Intersection	
Intersection Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	380	10	10	330	10	10	5	10	10	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	9	0	0	8	0	0	0	0	0	0	0
Mvmt Flow	11	400	11	11	347	11	11	5	11	11	5	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	358	0	0	411	0	0	808	805	405	808	806	353
Stage 1	-	-	-	-	-	-	426	426	-	374	374	-
Stage 2	-	-	-	-	-	-	382	379	-	434	432	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	1212	-	-	1159	-	-	302	318	650	302	318	695
Stage 1	-	-	-	-	-	-	610	589	-	651	621	-
Stage 2	-	-	-	-	-	-	645	618	-	604	586	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1212	-	-	1159	-	-	288	310	650	288	310	695
Mov Capacity-2 Maneuver	-	-	-	-	-	-	288	310	-	288	310	-
Stage 1	-	-	-	-	-	-	603	582	-	643	614	-
Stage 2	-	-	-	-	-	-	622	611	-	582	579	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	15	15

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	377	1212	-	-	1159	-	-	383
HCM Lane V/C Ratio	0.07	0.009	-	-	0.009	-	-	0.069
HCM Control Delay (s)	15.3	7.996	0	-	8.135	0	-	15.1
HCM Lane LOS	C	A	A		A	A		C
HCM 95th %tile Q(veh)	0.224	0.026	-	-	0.027	-	-	0.22

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	10	10	220	10	5	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	1	0	0	7
Mvmt Flow	11	11	244	11	6	100

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	361	250	0	0	256	0
Stage 1	250	-	-	-	-	-
Stage 2	111	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	642	794	-	-	1321	-
Stage 1	796	-	-	-	-	-
Stage 2	919	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	639	794	-	-	1321	-
Mov Capacity-2 Maneuver	639	-	-	-	-	-
Stage 1	796	-	-	-	-	-
Stage 2	914	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	0

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	708	1321	-
HCM Lane V/C Ratio	-	-	0.031	0.004	-
HCM Control Delay (s)	-	-	10.2	7.737	0
HCM Lane LOS			B	A	A
HCM 95th %tile Q(veh)	-	-	0.097	0.013	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	10	200	100	35	35	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	-	-	-	0	50
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	3	7	8	4	0
Mvmt Flow	11	222	111	39	39	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	111	0	-	0	355	111
Stage 1	-	-	-	-	111	-
Stage 2	-	-	-	-	244	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1492	-	-	-	639	948
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	792	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1492	-	-	-	634	948
Mov Capacity-2 Maneuver	-	-	-	-	634	-
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	786	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1492	-	-	-	634	948
HCM Lane V/C Ratio	0.007	-	-	-	0.061	0.012
HCM Control Delay (s)	7.431	0	-	-	11	8.8
HCM Lane LOS	A	A			B	A
HCM 95th %tile Q(veh)	0.023	-	-	-	0.196	0.036

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	70	25	10	50	30	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	50	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	0	0	27	6	9
Mvmt Flow	78	28	11	56	33	17

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	78	0	156	78
Stage 1	-	-	-	-	78	-
Stage 2	-	-	-	-	78	-
Follow-up Headway	-	-	2	-	4	3
Pot Capacity-1 Maneuver	-	-	1533	-	826	964
Stage 1	-	-	-	-	935	-
Stage 2	-	-	-	-	935	-
Time blocked-Platoon, %	-	-		-		
Mov Capacity-1 Maneuver	-	-	1533	-	820	964
Mov Capacity-2 Maneuver	-	-	-	-	820	-
Stage 1	-	-	-	-	935	-
Stage 2	-	-	-	-	928	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	9

Minor Lane / Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	863	-	-	1533	-
HCM Lane V/C Ratio	0.058	-	-	0.007	-
HCM Control Delay (s)	9.4	-	-	7.365	0
HCM Lane LOS	A			A	A
HCM 95th %tile Q(veh)	0.184	-	-	0.022	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	30	0	65	25	0	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	18	0	0	15	0	18
Mvmt Flow	33	0	72	28	0	33

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	105	72	0	0	72	0
Stage 1	72	-	-	-	-	-
Stage 2	33	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	856	996	-	-	1541	-
Stage 1	912	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	856	996	-	-	1541	-
Mov Capacity-2 Maneuver	856	-	-	-	-	-
Stage 1	912	-	-	-	-	-
Stage 2	950	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	856	1541	-
HCM Lane V/C Ratio	-	-	0.039	-	-
HCM Control Delay (s)	-	-	9.4	0	-
HCM Lane LOS			A	A	
HCM 95th %tile Q(veh)	-	-	0.121	0	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	15	0	30	15	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	11	0	0	7	10
Mvmt Flow	17	0	33	17	0	17

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	59	42	0	0	50	0
Stage 1	42	-	-	-	-	-
Stage 2	17	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	953	1004	-	-	1525	-
Stage 1	986	-	-	-	-	-
Stage 2	1011	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	953	1004	-	-	1525	-
Mov Capacity-2 Maneuver	953	-	-	-	-	-
Stage 1	986	-	-	-	-	-
Stage 2	1011	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	953	1525	-
HCM Lane V/C Ratio	-	-	0.017	-	-
HCM Control Delay (s)	-	-	8.8	0	-
HCM Lane LOS			A	A	
HCM 95th %tile Q(veh)	-	-	0.053	0	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	10	55	35	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	0
Mvmt Flow	0	11	61	39	17	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	100	0	-	0	92	81
Stage 1	-	-	-	-	81	-
Stage 2	-	-	-	-	11	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1505	-	-	-	913	985
Stage 1	-	-	-	-	947	-
Stage 2	-	-	-	-	1017	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1505	-	-	-	913	985
Mov Capacity-2 Maneuver	-	-	-	-	913	-
Stage 1	-	-	-	-	947	-
Stage 2	-	-	-	-	1017	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1505	-	-	-	913
HCM Lane V/C Ratio	-	-	-	-	0.018
HCM Control Delay (s)	0	-	-	-	9
HCM Lane LOS	A				A
HCM 95th %tile Q(veh)	0	-	-	-	0.056

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	20	10	5	870	775	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Yeild
Storage Length	0	-	450	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	5	0
Mvmt Flow	21	11	5	916	816	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1742	408	816	0	-	0
Stage 1	816	-	-	-	-	-
Stage 2	926	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	88	598	820	-	-	-
Stage 1	400	-	-	-	-	-
Stage 2	389	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	87	598	820	-	-	-
Mov Capacity-2 Maneuver	87	-	-	-	-	-
Stage 1	400	-	-	-	-	-
Stage 2	387	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	44	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	820	-	122	-	-
HCM Lane V/C Ratio	0.006	-	0.259	-	-
HCM Control Delay (s)	9.419	-	44.5	-	-
HCM Lane LOS	A		E		
HCM 95th %tile Q(veh)	0.019	-	0.965	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	30	815	670	140	60	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	200	-	-	100	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	6	5	4	0	0
Mvmt Flow	32	858	705	147	63	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	705	0	-	0	1626	705
Stage 1	-	-	-	-	705	-
Stage 2	-	-	-	-	921	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	902	-	-	-	114	440
Stage 1	-	-	-	-	494	-
Stage 2	-	-	-	-	391	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	902	-	-	-	110	440
Mov Capacity-2 Maneuver	-	-	-	-	110	-
Stage 1	-	-	-	-	494	-
Stage 2	-	-	-	-	377	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	71

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	902	-	-	-	123
HCM Lane V/C Ratio	0.035	-	-	-	0.599
HCM Control Delay (s)	9.136	-	-	-	70.7
HCM Lane LOS	A				F
HCM 95th %tile Q(veh)	0.109	-	-	-	3.011

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	10	65	0	10	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	18	0	0	15	0	18
Mvmt Flow	0	11	72	0	11	33

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	128	72	0	0	72	0
Stage 1	72	-	-	-	-	-
Stage 2	56	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	830	996	-	-	1541	-
Stage 1	912	-	-	-	-	-
Stage 2	927	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	824	996	-	-	1541	-
Mov Capacity-2 Maneuver	824	-	-	-	-	-
Stage 1	912	-	-	-	-	-
Stage 2	921	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	2

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	996	1541	-
HCM Lane V/C Ratio	-	-	0.011	0.007	-
HCM Control Delay (s)	-	-	8.7	7.353	0
HCM Lane LOS			A	A	A
HCM 95th %tile Q(veh)	-	-	0.034	0.022	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	15	30	0	25	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	11	0	0	7	10
Mvmt Flow	0	17	33	0	28	17

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	105	33	0	0	33	0
Stage 1	33	-	-	-	-	-
Stage 2	72	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	898	1015	-	-	1547	-
Stage 1	995	-	-	-	-	-
Stage 2	956	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	882	1015	-	-	1547	-
Mov Capacity-2 Maneuver	882	-	-	-	-	-
Stage 1	995	-	-	-	-	-
Stage 2	939	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	5

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1015	1547	-
HCM Lane V/C Ratio	-	-	0.016	0.018	-
HCM Control Delay (s)	-	-	8.6	7.37	0
HCM Lane LOS			A	A	A
HCM 95th %tile Q(veh)	-	-	0.05	0.055	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	10	10	55	0	0	10
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	0
Mvmt Flow	11	11	61	0	0	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	62	0	-	0	95	62
Stage 1	-	-	-	-	62	-
Stage 2	-	-	-	-	33	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1554	-	-	-	909	1009
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	995	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1554	-	-	-	901	1008
Mov Capacity-2 Maneuver	-	-	-	-	901	-
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	987	-

Approach	EB	WB	SB
HCM Control Delay, s	4	0	9

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1554	-	-	-	1008
HCM Lane V/C Ratio	0.007	-	-	-	0.011
HCM Control Delay (s)	7.333	0	-	-	8.6
HCM Lane LOS	A	A			A
HCM 95th %tile Q(veh)	0.022	-	-	-	0.033

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	25	30	10	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	28	33	11	11	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	44	0	-	0	67	39
Stage 1	-	-	-	-	39	-
Stage 2	-	-	-	-	28	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1577	-	-	-	943	1038
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	1000	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1577	-	-	-	943	1038
Mov Capacity-2 Maneuver	-	-	-	-	943	-
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	1000	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1577	-	-	-	943
HCM Lane V/C Ratio	-	-	-	-	0.012
HCM Control Delay (s)	0	-	-	-	8.9
HCM Lane LOS	A				A
HCM 95th %tile Q(veh)	0	-	-	-	0.036

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	15	15	15	25	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	11	7	0
Mvmt Flow	0	17	17	17	28	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	33	0	-	0	42	25
Stage 1	-	-	-	-	25	-
Stage 2	-	-	-	-	17	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1592	-	-	-	957	1057
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	993	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1592	-	-	-	957	1057
Mov Capacity-2 Maneuver	-	-	-	-	957	-
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	993	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1592	-	-	-	957
HCM Lane V/C Ratio	-	-	-	-	0.029
HCM Control Delay (s)	0	-	-	-	8.9
HCM Lane LOS	A				A
HCM 95th %tile Q(veh)	0	-	-	-	0.09

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	10	0	0	35	15	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	11	0	0	39	17	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	61	22	28	0	-	0
Stage 1	22	-	-	-	-	-
Stage 2	39	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	950	1061	1599	-	-	-
Stage 1	1006	-	-	-	-	-
Stage 2	989	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	950	1061	1599	-	-	-
Mov Capacity-2 Maneuver	950	-	-	-	-	-
Stage 1	1006	-	-	-	-	-
Stage 2	989	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1599	-	950	-	-
HCM Lane V/C Ratio	-	-	0.012	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A		A		
HCM 95th %tile Q(veh)	0	-	0.035	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection Operations Reports – Average Weekday

Intersection	
Intersection Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	25	15	40	2165	1210	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	353	-	-	300
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	2	4	4
Mvmt Flow	26	16	42	2279	1274	42

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2498	637	1274	0	-	0
Stage 1	1274	-	-	-	-	-
Stage 2	1224	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	# 24	425	552	-	-	-
Stage 1	230	-	-	-	-	-
Stage 2	245	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	# 22	425	552	-	-	-
Mov Capacity-2 Maneuver	114	-	-	-	-	-
Stage 1	230	-	-	-	-	-
Stage 2	226	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	36	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	552	-	157	-	-
HCM Lane V/C Ratio	0.076	-	0.268	-	-
HCM Control Delay (s)	12.06	-	36.1	-	-
HCM Lane LOS	B		E		
HCM 95th %tile Q(veh)	0.247	-	1.026	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	20	45	160	510	365	10
Conflicting Peds, #/hr	0	0	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	150	-	-	130
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	4	2	4	8	13
Mvmt Flow	21	47	168	537	384	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1258	386	384	0	-	0
Stage 1	384	-	-	-	-	-
Stage 2	874	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	190	657	1174	-	-	-
Stage 1	693	-	-	-	-	-
Stage 2	412	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	163	656	1172	-	-	-
Mov Capacity-2 Maneuver	163	-	-	-	-	-
Stage 1	693	-	-	-	-	-
Stage 2	353	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18	2	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1172	-	340	-	-
HCM Lane V/C Ratio	0.144	-	0.201	-	-
HCM Control Delay (s)	8.586	-	18.2	-	-
HCM Lane LOS	A		C		
HCM 95th %tile Q(veh)	0.501	-	0.74	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	5	15	30	530	350	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	18	0	3	7	0
Mvmt Flow	5	16	32	558	368	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	995	374	379	0	-	0
Stage 1	374	-	-	-	-	-
Stage 2	621	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	274	638	1191	-	-	-
Stage 1	700	-	-	-	-	-
Stage 2	540	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	263	638	1191	-	-	-
Mov Capacity-2 Maneuver	263	-	-	-	-	-
Stage 1	700	-	-	-	-	-
Stage 2	519	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1191	-	470	-	-
HCM Lane V/C Ratio	0.027	-	0.045	-	-
HCM Control Delay (s)	8.105	0	13	-	-
HCM Lane LOS	A	A	B		
HCM 95th %tile Q(veh)	0.082	-	0.14	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	30	10	20	10	10	10	40	485	10	10	335	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	10	0	0	0	0	100	0	4	14	0	7	4
Mvmt Flow	32	11	21	11	11	11	42	511	11	11	353	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1000	994	368	1005	1005	516	384	0	0	521	0	0
Stage 1	389	389	-	600	600	-	-	-	-	-	-	-
Stage 2	611	605	-	405	405	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	4	2	-	-	2	-	-
Pot Capacity-1 Maneuver	214	247	682	222	243	406	1186	-	-	1056	-	-
Stage 1	619	612	-	491	493	-	-	-	-	-	-	-
Stage 2	468	491	-	626	602	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	192	232	682	198	228	406	1186	-	-	1056	-	-
Mov Capacity-2 Maneuver	192	232	-	198	228	-	-	-	-	-	-	-
Stage 1	588	604	-	466	468	-	-	-	-	-	-	-
Stage 2	423	466	-	588	594	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	23	21	1	0

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1186	-	-	262	252	1056	-	-
HCM Lane V/C Ratio	0.036	-	-	0.241	0.125	0.01	-	-
HCM Control Delay (s)	8.147	0	-	23.1	21.3	8.443	0	-
HCM Lane LOS	A	A		C	C	A	A	
HCM 95th %tile Q(veh)	0.11	-	-	0.919	0.423	0.03	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	10	10	15	495	350	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	6	6	17
Mvmt Flow	11	11	16	521	368	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	927	374	379	0	-	0
Stage 1	374	-	-	-	-	-
Stage 2	553	-	-	-	-	-
Follow-up Headway	4	4	2	-	-	-
Pot Capacity-1 Maneuver	300	578	1191	-	-	-
Stage 1	700	-	-	-	-	-
Stage 2	580	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	294	578	1191	-	-	-
Mov Capacity-2 Maneuver	294	-	-	-	-	-
Stage 1	700	-	-	-	-	-
Stage 2	569	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1191	-	390	-	-
HCM Lane V/C Ratio	0.013	-	0.054	-	-
HCM Control Delay (s)	8.063	0	14.8	-	-
HCM Lane LOS	A	A	B		
HCM 95th %tile Q(veh)	0.04	-	0.171	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	10	10	485	10	10	375
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	127	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	5	0	0	6
Mvmt Flow	11	11	511	11	11	395

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	932	516	0	0	521	0
Stage 1	516	-	-	-	-	-
Stage 2	416	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	298	563	-	-	1056	-
Stage 1	603	-	-	-	-	-
Stage 2	670	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	295	563	-	-	1056	-
Mov Capacity-2 Maneuver	295	-	-	-	-	-
Stage 1	603	-	-	-	-	-
Stage 2	663	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15	0	0

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	387	1056	-
HCM Lane V/C Ratio	-	-	0.054	0.01	-
HCM Control Delay (s)	-	-	14.8	8.443	-
HCM Lane LOS			B	A	
HCM 95th %tile Q(veh)	-	-	0.172	0.03	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	10	70	730	25	115	645
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yeild	-	Yeild
Storage Length	0	-	-	-	123	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	10	5	0	6	5
Mvmt Flow	11	74	768	26	121	679

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1350	768	0	0	768	0
Stage 1	768	-	-	-	-	-
Stage 2	582	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	155	385	-	-	828	-
Stage 1	461	-	-	-	-	-
Stage 2	527	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	132	385	-	-	828	-
Mov Capacity-2 Maneuver	132	-	-	-	-	-
Stage 1	461	-	-	-	-	-
Stage 2	450	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21	0	2

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	311	828	-
HCM Lane V/C Ratio	-	-	0.271	0.146	-
HCM Control Delay (s)	-	-	20.8	10.091	-
HCM Lane LOS			C	B	
HCM 95th %tile Q(veh)	-	-	1.073	0.511	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	720	10	25	615	10	10	10	15	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	167	-	-	161	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	5	0	6	5	0	0	0	0	0	0	0
Mvmt Flow	11	758	11	26	647	11	11	11	16	11	11	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	658	0	0	768	0	0	1500	1495	763	1502	1494	653
Stage 1	-	-	-	-	-	-	784	784	-	705	705	-
Stage 2	-	-	-	-	-	-	716	711	-	797	789	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	939	-	-	828	-	-	101	124	408	101	124	471
Stage 1	-	-	-	-	-	-	389	407	-	430	442	-
Stage 2	-	-	-	-	-	-	424	439	-	383	405	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	939	-	-	828	-	-	89	119	408	88	119	471
Mov Capacity-2 Maneuver	-	-	-	-	-	-	89	119	-	88	119	-
Stage 1	-	-	-	-	-	-	384	402	-	425	428	-
Stage 2	-	-	-	-	-	-	392	425	-	354	400	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	37	39

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	150	939	-	-	828	-	-	137
HCM Lane V/C Ratio	0.246	0.011	-	-	0.032	-	-	0.231
HCM Control Delay (s)	36.6	8.877	-	-	9.49	-	-	39
HCM Lane LOS	E	A			A			E
HCM 95th %tile Q(veh)	0.917	0.034	-	-	0.098	-	-	0.845

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	695	40	10	635	30	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	Free	-	None
Storage Length	-	100	162	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	0	0	5	0	0
Mvmt Flow	732	42	11	668	32	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	732	0	1421	732
Stage 1	-	-	-	-	732	-
Stage 2	-	-	-	-	689	-
Follow-up Headway	-	-	2	-	4	3
Pot Capacity-1 Maneuver	-	-	882	-	152	424
Stage 1	-	-	-	-	480	-
Stage 2	-	-	-	-	502	-
Time blocked-Platoon, %	-	-		-		
Mov Capacity-1 Maneuver	-	-	882	-	150	424
Mov Capacity-2 Maneuver	-	-	-	-	150	-
Stage 1	-	-	-	-	480	-
Stage 2	-	-	-	-	496	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	31

Minor Lane / Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	179	-	-	882	-
HCM Lane V/C Ratio	0.235	-	-	0.012	-
HCM Control Delay (s)	31.2	-	-	9.131	-
HCM Lane LOS	D			A	
HCM 95th %tile Q(veh)	0.878	-	-	0.036	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	10	620	495	40	25	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	5	5	0	0	0
Mvmt Flow	11	653	521	42	26	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	563	0	-	0	1216	542
Stage 1	-	-	-	-	542	-
Stage 2	-	-	-	-	674	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1019	-	-	-	202	544
Stage 1	-	-	-	-	587	-
Stage 2	-	-	-	-	510	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1019	-	-	-	199	544
Mov Capacity-2 Maneuver	-	-	-	-	199	-
Stage 1	-	-	-	-	587	-
Stage 2	-	-	-	-	501	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	24

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1019	-	-	-	223
HCM Lane V/C Ratio	0.01	-	-	-	0.142
HCM Control Delay (s)	8.57	0	-	-	23.8
HCM Lane LOS	A	A			C
HCM 95th %tile Q(veh)	0.031	-	-	-	0.485

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	600	15	45	445	10	10	10	20	10	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yeild	-	-	Yeild	-	-	None	-	-	None
Storage Length	183	-	150	167	-	150	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	6	0	3	5	0	0	0	0	0	0	0
Mvmt Flow	11	632	16	47	468	11	11	11	21	11	5	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	468	0	0	632	0	0	1224	1216	632	1231	1216	468
Stage 1	-	-	-	-	-	-	653	653	-	563	563	-
Stage 2	-	-	-	-	-	-	571	563	-	668	653	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	1104	-	-	946	-	-	157	183	484	156	183	599
Stage 1	-	-	-	-	-	-	460	467	-	514	512	-
Stage 2	-	-	-	-	-	-	509	512	-	451	467	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1104	-	-	946	-	-	144	172	484	136	172	599
Mov Capacity-2 Maneuver	-	-	-	-	-	-	144	172	-	136	172	-
Stage 1	-	-	-	-	-	-	455	462	-	509	487	-
Stage 2	-	-	-	-	-	-	470	487	-	417	462	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1	23	25

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	237	1104	-	-	946	-	-	210
HCM Lane V/C Ratio	0.178	0.01	-	-	0.05	-	-	0.125
HCM Control Delay (s)	23.4	8.292	-	-	9.006	-	-	24.6
HCM Lane LOS	C	A			A			C
HCM 95th %tile Q(veh)	0.632	0.029	-	-	0.158	-	-	0.422

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	330	5	10	280	10	5	5	10	10	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	90	-	-	90	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	9	0	20	8	0	0	0	0	0	0	0
Mvmt Flow	5	347	5	11	295	11	5	5	11	11	5	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	295	0	0	347	0	0	682	674	347	682	674	295
Stage 1	-	-	-	-	-	-	358	358	-	316	316	-
Stage 2	-	-	-	-	-	-	324	316	-	366	358	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	1278	-	-	1118	-	-	367	379	701	367	379	749
Stage 1	-	-	-	-	-	-	664	631	-	699	659	-
Stage 2	-	-	-	-	-	-	692	659	-	657	631	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1278	-	-	1118	-	-	353	373	701	353	373	749
Mov Capacity-2 Maneuver	-	-	-	-	-	-	353	373	-	353	373	-
Stage 1	-	-	-	-	-	-	661	628	-	696	651	-
Stage 2	-	-	-	-	-	-	669	651	-	639	628	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	13	13

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	478	1278	-	-	1118	-	-	454
HCM Lane V/C Ratio	0.044	0.004	-	-	0.009	-	-	0.058
HCM Control Delay (s)	12.9	7.829	0	-	8.251	0	-	13.4
HCM Lane LOS	B	A	A		A	A		B
HCM 95th %tile Q(veh)	0.138	0.012	-	-	0.029	-	-	0.184

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	310	10	10	265	10	10	5	10	10	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	9	0	0	8	0	0	0	0	0	0	0
Mvmt Flow	11	326	11	11	279	11	11	5	11	11	5	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	289	0	0	337	0	0	666	664	332	666	663	284
Stage 1	-	-	-	-	-	-	353	353	-	305	305	-
Stage 2	-	-	-	-	-	-	313	311	-	361	358	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	1284	-	-	1234	-	-	376	384	714	376	384	760
Stage 1	-	-	-	-	-	-	668	634	-	709	666	-
Stage 2	-	-	-	-	-	-	702	662	-	662	631	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1284	-	-	1234	-	-	361	376	714	360	376	760
Mov Capacity-2 Maneuver	-	-	-	-	-	-	361	376	-	360	376	-
Stage 1	-	-	-	-	-	-	661	627	-	701	659	-
Stage 2	-	-	-	-	-	-	679	655	-	640	624	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	13	13

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	455	1284	-	-	1234	-	-	461
HCM Lane V/C Ratio	0.058	0.008	-	-	0.009	-	-	0.057
HCM Control Delay (s)	13.4	7.827	0	-	7.942	0	-	13.3
HCM Lane LOS	B	A	A		A	A		B
HCM 95th %tile Q(veh)	0.184	0.025	-	-	0.026	-	-	0.181

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	10	10	180	10	5	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	1	0	0	7
Mvmt Flow	11	11	200	11	6	78

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	295	206	0	0	211	0
Stage 1	206	-	-	-	-	-
Stage 2	89	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	700	840	-	-	1372	-
Stage 1	833	-	-	-	-	-
Stage 2	940	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	697	840	-	-	1372	-
Mov Capacity-2 Maneuver	697	-	-	-	-	-
Stage 1	833	-	-	-	-	-
Stage 2	935	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	0

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	762	1372	-
HCM Lane V/C Ratio	-	-	0.029	0.004	-
HCM Control Delay (s)	-	-	9.9	7.635	0
HCM Lane LOS			A	A	A
HCM 95th %tile Q(veh)	-	-	0.09	0.012	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	10	165	80	30	30	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	-	-	-	0	50
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	3	7	8	4	0
Mvmt Flow	11	183	89	33	33	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	89	0	-	0	295	89
Stage 1	-	-	-	-	89	-
Stage 2	-	-	-	-	206	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1519	-	-	-	692	975
Stage 1	-	-	-	-	929	-
Stage 2	-	-	-	-	824	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1519	-	-	-	686	975
Mov Capacity-2 Maneuver	-	-	-	-	686	-
Stage 1	-	-	-	-	929	-
Stage 2	-	-	-	-	817	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1519	-	-	-	686	975
HCM Lane V/C Ratio	0.007	-	-	-	0.049	0.011
HCM Control Delay (s)	7.387	0	-	-	10.5	8.7
HCM Lane LOS	A	A			B	A
HCM 95th %tile Q(veh)	0.022	-	-	-	0.153	0.035

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	55	25	10	45	25	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	50	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	0	0	27	6	9
Mvmt Flow	61	28	11	50	28	17

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	61	0	133	61
Stage 1	-	-	-	-	61	-
Stage 2	-	-	-	-	72	-
Follow-up Headway	-	-	2	-	4	3
Pot Capacity-1 Maneuver	-	-	1555	-	851	985
Stage 1	-	-	-	-	952	-
Stage 2	-	-	-	-	941	-
Time blocked-Platoon, %	-	-		-		
Mov Capacity-1 Maneuver	-	-	1555	-	845	985
Mov Capacity-2 Maneuver	-	-	-	-	845	-
Stage 1	-	-	-	-	952	-
Stage 2	-	-	-	-	934	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	9

Minor Lane / Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	893	-	-	1555	-
HCM Lane V/C Ratio	0.05	-	-	0.007	-
HCM Control Delay (s)	9.2	-	-	7.332	0
HCM Lane LOS	A			A	A
HCM 95th %tile Q(veh)	0.157	-	-	0.022	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	25	0	50	15	0	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	18	0	0	15	0	18
Mvmt Flow	28	0	56	17	0	28

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	84	56	0	0	56	0
Stage 1	56	-	-	-	-	-
Stage 2	28	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	880	1016	-	-	1562	-
Stage 1	927	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	880	1016	-	-	1562	-
Mov Capacity-2 Maneuver	880	-	-	-	-	-
Stage 1	927	-	-	-	-	-
Stage 2	955	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	880	1562	-
HCM Lane V/C Ratio	-	-	0.032	-	-
HCM Control Delay (s)	-	-	9.2	0	-
HCM Lane LOS			A	A	
HCM 95th %tile Q(veh)	-	-	0.098	0	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	15	0	25	15	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	11	0	0	7	10
Mvmt Flow	17	0	28	17	0	17

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	53	36	0	0	44	0
Stage 1	36	-	-	-	-	-
Stage 2	17	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	960	1011	-	-	1533	-
Stage 1	992	-	-	-	-	-
Stage 2	1011	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	960	1011	-	-	1533	-
Mov Capacity-2 Maneuver	960	-	-	-	-	-
Stage 1	992	-	-	-	-	-
Stage 2	1011	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	960	1533	-
HCM Lane V/C Ratio	-	-	0.017	-	-
HCM Control Delay (s)	-	-	8.8	0	-
HCM Lane LOS			A	A	
HCM 95th %tile Q(veh)	-	-	0.053	0	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	10	45	30	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	0
Mvmt Flow	0	11	50	33	17	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	83	0	-	0	78	67
Stage 1	-	-	-	-	67	-
Stage 2	-	-	-	-	11	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1527	-	-	-	930	1002
Stage 1	-	-	-	-	961	-
Stage 2	-	-	-	-	1017	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1527	-	-	-	930	1002
Mov Capacity-2 Maneuver	-	-	-	-	930	-
Stage 1	-	-	-	-	961	-
Stage 2	-	-	-	-	1017	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1527	-	-	-	930
HCM Lane V/C Ratio	-	-	-	-	0.018
HCM Control Delay (s)	0	-	-	-	8.9
HCM Lane LOS	A				A
HCM 95th %tile Q(veh)	0	-	-	-	0.055

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	20	10	0	735	645	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Yeild
Storage Length	0	-	450	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	5	0
Mvmt Flow	21	11	0	774	679	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1453	339	679	0	-	0
Stage 1	679	-	-	-	-	-
Stage 2	774	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	134	663	923	-	-	-
Stage 1	471	-	-	-	-	-
Stage 2	458	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	134	663	923	-	-	-
Mov Capacity-2 Maneuver	134	-	-	-	-	-
Stage 1	471	-	-	-	-	-
Stage 2	458	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	29	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	923	-	183	-	-
HCM Lane V/C Ratio	-	-	0.173	-	-
HCM Control Delay (s)	0	-	28.7	-	-
HCM Lane LOS	A		D		
HCM 95th %tile Q(veh)	0	-	0.606	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	25	685	555	110	50	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	200	-	-	100	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	6	5	4	0	0
Mvmt Flow	26	721	584	116	53	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	584	0	-	0	1358	584
Stage 1	-	-	-	-	584	-
Stage 2	-	-	-	-	774	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1001	-	-	-	166	515
Stage 1	-	-	-	-	561	-
Stage 2	-	-	-	-	458	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1001	-	-	-	162	515
Mov Capacity-2 Maneuver	-	-	-	-	162	-
Stage 1	-	-	-	-	561	-
Stage 2	-	-	-	-	446	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	35

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1001	-	-	-	183
HCM Lane V/C Ratio	0.026	-	-	-	0.345
HCM Control Delay (s)	8.693	-	-	-	34.7
HCM Lane LOS	A				D
HCM 95th %tile Q(veh)	0.081	-	-	-	1.442

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	10	50	0	10	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	18	0	0	15	0	18
Mvmt Flow	0	11	56	0	11	28

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	106	56	0	0	56	0
Stage 1	56	-	-	-	-	-
Stage 2	50	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	854	1016	-	-	1562	-
Stage 1	927	-	-	-	-	-
Stage 2	933	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	848	1016	-	-	1562	-
Mov Capacity-2 Maneuver	848	-	-	-	-	-
Stage 1	927	-	-	-	-	-
Stage 2	926	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	2

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1016	1562	-
HCM Lane V/C Ratio	-	-	0.011	0.007	-
HCM Control Delay (s)	-	-	8.6	7.321	0
HCM Lane LOS			A	A	A
HCM 95th %tile Q(veh)	-	-	0.033	0.021	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	15	25	0	15	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	11	0	0	7	10
Mvmt Flow	0	17	28	0	17	17

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	78	28	0	0	28	0
Stage 1	28	-	-	-	-	-
Stage 2	50	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	930	1022	-	-	1554	-
Stage 1	1000	-	-	-	-	-
Stage 2	978	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	920	1022	-	-	1554	-
Mov Capacity-2 Maneuver	920	-	-	-	-	-
Stage 1	1000	-	-	-	-	-
Stage 2	967	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	4

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1022	1554	-
HCM Lane V/C Ratio	-	-	0.016	0.011	-
HCM Control Delay (s)	-	-	8.6	7.342	0
HCM Lane LOS			A	A	A
HCM 95th %tile Q(veh)	-	-	0.05	0.033	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	10	10	45	0	0	10
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	0
Mvmt Flow	11	11	50	0	0	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	51	0	-	0	84	51
Stage 1	-	-	-	-	51	-
Stage 2	-	-	-	-	33	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1568	-	-	-	923	1023
Stage 1	-	-	-	-	977	-
Stage 2	-	-	-	-	995	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1568	-	-	-	915	1022
Mov Capacity-2 Maneuver	-	-	-	-	915	-
Stage 1	-	-	-	-	976	-
Stage 2	-	-	-	-	987	-

Approach	EB	WB	SB
HCM Control Delay, s	4	0	9

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1568	-	-	-	1022
HCM Lane V/C Ratio	0.007	-	-	-	0.011
HCM Control Delay (s)	7.312	0	-	-	8.6
HCM Lane LOS	A	A			A
HCM 95th %tile Q(veh)	0.021	-	-	-	0.033

Notes

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Intersection	
Intersection Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	15	25	10	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	17	28	11	11	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	39	0	-	0	50	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	17	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1584	-	-	-	964	1046
Stage 1	-	-	-	-	995	-
Stage 2	-	-	-	-	1011	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1584	-	-	-	964	1046
Mov Capacity-2 Maneuver	-	-	-	-	964	-
Stage 1	-	-	-	-	995	-
Stage 2	-	-	-	-	1011	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1584	-	-	-	964
HCM Lane V/C Ratio	-	-	-	-	0.012
HCM Control Delay (s)	0	-	-	-	8.8
HCM Lane LOS	A				A
HCM 95th %tile Q(veh)	0	-	-	-	0.035

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	15	15	15	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	11	7	0
Mvmt Flow	0	17	17	17	17	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	33	0	-	0	42	25
Stage 1	-	-	-	-	25	-
Stage 2	-	-	-	-	17	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1592	-	-	-	957	1057
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	993	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1592	-	-	-	957	1057
Mov Capacity-2 Maneuver	-	-	-	-	957	-
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	993	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1592	-	-	-	957
HCM Lane V/C Ratio	-	-	-	-	0.017
HCM Control Delay (s)	0	-	-	-	8.8
HCM Lane LOS	A				A
HCM 95th %tile Q(veh)	0	-	-	-	0.053

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	10	0	0	30	15	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	11	0	0	33	17	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	55	22	28	0	-	0
Stage 1	22	-	-	-	-	-
Stage 2	33	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	958	1061	1599	-	-	-
Stage 1	1006	-	-	-	-	-
Stage 2	995	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	958	1061	1599	-	-	-
Mov Capacity-2 Maneuver	958	-	-	-	-	-
Stage 1	1006	-	-	-	-	-
Stage 2	995	-	-	-	-	-

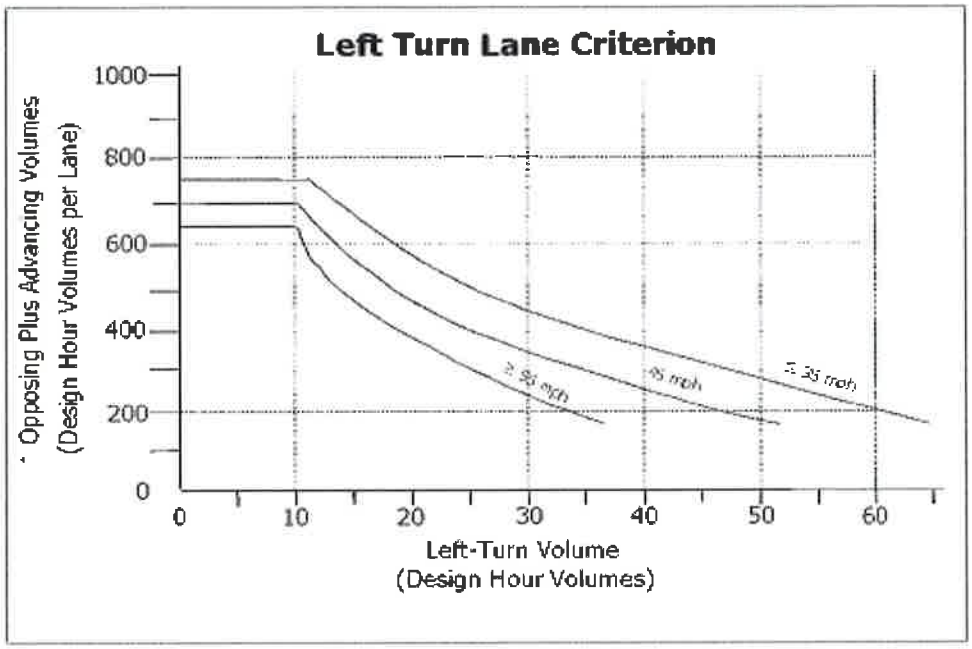
Approach	EB	NB	SB
HCM Control Delay, s	9	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1599	-	958	-	-
HCM Lane V/C Ratio	-	-	0.012	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A		A		
HCM 95th %tile Q(veh)	0	-	0.035	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Warrants



*(Advancing Volume/Number of Advancing Through Lanes) + (Opposing Volume/Number of Opposing Through Lanes))

Left Turn Lane Criterion

Intersection	Movement	Estimated 2035 PM Peak Hour Volume (DHV)	Opposing Plus Advancing Volumes	Turn Lane Warrant Threshold	Is Warrant Met?
US 30 / Tide Creek Road	US 30- Northbound Left	40	1,130	10	Yes
US 30 / Nicolai Road	US 30- Northbound Left	45	1,115	10	Yes
US 30 / Neer City Road	US 30- Northbound Left	25	1,080	10	Yes
US 30 / Colvin Road	US 30- Eastbound Left	5	785	10	No
	US 30- Westbound Left	5	785	10	No
US 30 / Woodson Road	US 30- Eastbound Left	10	740	10	Yes
	US 30- Westbound Left	10	740	10	Yes
OR 47 / McDonald Road	OR 47- Southbound Left	5	325	22	No
OR 47 / Timber Road	OR 47- Northbound Left	10	310	25	No
OR 47 / Scappoose-Vernonia Hwy	OR 47- Southbound Left	10	155	N/A	No
OR 47 / Apiary Road	OR 47- Southbound Left	10	105	N/A	No
OR 47 / OR 202	OR 202- Eastbound Left	25	70	N/A	No
OR 202 / Fishhawk Road	OR 202- Eastbound Left	10	75	N/A	No

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	US 30	**Minor Street:**	Berg Road
Project:	Columbia County TSP Update	**City/County:**	Columbia County
Year:	2035	**Alternative:**	Baseline (PM Peak DHV)

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
Case B: Interruption of Continuous Traffic					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

5.65% of the above ADT volumes is equal to the MUTCD vehicles per hour (vph)

	100 percent of standard warrants
x	70 percent of standard warrants[2]

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2+	7,400	39,300	
	Minor	1	1,850	300	No
Case B	Major	2+	11,100	39,300	
	Minor	1	950	300	No

Analyst and Date: 11/10/14 | Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. Before a signal can be installed a traffic signal investigation must be conducted or reviewed by the Region Traffic Manager. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	US 30	**Minor Street:**	Church Road
Project:	Columbia County TSP Update	**City/County:**	Columbia County
Year:	2035	**Alternative:**	Baseline (PM Peak DHV)

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
Case B: Interruption of Continuous Traffic					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

5.65% of the above ADT volumes is equal to the MUTCD vehicles per hour (vph)

		100 percent of standard warrants
x		70 percent of standard warrants[2]

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2+	7,400	39,300	
	Minor	1	1,850	400	No
Case B	Major	2+	11,100	39,300	
	Minor	1	950	400	No

Analyst and Date: 11/10/14 | Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. Before a signal can be installed a traffic signal investigation must be conducted or reviewed by the Region Traffic Manager. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

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Section J

Memo 9: Transportation Solutions Identification Process

The contents of Volume 2 represent an iterative process in the development of the TSP. Refinements to various plan elements occurred throughout the process as new information was obtained. In all cases, the contents of Volume 1 supersede those in Volume 2.

TECHNICAL MEMORANDUM #9

DATE: May 5, 2015

TO: Columbia County TSP Project Management Team

FROM: John Bosket, DKS Associates
Kevin Chewuk, DKS Associates
Edith Lopez Victoria, DKS Associates

SUBJECT: **Columbia County Transportation System Plan Update**
Technical Memorandum #9: Transportation Solutions Identification Process P11086-022

This memorandum describes the recommended process for creating a prioritized list of transportation improvements that best achieves Columbia County's objectives with the funding that is expected to be available. The outcome of this process will result in "Aspirational" and "Financially Constrained" lists of projects. The Aspirational list includes all projects that the county would implement if funding was not a constraint. The Financially Constrained list is a subset of the Aspirational list including high-priority projects that fit within the level of anticipated funding.

Developing the Financially Constrained Plan

The following process will be utilized to develop the Financially Constrained Transportation System Plan:

Step 1. **Identify Expected Funding:** The first step is to identify the expected amount of funding the county will have available through 2035 to build transportation system improvements. The estimates will be broken out by expected primary funding responsibility (county, state, or developer) and will be based on historic revenue and expenditure data and an assumption that past trends will continue into the future. State funding estimates will be determined in coordination with ODOT Region 2 staff.

Step 2. **Develop Set of Aspirational Projects:** This step involves developing an Aspirational list of projects to address the needs of the future transportation system for all modes, as identified in Technical Memorandum #8. At this point, the list of projects will not be constrained by funding.

The recommended approach for identifying solutions considers four tiers of priorities that put an emphasis on improving system efficiency and management over adding capacity, which often requires greater property impacts and expense. The four priority tiers include:

1. Highest Priority – preserve the function of the system through management practices such as improved traffic signal operations, encouraging alternative modes of travel, and implementation of new policies and standards.

2. High Priority – improve existing facility efficiency through minor enhancement projects that upgrade roads to desired standards, fill important system connectivity gaps, or include safety improvements to intersections and corridors.

3. Moderate Priority – add capacity to the system by widening, constructing major improvements to existing roadways, or extending existing roadways to create parallel routes to congested corridors.

4. Lowest Priority – add capacity to the system by constructing new facilities.

The project team will recommend higher priority solution types to address identified needs unless a lower priority solution is clearly more cost-effective or better supports the goals and objectives of the community.

Step 3. **Develop Cost Estimates:** Cost estimates will be developed for each Aspirational project and compared to expected funding for projects through 2035 (from Step 1). Each project will be assigned a primary funding responsibility (county, state, or developer).

Step 4. **Alternatives Evaluation:** Each project from the Aspirational project list will be scored based on the evaluation criteria that was developed in Technical Memorandum #5. In situations where multiple project alternatives are available to address the same or conflicting transportation system needs, the evaluation criteria will be used to identify the project that will best meet the goals of the TSP. The project scoring highest will be retained on the Aspirational project list.

Step 5. **Group Projects into Reasonably Fundable Packages:** Projects will then be grouped into packages of solutions that could reasonably be expected to be funded and implemented through 2035. The packages will include a prioritized list of county responsible projects, and a prioritized list of state responsible projects that the county could use to make decisions for applying for grants or other funding mechanisms. Developer responsible projects will be built in coordination with land use actions and future development. Only projects associated with new development on vacant parcels will be assumed to occur within the planning horizon of the TSP. While projects related to property re-development may occur within the TSP planning horizon, no funding will be assumed.

Step 6. **Develop Hybrid Package of Solutions:** The packages will be compared and discussed, which may lead to further refinement of the evaluation criteria or the emergence of a hybrid package to be included as the "Financially Constrained Transportation System." Projects that do not make the Financially Constrained list will be assigned a priority for implementation beyond the funded list of projects based on individual project scores.

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Section K

Memo 10: Funding Assumptions

The contents of Volume 2 represent an iterative process in the development of the TSP. Refinements to various plan elements occurred throughout the process as new information was obtained. In all cases, the contents of Volume 1 supersede those in Volume 2.

TECHNICAL MEMORANDUM #10

DATE: September 23, 2015

TO: Columbia County TSP Project Management Team

FROM: John Bosket, DKS Associates
Kevin Chewuk, DKS Associates

SUBJECT: **Columbia County Transportation System Plan Update**
Technical Memorandum #10: Funding Assumptions P11086-022

This memorandum details the transportation funding that can reasonably be expected to be available through 2035. The funding assumptions will help prioritize the investments the county can make in the transportation system, and will be utilized to develop reasonable budgeting assumptions when selecting a set of transportation improvements to meet identified needs over the next 20 years.

Current Funding Sources

The county uses four general funding sources for transportation, including funds from:

- **The Surface Transportation Program (STP)**

  The STP includes Federal Highway Trust Funds that are received from federal motor vehicle fuel tax and truck-related weight-mile charges. The six-year Federal Transportation Authorization Act allocates funds through various programs. Federal Highway Trust Funds from the STP flow to the states that use them primarily for safety, highway, and bridge projects. Columbia County receives a portion of these funds based upon actual population.

- **The State Highway Trust Fund**

  The State Highway Trust Fund makes distributions from the state motor vehicle fuel tax, vehicle registration fees, and truck weight-mile fees on a per capita basis. Cities and counties receive a share of State Highway Trust Fund monies, and by statute may use the money for any road-related purpose, including walking, biking, bridge, street, signal, and safety improvements.

  The state gas tax funds previously have failed to keep up with cost increases and inflation. With increased fuel efficiency of vehicles and the State's emphasis on reducing vehicle miles traveled, the real revenue collected gradually has eroded over time. In an effort to offset the relative decline in contribution of state funds, the 2009 legislature passed the Oregon Jobs and Transportation Act (Oregon House Bill 2001). It increases transportation-related fees including the state gas tax and vehicle registration fees as a fixed amount at the time a vehicle is registered with the Department of Motor Vehicles. Vehicle registration fees in Oregon

increased from $27 to $43 per vehicle per year for passenger cars, with similar increases for other vehicle types. The gas tax in Oregon increased on January 1, 2011 by six cents, to 30 cents per gallon, the first increase in the state gas tax since 1993.

- **A Natural Resource Depletion Fee**

  Columbia County has collected a natural resource depletion fee since 1997. The fee is levied monthly at a rate of 15 cents per ton for depleting natural resources from the soils and waters of the county, or transporting natural resources into the county for commercial, construction or industrial uses.

- **A System Development Charge (SDC)**

  The county also collects SDC's from new development, which are a funding source for all capacity adding projects for the transportation system. The funds collected can pay for constructing or improving portions of roadways impacted by applicable development. The SDC is a one-time fee. The transportation facilities SDC rate within the unincorporated areas of the county is currently $2,272.50 for rural residential uses, and $2,250 per peak hour trip for other uses.

Revenues and Expenditures

Revenues

Current annual revenues include $420,000 from the Surface Transportation Program, $3.6 million from the State gas tax and vehicle registration fees, $370,000 from the natural resource depletion fee, and $55,000 from SDC's (see Table 1). State law requires that the county must set aside a minimum of one percent of the State gas tax and vehicle registration funds received for construction and maintenance of walking and bicycling facilities. In Columbia County, this represents approximately $35,000 per year. The county also currently receives approximately $35,000 in other revenues annually (e.g., miscellaneous permit fees).

Assuming, as a conservative estimate,[1] the same levels of funding occur in the future, Columbia County can expect to receive $90.6 million in revenue through 2035.

ODOT has also indicated that between $8 to $12 million in discretionary state and/or federal funds may be available to invest in Columbia County over the next 20 years[2] for system modernization and enhancement.

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[1] This assumes the population growth rate in Columbia County will be roughly the same as the cost inflation rate, therefore, maintaining existing revenues through 2035.

[2] The State has not committed any future funding for projects in Columbia County. This assumption is for long-range planning purposes only. This estimate is based on assuming that Columbia County will receive a reasonable

Expenditures

Expenditures include more than just patching roadways. It also includes personnel services, roadway striping, traffic control, vegetation trimming, storm preparation and damage clearing (e.g., snow plowing, landslide clearing), sign maintenance, and roadway engineering.

The county estimates that it needs approximately $10 million per year (or $200 million through 2035) to maintain and operate the 553 miles of roadways at status quo, more than double that of the current revenue ($90.6 million through 2035). This means that over $5 million per year in needed roadway maintenance and repair work will be deferred.

Deferring necessary repair and preservation means spending much more to fix the same roadways later, and repair costs rise exponentially as roadways are left unmaintained. Every $1 spent to keep a roadway in good condition avoids $6 to $14 needed later to rebuild the same roadway once it has deteriorated significantly[3].

Heavy truck traffic and wet weather comprise two of the most critical factors in pavement deterioration[4]. Heavy trucks (particularly those hauling gravel, logs, construction materials, overseas containers, agricultural products, garbage) flex the pavement and create spaces underneath. Wet weather, with cracked pavement or poor drainage, can lead to water undermining pavement.

share of the state/federal funding projected to be available over the 20-year planning horizon in Region 2 and based on ODOT sustaining their current revenue structure. It is used to illustrate the degree of financial constraints faced by ODOT as of the writing of this document. Actual funding through state and federal sources may be higher or lower than the range of this estimate. This estimate does not include projects that might be funded through the federal Highway Safety Improvement Program (HSIP).

[3] Smart Growth America, Repair Priorities 2014, American Association of State Highway Officials (AASHTO)

[4] Long-Term Pavement Performance, U.S. Department of Transportation, Federal Highway Administration

Table 1: Columbia County Revenue and Expenditures (2015 Dollars)		
County Revenue Source*	**Average Annual Amount**	**Estimated Amount Through 2035**
Surface Transportation Program (STP)	$420,000	$8,400,000
State Gas Tax and License Fees	$3,615,000	$72,300,000
Bikeway/Walkway (1% of State Gas Tax and License Fees)	$35,000	$700,000
Natural Resource Depletion Fee	$370,000	$7,400,000
System Development Charges	$55,000	$1,100,000
Permits	$35,000	$700,000
Total Revenue	**$4,530,000**	**$90,600,000**
County Expenditures*	**Average Annual Amount**	**Estimated Amount Through 2035**
Personnel Services	$2,360,000	$47,200,000
Materials and Services	$1,610,000	$32,200,000
Capital Outlay	$560,000	$11,200,000
Deferred Maintenance and Repair	$5,470,000	$109,400,000
Total Expenditures	**$10,000,000**	**$200,000,000**
Funding Summary	**Average Annual Amount**	**Estimated Amount Through 2035**
Funding Summary for County Roadways (County Revenue – County Expenditures)	-$5,470,000	-$109,400,000

*Source: Memorandum from David Hill, Public Works Director, Columbia County Public Works Department, dated May 8, 2015

Funding Summary

Maintaining and operating the roadways requires more revenue than the county is able to generate for transportation uses. Due to funding constraints, the county is deferring over $5 million per year in needed roadway maintenance and repair work (over $100 million over the next 20 years). These costs will continue to increase over time, leaving no funding for county street improvement needs (e.g., construction of new facilities) over the next 20 years. The county will only have up to $12 million from state and/or federal funding sources to cover investments along state highways over the next 20 years.

The county may wish to consider expanding its funding options in order to fund more of the needed roadway maintenance and repair work, or desired transportation improvements in a timely manner.

Potential Additional Funding Sources

New transportation funding options include local taxes, assessments and charges, and state and federal appropriations, grants, and loans. Factors that constrain these resources, include the willingness of local leadership and the electorate to burden citizens and businesses with taxes and fees; the portion of available local funds dedicated or diverted to transportation issues from other competing county programs; and the availability of state and federal funds. The county should consider all opportunities for providing or enhancing funding for the transportation improvements included in the TSP.

Counties and cities have used the following sources to fund the capital and maintenance aspects of their transportation programs. As described below and summarized in Table 2, they may help to address existing or new needs identified in Columbia County's TSP.

Table 2: Columbia County Potential Funding Options

Funding Option	Allowed Use of Funds	Existing or New Funding Source	Action Required to Implement	Example Charge	Potential Additional Annual Revenue
County Natural Resource Depletion Fee	Capital improvements or maintenance	Existing	Board of County Commissioners (BCC) action	+10 cents per ton for natural resource depletion	$250,000
County System Development Charges	Capital improvements	Existing	BCC action	+$1,000 per peak hour trip for new development	$25,000
County Transportation Utility Fee	Capital improvements or maintenance	New	BCC action	$5 per month for residential and commercial users	$975,000
County Fuel Tax	Capital improvements or maintenance	New	Voter Approval	One cent per gallon	$192,000
County Vehicle Registration Fee	Capital improvements or maintenance	New	Voter Approval	$20 for passengers cars, and $11 for motorcycles per year	$600,000
County Service District for Roads	Capital improvements or maintenance	New	Voter Approval	$0.50 per $1,000 in assessed value	$1,280,000
County Property Tax Levy	Capital improvements or maintenance	New	Voter Approval	$0.2456 per $1,000 in assessed value (per year, for 5 years)	$630,000 (per year, for 5 years)
Local Improvement Districts	Capital improvements	New	Affected Property Owners	n/a	n/a
Debt Financing	Capital improvements	New	Varies	n/a	n/a
County Truck Impact/ Utility Fee	Capital improvements or maintenance	New	Varies	$1 for passenger car and trucks, $370 for small trucks, and $1,671 for large trucks per year	$10,000,000

County Natural Resource Depletion Fee

Columbia County has collected a natural resource depletion fee since 1997. The fee is levied monthly at a rate of 15 cents per ton for depleting natural resources from the soils and waters of the county, or transporting natural resources into the county for commercial, construction or industrial uses. Revenue from the fee can be utilized for the construction, reconstruction, improvement, repair and maintenance of roadways in the county. The county currently receives approximately $370,000 annually from the fee. A recent ballot measure to increase the depletion fee by 35 cents per ton was defeated by voters. A portion of the increase (10 cents per ton) could provide an additional $250,000 annually for road improvements and maintenance.

County System Development Charges

System development charges (SDC) are fees collected from new development and used as a funding source for all capacity adding projects for the transportation system. The fee is based on the proposed land use and size, and is proportional to each land use's potential PM peak hour vehicle trip generation.

The county currently collects an SDC of $2,250 per peak hour trip for transportation facilities. The county may wish to update the current SDC rate for transportation facilities and/or pursue a pedestrian and bicycle SDC based on the transportation needs established in the TSP. As an example, an SDC rate of $3,250 per peak hour trip (and assuming similar growth as the previous years) would provide the county with an additional $25,000 annually. If an SDC update is desired, a rate study would be required to determine appropriate fees based on capacity projects costs, growth potential, and local preferences.

County Transportation Utility Fee

A transportation utility fee is a recurring monthly charge that could be paid by all residences and businesses within the county. The county can base the fee on the estimated number of trips a particular land use generates or as a flat fee per residence or business. This fee is typically collected through regular utility billing, however, it could be collected as a separate stand-alone bill. Existing law places no express restrictions on the use of transportation utility fee funds, other than the restrictions that normally apply to the use of government funds.[5] Some local agencies utilize the revenue for any transportation related project, including construction, improvements and repairs; however, many choose self-imposed restrictions or parameters on the use of the funds.

[5] Implementing Transportation Utility Fees, League of Oregon Cities.

For every $1.00 per month in charged rates for residential and commercial uses in unincorporated areas of the county, the county could expect to collect nearly $200,000 annually[6]. Clatskanie, for example, charges a flat fee of $5 per month for commercial uses, and $2.50 per month for residential uses.

County Fuel Tax

Twenty-two cities and two counties (including Multnomah and Washington Counties) in Oregon have adopted local fuel taxes ranging from one to five cents per gallon. The fuel distributers pay collected taxes to the jurisdictions monthly. The process for presenting such a tax to voters will need to be consistent with Oregon State law as well as the laws of the county. Nearby locations with a fuel tax include Astoria (three cents per gallon), Warrenton (three cents per gallon), Multnomah County (three cents per gallon), and Washington County (one cent per gallon).

To estimate the potential revenue generated from a local fuel tax in Columbia County, the monthly gallons of fuel utilized per resident was assessed in Oregon, and each of the sixteen jurisdictions where ODOT administers the local fuel taxes[7]. Based on this analysis, Oregon residents utilized on average around 32.06 gallons, Washington County residents around 31.52 gallons, and Multnomah County residents around 25.45 gallons of fuel per month. Assuming the Washington County rate (31.52 gallons per resident, per month), Columbia County residents were estimated to utilize around 1.6 million gallons of fuel per month. A local fuel tax of one cent per gallon could bring an additional, $16,000 monthly, $192,000 annually or $3.8 million through 2035.

County Vehicle Registration Fee

The State of Oregon currently requires vehicle owners to register their vehicles and then renew their registration on a biennial basis. The State's biennial registration fee is $86 for passenger cars and light trucks and $48 for motorcycles. In addition to the State fee, Multnomah County is the only county that also has a vehicle registration fee. It adopted a $38 biennial vehicle registration fee to help fund the Sellwood Bridge replacement. Washington County also recently proposed an annual vehicle registration fee of $30 for most vehicles and $17 for motorcycles and mopeds. Vehicle registration fees for counties in Oregon can be enacted by ordinance, but if a county has a population less than 350,000 residents (like Columbia County), then the ordinance requires voter approval. Under State law, 40 percent of the collected fee must go to the cities within a county, unless they agree to a different percentage.

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[6] Based on total tax accounts in unincorporated areas of Columbia County for FY 2014-15 (16,241); Summary of Assessment and Tax Roll 2014-15, Columbia County.

[7] Based on 2013 population reports compiled by the Population Research Center, Portland State University, and Taxable Fuel Distribution Reports published by ODOT, March 2015.

Columbia County has 50,237 registered passenger cars, and 2,304 registered motorcycles[8]. As an example, with a registration fee of $20 for passengers cars, and $11 for motorcycles, the county could expect to collect over $1 million annually, with $600,000 going to the county, and $400,000 distributed to cities.

County Service District for Roads

Counties can also form service districts, which are areas within a county where it provides special services that can be financed by service or user charges, connection charges, district ad valorem taxes, bonds, local option tax levies, or any combination thereof. Voter approval would be required to form such a district, and the district would include a permanent tax rate. Incorporated cities must consent to be included within a service district, or the district boundary could be drawn to include unincorporated areas of the county only.

Clatsop County has six road districts, with separate districts for the incorporated areas (Astoria, Cannon Beach, Gerhart, Seaside, and Warrenton), and unincorporated county. Property owners in unincorporated areas of the county are charged $1.0175 per $1,000 in assessed value, which brings in approximately $2 million per year. Washington County also has an Urban Road Maintenance District that charges property owners in unincorporated areas of the county $0.2456 per $1,000 in assessed value, which brings in approximately $4.1 million per year. Other counties around Oregon charge up to $4 per $1,000 in assessed value. The funds are utilized to provide preventive maintenance and safety improvements along public roads within the maintenance district boundaries.

Assuming the Clatsop County rate for unincorporated areas of the county ($1.0175 per $1,000 in assessed value), the county could expect to collect around $2.6 million annually[9]. Assuming the Washington County rate ($0.2456 per $1,000 in assessed value) for unincorporated areas of the county, the county could expect to collect around $630,000 annually.

County Property Tax Levy

Countywide property tax levies are another funding option available to Oregon counties. Voter approval is required to enact a local option tax, and the tax may be imposed for up to five years at a time, at which time a county will need voter approval if it desires to renew the levy. The only exception is that a levy for a specific capital project may be imposed for the expected useful life of the capital project up to a maximum of 10 years. Cities have a legal right to 50 percent of any county road property tax levied within their boundaries, unless they agree to a different percentage. Cities also have the option to adopt charter amendments that exempt property within their boundaries from county road levies altogether. Assuming the Washington County rate ($0.2456 per $1,000 in assessed value) as

[8] Oregon Motor Vehicle Registrations by County, as of December 31, 2014.
[9] Based on total assessed value of property in unincorporated areas of Columbia County for FY 2014-15 ($2,561,415,095); Summary of Assessment and Tax Roll 2014-15, Columbia County.

a five year levy for unincorporated areas of the county, the county could expect to collect around $3.1 billion over five years.

Local Improvement Districts

Local Improvement Districts (LIDs) can fund capital transportation projects that benefit a specific group of property owners. LIDs require owner/voter approval and a specific project definition. Assessments against benefiting properties pay for improvements. LIDs can supply match for other funds where a project has system wide benefit beyond benefiting the adjacent properties. LIDs are often used for sidewalks and pedestrian amenities that provide local benefit to residents along the subject street. Property owners pay fees through property tax bills over a specified number of years.

Debt Financing

While not a direct funding source, debt financing is another funding method. Through debt financing, available funds can be leveraged and the cost can be spread over the projects useful life. Though interest costs are incurred, the use of debt financing can serve not only as a practical means of funding major improvements, but it is also viewed as an equitable funding source for larger projects because it spreads the burden of repayment over existing and future customers who will benefit from the projects. One caution in relying on debt service is that a funding source must still be identified to fulfill annual repayment obligations. Three methods of debt financing are listed below:

- General Obligation (GO) Bonds – Subject to voter approval, a county can issue GO bonds to debt finance capital improvement projects. GO bonds are backed by the increased taxing authority of the county, and the annual principal and interest repayment is funded through a new, voter-approved assessment on property throughout the county (i.e., a property tax increase). Depending on the critical nature of projects identified in the Transportation Plan and the willingness of the electorate to accept increased taxation for transportation improvements, voter-approved GO bonds may be a feasible funding option for specific projects. Proceeds may not be used for ongoing maintenance.
- Limited Tax General Obligation (LTGO) Bonds – Limited Tax General Obligation (LTGO) Bonds are similar to General Obligation (GO) bonds; however, they do not have to be voted on by constituents. A county pledges its general revenues to bondholders along with the utility revenues. The advantages to this option are that it does not require reserves or coverage (such as Revenue bonds) and does not require a vote.
- Revenue Bonds – Revenue bonds are debt instruments secured by rate revenue. For a county to issue revenue bonds for transportation projects, it would need to identify a stable source of ongoing rate funding. Interest costs for revenue bonds are slightly higher than for general obligation bonds due to the perceived stability offered by the "full faith and credit" of a jurisdiction.

County Truck Impact/ Utility Fee

Studies have shown that truck traffic causes considerably more damage to roadways than passenger vehicles, and that truck traffic accounts for up to 60 percent of the damage to roadways[10]. One study found that the average annual roadway maintenance cost per truck amounts to $7.60 per mile, while passenger cars cost approximately eight cents per mile[11].

This damage to roadways is not accounted for in the traditional system development charge methodology. A review of current practices at peer agencies revealed that only a few are currently assessing truck users for their impact to local roadways. Some agencies collect a fee from new development for generating truck trips (similar to SDC's), while some assess a user fee for the impact of trucks on the roadway network (similar to a transportation utility fee).

The city of Auburn, Washington has adopted truck impact fees that are collected from new development[12] and based on the truck trip generation rates in the ITE Trip Generation Handbook. These impact fees are assessed in addition to the regular transportation impact fees.

The city of Sumner, Washington applies a truck trip factor that increases the ITE trip generation rate associated with their transportation impact fees[13] that are collected from new development. The factor is applied to account for a passenger car-to-truck equivalent factor and is based on truck percentages by land use obtained from the city's travel demand model.

Other agencies base their fees on a cost per unit of measure for the additional maintenance required due to the influence of the heavy truck traffic.

The town of Los Altos Hills, California charges impact fees for trucks associated with new construction and refuse collection. The impact fees were developed based on the annual cost of maintaining the collector and local streets in the town (arterial roadways were excluded), and the weighted impact of various vehicle types. The weighted impact by vehicle type was determined by multiplying the number of trips by an average equivalent single axle loads (ESAL)[14] factor, which converts a single truck trip to car trips. The resulting percentages were then multiplied by the total cost to maintain the collector and local streets, resulting in annual maintenance costs attributed to various vehicle types. To determine the construction vehicle impact fee, the annual maintenance costs attributed to construction vehicles were divided by the total value of building permits issued during the year, resulting in the impact fee that would be assessed (as a percent of each building permit valuation).

[10] UC Berkeley Institute of Transportation Studies, Pavement Research Center; The University of California Transportation Center; University of California, Davis; Institute of Transportation Studies, Pavement Research Center; Kansas Department of Transportation, K-TRANS Research Program; Urban Renaissance Institute, Toronto, Canada; Illinois Department of Transportation

[11] Evaluation of Truck Impacts on Pavement Maintenance Costs, University of California, Davis.

[12] Truck Impact Fees, City of Auburn, Washington, January 2007.

[13] Transportation Impact Fees, City of Sumner, Washington, 2003.

[14] Based on factors developed by AASHTO, State of Washington, and the State of Montana.

To determine the refuse vehicle impact fee, the annual maintenance costs attributed to refuse vehicles were divided by the total number of refuse accounts, resulting in the impact fee that would be assessed (as a monthly cost for each account).

Boulder County, Colorado charges an oil and gas road deterioration and roadway safety fee that is designed to recoup the incremental costs to the county transportation system resulting from significant heavy truck traffic generated by oil and gas development. The fee is based on the proportional expected road usage, and associated costs to the county, from oil and gas development. The road deterioration fee recoups the costs associated with roadways wearing out quicker, and requiring reconstruction sooner. The roadway safety fee accounts for the widening that is needed in locations with substandard shoulders, as a result of increased truck traffic.

If the county wishes to consider such a fee, a rate study would be required to determine an appropriate methodology, administrative structure, and fees based on maintenance needs and/or capacity project costs, and local preferences. An example methodology is summarized below.

1. Determine the minimum level of quality (i.e., pavement condition index rating) at which county roadways must be maintained.
   - For this example, assume the county would maintain roadways to a "good" pavement rating, based on pavement condition indexing.
2. Determine the annual roadway maintenance costs to maintain the minimum level of quality of county roadways.
   - For this example, assume the county would spend $10 million annually to maintain roadways to a "good" pavement rating.
3. Determine the existing trips by vehicle type to be applied countywide.
   - For this example, the 59,645 registered vehicles[15] in Columbia County were assumed to each make one trip (i.e., 52,710 passenger car and truck trips, 1,264 small truck trips, and 5,671 large truck trips).
4. Convert trips for all vehicle types to equivalent single axle loads (i.e., ESALs). This is accomplished by multiplying the number of trips per vehicle type (from step 3) by an ESAL factor for the vehicle type.
   - Using the Washington Department of Transportation ESAL factors (i.e., 0.0007 for passenger car and truck trips, 0.25 for small truck trips, and 1.13 for large truck trips), the county would have 6,761 ESALs (i.e., 37 passenger car and truck ESALs, 316 small truck ESALs, and 6,408 large truck ESALs).
5. Determine the annual cost per ESAL by dividing the annual roadway maintenance costs (from step 2) by the total ESAL for the county (via step 4).

[15] Oregon Motor Vehicle Registrations by County, as of December 31, 2014.

- For this example, the annual cost per ESAL would be $1,479.

6. Determine the annual maintenance fee per trip type. This is done by multiplying the ESAL factors (via step 4) by the annual cost per ESAL (from step 5).
   - For this example, the annual maintenance fee would be $1 for passenger car and trucks, $370 for small trucks, and $1,671 for large trucks.

ODOT Statewide Transportation Improvement Program (STIP) Enhance Funding

ODOT has modified the process for selecting projects that receive STIP funding to allow local agencies to receive funding for projects off the state system. Projects that enhance system connectivity and improve multi-modal travel options are the focus. The updated TSP prepares the county to apply for STIP funding.

ODOT Highway Safety Improvement Program (HSIP) Funding

With significantly more funding under the HSIP and direction from the Federal Highway Administration to address safety challenges on all public roads, ODOT will increase the amount of funding available for safety projects on local roads. ODOT will distribute safety funding to each ODOT region, which will collaborate with local governments to select projects that can reduce fatalities and serious injuries, regardless of whether they lie on a local road or a state highway.

ODOT expects to start its jurisdictionally blind safety approach in 2017 for the 2019-2021 STIP. Meanwhile, ODOT intends to implement a transition plan for 2013-2016 to bridge the gap by allocating funding for local roads primarily focused on a few systemic low cost fixes implemented in the shorter timeframe[16].

[16] ODOT Jurisdictionally Blind Safety Program

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Section L

Memo 11: Transportation Standards

The contents of Volume 2 represent an iterative process in the development of the TSP. Refinements to various plan elements occurred throughout the process as new information was obtained. In all cases, the contents of Volume 1 supersede those in Volume 2.

TECHNICAL MEMORANDUM #11

DATE: September 23, 2015

TO: Columbia County TSP Project Management Team

FROM: John Bosket, DKS Associates
Kevin Chewuk, DKS Associates

SUBJECT: **Columbia County Transportation System Plan Update**
Technical Memorandum #11: Transportation Standards P11086-022

This document provides an overview of the transportation system standards recommended for adoption as part of the TSP update for Columbia County. Included is a detail of the roadway functional classification system, typical designs for roadways and shared use paths, special route designations, access spacing and mobility standards, and guidance for Traffic Impact Analysis requirements. Together, these standards will help ensure future facilities are designed appropriately and that all facilities are managed to serve their intended purpose.

Functional Classification

Traditionally, roadways are classified based on the type of vehicular travel they are intended to serve (local versus through traffic). In Columbia County, the functional classification of a roadway (shown in Figure 1) determines the level of mobility for all travel modes, level of access, and use. The roadway functional classification system recognizes that individual roadways do not act independently, but instead form a network that serves travel needs on a local and regional level. From highest to lowest intended use, the classifications are principal arterial, minor arterial, major collector, minor collector, and local roadways. Roadways with higher intended usage generally limit access to adjacent property in favor of more efficient motor vehicle traffic movement (i.e., mobility). Local roadways with lower intended usage have more driveway access and intersections, and generally accommodate shorter trips to nearby destinations.

- **Principal Arterials** are state roadways. These roadways serve the highest volume of motor vehicle traffic and are primarily used for longer distance regional trips.
- **Minor Arterials** are intended to move traffic between principal arterials and major collector roadways. These roadways generally experience higher traffic volumes and often act as a corridor connecting many parts of the county.
- **Major Collectors** are intended to serve local traffic traveling to and from principal arterial or minor arterial roadways. These roadways provide greater accessibility to neighborhoods, often connecting to major activity generators and providing efficient through movement for local traffic.

- **Minor Collectors** often connect the neighborhoods to the major collector roadways. These roadways serve as major neighborhood routes and generally provide more direct access to properties or driveways than arterial or major collector roadways.
- **Local Roads** provide more direct access to residences. These roadways are often lined with homes and are designed to serve lower volumes of traffic.

The federal government also has a functional classification system that is used to determine federal aid funding eligibility. Roadways federally designated as a major collector, minor arterial, principal arterial, or interstate are eligible for federal aid. Columbia County's functional classification system uses the same designations as the federal government (e.g., a county designated minor arterial is intended to be the same as a federally designated minor arterial). Future updates to the federal functional classification system should incorporate the designations reflected in the TSP along county roadways.

Functional Classification Changes

Table 1 shows the TSP recommended changes to the existing functional classifications of roadways in Columbia County to better reflect their intended use. Since state highways serve regional travel through the county, they are principal arterial roadways (i.e., US 30, OR 47 and OR 202). Roadways providing primary access to principal arterial roadways are minor arterials. Roadways providing primary access to neighborhoods and activity generators in Columbia County are major or minor collectors. All other roadways are classified as local roads. The updated functional classifications can be seen in Figure 1. The Columbia County functional classification map shows the designations of county and state owned roadways only; refer to the TSP of the respective agency within an Urban Growth Boundary (UGB) for designations of other roadways (e.g., Clatskanie, Columbia City, Rainier, Scappoose, St Helens, or Vernonia).

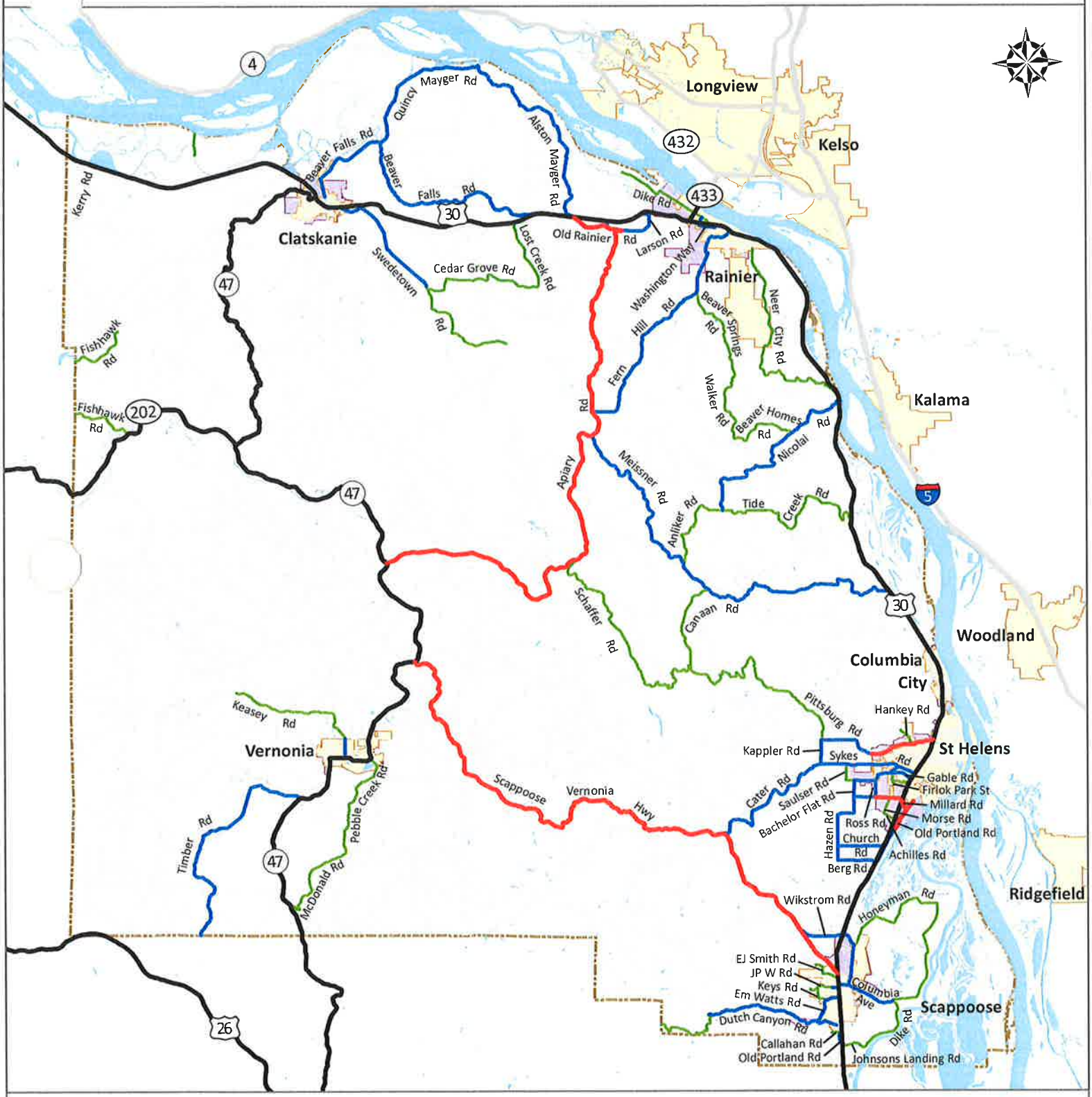
Table 1: Functional Classification Changes

Roadway	From	To	Change from Prior Functional Classification
Columbia Avenue	Highway 30	Dike Rd	Upgrade from Minor Collector to Major Collector
Church Rd	Highway 30	Hazen Rd	Upgrade from Local Road to Major Collector
Dike Rd (Scappoose)	Johnsons Landing Rd	East Columbia Avenue	Upgrade from Local Road to Minor Collector
Dutch Canyon Rd	Old Portland Rd	Otto Miller Rd	Upgrade from Local Road to Major Collector
Johnsons Landing Rd	Highway 30	Dike Rd	Upgrade from Local Road to Minor Collector
Old Portland Rd	Scappoose City Limits	Highway 30	Upgrade from Local Road to Major Collector
Sykes Rd	Highway 30	Cater Rd	Upgrade from Minor Collector to Major Collector
Wickstrom Rd	Highway 30	Scappoose Vernonia Rd	Upgrade from Local Road to Major Collector
Anliker Rd	Nicolai Rd	Meissener Rd	Downgrade from Major Collector to Minor Collector
Beaver Homes Rd	Nicolai Rd	Barker Rd	Upgrade from Local Road to Minor Collector
Dike Rd (Rainier)	Highway 30	Amundson Rd	Downgrade from Major Collector to Minor Collector
Dike Rd (Rainier)	Amundson Rd	West Terminus	Downgrade from Major Collector to Local Road
Fairview Rd	Nicolai Rd	Holbrook Rd	Downgrade from Major Collector to Local Road
Heath Road	Highway 30	Old Rainier Rd	Upgrade from Local Road to Major Collector
Holbrook Rd	Nicolai Rd	Beaver Homes Rd	Downgrade from Major Collector to Local Road
Neer City Rd	Highway 30	Rainier City Limits	Upgrade from Local Road to Minor Collector
Nicolai Rd	Highway 30	Anliker Rd	Upgrade from Local Road to Major Collector
Keasey Rd	State Street	Creek View Lane	Downgrade from Major Collector to Minor Collector
Keasey Rd	Creek View Lane	West Terminus	Downgrade from Minor Collector to Local Road
Cedar Grove Rd	Swedetown Rd	Lost Creek Rd	Upgrade from Local Road to Minor Collector
Alston Mayger Rd	Highway 30	Mayger Rd	Upgrade from Local Road to Major Collector
Mayger Rd	Alston Mayger Rd	Beaver Falls Rd	Upgrade from Local Road to Major Collector
Delena Mayger Rd	Beaver Falls Rd	Alston Mayger Rd	Downgrade from Major Collector to Local Road
Lost Creek Rd	Highway 30	Cedar Grove Rd	Upgrade from Local Road to Minor Collector
Point Adams Rd	Highway 30	River Front Rd	Downgrade from Minor Collector to Local Road
River Front Rd	Point Adams Rd	Webb District Rd (east end)	Downgrade from Minor Collector to Local Road
Webb District Rd	River Front Rd	River Front Rd	Downgrade from Minor Collector to Local Road
Woodson Rd	Highway 30	Webb District Rd	Downgrade from Minor Collector to Local Road

Columbia County Transportation System Plan

DKS

Figure 1 - Roadway Functional Classification



Legend

Functional Classification

- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Local Road

- City Limits
- Urban Growth Boundary
- Columbia County

Miles: 0 1 2 4 6

Freight and Resource Routes

Figure 2 shows roadways designated to help ensure trucks can efficiently travel through and access major destinations in Columbia County. These routes play a vital role in the economical movement of raw materials and finished products, while maintaining neighborhood livability, public safety, and minimizing maintenance costs of the roadway system.

Freight Routes

ODOT has classified US 30 as a freight route and a reduction review route through Columbia County. It is also designated as a truck route by the federal government. Federal truck routes generally require 12-foot travel lanes. Reduction review routes are highways that require review with any proposed changes to determine if there will be a reduction of vehicle-carrying capacity. The TSP update has not changed the ODOT designations.

Resource Routes

As part of the TSP update, it is recommended that County "resource routes" be designated to facilitate the movement of truck freight between major destinations (e.g., ports and harbors) and US 30. These roadways serve an important role in the county roadway network and should be designed and managed to safely accommodate the movement of goods. These routes would require a minimum of 12-foot travel lanes with five-foot shoulders and could be considered priority routes maintenance.

Designated resource routes would include portions of:

- NW 5th Street-Beaver Falls Road, Quincy Mayger Road, and Kallunki Road near Clatskanie;
- Dike Road and Rock Crest Street near Rainier;
- Millard Road and Old Portland Road near St Helens;
- E Columbia Avenue, Honeyman Road, W Lane Road, and Johnson Landing Road near Scappoose; and
- Banzer Road, Apiary Road, Scappoose Vernonia Highway, OR 202, and OR 47.

Columbia County Transportation System Plan

DKS

Figure 2 - Freight and Resource Routes

Emergency Response Routes

Figure 3 shows designated Emergency Transportation and Lifeline Routes in Columbia County, along with current bridge locations and conditions.

The County, in coordination with other agencies in the Portland/Vancouver metropolitan area, has identified major roadways as Emergency Transportation Routes (ETR). These routes are needed during a major regional emergency or disaster to move response resources such as personnel, supplies, and equipment to heavily damaged areas. Designated routes in Columbia County include US 30, OR 47, OR 202, Timber Road, Apiary Road, and Scappoose Vernonia Highway. The TSP update will formally adopt these route designations, and will prioritize investments along them to preserve the function for emergency response.

The Oregon Highway Plan (OHP) Goal 1, Policy 1E has designated routes for emergency response in the event of an earthquake, categorized as Tier 1, 2 and 3. The routes identified as Tier 1 are considered to be the most significant and necessary to ensure a functioning statewide transportation network. A functioning Tier 1 lifeline system provides traffic flow through the state and to each region. The Tier 2 lifeline routes provide additional connectivity and redundancy to the Tier 1 lifeline system. The Tier 2 system allows for direct access to more locations and increased traffic volume capacity, and it provides alternate routes in high-population regions in the event of outages on the Tier 1 system. The Tier 3 lifeline routes provide additional connectivity and redundancy to the lifeline systems provided by Tiers 1 and 2. US 30 is the only lifeline route in Columbia County, designated as Tier 1. The TSP update has not changed the OHP designations.

Figure 3 - Emergency Response Routes

Typical Roadway Cross-section Standards

Figures 4a to 4c include three typical standard cross-section types for county roadways outside of an UGB, with guidelines for constrained areas where design elements may need to be reduced shown in Table 2. These are consistent with the current roadway design standards, with the exception of major and minor collector roadways, which now require wider shoulders (5 feet versus 4 feet), and narrower through travel lanes (11 feet versus 12 feet). Local roadways also now require wider shoulders (4 feet versus 3 feet) where the average daily traffic (ADT) exceeds 3,000 vehicles. It is recommended that county roadways inside an UGB be subject to the roadway design standards from the respective city's TSP (e.g., Clatskanie, Columbia City, Rainier, Scappoose, St Helens, or Vernonia).

The TSP update does not modify the design standards for US 30, OR 47 and OR 202, the county's only principal arterials. These roadways are state highways and subject to the design criteria in the state's Highway Design Manual.

Constrained roadway option: The construction of some roadways may be constrained by challenging topography or environmentally sensitive, historic, or developed areas. These roadways may require modified designs to allow for reasonable construction costs. Guidance for modifications to the standard designs is provided in Table 2. Any modification of a standard design requires approval of a variance prior to construction.

Table 2: Constrained Roadway Design Options

	Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local Roadway
Minimum Through Lane Width	N/A	11 feet*	10 feet*	10 feet*	10 feet*
Minimum Shoulder Width		4 feet	4 feet	4 feet	3 feet, if less than 3,000 ADT

* The minimum through lane width along a resource route should be maintained at 12 feet where feasible.

Figure 4a: Minor Arterial Roadway, outside an UGB

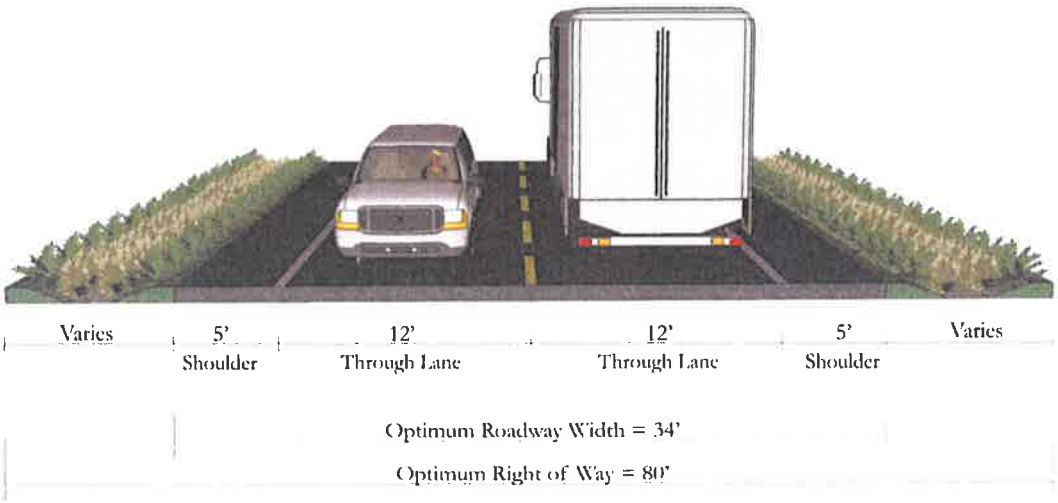


Figure 4b: Major and Minor Collector Roadway, outside an UGB

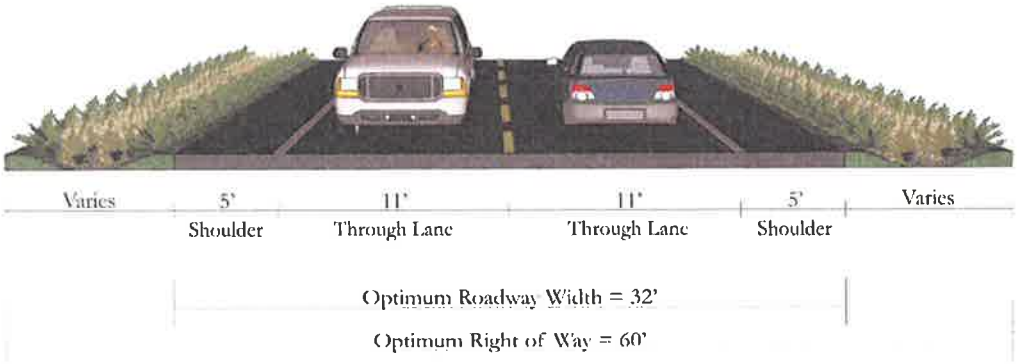


Figure 4c: Local Roadway, outside an UGB

Walking and Biking Design Standards

The following sections detail various walking and biking standards and treatment guidelines.

Walking and Biking Facilities

As shown in Figures 4a to 4c, the existing county roadway design standards will be modified to require wider shoulders along major and minor collector, and local roadways in unconstrained areas. Newly constructed roadways outside an UGB should provide accommodations to walking and biking users via a five-foot paved shoulder along minor arterial, major collector, and minor collector roadways, and a four-foot paved shoulder along local roadways.

The TSP update is recommending that county roadways within an UGB include walking and biking facilities consistent with the roadway design standards from the respective city's TSP. In general, the design should include a minimum five-foot clear throughway for walking along all roadways, and a minimum five-foot striped bike lane along minor arterial and major collector roadways.

Shared-Use Paths

Shared-use paths provide off-roadway facilities for walking and biking travel. Depending on their location, they can serve both recreational and transportation needs. Shared-use path designs vary in surface types and widths. Hard surfaces are generally better for bicycle travel. Widths need to provide ample space for both walking and biking and should be able to accommodate maintenance vehicles.

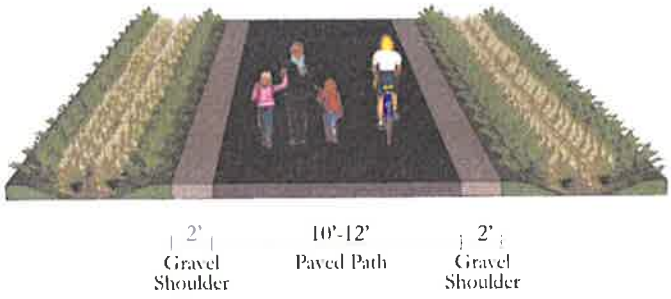


Figure 5: Design Standards for Shared-Use Paths

The TSP update recommends that a paved shared-use path should be 12 feet wide in areas with significant walking or biking demand; otherwise, it should be 10 feet wide (see Figure 5). The Roads Department Director may reduce the width of the typical paved shared-use path to a minimum of eight feet in constrained areas (e.g., steep, environmentally sensitive, historic, or previously developed areas).

Roadway and Access Spacing Standards

Access management is a broad set of techniques that balance the need to provide for efficient, safe, and timely travel with the ability to allow access to individual destinations. Appropriate access management standards and techniques can reduce congestion and accident rates, and may lessen the need for construction of additional roadway capacity.

Table 3 identifies new recommended minimum public roadway intersection and minimum private access spacing standards for roadways in Columbia County. New roadways or redeveloping properties must comply with these standards to the extent practical, as determined by the Roads Department Director. As the opportunity arises through redevelopment, roadways not complying with these standards could improve with strategies such as shared access points, access restrictions (through the use of a median or channelization islands), or closure of unnecessary access points, as feasible.

It is recommended that local agencies apply their adopted roadway and access spacing standards to county owned roadways within an UGB, given that they are not less restrictive than the standards identified below. Like roadway design and mobility targets, access spacing standards for state highways are determined by ODOT. ODOT spacing standards are defined in the Oregon Highway Plan, OAR 731-051, and ODOT's Highway Design Manual.

Table 3: Roadway and Access Spacing Standards

	Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local Roadway
Minimum Block Size (Public Roadway to Public Roadway)	See Oregon Highway Plan	265 feet	265 feet	265 feet	265 feet
Minimum Driveway Spacing (Public Roadway to Driveway and Driveway to Driveway)		265 feet	130 feet	65 feet	30 feet

Note: all distances measured from center to center of adjacent approaches.

Mobility Targets

The adoption of mobility targets for roadways and intersections in Columbia County is recommended as part of the TSP update to provide a metric for assessing the impacts of new development on the existing transportation system and for identifying where capacity improvements may be needed. They are the basis for requiring improvements needed to sustain the transportation system as growth and development occur. Two methods to gauge intersection operations include volume-to-capacity (v/c) ratios and level of service (LOS).

- **Volume-to-capacity (v/c) ratio:** A v/c ratio is a decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used at a turn movement, approach leg, or intersection. The ratio is the peak hour traffic volume divided by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. A ratio approaching 1.00 indicates increased congestion and reduced performance.
- **Level of service (LOS):** LOS is a "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay is excessive and demand exceeds capacity, typically resulting in long queues and delays.

All roadways and intersections owned by Columbia County must operate at or below the following recommended mobility targets. A local agency may choose to apply their adopted mobility targets to county owned roadways in an UGB, given that they do not allow for a lesser degree of mobility.

Signalized, All-way Stop, or Roundabout Controlled Intersections: The intersection as a whole must operate with a Level of Service (LOS) "E" or better and a volume to capacity (v/c) ratio not higher than 0.85 during the highest one-hour period on an average weekday (typically, but not always the evening peak period between 4 p.m. and 6 p.m. during the spring or fall).

Two-way Stop and Yield Controlled Intersections: All intersection approaches serving more than 20 vehicles during the highest one-hour period on an average weekday (typically, but not always the evening peak period between 4 p.m. and 6 p.m. during the spring or fall) shall operate with a LOS "E" or better and a v/c ratio not higher than 0.90. Mobility targets do not apply to approaches at intersections serving 20 vehicles or fewer during the peak hour.

- **State-owned roadways** must comply with the mobility targets included in the Oregon Highway Plan. The TSP update does not modify these mobility targets.
- **City-owned roadways** should comply with the mobility targets included in local TSP's, as determined by the respective agencies.

Traffic Impact Analysis (TIA) Guidelines

The TSP update is recommending new Traffic Impact Analysis (TIA) requirements to implement Sections 660-012-0045(2)(b) and -0045(2)(e) of the State Transportation Planning Rule (TPR). These sections require the county to adopt mobility targets and a process to apply conditions to land use proposals in order to minimize impacts on and protect transportation facilities.

The county's development review process is designed to help the county achieve its goal of managing growth in a responsible and sustainable manner. The applicant for development is required to submit full and accurate information upon which the county staff and elected officials can base decisions. A developer-submitted transportation study prepared by a professional engineer qualified in the traffic engineering field is a critical tool used by the county to assess the expected transportation system impacts associated with a proposed development and the long-term viability of the transportation system.

A TIA may be required to be submitted to the county with a land use application at the request of the Roads Department Director or if the proposal is expected to involve one (1) or more of the following:

1. Changes in land use designation, or zoning designation.
2. Projected increase in trip generation of 25 or more trips during either the AM or PM peak hour, or more than 250 daily trips.
3. Potential impacts to residential areas or local roadways.
4. Potential impacts to pedestrian and bicycle routes, including, but not limited to school routes and multimodal roadway improvements identified in the TSP.
5. The location of an existing or proposed access driveway does not meet minimum spacing or sight distance requirements, or is located where vehicles entering or leaving the property are restricted, or such vehicles are likely to queue or hesitate at an approach or access connection, thereby creating a safety hazard.
6. A change in internal traffic patterns may cause safety concerns.
7. A TIA is required by ODOT pursuant with OAR 734-051.
8. An increase in use of adjacent roadways by vehicles exceeding 20,000 pound gross vehicle weight.

It is the responsibility of the applicant to provide enough detailed information for the county to make a determination. The required scope of work, including study area, horizon years, requirements, and methodology will be determined in coordination with the Roads Department Director.

Transportation System Management (TSM)

Columbia County has several regional state-owned roadways, and major county-owned rural roadways (e.g., US 30, OR 47, OR 202, Apiary Road, and Scappoose Vernonia Highway) that could benefit from transportation system management (TSM) infrastructure. The TSP update recommends that before future investments are made along these roadways, designs should be reviewed with county and ODOT staff to determine if communications or other ITS infrastructure should be addressed as part of the roadway design/construction.

Section L

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Section M

Memo 12: Transportation Solutions

The contents of Volume 2 represent an iterative process in the development of the TSP. Refinements to various plan elements occurred throughout the process as new information was obtained. In all cases, the contents of Volume 1 supersede those in Volume 2.

TECHNICAL MEMORANDUM #12

DATE: March 1, 2016

TO: Columbia County TSP Project Management Team

FROM: John Bosket, DKS Associates
Kevin Chewuk, DKS Associates

SUBJECT: **Columbia County Transportation System Plan Update**
Technical Memorandum #12: Transportation Solutions P11086-022

This document details the transportation system investments recommended to accommodate future travel in Columbia County. Included is a summary of the process utilized to develop and analyze the solutions and a description of the projects identified to improve the transportation system in the County.

Transportation Vision Statement

Before developing projects, we must first talk about the ideal transportation system for the County. The following vision statement was developed with the County Transportation Road Advisory Committee to provide direction for the future of the transportation system.

> *The creation of efficient, safe, and diverse transportation system to serve the needs of Columbia County residents, where existing transportation infrastructure and assets are managed and maintained, and investments to the transportation system use available funding efficiently.*

The vision statement and nine associated goals (see Technical Memorandum #5: Goals, Objectives, and Evaluation Criteria) describe the desires of the County with regard to its transportation system. The nine transportation goals also help set priorities for transportation solutions. It is not the expectation that the County must achieve this vision, but instead that it act as a guide for developing projects within the TSP.

Developing Aspirational Projects

Columbia County's approach to developing an Aspirational list of projects to address the needs of the future transportation system emphasized improved system efficiency and management over adding capacity. The approach considered four tiers of priorities that included:

1. Highest Priority – preserve the function of the system through management practices such as improved traffic signal operations, encouraging alternative modes of travel, and implementation of new policies and standards.

2. High Priority – improve existing facility efficiency through minor enhancement projects that upgrade roads to desired standards, fill important system connectivity gaps, or include safety improvements to intersections and corridors.

3. Moderate Priority – add capacity to the system by widening, constructing major improvements to existing roadways, or extending existing roadways to create parallel routes to congested corridors.

4. Lowest Priority – add capacity to the system by constructing new facilities.

The project team recommended higher priority solution types to address identified needs unless a lower priority solution was clearly more cost-effective or better supported the goals and objectives of the County. This process allowed the County to maximize use of available funds, minimize impacts to the natural and built environments, and balance investments across all modes of travel.

Measurable evaluation criteria was used (see Technical Memorandum #5: Goals, Objectives, and Evaluation Criteria) based on the goals and objectives (developed in coordination with the County Transportation Road Advisory Committee) to screen and prioritize transportation solutions (see Figure 1). Projects deemed to contribute more towards achieving the transportation goals of Columbia County ranked higher, and the plan assigned higher priority to their implementation. Solutions recommended in the Aspirational project list, consequently, are consistent with the goals and objectives.

Figure 1: Reflecting the Vision in the Plan

Aspirational Projects

Aspirational projects (projects which the County supports and would like to implement) include all identified projects for improving Columbia County's transportation system, regardless of their primary funding source, and priority. These projects are not reasonably likely to be funded during the 20-year planning horizon, but do address an identified problem and are supported by the County.

The preliminary list of aspirational projects attempt to address the gaps and deficiencies identified in Technical Memorandum #6 (Existing Transportation System Conditions) and in Technical Memorandum #8 (Future Transportation Conditions and Needs), and was developed by following the four-tiered identification process detailed earlier in this document. The set includes projects for all of the major modes of travel in the County (motor vehicle, pedestrian, bicycle, transit, and rail). The full

ist of aspirational projects, shown in Table 1 and Figures 2a through 2d, includes those proposed in previous plans and studies as well as those added through the TSP planning process. The TSP planning process eliminates any project that may not be feasible for reasons other than financial (such as environmental or existing development limitations).

The full list includes 67 projects, totaling an estimated $446 million worth of investments. Each project was assigned a primary source of funding for planning purposes (County, State, or CC Rider), although such designations do not create any obligation for funding. A prioritized list of "County" projects (where the County is assumed to be the primary contributor of funding) that is constrained to a 20-year funding estimate will be provided in Technical Memorandum #13 (Transportation System Recommendations). Technical Memorandum #13 will also provide a prioritized list of "State" projects that the County could use to make decisions for applying for grants or other funding mechanisms. The County can, however, choose to provide funds to help support State projects—thus, expediting the timeline on those projects the County would like prioritized. While there may be "CC Rider" projects that the TSP would like to be prioritized in the next 20 years, these decisions are ultimately up to the County transit division (CC Rider).

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score	A
1	Improve the US 30 / Woodson Road intersection and railroad crossing, which would include widening of US 30 to provide eastbound and westbound left-turn lanes, and a wider shoulder on the north side of the highway (65 feet in length) to allow southbound traffic to clear the railroad crossing when a train approaches, installing flashing railroad crossing lights and gates, and improving railroad crossing signage and markings.	Address safety at rural intersection. Address safety at railroad crossing.	Rail (Roadways / Bridges)	$2,400,000	State	Medium	W Rc
2	Improve the Woodson transit stop, to include shoulder widening, improved lighting, a sheltered stop with seating, and route information. Improvements should not impact the highway clear zone.	Enhance transit service and amenities.	Transit	$50,000	CC Rider	High	
3	Improve the Marshland transit stop, to include shoulder widening, improved lighting, a sheltered stop with seating, and route information. Improvements should not impact the highway clear zone.	Enhance transit service and amenities.	Transit	$50,000	CC Rider	High	

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
4	Improve the US 30 / Marshland Road (east) railroad crossing, to include new railroad crossing signs on Marshland Road, and vegetation removal to enhance sight distance at the railroad crossing.	Address safety at railroad crossing.	Rail	$5,000	County	Low
5	Improve the US 30 / Point Adams Road railroad crossing, to include replacement of the existing flashing railroad crossing lights, and new shelter grounding equipment and circuitry.	Address safety at railroad crossing.	Rail	$350,000	State	Low
6	Improve Swedetown Road to Major Collector standard from the Clatskanie UGB to Cedar Grove Road, to include wider shoulders.	Provide pedestrian and bicycle connection to urban fringe area.	Pedestrian / Bike	$4,475,000	County	Medium
7	Improve US 30 from the east Clatskanie UGB to the west Rainier UGB, to include centerline rumble strips with delineation to address head-on crashes.	Address safety along rural roadway.	Roadways / Bridges	$125,000	State	Low

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score	A
8	Improve Beaver Falls Road to Major Collector standard from the Clatskanie UGB to Delena Road, to include wider shoulders, upgraded bridges, and additional guardrail.	Address safety along rural roadway. Provide pedestrian and bicycle connection to urban fringe area.	Roadways / Bridges (Pedestrian / Bike)	$24,450,000	County	Low	W 2 E
9	Improve and extend the existing segment of Hermo Road from Quincy Mayger Road to Port Westward. This roadway should be reconstructed / constructed as a Local roadway resource route.	Improve freight access to Port of St Helens.	Roadways / Bridges (Freight)	$12,500,000	County	Medium	
10	Improve the Hermo Road railroad crossing, to include installation of flashing railroad crossing lights and gates.	Address safety at railroad crossing.	Rail	$350,000	State	Low	
11	Improve the railroad crossing at the Kallunki Road / Quincy Mayger Road intersection, to include installation of flashing railroad crossing lights and gates.	Address safety at railroad crossing.	Rail	$350,000	State	Low	

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
12	Improve Alston Mayger Road / Quincy Mayger Road to Major Collector standard, as a resource route, from US 30 to Kallunki Road, to include wider shoulders, and upgraded bridges.	Improve freight access to US 30.	Roadways / Bridges (Freight)	$6,000,000	County	Medium
13	Improve Delena Mayger Road to Local roadway standard from Alston Mayger Road to Cox Road, to include roadway surface enhancements, and wider shoulders.	Improve roadway to county standard.	Roadways / Bridges (Pedestrian / Bike)	$3,200,000	County	Low
14	Replace the Beaver Falls Road Bridge (County Bridge 076).	Replace weight restricted bridge.	Bridges	$1,630,000	County	High
15	Replace the Beaver Falls Road Bridge (County Bridge 075).	Replace weight restricted bridge.	Bridges	$1,440,000	County	High
16	Improve the Alston Store transit stop, to include a sheltered stop with seating, and route information.	Enhance transit service and amenities.	Transit	$10,000	CC Rider	High
17	Construct a new park-and-ride along Wonderly Road, to include a sheltered stop with seating, and route information.	Enhance transit service and amenities.	Transit	$200,000	CC Rider	High

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
18	Improve Old Rainier Road to Minor Arterial roadway standard from US 30 to Apiary Road, Old Rainier Road to Major Collector roadway standard from Apiary Road to Larson Road, and Old Rainier Road to Local roadway standard from Larson Road to the Rainier UGB, to include wider shoulders.	Provide pedestrian and bicycle connection to rural activity generator.	Pedestrian / Bike	$4,000,000	County	High
19	Improve Larson Road to Major Collector roadway standard between US 30 and Old Rainier Road, and to Local roadway standard between Old Rainier Road and Parkdale Road, to include wider shoulders.	Provide pedestrian and bicycle connection to rural activity generator.	Pedestrian / Bike	$1,700,000	County	High
20	Realign Old Rainier Road to the west of the existing Apiary Road intersection, to form a new "T" intersection. This roadway should be constructed as a Minor Arterial resource route.	Improve freight access to US 30.	Roadways / Bridges (Freight)	$1,725,000	County	Medium
21	Improve Apiary Road to Minor Arterial standard (as a resource route) from OR 47 to Old Rainier Road, to include spot roadway surface and shoulder widening, and improved curve delineation.	Improve freight access to US 30.	Roadways / Bridges (Freight)	$6,500,000	County	High

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
22	Improve the Apiary Road / Fern Hill Road intersection, to include vegetation removal to enhance sight distance.	Address safety at rural intersection.	Roadways / Bridges	$25,000	County	Low
23	Replace the existing Longview to Rainier Bridge, or support an additional Columbia River crossing.	Improve freight access between Oregon and Washington.	Bridges	$300,000,000	ODOT/ WSDOT	High
24	Improve US 30 between the east Rainier UGB and the west Columbia City UGB, to include centerline rumble strips with delineation to address head-on crashes.	Address safety along rural roadway.	Roadways / Bridges	$150,000	State	Medium
25	Improve Graham Road to Local roadway standard from US 30 to Blakely Street, to include wider shoulders.	Provide pedestrian and bicycle connection to rural activity generator.	Roadways / Bridges (Pedestrian / Bike)	$1,000,000	County	Medium
26	Improve the Graham Road railroad crossing, to include installation of flashing railroad crossing lights and gates.	Address safety at railroad crossing.	Rail	$350,000	State	Low
27	Create an off-street shared-use path connection between Trojan Park and Prescott Beach County Park.	Provide pedestrian and bicycle connection to rural activity generator.	Pedestrian / Bike	$400,000	County	High

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score	A
28	Widen US 30 at the Neer City Road intersection, to include a northbound left-turn lane.	Address safety at rural intersection.	Roadways / Bridges	$1,800,000	State	Medium	N R
29	Widen US 30 at the Nicolai Road intersection, to include northbound and southbound left-turn lanes, a shoulder on the east side of the highway (75 feet in length) for westbound traffic to clear the railroad crossing when a train approaches, and improved alignment of the east and west approaches.	Address safety at rural intersection. Address safety at railroad crossing.	Roadways / Bridges (Rail)	$3,500,000	State	Medium	
30	Improve the US 30 / Nicolai Road railroad crossing, to include improved signage and pavement markings at the grade crossing, replacing old tracks, repairing/replacing crossing surface, and installing flashing railroad crossing lights and gates.	Address safety at railroad crossing.	Rail	$400,000	State	Low	
31	Replace the Beaver Falls Road Bridge (County Bridge 044).	Replace weight restricted bridge.	Bridges	$600,000	County	High	
32	Replace the Beaver Falls Road Bridge (County Bridge 046).	Replace weight restricted bridge.	Bridges	$600,000	County	High	

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
33	Widen US 30 at the Nicolai Cutoff Road intersection, to include a northbound left-turn lane.	Address safety at rural intersection.	Roadways / Bridges	$1,800,000	State	Medium
34	Widen US 30 at the Tide Creek Road intersection, to include a northbound left-turn lane, and a new bridge with improved horizontal curve radaii and width. The Tide Creek Bridge is an existing freight pinch point, and with improvements could accommodate wider loads.	Address safety at rural intersection.	Roadways / Bridges (Freight)	$6,500,000	State	Low
35	Improve Anliker Road to Minor Collector standard from Meissner Road to Nicolai Road, to include roadway surface enhancements, and wider shoulders.	Improve roadway to county standard.	Roadways / Bridges (Pedestrian / Bike)	$4,600,000	County	Medium
36	Improve the Canaan Road transit stop, to include a new park-and-ride, sheltered stop with seating, and route information.	Enhance transit service and amenities.	Transit	$50,000	CC Rider	High

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
37	Upgrade the US 30 spur track crossing north of Columbia City by replacing the control circuitry, to include new activation equipment, shunt-enhancing equipment, track leads, batteries, and battery charging equipment.	Address safety at railroad crossing.	Rail	$100,000	State	Low
38	Improve Pittsburg Road to Major Collector standard from the St Helens UGB to West Kappler Road, to include wider shoulders.	Provide pedestrian and bicycle connection to urban fringe area.	Pedestrian / Bike	$650,000	County	Medium
39	Realign the northbound West Kappler Road approach or southbound Pittsburg Road approach to form a single intersection at Brinn Road. This roadway should be constructed as a Major Collector.	Address safety at rural intersection.	Roadways / Bridges	$600,000	County	Low
40	Replace Anderson Road Bridge (County Bridge 039).	Replace weight restricted bridge.	Bridges	$500,000	County	High
41	Improve Sykes Road to Major Collector standard from the St Helens UGB (near Benjamin Lane) to West Kappler Road, to include wider shoulders.	Provide pedestrian and bicycle connection to urban fringe area.	Pedestrian / Bike	$600,000	County	Medium

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
42	Improve Bachelor Flat Road, Bennett Road, Hazen Road, and Berg Road to Major Collector roadway standard from the St Helens UGB to US 30, to include wider shoulders.	Provide pedestrian and bicycle connection to urban fringe area.	Pedestrian / Bike	$4,300,000	County	High
43	Improve US 30 between Old Portland Road and Millard Road. This project includes increasing the turning radius of the right-turn lane onto Bennett Road by widening and restriping the roadway near the intersection, restricting access to Bennett Road to right-in, right-out, left-in only, constructing a "J-turn" area for westbound Bennett Road traffic to access southbound US 30, adding a traffic signal at the Millard Road intersection with US 30, and closing the Old Portland Road railroad crossing.	Reduce traffic delay at intersections. Address safety along rural roadway.	Roadways / Bridges	$5,550,000	State	Medium
44	Improve Old Portland Road to Major Collector roadway standard from the St Helens UGB to US 30, to include wider shoulders.	Provide pedestrian and bicycle connection to urban fringe area.	Pedestrian / Bike	$500,000	County	Medium

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
45	Widen the Berg Road approach to US 30 to include a left-turn and right-turn lane.	Reduce traffic delay at intersection.	Roadways / Bridges	$425,000	State	Low
46	Study for the feasibility of improved roadway connectivity along the west side of US 30, between Scappoose and St Helens.	Study for improved roadway connectivity.	Study	$175,000	County	Medium
47	Improve Reeder Road to Local roadway standard from Multnomah County to the northern terminus, to include wider shoulders.	Provide pedestrian and bicycle connection to urban fringe area.	Pedestrian / Bike	$400,000	County	Medium
48	Widen US 30 at the West Lane Road intersection, to include a shoulder on the east side of the highway (75 feet in length) for westbound traffic to clear the railroad crossing when a train approaches.	Address safety at railroad crossing.	Rail	$275,000	State	Low
49	Improve Wikstrom Road to Major Collector standard from Scappoose Vernonia Highway to US 30, to include wider shoulders.	Provide pedestrian and bicycle connection to urban fringe area.	Pedestrian / Bike	$3,950,000	County	Medium

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
50	Upgrade the railroad crossing equipment at the US 30 / Johnsons Landing Road crossing, to include new constant warning time activation equipment, standby battery, and rectifier.	Address safety at railroad crossing.	Rail	$100,000	State	Low
51	Ride Share parking- provide parking for 25 spaces next to truck scale near the county line. Project to be coordinated with ODOT, Multnomah and Columbia County.	Enhance transit service and amenities.	Transit	$375,000	CC Rider	High
52	Replace the Dutch Canyon Road Bridge (County Bridge 002).	Replace weight restricted bridge.	Bridges	$600,000	County	High
53	Replace the Dutch Canyon Road Bridge (County Bridge 121).	Replace weight restricted bridge.	Bridges	$600,000	County	High
54	Realign Wikstrom Road to the south of the existing Scappoose Vernonia Highway intersection, to form a new "T" intersection. This roadway should be constructed as a Major Collector.	Address safety at rural intersection.	Roadways / Bridges	$600,000	County	Low
55	Replace the Reid Road Bridge (County Bridge 128).	Replace weight restricted bridge.	Bridges	$480,000	County	High

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
56	Improve Cater Road to Major Collector standard from Scappoose Vernonia Highway to Sykes Road, to include wider shoulders, and improved curve delineation.	Address safety along rural roadway. Provide pedestrian and bicycle connection to rural activity generator.	Roadways / Bridges	$4,250,000	County	Medium
57	Widen Scappoose Vernonia Highway at the Cater Road intersection, to include an eastbound left-turn lane.	Address safety at rural intersection.	Roadways / Bridges (Pedestrian / Bike)	$400,000	County	Low
58	Improve Scappoose Vernonia Highway to Minor Arterial standard (as a resource route) from OR 47 to US 30, to include spot roadway surface and shoulder widening, better curve delineation, and additional guardrail.	Address safety along rural roadway.	Roadways / Bridges (Freight)	$6,650,000	County	High
59	Improve the Crown-Zellerbach Trail from the Multnomah Slough to Vernonia, to include parking facilities, an improved trail surface, and enhanced amenities.	Improve existing shared-use path.	Pedestrian / Bike	$500,000	County	High

Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
60	Create an off-street shared-use path connection between the end of the Banks-Vernonia Trail near Vernonia Lake, and the Crown-Zellerbach Trail along Scappoose Vernonia Highway.	Complete shared-use path gap.	Pedestrian / Bike	$1,900,000	County	High
61	Replace the Scappoose Vernonia Highway Bridge (County Bridge 020).	Replace weight restricted bridge.	Bridges	$2,250,000	County	High
62	Improve OR 47 between OR 202 and the north Vernonia UGB (14 mile segment), to include spot improvements, and general roadway widening to address lane departure crashes.	Address safety along rural roadway.	Roadways / Bridges	$5,000,000	State	Medium
63	Replace the Freeman Road Bridge (County Bridge 119).	Replace weight restricted bridge.	Bridges	$1,200,000	County	High
64	Replace the Flack Road Bridge (County Bridge 126).	Replace weight restricted bridge.	Bridges	$1,080,000	County	High
65	Improve Timber Road to Major Collector standard from OR 47 to the Washington County line, to include wider shoulders, and improved curve delineation.	Address safety along rural roadway.	Roadways / Bridges	$6,125,000	County	Medium

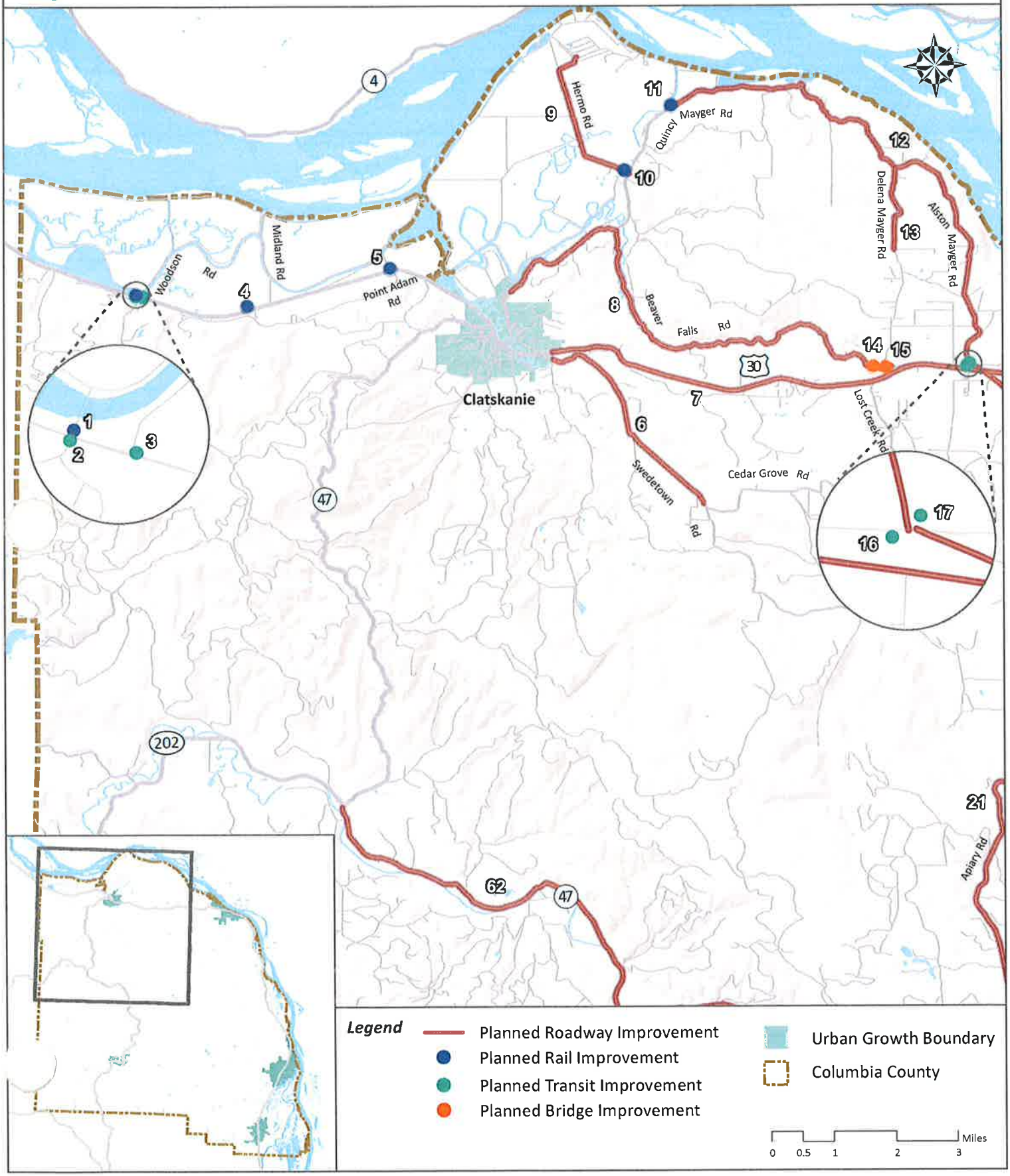
Table 1: Aspirational Project List

Project ID	Project Description	Project Purpose	Primary (Secondary) Mode	Estimated Cost (2015 Dollars)	Primary Funding Source	Evaluation Score
66	Improve the vertical clearance at the Lewis and Clark Bridge overpass. This is an existing freight pinch point, with a vertical clearance one foot lower than the design standard. With improvements, this segment could accommodate taller loads.	Improve freight access along US 30.	Freight	$2,500,000	State	Medium
67	Study for the feasibility of adding passing lanes along various segments of US 30, between Columbia City and Clatsop County.	Study to provide safe passing opportunities along rural roadway segments.	Study	$200,000	State	Low

Columbia County Transportation System Plan

DKS

ure 2a - Aspirational Projects in NW Columbia County



Columbia County Transportation System Plan

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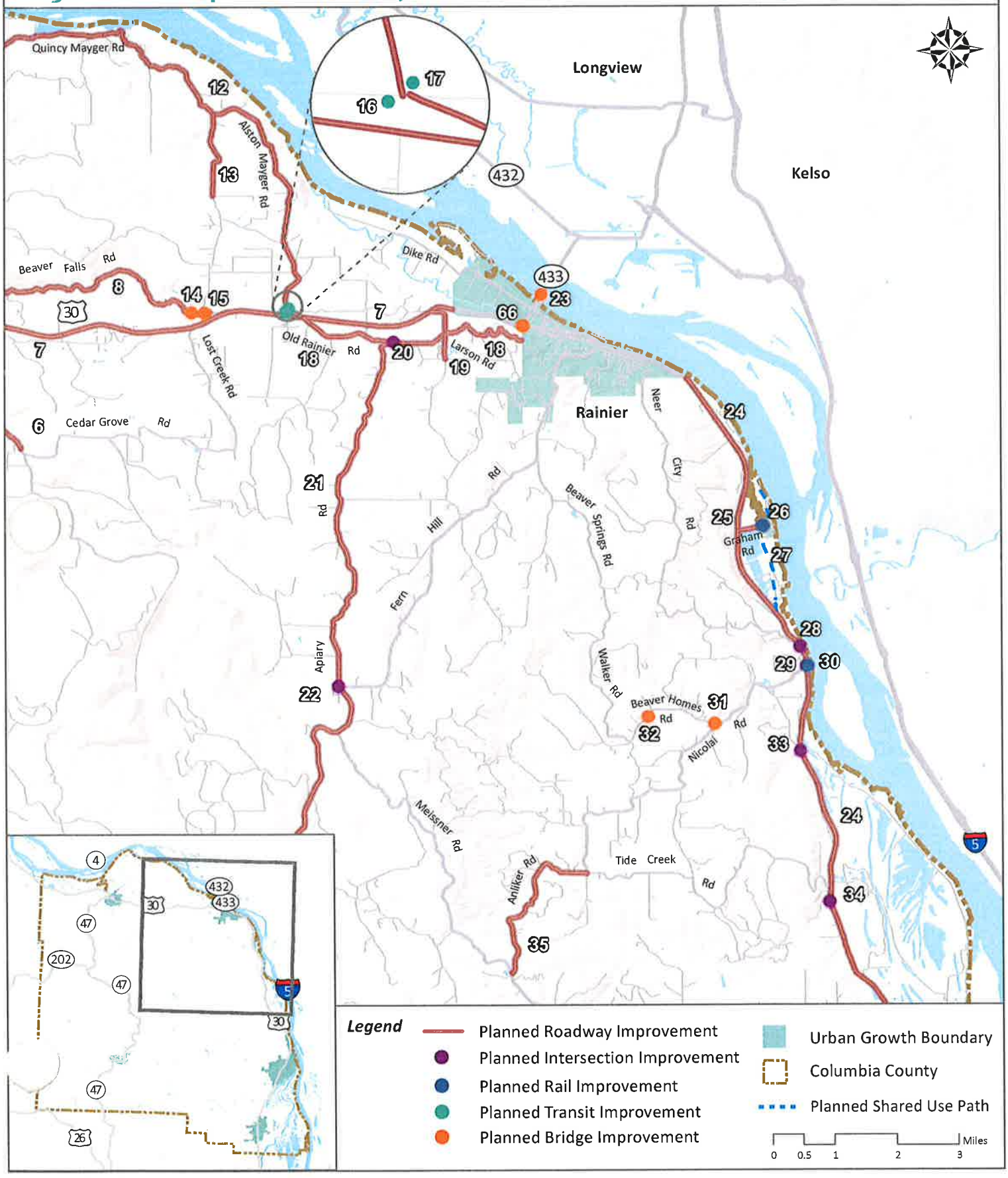
ure 2b - Aspirational Projects in NE Columbia County



Columbia County Transportation System Plan

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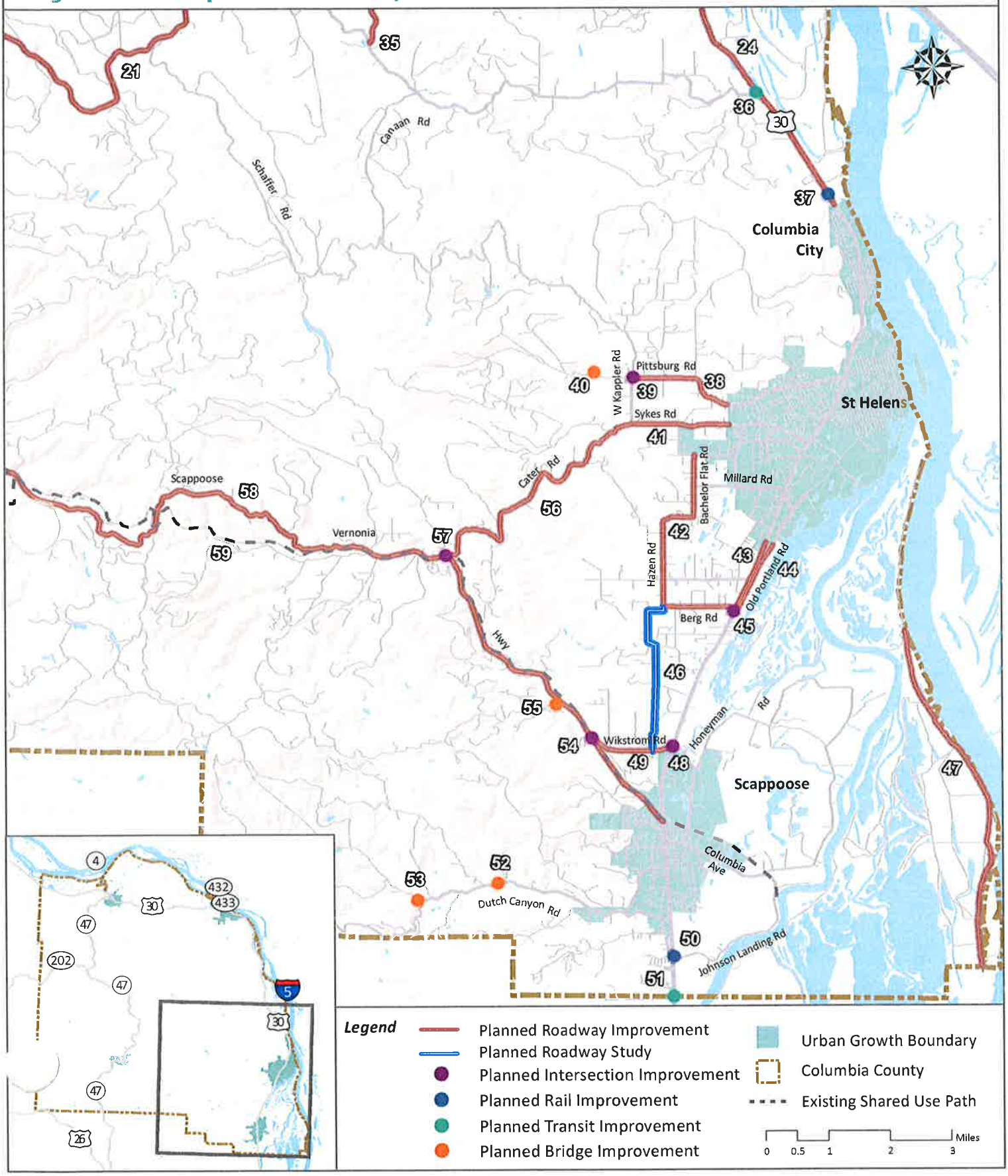

Columbia County Transportation System Plan

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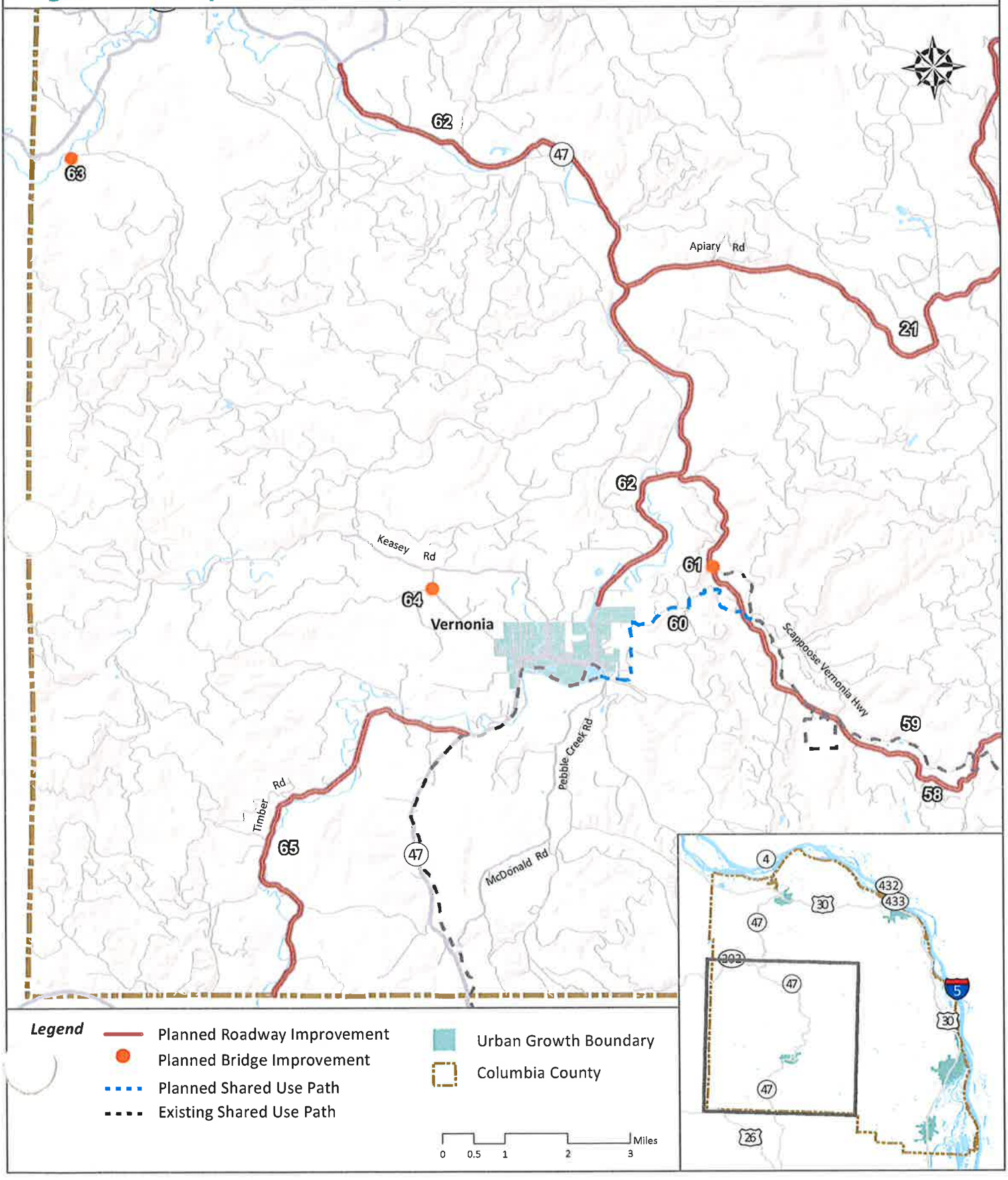

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Section N

Memo 13: Implementing Regulations and Policy Amendments

The contents of Volume 2 represent an iterative process in the development of the TSP. Refinements to various plan elements occurred throughout the process as new information was obtained. In all cases, the contents of Volume 1 supersede those in Volume 2.

TECHNICAL MEMORANDUM #13

DATE: September 15, 2016 (amended February 13, 2017)

TO: Columbia County TSP Project Management Team

FROM: Darci Rudzinski, Angelo Planning Group

SUBJECT: **Columbia County Transportation System Plan Update**
Technical Memorandum #13: Implementing Regulations and Policy Amendments P11086-022

The purpose of this memorandum is to provide the County with some sample policy and development ordinance language to address the recommendations in Technical Memorandum #4 (7/11/14). These recommendations identified provisions and requirements in the Columbia County Comprehensive Plan, Zoning Ordinance (ZO), and Subdivision and Partitioning Ordinance (SPO) that should be updated in order to: (1) be consistent with and implement the updated Transportation System Plan (TSP); and (2) better comply with the Oregon Transportation Plan (OTP) and the Transportation Planning Rule (TPR).

Transportation Goals and Policies

Adopted County transportation policies are found in Part XIII, Transportation, of the Comprehensive Plan. These policies reflect amendments proposed as part of the 1998 Columbia County Rural Transportation System Plan[1]. Adopted policies address multi-modal transportation, transit for the transportation disadvantaged, right-of-way dedication, off-site improvements, access management, port development, and airport protection. Consistent with the approach that was taken to ensure consistency between the 1998 TSP and the adopted Comprehensive Plan, it is recommended that the County make some revisions to the transportation element of the Comprehensive Plan to bring it up to date with the 2016 TSP. Background information in Part XIII will need to be updated or replaced with descriptions and analysis from the updated TSP[2]. Policy language should also be updated to reflect the project objectives and outcomes.

Updated transportation policy language is included in the Table 1. The first column shows existing text from Part XIII of the Comprehensive Plan and suggested amendments in a legislative amendment format (underline/strikeout text).

[1] Chapter 6, Implementing Mechanisms, Section 6.6 Summary of Implementing Actions, p. 6-5.
[2] County staff will need to review background information in Part XIII and advise regarding what content should be retained and updated. The County may also elect to replace background information with a brief introduction to the 2016 TSP update process and refer users to that document, rather than duplicating information in the Comprehensive Plan.

Recommended amendments are based on goals and objectives developed for this TSP update process (Technical Memorandum #5), the transportation standards (Technical Memorandum #11), and on policy issues identified during the course of the TSP update process. The suggested changes to existing policies are discussed in the commentary column in Table 1.

Once these updated and proposed policies are reviewed by the Project Management Team (PMT), advisory committees, and general public they will be revised for consideration during the TSP adoption process. The final version of the policies will be considered for adoption into to the Comprehensive Plan.

Table 1: Comprehensive Plan Transportation Policy Recommendations

Part XIII. Transportation		Commentary
Goal:		
	The creation of an efficient, safe, and ~~diverse~~ multi-modal transportation system to serve the needs of Columbia County residents.	The term "multi-modal" is a more accurate description of the transportation system and is consistent with the local and state interest in planning for all modes.
Objectives:		These objectives are general and are not inconsistent with the more specific objectives of the TSP update.
1.	To ~~utilize the various modes of transportation that are available in the County to provide for the residents.~~ maximize efficient use of transportation infrastructure for all users and modes.	Modifications suggest that the County wishes to maximize the use of infrastructure, rather than to "utilize modes."
2.	To encourage and promote an efficient, accessible, equitable, and economical transportation system to serve the commercial and industrial establishments of the County.	Suggested addition captures the project objective to enhance access to various modes – including transit and freight. The County could consider a "stand alone" objective addressing the equitable distribution of the benefits and impacts of transportation decision, consistent with project Objective 3b.
3.	To ~~improve the existing transportation system.~~ plan for an economically viable and cost-effective transportation system that makes the best use of limited transportation funds.	This language is from project Objective 7a and signifies a shift from enhancing to maintaining the system.

Table 1: Comprehensive Plan Transportation Policy Recommendations

Part XIII. Transportation	Commentary
Policies:	
The County has developed a transportation plan consistent with Oregon Land Use Planning Goal 12 "Transportation" and implementing Rule OAR 660-012.	
1. Columbia County's transportation plan was adopted on ___, ~~1998~~ 2016, entitled "Columbia County ~~Rural~~ Transportation System Plan". It is hereby incorporated into and made part of the Columbia County Comprehensive Plan by this reference. This transportation plan shall be reviewed periodically and updated as necessary.	Recommend updating to reflect the adoption date of the 2016 TSP.
2. The dedication of adequate rights-of-way to meet the standards set in the Transportation Plan shall be required of any person seeking a Zone Change, Conditional Use Permit, Subdivision, or Partition. The developer of a subdivision in an urban growth area will be required to make the appropriate improvements to any related street to meet the roadway, access spacing, and mobility standards set in a Transportation Plan.	The proposed amendment reflects newly established access spacing mobility standards.
3. All expanding or new development shall contribute a fair and proportionate share toward ~~A~~appropriate off-site improvements to county roads ~~shall be required~~ whenever a development results in a major increase in traffic on an existing county road.	Modified language acknowledges that rough proportionality must be exercised in development exactions.
4. The County will manage access to roadways to reduce congestions and conflicting travel patterns. The County will work with the Oregon Department of Transportation (ODOT) to limit the number of access points onto Principal Arterials ~~arterial roads~~. Direct access to U.S. Highway 30 will be limited as much as is practical in order to reduce the potential for congestion and conflicting traffic patterns which would disrupt the flow of traffic.	Proposed additions are consistent with project Objective 1g and the Roadway Functional Classification (TSP Figure 11).

Table 1: Comprehensive Plan Transportation Policy Recommendations

	Part XIII. Transportation	Commentary
5.	The County shall work to enhance freight efficiency, access, capacity and reliability, including access to intermodal faculties such as ports and airports. Industrial uses shall be encouraged to locate in such a manner that they may take advantage of the water and rail transportation systems which are available to the County.	Added language reflects Project Objectives 6b and 6c.
6.	The County will support reducing the number of rail crossings and will support measures to enhance safety at rail crossings.	Proposed additional language is consistent with project Objective 2c.
7.	The County will work with the Port of St. Helens to encourage the establishment and use of dock facilities.	
8.	The two existing airports, in Scappoose and Vernonia, will be zoned with a landing field overlay zone that incorporates the height restrictions set by the Federal Aviation Administration. It will allow the development of airport related industrial uses.	
9.	Restriction of the location of new pipelines and high voltage transmission lines to within existing rights-of-way will be encouraged whenever possible.	
10.	The County will develop and implement plans to address safe and convenient pedestrian and bicycle circulation, including providing access to key activity centers, such as transit facilities, commercial centers, and community facilities, and improving connections and the ability to transfer between transportation modes.	Updated language reflects project Objectives 4c and 4e.

Table 1: Comprehensive Plan Transportation Policy Recommendations

	Part XIII. Transportation	Commentary
11.	Columbia County will continue to ~~support the efforts of COLCO Transportation to supply public transit to the citizens of the County~~ coordinate with transit providers and transit plans (e.g., the 2009 Columbia County Community-Wide Transit Plan and US 30 Transit Access Plan) to improve the coverage, reliability and frequency of services.	Updated language reflects the recommendations of adopted transit plans and project Objective 5a. Policy 11 is broadly inclusive of other transit-related TSP objectives; the County could consider adding additional policies that reflect other objectives under project Goal 5 (Work with transit service providers to provide transit service and amenities that encourage and increase ridership).
12.	The County shall promote transit accessibility to transportation-disadvantaged groups and ~~S~~special attention will be given to ~~the needs of the handicapped~~ citizens with special needs whenever the County considers a proposal for the provision of public transit.	Updated language is consistent with project Objective 5b.
13.	The County will promote walking, bicycling, and sharing the road through public information and organized events	Project Objective 4d.
14.	The County will improve bicycle access along all major corridors to provide intercity bicycle connectivity, including high quality bicycle access along Highway 30. Support the development of the CZ Trail and connection to the Banks-Vernonia Trail.	Project Objective 4f.
15.	The County shall maintain the existing system of roads and bridges to a level suitable to the function of the road, allowing for smooth and comfortable travel, and reducing vehicle maintenance costs, through the preservation of pavements, and prevention of damage by overweight vehicles.	Project Objective 1c.
16.	The County will provide and support needed investments along Emergency Response Routes to preserve emergency response access and mobility.	Proposed policy is consistent with project Objective 2d and supports the identified Emergency Response Routes (Figure 13 in the TSP).

Table 1: Comprehensive Plan Transportation Policy Recommendations

Part XIII. Transportation		Commentary
17.	The County will employ new technologies, such as Intelligent Transportation System (ITS) elements, to enhance and make the most efficient use of the transportation system and extend the useful life of existing facilities.	Proposed policy is consistent with project Objective 1e.
18.	The County will work to provide all users with access to integrated transportation facilities and services, including addressing the needs of those with limited mobility, consistent with the federal Americans with Disabilities Act (ADA).	Proposed policy is consistent with project Objective 3c.
19.	The County shall identify, develop, and actively seek diverse and stable funding sources to implement recommended projects in a timely fashion and ensure sustained funding for road maintenance and transportation improvement projects.	Project Objectives 7b and 7c.
20.	The County will coordinate transportation and land use planning and decision-making with other transportation agencies and public service providers, such as ODOT, cities within the County, and the Port, when their facilities or services may be impacted by a County decision or there may be opportunities to increase the efficiency and benefits of a potential improvement.	Proposed policy reflects project Objectives under project Goal 9 (Coordinate with local and state agencies and transportation plans).
21.	For County roads within a UGB but not yet within city limits, the County will apply roadway and access spacing standards consistent with the subject city's adopted transportation system plan, provided that the urban standards are not less restrictive than County standards.	Proposed policy reflects project Objectives under project Goal 9 (Coordinate with local and state agencies and transportation plans).

Ordinance Amendments

Columbia County's ZO and SPO were audited to ensure that development requirements reflect the goals and objectives of the TSP update, as well as address transportation-related issues that have been raised over the course of the project to date. The intent of this exercise was to identify potential consistency issues between local code requirements and the TSP goals and objectives, as well as note any possible Oregon Transportation Planning Rule (TPR) compliance concerns, before drafting actual amendments to County land use requirements. The complete results of this audit are found in Technical Memorandum #4; Table 2 below includes a list of recommended ordinance amendments resulting from this audit, including the TPR reference and the page reference from Technical Memorandum #4. Sample or "model" code language for the County to consider is provided following the Table, and is shown in underlined text. Pursuant to Task 8.3 of the project work order contract, the County may consider the examples when developing the precise language to update and incorporate into existing regulations. ***County amendments and suggested refinements will be incorporated into the final text of Technical Memorandum #14.***

Table 2: Columbia County Zoning Ordinance (ZO) and Subdivision and Partitioning Ordinance (SPO) Recommendations

	Recommendation	Ordinance Section	TSP Goal/TPR Citation
1.	**Permit outright transportation improvements that are consistent with the adopted TSP.** Specific transportation facilities, services, and improvements are commonly not subject to land use regulation due to the minimal impact on land use. These should be listed as permitted outright or made exempt from regulations through provisions added to the CCZO. The recommendation is to add a new code section to allow outright improvements that implement the transportation system plan and/or can be shown to be consistent with adopted policy.	ZO ARTICLE II – GENERAL PROVISIONS Section 200 GENERAL PROVISIONS	Goal 7: Provide transportation facilities and services that are fiscally responsible and economically feasible. OAR 660-012-0045(1)(a)
2.	**Amend access management standards in designated Highway Commercial Districts to be consistent with the TSP.** Development standards should be made consistent with access management and spacing standards proposed in the updated TSP.	ZO ARTICLE V – SUBURBAN DISTRICTS Section 800 HIGHWAY COMMERCIAL	

Table 2: Columbia County Zoning Ordinance (ZO) and Subdivision and Partitioning Ordinance (SPO) Recommendations

	Recommendation	Ordinance Section	TSP Goal/TPR Citation
3.	**Establish transportation impact analysis (TIA) requirement thresholds in the code; refer to the performance standards established in the TSP in the TIA requirements.** Existing site design review submittal requirements (Section 1555) include an "impact assessment," which could potentially include a traffic impact analysis (TIA) but do not establish the thresholds for such a requirement. Subdivision requirements (preliminary plat, Section 403) allow the Planning Commission to require additional information from an applicant, which could potentially include a TIA. Mobility standards for County roads are not clearly established in the 1998 TSP. A traffic impact analysis (TIA) requirement is suggested to be included in the ZO, with thresholds identified for the requirement that are proportionate to the potential impacts of development.	ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS [New] Section 1500 TRANSPORTATION IMPACT ANALYSIS	Goal 1: Provide for efficient and convenient motor vehicle travel. OAR 660-012-0045(2)(b) OAR 660-012-0045(2)(g)
4.	**Add provisions for bicycle parking in the ZO.** Providing bicycle parking in association with particular uses can help encourage this mode of transportation, as well as generally help to reduce vehicular trips. Development in higher density residential and commercial areas, as well as institutional uses where the key users do not typically drive vehicles, such as elementary schools, are good candidates for including bicycle parking.	ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS Section 1400 OFF-STREET PARKING AND LOADING	Goal 4: Increase the quality and availability of pedestrian and bicycle facilities. OAR 660-012-0045(3)(a)
5.	**Enhance land use notice requirements to ensure transportation facility and service providers' participation in the land use process.** The County should codified requirements that notice be provided to transportation facility and service providers, as well as other public agencies, where a land use application is being considered that may affect a transportation facility or service. Transportation facility and service providers should also be invited to participate in site design review pre-application conferences, where proposed actions may impact service or facilities.	ZO ARTICLE VII – DISCRETIONARY PERMITS Section 1500 DISCRETIONARY PERMITS ZO ARTICLE VIII – ADMINISTRATION Section 1600 ADMINISTRATION	Goal 9: Coordinate with local and state agencies and transportation plans. OAR 660-012-0045(2)(f)

Table 2: Columbia County Zoning Ordinance (ZO) and Subdivision and Partitioning Ordinance (SPO) Recommendations

	Recommendation	Ordinance Section	TSP Goal/TPR Citation
6.	**Add new Site Design Review and parking lot criteria addressing safe and convenient on-site pedestrian circulation.** Proposed amendments ensure that all new development, redevelopment, expansion, or improvement of all community, governmental, institutional, commercial, industrial and multi-family residential (4 or more units) uses in the County accommodate internal (on-site) safe and convenient pedestrian circulation. New definitions associated with the proposed amendments include "Shared-use Path" and "Walkway."	SPO ARTICLE I – INTRODUCTORY PROVISIONS SECTION 103. CONSTRUCTION AND DEFINITIONS. ZO ARTICLE I – GENERAL DEFINITIONS Section 100 GENERAL DEFINITIONS: ZO ARTICLE VII – DISCRETIONARY PERMITS Section 1500 DISCRETIONARY PERMITS	Goal 4: Increase the quality and availability of pedestrian and bicycle facilities. OAR 660-012-0045(3)(b) OAR 660-012-0045(3)(c)
7.	**Add new ZO permit requirements for transit improvements and permit transit signs in all zoning districts.** Proposed ordinance language is consistent with recommendations from the 2009 Columbia County Community-wide Transit Plan/US 30 Transit Access Plan. The transit provisions, along with a new Pedestrian Access and Circulation site plan requirements (Section 1500 DISCRETIONARY PERMITS, Subsection 1561), will help further County transit goals and improve access to transit facilities by requiring that certain development proposals accommodate transit facilities and provide pedestrian connections to existing and planned transit stops.	ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS Section 1300 SIGNS [New] Section 1500 TRANSIT IMPROVEMENTS	Goal 5: Work with transit service providers to provide transit service and amenities that encourage and increase ridership. OAR 660-012-0045(4)(a)

Table 2: Columbia County Zoning Ordinance (ZO) and Subdivision and Partitioning Ordinance (SPO) Recommendations

	Recommendation	Ordinance Section	TSP Goal/TPR Citation
8.	**Add requirements for preferential parking for carpools and vanpools in designated employee parking areas in new developments.** Designating employee parking areas in new developments that are reserved for carpools and vanpools can incentivize and promote ride-sharing and can help reduce vehicle miles traveled.	ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS Section 1400 OFF-STREET PARKING AND LOADING	Goal 3: Provide an equitable, and connected multi-modal transportation system. Goal 8: Provide a transportation system that conserves energy, and protects and improves the environment. OAR 660-012-0045(4)(d)
9.	**Allow a portion of existing parking areas to redevelop for transit-oriented improvements consistent with the Columbia County Community-wide Transit Plan/US 30 Transit Access Plan.** Allowing for a portion of existing parking areas to redevelop for transit uses, and allowing for parking minimums to be relaxed for these uses, will help accommodate transit usage in the county.	ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS Section 1400 OFF-STREET PARKING AND LOADING	Goal 5: Work with transit service providers to provide transit service and amenities that encourage and increase ridership. OAR 660-012-0045(4)(e)
10.	**To enhance connectivity, limit the use of cul-de-sacs. Where cul-de-sacs are included in development proposals, require that more direct, convenient and safer bicycle and pedestrian travel be accommodated within and between residential areas through the use of a shared-use path.** Proposed SPO amendments refine existing cul-de-sac requirements and replaces the term "pedestrian ways" with "shared-use path," as described in the updated TSP.	SPO ARTICLE X – SUBDIVISION AND PARTITION REQUIREMENTS SECTION 1005. STREETS.	Goal 3: Provide an equitable, and connected multi-modal transportation system. Goal 4: Increase the quality and availability of pedestrian and bicycle facilities. OAR 660-012-0045(6)

Table 2: Columbia County Zoning Ordinance (ZO) and Subdivision and Partitioning Ordinance (SPO) Recommendations

	Recommendation	Ordinance Section	TSP Goal/TPR Citation
11.	**Modify road standards in the SPO to be consistent with the update TSP roadway standards.** The existing County roadway standards in the SPO are consistent with the TPR's direction to minimize pavement width and total ROW consistent with the operational needs of the facility. However, the updated TSP has modified the right-of-way width for collector streets and this dimension needs to be made consistent in the SPO. Proposed language also reflects the County's current practice of applying city standards on County-owned facilities within urban growth boundaries. ***Note: the typical cross-sections in the County Road Standards should be replaced with the typical cross-sections in the updated TSP.***	SPO ARTICLE X – SUBDIVISION AND PARTITION REQUIREMENTS SECTION 1005. STREETS.	Goal 1: Provide for efficient and convenient motor vehicle travel. OAR 660-012-0045(7)
12.	**Add Legislative Amendment (including Major Map Amendment) approval criteria that require consistency with the Statewide Planning Goals.** Proposed ZO amendments clarify that proposed legislative amendments to the acknowledged comprehensive plan and land use regulations must be found consistent with Statewide Planning Goals. Specific to the Transportation Planning Rule, proposed legislative amendments that affect an existing or planned transportation facility must ensure that allowed land uses are consistent with the identified function, capacity, and performance standards of the facility.	ZO ARTICLE VII – DISCRETIONARY PERMITS Section 1500 DISCRETIONARY PERMITS ZO ARTICLE VIII – ADMINISTRATION Section 1600 ADMINISTRATION	Goal 1: Provide for efficient and convenient motor vehicle travel. OAR 660-012-0060
13.	**Allow for consolidated review of land use decisions in cases when project development requires land use decision-making.** The TPR addresses project development and implementation - how a transportation facility or improvement authorized in a TSP is designed and constructed (Section -0050). Adding a provision to Article VIII (Administration) that specifies that projects authorized in an acknowledged TSP will not be subject to further justification with regard to their need, mode, function, or general location during project development, will ensure consistency with the TPR.	ZO ARTICLE VIII – ADMINISTRATION Section 1600 ADMINISTRATION	Goal 9: Coordinate with local and state agencies and transportation plans. OAR 660-012-0045(1)(c) OAR 660-012-0045(2)(d)

Recommendation 1

ZO ARTICLE II – GENERAL PROVISIONS

Section 200 GENERAL PROVISIONS:

223 Transportation Improvements Permitted Outright: Except where otherwise specifically regulated by this ordinance, the following improvements are permitted outright:

.1 Normal operation, maintenance, repair, and preservation activities of existing transportation facilities.
.2 Installation of culverts, pathways, medians, fencing, guardrails, lighting, and similar types of improvements within the existing right-of-way.
.3 Projects that are consistent with projects identified and planned for in the Transportation System Plan.
.4 Public transit facilities.
.5 Landscaping as part of a transportation facility.
.6 Emergency measure necessary for the safety and protection of property.
.7 Acquisition of right-of-way for public roads, highways, and other transportation improvements designated in the Transportation System Plan except for those that are located in Primary Agriculture (PA) or Primary Forest (PF) zones.
.8 Construction of a street or road as part of an approved subdivision or land partition consistent with the applicable land division ordinance.

Recommendation 2

ZO ARTICLE V – SUBURBAN DISTRICTS

Section 800 HIGHWAY COMMERCIAL

806 Portions of arterials or thoroughfares that have been designated as Highway Commercial Districts by the Commission shall be subject to the following requirements:

.1 Approach roads and driveways giving access onto the designated arterial or thoroughfare shall ~~not be less than 15 feet in width nor more than 25 feet in width and shall be so constructed as to~~ conform to the specifications for road construction of the Columbia County Road Department.
.2 Access shall not be permitted along the designated arterial or thoroughfare within a distance of ~~60~~ 265 feet from the right-of-way line of an intersecting street.

Recommendation 3

ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS

Section 1500 TRANSPORTATION IMPACT ANALYSIS

501 Transportation Impact Analysis: A Transportation Impact Analysis (TIA) must be submitted with a land use application at the request of the Roads Department Director or if the proposal is expected to involve one or more of the conditions in (1) in order to minimize impacts on and protect transportation facilities, consistent with Section 660-012-0045(2)(b) and (e) of the State Transportation Planning Rule.

.1 Applicability – A TIA shall be required to be submitted to the County with a land use application at the request of the Roads Department Director or if the proposal is expected to involve one (1) or more of the following:

A. Changes in land use designation, or zoning designation that will generate more vehicle trip ends.

B. Projected increase in trip generation of 25 or more trips during either the AM or PM peak hour, or more than 400 daily trips.

C. Potential impacts to intersection operations.

D. Potential impacts to residential areas or local roadways, including any non-residential development that will generate traffic through a residential zone.

E. Potential impacts to pedestrian and bicycle routes, including, but not limited to school routes and multimodal roadway improvements identified in the TSP.

F. The location of an existing or proposed access driveway does not meet minimum spacing or sight distance requirements, or is located where vehicles entering or leaving the property are restricted, or such vehicles are likely to queue or hesitate at an approach or access connection, thereby creating a safety hazard.

G. A change in internal traffic patterns may cause safety concerns.

H. A TIA is required by ODOT pursuant with OAR 734-051.

I. Projected increase of five trips by vehicles exceeding 26,000-pound gross vehicle weight (13 tons) per day, or an increase in use of adjacent roadways by vehicles exceeding 26,000-pound gross vehicle weight (13 tons) by 10 percent.

.2 Level of analysis – A Transportation Impact Analysis (TIA) is required for developments that are expected to have an impact on the transportation system, per the conditions in (1).

.3 Consistent with the County's Guidelines for Transportation Impact Analysis (TIA), a landowner or developer seeking to develop/redevelop property shall contact the County at the project's outset. The County will review existing transportation data to establish whether a TIA is required. It is the responsibility of the applicant to provide enough detailed information for the County to make a determination. An applicant should have the following prepared, preferably in writing:

A. Type of uses within the development

B. The size of the development

C. The location of the development

D. Proposed new accesses or roadways

E. Estimated trip generation and source of data

F. Proposed study area

If the County cannot properly evaluate a proposed development's impacts without a more detailed study, a TIA will be required. Within a reasonable time following the initial contact, the County will establish whether a TIA is required. The County will provide a scoping summary detailing the study area and any special parameters or requirements, beyond the requirements set forth in the County's Guidelines for Transportation Impact Analysis, when preparing the TIA.

.4 Approval Criteria. When a TIA is required, a proposal is subject to the following criteria:

A. The TIA addresses the applicable elements identified by the County Roads Department Director and the County's Guidelines for Transportation Impact Analysis;

B. The TIA demonstrates that adequate transportation facilities exist to serve the proposed development or, identifies mitigation measures that resolve identified traffic safety problems in a manner that is satisfactory to the County Roads Department Director and, when state highway facilities are affected, to ODOT;

C. For affected non-highway facilities, the TIA establishes that mobility standards adopted by the County have been met; and

D. Proposed public improvements are designed and will be constructed consistent with County Road Standards and access spacing standards in the Transportation System Plan.

.5 Conditions of Approval.

A. The County may deny, approve, or approve a proposal with conditions necessary to meet operational and safety standards; provide the necessary right-of-way for improvements; and to require construction of improvements to ensure consistency with the future planned transportation system.

B. Construction of off-site improvements may be required to mitigate impacts resulting from development that relate to capacity deficiencies and public safety; and/or to upgrade or construct public facilities to County standards.

C. Improvements required as a condition of development approval, when not voluntarily provided by the applicant, shall be roughly proportional to the impact of the development on transportation facilities. Findings in the development approval shall

indicate how the required improvements directly relate to and are roughly proportional to the impact of development.

Recommendation 4

ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS

Section 1400 OFF-STREET PARKING AND LOADING

1419 Minimum Required Bicycle Parking Spaces:

21.05 Bicycle Parking

.1 All Public and Semi-Public Buildings and Uses, Retail Uses, and Commercial Recreation uses where required new vehicle parking areas exceed 10 motorized spaces must include a designated area for bicycle parking within 50 feet of a public entrance.

.2 The following are the required number of bicycle parking spaces.

A. Apartment Dwelling. Every residential use of four (4) or more dwelling units shall provide at least one (1) sheltered bicycle parking space for each unit. Sheltered bicycle parking spaces may be located within a garage, storage shed, basement, utility room or similar area. In those instances in which the residential complex has no garage or other easily accessible storage unit, the required bicycle parking spaces shall be sheltered under an eave, overhand, an independent structure, or similar cover.

B. Parking Lots. All public and commercial parking lots and parking structures shall provide a minimum of one (1) bicycle parking space for every 10 motor vehicle parking spaces.

C. Schools. Elementary and junior high schools, including private or parochial, shall provide one bicycle parking space for every 10 students and employees. High schools shall provide one bicycle parking space for every five (5) students and employees. All spaces shall be sheltered under an eave, overhang, independent structure, or similar cover.

.3 Single-family dwellings, mobile homes, warehouse, storage and wholesale businesses, and manufacturing establishments shall be exempted from the requirements of Section 21.05 Bicycle Parking.

Recommendation 5

ZO ARTICLE VII – DISCRETIONARY PERMITS
Section 1500 DISCRETIONARY PERMITS
1554 Pre-application Conference Committee: The committee shall be appointed by the Planning Director and shall consist of at least the following officials, or their designated staff members. Only affected officials need to be present at each pre-application conference.

A. The County Planning Director
B. The County Director of Public Works.

C. The Fire Marshal of the appropriate Rural Fire District.
D. The County Building Official.
E. The County Sanitarian.
F. A city representative, for projects inside Urban Growth Boundaries.
G. A representative from the County transit agency.
H. A representative from the Oregon Department of Transportation, for proposals that may impact state transportation facilities.
~~G.~~ I. Other appointees by the Planning Director, such as an Architect, Landscape Architect, real estate agent, appropriate officials, etc.

ZO ARTICLE VIII – ADMINISTRATION

1603 Quasijudicial Public Hearings: As provided elsewhere in this ordinance, the Hearings Officer, Planning Commission, or Board of Commissioners may approve certain actions which are in conformance with the provisions of this ordinance. Zone Changes, Conditional Use Permits, Major Variances, and Temporary Use Permits shall be reviewed by the appropriate body and may be approved using the following procedures:

.1 The applicant shall submit an application and any necessary supplemental information as required by this ordinance to the Planning Department. The application shall be reviewed for completeness and the applicant notified in writing of any deficiencies. The application shall be deemed complete upon receipt of all pertinent information. If an application for a permit or zone change is incomplete, the Planning Department shall notify the applicant of exactly what information is missing within 5 days of receipt of the application and allow the applicant to submit the missing information. The application shall be deemed complete for the purpose of this section upon receipt by the Planning Department of the missing information. [effective 7-15-97]

.2 Once an application is deemed complete, it shall be scheduled for the earliest possible hearing before the Planning Commission or Hearings Officer. The Director will publish a notice of the request in a paper of general circulation not less than 10 calendar days prior to the scheduled public hearing. Notices will also be mailed to adjacent individual property owners, in accordance with ORS 197.763[effective 7-15-97], and affected jurisdictions and agencies. Agency notification may include the Department of Environmental Quality, the Oregon Department of Transportation, and Columbia County Rider.
[Note: ORS 197.763 requires 20 days notice (or 10 days before the first hearing if there will be 2 or more hearings), and that notice be provided to property owners within 100' (inside UGBs), 250' (outside UGBs), or 500' (in farm or forest zones).]

.3 At the public hearing, the staff, applicant, and interested parties may present information relevant to the criteria and standards pertinent to the proposal, giving reasons why the application should or should not be approved, or what modifications are necessary for approval. [effective 7-15-97] .4 Approval of any action by the Planning Commission at the public hearing shall be by procedure outlined in Ordinance 91-2. [effective 7-15-97]

1606 Legislative Hearing: Requests to amend the text of the Zoning Ordinance or to change a large area of the Zoning Map of Columbia County in order to bring it into compliance with the

Comprehensive Plan are legislative hearings. Legislative hearings shall be conducted in accordance with the following procedures.

.1 A legislative amendment to the Zoning Ordinance Text or Map may be initiated at the request of the Board of Commissioners, a majority of the Commission, or the Director, or any citizen of the County may petition the Commission for such a change.

.2 Notice of a Legislative Hearing shall be prepared in conformance with ORS 215.503. Notice shall be published at least twice, one week apart in newspapers of general circulation in Columbia County. The last of these notices shall be published no less than 10 calendar days prior to the Legislative Hearing. The mailing of notice to individual property owners is not required but shall be done if ordered by the Board of Commissioners. Notice shall be mailed to any affected governmental agency. Notice shall be provided to the Oregon Department of Transportation and Columbia County Rider for proposals that impact the transportation system.

1609 Notice of Review by the Director: The submittal of an application which may be approved by the Director requires that notice of the review of such an application be given to affected persons. ~~This means that notice of this review will be mailed to all property owners within 250 feet of the subject property and to the Citizen Planning Advisory Committee for the area.~~

.1 Notice of this review will be mailed to the following:

A. All property owners within 250 feet of the subject property.

B. The Citizen Planning Advisory Committee for the area.

C. Any governmental agency that is entitled to notice under an intergovernmental agreement entered into with the County and any other affected agencies. At a minimum, the Director shall notify the road authority if different than the County.

.2 These notices shall contain:

[…]

Recommendation 6

SPO ARTICLE I – INTRODUCTORY PROVISIONS

SECTION 103. CONSTRUCTION AND DEFINITIONS.

[…]

C. Definitions. Consistent with the definitions of ORS 92.010, for the purpose of this ordinance, the following words and phrases shall mean:

(46) Sales or Sell. Includes every disposition or transfer of land in a subdivision or partition or an interest or estate therein.

(47) Shared-used Path. An off-street path that can be used and shared by several transportation modes, including bicycles, pedestrians, and other non-motorized modes. Shared-use paths accommodate two-way travel.

~~(47)~~ (48) Sidewalk. A pedestrian walkway with an all weather surface.

[NOTE: All subsequent definitions will need to be renumbered.]

[…]

(53) Walkway. A sidewalk or path, including any access way, improved to County standards, or to other roadway authority standards, as applicable. See also, Access, Shared-use Path and Sidewalk.

ZO ARTICLE I – GENERAL DEFINITIONS

Section 100 GENERAL DEFINITIONS:
[…]

.111 Trailer Park: Land designed or used for the temporary parking of 4 or more trailers or vehicles used for human habitation.

.112 Walkway. A sidewalk or path, including any access way, improved to County standards, or to other roadway authority standards, as applicable. See also, Access and Shared-use Path.

.112 Yard: An open space on a lot or parcel with a building and bounded on 1 or more sides by such building, such space being unoccupied and unobstructed from 30 inches above the ground upward.
[NOTE: All subsequent definitions will need to be renumbered.]

ZO ARTICLE VII – DISCRETIONARY PERMITS
Section 1500 DISCRETIONARY PERMITS

1561 Proposed Site Plan: A complete application for design review shall be submitted, including the following plans, […]

E. Pedestrian Access and Circulation

1. Site Layout and Design. To ensure safe, direct, and convenient pedestrian circulation, all developments, except single-family detached housing (i.e., on individual lots), shall provide a continuous pedestrian system.

2. Continuous Walkway System. The pedestrian walkway system shall extend throughout the development site and connect to all future phases of development, and to existing or planned off-site adjacent trails, public parks, and open space areas to the greatest extent practicable.

3. Safe, Direct, and Convenient. Pedestrian walkways within developments shall provide safe, reasonably direct, and convenient connections between primary building entrances and all adjacent streets, based on the following definitions:

a. Reasonably direct. A route that does not deviate unnecessarily from a straight line or a route that does not involve a significant amount of out-of-direction travel for likely users.

b. Safe and convenient. Routes that are reasonably free from hazards and provide a reasonably direct route of travel between destinations.

c. "Primary entrance" for commercial, industrial, public, and institutional buildings is the main public entrance to the building. In the case where no public entrance exists, street connections shall be provided to the main employee entrance.

d. "Primary entrance" for residential buildings is the front door (i.e., facing the street). For multifamily buildings in which each unit does not have its own exterior entrance, the "primary entrance" may be a lobby, courtyard, or breezeway which serves as a common entrance for more than one dwelling.

4. When proposed commercial, office, institutional or multi-family uses are located on a site that includes or is adjacent to an existing or planned transit stop, the proposed pedestrian circulation system must demonstrate a safe and convenient pedestrian route from building entrances to the transit stop or to a public right-of-way that provides access to the transit stop.

1563 Standards for Approval:

The Planning Commission or Director shall make a finding with respect to each of the following criteria when approving, approving with conditions, or denying an application:

[...]

F. Walkway Design and Construction. Walkways, including those provided with pedestrian access ways, shall conform to all of the standards in subsections 1-4:

1. Vehicle/Walkway Separation. Except for crosswalks (subsection 2), where a walkway abuts a driveway or street, it shall be raised 6 inches and curbed along the edge of the driveway/street. Alternatively, the decision body may approve a walkway abutting a driveway at the same grade as the driveway if the walkway is protected from all vehicle maneuvering areas. An example of such protection is a row of decorative metal or concrete bollards designed for withstand a vehicle's impact, with adequate minimum spacing between them to protect pedestrians.

2. Crosswalks. Where walkways cross a parking area, driveway, or street ("crosswalk"), they shall be clearly marked with contrasting paving materials (e.g., light-color concrete inlay between asphalt), which may be part of a raised/hump crossing area. Painted or thermo-plastic striping and similar types of non-permanent applications may be approved for crosswalks not exceeding 24 feet in length.

3. Walkway Width and Surface. Walkway and accessway surfaces shall be concrete, asphalt, brick/masonry pavers, or other durable surface, as approved by the City Engineer, at least

six (6) feet wide. Multi-use paths (i.e., for bicycles and pedestrians) shall be concrete or asphalt, at least 10 feet wide.

4. Accessible routes. Walkways shall comply with applicable Americans with Disabilities Act (ADA) requirements. The ends of all walkways, where the walkway intersects a driveway or street shall provide ramps that are ADA accessible, and walkways shall provide direct routes to primary building entrances.

ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS

Section 1400 OFF-STREET PARKING AND LOADING

1415 Parking Areas: All parking areas, excluding one and two-family dwellings, shall meet the following requirements:

.1 All parking areas of less than 20 parking spaces shall have one handicapped parking space. Parking areas with more than 20 spaces shall provide one handicapped parking space for every 50 standard parking spaces.

.2 All parking areas shall be divided into bays of not more than 20 parking spaces. Between, and at the end of each parking bay, there shall be planters which have a minimum width of 5 feet and be at least 17 feet in length. Each planter shall contain one major structural tree and ground cover which has been deemed appropriate by the Director. Truck loading areas need not comply with the preceding requirements.

.3 Parking areas shall be separated from the exterior wall of a structure, exclusive of paved pedestrian entranceways, by a 5 foot strip of landscaping.

.4 Industrial or commercial parking areas, which abut a residential or apartment district, shall meet the building setback of the most restrictive adjoining residential or apartment district.

.5 When industrial or commercial parking areas adjoin a residential or apartment district, there shall be a sight obscuring planting, which is at least 80 percent opaque and when viewed horizontally from between 2 and 8 feet above ground level. This planting shall be composed of materials which are an adequate size so as to achieve the required degree of screening within 12 months after installation.

.6 Parking areas shall be set back from a lot or parcel line adjoining a street. The setback area shall be landscaped.

.7 All parking area setbacks shall be landscaped with major trees, shrubs, and ground cover as approved by the Director.

.8 A minimum of 10 percent of the parking area shall be landscaped and maintenance of the landscaping shall be the owner's responsibility.

.9 Internal pedestrian connections shall be provided in parking lots with greater than ten (10) parking spaces. These connections shall be a minimum of five (5) feet wide and distinguished from vehicular areas through changes in elevation or contrasting paving materials (such as light-color concrete inlay between asphalt). Paint or thermo-plastic

striping and similar types of non-permanent applications may be approved for crossings of parking lot areas that do not exceed 24 feet in crossing length.

Recommendation 7

ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS

Section 1300 SIGNS

1311 Signs for Essential Services and Public Facilities: The following signs shall be permitted in all districts:

.1 City limits signs and public notice signs.
.2 Police, fire, school, and hospital directional signs.
.3 Park directional signs.
.4 Traffic and safety signs.
.5 Transit-related (bus) signs.

[New] Section 1500 TRANSIT IMPROVEMENTS

1500 Transit Improvements. Sites that include existing or planned transit facilities, as identified in the County Transit Plan, may be required to provide the following:

.1 A reasonably direct pedestrian connection, as defined by Section 1561.E.3.a, between the transit facility and building entrances on the site.
.2 A transit passenger landing pad accessible to disabled persons.
.3 An easement or dedication for a passenger shelter or bench if such facility is identified in the County Transit Plan.
.4 Lighting at the transit facility.

Recommendation 8

ZO ARTICLE VI – SPECIAL DISTRICTS, OVERLAY DISTRICTS AND SPECIAL PROVISIONS

Section 1400 OFF-STREET PARKING AND LOADING

1415 Parking Areas: All parking areas, excluding one and two-family dwellings, shall meet the following requirements:

[…]

.10 In urban growth boundaries and urban unincorporated communities, parking lots for commercial, industrial, and public/quasi-public uses that have designated employee parking and more than 20 parking spaces shall provide at least 10% of the employee parking spaces (with a minimum of two spaces) as preferential long-term carpool and vanpool parking spaces.

Preferential carpool and vanpool parking spaces shall be closer to the entrances of the building than other parking spaces, with the exception of ADA accessible parking spaces.

Recommendation 9

.11 A portion of existing parking areas may be redeveloped for transit-oriented improvements, such as a bus stops and pullouts, bus shelters, park and ride stations, transit-oriented developments, and similar facilities, where identified in or consistent with an adopted County transit plan. Subject sites incorporating transit improvements as part of a development proposal are eligible for up to a 10% reduction in required vehicular parking spaces.

Recommendation 10

SPO ARTICLE X – SUBDIVISION AND PARTITION REQUIREMENTS

SECTION 1005. STREETS.

[…]

K. Cul-de-sacs. A cul-de-sac street shall only be used where the County Public Works Director determines that environmental or topographical constraints, existing development patterns, or compliance with other applicable County requirements preclude a street extension. A cul-de-sac turnaround shall be provided at the end of a permanent deadend street in accordance with the County construction standards and specifications. For greater convenience to traffic and more effective police and fire protection, permanent dead-end streets shall, in general, be limited in length to six times the minimum lot width, serving no more than 18 dwelling units, and not exceeding 400 feet in length in urban areas and 800 feet in rural areas, from entrance to center of turnaround, with a radius of 50 feet at the property line and not less than 40 feet at the outer curb line or traveled way. The cul-de-sac shall provide, or not preclude the opportunity to later install, a shared-use path between it and adjacent developable lands. Such access ways shall conform to Section 1011.

L. Street Surfacing and Improvements. Public streets, including alleys, within developments shall be improved in accordance with the requirements of the Columbia County Road Standards. Within urban growth boundaries streets shall be developed in accordance with any applicable city/county joint management agreements. [Amended 11-4- 92]

SECTION 1011. ~~PEDESTRIANWAYS.~~ SHARED-USE PATHS ***[Note: Term replaced to be consistent with the walking and biking standards in the 2016 TSP. If this modification is acceptable, all existing references to "pedestrianways" in the SPO and ZO will need to be changed to "shared-use path." There are currently seven (7) references to "pedestrian ways" in the SPO and one (1) reference in the ZO.]***

When desirable for public convenience and when not prohibited by topography or by the provisions of an Overlay District, ~~pedestrianways~~ shared-use paths may be required to connect to cul-de-sacs or to pass through unusually long or oddly shaped blocks. The width of the paved shared-use path shall be a minimum of 10 feet in width. The Public Works Director may allow for a reduced minimum of eight (8) feet in constrained areas (e.g., steep, environmentally sensitive, historic, or previously developed areas). In areas with significant walking or biking demand, ~~T~~the Commission may require, in

order to facilitate pedestrian access from streets, perpetual, unobstructed easements at least 12 feet in width.

Recommendation 11

SPO ARTICLE X – SUBDIVISION AND PARTITION REQUIREMENTS

SECTION 1005. STREETS.

C. Street Widths and Roadways. Unless otherwise indicated on the official map, or the roadway meets the criteria in 1005.C.(5), the width of rights-of-way and roadway improvements shall be in compliance with the following:

(1) Minor Arterial. Right-of-way width 80 feet.

(2) Collector. Right-of-way width ~~50~~ 60 feet.

(3) Local. Right-of-way width 50 feet ~~-- this width may be varied by the Commission to the width in urban areas to meet the requirement of individual cities~~.

(4) The Board may, upon a recommendation by the County Roadmaster, require additional right-of-way width to protect the public health, safety, and welfare.

(5) For roadways within a UGB but outside city limits, the County will apply the adopted roadway and access spacing standards of the applicable jurisdiction, where these standards are equal to, or more restrictive than, adopted County standards.

Recommendation 12

ZO ARTICLE VII – DISCRETIONARY PERMITS

1502 **ZONE CHANGES** (Map Amendments): There are two types of zone changes which will be considered by the Commission: Major Map Amendments and MinorMap Amendments.

.1 Major map Amendments are defined as Zone Changes which require the Comprehensive Plan Map to be amended in order to allow the proposed Zone Change to conform with the Comprehensive Plan. The approval of this type of Zone Change is a 2 step process:
[…]

B. Final approval of a Major Map Amendment may be given by the Board of Commissioners. The Commissioners shall hold a hearing on the proposed Zone Change either concurrently or following a hearing on the proposed Comprehensive Plan Amendment which is necessary to allow the proposed zoning to conform with the Comprehensive Plan. The Board may approve a Major Map Amendment provided they find adequate evidence has been presented substantiating the following:

1. The proposed Zone Change is consistent with the policies of the Comprehensive Plan;

2. The proposed Zone Change is consistent with the Statewide Planning Goals (ORS 197), including Goal 12 Transportation and the requirements of the Transportation Planning Rule (ORS 660-012) Section -0060; and

3. The property and affected area are presently provided with adequate facilities, services, and transportation networks to support the use, or such facilities, services, and transportation networks are planned to be provided concurrently with the development of the property.

ZO ARTICLE VIII – ADMINISTRATION

1606 Legislative Hearing: Requests to amend the text of the Zoning Ordinance or to change a large area of the Zoning Map of Columbia County in order to bring it into compliance with the Comprehensive Plan are legislative hearings. Legislative hearings shall be conducted in accordance with the following procedures.

.1 A legislative amendment to the Zoning Ordinance Text or Map may be initiated at the request of the Board of Commissioners, a majority of the Commission, or the Director, or any citizen of the County may petition the Commission for such a change.

.2 Notice of a Legislative Hearing shall be published at least twice, one week apart in newspapers of general circulation in Columbia County. The last of these notices shall be published no less than 10 calendar days prior to the Legislative Hearing. The mailing of notice to individual property owners is not required but shall be done if ordered by the Board of Commissioners.

.3 The Commission shall hold a hearing to consider the proposed amendments and shall make a recommendation to the Board of Commissioners with regard to the proposed amendments. The Board of Commissioners shall hold at least one hearing to consider the proposed amendments. Both the Commission and the Board of Commissioners hearings will require notice in the manner outlined in Section 1611.

1607 Legislative Amendment Criteria

.1 Consistency with Statewide Planning Goals: If the proposal involves an amendment to the Comprehensive Plan, the amendment must be consistent with the Statewide Planning Goals and relevant Oregon Administrative Rules.

.2 Consistency with the Comprehensive Plan: All amendments to the Zoning Ordinance Text and Map shall be consistent with the Comprehensive Plan Text and Maps.

~~.1 The Commission shall hold a hearing to consider the proposed amendments and shall make a recommendation to the Board of Commissioners with regard to the proposed amendments. The Board of Commissioners shall hold at least one hearing to consider the proposed amendments. Both the Commission and the Board of Commissioners hearings will require notice in the manner outlined in Section 1611.~~

Recommendation 13

ZO ARTICLE VIII – ADMINISTRATION

Section 1600 ADMINISTRATION:

1620 Consolidated Review of Applications.

.1 When an applicant applies for more than one type of land use or development permit for the same one or more contiguous parcels of land, the proceedings shall be consolidated for review and decision. When proceedings are consolidated, required notices may be consolidated, provided the notice shall identify each application to be decided. When more than one application is reviewed in a hearing, separate findings and decisions shall be made on each application.

.2 Transportation improvement projects approved as part of a land use decision or authorized in the adopted Columbia County TSP will not be subject to separate or additional land use permitting with regard to justifying their need, mode, function, or general location during project development.

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Section O

Public Involvement Summary

The contents of Volume 2 represent an iterative process in the development of the TSP. Refinements to various plan elements occurred throughout the process as new information was obtained. In all cases, the contents of Volume 1 supersede those in Volume 2.

Columbia County Transportation System Plan Update

Transportation Road Advisory Committee (TRAC) Meeting #1 Summary

MEETING DATE: July 24, 2014

MEETING TIME: 10:00 a.m. to 12:00 p.m.

MEETING LOCATION: Columbia County Road Department, 1054 Oregon Street, St. Helens.

MEETING PURPOSE: The purpose of this meeting is to provide an orientation to the TSP project and to obtain input on the Goals, Objectives, and Evaluation Criteria for transportation in Columbia County.

TOPICS

1. Sign-in, Agenda Overview, and Introductions

Project staff and TRAC members in attendance introduced themselves. The following were in attendance:

- Dave Hill- Columbia County
- Lonny Welter- Columbia County
- Cherie Moylan- Columbia County
- John Bosket- DKS
- Kevin Chewuk- DKS
- Nita Greene- TRAC Member
- Rosemary Lohrke- TRAC Member
- Janet Wright- TRAC Member

2. Project Orientation

Project staff presented the following to the TRAC through a PowerPoint presentation:

What is a TSP and why are they important? The TSP is a long-range plan that establishes a system of transportation facilities to meet current and future needs. It is the transportation element of the comprehensive plan. The TSP is important because it provides direction for developing the county's transportation system, provides a basis for making better decisions about how to invest in the transportation system, coordinates state, county, and local planning, and makes the county more competitive for state and federal transportation funding.

What should TSPs include? The TSP must provide direction for future decisions. This is done through documented vision, goals, and policies that describe the values and priorities of the community, as well as through amendments to the county's municipal code to support action and enforcement.

The TSP must also include projects to expand and improve the existing transportation system for all modes of travel. In addition to projects that build new facilities, an array of tools should also be provided to help maximize the return on investments made in facilities you already have though better management practices (e.g., street connectivity requirements, street design standards, standards for mobility and driveway spacing that vary with the intended function of the street). Furthermore, the TSP should include a strategic approach to planning future investments that acknowledges fiscal constraints.

The Columbia County TSP development process: The TSP development process includes the following project stages:

- Establishing an initial set of TSP Goals and Policies
- Evaluation of Existing and Future Conditions
- Develop Evaluation Criteria
- Develop Transportation Solutions
- Draft Plan
- Adoption Hearings

During this process, there will be a series of TRAC meetings, public open houses, and County Commission work sessions. To stay informed of project progress and upcoming events, TRAC members and citizens are encouraged to regularly check our project website at www.columbiacountytsp.org.

TRAC roles and responsibilities: the TRAC will serve as community representatives and will help to develop the county's Vision, Goals, and Objectives; identify system needs; develop solutions; and evaluate and prioritize solutions. Our goal is to have the TSP reflect Columbia County's interests and have the TRAC willing to endorse the plan before the County Commission.

3. Transportation Goals, Objectives, and Evaluation Criteria

This part of the meeting focused on describing values, key areas of interest, and desired direction for transportation system development in the future. The project team will take the input gained from this discussion and use it to draft a vision and complimentary goals and objectives for the TSP. While the vision, goals, and objectives are subject to change throughout the project, they will be used to guide the development of the types of improvements the community would like to see and evaluate the plan to ensure it aligns with local interests.