

June 28, 2021

Richard Tramm
City Administrator
City of Montgomery
101 Old Plantersville Road
Montgomery, Texas 77316

Speed Zoning Summary Report

Road: FM 1097
County: Montgomery
Control-Section: 1259-01
Begin Mile Point: 0.000
End Mile Point: 1.500

Dear Mr. Tramm,

Jones|Carter has completed our review of FM 1097 between mile points 0.000 to 1.500. Speed data was collected at 3 locations and curve data was collected at 4 locations within the zoned section. A summary of the collected data appears in the tables below. The raw data can be found in the **Appendix**.

A. Spot Speed Studies

Spot speed surveys of vehicles traveling on FM 1097 were conducted at three different locations. The speeds of around 125 vehicles in each direction were recorded at each of the study locations. The data obtained in these studies were used to determine the 85th percentile speeds, which are summarized in **Table 1**. The posted speed limit is 55 mph on the study section of FM 1097 with various advisory speeds for the curves. Complete speed survey data is included in **Appendix**.

Figure 1: FM 1097 Speed Study and Curve Locations

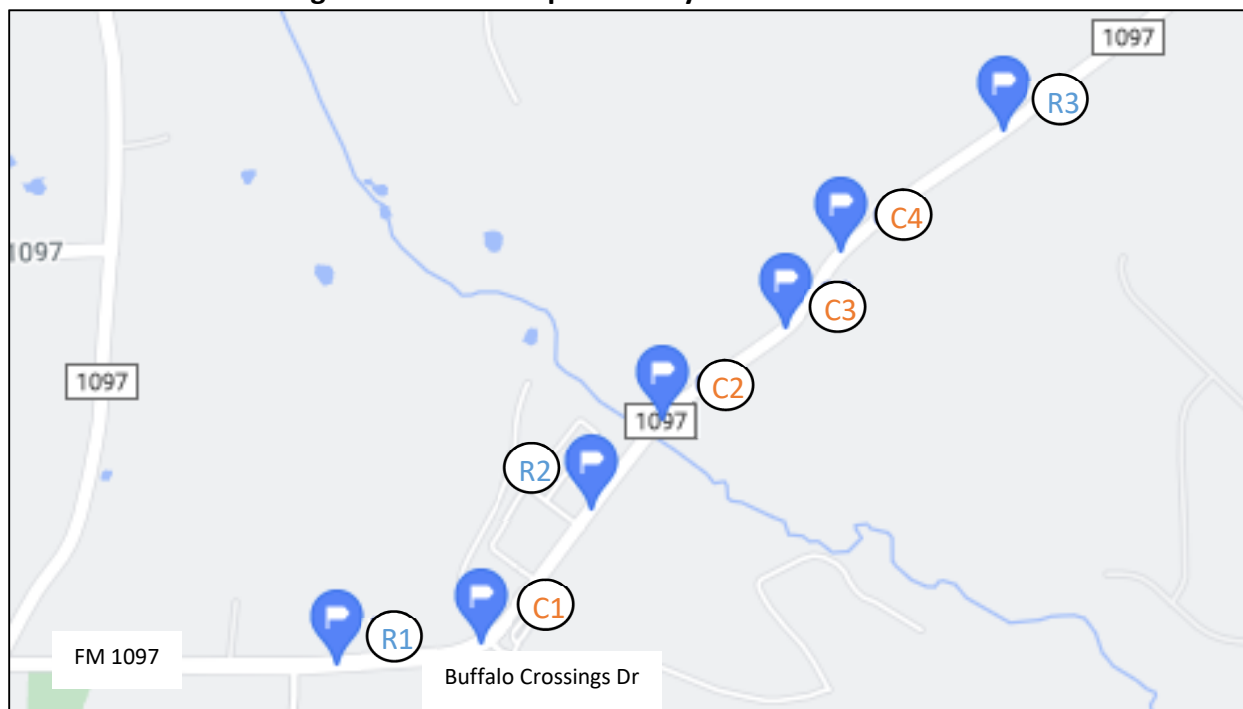


Table 1: 85th Percentile Speed Study Data

Number	Location of Speed Study	Posted Speed (mph)	Date Collected	Direction of Travel	Total Vehicles Recorded	Max Speed (mph)	85th Percentile Speed (mph)	Recommended Posted Speed (mph)
R1	East of Plez Morgan Dr	55	6/14/2021	EB	125	62	55	50
		55	6/14/2021	WB	125	70	51	50
R2	East of Buffalo Crossings Dr	55	6/14/2021	EB	125	59	50	50
		55	6/14/2021	WB	125	56	51	50
R3	South of Peel Crossings Dr	55	6/14/2021	EB	125	61	55	No Change
		55	6/14/2021	WB	125	70	57	No Change

B. Curve Study

A test run was conducted on FM 1097 in both directions between FM 149 and 0.36 miles south of Peel Road. TRAMS software was used during the runs to collect data on the four curves present along the study segment. The data obtained from the test run is summarized in **Table 2**, and the complete data is included in **Appendix**.

Table 2: Curve Data

Curve	Travel Direction	Existing Roadway Speed Limit (mph)	Existing Advisory Speed (mph)	Collected Advisory Speed (mph)	Recommended Advisory Speed (mph)
C1	EB	55	40	30	35
	WB	55	40	35	35
C2	EB	55	50	40	40
	WB	55	50	40	40
C3	EB	55	45	40	No Change
	WB	55	45	45	No Change
C4	EB	55	45	40	No Change
	WB	55	45	45	No Change

C. Trial Runs

Jones|Carter staff traveled the segment of roadway on Tuesday, June 15, 2021 and had the following observations regarding traffic operations:

- No conditions were observed within the study segment that would influence the proposed speed zones during test runs through the area.
- Trial runs were conducted and the raw field data can be found in the **Appendix**.

D. Recommendations

Based on the review of the existing conditions and data collected, it is recommended that TxDOT consider the following changes to the speed zone and signing in the City of Montgomery on FM 1097:

1. Change the speed limit to 50 mph and update signing.
2. Change the advisory speed limit signing for Curve C1 to 35 mph.
3. Change the advisory speed limit signing for Curve C2 to 40 mph.

If you have any questions or comments, please contact me at (713) 777-5337.



Mary Beth Hairrell, P.E.
Project Engineer
Jones|Carter

Interim Review:

This Document is released for Review Only
under the authority of Mary Beth Hairrell, P.E.,
Texas No. 140234 on June 28, 2021.

Appendix

Contents

- Appendix A Speed Study Data
- Appendix B Curve Study Data
- Appendix C Trial Run Data
- Appendix D FM 1097 Existing Signs Figure
- Appendix E FM 1097 Recommended Signs Figure

Appendix A
Speed Study Data



RADAR MOTOR VEHICLE SPEED Field Tally Sheet

Date: 06/14/21 County: Montgomery Hwy: FM 1097 Location: R1: 250 feet east of Plez Morgan Drive

Time (from): 1:07 PM (to): 2:10 PM Weather: Clear

Surface type: _____ Surface condition: Wet or Dry / Smooth or Rough

M.P.H.	AUTOMOBILES		M.P.H.	AUTOMOBILES		M.P.H.	AUTOMOBILES		M.P.H.
	Direction: EB			Direction: EB			Direction:	Direction:	
>80									>80
79									79
78									78
77									77
76									76
75									75
74									74
73									73
72									72
71									71
70				1		130			70
69									69
68									68
67									67
66									66
65									65
64									64
63									63
62	2		130						62
61									61
60									60
59	3		128						59
58	2		125						58
57	2		123						57
56	7		121	3		129			56
55	6		114	1		126			55
54	4		108	3		125			54
53	9		104	3		122			53
52	10		95	5		119			52
51	10		85	9		114			51
50	11		75	9		105			50
49	8		64	13		96			49
48	12		56	12		83			48
47	14		44	18		71			47
46	7		30	11		53			46
45	6		23	14		42			45
44	2		17	3		28			44
43	3		15	6		25			43
42	3		12	1		19			42
41	3		9	4		18			41
40	3		6	5		14			40
39	1		3	2		9			39
38				2		7			38
37	1		2	1		5			37
36	1		1	1		4			36
35				2		3			35
34									34
33				1		1			33
32									32
31									31
<30									<30
Total Automobiles			Total Automobiles						
		x 0.85			x 0.85				
85th Percentile Automobile:		111	85th Percentile Automobile:		111				
85th Percentile Speed (m.p.h.):		55	85th Percentile Speed (m.p.h.):		51				

Total No. of Cars	85% Car No.	Total No. of Cars	85% Car No.	Total No. of Cars	85% Car No.	Total No. of Cars	85% Car No.
80	68	120	102	160	136	200	170
81	69	121	103	161	137	201	171
82	70	122	104	162	138	202	172
83	71	123	105	163	139	203	173
84	71	124	105	164	139	204	173
85	72	125	106	165	140	205	174
86	73	126	107	166	141	206	175
87	74	127	108	167	142	207	176
88	75	128	109	168	143	208	177
89	76	129	110	169	144	209	178
90	77	130	111	170	145	210	179
91	77	131	111	171	145	211	179
92	78	132	112	172	146	212	180
93	79	133	113	173	147	213	181
94	80	134	114	174	148	214	182
95	81	135	115	175	149	215	183
96	82	136	116	176	150	216	184
97	82	137	116	177	150	217	184
98	83	138	117	178	151	218	185
99	84	139	118	179	152	219	186
100	85	140	119	180	153	220	187
101	86	141	120	181	154	221	188
102	87	142	121	182	155	222	189
103	88	143	122	183	156	223	190
104	88	144	122	184	156	224	190
105	89	145	123	185	157	225	191
106	90	146	124	186	158	226	192
107	91	147	125	187	159	227	193
108	92	148	126	188	160	228	194
109	93	149	127	189	161	229	195
110	94	150	128	190	162	230	196
111	94	151	128	191	162	231	196
112	95	152	129	192	163	232	197
113	96	153	130	193	164	233	198
114	97	154	131	194	165	234	199
115	98	155	132	195	166	235	200
116	99	156	133	196	167	236	201
117	99	157	133	197	167	237	201
118	100	158	134	198	168	238	202
119	101	159	135	199	169	239	203



RADAR MOTOR VEHICLE SPEED Field Tally Sheet

Date: 06/14/21 County: Montgomery Hwy: FM 1097 Location: R2: 1,000 feet east of Buffalo Crossings Drive

Time (from): 3:00 PM (to): 4:05 PM Weather: Clear

Surface type: _____ Surface condition: Wet or Dry / Smooth or Rough

M.P.H.	AUTOMOBILES		AUTOMOBILES		AUTOMOBILES		M.P.H.
	Direction: EB	Cumulative Total	Direction: EB	Cumulative Total	Direction:	Direction:	
>80							>80
79							79
78							78
77							77
76							76
75							75
74							74
73							73
72							72
71							71
70							70
69							69
68							68
67							67
66							66
65							65
64							64
63							63
62							62
61							61
60							60
59	1	125					59
58							58
57							57
56	1	124	2	125			56
55	1	123	2	123			55
54			1	121			54
53	4	122	8	120			53
52	3	118	4	112			52
51	4	115	6	108			51
50	6	111	14	102			50
49	9	105	10	88			49
48	4	96	11	78			48
47	9	92	15	67			47
46	4	83	10	52			46
45	11	79	14	42			45
44	7	68	9	28			44
43	13	61	7	19			43
42	10	48	4	12			42
41	10	38	1	8			41
40	10	28	2	7			40
39	7	18	2	5			39
38	3	11					38
37	4	8	1	3			37
36	1	4					36
35	1	3					35
34							34
33	1	2	2	2			33
32	1	1					32
31							31
<30							<30
	Total Automobiles		Total Automobiles				
		x 0.85		x 0.85			
	85th Percentile Automobile: 106		85th Percentile Automobile: 106				
	85th Percentile Speed (m.p.h.): 50		85th Percentile Speed (m.p.h.): 51				

Total No. of Cars	85% Car No.	Total No. of Cars	85% Car No.	Total No. of Cars	85% Car No.	Total No. of Cars	85% Car No.
80	68	120	102	160	136	200	170
81	69	121	103	161	137	201	171
82	70	122	104	162	138	202	172
83	71	123	105	163	139	203	173
84	71	124	105	164	139	204	173
85	72	125	106	165	140	205	174
86	73	126	107	166	141	206	175
87	74	127	108	167	142	207	176
88	75	128	109	168	143	208	177
89	76	129	110	169	144	209	178
90	77	130	111	170	145	210	179
91	77	131	111	171	145	211	179
92	78	132	112	172	146	212	180
93	79	133	113	173	147	213	181
94	80	134	114	174	148	214	182
95	81	135	115	175	149	215	183
96	82	136	116	176	150	216	184
97	82	137	116	177	150	217	184
98	83	138	117	178	151	218	185
99	84	139	118	179	152	219	186
100	85	140	119	180	153	220	187
101	86	141	120	181	154	221	188
102	87	142	121	182	155	222	189
103	88	143	122	183	156	223	190
104	88	144	122	184	156	224	190
105	89	145	123	185	157	225	191
106	90	146	124	186	158	226	192
107	91	147	125	187	159	227	193
108	92	148	126	188	160	228	194
109	93	149	127	189	161	229	195
110	94	150	128	190	162	230	196
111	94	151	128	191	162	231	196
112	95	152	129	192	163	232	197
113	96	153	130	193	164	233	198
114	97	154	131	194	165	234	199
115	98	155	132	195	166	235	200
116	99	156	133	196	167	236	201
117	99	157	133	197	167	237	201
118	100	158	134	198	168	238	202
119	101	159	135	199	169	239	203



RADAR MOTOR VEHICLE SPEED Field Tally Sheet

Date: 06/14/21 County: Montgomery Hwy: FM 1097 Location: R3: 2,450 feet south of Peel Road

Time (from): 4:07 PM (to): 4:56 PM Weather: Clear

Surface type: _____ Surface condition: Wet or Dry / Smooth or Rough

M.P.H.	AUTOMOBILES		Cumulative Total	AUTOMOBILES		Cumulative Total	AUTOMOBILES		M.P.H.
	Direction: EB			Direction: EB			Direction:	Direction:	
>80									>80
79									79
78									78
77									77
76									76
75									75
74									74
73									73
72									72
71									71
70				1	125				70
69				1	124				69
68									68
67				1	123				67
66									66
65									65
64				1	122				64
63									63
62				2	121				62
61	1	125		2	119				61
60	1	124		4	117				60
59				2	113				59
58	1	123		4	111				58
57	7	122		13	107				57
56	8	115		10	94				56
55	7	107		14	84				55
54	8	100		9	70				54
53	13	92		11	61				53
52	12	79		21	50				52
51	14	67		8	29				51
50	14	53		5	21				50
49	6	39		2	16				49
48	4	33		4	14				48
47	11	29		5	10				47
46	2	18		2	5				46
45	5	16		3	3				45
44	5	11							44
43	3	6							43
42	2	3							42
41									41
40	1	1							40
39									39
38									38
37									37
36									36
35									35
34									34
33									33
32									32
31									31
<30									<30
	Total Automobiles			Total Automobiles					
		x 0.85			x 0.85				
	85th Percentile Automobile:		106	85th Percentile Automobile:		106			
	85th Percentile Speed (m.p.h.):		55	85th Percentile Speed (m.p.h.):		57			

Total No. of Cars	85% Car No.	Total No. of Cars	85% Car No.	Total No. of Cars	85% Car No.	Total No. of Cars	85% Car No.
80	68	120	102	160	136	200	170
81	69	121	103	161	137	201	171
82	70	122	104	162	138	202	172
83	71	123	105	163	139	203	173
84	71	124	105	164	139	204	173
85	72	125	106	165	140	205	174
86	73	126	107	166	141	206	175
87	74	127	108	167	142	207	176
88	75	128	109	168	143	208	177
89	76	129	110	169	144	209	178
90	77	130	111	170	145	210	179
91	77	131	111	171	145	211	179
92	78	132	112	172	146	212	180
93	79	133	113	173	147	213	181
94	80	134	114	174	148	214	182
95	81	135	115	175	149	215	183
96	82	136	116	176	150	216	184
97	82	137	116	177	150	217	184
98	83	138	117	178	151	218	185
99	84	139	118	179	152	219	186
100	85	140	119	180	153	220	187
101	86	141	120	181	154	221	188
102	87	142	121	182	155	222	189
103	88	143	122	183	156	223	190
104	88	144	122	184	156	224	190
105	89	145	123	185	157	225	191
106	90	146	124	186	158	226	192
107	91	147	125	187	159	227	193
108	92	148	126	188	160	228	194
109	93	149	127	189	161	229	195
110	94	150	128	190	162	230	196
111	94	151	128	191	162	231	196
112	95	152	129	192	163	232	197
113	96	153	130	193	164	233	198
114	97	154	131	194	165	234	199
115	98	155	132	195	166	235	200
116	99	156	133	196	167	236	201
117	99	157	133	197	167	237	201
118	100	158	134	198	168	238	202
119	101	159	135	199	169	239	203

Appendix B
Curve Study Data

CURVE ADVISORY SPEED WORKSHEET

General Information

County:	Montgomery	Curve Data Source:	Date:	June 18, 2021
Highway:	FM 1097 EB	Known curve geometry	Analyst:	Abdel R Trawi

Input Data

Data Description	Curve ID Number					
	C1	C2	C3	C4		
Curve deflection, left or right	Left	Right	Left	Right		
Roadway configuration (2U, 4U, 4D, 4F)	2U	2U	2U	2U		
Compass heading 1, degrees	251.7	124	254	239	330	189
BBI reading of superelevation, degrees	4.8	5.1	7.4	1.0	1.0	8.3
Deflection of ball for superelevation reading, left or right	Right	Left	Left	Right	Right	Left
Speed when recording the BBI reading of superelevation, mph	0	0	0	0	0	0
Curve length, ft <i>Caution, curve length outside equation range.</i>	216	237	118	57	57	110
Compass heading 2, degrees	261	94	244	207	300	158
Survey method (partial or full)	Partial	Partial	Partial	Partial	Partial	Partial
Regulatory speed limit, mph	55	55	55	55		
Estimate of 85th% tangent speed, mph	61	63	60	63		

Alternate Input Data (if data are entered here, they will be used instead of estimates from the data above)

85th% tangent speed, mph	55	50	50	50		
Total curve deflection angle, degrees	47	16	24	19		
Curve deflection angle, degrees	5.1	1.8	4.1	2.2		
Superelevation rate, percent	-2.0	0.0	16.0	2.4		
Curve radius, ft	457	900	350	667		

Advisory Speed

Survey method (partial or full)	Partial	Partial	Partial	Partial	Full	Full
Total deflection angle, degrees	47	16	24	19	0	0
Curve deflection angle, degrees <i>Caution, deflection angle outside equation range.</i>	5.1	1.8	4.1	2.2	0.0	0.0
Curve radius, ft	457	900	350	667		
Degree of curvature, degrees	12.5	6.4	16.3	8.6		
Curve path radius, ft	493	1222	487	879		
Superelevation rate, percent	-2.0	0.0	16.0	2.4		
Average tangent speed, mph	48	44	44	44		
Unrounded advisory speed, mph	34	41	42	40		
Rounded advisory speed, mph	30	40	40	40		

Traffic Control Device Guidelines

85th% tangent speed, mph	55	50	50	50		
85th% curve speed, mph	40	50	48	49		
Curve severity category	C		A	A		

Curve Warning Signs

Curve sign (W1-2, W1-4, W1-5)		Req.	Req.	Req.		
Turn sign (W1-1, W1-3, W1-5)	Req.					
Hairpin Curve sign (W1-11)						
Minimum Curve sign size, in	36x36	36x36	36x36	36x36		
Min. advance placement distance, ft	175	100	100	100		
Advisory Speed plaque (W13-1P)	Req.	Req.	Req.	Req.		
Min. Adv. Speed plaque sign size, in	18x18	18x18	18x18	18x18		

Comb. Curve/Adv. Speed sign (W1-2a)						
Comb. Turn/Adv. Speed sign (W1-1a)	Opt.					
<i>Minimum Comb. sign size, in</i>	30x30					
One-Dir. Large Arrow (W1-6 or W1-9T)	Opt.	Opt.	Opt.	Opt.		
Chevrons (W1-8)	Req.	Req.	Req.	Req.		
<i>Chevron spacing, ft</i>	120	160	80	120		
Delineation Devices						
Raised pavement markers	Opt.	Opt.	Opt.	Opt.		
Delineators	Opt.	Opt.	Opt.	Opt.		
<i>Delineator spacing, ft</i>	60	85	50	75		
Special Treatments						
Opt. = optional		Rec. = recommended		Req. = required		

CURVE ADVISORY SPEED WORKSHEET

General Information						
County:	Montgomery	Curve Data Source:	Date:		June 18, 2021	
Highway:	FM 1097 WB	Known curve geometry	Analyst:		Abdel R Trawi	
Input Data						
Data Description	Curve ID Number					
	C1	C2	C3	C4		
Curve deflection, left or right	Right	Left	Right	Left		
Roadway configuration (2U, 4U, 4D, 4F)	2U	2U	2U	2U		
Compass heading 1, degrees	251.7	124	254	239	330	189
BBI reading of superelevation, degrees	4.8	5.1	7.4	1.0	1.0	8.3
Deflection of ball for superelevation reading, left or right	Right	Left	Left	Right	Right	Left
Speed when recording the BBI reading of superelevation, mph	0	0	0	0	0	0
Curve length, ft <i>Caution, curve length outside equation range.</i>	216	237	118	57	57	110
Compass heading 2, degrees	261	94	244	207	300	158
Survey method (partial or full)	Partial	Partial	Partial	Partial	Partial	Partial
Regulatory speed limit, mph	55	55	55	55		
Estimate of 85th% tangent speed, mph	59	63	61	61		
Alternate Input Data (if data are entered here, they will be used instead of estimates from the data above)						
85th% tangent speed, mph	51	57	57	57		
Total curve deflection angle, degrees	48	15	22	19		
Curve deflection angle, degrees	4.3	2.4	3.5	3.6		
Superelevation rate, percent	9.5	-4.7	11.8	9.1		
Curve radius, ft	343	936	408	441		
Advisory Speed						
Survey method (partial or full)	Partial	Partial	Partial	Partial	Full	Full
Total deflection angle, degrees	48	15	22	19	0	0
Curve deflection angle, degrees <i>Caution, deflection angle outside equation range.</i>	4.3	2.4	3.5	3.6	0.0	0.0
Curve radius, ft	343	936	408	441		
Degree of curvature, degrees	16.7	6.1	14.0	13.0		
Curve path radius, ft	378	1291	568	655		
Superelevation rate, percent	9.5	-4.7	11.8	9.1		
Average tangent speed, mph	45	50	50	50		
Unrounded advisory speed, mph	36	42	44	45		
Rounded advisory speed, mph	35	40	45	45		
Traffic Control Device Guidelines						
85th% tangent speed, mph	51	57	57	57		
85th% curve speed, mph	41	51	51	52		
Curve severity category	B	B	B	B		
Curve Warning Signs						
Curve sign (W1-2, W1-4, W1-5)	Req.	Req.	Req.	Req.		
Turn sign (W1-1, W1-3, W1-5)						
Hairpin Curve sign (W1-11)						
Minimum Curve sign size, in	36x36	36x36	36x36	36x36		
Min. advance placement distance, ft	100	125	100	100		
Advisory Speed plaque (W13-1P)	Req.	Req.	Req.	Req.		
Min. Adv. Speed plaque sign size, in	18x18	18x18	18x18	18x18		

Comb. Curve/Adv. Speed sign (W1-2a)						
Comb. Turn/Adv. Speed sign (W1-1a)						
<i>Minimum Comb. sign size, in</i>						
One-Dir. Large Arrow (W1-6 or W1-9T)	Opt.	Opt.	Opt.	Opt.		
Chevrons (W1-8)	Req.	Req.	<i>Rec.</i>	<i>Rec.</i>		
<i>Chevron spacing, ft</i>	80	160	80	120		
Delineation Devices						
Raised pavement markers	Opt.	Opt.	Opt.	Opt.		
Delineators	Opt.	Opt.	Opt.	Opt.		
<i>Delineator spacing, ft</i>	50	90	55	60		
Special Treatments						
	Opt. = optional	<i>Rec. = recommended</i>		Req. = required		

Appendix C

Trial Run Data



Form 1929 (rev. 3/21/2005)

Summary of Trial Run for Speed Zones

Date: 6/15 Driver(s): Adam Barnes

Time: (from) _____ (to) _____ Weather: Sunny

Surface Type: Asphalt Surface Condition: Wet or Dry / Smooth or Rough

County (City — if applicable)	Highway / Control Section	Limits		Length (miles)	Speed (miles per hour)
		Begin	End		
Montgomery	FM 1097	0	0.3	0.3	56
"	"	0.3	0.6	" "	40
"	"	0.6	0.9	"	49
"	"	0.9	1.2	"	47
"	"	1.2	1.5	"	56
"	"	1.5	1.2	"	61
"	"	1.2	0.9	"	56
"	"	0.9	0.6	"	58
"	"	0.6	0.3	"	56
"	"	0.3	0.0	"	54
				"	

TR1
EB

turn

TR2
WB

bridge

Instructions:

- List counties (cities) in alphabetical order.
- Order highways as follows:
 1. Interstate Highways
 2. US Highways
 3. State Highways
 4. FM/RM Roads
- Show lengths up to 3 decimal places.



Form 1929 (rev. 3/21/2005)

Summary of Trial Run for Speed Zones

Date: 6/15 Driver(s): Kate Sumberg

Time: (from) _____ (to) _____ Weather: Sunny

Surface Type: Asphalt Surface Condition: Wet or Dry / Smooth or Rough

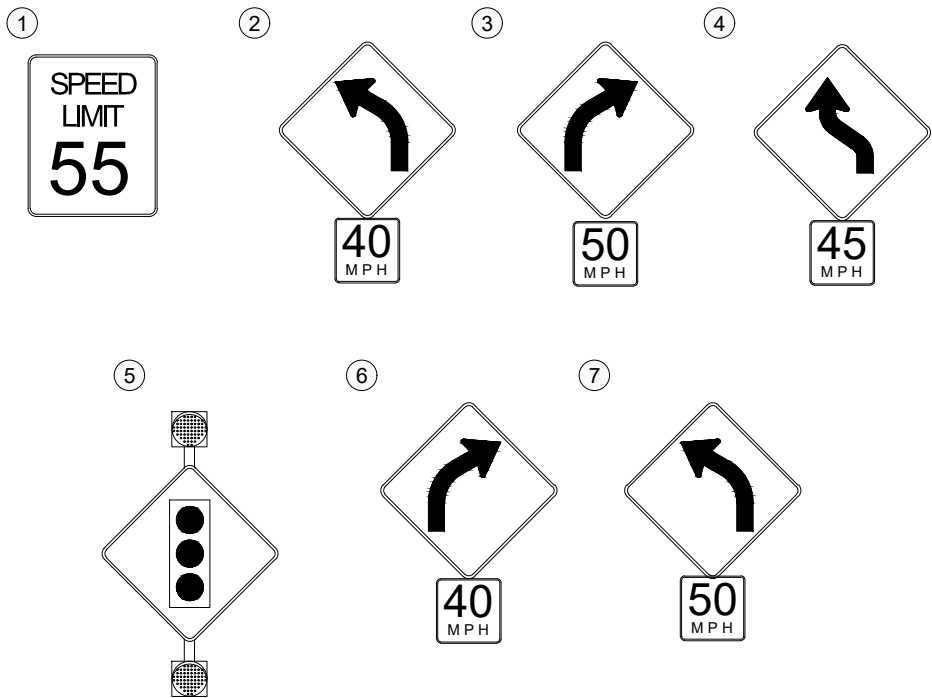
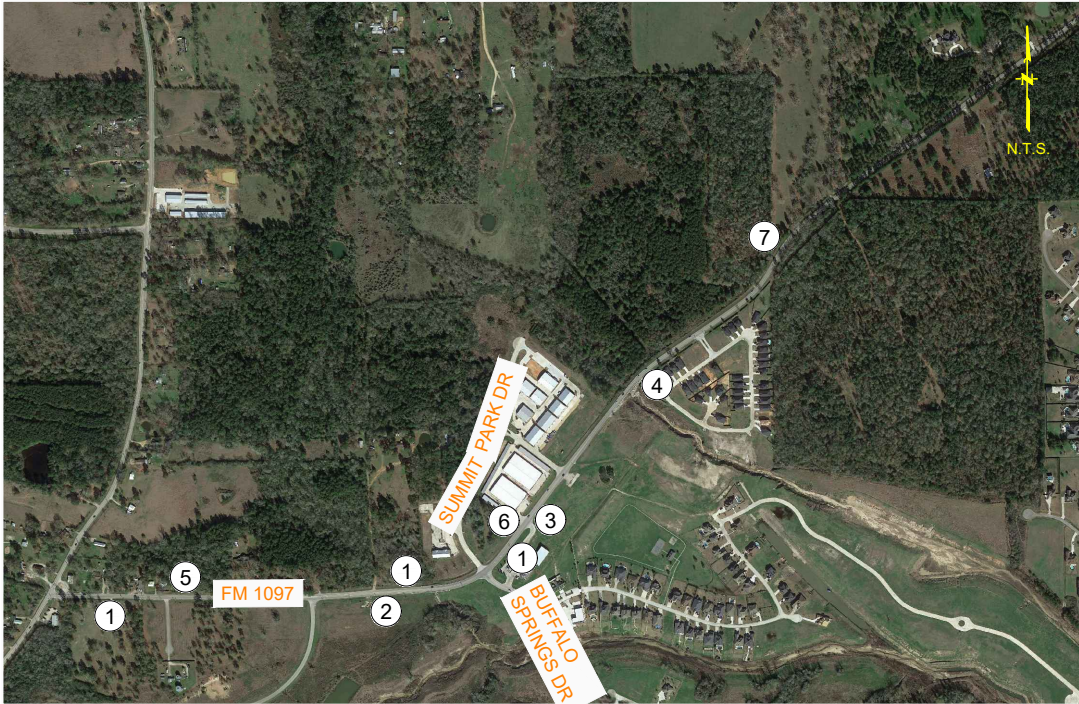
TR3
EB

TR4
WB

County (City — if applicable)	Highway / Control Section	Limits		Length (miles)	Speed (miles per hour)
		Begin	End		
Montgomery	FM 1097	0.0	0.3	0.3	59
"	"	0.3	0.6	"	47*
"	"	0.6	0.9	"	49
"	"	0.9	1.2	"	53
"	"	1.2	1.5	"	58
"	"	1.2 1.5	1.2	"	58
"	"	1.2	0.9	"	52
"	"	0.9	0.6	"	41
"	"	0.6	0.3	"	54
"	"	0.3	0.0	"	53

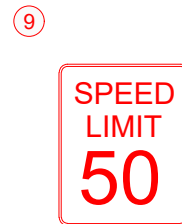
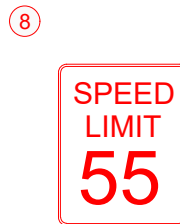
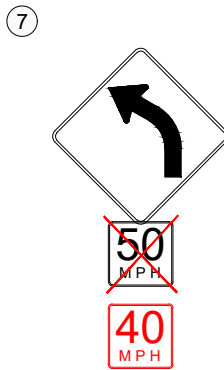
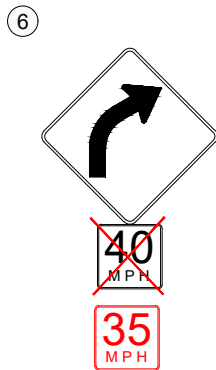
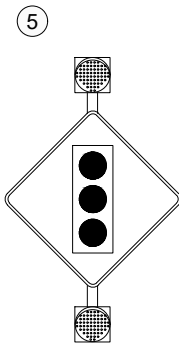
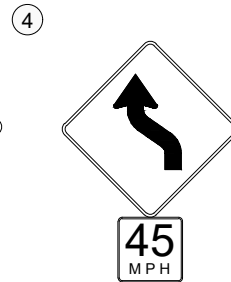
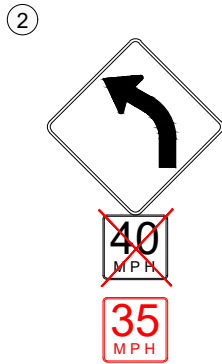
- Instructions:**
- List counties (cities) in alphabetical order.
 - Order highways as follows:
 - Interstate Highways
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 - FM/RM Roads
 - Show lengths up to 3 decimal places.

Appendix D
FM 1097 Existing Signs Figure



FM 1097 EXISTING SIGNS

Appendix E
FM 1097 Recommended Signs Figure



FM 1097 RECOMMENDED SIGNS