

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

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**OFFICE OF DESIGN POLICY & SUPPORT  
INTERDEPARTMENTAL CORRESPONDENCE**

**FILE** P.I. # 0007096  
CSCMQ-0007-00(096)  
GDOT District 7 - Metro Atlanta  
Fulton County  
CR 1385/Bufington Rd. From I-85 to  
SR 14/US 29/Roosevelt Hwy  
Enhancement

**OFFICE** Design Policy & Support

**DATE** March 15, 2012

*Kim Phillips*  
**FROM** *for* Brent Story, State Design Policy Engineer

**TO** SEE DISTRIBUTION

**SUBJECT** APPROVED REVISED CONCEPT REPORT

Attached is the approved Revised Concept Report for the above subject project.

Attachment

**DISTRIBUTION:**

Genetha Rice-Singleton, Program Control Administrator  
Bobby Hilliard, State Program Delivery Engineer  
Cindy VanDyke, State Transportation Planning Administrator  
Angela Robinson, Financial Management Administrator  
Glenn Bowman, State Environmental Administrator  
Ben Rabun, State Bridge Engineer  
Kathy Zahul, State Traffic Engineer  
Georgene Geary, State Materials & Research Engineer  
Lisa Myers, State Project Review Engineer  
Jeff Baker, State Utilities Engineer  
Ken Thompson, Statewide Location Bureau Chief  
Bryant Poole, District Engineer  
Scott Lee, District Preconstruction Engineer  
Jonathan Walker, District Utilities Engineer  
Moussa Issa, Project Manager  
BOARD MEMBER - 13th Congressional District

DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA

REVISED CONCEPT REPORT

Project Number: CSCMQ-0007-00(096)

County: Fulton

P.I. Number: 0007096

Federal Route Number: N/A

State Route Number: N/A

The significant changes in the concept and the reason for those changes are as follows:

- (1) The 9 ft sidewalk and 15.5 ft shoulder located on the west side of Buffington Road will be revised to vary from 5ft - 6ft sidewalk with a 10.5 ft shoulder. This will reduce Utility impacts (utility relocation cost) and will reduce the impacts to Right of Way (ROW Cost) for the project.
- (2) Removal of widening roadway travel lane widths and reconstruction of existing curb/gutter and corrections to geometry (vertical curve and superelevation). A Design Exception has been approved by GDOT (1-10-11) for two substandard vertical curves along the project corridor. The Design Exception will reduce the construction cost significantly.

Submitted for approval:

DATE 2-23-11

Michael Francis P.E. Jacobs  
Design Consultant Name and Firm

DATE 2-23-11

Rich P. Carter  
Local Government

DATE 8-18-11

W.S.S.  
Design Phase Office Head (if applicable)

DATE 8/19/11

Ben Hinkle  
Office Head (Project Manager's Office)

DATE 8-18-11

Carolee J. Paul  
Project Manager

Recommendation for approval:

DATE 9-2-2011

Glenn Bowman \*  
State Environmental Administrator

DATE 9-27-2011

Ben Rabun \*  
State Bridge Design Engineer (if applicable)

The concept as presented herein and submitted for approval is consistent with that which is included in the Regional Transportation Program (RTP) and/or the State Transportation Improvement Program (STIP).

DATE 2-8-12

Cynthia L. Vucelja \*  
State Transportation Planning Administrator

\* Recommendation on file

## **PLANNING, APPROVED CONCEPT, & BACKGROUND DATA**

The Concept Report was approved on December 19, 2005. The following items from the approved Concept Report have changed. The sidewalk width located on the west side of Buffington Road will be reduced from 9 ft to 5 ft. The existing travel lanes width will be maintained with no reconstructing of the existing curb/gutter/sidewalks.

**Project Justification Statement:** Fulton County has experienced significant increase in traffic flow (vehicular and pedestrian) along the corridor of Buffington Road due to land development and commercial industries. Fulton County has identified the need to construct sidewalks for both east and west side along the corridor and intersection improvements to include turn lanes and signal upgrades along the corridor. The project consists of 1.84 miles of improvements from Royal South Parkway to SR 14/Roosevelt Highway. Buffington Road is located entirely within Fulton County with portions of the project located in unincorporated Union City and College Park and serves residential and commercial developments intermittently along the corridor. The purpose of this project is to reduce vehicle trips by providing linkage to MARTA for the high density residential communities. There are MARTA bus stops located along Buffington Road at the intersections of Royal South Parkway, Sable Chase Road, Sable Run Road, Estes Road, Augusta Street, Naturally Fresh Boulevard, and Roosevelt Highway. The sidewalks would also provide pedestrian access to several commercial and industrial facilities located on Buffington Road. The addition of curb/gutter and sidewalk will greatly improve pedestrian mobility by creating a barrier and distance between pedestrians and vehicles. Also included is the addition of turn-lanes to be located at the following intersections/driveways: Vulcan Plant and the Coca-Cola Plant driveways, Naturally Fresh Boulevard, SR 14 Spur Ramps, and SR 14/Roosevelt Highway. The roadway improvements will improve the air quality by the amount of idle time for vehicles. Signal upgrades and modifications are proposed at Sable Run Road, Naturally Fresh Boulevard, and SR 14/Roosevelt Highway which will allow the County to interconnect the signals and provide coordination to achieve a continuous progression throughout the corridor.

Portions of the sidewalks with curb and gutter have been constructed along the corridor. The beginning terminus at Royal South Parkway was chosen due to this being where existing sidewalks are presently located north of the intersection on both east and west sides. It was deemed logical by the County to tie this project directly to the existing sidewalks at the intersection Royal South Parkway. Furthermore, Royal South Parkway is located approximately 400 feet north of the I-85 overpass bridge which does not have existing pedestrian facilities crossing the bridge. To extend this project further south to cross the bridge would be costly. However, existing sidewalks are located just south of the I-85 overpass bridge from the first cross street (Old Bill Cook Road) down to the next major intersection of Flat Shoals Road and was constructed in another Phase by the County. The ending terminus for this project was chosen to tie the sidewalks at the T-intersection where Buffington Road terminates at SR 14/Roosevelt Highway.

The traffic analysis shows the corridor opening year 2015 to operate at LOS (E) and Design Year 2035 to operate at LOS (E). Please note that this project is not a capacity adding project and the two lane

corridor will remain with additions of turn lanes at key intersections. By adding turn lanes at the key intersection, will reduce the mainline through volumes during peak hours and reduce the potential of drivers to stop for turning vehicles. This is will improve the delay and travel times along the corridor and reduce the potential for collisions (rear-end, angle, etc). The intersections analysis for Existing Year 2011 and Opening Year 2015 are currently operating at an acceptable LOS. However, by Design Year 2035, traffic conditions are expected to degrade resulting in an unacceptable LOS (E and F) for intersections at SR 14/Roosevelt Highway and Spur 14/South Fulton Parkway off ramp respectively.

The segment crash history (crash rate, injury rate, and fatality rate) for the last three published years (2006, 07, and 08) were obtained. With the exception of 2006, the historical crash segment data was below the statewide average for similar type facility. See Table 1.

<b>Table 1 – Crash History (Segment)</b>						
<b>Buffington Road from Royal South Parkway to Roosevelt Highway</b>						
Year	Crashes	Crash Rate	Injuries	Injury Rate	Fatalities	Fatality Rate
2006	23	318 <b>(548)</b>	12	166 <b>(137)</b>	0	0 <b>(1.43)</b>
2007	17	257 <b>(513)</b>	8	121 <b>(126)</b>	0	0 <b>(1.36)</b>
2008	19	280 <b>(469)</b>	4	59 <b>(117)</b>	0	0 <b>(1.33)</b>

**Note: Bolded entries in parenthesis represent the statewide average**

Intersection crash history was also obtained for the last three published years (2006, 07, and 08) where additional turn-lanes are to be constructed. See Table 2.

<b>Table 2: Crash History – Intersections and Driveways</b>				
<b>SR 14/Roosevelt Highway</b>				
Year	Crashes	Crash Type	Injuries	Fatalities
2006	6	5 – Rear End, 1-Angle	4	0
2007	4	Not available	0	0
2008	4	Not available	0	0
<b>SR 14 Spur On-Ramp</b>				
Year	Crashes	Crash Type	Injuries	Fatalities
2006	5	4 – Rear End, 1 – Sideswipe	2	0

2007	5	2- Rear End, 1- Angle, 1- Head On, 1- Non Motor Veh	0	0
2008	6	0	0	0
<b>Naturally Fresh Blvd</b>				
Year	Crashes	Crash Type	Injuries	Fatalities
2006	0	0	0	0
2007	1	1 – Head On	0	0
2008	0	0	0	0
<b>Coca Cola Driveway</b>				
Year	Crashes	Crash Type	Injuries	Fatalities
2006	0	0	0	0
2007	0	0	0	0
2008	1	1 – Head On	0	0
<b>Rock Quarry Road</b>				
Year	Crashes	Crash Type	Injuries	Fatalities
2006	0	0	0	0
2007	1	1 – Rear End	1	0
2008	0	0	0	0

**Note: Crashes taken 0.25 mile of intersections/driveway.**

This project is identified in the current Transportation Improvement Plan (TIP) of the Atlanta Regional Commission (ARC). Other transportation projects in the vicinity include the, Oakley Industrial Boulevard Extension, Buffington Road at Morning Creek Bridge Replacement, US 29/Roosevelt Highway, SR 14 Alternate/SR 70 (South Fulton Parkway) Access Management Plan, and SR 279 (Old National Highway) Transit Oriented Development Implementation Program.

**Description of the approved concept:**

This project consists of 1.84 miles of construction of sidewalk along both sides of Buffington Road between Royal South Parkway and Roosevelt Highway. Buffington Road is currently a two-lane road with turn-lanes and a 45 mph speed limit. Buffington Road lies entirely within Fulton County and serves residential and commercial developments intermittently along its 3-mile corridor.

This project consists of two funding sources. The first funding source is CMAQ and this portion of the project is to be included in the CMAQ Congestion Mitigation/Air Quality Program. The CMAQ funding source will be used to pay for the construction of sidewalk, curb and gutter, drainage, driveway, intersection, and railroad crossing improvements. The second source of funding is Fulton County which will include all the pavement work required for the overlay and leveling improvements.

*Description of the CMAQ Portion:* The CMAQ funding portion of the project consists of utilizing the existing horizontal alignment and two-lane roadway section of Buffington Road. The proposed improvements include the addition of 30” curb and gutter, and 10.5’ shoulder with a 5’ sidewalk and 2’ grass strip on the east side of Buffington Road and a 15.5’ shoulder with a 9’ sidewalk and 2’ grass strip on the west side. Also, included is the construction of drainage to accommodate the curb and gutter that will be added to Buffington Road. There are numerous driveways along Buffington Road that will be reconstructed as part of the CMAQ portion of this project.

Also included in the CMAQ funding portion of the project is the upgrade of the railroad crossing located near the intersection of Roosevelt Highway. The upgraded is needed because of the addition of sidewalk and turn-lanes at the intersection of Buffington Road and Roosevelt Highway. Another item included in the CMAQ portion is the addition of turn-lanes at the Vulcan Plant, the Coca-Cola Plant, the SR 14 Spur ramps, and Roosevelt Highway/SR 14, and the signal modifications on Buffington Road at Sable Run Road, Naturally Fresh Boulevard, and Roosevelt Highway/SR 14. Below is a table showing the addition of turn-lanes along Buffington Road.

**Turn-Lanes Located Along Buffington Road**

<b>Location</b>	<b>Existing NB Lanes</b>	<b>Proposed NB Lanes</b>	<b>Existing SB Lanes</b>	<b>Proposed SB Lanes</b>
Miller Property (Vulcan Plant) Driveway	Right Turn-Lane	Right Turn-Lane	None	Left Turn-Lane
Southern Coca-Cola Driveway	Right Turn-Lane	Right Turn-Lane	None	Left Turn-Lane
SR 14 Spur On-Ramp	None	Right Turn-Lane	None	None
Roosevelt Highway	None	Left Turn-Lane Right Turn-Lane	N/A	N/A

*Description of Fulton County Portion:* The County funded portion of the project consists of the pavement overlay and leveling to fix the superelevation and roadway cross-slop and the widening of the existing travel-lanes to a width of 12 ft. The proposed project will improve the functional operation of the corridor.

**PDP Classification:**     Major                       Minor  
**Federal Oversight:**     Full Oversight     Exempt     State Funded     Other

**Projected Traffic as shown in the approved Concept Report:**

Open Year (2007): 11,180                      Design Year (2027): 20,200

**Updated Traffic ADT:**

Open Year (2015): 13,600                      Design Year (2035): 19,700

**Functional Classification (Mainline):** Urban Minor Arterial Street

**VE Study anticipated:**     No                       Yes                       Completed – Date:

**PROPOSED REVISIONS**

**Approved Features:**

**Proposed Features:**

<p>The project begins at the intersection of Royal South Parkway and ends at SR 14/Roosevelt Highway with a total length of 1.84 miles. The project will reconstruct Buffington Road with the addition of 30"curb/gutter and sidewalks. The eastside consist of 10.5 ft shoulder with a 5 ft sidewalk and the westside a 15.5 ft shoulder with a 9 ft sidewalk. Travel lanes will be widen to 12 feet, with turn-lanes being added at following locations: Vulcan Plant Driveway (SB left-turn lane), Coca-Cola Driveway (SB left-turn lane), SR 14 Spur On-Ramp (NB right-turn lane), and Roosevelt Highway (NB left-turn lane and NB right-turn lane) curb and gutter modified/added as well.</p>	<p>The 9 ft sidewalk located on the west side will be revised to 5 ft – 6ft width and the shoulder from 15.5 ft to 10.5 ft.</p> <p>There will be no widening of the existing travel-lanes to 12ft and no reconstruction of existing curb/gutter and no correction to geometry (vertical and super-elevation). A design exception for the two substandard vertical curves along the project has been submitted/approved by GDOT.</p> <p>An additional right-turn lane will be added at the intersection of Naturally Fresh Boulevard (NB right-turn lane).</p>
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**Reason(s) for change:** This revision to the concept report is to reduce the overall Construction Cost for the project. In the previously approved proposed concept, the 9ft sidewalk conflicts with several existing Georgia Power utility poles; this change will reduce the utility impacts/relocation cost. Second, this change will also reduce ROW impacts to several parcels by reducing and/or eliminating the required ROW and Easement needed along the westside of the corridor. Lastly, by not widening and correcting the vertical substandard vertical curves will reduce the construction cost as well as eliminate the need for approximately six (6) total takes/damages to parcels located at three different subdivision entrances. These changes will provide an estimated overall savings in the following amounts: \$710,000 (Right of Way), \$300,000 (Utility Relocations), and \$1,574,000 (Construction Cost). This is a total estimated savings of \$2,584,000.

## ENVIRONMENTAL

### Air Quality:

Is the project located in a PM 2.5 Non-attainment area?  
Is the project located in an Ozone Non-attainment area?

No  
 No

Yes  
 Yes

Fulton County is Non-attainment for ozone. All appropriate modeling and evaluations were performed for the project environmental document. The proposed project concept will not change the conforming plan's model description and the number of through lanes is not being modified.

**Potential environmental impacts of proposed revision:** There are no expected environmental impacts due to the reduction of the project foot print (cross section width) by reduction in sidewalk, and there is no change in total project length. The project Reevaluation has been submitted and approved on Jan 19, 2012 and will not impact the project schedule.

**Have proposed revisions been reviewed by environmental staff?**

No

Yes

**Environmental responsibilities (Studies/Documents/Permits):** The County and Consultant are responsible for environmental studies, documents and permits.

### Environmental impacts by section:

**NEPA:** Reevaluation was completed and has been approved.

**Ecology:** No impacts and no additional surveys required.

**Archeology:** No impacts and no additional surveys required.

**History:** No impacts and no additional surveys required.

**Air & Noise:** No impacts and no additional modeling required.

**Public Involvement:** No public involvement required.

## PROJECT COST & ADDITIONAL INFORMATION

Updated Cost Estimate	
Base Construction Cost:	\$1,830,953.04
Engineering and Inspection:	\$ 91,547.65
<u>Total Construction Cost:</u>	\$1,922,500.69
Right-of-Way:	\$2,760,000.00
Utilities (reimbursable costs):	\$290,562
Environmental Mitigation:	None

**Recommendation:** The Office of Program and Delivery recommendation is that the proposed revision to the concept be approved for implementation.

**Comments:** *None*

**Attachments:**

1. Cost Estimate(s)
2. Location Map
3. Typical Section
4. Traffic Report
5. Design Exception

**APPROVALS**

*Exempt Projects*

Concur: Bill L. M. M.  
Director of Engineering

Approve: Dee M. R.  
Chief Engineer

3-12-12  
Date

**Project Number: PI 0007096**  
**CSCMQ-0007-00(096)**

**Description: Cost Estimate**

**COST SUMMARY**

Construction Cost	\$1,830,953.04
E & I Rate 5%	<u>\$91,547.65</u>
 Total Construction Cost	 = \$1,922,500.69

Right-of-Way	\$2,760,000.00
Reimb Utilities	<u>\$290,562.00</u>

**Grand Total Estimated Project Cost = \$4,973,062.69**

STATE HIGHWAY AGENCY

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JOB ESTIMATE REPORT

JOB NUMBER : 0007096FULTONCO      SPEC YEAR: 01  
 DESCRIPTION: BUFFINGTON ROAD PEDESTRIAN AND ROADWAY IMPROVEMENTS

\*\*\*\*\* This job contains obsolete items \*\*\*\*\*

COST GROUPS FOR JOB 0007096FULTONCO

COST GROUP	DESCRIPTION	QUANTITY	PRICE	AMOUNT	ACTIVE?
ERTHLS	EARTHWORK (LS)				N
BASE	BASE/AGGREGATE (TN)				N
ERTHCY	EARTHWORK (CY)				N
TRFTPCTO	TRAFFIC CONTROL-TEMPORARY (PCT OF JOB)	0.000		0.00	N
EROC	EROSION CONTROL (SY)				N
CONC	CONCRETE (SY)				N
MILL	MILLING (SY)				N
SRFT	SURFACE TREATMENT (SY)				N
GDRL	GUARDRAIL/BARRIER (LF)				N
DRNGEA	DRAINAGE (EA)				N
SGNL	TRAFFIC SIGNALS (LS)	0.000			N
CURB	CURB & GUTTER (LF)				N
UTIL	UTILITIES (LF)				N
SSGN	SMALL ROADSIDE SIGNS				N
ACTIVE COST GROUP TOTAL				0.00	
INFLATED COST GROUP TOTAL				0.00	

ITEMS FOR JOB 0007096FULTONCO

LINE	ITEM	ALT	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
0010	205-0001		CY	UNCLASS EXCAV	8911.000	9.71	86574.91
0015	206-0002		CY	BORROW EXCAV, INCL MATL	1910.000	12.72	24310.25
0020	647-1000		LS	TRAF SIGNAL INSTALLATION NO - COST AS PER MIKE FRANCIS, 4 AT 110K EA	1.000	440000.00	440000.00
0025	163-0232		AC	TEMPORARY GRASSING	2.000	371.18	742.36
0030	163-0240		TN	MULCH	121.000	200.30	24237.43
0035	163-0503		EA	CONSTR AND REMOVE SILT CONTROL GATE, TP 3	4.000	300.69	1202.77
0040	163-0529		LF	CNST/REM TEMP SED BAR OR BLD STRW CK DM	7722.000	2.68	20748.55
0045	163-0550		EA	CONS & REM INLET SEDIMENT TRAP	30.000	128.32	3849.87
0050	165-0010		LF	MAINT OF TEMP SILT FENCE, TP A	324.000	0.77	251.63
0055	165-0030		LF	MAINT OF TEMP SILT FENCE, TP C	16.000	1.44	23.06
0060	165-0071		LF	MAINT OF SEDIMENT BARRIER - BALED STRAW	3861.000	0.76	2945.67
0065	165-0087		EA	MAINT OF SILT CONTROL GATE, TP 3	4.000	113.51	454.07
0070	165-0105		EA	MAINT OF INLET SEDIMENT TRAP	30.000	42.44	1273.46
0075	167-1000		EA	WATER QUALITY MONITORING AND SAMPLING	2.000	460.67	921.34

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## JOB ESTIMATE REPORT

0080	167-1500	MO	WATER QUALITY INSPECTIONS	6.000	353.02	2118.13
0085	171-0010	LF	TEMPORARY SILT FENCE, TYPE A	648.000	2.00	1302.43
0090	171-0030	LF	TEMPORARY SILT FENCE, TYPE C	32.000	3.47	111.29
0095	700-6910	AC	PERMANENT GRASSING	4.000	734.14	2936.58
0100	700-7000	TN	AGRICULTURAL LIME	7.000	69.17	484.20
0105	700-7010	GL	LIQUID LIME	9.000	23.50	211.54
0110	700-8000	TN	FERTILIZER MIXED GRADE	4.000	402.46	1609.87
0115	700-8100	LB	FERTILIZER NITROGEN CONTENT	26.000	1.98	51.64
0120	716-2000	SY	EROSION CONTROL MATS, SLOPES	2430.000	0.96	2353.04
0125	611-5551	EA	RESET SIGN	24.000	384.69	9232.62
0130	636-1020	SF	HWY SGN,TP1MAT,REFL SH TP3	89.000	15.06	1341.03
0135	636-1033	SF	HWY SIGNS, TP1MAT,REFL SH TP 9	60.000	20.98	1259.24
0140	636-2070	LF	GALV STEEL POSTS, TP 7	502.000	7.79	3913.83
0145	653-0100	EA	THERM PVMT MARK, RR/HWY X SYM	10.000	383.18	3831.87
0150	653-0110	EA	THERM PVMT MARK, ARROW, TP 1	2.000	67.63	135.27
0155	653-0120	EA	THERM PVMT MARK, ARROW, TP 2	36.000	68.84	2478.35
0160	653-0130	EA	THERM PVMT MARK, ARROW, TP 3	2.000	93.47	186.95
0165	653-0150	EA	THERM PVMT MARK, ARROW, TP 5	1.000	108.05	108.05
0170	653-0210	EA	THERM PVMT MARK, WORD , TP 1	3.000	103.92	311.77
0175	653-1501	LF	THERMO SOLID TRAF ST 5 IN, WHI	11000.000	0.34	3800.83
0180	653-1502	LF	THERMO SOLID TRAF ST, 5 IN YEL	5280.000	0.39	2084.49
0185	653-1704	LF	THERM SOLID TRAF STRIPE,24",WH	603.000	3.24	1959.20
0190	653-1804	LF	THERM SOLID TRAF STRIPE, 8",WH	4800.000	1.69	8143.44
0195	653-3501	GLF	THERMO SKIP TRAF ST, 5 IN, WHI	2000.000	0.27	549.86
0209	310-5120	SY	GR AGGR BS CRS 12IN INCL MATL	2906.000	19.73	57347.90
0210	318-3000	TN	AGGR SURF CRS	250.000	17.02	4256.61
0215	402-1812	TN	RECYL AC LEVELING,INC BM&HL	1000.000	73.32	73323.05
0220	402-3121	TN	RECYL AC 25MM SP,GP1/2,BM&HL	479.000	69.49	33287.63
0225	402-3130	TN	RECYL AC 12.5MM SP,GP2,BM&HL	225.000	78.49	17662.46
0230	402-3190	TN	RECYL AC 19 MM SP,GP 1 OR 2 ,INC BM&HL	320.000	73.12	23398.82
0235	413-1000	GL	BITUM TACK COAT	350.000	3.19	1119.34
0240	441-0014	SY	DRIVEWAY CONCRETE, 4 IN TK	410.000	23.54	9654.83
0245	441-0104	SY	CONC SIDEWALK, 4 IN	6945.000	23.90	166010.85
0250	441-0301	EA	CONC SPILLWAY, TP 1	1.000	1726.45	1726.46
0260	441-4020	SY	CONC VALLEY GUTTER, 6 IN	310.000	32.67	10128.99
0265	441-6022	LF	CONC CURB & GUTTER, 6"X30"TP2	9247.000	14.09	130302.53
0270	500-9999	CY	CL B CONC,BASE OR PVMT WIDEN	124.000	145.22	18008.45
0275	550-1180	LF	STM DR PIPE 18",H 1-10	2375.000	29.49	70056.63
0280	550-4118	EA	FLARED END SECT 18 IN, SIDE DR	14.000	333.64	4671.07
0285	550-1240	LF	STM DR PIPE 24",H 1-10	123.000	40.37	4966.54
0290	550-4124	EA	FLARED END SECT 24 IN, SIDE DR	4.000	347.11	1388.44
0295	603-2182	SY	STN DUMPED RIP RAP, TP 3, 24"	31.000	47.48	1472.16
0300	603-7000	SY	PLASTIC FILTER FABRIC	31.000	3.81	118.39
0305	611-3000	EA	RECONSTR CATCH BASIN, GROUP 1	6.000	2027.50	12165.00
0310	641-1100	LF	GUARDRAIL, TP T	337.000	36.22	12207.32
0315	641-1200	LF	GUARDRAIL, TP W	1064.000	15.91	16936.61
0320	641-5001	EA	GUARDRAIL ANCHORAGE, TP 1	5.000	633.76	3168.83
0325	641-5006	EA	GUARDRAIL ANCHORAGE, TP 6	4.000	418.93	1675.73
0330	641-5012	EA	GUARDRAIL ANCHORAGE, TP 12	8.000	1803.14	14425.15
0340	668-1100	EA	CATCH BASIN, GP 1	14.000	1987.17	27820.46
0345	668-1110	LF	CATCH BASIN, GP 1, ADDL DEPTH	2.000	189.07	378.15
0350	668-2200	EA	DROP INLET, GP 2	3.000	2903.23	8709.70
0355	668-4300	EA	STORM SEW MANHOLE, TP 1	1.000	1834.05	1834.05

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## JOB ESTIMATE REPORT

0360	201-1500	LS	CLEARING & GRUBBING - COST AS PER MICHAEL FRANCIS	1.000	54000.00	54000.00
0365	150-1000	LS	TRAFFIC CONTROL - COST AS PER MICHAEL FRANCIS	1.000	85000.00	85000.00
0370	001-1000	*	FORCE ACCOUNT NO. RR CROSSING	1.000	200000.00	200000.00
0375	001-0000	\$	MISC ITEMS INTERSECTION INTERCONNECT/ ATMS	1.000	105680.00	105680.00

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ITEM TOTAL 1830953.04  
INFLATED ITEM TOTAL 1830953.04

TOTALS FOR JOB 0007096FULTONCO

-----  
ESTIMATED COST: 1830953.04  
CONTINGENCY PERCENT ( 0.0 ): 0.00  
ESTIMATED TOTAL: 1830953.04  
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OBSOLETE ITEMS FOR JOB 0007096FULTONCO

=====

LINE ITEM  
-----  
0105 700-7010  
0375 001-0000



PI# 0007096-Buffington Road  
Estimated Per Pole Location Cost

1. Sta 132+10 Conflict with ADA Ramp (poles on each side of this location require span guys & poles due to angle of pole line)
  - **Approximate Cost this Location = \$40,315.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**
    2. **Install Span Guys, Poles on Each Side of Location**
    3. **Engineering & Easement Costs**
2. Sta 147+90 Conflict with 3.5' fill and adjacent pole relocation @ Sta 150+15.
  - **Approximate Cost this Location = \$20,872.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**
    2. **Tree Work**
    3. **Engineering & Easement Costs**
3. Sta 150+15 Conflict with 4' cut and adjacent pole relocation @ Sta 151+30.
  - **Approximate Cost this Location = \$24,015.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**
    2. **Remove/Replace Recloser Assembly**
    3. **Tree Work**
    4. **Engineering & Easement Costs**
4. Sta 151+30 Conflict with roadway, curb & sidewalk as noted in meeting notes dated 11/02/2011.
  - **Approximate Cost this Location = \$22,808.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**
    2. **Remove/Replace Transformer Assembly**
    3. **Tree Work**
    4. **Engineering & Easement Costs**
5. Sta 152+25 Conflict with roadway, curb & sidewalk as noted in meeting notes dated 11/02/2011.
  - **Approximate Cost this Location = \$28,638.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**
    2. **Remove/Replace Switch Assembly**
    3. **Tree Work**
    4. **Engineering & Easement Costs**
6. Sta 154+30 Conflict with Underground Primary, roadway, curb and adjacent pole relocation at Sta 152+25. Pole 1 foot off face of curb and 3 foot off travel lane.
  - **Approximate Cost this Location = \$20,046.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**
    2. **Remove/Replace 3Ø Underground Pothead Assembly**
    3. **Remove/Replace 3Ø Underground Primary**
    4. **Engineering & Easement Costs**
7. Sta 155+60 Conflict with Underground Primary, roadway, curb and adjacent pole relocation at Sta 154+30. Pole 1 foot off face of curb and 3 foot off travel lane. (adjacent pole @ Sta 157+50 will require span guy & pole due to angle of pole line)
  - **Approximate Cost this Location = \$29,653.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**

PI# 0007096-Bufferington Road  
Estimated Per Pole Location Cost

2. **Remove/Replace 3Ø Underground Pothead Assembly**
  3. **Remove/Replace 3Ø Underground Primary**
  4. **Install Span Guy, Pole at STA 157+50**
  5. **Engineering & Easement Costs**
8. Sta 176+80 Conflict with roadway, curb & sidewalk as noted in meeting notes dated 11/02/2011.
- **Approximate Cost this Location = \$39,768.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**
    2. **Remove/Replace 3Ø Underground Pothead Assembly**
    3. **Remove/Replace 3Ø Underground Primary**
    4. **Install Span Guy, Pole at STA 175+80**
    5. **Engineering & Easement Costs**
9. Sta 192+30 Conflict with roadway and adjacent pole relocation @ Sta 194+40. Pole 5 foot off travel lane.
- **Approximate Cost this Location = \$43,799.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**
    2. **Install Span Guy, Pole at STA 190+40**
    3. **Tree Work**
    4. **Engineering & Easement Costs**
10. Sta 194+40 Conflict with roadway, curb & sidewalk as noted in meeting notes dated 11/02/2011.
- **Approximate Cost this Location = \$19,286.00**
  - **Includes**
    1. **Remove/Replace existing Pole, Wire, Hardware**
    2. **Engineering & Easement Costs**

The total cost of relocation is estimated to be \$290,562.00. This estimate includes engineering, labor, material, & estimated easement acquisition costs. The average per pole (existing facilities) relocation cost with all these variables included is approximately \$29,056.00. The cost includes the setting of 5 span guy poles to support the angle of the pole line at various locations which includes labor, material, engineering & estimated easement acquisition costs. This makes the (new/existing facilities) approximate per pole location cost \$19,371.00.

This estimate represents a total reduction of \$442,768.00 from the original estimate of \$733,330.00.

Sincerely,

Robert S. Plunkett  
Engineering Rep Sr  
Georgia Power Company  
Bin# 79611  
1704 Noah's Ark Road  
Jonesboro, GA 30236  
770-603-5407

**Project Number: PI 0007096**  
**CSCMQ-0007-00(096)**

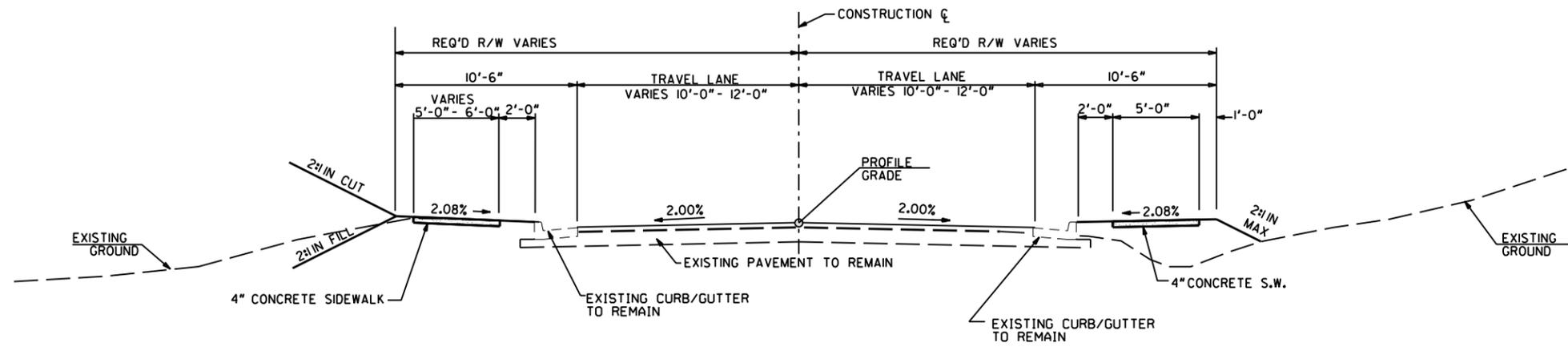
**Description: Cost Estimate**

**COST SUMMARY**

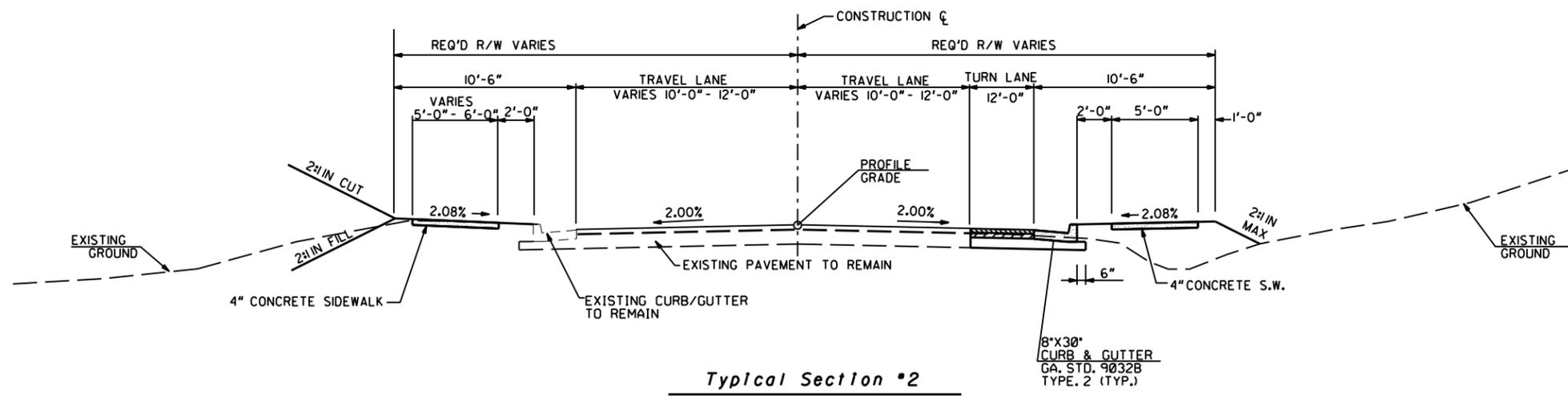
Construction Cost	\$1,830,953.04
E & I Rate 5%	<u>\$91,547.65</u>
 Total Construction Cost	 = \$1,922,500.69

Right-of-Way	\$2,760,000.00
Reimb Utilities	<u>\$290,562.00</u>

**Grand Total Estimated Project Cost = \$4,973,062.69**



**Typical Section #1**  
**BUFFINGTON ROAD**  
**OVERLAY, LEVELING - TANGENT SECTION**



**Typical Section #2**  
**BUFFINGTON ROAD**  
**WIDENING TURN-LANE, OVERLAY, LEVELING - TANGENT SECTION**

<p>PROPERTY AND EXISTING R/W LINE -----</p> <p>REQUIRED R/W LINE _____</p> <p>CONSTRUCTION LIMITS -C- F-</p> <p>EASEMENT FOR CONSTR &amp; MAINTENANCE OF SLOPES [diagonal hatching]</p> <p>EASEMENT FOR CONSTR OF SLOPES [cross-hatching]</p> <p>EASEMENT FOR CONSTR OF DRIVES [grid hatching]</p>	<p>BEGIN LIMIT OF ACCESS.....BLA</p> <p>END LIMIT OF ACCESS.....ELA</p> <p>LIMIT OF ACCESS [dashed line]</p> <p>REQ'D R/W &amp; LIMIT OF ACCESS [thick line]</p>
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------

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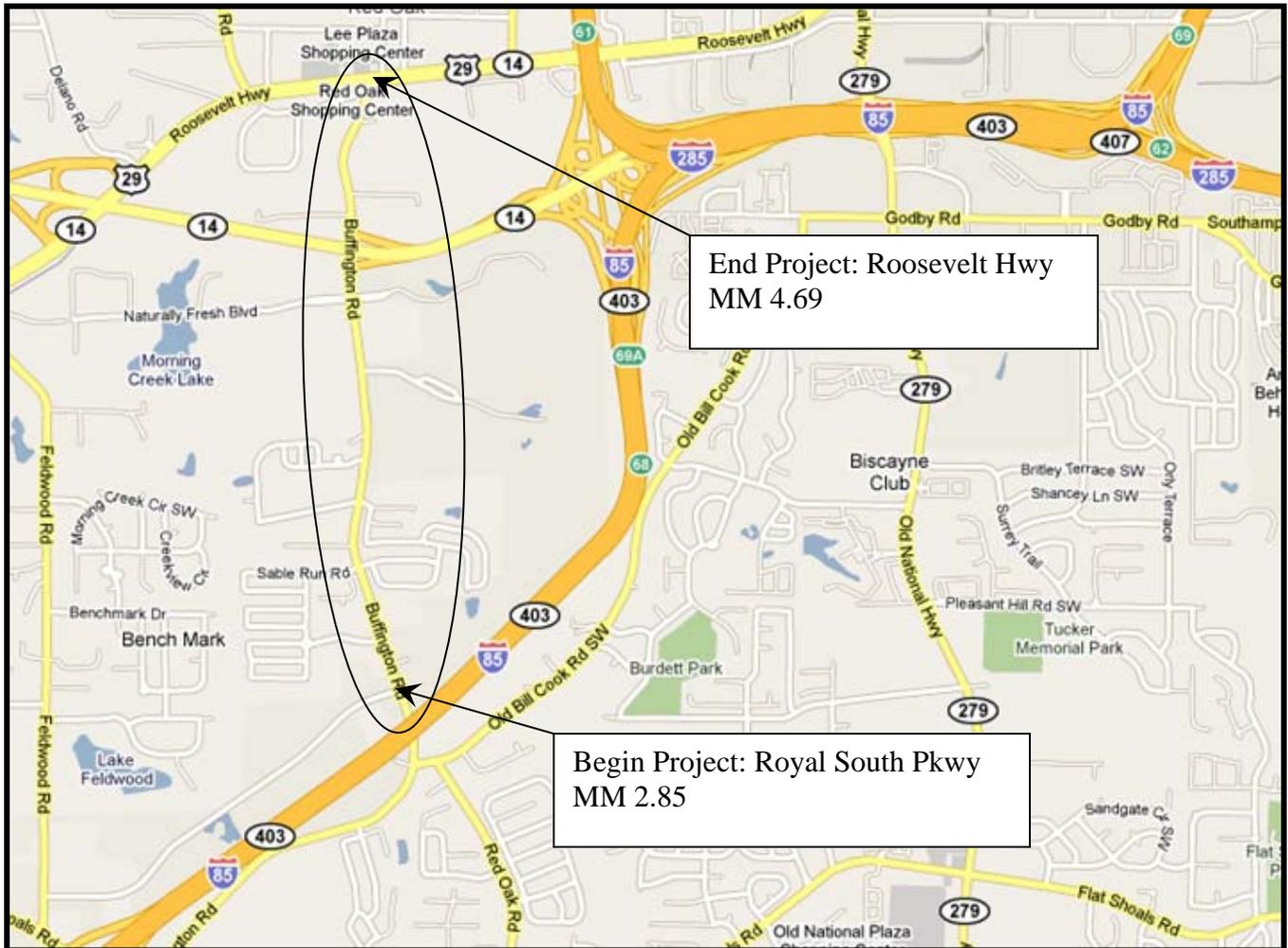
NOT TO SCALE

REVISION DATES	

FULTON COUNTY PUBLIC WORKS GDOT DISTRICT 7 TYPICAL SECTIONS	DRAWING No. <b>5-01</b>
BUFFINGTON ROAD PEDESTRIAN AND ROADWAY IMPROVEMENTS	

Proposed Length of Project: 1.85 Miles

The Project is located entirely in Fulton County, Georgia and crosses the city limits of College Park and Union City.



**To:** Antonio Valenzuela, Fulton County Department of Public Works (Fulton County)

**From:** Amy Diaz and Scott Moore, Jacobs Engineering Group, Inc. (JEG)

**Date:** August 28, 2009

**Subject:** Buffington Road Upgrade Project: Traffic Study Update

**cc:** Jeff VanDyke, JEG  
 Derrick Vincent, JEG  
 David Kasbo, JEG

As a part of the update to the Buffington Road Upgrade Project, Jacobs Engineering Group, Inc. (JEG) has reviewed the September 1999 traffic study/analysis performed for Fulton County by Grice & Associates, Inc. This study is hereafter referred to as the September 1999 study and is included in Appendix A. The following review includes updates for traffic volumes and analysis to bring the project up-to-date. The following memorandum includes details for the current existing (2009), opening year (2011) and design year (2031) conditions.

The September 1999 study includes traffic information based on traffic counts taken on April 28, 1999 and traffic volume projections for 2020 conditions. This traffic volume information is included in traffic volume tables in Appendix B. Based on the 1999 and 2020 information, the 1999 traffic volumes were increased by 1.9 percent exponential growth per year to match the 2020 projections. This growth rate was compared to historical information for Georgia Department of Transportation (GDOT) traffic count stations. Table 1 shows the last six years of traffic data and the resulting annual growth rate for the Buffington Road count stations within the study area.

Table 1: Historical Traffic Information

Location	2003	2004	2005	2006	2007	2008	Total Annual Exponential Growth
Station 5744 (Buffington Road between Roosevelt Highway and South Fulton Parkway)	9,138	9098	9,190	10,650	10,670	10,820	3.4%
Station 5743 (Buffington Road between South Fulton Parkway and Old Bill Cook Road)	8,602	9,805	9,920	8,490	9,060	8,530	-0.2%
Weighted Average							1.8%

This historical growth rate is comparable to the growth rate used in the September 1999 study. JEG therefore used the more conservative 1.9% growth rate from the September 1999 study in order to increase the traffic volumes to current existing, opening year and design year conditions. These traffic volumes projections are included in the traffic volume tables in Appendix B.

The traffic volume analysis was also updated to the current existing, opening year and design year conditions. Some traffic improvements recommended in the September 1999 study are currently in place and are included in the JEG analysis. Figure 1 illustrates the existing geometric and traffic control conditions at the study intersections. The following list summarizes the existing roadway geometry by approach for each analyzed intersection:

Buffington Road at Roosevelt Highway (traffic signal control):

- Northbound (Buffington Road): one shared left/through lane and one exclusive right turn lane
- Southbound (driveway): one shared left/through/right lane
- Eastbound (Roosevelt Highway): one exclusive left turn lane, one through lane and one exclusive right turn lane
- Westbound (Roosevelt Highway): one exclusive left turn lane and one shared through/right turn lane

Buffington Road at South Fulton Parkway Off-Ramp (traffic signal control):

- Northbound (Buffington Road): one through lane
- Southbound (Buffington Road): one through lane
- Westbound (South Fulton Parkway Off-Ramp): one exclusive left turn lane and one exclusive right turn lane

Buffington Road at South Fulton Parkway On-Ramp:

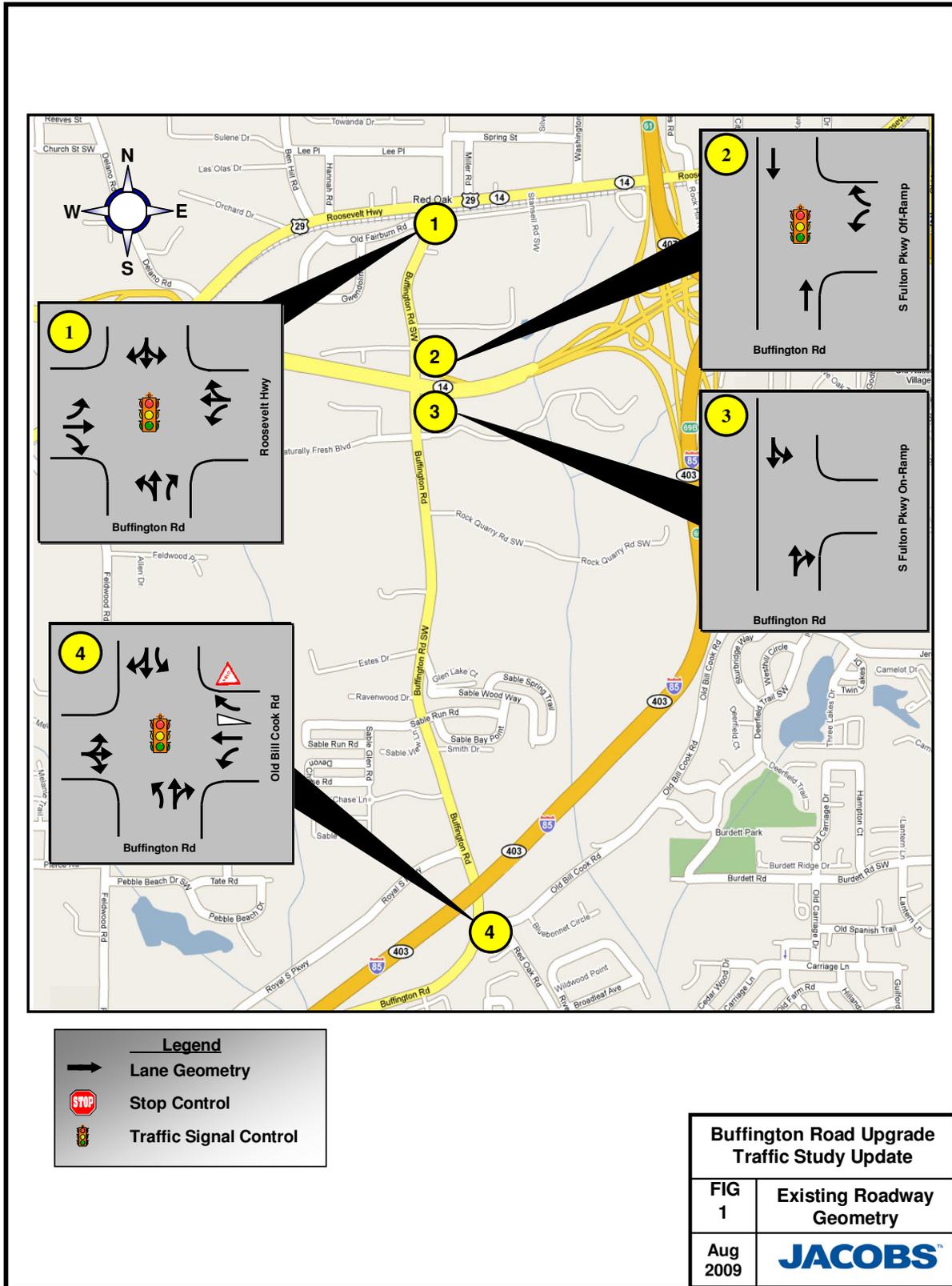
- Northbound (Buffington Road): one shared through/right turn lane
- Southbound (Buffington Road): one shared left/through lane

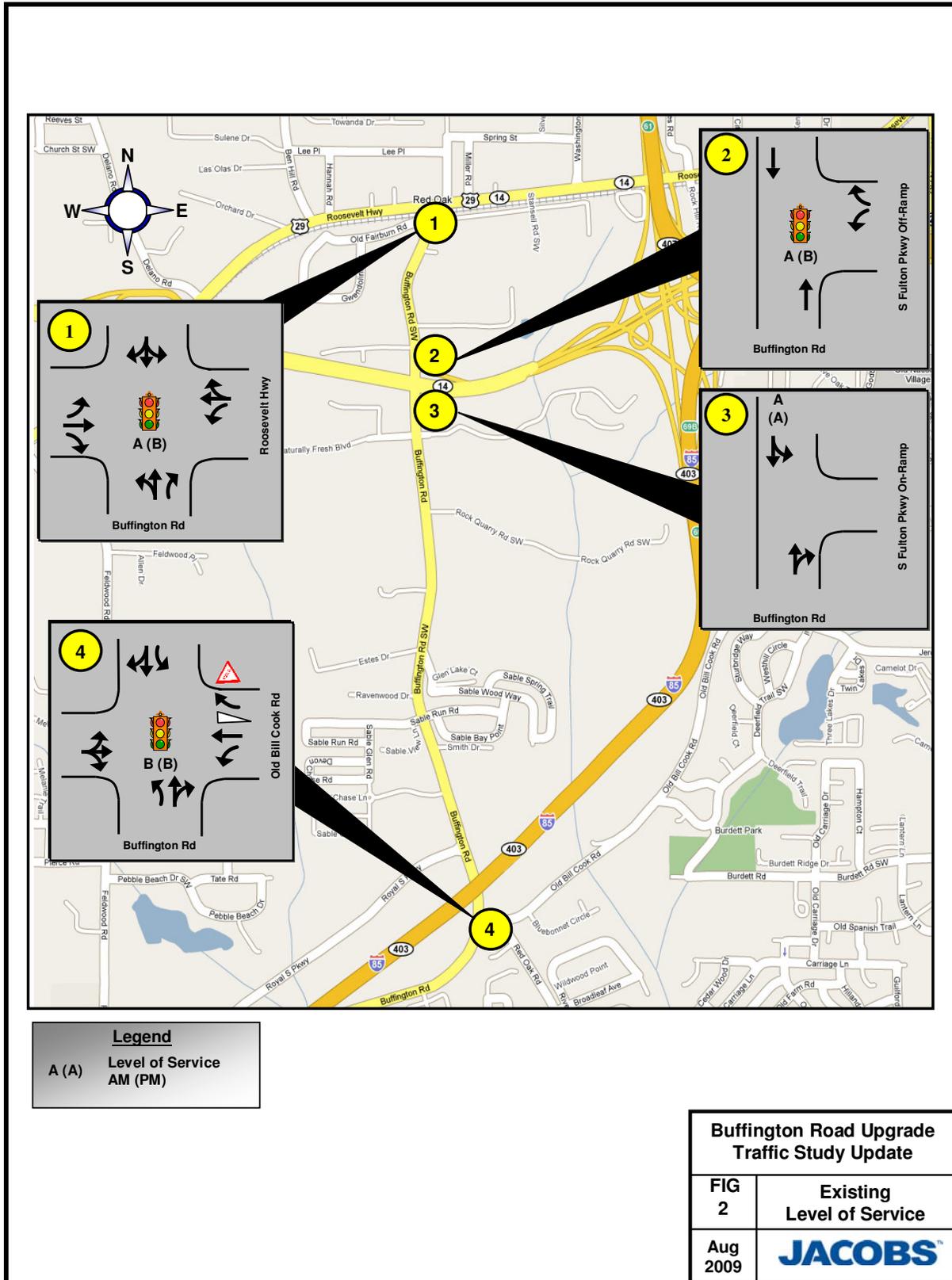
Buffington Road at Old Bill Cook Road (traffic signal control):

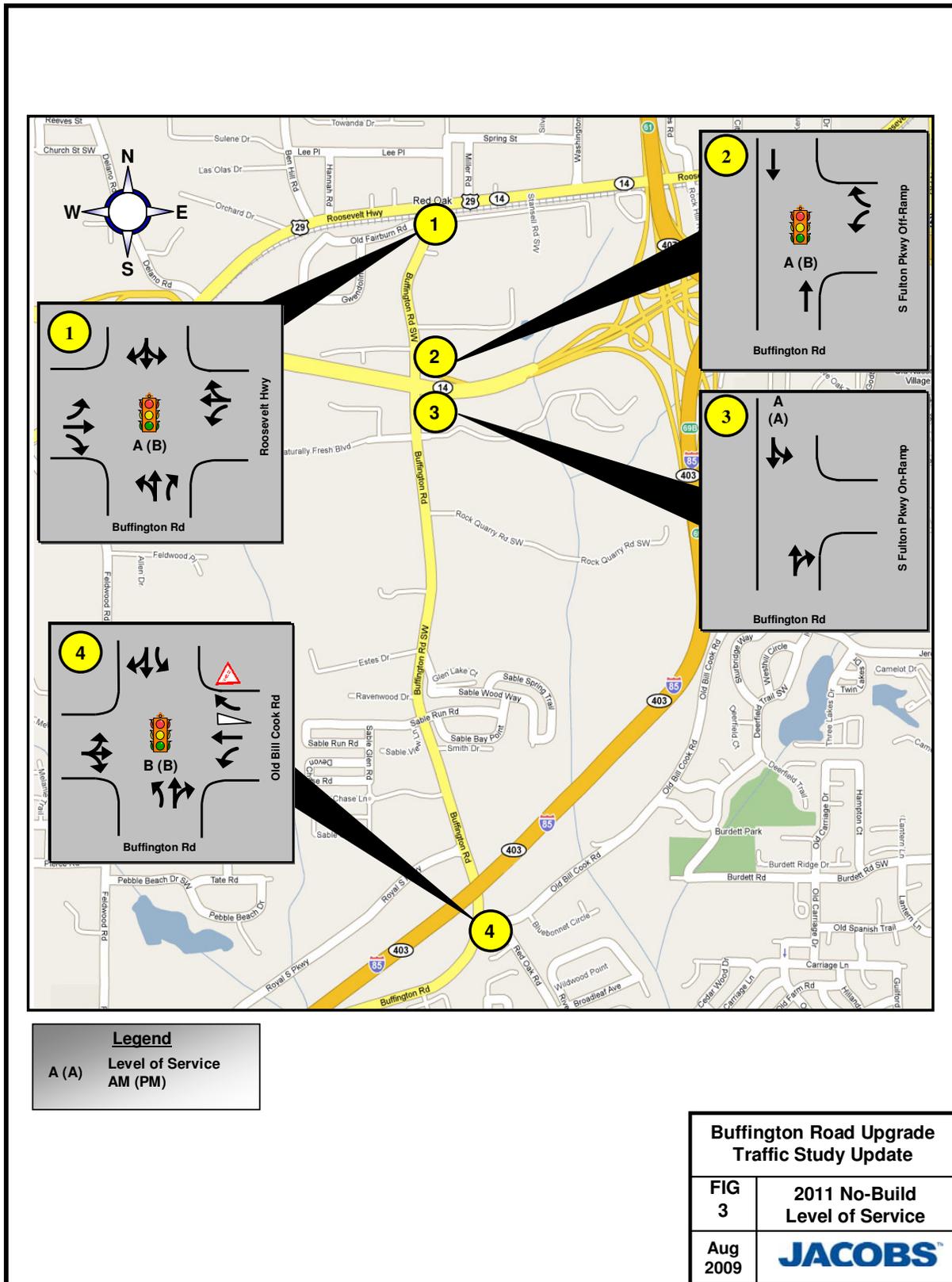
- Northbound (Buffington Road): one exclusive left turn lane and one shared through/right turn lane
- Southbound (Buffington Road): one exclusive left turn lane and one shared through/right turn lane
- Eastbound (Old Bill Cook Road): one shared left/through/right lane
- Westbound (Old Bill Cook Road): one exclusive left turn lane and one shared through/channelized right turn lane

Based on this roadway geometry and the projected traffic volumes, the study intersections were then analyzed for updated level of service (LOS) results. The traffic signal timings used in the capacity analysis were optimized for the projected traffic volumes. The *Highway Capacity Manual* (HCM 2000) provides ranges of delay for each LOS definition, spanning from very minimal delays (LOS A) to high delays (LOS F). LOS F is considered unacceptable for most drivers.

The LOS results for the study intersections using the existing lane configuration are shown in Table 2. Figures 2 to 4 illustrate the LOS at the study intersections under existing, opening and design conditions. Detailed analysis outputs are included in Appendix C.







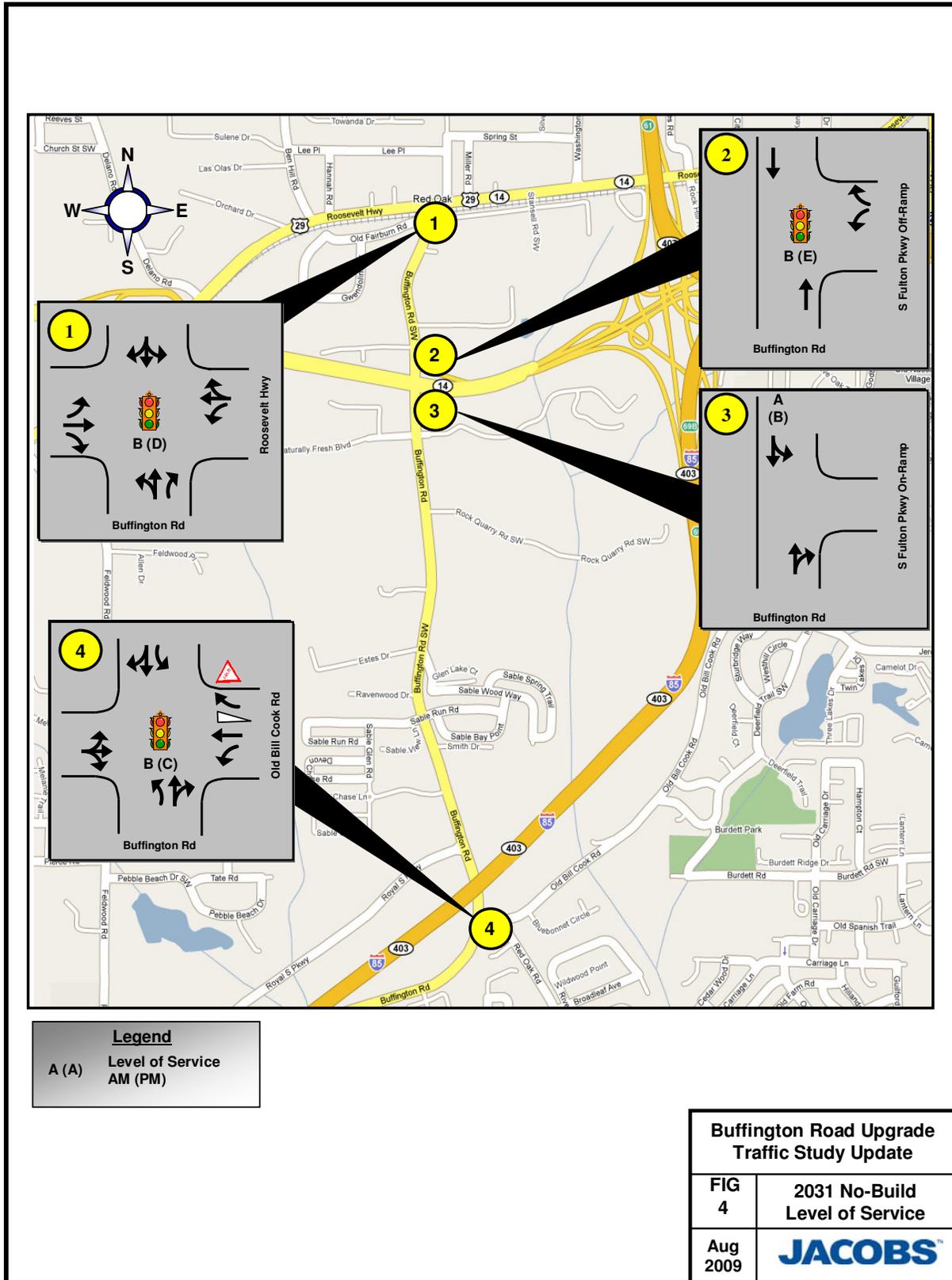


Table 2: Existing (2009), Opening Year (2011) and Design Year (2031) LOS Results

Intersection	Existing Conditions (2009)				Opening Year Conditions (2011)				Design Year Conditions (2031)			
	AM Conditions		PM Conditions		AM Conditions		PM Conditions		AM Conditions		PM Conditions	
	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)
Buffington Road at Roosevelt Highway (s)	A	8	B	13	A	8	B	14	B	13	D	44
Buffington Road at South Fulton Parkway Off-Ramps (s)	A	9	B	18	A	9	B	19	B	14	E	64
Buffington Road at South Fulton Parkway On-Ramp (u)												
SB Left	A	4	A	6	A	4	A	6	A	7	B	14
Buffington Road at Old Bill Cook Road (s)	B	12	B	12	B	12	B	13	B	15	C	30

(s) = signalized intersection, (u) = unsignalized intersection

The signalized intersection at the South Fulton Parkway off-ramp is anticipated to experience LOS E (typically considered unacceptable) during the PM peak period. The LOS E at the intersection is primarily due to the heavy off-ramp left-turn volumes, exceeding 700 vph during the PM peak hour. Improvements to the intersection would need to include widening of Buffington Road to a four-lane roadway to accommodate the dual off-ramp left-turn lanes needed to improve the delay. Additionally, widening Buffington Road would almost certainly involve the replacement of the South Fulton Parkway Bridge. The significant impact required to improve the intersection is beyond the scope of this project but should be considered in the future for Buffington Road capacity improvements.

Additionally, the northbound approach of Buffington Road at Roosevelt Highway is anticipated to experience moderate delays and queues from the heavy left turn movement. Although the intersection operates at LOS D, the northbound approach experiences LOS F. Separating the shared left/through lane in conjunction with modifying the westbound left-turn phase to protected/permissive will alleviate some of this congestion while permitting the intersection and all approaches to operate at LOS D or above.

In the September 1999 study, exclusive turn lanes were included in the design condition for the Buffington Road at South Fulton Parkway on-ramp. As mentioned in the September 1999 report, these lanes are not needed for capacity restrictions at the intersection but have a safety benefit. Because the lanes are not needed for capacity, no changes were made in the intersection geometry at this intersection for the recommended capacity improvements in the design year conditions.

The following capacity improvements were applied to the design year (2031) conditions:

#### Buffington Road at Roosevelt Highway

- Northbound (Buffington Road): approach geometry changed from one shared left/through lane and one exclusive right turn lane to one exclusive left turn lane, one exclusive through lane and one exclusive right turn lane

The recommended lane geometry is shown in Figure 5.

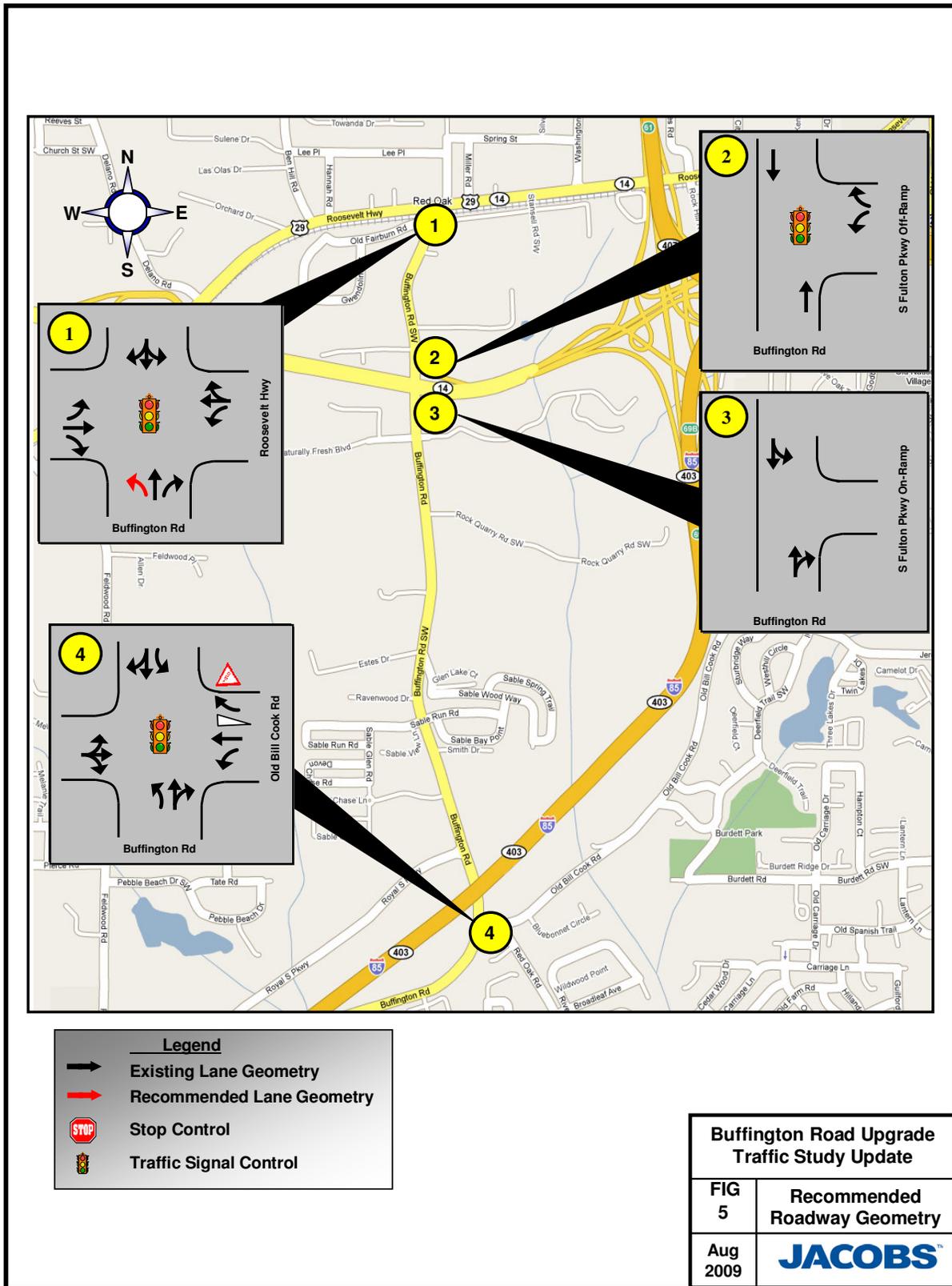
The design year (2031) Buffington Road segment LOS was also evaluated based on HCM 2000 methodology. Based on the September 1999 study count information, the PM peak hour has the highest traffic volumes. The design year segment PM peak hour volume was approximated from the adjacent turning movement counts, as follows:

#### 2031 Segment Volumes

- Buffington Road south of Roosevelt Highway: 568 NB/663 SB
- Buffington Road between South Fulton Parkway On-Ramp and Old Bill Cook Road: 644 NB/1289 SB

These traffic volumes resulted in LOS E operations for Buffington Road during the PM peak hour. Detailed traffic analysis is included in Appendix D.

If you have any questions or concerns about this traffic study update, please contact me.



**Appendix A  
September 1999 Study**

**TRAFFIC STUDY/ANALYSIS**

**FOR**

**FULTON COUNTY, GA**

**BUFFINGTON ROAD  
UPGRADE PROJECT**

Prepared for:

**Fulton County Department of Public Works  
Transportation Department  
141 Pryor Street, Suite 6000  
Atlanta, Georgia 30303**

Submitted to:

**Wolverton & Associates, Inc.  
5600 Oakbrook Parkway, Suite 100  
Norcross, Georgia 30093**

Prepared by:

**Grice & Associates, Inc.  
230 Peachtree Street, NW, Suite 1680  
Atlanta, Georgia 30303**

September 1999

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Table 6:	Storage Lengths

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## APPENDICES

Appendix 1:	Existing HCS Analysis (Short-Format) Printed Output
Appendix 2:	Proposed HCS Analysis (Short-Format) Printed Output

## **I. INTRODUCTION**

Fulton County has identified the need to enhance and improve traffic operations along the Buffington Road corridor. This road segment is approximately three miles in length and is located between Flat Shoals Road and Roosevelt Highway in South Fulton County. The existing project corridor is mostly residential and commercial with several business parks located within the project limits. This project will not only improve traffic operation along Buffington Road, but also increase safety within the immediate project limits. There is a CSX railroad crossing near Buffington Road and Roosevelt Highway intersection, which creates a safety hazard at this intersection.

This traffic study will document the existing conditions and proposed changes as it relates to the intersections in the study area. This information will then be used in developing future plans for the construction of required improvements.

The purpose of this project is to stimulate growth in South Fulton County. There is potential for growth considering the area's proximity to interstate I-85 and downtown Atlanta. Currently, there are two signalized intersections within the project limits.

## **II. EXISTING CONDITIONS**

The project corridor is located along Buffington Road. There are two signalized intersections in the project area, one on ramp and one off ramp for South Fulton Parkway. Buffington Road is a two-lane road with no median; however, not many mid-block driveways exist along Buffington Road.

## A. Roadway Network

There are several heavily traveled roadways within the project study area. Each roadway generates a significant amount of traffic and congestion that is experienced during the AM and PM peak periods. Buffington Road is a two lane north-south roadway within the project limits. There is no median or dividers along this roadway, which allows for the possibility for mid-block maneuvering. However, in this case, there isn't an abundance of driveways. The driveways with the most traffic are located near the South Fulton Parkway ramps. Within this area are several businesses that generate a considerable amount of traffic. Also, there is an automobile auction yard on Buffington Road that creates heavy traffic during certain days of the week. South Fulton Parkway off ramp on Buffington Road is congested during peak periods and it affects the flow of traffic along Buffington Road. In addition to the passenger cars, this segment of roadway is heavily used by truck traffic. Because there are several business/office parks with distribution centers, trucks make up a percentage of traffic volume along this roadway.

- BUFFINGTON ROAD AT FLAT SHOALS ROAD

Fulton County has included this intersection with another intersection improvement project. Any improvements or changes along Buffington Road will impact traffic at this intersection. Flat Shoals has two through and one left turn lane in each direction and an eastbound right turn lane. Some traffic uses Flat Shoals Road to gain access to Old National Highway. The north and south approach of Buffington Road crosses Flat Shoals at a skewed angle. This creates a safety concern for operation along Buffington Road.

A church is located on the southwest corner of this intersection. An entrance and exit driveway is provided to the church along Buffington Road. These access points are less than 200 feet away from the intersection. A congestion problem is created on Sundays as traffic attempts to access the driveways to the church. Due to the short distance between the driveways and intersection, traffic going northbound on Buffington Road and making

a left into the church creates a backup and the backup could potentially block the intersection. This is a major safety issue. This intersection is signalized, although at present the left turning traffic from Flat Shoals has no signalized protected movement.

- **BUFFINGTON ROAD AT OLD BILL COOK ROAD**

This intersection is the first in the project limits. It is located at the Buffington Road Fire Station. Eastbound approach is only to access the fire station while the westbound approach is Old Bill Cook Road. The westbound approach has a vertical curve, which presents motorists with a slight sight distance problem. The speed limit on Old Bill Cook Road is 35 mph. Old Bill Cook Road is a two-lane road. Due to the vertical curve and lane configuration on Old Bill Cook Road, traffic accessing Buffington Road experiences delays. These delays are more pronounced during AM and PM peak hour periods. This intersection is signalized with presence loop detectors on Old Bill Cook Road and advance loop detectors on Buffington Road.

- **BUFFINGTON ROAD AT ROOSEVELT HIGHWAY**

This is a signalized intersection. Buffington Road ends at this intersection. Roosevelt Highway is a two-lane road with separate left turn lanes provided at the intersection. There is a right turn lane provided for traffic turning south on Buffington Road. The speed limit on Roosevelt Highway is 45 mph. There is a shopping mall at the north of this intersection. There is a CSX railroad crossing just south of this intersection. Currently, there are electronic signs saying "no turns" at the intersection, which lights up when a train is approaching. The crossing is approximately 100 feet from the intersection. About 100 feet further south of the railroad crossing, is an entrance for an Automobile Auction yard. There is another driveway to the auction yard approximately 500 feet from railroad crossing. The first is primarily used by traffic accessing auction yard while trucks with trailers mostly use the latter. The latter entrance is a check-in point for vehicles to be auctioned. Traveling northbound on Buffington Road, there is a right turn lane before the

check-in entrance and also between the two entrances for auction yard. Distance between the two auction entrances is approximately 400 feet.

There is a vertical curve just before the railroad intersection on northbound Buffington Road. Just after the railroad crossing, there is a slight downgrade. This vertical downgrade causes a problem in determining the exact distance between the intersection and railroad crossing as the motorist approaches the intersection.

A maximum of three small cars can be accommodated between the intersection and railroad crossing while a maximum of three small cars can be accommodated between the railroad crossing and entrance to the auction yard.

During auction days, congestion is experienced throughout the day at this intersection. The auction yard is mostly busy on Thursdays, Fridays, and Saturdays. Motorists turning left into the auction yard traveling southbound on Buffington Road causes congestion and delays. These delays are more pronounced due to the fact that it causes the motorist to travel at a slower rate crossing the railroad and also because of the entrance being of close proximity to the intersection. This maneuver causes traffic turning right on to Buffington Road from Roosevelt Highway to experience long delays. This can cause vehicles to be trapped on the railroad track or under railroad bar, which presents a safety concern.

There is another entrance for the auction yard on Roosevelt Highway approximately 450 feet east of the Buffington-Roosevelt intersection. Although this does not fall under the project area, it has an impact on the overall project.

Currently, Stansell Road has a stop sign for railroad crossing. The distance between the stop bar and Roosevelt Highway is less than 100 feet. During auctions, a high volume of traffic uses this entrance, which causes traffic backups on Roosevelt Highway. Because Roosevelt Highway is only one lane in each direction, traffic going into the auction yard from Roosevelt Highway causes backups and hence delays. Due to the relatively small

distance between Stansell Road and the Buffington-Roosevelt intersection, traffic tends to stack between these intersections when the auction facility is open

- **BUFFINGTON ROAD AT SOUTH FULTON PARKWAY**

South Fulton Parkway access ramps at Buffington Road are stop sign controlled with major traffic on Buffington Road. Buffington Road crosses over both South Fulton Parkway and Interstate 85. There is an on-ramp and off-ramp for vehicles to access South Fulton Parkway. There is a significant amount of traffic on Buffington Road accessing the parkway during AM and PM peak hours. The delay associated with these ramps are more severe during the PM peak period.

There are signs at this ramp indicating access to both I-85 and I-285. Traffic accessing I-85 and I-285 uses south Fulton Parkway to get onto the two interstates.

There is one lane for the on ramp traffic at this intersection and one lane for the off-ramp traffic. Since, most of the traffic accessing the off-ramp is left turning traffic, motorists experience long delays. Due to a stop sign controlled intersection and one lane approaches for both the on and off ramps, motorists experience long delays.

The delay caused to off ramp traffic is severe during the PM peak period as most of the traffic on the off ramp is left turning traffic. During the PM peak period, southbound Buffington Road is heavily traveled. Motorists turning left have to look for a safe gap, which in turn increases the delay to the right turning traffic.

## **B. Data Acquisition**

A field review of the project corridor was conducted. Existing turning movement counts at the above-mentioned intersections were collected on Wednesday, April 28, 1999. Counts were taken during two peak periods, which were the AM and PM peak periods. AM peak period consisted of traffic movement counts from 7:00-9:00 AM and PM peak

period consisted of traffic movement counts from 4:00-6:00 PM Traffic counts were not collected during other times as traffic volume is light during other times of day Turning movement counts were collected at the following intersections

- Buffington Road at Old Bill Cook Road
- Buffington Road at Roosevelt Highway
- Buffington Road over South Fulton Parkway

Twenty-four hour average daily traffic (ADT) counts (see Table 1) were collected for the following segments:

- Buffington Road (Between South Fulton Parkway and Roosevelt Highway)
- Roosevelt Highway<sup>1</sup> (West of Buffington Road)
- Roosevelt Highway<sup>2</sup> (East of Buffington Road)

**Table 1 – Average Daily Traffic (ADT)**

ROADWAY SEGMENT	1998 AVERAGE DAILY TRAFFIC (ADT)	2020 AVERAGE DAILY TRAFFIC (ADT)
Buffington Road	8,248	14,896
Roosevelt Highway <sup>1</sup>	11,259	20,335
Roosevelt Highway <sup>2</sup>	36,744	66,363

Source: Georgia Department of Transportation, 1998

### C. EXISTING HIGHWAY CAPACITY SOFTWARE ANALYSIS

Using the procedure outlined in the 1994 Highway Capacity Manual (HCM) update, an analysis of the existing capacity for both morning and afternoon peak periods were performed In order to facilitate the analysis, a procedure known as Highway Capacity Software (HCS) was used to analyze the signalized and unsignalized intersections capacity HCS results are based on the Highway Capacity Manual (HCM) HCS has a procedure to analyze both signalized and unsignalized intersections Conditions are evaluated in terms of average vehicle delays and are correlated to the Level of Service (LOS) of the intersection The LOS can range from A-F, A being the best operating

conditions and F being the worst To most agencies, a LOS C is acceptable For some agencies, a LOS D is acceptable LOS E and F are unacceptable and cause agencies to make intersection improvements to get a better LOS These improvements can be in the intersection geometry or change in the signal timings

Table 2 and table 3 list the criteria for LOS for signalized and unsignalized intersections.

**Table 2 - LOS for Signalized Intersections**

LEVEL OF SERVICE	STOPPED DELAY PER VEHICLE (SEC)
A	< 5.1
B	5.1 - 15.0
C	15.1 - 25.0
D	25.1 - 40.0
E	40.1 - 60.0
F	> 60.0

Reference: Highway Capacity Manual, 3<sup>rd</sup> Ed , 1994 Update

**Table 3 - LOS for Unsignalized Intersections**

LEVEL OF SERVICE	AVERAGE TOTAL DELAY (SEC/VEH)
A	< 5
B	> 5 and < 10
C	> 10 and < 20
D	> 20 and < 30
E	> 30 and < 45
F	> 45

A capacity analysis was performed for each intersection using the existing configurations Table 4 shows the results for existing conditions for each intersection

Table 4 – Existing Level of Service (LOS)

INTERSECTION	AM LOS	PM LOS
Buffington Rd at Old Bill Cook Rd.	B	C
Buffington Rd. at Roosevelt Hwy.	C	D
Buffington Rd. at S Fulton Pkwy (On Ramp)	A	A
Buffington Rd at S Fulton Pkwy (Off Ramp)	C	F

The LOS at Buffington Road and Old Bill Cook Road during the AM is B and PM is C. However, southbound Buffington Road traffic experiences LOS D. This is because most of the traffic during the PM is turning left on Old Bill Cook Road.

The LOS at Buffington Road and Roosevelt Highway is C during the AM peak period and D during the PM peak period.

South Fulton on ramp has a LOS of A both during the AM and PM peak periods. As can be seen from the LOS table for the various intersections, South Fulton Parkway off ramp traffic experiences major delays during the PM peak period. This is due to the fact that there is only one lane for the off ramp traffic at this unsignalized T-intersection. As shown in Table 4, the LOS during AM is C and LOS during PM is F.

### III. PROPOSED GEOMETRIC CHANGES

Based upon traffic engineering principles and specific study area needs and expectations, several geometric modifications were analyzed to improve traffic operations and safety. These modifications can be found in Figure 5. The proposed geometric modifications were analyzed using the projected traffic volumes for the year 2020. Based on the current growth rate, the traffic volumes were multiplied accordingly. In addition to the geometric changes, several signal modifications were taken into consideration while analyzing these intersections.

#### Buffington Road at Old Bill Cook Road

To improve operations at this intersection, a separate left turn lane was added to the southbound and northbound approaches of Buffington Road. The LOS for AM and PM are D for both time periods analyzed. Adding a left turn lane on southbound Buffington Road, which is heavily traveled, decreases the delays caused to motorists at this intersection.

#### Buffington Road at South Fulton Parkway Off Ramp

To reduce delays caused to motorists on the off ramp, a separate lane was added and the intersection was analyzed using HCS. The results can be seen in the appendix. Results show that by adding a separate lane, delay to right turning traffic from off ramp onto northbound Buffington Road is greatly reduced and a LOS of C is experienced. The left turning traffic still experiences a LOS of F, however, the total delay caused to the motorists is greatly reduced by adding a separate lane.

HCS was also used to analyze traffic conditions at this intersection by adding a signal here. The analysis shows that by adding a signal at Buffington Road and South Fulton Parkway, the experienced delay to the off ramp traffic is considerably reduced. The results show that the intersection LOS for both AM and PM periods is B. It is

recommended that this intersection be analyzed for installation of a traffic signal. A signal warrant analysis should be performed

#### IV. CONCLUSION

##### Buffington Road at South Fulton Parkway On Ramp

From reviewing the existing LOS for this intersection, it experiences an LOS A for both the AM and PM Peak periods. With the projected traffic volume the Los is still an A for both periods. For safety reasons a northbound right lane should be added. This would relieve the delays experienced during motorist transitioning to make a right turn onto the ramp to access South Fulton Parkway.

##### Buffington Road at Roosevelt Highway

This intersection operates at acceptable LOS for the existing traffic volumes. However, as the volume increases by the 20 year projection the following geometric modifications should be considered. The northbound approach should be modified to have a left, through and right lane. Likewise for the eastbound and the westbound approaches. The southbound approach experiences a very low projected volume, therefore no geometric changes are recommended for this approach.

With the intentions of improving traffic operations at intersections along the Buffington Road corridor, the project team have thoroughly analyzed each intersection utilizing the Highway Capacity Software (HCS). The analysis consisted of both the AM and PM peak periods. In addition to the two peak periods, the analysis also consisted of both existing traffic volumes and the projected traffic volumes for the year 2020. The analysis considered two major components to present an acceptable LOS for these studied intersections. The components consist of either making geometric changes and/or changes to the signal timings. For some of the intersections, both components were used to reach an acceptable LOS.

The proposed lane configurations for each intersection within this project can be found in Table 5. In addition to the lane configurations, the LOS for each intersection can also be

found in Table 5 Several left and right turn storage lanes were added to improve traffic operation at studied intersections These storage lengths can be found in Table 6.

**Table 5 – Buffington Road Proposed Lane Configurations/LOS**

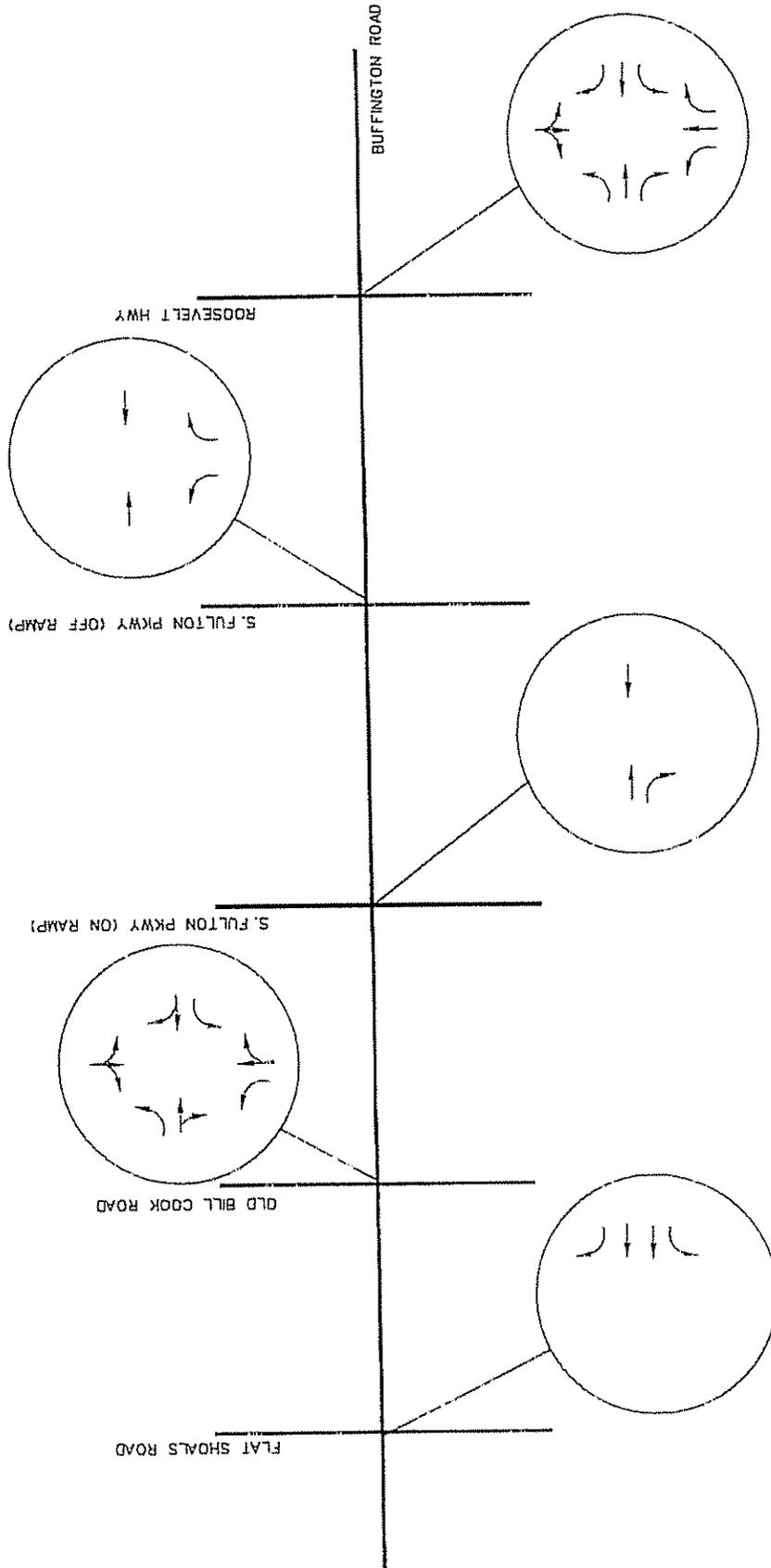
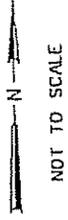
INTERSECTION	2020 AM/PM LOS	LANE CONFIGURATION
Buffington Rd / Old Bill Cook Rd	D/D	NB-L,TR SB-L,TR EB-LTR WB-L,TR
Buffington Rd / South Fulton Parkway (On-Ramp)	A/A	NB-T,R SB-T
Buffington Rd / South Fulton Parkway (Off-Ramp)	C/F*	NB-T SB-T EB-L,R
Buffington Rd / Roosevelt Highway	D/E	NB-L,T,R SB-LTR EB-L,T,R WB-L,T,R

\* Denotes that V/C is greater than 1.20 (meaningless)

**Table 6 – Storage Lengths**

INTERSECTION	STORAGE LENGTH (FEET)
Roosevelt Hwy at Buffington Rd	NBL 150'
	NBR 325'
	EBL 100'
	EBR 300'
	WBL 120'
	WBR 100'
S Fulton Pkwy (Off Ramp) at Buffington Rd.	EBR 250'
S Fulton Pkwy (On Ramp) at Buffington Rd.	NBR 540'
Old Bill Cook Rd at Buffington Rd	NBL 75'
	SBL 300'
	WBL 150'

BUFFINGTON ROAD  
 (FROM FLAT SHOALS ROAD TO ROOSEVELT HWY.)  
 PROPOSED LANE CONFIGURATIONS



1700

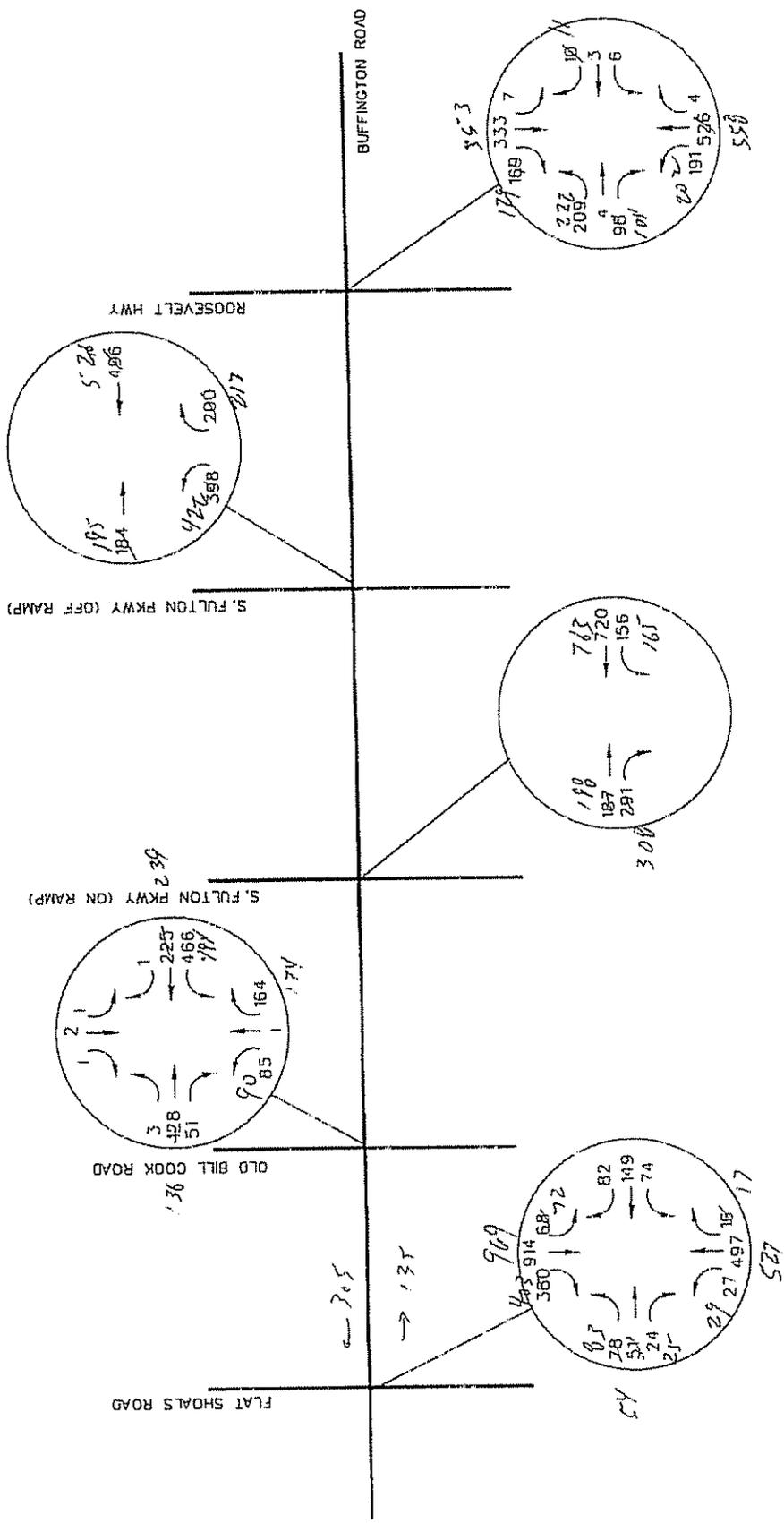
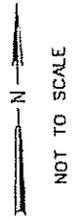
GRICE  
 & ASSOCIATES, INC.

FIGURE 5

PROJECT:	DATE:	SHEET:	NO. OF SHEETS:
1700	1972	5	14



BUFFINGTON ROAD  
 (FROM FLAT SHOALS ROAD TO ROOSEVELT HWY.)  
 PM PEAK TRAFFIC COUNTS (EXISTING)



82521

**GRICE**  
 & ASSOCIATES, INC.

FIGURE 2

DATE	NO.	REV.	BY	DATE
TOTAL				1 of 1



BUFFINGTON ROAD  
 (FROM FLAT SHOALS ROAD TO ROOSEVELT HWY.)  
 PROPOSED PM PEAK TRAFFIC COUNTS (2020)  
 E 1023

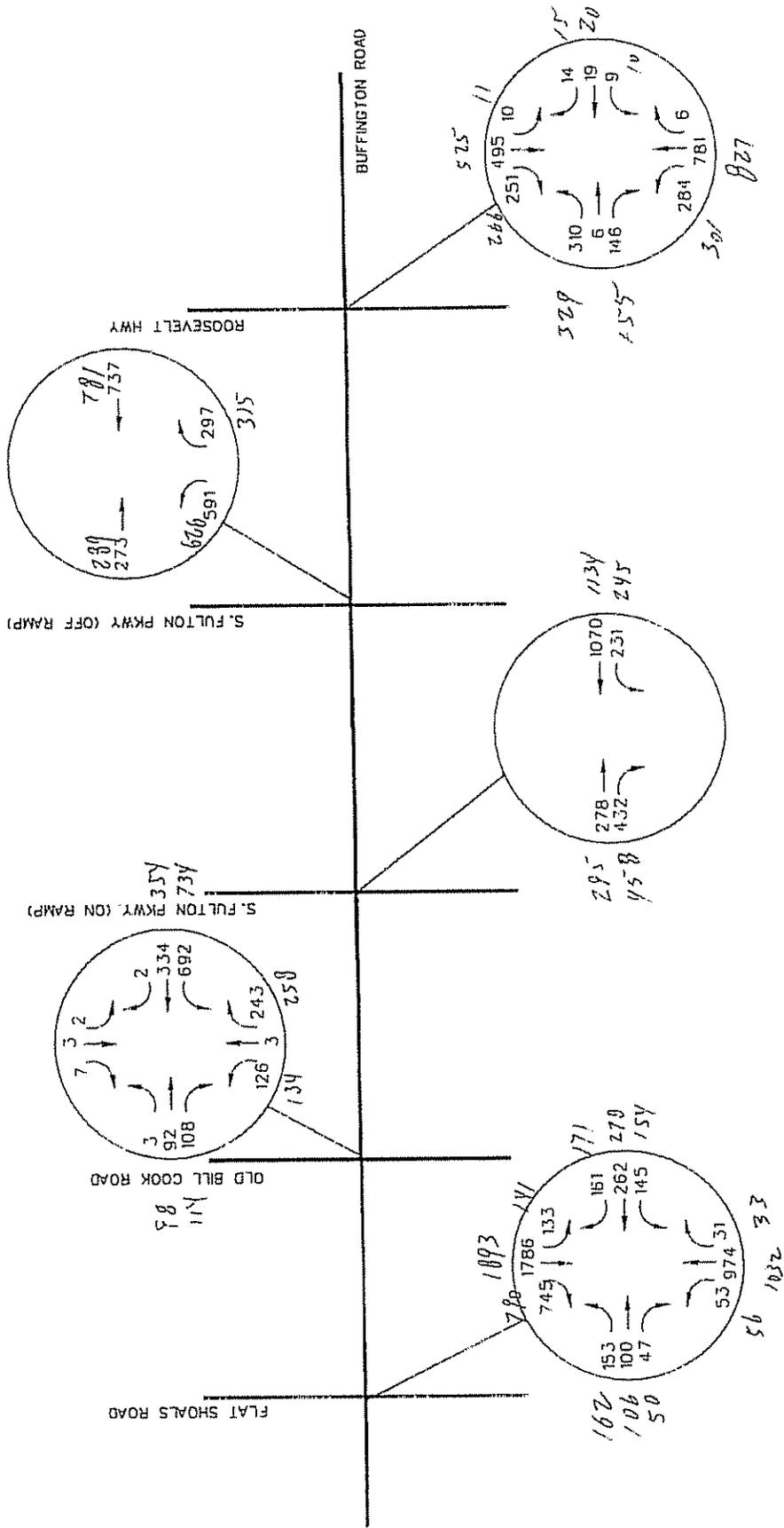
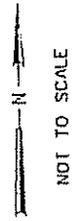


FIGURE 4

GRICE & ASSOCIATES, INC.

DATE	1971	1 of 1
PROJECT	DATE	SCALE
NO.	NO.	NO.

**APPENDIX 1**

**EXISTING (1999)  
HCS (Short-Format) OUTPUT**

**BUFFINGTON ROAD**

**AT**

**OLD BILL COOK ROAD**

**EXISTING 1999  
HCS (Short-Format) OUTPUT**

=====  
 Streets: (N-S) Buffington Road (E-W) Old Bill Cook Road  
 Analyst: JJF File Name: BUF2AMPR.HC9  
 Area Type: CBD 7-1-99 7-9 AM  
 Comment: Proposed Configuration  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	< 0	1	1	< 0	0	> 1	< 0	1	1	< 0
Volumes	3	128	51	106	37	1	7	1	5	33	4	332
Lane W (ft)	12.0	12.0		12.0	12.0		12.0			12.0	12.0	
RTOR Vols			0			0			0			0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

-----

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
NB Left	*				EB Left	*		
Thru	*				Thru	*		
Right	*				Right	*		
Peds	*				Peds	*		
SB Left	*				WB Left	*		
Thru	*				Thru	*		
Right	*				Right	*		
Peds	*				Peds	*		
EB Right					NB Right			
WB Right					SB Right			
Green	36.0P				Green	21.0A		
Yellow/AR	4.0				Yellow/AR	4.0		
Cycle Length:	65 secs Phase combination order: #1 #5							

-----

Intersection Performance Summary

Lane	Group:	Mvmts	Adj Sat	v/c	g/C	Delay	LOS	Approach:	
								Cap	Flow
NB	L	759	1334	0.004	0.569	4.6	A	5.3	B
	TR	850	1494	0.234	0.569	5.3	B		
SB	L	524	921	0.225	0.569	5.3	B	5.1	B
	TR	897	1576	0.047	0.569	4.7	A		
EB	LTR	360	1063	0.042	0.338	11.0	B	11.0	B
WB	L	502	1482	0.074	0.338	11.1	B	21.5	C
	TR	443	1310	0.841	0.338	22.5	C		

Intersection Delay = 13.8 sec/veh Intersection LOS = B  
 Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.460

-----

=====  
 Streets: (N-S) Buffington Road (E-W) Old Bill Cook Road  
 Analyst: JJF File Name: BUF2PMPR.HC9  
 Area Type: CBD 7-1-99 4-6 PM  
 Comment: Proposed Configuration  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	< 0	1	1	< 0	0	> 1	< 0	1	1	< 0
Volumes	1	62	73	466	225	1	1	2	1	85	1	164
Lane W (ft)	12.0	12.0		12.0	12.0			12.0		12.0	12.0	
RTOR Vols			0			0			0			0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
NB Left	*				EB Left	*		
Thru	*				Thru	*		
Right	*				Right	*		
Peds	*				Peds	*		
SB Left	*				WB Left	*		
Thru	*				Thru	*		
Right	*				Right	*		
Peds	*				Peds	*		
EB Right					NB Right			
WB Right					SB Right			
Green	36.0P				Green	21.0A		
Yellow/AR	4.0				Yellow/AR	4.0		
Cycle Length: 65 secs Phase combination order: #1 #5								

Intersection Performance Summary

	Lane	Group:	Adj Sat			Delay	LOS	Approach:		
			Cap	Flow	v/c Ratio			g/C Ratio	Delay	LOS
NB	L		448	787	0.002	0.569	4.6	A	5.1	B
	TR		805	1414	0.186	0.569	5.1	B		
SB	L		586	1030	0.883	0.569	19.7	C	15.1	C
	TR		901	1582	0.279	0.569	5.5	B		
EB	LTR		449	1328	0.009	0.338	10.8	B	10.8	B
WB	L		519	1532	0.181	0.338	11.5	B	12.4	B
	TR		443	1308	0.413	0.338	12.8	B		

Intersection Delay = 13.2 sec/veh Intersection LOS = B  
 Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.708

**BUFFINGTON ROAD**  
**AT**  
**SOUTH FULTON PARKWAY (ON RAMP)**

**EXISTING 1999**  
**HCS (Short-Format) OUTPUT**

Center For Microcomputers In Transportation  
 University of Florida  
 512 Weil Hall  
 Gainesville, FL 32611-6585  
 Ph: (352) 392-0378

Streets: (N-S) Buffington Road (E-W) Fulton Pkwy(On Ramp)  
 Major Street Direction... NS  
 Length of Time Analyzed... 15 (min)  
 Analyst..... JJF  
 Date of Analysis..... 7/1/99  
 Other Information..... M  
 Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	1	1	0	0	0	0	0	0	0
Stop/Yield			Y			N						
Volumes		200	299	95	273							
PHF		1	1	1	1							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	200	
Potential Capacity: (pcph)	1377	
Movement Capacity: (pcph)	1377	
Prob. of Queue-Free State:	0.92	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	105	1377		2.8	0.2	A	0.7

Intersection Delay = 0.3 sec/veh

Center For Microcomputers In Transportation  
 University of Florida  
 512 Weil Hall  
 Gainesville, FL 32611-6585  
 Ph: (352) 392-0378

Streets: (N-S) Buffington Road (E-W) Fulton Pkwy (On Ramp)  
 Major Street Direction.... NS  
 Length of Time Analyzed... 15 (min)  
 Analyst..... JJF  
 Date of Analysis..... 7/1/99  
 Other Information..... PM  
 Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	1	1	0	0	0	0	0	0	0
Stop/Yield			Y			N						
Volumes		187	291	156	720							
PHF		1	1	1	1							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street		SB	NB
Conflicting Flows: (vph)		187	
Potential Capacity: (pcph)		1396	
Movement Capacity: (pcph)		1396	
Prob. of Queue-Free State:		0.88	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	172	1396		2.9	0.4	A	0.5

Intersection Delay = 0.3 sec/veh

**BUFFINGTON ROAD**  
**AT**  
**SOUTH FULTON PARKWAY (OFF RAMP)**

**EXISTING 1999**  
**HCS (Short-Format) OUTPUT**

=====  
 Center For Microcomputers In Transportation  
 University of Florida  
 512 Weil Hall  
 Gainesville, FL 32611-6585  
 Ph: (352) 392-0378  
 =====

Streets: (N-S) Buffington Road (E-W) Fulton Pkwy(Off Rmp)  
 Major Street Direction... NS  
 Length of Time Analyzed... 15 (min)  
 Analyst..... JJF  
 Date of Analysis..... 7/1/99  
 Other Information..... AM  
 Two-way Stop-controlled Intersection  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	0	0	1	0	1
Stop/Yield			Y			N						
Volumes		145			221					281		132
PHF		1			1					.945		.945
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's										1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street		WB	EB
Conflicting Flows: (vph)		145	
Potential Capacity: (pcph)		1169	
Movement Capacity: (pcph)		1169	
Prob. of Queue-Free State:		0.87	
Step 4: LT from Minor Street		WB	EB
Conflicting Flows: (vph)		366	
Potential Capacity: (pcph)		650	
Major LT, Minor TH			
Impedance Factor:		1.00	
Adjusted Impedance Factor:		1.00	
Capacity Adjustment Factor			
due to Impeding Movements		1.00	
Movement Capacity: (pcph)		650	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	327	650		11.0	2.9	C	8.6
WB R	154	1169		3.5	0.5	A	

Intersection Delay = 4.6 sec/veh

=====  
 Center For Microcomputers In Transportation  
 University of Florida  
 512 Weil Hall  
 Gainesville, FL 32611-6585  
 Ph: (352) 392-0378  
 =====

=====  
 Streets: (N-S) Buffington Road (E-W) Fulton Pkwy(Off Rmp)  
 Major Street Direction.... NS  
 Length of Time Analyzed... 15 (min)  
 Analyst..... JJF  
 Date of Analysis..... 7/1/99  
 Other Information..... PM  
 Two-way Stop-controlled Intersection  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	0	0	1	0	1
Stop/Yield			Y			N						
Volumes		184			496					398		200
PHF		1			1					.945		.945
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's										1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street		WB	EB
Conflicting Flows: (vph)		184	
Potential Capacity: (pcph)		1117	
Movement Capacity: (pcph)		1117	
Prob. of Queue-Free State:		0.79	
Step 4: LT from Minor Street		WB	EB
Conflicting Flows: (vph)		680	
Potential Capacity: (pcph)		428	
Major LT, Minor TH			
Impedance Factor:		1.00	
Adjusted Impedance Factor:		1.00	
Capacity Adjustment Factor			
due to Impeding Movements		1.00	
Movement Capacity: (pcph)		428	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	463	428		93.4	14.0	F	63.5
WB R	233	1117		4.1	0.9	A	

Intersection Delay = 29.7 sec/veh

**BUFFINGTON ROAD**  
**AT**  
**ROOSEVELT HIGHWAY**  
**EXISTING 1999**  
**HCS (Short-Format) OUTPUT**

=====  
 Streets: (N-S) Buffington Road (E-W) Roosevelt Highway  
 Analyst: JJF File Name: BUF3AMPR.HC9  
 Area Type: CBD 7-1-99 7-9 AM  
 Comment: Proposed Configuration  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	1	1	1	1	1	< 0
Volumes	81	8	175	1	4	1	5	437	156	59	206	2
Lane W (ft)	12.0			12.0			12.0	12.0	12.0	12.0	12.0	
RTOR Vols	0			0			0			0		
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
NB Left	*				EB Left	*		
Thru	*				Thru		*	
Right	*				Right		*	
Peds	*				Peds	*		
SB Left	*				WB Left	*		
Thru	*				Thru		*	
Right	*				Right		*	
Peds	*				Peds	*		
EB Right					NB Right			
WB Right					SB Right			
Green	36.0A				Green	10.0A	32.0P	
Yellow/AR	4.0				Yellow/AR	4.0	4.0	
Cycle Length:	90 secs Phase combination order: #1 #5 #6							

Intersection Performance Summary

Lane	Group:	Adj Sat	v/c	g/C	Delay	LOS	Approach:		
							Delay	LOS	
Mvmts	Cap	Flow	Ratio	Ratio					
NB	LTR	496	1207	0.590	0.411	17.0	C	17.0	C
SB	LTR	537	1306	0.011	0.411	11.9	B	11.9	B
EB	L	189	1547	0.032	0.122	26.5	D	20.9	C
	T	597	1629	0.814	0.367	22.7	C		
	R	507	1384	0.341	0.367	15.8	C		
WB	L	189	1547	0.349	0.122	28.0	D	20.1	C
	TR	596	1626	0.387	0.367	17.9	C		

Intersection Delay = 19.8 sec/veh Intersection LOS = C  
 Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.649

Streets: (N-S) Buffington Road (E-W) Roosevelt Highway  
 Analyst: JJF File Name: BUF3PMPR.HC9  
 Area Type: CBD 7-1-99 4-6 PM  
 Comment: Proposed Configuration

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	1	1	1	1	1	< 0
Volumes	209	4	98	6	3	10	7	333	169	191	526	4
Lane W (ft)	12.0			12.0			12.0	12.0	12.0	12.0	12.0	
RTOR Vols	0			0			0			0		
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
NB Left	*				EB Left	*		
Thru	*				Thru		*	
Right	*				Right		*	
Peds	*				Peds	*		
SB Left	*				WB Left	*	*	
Thru	*				Thru		*	*
Right	*				Right		*	*
Peds	*				Peds	*		
EB Right					NB Right			
WB Right					SB Right			
Green	26.0A				Green	20.0A	5.0A	28.0P
Yellow/AR	4.0				Yellow/AR	4.0	4.0	4.0
Cycle Length:	95 secs Phase combination order: #1 #5 #6 #7							

Intersection Performance Summary

Lane	Group:	Adj Sat	v/c	g/C	Delay	LOS	Approach:	Delay	LOS
Mvmts	Cap	Flow	Ratio	Ratio					
NB	LTR	340	1196	1.015	0.284	67.5	F	67.5	F
SB	LTR	292	1027	0.072	0.284	18.9	C	18.9	C
EB	L	342	1547	0.023	0.221	22.0	C	23.7	C
	T	497	1629	0.744	0.305	25.3	D		
WB	R	422	1384	0.445	0.305	20.7	C		
	L	489	1547	0.434	0.316	20.0	C	29.0	D
	TR	651	1627	0.904	0.400	32.3	D		

Intersection Delay = 34.8 sec/veh Intersection LOS = D  
 Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.724

APPENDIX 2

PROPOSED (2020)  
HCS (Short-Format) OUTPUT

2023

**BUFFINGTON ROAD**

**AT**

**OLD BILL COOK ROAD**

**FUTURE ~~2020~~ 2023**  
**HCS (Short-Format) OUTPUT**

=====  
 Streets: (N-S) Buffington Road (E-W) Old Bill Cook Road  
 Analyst: JJF File Name: BUF2AM20.HC9  
 Area Type: CBD 7-1-99 7-9 AM  
 Comment: Proposed Configuration (20 YEAR)  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	< 0	1	1	< 0	0	> 1	< 0	1	1	< 0
Volumes	4	190	75	156	55	1	10	1	7	49	6	493
Lane W (ft)	12.0	12.0		12.0	12.0			12.0		12.0	12.0	
RTOR Vols			0			0			0			0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
NB Left	*				EB Left	*		
Thru	*				Thru	*		
Right	*				Right	*		
Peds	*				Peds	*		
SB Left	*				WB Left	*		
Thru	*				Thru	*		
Right	*				Right	*		
Peds	*				Peds	*		
EB Right					NB Right			
WB Right					SB Right			
Green	36.0P				Green 30.0A			
Yellow/AR	4.0				Yellow/AR 4.0			
Cycle Length:	74 secs Phase combination order: #1 #5							

Intersection Performance Summary

	Lane Group:	Mvmts	Adj Sat	v/c	g/C	Delay	LOS	Approach:	
								Cap	Flow
NB	L	632	1265	0.006	0.500	7.1	B	8.9	B
	TR	748	1495	0.393	0.500	8.9	B		
SB	L	330	661	0.523	0.500	10.7	B	9.8	B
	TR	789	1578	0.079	0.500	7.3	B		
EB	LTR	398	950	0.050	0.419	9.7	B	9.7	B
WB	L	612	1461	0.088	0.419	9.9	B	41.5	E
	TR	549	1311	1.011	0.419	44.5	E		

Intersection Delay = 26.2 sec/veh Intersection LOS = D  
 Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.746

Streets: (N-S) Buffington Road (E-W) Old Bill Cook Road  
 Analyst: JJF File Name: BUF2PM20.HC9  
 Area Type: CBD 7-1-99 4-6 PM  
 Comment: Proposed Configuration(20 YEAR)

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	< 0	1	1	< 0	0	> 1	< 0	1	1	< 0
Volumes	1	92	108	692	334	1	1	3	1	126	1	243
Lane W (ft)	12.0	12.0		12.0	12.0			12.0		12.0	12.0	
RTOR Vols			0			0			0			0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
NB Left	*				EB Left	*		
Thru			*		Thru	*		
Right			*		Right	*		
Peds	*				Peds	*		
SB Left	*	*			WB Left	*		
Thru		*	*		Thru	*		
Right		*	*		Right	*		
Peds	*				Peds	*		
EB Right					NB Right			
WB Right					SB Right			
Green	9.0A	55.0A	23.0P		Green	30.0A		
Yellow/AR	4.0	0.0	0.0		Yellow/AR	4.0		
Cycle Length: 125 secs Phase combination order: #1 #2 #3 #5								

Intersection Performance Summary

Lane	Group:	Adj Sat	v/c	g/C	Delay	LOS	Approach:	Delay	LOS
Mvmts	Cap	Flow	Ratio	Ratio					
NB	L	120	1504	0.008	0.080	40.2	E	73.0	F
	TR	233	1455	0.954	0.160	73.2	F		
SB	L	782	1504	0.983	0.520	43.5	E	32.6	D
	TR	950	1583	0.392	0.600	10.1	B		
EB	LTR	326	1315	0.015	0.248	27.0	D	27.0	D
WB	L	378	1524	0.370	0.248	29.9	D	38.6	D
	TR	324	1308	0.835	0.248	43.1	E		
Intersection Delay = 39.0 sec/veh Intersection LOS = D									
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.939									

**BUFFINGTON ROAD**

**AT**

**SOUTH FULTON PARKWAY (ON RAMP)**

**FUTURE 2020**

**HCS (Short-Format) OUTPUT**

=====  
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 Gainesville, FL 32611-6585  
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 =====

=====  
 Streets: (N-S) Buffington Road (E-W) Fulton Pkwy(On Ramp)  
 Major Street Direction.... NS  
 Length of Time Analyzed... 15 (min)  
 Analyst..... JJF  
 Date of Analysis..... 7/1/99  
 Other Information..... AM Proposed (20 YEAR)  
 Two-way Stop-controlled Intersection  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	1	1	0	0	0	0	0	0	0
Stop/Yield			Y			N						
Volumes		297	444	141	406							
PHF		1	1	1	1							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	297	
Potential Capacity: (pcph)	1238	
Movement Capacity: (pcph)	1238	
Prob. of Queue-Free State:	0.87	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	155	1238		3.3	0.4	A	0.9

Intersection Delay = 0.4 sec/veh

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Streets: (N-S) Buffington Road (E-W) Fulton Pkwy(On Ramp)  
 Major Street Direction... NS  
 Length of Time Analyzed... 15 (min)  
 Analyst..... JJF  
 Date of Analysis..... 7/1/99  
 Other Information..... PM Proposed (20 YEAR)  
 Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	1	1	0	0	0	0	0	0	0
Stop/Yield			Y			N						
Volumes		278	432	231	1070							
PHF		1	1	1	1							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	278	
Potential Capacity: (pcph)	1264	
Movement Capacity: (pcph)	1264	
Prob. of Queue-Free State:	0.80	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	254	1264		3.6	0.8	A	0.6

Intersection Delay = 0.4 sec/veh

**BUFFINGTON ROAD**

**AT**

**SOUTH FULTON PARKWAY (OFF RAMP)**

**FUTURE 2020**

**HCS (Short-Format) OUTPUT**

=====  
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 =====

Streets: (N-S) Buffington Road (E-W) Fulton Pkwy (Off Rmp)  
 Major Street Direction.... NS  
 Length of Time Analyzed... 15 (min)  
 Analyst..... JJF  
 Date of Analysis..... 7/1/99  
 Other Information..... AM Proposed (20 YEAR)  
 Two-way Stop-controlled Intersection  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	0	0	1	0	1
Stop/Yield			Y			N						
Volumes		215			328					417		196
PHF		1			1					.945		.945
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's										1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	215	
Potential Capacity: (pcph)	1077	
Movement Capacity: (pcph)	1077	
Prob. of Queue-Free State:	0.79	
Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	543	
Potential Capacity: (pcph)	513	
Major LT, Minor TH		
Impedance Factor:	1.00	
Adjusted Impedance Factor:	1.00	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	513	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	485	513		50.7	10.8	F	35.9
WB R	228	1077		4.2	0.9	A	

Intersection Delay = 19.0 sec/veh

=====  
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 =====

Streets: (N-S) Buffington Road (E-W) Fulton Pkwy(Off Rmp)  
 Major Street Direction.... NS  
 Length of Time Analyzed... 15 (min)  
 Analyst..... JJF  
 Date of Analysis..... 7/1/99  
 Other Information..... PM Proposed (20 YEAR)  
 Two-way Stop-controlled Intersection  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	0	0	1	0	1
Stop/Yield			Y			N						
Volumes		273			737					591		297
PHF		1			1					.945		.945
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's										1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street		WB	EB
Conflicting Flows: (vph)		273	
Potential Capacity: (pcph)		1007	
Movement Capacity: (pcph)		1007	
Prob. of Queue-Free State:		0.66	
Step 4: LT from Minor Street		WB	EB
Conflicting Flows: (vph)		1010	
Potential Capacity: (pcph)		275	
Major LT, Minor TH			
Impedance Factor:		1.00	
Adjusted Impedance Factor:		1.00	
Capacity Adjustment Factor			
due to Impeding Movements		1.00	
Movement Capacity: (pcph)		275	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	688	275		710.1	53.5	F	474.4
WB R	345	1007		5.4	1.7	B	

Intersection Delay = 221.9 sec/veh

**BUFFINGTON ROAD**  
**AT**  
**ROOSEVELT HIGHWAY**  
**FUTURE 2020**  
**HCS (Short-Format) OUTPUT**

=====  
 Streets: (N-S) Buffington Road (E-W) Roosevelt Highway  
 Analyst: JJF File Name: BUF3AM20.HC9  
 Area Type: CBD 7-1-99 7-9 AM  
 Comment: Proposed Configuration(20 YEAR)  
 =====

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	0	> 1	< 0	1	1	1	1	1	1
Volumes	120	11	260	1	6	1	7	649	232	87	306	3
Lane W (ft)	12.0	12.0	12.0		12.0		12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols			0			0			0			0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
NB Left	*				EB Left	*		
Thru	*				Thru		*	
Right	*				Right		*	
Peds	*				Peds	*		
SB Left		*			WB Left	*		
Thru		*			Thru		*	
Right		*			Right		*	
Peds		*			Peds	*		
EB Right					NB Right			
WB Right					SB Right			
Green	36.0A				Green	25.0A	52.0P	
Yellow/AR	4.0				Yellow/AR	4.0	4.0	
Cycle Length:	125 secs				Phase combination order:	#1 #5 #6		

Intersection Performance Summary

	Lane	Group:	Adj Sat		v/c		Delay	LOS	Approach:	
			Cap	Flow	Ratio	g/C			Delay	LOS
NB	L		432	1461	0.308	0.296	26.0	D	33.2	D
	T		469	1583	0.026	0.296	23.7	C		
	R		376	1270	0.769	0.296	36.9	D		
SB	LTR		411	1389	0.022	0.296	23.7	C	23.7	C
EB	L		322	1547	0.025	0.208	29.9	D	48.3	E
	T		691	1629	1.044	0.424	58.7	E		
	R		587	1384	0.440	0.424	19.7	C		
WB	L		322	1547	0.301	0.208	32.0	D	25.2	D
	T		691	1629	0.492	0.424	23.4	C		
	R		587	1384	0.005	0.424	15.8	C		

Intersection Delay = 39.2 sec/veh Intersection LOS = D  
 Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.790

Streets: (N-S) Buffington Road (E-W) Roosevelt Highway  
 Analyst: JJF File Name: BUF3PM20.HC9  
 Area Type: CBD 7-1-99 4-6 PM  
 Comment: Proposed Configuration(20 YEAR)

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	0	> 1	< 0	1	1	1	1	1	1
Volumes	310	6	146	9	4	14	10	495	251	284	781	6
Lane W (ft)	12.0	12.0	12.0	12.0			12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols	0			0			0			0		
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
NB Left	*	*			EB Left	*		
Thru	*	*			Thru		*	
Right	*	*			Right		*	
Peds	*				Peds	*		
SB Left		*			WB Left	*		
Thru		*			Thru		*	
Right		*			Right		*	
Peds	*				Peds	*		
EB Right					NB Right			
WB Right					SB Right			
Green	26.0A	10.0A			Green	38.0A	90.0A	
Yellow/AR	4.0	4.0			Yellow/AR	4.0	4.0	
Cycle Length: 180 secs Phase combination order: #1 #2 #5 #6								

Intersection Performance Summary

Lane	Group:	Mvmts	Cap	Adj Sat	Flow	v/c	g/C	Ratio	Delay	LOS	Approach:	
											Delay	LOS
NB	L	310		1504	1.110	0.228	124.0	F			96.7	F
	T	361		1583	0.019	0.228	34.8	D				
	R	289		1270	0.560	0.228	41.6	E				
SB	LTR	76		1243	0.395	0.061	54.3	E			54.3	E
EB	L	335		1547	0.033	0.217	35.9	D			21.2	C
	T	824		1629	0.668	0.506	22.6	C				
	R	700		1384	0.399	0.506	18.0	C				
WB	L	335		1547	0.943	0.217	69.8	F			66.1	F
	T	824		1629	1.054	0.506	65.1	F				
	R	700		1384	0.010	0.506	14.3	B				

Intersection Delay = 57.4 sec/veh Intersection LOS = E  
 Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 1.049

# **Appendix B**

## **Projected Traffic Volumes**

**Buffington Road Study Update**  
**Traffic Volumes**

**Jacobs**  
**August 2009**

**Buffington Road at Old Bill Cook Road**

**A.M. Peak Hour**

Condition	Northbound				Southbound				Eastbound				Westbound			
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot
Existing Counts (1999)	3	128	51	182	106	37	1	144	7	1	5	13	33	4	332	369
Study Projected 2020 Counts:	4	190	75	269	156	55	1	212	10	1	7	18	49	6	493	548
1999 to 2020 Growth Rate:	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
2009 Base Volumes:	4	155	62	220	128	45	1	174	8	1	6	16	40	5	401	445
2011 Base Volumes:	4	160	64	228	133	46	1	180	9	1	6	16	41	5	416	463
2031 Base Volumes:	5	234	93	332	194	68	2	263	13	2	9	24	60	7	606	674

**P.M. Peak Hour**

Condition	Northbound				Southbound				Eastbound				Westbound			
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot
Existing Counts (1999)	1	62	73	136	466	225	1	692	1	2	1	4	85	1	164	250
Study Projected 2020 Counts:	1	92	108	201	692	334	1	1027	1	3	1	5	126	1	243	370
1999 to 2020 Growth Rate:	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
2009 Base Volumes:	1	75	88	164	563	272	1	835	1	2	1	4	103	1	198	302
2011 Base Volumes:	1	78	91	170	584	282	1	867	1	3	1	5	107	1	206	313
2031 Base Volumes:	2	113	133	248	851	411	2	1264	2	4	2	8	155	2	300	457



**Buffington Road Study Update**  
**Traffic Volumes**

**Jacobs**  
**August 2009**

**Buffington Road at South Fulton Off-Ramp**

**A.M. Peak Hour**

Condition	Northbound				Southbound				Eastbound				Westbound			
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot
Existing Counts (1999)	0	145	0	145	0	221	0	221	0	0	0	0	281	0	132	413
Study Projected 2020 Counts:	0	215	0	215	0	328	0	328	0	0	0	0	417	0	196	613
1999 to 2020 Growth Rate:		1.9%				1.9%							1.9%		1.9%	1.9%
2009 Base Volumes:	0	175	0	175	0	267	0	267	0	0	0	0	339	0	159	499
2011 Base Volumes:	0	182	0	182	0	277	0	277	0	0	0	0	352	0	165	518
2031 Base Volumes:	0	265	0	265	0	404	0	404	0	0	0	0	513	0	241	754

**P.M. Peak Hour**

Condition	Northbound				Southbound				Eastbound				Westbound			
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot
Existing Counts (1999)	0	184	0	184	0	496	0	496	0	0	0	0	398	0	200	598
Study Projected 2020 Counts:	0	273	0	273	0	737	0	737	0	0	0	0	591	0	297	888
1999 to 2020 Growth Rate:		1.9%				1.9%							1.9%		1.9%	1.9%
2009 Base Volumes:	0	222	0	222	0	599	0	599	0	0	0	0	480	0	241	722
2011 Base Volumes:	0	231	0	231	0	622	0	622	0	0	0	0	499	0	251	750
2031 Base Volumes:	0	336	0	336	0	906	0	906	0	0	0	0	727	0	365	1092

**Buffington Road Study Update**  
**Traffic Volumes**

**Jacobs**  
**August 2009**

**Buffington Road at Roosevelt Highway**

**A.M. Peak Hour**

Condition	Northbound				Southbound				Eastbound				Westbound			
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot
Existing Counts (1999)	81	8	175	264	1	4	1	6	5	437	156	598	59	206	2	267
Study Projected 2020 Counts:	120	11	260	391	1	6	1	8	7	649	233	889	87	306	3	396
1999 to 2020 Growth Rate:	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
2009 Base Volumes:	98	10	211	319	1	5	1	7	6	528	188	722	71	249	2	322
2011 Base Volumes:	102	10	219	331	1	5	1	8	6	548	196	750	74	258	3	335
2031 Base Volumes:	148	15	320	482	2	7	2	11	9	798	285	1092	108	376	4	488

**P.M. Peak Hour**

Condition	Northbound				Southbound				Eastbound				Westbound			
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot
Existing Counts (1999)	209	4	98	311	6	3	10	19	7	333	169	509	191	526	4	721
Study Projected 2020 Counts:	310	6	146	462	9	4	14	27	10	495	251	756	284	781	6	1071
1999 to 2020 Growth Rate:	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
2009 Base Volumes:	252	5	118	375	7	4	12	23	8	402	204	614	231	635	5	870
2011 Base Volumes:	262	5	123	390	8	4	13	24	9	417	212	638	239	659	5	904
2031 Base Volumes:	382	7	179	568	11	5	18	35	13	608	309	930	349	961	7	1317

# **Appendix C Intersection Analysis**

2009 AM

1: Roosevelt Highway & Buffington Road

9/11/2009



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	528	188	71	249	2	98	10	211	1	5	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1861			1782	1583		1814	
Flt Permitted	0.59	1.00	1.00	0.36	1.00			0.74	1.00		0.96	
Satd. Flow (perm)	1102	1863	1583	670	1861			1380	1583		1747	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	574	204	77	271	2	107	11	229	1	5	1
RTOR Reduction (vph)	0	0	100	0	0	0	0	0	175	0	1	0
Lane Group Flow (vph)	7	574	104	77	273	0	0	118	54	0	6	0
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4		4	8		
Actuated Green, G (s)	20.1	20.1	20.1	20.1	20.1			9.2	9.2		9.2	
Effective Green, g (s)	20.1	20.1	20.1	20.1	20.1			9.2	9.2		9.2	
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.51			0.23	0.23		0.23	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	564	953	810	343	952			323	371		409	
v/s Ratio Prot		c0.31			0.15							
v/s Ratio Perm	0.01		0.07	0.12				c0.09	0.03		0.00	
v/c Ratio	0.01	0.60	0.13	0.22	0.29			0.37	0.14		0.02	
Uniform Delay, d1	4.7	6.8	5.0	5.3	5.5			12.6	11.9		11.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.0	1.1	0.1	0.3	0.2			0.7	0.2		0.0	
Delay (s)	4.7	7.9	5.1	5.6	5.7			13.3	12.1		11.6	
Level of Service	A	A	A	A	A			B	B		B	
Approach Delay (s)		7.1			5.7			12.5			11.6	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	39.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	402	204	231	635	5	252	5	118	7	4	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.98	
Satd. Flow (prot)	1770	1863	1583	1770	1861			1776	1583		1705	
Flt Permitted	0.24	1.00	1.00	0.44	1.00			0.71	1.00		0.90	
Satd. Flow (perm)	445	1863	1583	826	1861			1326	1583		1553	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	437	222	251	690	5	274	5	128	8	4	13
RTOR Reduction (vph)	0	0	105	0	0	0	0	0	53	0	9	0
Lane Group Flow (vph)	9	437	117	251	695	0	0	279	75	0	16	0
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4		4	8		
Actuated Green, G (s)	31.7	31.7	31.7	31.7	31.7			18.3	18.3		18.3	
Effective Green, g (s)	31.7	31.7	31.7	31.7	31.7			18.3	18.3		18.3	
Actuated g/C Ratio	0.53	0.53	0.53	0.53	0.53			0.30	0.30		0.30	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	235	984	836	436	983			404	483		474	
v/s Ratio Prot		0.23			c0.37							
v/s Ratio Perm	0.02		0.07	0.30				c0.21	0.05		0.01	
v/c Ratio	0.04	0.44	0.14	0.58	0.71			0.69	0.16		0.03	
Uniform Delay, d1	6.8	8.7	7.2	9.6	10.6			18.4	15.2		14.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.1	0.3	0.1	1.8	2.3			5.0	0.2		0.0	
Delay (s)	6.9	9.0	7.3	11.4	13.0			23.4	15.4		14.7	
Level of Service	A	A	A	B	B			C	B		B	
Approach Delay (s)		8.4			12.6			20.9			14.7	
Approach LOS		A			B			C			B	

**Intersection Summary**

HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	339	159	175	0	0	267
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	1863			1863
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1770	1583	1863			1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	368	173	190	0	0	290
RTOR Reduction (vph)	0	108	0	0	0	0
Lane Group Flow (vph)	368	65	190	0	0	290
Turn Type	Perm					
Protected Phases	8		2			6
Permitted Phases	8					
Actuated Green, G (s)	13.2	13.2	12.0			12.0
Effective Green, g (s)	13.2	13.2	12.0			12.0
Actuated g/C Ratio	0.37	0.37	0.34			0.34
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	664	594	635			635
v/s Ratio Prot	c0.21		0.10			c0.16
v/s Ratio Perm		0.04				
v/c Ratio	0.55	0.11	0.30			0.46
Uniform Delay, d1	8.7	7.2	8.5			9.1
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	1.0	0.1	0.3			0.5
Delay (s)	9.7	7.3	8.8			9.6
Level of Service	A	A	A			A
Approach Delay (s)	8.9		8.8			9.6
Approach LOS	A		A			A

#### Intersection Summary

HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	35.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	480	241	222	0	0	599
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	1863			1863
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1770	1583	1863			1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	262	241	0	0	651
RTOR Reduction (vph)	0	161	0	0	0	0
Lane Group Flow (vph)	522	101	241	0	0	651
Turn Type	Perm					
Protected Phases	8		2			6
Permitted Phases	8					
Actuated Green, G (s)	24.9	24.9	29.9			29.9
Effective Green, g (s)	24.9	24.9	29.9			29.9
Actuated g/C Ratio	0.38	0.38	0.46			0.46
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	680	608	860			860
v/s Ratio Prot	c0.29		0.13			c0.35
v/s Ratio Perm		0.06				
v/c Ratio	0.77	0.17	0.28			0.76
Uniform Delay, d1	17.4	13.1	10.8			14.4
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	5.2	0.1	0.2			3.8
Delay (s)	22.6	13.2	11.0			18.3
Level of Service	C	B	B			B
Approach Delay (s)	19.5		11.0			18.3
Approach LOS	B		B			B

**Intersection Summary**

HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	64.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↕			↕
Volume (veh/h)	0	0	241	361	115	330
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	262	392	125	359
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						516
pX, platoon unblocked						
vC, conflicting volume	1067	458			654	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1067	458			654	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			87	
cM capacity (veh/h)	213	603			933	
<b>Direction, Lane #</b>	<b>NB 1</b>	<b>SB 1</b>				
Volume Total	654	484				
Volume Left	0	125				
Volume Right	392	0				
cSH	1700	933				
Volume to Capacity	0.38	0.13				
Queue Length 95th (ft)	0	12				
Control Delay (s)	0.0	3.6				
Lane LOS		A				
Approach Delay (s)	0.0	3.6				
Approach LOS						
<b>Intersection Summary</b>						
Average Delay			1.5			
Intersection Capacity Utilization			65.2%		ICU Level of Service	C
Analysis Period (min)			15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	226	351	188	869
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	246	382	204	945
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						516
pX, platoon unblocked	0.68					
vC, conflicting volume	1790	436			627	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1923	436			627	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			79	
cM capacity (veh/h)	40	620			955	

Direction, Lane #	NB 1	SB 1
Volume Total	627	1149
Volume Left	0	204
Volume Right	382	0
cSH	1700	955
Volume to Capacity	0.37	0.21
Queue Length 95th (ft)	0	20
Control Delay (s)	0.0	5.6
Lane LOS		A
Approach Delay (s)	0.0	5.6
Approach LOS		

Intersection Summary			
Average Delay		3.6	
Intersection Capacity Utilization		96.2%	ICU Level of Service F
Analysis Period (min)		15	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗		↖	↗		↖	↗	
Volume (vph)	8	1	6	40	5	401	4	155	62	128	45	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt		0.94		1.00	0.85		1.00	0.96		1.00	1.00	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1714		1770	1587		1770	1783		1770	1857	
Flt Permitted		0.41		0.75	1.00		0.72	1.00		0.42	1.00	
Satd. Flow (perm)		727		1390	1587		1349	1783		777	1857	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	1	7	43	5	436	4	168	67	139	49	1
RTOR Reduction (vph)	0	6	0	0	347	0	0	21	0	0	0	0
Lane Group Flow (vph)	0	11	0	43	94	0	4	214	0	139	50	0
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.0		8.0	8.0		10.7	10.7		21.3	21.3	
Effective Green, g (s)		8.0		8.0	8.0		10.7	10.7		21.3	21.3	
Actuated g/C Ratio		0.20		0.20	0.20		0.27	0.27		0.54	0.54	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		148		283	323		367	485		563	1006	
v/s Ratio Prot					c0.06			c0.12		c0.04	0.03	
v/s Ratio Perm		0.02		0.03			0.00			0.10		
v/c Ratio		0.08		0.15	0.29		0.01	0.44		0.25	0.05	
Uniform Delay, d1		12.7		12.9	13.2		10.4	11.8		4.8	4.2	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2		0.3	0.5		0.0	0.6		0.2	0.0	
Delay (s)		12.9		13.1	13.7		10.4	12.5		5.1	4.3	
Level of Service		B		B	B		B	B		A	A	
Approach Delay (s)		12.9			13.7			12.4			4.9	
Approach LOS		B			B			B			A	

**Intersection Summary**

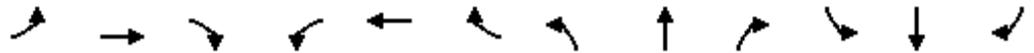
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	39.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗		↖	↗		↖	↗	
Volume (vph)	1	2	1	103	1	198	1	75	88	563	272	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt		0.97		1.00	0.85		1.00	0.92		1.00	1.00	
Flt Protected		0.99		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1778		1770	1585		1770	1712		1770	1862	
Flt Permitted		0.91		0.76	1.00		0.58	1.00		0.41	1.00	
Satd. Flow (perm)		1636		1407	1585		1078	1712		756	1862	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	2	1	112	1	215	1	82	96	612	296	1
RTOR Reduction (vph)	0	1	0	0	173	0	0	69	0	0	0	0
Lane Group Flow (vph)	0	3	0	112	43	0	1	109	0	612	297	0
Turn Type	Perm		Perm		Perm		pm+pt					
Protected Phases		4		8	8		2	2		1	6	
Permitted Phases	4			8		2				6		
Actuated Green, G (s)		9.3		9.3	9.3		8.5	8.5		28.5	28.5	
Effective Green, g (s)		9.3		9.3	9.3		8.5	8.5		28.5	28.5	
Actuated g/C Ratio		0.19		0.19	0.19		0.18	0.18		0.60	0.60	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		318		274	308		192	304		769	1110	
v/s Ratio Prot					0.03			0.06		c0.25	0.16	
v/s Ratio Perm		0.00		c0.08			0.00			c0.22		
v/c Ratio		0.01		0.41	0.14		0.01	0.36		0.80	0.27	
Uniform Delay, d1		15.5		16.8	15.9		16.2	17.3		6.5	4.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0		1.0	0.2		0.0	0.7		5.7	0.1	
Delay (s)		15.5		17.8	16.1		16.2	18.0		12.2	4.8	
Level of Service		B		B	B		B	B		B	A	
Approach Delay (s)		15.5			16.7			18.0			9.8	
Approach LOS		B			B			B			A	

**Intersection Summary**

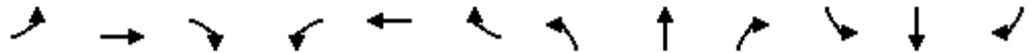
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	548	196	74	258	3	102	10	219	1	5	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1860			1782	1583		1814	
Flt Permitted	0.59	1.00	1.00	0.35	1.00			0.74	1.00		0.96	
Satd. Flow (perm)	1092	1863	1583	645	1860			1379	1583		1750	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	596	213	80	280	3	111	11	238	1	5	1
RTOR Reduction (vph)	0	0	99	0	0	0	0	0	183	0	1	0
Lane Group Flow (vph)	7	596	114	80	283	0	0	122	55	0	6	0
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4		4	8		
Actuated Green, G (s)	22.6	22.6	22.6	22.6	22.6			9.8	9.8		9.8	
Effective Green, g (s)	22.6	22.6	22.6	22.6	22.6			9.8	9.8		9.8	
Actuated g/C Ratio	0.53	0.53	0.53	0.53	0.53			0.23	0.23		0.23	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	582	993	844	344	991			319	366		404	
v/s Ratio Prot		c0.32			0.15							
v/s Ratio Perm	0.01		0.07	0.12				c0.09	0.03		0.00	
v/c Ratio	0.01	0.60	0.13	0.23	0.29			0.38	0.15		0.02	
Uniform Delay, d1	4.7	6.8	5.0	5.3	5.5			13.7	13.0		12.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.0	1.0	0.1	0.3	0.2			0.8	0.2		0.0	
Delay (s)	4.7	7.8	5.1	5.6	5.6			14.5	13.2		12.6	
Level of Service	A	A	A	A	A			B	B		B	
Approach Delay (s)		7.1			5.6			13.6			12.6	
Approach LOS		A			A			B			B	

**Intersection Summary**

HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	42.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	417	212	239	659	5	262	5	123	8	4	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.98	
Satd. Flow (prot)	1770	1863	1583	1770	1861			1776	1583		1704	
Flt Permitted	0.22	1.00	1.00	0.43	1.00			0.71	1.00		0.89	
Satd. Flow (perm)	414	1863	1583	800	1861			1323	1583		1540	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	453	230	260	716	5	285	5	134	9	4	14
RTOR Reduction (vph)	0	0	107	0	0	0	0	0	53	0	10	0
Lane Group Flow (vph)	10	453	123	260	721	0	0	290	81	0	17	0
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		2			6			4				8
Permitted Phases	2		2	6			4		4	8		
Actuated Green, G (s)	33.4	33.4	33.4	33.4	33.4			19.1	19.1		19.1	
Effective Green, g (s)	33.4	33.4	33.4	33.4	33.4			19.1	19.1		19.1	
Actuated g/C Ratio	0.53	0.53	0.53	0.53	0.53			0.31	0.31		0.31	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	221	996	846	428	995			404	484		471	
v/s Ratio Prot		0.24			c0.39							
v/s Ratio Perm	0.02		0.08	0.32				c0.22	0.05		0.01	
v/c Ratio	0.05	0.45	0.15	0.61	0.72			0.72	0.17		0.04	
Uniform Delay, d1	6.9	8.9	7.3	10.0	11.1			19.3	15.9		15.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.1	0.3	0.1	2.4	2.6			6.0	0.2		0.0	
Delay (s)	7.0	9.3	7.4	12.5	13.7			25.3	16.0		15.3	
Level of Service	A	A	A	B	B			C	B		B	
Approach Delay (s)		8.6			13.4			22.4			15.3	
Approach LOS		A			B			C			B	

**Intersection Summary**

HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	62.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	352	165	182	0	0	277
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	1863			1863
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1770	1583	1863			1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	383	179	198	0	0	301
RTOR Reduction (vph)	0	112	0	0	0	0
Lane Group Flow (vph)	383	67	198	0	0	301
Turn Type	Perm					
Protected Phases	8		2			6
Permitted Phases	8					
Actuated Green, G (s)	13.5	13.5	12.5			12.5
Effective Green, g (s)	13.5	13.5	12.5			12.5
Actuated g/C Ratio	0.38	0.38	0.35			0.35
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	664	594	647			647
v/s Ratio Prot	c0.22		0.11			c0.16
v/s Ratio Perm		0.04				
v/c Ratio	0.58	0.11	0.31			0.47
Uniform Delay, d1	9.0	7.3	8.6			9.1
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	1.2	0.1	0.3			0.5
Delay (s)	10.2	7.4	8.9			9.7
Level of Service	B	A	A			A
Approach Delay (s)	9.3		8.9			9.7
Approach LOS	A		A			A

**Intersection Summary**

HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	36.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	499	251	231	0	0	622
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	1863			1863
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1770	1583	1863			1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	542	273	251	0	0	676
RTOR Reduction (vph)	0	167	0	0	0	0
Lane Group Flow (vph)	542	106	251	0	0	676
Turn Type	Perm					
Protected Phases	8		2			6
Permitted Phases	8					
Actuated Green, G (s)	26.4	26.4	31.3			31.3
Effective Green, g (s)	26.4	26.4	31.3			31.3
Actuated g/C Ratio	0.39	0.39	0.46			0.46
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	690	617	861			861
v/s Ratio Prot	c0.31		0.13			c0.36
v/s Ratio Perm		0.07				
v/c Ratio	0.79	0.17	0.29			0.79
Uniform Delay, d1	18.2	13.5	11.3			15.4
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	5.9	0.1	0.2			4.7
Delay (s)	24.0	13.6	11.5			20.1
Level of Service	C	B	B			C
Approach Delay (s)	20.6		11.5			20.1
Approach LOS	C		B			C

#### Intersection Summary

HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	67.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

2011 AM

3: South Fulton On-Ramp & Buffington Road

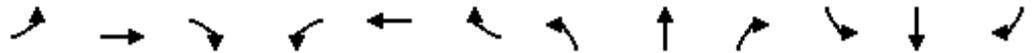
9/11/2009



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↔			↔
Volume (veh/h)	0	0	251	375	119	342
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	273	408	129	372
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						516
pX, platoon unblocked						
vC, conflicting volume	1107	477			680	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1107	477			680	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			86	
cM capacity (veh/h)	200	588			912	
<b>Direction, Lane #</b>	<b>NB 1</b>	<b>SB 1</b>				
Volume Total	680	501				
Volume Left	0	129				
Volume Right	408	0				
cSH	1700	912				
Volume to Capacity	0.40	0.14				
Queue Length 95th (ft)	0	12				
Control Delay (s)	0.0	3.8				
Lane LOS		A				
Approach Delay (s)	0.0	3.8				
Approach LOS						
<b>Intersection Summary</b>						
Average Delay			1.6			
Intersection Capacity Utilization			67.4%		ICU Level of Service	C
Analysis Period (min)			15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↔			↔
Volume (veh/h)	0	0	234	365	196	902
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	254	397	213	980
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						516
pX, platoon unblocked	0.66					
vC, conflicting volume	1859	453			651	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2040	453			651	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			77	
cM capacity (veh/h)	32	607			935	
<b>Direction, Lane #</b>	<b>NB 1</b>	<b>SB 1</b>				
Volume Total	651	1193				
Volume Left	0	213				
Volume Right	397	0				
cSH	1700	935				
Volume to Capacity	0.38	0.23				
Queue Length 95th (ft)	0	22				
Control Delay (s)	0.0	6.2				
Lane LOS		A				
Approach Delay (s)	0.0	6.2				
Approach LOS						
<b>Intersection Summary</b>						
Average Delay			4.0			
Intersection Capacity Utilization			99.7%		ICU Level of Service	F
Analysis Period (min)			15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↕		↕	↕	
Volume (vph)	9	1	6	41	5	416	4	160	64	133	46	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt		0.95		1.00	0.85		1.00	0.96		1.00	1.00	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1717		1770	1586		1770	1783		1770	1857	
Flt Permitted		0.43		0.75	1.00		0.72	1.00		0.42	1.00	
Satd. Flow (perm)		756		1389	1586		1348	1783		780	1857	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	1	7	45	5	452	4	174	70	145	50	1
RTOR Reduction (vph)	0	5	0	0	355	0	0	21	0	0	0	0
Lane Group Flow (vph)	0	13	0	45	102	0	4	223	0	145	51	0
Turn Type	Perm		Perm			Perm			pm+pt			
Protected Phases		4			8			2			1	6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.7		8.7	8.7		11.1	11.1		21.8	21.8	
Effective Green, g (s)		8.7		8.7	8.7		11.1	11.1		21.8	21.8	
Actuated g/C Ratio		0.21		0.21	0.21		0.27	0.27		0.54	0.54	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		162		298	341		369	489		559	1000	
v/s Ratio Prot				c0.06			c0.13			c0.04		0.03
v/s Ratio Perm		0.02		0.03			0.00			0.10		
v/c Ratio		0.08		0.15	0.30		0.01	0.46		0.26	0.05	
Uniform Delay, d1		12.7		12.9	13.3		10.7	12.2		5.1	4.4	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2		0.2	0.5		0.0	0.7		0.2	0.0	
Delay (s)		12.9		13.1	13.8		10.7	12.9		5.3	4.5	
Level of Service		B		B	B		B	B		A	A	
Approach Delay (s)		12.9		13.8			12.8			5.1		
Approach LOS		B		B			B			A		

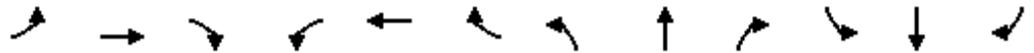
**Intersection Summary**

HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	40.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗		↖	↗		↖	↗	
Volume (vph)	1	3	1	107	1	206	1	78	91	584	282	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt		0.97		1.00	0.85		1.00	0.92		1.00	1.00	
Flt Protected		0.99		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1795		1770	1585		1770	1712		1770	1862	
Flt Permitted		0.92		0.75	1.00		0.57	1.00		0.41	1.00	
Satd. Flow (perm)		1676		1405	1585		1067	1712		759	1862	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	3	1	116	1	224	1	85	99	635	307	1
RTOR Reduction (vph)	0	1	0	0	180	0	0	69	0	0	0	0
Lane Group Flow (vph)	0	4	0	116	45	0	1	115	0	635	308	0
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		9.5		9.5	9.5		8.7	8.7		28.9	28.9	
Effective Green, g (s)		9.5		9.5	9.5		8.7	8.7		28.9	28.9	
Actuated g/C Ratio		0.20		0.20	0.20		0.18	0.18		0.60	0.60	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		329		276	311		192	308		771	1112	
v/s Ratio Prot					0.03			0.07		c0.26	0.17	
v/s Ratio Perm		0.00		c0.08			0.00			c0.23		
v/c Ratio		0.01		0.42	0.14		0.01	0.37		0.82	0.28	
Uniform Delay, d1		15.7		17.0	16.1		16.3	17.5		6.7	4.7	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0		1.0	0.2		0.0	0.8		7.1	0.1	
Delay (s)		15.7		18.1	16.3		16.3	18.2		13.8	4.8	
Level of Service		B		B	B		B	B		B	A	
Approach Delay (s)		15.7			16.9			18.2			10.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	48.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	798	285	108	376	4	148	15	320	2	7	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1860			1782	1583		1806	
Flt Permitted	0.49	1.00	1.00	0.17	1.00			0.74	1.00		0.96	
Satd. Flow (perm)	904	1863	1583	323	1860			1372	1583		1744	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	867	310	117	409	4	161	16	348	2	8	2
RTOR Reduction (vph)	0	0	103	0	0	0	0	0	129	0	2	0
Lane Group Flow (vph)	10	867	207	117	413	0	0	177	219	0	10	0
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4		4	8		
Actuated Green, G (s)	37.4	37.4	37.4	37.4	37.4			15.2	15.2		15.2	
Effective Green, g (s)	37.4	37.4	37.4	37.4	37.4			15.2	15.2		15.2	
Actuated g/C Ratio	0.60	0.60	0.60	0.60	0.60			0.24	0.24		0.24	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	540	1113	946	193	1111			333	384		423	
v/s Ratio Prot		c0.47			0.22							
v/s Ratio Perm	0.01		0.13	0.36				0.13	c0.14		0.01	
v/c Ratio	0.02	0.78	0.22	0.61	0.37			0.53	0.57		0.02	
Uniform Delay, d1	5.1	9.5	5.8	8.0	6.5			20.6	20.8		18.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.0	3.5	0.1	5.3	0.2			1.6	2.0		0.0	
Delay (s)	5.1	13.0	5.9	13.3	6.7			22.2	22.9		18.1	
Level of Service	A	B	A	B	A			C	C		B	
Approach Delay (s)		11.1			8.2			22.7			18.1	
Approach LOS		B			A			C			B	

**Intersection Summary**

HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	62.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	77.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

2031 PM

1: Roosevelt Highway & Buffington Road

9/11/2009



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	608	309	349	961	7	382	7	179	11	5	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.98	
Satd. Flow (prot)	1770	1863	1583	1770	1861			1776	1583		1699	
Flt Permitted	0.06	1.00	1.00	0.30	1.00			0.70	1.00		0.76	
Satd. Flow (perm)	120	1863	1583	559	1861			1309	1583		1305	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	661	336	379	1045	8	415	8	195	12	5	20
RTOR Reduction (vph)	0	0	128	0	0	0	0	0	50	0	14	0
Lane Group Flow (vph)	14	661	208	379	1053	0	0	423	145	0	23	0
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		2			6			4				8
Permitted Phases	2		2	6			4		4	8		
Actuated Green, G (s)	62.0	62.0	62.0	62.0	62.0			28.0	28.0		28.0	
Effective Green, g (s)	62.0	62.0	62.0	62.0	62.0			28.0	28.0		28.0	
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.62			0.28	0.28		0.28	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	74	1155	981	347	1154			367	443		365	
v/s Ratio Prot		0.35			0.57							
v/s Ratio Perm	0.12		0.13	c0.68				c0.32	0.09		0.02	
v/c Ratio	0.19	0.57	0.21	1.09	0.91			1.15	0.33		0.06	
Uniform Delay, d1	8.2	11.2	8.3	19.0	16.6			36.0	28.5		26.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	1.2	0.7	0.1	75.3	10.9			95.3	0.4		0.1	
Delay (s)	9.4	11.9	8.4	94.3	27.5			131.3	29.0		26.4	
Level of Service	A	B	A	F	C			F	C		C	
Approach Delay (s)		10.7			45.2			99.0			26.4	
Approach LOS		B			D			F			C	

Intersection Summary

HCM Average Control Delay	44.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	513	241	265	0	0	404
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	1863			1863
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1770	1583	1863			1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	558	262	288	0	0	439
RTOR Reduction (vph)	0	148	0	0	0	0
Lane Group Flow (vph)	558	114	288	0	0	439
Turn Type	Perm					
Protected Phases	8		2			6
Permitted Phases	8					
Actuated Green, G (s)	22.9	22.9	19.7			19.7
Effective Green, g (s)	22.9	22.9	19.7			19.7
Actuated g/C Ratio	0.44	0.44	0.37			0.37
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	771	689	698			698
v/s Ratio Prot	c0.32		0.15			c0.24
v/s Ratio Perm		0.07				
v/c Ratio	0.72	0.17	0.41			0.63
Uniform Delay, d1	12.2	9.0	12.2			13.5
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	3.4	0.1	0.4			1.8
Delay (s)	15.6	9.2	12.6			15.2
Level of Service	B	A	B			B
Approach Delay (s)	13.6		12.6			15.2
Approach LOS	B		B			B

#### Intersection Summary

HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	52.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

2031 PM

## 2: South Fulton Off-Ramp &amp; Buffington Road

9/11/2009



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	727	365	336	0	0	906
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	1863			1863
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1770	1583	1863			1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	790	397	365	0	0	985
RTOR Reduction (vph)	0	166	0	0	0	0
Lane Group Flow (vph)	790	231	365	0	0	985
Turn Type	Perm					
Protected Phases	8		2			6
Permitted Phases	8					
Actuated Green, G (s)	50.0	50.0	60.0			60.0
Effective Green, g (s)	50.0	50.0	60.0			60.0
Actuated g/C Ratio	0.42	0.42	0.50			0.50
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	738	660	932			932
v/s Ratio Prot	c0.45		0.20			c0.53
v/s Ratio Perm		0.15				
v/c Ratio	1.07	0.35	0.39			1.06
Uniform Delay, d1	35.0	23.9	18.7			30.0
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	53.6	0.3	0.3			45.7
Delay (s)	88.6	24.2	18.9			75.7
Level of Service	F	C	B			E
Approach Delay (s)	67.1		18.9			75.7
Approach LOS	E		B			E

## Intersection Summary

HCM Average Control Delay	63.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	96.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

2031 AM

## 3: South Fulton On-Ramp &amp; Buffington Road

9/11/2009



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	365	546	173	499
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	397	593	188	542
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						516
pX, platoon unblocked	0.90					
vC, conflicting volume	1612	693			990	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1624	693			990	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			73	
cM capacity (veh/h)	74	443			698	
<b>Direction, Lane #</b>	<b>NB 1</b>	<b>SB 1</b>				
Volume Total	990	730				
Volume Left	0	188				
Volume Right	593	0				
cSH	1700	698				
Volume to Capacity	0.58	0.27				
Queue Length 95th (ft)	0	27				
Control Delay (s)	0.0	6.6				
Lane LOS		A				
Approach Delay (s)	0.0	6.6				
Approach LOS						
<b>Intersection Summary</b>						
Average Delay			2.8			
Intersection Capacity Utilization			95.2%		ICU Level of Service	F
Analysis Period (min)			15			

2031 PM

3: South Fulton On-Ramp & Buffington Road

9/11/2009



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↔			↔
Volume (veh/h)	0	0	342	531	285	1315
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	372	577	310	1429
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						516
pX, platoon unblocked	0.51					
vC, conflicting volume	2709	660			949	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3891	660			949	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			57	
cM capacity (veh/h)	1	463			724	
<b>Direction, Lane #</b>	<b>NB 1</b>	<b>SB 1</b>				
Volume Total	949	1739				
Volume Left	0	310				
Volume Right	577	0				
cSH	1700	724				
Volume to Capacity	0.56	0.43				
Queue Length 95th (ft)	0	54				
Control Delay (s)	0.0	13.6				
Lane LOS		B				
Approach Delay (s)	0.0	13.6				
Approach LOS						
<b>Intersection Summary</b>						
Average Delay			8.8			
Intersection Capacity Utilization			142.2%		ICU Level of Service	H
Analysis Period (min)			15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↕		↕	↕	
Volume (vph)	13	2	9	60	7	606	5	234	93	194	68	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt		0.95		1.00	0.85		1.00	0.96		1.00	1.00	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1720		1770	1587		1770	1783		1770	1855	
Flt Permitted		0.29		0.74	1.00		0.71	1.00		0.32	1.00	
Satd. Flow (perm)		508		1379	1587		1318	1783		592	1855	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	2	10	65	8	659	5	254	101	211	74	2
RTOR Reduction (vph)	0	8	0	0	513	0	0	20	0	0	1	0
Lane Group Flow (vph)	0	18	0	65	154	0	5	335	0	211	75	0
Turn Type	Perm		Perm		Perm		pm+pt					
Protected Phases		4		8	8		2	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		11.2		11.2	11.2		15.5	15.5		29.4	29.4	
Effective Green, g (s)		11.2		11.2	11.2		15.5	15.5		29.4	29.4	
Actuated g/C Ratio		0.22		0.22	0.22		0.31	0.31		0.58	0.58	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		112		305	351		404	546		551	1078	
v/s Ratio Prot				c0.10			c0.19			c0.07		0.04
v/s Ratio Perm		0.04		0.05			0.00			0.16		
v/c Ratio		0.16		0.21	0.44		0.01	0.61		0.38	0.07	
Uniform Delay, d1		15.9		16.1	17.0		12.2	15.0		6.0	4.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7		0.4	0.9		0.0	2.0		0.4	0.0	
Delay (s)		16.6		16.5	17.9		12.2	17.0		6.4	4.7	
Level of Service		B		B	B		B	B		A	A	
Approach Delay (s)		16.6		17.7			17.0			5.9		
Approach LOS		B		B			B			A		

**Intersection Summary**

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	50.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

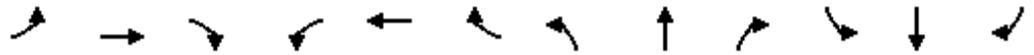


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗	↘		↗	↘		↗	↘	
Volume (vph)	2	4	2	155	2	300	2	113	133	851	411	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr <sub>t</sub>		0.97		1.00	0.85		1.00	0.92		1.00	1.00	
Fl <sub>t</sub> Protected		0.99		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1778		1770	1585		1770	1712		1770	1862	
Fl <sub>t</sub> Permitted		0.66		0.75	1.00		0.50	1.00		0.22	1.00	
Satd. Flow (perm)		1191		1402	1585		937	1712		413	1862	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	4	2	168	2	326	2	123	145	925	447	2
RTOR Reduction (vph)	0	2	0	0	274	0	0	43	0	0	0	0
Lane Group Flow (vph)	0	6	0	168	54	0	2	225	0	925	449	0
Turn Type	Perm		Perm		Perm		pm+pt					
Protected Phases		4			8			2		1		6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.3		14.3	14.3		15.8	15.8		66.0		66.0
Effective Green, g (s)		14.3		14.3	14.3		15.8	15.8		66.0		66.0
Actuated g/C Ratio		0.16		0.16	0.16		0.17	0.17		0.73		0.73
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0		5.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)		189		222	251		164	300		981		1361
v/s Ratio Prot					0.03			0.13		c0.47		0.24
v/s Ratio Perm		0.01		c0.12			0.00			c0.22		
v/c Ratio		0.03		0.76	0.21		0.01	0.75		0.94		0.33
Uniform Delay, d <sub>1</sub>		32.2		36.3	33.1		30.8	35.4		16.1		4.3
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00		1.00
Incremental Delay, d <sub>2</sub>		0.1		13.7	0.4		0.0	10.1		16.6		0.1
Delay (s)		32.2		50.0	33.5		30.8	45.5		32.8		4.5
Level of Service		C		D	C		C	D		C		A
Approach Delay (s)		32.2			39.1			45.4				23.5
Approach LOS		C			D			D				C

Intersection Summary			
HCM Average Control Delay	29.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	90.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

2031 PM with Improvements  
1: Roosevelt Highway & Buffington Road

9/11/2009



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	608	309	349	961	7	382	7	179	11	5	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0		5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1770	1863	1583	1770	1861		1770	1863	1583		1699	
Flt Permitted	0.11	1.00	1.00	0.10	1.00		0.73	1.00	1.00		0.94	
Satd. Flow (perm)	207	1863	1583	182	1861		1365	1863	1583		1629	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	661	336	379	1045	8	415	8	195	12	5	20
RTOR Reduction (vph)	0	0	128	0	0	0	0	0	133	0	14	0
Lane Group Flow (vph)	14	661	208	379	1053	0	415	8	62	0	23	0
Turn Type	Perm		Perm	pm+pt			Perm		Perm	Perm		
Protected Phases		2		1	6			4				8
Permitted Phases	2		2	6			4		4	8		
Actuated Green, G (s)	36.0	36.0	36.0	58.0	58.0		31.4	31.4	31.4		31.4	
Effective Green, g (s)	36.0	36.0	36.0	58.0	58.0		31.4	31.4	31.4		31.4	
Actuated g/C Ratio	0.36	0.36	0.36	0.58	0.58		0.32	0.32	0.32		0.32	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	75	675	573	378	1086		431	589	500		515	
v/s Ratio Prot		0.35		0.17	c0.57			0.00				
v/s Ratio Perm	0.07		0.13	c0.41			c0.30		0.04		0.01	
v/c Ratio	0.19	0.98	0.36	1.00	0.97		0.96	0.01	0.12		0.05	
Uniform Delay, d1	21.7	31.3	23.3	30.9	19.8		33.4	23.4	24.2		23.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	1.2	29.1	0.4	47.0	20.0		33.6	0.0	0.1		0.0	
Delay (s)	22.9	60.4	23.7	77.8	39.8		67.1	23.4	24.3		23.6	
Level of Service	C	E	C	E	D		E	C	C		C	
Approach Delay (s)		47.7			49.9			53.0			23.6	
Approach LOS		D			D			D			C	

Intersection Summary

HCM Average Control Delay	49.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	99.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	94.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

# **Appendix D Segment Analysis**

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-Mail: \_\_\_\_\_

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Two-Way Two-Lane Highway Segment Analysis

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Analyst                           AAD  
 Agency/Co.                   Fulton County  
 Date Performed               7/27/2009  
 Analysis Time Period       PM Peak Hour  
 Highway                       Buffington Road  
 From/To                       south of Roosevelt Highway  
 Jurisdiction                 Fulton County  
 Analysis Year                2031  
 Description   Buffington Road Improvments

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Input Data

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Highway class	Class 1				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.4	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	100	%
Grade: Length		mi	Access points/mi	7	/mi
Up/down		%			

Two-way hourly volume, V	1231	veh/h
Directional split	54 / 46	%

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Average Travel Speed

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Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate, (note-1) vp	1341	pc/h
Highest directional split proportion (note-2)	724	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	52.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	1.8	mi/h
Free-flow speed, FFS	50.3	mi/h
Adjustment for no-passing zones, fnp	1.8	mi/h
Average travel speed, ATS	38.0	mi/h

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Percent Time-Spent-Following

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Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate, (note-1) vp	1338	pc/h
Highest directional split proportion (note-2)	723	
Base percent time-spent-following, BPTSF	69.2	%
Adj.for directional distribution and no-passing zones, fd/np	8.7	
Percent time-spent-following, PTSF	77.9	%

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Level of Service and Other Performance Measures

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Level of service, LOS	E	
Volume to capacity ratio, v/c	0.42	
Peak 15-min vehicle-miles of travel, VMT15	134	veh-mi
Peak-hour vehicle-miles of travel, VMT60	492	veh-mi
Peak 15-min total travel time, TT15	3.5	veh-h

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Notes:

1. If  $vp \geq 3200$  pc/h, terminate analysis-the LOS is F.
2. If highest directional split  $vp \geq 1700$  pc/h, terminate analysis-the LOS is F.

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 E-Mail: \_\_\_\_\_

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Two-Way Two-Lane Highway Segment Analysis

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Analyst                           AAD  
 Agency/Co.                   Fulton County  
 Date Performed               7/27/2009  
 Analysis Time Period       PM Peak Hour  
 Highway                       Buffington Road  
 From/To                       south of South Fulton Parkway  
 Jurisdiction                 Fulton County  
 Analysis Year                 2031  
 Description   Buffington Road Improvments

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Input Data

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Highway class	Class 1				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	1.3	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	100	%
Grade: Length		mi	Access points/mi	14	/mi
Up/down		%			

Two-way hourly volume, V	1933	veh/h
Directional split	67 / 33	%

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Average Travel Speed

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Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate, (note-1) vp	2105	pc/h
Highest directional split proportion (note-2)	1410	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	52.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	3.5	mi/h
Free-flow speed, FFS	48.5	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATS	31.1	mi/h

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Percent Time-Spent-Following

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Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate, (note-1) vp	2101	pc/h
Highest directional split proportion (note-2)	1408	
Base percent time-spent-following, BPTSF	84.2	%
Adj. for directional distribution and no-passing zones, fd/np	4.1	
Percent time-spent-following, PTSF	88.3	%

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Level of Service and Other Performance Measures

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Level of service, LOS	E	
Volume to capacity ratio, v/c	0.66	
Peak 15-min vehicle-miles of travel, VMT15	683	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2513	veh-mi
Peak 15-min total travel time, TT15	22.0	veh-h

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Notes:

1. If  $vp \geq 3200$  pc/h, terminate analysis-the LOS is F.
2. If highest directional split  $vp \geq 1700$  pc/h, terminate analysis-the LOS is F.

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

INTERDEPARTMENTAL CORRESPONDENCE

**FILE:** PI: 0007096, Fulton County      **OFFICE:** Consultant Design  
CSCMQ-0007-00(096)  
Buffington Road Pedestrian and  
Roadway Improvement

**DATE:** November 18, 2010

**FROM:** Bryant Poole, District 7 Engineer

**TO:** Brent A. Story, P.E., State Design Policy Engineer

**SUBJECT: Request for Design Exception**

Approval of a Design Exception is requested for this project.

**Project Description**

CSCMQ-0007-00(096) is the Buffington Road Pedestrian and Roadway Improvement project. The project is currently identified in the Transportation Improvement Plan (TIP) of the Atlanta Regional Commission (ARC) and is a local let project for Fulton County. Buffington Road is located in Fulton County with portions of the project located in unincorporated Union City and College Park and serves both residential and commercial developments along the corridor. The project has a total length of 1.84 miles and begins at Royal South Parkway and ends at Roosevelt Highway/SR 14. This project is proposed as intersection improvements (addition of turn lanes and drainage improvements) and pedestrian improvements (addition of sidewalks and curb and gutter). The project also proposes to upgrade four (4) existing signal locations.

**Design Features Requiring Design Exception**

Design Exceptions will be required for two substandard vertical curves. The following table lists the substandard vertical curves along the project corridor. The speed design was determined from A Policy on Geometric Design of Highways and Streets, 2004, AASHTO, Exhibits 3-71 and 3-74.

**Substandard Vertical Curves along Buffington Road**

PVI Location		Curve Length	K-Value	Design Speed	Type
STA 109+52	EXISTING	430'	59	35 mph	SAG
	DESIRABLE	680'	79	45 mph	
STA 116+80	EXISTING	620'	58	40 mph	CREST
	DESIRABLE	720'	61	45 mph	

The total length of the vertical curve design exception is 0.2 miles. The total length of the project is 1.84 miles.

### Current and Future Traffic with Accident History

Buffington Road is classified as a Minor Arterial with a design of 45 mph. The 2011 Average Daily Traffic (ADT) along this section of roadway is projected to be 12,600 vehicles per day (vpd), and the 2031 projected ADT is 18,300 vpd. Accident history data was obtained from GDOT for the last three (3) available years (2006, 2007, and 2008) for segment Sable Chase Road to Ravenswood Drive. Table 1 depicts the historical number of crashes, injuries, and fatalities along segment Sable Chase Road to Ravenswood Drive.

<b>Table 1 – Crash History (Segment) Buffington Road from Sable Chase Road to Ravenswood Drive</b>						
Year	Crashes	Crash Rate	Injuries	Injury Rate	Fatalities	Fatality Rate
2006	2	156 (548)	1	78 (137)	0	0 (1.43)
2007	2	156 (513)	0	0 (126)	0	0 (1.36)
2008	2	156 (469)	0	0 (117)	0	0 (1.33)

**Note: Bolded entries in parenthesis represent the statewide average**

As shown in Table 1, the segment is lower than the statewide average for 2006 through 2008.

Table 2 depicts the historical number of crashes, injuries, and fatalities for the signalized intersection of Buffington Road and Sable Run Road. Data represents accidents within a 250 feet buffer width from intersection.

<b>Table 2 – Crash History (Intersection) Buffington Road and Sable Run Road</b>			
Year	Crashes	Injuries	Fatalities
2006	0	0	0
2007	0	0	0
2008	1	0	0

### Summary for Not Meeting Current Guidelines

Correcting the two substandard curves will greatly increase the total cost for the project. Buffington Road currently has approximately 2,300 LF of curb/gutter and side walk constructed at its ultimate location. In order to correct the substandard curves would require raising the existing profile approximately 3 feet. This would result in impacts to the existing curb/gutter and sidewalks and would require reconstruction for this section. The existing curb and gutter and sidewalks are in good condition and are estimated to have been constructed within the last 5 to 10 years.

Additionally, correcting substandard curves will impact approximately twelve (12) Georgia Power existing utility poles. These impacted poles would have to be relocated and adjusted to meet both horizontal and vertical clear zone requirements.

Lastly, correcting the substandard vertical curves will increase the impacts to Right-of-Way (ROW). There are three existing side roads in this section which are the entrances to residential subdivisions. These side roads have adjacent properties with driveways less than 60 feet from Buffington Road centerline. The ROW impacts will require approximately six (6) total takes and some damages to other parcels in order to tie the existing side road vertical alignments in with the mainline alignment.

### **Cost Summary for Meeting Guidelines**

The estimated additional costs to reconstruct the two (2) substandard vertical curves on Buffington Road in accordance with AASHTO design guidelines and GDOT's policies are as follows:

Earthwork:	\$110,000
Pavement	\$1,224,000
Erosion Control	\$50,000
Traffic Control	\$50,000
Drainage	\$140,000
Right of Way	\$710,000
Utilities	<u>\$300,000</u>
<b>TOTAL</b>	<b>\$2,584,000</b>

### **Proposed Mitigation Strategies for Substandard Vertical Curves**

To mitigate the substandard vertical sag curve, Fulton County will add additional luminaries lighting to existing utility poles as needed and clear trees and overhanging branches within existing ROW to increase the driver's line of sight. Advance warning signs will also be added to inform the driver of limited sight distance to increase driver awareness.

For the substandard crest vertical curve, there is an existing signalized intersection located at approximate station 121+86 (Sable Run Road). This substandard crest curve does not meet sight distance requirements for AASHTO's "Intersections with Traffic Signal Control, Case D" for the right turn from the minor road onto Buffington Road and the left turn from the major road onto Sable Run Road. In order to mitigate the limited right turn sight distance from the minor road, the County will install a "No Turn on Red" sign for this movement at the signalized intersection. For the left turn from the major road, the existing signal left turn movement will be modified as part of the signal upgrade/design to be a protected only left turn movement.

Finally, Fulton County will also consider establishment of an advisory speed for the needed substandard curves. Although an advisory speed plaque does not guarantee that a driver will slow down and is not enforceable, it may alert the driver that this section of roadway could be hazardous.

0007096 Fulton  
Design Exception Request  
11/29/2010

**Recommendation**

Due to the total estimated cost for construction, right of way, and utilities of reconstructing the substandard vertical curves to meet AASHTO and GDOT's policies we recommend approval of this design exception.

If additional information is needed, please contact Gerald Ford at (770) 986-1111.

Concur: James B Bush  
Director of Engineering

1/6/2011  
Date

Approved: D. Campbell  
Chief Engineer

1/10/11  
Date