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February 16, 2009

Mr. Justin Hildreth, P.E.
Town Engineer
Town of Avon
PO Box 975
Avon, CO 81620

Re: Traffic Review and Intersection Evaluation
Buck Creek Road/Nottingham Road and Swift Gulch Road/Nottingham Road
FHU Reference No. 09-007

Dear Mr. Hildreth:

This letter summarizes our findings regarding traffic operations at the intersections of Swift Gulch Road / Nottingham Road and Buck Creek Road / Nottingham Road under several traffic control options. Our previous memo, dated January 28, 2009, indicated that the intersection of Swift Gulch Road and Nottingham Road currently meets warrants for signalization, under existing traffic volumes, based on MUTCD guidelines. Subsequently, an evaluation of this intersection under long-range future traffic conditions was requested. Therefore, we have prepared long-term traffic forecasts and have analyzed this intersection under signalized traffic control and as a single-lane roundabout. Additionally, due to potential right-of-way constraints at Swift Gulch Road / Nottingham Road, the intersection at Buck Creek Road / Nottingham was also analyzed as a single-lane roundabout with the Swift Gulch Road / Nottingham Road intersection being a ¾ movement stop-controlled intersection. Our methodologies and analysis results for these alternative traffic control scenarios are presented below.

TRAFFIC VOLUME FORECASTS

Long-range traffic volume forecasts for the intersection of Swift Gulch Road / Nottingham Road were estimated based on expected area growth. It has been estimated that future developments would add approximately 1,400 vehicles per day (vpd), equating to 140 vehicles during the peak hours, to Swift Gulch Road. In an effort to be conservative, it was assumed that all additional traffic would access Swift Gulch Road via Nottingham Road. Of the additional traffic, it was estimated that 35% would be travelling to/from the southeast (Avon) and 65% would be travelling to/from the northwest, which is consistent with the existing traffic patterns. Long-range traffic volumes for the intersection of Buck Creek Road / Nottingham Road were gleaned from the Buck Creek PUD Traffic Impact Study (Kimley-Horn, 2009).

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TRAFFIC ANALYSIS

Several traffic control options were analyzed for both study intersections under long-range future traffic volumes. Each scenario and the corresponding analysis results are described below:

Signal Control at Swift Gulch Road / Nottingham Road

This scenario analyzed the intersection of Swift Gulch Road / Nottingham Road as a signalized intersection. The intersection of Buck Creek Road / Nottingham Road was analyzed as a two-way stop-controlled intersection, as it is currently. The analyses assumed the existing lane geometry at both intersections.

Under signalized control, the intersection at Swift Gulch Road / Nottingham Road would operate at an overall level of service (LOS) B during the AM and PM peak hours. All individual movements would operate at LOS C or better during both peak hours. The northbound 95th percentile queue lengths would reach a maximum of 150 feet during the PM peak hour while the maximum southbound queue length would be 260 feet during the AM peak hour. Long-range future level of service results for the Buck Creek Road / Nottingham Road intersection can be found in the previous memo.

Single-Lane Roundabout at Swift Gulch Road / Nottingham Road

In this scenario, the intersection of Swift Gulch Road / Nottingham Road was analyzed as a three-legged, single-lane roundabout with the intersection at Buck Creek Road / Nottingham Road unchanged, as in the previous scenario. Under roundabout control, the intersection of Swift Gulch Road / Nottingham Road would operate at LOS A during both peak hours. The longest queue length on any approach would be 150 feet.

Single-Lane Roundabout at Buck Creek Road, ¾ Movement at Swift Gulch Road

Due to right-of-way concerns, this scenario analyzed a single-lane roundabout at Buck Creek Road / Nottingham Road with Swift Gulch Road / Nottingham Road being restricted to a ¾ movement stop-controlled intersection. This would force traffic wanting to turn left (south) onto Nottingham Road from Swift Gulch Road to instead turn right and use the roundabout at Buck Creek Road to make a U-turn before heading south. Since the two intersections are less than 400 feet apart, significant out-of-direction travel is not a concern and any additional travel time would be off-set by removing the stop-controlled left-turn and corresponding delay time. The roundabout at Buck Creek Road / Nottingham Road is expected to operate at LOS A during both peak hours. The stop-controlled intersection at Swift Gulch Road / Nottingham Road would have an overall intersection LOS of A during both peak hours. The stop-controlled right turn movement from Swift Gulch Road would operate at LOS B during the AM and PM peak hours. The longest queue length on any approach would be 150 feet.

SUMMARY

After forecasting long-range traffic volumes at the intersection of Swift Gulch Road / Nottingham Road, three different traffic control scenarios were analyzed: signalization of the Swift Gulch Road / Nottingham Road intersection, leaving the intersection of Buck Creek Road / Nottingham Road unchanged; a single-lane roundabout at Swift Gulch Road, leaving the intersection of Buck Creek Road / Nottingham Road unchanged; and a single-lane roundabout at Buck Creek Road, restricting the Swift Gulch Road / Nottingham Road intersection to a stop-controlled ¾ movement.

All three traffic control scenarios would operate well during both peak hours under long-range future conditions. The overall levels of service would be A or B during the AM and PM peak hours

while the lowest LOS for any individual movement would be LOS C. The longest queue lengths are expected with the Swift Gulch Road / Nottingham Road intersection signalized, however it is not anticipated that these queues would interfere with the operations of adjacent intersections. In summary, implementing any of these three traffic control improvements could provide acceptable traffic operations at both intersections under long-range future traffic volumes.

We trust this information will assist your transportation planning efforts in Avon. If you have any questions, please do not hesitate to call.

Sincerely,

FELSBURG HOLT & ULLEVIG

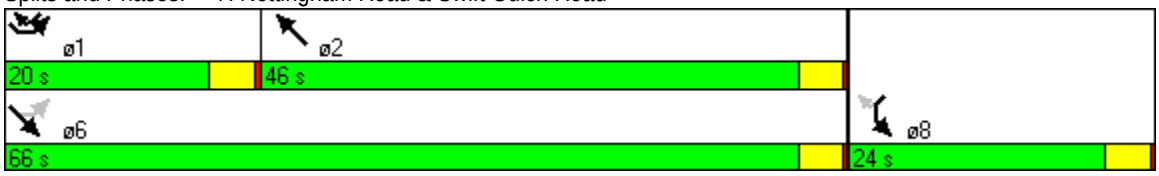
Charles M. Buck, PE, PTOE
Senior Transportation Engineer

Lacy S. Brown, EIT
Transportation Engineer

Lane Group	SEL	SET	NWT	SWL	SWR
Lane Configurations					
Volume (vph)	265	320	245	110	180
Turn Type	pm+pt				pm+ov
Protected Phases	1	6	2	8	1
Permitted Phases	6				8
Detector Phase	1	6	2	8	1
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	66.0	46.0	24.0	20.0
Total Split (%)	22.2%	73.3%	51.1%	26.7%	22.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag		Lead
Lead-Lag Optimize?	Yes		Yes		Yes
Recall Mode	Max	Max	Max	Max	Max
Act Effct Green (s)		62.0	42.0	20.0	40.0
Actuated g/C Ratio		0.69	0.47	0.22	0.44
v/c Ratio		0.82	0.47	0.31	0.24
Control Delay		18.2	17.0	31.8	3.1
Queue Delay		0.0	0.0	0.0	0.0
Total Delay		18.2	17.0	31.8	3.1
LOS		B	B	C	A
Approach Delay		18.2	17.0	14.0	
Approach LOS		B	B	B	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT, Start of Green	
Natural Cycle: 70	
Control Type: Pretimed	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 16.8	Intersection LOS: B
Intersection Capacity Utilization 68.1%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 7: Nottingham Road & Swift Gulch Road



Lane Group	SET	NWT	SWL	SWR
Lane Group Flow (vph)	636	402	120	196
v/c Ratio	0.82	0.47	0.31	0.24
Control Delay	18.2	17.0	31.8	3.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	18.2	17.0	31.8	3.1
Queue Length 50th (ft)	150	135	57	0
Queue Length 95th (ft)	#256	214	106	37
Internal Link Dist (ft)	334	248	387	
Turn Bay Length (ft)				
Base Capacity (vph)	771	850	393	812
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.82	0.47	0.31	0.24

Intersection Summary

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

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (vph)	265	320	245	125	110	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00
Frt		1.00	0.95		1.00	0.85
Flt Protected		0.98	1.00		0.95	1.00
Satd. Flow (prot)		1822	1778		1770	1583
Flt Permitted		0.47	1.00		0.95	1.00
Satd. Flow (perm)		874	1778		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	288	348	266	136	120	196
RTOR Reduction (vph)	0	0	20	0	0	118
Lane Group Flow (vph)	0	636	382	0	120	78
Turn Type	pm+pt					pm+ov
Protected Phases	1	6	2		8	1
Permitted Phases	6					8
Actuated Green, G (s)		62.0	42.0		20.0	36.0
Effective Green, g (s)		62.0	42.0		20.0	36.0
Actuated g/C Ratio		0.69	0.47		0.22	0.40
Clearance Time (s)		4.0	4.0		4.0	4.0
Lane Grp Cap (vph)		771	830		393	704
v/s Ratio Prot		c0.15	0.21		c0.07	0.02
v/s Ratio Perm		c0.42				0.03
v/c Ratio		0.82	0.46		0.31	0.11
Uniform Delay, d1		10.1	16.3		29.2	17.0
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		9.8	1.8		2.0	0.3
Delay (s)		19.9	18.1		31.2	17.3
Level of Service		B	B		C	B
Approach Delay (s)		19.9	18.1		22.6	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

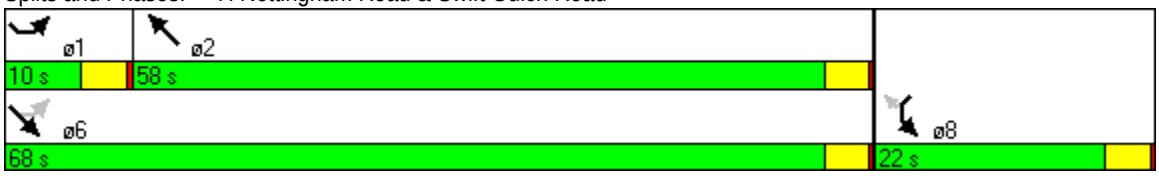
c Critical Lane Group

Lane Group	SEL	SET	NWT	SWL	SWR
Lane Configurations					
Volume (vph)	210	290	325	150	255
Turn Type	pm+pt				Perm
Protected Phases	1	6	2	8	
Permitted Phases	6				8
Detector Phase	1	6	2	8	8
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0
Total Split (s)	10.0	68.0	58.0	22.0	22.0
Total Split (%)	11.1%	75.6%	64.4%	24.4%	24.4%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag		
Lead-Lag Optimize?	Yes		Yes		
Recall Mode	Max	Max	Max	Max	Max
Act Effct Green (s)		64.0	54.0	18.0	18.0
Actuated g/C Ratio		0.71	0.60	0.20	0.20
v/c Ratio		0.72	0.43	0.46	0.51
Control Delay		12.8	10.4	36.6	7.8
Queue Delay		0.0	0.0	0.0	0.0
Total Delay		12.8	10.4	36.6	7.8
LOS		B	B	D	A
Approach Delay		12.8	10.4	18.5	
Approach LOS		B	B	B	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT, Start of Green
Natural Cycle: 65
Control Type: Pretimed
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 13.7 — Intersection LOS: B
Intersection Capacity Utilization 69.0% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 7: Nottingham Road & Swift Gulch Road



Lane Group	SET	NWT	SWL	SWR
Lane Group Flow (vph)	543	473	163	277
v/c Ratio	0.72	0.43	0.46	0.51
Control Delay	12.8	10.4	36.6	7.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	12.8	10.4	36.6	7.8
Queue Length 50th (ft)	108	122	82	0
Queue Length 95th (ft)	161	189	144	64
Internal Link Dist (ft)	347	347	389	
Turn Bay Length (ft)				
Base Capacity (vph)	756	1093	354	538
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.72	0.43	0.46	0.51

Intersection Summary

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (vph)	210	290	325	110	150	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00
Frt		1.00	0.97		1.00	0.85
Flt Protected		0.98	1.00		0.95	1.00
Satd. Flow (prot)		1824	1799		1770	1583
Flt Permitted		0.53	1.00		0.95	1.00
Satd. Flow (perm)		983	1799		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	228	315	353	120	163	277
RTOR Reduction (vph)	0	0	14	0	0	222
Lane Group Flow (vph)	0	543	459	0	163	55
Turn Type	pm+pt					Perm
Protected Phases	1	6	2		8	
Permitted Phases	6					8
Actuated Green, G (s)		64.0	54.0		18.0	18.0
Effective Green, g (s)		64.0	54.0		18.0	18.0
Actuated g/C Ratio		0.71	0.60		0.20	0.20
Clearance Time (s)		4.0	4.0		4.0	4.0
Lane Grp Cap (vph)		755	1079		354	317
v/s Ratio Prot		c0.05	0.26		c0.09	
v/s Ratio Perm		c0.46				0.03
v/c Ratio		0.72	0.43		0.46	0.17
Uniform Delay, d1		7.7	9.7		31.7	29.8
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		5.8	1.2		4.3	1.2
Delay (s)		13.5	10.9		36.0	31.0
Level of Service		B	B		D	C
Approach Delay (s)		13.5	10.9		32.9	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	18.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	265	320	245	125	0	180
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	288	348	266	136	0	196
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	402				1258	334
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	402				1258	334
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	75				100	72
cM capacity (veh/h)	1156				142	708

Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	636	402	196
Volume Left	288	0	0
Volume Right	0	136	196
cSH	1156	1700	708
Volume to Capacity	0.25	0.24	0.28
Queue Length 95th (ft)	25	0	28
Control Delay (s)	5.7	0.0	12.0
Lane LOS	A		B
Approach Delay (s)	5.7	0.0	12.0
Approach LOS			B

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	210	290	325	110	0	255
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	228	315	353	120	0	277
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	473				1185	413
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	473				1185	413
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	79				100	57
cM capacity (veh/h)	1089				165	639

Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	543	473	277
Volume Left	228	0	0
Volume Right	0	120	277
cSH	1089	1700	639
Volume to Capacity	0.21	0.28	0.43
Queue Length 95th (ft)	20	0	55
Control Delay (s)	5.2	0.0	14.9
Lane LOS	A		B
Approach Delay (s)	5.2	0.0	14.9
Approach LOS			B

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Swift Gulch / Nottingham

Future AM Peak

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

Swift Gulch / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale	Peak Flow Factor
South: Nottingham							
	East	8R	Right	133	3	1.00	0.92
	North	8T	Thru	261	5	1.00	0.92
East: Swift Gulch							
	South	1L	Left	117	2	1.00	0.92
	North	6R	Right	192	4	1.00	0.92
North: Nottingham							
	South	4T	Thru	341	7	1.00	0.92
	East	7L	Left	282	6	1.00	0.92

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

Table B.2B - Flow Rates (Total Vehicles and Percent Heavy)

```
Swift Gulch / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

--------------------------------------------------
  Mov          Left        Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
--------------------------------------------------
Demand flows in veh/hour as used by the program
South: Nottingham
   8T T        0   0.0     266   1.9       0   0.0
   8R R        0   0.0       0   0.0     136   2.2
--------------------------------------------------
East: Swift Gulch
   1L L      119   1.7       0   0.0       0   0.0
   6R R        0   0.0       0   0.0     196   2.0
--------------------------------------------------
North: Nottingham
   7L L      288   2.1       0   0.0       0   0.0
   4T T        0   0.0     348   2.0       0   0.0
--------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.5 - Movement Performance

```
-------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
-------------------------------------------------------------------------
South: Nottingham
   8T T     0.56     0.67     7.6   0.59  0.64    3.7    93    4.83   31.7
   8R R     0.33     0.39     8.6   0.59  0.69    3.7    93    2.54   31.2
-------------------------------------------------------------------------
East: Swift Gulch
   1L L     0.47     0.57    14.3   0.53  0.75    2.7    68    2.51   28.6
   6R R     0.45     0.54     8.2   0.53  0.66    2.7    68    3.55   31.4
-------------------------------------------------------------------------
North: Nottingham
   7L L     1.07     1.28    13.3   0.46  0.66    5.7   144    5.92   28.7
   4T T     0.60     0.72     6.2   0.46  0.52    5.7   144    5.93   32.3
-------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

Swift Gulch / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
South: Nottingham									
402	0.481	0.89	1.06	7.9	0.59	0.66	93	7.37	31.5
East: Swift Gulch									
315	0.377	0.92	1.10	10.5	0.53	0.69	68	6.06	30.2
North: Nottingham									
636	0.581	1.67	2.00	9.5	0.46	0.58	144	11.85	30.5
ALL VEHICLES:									
1353	0.581	3.48	4.17	9.2	0.52	0.63	144	25.28	30.7
INTERSECTION (persons):									
1624	0.581		4.17	9.2	0.52	0.63		25.28	30.7

Queue values in this table are 95% back of queue (feet).

Table S.7 - Lane Performance

Swift Gulch / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back (vehs)	Queue 95% Back (ft)	Lane Length (ft)
South: Nottingham								
1 TR	402	838	0.480	7.9	0.66	3.7	93.2	1600.0
East: Swift Gulch								
1 LR	315	838	0.376	10.5	0.69	2.7	67.9	1600.0
North: Nottingham								
1 LT	636	1095	0.581	9.5	0.58	5.7	143.8	1600.0

Table S.8 - Lane Flow and Capacity Information

Swift Gulch / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

	Min	Tot

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Cap (veh /h)	Cap (veh /h)	Deg. Satn x	Lane Util %
South: Nottingham								
1 TR	0	266	136	402	150	838	0.480	100
East: Swift Gulch								
1 LR	119	0	196	315	150	838	0.376	100
North: Nottingham								
1 LT	288	348	0	636	150	1095	0.581	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

Table S.15 - Capacity and Level of Service

Swift Gulch / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
South: Nottingham								
8T	T	266	554	0.480	7.6	A	3.7	93
8R	R	136	283	0.481	8.6	A	3.7	93
East: Swift Gulch								
1L	L	119	316	0.377	14.3	B	2.7	68
6R	R	196	521	0.376	8.2	A	2.7	68
North: Nottingham								
7L	L	288	496	0.581*	13.3	B	5.7	144
4T	T	348	599	0.581*	6.2	A	5.7	144
ALL VEHICLES:		1353		0.581	9.2	A	5.7	144

Level of Service calculations are based on average control delay including geometric delay (HCM criteria), independent of the current delay definition used. For the criteria, refer to the "Level of Service" topic in the SIDRA Output Guide or the Output section of the on-line help.

* Maximum v/c ratio, or critical green periods

SIDRA SOLUTIONS

Site: AM Peak
I:\09007\SwiftGulch Roundabout future.aap
Processed Feb 13, 2009 02:51:19PM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
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SIDRA INTERSECTION

Output Tables

Swift Gulch / Nottingham

Future PM Peak

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Swift Gulch / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

-----------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-----------------------------------------------------------------
 South: Nottingham
           East         8R   Right   117     2    1.00     0.92
           North        8T   Thru    346     7    1.00     0.92
-----------------------------------------------------------------
 East: Swift Gulch
           South        1L   Left    160     3    1.00     0.92
           North        6R   Right   272     6    1.00     0.92
-----------------------------------------------------------------
 North: Nottingham
           South        4T   Thru    309     6    1.00     0.92
           East         7L   Left    224     5    1.00     0.92
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table B.2B - Flow Rates (Total Vehicles and Percent Heavy)

```
Swift Gulch / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

--------------------------------------------------
  Mov          Left        Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
--------------------------------------------------
Demand flows in veh/hour as used by the program
South: Nottingham
   8T T        0   0.0     353   2.0       0   0.0
   8R R        0   0.0       0   0.0     119   1.7
--------------------------------------------------
East: Swift Gulch
   1L L      163   1.8       0   0.0       0   0.0
   6R R        0   0.0       0   0.0     278   2.2
--------------------------------------------------
North: Nottingham
   7L L      229   2.2       0   0.0       0   0.0
   4T T        0   0.0     315   1.9       0   0.0
--------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
---------------------------------------------------------------------------
South: Nottingham
   8T T     0.70     0.84     7.1   0.56  0.60    4.3   108    6.28   31.8
   8R R     0.27     0.32     8.1   0.56  0.65    4.3   108    2.18   31.3
---------------------------------------------------------------------------
East: Swift Gulch
   1L L     0.74     0.89    16.4   0.70  0.87    5.3   134    3.84   27.7
   6R R     0.80     0.96    10.3   0.70  0.81    5.3   134    5.77   30.7
---------------------------------------------------------------------------
North: Nottingham
   7L L     0.87     1.04    13.7   0.52  0.70    5.0   126    4.78   28.6
   4T T     0.58     0.69     6.6   0.52  0.56    5.0   126    5.48   32.0
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

Swift Gulch / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
South: Nottingham									
472	0.517	0.97	1.16	7.4	0.56	0.61	108	8.45	31.7
East: Swift Gulch									
441	0.568	1.54	1.85	12.6	0.70	0.83	134	9.61	29.5
North: Nottingham									
544	0.543	1.44	1.73	9.6	0.52	0.61	126	10.27	30.4
ALL VEHICLES:									
1457	0.568	3.95	4.74	9.8	0.59	0.68	134	28.33	30.5
INTERSECTION (persons):									
1748	0.568		4.74	9.8	0.59	0.68		28.33	30.5

Queue values in this table are 95% back of queue (feet).

Table S.7 - Lane Performance

Swift Gulch / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back (vehs)	Queue 95% Back (ft)	Lane Length (ft)
South: Nottingham								
1 TR	472	913	0.517	7.4	0.61	4.3	108.2	1600.0
East: Swift Gulch								
1 LR	441	778	0.567	12.6	0.83	5.3	134.3	1600.0
North: Nottingham								
1 LT	544	1003	0.542	9.6	0.61	5.0	125.9	1600.0

Table S.8 - Lane Flow and Capacity Information

Swift Gulch / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

	Min	Tot

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Cap (veh /h)	Cap (veh /h)	Deg. Satn x	Lane Util %
South: Nottingham								
1 TR	0	353	119	472	150	913	0.517	100
East: Swift Gulch								
1 LR	163	0	278	441	150	778	0.567	100
North: Nottingham								
1 LT	229	315	0	544	150	1003	0.542	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

Table S.15 - Capacity and Level of Service

Swift Gulch / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
South: Nottingham								
8T	T	353	683	0.517	7.1	A	4.3	108
8R	R	119	230	0.517	8.1	A	4.3	108
East: Swift Gulch								
1L	L	163	287	0.568*	16.4	B	5.3	134
6R	R	278	490	0.567	10.3	B	5.3	134
North: Nottingham								
7L	L	229	422	0.543	13.7	B	5.0	126
4T	T	315	581	0.542	6.6	A	5.0	126
ALL VEHICLES:		1457		0.568	9.8	A	5.3	134

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.
* Maximum v/c ratio, or critical green periods

SIDRA SOLUTIONS

Site: PM Peak
I:\09007\SwiftGulch Roundabout future.aap
Processed Feb 13, 2009 02:51:18PM

A0129, Felsburg Holt & Ullevig, Large Office
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SIDRA INTERSECTION

Output Tables

Buck Creek / Nottingham

Future AM Peak

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Buck Creek / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

-----------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-----------------------------------------------------------------
 West: Nottingham
           South        2R   Right     1     0    1.00     0.92
           East         2T   Thru    549    11    1.00     0.92
           North        5L   Left     27     1    1.00     0.92
-----------------------------------------------------------------
 South: Buck Creek
           West         3L   Left      1     0    1.00     0.92
           East         8R   Right     5     0    1.00     0.92
           North        8T   Thru      1     0    1.00     0.92
-----------------------------------------------------------------
 East: Nottingham
           West         6T   Thru    383     8    1.00     0.92
           South        1L   Left      1     0    1.00     0.92
           East         1L   Left    117     2    1.00     0.92
           North        6R   Right    69     1    1.00     0.92
-----------------------------------------------------------------
 North: Buck Creek
           West         4R   Right    21     0    1.00     0.92
```

```
            South        4T   Thru      1     0    1.00     0.92
            East         7L   Left     69     1    1.00     0.92
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table B.2B - Flow Rates (Total Vehicles and Percent Heavy)

```
Buck Creek / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

--------------------------------------------------
  Mov          Left        Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
--------------------------------------------------
Demand flows in veh/hour as used by the program
West: Nottingham
   5L L       28   3.6       0   0.0       0   0.0
   2T T        0   0.0     560   2.0       0   0.0
   2R R        0   0.0       0   0.0       2  50.0
--------------------------------------------------
South: Buck Creek
   3L L        2  50.0       0   0.0       0   0.0
   8T T        0   0.0       2  50.0       0   0.0
   8R R        0   0.0       0   0.0       6  16.7
--------------------------------------------------
East: Nottingham
   1L L      120   1.7       0   0.0       0   0.0
   6T T        0   0.0     391   2.0       0   0.0
   6R R        0   0.0       0   0.0      70   1.4
--------------------------------------------------
North: Buck Creek
   7L L       70   1.4       0   0.0       0   0.0
   4T T        0   0.0       2  50.0       0   0.0
   4R R        0   0.0       0   0.0      22   4.5
--------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.5 - Movement Performance

```
-------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
-------------------------------------------------------------------------
West: Nottingham
   5L L     0.11     0.13    14.1   0.55  0.72    5.3   134    0.59   28.5
   2T T     1.09     1.31     7.0   0.55  0.59    5.3   134    9.91   31.9
   2R R     0.00     0.01     8.0   0.55  0.66    5.3   134    0.04   31.3
-------------------------------------------------------------------------
South: Buck Creek
```

```
   3L L     0.01     0.01    19.5   0.68  0.83    0.2     5    0.05   26.2
   8T T     0.01     0.01    12.4   0.68  0.74    0.2     5    0.04   29.4
   8R R     0.02     0.03    13.5   0.68  0.63    0.2     5    0.13   28.7
---------------------------------------------------------------------------
East: Nottingham
   1L L     0.50     0.60    14.9   0.17  0.68    3.7    94    2.48   28.5
   6T T     0.58     0.70     5.3   0.17  0.42    3.7    94    6.02   33.8
   6R R     0.12     0.15     6.4   0.17  0.47    3.7    94    1.12   33.1
---------------------------------------------------------------------------
North: Buck Creek
   7L L     0.30     0.36    15.5   0.55  0.79    0.8    20    1.51   28.2
   4T T     0.00     0.01     8.4   0.55  0.72    0.8    20    0.04   31.9
   4R R     0.06     0.07     9.5   0.55  0.65    0.8    20    0.40   31.4
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Buck Creek / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: Nottingham
  590   0.667    1.20     1.45     7.4   0.55  0.60   134   10.53    31.7
---------------------------------------------------------------------------
South: Buck Creek
   10   0.027    0.04     0.05    14.5   0.68  0.70     5    0.22    28.2
---------------------------------------------------------------------------
East: Nottingham
  581   0.435    1.20     1.44     7.4   0.17  0.48    94    9.62    32.4
---------------------------------------------------------------------------
North: Buck Creek
   94   0.136    0.36     0.44    14.0   0.55  0.75    20    1.95    28.9
---------------------------------------------------------------------------
ALL VEHICLES:
 1275   0.667    2.81     3.37     7.9   0.38  0.56   134   22.32    31.7
---------------------------------------------------------------------------
INTERSECTION (persons):
 1530   0.667             3.37     7.9   0.38  0.56         22.32    31.7
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Buck Creek / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
```

```
-------------------------------------------------------------
 West: Nottingham
 1 LTR     590   989 0.597    7.4  0.60    5.3  134.4   1600.0
-------------------------------------------------------------
 South: Buck Creek
 1 LTR      10   368 0.027   14.5  0.70    0.2    4.7   1600.0
-------------------------------------------------------------
 East: Nottingham
 1 LTR     581  1336 0.435    7.4  0.48    3.7   94.1   1600.0
-------------------------------------------------------------
 North: Buck Creek
 1 LTR      94   692 0.136   14.0  0.75    0.8   19.8   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Buck Creek / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

--------------------------------------------------
                               Min  Tot
 Lane     Dem Flow (veh/h)     Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot     /h)  /h)   x     %
--------------------------------------------------
 West: Nottingham
 1 LTR    28  560    2  590   150  989  0.597  100
--------------------------------------------------
 South: Buck Creek
 1 LTR     2    2    6   10    10  368  0.027  100
--------------------------------------------------
 East: Nottingham
 1 LTR   120  391   70  581   150 1336  0.435  100
--------------------------------------------------
 North: Buck Creek
 1 LTR    70    2   22   94    94  692  0.136  100
--------------------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Buck Creek / Nottingham
Future AM Peak
Intersection ID: 1
Roundabout

-------------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-------------------------------------------------------------------
West: Nottingham
  5L L             28     47   0.596    14.1    B      5.3    134
```

```
  2T T            560    939   0.596     7.0    A      5.3    134
  2R R              2      3   0.667*    8.0    A      5.3    134
-----------------------------------------------------------------
South: Buck Creek
  3L L              2     74   0.027    19.5    B      0.2      5
  8T T              2     74   0.027    12.4    B      0.2      5
  8R R              6    221   0.027    13.5    B      0.2      5
-----------------------------------------------------------------
East: Nottingham
  1L L            120    276   0.435    14.9    B      3.7     94
  6T T            391    899   0.435     5.3    A      3.7     94
  6R R             70    161   0.435     6.4    A      3.7     94
-----------------------------------------------------------------
North: Buck Creek
  7L L             70    515   0.136    15.5    B      0.8     20
  4T T              2     15   0.133     8.4    A      0.8     20
  4R R             22    162   0.136     9.5    A      0.8     20
-----------------------------------------------------------------
 ALL VEHICLES:   1275          0.667     7.9    A      5.3    134
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: AM Peak
I:\09007\BuckCreek Roundabout future.aap
Processed Feb 13, 2009 02:53:35PM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
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SIDRA INTERSECTION

Output Tables

Buck Creek / Nottingham

Future PM Peak

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

Buck Creek / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale	Peak Flow Factor
West: Nottingham							
	South	2R	Right	5	0	1.00	0.92
	East	2T	Thru	469	10	1.00	0.92
	North	5L	Left	21	0	1.00	0.92
South: Buck Creek							
	West	3L	Left	1	0	1.00	0.92
	East	8R	Right	5	0	1.00	0.92
	North	8T	Thru	1	0	1.00	0.92
East: Nottingham							
	West	6T	Thru	533	11	1.00	0.92
	South	1L	Left	5	0	1.00	0.92
	East	1L	Left	160	3	1.00	0.92
	North	6R	Right	85	2	1.00	0.92
North: Buck Creek							
	West	4R	Right	27	1	1.00	0.92

```
            South        4T   Thru      1     0    1.00     0.92
            East         7L   Left     59     1    1.00     0.92
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table B.2B - Flow Rates (Total Vehicles and Percent Heavy)

```
Buck Creek / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

--------------------------------------------------
  Mov          Left        Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
--------------------------------------------------
Demand flows in veh/hour as used by the program
West: Nottingham
   5L L       22   4.5       0   0.0       0   0.0
   2T T        0   0.0     479   2.1       0   0.0
   2R R        0   0.0       0   0.0       6  16.7
--------------------------------------------------
South: Buck Creek
   3L L        2  50.0       0   0.0       0   0.0
   8T T        0   0.0       2  50.0       0   0.0
   8R R        0   0.0       0   0.0       6  16.7
--------------------------------------------------
East: Nottingham
   1L L      168   1.8       0   0.0       0   0.0
   6T T        0   0.0     544   2.0       0   0.0
   6R R        0   0.0       0   0.0      87   2.3
--------------------------------------------------
North: Buck Creek
   7L L       60   1.7       0   0.0       0   0.0
   4T T        0   0.0       2  50.0       0   0.0
   4R R        0   0.0       0   0.0      28   3.6
--------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.5 - Movement Performance

```
-------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
-------------------------------------------------------------------------
West: Nottingham
   5L L     0.09     0.10    14.3   0.55  0.74    4.4   111    0.47   28.5
   2T T     0.96     1.15     7.2   0.55  0.61    4.4   111    8.49   31.9
   2R R     0.01     0.02     8.2   0.55  0.64    4.4   111    0.11   31.3
-------------------------------------------------------------------------
South: Buck Creek
```

```
   3L L     0.01     0.01    18.8   0.65  0.82    0.1     4    0.05   26.5
   8T T     0.01     0.01    11.7   0.65  0.72    0.1     4    0.04   29.8
   8R R     0.02     0.03    12.8   0.65  0.62    0.1     4    0.12   29.1
-----------------------------------------------------------------------
East: Nottingham
   1L L     0.69     0.83    14.8   0.19  0.67    6.1   154    3.53   28.5
   6T T     0.81     0.97     5.3   0.19  0.41    6.1   154    8.59   33.7
   6R R     0.15     0.18     6.4   0.19  0.47    6.1   154    1.42   33.0
-----------------------------------------------------------------------
North: Buck Creek
   7L L     0.29     0.35    17.4   0.65  0.85    0.9    24    1.38   27.2
   4T T     0.01     0.01    10.2   0.65  0.80    0.9    24    0.04   30.8
   4R R     0.09     0.11    11.3   0.65  0.71    0.9    24    0.55   30.1
-----------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Buck Creek / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
West: Nottingham
  507   0.545    1.06     1.28     7.5   0.55  0.62   111    9.06    31.7
-----------------------------------------------------------------------
South: Buck Creek
   10   0.025    0.04     0.05    13.8   0.65  0.68     4    0.22    28.7
-----------------------------------------------------------------------
East: Nottingham
  799   0.572    1.65     1.99     7.5   0.19  0.47   154   13.54    32.3
-----------------------------------------------------------------------
North: Buck Creek
   90   0.155    0.38     0.46    15.3   0.65  0.81    24    1.98    28.1
-----------------------------------------------------------------------
ALL VEHICLES:
 1406   0.572    3.14     3.77     8.0   0.35  0.55   154   24.80    31.7
-----------------------------------------------------------------------
INTERSECTION (persons):
 1687   0.572             3.77     8.0   0.35  0.55         24.80    31.7
-----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Buck Creek / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

-------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
```

```
-------------------------------------------------------------
 West: Nottingham
 1 LTR     507   934 0.543    7.5  0.62    4.4  111.2   1600.0
-------------------------------------------------------------
 South: Buck Creek
 1 LTR      10   395 0.025   13.8  0.68    0.1    4.3   1600.0
-------------------------------------------------------------
 East: Nottingham
 1 LTR     799  1398 0.572    7.5  0.47    6.1  153.8   1600.0
-------------------------------------------------------------
 North: Buck Creek
 1 LTR      90   581 0.155   15.3  0.81    0.9   23.9   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Buck Creek / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

--------------------------------------------------
                               Min  Tot
 Lane     Dem Flow (veh/h)     Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: Nottingham
 1 LTR    22  479    6  507   150  934  0.543  100
--------------------------------------------------
 South: Buck Creek
 1 LTR     2    2    6   10    10  395  0.025  100
--------------------------------------------------
 East: Nottingham
 1 LTR   168  544   87  799   150 1398  0.572  100
--------------------------------------------------
 North: Buck Creek
 1 LTR    60    2   28   90    90  581  0.155  100
--------------------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Buck Creek / Nottingham
Future PM Peak
Intersection ID: 1
Roundabout

-------------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-------------------------------------------------------------------
West: Nottingham
  5L L             22     41   0.537    14.3    B      4.4    111
```

```
  2T T            479    882   0.543     7.2    A      4.4    111
  2R R              6     11   0.545     8.2    A      4.4    111
----------------------------------------------------------------
South: Buck Creek
  3L L              2     79   0.025    18.8    B      0.1      4
  8T T              2     79   0.025    11.7    B      0.1      4
  8R R              6    237   0.025    12.8    B      0.1      4
----------------------------------------------------------------
East: Nottingham
  1L L            168    294   0.571    14.8    B      6.1    154
  6T T            544    952   0.571     5.3    A      6.1    154
  6R R             87    152   0.572*    6.4    A      6.1    154
----------------------------------------------------------------
North: Buck Creek
  7L L             60    388   0.155    17.4    B      0.9     24
  4T T              2     13   0.154    10.2    B      0.9     24
  4R R             28    181   0.155    11.3    B      0.9     24
----------------------------------------------------------------
 ALL VEHICLES:   1406          0.572     8.0    A      6.1    154
----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: PM Peak
I:\09007\BuckCreek Roundabout future.aap
Processed Feb 13, 2009 02:53:35PM

A0129, Felsburg Holt & Ullevig, Large Office
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