

MADISON PIKE (KY 17) ROUNDABOUT FEASIBILITY STUDY
NKAPC
Fort Wright / Covington, Kentucky

APPENDIX A

**Kenton County Traffic Forecast
Madison Pike (KY 17) Roundabout Evaluation Study**



**Division of Planning
June 9, 2006**

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Executive Summary

PROJECT DESCRIPTION

The purpose of this project is to analyze traffic for a modern roundabout evaluation study along Madison Pike (KY 17) in Kenton County. The roundabouts to be analyzed are along the KY 17 corridor at the intersections with Holds Branch Road, KY 3148 (Old KY 17), and the North TANK Bus Station Entrance combined with Electric Drive and Lakeview Drive. This forecast provides traffic estimates at these locations.

TYPE of FORECASTS

The following types of forecasts were developed:

- Average Daily Traffic (ADT) projections were developed for the analysis years 2006 and 2030 for the No-Build, Build scenario.
- 2006 and 2030 ADT and DHV turning movement forecasts were provided for 3 intersections along the corridor; KY 17 & Holds Branch Road, KY 17 & KY 3148 (Old KY 17), and KY 17 & Bus Entrance + Electric Drive + Lakeview Drive.
- Truck percentage estimates were provided for 2030.

TRAFFIC VOLUMES / GROWTH RATES

Current year 2006 volumes were based on historical counts in Kenton County and special counts performed in January 2006. Special turn movement counts were extrapolated to determine current year volumes for various project segments. The Northern Kentucky MPO (OKI) provided model runs for the current and future year. Future development information was gathered from the Northern Kentucky Area Planning Commission, DLZ Kentucky, Inc., and CDS Associates, Inc. along the corridor and side streets. ITE trip generation rates were applied to planned future development to estimate future traffic (for more information see attached development information at the end of the report). The data from the model, future development, and growth rate analysis were used to determine 2030 volumes.

DESIGN HOUR VOLUMES

Design Hour Volumes for the turning movements were determined directly from the special turn movement counts. The maximum maneuvers from the 2-hour AM count and the 2-hour PM count were used to develop a daily AM and PM DHV. A monthly factor was applied to normalize the counts to an average daily max. A K-factor factor was then applied to estimate the yearly DHV (30th highest hour of the year). The future year DHVs were cut off at an estimated capacity (using modified NCHRP 387 equations) of 1700 vehicles per lane in any direction on KY 17. The signal at Dudley Road and KY 17 would further constrain southbound volumes on KY 17 in the peak hour. It was determined the capacity should be 1450 vehicles per lane for the southbound KY 17 movements south of Dudley Road. KY 17 currently has two lanes in each direction so the maximum northbound total volume for the Design Hour was determined to be 3400. The maximum southbound total volume on KY 17 south of Dudley Road for the Design Hour was determined to be 2900. Capacity was not an issue for the intersection analyzed north of Dudley Road. It was determined that the K-factor would flatten out to 10% in the future, but this capacity restraint also constrained the ADT projections. AM and PM DHV directional factors were determined from the max maneuvers of the AM and PM special turning movement counts.

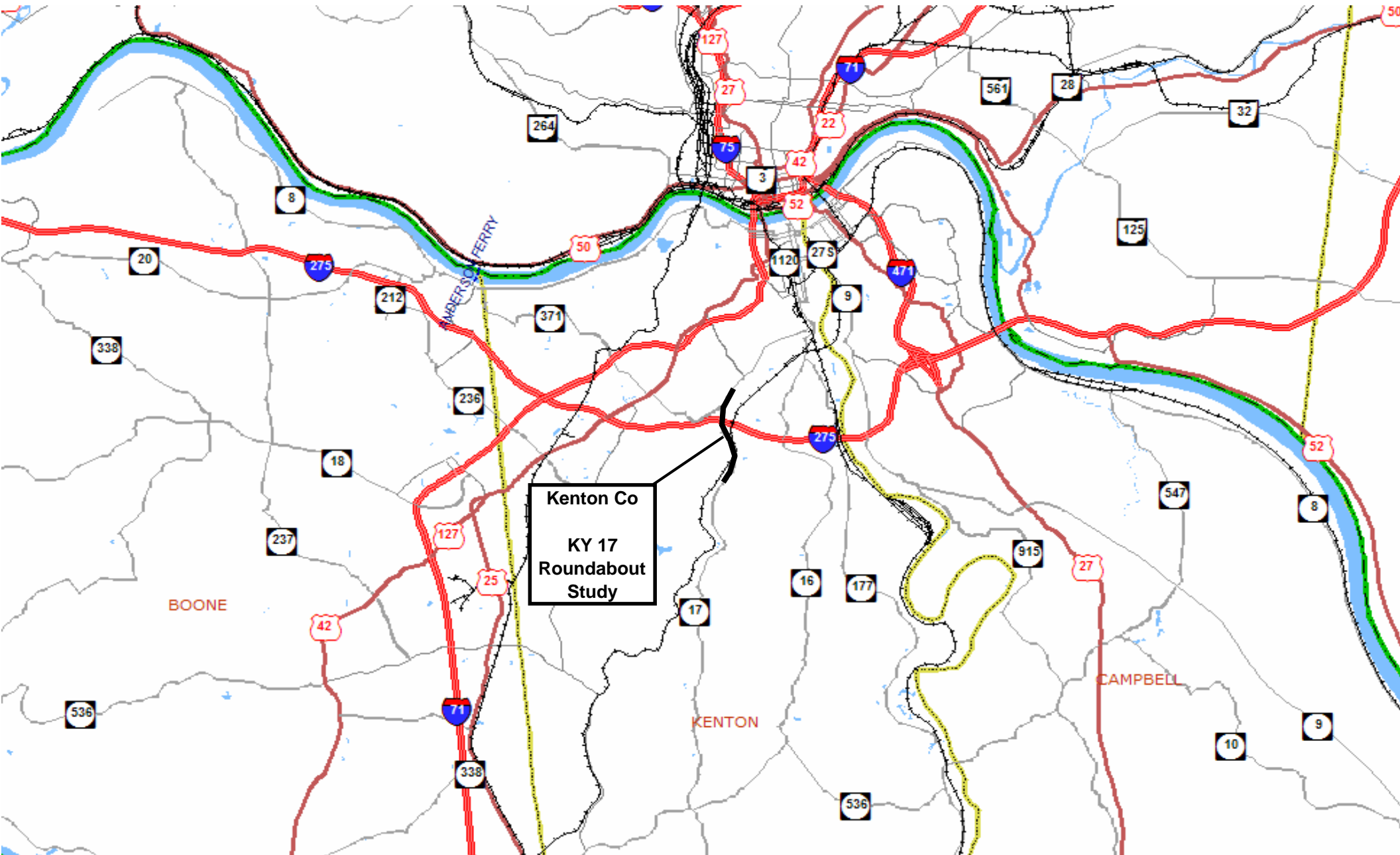
TURNING MOVEMENTS

Three turning movements were analyzed for the project. These turning movements were developed from the volume and DHV methods mentioned above. Also special turning movement counts were made and grown to reflect ADT turning movements. AM and PM Design Hour turn movements were based on the max turn maneuvers from the manual turn movement counts. These numbers were grown to reflect the DHV totals mentioned above.

TRUCK PERCENTAGES

Special counts were performed from 9AM to 1PM in January 2006 to determine truck percentages on KY 17. Factors were applied to estimate 24-hour classification data from other classification counts performed on the same functional class roadway. Research from across the state indicates a 1.5% growth rate be used for truck percentages. This factor was applied to forecast the 2030 projections.

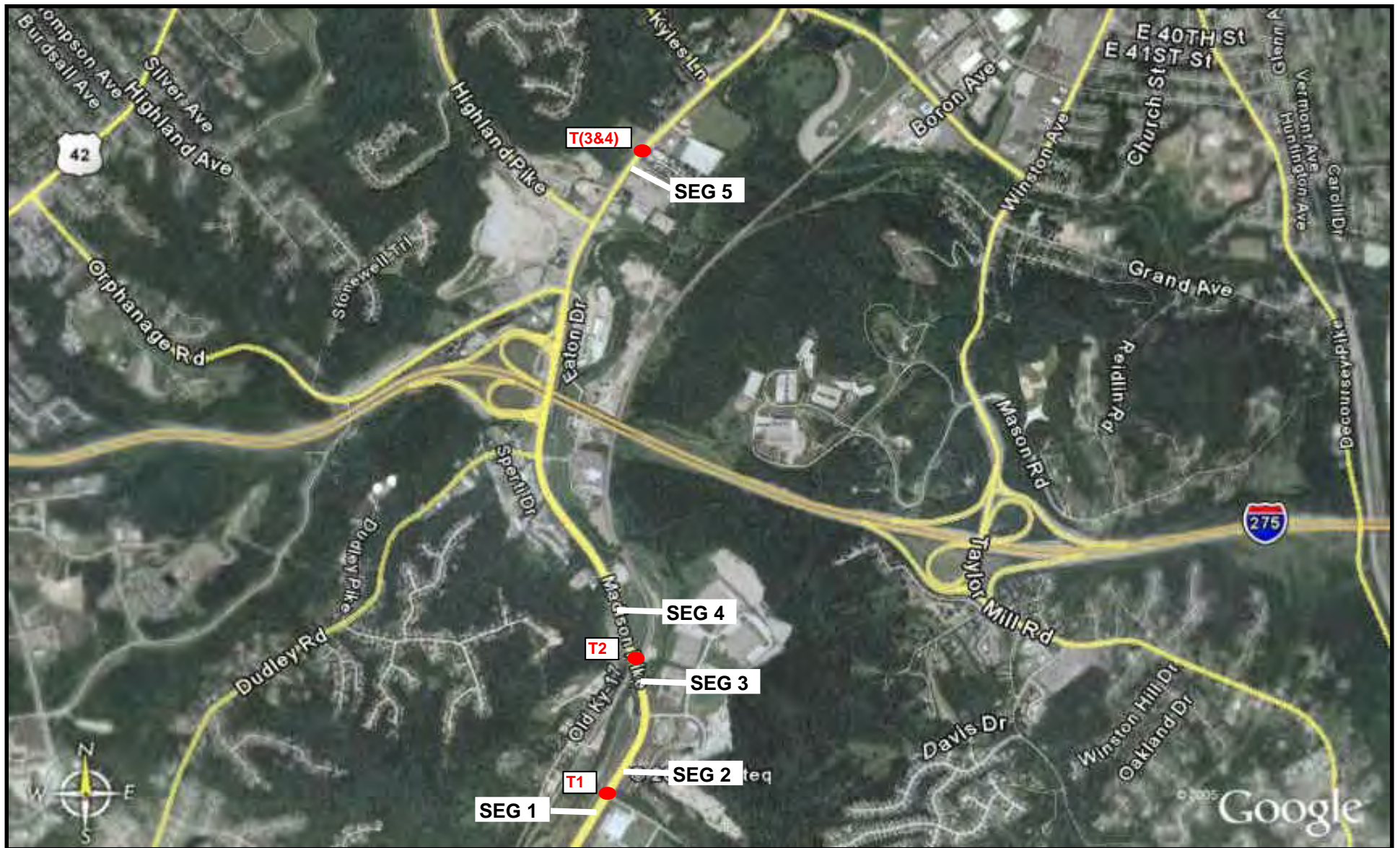
Division of Planning
Kenton County: Madison Pike (KY 17) Roundabout Evaluation Study
Traffic Forecast Vicinity Map



Division of Planning

Kenton County: Madison Pike (KY 17) Roundabout Evaluation Study

Traffic Forecast Summary Map



Segment	Route	Milepoint	2006 ADT	2030 ADT	2030 DHV	2030 T% (ADT)	2030 T% (DHV)	2030 Heavy T% (ADT)
1	KY 17	17.1	29,600	47,000	4,700	7.0%	6.0%	1.0%
2	KY 17	17.4	30,000	53,000	5,300	7.0%	6.0%	1.0%
3	KY 17	16.0	35,700	53,000	5,300	9.0%	8.0%	3.0%
4	KY 17	16.2	36,500	55,000	5,500	9.0%	8.0%	3.0%
5	KY 17	19.2	22,000	33,000	3,600	10.0%	8.0%	2.0%

TURNING MOVEMENTS

2006 and 2030 ADT and DHVs (Build, No-Build)

T1: KY 17 (Madison Pike) & Holds Branch Road

T2: KY 17 (Madison Pike) & KY 3148 (Old KY 17)

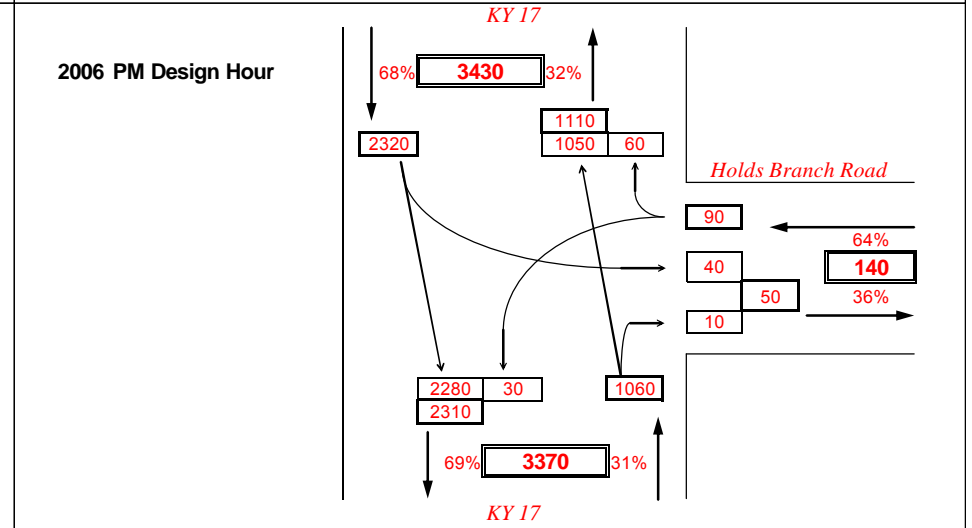
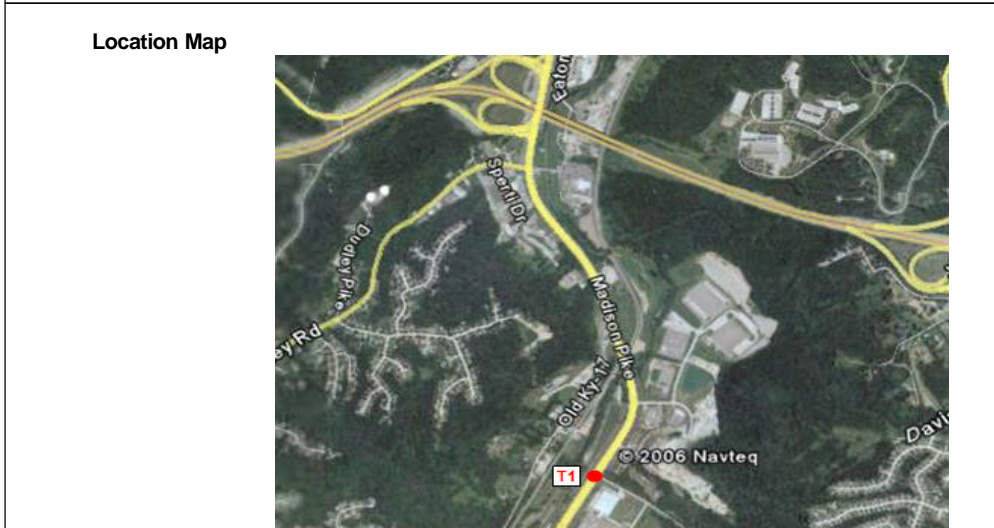
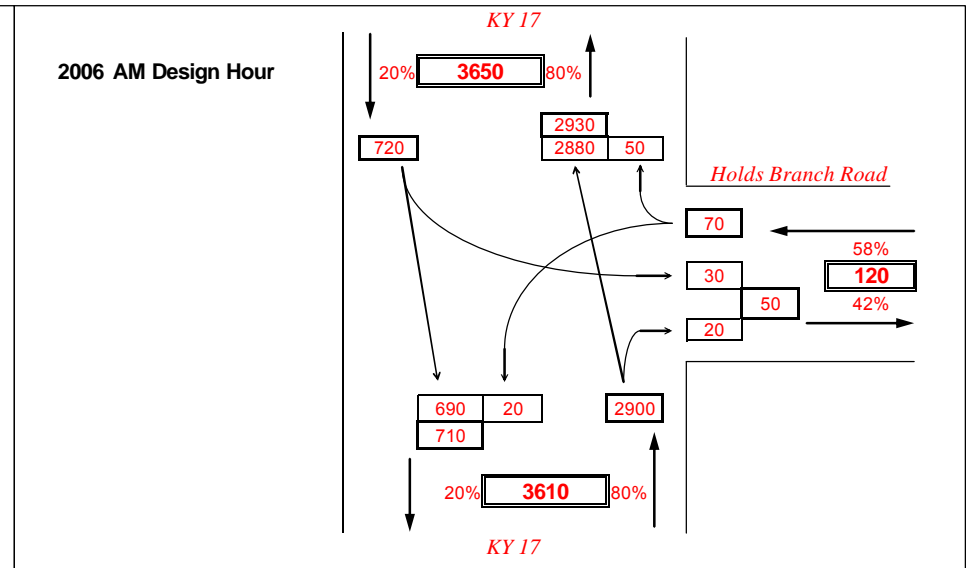
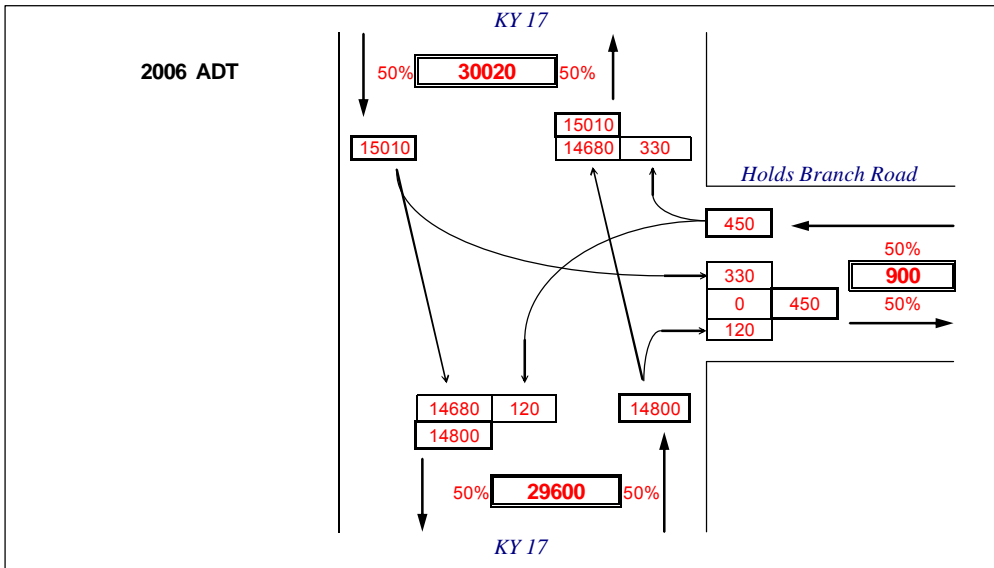
T4: KY 17 (Madison Pike) & North TANK Bus Station Entrance Combined with Electric Drive and Lakeview Drive / New Development from West of Intersection for 2030

PROJECT: Kenton Co, KY 17 Roundabout Study
 ITEM NUMBER:
 MARS NUMBER: 7793519P
 REQUEST DATE: 1/10/2006
 ANALYST: D. Hamilton
 SCENARIO: **2006 ADT and Design Hour Volumes**
 INTERSECTION: KY 17 & Holds Branch Road

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2006 Turning Movement Count

Peak Hour Factors		Thru		Right		Left			
		AM	PM	AM	PM	AM	PM		
↓	Southbound	0.96	0.94	0.94	0.94	--	--	0.79	0.63
↑	Northbound	0.96	0.94	0.94	0.94	0.56	0.63	--	--
←	Westbound	0.60	0.73	--	--	0.65	0.83	0.34	0.70

* Arrows indicate approach direction, PHF given by approach and approach movement

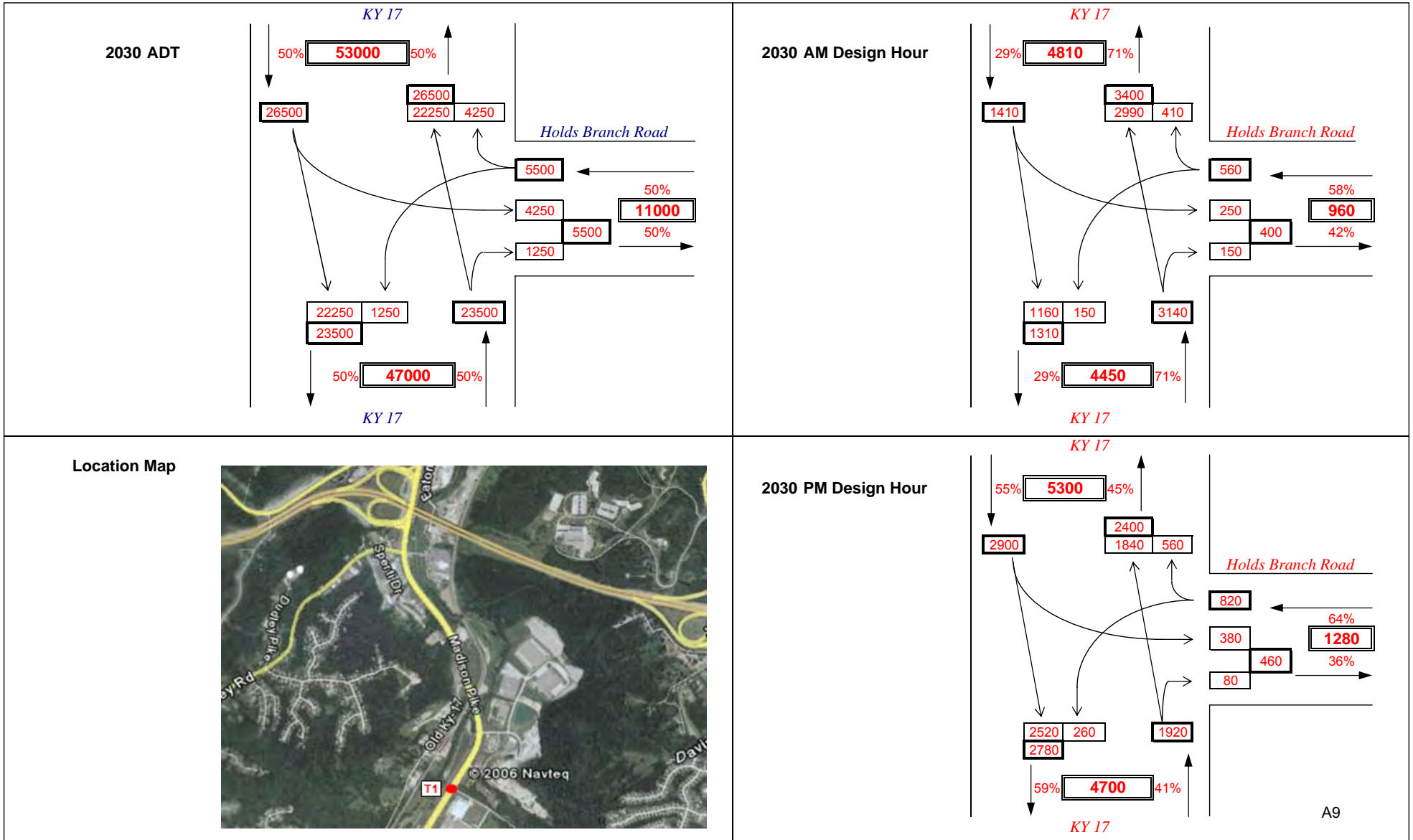


PROJECT: Kenton Co, KY 17 Roundabout Study
 ITEM NUMBER: 0
 MARS NUMBER: 7793519P
 REQUEST DATE: 1/10/2006
 ANALYST: D. Hamilton
 SCENARIO: 2030 ADT and Design Hour Volumes
 INTERSECTION: KY 17 & Holds Branch Road

NOTE: K-Factors and Directional Distributions were determined from 2006 traffic counts

Assumes KY 17 remains a four lane road and the peak hour capacity is 1700 veh per lane in the Northbound direction and 1450 veh per lane in the Southbound direction

Assumes proposed planned developments on Holds Branch Road are built

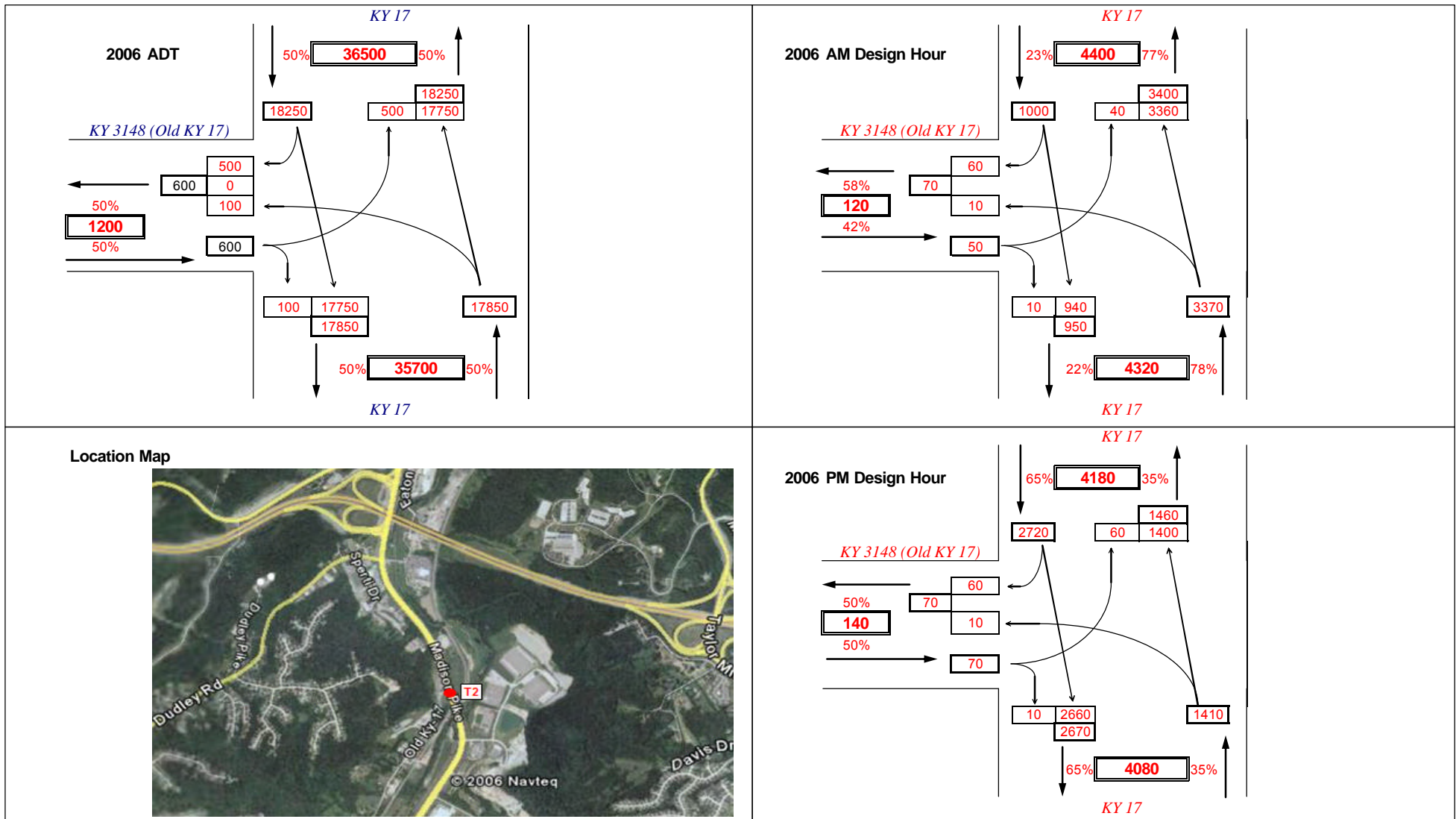


PROJECT: Kenton Co, KY 17 Roundabout Study
 ITEM NUMBER: 7793519P
 MARS NUMBER: 7793519P
 REQUEST DATE: 1/10/2006
 ANALYST: D. Hamilton
 SCENARIO: **2006 ADT and Design Hour Volumes**
 INTERSECTION: KY 17 & KY 3148 (Old KY 17)

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2006 Turning Movement Count

Peak Hour Factors		AM		PM		Thru		Right		Left	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
↓	Southbound	0.95	0.98	0.87	0.90	0.85	0.85	--	--	--	--
↑	Northbound	0.95	0.98	0.97	0.88	--	--	0.42	0.63	--	--
→	Eastbound	0.81	0.84	--	--	0.60	0.67	0.67	0.61	--	--

* Arrows indicate approach direction, PHF given by approach and approach movement



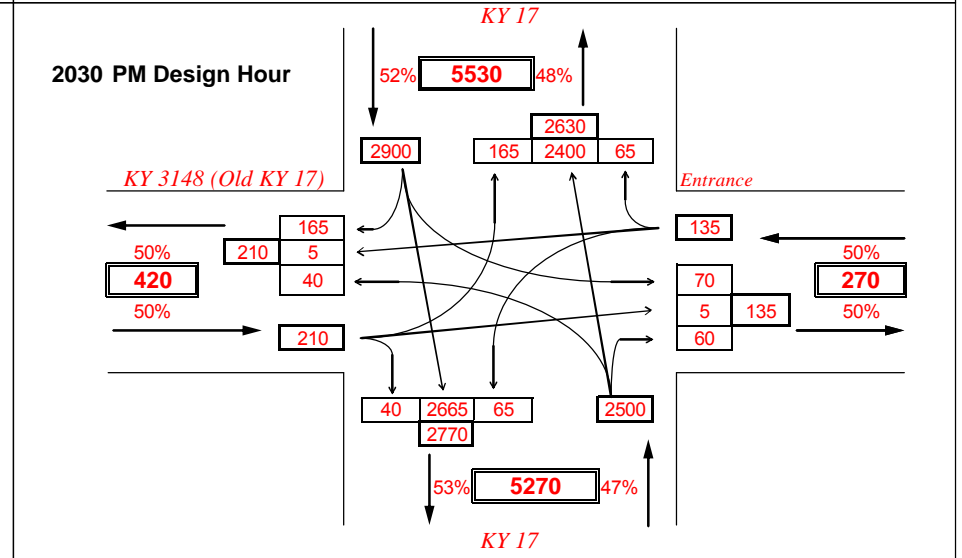
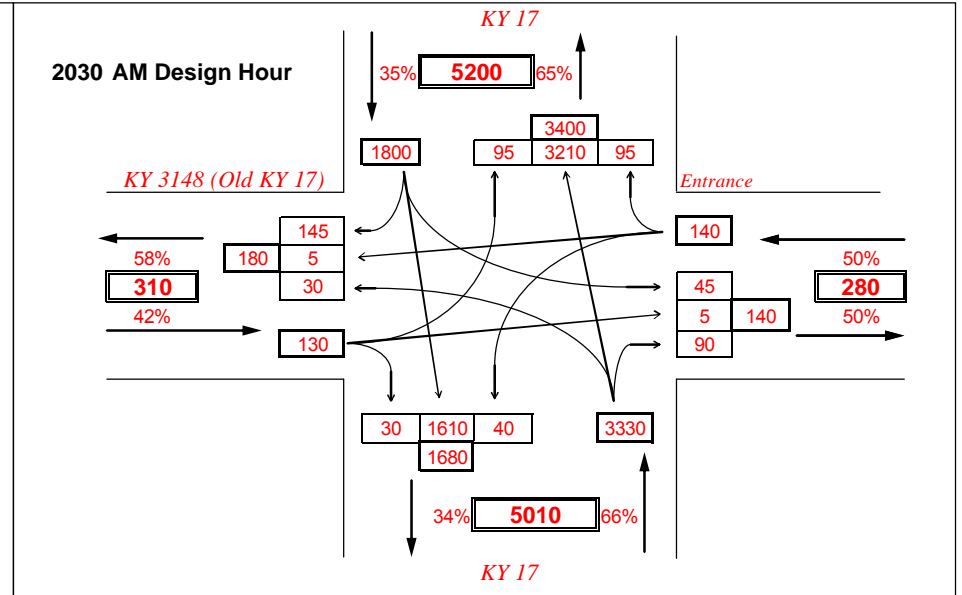
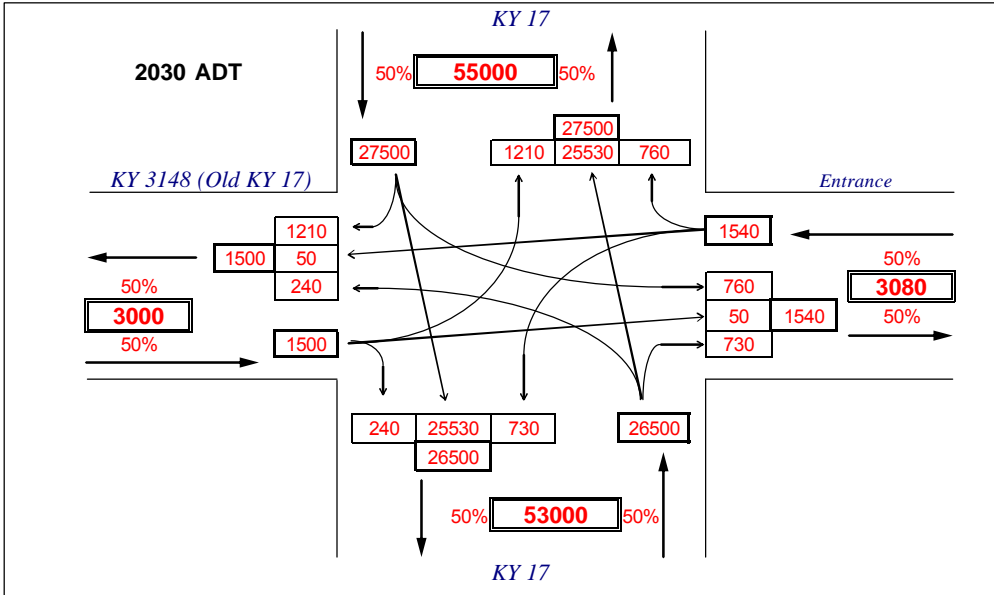
PROJECT: Kenton Co, KY 17 Roundabout Study
 ITEM NUMBER: 0
 MARS NUMBER: 7793519P
 REQUEST DATE 1/10/2006
 ANALYST: D. Hamilton
 SCENARIO: 2030 ADT and Design Hour Volumes
 INTERSECTION: KY 17 & KY 3148 (Old KY 17)

NOTE: K-Factors and Directional Distributions were determined from 2006 traffic counts

Assumes KY 17 remains a four lane road and the peak hour capacity is 1700 veh per lane in the Northbound direction and 1450 veh per lane in the Southbound direction

Assumes proposed planned developments on KY 3148 are built

Assumes proposed planned developments on new entrance are built

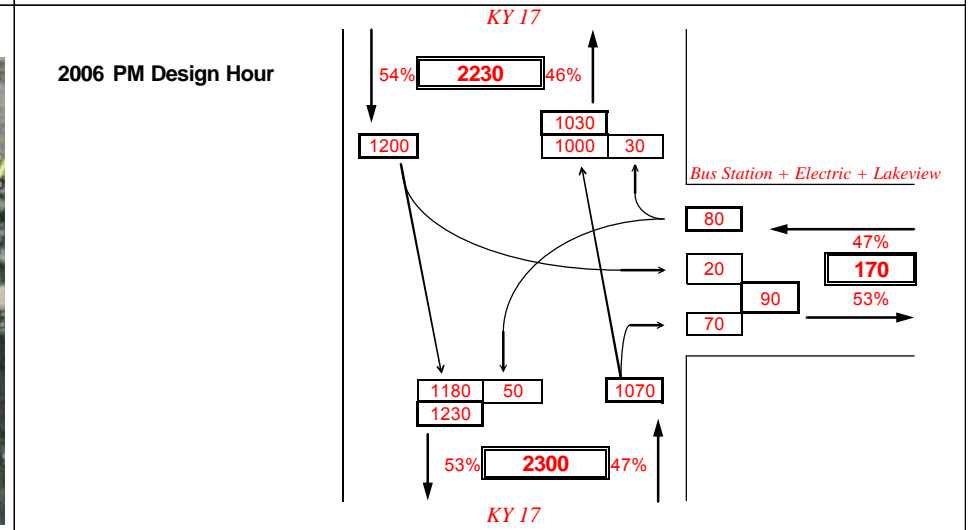
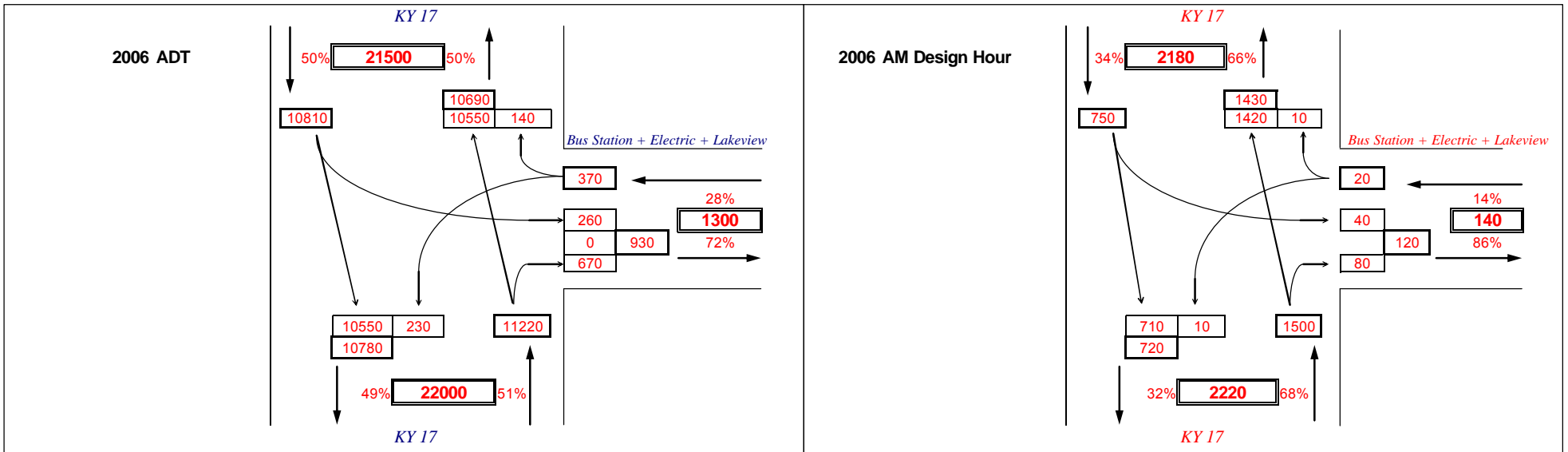


PROJECT: Kenton Co, KY 17 Roundabout Study
 ITEM NUMBER:
 MARS NUMBER: 7793519P
 REQUEST DATE: 1/10/2006
 ANALYST: D. Hamilton
 SCENARIO: **2006 ADT and Design Hour Volumes**
 INTERSECTION: KY 17 & Bus Station + Electric Dr + Lakeview Dr

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2006 Turning Movement Count

Peak Hour Factors	AM		PM		Thru		Right		Left	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Southbound	0.85	0.93	0.83	0.90	--	--	0.65	0.55		
Northbound	0.85	0.94	0.80	0.96	0.81	0.64	--	--		
Westbound	0.82	0.82	--	--	0.31	0.68	0.67	0.54		

* Arrows indicate approach direction, PHF given by approach and approach movement

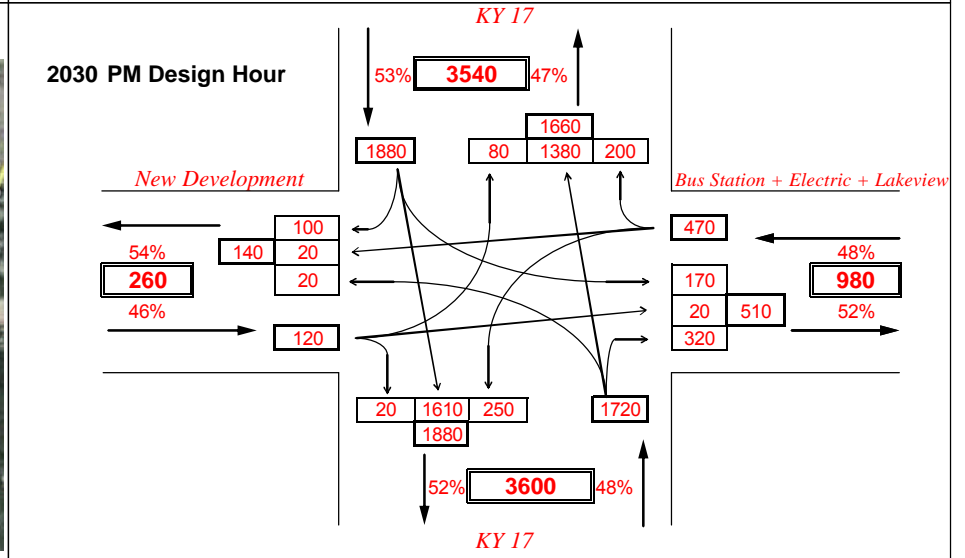
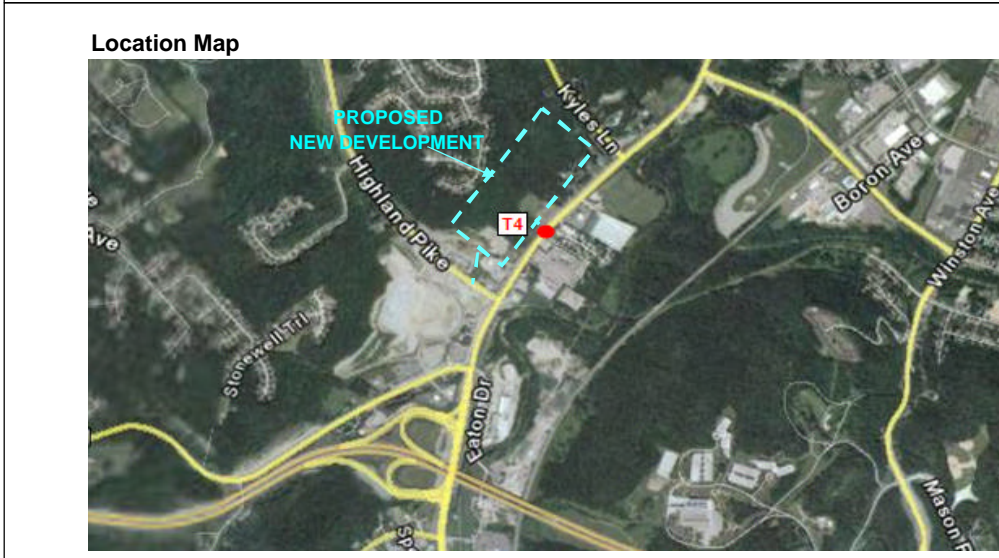
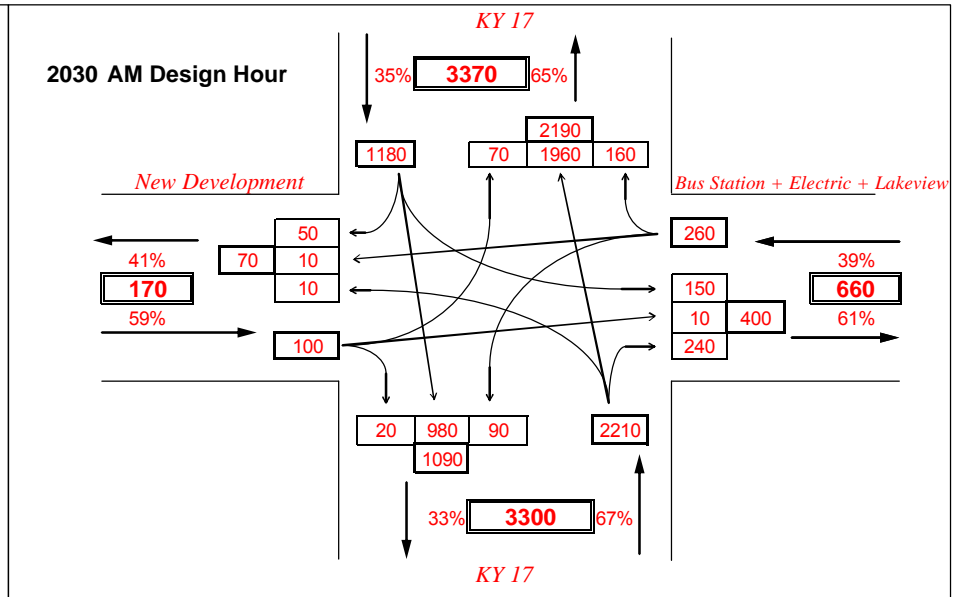
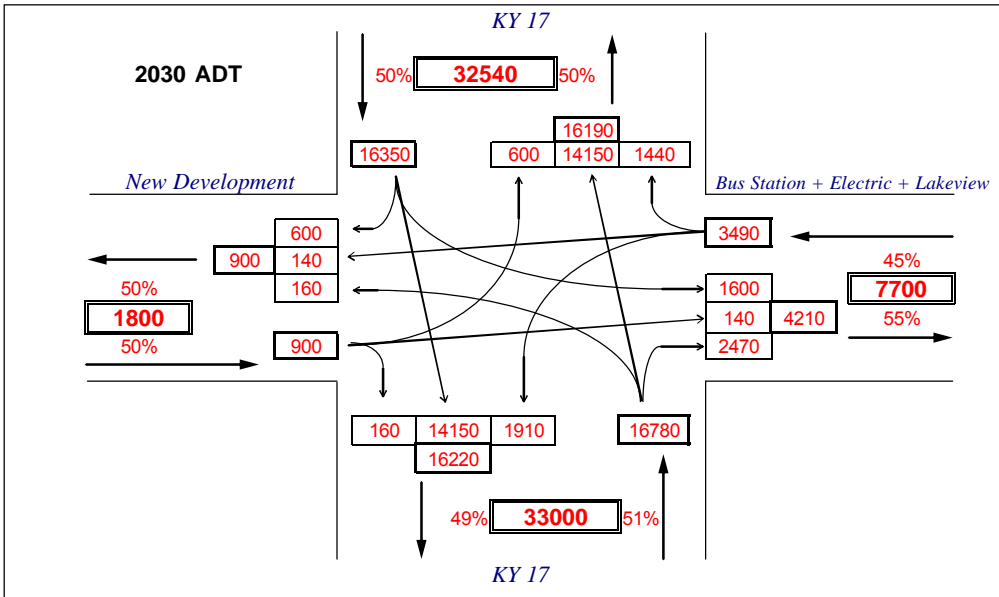


PROJECT: Kenton Co, KY 17 Roundabout Study
 ITEM NUMBER: 0
 MARS NUMBER: 7793519P
 REQUEST DATE 1/10/2006
 ANALYST: D. Hamilton
 SCENARIO: **2030 ADT and Design Hour Volumes**
 INTERSECTION: KY 17 & Bus Station + Electric Dr + Lakeview Dr

NOTE: K-Factors and Directional Distributions were determined from 2006 traffic counts

Assumes proposed planned developments on Lakeview Dr and Electric Dr are built

Assumes proposed planned developments across from Lakeview Dr and Electric Dr are built



**PLANNED FUTURE
DEVELOPMENTS AND ITS TRIP
RATES IN THE PROJECT AREA**

Round-About Study Land Use & Trip Generation Matrix (Net ITE Trips Adjusted for Pass By Traffic)

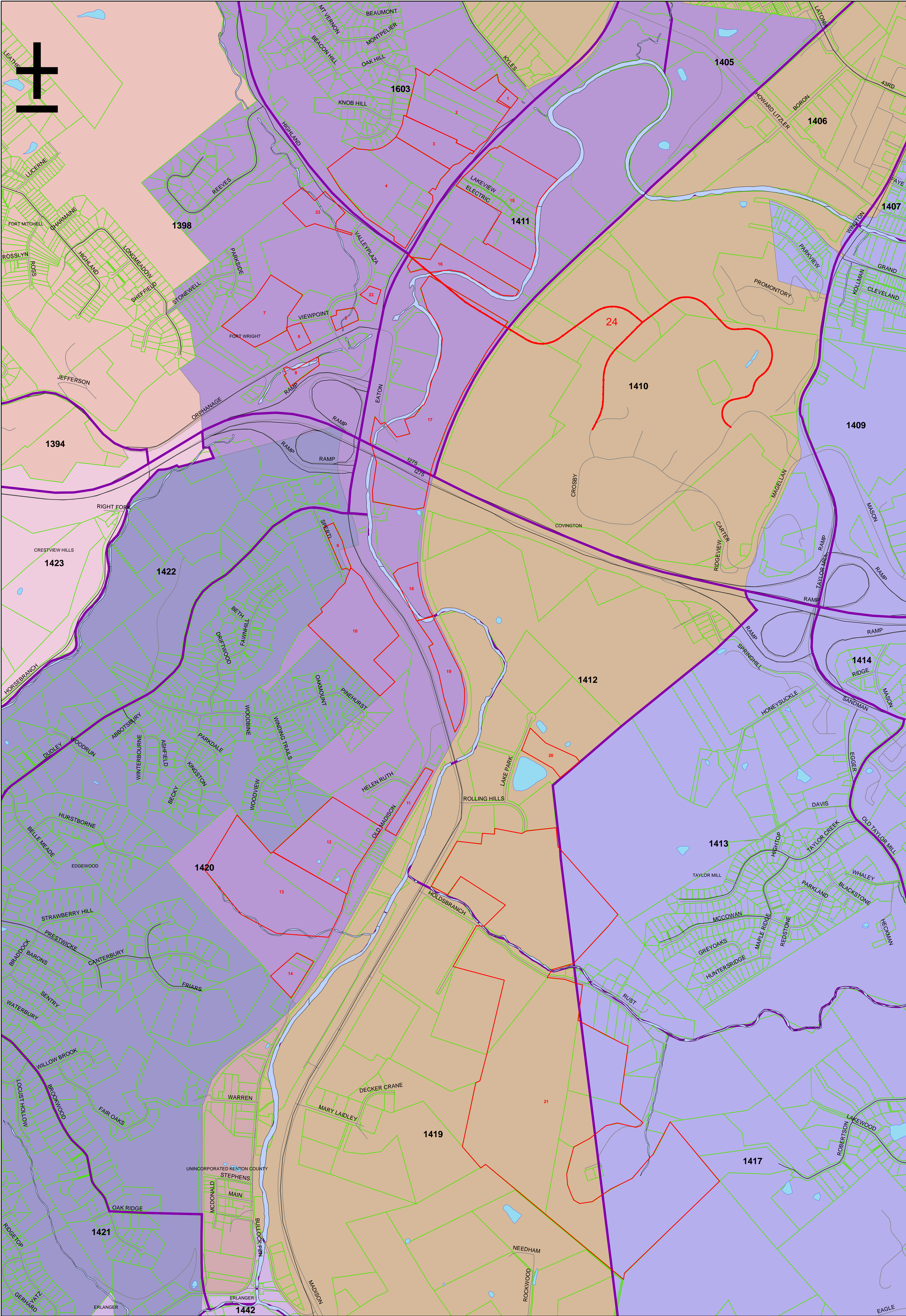
TAZ #	Owner	Acreeage	Proposed	Projected	ITE Land Use	Unit	Density	Total Trips per day	New Total Trips per Day	Passby (Hide Column)	AM Peak Hour Trips	PM Peak Hour Trips	Comments	
1603	1	YK Properties LLC	1.76		Funeral Home	566	per acre	1.76 Ac	9					
1603	2	Butcher, McKinley & Myrtle Brown, William & Jibby Lee	20		Office	710	per 1000 sq ft	15000 SF	310		42	96		
1603	3	Black, Paul & Irma	8		Condos	230	per unit	120 Units	750		60	70		
1603	3	Black, Paul & Irma	8		Office	710	per 1000 sq ft	5000 SF	133		17	85		
1603	4	Ratermann Bob INC			Office	710	per 1000 sq ft	30000 SF	528		72	112		
1603	4	United Dairy Farmers FW	31.8		Retail	814	per 1000 sq ft	50000 SF	1524		71	99	Adjust for Pass By (30%)	
1603	4	Shoppes LLC Foreign			Restaurant	932	per 1000 sq ft	8000 SF	580		52	50	Adjust for Pass By (43%)	
1398	5	RT Kentucky Restaurant	1.7	High Turnover Restaurant		932	per 1000 sq ft	8000 SF	580		52	50	Adjust for Pass By (43%)	
1398	6	White Castle KY LLC	1.6	Fast Food with Drive Through		934	per 1000 sq ft	7500 SF	1861		199	130	Adjust for Pass By (50%)	
1398	7	B & Z Development Inc	22		Hotel	310	per room	100 Rooms	892		48	53		
1398	8	BFW Group LTD	1.8		Office	710	per 1000 sq ft	18,000 SF	356		48	99		
1398	22	Rizzo			Fast food with Drive-Through	934	per 1000 sq ft	4,500	1117		120	78	Adjust for Pass By (50%)	
1398	23	B & Z Development Inc	2		Office	710	per 1000 sq ft	5000 SF	133		17	85		
1398	23	B & Z Development Inc	4		Retail	814	per 1000 sq ft	25000 SF	776		48	57	Adjust for Pass By (30%)	
1420	9	Shoppes of Edgewood	2.4		Service Station with Convenience Market	945	per 1000 sq ft	6000 SF			133	165	Adjust for Pass By (62%)	
1420	9	Shoppes of Edgewood	2.4		Bank	912	per 1000 sq ft	4500 SF	571		30	109	Adjust for Pass By (47%)	
1420	10	Hillside Development Corp	27.8		Home Improvement Super Store	862	per 1000 sq ft	118,000 SF	1874		74	150	Adjust for Pass By (48%)	
1420	11	Taylor, Martin & Helen	3.2		Office	710	per 1000 sq ft	5000 SF	133		17	85		
1420	12	Taylor, Martin & Helen	24		Condos	230	per unit	100 Units	642		52	60		
1420	13	Kunkle, Ed Eubank, William & Mary	40	Condos		230	per unit	170 Units	1008		79	93		
1420	14	Roberts, Hannelore & Willard Williams, Glen & Audrey	4.3		Condos	230	per unit	20 Units	164		14	16		
1411		Highland LLC,			Apartments	220	per unit	100 Units	751		53	73		
1411	15	Lies, John & Patricia Hamilton, William & Pamela Younts, Ann Mae Z Square 13 LTD Lee, Marian	30		Shopping center	820	per 1000 sq ft	95000 SF	4335		100	399	Adjust for Pass By (34%)	
1411	16	Ratermann, Walter & Nancy	15.9		Office	710	per 1000 sq ft	80000 SF	1123		157	168		
1411	16	Ratermann, Walter & Nancy	15.9		Park & Ride	90	per parking space	200 Spaces	925		133	121		
1411	17	Morrow Gravel Co Dudley Inc	35		Shopping Center	820	per 1000 sq ft	171,000 SF	6352	2160	34%	143	589	Adjust for Pass By (34%)
1411	17	Morrow Gravel Co Dudley Inc	35		Office	710	per 1000 sq ft	120,000 SF	1535		217	213		
1411	18	Taylor, Martin & Helen	4.7		New car sales	841	per 1000 sq ft	25000 SF	833		51	66		
1420	19	Taylor, Martin & Helen	8.7		Service Station with Convenience Market	945	per 1000 sq ft	4500 SF	1953		133	165	Adjust for Pass By (62%)	
1420	19	Taylor, Martin & Helen	8.7		Fast food with Drive-Through	934	per 1000 sq ft	4500 SF	1117	559	50%	120	78	Adjust for Pass By (50%)
1412	20	Lakeview Business	5											

1412		Holds Branch Dev. Co. LLC	5.9	Shopping Center		820	per 1000 sq ft	49900 SF	2853	2853		67	261	Adjust for Pass By
1412		Holds Branch Dev. Co. LLC		Condos		230	per unit	258 Units	1437	1437		110	130	
1412		Holds Branch Dev. Co. LLC	44	Single Family Homes		210	per unit	8 Units	101	101		15	11	
1413		Holds Branch Dev. Co. LLC		Condos		230	per unit	2 Units	23	23		3	3	
1413	21	Holds Branch Dev. Co. LLC	13	Single Family Homes		210	per unit	19 units	225	225		23	24	
1417		Holds Branch Dev. Co. LLC	54.9	Apartments		220	per unit	168	1160	1160		86	110	

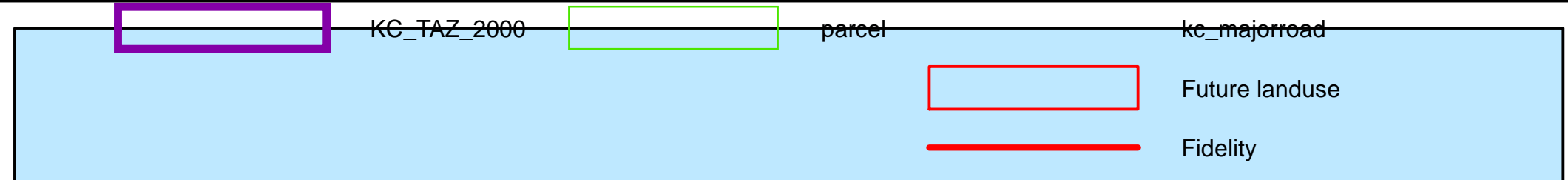
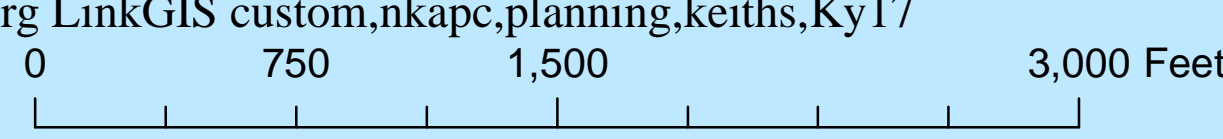
Round-About Study Land Use & Trip Generation Matrix (Net ITE Trips Adjusted for Pass By Traffic)

TAZ #	Owner	Acreage	Proposed	Projected	ITE Land Use	Unit	Density	Total Trips per day	New Total Trips per Day	Passby (Hide Column)	AM Peak Hour Trips	PM Peak Hour Trips	Comments
1417	Holds Branch Dev. Co. LLC	54.3	Single Family Homes		210	per unit	82 Units	866	866		67	75	
1419	Holds Branch Dev. Co. LLC	120	Single Family Homes		210	per unit	38 Homes	427	427		36	45	
1419	Holds Branch Dev. Co. LLC		Condos		230	per unit	446 Units	2288	2288		170	205	
1419	Holds Branch Dev. Co. LLC		Apartments		220	per unit	60 Units	510	510		33	51	
1411	24 Fidelity Campus Expansion		Office		*	Per Employee	4700 Employee	11,275	11275		2525	2356	

* Traffic projections for Fidelity Campus Expansion based on February 21 2001 Traffic Impact study prepared by KZF Design Inc.. The study was based on Highland Ave being extended east to the Fidelity Campus. A copy of the Trip Generation Table and exhibit are attached



KY17 Kenton County, KY 3/15/06
 NKAPC.org LinkGIS custom,nkpc,planning,keiths,Ky17
 1:6,622



TANK Facility Driveway Movements

Typical Weekday

	2006 Traffic			2030 Traffic+	
	South Drive Out Only	North Drive In Out		North Drive In Out	
Fixed Route Buses					
	<u>Time Range</u>				
Early Morning	4a.m. - 6a.m.	41	0	0	
Morning Peak	6a.m. - 9a.m.	38	42	53	
Midday	9a.m. - 3p.m.	48	36	46	
Evening Peak	3p.m. - 6p.m.	32	24	30	
Late Evening	6p.m. - 2a.m.	1	58	74	
School, Training, etc.		15	15	19	
Demand Response Buses					
		90	90	114	
Park & Ride Patrons					
	<u>Time Range</u>				
Morning Peak	6a.m. - 9a.m.		45	57	
Evening Peak	3p.m. - 6p.m.		45		57
TANK Employees / Visitors					
Administration / Visitors *			70	89	89
operators / Maintenance **		300	300	381	
TOTAL MOVEMENTS					
		565	680	115	863
					146

*estimate based on 40 administrative employees making an average of 1.5 trips in/out per day plus 15 visitors.

**estimate based on 200 drivers/mechanics making an average of 1.5 trips in/out per day.




















+ 2030 Traffic based on 1% growth per year as indicated by TANK

MADISON PIKE (KY 17) ROUNDABOUT FEASIBILITY STUDY
NKAPC
Fort Wright / Covington, Kentucky

APPENDIX B

HCM Signalized Intersection Capacity Analysis
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0			4.0		4.0	4.0	
Lane Util. Factor					1.00			0.95		1.00	0.95	
Frt					0.90			1.00		1.00	1.00	
Flt Protected					0.99			1.00		0.95	1.00	
Satd. Flow (prot)					1596			3402		1703	3406	
Flt Permitted					0.91			1.00		0.04	1.00	
Satd. Flow (perm)					1474			3402		72	3406	
Volume (vph)	0	0	0	20	0	50	0	2880	20	30	690	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	21	0	53	0	3032	21	32	726	0
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	69	0	0	3053	0	32	726	0
Turn Type	Perm		Perm	Perm						Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		
Actuated Green, G (s)					9.3			97.1		97.1	97.1	
Effective Green, g (s)					10.5			99.1		99.1	99.1	
Actuated g/C Ratio					0.09			0.84		0.84	0.84	
Clearance Time (s)					5.2			6.0		6.0	6.0	
Vehicle Extension (s)					3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)					132			2867		61	2870	
v/s Ratio Prot								c0.90			0.21	
v/s Ratio Perm					c0.05					0.44		
v/c Ratio					0.52			1.06		0.52	0.25	
Uniform Delay, d1					51.1			9.2		2.6	1.8	
Progression Factor					1.00			1.00		1.00	1.00	
Incremental Delay, d2					3.4			37.2		28.7	0.2	
Delay (s)					54.6			46.5		31.3	2.1	
Level of Service					D			D		C	A	
Approach Delay (s)		0.0			54.6			46.5			3.3	
Approach LOS		A			D			D			A	
Intersection Summary												
HCM Average Control Delay			38.2					HCM Level of Service		D		
HCM Volume to Capacity ratio			1.01									
Actuated Cycle Length (s)			117.6					Sum of lost time (s)		8.0		
Intersection Capacity Utilization			91.1%					ICU Level of Service		F		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕			↕↗		↗	↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50			50		50	50	
Trailing Detector (ft)	0	0	0	0	0			0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt					0.903			0.999				
Flt Protected					0.986					0.950		
Satd. Flow (prot)	0	1792	1792	0	1596	0	0	3402	0	1703	3406	0
Flt Permitted					0.924					0.042		
Satd. Flow (perm)	0	1792	1792	0	1496	0	0	3402	0	75	3406	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					6			2				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			35			55			55	
Link Distance (ft)		280			543			1720			1351	
Travel Time (s)		7.6			10.6			21.3			16.7	
Volume (vph)	0	0	0	20	0	50	0	2880	20	30	690	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	21	0	53	0	3032	21	32	726	0
Lane Group Flow (vph)	0	0	0	0	74	0	0	3053	0	32	726	0
Turn Type	Perm		Perm	Perm						Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		
Detector Phases	4	4	4	8	8			2		6	6	
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0			4.0		4.0	4.0	
Minimum Split (s)	6.2	6.2	6.2	6.2	6.2			30.0		30.0	30.0	
Total Split (s)	20.0	20.0	20.0	20.0	20.0	0.0	0.0	99.0	0.0	99.0	99.0	0.0
Total Split (%)	16.8%	16.8%	16.8%	16.8%	16.8%	0.0%	0.0%	83.2%	0.0%	83.2%	83.2%	0.0%
Maximum Green (s)	14.8	14.8	14.8	14.8	14.8			93.0		93.0	93.0	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6			5.0		5.0	5.0	
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6			1.0		1.0	1.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Recall Mode	None	None	None	None	None			Max		Max	Max	
Act Effct Green (s)					11.8			99.9		99.9	99.9	
Actuated g/C Ratio					0.10			0.86		0.86	0.86	
v/c Ratio					0.48			1.05		0.50	0.25	
Control Delay					49.8			43.5		36.1	2.4	
Queue Delay					0.0			0.0		0.0	0.0	
Total Delay					49.8			43.5		36.1	2.4	
LOS					D			D		D	A	
Approach Delay					49.8			43.5			3.8	
Approach LOS					D			D			A	
Queue Length 50th (ft)					48			~1336		5	46	
Queue Length 95th (ft)					97			#1554		#25	77	
Internal Link Dist (ft)		200			463			1640			1271	

KY 17 @ Holds Branch am Existing
DLZ, LLC

Synchro 6 Report

Lanes, Volumes, Timings
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)												
Base Capacity (vph)					200			2914		64	2917	
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			1.05		0.50	0.25	

Intersection Summary





















Area Type:	Other
Cycle Length:	119
Actuated Cycle Length:	116.7
Natural Cycle:	150
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.05
Intersection Signal Delay:	35.9
Intersection LOS:	D
Intersection Capacity Utilization:	91.1%
ICU Level of Service:	F
Analysis Period (min):	15
~	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.

Splits and Phases: 7: Pioneer Park & KY 17 Madison Pike

 99 s	 20 s
 99 s	 20 s




















HCM Signalized Intersection Capacity Analysis
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			4.0		4.0	4.0		
Lane Util. Factor					1.00			0.95		1.00	0.95		
Frt					0.90			0.99		1.00	1.00		
Flt Protected					0.99			1.00		0.95	1.00		
Satd. Flow (prot)					1596			3380		1703	3406		
Flt Permitted					0.91			1.00		0.05	1.00		
Satd. Flow (perm)					1464			3380		89	3406		
Volume (vph)	0	0	0	150	0	410	0	2990	150	250	1160	0	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	0	0	0	158	0	410	0	2990	158	263	1221	0	
RTOR Reduction (vph)	0	0	0	0	74	0	0	3	0	0	0	0	
Lane Group Flow (vph)	0	0	0	0	494	0	0	3145	0	263	1221	0	
Turn Type	Perm		Perm	Perm						pm+pt			
Protected Phases		4			8			2		1	6		
Permitted Phases	4		4	8						6			
Actuated Green, G (s)					26.8			75.0		87.0	87.0		
Effective Green, g (s)					28.0			77.0		89.0	89.0		
Actuated g/C Ratio					0.22			0.62		0.71	0.71		
Clearance Time (s)					5.2			6.0		4.0	6.0		
Lane Grp Cap (vph)					328			2082		167	2425		
v/s Ratio Prot								0.93		c0.10	0.36		
v/s Ratio Perm					c0.34					c1.03			
v/c Ratio					1.50			1.51		1.57	0.50		
Uniform Delay, d1					48.5			24.0		60.7	8.1		
Progression Factor					1.00			1.00		1.00	1.00		
Incremental Delay, d2					242.4			232.3		285.4	0.8		
Delay (s)					290.9			256.3		346.2	8.8		
Level of Service					F			F		F	A		
Approach Delay (s)		0.0			290.9			256.3			68.6		
Approach LOS		A			F			F			E		
Intersection Summary													
HCM Average Control Delay			206.5									HCM Level of Service	F
HCM Volume to Capacity ratio			1.54										
Actuated Cycle Length (s)			125.0									Sum of lost time (s)	8.0
Intersection Capacity Utilization			144.8%									ICU Level of Service	H
Analysis Period (min)			15										
c Critical Lane Group													

Lanes, Volumes, Timings
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt					0.903			0.992				
Flt Protected					0.986					0.950		
Satd. Flow (prot)	0	1792	1792	0	1596	0	0	3378	0	1703	3406	0
Flt Permitted					0.905					0.049		
Satd. Flow (perm)	0	1792	1792	0	1465	0	0	3378	0	88	3406	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					96			8				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			35			55			55	
Link Distance (ft)		280			543			1720			1351	
Travel Time (s)		7.6			10.6			21.3			16.7	
Volume (vph)	0	0	0	150	0	410	0	2990	150	250	1160	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	158	0	410	0	2990	158	263	1221	0
Lane Group Flow (vph)	0	0	0	0	568	0	0	3148	0	263	1221	0
Turn Type	Perm		Perm	Perm						pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4		4	8						6		
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0			30.0		8.0	30.0	
Total Split (s)	32.0	32.0	32.0	32.0	32.0	0.0	0.0	81.0	0.0	12.0	93.0	0.0
Total Split (%)	25.6%	25.6%	25.6%	25.6%	25.6%	0.0%	0.0%	64.8%	0.0%	9.6%	74.4%	0.0%
Maximum Green (s)	26.8	26.8	26.8	26.8	26.8			75.0		8.0	87.0	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6			5.0		3.5	5.0	
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6			1.0		0.5	1.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Walk Time (s)	5.0	5.0	5.0	5.0	5.0			5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)					28.0			77.0		89.0	89.0	
Actuated g/C Ratio					0.22			0.62		0.71	0.71	
v/c Ratio					1.41			1.51		1.58	0.50	
Control Delay					229.5			256.2		315.9	9.0	
Queue Delay					0.0			0.0		0.0	0.0	
Total Delay					229.5			256.2		315.9	9.0	
LOS					F			F		F	A	
Approach Delay					229.5			256.2			63.3	
Approach LOS					F			F			E	
Queue Length 50th (ft)					~556			~1877		~256	208	
Queue Length 95th (ft)					#782			#1995		#430	253	
Internal Link Dist (ft)		200			463			1640			1271	
Turn Bay Length (ft)												
Base Capacity (vph)					403			2084		166	2425	
Starvation Cap Reductn					0			0		0	0	

KY 17 @ Holds Branch am No Build
 DLZ, LLC

Synchro 6 Report

Lanes, Volumes, Timings
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn					0			0		0	0	
Storage Cap Reductn					0			0		0	0	
Reduced v/c Ratio					1.41			1.51		1.58	0.50	

Intersection Summary






















Area Type:	Other
Cycle Length:	125
Actuated Cycle Length:	125
Offset:	0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle:	150
Control Type:	Pretimed
Maximum v/c Ratio:	1.58
Intersection Signal Delay:	198.2
Intersection LOS:	F
Intersection Capacity Utilization	144.8%
ICU Level of Service	H
Analysis Period (min)	15
~	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.

Splits and Phases: 7: Pioneer Park & KY 17 Madison Pike



HCM Signalized Intersection Capacity Analysis
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)				4.0		4.0		4.0	4.0	4.0	4.0			
Lane Util. Factor				1.00		0.88		0.91	1.00	0.97	0.91			
Frt				1.00		0.85		1.00	0.85	1.00	1.00			
Flt Protected				0.95		1.00		1.00	1.00	0.95	1.00			
Satd. Flow (prot)				1703		2682		4893	1524	3303	4893			
Flt Permitted				0.95		1.00		1.00	1.00	0.95	1.00			
Satd. Flow (perm)				1703		2682		4893	1524	3303	4893			
Volume (vph)	0	0	0	150	0	410	0	2990	150	250	1160	0		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95		
Adj. Flow (vph)	0	0	0	158	0	410	0	2990	158	263	1221	0		
RTOR Reduction (vph)	0	0	0	0	0	186	0	0	12	0	0	0		
Lane Group Flow (vph)	0	0	0	158	0	224	0	2990	146	263	1221	0		
Turn Type	Perm			Prot			custom			Perm		Prot		
Protected Phases	4			3			2			1		6		
Permitted Phases	4			8			2							
Actuated Green, G (s)				13.0			20.5			80.5		10.5	95.5	
Effective Green, g (s)				13.0			21.0			81.0		11.0	96.0	
Actuated g/C Ratio				0.10			0.17			0.65		0.09	0.77	
Clearance Time (s)				4.0			4.5			4.5		4.5	4.5	
Lane Grp Cap (vph)				177			451			3171		988	3758	
v/s Ratio Prot				c0.09			c0.61			c0.08		0.25		
v/s Ratio Perm				c0.08			0.10							
v/c Ratio				0.89			0.50			0.94		0.15	0.90	0.32
Uniform Delay, d1				55.3			47.2			19.9		8.6	56.5	4.5
Progression Factor				1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2				44.2			3.9			7.3		0.3	33.0	0.2
Delay (s)				99.5			51.1			27.2		8.9	89.5	4.7
Level of Service				F			D			C		A	F	A
Approach Delay (s)	0.0			64.5			26.3			19.7				
Approach LOS	A			E			C			B				
Intersection Summary														
HCM Average Control Delay	28.6			HCM Level of Service			C							
HCM Volume to Capacity ratio	0.90													
Actuated Cycle Length (s)	125.0			Sum of lost time (s)			12.0							
Intersection Capacity Utilization	83.2%			ICU Level of Service			E							
Analysis Period (min)	15													
c Critical Lane Group														

Lanes, Volumes, Timings
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖		↖↗		↕↕↕	↖	↖↗	↕↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		50	400		150	550		50	300		0
Storage Lanes	1		0	1		1	0		1	2		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.91	1.00	0.97	0.91	1.00
Fr _t						0.850			0.850			
Fl _t Protected				0.950						0.950		
Satd. Flow (prot)	1792	1792	0	1703	0	2682	0	4893	1524	3303	4893	0
Fl _t Permitted				0.950						0.950		
Satd. Flow (perm)	1792	1792	0	1703	0	2682	0	4893	1524	3303	4893	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						224			35			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			35			55			55	
Link Distance (ft)		280			543			1720			1351	
Travel Time (s)		7.6			10.6			21.3			16.7	
Volume (vph)	0	0	0	150	0	410	0	2990	150	250	1160	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	158	0	410	0	2990	158	263	1221	0
Lane Group Flow (vph)	0	0	0	158	0	410	0	2990	158	263	1221	0
Turn Type	Perm			Prot		custom			Perm	Prot		
Protected Phases		4		3				2		1		6
Permitted Phases	4					8			2			
Minimum Split (s)	8.0	8.0		8.0		24.0		30.0	30.0	8.5	30.0	
Total Split (s)	8.0	8.0	0.0	17.0	0.0	25.0	0.0	85.0	85.0	15.0	100.0	0.0
Total Split (%)	6.4%	6.4%	0.0%	13.6%	0.0%	20.0%	0.0%	68.0%	68.0%	12.0%	80.0%	0.0%
Maximum Green (s)	3.5	3.5		13.0		20.5		80.5	80.5	10.5	95.5	
Yellow Time (s)	3.5	3.5		3.5		3.5		3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		0.5		1.0		1.0	1.0	1.0	1.0	
Lead/Lag	Lag	Lag		Lead				Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes				Yes	Yes	Yes		
Walk Time (s)	5.0	5.0				5.0		5.0	5.0		5.0	
Flash Dont Walk (s)	11.0	11.0				11.0		11.0	11.0		11.0	
Pedestrian Calls (#/hr)	0	0				0		0	0		0	
Act Effct Green (s)				13.0		21.0		81.0	81.0	11.0	96.0	
Actuated g/C Ratio				0.10		0.17		0.65	0.65	0.09	0.77	
v/c Ratio				0.89		0.64		0.94	0.16	0.90	0.32	
Control Delay				99.8		26.7		27.7	7.0	89.6	4.7	
Queue Delay				0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay				99.8		26.7		27.7	7.0	89.6	4.7	
LOS				F		C		C	A	F	A	
Approach Delay								26.6			19.8	
Approach LOS								C			B	
Queue Length 50th (ft)				128		78		744	35	110	95	
Queue Length 95th (ft)				#258		140		837	63	#190	112	
Internal Link Dist (ft)		200			463			1640			1271	
Turn Bay Length (ft)				400		150			50	300		

Lanes, Volumes, Timings
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)				177		637		3171	1000	291	3758	
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				0.89		0.64		0.94	0.16	0.90	0.32	

Intersection Summary





















Area Type: Other
 Cycle Length: 125
 Actuated Cycle Length: 125
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 100
 Control Type: Pretimed
 Maximum v/c Ratio: 0.94
 Intersection Signal Delay: 26.9 Intersection LOS: C
 Intersection Capacity Utilization 83.2% ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 7: Pioneer Park & KY 17 Madison Pike

ø4	ø1	ø2	ø3	ø5
15 s	85 s		17 s	8 s
ø6			ø8	
100 s			25 s	

HCM Signalized Intersection Capacity Analysis
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95		1.00	0.95	
Frt		1.00	0.85		0.91			1.00		1.00	1.00	
Flt Protected		0.97	1.00		0.98			1.00		0.95	1.00	
Satd. Flow (prot)		1733	1524		1605			3401		1703	3406	
Flt Permitted		0.66	1.00		0.88			1.00		0.24	1.00	
Satd. Flow (perm)		1177	1524		1439			3401		439	3406	
Volume (vph)	10	5	10	30	0	60	0	1050	10	40	2280	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	5	11	32	0	63	0	1105	11	42	2400	0
RTOR Reduction (vph)	0	0	10	0	58	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	16	1	0	37	0	0	1116	0	42	2400	0
Turn Type	Perm		Perm	Perm						Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		
Actuated Green, G (s)		7.5	7.5		7.5			95.9		95.9	95.9	
Effective Green, g (s)		8.7	8.7		8.7			97.9		97.9	97.9	
Actuated g/C Ratio		0.08	0.08		0.08			0.85		0.85	0.85	
Clearance Time (s)		5.2	5.2		5.2			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)		89	116		109			2905		375	2910	
v/s Ratio Prot								0.33			c0.70	
v/s Ratio Perm		0.01	0.00		c0.03					0.10		
v/c Ratio		0.18	0.01		0.34			0.38		0.11	0.82	
Uniform Delay, d1		49.6	49.0		50.2			1.8		1.3	4.1	
Progression Factor		1.00	1.00		1.00			1.00		1.00	1.00	
Incremental Delay, d2		1.0	0.0		1.8			0.4		0.6	2.8	
Delay (s)		50.6	49.0		52.1			2.2		2.0	6.9	
Level of Service		D	D		D			A		A	A	
Approach Delay (s)		49.9			52.1			2.2			6.8	
Approach LOS		D			D			A			A	
Intersection Summary												
HCM Average Control Delay			6.9					HCM Level of Service			A	
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			114.6					Sum of lost time (s)		8.0		
Intersection Capacity Utilization			81.7%					ICU Level of Service		D		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕			↕↗		↗	↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50			50		50	50	
Trailing Detector (ft)	0	0	0	0	0			0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Fr _t			0.850		0.910			0.999				
Fl _t Protected		0.967			0.983					0.950		
Satd. Flow (prot)	0	1733	1524	0	1603	0	0	3402	0	1703	3406	0
Fl _t Permitted		0.868			0.897					0.235		
Satd. Flow (perm)	0	1556	1524	0	1463	0	0	3402	0	421	3406	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			11		63			3				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			35			55			55	
Link Distance (ft)		280			543			1720			1351	
Travel Time (s)		7.6			10.6			21.3			16.7	
Volume (vph)	10	5	10	30	0	60	0	1050	10	40	2280	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	5	11	32	0	63	0	1105	11	42	2400	0
Lane Group Flow (vph)	0	16	11	0	95	0	0	1116	0	42	2400	0
Turn Type	Perm		Perm	Perm						Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		
Detector Phases	4	4	4	8	8			2		6	6	
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0			4.0		4.0	4.0	
Minimum Split (s)	6.2	6.2	6.2	6.2	6.2			30.0		30.0	30.0	
Total Split (s)	20.0	20.0	20.0	20.0	20.0	0.0	0.0	99.0	0.0	99.0	99.0	0.0
Total Split (%)	16.8%	16.8%	16.8%	16.8%	16.8%	0.0%	0.0%	83.2%	0.0%	83.2%	83.2%	0.0%
Maximum Green (s)	14.8	14.8	14.8	14.8	14.8			93.0		93.0	93.0	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6			5.0		5.0	5.0	
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6			1.0		1.0	1.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Recall Mode	None	None	None	None	None			Max		Max	Max	
Act Effct Green (s)		9.8	9.8		9.8			98.7		98.7	98.7	
Actuated g/C Ratio		0.08	0.08		0.08			0.87		0.87	0.87	
v/c Ratio		0.12	0.08		0.52			0.38		0.11	0.81	
Control Delay		47.6	23.1		24.5			2.5		2.8	8.0	
Queue Delay		0.0	0.0		0.0			0.0		0.0	0.0	
Total Delay		47.6	23.1		24.5			2.5		2.8	8.0	
LOS		D	C		C			A		A	A	
Approach Delay		37.6			24.5			2.5			7.9	
Approach LOS		D			C			A			A	
Queue Length 50th (ft)		11	0		22			67		4	331	
Queue Length 95th (ft)		33	18		75			126		14	640	
Internal Link Dist (ft)		200			463			1640			1271	

Lanes, Volumes, Timings
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)												
Base Capacity (vph)		205	210		247			2958		366	2961	
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		0.08	0.05		0.38			0.38		0.11	0.81	

Intersection Summary





















Area Type:	Other
Cycle Length:	119
Actuated Cycle Length:	113.5
Natural Cycle:	50
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.81
Intersection Signal Delay:	6.9
Intersection LOS:	A
Intersection Capacity Utilization:	81.7%
ICU Level of Service:	D
Analysis Period (min):	15

Splits and Phases: 7: Pioneer Park & KY 17 Madison Pike



HCM Signalized Intersection Capacity Analysis
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0		4.0			4.0		4.0	4.0		
Lane Util. Factor		1.00	1.00		1.00			0.95		1.00	0.95		
Frt		1.00	0.85		0.91			0.99		1.00	1.00		
Flt Protected		0.97	1.00		0.98			1.00		0.95	1.00		
Satd. Flow (prot)		1733	1524		1601			3384		1703	3406		
Flt Permitted		0.68	1.00		0.89			1.00		0.05	1.00		
Satd. Flow (perm)		1216	1524		1446			3384		94	3406		
Volume (vph)	10	5	10	260	0	560	0	1840	80	380	2520	0	
Peak-hour factor, PHF	0.95	0.95	0.97	0.97	0.95	0.95	0.95	0.95	0.95	0.95	0.97	0.95	
Adj. Flow (vph)	11	5	10	268	0	589	0	1937	84	400	2598	0	
RTOR Reduction (vph)	0	0	6	0	63	0	0	3	0	0	0	0	
Lane Group Flow (vph)	0	16	4	0	794	0	0	2018	0	400	2598	0	
Turn Type	Perm		Perm	Perm						pm+pt			
Protected Phases		4			8			2		1	6		
Permitted Phases	4		4	8						6			
Actuated Green, G (s)		24.8	24.8		24.8			70.0		89.0	89.0		
Effective Green, g (s)		26.0	26.0		26.0			72.0		91.0	91.0		
Actuated g/C Ratio		0.21	0.21		0.21			0.58		0.73	0.73		
Clearance Time (s)		5.2	5.2		5.2			6.0		4.0	6.0		
Lane Grp Cap (vph)		253	317		301			1949		262	2480		
v/s Ratio Prot								0.60		c0.18	0.76		
v/s Ratio Perm		0.01	0.00		c0.55					c0.93			
v/c Ratio		0.06	0.01		2.64			1.04		1.53	1.05		
Uniform Delay, d1		39.7	39.3		49.5			26.5		57.2	17.0		
Progression Factor		1.00	1.00		1.00			1.00		1.00	1.00		
Incremental Delay, d2		0.5	0.1		746.0			30.3		255.5	32.1		
Delay (s)		40.2	39.4		795.5			56.8		312.7	49.1		
Level of Service		D	D		F			E		F	D		
Approach Delay (s)		39.9			795.5			56.8			84.3		
Approach LOS		D			F			E			F		
Intersection Summary													
HCM Average Control Delay			177.9									HCM Level of Service	F
HCM Volume to Capacity ratio			1.76										
Actuated Cycle Length (s)			125.0									Sum of lost time (s)	8.0
Intersection Capacity Utilization			140.0%									ICU Level of Service	H
Analysis Period (min)			15										

c Critical Lane Group

Lanes, Volumes, Timings
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕			↕↗		↗	↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Fr _t			0.850		0.907			0.994				
Fl _t Protected		0.967			0.985					0.950		
Satd. Flow (prot)	0	1733	1524	0	1601	0	0	3385	0	1703	3406	0
Fl _t Permitted		0.678			0.889					0.053		
Satd. Flow (perm)	0	1215	1524	0	1445	0	0	3385	0	95	3406	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			8		80			6				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			35			55			55	
Link Distance (ft)		280			543			1720			1351	
Travel Time (s)		7.6			10.6			21.3			16.7	
Volume (vph)	10	5	10	260	0	560	0	1840	80	380	2520	0
Peak Hour Factor	0.95	0.95	0.97	0.97	0.95	0.95	0.95	0.95	0.95	0.95	0.97	0.95
Adj. Flow (vph)	11	5	10	268	0	589	0	1937	84	400	2598	0
Lane Group Flow (vph)	0	16	10	0	857	0	0	2021	0	400	2598	0
Turn Type	Perm		Perm	Perm						pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4		4	8						6		
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0			30.0		8.0	30.0	
Total Split (s)	30.0	30.0	30.0	30.0	30.0	0.0	0.0	76.0	0.0	19.0	95.0	0.0
Total Split (%)	24.0%	24.0%	24.0%	24.0%	24.0%	0.0%	0.0%	60.8%	0.0%	15.2%	76.0%	0.0%
Maximum Green (s)	24.8	24.8	24.8	24.8	24.8			70.0		15.0	89.0	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6			5.0		3.5	5.0	
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6			1.0		0.5	1.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Walk Time (s)	5.0	5.0	5.0	5.0	5.0			5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)		26.0	26.0		26.0			72.0		91.0	91.0	
Actuated g/C Ratio		0.21	0.21		0.21			0.58		0.73	0.73	
v/c Ratio		0.06	0.03		2.35			1.04		1.53	1.05	
Control Delay		40.7	23.8		639.6			56.9		285.1	50.3	
Queue Delay		0.0	0.0		0.0			0.0		0.0	0.0	
Total Delay		40.7	23.8		639.6			56.9		285.1	50.3	
LOS		D	C		F			E		F	D	
Approach Delay		34.2			639.6			56.9			81.7	
Approach LOS		C			F			E			F	
Queue Length 50th (ft)		11	1		~1093			~924		~406	~1202	
Queue Length 95th (ft)		31	17		#1345			#1063		#609	#1330	
Internal Link Dist (ft)		200			463			1640			1271	
Turn Bay Length (ft)												
Base Capacity (vph)		253	323		364			1952		262	2480	
Starvation Cap Reductn		0	0		0			0		0	0	

KY 17 @ Holds Branch pm No Build
 DLZ, LLC

Synchro 6 Report

Lanes, Volumes, Timings
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0	0		0			0		0	0	
Storage Cap Reductn		0	0		0			0		0	0	
Reduced v/c Ratio		0.06	0.03		2.35			1.04		1.53	1.05	

Intersection Summary

Area Type:	Other
Cycle Length:	125
Actuated Cycle Length:	125
Offset:	0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle:	75
Control Type:	Pretimed
Maximum v/c Ratio:	2.35
Intersection Signal Delay:	154.0
Intersection LOS:	F
Intersection Capacity Utilization	140.0%
ICU Level of Service	H
Analysis Period (min)	15
~	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.

Splits and Phases: 7: Pioneer Park & KY 17 Madison Pike



HCM Signalized Intersection Capacity Analysis

7: Pioneer Park & KY 17 Madison Pike

8/31/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0		4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00		0.88		0.91	1.00	0.97	0.91	
Frt	1.00	0.90		1.00		0.85		1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1703	1613		1703		2682		4893	1524	3303	4893	
Flt Permitted	0.95	1.00		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1703	1613		1703		2682		4893	1524	3303	4893	
Volume (vph)	10	5	10	260	0	560	0	1840	80	380	2520	0
Peak-hour factor, PHF	0.95	0.95	0.97	0.97	0.95	0.95	0.95	0.95	0.95	0.95	0.97	0.95
Adj. Flow (vph)	11	5	10	268	0	589	0	1937	84	400	2598	0
RTOR Reduction (vph)	0	10	0	0	0	518	0	0	10	0	0	0
Lane Group Flow (vph)	11	5	0	268	0	71	0	1937	74	400	2598	0
Turn Type	Prot			Prot		custom			Perm		Prot	
Protected Phases	7	4		3				2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	14.0	4.0		25.0		15.0		60.0	60.0	20.0	84.0	
Effective Green, g (s)	14.0	4.0		25.0		15.0		60.0	60.0	20.0	84.0	
Actuated g/C Ratio	0.11	0.03		0.20		0.12		0.48	0.48	0.16	0.67	
Clearance Time (s)	4.0	4.0		4.0		4.0		4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	191	52		341		322		2349	732	528	3288	
v/s Ratio Prot	0.01	0.00		c0.16				c0.40		0.12	c0.53	
v/s Ratio Perm						c0.03			0.05			
v/c Ratio	0.06	0.10		0.79		0.22		0.82	0.10	0.76	0.79	
Uniform Delay, d1	49.6	58.8		47.5		49.7		28.0	17.8	50.2	14.3	
Progression Factor	1.00	1.00		1.00		1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	3.9		16.5		1.6		3.5	0.3	9.8	2.0	
Delay (s)	50.2	62.7		64.0		51.3		31.4	18.0	60.0	16.4	
Level of Service	D	E		E		D		C	B	E	B	
Approach Delay (s)		57.4			55.3			30.9			22.2	
Approach LOS		E			E			C			C	
Intersection Summary												
HCM Average Control Delay			30.1			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			77.5%			ICU Level of Service				D		
Analysis Period (min)			15									

c Critical Lane Group

Lanes, Volumes, Timings
7: Pioneer Park & KY 17 Madison Pike

8/31/2006

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		50	400		150	550		50	300		0
Storage Lanes	1		0	1		1	0		1	2		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.91	1.00	0.97	0.91	1.00
Fr _t		0.900				0.850			0.850			
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1703	1613	0	1703	0	2682	0	4893	1524	3303	4893	0
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	1703	1613	0	1703	0	2682	0	4893	1524	3303	4893	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				589			20			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25				35			55			55
Link Distance (ft)		280				543			1720			1351
Travel Time (s)		7.6				10.6			21.3			16.7
Volume (vph)	10	5	10	260	0	560	0	1840	80	380	2520	0
Peak Hour Factor	0.95	0.95	0.97	0.97	0.95	0.95	0.95	0.95	0.95	0.95	0.97	0.95
Adj. Flow (vph)	11	5	10	268	0	589	0	1937	84	400	2598	0
Lane Group Flow (vph)	11	15	0	268	0	589	0	1937	84	400	2598	0
Turn Type	Prot			Prot		custom			Perm	Prot		
Protected Phases	7	4		3				2		1		6
Permitted Phases						8			2			
Minimum Split (s)	8.0	8.0		8.0		30.0		30.0	30.0	8.0		30.0
Total Split (s)	18.0	8.0	0.0	29.0	0.0	19.0	0.0	64.0	64.0	24.0	88.0	0.0
Total Split (%)	14.4%	6.4%	0.0%	23.2%	0.0%	15.2%	0.0%	51.2%	51.2%	19.2%	70.4%	0.0%
Maximum Green (s)	14.0	4.0		25.0		15.0		60.0	60.0	20.0	84.0	
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0		1.0		1.0	1.0	1.0	1.0	
Lead/Lag	Lead	Lag		Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes		Yes		Yes	Yes	Yes		
Walk Time (s)		5.0				5.0		5.0	5.0			5.0
Flash Dont Walk (s)		11.0				11.0		11.0	11.0			11.0
Pedestrian Calls (#/hr)		0				0		0	0			0
Act Effct Green (s)	14.0	4.0		25.0		15.0		60.0	60.0	20.0	84.0	
Actuated g/C Ratio	0.11	0.03		0.20		0.12		0.48	0.48	0.16	0.67	
v/c Ratio	0.06	0.25		0.79		0.70		0.82	0.11	0.76	0.79	
Control Delay	50.6	45.6		64.7		9.0		31.8	14.0	60.4	16.6	
Queue Delay	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	50.6	45.6		64.7		9.0		31.8	14.0	60.4	16.6	
LOS	D	D		E		A		C	B	E	B	
Approach Delay		47.7						31.0			22.5	
Approach LOS		D						C			C	
Queue Length 50th (ft)	8	4		208		0		481	27	161	494	
Queue Length 95th (ft)	27	28		#339		57		548	58	218	556	
Internal Link Dist (ft)		200				463		1640			1271	
Turn Bay Length (ft)	50			400		150			50	300		

Lanes, Volumes, Timings
 7: Pioneer Park & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	191	61		341		840		2349	742	528	3288	
Starvation Cap Reductn	0	0		0		0		0	0	0	0	
Spillback Cap Reductn	0	0		0		0		0	0	0	0	
Storage Cap Reductn	0	0		0		0		0	0	0	0	
Reduced v/c Ratio	0.06	0.25		0.79		0.70		0.82	0.11	0.76	0.79	

Intersection Summary

Area Type: Other
 Cycle Length: 125
 Actuated Cycle Length: 125
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 90
 Control Type: Pretimed
 Maximum v/c Ratio: 0.82
 Intersection Signal Delay: 26.1 Intersection LOS: C
 Intersection Capacity Utilization 77.5% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 7: Pioneer Park & KY 17 Madison Pike



HCM Unsignalized Intersection Capacity Analysis
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	40	10	10	3360	940	60
Peak Hour Factor	1.00	0.95	0.95	1.00	0.95	0.95
Hourly flow rate (vph)	40	11	11	3360	989	63
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage (veh)	0					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2722	526	1053			
vC1, stage 1 conf vol	1021					
vC2, stage 2 conf vol	1701					
vCu, unblocked vol	2722	526	1053			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.6	3.4	2.3			
p0 queue free %	38	98	98			
cM capacity (veh/h)	64	486	634			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	51	11	1680	1680	660	393
Volume Left	40	11	0	0	0	0
Volume Right	11	0	0	0	0	63
cSH	79	634	1700	1700	1700	1700
Volume to Capacity	0.64	0.02	0.99	0.99	0.39	0.23
Queue Length 95th (ft)	74	1	0	0	0	0
Control Delay (s)	111.0	10.8	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	111.0	0.0	0.0			
Approach LOS	F					

Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization	102.9%		ICU Level of Service	G		
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↕			↕	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	95	5	30	40	5	95	30	3210	90	45	1610	145
Peak Hour Factor	1.00	0.95	0.95	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	95	5	32	42	5	95	32	3210	95	47	1695	153
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh		0			0							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3632	5234	924	4297	5263	1652	1847			3305		
vC1, stage 1 conf vol	1866	1866		3321	3321							
vC2, stage 2 conf vol	1766	3368		976	1942							
vCu, unblocked vol	3632	5234	924	4297	5263	1652	1847			3305		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	0	0	88	0	0	0	90			40		
cM capacity (veh/h)	0	0	264	4	4	84	309			79		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	132	142	32	2140	1165	895	1000
Volume Left	95	42	32	0	0	47	0
Volume Right	32	95	0	0	95	0	153
cSH	0	11	309	1700	1700	79	1700
Volume to Capacity	Err	12.55	0.10	1.26	0.69	0.60	0.59
Queue Length 95th (ft)	Err	Err	8	0	0	67	0
Control Delay (s)	Err	Err	18.0	0.0	0.0	124.5	0.0
Lane LOS	F	F	C			F	
Approach Delay (s)	Err	Err	0.2			58.8	
Approach LOS	F	F					

Intersection Summary			
Average Delay		Err	
Intersection Capacity Utilization	112.3%	ICU Level of Service	H
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↕		↗	↕	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.91		1.00	1.00		1.00	0.99	
Flt Protected		0.97			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1674			1607		1703	3391		1703	3363	
Flt Permitted		0.57			0.89		0.07	1.00		0.04	1.00	
Satd. Flow (perm)		989			1449		124	3391		81	3363	
Volume (vph)	95	5	30	40	5	95	30	3210	90	45	1610	145
Peak-hour factor, PHF	1.00	0.95	0.95	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	5	32	42	5	95	32	3210	95	47	1695	153
RTOR Reduction (vph)	0	9	0	0	41	0	0	2	0	0	5	0
Lane Group Flow (vph)	0	123	0	0	101	0	32	3303	0	47	1843	0
Turn Type	Perm		Perm			pm+pt		pm+pt				
Protected Phases	4		8			5		2		1		6
Permitted Phases	4		8			2		6				
Actuated Green, G (s)	20.0		20.0			93.0		89.0		93.0		89.0
Effective Green, g (s)	20.0		20.0			93.0		89.0		93.0		89.0
Actuated g/C Ratio	0.16		0.16			0.74		0.71		0.74		0.71
Clearance Time (s)	4.0		4.0			4.0		4.0		4.0		4.0
Lane Grp Cap (vph)	158		232			143		2414		112		2394
v/s Ratio Prot						0.01		c0.97		c0.01		0.55
v/s Ratio Perm	c0.12		0.07			0.16		0.30				
v/c Ratio	0.78		0.43			0.22		1.37		0.42		0.77
Uniform Delay, d1	50.4		47.4			11.1		18.0		60.2		11.5
Progression Factor	1.00		1.00			1.00		1.00		1.00		1.00
Incremental Delay, d2	30.4		5.8			3.6		168.5		11.1		2.5
Delay (s)	80.8		53.2			14.7		186.5		71.4		13.9
Level of Service	F		D			B		F		E		B
Approach Delay (s)	80.8		53.2			184.8		15.3				
Approach LOS	F		D			F		B				

Intersection Summary

HCM Average Control Delay	120.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	112.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↕↗		↗	↕↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	0		0
Storage Lanes	0		0	0		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Fr _t		0.967			0.910			0.996			0.988	
Fl _t Protected		0.965			0.985		0.950			0.950		
Satd. Flow (prot)	0	1673	0	0	1607	0	1703	3392	0	1703	3365	0
Fl _t Permitted		0.570			0.889		0.069			0.045		
Satd. Flow (perm)	0	988	0	0	1450	0	124	3392	0	81	3365	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			49			6			19	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			25			55			55	
Link Distance (ft)		1049			589			1157			934	
Travel Time (s)		28.6			16.1			14.3			11.6	
Volume (vph)	95	5	30	40	5	95	30	3210	90	45	1610	145
Peak Hour Factor	1.00	0.95	0.95	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	5	32	42	5	95	32	3210	95	47	1695	153
Lane Group Flow (vph)	0	132	0	0	142	0	32	3305	0	47	1848	0
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	20.0	20.0		20.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	8.0	93.0	0.0	8.0	93.0	0.0
Total Split (%)	19.2%	19.2%	0.0%	19.2%	19.2%	0.0%	6.4%	74.4%	0.0%	6.4%	74.4%	0.0%
Maximum Green (s)	20.0	20.0		20.0	20.0		4.0	89.0		4.0	89.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)		20.0			20.0		93.0	89.0		93.0	89.0	
Actuated g/C Ratio		0.16			0.16		0.74	0.71		0.74	0.71	
v/c Ratio		0.79			0.52		0.22	1.37		0.42	0.77	
Control Delay		77.9			38.7		6.9	189.4		19.0	14.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		77.9			38.7		6.9	189.4		19.0	14.1	
LOS		E			D		A	F		B	B	
Approach Delay		77.9			38.7			187.7			14.3	
Approach LOS		E			D			F			B	
Queue Length 50th (ft)		96			69		5	~1867		7	444	
Queue Length 95th (ft)		#206			138		12	#1981		29	538	
Internal Link Dist (ft)		969			509			1077			854	
Turn Bay Length (ft)							200					

Lanes, Volumes, Timings
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)		167			273		143	2417		112	2401	
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		0.79			0.52		0.22	1.37		0.42	0.77	

Intersection Summary

Area Type: Other
 Cycle Length: 125
 Actuated Cycle Length: 125
 Offset: 7 (6%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Pretimed
 Maximum v/c Ratio: 1.37
 Intersection Signal Delay: 121.5 Intersection LOS: F
 Intersection Capacity Utilization 112.3% ICU Level of Service H
 Analysis Period (min) 15
 ~ 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.

























Splits and Phases: 3: Old KY 17 & KY 17 Madison Pike

8 s	93 s	24 s	8 s	93 s	24 s

HCM Signalized Intersection Capacity Analysis

3: Old KY 17 & KY 17 Madison Pike

8/31/2006

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								  			  	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.91		1.00	0.91	
Frt	1.00	0.87		1.00	0.86		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	1560		1703	1537		1703	4872		1703	4833	
Flt Permitted	1.00	1.00		1.00	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1792	1560		1792	1537		1703	4872		1703	4833	
Volume (vph)	95	5	30	40	5	95	30	3210	90	45	1610	145
Peak-hour factor, PHF	1.00	0.95	0.95	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	5	32	42	5	95	32	3210	95	47	1695	153
RTOR Reduction (vph)	0	31	0	0	92	0	0	3	0	0	8	0
Lane Group Flow (vph)	95	6	0	42	8	0	32	3302	0	47	1840	0
Turn Type	pm+pt		pm+pt			Prot			Prot			
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	12.0	4.0		12.0	4.0		8.0	89.0		8.0	89.0	
Effective Green, g (s)	12.0	4.0		12.0	4.0		8.0	89.0		8.0	89.0	
Actuated g/C Ratio	0.10	0.03		0.10	0.03		0.06	0.71		0.06	0.71	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	166	50		166	49		109	3469		109	3441	
v/s Ratio Prot	c0.04	0.00		0.02	0.01		0.02	c0.68		c0.03	0.38	
v/s Ratio Perm	c0.02			0.01								
v/c Ratio	0.57	0.12		0.25	0.16		0.29	0.95		0.43	0.53	
Uniform Delay, d1	54.1	58.8		52.4	58.9		55.8	16.1		56.3	8.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.6	4.9		3.6	7.1		6.7	7.6		12.0	0.6	
Delay (s)	67.7	63.7		56.0	66.0		62.5	23.7		68.3	9.0	
Level of Service	E	E		E	E		E	C		E	A	
Approach Delay (s)		66.6			63.0			24.1			10.4	
Approach LOS		E			E			C			B	
Intersection Summary												
HCM Average Control Delay			21.4	HCM Level of Service				C				
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			125.0	Sum of lost time (s)				16.0				
Intersection Capacity Utilization			82.6%	ICU Level of Service				E				
Analysis Period (min)			15									

c Critical Lane Group

Lanes, Volumes, Timings
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↑↑↑		↖	↑↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	60		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Fr _t		0.870			0.858			0.996			0.988	
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1559	0	1703	1538	0	1703	4874	0	1703	4835	0
Fl _t Permitted							0.950			0.950		
Satd. Flow (perm)	1792	1559	0	1792	1538	0	1703	4874	0	1703	4835	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		32			95			9			29	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			25			55			55	
Link Distance (ft)		1049			589			1157			934	
Travel Time (s)		28.6			16.1			14.3			11.6	
Volume (vph)	95	5	30	40	5	95	30	3210	90	45	1610	145
Peak Hour Factor	1.00	0.95	0.95	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	5	32	42	5	95	32	3210	95	47	1695	153
Lane Group Flow (vph)	95	37	0	42	100	0	32	3305	0	47	1848	0
Turn Type	pm+pt			pm+pt			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	12.0	8.0	0.0	12.0	8.0	0.0	12.0	93.0	0.0	12.0	93.0	0.0
Total Split (%)	9.6%	6.4%	0.0%	9.6%	6.4%	0.0%	9.6%	74.4%	0.0%	9.6%	74.4%	0.0%
Maximum Green (s)	8.0	4.0		8.0	4.0		8.0	89.0		8.0	89.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	12.0	4.0		12.0	4.0		8.0	89.0		8.0	89.0	
Actuated g/C Ratio	0.10	0.03		0.10	0.03		0.06	0.71		0.06	0.71	
v/c Ratio	0.57	0.46		0.25	0.71		0.29	0.95		0.43	0.54	
Control Delay	65.1	40.8		53.0	39.4		63.2	24.1		69.0	8.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	65.1	40.8		53.0	39.4		63.2	24.1		69.0	8.9	
LOS	E	D		D	D		E	C		E	A	
Approach Delay		58.3			43.5			24.5			10.4	
Approach LOS		E			D			C			B	
Queue Length 50th (ft)	72	4		31	4		25	782		37	224	
Queue Length 95th (ft)	128	#42		67	#86		60	883		79	257	
Internal Link Dist (ft)		969			509			1077			854	
Turn Bay Length (ft)							200			60		

Lanes, Volumes, Timings
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	166	81		166	141		109	3473		109	3451	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.57	0.46		0.25	0.71		0.29	0.95		0.43	0.54	

Intersection Summary

Area Type: Other
 Cycle Length: 125
 Actuated Cycle Length: 125
 Offset: 124 (99%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 120
 Control Type: Pretimed
 Maximum v/c Ratio: 0.95
 Intersection Signal Delay: 20.9 Intersection LOS: C
 Intersection Capacity Utilization 82.6% ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Old KY 17 & KY 17 Madison Pike

04	01	02	03	07
12 s	93 s	12 s	8 s	
08	05	06	07	07
12 s	93 s	12 s	8 s	

HCM Unsignalized Intersection Capacity Analysis
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	60	10	10	1400	2660	60
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	63	11	11	1474	2800	63
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	0					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3589	1432	2863			
vC1, stage 1 conf vol	2832					
vC2, stage 2 conf vol	758					
vCu, unblocked vol	3589	1432	2863			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.6	3.4	2.3			
p0 queue free %	0	91	91			
cM capacity (veh/h)	18	119	120			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	74	11	737	737	1867	996
Volume Left	63	11	0	0	0	0
Volume Right	11	0	0	0	0	63
cSH	21	120	1700	1700	1700	1700
Volume to Capacity	3.52	0.09	0.43	0.43	1.10	0.59
Queue Length 95th (ft)	Err	7	0	0	0	0
Control Delay (s)	Err	38.0	0.0	0.0	0.0	0.0
Lane LOS	F	E				
Approach Delay (s)	Err	0.3			0.0	
Approach LOS	F					
Intersection Summary						
Average Delay		166.7				
Intersection Capacity Utilization		86.0%		ICU Level of Service	E	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕		↗	↕↕			↕↕	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	165	5	40	65	5	65	40	2400	60	70	2665	165
Peak Hour Factor	0.95	0.95	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.95
Hourly flow rate (vph)	174	5	42	68	5	68	42	2526	63	74	2776	174
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh		0			0							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	4429	5684	1475	4222	5739	1295	2950			2589		
vC1, stage 1 conf vol	3010	3010		2642	2642							
vC2, stage 2 conf vol	1418	2674		1580	3097							
vCu, unblocked vol	4429	5684	1475	4222	5739	1295	2950			2589		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	0	0	63	0	0	54	62			52		
cM capacity (veh/h)	0	0	111	0	0	148	110			155		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	221	141	42	1684	905	1462	1562
Volume Left	174	68	42	0	0	74	0
Volume Right	42	68	0	0	63	0	174
cSH	0	0	110	1700	1700	155	1700
Volume to Capacity	Err	Err	0.38	0.99	0.53	0.48	0.92
Queue Length 95th (ft)	Err	Err	39	0	0	56	0
Control Delay (s)	Err	Err	56.6	0.0	0.0	119.8	0.0
Lane LOS	F	F	F			F	
Approach Delay (s)	Err	Err	0.9			57.9	
Approach LOS	F	F					

Intersection Summary			
Average Delay		Err	
Intersection Capacity Utilization	154.7%	ICU Level of Service	H
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↕		↗	↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.93		1.00	1.00		1.00	0.99	
Flt Protected		0.96			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1680			1636		1703	3393		1703	3376	
Flt Permitted		0.62			0.86		0.04	1.00		0.04	1.00	
Satd. Flow (perm)		1079			1442		81	3393		80	3376	
Volume (vph)	165	5	40	65	5	65	40	2400	60	70	2665	165
Peak-hour factor, PHF	0.95	0.95	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.95
Adj. Flow (vph)	174	5	42	68	5	68	42	2526	63	74	2776	174
RTOR Reduction (vph)	0	7	0	0	27	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	214	0	0	114	0	42	2588	0	74	2946	0
Turn Type		Perm		Perm			pm+pt			pm+pt		
Protected Phases		4		8			5	2		1	6	
Permitted Phases		4		8			2			6		
Actuated Green, G (s)		19.0		19.0			93.0	89.0		95.0	90.0	
Effective Green, g (s)		19.0		19.0			93.0	89.0		95.0	90.0	
Actuated g/C Ratio		0.15		0.15			0.74	0.71		0.76	0.72	
Clearance Time (s)		4.0		4.0			4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		164		219			112	2416		126	2431	
v/s Ratio Prot							0.01	0.76		c0.02	c0.87	
v/s Ratio Perm		c0.20		0.08			0.27			0.43		
v/c Ratio		1.31		0.52			0.38	1.07		0.59	1.21	
Uniform Delay, d1		53.0		48.8			60.0	18.0		60.2	17.5	
Progression Factor		1.00		1.00			1.00	1.00		1.00	1.00	
Incremental Delay, d2		174.7		8.6			9.3	40.8		18.5	99.5	
Delay (s)		227.7		57.4			69.4	58.8		78.7	117.0	
Level of Service		F		E			E	E		E	F	
Approach Delay (s)		227.7		57.4			58.9			116.0		
Approach LOS		F		E			E			F		

Intersection Summary			
HCM Average Control Delay	93.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	104.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕↔		↕	↕↔	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	200		0
Storage Lanes	0		0	0		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Fr _t		0.974			0.935			0.996			0.991	
Fl _t Protected		0.962			0.976		0.950			0.950		
Satd. Flow (prot)	0	1680	0	0	1636	0	1703	3392	0	1703	3375	0
Fl _t Permitted		0.618			0.861		0.045			0.044		
Satd. Flow (perm)	0	1079	0	0	1443	0	81	3392	0	79	3375	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			32			5			13	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			25			55			55	
Link Distance (ft)		1049			589			1157			934	
Travel Time (s)		28.6			16.1			14.3			11.6	
Volume (vph)	165	5	40	65	5	65	40	2400	60	70	2665	165
Peak Hour Factor	0.95	0.95	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.95
Adj. Flow (vph)	174	5	42	68	5	68	42	2526	63	74	2776	174
Lane Group Flow (vph)	0	221	0	0	141	0	42	2589	0	74	2950	0
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	20.0	20.0		20.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	23.0	23.0	0.0	23.0	23.0	0.0	8.0	93.0	0.0	9.0	94.0	0.0
Total Split (%)	18.4%	18.4%	0.0%	18.4%	18.4%	0.0%	6.4%	74.4%	0.0%	7.2%	75.2%	0.0%
Maximum Green (s)	19.0	19.0		19.0	19.0		4.0	89.0		5.0	90.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)		19.0			19.0		93.0	89.0		95.0	90.0	
Actuated g/C Ratio		0.15			0.15		0.74	0.71		0.76	0.72	
v/c Ratio		1.29			0.57		0.38	1.07		0.59	1.21	
Control Delay		208.8			47.9		16.0	60.3		34.6	120.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		208.8			47.9		16.0	60.3		34.6	120.0	
LOS		F			D		B	E		C	F	
Approach Delay		208.8			47.9			59.6			117.9	
Approach LOS		F			D			E			F	
Queue Length 50th (ft)		~223			82		6	~1223		11	~1539	
Queue Length 95th (ft)		#388			153		22	#1354		#73	#1661	
Internal Link Dist (ft)		969			509			1077			854	
Turn Bay Length (ft)							200			200		

Lanes, Volumes, Timings
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)		171			246		112	2417		125	2434	
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		1.29			0.57		0.38	1.07		0.59	1.21	

Intersection Summary

Area Type: Other
 Cycle Length: 125
 Actuated Cycle Length: 125
 Offset: 117 (94%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Pretimed
 Maximum v/c Ratio: 1.29
 Intersection Signal Delay: 94.1 Intersection LOS: F
 Intersection Capacity Utilization 104.1% ICU Level of Service G
 Analysis Period (min) 15
 ~ 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.

Splits and Phases: 3: Old KY 17 & KY 17 Madison Pike

ø1	ø2	ø4
9 s	93 s	23 s
ø5	ø6	ø8
8 s	94 s	23 s

HCM Signalized Intersection Capacity Analysis
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↔		↖	↗		↖	↑↑↑		↖	↑↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	0.91		1.00	0.91	
Frt	1.00	0.93		1.00	0.86		1.00	1.00		1.00	0.99	
Flt Protected	0.95	0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1618	1545		1703	1542		1703	4876		1703	4850	
Flt Permitted	0.50	0.56		1.00	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	851	890		1792	1542		1703	4876		1703	4850	
Volume (vph)	165	5	40	65	5	65	40	2400	60	70	2665	165
Peak-hour factor, PHF	0.95	0.95	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.95
Adj. Flow (vph)	174	5	42	68	5	68	42	2526	63	74	2776	174
RTOR Reduction (vph)	0	27	0	0	66	0	0	2	0	0	6	0
Lane Group Flow (vph)	133	61	0	68	7	0	42	2587	0	74	2944	0
Turn Type	pm+pt			pm+pt			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	18.0	18.0		10.0	4.0		7.0	85.0		10.0	88.0	
Effective Green, g (s)	18.0	18.0		10.0	4.0		7.0	85.0		10.0	88.0	
Actuated g/C Ratio	0.14	0.14		0.08	0.03		0.06	0.68		0.08	0.70	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	184	181		139	49		95	3316		136	3414	
v/s Ratio Prot	c0.06	0.03		0.02	0.00		0.02	0.53		c0.04	c0.61	
v/s Ratio Perm	c0.05	0.02		0.02								
v/c Ratio	0.72	0.34		0.49	0.15		0.44	0.78		0.54	0.86	
Uniform Delay, d1	50.0	48.2		55.1	58.8		57.1	13.6		55.3	13.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	21.7	5.0		11.8	6.2		14.2	1.9		14.7	3.1	
Delay (s)	71.7	53.2		66.9	65.0		71.3	15.5		70.0	17.1	
Level of Service	E	D		E	E		E	B		E	B	
Approach Delay (s)		64.3			65.9			16.4			18.4	
Approach LOS		E			E			B			B	

Intersection Summary			
HCM Average Control Delay	20.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕		↖	↗		↖	↕↕↕		↖	↕↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	60		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Fr _t		0.928			0.860			0.996			0.991	
Fl _t Protected	0.950	0.977		0.950			0.950			0.950		
Satd. Flow (prot)	1618	1544	0	1703	1542	0	1703	4874	0	1703	4849	0
Fl _t Permitted	0.500	0.977					0.950			0.950		
Satd. Flow (perm)	851	1544	0	1792	1542	0	1703	4874	0	1703	4849	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31			68			6			19	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			25			55			55	
Link Distance (ft)		1049			589			1157			934	
Travel Time (s)		28.6			16.1			14.3			11.6	
Volume (vph)	165	5	40	65	5	65	40	2400	60	70	2665	165
Peak Hour Factor	0.95	0.95	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.95
Adj. Flow (vph)	174	5	42	68	5	68	42	2526	63	74	2776	174
Lane Group Flow (vph)	133	88	0	68	73	0	42	2589	0	74	2950	0
Turn Type	pm+pt			pm+pt			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	14.0	12.0	0.0	10.0	8.0	0.0	11.0	89.0	0.0	14.0	92.0	0.0
Total Split (%)	11.2%	9.6%	0.0%	8.0%	6.4%	0.0%	8.8%	71.2%	0.0%	11.2%	73.6%	0.0%
Maximum Green (s)	10.0	8.0		6.0	4.0		7.0	85.0		10.0	88.0	
Yellow Time (s)	3.0	3.0		3.5	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		0.5	1.0		1.0	1.0		1.0	1.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	18.0	18.0		10.0	4.0		7.0	85.0		10.0	88.0	
Actuated g/C Ratio	0.14	0.14		0.08	0.03		0.06	0.68		0.08	0.70	
v/c Ratio	0.72	0.35		0.49	0.63		0.44	0.78		0.54	0.86	
Control Delay	72.6	36.3		61.2	39.9		72.0	15.8		70.8	17.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	72.6	36.3		61.2	39.9		72.0	15.8		70.8	17.4	
LOS	E	D		E	D		E	B		E	B	
Approach Delay		58.2			50.2			16.7			18.7	
Approach LOS		E			D			B			B	
Queue Length 50th (ft)	107	44		50	4		34	477		59	590	
Queue Length 95th (ft)	#208	98		96	#70		73	538		111	665	
Internal Link Dist (ft)		969			509			1077			854	
Turn Bay Length (ft)							200			60		

Lanes, Volumes, Timings
 3: Old KY 17 & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	184	249		139	115		95	3316		136	3419	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.72	0.35		0.49	0.63		0.44	0.78		0.54	0.86	

Intersection Summary

Area Type:	Other
Cycle Length:	125
Actuated Cycle Length:	125
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle:	100
Control Type:	Pretimed
Maximum v/c Ratio:	0.86
Intersection Signal Delay:	20.0
Intersection LOS:	C
Intersection Capacity Utilization	77.4%
ICU Level of Service	D
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 3: Old KY 17 & KY 17 Madison Pike

ø1	ø2	ø3	ø4
14 s	89 s	10 s	12 s
ø5	ø6	ø7	ø8
11 s	92 s	14 s	8 s

HCM Unsignalized Intersection Capacity Analysis
 3: Brooks/Electric & KY 17 Madison Pike

8/31/2006



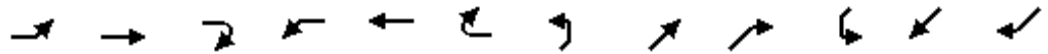
Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations	↔		↕↔		↔	↕↕
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	10	1420	80	40	710
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	11	1495	84	42	747
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	0					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1995	789			1579	
vC1, stage 1 conf vol	1537					
vC2, stage 2 conf vol	458					
vCu, unblocked vol	1995	789			1579	
tC, single (s)	7.0	7.1			4.3	
tC, 2 stage (s)	6.0					
tF (s)	3.6	3.4			2.3	
p0 queue free %	88	97			89	
cM capacity (veh/h)	91	321			386	

Direction, Lane #	WB 1	NE 1	NE 2	SW 1	SW 2	SW 3
Volume Total	21	996	582	42	374	374
Volume Left	11	0	0	42	0	0
Volume Right	11	0	84	0	0	0
cSH	141	1700	1700	386	1700	1700
Volume to Capacity	0.15	0.59	0.34	0.11	0.22	0.22
Queue Length 95th (ft)	13	0	0	9	0	0
Control Delay (s)	34.9	0.0	0.0	15.5	0.0	0.0
Lane LOS	D			C		
Approach Delay (s)	34.9	0.0		0.8		
Approach LOS	D					

Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			51.8%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Access Road & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↶	↷			↕		↶	↷		↶	↷	
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Volume (veh/h)	70	10	20	90	10	160	10	1960	240	150	980	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	74	11	21	95	11	168	11	2063	253	158	1032	53
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	TWLTL			TWLTL								
Median storage veh	0			0								
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2600	3711	542	3068	3611	1158	1084			2316		
vC1, stage 1 conf vol	1374	1374		2211	2211							
vC2, stage 2 conf vol	1226	2337		858	1400							
vCu, unblocked vol	2600	3711	542	3068	3611	1158	1084			2316		
tC, single (s)	7.7	6.7	7.1	7.7	6.7	7.1	4.3			4.3		
tC, 2 stage (s)	6.7	5.7		6.7	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	0	0	96	0	21	7	98			19		
cM capacity (veh/h)	0	1	469	12	13	180	605			194		

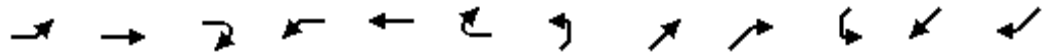
Direction, Lane #	EB 1	EB 2	WB 1	NE 1	NE 2	NE 3	SW 1	SW 2	SW 3		
Volume Total	74	32	274	11	1375	940	158	688	396		
Volume Left	74	0	95	11	0	0	158	0	0		
Volume Right	0	21	168	0	0	253	0	0	53		
cSH	0	2	27	605	1700	1700	194	1700	1700		
Volume to Capacity	776.16	14.58	9.96	0.02	0.81	0.55	0.81	0.40	0.23		
Queue Length 95th (ft)	Err	Err	Err	1	0	0	144	0	0		
Control Delay (s)	Err	Err	Err	11.1	0.0	0.0	73.8	0.0	0.0		
Lane LOS	F	F	F	B	F						
Approach Delay (s)	Err		Err	0.1	9.4						
Approach LOS	F		F								

Intersection Summary		
Average Delay	962.9	
Intersection Capacity Utilization	102.1%	ICU Level of Service G
Analysis Period (min)	15	

HCM Signalized Intersection Capacity Analysis

3: Access Road & KY 17 Madison Pike

8/31/2006



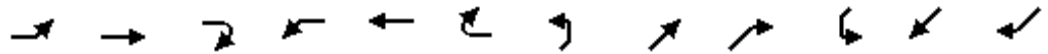
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.90			0.92		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	1586			1586		1671	3288		1671	3318	
Flt Permitted	0.36	1.00			0.87		0.25	1.00		0.04	1.00	
Satd. Flow (perm)	632	1586			1407		442	3288		76	3318	
Volume (vph)	70	10	20	90	10	160	10	1960	240	150	980	50
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	11	21	95	11	168	11	2063	253	158	1032	53
RTOR Reduction (vph)	0	18	0	0	46	0	0	7	0	0	3	0
Lane Group Flow (vph)	74	14	0	0	228	0	11	2309	0	158	1082	0
Turn Type	Perm		Perm			pm+pt		pm+pt				
Protected Phases	4		8			5		2		1		6
Permitted Phases	4		8			2		6				
Actuated Green, G (s)	20.0	20.0			20.0		89.0	88.2		100.2	95.4	
Effective Green, g (s)	20.0	20.0			20.0		89.0	88.2		100.2	95.4	
Actuated g/C Ratio	0.16	0.16			0.16		0.69	0.69		0.78	0.74	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	99	247			220		315	2262		159	2469	
v/s Ratio Prot		0.01					0.00	0.70		c0.06	0.33	
v/s Ratio Perm	0.12				c0.16		0.02			c0.71		
v/c Ratio	0.75	0.06			1.04		0.03	1.02		0.99	0.44	
Uniform Delay, d1	51.7	46.1			54.1		6.1	20.0		47.5	6.2	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	26.1	0.1			71.0		0.0	24.3		69.2	0.1	
Delay (s)	77.8	46.2			125.1		6.1	44.3		116.7	6.4	
Level of Service	E	D			F		A	D		F	A	
Approach Delay (s)		68.2			125.1			44.1			20.4	
Approach LOS		E			F			D			C	

Intersection Summary

HCM Average Control Delay	42.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	128.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
3: Access Road & KY 17 Madison Pike

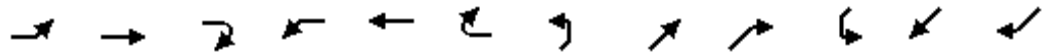
8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	200		0
Storage Lanes	1		0	0		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Fr _t		0.902			0.917			0.984			0.993	
Fl _t Protected	0.950				0.983		0.950			0.950		
Satd. Flow (prot)	1671	1587	0	0	1586	0	1671	3289	0	1671	3319	0
Fl _t Permitted	0.367				0.872		0.236			0.045		
Satd. Flow (perm)	646	1587	0	0	1407	0	415	3289	0	79	3319	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			54			24			10	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		425			596			1107			744	
Travel Time (s)		11.6			16.3			16.8			11.3	
Volume (vph)	70	10	20	90	10	160	10	1960	240	150	980	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	11	21	95	11	168	11	2063	253	158	1032	53
Lane Group Flow (vph)	74	32	0	0	274	0	11	2316	0	158	1085	0
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		21.0	21.0		8.0	20.0		8.0	20.0	
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	8.0	89.0	0.0	12.0	93.0	0.0
Total Split (%)	19.2%	19.2%	0.0%	19.2%	19.2%	0.0%	6.4%	71.2%	0.0%	9.6%	74.4%	0.0%
Maximum Green (s)	20.0	20.0		20.0	20.0		4.0	85.0		8.0	89.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	20.0	20.0			20.0		89.1	85.0		97.0	95.4	
Actuated g/C Ratio	0.16	0.16			0.16		0.68	0.68		0.78	0.76	
v/c Ratio	0.72	0.12			1.01		0.03	1.03		0.97	0.43	
Control Delay	86.4	24.7			100.5		4.5	48.4		94.6	6.0	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	86.4	24.7			100.5		4.5	48.4		94.6	6.0	
LOS	F	C			F		A	D		F	A	

Lanes, Volumes, Timings
 3: Access Road & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach Delay		67.8			100.5			48.2			17.3	
Approach LOS		E			F			D			B	
Queue Length 50th (ft)	57	8			~189		2	~1054		81	127	
Queue Length 95th (ft)	#140	38			#372		6	#1190		#223	214	
Internal Link Dist (ft)		345			516			1027			664	
Turn Bay Length (ft)							200			200		
Base Capacity (vph)	103	272			270		319	2244		163	2536	
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	0.72	0.12			1.01		0.03	1.03		0.97	0.43	

Intersection Summary

Area Type:	Other
Cycle Length:	125
Actuated Cycle Length:	125
Natural Cycle:	140
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.03
Intersection Signal Delay:	42.6
Intersection LOS:	D
Intersection Capacity Utilization:	102.1%
ICU Level of Service:	G
Analysis Period (min):	15
~ 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.	

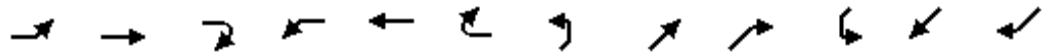
Splits and Phases: 3: Access Road & KY 17 Madison Pike

ø1	ø2	ø4
12 s	89 s	24 s
ø5	ø6	ø8
8 s	93 s	24 s

HCM Signalized Intersection Capacity Analysis

3: Access Road & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↖	↗		↖	↗		↖	↗	↗	↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.90		1.00	0.86		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1671	1586		1671	1512		1671	3343	1495	1671	3318	
Flt Permitted	0.32	1.00		0.74	1.00		0.23	1.00	1.00	0.05	1.00	
Satd. Flow (perm)	564	1586		1295	1512		408	3343	1495	84	3318	
Volume (vph)	70	10	20	90	10	160	10	1960	240	150	980	50
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	11	21	95	11	168	11	2063	253	158	1032	53
RTOR Reduction (vph)	0	18	0	0	76	0	0	0	60	0	3	0
Lane Group Flow (vph)	74	14	0	95	103	0	11	2063	193	158	1082	0
Turn Type	pm+pt		pm+pt		pm+pt		Perm		pm+pt			
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	20.0	16.0		20.0	16.0		84.0	80.0	80.0	93.0	85.0	
Effective Green, g (s)	20.0	16.0		20.0	16.0		84.0	80.0	80.0	93.0	85.0	
Actuated g/C Ratio	0.16	0.13		0.16	0.13		0.67	0.64	0.64	0.74	0.68	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	126	203		219	194		315	2140	957	177	2256	
v/s Ratio Prot	c0.02	0.01		0.01	0.07		0.00	c0.62		c0.06	0.33	
v/s Ratio Perm	c0.08			0.06			0.02		0.13	0.60		
v/c Ratio	0.59	0.07		0.43	0.53		0.03	0.96	0.20	0.89	0.48	
Uniform Delay, d1	47.7	47.9		46.9	51.0		7.1	21.1	9.3	41.8	9.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	18.5	0.6		6.1	10.1		0.2	12.7	0.5	44.2	0.7	
Delay (s)	66.2	48.6		53.0	61.0		7.4	33.8	9.8	86.0	10.2	
Level of Service	E	D		D	E		A	C	A	F	B	
Approach Delay (s)		60.9			58.3			31.1			19.9	
Approach LOS		E			E			C			B	

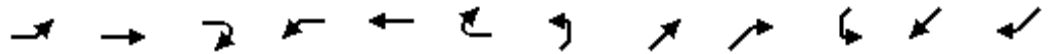
Intersection Summary

HCM Average Control Delay	30.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
 3: Access Road & KY 17 Madison Pike

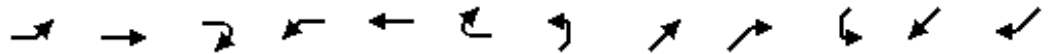
8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	300		200	300		200
Storage Lanes	1		0	1		0	1		1	2		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Fr _t		0.902			0.859				0.850		0.993	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1671	1587	0	1671	1511	0	1671	3343	1495	1671	3319	0
Flt Permitted	0.321			0.736			0.232			0.048		
Satd. Flow (perm)	565	1587	0	1295	1511	0	408	3343	1495	84	3319	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			87				168			9
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			25				45			45
Link Distance (ft)		425			596				1107			744
Travel Time (s)		11.6			16.3				16.8			11.3
Volume (vph)	70	10	20	90	10	160	10	1960	240	150	980	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	11	21	95	11	168	11	2063	253	158	1032	53
Lane Group Flow (vph)	74	32	0	95	179	0	11	2063	253	158	1085	0
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0	20.0	10.0	20.0	
Total Split (s)	8.0	20.0	0.0	8.0	20.0	0.0	8.0	84.0	84.0	13.0	89.0	0.0
Total Split (%)	6.4%	16.0%	0.0%	6.4%	16.0%	0.0%	6.4%	67.2%	67.2%	10.4%	71.2%	0.0%
Maximum Green (s)	4.0	16.0		4.0	16.0		4.0	80.0	80.0	9.0	85.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Walk Time (s)		5.0			5.0			5.0	5.0		5.0	
Flash Dont Walk (s)		11.0			11.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		0			0			0	0		0	
Act Effct Green (s)	20.0	16.0		20.0	16.0		84.0	80.0	80.0	93.0	85.0	
Actuated g/C Ratio	0.16	0.13		0.16	0.13		0.67	0.64	0.64	0.74	0.68	
v/c Ratio	0.59	0.14		0.43	0.67		0.03	0.96	0.25	0.89	0.48	
Control Delay	64.3	27.0		51.9	39.3		4.7	34.4	3.8	74.8	10.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	64.3	27.0		51.9	39.3		4.7	34.4	3.8	74.8	10.3	
LOS	E	C		D	D		A	C	A	E	B	
Approach Delay		53.0			43.7			30.9			18.5	
Approach LOS		D			D			C			B	
Queue Length 50th (ft)	51	8		66	71		2	768	24	79	198	
Queue Length 95th (ft)	#105	39		119	152		7	#1015	58	#211	243	
Internal Link Dist (ft)		345			516			1027			664	
Turn Bay Length (ft)							300		200	300		

Lanes, Volumes, Timings
 3: Access Road & KY 17 Madison Pike

9/19/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Base Capacity (vph)	126	221		219	269		315	2140	1017	177	2260	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.59	0.14		0.43	0.67		0.03	0.96	0.25	0.89	0.48	

Intersection Summary

Area Type: Other
 Cycle Length: 125
 Actuated Cycle Length: 125
 Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
 Natural Cycle: 110
 Control Type: Pretimed
 Maximum v/c Ratio: 0.96
 Intersection Signal Delay: 28.5 Intersection LOS: C
 Intersection Capacity Utilization 90.1% ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Access Road & KY 17 Madison Pike

ø1	ø2	ø	ø4
13 s	84 s	8 s	20 s
ø	ø6	ø	ø8
8 s	89 s	8 s	20 s

HCM Unsignalized Intersection Capacity Analysis
 3: Brooks/Electric & KY 17 Madison Pike

8/31/2006



Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations	↔		↕↔		↔	↕↕
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	50	30	1000	70	20	1180
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	53	32	1053	74	21	1242
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	0					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1753	563			1126	
vC1, stage 1 conf vol	1089					
vC2, stage 2 conf vol	663					
vCu, unblocked vol	1753	563			1126	
tC, single (s)	7.0	7.1			4.3	
tC, 2 stage (s)	6.0					
tF (s)	3.6	3.4			2.3	
p0 queue free %	61	93			96	
cM capacity (veh/h)	136	454			582	
Direction, Lane #	WB 1	NE 1	NE 2	SW 1	SW 2	SW 3
Volume Total	84	702	425	21	621	621
Volume Left	53	0	0	21	0	0
Volume Right	32	0	74	0	0	0
cSH	185	1700	1700	582	1700	1700
Volume to Capacity	0.46	0.41	0.25	0.04	0.37	0.37
Queue Length 95th (ft)	54	0	0	3	0	0
Control Delay (s)	39.9	0.0	0.0	11.4	0.0	0.0
Lane LOS	E			B		
Approach Delay (s)	39.9	0.0		0.2		
Approach LOS	E					
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			43.9%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Access Road & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↖	↗			↕		↖	↕↗		↖	↕↗	
Sign Control	Stop				Stop		Free				Free	
Grade	0%				0%		0%				0%	
Volume (veh/h)	80	20	20	250	20	200	20	1380	320	170	1610	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	84	21	21	263	21	211	21	1453	337	179	1695	105
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	TWLTL			TWLTL								
Median storage veh	0			0								
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3095	3937	900	2900	3821	895	1800			1789		
vC1, stage 1 conf vol	2105	2105		1663	1663							
vC2, stage 2 conf vol	989	1832		1237	2158							
vCu, unblocked vol	3095	3937	900	2900	3821	895	1800			1789		
tC, single (s)	7.7	6.7	7.1	7.7	6.7	7.1	4.3			4.3		
tC, 2 stage (s)	6.7	5.7		6.7	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	0	0	92	0	0	23	93			44		
cM capacity (veh/h)	0	1	270	6	9	272	314			318		

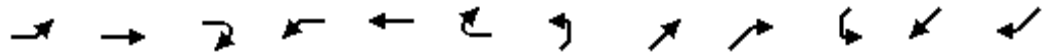
Direction, Lane #	EB 1	EB 2	WB 1	NE 1	NE 2	NE 3	SW 1	SW 2	SW 3		
Volume Total	84	42	495	21	968	821	179	1130	670		
Volume Left	84	0	263	21	0	0	179	0	0		
Volume Right	0	21	211	0	0	337	0	0	105		
cSH	0	2	10	314	1700	1700	318	1700	1700		
Volume to Capacity	Err	18.97	47.67	0.07	0.57	0.48	0.56	0.66	0.39		
Queue Length 95th (ft)	Err	Err	Err	5	0	0	81	0	0		
Control Delay (s)	Err	Err	Err	17.3	0.0	0.0	30.0	0.0	0.0		
Lane LOS	F	F	F	C	D						
Approach Delay (s)	Err		Err	0.2			2.7				
Approach LOS	F		F								

Intersection Summary										
Average Delay			Err							
Intersection Capacity Utilization			101.6%			ICU Level of Service		G		
Analysis Period (min)			15							

HCM Signalized Intersection Capacity Analysis

3: Access Road & KY 17 Madison Pike

8/31/2006



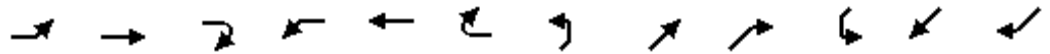
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↔	↔			↔		↔	↔		↔	↔	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92			0.94		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	1627			1615		1671	3248		1671	3313	
Flt Permitted	0.51	1.00			0.81		0.06	1.00		0.06	1.00	
Satd. Flow (perm)	901	1627			1345		109	3248		103	3313	
Volume (vph)	80	20	20	250	20	200	20	1380	320	170	1610	100
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	21	21	263	21	211	21	1453	337	179	1695	105
RTOR Reduction (vph)	0	14	0	0	22	0	0	16	0	0	4	0
Lane Group Flow (vph)	84	28	0	0	473	0	21	1774	0	179	1796	0
Turn Type	Perm		Perm			pm+pt		pm+pt				
Protected Phases	4		8			5		2		1		6
Permitted Phases	4		8			2		6				
Actuated Green, G (s)	41.0	41.0			41.0		67.0	64.6		77.6	71.2	
Effective Green, g (s)	41.0	41.0			41.0		67.0	64.6		77.6	71.2	
Actuated g/C Ratio	0.32	0.32			0.32		0.53	0.51		0.61	0.56	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	292	527			436		87	1657		175	1863	
v/s Ratio Prot	0.02					0.00		c0.55		c0.07		0.54
v/s Ratio Perm	0.09		c0.35			0.12		0.56				
v/c Ratio	0.29	0.05			1.09		0.24	1.07		1.02	0.96	
Uniform Delay, d1	31.9	29.4			42.8		24.9	31.0		41.7	26.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.0			68.2		1.4	43.8		74.1	13.3	
Delay (s)	32.5	29.5			111.0		26.3	74.8		115.9	39.8	
Level of Service	C	C			F		C	E		F	D	
Approach Delay (s)	31.5		111.0			74.2		46.7				
Approach LOS	C		F			E		D				

Intersection Summary

HCM Average Control Delay	64.8	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	126.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
 3: Access Road & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	200		0
Storage Lanes	1		0	0		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Fr _t		0.925			0.942			0.972			0.991	
Fl _t Protected	0.950				0.974		0.950			0.950		
Satd. Flow (prot)	1671	1627	0	0	1614	0	1671	3249	0	1671	3313	0
Fl _t Permitted	0.511				0.811		0.063			0.060		
Satd. Flow (perm)	899	1627	0	0	1344	0	111	3249	0	106	3313	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			32			32			8	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		425			596			1107			744	
Travel Time (s)		11.6			16.3			16.8			11.3	
Volume (vph)	80	20	20	250	20	200	20	1380	320	170	1610	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	21	21	263	21	211	21	1453	337	179	1695	105
Lane Group Flow (vph)	84	42	0	0	495	0	21	1790	0	179	1800	0
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		21.0	21.0		8.0	20.0		8.0	20.0	
Total Split (s)	45.0	45.0	0.0	45.0	45.0	0.0	8.0	67.0	0.0	13.0	72.0	0.0
Total Split (%)	36.0%	36.0%	0.0%	36.0%	36.0%	0.0%	6.4%	53.6%	0.0%	10.4%	57.6%	0.0%
Maximum Green (s)	41.0	41.0		41.0	41.0		4.0	63.0		9.0	68.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	41.0	41.0			41.0		67.1	63.0		76.0	71.2	
Actuated g/C Ratio	0.33	0.33			0.33		0.52	0.50		0.61	0.57	
v/c Ratio	0.28	0.08			1.07		0.20	1.08		1.01	0.95	
Control Delay	34.5	17.9			100.3		14.6	78.5		101.7	38.4	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	34.5	17.9			100.3		14.6	78.5		101.7	38.4	
LOS	C	B			F		B	E		F	D	

Lanes, Volumes, Timings
 3: Access Road & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach Delay		29.0			100.3			77.7			44.1	
Approach LOS		C			F			E			D	
Queue Length 50th (ft)	50	12			~426		6	~847		~100	731	
Queue Length 95th (ft)	97	38			#643		17	#988		#253	#934	
Internal Link Dist (ft)		345			516			1027			664	
Turn Bay Length (ft)							200			200		
Base Capacity (vph)	295	548			462		107	1653		177	1890	
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	0.28	0.08			1.07		0.20	1.08		1.01	0.95	

Intersection Summary

Area Type:	Other
Cycle Length:	125
Actuated Cycle Length:	125
Natural Cycle:	120
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.08
Intersection Signal Delay:	63.8
Intersection LOS:	E
Intersection Capacity Utilization:	101.6%
ICU Level of Service:	G
Analysis Period (min):	15
~ 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.	

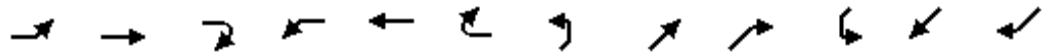
Splits and Phases: 3: Access Road & KY 17 Madison Pike

ø1	ø2	ø4
13 s	67 s	45 s
ø5	ø6	ø8
8 s	72 s	45 s

HCM Signalized Intersection Capacity Analysis

3: Access Road & KY 17 Madison Pike

8/31/2006



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.92		1.00	0.86		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1671	1627		1671	1519		1671	3343	1495	1671	3313	
Flt Permitted	0.50	1.00		0.58	1.00		0.06	1.00	1.00	0.06	1.00	
Satd. Flow (perm)	881	1627		1027	1519		110	3343	1495	108	3313	
Volume (vph)	80	20	20	250	20	200	20	1380	320	170	1610	100
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	21	21	263	21	211	21	1453	337	179	1695	105
RTOR Reduction (vph)	0	18	0	0	155	0	0	0	114	0	4	0
Lane Group Flow (vph)	84	24	0	263	77	0	21	1453	223	179	1796	0
Turn Type	pm+pt		pm+pt			pm+pt			Perm	pm+pt		
Protected Phases	7	4		3	8		5	2			1	6
Permitted Phases	4			8			2		2		6	
Actuated Green, G (s)	23.0	16.0		35.0	24.0		67.0	64.0	64.0	82.0	75.0	
Effective Green, g (s)	23.0	16.0		35.0	24.0		67.0	64.0	64.0	82.0	75.0	
Actuated g/C Ratio	0.18	0.13		0.28	0.19		0.54	0.51	0.51	0.66	0.60	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	206	208		365	292		96	1712	765	246	1988	
v/s Ratio Prot	0.02	0.01		c0.09	0.05		0.01	0.43		c0.08	c0.54	
v/s Ratio Perm	0.05			c0.12			0.11		0.15	0.40		
v/c Ratio	0.41	0.11		0.72	0.26		0.22	0.85	0.29	0.73	0.90	
Uniform Delay, d1	43.9	48.2		38.9	43.0		20.7	26.3	17.5	33.8	21.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.9	1.1		11.6	2.2		5.2	5.5	1.0	17.1	7.3	
Delay (s)	49.7	49.3		50.6	45.2		25.9	31.8	18.5	50.9	29.1	
Level of Service	D	D		D	D		C	C	B	D	C	
Approach Delay (s)		49.6			48.0			29.2			31.1	
Approach LOS		D			D			C			C	

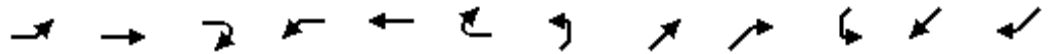
Intersection Summary

HCM Average Control Delay	32.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
 3: Access Road & KY 17 Madison Pike

8/31/2006

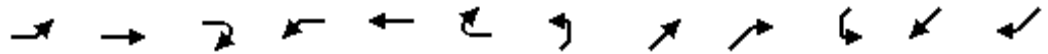


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	300		200	300		60
Storage Lanes	1		0	1		0	1		1	2		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Fr _t		0.925			0.864				0.850		0.991	
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1671	1627	0	1671	1520	0	1671	3343	1495	1671	3313	0
Fl _t Permitted	0.501			0.584			0.062			0.061		
Satd. Flow (perm)	881	1627	0	1027	1520	0	109	3343	1495	107	3313	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			192				234			9
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		25			25				45			45
Link Distance (ft)		425			596				1107			744
Travel Time (s)		11.6			16.3				16.8			11.3
Volume (vph)	80	20	20	250	20	200	20	1380	320	170	1610	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	21	21	263	21	211	21	1453	337	179	1695	105
Lane Group Flow (vph)	84	42	0	263	232	0	21	1453	337	179	1800	0
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Minimum Split (s)	8.0	20.0		8.0	20.0		7.0	20.0	20.0	10.0	20.0	
Total Split (s)	11.0	20.0	0.0	19.0	28.0	0.0	7.0	68.0	68.0	18.0	79.0	0.0
Total Split (%)	8.8%	16.0%	0.0%	15.2%	22.4%	0.0%	5.6%	54.4%	54.4%	14.4%	63.2%	0.0%
Maximum Green (s)	7.0	16.0		15.0	24.0		3.0	64.0	64.0	14.0	75.0	
Yellow Time (s)	3.5	3.0		3.5	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	0.5	1.0		0.5	1.0		1.0	1.0	1.0	1.0	1.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Walk Time (s)		5.0			5.0			5.0	5.0		5.0	
Flash Dont Walk (s)		11.0			11.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		0			0			0	0		0	
Act Effct Green (s)	23.0	16.0		35.0	24.0		67.0	64.0	64.0	82.0	75.0	
Actuated g/C Ratio	0.18	0.13		0.28	0.19		0.54	0.51	0.51	0.66	0.60	
v/c Ratio	0.41	0.19		0.72	0.52		0.22	0.85	0.38	0.73	0.90	
Control Delay	41.9	31.5		51.4	14.5		14.2	32.3	6.8	45.7	29.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	41.9	31.5		51.4	14.5		14.2	32.3	6.8	45.7	29.6	
LOS	D	C		D	B		B	C	A	D	C	
Approach Delay		38.4			34.1			27.4			31.1	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	52	15		182	27		6	516	42	90	630	
Queue Length 95th (ft)	95	51		#273	105		15	625	104	#193	766	
Internal Link Dist (ft)		345			516			1027			664	
Turn Bay Length (ft)							300		200	300		

KY 17 @ TANK pm Build Option 1
 DLZ, LLC

Lanes, Volumes, Timings
 3: Access Road & KY 17 Madison Pike

8/31/2006



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Base Capacity (vph)	206	227		365	447		96	1712	880	245	1991	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.41	0.19		0.72	0.52		0.22	0.85	0.38	0.73	0.90	

Intersection Summary

Area Type: Other
 Cycle Length: 125
 Actuated Cycle Length: 125
 Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
 Natural Cycle: 90
 Control Type: Pretimed
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 30.1 Intersection LOS: C
 Intersection Capacity Utilization 82.2% ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Access Road & KY 17 Madison Pike

ø1	ø2	ø3	ø4
18 s	68 s	19 s	20 s
ø5	ø6	ø7	ø8
7 s	79 s	11 s	28 s

MADISON PIKE (KY 17) ROUNDABOUT FEASIBILITY STUDY
NKAPC
Fort Wright / Covington, Kentucky

APPENDIX C

MADISON PIKE (KY 17) ROUNDABOUT FEASIBILITY STUDY

Design Criteria

Designed By:

Date:

Checked By:

Date:

MADISON PIKE - SOUTH OF DUDLEY

For use with Old Madison Pike and Holds Branch Road Intersections

Item	Criteria	Reference
General - KYTC Standard Roadway Criteria		
Roadway Classification	Urban Arterial	KYTC Provided
Type of Terrain	Rolling	As-Builts
Design Speed	60 MPH	As-Builts, SP 059_35_15
Pavement Width	12' Lanes	KYTC Exhibit 700-04
Sidewalk	5' min., 8' des.	KYTC Exhibit 700-04
Design Vehicle	WB-62	KYTC Provided
Minimum Clear Zone	Varies - Fill, Cut, Foreslope, Traffic	AASHTO - RDG Table 3.1
Roundabout	Varies	FHWA/Ourston
Geometric Alignment		
Minimum Grade (curbed)	0.5% min	AASHTO pg 236
Minimum Grade (uncurbed)	Flat with adequate cross slope	AASHTO pg 236
Maximum Grade	6%	KYTC Exhibit 700-04
Stopping Sight Distance - 60 mph	SSD = 570 feet	KYTC Exhibit 700-04
Superelevation	4% - 6% max	KYTC Exhibit 700-04
Minimum Horizontal Radius - eMAX 4%	1500 feet	AASHTO Exhibit 3-15 pg 147
Normal Pavement Cross Slope	2%	KYTC Exhibit 700-04
Normal Shoulder Cross Slope	4% - paved, 8% - earth	KYTC Exhibit 700-04
Existing Mainline Typical Sections		
Existing Posted Speed	55 MPH	Observed
Lane Width	12' (Truck Route)	As-Builts, SP 059_35_15
Shoulder Width (Useable)	10 feet	As-Builts, SP 059_35_15
Shoulder Slope	4%	As-Builts, SP 059_35_15
Superelevation	2.6% max	As-Builts, SP 059_35_15
Fill Slope	4:1 under 10', 2:1 over 10'	As-Builts, SP 059_35_15
Foreslope	6:1	As-Builts, SP 059_35_15
Backslope	4:1 under 10', 2:1 over 10'	As-Builts, SP 059_35_15
Backslope (rock cut)	Approx. 1:1	Observed
Median	20' Mountable Median	As-Builts, SP 059_35_15

REFERENCES

AASHTO: A Policy on Geometric Design of Highways and Streets, 2004

AASHTO - RDG: Roadside Design Guide

As-Builts: Plans for KY 17 supplied by KYTC

KYTC: Kentucky Transportation Cabinet Highway Design Manual, 2006

FHWA/Ourston: FHWA-Roundabouts: An Informational Guide - FHWA-RD-00-067, 2000 / Ourston - Roundabout Design Guidelines

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MADISON PIKE (KY 17) ROUNDABOUT FEASIBILITY STUDY

Design Criteria

Designed By:

Date:

Checked By:

Date:

MADISON PIKE - NORTH OF DUDLEY

For use with the TANK Facility Entrance and Brooks Dr. Intersection

Item	Criteria	Reference
General - KYTC Standard Roadway Criteria		
Roadway Classification	Urban Arterial	KYTC Provided
Type of Terrain	Rolling	As-Builts
Design Speed	50 MPH	As-Builts, SSP 059 0017 018-021
Pavement Width	12' Lanes	KYTC Exhibit 700-04
Sidewalk	5' min., 8' des.	KYTC Exhibit 700-04
Design Vehicle	WB-62	KYTC Provided
Minimum Clear Zone	Varies - Fill, Cut, Foreslope, Traffic	AASHTO - RDG Table 3.1
Roundabout	Varies	FHWA/Ourston
Geometric Alignment		
Minimum Grade (curbed)	0.5% min	AASHTO pg 236
Minimum Grade (uncurbed)	Flat with adequate cross slope	AASHTO pg 236
Maximum Grade	7%	KYTC Exhibit 700-04
Stopping Sight Distance - 50 mph	SSD = 425 feet	KYTC Exhibit 700-04
Superelevation	4% - 6% max	KYTC Exhibit 700-04
Minimum Horizontal Radius - eMAX 4%	926 feet	AASHTO Exhibit 3-15 pg 147
Normal Pavement Cross Slope	2%	KYTC Exhibit 700-04
Normal Shoulder Cross Slope	4% - paved, 8% - earth	KYTC Exhibit 700-04
Existing Mainline Typical Sections		
Existing Posted Speed	45 MPH	Observed
Lane Width	12' (Truck Route)	As-Builts, SSP 059 0017 018-021
Shoulder Width (Useable)	10 feet	As-Builts, SSP 059 0017 018-021
Shoulder Slope	4%	As-Builts, SSP 059 0017 018-021
Superelevation	2.6% max	As-Builts, SSP 059 0017 018-021
Fill Slope	4:1 under 10', 2:1 over 10'	As-Builts, SSP 059 0017 018-021
Foreslope	6:1	As-Builts, SSP 059 0017 018-021
Backslope	4:1 under 10', 2:1 over 10'	As-Builts, SSP 059 0017 018-021
Backslope (rock cut)	Approx. 1:1	Observed
Median	12' Transversable (flush)	Observed

REFERENCES

AASHTO: A Policy on Geometric Design of Highways and Streets, 2004

AASHTO - RDG: Roadside Design Guide

As-Builts: Plans for KY 17 supplied by KYTC

KYTC: Kentucky Transportation Cabinet Highway Design Manual, 2006

FHWA/Ourston: FHWA-Roundabouts: An Informational Guide - FHWA-RD-00-067, 2000 / Ourston - Roundabout Design Guidelines

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MADISON PIKE (KY 17) ROUNDABOUT FEASIBILITY STUDY
NKAPC
Fort Wright / Covington, Kentucky

APPENDIX D

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*****
*
* 7:7:06 KENTUCKY 17 KY 17/HOLDS BRANCH 194
*
*****
*
* E (m) 12.00 12.00 12.00 12.00 * TIME PERIOD min 90
* L' (m) 75.00 100.0 10.00 150.0 * TIME SLICE min 15
* V (m) 3.60 7.30 3.60 7.30 * RESULTS PERIOD min 15 75
* RAD (m) 27.00 27.00 27.00 27.00 * TIME COST $/hr 15.00
* PHI (d) 35.00 35.00 35.00 35.00 * FLOW PERIOD min 15 75
* DIA (m) 80.00 80.00 80.00 80.00 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm AM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * *
*BRANCH WB *1.06* 410 0 150 0 *1.00*50*0.95 1.050 0.95*15 45 75
*KY 17 SB *1.06* 0 1160 250 0 *1.00*50*0.95 1.050 0.95*15 45 75
*PARK EB *1.06* 0 0 0 0 *1.00*50*0.95 1.050 0.95*15 45 75
*KY 17 NB *1.06* 0 2990 0 0 *1.00*50*0.95 1.050 0.95*15 45 75
* * * * * * * * * *
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* * * * * * * * * *
*****
*
* FLOW veh 560 1410 0 2990
* CAPACITY veh 832 3131 921 3109 * AVDEL s 16.8
* AVE DELAY mins 0.21 0.03 0.00 0.41 * L O S C
* MAX DELAY mins 0.27 0.04 0.00 0.64 * VEH HRS 23.1
* AVE QUEUE veh 2 1 0 22 * COST $ 346.3
* MAX QUEUE veh 3 1 0 31
*
*****

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*****
*
* 7:7:06 KENTUCKY 17 KY 17/HOLDS BRANCH 197
*
*****
*
* E (m) 12.00 12.00 12.00 12.00 * TIME PERIOD min 90
* L' (m) 75.00 100.0 10.00 150.0 * TIME SLICE min 15
* V (m) 3.60 7.30 3.60 7.30 * RESULTS PERIOD min 15 75
* RAD (m) 27.00 27.00 27.00 27.00 * TIME COST $/hr 15.00
* PHI (d) 35.00 35.00 35.00 35.00 * FLOW PERIOD min 15 75
* DIA (m) 80.00 80.00 80.00 80.00 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * *
*BRANCH WB *1.06* 560 0 260 0 *1.00*50*0.95 1.050 0.95*15 45 75
*KY 17 SB *1.06* 0 2520 380 0 *1.00*50*0.95 1.050 0.95*15 45 75
*PARK EB *1.06* 10 5 10 0 *1.00*50*0.95 1.050 0.95*15 45 75
*KY 17 NB *1.06* 0 1840 0 0 *1.00*50*0.95 1.050 0.95*15 45 75
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*****
*
* FLOW veh 820 2900 25 1840
* CAPACITY veh 1572 3051 153 3003 * AVDEL s 12.6
* AVE DELAY mins 0.08 0.35 0.46 0.05 * L O S B
* MAX DELAY mins 0.09 0.52 0.64 0.06 * VEH HRS 19.5
* AVE QUEUE veh 1 18 0 2 * COST $ 292.5
* MAX QUEUE veh 1 25 0 2
*
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*****
*
* 7:7:06 KENTUCKY 17 KY 17/OLD KY 17 162
*
*****
*
* E (m) 12.00 8.40 4.50 * TIME PERIOD min 90
* L' (m) 100.0 25.00 10.00 * TIME SLICE min 15
* V (m) 7.30 3.60 4.50 * RESULTS PERIOD min 15 75
* RAD (m) 27.00 27.00 27.00 * TIME COST $/hr 15.00
* PHI (d) 35.00 35.00 35.00 * FLOW PERIOD min 15 75
* DIA (m) 75.00 75.00 75.00 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 * FLOW PEAK am/op/pm AM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * *
*SB KY 17 *1.08* 150 1650 0 *1.00*50*0.95 1.050 0.95*15 45 75
*OLD 17 EB *1.08* 30 100 0 *1.00*50*0.95 1.050 0.95*15 45 75
*NB KY 17 *1.08* 0 30 0 *1.00*50*0.95 1.050 0.95*15 45 75
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*
* FLOW veh 1800 130 30
* CAPACITY veh 3157 965 1213 * AVDEL s 2.7
* AVE DELAY mins 0.04 0.07 0.05 * L O S A
* MAX DELAY mins 0.05 0.08 0.05 * VEH HRS 1.5
* AVE QUEUE veh 1 0 0 * COST $ 22.3
* MAX QUEUE veh 1 0 0
*
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*****
*
* 7:7:06 KENTUCKY 17 KY 17/OLD KY 17 163
*
*****
*
* E (m) 12.00 8.40 4.50 * TIME PERIOD min 90 *
* L' (m) 100.0 25.00 10.00 * TIME SLICE min 15 *
* V (m) 7.30 3.60 4.50 * RESULTS PERIOD min 15 75 *
* RAD (m) 27.00 27.00 27.00 * TIME COST $/hr 15.00 *
* PHI (d) 35.00 35.00 35.00 * FLOW PERIOD min 15 75 *
* DIA (m) 75.00 75.00 75.00 * FLOW TYPE pcu/veh VEH *
* GRAD SEP 0 0 0 * FLOW PEAK am/op/pm PM *
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * *
*SB KY 17 *1.08* 170 2730 0 *1.00*50*0.95 1.050 0.95*15 45 75 *
*OLD 17 EB *1.08* 40 170 0 *1.00*50*0.95 1.050 0.95*15 45 75 *
*NB KY 17 *1.08* 0 40 0 *1.00*50*0.95 1.050 0.95*15 45 75 *
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*
* FLOW veh 2900 210 40 *
* CAPACITY veh 3149 396 1183 * AVDEL s 13.7 *
* AVE DELAY mins 0.22 0.32 0.05 * L O S B *
* MAX DELAY mins 0.31 0.41 0.06 * VEH HRS 12.0 *
* AVE QUEUE veh 11 1 0 * COST $ 180.0 *
* MAX QUEUE veh 15 1 0 *
*
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*
* 7:7:06          KENTUCKY 17 KY 17/TANK/ELECTRIC/LAKEVIEW          129 *
*
*****
*
* E (m) 8.40 12.00 8.40 12.00 * TIME PERIOD min 90 *
* L' (m) 20.00 10.00 10.00 30.00 * TIME SLICE min 15 *
* V (m) 3.60 7.30 3.60 7.30 * RESULTS PERIOD min 15 75 *
* RAD (m) 20.00 20.00 20.00 20.00 * TIME COST $/hr 15.00 *
* PHI (d) 30.00 30.00 30.00 30.00 * FLOW PERIOD min 15 75 *
* DIA (m) 75.00 75.00 75.00 75.00 * FLOW TYPE pcu/veh VEH *
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm AM *
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*TANK WB *1.08* 160 10 90 0 *1.00*50*0.95 1.050 0.95*15 45 75 *
*KY 17 SB *1.08* 60 980 150 0 *1.00*50*0.95 1.050 0.95*15 45 75 *
*NEW EB *1.08* 30 10 80 0 *1.00*50*0.95 1.050 0.95*15 45 75 *
*KY 17 NB *1.08* 240 1950 10 0 *1.00*50*0.95 1.050 0.95*15 45 75 *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
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* FLOW veh 260 1190 120 2200 * * * * * * * * * * * * * * * *
* CAPACITY veh 714 2503 954 2757 * AVDEL s 5.2 *
* AVE DELAY mins 0.13 0.05 0.07 0.10 * L O S A *
* MAX DELAY mins 0.15 0.05 0.08 0.12 * VEH HRS 5.4 *
* AVE QUEUE veh 1 1 0 4 * COST $ 81.7 *
* MAX QUEUE veh 1 1 0 4 * * * * * * * * * * * * * * * *
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*****
*
* 7:7:06          KENTUCKY 17 KY 17/TANK/ELECTRIC/LAKEVIEW          130
*
*****
*
* E      (m)      8.40  12.00  8.40  12.00          * TIME PERIOD      min      90
* L'     (m)      20.00  10.00  10.00  30.00         * TIME SLICE       min      15
* V      (m)      3.60   7.30   3.60   7.30          * RESULTS PERIOD   min     15 75
* RAD    (m)      20.00  20.00  20.00  20.00         * TIME COST        $/hr   15.00
* PHI    (d)      30.00  30.00  30.00  30.00         * FLOW PERIOD      min     15 75
* DIA    (m)      75.00  75.00  75.00  75.00         * FLOW TYPE        pcu/veh  VEH
* GRAD SEP      0      0      0      0              * FLOW PEAK        am/op/pm  PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
*TANK WB  *1.08* 200  20  250  0          *1.00*50*0.95 1.050 0.95*15 45 75
*KY 17 SB *1.08* 130 1600 170 0          *1.00*50*0.95 1.050 0.95*15 45 75
*NEW EB   *1.08* 30  20  110  0          *1.00*50*0.95 1.050 0.95*15 45 75
*KY 17 NB *1.08* 320 1360 40  0          *1.00*50*0.95 1.050 0.95*15 45 75
*          *   *
*          *   *
*          *   *
*****
*
* FLOW      veh      470  1900  160  1720
* CAPACITY  veh      989  2373  570  2714          * AVDEL s      5.8
* AVE DELAY mins    0.11  0.12  0.14  0.06          * L O S        A
* MAX DELAY mins    0.13  0.15  0.16  0.07          * VEH HRS      6.9
* AVE QUEUE  veh      1      4      0      2          * COST $      103.0
* MAX QUEUE  veh      1      5      0      2
*
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MADISON PIKE (KY 17) ROUNDABOUT FEASIBILITY STUDY
NKAPC
Fort Wright / Covington, Kentucky

APPENDIX E

MADISON PIKE (KY 17) INTERSECTION IMPROVEMENTS STUDY

COST ESTIMATE SUMMARY

Madison Pike and Holds Branch Road / Pioneer Park

	Signalized	Roundabout
Construction Cost*	\$ 2,500,000	\$ 4,100,000
Right of Way Impacts ¹	0.6 acres	1.1 acres

¹ Does not include land required from Pioneer Park

Madison Pike and Old Madison Pike

	Signalized	Roundabout
Construction Cost*	\$ 5,800,000	\$ 5,000,000
Right of Way Impacts	1.7 acres ²	1.3 acres

² R/W required for east property access

Madison Pike and TANK Facility Entrance / Lakeview Drive

	Signalized	Roundabout
Construction Cost*	\$ 1,300,000	\$ 4,800,000
Right of Way Impacts	0.1 acres	1.6 acres

* All construction cost estimates rounded to the nearest \$100,000

CDS Associates, Inc.

Project: **MADISON AVE SIGNALIZED INTERSECTIONS
PRELIMINARY OPINION OF CONSTRUCTION COST**

Date: 07/28/2006
Project No.: 2005882

ITEM NO.	SPEC. NO.	ITEM	Estimated Quantity	Unit of Measure	Unit Cost Total	Total Amount Bid
		KY 17 & HOLDS BRANCH - 2150 LF				
		CLEARING AND GRUBBING	1	LS	\$4,000.00	\$4,000.00
		PAVEMENT MILLING	18200	SY	\$2.75	\$50,050.00
		EMBANKMENT (11525 SY x 5')	15000	CY	\$15.00	\$225,000.00
		EXCAVATION (INCLUDES REMOVAL OF PAVEMENT)	3120	CY	\$14.00	\$43,680.00
		3" ASPHALT SURFACE (Area = 18200 SY)	3035	TN	\$62.00	\$188,170.00
		8" AGGREGATE BASE (Area = 4725 SY)	2100	TN	\$22.00	\$46,200.00
		15" ASPHALT PAVEMENT (Area = 4725 SY) - (Shoulder Area = 6800)	9610	TN	\$62.00	\$595,820.00
		CURB AND GUTTER	3000	LF	\$25.00	\$75,000.00
		TRAFFIC SIGNAL	1	LS	\$85,000.00	\$85,000.00
		LIGHTING	1	LS	\$35,000.00	\$35,000.00
		WATERMAIN REPLACEMENT	1000	LF	\$80.00	\$80,000.00
		SIGNING/PAVEMENT MARKING	1	LS	\$50,000.00	\$50,000.00
		RESTORATION (SEED AND MULCH)	4780	SY	\$2.50	\$11,950.00
		MAINTENANCE OF TRAFFIC	1	LS	\$20,000.00	\$20,000.00
		MISC ITEMS (15%)	1	LS	\$226,480.50	\$226,480.50
		SUBTOTAL				\$1,736,350.50
		CONTINGENCY (20%) ±				\$347,270.10
		CONSTRUCTION TOTAL				\$2,083,620.60
		USE ESTIMATED CONSTRUCTION TOTAL				\$2,100,000.00
		ENGINEERING FEES (20%)				\$420,000.00
		USE ENGINEERING FEES				\$400,000.00
		TOTAL				\$2,500,000.00

Note: Driveway work, ROW acquisition costs, landscaping and utility costs other than water main relocation are not included in the above figures.

CDS Associates, Inc.

Project: **MADISON AVE ROUNDABOUT STUDY
PRELIMINARY OPINION OF CONSTRUCTION COST**

Date: 07/28/2006
Project No.: 2005882

ITEM NO.	SPEC. NO.	ITEM	Estimated Quantity	Unit of Measure	Unit Cost Total	Total Amount Bid	
		KY 17 & HOLDS BRANCH					
		CLEARING AND GRUBBING	1	LS	\$5,000.00	\$5,000.00	
		PAVEMENT REMOVAL	9360	SY	\$10.00	\$93,600.00	
		RETAINING WALL (400' x 10')	4000	SF	\$85.00	\$340,000.00	
		EMBANKMENT	20000	CY	\$15.00	\$300,000.00	
		8" AGGREGATE BASE	6100	TN	\$22.00	\$134,200.00	
		15" ASPHALT PAVEMENT	11300	TN	\$62.00	\$700,600.00	
		20' BOX CULVERT - 50 LF EXTENSION WITH HEADWALL	1	LS	\$250,000.00	\$250,000.00	
		CHANNEL REGRADING	120	LF	\$125.00	\$15,000.00	
		STORM PIPE	2500	LF	\$60.00	\$150,000.00	
		STORM STRUCTURES	20	EA	\$2,500.00	\$50,000.00	
		CONCRETE APRON	690	SY	\$65.00	\$44,850.00	
		CURB AND GUTTER	2500	LF	\$25.00	\$62,500.00	
		LIGHTING	1	LS	\$80,000.00	\$80,000.00	
		WATERMAIN REPLACEMENT	1500	LF	\$80.00	\$120,000.00	
		SIGNING/PAVEMENT MARKING (incl. warning signs with lights)	1	LS	\$50,000.00	\$50,000.00	
		RESTORATION (SEED AND MULCH)	2800	SY	\$2.50	\$7,000.00	
		MAINTENANCE OF TRAFFIC	1	LS	\$40,000.00	\$40,000.00	
		MISC ITEMS (15%)	1	LS	\$366,412.50	\$366,412.50	
		SUBTOTAL					\$2,809,162.50
		CONTINGENCY (20%) ±					\$561,832.50
		CONSTRUCTION TOTAL					\$3,370,995.00
		USE ESTIMATED CONSTRUCTION TOTAL					\$3,400,000.00
		ENGINEERING FEES (20%)					\$680,000.00
		USE ENGINEERING FEES					\$700,000.00
		TOTAL					\$4,100,000.00

Note: Driveway work, ROW acquisition costs, landscaping and utility costs other than water main relocation are not included in the above figures.

CDS Associates, Inc.

Project:

**MADISON AVE SIGNALIZED INTERSECTIONS
PRELIMINARY OPINION OF CONSTRUCTION COST**

Date: 07/28/2006
Project No.: 2005882

ITEM NO.	SPEC. NO.	ITEM	Estimated Quantity	Unit of Measure	Unit Cost Total	Total Amount Bid
		KY 17 & OLD KY 17				
		CLEARING AND GRUBBING	1	LS	\$5,000.00	\$5,000.00
		PAVEMENT MILLING	16550	SY	\$2.75	\$45,512.50
		BANK LICK CREEK BRIDGE DECK WIDENING	11000	SF	\$185.00	\$2,035,000.00
		EMBANKMENT	15000	CY	\$15.00	\$225,000.00
		EXCAVATION (Includes removal of existing pavement)	3000	CY	\$14.00	\$42,000.00
		3" ASPHALT SURFACE (Area = 16550 SY)	2760	TN	\$62.00	\$171,120.00
		8" AGGREGATE BASE (Area = 3630 SY)	1620	TN	\$22.00	\$35,640.00
		15" ASPHALT PAVEMENT (Area = 3630 SY) - (Shoulder Area = 6800)	9050	TN	\$62.00	\$561,100.00
		CURB AND GUTTER	2470	LF	\$25.00	\$61,750.00
		TRAFFIC SIGNAL	1	LS	\$85,000.00	\$85,000.00
		LIGHTING	1	LS	\$35,000.00	\$35,000.00
		WATERMAIN REPLACEMENT	800	LF	\$80.00	\$64,000.00
		SIGNING/PAVEMENT MARKING/SIGNING	1	LS	\$50,000.00	\$50,000.00
		RESTORATION (SEED AND MULCH)	4200	SY	\$2.50	\$10,500.00
		MAINTENANCE OF TRAFFIC	1	LS	\$17,000.00	\$17,000.00
		MISC ITEMS (15%)	1	LS	\$516,543.38	\$516,543.38
					SUBTOTAL	\$3,960,165.88
		CONTINGENCY (20%) ±				\$792,033.18
					CONSTRUCTION TOTAL	\$4,752,199.05
					USE ESTIMATED CONSTRUCTION TOTAL	\$4,800,000.00
		ENGINEERING FEES (20%)				\$960,000.00
					USE ENGINEERING FEE	\$1,000,000.00
					TOTAL	\$5,800,000.00

Note: Driveway work, ROW acquisition costs, landscaping and utility costs other than water main relocation are not included in the above figures. Work on the Bank Lick Creek Bridge will consist of widening, resurfacing and pavement marking.

CDS Associates, Inc.

Project: **MADISON AVE ROUNDABOUT STUDY
PRELIMINARY OPINION OF CONSTRUCTION COST**

Date: 07/28/2006
Project No.: 2005882

ITEM NO.	SPEC. NO.	ITEM	Estimated Quantity	Unit of Measure	Unit Cost Total	Total Amount Bid	
		KY 17 & OLD KY 17					
		CLEARING AND GRUBBING	1	LS	\$6,000.00	\$6,000.00	
		PAVEMENT REMOVAL	8360	SY	\$10.00	\$83,600.00	
		RETAINING WALL (515' X 15')	7725	SF	\$95.00	\$733,875.00	
		EMBANKMENT	18000	CY	\$15.00	\$270,000.00	
		EXCAVATION	9000	CY	\$14.00	\$126,000.00	
		8" AGGREGATE BASE	7700	TN	\$22.00	\$169,400.00	
		15" ASPHALT PAVEMENT	14400	TN	\$62.00	\$892,800.00	
		STORM PIPE	1800	LF	\$60.00	\$108,000.00	
		STORM STRUCTURES	11	EA	\$2,500.00	\$27,500.00	
		CONCRETE APRON	610	SY	\$65.00	\$39,650.00	
		CURB AND GUTTER	3700	LF	\$25.00	\$92,500.00	
		CONCRETE MEDIAN - 10' WIDE	665	LF	\$70.00	\$46,550.00	
		LIGHTING	1	LS	\$80,000.00	\$80,000.00	
		WATERMAIN REPLACEMENT	2000	LF	\$80.00	\$160,000.00	
		SIGNING/PAVEMENT MARKING (incl. warning signs with lights)	1	LS	\$50,000.00	\$50,000.00	
		RESTORATION (SEED AND MULCH)	2700	SY	\$2.50	\$6,750.00	
		MAINTENANCE OF TRAFFIC	1	LS	\$45,000.00	\$45,000.00	
		MISC ITEMS (15%)	1	LS	\$440,643.75	\$440,643.75	
		SUBTOTAL					\$3,378,268.75
		CONTINGENCY (20%) ±					\$844,567.19
		CONSTRUCTION TOTAL					\$4,222,835.94
		USE ESTIMATED CONSTRUCTION TOTAL					\$4,200,000.00
		ENGINEERING FEES (20%)					\$840,000.00
		USE ENGINEERING FEES					\$800,000.00
		TOTAL					\$5,000,000.00

Note: Driveway work, ROW acquisition costs, landscaping and utility costs other than water main relocation are not included in the above figures. Work on the Bank Lick Creek Bridge will consist only of resurfacing and pavement marking.

CDS Associates, Inc.

Project: **MADISON AVE SIGNALIZED INTERSECTIONS
PRELIMINARY OPINION OF CONSTRUCTION COST**

Date: 07/28/2006
Project No.: 2005882

ITEM NO.	SPEC. NO.	ITEM	Estimated Quantity	Unit of Measure	Unit Cost Total	Total Amount Bid
		KY 17 & TANK ENTRANCE 950 LF				
		CLEARING AND GRUBBING	1	LS	\$5,000.00	\$5,000.00
		PAVEMENT MILLING	8310	SY	\$2.75	\$22,852.50
		RETAINING WALL (250' X 5.5')	1400	SF	\$95.00	\$133,000.00
		EXCAVATION (Includes removal of existing pavement)	6000	CY	\$14.00	\$84,000.00
		3" ASPHALT SURFACE (Area = 8310 SY)	695	TN	\$62.00	\$43,090.00
		8" AGGREGATE BASE (Area = 1338 SY)	600	TN	\$22.00	\$13,200.00
		15" ASPHALT PAVEMENT (Area = 1338 SY) - (Shoulder Area = 3780)	4300	TN	\$62.00	\$266,600.00
		CURB AND GUTTER	450	LF	\$25.00	\$11,250.00
		TRAFFIC SIGNAL	1	LS	\$93,000.00	\$93,000.00
		LIGHTING	1	LS	\$35,000.00	\$35,000.00
		WATERMAIN REPLACEMENT	350	LF	\$80.00	\$28,000.00
		SIGNING/PAVEMENT MARKING	1	LS	\$50,000.00	\$50,000.00
		RESTORATION (SEED AND MULCH)	2500	SY	\$2.50	\$6,250.00
		MAINTENANCE OF TRAFFIC	1	LS	\$25,000.00	\$25,000.00
		MISC ITEMS (15%)	1	LS	\$122,436.38	\$122,436.38
		SUBTOTAL				\$938,678.88
		CONTINGENCY (20%) ±				\$187,735.78
		CONSTRUCTION TOTAL				\$1,126,414.65
		USE ESTIMATED CONSTRUCTION TOTAL				\$1,100,000.00
		ENGINEERING FEES (20%)				\$220,000.00
		USE ENGINEERING FEES				\$200,000.00
		TOTAL				\$1,300,000.00

Note: Driveway work, ROW acquisition costs, landscaping and utility costs other than water main relocation are not included in the above figures.