

# **Appendix A: Summary of Data Collected on MBTA Bus Routes 116 and 117**

**Table A-1  
Route 116 Inbound Boarding Observations**

Trip Date	Total Dwell Time (min)	Total APC Boardings	Total AFC Boardings	CharlieCard Transactions	CharlieTicket Transactions	Cash Transactions	Add Value Transactions	Baby Carriage	Shopping Cart	Wheeled Mobility Device
6:42 1/21/16	4.5	41	38	28	8	2	1	0	0	0
7:11 1/20/16	7.2	74	81	55	24	2	6	0	0	0
8:01 1/20/16	6.4	62	54	41	13	0	1	1	0	0
8:33 1/14/16	9.0	78	73	50	21	2	2	1	0	0
10:031/12/16	13.6	80	78	52	21	5	6	2	1	0
11:031/14/16	9.1	62	64	46	13	5	8	3	0	0
12:591/12/16	7.3	69	56	42	8	6	7	2	0	0
13:151/12/16	6.7	34	31	27	1	3	4	2	0	0
13:151/14/16	3.7	24	24	14	8	2	0	2	0	0
13:341/14/16	11.9	73	83	58	20	5	7	1	0	1
14:161/13/16	7.5	49	59	42	14	3	7	1	0	0
15:191/14/16	5.3	40	37	25	10	2	3	0	0	0
15:541/13/16	12.9	52	52	38	12	2	8	1	0	1
16:101/12/16	5.7	48	48	43	4	1	9	2	0	0
16:581/14/16	8.8	50	56	35	14	7	3	0	0	0
17:141/12/16	4.7	41	38	30	8	0	4	2	0	0
17:391/21/16	1.8	16	15	10	5	0	1	0	0	0
18:191/13/16	5.0	30	38	26	12	0	7	0	0	0
18:451/12/16	5.5	50	46	34	12	0	4	0	1	0
19:451/13/16	3.4	19	17	10	4	3	0	0	0	0
20:191/19/16	1.3	5	5	3	2	0	1	0	0	0
20:531/13/16	7.1	34	42	32	9	1	8	0	0	0
21:251/19/16	1.2	6	7	3	4	0	0	0	0	0
<b>Total</b>	<b>149.6</b>	<b>1,037</b>	<b>1,042</b>	<b>744</b>	<b>247</b>	<b>51</b>	<b>97</b>	<b>20</b>	<b>2</b>	<b>2</b>

AFC = Automatic fare collection. APC = Automatic passenger counters.

Note: Counts do not include activity at first and last stop of the trip. Add value transactions are also counted as CharlieCard transactions. One additional Route 116 Inbound trip (8:53 on 1/12/16) was observed by CTPS staff, but did not have functioning APC equipment on-board.

**Table A-2  
Route 116 Outbound Boarding Observations**

Trip	Date	Total Dwell Time (min.)	Total APC Boardings	Total AFC Boardings	CharlieCard Transactions	CharlieTicket Transactions	Cash Transactions	Add Value Transactions	Baby Carriage	Shopping Cart	Wheeled Mobility Device
6:28	1/14/16	3.8	27	30	22	7	1	4	0	0	0
6:57	1/13/16	7.0	30	22	13	6	3	0	0	0	0
7:14	1/20/16	3.9	27	25	17	7	1	1	0	0	0
7:48	1/14/16	3.3	20	17	9	6	2	1	0	0	0
8:22	1/12/16	2.5	14	13	10	1	2	2	0	0	0
9:25	1/20/16	3.4	29	32	24	8	0	3	0	0	0
9:25	1/21/16	8.5	63	59	44	13	2	6	3	0	0
10:30	1/14/16	3.2	18	19	17	1	1	2	1	0	0
11:30	1/12/16	9.4	57	50	35	8	7	3	0	0	0
11:30	1/14/16	5.4	19	21	18	3	0	2	0	0	0
12:00	1/14/16	4.9	33	33	20	10	3	2	0	0	1
12:30	1/12/16	5.9	31	33	27	2	4	5	0	1	0
12:30	1/14/16	10.4	42	45	29	8	8	3	0	0	0
13:00	1/14/16	7.5	36	33	21	7	5	1	0	0	0
13:40	1/12/16	3.3	27	26	16	8	2	1	1	0	0
13:59	1/12/16	6.5	33	33	30	1	2	4	0	0	0
13:59	1/14/16	6.0	44	47	33	10	4	8	0	0	0
14:18	1/14/16	7.9	55	55	43	10	2	5	1	0	0
16:48	1/21/16	10.0	35	32	26	5	1	6	2	0	0
20:40	1/12/16	4.2	23	23	18	4	1	2	0	0	0
21:40	1/12/16	2.9	9	7	5	2	0	0	0	0	0
22:40	1/12/16	1.6	5	6	5	1	0	2	0	0	0
23:10	1/13/16	3.1	8	7	5	2	0	1	0	0	0
23:40	1/12/16	2.1	6	5	2	3	0	0	0	0	0
<b>Total</b>		<b>126.6</b>	<b>691</b>	<b>673</b>	<b>489</b>	<b>133</b>	<b>51</b>	<b>64</b>	<b>8</b>	<b>1</b>	<b>1</b>

AFC = Automatic fare collection. APC = Automatic passenger counters.

Note: Counts do not include activity at first and last stop of the trip. Add value transactions are also counted as CharlieCard transactions. Eleven additional Route 116 outbound trips (8:05, 9:35, 11:00, 17:36 on 1/12/16; 8:36, 21:10, 22:10 on 1/13/16; 17:04, 18:30 on 1/14/16; 15:46, 17:20 on 1/14/16) were observed by CTPS staff, but did not have functioning APC equipment on-board.

**Table A-3  
Route 117 Inbound Boarding Observations**

Trip	Date	Total Dwell Time (min)	Total APC Boardings	Total AFC Boardings	CharlieCard Transactions	CharlieTicket Transactions	Cash Transactions	Add Value Transactions	Baby Carriage	Shopping Cart	Wheeled Mobility Device
6:35	1/20/16	4.9	51	45	33	12	0	0	0	0	0
7:05	1/14/16	7.0	66	68	40	20	8	3	0	0	0
7:39	1/12/16	5.7	50	53	41	12	0	5	0	0	0
8:43	1/20/16	7.3	62	64	41	19	4	1	0	0	0
9:03	1/12/16	3.5	24	22	14	7	1	1	1	0	0
9:48	1/14/16	4.8	47	49	33	13	3	2	0	0	0
10:48	1/12/16	5.5	33	29	19	8	2	0	1	0	0
11:18	1/14/16	5.3	36	34	25	8	1	2	2	0	0
11:48	1/12/16	5.8	49	41	32	4	5	4	1	0	0
12:18	1/12/16	7.7	45	48	39	8	1	6	0	0	0
12:18	1/14/16	9.1	53	50	38	8	4	4	1	0	0
12:47	1/13/16	7.9	51	62	44	13	5	7	1	0	0
13:45	1/12/16	10.2	75	74	48	20	6	4	2	0	0
13:45	1/14/16	5.3	54	51	36	14	1	5	1	0	0
14:51	1/12/16	6.2	37	38	32	5	1	5	0	1	0
15:29	1/12/16	2.5	25	22	19	2	1	2	0	0	0
16:03	1/21/16	4.6	27	26	22	4	0	4	0	0	0
16:35	1/20/16	4.9	56	36	25	10	1	0	1	0	0
16:51	1/13/16	4.3	37	40	31	7	2	4	0	0	0
20:00	1/12/16	2.5	16	15	5	9	1	1	0	0	0
21:10	1/12/16	2.6	13	15	13	2	0	3	0	1	0
22:11	1/12/16	1.8	9	10	3	7	0	0	0	0	0
23:13	1/12/16	0.5	4	4	2	2	0	0	0	0	0
<b>Total</b>		<b>119.9</b>	<b>920</b>	<b>896</b>	<b>635</b>	<b>214</b>	<b>47</b>	<b>63</b>	<b>11</b>	<b>2</b>	<b>0</b>

AFC = Automatic fare collection. APC = Automatic passenger counters.

Note: Counts do not include activity at first and last stop of the trip. Add value transactions are also counted as CharlieCard transactions. Nine additional Route 117 inbound trips (10:18 on 1/12/16; 9:23, 20:34, 21:41, 22:43 on 1/13/16; 8:11, 8:26, 16:19, 17:51 on 1/14/16) were observed by CTPS staff, but did not have functioning APC equipment on-board.

**Table A-4  
Route 117 Outbound Boarding Observations**

Trip	Date	Total Dwell Time (min)	Total APC Boardings	Total AFC Boardings	CharlieCard Transactions	CharlieTicket Transactions	Cash Transactions	Add Value Transactions	Baby Carriage	Shopping Cart	Wheeled Mobility Device
6:35	1/20/16	1.9	17	19	11	7	1	1	0	0	0
6:52	1/12/16	2.8	28	21	14	6	1	0	0	0	0
7:27	1/21/16	3.2	25	22	21	1	0	1	1	0	0
7:45	1/14/16	3.1	23	22	19	2	1	1	0	0	0
7:59	1/20/16	2.7	25	24	16	7	1	1	0	0	0
8:30	1/13/16	4.4	19	19	17	2	0	0	0	0	0
8:44	1/20/16	1.3	7	7	3	4	0	0	0	0	0
9:10	1/14/16	1.0	4	3	1	2	0	0	0	0	0
12:15	1/12/16	4.9	29	27	23	2	2	2	1	1	0
13:12	1/12/16	2.8	20	18	12	6	0	0	0	0	0
13:31	1/13/16	5.2	40	39	32	6	1	2	2	0	0
14:28	1/12/16	6.2	23	29	23	2	4	2	0	0	0
14:28	1/14/16	9.3	51	57	42	9	6	9	0	1	0
15:20	1/12/16	3.5	35	26	23	3	0	3	1	0	0
15:36	1/12/16	4.5	19	17	16	0	1	3	0	0	0
16:08	1/12/16	4.2	15	16	15	1	0	2	0	0	0
16:08	1/14/16	7.0	40	36	33	3	0	8	1	0	0
16:40	1/13/16	6.4	24	23	20	3	0	3	1	0	0
16:56	1/12/16	2.7	11	10	7	3	0	1	0	0	0
17:44	1/14/16	4.7	27	22	16	4	2	1	1	0	0
18:00	1/12/16	7.8	37	39	22	14	3	4	0	0	0
19:00	1/13/16	1.7	7	8	7	0	1	1	0	0	0
19:25	1/12/16	4.2	27	28	19	6	3	2	0	0	0
20:25	1/13/16	2.9	14	14	10	4	0	0	0	0	0
20:55	1/19/16	2.4	10	13	11	2	0	1	0	0	0
21:25	1/13/16	3.2	14	14	6	7	1	0	0	0	0
21:55	1/19/16	1.9	4	4	3	0	1	0	0	0	0
<b>Total</b>		<b>105.8</b>	<b>595</b>	<b>577</b>	<b>442</b>	<b>106</b>	<b>29</b>	<b>48</b>	<b>8</b>	<b>2</b>	<b>0</b>

AFC = Automatic fare collection. APC = Automatic passenger counters.

Note: Counts do not include activity at first and last stop of the trip. Add value transactions are also counted as CharlieCard transactions. One additional Route 117 outbound trip (15:05 on 1/13/16) was observed by CTPS staff, but did not have functioning APC equipment on-board.

# **Appendix B: Summary of MBTA Supplemental Bus Trip Observations**

**Table B-1  
MBTA Supplemental Bus Trips Delay Summary, Fall 2015**

Route	Dir.	Scheduled Start Time	Scheduled Run Time (min.)	Number of Obs.	Median Departure Lateness (min.)	90 Percentile Departure Lateness (min.)	Median Run-Time Difference (min.)	90 Percentile Run-Time Difference (min.)	20 Percent of Scheduled Run Time (min.)	Median Endpoint Lateness (min.)	90 Percentile Endpoint Lateness (min.)	Endpoint Late?
36-9	Out	13:35	38	52	17.3	21.7	-3.1	3.5	7.6	15.5	21.5	Median Late
19-5	Out	13:40	20	53	10.5	13.4	1.6	6.5	4	12.7	18.1	Median Late
44-2	Out	13:40	9	54	12.0	13.8	0.4	2.2	1.8	12.5	14.9	Median Late
22-3	Out	13:40	17	57	9.3	10.2	2.9	7.4	3.4	12.4	15.1	Median Late
436-8	In	14:27	31	51	13.3	14.4	0.1	9.4	6.2	11.6	22.0	Median Late
10-8	Out	13:40	31	42	9.9	12.7	1.0	7.4	6.2	11.2	18.9	Median Late
23-6	In	13:40	4	51	10.2	16.2	-0.3	1.1	0.8	11.0	17.0	Median Late
10-8	Out	13:40	31	33	11.4	14.6	-1.5	4.7	6.2	10.2	13.4	Median Late
19-5	Out	13:40	20	52	9.6	11.6	0.4	5.3	4	10.0	14.3	Median Late
22-1	Out	14:05	33	52	7.3	8.4	2.1	8.1	6.6	9.6	15.0	Median Late
429-3	In	14:20	20	46	6.4	12.6	3.3	8.4	4	9.0	19.4	Median Late
101-8	In	14:30	31	49	2.4	7.5	6.7	14.8	6.2	8.0	17.4	Median Late
101-8	In	14:25	31	45	-0.6	4.9	8.4	16.3	6.2	7.0	17.9	Median Late
426-3	Out	14:20	15	49	3.5	9.1	1.7	8.2	3	6.8	14.9	Median Late
101-8	In	14:35	31	53	-1.1	6.8	7.0	15.8	6.2	6.8	14.9	Median Late
37-3	Out	14:56	27	45	5.7	12.4	1.0	2.4	5.4	6.0	11.9	Median Late
79-1	In	14:45	20	39	3.9	10.6	2.4	8.0	4	5.8	13.8	Median Late
430-7	Out	14:20	18	26	3.2	5.4	2.0	4.8	3.6	5.7	8.3	Median Late
101-8	In	14:40	31	51	0.1	3.8	6.4	13.4	6.2	5.4	13.2	Median Late
240-G	In	14:30	32	49	2.4	6.6	1.6	4.6	6.4	5.2	9.8	Median Late
57-8	Out	14:15	43	55	10.4	12.9	-5.1	-0.6	8.6	5.0	9.4	Median Late
108-2	Out	14:20	12	56	3.4	6.4	1.6	3.7	2.4	5.0	9.0	Median Late
35-3	Out	14:18	61	41	-2.9	15.3	5.1	15.9	12.2	4.9	14.3	90 Percentile Late
429-4	In	14:35	25	54	-0.2	8.6	1.4	18.8	5	4.9	10.8	90 Percentile Late
429-3	In	14:25	22	56	2.5	8.2	1.7	6.0	4.4	4.5	11.1	Median Late
429-4	In	14:35	25	53	7.4	12.4	-2.8	7.9	5	4.3	9.8	90 Percentile Late
89-1	In	14:30	17	51	0.1	2.4	4.7	20.5	3.4	4.3	12.4	Median Late
426-3	Out	14:25	15	40	1.3	4.9	3.1	6.5	3	4.3	10.3	Median Late
431	In	14:35	3	53	3.7	5.6	0.3	1.6	0.6	4.1	6.3	Median Late
436-9	In	14:35	21	47	3.8	5.5	0.0	2.6	4.2	3.4	7.6	90 Percentile Late
431	In	14:35	3	55	2.4	6.1	-0.1	10.4	0.6	3.2	7.6	Median Late
429-3	In	14:40	24	52	0.9	6.2	0.5	5.4	4.8	3.2	10.7	90 Percentile Late
28-9	Out	14:15	66	42	11.0	13.1	-8.5	6.9	13.2	2.4	18.9	90 Percentile Late
436-2	Out	14:46	28	30	0.3	2.8	0.2	4.8	5.6	2.4	7.1	90 Percentile Late

Route	Dir.	Scheduled Start Time	Scheduled Run Time (min.)	Number of Obs.	Median Departure Lateness (min.)	90 Percentile Departure Lateness (min.)	Median Run-Time Difference (min.)	90 Percentile Run-Time Difference (min.)	20 Percent of Scheduled Run Time (min.)	Median Endpoint Lateness (min.)	90 Percentile Endpoint Lateness (min.)	Endpoint Late?
39-9	Out	14:15	41	52	11.7	12.6	-9.6	-3.6	8.2	2.3	6.5	90 Percentile Late
120-5	Out	14:20	19	55	0.6	5.4	0.2	4.7	3.8	2.3	7.4	90 Percentile Late
79-1	In	14:35	20	53	1.0	4.7	1.2	4.6	4	1.9	9.3	90 Percentile Late
66-7	In	14:10	36	48	-1.9	3.3	4.4	12.6	7.2	1.8	11.2	90 Percentile Late
93-4	In	13:50	27	26	1.2	5.7	-1.2	2.7	5.4	1.7	4.5	90 Percentile Not Late
39-9	Out	14:15	41	50	11.9	18.8	-11.9	-5.1	8.2	1.7	11.1	Median Late
39-9	Out	14:15	41	2	3.2	9.6	-1.8	6.8	8.2	1.4	3.6	90 Percentile Not Late
57-8	Out	14:25	43	39	6.0	13.1	-6.2	3.3	8.6	1.2	7.9	90 Percentile Late
216-1	Out	14:40	12	55	1.2	5.2	0.5	7.0	2.4	1.1	5.5	90 Percentile Late
217-2	In	14:35	21	48	2.3	5.1	-2.1	2.0	4.2	1.0	5.1	90 Percentile Late
36-7	In	14:40	16	15	4.1	8.6	-3.4	-1.3	3.2	0.9	5.9	90 Percentile Late
39-9	Out	14:15	41	55	11.2	15.0	-12.0	-5.0	8.2	0.9	6.9	90 Percentile Late
39-9	Out	14:15	41	56	11.4	13.7	-11.3	-5.0	8.2	0.8	6.4	90 Percentile Late
34-K	Out	13:35	55	51	17.2	19.0	-17.4	-7.7	11	0.6	10.0	90 Percentile Late
38-1	Out	13:35	51	55	16.9	18.7	-16.2	-13.0	10.2	0.5	3.8	90 Percentile Not Late
211-3	In	14:40	10	49	0.9	3.0	-0.5	0.6	2	0.5	2.9	90 Percentile Late
79-1	In	14:55	20	46	0.5	3.9	-1.5	4.9	4	-0.2	7.2	90 Percentile Late
51-1	In	15:05	58	51	3.8	8.1	-3.9	3.8	11.6	-0.3	9.4	90 Percentile Late
429-3	Out	14:46	21	46	-3.2	-0.9	1.9	5.0	4.2	-1.1	2.2	90 Percentile Not Late
22-2	Out	14:15	53	52	-2.2	6.0	1.7	9.6	10.6	-1.3	7.6	90 Percentile Late
23-1	Out	13:40	33	57	10.2	14.2	-12.5	-3.9	6.6	-1.3	5.5	90 Percentile Late
51-9	In	15:15	57	49	0.4	0.7	-1.9	4.0	11.4	-1.5	4.5	90 Percentile Not Late
88-1	Out	14:50	19	52	2.1	8.9	-4.9	-2.5	3.8	-1.8	4.4	90 Percentile Late
426-2	Out	14:35	28	53	2.9	7.1	-5.2	9.2	5.6	-1.9	3.4	90 Percentile Not Late
19-4	Out	14:15	61	51	2.4	10.6	-4.0	4.2	12.2	-2.4	3.9	90 Percentile Not Late
19-1	Out	14:05	32	49	6.7	7.5	-9.2	-4.3	6.4	-2.7	1.3	90 Percentile Not Late
39-9	Out	14:15	41	56	10.7	12.8	-13.7	-7.0	8.2	-2.8	3.6	90 Percentile Not Late
211-9	In	14:45	29	49	-3.0	0.6	-0.8	2.5	5.8	-3.0	1.5	90 Percentile Not Late
28-5	In	13:55	14	49	-3.4	7.2	-0.2	1.7	2.8	-3.1	6.2	90 Percentile Late
57-4	In	13:55	27	53	9.6	11.0	-13.0	3.1	5.4	-3.2	-0.3	90 Percentile Not Late
9702	In	14:05	34	40	1.9	5.9	-6.4	6.9	6.8	-3.3	6.6	90 Percentile Late
28-3	Out	14:00	25	43	-4.4	2.0	1.0	6.9	5	-3.3	4.4	90 Percentile Not Late
455-3	In	14:35	26	3	5.1	5.9	-7.9	-7.8	5.2	-3.4	-2.9	90 Percentile Not Late
88-1	Out	14:40	19	55	0.9	7.2	-4.8	-2.8	3.8	-3.4	3.8	90 Percentile Not Late
15-5	Out	14:05	26	39	4.4	10.8	-8.8	8.6	5.2	-3.6	5.7	90 Percentile Late
245-5	In	14:40	28	51	0.3	4.6	-4.1	-0.5	5.6	-4.2	0.7	90 Percentile Not Late
66-7	In	14:10	36	57	-4.0	-0.7	0.3	10.8	7.2	-4.2	3.9	90 Percentile Not Late



Route	Dir.	Scheduled Start Time	Scheduled Run Time (min.)	Number of Obs.	Median Departure Lateness (min.)	90 Percentile Departure Lateness (min.)	Median Run-Time Difference (min.)	90 Percentile Run-Time Difference (min.)	20 Percent of Scheduled Run Time (min.)	Median Endpoint Lateness (min.)	90 Percentile Endpoint Lateness (min.)	Endpoint Late?
216-3	Out	14:40	19	48	-0.5	3.8	-3.0	0.4	3.8	-4.4	0.5	90 Percentile Not Late
9701	In	14:10	21	1	-4.0	-4.0	-0.7	-0.7	4.2	-4.6	-4.6	90 Percentile Not Late
28-6	Out	14:08	43	23	-2.6	8.3	-4.7	6.5	8.6	-4.9	3.9	90 Percentile Not Late
214-4	Out	14:40	17	11	-4.3	-3.1	-0.6	1.8	3.4	-5.3	-3.7	90 Percentile Not Late
15-6	Out	14:05	35	43	-1.4	4.0	-4.3	2.3	7	-5.6	-1.7	90 Percentile Not Late
23-3	Out	14:05	41	49	0.4	4.5	-5.8	4.1	8.2	-5.7	-0.7	90 Percentile Not Late
134-4	In	14:30	28	48	2.8	4.4	-8.2	1.8	5.6	-5.8	-2.8	90 Percentile Not Late
95-5	In	14:30	24	51	1.7	4.5	-7.8	0.1	4.8	-6.3	-0.9	90 Percentile Not Late
32-9	Out	13:35	58	56	17.0	18.7	-23.0	-18.5	11.6	-6.6	-1.6	90 Percentile Not Late
134-4	In	14:25	29	51	3.3	4.2	-10.4	6.8	5.8	-6.8	-2.3	90 Percentile Not Late
95-5	In	14:40	24	50	2.4	6.0	-10.5	-4.7	4.8	-7.4	-2.9	90 Percentile Not Late
134-4	In	14:40	28	51	2.0	3.5	-10.2	-3.8	5.6	-8.2	-3.3	90 Percentile Not Late
211-1	In	14:35	24	51	2.1	4.7	-10.8	-8.7	4.8	-8.5	-4.6	90 Percentile Not Late
426-2	Out	14:40	28	53	0.3	3.4	-9.7	1.5	5.6	-8.9	-1.6	90 Percentile Not Late
212-5	In	14:40	23	16	1.2	2.1	-11.7	-10.6	4.6	-11.2	-8.9	90 Percentile Not Late
69-1	In	14:34	28	47	1.7	7.4	-13.5	-8.9	5.6	-11.7	-4.3	90 Percentile Not Late
69-1	In	14:47	28	46	0.7	10.1	-13.2	-6.8	5.6	-12.2	2.8	90 Percentile Not Late
214-3	Out	14:40	22	47	3.0	5.6	-15.9	-2.5	4.4	-12.5	-10.3	90 Percentile Not Late
214-3	Out	14:40	22	41	1.0	4.7	-15.3	2.0	4.4	-13.5	-10.5	90 Percentile Not Late
83-2	Out	14:40	32	40	1.2	10.4	-16.7	-13.6	6.4	-15.4	-5.4	90 Percentile Not Late
09-5	Out	14:15	65	40	-10.0	3.9	-3.7	3.6	13	-15.6	-6.3	90 Percentile Not Late
350-9	Out	14:25	42	51	-0.3	6.9	-16.8	-12.3	8.4	-16.8	-4.4	90 Percentile Not Late
83-2	Out	14:40	32	54	-0.7	5.3	-16.6	12.3	6.4	-17.2	11.6	90 Percentile Not Late
39-7	Out	14:28	26	0	.	.	.	.	5.2	.	.	N/A
88-1	Out	14:35	19	0	.	.	.	.	3.8	.	.	N/A
9701	In	14:05	21	0	.	.	.	.	4.2	.	.	N/A
9703	In	14:10	68	0	.	.	.	.	13.6	.	.	N/A

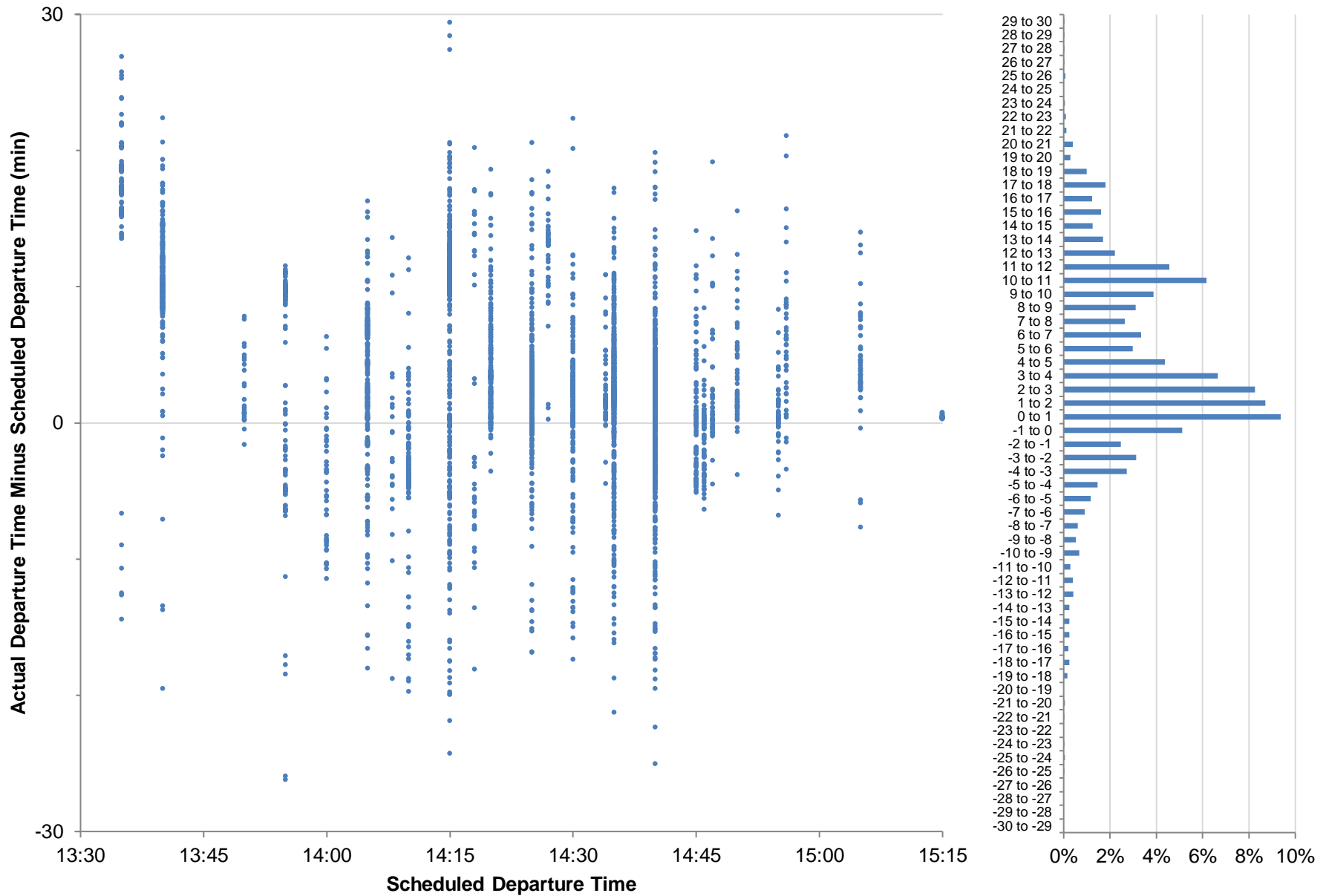
**Table B-2  
MBTA Supplemental Bus Trips Suggested Scheduling Adjustments**

Route	Dir.	Start Time	Start-Time Adjustment	Run-Time Increase	Run-Time Decrease
36-9	Out	13:35	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
19-5	Out	13:40	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
44-2	Out	13:40	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
22-3	Out	13:40	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
436-8	In	14:27	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
10-8	Out	13:40	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
23-6	In	13:40	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
10-8	Out	13:40	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
19-5	Out	13:40	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
22-1	Out	14:05	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
429-3	In	14:20	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
101-8	In	14:30	Maybe, 90% is more than 3 minutes late	Yes, median is more than 120% of scheduled	No, median is more than 80% of scheduled
101-8	In	14:25	Maybe, 90% is more than 3 minutes late	Yes, median is more than 120% of scheduled	No, median is more than 80% of scheduled
426-3	Out	14:20	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
101-8	In	14:35	Maybe, 90% is more than 3 minutes late	Yes, median is more than 120% of scheduled	No, median is more than 80% of scheduled
37-3	Out	14:56	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
79-1	In	14:45	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
430-7	Out	14:20	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
101-8	In	14:40	Maybe, 90% is more than 3 minutes late	Yes, median is more than 120% of scheduled	No, median is more than 80% of scheduled
240-G	In	14:30	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
57-8	Out	14:15	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
108-2	Out	14:20	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
35-3	Out	14:18	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
429-4	In	14:35	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
429-3	In	14:25	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
429-4	In	14:35	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
89-1	In	14:30	No, 90% is less than 3 minutes	Yes, median is more than 120% of scheduled	No, median is more than 80% of scheduled
426-3	Out	14:25	Maybe, 90% is more than 3 minutes late	Yes, median is more than 120% of scheduled	No, median is more than 80% of scheduled
431	In	14:35	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
436-9	In	14:35	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
431	In	14:35	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
429-3	In	14:40	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
28-9	Out	14:15	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
436-2	Out	14:46	No, 90% is less than 3 minutes	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
39-9	Out	14:15	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
120-5	Out	14:20	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
79-1	In	14:35	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
66-7	In	14:10	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled

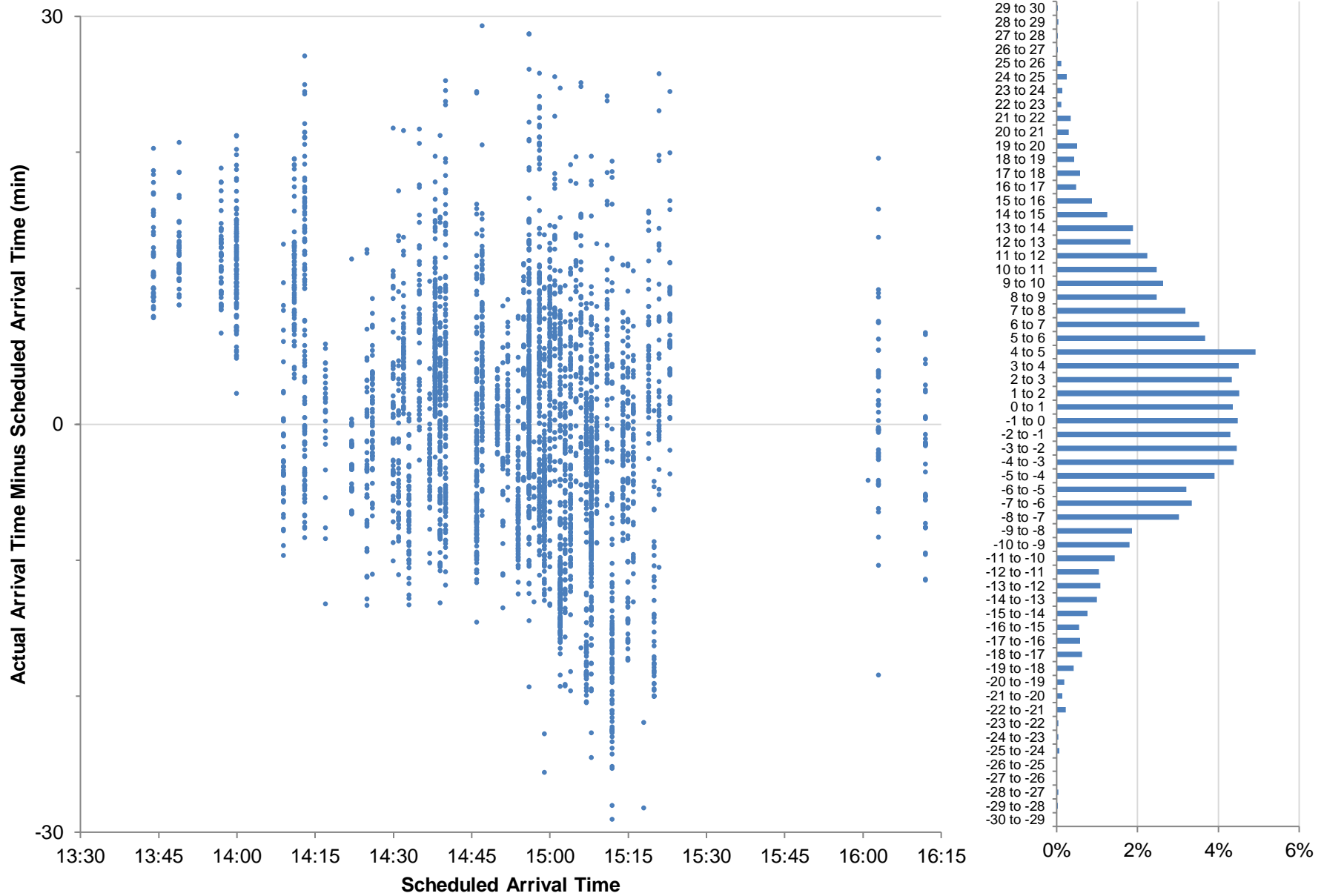
Route	Dir.	Start Time	Start-Time Adjustment	Run-Time Increase	Run-Time Decrease
93-4	In	13:50	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
39-9	Out	14:15	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
39-9	Out	14:15	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
57-8	Out	14:25	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
216-1	Out	14:40	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
217-2	In	14:35	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
36-7	In	14:40	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
39-9	Out	14:15	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
39-9	Out	14:15	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
34-K	Out	13:35	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
38-1	Out	13:35	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Yes, 90% is less than 80% of scheduled
211-3	In	14:40	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
79-1	In	14:55	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
51-1	In	15:05	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
429-3	Out	14:46	No, 90% is less than 3 minutes	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
22-2	Out	14:15	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
23-1	Out	13:40	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
51-9	In	15:15	No, 90% is less than 3 minutes	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
88-1	Out	14:50	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
426-2	Out	14:35	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
19-4	Out	14:15	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
19-1	Out	14:05	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
39-9	Out	14:15	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
211-9	In	14:45	No, 90% is less than 3 minutes	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
28-5	In	13:55	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
57-4	In	13:55	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
9702	In	14:05	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
28-3	Out	14:00	No, 90% is less than 3 minutes	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
455-3	In	14:35	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Yes, 90% is less than 80% of scheduled
88-1	Out	14:40	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
15-5	Out	14:05	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	Maybe, median is less than 80% of scheduled
245-5	In	14:40	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
66-7	In	14:10	No, 90% is less than 3 minutes	Maybe, 90% is more than 120% of scheduled	No, median is more than 80% of scheduled
216-3	Out	14:40	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
9701	In	14:10	No, 90% is less than 3 minutes	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
28-6	Out	14:08	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
214-4	Out	14:40	No, 90% is less than 3 minutes	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
15-6	Out	14:05	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
23-3	Out	14:05	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
134-4	In	14:30	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled

Route	Dir.	Start Time	Start-Time Adjustment	Run-Time Increase	Run-Time Decrease
95-5	In	14:30	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
32-9	Out	13:35	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Yes, 90% is less than 80% of scheduled
134-4	In	14:25	Yes, median is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	Maybe, median is less than 80% of scheduled
95-5	In	14:40	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
134-4	In	14:40	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
211-1	In	14:35	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Yes, 90% is less than 80% of scheduled
426-2	Out	14:40	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
212-5	In	14:40	No, 90% is less than 3 minutes	No, 90% is less than 120% of scheduled	Yes, 90% is less than 80% of scheduled
69-1	In	14:34	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Yes, 90% is less than 80% of scheduled
69-1	In	14:47	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Yes, 90% is less than 80% of scheduled
214-3	Out	14:40	Yes, median is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
214-3	Out	14:40	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Maybe, median is less than 80% of scheduled
83-2	Out	14:40	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Yes, 90% is less than 80% of scheduled
09-5	Out	14:15	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	No, median is more than 80% of scheduled
350-9	Out	14:25	Maybe, 90% is more than 3 minutes late	No, 90% is less than 120% of scheduled	Yes, 90% is less than 80% of scheduled
83-2	Out	14:40	Maybe, 90% is more than 3 minutes late	Maybe, 90% is more than 120% of scheduled	Maybe, median is less than 80% of scheduled
39-7	Out	14:28	N/A	N/A	N/A
88-1	Out	14:35	N/A	N/A	N/A
9701	In	14:05	N/A	N/A	N/A
9703	In	14:10	N/A	N/A	N/A

**Figure B-1**  
**Start Point Departure Time of MBTA Supplemental Bus Trips, Fall 2015**

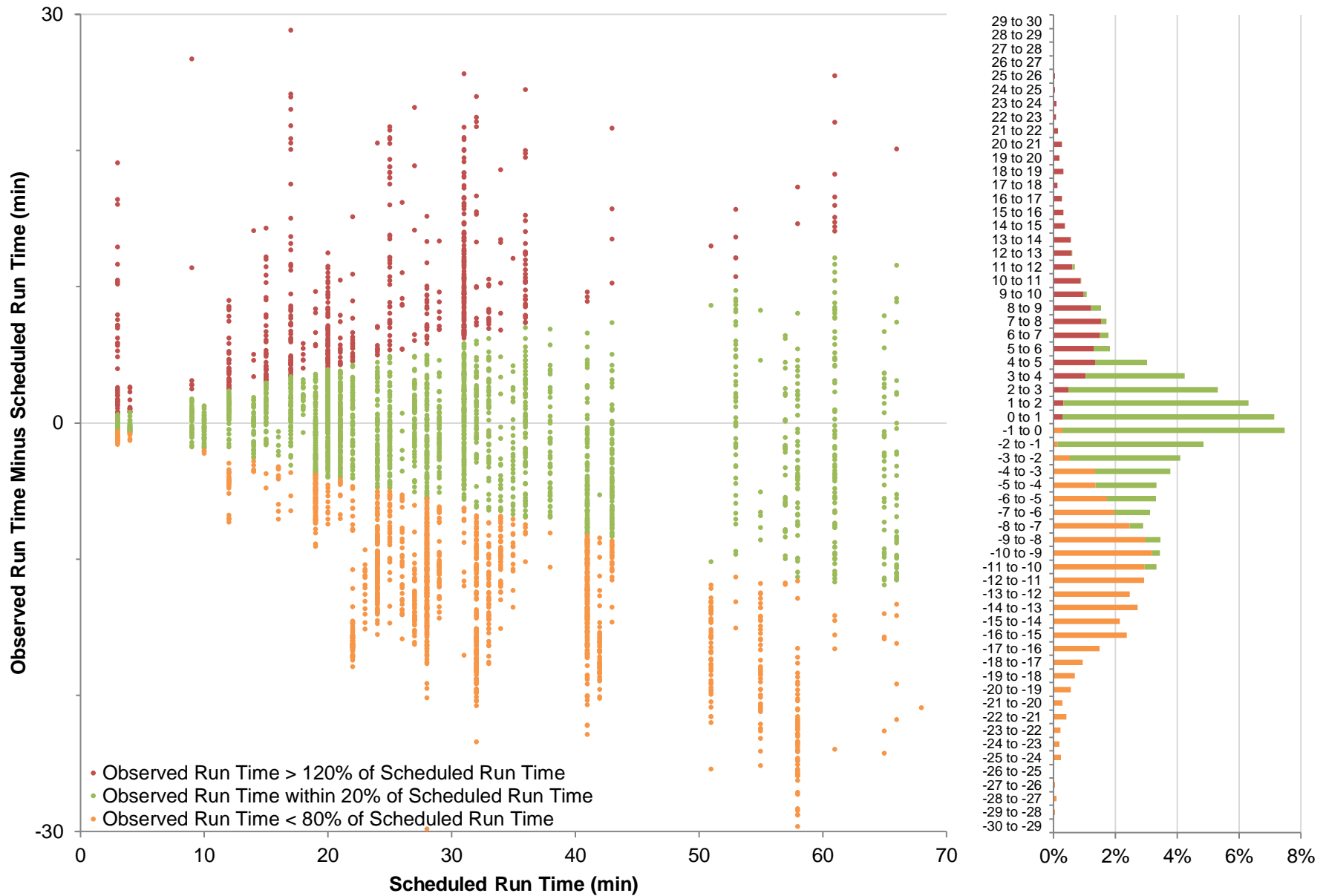


**Figure B-2**  
**End Point Arrival Time of MBTA Supplemental Bus Trips, Fall 2015**

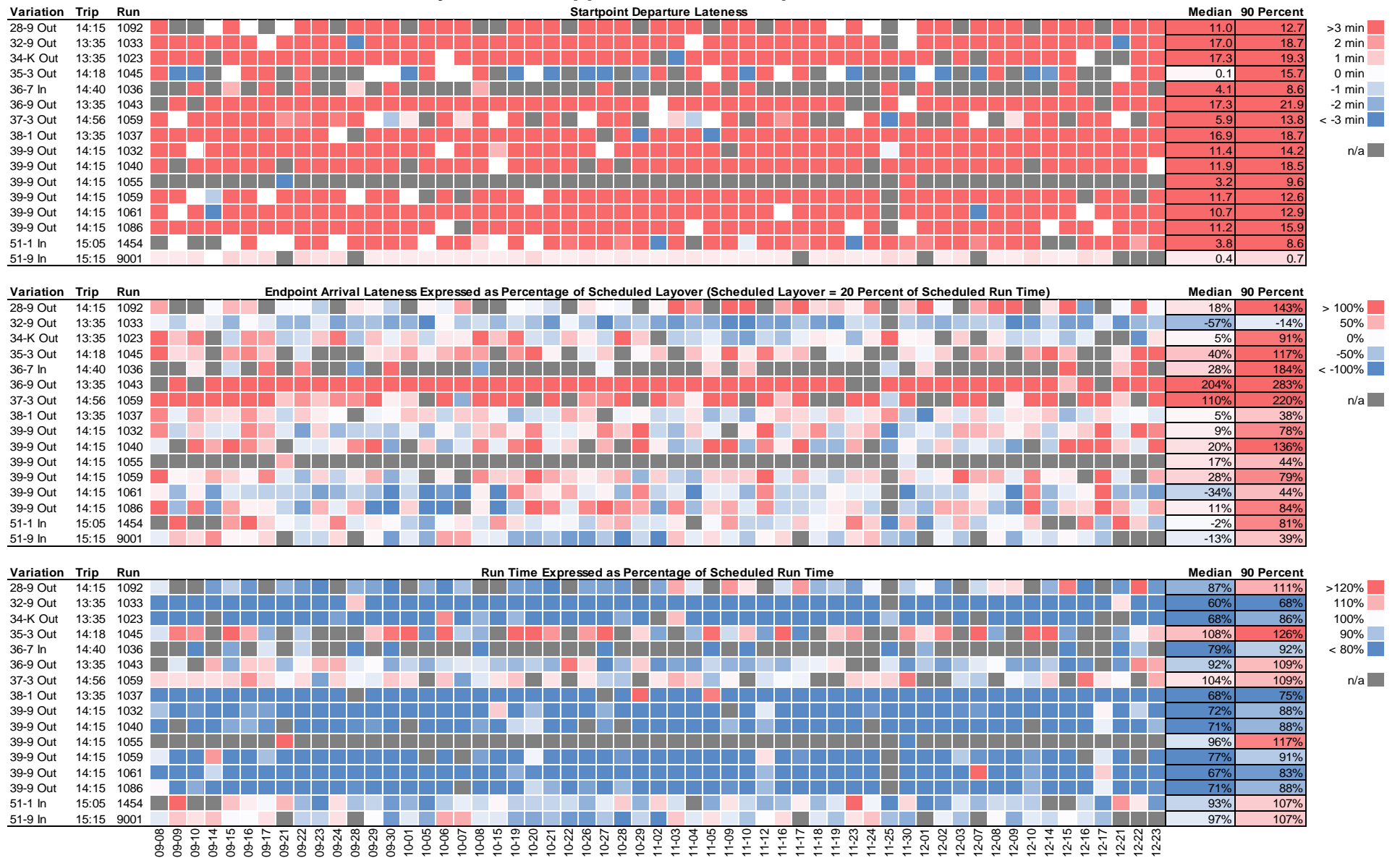




**Figure B-3**  
**Run Time of MBTA Supplemental Bus Trips, Fall 2015**

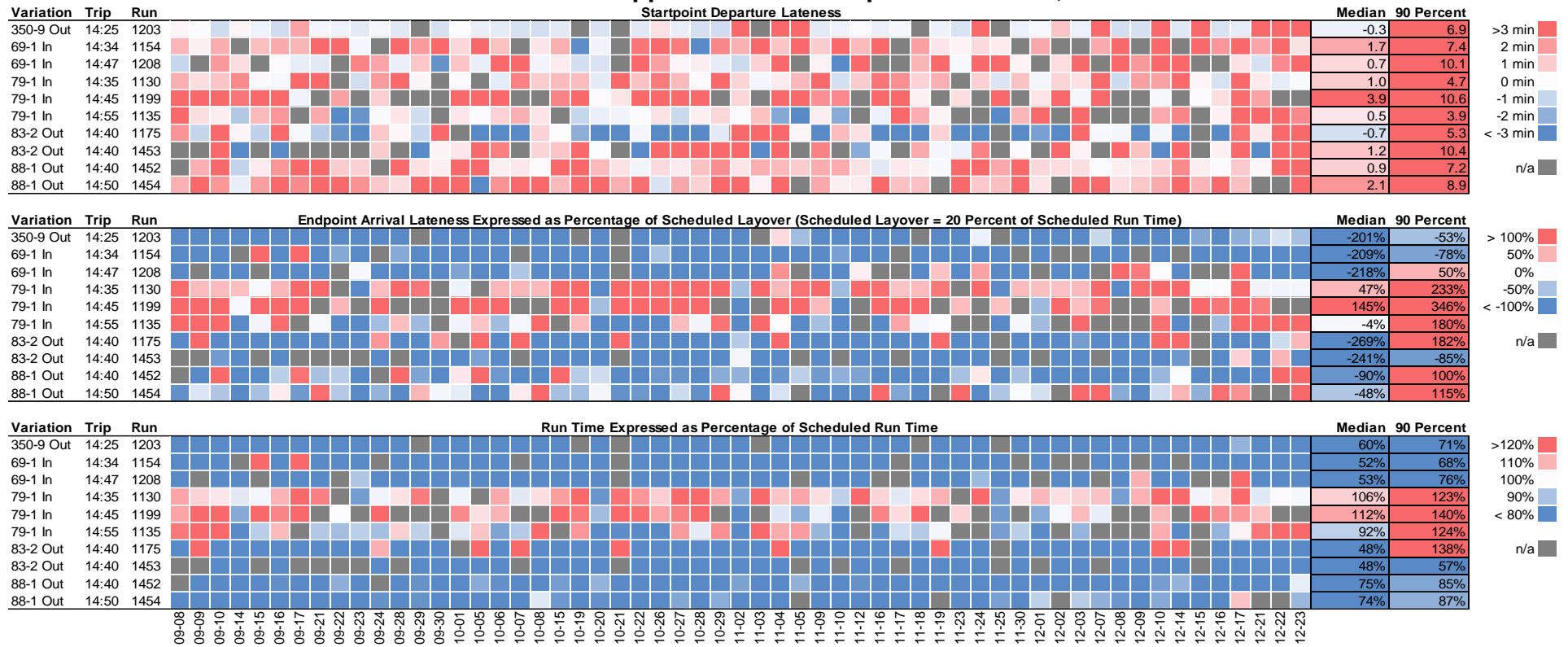


### Figure B-4 Arborway District Supplemental Bus Trip Observations, Fall 2015

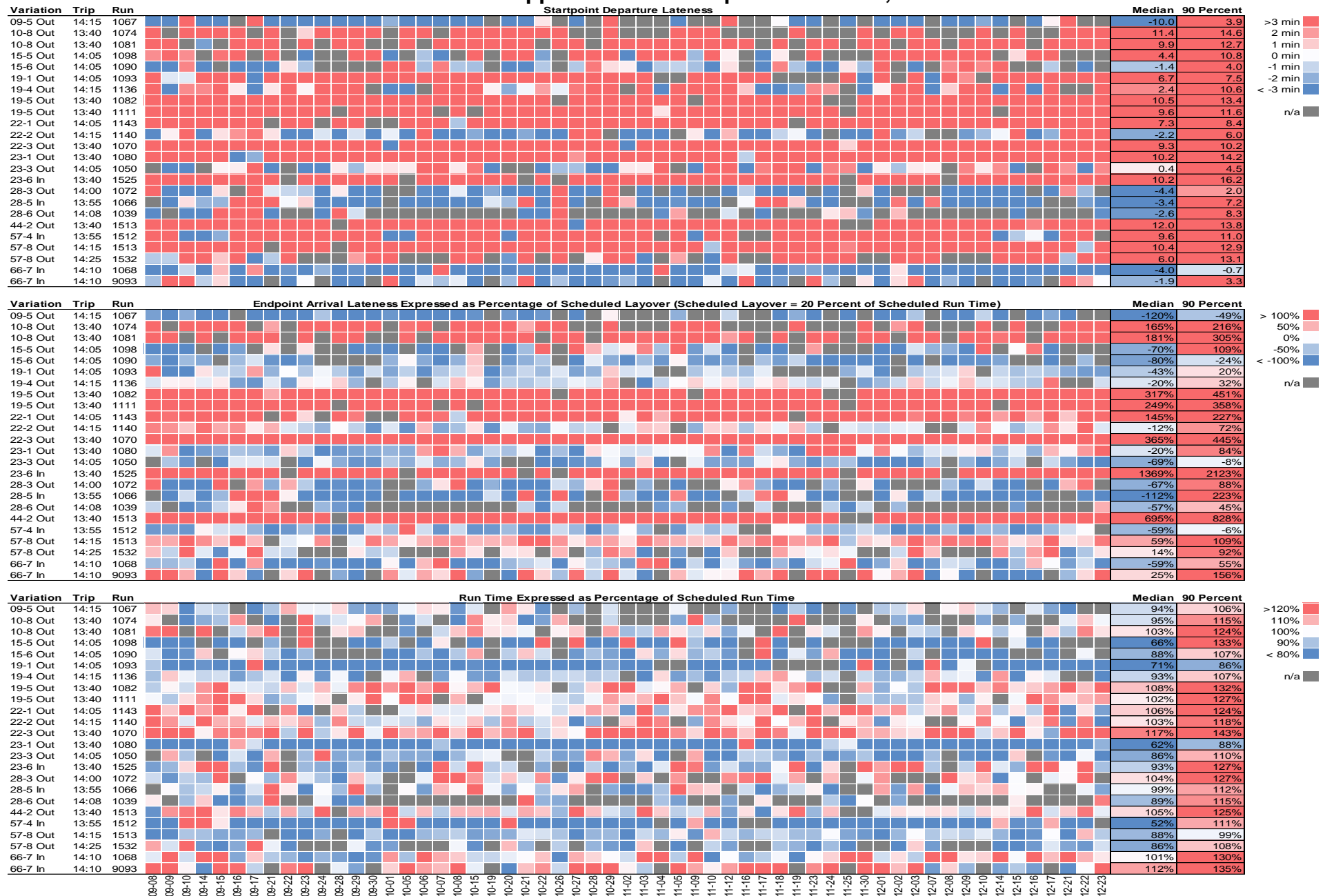




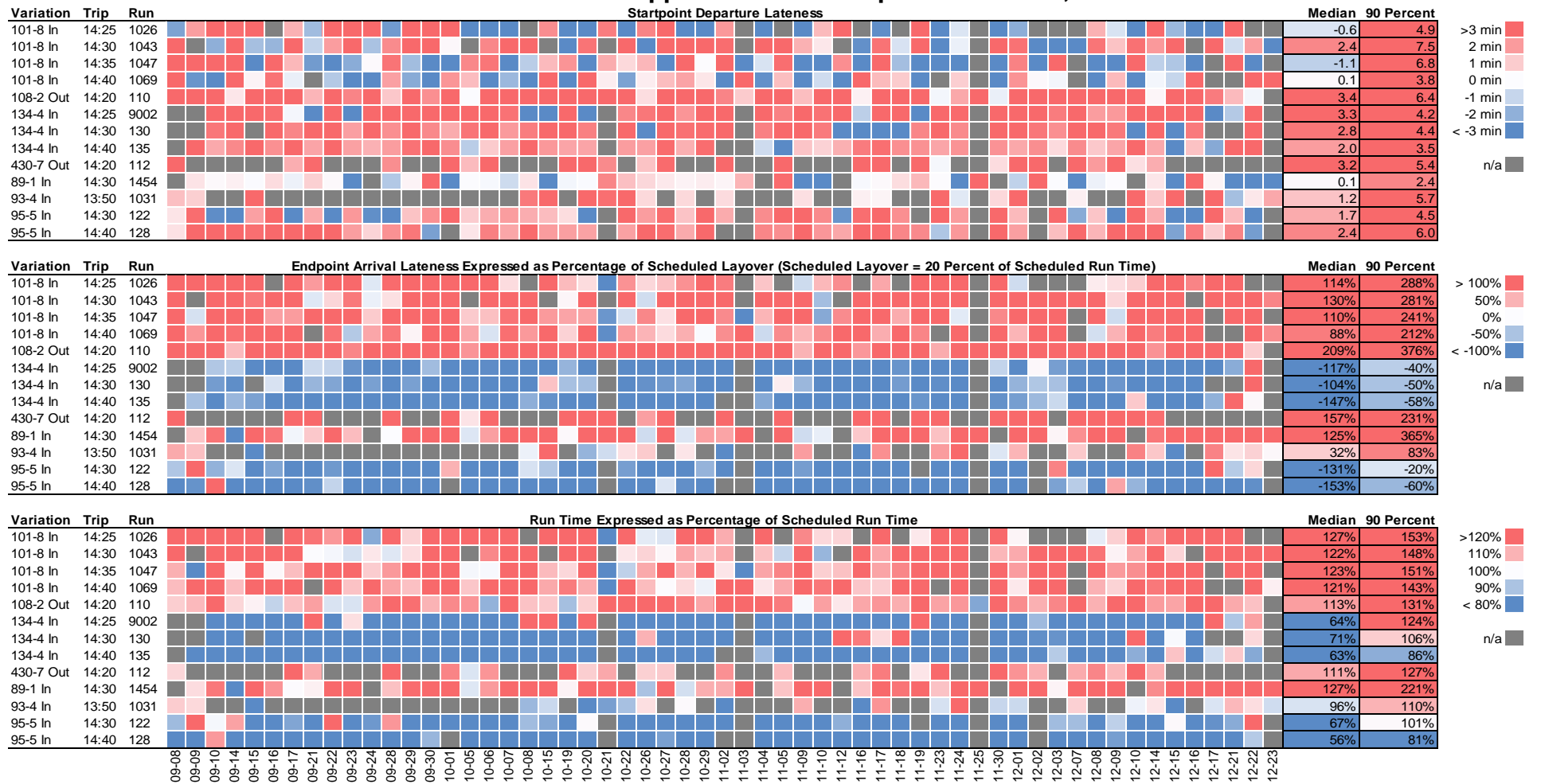
**Figure B-5**  
**Bennett District Supplemental Bus Trip Observations, Fall 2015**



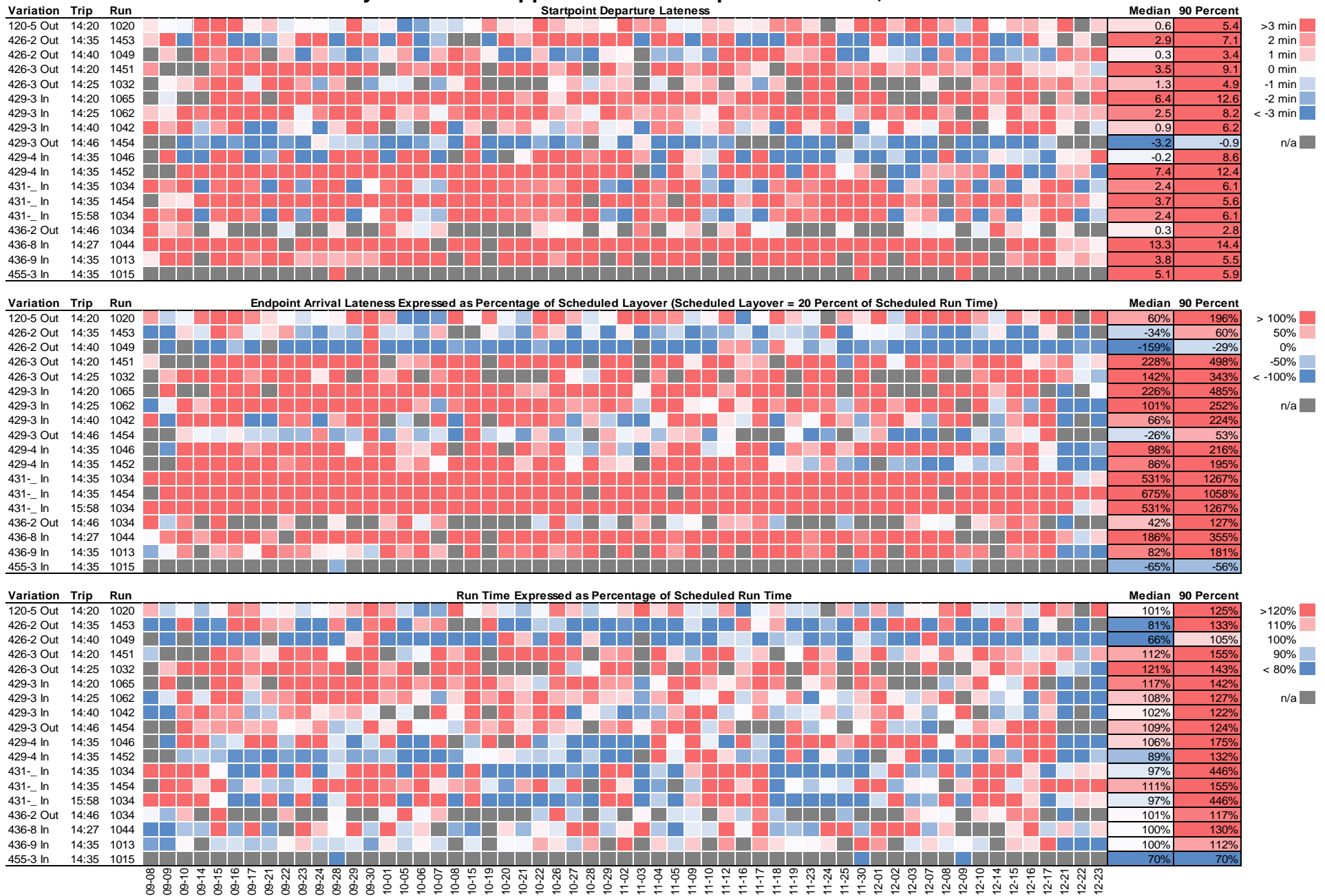
**Figure B-6**  
**Cabot District Supplemental Bus Trip Observations, Fall 2015**



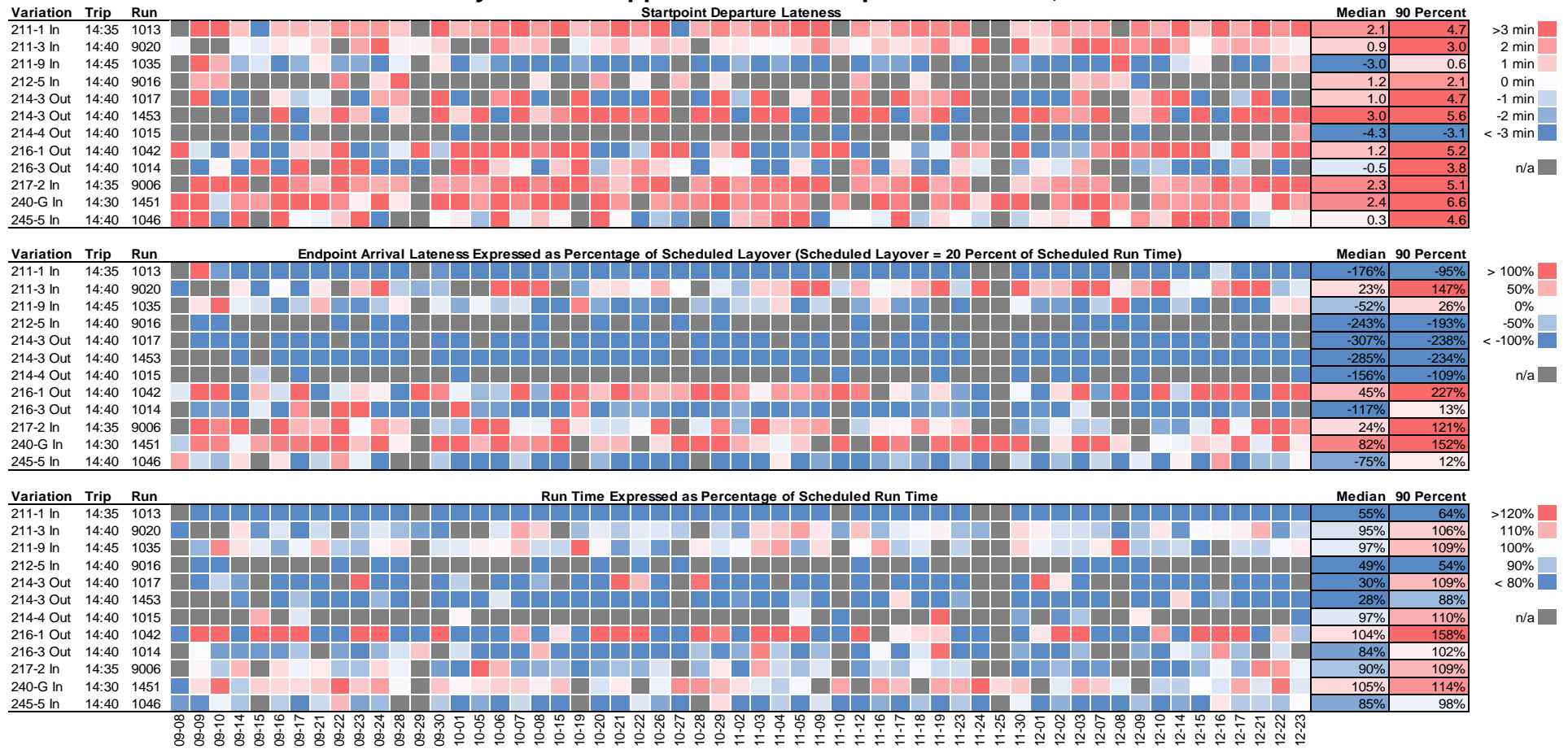
**Figure B-7**  
**Charlestown District Supplemental Bus Trip Observations, Fall 2015**



**Figure B-8**  
**Lynn District Supplemental Bus Trip Observations, Fall 2015**



**Figure B-9**  
**Quincy District Supplemental Bus Trip Observations, Fall 2015**



# **Appendix C: Summary of MBTA Swing-On Delay Observations**

**Table C-1**  
**Summary of Swing-On Delay by Route, Fall 2015**

Route	Dir.	Sched. Swing- Ons	Scenario A			Scenario B			All Trips		
			Number of Obs.	Swing Delay	Swing Delay per Trip	Number of Obs.	Swing Delay	Swing Delay per Trip	Number of Obs.	Swing Delay	Swing Delay per Trip
29-5	In	1	10	75.2	7.5	43	230.6	5.4	53	305.8	5.8
29-1	Out	1	8	65.6	8.2	36	139.9	3.9	44	205.4	4.7
62-8	Out	1	29	93.6	3.2	6	31.5	5.3	35	125.2	3.6
78-1	Out	4	165	437.0	2.6	46	191.3	4.2	211	628.3	3.0
78-2	Out	2	64	160.9	2.5	37	129.7	3.5	101	290.6	2.9
111-5	Out	2	67	153.5	2.3	34	134.8	4.0	101	288.3	2.9
465	Out	5	262	765.0	2.9	20	35.1	1.8	282	800.1	2.8
608	In	4	187	421.6	2.3	17	44.6	2.6	204	466.2	2.3
75	Out	3	139	317.4	2.3	18	29.3	1.6	157	346.6	2.2
450-8	In	6	248	323.5	1.3	87	371.6	4.3	335	695.1	2.1
19	Out	3	84	136.0	1.6	66	167.8	2.5	150	303.8	2.0
77	Out	24	877	1494.5	1.7	247	780.0	3.2	1,124	2274.5	2.0
746	Out	1	22	35.7	1.6	8	24.7	3.1	30	60.4	2.0
76-3	Out	2	83	166.3	2.0	9	14.1	1.6	92	180.5	2.0
29-1	In	2	47	94.3	2.0	28	52.5	1.9	75	146.9	2.0
120	Out	12	582	1019.0	1.8	90	229.1	2.5	672	1248.1	1.9
39-3	In	19	709	825.6	1.2	305	1038.2	3.4	1,014	1863.7	1.8
44-1	In	3	78	98.6	1.3	87	201.9	2.3	165	300.6	1.8
79	Out	7	315	547.2	1.7	17	26.0	1.5	332	573.2	1.7
106-6	Out	1	48	81.1	1.7	9	13.0	1.4	57	94.2	1.7
33-6	Out	2	58	161.7	2.8	49	9.0	0.2	107	170.7	1.6
111-2	Out	8	308	324.1	1.1	113	341.6	3.0	421	665.8	1.6
131-1	Out	1	22	16.4	0.7	31	66.9	2.2	53	83.3	1.6
17	Out	8	209	116.2	0.6	168	460.8	2.7	377	577.1	1.5
72	Out	6	187	173.7	0.9	116	290.0	2.5	303	463.7	1.5
742-3	Out	2	47	91.6	1.9	14	1.7	0.1	61	93.3	1.5
66-6	Out	30	1,162	1615.7	1.4	446	824.4	1.8	1,608	2440.1	1.5
430-1	Out	4	199	319.6	1.6	23	14.5	0.6	222	334.1	1.5
350-4	Out	1	32	51.3	1.6	18	21.9	1.2	50	73.2	1.5
24	Out	4	218	317.3	1.5	8	10.4	1.3	226	327.7	1.5
74	Out	4	219	298.8	1.4	4	12.1	3.0	223	310.9	1.4
106	Out	4	155	150.5	1.0	55	140.3	2.6	210	290.8	1.4
67-4	Out	3	120	159.2	1.3	18	30.9	1.7	138	190.1	1.4
16-9	Out	6	264	369.0	1.4	29	34.5	1.2	293	403.6	1.4
459	In	6	304	355.2	1.2	36	112.4	3.1	340	467.6	1.4
44-3	Out	2	53	55.8	1.1	52	84.1	1.6	105	139.9	1.3
19-3	In	1	46	41.3	0.9	10	32.9	3.3	56	74.2	1.3
01	Out	26	1,191	1426.8	1.2	198	357.5	1.8	1,389	1784.4	1.3
747	Out	8	175	279.9	1.6	239	248.3	1.0	414	528.1	1.3
751	In	6	217	203.0	0.9	96	191.1	2.0	313	394.1	1.3
62-3	Out	2	78	103.6	1.3	8	3.4	0.4	86	107.0	1.2
97-5	Out	2	83	108.7	1.3	31	32.7	1.1	114	141.4	1.2
114-1	Out	3	102	57.6	0.6	67	150.7	2.2	169	208.3	1.2

Route	Dir.	Sched. Swing-Ons	Scenario A			Scenario B			All Trips		
			Number of Obs.	Swing Delay	Swing Delay per Trip	Number of Obs.	Swing Delay	Swing Delay per Trip	Number of Obs.	Swing Delay	Swing Delay per Trip
134-3	Out	2	105	120.2	1.1	3	11.4	3.8	108	131.5	1.2
112	In	7	325	333.4	1.0	64	138.7	2.2	389	472.1	1.2
751	Out	6	176	122.8	0.7	144	262.3	1.8	320	385.1	1.2
455-6	In	7	344	295.2	0.9	51	176.0	3.5	395	471.2	1.2
15	Out	7	186	289.7	1.6	167	128.6	0.8	353	418.3	1.2
106-7	Out	5	246	275.1	1.1	29	47.1	1.6	275	322.1	1.2
134-6	Out	3	147	173.9	1.2	16	17.0	1.1	163	190.9	1.2
350-5	Out	5	209	195.7	0.9	34	82.5	2.4	243	278.2	1.1
23	Out	26	736	1090.8	1.5	573	360.2	0.6	1,309	1451.1	1.1
108-1	Out	2	94	100.2	1.1	9	13.8	1.5	103	114.0	1.1
749	In	16	662	536.6	0.8	182	392.3	2.2	844	928.8	1.1
742	Out	7	187	136.6	0.7	56	129.7	2.3	243	266.3	1.1
18	Out	2	90	45.6	0.5	19	72.9	3.8	109	118.5	1.1
110-4	Out	2	91	79.4	0.9	21	35.7	1.7	112	115.1	1.0
105-1	In	4	90	31.4	0.3	133	196.1	1.5	223	227.5	1.0
110	Out	5	251	239.0	1.0	22	31.5	1.4	273	270.5	1.0
65	Out	7	345	338.6	1.0	48	40.1	0.8	393	378.6	1.0
43	In	5	175	224.4	1.3	95	34.4	0.4	270	258.8	1.0
742-1	Out	3	77	81.2	1.1	26	15.8	0.6	103	97.0	0.9
97-5	In	2	94	56.5	0.6	19	47.3	2.5	113	103.8	0.9
111-8	Out	2	92	78.4	0.9	9	12.3	1.4	101	90.7	0.9
45-3	Out	2	68	62.2	0.9	35	30.0	0.9	103	92.2	0.9
442-1	Out	3	93	47.5	0.5	81	106.4	1.3	174	153.9	0.9
45	Out	8	270	324.4	1.2	151	46.8	0.3	421	371.3	0.9
90	Out	5	231	189.3	0.8	31	38.6	1.2	262	227.9	0.9
459	Out	2	77	32.8	0.4	31	58.2	1.9	108	91.0	0.8
22	Out	16	549	608.5	1.1	252	65.2	0.3	801	673.6	0.8
441-7	Out	5	231	128.0	0.6	48	101.0	2.1	279	229.0	0.8
60-2	Out	3	114	74.9	0.7	53	57.2	1.1	167	132.1	0.8
60	Out	5	263	204.3	0.8	17	11.9	0.7	280	216.2	0.8
84-1	Out	3	128	97.7	0.8	19	13.5	0.7	147	111.3	0.8
435	Out	5	228	168.4	0.7	44	32.4	0.7	272	200.8	0.7
741	Out	20	539	422.4	0.8	111	23.2	0.2	650	445.5	0.7
15-2	Out	6	198	182.6	0.9	101	22.0	0.2	299	204.6	0.7
80	Out	3	162	106.6	0.7	1	0.0	0.0	163	106.6	0.7
708-1	Out	3	139	27.8	0.2	16	73.0	4.6	155	100.9	0.7
27	In	4	184	94.4	0.5	37	48.2	1.3	221	142.6	0.6
70A-1	Out	6	282	193.2	0.7	42	11.8	0.3	324	205.0	0.6
456	Out	1	49	32.6	0.7	5	0.7	0.1	54	33.3	0.6
87-2	Out	6	304	142.3	0.5	32	64.7	2.0	336	206.9	0.6
44-1	Out	7	231	157.1	0.7	135	67.6	0.5	366	224.7	0.6
68	In	3	94	53.9	0.6	53	35.5	0.7	147	89.4	0.6
76	Out	2	78	44.1	0.6	6	5.3	0.9	84	49.4	0.6
99-7	Out	6	275	140.9	0.5	62	57.0	0.9	337	197.8	0.6
70-5	Out	13	525	320.7	0.6	99	37.5	0.4	624	358.2	0.6



Route	Dir.	Sched. Swing- Ons	Scenario A			Scenario B			All Trips		
			Number of Obs.	Swing Delay	Swing Delay per Trip	Number of Obs.	Swing Delay	Swing Delay per Trip	Number of Obs.	Swing Delay	Swing Delay per Trip
83-1	Out	3	125	39.8	0.3	27	45.5	1.7	152	85.3	0.6
07-1	In	5	172	62.7	0.4	87	79.8	0.9	259	142.5	0.6
08-9	Out	1	36	17.8	0.5	20	11.0	0.5	56	28.8	0.5
88	Out	7	336	131.2	0.4	44	62.5	1.4	380	193.8	0.5
100-3	Out	4	163	65.7	0.4	51	42.2	0.8	214	108.0	0.5
442-7	Out	3	153	48.5	0.3	16	36.4	2.3	169	84.9	0.5
69	In	2	96	47.5	0.5	10	5.3	0.5	106	52.8	0.5
69	Out	6	283	123.0	0.4	28	31.3	1.1	311	154.3	0.5
09	In	9	244	131.2	0.5	200	82.5	0.4	444	213.7	0.5
426	Out	2	104	38.1	0.4	11	16.2	1.5	115	54.3	0.5
64	Out	5	219	114.0	0.5	46	11.0	0.2	265	125.0	0.5
11-3	In	6	224	81.0	0.4	90	62.7	0.7	314	143.7	0.5
70A-4	Out	3	102	42.9	0.4	54	28.4	0.5	156	71.3	0.5
411-8	Out	3	103	24.2	0.2	12	27.1	2.3	115	51.3	0.4
57	Out	22	1,108	417.9	0.4	115	121.3	1.1	1,223	539.2	0.4
136-5	Out	4	200	70.9	0.4	20	22.8	1.1	220	93.7	0.4
137-3	Out	3	148	34.5	0.2	18	34.0	1.9	166	68.5	0.4
33-5	Out	2	110	41.4	0.4	4	0.9	0.2	114	42.4	0.4
117-5	In	1	57	19.0	0.3	1	1.0	1.0	58	20.0	0.3
41	In	6	191	46.2	0.2	137	66.3	0.5	328	112.5	0.3
436	Out	5	247	60.0	0.2	29	32.7	1.1	276	92.8	0.3
106-5	Out	1	55	18.4	0.3	0	0.0	N/A	55	18.4	0.3
15-1	Out	2	59	18.5	0.3	45	11.8	0.3	104	30.3	0.3
435-4	Out	1	8	3.1	0.4	28	6.5	0.2	36	9.6	0.3
70-8	Out	2	90	25.4	0.3	6	0.0	0.0	96	25.4	0.3
450-8	Out	4	218	44.3	0.2	6	5.9	1.0	224	50.2	0.2
426	In	6	202	43.7	0.2	100	13.9	0.1	302	57.6	0.2
119-1	In	1	15	1.3	0.1	41	9.3	0.2	56	10.5	0.2
108-6	Out	2	103	7.2	0.1	9	12.4	1.4	112	19.6	0.2
134-2	Out	1	54	9.4	0.2	0	0.0	N/A	54	9.4	0.2
10-9	Out	3	142	23.8	0.2	24	0.4	0.0	166	24.3	0.1
71	In	16	658	54.9	0.1	203	67.6	0.3	861	122.5	0.1
450-9	In	1	57	7.5	0.1	1	0.0	0.0	58	7.5	0.1
108-1	In	2	95	13.8	0.1	17	0.0	0.0	112	13.8	0.1
116-4	In	2	100	4.5	0.0	9	7.3	0.8	109	11.8	0.1
11-3	Out	12	434	25.5	0.1	211	44.0	0.2	645	69.5	0.1
07-1	Out	3	120	3.4	0.0	43	14.2	0.3	163	17.5	0.1
708-1	In	1	14	2.6	0.2	39	2.8	0.1	53	5.5	0.1
429	In	2	93	1.6	0.0	22	9.8	0.4	115	11.4	0.1
08-9	In	8	125	4.1	0.0	239	26.5	0.1	364	30.6	0.1
55-1	Out	3	41	11.5	0.3	112	0.0	0.0	153	11.5	0.1
10-9	In	1	37	0.0	0.0	6	2.6	0.4	43	2.6	0.1
429	Out	3	129	6.3	0.0	35	3.7	0.1	164	10.0	0.1
73	In	15	565	20.1	0.0	180	20.1	0.1	745	40.2	0.1
92-1	In	1	46	2.2	0.0	10	0.0	0.0	56	2.2	0.0

Route	Dir.	Sched. Swing- Ons	Scenario A			Scenario B			All Trips		
			Number of Obs.	Swing Delay	Swing Delay per Trip	Number of Obs.	Swing Delay	Swing Delay per Trip	Number of Obs.	Swing Delay	Swing Delay per Trip
99-7	In	2	114	4.4	0.0	0	0.0	N/A	114	4.4	0.0
100-3	In	1	25	0.0	0.0	28	1.9	0.1	53	1.9	0.0
132	Out	2	75	0.8	0.0	38	1.7	0.0	113	2.5	0.0
92-1	Out	1	18	0.0	0.0	33	1.1	0.0	51	1.1	0.0
441-7	In	2	107	0.7	0.0	1	0.0	0.0	108	0.7	0.0
108-6	In	2	86	0.0	0.0	27	0.5	0.0	113	0.5	0.0
09	Out	3	113	0.0	0.0	53	0.6	0.0	166	0.6	0.0
43	Out	4	10	0.0	0.0	200	0.2	0.0	210	0.2	0.0
442-7	In	1	55	0.0	0.0	0	0.0	N/A	55	0.0	0.0
16-2	Out	1	2	0.0	0.0	44	0.0	0.0	46	0.0	0.0
708	In	1	33	0.0	0.0	22	0.0	0.0	55	0.0	0.0
92-3	Out	1	51	0.0	0.0	4	0.0	0.0	55	0.0	0.0

**Table C-2**  
**Summary of Swing-On Delay by Start-Point Location, Fall 2015**

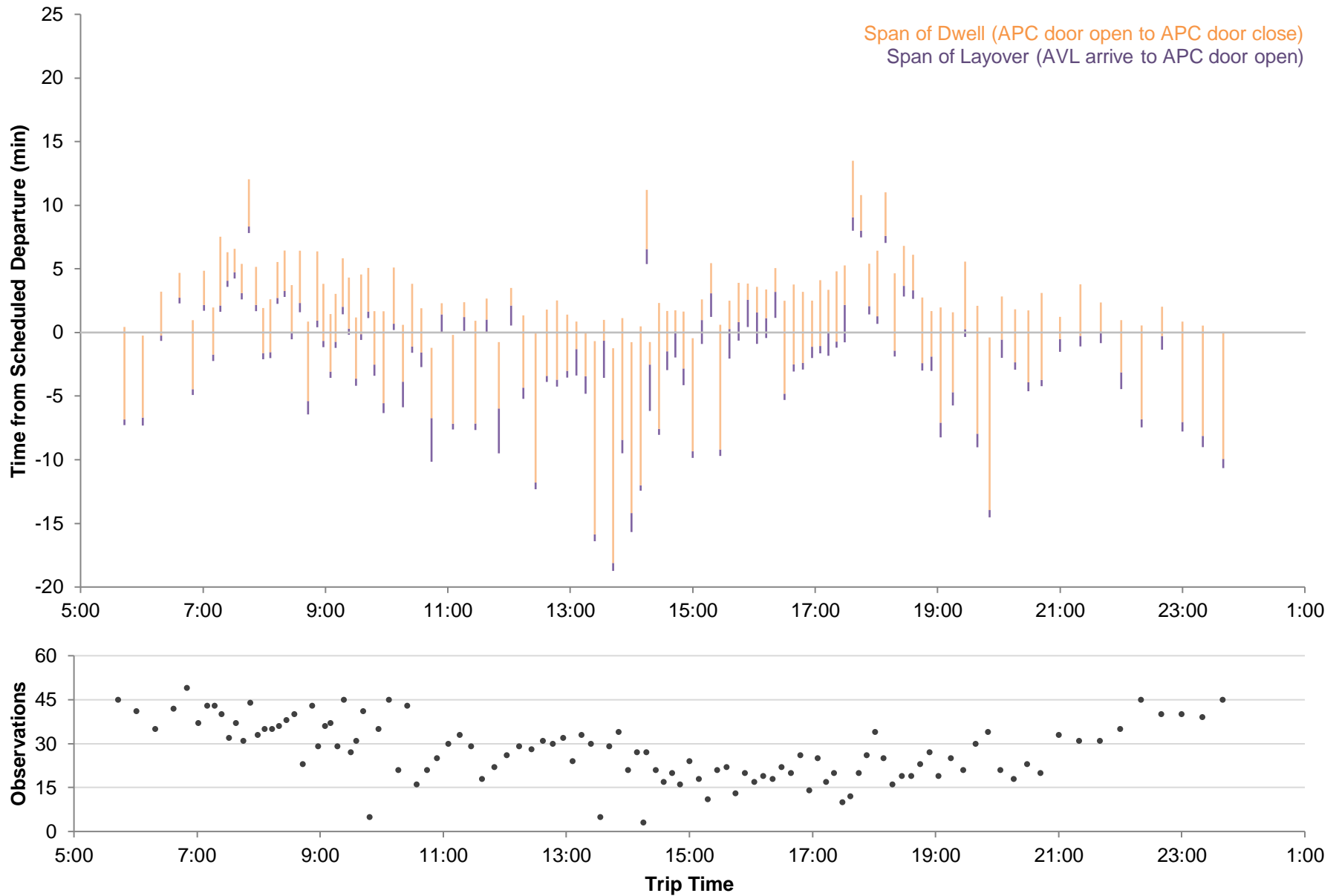
Location	Sched. Swing-Ons	Scenario A			Scenario B			All Trips		
		Obs.	Swing Delay	Swing Delay per Trip	Obs.	Swing Delay	Swing Delay per Trip	Obs.	Swing Delay	Swing Delay per Trip
jasst	4	86	164	1.9	123	342	2.8	209	506	2.4
bally	43	1,651	2,882	1.7	468	1,432	3.1	2,119	4,315	2.0
fhill	19	709	826	1.2	305	1,038	3.4	1,014	1,864	1.8
mavck	15	684	1,077	1.6	157	380	2.4	841	1,456	1.7
salem	25	1,215	1,746	1.4	195	695	3.6	1,410	2,442	1.7
matpn	15	627	784	1.3	169	352	2.1	796	1,136	1.4
alewf	26	1,072	1,459	1.4	135	229	1.7	1,207	1,688	1.4
hayms	22	976	1,060	1.1	190	555	2.9	1,166	1,615	1.4
dudly	78	3,232	3,782	1.2	922	1,765	1.9	4,154	5,547	1.3
fldcr	1	46	41	0.9	10	33	3.3	56	74	1.3
andrw	19	702	559	0.8	232	641	2.8	934	1,200	1.3
esxat	6	176	123	0.7	144	262	1.8	320	385	1.2
rugg	92	2,784	3,430	1.2	1,911	1,267	0.7	4,695	4,697	1.0
welst	51	2,371	2,074	0.9	412	631	1.5	2,783	2,705	1.0
soust	33	872	768	0.9	215	195	0.9	1,087	963	0.9
malst	24	986	573	0.6	294	410	1.4	1,280	983	0.8
wondw	14	634	248	0.4	155	252	1.6	789	500	0.6
kenbs	38	1,866	1,053	0.6	253	242	1.0	2,119	1,295	0.6
hhgat	5	190	101	0.5	63	41	0.6	253	142	0.6
cntsq	3	125	40	0.3	27	46	1.7	152	85	0.6
lchmr	22	1,085	503	0.5	105	159	1.5	1,190	662	0.6
unvpk	29	1,218	696	0.6	247	89	0.4	1,465	785	0.5
ctypt	21	677	275	0.4	383	228	0.6	1,060	503	0.5
censq	18	734	308	0.4	206	86	0.4	940	394	0.4
otsum	5	197	36	0.2	74	72	1.0	271	108	0.4
jpctr	6	191	46	0.2	137	66	0.5	328	113	0.3
stjim	3	142	24	0.2	24	0	0.0	166	24	0.1
wtrsq	16	658	55	0.1	203	68	0.3	861	122	0.1
ngate	3	108	3	0.0	63	19	0.3	171	22	0.1
bdfch	12	434	26	0.1	211	44	0.2	645	70	0.1
louis	1	14	3	0.2	39	3	0.1	53	5	0.1
umass	9	127	4	0.0	283	26	0.1	410	31	0.1
lindn	4	181	14	0.1	44	0	0.0	225	14	0.1
silmt	3	129	6	0.0	35	4	0.1	164	10	0.1
wavsq	15	565	20	0.0	180	20	0.1	745	40	0.1
amall	1	46	2	0.0	10	0	0.0	56	2	0.0
uphgh	2	114	4	0.0	0	0	N/A	114	4	0.0
elm	1	25	0	0.0	28	2	0.1	53	2	0.0
pktrm	7	51	11	0.2	312	0	0.0	363	12	0.0
milk	2	69	0	0.0	37	1	0.0	106	1	0.0
marbl	3	162	1	0.0	1	0	0.0	163	1	0.0
copst	3	113	0	0.0	53	1	0.0	166	1	0.0
bethi	1	33	0	0.0	22	0	0.0	55	0	0.0

**Table C-3**  
**Summary of Swing-On Delay by Time of Day, Fall 2015**

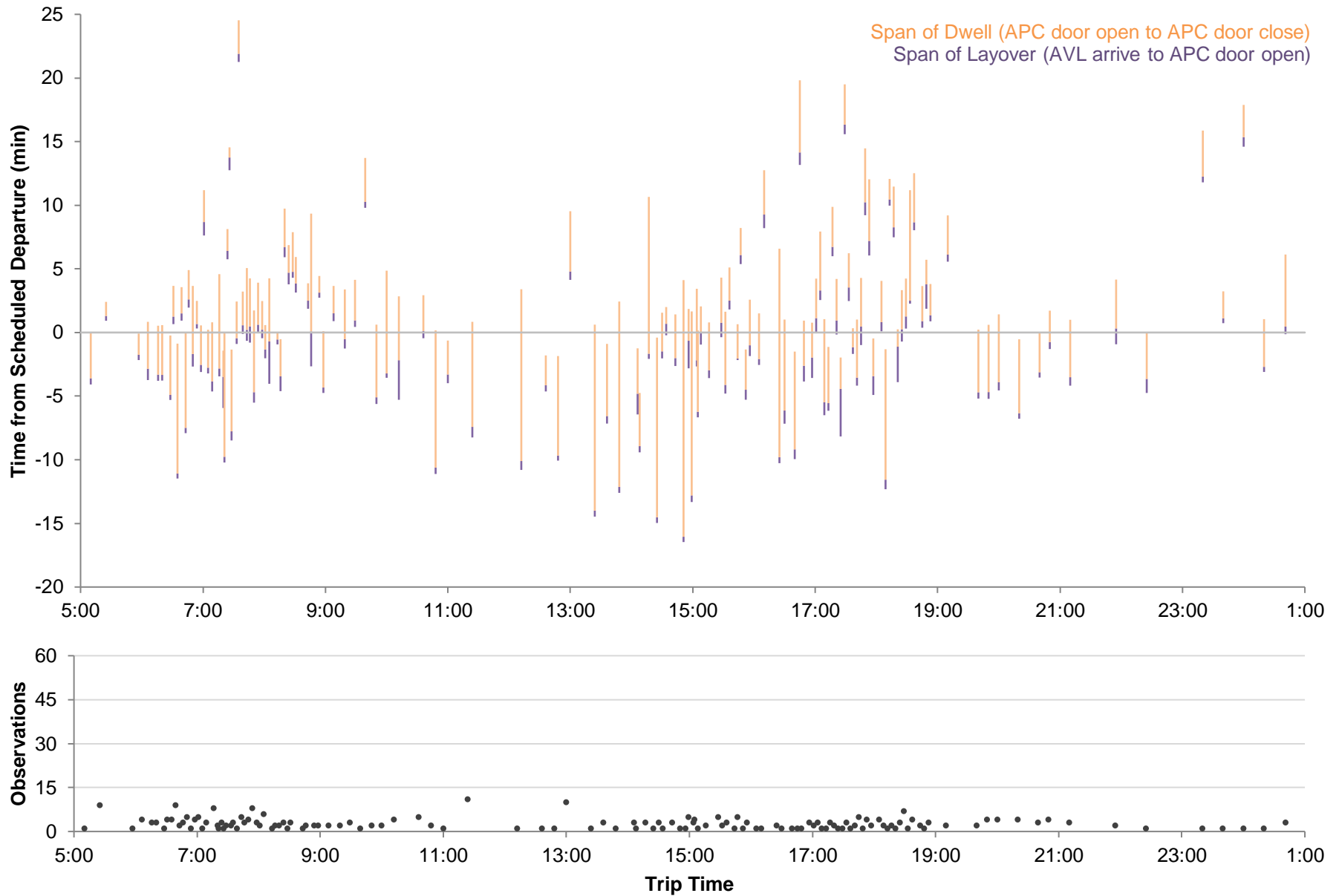
Time of Day	Sched. Swing- Ons	Scenario A			Scenario B			All Trips		
		Obs.	Swing Delay	Swing Delay per Trip	Obs.	Swing Delay	Swing Delay per Trip	Obs.	Swing Delay	Swing Delay per Trip
8:00-8:59	10	230	365	1.6	259	699	2.7	489	1,064	2.2
9:00-9:59	31	1,233	1,626	1.3	387	662	1.7	1,620	2,288	1.4
10:00-10:59	63	2,726	2,490	0.9	596	859	1.4	3,322	3,350	1.0
11:00-11:59	79	3,516	2,418	0.7	622	405	0.7	4,138	2,823	0.7
12:00-12:59	49	2,135	1,872	0.9	437	628	1.4	2,572	2,500	1.0
13:00-13:59	66	2,835	2,315	0.8	615	572	0.9	3,450	2,887	0.8
14:00-14:59	61	2,641	2,389	0.9	492	419	0.9	3,133	2,809	0.9
15:00-15:59	79	2,960	2,826	1.0	996	1,138	1.1	3,956	3,964	1.0
16:00-16:59	126	4,425	3,953	0.9	2,143	3,117	1.5	6,568	7,070	1.1
17:00-17:59	67	2,113	1,990	0.9	1,260	2,106	1.7	3,373	4,096	1.2
18:00-18:59	20	604	461	0.8	395	215	0.5	999	676	0.7
19:00-19:59	13	412	410	1.0	231	341	1.5	643	752	1.2
20:00-20:59	19	739	910	1.2	257	263	1.0	996	1,173	1.2
21:00-21:59	27	1,053	554	0.5	291	261	0.9	1,344	815	0.6
22:00-22:59	8	340	199	0.6	95	10	0.1	435	209	0.5
23:00-23:59	2	115	46	0.4	1	0	0.0	116	46	0.4

## **Appendix D: Summary of Early Pull-Up Opportunity**

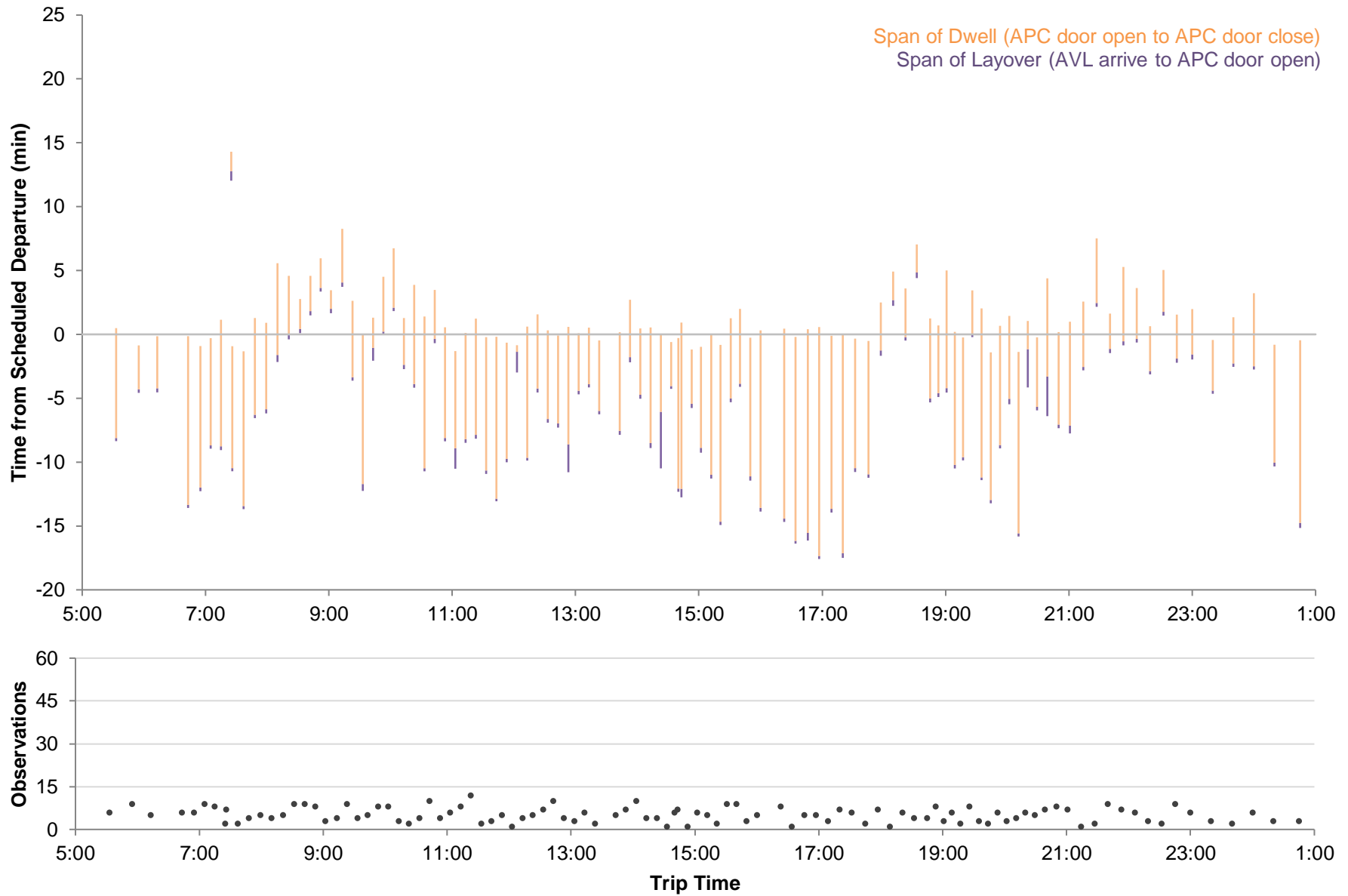
**Figure D-1**  
**Average Span of Layover and Dwell for Observed Route 28 Outbound Trips, Fall 2015**



**Figure D-2**  
**Average Span of Layover and Dwell for Observed Route 32 Outbound Trips, Fall 2015**



**Figure D-3**  
**Average Span of Layover and Dwell for Observed Route 57 Outbound Trips, Fall 2015**





**Figure D-4**  
**Average Span of Layover and Dwell for Observed Route 111 Outbound Trips, Fall 2015**

