

ORIGINAL TO GENERAL FILES

D.O.T. 66

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

**INTERDEPARTMENT CORRESPONDENCE**

**FILE** STP-0000-00(844) Gwinnett County **OFFICE** Preconstruction  
P.I. No. 0000844  
*CWH* **DATE** August 23, 2001  
**FROM** C. Wayne Hutto, Assistant Director of Preconstruction  
**TO** SEE DISTRIBUTION

**SUBJECT PROJECT CONCEPT REPORT APPROVAL**

Attached for your files is the approval for subject project.

CWH/cj

Attachment

**DISTRIBUTION:**

Tom Turner  
David Mulling  
Harvey Keepler  
Jerry Hobbs  
Herman Griffin  
Michael Henry  
Marion Waters  
Marta Rosen  
Paul Liles  
Jimmy Chambers  
Larry Dent  
**BOARD MEMBER**

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

**INTERDEPARTMENT CORRESPONDENCE**

**FILE** STP-0000-00(844) Gwinnett County **OFFICE** Preconstruction  
P.I. No. 0000844 **DATE** August 13, 2001

**FROM** C. Wayne Hutto, P.E., Assistant Director of Preconstruction

**TO** Frank L. Danchetz, P.E., Chief Engineer

**SUBJECT** PROJECT CONCEPT REPORT

This project is the intersection improvements on US 29/SR 8 at Pleasant Hill Road/Lester Road in Gwinnett County. US 29/SR 8 is an existing five lane urban section with a 12' flush median. This intersection is located within a densely developed retain commercial area. It serves both local and commuter traffic. The current lane configuration and traffic operations do not serve the existing traffic operations effectively. The existing (1997) traffic volumes on this section of US 29/SR 8 is 39,215 VPD and future volumes are expected to be 67,000 VPD in the year 2020. Traffic operations will continue to deteriorate due to volume increases unless improvements are made.

The construction proposes to install a 20' raised median on US 29/SR 8 from Luxomni Road to Ronald Reagan Parkway and on Pleasant Hill Road from US 29/SR 8 to Carter Drive. Dual left turn lanes will be installed on the eastbound approach of Pleasant Hill Road at US 29/SR 8. This project will also improve right turn lanes on Pleasant Hill Road at Berkmar High School and provide a sidewalk. Traffic will be maintained during construction.

Environmental concerns include requiring a Categorical Exclusion be prepared; a public information meeting will be held; time saving procedures are appropriate.

The estimated costs for this project are:

	<u>PROPOSED</u>	<u>APPROVED</u>	<u>PROG DATE</u>	<u>LET DATE</u>
Construction (includes E&C and inflation)	\$3,803,000	\$500,000	2005	FY-05
Right-of-Way	\$2,214,000	\$200,000		
Utilities*	\$ 700,000	----		

\*Gwinnett County signed LGPA on 9-27-00 for PE.

Frank L. Danchetz

Page 2

STP-0000-00(844) Gwinnett

August 13, 2001

I recommend this project concept be approved.

CWH:JDQ/cj

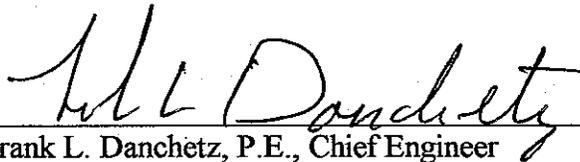
Attachment

CONCUR



Thomas L. Turner, P.E., Director of Preconstruction

APPROVE



Frank L. Danchetz, P.E., Chief Engineer

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

-----  
**INTERDEPARTMENTAL CORRESPONDENCE**

**FILE:** STP-0000-00(844) Gwinnett  
P.I. Number 0000844

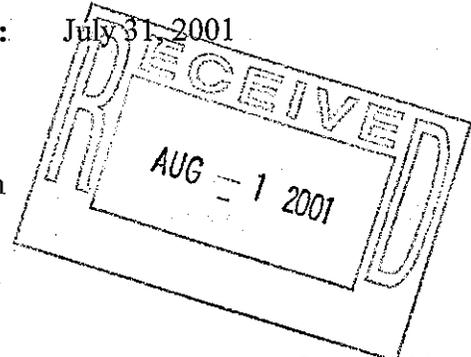
**OFFICE:** Engineering Services

**DATE:** July 31, 2001

**FROM:** *DTM*  
David Mulling, Project Review Engineer

**TO:** Wayne Hutto, Assistant Director of Pre-construction

**SUBJECT:** **CONCEPT REPORT**



We have reviewed the concept report submitted July 18, 2001 by the letter from Todd Long dated July 12, 2001, and have the following comments:

1. The 25,150 tons of Asphalt Concrete Leveling shown in the cost estimate is not consistent with the work shown on the typical sections. This amount appears to be excessive even if the intent is to use leveling to raise the grade of existing pavement at the two proposed grade changes on US29.
2. The 1125 tons of 1.5 inches of Asphalt Concrete Superpave shown in the cost estimate is not adequate to surface the existing pavement and proposed widening as shown on the typical sections.
3. The report is not clear as to the purpose for the proposed 10,000 square foot retaining wall.
4. The estimated costs for Reimbursable Utilities was not provided.
5. The report notes the project as not being in a Non-attainment area. Gwinnett County is located within a Non-attainment area.
6. The report notes the environmental analysis as both Categorical Exclusion and Environmental Assessment/FONSI. Also permit requirements not addressed.

The costs for the project are:

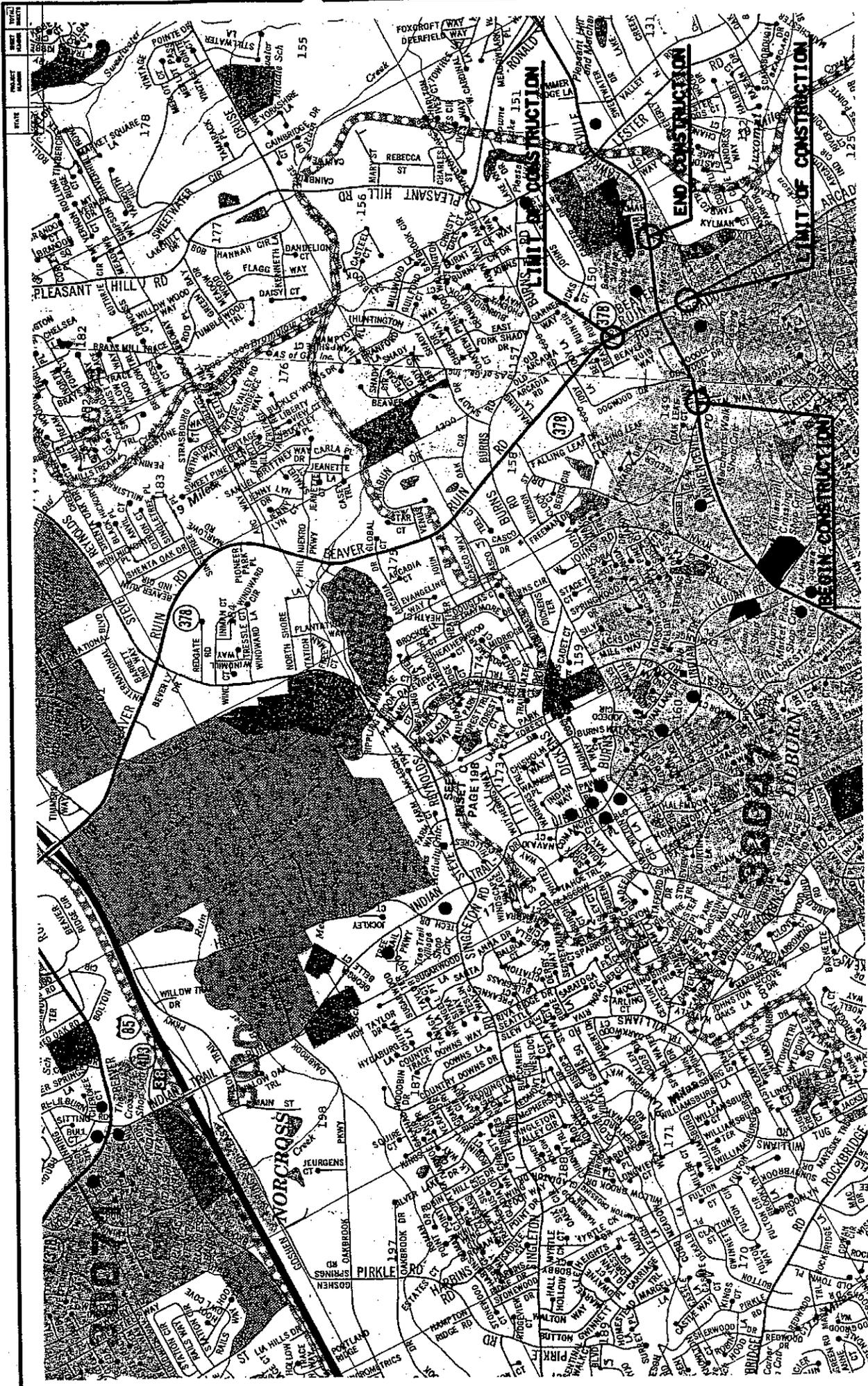
Construction	\$3,143,000
Inflation	\$ 314,000
E&C	\$ 346,000
Reimbursable Utilities	\$ ?
Right of Way	\$2,214,000

DTM

c: Todd Long – District 1 Preconstruction

## SCORING RESULTS AS PER MOG 2440-2

<b>Project Number:</b> STP-0000-00(844)		<b>County:</b> GWINNETT		<b>PI No.:</b> 0000844	
<b>Report Date:</b> 7/12/01		<b>Concept By:</b>			
		DOT Office: DISTRICT 1			
<input checked="" type="checkbox"/> CONCEPT					
		Consultant: R. K. SHAH			
<b>Project Type:</b> Choose One From Each Column		<input checked="" type="checkbox"/> Major <input type="checkbox"/> Minor	<input checked="" type="checkbox"/> Urban <input type="checkbox"/> Rural	<input type="checkbox"/> ATMS <input type="checkbox"/> Bridge <input type="checkbox"/> Building <input type="checkbox"/> Interchange <input checked="" type="checkbox"/> Intersection <input type="checkbox"/> Interstate <input type="checkbox"/> New Location <input type="checkbox"/> Widening & Reconstruction <input type="checkbox"/> Miscellaneous	
<b>FOCUS AREAS</b>	<b>SCORE</b>	<b>RESULTS</b>			
<b>Presentation</b>	80%	Asphalt Concrete quantities inconsistencies, retaining wall need not clear, reimbursable utility costs not provided			
<b>Judgement</b>	100%				
<b>Environmental</b>	90%	Incorrect non-attainment identification, level of environmental analysis not clear.			
<b>Right of Way</b>	100%				
<b>Utility</b>	100%				
<b>Constructability</b>	100%				
<b>Schedule</b>	100%				



DATE		BY		REVISIONS	
WALTERSON & ASSOCIATES, INC. 3500 QUINCY PARKWAY BEAVERTON, OREGON 97003 (503) 418-1111					
WALTERSON & ASSOCIATES INCORPORATED					
INTERSECTION IMPROVEMENT BEAVER RUIN ROAD @ US 29					
PROJECT LOCATION					
BEAVER RUIN ROAD					
CITY OF BEAVERTON					
PLANNING DEPARTMENT					
2					

**Need and Purpose:** The intersection of U.S. 29 and Beaver Ruin Road is located in western Gwinnett County, approximately 3.1 miles south of I-85 and 8.5 miles east of I-285. U.S. 29 is a major east-west arterial, and Beaver Ruin Road, which becomes Arcado Road south of U.S. 29, is a major north-south arterial through Gwinnett County.

This intersection is located within a densely developed retail commercial area. It serves local and commuter traffic. The current lane configuration does not service the existing traffic operation efficiently. Through the 1997 Sales Tax Program, Gwinnett County is implementing this project to improve traffic operation at this intersection.

Based on the current and projected traffic volumes, there is a need to upgrade this intersection to provide efficient traffic operation. Dual left-turn lanes on all U.S. 29 and Beaver Ruin Road approaches will allow vehicles to clear the intersection efficiently and reduce overall delay at the intersection. Furthermore, the project will provide a separate right-turn lane at U.S. 29 onto Beaver Ruin Road.

Accident data from the past three years indicate that many accidents occur when vehicles attempt to make a left turn into the many commercial developments at this intersection. For this reason, a raised median is planned for each approach of the intersection except on Arcado Road.

As traffic volumes increase on U.S. 29 and Beaver Ruin Road/Arcado Road, traffic operation at this intersection will continue to deteriorate unless improvements are made. The project is necessary to provide safe and efficient traffic operation for the traveling public.

ROADWAY	SECTION	EXISTING ADT (11/99)	PROJECTED ADT (Year 2020)
US 29	North of Beaver Ruin Road toward Lawrenceville	44,000	69,000
US 29	South of Beaver Ruin Road	31,500	46,800
Beaver Ruin Road	West of US 29	26,900	35,500
Arcado Road	East of US 29	16,000	29,500

The following table shows the total accidents for the three-year period 1995 through 1997.

YEAR	TOTAL ACCIDENTS	INJURY
1999	53	17
1997	61	17
1996	46	17
1995	39	17

With the addition of turn lanes on each approach, the left turn phases will be converted to "exclusive only" operation, which will improve safety.

**Description of the proposed project:** This project will include a total of 1.10 miles of widening and reconstruction on US 29 /SR 8 including the intersection improvements at Beaver Ruin and Arcado Roads. The construction will take place from just West of Postal Way to Luxomi Rd. in Gwinnett County, where it will tie to a matching section presently under design. This design will change the typical section from a four lane (two in each direction) divided by a flush median, - to- a four lane (two in each direction) divided by a variable width raised median. The purpose of the raised median is to reduce the accident potential from the left turn movement into and out of the many commercial developments through this section. Dual left turn lanes will be provided at the Beaver Ruin and Arcado Rd intersection to allow the vehicles to clear the intersection efficiently and reduce overall delays. Furthermore it will provide a separate right turn lane from Westbound US 29 to Beaver Ruin road and from Northbound Arcado Rd to Beaver Ruin. A five foot sidewalk will be added to each side of the entire project. The existing signal at Beaver Ruin / Arcado Rd. and US 29 will be upgraded as well as minor modifications to other existing signals in providing a interconnect of all signals within the project limits.

Is the project located in a Non-attainment area?  Yes  No. (See above description. Project schedule undetermined at this time.)

**PDP Classification: Minor Project**  
Full Oversight ( ), Exempt ( x ), State Funded ( ), or Other ( )

**Functional Classification: Urban Arterial**

U. S. Route Number(s): 29 State Route Number(s): 8

**Traffic (AADT):**  
Current Year: (2000) 44,000 Design Year: (2020) 69,000

**Existing design features:**

- Typical Section: The existing section consist of four twelve foot lanes divided by a 12 foot flush median with curb and gutter. Left and right turn lanes are present throughout the project.
- Posted speed 45 mph Maximum degree of curvature: 7.0
- Maximum grade: 4.14 %
- Width of right of way: 80 -130 ft.
- Major structures: NA
- Major interchanges or intersections along the project: SEE ABOVE
- Existing length of roadway segment and the beginning mile logs for each county segment. For new location projects, the existing length of roadway is zero (0).

**Proposed Design Features:**

- Proposed typical section(s): The proposed typical provides for four twelve foot lanes (two in each direction) divided by an eight foot raised concrete median and dual left turn lanes at the Beaver Ruin and Arcado Rd. intersection. and a separate right turn lane from westbound US 29 to Beaver Ruin and northbound Arcado to beaver Ruin.
- Proposed Design Speed Mainline 45 mph
- Proposed Maximum grade Mainline 4.14 %      Maximum grade allowable 8 %.
- Proposed Maximum grade Side Street 4.14 %      Maximum grade allowable 8 %.
- Proposed Maximum grade driveway 11 %
- Proposed Maximum degree of curve 7^      Maximum degree allowable 10^.
- Right of way
  - Width 140' Max .
  - Easements: Temporary ( x ), Permanent ( x ), Utility ( ), Other ( x ).
  - Type of access control: Full ( ), Partial ( ), By Permit ( x ), Other ( ).
  - Number of parcels: 44      Number of displacements:
    - Business: 1
    - Residences: 0
    - Mobile homes: 0
    - Other: 0

- Structures:
  - Bridges, N/A
  - Retaining walls (possible gravity type walls – to be determined)
- Major intersections and interchanges. see above
- Traffic control during construction: Traffic to be maintained on existing roadway during construction. Temporary lane closures will be required.
- Design Exceptions to controlling criteria anticipated:

	(YES)	(NO)	(UNDETERMINED)
HORIZONTAL ALIGNMENT:	( )	( x )	( )
ROADWAY WIDTH:	( )	( x )	( )
SHOULDER WIDTH:	( )	( x )	( )
VERTICAL GRADES:	( )	( x )	( )
CROSS SLOPES:	( )	( x )	( )
STOPPING SIGHT DISTANCE:	( )	( x )	( )
SUPERELEVATION RATES:	( x )	( )	( )
HORIZONTAL CLEARANCE:	( )	( x )	( )
SPEED DESIGN:	( )	( x )	( )
VERTICAL CLEARANCE:	( )	( x )	( )



**Other alternates considered:**

- 1) Widening to north side only was considered but was found to inflict unusually heavy impacts to businesses on the north side because of the relationship to the project profile.
- 2) The option to not build was eliminated by the need to relieve congestion in the area.

**Comments:** none

**Attachments:**

1. Cost Estimates:
  - a. Construction including E&C,
  - b. Right of Way, and
  - c. Utilities.
2. Sketch location map,
3. Typical sections,
4. Concept Meeting Minutes,
5. Capacity Analysis

PRELIMINARY COST ESTIMATE

PROJECT NUMBER: STP 0000 00 (845)

COUNTY: GWINNETT

DATE: June 18, 2001

ESTIMATED LETTING DATE: SUMMER 2004

PREPARED BY: CHRIS HAGGARD

PROJECT LENGTH (MILES): 1.023 MILES

( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

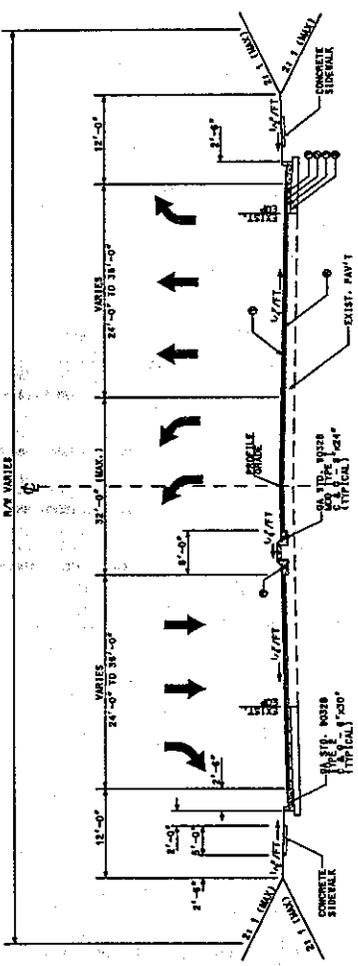
PROJECT COST	
A. RIGHT-OF-WAY:	
1. PROPERTY (LAND & EASEMENT)	\$1,011,208.0
2. DISPLACEMENTS; RES:0, BUS;0, M.H.:0	\$ 0
3. OTHER COST (ADM./COST, INFLATION)	\$ 0
SUBTOTAL:A	\$1,011,208.0
B. REIMBURSABLE UTILITIES:	
1. RAILROAD	\$ 0
2. TRANSMISSION LINES PRIVATE REIMBURSABLE	\$ 100,000
3. <del>SERVICES</del> PUBLIC OWNED	\$ 150,000
SUBTOTAL:B	\$ 250,000
C. CONSTRUCTION:	
1. MAJOR STRUCTURES	\$ 0
a. RETAINING WALLS	\$ 100,000.00
b. BRIDGES	\$ 0
c. DETOURS BRIDGES	\$ 0
d. BOX CULVERTS	\$ 30,000.00
SUBTOTAL:C-1	\$130,000.00
2. GRADING AND DRAINAGE:	
a. EARTHWORK	\$ 100,000.00
b. DRAINAGE:	
1) Cross Drain Pipe (exclude box culverts)	\$ 0
2) Curb and Gutter	\$ 240,600.00

*add*  
8/10/200

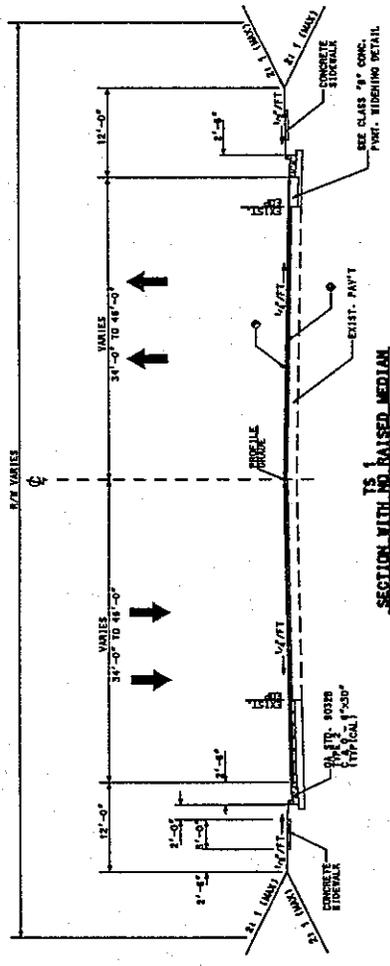
PROJECT COST		
3) Longitudinal System(include catch basins)		\$ 260,280.00
SUBTOTAL:C-2		\$ 600,880.00
3. BASE AND PAVING:		
a. AGGREGATE BASE		\$ 100,281.00
b. ASPHALT PAVING: Surface		\$ 167,467
Binder		\$ 42,641
Base		\$ 88,935
SUBTOTAL:C-3.b		\$ 399,324.00
c. CONCRETE PAVING		\$ 0
d. OTHER (leveling)		\$ 300,000.00
SUBTOTAL:C-3		\$ 699,324.00
4. LUMP ITEMS:		
a. TRAFFIC CONTROL		\$ 75,000.00
b. CLEARING AND GRUBBING		\$ 0
c. LANDSCAPING		\$ 0
d. EROSION CONTROL		\$ 17,500.00
e. DETOURS		\$ 0
SUBTOTAL:C-4		\$ 92,500.00
5. MISCELLANEOUS:		
a. LIGHTING		\$ 0
b. SIGNING - STRIPING - SIGNAL		\$ 75,000.00
c. GUARDRAIL		\$ 5,000.00
d. SIDEWALK - MEDIAN BARRIER		\$ 190,431.00
SUBTOTAL:C-5		\$ 270,431.00
6. SPECIAL FEATURES	SUBTOTAL:C-6	\$ 0

ESTIMATE SUMMARY		
A. RIGHT-OF-WAY	\$1,011,208.00	
B. REIMBURSABLE UTILITIES		
C. CONSTRUCTION		
1. MAJOR STRUCTURES	\$130,000.00	
2. GRADING AND DRAINAGE	\$600,880.00	
3. BASE AND PAVING	\$699,324.00	
4. LUMP ITEMS	\$ 92,500.00	
5. MISCELLANEOUS	\$270,431.00	
6. SPECIAL FEATURES	\$ 0	
SUBTOTAL CONSTRUCTION COST	\$1,793,135.00	
E. & C. (10%)	\$ 179,313.	
INFLATION (5% PER YEAR) x 3 years	\$ 295,867.0	
NUMBER OF YEARS	3	
TOTAL CONSTRUCTION COST	\$2,268,315	
GRAND TOTAL PROJECT COST	\$3,279,523	

DATE	PROJECT NUMBER	SCALE	BY
08/18/2001	96113		



**DUAL LEFT TURN WITH RAISED MEDIAN**  
 BEAVER RUIN ROAD  
 US 29



**SECTION WITH NO RAISED MEDIAN**  
 ARCADIO ROAD

- ① RECYCLED ASPHALTIC CONCRETE 12.5 MM SUPERPAVE # 102 #417 (1.5")
  - ② RECYCLED ASPHALTIC CONCRETE 19 MM SUPERPAVE (2")
  - ③ RECYCLED ASPHALTIC CONCRETE 25 MM SUPERPAVE (4")
  - ④ GRADED AGGREGATE BASE (10")
  - ⑤ MOUNTABLE CURB & GUTTER (6A STD W328 TYPE 7)
  - ⑥ LEVELING - AS REQ'D
- NOTE: SUPERPAVE MIX DESIGN LEVEL ON THIS PROJECT TO BE LEVEL C.

DESIGNER		DATE									
REVISIONS		BY									
WOLFEIN & ASSOCIATES, INC. 5310 ARCADIO PARKWAY HOUSTON, TEXAS 77055 (713) 241-1111											
BEHAVIORAL & ASSOCIATES, INC. 5310 ARCADIO PARKWAY HOUSTON, TEXAS 77055 (713) 241-1111											
BEAVER RUIN ROAD TYPICAL SECTIONS BEAVER RUIN RD @ U.S. 29											



GWINNETT COUNTY  
Department of Transportation  
Capital Program Management Division  
(770)822-7400

Date: April 9, 2001

To: See Distribution

Subject: Concept Meeting Minutes

Projects: STP-0000-00(844) And STP-0000-00(845) Gwinnett County  
Gwinnett County Project 9608 and 9618 Respectively

A concept meeting was held on this date covering the above listed projects. Project STP-0000-00(844) Gwinnett is the reconstruction of SR8/US29 from Luxomni Road to the ramps for Ronald Reagan Parkway, including the reconstruction of the Pleasant Hill/Lester intersection and project STP-0000-00(845) Gwinnett is the reconstruction of SR8/US29 from Postal Way to Luxomni Road, including the reconstruction of the Beaver Ruin/Arcado Road intersection. The proposed reconstruction includes the addition of a 20 foot wide raised median along SR8/US29 through the limits of the two projects, the addition of dual left turns in four quadrants of the Beaver Ruin/Arcado intersection, the addition of dual lefts in one quadrant of the Pleasant Hill/Lester intersection, the correction of substandard verticals along SR8/US29 and Pleasant Hill and the addition of a signal at the ramps to the Ronald Reagan Parkway.

Todd Long opened the meeting. He asked the attendees to identify themselves and started a sign in sheet. He indicated that the project would be financed by both the County and State (County to pay for design and utilities and acquire the right of way with the State funding the right of way and construction). He talked about the purpose of the project and then turned the meeting over to Ron Braziel.

Ron Braziel gave a history of the project development. He explaining that the projects were identified as intersection improvements in the County's Capital Improvement program and that public information meetings were held on the intersection improvements before the State projects were identified.

Alternates considered were widening to one side or the other and correcting the verticals by either cutting the crests or raising the sags. The alternate selected was to widening symmetrically and raise the sags.

Todd Long suggested that we start with the Beaver Ruin section and opened the meeting up for comments and suggestion.

75 LANGLEY DRIVE • LAWRENCEVILLE, GEORGIA 30045-6900

A discussion was opened about the design of the new lane configurations based on the design year traffic. It was agreed that the proposed design will improve the traffic flow and make the intersections safer for pedestrian traffic.

Also discussed was the spacing of the proposed median openings. Georgia DOT preferred openings are at Postal Way, Woodcliff Drive, Beaver Ruin/Arcado, the entrance to Beaver Ruin Village, Luxomni Road, entrance to Pep Boys, Pleasant Hill/Lester, a left in only to Pleasant Hill Market/the Bowling center, relocated Summer Ridge Lane, entrance to Quiktrip/Little Gardens and the ramps to Ronald Reagan Parkway.

Pleasant Hill reconstruction will require the lowering of a crest approaching SR8/US29. Staging will be required to lower the roadway with impacts to the existing car wash to provide for detour construction.

The concept team felt that that the radius of SR8/US29 and Arcado Road needed to be changed to a 75 foot radius with a right turn lane from Arcado to SR8/US29 and additional width added on SR8/US29 to provide for u-turns.

Todd Long ask that the County verify that this is not a designated bike route. The County has since confirmed that this is not a bike route.

The improvements to Pleasant Hill and Beaver Ruin will mean the displacement of one gas station/dry cleaners, one car wash and a Texaco Station at Beaver Ruin/Arcado.

Utility representatives present were AT&T, Bellsouth and Gwinnett Department of Public Utilities. AT&T representatives stated most of their fiber and regular lines were on poles and would be relocated and that the poles needed to be checked for ownership and if they are on a separate private easement. Bellsouth has conduit and above ground shared with Georgia Power and would like to leave the conduit under pavement. Gwinnett Department of Public Utilities has a 16" water main throughout the project and will need to replace it.

Also discussed was providing interconnects for all signals and ATMS lines for cameras.

The Consultants were instructed to finalize the concept report based on comments from the meeting and to break the projects at Luxomni Road.

A recommendation was made that an additional Public Meeting would be necessary.

The State funding for these projects is in FY2005, therefore the projects need to be ready for letting in the summer of 2004.

There were no further questions, so the meeting was concluded.

Distribution:

Georgia DOT – Todd Long, Joe Garland, Keith Deyton and Tony R Bradely  
Gwinnett DOT – Bill Powel, Joe Womble, Alan Chapman, and Frank Clark  
MAAI – Alva Byrom, Pete Barnett, Don Watson and Ron Braziel  
R. K. Shah & Associates – R. K. Shah  
Wolverton & Associates – Wayne Sorrow, Vern Wilburn and Chris Haggard  
AT&T – Dennis Beaulieu and Jack Kovalski  
Bellsouth – Sev Burkhalter  
Gwinnett DPU – Tommy Hunter

RECEIVED  
APR 27 2001  
Per. *RF*

**TRAFFIC STUDY UPDATE**

For

**ROAD IMPROVEMENT PROJECT**

**BEAVER RUIN ROAD and US 29**  
**Project #9613**

Prepared By:

**WOLVERTON & ASSOCIATES, INC.**  
5300 Oakbrook Parkway  
Suite 150  
Norcross, GA 30093

April 23, 2001

## TABLE OF CONTENTS

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1. INTRODUCTION .....	1
2. DESIGN TRAFFIC VOLUMES .....	4
3. CAPACITY ANALYSIS .....	7
4. SIGNAL WARRANT ANALYSIS .....	9
5. SUMMARY OF CONCLUSIONS .....	11

### APPENDIX A

CAPACITY ANALYSIS REPORTS, AM PEAK HOUR, EXISTING CONDITIONS

### APPENDIX B

CAPACITY ANALYSIS REPORTS, AM PEAK HOUR, PROJECTED CONDITIONS

### APPENDIX C

CAPACITY ANALYSIS REPORTS, PM PEAK HOUR, EXISTING CONDITIONS

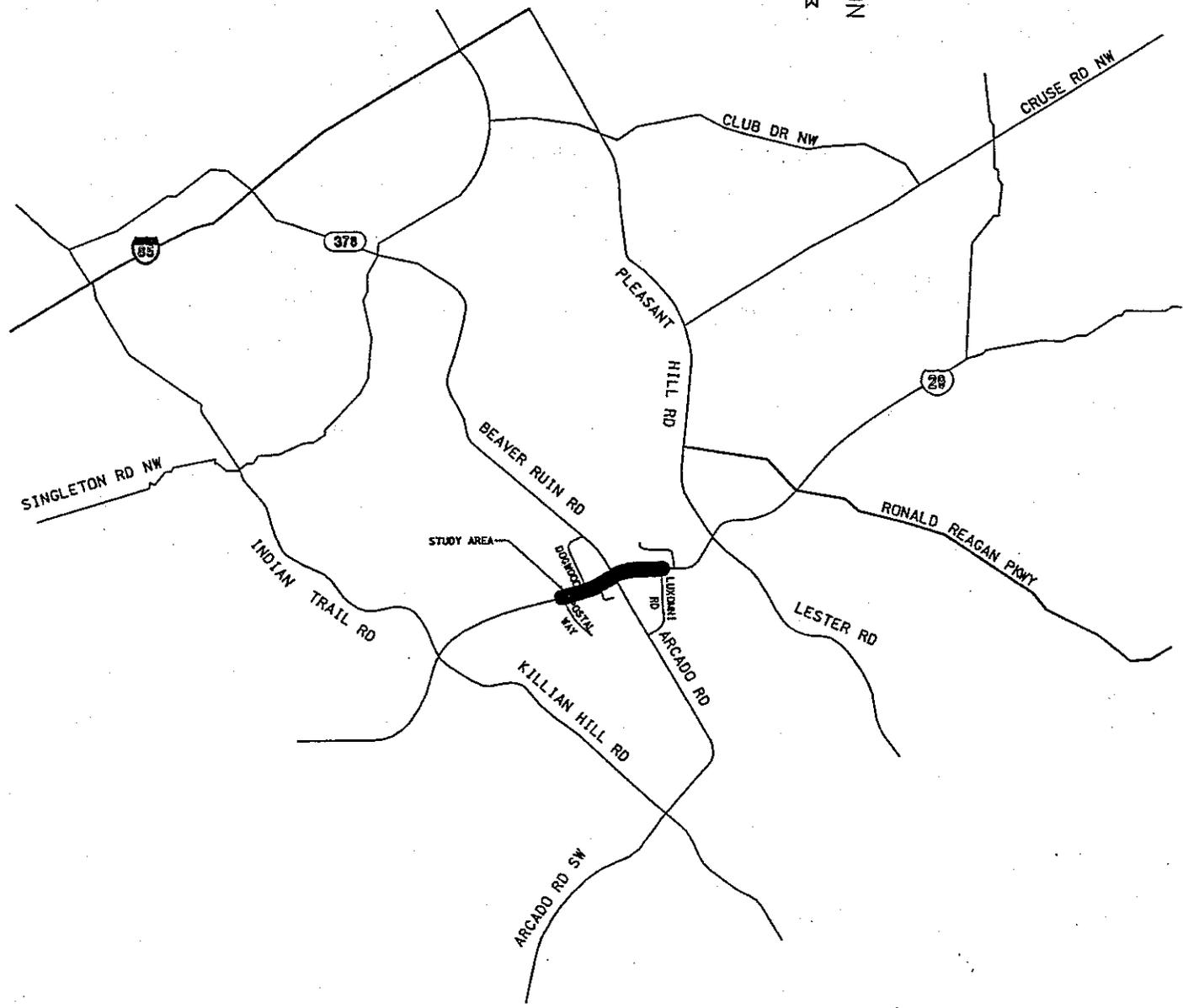
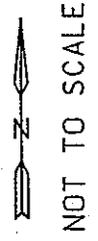
### APPENDIX D

CAPACITY ANALYSIS REPORTS, PM PEAK HOUR, PROJECTED CONDITIONS

### APPENDIX E

CAPACITY ANALYSIS REPORTS, LUXOMNI RD, UNSIGNALIZED

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5300 OAKBROOK PARKWAY  
SUITE 150  
NORCROSS, GA 30093  
770.447.8999

VICINITY MAP

FIGURE 1

# 1. INTRODUCTION

---

The original traffic study was prepared when the scope of the improvement involved only turn lanes at the intersection of Beaver Ruin Road and US 29. The project now involves the construction of a median along US 29. The median will extend eastward to Berkmar Way and westward to Postal Way. This project will be coordinated with another project for Pleasant Hill Road and US 29 that will have a median along US 29 to extend to Berkmar Way.

This study will update the capacity analysis for the intersection of Beaver Ruin Road and US 29. Capacity analysis is also provided for the intersections of US 29 at: Luxomni Road, Postal Way, and Kroger Plaza.

Signal warrant analyses were also conducted for the intersection of US 29 and Luxomni Drive. Since signalization was found to be warranted, the capacity analysis was conducted with stop control and also with signalization.

Figure 1 on the following page is a vicinity map showing the intersection in relation to the major roadways in the area. Figure 2 illustrates the existing lane geometrics and traffic control for the project area.



## 2. DESIGN TRAFFIC VOLUMES

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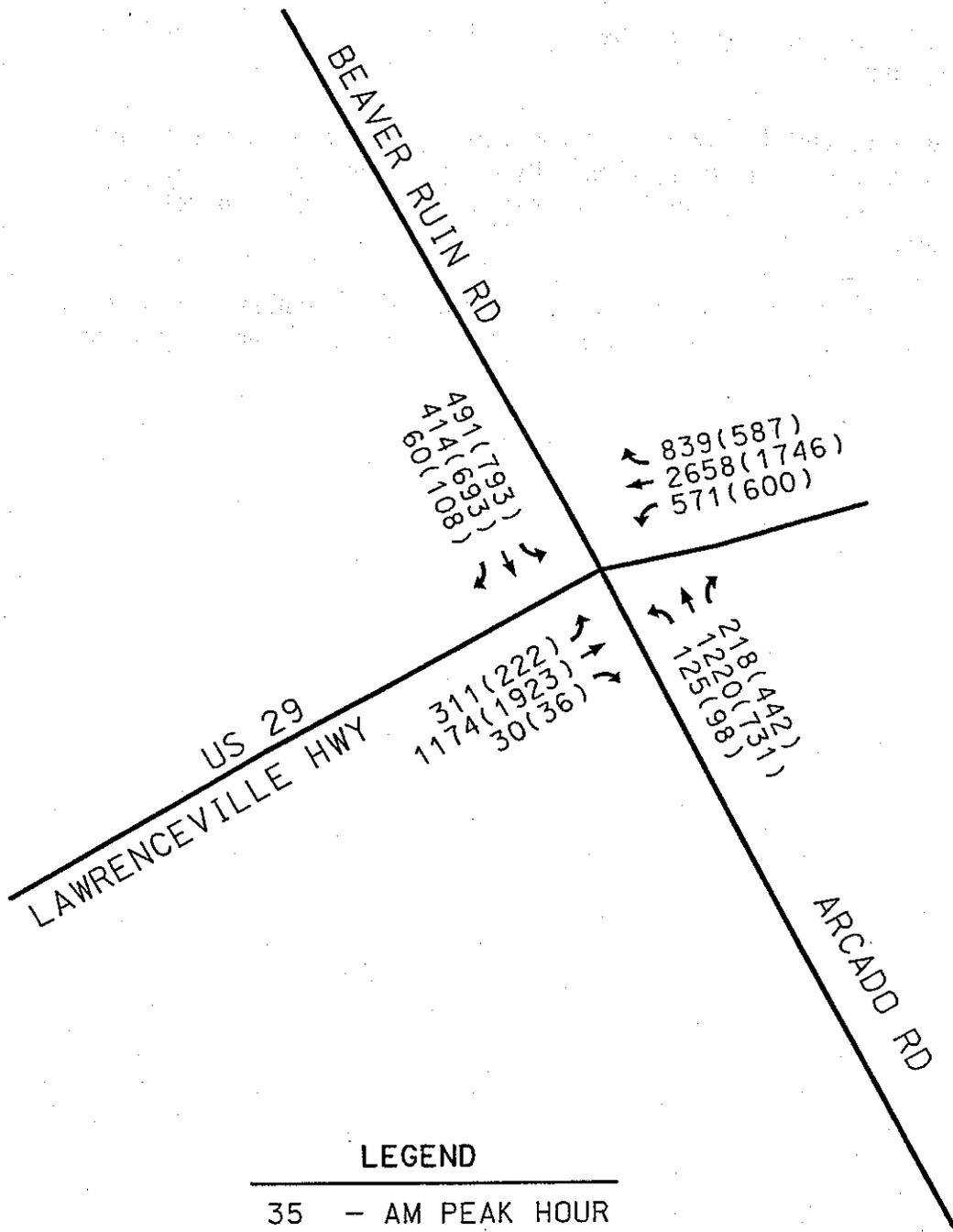
Gwinnett County provided traffic projections for the project. Figure 3 shows the projected peak hour volumes for the year 2020.

The projected volumes were evaluated in the original study. However, due to the magnitude of the projected increases in traffic, no meaningful capacity analysis could be conducted. The capacity analysis procedures of the Highway Capacity Manual are only valid for volume to capacity ratios of 1.2 or less.

The methodology used for the capacity analysis involved examining the existing volumes and providing as much improvements as possible within the constraints of an intersection improvement project.

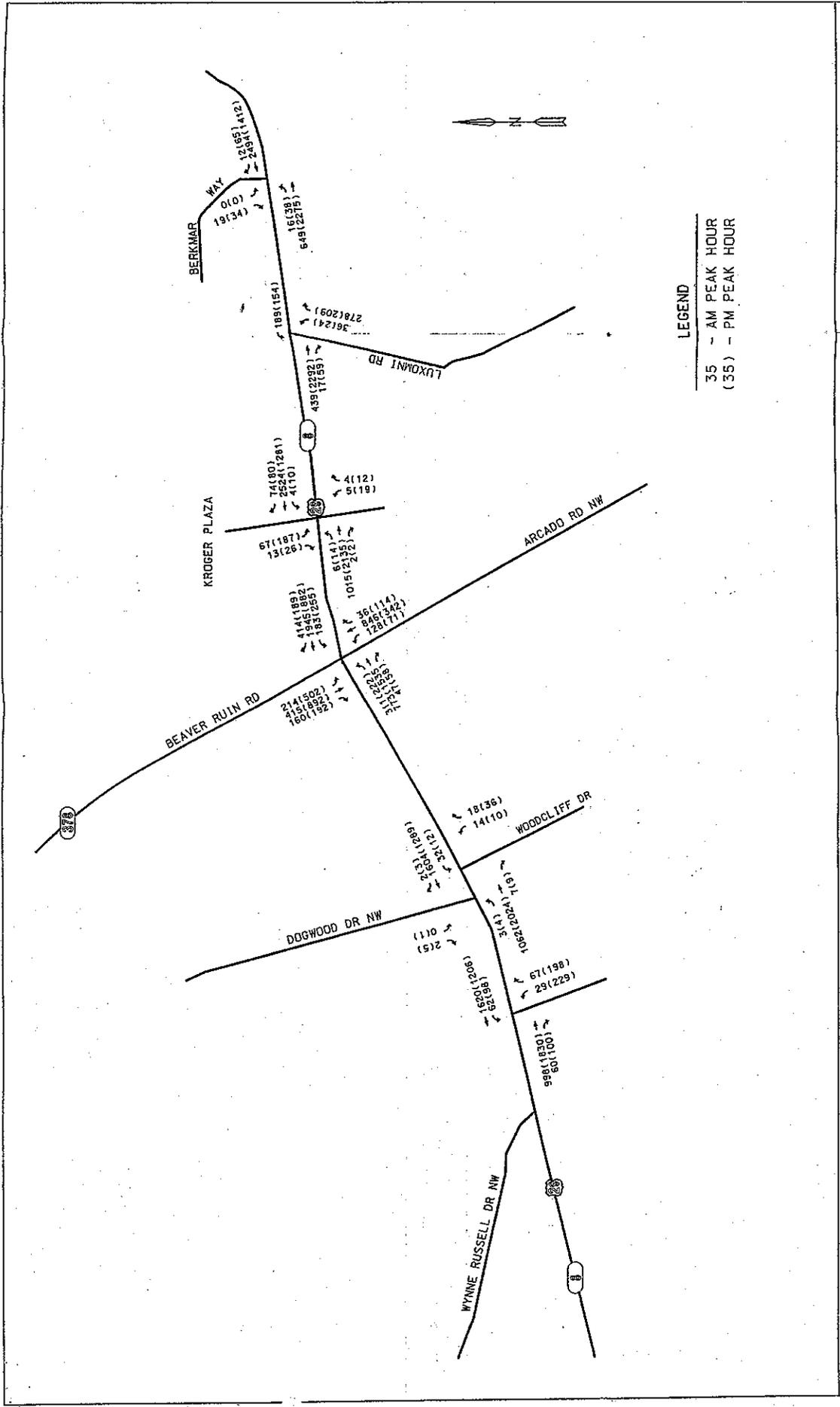
Figure 4 illustrates the existing traffic volumes for the study intersections.


  
 NOT TO SCALE



**LEGEND**

35 - AM PEAK HOUR  
 (35) - PM PEAK HOUR



EXISTING TRAFFIC VOLUME

FIGURE 4

5300 OAKBROOK PARKWAY  
 SUITE 150  
 NORCROSS, GA 30093  
 (770) 447-0889

Walston & Associates

### 3. CAPACITY ANALYSIS

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In addition to the intersection of US 29 and Beaver Ruin Road, capacity analysis was also conducted for the intersections of US 29 at Luxomni Road, US 29 at Kroger, and US 29 at Postal Way. The Luxomni Road intersection was evaluated both as a signalized intersection and also with stop control on Luxomni Road.

The procedures outlined in the *1997 Highway Capacity Manual* (Special Report 209, Transportation Research Board) were used to conduct capacity analysis. The Synchro Program was used to conduct the analysis.

The Highway Capacity Manual defines level of service (LOS) in terms of the amount of control delay, including deceleration time, move-up delay, and acceleration time. The LOS definitions for signalized intersections are provided in Table 1.

**Table 1- LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS**

<b>LEVEL OF SERVICE</b>	<b>CONTROL DELAY PER VEHICLE (SEC)</b>
A	$\leq 10$
B	$> 10$ and $\leq 20$
C	$> 20$ and $\leq 35$
D	$> 35$ and $\leq 55$
E	$> 55$ and $\leq 80$
F	$> 80$

The results of the capacity analysis for signalized intersections are summarized in Table 2. The current level of service is provided along with the projected level of service after the improvements are complete. The improvements that affect capacity analysis occur at the intersection of US 29 and Beaver Ruin Road. The project will result in dual left turn lanes on all approaches and right turn lanes on westbound US 29, on southbound Beaver Ruin Road, and on northbound Arcado Road.

The Luxomni Road intersection is currently unsignalized but is evaluated in Table 2 with signal control.

**Table 2- RESULTS OF CAPACITY ANALYSIS**

INTERSECTION OF US 29 AND:	A.M. PEAK HOUR		P.M. PEAK HOUR	
	EXISTING	W/IMPROVEMENTS	EXISTING	W/IMPROVEMENTS
LUXOMNI ROAD	A (7.1)	A(7.0)	C(22.4)	C(22.1)
KROGER	C(34.1)	C(34.6)	B(13.5)	A(8.7)
BEAVER RUIN ROAD	F(136.5)	E(70.5)	E(71.5)	D(38.5)
POSTAL WAY	A(2.6)	A(2.4)	C(26.9)	C(27.5)

The results of Luxomni Road intersection evaluation with stop control are given in Table 3.

**Table 3 - CAPACITY ANALYSIS OF LUXOMNI ROAD WITH STOP CONTROL**

MOVEMENT	A.M. PEAK HOUR	P.M. PEAK HOUR
Left Turn From Luxomni Rd	F(389.7)	F(*)
Left Turn From US 29	A(9.2)	F(118.6)

Note: The asterisk indicates saturated conditions worse than for which the procedures are valid to estimate delay.

## 4. SIGNAL WARRANT ANALYSIS

A signal warrant evaluation was conducted for the intersection of US 29 and Luxomni Road. The following table provides the results of a 24-hour machine traffic count on the Luxomni Road approach.

**Table 4 - EXISTING APPROACH TRAFFIC VOLUMES, LUXOMNI RD at US 29**

HOUR	LUXOMNI ROAD, NB
12:00 AM	8
1:00	5
2:00	8
3:00	7
4:00	9
5:00	47
6:00	183
7:00	302
8:00	239
9:00	143
10:00	127
11:00	120
12:00 Noon	148
1:00 PM	152
2:00	172
3:00	182
4:00	216
5:00	220
6:00	189
7:00	109
8:00	74
9:00	57
10:00	45
11:00	33

The hourly volumes for US 29 are not available. However, the volumes on US 29 are obviously high enough to satisfy Warrant 1 and Warrant 2. The ADT on US 29 is approximately 40,000. The Manual of Traffic Signal Design published by the Institute of Transportation Engineers in 1982, provides guidelines for estimating the eighth highest hour volume if only the ADT volume is known. The eighth highest hour can be estimated by taking 6.25 percent of the ADT. Based on this guideline, the estimated two-way volume during the eighth highest hour is estimated as 2500 vehicles.

The eighth highest hour volume can then be used in the warrant analysis for Warrants 1 and 2 since these two warrants must be met for eight hours in order for them to be satisfied. The following table contains a comparison of the current hourly volumes to the requirements of Warrant 1 and Warrant 2. The estimated eighth highest hour volume (2500) is shown for all hours of the main street.

**Table 5 – COMPARISON OF HOURLY VOLUME TO WARRANTS 1 and 2, US 29 and LUXOMNI RD**

HOUR BEGINNING	Main St Vol. (Total Both Directions)	Side St Vol. (Heavier Approach)	WARRANT 1		WARRANT 2	
			Main St. Vol. Met? (420 VPH)	Side St. Vol. Met? (105 VPH)	Main St. Vol. Met? (630VPH)	Side St. Vol. Met? (53 VPH)
7 AM	2500	302	Yes	Yes	Yes	Yes
8 AM	2500	239	Yes	Yes	Yes	Yes
9 AM	2500	143	Yes	Yes	Yes	Yes
10 AM	2500	127	Yes	Yes	Yes	Yes
11 AM	2500	120	Yes	Yes	Yes	Yes
12 Noon	2500	148	Yes	Yes	Yes	Yes
1 PM	2500	152	Yes	Yes	Yes	Yes
2 PM	2500	172	Yes	Yes	Yes	Yes
3 PM	2500	182	Yes	Yes	Yes	Yes
4 PM	2500	216	Yes	Yes	Yes	Yes
5 PM	2500	220	Yes	Yes	Yes	Yes

The side street volumes used in the table above include all approach traffic. If the right turn volume were excluded, the warrants would not be satisfied. However, consideration should be given to the high left turning volume from US 29 onto Luxomni Road (currently 189 in AM and 154 in PM Peak Hours).

When evaluated as an unsignalized intersection, the side street left turn and the main street left turn exhibits extremely poor levels of service.

If the intersection of US 29 and Luxomni Road were signalized, some traffic might be diverted away from the intersection of US 29 and Beaver Ruin/Arcado Road. This would improve operation at the Beaver Ruin intersection, but would increase traffic along Luxomni Road, which is residential in character.

## 5. SUMMARY OF CONCLUSIONS

The study area is characterized by significant congestion at the present time. Gwinnett County is projecting the traffic levels to significantly increase in the future. Due to high traffic demand, projected traffic levels could not be evaluated with capacity analysis because the Highway Capacity Manual procedures are limited to v/c (volume to capacity) ratios of 1.2 or less. Therefore, current volume levels were used to conduct capacity analysis.

The intersection of US 29 and Beaver Ruin Road was evaluated with dual left turn lanes on all approaches and right turn lanes on westbound US 29, on northbound Arcado Road, and southbound on Beaver Ruin Road. With these changes, the intersection level of service improves during the AM Peak Hour from F(136) to E(70), which is substantial. During the PM Peak Hour, the level of service improves from E(71) to D(38).

The following table shows the estimated queue lengths of turn lanes that were obtained from the Synchro analysis. The design should provide for these lengths as a minimum. These storage distances are considered minimums because they are based on operations immediately after the improvements are complete.

**Table 6 – MINIMUM FULL-WIDTH STORAGE LENGTHS FOR TURN LANES**

INTERSECTION	MOVEMENT	CURRENT PEAK HOUR VOLUME (CRITICAL PERIOD)	MAXIMUM QUEUE LENGTH AFTER IMPROVEMENTS, Feet
Luxomni Rd	WB Left on US 29	154 (PM)	389
	NB Right on Luxomni	209 (PM)	370
Kroger Plaza	EB Left on US 29	14 (PM)	2
	SB Left from Kroger	187 (PM)	290
Beaver Ruin Rd	EB Left on US 29	311 (AM)	229
	WB Left on US 29	255 (PM)	202
	WB Right on US 29	414 (AM)	101
	NB Left on Arcado	71 (PM)	68
	NB Right on Arcado	114 (PM)	54
	SB Left on Beaver Ruin	502 (PM)	328
	SB Right on Beaver Ruin	192 (PM)	73
Postal Way	WB Left on US 29	98 (PM)	130
	NB Left on Postal Way	229 (PM)	539

The intersection of US 29 and Luxomni Road currently meets Signal Warrants 1 and 2 if the right turns are included in the analysis. Unsignalized capacity analysis indicates that very poor levels of service exist. Consideration should be given to installing signals at this intersection.

The current left turn volume from US 29 to Luxomni Road is significant. This movement has 189 vehicles during the AM Peak Hour and 154 vehicles during the PM Peak Hour. The installation of a traffic signal may result in this movement increasing which would be coupled with a decrease in the westbound left turn movement at Arcado Road. Such a change is likely to result in an overall increase in efficiency and level of service. The downside of this would be that additional traffic flow would occur along Luxomni Road between US 29 and Arcado Road.

# APPENDIX A

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## CAPACITY ANALYSES REPORTS

### AM PEAK HOUR, EXISTING CONDITIONS

Timings

5: US 29 & Luxomni Rd

4/26/2001



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↵	↑↑	↵	↵
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	3522	0	1770	3539	1770	1583
Flt Permitted			0.471		0.950	
Satd. Flow (perm)	3522	0	877	3539	1770	1583
Satd. Flow (RTOR)	11					302
Volume (vph)	439	17	189	2294	36	278
Lane Group Flow (vph)	495	0	205	2493	39	302
Turn Type			Perm			Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Total Split (s)	80.0	0.0	80.0	80.0	20.0	20.0
Act Effct Green (s)	83.1		83.1	83.1	8.9	8.9
Actuated g/C Ratio	0.83		0.83	0.83	0.09	0.09
v/c Ratio	0.17		0.28	0.85	0.25	0.73
Uniform Delay, d1	1.6		1.9	4.8	42.4	0.0
Delay	2.2		2.5	8.2	40.7	5.1
LOS	A		A	A	D	A
Approach Delay	2.2			7.7	9.2	
Approach LOS	A			A	A	
Queue Length 50th (ft)	13		18	294	24	0
Queue Length 95th (ft)	44		59	721	52	76
Internal Link Dist (ft)	570			410	784	
50th Up Block Time (%)				2%		
95th Up Block Time (%)				13%		
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)				163		

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 8 (8%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

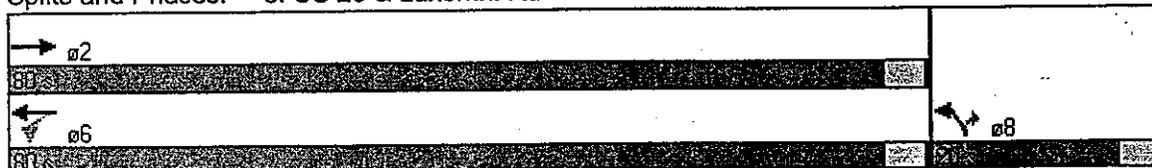
Intersection Signal Delay: 7.1

Intersection LOS: A

Intersection Capacity Utilization 78.9%

ICU Level of Service C

Splits and Phases: 5: US 29 & Luxomni Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖ ↗		↖ ↗		↖ ↗		↖ ↗		↖ ↗		↖ ↗	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1770	3539	0	0	3525	0	0	1720	0	1770	1548	0
Flt Permitted	0.077				0.954				0.922		0.950	
Satd. Flow (perm)	143	3539	0	0	3363	0	0	1625	0	1550	1548	0
Satd. Flow (RTOR)					4				4		14	
Volume (vph)	6	1015	2	4	2524	74	5	1	4	67	1	13
Lane Group Flow (vph)	7	1105	0	0	2827	0	0	10	0	73	15	0
Turn Type	pm+pt		Perm		Perm		Perm		custom			
Protected Phases	5	2			6			8	4		4	
Permitted Phases	2		6		8		4					
Total Split (s)	8.0	60.0	0.0	52.0	52.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
Act Effct Green (s)	83.2	83.2			81.6			6.0	9.3		9.3	
Actuated g/C Ratio	0.83	0.83			0.82			0.06	0.09		0.09	
v/c Ratio	0.04	0.38			1.03			0.10	0.44		0.10	
Uniform Delay, d1	2.4	3.4			13.2			29.3	43.9		2.8	
Delay	0.3	0.2			47.3			35.9	42.2		19.6	
LOS	A	A			D			D	D		B	
Approach Delay	0.2				47.3			35.9	38.3			
Approach LOS	A				D			D	D			
Queue Length 50th (ft)	0	0			~630			3	45		1	
Queue Length 95th (ft)	m1	m0			#1412			19	86		17	
Internal Link Dist (ft)	820				570			440	592			
50th Up Block Time (%)					7%							
95th Up Block Time (%)					21%							
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)					394							

**Intersection Summary**

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 9 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 1.03  
 Intersection Signal Delay: 34.1  
 Intersection LOS: C  
 Intersection Capacity Utilization 99.6%  
 ICU Level of Service E

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

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

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

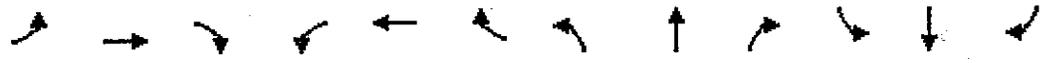
Splits and Phases: 7: US 29 & Kroger

 ø2	 ø4	 ø8
 ø6	 ø5	

Timings

9: US 29 & Beaver Ruin Rd

4/26/2001



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↕	↙	↘	↕	↙	↘	↕	↙	↘	↕	↙
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1770	3539	1583	1770	3447	0	1770	3518	0	1770	3539	1583
Flt. Permitted	0.950			0.950			0.277			0.200		
Satd. Flow (perm)	1770	3539	1583	1770	3447	0	516	3518	0	373	3539	1583
Satd. Flow (RTOR)			51		33			4				174
Volume (vph)	311	773	47	183	1945	414	128	846	36	214	415	160
Lane Group Flow (vph)	338	840	51	199	2564	0	139	959	0	233	451	174
Turn Type	Prot		Perm	Prot			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2				8			4		4
Total Split (s)	16.0	42.0	42.0	24.0	50.0	0.0	10.0	25.0	0.0	9.0	24.0	24.0
Act Effct Green (s)	12.0	38.0	38.0	20.0	46.0		27.0	21.0		25.0	20.0	20.0
Actuated g/C Ratio	0.12	0.38	0.38	0.20	0.46		0.27	0.21		0.25	0.20	0.20
v/c Ratio	1.59	0.62	0.08	0.56	1.60		0.65	1.29		1.43	0.64	0.38
Uniform Delay, d1	44.0	25.2	0.0	36.0	26.4		26.6	39.3		30.5	36.6	0.0
Delay	209.0	22.1	4.1	26.5	201.7		31.7	142.7		176.4	37.0	5.6
LOS	F	C	A	C	F		C	F		F	D	A
Approach Delay		72.7			189.1			128.6			68.5	
Approach LOS		E			F			F			E	
Queue Length 50th (ft)	-314	227	4	110	-1242		67	-414		-150	139	0
Queue Length 95th (ft)	#489	294	18	m94m#1172			#129	#543		#299	193	54
Internal Link Dist (ft)		1020			820			1144			1080	
50th Up Block Time (%)					14%							
95th Up Block Time (%)					24%							
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)					486							

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.60

Intersection Signal Delay: 136.5

Intersection LOS: F

Intersection Capacity Utilization 144.4%

ICU Level of Service H

Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

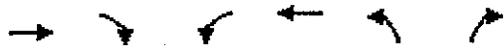
m Volume for 95th percentile queue is metered by upstream signal.

# APPENDIX B

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## CAPACITY ANALYSES REPORTS

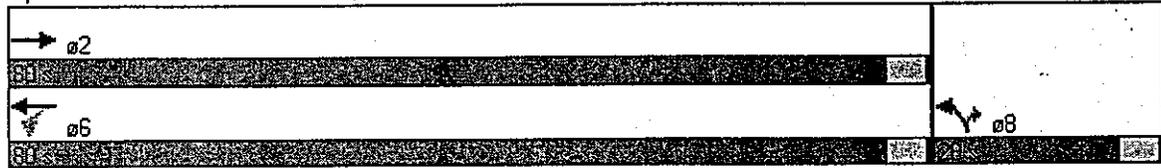
### AM PEAK HOUR, PROJECTED CONDITIONS



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↗
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	3522	0	1770	3539	1770	1583
Flt Permitted			0.471		0.950	
Satd. Flow (perm)	3522	0	877	3539	1770	1583
Satd. Flow (RTOR)	11					302
Volume (vph)	439	17	189	2294	36	278
Lane Group Flow (vph)	495	0	205	2493	39	302
Turn Type			Perm			Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Total Split (s)	80.0	0.0	80.0	80.0	20.0	20.0
Act Effct Green (s)	83.1		83.1	83.1	8.9	8.9
Actuated g/C Ratio	0.83		0.83	0.83	0.09	0.09
v/c Ratio	0.17		0.28	0.85	0.25	0.73
Uniform Delay, d1	1.6		1.9	4.8	42.4	0.0
Delay	1.8		2.5	8.2	40.7	5.1
LOS	A		A	A	D	A
Approach Delay	1.8			7.7	9.2	
Approach LOS	A			A	A	
Queue Length 50th (ft)	0		18	294	24	0
Queue Length 95th (ft)	0		59	721	52	67
Internal Link Dist (ft)	570			410	784	
50th Up Block Time (%)				2%		
95th Up Block Time (%)				13%		
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)				163		

**Intersection Summary:**  
 Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 1 (1%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.85  
 Intersection Signal Delay: 7.0  
 Intersection LOS: A  
 Intersection Capacity Utilization 78.9%  
 ICU Level of Service C

Splits and Phases: 5: US 29 & Luxomni Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑			↑↑			↕		↘	↙	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1770	3539	0	0	3525	0	0	1720	0	1770	1548	0
Eff. Permitted	0.077				0.954			0.922		0.950		
Satd. Flow (perm)	143	3539	0	0	3363	0	0	1625	0	1550	1548	0
Satd. Flow (RTOR)					4			4			14	
Volume (vph)	6	1015	2	4	2524	74	5	1	4	67	1	13
Lane Group Flow (vph)	7	1105	0	0	2827	0	0	10	0	73	15	0
Turn Type	pm+pt			Perm			Perm			custom		
Protected Phases	5	2			6			8		4	4	
Permitted Phases	2			6			8			4		
Total Split (s)	8.0	60.0	0.0	52.0	52.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
Act Effct Green (s)	82.4	83.2			81.6			6.0		9.3	9.3	
Actuated g/C Ratio	0.82	0.83			0.82			0.06		0.09	0.09	
v/c Ratio	0.04	0.38			1.03			0.10		0.44	0.10	
Uniform Delay, d1	2.3	3.4			13.2			29.3		43.9	2.8	
Delay	2.2	1.7			47.4			35.9		42.2	19.6	
LOS	A	A			D			D		D	B	
Approach Delay		1.7			47.4			35.9			38.3	
Approach LOS		A			D			D			D	
Queue Length 50th (ft)	0	5			-781			3		45	1	
Queue Length 95th (ft)	m2	113			#1412			16		86	0	
Internal Link Dist (ft)		820			570			440			592	
50th Up Block Time (%)					6%							
95th Up Block Time (%)					43%							
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)					685							

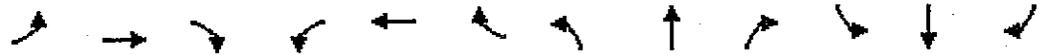
**Intersection Summary:**  
 Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 96 (96%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 1.03  
 Intersection Signal Delay: 34.6      Intersection LOS: C  
 Intersection Capacity Utilization 99.6%      ICU Level of Service E  
 Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: US 29 & Kroger

 ø2	 ø4	 ø8
 ø5	 ø6	

Timings  
9: US 29 & Beaver Ruin Rd

4/26/2001



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑↑	↗	↔↔	↑↑	↗	↔↔	↑↑	↗	↔↔	↑↑	↗
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.950			0.950			0.290			0.190		
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1048	3539	1583	687	3539	1583
Satd. Flow (RTOR)			51			135			39			163
Volume (vph)	311	773	47	183	1945	414	128	846	36	214	415	160
Lane Group Flow (vph)	338	840	51	199	2114	450	139	920	39	233	451	174
Turn Type	Prot		Perm	Prot		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6	8		8	4		4
Total Split (s)	12.0	52.0	52.0	14.0	54.0	54.0	9.0	26.0	26.0	8.0	25.0	25.0
Act Effct Green (s)	8.0	48.0	48.0	10.0	50.0	50.0	27.0	22.0	22.0	25.0	21.0	21.0
Actuated g/C Ratio	0.08	0.48	0.48	0.10	0.50	0.50	0.27	0.22	0.22	0.25	0.21	0.21
v/c Ratio	1.23	0.49	0.06	0.58	1.19	0.52	0.35	1.18	0.10	0.83	0.61	0.38
Uniform Delay, d1	46.0	17.7	0.0	43.0	25.0	11.2	25.6	39.0	0.0	28.1	35.7	2.0
Delay	133.4	20.3	7.1	41.7	100.5	4.9	25.8	111.5	10.4	41.2	36.1	6.7
LOS	F	C	A	D	F	A	C	F	B	D	D	A
Approach Delay		50.8			80.7			97.1			31.5	
Approach LOS		D			F			F			C	
Queue Length 50th (ft)	-139	181	0	71	-862	101	32	-372	0	57	137	5
Queue Length 95th (ft)	#229	277	27	m69	m#806	m18	56	#496	25	#111	191	60
Internal Link Dist (ft)		1020			820			1144			1080	
50th Up Block Time (%)					6%							
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)					62							

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 8 (8%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.23

Intersection Signal Delay: 70.5

Intersection LOS: E

Intersection Capacity Utilization 113.5%

ICU Level of Service G

Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

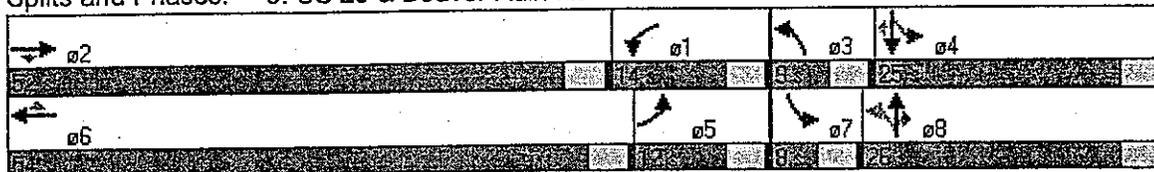
m Volume for 95th percentile queue is metered by upstream signal.

Timings

9: US 29 & Beaver Ruin Rd

4/26/2001

Splits and Phases: 9: US 29 & Beaver Ruin Rd



AM PEAK HOUR

PROJECTED CONDITIONS

Page 5

WOLVERNORC-ST51

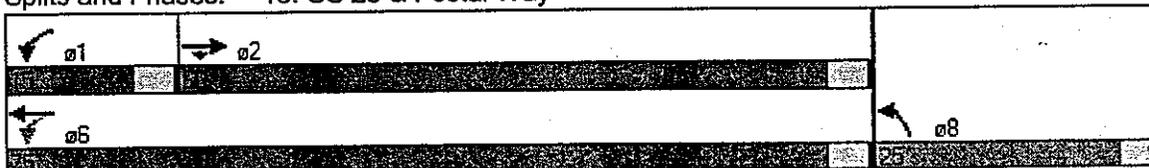


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	3539	1583	1770	3539	1662	0
Flt Permitted			0.174		0.985	
Satd. Flow (perm)	3539	1583	324	3539	1662	0
Satd. Flow (RTOR)		65			73	
Volume (vph)	998	60	62	1620	29	67
Lane Group Flow (vph)	1085	65	67	1761	105	0
Turn Type	Perm pm+pt					
Protected Phases	2		1	6	8	
Permitted Phases		2	6			
Total Split (s)	60.0	60.0	15.0	75.0	25.0	0.0
Act Effct Green (s)	79.2	79.2	86.0	86.8	7.9	
Actuated g/C Ratio	0.79	0.79	0.86	0.87	0.08	
v/c Ratio	0.39	0.05	0.19	0.57	0.53	
Uniform Delay, d1	3.9	0.0	1.1	2.2	13.5	
Delay	4.5	1.1	0.2	0.4	16.7	
LOS	A	A	A	A	B	
Approach Delay	4.3			0.4	16.7	
Approach LOS	A			A	B	
Queue Length 50th (ft)	107	0	1	7	19	
Queue Length 95th (ft)	172	11	m1	m7	68	
Internal Link Dist (ft)	1400			370	984	
50th Up Block Time (%)						
95th Up Block Time (%)						
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)						

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 40 (40%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.57  
 Intersection Signal Delay: 2.4  
 Intersection LOS: A  
 Intersection Capacity Utilization 61.6%  
 ICU Level of Service B  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 16: US 29 & Postal Way

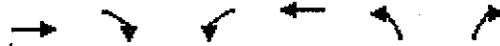


APPENDIX C

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CAPACITY ANALYSES REPORTS

PM PEAK HOUR, EXISTING CONDITIONS

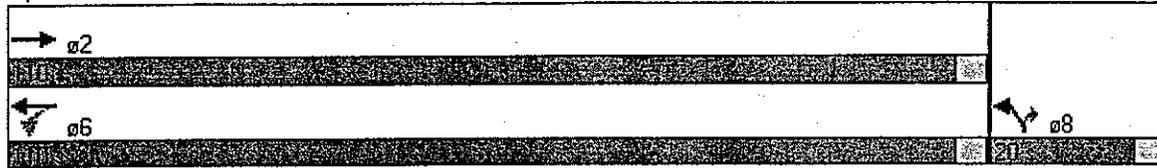


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑↑	↑	↑
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	3525	0	1770	3539	1770	1583
Flt Permitted			0.038		0.950	
Satd. Flow (perm)	3525	0	71	3539	1770	1583
Satd. Flow (RTOR)	7					17
Volume (vph)	2292	59	154	1307	24	209
Lane Group Flow (vph)	2555	0	167	1421	26	227
Turn Type			Perm			Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Total Split (s)	110.0	0.0	110.0	110.0	20.0	20.0
Act Effct Green (s)	106.0		106.0	106.0	16.0	16.0
Actuated g/C Ratio	0.82		0.82	0.82	0.12	0.12
v/c Ratio	0.89		2.88	0.49	0.12	1.08
Uniform Delay, d1	8.0		12.1	3.7	50.7	52.4
Delay	3.3		342.8	3.8	51.2	114.2
LOS	A		F	A	D	F
Approach Delay	3.3			39.4	107.8	
Approach LOS	A			D	F	
Queue Length 50th (ft)	82		-242	156	20	-180
Queue Length 95th (ft)	89		#389	186	49	#370
Internal Link Dist (ft)	570			410	784	
50th Up Block Time (%)						
95th Up Block Time (%)						
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)						

**Intersection Summary**

Cycle Length: 130  
 Actuated Cycle Length: 130  
 Offset: 6 (5%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 2.88  
 Intersection Signal Delay: 22.4  
 Intersection LOS: C  
 Intersection Capacity Utilization 93.5%  
 ICU Level of Service E  
 - Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 5: US 29 & Luxomni Rd



Timings  
7: US 29 & Kroger

4/26/2001

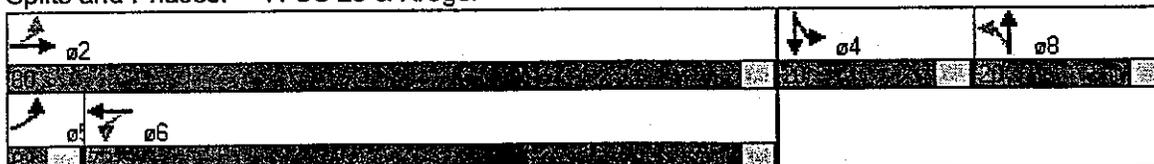


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↕	↕		↖	↗	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1770	3539	0	1770	3507	0	0	1718	0	1770	1530	0
Flt Permitted	0.080			0.059				0.850		0.950		
Satd. Flow (perm)	149	3539	0	110	3507	0	0	1504	0	1515	1530	0
Satd. Flow (RTOR)				9				13			28	
Volume (vph)	14	2135	2	10	1281	80	19	1	12	187	1	26
Lane Group Flow (vph)	15	2323	0	11	1479	0	0	35	0	203	29	0
Turn Type	pm+pt		Perm			Perm			custom			
Protected Phases	5	2			6			8		4	4	
Permitted Phases	2			6			8			4		
Total Split (s)	8.0	80.0	10.0	72.0	72.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
Act Effct Green (s)	88.9	88.9		85.7	85.7			7.4		15.5	15.5	
Actuated g/C Ratio	0.74	0.74		0.71	0.71			0.06		0.13	0.13	
v/c Ratio	0.09	0.89		0.14	0.59			0.33		0.88	0.13	
Uniform Delay: d1	4.5	13.0		6.8	10.5			35.0		51.3	1.6	
Delay	0.4	3.3		8.3	8.2			37.8		68.7	16.7	
LOS	A	A		A	A			D		E	B	
Approach Delay		3.3			8.2			37.8			62.2	
Approach LOS		A			A			D			E	
Queue Length 50th (ft)	0	18		2	170			16		156	1	
Queue Length 95th (ft)	m1	m33		m5	462			49		#290	27	
Internal Link Dist (ft)		820			570			440			592	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

**Intersection Summary**

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 25 (21%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.89  
 Intersection Signal Delay: 8.7  
 Intersection LOS: A  
 Intersection Capacity Utilization 88.8%  
 ICU Level of Service D  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m: Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: US 29 & Kroger



PM PEAK HOUR

PROJECTED CONDITIONS

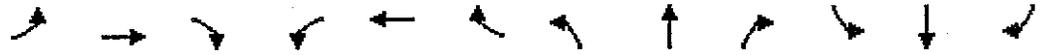
Page 3

WOLVERNORC-ST51

Timings

9: US 29 & Beaver Ruin Rd

4/26/2001



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↗↗	↖	↖↖	↗↗	↖	↖↖	↗↗	↖	↖↖	↗↗	↖
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	1583	3433	3539	1583
Satd. Flow (RTOR)			45			205			124			186
Volume (vph)	222	1535	58	255	882	189	71	342	114	502	892	192
Lane Group Flow (vph)	241	1668	63	277	959	205	77	372	124	546	970	209
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Total Split (s)	18.0	61.0	61.0	14.0	57.0	57.0	8.0	21.0	21.0	24.0	37.0	37.0
Act Effct Green (s)	14.0	57.0	57.0	10.0	53.0	53.0	4.0	16.0	16.0	21.0	33.0	33.0
Actuated g/C Ratio	0.12	0.48	0.48	0.08	0.44	0.44	0.03	0.13	0.13	0.18	0.28	0.28
v/c Ratio	0.60	0.99	0.08	0.97	0.61	0.25	0.68	0.79	0.39	0.91	1.00	0.37
Uniform Delay, d1	50.3	31.3	4.8	54.8	25.7	0.0	57.3	50.4	0.0	48.6	43.4	3.5
Delay	34.6	27.6	2.9	77.5	19.1	2.3	68.8	50.9	8.2	65.7	64.4	6.9
LOS	C	C	A	E	B	A	E	D	A	E	E	A
Approach Delay		27.7			27.9			44.1			57.8	
Approach LOS		C			C			D			E	
Queue Length 50th (ft)	92	476	1	112	132	0	30	147	0	218	395	12
Queue Length 95th (ft)	m94	m#781	m3	#202	192	36	#68	202	54	#328	#542	73
Internal Link Dist (ft)		1020			820			1144			1080	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 4 (3%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 38.5

Intersection LOS: D

Intersection Capacity Utilization 97.5%

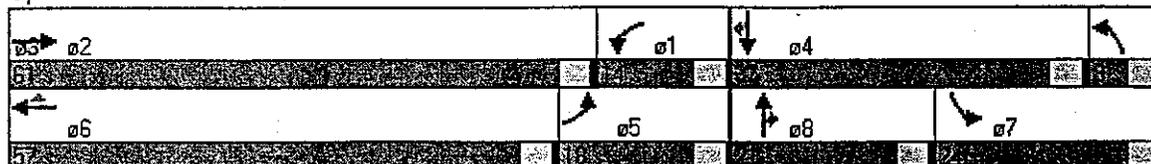
ICU Level of Service E

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

Queue shown is maximum after two cycles.

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

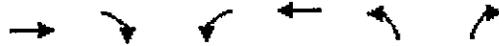
Splits and Phases: 9: US 29 & Beaver Ruin Rd



PM PEAK HOUR

PROJECTED CONDITIONS

WOLVERNORC-ST51

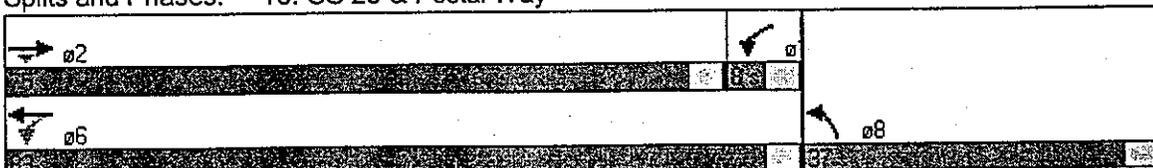


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	3539	1583	1770	3539	1700	0
Flt/Permitted			0.053		0.974	
Satd. Flow (perm)	3539	1583	99	3539	1700	0
Satd. Flow (RTOR)		84			36	
Volume (vph)	1830	100	98	1206	229	198
Lane Group Flow (vph)	1989	109	107	1311	464	0
Turn Type	Perm pm+pt					
Protected Phases	2		1	6	8	
Permitted Phases		2	6			
Total Split (s)	75.0	75.0	8.0	83.0	37.0	0.0
Act Effct Green (s)	71.8	71.8	79.8	79.8	32.2	
Actuated g/C Ratio	0.60	0.60	0.67	0.67	0.27	
v/c Ratio	0.94	0.11	0.88	0.56	0.96	
Uniform Delay, d1	22.1	2.3	34.5	10.7	39.9	
Delay	28.2	3.4	69.4	14.5	57.5	
LOS	C	A	E	B	E	
Approach Delay	26.9			18.6	57.5	
Approach LOS	C			B	E	
Queue Length 50th (ft)	714	8	21	239	307	
Queue Length 95th (ft)	#937	31 m#130		329	#539	
Internal Link Dist (ft)	1400			370	984	
50th Up Block Time (%)						
95th Up Block Time (%)						
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)						

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 111 (93%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 27.5  
 Intersection LOS: C  
 Intersection Capacity Utilization 97.9%  
 ICU Level of Service E  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m: Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 16: US 29 & Postal Way



APPENDIX D

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CAPACITY ANALYSES REPORTS

PM PEAK HOUR, PROJECTED CONDITIONS

Timings  
5: US 29 & Luxomni Rd

4/26/2001



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↗
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	3525	0	1770	3539	1770	1583
Flt Permitted			0.042		0.950	
Satd. Flow (perm)	3525	0	78	3539	1770	1583
Satd. Flow (RTOR)	7					15
Volume (vph)	2292	59	154	1307	24	209
Lane Group Flow (vph)	2555	0	167	1421	26	227
Turn Type			Perm			Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Total Split (s)	100.0	0.0	100.0	100.0	20.0	20.0
Act Effct Green (s)	96.0		96.0	96.0	16.0	16.0
Actuated g/C Ratio	0.80		0.80	0.80	0.13	0.13
v/c Ratio	0.91		2.69	0.50	0.11	1.01
Uniform Delay, d1	8.7		11.7	4.0	45.7	48.5
Delay	3.8		350.0	4.1	46.2	96.5
LOS	A		F	A	D	F
Approach Delay	3.8			40.5	91.4	
Approach LOS	A			D	F	
Queue Length 50th (ft)	8		-219	156	18	-171
Queue Length 95th (ft)	7		#361	188	46	#338
Internal Link Dist (ft)	570			410	784	
50th Up Block Time (%)						
95th Up Block Time (%)	2%					
Trun Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)						

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 44 (37%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 2.69  
 Intersection Signal Delay: 22.1  
 Intersection LOS: C  
 Intersection Capacity Utilization 93.5%  
 ICU Level of Service E  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 5: US 29 & Luxomni Rd

→ 02	
← 06	↔ 08



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑			↑↑			↕		↘	↑	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1770	3539	0	0	3507	0	0	1718	0	1770	1526	0
Flt Permitted	0.098				0.747			0.847		0.950		
Satd. Flow (perm)	182	3539	0	0	2620	0	0	1499	0	1494	1526	0
Satd. Flow (RTOR)					9			13			28	
Volume (vph)	14	2135	2	10	1281	80	19	1	12	187	1	26
Lane Group Flow (vph)	15	2323	0	0	1490	0	0	35	0	203	29	0
Turn Type	pm+pt			Perm			Perm			custom		
Protected Phases	5	2			6			8		4	4	
Permitted Phases	2			6			8			4		
Total Split (s)	8.0	90.0	0.0	82.0	82.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
Act Effct Green (s)	98.3	98.3			95.1			7.6		16.0	16.0	
Actuated g/C Ratio	0.76	0.76			0.73			0.06		0.12	0.12	
v/c Ratio	0.08	0.87			0.78			0.35		0.93	0.14	
Uniform Delay, d1	4.7	12.4			13.4			38.1		56.4	17	
Delay	1.9	6.9			13.0			41.1		87.0	18.1	
LOS	A	A			B			D		F	B	
Approach Delay		6.9			13.0			41.1			78.4	
Approach LOS		A			B			D			E	
Queue Length 50th (ft)	1	230			167			13		172	1	
Queue Length 95th (ft)	m1	m196			509			48		#322	31	
Internal Link Dist (ft)		820			570			440			592	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 110 (85%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 13.5

Intersection LOS: B

Intersection Capacity Utilization 88.8%

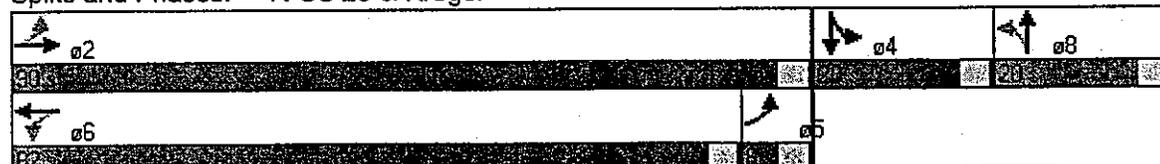
ICU Level of Service D

# 95th percentile volume exceeds capacity; queue may be longer

Queue shown is maximum after two cycles.

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

Splits and Phases: 7: US 29 & Kroger



Timings

9: US 29 & Beaver Ruin Rd

4/26/2001



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕	↗	↖	↕	↗	↖	↕	↗	↖	↕	↗
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1770	3539	1583	1770	3447	0	1770	3405	0	1770	3539	1583
Flt Permitted	0.950			0.950			0.250			0.200		
Satd. Flow (perm)	1770	3539	1583	1770	3447	0	466	3405	0	373	3539	1583
Satd. Flow (RTOR)			37		23			29				180
Volume (vph)	222	1535	58	255	882	189	71	342	114	502	892	192
Lane Group Flow (vph)	241	1668	63	277	1164	0	77	496	0	546	970	209
Turn Type	Prot		Perm	Prot			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2				8			4		4
Total Split (s)	22.0	57.0	57.0	21.0	56.0	0.0	8.0	20.0	0.0	32.0	44.0	44.0
Act Effect Green (s)	17.9	53.0	53.0	17.0	52.0		20.0	16.0		48.0	40.0	40.0
Actuated g/C Ratio	0.14	0.41	0.41	0.13	0.40		0.15	0.12		0.37	0.31	0.31
v/c Ratio	0.98	1.16	0.09	1.20	0.84		0.69	1.11		1.24	0.89	0.34
Uniform Delay, d1	55.8	38.5	9.6	56.5	34.4		30.6	53.3		37.2	42.9	4.4
Delay	64.7	91.1	2.6	128.6	22.4		47.9	110.7		134.6	47.0	7.2
LOS	E	F	A	F	C		D	F		F	D	A
Approach Delay		85.0			42.8			102.3			69.9	
Approach LOS		F			D			F			E	
Queue Length 50th (ft)	196	-877	8	-284	456		42	-241		-523	410	17
Queue Length 95th (ft)	m#237	m#969	m#9	m#423	462		#103	#324		#749	#526	78
Internal Link Dist (ft)		1020			820			1144			1080	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

**Intersection Summary:**

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 94 (72%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 71.5      Intersection LOS: E

Intersection Capacity Utilization 119.3%      ICU Level of Service G

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

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

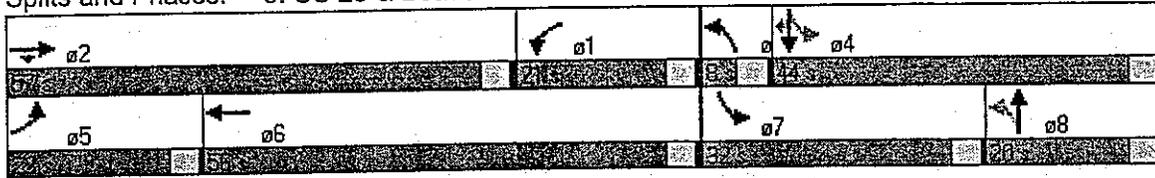
m Volume for 95th percentile queue is metered by upstream signal.

Timings

9: US 29 & Beaver Ruin Rd

4/26/2001

Splits and Phases: 9: US 29 & Beaver Ruin Rd



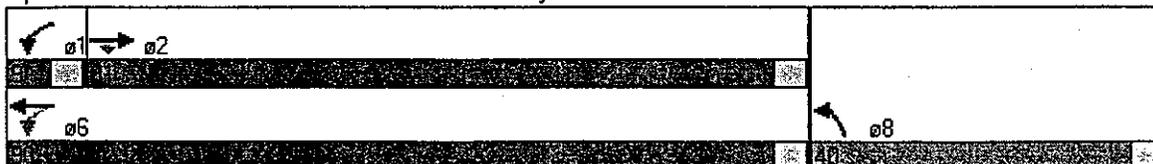


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	3539	1583	1770	3539	1700	0
Flt Permitted			0.049		0.974	
Satd. Flow (perm)	3539	1583	91	3539	1700	0
Satd. Flow (RTOR)		78			33	
Volume (vph)	1830	100	98	1206	229	198
Lane Group Flow (vph)	1989	109	107	1311	464	0
Turn Type	Perm pm+pt					
Protected Phases	2		1	6	8	
Permitted Phases		2	6			
Total Split (s)	81.0	81.0	9.0	90.0	40.0	0.0
Act Effct Green (s)	77.9	77.9	87.0	87.0	35.1	
Actuated g/C Ratio	0.60	0.60	0.67	0.67	0.27	
v/c Ratio	0.94	0.11	0.85	0.55	0.96	
Uniform Delay, d1	23.8	3.0	15.8	11.3	43.4	
Delay	29.7	4.0	37.3	11.8	60.6	
LOS	C	A	D	B	E	
Approach Delay	28.3			13.7	60.6	
Approach LOS	C			B	E	
Queue Length 50th (ft)	781	10	31	492	360	
Queue Length 95th (ft)	#1004	35	m#88	560	#572	
Internal Link Dist (ft)	1400			370	984	
50th Up Block Time (%)				10%		
95th Up Block Time (%)				8%		
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)				114		

**Intersection Summary**

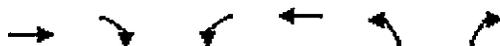
Cycle Length: 130  
 Actuated Cycle Length: 130  
 Offset: 64 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Control Type: Actuated Coordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 26.9  
 Intersection LOS: C  
 Intersection Capacity Utilization 97.9%  
 ICU Level of Service E  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m 95th percentile queue is metered by upstream signal

Splits and Phases: 16: US 29 & Postal Way



HCM Unsignalized Intersection Capacity Analysis  
 5: US 29 & Luxomni Rd

4/26/2001



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	2292	59	154	1307	24	209
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	2491	64	167	1421	26	227

Pedestrians

Lane Width (ft)

Walking Speed (ft/s)

Percent Blockage

Right turn flare (veh)

Median type: None

Median storage (veh)

vC, conflicting volume		2555	3568	1278
vC1, stage 1 conf vol				
vC2, stage 2 conf vol				
tC, single (s)		4.1	6.8	6.9
tC, 2 stage (s)				
tF (s)		2.2	3.5	3.3
p0 queue free %		2	0	0
cM capacity (veh/h)		171	0	157

Direction Lane #	EB1	EB2	WB1	WB2	WB3	NB1	NB2
Volume Total	1661	895	167	710	710	26	227
Volume Left	0	0	167	0	0	26	0
Volume Right	0	64	0	0	0	0	227
cSH	1700	1700	171	1700	1700	0	157
Volume to Capacity	0.98	0.53	0.98	0.42	0.42	338.27	1.45
Queue Length (ft)	0	0	193	0	0	Err	365
Control Delay (s)	0.0	0.0	118.6	0.0	0.0	Err	285.9
Lane LOS			F			F	F
Approach Delay (s)	0.0		12.5			1286.4	
Approach LOS						F	

Intersection Summary

Average Delay	78.6
Intersection Capacity Utilization	93.5%
ICU Level of Service	E

**AGREEMENT**  
**BETWEEN**  
**DEPARTMENT OF TRANSPORTATION**  
**STATE OF GEORGIA**  
**AND**  
**GWINNETT COUNTY**  
**FOR**

**INTERSECTION IMPROVEMENTS AT SR 8/US 29 at SR 378/BEAVER RUIN ROAD**

THIS AGREEMENT, is made and entered into this 9 day of Sept, 2000, by and between the DEPARTMENT OF TRANSPORTATION, an agency of the State of Georgia, hereinafter called the "DEPARTMENT", and GWINNETT COUNTY, GEORGIA, acting by and through its BOARD OF COMMISSIONERS, hereinafter called the "LOCAL GOVERNMENT".

WHEREAS, the LOCAL GOVERNMENT has represented to the DEPARTMENT a desire to construct intersection improvements at SR 8/US 29 at SR 378/BEAVER RUIN ROAD described as Project STP-0000-00(845), P.I. No. 0000845, hereinafter referred to as the "PROJECT"; and

WHEREAS, the LOCAL GOVERNMENT has represented to the DEPARTMENT a desire to participate by providing the preconstruction engineering activities needed for the improvements and other costs as specified in the AGREEMENT, and the DEPARTMENT has relied upon such representations; and

**WHEREAS, the DEPARTMENT has expressed a willingness to fund the right-of-way and construction of the PROJECT with funds apportioned to the DEPARTMENT by the Federal Highway Administration, hereinafter referred to as the "FHWA", under Title 23, United States Code, Section 104, subject to those certain conditions set forth in the AGREEMENT.**

**THEREFORE, in consideration of the mutual promises made and of the benefits to flow from one to the other, the DEPARTMENT and the LOCAL GOVERNMENT hereby agree each with the other as follows:**

- 1. All Primary Consultant firms hired by the LOCAL GOVERNMENT to provide services on the PROJECT shall be prequalified with the DEPARTMENT in the appropriate area-classes. The DEPARTMENT shall, on request, furnish the LOCAL GOVERNMENT with a list of prequalified consultant firms in the appropriate area-classes.**
- 2. The PROJECT construction and right-of-way plans shall be prepared in English units.**
- 3. Both the LOCAL GOVERNMENT and the DEPARTMENT hereby acknowledge that time is of the essence and both parties shall adhere to the priorities established in the approved State Transportation Improvement Program (STIP) or earlier. Furthermore, all parties shall adhere to the detailed project schedule, as approved by the DEPARTMENT. In the completion of respective commitments contained herein, if a change in schedule is needed, the DEPARTMENT shall have final authority. If, for any reason, the LOCAL GOVERNMENT does not produce acceptable**

deliverables at the milestone dates defined in the STIP, or in the approved schedule, the DEPARTMENT reserves the right to delay the project's implementation until funds can be re-identified for construction or right-of-way, as applicable.

4. All drafting and design work performed on the project shall be done utilizing Microstation and CAICE software respectively, and shall be organized as per the DEPARTMENT'S guidelines on electronic file management.
5. The LOCAL GOVERNMENT shall contribute towards the PROJECT by funding all cost for the preconstruction engineering (design). The preconstruction engineering activities shall be accomplished in accordance with the DEPARTMENT'S Plan Development Process, the Plan Presentation Guide, the applicable guidelines of the American Association of State Highway and Transportation Officials, hereinafter referred to as "AASHTO", the DEPARTMENT'S Standard Specification for the Construction of Transportation Systems, PROJECT schedules, and applicable guidelines of the DEPARTMENT. The LOCAL GOVERNMENT responsibility for design shall include, but is not limited to the following items.
  - a. Prepare the PROJECT concept report in accordance with the format used by the DEPARTMENT. The concept for the PROJECT shall be developed to accommodate the future traffic volumes as generated by the LOCAL GOVERNMENT as provided for in paragraph 5b and approved by the



design of the bridge and shall incorporate these plans into this PROJECT as a part of this Agreement.

9. The DEPARTMENT shall be responsible for all reimbursable utility relocation costs necessary for the construction of the PROJECT.
10. The LOCAL GOVERNMENT shall be responsible for providing energy, maintenance and operational costs of any roadway and interchange lighting within the PROJECT limits.
11. The LOCAL GOVERNMENT shall be responsible for all costs for maintaining any sidewalks within the PROJECT limits.
12. The LOCAL GOVERNMENT shall follow the DEPARTMENT'S procedures for identification of existing and proposed utility facilities on the PROJECT. These procedures, in part, require all requests for existing, proposed or relocated facilities to flow through the DEPARTMENT'S Project Liaison and the District Utilities Engineer.
13. Upon completion and approval of the PROJECT plans, certification that all needed rights-of-way have been obtained and cleared of obstructions, and certification that all needed permits for the PROJECT have been obtained by the LOCAL GOVERNMENT, the DEPARTMENT shall let the PROJECT for construction. Except as provided herein and upon receipt of an acceptable bid, the DEPARTMENT shall bear 100% of all costs for construction, including all costs associated with inspection and materials testing during construction. The DEPARTMENT shall be solely responsible for securing and awarding the construction contract for the PROJECT.

14. The LOCAL GOVERNMENT agrees that all reports, plans, drawings, studies, specifications, estimates, maps, computations, computer diskettes and printouts, and any other data prepared under the terms of this agreement shall become the property of the DEPARTMENT. This data shall be organized, indexed, bound and delivered to the DEPARTMENT no later than the advertisement of the PROJECT for letting. The DEPARTMENT shall have the right to use this material without restriction or limitation and without compensation to the LOCAL GOVERNMENT.
15. The LOCAL GOVERNMENT shall be responsible for the professional quality, technical accuracy, and the coordination of all designs, drawings, specifications, and other services furnished by or on behalf of the LOCAL GOVERNMENT pursuant to this AGREEMENT. The LOCAL GOVERNMENT shall correct or revise, or cause to be corrected or revised, any errors or deficiencies in the designs, drawings, specifications, and other services furnished for this PROJECT. All revisions shall be coordinated with the DEPARTMENT prior to issuance. The LOCAL GOVERNMENT shall also be responsible for any claim, damage, loss or expense that is attributable to negligent acts, errors, or omissions related to the designs, drawings, specifications, and other services furnished by or on behalf of the LOCAL GOVERNMENT pursuant to this AGREEMENT.
16. The LOCAL GOVERNMENT shall prepare all shop drawings for approval by the DEPARTMENT.

17. This AGREEMENT is made and entered into in Fulton County, Georgia,  
and shall be governed and construed under the laws of the State of Georgia.  
The covenants herein contained shall, except as otherwise provided, accrue to  
the benefit of and be binding upon the successors and assigns of the parties  
hereto.

IN WITNESS WHEREOF, the DEPARTMENT and the LOCAL GOVERNMENT have caused these presents to be executed under seal by their duly authorized representatives.

RECOMMENDED:

BOARD OF COMMISSIONERS

Larry E. Dent  
Larry E. Dent  
District Engineer

BY: [Signature]  
Chairman

Thomas L. Turner  
Thomas Turner, P.E.  
Director of Preconstruction

Signed, sealed and delivered this  
7 Day of Sept., 2000  
in the presence of:

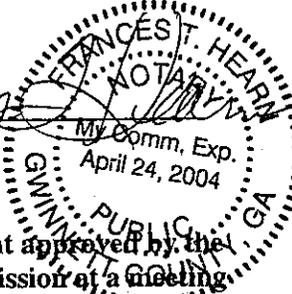
Frank L. Danchetz  
Frank L. Danchetz, P.E.  
Chief Engineer

Linda G. Holbrook  
Witness

DEPARTMENT OF TRANSPORTATION

[Signature]  
Witness

BY: [Signature]  
Tom Coleman, Jr.  
Commissioner

[Signature]  
Notary Public  


ATTEST:

This Agreement approved by the  
County Commission at a meeting  
held at:

Billy J. Sharp  
Treasurer

Lawrenceville, Ga.

The 6th day of Sept, 2000

[Signature]  
County Clerk

REVIEWED 9.28.00  
(DATE)  
[Signature]  
LEGAL - TRANSPORTATION

APPROVED AS TO FORM:

[Signature]

# NOTICE OF LOCATION AND DESIGN APPROVAL

**STP-0000-00 (845)**  
**GWINNETT COUNTY**  
**P.I. NO. 0000845**

Notice is hereby given in compliance with Georgia Code 22-2-109 that the Georgia Department of Transportation has approved the Location and Design of the above project.

The date of location approval is: \_\_\_\_\_

This project consists of widening and reconstruction on US 29/SR 8 including the intersection improvements at Beaver Ruin and Arcado Roads. The construction will take place from just West of Postal Way to Luxomi Road in Gwinnett County.

Any interested party may obtain a copy of the drawings or maps or plats or portions thereof by paying a nominal fee and requesting in writing to:

Todd I. Long, P.E., Project Manager  
Georgia Department of Transportation  
Gainesville District Office  
[Todd.long@dot.state.ga.us](mailto:Todd.long@dot.state.ga.us)  
2505 Athens Highway, S.E.  
Gainesville, GA 30503-1057  
770.532.5520

Any written request or communication in reference to this project or notice should include the Project and P. I. Numbers as noted at the top of this notice.

DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA

District One

PROJECT CONCEPT REPORT

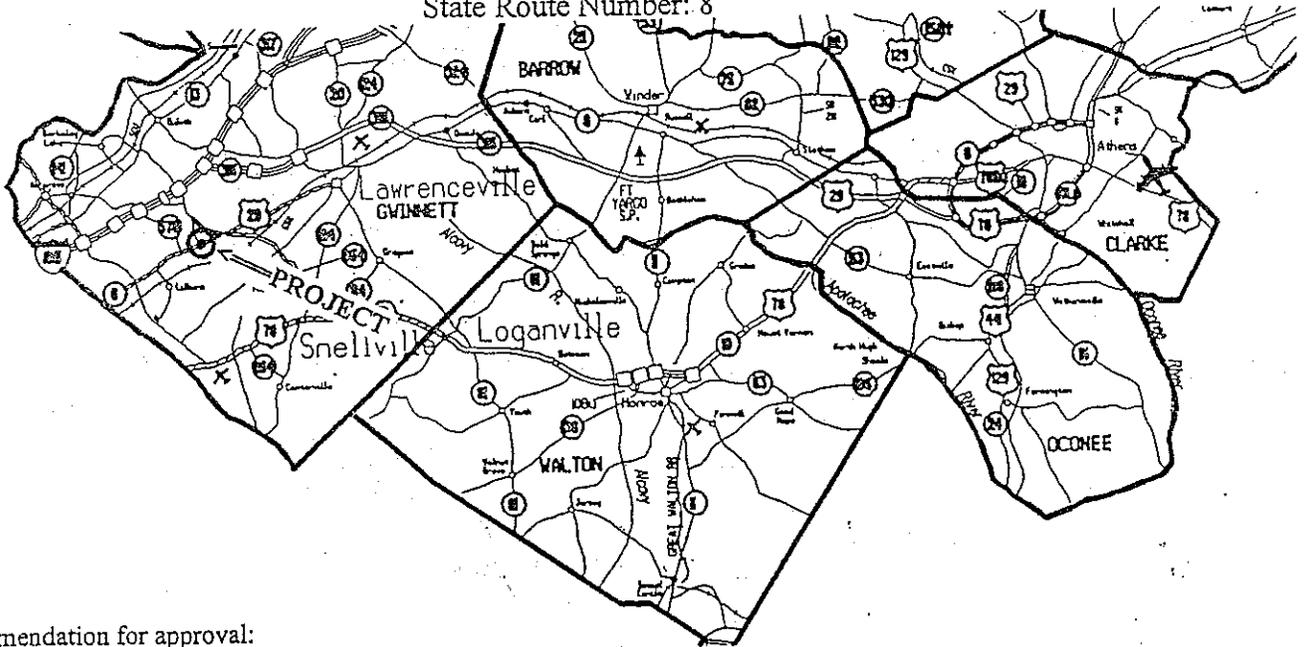
Project Number: STP-0000-00(844)

County: Gwinnett

P. I. Number: 0000844

Federal Route Number: 29

State Route Number: 8



Recommendation for approval:

DATE 7/12/01

DATE 7/12/01

[Signature]  
Project Manager  
[Signature]  
Office Head/District Engineer

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 \_\_\_\_\_

DATE 7/19/01

DATE \_\_\_\_\_

DATE \_\_\_\_\_

DATE \_\_\_\_\_

DATE \_\_\_\_\_

State Transportation Planning Administrator

[Signature]  
State Transportation Programming Engineer

State Environmental/Location Engineer

State Traffic Operations Engineer

Project Review Engineer

State Bridge & Structural Engineer

Department of Transportation  
State of Georgia

INTERDEPARTMENTAL CORRESPONDENCE

File: STP - 0000-00 (844) / Gwinnett County  
P.I. No. 000844

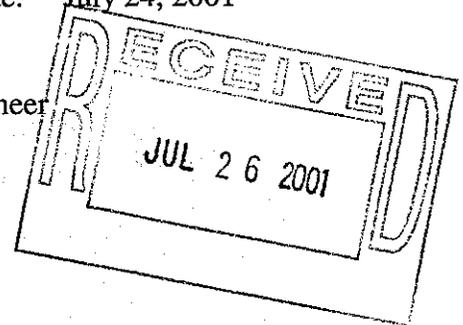
Office: Traffic Operations  
Atlanta, Georgia

Date: July 24, 2001

From: <sup>MGW</sup> M.G. Waters, III, P.E., State Traffic Operations Engineer

To: Wayne Hutto, Assistant Director of Preconstruction

Subject: Project Concept Report Review



We have reviewed the above referenced concept report for the installation of a 20-foot raised median on SR 8/US 29 and dual left turn lanes at the intersection of SR 8/US 29 and Pleasant Hill Road. The project length is 0.985 miles.

SR 8/US 29 is an existing 5-lane urban roadway with a 12-foot flush median and a current AADT of 39,215 vehicles. The posted speed limit is 40/45 mph.

This concept proposes to install the 20-foot raised median on SR 8/US 29 from Luxomni Road to Ronald Reagan Parkway and on Pleasant Hill Road from SR 8/US 29 to Carter Drive. Dual left turn lanes will be installed on the eastbound approach of Pleasant Hill Road at SR 8/US 29.

We believe this concept will improve safety and traffic operations within this area, therefore find this report satisfactory for approval.

MGW/BM

Attachment (signature page)

Cc: Harvey Keeper, State Environment/Location Engineer  
Todd Long, District Preconstruction Engineer  
David Mulling, State Review Engineer, w/ attachment  
Marta Rosen, State Transportation Planning Administrator  
Chuck Hasty, TMC  
General Files

DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA

District One

PROJECT CONCEPT REPORT

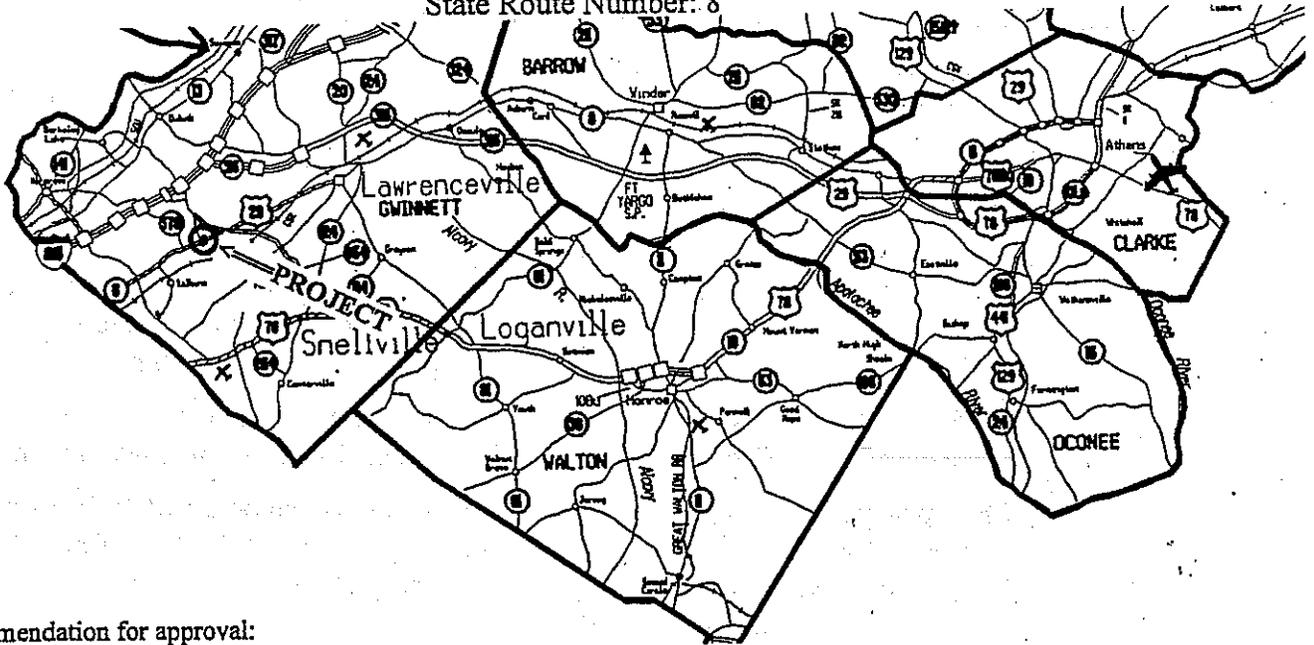
Project Number: STP-0000-00(844)

County: Gwinnett

P. I. Number: 0000844

Federal Route Number: 29

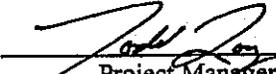
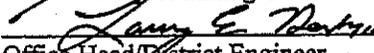
State Route Number: 8



Recommendation for approval:

DATE 7/12/01

DATE 7/13/01

  
Project Manager  
  
Office Head/District Engineer

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 \_\_\_\_\_

DATE \_\_\_\_\_

DATE \_\_\_\_\_

DATE 7/25/01

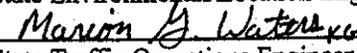
DATE \_\_\_\_\_

DATE \_\_\_\_\_

\_\_\_\_\_  
State Transportation Planning Administrator

\_\_\_\_\_  
State Transportation Programming Engineer

\_\_\_\_\_  
State Environmental/Location Engineer

  
State Traffic Operations Engineer

\_\_\_\_\_  
Project Review Engineer

\_\_\_\_\_  
State Bridge & Structural Engineer

DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA

District One

PROJECT CONCEPT REPORT

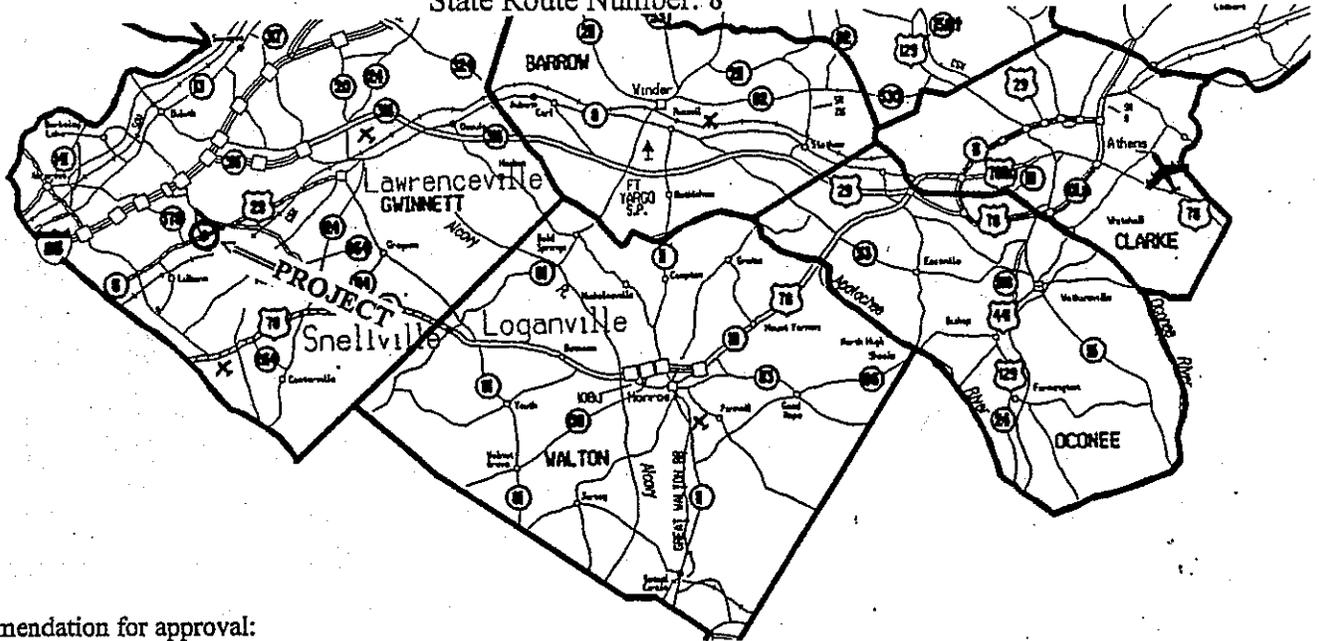
Project Number: STP-0000-00(844)

County: Gwinnett

P. I. Number: 0000844

Federal Route Number: 29

State Route Number: 8



Recommendation for approval:

DATE 7/12/01

DATE 7/12/01

[Signature]  
Project Manager  
[Signature]  
Office Head/District Engineer

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 \_\_\_\_\_

\_\_\_\_\_  
State Transportation Planning Administrator

DATE \_\_\_\_\_

\_\_\_\_\_  
State Transportation Programming Engineer

DATE \_\_\_\_\_

\_\_\_\_\_  
State Environmental/Location Engineer

DATE \_\_\_\_\_

\_\_\_\_\_  
State Traffic Operations Engineer

DATE \_\_\_\_\_

\_\_\_\_\_  
Project Review Engineer

DATE 7/24/01

[Signature]  
State Bridge & Structural Engineer

DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA

District One

PROJECT CONCEPT REPORT

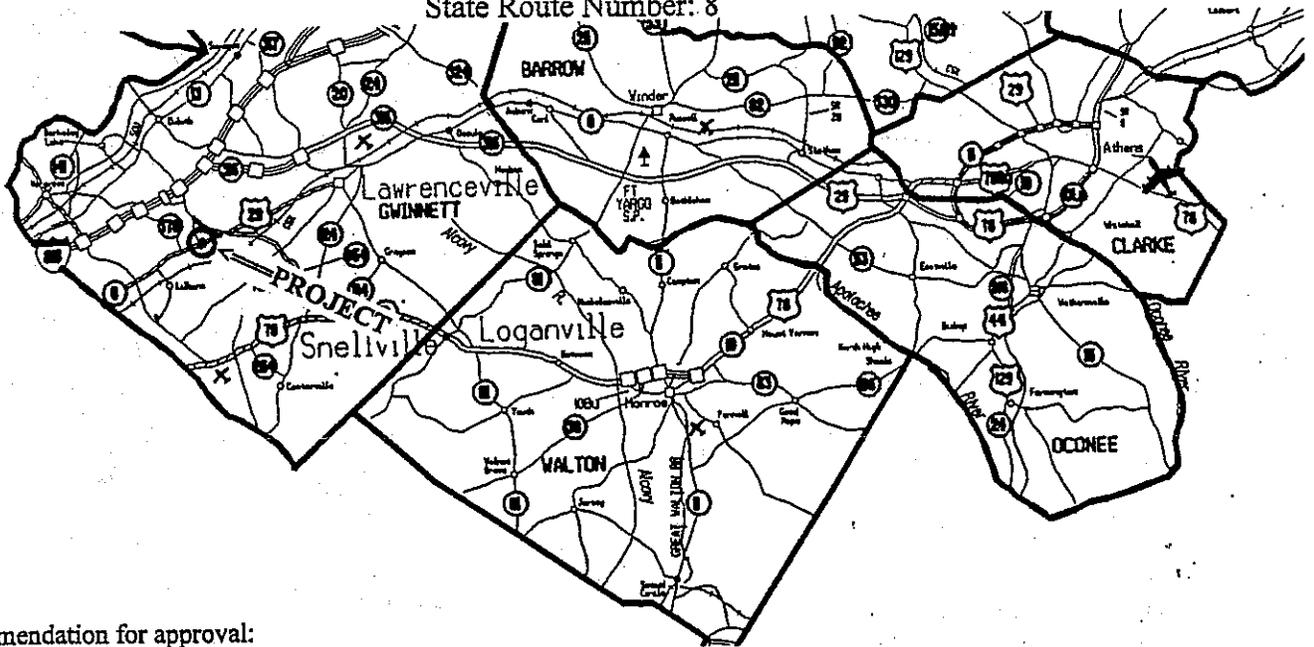
Project Number: STP-0000-00(844)

County: Gwinnett

P. I. Number: 0000844

Federal Route Number: 29

State Route Number: 8



Recommendation for approval:

DATE 7/12/01

DATE 7/12/01

[Signature]  
Project Manager  
[Signature]  
Office Head/District Engineer

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 \_\_\_\_\_

DATE \_\_\_\_\_

DATE \_\_\_\_\_

DATE \_\_\_\_\_

DATE 7/31/01

DATE \_\_\_\_\_

\_\_\_\_\_  
State Transportation Planning Administrator

\_\_\_\_\_  
State Transportation Programming Engineer

\_\_\_\_\_  
State Environmental/Location Engineer

\_\_\_\_\_  
State Traffic Operations Engineer

[Signature]  
Project Review Engineer

\_\_\_\_\_  
State Bridge & Structural Engineer