

APPENDIX G

Traffic Analysis

WILLIAM F. CRIBARI MEMORIAL BRIDGE

(BRIDGE NO. 01349)

STATE ROUTE 136 OVER THE SAUGATUCK RIVER

WESTPORT, CONNECTICUT

TRAFFIC STUDY

ANALYSIS OF TRAFFIC DETOUR

Prepared for
Connecticut Department of Transportation

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April 2016

**WILLIAM F. CRIBARI MEMORIAL BRIDGE
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APRIL 2016

Contents **Page No.**

Purpose	1
Detour Route	1
Intersection Location Map	2
Detour Map	3
Traffic Data Collection	4
Traffic Analysis	5
Executive Summary	21

Appendices

Appendix G-A	Existing Traffic Volume Diagrams
Appendix G-B	Proposed Detour Traffic Volume Diagrams
Appendix G-C	List of Traffic Volume Assumptions

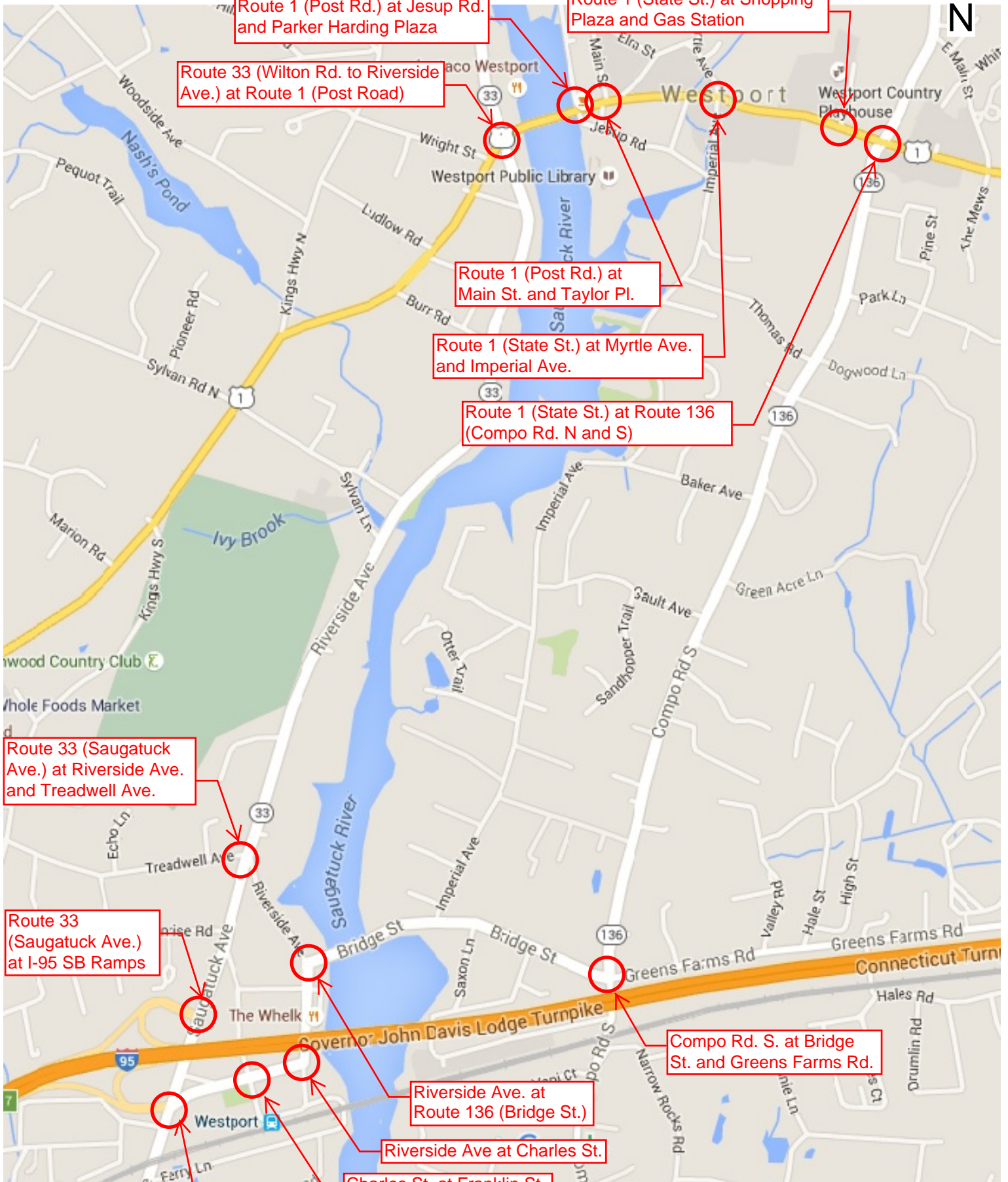
PURPOSE

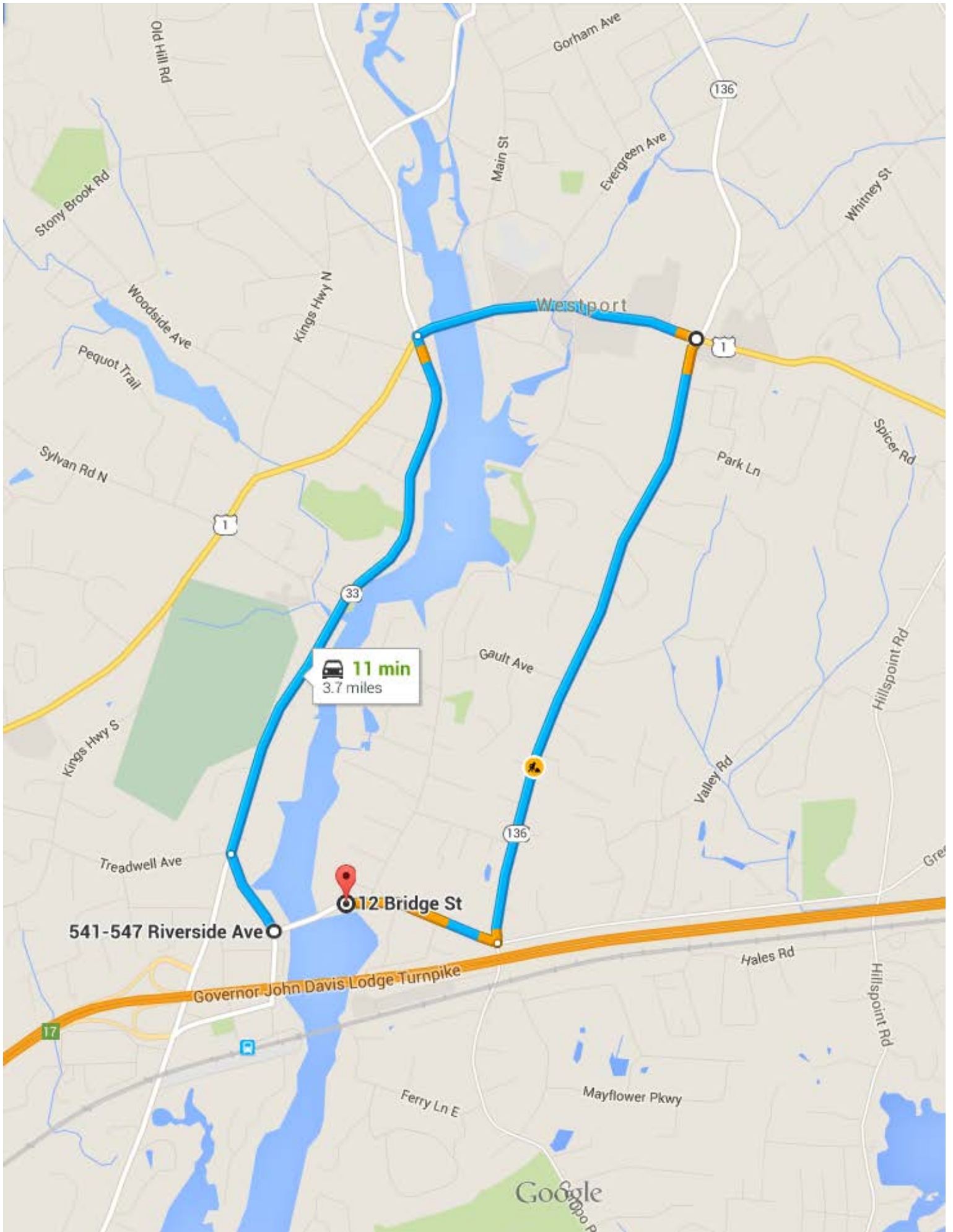
The Connecticut Department of Transportation (CTDOT) has initiated a project for the William F. Cribari Memorial Bridge (Bridge No. 01349), which carries Route 136 (Bridge Street) over the Saugatuck River in the Town of Westport, to review and address the structural and/or functional obsolescence of the bridge. As a part of the review process, a Rehabilitation Study Report has been prepared to investigate different alternatives to address the existing issues. Further review is provided in the report as to the feasibility for how any proposed construction would be carried out for the available options. The purpose of this Traffic Study is to supplement the Rehabilitation Study Report in determining the impacts a temporary closure of the bridge during construction, and the implementation of a detour, would have on the surrounding roadway intersections. An intersection location map is provided in Figure 1.

DETOUR ROUTE

The anticipated detour for traffic travelling eastbound across Bridge Street will utilize Route 33 (Riverside Avenue) to Route 1 (Post Road). Route 1 then continues to Route 136 (Compo Road S), which will carry traffic towards Bridge Street/Greens Farms Road. Westbound traffic traveling across Bridge No. 01349 will be directed in the opposite direction along the same route. A map of the detour is shown in Figure 2.

Intersection Location Map





TRAFFIC DATA COLLECTION

Machine counts were obtained at the following locations:

- Route 136 (Compo Road S.), north of Baker Avenue
- Route 33 (Riverside Avenue), south of Sylvan Lane
- Route 136 (Bridge Street), east of Riverside Avenue
- Route 1 (State Street), east of Main Street
- Route 1 (Post Road), east of Wilton Road

Manual turning movement counts during peak hour traffic were conducted at the following 13 intersections:

- Route 33 (Saugatuck Avenue) at I-95 Northbound Ramps and Park Street
- Charles Street at Franklin Street
- Route 136 (Riverside Avenue) at Charles Street
- Route 33 (Saugatuck Avenue) at I-95 Southbound Ramps
- Route 33 (Saugatuck Avenue) at Riverside Avenue and Treadwell Avenue
- Riverside Avenue at Route 136 (Bridge Street)
- Compo Road S. at Bridge Street and Greens Farms Road
- Route 33 (Wilton Road to Riverside Avenue) at Route 1 (Post Road)
- Route 1 (Post Road) at Jesup Road and Parker Harding Plaza
- Route 1 (Post Road to State Street) at Main Street and Taylor Pl.
- Route 1 (State Street) at Myrtle Avenue and Imperial Avenue
- Route 1 (State Street) at shopping plaza and gas station
- Route 1 (State Street) at Route 136 (Compo Road N. to Compo Road S.)

Appendix A contains the traffic volume diagrams (existing conditions) for each movement at the intersections studied.

Appendix B contains the traffic volume diagrams (proposed detour conditions) for each movement at the intersections studied.

Appendix C contains a list of the assumptions made regarding the behavior of traffic for vehicles traveling across Bridge No. 01349. These assumptions include balancing of the traffic counts for input into the simulation program, use percentages of existing condition traffic volumes with their respective turning movements, and transportation judgment in determining the ultimate destination of each vehicle within the traffic model. The results of the assumptions were used to determine the traffic volumes reflected in the Appendix A and B diagrams.

TRAFFIC ANALYSIS

In order to determine the traffic impact of the temporary closure of Bridge No. 01349 on the surrounding intersections, analyses were performed to determine the Level of Service (LOS) for each intersection and their respective approaches as well as the average queue length at each intersection approach.

Evaluation of capacity is expressed in Level-of-Service ratings, a grading system or qualitative analysis. Level-of-Service “A” is considered the highest and best operations level. Level-of-Service “F” is considered the lowest operational level and is an indication of traffic delays and congestion. Level-of-Service “C” is an average operational level and most designs attempt to achieve operations at this level.

In addition to the capacity evaluation, a review of the queue length at each intersection approach was performed to better understand the real-life traffic situation during the AM and PM peak hours. A queue is defined as a line of vehicles waiting to be served by the system in which the flow rate from the front of the queue determines the average speed within the queue. Slowly moving vehicles or people joining the rear of the queue are usually considered part of the queue, and the internal queue dynamics may involve starts and stops. The queue length data allows us to see how far traffic backs up at each intersection throughout the course of the peak hour, which also allows us to identify problem areas where spillback from some intersections cause major congestion in others; information that is not necessarily seen in the LOS data alone. Also, where the LOS grading stops dropping once it reaches “F”, the queue length allows us to determine how much worse one “F” compares to another or if conditions of an “F” worsen between traffic models.

The simulation software used to perform the analyses are Synchro 9 and SimTraffic. Synchro 9 was used to determine macro level LOS at each intersection as well as provide optimizations for the traffic signals for the new conditions of the detour and proposed improvements of the Bridge Street/Riverside Avenue intersection. SimTraffic was used to more accurately simulate real-world conditions and determine the average queue length at each of the intersection approaches. A 60-minute record time was used for all SimTraffic runs.

Existing Condition vs. Proposed Detour Condition

Signal Plans providing traffic signal timing and phasing details for each of the studied intersections were provided by the CTDOT Division of Traffic Engineering and input for the existing condition simulations.

For the implementation of the proposed detour, the existing signals required modification to accommodate the new conditions with regards to traffic volumes. Signal phasing and timing for the proposed detour conditions were optimized through Synchro 9, which involves allocating the appropriate green times for each signal phase with respect to the new traffic volumes at each approach.

The following tables in Figure 3 provide a comparison of the LOS and average queue lengths at each of the studied intersections for the existing and proposed detour conditions.

FIGURE 3

Intersection: Route 33 (Saugatuck Ave.) at I-95 NB Ramps and Park Street					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	L	F (184.5)	E (67.5)	E (61.0)	D (51.9)
	TR	F (119.9)	C (25.3)	E (56.8)	A (8.8)
Westbound	LT	F (58.5)	E (67.4)	E (67.1)	C (33.9)
Northbound	L	C (29.6)	F (89.2)	B (14.9)	C (21.3)
	TR	B (12.6)	D (18.2)	B (13.7)	C (17.8)
Southbound	LT	D (47.0)	F (92.0)	C (29.5)	C (32.1)
	R	A (3.9)	B (13.6)	A (5.5)	A (5.8)
Intersection LOS:		F	E	C	C

Intersection: Route 33 (Saugatuck Ave.) at I-95 SB Ramps					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	L	D (40.6)	C (31.4)	D (46.1)	C (28.8)
	R	B (13.1)	B (11.7)	A (3.6)	A (2.2)
Northbound	L	A (6.4)	A (3.6)	A (9.2)	A (5.4)
	T	A (4.3)	A (6.1)	A (5.8)	A (8.5)
Southbound	TR	A (9.1)	B (18.9)	A (8.6)	A (8.8)
Intersection LOS:		B	B	B	B

Intersection: Charles Street at Franklin Street					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	LT	A (3.8)	A (4.6)	A (4.0)	A (4.8)
Westbound	TR	A (4.4)	A (4.0)	A (3.4)	A (4.1)
Northbound	L	C (31.1)	B (13.7)	C (31.1)	B (13.6)
	T	C (30.2)	B (13.4)	C (29.7)	B (13.1)
	R	B (10.8)	A (5.7)	B (10.5)	A (5.6)
Intersection LOS:		A	A	A	A

Intersection: Riverside Ave at Charles Street					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	LR	C (28.9)	B (10.2)	B (17.3)	A (9.7)
Northbound	LT	A (9.0)	A (6.3)	B (14.8)	A (7.0)
Southbound	TR	D (47.9)	A (7.8)	B (16.3)	A (6.4)
Intersection LOS:		D	A	B	A

Intersection: Route 33 (Saugatuck Ave.) at Riverside Ave. and Treadwell Ave.					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	LTR	D (49.7)	F (206.7)	E (60.6)	F (234.6)
Westbound	LT	E (64.8)	E (66.1)	E (59.4)	E (66.1)
	R	B (17.8)	F (87.2)	B (19.2)	F (233.5)
Northbound	LTR	E (57.7)	F (193.6)	E (78.5)	D (40.6)
Southbound	L	B (16.5)	B (17.9)	C (22.3)	A (7.6)
	TR	B (16.4)	D (36.4)	B (18.3)	B (17.4)
Intersection LOS:		D	F	D	E

Intersection: Riverside Ave. at Route 136 (Bridge Street)					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	LTR	A (0.0)	A (0.0)	B (11.5)	A (1.5)
Westbound	LT	F (134.2)	-	C (29.5)	-
	R	A (9.7)	-	A (8.0)	-
Northbound	LT	B (19.9)	A (6.1)	C (21.7)	A (8.7)
	R	A (6.5)	-	A (7.0)	-
Southbound	L	B (16.0)	-	B (15.4)	-
	TR	B (14.0)	A (2.0)	A (9.4)	A (2.7)
Intersection LOS:		E	A	B	A

Intersection: Route 136 (Compo Road S.) at Route 136 (Bridge Street) and Greens Farms Road					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	L	A (6.4)	-	A (8.6)	-
	TR	A (5.6)	A (7.9)	A (9.6)	B (15.5)
Westbound	LTR	C (26.8)	B (11.7)	B (18.7)	A (8.7)
Northbound	L	E (59.8)	B (11.6)	C (29.8)	A (7.4)
	TR	B (16.2)	B (12.2)	B (16.5)	A (9.0)
Southbound	L	C (25.5)	C (24.1)	B (18.6)	D (37.9)
	TR	B (10.3)	B (12.2)	B (16.3)	A (8.7)
Intersection LOS:		C	B	B	B

Intersection: Route 33 (Wilton Road to Riverside Ave.) at Route 1 (Post Road)					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	L	B (17.7)	F (95.6)	D (54.2)	F (379.2)
	TR	C (31.5)	F (223.7)	D (49.7)	F (297.9)
Westbound	L	C (33.3)	F (468.1)	D (44.3)	F (548.6)
	TR	F (164.6)	F (100.3)	F (81.0)	F (148.9)
Northbound	LTR	C (26.6)	F (214.4)	E (65.9)	F (344.7)
Southbound	LTR	D (44.3)	F (413.0)	F (231.2)	F (682.3)
Intersection LOS:		E	F	F	F

Intersection: Route 1 (Post Road) at Jesup Road and Parker Harding Plaza					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	L	A (9.1)	A (6.7)	B (10.2)	A (4.0)
	TR	B (13.4)	C (20.1)	D (53.4)	F (156.3)
Westbound	LTR	D (52.6)	E (56.5)	C (27.0)	F (97.2)
Northbound	LTR	C (23.9)	E (74.5)	C (25.2)	F (228.4)
Southbound	LT	B (18.5)	D (40.2)	B (17.9)	E (68.5)
	R	A (6.1)	C (22.6)	A (5.4)	B (14.7)
Intersection LOS:		C	D	D	F

Intersection: Route 1 (Post Road to State Street) at Main Street and Taylor Pl.					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	L	A (2.8)	A (3.5)	A (2.6)	A (1.2)
	T	A (3.4)	A (4.5)	A (4.5)	E (53.3)
Westbound	T	B (10.3)	E (17.4)	A (8.8)	F (75.1)
	R	A (2.6)	A (1.7)	A (2.7)	B (14.9)
Northbound	LTR	B (16.2)	C (25.7)	B (20.0)	F (89.9)
Intersection LOS:		A	D	A	F

Intersection: Route 1 (State Street) at Myrtle Ave. and Imperial Ave.					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	LTR	B (12.1)	B (15.4)	B (19.6)	F (105.5)
Westbound	LT	D (35.1)	E (73.4)	C (25.7)	E (56.8)
	R	A (4.0)	A (2.3)	A (4.3)	A (3.1)
Northbound	LTR	B (19.8)	F (121.8)	C (21.0)	F (122.5)
Southbound	LTR	C (27.5)	F (162.9)	D (45.8)	F (108.9)
Intersection LOS:		C	E	C	F

Intersection: Route 1 (State Street) at Shopping Plaza and Gas Station					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	LTR	A (3.9)	A (5.3)	A (6.7)	B (10.8)
Westbound	LTR	A (6.3)	C (17.7)	A (5.0)	A (4.9)
Northbound	LTR	A (9.2)	C (27.5)	A (5.2)	A (8.0)
Southbound	LTR	B (11.7)	C (33.3)	B (12.9)	B (19.8)
Intersection LOS:		A	B	A	A

Intersection: Route 1 (State Street) at Route 136 (Compo Road N. to Compo Road S.)					
		AM		PM	
		Existing	Detour	Existing	Detour
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	L	D (52.6)	F (156.6)	E (60.8)	F (85.1)
	TR	C (24.6)	D (40.2)	D (40.9)	F (91.2)
Westbound	L	D (51.4)	E (79.9)	D (54.6)	F (136.4)
	TR	E (56.8)	F (193.9)	C (24.5)	D (45.2)
Northbound	L	D (51.9)	F (231.3)	D (54.6)	F (107.5)
	TR	C (30.5)	D (51.1)	F (87.5)	F (90.1)
Southbound	L	F (83.4)	C (34.5)	F (81.4)	D (45.4)
	TR	E (61.0)	F (231.7)	D (42.1)	F (118.7)
Intersection LOS:		D	F	D	F

Intersection: Route 33 (Saugatuck Ave.) at I-95 NB Ramps and Park Street					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	L	219	232	175	226
	TR	251	259	196	222
Westbound	LT	207	7	94	24
Northbound	L	76	66	67	65
	TR	74	64	59	95
Southbound	L	168	150	60	54
	TR	99	56	56	59

Intersection: Route 33 (Saugatuck Ave.) at I-95 SB Ramps					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	L	80	76	124	231
	R	119	104	66	99
Northbound	L	91	45	92	54
	T	85	199	73	279
Southbound	TR	121	101	126	84

Intersection: Charles Street at Franklin Street					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	LT	79	18	92	8
Westbound	TR	76	3	34	6
Northbound	L	35	30	47	25
	T	32	23	31	30
	R	42	40	45	34

Intersection: Riverside Ave at Charles Street					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	LR	137	44	140	42
Northbound	LT	37	19	78	49
Southbound	TR	183	51	106	14

Intersection: Route 33 (Saugatuck Ave.) at Riverside Ave. and Treadwell Ave.					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	LTR	87	132	119	415
Westbound	LT	74	147	63	515
	R	61	111	78	161
Northbound	LTR	203	427	370	552
Southbound	L	94	96	102	34
	TR	144	147	150	109

Intersection: Riverside Ave. at Route 136 (Bridge Street)					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	LTR	3	3	36	36
Westbound	LT	952	-	188	-
	R	74	-	73	-
Northbound	LT	18	-	47	72
	R	126	-	148	-
Southbound	L	68	-	123	-
	TR	48	17	434	7

Intersection: Route 136 (Compo Road S.) at Route 136 (Bridge Street) and Greens Farms Road					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	L	41	-	60	-
	TR	42	2	88	4
Westbound	LTR	212	350	98	82
Northbound	L	71	1	79	1
	TR	64	194	88	77
Southbound	L	23	89	29	98
	TR	75	39	78	51

Intersection: Route 33 (Wilton Road to Riverside Ave.) at Route 1 (Post Road)					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	L	58	442	213	495
	TR	141	541	297	559
Westbound	L	482	603	217	581
	TR	571	546	496	544
Northbound	LTR	188	2644	509	2742
Southbound	LTR	679	961	677	736

Intersection: Route 1 (Post Road) at Jesup Road and Parker Harding Plaza					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	L	31	24	35	23
	TR	131	138	411	204
Westbound	LTR	204	210	205	210
Northbound	LTR	87	273	59	265
Southbound	LT	58	123	32	125
	R	86	117	52	112

Intersection: Route 1 (Post Road to State Street) at Main Street and Taylor Pl.					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	L	23	22	30	17
	T	37	66	107	102
Westbound	T	78	78	76	83
	R	11	80	18	6
Northbound	LTR	25	30	36	42

Intersection: Route 1 (State Street) at Myrtle Ave. and Imperial Ave.					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	LTR	68	69	114	149
Westbound	LT	575	611	99	571
	TR	583	614	104	572
Northbound	LTR	65	135	79	156
Southbound	LTR	152	305	134	301

Intersection: Route 1 (State Street) at Shopping Plaza and Gas Station					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	LTR	65	44	90	109
Westbound	LTR	443	467	83	415
Northbound	LTR	29	35	14	13
Southbound	LTR	40	50	58	129

Intersection: Route 1 (State Street) at Route 136 (Compo Road N. to Compo Road S.)					
		AM		PM	
		Existing	Detour	Existing	Detour
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	L	37	62	77	124
	TR	117	119	191	274
Westbound	L	123	40	64	80
	TR	566	649	151	460
Northbound	L	72	144	89	144
	TR	97	3131	176	2156
Southbound	L	156	165	82	147
	TR	288	692	107	412

Existing Condition vs. Proposed Improvements at the Riverside Avenue and Route 136 (Bridge Street) Intersection

As noted in the previous tables for the intersection of Riverside Avenue at Route 136 (Bridge Street), the LOS level for the existing condition an “E” for the overall intersection during the AM peak hour. As part of the Rehabilitation Study and this traffic analysis, it was requested that methods of improvement be looked into for the possibility of raising the intersection LOS to an acceptable level.

The proposed improvements reviewed include optimization of the traffic signal and increasing the length of the existing Route 136 (Bridge Street) westbound right turn storage lane. Two different traffic models were created to review the effect these changes would have at the intersection; the difference between the two being the length of the right turn storage lane. Option 1 proposes a 105-foot storage lane, which ultimately results in the lane running from the intersection to just before the bridge. Option 2 was analyzed for the sole purpose in the event a full bridge replacement was decided upon, and proposes a 500-foot storage lane; reviewing the need for whether or not 2 westbound travel lanes would be required across the new bridge.

The proposed signal improvements are consistent for the two proposed AM traffic models and the two proposed PM traffic models. Because the optimization of the intersection would modify the flow of traffic leading towards the other nearby intersections: Riverside Ave. at Charles St., and Riverside Ave. at Treadwell Ave., these intersections were also optimized to reduce the resultant queue length from the smoother traffic flow.

During the AM peak hour, the majority of traffic approaching the intersection comes from Bridge Street. As noted in Figures 3 and 4, the LOS for the left and thru (LT as shown in the tables) movement from Route 136 (Bridge Street) is an “F”. Therefore, green time was added to the Route 136 (Bridge Street) phase, and consequently, green time was taken away from the Riverside Avenue approaches.

During the PM peak hour, the majority of traffic approaching the intersection comes from the Route 136 (Bridge Street) LT movement and the southbound Riverside Avenue LT movement, the latter being slightly greater of the two. The resultant optimization therefore allowed for a slight increase in the green time along Riverside Avenue and a slight decrease in the green time for Route 136 (Bridge Street).

Figure 4 shows the comparison tables of the existing condition vs. the two proposed improvements at the Route 136 (Bridge Street) intersection with Riverside Avenue.

Intersection:		Riverside Ave. at Route 136 (Bridge Street) Existing vs. Additional Storage Lane Length and Timing/Phasing Improvements					
		AM			PM		
		Existing (55' Rt. Turn Storage)	105' Rt. Turn Storage Lane	500' Rt. Turn Storage Lane	Existing (55' Rt. Turn Storage)	105' Rt. Turn Storage Lane	500' Rt. Turn Storage Lane
		LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)	LOS (Control Delay)
Eastbound	LTR	A (0.0)	A (0.0)	A (0.0)	B (11.5)	B (11.3)	B (11.3)
Westbound	LT	F (134.2)	D (38.1)	D (38.1)	C (29.5)	D (36.0)	D (36.0)
	R	A (9.7)	A (2.9)	A (1.7)	A (8.0)	A (4.1)	A (4.1)
Northbound	LT	B (19.9)	C (32.6)	C (32.6)	C (21.7)	B (17.8)	B (17.8)
	R	A (6.5)	A (9.2)	A (9.2)	A (7.0)	A (6.3)	A (6.3)
Southbound	L	B (16.0)	C (33.1)	C (33.1)	B (15.4)	B (13.2)	B (13.2)
	TR	B (14.0)	C (27.5)	C (27.5)	A (9.4)	A (7.3)	A (7.3)
Intersection LOS:		E	C	C	B	B	B

Intersection:		Riverside Ave. at Route 136 (Bridge Street) Existing vs. Additional Storage Lane Length and Timing/Phasing Improvements					
		AM			PM		
		Existing (55' Rt. Turn Storage)	105' Rt. Turn Storage Lane	500' Rt. Turn Storage Lane	Existing (55' Rt. Turn Storage)	105' Rt. Turn Storage Lane	500' Rt. Turn Storage Lane
		Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)	Average Queue Length (ft.)
Eastbound	LTR	3	5	6	36	33	29
Westbound	LT	952	256	203	188	110	101
	R	74	106	48	73	69	50
Northbound	LT	18	39	25	47	42	38
	R	126	102	99	148	109	97
Southbound	L	68	94	96	123	116	114
	TR	48	105	100	434	200	142

FIGURE 4

EXECUTIVE SUMMARY

As reflected in the LOS and queue tables in Figure 3, despite improvements to the signal timing and phasing, the proposed detour would result in substantial impacts at the intersections along the studied portion of the Route 1 corridor. The LOS levels show the detour would reduce nearly all intersections within the detour path to a “D” or lower. The queue lengths show that traffic would back up along the entire Route 1 corridor within the detour limits and immediate approaches. This is most evident at the intersections of Route 1 (Post Road) and Route 33 (Riverside Avenue), and Route 1 (State Street) and Route 136 (Compo Road S) where the average queue for the northbound approaches of Routes 33 and 136 are backed up over 2000 feet. It is apparent by this data that the single lane approaches towards Route 1 are not capable of handling the volume demand that the detour would require.

Improvements to make the detour work would, at a minimum, involve providing additional lanes and/or much larger storage and receiving lanes at the Route 33 and 136 northbound approaches towards Route 1. Widening Route 1 to accommodate for the increased volumes would not be a feasible option due to the proximity of buildings and businesses along the corridor. Another option to create additional capacity along Route 1 would be to remove on-street parking in favor of an additional lane; however this is also not recommended due to the negative impacts it would have on the businesses in this area while the detour is in effect. It should be noted that a study of the full extent and impacts of the work required to bring the detour route to an operational level was not made as a part of this analysis, and that the work required may be much more extensive than the options noted here.

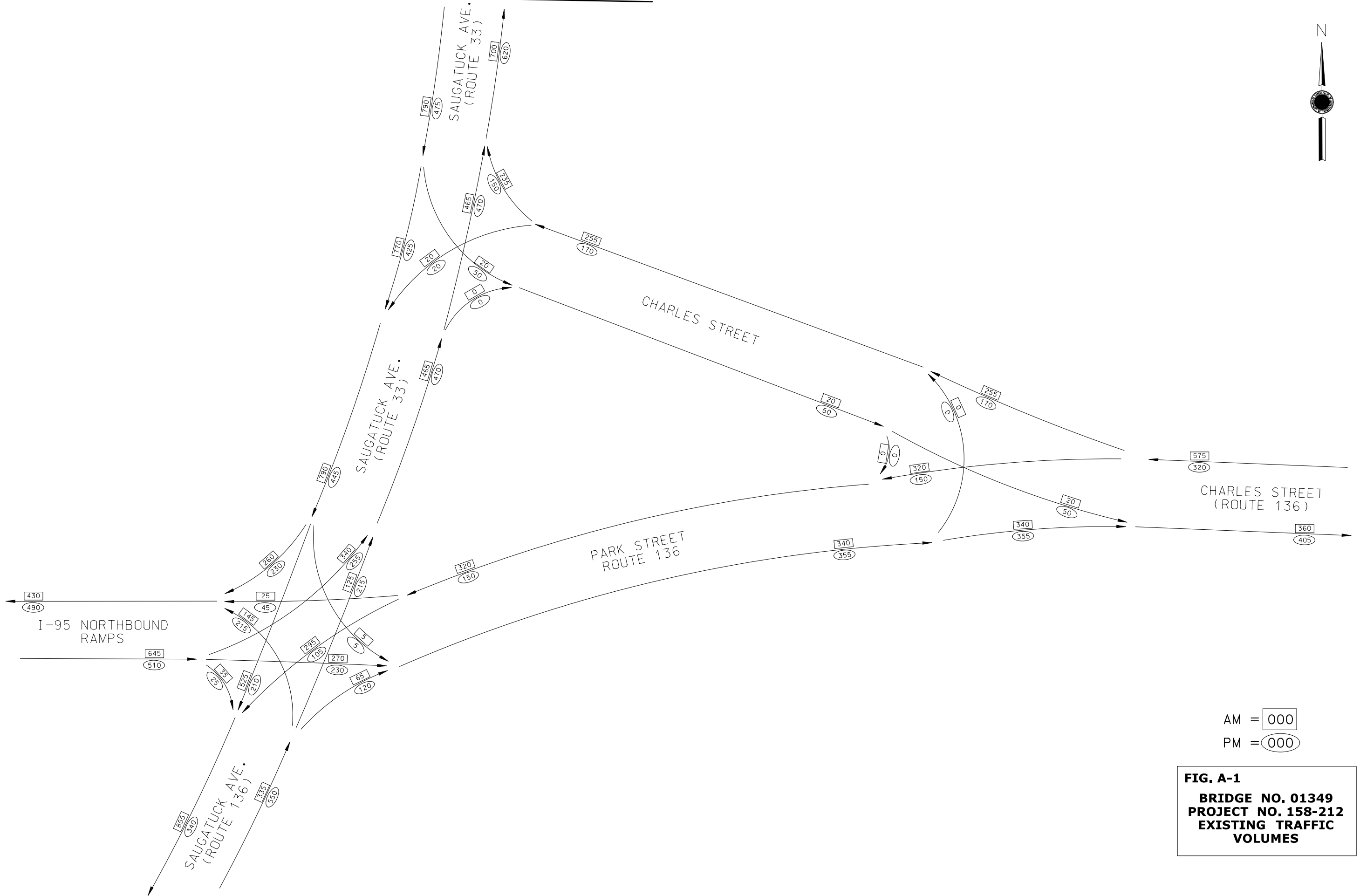
Because of the adverse impacts the redirection of traffic would create along entire proposed detour route, it is recommended that a temporary bridge be constructed to accommodate Route 136 (Bridge Street) traffic while Bridge No. 01349 is closed for construction.

As noted in the comparison tables in Figure 4, the proposed improvements of modifying the existing signal and extending the right turn storage lane along Route 136 (Bridge Street) would bring the intersection to an acceptable operating level of “C” in the AM and maintains a “B” in the PM. In the event that a full structure replacement option is decided upon: by comparing the 105-foot storage lane to the 500-foot storage lane, it is noted that the 500-foot lane results in a minor improvement over 105-foot lane; however, the improvement is not substantial enough to warrant the extra costs that would be required to create an additional lane across the entire length of the bridge. It is therefore recommended that the lengthening of the existing right turn storage lane to 105 feet be considered in the event that improvements to the Riverside Avenue and Route 136 (Bridge Street) intersection are included as part of the bridge project.

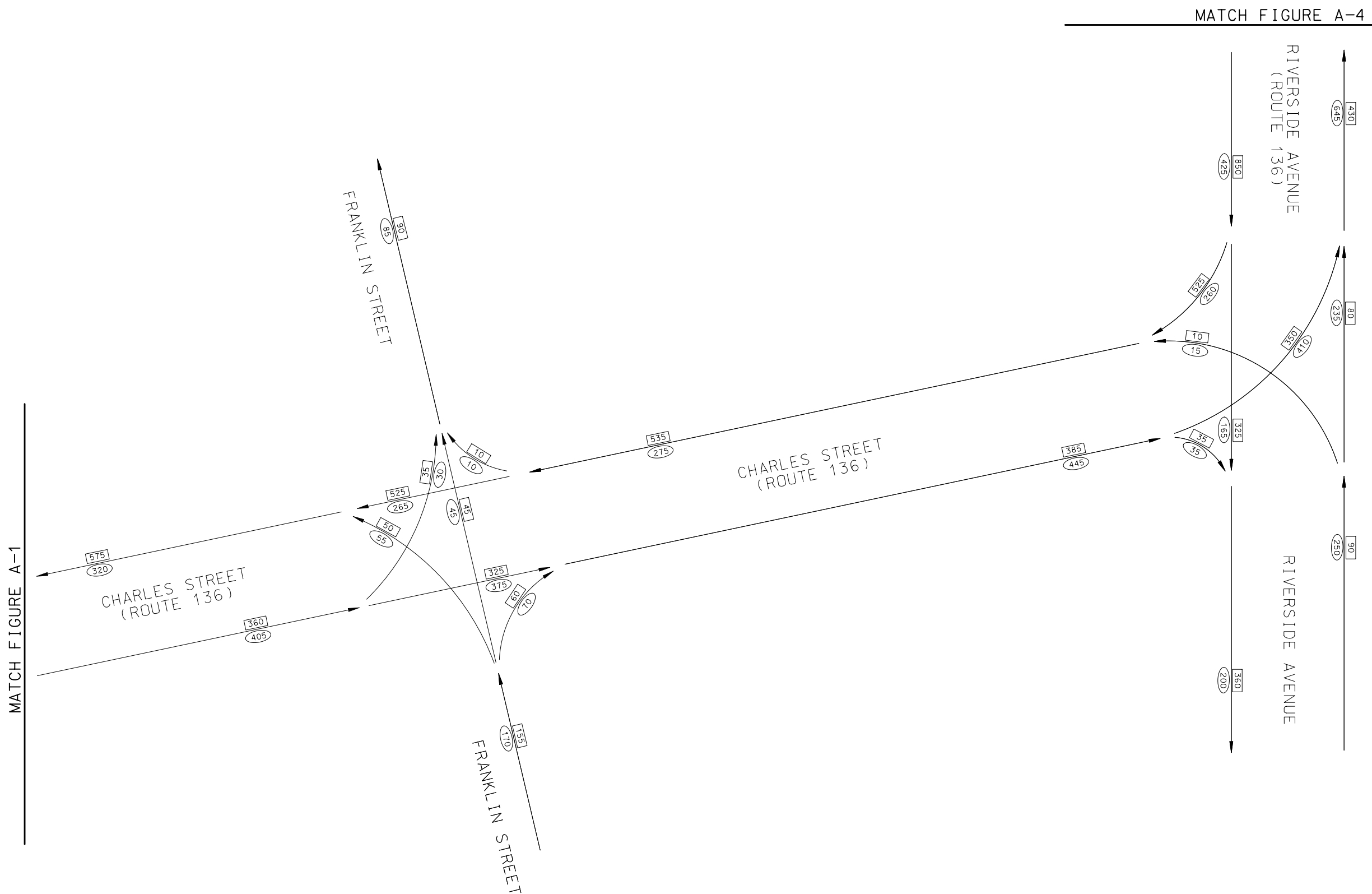
APPENDIX G-A

Existing Traffic Volume Diagrams

MATCH FIGURE A-3



MATCH FIGURE A-2



AM = 000
PM = 000

FIG. A-2
BRIDGE NO. 01349
PROJECT NO. 158-212
EXISTING TRAFFIC
VOLUMES

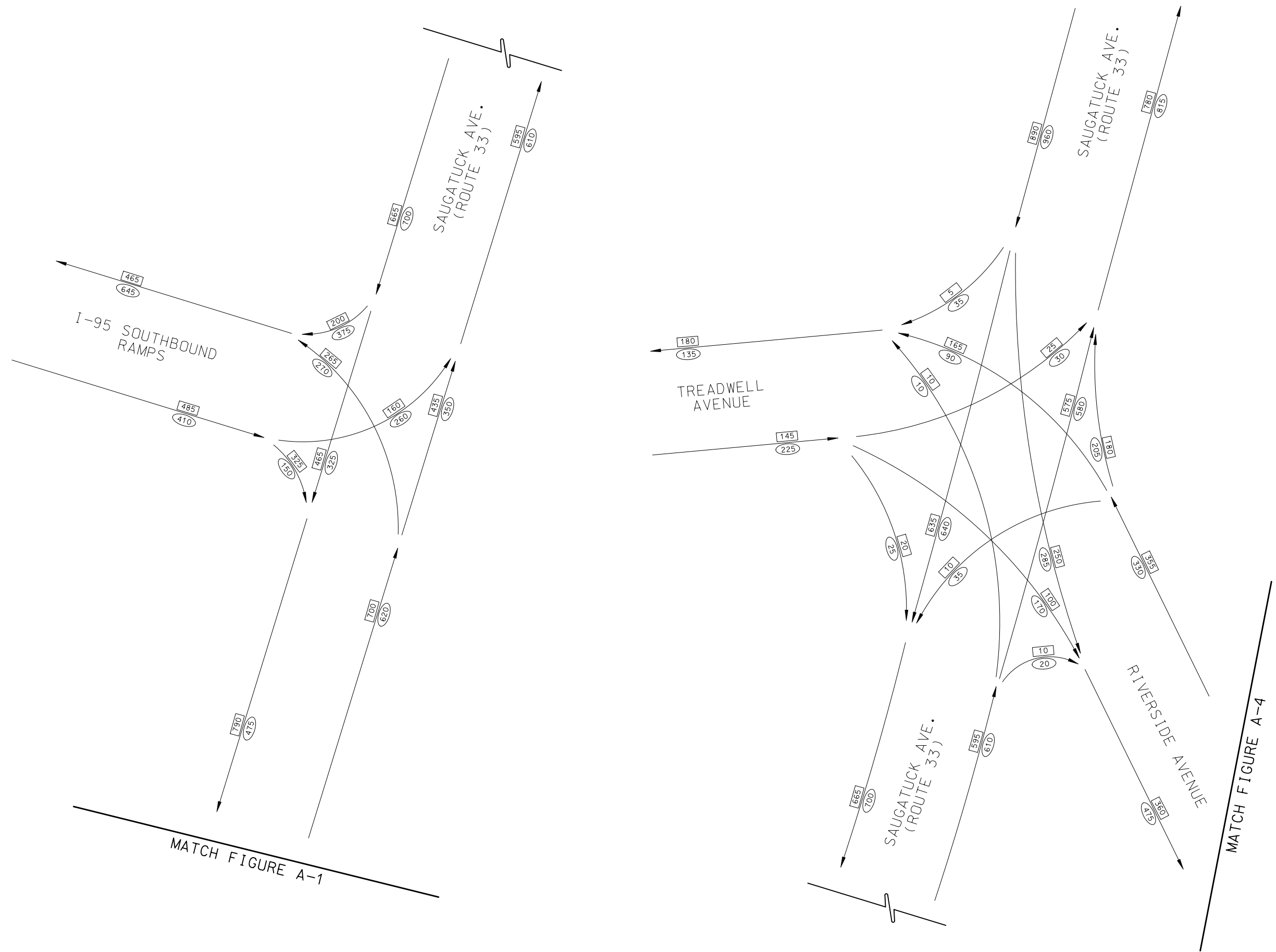
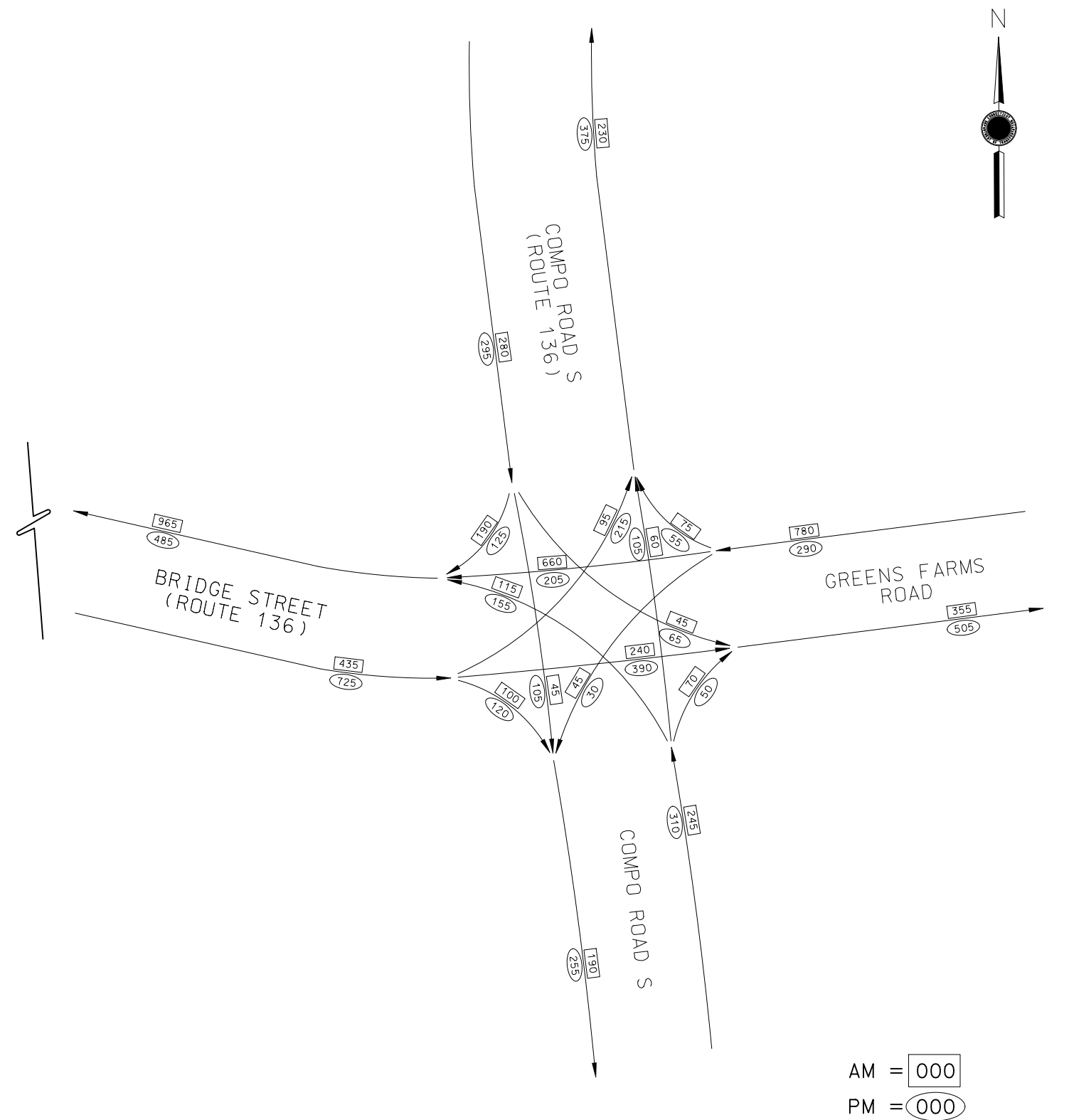
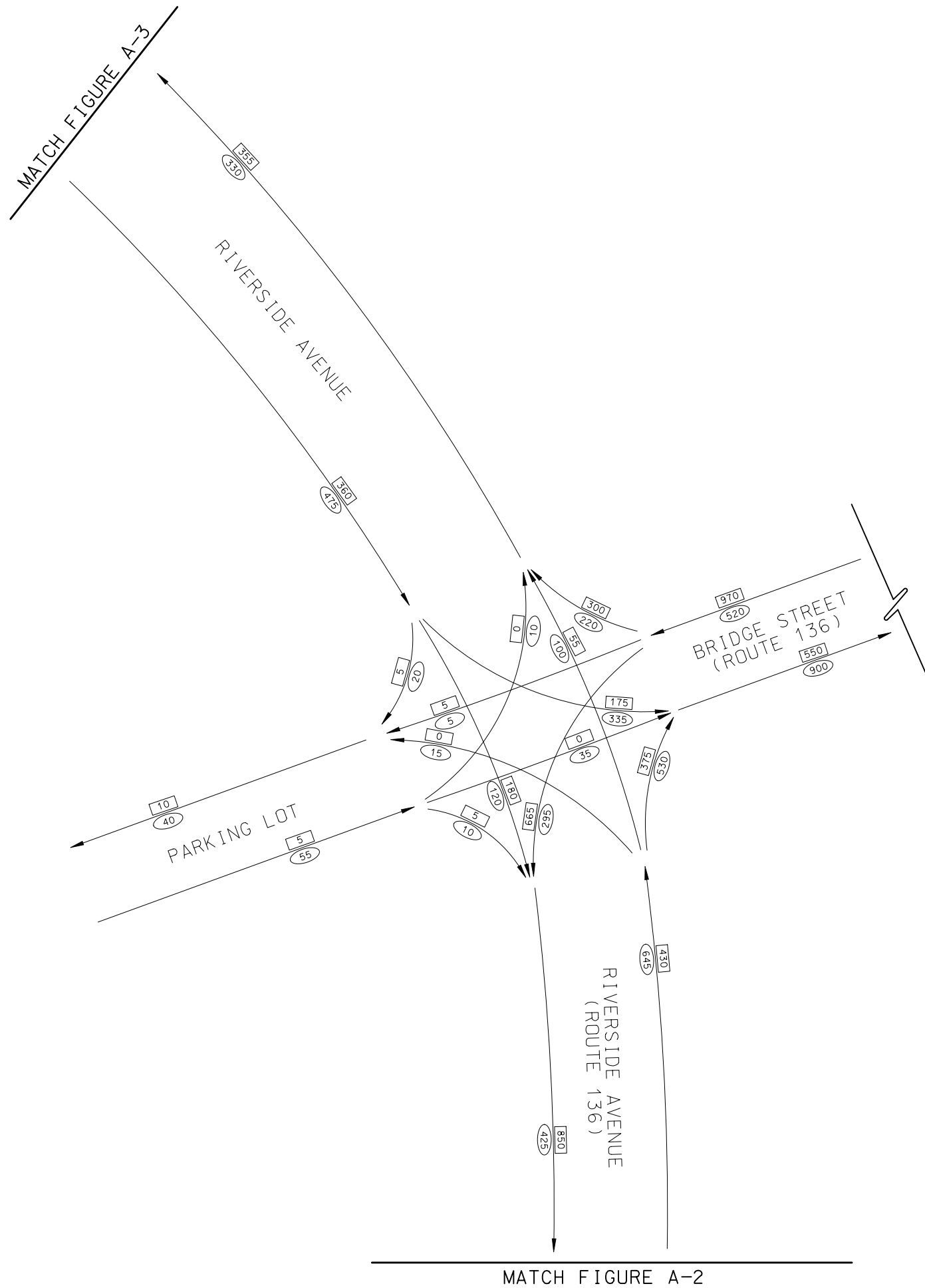


FIG. A-3
BRIDGE NO. 01349
PROJECT NO. 158-212
EXISTING TRAFFIC
VOLUMES



AM = 000
 PM = 000

FIG. A-4
BRIDGE NO. 01349
PROJECT NO. 158-212
EXISTING TRAFFIC
VOLUMES

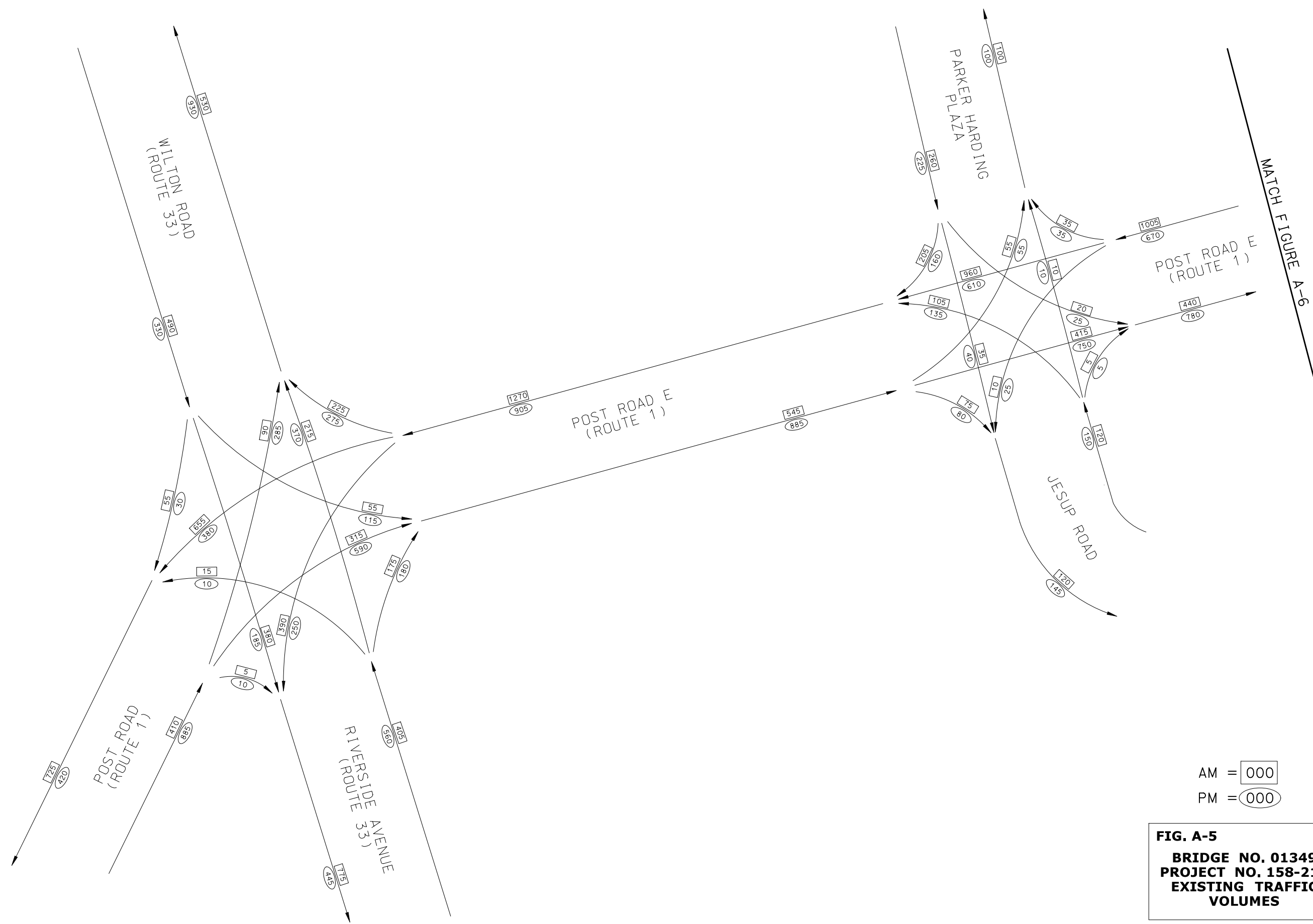
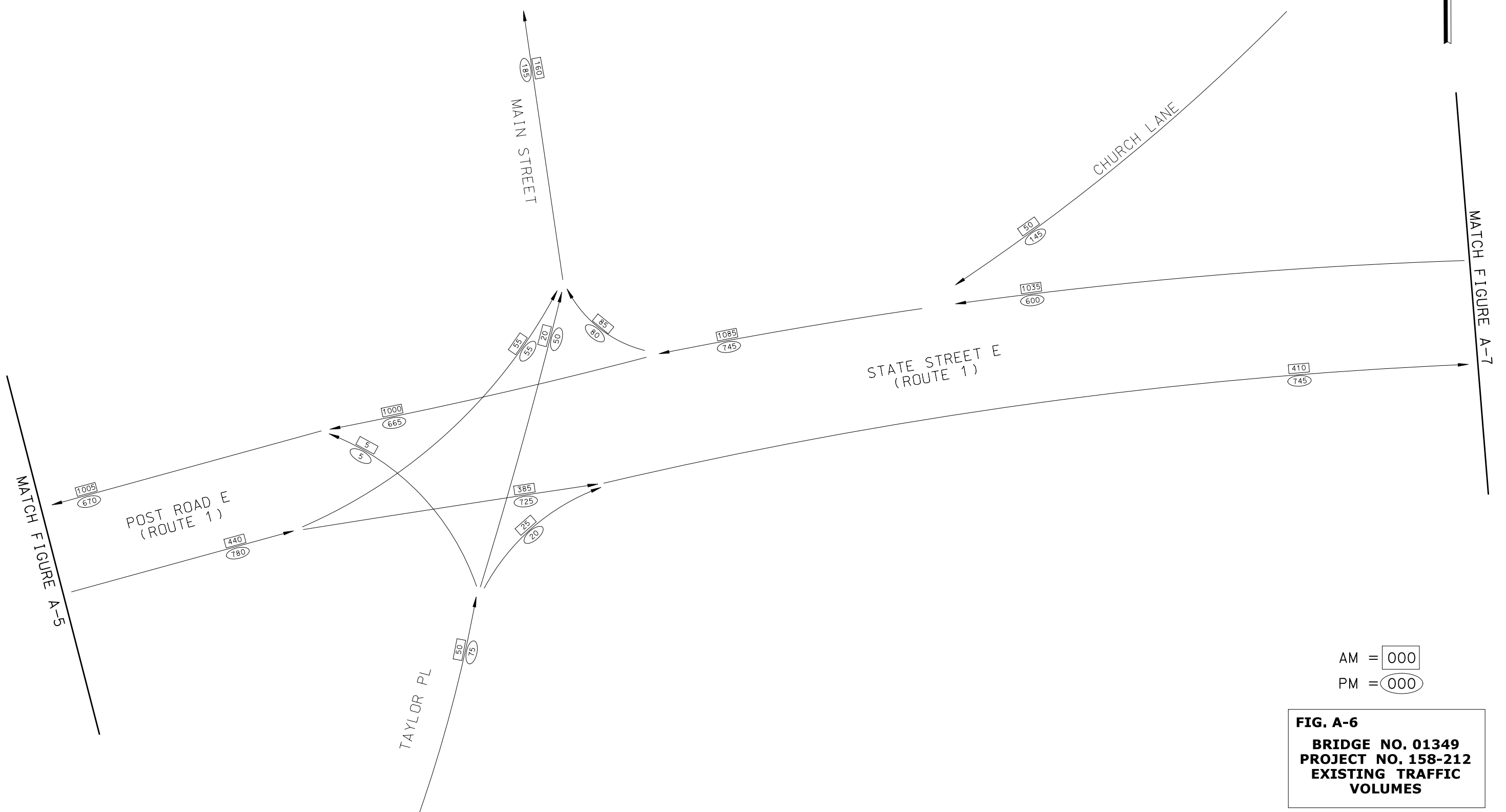
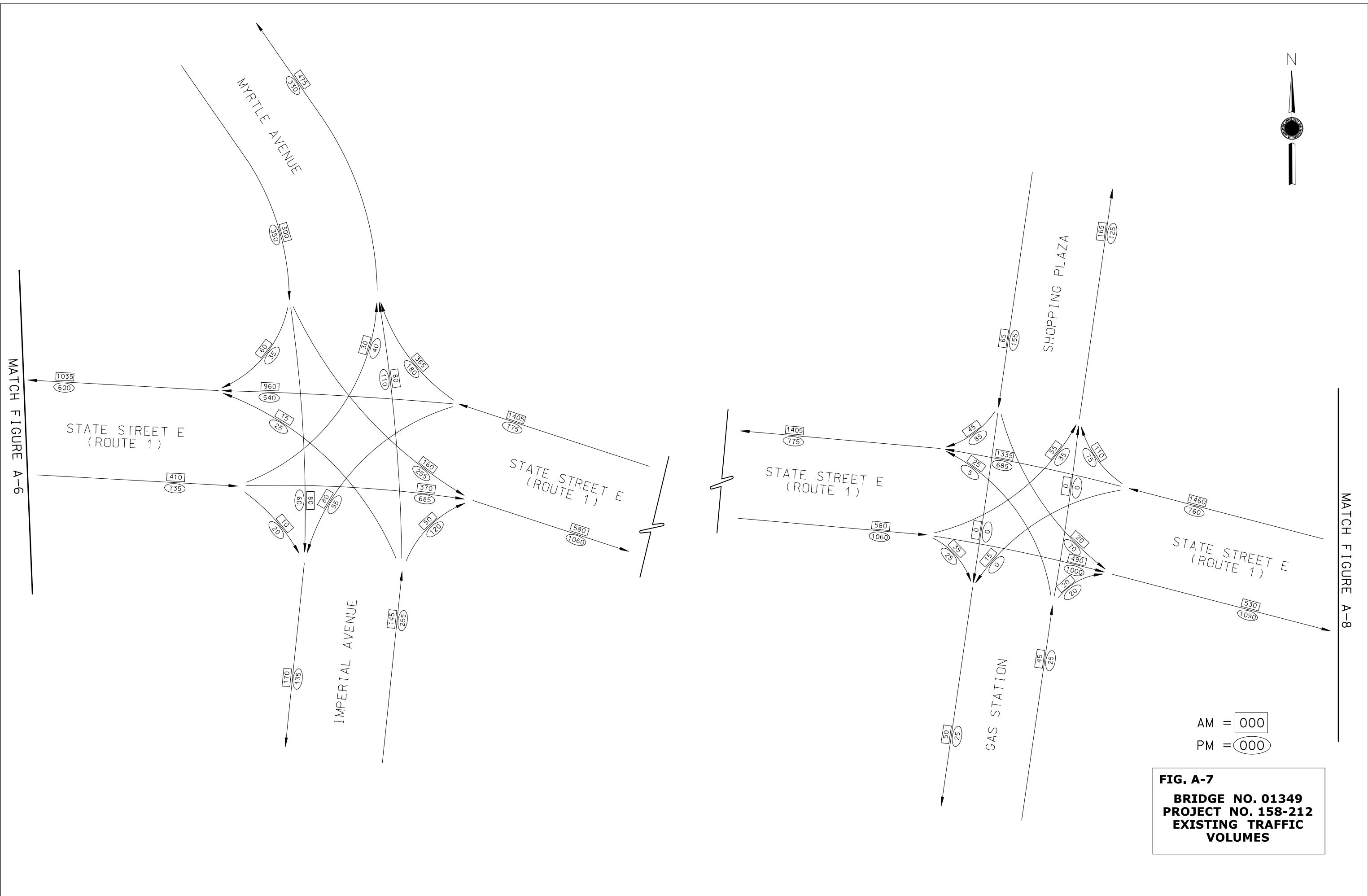


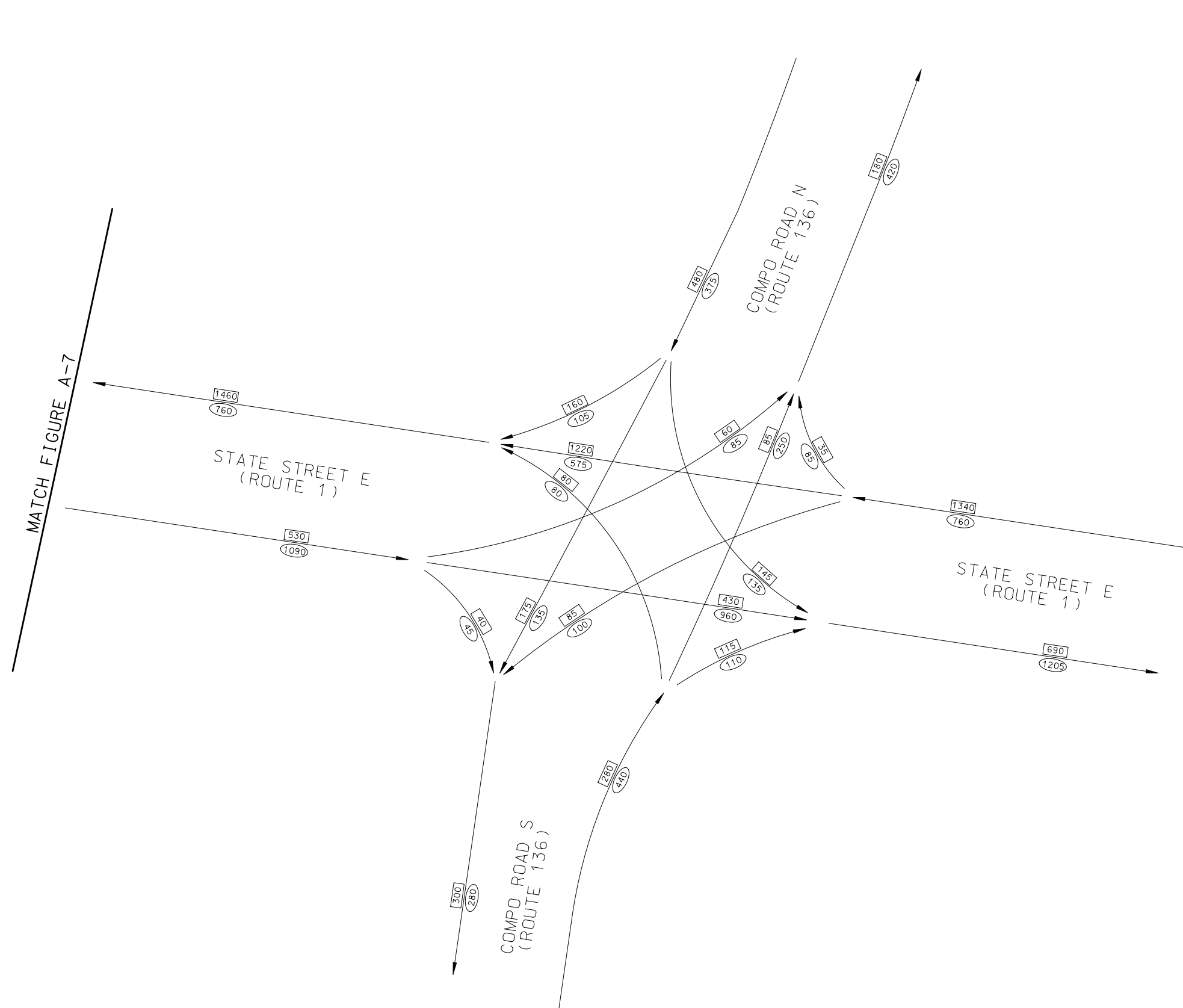
FIG. A-5
BRIDGE NO. 01349
PROJECT NO. 158-212
EXISTING TRAFFIC
VOLUMES



AM = 000
PM = 000

FIG. A-6
BRIDGE NO. 01349
PROJECT NO. 158-212
EXISTING TRAFFIC
VOLUMES





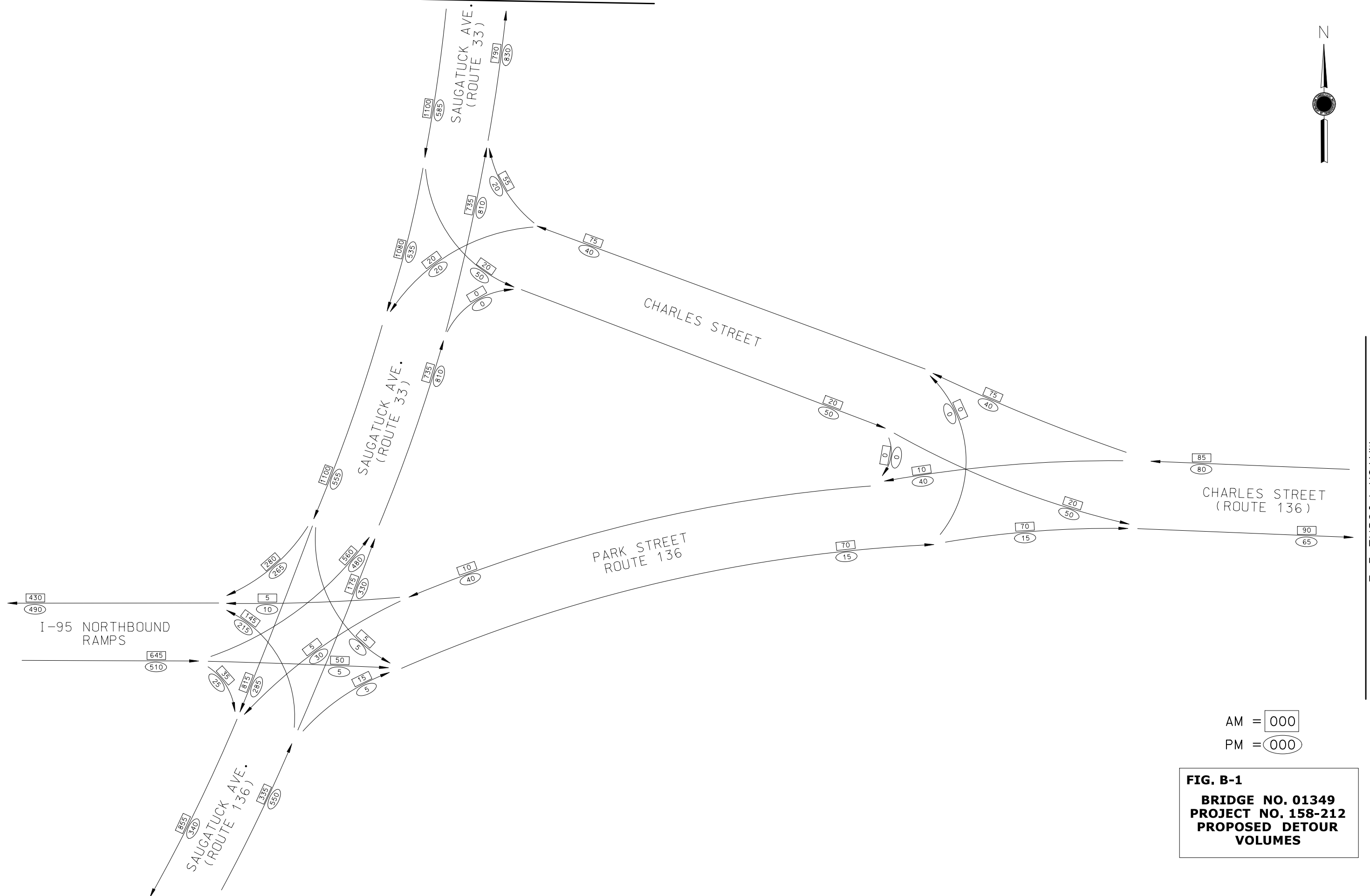
AM = 000
 PM = 000

FIG. A-8
BRIDGE NO. 01349
PROJECT NO. 158-212
EXISTING TRAFFIC
VOLUMES

APPENDIX G-B

Proposed Detour Traffic Volume Diagrams

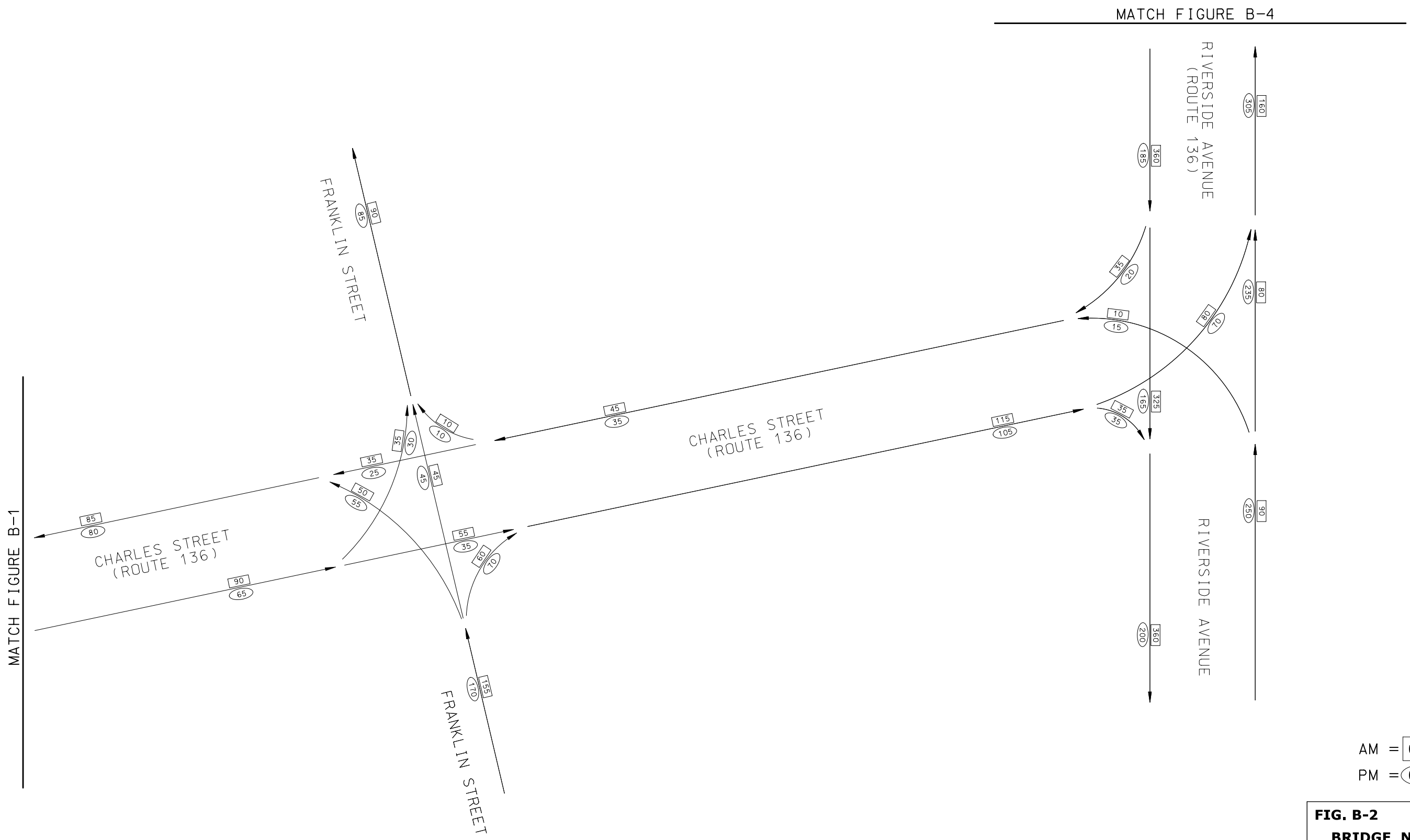
MATCH FIGURE B-3



AM = 000
 PM = 000

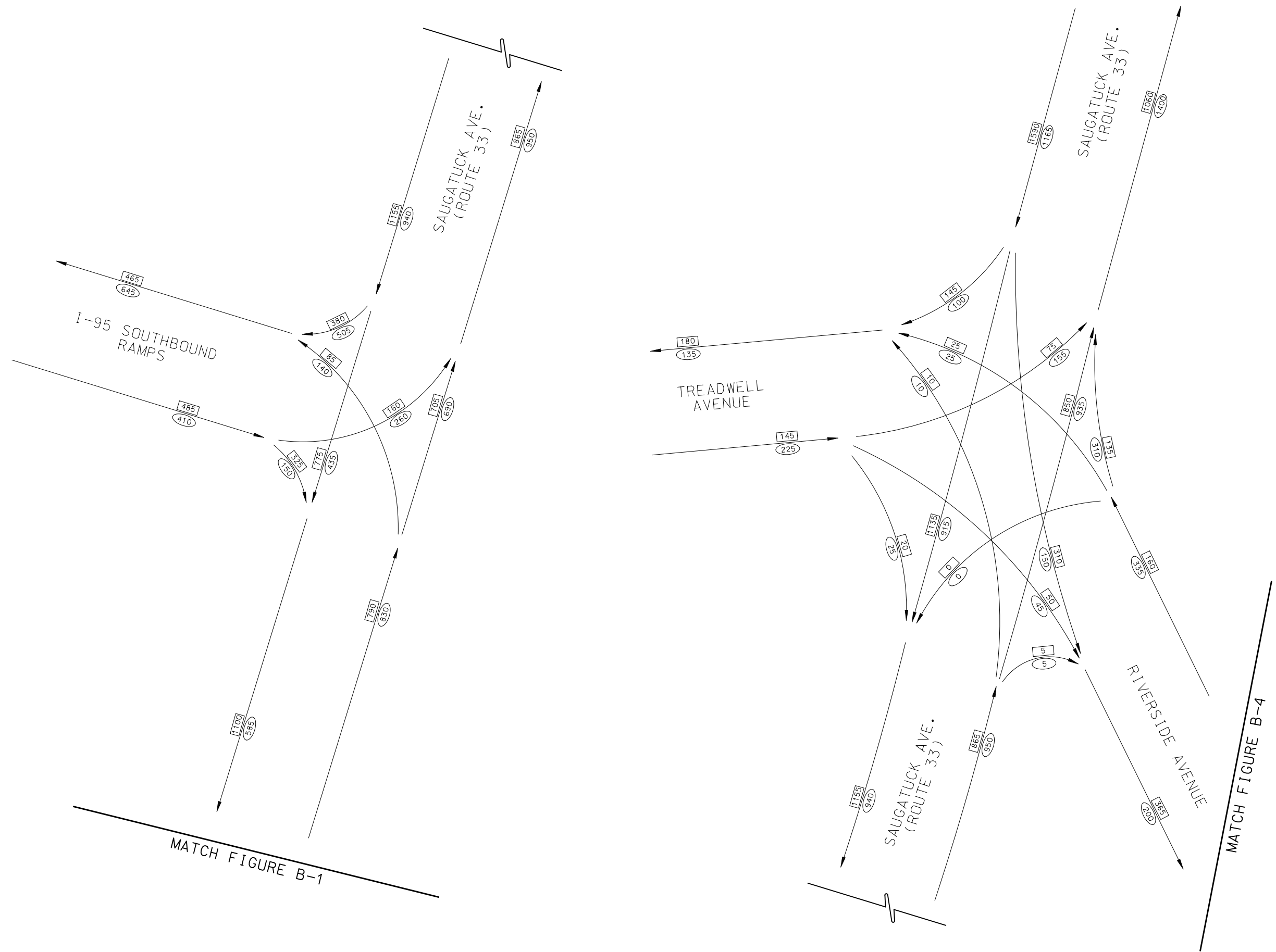
FIG. B-1
BRIDGE NO. 01349
PROJECT NO. 158-212
PROPOSED DETOUR
VOLUMES

MATCH FIGURE B-2



AM = 000
PM = 000

FIG. B-2
BRIDGE NO. 01349
PROJECT NO. 158-212
PROPOSED DETOUR
VOLUMES



AM = 000
PM = 000

FIG. B-3
BRIDGE NO. 01349
PROJECT NO. 158-212
PROPOSED DETOUR
VOLUMES

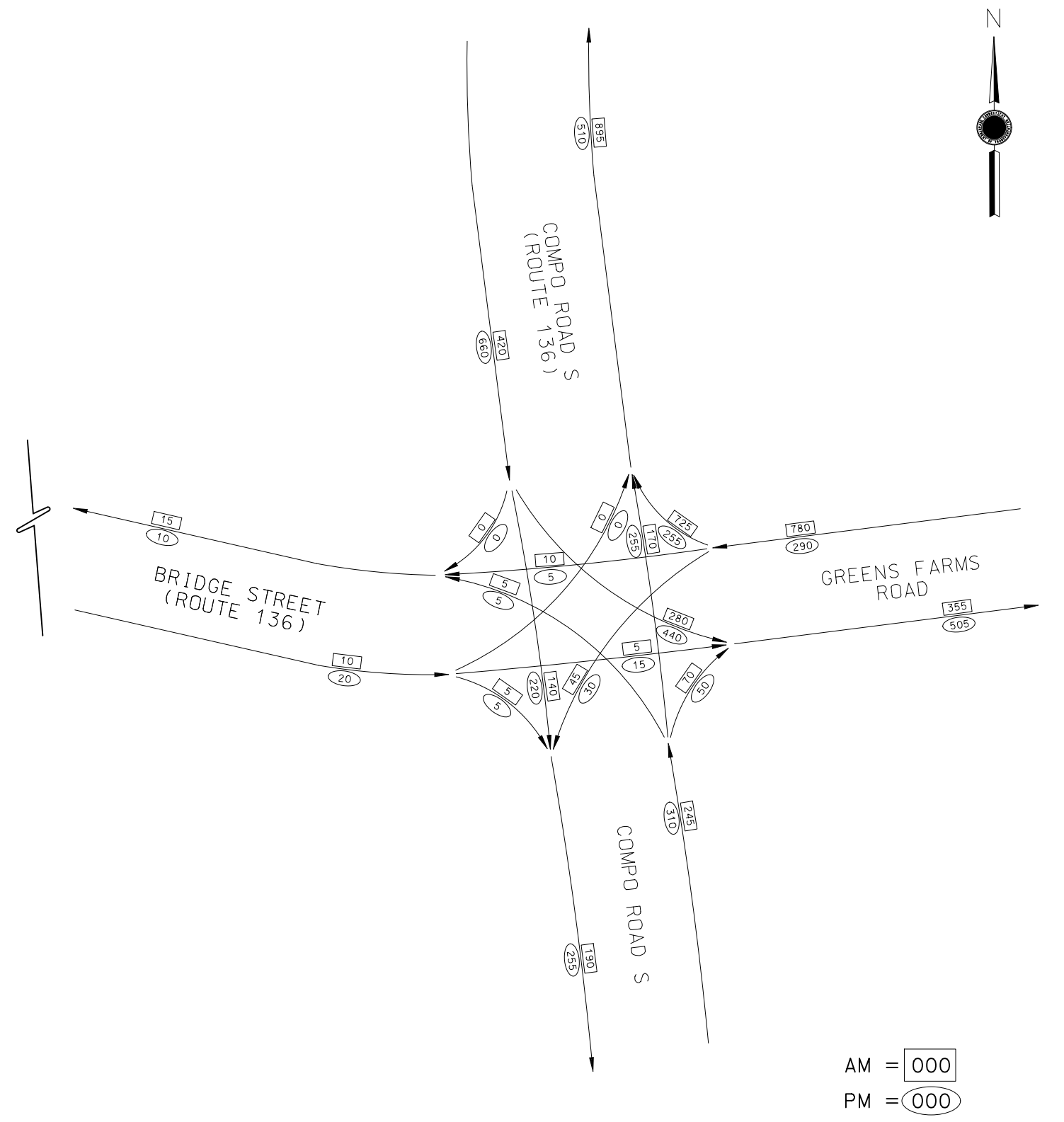
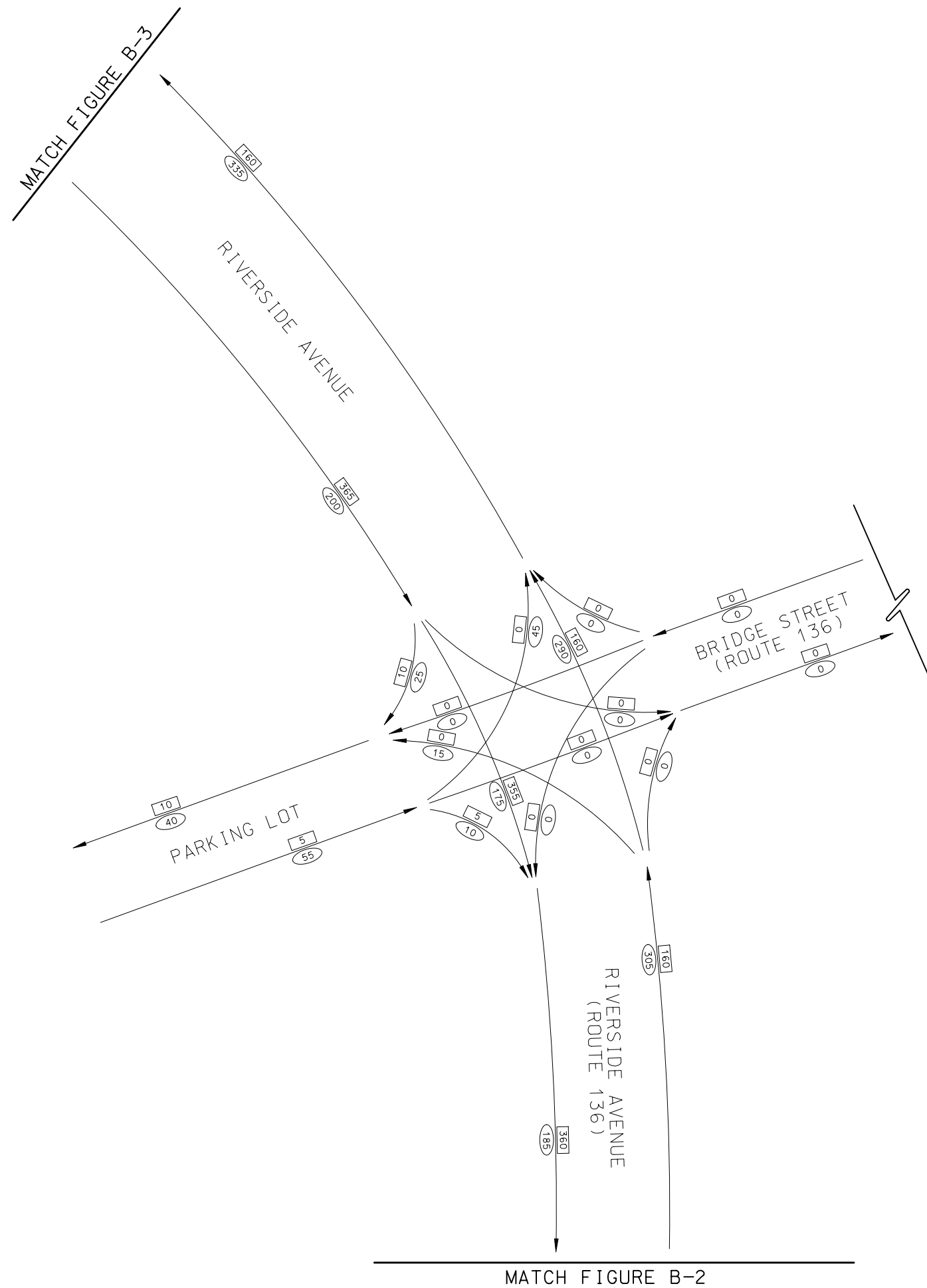


FIG. B-4
BRIDGE NO. 01349
PROJECT NO. 158-212
PROPOSED DETOUR
VOLUMES

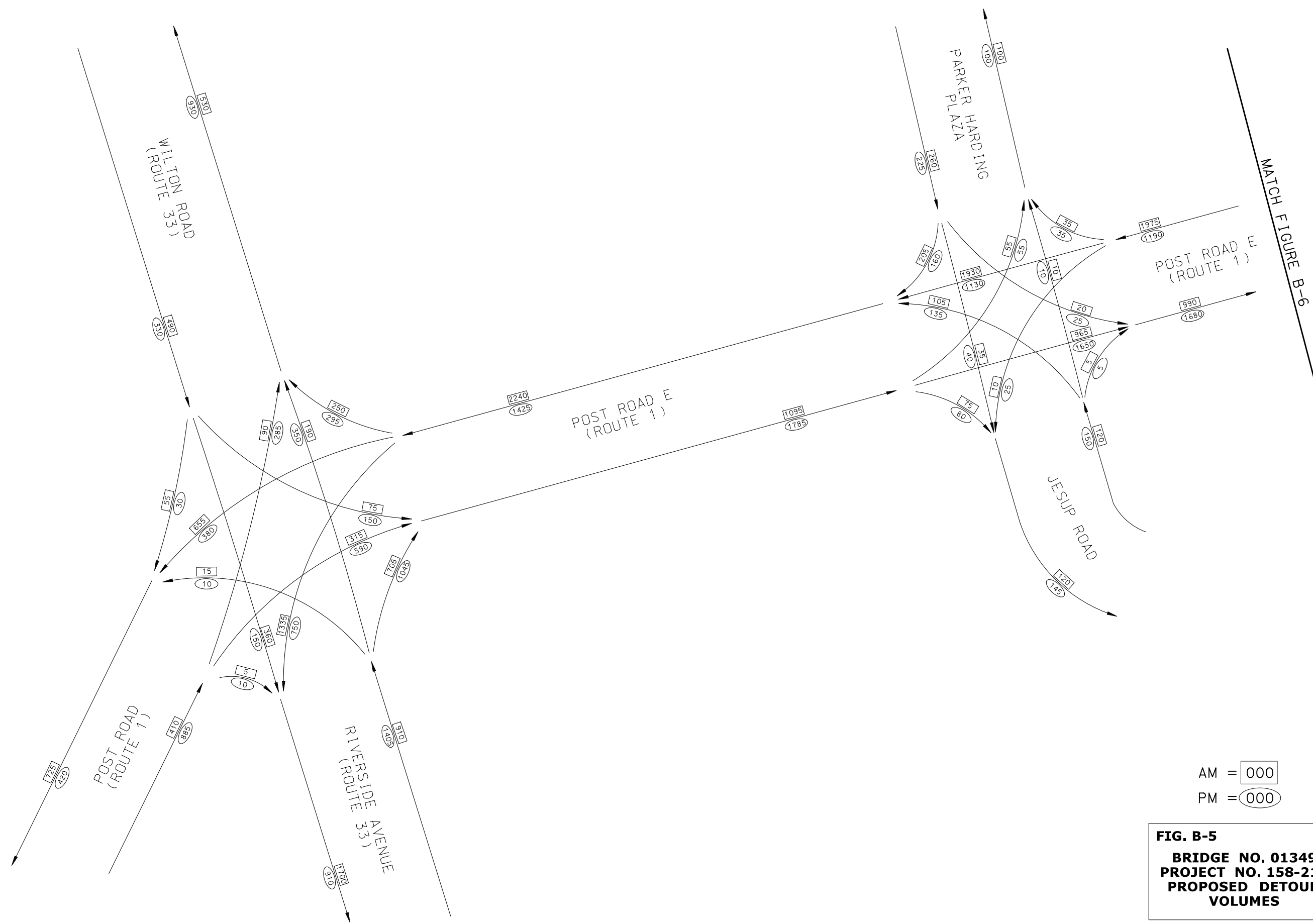
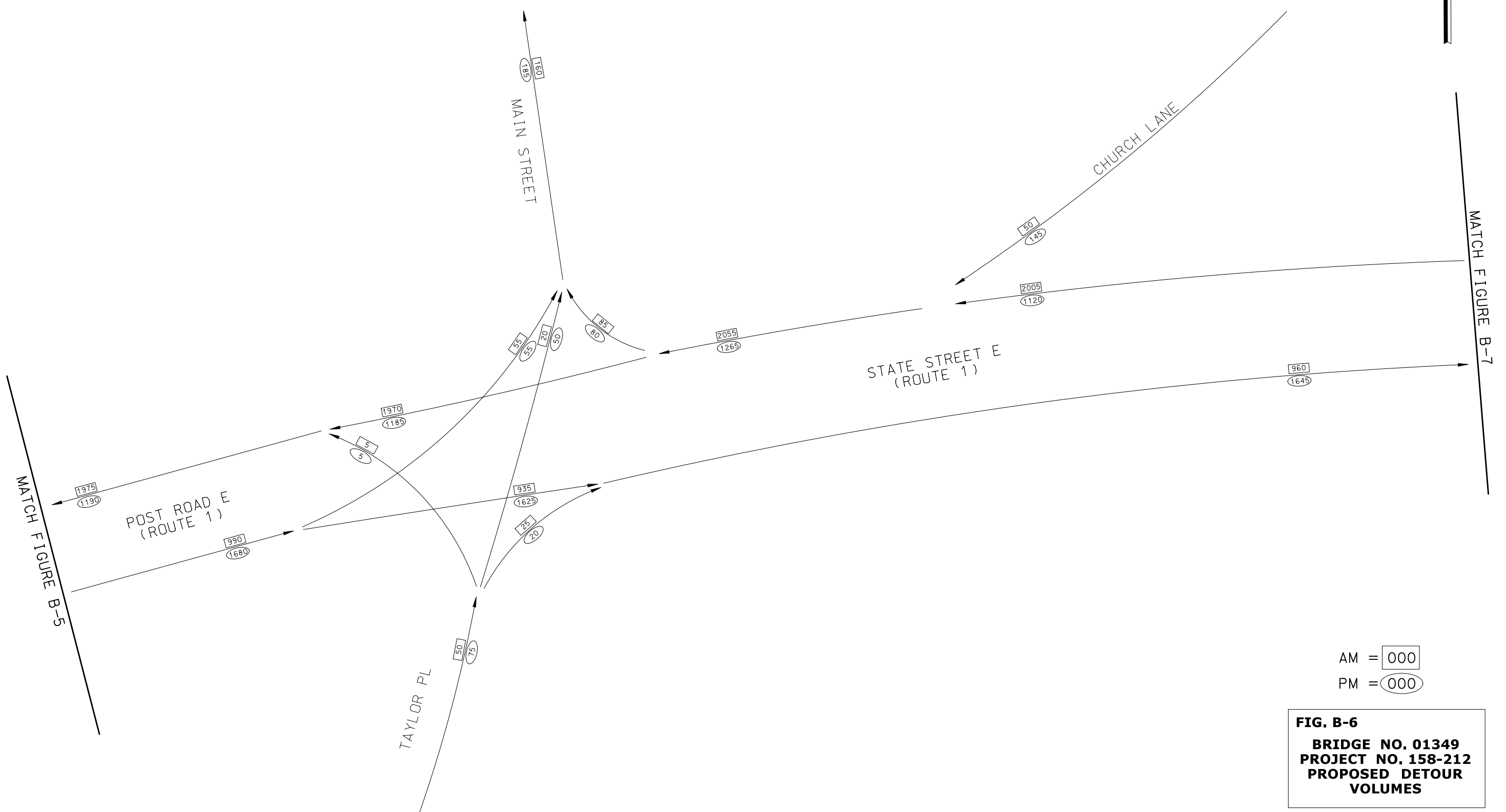
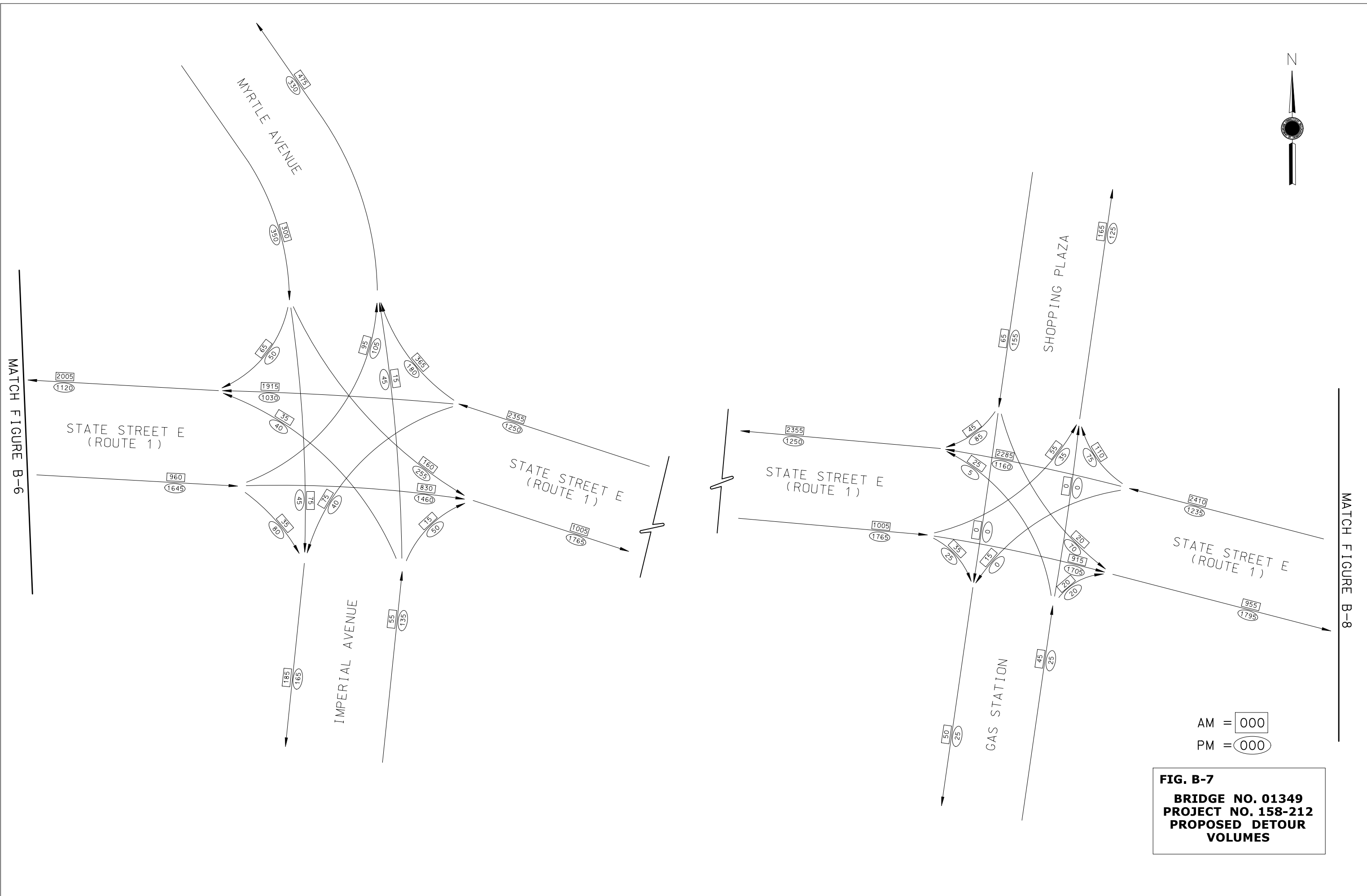


FIG. B-5
BRIDGE NO. 01349
PROJECT NO. 158-212
PROPOSED DETOUR
VOLUMES



AM = 000
PM = 000

FIG. B-6
BRIDGE NO. 01349
PROJECT NO. 158-212
PROPOSED DETOUR
VOLUMES



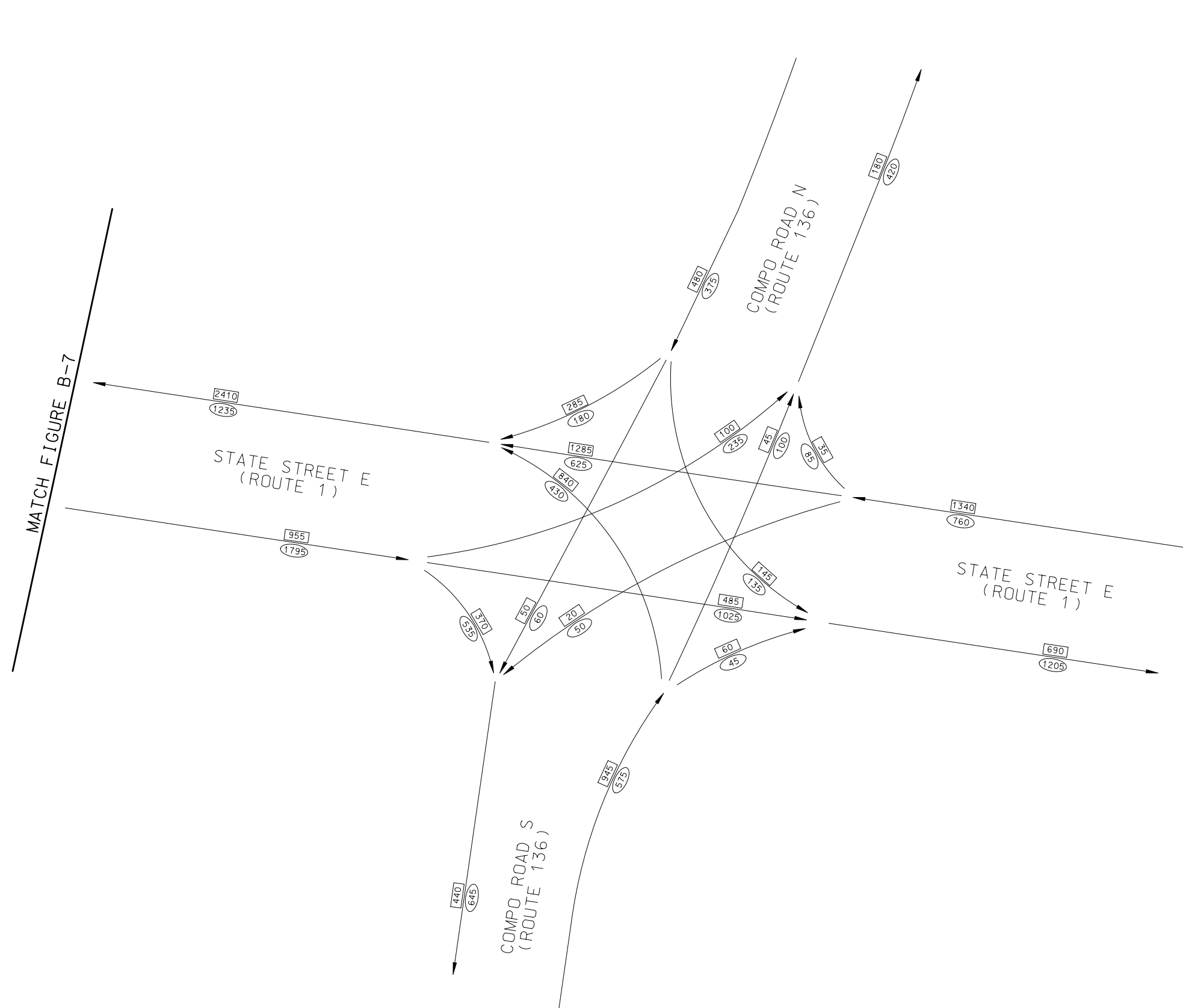


FIG. B-8
BRIDGE NO. 01349
PROJECT NO. 158-212
PROPOSED DETOUR
VOLUMES

APPENDIX G-C

List of Traffic Volume Assumptions

GENERAL:

The following assumptions were made for all traffic simulation models:

- Volumes shown in the diagrams are based upon +/- 10% of the calculated Design Flow Rate and have been rounded to the nearest multiple of 5
- Turning movements at Route 33, Park St., and Charles St. triangular interchange layout (shown in Figures A-1 and B-1) are based on balancing of the traffic volume counts made at the surrounding intersections
- To balance the traffic volume decrease noted in the traffic counts along Route 1, additional volumes are shown making right turns to account for and simulate vehicles using parking lots or on-street parking between intersections along this corridor
- Incoming traffic from Church Street is determined by balancing the traffic volumes of the nearby intersections
- Traffic entering/exiting Imperial Ave. at Bridge St. is determined by balancing the traffic volumes of the nearby intersections
- Traffic entering/exiting Route 33 between intersections with Route 1 and Treadwell Ave. are assumed based on balancing the traffic model with the counts taken at each respective intersection
- Traffic entering/exiting Route 136 between intersections with Bridge St. and Route 1 are assumed based on balancing the traffic model with the counts taken at each respective intersection
- Traffic entering/exiting Ferry Lane
- Traffic entering/exiting Ketcham St.

PROPOSED DETOUR AM:

- Destination breakdown for the 550 vehicles entering Bridge St. eastbound is as follows:
 - 95 vehicles – final destination is Compo Rd. S. southbound
 - 235 vehicles – final destination is Greens Farms Rd.
 - 95 vehicles will take Compo Rd. S northbound
 - 5 vehicles – final destination is along Compo Rd. S.
 - 35 vehicles – final destination is Compo Rd. N.
 - 55 vehicles – final destination is Route 1 eastbound
 - 125 vehicles will take Imperial Ave.
 - 25 vehicles – final destination is along Imperial Ave.
 - 65 vehicles – final destination is Myrtle Ave.
 - 35 vehicles – take Route 1 eastbound

- Origin breakdown of 175 vehicles entering Bridge St. from Riverside Ave. southbound is as follows:
 - 5 vehicles – from Route 33 northbound, all from I-95 southbound ramps
 - 50 vehicles – from Treadwell Ave.
 - 120 vehicles – from Route 33 southbound
 - 20 vehicles – from Route 33 southbound prior to Route 1
 - 100 vehicles – from various side streets between the intersections of Route 33 with Route 1 and Treadwell Ave.

- Origin breakdown of 375 vehicles entering Bridge St. from Riverside Ave. northbound is as follows:
 - 45 vehicles – from Riverside Ave. northbound
 - 60 vehicles – from Franklin St.
 - 50 vehicles – from Route 33 northbound
 - 220 vehicles – from 1-95 northbound ramps

- Destination breakdown for the 300 vehicles entering Riverside Ave. northbound from Bridge St. is as follows:
 - 10 vehicles – final destination is I-95 southbound ramps
 - 140 vehicles – final destination is Treadwell Ave.
 - 150 vehicles will take Route 33 northbound
 - 25 vehicles – final destination is Route 33 northbound past Route 1
 - 125 vehicles – final destination is various side streets located between the Route 33 intersections with Riverside Ave. and Route 1

- Destination breakdown for the 665 vehicles entering Riverside Ave. southbound from Bridge St. is as follows:
 - 165 vehicles – final destination is Riverside Ave. southbound
 - 10 vehicles – final destination is Franklin Ave.
 - 180 vehicles – final destination is I-95 southbound ramps
 - 20 vehicles – final destination is I-95 northbound ramps
 - 290 vehicles – final destination is Route 33 southbound

- Origin breakdown of 970 vehicles from Bridge St. westbound is as follows:
 - 20 vehicles – from Imperial Ave.
 - 10 vehicles – Imperial Ave. residences
 - 5 vehicles – from Myrtle Ave.
 - 5 vehicles – from Route 1 westbound
 - 110 vehicles – from Compo Road S. northbound
 - 650 vehicles – from Greens Farms Road
 - 190 vehicles – from Compo Road S. southbound
 - 125 vehicles – from Compo Road N.
 - 65 vehicles – from Route 1 westbound

PROPOSED DETOUR PM:

- Destination breakdown for the 900 vehicles entering Bridge St. eastbound is as follows:
 - 115 vehicles – final destination is Compo Rd. S. southbound
 - 375 vehicles – final destination is Greens Farms Rd.
 - 215 vehicles will take Compo Rd. S northbound
 - 150 vehicles – final destination is Compo Rd. N.
 - 65 vehicles – final destination is Route 1 eastbound
 - 195 vehicles will take Imperial Ave.
 - 60 vehicles – final destination is along Imperial Ave.
 - 65 vehicles – final destination is Myrtle Ave.
 - 70 vehicles – take Route 1 eastbound

- Origin breakdown of 335 vehicles entering Bridge St. from Riverside Ave. southbound is as follows:
 - 15 vehicles – from Route 33 northbound, all from I-95 southbound ramps
 - 125 vehicles – from Treadwell Ave.
 - 195 vehicles – from Route 33 southbound
 - 35 vehicles – from Route 33 southbound prior to Route 1
 - 160 vehicles – from various side streets between the intersections of Route 33 with Route 1 and Treadwell Ave.

- Origin breakdown of 530 vehicles entering Bridge St. from Riverside Ave. northbound is as follows:
 - 120 vehicles – from Riverside Ave. northbound
 - 70 vehicles – from Franklin St.
 - 115 vehicles – from Route 33 northbound
 - 225 vehicles – from I-95 northbound ramps

- Destination breakdown for the 220 vehicles entering Riverside Ave. northbound from Bridge St. is as follows:
 - 35 vehicles – final destination is I-95 southbound ramps
 - 65 vehicles – final destination is Treadwell Ave.
 - 120 vehicles will take Route 33 northbound
 - 20 vehicles – final destination is Route 33 northbound past Route 1
 - 100 vehicles – final destination is various side streets located between the Route 33 intersections with Riverside Ave. and Route 1

- Destination breakdown for the 295 vehicles entering Riverside Ave. southbound from Bridge St. is as follows:
 - 45 vehicles – final destination is Riverside Ave. southbound
 - 10 vehicles – final destination is Franklin Ave.
 - 130 vehicles – final destination is I-95 southbound ramps
 - 35 vehicles – final destination is I-95 northbound ramps
 - 75 vehicles – final destination is Route 33 southbound

- Origin breakdown of 520 vehicles from Bridge St. westbound is as follows:
 - 45 vehicles – from Imperial Ave.
 - 15 vehicles – Imperial Ave. residences
 - 15 vehicles – from Myrtle Ave.
 - 15 vehicles – from Route 1 westbound
 - 150 vehicles – from Compo Route S. northbound
 - 200 vehicles – from Greens Farms Road
 - 125 vehicles – from Compo Road S. southbound
 - 75 vehicles – from Compo Road N.
 - 50 vehicles – from Route 1 westbound