12	12	12	12	13	13	12	12	12	12
Grade (%)		-5%			5%			0%			0%	
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Lane Util. Factor	1.00	0.91			0.91		0.95	0.91	0.95			
Frt	1.00	1.00			1.00		1.00	0.89	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (prot)	1856	5264			5007		1737	1555	1519			
Flt Permitted	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (perm)	1856	5264			5007		1737	1555	1519			
Peak-hour factor, PHF	0.93	0.88	0.97	0.90	0.90	0.25	0.86	0.25	0.98	0.92	0.92	0.92
Adj. Flow (vph)	342	2067	0	0	1353	0	298	0	370	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	342	2067	0	0	1353	0	232	221	215	0	0	0
Heavy Vehicles (%)	3%	1%	0%	2%	1%	2%	2%	0%	1%	2%	2%	2%
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	22.4	69.8			41.4		18.2	18.2	18.2			
Effective Green, g (s)	22.4	69.8			41.4		18.2	18.2	18.2			
Actuated g/C Ratio	0.22	0.70			0.41		0.18	0.18	0.18			
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	416	3674			2073		316	283	276			
v/s Ratio Prot	c0.18	0.39			c0.27							
v/s Ratio Perm							0.13	0.14	0.14			
v/c Ratio	0.82	0.56			0.65		0.73	0.78	0.78			
Uniform Delay, d1	36.9	7.5			23.5		38.6	39.0	39.0			
Progression Factor	1.12	0.75			1.06		1.00	1.00	1.00			
Incremental Delay, d2	11.0	0.5			0.9		8.5	13.1	13.0			
Delay (s)	52.5	6.2			25.8		47.2	52.1	52.0			
Level of Service	D	A			C		D	D	D			
Approach Delay (s)		12.7			25.8			50.3			0.0	
Approach LOS		B			C			D			A	
Intersection Summary												
HCM Average Control Delay			22.4			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			66.9%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 18: West Chester Pike & S Lawrence Rd

2020 Sat Build
 6/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↑↓	↑↑	↑↓	↑
Volume (vph)	2035	147	443	1835	168	399
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-5%			1%	0%	
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.91	1.00	0.97	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5264	1639	3450	3556	3433	1568
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	8000	1639	3450	3556	3433	1568
Peak-hour factor, PHF	0.88	0.83	0.91	0.90	0.86	0.88
Adj. Flow (vph)	2312	177	487	2039	195	453
RTOR Reduction (vph)	0	5	0	0	0	1
Lane Group Flow (vph)	2312	172	487	2039	195	452
Heavy Vehicles (%)	1%	1%	1%	1%	2%	3%
Turn Type		pt+ov	Prot			custom
Protected Phases	2	2 8	1	6	8	8
Permitted Phases						1
Actuated Green, G (s)	44.2	72.2	15.8	66.0	22.0	37.8
Effective Green, g (s)	44.2	72.2	15.8	66.0	22.0	37.8
Actuated g/C Ratio	0.44	0.72	0.16	0.66	0.22	0.38
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		4.0	3.0	2.0	2.0
Lane Grp Cap (vph)	2327	1183	545	2347	755	687
v/s Ratio Prot	c0.44	0.11	0.14	c0.57	0.06	c0.14
v/s Ratio Perm						0.14
v/c Ratio	0.99	0.15	0.89	0.87	0.26	0.66
Uniform Delay, d1	27.8	4.3	41.3	13.5	32.3	25.8
Progression Factor	0.71	0.91	1.05	0.96	1.00	1.00
Incremental Delay, d2	15.7	0.0	9.6	2.4	0.1	1.7
Delay (s)	35.4	4.0	52.8	15.4	32.3	27.5
Level of Service	D	A	D	B	C	C
Approach Delay (s)	33.2			22.6	29.0	
Approach LOS	C			C	C	

Intersection Summary			
HCM Average Control Delay	28.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 26: West Chester Pike & Old West Chester Pike

2020 Sat Build
 6/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↙	↑↑↑			↑	↗		↕	
Volume (vph)	0	1756	59	49	1635	19	61	0	49	6	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			4%			7%	
Total Lost time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		0.95		1.00	0.91			1.00	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.97	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.96	
Satd. Flow (prot)		3483		1805	5176			1769	1552		1708	
Flt Permitted		1.00		0.95	1.00			0.75	1.00		0.74	
Satd. Flow (perm)		3483		1805	5176			1391	1552		1302	
Peak-hour factor, PHF	0.94	0.94	0.91	0.75	0.93	0.68	0.88	0.25	0.80	0.50	0.25	1.00
Adj. Flow (vph)	0	1868	65	65	1758	28	69	0	61	12	0	4
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	56	0	4	0
Lane Group Flow (vph)	0	1931	0	65	1785	0	0	69	5	0	12	0
Heavy Vehicles (%)	1%	1%	3%	2%	2%	0%	0%	0%	2%	0%	0%	0%
Turn Type				Prot			Perm		Perm	Perm		
Protected Phases		2		1	6			8				4
Permitted Phases							8		8	4		
Actuated Green, G (s)		68.3		6.1	79.4			8.6	8.6		8.6	
Effective Green, g (s)		68.3		6.1	79.4			8.6	8.6		8.6	
Actuated g/C Ratio		0.68		0.06	0.79			0.09	0.09		0.09	
Clearance Time (s)		6.0		5.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		2379		110	4110			120	133		112	
v/s Ratio Prot		c0.55		0.04	c0.34							
v/s Ratio Perm								c0.05	0.00		0.01	
v/c Ratio		0.81		0.59	0.43			0.57	0.04		0.11	
Uniform Delay, d1		11.3		45.7	3.2			43.9	41.9		42.2	
Progression Factor		0.50		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		2.3		8.2	0.3			6.5	0.1		0.4	
Delay (s)		7.9		54.0	3.6			50.5	42.0		42.6	
Level of Service		A		D	A			D	D		D	
Approach Delay (s)		7.9			5.3			46.5			42.6	
Approach LOS		A			A			D			D	

Intersection Summary

HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Langford Run Road & Lawrence Road

2020 Sat Build
 6/22/2011



Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗	↖	↕	↕↗	
Volume (veh/h)	0	217	224	442	451	82
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.25	0.92	0.92	0.87	0.88	0.92
Hourly flow rate (vph)	0	236	243	508	512	89
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				992		
pX, platoon unblocked						
vC, conflicting volume	1298	301	602			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1298	301	602			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	66	75			
cM capacity (veh/h)	117	701	986			

Direction, Lane #	SB 1	NE 1	NE 2	NE 3	SW 1	SW 2
Volume Total	236	243	254	254	342	260
Volume Left	0	243	0	0	0	0
Volume Right	236	0	0	0	0	89
cSH	701	986	1700	1700	1700	1700
Volume to Capacity	0.34	0.25	0.15	0.15	0.20	0.15
Queue Length 95th (ft)	37	24	0	0	0	0
Control Delay (s)	12.7	9.8	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	12.7	3.2			0.0	
Approach LOS	B					

Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			35.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Sussex Blvd & Lawrence Road

2020 Sat Build
6/22/2011



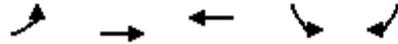
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	2	2	6	17	2	65	5	599	11	76	586	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	12	12	16	12	12	12	12	12	12	12
Total Lost time (s)		5.0			5.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.93			0.90			1.00			1.00	
Flt Protected		0.99			0.99			1.00			0.99	
Satd. Flow (prot)		1991			1891			3563			3550	
Flt Permitted		0.93			0.91			0.94			0.78	
Satd. Flow (perm)		1871			1747			3366			2784	
Peak-hour factor, PHF	0.50	0.25	0.50	0.71	0.50	0.86	0.63	0.94	0.92	0.76	0.89	0.75
Adj. Flow (vph)	4	8	12	24	4	76	8	637	12	100	658	8
RTOR Reduction (vph)	0	11	0	0	70	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	13	0	0	34	0	0	655	0	0	766	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	0%	1%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		6			2			4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		6.1			6.1			29.0			55.9	
Effective Green, g (s)		6.1			6.1			29.0			55.9	
Actuated g/C Ratio		0.08			0.08			0.40			0.77	
Clearance Time (s)		5.0			5.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		156			146			1337			2362	
v/s Ratio Prot											c0.10	
v/s Ratio Perm		0.01			c0.02			c0.19			0.15	
v/c Ratio		0.08			0.24			0.49			0.32	
Uniform Delay, d1		30.9			31.3			16.5			2.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.8			1.3			0.4	
Delay (s)		31.1			32.1			17.8			3.0	
Level of Service		C			C			B			A	
Approach Delay (s)		31.1			32.1			17.8			3.0	
Approach LOS		C			C			B			A	

Intersection Summary

HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues
2: West Chester Pike & N Lawrence Rd

2020 Sat Build
6/22/2011



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	765	1893	1902	102	736
v/c Ratio	0.81	0.66	0.74	0.92	1.15
Control Delay	25.5	15.3	21.3	114.7	113.5
Queue Delay	0.0	0.8	0.1	0.0	0.0
Total Delay	25.5	16.2	21.4	114.7	113.5
Queue Length 50th (ft)	247	541	345	66	-559
Queue Length 95th (ft)	m254	m542	461	#169	#709
Internal Link Dist (ft)		667	623	750	
Turn Bay Length (ft)	290			325	
Base Capacity (vph)	1366	2858	2584	111	641
Starvation Cap Reductn	0	592	0	0	0
Spillback Cap Reductn	0	62	83	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.56	0.84	0.76	0.92	1.15

Intersection Summary

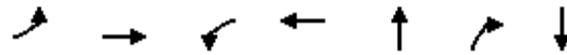
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: West Chester Pike & N New Ardmore Ave

2020 Sat Build
6/22/2011



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	12	1438	76	1466	16	32	108
v/c Ratio	0.11	0.62	0.54	0.56	0.10	0.16	0.65
Control Delay	45.9	13.0	55.7	6.6	40.3	15.8	58.1
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	45.9	13.0	55.7	6.7	40.3	15.8	58.1
Queue Length 50th (ft)	7	297	44	154	9	0	62
Queue Length 95th (ft)	16	371	71	311	8	24	83
Internal Link Dist (ft)		672		286	395		285
Turn Bay Length (ft)	180		145				
Base Capacity (vph)	158	2331	153	2637	182	224	193
Starvation Cap Reductn	0	0	0	224	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.62	0.50	0.61	0.09	0.14	0.56

Intersection Summary

Queues
6: West Chester Pike & Langford

2020 Sat Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1190	343	592	1047	312	628
v/c Ratio	0.98	0.49	0.77	0.41	0.63	0.62
Control Delay	49.5	12.7	25.6	3.6	46.1	13.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.5	12.7	25.6	3.6	46.1	13.5
Queue Length 50th (ft)	~304	90	397	83	95	203
Queue Length 95th (ft)	#398	144	431	66	139	306
Internal Link Dist (ft)	264			598	750	
Turn Bay Length (ft)			450		200	400
Base Capacity (vph)	1219	707	767	2566	549	1045
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.49	0.77	0.41	0.57	0.60

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
 10: West Chester Pike & I-476 SB Off-Ramp

2020 Sat Build
 6/22/2011



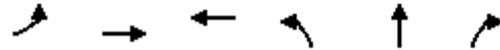
Lane Group	EBT	WBT	WBR	SBL	SBT	SBR
Lane Group Flow (vph)	1749	1323	349	808	4	423
v/c Ratio	0.61	0.67	0.22	0.70	0.01	0.83
Control Delay	8.4	9.4	0.3	33.0	21.0	45.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.4	9.4	0.3	33.0	21.0	45.1
Queue Length 50th (ft)	51	72	0	224	2	241
Queue Length 95th (ft)	m378	96	0	271	2	264
Internal Link Dist (ft)	598	662			574	
Turn Bay Length (ft)						
Base Capacity (vph)	2881	1961	1567	1326	328	592
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.67	0.22	0.61	0.01	0.71

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
15: West Chester Pike & I-476 NB

2020 Sat Build
6/22/2011



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	342	2067	1353	232	221	215
v/c Ratio	0.82	0.56	0.65	0.73	0.78	0.78
Control Delay	55.9	6.5	27.5	52.2	57.7	57.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.9	6.5	27.5	52.2	57.7	57.9
Queue Length 50th (ft)	214	112	325	144	145	134
Queue Length 95th (ft)	271	169	374	216	54	#224
Internal Link Dist (ft)		662	483		1111	
Turn Bay Length (ft)	510			520		
Base Capacity (vph)	483	3673	2071	365	327	319
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.56	0.65	0.64	0.68	0.67

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
18: West Chester Pike & S Lawrence Rd

2020 Sat Build
6/22/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	2312	177	487	2039	195	453
v/c Ratio	0.99	0.15	0.90	0.87	0.26	0.66
Control Delay	37.2	3.9	55.0	16.4	32.9	27.4
Queue Delay	0.0	0.0	0.0	13.9	0.0	0.1
Total Delay	37.2	3.9	55.0	30.3	32.9	27.5
Queue Length 50th (ft)	~579	19	137	675	52	216
Queue Length 95th (ft)	#625	23	m#200	m191	79	315
Internal Link Dist (ft)	45			667	682	
Turn Bay Length (ft)			290			200
Base Capacity (vph)	2327	1188	556	2346	790	665
Starvation Cap Reductn	0	0	0	340	0	0
Spillback Cap Reductn	0	0	0	0	0	11
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.15	0.88	1.02	0.25	0.69

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

26: West Chester Pike & Old West Chester Pike

6/22/2011



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1933	65	1786	69	61	16
v/c Ratio	0.77	0.50	0.42	0.51	0.30	0.12
Control Delay	8.2	58.5	3.7	55.5	14.8	35.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.2	58.5	3.7	55.5	14.8	35.6
Queue Length 50th (ft)	127	40	112	42	0	7
Queue Length 95th (ft)	m126	70	146	22	29	6
Internal Link Dist (ft)	623		1219	580		169
Turn Bay Length (ft)		170			70	
Base Capacity (vph)	2502	134	4239	167	240	160
Starvation Cap Reductn	16	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.49	0.42	0.41	0.25	0.10

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues
5: Sussex Blvd & Lawrence Road

2020 Sat Build
6/22/2011



Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	24	104	657	766
v/c Ratio	0.12	0.43	0.47	0.32
Control Delay	21.2	17.7	17.1	3.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.2	17.7	17.1	3.2
Queue Length 50th (ft)	5	12	110	41
Queue Length 95th (ft)	3	14	155	74
Internal Link Dist (ft)	355	298	265	912
Turn Bay Length (ft)				
Base Capacity (vph)	521	534	1385	2389
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.05	0.19	0.47	0.32
Intersection Summary				

P – Concept Plan



ADD RIGHT-TURN DECELERATION LANE FOR MATHER AVENUE

MEDIAN BREAK AND NEW TRAFFIC SIGNAL

PROPOSED LANE CONFIGURATION: (1) LEFT-TURN LANE AND (2) THROUGH LANES

ELIMINATE I-476 SB SLIP RAMP; PROPOSED LANE CONFIGURATION: (2) LEFT-TURN LANES, (1) THROUGH LANE, AND (1) RIGHT-TURN LANE

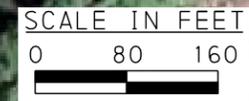
PROPOSED LANE CONFIGURATION: (3) THROUGH LANES AND (1) RIGHT-TURN LANE

PROPOSED LANE CONFIGURATION: (2) LEFT-TURN LANES AND (1) RIGHT-TURN LANE

RESTRIPE RAMP TO EXTEND SEPARATE LANES FROM EAST AND WEST, TO MOVE THE MERGE FURTHER NORTH AND INCREASE RAMP FLOW

PROPOSED LANE CONFIGURATION: (1) LEFT-TURN LANE, (1) SHARED LEFT/RIGHT-TURN LANE, AND (1) RIGHT-TURN LANE

MODIFY EXISTING OVERHEAD LANE CONTROL SIGN



Q – Correspondence



pennsylvania

DEPARTMENT OF TRANSPORTATION

www.dot.state.pa.us

Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

June 7, 2010

DELAWARE COUNTY, MARPLE TOWNSHIP
S.R. 0003 (WEST CHESTER PIKE)
HIGHWAY OCCUPANCY PERMIT APPLICATION NO. pre689
MARPLE ASSOCIATES SITE
TRAFFIC LOG NO.: D09-039XQ
POINT OF ACCESS STUDY REVIEW

Anthony T. Hamaday
Township Manager
Township of Marple
227 South Sproul Road
Broomall, PA 19008-2397

Dear Mr. Hamaday:

The Department has reviewed the submitted Point of Access Study for compliance with applicable Department Guidelines. The Department reserves the right to make future additional comments based on the formal submission of a complete Transportation Impact Study.

Our comments on your submission are as follows:

POINT OF ACCESS STUDY COMMENTS

1. For the purposes of the pending Highway Occupancy Permit application the department will not require further submissions of the Point of Access (POA) Study unless the scope of the project is modified to increase the impact on the I-476 interchange. Note that a formal Transportation Impact Study (TIS) will be required in support of the proposed Highway Occupancy Permit application.
 2. As a reminder, the scope of the Transportation Impact Study (TIS) should be expanded to include the following intersections:
 - a. South Lawrence Road (S.R. 1020) and Langford Road. Please note that all options at this intersection must be fully investigated, including allowing full movement and signalization. The possibilities and challenges associated with this evaluation must be included in the TIS. This investigation must include a conceptual design.
 - b. South Lawrence Road (S.R. 1020) and Sussex Boulevard.
 3. It is anticipated that the formal TIS will include and build upon the following elements of the submitted POA Study:
 - a. Trip Generation / Distribution / Assignment
-

b. Calibrated Synchro / SimTraffic Modeling, including the additional measures of effectiveness used in the POA Study.

c. Concept Development.

Please be aware that deviations in the above elements may result in future comments in the TIS related to previously approved elements in the POA Study.

4. The formal Transportation Impact Study submission must address the following comments:

a. The TIS must be signed and sealed by a professional engineer per PennDOT Publication 46, Chapter 11.1.4.

b. The queue summary tables must indicate all lane groups where the 95th percentile queue exceeds capacity, as noted in the Synchro output and the summary tables.

c. For the proposed conditions, the southbound I-476 Synchro files show a single shared through-right lane, whereas the submitted concept shows both the shared lane and an additional exclusive right-turn lane. This inconsistency should be addressed.

d. The calibration study submitted under separate cover should be included in the formal TIS.

e. The Synchro model should be calibrated to the field observed travel time, using the Synchro Arterial Travel Time output. There may be some Synchro only parameters, such as the Lost Time Adjustment factor, that may need to be adjusted to match the existing travel times.

f. As a reminder, proposed timing modifications should not adversely impact corridor operations and progression. This includes both directions of travel for the entire study area.

g. To clarify a previous comment, lagging left turn phases must be avoided at locations where left turn permissive phasing is allowed. Lagging left turn phases may be considered at locations where left turns operate using protected only phasing.

5. The formal Highway Occupancy Permit (HOP) application must address the following:

a. There is a significant grade differential within the S.R. 0003 median; the design of the proposed turn lane(s) must address this.

b. Drainage impacts from the closure of the channelized right turn ramp, along with the addition of the left turn lane, must be mitigated.

c. The provision of a westbound right turn deceleration lane to Mather Avenue.

d. The modification or relocations of the guide sign structure along eastbound S.R. 0003 (Segment 0120/Offset 3600).

6. As a reminder, future signal related HOP submissions must address the following:

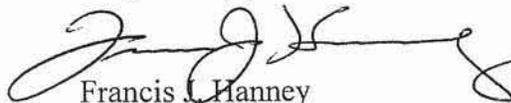
a. The formal HOP application cannot be recommended for approval until the municipality receives permits for the installation of the proposed traffic signal and approval to modify the existing traffic signals and system(s).

b. The proposed development and associated signal lies within two coordinated systems, and the impacts are anticipated to influence both systems. Interconnection options between the two systems, including fiber-optic connection along S.R. 0003 between North and South Lawrence Roads, will need to be investigated as part of the formal submission.

- c. A traffic signal permit plan and traffic signal report must be submitted for each new and/or modified signal. The report must include warrant analysis, a pedestrian study, three-years of reportable crashes, clearance intervals, left-turn analysis, pedestrian clearance calculations, volume density calculations and supporting speed studies, capacity analysis, and 20 scale curb ramp details.
- d. The proposed signal timings assumed for future conditions increase the coordinated cycle length. The study intersections are located within two separate signal systems, one each in Marple and Haverford Townships. Any signal timing adjustments made must ensure a proper level of progression through these systems, and as such, the implementation of the proposed signal timings must include any intersections throughout the system where signal retiming is necessary. Future submissions must include concurrence from both Townships.

The Department has performed this Point of Access Study review based only on the limited information provided. We reserve the right to make future, additional, detailed comments based on the formal submission and application for a Highway Occupancy Permit. If you have any questions pertaining to the technical aspects of this review, please contact Mahmood Shehata, P.E., PTOE of McCormick Taylor Inc. at 610.640.3500 or at mshehata@mtmail.biz.

Respectfully,



Francis J. Hanney
District Traffic Services Manager
Engineering District 6-0

cc: R. Avicolli
L.R. Belmonte
A.B. Patel
Traffic Services File
Adrienne Eiss, Orth-Rodgers and Associates
Haverford Township
Delaware County Planning Commission

Adrienne Eiss

From: Shehata, Mahmood [MShehata@mccormicktaylor.com]
Sent: Friday, June 25, 2010 2:24 PM
To: Adrienne Eiss
Cc: Hanney, Francis J.; Lapenta, Susan; Lutz, Paul; Patel, Ashwin; Dick Orth; Jason Zhang
Subject: RE: Marple Associates TIS questions

Adrienne:

Thanks for the correspondence – sorry it took me a while to respond. Please find the answers below.

1. The June 7 comments noted the scope needs to include the intersections of South Lawrence Road & Langford Road and South Lawrence Road and Sussex Boulevard. The minutes of the January 12, 2010 scoping meeting indicated that the intersection of West Chester Pike and Old West Chester Pike needed to be included. Also, there is a signalized intersection on South Lawrence Road (at the Pathmark supermarket driveway) between West Chester Pike and Langford Road. Please verify whether or not either of those latter two locations are to be included in the TIS.
The intersection of West Chester Pike and Old Westchester Pike also needs to be included. It was included in the provided electronic Synchro files, thus why we did not comment. The Pathmark driveway does not need to be studied at this time.
2. Please clarify whether or not the Saturday peak period is to be studied in the TIS. Attached is an ATR count of the I-476 SB offramp that shows comparative weekday and weekend volume. Also attached is the Saturday peak hour site trip generation and PM peak hour trip generation for comparison.
Given the size and the nature of the proposed development, the Saturday peak period will need to be studied (in addition to the AM and PM peaks).
3. The June 7 letter (6c) stated that a traffic signal permit plan and report including a crash history must be submitted for each new and/or modified signal. Please clarify whether crash history is required in the TIS. If not, we would defer that task until design. In any event, a crash analysis for the intersection of South Lawrence Road and Langford Run Road will be included in the TIS as part of the investigation of options per comment 2a.
Per the current TIS guidelines, crash history is required in the TIS.
4. Please clarify which if any of the changes below to an existing signal would require a signal permit plan and report including a crash history and 20-scale curb ramp details
 - Controller equipment change and/or new interconnect
If the signals are currently interconnected, then no permit plan adjustment is required.
 - Offset change
If on a system, only the system plan needs to be adjusted. If not, then the permit plan will need to be revised. Calculations (not a full report) will need to be submitted.
 - Timing split change, no change to phasing or signal color sequence
If on a system, only the system plan needs to be adjusted. If not, then the permit plan will need to be revised. Calculations (not a full report) will need to be submitted.
5. The June 7 letter (6c) noted the traffic signal report must include three-years of reportable crashes. Please verify that three years rather than five years is required, and that it is not necessary to obtain non-reportable crash history from the Townships.
The signal report requires at least three years of reportable crashes. The TIS guidelines require 5 years – submitting the same analysis for the traffic signal design report is generally acceptable. Non-reportable crashes are not required.

Thanks,
Mahmood

Mahmood Shehata, P.E., PTOE

Project Engineer

McCormick Taylor, Inc.

From: Adrienne Eiss [<mailto:aeiss@orth-rodgers.com>]

Sent: Tuesday, June 15, 2010 6:25 PM

To: Shehata, Mahmood

Cc: Hanney, Francis J.; Lapenta, Susan; Lutz, Paul; Patel, Ashwin; Dick Orth; Jason Zhang

Subject: Marple Associates TIS questions

Delaware County, Marple Township

Marple Associates

SR 0003 West Chester Pike

Traffic Log D09-039-XQ

Mahmood,

Attached Word doc contains questions on required scope of the TIS. Regarding question 2, attached is available Saturday information (trip generation and an ATR count of the I-476 SB off ramp).

Thanks for your attention to this matter.

Adrienne

Adrienne Eiss, PTP

Senior Project Manager

Orth-Rodgers & Associates, Inc.

301 Lindenwood Drive, Suite 130

Malvern, PA 19355

Phone: (610) 407-9700 Ext. 12

Fax: (610) 407-9600

aeiss@orth-rodgers.com



pennsylvania

DEPARTMENT OF TRANSPORTATION

www.dot.state.pa.us

Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

November 29, 2010

DELAWARE COUNTY, MARPLE TOWNSHIP
S.R. 0003 (WEST CHESTER PIKE)
HIGHWAY OCCUPANCY PERMIT APPLICATION NO. pre689
MARPLE ASSOCIATES SITE
TRAFFIC LOG NO.: D09-039XR
PRELIMINARY REVIEW

Adrienne Eiss, PTP
Orth-Rodgers and Associates
301 Lindenwood Drive, Suite 130
Malvern, PA 19355

Dear Mrs. Eiss:

The Department has reviewed the preliminary submission for compliance with applicable Department Regulations. This preliminary review has identified deficiencies that must be addressed in order for your application submission to be processed as efficiently as possible.

The Department understands that the provided traffic impact analysis is preliminary in nature. As such, the Department reserves the right to make future additional comments based on a formal submission with a complete traffic impact study.

Our comments on your preliminary submission are as follows:

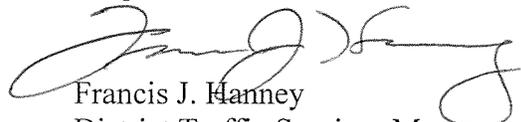
PRELIMINARY COMMENTS

1. The PennDOT project number, D09-039XR, for this preliminary review must be written in red in the "Description" section on the HOP application when the formal HOP application is submitted.
 2. Per 441.8(m) the proposed signalized access constitutes a "median opening" since this is the "removal of a portion of median ... to provide access". It is the applicant's responsibility to demonstrate that such an opening will improve the highway system. Additionally, the District Executive must ultimately approve the opening.
 3. Per the TIS Guidelines Peak Hour Factors should be calculated per movement.
 4. The westbound right turns from S.R. 0003 to I-476 SB are not controlled by the signal; they should be removed from the capacity analyses and the overall delays recalculated.
-

5. The future conditions analyses decrease green splits for “minor approaches” by as much as a third at several intersections (e.g. northbound I-476 off-ramp approaching S.R. 0003 and northbound Lawrence Road approaching S.R. 0003); this results in unacceptable increases in movement delays and queuing.
6. The figures should be revised to correctly identify the balanced volumes.

Additional comments may follow upon review of the submitted application. If you have any questions pertaining to the technical aspects of this review, please contact Albert Federico, P.E., PTOE of McCormick Taylor Inc. at 610.640.3500 or at afederico@mtmail.biz.

Respectfully,


Francis J. Hanney
District Traffic Services Manager
Engineering District 6-0

cc: R. Avicoli
L.R. Belmonte
A.B. Patel
Traffic Services File
Marple Township
Haverford Township
Delaware County Planning Commission

December 23, 2010

Mr. Francis J. Hanney
District Traffic Services Manager
PennDOT, Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

Re: HOP Application No. pre689
Traffic Log No. D09-039XR
Marple Associates Site
Delaware County, Marple Township

Dear Fran,

This letter is in response to your review letter dated November 29, 2010 relative to our Traffic Impact Study dated October 14, 2010. This letter describes how the review comments have been addressed.

Each comment is numbered as in the review letter, and is followed by the response.

- 1. The PennDOT project number, D09-039XR, for this preliminary review must be written in red in the "Description" section on the HOP application when the formal HOP application is submitted.*

Will do.

- 2. Per 441.8(m) the proposed signalized access constitutes a "median opening" since this is the "removal of a portion of median ... to provide access". It is the applicant's responsibility to demonstrate that such an opening will improve the highway system. Additionally, the District Executive must ultimately approve the opening.*

67 PA Code Chapter 441.8(m)(1)states: "The removal of a portion of median divisor along a divided highway to provide access to and from traffic in both directions will not be permitted unless it is determined that the operating characteristics of the highway system will be improved by such action." In this case, it must be shown that for the post development condition, the highway system works better with the median opening than without the median opening.

It was our understanding that advantages to the highway network of the median opening and full movement signalized access on West Chester Pike had been addressed in the POA study:

- By providing direct access, it prevents undesirable movements by drivers attempting to reach the development (such as a U turn from westbound West Chester Pike at the New Ardmore Ave. signal) or departing the development (such as a U turn from eastbound West Chester Pike at the I-476 NB on-ramp in order to proceed west on West Chester Pike).
- By providing direct access, it helps prevent overloading and capacity/queuing problems that would occur at other intersections resulting from drivers traveling to the development via indirect access.

- Provides a bypass (via Langford Run Road) of a congested area of West Chester Pike for non-development motorists traveling between the west and the south.

We would appreciate the opportunity to meet with you to discuss what further demonstration is needed.

3. *Per the TIS Guidelines Peak Hour Factors should be calculated per movement.*

The Peak Hour Factors per movement were obtained from the manual turning counts and have been applied to all the Synchro analyses.

4. *The westbound right turns from S.R.0003 to I-476 SB are not controlled by the signal; they should be removed from the capacity analyses and the overall delays recalculated.*

The westbound right turns have been removed from the capacity analyses and the intersection overall delays have been recalculated as shown in the attached updated figures and tables.

5. *The future conditions analyses decrease green splits for “minor approaches” by as much as a third at several intersections (e.g. northbound I-476 off-ramp approaching S.R. 0003 and northbound Lawrence Road approaching S.R. 0003); this results in unacceptable increases in movement delays and queuing.*

Regarding the Synchro models in our previous submission, the intersection split optimization function in Synchro had been used in order to obtain the “best” calculated overall intersection level of service. Because of the high traffic volumes in both directions on West Chester Pike and the coordinated signals, the program favors and puts higher priority onto through movements on West Chester Pike over other movements on “minor approaches”. This resulted in the significant decrease in green splits for those “minor approaches” as you have observed.

To address this comment, along with our effort to update all the Peak Hour Factors in our analyses, all the Synchro models were revisited and further adjusted. The major adjustments applied are summarized below.

- The splits for the minor approaches which had significantly decreased green splits in the previous submission have been increased so that in general their delays and queuing are similar and comparable to those under the existing conditions. Special attention was paid to those two approaches mentioned in the comment letter. Their timing splits in the original submission and the current updated submission are illustrated in the Table 1 below.
- During this re-analysis, it was discovered that a lagging westbound protected left turn phase at the new signalized intersection at Langford Run Road will not only improve the operation of the left turn movement, it also improves the progression along West Chester Pike especially in the eastbound direction. Therefore, in all the post-development analyses

the westbound left turn phase at the new signal on Langford Run Road was changed from leading to lagging. Since this a protected-only left turn, there is no “yellow trap” hazard.

- The intersection offsets along West Chester Pike were adjusted accordingly to accommodate the signal timing changes at the intersections.

Table 1 – Timing Split on the “Minor Approaches”

Intersection	Scenario		Original Submission			Current Run		
			AM	PM	SAT	AM	PM	SAT
West Chester Pike & I-476 NB Ramps (15)	Existing		<u>33</u>	<u>42</u>	<u>31</u>	<u>33</u>	<u>42</u>	<u>31</u>
	2015	No Build	26	47	39			
		Build	20	33	27			
	2020	No Build	26	47	39	30	42	31
		Build	20	34	27	28	38	27
	West Chester Pike & S Lawrence Rd (18)	Existing		<u>33</u>	<u>44</u>	<u>31</u>	<u>33</u>	<u>44</u>
2015		No Build	22	23	28			
		Build	19	19	23			
2020		No Build	22	23	28	29	35	29
		Build	19	19	23	25	28	29

The updated results are summarized in the attached Level of Service and Queue Length comparison tables. All the intersection overall delays are within 10 seconds under the pre and post development phases and none of the overall intersection level of service is at LOS ‘F’.

Some of the individual movements do show noticeable differences under the “No Build” and “Build” conditions in design year 2020 during AM and PM peak hours. These movements’ Level of Service and queuing results are illustrated in Table 2. These individual movements are mainly located at two intersections: the intersection of West Chester Pike and I-476 Northbound On/Off Ramp, and the intersection of West Chester Pike and North Lawrence Road. The intersection of West Chester Pike and S. Lawrence is also discussed since it was mentioned in the review comment.

Table 2 – Movements Experiencing Noticeable Changes in LOS & Queuing
 Revised Synchro Analysis

Year 2020 AM Peak Hour						
Intersection	Movement	Scenario	LOS	50th % Q	95th % Q	Int. Overall LOS
WCP & I-476 NB On/Off Ramps	EB Left	No Build	E(63)	~351	#466	No Build: D(44) vs. Build: D(40)
		Build	D(40)	378	#516	
	NB LT(R)	No Build	C(32)	58	28	
		Build	D(49)	125	36	
	NB Right	No Build	E(60)	186	236	
		Build	D(48)	111	150	
WCP & N. Lawrence Road	WB Thru/Right	No Build	D(36)	452	#644	No Build: D(49) vs. Build: E(56)
		Build	D(50)	~512	#712	
Year 2020 PM Peak Hour						
Intersection	Movement	Scenario	LOS	50th % Q	95th % Q	Int. Overall LOS
WCP & I-476 NB On/Off Ramps	EB Left	No Build	D(55)	321	#401	No Build: D(44) vs. Build: D(32)
		Build	D(40)	440	m#479	
	NB Left	No Build	C(32)	86	144	
		Build	D(52)	232	333	
	NB LT(R)	No Build	C(32)	86	35	
		Build	E(60)	234	342	
	NB Right	No Build	F(115)	~470	#690	
		Build	E(59)	222	326	
WCP & N. Lawrence Road	WB Thru/Right	No Build	D(47)	528	563	No Build: C(31) vs. Build: D(39)
		Build	E(56)	590	#646	
	SB Right	No Build	E(62)	618	#919	
		Build	F(83)	~782	#1032	

Intersection of WCP & I-476 NB On/Off Ramps

At this intersection, it is proposed to convert the existing center shared thru/left turn lane to a lane shared by all three movements. By doing this, the ramp approach LOS improves, especially during the PM peak hour when the LOS of the approach improves from LOS 'F' under the "No Build" conditions to LOS 'E' under the "Build" conditions. By improving this approach, it is possible to allocate some green time from this approach to other movements on WCP. That is why the eastbound left turn shows improved service level with shorter delay during the peak hours. Of the three lanes on the northbound off ramp approach, the left turn lane and the center lane will have longer delays while the right turn lane will improve greatly under the "Build" conditions. The total queue length of the three lanes on the northbound approach remains quite comparable under the "No Build" and "Build" conditions.

Intersection of WCP & S. Lawrence Road

As illustrated in Table 1, some green time is allocated from S. Lawrence Road to movements on West Chester Pike under both "No Build" and "Build" conditions. However, the amount is not as significant as in the previous submission in order to maintain comparable LOS and queue length for the movements on S. Lawrence Road.

During the AM peak hour, the westbound through on West Chester Pike improves from the existing LOS 'F' to 'E' under both "No Build" and "Build" conditions; in the PM and Saturday peak hours all movements operate at LOS 'D' or better. It needs to point out that the queue length of the northbound right turn out of S. Lawrence Road exceeds the available storage of 200 feet under all scenarios even though its LOS is always 'D' or better. However, the queuing results under all scenarios are very similar with a difference of about two vehicles.

Intersection of WCP & N. Lawrence Road

During the AM peak hour, the average delay of the westbound approach on West Chester Pike increases from 36 seconds under "No Build" conditions to 50 seconds under "Build" conditions. The overall intersection LOS also drops from 'D' to 'E'. However, the difference in queue length is about two vehicles and the difference in overall intersection delay between two scenarios is 7 seconds which meets the LOS requirement stated in TIS Guidelines.

A similar situation occurs during the PM peak hour. The westbound approach on West Chester Pike changes from LOS 'D' (47 seconds delay) under the "No Build" conditions to LOS 'E' (56 seconds delay) under the "Build" conditions. The southbound right turn out of N. Lawrence Road also changes from LOS 'E' (62 seconds delay) to LOS 'F' (83 seconds delay). The difference in queue length is about four vehicles and the difference in overall intersection delay between two scenarios is 8 seconds, which also meets the LOS requirement stated in TIS Guidelines.

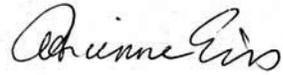
Mr. Fran Haney
Traffic Log No. D09-039XR
December 23, 2010
Page 6

6. *The figures should be revised to correctly identify the balanced volumes.*

This comment has been addressed and the revised figures are attached for review.

We would appreciate the opportunity to meet with you to discuss completion of the TIS effort and next steps. Thank you.

Very truly yours,
ORTH- RODGERS & ASSOCIATES, INC.



ADRIENNE EISS, PTP
Senior Project Manager

cc w/enclosures:

Susan LaPenta
H. Richard Orth
Albert Federico
Claude DeBotton
Paul DeBotton

Existing AM Peak Hour Traffic Volumes

Traffic Impact Study - Marple Associates

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA

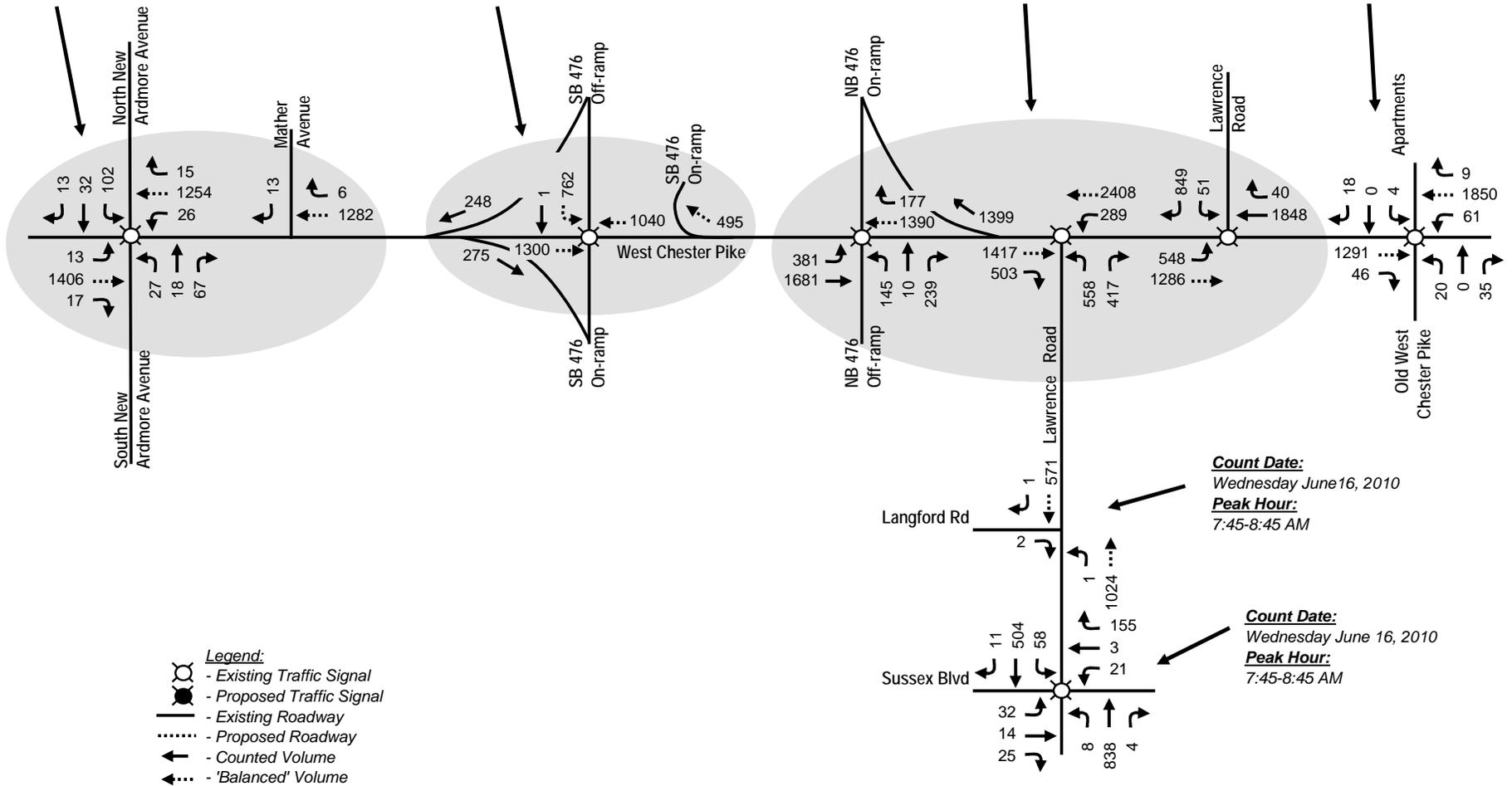


Count Date:
Tuesday January 26, 2010
Peak Hour:
7:15-8:15 AM

Count Date:
Thursday January 21, 2010
Peak Hour:
7:15-8:15 AM

Count Date:
Wednesday January 20, 2010
Peak Hour:
7:45-8:45 AM

Count Date:
Wednesday September 15, 2010
Peak Hour:
7:00-8:00 AM



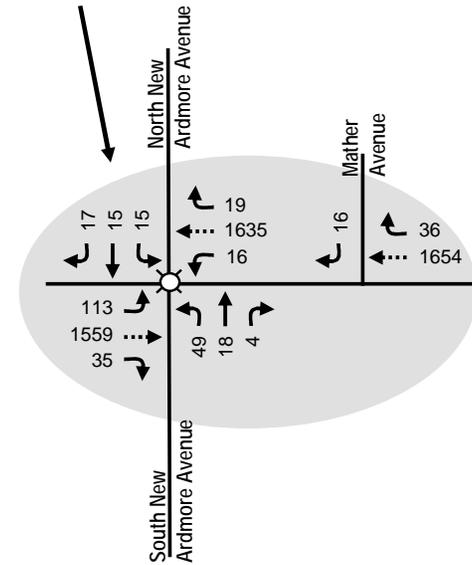
Existing PM Peak Hour Traffic Volumes

Traffic Impact Study - Marple Associates

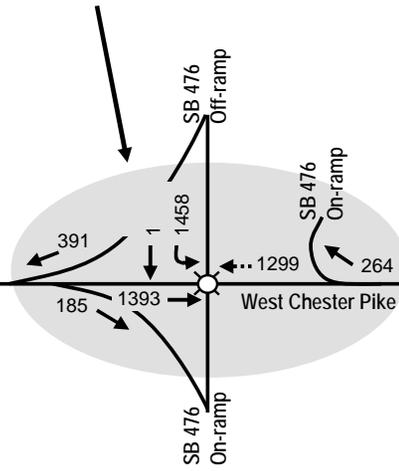
MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA



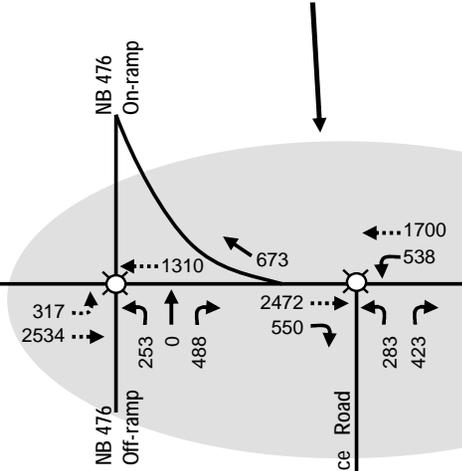
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Peak Hour:
4:15-5:15 PM



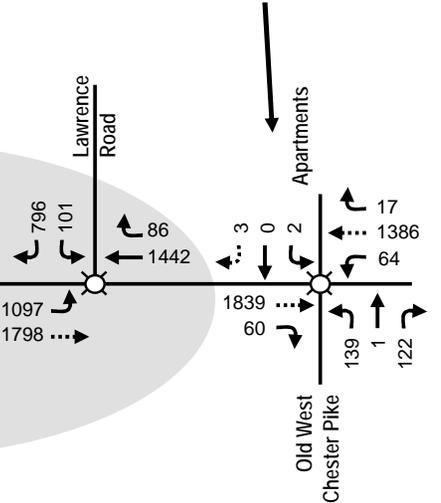
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Peak Hour:
5:00-6:00 PM



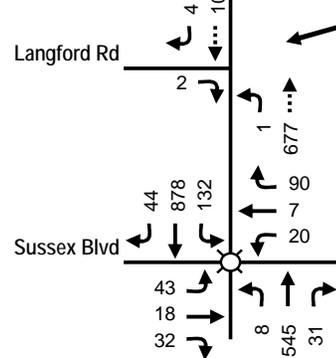
Count Date:
Tuesday March 31, 2009
Peak Hour:
5:00-6:00 PM



Count Date:
Wednesday January 20, 2010
Peak Hour:
4:15-5:15 PM



Count Date:
Wednesday January 27, 2010
Peak Hour:
4:30-5:30 PM



Count Date:
Tuesday January 26, 2010
Peak Hour:
4:45-5:45 PM

- Legend:**
- Existing Traffic Signal
 - Proposed Traffic Signal
 - Existing Roadway
 - Proposed Roadway
 - Counted Volume
 - 'Balanced' Volume

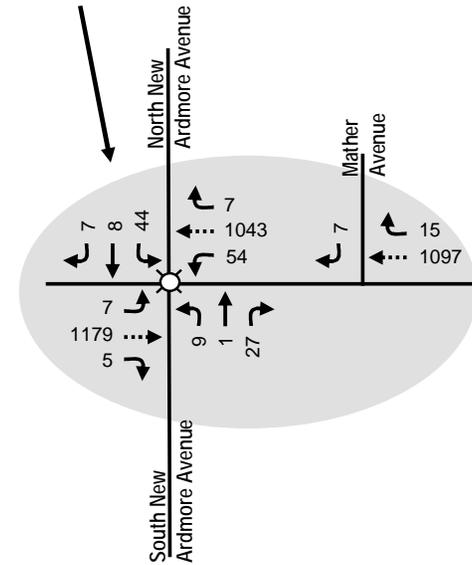
Existing Saturday Peak Hour Traffic Volumes

Traffic Impact Study - Marple Associates

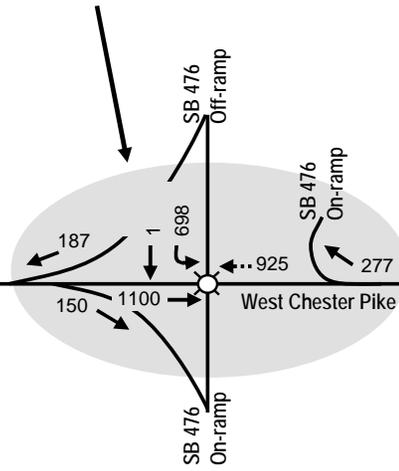
MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA



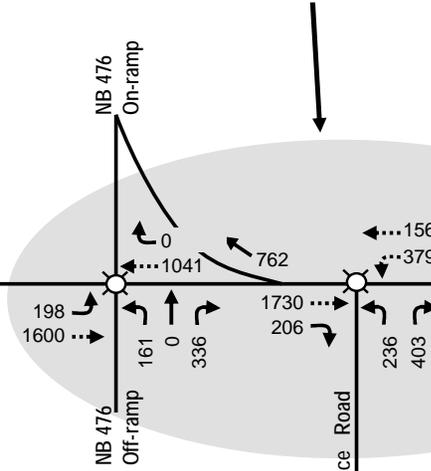
Count Date:
August 14, 2010
Peak Hour:
2:30-3:30 PM



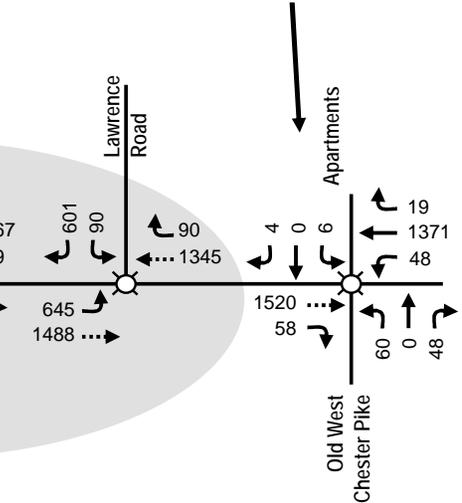
Count Date:
September 11, 2010
Peak Hour:
3:00-4:00 PM



Count Date:
September 11, 2010
Peak Hour:
2:30-3:30 PM

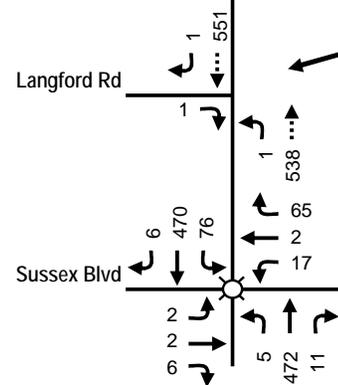


Count Date:
September 11, 2010
Peak Hour:
2:15-3:15 PM



- Legend:**
- Existing Traffic Signal
 - Proposed Traffic Signal
 - Existing Roadway
 - Proposed Roadway
 - Counted Volume
 - 'Balanced' Volume

Count Date:
August 21, 2010
Peak Hour:
1:15-2:15 PM



Count Date:
August 21, 2010
Peak Hour:
1:00-2:00 PM

Table 1. AM Peak Hour Level of Service Comparison

intersection (node)	approach	movement	Existing (by move)	2015 No Build (move)	2015 Build (move)	2020 No Build (move)	2020 Build (move)
West Chester Pike & New Ardmore (3)	EB	Left	E(55)	E(66)	E(66)	E(66)	E(65)
		Thru/Right	B(15)	B(15)	B(14)	B(15)	B(14)
	WB	Left	D(50)	E(63)	E(64)	E(65)	E(64)
		Thru/Right	B(13)	A(6)	B(10)	A(6)	B(11)
	NB	Left/Thru	D(38)	D(37)	D(39)	D(37)	D(39)
		Right	D(36)	D(35)	D(37)	D(35)	D(37)
SB	LTR	D(54)	D(51)	E(61)	D(51)	E(61)	
Overall			B(18)	B(15)	B(17)	B(15)	B(17)
West Chester Pike & Langford (6)	EB	Thru			C(26)		C(26)
		Right			A(10)		A(10)
	WB	Left			C(26)		C(27)
		Thru			A(2)		A(2)
	NB	Left			D(44)		D(44)
		Right			C(28)		C(28)
Overall					B(18)		B(18)
West Chester Pike & I-476 SB Ramps (10)	EB	Thru	B(18)	B(12)	B(17)	B(13)	B(17)
	WB	Thru	B(18)	A(6)	A(5)	A(6)	A(5)
	SB	Left	D(36)	D(36)	C(34)	D(36)	C(34)
		Thru/Right	C(24)	C(24)	C(28)	C(24)	C(27)
Overall			B(19)	B(16)	B(18)	B(16)	B(18)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	E(61)	E(59)	D(38)	E(63)	D(40)
		Thru	A(9)	A(9)	A(9)	A(9)	A(9)
	WB	Thru	F(95)	E(66)	E(66)	E(71)	E(69)
		Left	C(32)	C(33)	D(43)	C(32)	D(43)
	NB	LT(R)	C(32)	C(33)	D(48)	C(32)	D(49)
		Right	D(50)	E(59)	D(49)	E(60)	D(48)
Overall			D(52)	D(41)	D(38)	D(44)	D(40)
West Chester Pike & S Lawrence Rd (18)	EB	Thru	C(29)	B(13)	B(14)	B(13)	B(14)
		Right	B(13)	A(4)	A(5)	A(3)	A(5)
	WB	Left	D(54)	D(48)	D(47)	D(48)	D(47)
		Thru	F(89)	E(74)	E(72)	E(75)	E(77)
	NB	Left	D(37)	D(45)	D(47)	D(47)	D(48)
		Right	C(24)	C(26)	C(34)	C(27)	C(31)
Overall			D(55)	D(45)	D(45)	D(45)	D(47)
West Chester Pike & N Lawrence Rd (2)	EB	Left	D(40)	D(46)	D(44)	D(46)	D(44)
		Thru	A(5)	A(9)	B(10)	A(9)	B(11)
	WB	Thru/Right	B(18)	C(34)	D(46)	D(36)	D(50)
		Left	D(45)	C(34)	C(34)	C(34)	C(34)
SB	Right	F(264)	F(133)	F(142)	F(136)	F(144)	
Overall			E(64)	D(47)	D(54)	D(49)	E(56)
West Chester Pike & Old West Chester Pike (26)	EB	Thru/Right	B(12)	A(6)	A(7)	A(6)	A(7)
		Left	D(47)	D(51)	D(53)	D(51)	D(53)
	WB	Thru/Right	A(3)	A(3)	A(3)	A(3)	A(3)
		Left/Thru	D(47)	D(47)	D(48)	D(47)	D(48)
	NB	Right	D(44)	D(44)	D(44)	D(44)	D(44)
		LTR	D(45)	D(45)	D(45)	D(45)	D(45)
Overall			A(9)	A(7)	A(7)	A(7)	A(7)
S Lawrence Road & Langford Run Rd (#)	EB	R	b(12)	b(12)	b(13)	b(12)	b(13)
	NB	L	b(12)	b(12)	c(16)	b(12)	c(16)
S Lawrence Road & Sussex Blvd (#)	EB	LTR	D(53)	D(52)	D(53)	D(53)	D(53)
	WB	LTR	C(31)	C(31)	C(31)	C(31)	C(31)
	NB	LTR	C(25)	C(26)	C(28)	C(26)	C(28)
	SB	LTR	A(4)	A(4)	A(4)	A(4)	A(4)
	Overall			C(21)	C(21)	C(22)	C(21)

Note: All analyses used revised timing and PHF by movement.

Table 2. PM Peak Hour Level of Service Comparison

intersection (node)	approach	movement	Existing (by move)	2015 No Build (move)	2015 Build (move)	2020 No Build (move)	2020 Build (move)
West Chester Pike & New Ardmore (3)	EB	Left	E(67)	E(75)	E(75)	E(75)	E(75)
		Thru/Right	A(9)	A(8)	A(9)	A(8)	A(9)
	WB	Left	E(77)	E(73)	E(78)	E(73)	E(78)
		Thru/Right	C(23)	B(12)	B(13)	B(13)	B(14)
	NB	Left/Thru	E(68)	E(77)	E(77)	E(77)	E(77)
		Right	D(50)	D(51)	D(51)	D(51)	D(51)
SB	LTR	E(55)	E(58)	E(58)	E(58)	E(58)	
Overall			C(20)	B(15)	B(16)	B(15)	B(16)
West Chester Pike & Langford (6)	EB	Thru			C(27)		C(27)
		Right			A(8)		A(8)
	WB	Left			D(39)		D(39)
		Thru			A(3)		A(3)
	NB	Left			D(51)		D(51)
		Right			C(32)		C(32)
Overall					C(21)		C(21)
West Chester Pike & I-476 SB Ramps (10)	EB	Thru	D(37)	C(22)	C(24)	C(22)	C(24)
	WB	Thru	B(19)	C(31)	D(35)	C(32)	D(37)
	SB	Left	D(44)	D(43)	D(45)	D(44)	D(47)
		Thru/Right	B(18)	B(17)	C(23)	B(17)	C(23)
Overall			C(32)	C(32)	C(32)	C(33)	C(34)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	F(107)	D(54)	D(40)	D(55)	D(40)
		Thru	B(16)	B(18)	B(14)	B(19)	B(14)
	WB	Thru	D(40)	D(36)	D(46)	D(37)	D(49)
		Left	C(32)	C(32)	D(52)	C(32)	D(52)
	NB	LT(R)	C(32)	C(32)	E(59)	C(32)	E(60)
		Right	F(106)	F(111)	E(59)	F(115)	E(59)
Overall			D(39)	D(36)	C(31)	D(36)	C(32)
West Chester Pike & S Lawrence Rd (18)	EB	Thru	F(80)	D(41)	D(42)	D(47)	D(45)
		Right	B(12)	A(5)	A(5)	A(5)	A(5)
	WB	Left	D(52)	D(37)	D(46)	D(37)	D(49)
		Thru	C(25)	B(19)	C(20)	B(20)	C(20)
	NB	Left	D(38)	D(41)	D(44)	D(41)	D(44)
		Right	C(26)	C(29)	C(33)	C(29)	C(34)
Overall			D(49)	C(30)	C(32)	C(33)	C(34)
West Chester Pike & N Lawrence Rd (2)	EB	Left	E(60)	C(23)	D(39)	C(23)	D(39)
		Thru	B(10)	A(6)	A(4)	A(6)	A(4)
	WB	Thru/Right	D(46)	D(46)	D(53)	D(47)	E(56)
	SB	Left	E(62)	E(62)	E(62)	E(63)	E(63)
Right		D(47)	E(60)	F(80)	E(62)	F(83)	
Overall			D(37)	C(31)	D(38)	C(31)	D(39)
West Chester Pike & Old West Chester Pike (26)	EB	Thru/Right	B(19)	B(11)	C(25)	B(12)	C(27)
	WB	Left	E(63)	F(93)	F(93)	F(93)	F(93)
		Thru/Right	A(5)	A(6)	A(6)	A(6)	A(6)
	NB	Left/Thru	F(111)	F(82)	F(97)	F(83)	F(97)
		Right	D(47)	D(46)	D(47)	D(46)	D(47)
SB	LTR	D(46)	D(44)	D(45)	D(44)	D(45)	
Overall			C(20)	B(16)	C(23)	B(16)	C(24)
S Lawrence Road & Langford Run Rd (#)	EB	R	b(13)	b(13)	c(20)	b(13)	c(20)
	NB	L	b(11)	b(11)	b(14)	b(11)	b(14)
S Lawrence Road & Sussex Blvd (#)	EB	LTR	D(37)	D(37)	D(37)	D(37)	D(37)
	WB	LTR	C(25)	C(25)	C(25)	C(25)	C(25)
	NB	LTR	B(20)	B(20)	C(21)	B(20)	C(21)
	SB	LTR	B(13)	B(13)	B(16)	B(13)	B(16)
Overall			B(18)	B(18)	B(20)	B(18)	C(20)

Note: All analyses used revised timing and PHF by movement.

Table 3. Saturday Peak Hour Level of Service Comparison

intersection (node)	approach	movement	Existing (by move)	2015 No Build (move)	2015 Build (move)	2020 No Build (move)	2020 Build (move)
West Chester Pike & New Ardmore (3)	EB	Left	E(63)	E(61)	E(61)	E(61)	E(61)
		Thru/Right	B(11)	B(11)	B(12)	B(11)	B(12)
	WB	Left	E(63)	E(56)	E(57)	E(56)	E(57)
		Thru/Right	B(13)	A(5)	A(5)	A(5)	A(5)
	NB	Left/Thru	D(40)	D(40)	D(40)	D(40)	D(40)
		Right	D(39)	D(40)	D(40)	D(40)	D(40)
SB	LTR	D(47)	D(51)	D(51)	D(51)	D(51)	
Overall			B(15)	B(12)	B(12)	B(12)	B(12)
West Chester Pike & Langford (6)	EB	Thru			D(47)		D(49)
		Right			B(17)		B(17)
	WB	Left			C(27)		C(26)
		Thru			A(2)		A(2)
	NB	Left			D(43)		D(43)
		Right			B(15)		B(15)
Overall					C(25)		C(26)
West Chester Pike & I-476 SB Ramps (10)	EB	Thru	B(15)	A(9)	A(9)	A(9)	A(9)
	WB	Thru	A(7)	A(2)	A(7)	A(2)	A(7)
	SB	Left	D(37)	D(36)	C(34)	D(36)	C(34)
		Thru/Right	C(26)	C(26)	C(30)	C(25)	C(30)
Overall			B(16)	B(14)	B(15)	B(14)	B(15)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	E(62)	D(45)	D(47)	D(45)	D(47)
		Thru	A(2)	B(10)	A(10)	B(11)	A(10)
	WB	Thru	C(24)	B(15)	C(25)	B(15)	C(25)
		Left	C(32)	C(31)	D(49)	C(31)	D(49)
	NB	LT(R)	C(32)	C(31)	D(50)	C(31)	D(50)
		Right	E(58)	E(60)	D(49)	E(61)	D(50)
Overall			B(19)	B(19)	C(23)	B(20)	C(23)
West Chester Pike & S Lawrence Rd (18)	EB	Thru	C(35)	B(20)	C(28)	C(20)	C(31)
		Right	A(4)	A(3)	A(2)	A(3)	A(2)
	WB	Left	D(48)	D(37)	D(52)	D(37)	D(53)
		Thru	C(21)	B(18)	B(15)	B(18)	B(15)
	NB	Left	C(32)	C(33)	C(32)	C(33)	C(32)
		Right	C(23)	C(25)	C(28)	C(26)	C(28)
Overall			C(28)	C(21)	C(25)	C(21)	C(26)
West Chester Pike & N Lawrence Rd (2)	EB	Left	D(53)	C(24)	C(25)	C(24)	C(25)
		Thru	A(2)	A(6)	B(15)	A(6)	B(15)
	WB	Thru/Right	B(19)	B(17)	C(20)	B(17)	C(20)
	SB	Left	F(102)	F(104)	F(104)	F(106)	F(106)
Right		F(85)	F(88)	F(102)	F(90)	F(103)	
Overall			C(29)	C(26)	C(32)	C(27)	C(32)
West Chester Pike & Old West Chester Pike (26)	EB	Thru/Right	A(8)	A(5)	A(8)	A(5)	A(8)
	WB	Left	D(46)	D(54)	D(54)	D(54)	D(54)
		Thru/Right	A(3)	A(3)	A(4)	A(3)	A(4)
	NB	Left/Thru	D(48)	D(51)	D(51)	D(51)	D(51)
		Right	D(42)	D(42)	D(42)	D(42)	D(42)
SB	LTR	D(42)	D(43)	D(43)	D(43)	D(43)	
Overall			A(8)	A(7)	A(8)	A(7)	A(8)
S Lawrence Road & Langford Run Rd (#)	EB	R	b(10)	b(10)	b(13)	b(10)	b(13)
	NB	L	a(9)	a(9)	a(10)	a(9)	b(10)
S Lawrence Road & Sussex Blvd (#)	EB	LTR	C(31)	C(31)	C(31)	C(31)	C(31)
	WB	LTR	C(32)	C(32)	C(32)	C(32)	C(32)
	NB	LTR	B(17)	B(17)	B(18)	B(17)	B(18)
	SB	LTR	A(3)	A(3)	A(3)	A(3)	A(3)
Overall			B(11)	B(11)	B(12)	B(11)	B(12)

Note: All analyses used revised timing and PHF by movement.

Table 4. AM Peak Hour Queue Length

Intersection (Node)	Approach	Movement	storage length	Existing (move)		2015 No Build (move)		2015 Build (move)		2020 No Build (move)		2020 Build (move)	
				Synchro		Synchro		Synchro		Synchro		Synchro	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & New Ardmore (3)	EB	L	180	15	24	15	24	15	24	15	24	15	24
		TTR		360	462	372	479	372	464	380	487	380	473
	WB	L	145	20	35	27	45	25	39	27	45	25	39
		TTR		257	537	47	104	200	253	47	118	203	257
	NB	LT		30	53	30	53	31	56	30	53	31	56
SB	LTR		0	37	0	36	0	38	0	36	0	38	
				103	150	103	148	104	#169	103	148	104	#169
West Chester Pike & Langford (6)	EB	TTT						354	416			360	420
		R						53	m73			53	m71
	WB	L	450					106	144			106	146
		TT						44	62			46	64
	NB	LL						48	77			48	77
	R						92	146			92	146	
West Chester Pike & I-476 SB Ramps (10)	EB	TTT		306	368	129	204	379	491	133	208	384	498
	WB	TT		195	m177	77	m175	43	m160	84	m191	54	156
	SB	LL		242	281	248	288	243	284	406	m0	245	288
		T(R)	180	2	2	2	2	104	137	250	288	104	138
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	192	#419	~346	#460	373	#506	~351	#466	378	#516
		TTT		206	228	152	268	201	269	158	272	213	278
	WB	TT		323	m231	338	m249	~455	m367	352	m254	~463	m348
	NB	L	520	57	95	57	100	117	167	57	100	118	170
		LT(R)	520	58	26	58	28	119	34	58	28	125	36
	R		174	213	183	232	111	148	186	236	111	150	
West Chester Pike & S Lawrence Rd (18)	EB	TTT	600	354	408	124	198	262	249	125	205	253	243
		R		229	350	50	m65	109	65	50	m66	93	95
	WB	LL	460*	111	m121	120	m117	136	m125	118	m112	137	m127
		TT		~1051	m#912	~1005	m#971	~1001	m#471	~1006	m#946	~1082	m#536
	NB	LL		191	239	200	#262	172	#226	211	#266	175	#237
	R	200	204	296	221	316	229	330	226	322	233	336	
West Chester Pike & N Lawrence Rd (2)	EB	LL	460*	187	243	200	247	201	255	204	251	203	258
		TT		87	184	168	190	179	253	165	198	181	259
	WB	TTTR		350	465	442	#630	~487	#698	452	#644	~512	#712
		L	325	37	73	33	65	33	65	33	65	33	65
SB	R		~831	#1006	~741	#918	~777	#950	~752	#931	~787	#960	
West Chester Pike & Old West Chester Pike (26)	EB	TTR		298	417	219	290	248	348	214	295	250	355
	WB	L	170	44	81	45	85	45	85	45	85	45	85
		TTTR		109	160	112	156	125	158	115	159	127	161
	NB	LT		15	11	15	11	17	12	15	11	17	12
		R		0	9	0	9	0	9	0	9	0	9
SB	LTR		7	0	7	0	7	0	7	0	7	0	
S Lawrence Rd & Langford Run Rd (#)	EB	R		-	1	-	1	-	17	-	1	-	17
	NB	L	155	-	1	-	1	-	37	-	1	-	37
S Lawrence Rd & Sussex Blvd (#)	EB	LTR		46	35	46	35	46	35	46	35	46	35
	WB	LTR		14	42	14	42	14	42	14	42	14	42
	NB	LTTR		212	275	218	284	236	305	222	288	239	310
	SB	LTTR		42	78	43	79	45	84	43	80	46	85

*Average length of dual left turn lanes

~: This indicates that the approach is above capacity and the queue length could be much longer.

#: This indicates that the volume for the 95th percentile cycle exceeds capacity.

m: This indicates that the volume for the 95th percentile queue is metered by an upstream signal.

In many cases, the 95th percentile queue will not be experienced due to upstream metering.

If the upstream intersection is at / near capacity, the 50th percentile queue represents the max. queue experienced.

The queue length reported is the one for the lane with the highest queue in the lane group.

Table 5. PM Peak Hour Queue Length

Intersection (Node)	Approach	Movement	storage length	Existing (move)		2015 No Build (move)		2015 Build (move)		2020 No Build (move)		2020 Build (move)	
				Synchro		Synchro		Synchro		Synchro		Synchro	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & New Ardmore (3)	EB	L	180	95	#188	98	#188	98	#188	98	#188	98	#188
		TTR		214	508	193	393	219	447	196	401	223	456
	WB	L	145	12	m18	13	m22	13	m22	13	m22	12	m22
		TTR		783	843	201	260	385	449	211	270	388	459
	NB	LT		57	88	58	99	58	#99	58	#99	58	#99
R			0	6	0	7	0	7	0	7	0	7	
West Chester Pike & Langford (6)	EB	TTT						380	469			386	475
		R	450					73	64			72	64
	WB	L						355	m359			350	m356
		TT						42	m56			43	m57
	NB	LL						114	155			114	155
R							356	467			356	467	
West Chester Pike & I-476 SB Ramps (10)	EB	TTT		353	499	335	252	220	#338	339	254	221	#347
	WB	TT		111	#178	599	#699	-673	m713	606	m#704	-686	m#707
	SB	LL		578	#742	580	#745	590	#758	591	#760	602	#772
T(R)		180	2	3	2	2	157	224	2	2	158	225	
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	314	#427	318	#396	437	m#483	321	#401	440	m#479
		TTT		541	574	432	502	478	m596	445	m517	498	m603
	WB	TT		443	396	414	#486	-461	#558	420	#495	-469	#563
		L	520	84	141	85	142	231	331	86	144	232	333
	NB	LT(R)	520	84	35	85	35	231	74	86	35	234	342
R			-449	#667	-462	#681	220	323	-470	#690	222	326	
West Chester Pike & S Lawrence Rd (18)	EB	TTT	600	-896	m#1020	-847	m#893	-882	#961	-863	m#908	-899	#978
		R		390	m462	158	m151	99	103	157	m152	99	104
	WB	LL	460*	226	m#248	194	m216	-265	m#261	193	m215	-269	m#260
		TT		570	m753	665	m742	728	m730	680	m751	739	m726
	NB	LL		115	130	120	147	85	112	121	148	87	114
R		200	236	301	228	329	248	361	231	334	252	366	
West Chester Pike & N Lawrence Rd (2)	EB	LL	460*	456	m414	183	m160	360	m352	169	m161	371	m356
		TT		156	m151	87	m78	66	m53	95	m77	74	m54
	WB	TTTR		483	m#624	516	557	581	#635	528	563	590	#646
		L	325	103	139	105	141	105	141	106	141	106	141
SB	R		592	#818	612	#901	-765	#1014	618	#919	-782	#1032	
West Chester Pike & Old West Chester Pike (26)	EB	TTR	170	386	#996	137	#328	-166	#1098	139	#963	-171	#1117
		L		60	96	63	#129	63	#129	63	#129	63	#129
	WB	TTTR		112	131	129	150	140	163	131	153	142	164
		LT		134	52	132	51	135	52	133	52	135	52
	SB	R		27	58	35	66	40	73	36	56	40	73
LTR			5	4	5	4	5	4	5	4	5	4	
S Lawrence Rd & Langford Run Rd (#)	EB	R		-	1	-	1	-	65	-	1	-	66
	NB	L		-	1	-	1	-	38	-	1	-	39
S Lawrence Rd & Sussex Blvd (#)	EB	LTR		106	39	106	39	106	39	106	39	106	39
	WB	LTR		22	23	22	23	22	23	22	23	22	23
	NB	LTTR		120	168	113	160	135	188	114	162	137	191
	SB	LTTR		163	#244	163	243	187	#345	165	246	190	#355

*Average length of dual left turn lanes

~: This indicates that the approach is above capacity and the queue length could be much longer.

#: This indicates that the volume for the 95th percentile cycle exceeds capacity.

m: This indicates that the volume for the 95th percentile queue is metered by an upstream signal.

In many cases, the 95th percentile queue will not be experienced due to upstream metering.

If the upstream intersection is at / near capacity, the 50th percentile queue represents the max. queue experienced.

The queue length reported is the one for the lane with the highest queue in the lane group.

Table 6. Saturday Peak Hour Queue Length

Intersection (Node)	Approach	Movement	storage length	Existing (move)		2015 No Build (move)		2015 Build (move)		2020 No Build (move)		2020 Build (move)		
				Synchro		Synchro		Synchro		Synchro		Synchro		
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	
West Chester Pike & New Ardmore (3)	EB	L	180	7	17	7	16	7	16	7	16	7	16	
		TTR		242	303	249	312	293	365	253	317	297	371	
	WB	L	145	38	71	51	78	45	74	51	78	45	74	
		TTR		281	448	87	102	32	166	88	103	37	168	
	NB	LT		9	8	9	8	9	8	9	8	9	8	
SB	R		0	24	0	24	0	24	0	24	0	24		
	SB	LTR		62	81	62	83	62	83	62	83	62	83	
West Chester Pike & Langford (6)	EB	TTT						-254	#378			-291	#385	
		R						88	154			88	156	
	WB	L	450						322	445			321	447
		TT							44	26			55	27
	NB	LL							95	139			95	139
	SB	R						203	306			203	306	
West Chester Pike & I-476 SB Ramps (10)	EB	TTT		209	275	94	113	113	m134	95	114	113	m132	
	WB	TT		69	81	15	27	54	74	15	27	71	95	
	SB	LL		236	274	240	276	235	267	242	278	238	271	
		T(R)		180	2	3	2	2	117	133	2	2	118	134
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	133	182	136	187	212	269	136	186	214	270	
		TTT		22	26	222	206	203	234	228	210	213	238	
	WB	TT		171	223	208	264	318	371	208	265	321	374	
		L	520	49	90	50	91	145	214	51	92	146	216	
	NB	LT(R)	520	50	25	50	25	132	42	51	25	135	45	
	SB	R		195	#344	203	#359	123	204	207	#367	126	208	
West Chester Pike & S Lawrence Rd (18)	EB	TTT	600	448	#564	422	#540	-221	#614	427	#552	-228	#642	
		R		20	m29	14	m17	8	15	14	m17	15	20	
	WB	LL	460*	145	m170	144	m138	135	m#186	145	m140	137	m#200	
		TT		396	m562	500	m548	665	m208	505	m553	675	m191	
	NB	LL		73	104	81	114	51	78	82	115	52	79	
	SB	R	200	215	284	234	317	214	312	237	321	216	315	
West Chester Pike & N Lawrence Rd (2)	EB	LL	460*	217	m235	146	m132	242	m253	149	m129	247	m253	
		TT		37	66	427	561	534	m543	432	566	541	m542	
	WB	TTTR		279	374	267	360	340	454	272	367	345	461	
	SB	L	325	65	#165	65	#166	65	#166	66	#169	66	#169	
	SB	R		-478	#622	-492	#637	-553	#702	-498	#643	-559	#709	
West Chester Pike & Old West Chester Pike (26)	EB	TTR		107	m234	77	m101	127	126	78	m102	127	m126	
		L	170	39	65	40	70	40	70	40	70	40	70	
	WB	TTTR		86	131	89	117	110	145	90	119	112	146	
		LT		42	21	42	22	42	22	42	22	42	22	
	SB	R		0	28	0	29	0	29	0	29	0	29	
	SB	LTR		7	6	7	6	7	6	7	6	7		
S Lawrence Rd & Langford Run Rd (#)	EB	R		-	1	-	0	-	37	-	0	-	37	
	NB	L		-	0	-	0	-	24	-	0	-	24	
S Lawrence Rd & Sussex Blvd (#)	EB	LTR		5	3	5	3	5	3	5	3	5	3	
	WB	LTR		12	14	12	14	12	14	12	14	12	14	
	NB	LTTR		82	120	85	123	108	153	86	124	110	155	
	SB	LTTR		32	60	33	61	41	74	33	62	41	74	

*Average length of dual left turn lanes

~: This indicates that the approach is above capacity and the queue length could be much longer.

#: This indicates that the volume for the 95th percentile cycle exceeds capacity.

m: This indicates that the volume for the 95th percentile queue is metered by an upstream signal.

In many cases, the 95th percentile queue will not be experienced due to upstream metering.

If the upstream intersection is at / near capacity, the 50th percentile queue represents the max. queue experienced.

The queue length reported is the one for the lane with the highest queue in the lane group.

MEETING MINUTES
Revised March 4, 2011

MEETING DATE: February 15, 2011

LOCATION: PennDOT Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19140

RE: HOP Application No. PRE689
Marple Associates Site
Traffic Log No. D09-039XP
SR0003 (West Chester Pike)
Marple Township, Delaware County
Transportation Impact Study Review Comments

ATTENDEES:

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A meeting was held at the office of the Traffic Unit of PennDOT, Engineering District 6-0, on Tuesday, February 15, 2011 to review/discuss PennDOT comments that still need resolution relative to the above-referenced application. Previously, a Traffic Impact Study dated October 14, 2011 was submitted for review; PennDOT responded with comment letter dated November 29, 2010; a written response to comments was returned by Orth-Rodgers dated December 23, 2010.

Northbound I-476 Off-Ramp

1. The proposed restriping of the northbound I-476 off-ramp for a double right turn has a conflict with the eastern pedestrian crosswalk across West Chester Pike. There are few if any pedestrian crossings here. Paul Lutz suggested the conflict can be addressed by creating a pedestrian circulation plan where pedestrians use only the north side to walk along West Chester Pike between the new driveway access signal and North Lawrence Road.
2. The proposed double right turn on the northbound I-476 off-ramp must be analyzed without right-turn-on-red.
3. In order to provide a double right on the northbound I-476 off-ramp, may need to provide advance destination signing on the ramp to prevent a weave problem due to the close intersection spacing.
4. Al Federico commented that PM delay on the northbound off-ramp increased significantly. However, this is just the delay for left turns. The delay for the heavy right turn is cut in half by allowing it to share the center ramp lane. The overall approach delay and queue is reduced.
5. ORA should examine this ramp again using a single right turn lane; provide the right turn queue in SimTraffic and in Synchro and compare with the proposed double right. The ramp cannot be allowed to back up to the main line.

Northbound I-476 On-Ramp

6. Traffic on this ramp has a free entry to I-476. However drivers seem to expect to have to merge into mainline traffic, and they slow down. Due to the extremely high ramp volume, this causes a backup all the way down the ramp to West Chester Pike. Suggestions for improvements include signs, e.g. MAINTAIN SPEED, STAY IN LANE, and addition of lane delineators. Fran said the Department will perform improvements for the ramp and they can be done now.
7. The high demand for this on-ramp causes backups in the westbound right lane of West Chester Pike that extend east past North Lawrence Road. Some drivers bypass the queue by continuing to the traffic signal at the northbound off-ramp/eastbound left turn, and turning right at the signal.
8. Ashwin proposed an alternative intersection design, i.e. eliminate the slip ramp and redesign the area to create a signalized westbound double right turn into the ramp. ORA will analyze this alternative.

Southbound I-476 Off-Ramp

9. The question was raised whether directional signing is needed on the ramp for the double right turn, i.e. to direct the far right lane to West Chester Pike WEST and the inner right lane to Langford Run Road. Adrienne responded that the second right turn lane was added at the request of Marple Township's former traffic engineer. The second right turn lane isn't needed for capacity reasons because the ramp gets so much signal green time for the left turn.
10. ORA will reanalyze the ramp as a single right turn lane and provide queue simulation.
11. Fran asked whether the existing slip ramp might be retained for traffic heading west on West Chester Pike. However, Marple Township is in favor of bringing all ramp traffic to the signal. The slip ramp has been a safety concern for Marple Township because of the proximity of Mather Lane, a residential street. Drivers exit the off-ramp at highway speed and are looking behind to merge into West Chester Pike traffic, while drivers ahead may be slowing down to turn right into Mather Lane.

North Lawrence Road

12. The southbound right turn to westbound West Chester Pike is extremely high volume and has an existing poor peak hour level of service. There is already a separate right turn lane and a right turn signal overlap. There is no feasible physical widening to increase capacity. Part of the volume stems from traffic destined to the I-476 northbound on-ramp. There is no potential new road connection to the ramp from North Lawrence Road. Lori Hanlon-Widdop noted that Darby Creek Road has grades and winding alignment that are not suitable for a collector road.

Bike Lanes

13. The Department is working on a plan to provide bike lanes on West Chester Pike. The concept for how to do this is not yet completed.

Signal System

14. Presently there are two separate interconnected signal systems on West Chester Pike, one in Haverford and one in Marple. The fiber in each Township was installed 5 – 6 years ago under a Department project. The controllers are Econolite.
15. Paul Lutz would like to see one master controller rather than two systems synchronized by GPS. Explain to the Townships their maintenance responsibilities. No timing changes without the consent of both municipalities.

16. Paul wants a current inventory of all signal equipment.
17. If the signals were combined into a single system with the master in Haverford Township, Marple Township would need to be provided with a copy of the Aries system software so they could monitor the Marple signals.
18. Representatives of both Marple Township and Haverford Township said that they could work out an agreement regarding operation and maintenance of a shared system.
19. An alternative to connecting the two systems with a single master is to install Traffic Adaptive Control at all the signals from Old West Chester Pike to new Ardmore Avenue.
20. The cost of Traffic Adaptive Control is approximately \$30,000 per intersection.
21. A Traffic Adaptive System could qualify as an Alternative Transportation plan (ATP) in the event that level of service deficiencies cannot be addressed by other improvements. An ATP keeps the developer out of the position of needing a Waiver for Level of Service.

ACTION ITEMS

1. Department will place signs on I-476 northbound on-ramp to keep ramp drivers accelerating as they enter the main line.
2. ORA will conduct inventory of West Chester Pike signal equipment, with assistance from the Townships
3. ORA will re-analyze the I-476 southbound off-ramp with a single right turn lane.
4. ORA will re-analyze I-476 northbound on-off ramp intersection with
 - Westbound West Chester Pike signalized double right turn into on-ramp and removal of the existing slip ramp
 - Northbound off-ramp alternatives: double right turn with No Turn on Red, or, single right turn

The intersection alternatives analyses will include SimTraffic queue simulation.

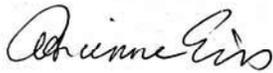
5. ORA will perform physical feasibility assessment of modifying I-476 northbound ramp intersection for double right turn into on-ramp

If the modifications to the I-476 northbound ramp intersection are feasible and provide acceptable levels of service and queuing, then the two signal systems on West Chester Pike shall be physically hard wired and connected in the traditional manner with a single master. If not, provide an Alternative Transportation Plan consisting of Traffic Adaptive Control of the signals between Old West Chester Pike and New Ardmore Avenue.

The minutes initially sent out on February 21, 2010 have been revised in accordance with comments received from attendees and accurately reflect the meeting as described.

Very Truly Yours,

ORTH-RODGERS & ASSOCIATES, INC.



ADRIENNE EISS, PTP
Senior Project Manager

cc: Attendees
Claude DeBotton
Paul DeBotton
James Balk
File

April 1, 2011

Mr. Francis J. Hanney
District Traffic Services Manager
PennDOT, Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

RE: HOP Application No. pre689
Traffic Log No. D09-039XR
Marple Associates Site
Delaware County, Marple Township

Dear Fran,

This letter is to address questions and comments concerning proposed travel lanes at I-476 ramp intersections received at the February 15, 2011 meeting at the District 6-0 office attended by representatives of PennDOT, Marple Township and Haverford Township.

The comments addressed below are listed in the minutes dated March 4, 2011 under #2, 5, 8, and 10. Each comment is numbered as in the meeting minutes, and is followed by the response.

2. The proposed double right turn on the northbound I-476 off-ramp must be analyzed without right-turn-on-red.

In our previous submissions, the “right-turn-on-red” (RTOR) option for the proposed northbound I-476 off-ramp double right turn was unchecked in the Synchro files for the evening peak hour conditions with the proposed development. This means the “evening build scenarios” have already been analyzed in Synchro without RTOR on the northbound I-476 off-ramp.

The RTOR was permitted in the previous analyses in the “Build” scenarios during morning and Saturday peak hours. The analyses for these two peak hours in Year 2020 were re-conducted without RTOR. The LOS and queue lengths are summarized and compared with the previous analysis results in the attached Table 1. It can be seen that results from the analysis for morning and Saturday peak hours without the northbound off-ramp RTOR are very similar to those with RTOR allowed conducted and submitted previously. The overall intersection level of service and delay are virtually the same and remain acceptable. Similar results are shown for the queue lengths as well. Without RTOR, the northbound off-ramp right turn queue lengths are only a little bit longer with the differential of no more than a car’s length (25 feet).

5. ORA should examine this ramp (the northbound I-476 off-ramp) again using a single right turn lane; provide the right turn queue in SimTraffic and in Synchro and compare with the proposed double right. The ramp cannot be allowed to back up to the main line.

Among the three peak hours, the evening peak hour in Year 2020 with the proposed development has the highest turning volume and thus produces the longest queue length in Synchro on the I-476 off-ramp northbound right turn movements. Therefore, the analysis of a single right turn lane vs. the proposed double right turn at this intersection was conducted only during the critical evening peak hour in both Synchro and SimTraffic. The SimTraffic results for each scenario were the average results from five simulation runs with different random seed numbers.

Unlike under the conditions with double right turn lanes, right-turn-on-red is permitted under the condition of a single right turn lane. The intersection signal timing / offset was also optimized in Synchro accordingly under the single right turn lane condition but the changes are minimal.

The Synchro and SimTraffic results comparison between the proposed double right turn lanes and a single right turn lane at the I-476 northbound off-ramp are summarized in Table 2. With a single right turn lane, it can be seen that the right turn from the off-ramp will operate at LOS 'F' with or without the proposed development. The average delay expected for the northbound right turn will be more than three minutes with the proposed development and almost two minutes without the proposed development. The overall intersection delay with the proposed development and a single northbound off-ramp right turn is more than 10 seconds longer than without the proposed development. With the proposed double right turn and the development, the delay of the off-ramp center lane increases while the right lane decreases. The approach delay and the overall intersection delay are reduced when compared to the 'No Build' conditions without the proposed development.

The queue lengths of the off-ramp right turn were compared between single and double right turn lanes scenarios, using Year 2020 'Build' conditions with the proposed development. The striped left and center lanes on the ramp both have a storage length of about 520 feet. The ramp length from the signal stop line to the striped gore on the I-476 northbound main line is about 1,100 feet. The results from SimTraffic simulation runs show that during the 2020 evening peak hour the maximum right turn queue length with a single right turn is more than 900 feet, almost three times longer than the maximum queue length with the proposed double right turn. The maximum back of the single right turn queue reaches past the end of the grass gore island but does not extend onto the I-476 northbound main line.

We understand that provisions for pedestrians will need to be made if the ramp is changed to a double right turn. As proposed by Paul Lutz at the February 15 meeting, the

provision for east-west pedestrian movements along West Chester Pike could all be on the north side.

Regarding the potential need for signing on the ramp if a double right turn is permitted, we would propose instead that a dotted line lead the center lane right turn onto eastbound West Chester Pike in third lane from the curb. The rightmost ramp lane could then turn either into a through lane or the right turn lane for South Lawrence Road. A side mounted sign on the ramp could indicate "South Lawrence Road USE RIGHT LANE".

The double right turn on the ramp was proposed in order to meet overall Level of Service requirements for comparison of PM Build vs. No Build conditions at the signalized intersection. The potential addition of a westbound double right turn into the on-ramp (see next section) would add delay to this intersection in any event. If the Department prefers that the northbound off-ramp maintain a single right turn lane, we would concur as long as the Marple Associates development and the proposed road improvements can be approved.

8. (Regarding access to the northbound I-476 on-ramp): *Ashwin proposed an alternative intersection design, i.e. eliminate the slip ramp and redesign the area to create a signalized westbound double right turn into the ramp. ORA will analyze this alternative.*

The objective of this proposed alternative is to relieve conflicts resulting from the heavy volume trying to enter this slip ramp located just past the South Lawrence Road signal, and to achieve better flow through the South Lawrence intersection. We have analyzed this alternative and believe that it is feasible and provides a measure of improvement over existing conditions, as summarized in Table 3. A concept plan is attached.

Currently, during the AM peak hour West Chester Pike feeds a total of 2,000 vehicles onto I-476 northbound: 400 turning left from eastbound West Chester Pike and 1,600 through the westbound slip ramp. Of the 1,600 westbound vehicles, 400 have turned left from South Lawrence Road and 1,200 are from West Chester Pike.

Figure 1 tracks the movements from the various approaches to the on-ramp, and illustrates the differences in Year 2020 volume with development between the AM and PM peak hours. The AM is clearly the critical hour; therefore the traffic analysis was performed for the AM peak hour.

The access to the slip ramp is located just west of South Lawrence Road intersection signal. Therefore, to be able to enter the ramp, westbound West Chester Pike traffic should be in the right lane approaching the South Lawrence Road signal. The westbound rightmost through lane approaching the intersection is taken up by the traffic heading to the slip ramp and a long queue is formed. Some aggressive drivers who want to get to

the slip ramp but do not want to wait in the queue are using the second through lane to get to the South Lawrence intersection and then try to merge back into the right lane right before they pass the signal. These aggressive last-minute lane change behaviors not only slow down the traffic movement on the already congested right lane but also literally block the other 1,300 westbound vehicles in the second through lane. The resultant queue spills passes several upstream signalized intersections including North Lawrence Road and Old West Chester Pike. A considerable number of other drivers travel straight in the second through lane and then switch to the rightmost lane and make an illegal right turn into the I-476 northbound on-ramp at the ramp signal.

The concept plan ORA developed based on Ashwin's suggestion provides channelized westbound dual right turn lanes at the intersection of I-476 northbound ramps. It is expected the dual right turn lanes will increase the throughput at South Lawrence Road for the congested right through lane. The additional distance between South Lawrence Road and the ramp entry point allows for a merge section in which vehicles in the second through lane at the South Lawrence Road intersection will find it easier to move over to get to the right turn lane without stopping and blocking through traffic in that lane.

Bringing the right turn entry closer to the ramp signal will also enable a safer pedestrian path along the north side of West Chester Pike, since the right turn can be signal-controlled upon pedestrian actuation.

Other than stopping for the crossing pedestrians, the westbound right turn lanes would operate as free flow (right turn signal arrow). This requires separate receiving lanes in the northbound on-ramp. With two receiving lanes for the dual right turn and the receiving lane for the eastbound left turn from West Chester Pike (also used by any northbound off-ramp traffic that goes straight to the on-ramp), the signalized intersection has three lanes departing towards I-476 northbound. These three lanes eventually will be tapered down into one free-on lane onto I-476 northbound.

The concept plan was evaluated in Synchro under the Year 2020 morning peak hour traffic conditions with the proposed Marple development. For comparison purposes, the existing slip ramp configuration and an alternative with single free right turn lane at the intersection were also analyzed. The three Synchro models are:

- Existing slip ramp configuration
- Single free right turn at the intersection of I-476 northbound ramps
- Dual signalized right turn at the intersection of I-476 northbound ramps – right turn arrow on all phases except actuated pedestrian crossing.

These three models cover West Chester Pike from New Ardmore Avenue to Old West Chester Pike and they share the same volumes and signal timings. The lane change settings in these models have been modified for the westbound direction approaching the I-476 northbound ramps so that the vehicles will be getting into their destination lanes

later and closer to their next turns. This is to mimic the driving behavior described above. Five one-hour-long simulation runs were conducted for each of these three models in SimTraffic. The SimTraffic output of the average results of travel times and queue lengths are attached. The results of the affected westbound sections and intersections along West Chester Pike are summarized in Table 3.

The results show that both the relocated single free right turn and the dual right turn result in a significant improvement in overall travel time in the westbound direction going from the eastern end of the model to the intersection of I-476 Northbound Ramps. Removal of the existing westbound traffic clogging at the intersection of South Lawrence Road improves the throughput of the congested intersection of North Lawrence Road even though North Lawrence is still one of the bottlenecks for the westbound traffic progression along West Chester Pike.

At North Lawrence Road during the morning peak hour, the westbound approach is only receiving 34 seconds green band if the opposing eastbound double left turn maxes out. However, at the upstream intersection of Old West Chester Pike, the westbound green band is at least 79 seconds. Therefore the westbound approach between North Lawrence Road and Old West Chester Pike fills up every cycle and the queue spills further east past the Old West Chester Pike. The existing clogging of westbound traffic progression at the intersection of South Lawrence Road further deteriorates the capacity of the upstream intersection of North Lawrence Road. Both ramp access improvement alternatives restore some throughput of the North Lawrence Road intersection and the length of queue spilling past Old West Chester Pike is much shorter.

Among the two alternatives, the dual right turn offers an extra lane capacity to accommodate the 1,600 right turn vehicles better than a single right. With a single right, it is still expected that the traffic flow in the right turn lane will be occasionally slowed down and interrupted when vehicles in the right through lane are trying to merge over. This is similar to the clogging that occurs at the intersection of South Lawrence Road under the existing conditions but not as bad. Still, its effect is shown in the longer travel time and queue length in the westbound direction. The free dual right turn design provides extra capacity and offers better performance. This is the alternative we are recommending.

In the PM peak hour, westbound West Chester Pike at South Lawrence Road carries twice as many through vehicles as vehicles destined to I-476 north. Therefore, it is expected that some vehicles in the rightmost lane will be through vehicles heading further west. It can also be expected that all vehicles destined to the ramp will be in the rightmost lane at the South Lawrence Road signal, so there should be no issue with weaving across through traffic to get to the right turn lanes. At the ramp signal, the dual right turn lane will have excess capacity in the PM.

The aerial photo plan attached at the end of this letter illustrates the physical layout of the concept. The on-ramp merge design was referenced to AASHTO Green Book (Fourth Edition, 2001). The criteria illustrated in *Exhibit 10-69. Typical Single-Lane Entrance Ramps* were used. A tapered design was applied to merge the on-ramp traffic from West Chester Pike eastbound into the dual right turn from West Chester Pike westbound and a parallel design was applied to merge the two lanes into one before it gets on I-476. The design parameters with the volumes were examined in HCS+ Ramp Analysis and the results show that both merge sections should operate within capacity. In the second merge where two lanes merge into one, we have shown the second right turn lane merging right. This is intended to encourage westbound West Chester Pike traffic in the right lane at South Lawrence Road to move over to the far right turn lane (moving two lanes to the right), from which they can remain in the same lane all the way to I-476. When the right through lane at South Lawrence Road moves over to the far right turn lane, it is easier for traffic in the second through lane at South Lawrence Road to cross into a right turn lane.

The inside radius of the right turn lane as shown on the plan is 130'. The distance between the beginning of the right turn lane and the right turn stop line at the I-476 ramp signal is approximately 450 feet. The distance between the stop line at South Lawrence Road and the gore for the ramp entry is improved from the existing 250 feet to approximately 580 feet.

10. ORA will reanalyze the ramp (I-476 southbound off-ramp) as a single right turn lane and provide queue simulation.

The critical period for the I-476 southbound off-ramp intersection is the evening peak hour. Therefore, the analyses on the scenarios with a single right turn lane and with the proposed double right turn lane were conducted with the 2020 evening peak hour traffic volume under the 'Build' conditions with the proposed development. Results from both Synchro and SimTraffic simulations are summarized in Table 4.

It can be seen that with a single right turn lane, the off-ramp right turns will operate acceptably at LOS 'D' with 39 seconds average delay. The additional right turn lane can reduce the delay by 16 seconds but it has little impact on the overall intersection delay. The dominant movement on the off-ramp is the left turn movement. The maximum queue length of the single right turn lane is estimated to be at about 500 feet in SimTraffic. The submitted concept plan along West Chester Pike proposes a storage length of 800 feet for this right turn movement. Therefore, the right turn queue should be well accommodated. It is expected that the off-ramp right turn queue will be cleared every cycle during most of the day.

Mr. Francis J. Hanney
Response to Comments of 2/15/11 Meeting
April 1, 2011
Page 7

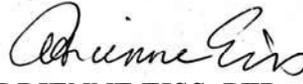
The disadvantage of a double right turn lane is that the driver needs to decide which of the two lanes to use and overhead guide signing is needed. The double right turn lane was proposed by the previous Marple Township traffic engineer; his stated concern was that if the westbound left turn lane into the Marple Associates development was full, the off-ramp right turns could be blocked by a vehicle destined to the development. Based on our analysis, we do not believe that is a valid concern because of the provision of a 450' long left turn lane approaching the proposed development. The Synchro output shows that the left turn lane storage is adequate and the SimTraffic simulation runs show that the left turn lane clears when the I-476 southbound off-ramp gets a green light due to the signal coordination.

Our recommendation is to provide a single right turn lane on the I-476 southbound off-ramp.

Your review of these analyses is requested. If the conclusions are acceptable, we will complete the final Traffic Impact Study report. The final Traffic Impact Study report will document improvements that are to be included on the Highway Occupancy Permit Plan submission, at such time as funding is available for the project.

We would be happy to provide printouts of the Synchro and SimTraffic output and/or the Synchro electronic files for your review.

Very truly yours
ORTH-RODGERS & ASSOCIATES, INC.



ADRIENNE EISS, PTP
Senior Project Manager

cc w/enclosures:

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H. Richard Orth
Claude DeBotton
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Anthony Hamaday, Marple Township
Joe Mastronardo, Pennoni
Lori Hanlon-Widdop, Haverford Twp
Richard Dougherty, Haverford Twp
Michael Schneider, Pennoni

Table 1 – LOS and Queue Length for I-476 Northbound Off-ramp Intersection with Double Right and No Turn On Red during Two Peak Hours
 (Note: PM analysis in previous report used NTOR and is unchanged)

			AM			SAT		
			2020 No Build	2020 Build (Previous Submission)	2020 Build (NB NTOR)	2020 No Build	2020 Build (Previous Submission)	2020 Build (NB NTOR)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	E(63)	D(40)	D(46)	D(45)	D(47)	D(47)
		Thru	A(9)	A(9)	A(10)	B(11)	A(10)	A(10)
	WB	Thru	E(71)	E(69)	E(69)	B(15)	C(25)	C(26)
		NB	Left	C(32)	D(43)	D(41)	C(31)	D(49)
	LT(R)		C(32)	D(49)	D(50)	C(31)	D(50)	D(52)
	Right		E(60)	D(48)	D(49)	E(61)	D(50)	D(52)
	Overall			D(44)	D(40)	D(40)	B(20)	C(23)

<u>AM Peak Hour</u>				2020 No Build		2020 Build (NB TOR)		2020 Build (NB NTOR)	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	~351	#466	378	#516	378	#516
		TTT		158	272	213	278	213	278
	WB	TT		352	m254	~463	m348	~463	m348
		NB	L	520	57	100	118	170	116
	LT(R)		520	58	28	125	36	140	51
	R		186	236	111	150	127	167	

<u>SAT Peak Hour</u>				2020 No Build		2020 Build (NB TOR)		2020 Build (NB NTOR)	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	136	186	214	270	214	270
		TTT		228	210	213	238	240	238
	WB	TT		208	265	321	374	325	374
		NB	L	520	51	92	146	216	144
	LT(R)		520	51	25	135	45	145	54
	R		207	#367	126	208	134	#224	

Table 2 – LOS and Queue Length for I-476 Northbound Off-ramp with One Right Turn Lane and Right Turns on Red vs. Double Right Turn Lane with No Turn on Red during PM Peak

PM Peak Hour			2020 No Build	2020 Build (Double RT)	2020 Build (Single RT)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	D(55)	D(40)	E(68)
		Thru	B(19)	B(14)	B(15)
	WB	Thru	D(37)	D(49)	D(49)
		Left	C(32)	D(52)	D(36)
	NB	LT(R)	C(32)	E(60)	D(36)
		Right	F(115)	E(59)	F(191)
Overall			D(36)	C(32)	D(47)

PM Peak Hour - Synchro Results			Existing Storage Length (ft)	2020 Build (Dual NB R)		2020 Build (Single NB R)	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	440	m#479	~452	m#492
		TTT		498	m603	475	m519
	NB	WB	TT	~469	#563	449	#543
		L	520	232	333	114	185
		LT(R)	520	234	342	114	185
	R	1,100	222	326	~545	#767	

PM Peak Hour - SimTraffic Results (Avg. of 5 Simulation Runs)			Existing Storage Length (ft)	2020 Build (Dual NB R)		2020 Build (Single NB R)	
				50th % Q length	Max. Q	50th % Q length	Max. Q
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	375	534	389	535
		TTT		456	744	500	752
	NB	WB	TT	473	545	465	548
		L	520	134	247	96	250
		LT(R)	520	186	312	157	528
	R	1,100	185	307	447	914	

Table 3 – Travel Time and Queue Length for the Westbound Sections and Intersections along West Chester Pike
I-476 Northbound On-Ramp Alternatives Analysis

**Westbound Travel Time (seconds) along West Chester Pike
Year 2020 AM Peak Hour w/ Proposed Development**

Westbound Segment along West Chester Pike	Existing Slip Ramp	Free Single Right @ Signal	Free Double Right @ Signal
East End to Old West Chester Pike	214	58	37
Old West Chester Pike to N. Lawrence Road	122	97	82
N. Lawrence Road to S. Lawrence Road	46	34	30
S. Lawrence Road to I-476 NB Ramps	31	47	43

**Westbound Through Traffic Intersection Queue Lengths (feet) along West Chester Pike
Year 2020 AM Peak Hour w/ Proposed Development**

Intersection along West Chester Pike	Existing Slip Ramp		Free Single Right @ Signal		Free Double Right @ Signal	
	Avg. Q	Max. Q	Avg. Q	Max. Q	Avg. Q	Max. Q
Old West Chester Pike	856*	1276*	378	869	207	633
N. Lawrence Road	616	692	590	681	577	685
S. Lawrence Road	673	717	408	740	352	652
I-476 NB Ramps	250	487	444	607	398	597

Note: For multi-lane approach, the highest queue lengths occurred were used in the table.

** Maximum queue extends beyond the length of the link and the actual queue length is longer.*

Table 4 – LOS and Queue Length for I-476 Southbound Off-ramp with One Right Turn Lane and Right Turns on Red vs. Double Right Turn Lane with No Turn on Red during PM Peak

PM Peak Hour			2020 No Build	2020 Build (Double RT)	2020 Build (Single RT)
West Chester Pike & I-476 SB Ramps (10)	EB	Thru	C(22)	C(24)	C(24)
	WB	Thru	C(32)	D(37)	D(37)
	SB	Left	D(44)	D(47)	D(47)
		Thru/Right	B(17)	C(23)	D(39)
		Right		C(22)	
Overall			C(33)	C(34)	D(35)

PM Peak Hour - Synchro Results			Existing Storage Length (ft)	2020 Build (Dual SB R)		2020 Build (Single SB R)	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & I-476 SB Ramps (10)	EB	TTT		221	#347	221	#347
	WB	TT		~686	m#707	~686	m#707
	SB	LL		602	#772	602	#772
		T(R)	180	158	52	391	95
		R		153	225	-	-

PM Peak Hour - SimTraffic Results (Avg. of 5 Simulation Runs)			Existing Storage Length (ft)	2020 Build (Dual SB R)		2020 Build (Single SB R)	
				50th % Q length	Max. Q	50th % Q length	Max. Q
West Chester Pike & I-476 SB Ramps (10)	EB	TTT		195	361	164	300
	WB	TT		201	566	187	505
	SB	LL		514	646	505	633
		T(R)	180	130	270	284	488
		R		126	198	-	-

Table 1 – LOS and Queue Length for I-476 Northbound Off-ramp Intersection with Double Right and No Turn On Red during Two Peak Hours
 (Note: PM analysis in previous report used NTOR and is unchanged)

			AM			SAT		
			2020 No Build	2020 Build (Previous Submission)	2020 Build (NB NTOR)	2020 No Build	2020 Build (Previous Submission)	2020 Build (NB NTOR)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	E(63)	D(40)	D(46)	D(45)	D(47)	D(47)
		Thru	A(9)	A(9)	A(10)	B(11)	A(10)	A(10)
	WB	Thru	E(71)	E(69)	E(69)	B(15)	C(25)	C(26)
		NB	Left	C(32)	D(43)	D(41)	C(31)	D(49)
	LT(R)		C(32)	D(49)	D(50)	C(31)	D(50)	D(52)
	Right		E(60)	D(48)	D(49)	E(61)	D(50)	D(52)
	Overall			D(44)	D(40)	D(40)	B(20)	C(23)

<u>AM Peak Hour</u>				2020 No Build		2020 Build (NB TOR)		2020 Build (NB NTOR)	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	~351	#466	378	#516	378	#516
		TTT		158	272	213	278	213	278
	WB	TT		352	m254	~463	m348	~463	m348
		NB	L	520	57	100	118	170	116
	LT(R)		520	58	28	125	36	140	51
	R		186	236	111	150	127	167	

<u>SAT Peak Hour</u>				2020 No Build		2020 Build (NB TOR)		2020 Build (NB NTOR)	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	136	186	214	270	214	270
		TTT		228	210	213	238	240	238
	WB	TT		208	265	321	374	325	374
		NB	L	520	51	92	146	216	144
	LT(R)		520	51	25	135	45	145	54
	R		207	#367	126	208	134	#224	

Table 2 – LOS and Queue Length for I-476 Northbound Off-ramp with One Right Turn Lane and Right Turns on Red vs. Double Right Turn Lane with No Turn on Red during PM Peak

PM Peak Hour			2020 No Build	2020 Build (Double RT)	2020 Build (Single RT)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	D(55)	D(40)	E(68)
		Thru	B(19)	B(14)	B(15)
	WB	Thru	D(37)	D(49)	D(49)
		Left	C(32)	D(52)	D(36)
	NB	LT(R)	C(32)	E(60)	D(36)
		Right	F(115)	E(59)	F(191)
Overall			D(36)	C(32)	D(47)

PM Peak Hour - Synchro Results			Existing Storage Length (ft)	2020 Build (Dual NB R)		2020 Build (Single NB R)		
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	440	m#479	~452	m#492	
		TTT		498	m603	475	m519	
	NB	WB	TT	~469	#563	449	#543	
		NB	L	520	232	333	114	185
			LT(R)	520	234	342	114	185
	R	1,100	222	326	~545	#767		

PM Peak Hour - SimTraffic Results (Avg. of 5 Simulation Runs)			Existing Storage Length (ft)	2020 Build (Dual NB R)		2020 Build (Single NB R)		
				50th % Q length	Max. Q	50th % Q length	Max. Q	
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	375	534	389	535	
		TTT		456	744	500	752	
	NB	WB	TT	473	545	465	548	
		NB	L	520	134	247	96	250
			LT(R)	520	186	312	157	528
	R	1,100	185	307	447	914		

Table 3 – Travel Time and Queue Length for the Westbound Sections and Intersections along West Chester Pike
I-476 Northbound On-Ramp Alternatives Analysis

**Westbound Travel Time (seconds) along West Chester Pike
Year 2020 AM Peak Hour w/ Proposed Development**

Westbound Segment along West Chester Pike	Existing Slip Ramp	Free Single Right @ Signal	Free Double Right @ Signal
East End to Old West Chester Pike	214	58	37
Old West Chester Pike to N. Lawrence Road	122	97	82
N. Lawrence Road to S. Lawrence Road	46	34	30
S. Lawrence Road to I-476 NB Ramps	31	47	43

**Westbound Through Traffic Intersection Queue Lengths (feet) along West Chester Pike
Year 2020 AM Peak Hour w/ Proposed Development**

Intersection along West Chester Pike	Existing Slip Ramp		Free Single Right @ Signal		Free Double Right @ Signal	
	Avg. Q	Max. Q	Avg. Q	Max. Q	Avg. Q	Max. Q
Old West Chester Pike	856*	1276*	378	869	207	633
N. Lawrence Road	616	692	590	681	577	685
S. Lawrence Road	673	717	408	740	352	652
I-476 NB Ramps	250	487	444	607	398	597

Note: For multi-lane approach, the highest queue lengths occurred were used in the table.

** Maximum queue extends beyond the length of the link and the actual queue length is longer.*

Table 4 – LOS and Queue Length for I-476 Southbound Off-ramp with One Right Turn Lane and Right Turns on Red vs. Double Right Turn Lane with No Turn on Red during PM Peak

PM Peak Hour			2020 No Build	2020 Build (Double RT)	2020 Build (Single RT)
West Chester Pike & I-476 SB Ramps (10)	EB	Thru	C(22)	C(24)	C(24)
	WB	Thru	C(32)	D(37)	D(37)
	SB	Left	D(44)	D(47)	D(47)
		Thru/Right	B(17)	C(23)	D(39)
		Right		C(22)	
Overall			C(33)	C(34)	D(35)

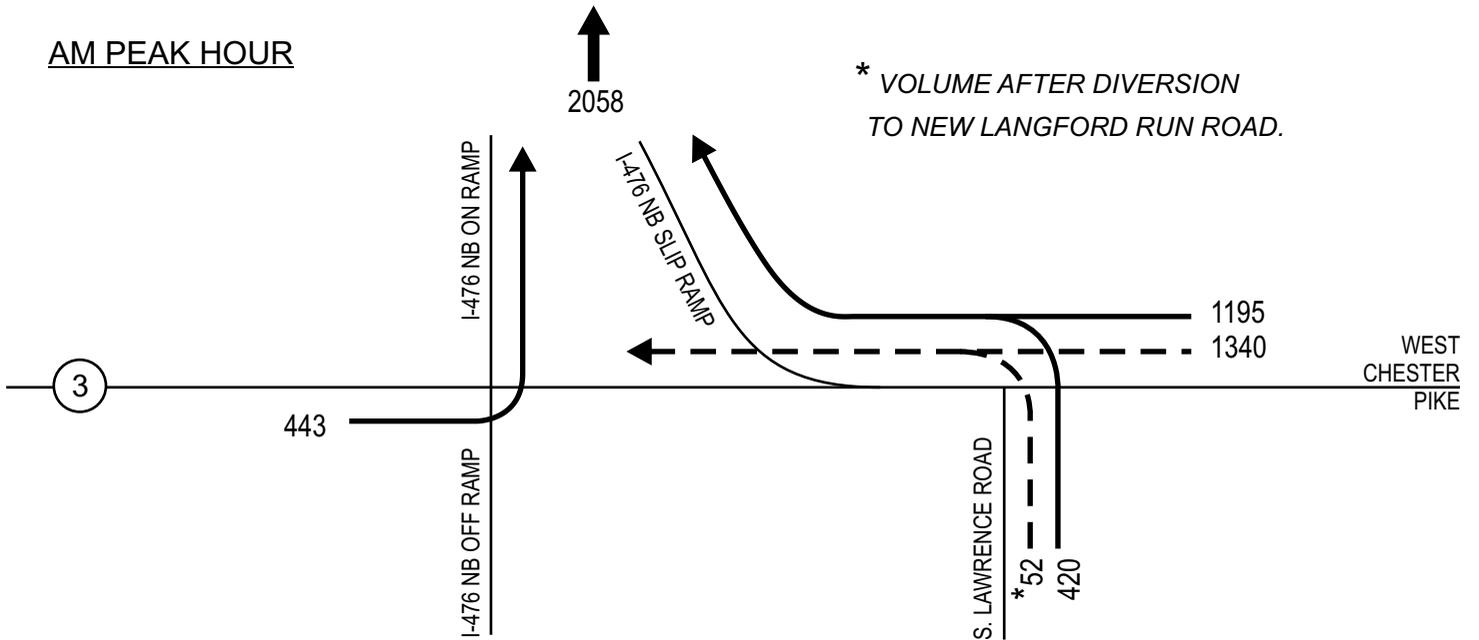
PM Peak Hour - Synchro Results			Existing Storage Length (ft)	2020 Build (Dual SB R)		2020 Build (Single SB R)	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & I-476 SB Ramps (10)	EB	TTT		221	#347	221	#347
	WB	TT		~686	m#707	~686	m#707
	SB	LL		602	#772	602	#772
		T(R)	180	158	52	391	95
		R		153	225	-	-

PM Peak Hour - SimTraffic Results (Avg. of 5 Simulation Runs)			Existing Storage Length (ft)	2020 Build (Dual SB R)		2020 Build (Single SB R)	
				50th % Q length	Max. Q	50th % Q length	Max. Q
West Chester Pike & I-476 SB Ramps (10)	EB	TTT		195	361	164	300
	WB	TT		201	566	187	505
	SB	LL		514	646	505	633
		T(R)	180	130	270	284	488
		R		126	198	-	-

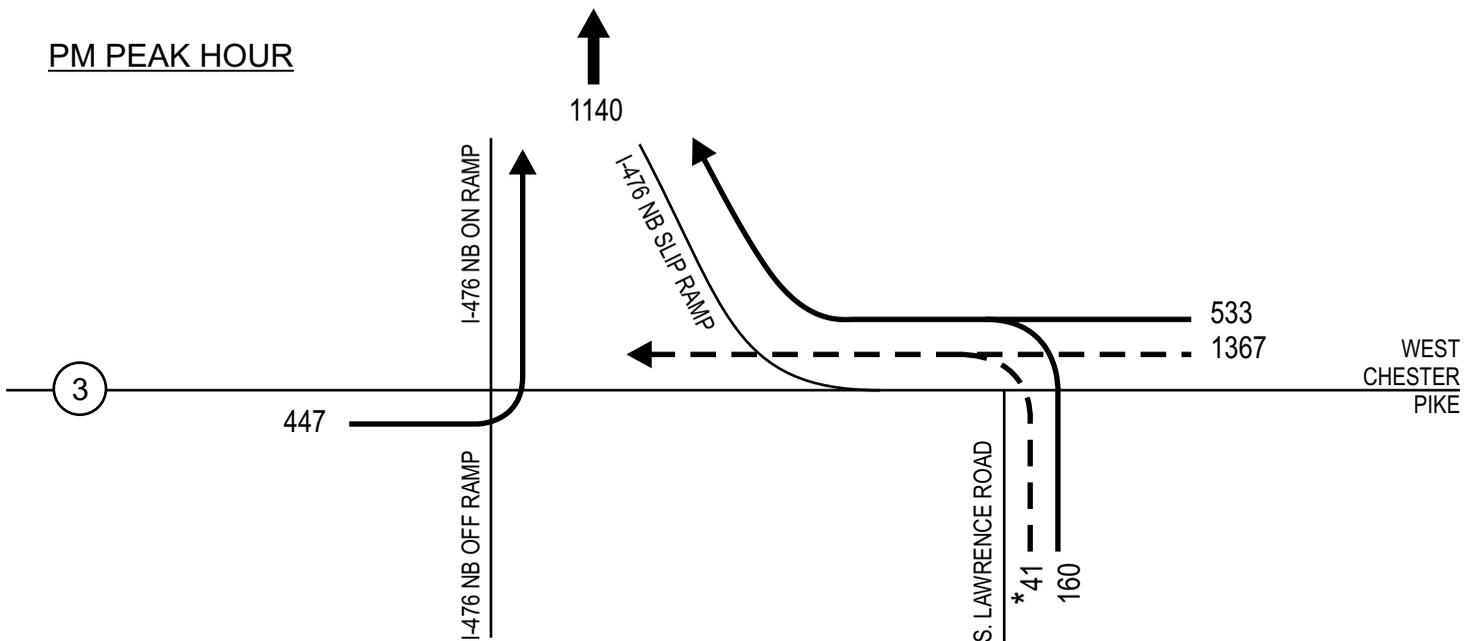
Year 2020 Peak Hour Traffic Volumes with Marple Development
Marple Associates Site
 MARPLE TOWNSHIP
 DELAWARE COUNTY, PENNSYLVANIA



AM PEAK HOUR



PM PEAK HOUR



LEGEND

- TRAFFIC HEADING TO I-476 NORTHBOUND
- TRAFFIC HEADING TO WEST CHESTER PIKE WESTBOUND

Intersection: 2: West Chester Pike & N Lawrence Rd

Movement	EB	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	L	T	T	T	T	TR	L	R
Maximum Queue (ft)	306	314	300	294	703	692	680	394	792
Average Queue (ft)	191	203	130	144	600	616	614	78	766
95th Queue (ft)	270	279	223	229	796	782	771	268	882
Link Distance (ft)		664	664	664	629	629	629		761
Upstream Blk Time (%)					28	38	44		58
Queuing Penalty (veh)					194	260	303		0
Storage Bay Dist (ft)	290							325	
Storage Blk Time (%)	0	0							55
Queuing Penalty (veh)	1	1							29

Intersection: 3: West Chester Pike & N New Ardmore Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	TR	L	T	TR	LT	R	LTR
Maximum Queue (ft)	53	291	288	56	236	240	118	83	219
Average Queue (ft)	11	142	147	17	79	96	36	39	109
95th Queue (ft)	37	246	257	46	172	187	86	72	180
Link Distance (ft)		722	722		292	292	415	415	310
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	180			145					
Storage Blk Time (%)		2			1				
Queuing Penalty (veh)		0			0				

Intersection: 6: West Chester Pike & Langford

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	T	R	L	T	T	L	L	R
Maximum Queue (ft)	296	311	345	120	209	87	94	92	101	192
Average Queue (ft)	188	196	212	35	98	31	37	46	50	87
95th Queue (ft)	294	301	331	86	175	72	78	81	88	161
Link Distance (ft)	280	280	280	280		585	585		754	
Upstream Blk Time (%)	1	1	2							
Queuing Penalty (veh)	3	4	10							
Storage Bay Dist (ft)					450			200		400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Intersection: 10: West Chester Pike & I-476 SB Off-Ramp

Movement	EB	EB	EB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	T	T	L	L	TR	R
Maximum Queue (ft)	337	333	381	196	192	360	364	172	171
Average Queue (ft)	175	135	131	33	36	219	228	83	85
95th Queue (ft)	316	273	294	119	120	340	339	135	140
Link Distance (ft)	585	585	585	676	676	574	574	574	574
Upstream Blk Time (%)			0						
Queuing Penalty (veh)			0						
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 12: I-476 SB Off-Ramp &

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 15: West Chester Pike & I-476 NB

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	T	T	T	TR	L	LTR	R
Maximum Queue (ft)	466	263	282	335	441	487	130	119	180	188
Average Queue (ft)	289	128	154	197	219	250	124	55	100	109
95th Queue (ft)	435	230	254	306	358	421	141	100	154	166
Link Distance (ft)		676	676	676	451	451				1115
Upstream Blk Time (%)					0	0				
Queuing Penalty (veh)					1	3				
Storage Bay Dist (ft)	510						90	520	520	
Storage Blk Time (%)	0					23	19			
Queuing Penalty (veh)	1					151	87			

Intersection: 18: West Chester Pike & S Lawrence Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	T	R	L	L	T	T	L	L	R
Maximum Queue (ft)	158	158	157	141	279	660	717	712	710	722	250
Average Queue (ft)	104	115	116	51	153	277	656	673	429	574	223
95th Queue (ft)	173	169	168	110	234	602	833	758	929	892	310
Link Distance (ft)	63	63	63	63		664	664	664	688	688	
Upstream Blk Time (%)	19	21	24	3		0	12	17	7	21	
Queuing Penalty (veh)	96	107	121	16		2	120	162	0	0	
Storage Bay Dist (ft)					290						200
Storage Blk Time (%)					0	2				48	11
Queuing Penalty (veh)					0	3				207	25

Intersection: 20: West Chester Pike &

Movement	EB	EB	EB	EB	WB	WB
Directions Served	T	T	T	T	T	TR
Maximum Queue (ft)	181	182	130	4	12	100
Average Queue (ft)	20	24	13	0	1	5
95th Queue (ft)	91	98	68	3	11	47
Link Distance (ft)	451	451	451	451	63	63
Upstream Blk Time (%)					0	0
Queuing Penalty (veh)					0	4
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 24: West Chester Pike & Mather Avenue

Movement	EB	SB
Directions Served	T	R
Maximum Queue (ft)	38	34
Average Queue (ft)	3	11
95th Queue (ft)	23	34
Link Distance (ft)	292	146
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 26: West Chester Pike & Old West Chester Pike

Movement	EB	EB	WB	WB	WB	WB	NB	NB	SB
Directions Served	T	TR	L	T	T	TR	LT	R	LR
Maximum Queue (ft)	121	154	220	1274	1276	350	86	96	74
Average Queue (ft)	36	49	72	849	856	270	19	28	20
95th Queue (ft)	89	116	197	1728	1727	493	57	70	55
Link Distance (ft)	629	629		1248	1248		599		180
Upstream Blk Time (%)				25	27				
Queuing Penalty (veh)				0	0				
Storage Bay Dist (ft)			170			300		70	
Storage Blk Time (%)			0	36	36	32	1	1	
Queuing Penalty (veh)			1	22	246	210	0	0	

Network Summary

Network wide Queuing Penalty: 2391

Queue Report
 Free Single Right at Signal of I-476 Northbound On Ramps

2020 AM Peak
 3/28/2011

Intersection: 2: West Chester Pike & N Lawrence Rd

Movement	EB	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	L	T	T	T	T	TR	L	R
Maximum Queue (ft)	287	293	276	269	652	673	681	334	795
Average Queue (ft)	186	195	123	143	547	580	590	55	774
95th Queue (ft)	271	273	206	218	778	769	759	202	808
Link Distance (ft)		664	664	664	629	629	629		761
Upstream Blk Time (%)					18	25	29		61
Queuing Penalty (veh)					121	168	197		0
Storage Bay Dist (ft)	290							325	
Storage Blk Time (%)	0	0							58
Queuing Penalty (veh)	1	1							30

Intersection: 3: West Chester Pike & N New Ardmore Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	TR	L	T	TR	LT	R	LTR
Maximum Queue (ft)	77	336	350	56	212	195	111	74	210
Average Queue (ft)	14	143	149	17	76	92	35	31	103
95th Queue (ft)	56	267	283	43	161	175	80	62	180
Link Distance (ft)		722	722		292	292	415	415	310
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	180			145					
Storage Blk Time (%)	0	3			1				
Queuing Penalty (veh)	0	0			0				

Intersection: 6: West Chester Pike & Langford

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	T	R	L	T	T	L	L	R
Maximum Queue (ft)	342	335	357	140	218	99	110	90	92	211
Average Queue (ft)	187	197	211	42	94	37	43	46	48	97
95th Queue (ft)	309	311	335	99	176	82	87	84	82	180
Link Distance (ft)	280	280	280	280		585	585		754	
Upstream Blk Time (%)	2	1	2							
Queuing Penalty (veh)	7	4	10							
Storage Bay Dist (ft)					450			200		400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queue Report
 Free Single Right at Signal of I-476 Northbound On Ramps

2020 AM Peak
 3/28/2011

Intersection: 10: West Chester Pike & I-476 SB Off-Ramp

Movement	EB	EB	EB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	T	T	L	L	TR	R
Maximum Queue (ft)	375	371	304	146	127	361	369	237	198
Average Queue (ft)	181	144	117	16	21	222	225	83	80
95th Queue (ft)	333	299	251	71	74	319	327	155	146
Link Distance (ft)	585	585	585	676	676	574	574	574	574
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 12: I-476 SB Off-Ramp &

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 15: West Chester Pike & I-476 NB

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	T	T	T	R	L	LTR	R
Maximum Queue (ft)	519	580	415	385	602	607	609	126	178	172
Average Queue (ft)	350	167	160	202	379	444	365	56	101	102
95th Queue (ft)	549	418	297	330	618	663	772	103	153	159
Link Distance (ft)		676	676	676	593	593	593			1115
Upstream Blk Time (%)		1			1	2	4			
Queuing Penalty (veh)		4			10	16	36			
Storage Bay Dist (ft)	510							520	520	
Storage Blk Time (%)	5									
Queuing Penalty (veh)	29									

Queue Report
 Free Single Right at Signal of I-476 Northbound On Ramps

2020 AM Peak
 3/28/2011

Intersection: 17: Bend

Movement	NB	NB
Directions Served		T
Maximum Queue (ft)	808	932
Average Queue (ft)	471	494
95th Queue (ft)	936	1047
Link Distance (ft)	927	927
Upstream Blk Time (%)		2
Queuing Penalty (veh)		21
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 18: West Chester Pike & S Lawrence Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	T	R	L	L	T	T	L	L	R
Maximum Queue (ft)	286	277	238	116	326	478	740	703	377	408	250
Average Queue (ft)	139	140	129	45	178	238	324	408	175	187	163
95th Queue (ft)	239	230	206	92	298	424	649	663	315	355	271
Link Distance (ft)	593	593	593	593		664	664	664	688	688	
Upstream Blk Time (%)						0	2	2			
Queuing Penalty (veh)						1	15	23			
Storage Bay Dist (ft)					290						200
Storage Blk Time (%)					0	6				9	5
Queuing Penalty (veh)					0	11				39	11

Intersection: 24: West Chester Pike & Mather Avenue

Movement	EB	EB	EB	SB
Directions Served	T	T	T	R
Maximum Queue (ft)	12	56	77	43
Average Queue (ft)	0	2	3	13
95th Queue (ft)	7	29	33	38
Link Distance (ft)		292	292	146
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	0	0		
Queuing Penalty (veh)	0	0		

Queue Report
 Free Single Right at Signal of I-476 Northbound On Ramps

2020 AM Peak
 3/28/2011

Intersection: 26: West Chester Pike & Old West Chester Pike

Movement	EB	EB	WB	WB	WB	WB	NB	NB	SB
Directions Served	T	TR	L	T	T	TR	LT	R	LR
Maximum Queue (ft)	167	168	183	860	869	336	93	89	70
Average Queue (ft)	44	54	58	364	378	177	25	30	21
95th Queue (ft)	112	127	145	1103	1110	411	72	71	59
Link Distance (ft)	629	629		1248	1248		599		180
Upstream Blk Time (%)				2	2				
Queuing Penalty (veh)				0	0				
Storage Bay Dist (ft)			170			300		70	
Storage Blk Time (%)				19	14	13	3	1	
Queuing Penalty (veh)				12	93	85	1	0	

Network Summary

Network wide Queuing Penalty: 948

Queue Report
 Free Dual Right at Signal of I-476 Northbound On Ramps

2020 AM Peak
 3/28/2011

Intersection: 2: West Chester Pike & N Lawrence Rd

Movement	EB	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	L	T	T	T	T	TR	L	R
Maximum Queue (ft)	297	309	297	294	671	677	685	329	789
Average Queue (ft)	188	196	134	148	526	566	577	51	775
95th Queue (ft)	274	280	232	239	743	751	753	191	799
Link Distance (ft)		664	664	664	629	629	629		761
Upstream Blk Time (%)					9	14	18		61
Queuing Penalty (veh)					62	98	122		0
Storage Bay Dist (ft)	290							325	
Storage Blk Time (%)	0	1							58
Queuing Penalty (veh)	1	2							30

Intersection: 3: West Chester Pike & N New Ardmore Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	TR	L	T	TR	LT	R	LTR
Maximum Queue (ft)	77	325	345	62	214	196	111	74	210
Average Queue (ft)	14	139	146	18	77	95	35	31	103
95th Queue (ft)	56	261	276	47	162	176	80	63	180
Link Distance (ft)		722	722		292	292	415	415	310
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	180			145					
Storage Blk Time (%)	0	2			1				
Queuing Penalty (veh)	0	0			0				

Intersection: 6: West Chester Pike & Langford

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	T	R	L	T	T	L	L	R
Maximum Queue (ft)	325	327	347	127	227	90	99	87	94	211
Average Queue (ft)	188	195	210	41	94	36	43	45	48	96
95th Queue (ft)	305	310	335	93	179	80	85	82	84	179
Link Distance (ft)	280	280	280	280		585	585		754	
Upstream Blk Time (%)	2	1	3							
Queuing Penalty (veh)	7	5	12							
Storage Bay Dist (ft)					450			200		400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queue Report
 Free Dual Right at Signal of I-476 Northbound On Ramps

2020 AM Peak
 3/28/2011

Intersection: 10: West Chester Pike & I-476 SB Off-Ramp

Movement	EB	EB	EB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	T	T	L	L	TR	R
Maximum Queue (ft)	359	327	286	108	100	361	369	237	193
Average Queue (ft)	182	140	114	14	19	222	225	82	80
95th Queue (ft)	327	280	241	59	63	319	325	156	144
Link Distance (ft)	585	585	585	676	676	574	574	574	574
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 12: I-476 SB Off-Ramp &

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 15: West Chester Pike & I-476 NB

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	T	T	T	R	R	L	LTR	R
Maximum Queue (ft)	516	565	331	346	597	578	581	568	131	179	172
Average Queue (ft)	338	164	160	198	365	398	289	141	57	100	103
95th Queue (ft)	525	397	274	310	607	612	676	490	105	152	158
Link Distance (ft)		676	676	676	593	593	593	593			1115
Upstream Blk Time (%)		0			2	1	1	0			
Queuing Penalty (veh)		1			13	8	5	3			
Storage Bay Dist (ft)	510								520	520	
Storage Blk Time (%)	3										
Queuing Penalty (veh)	17										

Queue Report
Free Dual Right at Signal of I-476 Northbound On Ramps

2020 AM Peak
3/28/2011

Intersection: 18: West Chester Pike & S Lawrence Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	T	R	L	L	T	T	L	L	R
Maximum Queue (ft)	280	270	280	111	332	462	571	652	283	344	250
Average Queue (ft)	141	138	131	46	180	232	268	352	155	157	150
95th Queue (ft)	241	222	215	93	302	428	524	575	243	269	251
Link Distance (ft)	593	593	593	593		664	664	664	688	688	
Upstream Blk Time (%)						0	1	1			
Queuing Penalty (veh)						0	7	6			
Storage Bay Dist (ft)					290						200
Storage Blk Time (%)					0	6			2	3	
Queuing Penalty (veh)					0	11			10	8	

Intersection: 24: West Chester Pike & Mather Avenue

Movement	EB	EB	EB	SB
Directions Served	T	T	T	R
Maximum Queue (ft)	5	34	68	43
Average Queue (ft)	0	1	3	13
95th Queue (ft)	3	24	30	39
Link Distance (ft)		292	292	146
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	50			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 26: West Chester Pike & Old West Chester Pike

Movement	EB	EB	WB	WB	WB	WB	NB	NB	SB
Directions Served	T	TR	L	T	T	TR	LT	R	LR
Maximum Queue (ft)	122	172	164	584	633	323	93	89	63
Average Queue (ft)	40	53	53	193	207	111	25	30	18
95th Queue (ft)	101	126	124	775	793	312	71	72	50
Link Distance (ft)	629	629		1248	1248		599		180
Upstream Blk Time (%)				2	2				
Queuing Penalty (veh)				0	0				
Storage Bay Dist (ft)			170			300		70	
Storage Blk Time (%)				9	6	5	2	1	
Queuing Penalty (veh)				6	43	33	1	0	

Network Summary

Network wide Queuing Penalty: 511

Arterial Level of Service: EB West Chester Pike

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
S New Ardmore Ave	3	7.4	19.6	0.1	27	26	7.8
Mather Avenue	24	2.3	7.8	0.1	32	32	2.4
Langford	6	17.4	22.6	0.1	10	11	16.4
	10	15.4	25.7	0.1	18	18	15.7
I-476 NB Off-Ramp	15	17.9	29.1	0.1	17	18	17.5
	20	3.7	11.6	0.1	33	33	3.9
S Lawrence Rd	18	9.2	11.4	0.0	8	7	10.0
N Lawrence Rd	2	8.9	20.4	0.1	25	25	8.8
Old West Chester Pik	26	4.6	15.3	0.1	31	31	4.9
Total		86.8	163.5	1.0	21	21	87.4

Arterial Level of Service: EB West Chester Pike

Cross Street	Run 2 Speed	Run 2 Delay	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay	Run 1 Speed
S New Ardmore Ave	26	7.7	27	7.3	28	6.7	27
Mather Avenue	32	2.4	32	2.3	32	2.2	32
Langford	10	17.9	10	17.9	11	17.1	10
	18	15.6	18	15.1	19	14.6	18
I-476 NB Off-Ramp	18	17.7	17	18.4	18	17.4	17
	34	3.6	33	3.7	34	3.4	33
S Lawrence Rd	8	9.0	8	9.2	8	9.0	8
N Lawrence Rd	25	8.8	25	8.8	25	8.6	24
Old West Chester Pik	32	4.3	31	4.6	32	4.2	31
Total	21	86.9	21	87.2	21	83.3	21

Arterial Level of Service: WB West Chester Pike

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
Old West Chester Pik	26	194.0	214.3	0.2	7	7	207.9
N Lawrence Rd	2	111.5	122.1	0.1	4	4	117.6
S Lawrence Rd	18	30.2	41.5	0.1	13	12	34.3
	20	2.0	4.3	0.0	21	20	2.2
I-476 NB	15	22.5	30.8	0.1	12	13	22.3
I-476 SB Off-Ramp	10	6.4	18.0	0.1	28	29	6.1
Langford	6	3.3	13.4	0.1	34	34	3.5
Mather Avenue	24	1.1	6.5	0.1	36	36	1.1
N New Ardmore Ave	3	5.1	10.6	0.1	23	23	5.2
Total		376.2	461.5	1.1	10	10	400.2

Arterial Level of Service: WB West Chester Pike

Cross Street	Run 2 Speed	Run 2 Delay	Run 1 Speed	Run 1 Delay	2020 Build AM Peak Hour Conditions	Run 1 Speed	Run 1 Delay
Old West Chester Pik	7	219.0	8	132.3	7	230.4	7
N Lawrence Rd	4	112.1	4	105.8	4	111.0	4
S Lawrence Rd	13	28.6	13	30.2	12	29.7	13
	21	2.1	21	1.9	20	2.0	21
I-476 NB	12	22.5	13	22.0	12	22.8	12
I-476 SB Off-Ramp	27	7.3	30	5.5	28	6.8	28
Langford	34	3.5	35	3.0	34	3.5	35
Mather Avenue	36	1.1	36	1.1	36	1.2	36
N New Ardmore Ave	23	5.2	23	5.4	24	5.0	24
Total	10	401.3	11	307.2	10	412.3	10

Arterial Level of Service: EB West Chester Pike

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
S New Ardmore Ave	3	7.8	20.1	0.1	26	27	7.0
Mather Avenue	24	2.4	7.9	0.1	32	31	2.5
Langford	6	17.5	22.7	0.1	10	10	19.4
	10	15.1	25.4	0.1	18	19	14.6
I-476 NB Off-Ramp	15	18.2	29.4	0.1	17	17	18.8
S Lawrence Rd	18	12.6	22.7	0.1	21	19	14.2
N Lawrence Rd	2	8.8	20.3	0.1	25	25	8.5
Old West Chester Pik	26	4.9	15.5	0.1	31	31	5.0
Total		87.4	164.0	1.0	21	21	90.0

Arterial Level of Service: EB West Chester Pike

Cross Street	Run 476 NB On Ramp Signal	Run 476 NB Off-Ramp Signal	Run 2020 Build	AM Peak	HOV 3+ Conditions	Run 1 Ramp at Signal
	Speed	Delay	Speed	Delay	Speed	Delay
S New Ardmore Ave	25	8.5	27	7.3	26	8.0
Mather Avenue	32	2.4	32	2.2	32	2.3
Langford	11	15.9	11	16.7	10	17.8
	18	14.8	18	15.0	17	16.6
I-476 NB Off-Ramp	17	17.8	17	18.2	17	18.9
S Lawrence Rd	21	12.3	21	12.2	21	12.3
N Lawrence Rd	25	8.8	25	8.8	25	9.0
Old West Chester Pik	31	5.0	31	4.9	32	4.4
Total	21	85.3	21	85.3	21	89.4

Arterial Report
 Free Single Right at Signal of I-476 Northbound On Ramps

2020 AM Peak
 3/18/2011

Arterial Level of Service: WB West Chester Pike

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
Old West Chester Pik	26	37.7	58.1	0.2	16	30	10.7
N Lawrence Rd	2	86.4	97.0	0.1	5	6	78.2
S Lawrence Rd	18	23.1	34.3	0.1	15	15	24.5
I-476 NB	15	36.0	46.5	0.1	10	10	38.1
I-476 SB Off-Ramp	10	4.7	16.3	0.1	31	32	4.3
Langford	6	3.2	13.2	0.1	35	36	2.7
Mather Avenue	24	1.1	6.5	0.1	36	37	1.1
N New Ardmore Ave	3	4.9	10.4	0.1	24	24	4.8
Total		197.1	282.4	1.1	14	15	164.5

Arterial Level of Service: WB West Chester Pike

Cross Street	Run 476 NB On Ramp Signal	Run 476 SB Off-Ramp Signal	Run 20 Build	Run 20 Peak	Run 20 Conditions	Run 20 Slip Ramp at Signal
	Speed	Delay	Speed	Delay	Speed	Delay
Old West Chester Pik	32	8.8	16	37.3	11	64.7
N Lawrence Rd	6	69.6	5	91.3	5	92.6
S Lawrence Rd	18	17.5	16	21.2	17	18.7
I-476 NB	12	27.4	10	34.7	11	33.5
I-476 SB Off-Ramp	32	4.4	29	5.6	31	4.8
Langford	35	3.0	34	3.7	35	3.2
Mather Avenue	37	1.0	36	1.1	36	1.1
N New Ardmore Ave	24	5.0	24	5.1	25	4.6
Total	17	136.7	13	200.0	12	223.3

Arterial Level of Service: EB West Chester Pike

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
S New Ardmore Ave	3	7.7	19.9	0.1	26	27	6.9
Mather Avenue	24	2.4	7.9	0.1	32	31	2.5
Langford	6	17.4	22.6	0.1	10	9	19.6
	10	15.1	25.4	0.1	18	18	15.1
I-476 NB Off-Ramp	15	18.2	29.3	0.1	17	17	18.9
S Lawrence Rd	18	12.9	22.9	0.1	21	20	13.3
N Lawrence Rd	2	9.1	20.6	0.1	25	25	8.7
Old West Chester Pik	26	4.9	15.6	0.1	31	30	5.2
Total		87.6	164.2	1.0	21	21	90.2

Arterial Level of Service: EB West Chester Pike

Cross Street	Run 4 On Ramp	Run 2 On Ramp	Signalized Ramp	Test 2020	2020 AM Peak Hour	Conditions	Double Right
	Speed	Delay	Speed	Delay	Speed	Delay	Speed
S New Ardmore Ave	26	7.8	27	7.5	26	7.8	25
Mather Avenue	32	2.3	32	2.2	32	2.3	31
Langford	12	14.7	10	17.9	11	16.9	10
	19	14.1	18	15.3	17	16.5	19
I-476 NB Off-Ramp	18	17.6	17	18.7	17	18.6	18
S Lawrence Rd	21	12.3	21	12.7	21	12.5	20
N Lawrence Rd	25	9.0	25	9.1	26	8.3	23
Old West Chester Pik	31	4.8	31	4.9	32	4.4	31
Total	22	82.6	21	88.3	21	87.3	21

Arterial Level of Service: WB West Chester Pike

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
Old West Chester Pik	26	21.4	41.6	0.2	22	33	8.1
N Lawrence Rd	2	78.0	88.5	0.1	6	5	89.7
S Lawrence Rd	18	19.1	30.4	0.1	17	17	19.9
I-476 NB	15	41.2	51.8	0.1	9	9	42.2
I-476 SB Off-Ramp	10	4.8	16.4	0.1	31	31	4.8
Langford	6	3.2	13.2	0.1	35	36	2.8
Mather Avenue	24	1.1	6.5	0.1	36	37	1.1
N New Ardmore Ave	3	4.9	10.4	0.1	24	24	4.8
Total		173.8	258.8	1.1	15	15	173.5

Arterial Level of Service: WB West Chester Pike

Cross Street	Run 4 On Ramp Speed	Run 2 On Ramp Delay	Signalized Ramp Speed	Signalized Ramp Delay	2020 AM Peak Hour Conditions	Run 1 Double Right Delay	Run 1 Double Right Speed
Old West Chester Pik	35	6.1	28	11.9	10	71.6	32
N Lawrence Rd	6	65.0	6	74.4	5	91.7	6
S Lawrence Rd	21	13.5	18	17.1	20	14.3	12
I-476 NB	13	25.3	10	36.6	11	33.4	6
I-476 SB Off-Ramp	32	4.3	30	5.3	30	5.2	32
Langford	35	3.0	34	3.7	35	3.2	35
Mather Avenue	37	1.0	36	1.1	37	1.0	36
N New Ardmore Ave	24	5.1	23	5.1	25	4.7	24
Total	18	123.2	16	155.2	12	225.1	14

PROPOSED LANE CONFIGURATION:
 (1) LEFT-TURN LANE, (1) SHARED LEFT/THRU/RIGHT TURN LANE, AND (1) RIGHT-TURN LANE

I-476 NB OFF-RAMP

WEST CHESTER PIKE
 PA ROUTE 3

LAWRENCE ROAD

INTERSTATE 476
 BLUE ROUTE

LANE ENDS
 MERGE
 RIGHT

LANE ENDS
 MERGE
 RIGHT

130'
 RADIUS

600'
 TAPERED DESIGN

I-476 NB
 ON-RAMP

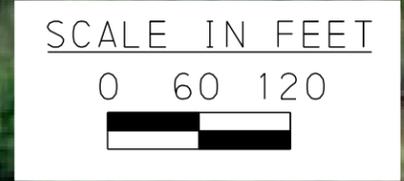
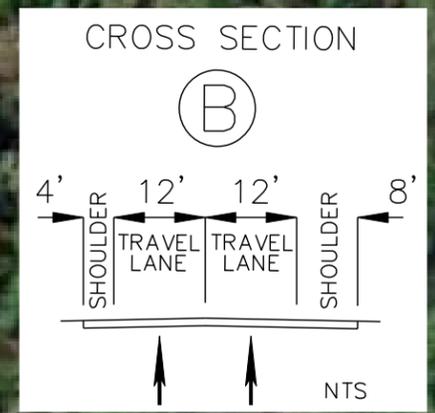
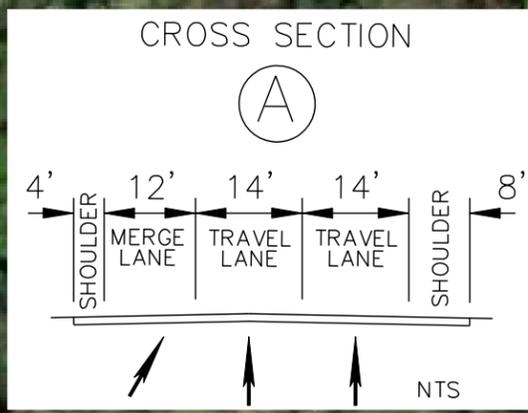
300'

300'

PARALLEL DESIGN

PROPOSED DOUBLE
 RIGHT-TURN LANE
 (20' WIDE LANES
 ALONG CURVE)
 IS FREE FLOW
 UNLESS PEDESTRIAN
 ACTIVATED

12' WIDE
 LANES; 8'
 SHOULDER





pennsylvania

DEPARTMENT OF TRANSPORTATION

www.dot.state.pa.us

Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

May 9, 2011

DELAWARE COUNTY, MARPLE TOWNSHIP
S.R. 0003 (WEST CHESTER PIKE)
HIGHWAY OCCUPANCY PERMIT APPLICATION NO. pre689
MARPLE ASSOCIATES SITE
TRAFFIC LOG NO.: D09-039XR
REVIEW OF SUPPLEMENTAL SUBMISSION

Adrienne Eiss, PTP
Orth-Rodgers and Associates
301 Lindenwood Drive, Suite 130
Malvern, PA 19355

Dear Mrs. Eiss:

The Department has reviewed the supplemental materials submitted responding to items 2, 5, 8 and 10 as discussed at our February 15, 2011 meeting. Our comments on this submission are as follows:

PRELIMINARY COMMENTS

1. The submitted letter only summarizes findings for specific periods. While it is agreed that these are generally the "critical" periods of the individual locations referenced in the letter, a final determination regarding the need for or adequacy of mitigation cannot be finalized until the results of evaluations of all applicable periods are provided. As such, the Department reserves the right to make future additional comments based on a formal submission of the complete Transportation Impact Study.
2. Northbound I-476 and S.R. 0003
 - a. Northbound I-476 on-ramp
 - i) The submitted materials indicate that the dual right turn lane concept operates with lower delays and queues during the PM Peak under future build conditions than the existing configuration. Future TIS submissions must address all study periods.
 - ii) Verify that all reported results are consistent with the analyses output.
 - iii) Ensure that the Synchro file for dual right turn lane alternative accurately reflects the conceptual design with respect to operating speed, lane configurations, lane lengths and merge directions.
 - iv) HCS+ Ramps Analyses referenced in the submission should be included with future submissions.
 - v) Provide the specific design criteria used to develop the dual right turn lane concept and provide specific references to the sections and/or exhibits of the current AASHTO Green Book. Additionally, the following must be addressed:

- (1) Ensure that adequate distance is provided from start of the on-ramp to accommodate vehicles accelerating from a full stop to the ramp operating speed prior to the first lane reduction taper.
 - (2) Provide the AASHTO criteria used to establish the 300' buffer difference the two lane reduction tapers.
 - (3) The second lane drop, while labeled as a parallel design (continuing the left lane of a two-lane ramp onto the freeway and dropping the right lane) appears to be a left lane drop.
 - (4) The type of lane drop selected should consider the approach traffic volumes.
- b. Northbound I-476 off-ramp
- i) The submitted materials indicate that the dual right turn lane concept operates with lower delays and queues during the PM Peak under future build conditions. Future TIS submissions must address all study periods, as well as previously discussed concerns regarding reductions to the green split for the northbound approach during the AM peak.
 - ii) If the dual right turn lanes are determined to be acceptable mitigation, then modifications to the existing overhead lane control will be required to direct vehicles to South Lawrence Road.
- c. The applicant will be required to provide compliant modifications to the intersection pedestrian facilities once a final determination regarding appropriate mitigation of project traffic impacts at this intersection has been determined.
3. Southbound I-476 off-ramp to S.R. 0003
- a. The single right turn lane concept should provide a new dedicated right turn lane, not a shared through-right turn lane.

Additional comments may follow upon review of the submitted application. If you have any questions pertaining to the technical aspects of this review, please contact Albert Federico, P.E., PTOE of McCormick Taylor Inc. at 610.640.3500 or at apfederico@mtmail.biz.

Respectfully,



Francis J. Hanney
District Traffic Services Manager
Engineering District 6-0

cc: R. Avicelli
L.R. Belmonte
A.B. Patel
Traffic Services File
Marple Township
Haverford Township
Delaware County Planning Commission

May 18, 2011

Mr. Francis J. Hanney
District Traffic Services Manager
PennDOT, Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

RE: HOP Application No. pre689
Traffic Log No. D09-039XR
Marple Associates Site
Delaware County, Marple
Township

Dear Fran,

This letter addresses your review letter dated May 9, 2011 concerning our most recent response to PennDOT comments on the Marple Associates traffic analysis. The comments are restated, followed by the response.

1. *The submitted letter only summarizes findings for specific periods. While it is agreed that these are generally the “critical” periods of the individual locations referenced in the letter, a final determination regarding the need for or adequacy of mitigation cannot be finalized until the results of evaluations of all applicable periods are provided. As such, the Department reserves the right to make future additional comments based on a formal submission of the complete traffic impact study.*

In the interest of controlling costs of analysis for the client, we have we submitted analyses of the worst time period. We intend to prepare the complete final TIS report after receiving an indication from PennDOT that the proposed improvements are acceptable for the time periods shown. We understand that the determination of required improvements cannot be finalized until all time periods are provided and reviewed by the Department. We believe that once the improvements for the critical time periods are agreed upon, they will also be adequate for the other time periods and we can efficiently complete the full TIS documentation.

2. *Northbound I-476 and S.R. 0003*

- 2a. *Northbound I-476 on-ramp*

The May 9 review letter has several comments on ORA’s traffic analysis and on the layout of a relocated on ramp with dual right turn lane at the signal.

The intersection traffic mitigation requirements are met by improving the northbound off ramp, and therefore we do not propose to modify the on ramp.

2b. Northbound I-476 off-ramp

- i) *The submitted materials indicate that the dual right turn lane concept operates with lower delays and queues during the PM peak under future build conditions. Future TIS submissions must address all study periods, as well as previously discussed concerns regarding reductions to the green split for the northbound approach during the AM peak.*

With regard to the green split for the northbound approach, the following table is extracted from Table 1 from our response letter dated December 23, 2010. It was used to address Comment 5 from PennDOT’s review letter dated November 29, 2010 that expressed PennDOT’s concern on the “decreased green splits for minor approaches”. The side street green splits shown in the table were used for the analysis described in our last two response letters (Dec. 2010 & Apr. 2011). The modified splits are fairly close to what are being used under the existing conditions. The proposed reduction in off-ramp green time is 5 seconds in the AM and 4 seconds in the PM and Saturday peak hours. This reduction is more than compensated for by the restriping of the ramp to provide a dual right turn.

Table 1. Signal Timing Splits (seconds) at the Intersection of WCP & I-476 NB Off-Ramp

Scenario		AM	PM	SAT
<u>Existing Ramp Split</u>		<u>33</u>	<u>42</u>	<u>31</u>
Updated analysis Ramp Split	2020 No Build	30	42	31
	2020 Build	28	38	27

With the above timings as well as the provision of the dual right turn lanes (with No Turn on Red for the dual right) at the northbound off-ramp approach, PennDOT’s LOS criteria are met during all three peak periods. The queue lengths with the proposed development traffic are comparable with those without development. The Synchro analysis results for LOS and queue length at the intersection of West Chester Pike and I-476 northbound ramp for year 2020, all study periods, are summarized in Tables 2 and 3 below.

Table 2. Peak Periods LOS Comparisons at the Intersection of WCP & I-476 NB Off-Ramp
 (2020 No Build vs. 2020 Build)

West Chester Pike & I-476 NB Ramps		AM		PM		SAT	
		2020 No Build	2020 Build	2020 No Build	2020 Build	2020 No Build	2020 Build
EB	Left	E(63)	D(46)	D(55)	D(40)	D(45)	D(47)
	Thru	A(9)	A(10)	B(19)	B(14)	B(11)	A(10)
WB	Thru	E(71)	E(69)	D(37)	D(49)	B(15)	C(26)
NB	Left	C(32)	D(41)	C(32)	D(52)	C(31)	D(47)
	LT(R)	C(32)	D(50)	C(32)	E(60)	C(31)	D(52)
	Right	E(60)	D(49)	F(115)	E(59)	E(61)	D(52)
Overall		D(44)	D(40)	D(36)	C(32)	B(20)	C(24)

Table 3. Peak Periods Queue Length Comparisons at the Intersection of
 WCP & I-476 NB Off-Ramp (2020 No Build vs. 2020 Build)

AM Peak Hour			2020 No Build		2020 Build	
			50th % Q length	95th % Q length	50th % Q length	95th % Q length
EB	L	510	~351	#466	378	#516
	TTT		158	272	213	278
WB	TT		352	m254	~463	m348
NB	L	520	57	100	116	170
	LT(R)	520	58	28	140	51
	R		186	236	127	167

PM Peak Hour			2020 No Build		2020 Build	
			50th % Q length	95th % Q length	50th % Q length	95th % Q length
EB	L	510	321	#401	440	m#479
	TTT		445	m517	498	m603
WB	TT		420	#495	~469	#563
NB	L	520	86	144	232	333
	LT(R)	520	86	35	234	342
	R		~470	#690	222	326

SAT Peak Hour			2020 No Build		2020 Build	
			50th % Q length	95th % Q length	50th % Q length	95th % Q length
EB	L	510	136	186	214	270
	TTT		228	210	240	238
WB	TT		208	265	325	374
NB	L	520	51	92	144	216
	LT(R)	520	51	25	145	54
	R		207	#367	134	#224

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Marple Associates
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Please note that the previously discussed concern regarding minor street green time at the intersection of South Lawrence Road was also addressed in our letter of December 23, 2010 by increasing the minor street time from what was presented in the original TIS. In 2020 with the proposed development, because of the traffic diversion onto the new Langford Run Road connection as well as the closure of the Pathmark Supermarket, the projected traffic volumes coming out of South Lawrence Road actually are somewhat lower (975 vs. 903 in the AM, 706 vs. 585 in the PM, 639 vs. 567 in Saturday). That is why it is possible to re-allocate some green time from the side street to West Chester Pike to improve the LOS and progression on the mainline without severely affecting the operation of the side street traffic.

The updated Synchro output summary matrices for LOS and queue are attached for all three analysis hours for the entire network.

2b. Northbound I-476 off-ramp

- ii) If the dual right turn lanes are determined to be acceptable mitigation, then modifications to the existing overhead lane control will be required to direct vehicles to South Lawrence Road.*

We concur.

We request a determination from PennDOT that dual right turn lanes on the northbound off ramp are an acceptable mitigation.

2c. The applicant will be required to provide compliant modifications to the intersection pedestrian facilities once a final determination regarding appropriate mitigation of project traffic impacts at this intersection has been determined.

Our understanding from the February 15 meeting was that pedestrians on West Chester Pike could all be directed to walk along the north side between the new signal at Langford Run Road and North Lawrence Road, so we would need to remove crosswalks and pedestrian signals for crossing West Chester Pike at the ramp intersections in between (there are no crossings of West Chester Pike at South Lawrence). However, looking at the northwest corner of the North Lawrence Road intersection (which has guiderail at the curb and a steep drop-off) and the north side of West Chester Pike east of North Lawrence (which has embankment with no sidewalk or shoulder area for walking), it appears that directing all pedestrians to the north side might not be the best answer.

As an alternative, we can provide for pedestrians crossing West Chester Pike at the northbound I-476 ramp intersection using a two-stage crossing. Once actuated by a pedestrian, the eastbound through traffic on West Chester Pike would be stopped during the protected eastbound left turn phase and the pedestrian would be allowed to cross between the south side of West Chester Pike and the median. The pedestrian would cross between the median and the

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north side of West Chester Pike during the green phase for the northbound off-ramp movements. Currently, this intersection is already configured for a two-stage crossing for pedestrians with provision of a push button in the median, because the ramp phase green time is not sufficient for the full-width pedestrian crossing. Given the infrequent pedestrian activities at this location, we do not expect the proposed alternative will have any significant impact on the eastbound through traffic at the ramp intersection.

We would appreciate further input and perhaps a field meeting including the Township traffic engineers to determine the best accommodation for the pedestrian.

3. *Southbound I-476 off-ramp to S.R. 0003*

The single right turn lane concept should provide a new dedicated right turn lane, not a shared through-right turn lane.

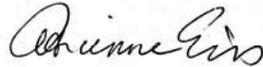
We concur.

At this point, we believe we do not need a waiver for Level of Service.

At the February 15, 2011 meeting at PennDOT, representatives of both Marple Township and Haverford Township said that they could work out an agreement regarding operation and maintenance of a shared signal system for West Chester Pike. Therefore, we propose to combine the signals into a single system with the master in Haverford Township. Marple Township would need to be provided with a copy of the Aries system software so they could monitor the Marple signals.

We are eager to resolve these few last remaining questions and prepare the formal Traffic Impact Study report. Thank you.

Very truly yours,
ORTH- RODGERS & ASSOCIATES, INC.



ADRIENNE EISSL, PTP
Senior Project Manager

cc: Albert Federico
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Paul Lutz
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Anthony Hamaday, Marple Township
Lori Hanlon-Widdop, Haverford Township
Michael Schneider, Pennoni Associates
Joseph Mastronardo, Pennoni Associates

Appendix Table 1. AM Peak Hour Level of Service Comparison

intersection (node)	approach	movement	Existing (by move)	2015 No Build (move)	2015 Build (move)	2020 No Build (move)	2020 Build (move)
West Chester Pike & New Ardmore (3)	EB	Left	E(55)	E(66)	E(66)	E(66)	E(66)
		Thru/Right	B(15)	B(15)	B(14)	B(15)	B(14)
	WB	Left	D(50)	E(63)	E(69)	E(65)	E(69)
		Thru/Right	B(13)	A(6)	A(10)	A(6)	A(10)
	NB	Left/Thru	D(38)	D(37)	D(39)	D(37)	D(39)
		Right	D(36)	D(35)	D(37)	D(35)	D(37)
	SB	LTR	D(54)	D(51)	E(61)	D(51)	E(61)
Overall			B(18)	B(15)	B(17)	B(15)	B(17)
West Chester Pike & Langford (6)	EB	Thru			C(26)		C(26)
		Right			A(10)		A(10)
	WB	Left			C(26)		C(26)
		Thru			A(2)		A(2)
	NB	Left			D(44)		D(44)
		Right			C(28)		C(28)
	Overall					B(18)	
West Chester Pike & I-476 SB Ramps (10)	EB	Thru	B(18)	B(12)	B(17)	B(13)	B(17)
	WB	Thru	B(18)	A(6)	A(5)	A(6)	A(5)
	SB	Left	D(36)	D(36)	C(34)	D(36)	C(34)
		Thru	C(24)	C(24)	C(23)	C(24)	C(23)
		Right			D(37)		D(37)
	Overall			B(19)	B(16)	B(19)	B(16)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	E(61)	E(59)	D(44)	E(63)	D(46)
		Thru	A(9)	A(9)	A(9)	A(9)	A(10)
	WB	Thru	F(95)	E(66)	E(63)	E(71)	E(69)
		Left	C(32)	C(33)	D(41)	C(32)	D(41)
	NB	LT(R)	C(32)	C(33)	D(49)	C(32)	D(50)
		Right	D(50)	E(59)	D(50)	E(60)	D(49)
	Overall			D(52)	D(41)	D(38)	D(44)
West Chester Pike & S Lawrence Rd (18)	EB	Thru	C(29)	B(13)	B(14)	B(13)	B(13)
		Right	B(13)	A(4)	A(5)	A(3)	A(5)
	WB	Left	D(54)	D(48)	D(47)	D(48)	D(47)
		Thru	F(89)	E(74)	E(72)	E(75)	E(77)
	NB	Left	D(37)	D(45)	D(47)	D(47)	D(48)
		Right	C(24)	C(26)	C(31)	C(27)	C(31)
	Overall			D(55)	D(45)	D(45)	D(45)
West Chester Pike & N Lawrence Rd (2)	EB	Left	D(40)	D(46)	D(44)	D(46)	D(44)
		Thru	A(5)	A(9)	B(10)	A(9)	B(10)
	WB	Thru/Right	B(18)	C(34)	D(46)	D(36)	D(50)
		Left	D(45)	C(34)	C(34)	C(34)	C(34)
	SB	Right	F(264)	F(133)	F(142)	F(136)	F(144)
		Overall			E(64)	D(47)	D(54)
West Chester Pike & Old West Chester Pike (26)	EB	Thru/Right	B(12)	A(6)	A(7)	A(6)	A(7)
	WB	Left	D(47)	D(51)	D(53)	D(51)	D(53)
		Thru/Right	A(3)	A(3)	A(3)	A(3)	A(3)
	NB	Left/Thru	D(47)	D(47)	D(48)	D(47)	D(48)
		Right	D(44)	D(44)	D(44)	D(44)	D(44)
	SB	LTR	D(45)	D(45)	D(45)	D(45)	D(45)
Overall			A(9)	A(7)	A(7)	A(7)	A(7)
S Lawrence Road & Langford Run Rd (#)	EB	R	b(12)	b(12)	b(13)	b(12)	b(13)
	NB	L	b(12)	b(12)	c(16)	b(12)	c(16)
S Lawrence Road & Sussex Blvd (#)	EB	LTR	D(53)	D(52)	D(53)	D(53)	D(53)
	WB	LTR	C(31)	C(31)	C(31)	C(31)	C(31)
	NB	LTR	C(25)	C(26)	C(28)	C(26)	C(28)
	SB	LTR	A(4)	A(4)	A(4)	A(4)	A(4)
	Overall			C(21)	C(21)	C(22)	C(21)

Note: All analyses used revised timing and PHF by movement.

Appendix Table 2. PM Peak Hour Level of Service Comparison

intersection (node)	approach	movement	Existing (by move)	2015 No Build (move)	2015 Build (move)	2020 No Build (move)	2020 Build (move)
West Chester Pike & New Ardmore (3)	EB	Left	E(67)	E(75)	E(75)	E(75)	E(75)
		Thru/Right	A(9)	A(8)	A(9)	A(8)	A(9)
	WB	Left	E(77)	E(73)	E(79)	E(73)	E(79)
		Thru/Right	C(23)	B(12)	B(12)	B(13)	B(13)
	NB	Left/Thru	E(68)	E(77)	E(77)	E(77)	E(77)
		Right	D(50)	D(51)	D(51)	D(51)	D(51)
SB	LTR	E(55)	E(58)	E(58)	E(58)	E(58)	
Overall			C(20)	B(15)	B(15)	B(15)	B(15)
West Chester Pike & Langford (6)	EB	Thru			C(27)		C(27)
		Right			A(8)		A(8)
	WB	Left			D(40)		D(40)
		Thru			A(4)		A(4)
	NB	Left			D(51)		D(51)
		Right			C(32)		C(32)
Overall					C(21)		C(21)
West Chester Pike & I-476 SB Ramps (10)	EB	Thru	D(37)	C(22)	C(24)	C(22)	C(24)
	WB	Thru	B(19)	C(31)	D(35)	C(32)	D(38)
	SB	Left	D(44)	D(43)	D(45)	D(44)	D(47)
		Thru	B(18)	B(17)	B(18)	B(17)	B(18)
		Right			C(33)		C(33)
Overall			C(32)	C(32)	C(32)	C(33)	C(35)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	F(107)	D(54)	D(39)	D(55)	D(40)
		Thru	B(16)	B(18)	B(14)	B(19)	B(14)
	WB	Thru	D(40)	D(36)	D(46)	D(37)	D(49)
		Left	C(32)	C(32)	D(52)	C(32)	D(52)
	NB	LT(R)	C(32)	C(32)	E(59)	C(32)	E(60)
		Right	F(106)	F(111)	E(59)	F(115)	E(59)
Overall			D(39)	D(36)	C(31)	D(36)	C(32)
West Chester Pike & S Lawrence Rd (18)	EB	Thru	F(80)	D(41)	D(42)	D(47)	D(45)
		Right	B(12)	A(5)	A(5)	A(5)	A(5)
	WB	Left	D(52)	D(37)	D(46)	D(37)	D(49)
		Thru	C(25)	B(19)	C(20)	B(20)	C(20)
	NB	Left	D(38)	D(41)	D(44)	D(41)	D(44)
		Right	C(26)	C(29)	C(33)	C(29)	C(34)
Overall			D(49)	C(30)	C(32)	C(33)	C(34)
West Chester Pike & N Lawrence Rd (2)	EB	Left	E(60)	C(23)	D(39)	C(23)	D(39)
		Thru	B(10)	A(6)	A(4)	A(6)	A(4)
	WB	Thru/Right	D(46)	D(46)	D(53)	D(47)	E(56)
	SB	Left	E(62)	E(62)	E(62)	E(63)	E(63)
		Right	D(47)	E(60)	F(80)	E(62)	F(83)
Overall			D(37)	C(31)	D(38)	C(31)	D(39)
West Chester Pike & Old West Chester Pike (26)	EB	Thru/Right	B(19)	B(11)	C(25)	B(12)	C(27)
	WB	Left	E(63)	F(93)	F(93)	F(93)	F(93)
		Thru/Right	A(5)	A(6)	A(6)	A(6)	A(6)
	NB	Left/Thru	F(111)	F(82)	F(97)	F(83)	F(97)
		Right	D(47)	D(46)	D(47)	D(46)	D(47)
SB	LTR	D(46)	D(44)	D(45)	D(44)	D(45)	
Overall			C(20)	B(16)	C(23)	B(16)	C(24)
S Lawrence Road & Langford Run Rd (#)	EB	R	b(13)	b(13)	c(20)	b(13)	c(20)
	NB	L	b(11)	b(11)	b(14)	b(11)	b(14)
S Lawrence Road & Sussex Blvd (#)	EB	LTR	D(37)	D(37)	D(37)	D(37)	D(37)
	WB	LTR	C(25)	C(25)	C(25)	C(25)	C(25)
	NB	LTR	B(20)	B(20)	C(21)	B(20)	C(21)
	SB	LTR	B(13)	B(13)	B(16)	B(13)	B(16)
Overall			B(18)	B(18)	B(20)	B(18)	C(20)

Note: All analyses used revised timing and PHF by movement.

Appendix Table 3. Saturday Peak Hour Level of Service Comparison

intersection (node)	approach	movement	Existing (by move)	2015 No Build (move)	2015 Build (move)	2020 No Build (move)	2020 Build (move)
West Chester Pike & New Ardmore (3)	EB	Left	E(63)	E(61)	E(61)	E(61)	E(61)
		Thru/Right	B(11)	B(11)	B(12)	B(11)	B(12)
	WB	Left	E(63)	E(56)	E(60)	E(56)	E(60)
		Thru/Right	B(13)	A(5)	A(4)	A(5)	A(4)
	NB	Left/Thru	D(40)	D(40)	D(40)	D(40)	D(40)
		Right	D(39)	D(40)	D(40)	D(40)	D(40)
	SB	LTR	D(47)	D(51)	D(51)	D(51)	D(51)
Overall			B(15)	B(12)	B(12)	B(12)	B(12)
West Chester Pike & Langford (6)	EB	Thru			D(47)		D(49)
		Right			B(17)		B(17)
	WB	Left			C(30)		C(30)
		Thru			A(4)		A(4)
	NB	Left			D(43)		D(43)
		Right			B(15)		B(15)
	Overall					C(26)	
West Chester Pike & I-476 SB Ramps (10)	EB	Thru	B(15)	A(9)	A(9)	A(9)	A(9)
	WB	Thru	A(7)	A(2)	A(9)	A(2)	A(8)
	SB	Left	D(37)	D(36)	C(32)	D(36)	C(32)
		Thru	C(26)	C(26)	C(23)	C(25)	C(23)
		Right			D(42)		D(42)
	Overall			B(16)	B(14)	B(15)	B(14)
West Chester Pike & I-476 NB Ramps (15)	EB	Left	E(62)	D(45)	D(47)	D(45)	D(46)
		Thru	A(2)	B(10)	A(10)	B(11)	A(10)
	WB	Thru	C(24)	B(15)	C(26)	B(15)	C(26)
		Left	C(32)	C(31)	D(47)	C(31)	D(47)
	NB	LT(R)	C(32)	C(31)	D(52)	C(31)	D(52)
		Right	E(58)	E(60)	D(52)	E(61)	D(52)
	Overall			B(19)	B(19)	C(24)	B(20)
West Chester Pike & S Lawrence Rd (18)	EB	Thru	C(35)	B(20)	C(28)	C(20)	C(30)
		Right	A(4)	A(3)	A(2)	A(3)	A(2)
	WB	Left	D(48)	D(37)	D(52)	D(37)	D(53)
		Thru	C(21)	B(18)	B(15)	B(18)	B(15)
	NB	Left	C(32)	C(33)	C(32)	C(33)	C(32)
		Right	C(23)	C(25)	C(28)	C(26)	C(28)
	Overall			C(28)	C(21)	C(25)	C(21)
West Chester Pike & N Lawrence Rd (2)	EB	Left	D(53)	C(24)	C(25)	C(24)	C(25)
		Thru	A(2)	A(6)	B(15)	A(6)	B(15)
	WB	Thru/Right	B(19)	B(17)	C(20)	B(17)	C(20)
		Left	F(102)	F(104)	F(104)	F(106)	F(106)
	SB	Right	F(85)	F(88)	F(102)	F(90)	F(103)
		Overall			C(29)	C(26)	C(32)
West Chester Pike & Old West Chester Pike (26)	EB	Thru/Right	A(8)	A(5)	A(8)	A(5)	A(8)
	WB	Left	D(46)	D(54)	D(54)	D(54)	D(54)
		Thru/Right	A(3)	A(3)	A(4)	A(3)	A(4)
	NB	Left/Thru	D(48)	D(51)	D(51)	D(51)	D(51)
		Right	D(42)	D(42)	D(42)	D(42)	D(42)
	SB	LTR	D(42)	D(43)	D(43)	D(43)	D(43)
Overall			A(8)	A(7)	A(8)	A(7)	A(8)
S Lawrence Road & Langford Run Rd (#)	EB	R	b(10)	b(10)	b(13)	b(10)	b(13)
	NB	L	a(9)	a(9)	a(10)	a(9)	b(10)
S Lawrence Road & Sussex Blvd (#)	EB	LTR	C(31)	C(31)	C(31)	C(31)	C(31)
	WB	LTR	C(32)	C(32)	C(32)	C(32)	C(32)
	NB	LTR	B(17)	B(17)	B(18)	B(17)	B(18)
	SB	LTR	A(3)	A(3)	A(3)	A(3)	A(3)
	Overall			B(11)	B(11)	B(12)	B(11)

Note: All analyses used revised timing and PHF by movement.

Appendix Table 4. AM Peak Hour Queue Length

Intersection (Node)	Approach	Movement	storage length	Existing (move)		2015 No Build (move)		2015 Build (move)		2020 No Build (move)		2020 Build (move)	
				Synchro		Synchro		Synchro		Synchro		Synchro	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & New Ardmore (3)	EB	L	180	15	24	15	24	15	24	15	24	15	24
		TTR		360	462	372	479	372	464	380	487	380	473
	WB	L	145	20	35	27	45	25	42	27	45	25	42
		TTR		257	537	47	104	185	255	47	118	188	257
	NB	LT		30	53	30	53	31	56	30	53	31	56
SB	R		0	37	0	36	0	38	0	36	0	38	
West Chester Pike & Langford (6)	EB	LTR		103	150	103	148	104	#169	103	148	104	#169
		TTT					354	416				360	420
	WB	R	450				53	m73				53	m71
		L					106	147				106	147
	NB	TT					46	64				47	65
	LL					48	77				48	77	
West Chester Pike & I-476 SB Ramps (10)	EB	R					92	146				92	146
		TTT		306	368	129	204	379	491	133	208	384	498
	WB	TT		195	m177	77	m175	47	m156	84	m191	53	m155
		LL		242	281	248	288	243	284	406	m0	245	288
	SB	T	180	2	2	2	2	2	250	288	2	2	
	R					218	272				220	274	
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	192	#419	~346	#460	374	#506	~351	#466	378	#516
		TTT		206	228	152	268	206	269	158	272	216	278
	WB	TT		323	m231	338	m249	~453	m347	352	m254	~464	m350
		L	520	57	95	57	100	115	167	57	100	116	170
	NB	LT(R)	520	58	26	58	28	137	50	58	28	140	51
	R		174	213	183	232	128	168	186	236	127	167	
West Chester Pike & S Lawrence Rd (18)	EB	TTT	600	354	408	124	198	228	256	125	205	220	249
		R		229	350	50	m65	55	71	50	m66	55	70
	WB	LL	460*	111	m121	120	m117	136	m126	118	m112	137	m127
		TT		-1051	m#912	~1005	m#971	~1062	m#536	~1006	m#946	~1082	m#536
	NB	LL		191	239	200	#262	172	#226	211	#266	175	#237
	R	200	204	296	221	316	229	330	226	322	233	336	
West Chester Pike & N Lawrence Rd (2)	EB	LL	460*	187	243	200	247	201	255	204	251	203	258
		TT		87	184	168	190	176	253	165	198	177	259
	WB	TTTR		350	465	442	#630	~487	#698	452	#644	~512	#712
		L	325	37	73	33	65	33	65	33	65	33	65
	SB	R		~831	#1006	~741	#918	~777	#950	~752	#931	~787	#960
West Chester Pike & Old West Chester Pike (26)	EB	TTR		298	417	219	290	246	348	214	295	247	355
		L	170	44	81	45	85	45	85	45	85	45	85
	WB	TTTR		109	160	112	156	125	158	115	159	127	161
		LT		15	11	15	11	17	12	15	11	17	12
	SB	R		0	9	0	9	0	9	0	9	0	9
	LTR		7	0	7	0	7	0	7	0	7	0	
S Lawrence Rd & Langford Run Rd (#)	EB	R		-	1	-	1	-	17	-	1	-	17
		L	155	-	1	-	1	-	37	-	1	-	37
S Lawrence Rd & Sussex Blvd (#)	EB	LTR		46	35	46	35	46	35	46	35	46	35
		LTR		14	42	14	42	14	42	14	42	14	42
	NB	LTR		212	275	218	284	236	305	222	288	239	310
		LTR		42	78	43	79	45	84	43	80	46	85

*Average length of dual left turn lanes

~: This indicates that the approach is above capacity and the queue length could be much longer.

#: This indicates that the volume for the 95th percentile cycle exceeds capacity.

m: This indicates that the volume for the 95th percentile queue is metered by an upstream signal.

In many cases, the 95th percentile queue will not be experienced due to upstream metering.

If the upstream intersection is at / near capacity, the 50th percentile queue represents the max. queue experienced.

The queue length reported is the one for the lane with the highest queue in the lane group.

Appendix Table 5. PM Peak Hour Queue Length

Intersection (Node)	Approach	Movement	storage length	Existing (move)		2015 No Build (move)		2015 Build (move)		2020 No Build (move)		2020 Build (move)	
				Synchro		Synchro		Synchro		Synchro		Synchro	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & New Ardmore (3)	EB	L	180	95	#188	98	#188	98	#188	98	#188	98	#188
		TTR		214	508	193	393	219	447	196	401	223	456
	WB	L	145	12	m18	13	m22	12	m23	13	m22	12	m23
		TTR		783	843	201	260	364	449	211	270	367	459
	NB	LT		57	88	58	99	58	#99	58	#99	58	#99
		R		0	6	0	7	0	7	0	7	0	7
	SB	LTR		46	76	47	80	47	80	47	80	47	80
West Chester Pike & Langford (6)	EB	TTT	450					380	469			386	475
		R						73	64			72	64
	WB	L						327	m365			327	m361
		TT						62	m332			64	m336
	NB	LL						114	155			114	155
		R						356	467			356	467
West Chester Pike & I-476 SB Ramps (10)	EB	TTT		353	499	335	252	220	#338	339	254	221	#347
		TT		111	#178	599	#699	-673	m713	606	m#704	-686	m#707
	SB	LL		578	#742	580	#745	590	#758	591	#760	602	#772
		T	180	2	3	2	2	2	3	2	2	158	225
		R										371	511
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	314	#427	318	#396	437	m#483	321	#401	440	m#479
		TTT		541	574	432	502	478	m596	445	m517	498	m603
	WB	TT		443	396	414	#486	-461	#558	420	#495	-469	#563
		L	520	84	141	85	142	231	331	86	144	232	333
	NB	LT(R)	520	84	35	85	35	231	74	86	35	234	342
		R		-449	#667	-462	#681	220	323	-470	#690	222	326
West Chester Pike & S Lawrence Rd (18)	EB	TTT	600	-896	m#1020	-847	m#893	-882	#961	-863	m#908	-899	#978
		R		390	m462	158	m151	99	103	157	m152	99	104
	WB	LL	460*	226	m#248	194	m216	-265	m#261	193	m215	-269	m#260
		TT		570	m753	665	m742	728	m730	680	m751	739	m726
	NB	LL		115	130	120	147	85	112	121	148	87	114
		R	200	236	301	228	329	248	361	231	334	252	366
West Chester Pike & N Lawrence Rd (2)	EB	LL	460*	456	m414	183	m160	360	m352	169	m161	371	m356
		TT		156	m151	87	m78	66	m53	95	m77	74	m54
	WB	TTTR		483	m#624	516	557	581	#635	528	563	590	#646
		L	325	103	139	105	141	105	141	106	141	106	141
	SB	R		592	#818	612	#901	-765	#1014	618	#919	-782	#1032
West Chester Pike & Old West Chester Pike (26)	EB	TTR		386	#996	137	#328	-166	#1098	139	#963	-171	#1117
		L	170	60	96	63	#129	63	#129	63	#129	63	#129
	WB	TTTR		112	131	129	150	140	163	131	153	142	164
		LT		134	52	132	51	135	52	133	52	135	52
	NB	R		27	58	35	66	40	73	36	56	40	73
LTR			5	4	5	4	5	4	5	4	5	4	
S Lawrence Rd & Langford Run Rd (#)	EB	R		-	1	-	1	-	65	-	1	-	66
		L		-	1	-	1	-	38	-	1	-	39
S Lawrence Rd & Sussex Blvd (#)	EB	LTR		106	39	106	39	106	39	106	39	106	39
		LTR		22	23	22	23	22	23	22	23	22	23
	NB	LTTR		120	168	113	160	135	188	114	162	137	191
		LTTR		163	#244	163	243	187	#345	165	246	190	#355

*Average length of dual left turn lanes

-: This indicates that the approach is above capacity and the queue length could be much longer.

#: This indicates that the volume for the 95th percentile cycle exceeds capacity.

m: This indicates that the volume for the 95th percentile queue is metered by an upstream signal.

In many cases, the 95th percentile queue will not be experienced due to upstream metering.

If the upstream intersection is at / near capacity, the 50th percentile queue represents the max. queue experienced.

The queue length reported is the one for the lane with the highest queue in the lane group.

Appendix Table 6. Saturday Peak Hour Queue Length

Intersection (Node)	Approach	Movement	storage length	Existing (move)		2015 No Build (move)		2015 Build (move)		2020 No Build (move)		2020 Build (move)	
				Synchro		Synchro		Synchro		Synchro		Synchro	
				50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length	50th % Q length	95th % Q length
West Chester Pike & New Ardmore (3)	EB	L	180	7	17	7	16	7	16	7	16	7	16
		TTR		242	303	249	312	293	365	253	317	297	371
	WB	L	145	38	71	51	78	48	76	51	78	48	76
		TTR		281	448	87	102	37	130	88	103	37	134
	NB	LT		9	8	9	8	9	8	9	8	9	8
SB	R		0	24	0	24	0	24	0	24	0	24	
West Chester Pike & Langford (6)	EB	L	450					~254	#378			~291	#385
		R					88	154			88	156	
	WB	L					348	486			348	486	
		TT					67	63			66	65	
	NB	LL					95	139			95	139	
SB	R					203	306			203	306		
West Chester Pike & I-476 SB Ramps (10)	EB	TTT		209	275	94	113	118	m134	95	114	119	m132
		TT		69	81	15	27	71	95	15	27	72	96
	WB	LL		236	274	240	276	222	267	242	278	224	271
		T	180	2	3	2	2	2	2	2	2	2	2
	SB	R					239	261			241	264	
West Chester Pike & I-476 NB Ramps (15)	EB	L	510	133	182	136	187	212	269	136	186	214	270
		TTT		22	26	222	206	226	234	228	210	241	238
	WB	TT		171	223	208	264	320	371	208	265	325	374
		L	520	49	90	50	91	143	214	51	92	144	216
	NB	LT(R)	520	50	25	50	25	143	53	51	25	145	54
SB	R		195	#344	203	#359	132	#217	207	#367	134	#224	
West Chester Pike & S Lawrence Rd (18)	EB	TTT	600	448	#564	422	#540	~223	#614	427	#552	~237	#624
		R		20	m29	14	m17	8	15	14	m17	8	15
	WB	LL	460*	145	m170	144	m138	135	m#186	145	m140	137	m#200
		TT		396	m562	500	m548	665	m208	505	m553	675	m191
	NB	LL		73	104	81	114	51	78	82	115	52	79
SB	R	200	215	284	234	317	214	312	237	321	216	315	
West Chester Pike & N Lawrence Rd (2)	EB	LL	460*	217	m235	146	m132	242	m253	149	m129	248	m253
		TT		37	66	427	561	534	m543	432	566	541	m542
	WB	TTTR		279	374	267	360	340	454	272	367	345	461
		L	325	65	#165	65	#166	65	#166	66	#169	66	#169
	SB	R		~478	#622	~492	#637	~553	#702	~498	#643	~559	#709
West Chester Pike & Old West Chester Pike (26)	EB	TTR		107	m234	77	m101	127	126	78	m102	127	m126
		L	170	39	65	40	70	40	70	40	70	40	70
	WB	TTTR		86	131	89	117	110	145	90	119	112	146
		LT		42	21	42	22	42	22	42	22	42	22
	NB	R		0	28	0	29	0	29	0	29	0	29
SB	LTR		7	6	7	6	7	6	7	6	7	6	
S Lawrence Rd & Langford Run Rd (#)	EB	R		-	1	-	0	-	37	-	0	-	37
	NB	L		-	0	-	0	-	24	-	0	-	24
S Lawrence Rd & Sussex Blvd (#)	EB	LTR		5	3	5	3	5	3	5	3	5	3
	WB	LTR		12	14	12	14	12	14	12	14	12	14
	NB	LTR		82	120	85	123	108	153	86	124	110	155
	SB	LTR		32	60	33	61	41	74	33	62	41	74

*Average length of dual left turn lanes

~: This indicates that the approach is above capacity and the queue length could be much longer.

#: This indicates that the volume for the 95th percentile cycle exceeds capacity.

m: This indicates that the volume for the 95th percentile queue is metered by an upstream signal.

In many cases, the 95th percentile queue will not be experienced due to upstream metering.

If the upstream intersection is at / near capacity, the 50th percentile queue represents the max. queue experienced.

The queue length reported is the one for the lane with the highest queue in the lane group.

-----Original Message-----

From: Hanney, Francis J. [mailto:FHANNEY@state.pa.us]
Sent: Wednesday, May 18, 2011 1:58 PM
To: Adrienne Eiss; Federico, Al P.; Lapenta, Susan; Patel, Ashwin; Lutz, Paul; Hartline, Andrew; Anthony Hamaday; Lori Widdop; Mastronardo, Joseph A.; mschneider@pennoni.com
Cc: Claude de Botton; Paul de Botton; Cristie Campbell; Dick Orth
Subject: RE: Marple Associates

We are concerned about the backups that occur on Lawrence Rd that seem to be exacerbated by the delays created by the NB I-476 on-ramp in its current configuration. We discussed this at length and all seemed to agree that modifications to this ramp were needed both to help the ramp but primarily to address the situation on Lawrence Rd. Have you mitigated the impacts at Lawrence and RT 3? What do the queues look like without a ramps modification and just a traffic adaptive? You may have theoretically mitigated the impacts at the ramp/RT 3 intersection but did you address Lawrence and RT 3?

Francis J. Hanney, Traffic Services Manager
PA Department of Transportation
Engineering District 6-0
7000 Geerdes Blvd.
King of Prussia, PA 19406-1525
Phone: 610-205-6560 | Fax: 610-205-6598
fhanney@state.pa.us | www.dot.state.pa.us

-----Original Message-----

From: Adrienne Eiss [mailto:aeiss@orth-rodgers.com]
Sent: Wednesday, May 18, 2011 1:44 PM
To: Federico, Al P.; Hanney, Francis J.; Lapenta, Susan; Patel, Ashwin; Lutz, Paul; Hartline, Andrew; Anthony Hamaday; Lori Widdop; Mastronardo, Joseph A.; mschneider@pennoni.com
Cc: Claude de Botton; Paul de Botton; Cristie Campbell; Dick Orth
Subject: RE: Marple Associates

Al,

The proposed improvements are:

- * Modifications to S.R. 0003 intended to provide a signalized access to the site, including modifications to the I-476 SB off ramp
- * Modifying the lane configuration of the northbound I-476 NB off-ramp approach at S.R. 0003
- * Pedestrian provisions for the above
- * Installing fiber between North Lawrence and South Lawrence Road to connect the two existing separate fiber systems in Haverford and Marple Townships, and any other equipment changes needed to combine them into a single system with the master in Haverford Township

An adaptive signal system on SR 0003 or the modification to the I-476 northbound on-ramp were suggested as Alternative Transportation Plans if

the impact of the development cannot be mitigated by the other improvements.

We believe the impact of the development is mitigated by the proposed improvements. We will forward to you the Synchro output for Existing, 2015 No-Build and Build, 2020 No-Build and Build for the three analysis hours that are summarized in the Tables included with our letter.

Adrienne

Adrienne Eiss, PTP
Senior Project Manager
Orth-Rodgers & Associates, Inc.
301 Lindenwood Drive, Suite 130
Malvern, PA 19355
Phone: (610) 407-9700 Ext. 212
Fax: (610) 407-9600
aeiss@orth-rodgers.com

-----Original Message-----

From: Federico, Al P. [mailto:APFederico@mccormicktaylor.com]
Sent: Wednesday, May 18, 2011 12:35 PM
To: Adrienne Eiss; Hanney, Francis J.; Lapenta, Susan; Patel, Ashwin; Lutz, Paul; Hartline, Andrew; Anthony Hamaday; Lori Widdop; Mastronardo, Joseph A.; mschneider@pennoni.com
Cc: Claude de Botton; Paul de Botton; Cristie Campbell; Dick Orth
Subject: RE: Marple Associates

Adrienne,

These partial submissions are getting a bit difficult to keep track of, so I'd like to make sure we're all on the same page here. If I'm read this correctly, aside from modifications to S.R. 0003 intended to provide a signalized access to the site, the improvements/mitigation proposed as part of this project are:

- * Implementation of an adaptive signal system along S.R. 0003; and
- * Modifying the lane configuration of the northbound I-476 NB off-ramp approach at S.R. 0003.

Is that correct?

Al Federico

From: Adrienne Eiss [mailto:aeiss@orth-rodgers.com]
Sent: Wed 5/18/2011 11:59 AM
To: Hanney, Francis J.; Lapenta, Susan; Patel, Ashwin; Lutz, Paul; Hartline, Andrew; Federico, Al P.; Anthony Hamaday; Lori Widdop; Mastronardo, Joseph A.; mschneider@pennoni.com
Cc: Claude de Botton; Paul de Botton; Cristie Campbell; Dick Orth

Subject: RE: Marple Associates

Fran,

Thank you for your review letter of May 9, 2011. Attached is a response to the comments.

We are eager to resolve these last remaining items and prepare the formal Traffic Impact Study report.

Adrienne

Adrienne Eiss, PTP

Senior Project Manager

Orth-Rodgers & Associates, Inc.

301 Lindenwood Drive, Suite 130

Malvern, PA 19355

Phone: (610) 407-9700 Ext. 212

Fax: (610) 407-9600

aeiss@orth-rodgers.com

May 24, 2011

Mr. Francis J. Hanney
District Traffic Services Manager
PennDOT, Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

RE: HOP Application No. pre689
Traffic Log No. D09-039XR
Marple Associates Site
Delaware County, Marple Township

Dear Fran,

This letter is to summarize the reasoning behind the improvements proposed in our May 18, 2011 letter. The improvements are based on traffic analysis performed to address comments received at the February 15, 2011 meeting and in previous review letters. Based on the analysis results, we believe the PennDOT TIS Guidelines are met.

We did agree at the February 15 meeting that there is an existing problem on West Chester Pike westbound in the AM peak hour due to traffic entering the northbound on-ramp. We have examined the effect of development on conditions at Lawrence Road.

We believe that the PennDOT TIS Guidelines are met at the South and North Lawrence Road intersections with the proposed improvements based on Overall Intersection Level of Service as well as individual approach Level of Service and queues as indicated in the tables sent with our May 18 letter.

Comparison of Overall Intersection Level of Service - - 2020 Build vs. 2020 No Build - - at the South Lawrence Road intersection with West Chester Pike shows no change in any of the study hours (AM, PM, or Saturday). The Overall Intersection Level of Service at the North Lawrence Road intersection with West Chester Pike does change in the AM and PM peak hours but the increase in delay is 8 seconds or less.

Comparison of individual approach LOS for 2020 Build and No-Build at South Lawrence Road shows all individual approaches operate at the same LOS in the AM, PM and Saturday peak hours. At North Lawrence Road, all individual approaches operate at the same LOS in the AM, PM and Saturday peak hours except in three instances: in the PM peak hour, the eastbound left turn changes from C(23) to D(39), the westbound through movement changes from D(47) to E(56), and the southbound right turn changes from E(62) to F(83). (Negligible changes such as a change from B(17) to C(20) or from A(9) to B(10) were not counted.)

Review of individual approach queues at South Lawrence Road shows most movements experience no increase in queue length or an increase of one to three autos in the AM, PM and Saturday peak hours. The greatest increase in queue length experienced on any movement at South Lawrence Road is seven autos in the westbound through movement during the Saturday peak hour. At North Lawrence Road most individual approaches also experience little or no increase in queue length, except for two movements. The southbound right turn will experience an increase of about seven autos in the 50% queue and four autos in the 95% queue in the PM peak hour. The eastbound left turn will experience an increase of eight autos in queue length in the PM peak hour and five autos in the Saturday peak hour; however, the 95% left turn queue length is well accommodated by the available storage in both hours.

Mr. Fran Hanney
Marple Associates
May 24, 2011
Page 2

One movement (the North Lawrence Road right turn lane) experiences some significant impact in queue and level of service in one of the three analysis hours (the PM peak). But, in general, the individual approaches experience a minimal impact compared with No-Build conditions.

Our analysis has compared the future Build conditions with the optimized No-Build scenario. However, this optimized No-Build assumes optimized, reliable signal offsets, which is a false comparison because West Chester Pike between North and South Lawrence Roads is not even interconnected today. Interconnecting and coordinating the two existing systems will be a significant improvement.

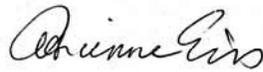
As a result of our analysis we have suggested the following proposed improvements:

- Modifications to S.R. 0003 intended to provide a signalized access to the site, including modifications to the I-476 SB off ramp
- Modification to the lane configuration of the northbound I-476 NB off-ramp approach at S.R. 0003
- Provisions for pedestrians at the above locations
- Installation of fiber between North Lawrence and South Lawrence Road to connect the two existing separate fiber systems in Haverford and Marple Townships, and any other equipment changes needed to combine them into a single system with the master in Haverford Township

We believe that the proposed improvements meet the PENNDOT TIS Guidelines for mitigation of development traffic impact. Therefore, the developer should not be held responsible for either of the suggested offsite improvements, i.e. adaptive signal control or relocation of the I-476 northbound on-ramp.

We appreciate your consideration of this information in your review and response to our letter of May 18.

Very truly yours,
ORTH- RODGERS & ASSOCIATES, INC.



ADRIENNE EISSL, PTP
Senior Project Manager

cc: Albert Federico
Ashwin Patel
Paul Lutz
Susan LaPenta
H. Richard Orth
Claude DeBotton
Paul DeBotton
Anthony Hamaday, Marple Township
Lori Hanlon-Widdop, Haverford Township
Michael Schneider, Pennoni Associates
Joseph Mastronardo, Pennoni Associates