

TELEGRAPH AVENUE COMPLETE STREETS PLAN



FINAL PLAN: APPENDIX B TECHNICAL ANALYSIS



NOVEMBER 2014

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APPENDIX B: TECHNICAL ANALYSIS

TRANSIT OPERATIONS ANALYSIS

PROJECT EFFECT ON TRANSIT OPERATIONS

Telegraph Avenue is an AC Transit trunk bus line, with 24-hour service, 5-7 minute peak headways, and approximately 9,000 daily boardings between downtown Oakland and downtown Berkeley. However, buses currently face several operational challenges on the corridor. Table B-I describes the major operational challenges, and summarizes how the proposed project will deal with each.

Table B-I: Summary of Proposed Project on Transit Operations

CHALLENGE	DESCRIPTION	EFFECT OF PROPOSED PROJECT
Inadequately sized bus stops	Several stops are too short for articulated buses to pull flush with curb, reducing passenger safety and increasing bus acceleration/ deceleration time.	Project will lengthen stops as needed. In addition, transit boarding islands will allow buses to easily pull flush with the curb.
Near-side bus stops	Near-side stops increase bus delay generally, reduce pedestrian safety, and do not allow buses to take advantage of existing Transit Signal Priority (TSP) equipment (TSP is non-functional when paired with near-side stops).	Project will relocate stops to far-side, improving operations and safety, and allow existing TSP equipment to be used to full effect.
Curb-side "friction"	Buses travel in the outer travel lane, where sources of delay include right-turning vehicles (there are no right-turn pockets on Telegraph), parking maneuvers, driveway maneuvers and double-parked vehicles.	Parking and driveway maneuvers would occur in the buffered bike lane rather than the vehicle through lane (where buses would operate). In addition, the buffered bike lane would provide sufficient space for right-turn pockets where needed.
Bus-bike conflicts	Telegraph Avenue has over 1,200 daily cyclists, and bus-bike conflicts were cited by AC Transit I/IR drivers as a primary concern. Bus and cyclist weaving at stops is a particular problem.	Project eliminates most bus-bike conflicts through combination of bike lanes and transit boarding islands.

Table B-I shows that the proposed project will directly address several of the operational concerns facing AC Transit on Telegraph Avenue. Telegraph Avenue today has two through lanes, but buses primarily use the outer-most through lane, which is clogged with slow-moving users (e.g., cyclists, right-turning vehicles, parking vehicles). Under the proposed project with buffered bike lanes, bicyclists, right-turning vehicles and parking maneuvers will continue to use the outer lane, but would no longer conflict with bus operations.

Analysis of transit operating speeds using the Transit Capacity and Quality of Service Manual (TCQSM) showed that the combined effect of the proposed project would have negligible or slightly positive effects on bus travel speeds during peak periods, even with the elimination of one through lane. This is largely due to the relatively low auto volumes on Telegraph Avenue south of 46th Street, which would allow Telegraph Avenue traffic to flow smoothly even with the reduction in automobile capacity. The Design Options Report provides a thorough description of the results of the TCQSM bus speed analysis.

EFFECT ON OVERALL TRANSIT QUALITY OF SERVICE

Transit quality of service depends on many factors. The TCQSM method for calculating transit level of service on urban arterials identifies six key components of transit service quality, as summarized in Table B-2.

Table B-2: Summary of Project Effects on Transit Quality of Service

FACTOR	ANTICIPATED PROJECT IMPACT	DESCRIPTION OF IMPACT
Adjacent Pedestrian Environment	Positive	Transit passengers are pedestrians immediately before and after transit trips. As a result, improvements to the safety and comfort of pedestrians on Telegraph will be realized by transit passengers as benefits.
Passenger Loads/ Crowding	None	N/A
Reliability	Positive	The unpredictability of curbside lane friction is a major cause of unreliable bus travel times. By placing buses in a lane with more predictable traffic flow, the proposed project will improve reliability.
Service Frequency	None	N/A
Speed	Neutral or slightly positive	As described above, the proposed project will maintain or modestly increase bus operating speeds.
Stop Amenities	Positive	Installation of transit islands will provide sufficient space for shelters and benches at stops, many of which currently lack either.

Table B-2 shows that the proposed changes to Telegraph Avenue will positively impact three of the six primary quality of service factors, and will have no effect (or a small positive effect) on the remaining three. While the project is not likely to result in an appreciable increase in transit travel speed, the combined effect of an improved pedestrian environment, more comfortable stops, and higher reliability will make Telegraph Avenue an overall better street for transit users.

RELATIONSHIP TO BUS RAPID TRANSIT

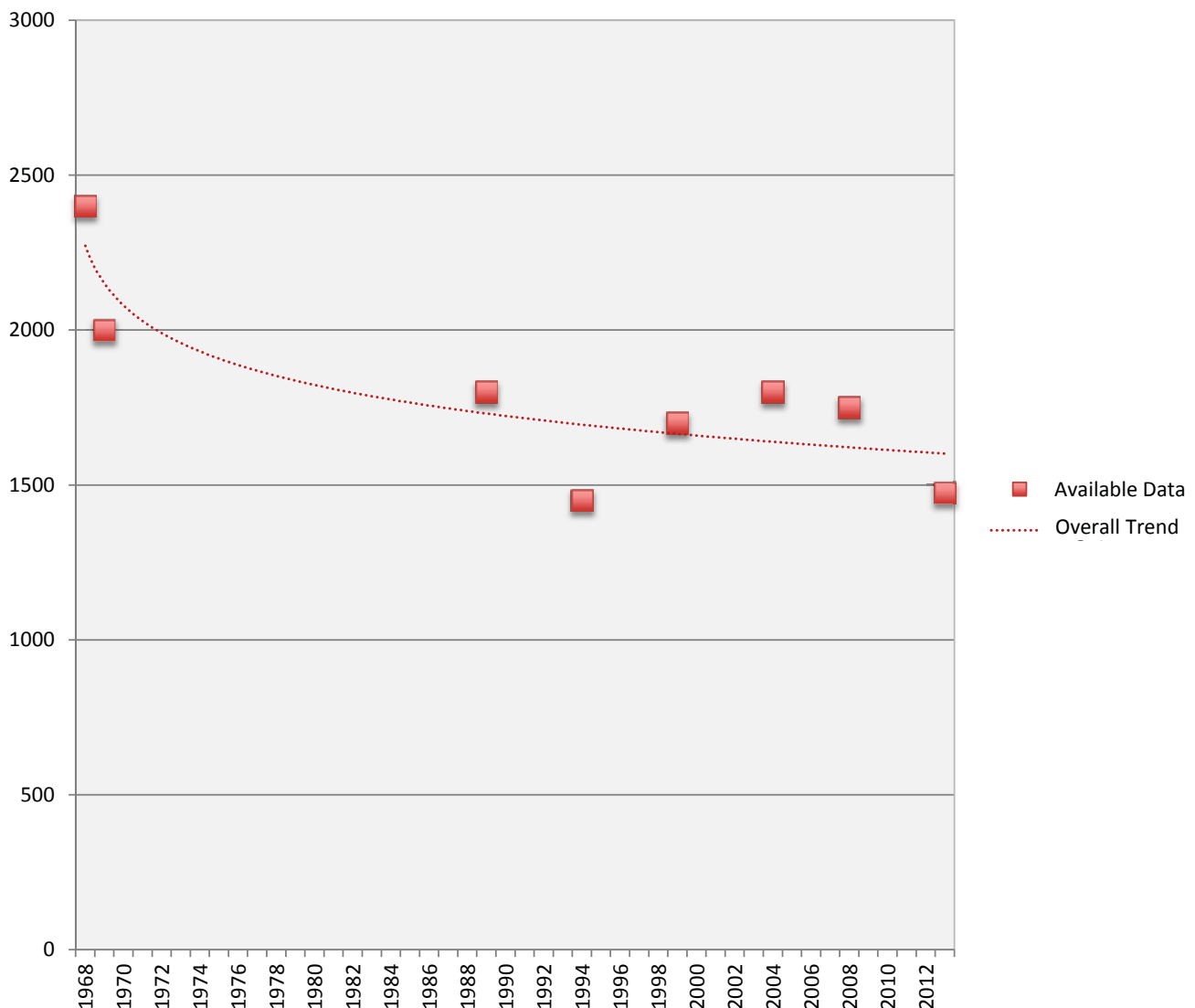
The proposed project does not preclude future BRT. As envisioned in the 2012 EIR, Telegraph Avenue BRT requires three primary geometric changes: (1) reduce Telegraph Avenue to one through lane; (2) prohibit left-turns at most minor intersections and driveways; and (3) remove a significant portion of the existing on-street parking (330 out of 509 on-street spaces). The proposed project is consistent with the first of these changes, and does not preclude the other two should AC Transit wish to move forward with project development for Bus Rapid Transit on Telegraph Avenue in the future.

CAPACITY ANALYSIS

A sensitivity test was performed on the proposed network to determine the additional capacity available on Telegraph Avenue. Traffic volumes were gradually increased until the volume to capacity ratio exceeded 0.95 and resulted in Level of Service E at any intersections during either the AM or PM peak hours. Traffic volume is able to increase by up to 10 percent (equivalent to a project generating more than twice the number of trips as the MacArthur Transit Village) on Telegraph Avenue and still maintain Level of Service D or better. In other words, even with the road diet, two additional MacArthur Transit Village projects could be constructed on the same site without exceeding City of Oakland LOS requirements. Thus, the operational analysis shows that intersection will operate acceptably with the Recommended Project's proposed road diet, and will continue to have additional capacity available.

Additionally, based on the historical trend, traffic volumes on Telegraph Avenue are not expected to increase. Figure B-1 shows traffic volumes on Telegraph Avenue between 39th Street and 40th Street over the past 45 years. While the initial drop in traffic between 1968 and 1969 can be attributed to the opening of State Route 24, traffic volume continues to trend downward over the next several decades. Similar trends were observed elsewhere on the corridor at Grand Avenue, 27th Street, and MacArthur Boulevard.

Figure B-1: Telegraph Avenue PM Peak Hour Traffic between 39th Street and 40th Street



Source: City of Oakland, Fehr & Peers, 2014

Table B-4: Existing Plus Project Signalized Intersection Operations

LOCATION	PEAK HOUR	EXISTING CONDITIONS			EXISTING PLUS PROJECT + MACARTHUR TRANSIT VILLAGE		
		V/C	DELAY	LOS	V/C	DELAY	LOS
Telegraph Avenue & Alcatraz Avenue	AM	0.78	29	C	N/A - No Proposed Change in Capacity		
	PM	0.78	34	C			
Telegraph Avenue & Aileen Street/SR 24	AM	0.65	22	C			
	PM	0.51	12	B			
Telegraph Avenue & 56th Street/SR 24	AM	0.45	5	A			
	PM	0.80	33	C			
Telegraph Avenue & 55th Street	AM	0.51	7	A			
	PM	0.64	6	A			
Telegraph Avenue & 52nd Street/ Claremont Avenue	AM	0.41	13	C			
	PM	0.48	5	D			
Telegraph Avenue & 51st Street	AM	0.65	24	C			
	PM	0.78	44	D			
Telegraph Avenue & 50th Street	AM	0.26	2	C			
	PM	0.27	2	A			
Telegraph Avenue & 48th Street	AM	0.22	3	A			
	PM	0.24	2	A			
Telegraph Avenue & 45th Street	AM	0.32	11	B	0.60	19	B
	PM	0.37	10	A	0.59	13	B
Telegraph Avenue & 42nd Street	AM	0.30	5	A	0.57	5	A
	PM	0.31	2	A	0.59	5	A
Telegraph Avenue & 40th Street	AM	0.47	13	B	0.59	15	B
	PM	0.60	19	B	0.83	35	C
Telegraph Avenue & W. MacArthur Boulevard	AM	0.29	3	A	0.53	15	B
	PM	0.50	14	B	0.75	29	C
Telegraph Avenue & 34th Street	AM	0.22	9	A	0.41	5	A
	PM	0.35	6	A	0.56	6	A
Telegraph Avenue & Hawthorne Avenue	AM	0.18	2	A	0.38	2	A
	PM	0.38	6	A	0.60	7	A
Telegraph Avenue & 30th Street	AM	0.25	4	A	0.41	4	A
	PM	0.35	5	A	0.57	5	A
Telegraph Avenue & 29th Street	AM	0.27	3	A	0.44	7	A
	PM	0.44	4	A	0.72	6	A
Telegraph Avenue & 27th Street	AM	0.40	21	C	0.58	22	C
	PM	0.50	11	B	0.60	11	B
Telegraph Avenue & W. Grand Avenue	AM	0.33	17	B	0.52	18	B
	PM	0.58	19	B	0.60	20	B
Telegraph Avenue & 20th Street	AM	0.30	14	B	0.50	15	B
	PM	0.36	14	B	0.53	16	B

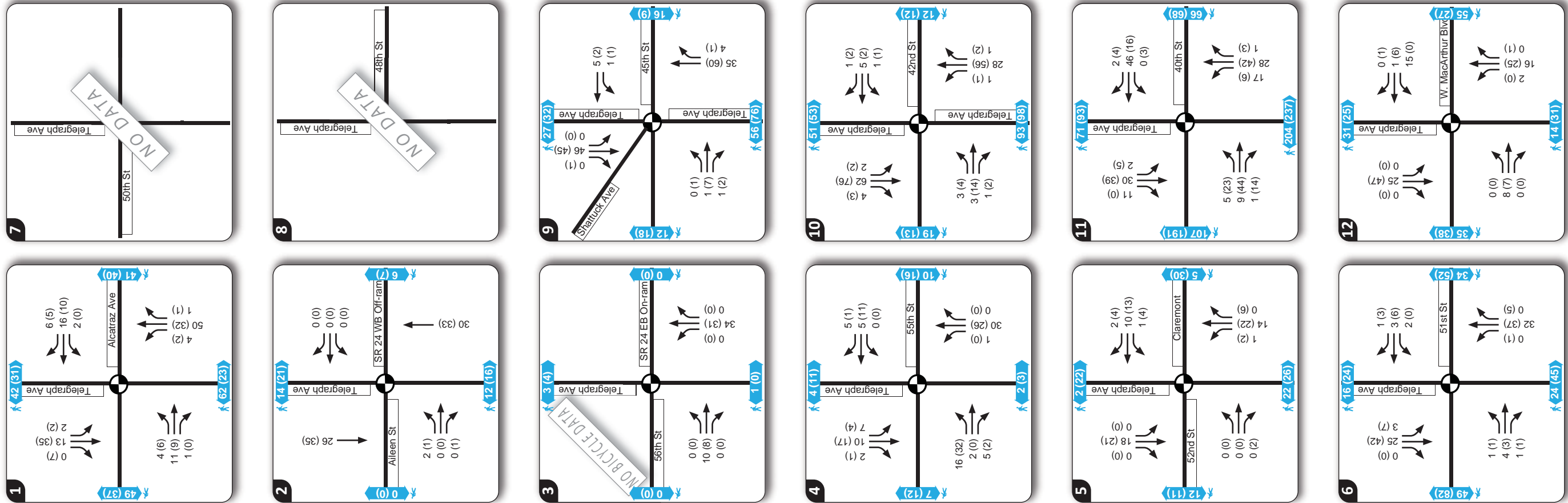
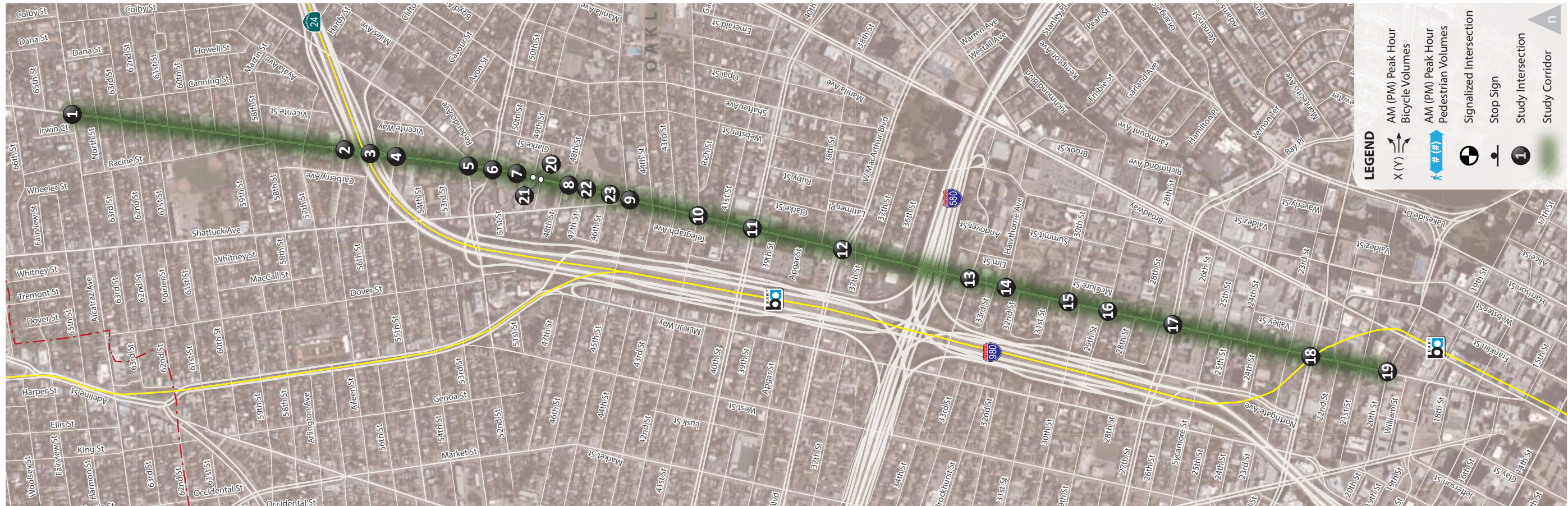


Figure B-2
Existing Peak Hour Bicycle and Pedestrian Volumes

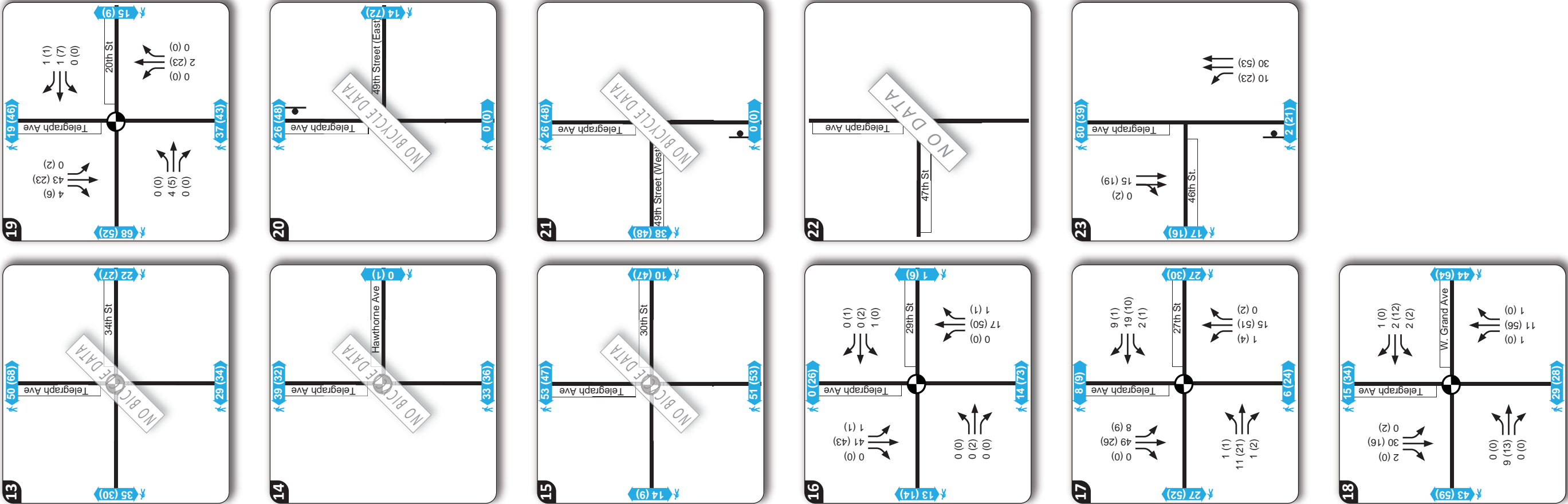
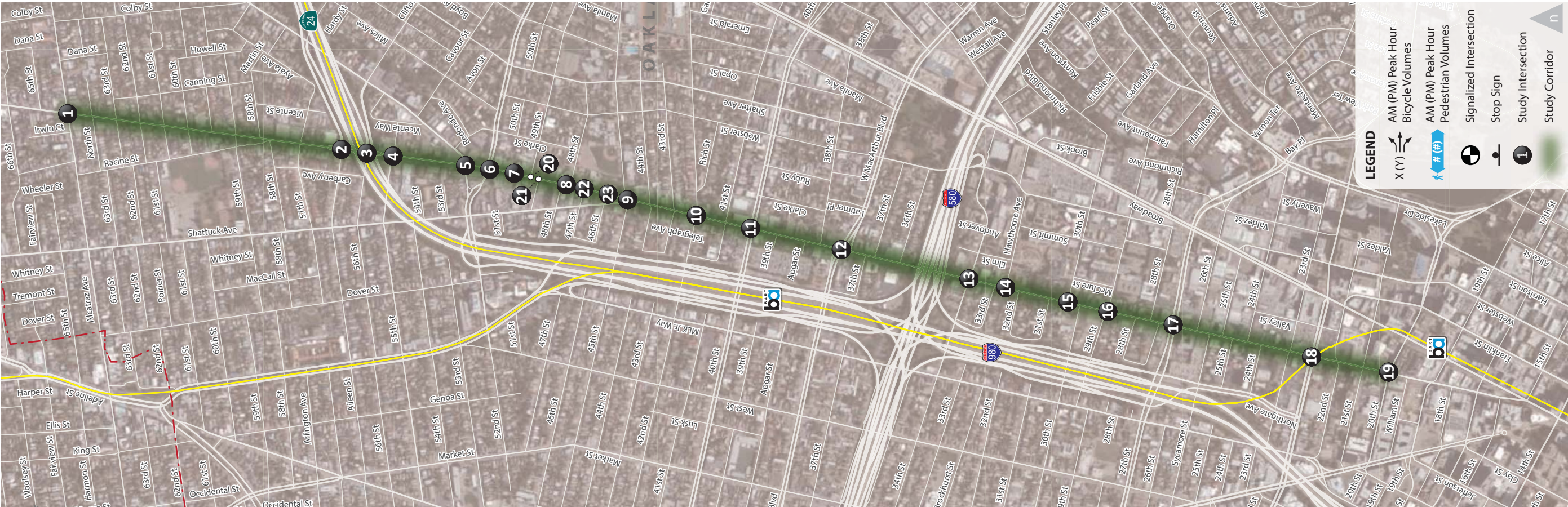


Figure B-3
Existing Peak Hour Bicycle and Pedestrian Volumes

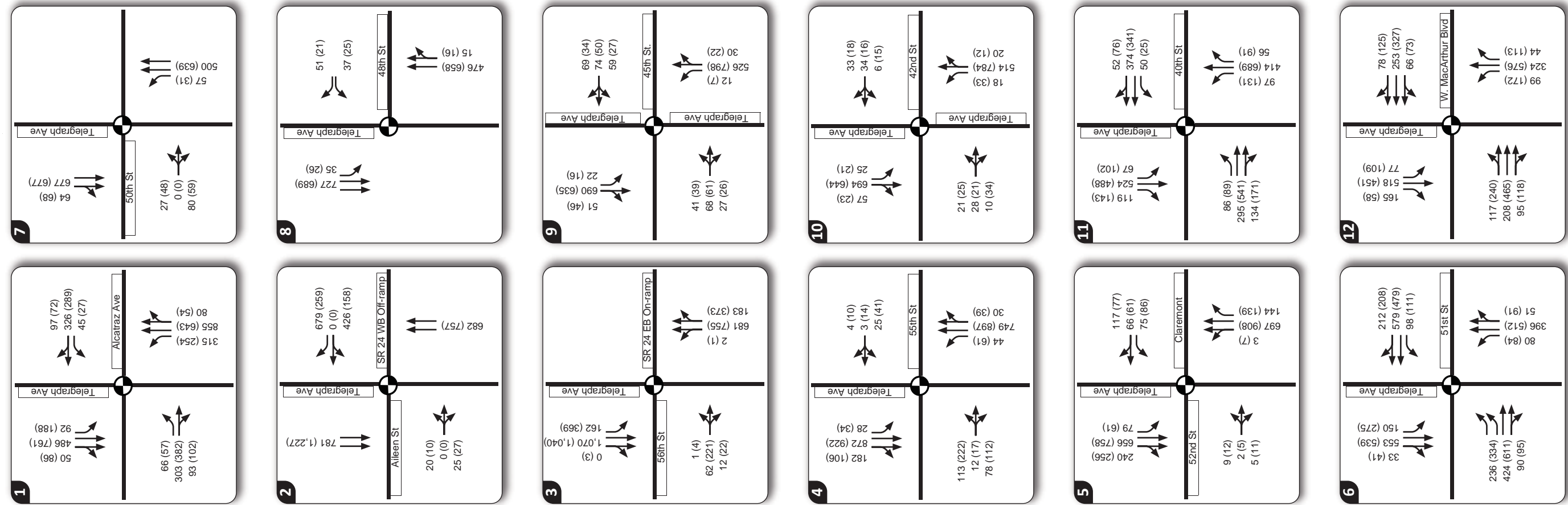


Figure B-4: Existing Plus MacArthur Transit Village Peak Hour Intersection Traffic Volumes, Proposed Lane Configurations and Traffic Control

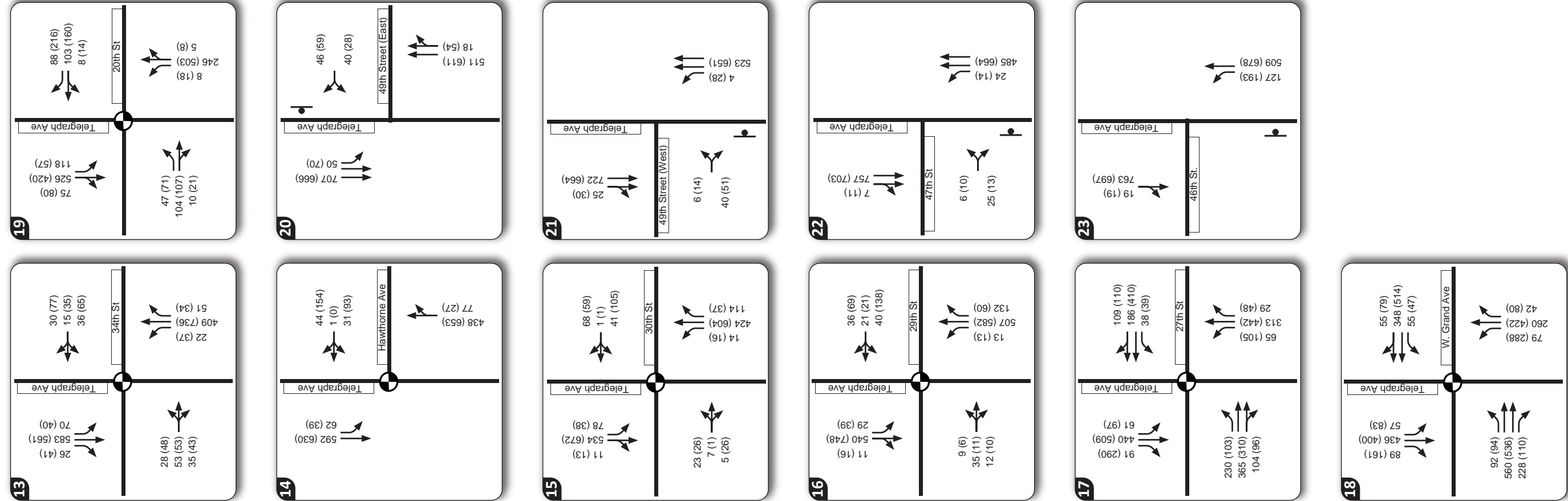


Figure B-5: Existing Plus MacArthur Transit Village Peak Hour Intersection Traffic Volumes, Proposed Lane Configurations and Traffic Control