TRAFFIC IMPACT STUDY

FOR

HARTMAN DISTRIBUTION CENTER
UNINCORPORATED COBB COUNTY, GA

Prepared For:

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March 10, 2014

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EXECUTIVE SUMMARY

This traffic impact study has been conducted to determine the traffic impacts expected from the proposed Hartman Distribution Center development near the City of Austell, GA. The development is planned to be completed in 2016. The development is located south of Interstate 20 in Cobb County, GA on White Road between the intersections of Factory Shoals Road and Riverside Parkway. The development will be accessed via these two intersections and by one new full access driveway on White Road.

Capacity analyses and level of service evaluations of the two intersections in the vicinity of the development were conducted for the existing condition; future condition without the development; and future condition with the proposed development. Analysis of the new driveway was conducted for the future condition with the proposed development. The evaluations were used to determine any potential mitigation that might be recommended to resolve any traffic issues resulting from the proposed development.

All studied intersections are expected to continue to operate at an acceptable level of service with the full build out of the development as proposed. The proposed development does not significantly impact the operations or capacity of the intersections. The intersection Riverside Parkway and White Road should be improved to provide a flared right turn for southbound vehicles. The development will construct a right-turn deceleration lane on White Road for the new driveway. The study concluded that with the proposed development there is no need for any additional lanes at any of the intersections, and that the intersections operate at an acceptable level of service as side street stop controlled.

PROJECT DESCRIPTION

A traffic impact study has been conducted for the proposed Hartman Distribution Center that is planned on White Road between Factory Shoals Road and Riverside Parkway near the City of Austell, Georgia in Cobb County. The proposed development will have approximately 620,000 SF of general warehouse space and is planned to be completed in 2016. The development will create a new driveway on White Road, which will serve as the sole access point for the development. The conceptual site plan of the development is included in the appendix.

The traffic impacts with the development as proposed will be compared to the traffic impacts on the surrounding roadway network in the future without the development. The development is in an urban area. The traffic impact study includes capacity analyses and level of service evaluations of two major intersections in the vicinity of the development and the new driveway. The study intersections for the development are:

- Factory Shoals Road at White Road
- Riverside Parkway at White Road
- Hartman Distribution Center Driveway at White Road

The study intersections were analyzed for the existing condition, future background condition without the development, and future condition with the proposed development.

All analyses conducted as part of this study have been based on the data collected for the existing condition and an assumed growth rate for this area estimated based on

historical traffic counts and future growth potential of the area. Any variations to the existing database and the assumptions made may affect the results of the study.

Figure 1 is a map of the vicinity of the proposed development.

Figure 1: Location Map

EXISTING CONDITIONS-2014

The study area consists of the intersections of Factory Shoals Road at White Road and Riverside Parkway at White Road. Pedestrian facilities are not present at either of the study intersections. Riverside Parkway connects to I-20 northeast of the proposed development site and the intersection of Riverside Parkway at White Road. Adjacent to the site are industrial and residential facilities.

Traffic Volumes

Turning Movement Counts (TMC) were collected at the intersections of Factory Shoals Road at White Road and Riverside Parkway at White Road. The counts were collected on Tuesday January 21, 2014 during the AM & PM peak hour periods of 7:00am – 9:00am and 4:00pm - 6:00pm. The morning peak hour for the intersection of Factory Shoals Road at White Road occurred from 7:15 AM to 8:15 AM. The morning peak hour for the intersection of Riverside Parkway at White Road occurred from 7:00 AM to 8:00

AM. The afternoon peak hour occurred from 5:00 PM to 6:00 PM for both intersections. Figure 2 shows the existing peak hour traffic volumes at the study intersections.

Also collected were 24-hour bi-directional volume counts on Factory Shoals Road north of I-20 and on Riverside Parkway south of Twin Hill Road. Georgia DOT (GDOT) daily, monthly, and axel traffic factors were used to adjust the short-term traffic counts. The Average Annual Daily Traffic (AADT) on Factory Shoals Road was 5,570 vehicles per day (vpd) and truck traffic was 4% of vehicles on the road. The AADT for Riverside Parkway was 13,815 vpd and truck traffic was 19% of vehicles on the road. The full count data is included in the appendix.

Roadway Conditions

Factory Shoals Road

Factory Shoals Road is currently a two lane roadway. According to GDOT, Factory Shoals Road is functionally classified as an Urban Local Road. Factory Shoals Road travels generally in the northeast-southwest direction with a posted speed limit of 40 mph. The average annual daily traffic volume (AADT) was 5,570 vehicles per day (vpd) on Factory Shoals Road north of I-20. The truck percentage on the road was 4%.

Riverside Parkway

Riverside Parkway is currently a two lane roadway. According to GDOT, Riverside Parkway is functionally classified as an Urban Minor Arterial. Riverside Parkway travels generally in the northeast-southwest direction, with a posted speed limit of 45 mph. The AADT was 13,815 vehicles per day (vpd). The truck percentage on the road was 19%.

White Road

White Road is a two lane roadway that runs generally north-south connecting Factory Shoals Road to Riverside Parkway. According to GDOT, White Road is functionally classified as an Urban Local Road with a posted speed limit of 35 mph.

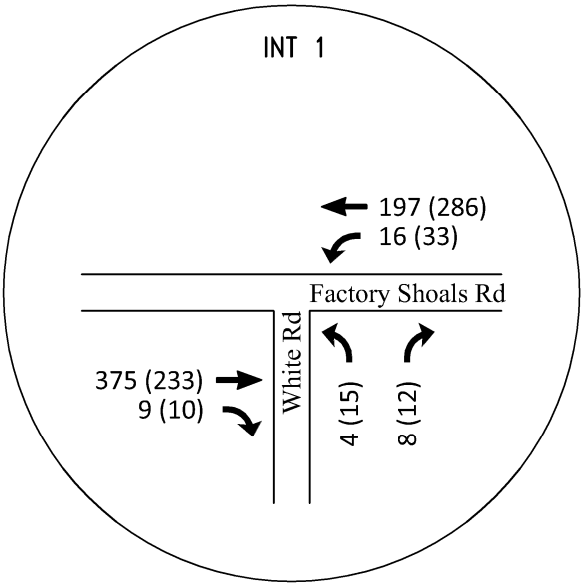
Intersection Geometry

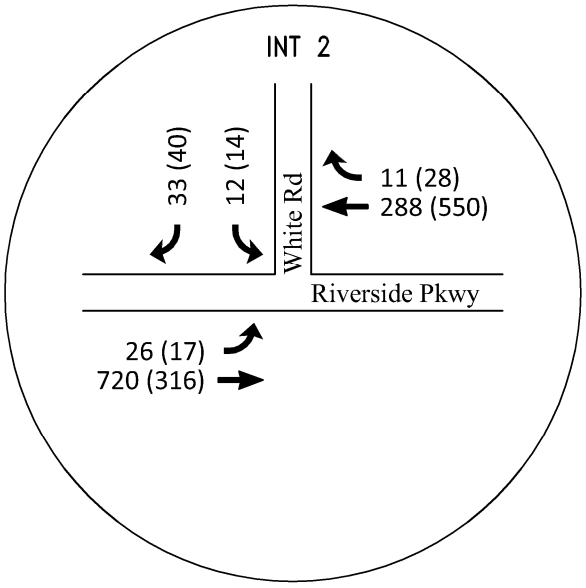
Factory Shoals Road at White Road

This is a three-legged intersection and is side street stop controlled with Factory Shoals Road being the main street. All approaches have a single lane. The northbound approach is the northern terminus for White Road.

Riverside Parkway at White Road

This is a three-legged intersection and is side street stop controlled with Riverside Parkway being the main street. All approaches have a single lane. The southbound approach is the southern terminus for White Road.





Legend: AM (PM)

EXISITING YEAR 2014
PEAK HOUR VOLUME
HARTMAN DISTRIBUTION CENTER DRI

FIGURE 2

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Level of Service

Intersection capacity analyses were performed at two intersections to determine the existing traffic conditions within the study area. Intersection capacity analyses were performed using the methodology outlined in the 2010 Highway Capacity Manual (HCM). This methodology is the industry standard for the evaluation of intersection capacity and delay. In order to facilitate the analysis, a computer software Synchro was used. This software conforms to the methodology of the HCM. The vehicular delay value that results from the Synchro analysis is used to determine the level of service of an intersection. Level of service (LOS) is a letter designation used to describe traffic operating conditions, on a declining scale from A to F. LOS "A" represents free-flow traffic conditions and LOS "F" represents extreme delays with stopped traffic conditions. Tables 1 & 2 below indicate the relationship between delay and level of service for un-signalized & signalized intersections.

Table 1 : Level of Service for Un-Signalized Intersections	
Level of Service	**Control Delay Per Vehicle (sec)**
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Table 2 : Level of Service for Signalized Intersections	
Level of Service	**Control Delay Per Vehicle (sec)**
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

The results of the existing intersection capacity analyses are summarized in Table 3 below. Side Street Stop Control has been reported for both intersections. For Side Street Stop Control intersections, delay and LOS are given for the minor street only. The intersection capacity analyses worksheets are included in the appendix.

Table 3: Existing Year-2014 Level of Service			
Intersection	Type of Control*	Existing-2014 AM-Peak Delay (LOS)	Existing-2014 PM-Peak Delay (LOS)
Factory Shoals Road at White Road	Side Street Stop	13.0 (B)	12.3 (B)
Riverside Parkway at White Road	Side Street Stop	17.1 (C)	17.3 (C)

*For side street stop control intersections, delay and LOS are given for minor street only

Under existing conditions, all system intersections are operating at an acceptable level of service during AM and PM peak hours, well above the minimum LOS D.

FUTURE BACKGROUND CONDITIONS-(2016) Without Development

Future Traffic Volumes

To estimate the volumes that will exist in the vicinity of the proposed development during the anticipated full build out year of 2016, current traffic trends were evaluated. Based on GDOT's STARS information Factory Shoals Road and Riverside Parkway have shown some negative growth. For the purpose of this study and to provide the most conservative analysis an assumed growth rate of 1% is used to estimate future traffic volumes in the project area. The future background traffic volumes are shown in Figure 3.

Future Background Level of Service

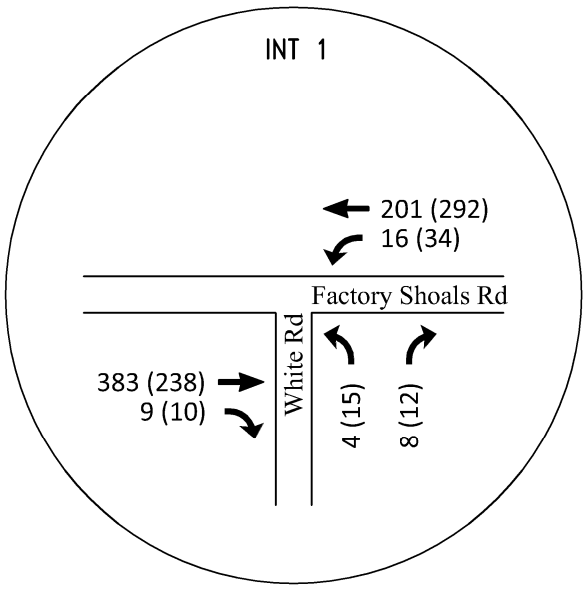
The level of service for the future background condition was determined using the same method as discussed previously in the Existing Conditions – Level of Service section. Intersection capacity analyses were performed on the future background traffic volumes. The LOS for all the intersections was similar to the existing conditions.

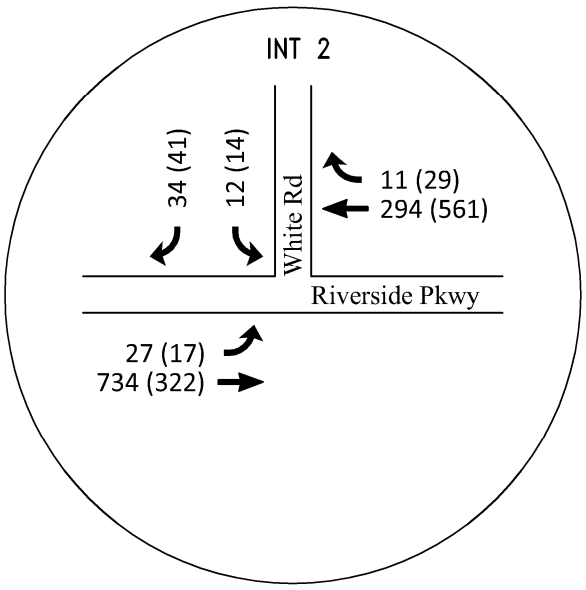
The results of the intersection capacity analysis for the 2016 future background year are summarized in Table 4. The study worksheets are included in the appendix.

Table 4: Future Background Level of Service w/o Proposed Development			
Intersection	Type of Control*	Future Year-2016 Without Development AM-Peak Delay (LOS)	Future Year-2016 Without Development PM-Peak Delay (LOS)
Factory Shoals Road at White Road	Side Street Stop	13.1 (B)	12.4 (B)
Riverside Parkway at White Road	Side Street Stop	17.4 (C)	17.6 (C)

*For side street stop control intersections, delay and LOS are given for minor street only

Under future background conditions, all system intersections are operating at an acceptable level of service during AM and PM peak hours, well above the minimum LOS D.





Legend: AM (PM)

YEAR 2016 BACKGROUND PEAK HOUR VOLUME

HARTMAN DISTRIBUTION CENTER DRI

FIGURE 3

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PROPOSED DEVELOPMENT

The proposed Hartman Distribution Center development will have approximately 620,000 SF of General Warehouse Space. The development is planned to be completed in 2016. One full access driveway will be built on White Road for the Distribution Center.

Approximately 85 percent of the site is already zoned Heavy Industrial. The northern end of the site will be being rezoned to Heavy Industrial, from R-20, to match the southern portion of the site. Cobb County's comprehensive land use plan calls for this area to be industrial in nature.

The proposed development was analyzed with the intersections of Factory Shoals Road at White Road, Riverside Parkway at White Road, and the new Distribution Center Driveway on White Road as the access development's points. The site development plan is attached in the appendix; this plan shows the highlighted fifteen percent of the site that is currently zoned R-20.

Trip Generation

It is anticipated that the proposed development will reach full build-out by 2016. The expected number of gross trips for this land use was determined using Trafficware's Trip Generation software. This software estimates trips generated by the proposed land use in accordance with the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 9th Edition, 2012. Full build-out and occupancy of the development was assumed when applying the trip generation rates and equations. The net new trips for the proposed mixed use development are provided in the Table 5. The trip generation worksheet and future volume data worksheet are attached in the appendix.

To provide the most conservative analysis the proposed development was analyzed as a 625,000 SF General Warehouse, even though the proposed development will be less than 620,000 SF.

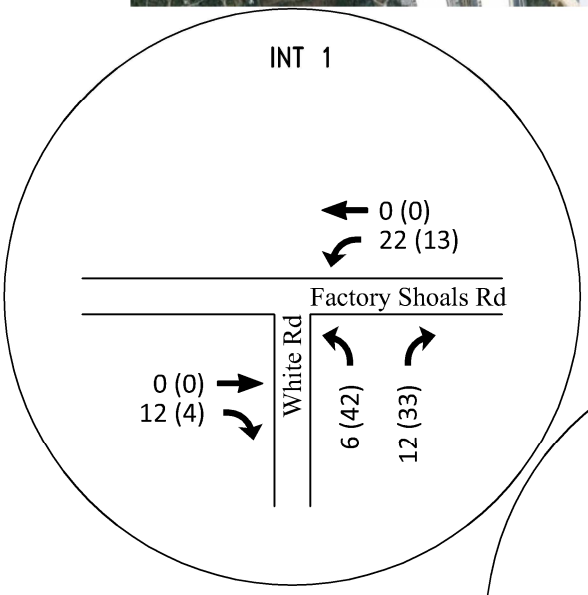
Table 5: Trip Generation - Proposed Development

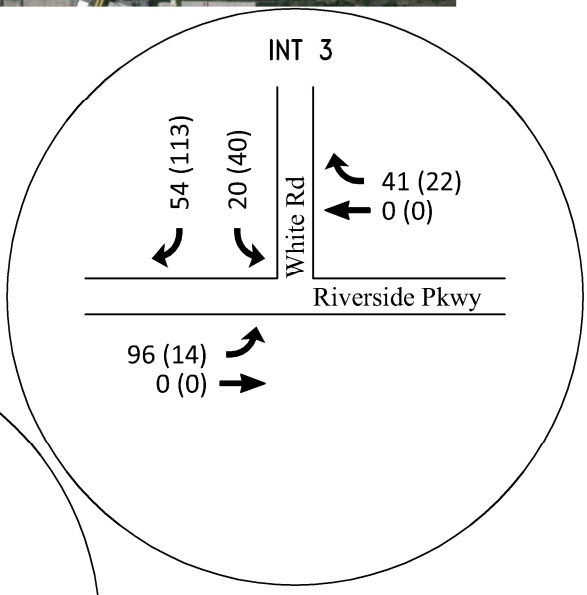
Land Use	ITE Code	24-Hr Two-Way Volume	AM-Peak (7-9)		PM-Peak (4-6)	
			Enter	Exit	Enter	Exit
625,000 SF General Warehouse	150	2225	171	92	53	228
Total		2225	171	92	53	228

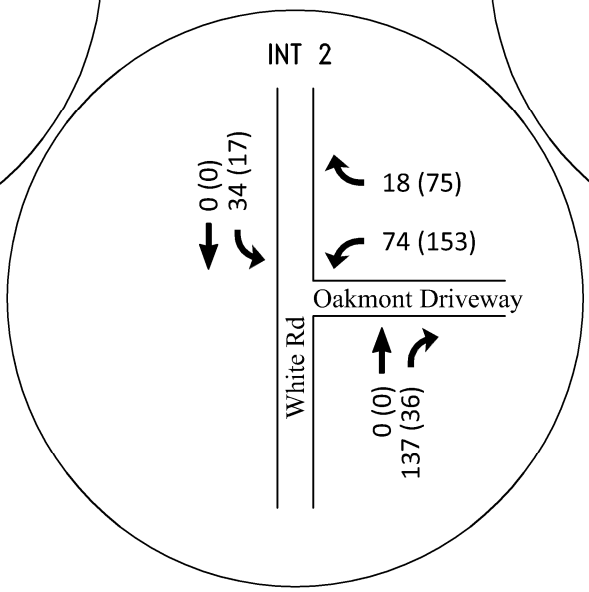
Source: ITE Trip Generation, 9th Edition, 2012

Trip Distribution and Assignment

The trip distribution for the proposed development has been determined based on the existing traffic flow patterns experienced in the area and the type of adjacent development. The site-generated traffic was assigned to the study intersections according to the expected trip distributions. The site generated traffic for the proposed development at the study intersections are shown in Figure 4. The lane geometry of the study intersections and the proposed site access are shown in Figure 5. The trip distribution percentages are attached in the appendix.







Legend: AM (PM)

SITE GENERATED
PEAK HOUR VOLUME
HARTMAN DISTRIBUTION CENTER DRI

FIGURE 4

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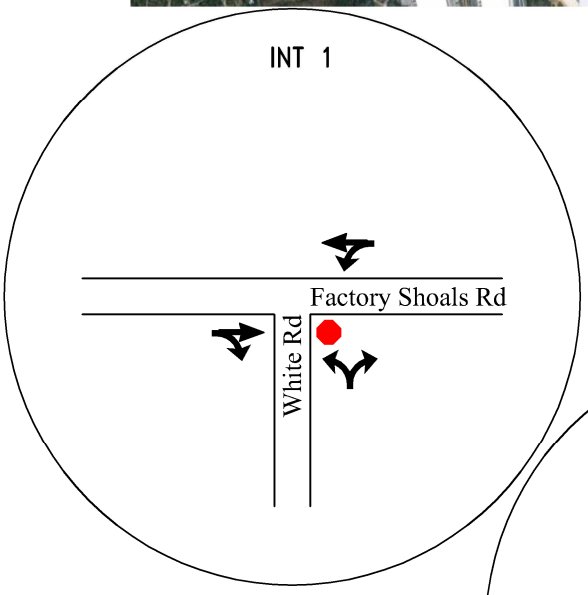

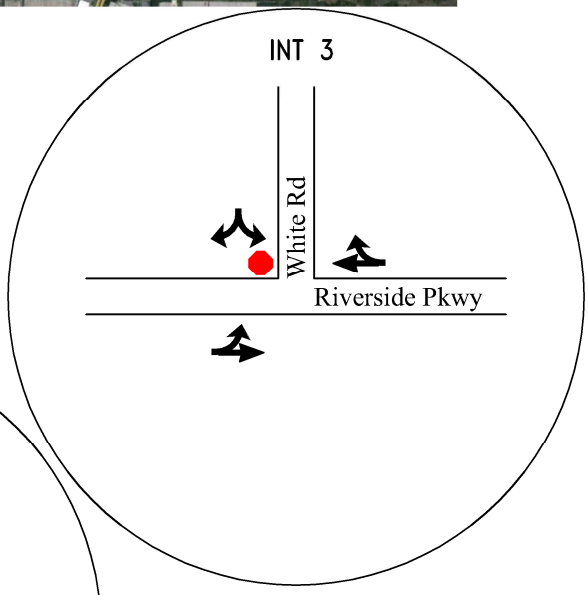

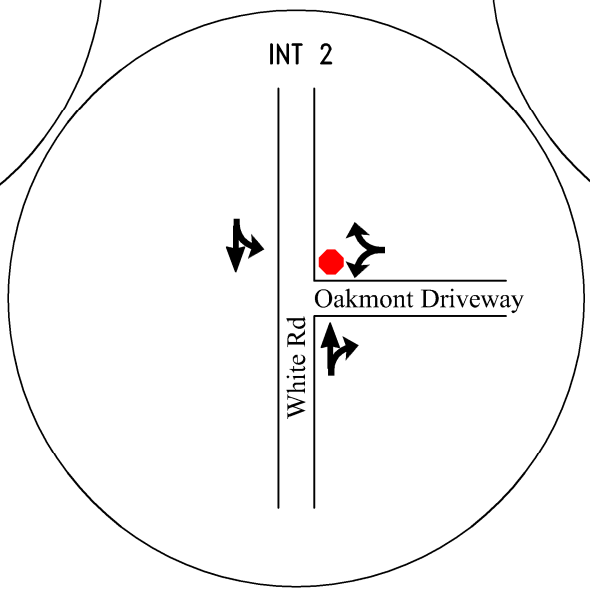

Legend: AM (PM)

FUTURE YEAR 2016 DEVELOPED LANE CONFIGURATION

HARTMAN DISTRIBUTION CENTER DRI

FIGURE 5

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FUTURE CONDITONS-(2016) WITH PROPOSED DEVELOPMENT

Future Traffic Volumes

The future traffic volumes were determined by adding the site generated traffic estimated for the Hartman Distribution Center development to the future background traffic volumes. To provide a conservative analysis no pass-by reductions or internal trip captures were used in determining the future volume assignments. The future traffic volumes for the proposed development are shown in Figure 6.

Future Level of Service

The level of service for the future condition with the proposed development was determined using the same methods as discussed previously in the Existing Condition-Level of Service section. Intersection capacity analyses were performed on calculated future traffic volumes with the proposed development.

The intersections were first analyzed using their existing geometry and Side Street Stop Control. All intersections, with the exception of Riverside Parkway at White Road, continue to operate at acceptable levels of service, well above the minimum LOS D, in the future with the development as proposed. The intersection at the new Distribution Center Driveway was analyzed as the driveway having a shared left-thru-right lane, and single lane approaches on White Road. Additionally, a right-turn deceleration lane will be constructed for the northbound approach on White Road at the driveway due to the high volume of right-turning vehicles.

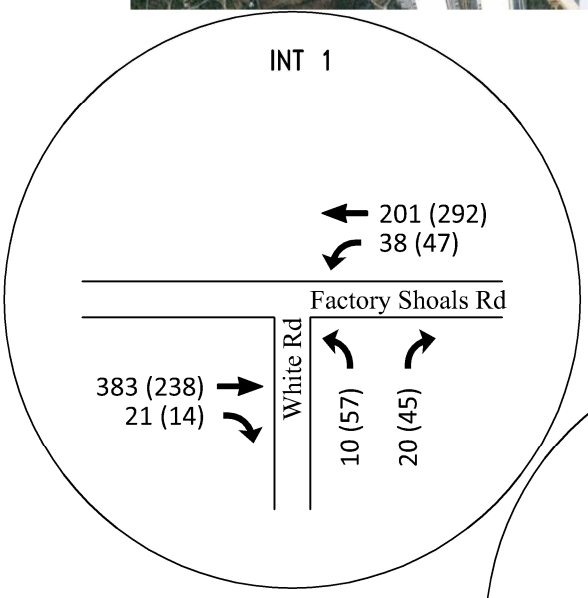
The intersection of Riverside Parkway at White Road was analyzed again with the proposed improvement of a flared right-turn on White Road and remaining Side Street Stop Controlled. This will allow right-turning vehicles to navigate around the left-turning vehicles waiting for a gap. With the flared right-turn addition on White Road the intersection operates at acceptable level of service, well above the minimum LOS D, in the future with the development as proposed.

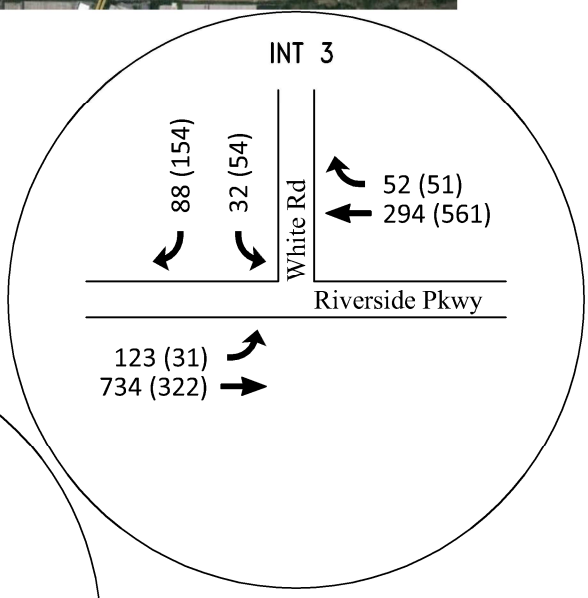
With the recommended improvement at the intersection of Riverside Parkway and White Road, all the intersections operate at an acceptable level of service in the future with the development as proposed. All intersections continue to operate at an acceptable level of service as Side Street Stop Controlled. The results of the intersection capacity analysis for the 2016 future year with the development are summarized in the Table 6. The intersection capacity analyses worksheets are included in the appendix.

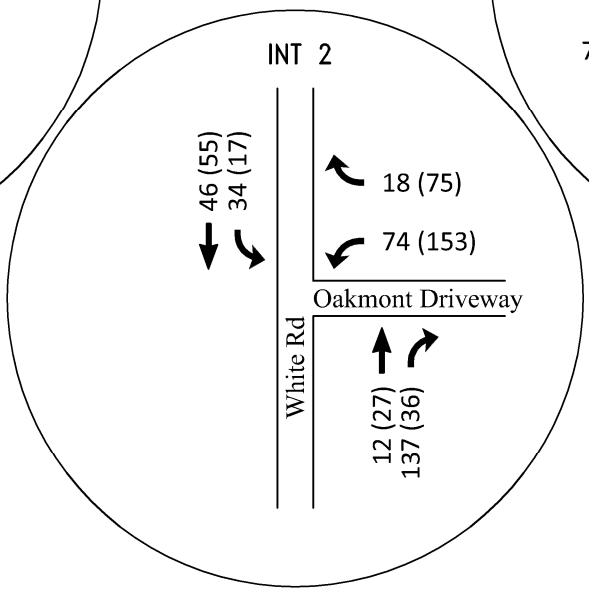
Table 6: Future Background Level of Service with Proposed Development

Intersection	Type of Control*	Future Year-2016 With Development		Future Year-2016 Development w/ Improvements	
		AM-Peak Delay (LOS)	PM-Peak Delay (LOS)	AM-Peak Delay (LOS)	PM-Peak Delay (LOS)
Factory Shoals Road at White Road	Side Street Stop	13.9 (B)	14.4 (B)	-	-
Riverside Parkway at White Road	Side Street Stop	34.5 (D)	37.4 (E)	26.0 (C)	19.4 (C)
Hartman Distribution Center	Side Street Stop	7.8 (A)	8.0 (A)	-	-

*For side street stop control intersections, delay and LOS are given for minor street only







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FUTURE YEAR 2016 DEVELOPED PEAK HOUR VOLUME

HARTMAN DISTRIBUTION CENTER DRI

FIGURE 6

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CONCLUSIONS AND RECOMMENDATIONS

The study intersections currently operate at acceptable levels of service. When the intersections were analyzed for the future year 2016 background peak hour volumes without the proposed development they continue to operate at an acceptable level of service, well above the minimum LOS D.

With the proposed development the study intersections are expected to continue to operate at acceptable levels of service with the site generated traffic. Based on the analyses conducted in the study, the traffic impacts of the proposed development on the surrounding roadway network were determined to be negligible. The level of service for the study intersections are expected to remain at acceptable levels in the future with the development as proposed, well above the minimum LOS D.

The Factory Shoals Road and White Road intersection is expected to operate at an acceptable level of service, LOS B, in the future with the development as proposed. The existing roadway lane configuration is adequate for the future conditions with the development. The intersection should continue to operate as Side Street Stop Controlled.

The Hartman Distribution Center Driveway and White Road intersection is expected to operate at an acceptable level of service, LOS A, in the future with the development as proposed. The existing roadway geometry of White Road is adequate for the future conditions with the development, but a right-turn deceleration lane will be constructed for the northbound approach on White Road to accommodate the high volume of right-turning vehicles into the new driveway. A single lane full access driveway will serve as the sole driveway for the development. The intersection should operate as Side Street Stop Controlled.

The Riverside Drive and White Road intersection is expected to operate at an acceptable level of service, LOS C, in the future with the development and intersection improvements as proposed on White Road. The single lane southbound approach on White Road should be improved to provide a flared right-turn, upon completion of the development. The intersection should continue to operate as Side Street Stop Controlled.

Hartman Distribution Center City of Austell, Cobb County, GA Traffic Study Appendix

Appendix A: Site Development Plan

Appendix B: Traffic Count Summary Sheets

Appendix C: Trip Generation and Distribution

Appendix D: Existing Year-2014 Intersection Capacity Analyses Sheets (ICAS)

Appendix E: Year-2016 Background ICAS without the Development

Appendix F: Year-2016 ICAS with the Development

Appendix A: Site Development Plan

HARTMAN INDUSTRIAL WAY
(60-FOOT RIGHT-OF-WAY)
(30' WIDE ASPHALT)

EXISTING 12" WATER LINE

APPROXIMATE LAND LOT LINE

N/F
HARTMAN ROAD, LLC.
DB14226,PG6385
(PIN:18 0701 00010)
ZONED LIws

GRID (GA WEST)

N/F
GEORGIA FLUSH DOOR SALES, INC
C/O JELD WEN, INC
(PIN:18 0778 00010)
ZONED HIws

L.L. 685 | L.L. 701 | L.L. 684 | L.L. 702 | L.L. 778 | L.L. 777

IPS #4RB

S1°13'12"E
1350.92'

INTERNAL PROPERTY LINE

50' FRONT BSL

AUTOMOBILE PARKING SPACES

TRAILER SPACES

TRAILER SPACES

CONCRETE TRUCK COURT

118'

185'

195'

250'

LOADING DOORS

20'

PROPOSED OFFICE ENTRANCE

PROPOSED OFFICE ENTRANCE

1104'

TO BE REZONED FROM R-20 TO HI

30'

AUTOMOBILE PARKING SPACES

BUILDING 100
617,374 SF

570'

AUTOMOBILE PARKING SPACES

P.O.B.

APPROXIMATE LAND LOT LINE

STORMWATER MANAGEMENT FACILITY WITH 5' FENCE

20' SIDE BSL

S89°09'29"E
677.75'

283'

N/F
GC EXCHANGE, INC.
DB14524,PG3256
PB145,PG39
(PIN:18 0701 00020)
ZONED HI

3/4" OTP FOUND (4.6' SE)

IPS #4RB

C1

L1

SIGN

TEL. EQUIP.

TEL. PED.

30'

77'

C2

40' REAR BSL

18"RCP
E: 997.1

24"CMP
E: 998.9

18"RCP
E: 992.6

24"CMP
E: 992.2

EXISTING 6" WATER LINE

L2

C3

L3

WHITE ROAD
(APPARENT 60'-FOOT RIGHT-OF-WAY)
(24' WIDE ASPHALT)

2"OTP FOUND

N/F
JADOW REALTY CO.
DB3938,PG120
ZONED LIws

N/F
HARRY LUNDY
ZONED LIws

±1250 LF OF 5' SIDEWALK PROPOSED ALONG FRONTAGE

50'

100'

C4

L4

5' LANDSCAPED SCREENING BUFFER

40' REAR BSL

APPROXIMATE LAND LOT LINE

L.L. 683 | L.L. 703 | L.L. 682 | L.L. 702

N 00°48'54" E 241.09'

1"OTP FOUND (ON-LINE)

1/2"OTP FOUND (16.9'SW)

BPS #4RB

N/F
LOIS SMITH BRIARD
DB6732,PG74
ZONED R-20

N/F
NELLIE W LUNDY
ZONED LIws

APPROXIMATE LAND LOT LINE

N/F
RUBIN LANSKY
LOLA LANSKY
DB3588,PG1
(PIN:18 0701 00010)
ZONED R-20

132'

PROPOSED OFFICE ENTRANCE

LOADING DOORS

CONCRETE TRUCK COURT

245'

198'

145'

TRAILER SPACES

75' IMPERVIOUS SETBACK
50' COUNTY BUFFER
25' STATE BUFFER
10' TOP OF BANK
TOP OF BANK
25' STATE BUFFER
50' COUNTY BUFFER
75' IMPERVIOUS SETBACK

30' SIDE BSL

STORMWATER MANAGEMENT FACILITY WITH 5' FENCE

SMH RIM:1012.9

SMH RIM:982.4

SMH RIM:988.7

SMH RIM:1001.8

SS

W

CATV

GRAPHIC SCALE
60 0 60 120
(IN FEET)
1 inch = 60 ft.

FEMA FIRM PANEL
NOT TO SCALE

LOCATION MAP
1"=1000'

PROPOSED LINE TABLE

LINE	LENGTH	DIRECTION
L1	281.75	N36°29'54"W
L2	148.20	N20°22'07"W
L3	158.74	N27°18'41"W
L4	79.30	N31°32'30"W

PROPOSED CURVE TABLE

CURVE	ARC LENGTH	RADIUS	DELTA	CHORD BRG.	CHORD LENGTH
C1	92.98	700.63	7.60	N32°41'48"W	92.91
C2	237.11	842.25	16.13	N28°26'00"W	236.33
C3	120.49	994.35	6.94	N23°50'24"W	120.42
C4	164.87	2233.02	4.23	N29°25'36"W	164.83

ZONING NOTES:

* NO WETLANDS EXIST ONSITE.
* NO LAKES EXIST ONSITE.
* NO ARCHITECTURAL OR ARCHEOLOGICAL LANDMARKS EXIST ONSITE.
* NO CEMETERIES EXIST ONSITE.

SITE DATA

DEVELOPER	OAKMONT INDUSTRIAL GROUP 3520 PIEDMONT ROAD SUITE 100 ATLANTA, GA. 30305 PHONE: (404) 869-9990
ENGINEER SURVEYOR	SOUTHEASTERN ENGINEERING, INC. 2470 SANDY PLAINS ROAD MARIETTA, GA. 30066 PHONE: (770) 321-3936
SITE AREA:	38.49 ACRES
CURRENT ZONING:	HI - HEAVY INDUSTRIAL R-20 RESIDENTIAL
PROPOSED ZONING:	HI - HEAVY INDUSTRIAL
PROPOSED USE:	OFFICE/WAREHOUSE
SETBACKS:	50' FRONT 20' SIDE 40' REAR
PARKING SPACES REQUIRED:	WAREHOUSING: 1 SPACE PER 2,000 SF 617,374 SF * 1 SPACE / 2,000 SF SPACES REQUIRED = 309 SPACES
PARKING SPACES PROVIDED:	309 PARKING SPACES PROVIDED
BUFFER:	VARIANCE REQUESTED TO REDUCE WIDTH OF "LANDSCAPE SCREENING BUFFER" FROM 50' TO 0', ALONG R-20 PROPERTY TO THE NORTH (LANSKY)
FLOODPLAIN:	THIS PROPERTY IS NOT LOCATED WITHIN THE 100-YEAR FLOODPLAIN, PER FEMA FIRM PANEL #13067C0214H, DATED 03-04-13.

SOUTHEASTERN ENGINEERING, INC.
2470 SANDY PLAINS ROAD MARIETTA, GEORGIA 30066
(770) 321-3936 FAX (770) 321-3939
www.southeasterneng.com

047-13-133

OAKMONT INDUSTRIAL GROUP

No	ISSUED DESCRIPTION	DATE

PROJECT OWNED/DEVELOPED BY:
OAKMONT INDUSTRIAL GROUP

24 HOUR CONTACT INFORMATION

ZONING SITE PLAN

HARTMAN DISTRIBUTION CENTER
PROJECT LOCATED AT:
LL. 684 & 702 18TH DISTRICT
COBB COUNTY, GA

GEORGIA REGISTERED No. 01277 PROFESSIONAL ENGINEER WAYNE MATHONY JR.

Project No.:	047-13-133
Designed By:	EWM
Issue Date:	2014 FEB 18

C1.0.0

Know what's below. Call before you dig.

FILE NAME: I:\CUSTOMERS_PROJECTS\047 Oakmont\047-13-133 Hartman White property\Traffic\DWG\047-13-133-ZONING.dwg PLOT DATE: 3/4/2014 USER: CHRIS MADDOX

ZONING NOTES:

* NO WETLANDS EXIST ONSITE.
* NO LAKES EXIST ONSITE.
* NO ARCHITECTURAL OR ARCHEOLOGICAL LANDMARKS EXIST ONSITE.
* NO CEMETERIES EXIST ONSITE.

SITE DATA

DEVELOPER	OAKMONT INDUSTRIAL GROUP 3520 PIEDMONT ROAD SUITE 100 ATLANTA, GA. 30305 PHONE: (404) 869-9990
ENGINEER SURVEYOR	SOUTHEASTERN ENGINEERING, INC. 2470 SANDY PLAINS ROAD MARIETTA, GA. 30066 PHONE: (770) 321-3936
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PROPOSED ZONING:	HI - HEAVY INDUSTRIAL
PROPOSED USE:	OFFICE/WAREHOUSE
SETBACKS:	50' FRONT 20' SIDE 40' REAR
PARKING SPACES REQUIRED:	WAREHOUSING: 1 SPACE PER 2,000 SF 617,374 SF * 1 SPACE / 2,000 SF SPACES REQUIRED = 309 SPACES
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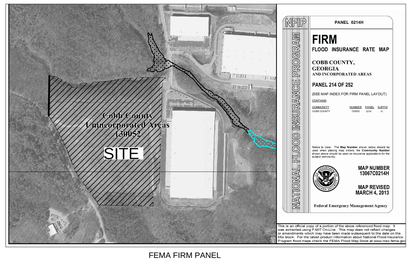
BUFFER:	VARIANCE REQUESTED TO REDUCE WIDTH OF "LANDSCAPE SCREENING BUFFER" FROM 50' TO 0', ALONG R-20 PROPERTY TO THE NORTH (LANSKY)
FLOODPLAIN:	THIS PROPERTY IS NOT LOCATED WITHIN THE 100-YEAR FLOODPLAIN, PER FEMA FIRM PANEL #13067C0214H, DATED 03-04-13.



FEMA FIRM PANEL
NOT TO SCALE

LOCATION MAP
1"=1000'

N
GRID (GA WEST)

SOUTHEASTERN ENGINEERING, INC.
2470 Sandy Plains Road Marietta, Georgia 30066
tel / 770.321.3936 fax / 770.321.3733
www.southeasterneng.com

047-13-133

OAKMONT INDUSTRIAL GROUP

No	ISSUED DESCRIPTION	DATE

PROJECT OWNED/DEVELOPED BY:
OAKMONT INDUSTRIAL GROUP

24 HOUR CONTACT INFORMATION

ZONING SITE PLAN

HARTMAN DISTRIBUTION CENTER

PROJECT LOCATED AT:
LL. 684 & 702 18TH DISTRICT
COBB COUNTY, GA

GEORGIA REGISTERED No. 31277 PROFESSIONAL ENGINEER WAYNE MATTHEWS JR.

Project No.:	047-13-133
Designed By:	EWM
Issue Date:	2014 FEB 18

C1.0.0

811 Know what's below. Call before you dig.

Appendix B: Traffic Count Summary Sheets

Project ID: 14-9014-012
Location: White Rd & Factory Shoals Rd
City: Austell

Day: Tuesday
Date: 1/21/2014

Peak Start Times	
AM	7:00 AM
MD	12:00 AM
PM	4:00 PM

Groups Printed - Cars, PU, Vans - Heavy Trucks

	White Rd Northbound					White Rd Southbound					Factory Shoals Rd Eastbound					Factory Shoals Rd Westbound					
Start Time	Left	Thru	Rgt	Peds	App. Total	Left	Thru	Rgt	Peds	App. Total	Left	Thru	Rgt	Peds	App. Total	Left	Thru	Rgt	Peds	App. Total	Int. Total
7:00 AM	0	0	8	0	8	0	0	0	0	0	0	76	2	0	78	2	33	0	0	35	121
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	89	2	0	91	5	31	0	0	36	127
7:30 AM	3	0	4	0	7	0	0	0	0	0	0	110	4	0	114	3	61	0	0	64	185
7:45 AM	1	0	3	0	4	0	0	0	0	0	0	92	1	0	93	5	49	0	0	54	151
Total	4	0	15	0	19	0	0	0	0	0	0	367	9	0	376	15	174	0	0	189	584
8:00 AM	0	0	1	0	1	0	0	0	0	0	0	84	2	0	86	3	56	0	0	59	146
8:15 AM	1	0	3	0	4	0	0	0	0	0	0	54	1	0	55	4	38	0	0	42	101
8:30 AM	0	0	5	0	5	0	0	0	0	0	0	45	0	0	45	3	30	0	0	33	83
8:45 AM	1	0	4	0	5	0	0	0	0	0	0	27	3	0	30	1	17	0	0	18	53
Total	2	0	13	0	15	0	0	0	0	0	0	210	6	0	216	11	141	0	0	152	383
BREAK																					
4:00 PM	1	0	8	0	9	0	0	0	0	0	0	36	5	0	41	7	42	0	0	49	99
4:15 PM	2	0	8	0	10	0	0	0	0	0	0	44	5	0	49	8	27	0	0	35	94
4:30 PM	1	0	9	0	10	0	0	0	0	0	0	44	1	0	45	13	48	0	0	61	116
4:45 PM	2	0	7	0	9	0	0	0	0	0	0	43	3	0	46	7	59	0	0	66	121
Total	6	0	32	0	38	0	0	0	0	0	0	167	14	0	181	35	176	0	0	211	430
5:00 PM	3	0	5	0	8	0	0	0	0	0	0	54	2	0	56	5	84	0	0	89	153
5:15 PM	1	0	3	0	4	0	0	0	0	0	0	74	2	0	76	9	60	0	0	69	149
5:30 PM	8	0	3	0	11	0	0	0	0	0	0	56	3	0	59	8	79	0	0	87	157
5:45 PM	3	0	1	0	4	0	0	0	0	0	0	49	3	0	52	11	63	0	0	74	130
Total	15	0	12	0	27	0	0	0	0	0	0	233	10	0	243	33	286	0	0	319	589
Grand Total	27	0	72	0	99	0	0	0	0	0	0	977	39	0	1016	94	777	0	0	871	1986
Apprch %	27.3	0.0	72.7	0.0		0.0	0.0	0.0	0.0		0.0	96.2	3.8	0.0		10.8	89.2	0.0	0.0		
Total %	1.4	0.0	3.6	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	49.2	2.0	0.0	51.2	4.7	39.1	0.0	0.0	43.9	
Cars, PU, Vans	21	0	66	0	87	0	0	0	0	0	0	973	31	0	1004	93	771	0	0	864	1955
% Cars, PU, Vans	77.8	0.0	91.7	0.0	87.9	0.0	0.0	0.0	0.0	0.0	0.0	99.6	79.5	0.0	98.8	98.9	99.2	0.0	0.0	99.2	98.4
Heavy Trucks	6	0	6		12	0	0	0		0	0	4	8		12	1	6	0		7	31
%Heavy Trucks	22.2	0.0	8.3	0.0	12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.4	20.5	0.0	1.2	1.1	0.8	0.0	0.0	0.8	1.6

Project ID: 14-9014-012
Location: White Rd & Factory Sho
City: Austell

PEAK HOURS

Day: Tuesday
Date: 1/21/2014

AM

	White Rd Northbound				White Rd Southbound				Factory Shoals Rd Eastbound				Factory Shoals Rd Westbound				
Start Time	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Int. Total
Peak Hour Analysis from 07:00 AM to 09:00 AM																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
7:15 AM	0	0	0	0	0	0	0	0	0	89	2	91	5	31	0	36	127
7:30 AM	3	0	4	7	0	0	0	0	0	110	4	114	3	61	0	64	185
7:45 AM	1	0	3	4	0	0	0	0	0	92	1	93	5	49	0	54	151
8:00 AM	0	0	1	1	0	0	0	0	0	84	2	86	3	56	0	59	146
Total Volume	4	0	8	12	0	0	0	0	0	375	9	384	16	197	0	213	609
% App. Total	33.3	0.0	66.7	100	0.0	0.0	0.0	0	0.0	97.7	2.3	100	7.5	92.5	0.0	100	
PHF				0.429				0.000				0.842				0.832	
Cars, PU, Vans	3	0	2	5	0	0	0	0	0	375	6	381	16	196	0	212	598
% Cars, PU, Vans	75.0	0.0	25.0	41.7	0.0	0.0	0.0	0.0	0.0	100.0	66.7	99.2	####	99.5	0.0	99.5	98.2
Heavy Trucks	1	0	6	7	0	0	0	0	0	0	3	3	0	1	0	1	11
%Heavy Trucks	25.0	0.0	75.0	58.3	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.8	0.0	0.5	0.0	0.5	1.8

PM

	White Rd Northbound				White Rd Southbound				Factory Shoals Rd Eastbound				Factory Shoals Rd Westbound				
Start Time	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Int. Total
Peak Hour Analysis from 04:00 PM to 06:00 PM																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
5:00 PM	3	0	5	8	0	0	0	0	0	54	2	56	5	84	0	89	153
5:15 PM	1	0	3	4	0	0	0	0	0	74	2	76	9	60	0	69	149
5:30 PM	8	0	3	11	0	0	0	0	0	56	3	59	8	79	0	87	157
5:45 PM	3	0	1	4	0	0	0	0	0	49	3	52	11	63	0	74	130
Total Volume	15	0	12	27	0	0	0	0	0	233	10	243	33	286	0	319	589
% App. Total	55.6	0.0	44.4	100	0.0	0.0	0.0	0	0.0	95.9	4.1	100	10.3	89.7	0.0	100	
PHF				0.614				0.000				0.799				0.896	
Cars, PU, Vans	13	0	12	25	0	0	0	0	0	233	10	243	33	284	0	317	585
% Cars, PU, Vans	86.7	0.0	####	92.6	0.0	0.0	0.0	0.0	0.0	100.0	####	100.0	####	99.3	0.0	99.4	99.3
Heavy Trucks	2	0	0	2	0	0	0	0	0	0	0	0	0	2	0	2	4
%Heavy Trucks	13.3	0.0	0.0	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.6	0.7

Project ID: 14-9014-013
Location: Bob White Rd & Riverside Pkwy
City: Austell

Day: Tuesday
Date: 1/21/2014

Peak Start Times	
AM	7:00 AM
MD	12:00 AM
PM	4:00 PM

Groups Printed - Cars, PU, Vans - Heavy Trucks

	Bob White Rd Northbound					Bob White Rd Southbound					Riverside Pkwy Eastbound					Riverside Pkwy Westbound					
Start Time	Left	Thru	Rgt	Peds	App. Total	Left	Thru	Rgt	Peds	App. Total	Left	Thru	Rgt	Peds	App. Total	Left	Thru	Rgt	Peds	App. Total	Int. Total
7:00 AM	0	0	0	0	0	2	0	4	0	6	8	177	0	0	185	0	59	4	0	63	254
7:15 AM	0	0	0	0	0	4	0	15	0	19	5	189	0	0	194	0	72	2	0	74	287
7:30 AM	0	0	0	0	0	3	0	5	0	8	8	172	0	0	180	0	81	3	0	84	272
7:45 AM	0	0	0	0	0	3	0	9	0	12	5	182	0	0	187	0	76	2	0	78	277
Total	0	0	0	0	0	12	0	33	0	45	26	720	0	0	746	0	288	11	0	299	1090
8:00 AM	0	0	0	0	0	5	0	4	0	9	6	139	0	0	145	0	67	4	0	71	225
8:15 AM	0	0	0	0	0	5	0	8	0	13	3	104	0	0	107	0	66	7	0	73	193
8:30 AM	0	0	0	0	0	3	0	2	0	5	1	96	0	0	97	0	57	3	0	60	162
8:45 AM	0	0	1	0	1	6	0	1	0	7	4	90	0	0	94	1	51	3	0	55	157
Total	0	0	1	0	1	19	0	15	0	34	14	429	0	0	443	1	241	17	0	259	737
BREAK																					
4:00 PM	0	0	0	0	0	4	0	8	0	12	9	78	0	0	87	0	116	6	0	122	221
4:15 PM	0	0	0	0	0	7	0	7	0	14	2	54	0	0	56	0	90	7	0	97	167
4:30 PM	0	0	0	0	0	3	0	3	0	6	4	76	0	0	80	0	105	13	0	118	204
4:45 PM	0	0	0	0	0	4	0	1	0	5	6	93	0	0	99	0	90	7	0	97	201
Total	0	0	0	0	0	18	0	19	0	37	21	301	0	0	322	0	401	33	0	434	793
5:00 PM	0	0	0	0	0	6	0	4	0	10	4	88	0	0	92	0	140	9	0	149	251
5:15 PM	2	0	0	0	2	3	0	14	0	17	5	88	0	0	93	0	137	6	0	143	255
5:30 PM	0	0	0	0	0	3	0	11	0	14	2	60	1	0	63	1	143	6	0	150	227
5:45 PM	0	0	0	0	0	2	0	11	0	13	6	80	0	0	86	0	130	7	0	137	236
Total	2	0	0	0	2	14	0	40	0	54	17	316	1	0	334	1	550	28	0	579	969
Grand Total	2	0	1	0	3	63	0	107	0	170	78	1766	1	0	1845	2	1480	89	0	1571	3589
Apprch %	66.7	0.0	33.3	0.0		37.1	0.0	62.9	0.0		4.2	95.7	0.1	0.0		0.1	94.2	5.7	0.0		
Total %	0.1	0.0	0.0	0.0	0.1	1.8	0.0	3.0	0.0	4.7	2.2	49.2	0.0	0.0	51.4	0.1	41.2	2.5	0.0	43.8	
Cars, PU, Vans	2	0	1	0	3	23	0	72	0	95	42	1658	1	0	1701	2	1386	43	0	1431	3230
% Cars, PU, Vans	####	0.0	####	0.0	100.0	36.5	0.0	67.3	0.0	55.9	53.8	93.9	####	0.0	92.2	100.0	93.6	48.3	0.0	91.1	90.0
Heavy Trucks	0	0	0		0	40	0	35		75	36	108	0		144	0	94	46		140	359
%Heavy Trucks	0.0	0.0	0.0	0.0	0.0	63.5	0.0	32.7	0.0	44.1	46.2	6.1	0.0	0.0	7.8	0.0	6.4	51.7	0.0	8.9	10.0

Project ID: 14-9014-013
Location: Bob White Rd & Riversic
City: Austell

PEAK HOURS

Day: Tuesday
Date: 1/21/2014

AM

	Bob White Rd Northbound				Bob White Rd Southbound				Riverside Pkwy Eastbound				Riverside Pkwy Westbound				
Start Time	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Int. Total
Peak Hour Analysis from 07:00 AM to 12:00 AM																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
7:00 AM	0	0	0	0	2	0	4	6	8	177	0	185	0	59	4	63	254
7:15 AM	0	0	0	0	4	0	15	19	5	189	0	194	0	72	2	74	287
7:30 AM	0	0	0	0	3	0	5	8	8	172	0	180	0	81	3	84	272
7:45 AM	0	0	0	0	3	0	9	12	5	182	0	187	0	76	2	78	277
Total Volume	0	0	0	0	12	0	33	45	26	720	0	746	0	288	11	299	1090
% App. Total	0.0	0.0	0.0	0	26.7	0.0	73.3	100	3.5	96.5	0.0	100	0.0	96.3	3.7	100	
PHF				0.000				0.592				0.961				0.890	
Cars, PU, Vans	0	0	0	0	3	0	20	23	18	697	0	715	0	263	4	267	1005
% Cars, PU, Vans	0.0	0.0	0.0	0.0	25.0	0.0	60.6	51.1	69.2	96.8	0.0	95.8	0.0	91.3	36.4	89.3	92.2
Heavy Trucks	0	0	0	0	9	0	13	22	8	23	0	31	0	25	7	32	85
%Heavy Trucks	0.0	0.0	0.0	0.0	75.0	0.0	39.4	48.9	30.8	3.2	0.0	4.2	0.0	8.7	63.6	10.7	7.8

PM

	Bob White Rd Northbound				Bob White Rd Southbound				Riverside Pkwy Eastbound				Riverside Pkwy Westbound				
Start Time	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Left	Thru	Rgt	App. Total	Int. Total
Peak Hour Analysis from 04:00 PM to 06:00 PM																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
5:00 PM	0	0	0	0	6	0	4	10	4	88	0	92	0	140	9	149	251
5:15 PM	2	0	0	2	3	0	14	17	5	88	0	93	0	137	6	143	255
5:30 PM	0	0	0	0	3	0	11	14	2	60	1	63	1	143	6	150	227
5:45 PM	0	0	0	0	2	0	11	13	6	80	0	86	0	130	7	137	236
Total Volume	2	0	0	2	14	0	40	54	17	316	1	334	1	550	28	579	969
	2	0	0		14.14	0	40.4	54.54	17.2	319	1		1	556	28.28		
% App. Total	####	0.0	0.0	100	25.9	0.0	74.1	100	5.1	94.6	0.3	100	0.2	95.0	4.8	100	
PHF				0.250				0.794				0.898				0.965	
Cars, PU, Vans	2	0	0	2	4	0	35	39	8	287	1	296	1	526	12	539	876
% Cars, PU, Vans	####	0.0	0.0	100.0	28.6	0.0	87.5	72.2	47.1	90.8	####	88.6	####	95.6	42.9	93.1	90.4
Heavy Trucks	0	0	0	0	10	0	5	15	9	29	0	38	0	24	16	40	93
%Heavy Trucks	0.0	0.0	0.0	0.0	71.4	0.0	12.5	27.8	52.9	9.2	0.0	11.4	0.0	4.4	57.1	6.9	9.6

Prepared by NDS/ATD

Prepared by National Data & Surveying Services

VOLUME

Riverside Pkwy s/o Twin Hill Rd/S Service Rd

Day: Tuesday
Date: 1/21/2014

City: Austell
Project #: GA14_9015_001

DAILY TOTALS	NB	SB	EB	WB	Total
	6,699	5,986	0	0	12,685

AM Period	NB		SB		EB	WB	TOTAL		PM Period	NB		SB		EB	WB	TOTAL	
00:00	19		7		0	0	26		12:00	126		91		0	0	217	
00:15	15		21		0	0	36		12:15	92		79		0	0	171	
00:30	9		16		0	0	25		12:30	75		86		0	0	161	
00:45	18	61	14	58	0	0	32	119	12:45	89	382	118	374	0	0	207	756
01:00	15		6		0	0	21		13:00	93		99		0	0	192	
01:15	12		13		0	0	25		13:15	82		67		0	0	149	
01:30	10		19		0	0	29		13:30	86		75		0	0	161	
01:45	7	44	5	43	0	0	12	87	13:45	77	338	82	323	0	0	159	661
02:00	6		10		0	0	16		14:00	104		78		0	0	182	
02:15	9		10		0	0	19		14:15	78		91		0	0	169	
02:30	8		5		0	0	13		14:30	107		96		0	0	203	
02:45	4	27	9	34	0	0	13	61	14:45	80	369	84	349	0	0	164	718
03:00	3		6		0	0	9		15:00	127		75		0	0	202	
03:15	11		6		0	0	17		15:15	103		91		0	0	194	
03:30	9		25		0	0	34		15:30	128		57		0	0	185	
03:45	4	27	38	75	0	0	42	102	15:45	90	448	86	309	0	0	176	757
04:00	14		16		0	0	30		16:00	137		83		0	0	220	
04:15	12		21		0	0	33		16:15	120		94		0	0	214	
04:30	18		34		0	0	52		16:30	175		91		0	0	266	
04:45	17	61	27	98	0	0	44	159	16:45	139	571	76	344	0	0	215	915
05:00	27		37		0	0	64		17:00	195		89		0	0	284	
05:15	31		59		0	0	90		17:15	162		103		0	0	265	
05:30	33		91		0	0	124		17:30	149		116		0	0	265	
05:45	68	159	108	295	0	0	176	454	17:45	132	638	108	416	0	0	240	1054
06:00	75		74		0	0	149		18:00	138		89		0	0	227	
06:15	107		62		0	0	169		18:15	113		83		0	0	196	
06:30	98		96		0	0	194		18:30	90		78		0	0	168	
06:45	114	394	123	355	0	0	237	749	18:45	79	420	96	346	0	0	175	766
07:00	119		90		0	0	209		19:00	61		72		0	0	133	
07:15	170		117		0	0	287		19:15	67		57		0	0	124	
07:30	129		112		0	0	241		19:30	80		38		0	0	118	
07:45	151	569	139	458	0	0	290	1027	19:45	45	253	45	212	0	0	90	465
08:00	113		108		0	0	221		20:00	48		40		0	0	88	
08:15	99		131		0	0	230		20:15	46		40		0	0	86	
08:30	85		121		0	0	206		20:30	63		28		0	0	91	
08:45	89	386	110	470	0	0	199	856	20:45	45	202	37	145	0	0	82	347
09:00	72		108		0	0	180		21:00	65		24		0	0	89	
09:15	83		87		0	0	170		21:15	42		18		0	0	60	
09:30	71		97		0	0	168		21:30	31		13		0	0	44	
09:45	63	289	99	391	0	0	162	680	21:45	29	167	29	84	0	0	58	251
10:00	74		93		0	0	167		22:00	40		18		0	0	58	
10:15	87		69		0	0	156		22:15	36		17		0	0	53	
10:30	78		70		0	0	148		22:30	27		18		0	0	45	
10:45	65	304	75	307	0	0	140	611	22:45	25	128	31	84	0	0	56	212
11:00	70		85		0	0	155		23:00	56		18		0	0	74	
11:15	67		79		0	0	146		23:15	34		23		0	0	57	
11:30	90		91		0	0	181		23:30	39		12		0	0	51	
11:45	80	307	85	340	0	0	165	647	23:45	26	155	23	76	0	0	49	231
TOTALS		2628		2924				**5552**	**TOTALS**		4071		3062				**7133**
SPLIT %		47.3%		52.7%				**43.8%**	**SPLIT %**		57.1%		42.9%				**56.2%**

DAILY TOTALS	NB	SB	EB	WB	Total
	6,699	5,986	0	0	12,685

AM Peak Hour	07:00		07:45					**07:15**	**PM Peak Hour**	16:30		17:00					**17:00**
AM Pk Volume	569		499					**1039**	**PM Pk Volume**	671		416					**1054**
Pk Hr Factor	0.837		0.897					**0.896**	**Pk Hr Factor**	0.818		0.853					**0.928**
7 - 9 Volume	955		928		0		0	**1883**	**4 - 6 Volume**	1209		760		0		0	**1969**
7 - 9 Peak Hour	07:00		07:45					**07:15**	**4 - 6 Peak Hour**	16:30		17:00					**17:00**
7 - 9 Pk Volume	569		499		0		0	**1039**	**4 - 6 Pk Volume**	671		416		0		0	**1054**
Pk Hr Factor	0.837		0.897		##		##	**0.896**	**Pk Hr Factor**	0.860		0.897		#		##	**0.928**

Prepared by NDS/ATD

Prepared by National Data & Surveying Services

VOLUME

Factory Shoals Rd n/o I-20/GA-402 Ramps

Day: Tuesday
Date: 1/21/2014

City: Austell
Project #: GA14_9015_004

DAILY TOTALS	NB	SB	EB	WB	Total
	2,827	2,851	0	0	5,678

AM Period	NB		SB		EB	WB	TOTAL		PM Period	NB		SB		EB	WB	TOTAL	
00:00	10		4		0	0	14		12:00	42		31		0	0	73	
00:15	10		2		0	0	12		12:15	33		32		0	0	65	
00:30	4		6		0	0	10		12:30	47		34		0	0	81	
00:45	2	26	7	19	0	0	9	45	12:45	35	157	32	129	0	0	67	286
01:00	2		0		0	0	2		13:00	39		43		0	0	82	
01:15	3		0		0	0	3		13:15	26		36		0	0	62	
01:30	5		2		0	0	7		13:30	35		37		0	0	72	
01:45	3	13	2	4	0	0	5	17	13:45	34	134	37	153	0	0	71	287
02:00	4		0		0	0	4		14:00	39		28		0	0	67	
02:15	2		5		0	0	7		14:15	38		37		0	0	75	
02:30	1		1		0	0	2		14:30	47		68		0	0	115	
02:45	3	10	2	8	0	0	5	18	14:45	38	162	46	179	0	0	84	341
03:00	3		1		0	0	4		15:00	81		53		0	0	134	
03:15	0		1		0	0	1		15:15	51		46		0	0	97	
03:30	5		6		0	0	11		15:30	68		47		0	0	115	
03:45	1	9	5	13	0	0	6	22	15:45	46	246	44	190	0	0	90	436
04:00	1		3		0	0	4		16:00	57		44		0	0	101	
04:15	4		5		0	0	9		16:15	56		39		0	0	95	
04:30	7		10		0	0	17		16:30	74		62		0	0	136	
04:45	6	18	11	29	0	0	17	47	16:45	65	252	61	206	0	0	126	458
05:00	7		13		0	0	20		17:00	109		58		0	0	167	
05:15	2		23		0	0	25		17:15	90		66		0	0	156	
05:30	7		52		0	0	59		17:30	90		72		0	0	162	
05:45	9	25	32	120	0	0	41	145	17:45	61	350	68	264	0	0	129	614
06:00	21		30		0	0	51		18:00	53		62		0	0	115	
06:15	22		36		0	0	58		18:15	38		53		0	0	91	
06:30	42		63		0	0	105		18:30	34		37		0	0	71	
06:45	59	144	87	216	0	0	146	360	18:45	32	157	19	171	0	0	51	328
07:00	92		55		0	0	147		19:00	28		28		0	0	56	
07:15	82		44		0	0	126		19:15	17		23		0	0	40	
07:30	89		97		0	0	186		19:30	53		13		0	0	66	
07:45	68	331	112	308	0	0	180	639	19:45	20	118	23	87	0	0	43	205
08:00	74		63		0	0	137		20:00	26		26		0	0	52	
08:15	49		55		0	0	104		20:15	13		28		0	0	41	
08:30	46		45		0	0	91		20:30	13		15		0	0	28	
08:45	32	201	39	202	0	0	71	403	20:45	12	64	15	84	0	0	27	148
09:00	20		40		0	0	60		21:00	13		13		0	0	26	
09:15	23		30		0	0	53		21:15	10		11		0	0	21	
09:30	30		31		0	0	61		21:30	7		14		0	0	21	
09:45	23	96	34	135	0	0	57	231	21:45	4	34	16	54	0	0	20	88
10:00	9		20		0	0	29		22:00	9		10		0	0	19	
10:15	11		20		0	0	31		22:15	10		8		0	0	18	
10:30	27		23		0	0	50		22:30	9		14		0	0	23	
10:45	21	68	26	89	0	0	47	157	22:45	6	34	10	42	0	0	16	76
11:00	21		24		0	0	45		23:00	21		6		0	0	27	
11:15	30		30		0	0	60		23:15	12		9		0	0	21	
11:30	41		32		0	0	73		23:30	13		4		0	0	17	
11:45	33	125	39	125	0	0	72	250	23:45	7	53	5	24	0	0	12	77
TOTALS		1066		1268				2334	TOTALS		1761		1583				3344
SPLIT %		45.7%		54.3%				41.1%	SPLIT %		52.7%		47.3%				58.9%

DAILY TOTALS	NB	SB	EB	WB	Total
	2,827	2,851	0	0	5,678

AM Peak Hour	07:00	07:30					07:00		PM Peak Hour	16:45	17:15					17:00		
AM Pk Volume	331	327					639		PM Pk Volume	354	268					614		
Pk Hr Factor	0.899	0.730					0.859		Pk Hr Factor	0.817	0.809					0.919		
7 - 9 Volume	532	510	0	0			1042		4 - 6 Volume	602	470	0	0			1072		
7 - 9 Peak Hour	07:00	07:30					07:00		4 - 6 Peak Hour	16:45	17:00					17:00		
7 - 9 Pk Volume	331	327	0	0			639		4 - 6 Pk Volume	354	264	0	0			614		
Pk Hr Factor	0.899	0.730	0.000	0.000			0.859		Pk Hr Factor	0.812	0.917	0.000	0.000			0.919		

Appendix C: Trip Generation and Distribution

Phase Time Period Trip Generation
Weekday Average Daily Trips

Project : General Warehouse
Alternative : Alternative 1
Phase : Phase 1

Open Date : 2/18/2014
Analysis Date : 2/18/2014

ITE	Land Use	Enter	Exit	Total
150	WAREHOUSE 1	1113	1112	2225
	625 Gross Floor Area 1000 SF			
	Unadjusted Driveway Volume	1113	1112	2225
	Unadjusted Pass-By Trips	0	0	0
	Internal Vehicle Trips	0	0	0
	Adjusted Driveway Volume	1113	1112	2225
	Adjusted Pass-By Trips	0	0	0
	Adjusted Total Volume Added to Adjacent Streets	1113	1112	2225

Phase Time Period Trip Generation
Weekday AM Peak Hour of Generator

Project : General Warehouse
Alternative : Alternative 1
Phase : Phase 1

Open Date : 2/18/2014
Analysis Date : 2/18/2014

ITE	Land Use	Enter	Exit	Total
150	WAREHOUSE 1	171	92	263
	625 Gross Floor Area 1000 SF			
	Unadjusted Driveway Volume	171	92	263
	Unadjusted Pass-By Trips	0	0	0
	Internal Vehicle Trips	0	0	0
	Adjusted Driveway Volume	171	92	263
	Adjusted Pass-By Trips	0	0	0
	Adjusted Total Volume Added to Adjacent Streets	171	92	263

Source: Institute of Transportation Engineers, Trip Generation Manual 9th Edition, 2012

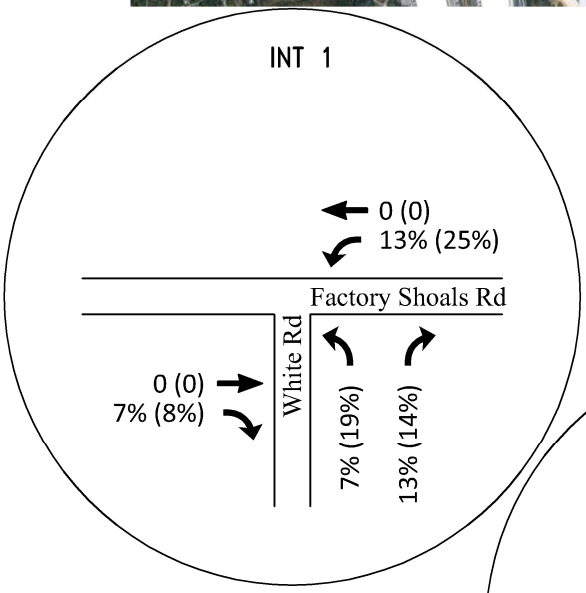
Phase Time Period Trip Generation
Weekday PM Peak Hour of Generator

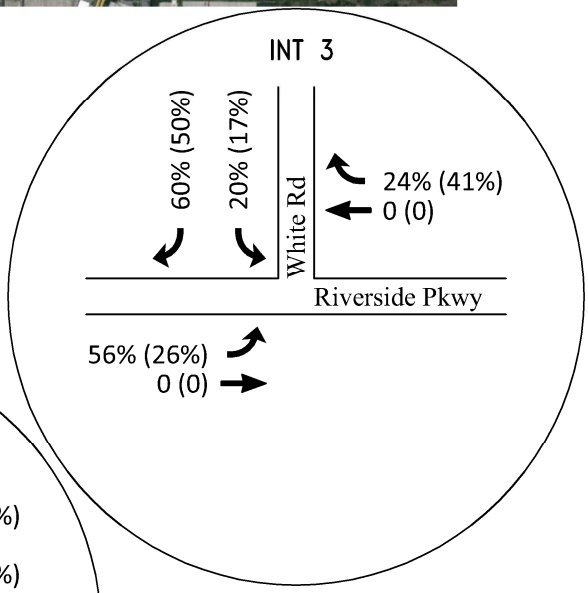
Project : General Warehouse
Alternative : Alternative 1
Phase : Phase 1

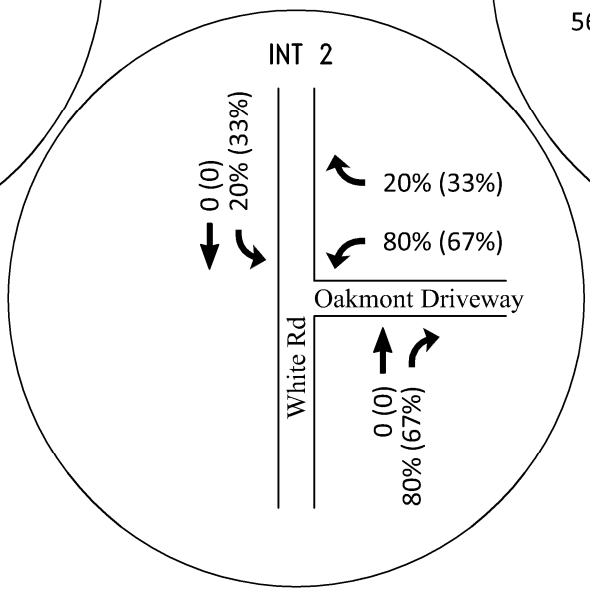
Open Date : 2/18/2014
Analysis Date : 2/18/2014

ITE	Land Use	Enter	Exit	Total
150	WAREHOUSE 1	53	228	281
	625 Gross Floor Area 1000 SF			
	Unadjusted Driveway Volume	53	228	281
	Unadjusted Pass-By Trips	0	0	0
	Internal Vehicle Trips	0	0	0
	Adjusted Driveway Volume	53	228	281
	Adjusted Pass-By Trips	0	0	0
	Adjusted Total Volume Added to Adjacent Streets	53	228	281

Source: Institute of Transportation Engineers, Trip Generation Manual 9th Edition, 2012







Legend: AM (PM)

SITE GENERATED TRAFFIC
PEAK HOUR DISTRIBUTION

OAKMONT DRI

AUSTELL, GA

FIGURE

Project No.	047-13-133
Design By:	CM
Drawn By:	CM
Checked By:	BAH
Date:	03/04/2014
Scale:	NTS

SEI
SOUTHEASTERN ENGINEERING
2470 Sandy Plains Road
Marietta, Georgia • 30066
tel: 770-321-3936 fax: 770-321-3935

Appendix D: Existing Year-2014 Intersection Capacity Analyses Sheets (ICAS)

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	AM Peak
Intersection:	Factory Shoals Rd & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2014
Project ID:	
East/West Street:	Factory Shoals Rd
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		375	9	16	197	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		407	9	17	214	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4		8			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	4		8			
Percent Heavy Vehicles	25		75			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		17		12				
C(m) (vph)		1143		461				
v/c		0.01		0.03				
95% queue length		0.05		0.08				
Control Delay		8.2		13.0				
LOS		A		B				
Approach Delay				13.0				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2014
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		375	9	16	197	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Peak-15 Minute Volume		102	2	4	54	
Hourly Flow Rate, HFR		407	9	17	214	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4		8			
Peak Hour Factor, PHF	0.92		0.92			
Peak-15 Minute Volume	1		2			
Hourly Flow Rate, HFR	4		8			
Percent Heavy Vehicles	25		75			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		214
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		2	25		75			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.7		6.9			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		2	25		75			
t(f)		2.2	3.7		4.0			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		416	660		412			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12	
Conflicting Flows			412				
Potential Capacity			509				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			509				
Probability of Queue free St.			0.98			1.00	

Step 2: LT from Major St.			4			1	
Conflicting Flows			416				
Potential Capacity			1143				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			1143				
Probability of Queue free St.			0.99			1.00	
Maj L-Shared Prob Q free St.			0.98				

Step 3: TH from Minor St.			8			11	
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor			1.00			1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98			0.98	
Movement Capacity							
Probability of Queue free St.			1.00			1.00	

Step 4: LT from Minor St.			7			10	
Conflicting Flows			660				
Potential Capacity			394				
Pedestrian Impedance Factor			1.00			1.00	
Maj. L, Min T Impedance factor						0.98	
Maj. L, Min T Adj. Imp Factor.						0.99	
Cap. Adj. factor due to Impeding mvmnt			0.99			0.97	
Movement Capacity			388				

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8			11	
Part 1 - First Stage							
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor							
Cap. Adj. factor due to Impeding mvmnt							
Movement Capacity							
Probability of Queue free St.							

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	660	
Potential Capacity	394	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.97
Movement Capacity	388	
Results for Two-stage process:		
a		
y		
C t	388	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	4		8			
Movement Capacity (vph)	388		509			
Shared Lane Capacity (vph)		461				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	388		509			
Volume	4		8			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		461				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		17		12				
C(m) (vph)		1143		461				
v/c		0.01		0.03				
95% queue length		0.05		0.08				
Control Delay		8.2		13.0				
LOS		A		B				
Approach Delay				13.0				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		214
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		8.2
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	PM Peak
Intersection:	Factory Shoals Rd & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2014
Project ID:	
East/West Street:	Factory Shoals Rd
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		233	10	33	286	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		253	10	35	310	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15		12			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	16		13			
Percent Heavy Vehicles	14		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		35		29				
C(m) (vph)		1301		522				
v/c		0.03		0.06				
95% queue length		0.08		0.18				
Control Delay		7.8		12.3				
LOS		A		B				
Approach Delay				12.3				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2014
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		233	10	33	286	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Peak-15 Minute Volume		63	3	9	78	
Hourly Flow Rate, HFR		253	10	35	310	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15		12			
Peak Hour Factor, PHF	0.92		0.92			
Peak-15 Minute Volume	4		3			
Hourly Flow Rate, HFR	16		13			
Percent Heavy Vehicles	14		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		310
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		2	14		2			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.5		6.2			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		2	14		2			
t(f)		2.2	3.6		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	263	638		258				
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12	
Conflicting Flows			258				
Potential Capacity			781				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			781				
Probability of Queue free St.			0.98			1.00	

Step 2: LT from Major St.			4			1	
Conflicting Flows			263				
Potential Capacity			1301				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			1301				
Probability of Queue free St.			0.97			1.00	
Maj L-Shared Prob Q free St.			0.97				

Step 3: TH from Minor St.			8			11	
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor			1.00			1.00	
Cap. Adj. factor due to Impeding mvmnt			0.97			0.97	
Movement Capacity							
Probability of Queue free St.			1.00			1.00	

Step 4: LT from Minor St.			7			10	
Conflicting Flows			638				
Potential Capacity			422				
Pedestrian Impedance Factor			1.00			1.00	
Maj. L, Min T Impedance factor						0.97	
Maj. L, Min T Adj. Imp Factor.						0.97	
Cap. Adj. factor due to Impeding mvmnt			0.97			0.96	
Movement Capacity			411				

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8			11	
Part 1 - First Stage							
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor							
Cap. Adj. factor due to Impeding mvmnt							
Movement Capacity							
Probability of Queue free St.							

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	638	
Potential Capacity	422	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.97
Maj. L, Min T Adj. Imp Factor.		0.97
Cap. Adj. factor due to Impeding mvmnt	0.97	0.96
Movement Capacity	411	
Results for Two-stage process:		
a		
y		
C t	411	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	16		13			
Movement Capacity (vph)	411		781			
Shared Lane Capacity (vph)		522				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	411		781			
Volume	16		13			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		522				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		35		29				
C(m) (vph)		1301		522				
v/c		0.03		0.06				
95% queue length		0.08		0.18				
Control Delay		7.8		12.3				
LOS		A		B				
Approach Delay				12.3				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.97
v(il), Volume for stream 2 or 5		310
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.97
d(M,LT), Delay for stream 1 or 4		7.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.3

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	AM Peak
Intersection:	Riverside Pkwy & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2014
Project ID:	
East/West Street:	Riverside Pkwy
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	26	720			288	11
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	28	782			313	11
Percent Heavy Vehicles	31	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				12		33
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				13		35
Percent Heavy Vehicles				75		40
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	28						48	
C(m) (vph)	1089						346	
v/c	0.03						0.14	
95% queue length	0.08						0.48	
Control Delay	8.4						17.1	
LOS	A						C	
Approach Delay							17.1	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Riverside Pkwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2014
Project ID:
East/West Street: Riverside Pkwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	26	720			288	11
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	7	196			78	3
Hourly Flow Rate, HFR	28	782			313	11
Percent Heavy Vehicles	31	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				12		33
Peak Hour Factor, PHF				0.92		0.92
Peak-15 Minute Volume				3		9
Hourly Flow Rate, HFR				13		35
Percent Heavy Vehicles				75		40
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	782	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	31					75		40
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.4					7.2		6.6
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	31					75		40
t(f)	2.5					4.2		3.7

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	324					1156		318
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							318	
Potential Capacity							643	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							643	
Probability of Queue free St.					1.00		0.95	
Step 2: LT from Major St.					4		1	
Conflicting Flows							324	
Potential Capacity							1089	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1089	
Probability of Queue free St.					1.00		0.97	
Maj L-Shared Prob Q free St.							0.95	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.95		0.95	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							1156	
Potential Capacity							158	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.95			
Maj. L, Min T Adj. Imp Factor.					0.96			
Cap. Adj. factor due to Impeding mvmnt					0.91		0.97	
Movement Capacity							154	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1156
Potential Capacity		158
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	
Maj. L, Min T Adj. Imp Factor.	0.96	
Cap. Adj. factor due to Impeding mvmnt	0.91	0.97
Movement Capacity		154
Results for Two-stage process:		
a		
y		
C t		154

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				13		35
Movement Capacity (vph)				154		643
Shared Lane Capacity (vph)					346	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				154		643
Volume				13		35
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					346	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	28						48	
C(m) (vph)	1089						346	
v/c	0.03						0.14	
95% queue length	0.08						0.48	
Control Delay	8.4						17.1	
LOS	A						C	
Approach Delay							17.1	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(il), Volume for stream 2 or 5	782	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.95	
d(M,LT), Delay for stream 1 or 4	8.4	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.4	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	PM Peak
Intersection:	Riverside Pkwy & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2014
Project ID:	
East/West Street:	Riverside Pkwy
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	17	316			550	28
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	18	343			597	30
Percent Heavy Vehicles	53	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				14		40
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				15		43
Percent Heavy Vehicles				72		13
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	18						58	
C(m) (vph)	751						350	
v/c	0.02						0.17	
95% queue length	0.07						0.59	
Control Delay	9.9						17.3	
LOS	A						C	
Approach Delay							17.3	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Riverside Pkwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2014
Project ID:
East/West Street: Riverside Pkwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	17	316			550	28
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	5	86			149	8
Hourly Flow Rate, HFR	18	343			597	30
Percent Heavy Vehicles	53	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				14		40
Peak Hour Factor, PHF				0.92		0.92
Peak-15 Minute Volume				4		11
Hourly Flow Rate, HFR				15		43
Percent Heavy Vehicles				72		13
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	343	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	53					72		13
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.6					7.1		6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	53					72		13
t(f)	2.7					4.1		3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	627					991		612
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							612	
Potential Capacity							474	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							474	
Probability of Queue free St.					1.00		0.91	
Step 2: LT from Major St.					4		1	
Conflicting Flows							627	
Potential Capacity							751	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							751	
Probability of Queue free St.					1.00		0.98	
Maj L-Shared Prob Q free St.							0.97	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.97		0.97	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							991	
Potential Capacity							205	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.97			
Maj. L, Min T Adj. Imp Factor.					0.98			
Cap. Adj. factor due to Impeding mvmnt					0.89		0.98	
Movement Capacity							200	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		991	
Potential Capacity		205	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.97		
Maj. L, Min T Adj. Imp Factor.	0.98		
Cap. Adj. factor due to Impeding mvmnt	0.89	0.98	
Movement Capacity		200	
Results for Two-stage process:			
a			
y			
C t		200	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				15		43
Movement Capacity (vph)				200		474
Shared Lane Capacity (vph)					350	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				200		474
Volume				15		43
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					350	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	18						58	
C(m) (vph)	751						350	
v/c	0.02						0.17	
95% queue length	0.07						0.59	
Control Delay	9.9						17.3	
LOS	A						C	
Approach Delay							17.3	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	343	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	9.9	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.3	

Appendix E: Year-2016 Background ICAS without the Development

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Background
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		383	9	16	201	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		416	9	17	218	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4		8			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	4		8			
Percent Heavy Vehicles	25		75			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		17		12				
C(m) (vph)		1134		455				
v/c		0.01		0.03				
95% queue length		0.05		0.08				
Control Delay		8.2		13.1				
LOS		A		B				
Approach Delay				13.1				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Background
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		383	9	16	201	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Peak-15 Minute Volume		104	2	4	55	
Hourly Flow Rate, HFR		416	9	17	218	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	4		8			
Peak Hour Factor, PHF	0.92		0.92			
Peak-15 Minute Volume	1		2			
Hourly Flow Rate, HFR	4		8			
Percent Heavy Vehicles	25		75			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		218
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		2	25		75			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.7		6.9			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		2	25		75			
t(f)		2.2	3.7		4.0			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		425	672		420			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	420	
Potential Capacity	503	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	503	
Probability of Queue free St.	0.98	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows	425	
Potential Capacity	1134	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1134	
Probability of Queue free St.	0.99	1.00
Maj L-Shared Prob Q free St.	0.98	
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows	672	
Potential Capacity	388	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.97
Movement Capacity	382	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	672	
Potential Capacity	388	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.97
Movement Capacity	382	
Results for Two-stage process:		
a		
y		
C t	382	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	4		8			
Movement Capacity (vph)	382		503			
Shared Lane Capacity (vph)		455				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	382		503			
Volume	4		8			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		455				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		17		12				
C(m) (vph)		1134		455				
v/c		0.01		0.03				
95% queue length		0.05		0.08				
Control Delay		8.2		13.1				
LOS		A		B				
Approach Delay				13.1				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		218
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		8.2
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Background
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		237	10	33	292	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		257	10	35	317	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15		12			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	16		13			
Percent Heavy Vehicles	14		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		35		29				
C(m) (vph)		1297		516				
v/c		0.03		0.06				
95% queue length		0.08		0.18				
Control Delay		7.9		12.4				
LOS		A		B				
Approach Delay				12.4				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Background
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		237	10	33	292	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Peak-15 Minute Volume		64	3	9	79	
Hourly Flow Rate, HFR		257	10	35	317	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	15		12			
Peak Hour Factor, PHF	0.92		0.92			
Peak-15 Minute Volume	4		3			
Hourly Flow Rate, HFR	16		13			
Percent Heavy Vehicles	14		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		317
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		2	14		2			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.5		6.2			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		2	14		2			
t(f)		2.2	3.6		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		267	649		262			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12	
Conflicting Flows			262				
Potential Capacity			777				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			777				
Probability of Queue free St.			0.98			1.00	

Step 2: LT from Major St.			4			1	
Conflicting Flows			267				
Potential Capacity			1297				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			1297				
Probability of Queue free St.			0.97			1.00	
Maj L-Shared Prob Q free St.			0.97				

Step 3: TH from Minor St.			8			11	
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor			1.00			1.00	
Cap. Adj. factor due to Impeding mvmnt			0.97			0.97	
Movement Capacity							
Probability of Queue free St.			1.00			1.00	

Step 4: LT from Minor St.			7			10	
Conflicting Flows			649				
Potential Capacity			416				
Pedestrian Impedance Factor			1.00			1.00	
Maj. L, Min T Impedance factor						0.97	
Maj. L, Min T Adj. Imp Factor.						0.97	
Cap. Adj. factor due to Impeding mvmnt			0.97			0.96	
Movement Capacity			405				

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8			11	
Part 1 - First Stage							
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor							
Cap. Adj. factor due to Impeding mvmnt							
Movement Capacity							
Probability of Queue free St.							

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	649	
Potential Capacity	416	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.97
Maj. L, Min T Adj. Imp Factor.		0.97
Cap. Adj. factor due to Impeding mvmnt	0.97	0.96
Movement Capacity	405	
Results for Two-stage process:		
a		
y		
C t	405	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	16		13			
Movement Capacity (vph)	405		777			
Shared Lane Capacity (vph)		516				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	405		777			
Volume	16		13			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		516				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		35		29				
C(m) (vph)		1297		516				
v/c		0.03		0.06				
95% queue length		0.08		0.18				
Control Delay		7.9		12.4				
LOS		A		B				
Approach Delay				12.4				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.97
v(il), Volume for stream 2 or 5		317
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.97
d(M,LT), Delay for stream 1 or 4		7.9
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.3

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	AM Peak
Intersection:	Riverside Pkwy & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2016 Background
Project ID:	
East/West Street:	Riverside Pkwy
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	27	734			294	11
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	29	797			319	11
Percent Heavy Vehicles	31	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				12		34
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				13		36
Percent Heavy Vehicles				75		40
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	29						49	
C(m) (vph)	1084						339	
v/c	0.03						0.14	
95% queue length	0.08						0.50	
Control Delay	8.4						17.4	
LOS	A						C	
Approach Delay							17.4	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Riverside Pkwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Background
Project ID:
East/West Street: Riverside Pkwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	27	734			294	11
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	7	199			80	3
Hourly Flow Rate, HFR	29	797			319	11
Percent Heavy Vehicles	31	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				12		34
Peak Hour Factor, PHF				0.92		0.92
Peak-15 Minute Volume				3		9
Hourly Flow Rate, HFR				13		36
Percent Heavy Vehicles				75		40
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	797	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	31					75		40
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.4					7.2		6.6
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	31					75		40
t(f)	2.5					4.2		3.7

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	330					1179		324
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		324
Potential Capacity		637
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		637
Probability of Queue free St.	1.00	0.94
Step 2: LT from Major St.	4	1
Conflicting Flows		330
Potential Capacity		1084
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1084
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		0.95
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		1179
Potential Capacity		152
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	
Maj. L, Min T Adj. Imp Factor.	0.96	
Cap. Adj. factor due to Impeding mvmnt	0.91	0.97
Movement Capacity		148

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1179
Potential Capacity		152
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	
Maj. L, Min T Adj. Imp Factor.	0.96	
Cap. Adj. factor due to Impeding mvmnt	0.91	0.97
Movement Capacity		148
Results for Two-stage process:		
a		
y		
C t		148

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				13		36
Movement Capacity (vph)				148		637
Shared Lane Capacity (vph)					339	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				148		637
Volume				13		36
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					339	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	29						49	
C(m) (vph)	1084						339	
v/c	0.03						0.14	
95% queue length	0.08						0.50	
Control Delay	8.4						17.4	
LOS	A						C	
Approach Delay							17.4	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(il), Volume for stream 2 or 5	797	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.95	
d(M,LT), Delay for stream 1 or 4	8.4	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.4	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	PM Peak
Intersection:	Riverside Pkwy & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2016 Background
Project ID:	
East/West Street:	Riverside Pkwy
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	31	322			561	51
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	33	349			609	55
Percent Heavy Vehicles	53	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				54		154
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				58		167
Percent Heavy Vehicles				72		13
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	33						225	
C(m) (vph)	725						326	
v/c	0.05						0.69	
95% queue length	0.14						4.83	
Control Delay	10.2						37.4	
LOS	B						E	
Approach Delay							37.4	
Approach LOS							E	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Riverside Pkwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Background
Project ID:
East/West Street: Riverside Pkwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	31	322			561	51
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	8	88			152	14
Hourly Flow Rate, HFR	33	349			609	55
Percent Heavy Vehicles	53	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				54		154
Peak Hour Factor, PHF				0.92		0.92
Peak-15 Minute Volume				15		42
Hourly Flow Rate, HFR				58		167
Percent Heavy Vehicles				72		13
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	349	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	53					72		13
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.6					7.1		6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	53					72		13
t(f)	2.7					4.1		3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	664					1051		636
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							636	
Potential Capacity							459	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							459	
Probability of Queue free St.					1.00		0.64	
Step 2: LT from Major St.					4		1	
Conflicting Flows							664	
Potential Capacity							725	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							725	
Probability of Queue free St.					1.00		0.95	
Maj L-Shared Prob Q free St.							0.94	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.94		0.94	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							1051	
Potential Capacity							187	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.94			
Maj. L, Min T Adj. Imp Factor.					0.96			
Cap. Adj. factor due to Impeding mvmnt					0.61		0.95	
Movement Capacity							178	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1051
Potential Capacity		187
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.94	
Maj. L, Min T Adj. Imp Factor.	0.96	
Cap. Adj. factor due to Impeding mvmnt	0.61	0.95
Movement Capacity		178
Results for Two-stage process:		
a		
y		
C t		178

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				58		167
Movement Capacity (vph)				178		459
Shared Lane Capacity (vph)					326	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				178		459
Volume				58		167
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					326	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	33						225	
C(m) (vph)	725						326	
v/c	0.05						0.69	
95% queue length	0.14						4.83	
Control Delay	10.2						37.4	
LOS	B						E	
Approach Delay							37.4	
Approach LOS							E	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.95	1.00
v(il), Volume for stream 2 or 5	349	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.94	
d(M,LT), Delay for stream 1 or 4	10.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.6	

Appendix F: Year-2016 ICAS with the Development

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		383	21	38	201	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		416	22	41	218	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10		20			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	10		21			
Percent Heavy Vehicles	25		75			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		41		31				
C(m) (vph)		1122		436				
v/c		0.04		0.07				
95% queue length		0.11		0.23				
Control Delay		8.3		13.9				
LOS		A		B				
Approach Delay				13.9				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		383	21	38	201	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Peak-15 Minute Volume		104	6	10	55	
Hourly Flow Rate, HFR		416	22	41	218	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	10		20			
Peak Hour Factor, PHF	0.92		0.92			
Peak-15 Minute Volume	3		5			
Hourly Flow Rate, HFR	10		21			
Percent Heavy Vehicles	25		75			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		218
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		2	25		75			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.7		6.9			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		2	25		75			
t(f)		2.2	3.7		4.0			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		438	727		427			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	427	
Potential Capacity	498	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	498	
Probability of Queue free St.	0.96	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows	438	
Potential Capacity	1122	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1122	
Probability of Queue free St.	0.96	1.00
Maj L-Shared Prob Q free St.	0.96	
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows	727	
Potential Capacity	359	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.96
Maj. L, Min T Adj. Imp Factor.		0.97
Cap. Adj. factor due to Impeding mvmnt	0.96	0.93
Movement Capacity	346	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	727	
Potential Capacity	359	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.96
Maj. L, Min T Adj. Imp Factor.		0.97
Cap. Adj. factor due to Impeding mvmnt	0.96	0.93
Movement Capacity	346	
Results for Two-stage process:		
a		
y		
C t	346	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	10		21			
Movement Capacity (vph)	346		498			
Shared Lane Capacity (vph)		436				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	346		498			
Volume	10		21			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		436				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		41		31				
C(m) (vph)		1122		436				
v/c		0.04		0.07				
95% queue length		0.11		0.23				
Control Delay		8.3		13.9				
LOS		A		B				
Approach Delay				13.9				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.96
v(il), Volume for stream 2 or 5		218
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.96
d(M,LT), Delay for stream 1 or 4		8.3
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.3

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		238	14	47	292	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		258	15	51	317	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	57		45			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	61		48			
Percent Heavy Vehicles	14		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		51		109				
C(m) (vph)		1290		490				
v/c		0.04		0.22				
95% queue length		0.12		0.84				
Control Delay		7.9		14.4				
LOS		A		B				
Approach Delay				14.4				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Factory Shoals Rd & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Factory Shoals Rd
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		238	14	47	292	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Peak-15 Minute Volume		65	4	13	79	
Hourly Flow Rate, HFR		258	15	51	317	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	57		45			
Peak Hour Factor, PHF	0.92		0.92			
Peak-15 Minute Volume	15		12			
Hourly Flow Rate, HFR	61		48			
Percent Heavy Vehicles	14		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		317
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		2	14		2			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.5		6.2			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		2	14		2			
t(f)		2.2	3.6		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	273	685		266				
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12	
Conflicting Flows			266				
Potential Capacity			773				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			773				
Probability of Queue free St.			0.94			1.00	

Step 2: LT from Major St.			4			1	
Conflicting Flows			273				
Potential Capacity			1290				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			1290				
Probability of Queue free St.			0.96			1.00	
Maj L-Shared Prob Q free St.			0.95				

Step 3: TH from Minor St.			8			11	
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor			1.00			1.00	
Cap. Adj. factor due to Impeding mvmnt			0.95			0.95	
Movement Capacity							
Probability of Queue free St.			1.00			1.00	

Step 4: LT from Minor St.			7			10	
Conflicting Flows			685				
Potential Capacity			396				
Pedestrian Impedance Factor			1.00			1.00	
Maj. L, Min T Impedance factor						0.95	
Maj. L, Min T Adj. Imp Factor.						0.96	
Cap. Adj. factor due to Impeding mvmnt			0.96			0.90	
Movement Capacity			380				

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8			11	
Part 1 - First Stage							
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor							
Cap. Adj. factor due to Impeding mvmnt							
Movement Capacity							
Probability of Queue free St.							

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	685	
Potential Capacity	396	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.95
Maj. L, Min T Adj. Imp Factor.		0.96
Cap. Adj. factor due to Impeding mvmnt	0.96	0.90
Movement Capacity	380	
Results for Two-stage process:		
a		
y		
C t	380	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	61		48			
Movement Capacity (vph)	380		773			
Shared Lane Capacity (vph)		490				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	380		773			
Volume	61		48			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		490				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		51		109				
C(m) (vph)		1290		490				
v/c		0.04		0.22				
95% queue length		0.12		0.84				
Control Delay		7.9		14.4				
LOS		A		B				
Approach Delay				14.4				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.96
v(il), Volume for stream 2 or 5		317
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.95
d(M,LT), Delay for stream 1 or 4		7.9
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.4

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	AM Peak
Intersection:	Riverside Pkwy & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2016 Developed
Project ID:	
East/West Street:	Riverside Pkwy
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	123	734			294	52
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	133	797			319	56
Percent Heavy Vehicles	31	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				32		88
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				34		95
Percent Heavy Vehicles				75		40
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	133						129	
C(m) (vph)	1041						247	
v/c	0.13						0.52	
95% queue length	0.44						2.76	
Control Delay	9.0						34.5	
LOS	A						D	
Approach Delay							34.5	
Approach LOS							D	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Riverside Pkwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Riverside Pkwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	123	734			294	52
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	33	199			80	14
Hourly Flow Rate, HFR	133	797			319	56
Percent Heavy Vehicles	31	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				32		88
Peak Hour Factor, PHF				0.92		0.92
Peak-15 Minute Volume				9		24
Hourly Flow Rate, HFR				34		95
Percent Heavy Vehicles				75		40
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	797	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	31					75		40
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.4					7.2		6.6
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	31					75		40
t(f)	2.5					4.2		3.7

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	375					1410		347
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							347	
Potential Capacity							618	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							618	
Probability of Queue free St.					1.00		0.85	
Step 2: LT from Major St.					4		1	
Conflicting Flows							375	
Potential Capacity							1041	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1041	
Probability of Queue free St.					1.00		0.87	
Maj L-Shared Prob Q free St.							0.76	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.76		0.76	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							1410	
Potential Capacity							106	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.76			
Maj. L, Min T Adj. Imp Factor.					0.81			
Cap. Adj. factor due to Impeding mvmnt					0.69		0.87	
Movement Capacity							92	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.76	0.76	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		1410	
Potential Capacity		106	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.76		
Maj. L, Min T Adj. Imp Factor.	0.81		
Cap. Adj. factor due to Impeding mvmnt	0.69	0.87	
Movement Capacity		92	
Results for Two-stage process:			
a			
y			
C t		92	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				34		95
Movement Capacity (vph)				92		618
Shared Lane Capacity (vph)					247	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				92		618
Volume				34		95
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					247	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	133						129	
C(m) (vph)	1041						247	
v/c	0.13						0.52	
95% queue length	0.44						2.76	
Control Delay	9.0						34.5	
LOS	A						D	
Approach Delay							34.5	
Approach LOS							D	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.87	1.00
v(il), Volume for stream 2 or 5	797	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.76	
d(M,LT), Delay for stream 1 or 4	9.0	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	2.2	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	PM Peak
Intersection:	Riverside Pkwy & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2016 Developed
Project ID:	
East/West Street:	Riverside Pkwy
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	31	322			561	51
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	33	349			609	55
Percent Heavy Vehicles	53	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				54		154
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				58		167
Percent Heavy Vehicles				72		13
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	33						225	
C(m) (vph)	725						326	
v/c	0.05						0.69	
95% queue length	0.14						4.83	
Control Delay	10.2						37.4	
LOS	B						E	
Approach Delay							37.4	
Approach LOS							E	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Riverside Pkwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Riverside Pkwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	31	322			561	51
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	8	88			152	14
Hourly Flow Rate, HFR	33	349			609	55
Percent Heavy Vehicles	53	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				54		154
Peak Hour Factor, PHF				0.92		0.92
Peak-15 Minute Volume				15		42
Hourly Flow Rate, HFR				58		167
Percent Heavy Vehicles				72		13
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	349	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	53					72		13
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.6					7.1		6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	53					72		13
t(f)	2.7					4.1		3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	664					1051		636
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							636	
Potential Capacity							459	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							459	
Probability of Queue free St.					1.00		0.64	
Step 2: LT from Major St.					4		1	
Conflicting Flows							664	
Potential Capacity							725	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							725	
Probability of Queue free St.					1.00		0.95	
Maj L-Shared Prob Q free St.							0.94	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.94		0.94	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							1051	
Potential Capacity							187	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.94			
Maj. L, Min T Adj. Imp Factor.					0.96			
Cap. Adj. factor due to Impeding mvmnt					0.61		0.95	
Movement Capacity							178	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1051
Potential Capacity		187
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.94	
Maj. L, Min T Adj. Imp Factor.	0.96	
Cap. Adj. factor due to Impeding mvmnt	0.61	0.95
Movement Capacity		178
Results for Two-stage process:		
a		
y		
C t		178

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				58		167
Movement Capacity (vph)				178		459
Shared Lane Capacity (vph)					326	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				178		459
Volume				58		167
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					326	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	33						225	
C(m) (vph)	725						326	
v/c	0.05						0.69	
95% queue length	0.14						4.83	
Control Delay	10.2						37.4	
LOS	B						E	
Approach Delay							37.4	
Approach LOS							E	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.95	1.00
v(il), Volume for stream 2 or 5	349	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.94	
d(M,LT), Delay for stream 1 or 4	10.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.6	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	AM Peak
Intersection:	Riverside Pkwy & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2016 Developed Improved
Project ID:	
East/West Street:	Riverside Pkwy
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	123	734			294	52
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	133	797			319	56
Percent Heavy Vehicles	31	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				32		88
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				34		95
Percent Heavy Vehicles				75		40
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		Yes	/1
Lanes				0	0	
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	133						129	
C(m) (vph)	1041						298	
v/c	0.13						0.43	
95% queue length	0.44						2.08	
Control Delay	9.0						26.0	
LOS	A						D	
Approach Delay							26.0	
Approach LOS							D	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Riverside Pkwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed Improved
Project ID:
East/West Street: Riverside Pkwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	123	734			294	52
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	33	199			80	14
Hourly Flow Rate, HFR	133	797			319	56
Percent Heavy Vehicles	31	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				32		88
Peak Hour Factor, PHF				0.92		0.92
Peak-15 Minute Volume				9		24
Hourly Flow Rate, HFR				34		95
Percent Heavy Vehicles				75		40
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		Yes /1
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	797	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	31					75		40
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.4					7.2		6.6
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	31					75		40
t(f)	2.5					4.2		3.7

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	375					1410		347
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							347	
Potential Capacity							618	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							618	
Probability of Queue free St.					1.00		0.85	
Step 2: LT from Major St.					4		1	
Conflicting Flows							375	
Potential Capacity							1041	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1041	
Probability of Queue free St.					1.00		0.87	
Maj L-Shared Prob Q free St.							0.76	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.76		0.76	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							1410	
Potential Capacity							106	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.76			
Maj. L, Min T Adj. Imp Factor.					0.81			
Cap. Adj. factor due to Impeding mvmnt					0.69		0.87	
Movement Capacity							92	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.76	0.76	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		1410	
Potential Capacity		106	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.76		
Maj. L, Min T Adj. Imp Factor.	0.81		
Cap. Adj. factor due to Impeding mvmnt	0.69	0.87	
Movement Capacity		92	
Results for Two-stage process:			
a			
y			
C t		92	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				34		95
Movement Capacity (vph)				92		618
Shared Lane Capacity (vph)					247	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				92		618
Volume				34		95
Delay				65.5		11.9
Q sep				0.62		0.31
Q sep +1				1.62		1.31
round (Qsep +1)				2		1
n max					2	
C sh					247	
SUM C sep					349	
n					1	
C act					298	

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	133						129	
C(m) (vph)	1041						298	
v/c	0.13						0.43	
95% queue length	0.44						2.08	
Control Delay	9.0						26.0	
LOS	A						D	
Approach Delay							26.0	
Approach LOS							D	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.87	1.00
v(il), Volume for stream 2 or 5	797	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.76	
d(M,LT), Delay for stream 1 or 4	9.0	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	2.2	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CMaddox
Agency/Co.:	SEI
Date Performed:	3/3/2014
Analysis Time Period:	PM Peak
Intersection:	Riverside Pkwy & White Rd
Jurisdiction:	Cobb Co.
Units: U. S. Customary	
Analysis Year:	2016 Developed Improved
Project ID:	
East/West Street:	Riverside Pkwy
North/South Street:	White Rd
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	31	322			561	51
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	33	349			609	55
Percent Heavy Vehicles	53	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				54		154
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				58		167
Percent Heavy Vehicles				72		13
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			Yes /1
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	33						225	
C(m) (vph)	725						472	
v/c	0.05						0.48	
95% queue length	0.14						2.53	
Control Delay	10.2						19.4	
LOS	B						C	
Approach Delay							19.4	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Riverside Pkwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed Improved
Project ID:
East/West Street: Riverside Pkwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	31	322			561	51
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	8	88			152	14
Hourly Flow Rate, HFR	33	349			609	55
Percent Heavy Vehicles	53	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				54		154
Peak Hour Factor, PHF				0.92		0.92
Peak-15 Minute Volume				15		42
Hourly Flow Rate, HFR				58		167
Percent Heavy Vehicles				72		13
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		Yes /1
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	349	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	53					72		13
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.6					7.1		6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	53					72		13
t(f)	2.7					4.1		3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	664					1051		636
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							636	
Potential Capacity							459	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							459	
Probability of Queue free St.					1.00		0.64	
Step 2: LT from Major St.					4		1	
Conflicting Flows							664	
Potential Capacity							725	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							725	
Probability of Queue free St.					1.00		0.95	
Maj L-Shared Prob Q free St.							0.94	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.94		0.94	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							1051	
Potential Capacity							187	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.94			
Maj. L, Min T Adj. Imp Factor.					0.96			
Cap. Adj. factor due to Impeding mvmnt					0.61		0.95	
Movement Capacity							178	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1051
Potential Capacity		187
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.94	
Maj. L, Min T Adj. Imp Factor.	0.96	
Cap. Adj. factor due to Impeding mvmnt	0.61	0.95
Movement Capacity		178
Results for Two-stage process:		
a		
y		
C t		178

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				58		167
Movement Capacity (vph)				178		459
Shared Lane Capacity (vph)					326	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				178		459
Volume				58		167
Delay				34.7		17.3
Q sep				0.56		0.80
Q sep +1				1.56		1.80
round (Qsep +1)				2		2
n max					2	
C sh					326	
SUM C sep					618	
n					1	
C act					472	

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	33						225	
C(m) (vph)	725						472	
v/c	0.05						0.48	
95% queue length	0.14						2.53	
Control Delay	10.2						19.4	
LOS	B						C	
Approach Delay							19.4	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.95	1.00
v(il), Volume for stream 2 or 5	349	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.94	
d(M,LT), Delay for stream 1 or 4	10.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.6	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Oakmont Drwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Oakmont Drwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				74	0	18
Peak-Hour Factor, PHF				0.92	0.92	0.92
Hourly Flow Rate, HFR				80	0	19
Percent Heavy Vehicles		--	--	50	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	0	0
Configuration					LTR	LR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume		12	137	34	46	
Peak Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		13	148	36	49	
Percent Heavy Vehicles		2	50	50	2	
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes		1	0	0	1	
Configuration			TR		LT	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LTR			TR	LT		
v (vph)		80			161	85		
C(m) (vph)		1358			928	584		
v/c		0.06			0.17	0.15		
95% queue length		0.19			0.63	0.51		
Control Delay		7.8			9.7	12.2		
LOS		A			A	B		
Approach Delay				9.7			12.2	
Approach LOS				A			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: AM Peak
Intersection: Oakmont Drwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Oakmont Drwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				74	0	18
Peak-Hour Factor, PHF				0.92	0.92	0.92
Peak-15 Minute Volume				20	0	5
Hourly Flow Rate, HFR				80	0	19
Percent Heavy Vehicles		--	--	50	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	0	0
Configuration				LT		R
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume		12	137	34	46	
Peak Hour Factor, PHF		0.92	0.92	0.92	0.92	
Peak-15 Minute Volume		3	37	9	12	
Hourly Flow Rate, HFR		13	148	36	49	
Percent Heavy Vehicles		2	50	50	2	
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		0

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1		6.5	6.2	7.1	6.5	
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		50		2	50	50	2	
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00		0.00	0.00	0.00	0.00	
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.6		6.5	6.7	7.6	6.5	
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20		4.00	3.30	3.50	4.00	
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		50		2	50	50	2	
t(f)		2.7		4.0	3.8	4.0	4.0	

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	0		179	0		250	170	
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s				0		0		0
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.		9		12
Conflicting Flows	0			
Potential Capacity	960			
Pedestrian Impedance Factor	1.00		1.00	
Movement Capacity	960			
Probability of Queue free St.	0.85		1.00	
Step 2: LT from Major St.		4		1
Conflicting Flows	0			
Potential Capacity	1358			
Pedestrian Impedance Factor	1.00		1.00	
Movement Capacity	1358			
Probability of Queue free St.	0.94		1.00	
Maj L-Shared Prob Q free St.	0.94			
Step 3: TH from Minor St.		8		11
Conflicting Flows	179		170	
Potential Capacity	715		723	
Pedestrian Impedance Factor	1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt	0.94		0.94	
Movement Capacity	673		680	
Probability of Queue free St.	0.98		0.93	
Step 4: LT from Minor St.		7		10
Conflicting Flows			250	
Potential Capacity			615	
Pedestrian Impedance Factor	1.00		1.00	
Maj. L, Min T Impedance factor	0.87		0.92	
Maj. L, Min T Adj. Imp Factor.	0.90		0.94	
Cap. Adj. factor due to Impeding mvmnt	0.90		0.80	
Movement Capacity			490	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.		8		11
Part 1 - First Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Probability of Queue free St.				

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	179	170
Potential Capacity	715	723
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	673	680
Result for 2 stage process:		
a		
y		
C t	673	680
Probability of Queue free St.	0.98	0.93
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		250
Potential Capacity		615
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.87	0.92
Maj. L, Min T Adj. Imp Factor.	0.90	0.94
Cap. Adj. factor due to Impeding mvmnt	0.90	0.80
Movement Capacity		490
Results for Two-stage process:		
a		
y		
C t		490

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)		13	148	36	49	
Movement Capacity (vph)		673	960	490	680	
Shared Lane Capacity (vph)			928	584		

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep		673	960	490	680	
Volume		13	148	36	49	
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh			928	584		
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LTR			TR	LT		
v (vph)		80			161	85		
C(m) (vph)		1358			928	584		
v/c		0.06			0.17	0.15		
95% queue length		0.19			0.63	0.51		
Control Delay		7.8			9.7	12.2		
LOS		A			A	B		
Approach Delay				9.7			12.2	
Approach LOS				A			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.94
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.94
d(M,LT), Delay for stream 1 or 4		7.8
N, Number of major street through lanes		0
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Oakmont Drwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Oakmont Drwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				153	0	75
Peak-Hour Factor, PHF				0.92	0.92	0.92
Hourly Flow Rate, HFR				166	0	81
Percent Heavy Vehicles		--	--	50	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	0	0
Configuration					LTR	LR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume		27	36	17	55	
Peak Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		29	39	18	59	
Percent Heavy Vehicles		2	50	50	2	
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes		1	0	0	1	
Configuration			TR		LT	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LTR			TR	LT		
v (vph)		166			68	77		
C(m) (vph)		1358			659	465		
v/c		0.12			0.10	0.17		
95% queue length		0.42			0.34	0.59		
Control Delay		8.0			11.1	14.3		
LOS		A			B	B		
Approach Delay				11.1			14.3	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: CMaddox
Agency/Co.: SEI
Date Performed: 3/3/2014
Analysis Time Period: PM Peak
Intersection: Oakmont Drwy & White Rd
Jurisdiction: Cobb Co.
Units: U. S. Customary
Analysis Year: 2016 Developed
Project ID:
East/West Street: Oakmont Drwy
North/South Street: White Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				153	0	75
Peak-Hour Factor, PHF				0.92	0.92	0.92
Peak-15 Minute Volume				42	0	20
Hourly Flow Rate, HFR				166	0	81
Percent Heavy Vehicles		--	--	50	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	0	0
Configuration				LT		R
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume		27	36	17	55	
Peak Hour Factor, PHF		0.92	0.92	0.92	0.92	
Peak-15 Minute Volume		7	10	5	15	
Hourly Flow Rate, HFR		29	39	18	59	
Percent Heavy Vehicles		2	50	50	2	
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		0

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1		6.5	6.2	7.1	6.5	
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		50		2	50	50	2	
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00		0.00	0.00	0.00	0.00	
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.6		6.5	6.7	7.6	6.5	
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20		4.00	3.30	3.50	4.00	
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		50		2	50	50	2	
t(f)		2.7		4.0	3.8	4.0	4.0	

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	0		413	0	406	372		
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s				0		0		0
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.		9		12
Conflicting Flows	0			
Potential Capacity	960			
Pedestrian Impedance Factor	1.00		1.00	
Movement Capacity	960			
Probability of Queue free St.	0.96		1.00	
Step 2: LT from Major St.		4		1
Conflicting Flows	0			
Potential Capacity	1358			
Pedestrian Impedance Factor	1.00		1.00	
Movement Capacity	1358			
Probability of Queue free St.	0.88		1.00	
Maj L-Shared Prob Q free St.	0.88			
Step 3: TH from Minor St.		8		11
Conflicting Flows	413		372	
Potential Capacity	529		558	
Pedestrian Impedance Factor	1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt	0.88		0.88	
Movement Capacity	464		490	
Probability of Queue free St.	0.94		0.88	
Step 4: LT from Minor St.		7		10
Conflicting Flows			406	
Potential Capacity			479	
Pedestrian Impedance Factor	1.00		1.00	
Maj. L, Min T Impedance factor	0.77		0.82	
Maj. L, Min T Adj. Imp Factor.	0.82		0.86	
Cap. Adj. factor due to Impeding mvmnt	0.82		0.83	
Movement Capacity			397	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.		8		11
Part 1 - First Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Probability of Queue free St.				

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		413	372
Potential Capacity		529	558
Pedestrian Impedance Factor		1.00	1.00
Cap. Adj. factor due to Impeding mvmnt		0.88	0.88
Movement Capacity		464	490
Result for 2 stage process:			
a			
y			
C t		464	490
Probability of Queue free St.		0.94	0.88
Step 4: LT from Minor St.		7	10
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			406
Potential Capacity			479
Pedestrian Impedance Factor		1.00	1.00
Maj. L, Min T Impedance factor		0.77	0.82
Maj. L, Min T Adj. Imp Factor.		0.82	0.86
Cap. Adj. factor due to Impeding mvmnt		0.82	0.83
Movement Capacity			397
Results for Two-stage process:			
a			
y			
C t			397

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)		29	39	18	59	
Movement Capacity (vph)		464	960	397	490	
Shared Lane Capacity (vph)			659	465		

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep		464	960	397	490	
Volume		29	39	18	59	
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh			659	465		
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LTR			TR	LT		
v (vph)		166			68	77		
C(m) (vph)		1358			659	465		
v/c		0.12			0.10	0.17		
95% queue length		0.42			0.34	0.59		
Control Delay		8.0			11.1	14.3		
LOS		A			B	B		
Approach Delay				11.1			14.3	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.88
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.88
d(M,LT), Delay for stream 1 or 4		8.0
N, Number of major street through lanes		0
d(rank,1) Delay for stream 2 or 5		