

Inbound Framingham/Worcester Line EMU times per Alon Levy, infill stations omitted, full high platforms at all stations

km	station	time from prev (s)	station time (s)	total time (s)	time with 7% pad	minute	current P512	savings
71.3	Worcester Union			0				
68.8	Biotech Park	103	55	158	169.06	3	infill	infill
58.7	Grafton	276	72	506	541.42	10	13	3
51.5	Westborough	166	75	747	799.29	14	17	3
44.2	Southborough	172	68	987	1056.09	18	26	8
39.0	Ashland	144	65	1196	1279.72	22	30	8
34.3	Framingham	131	67	1394	1491.58	25	41	16
32.1	West Natick	57	68	1519	1625.33	28	46	18
28.5	Natick Center	93	68	1680	1797.6	30	51	21
23.8	Wellesley Square	121	63	1864	1994.48	34	56	22
21.8	Wellesley Hills	66	58	1988	2127.16	36	60	24
20.3	Wellesley Farms	49	64	2101	2248.07	38	63	25
16.9	Auburndale	88	67	2256	2413.92	41	68	27
15.2	West Newton	47	65	2368	2533.76	43	71	28
13.3	Newtonville	53	65	2486	2660.02	45	74	29
7.5	Boston Landing	175	55	2716	2906.12	49	79	30
6.2	West Station	47	55	2818	3015.26	51	infill	infill
4.0	Yawkey	80	55	2953	3159.71	53	84	31
2.1	Back Bay	99	55	3107	3324.49	56	89	33
0	South Station	98	0	3205	3429.35	58	94	36
		25s dwell at each stop; remaining time is acceleration penalty if I understand Alon correctly						

Simulated passenger loading, 4 tph, all local trains, based on 2012 CTPS boardings

	X390	X405	X420	X435	X450	X465	X480	X495	X510	X525	X540	X555	X570	X585	X600	X615	X630	X645
<b>Departure time</b>	5:32	5:47	6:02	6:17	6:32	6:47	7:02	7:17	7:32	7:47	8:02	8:17	8:32	8:47	9:02	9:17	9:32	9:47
<b>Worcester Union</b>	8	6	27	51	47	28	41	78	68	62	40	34	37	35	19	30	28	18
<b>Grafton</b>	11	10	39	76	72	41	61	118	99	113	63	46	51	47	28	34	35	26
<b>Westborough</b>	17	15	57	112	104	55	77	166	169	171	100	73	75	70	33	39	38	31
<b>Southborough</b>	26	19	73	140	130	68	101	218	208	211	128	94	90	82	40	45	44	33
<b>Ashland</b>	29	24	86	176	165	88	138	269	256	253	167	110	100	101	45	50	47	37
<b>Framingham</b>	41	34	117	228	227	134	207	356	328	339	228	131	125	130	56	59	57	46
<b>West Natick</b>	61	52	149	284	291	198	274	430	385	416	298	147	147	156	70	73	68	60
<b>Natick Center</b>	66	57	160	286	292	238	330	488	439	487	358	165	157	169	76	80	76	66
<b>Wellesley Square</b>	72	66	170	288	292	304	382	524	474	534	422	190	174	186	79	88	79	70
<b>Wellesley Hills</b>	78	69	171	292	292	330	411	538	493	555	447	194	177	193	80	88	79	70
<b>Wellesley Farms</b>	79	72	174	296	292	352	437	570	521	590	483	217	189	205	81	89	82	73
<b>Auburndale</b>	82	76	176	301	292	375	454	580	534	613	500	236	194	206	81	90	82	73
<b>West Newton</b>	82	78	177	302	292	399	470	591	544	623	515	260	203	213	83	95	83	73
<b>Newtonville</b>	88	82	185	307	292	425	493	600	557	643	541	291	214	219	88	101	83	73
<b>Yawkey</b>	88	82	185	307	292	425	493	600	557	643	541	291	214	219	88	101	83	73
<b>Back Bay</b>	88	82	185	307	292	425	493	600	557	643	541	291	214	219	88	101	83	73
<b>Arrival time</b>	6:30	6:45	7:00	7:15	7:30	7:45	8:00	8:15	8:30	8:45	9:00	9:15	9:30	9:45	10:00	10:15	10:30	10:45
<b>Trainsets req'd</b>	1	1	1	2	2	2	3	3	3	3	3	2	1	1	1	1	1	1

Simulated passenger loading, 5 tph, all local trains, based on 2012 CTPS boardings

	X360	X372	X384	X396	X408	X420	X432	X444	X456	X468	X480	X492	X504	X516	X528	X540	X552	X564	X576	X588	X600	X612	X624	X636	X648
<b>Departure time</b>	5:02	5:14	5:26	5:38	5:50	6:02	6:14	6:26	6:38	6:50	7:02	7:14	7:26	7:38	7:50	8:02	8:14	8:26	8:38	8:50	9:02	9:14	9:26	9:38	9:50
<b>Worcester Union</b>	0	0	3	10	8	15	44	32	38	25	26	58	55	55	64	29	35	37	25	24	25	15	20	12	12
<b>Grafton</b>	0	0	4	13	13	21	66	53	55	39	37	87	90	89	103	62	49	49	38	36	29	18	26	20	15
<b>Westborough</b>	0	0	4	16	16	30	93	80	84	52	49	120	145	133	138	97	62	65	52	52	35	22	28	26	17
<b>Southborough</b>	0	0	6	21	20	44	125	107	107	63	62	161	181	169	173	120	83	85	75	68	40	25	33	28	22
<b>Ashland</b>	0	0	8	23	22	61	151	132	128	83	75	209	225	218	220	151	93	97	91	81	44	27	33	31	25
<b>Framingham</b>	0	0	11	31	29	77	199	172	171	124	124	307	283	274	289	207	110	111	111	102	56	35	41	39	34
<b>West Natick</b>	0	0	22	43	37	88	240	224	210	170	167	391	319	308	352	265	124	125	127	116	70	45	48	49	40
<b>Natick Center</b>	0	0	28	44	41	91	243	228	213	200	210	456	365	344	411	322	137	144	137	124	74	46	50	54	46
<b>Wellesley Square</b>	0	0	29	50	45	95	246	229	221	253	241	477	392	365	453	379	152	158	147	136	78	49	52	57	49
<b>Wellesley Hills</b>	0	0	31	53	49	97	249	229	223	264	261	489	406	377	471	398	159	163	153	142	78	49	52	57	49
<b>Wellesley Farms</b>	0	0	31	53	52	98	250	230	226	288	277	509	428	397	494	430	177	180	162	152	81	51	57	58	50
<b>Auburndale</b>	0	0	34	54	55	103	253	232	231	309	292	519	434	406	498	445	193	197	162	153	83	51	58	58	50
<b>West Newton</b>	0	0	34	55	55	104	253	232	231	328	302	530	441	415	503	463	214	209	165	157	87	52	63	58	50
<b>Newtonville</b>	0	0	35	58	60	108	257	236	233	350	327	540	452	428	515	483	236	224	168	164	98	59	67	58	50
<b>Yawkey</b>	0	0	35	58	60	108	257	236	233	350	327	540	452	428	515	483	236	224	168	164	98	59	67	58	50
<b>Back Bay</b>	0	0	35	58	60	108	257	236	233	350	327	540	452	428	515	483	236	224	168	164	98	59	67	58	50
<b>Arrival time</b>	6:00	6:12	6:24	6:36	6:48	7:00	7:12	7:24	7:36	7:48	8:00	8:12	8:24	8:36	8:48	9:00	9:12	9:24	9:36	9:48	10:00	10:12	10:24	10:36	10:48
<b>Trainsets req'd</b>	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	2	2	1	1	1	1	1	1	1

Simulated passenger loading, 6 tph, all local trains, based on 2012 CTPS boardings

	X360	X370	X380	X390	X400	X410	X420	X430	X440	X450	X460	X470	X480	X490	X500	X510	X520	X530	X540	X550	X560	X570	X580	X590	X600	X610	X620	X630	X640	X650
<b>Departure time</b>	5:02	5:12	5:22	5:32	5:42	5:52	6:02	6:12	6:22	6:32	6:42	6:52	7:02	7:12	7:22	7:32	7:42	7:52	8:02	8:12	8:22	8:32	8:42	8:52	9:02	9:12	9:22	9:32	9:42	9:52
<b>Worcester Union</b>	0	0	0	7	9	4	10	36	33	30	33	15	23	53	31	42	45	35	34	26	25	24	28	17	21	8	15	5	17	11
<b>Grafton</b>	0	0	0	9	10	6	16	61	50	47	46	27	33	74	54	67	73	56	48	31	29	36	33	23	26	10	20	9	20	15
<b>Westborough</b>	0	0	0	13	14	9	30	92	68	75	60	33	39	99	80	113	117	95	76	48	39	56	46	34	29	12	21	11	20	17
<b>Southborough</b>	0	0	0	15	18	12	40	114	91	100	66	42	49	131	102	147	144	126	101	63	49	67	64	46	34	14	23	13	25	18
<b>Ashland</b>	0	0	0	20	19	13	53	140	114	119	77	60	62	174	133	191	179	162	133	76	61	79	73	52	36	17	25	18	28	22
<b>Framingham</b>	0	0	0	25	29	20	67	168	144	152	109	89	96	255	178	244	234	220	185	88	77	99	95	69	41	24	32	31	38	25
<b>West Natick</b>	0	0	0	39	39	30	82	206	181	179	147	128	149	326	218	288	277	278	243	98	84	108	116	81	52	30	42	42	47	35
<b>Natick Center</b>	0	0	0	43	43	36	83	212	188	179	167	157	182	378	249	326	309	327	305	113	96	119	123	91	58	34	47	47	51	38
<b>Wellesley Square</b>	0	0	0	46	46	38	86	214	193	179	182	192	222	404	269	344	334	364	368	125	111	126	136	99	59	35	49	49	53	43
<b>Wellesley Hills</b>	0	0	0	48	48	39	90	216	195	179	190	210	237	417	274	357	348	385	391	129	115	128	143	104	59	35	49	49	53	43
<b>Wellesley Farms</b>	0	0	0	50	50	40	93	218	196	179	200	223	250	432	293	377	366	401	419	139	135	140	150	112	60	35	51	50	55	46
<b>Auburndale</b>	0	0	0	53	51	40	95	218	198	179	207	238	261	439	303	392	378	415	427	156	145	147	150	114	61	38	52	51	55	46
<b>West Newton</b>	0	0	0	54	52	40	95	218	198	179	210	254	274	443	310	400	385	423	444	173	157	153	157	117	62	41	55	51	55	46
<b>Newtonville</b>	0	0	0	61	57	44	100	225	204	179	221	271	294	450	324	409	394	434	464	194	173	162	159	121	65	44	60	52	55	46
<b>Yawkey</b>	0	0	0	61	57	44	100	225	204	179	221	271	294	450	324	409	394	434	464	194	173	162	159	121	65	44	60	52	55	46
<b>Back Bay</b>	0	0	0	61	57	44	100	225	204	179	221	271	294	450	324	409	394	434	464	194	173	162	159	121	65	44	60	52	55	46
<b>Arrival time</b>	6:00	6:10	6:20	6:30	6:40	6:50	7:00	7:10	7:20	7:30	7:40	7:50	8:00	8:10	8:20	8:30	8:40	8:50	9:00	9:10	9:20	9:30	9:40	9:50	10:00	10:10	10:20	10:30	10:40	10:50
<b>Trainsets req'd</b>	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1

Equipment required for 6tph all-local service in AM rush

Train	from	departs	to	arrives	length	equipment	notes
X360	WUS	5:02	BOS	6:00	1	M001	twelve trainsets stored in Worcester, M001-M012
Y305	BOS	5:05	WUS	6:03	1	M013	fourteen trainsets stored in Boston, M013-M026
X370	WUS	5:12	BOS	6:10	1	M002	
Y315	BOS	5:15	WUS	6:13	1	M014	
X380	WUS	5:22	BOS	6:20	1	M003	
Y325	BOS	5:25	WUS	6:23	1	M015	
X390	WUS	5:32	BOS	6:30	1	M004	
Y335	BOS	5:35	WUS	6:33	1	M016	
X400	WUS	5:42	BOS	6:40	1	M005	
Y345	BOS	5:45	WUS	6:43	1	M017	
X410	WUS	5:52	BOS	6:50	1	M006	
Y355	BOS	5:55	WUS	6:53	1	M018	
X420	WUS	6:02	BOS	7:00	1	M007	
Y365	BOS	6:05	WUS	7:03	1	M019+M020	prepositioning 2-trainset consist
X430	WUS	6:12	BOS	7:10	1	M008	
Y375	BOS	6:15	WUS	7:13	1	M021+M022	prepositioning 2-trainset consist
X440	WUS	6:22	BOS	7:20	1	M013	6:03 arrival from BOS
Y385	BOS	6:25	WUS	7:23	1	M023+M024	prepositioning 2-trainset consist
X450	WUS	6:32	BOS	7:30	1	M014	6:13 arrival from BOS
Y395	BOS	6:35	WUS	7:33	2	M001+M002	6:00 and 6:10 arrivals from WUS
X460	WUS	6:42	BOS	7:40	2	M009+M010	
Y405	BOS	6:45	WUS	7:43	2	M003+M004	6:20 and 6:30 arrivals from WUS
X470	WUS	6:52	BOS	7:50	2	M011+M012	
Y415	BOS	6:55	WUS	7:53	2	M025+M026	
X480	WUS	7:02	BOS	8:00	2	M015+M016	6:23 and 6:33 arrivals from BOS
Y425	BOS	7:05	WUS	8:03	2	M005+M006	6:40 and 6:50 arrivals from WUS
X490	WUS	7:12	BOS	8:10	2	M017+M018	6:43 and 6:53 arrivals from BOS
Y435	BOS	7:15	WUS	8:13	1	M007	7:00 arrival from WUS (too late to join WUS peak)
X500	WUS	7:22	BOS	8:20	2	M019+M020	7:03 arrival from BOS
Y445	BOS	7:25	WUS	8:23	1	M008	7:10 arrival from WUS
X510	WUS	7:32	BOS	8:30	2	M021+M022	7:13 arrival from BOS
Y455	BOS	7:35	WUS	8:33	1	M013	7:20 arrival from WUS
X520	WUS	7:42	BOS	8:40	2	M023+M024	7:23 arrival from BOS
Y465	BOS	7:45	WUS	8:43	1	M014	7:30 arrival from WUS
X530	WUS	7:52	BOS	8:50	2	M001+M002	7:33 arrival from BOS
Y475	BOS	7:55	WUS	8:53	1	M009	7:40 arrival from WUS, separated on platform
X540	WUS	8:02	BOS	9:00	2	M003+M004	7:43 arrival from BOS
Y485	BOS	8:05	WUS	9:03	1	M010	7:40 arrival from WUS, separated on platform; M011+M012 from 7:50 arrival to Southampton
X550	WUS	8:12	BOS	9:10	2	M025+M026	7:53 arrival from BOS

Train	from	departs	to	arrives	length	equipment	notes
Y495	BOS	8:15	WUS	9:13	1	M015	8:00 arrival from WUS, separated on platform; M017+M018 from 8:10 arrival to Southampton
X560	WUS	8:22	BOS	9:20	1	M006	8:03 arrival from BOS, separated on platform; M005 out of service on platform
Y505	BOS	8:25	WUS	9:23	1	M016	8:00 arrival from WUS, separated on platform
X570	WUS	8:32	BOS	9:30	1	M007	8:13 arrival from BOS
Y515	BOS	8:35	WUS	9:33	1	M019	8:20 arrival from WUS, separated on platform
X580	WUS	8:42	BOS	9:40	1	M008	8:23 arrival from BOS
Y525	BOS	8:45	WUS	9:43	1	M020	8:20 arrival from WUS, separated on platform; M021+M022 from 8:30 arrival to Southampton
X590	WUS	8:52	BOS	9:50	1	M013	8:33 arrival from BOS
Y535	BOS	8:55	WUS	9:53	1	M023	8:40 arrival from WUS, separated on platform
X600	WUS	9:02	BOS	10:00	1	M014	8:43 arrival from BOS
Y545	BOS	9:05	WUS	10:03	1	M024	8:40 arrival from WUS, separated on platform; M001+M002 from 8:50 arrival to Southampton
X610	WUS	9:12	BOS	10:10	1	M009	8:53 arrival from BOS
Y555	BOS	9:15	WUS	10:13	1	M003	9:00 arrival from WUS, separated on platform
X620	WUS	9:22	BOS	10:20	1	M010	9:03 arrival from BOS
Y565	BOS	9:25	WUS	10:23	1	M004	9:00 arrival from WUS, separated on platform; M025+M026 from 9:10 arrival to Southampton
X630	WUS	9:32	BOS	10:30	1	M015	9:13 arrival from BOS
Y575	BOS	9:35	WUS	10:33	1	M026	9:20 arrival from WUS
X640	WUS	9:42	BOS	10:40	1	M016	9:23 arrival from BOS
Y585	BOS	9:45	WUS	10:43	1	M007	9:30 arrival from WUS
X650	WUS	9:52	BOS	10:50	1	M019	9:33 arrival from BOS
Y595	BOS	9:55	WUS	10:53	1	M008	9:40 arrival from WUS
X660	WUS	10:02	BOS	11:00	1	M020	9:43 arrival from BOS
Y605	BOS	10:05	WUS	11:03	1	M013	9:50 arrival from WUS
X670	WUS	10:12	BOS	11:10	1	M023	9:53 arrival from BOS
Y615	BOS	10:15	WUS	11:13	1	M014	10:00 arrival from WUS
X680	WUS	10:22	BOS	11:20	1	M024	10:03 arrival from BOS
Y625	BOS	10:25	WUS	11:23	1	M009	10:10 arrival from WUS
X690	WUS	10:32	BOS	11:30	1	M003	10:13 arrival from BOS
Y635	BOS	10:35	WUS	11:33	1	M010	10:20 arrival from WUS
X700	WUS	10:42	BOS	11:40	1	M004	10:23 arrival from BOS
Y645	BOS	10:45	WUS	11:43	1	M015	10:30 arrival from WUS
							midday storage requirements: 10 trainsets in Boston (2500 feet), 1 trainset in Worcester (250 feet, on platform); requirements higher if frequency reduced at midday

Inbound Framingham/Worcester Line EMU times per Alon Levy, express service from West Natick to Boston Landing

km	station	time from prev (s)	station time (s)	total time (s)	time with 7% pad	minute	time ahead	current P504
71.3	Worcester Union			0				
68.8	Biotech Park	103	55	158	169.06	3	0	infill
58.7	Grafton	276	72	506	541.42	10	0	13
51.5	Westborough	166	75	747	799.29	14	0	17
44.2	Southborough	172	68	987	1056.09	18	0	26
39.0	Ashland	144	65	1196	1279.72	22	0	30
34.3	Framingham	131	67	1394	1491.58	25	0	40
32.1	West Natick	57	68	1519	1625.33	28	0	46
28.5	Natick Center	93	0	1612	1724.84	29	2	
23.8	Wellesley Square	121	0	1733	1854.31	31	3	
21.8	Wellesley Hills	66	0	1799	1924.93	33	4	
20.3	Wellesley Farms	49	0	1848	1977.36	33	5	
16.9	Auburndale	88	0	1936	2071.52	35	6	
15.2	West Newton	47	0	1983	2121.81	36	7	
13.3	Newtonville	53	0	2036	2178.52	37	9	
7.5	Boston Landing	175	55	2266	2424.62	41	9	
6.2	West Station	47	55	2368	2533.76	43	9	
4.0	Yawkey	80	55	2503	2678.21	45	9	69
2.1	Back Bay	99	55	2657	2842.99	48	9	74
0	South Station	98	0	2755	2947.85	50	9	80
			assumes 25s dwell at each stop; remaining time is acceleration					

Inbound Framingham/Worcester Line EMU times per Alon Levy, superexpress service from Worcester to Boston Landing

km	station	time from prev (s)	station time (s)	total time (s)	time with 7% pad	minute	time ahead	current P552
71.3	Worcester Union			0				
68.8	Biotech Park	103	55	158	169.06	3	0	infill
58.7	Grafton	276	0	434	464.38	8	2	
51.5	Westborough	166	0	600	642	11	3	
44.2	Southborough	172	0	772	826.04	14	4	
39.0	Ashland	144	0	916	980.12	17	5	
34.3	Framingham	131	67	1114	1191.98	20	5	
32.1	West Natick	57	0	1171	1252.97	21	7	
28.5	Natick Center	93	0	1264	1352.48	23	8	
23.8	Wellesley Square	121	0	1385	1481.95	25	9	
21.8	Wellesley Hills	66	0	1451	1552.57	26	10	
20.3	Wellesley Farms	49	0	1500	1605	27	11	
16.9	Auburndale	88	0	1588	1699.16	29	12	
15.2	West Newton	47	0	1635	1749.45	30	14	
13.3	Newtonville	53	0	1688	1806.16	31	15	
7.5	Boston Landing	175	55	1918	2052.26	35	15	
6.2	West Station	47	55	2020	2161.4	37	15	infill
4.0	Yawkey	80	55	2155	2305.85	39	15	55
2.1	Back Bay	99	55	2309	2470.63	42	15	60
0	South Station	98	0	2407	2575.49	43	15	66
			assumes 25s dwell at each stop; remaining time is acceleration					



2012 CTPS F/W inbound passenger loads, by arrival time at South Station

km	departing station	6:31	7:08	7:46	8:11	8:23	8:56	9:08	9:35	10:00	12:05
71.3	Worcester Union	21	136	49	65	199		129		81	42
58.7	Grafton	30	199	75	92	326		179		108	45
51.5	Westborough	43	293	99	125	500		255		124	53
44.2	Southborough	58	379	120	165	630		328		146	60
39.0	Ashland	68	470	153	216	789		380		159	62
34.3	Framingham	91	594	233	313	952	75	421	47	199	80
32.1	West Natick	126	737	334	401	1066	166	451	84	249	100
28.5	Natick Center	156		413	465	1171	250	485	105	273	119
23.8	Wellesley Square	179		513	560		331	524	130	288	135
21.8	Wellesley Hills	194		558	610		363	537	140	289	137
20.3	Wellesley Farms	205		602	691		403	571	159	298	141
16.9	Auburndale	217		638	728		445		166		142
15.2	West Newton	221		671	758		498		184		145
13.3	Newtonville	249		715	800		569		207		148
4.0	Yawkey	222	616	632	710		477				
2.1	Back Bay	161	439	359	392	647	332	279	119	201	76

2012 CTPS F/W inbound net boardings, by arrival time at South Station

km	departing station	6:31	7:08	7:46	8:11	8:23	8:56	9:08	9:35	10:00	12:05
71.3	Worcester Union	21	136	49	65	199		129		81	42
58.7	Grafton	9	63	26	27	127		50		27	3
51.5	Westborough	13	94	24	33	174		76		16	8
44.2	Southborough	15	86	21	40	130		73		22	7
39.0	Ashland	10	91	33	51	159		52		13	2
34.3	Framingham	23	124	80	97	163	75	41	47	40	18
32.1	West Natick	35	143	101	88	114	91	30	37	50	20
28.5	Natick Center	30		79	64	105	84	34	21	24	19
23.8	Wellesley Square	23		100	95		81	39	25	15	16
21.8	Wellesley Hills	15		45	50		32	13	10	1	2
20.3	Wellesley Farms	11		44	81		40	34	19	9	4
16.9	Auburndale	12		36	37		42		7		1
15.2	West Newton	4		33	30		53		18		3
13.3	Newtonville	28		44	42		71		23		3
4.0	Yawkey	-27	-121	-83	-90		-92				
2.1	Back Bay	-61	-177	-273	-318	-524	-145	-292	-88	-97	-72