CONCEPT A-1

TABLE 1
Intersection Operation Summary - Capacity - Route 75 Road Diet

	Lane Use	Weekday Morning Peak Hour											
		2022 Existing			2050 Future			2050 Future with Development			2050 Future with Development - Improved		
		LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 EB Ramps													
Overall		**A**	**3.9**	**0.27**	**A**	**5.1**	**0.44**	**A**	**5.5**	**0.48**	**A**	**6.9**	**0.56**
Route 20 EB Off-Ramp	EB	B	18.4	0.27	C	23.8	0.44	C	25.0	0.48	C	27.8	0.56
Private Driveway	WB	--	--	--	--	--	--	--	--	--	A	0.0	0.00
Route 75 (Ella Grasso Turnpike)	NBL	A	4.6	0.09	A	5.1	0.12	A	5.3	0.12	A	5.5	0.12
	NBTR	A	3.7	0.08	A	3.9	0.11	A	4.1	0.11	A	5.1	0.21
	SBL	--	--	--	--	--	--	--	--	--	A	5.9	0.01
	SBT	A	2.7	0.09	A	3.0	0.17	A	3.1	0.17	A	5.3	0.32
	SBR	A	0.8	0.21	A	1.1	0.29	A	1.3	0.33	A	1.9	0.33
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 WB Ramps													
Overall		**A**	**7.2**	**0.75**	**A**	**9.4**	**0.83**	**B**	**13.3**	**0.91**	**B**	**15.7**	**0.91**
Route 20 WB Off-Ramp	WBTL	C	27.7	0.24	C	27.0	0.34	C	22.9	0.27	C	22.9	0.27
	WBR	B	11.7	0.75	B	16.5	0.83	C	26.4	0.91	C	26.4	0.91
Route 75 (Ella Grasso Turnpike)	NBL	A	3.9	0.08	A	5.0	0.10	A	6.4	0.12	A	6.7	0.14
	NBT	A	3.3	0.11	A	4.1	0.15	A	5.4	0.17	A	6.6	0.33
	SBT	A	4.4	0.22	A	5.8	0.31	A	7.4	0.35	B	13.5	0.67
	SBR	A	1.7	0.08	A	1.8	0.12	A	1.9	0.14	A	2.9	0.14
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Halfway House Road/LAZ Parking Driveway													
Overall		**A**	**4.2**	**0.47**	**A**	**4.5**	**0.54**	**A**	**8.5**	**0.60**	**B**	**15.1**	**0.82**
LAZ Parking Driveway	EB	A	0.0	0.01	A	0.5	0.10	B	11.0	0.21	B	11.0	0.21
Halfway House Road	WB	B	15.3	0.47	B	19.3	0.54	D	38.8	0.60	D	38.8	0.60
Route 75 (Ella Grasso Turnpike)	NBL	--	--	--	--	--	--	--	--	--	A	7.3	0.03
	NB	A	3.8	0.27	A	5.1	0.35	A	8.5	0.46	C	20.2	0.82
	SBL	A	1.7	0.05	A	1.0	0.08	A	2.2	0.10	A	2.5	0.14
	SBTR	A	2.7	0.17	A	1.2	0.20	A	1.9	0.24	A	3.3	0.46
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 401 (Schoephoester Road)/National Drive													
Overall		**B**	**18.5**	**0.69**	**C**	**21.0**	**0.69**	**C**	**21.1**	**0.69**	**C**	**25.4**	**0.76**
Route 401 (Schoephoester Road)	EBL	D	39.6	0.34	D	40.9	0.43	D	41.2	0.44	D	41.2	0.44
	EBLT	D	39.3	0.34	D	39.8	0.41	D	39.9	0.42	D	39.9	0.42
	EBR	A	3.9	0.21	A	3.7	0.22	A	3.7	0.22	A	3.8	0.22
National Drive	WBL	D	36.0	0.09	D	38.4	0.20	D	41.0	0.22	D	42.9	0.24
	WBTR	C	24.6	0.21	C	24.9	0.25	C	26.6	0.34	C	28.4	0.37
Route 75 (Ella Grasso Turnpike)	NBL	D	36.3	0.69	C	34.3	0.69	C	31.4	0.69	C	30.9	0.71
	NBTR	A	6.6	0.18	B	10.9	0.25	B	12.9	0.31	B	19.1	0.59
	SBL	C	34.6	0.15	D	36.7	0.27	D	39.5	0.44	D	38.8	0.44
	SBT	C	23.0	0.26	C	26.8	0.38	C	25.3	0.41	C	34.2	0.76
	SBR	A	0.1	0.07	A	0.1	0.08	A	0.1	0.08	A	0.1	0.08
Traffic Signal - Route 401 (Schoephoester Road) at Light Lane/Airport Service Road													
Overall		**A**	**5.8**	**0.41**	**A**	**6.1**	**0.45**	**A**	**6.0**	**0.45**	**A**	**6.0**	**0.45**
Route 401 (Schoephoester Road)	EBL	A	1.9	0.08	A	2.0	0.10	A	2.0	0.10	A	2.0	0.10
	EBTR	A	4.5	0.09	A	4.5	0.11	A	4.5	0.11	A	4.5	0.11
	WBL	A	1.8	0.02	A	1.8	0.02	A	1.8	0.02	A	1.8	0.02
	WBTR	A	4.6	0.13	A	4.8	0.15	A	4.8	0.15	A	4.8	0.15
Airport Service Road	NB	A	0.8	0.08	A	3.5	0.22	A	3.5	0.22	A	3.5	0.22
Light Lane	SBLT	D	39.2	0.07	D	41.0	0.15	D	41.0	0.15	D	41.0	0.15
	SBR	B	14.7	0.41	B	14.4	0.45	B	14.4	0.45	B	14.4	0.45
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 140 (Elm Street)													
Overall		**A**	**7.9**	**0.45**	**A**	**8.6**	**0.50**	**A**	**8.8**	**0.55**	**A**	**9.5**	**0.55**
Route 140 (Elm Street)	WBL	D	37.6	0.45	D	36.7	0.48	C	34.6	0.46	C	34.6	0.46
	WBR	A	5.2	0.43	B	10.1	0.50	B	12.3	0.52	B	12.3	0.52
Route 75 (Ella Grasso Turnpike)	NB	A	8.6	0.26	A	7.1	0.34	A	6.3	0.39	A	6.7	0.39
	SBL	A	4.9	0.38	A	7.0	0.50	A	8.5	0.55	A	8.5	0.55
	SBT	A	2.9	0.16	A	3.6	0.21	A	4.1	0.23	A	6.1	0.43

CONCEPT A-1

TABLE 2
Intersection Operation Summary - Capacity

		Weekday Afternoon Peak Hour											
		2022			2050			2050			2050		
	Lane Use	Existing			Future			Future with Development			Future with Development - Improved		
		LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 EB Ramps													
Overall		**A**	**4.9**	**0.50**	**A**	**8.6**	**0.63**	**B**	**10.6**	**0.65**	**A**	**9.5**	**0.71**
Route 20 EB Off-Ramp	EB	C	27.5	0.50	C	30.8	0.63	C	31.3	0.65	D	35.3	0.71
Private Driveway	WB	--	--	--	--	--	--	--	--	--	B	15.0	0.15
Route 75 (Ella Grasso Turnpike)	NBL	A	3.8	0.11	A	5.3	0.14	A	5.6	0.14	A	6.9	0.15
	NBTR	A	3.1	0.14	A	4.6	0.20	A	4.8	0.21	A	7.9	0.41
	SBL	--	--	--	--	--	--	--	--	--	A	6.3	0.07
	SBT	A	2.4	0.10	A	6.0	0.20	A	8.9	0.20	A	7.6	0.37
	SBR	A	1.1	0.31	A	6.3	0.44	A	9.6	0.51	A	2.5	0.52
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 WB Ramps													
Overall		**B**	**10.9**	**0.86**	**C**	**21.3**	**0.92**	**C**	**24.2**	**0.93**	**D**	**41.8**	**1.01**
Route 20 WB Off-Ramp	WBTL	C	23.8	0.24	B	10.5	0.11	A	8.7	0.09	B	17.7	0.12
	WBR	C	22.2	0.86	C	34.6	0.92	C	33.9	0.93	E	55.7	1.01
Route 75 (Ella Grasso Turnpike)	NBL	A	5.0	0.06	B	16.7	0.18	C	23.8	0.27	D	37.5	0.45
	NBT	A	4.4	0.19	B	15.9	0.41	B	19.5	0.48	C	22.4	0.67
	SBT	A	6.1	0.27	B	18.8	0.56	C	24.7	0.71	D	53.7	0.99
	SBR	A	1.9	0.11	A	4.6	0.25	A	7.0	0.32	A	8.7	0.26
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Halfway House Road/LAZ Parking Driveway													
Overall		**A**	**9.7**	**0.71**	**B**	**11.6**	**0.71**	**B**	**14.7**	**0.81**	**D**	**50.6**	**1.10**
LAZ Parking Driveway	EB	C	20.1	0.11	C	20.4	0.26	B	16.1	0.36	B	17.8	0.37
Halfway House Road	WB	D	43.7	0.71	D	41.7	0.71	D	49.9	0.81	D	53.5	0.84
Route 75 (Ella Grasso Turnpike)	NBL	--	--	--	--	--	--	--	--	--	A	6.1	0.18
	NB	A	8.0	0.43	B	12.4	0.60	B	16.5	0.70	E	78.6	1.10
	SBL	A	2.2	0.07	A	2.6	0.10	A	3.2	0.11	A	6.6	0.17
	SBTR	A	2.2	0.23	A	1.8	0.31	A	2.6	0.35	C	21.2	0.77
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 401 (Schoephoester Road)/National Drive													
Overall		**C**	**21.1**	**0.69**	**C**	**23.5**	**0.71**	**C**	**24.8**	**0.76**	**D**	**38.4**	**0.95**
Route 401 (Schoephoester Road)	EBL	D	42.2	0.59	D	44.3	0.66	D	44.3	0.66	E	69.6	0.85
	EBLT	D	41.7	0.58	D	43.5	0.65	D	44.4	0.66	E	70.3	0.85
	EBR	A	3.0	0.27	A	3.7	0.31	A	4.6	0.32	A	3.5	0.36
National Drive	WBL	C	34.0	0.07	D	36.5	0.10	D	36.4	0.10	D	40.8	0.10
	WBTR	C	26.3	0.31	C	31.7	0.42	C	32.9	0.49	D	36.2	0.51
Route 75 (Ella Grasso Turnpike)	NBL	C	32.4	0.69	C	32.3	0.71	D	36.2	0.76	E	72.6	0.95
	NBTR	A	8.7	0.26	B	10.0	0.35	B	12.0	0.41	C	20.1	0.69
	SBL	C	34.8	0.07	C	35.0	0.16	D	37.3	0.35	E	60.5	0.52
	SBT	C	31.8	0.41	D	37.7	0.67	D	36.4	0.71	D	48.3	0.91
	SBR	A	0.1	0.11	A	0.2	0.13	A	0.2	0.13	A	0.2	0.13
Traffic Signal - Route 401 (Schoephoester Road) at Light Lane/Airport Service Road													
Overall		**A**	**8.6**	**0.53**	**B**	**11.5**	**0.58**	**B**	**11.5**	**0.58**	**B**	**10.9**	**0.58**
Route 401 (Schoephoester Road)	EBL	A	2.4	0.14	A	3.3	0.17	A	3.3	0.17	A	3.3	0.17
	EBTR	A	5.6	0.19	A	7.5	0.25	A	7.5	0.25	A	7.5	0.25
	WBL	A	2.0	0.02	A	2.9	0.04	A	2.9	0.04	A	1.8	0.04
	WBTR	A	5.5	0.20	A	7.4	0.25	A	7.4	0.25	A	5.6	0.25
Airport Service Road	NB	C	32.8	0.41	D	40.9	0.58	D	40.9	0.58	D	40.9	0.58
Light Lane	SBLT	D	41.8	0.24	D	44.7	0.43	D	44.7	0.43	D	44.7	0.43
	SBR	B	13.6	0.53	B	11.0	0.52	B	11.0	0.52	B	11.0	0.52
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 140 (Elm Street)													
Overall		**B**	**13.4**	**0.68**	**B**	**18.9**	**0.77**	**B**	**19.4**	**0.83**	**B**	**18.7**	**0.82**
Route 140 (Elm Street)	WBL	D	38.2	0.53	D	38.1	0.58	D	37.7	0.58	E	55.8	0.76
	WBR	A	7.4	0.35	B	10.4	0.35	B	11.5	0.37	B	12.8	0.41
Route 75 (Ella Grasso Turnpike)	NB	B	16.3	0.50	C	22.4	0.74	C	20.9	0.78	B	18.8	0.69
	SBL	B	12.9	0.68	C	29.3	0.77	D	37.3	0.83	C	29.2	0.82
	SBT	A	3.4	0.18	A	4.2	0.25	A	4.5	0.28	A	5.1	0.50

CONCEPT A-1

TABLE 3
Intersection Operation Summary - Queues (In Feet) - Route 75 Road Diet

			Weekday Morning Peak Hour							
			2022		2050		2050		2050	
	Lane Use	Available Storage	Existing		Future		Future with Development		Future with Development - Improved	
			50th	95th	50th	95th	50th	95th	50th	95th
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 EB Ramps										
Route 20 EB Off-Ramp	EB	>1000	17	43	40	73	48	83	48	86
Private Driveway	WB	50	--	--	--	--	--	--	0	0
	NBL	70	6	28	8	33	8	33	9	33
Route 75 (Ella Grasso Turnpike)	NBTR	215	9	31	14	39	15	40	34	86
	SBL	80	--	--	--	--	--	--	1	3
	SBT	535	9	21	19	35	19	35	36	105
	SBR	300	0	6	0	9	2	15	0	42
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 WB Ramps										
Route 20 WB Off-Ramp	WBLT	190	22	11	38	17	32	17	32	17
	WBR	>1000	0	62	23	107	56	238	56	238
	NBL	75	3	15	3	18	8	19	8	20
Route 75 (Ella Grasso Turnpike)	NBT	565	10	27	13	39	35	43	68	87
	SBT	>1000	24	71	40	106	70	115	180	346
	SBR	90	0	12	0	16	0	16	5	22
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Halfway House Road/LAZ Parking Driveway										
LAZ Parking Driveway	EB	165	0	0	0	0	1	31	1	31
Halfway House Road	WB	785	0	40	5	51	56	104	56	104
	NBL	50	--	--	--	--	--	--	3	12
Route 75 (Ella Grasso Turnpike)	NB	>1000	32	93	80	127	118	192	344	687
	SBL	415/50[1]	6	1	1	1	1	2	1	2
	SBTR	915	81	5	3	6	5	10	11	47
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 401 (Schoephoester Road)/National Drive										
Route 401 (Schoephoester Road)	EBL	375	25	49	33	60	35	63	35	63
	EBLT	375	25	30	33	37	35	40	35	40
	EBR	220	0	12	0	13	0	13	0	13
National Drive	WBL	200	4	9	10	16	10	17	10	17
	WBTR	150	4	21	6	25	7	29	7	29
	NBL	450	107	143	121	176	115	181	90	143
Route 75 (Ella Grasso Turnpike)	NBTR	920	31	121	68	174	114	206	304	438
	SBL	>1000	7	9	16	14	32	23	32	21
	SBT	>1000	71	130	116	154	128	155	243	421
	SBR	400	0	0	0	0	0	0	0	0
Traffic Signal - Route 401 (Schoephoester Road) at Light Lane/Airport Service Road										
Route 401 (Schoephoester Road)	EBL	170	6	11	6	12	6	12	6	12
	EBTR	>1000	18	25	22	29	22	30	22	30
	WBL	120	1	3	1	3	1	3	1	3
	WBTR	350	26	44	32	53	33	54	33	54
Airport Service Road	NB	470	0	0	0	5	0	5	0	5
Light Lane	SBLT	>1000	4	18	9	28	9	28	9	28
	SBR	200	0	19	0	19	0	19	0	19
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 140 (Elm Street)										
Route 140 (Elm Street)	WBL	155	49	80	59	88	60	89	60	89
	WBR	400	0	41	37	74	55	91	55	91
Route 75 (Ella Grasso Turnpike)	NB	>1000	89	38	120	45	37	50	37	78
	SBL	675	24	54	31	77	35	83	35	83
	SBT	880	20	39	28	59	34	68	80	176

[1]50-foot storage length under road diet conition

CONCEPT A-1

TABLE 4
Intersection Operation Summary - Queues (In Feet) - Route 75 Road Diet

			Weekday Afternoon Peak Hour							
			2022		2050		2050		2050	
	Lane Use	Available Storage	Existing		Future		Future with Development		Future with Development - Improved	
			50th	95th	50th	95th	50th	95th	50th	95th
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 EB Ramps										
Route 20 EB Off-Ramp	EB	>1000	43	87	73	126	79	134	83	138
Private Driveway	WB	50	--	--	--	--	--	--	12	35
	NBL	70	7	20	10	28	11	28	12	33
Route 75 (Ella Grasso Turnpike)	NBTR	215	20	40	32	62	33	64	86	180
	SBL	80	--	--	--	--	--	--	4	17
	SBT	535	12	18	28	74	57	97	74	157
	SBR	300	0	2	24	64	126	133	0	10
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 WB Ramps										
Route 20 WB Off-Ramp	WBLT	190	28	55	17	39	16	34	28	57
	WBR	>1000	48	152	201	423	228	468	325	580
	NBL	75	3	13	12	34	13	37	13	47
Route 75 (Ella Grasso Turnpike)	NBT	565	28	50	110	157	121	171	249	371
	SBT	>1000	45	93	140	196	172	240	458	727
	SBR	90	0	9	4	18	13	29	35	47
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Halfway House Road/LAZ Parking Driveway										
LAZ Parking Driveway	EB	165	7	8	23	15	30	12	33	15
Halfway House Road	WB	785	75	25	90	29	104	32	105	34
	NBL	50	--	--	--	--	--	--	7	6
Route 75 (Ella Grasso Turnpike)	NB	>1000	75	196	181	302	225	427	723	1022
	SBL	415/50[1]	1	4	1	4	1	3	4	15
	SBTR	915	10	18	14	24	16	26	325	585
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 401 (Schoephoester Road)/National Drive										
Route 401 (Schoephoester Road)	EBL	375	67	110	80	129	81	130	97	189
	EBLT	375	67	86	80	100	83	103	101	130
	EBR	220	0	23	5	31	11	37	0	2
National Drive	WBL	200	4	16	5	21	5	21	6	22
	WBTR	150	12	22	16	29	19	32	22	33
	NBL	450	135	313	132	367	126	368	197	350
Route 75 (Ella Grasso Turnpike)	NBTR	920	76	173	53	218	154	247	292	442
	SBL	>1000	4	10	10	18	26	32	29	36
	SBT	>1000	106	144	154	176	161	200	350	566
	SBR	400	0	0	0	0	0	0	0	0
Traffic Signal - Route 401 (Schoephoester Road) at Light Lane/Airport Service Road										
Route 401 (Schoephoester Road)	EBL	170	8	16	12	24	12	24	12	24
	EBTR	>1000	44	65	61	91	62	93	62	93
	WBL	120	1	2	2	4	2	4	1	2
	WBTR	350	42	73	57	101	58	102	41	47
Airport Service Road	NB	470	22	6	54	18	54	18	54	18
Light Lane	SBLT	>1000	20	22	36	32	36	32	36	32
	SBR	200	0	23	0	22	0	22	0	22
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 140 (Elm Street)										
Route 140 (Elm Street)	WBL	155	66	112	79	127	82	129	85	175
	WBR	400	25	59	49	99	56	109	58	109
Route 75 (Ella Grasso Turnpike)	NB	>1000	194	103	272	125	290	128	214	282
	SBL	675	41	109	114	294	134	335	110	198
	SBT	880	26	51	40	78	47	93	99	153

[1]50-foot storage length under road diet conition

CONCEPTS B, C-2, K-1, & K3

TABLE 5
Intersection Operation Summary - Capacity

		Weekday Morning Peak Hour											
		2022			2050			2050			2050		
	Lane Use	Existing			Future			Future with Development			Future with Development - Improved		
		LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 EB Ramps (Concept B)													
Overall		**A**	**3.9**	**0.27**	**A**	**5.1**	**0.44**	**A**	**5.5**	**0.48**	**A**	**5.9**	**0.56**
Route 20 EB Off-Ramp	EB	B	18.4	0.27	C	23.8	0.44	C	25.0	0.48	C	27.8	0.56
Private Driveway	WB	--	--	--	--	--	--	--	--	--	A	0.0	0.00
Route 75 (Ella Grasso Turnpike)	NBL	A	4.6	0.09	A	5.1	0.12	A	5.3	0.12	A	5.5	0.12
	NBTR	A	3.7	0.08	A	3.9	0.11	A	4.1	0.11	A	4.3	0.11
	SBL	--	--	--	--	--	--	--	--	--	A	4.0	0.02
	SBT	A	2.7	0.09	A	3.0	0.17	A	3.1	0.17	A	3.2	0.17
	SBR	A	0.8	0.21	A	1.1	0.29	A	1.3	0.33	A	1.3	0.33
Traffic Signal - Route 75 (Ella Grasso Turnpike) at New Town Road (Concept C-2 - Option II)													
Overall		**A**	**7.2**	**0.75**	**A**	**9.4**	**0.83**	**B**	**13.3**	**0.91**	**B**	**12.1**	**0.83**
New Town Road	WBTL	C	27.7	0.24	C	27.0	0.34	C	22.9	0.27	C	30.1	0.51
	WBR	B	11.7	0.75	B	16.5	0.83	C	26.4	0.91	B	15.6	0.83
Route 75 (Ella Grasso Turnpike)	NBL	A	3.9	0.08	A	5.0	0.10	A	6.4	0.12	A	5.6	0.12
	NBT	A	3.3	0.11	A	4.1	0.15	A	5.4	0.17	A	5.5	0.32
	SBT	A	4.4	0.22	A	5.8	0.31	A	7.4	0.35	B	10.4	0.58
	SBR	A	1.7	0.08	A	1.8	0.12	A	1.9	0.14	A	2.3	0.10
Traffic Signal - Route 20 WB Off Ramp at New Town Road (Concept C-2 - Option I)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**B**	**15.3**	**0.63**
New Town Road	EB	--	--	--	--	--	--	--	--	--	A	7.3	0.08
	WB	--	--	--	--	--	--	--	--	--	A	7.8	0.16
Route 20 WB Off Ramp	NBL	--	--	--	--	--	--	--	--	--	B	18.9	0.63
	NBR	--	--	--	--	--	--	--	--	--	A	5.3	0.09
Traffic Signal - Old County Road at Halfway House Road (Concept K-1)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**B**	**12.6**	**0.61**
Halfway House Road	EB	--	--	--	--	--	--	--	--	--	B	14.3	0.61
	WB	--	--	--	--	--	--	--	--	--	A	8.9	0.26
Old County Road	NB	--	--	--	--	--	--	--	--	--	B	14.0	0.61
	SB	--	--	--	--	--	--	--	--	--	B	11.2	0.54
Roundabout - Route 20 WB Off Ramp at New Town Road (Concept C-2 - Option II)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**B**	**10.6**	**0.62**
New Town Road	EB	--	--	--	--	--	--	--	--	--	A	3.1	0.06
	WB	--	--	--	--	--	--	--	--	--	A	8.8	0.24
Route 20 WB Off Ramp	NB	--	--	--	--	--	--	--	--	--	B	11.9	0.62
Roundabout - Route 75 (Ella Grasso Turnpike) at New Town Road (Concept C-2 - Option I)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**B**	**13.5**	**0.78**
New Town Road	WBLT	--	--	--	--	--	--	--	--	--	A	5.5	0.17
	WBR	--	--	--	--	--	--	--	--	--	B	13.1	0.63
Route 75 (Ella Grasso Turnpike)	NB	--	--	--	--	--	--	--	--	--	A	5.5	0.29
	SB	--	--	--	--	--	--	--	--	--	C	19.2	0.78
Roundabout - Old County Road at Halfway House Road (Concept K-3)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**A**	**5.7**	**0.31**
Halfway House Road	EB	--	--	--	--	--	--	--	--	--	A	5.7	0.20
	WB	--	--	--	--	--	--	--	--	--	A	4.9	0.07
Old County Road	NB	--	--	--	--	--	--	--	--	--	A	5.5	0.29
	SB	--	--	--	--	--	--	--	--	--	A	6.0	0.31

CONCEPTS B, C-2, K-1, & K3

TABLE 6
Intersection Operation Summary - Capacity

	Lane Use	Weekday Afternoon Peak Hour											
		2022 Existing			2050 Future			2050 Future with Development			2050 Future with Development - Improved		
		LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 EB Ramps (Concept B)													
Overall		**A**	**4.9**	**0.50**	**A**	**8.6**	**0.63**	**B**	**10.6**	**0.65**	**A**	**8.1**	**0.71**
Route 20 EB Off-Ramp	EB	C	27.5	0.50	C	30.8	0.63	C	31.3	0.65	D	35.3	0.71
Private Driveway	WB	--	--	--	--	--	--	--	--	--	B	15.0	0.15
Route 75 (Ella Grasso Turnpike)	NBL	A	3.8	0.11	A	5.3	0.14	A	5.6	0.14	A	6.8	0.15
	NBTR	A	3.1	0.14	A	4.6	0.20	A	4.8	0.21	A	5.8	0.22
	SBL	--	--	--	--	--	--	--	--	--	A	2.0	0.06
	SBT	A	2.4	0.10	A	6.0	0.20	A	8.9	0.20	A	1.6	0.20
	SBR	A	1.1	0.31	A	6.3	0.44	A	9.6	0.51	A	4.5	0.52
Traffic Signal - Route 75 (Ella Grasso Turnpike) at New Town Road (Concept C-2 - Option II)													
Overall		**B**	**10.9**	**0.86**	**C**	**21.3**	**0.92**	**C**	**24.2**	**0.93**	**C**	**30.5**	**1.00**
New Town Road	WBTL	C	23.8	0.24	B	10.5	0.11	A	8.7	0.09	B	16.8	0.27
	WBR	C	22.2	0.86	C	34.6	0.92	C	33.9	0.93	D	49.7	1.00
Route 75 (Ella Grasso Turnpike)	NBL	A	5.0	0.06	B	16.7	0.18	C	23.8	0.27	B	16.9	0.31
	NBT	A	4.4	0.19	B	15.9	0.41	B	19.5	0.48	B	16.7	0.68
	SBT	A	6.1	0.27	B	18.8	0.56	C	24.7	0.71	C	33.4	0.90
	SBR	A	1.9	0.11	A	4.6	0.25	A	7.0	0.32	A	5.4	0.20
Traffic Signal - Route 20 WB Off Ramp at New Town Road (Concept C-2 - Option I)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**B**	**10.8**	**0.53**
New Town Road	EB	--	--	--	--	--	--	--	--	--	C	27.2	0.49
	WB	--	--	--	--	--	--	--	--	--	C	28.4	0.53
Route 20 WB Off Ramp	NBL	--	--	--	--	--	--	--	--	--	A	5.1	0.34
	NBR	--	--	--	--	--	--	--	--	--	A	1.6	0.07
Traffic Signal - Old County Road at Halfway House Road (Concept K-1)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**B**	**17.3**	**0.75**
Halfway House Road	EB	--	--	--	--	--	--	--	--	--	C	21.2	0.73
	WB	--	--	--	--	--	--	--	--	--	B	13.3	0.30
Old County Road	NB	--	--	--	--	--	--	--	--	--	B	19.9	0.75
	SB	--	--	--	--	--	--	--	--	--	B	12.9	0.59
Roundabout - Route 20 WB Off Ramp at New Town Road (Concept C-2 - Option II)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**B**	**14.0**	**0.76**
New Town Road	EB	--	--	--	--	--	--	--	--	--	A	3.5	0.11
	WB	--	--	--	--	--	--	--	--	--	A	9.7	0.26
Route 20 WB Off Ramp	NB	--	--	--	--	--	--	--	--	--	C	16.6	0.76
Roundabout - Route 75 (Ella Grasso Turnpike) at New Town Road (Concept C-2 - Option I)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**D**	**27.6**	**0.94**
New Town Road	WBLT	--	--	--	--	--	--	--	--	--	A	7.0	0.22
	WBR	--	--	--	--	--	--	--	--	--	E	42.9	0.94
Route 75 (Ella Grasso Turnpike)	NB	--	--	--	--	--	--	--	--	--	A	8.6	0.53
	SB	--	--	--	--	--	--	--	--	--	D	32.3	0.93
Roundabout - Old County Road at Halfway House Road (Concept K-3)													
Overall		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**A**	**7.4**	**0.41**
Halfway House Road	EB	--	--	--	--	--	--	--	--	--	A	7.7	0.34
	WB	--	--	--	--	--	--	--	--	--	A	6.3	0.12
Old County Road	NB	--	--	--	--	--	--	--	--	--	A	7.5	0.41
	SB	--	--	--	--	--	--	--	--	--	A	7.3	0.38

CONCEPTS B, C-2, K-1, & K3

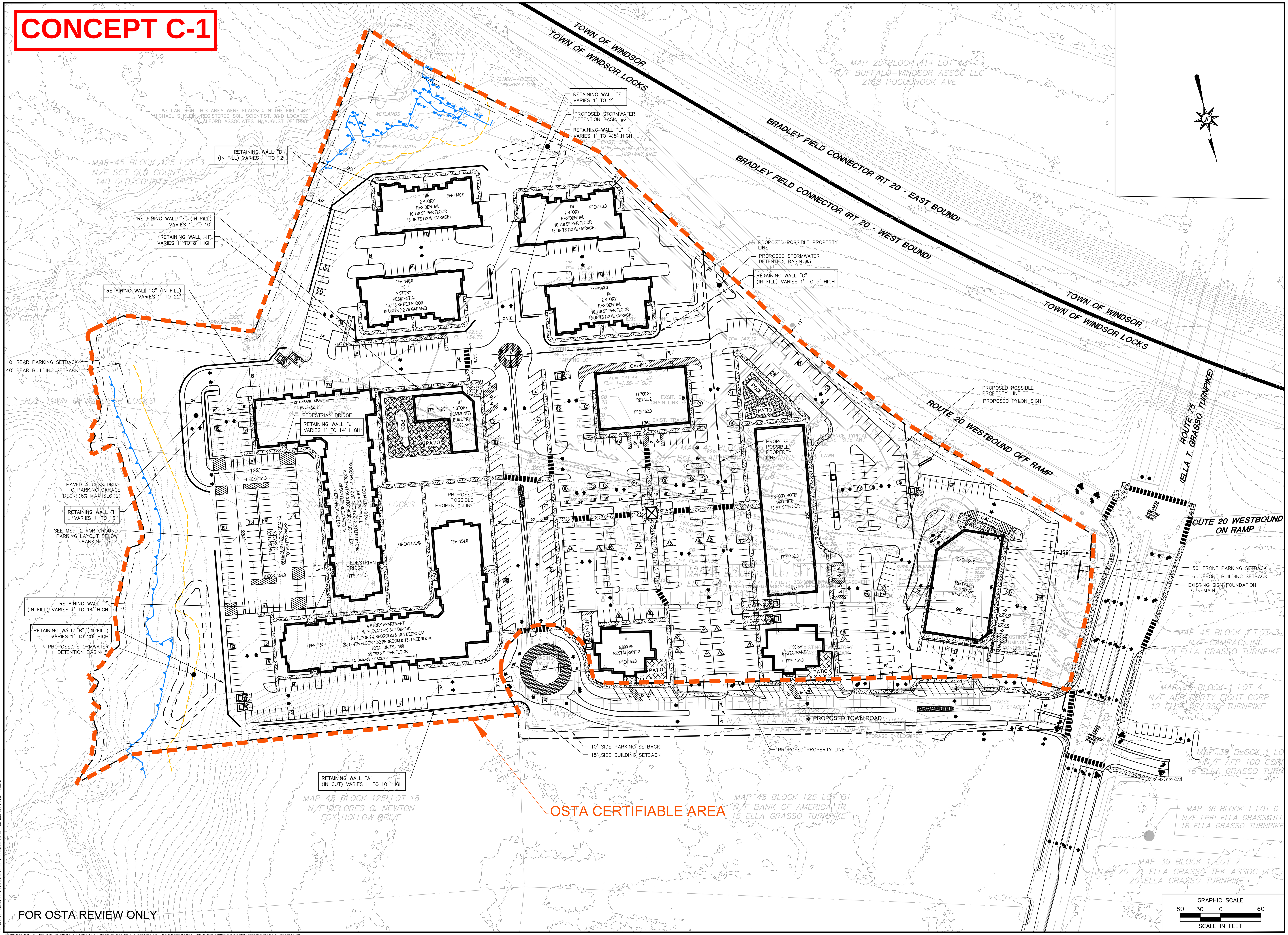
TABLE 7
Intersection Operation Summary - Queues (In Feet)

			Weekday Morning Peak Hour							
			2022		2050		2050		2050	
	Lane Use	Available Storage	Existing		Future		Future with Development		Future with Development - Improved	
			50th	95th	50th	95th	50th	95th	50th	95th
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 EB Ramps (Concept B)										
Route 20 EB Off-Ramp	EB	>1000	17	43	40	73	48	83	48	86
Private Driveway	WB	50	--	--	--	--	--	--	0	0
Route 75 (Ella Grasso Turnpike)	NBL	70	6	28	8	33	8	33	9	33
	NBTR	215	9	31	14	39	15	40	16	40
	SBL	80	--	--	--	--	--	--	1	4
	SBT	535	9	21	19	35	19	35	18	34
	SBR	300	0	6	0	9	2	15	2	15
Traffic Signal - Route 75 (Ella Grasso Turnpike) at New Town Road (Concept C-2 - Option II)										
New Town Road	WBLT	500	22	11	38	17	32	17	65	106
	WBR	500	0	62	23	107	56	238	24	128
Route 75 (Ella Grasso Turnpike)	NBL	75	3	15	3	18	8	19	4	19
	NBT	565	10	27	13	39	35	43	61	80
	SBT	>1000	24	71	40	106	70	115	119	280
	SBR	90	0	12	0	16	0	16	1	16
Traffic Signal - Route 20 WB Off Ramp at New Town Road (Concept C-2 - Option I)										
New Town Road	EB	500	--	--	--	--	--	--	10	31
	WB	500	--	--	--	--	--	--	21	56
Route 20 WB Off Ramp	NBL	>1000	--	--	--	--	--	--	80	121
	NBR	>1000	--	--	--	--	--	--	0	16
Traffic Signal - Old County Road at Halfway House Road (Concept K-1)										
Halfway House Road	EB	565	--	--	--	--	--	--	36	9
	WB	355	--	--	--	--	--	--	11	22
Old County Road	NB	385	--	--	--	--	--	--	56	147
	SB	680	--	--	--	--	--	--	53	131
Roundabout - Route 20 WB Off Ramp at New Town Road (Concept C-2 - Option II)										
New Town Road	EB	500	--	--	--	--	--	--	--	5
	WB	500	--	--	--	--	--	--	--	23
Route 20 WB Off Ramp	NB	>1000	--	--	--	--	--	--	--	110
Roundabout - Route 75 (Ella Grasso Turnpike) at New Town Road (Concept C-2 - Option I)										
New Town Road	WBLT	500	--	--	--	--	--	--	--	15
	WBR	500	--	--	--	--	--	--	--	115
Route 75 (Ella Grasso Turnpike)	NB	565	--	--	--	--	--	--	--	30
	SB	>1000	--	--	--	--	--	--	--	205
Roundabout - Old County Road at Halfway House Road (Concept K-3)										
Halfway House Road	EB	565	--	--	--	--	--	--	--	18
	WB	355	--	--	--	--	--	--	--	5
Old County Road	NB	385	--	--	--	--	--	--	--	30
	SB	680	--	--	--	--	--	--	--	33

CONCEPTS B, C-2, K-1, & K3

TABLE 8
Intersection Operation Summary - Queues (In Feet)

			Weekday Afternoon Peak Hour							
			2022		2050		2050		2050	
	Lane Use	Available Storage	Existing		Future		Future with Development		Future with Development - Improved	
			50th	95th	50th	95th	50th	95th	50th	95th
Traffic Signal - Route 75 (Ella Grasso Turnpike) at Route 20 EB Ramps (Concept B)										
Route 20 EB Off-Ramp	EB	>1000	43	87	73	126	79	134	83	138
Private Driveway	WB	50	--	--	--	--	--	--	12	35
Route 75 (Ella Grasso Turnpike)	NBL	70	7	20	10	28	11	28	12	32
	NBTR	215	20	40	32	62	33	64	38	73
	SBL	80	--	--	--	--	--	--	1	3
	SBT	535	12	18	28	74	57	97	8	16
	SBR	300	0	2	24	64	126	133	54	36
Traffic Signal - Route 75 (Ella Grasso Turnpike) at New Town Road (Concept C-2 - Option II)										
New Town Road	WBLT	500	28	55	17	39	16	34	51	95
	WBR	500	48	152	201	423	228	468	213	453
Route 75 (Ella Grasso Turnpike)	NBL	75	3	13	12	34	13	37	7	20
	NBT	565	28	50	110	157	121	171	216	330
	SBT	>1000	45	93	140	196	172	240	288	518
	SBR	90	0	9	4	18	13	29	14	25
Traffic Signal - Route 20 WB Off Ramp at New Town Road (Concept C-2 - Option I)										
New Town Road	EB	500	--	--	--	--	--	--	43	86
	WB	500	--	--	--	--	--	--	46	92
Route 20 WB Off Ramp	NBL	>1000	--	--	--	--	--	--	45	87
	NBR	>1000	--	--	--	--	--	--	0	12
Traffic Signal - Old County Road at Halfway House Road (Concept K-1)										
Halfway House Road	EB	565	--	--	--	--	--	--	80	40
	WB	355	--	--	--	--	--	--	32	29
Old County Road	NB	385	--	--	--	--	--	--	102	219
	SB	680	--	--	--	--	--	--	88	161
Roundabout - Route 20 WB Off Ramp at New Town Road (Concept C-2 - Option II)										
New Town Road	EB	500	--	--	--	--	--	--	--	10
	WB	500	--	--	--	--	--	--	--	28
Route 20 WB Off Ramp	NB	>1000	--	--	--	--	--	--	--	190
Roundabout - Route 75 (Ella Grasso Turnpike) at New Town Road (Concept C-2 - Option I)										
New Town Road	WBLT	500	--	--	--	--	--	--	--	20
	WBR	500	--	--	--	--	--	--	--	353
Route 75 (Ella Grasso Turnpike)	NB	565	--	--	--	--	--	--	--	80
	SB	>1000	--	--	--	--	--	--	--	373
Roundabout - Old County Road at Halfway House Road (Concept K-3)										
Halfway House Road	EB	565	--	--	--	--	--	--	--	38
	WB	355	--	--	--	--	--	--	--	10
Old County Road	NB	385	--	--	--	--	--	--	--	53
	SB	680	--	--	--	--	--	--	--	45


CONCEPT C-1
TOWN OF WINDSOR
TOWN OF WINDSOR LOCKS
BRADLEY FIELD CONNECTOR (RT 20 - EAST BOUND)
BRADLEY FIELD CONNECTOR (RT 20 - WEST BOUND)
ROUTE 20 WESTBOUND OFF RAMP
ROUTE 20 WESTBOUND ON RAMP
ROUTE 75 (ELLA T. GRASSO TURNPIKE)
MAP 25 BLOCK 414 LOT 43
N/F BUFFALO-WINDSOR ASSOC LLC
2168 POQUONOCK AVE
MAP 45 BLOCK 125 LOT 3
N/F SCT OLD COUNTY LLC
140 OLD COUNTY CIRCLE
RETAINING WALL "E" VARIES 1' TO 2'
PROPOSED STORMWATER DETENTION BASIN #2
RETAINING WALL "L" VARIES 1' TO 4.5' HIGH
RETAINING WALL "D" (IN FILL) VARIES 1' TO 12'
RETAINING WALL "F" (IN FILL) VARIES 1' TO 10'
RETAINING WALL "H" VARIES 1' TO 8' HIGH
RETAINING WALL "C" (IN FILL) VARIES 1' TO 22'
RETAINING WALL "G" (IN FILL) VARIES 1' TO 5' HIGH
RETAINING WALL "J" VARIES 1' TO 14' HIGH
RETAINING WALL "I" VARIES 1' TO 13'
RETAINING WALL "I" (IN FILL) VARIES 1' TO 14' HIGH
RETAINING WALL "B" (IN FILL) VARIES 1' TO 20' HIGH
RETAINING WALL "A" (IN CUT) VARIES 1' TO 10' HIGH
PROPOSED POSSIBLE PROPERTY LINE
PROPOSED STORMWATER DETENTION BASIN #3
PROPOSED POSSIBLE PROPERTY LINE
PROPOSED PYLON SIGN
10' REAR PARKING SETBACK
40' REAR BUILDING SETBACK
PAVED ACCESS DRIVE TO PARKING GARAGE DECK (6% MAX SLOPE)
SEE MSP-2 FOR GROUND PARKING LAYOUT BELOW PARKING DECK
PROPOSED STORMWATER DETENTION BASIN
50' FRONT PARKING SETBACK
60' FRONT BUILDING SETBACK
EXISTING SIGN FOUNDATION TO REMAIN
10' SIDE PARKING SETBACK
15' SIDE BUILDING SETBACK
PROPOSED PROPERTY LINE
PROPOSED TOWN ROAD
#5 2 STORY RESIDENTIAL 10,118 SF PER FLOOR 18 UNITS (12 W/ GARAGE)
#6 2 STORY RESIDENTIAL 10,118 SF PER FLOOR 18 UNITS (12 W/ GARAGE)
#3 2 STORY RESIDENTIAL 10,118 SF PER FLOOR 18 UNITS (12 W/ GARAGE)
#4 2 STORY RESIDENTIAL 10,118 SF PER FLOOR 18 UNITS (12 W/ GARAGE)
#7 1 STORY COMMUNITY BUILDING 5,000 SF
POOL
PATIO
PEDESTRIAN BRIDGE
GREAT LAWN
PROPOSED POSSIBLE PROPERTY LINE
4 STORY APARTMENT W/ ELEVATORS BUILDING #2
4 STORY APARTMENT W/ ELEVATORS BUILDING #1 1ST FLOOR 9-2 BEDROOM & 16-1 BEDROOM 2ND - 4TH FLOOR 12-2 BEDROOM & 13-1 BEDROOM TOTAL UNITS = 100 29,792 S.F. PER FLOOR
11,700 SF RETAIL 2 FFE=152.0
5 STORY HOTEL 140 UNITS 18,500 SF/FLOOR
RETAIL 1 14,700 SF
5,000 SF RESTAURANT 2 FFE=153.0
5,000 SF RESTAURANT 1 FFE=154.0
LOADING
MAP 45 BLOCK 125 LOT 18
N/F DELORES G. NEWTON
FOX HOLLOW DRIVE
MAP 45 BLOCK 125 LOT 51
N/F BANK OF AMERICA
15 ELLA GRASSO TURNPIKE
MAP 45 BLOCK 1 LOT 3
N/F CAMRAC INC
18 ELLA GRASSO TURNPIKE
MAP 39 BLOCK 1 LOT 4
N/F AMHERTY EIGHT CORP
12 ELLA GRASSO TURNPIKE
MAP 39 BLOCK 1 LOT
N/F AFP 100 CORP
16 ELLA GRASSO TURN
MAP 38 BLOCK 1 LOT 6
N/F LPRI ELLA GRASSO LLC
18 ELLA GRASSO TURNPIKE
MAP 39 BLOCK 1 LOT 7
N/F 20-24 ELLA GRASSO TPK ASSOC LLC
20 ELLA GRASSO TURNPIKE
OSTA CERTIFIABLE AREA
FOR OSTA REVIEW ONLY
GRAPHIC SCALE
60 30 0 60
SCALE IN FEET

Architecture
Engineering
Environmental
Land Surveying

BL Companies

6135 Park South Dr.
Charlotte, NC 28210
(980) 999-1772

PROPOSED MIXED USE DEVELOPMENT
ROUTE 75 (ELLA T. GRASSO TURNPIKE)
WINDSOR LOCKS, CT

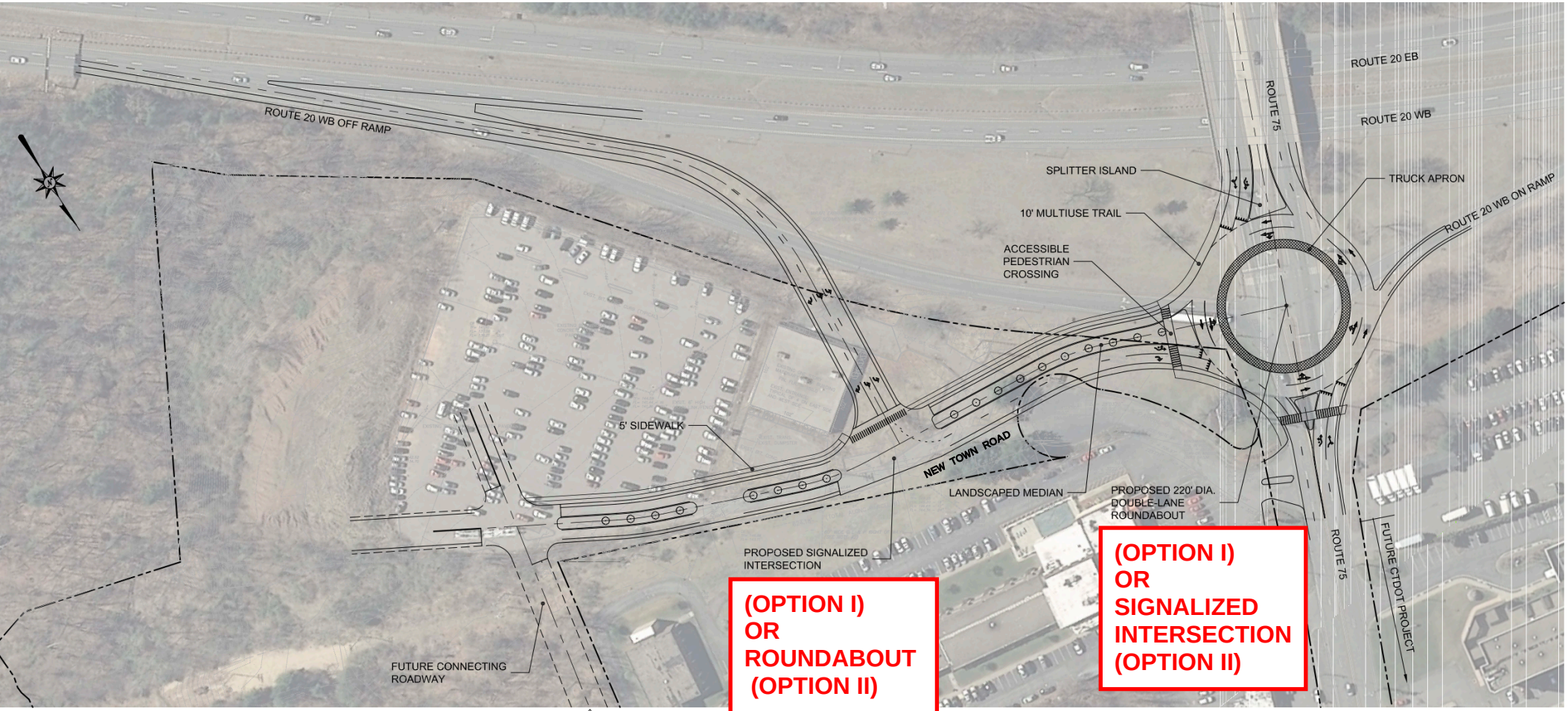
REVISIONS No.	Date	Desc.
1	04/04/19	PER TOWN COMMENTS

Designed	J.O.M.
Drawn	J.E.S.
Reviewed	
Scale	1"=60'
Project No.	1900163
Date	04/01/19
CAD File:	SP190016301

Title
MASTER SITE PLAN-OSTA

Sheet No.
MSP-1

CONCEPT C-2



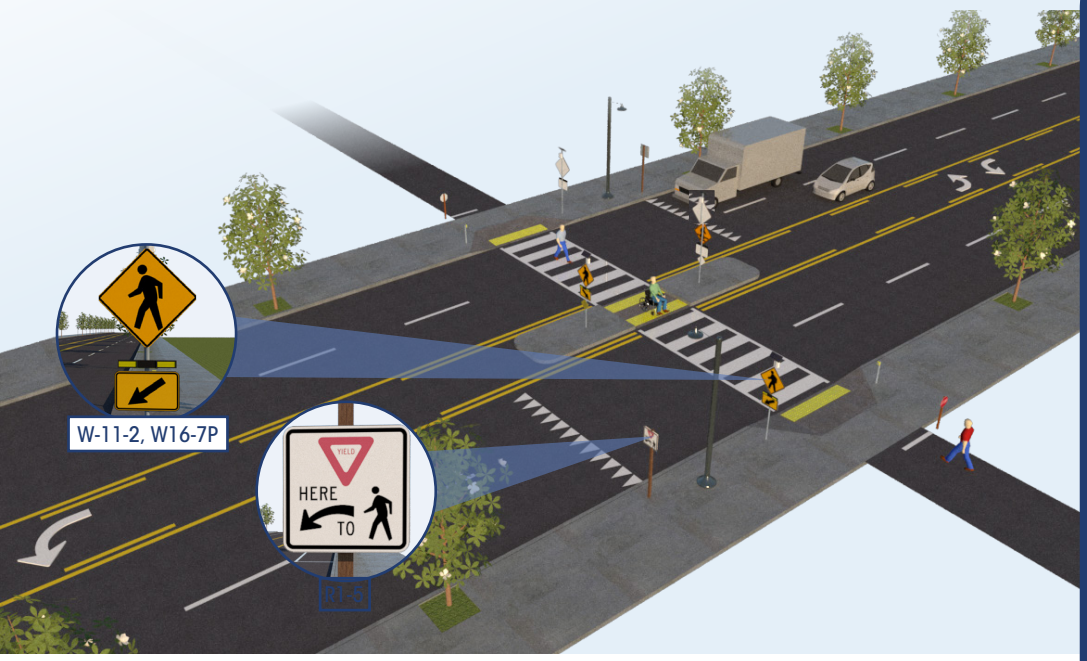
GRAPHIC SCALE

CONCEPTS E-1, M, N-1, N-2 & N-3

Rectangular Rapid-Flashing Beacon (RRFB)

SAFE TRANSPORTATION FOR EVERY PEDESTRIAN

COUNTERMEASURE TECH SHEET



RRFBs are pedestrian-actuated conspicuity enhancements used in combination with a pedestrian, school, or trail crossing warning sign to improve safety at uncontrolled, marked crosswalks. The device includes two rectangular-shaped yellow indications, each with an LED-array-based light source, that flash with high frequency when activated.

The RRFB is a treatment option at many types of established pedestrian crossings. Research indicates RRFBs can result in motorist yielding rates as high as 98 percent at marked crosswalks. However, yielding rates as low as 19 percent have also been noted. Compliance rates varied most per the city location, posted speed limit, crossing distance, and whether the road was one- or two-way. RRFBs are particularly effective at multilane crossings with speed limits less than 40 mph. Consider the Pedestrian Hybrid Beacon (PHB) instead for roadways with higher speeds. FHWA's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (HSA-17-072) provides specific conditions where practitioners should strongly consider the PHB instead of the RRFB.

Multiple lanes of traffic create challenges for pedestrians crossing at unsignalized locations.

RRFBs can make crosswalks and/or pedestrians more visible at a marked crosswalk.

RRFBs can reduce pedestrian crashes by **47%**

FEATURES:

- Enhanced warning improves motorist yielding

OFTEN USED WITH:

- Crosswalk visibility enhancements
- Pedestrian refuge island
- Advance STOP or YIELD markings and signs

U.S. Department of Transportation
Federal Highway Administration

Safe Roads for a Safer Future
Investment in roadway safety saves lives

EDC

June 2018, Updated | *FHWA-SA-18-065*

Rectangular Rapid-Flashing Beacon (RRFB)

EDC-4 STEP: https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/step.cfm

CONCEPTS E-1, M, N-1, N-2 & N-3

Princeton, NJ. Photo: VHB

CONSIDERATIONS

FHWA has issued interim approval for the use of the RRFB (IA-21). State and local agencies must request and receive permission to use this interim approval before they can use the RRFB. IA-21 does not provide guidance or criteria based on number of lanes, speed, or traffic volumes.

RRFBs are placed on both ends of a crosswalk. If the crosswalk contains a pedestrian refuge island or other type of median, an RRFB should be placed to the right of the crosswalk and on the median (instead of the left side of the crosswalk).

RRFBs typically draw power from standalone solar panel units, but may also be wired to a traditional power source. IA-21 provides conditions for the use of accessible pedestrian features with the RRFB assembly. When RRFBs are not in common use in a community, consider conducting an outreach effort to educate the public and law enforcement officers on their purpose and use.

COST

The cost associated with RRFB installation ranges from $4,500 to $52,000 each, with the average cost estimated at $22,250. These costs include the complete system installation with labor and materials.

References

MUTCD section 2B.12 In-Street and Overhead Pedestrian Crossing Signs (R1-6, R1-6a, R1-9, and R1-9a).

Fitzpatrick, K., M. Brewer, R. Avelar, and T. Lindheimer. "Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon." Report No. TTI-CTS-0010. Texas A&M Transportation Institute, College Station, Texas. June 2016. https://static.tti.tamu.edu/tti.tamu.edu/documents/TTI-CTS-0010.pdf

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CONCEPTS A-2, E-1, E-2, I, & N-3

OFFICE OF SAFETY
Proven Safety Countermeasures

Safety Benefits:

Median with Marked Crosswalk

46%

reduction in pedestrian crashes.[2]

Pedestrian Refuge Island

56%

reduction in pedestrian crashes.[2]

Medians and Pedestrian Refuge Islands in Urban and Suburban Areas

A **median** is the area between opposing lanes of traffic, excluding turn lanes. Medians in urban and suburban areas can be defined by pavement markings, raised medians, or islands to separate motorized and non-motorized road users.

A **pedestrian refuge island** (or crossing area) is a median with a refuge area that is intended to help protect pedestrians who are crossing a road.

Pedestrian crashes account for approximately 17 percent of all traffic fatalities annually, and 74 percent of these occur at non-intersection locations.[1] For pedestrians to safely cross a roadway, they must estimate vehicle speeds, determine acceptable gaps in traffic based on their walking speed, and predict vehicle paths. Installing a median or pedestrian refuge island can help improve safety by allowing pedestrians to cross one direction of traffic at a time.

Transportation agencies should consider medians or pedestrian refuge islands in curbed sections of urban and suburban multilane roadways, particularly in areas with a significant mix of pedestrian and vehicle traffic, traffic volumes over 9,000 vehicles per day, and travel speeds 35 mph or greater. Medians/refuge islands should be at least 4-ft wide, but preferably 8 ft for pedestrian comfort. Some example locations that may benefit from medians or pedestrian refuge islands include:

- Mid-block crossings.
- Approaches to multilane intersections.
- Areas near transit stops or other pedestrian-focused sites.

Example of a road with a median and pedestrian refuge islands. Source: City of Charlotte, NC

Median and pedestrian refuge island near a roundabout. Source: www.pedbikeimages.org / Dan Burden

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://highways.dot.gov/safety/proven-safety-countermeasures and https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-08/techSheetPedRefugeIsland2018.pdf.

1 National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration

2 (CMF ID: 175) Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, September 2008, Table 11.

FHWA-SA-21-044

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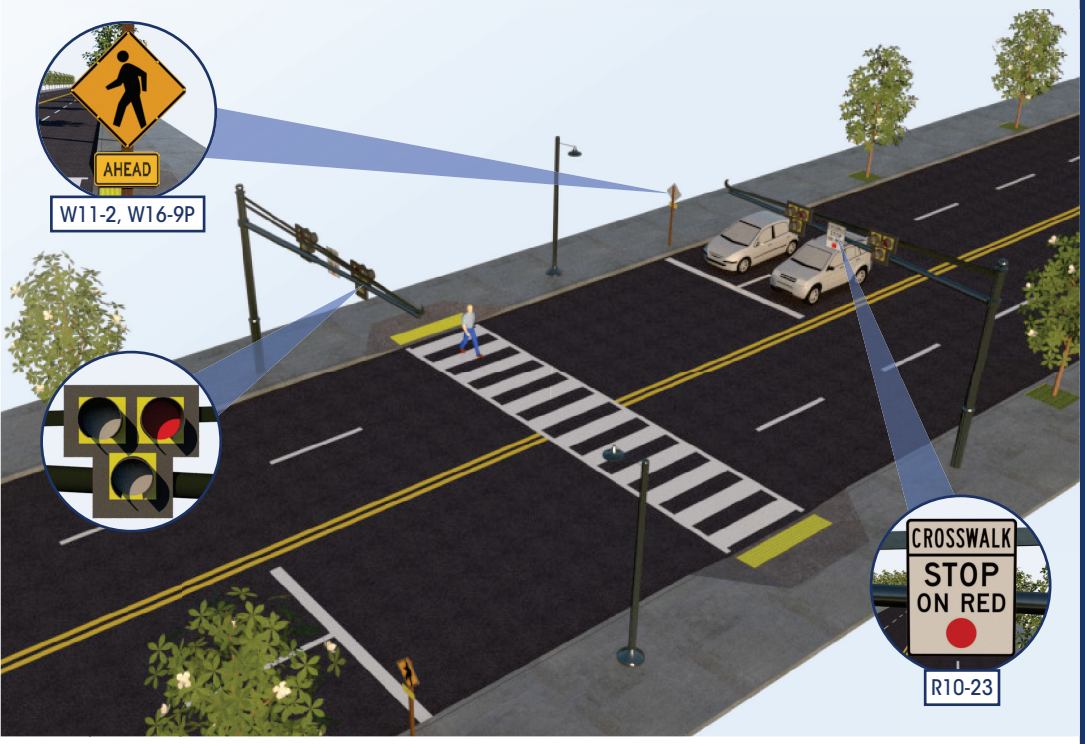
CONCEPT E-2

Pedestrian Hybrid Beacon (PHB)

SAFE TRANSPORTATION FOR EVERY PEDESTRIAN

COUNTERMEASURE TECH SHEET



A Pedestrian Hybrid Beacon head consists of two red lenses above a single yellow lens. Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection. When activated, the beacon displays a sequence of flashing and solid lights that indicate the pedestrian walk interval and when it is safe for drivers to proceed (see figure on back page).

The PHB is often considered for installation at locations where pedestrians need to cross and vehicle speeds or volumes are high, but traffic signal warrants are not met. These devices have been successfully used at school crossings, parks, senior centers, and other pedestrian crossings on multilane streets. PHBs are typically installed at the side of the road or on mast arms over midblock pedestrian crossings.

High speeds and multiple lanes of traffic create challenges for pedestrians crossing at unsignalized locations.

PHBs can warn and control traffic at unsignalized locations and assist pedestrians in crossing a street or highway at a marked crosswalk.

PHBs can reduce pedestrian crashes by **55%**

FEATURES:

- Beacons stop all lanes of traffic, which can reduce pedestrian crashes.

OFTEN USED WITH:

- High-visibility crosswalk markings
- Raised islands
- Advance STOP or YIELD signs and markings

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Safe Roads for a Safer Future
Investment in roadway safety saves lives

EDC

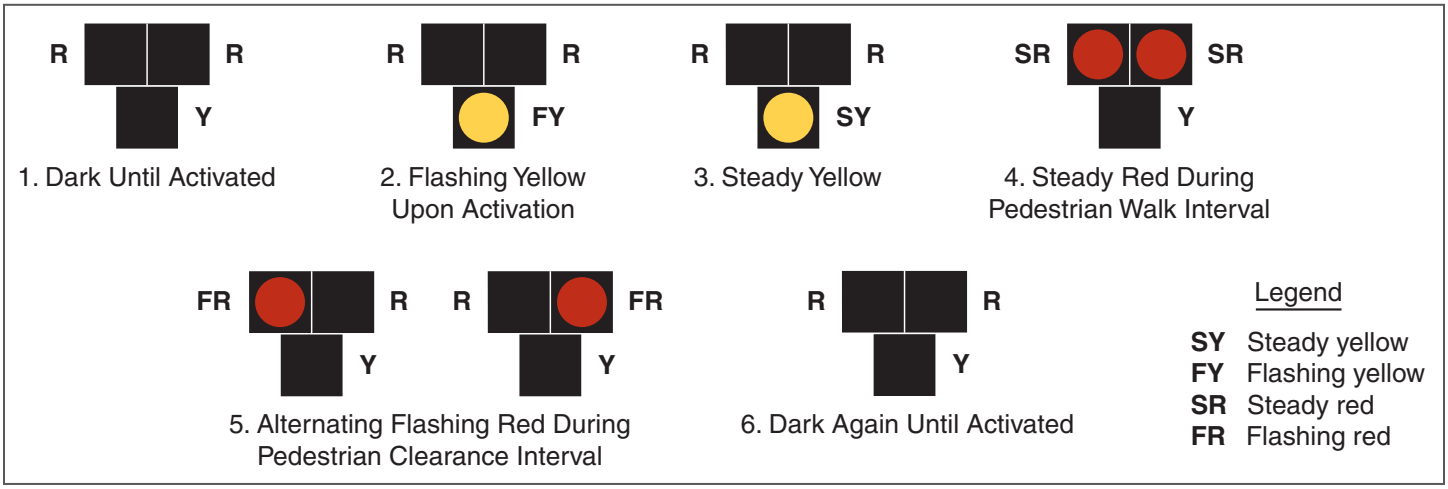
June 2018, Updated | *FHWA-SA-18-064*

CONCEPT E-2

Pedestrian Hybrid Beacon (PHB)

EDC-4 STEP: https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/step.cfm

Figure 4F-3. Sequence for a Pedestrian Hybrid Beacon from FHWA's *Manual on Uniform Traffic Control Devices*, 2009 Edition, p. 511



When a pedestrian activates a PHB, a flashing yellow light is followed by a solid yellow light, alerting drivers to slow. A solid red light requires drivers to stop while pedestrians have the right-of-way to cross the street. When the pedestrian signals display a flashing DON'T WALK indication, the overhead beacon flashes red, and drivers may proceed if the crosswalk is clear.

CONSIDERATIONS

PHBs are a candidate treatment for roads with three or more lanes that generally have annual average daily traffic (AADT) above 9,000. PHBs should be strongly considered for all midblock and intersection crossings where the roadway speed limits are equal to or greater than 40 miles per hour (mph). The PHB should meet the application guidelines provided in the Manual on Uniform Traffic Control Devices for existing or projected pedestrian volumes.

PHBs are intended for installation at midblock locations, but can be installed at intersections. They should only be installed in conjunction with marked crosswalks and pedestrian countdown signals.

When PHBs are not in common use in a community, consider conducting an outreach effort to educate the public and law enforcement officers on the PHBs' purpose and use.

COST

The PHB is often less expensive than a full traffic signal installation. The costs range from $21,000 to $128,000, with an average per unit cost of $57,680.

References

Zegeer, C., R. Srinivasan, B. Lan, D. Carter, S. Smith, C. Sundstrom, N.J. Thirsk, J. Zegeer, C. Lyon, E. Ferguson, and R. Van Houten. (2017). NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments. Transportation Research Board, Washington, D.C.

Federal Highway Administration. (2013). "Pedestrian Hybrid Beacon" in PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System. Available: http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=53

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CONCEPT H & P

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Proven Safety Countermeasures

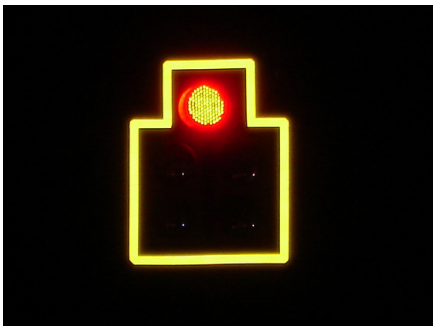
Backplates with Retroreflective Borders

Backplates added to a traffic signal head improve the visibility of the illuminated face of the signal by introducing a controlled-contrast background. The improved visibility of a signal head with a backplate is made even more conspicuous by framing it with a 1- to 3-inch yellow retroreflective border. Signal heads that have backplates equipped with retroreflective borders are more visible and conspicuous in both daytime and nighttime conditions.

Safety Benefits:

15%
reduction in total crashes.[1]

This treatment is recognized as a human factors enhancement of traffic signal visibility, conspicuity, and orientation for both older and color vision deficient drivers. This countermeasure is also advantageous during periods of power outages when the signals would otherwise be dark, providing a visible cue for motorists to stop at the intersection ahead.



Retroreflective borders are highly visible during the night. Source: South Carolina DOT

Considerations

Transportation agencies should consider backplates with retroreflective borders as part of their efforts to systematically improve safety performance at signalized intersections. Adding a retroreflective border to an existing signal backplate is a very low-cost safety treatment. This can be done by either adding retroreflective tape to an existing backplate or purchasing a new backplate with a retroreflective border already incorporated. The most efficient means of implementing this proven safety countermeasure is to adopt it as a standard treatment for signalized intersections across a jurisdiction or State.

Implementation challenges include minimizing installation time, accessing existing signal heads, and structural limitations due to added wind load in instances where an entire backplate is added. Agencies should consider the design of the existing signal support structure to determine if the design is sufficient to support the added wind load.

Signal backplate framed with a retroreflective border. Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://highways.dot.gov/safety/proven-safety-countermeasures and https://rosap.ntl.bts.gov/view/dot/42807.

1 (CMF ID: 1410) Sayed, T., Leur, P., and Pump, J., "Safety Impact of Increased Traffic Signal Backboards Conspicuity." 2005 TRB 84th Annual Meeting: Compendium of Papers CD-ROM, Vol. TRB#05-16, Washington, D.C., (2005).

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CONCEPT H & P

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Proven Safety Countermeasures

Safety Benefits:

13%

reduction in pedestrian-vehicle crashes at intersections.[1]

Leading Pedestrian Interval

A leading pedestrian interval (LPI) gives pedestrians the opportunity to enter the crosswalk at an intersection 3-7 seconds before vehicles are given a green indication. Pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn right or left.

LPIs provide the following benefits:

- Increased visibility of crossing pedestrians.
- Reduced conflicts between pedestrians and vehicles.
- Increased likelihood of motorists yielding to pedestrians.
- Enhanced safety for pedestrians who may be slower to start into the intersection.

FHWA's Handbook for ***Designing Roadways for the Aging Population*** recommends the use of the LPI at intersections with high turning vehicle volumes. Transportation agencies should refer to the ***Manual on Uniform Traffic Control Devices*** for guidance on LPI timing and ensure that pedestrian signals are accessible for all users. Costs for implementing LPIs are very low when only signal timing alteration is required.

An LPI allows a pedestrian to establish a presence in the crosswalk before vehicles are given a green indication. Source: FHWA

LPIs reduce potential conflicts between pedestrians and turning vehicles. Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://highways.dot.gov/safety/proven-safety-countermeasures and https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/fhwasa19040.pdf.

1 (CMF ID: 9918) Goughnour, E., D. Carter, C. Lyon, B. Persaud, B. Lan, P. Chun, I. Hamilton, and K. Signor. "Safety Evaluation of Protected Left-Turn Phasing and Leading Pedestrian Intervals on Pedestrian Safety." Report No. FHWA-HRT-18-044. Federal Highway Administration. (October 2018)

FHWA-SA-21-032

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CONCEPT K-1

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Safety Benefits:

10%
reduction of fatal and injury crashes at all locations/types/areas.

15%
reduction of nighttime crashes at all locations/types/areas.

27%
reduction of fatal and injury crashes at rural intersections.

19%
reduction of fatal and injury crashes at 2-lane by 2-lane intersections.

Average Benefit-Cost Ratio

12:1

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://highways.dot.gov/safety/proven-safety-countermeasures and https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/fhwasa18047.pdf.

FHWA-SA-21-031

Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections

This systemic approach to intersection safety involves deploying a package of multiple low-cost countermeasures, including enhanced signing and pavement markings, at a large number of stop-controlled intersections within a jurisdiction. These countermeasures increase driver awareness and recognition of the intersections and potential conflicts.

There are several benefits to systemically applying multiple low-cost countermeasures at stop-controlled intersections, including,

- Resources are maximized because the treatments are low cost.
- A high number of intersections can receive treatment.
- Improvements are highly cost-effective, with an average benefit-cost ratio of 12:1, even assuming a conservative 3-year service life.

Example of countermeasures on the through approach.
Source: South Carolina DOT

Example of countermeasures on the stop approach.
Source: South Carolina DOT

The low-cost countermeasures for stop-controlled intersections generally consist of the following treatments:

On the Through Approach

- Doubled-up (left and right), oversized advance intersection warning signs, with supplemental street name plaques (can also include flashing beacon).
- Retroreflective sheeting on sign posts.
- Enhanced pavement markings that delineate through lane edge lines.

On the Stop Approach

- Doubled-up (left and right), oversized advance "Stop Ahead" intersection warning signs (can also include flashing beacon).
- Doubled-up (left and right), oversized Stop signs.
- Retroreflective sheeting on sign posts.
- Properly placed stop bar.
- Removal of vegetation, parking, or obstructions that limit sight distance.
- Double arrow warning sign at stem of T-intersections.

Source: (CMF ID: 8867, 8870, 8874, 8893) T. Le et al. "Safety Effects of Low-Cost Systemic Safety Improvements at Signalized and Stop-Controlled Intersections," 96th Annual Meeting of the Transportation Research Board, Paper Number 17-05379, January 2017.

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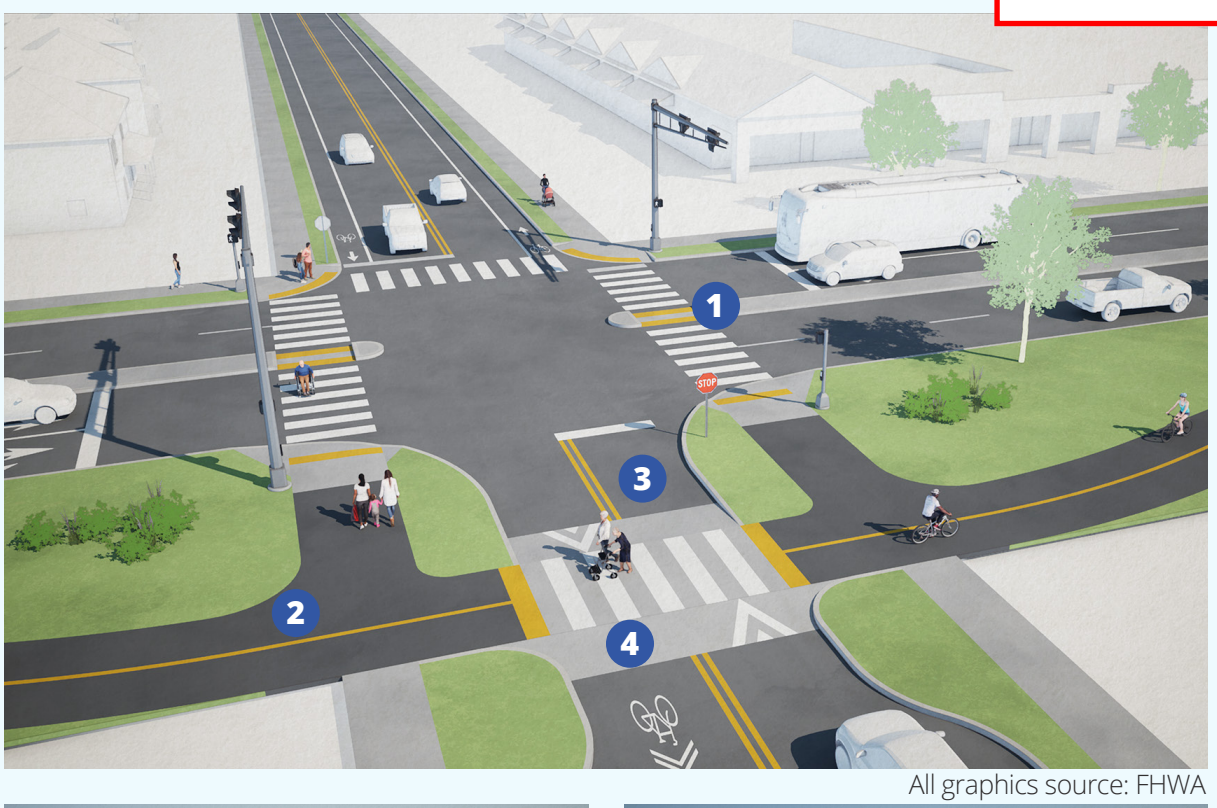
CONCEPT K-2

Stop-Controlled Intersections

Stop-controlled intersections include any conventional intersection where one or more approaches are controlled by a STOP sign. However, there are significant differences between intersections with multi-way stop control (typically all-way stop, or AWS) and minor road stop (MRS) control.



All graphics source: FHWA

Design Features

- Various countermeasures can be used to make pedestrians and bicyclists more visible and support improved driver awareness and yielding
- Countermeasures that should be implemented as often as possible include high-visibility crosswalks, effective intersection lighting, wide refuge islands, raised crosswalks (for MRS intersections) or tabled intersections (for AWS intersections).
- Stop-controlled intersections that involve more complex lane arrangements should be evaluated for treatments such as Rectangular Rapid Flashing Beacons (RRFBs) or Pedestrian Hybrid Beacons (PHBs) as appropriate.
- Install overhead lighting to illuminate bikeway and pathway networks and in advance of all intersection crossings.

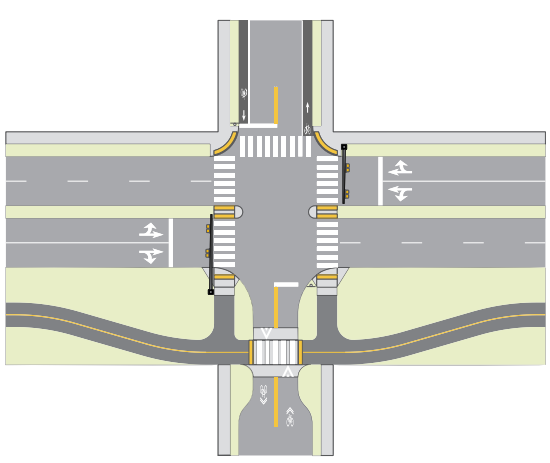
Benefits

- Generally, stop-controlled intersections tend to have smaller footprints, leading to shorter crossing distances for pedestrians and bicyclists (though additional through lanes or turn lanes add complexity to the intersection).
- Stop-controlled intersections, especially AWS intersections, can encourage mutual visibility among pedestrians, bicyclists, and drivers.

Intersection Types

MINOR ROAD STOP (MRS)

Minor road stop (MRS) intersections feature stop signs controlling the minor road approach(es) while the major road approaches are uncontrolled.

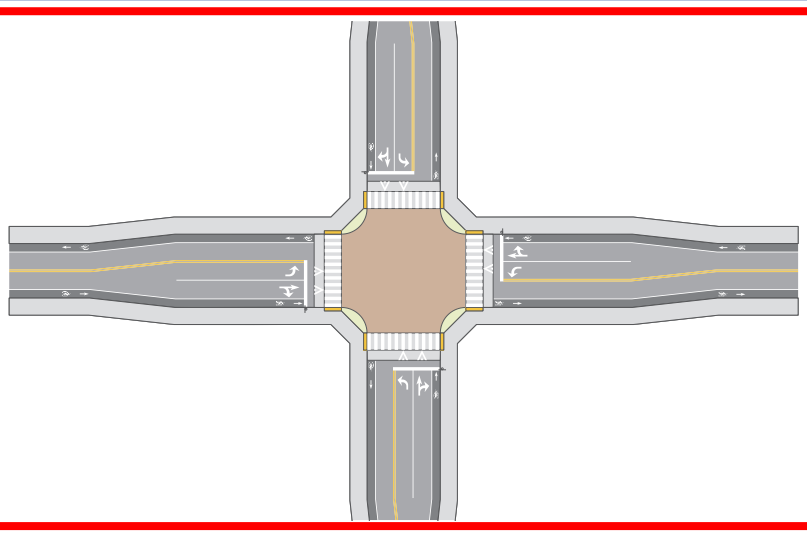


CONSIDERATIONS

- Crossing the uncontrolled approaches of a MRS intersection involves a higher risk to pedestrians and bicyclists because of the free-flow and higher-speed traffic conditions.
- Opportunities to cross may be less frequent due to the need to wait for a gap in major road traffic.
- Multi-lane uncontrolled pedestrian crossings should include additional countermeasures such as PHBs (shown) or RRFBs.
- A recessed crossing of approximately one car length provides space for drivers to yield to sidepath users and conflicting traffic as discrete events.

ALL WAY STOP (AWS)

All-way stop (AWS) intersections feature STOP signs controlling all approaches.



CONSIDERATIONS

- Because stopping is mandatory for all movements, vehicle speeds at AWS intersections are typically lower and crossing opportunities for pedestrians and bicyclists should be frequent.
- Raised intersections provide sidewalk-level crossings at each leg of an intersection. They encourage drivers to yield and provide pedestrians and bicyclists with a continuous accessible path of travel without grade changes.

References

FHWA (2021). Stop-Controlled Intersections. Federal Highway Administration, Washington, DC. Retrieved from https://safety.fhwa.dot.gov/intersection/stop/index.cfm.

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For more information refer to *Improving Intersections for Pedestrians and Bicyclists Informational Guide* [FHWA-SA-22-017].

Figure 5-29
Roadway Alternative A

BRADLEY INTERNATIONAL

MASTER PLAN UPDATE

GRAPHIC SCALE (FEET)

0 150 300

Figure 5-30
Roadway Alternative B

CONCEPT S

LOT	SPACES
Premium	824
Remote	753
Overflow	1,914
TOTAL	3,491
(Minus 77 Accessible Parking Allowance)	3,421
Cell Phone	80

BRADLEY INTERNATIONAL
MASTER PLAN UPDATE

GRAPHIC SCALE (FEET)
0 50 100 200

LEGEND

- Shuttle Bus Stop
- Walkway
- Elevated Walkway
- Landscape

Truck Route
Elevated Moving Walkway to Terminal
Premium Parking
Oversize Vehicle Parking
Runway 33 RPZ
Bus Cue
Limo Cue
Remote Parking
Overflow Parking
Gas Station and Mini-Mart
Cell Phone Lot
Rideshare Cue
Taxi Cue

Figure 5-31
Remote Parking Plan

CONCEPT S

LOT	SPACES
Premium	851
Remote	753
Overflow	2,294
TOTAL	3,898
(Minus 78 Accessible Parking Allowance)	3,820
Cell Phone	80

Elevated Moving Walkway to Terminal

Truck Route

Premium Parking

Oversize Vehicle Parking

Runway 33 RPZ

Remote Parking

Overflow Parking

Cell Phone Lot

BRADLEY INTERNATIONAL

MASTER PLAN UPDATE

N

GRAPHIC SCALE (FEET)

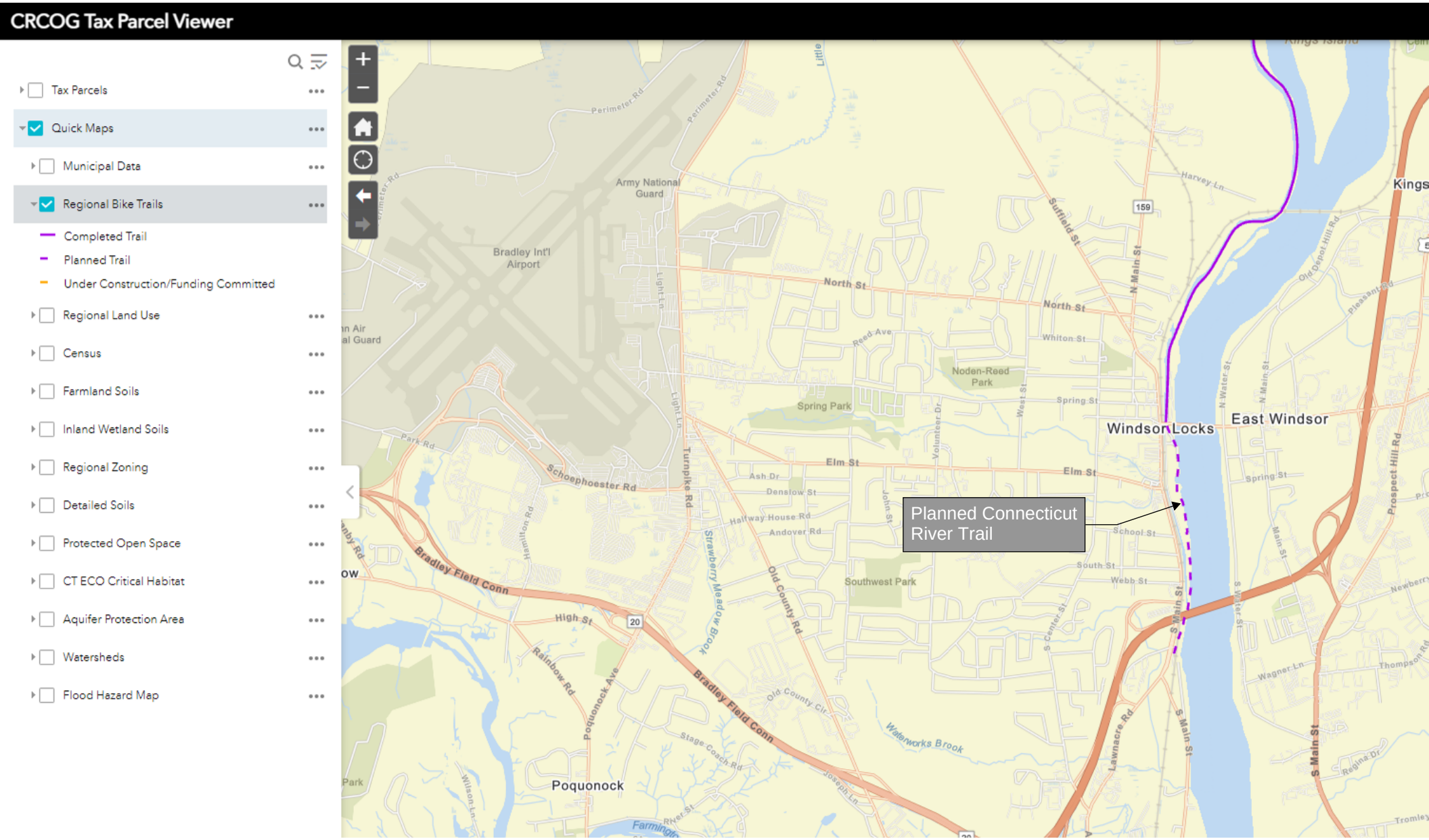
0 50 100 200

LEGEND

- Shuttle Bus Stop
- Walkway
- Elevated Walkway
- Landscape

Figure 5-32
Alternate
Remote Parking Plan

CONCEPT W-1



CRCOG GIS: https://crcog.maps.arcgis.com/apps/webappviewer/index.html?id=ed798533e6fd4304b2bef1f28e95c06f

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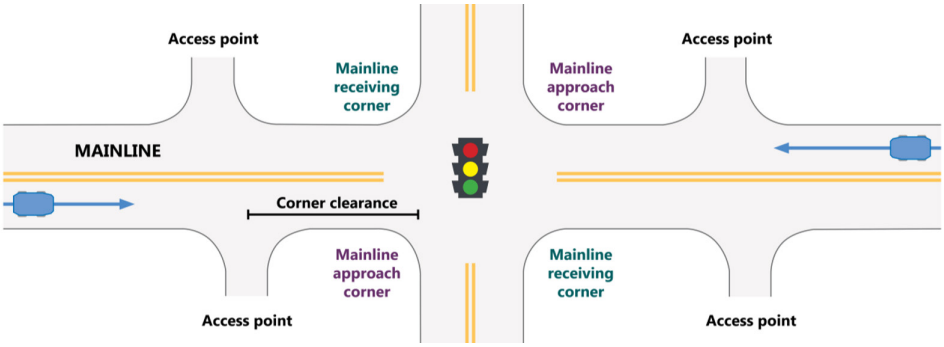
CONCEPT AM

Corridor Access Management

Access management refers to the design, application, and control of entry and exit points along a roadway. This includes intersections with other roads and driveways that serve adjacent properties. Thoughtful access management along a corridor can simultaneously enhance safety for all modes, facilitate walking and biking, and reduce trip delay and congestion.



Schematic of an intersection and adjacent access points. Source: FHWA

Safety Benefits:

Reducing driveway density

5-23%
reduction in total crashes along 2-lane rural roads.[3]

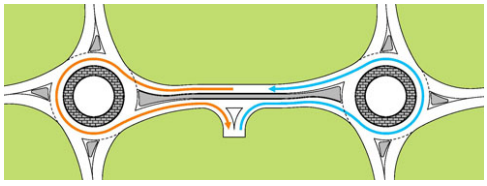
25-31%
reduction in fatal and injury crashes along urban/ suburban arterials.[4]

Every intersection, from a signalized intersection to an unpaved driveway, has the potential for conflicts between vehicles, pedestrians, and bicyclists. The number and types of conflict points—locations where the travel paths of two users intersect—influence the safety performance of the intersection or driveway. FHWA developed corridor-level crash prediction models to estimate and analyze the safety effects of selected access management techniques for different area types, land uses, roadway variables, and traffic volumes.[1]

The following access management strategies can be used individually or in combination with one another:

- Reduce density through driveway closure, consolidation, or relocation.
- Manage spacing of intersection and access points.
- Limit allowable movements at driveways (such as right-in/ right-out only).
- Place driveways on an intersection approach corner rather than a receiving corner, which is expected to have fewer total crashes.[2]
- Implement raised medians that preclude across-roadway movements.
- Utilize designs such as roundabouts or reduced left-turn conflicts (such as restricted crossing U-turn, median U-turns, etc.).
- Provide turn lanes (i.e., left-only, right-only, or interior two-way left).
- Use lower speed one-way or two-way off-arterial circulation roads.

Successful corridor access management involves balancing overall safety and mobility for all users along with the needs of adjacent land uses.



Tandem roundabouts with a continuous raised median eliminates left-turn and across-roadway conflicts. Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/intersection/cam/index.cfm.

1 Gross et al. Safety Evaluation of Access Management Policies and Techniques. FHWA-HRT-14-057, (2018).
2 Le et al. Safety Evaluation of Corner Clearance at Signalized Intersections. FHWA-HRT-17-084, (2018).
3 Harwood et al. Prediction of the Expected Safety Performance of Rural Two-Lane Highways. FHWA-RD-99-207, (2000).
4 Elvik, R. and Vaa, T., Handbook of Road Safety Measures. Oxford, United Kingdom, Elsevier, (2004).

FHWA-SA-21-040