

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

Traffic Operations
PROJECT CONCEPT REPORT
Project Number: CSSFT-0008-00(719)
County: Whitfield
P.I. Number: 0008719

Federal Route Number: 41 & 76
State Route Number: 3 & 71

North Dalton Bypass at Glenwood Avenue and Cleveland Highway

Submitted for approval:

DATE 24 SEPT 2010



Project Manager

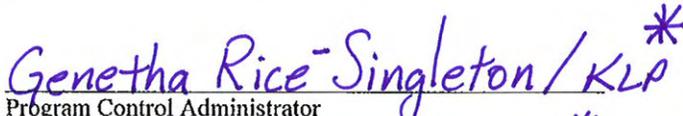
DATE 9-24-10



State Traffic Engineer

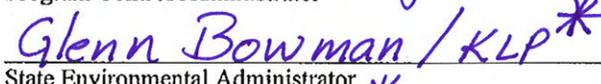
Recommendation for approval:

DATE 10/15/2010



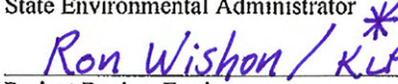
Program Control Administrator

DATE 10/13/2010



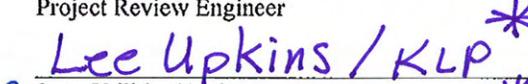
State Environmental Administrator

DATE 10/12/2010



Project Review Engineer

DATE 10/12/2010



for State Utilities Engineer

DATE 10/12/2010



District Engineer

DATE _____

State Transportation Financial Management Administrator

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 10-13-10



State Transportation Planning Administrator

* RECOMMENDATIONS ON FILE.



Project Location Map

Need and Purpose:

The North Dalton Bypass (US 41/US 76/SR 3) intersection with Glenwood Avenue and Cleveland Highway (SR 71) has had 529 crashes over the last eight years with 72% resulting in rear end crashes. Approximately 18% of the total crashes at the intersection were angle crashes. The intersection currently operates at a level of service D/D for the AM/PM peak hours, and the future no-build anticipated level of service for 2034 is E/F for the AM/PM peak hours. The need exists to improve the intersection to address the rear end and angle crashes and to improve the level of service at the North Dalton Bypass intersection with Glenwood Avenue and Cleveland Highway.

The purpose of the proposed project is to reduce the crash frequency and severity and improve the operation of the intersection of the North Dalton Bypass with Glenwood Avenue and Cleveland Highway. The proposed project will replace the existing traffic signal with a signal that will have a protected eastbound left turn phase and a westbound protective/permissive left turn phase for traffic on the North Dalton Bypass. These changes are anticipated to reduce side swipe crashes caused by left turning vehicles. Pedestrian facilities at the intersection and an additional eastside sidewalk are intended to provide pedestrians with improved crossings of travel lanes and accessibility to the businesses surrounding the intersection. The proposed project will also add dual left turn lanes on northbound Glenwood Avenue and eastbound on the North Dalton Bypass. The addition of dual movements will allow more vehicles through the intersection and is anticipated to improve the level of service to D/D for the 2034 AM/PM peak hours. The additional storage will provide more queue room for turning vehicles which is anticipated to reduce rear end crashes. Free flow right turns from North Dalton Bypass onto Glenwood Avenue and Cleveland Highway will be removed and replaced with a yield condition, eliminating an existing weave movement on Glenwood Avenue and Cleveland Highway that should improve the efficiency of the roadways.

Background

The North Dalton Bypass has two through lanes in each direction, a center two-way left turn lane, and rural shoulders. On both sides of the intersection, there are right turn lanes and the two-way left turn lane becomes a single left turn lane.

Glenwood Avenue and Cleveland Highway currently have two through lanes in each direction and urban shoulders with a sidewalk on the west side. There is an existing 4ft. wide raised median with single left turn lanes on both sides of the intersection.

The land use in the vicinity of the project is predominately commercial with some industrial on the north side. The North Dalton Bypass, Glenwood Avenue, and Cleveland Highway are functionally classified as urban minor arterials.

Crash Data

The crash data along the sections of the North Dalton Bypass, Cleveland Highway and Glenwood Avenue within the project limits was obtained for the period between January 1, 2000 and December 31, 2008. The crashes which were reported to have occurred at the North Dalton Bypass at Glenwood Avenue/Cleveland Highway intersection are summarized and are provided in Table 1. As shown in Table 1, there were a total of 529 crashes reported to have occurred at this intersection for the nine (9) year period, which included 117 injury crashes and 2 fatal crashes.

Table 1. Summary of Traffic Crash History by Severity at North Dalton Bypass (SR3/US 41/US76) at Glenwood Avenue and Cleveland Highway (SR71) Intersection

Year	Crashes		
	Total	Injury	Fatal
2000	73	22	0
2001	72	15	0
2002	70	10	0
2003	57	13	0
2004	66	14	0
2005	47	10	0
2006	60	13	2
2007	44	14	0
2008	40	6	0
Total	529	117	2

A detailed analysis of the crashes was completed to determine the type of crashes at the intersection. Table 2 indicates that the majority of the crashes recorded were rear end crashes, which accounted for about 72% of the total number of crashes. About 18% were angle crashes, 8% were sideswipe crashes, 1% was single-vehicle crashes, and 1% was head-on crashes. Further analysis showed that about 40% of the rear end crashes were caused by vehicles traveling in the south direction.

Table 2. Summary of Traffic Crash History by Type at North Dalton Bypass (SR3/US 41/US76) at Glenwood Avenue and Cleveland Highway (SR71) Intersection

Year	Type						Total
	Angle	Head On	Rear End	Sideswipe - Same Direction	Sideswipe - Opposite Direction	Other (Single-Vehicle)	
2000	12	0	55	2	3	1	73
2001	16	2	46	7	0	1	72
2002	10	1	50	8	0	1	70
2003	11	0	43	3	0	0	57
2004	15	0	43	8	0	0	66
2005	3	2	40	2	0	0	47
2006	13	2	39	5	0	1	60
2007	11	1	31	1	0	0	44
2008	6	0	33	1	0	0	40
Total	97	8	380	37	3	4	529

Operational Analysis

The A.M. and P.M. peak hour turning movement counts and 24-hour bi-directional counts were obtained at the major intersections and roadways within the study area by All Traffic Data, Inc. These “short-term” traffic counts were adjusted using day of the week, month of the year and axle adjustment factors to develop annual average daily traffic (AADT) volumes. The opening year for this project was assumed to be 2014 and the design year to be 2034. The design year was assumed to be 20 years from the opening year. The 2014 Opening

Year and the 2034 Design Year AADT for the roadways where intersection improvements are proposed are presented on Page 6.

The existing AM and PM peak hour turning movement volumes, existing AADT volumes, the design year AM and PM peak hour turning movement volumes and the opening year and design year AADT volumes are provided as an attachment (See attachment 4) with this report.

Capacity Analysis and Intersection Levels of Service

The existing and anticipated capacity analyses were conducted at the intersection to determine the operational characteristics based on the existing and future traffic conditions. The capacity analysis was conducted using the methodologies outlined in the Highway Capacity manual (HCM) and the Synchro 7.0 software program. The results of the capacity analyses are summarized in Table 3.

Table 3. Existing and Anticipated Intersection Levels of Service

Intersection	Traffic Control	Level of Service (AM/PM)				
		2010 Existing	2014 No Build	2014 Build	2034 No Build	2034 Build
North Dalton Bypass (SR 3/US 41/US 76) at Glenwood Avenue and Cleveland Highway (SR 71) intersection	Traffic Signal	D/D	D/D	C/C	E/F	D/D

Description of the proposed project:

The project begins on the North Dalton Bypass (SR 3/US41/US76) just east of the intersection with Glenwood Avenue and Cleveland Highway (SR 71) at MP 18.10 and ends at the west edge of the Norfolk Southern Railway overpass bridge at MP 18.37 for a total project length of 0.27 miles. The entire project is located within Whitfield County and the City of Dalton. The project limits on Glenwood Avenue begin north of the Mill Creek bridge and end at the intersection with the North Dalton Bypass. The project limits on Cleveland Highway (SR 71) start at the intersection with the North Dalton Bypass and extend 700 ft north.

The project proposes improvements to the existing intersection of the North Dalton Bypass (SR 3/US41/US76) with Glenwood Avenue and Cleveland Highway (SR71). The North Dalton Bypass eastbound leg will be improved with an extended right turn lane and the addition of dual left turn lanes. The Glenwood Avenue leg will also be improved with dual left turn lanes that will relocate the raised median between Smith Industrial Boulevard and the North Dalton Bypass. A sidewalk will be also added along the east side of Glenwood Avenue and Cleveland Highway throughout the project. The travel lanes on all four intersection legs will be shifted and tapered outside to provide room for the dual left turn lanes. The existing acceleration lanes on Glenwood Avenue and Cleveland Highway that receive the North Dalton Bypass right turns will be removed to eliminate weaving.

The existing traffic signal will be upgraded to incorporate the above new lane configurations, protected eastbound left turn phasing, westbound protective/permissive left turn phasing, and pedestrian movement accommodations. Minor adjustments will also be made to the existing traffic signal on Glenwood Avenue at the intersection with Smith Industrial Boulevard.

Is the project located in a PM 2.5 Non-attainment area? _____ Yes X No

Is the project located in an Ozone Non-attainment area? _____ Yes No
(The proposed project is exempt from conformity due to the potential reduction of crash frequency and severity.)

PDP Classification: Major _____ Minor

Federal Oversight: Full Oversight (), Exempt() , State Funded (), or Other ()

Functional Classification: Cleveland Hwy - Urban Minor Arterial
 SR 3/North Dalton Bypass and Glenwood Ave – Urban Principal Arterials

U. S. Route Number(s): 41 & 76 **State Route Number(s):** 3 & 71

Traffic (AADT):

Roadway Segment	2010 Existing Year AADT	2014 Base Year AADT	2034 Design Year AADT
North Dalton Bypass (SR 3/US 41/US 76) – West of intersection	31,100	32,650	39,850
North Dalton Bypass (SR 3/US 41/US 76) – East of intersection	18,900	19,900	24,300
Cleveland Highway (SR 71) – North of Intersection	25,650	26,900	32,850
Glenwood Ave. – South of intersection	31,450	33,050	40,300

Existing design features:

• Typical Section:

North Dalton Bypass (SR 3/US 41/US 76)	Four 12 ft wide travel lanes, a single 14 ft two-way left turn lane, a single 12 ft wide right turn lane, and rural shoulders (4 ft paved and 6 ft grass).
Glenwood Ave. and Cleveland Hwy. (SR 71)	Four 12 ft wide travel lanes, a 4 ft raised median with a single 12 ft left turn lane, a single 12 ft wide right turn lane, and urban border areas (consisting of 30 in curb and gutter with 5 ft sidewalks).

• Posted Speed:

North Dalton Bypass (SR 3/US 41/US 76)	55 mph west of intersection/45 mph east of intersection
Glenwood Ave. and Cleveland Hwy. (SR 71)	45 mph

- Maximum superelevation rate for curve:

6.0% - North Dalton Bypass (SR 3/US 41/US 76)
4% - Glenwood Avenue and Cleveland Highway (SR 71)

- Maximum grade:

6.0% - North Dalton Bypass (SR 3/US 41/US 76)
2.3% - Glenwood Avenue and Cleveland Highway (SR 71)
11% - Driveways

- Width of right of way:

Varies from 175' to 250' - North Dalton Bypass (SR 3/US 41/US 76)
Varies from 135' to 140' - Glenwood Avenue and Cleveland Highway (SR 71)

- Major structures: None

- Major interchanges or intersections along the project: Intersection of North Dalton Bypass (SR3/US 41/US76) with Glenwood Avenue/ Cleveland Highway (SR71)
- The existing roadway is entirely within Whitfield County and the City of Dalton. The project begins at MP 18.10 and ends at MP 18.37 on the North Dalton Bypass for a total project length of 0.27 miles.

Proposed Design Features:

- Proposed typical sections:

North Dalton Bypass (SR 3/US 41/US 76)	Four 12-ft wide travel lanes, two 12-ft wide northbound left turn lanes, one 12-ft wide southbound left turn lane, a 12-ft wide right turn lane in both directions and 10-ft shoulders (6.5-ft paved)
Glenwood Avenue and Cleveland Highway (SR 71)	Four 12-ft travel lanes, a 4-ft raised median, two 12-ft wide westbound left turn lanes, one 12-ft wide eastbound left turn lane, 12-ft wide right turn lanes in both directions and 10-ft. urban shoulders with 30-in curb and gutter and 5-ft sidewalk.

- Proposed design speed North Dalton Bypass (Mainline): 55 mph
- Proposed design speed Cleveland Hwy and Glenwood Ave. (Side Street): 45 mph
- Proposed maximum grade North Dalton Bypass (Mainline): 6.4%
- Maximum grade allowable North Dalton Bypass (Mainline): 6.0%
- Proposed maximum grade Cleveland Hwy and Glenwood Ave. (Side Street): 2.3%
- Maximum grade allowable Cleveland Hwy and Glenwood Ave. (Side Street): 6.0%
- Proposed maximum grade driveway: 11.0%
- Proposed minimum radius of curve: 1320-ft (Mainline), 1740-ft (Side Street)
- Minimum radius allowable: 1060-ft (Mainline), 711-ft (Side Street)
- Maximum allowable super-elevation rate: 6.0% (Mainline), 4.0% (Side Street)
- Proposed maximum super-elevation rate: 5.8% (Mainline), 3.2% (Side Street)
- Right-of-Way:
 - o Width: 135 – 250 ft.
 - o Easements: Temporary (), Permanent (X), Utility (), Other ().
 - o Type of access control: Full (), Partial (), By Permit (X), Other ().
 - o Number of parcels: 6 Number of displacements: *None*
- Structures: None

- Major intersections, median openings and signal locations: There are currently median openings on the Glenwood Avenue and Cleveland Highway within the project at the intersections with the North Dalton Bypass and Smith Industrial Boulevard. These intersections are also currently signalized.
- Transportation Management Plan Anticipated: Yes () No (X)
- Design Exceptions to controlling criteria anticipated:

	<u>UNDETERMINED</u>	<u>YES</u>	<u>NO</u>
HORIZONTAL ALIGNMENT:	()	()	(X)
LANE WIDTH:	()	()	(X)
SHOULDER WIDTH:	()	()	(X)
VERTICAL GRADES:	()	(X)	()
CROSS SLOPES:	()	()	(X)
STOPPING SIGHT DISTANCE:	()	()	(X)
SUPERELEVATION RATES:	()	()	(X)
VERTICAL ALIGNMENT:	()	(X)	()
SPEED DESIGN:	()	()	(X)
VERTICAL CLEARANCE:	()	()	(X)
BRIDGE WIDTH:	()	()	(X)
BRIDGE STRUCTURAL CAPACITY:	()	()	(X)
LATERAL OFFSET TO OBSTRUCTION:	()	()	(X)

• There are two design requirements associated with the proposed design profile which will require exception:

1 – The proposed profile slope of North Dalton Bypass (SR 3/US 41/US 76) is 6.4% which matches the existing profile grade, but is greater than the maximum profile slope of 6.0% required by AASHTO Publication, *A Policy on Geometric Design of Highways and Streets 2004*, Exhibit 7-10, Maximum Grades for Urban Arterials, on page 472.

2 – The proposed crest and sag vertical curve K values are 86 for the crest curve beginning at the bridge approach slab and ending approximately 310’ before the intersection, and 61 for the sag curve beginning approximately 310’ before the intersection and ending at the intersection. These values match the existing profile and are both lower than the minimum required 55 mph crest and vertical curve K values of 114 and 115 as required by the AASHTO Publication, *A Policy on Geometric Design of Highways and Streets 2004*, Exhibits 3-72 and 3-75 Design Controls for Crest and Sag Vertical Curves, on pages 272 and 277 respectively.

- Design Variances: The proposed/existing intersection skew is 64° 34’ which is less than 70 degrees required by the *GDOT Design Policy Manual*, but greater than 60 degrees required by AASHTO’s *A Policy on Geometric Design of Highways and Streets- 2004 Edition*. Therefore, a design variance will be required.
- Environmental concerns: *None anticipated*
- Anticipated Level of environmental analysis:
 - o Are Time Savings Procedures appropriate? Yes (X), No (),
 - o Categorical exclusion anticipated (X),
 - o Environmental Assessment/Finding of No Significant Impact anticipated (FONSI) (), or
 - o Environmental Impact Statement (EIS) ().

- Utility involvements: ***Utilities Reimbursement Letter Requested from District 6 on November 1, 2010***
 - o Atlanta Gas Light Company – Natural Gas
 - o Charter Communications – Cable TV
 - o Dalton Utilities – Electric Distribution, Natural Gas, Water, and Fiber Optics
 - o Georgia Power Company – Electric Distribution
 - o North Georgia EMC – Electric Distribution
 - o Windstream Communications - Telecommunications
- VE Study Anticipated: Yes (), No (X),
- Benefit/Cost Ratio: **5.59**

Project Cost Estimate and Funding Responsibilities:

	PE	ROW	UTILITY	CST	MITIGATION
By Whom	GDOT	GDOT	GDOT	GDOT	N/A
\$ amount	\$257,000	\$490,000	TBD	\$1,277,113.30	\$0.00

****CST Cost includes: Construction, Engineering and Inspection, Fuel Cost Adjustment, and Asphalt Cement Cost Adjustment:***

Project Activities Responsibilities:

- o Design: GS&P with GDOT Review
- o Right-of-Way Acquisition: GDOT
- o Right-of-Way funding (real property): GDOT
- o Relocation of Utilities: GDOT
- o Letting to contract: GDOT
- o Supervision of construction: GDOT
- o Providing material pits: N/A
- o Providing Detours: N/A
- o Environmental Studies/Documents/Permits: Edwards-Pitman with GDOT review

Coordination

- Initial concept meeting held on February 18, 2010. (*See attachments*)
- Local government comments. *None*
- Other projects in the area.
 - o Georgia DOT Project NHS-0000-00(931) consists of reconstructing the I-75/ SR 401 interchange with the North Dalton Bypass (US41/US76/ SR 3) in Whitfield County. It is presently in long range planning.
 - o Georgia DOT Project CSSTP-M003-00(741) consists of resurfacing and maintenance to SR 71 from the North Dalton Bypass (US41/US76/ SR 3) intersection to the intersection with Roland Hill Drive in Whitfield County. It is presently under construction.
 - o Georgia DOT Project M003274 consists of adding a turning lane on US41/SR 3 at the intersection with Reed Road in Whitfield County. It is presently under construction.
 - o Georgia DOT Project M003727 consists of adding a right turning lane on US41/SR 3 at the intersection with Shugart Road in Whitfield County. It is presently under construction.
 - o Georgia DOT Project CSNHS-0007-00(898) entails widening I-75/ SR 401 interchange from the Carbondale Road interchange to the North Dalton Bypass (US41/US76/ SR 3) interchange in Whitfield County. It is presently in long range planning.

- Georgia DOT Project CSNHS-0007-00(899) entails widening I-75/ SR 401 interchange from the North Dalton Bypass (US41/US76/ SR 3) interchange to the Alabama Road/SR 151 in Whitfield and Catoosa Counties. It is presently in long range planning.

- Railroads: Norfolk Southern Corporation, no impacts anticipated.
- Other coordination to date: *None*

Scheduling – Responsible Parties’ Estimate

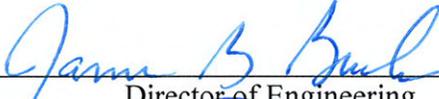
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|---|-------------------------|--------------|
| • Time to complete the environmental process: | Begin: 5/2010 | End: 11/2010 |
| • Time to complete preliminary construction plans: | Begin: 6/2010 | End: 11/2010 |
| • Time to complete right-of-way plans: | Begin: 12/2010 | End: 1/2011 |
| • Time to complete the Section 404 Permit: | Begin: N/A | End: N/A |
| • Time to complete final construction plans: | Begin: 1/2011 | End: 8/2011 |
| • Time to complete to purchase right-of-way: | Begin: 3/2011 | End: 2/2012 |
| • List other major items that will affect the project schedule: | <i>None anticipated</i> | |

Other alternates considered:

- The No Build Alternative was considered non-viable due to the anticipated future level of service of “F.”

Attachments:

1. Detailed cost estimate
 - a. Construction including Engineering and Inspection.
 - b. Completed Fuel/Asphalt price adjustment form
 - c. Right of Way
2. Project Concept Layout
3. Typical sections
4. Traffic diagrams
5. Capacity analysis
6. Initial concept meeting minutes
7. Benefit/ Cost Analysis

Concur: 
Director of Engineering

Approve: 
Chief Engineer

Date: 12/22/2010

DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA

INTERDEPARTMENT CORRESPONDENCE

FILE PROJECT No. , OFFICE
 DATE

P.I. No.

FROM

TO Ronald E. Wishon, Project Review Engineer

SUBJECT REVISIONS TO PROGRAMMED COSTS

MNGT LET DATE

PROJECT MANAGER

MNGT R/W DATE

PROGRAMMED COST (TPro W/OUT INFLATION)

LAST ESTIMATE UPDATE

CONSTRUCTION \$

DATE

RIGHT OF WAY \$

DATE

UTILITIES \$

DATE

REVISED COST ESTIMATES

CONSTRUCTION* \$

RIGHT OF WAY \$

UTILITIES \$

* Costs contain % Engineering and Inspection

REASON FOR COST INCREASE

In order to reduce staging time, HES Concrete was used to minimize traffic interruption.

CONTINGENCY SUMMARY

Construction Cost Estimate:	\$ 1,113,561.18	(Base Estimate)
Engineering and Inspection:	\$ 55,678.06	(Base Estimate x 5 %)
Total Fuel Adjustment	\$ 37,145.93	(From attached worksheet)
Total Liquid AC Adjustment	\$ 70,728.14	(From attached worksheet)
Construction Total:	\$ 1,277,113.30	

REIMBURSABLE UTILITY COST

Utility Owner

Reimbursable Cost

Attachments

JOB ESTIMATE REPORT

JOB NUMBER : PI 0008719
DESCRIPTION: SR 3 @ SR 71

SPEC YEAR: 01

NORTH DALTON BYPASS @ GLENWOOD AVE/CLEVELAND HIGHWAY

ITEMS FOR JOB PI 0008719

LINE	ITEM	ALT	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
0001	150-1000		LS	TRAFFIC CONTROL - CSSFT-0008-00(719)	1.000	150000.00	150000.00
0005	210-0100		LS	GRADING COMPLETE - CSSFT-0008-00(719)	1.000	100000.00	100000.00
0013	310-5100		SY	GR AGGR BS CRS 10IN INCL MATL	1942.000	23.32	45298.39
0014	310-5120		SY	GR AGGR BS CRS 12IN INCL MATL	2033.000	31.93	64918.81
0015	318-3000		TN	AGGR SURF CRS	150.000	19.20	2880.89
0020	402-1812		TN	RECYL AC LEVELING, INC. BM&HL	100.000	77.27	7727.36
0025	402-2121		TN	RECYL AC 25MM SP, GFI/2, BM&HL	559.000	73.72	41210.67
0034	402-3130		TN	RECYL AC 12.5MM SP, GP2, BM&HL	1270.000	73.91	93874.97
0035	402-3190		TN	RECYL AC 19 MM SP, GP 1 OR 2, INC. BM&HL	473.000	146.72	69402.14
0040	413-1000		GL	BITUM TACK COAT	1000.000	2.01	2019.76
0044	430-0620		SY	PLN PC CONC PAVT/HES/ 12" TK	1516.000	72.00	109152.00
0045	432-5010		SY	MILL ASPH CONC PAVT, VARS DEPTH	13353.000	2.41	32204.50
0050	441-0104		SY	CONC SIDEWALK, 4 IN	860.000	29.87	25694.92
0055	441-0148		SY	CONC MEDIAN, 6 IN	575.000	34.09	19603.56
0060	441-6221		SY	CONC CURB & GUTTER/ 8"x30" TPI	1277.000	17.80	22736.42
0070	620-0100		LF	TEMP BARRIER, METHOD NO. 1	109.000	38.76	3876.84
0075	624-1200		EA	RIGHT OF WAY MARKERS	10.000	120.00	1200.00
0080	207-0203		CY	FOUND BK FILL MATL, TP II	70.000	56.96	3987.65
0085	550-1180		LF	STM DR PIPE 18" H 1-10	250.000	96.29	9629.52
0090	550-4218		EA	FLARED END SECT 18 IN, ST OR	1.000	585.84	585.84
0095	611-3000		EA	RECONSTR CATCH BASIN, GROUP 1	5.000	2565.14	12825.72
0100	611-3030		EA	REC STORM SEW MANHOLE, TYPE I	1.000	1477.03	1477.03
0105	611-8000		EA	ADJUST CATCH BASIN TO GRADE	2.000	1769.46	3538.92
0110	668-1100		EA	CATCH BASIN, GP 1	2.000	2755.81	5511.62
0120	668-1100		EA	ADJUST CATCH BASIN TO GRADE	2.000	1955.45	3910.91
0130	668-4300		EA	STORM SEW MANHOLE, TP 1	1.000	2491.98	4983.96
0135	668-5000		EA	DROP INLET, GP 1	1.000	1837.03	1837.03
0140	163-0232		EA	JUNCTION BOX	391.73	391.73	391.73
0145	163-0240		EA	TEMPORARY GRASSING	29.000	217.68	6312.81
0150	163-0300		EA	MULCH	1.000	1356.85	1356.86
0155	163-0503		EA	CONSTRUCTION EXIT	1.000	422.19	422.20
0160	163-0550		EA	CONSTR AND REMOVE SILT CONTROL GATE, TP 3	1.000	625.16	625.16
0165	165-0010		EA	CONS & REM INLET SEDIMENT TRAP	6.000	104.19	625.16
0170	165-0087		EA	MAINT OF TEMP SILT FENCE, TP A	850.000	0.69	590.67
0175	165-0101		EA	MAINT OF SILT CONTROL GATE, TP 3	1.000	148.19	148.19
0180	165-0105		EA	MAINT OF CONST EXIT	1.000	601.48	601.48
0185	167-1000		EA	MAINT OF INLET SEDIMENT TRAP	1.000	51.63	309.82
0190	167-1500		EA	WATER QUALITY MONITORING AND SAMPLING	6.000	478.38	956.77
0195	171-0010		MO	WATER QUALITY INSPECTIONS	2.000	690.77	8289.25
0200	700-6910		LF	TEMPORARY SILT FENCE, TYPE A	12.000	690.77	8289.25
0205	700-7000		EA	PERMANENT GRASSING	1700.000	0.99	1690.60
0210	700-7010		TN	AGRICULTURAL LIME	2.000	648.62	1297.25
0215	700-8000		GL	LIQUID LIME	3.000	76.23	228.77
0220	700-8100		TN	FERTILIZER MIXED GRADE	8.000	22.56	180.51
0225	716-2000		TN	FERTILIZER NITROGEN CONTENT	1.000	426.71	426.71
0230	610-6515		EA	EROSION CONTROL MATS, SLOPES	103.000	1.77	182.70
0235	610-6873		EA	REM HIGHWAY SIGN, STD	551.000	1.04	577.70
0240	611-5360		EA	REM CONC STRAIN POLE	8.000	105.21	841.71
			EA	RESET HIGHWAY SIGN	4.000	148.00	592.00
			EA		5.000	157.49	787.49

JOB ESTIMATE REPORT

ITEM	DESCRIPTION	QTY	UNIT	EST. PRICE	TOTAL
0245	636-1033		SF		
0250	636-2080		LF		
0255	639-2002		LF		
0260	639-4003		EA		
0265	633-0120		EA		
0270	633-0170		EA		
0275	633-0210		EA		
0280	633-1501		LF		
0285	633-1502		LF		
0290	633-1704		LF		
0295	633-1804		LF		
0300	633-1810		LF		
0305	633-3501		GLF		
0310	633-6004		SY		
0315	633-6005		SY		
0320	634-1003		EA		
0324	639-5000		EA		
0330	647-1000		LS		
0335	647-2140		EA		
	HWY SIGNS, TPLMAT, REFL SH TP 9	369.000		19.42	7166.14
	GALV STEEL POSTS, TP 8	364.000		9.30	3387.46
	STEEL WIRE STRAND CABLE, 3/8"	355.000		3.53	1255.45
	STRAIN POLE, TP III	5.000		5812.34	29061.72
	THERM PVMT MARK, ARROW, TP 2	70.000		66.92	4684.74
	THERM PVMT MARK, ARROW, TP 7	7.000		82.15	575.10
	THERM PVMT MARK, WORD, TP 1	12.000		93.13	1117.58
	THERMO SOLID TRAF ST 5 IN, WHI	10260.000		0.45	4681.84
	THERMO SOLID TRAF ST, 5 IN, YEL	6376.000		0.47	3002.97
	THERM SOLID TRAF STRIPE, 24", WH	291.000		3.75	1093.96
	THERM SOLID TRAF STRIPE, 8", WH	3212.000		1.68	5416.57
	THER SLD TRAF STRIPE, 10 IN, W	326.000		2.13	697.46
	THERMO SKIP TRAF ST, 5 IN, WHI	11484.000		0.25	2928.31
	THERM TRAF STRIPING, WHITE	1159.000		2.94	3413.37
	THERM TRAF STRIPING, YELLOW	80.000		3.37	269.93
	RAISED PVMT MARKERS TP 3	360.000		4.29	1547.89
	DIRECTED BY ENGINEER			6331.95	25327.81
	TRAF SIGNAL INSTALLATION NO - AS	1.000		150000.00	150000.00
	DIRECTED BY ENGINEER				
	PULL BOX, PB-4	1.000		1443.27	1443.27

ITEM TOTAL
 INFLATED ITEM TOTAL

TOTALS FOR JOB PI 0008719

ESTIMATED COST:
 CONTINGENCY PERCENT (0.0):
 ESTIMATED TOTAL:

1113561.18
 1113561.18
 1113561.15
 0.00
 1113561.15

P.I. Number P.I. 0008719
 Project Number CSSFT-0008-00(719)

County Whitfield

Date 9/28/2010

Special Provision, Section 109-Measurement and Payment
FUEL PRICE ADJUSTMENT (ENGLISH 125% MAX)

ENTER FPL DIESEL	2.886
ENTER FPM DIESEL	6.494

ENTER FPL UNLEADED	2.625
ENTER FPM UNLEADED	5.90625

<http://www.dot.ga.gov/doingbusiness/Materials/Pages/asphaltcementindex.aspx>

INCREASE ADJUSTMENT
125.00%

INCREASE ADJUSTMENT
125.00%

ROADWAY ITEMS	QUANTITY	DIESEL FACTOR	GALLONS DIESEL	UNLEADED FACTOR	GALLONS UNLEADED	REMARKS
Excavations paid as specified by Sections 205 (CUBIC YARD)		0.29		0.15		
Excavations paid as specified by Sections 206 (CUBIC YARD)		0.29		0.15		
GAB paid as specified by the ton under Section 310 (TON)	3975.000	0.29	1152.75	0.24	954.00	
Hot Mix Asphalt paid as specified by the ton under Sections 400 (TON)		2.90		0.71		
Hot Mix Asphalt paid as specified by the ton under Sections 402 (TON)	2402.000	2.90	6965.80	0.71	1705.42	
PCC Pavement paid as specified by the square yard under Section 430 (SY)	1516.000	0.25	379.00	0.20	303.20	

BRIDGE ITEMS	Quantity	Unit Price	QF/1000	Diesel Factor	Gallons Diesel	Unleaded Factor	Gallons Unleaded	REMARKS
Bridge Excavation (CY) Section 211				8.00		1.50		
Class __ Concrete (CY) Section 500				8.00		1.50		
Class __ Concrete (CY) Section 500				8.00		1.50		
Class __ Concrete (CY) Section 500				8.00		1.50		
Superstru Con Class__(CY) Section 500				8.00		1.50		
Superstru Con Class__(CY) Section 500				8.00		1.50		
Superstru Con Class__(CY) Section 500				8.00		1.50		
Concrete Handrail (LF) Section 500				8.00		1.50		
Concrete Barrier (LF) Section 500				8.00		1.50		

BRIDGE ITEMS	Quantity	Unit Price	QF/1000	Diesel Factor	Gallons Diesel	Unleaded Factor	Gallons Unleaded	REMARKS
Stru Steel Plan Quantity (LB) Section 501				8.00		1.50		
Stru Steel Plan Quantity (LB) Section 501				8.00		1.50		
PSC Beams____ (LF) Section 507				8.00		1.50		
PSC Beams____ (LF) Section 507				8.00		1.50		
PSC Beams____ (LF) Section 507				8.00		1.50		
Stru Reinf Plan Quantity(LB) Section 511				8.00		1.50		
Stru Reinf Plan Quantity(LB) Section 511				8.00		1.50		
Bar Reinf Steel (LB) Section 511				8.00		1.50		
Piling__ inch (LF) Section 520				8.00		1.50		
Piling__ inch (LF) Section 520				8.00		1.50		
Piling__ inch (LF) Section 520				8.00		1.50		
Piling__ inch (LF) Section 520				8.00		1.50		
Piling__ inch (LF) Section 520				8.00		1.50		
Piling__ inch (LF) Section 520				8.00		1.50		
Drilled Caisson,____ (LF) Section 524				8.00		1.50		
Drilled Caisson,____ (LF) Section 524				8.00		1.50		
Drilled Caisson,____ (LF) Section 524				8.00		1.50		
Pile Encasement,____(LF) Section 547				8.00		1.50		
Pile Encasement,____(LF) Section 547				8.00		1.50		
SUM QF DIESEL=				8497.55	SUM QF UNLEADED=		2962.62	
DIESEL PRICE ADJUSTMENT(\$)					\$28,202.52			
UNLEADED PRICE ADJUSTMENT(\$)					\$8,943.41			

ASPHALT CEMENT PRICE ADJUSTMENT FOR BITUMINOUS TACK COAT(Surface Treatment 125% MAX)

APPLICABLE TO CONTRACTS CONTAINING THE 413 SPEC. SECTION 413.5.01 ADJUSTMENTS ASPHALT PRICE ADJUSTMENT FOR BITUMINOUS TACK COAT

<http://www.dot.ga.gov/doingbusiness/Materials/Pages/asphaltcementindex.aspx>

ENTER APL

ENTER APM

125.00%	INCREASE ADJUSTMENT
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Use this side for Asphalt Emulsion Only		
L.I.N.	TYPE	ASPHALT EMULSION (GALLONS)
TMT =		<input style="width: 100px;" type="text"/>
REMARKS:		

Use this side for Asphalt Cement Only		
L.I.N.	TYPE	TACK (GALLONS)
413-1000	PG 58-22	1000
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REMARKS:		

MONTHLY PRICE ADJUSTMENT(\$)	\$2,360.59
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ADJUSTMENT SUMMARY

FUEL PRICE ADJUSTMENT (<i>ENGLISH 125% MAX</i>)	
DIESEL PRICE ADJUSTMENT(\$)	<u>\$28,202.52</u>
UNLEADED PRICE ADJUSTMENT(\$)	<u>\$8,943.41</u>
ASPHALT CEMENT PRICE ADJUSTMENT (BITUMINOUS TACK COAT 125% MAX)	<u>\$2,360.59</u>
400 / 402 ASPHALT CEMENT PRICE ADJUSTMENT 125% MAX	<u>\$66,006.96</u>
ASPHALT CEMENT PRICE ADJUSTMENT FOR BITUMINOUS TACK COAT(Surface Treatment 125% MAX)	<u>\$2,360.59</u>

REMARKS:	
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TOTAL ADJUSTMENTS	\$107,874.06
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Preliminary Right of Way Cost Estimate



Phil Copeland
Right of Way Administrator
By LaShone B. Alexander

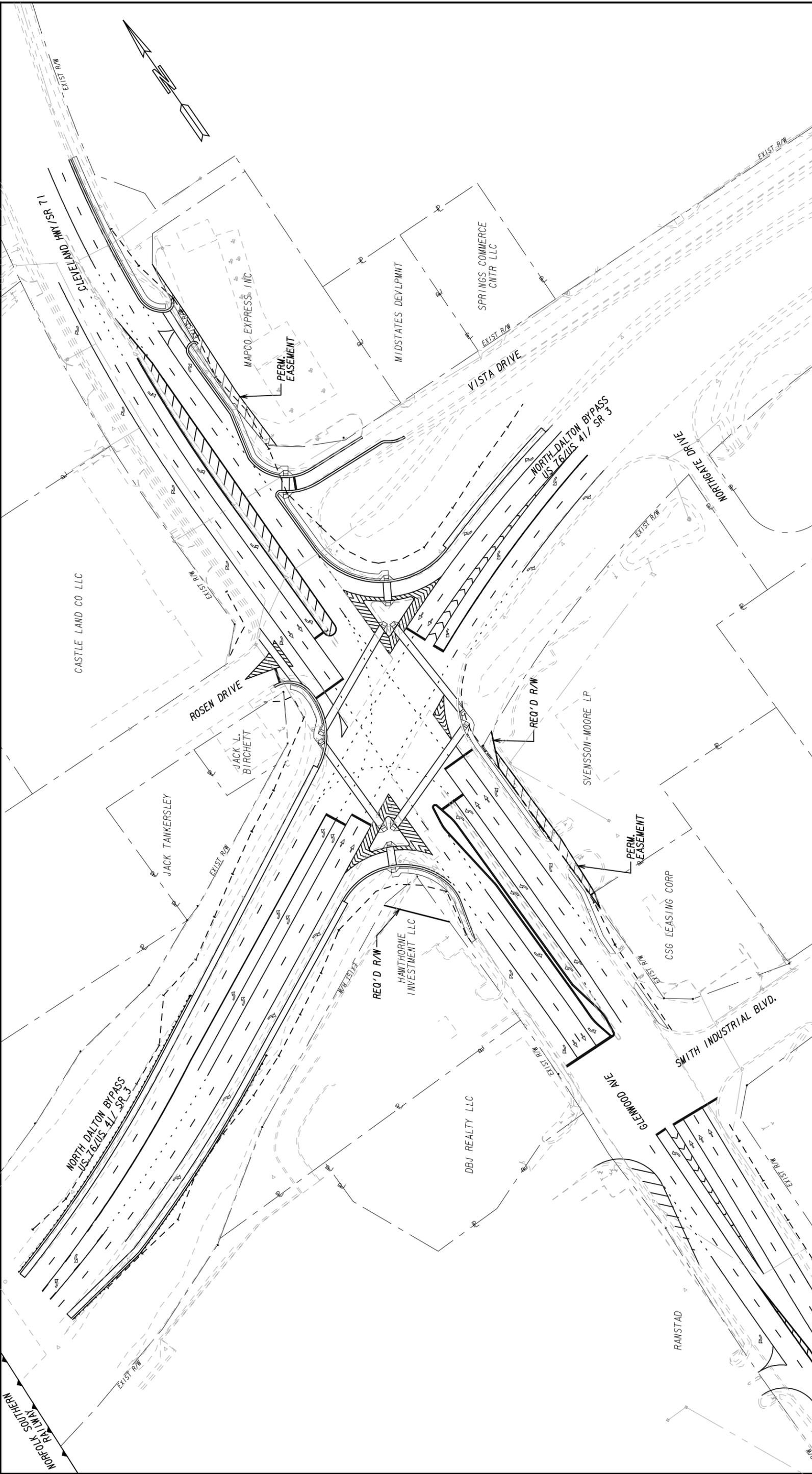
Date: November 12, 2009
 Project: Whitfield County UPDATE
 Existing/Required R/W: Varies/Varies
 Project Termini : Intersection Improvement on SR 3 @ SR 71/Glenwood AVE
 Project Description: SR 3 @ SR 71 Intersection Improvements

P.I. Number: 0008719
 No. Parcels: 3

Land: Commercial R/W: 18,220 SF @ \$2.50/SF	\$	45,550.00
Improvements : misc. site improvements	\$	80,000.00
Relocation: Commercial (0) Residential (0)	\$	0
Damage : Proximity (0) Cost to Cure (1)	\$	<u>70,000.00</u>
Net Cost	\$	195,550.00
Net Cost	\$	195,550.00
Scheduling Contingency 55 %		107,552.00
Adm/Court Cost 60 %		<u>181,861.00</u>
	\$	484,964.00

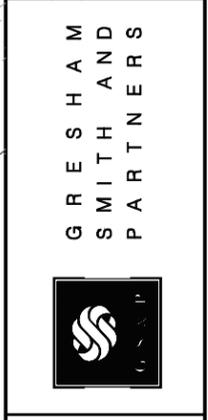
Total Cost \$490,0000

Note: The Market Appreciation (40%) is not included in the updated Preliminary Cost Estimate.



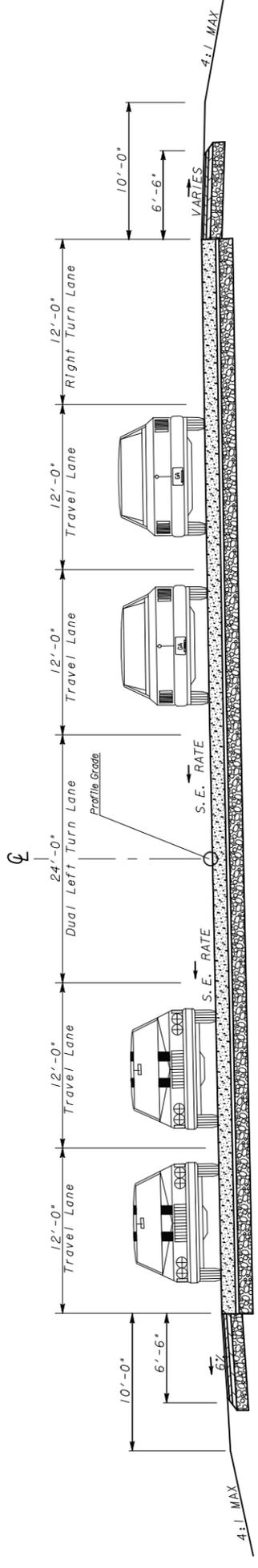
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TRAFFIC OPERATIONS
CONCEPT LAYOUT

PROJECT: CSSFT-0008-00(7/19)
COUNTY: WHITFIELD

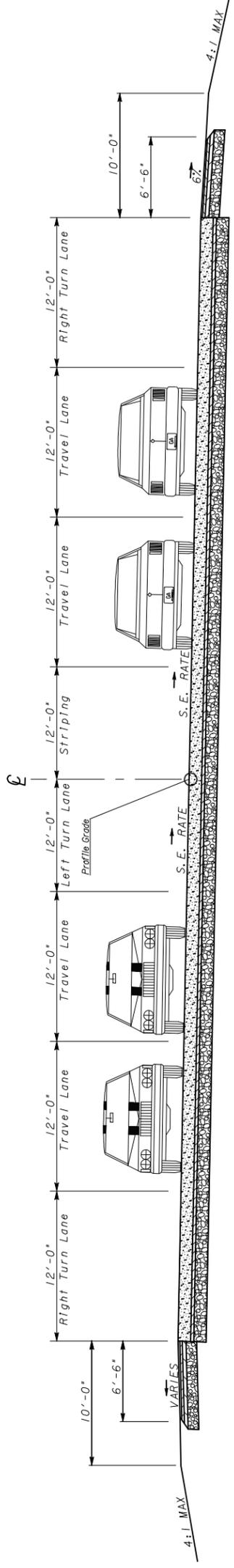


**G R E S H A M
S M I T H
P A R T N E R S**

SCALE IN FEET
0 50 100



TYPICAL SECTION 1
NORTH DALTON BYPASS
US 76/US 41/SR 3
WEST OF INTERSECTION



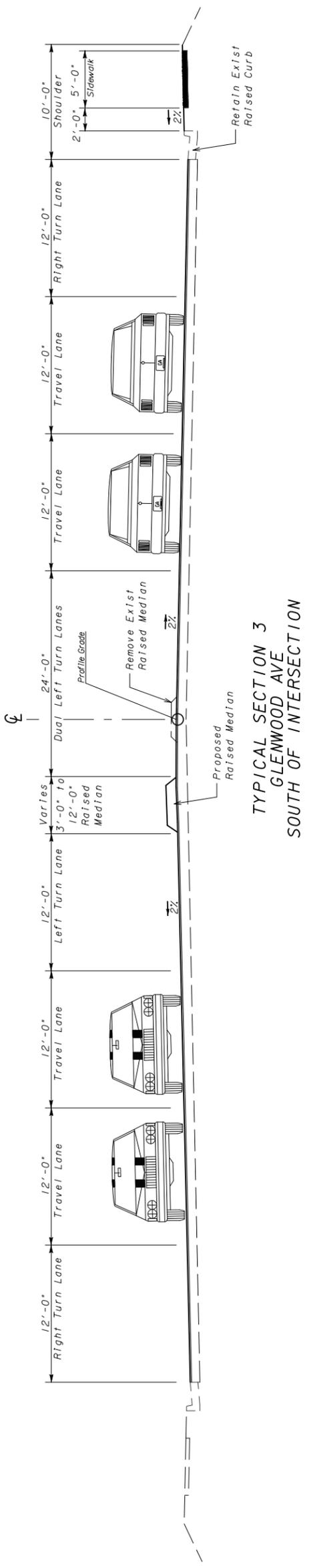
TYPICAL SECTION 2
NORTH DALTON BYPASS
US 76/US 41/SR 3
EAST OF INTERSECTION

REVISION DATES	STATE OF GEORGIA
	DEPARTMENT OF TRANSPORTATION
NOT TO SCALE	OFFICE: TRAFFIC OPERATIONS
	TYPICAL SECTIONS
GRESHAM SMITH AND PARTNERS	PROJECT: CSSFT-0008-00(719)
	COUNTY: WHITFIELD
DRAWING NO. 5-01	

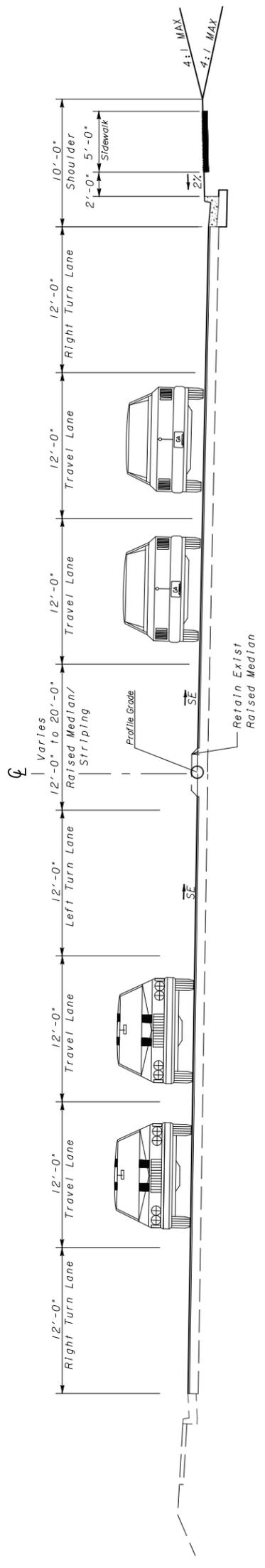
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TYPICAL SECTION 3
GLENWOOD AVE
SOUTH OF INTERSECTION



TYPICAL SECTION 4
CLEVELAND HWY/SR 71
NORTH OF INTERSECTION

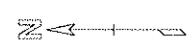
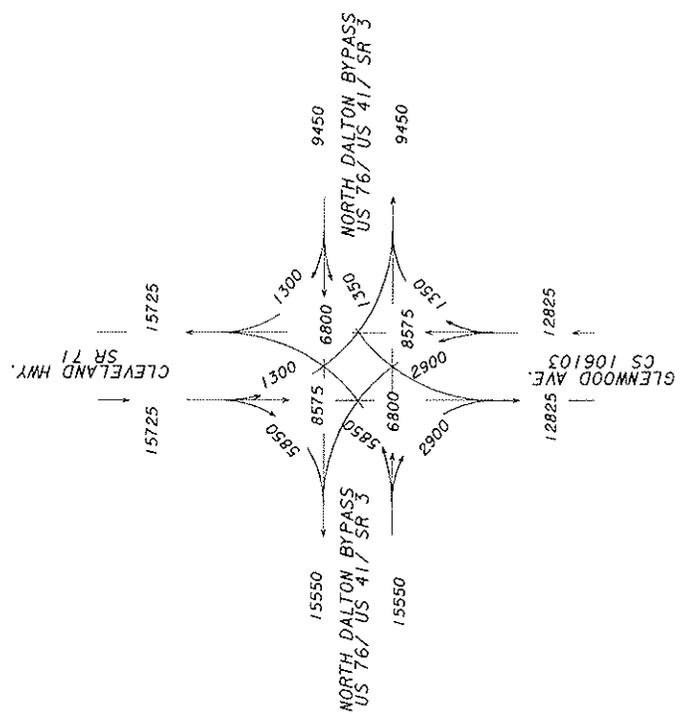
STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION	REVISION DATES	NOT TO SCALE	GRESHAM SMITH AND PARTNERS		PROJECT: CSSFT-0008-00(719)	DRAWING NO. 5-02
					COUNTY: WHITEFIELD	OFFICE: TRAFFIC OPERATIONS

REF 114
REF 113
REF 112
REF 111

REF 104
REF 103
REF 102
REF 101

REF 014
REF 013
REF 012
REF 011

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 PROJECT NUMBER: CSST-0008-00(1719)
 COUNTY: WHITFIELD
 SHEET NO.: TOTAL SHEETS: 10-02



REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE: TRAFFIC OPERATIONS
	PROJECT: CSST-0008-00(1719) COUNTY: WHITFIELD
	DATE: 10-02

LEGEND
 2010 AADT - 000
 24 HR. T - 14%
 S. U. - 10% COMB. - 4%

2010 EXISTING YEAR
 AADT VOLUMES
 NOT TO SCALE

HIGHWAY CAPACITY ANALYSIS WORKSHEETS

- 2010 Existing Year
- 2014 Opening Year No Build
- 2034 Design Year No Build
- 2014 Opening Year Build
- 2034 Design Year Build

HCM Signalized Intersection Capacity Analysis

2: North Dalton Bypass & Cleveland Highway

1/14/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗	↖	↖	↖↗	↖	↖	↖↗	↖	↖	↖↗	↖
Volume (vph)	329	480	361	106	596	69	166	383	150	170	924	667
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.91	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Fr _t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Fl _t Protected	0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1564	3274	1538	1719	3438	1538	1752	3505	1568	1787	3574	1599
Fl _t Permitted	0.95	0.99	1.00	0.95	1.00	1.00	0.14	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	1564	3274	1538	1719	3438	1538	261	3505	1568	726	3574	1599
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	362	527	397	116	655	76	182	421	165	187	1015	733
RTOR Reduction (vph)	0	0	250	0	0	61	0	0	113	0	0	331
Lane Group Flow (vph)	290	599	147	116	655	15	182	421	52	187	1015	402
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	3%	3%	3%	1%	1%	1%
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	2	2		6	6		3	8		7	4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	18.8	18.8	18.8	18.2	18.2	18.2	34.3	28.3	28.3	39.7	31.0	31.0
Effective Green, g (s)	18.8	18.8	18.8	18.2	18.2	18.2	34.3	28.3	28.3	39.7	31.0	31.0
Actuated g/C Ratio	0.21	0.21	0.21	0.20	0.20	0.20	0.38	0.31	0.31	0.44	0.34	0.34
Clearance 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
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	327	684	321	348	695	311	199	1102	493	423	1231	551
v/s Ratio Prot	c0.19	0.18		0.07	c0.19		c0.06	0.12		c0.04	0.28	
v/s Ratio Perm			0.10			0.01	c0.29		0.03	0.15		0.25
v/c Ratio	0.89	0.88	0.46	0.33	0.94	0.05	0.91	0.38	0.11	0.44	0.82	0.73
Uniform Delay, d ₁	34.6	34.5	31.1	30.7	35.4	28.9	22.8	24.0	21.9	16.1	27.0	25.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.35	0.88	0.69	1.00	1.00	1.00
Incremental Delay, d ₂	23.8	12.1	1.0	0.6	21.1	0.1	39.9	1.0	0.4	0.7	6.4	8.3
Delay (s)	58.3	46.5	32.2	31.3	56.5	29.0	70.6	22.1	15.6	16.8	33.4	34.1
Level of Service	E	D	C	C	E	C	E	C	B	B	C	C
Approach Delay (s)		44.8			50.6			32.2			32.0	
Approach LOS		D			D			C			C	

Intersection Summary

HCM Average Control Delay	38.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 2: North Dalton Bypass & Cleveland Highway

1/14/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	541	512	229	83	584	119	228	973	122	86	645	458
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.91	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Fr't	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1595	3311	1568	1687	3374	1509	1770	3539	1583	1736	3471	1553
Flt Permitted	0.95	0.99	1.00	0.95	1.00	1.00	0.15	1.00	1.00	0.17	1.00	1.00
Satd. Flow (perm)	1595	3311	1568	1687	3374	1509	273	3539	1583	304	3471	1553
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	595	563	252	91	642	131	251	1069	134	95	709	503
RTOR Reduction (vph)	0	0	190	0	0	86	0	0	88	0	0	369
Lane Group Flow (vph)	375	783	62	91	642	45	251	1069	46	95	709	134
Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	2%	2%	2%	4%	4%	4%
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	2	2		6	6		3	8		7	4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	22.0	22.0	22.0	18.0	18.0	18.0	38.0	30.8	30.8	27.2	24.0	24.0
Effective Green, g (s)	22.0	22.0	22.0	18.0	18.0	18.0	38.0	30.8	30.8	27.2	24.0	24.0
Actuated g/C Ratio	0.24	0.24	0.24	0.20	0.20	0.20	0.42	0.34	0.34	0.30	0.27	0.27
Clearance 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
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	390	809	383	337	675	302	282	1211	542	143	926	414
v/s Ratio Prot	0.24	c0.24		0.05	c0.19		c0.10	0.30		0.02	0.20	
v/s Ratio Perm			0.04			0.03	c0.28		0.03	0.18		0.09
v/c Ratio	0.96	0.97	0.16	0.27	0.95	0.15	0.89	0.88	0.08	0.66	0.77	0.32
Uniform Delay, d1	33.6	33.7	26.7	30.4	35.6	29.7	20.1	27.9	20.1	26.3	30.4	26.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.28	0.79	0.27	1.00	1.00	1.00
Incremental Delay, d2	35.4	23.7	0.2	0.4	23.2	0.2	25.5	8.7	0.3	11.1	6.0	2.1
Delay (s)	69.0	57.4	26.9	30.9	58.8	29.9	51.2	30.8	5.6	37.4	36.4	28.6
Level of Service	E	E	C	C	E	C	D	C	A	D	D	C
Approach Delay (s)		55.0			51.5			32.0			33.5	
Approach LOS		E			D			C			C	

Intersection Summary

HCM Average Control Delay	42.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: North Dalton Bypass & Cleveland Highway

1/14/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗	↖	↖	↖↗	↖	↖	↖↗	↖	↖	↖↗	↖
Volume (vph)	346	504	379	111	626	73	174	403	158	179	971	701
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.91	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Flt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1564	3274	1538	1719	3438	1538	1752	3505	1568	1787	3574	1599
Flt Permitted	0.95	0.99	1.00	0.95	1.00	1.00	0.13	1.00	1.00	0.34	1.00	1.00
Satd. Flow (perm)	1564	3274	1538	1719	3438	1538	246	3505	1568	646	3574	1599
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	380	554	416	122	688	80	191	443	174	197	1067	770
RTOR Reduction (vph)	0	0	256	0	0	63	0	0	122	0	0	331
Lane Group Flow (vph)	304	630	160	122	688	17	191	443	52	197	1067	439
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	3%	3%	3%	1%	1%	1%
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	2	2		6	6		3	8		7	4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	21.8	21.8	21.8	21.2	21.2	21.2	37.0	30.0	30.0	45.0	34.0	34.0
Effective Green, g (s)	21.8	21.8	21.8	21.2	21.2	21.2	37.0	30.0	30.0	45.0	34.0	34.0
Actuated g/C Ratio	0.22	0.22	0.22	0.21	0.21	0.21	0.37	0.30	0.30	0.45	0.34	0.34
Clearance 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
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	341	714	335	364	729	326	196	1052	470	416	1215	544
v/s Ratio Prot	c0.19	0.19		0.07	c0.20		c0.07	0.13		c0.05	0.30	
v/s Ratio Perm			0.10			0.01	c0.29		0.03	0.16		0.27
v/c Ratio	0.89	0.88	0.48	0.34	0.94	0.05	0.97	0.42	0.11	0.47	0.88	0.81
Uniform Delay, d1	38.0	37.9	34.1	33.4	38.8	31.4	26.9	28.0	25.3	17.7	31.1	30.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.33	0.89	0.74	1.00	1.00	1.00
Incremental Delay, d2	24.0	12.4	1.1	0.5	20.6	0.1	55.7	1.2	0.5	0.9	9.2	12.2
Delay (s)	61.9	50.2	35.2	34.0	59.4	31.5	91.7	26.1	19.2	18.5	40.2	42.2
Level of Service	E	D	D	C	E	C	F	C	B	B	D	D
Approach Delay (s)		48.2			53.4			40.1			38.9	
Approach LOS		D			D			D			D	

Intersection Summary

HCM Average Control Delay	44.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 2: North Dalton Bypass & Cleveland Highway

1/14/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↔	↗	↘	↔	↗	↘	↔	↗	↘	↔	↗
Volume (vph)	569	538	241	87	614	125	240	1023	128	90	678	481
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.91	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Fr _t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Fl _t Protected	0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1595	3311	1568	1687	3374	1509	1770	3539	1583	1736	3471	1553
Fl _t Permitted	0.95	0.99	1.00	0.95	1.00	1.00	0.14	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	1595	3311	1568	1687	3374	1509	258	3539	1583	292	3471	1553
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	625	591	265	96	675	137	264	1124	141	99	745	529
RTOR Reduction (vph)	0	0	200	0	0	83	0	0	93	0	0	382
Lane Group Flow (vph)	394	822	65	96	675	54	264	1124	48	99	745	147
Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	2%	2%	2%	4%	4%	4%
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	2	2		6	6		3	8		7	4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	22.0	22.0	22.0	18.0	18.0	18.0	38.0	30.8	30.8	28.2	25.0	25.0
Effective Green, g (s)	22.0	22.0	22.0	18.0	18.0	18.0	38.0	30.8	30.8	28.2	25.0	25.0
Actuated g/C Ratio	0.24	0.24	0.24	0.20	0.20	0.20	0.42	0.34	0.34	0.31	0.28	0.28
Clearance 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
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	390	809	383	337	675	302	260	1211	542	143	964	431
v/s Ratio Prot	0.25	c0.25		0.06	c0.20		c0.10	0.32		0.02	0.21	
v/s Ratio Perm			0.04			0.04	c0.33		0.03	0.19		0.09
v/c Ratio	1.01	1.02	0.17	0.28	1.00	0.18	1.02	0.93	0.09	0.69	0.77	0.34
Uniform Delay, d ₁	34.0	34.0	26.8	30.5	36.0	29.9	20.7	28.5	20.1	26.8	29.9	25.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.42	0.78	0.24	1.00	1.00	1.00
Incremental Delay, d ₂	48.2	35.7	0.2	0.5	34.6	0.3	56.7	12.4	0.3	13.5	6.0	2.1
Delay (s)	82.2	69.7	27.0	31.0	70.6	30.1	86.0	34.6	5.1	40.3	35.9	28.1
Level of Service	F	E	C	C	E	C	F	C	A	D	D	C
Approach Delay (s)		65.4			60.3			40.8			33.2	
Approach LOS		E			E			D			C	

Intersection Summary

HCM Average Control Delay	49.1	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: North Dalton Bypass & Cleveland Highway

1/14/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↖↖	↖	↖	↖↖	↖	↖↖	↖↖	↖	↖	↖↖	↖
Volume (vph)	346	504	379	111	626	73	174	403	158	179	971	701
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Fr _t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Fl _t Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3335	3438	1538	1719	3438	1538	3400	3505	1568	1787	3574	1599
Fl _t Permitted	0.95	1.00	1.00	0.44	1.00	1.00	0.95	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	3335	3438	1538	805	3438	1538	3400	3505	1568	697	3574	1599
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	380	554	416	122	688	80	191	443	174	197	1067	770
RTOR Reduction (vph)	0	0	170	0	0	62	0	0	118	0	0	7
Lane Group Flow (vph)	380	554	246	122	688	18	191	443	56	197	1067	763
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	3%	3%	3%	1%	1%	1%
Turn Type	Prot		Perm	pm+pt		Perm	Prot		Perm	pm+pt		pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2	6		6			8	4		4
Actuated Green, G (s)	15.6	28.4	28.4	26.6	19.7	19.7	6.4	29.2	29.2	41.8	32.3	47.9
Effective Green, g (s)	15.6	28.4	28.4	26.6	19.7	19.7	6.4	29.2	29.2	41.8	32.3	47.9
Actuated g/C Ratio	0.17	0.32	0.32	0.30	0.22	0.22	0.07	0.32	0.32	0.46	0.36	0.53
Clearance 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
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	578	1085	485	308	753	337	242	1137	509	439	1283	922
v/s Ratio Prot	0.11	0.16		0.03	c0.20		c0.06	0.13		c0.05	0.30	c0.14
v/s Ratio Perm			0.16	0.09		0.01			0.04	0.16		0.33
v/c Ratio	0.66	0.51	0.51	0.40	0.91	0.05	0.79	0.39	0.11	0.45	0.83	0.83
Uniform Delay, d1	34.7	25.1	25.1	24.0	34.3	27.8	41.1	23.5	21.3	15.0	26.4	17.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.03	0.91	0.94	1.00	1.00	1.00
Incremental Delay, d2	2.7	0.4	0.8	0.8	15.5	0.1	15.3	1.0	0.4	0.7	6.4	6.2
Delay (s)	37.4	25.5	25.9	24.9	49.8	27.8	57.7	22.4	20.4	15.7	32.8	23.8
Level of Service	D	C	C	C	D	C	E	C	C	B	C	C
Approach Delay (s)		29.0			44.4			30.3			27.7	
Approach LOS		C			D			C			C	

Intersection Summary

HCM Average Control Delay	31.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 2: North Dalton Bypass & Cleveland Highway

1/14/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	569	538	241	87	614	125	240	1023	128	90	678	481
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Fr _t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3400	3505	1568	1687	3374	1509	3433	3539	1583	1736	3471	1553
Flt Permitted	0.95	1.00	1.00	0.43	1.00	1.00	0.95	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	3400	3505	1568	762	3374	1509	3433	3539	1583	285	3471	1553
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	625	591	265	96	675	137	264	1124	141	99	745	529
RTOR Reduction (vph)	0	0	158	0	0	66	0	0	92	0	0	10
Lane Group Flow (vph)	625	591	107	96	675	71	264	1124	49	99	745	519
Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	2%	2%	2%	4%	4%	4%
Turn Type	Prot		Perm	pm+pt		Perm	Prot		Perm	pm+pt		pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2	6		6			8	4		4
Actuated Green, G (s)	18.8	34.6	34.6	25.4	20.6	20.6	9.0	31.2	31.2	29.0	25.6	44.4
Effective Green, g (s)	18.8	34.6	34.6	25.4	20.6	20.6	9.0	31.2	31.2	29.0	25.6	44.4
Actuated g/C Ratio	0.21	0.38	0.38	0.28	0.23	0.23	0.10	0.35	0.35	0.32	0.28	0.49
Clearance 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
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	710	1347	603	264	772	345	343	1227	549	147	987	835
v/s Ratio Prot	c0.18	0.17		0.02	c0.20		c0.08	c0.32		0.03	0.21	0.13
v/s Ratio Perm			0.07	0.08		0.05			0.03	0.19		0.20
v/c Ratio	0.88	0.44	0.18	0.36	0.87	0.20	0.77	0.92	0.09	0.67	0.75	0.62
Uniform Delay, d1	34.5	20.5	18.3	24.6	33.5	28.1	39.5	28.1	19.8	25.3	29.3	16.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.16	0.78	0.23	1.00	1.00	1.00
Incremental Delay, d2	12.3	0.2	0.1	0.9	10.8	0.3	9.0	11.1	0.3	11.5	5.4	1.4
Delay (s)	46.8	20.7	18.4	25.4	44.2	28.4	54.9	33.1	4.9	36.8	34.7	18.1
Level of Service	D	C	B	C	D	C	D	C	A	D	C	B
Approach Delay (s)		31.3			39.9			34.2			28.5	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM Average Control Delay			32.9					HCM Level of Service			C	
HCM Volume to Capacity ratio			0.86									
Actuated Cycle Length (s)			90.0					Sum of lost time (s)		12.0		
Intersection Capacity Utilization			79.8%					ICU Level of Service		D		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: North Dalton Bypass & Cleveland Highway

1/19/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	694	657	294	106	749	153	292	1248	156	110	827	587	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.91	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Fr _t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Fl _t Protected	0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1595	3311	1568	1687	3374	1509	1770	3539	1583	1736	3471	1553	
Fl _t Permitted	0.95	0.99	1.00	0.95	1.00	1.00	0.12	1.00	1.00	0.14	1.00	1.00	
Satd. Flow (perm)	1595	3311	1568	1687	3374	1509	233	3539	1583	261	3471	1553	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	
Adj. Flow (vph)	746	706	316	114	805	165	314	1342	168	118	889	631	
RTOR Reduction (vph)	0	0	233	0	0	62	0	0	78	0	0	392	
Lane Group Flow (vph)	470	982	83	114	805	103	314	1342	90	118	889	239	
Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	2%	2%	2%	4%	4%	4%	
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		Perm	
Protected Phases	2	2		6	6		3	8		7	4		
Permitted Phases			2			6	8		8	4		4	
Actuated Green, G (s)	29.0	29.0	29.0	23.0	23.0	23.0	46.0	38.0	38.0	32.0	28.0	28.0	
Effective Green, g (s)	29.0	29.0	29.0	23.0	23.0	23.0	46.0	38.0	38.0	32.0	28.0	28.0	
Actuated g/C Ratio	0.26	0.26	0.26	0.21	0.21	0.21	0.42	0.35	0.35	0.29	0.25	0.25	
Clearance 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	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	421	873	413	353	705	316	293	1223	547	130	884	395	
v/s Ratio Prot	0.29	c0.30		0.07	c0.24		c0.14	c0.38		0.03	0.26		
v/s Ratio Perm			0.05			0.07	0.31		0.06	0.23		0.15	
v/c Ratio	1.12	1.12	0.20	0.32	1.14	0.33	1.07	1.10	0.16	0.91	1.01	0.60	
Uniform Delay, d1	40.5	40.5	31.5	36.9	43.5	36.9	31.1	36.0	25.0	37.9	41.0	36.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.14	0.78	0.40	1.00	1.00	1.00	
Incremental Delay, d2	79.4	70.9	0.2	0.5	80.2	0.6	67.1	54.4	0.5	51.2	31.7	6.7	
Delay (s)	119.9	111.4	31.7	37.4	123.7	37.5	102.7	82.4	10.6	89.1	72.7	42.8	
Level of Service	F	F	C	D	F	D	F	F	B	F	E	D	
Approach Delay (s)		99.4			101.5			79.3			62.4		
Approach LOS		F			F			E			E		
Intersection Summary													
HCM Average Control Delay			84.3									HCM Level of Service	F
HCM Volume to Capacity ratio			1.10										
Actuated Cycle Length (s)			110.0									Sum of lost time (s)	12.0
Intersection Capacity Utilization			100.2%									ICU Level of Service	G
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 2: North Dalton Bypass & Cleveland Highway

1/19/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↔	↗	↘	↔	↗	↘	↔	↗	↘	↔	↗
Volume (vph)	422	616	463	136	764	88	213	491	192	218	1185	855
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.91	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frts	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1564	3274	1538	1719	3438	1538	1752	3505	1568	1787	3574	1599
Flt Permitted	0.95	0.99	1.00	0.95	1.00	1.00	0.12	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	1564	3274	1538	1719	3438	1538	226	3505	1568	527	3574	1599
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	454	662	498	146	822	95	229	528	206	234	1274	919
RTOR Reduction (vph)	0	0	237	0	0	74	0	0	145	0	0	314
Lane Group Flow (vph)	363	753	261	146	822	21	229	528	61	234	1274	605
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	3%	3%	3%	1%	1%	1%
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	2	2		6	6		3	8		7	4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	24.0	24.0	24.0	24.0	24.0	24.0	40.6	32.6	32.6	50.0	38.0	38.0
Effective Green, g (s)	24.0	24.0	24.0	24.0	24.0	24.0	40.6	32.6	32.6	50.0	38.0	38.0
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22	0.22	0.37	0.30	0.30	0.45	0.35	0.35
Clearance 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
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	341	714	336	375	750	336	194	1039	465	393	1235	552
v/s Ratio Prot	c0.23	0.23		0.08	c0.24		c0.09	0.15		0.07	0.36	
v/s Ratio Perm			0.17			0.01	0.35		0.04	0.20		c0.38
v/c Ratio	1.06	1.05	0.78	0.39	1.10	0.06	1.18	0.51	0.13	0.60	1.03	1.10
Uniform Delay, d1	43.0	43.0	40.5	36.7	43.0	34.1	30.3	32.1	28.3	20.1	36.0	36.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.52	0.80	0.34	1.00	1.00	1.00
Incremental Delay, d2	66.9	49.0	10.8	0.7	62.2	0.1	120.4	1.7	0.6	2.4	34.1	67.5
Delay (s)	109.9	92.0	51.2	37.4	105.2	34.2	166.5	27.4	10.1	22.5	70.1	103.5
Level of Service	F	F	D	D	F	C	F	C	B	C	E	F
Approach Delay (s)		83.4			89.6			56.8			78.1	
Approach LOS		F			F			E			E	

Intersection Summary		
HCM Average Control Delay	78.2	HCM Level of Service
HCM Volume to Capacity ratio	1.09	E
Actuated Cycle Length (s)	110.0	Sum of lost time (s)
Intersection Capacity Utilization	98.5%	16.0
Analysis Period (min)	15	ICU Level of Service
		F

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: North Dalton Bypass & Cleveland Highway

1/19/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔↔	↔	↔	↔↔	↔	↔↔	↔↔	↔	↔	↔↔	↔
Volume (vph)	422	616	463	136	764	88	213	491	192	218	1185	855
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Fr _t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Fl _t Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3335	3438	1538	1719	3438	1538	3400	3505	1568	1787	3574	1599
Fl _t Permitted	0.95	1.00	1.00	0.40	1.00	1.00	0.95	1.00	1.00	0.29	1.00	1.00
Satd. Flow (perm)	3335	3438	1538	724	3438	1538	3400	3505	1568	544	3574	1599
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	454	662	498	146	822	95	229	528	206	234	1274	919
RTOR Reduction (vph)	0	0	126	0	0	74	0	0	143	0	0	3
Lane Group Flow (vph)	454	662	372	146	822	21	229	528	63	234	1274	916
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	3%	3%	3%	1%	1%	1%
Turn Type	Prot		Perm	pm+pt		Perm	Prot		Perm	pm+pt		pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2	6		6			8	4		4
Actuated Green, G (s)	19.0	35.0	35.0	28.0	22.0	22.0	6.0	30.6	30.6	47.0	37.0	56.0
Effective Green, g (s)	19.0	35.0	35.0	28.0	22.0	22.0	6.0	30.6	30.6	47.0	37.0	56.0
Actuated g/C Ratio	0.19	0.35	0.35	0.28	0.22	0.22	0.06	0.31	0.31	0.47	0.37	0.56
Clearance 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
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	634	1203	538	262	756	338	204	1073	480	410	1322	959
v/s Ratio Prot	0.14	0.19		0.03	c0.24		c0.07	0.15		0.07	c0.36	c0.18
v/s Ratio Perm			0.24	0.12		0.01			0.04	0.20		0.39
v/c Ratio	0.72	0.55	0.69	0.56	1.09	0.06	1.12	0.49	0.13	0.57	0.96	0.96
Uniform Delay, d ₁	38.0	26.2	27.9	28.4	39.0	30.8	47.0	28.4	25.1	17.3	30.8	20.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.01	0.90	1.16	1.00	1.00	1.00
Incremental Delay, d ₂	3.9	0.5	3.8	2.6	59.0	0.1	98.2	1.5	0.5	1.9	17.5	19.0
Delay (s)	41.8	26.7	31.7	30.9	98.0	30.9	145.7	27.0	29.7	19.2	48.3	39.8
Level of Service	D	C	C	C	F	C	F	C	C	B	D	D
Approach Delay (s)		32.5			82.8			55.8			42.3	
Approach LOS		C			F			E			D	

Intersection Summary

HCM Average Control Delay	48.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 2: North Dalton Bypass & Cleveland Highway

1/19/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕	↗	↖	↕↕	↗	↔↔	↕↕	↗	↖	↕↕	↗
Volume (vph)	694	657	294	106	749	153	292	1248	156	110	827	587
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frts	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3400	3505	1568	1687	3374	1509	3433	3539	1583	1736	3471	1553
Flt Permitted	0.95	1.00	1.00	0.38	1.00	1.00	0.95	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	3400	3505	1568	680	3374	1509	3433	3539	1583	290	3471	1553
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	746	706	316	114	805	165	314	1342	168	118	889	631
RTOR Reduction (vph)	0	0	57	0	0	59	0	0	106	0	0	6
Lane Group Flow (vph)	746	706	259	114	805	106	314	1342	62	118	889	625
Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	2%	2%	2%	4%	4%	4%
Turn Type	Prot		pm+ov	pm+pt		Perm	Prot		Perm	pm+pt		pm+ov
Protected Phases	5	2	3	1	6		3	8		7	4	5
Permitted Phases			2	6		6			8	4		4
Actuated Green, G (s)	18.0	33.2	43.2	26.4	20.8	20.8	10.0	32.2	32.2	28.2	25.2	43.2
Effective Green, g (s)	18.0	33.2	43.2	26.4	20.8	20.8	10.0	32.2	32.2	28.2	25.2	43.2
Actuated g/C Ratio	0.20	0.37	0.48	0.29	0.23	0.23	0.11	0.36	0.36	0.31	0.28	0.48
Clearance 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
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	680	1293	822	262	780	349	381	1266	566	139	972	814
v/s Ratio Prot	c0.22	0.20	0.04	0.03	c0.24		c0.09	c0.38		0.03	0.26	0.15
v/s Ratio Perm			0.13	0.10		0.07			0.04	0.24		0.25
v/c Ratio	1.10	0.55	0.32	0.44	1.03	0.30	0.82	1.06	0.11	0.85	0.91	0.77
Uniform Delay, d1	36.0	22.4	14.3	24.1	34.6	28.6	39.1	28.9	19.3	30.6	31.4	19.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.19	0.72	0.28	1.00	1.00	1.00
Incremental Delay, d2	64.1	0.5	0.2	1.2	40.7	0.5	10.7	40.1	0.3	35.5	14.4	4.4
Delay (s)	100.1	22.9	14.6	25.3	75.3	29.1	57.3	61.0	5.7	66.2	45.8	23.7
Level of Service	F	C	B	C	E	C	E	E	A	E	D	C
Approach Delay (s)		54.0			63.0			55.3			38.7	
Approach LOS		D			E			E			D	

Intersection Summary

HCM Average Control Delay	51.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



G R E S H A M
S M I T H A N D
P A R T N E R S

March 3, 2010

MEETING MINUTES

SR 3 at SR 71 Intersection Safety Improvement Concept
CSSFT-0008-00(719), Whitfield County, PI No. 0008719
GS&P Project No. 26340.08

MEETING February 18, 2010
DATE:

PARTICIPANTS: Derrick Cameron - Georgia Department of Transportation (GDOT), Office of
Traffic Operations
Lakeshia Osborn - Georgia Department of Transportation (GDOT), Office of
Traffic Operations
Shonnell Gibbs - Georgia Department of Transportation (GDOT), Office of
Traffic Operations
Jennifer Deems - Georgia Department of Transportation (GDOT), District 6
Mick Workman - Georgia Department of Transportation (GDOT), District 6
David Moore - Georgia Department of Transportation (GDOT), District 6
Alex Rice - City of Dalton
Benny Dunn - City of Dalton
Kent Benson - Whitfield County
Ronnie Nix - Moreland-Altobelli Associates (MAAI)
Lou Chastain - Moreland-Altobelli Associates (MAAI)
Jody Braswell - Gresham, Smith and Partners (GS&P)
Jay Bockisch - Gresham, Smith and Partners (GS&P)
Eric Rickert - Gresham, Smith and Partners (GS&P)

DISCUSSION: PROJECT TEAM CONCEPT MEETING

A meeting was held on February 18, 2010 for the SR 3 at SR 71 Intersection Improvement Project in Whitfield County. The project is at the confluence of US 41/US 76/ SR 3 (North Dalton Bypass) with SR 71 (Cleveland Highway) and Glenwood Avenue in the City of Dalton.

GS&P began by discussing the design methodology used to create the findings in the draft concept report. GS&P then reviewed the content of the draft concept report.

GDOT District 6 recommended that GS&P review the GDOT Design Policy Manual to verify whether a design variance would be needed for the proposed intersection Level of Services (LOS), left turn lane lengths, and sidewalk offsets from the back of curb. GS&P responded that they would review the GDOT Design Policy Manual for these issues. (Post meeting note: the proposed intersection LOS's and sidewalk offsets conform with the GDOT guidelines and while the eastbound SR 3 dual left turn lanes are less than the GDOT Design Policy Manual's length guidelines, the GDOT Office of Design Policy and Support has advised that this deviation no longer requires a design variance).

Design Services For The Built Environment

2325 Lakeview Parkway, Suite 400 / Alpharetta, Georgia 30004-1976 / Phone 770.754.0755 / www.gspnet.com



PROJECT TEAM CONCEPT MEETING MINUTES
SR 3 at SR 71 Intersection Safety Improvement Concept
CSSFT-0008-00(719), Whitfield County, PI No. 0008719
GS&P Project No. 26340.08
Page 2

The City of Dalton requested that the proposed traffic growth rate in the report be increased to account for future industrial development in the area. GS&P responded that the growth rate was based on traffic counts obtained over the last few years and was appropriate for the intersection. GDOT Traffic Operations added that the number of crashes and not existing or proposed traffic volumes is justifying the need for improvements to the intersection. The City also requested on the concept display that the median hatching on SR 3 between the railroad overpass and the start of the eastbound left turn lane be changed to a two-way left turn lane to allow for turning motorists to queue onto the median. GS&P replied that they would update the display striping accordingly.

GDOT Traffic Operations instructed GS&P to investigate placement of a gravity retaining wall on the SR 3 at SR 71 intersection's southwest corner to minimize proposed right of way along SR 3. GS&P stated that they would investigate this.

GDOT Traffic Operations also remarked that the current project schedule will have the project being left for construction in April 2012 with a Preliminary Field Plan Review in January 2011 and approved right of way plans in April 2011.

GDOT District 6 requested that a note be placed on the construction plans stating that utilities can be placed on the easements since there will be little right of way acquisition.

This represents our understanding of the items discussed at this meeting. If you have any questions or comments concerning any of the information contained herein, please contact me.

Prepared by: Eric Rickert, PE
Project Engineer

Copy File, Attendees

BENEFIT COST ANALYSIS WORKSHEET

SR 3 @ SR 71
Whitfield County
(Special Comments)

ACCIDENT DATA

Description	Symbol	Value
Property Damage Accidents (no fatality or injury)	P	9.8
Fatalities	F	0.2
Injuries	I	3

FIXED VALUES

Description	Symbol	Value
Fatality Cost	Fc	\$5,800,000
Injury Cost	Ic	\$333,500
Property Damage Cost	Pc	\$4,400
Maintenance/Operating Cost	Cm	\$50,000

TABLE VALUES

Description	Symbol	Value
Reduction Factor (fatalities and injuries) (Appendix E)	R	0.76002
Reduction Factor (property damage) (Appendix E)	Rp	0.77016
Capital Recovery Factor (Appendix E)	Ek	0.135
Initial Improvement Cost (Itemized Cost Estimate)	Ci	\$1,847,800.62

Q = Weighted cost of fatal and injury collisions

$$Q = \frac{(Fc \times F) + (Ic \times I)}{F + I}$$

$$Q = 675156.25$$

B = Benefit

$$B = Q (F + I) (R) + Pc (P) (Rp)$$

$$B = 1675232.509$$

C = Cost

$$C = Ek (Ci) + Cm$$

$$C = 299453.0837$$

B/C = Benefit/Cost Ratio

$$B/C = 5.59430709$$

BENEFIT/COST RATIO: 5.59

BENEFIT COST ANALYSIS FACTOR DEFINITIONS

F: annual number of collisions involving fatalities during study period

I: average annual number of collisions involving injured people for the period of the study

P: average annual number of collisions involving only property damage for the period of the study

R: reduction of fatal and injury collisions by type (from Table A - Appendix E)

R_p: reduction of property damage only collisions by type (from Table A - Appendix E)

P_c: average cost, in thousands of \$, per property damage only collision

Q: weighted cost, in thousands of \$, of fatal and injury collisions

I_c: average cost per injury in thousands of \$

F_c: average cost per fatality in thousands of \$

E_k: capital recovery factor based on countermeasure life (from Table B - Appendix E)

C_i: estimated initial cost of the countermeasure (cost of the improvement including r/w) in thousands of \$

C_m: estimated annual maintenance and operating cost of the countermeasure in thousands of \$

COUNTERMEASURE WORKSHEET

SR 3 @ SR 71
Whitfield County
(Special Comments)

Enter From Appendix E: Table A

Type of Safety Countermeasure	Ek	R	r	Rp	rp
Install Dual Left Turn Lane	0.087	0.29	0.71	0.32	0.68
Provide protected left turn phase	0.102	0.48	0.52	0.48	0.52
convert permissive to protected/permissive	0.102	0.16	0.84	0.16	0.84
Install Advance Warning Signs	0.135	0.35	0.65	0.35	0.65

F&I Reduction Factor Values

R1	0.48
r1	0.52
R2	0.35
r2	0.65
R3	0.29
r3	0.71

PDO Reduction Factor Values

Rp1	0.48
rp1	0.52
Rp2	0.35
rp2	0.65
Rp3	0.32
rp3	0.68

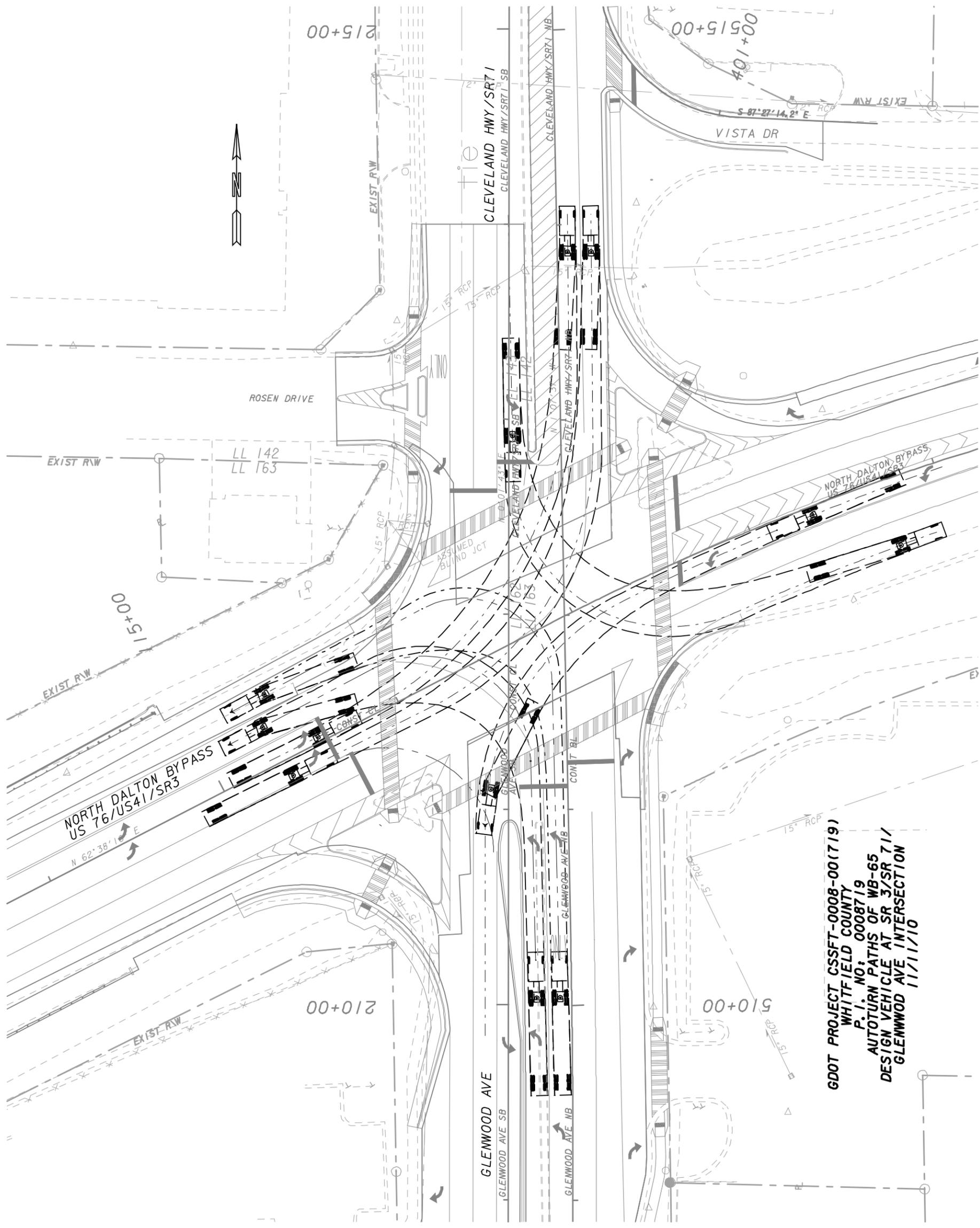
F&I Reduction Factor Calculations

R1 =	0.48
R2 X r1 =	0.182
R3 X r2 X r1 =	0.09802

TOTAL R = 0.76002**PDO Reduction Factor Calculations**

Rp1 =	0.48
Rp2 X rp1 =	0.182
Rp3 X rp2 X rp1 =	0.10816

TOTAL Rp = 0.77016**Ek = 0.135**



GDOT PROJECT CSSFT-0008-00(719)
 WHITFIELD COUNTY
 P.I. NO: 0008719
 AUTURN PATHS OF WB-65
 DESIGN VEHICLE AT SR 3/SR 71/
 GLENWOOD AVE INTERSECTION
 11/11/10