APPENDIX A

GUARDRAIL USE GUIDELINES FOR BENEFIT/COST = 2

Table A1: Guardrail Use Guidelines for Freeway, Benefit-Cost Greater Than 2

110 01								
	e Hazard			Ran	ge of Traffic \	olumes Wher	e Barrier is Op	timal
Hazard Offset	Curvature	Grade %	Offset to Slope	No Treatment	TL-2	TL-3	TL-4	TL-5
7	0	0	8				10-46	46-100
7	0	-2	8				10-37	37-100
7	2L	0	8				10-37	37-100
7	2L	-2	8				10-37	37-100
12	0	0	8				10-19	19-100
12	0	0	12				10-28	28-100
12	0	-2	8				10-19	19-100
12	0	-2	12				10-28	28-100
12	2L	0	8				10-19	19-100
12	2L	0	12				10-19	19-100
12	2L	-2	8		,		10-28	28-100
12	2L	-2	12				10-28	28-100
18	0	0	8				10-28	28-100
18	0	0	12				10-28	28-100
18	0	0	20				10-28	28-100
18	0	-2	8				10-28	28-100
18	0	-2	12				10-28	28-100
18	0	-2	20				10-28	28-100
18	2L	0	8				10-28	28-100
18	2L	0	12				10-28	28-100
18	2L	0	20				10-28	28-100
18	2L	-2	8				10-28	28-100
18	2L	-2	12				10-28	28-100
18	2L	-2	20				10-28	28-100
26	0	0	8		8	10-19	19-28	28-100
26	0	0	12			10-19	19-28	28-100
26	0	0	20				10-37	37-100
26	0	-2	8		ž L	10-19	19-28	28-100
26	0	-2	12			10-19	19-28	28-100
26	0	-2	20			10-19	19-28	28-100
26	2L	0	8			10-28		28-100
26	2L	0	12			10-19	19-28	28-100
26	2L	0	20			10-19	19-37	37-100
26	2L	-2	8			10-28		28-100
26	2L	-2	12			10-19	19-28	28-100
26	2L	-2	20			10-19	19-37	37-100
32	0	0	8			10-28		28-100
32	0	0	12			10-28	28-37	37-100
32	0	0	20			10-19	19-37	37-100
32	0	-2	8			10-28	28-37	37-100
32	0	-2	12			10-28		28-100
32	0	-2	20			10-19	19-37	37-100
32	2L	0	8			10-37		37-100
32	2L	0	12			10-37		37-100
32	2L	0	20			10-28	28-37	37-100
32	2L	-2	8			10-37		37-100
32	2L	-2	12			10-37		37-100
32	2L	-2	20			10-28	28-37	37-100

Note: 2L means 2 degrees of curvature to the left

Table A2: Guardrail Use Guidelines for Freeway, Benefit-Cost Greater Than 2

Moderately	Severe Haz	ard	W	Rang	e of Traffic	C Volumes Whe	ere Barrier is	Optimal
Hazard			Offset to	No				
Offset	Curvature	Grade %	Slope	Treatment	TL-2	TL-3	TL-4	TL-5
7	0	0	8			10-19	19-28	28-100
7	0	-2	8			10-19	19-28	28-100
7	2L	0	8			10-19	19-28	28-100
7	2L	-2	8			10-28	10 20	28-100
12	0	0	8			10-28		28-100
12	Ö	Ō	12			10-28		28-100
12	Ō	-2	8	1		10-19	19-28	28-100
12	0	-2	12			10-19	19-28	28-100
12	2L	0	8			10-28		28-100
12	2L	0	12			10-28		28-100
12	2L	-2	8			10-37		37-100
12	2L	-2	12			10-37		37-100
18	0	0	8			10-37		37-100
18	0	0	12			10-37		37-100
18	0	0	20			10-28	28-37	37-100
18	0	-2	8			10-37		37-100
18	0	-2	12			10-37		37-100
18	0	-2	20			10-37		37-100
18	2L	0	8			10-37		37-100
18	2L	0	12			10-46		46-100
18	2L	0	20			10-28	28-37	37-100
18	2L	-2	8			10-37		37-100
18	2L	-2	12			10-37		37-100
18	2L	-2	20			10-37		37-100
26	0	0	8			10-64		64-100
26	0	0	12			10-55		55-100
26	0	0	20			10-46		46-100
26	0	-2	8			10-55		55-100
26	0	-2	12			10-55		55-100
26	0	-2	20			10-46		46-100
26	2L	0	8			10-37, 55-64		37-55, 64-100
26	2L	0	12			10-55, 73-82		55-73, 82-100
26	2L	0	20			10-46		46-100
26	2L	-2	8	2 1		10-73		73-100
26	2L	-2	12			10-64		64-100
26	2L	-2	20			10-46		46-100
32	0	0	8			10-73		73-100
32	0	0	12			10-64		64-100
32	0	0	20			10-55		55-100
32	0	-2	8			10-73		73-100
32	0	-2	12			10-64		64-100
32	0	-2	20			10-55		55-100
32	2L	0	8			10-64, 82-91		64-82, 91-100
32	2L	0	12			10-64		64-100
32	2L	0	20			10-64		64-100
32	2L	-2	8			10-91		91-100
32 32	2L 2L	-2 -2	12 20			10-82		82-100
32		-2	20			10-55		55-100

Table A3: Guardrail Use Guidelines for Freeway, Benefit-Cost Greater Than 2

Moderate \$	Slope Hazaro	d		Range	of Traffic Volu	mes Where	Barrier is O	otimal
Hazard	Curvature	Grade %	Offset to	No	TL-2	TL-3	TL-4	TL-5
Offset	Curvature	Grade %	Slope	Treatment	IL-Z	IL-3	1L-4	IL-5
7	0	0	8		10-100			
7	0	-2	8		10-100			
7	2L	0	8		10-100			
7	2L	-2	8		10-100			
12	0	0	8		10-100			
12	0	0	12		10-100			
12	0	-2	8		10-100			
12	0	-2	12		10-100			
12	2L	0	8		10-100			
12	2L	0	12		10-100			
12	2L	-2	8		10-100	7		
12	2L	-2	12		10-100			
18	0	0	8		10-100			
18	0	0	12		10-100			
18	0	0	20		10-100			
18	0	-2	8		10-100			
18	0	-2	12		10-100			
18	0	-2	20		10-100			
18	2L	0	8		10-100			
18	2L	0	12		10-100			
18	2L	0	20		10-100			
18	2L	-2	8		10-100			
18	2L	-2	12		10-100			
18	2L	-2	20		10-100			
26	0	0	8		10-100			
26	0	0	12		10-100			
26	0	0	20		10-100			
26	0	-2	8		10-100			
26	0	-2	12		10-100			
26	0	-2	20		10-100			
26	2L	0	8		10-100			
26	2L	0	12		10-100			
26	2L	0	20		10-100			
26	2L	-2	8		10-100			
26	2L	-2	12		10-100			
26	2L	-2	20		10-100	9		
32	0	0	8		10-100			
32	0	0	12		10-100			
32	0	0	20		10-100			
32	0	-2	8		10-100			
32	0	-2	12		10-100			
32	0	-2	20		10-100			
32	2L	0	8		10-100			
32	2L	0	12		10-100			
32	2L	0	20		10-100			
32	2L	-2	8		10-100			
32	2L	-2	12		10-100			
32	2L	-2	20		10-100			

Table A4: Guardrail Use Guidelines for Freeway, Benefit-Cost Greater Than 2

Severe P	oint Hazard		able A4: Guard	Range of Traffic Volumes Where Barrier is Optimal						
Hazard	Curvature	Grade	Offset to	No Treatment	TL-2	TL-3	TL-4	TL-5		
Offset 7	0	% 0	Slope 8			10-73, 91-100	73-91			
- /-	0	0	12			28-64, 82-91	10-28, 64-82			
- 7	Ö	0	20			10-100	10 20, 04 02			
7	Ō	-2	8			10-64, 82-100		64-82		
7	0	-2	12			10-55, 73-100	55-73			
7	0	-2	20			10-82	82-100			
7	2L	0	8			10-100				
7	2L	0	12			10-100				
7	2L	0	20			10-100				
7	2L	-2	8			10-64, 82-100	64-82			
7	2L	-2 -2	12 20			10-100				
12	2L 0	0	8			10-100	10-28	28-100		
12	0	0	12			10-100	10-20	20-100		
12	ŏ	0	20			10-100				
12	ŏ	-2	8			10 100	10-28	28-100		
12	Ö	-2	12			10-100				
12	0	-2	20			10-100				
12	2L	0	8			10-100				
12	2L	0	12			10-100				
12	2L	0	20			10-100				
12	2L	-2	8			10-100				
12	2L	-2	12			10-91		91-100		
12	2L	-2	20			28-91	10-28	91-100		
18 18	0	0	8 12			10-19	19-28, 55-100	28-55		
18	0	0	20			10-100	10-19, 82-100	28-73		
18	0	-2	8			10-37, 73-82	82-100	37-73		
18	0	-2	12			10-37, 73-02	10-28, 91-100	28-91		
18	ŏ	-2	20			10-100	10-20, 31-100	20-31		
18	2L	0	8		10-28	28-100				
18	2L	0	12			10-100				
18	2L	0	20			10-100				
18	2L	-2	8		10-19	19-100				
18	2L	-2	12		10-28	28-100				
18	2L	-2	20		10-19	19-100				
26	0	0	8 12		10-19	19-100		55.04		
26 26	0	0	20		10-28	28-55, 91-100		55-91		
26	0	-2	20 8			10-100 10-100				
26	0	-2	12		10-19	19-100				
26	0	-2	20		10-13	10-100				
26	ŽL	0	8	10-100		.5 100				
26	2L	0	12	10-37, 55-64	37-55, 91-100	64-91				
26	2L	0	20	,	10-28	28-100				
26	2L	-2	8	10-55, 73-91	55-73, 91-100					
26	2L	-2	12	10-37, 64-73	37-64, 91-100	73-91				
26	2L	-2	20		10-73	73-100				
32	0	0	8	10-19, 73-100	19-28, 46-55	28-64				
32	0	0	12		10-19	19-100	70.04			
32 32	0	0 -2	20 8	10.10, 46.70	10-19	28-73, 91-100	73-91			
32	0	-2	12	10-19, 46-73	19-28 10-37	28-46, 73-100				
32	0	- <u>2</u> -2	20		10-37	37-100 28-100				
32	2L	0	8	10-100	10-20	20-100				
32	2L	0	12	10-100						
32	2L	0	20	10-46, 64-82	46-64, 82-100					
32	2L	-2	8	10-100	10 0 1, 02 100					
32	2L	-2	12	10-100						
32	2L	-2	20	10-37, 55-73	37-55, 91-100	73-91				

Table A5: Guardrail Use Guidelines for Freeway, Benefit-Cost Greater Than 2

Moderate	ly Severe P	oint Haza		o. Guardian Ose Guit		Benefit-Cost Greater ffic Volumes Where Bar		
Hazard		Grade	Offset to					
Offset	Curvature	%	Slope	No Treatment	TL-2	TL-3	TL-4	TL-5
7	0	0	8			10-100		
7	ŏ	ŏ	12			10-100		
7	Ö	ō	20			10-73, 91-100		73-91
7	0	-2	8			10-100		
7	0	-2	12			10-100		
7	0	-2	20			10-100		
7	2L	0	8			10-100		
7	2L	0	12			10-100		
7	2L	0	20			10-100		
7	2L 2L	-2 -2	8 12			10-100		
7	2L 2L	- <u>-</u> 2	20			10-100		
12	0	0	8			10-100 10-64, 82-100		64-82
12	0	0	12			10-64, 62-100		04-02
12	0	0	20			10-100		
12	Ö	-2	8			10-100		
12	ŏ	-2	12			10-100		
12	Ö	-2	20			10-100		
12	2L	0	8			10-100		
12	2L	0	12			10-100		
12	2L	0	20			10-100		
12	2L	-2	8		10-19	19-100		
12	2L	-2	12			10-100		
12	2L	-2	20			10-100		
18	0	0	8				10-46, 73-100	46-73
18	0	0	12			10-100		
18 18	0	-2	20 8			10-100	10-28, 64-100	28-64
18	0	-2	12			10-100	10-20, 64-100	20-64
18	0	-2	20			10-100		
18	ŽL	0	8	46-55	10-28	28-46, 55-100		
18	2L	ō	12	10 00	28-37	10-28, 37-100		
18	2L	0	20		28-37	10-28, 37-100		
18	2L	-2	8	10-28, 46-55	55-64	28-46, 64-100		
18	2L	-2	12	7	10-19	19-100		
18	2L	-2	20			10-100		
26	0	0	8		10-28	28-100		
26	0	0	12		10-19	19-46, 64-100		46-64
26	0	-2	20		10-19	19-100		
26 26	0	- <u>-</u> 2	8 12			10-100 10-100		
26	0	-2	20		10-19	19-100		
26	2L	0	8	10-82	82-100	19-100		
26	2L	ő	12	10-73, 91-100	02-100	73-91		
26	2L	ő	20	, 01 100	10-64	64-100		
26	2L	-2	8	10-100				
26	2L	-2	12	10-100				
26	2L	-2	20	10-37, 91-100	37-91			
32	0	0	8	10-28, 46-100		28-46		
32	0	0	12		10-37	37-100		
32	0	0	20	40.40.01.100	10-19	19-55, 73-100		55-73
32 32	0	-2 -2	8 12	10-46, 64-100	10.00.07.55	46-64		
32	0	-2 -2	20	28-37	10-28, 37-55 10-73	55-100 91-100		73-91
32	2L	- <u>-</u> 2	8	10-100	10-73	91-100		13-81
32	2L	0	12	10-100		 		
32	2L	0	20	10-100		 		
32	2L	-2	8	10-100				
32	2L	-2	12	10-100				
32	2L	-2	20	10-100				
				10 100	L	1		

Table A6: Guardrail Use Guidelines for Freeway, Benefit-Cost Greater Than 2

Moderate	Point Haza					umes Where Barrier is Optim	al	
Hazard	Curvature	Grade	Offset to	No Treatment	TL-2	TL-3	TL-4	TL-5
Offset	Curvature	%	Slope	No Treatment	IL-2	1L-3	IL-4	IL-5
7	0	0	8			10-100		
7	0	0	12			10-100		
7	0	0	20			10-100		
7	0	-2	8			10-100		
7	0	-2	12			10-100		
7	0	-2	20	10.07.55.01		10-100		
7	2L	0	8	10-37, 55-64		37-55, 64-100		
7	2L	0	12	10-28, 46-64, 100	10.10	28-46, 64-100		
7	2L 2L	-2	20 8	19-37, 91-100	10-19	37-91		
7	2L	-2	12	10-46, 91-100 28-46, 64-82		46-91	-	
 '7	2L	-2	20	10-28, 46-64, 82-100		10-28, 46-64, 82-100 28-46, 64-82		
12	0	0	8	10-28, 46-64, 82-100		10-100	+	
12	0	0	12			10-100		
12	Ö	0	20			10-100	+	
12	0	-2	8			10-100	t	
12	ŏ	-2	12			10-100		
12	0	-2	20			10-100		
12	2L	0	8	10-64, 82-100	64-82	, 00	1	
12	2L	0	12	10-73		73-100		
12	2L	0	20	10-28, 46-91	28-46, 91-100			
12	2L	-2	8	10-100				
12	2L	-2	12	28-37, 73-82, 100	10-28	37-73, 82-100		
12	2L	-2	20	28-46, 64-82	10-28	46-64, 82-100		
18	0	0	8	10-19, 37-46		19-37, 46-100		
18	0	0	12		10-28	28-100		
18	0	0	20			10-100		
18	0	-2	8	10-19, 37-64, 91-100		19-37, 64-91		
18	0	-2	12		10-28	28-100		
18	0 2L	-2 0	20 8	10.100	10-19	19-100		
18 18	2L	0	12	10-100				
18	2L	0	20	10-100 10-100				
18	2L	-2	8	10-100			-	
18	2L	-2	12	10-100				
18	2L	-2	20	10-64, 82-100	64-82			
26	0	0	8	10-100	0102			
26	0	0	12	10-100				
26	0	0	20	10-100				
26	0	-2	8	10-100				
26	0	-2	12	10-100				
26	0	-2	20		10-28	28-100		
26	2L	0	8	10-100				
26	2L	0	12	10-100				
26	2L	0	20	10-100				
26 26	2L 2L	-2 -2	8 12	10-100				
26	2L 2L	-2 -2	20	10-100				
32	0 0	0	8	10-100				
32	0	0	12	10-100 10-100			+	
32	0	0	20	10-100	91-100		+	
32	0	-2	8	10-100	31-100		+	
32	ŏ	-2	12	10-100			†	
32	Ö	-2	20	10-100				
32	2L	0	8	10-100				
32	2L	0	12	10-100				
32	2L	0	20	10-100				
32	2L	-2	8	10-100				
32	2L	-2	12	10-100				
32	2L	-2	20	10-100				

Table A7: Guardrail Use Guidelines for Rural Arterial, Benefit-Cost Greater Than 2

Severe Slop						Volumes Where		otimal
Hazard			Offset to	No				
Offset	Curvature	Grade %	Slope	Treatment	TL-2	TL-3	TL-4	TL-5
7	0	0	8	Trodemone		2.5-50		
7	0	-3	8			2.5-50		
7	4L	Ō	8			2.5-50		
7	4L	-3	8			2.5-50		
12	0	0	8			2.5-50		
12	0	0	12			2.5-50		
12	0	-3	8			2.5-50		
12	0	-3	12			2.5-50		
12	4L	0	8			2.5-50		
12	4L	0	12			2.5-50		
12	4L	-3	8			2.5-50		
12	4L	-3	12			2.5-50		
18	0	0	8			2.5-50		
18	0	0	12			2.5-50		
18 18	0	-3	20			2.5-50		
18	0	-3	8 12			2.5-50		
18	0	-3	20			2.5-50		
18	4L	0	8			2.5-50 2.5-50		
18	4L	0	12			2.5-50		
18	4L	0	20			2.5-50		
18	4L	-3	8			2.5-50		
18	4L	-3	12			2.5-50		
18	4L	-3	20			2.5-50		
26	0	Ō	8			2.5-50		
26	0	0	12			2.5-50		
26	0	0	20			2.5-50		
26	0	-3	8			2.5-50		
26	0	-3	12			2.5-50		
26	0	-3	20			2.5-50		
26	4L	0	8			2.5-50		
26	4L	0	12			2.5-50		
26	4L	0	20			2.5-50		
26	4L	-3	8			2.5-50		
26	4L	-3	12			2.5-50		
26 32	4L	-3 0	20		0.5.50	2.5-50		
32	0	0	8 12		2.5-50	24.50		
32	0	0	20		2.5-31 2.5-16.75	31-50 16.75-50		
32	0	-3	8		2.5-16.75	45.25-50		
32	0	-3	12		2.5-43.23	21.5-50		
32	0	-3	20		7.25-12	2.5-7.25, 12-50		
32	4L	0	8		2.5-50	2.0-7.20, 12-00		
32	4L	Ö	12		2.5-31, 40.5-50	31-40.5		
32	4L	Ö	20			2.5-50		
32	4L	-3	8		2.5-50			
32	4L	-3	12		2.5-31	31-50		
32	4L	-3	20			2.5-50		

Table A8: Guardrail Use Guidelines for Rural Arterial, Benefit-Cost Greater Than 2

Rural Arterial Moderately Severe Slope Functional Class Range of Traffic Volumes Where Barrier is Optimal Hazard Offset to No Curvature Grade % TL-3 TL-4 Offset Slope **Treatment** 0 0 8 2.5-50 0 -3 8 2.5-50 4L 0 8 2.5-50 4L -3 8 2.5-50 12 0 0 8 2.5-50 12 0 0 12 2.5-50 0 12 -3 8 2.5-50 12 0 -3 12 2.5-50 4L 12 0 8 2.5-50 12 4L 0 12 2.5-50 12 4L -3 8 2.5-50 12 4L -3 12 2.5-50 18 0 0 2.5-26.25 26.25-50 18 0 0 12 2.5-7.25 7.25-50 18 0 0 20 2.5-50 18 0 8 -3 2.5-21.5 21.5-50 18 0 -3 12 7.25-12 2.5-7.25, 12-50 20 18 0 -3 2.5-50 18 4L 0 8 2.5-50 18 4L 0 12 7.25-12 2.5-7.25, 12-50 18 4L 0 20 2.5-50 18 4L -3 8 2.5-50 18 4L -3 12 2.5-50 18 4L -3 20 2.5-50 26 0 0 8 2.5-50 26 12 0 0 2.5-50 26 0 20 0 2.5-50 26 0 -3 8 2.5-50 26 0 12 -3 2.5-50 26 0 20 2.5-31, 40.5-50 31-40.5 26 4L 0 8 2.5-50 26 4L 0 12 2.5-50 26 4L 20 0 2.5-50 26 4L -3 8 2.5-50 12 26 4L -3 2.5-50 26 4L -3 20 2.5-50 32 0 0 8 2.5-50 32 0 0 12 2.5-50 32 20 0 0 2.5-50 32 0 -3 8 2.5-50 12 32 0 -3 2.5-50 32 0 -3 20 2.5-50 32 4L 0 8 2.5-50 4L 12 32 0 2.5-50 32 4L 0 20 2.5-50 32 4L -3 8 2.5-50 32 4L 12 2.5-50 32 4L 20 2.5-50

Table A9: Guardrail Use Guidelines for Rural Arterial, Benefit-Cost Greater Than 2

Dural Arto	rial Moderate		tional Class		e of Traffic Vol			timal
	iai woderate	Slope Fullci	ionai Ciass		e or Traffic voi	umes where	Barrier is Op	timai
Hazard Offset	Curvature	Grade %	Offset to Slope	No Treatment	TL-2	TL-3	TL-4	TL-5
7	0	0	8		2.5-50			
7	0	-3	8		2.5-50			
7	4L	0	8		2.5-50			
7	4L	-3	8		2.5-50			
12	0	0	8		2.5-50			
12	0	0	12		2.5-50			
12	0	-3	8		2.5-50			
12	0	-3	12		2.5-50			
12	4L	0	8		2.5-50			
12	4L	0	12		2.5-50			
12	4L	-3	8		2.5-50			
12	4L	-3	12		2.5-50			
18	0	0	8		2.5-50			
18	0	0	12		2.5-50			
18	0	0	20		2.5-50			
18	0	-3	8		2.5-50			
18	0	-3	12		2.5-50			
18	0	-3	20		2.5-50			
18	4L	0	8		2.5-50			
18	4L	0	12		2.5-50			
18	4L	0	20		2.5-50			
18	4L	-3	8		2.5-50			
18	4L	-3	12		2.5-50			
18	4L	-3	20		2.5-50			
26	0	0	8		2.5-50			
26	0	0	12		2.5-50			
26	0	0	20		2.5-50			
26	0	-3	8		2.5-50			
26	0	-3	12		2.5-50			
26	0	-3	20		2.5-50			
26	4L	0	8		2.5-50			
26	4L	0	12		2.5-50			
26	4L	0	20		2.5-50			
26	4L	-3	8		2.5-50			
26	4L	-3	12		2.5-50			
26	4L	-3	20		2.5-50			
32	0	0	8		2.5-50			
32	0	0	12	2.5-50				
32	0	0	20		2.5-50			
32	0	-3	8		2.5-50			
32	0	-3	12	2.5-31	31-50			
32	0	-3	20		2.5-50			
32	4L	0	8	2.5-50				
32	4L	0	12	2.5-50				
32	4L	0	20		2.5-50			
32	4L	-3	8	2.5-50				
32	4L	-3	12	2.5-50				
32	4L	-3	20		2.5-50			

Table A10: Guardrail Use Guidelines for Rural Arterial, Benefit-Cost Greater Than 2

Severe P	oint Hazard	abic 7(10.	- Cuararan C	Se Gardennes for	Rural Arterial, Be	olumes Where Barr	D D	
Hazard		Grade	Offset to	Acres de la companya	100000000	continues:	200	
Offset	Curvature	%	Slope	No Treatment	TL-2	TL-3	TL-4	TL-5
5	0	0	8		2.5-21.5	21.5-50		
5	Ō	0	12		2.5-26.25	26.25-50		
5	0	0	20		2.5-26.25	26.25-50		
5	0	-3	8		2.5-16.75	16.75-50		
5	0	-3	12		2.5-21.5	21.5-50		
5	0	-3	20		2.5-21.5	21.5-50		
5	4L	0	8		2.5-50			
5	4L	0	12		2.5-50			
5	4L	0	20		2.5-50			
5	4L	-3	8		2.5-50			
5	4L	-3	12		2.5-50			
5	4L	-3	20		2.5-50			
8	0	0	8		2.5-21.5	21.5-45.25	45.25-50	
8	0	0	12		2.5-21.5	21.5-50		ļ
8	0	0	20		2.5-40.5	40.5-50	45.05.50	ļ
8	0	-3	8		2.5-16.75	16.75-45.25	45.25-50	
8	0	-3	12		2.5-16.75	16.75-50		-
8	0 4L	-3 0	20 8		2.5-35.75	35.75-50		-
8	4L 4L	0	12		2.5-26.25	26.25-50		
8	4L 4L	0	20		2.5-21.5	21.5-50		
8	4L 4L	-3	8		2.5-21.5 2.5-26.25	21.5-50 26.25-50		+
8	4L	-3	12		2.5-26.25	16.75-50		-
8	4L	-3	20		2.5-10.75	21.5-50		
12	0	0	8		2.5-16.75	16.75-50		<u> </u>
12	ŏ	0	12		2.3-10.73	10.75-50	2.5-50	
12	ŏ	Ö	20		2.5-35.75	35-75-50	2.3-30	
12	Ö	-3	8		2.5-12	12-50		
12	Ō	-3	12		2.0 12	12 00	2.5-50	
12	0	-3	20		2.5-31	31-50	2.0.00	
12	4L	0	8		2.5-50			
12	4L	0	12		2.5-35.75	35.75-50		
12	4L	0	20		2.5-21.5	21.5-50		
12	4L	-3	8		2.5-40.5	40.5-50		
12	4L	-3	12		2.5-31	31-50		
12	4L	-3	20		2.5-21.5	21.5-50		
18	0	0	8	2.5-50				
18	0	0	12		2.5-26.25		26.25-50	
18	0	0	20		2.5-50			
18	0	-3	8	2.5-50				<u> </u>
18	0	-3	12		2.5-21.5		21.5-50	
18	0	-3	20	2552	2.5-50			-
18 18	4L 4L	0	8 12	2.5-50	1			
18	4L 4L	0	20	2.5-50				
18	4L 4L	-3	8	2.5-50				+
18	4L 4L	-3 -3	12	2.5-50				+
18	4L 4L	-3 -3	20	2.5-50 2.5-50				+
24	0	-3	8	2.5-50				+
24	0	0	12	2.5-50	 			
24	0	0	20	2.5-12	12-50			+
24	0	-3	8	2.5-50	12-50			
24	ŏ	-3	12	2.5-50				1
24	ŏ	-3	20	2.5 00	2.5-50			1
24	4L	0	8	2.5-50	2.5-50			†
24	4L	0	12	2.5-50				
24	4L	0	20	2.5-50	<u> </u>			t
24	4L	-3	8	2.5-50				1
24	4L	-3	12	2.5-50				1
24	4L	-3	20	2.5-50				1
				2.0-00				

Table A11: Guardrail Use Guidelines for Rural Arterial, Benefit-Cost Greater Than 2

Moderate	ly Severe Po			Range of Traffic Volumes Where Barrier is Optimal						
Hazard		Grade	Offset to	Table 19 19 19		1000000	The State of the S	0.00		
Offset	Curvature	%	Slope	No Treatment	TL-2	TL-3	TL-4	TL-5		
5	0	0	8		2.5-21.5	21.5-50				
5	0	0	12		2.5-21.5	21.5-50				
5	0	0	20		2.5-16.75	16.75-50				
5	0	-3	8		2.5-16.75	16.75-50				
5	0	-3	12		2.5-16.75	16.75-50				
5	0	-3	20		2.5-21.5	21.5-50				
5	4L 4L	0	8		2.5-50					
5 5	4L 4L	0	12 20		2.5-50					
5	4L	-3	8		2.5-50 2.5-50			_		
5	4L	-3	12		2.5-50					
5	4L	-3	20		2.5-50					
8	0	0	8		2.5-21.5	21.5-40.5	40.5-50			
8	0	0	12		2.5-21.5	21.5-50				
8	0	0	20		2.5-21.5	21.5-50				
8	0	-3	8		2.5-21.5	21.5-35.75	35.75-50			
8	0	-3 -3	12 20		2.5-16.75	16.75-50		\vdash		
8	4L	-3	8		2.5-16.75 2.5-50	16.75-50		_		
8	4L	0	12		2.5-26.25	26.25-50		\vdash		
8	4L	ő	20		2.5-26.25	26.25-50		 		
8	4L	-3	8		2.5-35.75	35.75-50				
8	4L	-3	12		2.5-21.5	21.5-50				
8	4L	-3	20		2.5-21.5	21.5-50				
12	0	0	8		2.5-21.5	21.5-50				
12	0	0	12				2.5-50			
12	0	0	20		2.5-50					
12	0	-3	8		2.5-16.75	16.75-50				
12	0	-3	12				2.5-50			
12	0	-3	20		2.5-50					
12	4L	0	8	2.5-50						
12	4L	0	12	2.5-50						
12	4L	0	20	0.5.50	2.5-50					
12 12	4L 4L	-3 -3	8 12	2.5-50						
12	4L 4L	-3 -3	20	2.5-50	0.5.50			-		
18	0	0	8	2.5-50	2.5-50					
18	0	0	12	2.5-50	2.5-26.25		26.25-50			
18	0	0	20		2.5-50		20.25-50	_		
18	0	-3	8	2.5-50	2.3-30					
18	0	-3	12	2.0-00	2.5-21.5		21.5-50	<u> </u>		
18	0	-3	20		2.5-50		21.0-00	 		
18	4L	0	8	2.5-50	2.0 00					
18	4L	0	12	2.5-50						
18	4L	0	20	2.5-50						
18	4L	-3	8	2.5-50						
18	4L	-3	12	2.5-50						
18	4L	-3	20	2.5-50						
24	0	0	8	2.5-50						
24	0	0	12	2.5-50						
24	0	0	20		2.5-50					
24	0	-3	8	2.5-50						
24	0	-3	12	2.5-50						
24	0	-3	20		2.5-50					
24	4L	0	8	2.5-50						
24	4L	0	12	2.5-50						
24	4L	0	20	2.5-50						
24	4L	-3	8	2.5-50						
24	4L	-3	12	2.5-50						
24	4L	-3	20	2.5-50						

Table A12: Guardrail Use Guidelines for Rural Arterial, Benefit-Cost Greater Than 2

Moderate	Point Haza	rd			Range of Traffic Volum	nes Where Barrier is Optimal		
Hazard		Grade	Offset to					
Offset	Curvature	%	Slope	No Treatment	TL-2	TL-3	TL-4	TL-5
5	0	0	8		2.5-50			
5	0	0	12		2.5-50			
5	0	0	20		2.5-50			
5	0	-3	8		2.5-50			
5	0	-3	12		2.5-50			
5	0	-3	20		2.5-50			
5	4L	0	8	2.5-50				
5	4L	0	12	2.5-50				
5	4L	0	20	2.5-50				
5	4L	-3	8	2.5-50				
5 5	4L 4L	-3 -3	12 20	2.5-50				
8	0	-3	8	2.5-50	2.5.50			
8	0	0	12		2.5-50 2.5-50			-
8	0	0	20		2.5-50		-	
8	0	-3	8		2.5-50	1		
8	Ö	-3	12		2.5-50	1	-	
8	ŏ	-3	20		2.5-50		+	
8	4L	0	8	2.5-50	2.0-00			
8	4L	Ö	12	2.5-50				
8	4L	Ö	20	2.5-50				
8	4L	-3	8	2.5-50				
8	4L	-3	12	2.5-50			1	
8	4L	-3	20	2.5-50				
12	0	0	8	2.5-50				
12	0	0	12	2.5-50				
12	0	0	20		2.5-50			
12	0	-3	8	2.5-50				
12	0	-3	12	2.5-50				
12	0	-3	20		2.5-50			
12	4L	0	8	2.5-50				
12 12	4L 4L	0	12	2.5-50				
12	4L 4L	-3	20 8	2.5-50 2.5-50				
12	4L	-3	12	2.5-50			+	
12	4L	-3	20	2.5-50			+	
18	0	0	8	2.5-50				
18	ŏ	ŏ	12	2.5-50			+	
18	ŏ	Ö	20	2.0 00	2.5-50		1	
18	Ö	-3	8	2.5-50			\neg	
18	0	-3	12	2.5-50				
18	0	-3	20		2.5-50			
18	4L	0	8	2.5-50				
18	4L	0	12	2.5-50				
18	4L	0	20	2.5-50				
18	4L	-3	8	2.5-50				
18	4L	-3	12	2.5-50				
18	4L	-3	20	2.5-50				
24	0	0	8	2.5-50			-	
24 24	0	0	12 20	2.5-50		-		
24	0		8	2.5-50			-	-
24	0	-3 -3	12	2.5-50 2.5-50			-	
24	0	-3	20	2.5-50			$\overline{}$	
24	4L	0	8	2.5-50		1		
24	4L	0	12	2.5-50		 		
24	4L	ő	20	2.5-50		1	-	
24	4L	-3	8	2.5-50			_	—
24	4L	-3	12	2.5-50				
24	4L	-3 -3	12 20	2.5-50			$\overline{}$	
ــــــــــــــــــــــــــــــــــــــ				2.0 00				

Table A13: Guardrail Use Guidelines for Rural LC, Benefit-Cost Greater Than 2

- 17	10 (1000)	SS-23	000000		Range of Traffic Volumes Where Barrier is Opt				
	Severe Slop				of Traffic Vol	umes Where	Barrier is C	ptimal	
Hazard	Curvature	Grade	Offset to	No	TL-2	TL-3	TL-4	TL-5	
Offset		%	Slope	Treatment					
5	0	0	3		0.5-5				
5	0	0	6		0.5-5				
5	0	-6	3		0.5-5				
5	0	-6	6		0.5-5				
5	10L	0	3		0.5-5				
5 5	10L	-6	6		0.5-5				
5	10L 10L	-6 -6	6		0.5-5				
8	0	0	3		0.5-5				
8	0	0	6	-	0.5-5			-	
8	0	0	12		0.5-5			-	
8	0	-6	3		0.5-5				
8	0	-6	6		0.5-5 0.5-5				
8	0	-6 -6	12	 	0.5-5			 	
8	10L	0	3	 	0.5-5			-	
8	10L	0	6	 	0.5-5			-	
8	10L	0	12	 	0.5-5			-	
8	10L	-6	3						
8	10L	-6 -6	6	 	0.5-5 0.5-5			 	
8	10L	-6 -6	12	 				 	
12	0	0	3	├──┤	0.5-5 0.5-5			 	
12	0	0	6						
12	0	0	12		0.5-5 0.5-5				
12	0	-6	3						
12	0	-6	6		0.5-5 0.5-5				
12	0	-6	12						
12	10L	0	3		0.5-5 0.5-5				
12	10L	0	6		0.5-5				
12	10L	0	12		0.5-5				
12	10L	-6	3	-	0.5-5				
12	10L	-6	6	 	0.5-5			-	
12	10L	-6	12		0.5-5	4			
18	0	0	3		0.5-5			-	
18	0	0	6		0.5-5				
18	0	0	12	 	0.5-5				
18	0	-6	3		0.5-5				
18	0	-6	6	 	0.5-5				
18	0	-6	12	 	0.5-5			 	
18	10L	0	3	 	0.5-5			 	
18	10L	0	6	 	0.5-5			 	
18	10L	Ö	12	 	0.5-5			 	
18	10L	-6	3	 	0.5-5			 	
18	10L	-6	6	 	0.5-5			 	
18	10L	-6	12	 	0.5-5			1	
24	0	0	3	 	0.5-5			 	
24	Ö	Ö	6	 	0.5-5				
24	Ö	0	12	 	0.5-5			 	
24	Ö	-6	3		0.5-5				
24	Ö	-6	6	 	0.5-5			 	
24	0	-6	12	 	0.5-5				
24	10L	0	3	 	0.5-5			 	
24	10L	0	6	 	0.5-5				
24	10L	0	12		0.5-5			 	
24	10L	-6	3	 	0.5-5			 	
24	10L	-6	6	 	0.5-5			 	
24	10L	-6	12	 	0.5-5			 	

Table A14: Guardrail Use Guidelines forRural LC, Benefit-Cost Greater Than 2

Rural LC Mode Class			unctional		Traffic Volu			Optimal
			Offset to	No				
Hazard Offset	Curvature	Grade %	Slope	Treatment	TL-2	TL-3	TL-4	TL-5
5	0	0	3		0.5-5			
5	Ō	ō	6		0.5-5			
5	0	-6	3		0.5-5			
5	0	-6	6		0.5-5			
5	10L	0	3		0.5-5			
5	10L	0	6		0.5-5			
5	10L	-6	3		0.5-5			
5	10L	-6	6		0.5-5			
8	0	0	3		0.5-5			
8	0	0	6		0.5-5			
8	0	0	12		0.5-5			
8	0	-6	3		0.5-5			
8	0	-6	6		0.5-5			
8	0	-6	12		0.5-5			
8	10L	0	3		0.5-5			
8	10L	0	6		0.5-5			
8	10L	0	12		0.5-5			
8	10L	-6	3		0.5-5			
8	10L	-6	6		0.5-5			
8	10L	-6	12		0.5-5			
12	0	0	3		0.5-5			
12	0	0	6		0.5-5			
12	0	0	12		0.5-5			
12	0	-6	3		0.5-5			
12	0	-6	6		0.5-5			
12	0	-6	12		0.5-5			
12	10L	0	3		0.5-5			
12	10L	0	6		0.5-5			
12	10L	0	12		0.5-5			
12	10L	-6	3		0.5-5			
12	10L	-6	6		0.5-5			
12	10L	-6	12		0.5-5			
18	0	0	3		0.5-5			
18	0	0	6		0.5-5			
18	0	0	12		0.5-5			
18	0	-6	3		0.5-5			
18	0	-6	6		0.5-5			
18	0	-6	12		0.5-5			
18	10L	0	3		0.5-5			
18	10L	0	6		0.5-5			
18	10L	0	12		0.5-5			
18	10L	-6	3		0.5-5			
18	10L	-6	6		0.5-5			
18	10L	-6	12		0.5-5			
24	0	0	3		0.5-5			
24	0	0	6		0.5-5			
24	0	0	12		0.5-5			
24	0	-6	3		0.5-5			
24	0	-6	6		0.5-5			
24	0	-6	12		0.5-5			
24	10L	0	3		0.5-5			
24	10L	0	6		0.5-5			
24	10L	0	12		0.5-5			
24	10L	-6	3		0.5-5			
24	10L	-6	6		0.5-5			
24	10L	-6	12		0.5-5		<u> </u>	

Table A15: Guardrail Use Guidelines for Rural LC, Benefit-Cost Greater Than 2

Rural LC M	oderate Slo	pe Funct	ional Class	ss Range of Traffic Volumes Where Barrier is Opt			is Optimal	
Hazard	Curvature	Grade	Offset to	No Treatment	TL-2	TL-3	TL-4	TL-5
Offset		%	Slope	Treatment				
5	0	0	3		0.5-5			
5	0	0	6		0.5-5			
5	0	-6	3		0.5-5			
5	0	-6	6	2.5.5	0.5-5			
5	10L	0		0.5-5				
5 5	10L 10L	0 -6	6	0.5-5	4.05.5			
5	10L	-6 -6	6	0.5-1.85	1.85-5			
8	0	0	3	0.5-5 0.5-0.95	0.95-5			
8	0	0	6	0.5-0.95	0.95-5			
8	Ö	0	12	0.5-0.95	0.95-5			
8	ŏ	-6	3	0.0-0.90	0.5-5			
8	ŏ	-6	6		0.5-5			
8	ő	-6	12		0.5-5			
8	10L	0	3	0.5-5	0.0-0			
8	10L	Ö	6	0.5-5				
8	10L	ō	12	0.5-5				
8	10L	-6	3	0.5-5				
8	10L	-6	6	0.5-5				
8	10L	-6	12	0.5-5				
12	0	0	3	0.5-5				
12	0	0	6	0.5-5				
12	0	0	12	0.5-5				
12	0	-6	3	0.5-5				
12	0	-6	6	0.5-5				
12	0	-6	12	0.5-5				
12	10L	0	3	0.5-5				
12	10L	0	6	0.5-5				
12	10L	0	12	0.5-5				
12	10L	-6	3	0.5-5				
12	10L	-6	6	0.5-5				
12	10L	-6	12	0.5-5				
18	0	0	3	0.5-5				
18	0	0	6	0.5-5				
18	0	0	12	0.5-5				
18	0	-6	3	0.5-5				
18	0	-6	6	0.5-5				
18	0	-6	12	0.5-5				
18 18	10L 10L	0	3 6	0.5-5				
18	10L 10L	0	12	0.5-5				
18	10L	-6	3	0.5-5 0.5-5				
18	10L	-6 -6	6	0.5-5				
18	10L	-6	12	0.5-5				-
24	0	0	3	0.5-5				
24	0	0	6	0.5-5				
24	0	0	12	0.5-5				
24	0	-6	3	0.5-5				<u> </u>
24	Ö	-6	6	0.5-5				
24	Ö	-6	12	0.5-5				
24	10L	ō	3	0.5-5				
24	10L	Ö	6	0.5-5				
24	10L	Ö	12	0.5-5				
24	10L	-6	3	0.5-5				
24	10L	-6	6	0.5-5				
24	10L	-6	12	0.5-5				

Table A16: Guardrail Use Guidelines for Rural LC, Benefit-Cost Greater Than 2

Severe Pe	oint Hazard			Range of Traffic Volumes Where Barrier is Optimal					
Hazard	Jiiit Hazara	Grade	Offset to	range			эорини		
Offset	Curvature	%	Slope	No Treatment	TL-2	TL-3	TL-4	TL-5	
5	0	0	3		0.5-5				
5	0	0	6		0.5-5	-			
5	Ö	ŏ	12		0.5-5				
5	0	-6	3		0.5-5	1			
5	Ö	-6	6		0.5-5	+			
5	0	-6	12		0.5-5	†			
5	10L	0	3	0.5-5	0.0 0				
5	10L	0	6	0.5-5					
5	10L	0	12	0.5-2.3, 3.2-5	2.3-3.2				
5	10L	-6	3	0.5-2.3, 3.2-5	2.3-3.2				
5	10L	-6	6	0.5-2.75, 4.1-5	2.75-4.1				
5	10L	-6	12	0.5-2.75	2.75-5				
8	0	0	3	0.5-0.95	0.95-5				
8	0	0	6	0.5-0.95	0.95-5				
8	0	0	12	0.5-0.95	0.95-5				
8	0	-6	3		0.5-5				
8	0	-6	6		0.5-5				
8	0	-6	12		0.5-5				
8	10L	0	3	0.5-5					
8	10L	0	6	0.5-5					
8	10L	0	12	0.5-5					
8	10L	-6	3	0.5-1.85, 3.2-5	1.85-3.2				
8	10L	-6	6	0.5-5					
8	10L	-6	12	0.5-2.3, 3.2-5	2.3-3.2				
12	0	0	3	0.5-1.4	1.4-5				
12	0	0	6	0.5-0.95	0.95-5				
12	0	0	12	0.5-0.95	0.95-5				
12	0	-6	3		0.5-5				
12	0	-6	6		0.5-5	1			
12	0	-6	12	2.5.5	0.5-5	1			
12	10L	0	3 6	0.5-5					
12 12	10L 10L	0	12	0.5-5					
12	10L	-6	3	0.5-5					
12	10L	- 6	6	0.5-5 0.5-5					
12	10L	-6	12	0.5-5	7				
18	0	0	3			+			
18	0	0	6	0.5-5 0.5-5		+			
18	0	0	12	0.5-5					
18	0	-6	3	0.5-1.4, 3.2-4.1	1.4-3.2, 4.1-5	+			
18	0	-6	6	0.5-1.4, 3.2-4.1	1.85-5	+			
18	0	-6	12	0.5-0.95	0.95-5	+			
18	10L	ŏ	3	0.5-5	0.00 0	1			
18	10L	Ö	6	0.5-5					
18	10L	Ö	12	0.5-5					
18	10L	-6	3	0.5-5				1	
18	10L	-6	6	0.5-5					
18	10L	-6	12	0.5-5					
24	0	0	3	0.5-5					
24	0	0	6	0.5-5					
24	0	0	12	0.5-5					
24	0	-6	3	0.5-5					
24	0	-6	6	0.5-5					
24	0	-6	12	0.5-5					
24	10L	0	3	0.5-5					
24	10L	0	6	0.5-5					
24	10L	0	12	0.5-5					
24	10L	-6	3	0.5-5					
24	10L	-6	6	0.5-5					
24	10L	-6	12	0.5-5					

Table A17: Guardrail Use Guidelines for Rural LC, Benefit-Cost Greater Than 2

Moderate	ly Severe P				ge of Traffic Volumes Wr			
Hazard	Curvature	Grade	Offset to	No Treatment	TL-2	TL-3	TL-4	TL-5
Offset		%	Slope	No Treatment	TL-2	IL-3	1L-4	IL-5
5	0	0	3		0.5-5			
5	0	0	6		0.5-5			
5 5	0	0 -6	12		0.5-5			
5	0	-6	3 6		0.5-5 0.5-5			
5	0	-6	12		0.5-5			
5	10L	0	3	0.5-5	0.5-5			
5	10L	Ō	6	0.5-5				
5	10L	0	12	0.5-5				
5	10L	-6	3	0.5-3.65, 4.55-5	3.65-4.55			
5	10L	-6	6	0.5-1.85, 2.75-5	1.85-2.75			
5	10L	-6	12	0.5-1.85, 3.2-5	1.85-3.2			
8	0	0	3	0.5-0.95	0.95-5			
8	0	0	6	0.5-0.95	0.95-5			
8	0	0 -6	12 3	0.5-0.95	0.95-5			
8	0	-6	6		0.5-5 0.5-5			
8	0	-6 -6	12		0.5-5	 		
8	10L	0	3	0.5-5	0.0-0	 		
8	10L	0	6	0.5-5				
8	10L	Ō	12	0.5-5				
8	10L	-6	3	0.5-5				
8	10L	-6	6	0.5-5				
8	10L	-6	12	0.5-5				
12	0	0	3	0.5-1.4	1.4-5			
12	0	0	6	0.5-1.4	1.4-5			
12	0	0	12	0.5-1.4	1.4-5			
12 12	0	-6 -6	3 6		0.5-5			
12	0	-6 -6	12		0.5-5 0.5-5			
12	10L	0	3	0.5-5	0.5-5			
12	10L	0	6	0.5-5			2	
12	10L	0	12	0.5-5				
12	10L	-6	3	0.5-5				
12	10L	-6	6	0.5-5				
12	10L	-6	12	0.5-5				
18	0	0	3	0.5-5				
18	0	0	6	0.5-5				
18	0	0	12	0.5-5				
18	0	-6	3	0.5-5	1100115		·	
18 18	0	-6 -6	6 12	0.5-1.4, 3.2-4.1	1.4-3.2, 4.1-5			-
18	10L	-6 0	3	0.5-1.4 0.5-5	1.4-5			
18	10L	0	6	0.5-5				
18	10L	0	12	0.5-5				
18	10L	-6	3	0.5-5				
18	10L	-6	6	0.5-5				
18	10L	-6	12	0.5-5				
24	0	0	3	0.5-5				
24	0	0	6	0.5-5				
24	0	0	12	0.5-5				
24	0	-6	3	0.5-5				
24 24	0	-6 -6	6 12	0.5-5				-
24	10L	-6 0	3	0.5-5 0.5-5		 		-
24	10L	0	6	0.5-5				
24	10L	0	12	0.5-5				
24	10L	-6	3	0.5-5				
24	10L	-6	6	0.5-5				
24	10L	-6	12	0.5-5				

Table A18: Guardrail Use Guidelines for Rural LC, Benefit-Cost Greater Than 2

Moderate	Point Haza		ADIC 7(10. GG	ardrail Use Guidelines for R	nge of Traffic Volumes Where E	// // // // // // // // // // // // //	nal	
Hazard Offset	Curvature	Grade %	Offset to Slope	No Treatment	TL-2	TL-3	TL-4	TL-5
5	0	0	3	0.5-2.75, 3.65-4.1	2.75-3.65, 4.1-5			
5	0	0	6	0.5-2.3, 3.2-3.65, 4.55-5	2.3-3.2, 3.65-4.55			
5	0	0	12	0.5-2.75, 4.55-5	2.75-4.55			
5	0	-6	3	0.5-0.95	0.95-5			
5	0	-6	6	0.5-0.95	0.95-5			
5	0	-6	12	0.5-0.95	0.95-5			
5	10L	0	3	0.5-5				
5	10L	0	6	0.5-5				
5	10L	0	12	0.5-5				
5	10L	-6	3	0.5-5				
5	10L	-6	6	0.5-5				
5	10L	-6	12	0.5-5				
8	0	0	3	0.5-5				
8	0	0	6	0.5-2.3, 3.2-5	2.3-3.2	1		
8	0	0	12	0.5-1.4, 3.2-5	1.4-3.2			
8	Ö	-6	3	0.5-4.1	4.1-5	1		İ
8	0	-6	6	0.5-1.85, 3.65-4.1	1.85-3.65, 4.1-5	1		1
8	0	-6	12	0.5-1.85, 4.55-5	1.85-4.55			1
8	10L	0	3	0.5-5				1
8	10L	ō	6	0.5-5		1		1
8	10L	ō	12	0.5-1.4, 3.2-5	1.4-3.2	1		İ
8	10L	-6	3	0.5-5				
8	10L	-6	6	0.5-5				
8	10L	-6	12	0.5-1.4, 3.2-5	1.4-3.2			
12	0	0	3	0.5-5				
12	0	Ō	6	0.5-5				
12	Ö	ō	12	0.5-5				
12	Ö	-6	3	0.5-5		_		
12	Ö	-6	6	0.5-5				
12	Ö	-6	12	0.5-5		_		
12	10L	ō	3	0.5-5				
12	10L	ō	6	0.5-5				
12	10L	ō	12	0.5-5				
12	10L	-6	3	0.5-5				
12	10L	-6	6	0.5-5		_		
12	10L	-6	12	0.5-5				-
18	0	0	3	0.5-5				
18	Ö	ŏ	6	0.5-5		_		
18	ő	ŏ	12	0.5-5				t
18	ŏ	-6	3	0.5-5		_		
18	ŏ	-6	6	0.5-5		1		1
18	ŏ	-6	12	0.5-5		_		
18	10L	ō	3	0.5-5		_		t
18	10L	ŏ	6	0.5-5		_		
18	10L	ō	12	0.5-5		_		1
18	10L	-6	3	0.5-5		_		1
18	10L	-6	6	0.5-5		_		
18	10L	-6	12	0.5-5		_		
24	0	ō	3	0.5-5		_		
24	Ö	ŏ	6	0.5-5				
24	Ö	ŏ	12	0.5-5		_		1
24	ő	-6	3	0.5-5				t
24	ŏ	-6	6	0.5-5				
24	ŏ	-6	12	0.5-5				
24	10L	0	3	0.5-5		1		
24	10L	Ö	6	0.5-5				
24	10L	ŏ	12	0.5-5		1		t
24	10L	-6	3	0.5-5				1
24	10L	-6	6	0.5-5				
24	10L	-6	12	0.5-5		_		t
				0.5-5				

Table A19: Guardrail Use Guidelines for Urban Arterial, Benefit-Cost Greater Than 2

	ial Severe Slo						ere Barrier is Op	
Hazard Offset	Curvature	Grade %	Offset to Slope	No Treatment	TL-2	TL-3	TL-4	TL-5
5	0	Ő	3			5-80		
5	0	0	6			5-80		
5	0	-3	3			5-80		
5	0	-3	6			5-80		
5	6L	0	3			5-72.5		72.5-80
5	6L	0	6			5-65	65-72.5	72.5-80
5	6L	-3	3			5-80		
5	6L	-3	6			5-35	35-57.5	57.5-80
8	0	0	3			5-80		
8	0	0	6			5-80		
8	0	Ō	12			5-80		
8	Ō	-3	3			5-80		
8	Ö	-3	6			5-80		
8	Ö	-3	12			5-80		
8	6L	0	3			5-80		
8	6L	0	6			5-80	-	
8	6L	0	12					
		-				5-80		
8 8	6L 6L	-3 -3	3 6			5-80		\vdash
						5-80		
8	6L	-3	12			5-72.5		72.5-80
12	0	0	3			5-80		
12	0	0	6			5-80		
12	0	0	12			5-80		
12	0	-3	3			5-80		
12	0	-3	6			5-80		
12	0	-3	12			5-80		
12	6L	0	3			5-80		
12	6L	0	6			5-80		
12	6L	0	12			5-80		
12	6L	-3	3			5-80		
12	6L	-3	6			5-80		
12	6L	-3	12			5-80		
18	0	0	3			5-80		
18	0	0	6			5-80		
18	0	0	12			5-80		
18	0	-3	3			5-80		
18	0	-3	6			5-80		
18	0	-3	12			5-80		
18	6L	0	3			5-80		
18	6L	Ō	6			5-80		
18	6L	0	12			5-80		<u> </u>
18	6L	-3	3			5-80		
18	6L	-3	6			5-80		
18	6L	-3	12			5-80		
24	0	ő	3			5-80		
24	Ö	Ö	6			5-80		
24	ŏ	Ö	12			5-80		
24	ŏ	-3	3			5-80		
24	ŏ	-3	6			5-80		
24	0	-3	12			5-80		
24	6L	0	3		5-80	5-60	-	
24	6L	0	6			<u> </u>		
24	6L	0	12		5-80	E 00		
			3		F 00	5-80		_
24	6L	-3 -3	6		5-80			
24	6L	-3 -3	12		5-80	F 22		
24	6L	-3	12			5-80		

 Table A20: Guardrail Use Guidelines for Urban Arterial, Benefit-Cost Greater Than 2

Urban Arteria Class			lope Functional			lumes Where Ba		imal
Hazard Offset	Curvature	Grade %	Offset to Slope	No	TL-2	TL-3	TL-4	TL-5
5	0	0	3	Houtmont		5-80		
5	0	0	6			5-80		
5	0	-3	3			5-80		
5	0	-3	6			5-80		
5	6L	0	3			5-80		
5	6L	0	6			5-80		
5	6L	-3	3			5-80		
5	6L	-3	6			5-80		
8	0	0	3			5-80		
8	0	0	6			5-80		
8	0	0	12			5-80		
8	0	-3	3			5-80		
8	0	-3	6			5-80		
8	0	-3	12			5-80		
8	6L	0	3			5-80		
8	6L	0	6					5-80
8	6L	0	12			5-80		
8	6L	-3	3			5-80		
8	6L	-3	6					5-80
8	6L	-3	12			5-80		
12	0	0	3		5-27.5	27.5-80		
12	0	0	6		5-20	20-80		
12	0	0	12		5-12.5	12.5-80		
12	0	-3	3		5-27.5	27.5-80		
12	0	-3	6		5-80			
12	0	-3	12		5.00	5-80	-	
12	6L	0	3 6		5-80			5.00
12 12	6L 6L	0	12			5.00		5-80
12	6L	-3	3		5.00	5-80		
12	6L	-3	6		5-80		+	5-80
12	6L	-3	12	7		5-80	+	5-60
18	0	0	3		5-80	5-60	+	
18	0	0	6		5-80		+	
18	ŏ	0	12		5-57	57-80	_	
18	ŏ	-3	3		5-80	37-00	+	
18	Ö	-3	6		5-80		+	
18	Ö	-3	12		5-50	50-80	+	
18	6L	Ö	3		5-80	0000	<u> </u>	
18	6L	0	6		5-80		†	
18	6L	Ö	12		5-80			
18	6L	-3	3		5-80			
18	6L	-3	6		5-80			
18	6L	-3	12		5-80			
24	0	0	3		5-80			
24	0	0	6		5-80			
24	0	0	12		5-80			
24	0	-3	3		5-80			
24	0	-3	6		5-80			
24	0	-3	12		5-80			
24	6L	0	3		5-80			
24	6L	0	6		5-80			
24	6L	0	12		5-80			
24	6L	-3	3		5-80			
24	6L	-3	6		5-80			
24	6L	-3	12		5-80			

Table A21: Guardrail Use Guidelines for Urban Arterial, Benefit-Cost Greater Than 2

	ial Moderate		inctional		Traffic Volu			
Hazard	Cumatur	Grade	Offset to	No	TLO	TI 0	TI A	TI C
Offset	Curvature	%	Slope	Treatment	TL-2	TL-3	TL-4	TL-5
5	0	0	3		5-80			
5	Ö	Ō	6		5-80			
5	Ö	-3	3		5-80			
5	0	-3	6		5-80			
5	6L	0	3		5-80			
5	6L	0	6		5-80			
5	6L	-3	3		5-80			
5	6L	-3	6		5-80			
8	0	0	3		5-80			
8	0	Ō	6		5-80			
8	0	Ō	12		5-80			
8	0	-3	3		5-80			
8	Ö	-3	6		5-80			
8	0	-3	12		5-80			
8	6L	0	3		5-80			
8	6L	0	6		5-80			
8	6L	0	12		5-80			
8	6L	-3	3		5-80			
8	6L	-3	6		5-80			
8	6L	-3	12		5-80			
12	0	0	3					
12	0	0	6		5-80			
12	0	0	12		5-80			
					5-80			
12	0	-3	3		5-80			
12 12	0	-3	6 12		5-80			
12	6L	-3 0	3		5-80			
12					5-80			
	6L	0	6		5-80			
12	6L	0	12		5-80			
12	6L	-3	3 6		5-80			
12	6L	-3	12		5-80			
12	6L	-3			5-80			
18	0	0	3		5-80			
18	0	0	6		5-80			
18	0	0	12		5-80			
18	0	-3	3		5-80			
18	0	-3	6		5-80			
18	0	-3	12	5.00	5-80			
18	6L	0	3	5-20	20-80			
18	6L	0	6		5-80			
18	6L	0	12		5-80			
18	6L	-3	3		5-80			
18	6L	-3	6		5-80			
18	6L	-3	12		5-80			
24	0	0	3		5-80			
24	0	0	6		5-80			
24	0	0	12		5-80			
24	0	-3	3		5-80			
24	0	-3	6		5-80			
24	0	-3	12		5-80			
24	6L	0	3	5-80				
24	6L	0	6	5-80				
24	6L	0	12		5-80			
24	6L	-3	3	5-80				
24	6L	-3	6	5-80				
24	6L	-3	12	5-20	20-80			

Table A22: Guardrail Use Guidelines for Urban Arterial, Benefit-Cost Greater Than 2

Severe P	oint Hazard			Range of Traffic Volumes Where Barrier is Optimal						
Hazard		Grade	Offset to	No						
Offset	Curvature	%	Slope	Treatment	TL-2	TL-3	TL-4	TL-5		
5	0	0	3		5-12.5	12.5-50	50-80			
5	0	0	6		5-12.5	12.5-80				
5	0	0	12		5-12.5	12.5-80				
5	0	-3	3		5-12.5	12.5-42.5	42.5-80			
5	0	-3	6		5-12.5	12.5-80				
5 5	0 6L	-3 0	12 3		5-12.5	12.5-80				
5	6L	0	6		5-80 5-80					
5	6L	0	12		5-80					
5	6L	-3	3		5-80					
5	6L	-3	6		5-80					
5	6L	-3	12		5-80					
8	0	0	3		5-20	20-80				
8	0	0	6		5-35	35-80				
8	0	0	12		5-35	35-80				
8	0	-3	3		5-12.5	12.5-80				
8	0	-3	6		5-27.5	27.5-80				
8	0 6L	-3 0	12 3		5-27.5	27.5-80				
8	6L	0	6		5-80 5-80					
8	6L	0	12		5-80					
8	6L	-3	3		5-80					
8	6L	-3	6		5-80					
8	6L	-3	12		5-80					
12	0	0	3		5-80					
12	0	0	6		5-27.5	27.5-80				
12	0	0	12		5-80					
12	0	-3	3		5-80					
12	0	-3	6		5-80					
12	0	-3	12		5-65	65-80				
12 12	6L 6L	0	3 6		5-80					
12	6L	0	12		5-80 5-80					
12	6L	-3	3		5-80					
12	6L	-3	6		5-80					
12	6L	-3	12		5-80					
18	0	0	3		5-80					
18	0	0	6		5-72.5	72.5-80				
18	0	0	12		5-80					
18	0	-3	3		5-80					
18	0	-3	6		5-57.5	57.5-80				
18 18	6L	-3 0	12 3	5.00	5-80					
18	6L	0	6	5-80 5-80						
18	6L	0	12	5-60	12.5-80					
18	6L	-3	3	5-80	12.0 00					
18	6L	-3	6	5-80						
18	6L	-3	12	5-12.5	12.5-80					
24	0	0	3		5-80					
24	0	0	6		5-80					
24	0	0	12		5-80					
24 24	0	-3	3		5-80					
24	0	-3 -3	6 12		5-80					
24	6L	-3 0	3	5-80	5-80					
24	6L	0	6	5-80 5-80						
24	6L	0	12	5-80						
24	6L	-3	3	5-80						
24	6L	-3	6	5-80						
24	6L	-3	12	5-80						
24	6L	-3	12	5-80						

Table A23: Guardrail Use Guidelines for Urban Arterial, Benefit-Cost Greater Than 2

Moderate	ly Severe Po			Range of Traffic Volumes Where Barrier is Optimal						
Hazard		Grade	Offset to	No			0.000			
Offset	Curvature	%	Slope	Treatment	TL-2	TL-3	TL-4	TL-5		
5	0	0	3		5-20	20-80				
5	0	0	6		5-20	20-80				
5	0	0	12		5-20	20-80				
5 5	0	-3 -3	3 6		5-20	20-80				
5	0	-3 -3	12		5-12.5	12.5-80				
5	6L	-3	3		5-12.5 5-80	12.5-80				
5	6L	0	6		5-80					
5	6L	0	12		5-80					
5	6L	-3	3		5-80			1		
5	6L	-3	6		5-80					
5	6L	-3	12		5-80					
8	0	0	3		5-50	50-72.5	72.5-80			
8	0	0	6		5-50	50-80				
8	0	0	12		5-50	50-80	57.5.00	10 5 57 5		
8 8	0	-3 -3	3 6		5-42.5	50.00	57.5-80	42.5-57.5		
8	0	-3 -3	12		5-50 5-50	50-80 50-80		+		
8	6L	-3	3		5-80	50-60		+		
8	6L	0	6		5-80			+		
8	6L	0	12		5-80			 		
8	6L	-3	3		5-80			1		
8	6L	-3	6		5-80			1		
8	6L	-3	12		5-80					
12	0	0	3		5-80					
12	0	0	6		5-42.5, 57.5-80	42.5-57.5				
12	0	0	12		5-80					
12 12	0	-3	3		5-80					
12	0	-3 -3	6 12		5-80					
12	6L	0	3	5-12.5	5-80 12.5-80			+		
12	6L	0	6	3-12.3	5-80			 		
12	6L	0	12		5-80			 		
12	6L	-3	3		5-80			<u> </u>		
12	6L	-3	6		5-80			1		
12	6L	-3	12		5-80					
18	0	0	3		5-80					
18	0	0	6		5-80					
18	0	0	12		5-80					
18 18	0	-3 -3	3 6		5-80					
18	0	-3 -3	12		5-80 5-80			1		
18	6L	0	3	5-80	3-60			 		
18	6L	0	6	5-80				1		
18	6L	0	12	5-80				1		
18	6L	-3	3	5-80						
18	6L	-3	6	5-80						
18	6L	-3	12	5-80						
24	0	0	3		5-80					
24	0	0	6 12	5-80						
24 24	0	0 -3	12 3	5-80				_		
24	0	-3 -3	6	5-80 5-80				+		
24	0	-3 -3	12	5-80				+		
24	6L	0	3	5-80				 		
24	6L	0	6	5-80	1					
24	6L	0	12	5-80						
24	6L	-3	3	5-80						
24	6L	-3	6	5-80						
24	6L	-3	12	5-80						

Table A24: Guardrail Use Guidelines for Urban Arterial, Benefit-Cost Greater Than 2

	Point Haza		e Guidennes	1	of Traffic Vo			
Hazard		Grade	Offset to	No				
Offset	Curvature	%	Slope	Treatment	TL-2	TL-3	TL-4	TL-5
5	0	0	3		5-80			
5	0	0	6		5-80			
5	0	0	12		5-80			
5	0	-3	3		5-80			
5	0	-3	6		5-80			
5	0	-3	12	5.00	5-80			
5 5	6L	0	3 6	5-80				
5	6L 6L	0	12	5-80 5-80				
5	6L	-3	3	5-80				
5	6L	-3	6	5-80				
5	6L	-3	12	5-80				
8	0	0	3	5-50	50-80			
8	0	Ō	6		5-80			
8	Ö	Ö	12		5-80			
8	0	-3	3	5-42.5	42.5-80			
8	0	-3	6		5-80			
8	0	-3	12		5-80			
8	6L	0	3	5-80				
8	6L	0	6	5-80				
8	6L	0	12	5-80				
8	6L	-3	3	5-80				
8	6L	-3	6	5-80				
8	6L	-3	12	5-80				
12	0	0	3	5-80				
12	0	0	6 12	5-80	5.00			
12 12	0	-3	3	5.00	5-80			
12	0	-3 -3	6	5-80				
12	0	-3	12	5-80 5-12.5	12.5-50			
12	6L	0	3	5-12.5	12.5-50			
12	6L	0	6	5-80				
12	6L	0	12	5-80				
12	6L	-3	3	5-80				
12	6L	-3	6	5-80				
12	6L	-3	12	5-80				
18	0	0	3	5-80				
18	0	0	6	5-80				
18	0	0	12	5-80				
18	0	-3	3	5-80			2	
18	0	-3	6	5-80				
18	0	-3	12	5-80				
18	6L	0	3	5-80				
18 18	6L 6L	0	6 12	5-80				
18	6L	-3	3	5-80				
18	6L	-3	6	5-80 5-80				
18	6L	-3	12	5-80				
24	0	0	3	5-80				
24	ŏ	Ö	6	5-80				
24	Ö	Ö	12	5-80				
24	0	-3	3	5-80				
24	0	-3	6	5-80				
24	0	-3	12	5-80				
24	6L	0	3	5-80				
24	6L	0	6	5-80				
24	6L	0	12	5-80				
24	6L	-3	3	5-80				
24	6L	-3	6	5-80				
24	6L	-3	12	5-80				

Table A25: Guardrail Use Guidelines for Urban LC, Benefit-Cost Greater Than 2

	vere Slope Fu			Range of T			e Barrier is	Optimal
Hazard	Curvature	Grade %	Offset to	No	TL-2	TL-3	TL-4	TL-5
Offset			Slope	Treatment	10000000	120		120
5	0	0	3		.5-5	11		
5	0	0	6		.5-5			
5	0	-6	3		.5-5			
5	0	-6	6		.5-5			
5	10L	0	3		.5-5			
5	10L	0	6		.5-5			
5	10L	-6	3		.5-5			
5	10L	-6 0	6 3		.5-5			
8	0				.5-5			
8	0	0	6 12		.5-5			
8	0	-6			.5-5			
8	0		3 6		.5-5			
8	0	-6 -6	12		.5-5			
8	10L	-6 0	3		.5-5			
8		0	6		.5-5			
8	10L	0	12		.5-5			
8	10L 10L	-6	12 3		.5-5			
			6		.5-5			\vdash
8	10L 10L	-6 -6	12		.5-5			
					.5-5			
12 12	0	0	3 6		.5-5			
12	0	0	12		.5-5			
12	0	-6	3		.5-5			
12	0	-6	6		.5-5			
	0				.5-5			
12 12	10L	-6 0	12 3		.5-5			
12	10L	0	6		.5-5			
12	10L	0	12		.5-5 .5-5			
12	10L	-6	3		.5-5			
12	10L	-6	6		.5-5			
12	10L	-6	12		.5-5			
18	0	0	3		.5-5			
18	0	0	6		.5-5			
18	0	0	12		.5-5			
18	ŏ	-6	3		.5-5			
18	ŏ	-6	6		.5-5			
18	0	-6	12		.5-5			
18	10L	0	3		.5-5			
18	10L	Ö	6		.5-5			
18	10L	Ö	12		.5-5			
18	10L	-6	3		.5-5			
18	10L	-6	6		.5-5			
18	10L	-6	12		.5-5			
24	0	0	3		.5-5			
24	Ö	0	6		.5-5			
24	0	0	12		.5-5			
24	0	-6	3		.5-5			
24	0	-6	6		.5-5			
24	0	-6	12		.5-5			
24	10L	0	3		.5-5			
24	10L	0	6		.5-5			
24	10L	0	12		.5-5			
24	10L	-6	3		.5-5			
24	10L	-6	6		.5-5			
24	10L	-6	12		.5-5			

Table A26: Guardrail Use Guidelines for Urban LC, Benefit-Cost Greater Than 2

Urban LC Mo Class	derately Seve	re Slope I	unctional	Range of Traffic Volumes Where Barrier is Optimal						
Hazard Offset	Curvature	Grade %	Offset to Slope	No Treatment	TL-2	TL-3	TL-4	TL-5		
5	0	0	3		0.5-5					
5	0	0	6		0.5-5					
5	0	-6	3		0.5-2.3	2.3-5				
5	0	-6	6		0.5-2.75, 4.55-5	2.75-4.55				
5	10L	0	3	0.5-5						
5	10L	0	6	0.5-5						
5	10L	-6	3	0.5-5						
5	10L	-6	6	0.5-5						
8	0	0	3		0.5-5					
8	0	0	6		0.5-5					
8	0	0	12		0.5-5					
8	0	-6	3		0.5-2.3	2.3-5				
8	0	-6	6		0.5-5					
8	0	-6	12	0.5.5	0.5-5					
8	10L	0	3	0.5-5						
8	10L	0	6	0.5-5						
8 8	10L 10L	-6	12 3	0.5-5						
8		-6		0.5-5						
8	10L 10L	-6 -6	6 12	0.5-5 0.5-5	 					
12	0	0	3		0.0F.F					
12	0	0	6	0.5-0.95	0.95-5					
12	0	0	12	0.5-0.95	0.95-5					
12	0	-6			0.5-5	225				
12	0	-6 -6	3 6		0.5-2.3	2.3-5				
12	0	-6 -6	12	0.5-5	0.5-5					
12	10L	0	3	0.5-5						
12	10L 10L	0	6		-					
12	10L	0	12	0.5-5 0.5-5						
12	10L	-6	3	0.5-5	 					
12	10L	-6	6	0.5-5						
12	10L	-6	12	0.5-5						
18	0	0	3	0.5-5						
18	0	0	6	0.5-2.75, 4.55-5	2.75-4.55					
18	0	0	12	0.5-1.4	1.4-5					
18	0	-6	3	0.5-1.4	1.4-2.3	2.3-5				
18	0	-6	6	0.5-0.95	0.95-5	2.3-3				
18	0	-6	12	0.5-0.95	0.95-5					
18	10L	0	3	0.5-5	0.55-5					
18	10L	0	6	0.5-5	 					
18	10L	Ö	12	0.5-5	 					
18	10L	-6	3	0.5-5						
18	10L	-6	6	0.5-5						
18	10L	-6	12	0.5-5						
24	0	0	3	0.5-5						
24	0	0	6	0.5-5						
24	0	Ö	12	0.5-5						
24	0	-6	3	0.5-5	 					
24	0	-6	6	0.5-5						
24	0	-6	12	0.5-5	i i					
24	10L	0	3	0.5-5	1					
24	10L	0	6	0.5-5						
24	10L	0	12	0.5-5	1					
24	10L	-6	3	0.5-5						
24	10L	-6	6	0.5-5						
24	10L	-6	12	0.5-5						
	IUL	-0	12	0.5-5	<u> </u>		L			

Table A27: Guardrail Use Guidelines for Urban LC, Benefit-Cost Greater Than 2

Urban LC Moderate Slope Functional Class				Range of Traffic Volumes Where Barrier is Optimal					
Hazard	Curvature	Grade	Offset to	No Treatment	TL-2	TL-3	TL-4	TL-5	
Offset		%	Slope						
5	0	0	3	0.5-2.75, 4.55-5	2.75-4.55				
5	0	0	6	0.5-3.2, 4.55-5	3.2-4.55				
5	0	-6	3	0.5-1.4	1.4-5				
5	0	-6	6	0.5-1.4	1.4-5				
5	10L	0	3	0.5-5					
5	10L	0	6	0.5-5					
5 5	10L	-6 -6	3 6	0.5-5					
8	10L 0	<u>-6</u> 0	3	0.5-5					
8	0	0	6	0.5-5					
8	0	0	12	0.5-5					
8	0	-6	3	0.5-5	4.05.5				
8	0	-6 -6	6	0.5-1.85	1.85-5				
8	0	-6 -6	12	0.5-1.85	1.85-5				
8	10L	-6 0	3	0.5-1.85	1.85-5				
8	10L 10L	0	6	0.5-5					
8	10L	0	12	0.5-5				-	
8	10L 10L	-6	3	0.5-5					
8	10L	-6 -6	6	0.5-5					
8	10L 10L	-6 -6	12	0.5-5					
12	0	-6 0	3	0.5-5					
12	0	0	6	0.5-5					
12	0	0	12	0.5-5					
12	0	-6	3	0.5-5	2.05.4.55				
12	0	-6 -6	6	0.5-3.65, 4.55-5	3.65-4.55				
12	0	-6 -6	12	0.5-5					
12	10L	0	3	0.5-5					
12	10L	0	6	0.5-5					
12	10L	0	12	0.5-5 0.5-5					
12	10L 10L	-6	3	0.5-5					
12	10L 10L	-6	6	0.5-5					
12	10L 10L	-6	12	0.5-5					
18	0	0	3	0.5-5					
18	0	0	6	0.5-5					
18	0	0	12	0.5-5					
18	0	-6	3	0.5-5					
18	0	-6	6	0.5-5					
18	0	-6	12	0.5-5					
18	10L	0	3	0.5-5					
18	10L	Ö	6	0.5-5					
18	10L	Ö	12	0.5-5				 	
18	10L	-6	3	0.5-5					
18	10L	-6	6	0.5-5					
18	10L	-6	12	0.5-5					
24	0	0	3	0.5-5					
24	0	0	6	0.5-5					
24	0	0	12	0.5-5					
24	0	-6	3	0.5-5					
24	0	-6	6	0.5-5					
24	0	-6	12	0.5-5					
24	10L	0	3	0.5-5					
24	10L	0	6	0.5-5					
24	10L	0	12	0.5-5					
24	10L	-6	3	0.5-5					
24	10L	-6	6	0.5-5					
24	10L	-6	12	0.5-5					

Table A28: Guardrail Use Guidelines for Urban LC, Benefit-Cost Greater Than 2

Severe Po	oint Hazard			Range of Traffic Volumes Where Barrier is Optimal						
Hazard		Grade	Offset to							
Offset	Curvature	%	Slope	No Treatment	TL-2	TL-3	TL-4	TL-5		
5	0	0	3		0.5-5					
5	0	0	6		0.5-5					
5	0	0	12		0.5-5					
5	0	-6	3	0.5-0.95	0.95-5					
5	0	-6	6		0.5-5					
5	0	-6	12		0.5-5					
5	10L	0	3	0.5-5						
5	10L	0	6	0.5-1.4, 2.3-5	1.4-2.3					
5	10L	0	12	0.5-5	2222					
5 5	10L 10L	-6 -6	3 6	0.5-2.3, 3.2-5	2.3-3.2					
5	10L	- 6	12	0.5-1.4, 3.2-5 0.5-1.4, 2.3-5	1.4-3.2 1.4-2.3	—				
8	0	0	3	0.5-1.4, 2.3-5	0.95-5	_				
8	Ö	0	6	0.5-0.95	0.95-5					
8	ŏ	Ö	12	0.5-0.95	0.95-5					
8	Ö	-6	3	5.5 5.55	0.5-5					
8	Ö	-6	6		0.5-5					
8	0	-6	12		0.5-5					
8	10L	0	3	0.5-5						
8	10L	0	6	0.5-5						
8	10L	0	12	0.5-5						
8	10L	-6	3	0.5-5						
8	10L	-6	6	0.5-5						
8 12	10L	-6 0	12 3	0.5-5						
12	0	0	6	0.5-5 0.5-1.85, 4.1-5	1.05.4.1					
12	0	0	12	0.5-1.85, 4.1-5	1.85-4.1 1.4-5					
12	0	-6	3	0.5-1.4	1.4-5					
12	ŏ	-6	6	0.5-0.95	0.95-5					
12	Ö	-6	12	0.5-1.4, 2.3-5	1.4-2.3					
12	10L	0	3	0.5-5						
12	10L	0	6	0.5-5						
12	10L	0	12	0.5-5						
12	10L	-6	3	0.5-5						
12	10L	-6	6	0.5-5						
12	10L	-6	12	0.5-5						
18 18	0	0	3 6	0.5-5						
18	0	0	12	0.5-5 0.5-5						
18	0	-6	3	0.5-5						
18	Ö	-6	6	0.5-5						
18	ŏ	-6	12	0.5-2.3, 3.2-5	2.3-3.2					
18	10L	0	3	0.5-5						
18	10L	0	6	0.5-5						
18	10L	0	12	0.5-5						
18	10L	-6	3	0.5-5						
18	10L	-6	6	0.5-5						
18	10L	-6	12	0.5-5						
24	0	0	3 6	0.5-5						
24 24	0	0	12	0.5-5 0.5-5						
24	0	-6	3	0.5-5						
24	ŏ	-6	6	0.5-5						
24	0	-6	12	0.5-5						
24	10L	0	3	0.5-5						
24	10L	0	6	0.5-5						
24	10L	0	12	0.5-5						
24	10L	-6	3	0.5-5						
24	10L	-6	6	0.5-5						
24	10L	-6	12	0.5-5						

Table A29: Guardrail Use Guidelines for Urban LC, Benefit-Cost Greater Than 2

Moderately	Severe Point H	azard		Range of Traffic Volumes Where Barrier is Optimal					
Hazard	Curvature	Grade	Offset to	No Treatment	TL-2	TL-3	TL-4	TL-5	
Offset	The second secon	%	Slope	140 Treatment	-	12-0	15-4	12-0	
5	0	0	3		0.5-5				
5 5	0	0	6 12		0.5-5				
5	0	-6	3		0.5-5 0.5-5				
5	0	-6	6		0.5-5			-	
5	0	-6	12		0.5-5			<u> </u>	
5	10L	0	3	0.5-5	0.5-5			 	
5	10L	ŏ	6	0.5-5				 	
5	10L	0	12	0.5-5					
5	10L	-6	3	0.5-3.65, 4.55-5	3.65-4.55				
5	10L	-6	6	3.2-5	0.5-3.2				
5	10L	-6	12	0.5-1.85, 3.2-5	1.85-3.2				
8	0	0	3	0.5-0.95	0.95-5				
8	0	0	6	0.5-0.95	0.95-5				
8	0	0	12	0.5-0.95	0.95-5				
8	0	-6	3		0.5-5				
8	0	-6	6		0.5-5				
8	0	-6 0	12 3	0.5.5	0.5-5				
8	10L	0	6	0.5-5					
8	10L 10L	0	12	0.5-5 0.5-5				_	
8	10L	-6	3	0.5-5				-	
8	10L	-6	6	0.5-5				_	
8	10L	-6	12	0.5-5					
12	0	0	3	0.5-5	0.5-5				
12	Ö	0	6	0.5-1.4	1.4-5				
12	0	0	12	0.5-0.95	0.95-5			<u> </u>	
12	0	-6	3		0.5-5				
12	0	-6	6		0.5-5			i	
12	0	-6	12		0.5-5				
12	10L	0	3	0.5-5					
12	10L	0	6	0.5-5					
12	10L	0	12	0.5-5					
12	10L	-6	3	0.5-5					
12 12	10L 10L	-6 -6	6 12	0.5-5				-	
18	0	0	3	0.5-5 0.5-5				-	
18	0	0	6	0.5-5				<u> </u>	
18	ŏ	Ö	12	0.5-5					
18	0	-6	3	0.5-5					
18	0	-6	6	0.5-1.4, 3.2-4.1	1.4-3.2, 4.1-5				
18	0	-6	12	0.5-1.4	1.4-5				
18	10L	0	3	0.5-5					
18	10L	0	6	0.5-5					
18	10L	0	12	0.5-5					
18	10L	-6	3	0.5-5					
18	10L	-6	6	0.5-5					
18 24	10L	-6 0	12 3	0.5-5			-		
24	0	0	6	0.5-5 0.5-5	-		-	-	
24	0	0	12	0.5-5					
24	0	-6	3	0.5-5			<u> </u>	1	
24	ŏ	-6	6	0.5-5				1	
24	ŏ	-6	12	0.5-5					
24	10L	0	3	0.5-5			1	1	
24	10L	0	6	0.5-5					
24	10L	0	12	0.5-5					
24	10L	-6	3	0.5-5					
24	10L	-6	6	0.5-5					
24	10L	-6	12	0.5-5					

Table A30: Guardrail Use Guidelines for Urban LC, Benefit-Cost Greater Than 2

Moderate	Point Hazaı			Range of Traffic Volumes Where Barrier is Optimal					
Hazard		Grade	Offset to						
Offset	Curvature	%	Slope	No Treatment	TL-2	TL-3	TL-4	TL-5	
5	0	0	3	0.5-5					
5	0	0	6	0.5-5					
5 5	0	0 -6	12 3	0.5-5					
5	0	-6 -6	6	0.5-5 0.5-5		+			
5	0	-6	12	0.5-5					
5	10L	Ö	3	0.5-5		+			
5	10L	0	6	0.5-5					
5	10L	0	12	0.5-5					
5	10L	-6	3	0.5-5					
5	10L	-6	6	0.5-2.3, 3.2-5	2.3-3.2				
5	10L	-6	12	0.5-5					
8	0	0	3 6	0.5-5					
8	0	0	12	0.5-5 0.5-1.4, 3.2-5	1.4-3.2	+		\vdash	
8	0	-6	3	0.5-1.4, 3.2-3	1.7-0.4	 		 	
8	ŏ	-6	6	0.5-5				 	
8	0	-6	12	0.5-5					
8	10L	0	3	0.5-5					
8	10L	0	6	0.5-5					
8	10L	0	12	0.5-5					
8	10L 10L	-6 -6	3 6	0.5-5					
8	10L 10L	-6 -6	12	0.5-5		-			
12	0	0	3	0.5-5 0.5-5		_			
12	ŏ	Ö	6	0.5-5					
12	Ö	Ö	12	0.5-5		1			
12	0	-6	3	0.5-5					
12	0	-6	6	0.5-5					
12	0	-6	12	0.5-5					
12	10L	0	3	0.5-5					
12 12	10L 10L	0	6 12	0.5-5					
12	10L	-6	3	0.5-5 0.5-5		-			
12	10L	-6	6	0.5-5					
12	10L	-6	12	0.5-5		<u> </u>		 	
18	0	0	3	0.5-5					
18	0	0	6	0.5-5					
18	0	0	12	0.5-5					
18	0	-6	3	0.5-5					
18	0	-6	6	0.5-5					
18 18	0 10L	-6 0	12 3	0.5-5 0.5-5		 		 	
18	10L	0	6	0.5-5		 		 	
18	10L	Ö	12	0.5-5		 		 	
18	10L	-6	3	0.5-5					
18	10L	-6	6	0.5-5					
18	10L	-6	12	0.5-5					
24	0	0	3	0.5-5					
24	0	0	6	0.5-5					
24 24	0	-6	12 3	0.5-5				├──	
24	0	- 6	6	0.5-5 0.5-5		+		 	
24	0	-6	12	0.5-5		+		 	
24	10L	0	3	0.5-5					
24	10L	0	6	0.5-5					
24	10L	0	12	0.5-5					
24	10L	-6	3	0.5-5					
24	10L	-6	6	0.5-5					
24	10L	-6	12	0.5-5					