

MEMORANDUM



ENGINEERS
PLANNERS
SURVEYORS

Date: May 5, 2020
To: Mark Debald
From: Mark Sargent, PE; Jesse Vogl, AICP
cc: File
Project: 119-047 Poughkeepsie 9.44.55
Re: **Origin-Destination Study**

Purpose:

The purpose of this memorandum is to summarize the origin-destination analysis performed on the Arterials and Interchange in order to inform the development and analysis of future alternatives as part of the Poughkeepsie 9.44.55 study.

Analysis:

Origin-Destination (O-D) data was provided by StreetLight InSight based upon the zone structure shown in Figure 1 (attached). The zone structure divides the blocks between the Route 44/55 Arterials into three internal zones (I1, I2, and I3) with the Arterials themselves bounded by 12 external zones (E1-11 and E19). Similarly, the Interchange is also bounded by external zones (E12-18). In addition to the internal and external zones, screen lines were located on either end of the Arterial corridor (S1 to the west and S2 to the east) as well as US Route 9 to the north and south (N* and S*). This zone structure forms the basis of the analysis and was used to query traffic data from Tuesday thru Thursday in October 2019 for the morning (AM) peak period from 7:00 a.m. to 9:00 a.m. and the evening (PM) peak period from 4:00 p.m. to 6:00 p.m. The data represents the one-hour average peak within the two-hour query and generally coincides with the turning movement count data collection during October 2019. It is noted that all O-D patterns and volume totals were developed using the queried StreetLight data.

Data from StreetLight is developed based on archival location records created by mobile devices, such as smart phones and navigation systems, in order to develop travel patterns. The device data is normalized to represent vehicle trips. It is noted that the query resulted in a sample of approximately 24,000 unique devices accounting for approximately 187,000 trips on average over a 72 hour period. A trip is defined as starting when a device begins moving and ends when that device does not move at least five meters within five minutes. A trip is also required to be at least three minutes in duration and 500 meters in distance.

The O-D data was developed into four matrices (one for each peak hour and two separate matrices for screenlines) with origin zones (from) on the vertical axis and destination zones (to) on the horizontal axis. It is noted that a trip that travels through multiple pass-through zones (external zones and screen lines) is counted at all zones. The O-D matrices (attached) were used to answer the following questions:

1. What percentage of traffic on the Arterials is through traffic?

The percentage of through traffic on the Arterials can be calculated by comparing the traffic volumes that pass through S1 and S2 compared to the total volume of traffic on the Arterial at the origin point. Specifically, the percentage of eastbound through traffic can be defined as the traffic volume from S1 to S2c divided by the total eastbound traffic at S1, while the total westbound through traffic can be defined as the total volume from S2a to S1 divided by the total westbound traffic at S2a. Tables 1a and 1b show the relevant data from the overall O-D matrices for the AM and PM peak periods respectively.

MEMORANDUM

Poughkeepsie 9.44.55 Origin-Destination Study

May 5, 2020

Table 1a – AM Peak Hour Arterial Through Traffic

		To		
		S1 Westbound	S2c Eastbound	Total
From	S1 Eastbound	-	357	1,940 ¹ 18%
	S2a Westbound	255	-	1,888 ² 13%

¹Total S1 eastbound is equal to the sum of traffic from S1 to zones E1 thru E11, E19, and I1 thru 3

²Total S2a westbound is equal to the sum of traffic from zones E5 and E6 to S2A

Table 1b – PM Peak Hour Arterial Through Traffic

		To		
		S1 Westbound	S2 Eastbound	Total
From	S1 Eastbound	-	350	1,462 ¹ 24%
	S2 Westbound	330	-	1,727 ² 19%

¹Total S1 eastbound is equal to the sum of traffic from S1 to zones E1 thru E11, E19, and I1 thru 3

²Total S2 westbound is equal to the sum of traffic from zones E5 and E6 to S2A

The tables show that approximately 18 percent of eastbound and 13 percent of westbound traffic on the Arterials between S1 and S2 is through traffic during the AM peak hour while 24 percent of eastbound traffic and 19 percent of westbound traffic between S1 and S2 is through traffic during the PM peak hour. In round numbers, ± 20% of the traffic on the arterials is through traffic during the peak hours.

2. What percentage of traffic on US Route 9 is through traffic?

The percentage of through traffic on US Route 9 can be calculated by comparing the traffic volumes to and from zones E13 and E17 compared to the total volumes on US Route 9. The total northbound through traffic can be defined as the total volume of traffic from E13 to E17 divided by the total northbound traffic at E13, while the total southbound through traffic can be defined as the total volume of traffic from E17 to E13 divided by the total southbound traffic at E17. Similarly, through traffic on US Route 9 can be examined further from the interchange through a comparison of N* and S*. Tables 2a through 2d show the relevant data from the overall O-D matrices for the AM and PM peak periods respectively.

Table 2a – AM Peak Hour Interchange Through Traffic

		To		
		E13 Southbound	E17 Northbound	Total
From	E13 Northbound	-	682	1,534 44%
	E17 Southbound	615	-	928 66%

¹Total E13 northbound is equal to the sum of traffic from zone E13 to zones E12 thru E18 (excluding E13) and S1

²Total E17 southbound is equal to the sum of traffic from zone E17 to zones E12 thru E18 (excluding E17) and S1

Table 2b – PM Peak Hour Interchange Through Traffic

		To		
		E13 Southbound	E17 Northbound	Total
From	E13 Northbound	-	972	2,391 41%
	E17 Southbound	985	-	1,623 61%

¹Total E13 northbound is equal to the sum of traffic from zone E13 to zones E12 thru E18 and S1

²Total E17 southbound is equal to the sum of traffic from zone E17 to zones E12 thru E18 and S1

MEMORANDUM

Poughkeepsie 9.44.55 Origin-Destination Study

May 5, 2020

Table 2c – AM Peak Hour US Route 9 Through Traffic

		To			
		S* Southbound	N* Northbound	Total	
From	S* Northbound	-	308	1,711	18%
	N* Southbound	398	-	864	46%

Table 2d – PM Peak Hour US Route 9 Through Traffic

		To			
		S* Southbound	N* Northbound	Total	
From	S* Northbound	-	546	2,355	23%
	N* Southbound	454	-	1,115	41%

The tables show that approximately 44 percent of northbound and 66 percent of southbound traffic on US Route 9 between E13 and E17 is through traffic during the AM peak hour, while 41 percent of northbound traffic and 61 percent of southbound traffic between E13 and E17 is through traffic during the PM peak hour. The percentage of through traffic on US Route 9 is lower further from the interchange, with approximately 18 to 23 percent northbound through traffic during the AM and PM peak hours and approximately 46 to 41 percent southbound through traffic during the AM and PM peak hours. In general, this means approximately half of the traffic on US Route 9 is through traffic at the Interchange, and approximately 1/3 of the traffic passes through the larger area without exiting Route 9.

3. How much traffic is destined for downtown Poughkeepsie and where is it coming from?

The overall O-D matrices can be used to identify the volume of traffic to and from downtown Poughkeepsie by looking at traffic volumes to zone I1. The matrices indicate that 1,467 trips were destined to downtown during the AM peak hour accounting for approximately 7% of all peak hour trips within the study area, while 900 trips were destined to downtown during the PM peak hour accounting for approximately 3% of all peak hour trips (See Figure 1). Downtown is shown as the area between the Arterials from Columbus Drive to Clinton Street. Table 3a shows the primary zones from which people enter downtown during the AM and PM peak hours respectively.

Table 3a –Peak Hour Travel Patterns to Downtown

AM Peak Hour			PM Peak Hour		
Origin Zone	# Trips to Downtown (I1)	Percent of Total Trips to Downtown (I1)	Origin Zone	# Trips to Downtown (I1)	Percent of Total Trips to Downtown (I1)
E2	244	17%	E10	148	17%
E10	232	15%	E2	138	15%
E15	214	14%	E3	67	7%
E6	125	9%	E19	59	7%
E5	98	7%	E1	56	6%
E13	97	7%	E13	51	6%
E9	95	7%	E9	50	6%
E1	82	6%	E5	46	5%
E3	76	5%	E15	41	5%
E19	56	4%	E6	39	4%
Other	148	10%	Other	205	22%
Total	1,467	100%	Total	900	100%

MEMORANDUM

Poughkeepsie 9.44.55 Origin-Destination Study

May 5, 2020

4. What are the predominant travel patterns at the Interchange?

The predominant travel patterns at the Interchange can be examined by focusing on zones E12 thru E18 and S1 which completely bound the interchange. Table 4a and Table 4b show the O-D pairs between these zones during the AM and PM peak hours respectively.

Table 4a – AM Peak Hour Interchange Patterns

		To										
		S1	E12a	E12b	E13	E14a	E14b	E15	E16	E17	E18	Total
From	S1	-	0	16	149	21	3	716	18	78	8	1,007
	E12a	4	-	0	2	3	0	0	0	4	0	12
	E12b	7	0	-	48	21	2	15	7	47	9	154
	E13	234	4	120	-	39	5	261	39	682	152	1,534
	E14a	8	7	25	149	-	7	11	5	5	3	218
	E14b	5	7	0	13	16	-	8	4	21	5	77
	E15	1,442	6	58	535	50	17	-	49	271	48	2,474
	E16	13	3	10	67	22	5	42	-	11	205	375
	E17	64	0	64	615	16	16	145	3	-	6	928
	E18	15	0	2	128	12	3	39	93	4	-	292
Total		1,790	26	293	1,704	197	56	1,235	215	1,121	433	7,069

Table 4b – PM Peak Hour Interchange Patterns

		To										
		S1	E12a	E12b	E13	E14a	E14b	E15	E16	E17	E18	Total
From	S1	-	0	7	197	20	9	1,444	41	59	34	1,809
	E12a	0	-	0	22	24	21	8	3	5	0	82
	E12b	17	0	-	118	48	0	102	23	104	13	424
	E13	263	0	80	-	83	13	721	77	972	184	2,391
	E14a	11	0	14	268	-	9	31	34	21	12	398
	E14b	3	0	0	28	29	-	10	10	12	14	104
	E15	920	2	22	385	40	6	-	53	218	41	1,686
	E16	26	0	8	148	34	5	82	-	10	258	569
	E17	112	2	38	985	32	33	395	14	-	14	1,623
	E18	25	0	5	247	32	28	99	170	6	-	610
Total		1,374	4	172	2,396	341	122	2,890	423	1,407	569	9,694

The tables show that during both peak hours, through movements on Route 44/55 and US Route 9 are the predominant travel movements, accounting for approximately 45-50% of peak hour traffic. The predominant travel patterns, with the approximate percentages are listed in order of magnitude below:

1. Mid-Hudson Bridge to and from the Arterials (E15 to/from S1, 30%)
2. US Route 9 south to and from US Route 9 north (E13 to/from E17, 20%)
3. Mid-Hudson Bridge to and from the south on US Route 9 (E15 to/from E13, 10%)
4. Mid-Hudson Bridge to and from the north on US Route 9 (E15 to/from E17, 5%)
5. US Route 9 south to and from the Arterials (E13 to/from S1, 5%)
6. US Route 9 north to and from the Arterials (E 17 to/from S1, 2%)

MEMORANDUM

Poughkeepsie 9.44.55 Origin-Destination Study

May 5, 2020

5. How much traffic enters the City of Poughkeepsie from the north via Washington Street vs. the Interchange?

Travel patterns into the city from the north can be evaluated by comparing the number of vehicles traveling from N* to E1 to the number of vehicles traveling from N* to S1. Vehicles entering the City via S1 will have traveled through the Interchange while vehicles entering through E1 will have avoided the Interchange. Table 5a and Table 5b show the O-D pairs between N*, E1 and S1 for the AM and PM peak hours respectively.

Table 5a – AM Peak Hour Travel to/from the North

		To			
		N*	S1	E1	Total
From	N*	-	63	58	121
	S1	64	-	NA	64
	E1	84	NA	-	84
	Total	148	63	58	269

Table 5b – PM Peak Hour Travel to/from the North

		To			
		N*	S1	E1	Total
From	N*	-	85	55	140
	S1	54	-	NA	54
	E1	176	NA-	-	176
	Total	230	85	55	370

The tables indicate that during the AM peak hour, approximately half of traffic destined for downtown uses the Interchange (S1) while the remainder enters through Washington Street (E1). During the PM peak hour, the amount of traffic using the interchange to access downtown increases to approximately 60 percent. The tables also show that during the AM peak hour, approximately 55 percent of drivers destined for US Route 9 northbound exits the city via Washington Avenue while the remaining 45 percent uses the Interchange. The percentage of traffic exiting via Washington Street increases to approximately 75% during the PM peak hour. In round numbers, ½ to ¾ of traffic headed north on Route 9 uses Washington Street instead of the Interchange during peak hours.

6. How much traffic enters and exits the City to the south via Academy Street vs. the Interchange?

Travel patterns into the City from the south can be evaluated by comparing the number of vehicles traveling from S* to E10 and E11 to the number of vehicles traveling from S* to S1. Vehicles entering the City via S1 will have traveled through the Interchange while vehicles entering through E10 and E11 will have avoided the Interchange. Table 6a and Table 6b show the O-D pairs between S*, E10, E11 and S1 for the AM and PM peak hours respectively.

MEMORANDUM

Poughkeepsie 9.44.55 Origin-Destination Study

May 5, 2020

Table 6a – AM Peak Hour Travel to/from the South

		To				
		S*	E10	E11	S1	Total
From	S*	-	222	36	210	468
	E10	123	-	NA	NA	NA
	E11	43	NA	-	NA	NA
	S1	119	NA	NA	-	NA
	Total	285	NA	NA	NA	NA

Table 6b – PM Peak Hour Travel to/from the South

		To				
		S*	E10	E11	S1	Total
From	S*	-	305	52	248	605
	E10	361	-	NA	NA	NA
	E11	81	NA	-	NA	NA
	S1	185	NA	NA	-	NA
	Total	627	NA	NA	NA	NA

The tables indicate that during the AM peak hour, approximately 55 percent of traffic destined for downtown uses the Academy Street exit (E10 and E11), while 45 percent uses the Interchange (S1). During the PM peak hour, the amount of traffic using the Academy Street exit to access downtown increases to approximately 60 percent. The tables also show that during the AM peak hour, approximately 60 percent of the traffic destined for US Route 9 southbound exits the city via local streets while the remaining 40 percent uses the Interchange. The percentage of traffic exiting using local streets increases to approximately 70 percent during the PM peak hour. In round numbers, approximately ½ to ¾ of the traffic to/from points south use local streets instead of the Interchange.