



2015 Skagit County Road Segment & Intersection Concurrency

INTRODUCTION

Skagit County Code 14.28.110 “Annual Concurrency Assessment” requires that the County Engineer annually produce this report to update the status of County road concurrency. The following is produced to meet said requirement.

REQUIREMENTS

The concurrency assessment requires that *“the Skagit County Public Works Department, under the direction of the County Engineer, shall evaluate the High Traffic County Road Segments and High Traffic County Road Intersections using a Highway Capacity Manual type method (as selected by the County Engineer) to determine whether these road segments and intersections comply with the level of service standards adopted in the Comprehensive Plan.”* These Levels of Service (LOS) are described as follows in Skagit County’s Comprehensive Plan.

- 8A-2.1** Level of Service Standards – The Level of Service (LOS) standard for County roads is C. LOS D is acceptable for all road segments that:
- a) Have Annualized Average Daily Traffic (AADT) greater than 7,000 vehicles;*
 - and*
 - b) Are NOT federally functionally classified as an 09-Local Access Road; and*
 - c) Are designated as a County Freight and Goods Transportation Systems Route (FGTS).*

The LOS standard for County road intersections is LOS D.

LEVEL OF SERVICE DATA

Road Segments

As outlined in Skagit County’s Transportation Systems Plan (TSP), the methodology used to acquire the LOS of county road segments is outlined in Chapter Six of the TSP.

“The Skagit County Public Works Traffic Engineering Unit has selected an LOS study volume unit threshold of 7,000 AADT. This threshold is an indicator that a road segment may be approaching the LOS C/D threshold and should be studied in depth.”

Table 1 shows the current County roads that meet the criteria for further study and the current LOS as determined using the Transportation Research Board’s Highway Capacity Manual and Highway Capacity Software developed for this use by the University of Florida. Also shown is the projected 5-year LOS. This projected LOS was determined using a 2 percent yearly growth factor for each road segment. Projects along these roadways that are scheduled to be completed within this 5 year period were not significant enough to include as separate items. As one can see from Table 1, all the criteria for LOS concurrency have been met.

Table 1 – Road Segments

Road #	Road Name	FFC	Truck Rt	Beg MP	End MP	Length	2015 AADT	2016 Est	2017 Est	2018 Est	2019 Est	2020 Est	2015 LOS	2020 LOS
63000	COOK ROAD	07	T2	1.750	1.800	0.050	17799	18155	18518	18888	19266	19652	These two segments are in WSDOT ROW	
63000	COOK ROAD	07	T2	1.800	1.860	0.060	17799	18155	18518	18888	19266	19652		
63000	COOK ROAD	07	T2	1.860	1.890	0.030	13271	13536	13807	14083	14365	14652	D	D
63000	COOK ROAD	07	T2	1.890	1.950	0.060	13271	13536	13807	14083	14365	14652		
63000	COOK ROAD	07	T2	1.950	1.970	0.020	13271	13536	13807	14083	14365	14652		
63000	COOK ROAD	07	T2	1.970	2.191	0.221	13271	13536	13807	14083	14365	14652		
63000	COOK ROAD	07	T2	2.191	3.080	0.889	13271	13536	13807	14083	14365	14652		
63000	COOK ROAD	07	T2	3.080	3.360	0.280	13271	13536	13807	14083	14365	14652	D	D
63000	COOK ROAD	07	T2	3.360	3.820	0.460	14534	14825	15121	15424	15732	16047		
63000	COOK ROAD	07	T2	3.820	4.100	0.280	14534	14825	15121	15424	15732	16047		
63000	COOK ROAD	07	T2	4.100	4.320	0.220	14534	14825	15121	15424	15732	16047	D	D
63000	COOK ROAD	07	T2	4.320	4.600	0.280	14534	14825	15121	15424	15732	16047		
63000	COOK ROAD	07	T2	4.600	4.880	0.280	13004	13264	13529	13800	14076	14357		
63000	COOK ROAD	07	T2	4.880	5.000	0.120	13004	13264	13529	13800	14076	14357		
63000	COOK ROAD	07	T2	5.000	5.080	0.080	13004	13264	13529	13800	14076	14357		
63000	COOK ROAD	07	T2	5.080	5.260	0.180	13004	13264	13529	13800	14076	14357		
63000	COOK ROAD	07	T2	5.260	5.320	0.060	13004	13264	13529	13800	14076	14357		
63000	COOK ROAD	07	T2	5.320	5.390	0.070	13004	13264	13529	13800	14076	14357		
63000	COOK ROAD	16	T2	5.390	5.470	0.080	13004	13264	13529	13800	14076	14357		
63000	COOK ROAD	16	T2	5.470	5.500	0.030	13004	13264	13529	13800	14076	14357		
63000	COOK ROAD	16	T2	5.500	5.510	0.010	13004	13264	13529	13800	14076	14357		
63000	COOK ROAD	16	T2	5.510	5.620	0.110	13004	13264	13529	13800	14076	14357		
80090	PIONEER HIGHWAY	07	T3	0.000	0.883	0.883	7915	8073	8235	8399	8567	8739	C	C
80090	PIONEER HIGHWAY	07	T3	0.883	1.418	0.535	7985	8145	8308	8474	8643	8816	C	C
80090	PIONEER HIGHWAY	07	T3	1.418	1.748	0.330	7985	8145	8308	8474	8643	8816	C	C
80090	PIONEER HIGHWAY	07	T3	1.748	3.065	1.317	8293	8459	8628	8801	8977	9156	C	C
80090	PIONEER HIGHWAY	07	T2	3.065	3.089	0.024	11904	12142	12385	12633	12885	13143	D	D

Road Intersections

Intersection LOS

As with Road Segment LOS, Intersection LOS methodology is outlined in Chapter Six of the TSP. Intersection LOS, according to the Highway Capacity Manual, cannot be determined at stop controlled intersections. The individual stop-controlled leg LOS can be determined, but the overall intersection LOS cannot be determined. With regard to stop-controlled intersections, the TSP states that Skagit County will perform intersection analysis on;

“...intersections that may be approaching traffic signal warrants as described in the Manual on Uniform Traffic Control Devices (MUTCD). Signalization is considered as a possible solution to poor side street LOS; however, there have been many other considerations before concluding a traffic signal is required. Overall intersection safety is a major consideration and often results in alternatives to traffic signals such as roundabouts, route changes, additional lanes or new connections. When signalization occurs at an intersection the LOS can be determined as the average control delay to vehicles approaching the intersection.”

The TSP goes on regarding signalized and unsignalized intersections;

“Public Works staff will evaluate the LOS of all signalized locations on County Roads. They will also monitor traffic volumes on potential signalized locations to evaluate traffic signal warrants. This procedure will identify side street delay so capital projects may be identified and scoped. If signalization occurs, routes will be added to the list of intersections being monitored for LOS.”

Table 2 shows the signalized and unsignalized intersections on which Skagit County is collecting LOS data on a regular basis.

Table 2 – Intersections

Intersection Name	Intersection Type	NB Approach LOS	SB Approach LOS	EB Approach LOS	WB Approach LOS	Overall LOS
2015						
Cook Road / Old Hwy 99 N	Signalized	B	B	B	A	B
2020 Est						
Cook Road / Old Hwy 99 N	Signalized	B	B	B	B	B

The full Highway Capacity Reports on the intersection of Cook Road and Old Hwy 99 N for the current year and 5-year estimate are included in this Assessment as Appendix A and Appendix B respectively. This 5-year projected LOS was determined using a 2 percent yearly growth factor for each approach volume. The reports include the same data as last year's 2014 Concurrency Report as its data was collected on June 17, 2015 and remains current for the 2015 Concurrency Report.

It should be noted that this intersection was studied during the Peak PM hour for the Highway Capacity report as per industry standards and Concurrency requirements. However, during the Peak AM hour the LOS from the Westbound (WB) and Eastbound (EB) approaches would differ due to the prevailing traffic patterns for work-bound and home-bound trips. There are also two to three AM peak hour trains that travel through the at-grade rail crossing just east of the intersection that directly effect LOS during the morning commute.

SUMMARY

As of December 31, 2015 all Skagit County road segments and signalized intersections meet the current LOS standards as adopted in the Transportation Systems Plan and Comprehensive Plan of Skagit County. Therefore, all Skagit County road segments and intersections are concurrent.

Baseline

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: Given Kutz
Agency/Co.: Skagit County
Date Performed: 06/29/2015
Analysis Time Period: 5:00 pm
Intersection: Int #1
Area Type: All other areas
Jurisdiction: County
Analysis Year: 2015
Project ID: 2015 Concurrency Assessment
E/W St: Cook Road N/S St: Old Hwy 99 N

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	132	514	71	51	391	64	97	199	140	84	104	131
% Heavy Veh	7	5	5	5	5	5	5	7	5	5	5	7
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PK 15 Vol	36	140	19	14	106	17	26	54	38	23	28	36
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900		1900	1900		1900	1900	1900
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	1
LGConfig	L	TR		L	TR		L	TR		L	T	R
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	12.0
RTOR Vol			5			6			27			97
Adj Flow	143	631		55	488		105	339		91	113	37
%InSharedLn												
Prop LTS	1.000	0.000		1.000	0.000		1.000	0.000		1.000	0.000	
Prop RTS		0.114			0.129			0.363			0.000	1.000
Peds Bikes	0	0	0	0	0	0	0	0	0	0	0	0
Buses	0	0		0	0		0	0		0	0	0
%InProtPhase												
Duration	0.25											
Area Type: All other areas												

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Arriv. Type	3	3		3	3		3	3		3	3	3
Unit Ext.	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ext of g	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ped Min g		3.2			3.2			3.2			3.2	

PHASE DATA

Phase Combination 1			2	3	4	5	6	7	8
EB	Left	A				NB	Left	A	
	Thru	A					Thru	A	
	Right	A					Right	A	
	Peds	X					Peds	X	
WB	Left	A				SB	Left	A	
	Thru	A					Thru	A	
	Right	A					Right	A	
	Peds	X					Peds	X	
NB	Right					EB	Right		
SB	Right					WB	Right		
Green		27.0						17.1	
Yellow		4.0						3.6	
All Red		1.0						1.0	

Cycle Length: 53.7 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	132	514	71	51	391	64	97	199	140	84	104	131
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj flow	143	559	72	55	425	63	105	216	123	91	113	37
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	1
Lane group	L	TR		L	TR		L	TR		L	T	R
Adj flow	143	631		55	488		105	339		91	113	37
Prop LTs	1.000	0.000		1.000	0.000		1.000	0.000		1.000	0.000	
Prop RTs	0.114			0.129			0.363			0.000	1.000	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

LG	Eastbound			Westbound			Northbound			Southbound		
	L	TR		L	TR		L	TR		L	T	R
So	1900	1900		1900	1900		1900	1900		1900	1900	1900
Lanes	1	1	0	1	1	0	1	1	0	1	1	1
fW	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
fHV	0.935	0.952		0.952	0.952		0.952	0.941		0.952	0.952	0.935
fG	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
fP	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
fBB	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
fA	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
fLU	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
fRT		0.983			0.981			0.946			1.000	0.850
fLT	0.397	1.000		0.277	1.000		0.684	1.000		0.430	1.000	
Sec.												
fLpb	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fRpb		1.000			1.000			1.000			1.000	1.000
S	705	1779		501	1774		1238	1691		778	1810	1509
Sec.												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left	L	143	705	0.20	0.50	354	0.40
Prot							
Perm							
Thru	TR	631	1779	# 0.35	0.50	894	0.71
Right							
Westbound							
Prot							
Perm							
Left	L	55	501	0.11	0.50	252	0.22
Prot							
Perm							
Thru	TR	488	1774	0.28	0.50	892	0.55
Right							
Northbound							
Prot							
Perm							
Left	L	105	1238	0.08	0.32	394	0.27
Prot							
Perm							
Thru	TR	339	1691	# 0.20	0.32	538	0.63
Right							
Southbound							
Prot							
Perm							
Left	L	91	778	0.12	0.32	248	0.37
Prot							
Perm							
Thru	T	113	1810	0.06	0.32	576	0.20
Right	R	37	1509	0.02	0.32	481	0.08

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.56
Total lost time per cycle, L = 9.60 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.68

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios		Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Del d2	Res Del d3	Lane Group		Approach	
	v/c	g/C							Delay	LOS	Delay	LOS
Eastbound												
L	0.40	0.50	8.3	1.000	354	0.11	0.8	0.0	9.1	A		
TR	0.71	0.50	10.3	1.000	894	0.27	2.6	0.0	12.9	B	12.2	B
Westbound												
L	0.22	0.50	7.5	1.000	252	0.11	0.4	0.0	7.9	A		
TR	0.55	0.50	9.2	1.000	892	0.15	0.7	0.0	9.9	A	9.7	A
Northbound												
L	0.27	0.32	13.6	1.000	394	0.11	0.4	0.0	14.0	B		
TR	0.63	0.32	15.6	1.000	538	0.21	2.4	0.0	18.0	B	17.0	B
Southbound												
L	0.37	0.32	14.1	1.000	248	0.11	0.9	0.0	15.0	B		
T	0.20	0.32	13.3	1.000	576	0.11	0.2	0.0	13.5	B	14.0	B

R 0.08 0.32 12.8 1.000 481 0.11 0.1 0.0 12.9 B

Intersection delay = 12.8 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET

for exclusive lefts

Input

	EB	WB	NB	SB
	M	M	M	M
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 53.7 sec				
Total actual green time for LT lane group, G (s)	27.0	27.0	17.1	17.1
Effective permitted green time for LT lane group, g(s)	27.0	27.0	17.1	17.1
Opposing effective green time, go (s)	27.0	27.0	17.1	17.1
Number of lanes in LT lane group, N	1	1	1	1
Number of lanes in opposing approach, No	1	1	1	1
Adjusted LT flow rate, VLT (veh/h)	143	55	105	91
Proportion of LT in LT lane group, PLT	1.000	1.000	1.000	1.000
Proportion of LT in opposing flow, PLTo	0.00	0.00	0.00	0.00
Adjusted opposing flow rate, Vo (veh/h)	488	631	113	339
Lost time for LT lane group, tL	5.00	5.00	4.60	4.60
Computation				
LT volume per cycle, LTC=VLTC/3600	2.13	0.82	1.57	1.36
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	7.28	9.41	1.69	5.06
gf=G[exp(- a * (LTC ** b))]-tL, gf<=g	0.0	0.0	0.0	0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00	1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.50	0.50	0.68	0.68
gq, (see Exhibit C16-4,5,6,7,8)	4.93	9.41	0.00	3.89
gu=g-gq if gq>=gf, or = g-gf if gq<gf	22.07	17.59	17.10	13.21
n=Max(gq-gf)/2,0)	2.47	4.71	0.00	1.95
PTHo=1-PLTo	1.00	1.00	1.00	1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00	1.00	1.00	1.00
EL1 (refer to Exhibit C16-3)	2.06	2.35	1.46	1.80
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.15	0.15	0.23	0.23
gdifff=max(gq-gf,0)	0.00	0.00	0.00	0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.40	0.28	0.68	0.43
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdifff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.397	0.277	0.684	0.430

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET

for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 53.7 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
 Adjusted LT flow rate, VLT (veh/h)
 Proportion of LT in LT lane group, PLT 0.000 0.000 0.000 0.000
 Proportion of LT in opposing flow, PLTo
 Adjusted opposing flow rate, Vo (veh/h)
 Lost time for LT lane group, tL
 Computation
 LT volume per cycle, LTC=VLTC/3600
 Opposing lane util. factor, fLUo 1.000 1.000 1.000 1.000
 Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
 gf=G[exp(- a * (LTC ** b))]-tL, gf<=g
 Opposing platoon ratio, Rpo (refer Exhibit 16-11)
 Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
 gq, (see Exhibit C16-4,5,6,7,8)
 gu=g-gq if gq>=gf, or = g-gf if gq<gf
 n=Max(gq-gf)/2,0)
 PTHo=1-PLTo
 PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
 EL1 (refer to Exhibit C16-3)
 EL2=Max((1-Ptho**n)/Plto, 1.0)
 fmin=2(1+PL)/g or fmin=2(1+PL)/g
 gdiff=max(gq-gf,0)
 fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
 flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)
 or flt=[fm+0.91(N-1)]/N**
 Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)	27.0	27.0	17.1	17.1
Conflicting pedestrian volume, Vped (p/h)	0	0	0	0
Pedestrian flow rate, Vpedg (p/h)	0	0	0	0
OCCpedg	0.000	0.000	0.000	0.000
Opposing queue clearing green, gq (s)	4.93	9.41	0.00	3.89
Eff. ped. green consumed by opp. veh. queue, gq/gp	0.183	0.349	0.000	0.228
OCCpedu	0.000	0.000	0.000	0.000
Opposing flow rate, Vo (veh/h)	488	631	113	339
OCCr	0.000	0.000	0.000	0.000
Number of cross-street receiving lanes, Nrec	1	1	1	1
Number of turning lanes, Nturn	1	1	1	1
ApbT	1.000	1.000	1.000	1.000
Proportion of left turns, PLT	1.000	1.000	1.000	1.000
Proportion of left turns using protected phase, PLTA	0.000	0.000	0.000	0.000
Left-turn adjustment, fLpb	1.000	1.000	1.000	1.000

Permitted Right Turns

Effective pedestrian green time, gp (s)	27.0	27.0	17.1	17.1
Conflicting pedestrian volume, Vped (p/h)	0	0	0	0
Conflicting bicycle volume, Vbic (bicycles/h)	0	0	0	0
Vpedg	0	0	0	0
OCCpedg	0.000	0.000	0.000	0.000
Effective green, g (s)	27.0	27.0	17.1	17.1
Vbicg	0	0	0	0

OCCbicg	0.020	0.020	0.020	0.020
OCCr	0.000	0.000	0.000	0.000
Number of cross-street receiving lanes, Nrec	1	1	1	1
Number of turning lanes, Nturn	1	1	1	1
ApbT	1.000	1.000	1.000	1.000
Proportion right-turns, PRT	0.114	0.129	0.363	1.000
Proportion right-turns using protected phase, PRTA	0.000	0.000	0.000	0.000
Right turn adjustment, fRpb	1.000	1.000	1.000	1.000

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Cycle length, C	53.7	sec		
Adj. LT vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Protected phase effective green interval, g (s)				
Opposing queue effective green interval, gq				
Unopposed green interval, gu				
Red time $r=(C-g-gq-gu)$				
Arrival rate, $qa=v/(3600(\max[X,1.0]))$				
Protected ph. departure rate, $Sp=s/3600$				
Permitted ph. departure rate, $Ss=s(gq+gu)/(gu*3600)$				
XPerm				
XProt				
Case				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay		Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
			Unadj. ds	Adj. d1 sec				
Eastbound								
L	0.0	0.00	13.3	8.3	0.00	0.0	0.0	9.1
TR	0.0	0.00	13.3	10.3	0.00	0.0	0.0	12.9
	0.0						0.0	
Westbound								
L	0.0	0.00	13.3	7.5	0.00	0.0	0.0	7.9
TR	0.0	0.00	13.3	9.2	0.00	0.0	0.0	9.9
	0.0						0.0	
Northbound								
L	0.0	0.00	18.3	13.6	0.00	0.0	0.0	14.0
TR	0.0	0.00	18.3	15.6	0.00	0.0	0.0	18.0
	0.0						0.0	
Southbound								
L	0.0	0.00	18.3	14.1	0.00	0.0	0.0	15.0
T	0.0	0.00	18.3	13.3	0.00	0.0	0.0	13.5
R	0.0	0.00	18.3	12.8	0.00	0.0	0.0	12.9
Intersection Delay 12.8 sec/veh Intersection LOS B								

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound		Northbound		Southbound				
LaneGroup	L	TR		L	TR	L	TR	L	T	R		
Init Queue	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Flow Rate	143	631		55	488	105	339	91	113	37		
So	1900	1900		1900	1900	1900	1900	1900	1900	1900		
No.Lanes	1	1	0	1	1	0	1	1	1			
SL	705	1779		501	1774		1238	1691		778	1810	1509
LnCapacity	354	894		252	892		394	538		248	576	481
Flow Ratio	0.2	0.4		0.1	0.3		0.1	0.2		0.1	0.1	0.0
v/c Ratio	0.40	0.71		0.22	0.55		0.27	0.63		0.37	0.20	0.08
Grn Ratio	0.50	0.50		0.50	0.50		0.32	0.32		0.32	0.32	0.32
I Factor		1.000			1.000			1.000			1.000	
AT or PVG	3	3		3	3		3	3		3	3	3
Pltn Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
PF2	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Q1	1.3	7.3		0.5	5.0		1.2	4.3		1.0	1.2	0.4
kB	0.3	0.5		0.2	0.5		0.3	0.3		0.2	0.4	0.3
Q2	0.2	1.1		0.1	0.6		0.1	0.6		0.1	0.1	0.0
Q Average	1.5	8.4		0.5	5.6		1.3	4.9		1.2	1.3	0.4
Q Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	25.0
Q Storage	155	0		275	0		170	0		280	0	100
Q S Ratio	0.2			0.0			0.2			0.1		0.1
70th Percentile Output:												
fB%	1.2	1.2		1.2	1.2		1.2	1.2		1.2	1.2	1.2
BOQ	1.8	9.9		0.6	6.6		1.5	5.8		1.4	1.6	0.5
QSRatio	0.3			0.1			0.2			0.1		0.1
85th Percentile Output:												
fB%	1.6	1.5		1.6	1.5		1.6	1.6		1.6	1.6	1.6
BOQ	2.4	12.8		0.8	8.6		2.0	7.6		1.9	2.1	0.7
QSRatio	0.4			0.1			0.3			0.2		0.2
90th Percentile Output:												
fB%	1.8	1.7		1.8	1.7		1.8	1.7		1.8	1.8	1.8
BOQ	2.7	13.9		0.9	9.5		2.3	8.4		2.1	2.3	0.7
QSRatio	0.4			0.1			0.3			0.2		0.2
95th Percentile Output:												
fB%	2.1	1.9		2.1	1.9		2.1	2.0		2.1	2.1	2.1
BOQ	3.1	15.7		1.1	10.8		2.6	9.6		2.4	2.7	0.9
QSRatio	0.5			0.1			0.4			0.2		0.2
98th Percentile Output:												
fB%	2.6	2.2		2.7	2.4		2.6	2.4		2.6	2.6	2.7
BOQ	3.9	18.6		1.4	13.1		3.3	11.7		3.1	3.4	1.1
QSRatio	0.6			0.1			0.5			0.3		0.3

ERROR MESSAGES

No errors to report.

Inter.: Int #1
Area Type: All other areas
Jurisd: County
Year : 2015

N/S St: Old Hwy 99 N

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	1
LGConfig	L	TR		L	TR		L	TR		L	T	R
Volume	146	567	78	56	432	71	107	220	155	93	115	145
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	12.0
RTOR Vol			5			6			27			97

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A					NB	Left	A		
	Thru	A					NB	Thru	A		
	Right	A						Right	A		
	Peds	X						Peds	X		
WB	Left	A					SB	Left	A		
	Thru	A						Thru	A		
	Right	A						Right	A		
	Peds	X						Peds	X		
NB	Right						EB	Right			
SB	Right						WB	Right			
Green		27.0							17.1		
Yellow		4.0							3.6		
All Red		1.0							1.0		

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios		Lane Group		Approach	
			v/c	g/C	Delay	LOS	Delay	LOS

Intersection Delay = 14.3 (sec/veh) Intersection LOS = B

Baseline

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: Given Kutz
Agency/Co.: Skagit County
Date Performed: 06/29/2015
Analysis Time Period: 5:00 pm
Intersection: Int #1
Area Type: All other areas
Jurisdiction: County
Analysis Year: 2015
Project ID: 2015 Concurrency Assessment
E/W St: Cook Road N/S St: Old Hwy 99 N

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	146	567	78	56	432	71	107	220	155	93	115	145
% Heavy Veh	7	5	5	5	5	5	5	7	5	5	5	7
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PK 15 Vol	40	154	21	15	117	19	29	60	42	25	31	39
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900		1900	1900		1900	1900	1900
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	1
LGConfig	L	TR		L	TR		L	TR		L	T	R
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	12.0
RTOR Vol			5			6			27			97
Adj Flow	159	695		61	541		116	378		101	125	52
%InSharedLn												
Prop LTS	1.000	0.000		1.000	0.000		1.000	0.000		1.000	0.000	
Prop RTS		0.114			0.131			0.368			0.000	1.000
Peds Bikes	0	0	0	0	0	0	0	0	0	0	0	0
Buses	0	0		0	0		0	0		0	0	0
%InProtPhase												
Duration	0.25											
Area Type: All other areas												

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Arriv. Type	3	3		3	3		3	3		3	3	3
Unit Ext.	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ext of g	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ped Min g		3.2			3.2			3.2			3.2	

PHASE DATA

Phase Combination 1			2	3	4	5	6	7	8
EB	Left	A				NB	Left	A	
	Thru	A					Thru	A	
	Right	A					Right	A	
	Peds	X					Peds	X	
WB	Left	A				SB	Left	A	
	Thru	A					Thru	A	
	Right	A					Right	A	
	Peds	X					Peds	X	
NB	Right					EB	Right		
SB	Right					WB	Right		
Green		27.0						17.1	
Yellow		4.0						3.6	
All Red		1.0						1.0	

Cycle Length: 53.7 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound				Westbound				Northbound				Southbound		
	L	T	R		L	T	R		L	T	R		L	T	R
Volume, V	146	567	78		56	432	71		107	220	155		93	115	145
PHF	0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92
Adj flow	159	616	79		61	470	71		116	239	139		101	125	52
No. Lanes	1	1	0		1	1	0		1	1	0		1	1	1
Lane group	L	TR			L	TR			L	TR			L	T	R
Adj flow	159	695			61	541			116	378			101	125	52
Prop LTs	1.000	0.000			1.000	0.000			1.000	0.000			1.000	0.000	
Prop RTs	0.114				0.131				0.368				0.000	1.000	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

LG	Eastbound				Westbound				Northbound				Southbound		
	L	TR			L	TR			L	TR			L	T	R
So	1900	1900			1900	1900			1900	1900			1900	1900	1900
Lanes	1	1	0		1	1	0		1	1	0		1	1	1
fW	1.000	1.000			1.000	1.000			1.000	1.000			1.000	1.000	1.000
fHV	0.935	0.952			0.952	0.952			0.952	0.941			0.952	0.952	0.935
fG	1.000	1.000			1.000	1.000			1.000	1.000			1.000	1.000	1.000
fP	1.000	1.000			1.000	1.000			1.000	1.000			1.000	1.000	1.000
fBB	1.000	1.000			1.000	1.000			1.000	1.000			1.000	1.000	1.000
fA	1.000	1.000			1.000	1.000			1.000	1.000			1.000	1.000	1.000
fLU	1.000	1.000			1.000	1.000			1.000	1.000			1.000	1.000	1.000
fRT		0.983				0.980				0.945				1.000	0.850
fLT	0.351	1.000			0.226	1.000			0.677	1.000			0.376	1.000	
Sec.															
fLpb	1.000	1.000			1.000	1.000			1.000	1.000			1.000	1.000	
fRpb		1.000				1.000				1.000				1.000	1.000
S	624	1779			408	1774			1225	1689			681	1810	1509
Sec.															

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left	L	159	624	0.25	0.50	314	0.51
Prot							
Perm							
Thru	TR	695	1779	# 0.39	0.50	894	0.78
Right							
Westbound							
Prot							
Perm							
Left	L	61	408	0.15	0.50	205	0.30
Prot							
Perm							
Thru	TR	541	1774	0.30	0.50	892	0.61
Right							
Northbound							
Prot							
Perm							
Left	L	116	1225	0.09	0.32	390	0.30
Prot							
Perm							
Thru	TR	378	1689	# 0.22	0.32	538	0.70
Right							
Southbound							
Prot							
Perm							
Left	L	101	681	0.15	0.32	217	0.47
Prot							
Perm							
Thru	T	125	1810	0.07	0.32	576	0.22
Right	R	52	1509	0.03	0.32	481	0.11

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.61
Total lost time per cycle, L = 9.60 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.75

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios		Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Del d2	Res Del d3	Lane Group		Approach	
	v/c	g/C							Delay	LOS	Delay	LOS
Eastbound												
L	0.51	0.50	8.9	1.000	314	0.11	1.3	0.0	10.2	B		
TR	0.78	0.50	10.9	1.000	894	0.33	4.4	0.0	15.3	B	14.4	B
Westbound												
L	0.30	0.50	7.8	1.000	205	0.11	0.8	0.0	8.6	A		
TR	0.61	0.50	9.5	1.000	892	0.19	1.2	0.0	10.7	B	10.5	B
Northbound												
L	0.30	0.32	13.8	1.000	390	0.11	0.4	0.0	14.2	B		
TR	0.70	0.32	16.1	1.000	538	0.27	4.1	0.0	20.2	C	18.8	B
Southbound												
L	0.47	0.32	14.6	1.000	217	0.11	1.6	0.0	16.2	B		
T	0.22	0.32	13.4	1.000	576	0.11	0.2	0.0	13.6	B	14.4	B

R 0.11 0.32 12.9 1.000 481 0.11 0.1 0.0 13.0 B

Intersection delay = 14.3 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET

for exclusive lefts

Input

	EB	WB	NB	SB
	M	M	M	M
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 53.7 sec				
Total actual green time for LT lane group, G (s)	27.0	27.0	17.1	17.1
Effective permitted green time for LT lane group, g(s)	27.0	27.0	17.1	17.1
Opposing effective green time, go (s)	27.0	27.0	17.1	17.1
Number of lanes in LT lane group, N	1	1	1	1
Number of lanes in opposing approach, No	1	1	1	1
Adjusted LT flow rate, VLT (veh/h)	159	61	116	101
Proportion of LT in LT lane group, PLT	1.000	1.000	1.000	1.000
Proportion of LT in opposing flow, PLTo	0.00	0.00	0.00	0.00
Adjusted opposing flow rate, Vo (veh/h)	541	695	125	378
Lost time for LT lane group, tL	5.00	5.00	4.60	4.60
Computation				
LT volume per cycle, LTC=VLTC/3600	2.37	0.91	1.73	1.51
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	8.07	10.37	1.86	5.64
gf=G[exp(- a * (LTC ** b))]-tL, gf<=g	0.0	0.0	0.0	0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00	1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.50	0.50	0.68	0.68
gq, (see Exhibit C16-4,5,6,7,8)	6.47	11.79	0.00	5.13
gu=g-gq if gq>=gf, or = g-gf if gq<gf	20.53	15.21	17.10	11.97
n=Max(gq-gf)/2,0)	3.24	5.90	0.00	2.56
PTHo=1-PLTo	1.00	1.00	1.00	1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00	1.00	1.00	1.00
EL1 (refer to Exhibit C16-3)	2.16	2.50	1.48	1.86
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.15	0.15	0.23	0.23
gdifff=max(gq-gf,0)	0.00	0.00	0.00	0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.35	0.23	0.68	0.38
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdifff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.351	0.226	0.677	0.376

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET

for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 53.7 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
 Adjusted LT flow rate, VLT (veh/h)
 Proportion of LT in LT lane group, PLT 0.000 0.000 0.000 0.000
 Proportion of LT in opposing flow, PLTo
 Adjusted opposing flow rate, Vo (veh/h)
 Lost time for LT lane group, tL
 Computation
 LT volume per cycle, LTC=VLTC/3600
 Opposing lane util. factor, fLUo 1.000 1.000 1.000 1.000
 Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
 $gf = G[\exp(-a * (LTC * b))] - tL$, $gf \leq g$
 Opposing platoon ratio, Rpo (refer Exhibit 16-11)
 Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
 gq, (see Exhibit C16-4,5,6,7,8)
 $gu = g - gq$ if $gq \geq gf$, or $= g - gf$ if $gq < gf$
 $n = \text{Max}(gq - gf) / 2, 0$
 $PTHo = 1 - PLTo$
 $PL^* = PLT[1 + (N - 1)g / (gf + gu / EL1 + 4.24)]$
 EL1 (refer to Exhibit C16-3)
 $EL2 = \text{Max}((1 - Ptho * n) / Plto, 1.0)$
 $fmin = 2(1 + PL) / g$ or $fmin = 2(1 + PL) / g$
 $gdifff = \text{max}(gq - gf, 0)$
 $fm = [gf / g] + [gu / g] / [1 + PL(EL1 - 1)]$, (min=fmin;max=1.00)
 $flt = fm = [gf / g] + [gu / g] / [1 + PL(EL1 - 1)] + [gdifff / g] / [1 + PL(EL2 - 1)]$, (fmin<=fm<=1.00)
 or $flt = [fm + 0.91(N - 1)] / N^{**}$
 Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.

* If $Pl \geq 1$ for shared left-turn lanes with $N > 1$, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, $flt = fm$.

For special case of multilane approach opposed by single-lane approach or when $gf > gq$, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)	27.0	27.0	17.1	17.1
Conflicting pedestrian volume, Vped (p/h)	0	0	0	0
Pedestrian flow rate, Vpedg (p/h)	0	0	0	0
OCCpedg	0.000	0.000	0.000	0.000
Opposing queue clearing green, gq (s)	6.47	11.79	0.00	5.13
Eff. ped. green consumed by opp. veh. queue, gq/gp	0.240	0.437	0.000	0.300
OCCpedu	0.000	0.000	0.000	0.000
Opposing flow rate, Vo (veh/h)	541	695	125	378
OCCr	0.000	0.000	0.000	0.000
Number of cross-street receiving lanes, Nrec	1	1	1	1
Number of turning lanes, Nturn	1	1	1	1
ApbT	1.000	1.000	1.000	1.000
Proportion of left turns, PLT	1.000	1.000	1.000	1.000
Proportion of left turns using protected phase, PLTA	0.000	0.000	0.000	0.000
Left-turn adjustment, fLpb	1.000	1.000	1.000	1.000

Permitted Right Turns

Effective pedestrian green time, gp (s)	27.0	27.0	17.1	17.1
Conflicting pedestrian volume, Vped (p/h)	0	0	0	0
Conflicting bicycle volume, Vbic (bicycles/h)	0	0	0	0
Vpedg	0	0	0	0
OCCpedg	0.000	0.000	0.000	0.000
Effective green, g (s)	27.0	27.0	17.1	17.1
Vbicg	0	0	0	0

OCCbicg	0.020	0.020	0.020	0.020
OCCr	0.000	0.000	0.000	0.000
Number of cross-street receiving lanes, Nrec	1	1	1	1
Number of turning lanes, Nturn	1	1	1	1
ApbT	1.000	1.000	1.000	1.000
Proportion right-turns, PRT	0.114	0.131	0.368	1.000
Proportion right-turns using protected phase, PRTA	0.000	0.000	0.000	0.000
Right turn adjustment, fRpb	1.000	1.000	1.000	1.000

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Cycle length, C	53.7			sec
Adj. LT vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Protected phase effective green interval, g (s)				
Opposing queue effective green interval, gq				
Unopposed green interval, gu				
Red time $r=(C-g-gq-gu)$				
Arrival rate, $qa=v/(3600(\max[X,1.0]))$				
Protected ph. departure rate, $Sp=s/3600$				
Permitted ph. departure rate, $Ss=s(gq+gu)/(gu*3600)$				
XPerm				
XProt				
Case				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial	Dur.	Uniform Delay		Initial	Final	Initial	Lane
	Unmet Demand Q veh	Unmet Demand t hrs.	Unadj. ds	Adj. d1 sec	Queue Param. u	Unmet Demand Q veh	Queue Delay d3 sec	Group Delay d sec
Eastbound								
L	0.0	0.00	13.3	8.9	0.00	0.0	0.0	10.2
TR	0.0	0.00	13.3	10.9	0.00	0.0	0.0	15.3
	0.0						0.0	
Westbound								
L	0.0	0.00	13.3	7.8	0.00	0.0	0.0	8.6
TR	0.0	0.00	13.3	9.5	0.00	0.0	0.0	10.7
	0.0						0.0	
Northbound								
L	0.0	0.00	18.3	13.8	0.00	0.0	0.0	14.2
TR	0.0	0.00	18.3	16.1	0.00	0.0	0.0	20.2
	0.0						0.0	
Southbound								
L	0.0	0.00	18.3	14.6	0.00	0.0	0.0	16.2
T	0.0	0.00	18.3	13.4	0.00	0.0	0.0	13.6
R	0.0	0.00	18.3	12.9	0.00	0.0	0.0	13.0
Intersection Delay			14.3	sec/veh	Intersection LOS		B	

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound		Northbound		Southbound		
LaneGroup	L	TR		L	TR	L	TR	L	T	R
Init Queue	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flow Rate	159	695		61	541	116	378	101	125	52
So	1900	1900		1900	1900	1900	1900	1900	1900	1900
No.Lanes	1	1	0	1	1	0	1	1	1	
SL	624	1779		408	1774		1225	1689	681	1810
LnCapacity	314	894		205	892		390	538	217	576
Flow Ratio	0.3	0.4		0.1	0.3		0.1	0.2	0.1	0.1
v/c Ratio	0.51	0.78		0.30	0.61		0.30	0.70	0.47	0.22
Grn Ratio	0.50	0.50		0.50	0.50		0.32	0.32	0.32	0.32
I Factor		1.000			1.000			1.000		
AT or PVG	3	3		3	3		3	3	3	
Pltn Ratio	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00
PF2	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00
Q1	1.6	8.5		0.5	5.8		1.3	5.0	1.2	1.4
kB	0.3	0.5		0.2	0.5		0.3	0.3	0.2	0.4
Q2	0.3	1.6		0.1	0.7		0.1	0.8	0.2	0.1
Q Average	1.8	10.0		0.6	6.5		1.4	5.7	1.4	1.5
Q Spacing	25.0	25.0		25.0	25.0		25.0	25.0	25.0	25.0
Q Storage	155	0		275	0		170	0	280	0
Q S Ratio	0.3			0.1			0.2		0.1	0.1
70th Percentile Output:										
fB%	1.2	1.2		1.2	1.2		1.2	1.2	1.2	1.2
BOQ	2.2	11.8		0.7	7.7		1.7	6.8	1.7	1.8
QSRatio	0.4			0.1			0.3		0.1	0.2
85th Percentile Output:										
fB%	1.6	1.5		1.6	1.5		1.6	1.5	1.6	1.6
BOQ	2.9	15.2		1.0	10.0		2.3	8.9	2.2	2.3
QSRatio	0.5			0.1			0.3		0.2	0.2
90th Percentile Output:										
fB%	1.8	1.6		1.8	1.7		1.8	1.7	1.8	1.8
BOQ	3.2	16.5		1.1	11.0		2.5	9.8	2.4	2.6
QSRatio	0.5			0.1			0.4		0.2	0.3
95th Percentile Output:										
fB%	2.0	1.8		2.1	1.9		2.1	1.9	2.1	2.1
BOQ	3.8	18.5		1.3	12.4		2.9	11.1	2.8	3.0
QSRatio	0.6			0.1			0.4		0.3	0.3
98th Percentile Output:										
fB%	2.6	2.2		2.7	2.3		2.6	2.3	2.6	2.6
BOQ	4.7	21.7		1.6	15.0		3.7	13.5	3.6	3.8
QSRatio	0.8			0.1			0.5		0.3	0.4

ERROR MESSAGES

No errors to report.