Technical Appendices

- Appendix E, Activity Levels
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E

Activity Levels

This appendix provides detailed tables in support of Chapter 2, *Activity Levels*:

- Table E-1 Logan Airport Historical Air Passenger and Operations Data
- Table E-2 Logan Airport Changes in Domestic Passenger Operations by Carrier
- Table E-3 Logan Airport Changes in International Passenger Operations by Carrier
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Table E-1 Logan Airport Historical Air Passenger and Operations Data

Year	Operations	Air Passengers	Year	Operations	Air Passengers
1980	258,167	14,722,363	2001	463,125	24,474,930
1981	251,961	14,827,684	2002	392,079	22,696,141
1982	244,468	15,867,722	2003	373,304	22,791,169
1983	288,956	17,848,797	2004	405,258	26,142,516
1984	318,959	19,417,971	2005	409,066	27,087,905
1985	349,518	20,448,424	2006	406,119	27,725,443
1986	363,995	21,862,718	2007	399,537	28,102,455
1987	414,968	23,369,002	2008	371,604	26,102,651
1988	407,479	23,732,959	2009	345,306	25,512,086
1989	388,797	22,272,860	2010	352,643	27,428,962
1990	424,568	22,878,191	2011	368,987	28,907,938
1991	430,403	21,450,143	2012	354,869	29,235,643
1992	474,378	22,723,138	2013	361,339	30,218,631
1993	493,093	23,579,726	2014	363,797	31,634,445
1994	458,623	24,468,178	2015	372,930	33,449,580
1995	466,327	24,192,095	2016	391,222	36,288,042
1996	456,226	25,134,826	2017	401,371	38,412,419
1997	482,542	25,567,888	2018	424,024	40,941,925
1998	507,449	26,526,708	2019	427,176	42,522,411
1999	494,816	27,052,078	2020	206,702	12,618,128
2000	487,996	27,726,833	2021	266,034	22,678,499

Source: Massport and U.S. Department of Transportation, T-100 Database.

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Table E-2 Logan Airport Changes in Domestic Passenger Operations by Carrier

Airline	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs'19 Pct. Recovery
Scheduled Jet Carriers	**233,993**	**203,052**	**225,629**	**235,381**	**242,404**	**257,626**	**257,103**	**119,132**	**143,442**	**24,310**	**55.8%**
AirTran Airlines	3,090	13,672									
Alaska Airlines[1]		1,733	3,027	3,256	3,351	6,474	5,920	2,535	2,882	347	48.7%
Allegiant Air								184	1,063	879	
America West Airlines	5,116										
American Airlines[2]	30,821	21,313	56,623	55,249	50,766	54,055	50,150	24,634	27,917	3,283	55.7%
American Trans Air	1,448										
Continental Airlines	16,894	10,869									
Delta Air Lines[3]	52,954	28,980	30,705	30,476	32,050	35,040	37,496	18,552	27,343	8,791	72.9%
Frontier Airlines	1,052	1,094			2		1,211	674	1,006	332	83.1%
Hawaiian Airlines							425	132	380	248	89.4%
Independence Air											
JetBlue		49,981	79,364	84,590	93,485	99,929	104,571	46,789	54,122	7,333	51.8%
Midway Airlines	4,096										
Midwest Airlines	3,726	1,961									
Northwest Airlines	13,147										
People Express											
Southwest Airlines[4]		13,727	21,542	24,436	24,129	23,191	19,907	9,277	8,914	-363	44.8%
Spirit Airlines		3,023	4,896	7,245	8,853	10,269	9,838	4,897	5,067	170	51.5%
Sun Country Airlines	723	313	1,414	1,374	1,391	1,030	288	121	358	237	124.3%
Trans World Airlines	6,280										
United Airlines[5]	28,092	16,314	24,632	25,031	24,623	27,638	27,297	11,337	14,390	3,053	52.7%
US Airways[6]	66,554	36,678									
Virgin America		3,394	3,426	3,724	3,754						
Regional/Commuter Carriers	**160,041**	**94,535**	**70,274**	**68,204**	**68,753**	**74,766**	**79,736**	**47,257**	**68,029**	**20,772**	**85.3%**
America West Express	1,267										
American Eagle	62,140	15,291	52	6,418	7,046	5,302	3,731	2,904	8,409	5,505	225.4%
Boutique Air						1,229	1,881	2,106	1,689	-417	89.8%
Cape Air	31,026	35,899	35,994	35,993	33,235	35,523	35,358	25,013	31,107	6,094	88.0%
Continental Connection		1,809									
Continental Express		529									
Delta Connection	15,438	18,445	15,466	18,586	22,231	29,045	37,835	15,853	24,806	8,953	65.6%
MidAtlantic Express											
Midwest/Republic		258									
Northwest Airlink											
PenAir			3,747	3,662	3,438	1,229					
Republic Airlines			34								
Silver Airways						261	416	346		-346	0.0%
United Express		2,802	4,699	3,545	2,803	2,177	516	1,035	2,018	983	391.1%
US Airways Express	50,170	19,502	10,282								
Non-Scheduled Operations (Incl. Charter)	**1,008**	**501**	**176**	**158**	**176**	**199**	**109**	**34**	**84**	**50**	**77.1%**
Total Domestic Operations	**395,042**	**298,117**	**296,079**	**303,743**	**311,333**	**332,591**	**336,948**	**166,423**	**211,555**	**45,132**	**62.8%**

Source: Massport.

Notes: Excludes general aviation and all-cargo operations.

1 Alaska Airlines includes Virgin America beginning in 2018 (following 2016 acquisition).

2 American Airlines includes US Airways beginning in 2014 (following 2013 merger).

3 Delta Air Lines totals include Northwest Airlines beginning in 2009 (following 2008 merger).

4 Southwest Airlines include AirTran Airways beginning 2012 (following 2011 merger).

5 United Airlines totals include Continental Airlines beginning in 2011 (following 2010 merger).

6 US Airways totals in this chart include America West Airlines beginning in 2006 (following 2005 merger).

Table E-3 Logan Airport Changes in International Passenger Operations by Carrier

Airline	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs'19 Pct. Recovery
Scheduled Jet Carriers	**27,427**	**20,771**	**28,225**	**34,752**	**37,522**	**35,551**	**39,284**	**15,009**	**19,935**	**4,926**	**50.7%**
Aer Lingus	1,160	1,097	1,973	2,066	2,011	1,995	1,860	868	655	-213	35.2%
Aeromexico			345	580	624	657	16				0.0%
Air Berlin				192	278						
Air Canada	10,047	3,895	1,686	2,729	3,982	1,111	1,932	14	369	355	19.1%
Air Europa					72	2					
Air France	1,046	995	910	900	884	828	856	402	614	212	71.7%
Air Jamaica											
Air One											
Alitalia	729	624	562	558	548	544	550	72		-72	0.0%
American Airlines[1]	4,657	2,422	571	533	530	198	183	181	550	369	300.5%
Astraeus											
Avianca					226	501	218				0.0%
British Airways	2,159	2,082	2,575	2,702	2,522	2,685	2,650	1,136	991	-145	37.4%
Canadian Airlines	417										
Cathay Pacific			279	454	652	703	699	117	50	-67	7.2%
Copa Airlines			646	638	730	1,100	966	188	283	95	29.3%
Delta Air Lines[2]	733	1,675	3,122	3,459	3,871	4,034	4,722	1,397	1,477	80	31.3%
Eastern Airlines								8	5	-3	
El Al			152	296	298	288	296	58		-58	0.0%
Emirates			914	1,382	1,034	734	719	306	454	148	63.1%
Eurowings				72							
Finnair											
FlyGlobespan											
Hainan Airlines			744	961	1,032	1,078	1,056	100		-100	0.0%
Iberia Airlines[3]		435	336	412	464	707	859	132	158	26	18.4%
Icelandair	726	816	1,287	1,338	1,265	1,041	1,044	906	1,122	216	107.5%
Japan Airlines			728	736	730	732	728	396	644	248	88.5%
JetBlue		2,262	6,488	7,146	7,406	7,628	9,520	5,084	7,771	2,687	81.6%
KLM Royal Dutch Airlines					2		263	251	304	53	115.6%
Korean Air Lines	314						367	208	314	106	85.6%
LACSA Airlines[5]											
LATAM						210	476	129	5	-124	1.1%
Lufthansa	1,140	1,657	1,687	1,728	1,707	1,662	1,703	511	866	355	50.9%
Northwest Airlines	744										
Norwegian Air Shuttle[4]			34	656	718	928	1,429	134		-134	0.0%
Olympic Airways	256										
Primera Air						238					

Table E-3 Logan Airport Changes in International Passenger Operations by Carrier (Continued)

Airline	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs'19 Pct. Recovery
Qatar Airways				552	728	734	730	350	528	178	72.3%
Royal Air Maroc							161	50	2	-48	1.2%
Sabena	724										
SATA International Airlines		403	542	630	844	780	809	288	409	121	50.6%
Scandinavian Airlines				500	536	320	369				0.0%
Spirit Airlines								538	621	83	
SWISS International	926	720	711	1,020	924	942	978	198	328	130	33.5%
TACA[5]						156	136				0.0%
TACV - Cabo Verde		240	60			99	112	42		-42	0.0%
TAP - Air Portugal	200			378	643	642	644	328	525	197	81.5%
Thomas Cook Airlines				62	144	104	2				0.0%
Trans World Airlines											
Turkish Airlines			726	658	616	644	674	274	500	226	74.2%
United Airlines	728			21	13	14	21	1		-1	0.0%
US Airways		667									
VG Airlines											
Virgin Atlantic Airways	721	707	702	715	764	778	1,361	342	390	48	28.7%
WestJet Airlines						12	4				0.0%
Wow Air			445	678	724	722	171				0.0%
Regional/Commuter Carriers	**15,594**	**12,494**	**14,153**	**15,204**	**14,597**	**18,081**	**15,149**	**3,787**	**2,675**	**-1,112**	**17.7%**
Air Canada Regional[6]	4,088	7,065	10,024	9,051	7,497	10,719	8,910	2,913	2,054	-859	23.1%
American Eagle Airlines	8,975	2,480									
Delta Connection	2,531	81	38	32	63	60	50				0.0%
Porter Airlines		2,868	4,091	3,869	3,899	3,840	3,959	562	603	41	15.2%
WestJet Encore				2,252	3,138	3,462	2,230	312	18	-294	0.8%
Non-Scheduled Operations	**2,141**	**305**	**248**	**63**	**65**	**45**	**43**	**49**	**54**	**5**	**125.6%**
Total International Operations	**45,162**	**33,496**	**42,626**	**50,019**	**52,184**	**53,677**	**54,476**	**18,845**	**22,664**	**3,819**	**41.6%**

Source: Massport.
Note: Excludes general aviation and all-cargo operations.
1 American Airlines includes US Airways beginning in 2014 (following 2013 merger).
2 Delta Air Lines totals include Northwest Airlines beginning in 2009 (following 2008 merger).
3 LEVEL Airlines service to Barcelona is operated by Iberia.
4 Norwegian Air Shuttle includes Norwegian UK.
5 TACA operated as Avianca El Salvador (parent company: Avianca Group); LACSA operated as Avianca Costa Rica (parent company: Avianca Group).
6 Air Canada Regional includes flights operated by Sky Regional Airlines and Jazz Air.

Table E-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Domestic		**210,069**	**149,961**	**152,211**	**155,482**	**160,980**	**171,257**	**171,986**	**88,103**	**105,663**	**17,560**	**61%**
Washington National	DCA	8,474	9,419	8,678	8,629	8,759	8,511	9,246	4,170	5,256	413	77%
Chicago O'Hare	ORD	10,063	7,403	7,401	7,139	6,825	7,492	7,894	3,917	4,663	557	89%
Orlando	MCO	4,914	3,179	3,057	3,323	4,234	4,046	4,313	2,744	3,921	-117	51%
Atlanta	ATL	7,110	5,548	5,192	5,386	6,656	6,991	6,494	3,326	3,914	292	71%
Miami	MIA	2,068	2,238	2,520	2,523	2,519	2,485	2,224	1,620	3,633	326	60%
Fort Lauderdale	FLL	3,327	2,370	2,258	2,634	2,709	3,024	3,047	2,289	3,530	-820	31%
Charlotte	CLT	2,758	4,180	3,920	3,878	3,835	3,960	4,269	2,975	3,441	127	84%
Los Angeles	LAX	3,647	3,382	4,456	4,650	4,775	5,739	5,248	2,382	3,431	53	54%
New York La Guardia	LGA	11,872	11,705	9,352	9,365	11,080	10,889	10,893	3,619	3,384	705	154%
Philadelphia	PHL	11,785	6,548	7,971	5,786	5,298	6,099	7,907	3,660	3,005	461	82%
New York J F Kennedy	JFK	9,899	7,054	6,745	6,971	6,391	6,363	5,472	2,906	2,994	-74	100%
Nantucket	ACK	5,022	3,884	4,311	4,605	4,378	4,158	4,228	2,524	2,936	464	87%
Denver	DEN	2,628	2,812	2,611	2,839	2,812	3,117	3,285	1,884	2,705	-24	102%
New York Newark	EWR	5,206	3,666	5,366	5,239	5,169	5,571	5,926	2,414	2,460	-10	101%
Dallas/Fort Worth	DFW	5,002	2,938	3,406	3,418	3,231	3,157	3,126	2,144	2,382	318	47%
Raleigh/Durham	RDU	3,775	3,259	3,598	3,718	3,748	3,836	4,433	1,865	2,321	283	50%
San Francisco	SFO	3,526	3,711	4,272	4,551	4,796	5,384	5,075	2,198	2,160	116	65%
Tampa	TPA	2,502	1,246	1,177	1,429	2,106	2,526	2,696	1,661	2,074	-3	100%
Seattle/Tacoma	SEA	458	1,001	1,625	1,907	2,051	2,373	2,289	1,482	2,039	-3	100%
Detroit	DTW	2,937	2,353	3,875	3,932	3,849	3,784	3,615	1,977	1,860	-4	31%
Martha's Vineyard	MVY	3,863	3,218	2,731	2,929	2,572	2,809	2,596	1,558	1,850	58	51%
Nashville	BNA	642		688	1,467	2,058	2,525	3,063	1,524	1,850	-170	54%
Baltimore	BWI	1,773	7,053	4,897	5,731	5,987	5,888	5,658	2,564	1,744	555	90%
Fort Myers	RSW	949	1,587	1,742	1,938	2,173	2,360	2,060	1,605	1,732	241	86%
Minneapolis	MSP	3,078	1,927	2,737	2,865	2,801	3,363	3,230	1,679	1,732	125	66%
Bar Harbor	BHB	1,196	815	1,095	1,098	1,111	1,095	1,095	986	1,691	-21	61%
Provincetown	PVC	2,023	2,410	1,957	1,912	1,610	1,795	1,785	1,007	1,468	389	50%
Lebanon	LEB		1,734	1,460	1,464	1,464	1,460	1,460	1,534	1,460	413	77%
Houston Intercontinental	IAH	1,995	1,717	1,831	1,618	1,548	1,582	1,584	916	1,380	557	89%
Rockland	RKD	1,152	1,301	1,372	1,348	1,344	1,341	1,350	1,398	1,374	-117	51%
Augusta	AUG	584	1,000	1,248	1,220	1,220	1,217	1,226	1,244	1,234	292	71%
Richmond	RIC	1,537	1,431	2,603	2,338	2,349	2,305	2,369	805	1,123	326	60%
Cleveland	CLE	2,797	1,369	2,070	2,098	2,216	2,120	2,202	823	1,106	-820	31%
Phoenix	PHX	1,386	1,348	1,569	1,552	1,609	1,842	1,692	984	1,100	127	84%
Rutland	RUT	1,259	1,095	1,095	1,098	1,098	1,095	1,095	1,098	1,095	53	54%

Table E-4 Logan Airport Scheduled Passenger Departures by Destination (Continued)

Destination Airport	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Saranac Lake	SLK		1,174	1,095	1,098	1,098	1,095	1,095	1,098	1,095	705	154%
Pittsburgh	PIT	3,086	2,312	2,457	2,210	2,729	3,842	3,485	1,096	1,092	461	82%
Las Vegas	LAS	1,098	756	1,162	1,216	1,325	1,604	2,092	1,014	1,072	-74	100%
West Palm Beach	PBI	1,674	1,450	1,650	1,652	1,856	2,136	1,978	1,235	1,065	464	87%
Austin	AUS		365	444	754	855	1,083	1,122	452	1,007	-24	102%
Salt Lake City	SLC	1,094	669	617	1,009	1,156	1,179	1,148	744	985	-10	101%
Washington Dulles	IAD	8,625	4,625	2,505	2,485	2,484	2,457	1,444	834	959	318	47%
Chicago Midway	MDW	868	1,756	1,531	1,604	1,521	1,580	1,538	964	943	283	50%
Jacksonville	JAX		365	767	701	854	1,597	1,900	554	943	116	65%
Charleston	CHS			365	545	593	901	1,034	515	935	420	90%
Indianapolis	IND	765	1,121	1,181	1,595	1,511	1,401	1,356	252	827	575	61%
San Diego	SAN	366	571	1,052	1,042	1,046	1,191	1,232	630	819	189	67%
Cincinnati	CVG	2,235	1,364	1,218	1,204	1,229	1,253	1,304	373	762	389	58%
Columbus	CMH	2,708	972	1,081	1,591	1,416	1,445	1,453	329	743	414	51%
Massena	MSS						552	1,095	1,101	739	-362	67%
Portland (ME)	PWM	6,267						368	365	633	268	172%
Hyannis	HYA	2,274	1,165	787	775	697	430	383	276	602	326	157%
St. Louis	STL	2,187	934	722	745	1,021	1,075	1,227	591	597	6	49%
Myrtle Beach	MYR	105	365	383	379	375	414	378	272	595	323	157%
Rochester	ROC	3,644	908	886	767	806	888	1,369	518	480	-38	35%
Savannah	SAV			365	370	423	524	535	342	410	68	77%
Sarasota/Bradenton	SRQ		82	212	186	248	299	306	251	399	148	131%
Kansas City	MCI	597	313	661	631	684	1,028	886	178	354	176	40%
Buffalo	BUF	950	2,181	2,203	2,120	2,249	2,529	2,337	717	345	-372	15%
Portland	PDX		352	519	555	599	707	746	157	326	169	44%
Key West	EYW								20	316	296	
New Orleans	MSY		348	365	527	700	1,029	914	427	314	-113	34%
Bangor	BGR	6,644								234	234	
Norfolk	ORF	838				105	344	249	22	224	202	90%
Burlington	BTV	5,913								214	214	
Honolulu	HNL							210	67	190	123	91%
Milwaukee	MKE	1,189	2,213	854	990	1,059	1,131	1,022	161	162	1	16%
Syracuse	SYR	3,876	991	578	314	323	678	695	321	158	-163	23%
Harrisburg	MDT	1,307	551	325	300	314	313	330	117	135	18	41%
San Jose	SJC	842	232	223	236	323	286	278	50	120	70	43%
Asheville	AVL								32	116	84	

Table E-4 Logan Airport Scheduled Passenger Departures by Destination (Continued)

Destination Airport	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Fort Walton Beach	VPS								29	96	67	
Knoxville	TYS								26	93	67	
Traverse City	TVC									85	85	
Grand Rapids	GRR									83	83	
Wilmington	ILM									70	70	
Bozeman	BZN								22	60	38	
Sacramento	SMF			48	57	75	101	88		52	52	59%
San Antonio	SAT									48	48	
Hilton Head Island	HHH									45	45	
Steamboat Springs Hayden	HDN						4	30	30	28	-2	93%
Montrose	MTJ								4	16	12	
Jackson	JAC									14	14	
Houston	HOU			978	1,032	872	795	665	63	4	-59	1%
Palm Springs	PSP							35	2	2		6%
Madison	MSN				9				14	2	-12	
Providence	PVD	91							19	2	-17	
St. Petersburg/Clearwater	PIE									1	1	
Kansas City	MKC									1	1	
Cleveland Burke Lakefront	BKL									1	1	
Bedford	BED								1	1		
Greenville/Spartanburg	GSP									1	1	
Atlantic City Pomona	ACY		536	166	366	123						
Louisville	SDF											
Plattsburgh	PBG		1,025	756	697	627	363					
Pontiac	PTK											
Presque Isle	PQI	1,835	991	991	993	993	491					
Westchester County	HPN	6,065		263	502	422	116		132		-132	
Dallas Love Field	DAL			153	153	366	365	409	25		-25	0%
Burbank	BUR						113	299	83		-83	0%
South Bend	SBN											
Oakland	OAK		195	88	79	71	79	44				0%
Long Beach	LGB		459	292	297	353	443	403	96		-96	0%
Williamsport	IPT											
Albany	ALB	3,433	647	1,095	1,098	1,098	1,095	360				0%
Wichita	ICT											
Ontario	ONT											

Table E-4 Logan Airport Scheduled Passenger Departures by Destination (Continued)

Destination Airport	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Islip	ISP	4,222										
Tulsa	TUL											
Memphis	MEM	972	1,048									
Omaha	OMA											
Des Moines	DSM											
Oklahoma City	OKC											
Albuquerque	ABQ											
Spokane	GEG											
Corpus Christi	CRP											
Pensacola	PNS											
Northwest Florida	ECP											
El Paso	ELP											
Boise	BOI											
Akron/Canton	CAK		475	287								
Newport News	PHF		549									
Greensboro	GSO	415										
Trenton	TTN											
Watertown	ART											
Allentown/Bethlehem	ABE	780										
Manchester	MHT											
Dayton	DAY											
Plattsburgh	PLB											
Wilkes-Barre Scranton	AVP	584										
Columbia	CAE											
Ithaca	ITH	872										
Elmira/Corning	ELM	441										
Hartford	BDL											
Binghamton	BGM											
International		**23,711**	**18,761**	**21,765**	**25,351**	**26,475**	**27,255**	**27,504**	**9,700**	**10,888**	**1,188**	**40%**
San Juan	SJU	1,750	1,294	1,068	1,141	1,058	858	1,011	1,098	1,183	85	117%
London Heathrow	LHR	2,187	2,331	2,026	2,058	1,931	2,074	2,336	841	859	18	37%
Toronto	YYZ	3,691	3,603	2,799	3,702	3,861	3,898	3,671	1,072	786	-286	21%
Santo Domingo	SDQ		305	365	519	406	444	627	425	661	236	105%
Aruba	AUA	9	407	417	471	597	647	685	329	656	327	96%

Table E-4 Logan Airport Scheduled Passenger Departures by Destination (Continued)

Destination Airport	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Santiago	STI			206	275	284	383	475	338	636	298	134%
Montreal Dorval	YUL	3,401	2,008	2,047	2,092	2,070	2,293	1,721	482	451	-31	26%
Cancun	CUN		307	264	326	331	394	333	285	422	137	127%
Reykjavik Keflavik	KEF	393	404	854	968	964	870	612	225	409	184	67%
Amsterdam	AMS	366	457	579	580	580	579	714	300	406	106	57%
Dublin	DUB	223	348	653	694	816	815	885	393	326	-67	37%
Paris De Gaulle	CDG	898	710	916	938	895	938	898	274	309	35	34%
Frankfurt	FRA	580	548	536	515	502	474	501	186	304	118	61%
Toronto Island	YTZ		1,535	2,236	2,018	2,001	2,006	2,032	296	300	4	15%
Doha	DOH				284	366	365	365	222	261	39	72%
Lisbon	LIS	44	26	44	223	362	322	414	125	259	134	63%
Istanbul	IST			365	340	310	322	339	145	247	102	73%
Dubai	DXB			457	692	518	365	361	156	228	72	63%
Saint Thomas	STT	78	125	184	186	186		83	94	213	119	257%
Tokyo Narita	NRT			365	357	366	365	365	169	208	39	57%
Ponta Delgada	PDL	30	165	196	196	314	322	340	163	185	22	54%
Bermuda	BDA	550	532	536	510	598	730	695	158	183	25	26%
Seoul Incheon	ICN							184	105	157	52	86%
Zurich	ZRH	523	365	365	366	467	475	501	100	153	53	31%
Panama City	PTY			334	318	366	556	486	109	141	32	29%
Port Au Prince	PAP			26	53	62	114	122	69	127	58	104%
Munich	MUC		313	357	357	366	365	365	75	126	51	35%
Montego Bay	MBJ		126	56	52	118	121	126	66	119	53	95%
Madrid	MAD		218	166	205	258	249	353	35	78	43	22%
Punta Cana	PUJ		95	174	214	261	273	265	78	76	-2	29%
Providenciales	PLS	4	39	86	104	91	94	86	81	72	-9	83%
Saint Maarten	SXM		39	56	91	95		35	33	65	32	186%
Nassau	NAS		180	136	133	109	136	187	202	50	-152	27%
Barbados	BGI			9	43	74	74	74	27	44	17	60%
Saint Lucia Hewanorra	UVF			26	26	22	26	30	26	43	17	142%
Rome Leonardo Da Vinci-Fiumicino	FCO		313	271	271	275	275	402	40	37	-3	9%
Liberia	LIR			26	26	26	26	26	27	27		104%
Hong Kong	HKG			140	227	327	348	348	60	25	-35	7%
Terceira	TER	44	17	31	70	70	65	70	23	20	-3	29%
Puerto Plata	POP	4		26	26	26	26	30	16	16		53%
Ilha Do Sal (Cape Verde)	SID							4	20	7	-13	158%

Table E-4 Logan Airport Scheduled Passenger Departures by Destination (Continued)

Destination Airport	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Grand Cayman	GCM		17	26	43	26	26	30	31	6	-25	20%
Sao Paulo Guarulhos	GRU						105	235	70	3	-67	1%
Copenhagen	CPH				293	314	174	196	1	2	1	1%
Praia	RAI		121	30			48	48	13	2	-11	4%
Pointe-A-Pitre	PTP			9	30	26						
Moscow Sheremetyevo	SVO											
Oslo	OSL				57	61						
London Gatwick	LGW	362			161	218	339	365	79		-79	0%
Dusseldorf	DUS				101	197						
Funchal	FNC											
Ottawa	YOW	2,575	744	630	649	623	648	639	132		-132	0%
San Salvador	SAL						79	86				0%
Barcelona	BCN						100	156	31		-31	0%
Bogota	BOG					122	252	90				0%
Manchester	MAN	26			31	122	87	48				0%
Havana	HAV						9	52	13		-13	0%
Tel Aviv	TLV			75	148	157	148	148	31		-31	0%
Edinburgh	EDI							92				0%
Halifax	YHZ	3,210	852	700	955	1,037	1,064	851	158		-158	0%
Shannon	SNN	366	213	352	349	331	335	241	73		-73	0%
Fort De France	FDF			9	43	26						
Casablanca Mohamed V	CMN							79	31		-31	0%
Vancouver	YVR	366				62	135	92				0%
London Stansted	STN						96					
Beijing/Peking	PEK			287	323	366	348	322	37		-37	0%
Shanghai Pu Dong	PVG			83	157	157	196	209	24		-24	0%
Mexico City	MEX			166	292	301	379	369	8		-8	0%
Chongqing	CKG											
Porto	OPO											
Cologne/Bonn	CGN				52							
Sao Vicente	VXE		4									
Charlottetown	YYG											
Helsinki	HEL											
Milan Malpensa	MXP	366										
Fredericton	YFC											
Quebec	YQB	1,229										

Table E-4 Logan Airport Scheduled Passenger Departures by Destination (Continued)

Destination Airport	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Glasgow	GLA											
Connaught	NOC											
Stockholm Arlanda	ARN											
Las Palmas	LPA											
Nykoping	NYO											
Lerwick Sumburgh	LSI											
Freeport	FPO											
Brussels	BRU	362										
Gander	YQX											
Athens	ATH	74										
Total Scheduled Carrier Departures		**233,780**	**183,521**	**168,722**	**173,976**	**180,833**	**187,455**	**198,512**	**199,491**	**97,803**	**18,748**	**58%**

Source: OAG Schedules.
Note: Destinations listed on the table that do not have scheduled nonstop services in 2020 and/or 2021, may not appear to have scheduled departures and departing seats as nonstop service from those destinations may have occurred in during calendar years not displayed above.

F

Regional Transportation

This appendix provides detailed tables in support of Chapter 4, *Regional Transportation*:

- Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2021
- Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2021

Scheduled Passenger Operations by Market and Carrier for New England's Regional Airports:

- Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport
- Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F. Green Airport
- Table F-5 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport
- Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport
- Table F-7 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport
- Table F-8 Scheduled Passenger Operations by Market and Carrier for Bangor International Airport
- Table F-9 Scheduled Passenger Operations by Market and Carrier for Tweed-New Haven Airport
- Table F-10 Scheduled Passenger Operations by Market and Carrier for Worcester Regional
- Table F-11 Airport Scheduled Passenger Operations by Market and Carrier for Hanscom Field
- Table F-12 Scheduled Passenger Operations by Market and Carrier for Portsmouth International Airport

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Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2021

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2000													
Commercial	132,062	103,750	61,506	47,609	45,745	21,446	5,260	4,029	6,104	6,572	434,083	452,763	886,846
General Aviation[1]	31,863	52,184	45,740	56,571	59,377	34,831	56,200	46,518	31,601	204,512	619,397	35,233	654,630
Military & Other	5,811	2,764	586	2,072	10,241	26,507	328	495	9,973	1,287	60,064	0	60,064
Total	**169,736**	**158,698**	**107,832**	**106,252**	**115,363**	**82,784**	**61,788**	**51,042**	**47,678**	**212,371**	**1,113,544**	**487,996**	**1,601,540**
2001													
Commercial	128,638	100,606	61,669	47,770	47,261	18,286	4,581	5,631	4,485	6,414	425,341	434,386	859,727
General Aviation[1]	30,478	45,095	44,358	62,014	61,986	35,230	56,092	45,464	30,148	197,770	608,635	28,739	637,374
Military & Other	5,913	2,635	607	2,259	11,821	26,623	437	917	8,221	1,252	60,685	0	60,685
Total	**165,029**	**148,336**	**106,634**	**112,043**	**121,068**	**80,139**	**61,110**	**52,012**	**42,854**	**205,436**	**1,094,661**	**463,125**	**1,557,786**
2002													
Commercial	113,194	96,595	62,346	45,899	38,929	24,412	3,827	4,062	5,059	6,603	400,926	366,476	767,402
General Aviation[1]	27,838	45,473	29,549	57,720	59,679	35,711	62,163	52,277	28,333	210,221	608,964	25,596	634,560
Military & Other	6,085	2,587	376	2,162	12,167	27,297	593	418	8,220	1,424	61,329	0	61,329
Total	**147,117**	**144,655**	**92,271**	**105,781**	**110,775**	**87,420**	**66,583**	**56,757**	**41,612**	**218,248**	**1,071,219**	**392,072**	**1,463,291**
2003													
Commercial	103,917	84,301	68,184	42,658	38,293	25,626	3,705	868	4,552	2,956	375,060	344,644	719,704
General Aviation[1]	27,115	42,878	29,552	44,036	50,461	36,706	54,224	55,972	24,866	190,789	556,599	28,660	585,259
Military & Other	4,214	2,496	324	1,449	11,466	32,938	776	378	7,720	1,142	62,903	0	62,903
Total	**135,246**	**129,675**	**98,060**	**88,143**	**100,220**	**95,270**	**58,705**	**57,218**	**37,138**	**194,887**	**994,562**	**373,304**	**1,367,866**
2004													
Commercial	108,823	83,496	75,360	46,474	41,719	24,970	4,501	0	3,981	4,308	393,632	374,022	767,654
General Aviation[1]	32,269	34,878	27,438	41,547	54,709	29,884	58,881	61,343	25,962	175,301	542,212	31,236	573,448
Military & Other	4,100	346	749	1,338	12,404	29,676	1,010	530	7,797	1,195	59,145	0	59,145
Total	**145,192**	**118,720**	**103,547**	**89,359**	**108,832**	**84,530**	**64,392**	**61,873**	**37,740**	**180,804**	**994,989**	**405,258**	**1,400,247**

Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2021 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2005													
Commercial	119,048	88,374	76,342	42,661	43,987	25,976	6,137	2,727	3,197	3,627	412,076	377,830	789,906
General Aviation[1]	33,341	28,138	26,369	36,191	49,888	30,016	60,893	62,743	25,446	165,424	518,449	31,236	549,685
Military & Other	3,701	241	479	1,405	11,468	24,154	1,063	519	7,669	904	51,603	0	51,603
Total	**156,090**	**116,753**	**103,190**	**80,257**	**105,343**	**80,146**	**68,093**	**65,989**	**36,312**	**169,955**	**982,128**	**409,066**	**1,391,194**
2006													
Commercial	111,341	81,282	67,326	38,663	41,342	23,466	5,177	3,793	3,981	3,057	379,428	374,675	754,103
General Aviation[1]	34,548	25,510	25,074	35,572	44,471	29,848	51,702	56,770	25,962	167,560	497,017	31,444	528,461
Military & Other	4,348	229	738	1,536	9,299	22,359	1,157	609	7,797	1,433	49,505	0	49,505
Total	**150,237**	**107,021**	**93,138**	**75,771**	**95,112**	**75,673**	**58,036**	**61,172**	**37,740**	**172,050**	**925,950**	**406,119**	**1,332,069**
2007													
Commercial	107,097	80,525	69,134	41,450	39,928	22,571	4,594	3,162	4,270	3,477	376,208	370,905	747,113
General Aviation[1]	29,308	22,984	23,959	31,724	47,521	25,542	51,200	61,296	27,000	160,992	481,526	28,632	510,158
Military & Other	5,097	242	644	1,384	9,528	20,949	944	879	8,017	1,438	49,122	0	49,122
Total	**141,502**	**103,751**	**93,737**	**74,558**	**96,977**	**69,062**	**56,738**	**65,337**	**39,287**	**165,907**	**906,856**	**399,537**	**1,306,393**
2008													
Commercial	98,194	73,096	63,505	40,834	37,832	19,282	4,013	2,553	1,347	104	340,760	347,784	688,544
General Aviation[1]	22,908	19,470	16,198	31,869	46,391	27,143	44,642	43,763	31,051	164,195	447,630	23,820	471,450
Military & Other	3,637	187	840	974	9,688	20,449	243	886	7,993	1,590	46,487	0	46,487
Total	**124,739**	**92,753**	**80,543**	**73,677**	**93,911**	**66,874**	**48,898**	**47,202**	**40,391**	**165,889**	**834,877**	**371,604**	**1,206,481**
2009													
Commercial	82,021	62,233	54,336	35,909	31,153	16,485	3,096	2,527	422	0	288,182	333,064	621,246
General Aviation[1]	19,586	19,438	14,354	25,473	32,872	19,558	37,722	41,700	25,161	148,696	384,560	12,242	396,802
Military & Other	2,726	260	1,163	778	8,628	16,267	486	17	6,851	1,215	38,391	0	38,391
Total	**104,333**	**81,931**	**69,853**	**62,160**	**72,653**	**52,310**	**41,304**	**44,244**	**32,434**	**149,911**	**711,133**	**345,306**	**1,056,439**

Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2021 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2010													
Commercial	80,418	60,128	53,971	35,035	29,538	16,190	3,201	1,629	1,516	0	281,626	337,961	619,587
General Aviation[1]	18,759	21,096	13,636	24,776	36,106	20,142	31,884	41,843	25,674	161,942	395,858	14,682	410,540
Military & Other	3,028	347	933	446	4,776	15,525	381	572	7,707	1,795	35,510	0	35,510
Total	**102,205**	**81,571**	**68,540**	**60,257**	**70,420**	**51,857**	**35,466**	**44,044**	**34,897**	**163,737**	**712,994**	**352,643**	**1,065,637**
2011													
Commercial	86,838	57,194	51,379	35,157	29,166	16,177	3,367	2,017	1,717	750	283,762	340,757	624,519
General Aviation[1]	16,483	21,774	12,497	21,453	42,562	19,503	33,919	44,050	27,056	160,840	400,137	28,230	428,367
Military & Other	3,630	369	874	533	5,890	13,220	310	634	8,158	1,409	35,027	0	35,027
Total	**106,951**	**79,337**	**64,750**	**57,143**	**77,618**	**48,900**	**37,596**	**46,701**	**36,931**	**162,999**	**718,926**	**368,987**	**1,087,913**
2012													
Commercial	79,704	50,301	45,379	33,118	27,067	14,826	3,936	1,639	502	635	257,107	326,755	583,862
General Aviation[1]	15,589	24,781	12,504	20,864	42,352	18,069	34,775	42,655	30,186	164,841	406,616	28,114	434,730
Military & Other	3,726	434	1,073	584	7,079	11,503	416	740	7,917	738	34,210	0	34,210
Total	**99,019**	**75,516**	**58,956**	**54,566**	**76,498**	**44,398**	**39,127**	**45,034**	**38,605**	**166,214**	**697,933**	**354,869**	**1,052,802**
2013													
Commercial	78,213	48,340	43,572	31,076	26,814	14,707	4,094	1,586	560	253	249,215	334,657	583,872
General Aviation[1]	15,192	24,729	11,432	20,021	40,413	15,535	28,794	32,888	28,951	153,706	371,661	26,682	398,343
Military & Other	2,558	435	1,224	471	6,972	11,045	423	593	7,573	529	31,823	0	31,823
Total	**95,963**	**73,504**	**56,228**	**51,568**	**74,199**	**41,287**	**33,311**	**35,067**	**37,084**	**154,488**	**652,699**	**361,339**	**1,014,038**
2014													
Commercial	79,060	44,351	38,674	29,538	26,057	14,428	4,795	2,368	8,278	256	247,805	337,381	585,186
General Aviation[1]	14,752	29,490	12,293	16,535	40,858	15,548	26,273	29,138	24,440	133,437	342,764	26,416	369,180
Military & Other	2,665	1,036	908	560	6,842	11,567	529	956	7,621	602	33,286	0	33,286
Total	**96,477**	**74,877**	**51,875**	**46,633**	**73,757**	**41,543**	**31,597**	**32,462**	**40,339**	**134,295**	**623,855**	**363,797**	**987,652**

Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2021 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2015													
Commercial	76,425	42,417	38,060	30,415	25,178	13,618	6,316	2,414	8,547	220	243,610	344,764	588,374
General Aviation[1]	14,402	22,700	12,934	17,916	41,576	16,487	27,711	35,711	26,848	127,467	343,752	28,166	371,918
Military & Other	2,680	430	811	567	5,912	10,684	685	889	7,499	592	30,749	0	30,749
Total	**93,507**	**65,547**	**51,805**	**48,898**	**72,666**	**40,789**	**34,712**	**39,014**	**42,894**	**128,279**	**618,111**	**372,930**	**991,041**
2016													
Commercial	77,174	43,659	40,589	32,171	26,405	14,603	7,195	2,616	9,435	266	254,113	360,442	614,555
General Aviation[1]	14,460	26,032	14,447	18,334	38,614	16,815	28,811	31,858	29,043	120,891	339,305	30,780	370,085
Military & Other	3,178	397	501	488	6,114	11,271	683	780	8,913	632	32,957	0	32,957
Total	**94,812**	**70,088**	**55,537**	**50,993**	**71,133**	**42,689**	**36,689**	**35,254**	**47,391**	**121,789**	**626,375**	**391,222**	**1,017,597**
2017													
Commercial	78,435	45,831	37,850	32,845	26,684	15,874	6,820	2,925	9,597	295	257,156	370,251	627,407
General Aviation[1]	13,233	26,274	13,169	18,392	34,386	17,157	18,389	26,332	31,555	128,018	326,905	31,120	358,025
Military & Other	3,006	490	697	568	5,080	9,985	574	850	8,150	759	30,159	0	30,159
Total	**94,674**	**72,595**	**51,716**	**51,805**	**66,150**	**43,016**	**25,783**	**30,107**	**49,302**	**129,072**	**614,220**	**401,371**	**1,015,591**
2018													
Commercial	78,463	49,425	36,085	35,534	28,611	17,241	6,038	3,710	8,709	286	264,102	393,084	657,186
General Aviation[1]	13,280	21,124	15,664	20,717	38,078	16,670	18,220	14,473	30,424	120,945	309,595	30,940	340,535
Military & Other	2,898	399	423	675	3,547	9,758	536	753	7,600	433	27,022	0	27,022
Total	**94,641**	**70,948**	**52,172**	**56,926**	**70,236**	**43,669**	**24,794**	**18,936**	**46,733**	**121,664**	**600,719**	**424,024**	**1,024,743**
2019													
Commercial	76,352	46,393	34,965	35,855	28,413	17,678	6,094	5,554	9,346	426	261,076	398,254	659,330
General Aviation[1]	12,652	23,017	15,762	21,731	40,894	17,117	21,853	17,186	28,742	127,755	326,624	28,922	355,546
Military & Other	2,379	351	412	646	3,963	10,805	483	745	3,457	490	23,816	0	23,816
Total	**91,383**	**69,761**	**51,139**	**58,232**	**73,270**	**45,600**	**28,430**	**23,485**	**41,545**	**128,671**	**611,516**	**427,176**	**1,038,692**

Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2021 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional[4]	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2020													
Commercial	44,420	25,510	24,153	21,559	14,852	11,184	2,754	2,486	7,225	231	154,374	192,844	347,218
General Aviation[1]	10,872	20,243	13,892	16,832	37,241	11,970	27,393	14,109	28,656	98,925	280,133	13,858	293,991
Military & Other	2,850	600	655	937	4,466	11,792	262	651	2,672	569	25,454	0	25,454
Total	**58,142**	**46,353**	**38,700**	**39,328**	**56,559**	**34,946**	**30,409**	**17,246**	**38,553**	**99,725**	**459,961**	**206,702**	**666,663**
2021													
Commercial	56,187	32,296	25,520	30,955	19,519	16,231	3,600	2,087	11,272	448	198,115	241,992	440,107
General Aviation[1]	13,312	23,342	19,795	21,822	63,070	13,968	36,025	16,929	45,981	122,944	377,188	24,042	401,230
Military & Other	3,308	608	678	964	6,533	12,740	406	1,903	5,850	1,174	34,164	0	34,164
Total	**72,807**	**56,246**	**45,993**	**53,741**	**89,122**	**42,939**	**40,031**	**20,919**	**63,103**	**124,566**	**609,467**	**266,034**	**875,501**

Source: Massport, Federal Aviation Administration (FAA) Tower Counts, and individual airport records.

Note: 2018 and 2019 operations for Manchester-Boston Regional, Portland International Jetport, Burlington International, Bangor, and Portsmouth International airports have changed given updated data sources and dashboards provided by the Airports and the U.S. Bureau of Transportation Statistics (BTS).

1 Includes itinerant and local general aviation operations at the regional airports. There are no local (touch-and-go training) operations at Logan Airport.

2 Commercial operations at Hanscom Field include scheduled commercial operations only; other air taxi operations counted as GA.

3 Operations at Logan Airport include international operations.

4 Commercial, GA, and military operations at Worcester Regional have been updated compared to the previous EDR report to account for Part 139 operations not recorded by the FAA tower during the night hours when closed.

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2021

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2000 to 2001													
Commercial	(2.59%)	(3.03%)	0.27%	0.34%	3.31%	(14.73%)	(12.91%)	39.76%	(26.52%)	(2.40%)	(2.01%)	(4.06%)	(3.06%)
General Aviation[1]	(4.35%)	(13.58%)	(3.02%)	9.62%	4.39%	1.15%	(0.19%)	(2.27%)	(4.60%)	(3.30%)	(1.74%)	(18.43%)	(2.64%)
Military & Other	1.76%	(4.67%)	3.58%	9.03%	15.43%	0.44%	33.23%	85.25%	(17.57%)	(2.72%)	1.03%	-	1.03%
Total	**(2.77%)**	**(6.53%)**	**(1.11%)**	**5.45%**	**4.95%**	**(3.20%)**	**(1.10%)**	**1.90%**	**(10.12%)**	**(3.27%)**	**(1.70%)**	**(5.10%)**	**(2.73%)**
2001 Percent of Total	**10.59%**	**9.52%**	**6.85%**	**7.19%**	**7.77%**	**5.14%**	**3.92%**	**3.34%**	**2.75%**	**13.19%**	**70.27%**	**29.73%**	**100.00%**
2001 to 2002													
Commercial	(12.01%)	(3.99%)	1.10%	(3.92%)	(17.63%)	33.50%	(16.46%)	(27.86%)	12.80%	2.95%	(5.74%)	(15.63%)	(10.74%)
General Aviation[1]	(8.66%)	0.84%	(33.39%)	(6.92%)	(3.72%)	1.37%	10.82%	14.99%	(6.02%)	6.30%	0.05%	(10.94%)	(0.44%)
Military & Other	2.91%	(1.82%)	(38.06%)	(4.29%)	2.93%	2.53%	35.70%	(54.42%)	(0.01%)	13.74%	1.06%	-	1.06%
Total	**(10.85%)**	**(2.48%)**	**(13.47%)**	**(5.59%)**	**(8.50%)**	**9.09%**	**8.96%**	**9.12%**	**(2.90%)**	**6.24%**	**(2.14%)**	**(15.34%)**	**(6.07%)**
2002 Percent of Total	**10.05%**	**9.89%**	**6.31%**	**7.23%**	**7.57%**	**5.97%**	**4.55%**	**3.88%**	**2.84%**	**14.91%**	**73.21%**	**26.79%**	**100.00%**
2002 to 2003													
Commercial	(8.20%)	(12.73%)	9.36%	(7.06%)	(1.63%)	4.97%	(3.19%)	(78.63%)	(10.02%)	(55.23%)	(6.45%)	(5.96%)	(6.22%)
General Aviation[1]	(2.60%)	(5.71%)	0.01%	(23.71%)	(15.45%)	2.79%	(12.77%)	7.07%	(12.24%)	(9.24%)	(8.60%)	11.97%	(7.77%)
Military & Other	(30.75%)	(3.52%)	(13.83%)	(32.98%)	(5.76%)	20.67%	30.86%	(9.57%)	(6.08%)	(19.80%)	2.57%	-	2.57%
Total	**(8.07%)**	**(10.36%)**	**6.27%**	**(16.67%)**	**(9.53%)**	**8.98%**	**(11.83%)**	**0.81%**	**(10.75%)**	**(10.70%)**	**(7.16%)**	**(4.79%)**	**(6.52%)**
2003 Percent of Total	**9.89%**	**9.48%**	**7.17%**	**6.44%**	**7.33%**	**6.96%**	**4.29%**	**4.18%**	**2.72%**	**14.25%**	**72.71%**	**27.29%**	**100.00%**
2003 to 2004													
Commercial	4.72%	(0.95%)	10.52%	8.95%	8.95%	(2.56%)	21.48%	(100.00%)	(12.54%)	45.74%	4.95%	8.52%	6.66%
General Aviation[1]	19.01%	(18.66%)	(7.15%)	(5.65%)	8.42%	(18.59%)	8.59%	9.60%	4.41%	(8.12%)	(2.58%)	8.99%	(2.02%)
Military & Other	(2.71%)	(86.14%)	131.17%	(7.66%)	8.18%	(9.90%)	30.15%	40.21%	1.00%	4.64%	(5.97%)	-	(5.97%)
Total	**7.35%**	**(8.45%)**	**5.60%**	**1.38%**	**8.59%**	**(11.27%)**	**9.69%**	**8.14%**	**1.62%**	**(7.23%)**	**0.04%**	**8.56%**	**2.37%**
2004 Percent of Total	**10.37%**	**8.48%**	**7.39%**	**6.38%**	**7.77%**	**6.04%**	**4.60%**	**4.42%**	**2.70%**	**12.91%**	**71.06%**	**28.94%**	**100.00%**

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2021 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2004 to 2005													
Commercial	9.40%	5.84%	1.30%	(8.20%)	5.44%	4.03%	36.35%	-	(19.69%)	(15.81%)	4.69%	1.02%	2.90%
General Aviation[1]	3.32%	(19.32%)	(3.90%)	(12.89%)	(8.81%)	0.44%	3.42%	2.28%	(1.99%)	(5.63%)	(4.38%)	0.00%	(4.14%)
Military & Other	(9.73%)	(30.35%)	(36.05%)	5.01%	(7.55%)	(18.61%)	5.25%	(2.08%)	(1.64%)	(24.35%)	(12.75%)	-	(12.75%)
Total	**7.51%**	**(1.66%)**	**(0.34%)**	**(10.19%)**	**(3.21%)**	**(5.19%)**	**5.75%**	**6.65%**	**(3.78%)**	**(6.00%)**	**(1.29%)**	**0.94%**	**(0.65%)**
2005 Percent of Total	**11.22%**	**8.39%**	**7.42%**	**5.77%**	**7.57%**	**5.76%**	**4.89%**	**4.74%**	**2.61%**	**12.22%**	**70.60%**	**29.40%**	**100.00%**
2005 to 2006													
Commercial	(6.47%)	(8.02%)	(11.81%)	(9.37%)	(6.01%)	(9.66%)	(15.64%)	39.09%	24.52%	(15.72%)	(7.92%)	(0.84%)	(4.53%)
General Aviation[1]	3.62%	(9.34%)	(4.91%)	(1.71%)	(10.86%)	(0.56%)	(15.09%)	(9.52%)	2.03%	1.29%	(4.13%)	0.67%	(3.86%)
Military & Other	17.48%	(4.98%)	54.07%	9.32%	(18.91%)	(7.43%)	8.84%	17.34%	1.67%	58.52%	(4.07%)	-	(4.07%)
Total	**(3.75%)**	**(8.34%)**	**(9.74%)**	**(5.59%)**	**(9.71%)**	**(5.58%)**	**(14.77%)**	**(7.30%)**	**3.93%**	**1.23%**	**(5.72%)**	**(0.72%)**	**(4.25%)**
2006 Percent of Total	**11.28%**	**8.03%**	**6.99%**	**5.69%**	**7.14%**	**5.68%**	**4.36%**	**4.59%**	**2.83%**	**12.92%**	**69.51%**	**30.49%**	**100.00%**
2006 to 2007													
Commercial	(3.81%)	(0.93%)	2.69%	7.21%	(3.42%)	(3.81%)	(11.26%)	(16.64%)	7.26%	13.74%	(0.85%)	(1.01%)	(0.93%)
General Aviation[1]	(15.17%)	(9.90%)	(4.45%)	(10.82%)	6.86%	(14.43%)	(0.97%)	7.97%	4.00%	(3.92%)	(3.12%)	(8.94%)	(3.46%)
Military & Other	17.23%	5.68%	(12.74%)	(9.90%)	2.46%	(6.31%)	(18.41%)	44.33%	2.82%	0.35%	(0.77%)	-	(0.77%)
Total	**(5.81%)**	**(3.06%)**	**0.64%**	**(1.60%)**	**1.96%**	**(8.74%)**	**(2.24%)**	**6.81%**	**4.10%**	**(3.57%)**	**(2.06%)**	**(1.62%)**	**(1.93%)**
2007 Percent of Total	**10.83%**	**7.94%**	**7.18%**	**5.71%**	**7.42%**	**5.29%**	**4.34%**	**5.00%**	**3.01%**	**12.70%**	**69.42%**	**30.58%**	**100.00%**
2007 to 2008													
Commercial	(8.31%)	(9.23%)	(8.14%)	(1.49%)	(5.25%)	(14.57%)	(12.65%)	(19.26%)	(68.45%)	(97.01%)	(9.42%)	(6.23%)	(7.84%)
General Aviation[1]	(21.84%)	(15.29%)	(32.39%)	0.46%	(2.38%)	6.27%	(12.81%)	(28.60%)	15.00%	1.99%	(7.04%)	(16.81%)	(7.59%)
Military & Other	(28.64%)	(22.73%)	30.43%	(29.62%)	1.68%	(2.39%)	(74.26%)	0.80%	(0.30%)	10.57%	(5.36%)	-	(5.36%)
Total	**(11.85%)**	**(10.60%)**	**(14.08%)**	**(1.18%)**	**(3.16%)**	**(3.17%)**	**(13.82%)**	**(27.76%)**	**2.81%**	**(0.01%)**	**(7.94%)**	**(6.99%)**	**(7.65%)**
2008 Percent of Total	**10.34%**	**7.69%**	**6.68%**	**6.11%**	**7.78%**	**5.54%**	**4.05%**	**3.91%**	**3.35%**	**13.75%**	**69.20%**	**30.80%**	**100.00%**

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2021 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2008 to 2009													
Commercial	(16.47%)	(14.86%)	(14.44%)	(12.06%)	(17.65%)	(14.51%)	(22.85%)	(1.02%)	(68.67%)	(100.00%)	(15.43%)	(4.23%)	(9.77%)
General Aviation[1]	(14.50%)	(0.16%)	(11.38%)	(20.07%)	(29.14%)	(27.94%)	(15.50%)	(4.71%)	(18.97%)	(9.44%)	(14.09%)	(48.61%)	(15.83%)
Military & Other	(25.05%)	39.04%	38.45%	(20.12%)	(10.94%)	(20.45%)	100.00%	(98.08%)	(14.29%)	(23.58%)	(17.42%)	-	(17.42%)
Total	**(16.36%)**	**(11.67%)**	**(13.27%)**	**(15.63%)**	**(22.64%)**	**(21.78%)**	**(15.53%)**	**(6.27%)**	**(19.70%)**	**(9.63%)**	**(14.82%)**	**(7.08%)**	**(12.44%)**
2009 Percent of Total	**9.88%**	**7.76%**	**6.61%**	**5.88%**	**6.88%**	**4.95%**	**3.91%**	**4.19%**	**3.07%**	**14.19%**	**67.31%**	**32.69%**	**100.00%**
2009 to 2010													
Commercial	(1.95%)	(3.38%)	(0.67%)	(2.43%)	(5.18%)	(1.79%)	3.39%	(35.54%)	259.24%	-	(2.27%)	1.47%	(0.27%)
General Aviation[1]	(4.22%)	8.53%	(5.00%)	(2.74%)	9.84%	2.99%	(15.48%)	0.34%	2.04%	8.91%	2.94%	19.93%	3.46%
Military & Other	11.08%	33.46%	(19.78%)	(42.67%)	(44.65%)	(4.56%)	(21.60%)	3264.71%	12.49%	47.74%	(7.50%)	-	(7.50%)
Total	**(2.04%)**	**(0.44%)**	**(1.88%)**	**(3.06%)**	**(3.07%)**	**(0.87%)**	**(14.13%)**	**(0.45%)**	**7.59%**	**9.22%**	**0.26%**	**2.12%**	**0.87%**
2010 Percent of Total	**9.59%**	**7.65%**	**6.43%**	**5.65%**	**6.61%**	**4.87%**	**3.33%**	**4.13%**	**3.27%**	**15.37%**	**66.91%**	**33.09%**	**100.00%**
2010 to 2011													
Commercial	7.98%	(4.88%)	(4.80%)	0.35%	(1.26%)	(0.08%)	5.19%	23.82%	13.26%	-	0.76%	0.83%	0.80%
General Aviation[1]	(12.13%)	3.21%	(8.35%)	(13.41%)	17.88%	(3.17%)	6.38%	5.27%	5.38%	(0.68%)	1.08%	92.28%	4.34%
Military & Other	19.88%	6.34%	(6.32%)	19.51%	23.32%	(14.85%)	(18.64%)	10.84%	5.85%	(21.50%)	(1.36%)	-	(1.36%)
Total	**4.64%**	**(2.74%)**	**(5.53%)**	**(5.17%)**	**10.22%**	**(5.70%)**	**6.01%**	**6.03%**	**5.83%**	**(0.45%)**	**0.83%**	**4.63%**	**2.09%**
2011 Percent of Total	**9.83%**	**7.29%**	**5.95%**	**5.25%**	**7.13%**	**4.49%**	**3.46%**	**4.29%**	**3.39%**	**14.98%**	**66.08%**	**33.92%**	**100.00%**
2012 to 2013													
Commercial	(1.87%)	(3.90%)	(3.98%)	(6.17%)	(0.93%)	(0.80%)	4.01%	(3.23%)	11.55%	(60.16%)	(3.07%)	2.42%	0.00%
General Aviation[1]	(2.55%)	(0.21%)	(8.57%)	(4.04%)	(4.58%)	(14.02%)	(17.20%)	(22.90%)	(4.09%)	(6.75%)	(8.60%)	(5.09%)	(8.37%)
Military & Other	(31.35%)	0.23%	14.07%	(19.35%)	(1.51%)	(3.98%)	1.68%	(19.86%)	(4.35%)	(28.32%)	(6.98%)	-	(6.98%)
Total	**(3.09%)**	**(2.66%)**	**(4.63%)**	**(5.49%)**	**(3.01%)**	**(7.01%)**	**(14.86%)**	**(22.13%)**	**(3.94%)**	**(7.05%)**	**(6.48%)**	**1.82%**	**(3.68%)**
2013 Percent of Total	**9.46%**	**7.25%**	**5.54%**	**5.09%**	**7.32%**	**4.07%**	**3.28%**	**3.46%**	**3.66%**	**15.23%**	**64.37%**	**35.63%**	**100.00%**

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2021 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2013 to 2014													
Commercial	1.08%	(8.25%)	(11.24%)	(4.95%)	(2.82%)	(1.90%)	17.12%	49.31%	1378.21%	1.19%	(0.57%)	0.81%	0.23%
General Aviation[1]	(2.90%)	19.25%	7.53%	(17.41%)	1.10%	0.08%	(8.76%)	(11.40%)	(15.58%)	(13.19%)	(7.78%)	(1.00%)	(7.32%)
Military & Other	4.18%	138.16%	(25.82%)	18.90%	(1.86%)	4.73%	25.06%	61.21%	0.63%	13.80%	4.60%	-	4.60%
Total	**0.54%**	**1.87%**	**(7.74%)**	**(9.57%)**	**(0.60%)**	**0.62%**	**(5.15%)**	**(7.43%)**	**8.78%**	**(13.07%)**	**(4.42%)**	**0.68%**	**(2.60%)**
2014 Percent of Total	**9.77%**	**7.58%**	**5.25%**	**4.72%**	**7.47%**	**4.21%**	**3.20%**	**3.29%**	**4.08%**	**13.60%**	**63.17%**	**36.83%**	**100.00%**
2014 to 2015													
Commercial	(3.33%)	(4.36%)	(1.59%)	2.97%	(3.37%)	(5.61%)	31.72%	1.94%	3.25%	(14.06%)	(1.69%)	2.19%	0.54%
General Aviation[1]	(2.37%)	(23.02%)	5.21%	8.35%	1.76%	6.04%	5.47%	22.56%	9.85%	(4.47%)	0.29%	6.62%	0.74%
Military & Other	0.56%	(58.49%)	(10.68%)	1.25%	(13.59%)	(7.63%)	29.49%	(7.01%)	(1.60%)	(1.66%)	(7.62%)	-	(7.62%)
Total	**(3.08%)**	**(12.46%)**	**(0.13%)**	**4.86%**	**(1.48%)**	**(1.81%)**	**9.86%**	**20.18%**	**6.33%**	**(4.48%)**	**(0.92%)**	**2.51%**	**0.34%**
2015 Percent of Total	**9.44%**	**6.61%**	**5.23%**	**4.93%**	**7.33%**	**4.12%**	**3.50%**	**3.94%**	**4.33%**	**12.94%**	**62.37%**	**37.63%**	**100.00%**
2015 to 2016													
Commercial	0.98%	2.93%	6.64%	5.77%	4.87%	7.23%	13.92%	8.37%	10.39%	20.91%	4.31%	4.55%	4.45%
General Aviation[1]	0.40%	14.68%	11.70%	2.33%	(7.12%)	1.99%	3.97%	(10.79%)	8.18%	(5.16%)	(1.29%)	9.28%	(0.49%)
Military & Other	18.58%	(7.67%)	(38.22%)	(13.93%)	3.42%	5.49%	(0.29%)	(12.26%)	18.86%	6.76%	7.18%	-	7.18%
Total	**1.40%**	**6.93%**	**7.20%**	**4.28%**	**(2.11%)**	**4.66%**	**5.70%**	**(9.64%)**	**10.48%**	**(5.06%)**	**1.34%**	**4.90%**	**2.68%**
2016 Percent of Total	**9.32%**	**6.89%**	**5.46%**	**5.01%**	**6.99%**	**4.20%**	**3.61%**	**3.46%**	**4.66%**	**11.97%**	**61.55%**	**38.45%**	**100.00%**
2016 to 2017													
Commercial	1.63%	4.97%	(6.75%)	2.10%	1.06%	8.70%	(5.21%)	11.81%	1.72%	10.90%	1.20%	2.72%	2.09%
General Aviation[1]	(8.49%)	0.93%	(8.85%)	0.32%	(10.95%)	2.03%	(36.17%)	(17.35%)	8.65%	5.90%	(3.65%)	1.10%	(3.26%)
Military & Other	(5.41%)	23.43%	39.12%	16.39%	(16.91%)	(11.41%)	(15.96%)	8.97%	(8.56%)	20.09%	(8.49%)	-	(8.49%)
Total	**(0.15%)**	**3.58%**	**(6.88%)**	**1.59%**	**(7.01%)**	**0.77%**	**(29.73%)**	**(14.60%)**	**4.03%**	**5.98%**	**(1.94%)**	**2.59%**	**(0.20%)**
2017 Percent of Total	**9.32%**	**7.15%**	**5.09%**	**5.10%**	**6.51%**	**4.24%**	**2.54%**	**2.96%**	**4.85%**	**12.71%**	**60.48%**	**39.52%**	**100.00%**

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2021 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional[4]	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2017 to 2018													
Commercial	0.04%	7.84%	(4.66%)	8.19%	7.22%	8.61%	(11.47%)	26.84%	(9.25%)	(2.05%)	2.70%	6.17%	4.75%
General Aviation[1]	0.36%	(19.60%)	18.95%	12.64%	10.74%	(3.21%)	(0.92%)	(45.04%)	(3.58%)	(5.31%)	(5.23%)	(0.58%)	(4.83%)
Military & Other	(3.59%)	(18.57%)	(39.31%)	18.84%	(30.18%)	(2.47%)	(6.62%)	(11.41%)	(6.75%)	(25.34%)	(9.93%)	-	(9.93%)
Total	**(0.03%)**	**(2.27%)**	**0.88%**	**9.89%**	**6.18%**	**1.32%**	**(3.84%)**	**(37.10%)**	**(5.21%)**	**(5.39%)**	**(2.14%)**	**5.64%**	**0.94%**
2019 Percent of Total	**9.24%**	**6.92%**	**5.09%**	**5.56%**	**6.85%**	**4.26%**	**2.42%**	**1.85%**	**4.56%**	**11.87%**	**58.62%**	**41.38%**	**100.00%**
2018 to 2019													
Commercial	(2.69%)	(6.13%)	(3.10%)	0.90%	(0.69%)	2.53%	0.93%	39.58%	7.31%	48.95%	(1.25%)	1.32%	0.29%
General Aviation[1]	(4.73%)	8.96%	0.63%	4.89%	7.40%	2.68%	19.94%	18.75%	(5.53%)	5.63%	5.50%	(6.52%)	4.41%
Military & Other	(17.91%)	(12.03%)	(2.60%)	(4.30%)	11.73%	10.73%	(9.89%)	(1.06%)	(54.51%)	13.16%	(11.90%)	-	(11.90%)
Total	**(3.44%)**	**(1.67%)**	**(1.98%)**	**2.29%**	**4.32%**	**4.42%**	**14.66%**	**22.29%**	**(11.10%)**	**5.76%**	1.75%	**0.74%**	**1.33%**
2019 Percent of Total	**8.82%**	**6.73%**	**4.94%**	**5.62%**	**7.07%**	**4.40%**	**2.74%**	**2.26%**	**4.01%**	**12.42%**	**58.87%**	**41.23%**	**100.00%**
2019 to 2020													
Commercial	(41.82%)	(45.01%)	(30.92%)	(39.87%)	(47.73%)	(36.73%)	(54.81%)	(55.24%)	(22.69%)	(45.77%)	(40.87%)	(51.58%)	(47.34%)
General Aviation[1]	(14.07%)	(12.05%)	(11.86%)	(22.54%)	(8.93%)	(30.07%)	25.35%	(17.90%)	(0.30%)	(22.52%)	(14.23%)	(52.08%)	(17.31%)
Military & Other	19.80%	70.94%	58.98%	45.05%	12.69%	9.13%	(45.76%)	(12.62%)	(22.71%)	(1.04%)	6.88%	-	6.88%
Total	**(36.38%)**	**(33.55%)**	**(24.32%)**	**(32.46%)**	**(22.81%)**	**(23.36%)**	**6.96%**	(26.57%)	**(7.20%)**	**(22.50%)**	(24.78%)	**(51.61%)**	(35.82%)
2020 Percent of Total	**8.72%**	**6.95%**	**5.81%**	**5.90%**	**8.48%**	**5.24%**	**4.56%**	**2.59%**	**5.78%**	**14.96%**	**68.99%**	**31.01%**	**100.00%**
2020 to 2021													
Commercial	26.49%	26.60%	5.66%	43.58%	31.42%	45.13%	30.72%	(16.05%)	56.01%	93.94%	28.33%	25.49%	26.75%
General Aviation[1]	22.44%	15.31%	42.49%	29.65%	69.36%	16.69%	31.51%	19.99%	60.46%	24.28%	34.65%	73.49%	36.48%
Military & Other	16.07%	1.33%	3.51%	2.88%	46.28%	8.04%	54.96%	192.32%	118.94%	106.33%	34.22%	-	34.22%
Total	**25.22%**	**21.34%**	**18.84%**	**36.65%**	**57.57%**	**22.87%**	**31.64%**	**21.30%**	**63.68%**	**24.91%**	**32.50%**	**28.70%**	**31.33%**
2021 Percent of Total	**8.32%**	**6.42%**	**5.25%**	**6.14%**	**10.18%**	**4.90%**	**4.57%**	**2.39%**	**7.21%**	**14.23%**	**69.61%**	**30.39%**	**100.00%**

Source: Massport, Federal Aviation Administration (FAA) Tower Counts, and individual airport records.

1 Includes itinerant and local general aviation operations at the regional airports. There are no local (touch-and-go training) operations at Logan Airport.

2 Commercial operations at Hanscom Field include scheduled commercial operations only; other air taxi operations counted as GA.

3 Operations at Logan Airport include international operations.

4 Commercial, GA, and military operations at Worcester Regional have been updated compared to the previous EDR report to account for Part 139 operations not recorded by the FAA tower during the night hours when closed.

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
Jet Carriers																								
Aer Lingus	Dublin	DUB				66	305	292	287	37		-37	-				11,657	53,934	51,659	56,457	6,808		-6,808	-
Alaska	Chicago O'Hare	ORD	30										-	4,050										-
America West	Columbus	CMH	149										-	18,441										-
America West	Las Vegas	LAS	210										-	27,469										-
America West	Phoenix	PHX	275										-	37,772										-
American	Charlotte	CLT			1,775	1,918	1,982	1,968	2,108	1,323	1,284	-39	60.9%			244,756	278,511	306,378	298,319	314,805	203,464	200,794	-2,670	63.8%
American	Chicago O'Hare	ORD	2,139			240	671	636	964	177	91	-86	9.4%	304,855			35,717	102,663	101,714	154,171	25,696	15,652	-10,044	10.2%
American	Dallas/Fort Worth	DFW	1,343	1,052	695	678	678	669	590	305	426	121	72.2%	185,922	160,983	103,576	101,001	103,275	107,063	94,400	47,483	69,479	21,996	73.6%
American	Los Angeles	LAX	214			205	330	301	267	6		-6		31,244			30,588	50,150	48,137	42,578	960		-960	
American	Miami	MIA	366	413	400	365	361	361	352	190	635	445	180.5%	51,427	63,559	59,600	54,342	55,105	57,714	58,050	30,904	104,842	73,938	180.6%
American	Philadelphia	PHL			31	271	382	842	847	293		-293				3,069	28,245	38,044	93,690	109,517	38,056		-38,056	
American	New York J F Kennedy	JFK											-											-
American	San Juan	SJU	366	365									-	69,348	55,856									-
American	St. Louis	STL											-											-
American	Washington National	DCA			18	17	4						-			2,196	1,680	567						-
Boston-Maine Airways	Fort Lauderdale/Hollywood	FLL											-											-
Breeze Airways	Charleston	CHS									118	118	-									12,874	12,874	-
Breeze Airways	Columbus	CMH									93	93	-									9,813	9,813	-
Breeze Airways	Norfolk	ORF									94	94	-									9,734	9,734	-
Breeze Airways	Pittsburgh	PIT									94	94	-									9,932	9,932	-
Continental	Cleveland	CLE	582										-	68,974										-
Continental	Houston Intercontinental	IAH	366										-	45,790										-
Continental	New York Newark	EWR	331										-	38,916										-
Delta	Atlanta	ATL	2,192	2,099	2,374	2,360	2,290	2,335	2,391	1,440	1,727	287	72.2%	392,835	300,185	354,751	354,943	343,403	367,313	386,814	224,463	259,608	35,145	67.1%
Delta	Boston	BOS	4										-	634										-
Delta	Cancun	CUN		35	35	39	35	35	17	13		-13			5,470	5,207	5,956	5,049	5,584	3,086	2,340		-2,340	
Delta	Cincinnati	CVG	1,464		4								-	244,837		471								-
Delta	Detroit	DTW		1,003	1,375	1,366	1,333	1,308	1,522	220	294	74	19.3%		129,228	187,833	184,729	183,762	199,048	190,939	29,299	39,738	10,439	20.8%
Delta	Fort Lauderdale/Hollywood	FLL	732	237									-	87,108	33,674									-

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Delta	Fort Myers	RSW		99									-		13,104									-
Delta	Las Vegas	LAS		9									-		1,394									-
Delta	Los Angeles	LAX		83									-		13,257									-
Delta	Minneapolis	MSP		758	858	662	803	931	1,007	205	379	174	37.6%		99,431	114,722	96,039	105,445	129,502	131,162	26,822	62,942	36,120	48.0%
Delta	New York J F Kennedy	JFK	183										-	39,894										-
Delta	Orlando	MCO	1,838	261		4			9					218,705	99,129		471			959				
Delta	Salt Lake City	SLC											-											-
Delta	Tampa	TPA		813									-		33,625									-
Delta	West Palm Beach	PBI	732	205									-	87,108	37,536									-
Frontier	Denver	DEN							96	40	49	9	51.0%							17,280	7,604	8,946	1,342	51.8%
Frontier	Miami	MIA							30	34	26	-8	85.4%							5,477	6,276	4,836	-1,440	88.3%
Frontier	Orlando	MCO							127	134	196	62	154.2%							28,136	27,564	38,222	10,658	135.8%
Frontier	Raleigh/Durham	RDU							83		54	54	64.9%							14,966		10,026	10,026	67.0%
Frontier	Atlanta	ATL									64	64	-									11,904	11,904	-
Frontier	Burlington	BTV								6		-6	-								1,116		-1,116	-
jetBlue	Washington National	DCA			730	714	730	717	349							85,300	77,600	73,000	71,686	34,914				
jetBlue	Fort Lauderdale/Hollywood	FLL		101	590	568	726	739	691	409	629	220	91.0%		15,086	88,479	85,264	108,836	110,371	103,714	64,592	96,036	31,444	92.6%
jetBlue	Fort Myers	RSW			212	242	242	242	242	257	207	-50	85.5%			31,800	36,300	36,300	36,300	38,740	39,606	35,962	-3,644	92.8%
jetBlue	Orlando	MCO		101	730	746	730	730	826	482	641	159	77.6%		15,086	109,500	111,100	109,500	109,500	123,879	75,890	102,046	26,156	82.4%
jetBlue	San Juan	SJU			465	561	587	497	660	354	467	113	70.7%			69,686	84,150	88,114	74,550	99,043	55,164	74,502	19,338	75.2%
jetBlue	Tampa	TPA			365	365	409	417	365	215	346	131	94.8%			48,750	54,750	61,286	62,550	54,750	33,982	55,218	21,236	100.9%
jetBlue	West Palm Beach	PBI			365	387	365	365	446	288	404	116	90.6%			45,550	51,929	51,700	54,750	71,737	45,500	58,472	12,972	81.5%
jetBlue	Cancun	CUN								15	209	194	-								2,334	33,450	31,116	-
jetBlue	Las Vegas	LAS								2	183	181	-								324	29,394	29,070	-
jetBlue	Los Angeles	LAX								4	191	187	-								624	30,690	30,066	-
jetBlue	Miami	MIA									149	149	-									24,078	24,078	-
jetBlue	San Francisco	SFO								3	128	125	-								486	20,652	20,166	-
Laker Airways (Bahamas)	Freeport	FPO	39										-	5,850										-
Midway Airlines	Raleigh/Durham	RDU	683										-	69,213										-
Midwest/ Republic	Milwaukee	MKE	619										-	44,455										-

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Northwest	Amsterdam	AMS											-											-
Northwest	Detroit	DTW	1,699										-	215,750										-
Northwest	Fort Myers	RSW											-											-
Northwest	Minneapolis	MSP	1,177										-	135,570										-
Northwest	Orlando	MCO											-											-
Northwest	Tampa	TPA											-											-
Northwest	West Palm Beach	PBI											-											-
Norwegian Air	Edinburgh	EDI					70	26					-					13,124	4,860					-
Southwest	Atlanta	ATL			172								-			24,482								-
Southwest	Baltimore	BWI	2,841	2,700	2,435	2,514	2,486	2,343	2,000	1,251	1,191	-60	59.5%	389,158	367,534	353,038	372,278	363,930	344,395	294,277	189,965	186,057	-3,908	63.2%
Southwest	Chicago Midway	MDW	723	923	974	966	944	949	883	480	522	42	59.1%	99,090	126,412	147,672	148,701	139,257	148,117	135,369	74,624	85,462	10,838	63.1%
Southwest	Denver	DEN		306	374	374	404	391	327	190	190		58.0%		41,922	61,917	60,234	67,673	66,912	54,781	31,906	32,930	1,024	60.1%
Southwest	Fort Lauderdale/Hollywood	FLL		70	387	387	387	382	242	125	11	-114	4.5%		9,551	57,309	56,240	59,892	58,854	37,591	18,291	1,829	-16,462	4.9%
Southwest	Fort Myers	RSW			212	212	276	227	229	195	61	-134	26.6%			30,586	30,586	42,698	35,041	35,794	30,381	10,419	-19,962	29.1%
Southwest	Las Vegas	LAS	52	361	306	306	245	232					-	7,163	49,398	44,037	46,551	40,640	38,879					-
Southwest	Nashville	BNA	672	361							256	256	-	92,064	49,398							40,544	40,544	-
Southwest	Orlando	MCO	375	1,016	1,003	999	1,056	995	1,008	692	508	-184	50.4%	51,336	139,212	151,806	156,562	157,068	151,005	154,334	112,972	81,220	-31,752	52.6%
Southwest	Philadelphia	PHL											-											-
Southwest	St. Louis	STL						153	356	138	1	-137	0.3%						25,225	58,077	22,774	143	-22,631	0.2%
Southwest	Tampa	TPA		570	651	642	712	665	686	340	314	-26	45.8%		78,129	93,905	93,646	108,758	106,234	108,402	53,740	49,446	-4,294	45.6%
Southwest	West Palm Beach	PBI			4	4	9	4	4							633	633	1,246	633	633				
Spirit	Fort Lauderdale/Hollywood	FLL					184	507	521	298	316	18	60.7%					26,680	83,055	83,934	50,795	59,177	8,382	70.5%
Spirit	Fort Myers	RSW					61	142	151	109	66	-43	43.6%					11,102	25,870	27,534	18,913	11,759	-7,154	42.7%
Spirit	Myrtle Beach	MYR					140	258	258	203	406	203	157.4%					25,558	46,025	45,656	34,874	73,892	39,018	161.8%
Spirit	Orlando	MCO					245	643	696	352	491	139	70.6%					37,782	106,128	114,939	57,071	82,486	25,415	71.8%
Spirit	Tampa	TPA					61	195	212	180	86	-94	40.6%					11,102	35,412	38,532	31,391	15,319	-16,072	39.8%
Spirit	Miami	MIA									40	40	-									8,016	8,016	-
Sun Country	Orlando	MCO									13	13	-									2,418	2,418	-
Sun Country	Minneapolis	MSP									43	43	-									6,450	6,450	-

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Sunwing Airlines	Barbados	BGI								1		-1	-								189		-189	-
Sunworld International	Philadelphia	PHL											-											-
Trans World Airlines	Portland (ME)	PWM	305										-	43,310										-
Trans World Airlines	St. Louis	STL	1,460										-	206,109										-
United	Chicago O'Hare	ORD	2,034	1,296	554	605	727	897	988	202	250	48	25.3%	299,522	198,709	72,529	84,972	100,094	122,199	145,068	28,476	34,265	5,789	23.6%
United	Denver	DEN	366			275	365	365	365	246	364	118	99.7%	46,901			36,838	53,945	54,996	60,713	33,650	56,065	22,415	92.3%
United	New York Newark	EWR					190	226					-					27,237	33,464					-
United	San Francisco	SFO	366				75	92					-	45,384				8,983	11,776					-
United	Washington Dulles	IAD	1,455	1,192	82	472	430	858	750	114	439	325	58.5%	173,869	155,750	11,182	73,998	64,261	129,208	111,930	16,678	66,391	49,713	59.3%
United	Detroit	DTW								2		-2	-								358		-358	-
United	Houston	IAH									1	1	-									166	166	-
United	Stillwater	SWO									1	1	-									166	166	-
US Airways	Baltimore	BWI	488										-	41,760										-
US Airways	Charlotte	CLT	1,464	1,588									-	214,719	228,119									-
US Airways	Fort Lauderdale/Hollywood	FLL	366										-	39,232										-
US Airways	Orlando	MCO	1,098										-	117,696										-
US Airways	Philadelphia	PHL	2,148	361									-	310,118	49,914									-
US Airways	Phoenix	PHX											-											-
US Airways	Pittsburgh	PIT	1,800										-	278,575										-
US Airways	Washington Dulles	IAD	732										-	86,376										-
US Airways	Washington National	DCA	1,329	361									-	171,891	51,434									-
US Airways	West Palm Beach	PBI	366										-	39,232										-
USA 3000 Airlines	Cancun	CUN											-											-
USA 3000 Airlines	Punta Cana	PUJ											-											-
Subtotal			**38,171**	**18,695**	**18,175**	**19,530**	**22,030**	**23,934**	**23,953**	**11,570**	**14,748**	**3,178**	**61.6%**	**5,179,671**	**2,622,086**	**2,604,342**	**2,846,211**	**3,237,541**	**3,607,739**	**3,643,137**	**1,804,405**	**2,334,462**	**530,057**	**64.1%**

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
Regional/ Commuter Carriers																								
Air Canada Express	Montreal Dorval	YUL	1,385	1,021	1,008	1,038	1,021	684	343	73		-73		19,392	19,399	18,141	18,692	18,381	18,894	17,042	3,650		-3,650	
Air Canada Express	Toronto	YYZ	1,589	1,287	1,395	1,399	1,391	1,352	1,013	148		-148		61,991	36,960	25,118	35,328	40,045	45,448	46,424	7,400		-7,400	
America West Express	Columbus	CMH	450										-	22,493										-
American Connection	St. Louis	STL											-											-
American Eagle	Charlotte	CLT			290	156	127	157	91	117	320	203	350.0%			22,265	11,774	10,062	11,609	6,474	8,892	23,990	15,098	370.6%
American Eagle	Chicago O'Hare	ORD		1,501	1,604	1,421	685	718	546	572	909	337	166.4%		79,594	115,366	93,468	43,137	46,412	38,769	40,036	66,422	26,386	171.3%
American Eagle	New York J F Kennedy	JFK	1,460										-	48,166										-
American Eagle	Philadelphia	PHL			2,502	2,133	1,684	1,249	914	669	1,392	723	152.3%			146,222	123,285	103,743	73,671	53,306	41,327	92,787	51,460	174.1%
American Eagle	Pittsburgh	PIT			782								-			39,086								-
American Eagle	Raleigh/Durham	RDU		257									-		10,774									-
American Eagle	St. Louis	STL											-											-
American Eagle	Washington National	DCA			2,125	2,251	2,476	2,184	2,064	672	935	263	45.3%			130,975	142,309	147,169	124,991	124,954	44,551	65,756	21,205	52.6%
American Eagle	Miami	MIA								74	86	12	-								5,624	6,536	912	-
American Eagle	Dallas/Fort Worth	DFW									1	1	-									76	76	-
Continental Connection	Albany	ALB											-											-
Continental Connection	Binghamton	BGM											-											-
Continental Connection	Boston	BOS											-											-
Continental Connection	Buffalo	BUF	89										-	1,683										-
Continental Connection	Burlington	BTV	4										-	84										-
Continental Connection	New York J F Kennedy	JFK											-											-
Continental Connection	New York Newark	EWR		608									-		22,485									-
Continental Connection	Philadelphia	PHL											-											-

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Continental Connection	Rochester	ROC	93										-	1,767										-
Continental Connection	Syracuse	SYR	97										-	1,851										-
Continental Express	Cleveland	CLE	803	1,208									-	39,357	60,400									-
Continental Express	New York Newark	EWR	1,747	465									-	82,365	23,264									-
Delta Connection	Atlanta	ATL			4								-			326								-
Delta Connection	Cincinnati	CVG		1,218	475	300	308	305	313	72		-72			61,642	25,537	22,800	22,353	22,251	22,679	5,472		-5,472	
Delta Connection	Cleveland	CLE			243	266	300	304	313	72		-72				15,450	19,798	22,800	23,106	23,777	5,472		-5,472	
Delta Connection	Columbus	CMH											-											-
Delta Connection	Detroit	DTW		1,004	313	264	271	78	27	883	904	21	3402.2%		54,265	20,860	18,905	20,193	5,939	2,019	66,999	67,993	994	3366.9%
Delta Connection	Fort Lauderdale/Hollywood	FLL											-											-
Delta Connection	Fort Myers	RSW											-											-
Delta Connection	Indianapolis	IND											-											-
Delta Connection	Minneapolis	MSP		481	342	539	467	331	345	513	625	112	181.3%		36,567	25,556	40,845	34,547	25,123	25,844	38,981	46,845	7,864	181.3%
Delta Connection	Myrtle Beach	MYR	61										-	3,057										-
Delta Connection	New York J F Kennedy	JFK		365									-		18,250									-
Delta Connection	Orlando	MCO			35	8	9	13					-			2,354	641	662	938					-
Delta Connection	Raleigh/Durham	RDU		100	261	253	308	313	313	78		-78			6,136	17,611	18,054	23,441	23,454	23,777	5,907		-5,907	
Delta Connection	Tampa	TPA											-											-
Delta Connection	Washington National	DCA		166									-		11,324									-
Delta Connection	West Palm Beach	PBI											-											-
Frontier Express	Milwaukee	MKE		140									-		6,313									-
Independence Air	Washington Dulles	IAD											-											-
Midway Airlines	Raleigh/Durham	RDU	1,348										-	67,393										-
Midwest Connect	Milwaukee	MKE	4										-	142										-
Northwest Airlink	Detroit	DTW											-											-
Northwest Airlink	Indianapolis	IND											-											-
Northwest Airlink	Memphis	MEM											-											-
Northwest Airlink	Minneapolis	MSP											-											-

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
OneJet	Pittsburgh	PIT				289	521	346					-				2,597	4,344	5,706					-
Shuttle America	Albany	ALB	66										-	3,286										-
Shuttle America	Bedford	BED	233										-	11,671										-
Shuttle America	Buffalo	BUF	337										-	16,857										-
Shuttle America	Islip	ISP	27										-	1,329										-
Shuttle America	Wilmington	ILG	159										-	7,936										-
Swissair	New York J F Kennedy	JFK	31										-	1,023										-
Trans World Airlines	New York J F Kennedy	JFK	1,098										-	31,842										-
United Express	Chicago O'Hare	ORD		548	904	696	509	617	338	646	744	98	220.1%		36,797	60,980	45,255	34,256	40,539	23,571	46,090	48,794	2,704	207.0%
United Express	Cleveland	CLE											-											-
United Express	Houston	IAH			365	361	293	100	352	86	100	14	28.4%			26,998	25,240	20,583	6,982	24,650	6,530	7,468	938	30.3%
United Express	New York Newark	EWR			1,335	1,357	866	533					-			65,086	69,442	39,881	27,903					-
United Express	Washington Dulles	IAD		494	1,243	870	965	581	680	702	493	-209	72.5%		30,270	77,783	56,035	61,327	38,720	47,246	49,844	35,070	-14,774	74.2%
US Airways Express	Baltimore	BWI	1,185										-	43,850										-
US Airways Express	Buffalo	BUF	1,032										-	38,200										-
US Airways Express	Charlotte	CLT		537									-		45,043									-
US Airways Express	New York La Guardia	LGA		139									-		5,159									-
US Airways Express	New York Newark	EWR											-											-
US Airways Express	Philadelphia	PHL		2,404									-		183,838									-
US Airways Express	Pittsburgh	PIT		939									-		46,929									-
US Airways Express	Rochester	ROC	937	478									-	34,658	16,242									-
US Airways Express	Syracuse	SYR	732										-	27,084										-
US Airways Express	Washington National	DCA		1,334									-		89,629									-
Subtotal			**14,968**	**16,694**	**15,226**	**13,601**	**12,201**	**9,863**	**7,651**	**5,377**	**6,509**	**1,132**	**85.1%**	**567,477**	**901,282**	**835,714**	**744,468**	**646,924**	**541,685**	**480,533**	**376,775**	**461,737**	**84,962**	**96.1%**
Total			**53,139**	**35,389**	**33,402**	**33,131**	**34,231**	**33,797**	**31,605**	**16,947**	**21,257**	**4,310**	**67.3%**	**5,747,148**	**3,523,368**	**3,440,056**	**3,590,679**	**3,884,465**	**4,149,424**	**4,123,671**	**2,181,180**	**2,796,199**	**615,019**	**67.8%**

Source: OAG Schedules.

Notes: Allegiant stopped reporting to OAG between 2009-2016, during that period statistics from the T100 database were referenced.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F Green Airport

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Jet Carriers																								
Allegiant Airways	Cincinnati	CVG					13	39	26	22	24	2	91.3%					2,028	6,954	4,653	3,894	4,125	231	5.9%
Allegiant Airways	Punta Gorda	PGD					27	70	100	127	121	-6	121.0%					4,779	12,390	17,700	22,479	21,453	-1,026	-4.6%
Allegiant Airways	St. Petersburg/Clearwater	PIE					19	61					-					3,363	9,901				-	-
Allegiant Airways	Savannah	SAV							52				-							9,255			-	-
American	Charlotte	CLT			1,176	1,274	1,392	1,465	1,366	878	711	-167	52.0%			170,310	189,856	213,892	227,561	208,083	140,531	106,722	-33,809	-24.1%
American	Chicago O'Hare	ORD	1,464								1	1	-	203,104								150	150	-
American	Dallas/Fort Worth	DFW											-										-	-
American	Miami	MIA							73				-							9,362			-	-
American	Philadelphia	PHL			366	520	995	1,186	914	209		-209	-			36,514	50,988	97,768	131,961	112,780	25,186		-25,186	-100.0%
American	Washington National	DCA			52								-			6,483							-	-
Breeze Airways	Charleston	CHS									95	95	-									10,260	10,260	-
Breeze Airways	Norfolk	ORF									91	91	-									9,443	9,443	-
Breeze Airways	Pittsburgh	PIT									90	90	-									9,335	9,335	-
Continental	Cleveland	CLE	569										-	69,771									-	-
Continental	Houston Intercontinental	IAH	366										-	45,946									-	-
Continental	New York Newark	EWR	738										-	96,448									-	-
Condor	Frankfurt	FRA			22	18							-			5,940	4,783						-	-
Delta	Atlanta	ATL	1,464	510	997	1,060	1,047	1,035	1,043	262	711	449	68.2%	207,888	72,461	148,078	156,507	155,384	154,567	157,584	38,458	104,907	66,449	172.8%
Delta	Cincinnati	CVG	732										-	103,944									-	-
Delta	Detroit	DTW		414	707	719	715	414	414	87		-87	-		50,065	87,078	91,281	90,875	54,004	52,203	13,609		-13,609	-100.0%
Delta	Fort Lauderdale/Hollywood	FLL											-										-	-
Delta	Minneapolis	MSP		74							42	42	-		9,211							5,569	5,569	-
Delta	Orlando	MCO	732										-	87,108									-	-
Frontier	Atlanta	ATL						39			23	23	-						7,020			4,272	4,272	-
Frontier	Austin	AUS						35					-						6,249				-	-
Frontier	Charlotte	CLT						131	114				-						30,097	21,569			-	-
Frontier	Denver	DEN					144	179	74				-					25,946	35,037	13,397			-	-
Frontier	Fort Myers	RSW					53	65	56	47	70	23	124.7%					12,091	14,194	10,106	8,652	12,948	4,296	49.7%
Frontier	Miami	MIA					92	90			64	64	-					16,560	16,200			11,880	11,880	-
Frontier	Myrtle Beach	MYR						70			25	25	-						16,067			4,650	4,650	-

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F Green Airport (Continued)

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
Frontier	New Orleans	MSY					39	25					-					5,914	3,793				-	-
Frontier	Orlando	MCO					153	308	252	165	264	99	104.7%					32,140	63,943	50,550	35,700	49,394	13,694	38.4%
Frontier	Philadelphia	PHL									25	25	-									4,644	4,644	-
Frontier	Portland	PWM									1	1	-									186	186	-
Frontier	Raleigh/Durham	RDU						96	57				-						22,080	10,234			-	-
Frontier	Tampa	TPA					39	135	95	57	125	68	131.8%					9,069	26,151	17,074	10,524	23,282	12,758	121.2%
jetBlue	Fort Lauderdale/Hollywood	FLL			365	365	365	365	365	178	210	32	57.5%			54,750	54,750	54,750	54,750	54,750	28,104	33,526	5,422	19.3%
jetBlue	Orlando	MCO			713	713	713	642	598	271	361	90	60.3%			106,886	106,886	106,886	93,850	89,764	41,682	59,628	17,946	43.1%
jetBlue	West Palm Beach	PBI							297	138	174	36	58.5%							44,614	21,672	26,420	4,748	21.9%
jetBlue	Fort Myers	RSW								44	135	91	-								6,936	15,252		
jetBlue	Tampa	TPA								45	114	69	-								6,966	16,140		
Laker Airways (Bahamas)	Freeport	FPO											-										-	-
Northwest	Detroit	DTW	1,682										-	200,509									-	-
Northwest	Minneapolis	MSP											-										-	-
Norwegian Air	Belfast	BFS					35	61					-					6,642	11,556				-	-
Norwegian Air	Bergen	BGO					35						-					6,642					-	-
Norwegian Air	Cork	ORK					70	117	26				-					13,257	22,194	4,941			-	-
Norwegian Air	Dublin	DUB					114	252	222				-					21,546	47,709	41,711			-	-
Norwegian Air	Edinburgh	EDI					88	117					-					16,578	22,194				-	-
Norwegian Air	Fort De France	FDF					17	26					-					3,259	4,809				-	-
Norwegian Air	Pointe-A-Pitre	PTP					17	26					-					3,259	4,809				-	-
Norwegian Air	Shannon	SNN					53	148	35				-					9,936	27,972	6,588			-	-
SATA Internacional	Ponta Delgada	PDL				9	22	17					-				1,966	4,852	3,983				-	-
Southern Airways Express	Nantucket	ACK							96				-							868			-	-
Southwest	Baltimore	BWI	3,913	3,260	2,793	2,793	2,719	2,602	2,189	1,458	1,301	-157	59.4%	535,911	442,637	407,651	414,057	401,718	384,098	325,736	219,374	203,899	-15,475	-7.1%
Southwest	Chicago Midway	MDW	1,072	1,135	988	996	953	948	828	464	382	-82	46.2%	146,844	153,121	158,640	153,783	147,916	147,685	132,158	74,480	60,322	-14,158	-19.0%
Southwest	Denver	DEN											-										-	-
Southwest	Fort Lauderdale/Hollywood	FLL	9	594	477	485	507	528	446	228	119	-109	26.7%	1,194	81,378	70,778	74,477	78,412	81,576	66,813	35,484	18,137	-17,347	-48.9%

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F Green Airport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Southwest	Fort Myers	RSW			48	52	82	91	61	63	44	-19	72.3%			7,305	7,918	12,046	13,292	9,109	9,009	6,708	-2,301	-25.5%
Southwest	Houston	HOU	152										-	20,824									-	-
Southwest	Islip	ISP	608									-	-	83,237									-	-
Southwest	Kansas City	MCI	366									-	-	50,142									-	-
Southwest	Las Vegas	LAS		365								-	-		50,005								-	-
Southwest	Nashville	BNA	706	296									-	96,702	39,578								-	-
Southwest	Orlando	MCO	955	1,799	1,464	1,469	1,390	1,294	1,253	830	786	-44	62.8%	130,855	245,156	215,253	219,994	209,238	205,374	198,408	129,826	123,086	-6,740	-5.2%
Southwest	Philadelphia	PHL		1,402									-		192,054								-	-
Southwest	Phoenix	PHX	366	361									-	50,142	49,398								-	-
Southwest	Tampa	TPA	745	813	735	713	673	585	588	179	408	229	69.4%	102,065	111,231	108,451	107,723	100,790	89,945	92,161	27,869	63,240	35,371	126.9%
Southwest	West Palm Beach	PBI			31	31	22	4	4	6		-6	-			4,433	4,433	3,105	775	633	858		-858	-100.0%
Southwest	Washington National	DCA				122	730	730	752	487	104	-383	13.8%				19,119	104,390	105,633	109,189	69,737	14,904	-54,833	-78.6%
Southwest	St. Louis	STL								16		-16	-								2,288			
Spirit	Detroit	DTW											-										-	-
Spirit	Fort Lauderdale/Hollywood	FLL											-										-	-
Spirit	Fort Myers	RSW											-										-	-
Sun Country	Las Vegas	LAS							30				-							4,929			-	-
Sun Country	Minneapolis	MSP							127	34	54	20	42.6%							19,746	6,324	9,936	3,612	57.1%
Sun Country	Nashville	BNA							122				-							18,555			-	-
Sun Country	New Orleans	MSY							22				-							3,518			-	-
TACV	Praia	RAI			39	74	65	4					-			7,739	14,578	13,003	872				-	-
United	Chicago O'Hare	ORD	1,477	644	144	236		57		1		-1	-	239,076	82,802	17,570	31,940		7,241		179		-179	-100.0%
United	Washington Dulles	IAD									8	8	-									1,197	1,197	-
US Airways	Baltimore	BWI	2,462										-	263,921									-	-
US Airways	Charlotte	CLT	977	1,643									-	128,984	233,886								-	-
US Airways	Fort Lauderdale/Hollywood	FLL											-										-	-
US Airways	Orlando	MCO	52										-	5,605									-	-
US Airways	Philadelphia	PHL	1,830	1,299									-	253,015	130,008								-	-
US Airways	Pittsburgh	PIT	1,339										-	185,109									-	-

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F Green Airport (Continued)

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
US Airways	Washington National	DCA	1,333	365									-	167,278	49,501								-	-
Subtotal			**26,108**	**14,974**	**11,116**	**11,649**	**13,399**	**14,057**	**12,698**	**6,296**	**6,683**	**387**	**52.6%**	**3,475,622**	**1,992,492**	**1,613,859**	**1,705,039**	**1,988,034**	**2,168,485**	**1,918,741**	**979,821**		**-979,821**	**-100.0%**
Regional/ Commuter Carriers																								
Air Canada Express	Toronto	YYZ	989	625				140	105				-	37,482	11,880				6,986	5,243			-	-
American Eagle	Charlotte	CLT			341	301	187	266	278	295	613	318	220.6%			26,810	25,452	15,629	19,929	20,865	21,881	46,445	24,564	112.3%
American Eagle	Chicago O'Hare	ORD				550	717	704	909	447	749	302	82.4%				34,650	45,162	51,465	69,117	33,972	53,701	19,729	58.1%
American Eagle	Detroit	DTW											-										-	-
American Eagle	New York J F Kennedy	JFK	1,291										-	42,589									-	-
American Eagle	New York La Guardia	LGA	2,756										-	90,957									-	-
American Eagle	Raleigh/Durham	RDU											-										-	-
American Eagle	Philadelphia	PHL			2,163	1,982	1,035	791	895	741	1,136	395	126.9%			142,721	127,895	77,726	58,489	61,358	49,462	76,637	27,175	54.9%
American Eagle	Washington National	DCA			1,755	2,112	2,252	2,242	2,247	901	935	34	41.6%			111,865	138,655	148,758	135,774	139,649	61,757	65,515	3,758	6.1%
Cape Air	Block Island	BID			418								-			3,765							-	-
Cape Air	Hyannis	HYA											-										-	-
Cape Air	Martha's Vineyard	MVY	1,762	747	192								-	15,861	6,722	1,725							-	-
Cape Air	Nantucket	ACK	2,453	681	244								-	22,073	6,128	2,196							-	-
Continental Connection	Albany	ALB											-										-	-
Continental Connection	Boston	BOS											-										-	-
Continental Connection	New York Newark	EWR		427									-		31,630								-	-
Continental Connection	Plattsburgh	PLB											-										-	-
Continental Connection	Washington Dulles	IAD											-										-	-
Continental Express	Cleveland	CLE	699	1,217									-	34,936	60,836								-	-
Continental Express	New York Newark	EWR	1,482	1,028									-	86,552	51,407								-	-
Delta Connection	Atlanta	ATL		724	43								-		52,959	3,001							-	-
Delta Connection	Cincinnati	CVG		43									-		2,150								-	-
Delta Connection	Detroit	DTW		1,324	289	324	279	769	804	236	583	347	72.5%		78,701	18,671	22,103	20,162	56,330	60,218	17,033	43,369	26,336	154.6%

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F Green Airport (Continued)

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
Delta Connection	Minneapolis	MSP		347									-		26,192								-	-
Delta Connection	New York J F Kennedy	JFK											-										-	-
Delta Connection	New York La Guardia	LGA	610										-	19,520									-	-
Delta Connection	Raleigh/Durham	RDU											-										-	-
Delta Connection	Washington National	DCA											-										-	-
Independence Air	Washington Dulles	IAD											-										-	-
Midway Airlines	Raleigh/Durham	RDU											-										-	-
Northwest Airlink	Detroit	DTW											-										-	-
Northwest Airlink	Minneapolis	MSP											-										-	-
OneJet	Pittsburgh	PIT					87	149					-					610	1,045				-	-
United Express	Chicago O'Hare	ORD		455	605	464	673	610	942	382	375	-7	39.8%		29,820	34,473	24,750	42,292	39,764	51,047	25,546	25,414	-132	-0.5%
United Express	Cleveland	CLE											-										-	-
United Express	New York Newark	EWR			1,356	1,355	1,382	1,255	1,043	462	609	147	58.4%			73,682	64,804	71,607	72,633	54,037	25,358	35,004	9,646	38.0%
United Express	Washington Dulles	IAD	1,468	1,569	837	886	782	1,089	1,084	620	839	219	77.4%	52,832	99,719	52,139	55,328	46,877	67,692	66,611	36,280	41,950	5,670	15.6%
US Airways Express	Albany	ALB	679										-	12,898									-	-
US Airways Express	Boston	BOS	48										-	909									-	-
US Airways Express	Charlotte	CLT		126									-		10,047								-	-
US Airways Express	Hyannis	HYA											-										-	-
US Airways Express	Nantucket	ACK											-										-	-
US Airways Express	New York La Guardia	LGA	2,298	1,222									-	84,116	45,225								-	-
US Airways Express	New York Newark	EWR	1,569										-	31,176									-	-
US Airways Express	Philadelphia	PHL	366	1,526									-	13,542	107,790								-	-
US Airways Express	Pittsburgh	PIT											-										-	-
US Airways Express	Plattsburgh	PLB	26										-	497									-	-
US Airways Express	Washington National	DCA		1,373									-		92,151								-	-
Subtotal			**18,527**	**13,436**	**8,243**	**7,974**	**7,394**	**8,015**	**8,306**	**4,084**	**5,839**	**1,755**	**70.3%**	**546,963**	**713,356**	**471,048**	**493,637**	**468,823**	**510,107**	**528,146**	**271,289**	**388,035**	**116,746**	**43.0%**
Total			**44,635**	**28,409**	**19,359**	**19,623**	**20,793**	**22,072**	**21,004**	**10,380**	**12,522**	**2,142**	**59.6%**	**4,022,585**	**2,705,848**	**2,084,907**	**2,198,676**	**2,456,857**	**2,678,592**	**2,446,887**	**1,251,110**	**388,035**	**-863,075**	**-69.0%**

Source: OAG Schedules.

Notes: Allegiant stopped reporting to OAG between 2009-2016, during that period statistics from the T100 database were referenced.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-5 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Jet Carriers																								
American	Charlotte	CLT					52						-					6,674						-
American	Philadelphia	PHL						562	155										55,652	18,005				
Boston-Maine Airways	Myrtle Beach	MYR											-											-
Boston-Maine Airways	Portsmouth	PSM											-											-
Boston-Maine Airways	Sanford	SFB											-											-
Continental	Cleveland	CLE	130										-	16,151										-
Continental	New York Newark	EWR	462										-	62,358										-
Delta	Atlanta	ATL	244	275	365	365	365	361	271	16		-16		34,648	39,050	53,545	54,212	55,172	50,903	40,520	2,400		-2,400	
Delta	Cincinnati	CVG											-											-
Delta	Detroit	DTW		796	122	87	26	61					-		89,289	14,414	9,881	2,829	6,710					-
Delta	New York - LGA	LGA			4					2		-2	-			596					220		-220	-
Northwest	Detroit	DTW	1,609										-	194,058										-
Northwest	Minneapolis	MSP											-											-
Southwest	Baltimore	BWI	2,828	2,891	2,476	2,576	2,393	2,061	1,947	1,372	1,286	-86	66.0%	387,397	393,093	363,524	383,914	353,543	306,438	286,174	201,796	197,594	-4,202	69.0%
Southwest	Chicago Midway	MDW	706	1,144	948	996	922	896	822	398	353	-45	43.0%	96,702	155,466	148,825	153,459	143,869	140,510	124,338	63,186	56,111	-7,075	45.1%
Southwest	Denver	DEN											-											-
Southwest	Fort Lauderdale/Hollywood	FLL		9	4			4					-		1,194	633			613					-
Southwest	Kansas City	MCI	366										-	50,142										-
Southwest	Las Vegas	LAS		365	9								-		50,005	1,246								-
Southwest	Nashville	BNA	397										-	54,389										-
Southwest	Orlando	MCO	410	1,125	743	765	764	768	638	595	463	-132	72.6%	56,111	154,145	113,888	118,422	115,387	121,091	100,116	97,885	71,521	-26,364	71.4%
Southwest	Philadelphia	PHL		1,411									-		192,456									-
Southwest	Phoenix	PHX		322									-		44,114									-
Southwest	Tampa	TPA		782	479	487	461	470	439	266	81	-185	18.4%		107,173	70,529	71,922	67,276	73,837	69,350	41,814	12,511	-29,303	18.0%
Spirit	Fort Lauderdale	FLL									84	84	-									15,288	15,288	-
Spirit	Fort Myers	RSW									26	26	-									3,770	3,770	-
Spirit	Orlando	MCO									86	86	-									15,652	15,652	-
Spirit	Tampa	TPA									19	19	-									3,458	3,458	-

Table F-5 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport (Continued)

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
United	Chicago O'Hare	ORD	1,403									-	-	221,523									-	-
United	Portland (ME)	PWM	57									-	-	7,241									-	-
US Airways	Baltimore	BWI	1,782									-	-	191,078									-	-
US Airways	Charlotte	CLT		365								-	-		52,560								-	-
US Airways	Orlando	MCO	52									-	-	5,605									-	-
US Airways	Philadelphia	PHL	1,821	365	351							-	-	222,331	33,132	34,791							-	-
US Airways	Pittsburgh	PIT	1,085									-	-	139,837									-	-
US Airways	Washington National	DCA	675									-	-	82,085									-	-
Subtotal			**14,026**	**9,850**	**5,150**	**5,276**	**4,983**	**5,181**	**4,272**	**2,649**	**2,398**	**-251**	**56.1%**	**1,821,657**	**1,311,677**	**767,200**	**791,810**	**744,750**	**755,753**	**638,505**	**407,301**	**375,905**	**-31,396**	**58.9%**
Regional/ Commuter Carriers																								
Air Canada Express	Montreal Dorval	YUL										-	-										-	-
Air Canada Express	Toronto	YYZ	339	707								-	-	5,616	13,441								-	-
American Eagle	Charlotte	CLT			730	734	809	1,135	1,288	1,030	1,081	51	83.9%			54,688	60,890	67,927	85,018	92,149	74,655	80,660	6,005	87.5%
American Eagle	Chicago O'Hare	ORD							428	422	565	143	132.0%							26,964	27,430	37,718	10,288	139.9%
American Eagle	New York La Guardia	LGA	1,833									-	-	60,480									-	-
American Eagle	Philadelphia	PHL			2,237	2,090	2,066	1,420	1,759	962	1,139	177	64.8%			152,206	136,795	129,174	81,818	97,028	53,116	62,892	9,776	64.8%
American Eagle	Washington National	DCA			1,152	1,304	1,316	1,146	1,161	477	531	54	45.8%			74,008	85,620	84,908	80,357	80,532	29,373	38,979	9,606	48.4%
Boston-Maine Airways	Bangor	BGR										-	-										-	-
Boston-Maine Airways	Martha's Vineyard	MVY										-	-										-	-
Boston-Maine Airways	Nantucket	ACK										-	-										-	-
Boston-Maine Airways	New London/Groton	GON										-	-										-	-
Boston-Maine Airways	Portsmouth	PSM										-	-										-	-
Boston-Maine Airways	Saint John	YSJ										-	-										-	-
Continental Connection	Albany	ALB	80									-	-	1,515									-	-

Table F-5 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport (Continued)

			Departures											Departing Seats										
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Continental Connection	New York J F Kennedy	JFK											-											-
Continental Connection	New York Newark	EWR		141									-		9,483									-
Continental Connection	Plattsburgh	PLB											-											-
Continental Connection	Rochester	ROC	44										-	841										-
Continental Connection	Syracuse	SYR	22										-	421										-
Continental Connection	Westchester County	HPN											-											-
Continental Express	Cleveland	CLE	593	1,178									-	29,614	58,921									-
Continental Express	New York Newark	EWR	1,028	1,267									-	64,944	63,336									-
Delta Connection	Atlanta	ATL	488	90									-	24,400	6,300									-
Delta Connection	Bangor	BGR	244										-	12,200										-
Delta Connection	Cincinnati	CVG	1,673										-	83,657										-
Delta Connection	Detroit	DTW		499	912	935	961	939	1,043	312		-312			32,795	51,960	60,782	69,124	68,596	75,566	22,827		-22,827		
Delta Connection	New York J F Kennedy	JFK											-											-
Delta Connection	New York La Guardia	LGA	727		970	804	789	598	326	66		-66		36,357		55,968	49,250	48,605	35,805	18,350	3,300		-3,300	
Delta Connection	Minneapolis	MSP											-											-
Independence Air	Washington Dulles	IAD											-											-
Northwest Airlink	Detroit	DTW											-											-
Northwest Airlink	Minneapolis	MSP											-											-
United Express	Chicago O'Hare	ORD		1,040	779	718	750	488					-		67,675	42,976	39,887	39,041	24,400					-
United Express	Cleveland	CLE											-											-
United Express	New York Newark	EWR			1,304	1,284	982	939	244	4	148	144	60.6%			60,052	59,682	49,324	47,773	13,226	280	7,426	7,146	56.1%
United Express	Washington Dulles	IAD		1,104					763	251	429	178	56.2%		55,951					45,133	14,836	21,450	6,614	47.5%
US Airways Express	Boston	BOS											-											-
US Airways Express	Charlotte	CLT		153									-		13,146									-

Table F-5 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport (Continued)

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
US Airways Express	New York La Guardia	LGA	2,583	1,381									-	96,936	49,420									-
US Airways Express	Philadelphia	PHL		2,116									-		140,277									-
US Airways Express	Pittsburgh	PIT											-											-
US Airways Express	Washington National	DCA		1,039									-		81,095									-
Subtotal			**9,655**	**10,716**	**8,084**	**7,869**	**7,673**	**6,665**	**7,012**	**3,524**	**3,893**	**369**	**55.5%**	**416,980**	**591,840**	**491,858**	**492,906**	**488,103**	**423,766**	**448,948**	**225,817**	**249,125**	**23,308**	**55.5%**
Total			**23,681**	**20,566**	**13,234**	**13,145**	**12,656**	**11,846**	**11,283**	**6,173**	**6,291**	**118**	**55.8%**	**2,238,636**	**1,903,517**	**1,259,058**	**1,284,716**	**1,232,853**	**1,179,520**	**1,087,453**	**633,118**	**625,030**	**-8,088**	**57.5%**

Source: OAG Schedules.
Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
Jet Carriers																								
American	Charlotte	CLT			365	487	730	656	730	611	694	83	95.1%			45,504	62,336	93,963	86,100	97,818	81,303	101,088	19,785	103.3%
American	Chicago O'Hare	ORD									66	66	-									9,658	9,658	-
American	Philadelphia	PHL						537	410		3	3	0.7%						53,163	49,532		450	450	0.9%
American	Washington National	DCA			30	4	22						-			3,720	567	2,156						-
American	Dallas/Fort Worth	DFW								15	154	139	-								1,920	19,998	18,078	-
AirTran	Atlanta	ATL		92									-		10,764									-
AirTran	Baltimore	BWI		944									-		112,951									-
AirTran	Orlando	MCO		52									-		6,503									-
Cape Air	Boston	BOS							368	364	633	269	172.0%							3,312	3,276	5,697	2,421	172.0%
Continental	Cleveland	CLE											-											-
Continental	New York Newark	EWR											-											-
Delta	Atlanta	ATL	732	424	714	710	655	684	680	266	469	203	68.9%	103,944	60,167	107,000	106,660	99,378	107,560	104,422	41,274	75,066	33,792	71.9%
Delta	Cincinnati	CVG	1,089										-	154,658										-
Delta	Detroit	DTW				74	113	88	205	1	5	4	2.4%				8,124	12,446	9,633	22,581	157	550	393	2.4%
Delta	Minneapolis	MSP									42	42	-									6,119	6,119	-
Delta	New York La Guardia	LGA			30				74							3,300				9,024				
Frontier	Atlanta	ATL									29	29	-									5,394	5,394	-
Frontier	Denver	DEN						61	87										10,924	15,737				
Frontier	Fort Myers	RSW						13	61	66	103	37	170.0%						2,587	12,617	12,186	21,244	9,058	168.4%
Frontier	Miami	MIA									21	21	-									3,864	3,864	-
Frontier	Myrtle Beach	MYR									11	11	-									2,046	2,046	-
Frontier	Orlando	MCO						83	174	79	205	126	118.0%						15,571	34,940	14,652	40,834	26,182	116.9%
Frontier	Philadelphia	PHL								7	33	26	-								1,302	6,138	4,836	-
Frontier	Raleigh/Durham	RDU						57	87		26	26	29.7%						10,260	15,737		4,836	4,836	30.7%
Frontier	Tampa	TPA						22	73	41	78	37	106.4%						3,934	13,191	7,548	15,628	8,080	118.5%
Independence Air	Washington Dulles	IAD											-											-
jetBlue	New York J F Kennedy	JFK		1,201	1,295	1,198	1,223	1,209	311		246	246	79.1%		128,936	130,314	119,800	122,286	121,136	31,086		24,600	24,600	79.1%
jetBlue	Orlando	MCO		212									-		21,214									-
Northwest	Detroit	DTW	523										-	52,105										-
Southwest	Baltimore	BWI			1,106	1,175	1,226	1,235	1,297	1,111	1,131	20	87.2%			158,358	168,423	183,430	184,326	188,717	162,649	176,389	13,740	93.5%

Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport (Continued)

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
Southwest	Orlando	MCO			4	4	9	9					-			633	633	1,246	1,246					-
Southwest	Chicago Midway	MDW			9	9		22	17		144	144	826.2%			1,246	1,246		3,546	2,771		24,048	24,048	867.8%
Sun Country	Minneapolis	MSP								22	24	2	-								4,092	4,464	372	-
Trans World Airlines	Hartford	BDL	305										-	43,310										-
United	Chicago O'Hare	ORD	728			66		327	301		145	145	48.1%	88,996			8,066		44,205	38,151		18,518	18,518	48.5%
United	Denver	DEN							26		96	96	365.2%							3,943		14,376	14,376	364.6%
United	Manchester	MHT	366										-	53,802										-
United	New York Newark	EWR				9		313	162	4	23	19	14.2%				1,196		42,286	20,935	552	2,922	2,370	14.0%
United	Washington Dulles	IAD				18		171			240	240	-				2,657		23,903			34,716	34,716	-
US Airways	Charlotte	CLT		395									-		48,688									-
US Airways	Philadelphia	PHL	1,312										-	163,051										-
US Airways	Pittsburgh	PIT	1,081										-	137,472										-
US Airways	Washington National	DCA											-											-
Subtotal			**6,135**	**3,320**	**3,553**	**3,754**	**3,978**	**5,487**	**5,065**	**2,587**	**4,621**	**2,034**	**91.2%**	**797,338**	**389,224**	**450,075**	**479,708**	**514,905**	**720,381**	**664,514**	**330,911**	**618,643**	**287,732**	**93.1%**
Regional/ Commuter Carriers																								
Air Canada Express	Montreal Dorval	YUL	344										-	4,734										-
Air Canada Express	Toronto	YYZ		481									-		9,142									-
America West	New York Newark	EWR	52										-	2,457										-
American Eagle	Boston	BOS	3,804										-	125,518										-
American Eagle	Charlotte	CLT			143	243	61	165	73	178	63	-115	85.8%			11,666	20,898	4,233	12,407	5,068	13,528	4,777	-8,751	94.3%
American Eagle	Chicago O'Hare	ORD						244	297	246	419	173	140.9%						15,372	22,594	18,384	31,766	13,382	140.6%
American Eagle	New York La Guardia	LGA	2,033					546	582	164	152	-12	26.1%	67,084					25,244	33,467	10,640	10,001	-639	29.9%
American Eagle	Philadelphia	PHL			2,148	2,066	2,066	1,528	1,277	1,079	1,121	42	87.8%			141,789	120,072	118,721	86,532	78,745	68,831	77,332	8,501	98.2%
American Eagle	Washington National	DCA			1,613	1,707	1,724	1,635	1,721	819	860	41	50.0%			107,469	113,463	120,501	101,267	117,417	50,915	62,801	11,886	53.5%
American Eagle	Miami	MIA								8	30	22	-								608	2,280	1,672	-
Continental Connection	Albany	ALB											-											-
Continental Connection	Boston	BOS	204										-	3,871										-

Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Continental Connection	New York Newark	EWR		1,426									-		105,503									-
Continental Connection	Presque Isle	PQI											-											-
Continental Express	Cleveland	CLE	425	188									-	20,378	9,400									-
Continental Express	New York Newark	EWR	1,429	4									-	70,393	200									-
Delta Connection	Atlanta	ATL		350									-		25,532									-
Delta Connection	Boston	BOS											-											-
Delta Connection	Cincinnati	CVG											-											-
Delta Connection	Detroit	DTW		1,217	896	840	817	838	738	828	914	86	123.8%		62,320	59,315	60,354	59,080	62,502	54,368	61,260	66,956	5,696	123.2%
Delta Connection	New York J F Kennedy	JFK		270				858	979	206	563	357	57.5%		13,500				63,700	61,579	13,446	42,634	29,188	69.2%
Delta Connection	New York La Guardia	LGA	475	786	1,284	1,332	1,561	1,332	1,061	282	649	367	61.2%	15,191	41,440	76,325	80,582	100,527	88,797	70,234	17,946	46,465	28,519	66.2%
Delta Connection	Minneapolis	MSP											-											-
Elite Airways	Bar Harbor	BHB				18							-				886							-
Elite Airways	Halifax	YHZ					40						-					2,156						-
Elite Airways	Islip	ISP				18							-				886							-
Elite Airways	Melbourne	MLB				83	104	112	22								5,173	5,237	5,600	1,079				
Elite Airways	Sarasota/Bradenton	SRQ				17	104	130	74	52		-52					906	5,763	6,521	3,714	2,640		-2,640	
Elite Airways	Vero Beach	VRB						39	39	28	35	7	88.8%						1,964	1,971	1,640	2,430	790	123.3%
Elite Airways	Westchester County	HPN									104	104	-									7,260	7,260	-
Independence Air	Washington Dulles	IAD											-											-
Lufthansa German Airlines	Washington Dulles	IAD	31										-	1,550										-
Northwest Airlink	Detroit	DTW	484										-	33,366										-
Northwest Airlink	Minneapolis	MSP											-											-
Starlink Aviation	Yarmouth	YQI		521									-		9,386									-
Swissair	Boston	BOS	31										-	1,023										-
United Express	Chicago O'Hare	ORD		1,249	1,029	964		615	612	587	552	-35	90.2%		82,273	64,054	53,558		32,506	36,374	40,406	37,100	-3,306	102.0%
United Express	Cincinnati	CVG									45	45	-									2,250	2,250	-
United Express	Cleveland	CLE									44	44	-									2,200	2,200	-
United Express	Columbus	CMH									60	60	-									3,000	3,000	-
United Express	Indianapolis	IND									60	60	-									3,000	3,000	-

Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport (Continued)

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
United Express	Milwaukee	MKE									30	30	-									1,500	1,500	-
United Express	New York Newark	EWR			1,779	2,035		1,529	1,594	672	994	322	62.3%			108,900	113,044		81,721	83,131	41,554	60,370	18,816	72.6%
United Express	Pittsburgh	PIT									44	44	-									2,200	2,200	-
United Express	Washington Dulles	IAD	996	1,078	560	572		792	1,079	660	488	-172	45.2%	49,779	64,767	35,213	35,764		43,504	62,337	39,968	28,232	-11,736	45.3%
US Airways Express	Bangor	BGR	231										-	8,558										-
US Airways Express	Boston	BOS	2,229										-	42,359										-
US Airways Express	Charlotte	CLT		88									-		5,323									-
US Airways Express	New York La Guardia	LGA	1,218	1,647									-	43,901	78,477									-
US Airways Express	Philadelphia	PHL		1,947									-		133,521									-
US Airways Express	Pittsburgh	PIT											-											-
US Airways Express	Plattsburgh	PLB	48										-	909										-
US Airways Express	Presque Isle	PQI											-											-
US Airways Express	Washington National	DCA	1,089	1,043									-	33,976	83,302									-
US Airways Express	Westchester County	HPN	65										-	1,235										-
Subtotal			**15,187**	**12,296**	**9,452**	**9,895**	**6,477**	**10,364**	**10,150**	**5,809**	**7,227**	**1,418**	**71.2%**	**526,282**	**724,086**	**604,731**	**605,586**	**416,218**	**627,639**	**632,078**	**381,766**	**494,554**	**112,788**	**78.2%**
Total			**21,322**	**15,615**	**13,005**	**13,649**	**10,455**	**15,851**	**15,215**	**8,396**	**11,848**	**3,452**	**77.9%**	**1,323,619**	**1,113,310**	**1,054,806**	**1,085,294**	**931,123**	**1,348,020**	**1,296,593**	**712,677**	**1,113,197**	**400,520**	**85.9%**

Source: OAG Schedules.
Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).
Ulendo Airlink has been updated to Elite Airways in Table F-6, compare to the same table for Portland International Jetport in the previous EDR report. Elite Airways's main base of operations is at PWM.

Table F-7 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport

			Departures											Departing Seats									
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
Jet Carriers																								
AirTran	Baltimore	BWI											-											-
Allegiant Air	Orlando/Sanford	SFB			104	95	18						-			17,880	16,452	3,065						-
American	Philadelphia	PHL						686					-						67,872					-
Boutique Air	Boston	BOS									214	214	-									1,712	1,712	-
Continental	New York Newark	EWR											-											-
Delta	Atlanta	ATL			92	110	341	365	284	17		-17				13,708	15,202	38,852	45,507	35,086	2,108		-2,108	
Frontier	Denver	DEN							92	38	45	7	49.1%							16,509	7,016	8,214	1,198	49.8%
Frontier	Orlando	MCO							48	50	65	15	136.2%							8,589	9,272	12,378	3,106	144.1%
jetBlue	New York J F Kennedy	JFK	244	1,434	1,156	1,182	1,189	1,160	1,095	424	315	-109	28.8%	39,528	180,286	115,600	118,157	118,871	116,250	109,500	45,048	31,500	-13,548	28.8%
jetBlue	Orlando	MCO		330									-		33,014									-
Northwest	Detroit	DTW											-											-
United	Chicago O'Hare	ORD	815		113	345	202	429	401	53	69	16	17.2%	105,509		13,777	45,877	27,228	60,402	51,273	7,716	8,694	978	17.0%
United	Denver	DEN							26		36	36	137.0%							3,769		5,344	5,344	141.8%
United	New York Newark	EWR						322	86		2	2	2.3%						47,394	11,453		252	252	2.2%
United	Portland (ME)	PWM											-											-
United	Washington Dulles	IAD									17	17	-									2,310	2,310	-
United	El Paso Biggs Army Airfield	BIF									1	1	-									166	166	-
US Airways	Philadelphia	PHL	1,098										-	150,338										-
US Airways	Pittsburgh	PIT	732										-	103,568										-
US Airways	Washington National	DCA											-											-
Subtotal			**2,889**	**1,764**	**1,465**	**1,732**	**1,750**	**2,962**	**2,030**	**582**	**764**	**182**	**37.6%**	**398,943**	**213,300**	**160,965**	**195,688**	**188,016**	**337,424**	**236,178**	**71,160**	**70,570**	**-590**	**29.9%**
Regional/ Commuter Carriers																								
America West	New York Newark	EWR	166										-	7,889										-
American Eagle	Boston	BOS	3,094										-	102,111										-
American Eagle	Charlotte	CLT			122	378	627	730	730	791	850	59	116.4%			9,516	29,858	48,996	53,094	54,750	58,488	63,672	5,184	116.3%
American Eagle	Chicago O'Hare	ORD						244	240	51	363	312	151.4%						13,931	15,102	3,568	26,299	22,731	174.1%
American Eagle	New York La Guardia	LGA				18	21						-				886	1,064						-
American Eagle	Philadelphia	PHL			1,921	1,933	1,734	988	1,531	966	1,132	166	73.9%			126,772	103,725	103,662	58,638	91,729	56,494	68,315	11,821	74.5%

Table F-7 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
American Eagle	Washington National	DCA			1,339	1,394	1,386	1,151	1,082	358	533	175	49.3%			86,015	96,228	97,867	81,270	81,694	27,208	37,206	9,998	45.5%
American Eagle	Dallas/Fort Worth	DFW									18	18	-									1,368	1,368	-
American Eagle	Miami	MIA									8	8	-									608	608	-
Continental Connection	Albany	ALB											-											-
Continental Connection	Boston	BOS	244										-	4,628										-
Continental Connection	Buffalo	BUF	4										-	84										-
Continental Connection	Hartford	BDL											-											-
Continental Connection	New York Newark	EWR		405									-		30,002									-
Continental Connection	Plattsburgh	PLB	213										-	4,039										-
Continental Connection	Plattsburgh International	PBG											-											-
Continental Connection	Poughkeepsie	POU	66										-	1,262										-
Continental Connection	Washington Dulles	IAD											-											-
Continental Connection	Westchester County	HPN											-											-
Continental Express	Cleveland	CLE	322	366									-	16,064	18,286									-
Continental Express	New York Newark	EWR	1,458	1,020									-	70,203	51,000									-
Continental Express	Westchester County	HPN											-											-
Delta Connection	Atlanta	ATL			273	255	59	31	142	72	240	168	168.5%			20,748	19,369	4,484	2,356	10,825	5,472	18,240	12,768	168.5%
Delta Connection	Boston	BOS											-											-
Delta Connection	Cincinnati	CVG											-											-
Delta Connection	Detroit	DTW		1,227	1,004	1,005	1,000	1,013	1,092	874	821	-53	75.2%		61,417	57,053	55,842	51,402	55,441	63,857	53,377	52,123	-1,254	81.6%
Delta Connection	New York J F Kennedy	JFK		1,336				612	1,036	203	296	93	28.6%		67,071				45,706	59,240	12,204	20,052	7,848	33.8%
Delta Connection	New York La Guardia	LGA	355		1,257	1,151	1,073	1,000	759	164	102	-62	13.4%	11,351		76,339	69,396	60,573	58,113	49,916	11,797	7,260	-4,537	14.5%
Independence Air	Washington Dulles	IAD											-											-
Lufthansa German Airlines	Washington Dulles	IAD	31										-	1,550										-

Table F-7 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Northwest Airlink	Detroit	DTW											-											-
Northwest Airlink	Minneapolis	MSP											-											-
Porter Airlines	Toronto Island Apt	YTZ			39	22	26	26					-			2,886	1,607	1,903	1,903					-
Swissair	Boston	BOS	31										-	1,023										-
United Express	Chicago O'Hare	ORD		1,353	1,144	794	895	706	814	570	721	151	88.6%		84,431	63,845	42,348	50,322	35,279	43,814	33,150	39,508	6,358	90.2%
United Express	Cleveland	CLE											-											-
United Express	New York Newark	EWR			1,569	1,705	1,710	1,388	1,507	479	512	33	34.0%			96,340	94,246	89,273	72,093	81,616	24,304	29,138	4,834	35.7%
United Express	Washington Dulles	IAD	1,477	1,130	738	795	815	1,062	1,156	674	844	170	73.0%	73,843	61,988	41,127	48,150	47,274	66,445	72,344	39,506	47,370	7,864	65.5%
US Airways Express	Boston	BOS	2,404										-	48,139										-
US Airways Express	Charlotte	CLT											-											-
US Airways Express	New York La Guardia	LGA	2,074	1,680									-	76,749	62,144									-
US Airways Express	Philadelphia	PHL		1,903									-		128,140									-
US Airways Express	Pittsburgh	PIT											-											-
US Airways Express	Plattsburgh	PLB	2,427										-	46,116										-
US Airways Express	Poughkeepsie	POU	718										-	13,639										-
US Airways Express	Saranac Lake	SLK	44										-	841										-
US Airways Express	Washington National	DCA	988	1,043									-	31,574	77,625									-
US Airways Express	Wilkes-Barre Scranton	AVP	22										-	415										-
Subtotal			**16,138**	**11,461**	**9,405**	**9,450**	**9,346**	**8,950**	**10,089**	**5,202**	**6,440**	**1,238**	**63.8%**	**511,521**	**642,104**	**580,640**	**561,655**	**556,820**	**544,268**	**624,887**	**325,568**	**411,159**	**85,591**	**65.8%**
Total			**19,028**	**13,225**	**10,870**	**11,182**	**11,096**	**11,912**	**12,120**	**5,784**	**7,204**	**1,420**	**59.4%**	**910,464**	**855,404**	**741,605**	**757,343**	**744,836**	**881,692**	**861,065**	**396,728**	**481,729**	**85,001**	**55.9%**

Source: OAG Schedules.
Notes: Allegiant stopped reporting to OAG between 2009-2016, during that period statistics from the T100 database were referenced.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-8 Scheduled Passenger Operations by Market and Carrier for Bangor International Airport

			Departures											Departing Seats										
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Jet Carriers																								
Allegiant Airways	Fort Lauderdale	FLL		181	180	182	184	144	209		24	24	11.5%		27,150	31,156	31,730	31,221	24,218	34,512		4,254	4,254	12.3%
Allegiant Airways	Orlando/Sanford	SFB		181	180	182	184	144	209	205	210	5	100.5%		27,150	31,156	31,730	31,221	24,218	34,512	33,471	34,387	916	99.6%
Allegiant Airways	Punta Gorda	PGD											-											-
Allegiant Airways	St. Petersburg/Clearwater	PIE		107	134	143	136	118	165	179	177	-2	107.0%		16,050	23,531	25,201	23,926	20,424	27,619	31,515	31,377	-138	113.6%
American	Charlotte	CLT									73	73	-									10,950	10,950	-
American	Dallas/Fort Worth	DFW									81	81	-									10,368	10,368	-
American	Philadelphia	PHL									6	6	-									900	900	-
American	Washington National	DCA									4	4	-									512	512	-
Delta	Atlanta	ATL									15	15	-									1,980	1,980	-
Delta	Detroit	DTW			175	180							-			19,334	19,769							-
Delta	New York J F Kennedy	JFK					74	79					-					8,171	8,674					-
Pan American Airways	Allentown/Bethlehem	ABE											-											-
Pan American Airways	Baltimore	BWI											-											-
Pan American Airways	Pittsburgh	PIT	285										-	42,729										-
Pan American Airways	Portsmouth	PSM	389										-	58,414										-
Pan American Airways	Sanford	SFB											-											-
United	Chicago O'Hare	ORD						13	17										1,682	2,231				
Subtotal			**674**	**288**	**489**	**505**	**394**	**354**	**392**	**384**	**566**	**182**	**144.4%**	**101,143**	**43,200**	**74,021**	**76,700**	**63,318**	**54,998**	**64,362**	**64,986**	**90,474**	**25,488**	**140.6%**
Regional/ Commuter Carriers																								
American Eagle	Boston	BOS	4,670										-	154,115										-
American Eagle	Charlotte	CLT					13	153	210	273	544	271	259.4%					828	9,639	15,729	20,374	41,344	20,970	262.9%
American Eagle	Chicago O'Hare	ORD						22	148	43	346	303	233.3%						1,377	9,400	2,795	26,296	23,501	279.8%
American Eagle	Miami	MIA									11	11	-									836	836	-
American Eagle	New York La Guardia	LGA	382			35	44	214	210	6		-6		12,606			1,757	3,322	9,422	9,253	360		-360	
American Eagle	Philadelphia	PHL			1,452	1,447	1,551	1,504	1,579	971	1,048	77	66.4%			91,163	85,549	84,057	95,487	83,467	55,101	66,672	11,571	79.9%
American Eagle	Washington National	DCA			771	900	952	1,009	984	435	688	253	69.9%			40,260	47,737	60,581	60,159	55,962	25,509	49,045	23,536	87.6%

Table F-8 Scheduled Passenger Operations by Market and Carrier for Bangor International Airport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Boston-Maine Airways	Halifax	YHZ										-	-										-	-
Boston-Maine Airways	Manchester	MHT										-	-										-	-
Boston-Maine Airways	Portsmouth	PSM										-	-										-	-
Boston-Maine Airways	Saint John	YSJ										-	-										-	-
Continental Connection	Albany	ALB											-											-
Continental Express	New York Newark	EWR											-											-
Delta Connection	Atlanta	ATL											-											-
Delta Connection	Boston	BOS									234	234	-									17,784	17,784	-
Delta Connection	Cincinnati	CVG	1,342										-	67,100										-
Delta Connection	Detroit	DTW		975	279	204			9	36	27	-9	309.8%		50,540	19,614	14,863			662	2,736	2,024	-712	305.6%
Delta Connection	New York J F Kennedy	JFK		180			354	408		64	318	254	-		9,000			26,882	31,019		4,864	23,492	18,628	-
Delta Connection	New York La Guardia	LGA		537	976	1,007	1,008	1,008	1,192	243	167	-76	14.0%		26,958	57,025	58,761	60,323	59,863	62,269	12,150	12,152	2	19.5%
Delta Connection	Minneapolis	MSP											-											-
Northwest Airlink	Boston	BOS	27										-	797										-
Northwest Airlink	Detroit	DTW											-											-
Northwest Airlink	Minneapolis	MSP											-											-
Pan American Airways	Portsmouth	PSM											-											-
Pan American Airways	Saint John	YSJ											-											-
United Express	Chicago O'Hare	ORD			215	206	280	310	306	81	295	214	96.4%			14,190	13,624	19,682	21,720	21,420	6,096	21,958	15,862	102.5%
United Express	New York Newark	EWR				123	490	730	870	188	177	-11	20.3%				6,150	26,444	39,540	44,370	9,498	10,288	790	23.2%
United Express	Nantucket									20		-20	-								1,000		-1,000	-
United Express	Washington Dulles									397	635	238	-								21,050	31,770	10,720	-
US Airways Express	Boston	BOS	1,942										-	36,906										-
US Airways Express	New York La Guardia	LGA	35	1,017									-	1,295	44,051									-
US Airways Express	Philadelphia	PHL	428	1,156									-	15,836	68,510									-
US Airways Express	Pittsburgh	PIT											-											-

Table F-8 Scheduled Passenger Operations by Market and Carrier for Bangor International Airport (Continued)

			Departures											Departing Seats										
Carrier	**Market**	**Code**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**'20-'21 Change**	**'21 vs '19 Pct. Recovery**
US Airways Express	Portland (ME)	PWM	231										-	8,558										-
US Airways Express	Presque Isle	PQI	299										-	6,224										-
US Airways Express	Washington National	DCA		31									-		1,529									-
Subtotal			**9,357**	**3,896**	**3,693**	**3,922**	**4,692**	**5,359**	**5,508**	**2,757**	**4,490**	**1,733**	**81.5%**	**303,436**	**200,587**	**222,252**	**228,441**	**282,119**	**328,226**	**302,531**	**161,533**	**303,661**	**142,128**	**100.4%**
Total			**10,031**	**4,184**	**4,182**	**4,427**	**5,086**	**5,713**	**5,900**	**3,141**	**5,056**	**1,915**	**85.7%**	**404,579**	**243,787**	**296,273**	**305,141**	**345,437**	**383,225**	**366,893**	**226,519**	**394,135**	**167,616**	**107.4%**

Source: OAG Schedules.
Notes: Allegiant stopped reporting to OAG between 2009-2016, during that period statistics from the T100 database were referenced.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).
Destinations listed on the table that do not have scheduled nonstop services in 2020 and/or 2021, may not appear to have scheduled departures and departing seats as nonstop service from those destinations may have occurred in during calendar years not displayed above.

Table F-9 Scheduled Passenger Operations by Market and Carrier for Tweed-New Haven Airport

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Jet Carriers																								
Avelo Airlines	Fort Lauderdale	FLL									48	48	-									7,056	7,056	-
Avelo Airlines	Fort Myers	RSW									28	28	-									4,116	4,116	-
Avelo Airlines	Orlando	MCO									50	50	-									7,350	7,350	-
Avelo Airlines	Tampa	TPA									31	31	-									4,557	4,557	-
Avelo Airlines	West Palm Beach	PBI									16	16	-									2,352	2,352	-
Subtotal											**173**	**173**	**-**									**25,431**	**25,431**	**-**
Regional/ Commuter Carriers																								
American Eagle	Philadelphia	PHL			1,222	1,121	1,021	1,034	1,036	334	219	-115	21.1%			49,657	63,913	53,712	51,707	67,725	25,384	16,644	-8,740	24.6%
American Eagle	Charlotte	CLT							52	46		-46	-							3,402	3,496		-3,496	
Delta Connection	Cincinnati	CVG											-											-
Boston-Maine Airways	Baltimore	BWI											-											-
Boston-Maine Airways	Bedford	BED											-											-
Boston-Maine Airways	Elmira/Corning	ELM											-											-
Boston-Maine Airways	Portsmouth	PSM											-											-
Southern Airways Express	Nantucket	ACK							39				-							355				
US Airways Express	Philadelphia	PHL	1,773	1,608									-	65,612	59,491									-
US Airways Express	Washington National	DCA	937										-	34,658										-
Subtotal			**2,710**	**1,608**	**1,222**	**1,121**	**1,021**	**1,034**	**1,128**	**380**	**219**	**-161**	**19.4%**	**100,270**	**59,491**	**49,657**	**63,913**	**53,712**	**51,707**	**71,482**	**28,880**	**16,644**	**-12,236**	**23.3%**
Total		**2,710**	**2,710**	**1,608**	**1,222**	**1,121**	**1,021**	**1,034**	**1,128**	**380**	**392**	**12**	**34.8%**	**100,270**	**59,491**	**49,657**	**63,913**	**53,712**	**51,707**	**71,482**	**28,880**	**42,075**	**13,195**	**58.9%**

Source: OAG Schedules.

Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).
Boston-Maine Airways operated nonstop services in 2007.
Destinations listed on the table that do not have scheduled nonstop services in 2020 and/or 2021, may not appear to have scheduled departures and departing seats as nonstop service from those destinations may have occurred in during calendar years not displayed above.

Table F-10 Scheduled Passenger Operations by Market and Carrier for Worcester Regional Airport

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Jet Carriers																								
Allegiant Airways	Sanford	SFB										-	-										-	-
Boston-Maine Airways	Allentown/Bethlehem	ABE										-	-										-	-
Boston-Maine Airways	Portsmouth	PSM										-	-										-	-
Boston-Maine Airways	Sanford	SFB										-	-										-	-
Direct Air	Myrtle Beach	MYR		73								-	-		9,782								-	-
Direct Air	Orlando/Sanford	SFB		144								-	-		21,937								-	-
Direct Air	Punta Gorda	PGD		94								-	-		14,541								-	-
Direct Air	West Palm Beach	PBI		13								-	-		1,872								-	-
jetBlue	Fort Lauderdale/Hollywood	FLL			365	365	365	365	365	94	63	-31	17.3%			36,500	36,500	36,500	36,500	36,500	9,400	6,300	-3,100	17.3%
jetBlue	New York J F Kennedy	JFK						245	365	132	203	71	55.6%						24,500	36,500	13,200	20,300	7,100	55.6%
jetBlue	Orlando	MCO			365	365	365	365	365	95		-95	-			36,500	36,500	36,500	36,500	36,500	9,500		-9,500	-
Subtotal				**324**	**730**	**730**	**730**	**975**	**1,095**	**321**	**266**	**-55**	**24.3%**		**48,132**	**73,000**	**73,000**	**73,000**	**97,500**	**109,500**	**32,100**	**26,600**	**-5,500**	**24.3%**
Regional/ Commuter Carriers																								
American Eagle	Chicago O'Hare	ORD										-	-										-	-
American Eagle	New York J F Kennedy	JFK	552									-	-	18,216									-	-
American Eagle	Philadelphia	PHL						184	494	151	58	-93	11.7%						9,200	24,714	7,550	2,900	-4,650	11.7%
Delta Connection	Atlanta	ATL	670									-	-	33,500									-	-
Delta Connection	Detroit	DTW							153	249		-249	-							7,650	12,450		-12,450	-
Delta Connection	New York La Guardia	LGA									51	51	-									3,576	3,576	-
US Airways Express	Philadelphia	PHL	1,464									-	-	54,168									-	-
Subtotal			**2,686**					**184**	**647**	**400**	**109**	**-291**	**16.8%**	**105,884**					**9,200**	**32,364**	**20,000**	**6,476**	**-13,524**	**20.0%**
Total			**2,686**	**324**	**730**	**730**	**730**	**1,159**	**1,742**	**721**	**375**	**-346**	**21.5%**	**105,884**	**48,132**	**73,000**	**73,000**	**73,000**	**106,700**	**141,864**	**52,100**	**33,076**	**-19,024**	**23.3%**

Source: OAG Schedules.
Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).
Destinations listed on the table that do not have scheduled nonstop services in 2020 and/or 2021, may not appear to have scheduled departures and departing seats as nonstop service from those destinations may have occurred in during calendar years not displayed above.

Table F-11 Scheduled Passenger Operations by Market and Carrier for Hanscom Field

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Regional/ Commuter Carriers																								
Boston-Maine Airways	Elmira/Corning	ELM										-	-										-	-
Boston-Maine Airways	Hyannis	HYA										-	-										-	-
Boston-Maine Airways	Manchester	MHT										-	-										-	-
Boston-Maine Airways	Martha's Vineyard	MVY										-	-										-	-
Boston-Maine Airways	Nantucket	ACK										-	-										-	-
Boston-Maine Airways	New Haven	HVN										-	-										-	-
Boston-Maine Airways	New London/Groton	GON										-	-										-	-
Boston-Maine Airways	Portsmouth	PSM										-	-										-	-
Boston-Maine Airways	Trenton	TTN										-	-										-	-
Pan American Airways	Atlantic City Pomona Field	ACY										-	-										-	-
Pan American Airways	Martha's Vineyard	MVY										-	-										-	-
Pan American Airways	New York Newark	EWR										-	-										-	-
Pan American Airways	Portsmouth	PSM										-	-										-	-
Pan American Airways	Westchester County	HPN										-	-										-	-
Shuttle America	Buffalo	BUF	1,119									-	-	55,950									-	-
Shuttle America	Hartford	BDL	173									-	-	8,636									-	-
Shuttle America	New York La Guardia	LGA	523									-	-	26,143									-	-
Shuttle America	Trenton	TTN	2,062									-	-	103,093									-	-
Streamline	Trenton	TTN										-	-										-	-
US Airways	Martha's Vineyard	MVY										-	-										-	-
US Airways	Nantucket	ACK										-	-										-	-
US Airways	New York La Guardia	LGA										-	-										-	-
US Airways	Philadelphia	PHL										-	-										-	-
US Airways	Trenton	TTN										-	-										-	-
US Airways	Westchester County	HPN										-	-										-	-
Total			**3,876**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**193,821**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**

Source: OAG Schedules.
Notes: All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).
Last scheduled flight based on OAG schedules was flown in 2011 on Streamline Air (a subsidiary of Charter Air Transport – based at Hanscom Field) to Trenton, NJ.
Destinations listed on the table that do not have scheduled nonstop services in 2020 and/or 2021, may not appear to have scheduled departures and departing seats as nonstop service from those destinations may have occurred in during calendar years not displayed above.

Table F-12 Scheduled Passenger Operations by Market and Carrier for Portsmouth International Airport

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Jet Carriers																								
Allegiant Airways	Fort Lauderdale/Hollywood	FLL			27	43	35					-	-			4,779	7,611	6,177					-	-
Allegiant Airways	Orlando/Sanford	SFB			95	100	135	109	135	135	147	12	108.9%			16,111	17,062	22,498	18,500	22,062	21,816	23,802	1,986	107.9%
Allegiant Airways	Punta Gorda	PGD			35	48	99	83	144	153	151	-2	105.2%			5,909	8,496	17,496	14,691	25,412	27,081	26,751	-330	105.3%
Allegiant Airways	Savannah	SAV							26			-	-							4,653			-	-
Allegiant Airways	St. Petersburg/Clearwater	PIE				13	39				22	22	-				2,158	6,474				3,918	3,918	-
Allegiant Airways	Nashville	BNA									24	24	-									3,848	3,848	-
Allegiant Airways	Myrtle Beach	MYR					34	26	26	22		-22	-					5,644	4,653	4,653	3,894		-3,894	-
Boston-Maine Airways	Fort Lauderdale/Hollywood	FLL										-	-										-	-
Boston-Maine Airways	Hartford	BDL										-	-										-	-
Boston-Maine Airways	Newburgh	SWF										-	-										-	-
Boston-Maine Airways	Sanford	SFB										-	-										-	-
Frontier	Orlando	MCO						13	78			-	-						2,391	15,913			-	-
Pan American Airways	Allentown/Bethlehem	ABE	93									-	-	13,950									-	-
Pan American Airways	Bangor	BGR	389									-	-	58,414									-	-
Pan American Airways	Gary	GYY	51									-	-	7,714									-	-
Pan American Airways	Manchester	MHT										-	-										-	-
Pan American Airways	New York Newark	EWR										-	-										-	-
Pan American Airways	Pittsburgh	PIT	261									-	-	39,171									-	-
Pan American Airways	Sanford	SFB	296									-	-	44,400									-	-
Pan American Airways	Santo Domingo	SDQ										-	-										-	-
Pan American Airways	St. Petersburg/Clearwater	PIE										-	-										-	-
Pan American Airways	Worcester	ORH										-	-										-	-
Skybus	Columbus	CMH										-	-										-	-
Skybus	Greensboro	GSO										-	-										-	-
Skybus	Punta Gorda	PGD										-	-										-	-
Skybus	Saint Augustine	UST										-	-										-	-
Subtotal			**1,091**		**157**	**204**	**342**	**232**	**409**	**310**	**344**	**34**	**84.2%**	**163,650**		**26,799**	**35,327**	**58,289**	**40,235**	**72,692**	**52,791**	**58,319**	**5,528**	**80.2%**

Table F-12 Scheduled Passenger Operations by Market and Carrier for Portsmouth International Airport (Continued)

			Departures											Departing Seats									
Carrier	Market	Code	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery	2000	2010	2015	2016	2017	2018	2019	2020	2021	'20-'21 Change	'21 vs '19 Pct. Recovery
Regional/ Commuter Carriers																								
Boston-Maine Airways	Baltimore	BWI										-	-										-	-
Boston-Maine Airways	Bangor	BGR										-	-										-	-
Boston-Maine Airways	Bedford	BED										-	-										-	-
Boston-Maine Airways	Hyannis	HYA										-	-										-	-
Boston-Maine Airways	Manchester	MHT										-	-										-	-
Boston-Maine Airways	Martha's Vineyard	MVY										-	-										-	-
Boston-Maine Airways	Nantucket	ACK										-	-										-	-
Boston-Maine Airways	New Haven	HVN										-	-										-	-
Boston-Maine Airways	New London/Groton	GON										-	-										-	-
Boston-Maine Airways	Saint John	YSJ										-	-										-	-
Boston-Maine Airways	Trenton	TTN										-	-										-	-
Boston-Maine Airways	Westchester County	HPN										-	-										-	-
Pan American Airways	Atlantic City Pomona Field	ACY										-	-										-	-
Pan American Airways	Baltimore	BWI										-	-										-	-
Pan American Airways	Bangor	BGR										-	-										-	-
Pan American Airways	Bedford	BED										-	-										-	-
Pan American Airways	Martha's Vineyard	MVY										-	-										-	-
Pan American Airways	Saint John	YSJ										-	-										-	-
Subtotal												**-**	**-**										**-**	**-**
Total			**1,091**	**0**	**0**	**0**	**157**	**204**	**342**	**232**	**409**	**177**	**76.4%**	**163,650**	**0**	**0**	**0**	**26,799**	**35,327**	**58,289**	**40,235**	**72,692**	**32,458**	**80.7%**

Source: OAG Schedules.

Notes: Allegiant stopped reporting to the OAG in 2009, Allegiant 2009-2016 statistics from the T100 database; 2017-2019 statistics from OAG, which recommenced reporting..

All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).

All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).

All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).

All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Destinations listed on the table that do not have scheduled nonstop services in 2020 and/or 2021, may not appear to have scheduled departures and departing seats as nonstop service from those destinations may have occurred in during calendar years not displayed above.

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G

Ground Access to and from Logan Airport

This appendix provides information in support of Chapter 5, *Ground Access to and from Logan Airport*:

- Table G-1A Logan Express Bus Service Ridership (Annual)
- Table G-1B Logan Express Back Bay Service Ridership (Annual)
- Table G-2 Water Transportation Services Ridership to and from Logan Airport (Annual)
- Table G-3 Massachusetts Bay Transportation Authority (MBTA) Airport Station Passengers
- Table G-4 Annual Taxi Dispatches (Tickets Sold)
- Table G-5 On-Airport Commercial Parking Rates, 2010-2017
- Table G-6 Logan Airport Employee Parking Supply
- Table G-7 Logan Airport Commercial Parking Supply
- Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment, and Vehicle Miles Traveled (VMT) Summary
- Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment, and Vehicle Miles Traveled (VMT) Summary
- VISSIM Existing Traffic Roadway Network
- VISSIM Future Traffic Roadway Network
- April 2020 Logan Airport Parking Space Inventory, submitted to Massachusetts Department of Environmental Protection (also known as the *Parking Freeze Report*)
- September 2020 Logan Airport Parking Space Inventory, submitted to Massachusetts Department of Environmental Protection (also known as the *Parking Freeze Report*)
- April 2021 Logan Airport Parking Space Inventory, submitted to Massachusetts Department of Environmental Protection (also known as the *Parking Freeze Report*)
- October 2021 Logan Airport Parking Space Inventory, submitted to Massachusetts Department of Environmental Protection (also known as the *Parking Freeze Report*)

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Table G-1A Logan Express Bus Service Ridership

	Ridership			Percent Change		
Service Year	**Air Passengers**	**Employees**	**Total**	**Air Passengers**	**Employees**	**Total**
Framingham						
1992	207,847	7,573	215,420	4.3%	21.3%	4.8%
1993	229,064	12,307	241,371	10.2%	62.5%	12.0%
1994	250,342	17,352	267,694	9.3%	41.0%	10.9%
1995	274,754	21,129	295,883	9.8%	21.8%	10.5%
1996	325,665	22,932	348,597	18.5%	8.5%	17.8%
1997	316,306	29,871	346,175	(2.9%)	30.3%	(0.7%)
1998	337,007	33,971	370,978	6.5%	13.7%	7.2%
1999	345,715	31,946	380,661	3.5%	(6.0%)	2.6%
2000	371,560	34,508	406,068	6.6%	8.0%	6.7%
2001	354,521	38,740	393,261	(4.6%)	12.3%	(3.2%)
2002	342,746	42,441	385,187	(3.3%)	8.7%	(2.1%)
2003	310,024	55,979	366,003	(9.5%)	31.9%	(5.0%)
2004	323,931	54,763	378,694	4.5%	(2.2%)	3.5%
2005	318,125	57,569	375,694	(1.8%)	5.1%	(0.8%)
2006	349,022	60,764	409,789	9.7%	5.5%	9.1%
2007	311,299	57,252	368,551	(2.1%)[5]	(0.6%)[5]	(1.9%)[5]
2008	276,112	57,797	333,909	(11.3%)	1.0%	(9.4%)
2009	264,233	59,840	324,073	(4.3%)	3.5%	(2.9%)
2010	272,190	62,226	334,416	3.0%	4.0%	3.2%
2011[1]	272,301	68,228	340,529	0.0%	9.6%	1.8%
2012	279,603	82,951	362,554	2.7%	21.6%	6.5%
2013	295,654	84,008	379,662	5.7%	1.3%	4.7%
2014	303,646	87,488	391,134	2.7%	4.1%	3.0%
2015	345,680	82,943	428,623	13.8%	(5.2%)	9.6%
2016	406,253	92,642	498,895	17.5%	11.7%	16.4%
2017	434,906	99,639	534,545	7.1%	7.6%	7.2%
2018	463,377	114,151	577,528	6.5%	14.6%	8.0%
2019	486,507	129,704	616,211	5.0%	13.6%	6.7%
2020	**125,126**	**57,704**	**182,830**	**(74.3%)**	**(55.5%)**	**(70.3%)**
2021	**227,996**	**56,974**	**284,970**	**82.2%**	**(1.3%)**	**55.9%**

Table G-1A Logan Express Bus Service Ridership (Continued)

	Ridership			Percent Change		
Service Year	**Air Passengers**	**Employees**	**Total**	**Air Passengers**	**Employees**	**Total**
Braintree						
1992	186,217	9,694	195,911	10.6%	16.6%	10.8%
1993	205,209	22,768	227,977	10.2%	134.9%	16.4%
1994	247,636	37,489	285,125	20.7%	64.7%	25.1%
1995	264,579	70,723	335,302	6.8%	88.7%	17.6%
1996	335,232	103,519	438,751	26.7%	46.4%	30.1%
1997	300,006	135,340	435,346	(10.5%)	30.7%	(0.8%)
1998	300,005	156,105	456,110	0.0%	15.3%	4.8%
1999	328,818	125,286	454,105	9.6%	(19.7%)	(0.5%)
2000	355,932	149,687	505,619	8.2%	19.5%	11.3%
2001	345,249	156,240	501,489	(3.0%)	4.4%	(0.8%)
2002	323,115	190,360	513,475	(6.4%)	21.8%	2.4%
2003	301,013	216,765	517,778	(6.8%)	13.9%	0.8%
2004	318,100	208,566	526,666	5.7%	(3.8%)	1.7%
2005	307,659	189,531	497,190	(3.2%)	(9.1%)	(5.5%)
2006	333,413	202,983	536,396	8.4%	7.1%	7.9%
2007	300,715	196,955	497,670	(2.3%)5	3.9%[5]	0.1%[5]
2008	252,289	221,591	473,880	(16.1%)	12.5%	(4.8%)
2009	231,151	234,908	466,059	(8.4%)	6.0%	(1.7%)
2010	231,422	251,443	482,865	0.1%	7.0%	3.6%
2011[1]	233,521	285,515	519,036	0.9%	13.6%	7.5%
2012	247,346	314,542	561,888	5.9%	10.2%	8.3%
2013	268,154	320,329	588,483	8.4%	1.8%	4.7%
2014	296,975	313,334	610,309	10.7%	(2.2%)	3.7%
2015	313,576	311,695	625,271	5.6%	(0.5%)	2.5%
2016	329,043	326,115	655,158	4.9%	4.6%	4.8%
2017	345,401	349,435	694,836	5.0%	7.2%	6.1%
2018	370,654	371,813	742,467	7.3%	6.4%	6.9%
2019	407,090	413,405	820,495	9.8%	11.2%	10.5%
2020	**110,171**	**158,762**	**268,933**	**(72.9%)**	**(61.6%)**	**(67.2%)**
2021	**221,821**	**164,818**	**386,639**	**101.3%**	**3.8%**	**43.8%**

Table G-1A Logan Express Bus Service Ridership (Continued)

	Ridership			Percent Change		
Service Year	**Air Passengers**	**Employees**	**Total**	**Air Passengers**	**Employees**	**Total**
Woburn[2]						
1992[3]	3,052	91	3,143	NA	NA	-
1993	59,635	5,027	64,662	NA	NA	-
1994	119,567	9,082	128,649	100.5%	80.7%	99.0%
1995	150,147	13,376	163,523	25.6%	47.3%	27.1%
1996	190,566	17,322	207,888	26.9%	29.5%	27.1%
1997	199,715	20,018	219,733	4.8%	15.6%	5.7%
1998	208,286	22,876	231,162	4.3%	14.3%	5.2%
1999	191,454	23,495	214,949	(8.1%)	2.7%	(7.0%)
2000	195,744	27,522	223,266	2.2%	17.1%	3.9%
2001	177,375	38,318	215,530	(9.4%)	39.2%	(3.4%)
2002	161,145	73,277	234,422	(9.2%)	91.0%	8.7%
2003	164,980	103,963	268,943	(2.4%)	41.9%	14.7%
2004	172,110	111,326	283,436	4.3%	7.1%	5.4%
2005	163,227	110,961	274,188	(5.1%)	(0.3%)	(3.2%)
2006	167,341	121,672	289,013	2.5%	9.7%	5.4%
2007	149,149	123,066	272,215	(8.6%)[5]	10.9%[5]	(0.7%)[5]
2008	129,385	122,777	252,162	(13.3%)	(0.2%)	(7.4%)
2009	113,607	121,633	235,240	(12.2%)	(0.9%)	(6.7%)
2010	115,257	127,120	242,377	1.5%	4.5%	3.0%
2011[1]	118,232	151,029	269,261	2.6%	18.8%	11.1%
2012	126,549	188,747	315,296	7.0%	25.0%	17.1%
2013	140,407	192,289	332,696	11.0%	1.9%	5.5%
2014	156,045	194,341	350,386	11.1%	1.1%	5.3%
2015	163,469	191,242	354,711	4.8%	(1.6%)	1.2%
2016	170,704	197,568	368,272	4.4%	3.3%	3.8%
2017	176,485	209,194	385,679	3.4%	5.9%	4.7%
2018	178,398	226,698	405,096	1.1%	8.4%	5.0%
2019	184,031	240,047	424,078	3.2%	5.9%	4.7%
2020	**48,406**	**89,153**	**137,559**	**(73.7%)**	**(62.9%)**	**(67.6%)**
2021	**64,885**	**44,270**	**109,155**	**34.0%**	**(50.3%)**	**(20.6%)**

Table G-1A Logan Express Bus Service Ridership (Continued)

	Ridership			Percent Change		
Service Year	**Air Passengers**	**Employees**	**Total**	**Air Passengers**	**Employees**	**Total**
Peabody						
2001[4]	8,151	3,097	11,248	NA	NA	NA
2002	28,626	20,629	49,255	NA	NA	NA
2003	32,318	23,425	55,743	21.4%	13.6%	13.2%
2004	43,389	33,642	77,031	34.3%	43.6%	38.2%
2005	51,023	39,599	87,622	17.6%	17.7%	13.7%
2006	42,142	32,632	74,774	(17.4%)	(17.6%)	(14.7%)
2007	36,367	26,949	63,316	(28.7%)[5]	(31.9%)[5]	(27.7%)[5]
2008	30,887	30,596	61,483	(15.1%)	13.5%	(2.9%)
2009	27,856	32,220	60,076	(9.8%)	5.3%	(2.3%)
2010	25,543	26,231	51,744	(8.3%)	(18.6%)	(13.8%)
2011[1]	25,555	31,741	57,296	0.0%	21.0%	10.7%
2012	27,542	37,909	65,451	7.8%	19.4%	14.2%
2013	28,790	38,067	66,857	4.5%	0.4%	2.1%
2014	31,485	36,848	68,333	9.4%	(3.2%)	2.2%
2015	37,478	36,125	73,603	19.0%	(2.0%)	7.7%
2016	40,872	36,143	77,015	9.1%	0.0%	4.6%
2017	46,117	37,233	83,350	12.8%	3.0%	8.2%
2018	50,821	37,953	88,774	10.2%	1.9%	6.5%
2019	53,635	40,928	94,563	5.5%	7.8%	6.5%
2020	**9,697**	**9,363**	**19,060**	**(81.9%)**	**(77.1%)**	**(79.8%)**
2021	**0**	**0**	**0**	**NA**	**NA**	**NA**

Table G-1A Logan Express Bus Service Ridership (Continued)

	Ridership			Percent Change		
Service Year	**Air Passengers**	**Employees**	**Total**	**Air Passengers**	**Employees**	**Total**
Total System Ridership						
1992	397,116	17,358	414,474	8.0%	19.2%	8.5%
1993	493,908	39,832	533,740	24.4%	129.5%	28.8%
1994	617,545	63,923	681,468	25.0%	60.5%	27.7%
1995	689,480	105,228	794,708	11.6%	64.6%	16.6%
1996	851,463	143,773	995,236	23.4%	36.6%	25.2%
1997	816,015	185,229	1,001,254	(4.2%)	28.8%	0.6%
1998	845,598	212,952	1,058,550	3.6%	15.0%	5.7%
1999	868,987	180,727	1,049,714	2.7%	(15.2%)	(0.8%)
2000	923,236	211,717	1,134,953	6.2%	17.1%	8.1%
2001	885,296	236,395	1,121,691	(4.1%)	11.7%	(1.2%)
2002	855,632	326,707	1,182,339	(3.4%)	38.2%	5.4%
2003	808,335	400,132	1,208,467	(5.5%)	22.5%	2.2%
2004	857,530	408,297	1,265,827	6.1%	2.0%	2.2%
2005	837,034	397,660	1,234,694	(2.4%)	(2.6%)	(2.4%)
2006	891,918	418,051	1,309,969	6.6%	5.1%	6.1%
2007	797,530	404,222	1,201,752	(4.7%)[5]	1.7%[5]	(2.7%)[5]
2008	688,673	432,761	1,121,434	(13.6%)	7.1%	(6.7%)
2009	636,847	448,601	1,085,448	(7.5%)	3.7%	(3.2%)
2010	644,412	467,020	1,111,432	1.2%	4.1%	2.4%
2011[1]	649,609	536,513	1,186,122	0.8%	14.9%	6.7%
2012	681,040	624,149	1,305,189	4.8%	16.3%	10.0%
2013	733,005	634,693	1,367,698	8.0%	2.0%	5.0%
2014	788,151	632,011	1,420,162	7.5%	(0.4%)	3.8%
2015	860,203	622,005	1,482,208	9.1%	-1.6%	4.4%

Table G-1A Logan Express Bus Service Ridership (Continued)						
2016	946,872	652,468	1,599,340	10.1%	4.9%	7.9%
2017	1,002,909	695,504	1,698,410	5.9%	6.6%	6.2%
2018	1,063,250	750,615	1,813,865	6.0%	7.9%	6.8%
2019	1,131,263	824,084	1,955,347	6.4%	9.8%	7.8%
2020	**347,440**	**314,982**	**662,422**	**(69.3%)**	**(61.8%)**	**(66.1%)**
2021	**541,702**	**266,062**	**780,764**	**55.9%**	**(15.5%)**	**17.9%**

Source: Massport.
Notes: January 23, 2008: I-90/Ted Williams Tunnel opens to all traffic.
NA Not applicable.
1 Changes to employee parking and bus fares were implemented in October 2011.
2 Woburn Express moved from Mishawum Station to the Anderson Regional Transportation Center (ARTC) in Woburn in May 2001.
3 Reflects a partial year of operation. Woburn Logan Express service was implemented in November 1992.
4 Reflects a partial year of operation. The Peabody Logan Express service commenced in September 2001.
5 Percent comparison between 2007 and 2005. The I-90 Ted Williams Tunnel closures in 2006 resulted in atypical ridership.

Table G-1B Logan Express Back Bay Service Ridership[1]		
	Ridership	**Percent Change**
Service Year		
2014	152,892	NA
2015	290,796	NA
2016	216,329	(25.6%)
2017	137,326	(36.5%)
2018	118,663	(13.6%)
2019	250,477	111.1%
2020[2]	**54,040**	**NA**
2021[2]	**0**	**NA**

Source: Massport.

1 Back Bay Logan Express service commenced in April 2014. Only total ridership available.

2 Back Bay Logan Express service has been suspended since March 2020.

Table G-2 Water Transportation Services Ridership to and from Logan Airport

	Rowes Wharf/Fan Pier Water Shuttle	Private Water Taxi (on-demand)	Harbor Express (Hingham-Hull-Boston Logan)[1]	Boston Logan Water Shuttle (Long Wharf)	Total
1990	181,530	NS	NS	NS	181,530
1991	142,500	NS	NS	NS	142,500
1992	133,297	NS	NS	NS	133,297
1993	159,525	NS	NS	NS	159,525
1994	209,057	NS	NS	NS	209,057
1995	203,829	NS	NS	NS	203,829
1996	159,992	3,364	11,781	NS	175,137
1997	132,542	6,299	71,309	NS	210,150
1998	124,836	9,243	101,174	NS	235,253
1999	122,211	17,252	98,539	NS	238,002
2000	128,097	26,335	83,243	NS	237,675
2001	107,400	29,642	82,704	NS	219,746
2002	75,304	36,736	66,471	NS	178,511
2003	26,480[2]	35,724[3]	61,849	5,722[4]	129,775
2004	NS	54,540	58,788	3,202[5]	116,530
2005	NS	44,975	51,960	NS	96,935
2006	NS	63,639	70,998	NS	134,637
2007	NS	50,737	59,460	NS	110,197
2008	NS	48,630	48,003	NS	96,633
2009	NS	50,734	37,861	NS	88,595
2010	NS	54,382	34,794	NS	89,176
2011	NS	58,879	33,403	NS	92,282
2012	NS	60,840	30,337	NS	91,177
2013	NS	70,378	21,952	NS	92,303
2014	NS	67,479	19,340	NS	86,819
2015	NS	70,798	7,748	NS	78,546
2016	NS	74,788	7,757	NS	82,545
2017	NS	83,689	7,424	NS	91,113
2018	NS	77,813	6,609	NS	84,422
2019	NS	61,071	7,467	NS	68,538
2020	**NS**	**5,730**	**938**	**NS**	**6,668**
2021	**NS**	**2,653**	**1,760**	**NS**	**4,413**

Source: Massport.
Notes: Figures from 2003 – 2007 have been revised from previous documents.
NS Operation not in service.
1 Service to Quincy was discontinued in 2013 and now operates between Hingham/Hull/Boston (Long Wharf)/Logan.
2 Rowes Wharf Water Shuttle operated from January to June only in 2003.
3 Operated from May to October only in 2003.
4 Long Wharf Boston Logan Water Shuttle operated from August to December in 2003.
5 Joint operation with City Water Taxi began on August 16, 2003.

Table G-3 Massachusetts Bay Transportation Authority (MBTA) Airport Station Passengers				
Year	**Entrances**	**Exits**	**Total Turnstile Count[1]**	**Percent Change**
1990	NA	NA	2,854,317	-
1991	NA	NA	2,515,293	(11.9%)
1992	NA	NA	2,626,572	4.2%
1993	NA	NA	2,604,980	(0.8%)
1994	NA	NA	3,108,734	19.3%
1995	NA	NA	3,040,868	(2.2%)
1996	NA	NA	2,974,850	(2.2%)
1997[2]	NA	NA	2,774,268	(6.7%)
1998	NA	NA	2,850,367	2.7%
1999	NA	NA	2,974,045	4.3%
2000	NA	NA	3,019,086	1.5%
2001	NA	NA	2,896,638	(4.1%)
2002	NA	NA	2,670,594	(7.8%)
2003[3]	1,300,272	1,275,627	2,575,899	(3.6%)
2004	1,373,861	1,366,511	2,740,372	6.4%
2005	NA	NA	NA	NA
2006	NA	NA	NA	NA
2007[4]	1,412,055	--	2,524,079	--
2008[5]	2,212,111	--	3,647,394	56.7%
2009[5]	2,329,370	--	3,750,549	5.3%
2010[5]	2,270,241	--	3,629,193	(2.5%)
2011	2,277,311	NA	NA	0.3%
2012	2,442,085	NA	NA	7.2%
2013	2,597,306	NA	NA	6.3%
2014	2,378,965	NA	NA	(8.4%)[6]
2015	2,122,597	NA	NA	(10.8%)[6]

Table G-3 (continued)	**Massachusetts Bay Transportation Authority (MBTA) Airport Station Passengers**			
2016	2,240,744	NA	NA	5.6%
2017	2,197,783	NA	NA	(1.9%)
2018	2,295,250	NA	NA	4.4%
2019	1,635,147	NA	NA	(28.8%)
2020	**1,041,968**	NA	NA	**(36%)**
2021	**1,361,036**	NA	NA	**31%**

Source: MBTA.

Notes: Total Turnstile count figures include both Logan Airport bound (turnstile exits) and non-Logan Airport bound (turnstile entrances) passengers.

NA Data not available

1 As stated in the *Logan Airport 1999 ESPR*, Massport believes that ridership estimates through 2005 from the old Airport Station were understated because many travelers that were destined for the Airport with baggage had been observed to avoid the turnstiles and exit the old Airport Station via the wide gate (designed for handicapped access) that did not have the capability to count passengers.

2 Airport Station was closed on six weekends during September and October 1997 due to construction.

3 Airport Station was closed on eight weekend days during 2003.

4 Automated fare collection and new fare gates implemented beginning January 2007. Station access to Bremen Street Park opened June 2007. Exits are undercounted.

5 Exits are undercounted, as some exits occur through exit doors rather than turnstiles.

6 Due to the closure of Government Center Station in 2014, it is possible that passengers who would normally take the Blue Line to the Green Line switched to alternate modes for their trips.

Table G-4 Annual Taxi Dispatches (Tickets Sold)		
Year	**Total (yearly tickets sold)**	**Percent Change**
1990	1,330,418	-
1991	1,208,611	(9.2%)
1992	1,266,033	4.8%
1993	1,336,603	5.6%
1994	1,409,505	5.5%
1995	1,499,869	6.4%
1996	1,721,093	14.7%
1997	1,827,244	6.2%
1998	1,888,281	3.3%
1999	1,955,895	3.6%
2000	2,140,724	9.4%
2001	1,789,736	(16.4%)
2002	1,679,508	(6.2%)
2003	1,562,076	(7.0%)
2004	1,713,696	9.7%
2005	1,769,876	3.3%
2006	1,857,609	5.0%
2007	1,925,817	3.7%
2008	1,749,730	(9.1%)
2009	1,630,333	(6.8%)
2010	1,829,961	12.1%
2011	1,937,743	6.0%
2012	2,022,239	4.4%
2013	2,131,371	5.0%
2014	2,237,793	5.0%
2015	2,302,059	2.9%
2016	2,420,391	5.1%
2017	1,975,174	(18.4%)
2018	1,697,831	(14.0%)
2019	1,573,627	(7.3%)
2020	**316,351**	**(-79.9%)**
2021	**525,858**	**66.2%**

Source: Massport.

Table G-5A On-Airport Commercial Parking Rates, 2010-2021 (Terminal Area Facilities[1])

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
0 to 30 minutes	$3	$3	$3	$3	$3	$3	$3	N/A	N/A	N/A	N/A	N/A
31 minutes to 1 hour	$6	$6	$6	$6	$6	$6	$6	N/A	N/A	N/A	N/A	N/A
0 minutes to 1 hour							N/A	$7	$7	$8	$8	$8
1 to 1.5 hours	$9	$9	$9	$9	$11	$10	$12	N/A	N/A	N/A	N/A	N/A
1.5 to 2 hours	$12	$12	$12	$12	$14	$14	$17	N/A	N/A	N/A	N/A	N/A
1 to 2 hours							N/A	$19	$19	$21	$21	$21
2 to 3 hours	$15	$15	$17	$17	$19	$19	$22	$24	$24	$26	$26	$26
3 to 4 hours	$18	$18	$21	$21	$23	$23	$26	$28	$28	$30	$30	$30
4 to 7 hours	$22	$22	$25	$25	$27	$27	$30	$32	$32	$34	$34	$34
7 to 24 hours (Daily)	$24	$24	$27	$27	$29	$29	$32	$35	$35	$38	$38	$38
Additional days 0 to 6 hours	$12	$12	$14	$14	$15	$15	$16	$18	$18	$19	$19	$19
Additional day(s) 6 to 24 hours	$24	$24	$27	$27	$29	$29	$32	$35	$35	$38	$38	$38

Source: Massport.

1 Central/West Parking Garage, Terminal B Garage, Terminal E Lots

Table G-5B On-Airport Commercial Parking Rates, 2010-2021 (Economy Parking)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Daily Rate	$18	$18	$18	$18	$20	$20	$23	$26	$26	$29	$29	$29
Additional days 0 to 6 hours	$9	$9	$9	$9	$10	$10	$12	$13	$13	$15	$15	$15
Additional days 6 to 24 hours	$18	$18	$18	$18	$20	$20	$23	$26	$26	$29	$29	$29
Weekly Rate (6-7 days)	$108	$108	$108	$108	$120	$120	$138	N/A	N/A	N/A	N/A	N/A

Source: Massport.

Table G-6 Logan Airport Employee Parking Supply

	Number of Spaces															
Location	**Mar 2014**	**Sept 2014**	**Mar 2015**	**Sept 2015**	**Mar 2016**	**Sept 2016**	**Mar 2017**	**Oct 2017**	**Mar 2018**	**Oct 2018**	**Mar 2019**	**Oct 2019**	**Mar 2020**	**Sept 2020**	**Mar 2021**	**Sept 2021**
Terminal Area	857	868	868	865	865	865	865	865	865	865	865	901	**900**	**906**	**900**	**894**
North Service Area	883	883	881	876	876	876	876	876	876	876	876	833	**812**	**812**	**812**	**663**
Southwest Service Area	4	4	14	16	16	16	16	16	16	16	16	16	**16**	**16**	**12**	**12**
South Service Area	681	681	674	665	665	665	665	665	665	665	665	695	**702**	**702**	**702**	**649**
Airside (Fire/Rescue)	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0**	**0**
Total spaces in service	2,425	2,436	2,437	2,422	2,422	2,422	2,422	2,422	2,422	2,422	2,422	2,445	**2,430**	**2,436**	**2,426**	**2,218**
Total spaces out of service	248	237	236	251	26	26	26	26	26	26	26	3	**18**	**12**	**22**	**230**
Total employee spaces	2,673	2,673	2,673	2,673	2,448	2,448	2,448	2,448	2,448	2,448	2,448	2,448	**2,448**	**2,448**	**2,448**	**2,448**

Source: Logan Airport Parking Space Inventory submitted to Massachusetts Department of Environmental Protection (MassDEP), March and September 2014-2021 (September 2017 was revised in October 2017.

Table G-7 Logan Airport Commercial Parking Supply

	Number of Spaces															
Location	**Mar 2014**	**Sept 2014**	**Mar 2015**	**Sept 2015**	**Mar 2016**	**Sept 2016**	**Mar 2017**	**Oct 2017**	**Mar 2018**	**Sept 2018**	**March 2019**	**Sept 2019**	**Mar 2020**	**Sept 2020**	**March 2021**	**Sept 2021**
Terminal Area																
Central Garage and West Garage	10,267	10,267	10,267	10,340	11,954	11,954	11,954	11,954	11,954	11,954	11,954	10,964	**11,038**	**11,038**	**9,053**	**9,108**
Terminal B Garage	2,254	2,254	2,254	2,201	2,212	2,212	2,212	2,212	2,212	2,212	2,212	2,212	**2,212**	**227**	**0**	**2,212**
Terminal E Lot 1	275	275	243	237	237	237	237	237	237	237	237	237	**237**	**237**	**0**	**0**
Terminal E Lot 2	248	248	248	249	249	249	249	249	249	249	249	203	**0**	**203**	**0**	**0**
Terminal E Lot 3 (Gulf Lot)	219	219	219	217	217	217	217	217	217	217	217	93	**93**	**93**	**0**	**0**
Signature (General Aviation)	35	35	35	35	35	35	35	35	35	35	35	35	**35**	**35**	**35**	**35**
Logan Airport Hilton	235	235	35	35	235	235	235	235	235	235	235	63	**106**	**110**	**110**	**110**
North Service Area																
Economy Garage	2,809	2,809	2,809	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	**2,864**	**2,864**	**0**	**0**
Overflow Green Lot (Wood Island)	0	0	235	242	0	0	0	0	0	0	0	0	**0**	**0**	**0**	**0**
South Service Area																
Harborside Hyatt Conference Center and Hotel	270	270	270	270	270	270	270	270	270	270	270	270	**270**	**270**	**270**	**270**
Overflow Blue Lot (Harborside Dr.)	0	0	315	339	367	367	367	367	367	0	0	0	**0**	**0**	**0**	**0**
Southwest Service Area																
Overflow Red Lot (Tomahawk Dr.)	0	0	282	282	0	0	0	0	0	0	0	100	**100**	**100**	**0**	**0**
Massport In-Service Parking Supply (lined spaces)	16,072	16,072	16,872	16,971	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	**16,544**	**16,444**	**16,679**	**16,679**
Total spaces in service[1]	16,612	16,612	17,212	17,311	18,640	18,640	18,640	18,640	18,640	18,273	18,273	17,041	**16,955**	**15,177**	**9,468**	**11,735**
Total spaces out of service	1,803	1,803	1,203	1,104	-	-	-	5,000	5,000	5,367	5,367	6,599	**6,685**	**8,463**	**14,172**	**11,905**
Total commercial spaces	18,415	18,415	18,415	18,415	18,640	18,640	18,640	23,640	23,640	23,640	23,640	23,640	**23,640**	**23,640**	**23,640**	**23,640**

Source: Logan Airport Parking Space Inventory submitted to MassDEP, March and September 2014 - 2021 (September 2017 was revised in October 2017).

1 Total spaces in service includes Signature (General Aviation), Logan Airport Hilton, Harborside Hyatt Conference Center and Hotel, and overflow lots (Overflow Green Lot, Overflow Red Lot, etc.) from previous years.

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
1	344	27	336	266	2,066	4,778	22	17	135	311
2	496	29	299	229	1,756	4,667	28	22	165	438
3	1,347	20	214	275	2,142	4,595	55	70	547	1,172
4	1,166	27	254	412	2,687	5,322	56	91	593	1,175
5	378	24	469	687	4,829	9,916	34	49	346	710
6	441	31	306	254	2,033	4,574	26	21	170	382
7	896	23	163	433	2,796	5,342	28	73	474	907
8	644	27	619	471	3,588	8,624	76	57	438	1,052
9	1,214	26	127	308	2,246	4,783	29	71	516	1,100
10	1,303	25	505	200	1,638	4,448	125	49	404	1,098
11	421	24	15	25	234	821	1	2	19	65
12	236	31	8	8	60	174	0	0	3	8
13	1,311	31	45	182	1,206	2,039	11	45	299	506
14	750	26	635	496	3,822	9,445	90	70	543	1,342
15	441	23	324	774	4,979	9,780	27	65	416	817
16	1,724	23	22	56	434	880	7	18	142	287
17	644	19	35	145	969	1,913	4	18	118	233
18	354	26	493	163	1,342	3,841	33	11	90	257
19	687	15	12	37	296	607	2	5	39	79
20	94	15	23	33	294	635	0	1	5	11
21	877	21	-	-	-	-	-	-	-	-
22	79	32	-	-	-	-	-	-	-	-
23	81	28	-	-	-	-	-	-	-	-
24	79	5	-	-	-	-	-	-	-	-
25	87	9	-	-	-	-	-	-	-	-
26	209	19	-	-	-	-	-	-	-	-
27	187	5	22	56	434	880	1	2	15	31
28	124	6	22	56	434	880	1	1	10	21
29	226	31	11	112	675	1,319	0	5	29	56
30	1,070	5	-	-	-	397	-	-	-	80
31	385	32	11	112	675	1,319	1	8	49	96
32	516	26	-	-	-	-	-	-	-	-
34	181	23	-	-	-	397	-	-	-	14
35	248	26	-	-	-	397	-	-	-	19
36	89	21	-	-	-	397	-	-	-	7
37	102	26	-	-	-	-	-	-	-	-

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
38	110	32	-	-	-	-	-	-	-	-
39	219	31	-	-	-	-	-	-	-	-
40	232	9	-	-	-	-	-	-	-	-
41	177	26	-	-	-	-	-	-	-	-
42	205	29	-	-	-	-	-	-	-	-
43	597	26	-	-	-	-	-	-	-	-
44	587	32	-	-	-	-	-	-	-	-
45	96	32	-	-	-	-	-	-	-	-
46	112	17	-	-	-	-	-	-	-	-
47	859	27	-	-	-	-	-	-	-	-
48	94	15	-	-	-	-	-	-	-	-
49	420	26	-	-	-	-	-	-	-	-
50	353	33	19	33	297	565	1	2	20	38
51	717	26	19	33	297	565	3	4	40	77
52	403	33	14	58	384	710	1	4	29	54
53	321	34	-	-	-	-	-	-	-	-
54	612	32	14	58	384	710	2	7	45	82
55	194	26	25	49	414	804	1	2	15	30
56	101	8	7	15	130	243	0	0	2	5
57	97	31	9	32	241	406	0	1	4	7
58	103	33	-	-	-	-	-	-	-	-
59	105	5	-	-	-	-	-	-	-	-
60	331	26	26	66	525	966	2	4	33	61
61	224	9	3	9	61	137	0	0	3	6
62	218	24	88	92	680	1,694	4	4	28	70
63	242	23	0	1	5	11	0	0	0	0
64	232	5	85	84	623	1,568	4	4	27	69
65	593	26	111	149	1,144	2,524	12	17	128	283
66	465	25	129	244	1,592	2,939	11	21	140	259
67	483	21	-	-	-	-	-	-	-	-
68	487	5	-	-	-	-	-	-	-	-
69	361	15	-	-	-	-	-	-	-	-
90	582	6	20	74	501	949	2	8	55	105
103	85	33	-	-	-	-	-	-	-	-
104	85	5	-	-	-	-	-	-	-	-
105	95	5	-	-	-	-	-	-	-	-
106	95	5	-	-	-	-	-	-	-	-

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
107	260	20	16	18	133	404	1	1	7	20
108	389	24	21	43	294	797	2	3	22	59
109	114	27	19	120	735	1,091	0	3	16	24
110	169	28	19	120	735	1,091	1	4	24	35
111	261	5	-	-	-	-	-	-	-	-
112	237	30	19	120	735	1,091	1	5	33	49
113	565	17	129	244	1,592	2,939	14	26	170	314
114	609	32	118	66	664	1,572	14	8	77	181
115	451	29	8	10	73	230	1	1	6	20
116	399	22	129	88	812	1,994	10	7	61	151
117	283	22	10	22	148	423	1	1	8	23
118	295	29	8	10	73	230	0	1	4	13
119	240	12	3	13	86	201	0	1	4	9
120	365	30	13	35	234	623	1	2	16	43
121	356	17	8	10	73	230	1	1	5	16
122	486	16	8	8	60	174	1	1	6	16
123	486	18	8	8	60	174	1	1	6	16
124	280	25	-	-	-	-	-	-	-	-
125	280	19	-	-	-	-	-	-	-	-
126	631	20	16	18	133	404	2	2	16	48
127	652	24	21	43	294	797	3	5	36	98
128	257	32	8	8	60	174	0	0	3	8
129	257	18	8	8	60	174	0	0	3	8
130	422	5	-	-	-	-	-	-	-	-
131	493	29	-	-	-	-	-	-	-	-
132	361	23	40	76	587	1,326	3	5	40	91
133	236	27	21	43	294	797	1	2	13	36
134	1,521	30	51	188	1,262	2,243	15	54	364	646
135	1,542	27	13	35	234	623	4	10	68	182
136	384	5	-	-	-	-	-	-	-	-
137	354	18	-	-	-	-	-	-	-	-
138	225	23	-	-	-	-	-	-	-	-
139	96	14	24	58	454	922	0	1	8	17
140	295	27	8	10	73	230	0	1	4	13
142	257	29	63	233	1,500	2,636	3	11	73	128
144	518	9	85	93	735	1,780	8	9	72	175
145	195	22	29	38	333	784	1	1	12	29

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
146	463	22	28	35	310	748	2	3	27	66
147	230	22	125	140	1,102	2,741	5	6	48	119
148	794	22	40	47	367	961	6	7	55	145
149	661	21	3	10	91	150	0	1	11	19
150	281	21	4	11	114	186	0	1	6	10
151	360	21	3	10	104	172	0	1	7	12
152	88	32	-	-	-	-	-	-	-	-
153	66	31	0	1	10	15	0	0	0	0
154	173	33	1	4	33	51	0	0	1	2
155	258	30	97	104	791	2,063	5	5	39	101
156	645	26	97	104	785	1,982	12	13	96	242
157	218	22	-	0	6	81	-	0	0	3
158	185	24	62	104	1,188	2,100	2	4	42	74
159	354	17	62	104	1,194	2,180	4	7	80	146
160	470	28	1	3	36	56	0	0	3	5
161	94	15	98	106	821	2,039	2	2	15	36
162	50	15	1	3	32	51	0	0	0	0
163	66	15	97	104	788	1,988	1	1	10	25
164	367	33	2	7	51	80	0	0	4	6
165	124	26	-	-	-	-	-	-	-	-
166	84	26	-	-	-	-	-	-	-	-
167	956	26	-	-	-	-	-	-	-	-
168	380	15	1	3	34	53	0	0	2	4
169	293	12	1	3	34	53	0	0	2	3
170	205	33	-	-	-	-	-	-	-	-
171	158	5	-	-	-	-	-	-	-	-
172	180	5	-	-	-	-	-	-	-	-
173	48	5	-	-	-	-	-	-	-	-
174	502	10	3	29	433	575	0	3	41	55
175	640	9	97	106	847	2,524	12	13	103	306
176	319	22	123	520	3,136	6,077	7	31	189	367
177	286	22	463	381	2,813	6,288	25	21	152	341
178	353	18	193	651	3,832	7,855	13	44	256	525
179	348	32	367	275	1,966	3,764	24	18	130	248
180	366	18	168	253	1,537	2,989	12	18	107	207
181	453	8	105	106	797	2,004	9	9	68	172
182	119	8	105	106	797	2,004	2	2	18	45

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
183	50	8	105	106	797	2,004	1	1	8	19
184	54	8	105	106	797	2,004	1	1	8	20
185	62	8	105	126	1,165	2,476	1	1	14	29
186	39	8	0	20	368	472	0	0	3	3
187	338	5	-	-	-	-	-	-	-	-
188	92	12	-	-	-	-	-	-	-	-
189	171	5	-	-	-	-	-	-	-	-
190	193	13	-	-	-	-	-	-	-	-
191	169	5	-	-	-	-	-	-	-	-
192	540	5	-	-	-	-	-	-	-	-
193	138	9	97	106	847	2,524	3	3	22	66
194	932	21	97	106	847	2,524	17	19	150	446
195	79	10	1	3	34	53	0	0	1	1
196	49	10	3	8	65	103	0	0	1	1
197	83	5	4	11	99	157	0	0	2	2
198	692	5	2	6	57	90	0	1	8	12
199	70	27	2	6	57	90	0	0	1	1
200	158	5	-	-	-	-	-	-	-	-
201	160	5	-	-	-	-	-	-	-	-
202	335	22	-	-	-	-	-	-	-	-
203	30	5	-	-	-	-	-	-	-	-
204	2,022	8	105	126	1,165	2,476	40	48	446	948
205	71	26	60	101	1,134	2,008	1	1	15	27
206	142	26	60	100	1,153	2,035	2	3	31	55
207	859	33	50	88	713	1,401	8	14	116	228
208	284	32	38	30	334	819	2	2	18	44
209	80	18	144	206	1,217	2,606	2	3	18	39
210	71	11	142	201	1,169	2,198	2	3	16	30
211	390	18	209	266	1,812	3,970	15	20	134	293
212	117	18	142	201	1,169	2,198	3	4	26	49
213	1,344	22	361	904	5,369	10,843	92	230	1,367	2,760
214	449	32	417	363	2,678	5,164	35	31	228	439
215	1,110	32	-	0	16	427	-	0	3	90
216	905	32	306	254	2,017	4,147	52	43	346	711
217	1,050	32	37	194	1,211	1,885	7	39	241	375
218	581	25	161	341	2,182	4,437	18	38	240	488
219	1,063	32	148	97	669	1,490	30	20	135	300

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
220	415	32	156	101	698	1,552	12	8	55	122
221	698	33	7	4	29	63	1	1	4	8
222	1,920	29	15	14	102	293	6	5	37	107
223	1,564	28	309	438	2,852	5,927	92	130	845	1,756
224	377	29	17	49	337	823	1	4	24	59
225	551	29	9	39	264	593	1	4	28	62
226	788	33	8	10	73	230	1	1	11	34
227	1,303	33	-	-	-	-	-	-	-	-
228	580	30	421	332	2,309	5,183	46	36	254	569
229	1,653	31	171	245	1,666	3,484	54	77	522	1,091
230	2,058	29	250	87	643	1,699	98	34	251	662
231	1,300	20	4	36	264	880	1	9	65	217
232	736	26	171	245	1,666	3,484	24	34	232	486
233	488	28	266	101	744	1,992	25	9	69	184
234	449	28	78	105	729	1,546	7	9	62	131
235	310	14	46	63	450	957	3	4	26	56
236	310	11	31	42	279	588	2	2	16	35
237	105	5	9	39	264	593	0	1	5	12
238	697	31	-	-	-	-	-	-	-	-
239	186	22	11	39	267	497	0	1	9	18
240	145	10	15	14	102	293	0	0	3	8
241	578	10	27	53	368	790	3	6	40	87
242	125	20	-	-	-	-	-	-	-	-
243	564	20	-	-	-	-	-	-	-	-
244	88	20	-	-	-	-	-	-	-	-
245	48	13	-	-	-	-	-	-	-	-
246	175	5	15	14	102	293	1	0	3	10
247	65	6	-	-	-	-	-	-	-	-
248	39	5	19	43	295	560	0	0	2	4
249	128	5	27	53	368	790	1	1	9	19
250	484	5	27	53	368	790	2	5	34	72
251	388	32	-	-	-	-	-	-	-	-
252	308	11	-	-	-	-	-	-	-	-
253	54	5	-	-	-	-	-	-	-	-
254	51	5	-	-	-	-	-	-	-	-
255	290	31	-	-	-	-	-	-	-	-
256	377	31	-	-	-	-	-	-	-	-

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
257	215	31	-	-	-	-	-	-	-	-
258	321	10	-	-	-	-	-	-	-	-
259	203	10	-	-	-	-	-	-	-	-
260	362	10	-	-	-	-	-	-	-	-
261	219	31	-	-	-	-	-	-	-	-
262	218	11	-	-	-	-	-	-	-	-
263	177	16	-	-	-	-	-	-	-	-
264	157	5	-	-	-	-	-	-	-	-
265	2,458	28	202	215	1,646	3,521	94	100	766	1,639
266	752	28	205	235	1,808	3,808	29	33	257	542
267	1,323	28	205	235	1,808	3,808	51	59	453	954
268	1,252	31	203	235	1,805	3,843	48	56	428	911
269	302	29	-	-	-	-	-	-	-	-
270	1,005	17	16	73	560	1,131	3	14	107	215
271	954	15	27	39	331	703	5	7	60	127
272	656	23	50	98	754	1,520	6	12	94	189
273	485	7	135	181	1,372	3,078	12	17	126	283
274	1,244	27	46	70	491	985	11	17	116	232
275	419	5	-	-	-	-	-	-	-	-
276	649	27	42	64	454	917	5	8	56	113
277	2,473	25	42	50	345	732	20	23	162	343
278	573	32	205	237	1,784	3,772	22	26	194	409
279	458	21	118	151	1,123	2,598	10	13	97	225
280	295	25	13	43	302	561	1	2	17	31
281	440	21	13	43	302	561	1	4	25	47
282	76	21	-	-	-	-	-	-	-	-
283	697	21	33	78	524	1,143	4	10	69	151
284	690	20	99	134	979	2,296	13	17	128	300
285	91	20	91	124	906	2,066	2	2	16	36
286	464	20	138	190	1,382	3,063	12	17	121	269
287	229	29	138	190	1,382	3,063	6	8	60	133
288	500	10	138	190	1,382	3,063	13	18	131	290
289	738	26	302	589	4,176	9,147	42	82	584	1,279
290	190	27	301	513	3,770	8,253	11	18	136	297
291	494	32	67	66	643	1,772	6	6	60	166
292	689	26	234	447	3,126	6,481	31	58	408	846
293	325	29	771	300	2,382	6,439	47	18	147	396

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
294	396	25	223	138	1,073	2,705	17	10	80	203
295	1,017	30	547	162	1,309	3,734	105	31	252	719
296	162	19	1	76	406	894	0	2	12	27
297	140	19	1	76	406	894	0	2	11	24
298	951	12	141	51	442	898	25	9	80	162
299	805	14	1	150	727	1,301	0	23	111	198
300	518	16	105	108	821	2,036	10	11	81	200
301	749	7	103	106	801	1,994	15	15	114	283
302	652	15	223	138	1,073	2,705	28	17	133	334
303	547	5	-	-	-	-	-	-	-	-
304	406	13	-	-	-	-	-	-	-	-
305	442	5	-	-	-	-	-	-	-	-
306	207	5	-	-	-	-	-	-	-	-
307	70	5	-	-	-	-	-	-	-	-
308	319	13	97	106	799	1,992	6	6	48	120
309	281	7	105	106	797	1,992	6	6	42	106
310	555	27	47	104	1,000	2,253	5	11	105	237
311	208	17	134	472	2,850	5,840	5	19	112	230
312	125	17	90	397	2,283	4,162	2	9	54	99
313	332	27	109	79	638	1,906	7	5	40	120
314	440	27	519	321	2,502	6,025	43	27	209	502
315	215	16	192	462	2,564	5,447	8	19	104	222
316	543	17	105	94	713	1,860	11	10	73	191
317	180	14	116	190	1,046	2,283	4	6	36	78
318	221	11	116	190	1,045	2,278	5	8	44	95
319	2,544	9	221	296	1,843	4,270	106	142	888	2,057
320	552	12	-	-	-	-	-	-	-	-
321	628	14	97	106	799	1,992	12	13	95	237
322	181	12	0	0	1	5	0	0	0	0
323	58	12	0	0	1	5	0	0	0	0
324	387	13	-	-	-	-	-	-	-	-
325	406	12	0	0	1	5	0	0	0	0
326	89	5	-	-	-	-	-	-	-	-
327	463	13	-	0	3	6	-	0	0	1
328	79	16	-	0	3	6	-	0	0	0
329	103	16	-	0	3	6	-	0	0	0
330	323	13	-	-	-	-	-	-	-	-

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
331	179	11	221	296	1,843	4,270	7	10	62	145
332	993	5	535	189	1,470	3,821	101	35	276	719
333	384	10	-	-	-	-	-	-	-	-
334	366	24	438	83	671	1,829	30	6	47	127
335	583	29	313	156	1,265	2,942	35	17	140	325
336	428	27	90	397	2,283	4,162	7	32	185	337
337	94	5	-	-	-	-	-	-	-	-
338	366	5	-	-	-	-	-	-	-	-
339	311	5	-	-	-	-	-	-	-	-
340	273	20	-	12	84	144	-	1	4	7
341	66	16	-	12	84	144	-	0	1	2
342	48	29	-	12	84	144	-	0	1	1
343	52	22	-	-	-	-	-	-	-	-
344	82	12	-	12	84	144	-	0	1	2
345	25	5	105	94	713	1,860	0	0	3	9
346	121	5	-	-	-	-	-	-	-	-
347	303	7	105	106	797	2,004	6	6	46	115
348	146	22	205	165	1,237	3,083	6	5	34	85
349	67	22	97	104	783	1,942	1	1	10	25
350	446	5	97	104	783	1,942	8	9	66	164
351	335	5	-	-	-	-	-	-	-	-
352	430	5	-	-	-	-	-	-	-	-
353	360	5	-	-	-	-	-	-	-	-
354	50	8	105	106	797	2,004	1	1	8	19
355	88	13	97	89	663	1,759	2	1	11	29
356	113	13	150	211	1,428	3,163	3	5	31	68
358	463	5	-	-	-	-	-	-	-	-
359	229	12	-	-	-	-	-	-	-	-
360	245	13	-	-	-	-	-	-	-	-
361	248	17	-	-	-	-	-	-	-	-
362	199	9	-	-	-	-	-	-	-	-
363	230	22	0	14	109	185	0	1	5	8
364	256	19	3	20	162	288	0	1	8	14
365	201	23	-	-	-	-	-	-	-	-
366	201	10	-	-	-	-	-	-	-	-
367	337	32	342	441	3,185	5,967	22	28	203	381
368	868	11	535	189	1,470	3,821	88	31	242	628

Table G-8 2020 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
369	167	15	410	241	1,864	4,120	13	8	59	130
370	96	15	33	123	853	1,915	1	2	16	35
371	141	20	87	368	1,850	3,586	2	10	49	96
372	283	29	-	-	-	-	-	-	-	-
373	283	27	-	-	-	-	-	-	-	-
			LOGAN AIRPORT VMT				**2,904**	**3,394**	**24,072**	**52,794**

Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
1	344	27	798	858	6,149	13,592	52	56	401	886
2	496	29	572	581	4,205	10,707	54	55	395	1,006
3	1347	20	423	559	4,088	9,443	108	143	1,043	2,409
4	1166	27	628	963	6,633	14,658	139	213	1,465	3,237
5	378	24	1,050	1,522	10,721	24,102	75	109	768	1,725
6	441	31	544	578	4,410	11,354	45	48	368	948
7	896	23	506	944	6,311	12,748	86	160	1,071	2,163
8	644	27	1,322	1,328	9,551	21,765	161	162	1,165	2,655
9	1214	26	924	889	5,799	12,420	213	204	1,333	2,856
10	1303	25	410	476	4,047	9,953	101	117	999	2,456
11	421	24	47	111	803	2,534	4	9	64	202
12	236	31	7	8	60	174	0	0	3	8
13	1311	31	189	309	2,107	3,803	47	77	523	944
14	750	26	1,370	1,439	10,354	24,300	195	204	1,471	3,452
15	441	23	1,014	1,591	11,146	23,658	85	133	931	1,976
16	1724	23	22	56	434	880	7	18	142	287
17	644	19	211	358	2,439	5,389	26	44	297	657
18	354	26	398	439	3,751	9,346	27	29	252	627
19	687	15	12	37	296	607	2	5	39	79
20	94	15	54	119	863	1,689	1	2	15	30
21	877	21	-	-	-	-	-	-	-	-
22	79	32	-	-	-	-	-	-	-	-
23	81	28	-	-	-	-	-	-	-	-
24	79	5	-	-	-	-	-	-	-	-
25	87	9	-	-	-	-	-	-	-	-
26	209	19	-	-	-	-	-	-	-	-
27	187	5	22	56	434	880	1	2	15	31
28	124	6	22	56	434	880	1	1	10	21
29	226	31	157	239	1,576	3,807	7	10	67	163
30	1070	5	-	-	-	1,126	-	-	-	228
31	385	32	157	239	1,576	3,807	11	17	115	278
32	516	26	-	-	-	-	-	-	-	-
34	181	23	-	-	-	1,126	-	-	-	39
35	248	26	-	-	-	1,126	-	-	-	53
36	89	21	-	-	-	1,126	-	-	-	19
37	102	26	-	-	-	-	-	-	-	-

Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
38	110	32	-	-	-	-	-	-	-	-
39	219	31	-	-	-	-	-	-	-	-
40	232	9	-	-	-	-	-	-	-	-
41	177	26	-	-	-	-	-	-	-	-
42	205	29	-	-	-	-	-	-	-	-
43	597	26	-	-	-	-	-	-	-	-
44	587	32	-	-	-	-	-	-	-	-
45	96	32	-	-	-	-	-	-	-	-
46	112	17	-	-	-	-	-	-	-	-
47	859	27	-	-	-	-	-	-	-	-
48	94	15	-	-	-	-	-	-	-	-
49	420	26	-	-	-	-	-	-	-	-
50	353	33	59	123	879	1,648	4	8	59	110
51	717	26	59	123	879	1,648	8	17	119	224
52	403	33	59	139	1,146	2,242	5	11	87	171
53	321	34	-	-	-	-	-	-	-	-
54	612	32	59	139	1,146	2,242	7	16	133	260
55	194	26	81	197	1,417	2,620	3	7	52	96
56	101	8	24	53	395	766	0	1	8	15
57	97	31	50	108	769	1,445	1	2	14	27
58	103	33	-	-	-	-	-	-	-	-
59	105	5	-	-	-	-	-	-	-	-
60	331	26	106	252	1,791	3,299	7	16	112	207
61	224	9	12	51	363	619	1	2	15	26
62	218	24	153	178	1,292	2,932	6	7	53	121
63	242	23	1	4	28	47	0	0	1	2
64	232	5	141	131	957	2,361	6	6	42	104
65	593	26	247	378	2,720	5,613	28	43	305	630
66	465	25	129	295	2,034	3,931	11	26	179	346
67	483	21	-	-	-	-	-	-	-	-
68	487	5	-	-	-	-	-	-	-	-
69	361	15	-	-	-	-	-	-	-	-
90	582	6	81	213	1,683	3,214	9	24	186	354
103	85	33	-	-	-	-	-	-	-	-
104	85	5	-	-	-	-	-	-	-	-
105	95	5	-	-	-	-	-	-	-	-
106	95	5	-	-	-	-	-	-	-	-

Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
107	260	20	21	18	133	404	1	1	7	20
108	389	24	89	90	594	1,345	7	7	44	99
109	114	27	164	247	1,636	2,855	4	5	35	62
110	169	28	164	247	1,636	2,855	5	8	52	91
111	261	5	-	-	-	-	-	-	-	-
112	237	30	164	247	1,636	2,855	7	11	73	128
113	565	17	129	295	2,034	3,931	14	32	218	421
114	609	32	141	119	938	2,265	16	14	108	261
115	451	29	14	10	73	230	1	1	6	20
116	399	22	183	158	1,199	2,897	14	12	91	219
117	283	22	42	39	261	632	2	2	14	34
118	295	29	14	10	73	230	1	1	4	13
119	240	12	40	43	274	539	2	2	12	25
120	365	30	82	82	534	1,171	6	6	37	81
121	356	17	14	10	73	230	1	1	5	16
122	486	16	7	8	60	174	1	1	6	16
123	486	18	7	8	60	174	1	1	6	16
124	280	25	-	-	-	-	-	-	-	-
125	280	19	-	-	-	-	-	-	-	-
126	631	20	21	18	133	404	3	2	16	48
127	652	24	89	90	594	1,345	11	11	73	166
128	257	32	7	8	60	174	0	0	3	8
129	257	18	7	8	60	174	0	0	3	8
130	422	5	-	-	-	-	-	-	-	-
131	493	29	-	-	-	-	-	-	-	-
132	361	23	46	76	587	1,326	3	5	40	91
133	236	27	89	90	594	1,345	4	4	27	60
134	1521	30	203	315	2,163	4,007	58	91	623	1,154
135	1542	27	82	82	534	1,171	24	24	156	342
136	384	5	-	-	-	-	-	-	-	-
137	354	18	-	-	-	-	-	-	-	-
138	225	23	-	-	-	-	-	-	-	-
139	96	14	25	58	454	922	0	1	8	17
140	295	27	14	10	73	230	1	1	4	13
142	257	29	366	489	3,307	6,426	18	24	161	313
144	518	9	141	174	1,216	2,951	14	17	119	289
145	195	22	34	58	415	929	1	2	15	34

Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
146	463	22	34	58	415	929	3	5	36	81
147	230	22	187	221	1,583	3,912	8	10	69	170
148	794	22	46	47	367	961	7	7	55	145
149	661	21	6	15	111	223	1	2	14	28
150	281	21	6	15	111	223	0	1	6	12
151	360	21	6	15	111	223	0	1	8	15
152	88	32	-	-	-	-	-	-	-	-
153	66	31	-	-	-	-	-	-	-	-
154	173	33	-	-	-	-	-	-	-	-
155	258	30	153	180	1,241	3,398	7	9	61	166
156	645	26	153	163	1,168	2,983	19	20	143	364
157	218	22	-	18	73	415	-	1	3	17
158	185	24	92	322	2,145	3,857	3	11	75	135
159	354	17	92	340	2,218	4,272	6	23	149	286
160	470	28	-	-	-	-	-	-	-	-
161	94	15	153	163	1,168	2,983	3	3	21	53
162	50	15	-	-	-	-	-	-	-	-
163	66	15	153	163	1,168	2,983	2	2	15	37
164	367	33	-	-	-	-	-	-	-	-
165	124	26	-	-	-	-	-	-	-	-
166	84	26	-	-	-	-	-	-	-	-
167	956	26	-	-	-	-	-	-	-	-
168	380	15	-	-	-	-	-	-	-	-
169	293	12	-	-	-	-	-	-	-	-
170	205	33	-	-	-	-	-	-	-	-
171	158	5	-	-	-	-	-	-	-	-
172	180	5	-	-	-	-	-	-	-	-
173	48	5	-	-	-	-	-	-	-	-
174	502	10	7	186	1,144	1,755	1	18	109	167
175	640	9	153	226	1,520	4,778	19	27	184	579
176	319	22	647	1,106	7,101	14,651	39	67	429	885
177	286	22	592	664	5,245	12,527	32	36	284	679
178	353	18	1,100	1,251	8,243	18,541	74	84	551	1,240
179	348	32	439	438	3,725	7,748	29	29	245	511
180	366	18	390	489	4,050	8,445	27	34	281	585
181	453	8	161	153	1,131	2,797	14	13	97	240
182	119	8	161	153	1,131	2,797	4	3	25	63

Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
183	50	8	161	153	1,131	2,797	2	1	11	26
184	54	8	161	153	1,131	2,797	2	2	12	29
185	62	8	168	338	2,275	4,552	2	4	27	53
186	39	8	7	186	1,144	1,755	0	1	8	13
187	338	5	-	-	-	-	-	-	-	-
188	92	12	-	-	-	-	-	-	-	-
189	171	5	-	-	-	-	-	-	-	-
190	193	13	-	-	-	-	-	-	-	-
191	169	5	-	-	-	-	-	-	-	-
192	540	5	-	-	-	-	-	-	-	-
193	138	9	153	226	1,520	4,778	4	6	40	125
194	932	21	153	226	1,520	4,778	27	40	268	843
195	79	10	-	-	-	-	-	-	-	-
196	49	10	-	-	-	-	-	-	-	-
197	83	5	-	-	-	-	-	-	-	-
198	692	5	-	-	-	-	-	-	-	-
199	70	27	-	-	-	-	-	-	-	-
200	158	5	-	-	-	-	-	-	-	-
201	160	5	-	-	-	-	-	-	-	-
202	335	22	-	-	-	-	-	-	-	-
203	30	5	-	-	-	-	-	-	-	-
204	2022	8	168	338	2,275	4,552	64	130	871	1,743
205	71	26	87	307	2,033	3,633	1	4	27	49
206	142	26	87	307	2,033	3,633	2	8	55	98
207	859	33	163	352	2,344	5,318	26	57	381	865
208	284	32	223	174	1,139	2,781	12	9	61	150
209	80	18	335	408	3,367	7,831	5	6	51	119
210	71	11	319	366	3,092	6,443	4	5	42	87
211	390	18	632	737	5,348	12,936	47	54	395	956
212	117	18	319	366	3,092	6,443	7	8	69	143
213	1344	22	1,490	1,739	12,293	26,987	379	443	3,129	6,869
214	449	32	601	790	6,068	13,066	51	67	516	1,111
215	1110	32	-	37	181	1,236	-	8	38	260
216	905	32	544	541	4,229	10,118	93	93	725	1,734
217	1050	32	248	440	3,026	5,328	49	88	602	1,060
218	581	25	508	647	4,834	10,910	56	71	532	1,201
219	1063	32	242	169	1,276	3,154	49	34	257	635

Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
220	415	32	259	181	1,355	3,344	20	14	106	263
221	698	33	17	12	79	190	2	2	10	25
222	1920	29	31	22	152	420	11	8	55	153
223	1564	28	750	816	6,110	14,064	222	242	1,810	4,166
224	377	29	118	115	825	1,877	8	8	59	134
225	551	29	104	105	752	1,647	11	11	78	172
226	788	33	14	10	73	230	2	1	11	34
227	1303	33	-	-	-	-	-	-	-	-
228	580	30	986	867	5,904	13,867	108	95	649	1,523
229	1653	31	642	587	3,986	9,320	201	184	1,248	2,918
230	2058	29	344	280	1,918	4,547	134	109	748	1,772
231	1300	20	41	173	1,156	3,320	10	43	285	817
232	736	26	642	587	3,986	9,320	89	82	556	1,299
233	488	28	375	302	2,070	4,967	35	28	191	459
234	449	28	199	271	1,856	3,943	17	23	158	335
235	310	14	111	184	1,252	2,519	7	11	74	148
236	310	11	88	87	604	1,423	5	5	35	84
237	105	5	103	102	727	1,593	2	2	14	32
238	697	31	-	-	-	-	-	-	-	-
239	186	22	40	100	806	1,582	1	4	28	56
240	145	10	31	22	152	420	1	1	4	12
241	578	10	71	122	958	2,002	8	13	105	219
242	125	20	-	-	-	-	-	-	-	-
243	564	20	-	-	-	-	-	-	-	-
244	88	20	-	-	-	-	-	-	-	-
245	48	13	-	-	-	-	-	-	-	-
246	175	5	31	22	152	420	1	1	5	14
247	65	6	-	-	-	-	-	-	-	-
248	39	5	57	112	885	1,772	0	1	7	13
249	128	5	71	122	958	2,002	2	3	23	49
250	484	5	71	122	958	2,002	7	11	88	184
251	388	32	-	-	-	-	-	-	-	-
252	308	11	-	-	-	-	-	-	-	-
253	54	5	-	-	-	-	-	-	-	-
254	51	5	-	-	-	-	-	-	-	-
255	290	31	-	-	-	-	-	-	-	-
256	377	31	-	-	-	-	-	-	-	-

Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
257	215	31	-	-	-	-	-	-	-	-
258	321	10	-	-	-	-	-	-	-	-
259	203	10	-	-	-	-	-	-	-	-
260	362	10	-	-	-	-	-	-	-	-
261	219	31	-	-	-	-	-	-	-	-
262	218	11	-	-	-	-	-	-	-	-
263	177	16	-	-	-	-	-	-	-	-
264	157	5	-	-	-	-	-	-	-	-
265	2458	28	234	282	2,375	5,174	109	131	1,105	2,408
266	752	28	273	414	3,320	7,108	39	59	473	1,012
267	1323	28	273	414	3,320	7,108	68	104	832	1,781
268	1252	31	262	396	3,124	6,791	62	94	741	1,610
269	302	29	-	-	-	-	-	-	-	-
270	1005	17	53	210	1,452	2,908	10	40	276	553
271	954	15	57	125	900	1,757	10	23	163	317
272	656	23	119	276	2,089	4,114	15	34	260	511
273	485	7	260	403	3,018	6,428	24	37	277	590
274	1244	27	118	243	1,692	3,333	28	57	399	785
275	419	5	-	-	-	-	-	-	-	-
276	649	27	115	237	1,655	3,265	14	29	203	401
277	2473	25	90	135	910	1,783	42	63	426	835
278	573	32	257	329	2,778	5,964	28	36	301	647
279	458	21	216	288	2,265	5,052	19	25	197	438
280	295	25	46	115	918	1,805	3	6	51	101
281	440	21	46	115	918	1,805	4	10	76	150
282	76	21	-	-	-	-	-	-	-	-
283	697	21	176	163	1,168	2,710	23	21	154	358
284	690	20	208	283	2,065	4,570	27	37	270	597
285	91	20	194	273	1,992	4,340	3	5	34	75
286	464	20	310	488	3,463	7,253	27	43	304	637
287	229	29	310	488	3,463	7,253	13	21	150	315
288	500	10	310	488	3,463	7,253	29	46	328	687
289	738	26	1,607	1,649	10,941	25,059	225	230	1,529	3,503
290	190	27	1,388	1,517	9,734	22,461	50	55	350	808
291	494	32	314	371	2,257	6,493	29	35	211	608
292	689	26	1,074	1,146	7,477	15,968	140	150	976	2,084
293	325	29	785	778	6,118	14,920	48	48	377	918

Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
294	396	25	281	287	2,231	5,111	21	22	167	383
295	1017	30	504	491	3,887	9,809	97	95	749	1,889
296	162	19	219	131	1,206	2,598	7	4	37	80
297	140	19	219	131	1,206	2,598	6	3	32	69
298	951	12	73	161	1,172	2,371	13	29	211	427
299	805	14	246	206	1,920	4,072	37	31	293	621
300	518	16	169	173	1,348	3,247	17	17	132	319
301	749	7	166	171	1,328	3,205	24	24	188	455
302	652	15	281	287	2,231	5,111	35	35	275	631
303	547	5	-	-	-	-	-	-	-	-
304	406	13	-	-	-	-	-	-	-	-
305	442	5	-	-	-	-	-	-	-	-
306	207	5	-	-	-	-	-	-	-	-
307	70	5	-	-	-	-	-	-	-	-
308	319	13	153	153	1,133	2,785	9	9	68	168
309	281	7	161	153	1,131	2,785	9	8	60	148
310	555	27	352	424	2,647	5,816	37	45	278	611
311	208	17	618	1,018	6,550	13,792	24	40	258	543
312	125	17	272	780	5,047	9,731	6	18	119	230
313	332	27	211	247	1,881	5,689	13	16	118	358
314	440	27	675	658	5,151	12,872	56	55	429	1,073
315	215	16	427	735	4,950	10,630	17	30	202	433
316	543	17	161	141	1,047	2,653	17	14	108	273
317	180	14	277	434	2,821	5,894	9	15	96	201
318	221	11	238	406	2,614	5,364	10	17	109	225
319	2544	9	400	559	3,746	8,149	193	269	1,805	3,927
320	552	12	-	-	-	-	-	-	-	-
321	628	14	153	153	1,133	2,785	18	18	135	331
322	181	12	39	28	206	530	1	1	7	18
323	58	12	39	28	206	530	0	0	2	6
324	387	13	-	-	-	-	-	-	-	-
325	406	12	39	28	206	530	3	2	16	41
326	89	5	-	-	-	-	-	-	-	-
327	463	13	8	29	246	543	1	3	22	48
328	79	16	8	29	246	543	0	0	4	8
329	103	16	8	29	246	543	0	1	5	11
330	323	13	-	-	-	-	-	-	-	-

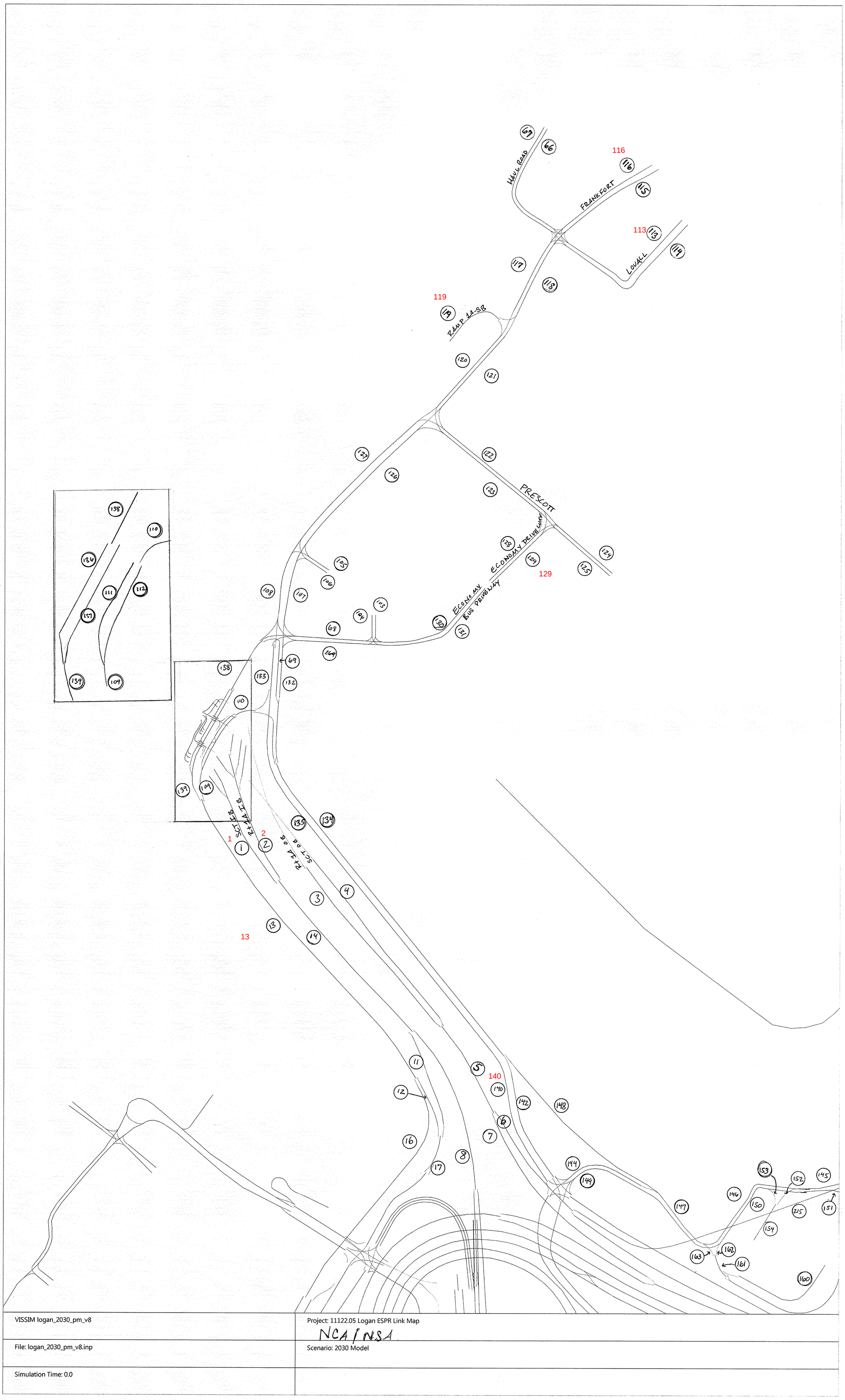
Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
331	179	11	400	559	3,746	8,149	14	19	127	276
332	993	5	447	397	3,140	6,905	84	75	590	1,299
333	384	10	-	-	-	-	-	-	-	-
334	366	24	293	244	2,006	4,120	20	17	139	286
335	583	29	310	351	2,676	6,675	34	39	296	737
336	428	27	272	780	5,047	9,731	22	63	409	789
337	94	5	-	-	-	-	-	-	-	-
338	366	5	-	-	-	-	-	-	-	-
339	311	5	-	-	-	-	-	-	-	-
340	273	20	-	12	84	144	-	1	4	7
341	66	16	-	12	84	144	-	0	1	2
342	48	29	-	12	84	144	-	0	1	1
343	52	22	-	-	-	-	-	-	-	-
344	82	12	-	12	84	144	-	0	1	2
345	25	5	161	141	1,047	2,653	1	1	5	13
346	121	5	-	-	-	-	-	-	-	-
347	303	7	161	153	1,131	2,797	9	9	65	161
348	146	22	364	308	2,475	6,198	10	9	68	171
349	67	22	153	151	1,117	2,735	2	2	14	35
350	446	5	153	151	1,117	2,735	13	13	94	231
351	335	5	-	-	-	-	-	-	-	-
352	430	5	-	-	-	-	-	-	-	-
353	360	5	-	-	-	-	-	-	-	-
354	50	8	161	153	1,131	2,797	2	1	11	26
355	88	13	153	136	997	2,552	3	2	17	43
356	113	13	282	299	2,449	5,669	6	6	52	121
358	463	5	-	-	-	-	-	-	-	-
359	229	12	-	-	-	-	-	-	-	-
360	245	13	-	-	-	-	-	-	-	-
361	248	17	-	-	-	-	-	-	-	-
362	199	9	-	-	-	-	-	-	-	-
363	230	22	25	102	745	1,482	1	4	32	65
364	256	19	39	132	946	1,934	2	6	46	94
365	201	23	-	-	-	-	-	-	-	-
366	201	10	-	-	-	-	-	-	-	-
367	337	32	785	952	7,013	15,000	50	61	448	957
368	868	11	447	397	3,140	6,905	73	65	516	1,135

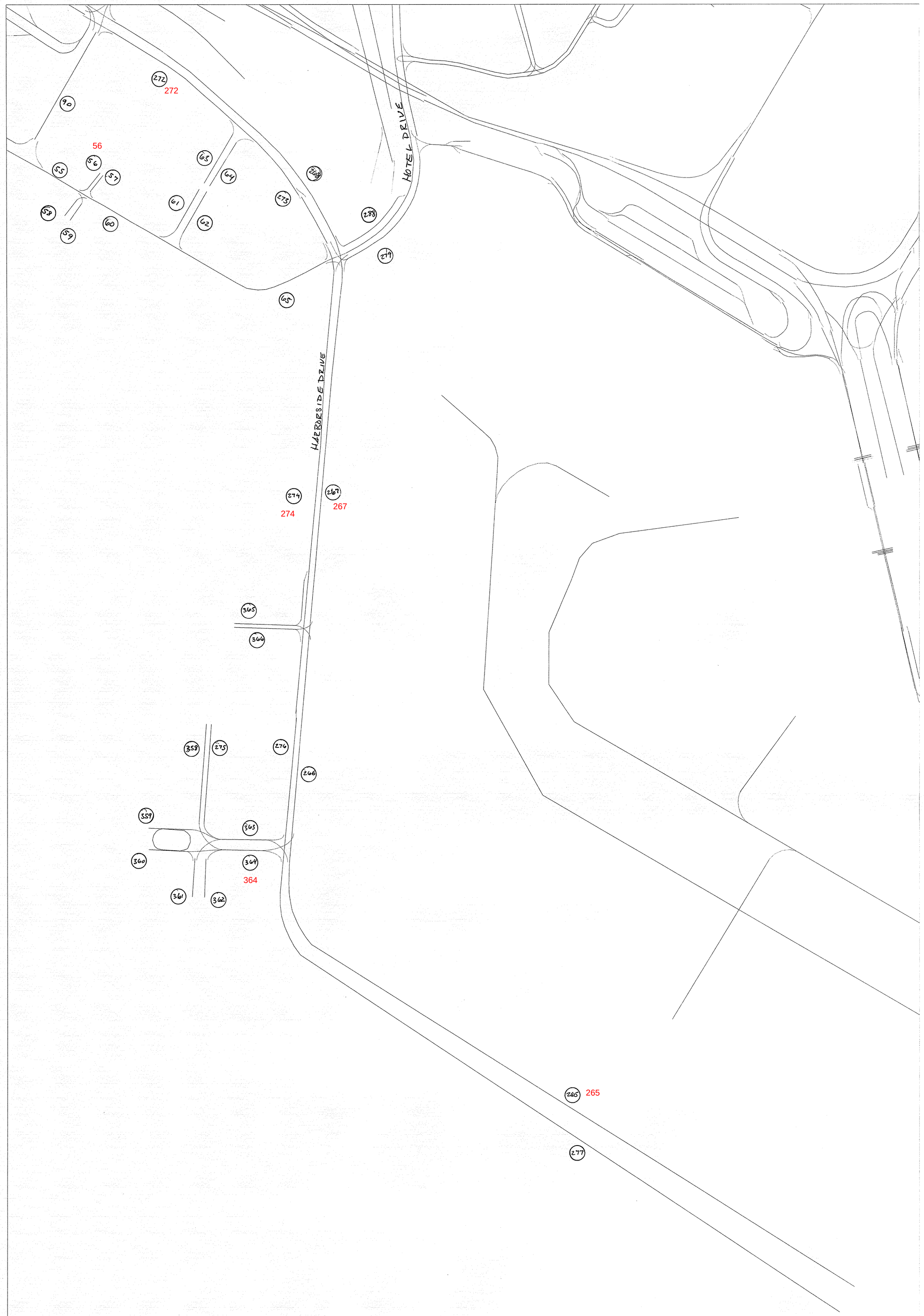
Table G-9 2021 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
369	167	15	464	411	3,271	7,184	15	13	103	227
370	96	15	374	326	2,055	4,919	7	6	37	89
371	141	20	265	595	3,903	7,976	7	16	104	213
372	283	29	-	-	-	-	-	-	-	-
373	283	27	-	-	-	-	-	-	-	-
			LOGAN AIRPORT VMT				**5,993**	**7,424**	**53,180**	**118,937**

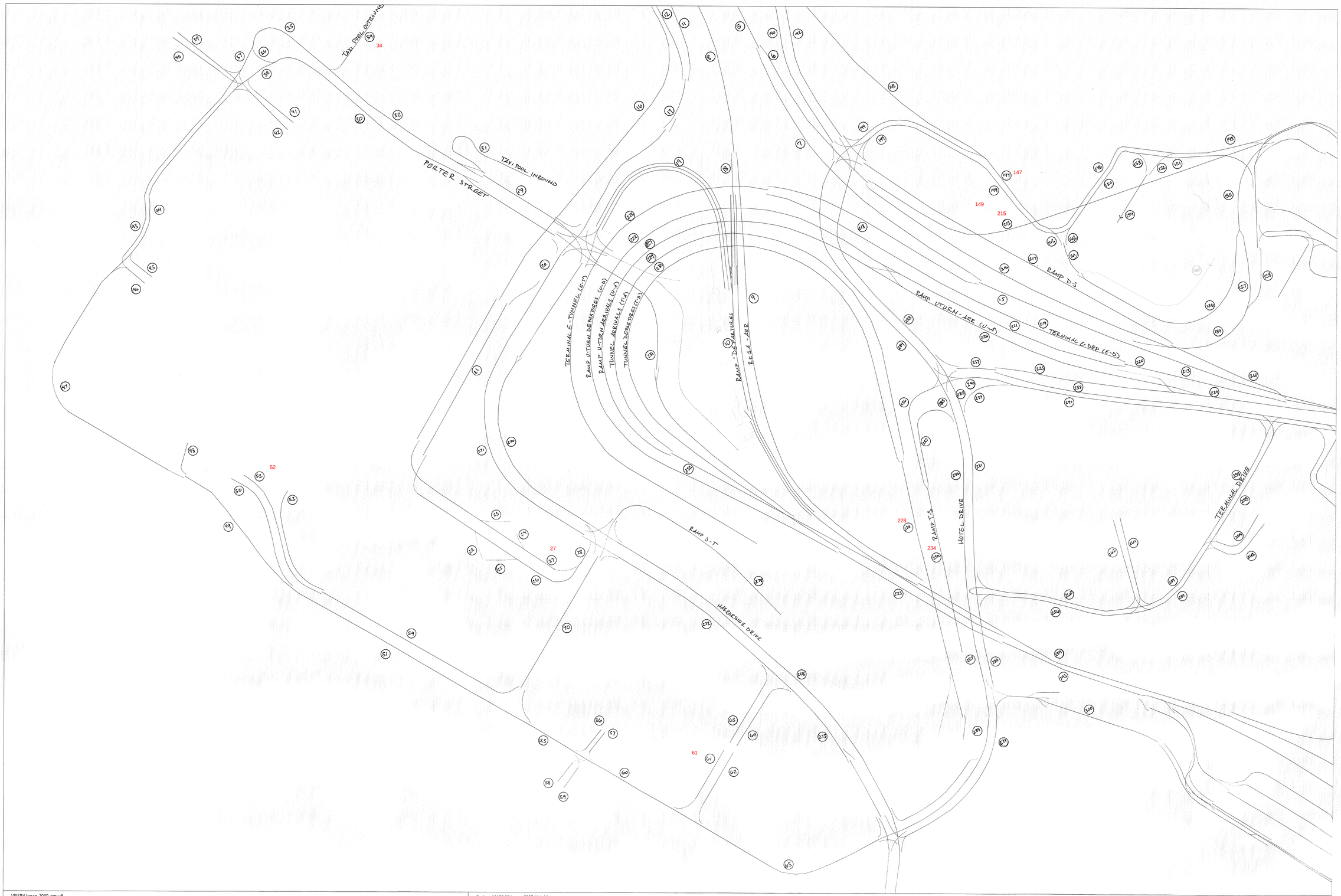
VISSIM 2011 logan network map	Project: 2011 Logan Network
File: 2011 logan network map.inp	Scenario: Network Map
Simulation Time: 0.0	



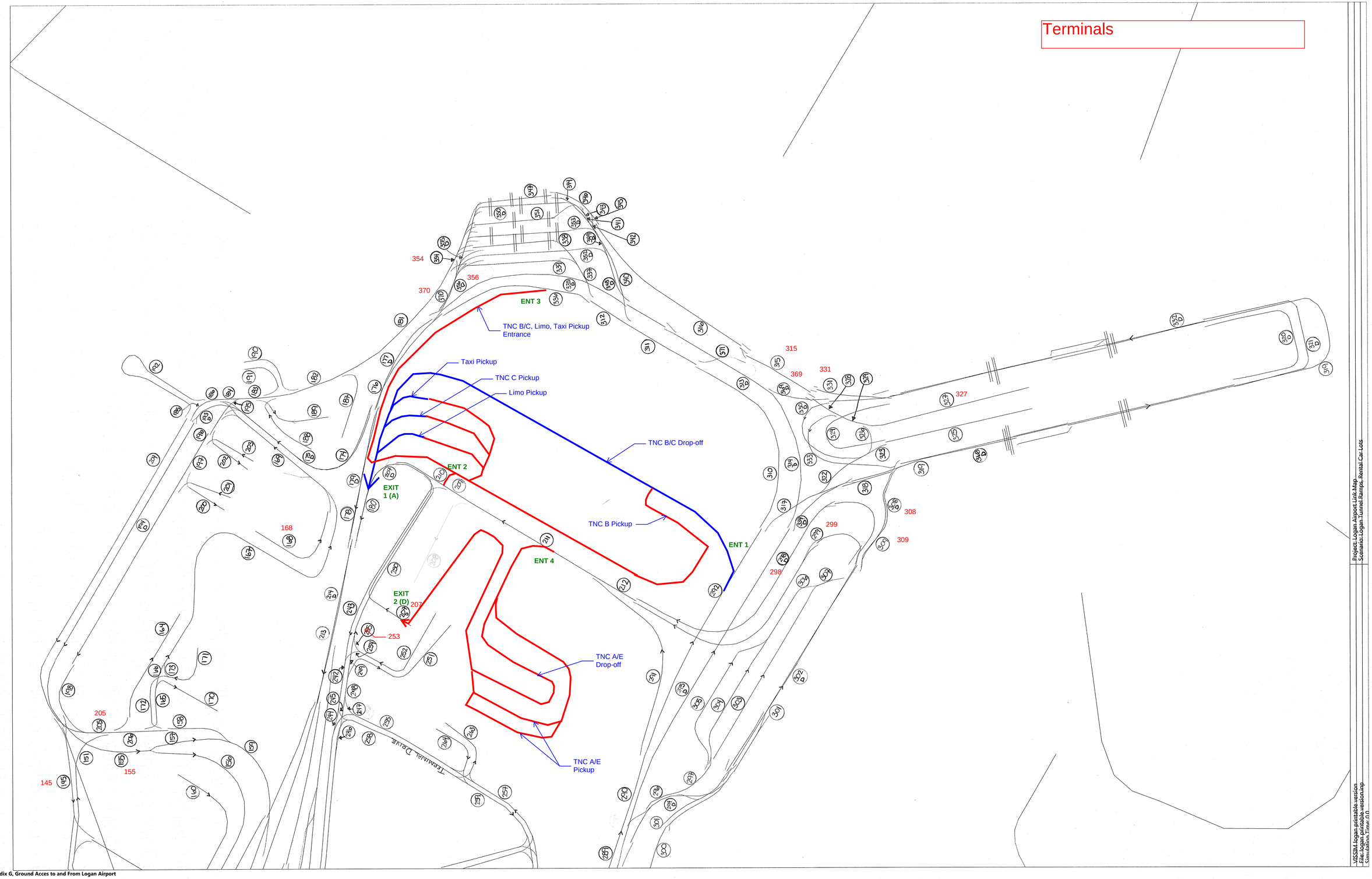
VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map NCA / NSA
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	



VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map SCA
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	



VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map SWS4 / Service Roadways.
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	


Terminals
ENT 3
TNC B/C, Limo, Taxi Pickup Entrance
Taxi Pickup
TNC C Pickup
Limo Pickup
TNC B/C Drop-off
ENT 2
EXIT 1 (A)
TNC B Pickup
ENT 1
ENT 4
EXIT 2 (D)
TNC A/E Drop-off
TNC A/E Pickup
Terminal Drive
354
356
370
315
369
331
327
308
309
299
298
168
207
253
205
155
145
Project: Logan Airport Link Map
Scenario: Logan Tunnel Ramps, Rental Car Lots
VISSIM logan printable version
File: logan printable version.inp
Simulation Time: 0h

Massachusetts Port Authority
One Harborside Drive, Suite 200-S
East Boston, MA 02128-2909
Telephone: 617-568-5000
www.massport.com

April 7, 2020

Christine Kirby, Director, Air & Climate Division
Massachusetts Department of Environmental Protection
Bureau of Air & Waste
One Winter Street
Boston, MA 02108

Re: Logan Airport Parking Space Inventory

Dear Ms. Kirby:

In compliance with the reporting requirements of 310 CMR 7.30(3)(a), enclosed please find the Massachusetts Port Authority (Massport) submissions for the Logan Airport (the Airport) Parking Space Inventory:

- Commercial Parking Space Inventory;
- Employee Parking Space Inventory; and
- Location Map.

The attachments provide the quantity, physical distribution, and allocation of commercial and employee parking spaces on the Airport, as defined by 310 CMR 7.30, as amended, effective as of June 30, 2017. These inventory tables represent information provided by the Aviation Department and are supported by comprehensive field checks and counts conducted in March 2020.

The Commercial Parking Space Inventory totals 23,640 parking spaces; the Employee Parking Space Inventory totals 2,448 parking spaces; and the total inventory of parking spaces at the Airport is 26,088. The in-service commercial parking spaces total 16,955 and the in-service employee parking spaces total 2,430 spaces. The inventory of in-service spaces has changed since our last filing in September due to reconfiguration of both employee and commercial parking space locations to accommodate several ongoing and upcoming construction projects including: Terminal E project, Ride App (TNC) lot relocation, and B-C Connector. Additionally, for your information, we continue to provide information on rental car parking spaces, also attached.

The attached Logan Airport Parking Space Inventory reflects Massport's successful management of its parking program, within the requirements of 310 CMR 7.30, as amended.

If you have any questions, please call me at 617-568-3689.

Sincerely,

Hayes Morrison
Deputy Director - Maritime, Land Use, and Transportation Planning
Strategic & Business Planning Department

cc: D. Conroy, EPA
L. Gilmore, MPA
M. Hadley, MPA
S. Dalzell, MPA
C. McDonald, MPA

Commercial Parking Space Inventory
Logan International Airport
March 2020 Submission

Commercial Parking Spaces

Old Map ID#	Map ID#	Location of Commercial Parking Areas	Mar-20 Number of Spaces
		Terminal Area and Economy Spaces	
C1a	C1	Central Garage	6385
C1b	C2	West Garage	2954
		West Garage Expansion	1699
C2	C3	Terminal B Garage	2212
C8a	C5	Terminal E Lot 1	237
C8b	C6	Terminal E Lot 2	0
C9	C7	Terminal E Lot 3 (fka "Gulf Station" Lot)	93
	C12	Blue Lot	0
C6	C8	Economy Garage	2864
		subtotal	16444
		Overflow Commercial Spaces	
	C11	Red Lot (Tomahawk Dr.)	100
	C13	Green Lot (Wood Island)	
		subtotal	100
		Hotel Spaces	
C4	C4a ~~& C4b~~	Logan Airport Hilton Hotel (one lot)	106
C7a	C10	Harborside Hyatt Conference Center	270
		subtotal	376
		General Aviation Spaces	
C5	C9	Signature (General Aviation Terminal)	35
		subtotal	35
		Total In-Service Commercial Parking Spaces	**16,955**
		Total Designated Commercial Parking Spaces	**6,685**
		Total Commercial Parking Spaces	**23,640**
		Total Employee Parking Spaces *(see table on next page)*	**2,448**
		TOTAL PARKING FREEZE SPACES	**26,088**

Employee Parking Space Inventory
Logan International Airport
March 2020 Submission

Employee Parking Spaces

Area		Map ID#	Location of Employee Parking Areas	Mar-20 Number of Spaces
Terminal			West Garage	59
Terminal	Terminal Area	E81	West Garage Expansion - MPA Employee	11
Terminal	Terminal Area		West Garage Expation - Hilton Employee	7
Terminal	Terminal Area	E26	Airport Tower/Administration Parking	603
Terminal	Terminal Area	E20	Terminal C Pier A (Old Terminal D) (two lots)	100
Terminal	Terminal Area	E18	Massport Facilities 1 (Heating Plant)	92
Terminal	Terminal Area	E34	Hilton Hotel employee lot	28
North	North Service Area	E68a	LSG Sky Chefs (Bldg. 68), main lot	25
North	North Service Area	E68b	LSG Sky Chefs (Bldg. 68), overflow lot	126
North	North Service Area	E1	Flight Kitchen Building 1 (and nearby lot)	80
North	North Service Area	E40	Lovell Street Lot (contractor trailer)	25
North	North Service Area	E53	Green Bus Depot (Bus Maintenance Facility)	12
North	North Service Area	E11a	North Cargo Building 11, TSA lot	93
North	North Service Area	E11b	North Cargo Building 11, State Police lot	136
North	North Service Area	E43	North Gate & EMS Trailer (EMS Station A7)	20
North	North Service Area	E8	North Cargo Building 8	114
North	North Service Area	E5	US Airways Administration/Hangar (Bldg. 5)	15
airside	North Service Area	*N/A*	Massport Facilities 2 (airside, Bldg. 3)	0
North	North Service Area	E4	Massport Facilities 3 (landside, Bldg. 4)	69
North	North Service Area	E13	UPS (E Lot 3)	41
North	North Service Area	E94	United Aircraft Maintenance (Buildings 93 & 94)	56
SW	SWSA	E59	Bus/Limo Pool Lot	4
SW	SWSA	E60	Rental Car Center (Customer Service Center)	4
SW	SWSA	E72	Taxi Pool Lot	4
	SWSA	E86	Nouria Gas Station	4
South	South Service Area	E84	Bird Island Flats / Logan Office Center (LOC) Garage	416
South	South Service Area	E63	South Cargo Building 63	16
South	South Service Area	E62	South Cargo Building 62	43
South	South Service Area	E58	South Cargo Building 58	23
South	South Service Area	E57	South Cargo Building 57	44
South	South Service Area	E56	South Cargo Building 56	39
South	South Service Area	E78	Fire-Rescue HQ & Amelia Earhart Terminal/Hangar	121
airside		*N/A*	*ARFF Satellite Station* [1]	0

[1] This facility is located on the airfield and is not shown in the map. No employee parking spaces are provided.

Total In-Service Employee Parking Spaces	**2,430**
Total Designated Employee Parking Spaces	**18**
Total Employee Parking Spaces	**2,448**
Total Commercial Parking Spaces *(see table on previous page)*	**23,640**
TOTAL PARKING SPACES	**26,088**
TOTAL PARKING FREEZE SPACES	**26,088**

SUMMARY

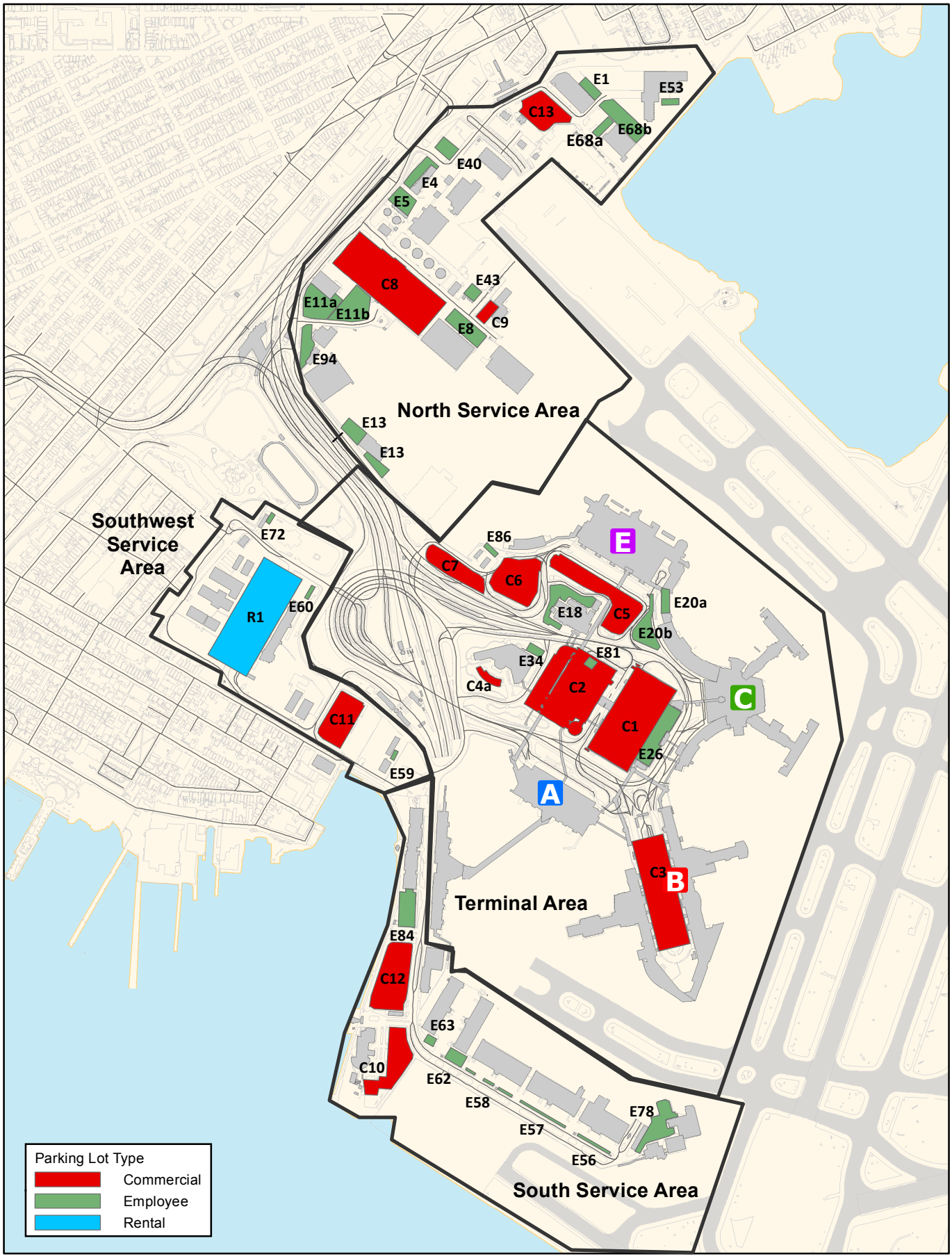
TOTAL COMMERCIAL PARKING SPACES	***23,640***
TOTAL EMPLOYEE PARKING SPACES	***2,448***
TOTAL PARKING FREEZE SPACES	***26,088***

* Total Designated Employee Parking Space Calculation

For Information Only:
Rental Car Spaces Inventory
Logan International Airport
March 2020 Submission

Rental Car Company Parking Spaces

Map ID#		Number of Spaces
R1	Rental Car Center (RCC)	5,020
Total Rental Car Spaces		**5,020**



Massachusetts Port Authority
Strategic and Business Planning
September 2016

N

0 0.075 0.15 0.3 Miles

Logan Airport Parking Space Inventory

Projection: Lambert Conformal Conic **Coordinate System:** NAD 1983 State Plane Massachusetts Mainland FIPS 2001 (Meter)

Massachusetts Port Authority
One Harborside Drive, Suite 200-S
East Boston, MA 02128-2909
Telephone: 617-568-5000
www.massport.com

September 30, 2020

Christine Kirby, Director, Air & Climate Division
Massachusetts Department of Environmental Protection
Bureau of Air & Waste
One Winter Street
Boston, MA 02108

Re: Logan Airport Parking Space Inventory

Dear Ms. Kirby:

In compliance with the reporting requirements of 310 CMR 7.30(3)(a), enclosed please find the Massachusetts Port Authority (Massport) submissions for the Logan Airport (the Airport) Parking Space Inventory:

- Commercial Parking Space Inventory;
- Employee Parking Space Inventory; and
- Location Map.

This submission was filed during the ongoing and unprecedented COVID-19 worldwide pandemic. Flights in and out of Logan are dramatically reduced and passenger levels dropped over 90 percent during spring 2020 and continue at a significantly reduced level as of the date of this filing. As a result, there are far fewer passengers and employees travelling to and from Logan and far less parking demand at the Airport.

Under these extraordinary circumstances, Massport has taken emergency actions to reduce the potential spread of COVID-19 within the Airport terminals as well as in our ground transportation options for passengers and Airport employees. Massport has temporarily relocated Chelsea garage parkers, employees who typically park off-Airport, into the Terminal B garage[1]. Typically, Massport provided shuttle bus transport for Chelsea parkers to Logan Airport. The relocation addresses employee concerns of not being able to properly social distance and safely travel on shuttle buses to and from Logan Airport during peak hours. Additionally, temporarily removing the need for shuttle buses reduces transportation related emissions. For similar reasons, Massport has temporarily closed the Economy garage to air passengers. Given its permanent parking inventory, Massport remains in full compliance with the Logan Airport parking freeze.

.

Within that context, Massport continues to evaluate and plan for the recovery of air passenger activity. While it's unclear when the impacts of COVID-19 will dissipate, Massport will continue to fully comply

[1] Given the decreased demand, Massport has temporarily closed Terminal B garage to air passengers, with the exception of Passport Gold members.

with the stipulations in Logan Airport parking freeze. Massport will resume typical operations when air passenger levels fully recover and it is safe, reasonable, and feasible to bring back temporarily suspended ground transportation operations and options.

The attachments provide the quantity, physical distribution, and allocation of commercial and employee parking spaces on the Airport, as defined by 310 CMR 7.30, as amended, effective as of June 30, 2017. These inventory tables represent information provided by the Aviation Department and are supported by comprehensive field checks and counts conducted in September 2020.

The permanent Commercial Parking Space Inventory totals 23,640 parking spaces; the permanent Employee Parking Space Inventory totals 2,448 parking spaces; and the total inventory of parking spaces at the Airport is 26,088. The in-service commercial parking spaces total 15,173 and the in-service employee parking spaces total 2,430 spaces. The inventory of in-service spaces has changed since our last filing in September due to reconfiguration of both employee and commercial parking space locations due to completion of and to accommodate several ongoing and upcoming construction projects including: Terminal E project and B-C Connector. The inventory of commercial parking spaces converted to temporary emergency parking for Chelsea Garage parkers is 1,985 spaces. Additionally, for your information, we continue to provide information on rental car parking spaces, also attached.

The attached Logan Airport Parking Space Inventory reflects Massport's successful management of its parking program, within the requirements of 310 CMR 7.30, as amended.

If you have any questions, please call me at 617-568-3689.

Sincerely,

Hayes Morrison
Deputy Director - Maritime, Land Use, and Transportation Planning
Strategic & Business Planning Department

cc: D. Conroy, EPA
L. Gilmore, MPA
M. Hadley, MPA
S. Dalzell, MPA
C. McDonald, MPA

For Information Only:
Rental Car Spaces Inventory
Logan International Airport

September 2020 Submission

Commercial Parking Spaces

Old Map ID#	Map ID#	Location of Commercial Parking Areas		Sep-20 Number of Spaces
		Terminal Area and Economy Spaces		
C1a	C1	Central Garage		6385
C1b	C2	West Garage		2954
		West Garage Expansion		1699
C2	C3	Terminal B Garage		227
C8a	C5	Terminal E Lot 1		237
C8b	C6	Terminal E Lot 2		203
C9	C7	Terminal E Lot 3 (fka "Gulf Station" Lot)		93
	C12	Blue Lot		0
C6	C8	Economy Garage		2864
			subtotal	14662
		Overflow Commercial Spaces		
	C11	Red Lot (Tomahawk Dr.)		100
	C13	Green Lot (Wood Island)		
			subtotal	100
		Hotel Spaces		
C4	C4a ~~& C4b~~	Logan Airport Hilton Hotel (one lot)		110
C7a	C10	Harborside Hyatt Conference Center		270
			subtotal	380
		General Aviation Spaces		
C5	C9	Signature (General Aviation Terminal)		35
			subtotal	35
	Total In-Service Commercial Parking Spaces			**15,177**
	Total Emergency Conversion for Chelsea Garage Parkers			**1,985**
	Total Designated Commercial Parking Spaces			**6,478**
	Total Commercial Parking Spaces			**23,640**
	Total Employee Parking Spaces *(see table on next page)*			**2,448**
	TOTAL PARKING FREEZE SPACES			**26,088**

For Information Only:
Rental Car Spaces Inventory
Logan International Airport

September 2020 Submission

Employee Parking Spaces

Area		Map ID#	Location of Employee Parking Areas	Sep-20 Number of Spaces
Terminal			West Garage	59
Terminal	Terminal Area	E81	West Garage Expansion - MPA Employee	11
Terminal			West Garage Expation - Hilton Employee	7
Terminal		E26	Airport Tower/Administration Parking	603
Terminal		E20	Terminal C Pier A (Old Terminal D) (two lots)	100
Terminal		E18	Massport Facilities 1 (Heating Plant)	92
Terminal		E34	Hilton Hotel employee lot	34
North		E68a	LSG Sky Chefs (Bldg. 68), main lot	25
North		E68b	LSG Sky Chefs (Bldg. 68), overflow lot	126
North		E1	Flight Kitchen Building 1 (and nearby lot)	80
North		E40	Lovell Street Lot (contractor trailer)	25
North		E53	Green Bus Depot (Bus Maintenance Facility)	12
North	North Service Area	E11a	North Cargo Building 11, TSA lot	93
North		E11b	North Cargo Building 11, State Police lot	136
North		E43	North Gate & EMS Trailer (EMS Station A7)	20
North		E8	North Cargo Building 8	114
North		E5	US Airways Administration/Hangar (Bldg. 5)	15
airside		*N/A*	Massport Facilities 2 (airside, Bldg. 3)	0
North		E4	Massport Facilities 3 (landside, Bldg. 4)	69
North		E13	UPS (E Lot 3)	41
North		E94	United Aircraft Maintenance (Buildings 93 & 94)	56
SW		E59	Bus/Limo Pool Lot	4
SW	SWSA	E60	Rental Car Center (Customer Service Center)	4
SW		E72	Taxi Pool Lot	4
SW		E86	Nouria Gas Station	4
South		E84	Bird Island Flats / Logan Office Center (LOC) Garage	416
South		E63	South Cargo Building 63	16
South		E62	South Cargo Building 62	43
South		E58	South Cargo Building 58	23
South		E57	South Cargo Building 57	44
South	South Service Area	E56	South Cargo Building 56	39
South		E78	Fire-Rescue HQ & Amelia Earhart Terminal/Hangar	121
airside		*N/A*	*ARFF Satellite Station* [1]	0

[1] This facility is located on the airfield and is not shown in the map. No employee parking spaces are provided

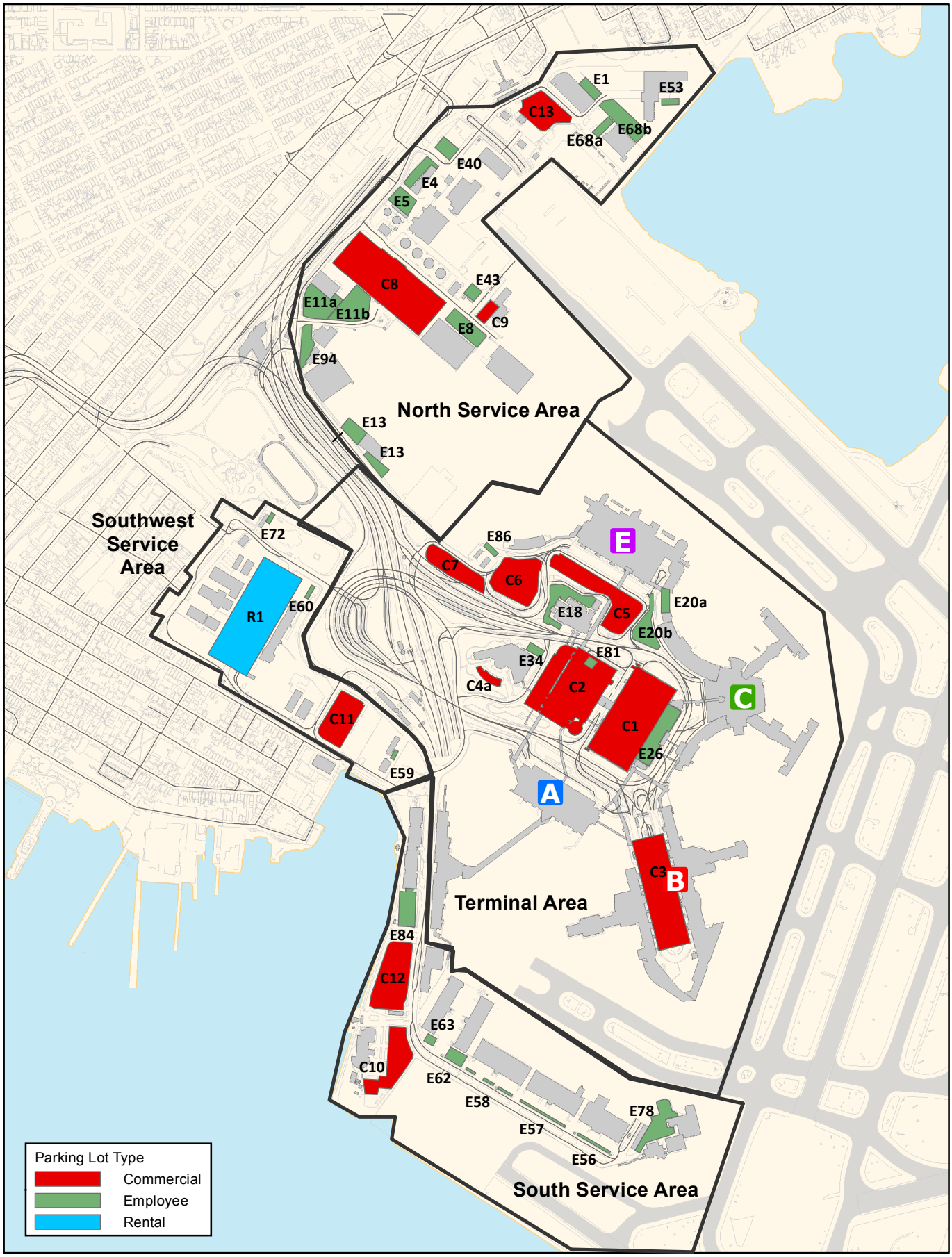
Total In-Service Employee Parking Spaces	**2,436**
Total Designated Employee Parking Spaces	**12**
Total Employee Parking Spaces	**2,448**
Total Commercial Parking Spaces *(see table on previous page)*	**23,640**
TOTAL PARKING SPACES	**26,088**
TOTAL PARKING FREEZE SPACES	**26,088**

For Information Only:
Rental Car Spaces Inventory
Logan International Airport

September 2020 Submission

Rental Car Company Parking Spaces

Map ID#		Number of Spaces
R1	Rental Car Center (RCC)	5,020
Total Rental Car Spaces		**5,020**



Massachusetts Port Authority
Strategic and Business Planning
September 2016

Logan Airport Parking Space Inventory

N

0 0.075 0.15 0.3 Miles

G-53

Projection: Lambert Conformal Conic **Coordinate System:** NAD 1983 State Plane Massachusetts Mainland FIPS 2001 (Meter)

Massachusetts Port Authority
One Harborside Drive, Suite 200-S
East Boston, MA 02128-2909
Telephone: 617-568-5000
www.massport.com

April 14, 2021

Christine Kirby, Assistant Commissioner
Massachusetts Department of Environmental Protection
Bureau of Air & Waste
One Winter Street
Boston, MA 02108

Re: Logan Airport Parking Space Inventory

Dear Ms. Kirby:

In compliance with the reporting requirements of 310 CMR 7.30(3)(a), enclosed please find the Massachusetts Port Authority (Massport) submissions for the Logan Airport (the Airport) Parking Space Inventory:

- Commercial Parking Space Inventory;
- Employee Parking Space Inventory; and
- Location Map.

This submission was filed during the ongoing and unprecedented COVID-19 worldwide pandemic. After a year, flights in and out of Logan continue to be significantly reduced; passenger levels dropped over 90 percent during spring 2020 and continue at a reduced level as of the date of this filing. As a result, there are far fewer passengers and employees travelling to and from Logan and far less parking demand at the Airport.

Under these extraordinary circumstances, Massport has taken emergency actions to reduce the potential spread of COVID-19 within the Airport terminals as well as in our ground transportation options for passengers and Airport employees. Massport has temporarily relocated Chelsea garage parkers, employees who typically park off-Airport, initially into Terminal B Garage, and more recently into the Central and West garages. The move to Central and West garages was to centrally locate these parkers to encourage them to walk to their respective terminals. Given the low demand for air travel and consequently on-Airport parking, Massport has temporarily closed several parking facilities including, the Economy garage, Terminal B, and Terminal E Lot #3 to air passengers. Terminal E Lots #1 and #2 are also currently closed for construction project support purposes. Given its permanent parking inventory, Massport remains in full compliance with the Logan Airport parking freeze.
.
Within that context, Massport continues to evaluate and plan for the recovery of air passenger activity. While it's unclear when the impacts of COVID-19 will fully dissipate, Massport will continue to fully comply with the stipulations in Logan Airport parking freeze. Massport expects to resume more typical

ground access operations based on air passenger demand and when it is safe, reasonable, and feasible to bring back temporarily suspended ground transportation operations and options.

The attachments provide the quantity, physical distribution, and allocation of commercial and employee parking spaces on the Airport, as defined by 310 CMR 7.30, as amended, effective as of June 30, 2017. These inventory tables represent information provided by the Aviation Department and are supported by comprehensive field checks and counts conducted in March 2021.

The permanent Commercial Parking Freeze Space Inventory totals 23,640 parking spaces; the permanent Employee Parking Space Inventory totals 2,448 parking spaces; and the total inventory of parking spaces at the Airport is 26,088. The in-service commercial parking spaces total 9,468 and the in-service employee parking spaces total 2,426 spaces. The inventory of in-service spaces has changed since our last filing in September due to the temporary closure of Economy garage, Terminal B garage, and Terminal E parking lots as described above. The inventory of commercial parking spaces within Central and West garages converted to temporary employee parking for Chelsea Garage parkers is 1,985 spaces. Additionally, for your information, we continue to provide information on rental car parking spaces, also attached.

The attached Logan Airport Parking Space Inventory reflects Massport's successful management of its parking program, within the requirements of 310 CMR 7.30, as amended.

If you have any questions, please call me at 617-568-3745.

Sincerely,

Albert Ng
Senior Transportation Planner
Strategic & Business Planning Department

cc: D. Conroy, EPA
M. Hadley, MPA
S. Dalzell, MPA
C. McDonald, MPA

Commercial Parking Space Inventory
Logan International Airport
March 2021 Submission

Commercial Parking Spaces

Old Map ID#	Map ID#	Location of Commercial Parking Areas		Mar-21 Number of Spaces
		Terminal Area and Economy Spaces		
C1a	C1	Central Garage		6385
C1b	C2	West Garage		2954
		West Garage Expansion		1699
			subtotal	11038
		Emergency Conversion for Chelsea Garage Parkers (-)		-1985
			subtotal	9053
C2	C3	Terminal B Garage (CLOSED)		0
C8a	C5	Terminal E Lot 1 (CLOSED)		0
C8b	C6	Terminal E Lot 2 (CLOSED)		0
C9	C7	Terminal E Lot 3 (fka "Gulf Station" Lot) (CLOSED)		0
	C12	Blue Lot (Permanently Closed - now taxi pool)		0
C6	C8	Economy Garage (CLOSED)		0
			subtotal	0
		Overflow Commercial Spaces		
	C11	Red Lot (Tomahawk Dr.) (CLOSED)		0
	C13	Green Lot (Wood Island) (Permanently Closed)		
			subtotal	0
		Hotel Spaces		
C4	C4a ~~& C4b~~	Logan Airport Hilton Hotel (one lot)		110
C7a	C10	Harborside Hyatt Conference Center		270
			subtotal	380
		General Aviation Spaces		
C5	C9	Signature (General Aviation Terminal)		35
			subtotal	35
	Total In-Service Commercial Parking Spaces			**9,468**
	Total Emergency Conversion for Chelsea Garage Parkers			**1,985**
	Total Designated Commercial Parking Spaces			**12,187**
	Total Commercial Parking Spaces			**23,640**
	Total Employee Parking Spaces *(see table on next page)*			**2,448**
	TOTAL PARKING FREEZE SPACES			**26,088**

Employee Parking Space Inventory
Logan International Airport
March 2021 Submission

Employee Parking Spaces

Area		Map ID#	Location of Employee Parking Areas	Mar-21 Number of Spaces
Terminal	Terminal Area		West Garage	59
Terminal		E81	West Garage Expansion - MPA Employee	11
Terminal			West Garage Expation - Hilton Employee	7
Terminal		E26	Airport Tower/Administration Parking	603
Terminal		E20	Terminal C Pier A (Old Terminal D) (two lots)	100
Terminal		E18	Massport Facilities 1 (Heating Plant)	92
Terminal		E34	Hilton Hotel employee lot	28
North	North Service Area	E68a	LSG Sky Chefs (Bldg. 68), main lot	25
North		E68b	LSG Sky Chefs (Bldg. 68), overflow lot	126
North		E1	Flight Kitchen Building 1 (and nearby lot)	80
North		E40	Lovell Street Lot (contractor trailer)	25
North		E53	Green Bus Depot (Bus Maintenance Facility)	12
North		E11a	North Cargo Building 11, TSA lot	93
North		E11b	North Cargo Building 11, State Police lot	136
North		E43	North Gate & EMS Trailer (EMS Station A7)	20
North		E8	North Cargo Building 8	114
North		E5	US Airways Administration/Hangar (Bldg. 5)	15
airside		*N/A*	Massport Facilities 2 (airside, Bldg. 3)	0
North		E4	Massport Facilities 3 (landside, Bldg. 4)	69
North		E13	UPS (E Lot 3)	41
North		E94	United Aircraft Maintenance (Buildings 93 & 94)	56
SW	SWSA	E59	Bus/Limo Pool Lot	4
SW		E60	Rental Car Center (Customer Service Center)	4
SW		E72	Taxi Pool Lot	0
SW		E86	Nouria Gas Station	4
South	South Service Area	E84	Bird Island Flats / Logan Office Center (LOC) Garage	416
South		E63	South Cargo Building 63	16
South		E62	South Cargo Building 62	43
South		E58	South Cargo Building 58	0 23
South		E57	South Cargo Building 57	44
South		E56	South Cargo Building 56	39
South		E78	Fire-Rescue HQ & Amelia Earhart Terminal/Hangar	121
airside		*N/A*	*ARFF Satellite Station* [1]	0

[1] This facility is located on the airfield and is not shown in the map. No employee parking spaces are provided.

0

Total In-Service Employee Parking Spaces	**2,426**
Total Designated Employee Parking Spaces	**22**
Total Employee Parking Spaces	**2,448**
Total Commercial Parking Spaces *(see table on previous page)*	**23,640**
TOTAL PARKING SPACES	**26,088**
TOTAL PARKING FREEZE SPACES	**26,088**

SUMMARY

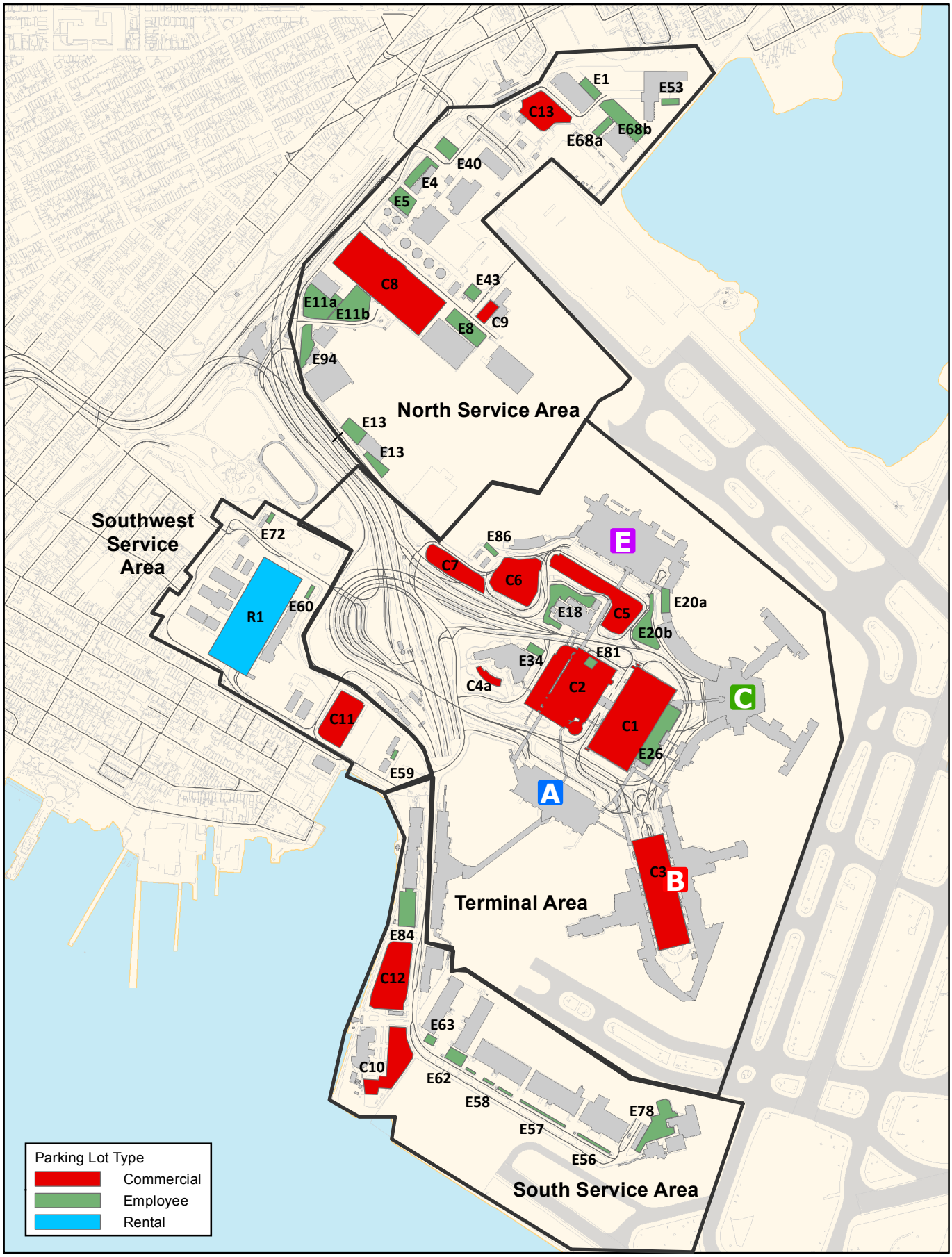
TOTAL COMMERCIAL PARKING SPACES	***23,640***
TOTAL EMPLOYEE PARKING SPACES	***2,448***
TOTAL PARKING FREEZE SPACES	***26,088***

* Total Designated Employee Parking Space Calculation

For Information Only:
Rental Car Spaces Inventory
Logan International Airport
March 2021 Submission

Rental Car Company Parking Spaces

Map ID#		Number of Spaces
R1	Rental Car Center (RCC)	5,020
Total Rental Car Spaces		**5,020**



Massachusetts Port Authority
Strategic and Business Planning
September 2016

Logan Airport Parking Space Inventory

N

0 0.075 0.15 0.3 Miles

G-59

Projection: Lambert Conformal Conic **Coordinate System:** NAD 1983 State Plane Massachusetts Mainland FIPS 2001 (Meter)

Massachusetts Port Authority
One Harborside Drive, Suite 200-S
East Boston, MA 02128-2909
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October 26, 2021

Christine Kirby, Assistant Commissioner
Massachusetts Department of Environmental Protection
Bureau of Air & Waste
One Winter Street
Boston, MA 02108

Re: Logan Airport Parking Space Inventory

Dear Ms. Kirby:

In compliance with the reporting requirements of 310 CMR 7.30(3)(a), enclosed please find the Massachusetts Port Authority (Massport) submissions for the Logan Airport (the Airport) Parking Space Inventory:

- Commercial Parking Space Inventory;
- Employee Parking Space Inventory; and
- Location Map.

This submission was filed during the ongoing COVID-19 worldwide pandemic. Since March 2020, flights in and out of Logan have slowly recovered but continue to be significantly reduced as compared to pre-COVID-19 levels. After dropping over 90% in spring 2020, passenger levels are also recovering slowly but continue at a reduced level as of the date of this filing. As a result, currently there are far fewer passengers and employees travelling to and from Logan and far less parking demand at the Airport.

Throughout these extraordinary circumstances, Massport has taken emergency actions to reduce the potential spread of COVID-19 within the Airport terminals as well as in our ground transportation options for passengers and Airport employees. Massport has temporarily relocated Chelsea garage parkers, employees who typically park off-Airport, initially into Terminal B Garage, and later into the Central and West garages. Given the low demand for air travel and consequently on-Airport parking, Massport temporarily closed several parking facilities including, the Economy garage, Terminal B, and Terminal E Lot #3 to air passengers. Terminal E Lots #1 and #2 are also currently closed for construction project support purposes. As passenger levels slowly recover, Massport continues to adjust parking services to best meet demand and operational efficiencies. Given its permanent parking inventory, Massport remains in full compliance with the Logan Airport parking freeze.

While it's unclear when the impacts of COVID-19 will fully dissipate, Massport will continue to fully comply with the stipulations in the Logan Airport parking freeze. Recently, Massport has begun to restore a number of our ground service operations with a focus on our key HOV services, including restoration of weekday, half-hour service at the Braintree, Framingham, and Woburn Logan Express sites. Plans are also being developed for the restoration of the Peabody Logan Express service. As a further incentive to regrow these HOV services, Massport has also implemented introductory reduced fares for advanced bookings through the new on-line Logan Express ticketing system, as well as reduced wait times for HOV passengers going through security. We continue to closely

monitor passenger levels and ground access trends and will look to resume additional ground access operations based on air passenger demand and when it is safe, reasonable, and feasible to bring back temporarily suspended ground transportation operations and options. As another element of our Authority-wide emission reductions program, Massport is continuing to add EV charging stations within our commercial, employee and ride-for-hire lots both on and off-airport.

In early September 2021, Massport's Ground Transportation Unit of the Aviation Department conducted a lot-by-lot inventory and map update. This included all of our commercial and employee spaces. As a result of this inventory, several adjustments were made to better reflect the existing freeze regulations. These included both minor changes at certain lots where spaces were shifted, added, or removed as well as elimination of on-airport "pool" vehicle spaces that had previously been counted within the employee category. Pool vehicles typically include Massport vehicles, State Police and other vehicles which remain parked overnight at lots across the airport. Also note that the current map now eliminates several former employee lots that have been converted to buildings, the Logan Taxi Pool, ride-for-hire lots or other non-parking uses. Where parking facilities remain temporarily closed, we also update that information. The attachments provide the updated quantity, physical distribution, and allocation of commercial and employee parking spaces on the Airport, as defined by 310 CMR 7.30, as amended, effective as of June 30, 2017.

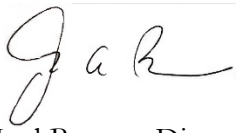
The permanent Commercial Parking Freeze Space Inventory totals 23,640 parking spaces; the permanent Employee Parking Space Inventory totals 2,448 parking spaces; and the total inventory of parking spaces at the Airport is 26,088. The in-service commercial parking spaces total 11,735 and the in-service employee parking spaces total 2,218 spaces. The inventory of commercial parking spaces within Central and West garages converted to temporary employee parking for Chelsea Garage parkers is 1,985 spaces. Additionally, for your information, we continue to provide information on rental car parking spaces, also attached.

The attached Logan Airport Parking Space Inventory reflects Massport's successful management of its parking program, within the requirements of 310 CMR 7.30, as amended.

If you have any questions, please call me at 617-568-3705.

Sincerely,

Massachusetts Port Authority



Joel Barrera, Director
Strategic & Business Planning Department

cc: D. Conroy, EPA
M. Hadley, S. K. Lee, S. Dalzell, C. McDonald/Massport

Attachments

Commercial Parking Spaces Inventory
Logan International Airport
September 2021 Submission

Commercial Parking Spaces

Map ID#	Location of Commercial Parking Areas		Sept. 2021 Number of Spaces
Terminal Area Parking and Economy Parking Spaces			
C1	Central Garage		6440
C2	West Garage		2954
	West Garage Expansion		1699
		subtotal	**11093**
	Emergency Conversion for Chelsea Garage Parkers (-)		-1985
		subtotal	**9108**
C3	Terminal B Garage		2212
C5	Terminal E Lot 1 (*TEMPORARILY CLOSED*)		0
C6	Terminal E Lot 2 (*TEMPORARILY CLOSED*)		0
C7	Terminal E Lot 3 (*TEMPORARILY CLOSED*)		0
C8	Economy Garage (*TEMPORARILY CLOSED*)		0
		subtotal	**2212**
Overflow Commercial Spaces			
C11	Red Lot (Tomahawk Dr.) (*TEMPORARILY CLOSED*)		0
		subtotal	**0**
Hotel Spaces			
C4a	Logan Airport Hilton Hotel (one lot)		110
C10	Harborside Hyatt Conference Center		270
		subtotal	**380**
General Aviation Spaces			
C9	Signature (General Aviation Terminal)		35
		subtotal	**35**
Total In-Service Commercial Parking Spaces			**11,735**
Total Emergency Conversion for Chelsea Garage Parkers			**1,985**
Total Designated Commercial Parking Spaces			**9,920**
Total Commercial Parking Spaces			**23,640**
Total Employee Parking Spaces *(see table on next page)*			**-**
TOTAL PARKING FREEZE SPACES			**23,640**

Employee Parking Spaces Inventory
Logan International Airport
September 2021 Submission

Employee Parking Spaces

Area	Map ID#	Location of Employee Parking Areas	Sept. 2021 Number of Spaces
Terminal Area	E81	West Garage - MPA Employee	55
Terminal Area	E81a	West Garage Expansion - MPA Employee	12
Terminal Area	E81b	West Garage Expansion - Hilton Employee	7
Terminal Area	E3a	UPS	36
Terminal Area	E3b	Terminal B Garage (UPS)	55
Terminal Area	E26	Airport Tower/Administration Parking	533
Terminal Area	E20a & E20b	Terminal C Pier A (Old Terminal D) (two lots)	87
Terminal Area	E18	Massport Facilities 1 (Heating Plant)	81
Terminal Area	E34	Hilton Hotel employee lot	28
North Service Area	E68a	LSG Sky Chefs (Bldg. 68), main lot	25
North Service Area	E68b	LSG Sky Chefs (Bldg. 68), overflow lot	126
North Service Area	E1	Flight Kitchen Building 1 (and nearby lot)	80
North Service Area	E40	Lovell Street Lot (contractor trailer)	25
North Service Area	E53	Green Bus Depot (Bus Maintenance Facility)	12
North Service Area	E11a	North Cargo Building 11, TSA lot	64
North Service Area	E11b	North Cargo Building 11, State Police lot	36
North Service Area	E43	North Gate & EMS Trailer (EMS Station A7)	12
North Service Area	E8	North Cargo Building 8	118
North Service Area	E5	US Airways Administration/Hangar (Bldg. 5)	0
North Service Area	E4	Massport Facilities 3 (landside, Bldg. 4)	102
North Service Area	E13	UPS (Building 13) - currently vacant	0
North Service Area	E96	UPS (Building 96)	8
North Service Area	E94	United/Delta Buildings (Buildings 93/94)	55
Southwest Service Area	E59	Bus/Limo Pool Lot	4
Southwest Service Area	E60	Rental Car Center (Customer Service Center)	4
Southwest Service Area	E72	Taxi Pool Lot	0
Southwest Service Area	E50	Nouria Gas Station	4
South Service Area	E84	Bird Island Flats / Logan Office Center (LOC) Garage	370
South Service Area	E63	South Cargo Building 63	16
South Service Area	E62	South Cargo Building 62	51
South Service Area	E58	South Cargo Building 58	23
South Service Area	E57	South Cargo Building 57	44
South Service Area	E56	South Cargo Building 56	33
South Service Area	E78	Fire-Rescue HQ & Amelia Earhart Terminal	112

Total In-Service Employee Parking Spaces	**2,218**
Total Designated Employee Parking Spaces	**230**
Total Employee Parking Spaces	**2,448**
Total Commercial Parking Spaces *(see table on previous page)*	**23,640**
TOTAL PARKING SPACES	**26,088**
TOTAL PARKING FREEZE SPACES	**26,088**

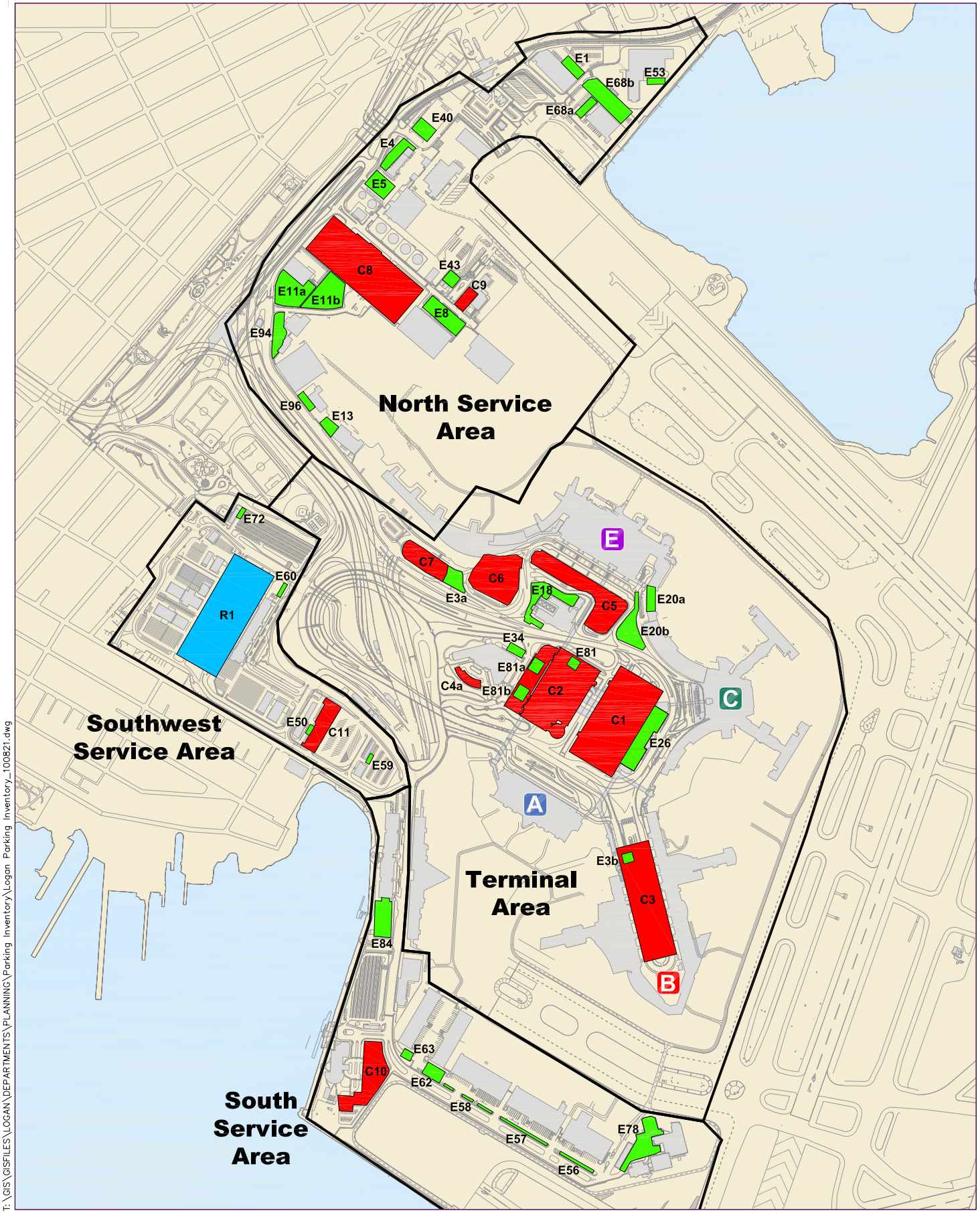
LOGAN PARKING FREEZE SUMMARY

TOTAL COMMERCIAL PARKING SPACES	***23,640***
TOTAL EMPLOYEE PARKING SPACES	***2,448***
TOTAL PARKING FREEZE SPACES	***26,088***

Rental Car Spaces Inventory
Logan International Airport
September 2021 Submission

Rental Car Company Parking Spaces

Map ID#	Location of Employee Parking Areas	Sept. 2021 Number of Spaces
R1	Rental Car Center (RCC)	5,020
Total Rental Car Spaces		**5,020**



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Logan Airport Parking Space Inventory

Logan International Airport
East Boston, MA

Massachusetts Port Authority
September 2021

Legend:

- Logan Parking Service Area Zones
- Commercial Parking Space Locations
- Employee Parking Space Locations
- Rental Car Parking Space Locations

N

0 250 500 1000
in feet

Notes:

This plan is intended for informational purposes only and no use may be made of the same without the express written permission of the Massachusetts Port Authority ("Massport"). Massport does not certify the accuracy, information or title to the properties contained in this plan nor make any warranties of any kind, express or implied, in fact or by law, with respect to any boundaries, easements, restrictions, claims, overlaps or other encumbrances affecting such properties.

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H

Noise Abatement

- This appendix provides detailed information, tables, and figures in support of Chapter 6, *Noise Abatement*. The contents of this appendix are summarized below.

Appendix Contents

- Table H-3 Percentage of Commercial Jet Operations by Part 36 Stage Category – 1998 to 2021
- Table H-4 Modeled Nighttime Operations at Logan Airport – 1990 to 2021
- Table H-5a 2021 Modeled Runway Use by Aircraft Group
- Table H-5b 2020 Modeled Runway Use by Aircraft Group
- Table H-5c 2019 Modeled Runway Use by Aircraft Group
- Table H-6a Summary of Jet and Non-Jet Aircraft Runway Use: 2021
- Table H-6b Summary of Jet and Non-Jet Aircraft Runway Use: 2020
- Table H-6c Summary of Jet and Non-Jet Aircraft Runway Use: 2019
- Table H-7 Total 2021, 2020 and 2019 Modeled Runway Use by All Operations
- Table H-8 Summary of Jet Aircraft Runway Use – 1990 to 2021
- Table H-9 Runway Usage by Runway End
- Table H-10 Total Count of Flight Tracks Modeled with AEDT (2019, 2020, and 2021)

- Annual Model Results and Status of Mitigation Programs
  - Table H-11 Noise-Exposed Population by Community
  - Table H-12 Cumulative Noise Index (EPNL) – 1990 to 2021 (limit 156.5)
  - Table H-13 Annual Operations and Partial CNL by Airline and per Operation (2019, 2020, and 2021)
  - Table H-14 Residential Sound Insulation Program (RSIP) Status (1986-2021)
  - Table H-15 Schools Treated Under Massport Sound Insulation Program
  - Figure H-13 Noise Complaint Line Calls and Callers by Year
  - Table H-16 Noise Complaint Line Summary
- AEDT Correspondence
- Flight Track Monitoring Report
  - Figure H-14 Logan Airport Flight Track Monitor Gates
  - Table H-17a Runway 4R Nahant Gate Summary for 2019
  - Table H-17b Runway 4R Nahant Gate Summary for 2020
  - Table H-17c Runway 4R Nahant Gate Summary for 2021
  - Table H-18a Runway 4R Shoreline Crossings Above 6,000 Feet for 2019
  - Table H-18b Runway 4R Shoreline Crossings Above 6,000 Feet for 2020
  - Table H-18c Runway 4R Shoreline Crossings Above 6,000 Feet for 2021
  - Table H-19a Runway 9 Gate Summary – Winthrop Gates 1 and 2 for 2019
  - Table H-19b Runway 9 Gate Summary – Winthrop Gates 1 and 2 for 2020
  - Table H-19c Runway 9 Gate Summary – Winthrop Gates 1 and 2 for 2021
  - Table H-20a Runway 9 Shoreline Crossings Above 6,000 feet for 2019

Fundamentals of Acoustics and Environmental Noise

This section introduces the fundamentals of acoustics and noise terminology as well as the effects of noise on human activity and community annoyance.

Introduction to Acoustics and Noise Terminology

Chapter 6, *Noise Abatement* of this *2020/2021 Environmental Data Report (EDR)* relies largely on a measure of cumulative noise exposure over an entire calendar year, in terms of a metric called the Day-Night Average Sound Level (DNL). However, DNL does not always provide a sufficient description of noise for many purposes. Other measures are available to address essentially any issue of concern. This section introduces the following acoustic metrics, which are all related to DNL, but provide bases for evaluating a broad range of noise situations. These metrics include:

- Decibel (dB)
- A-Weighted Decibel (dBA)
- Sound Exposure Level (SEL)
- Equivalent Sound Level (Leq)
- Time Above (TA)
- Time Above, Night (TAN)
- DNL

The Decibel (dB)

All sounds come from a sound source – a musical instrument, a voice speaking, or an airplane that passes overhead. It takes energy to produce sound. The sound energy produced by any sound source is transmitted through the air in the form of sound waves – tiny, quick oscillations of pressure just above and just below atmospheric pressure. These oscillations, or sound pressures, impinge on the ear, creating the sound we hear.

Our ears are sensitive to a wide range of sound pressures. The loudest sounds that we hear without pain have about one million times more energy than the quietest sounds we hear. However, our ears are incapable of detecting small differences in these pressures. Thus, to match how we hear this sound energy, we compress the total range of sound pressures to a more meaningful range by introducing the concept of sound pressure level (SPL). SPL is a measure of the sound pressure of a given noise source relative to a standard reference value (typically the quietest sound that a young person with good hearing can detect). SPLs are measured in decibels (abbreviated dB). Decibels are logarithmic quantities – logarithms of the squared ratio of two pressures, the numerator being the pressure of the sound source of interest, and the denominator being the reference pressure (the quietest sound we can hear).

The logarithmic conversion of sound pressure to SPL means that the quietest sound we can hear (the reference pressure) has a SPL of about zero dB, while the loudest sounds we hear without pain have SPLs of about 120 dB. Most sounds in our day-to-day environment have SPLs from 30 to 100 dB.

Because decibels are logarithmic quantities, they do not behave like regular numbers with which we are more familiar. For example, if two sound sources each produce 100 dB and they are operated together, they produce only 103 dB – not 200 dB as we might expect. Four equal sources operating simultaneously result in a total SPL of 106 dB. In fact, for every doubling of the number of equal sources, the SPL goes up another three decibels. A tenfold increase in the number of sources makes the SPL go up 10 dB. A hundredfold increase makes the level go up 20 dB, and it takes a thousand equal sources to increase the level 30 dB.

If one source is much louder than another source, the two sources together will produce the same SPL (and sound to our ears) as if the louder source were operating alone. For example, a 100-dB source plus an 80-dB source produces 100 dB when operating together. The louder source "masks" the quieter one, but if the quieter source gets louder, it will have an increasing effect on the total SPL. When the two sources are equal, as described above, they produce a level 3 dB above the sound of either one by itself.

From these basic concepts, note that one hundred 80 dB sources will produce a combined level of 100 dB; if a single 100-dB source is added, the group will produce a total SPL of 103 dB. Clearly, the loudest source has the greatest effect on the total decibel level.

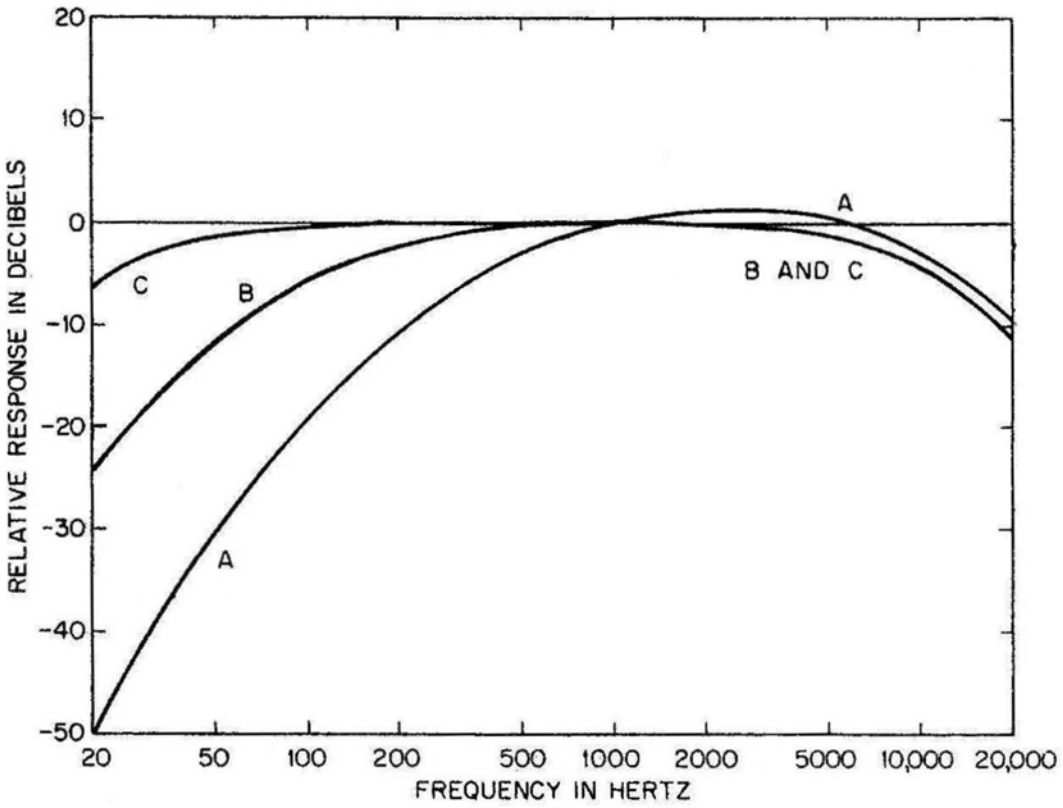
A-Weighted Decibel (dBA)

Another important characteristic of sound is its frequency, or "pitch." This is the rate of repetition of the sound pressure oscillations as they reach our ear. Formerly expressed in cycles per second, frequency is now expressed in units known as Hertz (Hz).

Most people hear from about 20 Hz to about 10,000 to 15,000 Hz. People respond to sound most readily when the predominant frequency is in the range of normal conversation, around 1,000 to 2,000 Hz. Acousticians have developed "filters" to match our ears' sensitivity and help us to judge the relative loudness of sounds made up of different frequencies. The so-called "A" filter does the best job of matching the sensitivity of our ears to most environmental noises. SPLs measured through this filter are referred to as A-weighted levels (dBA). A-weighting significantly de-emphasizes noise at low and very high frequencies (below about 500 Hz and above about 10,000 Hz) where we do not hear as well. Because this filter generally matches our ears' sensitivity, sounds having higher A-weighted sound levels are usually judged louder than those with lower A-weighted sound levels, a relationship which does not always hold true for unweighted levels. It is for these reasons that A-weighted sound levels are normally used to evaluate environmental noise.

Other weighting networks include the B and C filters. They correspond to different level ranges of the ear. The rarely used B-weighting attenuates low frequencies (those less than 500 Hz), but to a lesser degree than A-weighting. C weighting is nearly flat throughout the audible frequency range, hardly de-emphasizing low frequency noise. C-weighted levels can be preferable in evaluating sounds for which low-frequency components are responsible for secondary effects such as the shaking of a building, window rattle, or perceptible vibrations. Uses include the evaluation of blasting noise, artillery fire, and in some cases, aircraft noise inside buildings. **Figure H-1** compares these various weighting networks.

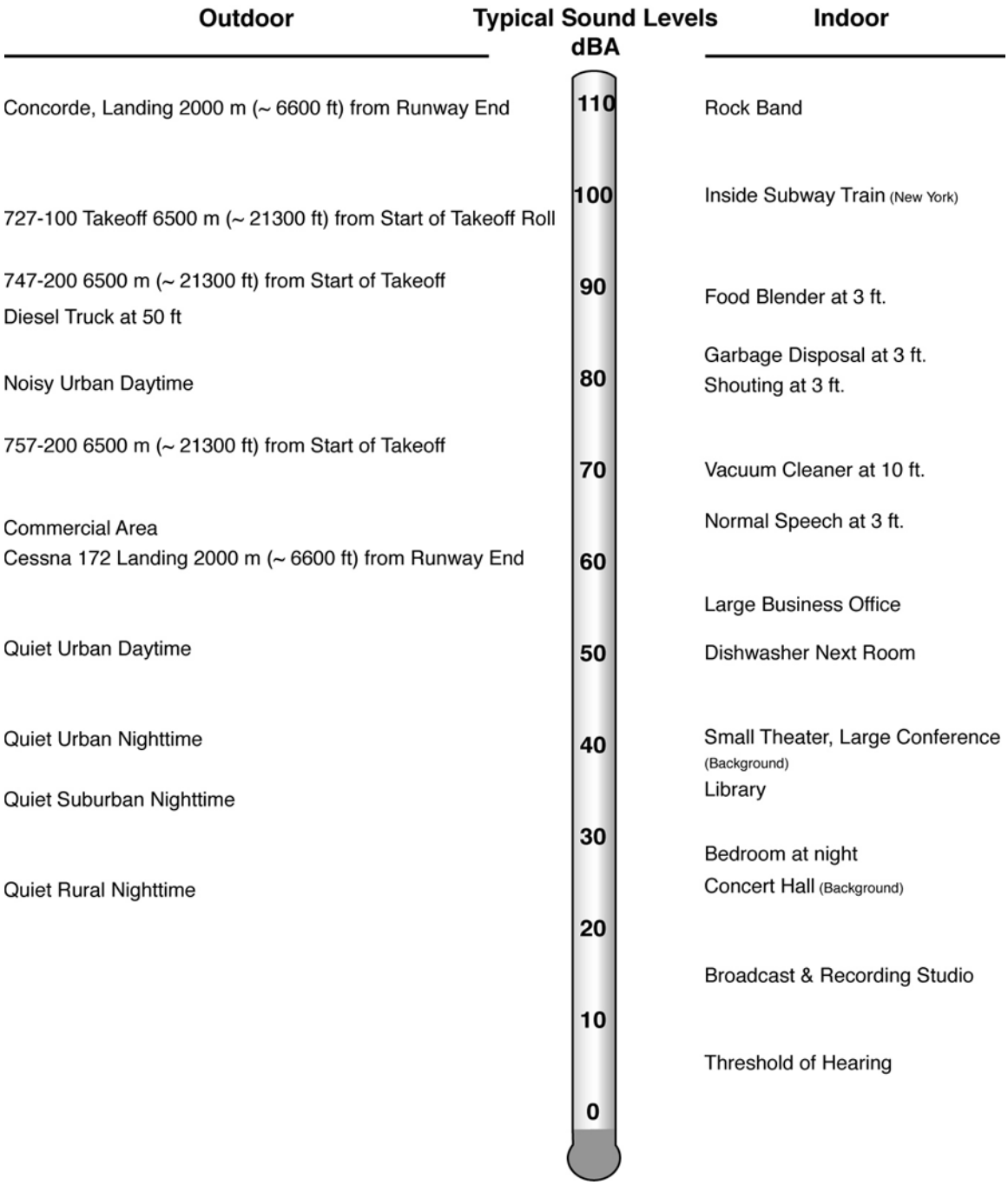
Figure H-1 Frequency-Response Characteristics of Various Weighting Networks



Source: Harris, Cyril M., editor; Handbook of Acoustical Measurements and Noise Control, (Chapter 5, "Acoustical Measurement Instruments"; Johnson, Daniel L.; Marsh, Alan H.; and Harris, Cyril M.); New York; McGraw-Hill, Inc.; 1991; p. 5.13.

Because of the correlation with our hearing, the A-weighted level has been adopted as the basic measure of environmental noise by the U.S. Environmental Protection Agency (EPA) and by nearly every other federal and state agency concerned with community noise. **Figure H-2** presents typical A-weighted sound levels of several common environmental sources.

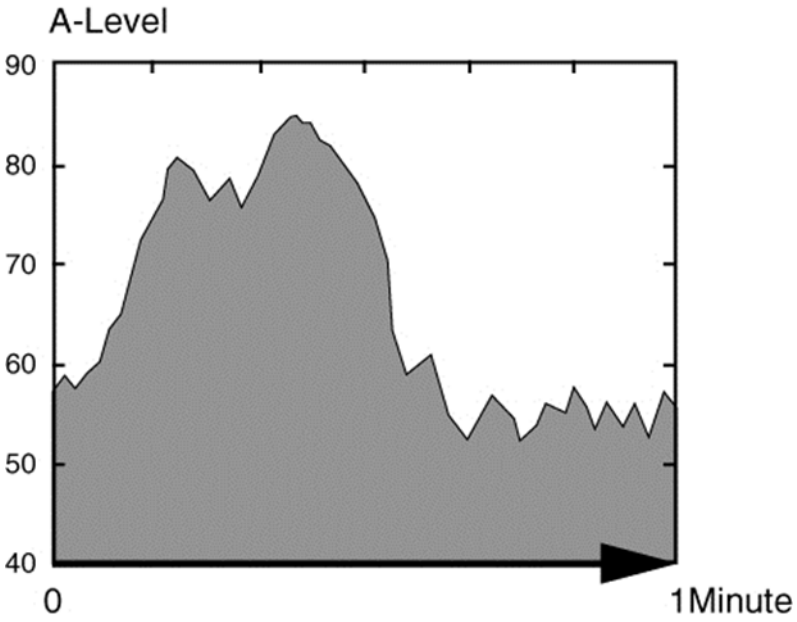
Figure H-2 Common Environmental Sound Levels, in dBA



Source: HMMH (Aircraft noise levels from FAA Advisory Circular 36-3H)
Note: dBA – A-weighted decibel.

An additional dimension to environmental noise is that A-weighted levels vary with time. For example, the sound level increases as an aircraft approaches, then falls and blends into the background as the aircraft recedes into the distance (though even the background varies as birds chirp or the wind blows, or a vehicle passes by). **Figure H-3** illustrates this concept.

Figure H-3 Variations in the A-Weighted Sound Level Over Time



Source: HMMH.

Maximum A-Weighted Noise Level (L_{max})

The variation in noise level over time often makes it convenient to describe a particular noise "event" by its maximum sound level, abbreviated as L_{max}. In the figure above, it is approximately 85 dBA.

The maximum level describes only one dimension of an event; it provides no information on the cumulative noise exposure. In fact, two events with identical maxima may produce very different total exposures. One may be of very short duration, while the other may continue for an extended period and be judged much more annoying. The next measure corrects for this deficiency.

Sound Exposure Level (SEL)

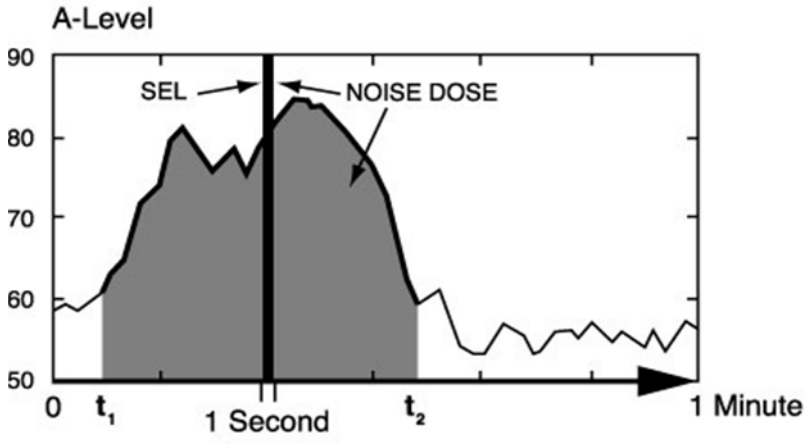
The most frequently used measure of noise exposure for an individual aircraft noise event (and the measure that Part 150[1] specifies for this purpose) is the SEL. SEL is a measure of the total noise energy produced during an event, from the time when the A-weighted sound level first exceeds a threshold level (normally just above the background or ambient noise) to the time that the sound level drops back down below the threshold. To allow comparison of noise events with very different durations, SEL "normalizes" the duration in every case to one second; that is, it is expressed as the steady noise level with just a

1 "Part 150" refers to Federal Aviation Regulations (FAR) Part 150, discussed in detail in the Regulatory Framework Section of this Appendix.

one-second duration that includes the same amount of noise energy as the actual longer duration, time-varying noise. In lay terms, SEL "squeezes" the entire noise event into one second.

Figure H-4 depicts this transformation. The shaded area represents the energy included in an SEL measurement for the noise event, where the threshold is set to 60 dBA. The dark shaded vertical bar, which is 90 dBA high and just one second long (wide), contains the same sound energy as the full event.

Figure H-4 Sound Exposure Level (SEL)



Source: HMMH.

Because the SEL is normalized to one second, it will always be larger than the L_{max} for an event longer than one second. In this case, the SEL is 90 dB; the L_{max} is approximately 85 dBA. For most aircraft overflights, the SEL is normally on the order of 7 to 12 dB higher than L_{max}. Because SEL considers duration, longer exposure to relatively slow, quiet aircraft, such as propeller models, can have the same or higher SEL than shorter exposure to faster, louder planes, such as corporate jets.

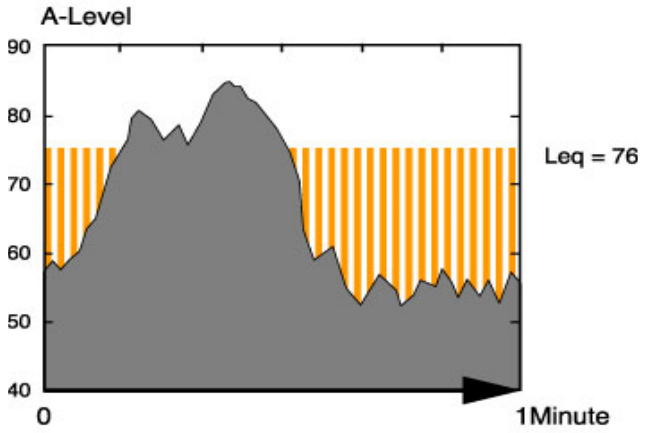
Equivalent Sound Level (L_{eq})

The L_{max} and SEL quantify the noise associated with individual events. The remaining metrics in this section describe longer-term cumulative noise exposure that can include many events.

The Equivalent Sound Level (L_{eq}) is a measure of exposure resulting from the accumulation of A-weighted sound levels over a particular period of interest (e.g., an hour, an eight-hour school day, nighttime, or a full 24-hour day). Because the length of the period can differ, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example $L_{eq(8)}$ or $L_{eq(24)}$.

L_{eq} is equivalent to the constant sound level over the period of interest that contains as much sound energy as the actual time-varying level. This is illustrated in **Figure H-5**. Both the solid and striped shaded areas have a one-minute L_{eq} value of 76 dB. It is important to recognize, however, that the two signals (the constant one and the time-varying one) would sound very different in real life. Also, be aware that the "average" sound level suggested by L_{eq} is not an arithmetic value, but a logarithmic, or "energy-averaged" sound level. Thus, loud events dominate L_{eq} measurements.

Figure H-5 Example of a One Minute Equivalent Sound Level (L_{eq})



Source: HMMH.

In airport noise studies, L_{eq} is often presented for consecutive one-hour periods to illustrate how the exposure rises and falls throughout a 24-hour period, and how individual hours are affected by unusual activity, such as rush hour traffic or a few loud aircraft.

Time Above (TA)

TA is a metric that gives the duration, in minutes, for which aircraft-related noise exceeds a specified A-weighted sound level during a given period. The measure is referred to generally as TA. For this *2020/2021 EDR*, three threshold sound levels are used in the analysis: 65, 75, and 85 dBA. These times are computed using the Federal Aviation Administration (FAA)-approved Aviation Environmental Design Tool (AEDT).

Time Above Night (TAN)

TAN is identical to TA, except it is computed for only the 9-hour period between 10:00 PM and 7:00 AM. The TAN is also developed using three threshold sound levels 65, 75, and 85 dBA.

Day-Night Average Sound Level (DNL)

Virtually all studies of aircraft noise rely on a slightly more complicated measure of noise exposure that describes cumulative noise exposure during an average annual day: the DNL. (EPA identified DNL as the most appropriate means of evaluating airport noise based on the following considerations:[2]

1. The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods.

2. The measure should correlate well with known effects of the noise environment and on individuals and the public.

2 Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," U. S. EPA Report No. 550/9-74-004, March 1974.

3. The measure should be simple, practical, and accurate. In principal, it should be useful for planning as well as for enforcement or monitoring purposes.

4. The required measurement equipment, with standard characteristics, should be commercially available.

5. The measure should be closely related to existing methods currently in use.

6. The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.

7. The measure should lend itself to small, simple monitors, which can be left unattended in public areas for long periods.

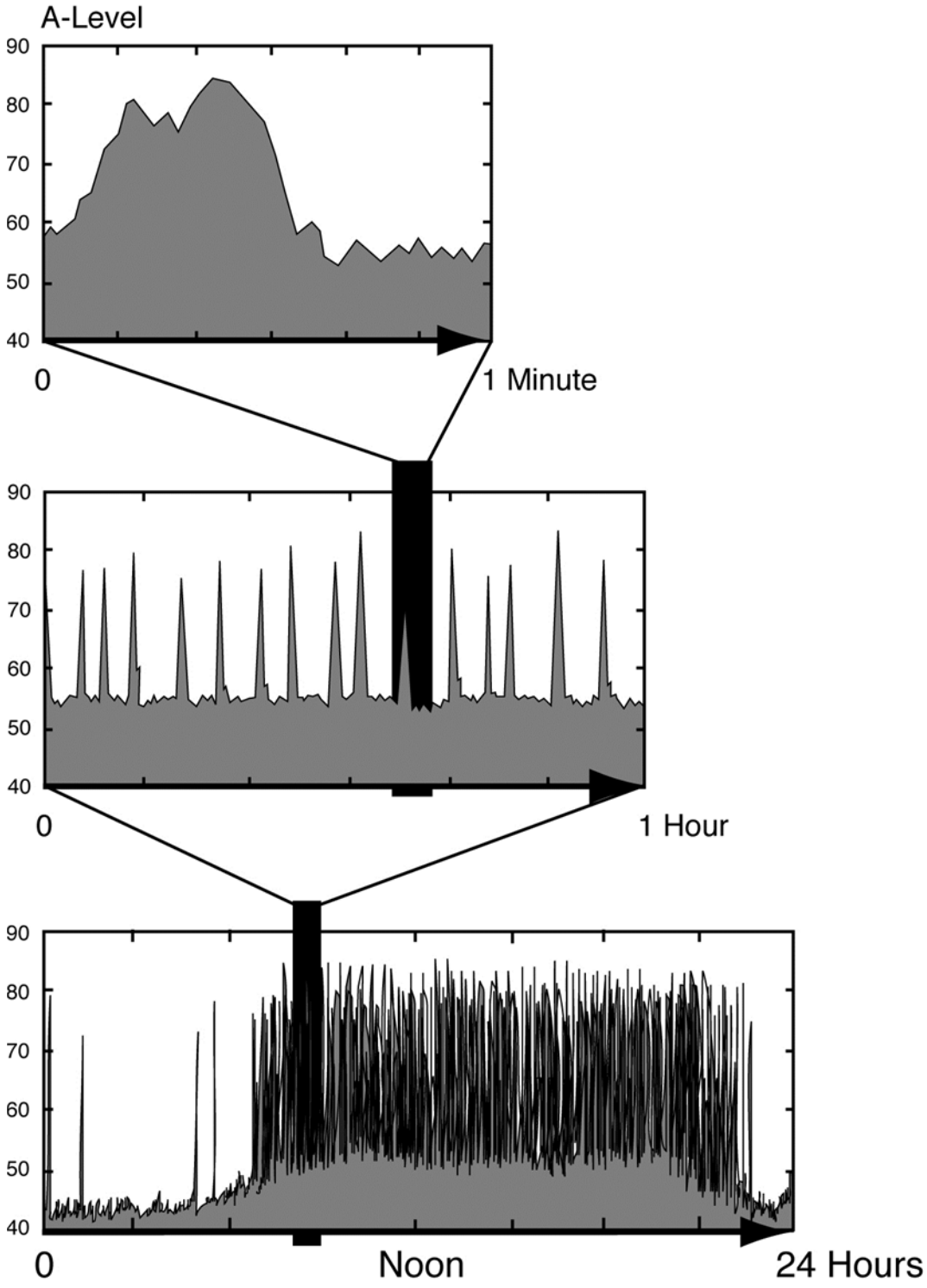
Most federal agencies dealing with noise have formally adopted DNL. The Federal Interagency Committee on Noise (FICON) reaffirmed the appropriateness of DNL in 1992 and DNL was reaffirmed again by the Federal Interagency Committee on Aircraft Noise (FICAN) in 2018. The FICON summary report stated; "There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric."

The DNL represents noise as it occurs over a 24-hour period, with one important exception: DNL treats nighttime noise differently from daytime noise. In determining DNL, it is assumed that the A-weighted levels occurring at night (defined as 10:00 PM to 7:00 AM) are 10 dB louder than they really are. This 10-dB penalty is applied to account for greater sensitivity to nighttime noise, and the fact that events at night are often perceived to be more intrusive because nighttime ambient noise is less than daytime ambient noise.

Figure H-4 illustrated the A-weighted sound level due to an aircraft fly-over as it changed with time. The top frame of **Figure H-6** repeats this figure. The shaded area reflects the noise dose that a listener receives during the one-minute period of the sample. The center frame of **Figure H-6** includes this one-minute sample within a full hour. The shaded area represents the noise during that hour with 16 noise events, each producing an SEL. Similarly, the bottom frame includes the one-hour interval within a full 24 hours. Here the shaded area represents the listener's noise dose over a complete day. Note that several overflights occur at a time when the background noise drops some 10 dB, to approximately 45 dBA.

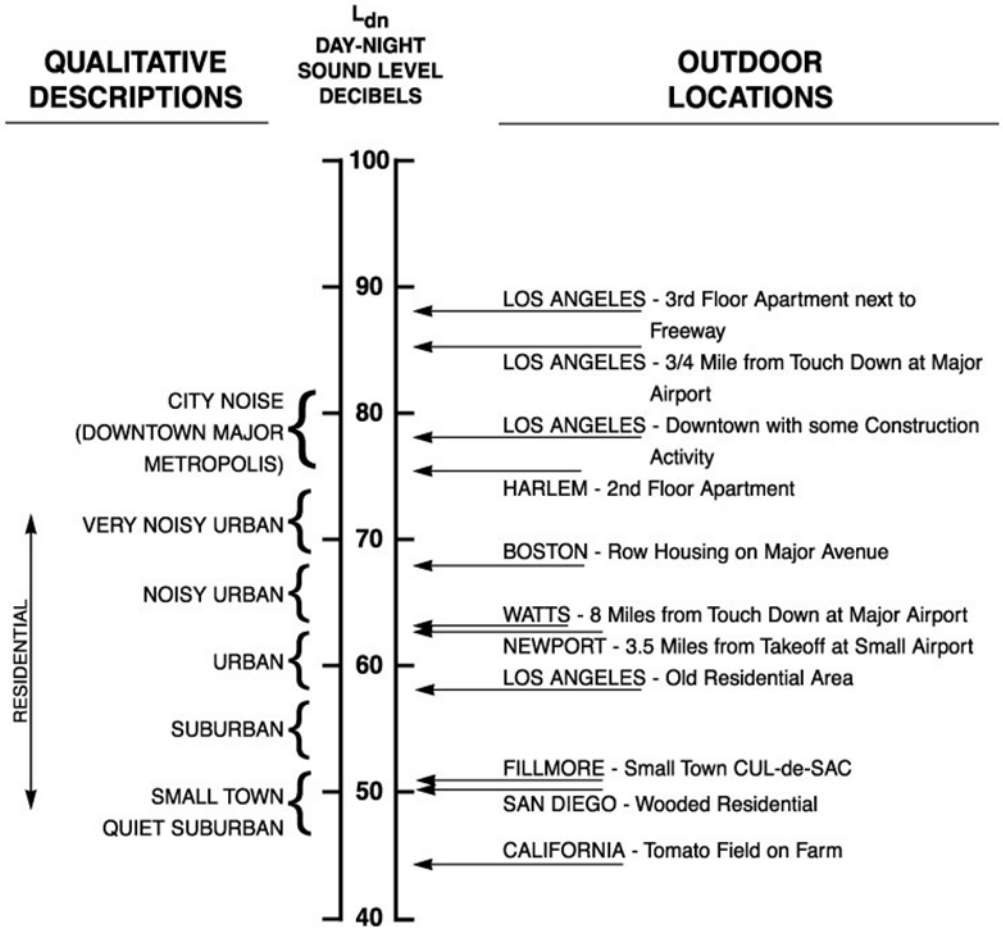
DNL can be measured or estimated. Measurements are practical only for obtaining DNL values for relatively limited numbers of points, and, in the absence of a permanently installed monitoring system, only for relatively short time periods. Most airport noise studies are based on computer-generated DNL estimates, determined by accounting for all the SELs from individual events, which comprise the total noise dose at a given location. Computed DNL values are often depicted in terms of equal-exposure noise contours (much as topographic maps have contours of equal elevation). **Figure H-7** depicts typical DNL values for a variety of noise environments.

Figure H-6 Daily Noise Dose



Source: HMMH.

Figure H-7 Examples of Day-Night Average Sound Levels (DNL)



Source: U.S. Environmental Protection Agency (EPA), Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974, p. 14.

In 2015, the FAA began a multi-year effort to update the scientific evidence on the relationship between aircraft noise exposure and its effects on communities around airports.[3] This was the most comprehensive study using a single noise survey ever undertaken in the United States, polling communities surrounding 20 airports nationwide.

For detailed information on the survey, please review the survey introduction and read the survey report[4]. Further information on FAA's aircraft noise research program, can also be found on a Federal Register notice published on January 13, 2021[5]. This notice invited comments on the FAA's aircraft noise research

3 Federal Aviation Administration. Press Release – FAA To Re-Evaluate Method for Measuring Effects of Aircraft Noise. https://www.faa.gov/news/press_releases/news_story.cfm?newsId=18774

4 Federal Aviation Administration. Analysis of the Neighborhood Environmental Survey. https://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications/Airport-Safety-Detail/ArtMID/3682/ArticleID/2845/Analysis-of-NES

5 Federal Aviation Administration. Overview of FAA Aircraft Noise Policy and Research Efforts: Request for Input on Research Activities to Inform Aircraft Noise Policy. https://www.federalregister.gov/documents/2021/01/13/2021-00564/overview-of-faa-aircraft-noise-policy-and-research-efforts-request-for-input-on-research-activities

program, including the survey, through a 90-day total period which closed on April 14, 2021. The FAA is currently reviewing the over 4,000 comments received to this docket (FAA-2021-0037-001).

The FAA will not make any determinations based on the findings of these research programs for the FAA's noise policies, including any potential revised use of the DNL noise metric, until it has carefully considered public and other stakeholder input along with any additional research needed to improve the understanding of the effects of aircraft noise exposure on communities.

The FAA Reauthorization Act of 2018 under Section 188 and 173, required FAA to complete the evaluation of alternative metrics to the DNL standard within one year. The Section 188 and 173 Report to Congress was delivered on April 14, 2020[6] and concluded that while no single noise metric can cover all situations, DNL provides the most comprehensive way to consider the range of factors influencing exposure to aircraft noise. In addition, use of supplemental metrics is both encouraged and supported to further disclose and aid in the public understanding of community noise impacts.

The Effects of Aircraft Noise on People

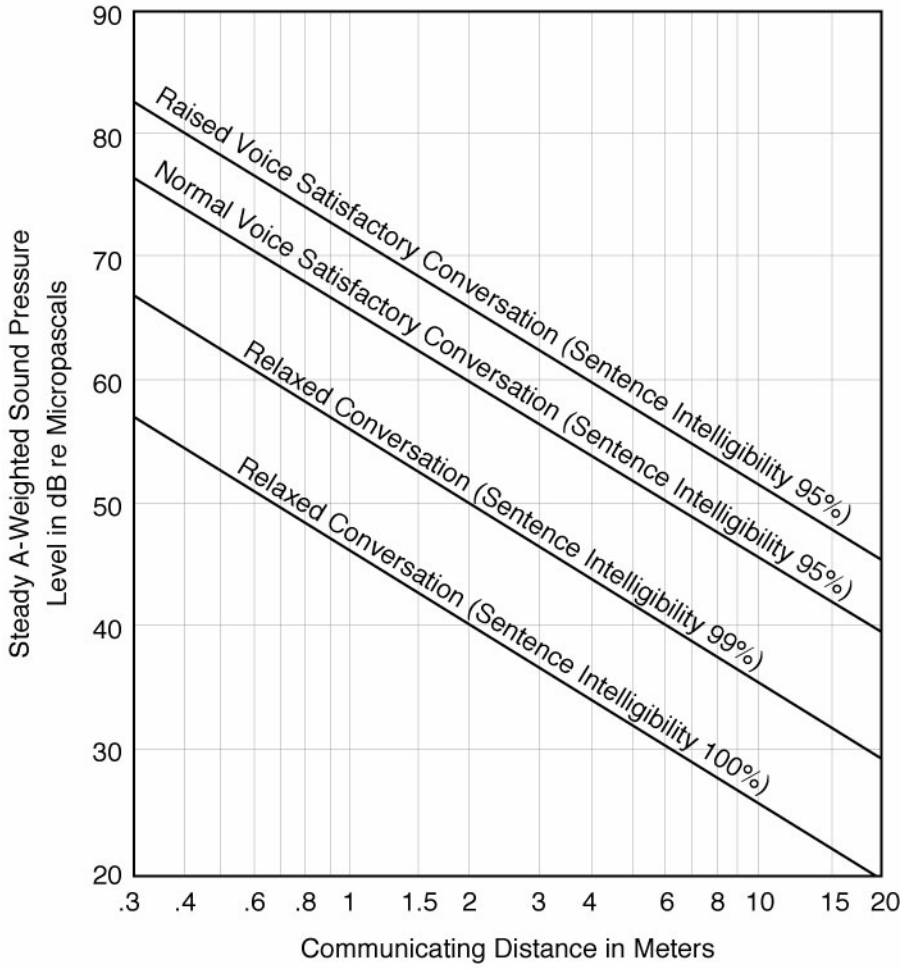
To residents around airports, aircraft noise can be an annoyance and a nuisance. It can interfere with conversation and listening to television, it can disrupt classroom activities in schools, and it can disrupt sleep. Relating these effects to specific noise metrics helps in the understanding of how and why people react to their environment.

Speech Interference

A primary effect of aircraft noise is its tendency to drown out or "mask" speech, making it difficult to carry on a normal conversation. The sound level of speech decreases as the distance between a talker and listener increases. As the background sound level increases, it becomes harder to hear speech. **Figure H-8** presents typical distances between talker and listener for satisfactory outdoor conversations, in the presence of different steady A-weighted background noise levels for raised, normal, and relaxed voice effort. As the background level increases, the talker must raise their voice, or the individuals must get closer together to continue talking.

6 Federal Aviation Administration. Report to Congress on an evaluation of alternative noise metrics. https://www.faa.gov/about/plans_reports/congress/media/Day-Night_Average_Sound_Levels_COMPLETED_report_w_letters.pdf

Figure H-8 Outdoor Speech Intelligibility



Source: U.S. Environmental Protection Agency (EPA), Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974, p. D-5.

As indicated in the figure, "satisfactory conversation" does not always require hearing every word; 95 percent intelligibility is acceptable for many conversations. Listeners can infer a few unheard words when they occur in a familiar context. However, in relaxed conversation, we have higher expectations of hearing speech and generally require closer to 100 percent intelligibility. Any combination of talker-listener distances and background noise that falls below the bottom line in **Figure H-8** (thus assuring 100 percent intelligibility) represents an ideal environment for outdoor speech communication and is considered necessary for acceptable indoor conversation as well.

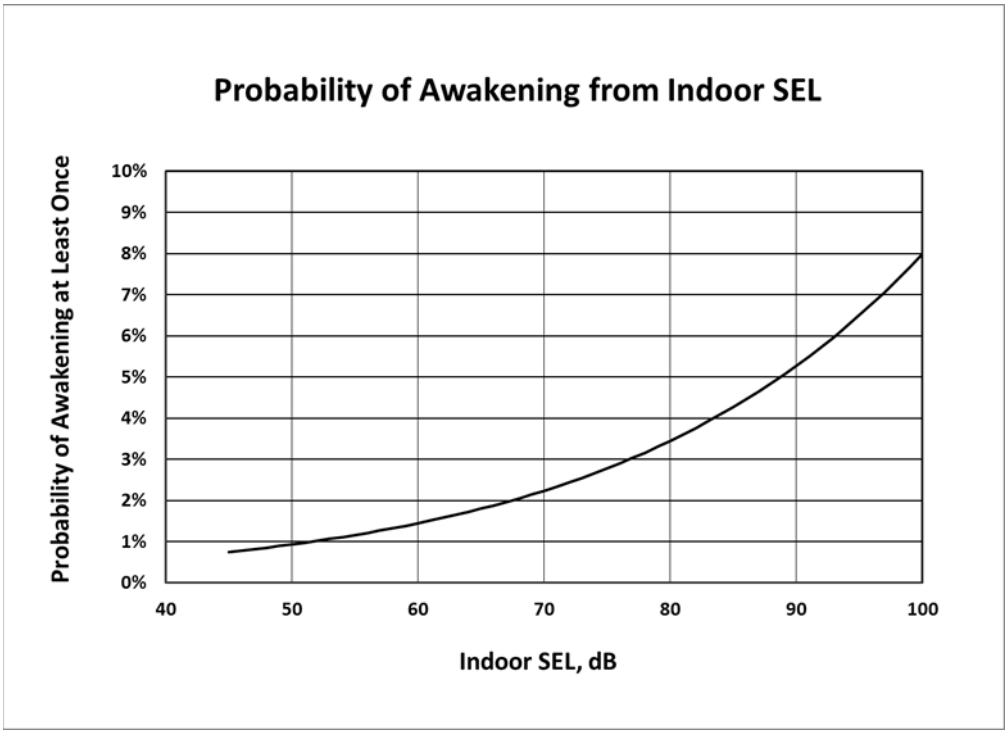
One implication of the relationships in **Figure H-8** is that for typical communication at distances of 3 or 4 feet (1 to 1.5 meters), acceptable outdoor conversations can be carried on in a normal voice as long as the background noise outdoors is less than about 65 dBA. If the noise exceeds this level, as might occur when an aircraft passes overhead, intelligibility would be lost unless vocal effort were increased, or communication distance were decreased.

Indoors, typical distances, voice levels, and intelligibility expectations generally require a background level less than 45 dBA. With windows partly open, housing generally provides about 12 dBA of interior-to-exterior noise level reduction. Thus, if the outdoor sound level is 60 dBA or less, there is a reasonable chance that the resulting indoor sound level will afford acceptable conversation inside. With windows closed, 24 dB of attenuation is typical.

Sleep Interference

Research on sleep disruption from noise has led to widely varying observations. In part, this is because (1) sleep can be disturbed without awakening, (2) the deeper the sleep the more noise it takes to cause arousal, and (3) the tendency to awaken increases with age, and other factors. **Figure H-9** shows one such relationship from recent research conducted in the U.S. – the probability that a group of people will be awakened at least once when exposed to a given indoor SEL.

Figure H-9 Probability of Awakening at Least Once from Indoor Noise Event



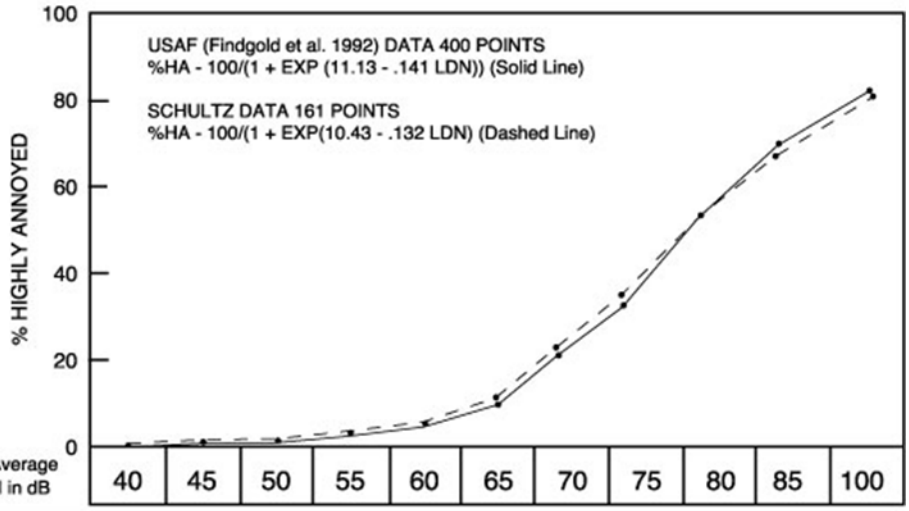
Source: American National Standards Institute (ANSI) S12.9-2008/Part 6, Quantities and Procedures for Description and Measurement of Environmental Sound — Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes; Equation 1.

For example, an indoor SEL of 80 dB results in approximately 3.5 percent of the exposed population being awakened. If windows are open in the bedroom on a warm evening and a house provides a typical outside-to-inside noise level reduction of around 15 dB, which suggests it takes an SEL of about 95 dB outdoors to awaken 3.5 percent of the population. The American National Standards Institute (ANSI) has extended this concept further and developed a standard (ANSI S12.9-2008/Part 6) for computing the percentage of the population that is likely to be awakened by multiple noise events occurring throughout the night. The FICAN subsequently endorsed the standard as the best available means of estimating behavioral awakenings from aircraft noise.

Community Annoyance

Social survey data make it clear that individual reactions to noise vary widely for a given noise level. Nevertheless, as a group, people's aggregate response is predictable and relates well to measures of cumulative noise exposure such as DNL. **Figure H-10** shows a widely recognized relationship between environmental noise and annoyance. Based on data from 18 surveys conducted worldwide, the curve indicates that at levels as low as DNL 55, approximately 5.0 percent of the people will still be highly annoyed, with the percentage increasing more rapidly as exposure increases above DNL 65 dB.

Figure H-10 Percentage of People Highly Annoyed

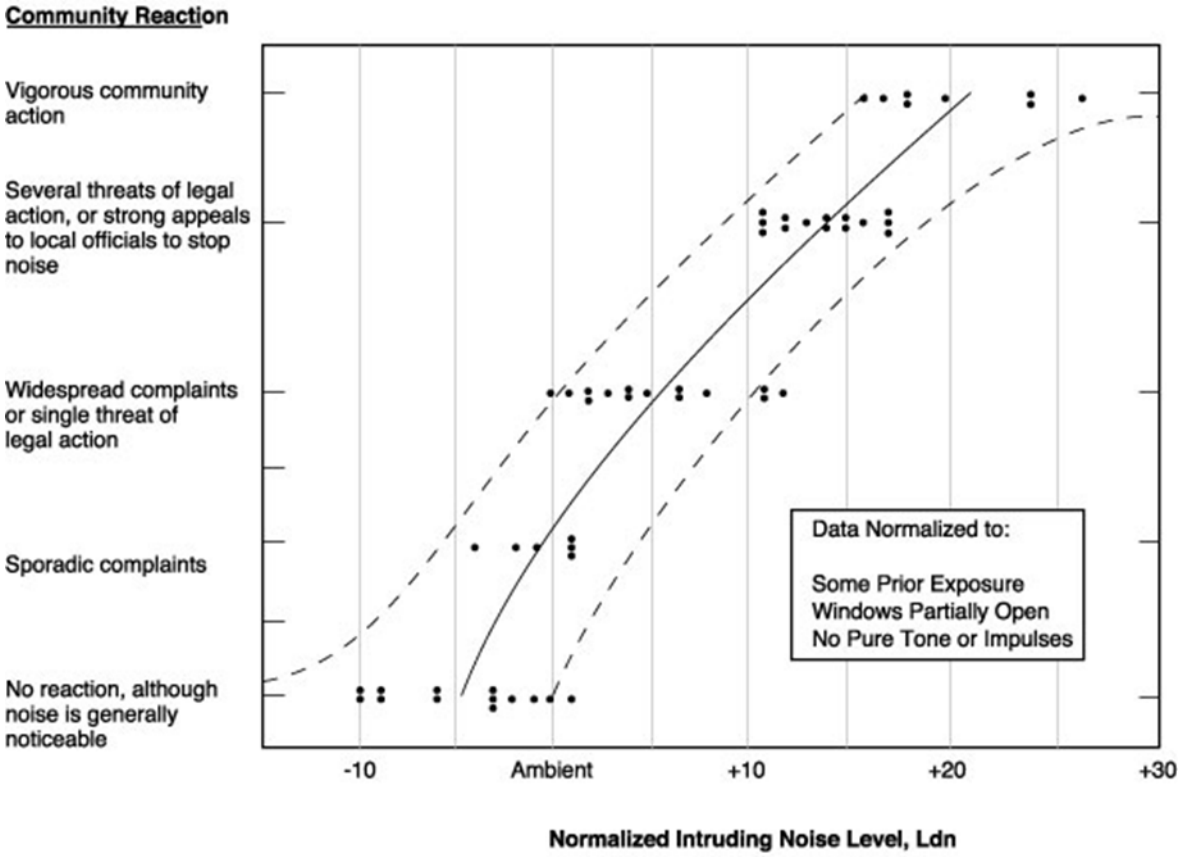


Day - Night Average Sound Level in dB		40	45	50	55	60	65	70	75	80	85	100
Calculated %HA Points	USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
	SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Source: Federal Interagency Committee on Aviation Noise (FICAN). "Federal Agency Review of Selected Airport Noise Analysis Issues." August 1992. (From data provided by USAF Armstrong Laboratory). pp. 3-6.

Separate work by the EPA has shown that overall community reaction to a noise environment can also be related to DNL. This relationship is shown in **Figure H-11**. Levels have been normalized to the same set of exposure conditions to permit valid comparisons between ambient noise environments. Data summarized in **Figure H-11** suggest that little reaction would be expected for intrusive noise levels five decibels below the ambient, while widespread complaints can be expected as intruding noise exceeds background levels by about 5 dB. Vigorous action is likely when the background is exceeded by 20 dB.

Figure H-11 Community Reaction as a Function of Outdoor DNL

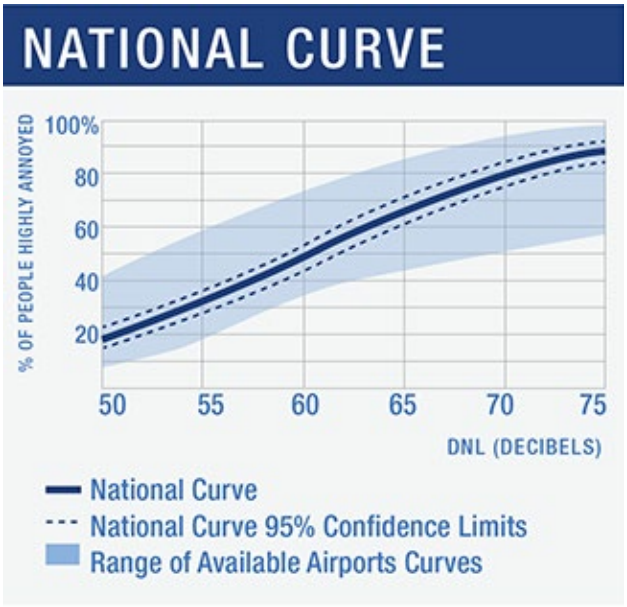


Source: Wyle Laboratories, "Community Noise," prepared for the U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C., December 1971, pg. 63.
Note: DNL - Day-Night Average Sound Level.

While the Schultz Curve remains the accepted standard for describing transportation noise exposure-annoyance relationships, its original supporting scientific evidence and social survey data were based on information that was available in the 1970s. The last in-depth review and revalidation of the Schultz Curve was conducted in 1992. More recent analyses have shown that aviation noise results in higher annoyance than other modes of transportation. Recent international social surveys have also generally shown higher annoyance than the Schultz Curve. These analyses and survey data indicate that the Schultz Curve may not reflect the current U.S. public perception of aviation noise.

To ensure that FAA's continued efforts to reduce the effects of aircraft noise exposure on communities is based upon accurate information, FAA conducted a nationwide survey to measure the relationship between aircraft noise exposure and annoyance in communities near airports. This survey captured the

community response to a modern fleet of aircraft as they are being flown today and used best practices in terms of noise analysis and data collection. The responses from the survey have been used to create a new National Curve. The survey results show that there has been a substantial change in the public perception of aviation noise, relative to the Schultz Curve, which will ultimately inform future FAA noise initiatives. Compared with the existing Schultz Curve, the new National Curve shows a substantial increase in the percentage of people who are highly annoyed by aircraft noise over the entire range of aircraft noise levels considered, including at lower noise levels.



Regulatory Framework

Federal Aviation Regulation (FAR) Part 36

Logan Airport operates within a framework of federal aviation regulations that limits an airport operator's ability to control noise. For example, FAA's FAR Part 36[7] sets noise limits for aircraft certification and the procedures by which aircraft noise emission levels must be measured to determine compliance. The regulation defines noise emission limits for turbojets, turboprops, and helicopters, classifying turbojets into categories referred to as stages based on noise levels at each of three locations: takeoff, landing, and to the side of the runway during takeoff (sideline). The categories are:

- Stage 1 aircraft are the oldest and usually have the loudest operations, having preceded the existence of any noise emission regulation. Rare examples include old, restored civil or military aircraft. There are no Stage 1 aircraft operating at Logan Airport.
- Stage 2 aircraft are less old and less noisy than Stage 1; they were the first aircraft types required to meet a noise limit. A subsequent regulation, FAR Part 91 (described below), prohibits the operation of a Stage 2 aircraft in the continental U.S. unless its takeoff weight is 75,000 pounds or less. The FAA Reauthorization bill of 2012 also mandated the phase out of Stage 2 aircraft with a

7 14 CFR Part 36, "Noise Standards: Aircraft Type and Air Worthiness Certification."

takeoff weight less than 75,000 pounds by the end of 2015. Thus, there are no longer any Stage 2 aircraft operating at Logan Airport.

- Stage 3 aircraft were certified for service before 2006 and have relatively quiet jets, although some are Stage 2 aircraft that have been re-engined, or have been fitted with hushkits, enabling them to meet Stage 3 noise limits.
- Stage 4 aircraft are required to operate with a cumulative noise level at least 10 dB quieter than Stage 3 aircraft at three prescribed measurement points. Jet aircraft certificated after January 1, 2006 must meet the Stage 4 limits. Although not required, the majority of aircraft in the 2020 and 2021 Logan Airport fleets would also meet the Stage 4 noise limits if they were recertificated.
- Stage 5 aircraft are the newest and quietest aircraft. All aircraft certificated after January 1, 2018 must meet Stage 5 limits, which are a cumulative 7 dB below Stage 4 and 17 dB below Stage 3 aircraft. The Boeing 787, 747-8, and Airbus A350 and A380 are examples of aircraft that meet the new limits. About 29 percent of aircraft in the 2020 and 2021 Logan Airport fleets would meet Stage 5 noise limits.

Logan Airport Noise Abatement Rules and Regulations

For decades, Massport's primary mechanism for reducing noise impacts from Logan Airport's operations was the Noise Rules.[8] The Noise Rules were designed to reduce noise impacts by encouraging use of quieter aircraft by requiring decreased use of noisier aircraft and by limiting nighttime activity by louder Stage 2 types. Many secondary goals aimed at limiting noise in specific areas also were stated.

Specific provisions of the Noise Rules, which continue to serve these goals, include:

- Limiting cumulative noise exposure at Logan Airport (as measured by Massport's cumulative noise index [CNI]) to a maximum of 156.5 Effective Perceived Noise Decibels (EPNdB);
- Maximizing use of Stage 3 aircraft;
- Restricting nighttime operations by Stage 2 aircraft;
- Placing limitations on times and locations of engine run-ups and use of auxiliary power units (APU); and
- Restricting use of certain runways by noisier aircraft and time of day.

These restrictions and limitations are subject to FAA implementation and safe operation of the Airport and airspace. While the specific language applying to Stage 2 and Stage 3 aircraft is no longer applicable, due to aircraft fleet modernizations, CNI continues to be calculated and monitored annually.

8 The Logan International Airport Noise Abatement Rules and Regulations, effective July 1, 1986, are codified at 740 Code of Massachusetts Regulations (CMR) 24.01 et seq (also known as the Noise Rules).

FAR Part 150

First implemented in February 1981, FAR Part 150[9] defines procedures that an airport operator must follow if it chooses to conduct and implement an airport noise and land use compatibility plan. Part 150 Noise Compatibility studies require the use of DNL to evaluate the airport noise environment. FAR Part 150 identifies noise compatibility guidelines for different land uses depending on their sensitivity. Key values include a DNL of 75 dB, above which no residences, schools, hospitals, or churches are considered compatible, and a DNL of 65 dB, above which those land uses are considered compatible only if they are sound insulated.

Noise abatement or mitigation measures that an airport operator must consider in a Part 150 study include acquisition of incompatible land, construction of noise barriers, sound insulation of buildings, implementation of a preferential runway program, use of noise abatement flight tracks, implementation of airport use restrictions, and any other actions that would have a beneficial effect on the public.

While Massport has implemented variations of these and additional measures at Logan Airport, Massport has not filed an official Part 150 noise compatibility study with FAA because all of Logan Airport's program elements, while regularly reviewed and updated, preceded the promulgation of Part 150 and are effectively grandfathered under the regulation.

In 2021, Massport submitted a Noise Exposure Map prepared in accordance with Part 150 to FAA in order to update the Residential Sound Insulation Program. The Noise Exposure Map was accepted by the FAA in December 2021.

FAR Parts 91 and 161

The Airport Noise and Capacity Act of 1990 (ANCA)[10] directed the U.S. Secretary of Transportation to undertake three key noise-related actions:

- Establish a schedule for a phase out of Part 36 Stage 2 aircraft by the year 2000;
- Establish a program for FAA review of all new airport noise and access restrictions limiting operations of Stage 2 aircraft: and
- Establish a program for FAA review and approval of any restriction that limits operations of Stage 3 aircraft, including public notice requirements.

FAA addressed these requirements through amendment of an existing federal regulation, "Part 91,"[11] and establishment of a new regulation, "Part 161."[12] ANCA effectively ended Massport's pursuit of any additional operational restrictions outside of this program.

9 14 CFR Part 150, "Airport Noise Compatibility Planning."

10 Pub. L. No. 101-508, 104 Stat. 1388, as recodified at 49 United States Code 47521- 47533.

11 14 CFR Part 91, "General Operating and Flight Rules."

12 14 CFR Part 161, "Notice and Approval of Airport Noise and Access Restrictions."

Amendment to Part 91

FAA establishes and regulates operating noise limits for civil aircraft operation in Subpart I, "Operating Noise Limits," of 14 CFR Part 91, "General Operating and Flight Rules." The noise limits are based on aircraft noise certification criteria set forth in 14 CFR Part 36, described above.

In 1976, FAA ordered a phase out of all Stage 1 aircraft with a maximum gross takeoff weight (MGTOW) over 75,000 pounds, to be completed on January 1, 1985. After that date, Stage 1 civil aircraft over 75,000 pounds MGTOW were banned from operating in the U.S. (with limited exemptions related to commercial service at "small communities," which has since expired in 1988). ANCA required a similar phase out of Stage 2 aircraft over 75,000 pounds by December 31, 1999. The 75,000-pound weight limit exempted most "business" (or "corporate") jets and a very small number of the very smallest "air carrier" type jets until December 31, 2015, when a full ban took effect.[13] Aircraft operators responded to the Stage 1 and 2 phase-outs by retiring their non-compliant aircraft or modifying some of their aircraft to meet the more stringent standards. The modifications undertaken include installation of quieter engines, noise-reducing physical modifications to the airframe and/or existing engines, and limitation of operating weights and procedures to meet the applicable Part 36 limits. Some former Stage 2 aircraft that were "recertificated" as Stage 3 with these modifications may still operate at Logan Airport, but only on an occasional basis as general aviation aircraft. Aircraft with these modifications are no longer operating as part of the commercial fleet at Logan Airport.

From 2006 to 2017, as airlines added new aircraft, Stage 4 aircraft were added to their fleets. The Stage 4 noise standard applies to any new jet aircraft type designs over 12,500 pounds requiring FAA approval after January 1, 2006. The International Civil Aviation Organization (ICAO) has also adopted the same regulation for international operators, but neither FAA nor ICAO have indicated there will be restrictions on the remaining recertificated Stage 3 aircraft from carrier fleets.

ICAO and FAA adopted a higher standard of noise classification called Stage 5 (Chapter 14 for ICAO) which was effective for new aircraft type certification after December 31, 2017 and December 31, 2020, depending on the weight of the aircraft.[14] Many aircraft currently operating at Logan Airport meet Stage 5 noise standards.

Part 161

FAA implemented the ANCA requirements related to notice, analysis, and approval of use restrictions affecting Stage 2 and 3 aircraft through the establishment of a new regulation, 14 CFR Part 161, "Notice and Approval of Airport Noise and Access Restrictions." In simple terms, Part 161 requires an airport operator that proposes to implement a restriction on Stage 2 or 3 aircraft operations to undertake, document, and publicize certain benefit-cost analyses, comparing the noise benefits of the restriction to its economic costs. Operators must obtain specific FAA approvals of the analysis, documentation, and notice processes, and – for Stage 3 restrictions – approval of the restriction itself.

13 FAA Modernization and Reform Act of 2012 sets a January 1, 2016 ban of Stage 2 aircraft less than 75,000 lbs.

14 The Final Rule was published on October 4, 2017.

Part 161 and ANCA define more demanding requirements and explicit guidance for Stage 3 restrictions. To implement a Stage 3 restriction, formal FAA approval is required. FAA's role for Stage 2 restrictions is limited to commenting on compliance with Part 161 notice and analysis procedural requirements. Part 161 provides guidance regarding appropriate information to provide in support of these findings. While Part 161 does not require this information for a Stage 2 restriction, Part 161 states that it would be "useful." Moreover, FAA has required airports to provide this same information for Stage 2 restrictions (and even for Stage 1 restrictions pursued under FAR Part 150), on the grounds that they are required for airports to comply with grant assurance 22(a), "Economic Nondiscrimination," which states that an airport operator "will make its airport available as an airport for public use on reasonable terms and without unjust discrimination to all types, kinds, and classes of aeronautical activities, including commercial aeronautical activities offering services to the public at the Airport."[15]

Although several (on the order of a dozen) airports have embarked on efforts to adopt both Stage 2 and 3 restrictions in the past two decades, FAA has found that only one, Naples Municipal Airport, a general aviation (GA) airport in Naples, Florida, has fully complied with Part 161 analysis, notice, and documentation requirements for a ban on Stage 2 jet operations. FAA found the airport was in violation of prior to FAA grant assurances. The airport operator successfully sued FAA to overturn that ruling and has implemented the restriction.

ANCA and Part 161 specifically exempt Stage 3 use restrictions that were effective on or before October 1, 1990, and Stage 2 restrictions that were proposed before that date. The Logan Airport Noise Rules were promulgated in 1986; therefore, ANCA and Part 161 have no bearing on their continued implementation in their current form. Any future proposals to make the rules more stringent regarding Stage 2 operations or to restrict Stage 3 operations in any way would almost certainly trigger Part 161 notice, analysis, and approval processes for Stage 3 restrictions. In 2006, Massport requested an opinion from FAA regarding the pursuit of a Part 161 waiver or exemption to allow Massport to implement a curfew of nighttime operations of hush-kitted Stage 3 aircraft. FAA informed Massport that a waiver or exemption from the requirements of Part 161 is not authorized under, or consistent with, federal statutory and regulatory requirements. A copy of FAA's letter to Massport was provided in Appendix H, *Noise Abatement* in the *2005 EDR*.

Logan Airport Noise Modeling

To relate portions of the foregoing discussion to the specific noise environment around Logan Airport for this *2020/2021 EDR*, Massport has developed DNL noise contours, TA noise metrics, and population counts for 2020 and 2021 using the latest version of the FAA's AEDT, version 3d, and a proprietary AEDT pre-processor. The pre-processor software takes radar data from individual flights occurring throughout the year, and structures it into a form usable as input to the AEDT. The AEDT serves as the computational

15 FAA Order 5190.6(b), "Airport Compliance Manual" Chapter 13, Section 14, paragraph (a). To be approved, restrictions must meet the following six statutory criteria: 1) The proposed restriction is reasonable, nonarbitrary, and nondiscriminatory. 2) The proposed restriction does not create an undue burden on interstate or foreign commerce. 3) The proposed restriction maintains safe and efficient use of the navigable airspace. 4) The proposed restriction does not conflict with any existing federal statute or regulation. 5) The applicant has provided adequate opportunity for public comment on the proposed restriction. 6) The proposed restriction does not create an undue burden on the national aviation system.

"engine" for calculating noise. Prior to 2016, Massport used the FAA's Integrated Noise Model (INM) with a pre-processor called RealContours™ which operated in a similar manner.

Standard AEDT input methodology involves development of operational inputs and calculation of the DNL for a prototypical average annual day.[16] This approach requires manually collecting, refining, and entering the enormous amount of data averaged over a full year of activity at an airport. Typically, the model inputs may include an aircraft fleet mix with several dozen representative aircraft types, on the order of 100 to 300 representative flight tracks (common for a facility the size of Logan Airport), and runway use and flight track use percentages for three or four categories of aircraft types with similar performance characteristics. This normal approach to noise modeling meets accepted professional standards and reduces the effort and cost that would be associated with manually entering the parameters for every actual operation. However, it represents a significant simplification of the extraordinary diversity of actual aircraft operations over a year.

Instead of relying on consolidated data summaries, Massport takes maximum possible advantage of both AEDT's capabilities and the investment that Massport has made in its Noise and Operations Management System (NOMS). The AEDT pre-processor improves the precision of modeling by utilizing operations monitoring results in these key areas:

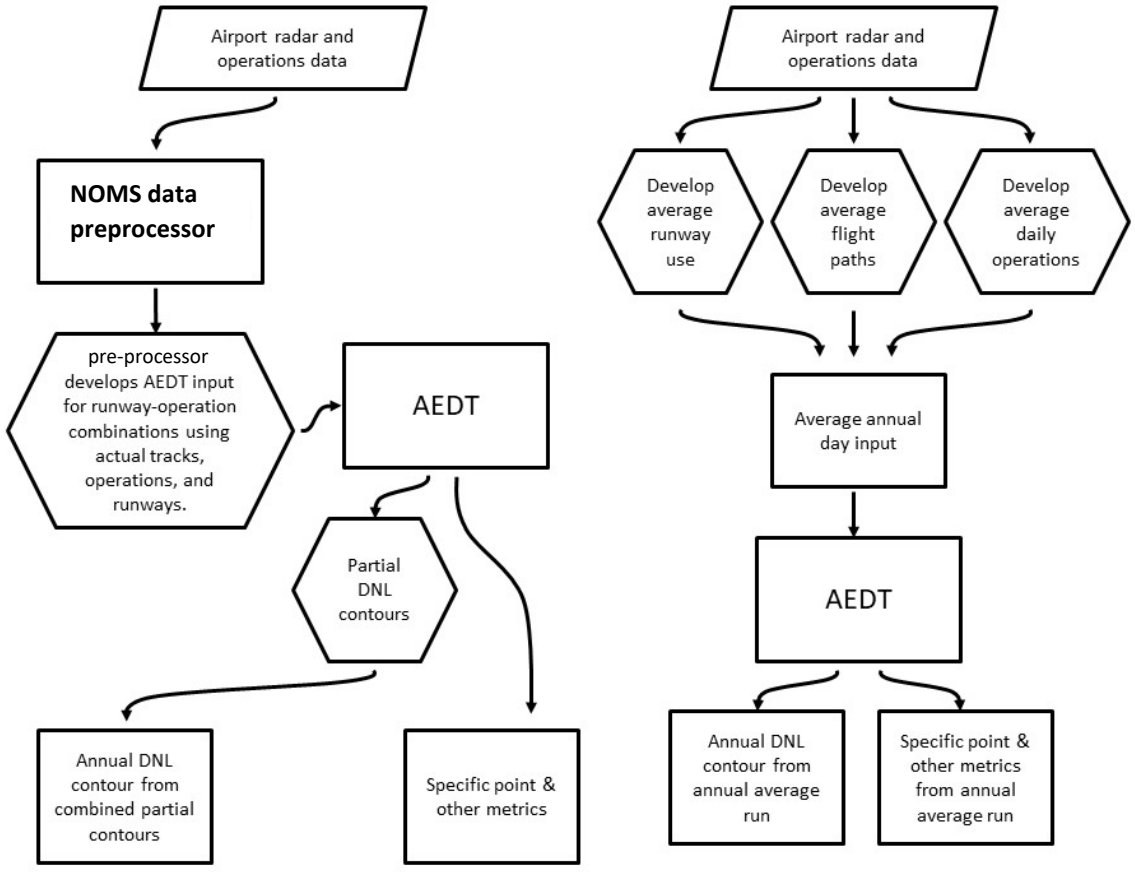
- Directly converts the flight track for every identified aircraft operation to an AEDT track, rather than assigning multiple operations to a limited number of prototypical tracks.
- Models each operation on the specific runway that it actually used, rather than applying a generalized distribution to broad ranges of aircraft types.
- Models each operation in the time period that it occurred, which realistically represent delays that occur during the year, rather than relying on scheduled flight times.
- Selects the specific airframe and engine combination to model, on an operation-by-operation basis, based on the registration data for each flight wherever possible; otherwise, based on the published compositions of the fleets of the specific airlines operating at Logan Airport.

Figure H-12 provides a schematic representation of Massport's annual noise modeling process compared to the standard AEDT process. The flow chart on the left depicts data from the NOMS system being used as noise model inputs, while the flow chart on the right illustrates the development of a simplified average annual day that would be otherwise necessary.

For 2020, the AEDT noise model used 205,834 flights from the NOMS that retained suitable data. For 2021, the number of usable flights was 263,836.

16 Guidance on Using the Aviation Environmental Design Tool (AEDT) to Conduct Environmental Modeling for FAA Actions Subject to NEPA, October 27, 2017, Section 3.2, p. 13

Figure H-12 Schematic Noise Modeling Process (using NOMS data pre-processor vs. standard AEDT use)



Source: Federal Aviation Administration (FAA), HMMH.

AEDT Noise Analysis

Logan Airport presents a set of unique challenges to modeling software, and over the course of many years, Massport addressed these challenges by developing a series of adjustments and customizations to better represent the operations, conditions, and terrain that affect noise at Logan Airport. The following adjustments were historically incorporated into INM analyses:

- ***Custom profiles***. The analysis has developed custom climbing and descent profiles based on radar altitude data, rather than using default profiles built into INM. This results in more accurate aircraft thrust calculations, which in turn affects an aircraft's noise emissions.
- ***Daily weather data***. Noise calculations have used average weather conditions for each day to determine aircraft performance and sound propagation.

- ***Hill effect adjustment***. Due to discrepancies between noise monitor data and INM calculations in the Orient Heights area close to the Airport, adjustments have been included to improve the accuracy of calculations in areas with direct line-of-sight exposure to the airfield.
- ***Over-water adjustment***. The INM calculations assume that noise is absorbed as it propagates over ground. However, Logan Airport is mostly surrounded by water, which reflects rather than absorbs the sound. This results in higher noise levels in areas near the Airport. An adjustment has been used that allows the INM to assume higher aircraft noise emissions when they are close to the ground.

In 2015, FAA released its next-generation environmental analysis software, the AEDT version 2B.[17] AEDT incorporates the computational engines of the legacy tools INM and the Emissions and Dispersion Modeling System (EDMS) and provides a unified database back end and graphical user interface. With a common set of aircraft and airport data that are updated regularly, AEDT ensures that noise and emissions analyses can be performed with up-to-date information.

Massport first explored the use of AEDT for the *2015 EDR* and adopted AEDT as its ongoing noise model beginning with the *2016 EDR*. In transitioning from INM to AEDT, Massport has investigated how to implement the historical adjustments in the new software. While the Massachusetts state EDR/Environmental Status and Planning Report (ESPR) process does not require FAA approval, Massport wishes to perform analysis to FAA standards. Massport has held numerous meetings with FAA since the release of AEDT to get approval for adjustments to AEDT. The following is a summary of the proposed measures to address the adjustments previously implemented in INM, and FAA's response.

- ***Altitude control codes***. This feature of AEDT performs a similar function to the custom profiles used previously, using altitude data to more accurately calculate aircraft thrust levels. Since this is a capability built into AEDT, **FAA approval is implicit** and was not requested.
- ***Aircraft weight adjustment***. It has been determined that some aircraft takeoff weights, based on Department of Transportation T-100 data, do not always match the weight assumptions (stage length) made by AEDT. Consequently, an adjustment was developed to more accurately represent takeoff weight, and therefore aircraft thrust during takeoff. **FAA concurs with this approach but required that the analysis evaluate all aircraft departures.** The weight analysis resulted in some aircraft increasing stage length and some aircraft decreasing in stage length. This resulted in essentially no modification to the noise contours; therefore, Massport decided to no longer include this adjustment in the modeling process.
- ***Annual weather***. AEDT by default used 10-year average weather for the Airport. Massport has proposed using an annual average for the year under study to better capture year-to-year variations in weather.[18] **FAA concurs with this approach**. AEDT 3 allows for the use of annual average weather in the model so this approach no longer needs FAA approval.
- ***Hill effects***. Massport has proposed including the adjustments previously used in INM. **FAA does not concur with this approach**. There are ongoing research studies to develop modifications to the AEDT model and FAA recommends waiting until those methods are available.

17 AEDT 2A was released in 2013 and replaced the NIRS model for airspace analysis. AEDT 2B replaces, AEDT 2A, INM and EDMS.

18 Daily weather is currently not an option in AEDT modeling inputs, however Massport will continue to request that FAA allow for such an option.

- ***Over water adjustment***. Massport explored other options including the existing INM adjustment method. Massport proposed including the adjustments previously used in INM. **FAA does not concur with this approach**. There are ongoing research studies to develop modifications to the AEDT model and FAA recommends waiting until those methods are available.

Massport will continue to work with FAA to address these issues and to incorporate enhancements to AEDT as they become available. In March 2017, the Airport Cooperative Research Program (ACRP) published an FAA-sponsored study entitled "Improving AEDT Noise Modeling of Ground Surfaces." The study recommends a methodology and provides guidance for implementation in AEDT, however at the time of this study, FAA has not recommended the method for use with AEDT or incorporated the ACRP study information into the AEDT.

In March 2018, ACRP published "Enhanced AEDT Modeling of Aircraft Arrival and Departure Profiles Volume 1: Guidance."[19] It highlights new data with alternate default profiles for specific aircraft and new methodology available to model users to customize flight profiles in greater detail than was previously available. The study recommends a methodology and provides guidance for implementation in AEDT. Modified profiles have been added to the AEDT database, however, these profiles are not standard data and Massport would have to demonstrate the need to use the profiles and seek approval for each study.

At this time, FAA has concurred with adjustments for annual average weather and the adjustment of aircraft stage length (both adjustments are no longer used), but disapproved adjustments for over-water effects and elevated terrain line-of-sight exposure. Massport has performed the AEDT analyses for 2020 and 2021 using only FAA standard methods.

FAA guidance states that an airport noise modeling project should use the most current model version available at the time the project begins. FAA's AEDT version 2c Service Pack 2 (AEDT 2c SP2) was released for general use on March 13, 2017; it was the version used to generate the 2016 DNL contours and accompanying noise analyses. AEDT version 2d was released on September 27, 2017. Massport used AEDT 2d for the 2017 DNL calculations. AEDT version 3b was released on September 24, 2019, followed by AEDT version 3c (originally released on March 6, 2020, and re-released with corrections on June 19, 2020). Massport used the re-released AEDT version 3c for the 2018 and 2019 analyses. AEDT version 3d was released on March 29, 2021. Massport used the AEDT version 3d for all of the 2020 and 2021 noise modeling contained in this EDR.

The most significant changes in the model from AEDT 3c to AEDT 3d are improvements to emissions and dispersion modeling. The differences between AEDT 3c and AEDT 3d with regard to noise calculations are minimal. One new aircraft type, the 7673ER, was added to the AEDT version 3d database; the noise and performance data for that aircraft had been released separately in May 2020 and was included in the 2018 and 2019 noise modeling with AEDT version 3c. Two other aircraft types in the AEDT database received nose/performance updates: the 7773ER and the FAL900EX. The following sections of this appendix provide several tables describing the AEDT input data for 2020 and 2021. Where possible, the data for 2019 are included for comparison.

19 Airport Cooperative Research Program Web-Only Document 36: Enhanced AEDT Modeling of Aircraft Arrival and Departure Profiles, Volume 1: Guidance. http://www.trb.org/Main/Blurbs/178074.aspx.

2020/2021 Radar Data

Logan Airport's radar data are the basis for Massport's annual noise calculations. The Passive Surveillance Radar System (PASSUR) radar dataset was used for the *2004 ESPR* through the *2008 EDR*. For the *2009 EDR* through the *2014 EDR*, Massport used the radar data from its Harris NOMS system. These radar data were obtained from a multilateration system of eight sensors deployed around the Airport. The positioning data from these sensors were correlated to provide better, more accurate coverage of aircraft (in areas where the traditional FAA radar has limitations) and provide a more complete set of points to define each track. Traditional radar provides points every four to five seconds where the multilateration system provides data every second.

In 2015, the Massport system switched to FAA's NextGen data feed, which integrates the Automatic Dependent Surveillance Broadcast (ADS-B) feed with multiple redundant real-time FAA surveillance sources into a single fused data feed. The NextGen data is a "multisensor based" subscription data source that aggregates all available surveillance sources, including:

- FAA En Route Radars;
- FAA Terminal Radars;
- FAA Airport Surface Detection Equipment X Band (ASDE-X) Systems;
- FAA Aircraft Situational Display to Industry (ASDI) Oceanic and Canadian Tracks only; and
- Harris ADS-B Data Feed.

Logan Airport is supported by an FAA ASDE-X system which provides highly accurate one-second data points for aircraft situational awareness on the Airport and within at least 5 miles of the Airport. These data are fused with the other sources and provided to the Massport NOMS system in a geo-referenced data format. The geo-referenced radar data are imported into the AEDT model, which is built on a geo-referenced platform to retain accuracy of the data for modeling.

The system was able to collect 366 complete days of data for 2020 and 365 days for 2021 with over 99 percent of the flight tracks (205,834 out of the total 206,789 in 2020 and 263,836 out of the total 264,878 in 2021) usable for the development of the noise exposure contours.

Fleet Mix

The 2020 and 2021 radar data were first processed to establish a baseline set of operations. After processing, the operations from these tracks were then scaled slightly upwards by airline and aircraft type to match the reported totals provided by Massport for the respective year. **Tables H-1a** (2021), **H-1b** (2020), and **H-1c** (2019 for comparison) provide the scaled annual operations, by Aircraft Noise and Performance (ANP) aircraft type. Each ANP type listed in **Tables H-1a, H1-b,** and **H-1c** is also mapped to a Runway use group based on its weight and performance characteristics described in the Runway Use section below.

Regional jets (RJ) are defined as those aircraft with 90 or fewer seats, consistent with the categorization in Chapter 2, *Activity Levels*.[20] For years prior to 2010, the RJs in this report were classified as aircraft with less than 100 seats. When RJs first started gaining popularity, the aircraft types available were typically 50 seats or less, while the traditional air carrier jet has over 100 seats. As newer aircraft types have become available, the smaller 35- to 50-seat types have been replaced by 70- to 99-seat types, with the types having 90 or more seats flying many of the traditional air carrier routes. The majority of the newer types fall into two categories: the 70- to 75-seat category, which remain categorized as RJs, and the 91- to 99-seat category, which are categorized as air carrier jets. The Embraer 190 falls into this second category and is now classified in the Light Jet B group.

20 U.S. Code, 2006 Edition, Supplement 3, Title 49 – Transportation Subtitle VII – Aviation Programs Part A – Air Commerce and Safety, Subpart II, Economic Regulation, Chapter 417 - Operations or Carriers, Subchapter III - Regional Air Service Incentive Program, Sec. 41762 – Definitions – defines RJ air carrier service to be aircraft with a maximum of 75 seats. Therefore, this report categorizes aircraft with 70-75 seats and below as RJ and aircraft with 90 seats and higher aircraft as air carrier (Note: there are no types with 75 to 90 seats).

Table H-1a 2021 Annual Modeled Operations

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations						
747400	Heavy Jet A	2	0	2	0	4
A340-211	Heavy Jet A	101	1	99	3	204
A380-861	Heavy Jet A	1	0	1	0	2
767300	Heavy Jet B	137	35	27	145	344
7673ER	Heavy Jet B	2,097	827	1,636	1,288	5,848
767400	Heavy Jet B	34	0	5	29	68
777200	Heavy Jet B	572	128	599	101	1,400
767CF6	Heavy Jet B	79	32	11	100	223
767JT9	Heavy Jet B	6	9	9	6	30
7773ER	Heavy Jet B	256	3	29	230	518
7878R	Heavy Jet B	1,253	0	1,126	127	2,506
A300-622R	Heavy Jet B	265	358	357	266	1,247
A330-301	Heavy Jet B	770	5	674	101	1,551
A330-343	Heavy Jet B	678	175	510	343	1,705
A350-941	Heavy Jet B	528	22	184	365	1,099
DC1010	Heavy Jet B	3	1	1	3	8
DC1030	Heavy Jet B	7	2	3	6	18
MD11GE	Heavy Jet B	103	9	58	54	224
MD11PW	Heavy Jet B	38	5	29	14	86
717200	Light Jet A	5	1	6	0	12
737800	Light Jet B	9,671	4,239	12,551	1,360	27,820
7378MAX	Light Jet B	1,011	494	1,362	143	3,010
737300	Light Jet B	1	0	1	0	2
737400	Light Jet B	25	7	19	13	64
737500	Light Jet B	0	1	1	0	2
737700	Light Jet B	4,116	1,635	4,917	833	11,500
757300	Light Jet B	8	2	8	2	20
757PW	Light Jet B	1,510	669	1,952	227	4,358
757RR	Light Jet B	379	66	418	27	890
A319-131	Light Jet B	4,858	1,027	5,415	470	11,770
A320-211	Light Jet B	1,802	752	2,406	148	5,108
A320-232	Light Jet B	10,494	3,039	12,377	1,155	27,065
A320-271N	Light Jet B	640	202	771	71	1,685
A321-232	Light Jet B	13,049	5,003	15,662	2,391	36,105
EMB190	Light Jet B	10,666	1,485	11,303	849	24,304
BD-700-1A10	RJ	4	0	4	0	9
CL600	RJ	13	1	14	0	28
CNA55B	RJ	1	0	1	0	2
CRJ9-ER	RJ	1,356	143	1,288	211	2,997

Table H-1a 2021 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations, continued						
CRJ9-LR	RJ	729	3	719	13	1,463
EMB14L	RJ	707	14	664	57	1,441
EMB170	RJ	2,227	126	2,215	138	4,708
EMB175	RJ	12,496	1,001	12,563	934	26,994
GIV	RJ	1	0	1	0	2
Commercial Jets Subtotal		**82,698**	**21,524**	**91,997**	**12,224**	**208,443**
Commercial Non-Jet Operations						
BEC58P	Non-jet	15,525	28	15,536	18	31,107
CNA208	Non-jet	879	9	874	14	1,777
DHC6	Non-jet	7	8	15	0	30
DHC830	Non-jet	308	9	318	0	635
Commercial Non-Jet Operations Subtotal		**16,720**	**55**	**16,742**	**32**	**33,549**
Commercial Aircraft Total		**99,417**	**21,579**	**108,740**	**12,256**	**241,992**
General Aviation Operations						
A109	Helicopter	6	0	6	0	12
B206L	Helicopter	40	0	40	0	79
B407	Helicopter	18	1	18	1	38
B429	Helicopter	10	30	8	32	79
EC130	Helicopter	30	5	31	5	72
R44	Helicopter	16	0	15	1	32
S76	Helicopter	99	8	88	19	215
SA330J	Helicopter	100	3	101	2	207
SA350D	Helicopter	55	7	55	7	123
SA355F	Helicopter	12	0	12	0	24
SA365N	Helicopter	2	0	2	0	4
74720B	Heavy Jet A	1	0	1	0	2
747400	Heavy Jet A	2	0	1	1	4
7673ER	Heavy Jet B	3	0	3	0	6
737700	Light Jet B	8	0	7	1	16
757PW	Light Jet B	1	0	0	1	2
A319-131	Light Jet B	3	0	2	1	6
EMB190	Light Jet B	0	1	1	0	2
MD81	Light Jet B	2	1	0	3	6
BD-700-1A10	RJ	305	31	298	39	673
BD-700-1A11	RJ	123	12	121	14	270
CIT3	RJ	16	0	16	0	32

Table H-1a 2021 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
General Aviation Operations, continued						
CL600	RJ	1,290	113	1,334	68	2,805
CL601	RJ	362	19	360	21	763
CNA500	RJ	45	2	45	2	93
CNA510	RJ	21	1	21	1	44
CNA525C	RJ	233	45	234	44	556
CNA55B	RJ	934	68	945	57	2,004
CNA560U	RJ	140	10	135	15	300
CNA560XL	RJ	630	43	640	32	1,345
CNA680	RJ	1,451	105	1,486	70	3,113
CNA750	RJ	637	67	658	46	1,408
ECLIPSE500	RJ	35	5	37	3	79
EMB145	RJ	45	4	44	5	97
FAL20	RJ	6	1	4	3	14
FAL900EX	RJ	183	14	184	12	393
G650ER	RJ	121	13	121	13	268
GIV	RJ	424	39	418	45	926
GV	RJ	261	22	252	31	566
IA1125	RJ	45	15	54	6	119
LEAR35	RJ	781	84	794	71	1,730
MU3001	RJ	229	11	226	14	481
BEC58P	Non-jet	317	23	319	21	679
CNA172	Non-jet	20	0	20	0	40
CNA182	Non-jet	24	0	24	0	48
CNA206	Non-jet	4	0	4	0	8
CNA208	Non-jet	1,047	57	1,038	66	2,207
CNA441	Non-jet	32	4	31	5	73
COMSEP	Non-jet	260	13	259	14	546
DHC6	Non-jet	461	34	460	35	989
GASEPV	Non-jet	199	3	199	3	405
PA28	Non-jet	13	2	14	1	30
PA30	Non-jet	5	0	5	0	10
	General Aviation Total	**11,106**	**915**	**11,189**	**832**	**24,042**
	Grand Total	**110,523**	**22,494**	**119,929**	**13,088**	**266,034**

Source: HMMH, 2022.
Notes: ANP - Aircraft Noise and Performance.
BEC58P is the AEDT substitution for the Cessna 402.
Some totals may not match due to rounding.

Table H-1b 2020 Annual Modeled Operations						
		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations						
7478	Heavy Jet A	1	0	1	0	2
747400	Heavy Jet A	154	0	152	2	308
A340-211	Heavy Jet A	76	0	47	29	152
A340-642	Heavy Jet A	69	0	66	3	138
A380-861	Heavy Jet A	31	0	0	31	62
767300	Heavy Jet B	67	17	8	76	168
7673ER	Heavy Jet B	1,502	760	1,307	955	4,524
767400	Heavy Jet B	106	4	105	5	220
777200	Heavy Jet B	200	49	224	25	498
767CF6	Heavy Jet B	73	39	25	87	224
767JT9	Heavy Jet B	76	16	5	87	185
7773ER	Heavy Jet B	298	6	34	270	608
7878R	Heavy Jet B	801	18	787	32	1,638
A300-622R	Heavy Jet B	455	648	600	503	2,207
A330-301	Heavy Jet B	539	3	487	55	1,085
A330-343	Heavy Jet B	387	143	340	190	1,059
A350-941	Heavy Jet B	246	0	133	113	491
DC1010	Heavy Jet B	11	4	5	10	30
DC1030	Heavy Jet B	9	8	7	10	34
MD11GE	Heavy Jet B	35	6	28	13	83
MD11PW	Heavy Jet B	17	4	15	6	42
717200	Light Jet A	293	50	302	41	687
737800	Light Jet B	9,203	3,611	10,518	2,296	25,628
737300	Light Jet B	0	0	0	0	0
737400	Light Jet B	3	0	2	1	6
737700	Light Jet B	2,623	458	2,648	434	6,163
757300	Light Jet B	18	16	28	6	68
757PW	Light Jet B	748	398	1,012	134	2,291
757RR	Light Jet B	669	234	740	162	1,805
A319-131	Light Jet B	4,920	565	4,806	678	10,969
A320-211	Light Jet B	1,739	468	2,071	136	4,414
A320-232	Light Jet B	10,428	2,051	10,998	1,481	24,958
A320-271N	Light Jet B	530	86	567	49	1,232
A321-232	Light Jet B	10,544	3,454	12,254	1,744	27,997
EMB190	Light Jet B	9,758	961	9,496	1,223	21,438
MD83	Light Jet B	1	0	1	0	2
CL600	RJ	114	1	101	13	229
CRJ9-ER	RJ	968	71	1,006	34	2,079
CRJ9-LR	RJ	242	19	209	52	522

Table H-1b 2020 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations, continued						
MD11PW	Heavy Jet B	17	4	15	6	42
717200	Light Jet A	293	50	302	41	687
737800	Light Jet B	9,203	3,611	10,518	2,296	25,628
737300	Light Jet B	0	0	0	0	0
Commercial Jets Subtotal		**67,247**	**14,634**	**70,164**	**11,718**	**163,764**
Commercial Non-Jet Operations						
BEC58P	Non-jet	12,452	54	12,496	10	25,013
CNA208	Non-jet	1,224	13	1,218	19	2,474
DHC830	Non-jet	608	16	613	11	1,247
SF340	Non-jet	173	0	173	0	346
Commercial Non-Jet Operations Subtotal		**14,457**	**83**	**14,500**	**40**	**29,080**
Commercial Aircraft Total		**81,704**	**14,718**	**84,663**	**11,759**	**192,844**
General Aviation Operations						
B206L	Helicopter	50	0	50	0	100
B407	Helicopter	4	0	3	1	8
B429	Helicopter	10	4	13	1	27
B430	Helicopter	1	0	1	0	2
EC130	Helicopter	27	14	30	11	82
H500D	Helicopter	2	0	2	0	4
R22	Helicopter	1	1	0	2	4
R44	Helicopter	10	0	10	0	20
S76	Helicopter	39	4	37	6	86
SA330J	Helicopter	51	7	53	5	115
SA350D	Helicopter	10	8	9	9	35
SA355F	Helicopter	10	0	10	0	20
T42	Helicopter	1	0	1	0	2
SA365N	Helicopter	1	0	1	0	2
747400	Heavy Jet A	0	1	1	0	2
74720B	Heavy Jet A	1	0	1	0	2
767300	Heavy Jet B	2	0	2	0	4
7673ER	Heavy Jet B	2	0	2	0	4
767CF6	Heavy Jet B	1	0	1	0	2
A330-301	Heavy Jet B	1	0	1	0	2
727EM2	Light Jet A	0	1	0	1	2
737800	Light Jet B	3	0	2	1	6
737400	Light Jet B	1	0	1	0	2
737700	Light Jet B	4	0	4	0	8

Table H-1b 2020 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
General Aviation Operations, continued						
757RR	Light Jet B	0	1	1	0	2
A319-131	Light Jet B	2	0	1	1	4
A320-271N	Light Jet B	1	0	1	0	2
A320-232	Light Jet B	1	0	1	0	2
A321-232	Light Jet B	3	0	3	0	6
EMB190	Light Jet B	1	0	0	1	2
BD-700-1A10	RJ	200	8	191	16	415
BD-700-1A11	RJ	57	5	59	3	123
CIT3	RJ	7	0	7	0	14
CL600	RJ	658	42	660	40	1,401
CL601	RJ	210	16	213	13	452
CNA500	RJ	23	0	23	0	47
CNA510	RJ	87	4	85	6	182
CNA525C	RJ	171	39	183	28	421
CNA55B	RJ	485	60	493	52	1,090
CNA560U	RJ	18	1	17	2	37
CNA560XL	RJ	394	21	392	23	830
CNA680	RJ	635	35	629	41	1,341
CNA750	RJ	301	31	310	22	663
ECLIPSE500	RJ	6	0	6	0	12
EMB145	RJ	25	3	27	1	57
FAL20	RJ	1	0	1	0	2
FAL900EX	RJ	99	5	99	5	207
G650ER	RJ	80	7	80	7	174
GIIB	RJ	2	0	1	1	4
GIV	RJ	269	25	266	27	587
GV	RJ	181	26	192	14	413
IA1125	RJ	28	10	30	8	76
LEAR25	RJ	1	0	1	0	2
LEAR35	RJ	467	95	459	102	1,123
MU3001	RJ	185	8	184	9	386
BEC58P	Non-jet	211	11	211	11	444
C130	Non-jet	1	0	1	0	2
CNA172	Non-jet	24	0	23	2	49
CNA182	Non-jet	23	0	22	1	45
CNA206	Non-jet	8	0	8	0	16
CNA208	Non-jet	590	39	588	41	1,258
CNA441	Non-jet	7	5	7	5	23
COMSEP	Non-jet	146	7	148	5	305
DHC6	Non-jet	319	26	310	35	691

Table H-1b 2020 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Group**
General Aviation Operations, continued						
GASEPF	Non-jet	7	0	7	0	14
GASEPV	Non-jet	171	3	169	5	348
PA28	Non-jet	15	0	15	0	29
PA30	Non-jet	7	1	7	1	16
	General Aviation Total	**6,357**	**572**	**6,362**	**567**	**13,858**
	Grand Total	**88,061**	**15,290**	**91,025**	**12,326**	**206,702**

Source: HMMH, 2022
Notes: ANP - Aircraft Noise and Performance.
BEC58P is the AEDT substitution for the Cessna 402.
Some totals may not match due to rounding.

Table H-1c 2019 Annual Modeled Operations

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations						
7478	Heavy Jet A	210	0	209	1	419
747400	Heavy Jet A	277	3	274	6	559
A340-211	Heavy Jet A	358	4	146	216	725
A340-642	Heavy Jet A	308	4	295	16	623
A380-841	Heavy Jet A	201	0	201	0	402
A380-861	Heavy Jet A	160	0	3	157	320
767300	Heavy Jet B	14	1	11	4	30
767400	Heavy Jet B	50	1	49	2	102
777200	Heavy Jet B	1,058	295	1,003	350	2,707
777300	Heavy Jet B	1	0	1	0	2
767CF6	Heavy Jet B	87	40	6	121	254
767JT9	Heavy Jet B	120	17	3	134	273
7773ER	Heavy Jet B	848	127	40	935	1,949
7878R	Heavy Jet B	1,867	42	1,396	514	3,819
A300-622R	Heavy Jet B	410	665	615	460	2,151
A330-301	Heavy Jet B	2,082	4	1,709	377	4,172
A330-343	Heavy Jet B	1,576	445	1,224	797	4,043
A350-941	Heavy Jet B	250	1	242	9	502
DC1010	Heavy Jet B	30	10	24	16	81
DC1030	Heavy Jet B	18	13	14	17	63
MD11GE	Heavy Jet B	38	6	44	1	89
MD11PW	Heavy Jet B	13	3	15	1	32
U_7673ER	Heavy Jet B	2,455	841	2,147	1,148	6,590
717200	Light Jet A	1,656	390	1,482	564	4,093
737800	Light Jet A	15,886	6,442	18,296	4,033	44,658
MD9025	Light Jet A	3	0	3	0	6
MD9028	Light Jet A	1	1	1	1	4
737300	Light Jet B	1	0	1	0	2
737400	Light Jet B	24	12	24	12	71
737700	Light Jet B	5,763	1,973	6,263	1,474	15,473
757300	Light Jet B	289	20	278	31	618
737MAX8	Light Jet B	192	191	228	154	765
737N17	Light Jet B	1	0	0	1	2
757PW	Light Jet B	2,842	1,098	3,113	826	7,879
757RR	Light Jet B	1,767	598	2,128	237	4,730
A319-131	Light Jet B	6,840	1,220	6,820	1,241	16,121
A320-211	Light Jet B	3,642	1,047	4,252	437	9,380
A320-232	Light Jet B	17,864	6,681	20,414	4,131	49,090
A320-271N	Light Jet B	507	206	508	204	1,425

Table H-1c 2019 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations, continued						
A321-232	Light Jet B	17,276	6,158	19,398	4,036	46,868
EMB190	Light Jet B	29,533	6,367	29,873	6,027	71,800
MD83	Light Jet B	5	0	4	1	10
CL600	RJ	783	19	745	58	1,605
CNA750	RJ	1	0	1	0	2
CRJ9-ER	RJ	5,246	560	5,159	646	11,610
CRJ9-LR	RJ	733	30	625	138	1,526
EMB145	RJ	18	0	17	1	36
EMB14L	RJ	1,655	119	1,763	11	3,549
EMB170	RJ	5,264	375	5,204	436	11,279
EMB175	RJ	8,863	1,033	8,972	924	19,792
FAL20	RJ	1	1	2	0	3
G650ER	RJ	1	0	1	0	2
GV	RJ	2	0	2	0	3
LEAR35	RJ	7	5	8	3	24
Commercial Jets Subtotal		**139,096**	**37,071**	**145,257**	**30,910**	**352,334**
Commercial Non-Jet Operations						
BEC58P	Non-jet	17,514	165	17,608	71	35,358
CNA208	Non-jet	1,126	12	1,118	20	2,276
DHC6	Non-jet	5	12	16	0	33
DHC830	Non-jet	3,764	152	3,727	189	7,833
GASEPV	Non-jet	2	0	2	0	4
SF340	Non-jet	208	0	208	0	416
Commercial Non-Jet Operations Subtotal		**22,619**	**341**	**22,681**	**279**	**45,920**
Commercial Aircraft Total		**161,715**	**37,412**	**167,938**	**31,189**	**398,254**
General Aviation Operations						
A109	Helicopter	7	0	7	0	14
B206L	Helicopter	11	0	11	0	21
B407	Helicopter	22	2	20	4	48
B427	Helicopter	1	0	1	0	2
B429	Helicopter	8	14	11	11	43
B430	Helicopter	3	1	4	0	8
EC130	Helicopter	34	2	30	6	72
H500D	Helicopter	2	0	2	0	4
R44	Helicopter	20	1	19	2	43
S76	Helicopter	148	28	135	41	351

Table H-1c 2019 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
General Aviation Operations, continued						
SA330J	Helicopter	193	24	191	26	434
SA350D	Helicopter	3	0	2	1	6
SA355F	Helicopter	31	1	32	0	64
SA365N	Helicopter	5	1	5	1	12
747400	Heavy Jet A	1	0	1	0	2
747SP	Heavy Jet A	1	0	1	0	2
A340-211	Heavy Jet A	1	0	0	1	2
A340-642	Heavy Jet A	2	0	2	0	4
777300	Heavy Jet B	2	1	3	0	6
7773ER	Heavy Jet B	0	1	0	1	2
7878R	Heavy Jet B	1	0	1	0	2
A330-301	Heavy Jet B	1	0	1	0	2
A330-343	Heavy Jet B	1	0	1	0	2
C17	Heavy Jet B	1	0	1	0	2
U_7673ER	Heavy Jet B	1	0	1	0	2
737800	Light Jet A	0	1	1	0	2
727EM1	Light Jet A	1	0	0	1	2
737400	Light Jet B	23	4	18	9	54
737700	Light Jet B	5	0	5	0	10
757PW	Light Jet B	0	1	0	1	2
757RR	Light Jet B	1	0	1	0	2
A319-131	Light Jet B	4	0	3	1	8
A321-232	Light Jet B	0	1	1	0	2
EMB190	Light Jet B	1	0	1	0	2
MD81	Light Jet B	1	0	1	0	2
BD-700-1A10	RJ	325	36	319	41	720
BD-700-1A11	RJ	140	17	143	14	314
CIT3	RJ	25	0	25	0	50
CL600	RJ	1,506	139	1,535	110	3,290
CL601	RJ	278	25	279	23	604
CNA500	RJ	46	3	43	6	97
CNA510	RJ	195	9	191	13	407
CNA525C	RJ	388	60	383	65	897
CNA55B	RJ	904	79	920	63	1,966
CNA560E	RJ	2	1	3	0	6
CNA560U	RJ	679	50	687	42	1,458
CNA560XL	RJ	334	14	334	14	695
CNA680	RJ	1,104	72	1,126	51	2,353
CNA750	RJ	873	70	889	54	1,886
CRJ9-ER	RJ	0	1	1	0	2

Table H-1c 2019 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
General Aviation Operations, continued						
ECLIPSE500	RJ	11	1	11	1	23
EMB145	RJ	29	3	29	3	64
FAL20	RJ	4	0	3	1	8
FAL900EX	RJ	283	21	278	26	608
G650ER	RJ	174	28	190	12	405
GIIB	RJ	6	1	7	0	14
GIV	RJ	564	77	568	73	1,282
GV	RJ	398	42	400	40	879
IA1125	RJ	180	21	185	15	401
LEAR25	RJ	1	0	1	0	2
LEAR35	RJ	837	135	861	110	1,942
MU3001	RJ	314	22	311	25	672
1900D	Non-jet	1	0	1	0	2
BEC58P	Non-jet	426	26	426	26	904
C130	Non-jet	4	0	4	0	8
CNA172	Non-jet	24	2	26	0	52
CNA182	Non-jet	75	0	75	0	149
CNA206	Non-jet	5	0	5	0	10
CNA208	Non-jet	1,137	99	1,138	99	2,473
CNA441	Non-jet	17	3	16	4	41
COMSEP	Non-jet	317	34	335	17	703
DHC6	Non-jet	780	81	749	112	1,722
DHC8	Non-jet	2	0	2	0	4
EMB120	Non-jet	0	1	0	1	2
GASEPF	Non-jet	15	0	15	0	29
GASEPV	Non-jet	204	12	209	8	434
HS748A	Non-jet	2	0	2	0	4
PA28	Non-jet	23	2	25	0	50
PA30	Non-jet	1	0	1	0	2
PA31	Non-jet	26	0	25	1	52
PA42	Non-jet	2	1	2	1	6
	General Aviation Total	**13,191**	**1,270**	**13,286**	**1,175**	**28,922**
	Grand Total	**174,907**	**38,681**	**181,224**	**32,364**	**427,176**

Source: HMMH, 2020.

Notes: ANP - Aircraft Noise and Performance.
BEC58P is the AEDT substitution for the Cessna 402.
The CRJ9-ER in the RJ category is the CRJ700 aircraft.
Some totals may not match due to rounding.

In the calculation of DNL, annual operations data are scaled to represent an average annual day by dividing by the 365 days in a year (or, in the case of a leap year like 2020, by the 366 days). To compare operations between years, it is simpler to look at category totals. **Tables H-2a, H-2b, H-2c,** and **H-2d** summarizes the numbers of average daily operations by categories of aircraft operating at Logan Airport from 1990 through 2021. Operations are summarized by operator category (commercial/GA), aircraft category, and day or night operation (night defined as 10:00 PM to 7:00 AM, consistent with the definition of DNL). GA operations were not included in the noise modeling prior to 1998 and commercial jet operations were not separated until 1999.

Table H-2a Modeled Daily Operations[1] by Commercial and GA Aircraft – 1990 to 1997

		1990	1991	1992	1993	1994	1995	1996	1997
Commercial Aircraft									
Stage 2 Jets[2]	Day	312.40	N/A	228.89	203.34	189.40	156.90	132.40	108.46
	Night	19.99	N/A	13.13	7.44	10.10	5.50	4.79	7.75
	Total	**332.39**	N/A	**242.02**	**210.78**	**199.50**	**162.40**	**137.19**	**116.21**
Stage 3 Jets	Day	288.89	N/A	384.49	418.99	425.70	429.40	439.81	505.08
	Night	57.25	N/A	58.29	65.47	62.80	69.00	80.16	85.06
	Total	**346.14**	N/A	**442.78**	**484.46**	**488.50**	**498.40**	**519.97**	**590.14**
Air Carrier Jets	Day	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
	Night	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
	Total	**N/A[3]**	N/A	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**
Regional Jets[5]	Day	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
	Night	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
	Total	**N/A[3]**	N/A	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**
Non-jets	Day	444.41	N/A	411.84	598.16	541.97	526.85	505.31	514.7
	Night	11.72	N/A	69.32	46.84	13.59	11.14	13.73	27.27
	Total	**456.13**	N/A	**481.16**	**645.00**	**555.56**	**537.99**	**519.04**	**541.97**
Total Commercial Operations									
Operations	Day	1045.70	N/A	1,025.22	1,220.49	1,157.07	1,113.15	1,077.52	1,128.24
	Night	88.96	N/A	140.74	119.75	86.49	85.64	98.68	120.08
	Total	**1,134.66**	N/A	**1,165.96**	**1,340.24**	**1,243.56**	**1,198.79**	**1,176.20**	**1,248.32**
GA Aircraft									
Stage 2 Jets[2]	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Total	**N/A[4]**	N/A	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**
Stage 3 Jets	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Total	**N/A[4]**	N/A	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**
Non-jets	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Total	**N/A[4]**	N/A	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**
Total GA Operations									
Operations	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
	Total	**N/A[4]**	N/A	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**
Overall Totals									
	Day	1,045.70	N/A	1,025.22	1,220.49	1,157.07	1,113.15	1,077.52	1,128.24
	Night	88.96	N/A	140.74	119.75	86.49	85.64	98.68	120.08
	Total	**1,134.66**	N/A	**1,165.96**	**1,340.24**	**1,243.56**	**1,198.79**	**1,176.20**	**1,248.32**

Table H-2b Modeled Daily Operations[1] by Commercial and GA Aircraft – 1998 to 2005									
		1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Commercial Aircraft									
Stage 2 Jets[2]	Day	84.93	83.30	5.13	1.18	0.05	0.08	0.03	0.05
	Night	5.92	6.66	0.26	0.05	0.00	0.00	0.01	0.01
	Total	**90.85**	**89.96**	**5.39**	**1.23**	**0.05**	**0.08**	**0.05**	**0.06**
Stage 3 Jets	Day	541.43	597.28	727.09	756.24	740.75	717.85	772.39	765.76
	Night	95.54	98.59	103.66	109.77	97.04	92.69	113.24	113.66
	Total	**636.97**	**695.87**	**830.75**	**866.01**	**837.79**	**810.54**	**885.63**	**879.42**
Air Carrier Jets	Day	N/A[3]	569.18	648.95	569.99	500.70	461.06	518.96	505.48
	Night	N/A[3]	96.21	99.79	101.30	83.52	72.69	89.24	91.99
	Total	**N/A[3]**	**665.39**	**748.74**	**671.29**	**584.22**	**533.75**	**608.20**	**597.47**
Regional Jets[5]	Day	N/A[3]	28.10	78.14	186.25	240.05	256.80	253.43	260.34
	Night	N/A[3]	2.38	3.87	8.47	13.52	19.99	24.00	21.68
	Total	**N/A[3]**	**30.48**	**82.01**	**194.72**	**253.57**	**276.79**	**277.43**	**282.01**
Non-jets	Day	552.56	448.82	409.62	317.62	165.45	135.18	133.24	148.77
	Night	21.86	16.63	21.58	10.97	3.45	2.41	3.03	3.02
	Total	**574.42**	**465.45**	**431.20**	**328.58**	**168.89**	**137.59**	**136.28**	**151.79**
Total Commercial Operations									
Operations	Day	1,178.92	1,129.90	1,141.84	1,075.04	906.25	853.10	905.66	914.59
	Night	123.32	121.88	125.51	120.79	100.49	95.10	116.29	116.68
	Total	**1,302.24**	**1,251.78**	**1,267.35**	**1,195.82**	**1,006.73**	**948.20**	**1,021.95**	**1,031.27**
GA Aircraft									
Stage 2 Jets[2]	Day	5.25	9.89	7.29	5.15	3.65	2.84	0.94	2.29
	Night	0.40	0.74	0.64	0.50	0.41	0.26	0.14	0.25
	Total	**5.65**	**10.63**	**7.93**	**5.65**	**4.08**	**3.10**	**1.08**	**2.54**
Stage 3 Jets	Day	30.54	48.46	40.08	34.23	37.83	46.21	53.72	58.84
	Night	4.21	6.55	3.21	3.28	6.42	6.98	8.37	9.33
	Total	**34.75**	**55.01**	**43.29**	**37.51**	**44.25**	**53.19**	**62.09**	**68.16**
Non-jets	Day	37.29	19.36	34.57	37.31	17.36	17.81	16.95	14.00
	Night	16.28	18.89	1.83	1.92	4.45	4.40	5.20	4.75
	Total	**53.57**	**38.25**	**36.40**	**39.23**	**21.81**	**22.21**	**22.14**	**18.75**
Total GA Operations									
Operations	Day	73.08	77.71	81.94	76.68	58.84	66.88	71.60	75.12
	Night	20.89	26.17	5.68	5.71	11.29	11.64	13.71	14.33
	Total	**93.97**	**103.88**	**87.62**	**82.39**	**70.13**	**78.52**	**85.31**	**89.46**
Overall Totals									
	Day	1,252.00	1,207.61	1,223.78	1,151.72	965.09	919.98	977.27	989.71
	Night	144.21	148.05	131.19	126.50	111.78	106.74	130.00	131.02
	Total	**1,396.21**	**1,355.66**	**1,354.97**	**1,278.21**	**1,076.86**	**1,026.72**	**1,107.26**	**1,120.73**

Table H-2c Modeled Daily Operations[1] by Commercial and GA Aircraft – 2006 to 2013

		2006	2007	2008	2009	2010	2011	2012	2013	2014
Commercial Aircraft										
Stage 2 Jets[2]	Day	0.03	0.03	0.01	0.00	0.01	0.01	0.01	0.01	0.00
	Night	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00
	Total	**0.03**	**0.04**	**0.02**	**0.00**	**0.02**	**0.01**	**0.01**	**0.01**	**0.00**
Stage 3 Jets	Day	767.55	748.13	699.39	667.45	674.25	684.19	649.22	667.65	670
	Night	114.81	118.29	114.30	103.05	107.92	109.38	106.55	115.91	123.6
	Total	**882.36**	**866.42**	**813.69**	**770.50**	**782.17**	**793.57**	**755.77**	**783.56**	**793.61**
Air Carrier Jets	Day	490.63	472.39	443.15	422.92	521.64	571.03	530.76	546.27	556.59
	Night	92.71	96.28	89.89	82.21	93.98	99.17	98.68	107.17	115.84
	Total	**583.34**	**568.66**	**533.04**	**505.14**	**615.62**	**670.2**	**629.44**	**653.44**	**672.43**
Regional Jets[5]	Day	276.95	275.77	256.24	244.53	152.61	113.16	118.46	121.38	113.41
	Night	22.11	22.03	24.40	20.84	13.94	10.21	7.87	8.74	7.77
	Total	**299.06**	**297.80**	**280.64**	**265.37**	**166.55**	**123.37**	**126.33**	**130.12**	**121.18**
Non-jets	Day	140.81	145.27	132.52	136.43	138.53	135.18	133.92	132.33	128.45
	Night	3.26	3.47	4.00	5.56	5.21	4.73	3.06	3.21	2.28
	Total	**144.07**	**148.73**	**136.52**	**141.99**	**143.74**	**139.91**	**136.98**	**135.54**	**130.73**
Total Commercial Operations										
Operations	Day	908.41	893.43	831.92	804.77	812.78	819.39	783.14	799.99	798.45
	Night	118.09	121.77	118.31	108.65	113.13	114.11	109.62	119.12	125.88
	Total	**1,026.51**	**1,015.19**	**950.23**	**913.42**	**925.91**	**933.5**	**892.76**	**919.12**	**924.33**
GA Aircraft										
Stage 2 Jets[2]	Day	1.90	1.24	0.36	0.09	0.27	0.08	0.25	0.31	0.00
	Night	0.17	0.19	0.03	0.01	0.04	0.00	0.04	0.02	0.00
	Total	**2.07**	**1.43**	**0.38**	**0.10**	**0.30**	**0.08**	**0.29**	**0.33**	**0.00**
Stage 3 Jets	Day	61.08	54.82	43.98	22.31	27.80	52.51	52.93	51.21	52.64
	Night	6.57	6.39	4.52	2.28	3.21	5.35	7.20	5.10	4.65
	Total	**67.65**	**61.21**	**48.49**	**23.59**	**31.01**	**57.87**	**60.13**	**56.31**	**57.29**
Non-jets	Day	15.05	11.98	15.13	8.19	8.19	18.18	15.16	13.06	13.95
	Night	1.39	3.61	1.08	0.74	0.72	1.29	1.29	1.15	1.13
	Total	**16.44**	**15.58**	**16.20**	**8.93**	**8.92**	**19.48**	**16.45**	**14.22**	**15.08**
Total GA Operations										
Operations	Day	78.03	68.04	59.46	30.46	36.26	70.78	68.35	64.58	66.59
	Night	8.13	10.19	5.62	3.08	3.97	6.65	8.52	6.28	5.78
	Total	**86.15**	**78.22**	**65.05**	**33.54**	**40.22**	**77.43**	**76.86**	**70.85**	**72.37**
Overall Totals										
	Day	986.43	961.46	891.39	834.33	849.03	890.16	851.49	864.57	865.05
	Night	126.22	131.96	123.93	111.70	117.10	120.76	118.13	125.40	131.66
	Total	**1,112.66**	**1,093.42**	**1,015.31**	**946.03**	**966.13**	**1,010.92**	**969.61**	**989.97**	**996.70**

Table H-2d Modeled Daily Operations[1] by Commercial and GA Aircraft – 2014 to 2021

		2015	2016	2017	2018	2019	2020	2021	Change 2019 to 2020	Change 2020 to 2021
Commercial Aircraft										
Stage 2 Jets[2]	Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Night	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Stage 3 Jets	Day	685.92	713.65	734.46	770.67	779.05	376.47	478.62	-403.61	103.18
	Night	130.96	142.16	158.49	177.15	186.25	72.20	92.46	-114.25	20.46
	Total	**816.88**	**855.81**	**892.95**	**947.82**	**965.30**	**448.67**	**571.08**	**-517.86**	**123.63**
Air Carrier Jets	Day	585.55	620.45	636.04	657.25	655.57	319.04	382.72	-337.40	64.55
	Night	126.36	134.93	148.75	164.09	174.30	68.41	85.22	-106.08	17.01
	Total	**711.92**	**755.38**	**784.79**	**821.34**	**829.87**	**387.45**	**467.94**	**-443.48**	**81.56**
Regional Jets[5]	Day	100.36	93.20	98.42	113.42	123.48	57.43	95.90	-66.21	38.62
	Night	4.6	7.23	9.74	13.06	11.95	3.79	7.24	-8.16	3.45
	Total	**104.96**	**100.43**	**108.16**	**126.48**	**135.43**	**61.22**	**103.13**	**-74.37**	**42.08**
Non-jets	Day	125.27	125.88	119.03	126.76	124.11	79.33	91.68	-44.99	12.56
	Night	2.41	3.01	2.24	2.36	1.70	0.34	0.24	-1.36	-0.10
	Total	**127.68**	**128.89**	**121.27**	**129.12**	**125.81**	**79.67**	**91.92**	**-46.35**	**12.46**
Total Commercial Operations										
Operations	Day	811.19	839.53	853.49	897.44	903.16	455.80	570.29	-448.60	115.74
	Night	133.37	145.17	160.73	179.51	187.95	72.54	92.70	-115.61	20.36
	Total	**944.56**	**984.70**	**1,014.22**	**1,076.94**	**1,091.11**	**528.34**	**662.99**	**-564.21**	**136.10**
GA Aircraft										
Stage 2 Jets[2]	Day	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Night	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Stage 3 Jets	Day	51.82	51.82	52.19	55.77	53.17	25.32	45.96	-27.92	20.71
	Night	4.28	4.59	4.56	5.08	4.79	2.38	3.69	-2.42	1.32
	Total	**56.10**	**56.41**	**56.75**	**60.85**	**57.96**	**27.70**	**49.65**	**-30.34**	**22.03**
Non-jets	Day	19.31	25.92	26.43	22.01	19.37	9.52	15.12	-9.88	5.62
	Night	1.46	1.87	2.25	1.91	1.90	0.74	1.10	-1.16	0.35
	Total	**20.77**	**27.79**	**28.68**	**23.92**	**21.28**	**10.27**	**16.22**	**-11.04**	**5.98**
Total GA Operations										
Operations	Day	71.40	77.75	78.61	77.78	72.54	34.85	61.08	-37.79	26.33
	Night	5.77	6.46	6.81	6.99	6.70	3.12	4.79	-3.58	1.67
	Total	**77.17**	**84.21**	**85.43**	**84.77**	**79.24**	**37.97**	**65.87**	**-41.37**	**28.01**
Overall Totals										
	Day	882.59	917.28	932.10	975.22	975.70	490.65	631.37	-486.39	142.07
	Night	139.14	151.63	167.54	186.49	194.64	75.66	97.49	-119.19	22.03
	Total	**1,021.73**	**1,068.91**	**1,099.65**	**1,161.71**	**1,170.35**	**566.31**	**728.86**	**-605.59**	**164.10**

Commercial Jet Aircraft by Part 36 Stage Category

As described in the Regulatory Framework section of this appendix, jet aircraft are classified into categories referred to as stages based on noise levels. The heavier the aircraft, the more noise it is permitted to make, within limits. Aircraft are allowed to be recertificated to the higher standard when modifications are made to the aircraft engine or design. Because of the substantial differences in noise between Stage 2, recertificated Stage 3, Stage 3, Stage 4, and Stage 5 aircraft, Massport tracks operations by these separate categories to follow their trends. **Table H-3** shows the percentage of commercial jet operations by stage category from 1998 through 2021.

One of the most significant changes occurring after the economic downturn in 2001 was the almost immediate retirement of the re-certificated Stage 3 aircraft from airlines' fleets due to their high operating costs. This type of accelerated retirement was not as prevalent during the 2008 to 2009 economic downturn since the major airlines no longer operated these aircraft.

Nighttime Operations

Massport tracks flights that operate in the defined nighttime period between the hours of 10:00 PM to 7:00 AM, when each flight is penalized 10 dB in calculations of DNL. **Table H-4** shows this nighttime activity by different groups of aircraft. Nighttime flights by commercial jet operators decreased by approximately 61 percent in 2020 (in comparison to 2019) and then increased by approximately 29 percent in 2021 (over 2020 totals). The 2020 decrease is a result of the pandemic-induced changes in aircraft activity levels, but the magnitude of the decrease (61 percent) is greater than the overall decrease in commercial jet operations (54 percent). The subsequent 2021 increase is about the same magnitude (28 percent) as the rebound in overall operations. Nighttime commercial non-jet operations decreased to, on average, less than one operations per night in both 2020 and 2021. GA nighttime traffic levels decreased by more than half in 2020 but rebounded in 2021. As in years past, the majority of nighttime operations (between 10:00 PM and 7:00 AM) occurred either before midnight or after 5:00 AM.

Table H-3 Percentage of Commercial Jet Operations by Part 36 Stage Category – 1998 to 2021

	Stage 5 Requirements[1]	Stage 4 Requirements[2]	Stage 3[3]	Recertificated Stage 3[4]	Stage 2 Greater than 75,000 lbs.	Total
1998	N/A	N/A	65.9%	21.7%	12.4%	100%
1999	N/A	N/A	70.0%	21.0%	9.0%	100%
2000	N/A	N/A	75.0%	24.0%	1.0%	100%
2001	N/A	N/A	86.3%	13.6%	0.1%	100%
2002	N/A	N/A	92.8%	7.2%	0.0%	100%
2003	N/A	N/A	95.8%	4.1%	0.0%	100%
2004	N/A	N/A	97.8%	2.2%	0.0%	100%
2005	N/A	N/A	98.0%	2.0%	0.0%	100%
2006	N/A	N/A	98.6%	1.4%	0.0%	100%
2007	N/A	N/A	98.9%	1.1%	0.0%	100%
2008	N/A	N/A	99.1%	0.9%	0.0%	100%
2009	N/A	87.8%	11.3%	0.9%	0.0%	100%
2010	N/A	93.2%	5.7%	1.1%	0.0%	100%
2011	N/A	95.5%	4.0%	0.5%	0.0%	100%
2012	N/A	95.8%	4.1%	0.1%	0.0%	100%
2013	N/A	97.4%	2.6%	0.0%	0.0%	100%
2014	N/A	97.4%	2.6%	0.0%	0.0%	100%
2015	N/A	96.7%	3.3%	0.0%	0.0%	100%
2016	17.8%	79.2%	3.0%	0.0%	0.0%	100%
2017	17.7%	79.8%	2.4%	0.0%	0.0%	100%
2018	15.5%	83.0%	1.5%	0.0%	0.0%	100%
2019	15.2%	82.9%	2.0%	0.0%	0.0%	100%
2020	28.5%	68.7%	2.8%	0.0%	0.0%	100%
2021	29.1%	69.2%	1.7%	0.0%	0.0%	100%

Source: Massport and Federal Aviation Administration (FAA) radar data, HMMH 2022

Notes: N/A – not applicable. Values less than 0.05% appear as 0.0% due to rounding.

1 This column includes operations by aircraft that would qualify as Stage 5 if recertificated. Aircraft with maximum takeoff weight greater than 121,254 pounds that are certificated after January 1, 2018, must meet Stage 5 standards. The percent of Logan Airport operations in aircraft meeting Stage 5 requirements was not determined prior to 2016.

2 This column includes aircraft that are either certificated Stage 4 or would qualify as Stage 4 if recertificated. Certification as Stage 4 was not available until 2006 and the percent of Logan Airport operations in aircraft that meet Stage 4 requirements was not determined prior to 2009.

3 Certificated Stage 3 aircraft are originally manufactured meeting Stage 3 requirements under Federal Regulation Part 36. This column includes only operations by Certificated Stage 3 aircraft that do not meet higher certification standards.

4 Recertificated Stage 3 aircraft are aircraft that were originally manufactured and certified as Stage 1 or 2 under Federal Regulation Part 36, which either have been treated with hushkits or have been re-engineered to meet Stage 3 requirements.

Table H-4 Modeled Nighttime Operations at Logan Airport – 1990 to 2021

	Commercial Jets	Commercial Non-Jets	General Aviation	Total
1990	77.24	11.72	N/A	88.96
1991	N/A	N/A	N/A	N/A
1992	71.42	69.32	N/A	140.74
1993	72.91	46.84	N/A	119.75
1994	72.90	13.59	N/A	86.49
1995	74.50	11.14	N/A	85.64
1996	84.95	13.73	N/A	98.68
1997	92.81	27.27	N/A	120.08
1998	101.46	21.86	20.89	144.21
1999	105.25	16.63	26.17	148.05
2000	103.92	21.58	5.68	131.19
2001	109.82	10.97	5.71	126.50
2002	97.04	3.45	11.29	111.78
2003	92.69	2.41	11.64	106.74
2004	113.26	3.03	13.71	130.00
2005	113.67	3.02	14.33	131.02
2006	114.81	3.26	8.13	126.22
2007	118.30	3.47	10.19	131.96
2008	114.31	4.00	5.62	123.93
2009	103.05	5.56	3.08	111.70
2010	107.93	5.21	3.97	117.10
2011	109.38	4.73	6.65	120.76
2012	106.55	3.06	8.52	118.13
2013	115.91	3.21	6.28	125.40
2014	123.60	2.28	5.78	131.66
2015	130.96	2.41	5.77	139.14
2016[1]	142.16	3.01	6.48	151.63
2017	158.49	2.24	6.81	167.55
2018	177.15	2.36	6.99	186.49
2019	186.25	1.70	6.70	194.64
2020	72.00	0.34	3.11	75.45
2021	92.46	0.24	4.79	97.49
Change (2019 to 2020)	**-114.25**	**-1.36**	**-3.58**	**-119.19**
Percent Change	-61%	-80%	-54%	-61%
Change (2020 to 2021)	**20.46**	**-0.10**	**1.67**	**22.03**
Percent Change	28%	-30%	54%	29%

Source: Massport, HMMH, 2022

Notes: GA – general aviation; N/A - not available. Negative numbers shown in parentheses ( ).

1 Minor errors reported for 2016 data in *2016 EDR* have been corrected in this table.

Runway Use

Using radar data, the AEDT pre-processor determines which runway was used, the specific aircraft type, and time classification (daytime or nighttime) for each flight. Massport compares annual runway use to previous years using a variety of summary tables with different perspectives.

The first summary of daytime and nighttime runway usages presented here is broken into six representative aircraft groups with similar runway requirements. The list below provides example aircraft types from each group:

- Heavy Jet A – B747s, A340s, A380s;
- Heavy Jet B – B767s, B777s, B787s, A300s, A310s, A330s, A350s, MD-11s;
- Light Jet A – B717s, B737-800s, MD-90s;
- Light Jet B – B737s, B757s, A319s, A320s, MD-80s, E190;
- Regional Jet (RJ) – E135, E145, E170, E175, CRJ2, CRJ7, CRJ9, J328 and Corporate Jets; and
- Turboprops and Piston Aircraft (non-jets).

Tables H-5a and **H-5b** show the runway use summary for the modeled 2021 and 2020 noise conditions, respectively. **Table H-5c** shows the corresponding summary from the modeled 2019 noise conditions for comparison. The turbojet aircraft in the table were grouped into the different categories for reporting purposes. Because the DNL contours developed using the NOMS data with the AEDT pre-processor reflect the actual use of the runways by each flight, they accurately represent Logan Airport's noise environment. The modeled runway usage for a given particular aircraft type may be different from the overall group runway use presented in **Tables H-5a, H-5b,** and **H-5c**.

Runway 9-27 was closed for almost three months in the summer of 2020 while Massport was able to take advantage of the historically low flight activity and accelerate the runway rehabilitation and safety project. Comparing **Table H-5a** (2021) with the similar **Table H-5b** (2020) for arrivals shows a small reduction in the use of Runway 22L, in favor of Runway 04R and Runway 27. For departures, Runway 22R is used less often in 2021 than in 2020, with corresponding increases on Runway 9 in the daytime and Runway 15R at night.

In turn, comparing **Table H-5b** (2020) to **Table H-5c** (2019) for arrivals shows a reduced percentage use of Runways 4R and 27, with increased use of Runway 33L and increased daytime use of Runway 22L. Departing aircraft used Runway 9 less often in 2020 than in 2019, and used Runway 22R less often at night; the percentage use of the other runways increased moderately, generally in proportion to the usual distribution.

Table H-5a 2021 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
ARRIVALS												
Runway	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
04L	-	-	<0.1%	-	-	-	0.6%	<0.1%	1.8%	<0.1%	6.1%	0.8%
04R	31.1%	100.0%	27.7%	16.9%	57.1%	100.0%	27.0%	19.1%	26.4%	19.9%	20.7%	13.2%
9	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	0.5%	-
15R	0.9%	-	3.8%	1.9%	-	-	4.1%	1.4%	3.7%	1.6%	5.6%	2.0%
22L	28.3%	-	33.1%	26.0%	21.4%	-	31.4%	33.3%	32.2%	36.9%	30.0%	45.1%
22R	-	-	-	-	-	-	<0.1%	-	<0.1%	<0.1%	3.6%	2.4%
27	17.0%	-	13.3%	3.4%	21.4%	-	19.6%	14.3%	15.9%	16.7%	9.3%	7.5%
32	-	-	-	-	-	-	0.4%	-	2.4%	-	3.6%	-
33L	22.6%	-	22.1%	51.7%	-	-	16.9%	31.9%	17.6%	24.8%	17.6%	29.0%
33R	-	-	-	-	-	-	-	-	-	-	3.1%	-
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
DEPARTURES												
Runway	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
04L	-	-	-	-	-	-	-	-	-	-	12.6%	3.5%
04R	26.9%	25.0%	10.1%	4.9%	-	-	5.0%	4.2%	0.8%	0.6%	6.4%	5.5%
9	3.8%	-	17.4%	11.3%	33.3%	-	23.8%	14.5%	30.5%	19.2%	17.7%	8.0%
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	-	-
15R	8.7%	50.1%	7.3%	27.6%	-	-	3.9%	22.9%	1.6%	19.9%	3.1%	44.4%
22L	17.3%	-	6.8%	2.2%	-	-	2.8%	2.2%	0.1%	0.3%	0.1%	0.8%
22R	7.7%	24.9%	26.0%	15.8%	50.0%	-	29.5%	18.0%	34.6%	25.1%	35.3%	14.3%
27	-	-	10.2%	3.9%	16.7%	-	13.9%	13.9%	15.4%	11.8%	7.0%	6.4%
32	-	-	-	-	-	-	-	-	-	-	-	-
33L	35.6%	-	22.1%	34.3%	-	-	21.1%	24.4%	17.1%	23.0%	17.8%	17.0%
33R	-	-	-	-	-	-	-	-	-	-	-	-
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Massport, HMMH, 2022

Notes: Nighttime for noise modeling is defined as 10:00 PM to 7:00 AM.
Values may not add exactly to 100 percent due to rounding.

Table H-5b 2020 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
ARRIVALS												
Runway	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
04L	-	-	<0.1%	0.1%	0.3%	-	0.8%	<0.1%	2.1%	0.2%	4.3%	1.4%
04R	26.4%	-	23.7%	17.6%	30.8%	29.4%	24.5%	17.8%	24.4%	19.1%	20.4%	11.2%
9	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	0.8%	0.5%
15R	0.9%	-	4.8%	2.7%	0.3%	3.9%	4.3%	2.5%	3.6%	1.6%	6.1%	19.1%
22L	30.1%	100.0%	36.8%	29.6%	32.9%	19.6%	36.1%	36.9%	33.4%	35.2%	34.6%	21.9%
22R	-	-	-	-	-	-	<0.1%	-	<0.1%	0.1%	3.6%	3.2%
27	8.8%	-	13.1%	3.3%	17.8%	11.8%	17.3%	12.4%	14.4%	21.1%	4.9%	5.6%
32	-	-	-	-	-	-	1.0%	-	4.8%	-	4.7%	-
33L	33.7%	-	21.6%	46.8%	17.8%	35.3%	16.0%	30.4%	17.4%	22.7%	18.2%	34.8%
33R	-	-	-	-	-	-	-	-	-	-	2.4%	2.4%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
DEPARTURES												
Runway	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
04L	-	-	-	-	-	-	-	-	-	-	10.5%	5.0%
04R	9.0%	4.6%	8.1%	6.5%	0.7%	-	5.6%	4.6%	3.6%	3.0%	9.8%	2.7%
9	7.2%	-	12.7%	9.1%	31.1%	28.6%	19.8%	12.7%	23.5%	17.1%	10.4%	3.3%
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	-	-
15R	13.5%	43.1%	10.8%	19.9%	-	2.3%	5.4%	13.4%	4.1%	13.2%	8.1%	41.1%
22L	5.3%	4.6%	6.0%	3.7%	-	-	2.3%	2.5%	1.1%	2.2%	2.0%	2.2%
22R	24.1%	13.8%	28.3%	28.5%	29.1%	23.8%	33.8%	26.8%	34.1%	27.1%	34.3%	14.8%
27	1.1%	-	9.3%	2.8%	21.9%	42.9%	12.2%	19.1%	12.8%	19.1%	4.3%	3.8%
32	-	-	-	-	-	-	-	-	-	-	-	-
33L	39.9%	33.9%	24.7%	29.5%	17.2%	2.4%	20.9%	21.0%	20.8%	18.4%	20.8%	27.1%
33R	-	-	-	-	-	-	-	-	-	-	-	-
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Massport, HMMH, 2022

Notes: Nighttime for noise modeling is defined as 10:00 PM to 7:00 AM.
Values may not add exactly to 100 percent due to rounding.

Table H-5c 2019 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
ARRIVALS												
Runway	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
04L	0.1%	-	0.3%	0.2%	2.5%	0.2%	4.1%	0.4%	8.3%	0.8%	25.5%	3.2%
04R	43.4%	18.3%	41.1%	23.4%	33.7%	21.2%	28.0%	18.3%	28.4%	23.2%	12.6%	19.2%
9	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	0.1%	-
15R	0.4%	-	0.5%	0.2%	0.5%	0.2%	0.6%	0.2%	0.4%	0.2%	2.2%	11.3%
22L	29.5%	54.5%	27.0%	35.6%	22.8%	39.3%	28.8%	38.7%	24.8%	40.3%	25.9%	30.1%
22R	-	-	-	-	<0.1%	<0.1%	<0.1%	-	<0.1%	0.1%	3.0%	4.0%
27	4.4%	9.3%	15.2%	3.6%	31.4%	17.7%	24.2%	16.5%	19.9%	22.1%	4.0%	11.4%
32	-	-	-	-	-	-	1.8%	-	5.7%	-	12.9%	-
33L	22.2%	18.0%	16.0%	37.0%	9.1%	21.5%	12.4%	25.9%	12.5%	13.4%	7.6%	16.1%
33R	-	-	-	-	-	-	-	-	-	-	6.0%	4.7%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
DEPARTURES												
Runway	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
04L	-	-	-	-	-	-	-	-	-	-	20.5%	12.3%
04R	16.3%	10.1%	11.9%	4.0%	8.8%	5.8%	3.3%	2.2%	0.2%	0.4%	2.9%	2.3%
9	5.7%	0.8%	18.9%	15.1%	26.5%	16.3%	33.0%	20.5%	38.5%	26.3%	18.7%	8.0%
14	-	-	-	-	-	-	-	-	-	-	-	-
15L	-	-	-	-	-	-	-	-	-	-	0.0%	-
15R	30.9%	44.3%	10.4%	18.8%	3.5%	14.3%	2.1%	10.6%	0.5%	6.3%	2.2%	23.7%
22L	6.5%	3.9%	4.7%	2.0%	3.5%	3.5%	1.5%	1.3%	0.1%	0.6%	0.1%	0.2%
22R	14.3%	11.4%	24.6%	32.6%	25.8%	20.5%	28.8%	29.4%	30.4%	33.0%	29.6%	29.6%
27	0.1%	-	6.8%	1.9%	10.6%	23.1%	11.6%	20.3%	11.3%	20.6%	5.2%	3.6%
32	-	-	-	-	-	-	-	-	-	-	-	-
33L	26.2%	29.6%	22.6%	25.6%	21.3%	16.5%	19.8%	15.6%	19.1%	12.7%	20.7%	20.5%
33R	-	-	-	-	-	-	-	-	-	-	-	-
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Massport, HMMH, 2020.
Notes: Nighttime for noise modeling is defined as 10:00 PM to 7:00 AM.
Values may not add exactly to 100 percent due to rounding.

While **Tables H-5a** through **H-5c** present runway use by aircraft groups, **Tables H-6a, H-6b,** and **H-6c** present the total runway use (jets and non-jets) by runway and time of day. The first section of the table displays the number of operations on each runway by time period for an average day. The second section displays the same information for the entire year and the last section displays the percent that each runway is used for a given operation type and time of day.

Table H-6a shows that on an average day in 2021, Runway 22R had the most departures (110, per day and night combined) and Runway 22L had the most arrivals (about 115 per day and night combined). **Table H-6b** shows that on an average day in 2020, Runway 22R had the most departures (about 93 per day and night combined) and Runway 22L was again the leading arrival runway (100 per day and night combined). In comparison, **Table H-6c** shows that on an average day in 2019, Runways 9 and 22R handled the most departures (167 each, per day and night combined) and Runway 22L had the most arrivals (almost 170 per day and night combined).

Table H-6a Summary of Jet and Non-Jet Aircraft Runway Use: 2021

	Runway												
	4L	**4R**	**9**	**14**	**15L**	**15R**	**22L**	**22R**	**27**	**32**	**33L**	**33R**	**Total**
2021 Daily Operations													
Dep Day	6.7	14.9	78.8	0.0	0.0	11.3	6.4	103.1	42.4	0.0	65.0	0.0	**328.6**
Dep Night	0.0	1.4	5.1	0.0	0.0	8.6	0.7	6.6	3.9	0.0	9.5	0.0	**35.9**
Arr Day	5.5	78.2	0.0	0.0	0.2	12.8	95.2	2.0	50.0	4.3	52.9	1.6	**302.8**
Arr Night	0.0	11.7	0.0	0.0	0.0	1.0	20.3	0.0	8.4	0.0	20.1	0.0	**61.6**
Total Daily Operations	12.2	106.2	83.9	0.0	0.2	33.8	122.6	111.7	104.8	4.3	147.5	1.6	**728.9**
2021 Annual Operations													
Dep Day	2,455	5,447	28,763	0	0	4,129	2,327	37,630	15,466	0	23,713	0	**119,929**
Dep Night	8	509	1,871	0	0	3,137	243	2,417	1,440	0	3,463	0	**13,088**
Arr Day	2,002	28,534	0	0	89	4,683	34,746	715	18,252	1,584	19,318	601	**110,523**
Arr Night	5	4,261	0	0	0	380	7,420	7	3,080	0	7,341	0	**22,494**
Total Annual Operations	4,470	38,751	30,634	0	89	12,329	44,735	40,769	38,238	1,584	53,835	601	**266,034**
2021 Percentage Operations													
Dep Day	2%	5%	24%	0%	0%	3%	2%	31%	13%	0%	20%	0%	**100%**
Dep Night	<1%	4%	14%	0%	0%	24%	2%	18%	11%	0%	26%	0%	**100%**
Arr Day	2%	26%	0%	0%	<1%	4%	31%	1%	17%	1%	17%	1%	**100%**
Arr Night	<1%	19%	0%	0%	0%	2%	33%	<1%	14%	0%	33%	0%	**100%**

Source: Massport NOMS data and HMMH 2022

Notes: These data reflect actual counts or percentages of aircraft operations on each runway end. They should not be confused with effective runway use, which is used by the Preferential Runway Advisory System (PRAS) to derive recommendations for use of a particular runway.
Runway 14-32 is unidirectional: there are no arrivals to Runway 14 and no departures from Runway 32.
Values may not add to 100 percent due to rounding.

Table H-6b Summary of Jet and Non-Jet Aircraft Runway Use: 2020

	Runway												
	4L	**4R**	**9**	**14**	**15L**	**15R**	**22L**	**22R**	**27**	**32**	**33L**	**33R**	**Total**
2020 Daily Operations													
Dep Day	4.7	15.2	46.0	0.0	0.0	14.8	5.5	83.8	26.8	0.0	52.6	0.0	**249.4**
Dep Night	0.0	1.6	4.1	0.0	0.0	5.1	0.9	9.1	5.3	0.0	7.6	0.0	**33.8**
Arr Day	4.0	57.3	0.0	0.0	0.4	10.8	85.3	1.6	34.4	5.5	41.1	1.1	**241.3**
Arr Night	0.0	7.5	0.0	0.0	0.0	1.1	15.0	0.0	5.0	0.0	13.3	0.0	**41.9**
Total Daily Operations	8.7	81.5	50.1	0.0	0.4	31.8	106.6	94.5	71.5	5.5	114.6	1.1	**566.3**
2020 Annual Operations													
Dep Day	1,708	5,565	16,781	0	0	5,393	2,003	30,589	9,796	0	19,191	0	**91,025**
Dep Night	9	583	1,511	0	0	1,873	329	3,320	1,930	0	2,771	0	**12,326**
Arr Day	1,453	20,897	0	0	130	3,947	31,127	583	12,552	1,991	14,995	387	**88,061**
Arr Night	8	2,721	0	0	1	408	5,459	8	1,815	0	4,865	5	**15,290**
Total Annual Operations	3,178	29,766	18,291	0	131	11,621	38,918	34,499	26,093	1,991	41,822	392	**206,702**
2020 Percentage Operations													
Dep Day	2%	6%	18%	0%	0%	6%	2%	34%	11%	0%	21%	0%	**100%**
Dep Night	<1%	5%	12%	0%	0%	15%	3%	27%	16%	0%	22%	0%	**100%**
Arr Day	2%	24%	0%	0%	<1%	4%	35%	1%	14%	2%	17%	<1%	**100%**
Arr Night	<1%	18%	0%	0%	<1%	3%	36%	<1%	12%	0%	32%	<1%	**100%**

Source: Massport NOMS data and HMMH 2022

Notes: These data reflect actual counts or percentages of aircraft operations on each runway end. They should not be confused with effective runway use, which is used by the Preferential Runway Advisory System (PRAS) to derive recommendations for use of a particular runway.
Runway 14-32 is unidirectional: there are no arrivals to Runway 14 and no departures from Runway 32.
Values may not add to 100 percent due to rounding.

Table H-6c Summary of Jet and Non-Jet Aircraft Runway Use: 2019

	Runway												
	4L	**4R**	**9**	**14**	**15L**	**15R**	**22L**	**22R**	**27**	**32**	**33L**	**33R**	**Total**
2019 Daily Operations													
Dep Day	14.8	18.9	150.7	0.0	0.0	12.6	7.1	141.9	50.6	0.0	100.0	0.0	**496.5**
Dep Night	0.2	2.6	17.0	0.0	0.0	11.2	1.5	25.5	15.4	0.0	15.3	0.0	**88.6**
Arr Day	36.8	131.2	0.0	0.0	0.1	3.8	129.4	2.2	98.1	18.7	56.2	4.3	**480.6**
Arr Night	0.5	20.4	0.0	0.0	0.0	0.4	40.4	0.1	16.9	0.0	25.8	0.1	**104.5**
Total Daily Operations	52.2	173.1	167.7	0.0	0.1	27.9	178.3	169.7	181.0	18.7	197.3	4.4	**1,170.3**
2019 Annual Operations													
Dep Day	5,384	6,882	55,019	0	1	4,593	2,586	51,805	18,452	0	36,511	0	**181,234**
Dep Night	79	953	6,197	0	0	4,087	530	9,303	5,624	0	5,581	0	**32,354**
Arr Day	13,417	47,882	0	0	23	1,375	47,237	791	35,794	6,822	20,506	1,581	**175,429**
Arr Night	172	7,450	0	0	0	138	14,733	31	6,180	0	9,422	32	**38,159**
Total Annual Operations	19,052	63,167	61,216	0	24	10,193	65,087	61,930	66,050	6,822	72,020	1,614	**427,176**
2019 Percentage Operations													
Dep Day	3%	4%	30%	0%	<1%	3%	1%	29%	10%	0%	20%	0%	**100%**
Dep Night	<1%	3%	19%	0%	0%	13%	2%	29%	17%	0%	17%	0%	**100%**
Arr Day	8%	27%	0%	0%	<1%	1%	27%	<1%	20%	4%	12%	1%	**100%**
Arr Night	<1%	20%	0%	0%	0%	<1%	39%	<1%	16%	0%	25%	<1%	**100%**

Source: Massport NOMS data and HMMH 2020.

Notes: These data reflect actual counts or percentages of aircraft operations on each runway end. They should not be confused with effective runway use, which is used by the Preferential Runway Advisory System (PRAS) to derive recommendations for use of a particular runway.
Runway 14-32 is unidirectional: there are no arrivals to Runway 14 and no departures from Runway 32.
Values may not add to 100 percent due to rounding.

Runway use can also be presented in terms of percent of total operations. **Table H-7** presents the 2021, 2020 and 2019 runway use for all operations which use Logan Airport, supplementing the information in **Tables H-5a, H-5b,** and **H-5c** that separate runway use by aircraft group and time of day, and the data in **Tables H-6a, H-6b,** and **H-6c** which total the runway use by operation type and time of day.

For 2019 through 2021, Runway 33L was the most active, with primarily jet departures. Runways 4R, 9, 22L, 22R and 27 handled the majority of the rest of the traffic. Some year-to-year shifts can be seen in the data in **Table H-7**. In 2020, (when Runway 9-27 was closed for almost three months for a rehabilitation and safety project) overall use of Runways 9 and 27 dropped and overall use of Runways 22L and 22R increased. For 2021, the usage rates were closer to those seen in 2019. In both 2020 and 2021, overall use of Runway 4L was lower than in 2019, while overall use of Runway 15R was higher.

Table H-7 Total 2021, 2020, and 2019 Modeled Runway Use by All Operations

	Jet Arrivals		Non-Jet Arrivals		Jet Departures		Non-Jet Departures		All Operations
	Day	Night	Day	Night	Day	Night	Day	Night	
Runway				**2021 Operations**					
4L	0.3%	<0.1%	0.4%	<0.1%	0.0%	0.0%	0.9%	<0.1%	**1.7%**
4R	9.2%	1.6%	1.5%	<0.1%	1.6%	0.2%	0.5%	<0.1%	**14.6%**
9	0.0%	0.0%	0.0%	0.0%	9.5%	0.7%	1.3%	<0.1%	**11.5%**
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
15L	0.0%	0.0%	<0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	**<0.1%**
15R	1.4%	0.1%	0.4%	<0.1%	1.3%	1.1%	0.2%	<0.1%	**4.6%**
22L	10.9%	2.8%	2.2%	<0.1%	0.9%	0.1%	<0.1%	<0.1%	**16.8%**
22R	<0.1%	<0.1%	0.3%	<0.1%	11.6%	0.9%	2.6%	<0.1%	**15.3%**
27	6.2%	1.2%	0.7%	<0.1%	5.3%	0.5%	0.5%	<0.1%	**14.4%**
32	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.6%**
33L	6.0%	2.7%	1.3%	<0.1%	7.6%	1.3%	1.3%	<0.1%	**20.2%**
33R	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.2%**
Total	34.2%	8.4%	7.3%	0.1%	37.8%	4.8%	7.3%	0.1%	**100.0%**
Runway				**2020 Operations**					
4L	0.4%	<0.1%	0.3%	<0.1%	0.0%	0.0%	0.8%	<0.1%	**1.5%**
4R	8.5%	1.3%	1.6%	<0.1%	1.9%	0.3%	0.8%	<0.1%	**14.4%**
9	0.0%	0.0%	0.0%	0.0%	7.3%	0.7%	0.8%	<0.1%	**8.8%**
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
15L	0.0%	0.0%	0.1%	<0.1%	0.0%	0.0%	0.0%	0.0%	**0.1%**
15R	1.4%	0.2%	0.5%	<0.1%	2.0%	0.9%	0.6%	<0.1%	**5.6%**
22L	12.3%	2.6%	2.7%	<0.1%	0.8%	0.2%	0.2%	<0.1%	**18.8%**
22R	<0.1%	<0.1%	0.3%	<0.1%	12.1%	1.6%	2.7%	<0.1%	**16.7%**
27	5.7%	0.9%	0.4%	<0.1%	4.4%	0.9%	0.3%	<0.1%	**12.6%**
32	0.6%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	**1.0%**
33L	5.8%	2.3%	1.4%	<0.1%	7.7%	1.3%	1.6%	<0.1%	**20.2%**
33R	0.0%	0.0%	0.2%	<0.1%	0.0%	0.0%	0.0%	0.0%	**0.2%**
Total	34.8%	7.3%	7.8%	0.1%	36.2%	5.9%	7.9%	0.1%	**100.0%**
Runway				**2019 Operations**					
4L	1.6%	<0.1%	1.6%	<0.1%	0.0%	0.0%	1.3%	<0.1%	**4.5%**
4R	10.4%	1.7%	0.8%	<0.1%	1.4%	0.2%	0.2%	<0.1%	**14.8%**
9	0.0%	0.0%	0.0%	0.0%	11.7%	1.4%	1.1%	<0.1%	**14.3%**
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
15L	0.0%	0.0%	<0.1%	0.0%	0.0%	0.0%	<0.1%	0.0%	**<0.1%**
15R	0.2%	<0.1%	0.1%	<0.1%	0.9%	0.9%	0.1%	<0.1%	**2.4%**
22L	9.5%	3.4%	1.6%	<0.1%	0.6%	0.1%	<0.1%	<0.1%	**15.2%**
22R	<0.1%	<0.1%	0.2%	<0.1%	10.3%	2.1%	1.8%	<0.1%	**14.5%**
27	8.1%	1.4%	0.2%	<0.1%	4.0%	1.3%	0.3%	<0.1%	**15.5%**
32	0.8%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	**1.6%**
33L	4.3%	2.2%	0.5%	<0.1%	7.3%	1.3%	1.3%	<0.1%	**16.9%**
33R	0.0%	0.0%	0.4%	<0.1%	0.0%	0.0%	0.0%	0.0%	**0.4%**
Total	34.9%	8.8%	6.1%	0.2%	36.3%	7.4%	6.1%	0.2%	**100.0%**

Source: Massport NOMS data and HMMH, 2022

Notes: Night for noise modeling is defined as 10:00 PM to 7:00 AM.
Nighttime runway restrictions are from 11:00 PM to 6:00 AM.
Values may not add to exactly 100 percent due to rounding.

Table H-8 presents a historical summary of runway use by jets. Since 2009, the radar data have been analyzed with Massport's Harris NOMS. Data from 2001 through 2008 were compiled with Massport's PreFlight™ software, an analysis package used to access fleet, day/night splits, and runway use information from radar data. Data prior to 2001 were derived from Massport's original noise monitoring system, supplemented with field records.

Note that Logan Airport Noise Rules prevent arrivals to Runway 22R and departures from Runway 4L by jet aircraft except for certain circumstances.

Table H-8 Summary of Jet Aircraft Runway Use – 1990 to 2021

Runway	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
1990										
Departures	0%[2]	3%	21%	N/A	10%	2%	36%	20%	N/A	7%
Arrivals	1%	25%	0%	N/A	2%	14%	0%	28%	N/A	29%
1992[2]										
Departures	0%	6%	31%	N/A	7%	2%	38%	10%	N/A	6%
Arrivals	1%	37%	0%	N/A	3%	12%	0%	30%	N/A	17%
1993										
Departures	0%	9%	33%	N/A	7%	3%	40%	4%	N/A	4%
Arrivals	2%	44%	0%	N/A	1%	11%	0%	28%	N/A	15%
1994										
Departures	0%	9%	33%	N/A	4%	3%	32%	12%	N/A	5%
Arrivals	3%	42%	0%	N/A	1%	8%	0%	27%	N/A	19%
1995										
Departures	0%	8%	36%	N/A	5%	5%	29%	11%	N/A	5%
Arrivals	3%	41%	0%	N/A	2%	8%	0%	27%	N/A	17%
1996										
Departures	0%	8%	32%	N/A	5%	6%	33%	12%	N/A	5%
Arrivals	2%	38%	0%	N/A	2%	11%	0%	29%	N/A	18%
1997										
Departures	0%	8%	30%	N/A	5%	6%	31%	15%	N/A	5%
Arrivals	2%	36%	0%	N/A	2%	9%	0%	30%	N/A	20%
1998										
Departures	0%	8%	35%	N/A	6%	5%	28%	14%	N/A	5%
Arrivals	2%	41%	0%	N/A	2%	7%	0%	28%	N/A	19%
1999										
Departures	0%	8%	31%	N/A	5%	4%	30%	15%	N/A	6%
Arrivals	3%	37%	0%	N/A	2%	10%	0%	28%	N/A	21%
2000										
Departures	0%	8%	35%	N/A	4%	3%	30%	15%	N/A	6%
Arrivals	4%	40%	0%	N/A	1%	7%	0%	28%	N/A	20%

Table H-8 Summary of Jet Aircraft Runway Use – 1990 to 2021 (Continued)										
Runway	**4L**	**4R**	**9**	**14[1]**	**15R**	**22L**	**22R**	**27**	**32[1]**	**33L**
2001										
Departures	0%	7%	34%	N/A	4%	3%	35%	12%	N/A	5%
Arrivals	5%	36%	0%	N/A	1%	8%	0%	32%	N/A	18%
2002										
Departures	0%	4%	31%	N/A	6%	3%	35%	16%	N/A	6%
Arrivals	6%	31%	0%	N/A	1%	12%	0%	30%	N/A	21%
2003										
Departures	0%	4%	33%	N/A	7%	2%	34%	14%	N/A	6%
Arrivals	7%	33%	0%	N/A	1%	14%	0%	28%	N/A	18%
2004										
Departures	0%	5%	34%	N/A	10%	4%	24%	18%	N/A	6%
Arrivals	6%	34%	0%	N/A	1%	12%	0%	24%	N/A	23%
2005										
Departures	0%	5%	36%	N/A	7%	1%	31%	13%	N/A	7%
Arrivals	8%	33%	0%	N/A	1%	11%	0%	29%	N/A	17%
2006										
Departures	0%	4%	33%	0%	3%	1%	40%	13%	0%	6%
Arrivals	7%	29%	0%	0%	1%	14%	0%	33%	0.2%	16%
2007										
Departures	0%	5%	31%	0%	4%	1%	33%	7%	0%	19%
Arrivals	5%	31%	0%	0%	1%	15%	0%	36%	2%	11%
2008										
Departures	0%	6%	33%	<1%	3%	<1%	36%	6%	0%	16%
Arrivals	6%	30%	0%	0%	2%	17%	0%	33%	2%	11%
2009[3]										
Departures	0%	7%	32%	0%	3%	2%	34%	6%	0%	16%
Arrivals	7%	31%	0%	0%	3%	17%	0%	30%	1%	11%
2010										
Departures	0%	4%	28%	<1%	8%	2%	31%	10%	0%	17%
Arrivals	5%	28%	0%	0%	1%	15%	0%	32%	1%	16%
2011[4]										
Departures	0%	6%	36%	<1%	5%	2%	36%	7%	0%	7%
Arrivals	7%	37%	0%	0%	<1%	16%	0%	28%	1%	11%
2012[4]										
Departures	0%	6%	33%	<1%	5%	3%	38%	6%	0%	9%
Arrivals	6%	34%	0%	0%	1%	16%	0%	33%	<1%	9%
2013										
Departures	<1%	5%	30%	<1%	5%	2%	35%	12%	0%	12%
Arrivals	6%	29%	0%	0%	1%	16%	<1%	32%	1%	15%

Table H-8 Summary of Jet Aircraft Runway Use – 1990 to 2021 (Continued)										
Runway	**4L**	**4R**	**9**	**14[1]**	**15R**	**22L**	**22R**	**27**	**32[1]**	**33L**
2014										
Departures	0%	5%	31%	<1%	5%	2%	28%	13%	0%	17%
Arrivals	5%	30%	0%	0%	2%	25%	<1%	21%	1%	16%
2015										
Departures	0%	4%	29%	<1%	5%	2%	32%	12%	0%	15%
Arrivals	5%	29%	0%	0%	2%	25%	<1%	23%	1%	16%
2016[5]										
Departures	0%	4%	30%	0%	6%	2%	27%	13%	0%	18%
Arrivals	4%	31%	0%	0%	1%	24%	<1%	23%	1%	16%
2017[6]										
Departures	0%	2%	25%	0%	5%	1%	28%	15%	0%	23%
Arrivals	5%	21%	0%	0%	5%	23%	<1%	27%	2%	18%
2018										
Departures	<1%	4%	30%	0%	5%	2%	34%	10%	0%	16%
Arrivals	4%	30%	0%	0%	<1%	32%	<1%	21%	1%	12%
2019										
Departures	0%	4%	30%	0%	4%	2%	28%	12%	0%	20%
Arrivals	4%	28%	0%	0%	<1%	29%	<1%	22%	2%	15%
2020[7]										
Departures	0%	5%	19%	0%	7%	2%	33%	13%	0%	21%
Arrivals	1%	23%	0%	0%	4%	36%	<1%	16%	1%	19%
2021										
Departures	0%	4%	24%	0%	6%	2%	29%	14%	0%	21%
Arrivals	1%	25%	0%	0%	3%	32%	<1%	17%	1%	20%

Source: Massport NOMS data and HMMH 2022

Notes: These data reflect actual percentages of jet aircraft operations on each runway end. They should not be confused with effective runway use, which is used by the Preferential Runway Advisory System (PRAS) to derive recommendations for use of a particular runway. Effective runway percentages include a factor of 10 applied to nighttime operations so that use of a runway at night more closely reflects its effect on total noise exposure.
Jet aircraft are not able to use Runway 15L or 33R due to its length of only 2,557 feet.
Values may not add to exactly 100 percent due to rounding.
N/A - not available.

1 Runway 14-32 opened in late November 2006. (Runway 14-32 is unidirectional with no arrivals to Runway 14 and no departures from Runway 32.)

2 The *1990 Final Generic Environmental Impact Report* was published and submitted to the Secretary of Environmental Affairs in July 1993. It included modeled operations and resulting noise contours for 1987, 1990, and a 1996-forecast year. The *1993 Annual Update* published in July 1994 included operations and contours for 1992 and 1993. 1991 data are not available.

3 Runway 9-27 had extended weekend closings for resurfacing during 2009.

4 Runway 15R-33L was closed for 3 months in 2011 and in 2012.

5 Runway 4L-22Rwas closed for 31 days in 2016.

6 Runway 4R-22L was closed for 35 days in 2017, with limited availability for Runway 4R arrivals for about 80 additional days.

7 Runway 9-27 was closed for almost 3 months in the summer of 2020, during an unprecedented period of low levels of aircraft activity due to the pandemic.

Since runway use plays such a key role in determining noise the aircraft noise distribution in the Airport's environment, Massport also tracks the level of traffic off each runway end by combining counts of operations that overfly the same general area. The total operations and percentages shown for 2019 through 2021 in **Table H-9** represent the amount of activity experienced off each runway end for a given year.

Table H-9 Runway Usage by Runway End

		2019		2020		2021	
Runway End	**Operation(s)[1]**	**Total Flights**	**% of Total[2]**	**Total Flights**	**% of Total[2]**	**Total Flights**	**% of Total[2]**
04L	R4L A + R22R D	74,697	**17.5%**	35,369	**17.1%**	42,054	**15.8%**
04R	R4R A + R22L D	58,449	**13.7%**	25,951	**12.6%**	35,365	**13.3%**
9	R9 A + R27 D	24,076	**5.6%**	11,726	**5.7%**	16,906	**6.4%**
14	N/A	0	**0.0%**	0	**0.0%**	0	**0.0%**
15L	R15L A + R33R D	23	**<0.1%**	131	**0.1%**	89	**0.0%**
15R	R15R A + R33L D	43,606	**10.2%**	26,317	**12.7%**	32,240	**12.1%**
22L	R22L A + R4R D	69,805	**16.3%**	42,733	**20.7%**	48,121	**18.1%**
22R	R22R A + R4L D	6,285	**1.5%**	2,308	**1.1%**	3,185	**1.2%**
27	R27 A + R9 D	103,191	**24.2%**	32,658	**15.8%**	51,966	**19.5%**
32	R32 A + R14 D	6,822	**1.6%**	1,991	**1.0%**	1,584	**0.6%**
33L	R33L A + R15R D	38,607	**9.0%**	27,127	**13.1%**	33,924	**12.8%**
33R	R33R A + R15L D	1,615	**0.4%**	392	**0.2%**	601	**0.2%**
All		**427,176**	**100.0%**	**206,702**	**100.0%**	**266,034**	**100.0%**

Source: Massport NOMS data and HMMH 2022

Notes: N/A – not applicable.
Runway 14-32 is unidirectional: there are no arrivals to Runway 14 and no departures from Runway 32. The 15 operations shown in this row for 2016 are non-jet departures which were most likely erroneously associated with Runway 32 by the computer algorithm.

1 A=Arrivals; D=Departures.

2 Percentages are rounded to the nearest tenth.

Flight Tracks

The AEDT pre-processor converts each radar track to an AEDT model track and then models the scaled aircraft operation on that track. This method keeps the modeled lateral and vertical dispersion of the aircraft types consistent with the radar data and ensures that anomalies in the departure paths are captured in the pre-processor system. **Table H-10** lists the number of flight tracks used in the modeling process for 2019, 2020 and 2021. A sample of flight tracks from 2020 and 2021 are displayed in **Figures 6-4** through **6-10** in Chapter 6, *Noise Abatement*.

Table H-10	Total Count of Flight Tracks Modeled with AEDT (2019, 2020, and 2021)											
	Runway											
	4L	4R	9	14	15L	15R	22L	22R	27	32	33L	33R
2021												
Departures	2,369	5,886	30,356	0	0	7,225	2,560	39,618	16,765	0	26,925	0
Arrivals	1,989	32,635	0	0	88	4,959	41,940	713	21,230	1,574	26,514	596
2020												
Departures	1,714	6,128	18,235	0	0	7,234	2,321	33,788	11,695	0	21,871	0
Arrivals	1,456	23,514	0	0	130	4,280	36,428	588	14,297	1,987	19,778	390
2019												
Departures	5,392	7,660	60,003	0	1	8,481	3,042	59,892	23,548	0	41,222	0
Arrivals	13,149	52,055	0	0	23	1,421	58,338	819	39,151	6,634	28,222	1,610

Source: Massport's Harris Noise and Operational Monitoring System (NOMS) data and HMMH, 2022

Annual Model Results and Status of Mitigation Programs

Noise Exposed Population

Table H-11 presents the noise-exposed population by community through 2021. This table includes population within the DNL 60 to 65 dB contour interval, although DNL 65 dB is the federally defined noise criterion used as a guideline to identify when residential land use is considered incompatible with aircraft noise. The population assessments for 2020 and 2021 use 2020 U.S. Census data.

As noted in the *2017 Environmental Status and Planning Report* (*2017 ESPR*), the method for calculating population impact was refined for the 2017 analysis. Historically, the population calculations were developed by the noise model (AEDT or INM) or by GIS software by adding the populations of U.S. Census blocks within each contour level. A block was considered to be within the contour if the center location (or centroid) was within the DNL contour. The weakness of that method arises from the fact that the population of a U.S. Census block is distributed throughout the block, not clustered at its centroid. Blocks on the edge of the contour were either entirely included or entirely excluded from the count, but in reality, some fraction of the block's population resides within the contour.

The updated method (adopted for the *2017 ESPR* and continued since) determines the fraction of the area of the U.S. Census block that is within the contour and multiplies the block population by this fraction to determine the population exposed to DNL 65 dB or greater for that block. This more accurately represents the included population within U.S. Census blocks that are on the DNL contour boundary. This proportional method, while still an approximation, also better addresses the more obscure problem of oddly shaped blocks whose centroid is outside the block boundary.

When comparing population impact assessment across multiple years, it should be noted that the population estimation is affected by the noise model used to create the contours. As discussed in the *2016 EDR*, AEDT-modeled contours are smaller than the INM-modeled contours, which included FAA-approved over-water effects, hill effects, and custom altitude profiles. Consequently, population calculations based on AEDT contours result in smaller exposed populations.

Table H-11 Noise-Exposed Population by Community							
Year	Census Data	80+ dB	75+ dB	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
BOSTON[2]							
1990	1980	0	0	1,778	28,970	30,748	N/A
1992	1980	0	0	800	4,316	5,116	N/A
1993	1980	0	0	264	2,820	3,084	N/A
1994	1990	0	106	265	7,698	8,069	30,895
1995	1990	0	106	851	8,815	9,772	33,765
1996	1990	0	106	374	8,775	9,255	40,992
1997	1990	0	106	719	13,857	14,682	54,804
1998	1990	0	58	580	10,877	11,515	52,201
1999 [3]	1990	0	58	364	11,632	12,054	45,948
2000	2000	0	0	234	9,014	9,248	35,785
2001	2000	0	0	315	6,515	6,700	27,778
2002	2000	0	0	132	2,625	2,757	23,225
2003	2000	0	0	164	1,730	1,894	21,763
2004 [4]	2000	0	65	192	4,142	4,399	24,473
2005 [4]	2000	0	65	104	2,020	2,189	17,661
2006 [4]	2000	0	65	99	1,054	1,218	14,866
2007 [4,5]	2000	0	0	169	4,094	4,263	21,446
2008 [4,5]	2000	0	5	0	3,487	3,492	18,890
2009 [4,5]	2000	0	5	67	937	1,009	12,284
2010 [4,5]	2010	0	0	0	689	689	17,646
2011 [4,5]	2010	0	0	0	331	331	11,600
2012 [4,5]	2010	0	0	0	421	421	11,037
2013 [4,5]	2010	0	0	0	612	612	14,835
2014 [4,5]	2010	0	0	34	4,151	4,185	23,343
2015 [4,5]	2010	0	0	110	7,225	7,365	32,309
2016 [4,5]	2010	0	0	0	4,031	4,031	20,806
2017 [4,5]	2010	0	0	14	4,720	4,734	24,595
2018 [4,5]	2010	0	0	11	2,228	2,239	23,445
2019 [4,5]	2010	0	0	7	4,029	4,036	25,163
2020 [4,5]	2020	0	0	0	60	60	7,946
2021 [4,5]	2020	0	0	0	885	885	9,473
CHELSEA							
1990	1980	0	0	0	4,813	4,813	N/A
1992	1980	0	0	0	3,952	3,952	N/A
1993	1980	0	0	0	0	0	N/A
1994	1990	0	0	0	0	0	8,510
1995	1990	0	0	0	95	95	9,750
1996	1990	0	0	0	0	0	8,744
1997	1990	0	0	0	0	0	10,001
1998	1990	0	0	0	0	0	9,222
1999	1990	0	0	0	95	95	9,249
2000	2000	0	0	0	0	0	7,361
2001	2000	0	0	0	0	0	4,508
2002	2000	0	0	0	0	0	3,995
2003	2000	0	0	0	0	0	3,591
2004 [4]	2000	0	0	0	0	0	7,756
2005 [4]	2000	0	0	0	0	0	5,772
2006 [4]	2000	0	0	0	0	0	2,477

Table H-11 Noise-Exposed Population by Community (Continued)							
Year	**Census Data**	**80+ dB**	**75+ dB**	**70-75 dB DNL**	**65-70 dB DNL[1]**	**Total (65+)**	**60-65 dB DNL**
CHELSEA							
2007 [4,5]	2000	0	0	0	0	0	9,774
2008 [4,5]	2000	0	0	0	0	0	7,793
2009 [4,5]	2000	0	0	0	0	0	5,462
2010 [4,5]	2010	0	0	0	0	0	4,897
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	3,485
2014 [4,5]	2010	0	0	0	0	0	9,236
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	12,110
2017 [4,5]	2010	0	0	0	65	65	13,900
2018 [4,5]	2010	0	0	0	0	0	10,526
2019 [4,5]	2010	0	0	0	0	0	12,650
2020 [4,5]	2020	0	0	0	0	0	721
2021 [4,5]	2020	0	0	0	0	0	4,708
EVERETT							
1990	1980	0	0	0	0	0	N/A
1992	1980	0	0	0	0	0	N/A
1993	1980	0	0	0	0	0	N/A
1994	1990	0	0	0	0	0	0
1995	1990	0	0	0	0	0	0
1996	1990	0	0	0	0	0	0
1997	1990	0	0	0	0	0	0
1998	1990	0	0	0	0	0	0
1999	1990	0	0	0	0	0	0
2000	2000	0	0	0	0	0	0
2001	2000	0	0	0	0	0	0
2002	2000	0	0	0	0	0	0
2003	2000	0	0	0	0	0	0
2004 [4]	2000	0	0	0	0	0	0
2005 [4]	2000	0	0	0	0	0	0
2006 [4]	2000	0	0	0	0	0	0
2007 [4,5]	2000	0	0	0	0	0	0
2008 [4,5]	2000	0	0	0	0	0	0
2009 [4,5]	2000	0	0	0	0	0	0
2010 [4,5]	2010	0	0	0	0	0	0
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	0
2014 [4,5]	2010	0	0	0	0	0	0
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	0
2017 [4,5]	2010	0	0	0	0	0	924
2018 [4,5]	2010	0	0	0	0	0	0
2019 [4,5]	2010	0	0	0	0	0	0
2020 [4,5]	2020	0	0	0	0	0	0
2021 [4,5]	2020	0	0	0	0	0	0

Table H-11 Noise-Exposed Population by Community (Continued)							
Year	Census Data	80+ dB	75+ dB	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
MEDFORD							
1990	1980	0	0	0	0	0	N/A
1992	1980	0	0	0	0	0	N/A
1993	1980	0	0	0	0	0	N/A
1994	1990	0	0	0	0	0	0
1995	1990	0	0	0	0	0	0
1996	1990	0	0	0	0	0	0
1997	1990	0	0	0	0	0	0
1998	1990	0	0	0	0	0	0
1999	1990	0	0	0	0	0	0
2000	2000	0	0	0	0	0	0
2001	2000	0	0	0	0	0	0
2002	2000	0	0	0	0	0	0
2003	2000	0	0	0	0	0	0
2004 [4]	2000	0	0	0	0	0	0
2005 [4]	2000	0	0	0	0	0	0
2006 [4]	2000	0	0	0	0	0	0
2007 [4,5]	2000	0	0	0	0	0	0
2008 [4,5]	2000	0	0	0	0	0	0
2009 [4,5]	2000	0	0	0	0	0	0
2010 [4,5]	2010	0	0	0	0	0	0
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	0
2014 [4,5]	2010	0	0	0	0	0	0
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	0
2017 [4,5]	2010	0	0	0	0	0	0
2018 [4,5]	2010	0	0	0	0	0	0
2019 [4,5]	2010	0	0	0	0	0	0
2020 [4,5]	2020	0	0	0	0	0	0
2021 [4,5]	2020	0	0	0	0	0	0
QUINCY							
1990	1980	0	0	0	0	0	N/A
1992	1980	0	0	0	0	0	N/A
1993	1980	0	0	0	0	0	N/A
1994	1990	0	0	0	0	0	0
1995	1990	0	0	0	0	0	0
1996	1990	0	0	0	0	0	0
1997	1990	0	0	0	0	0	0
1998	1990	0	0	0	0	0	0
1999	1990	0	0	0	0	0	0
2000	2000	0	0	0	0	0	636
2001	2000	0	0	0	0	0	610
2002	2000	0	0	0	0	0	610
2003	2000	0	0	0	0	0	610
2004 [4]	2000	0	0	0	0	0	610
2005 [4]	2000	0	0	0	0	0	610
2006 [4]	2000	0	0	0	0	0	610

Table H-11 Noise-Exposed Population by Community (Continued)							
Year	**Census Data**	**80+ dB**	**75+ dB**	**70-75 dB DNL**	**65-70 dB DNL[1]**	**Total (65+)**	**60-65 dB DNL**
QUINCY							
2007 [4,5]	2000	0	0	0	0	0	0
2008 [4,5]	2000	0	0	0	0	0	0
2009 [4,5]	2000	0	0	0	0	0	0
2010 [4,5]	2010	0	0	0	0	0	0
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	0
2014 [4,5]	2010	0	0	0	0	0	0
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	0
2017 [4,5]	2010	0	0	0	0	0	0
2018 [4,5]	2010	0	0	0	0	0	0
2019 [4,5]	2010	0	0	0	0	0	0
2020 [4,5]	2020	0	0	0	0	0	0
2021 [4,5]	2020	0	0	0	0	0	0
REVERE							
1990	1980	0	0	0	4,274	4,274	N/A
1992	1980	0	0	0	3,848	3,848	N/A
1993	1980	0	0	0	4,617	4,617	N/A
1994	1990	0	0	0	3,569	3,569	2,099
1995	1990	0	0	0	3,364	3,364	2,304
1996	1990	0	0	172	3,292	3,464	2,505
1997	1990	0	0	0	3,293	3,293	2,047
1998	1990	0	0	0	3,168	3,168	2,132
1999	1990	0	0	128	3,165	3,293	2,047
2000	2000	0	0	0	2,496	2,496	3,100
2001	2000	0	0	0	2,496	2,496	3,100
2002	2000	0	0	0	2,822	2,822	2,399
2003	2000	0	0	0	2,994	2,994	2,227
2004 [4]	2000	0	0	82	2,969	3,051	2,678
2005 [4]	2000	0	0	82	2,540	2,622	2,731
2006 [4]	2000	0	0	82	2,540	2,622	2,698
2007 [4,5]	2000	0	0	0	2,450	2,450	2,853
2008 [4,5]	2000	0	0	0	2,434	2,434	1,802
2009 [4,5]	2000	0	0	0	2,512	2,512	1,452
2010 [4,5]	2010	0	0	0	2,413	2,413	2,473
2011 [4,5]	2010	0	0	0	2,547	2,547	3,123
2012 [4,5]	2010	0	0	0	2,762	2,762	3,191
2013 [4,5]	2010	0	0	0	2,505	2,505	2,791
2014 [4,5]	2010	0	0	0	2,832	2,832	3,829
2015 [4,5]	2010	0	0	0	3,789	3,789	3,385
2016 [4,5]	2010	0	0	0	2,376	2,376	3,508
2017 [4,5]	2010	0	0	0	2,362	2,362	2,899
2018 [4,5]	2010	0	0	0	2,362	2,362	2,899
2019 [4,5]	2010	0	0	0	3,484	3,484	3,733
2020 [4,5]	2020	0	0	0	641	641	3,983
2021 [4,5]	2020	0	0	0	1,260	1,260	3,669

Table H-11 Noise-Exposed Population by Community (Continued)							
Year	**Census Data**	**80+ dB**	**75+ dB**	**70-75 dB DNL**	**65-70 dB DNL[1]**	**Total (65+)**	**60-65 dB DNL**
WINTHROP							
1990	1980	0	676	1,211	2,420	4,307	N/A
1992	1980	0	626	1,146	2,488	4,262	N/A
1993	1980	0	648	1,211	1,773	3,632	N/A
1994	1990	0	417	1,343	5,154	6,914	7,512
1995	1990	0	482	1,611	5,757	7,850	7,077
1996	1990	0	417	1,376	5,930	7,723	7,333
1997	1990	0	417	1,659	6,386	8,462	6,839
1998	1990	0	519	1,522	6,572	8,613	6,507
1999	1990	0	353	1,408	5,946	7,707	7,135
2000	2000	0	247	1,070	4,684	6,001	7,776
2001	2000	0	244	683	4,123	5,050	8,104
2002	2000	0	2	481	2,247	2,730	7,921
2003	2000	0	0	339	1,956	2,295	7,386
2004 [4]	2000	0	2	337	1,649	1,988	6,508
2005 [4]	2000	0	39	347	1,280	1,666	6,353
2006 [4]	2000	0	39	416	1,288	1,743	6,845
2007 [4,5]	2000	0	0	247	1,139	1,386	6,749
2008 [4,5]	2000	0	0	244	1,409	1,653	6,547
2009 [4,5]	2000	0	0	171	643	814	4,221
2010 [4,5]	2010	0	0	130	598	728	3,720
2011 [4,5]	2010	0	0	130	939	1069	4,303
2012 [4,5]	2010	0	0	200	1,186	1,386	5,305
2013 [4,5]	2010	0	0	130	1,060	1,190	5,466
2014 [4,5]	2010	0	0	130	1,775	1,905	6,456
2015 [4,5]	2010	0	0	320	2,623	2,943	6,375
2016 [4,5]	2010	0	0	130	913	1,403	5,062
2017 [4,5]	2010	0	0	125	647	772	4,656
2018 [4,5]	2010	0	0	51	1,170	1,221	5,586
2019 [4,5]	2010	0	0	96	1,152	1,248	5,621
2020 [4,5]	2020	0	0	0	103	103	1,901
2021 [4,5]	2020	0	0	0	352	352	2,106

Table H-11 Noise-Exposed Population by Community (Continued)							
Year	**Census Data**	**80+ dB**	**75+ dB**	**70-75 dB DNL**	**65-70 dB DNL[1]**	**Total (65+)**	**60-65 dB DNL**
All Communities							
1990	1980	0	676	2,989	40,477	44,142	NA
1992	1980	0	628	2,352	14,604	17,584	NA
1993	1980	0	648	1,475	9,210	11,333	NA
1994	1990	0	523	1,608	16,421	18,552	49,016
1995	1990	0	588	2,462	18,031	21,081	52,896
1996	1990	0	523	1,922	17,997	20,442	59,574
1997	1990	0	523	2,378	23,536	26,437	73,691
1998	1990	0	577	2,102	20,617	23,296	70,062
1999[3]	1990	0	411	1,900	20,838	23,149	64,379
2000	2000	0	247	1,304	16,194	17,745	54,190
2001	2000	0	244	998	13,004	14,246	43,616
2002	2000	0	2	613	7,694	8,309	38,150
2003	2000	0	0	503	6,680	7,183	35,577
2004 [4]	2000	0	67	611	8,760	9,438	41,975
2005 [4]	2000	0	104	533	5,840	6,477	33,127
2006 [4]	2000	0	104	597	4,882	5,583	27,496
2007 [4,5]	2000	0	0	416	7,683	8,099	40,822
2008 [4,5]	2000	0	5	244	7,330	7,579	35,122
2009 [4,5]	2000	0	5	238	4,092	4,335	23,419
2010 [4,5]	2010	0	0	130	3,700	3,830	28,736
2011 [4,5]	2010	0	0	130	3,817	3,947	19,026
2012 [4,5]	2010	0	0	200	4,369	4,569	19,533
2013 [4,5]	2010	0	0	130	4,177	4,307	26,577
2014 [4,5]	2010	0	0	164	8,758	8,922	42,864
2015 [4,5]	2010	0	0	430	13,667	14,097	52,748
2016 [4,5]	2010	0	0	130	7,320	7,450	41,486
2017 [4,5]	2010	0	0	139	7,794	7,933	46,974
2018 [4,5]	2010	0	0	62	6,972	7,034	43,270
2019 [4,5]	2010	0	0	103	8,665	8,768	47,167
2020 [4,5]	2020	0	0	0	804	804	14,551
2021 [4,5]	2020	0	0	0	2,497	2,497	19,956

Source: Data prepared for Massport by HMMH 2022

Notes: dB – decibel; DNL - Day-Night Average Sound Level; N/A – not available.

1 65 dB DNL is the federally defined noise criterion.

2 Boston includes portions of Dorchester, East Boston, Roxbury, South Boston, and the South End.

3 Boston population by community changed in 1999 due to employment of more accurate hill effects methodology and reporting change.

4 All results from 2004 to 2015 are from the RealContours™ modeling system with INM.
All results from 2016 to 2021 are from AEDT using the proprietary pre-processor.

5 2020 and 2021 noise analyses used AEDT version 3d, 2018 and 2019 noise analysis used AEDT version 3c, 2017 used AEDT version 2d, 2016 used AEDT version 2c SP2, 2012 through 2015 used INM version 7.0d, 2011 used INM version 7.0c, 2008 through 2010 used INM version 7.0b, 2007 used INM version 7.01, and 1990 and 2000 used earlier versions of INM.

Cumulative Noise Index (CNI)

Massport reports total annual fleet noise at Logan Airport, defined in the Logan Airport Noise Rules by a metric referred to as the CNI. The CNI is a single number representing the sum of the entire set of single-event noise levels experienced at the Airport over a full year of operation, weighted similarly to DNL so that activity occurring at night is weighted by adding an extra 10 dB to each event. This weighting is mathematically equivalent to multiplying the number of nighttime events by each aircraft by a factor of ten. The Logan Airport Noise Rules define CNI in terms of Effective Perceived Noise Level (EPNL) and require that the index be computed for the fleet of commercial aircraft operating at Logan Airport throughout the year. In addition, in EDRs and ESPRs, Massport reports partial CNI values of noise at Logan Airport, so that various subsets of the fleet (cargo, night operations, passenger jets, etc.) are identified (see **Table H-12**).

The Noise Rules, adopted by Massport following public hearings held in February 1986, established a CNI limit of 156.5 EPNdB. The CNI generally has decreased since 1990, remaining below that cap, with changes from year to year on the order of a few tenths of a decibel. The 2020 and 2021 total CNI remains well below the cap of 156.5 EPNL.

Table H-13 shows the relative contribution of each airline to total CNI. The table provides the number of flight operations, the contribution to CNI by airline, and the partial CNI per operation for 2019, 2020, and 2021. The data reflect the contributions of individual aircraft noise levels and the frequency with which they occur. The table is sorted by the partial CNI per operation for 2021 and shows a mix of mostly international carriers and cargo operators at the top of this list. This is due to the higher proportion of nighttime operations among these carriers, as well as the operation of larger and/or older (nosier) aircraft.

Table H-12 Cumulative Noise Index (EPNL) – 1990 to 2021 (limit 156.5)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Full CNI (Entire Commercial Jet Fleet)	**156.4**	**155.8**	**155.5**	**155.3**	**155.4**	**155.3**	**155.1**	**154.8**	**154.7**	**154.9**	**154.7**	**154.1**
Total Passenger Jets	155.2	154.8	154.6	154.4	154.4	154.2	154.1	153.9	153.7	153.9	153.6	152.9
Total Cargo Jets	150.1	148.9	148.0	147.9	148.3	148.8	148.6	147.5	147.9	148.0	148.2	147.8
Total Daytime	152.5	152.1	152.4	152.1	152.1	151.6	151.2	150.8	150.4	150.4	149.5	149.0
Total Nighttime	154.4	153.4	152.6	152.4	152.6	152.9	152.9	152.5	152.7	153.1	153.1	152.4
Total Stage 2 Jets	N/A	N/A	N/A	N/A	151.0	150.2	149.4	149.2	147.7	147.1	124.7	121.5
Total Stage 3 Jets	N/A	N/A	N/A	N/A	153.4	153.8	153.8	153.4	153.8	154.2	154.7	154.1
Daytime Stage 2	N/A	N/A	N/A	N/A	149.0	148.5	147.6	146.5	145.2	144.1	122.6	119.3
Nighttime Stage 2	N/A	N/A	N/A	N/A	146.7	145.1	144.8	145.8	144.1	144.0	120.5	117.3
Daytime Stage 3	N/A	N/A	N/A	N/A	149.1	148.8	148.7	148.8	148.9	149.2	149.5	149.0
Nighttime Stage 3	N/A	N/A	N/A	N/A	151.4	152.1	152.2	151.5	152.1	152.5	153.1	152.4
Passenger Jet Stage 2	N/A	N/A	N/A	N/A	150.5	149.9	149.2	148.9	147.5	146.8	124.2	116.3
Passenger Jet Stage 3	N/A	N/A	N/A	N/A	152.2	152.3	152.3	152.2	152.6	153.0	153.6	152.9
Cargo Jet Stage 2	N/A	N/A	N/A	N/A	141.5	137.4	136.8	137.4	139.0	134.5	114.8	119.9
Cargo Jet Stage 3	N/A	N/A	N/A	N/A	147.3	148.5	148.3	147.0	147.3	147.9	148.2	147.8
Daytime Passenger	N/A	152.0	152.2	152.0	152.0	151.5	151.1	150.6	150.1	150.1	149.3	148.7
Nighttime Passenger	N/A	151.6	150.9	150.6	150.8	151.0	151.0	151.1	151.2	151.6	151.6	150.8
Daytime Cargo	137.1	137.1	137.6	135.2	136.1	138.0	136.7	136.2	138.0	138.2	137.5	137.1
Nighttime Cargo	149.9	148.6	147.6	147.6	148.0	148.4	148.3	147.1	147.5	147.6	147.8	147.4
Daytime Passenger Stage 2	N/A	N/A	N/A	N/A	148.9	148.4	147.6	146.5	145.0	143.9	122.3	115.0
Daytime Passenger Stage 3	N/A	N/A	N/A	N/A	149.0	148.5	148.4	148.5	148.6	149.0	149.2	148.7
Nighttime Passenger Stage 2	N/A	N/A	N/A	N/A	149.0	148.5	148.4	148.5	142.8	143.7	119.8	110.2
Nighttime Passenger Stage 3	N/A	N/A	N/A	N/A	149.4	149.9	150.1	149.8	150.5	150.8	151.6	150.8
Daytime Cargo Stage 2	N/A	N/A	N/A	N/A	128.3	126.7	124.6	126.4	131.6	131.5	111.1	117.3
Daytime Cargo Stage 3	N/A	N/A	N/A	N/A	135.3	137.7	136.4	135.7	136.9	137.1	137.5	137.0
Nighttime Cargo Stage 2	N/A	N/A	N/A	N/A	141.3	137.0	136.5	137.0	138.2	131.5	112.3	116.4
Nighttime Cargo Stage 3	N/A	N/A	N/A	N/A	147.0	148.1	148.0	146.6	146.9	147.5	147.8	147.4

Table H-12 Cumulative Noise Index (EPNL) – 1990 to 2021 (limit 156.5) (Continued)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Full CNI (Entire Commercial Jet Fleet)	**153.2**	**152.7**	**153.4**	**153.2**	**152.6**	**152.7**	**152.9**	**152.3**	**151.9**	**152.1**	**152.2**
Total Passenger Jets	151.8	151.3	152.2	152.1	151.4	151.5	151.9	151.1	150.9	150.6	151.3
Total Cargo Jets	147.4	147.1	147.0	146.6	146.5	146.4	146.1	145.9	145.1	146.7	144.9
Total Daytime	148.5	148.0	148.5	148.2	147.5	147.2	147.6	147.1	146.8	146.9	147.0
Total Nighttime	151.3	150.9	151.7	151.6	151.0	151.2	151.4	150.7	150.3	150.6	150.6
Total Stage 2 Jets	114.3	114.1	118.1	--	--	--	--	--	113.6	110.8	104.9
Total Stage 3 Jets	153.2	152.7	153.4	153.2	152.0	152.7	152.9	152.3	151.9	152.1	152.2
Daytime Stage 2	111.2	113.7	109.4	--	--	--	--	--	103.6	N/A	104.9
Nighttime Stage 2	111.4	103.2	117.5	--	--	--	--	--	113.1	110.8	--
Daytime Stage 3	148.5	148.0	148.5	148.2	147.5	147.2	147.6	147.1	146.8	146.9	147.0
Nighttime Stage 3	151.3	150.9	151.7	151.6	151.0	151.2	151.4	150.7	150.3	150.6	150.6
Passenger Jet Stage 2	--	--	--	--	--	--	--	--	--	--	104.9
Passenger Jet Stage 3	151.8	151.3	152.2	152.1	151.4	151.5	151.9	151.1	150.9	150.6	151.3
Cargo Jet Stage 2	114.3	114.1	118.1	--	--	--	--	--	113.6	110.8	--
Cargo Jet Stage 3	147.4	147.1	147.0	146.6	146.5	146.4	146.1	145.9	145.1	146.7	144.9
Daytime Passenger	148.2	147.7	148.2	147.9	147.2	146.9	147.3	146.8	146.6	146.5	146.8
Nighttime Passenger	149.4	148.8	150.0	150.1	149.3	149.7	150.0	149.1	149.0	148.5	149.4
Daytime Cargo	137.0	136.2	135.7	135.8	135.5	135.8	135.8	135.2	134.5	136.6	134.0
Nighttime Cargo	147.0	146.8	146.7	146.2	146.1	146.0	145.6	145.5	144.7	146.3	144.5
Daytime Passenger Stage 2	--	--	--	--	--	--	--	--	--	--	104.9
Daytime Passenger Stage 3	148.2	147.7	148.2	147.9	147.2	146.9	147.3	146.8	146.6	146.5	146.8
Nighttime Passenger Stage 2	--	--	--	--	--	--	--	--	--	--	--
Nighttime Passenger Stage 3	149.4	148.8	150.0	150.1	149.3	149.7	150,.0	149.1	149.0	148.5	149.4
Daytime Cargo Stage 2	111.2	113.7	109.4	--	--	--	--	--	103.6	--	--
Daytime Cargo Stage 3	137.0	136.1	135.7	135.8	135.5	135.8	135.8	135.2	134.4	136.6	134.0
Nighttime Cargo Stage 2	111.4	103.2	117.5	--	--	--	--	--	113.1	110.8	--
Nighttime Cargo Stage 3	147.0	146.8	146.7	146.2	146.1	146.0	145.6	145.5	144.7	146.3	144.5

Table H-12 Cumulative Noise Index (EPNL) – 1990 to 2021 (limit 156.5) (Continued)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change 2019 to 2020	Change 2020 to 2021
Full CNI (Entire Commercial Jet Fleet)	**152.3**	**152.9**	**152.7**	**152.6**	**153.1**	**153.4**	**153.5**	**150.3**	**151.5**	**-3.2**	**1.2**
Total Passenger Jets	151.4	151.7	152.0	152.0	152.6	153.0	153.1	149.4	150.9	-3.7	1.5
Total Cargo Jets	145.1	144.5	144.2	143.8	143.4	142.9	143.0	143.1	142.7	0.1	(0.4)
Total Daytime	147.0	147.1	147.2	147.0	147.5	147.6	147.7	144.9	145.8	-2.8	0.9
Total Nighttime	150.8	151.0	151.2	151.2	151.7	152.1	152.2	148.9	150.1	-3.3	1.2
Total Stage 2 Jets	111.3	--	--	--	--	--	--	--	--	--	--
Total Stage 3 Jets	152.3	152.5	152.7	152.6	153.1	153.4	153.5	150.3	151.5	-3.2	1.2
Daytime Stage 2	101.4	--	--	--	--	--	--	--	--	--	--
Nighttime Stage 2	110.8	--	--	--	--	--	--	--	--	--	--
Daytime Stage 3	147.0	147.1	147.2	147.0	147.5	147.6	147.7	144.9	145.8	-2.8	0.9
Nighttime Stage 3	150.8	151.0	151.2	151.2	151.7	152.1	152.2	148.9	150.1	-3.3	1.2
Passenger Jet Stage 2	101.4	--	--	--	--	--	--	--	--	--	--
Passenger Jet Stage 3	151.4	151.7	152.0	152.0	152.6	153.0	153.1	149.4	150.9	-3.7	1.5
Cargo Jet Stage 2	110.8	--	--	--	--	--	--	--	--	--	--
Cargo Jet Stage 3	145.1	144.5	144.2	143.8	143.4	142.9	143.0	143.1	142.7	0.1	(0.4)
Daytime Passenger	146.8	146.9	147.0	146.8	147.3	147.5	147.6	144.5	145.4	-3.1	0.9
Nighttime Passenger	149.6	150.0	150.3	150.4	151.1	151.6	151.7	147.7	149.4	-4.0	1.7
Daytime Cargo	133.6	134.9	134.4	133.8	133.9	133.6	133.4	133.8	134.9	0.4	1.1
Nighttime Cargo	144.8	144.0	143.7	143.4	142.8	142.3	142.5	142.6	142.0	0.1	(0.6)
Daytime Passenger Stage 2	101.4	--	--	--	--	--	--	--	--	--	--
Daytime Passenger Stage 3	146.8	146.9	147.0	146.8	147.3	147.5	147.6	144.5	145.4	-3.1	0.9
Nighttime Passenger Stage 2	--	--	--	--	--	--	--	--	--	--	--
Nighttime Passenger Stage 3	149.6	150.0	150.3	150.4	151.1	151.6	151.7	147.7	149.4	-4.0	1.7
Daytime Cargo Stage 2	--	--	--	--	--	--	--	--	--	--	--
Daytime Cargo Stage 3	133.6	134.9	134.4	133.8	133.9	133.6	133.4	133.8	134.9	0.4	1.1
Nighttime Cargo Stage 2	110.8	--	--	--	--	--	--	--	--	--	--
Nighttime Cargo Stage 3	144.8	144.0	143.7	143.4	142.8	142.3	142.5	142.6	142.0	0.1	(0.6)

Source: HMMH, 2022

Notes: CNI – cumulative noise index; EPNL - Effective Perceived Noise Level;
N/A indicates information not available; dashes indicate no aircraft in that category
General aviation (GA) aircraft and non-jet aircraft are not included in the calculations. Negative numbers are shown in parentheses ( ).

Table H-13 Annual Operations and Partial CNI by Airline and per Operation, 2019, 2020, and 2021

Airlines with more than 100 flights in 2021 or 2020	Operations			Total Airline CNI (EPNdB)			Partial CNI (EPNdB) per Operation			Airline Category
	2019	2020	2021	2019	2020	2021	2019	2020	2021	
21 Air LLC	N/A	N/A	190	N/A	N/A	128.5	N/A	N/A	105.7	Cargo
United Parcel Service	2,096	2,258	2,183	138.9	139.1	138.2	105.7	105.6	104.8	Cargo
Kalitta Air (Cargo)	N/A	103	316	N/A	121.9	128.8	N/A	101.8	103.8	Cargo
Hawaiian Airlines	426	132	380	132.2	125.2	129.5	105.9	104.0	103.7	Domestic
Federal Express	3,775	4,367	4,892	140.3	140.3	140.2	104.5	103.9	103.3	Cargo
Emirates Airlines	719	306	456	131.1	127.0	128.4	102.5	102.1	101.8	International
Alaska Airlines	5,920	2,535	2,882	137.3	133.7	134.6	99.6	99.6	100.0	Domestic
Delta Air Lines	42,218	19,949	28,826	144.6	142.1	144.2	98.3	99.1	99.6	Domestic
Turkish Airlines	674	274	500	127.5	123.6	126.3	99.3	99.2	99.3	International
Iberia Air Lines Of Spain	859	132	158	127.1	121.5	121.0	97.7	100.3	99.1	International
KLM Royal Dutch Airlines	263	251	304	123.1	121.9	123.8	98.9	97.9	98.9	International
Southwest Airlines	19,907	9,277	8,916	141.7	138.3	138.1	98.7	98.7	98.6	Domestic
American Airlines	50,333	24,815	28,474	144.7	141.8	143.0	97.7	97.8	98.5	Domestic
Spirit Airlines	9,838	5,435	5,689	136.5	133.8	136.0	96.6	96.4	98.5	Domestic
TAP - Air Portugal	644	328	526	124.0	124.4	125.4	95.9	99.2	98.1	International
Swiss Air	978	198	328	130.1	123.5	123.3	100.2	100.6	98.1	International
British Airways	2,650	1,136	991	135.0	129.6	128.0	100.8	99.0	98.1	International
United Airlines	27,318	11,338	14,393	142.9	137.8	139.6	98.5	97.2	98.0	Domestic
Jetblue Airways	114,091	51,873	61,898	148.1	144.3	145.5	97.6	97.1	97.6	Domestic
Qatar Airways	730	350	528	130.4	125.4	124.5	101.8	100.0	97.3	International
SATA International Airlines	809	288	409	125.3	121.4	123.3	96.2	96.9	97.2	International
Korean Air Lines Co., Ltd.	367	208	314	121.1	120.3	122.1	95.5	97.1	97.1	International
Virgin Atlantic	1,361	342	391	132.8	127.2	122.9	101.5	101.8	97.0	International
Japan Airlines	728	396	644	123.1	122.9	125.0	94.5	97.0	97.0	International
Air France	856	402	616	126.5	123.3	124.5	97.2	97.2	96.6	International

Table H-13 Annual Operations by Partial CNI by Airline and per Operation, 2019, 2020, and 2021 (Continued)

Airlines with more than 100 flights in 2021 or 2020	Operations			Total Airline CNI (EPNdB)			Partial CNI (EPNdB) per Operation			Airline Category
	2019	2020	2021	2019	2020	2021	2019	2020	2021	
Icelandair	1,044	906	1,122	130.0	124.6	127.0	99.8	95.0	96.5	International
Frontier Airlines, Inc.	1,211	674	1,036	128.1	122.6	126.2	97.3	94.3	96.1	Domestic
Aer Lingus	1,860	868	655	129.5	125.4	124.2	96.8	96.0	96.0	International
Lufthansa	1,703	511	867	131.3	125.6	124.3	99.0	98.5	94.9	International
Republic Airlines	21,832	16,547	29,990	137.7	136.0	139.3	94.4	93.8	94.6	Domestic
Compañía Panameña de Aviación S.A.	962	188	283	124.3	116.4	118.8	94.5	93.7	94.3	International
SkyWest Airlines	4,880	175	250	132.9	116.3	118.2	96.0	93.8	94.2	Domestic
MN Airlines, LLC	288	121	358	118.8	114.6	119.5	94.2	93.8	93.9	Domestic
Endeavor Air	10,520	2,025	2,973	133.9	125.8	128.3	93.7	92.7	93.6	Domestic
Allegiant Air	N/A	184	1,063	N/A	116.0	123.6	N/A	93.3	93.3	Domestic
Envoy Airlines	396	N/A	528	116.0	N/A	119.7	90.0	N/A	92.5	Domestic
Sky Regional Airlines Inc	4,345	1,795	118	132.4	127.5	113.0	96.0	94.9	92.3	International
Jazz Air Inc.	2,922	745	2,274	126.2	121.2	125.3	91.6	92.5	91.7	International
Piedmont Airlines	3,087	971	1,439	126.8	121.3	122.1	91.9	91.5	90.5	Domestic
Atlas Air	531	480	N/A	132.1	131.7	N/A	104.8	104.9	N/A	Cargo
Cathay Pacific	699	117	N/A	133.7	122.5	N/A	105.2	101.8	N/A	International
Norwegian Air UK Limited	732	134	N/A	124.3	118.5	N/A	95.6	97.3	N/A	International
TAM- Linhas Aereas S.A.	476	129	N/A	124.8	117.7	N/A	98.1	96.6	N/A	International

Source: Massport and HMMH, 2022.

Notes: CNI – Cumulative Noise Index

N/A Not available; airline had no operations at Logan Airport in that year

1 Operations for some carriers differ to those in Chapter 2, *Activity Levels,* and Chapter 7, *Air Quality/Emissions Reduction,* because this table only includes jet aircraft and not turboprops, and because it includes both scheduled and unscheduled air carriers.

Residential Sound Insulation Program (RSIP)

As discussed in Chapter 6, *Noise Abatement*, Massport has been working to restart its residential sound insulation program (RSIP). In 2020 and 2021, no new dwelling units received sound insulation from Massport. A total of 5,467 residential buildings and 11,515 dwelling units have been sound insulated since 1986 when the program was first implemented. **Table H-14** lists the yearly progress of this mitigation effort.

Following FAA's approval of model adjustments based on the effects of terrain (discussed in the *1999 ESPR*), Massport submitted, and the New England Region of FAA approved, a new sound insulation program. The revised contour, approved for a two-year period beginning in 1999, included dwelling units in East Boston, South Boston, and Winthrop that previously had not been eligible for insulation. Massport received notice of FAA funding for $5 million. Subsequently, Massport updated its program contour, first with the *2001 EDR* contour and more recently with the Logan Airside Improvements Project approved contour. These updates allowed Massport to continue the program with yearly additional funds through 2014.

The Logan Airside Improvements Project incorporated runway use changes due to the new Runway 14-32 which opened in late November 2006. The Logan Airside Improvements Project update expanded the focus of the sound insulation program into Chelsea to satisfy the mitigation commitments made in the Airside Improvements Program Record of Decision (ROD). Massport also contacted property owners that were still eligible within the RSIP boundaries that had previously declined to participate; those owners were offered a second chance to participate in the program.

As of 2015, the FAA requires airports to use the AEDT model to establish eligibility for sound insulation; therefore, Massport has been working with the FAA to develop a Noise Exposure Map (NEM) contour (including block rounding). The FAA accepted Massport's 2020 Noise Exposure Map in December, 2021, allowing Massport to move forward with the RSIP.

Table H-14 Residential Sound Insulation Program (RSIP) Status (1986-2021)

Construction Year	Residential Buildings[1]	Dwelling Units[2]
1986	4	8
1987	43	51
1988	102	159
1989	94	133
1990	121	200
1991	175	360
1992	197	354
1993	318	654
1994	310	542
1995	372	753
1996	323	577
1997	364	808
1998	328	806
1999	330	718
2000	195	601
2001	260	278
2002	205	354
2003	230	468
2004	320	791
2005	314	471
2006	286	827
2007	160	548
2008	94	388
2009	111	287
2010	56	83
2011	62	114
2012[3]	0	0
2013	45	76
2014	48	106
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	0	0
2021	0	0
Total	**5,467**	**11,515**

Source: Massport, 2022
1 Includes multiple units.
2 Individual units.
3 Federal funding was delayed in 2012.

Table H-15 provides a list of all schools that have been treated under Massport's sound insulation program. To date, Massport has provided sound insulation to 36 schools at a cost of over $8 million.

Table H-15 Schools Treated Under Massport Sound Insulation Program

Boston:	
East Boston	**Winthrop**
East Boston High	Winthrop Jr. High School
St. Mary's Star of the Sea	E. B. Newton
St. Dominic Savio High	A. T. Cummings (Ctr.) School
St. Lazarus	*3 Winthrop Schools*
James Otis	
Samuel Adams	
Curtis Guild	**Revere**
Dante Alighieri	Beachmont School
P.J. Kennedy	*1 Revere School*
Donald McKay	
Hugh Roe O'Donnell	
E Boston Central Catholic	**Chelsea**
Manassah Bradley	Shurtleff School
13 East Boston Schools	Williams School
	St. Rose Elementary
South Boston	St. Stanislaus
St. Augustine	Chelsea High School
Cardinal Cushing	*5 Chelsea Schools*
Patrick Gavin	
St. Bridgid's	**36 Total Schools**
Oliver Hazard Perry	
Condon School	
6 South Boston Schools	
Roxbury and Dorchester	
Samuel Mason	
Dearborn Middle	
Ralph Waldo Emerson	
Lewis Middle	
Nathan Hale Elem.	
Phillis Wheatley Elem.	
Davis Ellis Elem.	
Henry L. Higginson	
8 Roxbury and Dorchester Schools	
27 Total Boston Schools	

Source: Massport, 2015.

Noise Complaints

Table H-16 presents a detailed list by community of the total noise complaints made in 2019, 2020, and 2021, which can be filed either on Massport's Noise Complaint Line, through a form on Massport's website, or through the PublicVue flight track portal. The Noise Complaint Line provides individuals the ability to express their concerns about aviation noise (activities) or to ask questions regarding noise at Logan Airport. Callers ask a range of questions such as "Why is this runway in use?"; "What times do the planes stop flying?"; and "Was that aircraft off-course?"

The Noise Abatement Office (NAO) staff documents noise line complaints by obtaining information from the caller about the nature of the complaint, time of the occurrence, location of caller's residence, and the activity that was disturbed. The NAO uses the collected information to determine the probable activity responsible for the complaint and writes a letter report to the complainant. The letter includes the original complaint, a response that identifies the activity responsible for the call (arrivals, departures, run-up, etc.), meteorological information at the time of the call (a major factor in aviation activities), runways in use at the time of the call, and a notice that FAA will receive a copy of the report.

In 2020, Massport received 240,951 noise complaints from 72 communities, a decrease from 268,929 noise complaints from 86 communities in 2019. In 2021, the number of complaint calls rose to 269,867 from 83 communities. The number of individual complainants decreased from 2,669 callers in 2019 to 1,037 callers in 2020, and then increased again to 1,204 callers in 2021. The decrease in complaints from 2019 to 2020 was about 10 percent, but the decrease in number of individual callers was roughly 61 percent. From 2020 to 2021 the number of complaints rose 12 percent while the number of individual callers rose 16 percent.

Recent technological advances in both Massport's noise complaint phone system and online complaint tracking system, as well as the incorporation of third-party complaint applications, have made it easier for community members to file a complaint and to receive information about particular noise events. In late 2018, Massport added the option to submit complaints through the Airnoise button[21] which has dramatically increased complaints logged in the system. In 2019, the average number of complaints per individual caller (the ratio of calls to callers) was 100.8. This ratio increased to an average 232 complaints per caller for 2020 and was an average 224 complaints per caller in 2021.

Figure H-13 shows the call and callers data graphically. Massport's website, http://www.massport.com/logan-airport/about-logan/noise-abatement/complaints/), provides for additional general questions and answers regarding the Noise Complaint Line.

21 Airnoise is a subscription service that allows the user to file a noise complaint by clicking a button. The system finds the aircraft closest to the complainer and then files a detailed noise complaint directly with Massport. https://www.airnoise.io/

Table H-16 Noise Complaint Line Summary

Town Name	2019 Calls	2019 Callers	2020 Calls	2020 Callers	2021 Calls	2021 Callers	Change in number of calls, 2019 to 2020	Change in number of calls, 2020 to 2012
Abington	0	0	0	0	1	1	0	1
Allston	0	0	1	1	77	2	1	76
Andover	0	0	1	1	0	0	1	(1)
Arlington	7,021	77	8,602	35	10,017	30	1,581	1,415
Ayer	0	0	0	0	49	1	0	49
Belmont	1,132	41	552	18	1,152	32	(580)	600
Beverly	13	6	0	0	38	5	(13)	38
Billerica	2	2	0	0	2	1	(2)	2
Bolton	1	1	0	0	0	0	(1)	0
Boston	162	27	43	22	70	28	(119)	27
Boxford	10	4	0	0	0	0	(10)	0
Braintree	126	5	11	2	2	2	(115)	(9)
Brockton	8	2	0	0	0	0	(8)	0
Brookline	2	2	2	2	3	2	0	1
Burlington	0	0	2	2	1	1	2	(1)
Cambridge	1,958	142	224	26	629	50	(1,734)	405
Canton	5	2	1	1	1	1	(4)	0
Carlisle	0	0	0	0	1	1	0	1
Charlestown	65	14	35	6	20	10	(30)	(15)
Chelmsford	1,931	2	438	2	1,201	3	(1,493)	763
Chelsea	1,605	47	377	16	232	15	(1,228)	(145)
Cohasset	975	9	669	4	732	5	(306)	63
Danvers	2	2	0	0	3	2	(2)	3
Dedham	2	2	1	1	2	1	(1)	1
Dorchester	28	15	7	7	37	15	(21)	30
Dover	8	1	326	2	1	1	318	(325)
Duxbury	287	2	95	1	8	1	(192)	(87)
East Boston	3,803	70	73	37	139	49	(3,730)	66
East Bridgewater	0	0	0	0	1	1	0	1
Essex	4	2	0	0	0	0	(4)	0
Everett	58	23	19	14	8	5	(39)	(11)
Framingham	8	1	3	1	13	2	(5)	10
Gloucester	2	2	2	2	0	0	0	(2)
Groton	7	2	0	0	0	0	(7)	0
Hamilton	187	11	0	0	1	1	(187)	1
Hingham	15	6	6	2	66	3	(9)	60
Holbrook	1	1	1	1	4	1	0	3
Holliston	0	0	0	0	1	1	0	1

Table H-16 Noise Complaint Line Summary (Continued)

Town Name	2019 Calls	2019 Callers	2020 Calls	2020 Callers	2021 Calls	2021 Callers	Change in number of calls, 2019 to 2020	Change in number of calls, 2020 to 2021
Hull	1,047	97	459	25	796	31	(588)	337
Hyde Park	1,514	11	299	6	11	5	(1,215)	(288)
Ipswich	139	8	70	7	2	2	(69)	(68)
Jamaica Plain	17,132	108	7,535	45	1,975	56	(9,597)	(5,560)
Lexington	1	1	0	0	0	0	(1)	0
Littleton	0	0	1	1	0	0	1	(1)
Lynn	60	21	6	3	64	16	(54)	58
Lynnfield	2	1	0	0	0	0	(2)	0
Malden	15,414	34	17,923	30	6,324	24	2,509	(11,599)
Manchester	0	0	1	1	0	0	1	(1)
Marblehead	1,291	14	1,624	7	2,742	16	333	1,118
Marlborough	0	0	0	0	11	1	0	11
Marshfield	5	4	0	0	5	3	(5)	5
Mattapan	1	1	0	0	0	0	(1)	0
Medfield	2	2	0	0	0	0	(2)	0
Medford	98,021	712	107,721	234	102,182	210	9,700	(5,539)
Melbourne	0	0	0	0	2	1	0	2
Melrose	1,967	4	2,281	3	1,488	3	314	(793)
Middleton	5	2	0	0	0	0	(5)	0
Millis	12	1	6	1	8	1	(6)	2
Milton	41,575	219	25,513	97	17,454	77	(16,062)	(8,059)
Nahant	73	20	109	22	219	36	36	110
Natick	2	1	0	0	0	0	(2)	0
Needham	9	3	48	3	49	2	39	1
Newington	5	1	9	1	38	1	4	29
Newton	208	18	6	5	124	6	(202)	118
North Andover	0	0	0	0	72	1	0	72
Norton	2	2	0	0	3	1	(2)	3
Norwell	2	1	1	1	3	2	(1)	2
Norwood	2	1	0	0	0	0	(2)	0
Peabody	29	10	18	2	24	4	(11)	6
Pembroke	3	1	0	0	0	0	(3)	0
Pepperell	0	0	0	0	1	1	0	1
Princeton	0	0	0	0	1	1	0	1
Quincy	7	6	10	9	12	5	3	2
Randolph	3	3	0	0	0	0	(3)	0
Reading	1	1	3	2	47	1	2	44
Revere	291	95	50	25	12,389	29	(241)	12,339

Table H-16 Noise Complaint Line Summary (Continued)

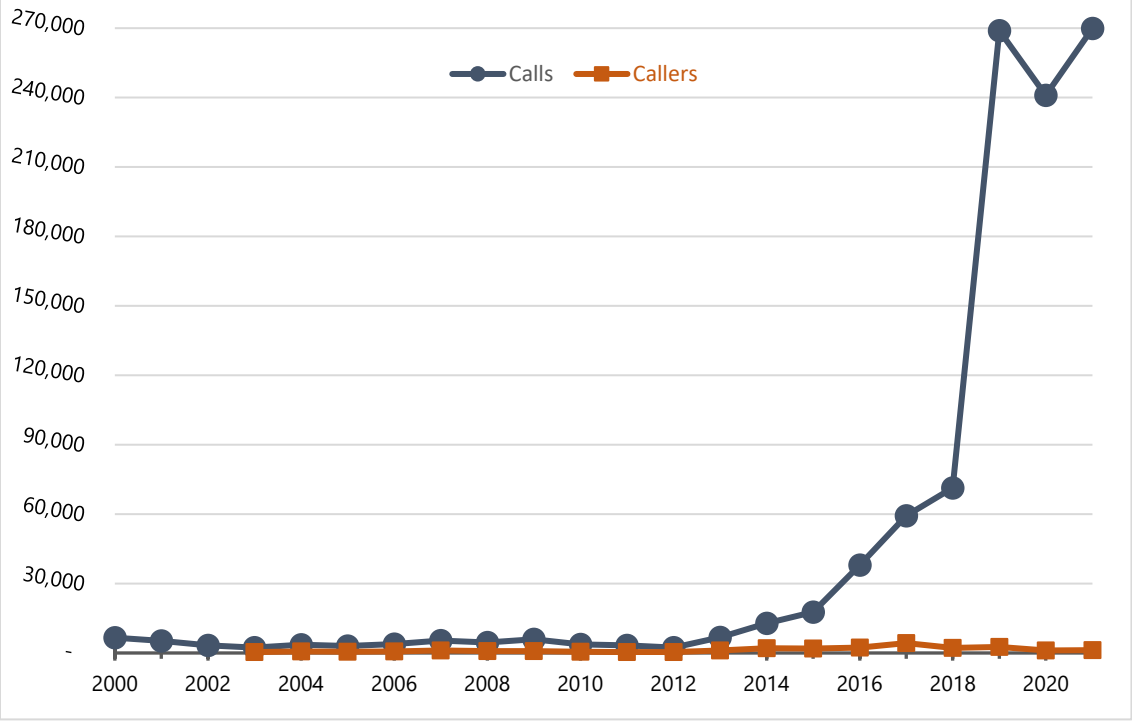
Town Name	2019 Calls	2019 Callers	2020 Calls	2020 Callers	2021 Calls	2021 Callers	Change in number of calls, 2019 to 2020	Change in number of calls, 2020 to 2021
Milton	41,575	219	25,513	97	17,454	77	(16,062)	(8,059)
Nahant	73	20	109	22	219	36	36	110
Natick	2	1	0	0	0	0	(2)	0
Needham	9	3	48	3	49	2	39	1
Newington	5	1	9	1	38	1	4	29
Newton	208	18	6	5	124	6	(202)	118
North Andover	0	0	0	0	72	1	0	72
Norton	2	2	0	0	3	1	(2)	3
Norwell	2	1	1	1	3	2	(1)	2
Norwood	2	1	0	0	0	0	(2)	0
Peabody	29	10	18	2	24	4	(11)	6
Pembroke	3	1	0	0	0	0	(3)	0
Pepperell	0	0	0	0	1	1	0	1
Princeton	0	0	0	0	1	1	0	1
Quincy	7	6	10	9	12	5	3	2
Randolph	3	3	0	0	0	0	(3)	0
Reading	1	1	3	2	47	1	2	44
Revere	291	95	50	25	12,389	29	(241)	12,339
Roslindale	2,975	78	895	30	4,157	40	(2,080)	3,262
Roxbury	5,151	24	1,448	11	3,548	21	(3,703)	2,100
Salem	82	16	198	4	176	8	116	(22)
Saugus	1	1	2	2	2	2	1	0
Scituate	946	5	2	2	0	0	(944)	(2)
Sharon	56	2	0	0	0	0	(56)	0
Somerville	28,070	229	26,737	73	26,565	108	(1,333)	(172)
South Boston	448	48	31	14	53	27	(417)	22
South End	5,309	27	3,144	20	359	14	(2,165)	(2,785)
Stoneham	3	3	5	2	2	1	2	(3)
Stoughton	65	1	6	1	23	1	(59)	17
Sudbury	21	2	2	1	5	2	(19)	3
Swampscott	8	6	15	5	24	15	7	9
Tewksbury	0	0	0	0	1	1	0	1
Topsfield	33	2	17	1	6	1	(16)	(11)
Wakefield	23	2	2	1	6	2	(21)	4
Waltham	3	3	1	1	1	1	(2)	0
Watertown	3,709	28	2,464	11	2,710	18	(1,245)	246
Wellesley	0	0	0	0	1	1	0	1
Wenham	537	5	72	3	39	2	(465)	(33)

Table H-16 Noise Complaint Line Summary (Continued)

	2019		2020		2021			
Town Name	**Calls**	**Callers**	**Calls**	**Callers**	**Calls**	**Callers**	**Change in number of calls, 2019 to 2020**	**Change in number of calls, 2020 to 2021**
West Newton	0	0	63	1	0	0	63	(63)
West Roxbury	5,239	27	1,715	10	1,097	11	(3,524)	(618)
Weston	0	0	0	0	1	1	0	1
Westwood	192	2	2	1	0	0	(190)	(2)
Westford	0	0	39	1	9	1	39	(30)
Weymouth	152	7	84	6	183	4	(68)	99
Wilmington	2	1	0	0	0	0	(2)	0
Winchester	9,143	15	14,657	16	15,329	19	5,514	672
Winthrop	8,121	201	13,861	76	54,166	85	5,740	40,305
Woburn	387	8	304	7	846	9	(83)	542
Worcester	0	0	1	1	0	0	1	(1)
Total	**268,929**	**2,669**	**240,951**	**1,037**	**269,867**	**1,204**	**(27,978)**	**28,916**

Source: Massport, HMMH 2022.
Note: Negative numbers are shown in parentheses ( ).

Figure H-13 Noise Complaint Line Calls and Callers by Year



Source: Massport and HMMH, 2022.

Flight Track Monitoring Report

As part of its ongoing commitment to mitigate noise at Logan Airport, Massport has undertaken evaluating the flight tracks of turbojet aircraft engaged in the implementation of established FAA noise abatement procedures. As is true for any airport operator, however, Massport has no authority to control where individual aircraft fly. That remains the responsibility of FAA, while the individual pilots are responsible for safely executing FAA's instructions. The flight procedures, which are used by the Air Traffic Control (ATC) staff at Boston Tower to achieve desired noise abatement tracks, are contained in FAA's Tower Order (BOS TWR 7040.1).

Since 2002, Massport has prepared annual reports for flight track monitoring. Prior to 2002, Massport had issued semi-annual reports, an outgrowth of the Flight Track Monitoring Program study. That study was contained in the *Generic Environmental Impact Report* filed with Massachusetts Environmental Policy Act (MEPA) in July 1996 and was the subject of two Community Working Group workshops in September and October 1996. The annual flight track monitoring reports are published in Appendix H, *Noise Abatement* in the annual EDR or ESPR. The information for 2019 is repeated in this report for reference. The period covered by this *2020/2021 EDR* is January 1, 2020 through December 31, 2021, with each calendar year tabulated separately.

The purpose of the ongoing monitoring program is to identify any systematic changes in flight tracks that may occur and to reduce flight track dispersion, where appropriate.

FAA Air Traffic Control (ATC) Procedures

FAA Tower Order BOS TWR 7040.1 entitled "Noise Abatement" describes the series of noise abatement policies, rules, regulations, and the procedures to be followed by FAA air traffic controllers in meeting their designated responsibilities to be "a good neighbor, while meeting our operational objectives/ responsibilities to the National Airspace System." Section 7.a.3 of the Order, subtitled "Turbojet Departure Noise Abatement Procedures," states that all turbojet departures shall be issued the Standard Instrument Departure (SID) procedure appropriate for the departure runway. Logan Airport has ten published SIDs; nine area navigation (RNAV) SIDs and one conventional SID.

The conventional SID is for aircraft that are not equipped to fly RNAV procedures. The conventional SID uses terms such as "BOS 2 DME" to indicate where aircraft should turn. Here, BOS refers to an aid to navigation known as the BOSTON VORTAC, a radio beacon physically located on Logan Airport near the eastern shoreline between the ends of Runways 27 and 33L (see **Figure H-14**). DME refers to "Distance Measuring Equipment," a co-located aid to navigation that provides pilots with a cockpit display of the number of nautical miles that the aircraft is from the designated radio beacon. Thus, BOS 2 DME means an aircraft should be two nautical miles away from the BOS. Pilots are then "vectored" or assigned to fly a magnetic heading given by and at the discretion of FAA air traffic controller to maintain the safe separation of aircraft. All altitudes in feet listed below (unless otherwise noted) are in mean sea level (MSL) and i indicate the aircraft altitude used both by the pilot in the cockpit and the air traffic controller on the ground.

During 2010, several of the conventional-only (or radar vector) and RNAV procedures from the *Boston Logan Airport Noise Study Categorical Exclusion* (CATEX)[22] were implemented. Eight RNAV departure procedures from Logan Airport were implemented. These eight procedures are used by aircraft departing Runways 4R, 9, 15R, 22L, 22R, 27, and 33L (Runways 27 and 33L were added in 2014). These procedures primarily affected departures flying over the North and South shores and were designed to increase the amount of jet traffic crossing back over land above 6,000 feet to minimize noise impacts to communities. A ninth RNAV procedure, which is used by Runway 27, has been modified several times.

Figure H-14 presents the gates used in the analysis for the Flight Track Monitoring Report. These gates are virtual vertical planes, which are used in the analysis to capture the aircraft flight paths. The gates are defined using a geographic coordinate for each end of the gate along with a floor and a ceiling altitude. The analysis captures the direction of the flights (in or out of the gate). The edges of each gate in **Figure H-14** point in the direction that the aircraft is coming from. The gate analysis information is used to evaluate the performance of the flight procedures off each runway end.

The RNAV procedures are still captured by the original flight track monitoring gates. Traffic crossing over the North Shore passes through the Revere, Swampscott and Marblehead Gates and traffic passing over the South Shore passes through the Hull 2, Hull 3, and Cohasset Gates. Turbojets departing Runway 27 on the RNAV pass through the Runway 27 gates and the Runway 33L RNAV flight tracks pass between (rather than through) the Somerville and Everett gates. The following pages present the jet aircraft gate crossing data by departure runway.

22 Federal Aviation Administration (FAA) *Boston Logan Airport Noise Study Categorical Exclusion Record of Decision* (CATEX ROD), Issued October 16, 2007.

Figure H-14 Logan Airport Flight Track Monitor Gates

Statistical Analyses of Flight Tracks - Runway 4R

Jet aircraft departures from Runway 4R remain on runway heading until 4DME and then turn right, crossing the Nahant causeway. They gain altitude over the water, and then, as needed, turn to cross the shoreline and proceed to their destinations. The Nahant Gate (shown in **Figure H- 14**) monitors aircraft after the first turn at 4 DME. The Swampscott and Marblehead Gates monitor northbound shoreline crossings, while the Hull 2, Hull 3, and Cohasset Gates monitor southbound shoreline crossings.

Tables H-17a, H-17b and H-17c show that Runway 4R departures for 2020 and 2021 were concentrated, with more than 99 percent "over the Causeway," and the remainder split between the north and south ends of the gate.

Table H-17a Runway 4R Nahant Gate Summary for 2019

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North End of Gate	25	0.4%
Over Causeway	6,794	99.5%
South End of Gate	7	0.1%
Total	**6,826**	**100.0%**

Source: Massport, HMMH 2020

Table H-17b Runway 4R Nahant Gate Summary for 2020

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North End of Gate	9	0.2%
Over Causeway	4,505	99.5%
South End of Gate	12	0.3%
Total	**4,526**	**100.0%**

Source: Massport, HMMH 2022

Table H-17c Runway 4R Nahant Gate Summary for 2021

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North End of Gate	16	0.3%
Over Causeway	4,566	99.3%
South End of Gate	16	0.3%
Total	**4,598**	**100.0%**

Source: Massport, HMMH 2022

Tables H-18a, H-18b and **H-18c** show how many of the shoreline crossings from Runway 4R were above 6,000 feet. For 2019, 94.5 percent of the flights were above 6,000 feet compared to almost 98 percent in 2020 and 96.5 percent in 2021. The Swampscott gate had the lowest percent of flights above 6,000 feet due to its proximity to the Nahant gate; aircraft crossing the Swampscott gate make an immediate left turn after crossing the Nahant causeway. Generally, less than 20 percent of Swampscott gate crossings are above 6,000 feet; in 2020, it was 38 percent. Crossings of the other four shoreline gates achieved altitudes over 6,000 feet over 98 percent of the time in 2020 and 2021.

Table H-18a Runway 4R Shoreline Crossings Above 6,000 Feet for 2019

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	211	28	13.3%
Marblehead Gate	2,716	2,652	97.6%
Hull 2 Gate	355	355	100.0%
Hull 3 Gate	865	865	100.0%
Cohasset Gate	347	346	99.7%
Total	**4,494**	**4,246**	**94.5%**

Source: Massport, HMMH 2020.

Table H-18b Runway 4R Shoreline Crossings Above 6,000 Feet for 2020

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	52	20	38.5%
Marblehead Gate	1,438	1,410	98.1%
Hull 2 Gate	260	259	99.6%
Hull 3 Gate	1,029	1,025	99.6%
Cohasset Gate	135	135	100.0%
Total	**2,914**	**2,849**	**97.8%**

Source: Massport, HMMH 2022.

Table H-18c Runway 4R Shoreline Crossings Above 6,000 Feet for 2021

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	102	15	14.7%
Marblehead Gate	1,800	1,780	98.9%
Hull 2 Gate	247	247	100.0%
Hull 3 Gate	745	744	99.9%
Cohasset Gate	189	188	99.5%
Total	**3,083**	**2,974**	**96.5%**

Source: Massport, HMMH 2022.

Statistical Analyses of Flight Tracks - Runway 9

Jets departing from Runway 9 maintain runway heading and gain altitude before turning back to cross the shoreline and proceed to their destinations. The Winthrop 1 and Winthrop 2 gates (shown in **Figure H-14**) monitor early turns for departures off Runway 9. The Revere, Swampscott, or Marblehead gates monitor northbound shoreline crossings, while the Hull 2, Hull 3, or Cohasset gates monitor southbound shoreline crossings.

Tables H-19a, **H-19b**, and **H-19c** show how many tracks turned prior to the BOS 2 DME. Northbound turns before BOS 2 DME pass through the Winthrop 1 Gate. Southbound traffic would pass through the Winthrop 2 Gate. In 2019, there were a total of 79 such turns and in 2020 and 2021, 13 and 14 tracks crossed these gates respectively. The compliance rate for avoiding the early turns was 99.9 percent in 2019, 2020, and 2021.

Table H-19a Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2019

	Number of Tracks Through Gate	Percent Turning Before BOS 2 DME
Winthrop 1 Gate	66	0.1%
Winthrop 2 Gate	13	<0.1%
Neither gate	56,179	99.9%
Total	**56,258**	**100%**

Source: Massport, HMMH 2020

Table H-19b Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2020

	Number of Tracks Through Gate	Percent Turning Before BOS 2 DME
Winthrop 1 Gate	8	<0.1%
Winthrop 2 Gate	5	<0.1%
Neither gate	16,543	99.9%
Total	**16,556**	**100.0%**

Source: Massport, HMMH 2022

Table H-19c Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2021

	Number of Tracks Through Gate	Percent Turning Before BOS 2 DME
Winthrop 1 Gate	8	<0.1%
Winthrop 2 Gate	6	<0.1%
Neither gate	27,038	99.9%
Total	**27,052**	**100.0%**

Source: Massport, HMMH 2022

Tables H-20a, H-20b and **H-20c** indicate that over 99 percent of Runway 9 departures were above 6,000 feet when crossing the shoreline in 2020 and 2021, compared with 99.0 percent in 2019. In 2021, approximately 67 percent of aircraft departing Runway 9 that cross back over the shoreline did so over the South Shore, as opposed to about 33 percent over the North Shore. Those percentages are close to what was observed in 2019 and recent previous years. In 2020, the split was approximately 59 percent over the south shore and 41 percent over the north shore, with significantly lower traffic levels.

Table H-20a Runway 9 Shoreline Crossings Above 6,000 Feet for 2019

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	115	15	13.0%
Swampscott Gate	1,245	1,116	89.6%
Marblehead Gate	13,318	13,268	99.6%
Hull 2 Gate	2,836	2,824	99.6%
Hull 3 Gate	5,698	5,586	98.0%
Cohasset Gate	18,089	18,065	99.9%
Total	**41,301**	**40,874**	**99.0%**

Source: Massport, HMMH 2020

Note: totals in this table were erroneous as published in the *2018/2019 EDR*; data have been corrected here

Table H-20b Runway 9 Shoreline Crossings Above 6,000 Feet for 2020

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	11	9	81.8%
Swampscott Gate	307	307	100.0%
Marblehead Gate	4,296	4,291	99.9%
Hull 2 Gate	102	101	99.0%
Hull 3 Gate	1,642	1,615	98.4%
Cohasset Gate	4,778	4,773	99.9%
Total	**11,136**	**11,096**	**99.6%**

Source: Massport, HMMH 2021.

Table H-20c Runway 9 Shoreline Crossings Above 6,000 Feet for 2021

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	40	31	77.5%
Swampscott Gate	412	376	91.3%
Marblehead Gate	5,862	5,836	99.6%
Hull 2 Gate	1,510	1,500	99.3%
Hull 3 Gate	2,427	2,370	97.7%
Cohasset Gate	8,798	8,786	99.9%
Total	**19,049**	**18,899**	**99.2%**

Source: Massport, HMMH 2020.

Statistical Analyses of Flight Tracks - Runway 15R

After takeoff, Runway 15R departures turn left approximately 30 degrees to avoid Hull, head out over Boston Harbor, and return over the shore through the Swampscott and Marblehead Gates (shown in **Figure H-14**) to the north, or through the Hull 2, Hull 3, and Cohasset Gates to the south. Massport uses the Hull 1 Gate to monitor departures from Runways 22R and 22L as well as from Runway 15R as they make their initial turn over Boston Harbor. The initial turn and success rate in avoidance of Hull overflights is in **Tables H-21a, H-21b** and **H-21c**. The percent of tracks from Runway 15R crossing north of the Hull peninsula as they passed through the Hull 1 Gate remained above 99 percent for 2020 and 2021.

Table H-21a Runways 15R Hull 1 Gate Summary for 2019

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	7,680	99.4%
Over Hull	44	0.6%
Total	**7,724**	**100%**

Source: Massport, HMMH 2020.

Table H-21b Runways 15R Hull 1 Gate Summary for 2020

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	5,830	99.8%
Over Hull	13	0.2%
Total	**5,843**	**100.0%**

Source: Massport, HMMH 2022.

Table H-21c Runways 15R Hull 1 Gate Summary for 2021

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	6,378	99.7%
Over Hull	22	0.3%
Total	**6,400**	**100.0%**

Source: Massport, HMMH 2022.

Tables H-22a, H-22b and **H-22c** indicate that over 99 percent of Runway 15R departures were above 6,000 feet when crossing the shoreline in both 2020 and 2021. The proportion of flights over 6,000 feet is usually lowest at the Hull 3 gate, due to that gate's proximity to the runway end. Very few departures from Runway 15R cross back over the Hull 2 gate, which is even closer to the runway end and requires a tight turn with rapid climb to achieve.

Table H-22a Runway 15R Shoreline Crossings Above 6,000 Feet for 2019

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	323	318	98.5%
Marblehead Gate	1,961	1,959	99.9%
Hull 2 Gate	2	1	50.0%
Hull 3 Gate	247	211	85.4%
Cohasset Gate	1,850	1,845	99.7%
Total	**4,383**	**4,334**	**98.9%**

Source: Massport, HMMH 2020.

Table H-22b Runway 15R Shoreline Crossings Above 6,000 Feet for 2020

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	190	189	99.5%
Marblehead Gate	1,290	1,289	99.9%
Hull 2 Gate	13	13	100.0%
Hull 3 Gate	308	297	96.4%
Cohasset Gate	2,062	2,061	100.0%
Total	**3,863**	**3,849**	**99.6%**

Source: Massport, HMMH 2022.

Table H-22c Runway 15R Shoreline Crossings Above 6,000 Feet for 2021

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	133	132	99.2%
Marblehead Gate	1,401	1,401	100.0%
Hull 2 Gate	16	16	100.0%
Hull 3 Gate	322	299	92.9%
Cohasset Gate	2,175	2,174	100.0%
Total	**4,047**	**4,022**	**99.4%**

Source: Massport, HMMH 2022.

Statistical Analyses of Flight Tracks - Runways 22R and 22L

Jet aircraft departures from Runways 22R and 22L make an immediate left turn. They gain altitude over the water, and then, as needed, turn to cross the shoreline and proceed to their destinations. The Squantum 2 and Hull 1 Gates (shown in **Figure H-14**) are used to monitor the turn to 140 degrees over Boston Harbor and then passage north of Hull. The shoreline gates are used to monitor shoreline crossings, as described for Runways 4R, 9, and 15R.

Tables H-23a, H-23b and **H-23c** show the dispersion of the jet departures from Runways 22R and 22L as they pass through the Squantum 2 Gate. The first segment of the 27,000-foot wide gate is the northernmost segment and is primarily over Boston Harbor. The subsequent segments extend southward toward Quincy. The percentage of tracks passing through the first two segments of this gate, representing compliance with the noise abatement procedures, is consistently about 93 percent.

Table H-23a Runways 22R and 22L Squantum 2 Gate[1] Summary for 2019

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	1,496	2.7%
12,000 - 14,000 ft	49,460	90.4%
14,000 - 21,000 ft	3,744	6.8%
21,000 - 27,000 ft	23	0.0%
Total	**54,723**	**100%**

Source: Massport, HMMH 2020.

1. The 27,000-foot wide Squantum 2 Gate is divided into four segments, identified in this table by distance from the northernmost point.

Table H-23b Runways 22R and 22L Squantum 2 Gate[1] Summary for 2020

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	790	2.6%
12,000 - 14,000 ft	26,983	90.0%
14,000 - 21,000 ft	2,173	7.2%
21,000 - 27,000 ft	28	0.1%
Total	**29,974**	**100.0%**

Source: Massport, HMMH 2022.

1 The 27,000-foot wide Squantum 2 Gate is divided into four segments, identified in this table by distance from the northernmost point.

Table H-23c Runways 22R and 22L Squantum 2 Gate[1] Summary for 2021

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	1,336	3.8%
12,000 - 14,000 ft	32,040	90.5%
14,000 - 21,000 ft	1,997	5.6%
21,000 - 27,000 ft	23	0.1%
Total	**35,396**	**100.0%**

Source: Massport, HMMH 2022.

1 The 27,000-foot wide Squantum 2 Gate is divided into four segments, identified in this table by distance from the northernmost point.

Departures from Runways 22R and 22L Massport are also monitored by Hull 1 Gate as they make their initial turn over Boston Harbor. **Tables H-24a**, **H-24b** and **H-24c** show that the percent of tracks crossing north of the Hull peninsula as they passed through the Hull 1 Gate is consistently about 99 percent.

Table H-24a Runways 22R, and 22L Hull 1 Gate Summary for 2019

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	54,073	98.9%
Over Hull	598	1.1%
Total	**54,671**	**100%**

Source: Massport, HMMH 2020.

Table H-24b Runways 22R, and 22L Hull 1 Gate Summary for 2020

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	29,627	99.1%
Over Hull	280	0.9%
Total	**29,907**	**100.0%**

Source: Massport, HMMH 2022.

Table H-24c Runways 22R, and 22L Hull 1 Gate Summary for 2021

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	34,914	98.8%
Over Hull	409	1.2%
Total	**35,323**	**100.0%**

Source: Massport, HMMH 2022.

Tables H-25a, **H-25b** and **H-25c** indicate the percent of Runway 22R and 22L departures that were above 6,000 feet when crossing the shoreline. Combined compliance for all the gates was 99.7 percent or better for all three years shown. The Hull 2 gate, closest to the Airport on the south shore, had the fewest crossings and also the lowest compliance rate.

Table H-25a Runways 22R and 22L Shoreline Crossings Above 6,000 Feet for 2019

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	96	96	100.0%
Swampscott Gate	2,017	2,017	100.0%
Marblehead Gate	13,237	13,233	100.0%
Hull 2 Gate	44	40	90.9%
Hull 3 Gate	3,560	3,484	97.9%
Cohasset Gate	19,402	19,395	100.0%
Total	**38,356**	**38,265**	**99.8%**

Source: Massport, HMMH 2020.

Table H-25b Runways 22R and 22L Shoreline Crossings Above 6,000 Feet for 2020

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	105	105	100.0%
Swampscott Gate	1,004	994	99.0%
Marblehead Gate	6,855	6,846	99.9%
Hull 2 Gate	24	23	95.8%
Hull 3 Gate	306	306	100.0%
Cohasset Gate	10,695	10,695	100.0%
Total	**18,989**	**18,969**	**99.9%**

Source: Massport, HMMH 2022.

Table H-25c Runways 22R and 22L Shoreline Crossings Above 6,000 Feet for 2021

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	98	97	99.0%
Swampscott Gate	890	884	99.3%
Marblehead Gate	8,073	8,069	100.0%
Hull 2 Gate	25	20	80.0%
Hull 3 Gate	1,823	1,774	97.3%
Cohasset Gate	13,272	13,266	100.0%
Total	**24,181**	**24,110**	**99.7%**

Source: Massport, HMMH 2022.

Statistical Analyses of Flight Tracks - Runway 27

On September 15, 1996, FAA implemented a new departure procedure for Runway 27 called the WYLYY RNAV procedure. In accordance with the provisions of the ROD issued for the Runway 27 Environmental Impact Statement, Massport has been providing on-going radar flight track data and analysis to FAA with respect to the procedure.

In 2012, for the first time since 1997 when flight track monitoring began, each gate (Gates A through E) averaged over 68 percent for every month in which the Airport had all runways open and for the annual average. The percent of flight tracks through all gates (a number tracked but not required per the 1996 ROD) rounded up to 68 percent for the last two months of 2011 and continued for all of 2012. FAA had discussed these data internally and concluded that acceptable flight track dispersion had been achieved and that no subsequent action by FAA is required per the 1996 ROD requirements.[23]

Massport continues to provide **Tables H-26a, H-26b** and **H-26c** in the subsequent annual reports. **Table H-26a** presents the conformance results for the Runway 27 corridor for 2019 and **Tables H-26b** and **H-26c** for 2020 and 2021 respectively. Gate A is closest to the Airport, with each subsequently labeled gate further from the runway. The gates increase in width as the distance is increased along the flight path, together forming a noise abatement corridor. A consistent percentage of traffic through each gate means that flights are not entering the corridor late or exiting the corridor too early. The average percentage of tracks through the entire corridor was 85.6 percent in 2019,[24] 87.3 percent in 2020, and 82.5 percent in 2021. The average percent through each gate went from 93.3 percent in 2019 to 94.3 percent in 2020 and 90.5 percent in 2021.

Table H-26a Runway 27 Corridor Percent of Tracks Through Each Gate for 2019

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A	Gate B	Gate C	Gate D	Gate E	Average Percent Through Each Gate
				1,400[1]	2,200[1]	2,900[1]	4,700[1]	6,300[1]	
January	2,221	1,781	80.2%	1,823	1,969	2,004	2,018	2,012	88.5%
February	2,390	2,124	88.9%	2,177	2,315	2,360	2,364	2,352	96.8%
March	1,326	1,180	89.0%	1,208	1,290	1,314	1,317	1,307	97.1%
April	1,919	1,658	86.4%	1,705	1,831	1,881	1,896	1,884	95.9%
May	1,479	1,161	78.5%	1,195	1,268	1,293	1,304	1,298	86.0%
June	1,273	1,090	85.6%	1,117	1,196	1,210	1,219	1,211	93.5%
July	1,321	1,203	91.1%	1,230	1,278	1,300	1,305	1,292	97.0%
August	1,454	1,175	80.8%	1,210	1,267	1,284	1,292	1,276	87.1%
September	1,946	1,750	89.9%	1,793	1,886	1,917	1,931	1,917	97.1%
October	1,454	1,307	89.9%	1,346	1,411	1,434	1,431	1,419	96.9%
November	2,886	2,411	83.5%	2,437	2,639	2,682	2,698	2,691	91.1%
December	2,541	2,176	85.6%	2,217	2,371	2,421	2,435	2,426	93.4%
Total	**22,210**	**19,016**	**85.6%**	**19,458**	**20,721**	**21,100**	**21,210**	**21,085**	**93.3%**

Source: Massport, HMMH 2022

Note: Gate counts in this table were reported correctly in the *2018/2019 EDR*, but the total departures from Runway 27 were in error and thus reported percentages were erroneous. Data has been corrected here.

23 Logan Airport Runway 27 Advisory Committee Meeting - January 23, 2012 meeting minutes.

24 The percentage of tracks through the entire corridor was erroneously reported in the 2018/2019 EDR as 86.9 percent in 2018 instead of the actual 83.7 percent and as 89.2 percent in 2019 instead of the actual 85.6 percent. The average percent through each gate in 2018 was 92.9 and in 2019 was 93.3 (erroneously reported as over 98 percent each).

Table H-26b Runway 27 Corridor Percent of Tracks Through Each Gate for 2020

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A	Gate B	Gate C	Gate D	Gate E	Average Percent Through Each Gate
				1,400[1]	2,200[1]	2,900[1]	4,700[1]	6,300[1]	
January	2,561	2,289	89.4%	2,330	2,506	2,540	2,556	2,539	97.4%
February	2,104	1,729	82.2%	1,796	1,873	1,895	1,892	1,871	88.7%
March	2,054	1,843	89.7%	1,892	1,998	2,026	2,029	2,015	97.0%
April	657	574	87.4%	594	627	639	646	643	95.9%
May	249	221	88.8%	225	237	239	243	242	95.3%
June	-	-	-	-	-	-	-	-	
July	-	-	-	-	-	-	-	-	
August	574	474	82.6%	484	501	512	515	512	87.9%
September	294	220	74.8%	227	234	235	239	238	79.8%
October	603	540	89.6%	552	586	591	593	594	96.7%
November	993	919	92.5%	944	964	976	984	978	97.6%
December	914	802	87.7%	830	856	871	877	870	94.2%
Total	**11,003**	**9,611**	**87.3%**	**9,874**	**10,382**	**10,524**	**10,574**	**10,502**	**94.3%**

Source: Massport, HMMH 2022
Note: Runway 9-27 was closed from late May until mid-August in 2020 for a runway safety improvement project

Table H-26c Runway 27 Corridor Percent of Tracks Through Each Gate for 2021

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A	Gate B	Gate C	Gate D	Gate E	Average Percent Through Each Gate
				1,400[1]	2,200[1]	2,900[1]	4,700[1]	6,300[1]	
January	499	456	91.4%	469	477	491	495	490	97.1%
February	821	752	91.6%	772	793	811	813	807	97.3%
March	1,244	1,116	89.7%	1,163	1,190	1,216	1,224	1,216	96.6%
April	1,292	1,080	83.6%	1,099	1,148	1,161	1,168	1,166	88.9%
May	1,169	991	84.8%	1,024	1,056	1,076	1,080	1,071	90.8%
June	734	660	89.9%	678	710	725	730	720	97.1%
July	1,142	906	79.3%	949	997	1,009	1,003	980	86.5%
August	838	571	68.1%	590	598	603	605	594	71.4%
September	1,361	1,096	80.5%	1,118	1,165	1,175	1,179	1,166	85.3%
October	1,777	1,577	88.7%	1,621	1,716	1,749	1,752	1,729	96.4%
November	2,589	2,235	86.3%	2,271	2,398	2,426	2,432	2,415	92.3%
December	1,988	1,304	65.6%	1,324	1,490	1,896	1,981	1,972	87.2%
Total	**15,454**	**12,744**	**82.5%**	**13,078**	**13,738**	**14,338**	**14,462**	**14,326**	**90.5%**

Source: Massport, HMMH 2022

Statistical Analyses of Flight Tracks - Runway 33L

Jets departing from Runway 33L fly in a corridor along the north side of the Mystic River until 5 DME or reaching an altitude of 3,000 feet and then turn on course to their destinations. The Somerville and Everett Gates (shown in **Figure H-14**) extend from BOS 2 DME to BOS 5 DME and are used to monitor the departure procedure for Runway 33L. Early turns to the left would pass through the Somerville Gate below 3,000 feet. Early turns to the right would pass through the Everett Gate below 3,000 feet.

Tables H-27a, **H-27b** and **H-27c** indicate that the percentage of tracks below 3,000 feet turning before BOS 5 DME decreased from 1.9 percent in 2019 to 1.3 percent in 2020, then increased to 2.5 percent in 2021. The portion of flights complying with the prescribed departure procedure in 2019 was 98.1, in 2020 was 98.7 percent, and in 2021 was 97.5 percent.

Table H-27a Runway 33L Gates – Early Turns Below 3,000 Feet for 2019

	Number of Tracks Through Gate	Number Through Gate Above 3,000 ft	Number Trough Gate Below 3,000 ft	Percentage of Departures Turning Early
Everett Gate	251	40	211	0.6%
Somerville Gate	596	97	499	1.4%
Neither gate	35,673			
Total	**36,520**	**137**	**710**	**1.9%**

Source: Massport, HMMH 2021.

Table H-27b Runway 33L Gates – Early Turns Below 3,000 Feet for 2020

	Number of Tracks Through Gate	Number Through Gate Above 3,000 ft	Number of Tracks Trough Gate Below 3,000 ft	Percentage of Departures Turning Early
Everett Gate	91	29	62	0.3%
Somerville Gate	240	59	181	1.0%
Neither gate	18,139			
Total	**18,470**	**88**	**243**	**1.3%**

Source: Massport, HMMH 2021.

Table H-27c Runway 33L Gates – Early Turns Below 3,000 Feet for 2021

	Number of Tracks Through Gate	Number Through Gate Above 3,000 ft	Number of Tracks Trough Gate Below 3,000 ft	Percentage of Departures Turning Early
Everett Gate	108	18	90	0.4%
Somerville Gate	580	85	495	2.1%
Neither gate	22,863			
Total	**23,551**	**103**	**585**	**2.5%**

Source: Massport, HMMH 2021.

2020 and 2021 DNL Levels for Census Block Group Locations

Table H-28 reports the DNL value for each Census block group down to DNL 50 dB, computed with AEDT for 2020 and 2021. A Census Block Group represents the outer limits of a group of US Census Blocks. The Average Block DNL provided below is the arithmetic average of the DNL modeled at each US Census Block in that group. The DNL at centroid represents the DNL modeled at the geographic center of the US Census Block Group.

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	Name	Population	Housing units	Average Block DNL	DNL at centroid	Average Block DNL	DNL at centroid
250250303021	Boston	747	278	49.9	49.6	49.8	49.5
250250304001	Boston	191	116	50.5	50.3	50.5	50.3
250250304002	Boston	616	402	49.7	49.8	49.8	49.8
250250304004	Boston	551	325	50.7	50.5	50.6	50.5
250250305001	Boston	379	243	50.8	50.4	50.9	50.5
250250305002	Boston	671	434	50.3	50.4	50.4	50.4
250250305003	Boston	216	144	49.9	50.1	50.0	50.2
250250402001	Boston	69	44	50.4	50.6	50.8	51.0
250250402002	Boston	262	79	49.5	49.5	49.8	49.8
250250403001	Boston	238	108	49.5	49.5	49.9	49.9
250250408011	Boston	681	338	50.0	50.0	50.3	50.4
250250408013	Boston	1517	967	50.2	51.0	50.6	51.3
250250501011	Boston	280	83	60.2	59.0	61.2	59.9
250250501012	Boston	1259	596	56.6	56.3	57.2	56.8
250250501013	Boston	1036	380	57.7	58.4	58.4	59.2
250250502001	Boston	915	349	56.9	57.1	57.5	57.8
250250502002	Boston	905	414	55.8	56.3	56.4	57.0
250250503001	Boston	885	555	54.2	53.6	54.6	54.0
250250503002	Boston	413	137	53.3	53.2	53.6	53.6
250250503003	Boston	841	654	53.2	53.1	53.4	53.3
250250504001	Boston	81	21	54.3	54.1	54.6	54.4
250250504002	Boston	115	64	54.6	54.9	54.7	55.0
250250505001	Boston	1648	774	56.5	56.5	56.9	56.9
250250506001	Boston	92	30	55.4	55.5	56.0	56.1
250250506002	Boston	516	224	54.6	55.1	55.0	55.5
250250507001	Boston	1403	517	56.6	56.7	57.3	57.4
250250507002	Boston	994	350	58.3	58.3	59.1	59.2
250250507003	Boston	659	244	59.0	59.5	59.9	60.4
250250509011	Boston	906	316	63.3	64.4	64.8	65.9
250250509012	Boston	1003	364	60.9	61.7	62.2	63.2

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**	**Average Block DNL**	**DNL at centroid**
250250509013	Boston	396	111	62.3	63.0	63.8	64.6
250250510001	Boston	1464	622	61.0	60.7	61.6	61.3
250250510002	Boston	1039	482	56.0	55.0	56.3	55.2
250250510003	Boston	695	283	59.8	59.8	60.6	60.5
250250511011	Boston	988	381	56.8	55.6	57.0	55.9
250250511012	Boston	726	300	54.8	54.4	54.9	54.5
250250511013	Boston	957	337	60.0	60.2	60.4	60.7
250250511014	Boston	379	108	59.6	54.8	60.2	55.1
250250512002	Boston	882	386	57.4	57.0	57.5	57.0
250250512003	Boston	48	26	55.8	56.2	55.8	56.2
250250601011	Boston	461	216	57.1	57.8	56.9	57.7
250250601012	Boston	304	174	57.5	56.5	57.7	56.5
250250601013	Boston	677	333	56.3	57.0	56.2	56.9
250250601014	Boston	485	296	55.1	55.8	55.2	55.9
250250602001	Boston	464	222	54.6	54.7	54.3	54.5
250250602002	Boston	851	434	53.1	53.3	53.1	53.3
250250603011	Boston	548	286	52.7	52.6	52.5	52.5
250250603012	Boston	429	187	52.0	52.1	52.0	52.1
250250603013	Boston	365	198	53.2	52.9	53.0	52.7
250250604001	Boston	763	395	51.5	51.7	51.5	51.7
250250604002	Boston	315	186	51.5	51.7	51.4	51.6
250250604003	Boston	311	156	51.2	51.2	51.1	51.1
250250604004	Boston	355	172	51.0	50.8	51.0	50.8
250250604005	Boston	212	108	51.7	51.6	51.7	51.6
250250605011	Boston	358	199	53.9	54.1	53.7	53.8
250250605013	Boston	346	207	52.8	53.0	52.8	52.9
250250605014	Boston	400	183	55.6	55.5	55.4	55.2
250250605015	Boston	272	130	53.0	53.0	53.0	53.0
250250606011	Boston	743	453	54.1	54.2	54.2	54.4
250250606031	Boston	942	786	58.3	58.8	58.4	59.0
250250606041	Boston	127	102	56.9	60.0	56.9	60.4
250250606042	Boston	432	532	55.5	55.6	55.5	55.6
250250607001	Boston	388	137	54.3	54.4	54.6	54.7
250250607002	Boston	129	46	53.9	54.0	54.1	54.3
250250608001	Boston	235	98	52.3	52.4	52.4	52.4
250250608002	Boston	517	265	52.4	52.5	52.5	52.6
250250608003	Boston	224	100	53.4	53.4	53.5	53.6

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**	**Average Block DNL**	**DNL at centroid**
250250608004	Boston	596	355	52.7	53.0	52.9	53.2
250250610001	Boston	327	166	51.4	51.4	51.5	51.5
250250610002	Boston	13	4	51.2	51.0	51.2	51.1
250250610003	Boston	474	233	50.9	51.0	51.1	51.1
250250611011	Boston	137	57	50.0	50.3	50.2	50.5
250250611012	Boston	556	261	49.6	49.5	49.8	49.7
250250612011	Boston	1186	625	51.7	52.6	51.9	52.9
250250612031	Boston	561	314	54.7	54.7	55.0	55.1
250250612041	Boston	343	256	55.7	55.3	56.0	55.6
250250701031	Boston	751	379	52.9	52.9	52.9	53.0
250250701041	Boston	303	164	53.0	53.7	53.0	53.7
250250701042	Boston	255	126	51.7	51.7	51.6	51.6
250250701043	Boston	522	346	50.4	50.4	50.3	50.3
250250702011	Boston	438	159	51.2	50.8	51.2	50.8
250250702012	Boston	1815	272	49.9	50.2	49.9	50.1
250250702021	Boston	2416	1374	51.4	51.3	51.4	51.3
250250702022	Boston	630	257	52.0	52.0	52.0	51.9
250250703021	Boston	155	91	49.9	49.7	49.9	49.7
250250704021	Boston	838	577	52.7	52.6	52.7	52.7
250250704022	Boston	565	363	51.1	51.1	51.1	51.1
250250705011	Boston	270	162	50.8	50.9	50.8	50.9
250250705012	Boston	495	266	51.5	51.5	51.5	51.5
250250705021	Boston	289	167	50.4	50.5	50.4	50.4
250250705022	Boston	813	352	50.2	50.2	50.2	50.1
250250706001	Boston	57	34	50.0	49.4	49.9	49.4
250250709021	Boston	569	329	50.1	49.5	50.1	49.5
250250709022	Boston	430	216	50.2	49.7	50.2	49.7
250250711011	Boston	563	229	51.4	51.7	51.5	51.8
250250711012	Boston	107	47	50.8	51.1	50.8	51.2
250250711014	Boston	547	292	52.1	52.0	52.3	52.1
250250712011	Boston	123	60	52.0	52.1	52.1	52.1
250250712012	Boston	687	367	52.9	52.9	53.0	53.1
250250712013	Boston	13	255	52.0	52.4	52.1	52.5
250250712014	Boston	396	181	51.7	51.5	51.7	51.5
250250801001	Boston	375	106	52.0	52.2	52.4	52.7
250250801002	Boston	171	65	51.5	51.4	51.9	51.8

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**	**Average Block DNL**	**DNL at centroid**
250250803001	Boston	424	180	51.3	51.4	51.5	51.7
250250803002	Boston	740	292	50.9	50.9	51.1	51.2
250250804011	Boston	475	237	50.4	50.5	50.4	50.6
250250805002	Boston	832	405	49.5	49.1	49.5	49.1
250250817002	Boston	445	223	50.5	50.5	50.9	50.9
250250817003	Boston	458	162	49.9	49.8	50.1	50.0
250250817004	Boston	514	196	49.9	49.9	50.1	50.0
250250817005	Boston	169	74	50.1	49.9	50.2	49.9
250250818001	Boston	211	84	51.0	51.0	51.4	51.3
250250818002	Boston	226	92	50.9	51.0	51.4	51.4
250250818003	Boston	87	21	50.6	50.5	51.1	51.0
250250819001	Boston	260	98	50.1	50.2	50.5	50.7
250250819002	Boston	166	66	49.7	49.9	50.0	50.3
250250819003	Boston	265	80	49.8	49.7	50.2	50.1
250250819004	Boston	781	309	49.5	49.6	49.9	50.0
250250820001	Boston	520	219	49.9	50.0	50.3	50.4
250250820002	Boston	421	194	50.0	50.0	50.5	50.5
250250820003	Boston	427	171	50.1	50.2	50.6	50.7
250250821001	Boston	612	225	49.6	49.5	50.0	50.0
250250821002	Boston	1234	485	49.2	49.2	49.6	49.7
250250821003	Boston	1356	638	49.8	49.8	50.3	50.3
250250903003	Boston	1081	391	49.3	49.4	49.7	49.7
250250904001	Boston	486	162	50.1	50.0	50.4	50.4
250250904002	Boston	407	177	50.3	49.8	50.7	50.1
250250904003	Boston	464	135	50.4	50.5	50.8	50.8
250250904004	Boston	397	157	50.9	50.8	51.4	51.3
250250906001	Boston	345	120	51.1	51.2	51.6	51.6
250250906002	Boston	721	255	51.2	51.3	51.6	51.7
250250907002	Boston	482	222	49.4	49.4	49.6	49.6
250250907004	Boston	190	90	51.1	51.0	51.4	51.2
250250909012	Boston	534	244	50.1	50.8	50.9	51.8
250250913001	Boston	541	184	49.3	49.2	49.5	49.4
250250913002	Boston	519	184	50.2	50.2	50.5	50.5
250250914002	Boston	354	135	49.4	49.2	49.6	49.5
250250921013	Boston	57	16	49.6	48.7	50.8	49.9
250251006011	Boston	204	87	50.9	48.9	52.3	50.3

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**	**Average Block DNL**	**DNL at centroid**
250251006031	Boston	491	175	53.6	53.3	55.1	54.7
250251006032	Boston	272	120	55.3	55.7	56.7	57.1
250251007001	Boston	396	179	49.9	51.3	51.3	52.7
250251007002	Boston	579	345	53.6	54.5	55.1	55.9
250251007003	Boston	146	52	54.3	53.2	55.7	54.7
250251007004	Boston	258	116	49.7	49.9	51.1	51.3
250251007005	Boston	198	82	48.8	49.1	50.1	50.5
250259816001	Boston	2	1	67.3	67.3	68.0	68.0
250251601022	Chelsea	1431	378	55.8	55.7	56.3	56.2
250251601024	Chelsea	40	9	56.6	56.5	57.1	57.0
250251601032	Chelsea	881	234	60.0	59.9	61.1	61.1
250251601033	Chelsea	303	164	57.1	57.6	57.7	58.2
250251601034	Chelsea	664	166	59.0	60.0	59.8	61.1
250251602001	Chelsea	717	185	57.7	57.5	58.7	58.5
250251602002	Chelsea	379	104	59.0	58.8	60.2	60.0
250251602003	Chelsea	458	125	59.8	60.4	61.0	61.5
250251602004	Chelsea	182	59	59.4	59.9	60.6	61.0
250251603001	Chelsea	389	207	59.1	57.1	60.3	58.1
250251603002	Chelsea	1013	652	57.0	56.5	58.2	57.7
250251604001	Chelsea	258	94	59.1	59.4	60.2	60.5
250251604002	Chelsea	164	52	57.2	57.0	58.3	58.0
250251604003	Chelsea	489	255	53.5	53.9	54.0	54.4
250251604004	Chelsea	157	98	56.2	56.1	57.0	56.8
250251605011	Chelsea	1076	328	52.6	52.5	53.0	52.9
250251605012	Chelsea	960	279	53.0	53.0	53.3	53.3
250251605013	Chelsea	283	90	54.6	54.2	55.1	54.6
250251605014	Chelsea	582	333	53.1	53.2	53.5	53.5
250251605015	Chelsea	878	322	52.1	52.2	52.4	52.5
250251605021	Chelsea	429	132	53.4	52.4	53.7	52.7
250251605023	Chelsea	609	190	50.4	50.6	50.5	50.7
250251605024	Chelsea	194	54	50.6	50.4	50.7	50.5
250251605025	Chelsea	456	199	52.2	53.5	52.3	53.8
250251606011	Chelsea	222	10	51.0	50.9	51.1	51.0
250251606013	Chelsea	579	196	50.0	49.9	50.1	50.0
250251606014	Chelsea	540	195	50.7	50.7	50.8	50.9
250251606021	Chelsea	850	297	50.3	50.1	50.5	50.3

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**	**Average Block DNL**	**DNL at centroid**
250173423011	Everett	1460	513	49.7	49.4	50.1	49.7
250173423012	Everett	1782	625	50.4	50.3	50.8	50.7
250173423021	Everett	2003	710	51.4	51.5	51.8	51.9
250173423022	Everett	805	287	53.2	53.1	53.6	53.5
250173423023	Everett	1740	620	51.1	51.1	51.5	51.6
250173424011	Everett	2148	897	54.2	54.3	54.8	54.8
250173424012	Everett	1398	537	54.8	54.9	55.6	55.7
250173424013	Everett	1058	407	51.3	51.2	51.8	51.6
250173424021	Everett	1387	674	54.4	54.4	55.8	56.1
250173424022	Everett	1413	630	54.1	53.7	55.2	54.4
250173424023	Everett	842	402	54.9	55.1	55.6	55.8
250173424024	Everett	22	9	55.8	55.0	56.9	56.2
250173425011	Everett	2291	843	51.1	51.1	51.6	51.5
250173425012	Everett	2449	991	53.7	53.5	54.3	54.1
250173425021	Everett	1607	575	49.3	49.4	49.6	49.7
250173426001	Everett	1368	428	50.3	50.2	50.5	50.5
250173426002	Everett	1076	363	52.0	52.1	52.4	52.5
250173426003	Everett	2525	960	51.0	51.1	51.4	51.5
250235001011	Hull	1501	859	52.2	47.4	52.9	47.9
250235001012	Hull	775	463	49.2	48.4	49.6	48.8
250235001042	Hull	929	499	48.7	46.6	49.7	47.4
250092051001	Lynn	1434	538	49.2	49.9	50.0	50.7
250092051002	Lynn	1275	424	49.9	50.1	50.7	50.8
250092051003	Lynn	1074	364	51.7	51.9	52.4	52.6
250092051004	Lynn	1653	576	51.4	51.8	52.1	52.5
250092051005	Lynn	692	261	52.3	52.5	53.0	53.2
250092052001	Lynn	869	424	50.2	50.3	50.9	51.0
250092052002	Lynn	805	285	52.7	52.5	53.4	53.2
250092052003	Lynn	1607	577	52.5	52.6	53.3	53.3
250092052004	Lynn	1603	496	53.3	53.5	54.1	54.2
250092052005	Lynn	1041	390	50.1	52.4	50.7	53.1
250092055001	Lynn	2391	762	50.0	48.7	50.7	49.4
250092055002	Lynn	3109	1034	54.1	54.0	54.9	54.8
250092058001	Lynn	1124	364	49.7	49.8	50.3	50.5
250092058002	Lynn	1220	342	49.9	50.2	50.6	50.8
250092059001	Lynn	1952	581	49.7	49.8	50.4	50.5

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**	**Average Block DNL**	**DNL at centroid**
250092060001	Lynn	1630	478	53.6	53.8	54.4	54.6
250092060002	Lynn	2074	685	52.4	52.6	53.1	53.3
250092061001	Lynn	1998	795	53.8	54.3	54.6	55.1
250092061002	Lynn	2201	684	54.5	54.7	55.3	55.5
250092062001	Lynn	1352	361	52.2	52.3	53.0	53.1
250092062002	Lynn	2507	811	53.9	54.3	54.6	55.1
250092062003	Lynn	2020	578	52.9	52.4	53.7	53.2
250092063001	Lynn	1220	388	49.3	49.3	50.1	50.0
250092063002	Lynn	1137	376	51.1	51.3	51.9	52.1
250092063004	Lynn	839	258	50.0	50.3	50.7	51.1
250092068001	Lynn	1982	719	49.0	48.9	49.8	49.7
250092068002	Lynn	2443	1062	50.9	50.8	51.7	51.6
250092070001	Lynn	966	614	52.7	51.9	53.5	52.6
250092070002	Lynn	1323	440	55.2	55.3	55.9	56.0
250092071001	Lynn	1581	455	53.3	53.5	54.1	54.3
250092071002	Lynn	1176	326	54.5	54.8	55.3	55.5
250092071003	Lynn	1050	338	52.0	52.1	52.7	52.8
250092072001	Lynn	1443	409	54.8	56.5	55.5	57.3
250092072002	Lynn	1560	713	55.3	55.4	56.0	56.2
250173412002	Malden	1022	472	51.4	51.6	51.9	52.1
250173412003	Malden	937	369	51.1	51.2	51.6	51.7
250173412004	Malden	1737	736	50.3	50.4	50.6	50.8
250173412005	Malden	1076	392	49.6	49.6	50.0	49.9
250173414005	Malden	781	392	50.3	50.3	50.7	50.6
250173391011	Medford	1286	696	48.8	48.8	49.8	49.8
250173391013	Medford	1109	806	49.0	48.8	50.2	50.0
250173394002	Medford	666	266	47.9	47.8	49.5	49.4
250173395001	Medford	2982	600	48.7	48.8	50.4	50.6
250173395002	Medford	1214	555	49.4	49.4	50.9	50.9
250173395003	Medford	677	297	48.3	48.2	49.5	49.5
250173395004	Medford	789	309	48.5	48.5	49.9	49.9
250173396001	Medford	844	388	49.7	49.6	51.4	51.3
250173396002	Medford	892	377	49.8	49.8	51.5	51.5
250173396003	Medford	1000	450	49.5	49.6	51.0	51.1
250173396004	Medford	843	370	49.5	49.6	50.8	51.0
250173396005	Medford	897	373	49.2	49.3	50.3	50.3

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**	**Average Block DNL**	**DNL at centroid**
250173396006	Medford	978	435	49.0	49.1	49.9	50.0
250173397001	Medford	654	296	50.6	51.0	52.1	52.7
250173397002	Medford	1622	686	50.2	50.3	51.5	51.6
250173397003	Medford	753	354	50.4	50.4	52.1	52.1
250173397004	Medford	887	375	49.7	49.7	50.9	50.8
250173398021	Medford	1490	703	52.1	52.1	53.7	53.8
250173398022	Medford	680	253	50.2	50.3	51.5	51.6
250173398023	Medford	761	275	50.9	50.9	52.3	52.3
250173398024	Medford	2554	1420	51.3	51.8	52.8	53.3
250173398031	Medford	1043	620	52.9	53.2	54.5	54.8
250173398032	Medford	2340	1431	53.1	53.1	54.5	54.4
250173398041	Medford	695	265	52.5	52.6	54.2	54.2
250173398042	Medford	535	240	52.6	52.6	53.8	53.9
250173398043	Medford	1030	429	52.1	51.9	53.2	53.0
250173399001	Medford	1577	671	50.9	50.8	51.8	51.8
250173399002	Medford	943	382	50.4	50.3	51.5	51.4
250173399003	Medford	1073	459	50.4	50.4	51.0	51.0
250173399004	Medford	812	347	49.7	49.8	50.8	50.9
250173399005	Medford	922	382	49.9	49.9	50.7	50.7
250173400001	Medford	1108	461	49.8	49.8	50.4	50.4
250173400002	Medford	778	379	49.1	49.1	49.8	49.8
250173400003	Medford	704	304	49.4	49.4	50.3	50.3
250173401003	Medford	1535	639	49.6	49.7	50.0	50.0
250214161011	Milton	2162	737	50.1	51.0	51.6	52.5
250214161013	Milton	827	282	49.2	49.1	50.7	50.7
250214164002	Milton	1071	346	50.7	51.1	52.1	52.6
250214164003	Milton	1007	359	49.1	51.4	50.6	52.9
250214164005	Milton	815	311	50.5	52.3	52.0	53.8
250214164006	Milton	1122	395	49.9	53.0	51.4	54.5
250214172014	Quincy	808	428	49.2	50.2	50.6	51.7
250214173001	Quincy	3660	2357	49.4	51.0	50.6	52.3
250251705021	Revere	241	91	56.9	57.3	57.7	58.1
250251705022	Revere	954	643	53.4	55.8	54.1	56.5
250251705023	Revere	524	266	58.3	58.3	59.1	59.1
250251705031	Revere	1065	601	52.6	54.2	53.2	54.9
250251705041	Revere	115	39	54.0	54.3	54.6	55.0

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**	**Average Block DNL**	**DNL at centroid**
250251705042	Revere	335	106	51.2	50.5	51.7	50.9
250251707011	Revere	735	334	54.9	52.2	55.3	52.4
250251707012	Revere	829	345	57.5	59.5	58.1	60.2
250251707021	Revere	52	21	51.3	51.1	51.6	51.3
250251707022	Revere	1180	375	53.0	52.5	53.4	52.8
250251707023	Revere	650	217	49.7	49.9	49.8	50.1
250251707024	Revere	562	183	51.3	51.1	51.6	51.5
250251707025	Revere	371	194	52.2	53.0	52.6	53.5
250251708001	Revere	1054	391	62.4	61.1	63.1	61.9
250251708002	Revere	652	218	62.8	62.9	63.5	63.7
250251708003	Revere	643	259	59.5	61.4	60.1	62.1
250251708004	Revere	445	177	63.0	57.9	63.7	58.5
250092047011	Salem	1014	402	49.0	50.9	49.7	51.6
250173501051	Somerville	1181	530	50.7	50.9	51.7	51.9
250173501061	Somerville	1660	1006	50.5	50.6	51.3	51.3
250173501081	Somerville	2655	1049	49.7	49.6	50.6	50.5
250173501091	Somerville	2176	882	48.9	48.6	49.6	49.3
250173504001	Somerville	1054	397	49.1	49.2	50.6	50.8
250173504002	Somerville	1380	601	48.5	48.5	49.5	49.6
250173504005	Somerville	899	392	48.8	48.8	50.1	50.1
250173505001	Somerville	874	391	48.5	48.5	49.9	49.9
250173505002	Somerville	869	395	48.4	48.4	50.0	50.0
250173506001	Somerville	1779	9	48.9	48.9	50.6	50.6
250173506002	Somerville	984	391	48.4	48.4	50.2	50.2
250173506003	Somerville	743	241	48.3	48.3	50.0	50.0
250173506004	Somerville	1282	507	48.6	48.7	50.3	50.3
250173507011	Somerville	1109	466	48.0	48.0	49.8	49.8
250173507013	Somerville	843	468	47.8	47.8	49.6	49.6
250173508001	Somerville	1045	507	48.0	48.0	49.7	49.8
250173508002	Somerville	1031	461	48.1	48.1	49.6	49.6
250251801011	Winthrop	335	143	51.0	50.9	51.2	51.1
250251801013	Winthrop	208	90	51.7	52.3	51.7	52.3
250251801014	Winthrop	2020	879	52.7	52.8	52.9	52.8
250251802001	Winthrop	641	234	56.8	56.7	57.0	56.8
250251802002	Winthrop	362	143	54.4	54.3	54.5	54.4
250251802003	Winthrop	545	264	55.9	56.0	56.1	56.1

Table H-28 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2020 Block Group				2020		2021	
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**	**Average Block DNL**	**DNL at centroid**
250251802004	Winthrop	1028	499	59.0	58.9	59.1	59.0
250251803011	Winthrop	522	212	57.9	57.7	58.0	57.8
250251803012	Winthrop	754	331	58.4	58.1	58.9	58.6
250251803013	Winthrop	419	157	61.0	61.0	60.9	60.8
250251803014	Winthrop	651	265	59.1	59.6	59.3	59.7
250251804001	Winthrop	721	376	54.5	53.1	55.3	53.6
250251804002	Winthrop	299	118	55.7	55.3	56.2	55.7
250251805001	Winthrop	384	180	52.2	53.0	52.7	53.9
250251805002	Winthrop	344	145	60.5	59.8	62.1	61.3
250251805003	Winthrop	239	118	55.3	54.5	56.6	55.6
250251805004	Winthrop	389	185	61.5	62.6	63.2	64.5
250259813001	Winthrop	55	33	62.0	76.3	62.3	76.7

Source: HMMH, 2022.

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Air Quality/Emissions Reduction

This appendix provides the following detailed information and data tables in support of Chapter 7, *Air Quality/Emissions Reduction*:

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  - Table I-1 National Ambient Air Quality Standards (NAAQS)
- Sources of Airport Air Emissions
  - Table I-2 Airport-Related Sources of Air Emissions
  - Table I-3 Attainment, Nonattainment, and Maintenance Area Designations
- State Implementation Plans (SIPs)
- Aircraft Fleet and Operational Data Used in the Aviation Environment Design Tool (AEDT)
  - Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type
  - Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type
- Ground Service Equipment (GSE)/Auxiliary Power Unit (APU) Time-in-Mode (TIM) Survey
  - Table I-6 Ground Service Equipment (GSE)/Auxiliary Power Unit (APU) Time-in-Mode (TIM) (minutes)
- Ground Service Equipment (GSE)/Alternative Fuels Conversion
  - Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day)
- Motor Vehicle Emissions
  - Table I-8 MOVES 3.0.3 Sample Input File for 2020
  - Table I-9 MOVES 3.0.3 Sample Output File for 2020
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- Fuel Storage and Handling
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- Stationary Sources
  - Table I-13 Stationary Source Fuel Throughputs by Fuel Category (gallons)
- 1993 – 2009 Criteria Air Pollutant Emissions Inventories
  - Table I-14 Estimated Volatile Organic Compound (VOC) Emissions (kg/day) at Logan Airport 1993-2001
  - Table I-15 Estimated Volatile Organic Compounds (VOC) Emissions (kg/day) at Logan Airport 2002-2009
  - Table I-16 Estimated Nitrogen Oxide (NO_X) Emissions (kg/day) at Logan Airport 1993-2001
  - Table I-17 Estimated Nitrogen Oxide (NO_X) Emissions (kg/day) at Logan Airport 2002-2009
  - Table I-18 Estimated Carbon Monoxide (CO) Emissions (kg/day) at Logan Airport 1993-2001
  - Table I-19 Estimated Carbon Monoxide (CO) Emissions (kg/day) at Logan Airport 2002-2009
  - Table I-20 Estimated Particulate Matter (PM_{10}/$PM_{2.5}$) Emissions (kg/day) at Logan Airport 2005-2009
- Greenhouse Gas (GHG) Emissions Inventory for 2020 and 2021
  - Table I-21 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information for 2020 and 2021
  - Table I-22 Greenhouse Gas (GHG) Emission Factors for 2020
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  - Table I-24 Greenhouse Gas (GHG) Emissions (MT CO_2e) for 2020
  - Table I-25 Greenhouse Gas (GHG) Emissions (MT CO_2e) for 2021
  - Table I-26 Logan Airport Greenhouse Gas (GHG) Emissions Compared to Massachusetts Totals (MMT of CO_2e)
- 2007-2021 Greenhouse Gas (GHG) Emissions Inventories
  - Table I-27 Estimated Total Greenhouse Gas (GHG) Emissions (MMT of CO_2e) at Logan Airport – 2007 through 2021

Fundamentals of Air Quality

This section contains a general summary of air quality and air emissions with a particular emphasis on airport-related emissions where appropriate. This material is intended to supplement and provide background information for the materials contained in Chapter 7, *Air Quality/Emissions Reduction*.

Pollutant Types and Standards

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for a select group of "criteria air pollutants" designed to protect public health, the environment, and the quality of life from the detrimental effects of air pollution. Listed alphabetically, these pollutants are briefly described below:

- **Carbon monoxide (CO)** is a colorless, odorless, tasteless gas. It may temporarily accumulate, especially in cool, calm weather conditions, when fuel use reaches a peak and CO is chemically most stable due to the low temperatures. CO from natural sources usually dissipates quickly, posing no threat to human health. Transportation sources (e.g., motor vehicles), energy generation, and open burning are among the predominant anthropogenic (i.e., man-made) sources of CO.
- **Lead (Pb)** in the atmosphere is generated from industrial sources including waste oil and solid waste incineration, iron and steel production, lead smelting, and battery and lead manufacturing. The lead content of motor vehicle emissions, which was the major source of lead in the past, has significantly declined with the widespread use of unleaded fuel. Low-lead fuel used in some general aviation (GA) aircraft is still a source of airport-related lead.
- **Nitrogen dioxide (NO_2)**, nitric oxide (NO), and the nitrate radical (NO_3) are collectively called oxides of nitrogen (NO_X). These three compounds are interrelated, often changing from one form to another in chemical reactions, and NO_2 is the compound commonly measured for comparison to the NAAQS. NO_X is generally emitted as NO, which is oxidized to NO_2. The principal man-made source of NO_X is fuel combustion in motor vehicles and power plants – aircraft engines are also a source. Reactions of NO_X with other atmospheric chemicals can lead to formation of ozone (O_3) and acidic precipitation.
- **Ozone (O_3)** is a secondary pollutant, formed from daytime reactions of NO_X and volatile organic compounds (VOCs) in the presence of sunlight. VOCs, which are a subset of hydrocarbons (HC) and have no NAAQS, are released in industrial processes and from evaporation of gasoline and solvents. Sources of NO_X are discussed above.
- **Particulate matter (PM_{10}/$PM_{2.5}$)** comprises very small particles of dirt, dust, soot, or liquid droplets called aerosols. The NAAQS for PM_{10}/$PM_{2.5}$ is segregated by sizes (i.e., equal to or less than 10 and equal to or less than 2.5 microns as PM_{10} and $PM_{2.5}$, respectively). PM_{10}/$PM_{2.5}$ is formed as an exhaust product in the internal combustion engine or can be generated from the breakdown and dispersion of other solid materials (e.g., fugitive dust).
- **Sulfur oxides (SO_X)** are primarily composed of sulfur dioxide (SO_2) which is emitted in natural processes and by man-made sources such as combustion of sulfur-containing fuels and sulfuric acid manufacturing.

The NAAQS for these criteria air pollutants are subdivided into the Primary Standards (designed to protect human health) and the Secondary Standards (designed to protect the environment and human welfare) and are listed below in **Table I-1**. Exceedances of these values constitute violations of the NAAQS.

Table I-1 National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary/ Secondary	Averaging Time	Standard ppm	Standard µg/m³	Form
Carbon Monoxide (CO)	Primary	8 hours	9	10,000	Not to be exceeded more than once a year.
		1 hour	35	40,000	Not to be exceeded more than once a year.
Lead (Pb)	Primary and Secondary	Rolling 3 Month Average	—	0.15	Not to exceed this level.
Nitrogen Dioxide (NO_2)	Primary	1 hour	0.100	188	The 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm.
	Primary and Secondary	Annual	0.053	100	Not to exceed this level.
Ozone (O_3)	Primary and Secondary	8 hours[1]	0.070	—	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.
Particulate Matter with a diameter ≤10µm (PM_{10})	Primary and Secondary	24 hours	—	150	Not to be exceeded more than once a year on average over 3 years.
Particulate Matter with a diameter ≤2.5µm ($PM_{2.5}$)	Primary and Secondary	24 hours	—	35	The 3-year average of the 98th percentile for each population-oriented monitor within an area is not to exceed this level.
	Primary	Annual	—	12	The 3-year average of the weighted annual mean from single or multiple monitors within an area is not to exceed this level.
	Secondary	Annual	—	15	The 3-year average of the weighted annual mean from single or multiple monitors within an area is not to exceed this level.
Sulfur Dioxide (SO_2)	Primary	1 hour	0.075	196	The 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed this level.
	Secondary	3 hours	0.5	1,300	Not to be exceeded more than once a year.

Source: U.S. Environmental Protection Agency (EPA), "NAAQS Table," updated April 5, 2022. https://www.epa.gov/criteria-air-pollutants/naaqs-table.

Note: There are no NAAQS standards for NO_X. µg/m³ - micrograms per cubic meter; ppm - parts per million.

1 Final rule signed October 1, 2015, and effective December 28, 2015. A previous (2008) O_3 standard remains in effect in some areas.

Sources of Airport Air Emissions

Large metropolitan airports generate air emissions from the following general source categories: aircraft, auxiliary power unit (APUs), ground service equipment (GSE), motor vehicles traveling to, from, and moving about the airport; fuel storage and transfer facilities; a variety of stationary sources (e.g., steam boilers, back-up generators); an assortment of aircraft maintenance activities (e.g., painting, cleaning, repair); routine airfield, roadway, and building maintenance activities (e.g., painting, cleaning, repair); and periodic construction activities for new projects or improvements to existing facilities.

Table I-2 provides a summary listing of airport-related sources of air emissions, the associated pollutants, and their characteristics.

Table I-2 Airport-related Sources of Air Emissions

Sources	Emissions	Characteristics
Aircraft	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, and VOCs	Exhaust products of fuel combustion that vary depending on aircraft engine type, number of engines, power setting, and period of operation. Emissions are also emitted by an aircraft's auxiliary power unit (APU).
Motor vehicles	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, and VOCs	Exhaust products of fuel combustion from patron and employee traffic approaching, departing, and moving about the airport site. Emissions vary depending on vehicle type, distance traveled, operating speed, and ambient conditions.
Ground service equipment (GSE)	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, and VOCs	Exhaust products of fuel combustion from service trucks, tow tugs, belt loaders, and other portable equipment.
Fuel storage and handling	VOCs	Formed from the evaporation and vapor displacement of fuel from storage tanks and fuel handling facilities. Emissions vary with fuel usage, type of storage tank, refueling method, fuel type, vapor recovery, climate, and ambient temperature.
Stationary sources	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, and VOCs	Exhaust products of fossil fuel combustion from boilers dedicated to indoor heating requirements and emissions from incinerators used for waste reduction. Emissions are generally well controlled with operational techniques and post-burn collection methods. Sources include boilers and hot water generators, emergency generators, incinerators, paint booth and surface coating operations, welding operations, and firefighting facilities.
Construction Activities[1]	CO, NO_2, $PM_{10}/PM_{2.5}$, SO_2, and VOCs	Construction projects may have associated emissions from dust generated during excavation and land clearing, exhaust emissions from construction equipment and motor vehicles, and evaporative emissions from asphalt paving and painting. The amount of particulate emissions varies with the material type, the amount of area exposed, and meteorology. The construction of airport and airfield improvement projects at airports represents temporary sources of emissions.

Source: CMT, 2022.

Notes: CO - carbon monoxide; NO_2 - nitrogen dioxide; $PM_{10}/PM_{2.5}$, - particulate matter equal to or less than 10 microns in diameter (PM_{10}) and equal to or less than 2.5 microns in diameter ($PM_{2.5}$); SO_2 - sulfur dioxide; and VOC - volatile organic compounds.

1 Air emissions associated with construction activities at Logan Airport were not computed for the 2020 and 2021 analyses.

EPA, state, and local air quality agencies maintain outdoor air monitoring networks to measure air quality conditions and gauge compliance with the NAAQS. Based upon the data collected by these agencies, all areas throughout the country are designated by EPA with respect to their compliance with the NAAQS. **Table I-3** provides the definitions of each of these designations.

Table I-3 Attainment, Nonattainment, and Maintenance Area Designations

Attainment	Attainment/Maintenance	Nonattainment Area	Unclassifiable
Any area that meets the NAAQS established for each criteria air pollutant.	Any area that is in transition from formerly being a Nonattainment area to an Attainment area (referred to as a Maintenance area).	Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) one or more of the NAAQS.	Any area that cannot be classified based on available information as meeting or not meeting the NAAQS.

Source: CMT, 2022.

For O_3, CO, PM_{10}, and $PM_{2.5}$, the Nonattainment designations are further classified by the severity, or degree, of the violation of the NAAQS. For example, in the case of O_3, these classifications range from highest to lowest as extreme, severe, serious, marginal, and moderate.

The Nonattainment designation of an area has a bearing on the emission control measures required and the time periods allotted by which a State Implementation Plan (SIP) must demonstrate Attainment of the NAAQS. It is also important to note that the degree of Nonattainment determines the thresholds of emissions that are "*de minimis,*" or levels below (i.e., within) which a formal SIP General Conformity Determination is not required.

Finally, the boundaries of Nonattainment areas are generally determined based on Core Based Statistical Areas (CBSA) as defined by U.S. census data (air monitoring station locations and contributing emission sources also play a role). Regional pollutants such as O_3 can encompass multiple CBSAs and can extend across state lines. Nonattainment areas for localized pollutants, such as lead and CO, typically only comprise a partial CBSA or a local "hot-spot."

State Implementation Plans (SIPs)

For the purposes of this summary explanation of SIPs, it is sufficient to characterize SIPs as the principal instrument by which a state formulates and implements its strategies for bringing Nonattainment or Maintenance areas into compliance with the NAAQS. In equally broad terms, the SIP contains the necessary emission limitations, control measures and timetables for achieving this objective. Therefore, the SIP development process is delegated to state air quality agencies that may in turn rely on regional, county, and local agencies to help prepare emission inventories that include airport-related emissions. A listing of the most current SIPs applicable to the Boston area are provided in Chapter 7, *Air Quality/Emissions Reduction*.

Aircraft Fleet and Operational Data used in AEDT

At the time of the preparation of the *2020/2021 Environmental Data Report (EDR)*, the Federal Aviation Administration's (FAA's) Aviation Environmental Design Tool (AEDT), Version 3d,[1] was the most current version; thus, it was used to prepare the 2020 and 2021 air quality analyses. On May 9, 2022, FAA released Version 3e of AEDT.

1 FAA, Aviation Environmental Design Tool (AEDT), https://aedt.faa.gov/.

Tables I-4 and **I-5** contain the data that were used in AEDT 3d to represent actual conditions at Logan Airport in 2020 and 2021, respectively. These data include aircraft type, engine type, and the number of annual landing and takeoff cycles (LTOs). The aircraft are divided into four categories: air carrier (AC), cargo (CA), commuter (CO), and general aviation (GA). Airport wide taxi/delay times of 22.3 minutes were assumed for 2020 and 2021, as they did not change between the analysis years. These data were obtained from the FAA Aviation System Performance Metrics (ASPM) Database.[2]

Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Air Carrier Aircraft			
Embraer ERJ190-LR	CF34-10E6	10,062	AC
Airbus A321-100 Series	V2533-A5	8,474	AC
Airbus A320-200 Series	V2527-A5	6,442	AC
Airbus A320-200 Series	V2527-A5 SelectOne™ Upgrade	5,526	AC
Boeing 737-800 Series	CFM56-7B27	4,796	AC
Airbus A321-100 Series	CFM56-5B3/P	3,568	AC
Boeing 737-900-ER	CFM56-7B27E/B1	2,930	AC
Boeing 737-800 Series	CFM56-7B26	2,644	AC
Airbus A319-100 Series	CFM56-5B6/P	1,880	AC
Airbus A319-100 Series	V2522-A5	1,688	AC
Boeing 737-800 Series	CFM56-7B24/3	1,673	AC
Boeing 737-700 Series	CFM56-7B22	1,402	AC
Airbus A320-200 Series	CFM56-5A3	1,242	AC
Airbus A321-NEO	CFM56-5B2/3	1,232	AC
Boeing 737-700 Series	CFM56-7B24	1,131	AC
Airbus A319-100 Series	CFM56-5A5	1,032	AC
Embraer ERJ190	CF34-8E5	654	AC
Airbus A319-100 X/LR	V2524-A5 SelectOne™ Upgrade	532	AC
Airbus A320-200 Series	CFM56-5-A1	530	AC
Boeing 757-200 Series	RB211-535E4B	517	AC
Boeing 787-9 Dreamliner	GEnx-1B76A/P2	495	AC
Airbus A321-200 Series	CFM56-5B3/P	489	AC
Airbus A320-200 Series	V2527E-A5	402	AC
Airbus A330-300 Series	Trent 772	401	AC
Airbus A320-NEO	PW1127G-JM	365	AC
Boeing 737-800 Series	CFM56-7B26/3	332	AC
Boeing 737-700 Series	CFM56-7B24/3	316	AC
Boeing 777-300 ER	GE90-115B	304	AC
Airbus A320-200 Series	CFM56-5B4/P	295	AC
Airbus A320-NEO	LEAP-1A26/26E1	252	AC

2 FAA. Aviation System Performance Metrics (ASPM) Database. https://aspm.faa.gov/.

Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Air Carrier Aircraft (Continued)			
Boeing 717-200 Series	BR700-715C1-30	237	AC
Boeing 787-9 Dreamliner	Trent 1000-J3	231	AC
Airbus A330-300 Series	PW4168A	216	AC
Boeing 767-300 ER	CF6-80C2B6F	210	AC
Airbus A321-200 Series	CFM56-5B1	183	AC
Boeing 737-900-ER	CFM56-7B26/3	176	AC
Airbus A319-100 Series	CFM56-5B3/3	164	AC
Airbus A350-1000 Series	Trent XWB-97	151	AC
Airbus A330-300 Series	CF6-80E1A4	133	AC
Boeing 767-400	CF6-80C2B8F	110	AC
Boeing 717-200 Series	BR700-715A1-30	106	AC
Boeing 777-200 Series	GE90-85B	106	AC
Boeing 737-900-ER	CFM56-7B26	98	AC
Airbus A319-100 Series	CFM56-5B6/3	95	AC
Airbus A350-900 series	Trent XWB-84	95	AC
Airbus A320-200 Series	CFM56-5B4	94	AC
Boeing 787-8 Dreamliner	Trent 1000-CE3	89	AC
Boeing 737-800 Series	CFM56-7B27E/B1	79	AC
Airbus A330-300 Series	CF6-80E1A2	77	AC
Airbus A330-200 Series	Trent 772	70	AC
Boeing 747-400 Series	RB211-524H-T	69	AC
Airbus A340-600 Series	Trent 556-61	69	AC
Airbus A320-200 Series	V2522-D5	68	AC
Boeing 737-800 Series	CFM56-7B24	63	AC
Airbus A330-200 Series	CF6-80E1A4	60	AC
Boeing 767-300 ER	CF6-80C2B7F	58	AC
Airbus A330-900N Series (Neo)	Trent7000-72C	58	AC
Airbus A321-200 Series	CFM56-5B3/3	55	AC
Boeing 777-200 Series	Trent 895	49	AC
Airbus A340-300 Series	CFM56-5C4	49	AC
Airbus A320-200 Series	CFM56-5B3/3	45	AC
Boeing 737-700 Series	CFM56-7B26	42	AC
Boeing 767-300 ER	PW4060	42	AC
Boeing 777-200-ER	GE90-94B	41	AC
Airbus A320-200 Series	V2527-A5E SelectOne™ Upgrade	41	AC
Airbus A319-100 X/LR	V2527-A5M SelectOne™ Upgrade Package	35	AC
Boeing 757-300 Series	RB211-535E4B	34	AC
Airbus A330-200 Series	CF6-80E1A3	34	AC

Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Air Carrier Aircraft (Continued)			
Airbus A380-800 Series	GP7270	31	AC
Airbus A340-300 Series	CFM56-5C4/P	27	AC
Boeing 737-900 Series	CFM56-7B26	24	AC
Airbus A319-100 X/LR	CFM56-5B7/3	24	AC
Airbus A330-200 Series	CF6-80E1A2	23	AC
Boeing 737-700 Series	CFM56-7B20	19	AC
Boeing 777-200 Series	Trent 892	19	AC
Airbus A319-100 Series	CFM56-5B5/P	19	AC
Boeing 747-400 Series	RB211-524G-T	17	AC
Boeing 777-200 Series	GE90-76B	17	AC
Boeing 777-200-ER	GE90-90B	16	AC
Airbus A319-100 Series	V2527-A5	14	AC
Boeing 737-400 Series	CFM56-3C-1	4	AC
Embraer ERJ190	CF34-10E6A1	4	AC
Boeing 767-300 Series	PW4060	4	AC
Boeing 787-8 Dreamliner	GENX-1B64	3	AC
Boeing 737-800 Series	CFM56-7B27/3	2	AC
Boeing 767-200 Series	PW4060	2	AC
Boeing 787-10 Dreamliner	GEnx-1B76A/P2	2	AC
Boeing 727-200 Series	JT8D-219	1	AC
Boeing 747-400 ER	CF6-80C2B5F	1	AC
Boeing 767-300 Series	CF6-80C2B6	1	AC
Boeing MD-88	JT8D-219	1	AC
Airbus A318-100 Series	CFM56-5B9/3	1	AC
Boeing 777-200 Series	PW4084	1	AC
Boeing 747-8	GEnx-2B67	1	AC
Airbus A320-NEO	PW1127GA-JM	1	AC
Total Air Carrier Aircraft LTOs		**65,517**	
Cargo Aircraft			
Boeing 767-300 ER Freighter	CF6-80C2B6F	1,947	CA
Boeing 757-200 Series	PW2037	994	CA
Airbus A300B4-600 Series	PW4158	718	CA
Airbus A300F4-600 Series	CF6-80C2A5F	361	CA
Boeing 757-200 Series	RB211-535E4	225	CA
Cessna 208 Caravan	PT6A-114	185	CA
Boeing 757-200 Series Freighter	RB211-535E4	162	CA
Boeing 757-200 Series	PW2040	134	CA

Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Cargo Aircraft (Continued)			
Boeing 767-200 Series Freighter	JT9D-7R4D, -7R4D1	108	CA
Boeing 767-200 Series	CF6-80C2B7F	95	CA
Boeing 747-400 Series	CF6-80C2B1F	68	CA
Boeing 767-300 Series	CF6-80C2B7F	66	CA
Boeing MD-11 Freighter	CF6-80C2D1F	41	CA
Airbus A300F4-600 Series	CF6-80C2A5	24	CA
Boeing 767-300 Series	CF6-80C2B6F	21	CA
Boeing MD-10-30	CF6-50C2	17	CA
Boeing MD-10-1 Freighter	CF6-6D	15	CA
Boeing 757-200 Series Freighter	PW2040	13	CA
Boeing MD-11 Freighter	PW4062	12	CA
Boeing MD-11 Freighter	PW4060	9	CA
Boeing 757-200 Series Freighter	PW2037	4	CA
Antonov 124 Ruslan	JT9D-7Q	1	CA
Total Cargo Aircraft LTOs		**5,220**	
Commuter Aircraft			
Cessna 402	TIO-540-J2B2	12,038	CO
Embraer ERJ175	CF34-8E5	6,041	CO
Embraer ERJ170	CF34-8E5	1,296	CO
Bombardier CRJ-900	CF34-8C5	1,010	CO
Embraer ERJ175	CF34-8E5A1	786	CO
Embraer ERJ175-LR	CF34-8E5	757	CO
Tecnam P2012 Traveller	TIO-540-J2B2	490	CO
Bombardier de Havilland Dash 8 Q400	PW150A	437	CO
Embraer ERJ170-LR	CF34-8E5	382	CO
Embraer ERJ145-LR	AE3007A1	266	CO
Bombardier CRJ-705-LR	CF34-8C5	261	CO
Embraer ERJ145-LR	AE3007A	197	CO
Bombardier CS100	PW1524G	176	CO
DeHavilland DHC-8-200	PW150A	142	CO
Bombardier CRJ-200	CF34-3B/CF34-3B/-3B1	115	CO
Bombardier Global 6000 Business/Bombardier	BR700-710A2-20	64	CO
Bombardier Global 5000 Business/Bombardier	BR700-710A2-20	62	CO
Bombardier de Havilland Dash 8 Q300	PW123	45	CO
Bombardier CRJ-700	CF34-8C1	25	CO
Embraer ERJ145-LR	AE3007A1P	25	CO
Embraer ERJ145-XR	AE3007A1E	5	CO

Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Commuter Aircraft (Continued)			
Bombardier CRJ-700	CF34-8C5B1	4	CO
Embraer ERJ175-LR	CF34-8E5A1	4	CO
Bombardier Global 7000 Business/Bombardier	BIZMEDIUMJET_F/Passport20-19BB1A	3	CO
Bombardier Learjet 36	TFE731-2-2B	1	CO
Bombardier Challenger 850	CF34-3B	1	CO
Bombardier (Canadair) CRJ200 ExecLiner	CF34-3A1	1	CO
Bombardier Learjet 25	PW610F	1	CO
Total Commuter Aircraft LTOs		**24,635**	
General Aviation Aircraft			
Pilatus PC-12	PT6A-67	1,210	GA
Pilatus PC-12	PT6A-67B	459	GA
Embraer 505	PW530	457	GA
Cessna 680-A Citation Latitude	PW306B	441	GA
Bombardier Challenger 350	HTF7350 (AS907-2-1A)/AS907-2-1A	424	GA
Cessna 560 Citation Excel	PW530	241	GA
Raytheon Super King Air 300	PT6A-67A	217	GA
Raytheon Beechjet 400	JT15D-5, -5A, -5B	191	GA
Cessna 560 Citation XLS	PW530	174	GA
Saab 340-B	CT7-9B	173	GA
Dassault Falcon 2000	PW308C Build Spec 1289	168	GA
Bombardier Challenger 300	HTF7350 (AS907-2-1A)/AS907-2-1A	162	GA
Cirrus SR22	TIO-540-J2B2	147	GA
Gulfstream G500/Gulfstream G-5 Gulfstream 5	BR700-710C4-11	146	GA
Cessna 680 Citation Sovereign	PW306B	144	GA
Gulfstream G350	TAY 611-8C	142	GA
Bombardier Global Express	BR700-710A2-20	141	GA
Bombardier Challenger 600	CF34-3A1	135	GA
Raytheon Hawker 800	TFE731-2/2A	123	GA
Bombardier Learjet 35	TFE731-3	113	GA
Cessna 525 CitationJet	PW4090	112	GA
Cessna 525C CitationJet	PW610F	99	GA
Cessna 750 Citation X	AE3007C1	93	GA
Raytheon Super King Air 200	PT6A-41	87	GA
Gulfstream G650	BR700-725A1-12	87	GA
Gulfstream G280	HTF7250G (AS907-2-1G)/AS907-2-1G	81	GA
Bombardier Learjet 35	TFE731-2-2B	79	GA
Embraer Legacy 450 (EMB-545)	AS907-3-1E-A1 (HTF7500E)	78	GA

Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
General Aviation Aircraft (Continued)			
Gulfstream IV-SP	TAY Mk611-8	71	GA
Raytheon Beech Baron 58	TIO-540-J2B2	69	GA
Bombardier Learjet 60	PW306A	69	GA
Dassault Falcon 900-EX	TFE731-2/2A	69	GA
Pilatus PC-24	PW610F	63	GA
Bombardier Challenger 605	CF34-3B/CF34-3B/-3B1	60	GA
Kaman SH-2 Seasprite	T700-GE-401 -401C	58	GA
Piper PA-34 Seneca	TSIO-360C	55	GA
Raytheon Beech Bonanza 36	TIO-540-J2B2	54	GA
Bell 206 JetRanger	250B17B	50	GA
Piper PA-32 Cherokee Six	TIO-540-J2B2	49	GA
Raytheon Hawker 800	TFE731-3	46	GA
Sikorsky S-76 Spirit	T700-GE-700	43	GA
Cessna 680 Citation Sovereign	PW308C Build Spec 1289	42	GA
Falcon 7X	PW307A	39	GA
Raytheon Beech 99	TPE331-6	38	GA
Piper PA-31 Navajo	TIO-540-J2B2	37	GA
Cessna 750 Citation X	PW308A	37	GA
Bombardier Learjet 45	TFE731-2/2A	37	GA
Eurocopter EC-T2 (CPDS)	TPE331-3	35	GA
Gulfstream G450	TAY Mk611-8	34	GA
Gulfstream G500/Gulfstream G-5 Gulfstream 5	BR700-710A1-10	27	GA
Dassault Falcon 50-EX	TFE731-2/2A	26	GA
Bombardier Challenger 604	CF34-3B/CF34-3B/-3B1	25	GA
Gulfstream G550	BR700-710A1-10	25	GA
Honda HA-420 Hondajet	PW610F	25	GA
Cessna S550 Citation S/II	PW610F	23	GA
Cessna 172 Skyhawk	O-320	21	GA
Cessna 525 CitationJet	JT15D-1 series	21	GA
Gulfstream G150	TFE731-3	21	GA
Bombardier Learjet 31	TFE731-3	20	GA
Raytheon Hawker 4000 Horizon	PW308A	19	GA
Bombardier Learjet 75	TFE731-3	19	GA
Aerospatiale SA-350D Astar (AS-350)	TPE331-3	18	GA
Cessna 700 Citation Longitude	HTF7000 (AS907-1-1A)	18	GA
Cessna 560 Citation V/Cessna 560 Citation	JT15D-5C	16	GA
Bombardier Learjet 45	TFE731-2-2B	16	GA
Piper PA-24 Comanche	TIO-540-J2B2	15	GA

Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
General Aviation Aircraft (Continued)			
Gulfstream G200	TFE731-2/2A	15	GA
Piper PA-28 Cherokee Series	IO-320-D1AD	15	GA
Embraer ERJ135 Legacy Business	AE3007A1P	15	GA
Cessna 210 Centurion	TIO-540-J2B2	14	GA
Cessna 414	TIO-540-J2B2	14	GA
Bell 429	TPE331-1	14	GA
Raytheon Hawker 1000	PW306A	14	GA
Cessna 182	IO-360-B	13	GA
Bombardier Learjet 55	TFE731-3	13	GA
Bombardier Challenger 300	HTF7000 (AS907-1-1A)	13	GA
Gulfstream G200	PW306A	12	GA
Piper PA46 Malibu (FAS)	TIO-540-J2B2	12	GA
Embraer ERJ135-LR	AE3007A1/3	11	GA
Gulfstream G100	TFE731-2/2A	11	GA
Robinson R44 Raven / Lycoming O-540-F1B5	TIO-540-J2B2	10	GA
Eurocopter AS 355NP	250B17B	10	GA
Piper PA-31T Cheyenne	PT6A-135A	10	GA
Cessna 182 R (FAS)	IO-360-B	10	GA
Bombardier Challenger 601	CF34-3A	9	GA
Mooney M20-K	TSIO-360C	9	GA
Cessna 208 Caravan	TPE331-12B	9	GA
Cessna 421 Piston	IO-360-B	9	GA
Embraer 500	HTF7500E (AS907-3-1E-A3)/AS907-3-1E-A3	9	GA
Cessna 206	TIO-540-J2B2	8	GA
Dassault Falcon 900-EX	TFE731-3	7	GA
Cessna 650 Citation III	TFE731-2/2A	7	GA
Dassault Falcon 8X	PW307D	7	GA
Cessna 400 (FAS)	TSIO-360C	7	GA
Cessna 310	TIO-540-J2B2	6	GA
Cirrus SR20	IO-360-B	6	GA
Piper PA46-TP Meridian	PT6A-42	6	GA
Eurocopter EC-130	TPE331-3	6	GA
Bombardier Learjet 70	TFE731-3	5	GA
Gulfstream Aerospace Gulfstream G500 (G-7)	PW814GA	5	GA
Beech 95 (FAS)	TIO-540-J2B2	5	GA
Bell 407 / Rolls-Royce 250-C47B	250B17B	4	GA
Gulfstream G600	PW815GA	4	GA
CESSNA CITATION 510	PW610F	4	GA

Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
General Aviation Aircraft (Continued)			
Cessna 177 (FAS)	IO-360-B	4	GA
Piper PA-27 Aztec	TIO-540-J2B2	3	GA
Maule MT-7-235	TIO-540-J2B2	3	GA
Piaggio P.180 Avanti	PT6A-60	3	GA
Piper PA-28 Cherokee Series	O-320	3	GA
Israel IAI-1124-A Westwind II	TFE731-3	3	GA
Gulfstream G100	TFE731-3	3	GA
Bombardier Learjet 45-XR	TFE731-2-2B	3	GA
Piper PA-30 Twin Comanche	IO-320-D1AD	3	GA
Bombardier Learjet 40	TFE731-2/2A	3	GA
Eclipse 500 / PW610F	PW610F	3	GA
DAHER TBM 900/930	PT6A-66	3	GA
CIRRUS SF-50 Vision	PW610F	3	GA
Diamond DA40	IO-360-B	3	GA
Diamond DA62	IO-360-B	3	GA
Grumman AA-5A/B (FAS)	O-320	3	GA
Hughes 500D	250B17B	2	GA
Cessna 441 Conquest II	TPE331-10UK	2	GA
Cessna 560 Citation V	JT15D-5, -5A, -5B	2	GA
EADS Socata TB-20 Trinidad	TIO-540-J2B2	2	GA
Robinson R22 Mariner	IO-320-D1AD	2	GA
Dassault Falcon 200	TFE731-3	2	GA
Raytheon Premier I	PW308C Build Spec 1289	2	GA
Diamond DA42 Twin Star	IO-360-B	2	GA
Embraer Legacy 500 (EMB-550)	AS907-3-1E-A2 (HTF7500E)	2	GA
Aerostar PA-60	TIO-540-J2B2	1	GA
Rockwell Commander 500/Rockwell Twin	TIO-540-J2B2	1	GA
Lockheed C-130 Hercules	T56 series III	1	GA
Dornier 328 Jet	PW306B	1	GA
Dassault Falcon 50-EX	TFE731-3	1	GA
Dassault Falcon 20-D	CF700-2D	1	GA
Cessna 150 Series	O-200	1	GA
Gulfstream II-SP	TAY Mk611-8	1	GA
Dassault Falcon 100	TFE731-3	1	GA
Cessna 340	TIO-540-J2B2	1	GA
Embraer ERJ135 Legacy Business	AE3007A1E	1	GA
Raytheon Beech 55 Baron	TIO-540-J2B2	1	GA
Eurocopter EC-155B1	T400-CP-400	1	GA

Table I-4 2020 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
General Aviation Aircraft (Continued)			
Bell 430	250B17B	1	GA
EPIC LT/Dynasty	PT6A-67A	1	GA
Cessna 500 Citation I	PW530	1	GA
Cessna 501 Citation ISP	PW610F	1	GA
Columbia Aircraft Lancair (COL3/4 All Types)	TIO-540-J2B2	1	GA
Gulfstream III (FAS)	SPEY Mk511	1	GA
Lancair Evolution (FAS)	TIO-540-J2B2	1	GA
Total General Aviation Aircraft LTOs		**7,979**	
Total Fleet LTOs		**103,351**	

Source: CMT and HMMH, 2022.
Notes: LTOs – landing and takeoff cycles; AC – Air carrier; CA – Cargo; CO – commuter; and GA – general aviation.

Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Air Carrier Aircraft			
Embraer ERJ190-LR	CF34-10E6	11,245	AC
Airbus A321-100 Series	V2533-A5	10,217	AC
Airbus A320-200 Series	V2527-A5	6,935	AC
Airbus A320-200 Series	V2527-A5 SelectOne? Upgrade Package	6,008	AC
Airbus A321-100 Series	CFM56-5B3/P	5,379	AC
Boeing 737-800 Series	CFM56-7B27	4,749	AC
Boeing 737-800 Series	CFM56-7B26	3,902	AC
Boeing 737-900-ER	CFM56-7B27E/B1	2,884	AC
Airbus A319-100 Series	V2522-A5	2,312	AC
Airbus A319-100 Series	CFM56-5B6/P	1,861	AC
Airbus A321-NEO	CFM56-5B2/3	1,649	AC
Boeing 737-700 Series	CFM56-7B24	1,605	AC
Boeing 737-700 Series	CFM56-7B22	1,466	AC
Boeing 737-800 Series	CFM56-7B24/3	1,387	AC
Airbus A320-200 Series	CFM56-5A3	1,189	AC
Embraer ERJ190	CF34-8E5	907	AC
Airbus A319-100 Series	CFM56-5A5	887	AC
Boeing 787-9 Dreamliner	GEnx-1B76A/P2	684	AC
Airbus A320-200 Series	CFM56-5B4/P	662	AC
Boeing 737-9	LEAP-1B28BBJ1	653	AC
Boeing 777-200 Series	Trent 892	629	AC
Airbus A330-300 Series	Trent 772	610	AC
Boeing 737-8	LEAP-1B28/28B2/28B1/28B3	591	AC
Airbus A320-NEO	PW1127G-JM	504	AC
Airbus A319-100 X/LR	V2524-A5 SelectOne? Upgrade Package	479	AC
Airbus A350-900 series	Trent XWB-84	451	AC
Airbus A321-200 Series	CFM56-5B3/P	434	AC
Airbus A320-200 Series	CFM56-5-A1	417	AC
Airbus A330-300 Series	PW4168A	397	AC
Boeing 787-9 Dreamliner	Trent 1000-J3	392	AC
Boeing 737-800 Series	CFM56-7B26/3	354	AC
Airbus A321-200 Series	CFM56-5B1	339	AC
Airbus A320-NEO	LEAP-1A26/26E1	338	AC
Airbus A320-200 Series	V2527E-A5	316	AC
Boeing 737-900-ER	CFM56-7B26/3	263	AC
Boeing 737-8	LEAP-1B27	261	AC
Boeing 777-300 ER	GE90-115B	259	AC
Boeing 737-700 Series	CFM56-7B24/3	208	AC

Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Air Carrier Aircraft (Continued)			
Airbus A330-300 Series	CF6-80E1A4	203	AC
Airbus A320-200 Series	V2500-A1	198	AC
Airbus A330-200 Series	Trent 772	190	AC
Boeing 767-300 ER	CF6-80C2B6F	174	AC
Airbus A320-200 Series	CFM56-5B4	156	AC
Boeing 737-800 Series	CFM56-7B24	149	AC
Boeing 737-900-ER	CFM56-7B26	147	AC
Airbus A330-300 Series	CF6-80E1A2	137	AC
Airbus A320-200 Series	CFM56-5B3/3	127	AC
Boeing 767-300 ER	CF6-80C2B7F	118	AC
Boeing 787-10 Dreamliner	Trent 1000-N3	117	AC
Airbus A340-300 Series	CFM56-5C4	99	AC
Airbus A350-1000 Series	Trent XWB-97	98	AC
Airbus A319-100 Series	CFM56-5B3/3	95	AC
Airbus A319-100 Series	CFM56-5B6/3	94	AC
Airbus A319-100 X/LR	CFM56-5B7/3	87	AC
Airbus A320-200 Series	V2522-D5	75	AC
Boeing 737-800 Series	CFM56-7B27E/B1	59	AC
Boeing 787-8 Dreamliner	Trent 1000-CE3	59	AC
Boeing 737-700 Series	CFM56-7B26	55	AC
Airbus A319-100 Series	CFM56-5B5/P	54	AC
Airbus A330-900N Series (Neo)	Trent7000-72C	52	AC
Boeing 767-300 ER	PW4060	38	AC
Airbus A321-200 Series	CFM56-5B3/3	35	AC
Boeing 767-400	CF6-80C2B8F	34	AC
Boeing 737-400 Series	CFM56-3C-1	32	AC
Boeing 777-200 Series	GE90-85B	28	AC
Airbus A330-200 Series	CF6-80E1A3	22	AC
Boeing 777-200 Series	Trent 895	18	AC
Airbus A330-200 Series	CF6-80E1A2	16	AC
Boeing 737-900 Series	CFM56-7B26	15	AC
Airbus A319-100 X/LR	V2527-A5M SelectOne? Upgrade	15	AC
Boeing 777-200-ER	GE90-90B	12	AC
Boeing 737-700 Series	CFM56-7B20	11	AC
Boeing 777-200-ER	GE90-94B	10	AC
Boeing 757-300 Series	RB211-535E4B	8	AC
Boeing 717-200 Series	BR700-715C1-30	4	AC
Airbus A340-300 Series	CFM56-5C4/P	3	AC

Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Air Carrier Aircraft (Continued)			
Boeing 777-200 Series	GE90-90B	3	AC
Boeing MD-81	JT8D-219	3	AC
Boeing 737-800 Series	CFM56-7B27/3	2	AC
Boeing 717-200 Series	BR700-715A1-30	2	AC
Boeing 757-300 Series	PW2040	2	AC
Boeing 747-400 Series	CF6-80C2B1F	2	AC
Airbus A320-200 Series	CFM56-5B4/2	2	AC
Boeing 747-400 Series Freighter	CF6-80C2B1F	2	AC
Airbus A318-100 Series	CFM56-5B9/P	2	AC
Airbus A319-100 Series	V2527-A5	1	AC
Airbus A320-200 Series	CFM56-5B4/2P	1	AC
Airbus A380-800 Series	GP7270	1	AC
Boeing 767-300 ER	PW4056	1	AC
Boeing 787-10 Dreamliner	GEnx-1B76A/P2	1	AC
Embraer ERJ190	CF34-10E7-B	1	AC
Boeing 737-500 Series	CFM56-3C-1	1	AC
Boeing 737-300 Series	CFM56-3C-1	1	AC
Total Air Carrier Aircraft LTOs		**76,695**	
Cargo Aircraft			
Boeing 767-300 ER Freighter	CF6-80C2B6F	2,570	CA
Boeing 757-200 Series	PW2037	2,110	CA
Airbus A300F4-600 Series	CF6-80C2A5F	311	CA
Airbus A300B4-600 Series	PW4158	291	CA
Boeing 757-200 Series Freighter	RB211-535E4	183	CA
Boeing 757-200 Series	RB211-535E4	145	CA
Boeing 767-300 Series	CF6-80C2B7F	124	CA
Boeing 757-200 Series	RB211-535E4B	117	CA
Boeing MD-11 Freighter	CF6-80C2D1F	110	CA
Boeing 767-200 Series	CF6-80C2B7F	55	CA
Boeing 767-300 Series	CF6-80C2B6F	52	CA
Cessna 208 Caravan	TPE331-12B	50	CA
Boeing 767-200 Series	PW4060	47	CA
Boeing 757-200 Series	PW2040	46	CA
Cessna 208 Caravan	PT6A-114	45	CA
Boeing MD-11 Freighter	PW4062	30	CA
Airbus A300F4-600 Series	CF6-80C2A5	21	CA
Boeing 757-200 Series Freighter	PW2040	19	CA

Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Cargo Aircraft (Continued)			
Boeing 767-300 Series	PW4084D	18	CA
Boeing MD-11 Freighter	PW4060	15	CA
Boeing 767-200 Series Freighter	JT9D-7R4D, -7R4D1	15	CA
Boeing MD-10-30	CF6-50C2	9	CA
Boeing 767-200 Series Freighter	CF6-80A2	8	CA
Boeing 757-200 Series Freighter	PW2037	5	CA
Boeing 767-300 Series	PW4060	4	CA
Boeing MD-10-1 Freighter	CF6-6D	4	CA
Boeing 767-200 Series Freighter	CF6-80A	1	CA
Boeing 767-300 ER Freighter	CF6-80C2B7F	1	CA
Antonov 124 Ruslan	JT9D-7Q	1	CA
Boeing 767-200 Series	CF6-80C2B4F	1	CA
Total Cargo Aircraft LTOs		**6,408**	
Commuter Aircraft			
Cessna 402	TIO-540-J2B2	14,573	CO
Embraer ERJ175	CF34-8E5A1	9,436	CO
Embraer ERJ175	CF34-8E5	1,946	CO
Embraer ERJ175-LR	CF34-8E5	1,900	CO
Embraer ERJ170	CF34-8E5	1,889	CO
Bombardier CRJ-900	CF34-8C5	1,474	CO
Bombardier CS300	PW1524G	1,389	CO
Bombardier CS100	PW1524G	1,023	CO
Tecnam P2012 Traveller	TIO-540-J2B2	1,000	CO
Bombardier CRJ-705-LR	CF34-8C5	732	CO
Embraer ERJ145-LR	AE3007A1	419	CO
Embraer ERJ170-LR	CF34-8E5	409	CO
Bombardier de Havilland Dash 8 Q400	PW150A	309	CO
Embraer ERJ145-LR	AE3007A	276	CO
Embraer ERJ175-LR	CF34-8E5A1	215	CO
Bombardier Global 5000	BR700-710A2-20	135	CO
Bombardier Global 6000	BR700-710A2-20	88	CO
Embraer ERJ170	CF34-8E5A1	56	CO
Embraer ERJ145-LR	AE3007A1P	25	CO
Bombardier CRJ-200	CF34-3B/-3B1	22	CO
Bombardier CRJ-700	CF34-8C1	20	CO
DeHavilland DHC-8-200	PW150A	9	CO
Bombardier (Canadair) CRJ200 ExecLiner	CF34-3A1	7	CO

Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
Commuter Aircraft (Continued)			
Bombardier CRJ-700	CF34-8C5B1	4	CO
Bombardier Learjet 36	TFE731-2-2B	1	CO
Embraer ERJ145-XR	AE3007A1E	1	CO
Total Commuter Aircraft LTOs		**37,358**	
General Aviation Aircraft			
Pilatus PC-12	PT6A-67	1,135	GA
Cessna 680-A Citation Latitude	PW306B	1,044	GA
Embraer 505	PW530	838	GA
Bombardier Challenger 350	AS907-2-1A (HTF7350)	814	GA
Pilatus PC-12	PT6A-67B	753	GA
Cessna 560 Citation Excel	PW530	382	GA
Raytheon Super King Air 300	PT6A-67A	378	GA
Gulfstream IV-SP	TAY Mk611-8	360	GA
Cessna 680 Citation Sovereign	PW306B	301	GA
Cessna 560 Citation XLS	PW530	290	GA
Bombardier Challenger 300	AS907-2-1A (HTF7350)	282	GA
Raytheon Hawker 800	TFE731-2/2A	271	GA
Cirrus SR22	TIO-540-J2B2	247	GA
Dassault Falcon 2000	PW308C Build Spec 1289	242	GA
Bombardier Challenger 601	AE3007A1	232	GA
Raytheon Beechjet 400	JT15D-5, -5A, -5B	228	GA
Bombardier Global Express	BR700-715C1-30	219	GA
Cessna 750 Citation X	AE3007C1	199	GA
Gulfstream G-5 Gulfstream 5 / G-5SP	BR700-715C1-30	168	GA
Cessna 525 CitationJet	PW4090	166	GA
Bombardier Challenger 605	CF34-3B/-3B1	153	GA
Bombardier Learjet 60	PW306A	152	GA
Cessna 700 Citation Longitude	HTF7000 (AS907-1-1A)	136	GA
Gulfstream G650ER	BR700-725A1-12	134	GA
Cessna 560 Citation V	JT15D-5, -5A, -5B	132	GA
Embraer Praetor 500	AS907-3-1E-A1 (HTF7500E)	130	GA
Raytheon Beech Baron 58	TIO-540-J2B2	123	GA
Pilatus PC-24	PW610F	121	GA
Dassault Falcon 900-LX	TFE731-3	113	GA
Cessna 525C CitationJet	PW610F	112	GA
Sikorsky S-76 Spirit	T700-GE-700	107	GA
Kaman SH-2 Seasprite	T700-GE-401 -401C	103	GA

Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
General Aviation Aircraft (Continued)			
Gulfstream G280	AS907-2-1G (HTF7250G)	102	GA
Bombardier Learjet 35	TFE731-3	94	GA
Cessna 750 Citation X	AE3007A	90	GA
Bombardier Learjet 45	TFE731-2/2A	84	GA
Raytheon Hawker 800	TFE731-3	79	GA
Honda HA-420 Hondajet	PW610F	75	GA
Raytheon Beech Bonanza 36	TIO-540-J2B2	74	GA
Piper PA-31 Navajo	TIO-540-J2B2	73	GA
Piper PA-34 Seneca	TSIO-360C	70	GA
Dassault Falcon 50-EX	TFE731-2/2A	68	GA
Gulfstream G200	TFE731-2/2A	65	GA
Falcon 7X	PW307A	63	GA
Aerospatiale SA-350D Astar (AS-350)	TPE331-3	62	GA
Raytheon Super King Air 200	PT6A-41	57	GA
Raytheon Beech 99	TPE331-6	51	GA
Cessna 525 CitationJet	JT15D-1 series	46	GA
Cessna S550 Citation S/II	PW610F	44	GA
Bell 206 JetRanger	250B17B	40	GA
Bell 429	TPE331-1	40	GA
Bombardier Challenger 604	CF34-3B/-3B1	39	GA
Piper PA-32 Cherokee Six	TIO-540-J2B2	39	GA
CIRRUS SF-50 Vision	PW610F	37	GA
Gulfstream Aerospace Gulfstream G500 (G-7)	PW814GA	35	GA
Bombardier Learjet 35	TFE731-2-2B	34	GA
Gulfstream G450	TAY Mk611-8	33	GA
Gulfstream G100	TFE731-2/2A	31	GA
Gulfstream G600	PW815GA	30	GA
Bombardier Learjet 75	TFE731-3	29	GA
Bombardier Challenger 300	HTF7000 (AS907-1-1A)	28	GA
Bombardier Learjet 31	TFE731-3	27	GA
Raytheon Hawker 4000 Horizon	PW308A	27	GA
Gulfstream G550	BR700-710A1-10	26	GA
Bombardier Learjet 45	TFE731-2-2B	26	GA
Cirrus SR20	IO-360-B	26	GA
Gulfstream G-5 Gulfstream 5 / G-5SP Gulfstream G500	BR700-710A1-10	24	GA
Piper PA46 Malibu (FAS)	TIO-540-J2B2	24	GA
Embraer ERJ135-LR	AE3007A1/3	22	GA

Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
General Aviation Aircraft (Continued)			
Embraer Praetor 600	AS907-3-1E-A3 (HTF7500E)	21	GA
Bombardier Learjet 40	TFE731-2/2A	20	GA
Gulfstream G150	TFE731-3	20	GA
Bombardier Challenger 601	CF34-3A	19	GA
Bell 407 / Rolls-Royce 250-C47B	250B17B	19	GA
Piper PA-24 Comanche	TIO-540-J2B2	19	GA
Eurocopter EC-130	TPE331-3	19	GA
Cessna 560 Citation Ultra	JT15D-5C	18	GA
Bombardier Global 7500	Passport20-19BB1A	17	GA
Cessna 182	IO-360-B	17	GA
Eurocopter EC-T2 (CPDS)	TPE331-3	17	GA
Diamond DA40	IO-360-B	17	GA
Bombardier Learjet 55	TFE731-3	16	GA
Bombardier Global Express	BR700-710A2-20	16	GA
Cessna 650 Citation III	TFE731-2/2A	16	GA
Robinson R44 Raven / Lycoming O-540-F1B5	TIO-540-J2B2	16	GA
Raytheon Beech 99	PT6A-28	15	GA
Piper PA-28 Cherokee Series	IO-320-D1AD	15	GA
Cessna 414	TIO-540-J2B2	15	GA
SOCATA TBM 850	PT6A-66	14	GA
Embraer ERJ135 Legacy Business	AE3007A1E	13	GA
Cessna 421 Piston	IO-360-B	13	GA
Piper PA-31T Cheyenne	PT6A-135A	13	GA
Bombardier Challenger 300	AE3007A1	13	GA
Raytheon Hawker 1000	PW306A	12	GA
Eurocopter AS 355NP	250B17B	12	GA
Cessna 210 Centurion	TIO-540-J2B2	12	GA
Dassault Falcon 100	TFE731-3	11	GA
Embraer ERJ135 Legacy Business	AE3007A1P	11	GA
Raytheon Premier I	PW308C Build Spec 1289	11	GA
Gulfstream G200	PW306A	10	GA
Dassault Falcon 50-EX	TFE731-3	10	GA
Cessna 310	TIO-540-J2B2	10	GA
Cessna 172 Skyhawk	O-320	10	GA
CESSNA CITATION 510	PW610F	9	GA
Cessna 177 (FAS)	IO-360-B	9	GA
Dassault Falcon 8X	PW307D	8	GA

Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
General Aviation Aircraft (Continued)			
Embraer 500	AS907-3-1E-A3 (HTF7500E)	8	GA
DAHER TBM 900/930	PT6A-66	8	GA
Mooney M20-K	TSIO-360C	7	GA
Cessna 182 R (FAS)	IO-360-B	7	GA
Gulfstream G100	TFE731-3	7	GA
Dassault Falcon 900-EX	TFE731-3	6	GA
Agusta A-109	250B17B	5	GA
Beech 95 (FAS)	TIO-540-J2B2	5	GA
Embraer Legacy 450 (EMB-545)	AS907-3-1E-A1 (HTF7500E)	5	GA
Aerostar PA-60	TIO-540-J2B2	5	GA
Cessna 441 Conquest II	TPE331-10GT	5	GA
Dassault Falcon 200	TFE731-3	5	GA
Cessna 206	TIO-540-J2B2	4	GA
Bombardier Learjet 70	TFE731-3	4	GA
Bombardier Learjet 45-XR	TFE731-2-2B	4	GA
Cessna 441 Conquest II	TPE331-10UK	4	GA
Eclipse 500 / PW610F	PW610F	3	GA
Piaggio P.180 Avanti	PT6A-60	3	GA
Dassault Falcon 20-D	CF700-2D	3	GA
Raytheon Super King Air 300	PT6A-60A	3	GA
Piper PA46-TP Meridian	PT6A-42	3	GA
Dassault Falcon 20-C	CF700-2D	3	GA
Piper PA-27 Aztec	TIO-540-J2B2	3	GA
Piper PA-30 Twin Comanche	IO-320-D1AD	2	GA
Raytheon Beech 60 Duke	TIO-540-J2B2	2	GA
Cessna 400 (FAS)	TSIO-360C	2	GA
Lancair Evolution (FAS)	TIO-540-J2B2	2	GA
Maule MT-7-235	TIO-540-J2B2	2	GA
Israel IAI-1124-A Westwind II	TFE731-3	2	GA
Diamond DA62	IO-360-B	2	GA
Eurocopter EC-155B1	T400-CP-400	2	GA
Embraer ERJ135-LR	AE3007A3	2	GA
Raytheon King Air 100	TPE331-6	2	GA
Dornier 328 Jet	PW306B	1	GA
Agusta A119	250B17B	1	GA
Cessna 340	TIO-540-J2B2	1	GA
Aviat Husky A1B	IO-360-B	1	GA
EADS Socata TBM-700	PT6A-64	1	GA

Table I-5 2021 Fleet Mix and Annual Landing and Takeoff Cycles (LTOs) by Aircraft Type

Aircraft Type	Engine	LTOs	Description
General Aviation Aircraft (Continued)			
Cessna 425 Conquest I	PT6A-135A	1	GA
Cessna 500 Citation I	PW530	1	GA
Rockwell Twin Commander 690	TPE331-3	1	GA
Dassault Falcon 20-F	CF700-2D	1	GA
Cessna 207 (Turbo) Stationair (FAS)	IO-360-B	1	GA
Columbia Aircraft Lancair (COL3/4 All Types) (FAS)	TIO-540-J2B2	1	GA
Rockwell Sabreliner 65	TFE731-3	1	GA
Mitsubishi MU-300 Diamond	JT15D-5, -5A, -5B	1	GA
Diamond DA42 Twin Star	IO-360-B	1	GA
Total General Aviation Aircraft LTOs		**12,556**	
Total Fleet LTOs		**133,017**	

Source: CMT and HMMH, 2022.
Notes: LTOs – landing and takeoff cycles; AC – Air carrier; CA – Cargo; CO – commuter; and GA – general aviation.

Ground Service Equipment (GSE)/Auxiliary Power Unit (APU) Time-in-Mode (TIM) Survey

The most recent GSE/APU time-in-mode (TIM) survey conducted at Logan Airport was performed on June 27-28, 2017. Data from the survey as well as information developed from ACRP Report 149[3] and AEDT's default TIM data was used in support of the *2020/2021 EDR*. The purpose of a GSE/APU TIM survey is to provide up-to-date operating times, which directly affect GSE/APU emissions.

TIM is the average time that GSE and APUs operate during a single aircraft LTO cycle. The surveyed TIM data are used in place of the default TIM values in AEDT, thus yielding emissions that better reflect actual conditions at Logan Airport. The 2017 TIM survey focused on the most prevalent airlines (e.g., Southwest, JetBlue, American, Delta, and United) and the most common aircraft types, such as narrow body air carriers (e.g., A320, A321, B737, B757) and large commuter aircraft (e.g., ERJ170, ERJ190, CRJ700, CRJ900). The GSE and APU TIM data for the surveyed aircraft are provided in **Table I-6**. GSE TIM data for the remaining aircraft within Logan's fleet are based on AEDT defaults.

APU operating times for wide body/large commuter air carriers, and small commuter aircraft, were assumed to have a TIM of 7 minutes per LTO. GA aircraft in the fleet were not equipped with APUs. Cargo aircraft APU TIM data was based on AEDT defaults (i.e., 26 minutes per LTO).

3 National Academies of Sciences, Engineering, and Medicine 2009, Transportation Research Board, Airport Cooperative Research Program, Report 149: *Improving Ground Support Equipment Operational Data for Airport Emissions Modeling*, 2015, Washington, DC: The National Academies Press, https://crp.trb.org/acrpwebresource4/acrp-report-149-improving-ground-support-equipment-operational-data-for-airport-emissions-modeling/.

Table I-6 Ground Service Equipment (GSE)/Auxiliary Power Unit (APU) Time-in-Mode (TIM) (minutes)

Source	Narrow-Body Air Carriers	Large Commuter Aircraft
Aircraft Tractor	6.37	7.13
Baggage Tractor	27.23	17.43
Belt Loader	26.85	14.88
Cabin Service Truck	2.07	0.53
Catering Truck	11.30	13.28
Hydrant Truck	3.73	2.53
Lavatory Truck	4.82	2.45
Service Truck	0.12	0.57
Water Service Truck	1.65	0.75
APUs	16.63	14.70

Source: GSE TIM survey conducted by CMT with assistance from Massport (security escorts) on June 27-28, 2017.
Note: APUs – auxiliary power units.

Ground Service Equipment (GSE) Alternative Fuels Conversion

For the 2020 and 2021 analyses, GSE emissions were calculated using AEDT emission factors in combination with the 2017 TIM survey, AEDT's default TIM data, and the GSE fuel types obtained from the 2020 and 2021 Logan Airport Vehicle Aerodrome Permit Applications. Use of the data from the 2017 TIM survey and the applications provides the most up-to-date GSE fleet operational and fuel mix characteristics (including alternative fuels and electric-powered GSE). **Table I-7** presents the emission reductions of criteria air pollutants/precursor pollutants due to the use of GSE alternative fueled vehicles (AVFs) from 2000 to 2021.

Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day)

Year	Pollutant	Percent Reduction	Emissions without Reduction	Reduction from AFVs	Emissions with Reduction
2000	VOCs	13.72%	178	24	154
	NO_X	9.87%	369	36	333
	CO	12.88%	6,124	789	5,335
2001	VOCs	13.72%	166	23	143
	NO_X	9.87%	338	33	305
	CO	12.88%	5,960	768	5,193
2002	VOCs	13.6%	286	39	247

Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day)

Year	Pollutant	Percent Reduction	Emissions without Reduction	Reduction from AFVs	Emissions with Reduction
	NO_X	8.0%	350	28	322
	CO	16.3%	6,174	1,004	5,170
2003	VOCs	13.8%	263	36	227
	NO_X	8.0%	316	25	291
	CO	16.4%	5,692	934	4,758
2004	VOCs	11.9%	212	25	187
	NO_X	6.6%	357	24	333
	CO	15.4%	4,236	650	3,586
2005	VOCs	12.2%	203	25	178
	NO_X	6.9%	335	23	312
	CO	15.4%	4,175	643	3,531
	$PM_{10}/PM_{2.5}$	9.9%	11	1	10
2006	VOCs	10.7%	86	9	77
	NO_X	7.5%	324	24	300
	CO	13.8%	1,841	255	1,586
	$PM_{10}/PM_{2.5}$	10.8%	10	1	9
2007	VOCs	8.2%	85	7	78
	NO_X	5.1%	315	16	299
	CO	10.4%	2,124	220	1,904
	$PM_{10}/PM_{2.5}$	5.9%	10	<1	10
2008	VOCs	8.3%	72	6	66
	NO_X	4.8%	270	13	257
	CO	10.2%	1,792	183	1,609
	$PM_{10}/PM_{2.5}$	5.6%	16	<1	15
2009	VOCs	8.2%	61	5	56

Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day)

Year	Pollutant	Percent Reduction	Emissions without Reduction	Reduction from AFVs	Emissions with Reduction
	NO_X	4.8%	230	11	219
	CO	10.0%	1,516	152	1,364
	$PM_{10}/PM_{2.5}$	3.5%	14	<1	14
2010	VOCs	7.5%	53	4	49
	NO_X	3.9%	206	8	198
	CO	8.5%	1,335	113	1,222
	$PM_{10}/PM_{2.5}$	2.5%	13	<1	13
2011	VOCs	13.2%	38	5	33
	NO_X	7.5%	188	14	173
	CO	16.7%	834	139	694
	$PM_{10}/PM_{2.5}$	5.5%	14	1	13
2012	VOCs	11.8%	34	4	30
	NO_X	6.8%	176	12	164
	CO	16.3%	738	120	618
	$PM_{10}/PM_{2.5}$	4.9%	13	<1	13
2013	VOCs	10.3%	29	3	26
	NO_X	6.5%	155	10	145
	CO	15.9%	634	101	533
	$PM_{10}/PM_{2.5}$	5.0%	12	<1	12
2014	VOCs	11.5%	26	3	23
	NO_X	5.6%	142	8	134
	CO	15.4%	572	88	484
	$PM_{10}/PM_{2.5}$	4.8%	12	<1	12
2015	VOCs	4.5%	22	1	21
	NO_X	5.2%	135	7	128

Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day)

Year	Pollutant	Percent Reduction	Emissions without Reduction	Reduction from AFVs	Emissions with Reduction
	CO	15.2%	521	79	442
	$PM_{10}/PM_{2.5}$	14.3%	14	2	12
2016	VOCs	9.0%	26	2	24
	NO_X	3.8%	173	6	167
	CO	13.5%	560	67	493
	$PM_{10}/PM_{2.5}$	2.6%	15	<1	15
2017	VOCs	8.7%	24	2	22
	NO_X	3.6%	148	5	143
	CO	13.7%	548	66	483
	$PM_{10}/PM_{2.5}$	3.8%	14	<1	14
2018	VOCs	8.0%	23	2	21
	NO_X	3.1%	154	5	149
	CO	12.3%	487	60	428
	$PM_{10}/PM_{2.5}$	2.0%	14	<1	14
2019	VOCs	6.6%	22	1	21
	NO_X	2.5%	152	4	148
	CO	11.5%	449	52	397
	$PM_{10}/PM_{2.5}$	1.7%	14	<1	14
2020	VOCs	10.3%	10	1	9
	NO_X	9.0%	33	3	30
	CO	12.7%	255	32	223
	$PM_{10}/PM_{2.5}$	8.1%	2	<1	2
2021	VOCs	12.3%	12	2	11
	NO_X	10.9%	38	4	34
	CO	15.1%	326	49	277

Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day)

Year	Pollutant	Percent Reduction	Emissions without Reduction	Reduction from AFVs	Emissions with Reduction
	$PM_{10}/PM_{2.5}$	10.0%	3	<1	3

Source: CMT and Massport, 2022.

Notes: VOC – volatile organic compounds; NO_X – nitrogen oxides; CO – carbon monoxide; $PM_{10}/PM_{2.5}$ – particulate matter equal to or less than 10 microns in diameter (PM_{10}) and equal to or less than 2.5 microns in diameter ($PM_{2.5}$); and AFVs – alternative fuel vehicles.

The 2000 and 2001 analyses used EDMS v4.03. The 2002 and 2003 analyses used EDMS v4.11, which used updated emission factors from the NONROAD2002 Model. The 2004 analysis used EDMS v4.21, which again used emission factors from EPA NONROAD2002 Model. The 2005 analysis used EDMS v4.5, which used emission factors from EPA NONROAD2002 Model. The 2006 analysis used EDMS v5.0.1, which used emission factors from EPA NONROAD2005 Model. The 2007 analysis used EDMS v5.0.2, which used emission factors from EPA NONROAD2005 Model. The 2008 analysis used EDMS v5.1, which used emission factors from EPA NONROAD2005 Model. The 2009 analysis used EDMS v5.1.2, which used emission factors from EPA NONROAD2005 Model. The 2010, 2011, and 2012 analyses used EDMS v5.1.3, which used emission factors from EPA NONROAD2005 Model. The 2013, 2014, 2015 analyses used EDMS v5.1.4.1, which used emission factors from EPA NONROAD2005. The 2016 analysis used AEDT2c SP2, which used emission factors from EPA NONROAD2008 Model. The 2017 analysis used AEDT 2d, which used emission factors from EPA NONROAD2008 Model. The 2018 and 2019 analysis used AEDT 3c, which used emission factors from EPA MOVES2014b. The 2020 and 2021 analysis used EDT 3d, which includes emission factors from EPA MOVES 3.0.3.

Motor Vehicle Emissions

The version of EPA's MOtor Vehicle Emission Simulator (MOVES) that was the latest version at the time the analysis of motor vehicle emissions for 2020 and 2021 was performed (MOVES 3.0.3) was used.[4] Since then, the EPA released another version (Version 3.0.4) of the computer model. A review of release notes for Version 3.0.4 indicates that use of MOVES Version 3.0.4 would not result in motor vehicle emission estimates that would be appreciably less or more than prepared using Version 3.0.3.[5]

MOVES emission factors were multiplied by average daily vehicle miles traveled (VMT) to calculate daily emissions. The on-Airport traffic data are summarized in the VMT analyses of Appendix G, *Ground Access to and from Logan Airport*.[6] In addition to estimating emissions from vehicles on roadways, MOVES was used to obtain vehicle emissions at idle to estimate parking and curbside motor vehicle emissions. Idling emissions were estimated by multiplying emission factors by an estimate of the total motor vehicle idling time in parking lots and at the arrival and departure curbsides at the Airport. Samples of the 2020 MOVES input/output files and the 2021 MOVES input/output files are provided in **Tables I-8** and **I-9**, and **Tables I-10** and **I-11**, respectively**.**

4 U.S. Environmental Protection Agency, "MOVES3: Latest Version of MOtor Vehicle Emission Simulator (MOVES)," updated August 5, 2022. https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves.

5 U.S. Environmental Protection Agency, "MOVES3 Update Log," updated August 5, 2022, https://www.epa.gov/moves/moves3-update-log.

6 Due to the modified roadway configuration of the Ted Williams Tunnel, through-traffic no longer traverses Airport property. Therefore, as of 2003, emissions from these vehicles are no longer included as part of the Logan Airport emissions inventory.

Table I-8 MOVES3.0.3 Sample Input File for 2020

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    <models>
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    <modelscale value="Inv"/>
    <modeldomain value="PROJECT"/>
    <geographicselections>
        <geographicselection type="COUNTY" key="25025" description="Suffolk County, MA (25025)"/>
    </geographicselections>
    <timespan>
        <year key="2020"/>
        <month id="7"/>
        <day id="5"/>
        <beginhour id="16"/>
        <endhour id="16"/>
        <aggregateBy key="Hour"/>
    </timespan>
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        <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="21" sourcetypename="Passenger
Car"/>
        <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="21" sourcetypename="Passenger Car"/>
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Car"/>
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Truck"/>
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Truck"/>
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Truck"/>
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Truck"/>
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    <offroadvehiclesccs>
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        <roadtype roadtypeid="1" roadtypename="Off-Network" modelCombination="M1"/>
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processname="Running Exhaust"/>
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Exhaust"/>
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processname="Extended Idle Exhaust"/>
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processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="98" pollutantname="CO2 Equivalent" processkey="1" processname="Running
Exhaust"/>
```

Table I-8 MOVES3.0.3 Sample Input File for 2020


```
	<pollutantprocessassociation pollutantkey="98" pollutantname="CO2 Equivalent" processkey="2" processname="Start
Exhaust"/>
	<pollutantprocessassociation pollutantkey="98" pollutantname="CO2 Equivalent" processkey="90"
processname="Extended Idle Exhaust"/>
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processname="Auxiliary Power Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="1"
processname="Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="15"
processname="Crankcase Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="2"
processname="Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="16"
processname="Crankcase Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="90"
processname="Extended Idle Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="17"
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	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="91"
processname="Auxiliary Power Exhaust"/>
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processname="Running Exhaust"/>
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processname="Start Exhaust"/>
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processname="Extended Idle Exhaust"/>
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processname="Auxiliary Power Exhaust"/>
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processname="Crankcase Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="2" processname="Start
Exhaust"/>
	<pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="16"
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Table I-8 MOVES3.0.3 Sample Input File for 2020


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Table I-8 MOVES3.0.3 Sample Input File for 2020

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processname="Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="16"
processname="Crankcase Start Exhaust"/>
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processname="Auxiliary Power Exhaust"/>
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        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="90"
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        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="17"
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        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="91"
processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="1"
processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="2"
processname="Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="91"
processname="Auxiliary Power Exhaust"/>
```

Table I-8 MOVES3.0.3 Sample Input File for 2020

```
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="1"
processname="Running Exhaust"/>
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processname="Crankcase Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="2"
processname="Start Exhaust"/>
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processname="Crankcase Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="17"
processname="Crankcase Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="91"
processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="11"
processname="Evap Permeation"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="13"
processname="Evap Fuel Leaks"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="18"
processname="Refueling Displacement Vapor Loss"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="19"
processname="Refueling Spillage Loss"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="1"
processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="15"
processname="Crankcase Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="2"
processname="Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="16"
processname="Crankcase Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="17"
processname="Crankcase Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="91"
processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="11"
processname="Evap Permeation"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="13"
processname="Evap Fuel Leaks"/>
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processname="Refueling Displacement Vapor Loss"/>
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processname="Refueling Spillage Loss"/>
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    </databaseselections>
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    </internalcontrolstrategies>
    <inputdatabase servername="" databasename="" description=""/>
    <uncertaintyparameters uncertaintymodeenabled="false" numberofrunspersimulation="0" numberofsimulations="0"/>
    <geographicoutputdetail description="LINK"/>
    <outputemissionsbreakdownselection>
        <modelyear selected="false"/>
        <fueltype selected="false"/>
        <fuelsubtype selected="false"/>
        <emissionprocess selected="false"/>
```

Table I-8 MOVES3.0.3 Sample Input File for 2020

```
            <onroadoffroad selected="false"/>
            <roadtype selected="true"/>
            <sourceusetype selected="true"/>
            <movesvehicletype selected="false"/>
            <onroadscc selected="false"/>
            <estimateuncertainty selected="false" numberOfIterations="2" keepSampledData="false" keepIterations="false"/>
            <sector selected="false"/>
            <engtechid selected="false"/>
            <hpclass selected="false"/>
            <regclassid selected="false"/>
        </outputemissionsbreakdownselection>
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        <outputvmtdata value="true"/>
        <outputsho value="true"/>
        <outputsh value="true"/>
        <outputshp value="true"/>
        <outputshidling value="true"/>
        <outputstarts value="true"/>
        <outputpopulation value="true"/>
        <scaleinputdatabase servername="localhost" databasename="bos_edr_2020_summer_in" description=""/>
        <pmsize value="0"/>
        <outputfactors>
            <timefactors selected="true" units="Hours"/>
            <distancefactors selected="true" units="Miles"/>
            <massfactors selected="true" units="Grams" energyunits="Million BTU"/>
        </outputfactors>
        <savedata>
        </savedata>
        <donotexecute>
        </donotexecute>
        <generatordatabase shouldsave="false" servername="" databasename="" description=""/>
            <donotperformfinalaggregation selected="false"/>
        <lookuptableflags scenarioid="" truncateoutput="true" truncateactivity="true" truncatebaserates="true"/>
    </runspec>
```

Source: CMT and Massport, 2022.

Table I-9 MOVES3.0.3 Sample Output File for 2020

MasterKey,MOVESRunID,iterationID,yearID,monthID,dayID,hourID,stateID,countyID,zoneID,linkID,pollutantID,processID,sourceTypeID,regClassId,fuelTypeID,modelYearID,roadTypeID,SCC,emissionQuant,activityTypeID,activity,emissionRate,massUnits,distanceUnits
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Table I-9 MOVES3.0.3 Sample Output File for 2020

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Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,116,\N,42,0,3,2012,5,0,0.00107407,1,0.00515659,0.208290744,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,116,\N,42,0,3,2012,5,0,0.0016111,1,0.00515659,0.312435156,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,116,\N,42,0,3,2012,5,0,0.0032222,1,0.00515659,0.624870312,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,115,\N,42,0,3,2012,5,0,1.33415E-07,1,0.00515659,2.58727E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,115,\N,42,0,3,2012,4,0,4.245E-07,1,0.00515659,8.23218E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,115,\N,42,0,3,2012,3,0,4.245E-07,1,0.00515659,8.23218E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,115,\N,42,0,3,2012,2,0,4.245E-07,1,0.00515659,8.23218E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,115,\N,42,0,3,2012,5,0,2.6683E-06,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,115,\N,42,0,3,2012,5,0,1.06732E-06,1,0.00515659,0.000206982,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,115,\N,42,0,3,2012,5,0,2.4136E-07,1,0.00515659,4.68061E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,115,\N,42,0,3,2012,5,0,2.68177E-07,1,0.00515659,5.20067E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,115,\N,42,0,3,2012,5,0,3.01699E-07,1,0.00515659,5.85075E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,115,\N,42,0,3,2012,5,0,3.448E-07,1,0.00515659,6.68659E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,115,\N,42,0,3,2012,5,0,4.02265E-07,1,0.00515659,7.80099E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,115,\N,42,0,3,2012,5,0,3.396E-07,1,0.00515659,6.58575E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,115,\N,42,0,3,2012,5,0,4.245E-07,1,0.00515659,8.23218E-05,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,115,\N,42,0,3,2012,5,0,5.66003E-07,1,0.00515659,0.000109763,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,115,\N,42,0,3,2012,5,0,8.49003E-07,1,0.00515659,0.000164644,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,115,\N,42,0,3,2012,5,0,1.69801E-06,1,0.00515659,0.000329289,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,112,\N,42,0,3,2012,5,0,1.29946E-06,1,0.00515659,0.000252,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,112,\N,42,0,3,2012,4,0,4.67806E-06,1,0.00515659,0.0009072,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,112,\N,42,0,3,2012,3,0,4.67806E-06,1,0.00515659,0.0009072,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,112,\N,42,0,3,2012,2,0,4.67806E-06,1,0.00515659,0.0009072,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,112,\N,42,0,3,2012,5,0,2.59892E-05,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,112,\N,42,0,3,2012,5,0,1.03957E-05,1,0.00515659,0.002016003,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,112,\N,42,0,3,2012,5,0,2.59893E-06,1,0.00515659,0.000504002,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,112,\N,42,0,3,2012,5,0,2.8877E-06,1,0.00515659,0.000560002,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,112,\N,42,0,3,2012,5,0,3.24866E-06,1,0.00515659,0.000630002,g,mi

Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,112,\N,42,0,3,2012,5,0,3.71276E-06,1,0.00515659,0.000720003,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,112,\N,42,0,3,2012,5,0,4.33154E-06,1,0.00515659,0.000840001,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,112,\N,42,0,3,2012,5,0,3.74244E-06,1,0.00515659,0.000725759,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,112,\N,42,0,3,2012,5,0,4.67806E-06,1,0.00515659,0.0009072,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,112,\N,42,0,3,2012,5,0,6.23743E-06,1,0.00515659,0.001209604,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,112,\N,42,0,3,2012,5,0,9.35614E-06,1,0.00515659,0.001814404,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,112,\N,42,0,3,2012,5,0,1.87123E-05,1,0.00515659,0.003628813,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,110,\N,42,0,3,2012,5,0,1.27347E-05,1,0.00515659,0.002469597,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,110,\N,42,0,3,2012,4,0,4.10627E-05,1,0.00515659,0.00796315,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,110,\N,42,0,3,2012,3,0,4.10627E-05,1,0.00515659,0.00796315,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,110,\N,42,0,3,2012,2,0,4.10627E-05,1,0.00515659,0.00796315,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,110,\N,42,0,3,2012,5,0,0.000254694,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,110,\N,42,0,3,2012,5,0,0.000101877,1,0.00515659,0.01975666,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,110,\N,42,0,3,2012,5,0,2.32863E-05,1,0.00515659,0.004515833,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,110,\N,42,0,3,2012,5,0,2.58737E-05,1,0.00515659,0.005017599,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,110,\N,42,0,3,2012,5,0,2.91079E-05,1,0.00515659,0.005644796,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,110,\N,42,0,3,2012,5,0,3.32662E-05,1,0.00515659,0.006451201,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,110,\N,42,0,3,2012,5,0,3.88104E-05,1,0.00515659,0.007526369,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,110,\N,42,0,3,2012,5,0,3.28502E-05,1,0.00515659,0.006370527,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,110,\N,42,0,3,2012,5,0,4.10627E-05,1,0.00515659,0.00796315,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,110,\N,42,0,3,2012,5,0,5.47506E-05,1,0.00515659,0.010617598,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,110,\N,42,0,3,2012,5,0,8.21257E-05,1,0.00515659,0.015926358,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,110,\N,42,0,3,2012,5,0,0.000164251,1,0.00515659,0.031852639,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,107,\N,42,0,3,2012,5,0,0.000132181,1,0.00515659,0.025633412,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,107,\N,42,0,3,2012,4,0,0.000132181,1,0.00515659,0.025633412,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,107,\N,42,0,3,2012,3,0,0.000132181,1,0.00515659,0.025633412,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,107,\N,42,0,3,2012,2,0,0.000132181,1,0.00515659,0.025633412,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,107,\N,42,0,3,2012,5,0,0,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,107,\N,42,0,3,2012,5,0,0.000330505,1,0.00515659,0.06409371,g,mi

Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,107,\N,42,0,3,2012,5,0,8.45342E-05,1,0.00515659,0.01639343,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,107,\N,42,0,3,2012,5,0,9.10659E-05,1,0.00515659,0.0176601,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,107,\N,42,0,3,2012,5,0,9.81132E-05,1,0.00515659,0.01902676,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,107,\N,42,0,3,2012,5,0,0.000105711,1,0.00515659,0.020500175,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,107,\N,42,0,3,2012,5,0,0.000113858,1,0.00515659,0.022080094,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,107,\N,42,0,3,2012,5,0,0.000122693,1,0.00515659,0.023793437,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,107,\N,42,0,3,2012,5,0,0.000132181,1,0.00515659,0.025633412,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,107,\N,42,0,3,2012,5,0,0.000142392,1,0.00515659,0.027613597,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,107,\N,42,0,3,2012,5,0,0.000153392,1,0.00515659,0.029746789,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,107,\N,42,0,3,2012,5,0,0.000165253,1,0.00515659,0.032046954,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,106,\N,42,0,3,2012,5,0,0.00010311,1,0.00515659,0.019995771,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,106,\N,42,0,3,2012,4,0,0.00644438,1,0.00515659,1.249736741,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,106,\N,42,0,3,2012,3,0,0.00644438,1,0.00515659,1.249736741,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,106,\N,42,0,3,2012,2,0,0.00644438,1,0.00515659,1.249736741,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,106,\N,42,0,3,2012,5,0,0.0020622,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,106,\N,42,0,3,2012,5,0,0.000824878,1,0.00515659,0.159965786,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,106,\N,42,0,3,2012,5,0,0.00165234,1,0.00515659,0.320432691,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,106,\N,42,0,3,2012,5,0,0.00183593,1,0.00515659,0.356035674,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,106,\N,42,0,3,2012,5,0,0.00206542,1,0.00515659,0.400539865,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,106,\N,42,0,3,2012,5,0,0.00236048,1,0.00515659,0.457759846,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,106,\N,42,0,3,2012,5,0,0.00275389,1,0.00515659,0.534052506,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,106,\N,42,0,3,2012,5,0,0.0051555,1,0.00515659,0.999788598,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,106,\N,42,0,3,2012,5,0,0.00644438,1,0.00515659,1.249736741,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,106,\N,42,0,3,2012,5,0,0.00859254,1,0.00515659,1.666322156,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,106,\N,42,0,3,2012,5,0,0.0128888,1,0.00515659,2.499481248,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,106,\N,42,0,3,2012,5,0,0.025777601,1,0.00515659,4.998962496,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,100,\N,42,0,3,2012,5,0,1.43957E-05,1,0.00515659,0.002791709,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,100,\N,42,0,3,2012,4,0,4.64186E-05,1,0.00515659,0.009001802,g,mi

Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,100,\N,42,0,3,2012,3,0,4.64186E-05,1,0.00515659,0.009001802,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,100,\N,42,0,3,2012,2,0,4.64186E-05,1,0.00515659,0.009001802,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,100,\N,42,0,3,2012,5,0,0.000287914,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,100,\N,42,0,3,2012,5,0,0.000115165,1,0.00515659,0.022333557,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,100,\N,42,0,3,2012,5,0,2.63235E-05,1,0.00515659,0.005104827,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,100,\N,42,0,3,2012,5,0,2.92484E-05,1,0.00515659,0.005672043,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,100,\N,42,0,3,2012,5,0,3.29044E-05,1,0.00515659,0.006381039,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,100,\N,42,0,3,2012,5,0,3.76051E-05,1,0.00515659,0.007292629,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,100,\N,42,0,3,2012,5,0,4.38724E-05,1,0.00515659,0.008508025,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,100,\N,42,0,3,2012,5,0,3.71348E-05,1,0.00515659,0.007201425,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,100,\N,42,0,3,2012,5,0,4.64186E-05,1,0.00515659,0.009001802,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,100,\N,42,0,3,2012,5,0,6.18917E-05,1,0.00515659,0.012002446,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,100,\N,42,0,3,2012,5,0,9.28374E-05,1,0.00515659,0.018003641,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,100,\N,42,0,3,2012,5,0,0.000185675,1,0.00515659,0.036007322,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,98,\N,42,0,3,2012,5,0,6.580440044,1,0.00515659,1276.122373,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,98,\N,42,0,3,2012,4,0,11.47280025,1,0.00515659,2224.881162,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,98,\N,42,0,3,2012,3,0,11.47280025,1,0.00515659,2224.881162,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,98,\N,42,0,3,2012,2,0,11.47280025,1,0.00515659,2224.881162,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,98,\N,42,0,3,2012,5,0,131.6089935,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,98,\N,42,0,3,2012,5,0,52.64350128,1,0.00515659,10208.97529,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,98,\N,42,0,3,2012,5,0,3.85236001,1,0.00515659,747.075084,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,98,\N,42,0,3,2012,5,0,4.280399799,1,0.00515659,830.0833856,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,98,\N,42,0,3,2012,5,0,4.815450191,1,0.00515659,933.8438897,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,98,\N,42,0,3,2012,5,0,5.503379822,1,0.00515659,1067.251745,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,98,\N,42,0,3,2012,5,0,6.420589924,1,0.00515659,1245.123183,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,98,\N,42,0,3,2012,5,0,9.178230286,1,0.00515659,1779.903006,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,98,\N,42,0,3,2012,5,0,11.47280025,1,0.00515659,2224.881162,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,98,\N,42,0,3,2012,5,0,15.29710007,1,0.00515659,2966.514627,g,mi

Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,98,\N,42,0,3,2012,5,0,22.94569969,1,0.00515659,4449.781557,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,98,\N,42,0,3,2012,5,0,45.8913002,1,0.00515659,8899.54388,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,91,\N,42,0,3,2012,5,0,5.79473E-05,1,0.00515659,0.011237516,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,91,\N,42,0,3,2012,4,0,6.61011E-05,1,0.00515659,0.01281877,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,91,\N,42,0,3,2012,3,0,6.61011E-05,1,0.00515659,0.01281877,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,91,\N,42,0,3,2012,2,0,6.61011E-05,1,0.00515659,0.01281877,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,91,\N,42,0,3,2012,5,0,0.001158943,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,91,\N,42,0,3,2012,5,0,0.000463577,1,0.00515659,0.089899977,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,91,\N,42,0,3,2012,5,0,2.81128E-05,1,0.00515659,0.005451824,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,91,\N,42,0,3,2012,5,0,3.12365E-05,1,0.00515659,0.006057579,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,91,\N,42,0,3,2012,5,0,3.51411E-05,1,0.00515659,0.00681479,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,91,\N,42,0,3,2012,5,0,4.01612E-05,1,0.00515659,0.007788323,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,91,\N,42,0,3,2012,5,0,4.68546E-05,1,0.00515659,0.00908635,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,91,\N,42,0,3,2012,5,0,5.28809E-05,1,0.00515659,0.010255012,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,91,\N,42,0,3,2012,5,0,6.61011E-05,1,0.00515659,0.01281877,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,91,\N,42,0,3,2012,5,0,8.81352E-05,1,0.00515659,0.017091767,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,91,\N,42,0,3,2012,5,0,0.000132202,1,0.00515659,0.025637577,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,91,\N,42,0,3,2012,5,0,0.000264405,1,0.00515659,0.051275154,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,90,\N,42,0,3,2012,5,0,3.609149933,1,0.00515659,699.9101803,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,90,\N,42,0,3,2012,4,0,4.117010117,1,0.00515659,798.3977797,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,90,\N,42,0,3,2012,3,0,4.117010117,1,0.00515659,798.3977797,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,90,\N,42,0,3,2012,2,0,4.117010117,1,0.00515659,798.3977797,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,90,\N,42,0,3,2012,5,0,72.1832962,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,90,\N,42,0,3,2012,5,0,28.87319946,1,0.00515659,5599.281442,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,90,\N,42,0,3,2012,5,0,1.750970006,1,0.00515659,339.5596623,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,90,\N,42,0,3,2012,5,0,1.945520043,1,0.00515659,377.2880899,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,90,\N,42,0,3,2012,5,0,2.188709974,1,0.00515659,424.4490867,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,90,\N,42,0,3,2012,5,0,2.501379967,1,0.00515659,485.0841157,g,mi

Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,90,\N,42,0,3,2012,5,0,2.918270111,1,0.00515659,565.9302045,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,90,\N,42,0,3,2012,5,0,3.293610096,1,0.00515659,638.7186121,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,90,\N,42,0,3,2012,5,0,4.117010117,1,0.00515659,798.3977797,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,90,\N,42,0,3,2012,5,0,5.489369869,1,0.00515659,1064.534842,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,90,\N,42,0,3,2012,5,0,8.23404026,1,0.00515659,1596.799443,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,90,\N,42,0,3,2012,5,0,16.46809959,1,0.00515659,3193.602585,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,87,\N,42,0,3,2012,5,0,0.004579968,1,0.00515659,0.888177594,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,87,\N,42,0,3,2012,4,0,0.011645215,1,0.00515659,2.258316896,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,87,\N,42,0,3,2012,3,0,0.011645215,1,0.00515659,2.258316896,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,87,\N,42,0,3,2012,2,0,0.011645215,1,0.00515659,2.258316896,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,87,\N,42,0,3,2012,5,0,0.091599561,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,87,\N,42,0,3,2012,5,0,0.036639743,1,0.00515659,7.105420748,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,87,\N,42,0,3,2012,5,0,0.003303012,1,0.00515659,0.640541823,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,87,\N,42,0,3,2012,5,0,0.003670013,1,0.00515659,0.711713157,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,87,\N,42,0,3,2012,5,0,0.004128759,1,0.00515659,0.800676251,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,87,\N,42,0,3,2012,5,0,0.004718584,1,0.00515659,0.91505896,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,87,\N,42,0,3,2012,5,0,0.005504999,1,0.00515659,1.067565807,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,87,\N,42,0,3,2012,5,0,0.009316111,1,0.00515659,1.806641741,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,87,\N,42,0,3,2012,5,0,0.011645215,1,0.00515659,2.258316896,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,87,\N,42,0,3,2012,5,0,0.015526986,1,0.00515659,3.011095576,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,87,\N,42,0,3,2012,5,0,0.023290429,1,0.00515659,4.516633791,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,87,\N,42,0,3,2012,5,0,0.046580758,1,0.00515659,9.033248077,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,79,\N,42,0,3,2012,5,0,0.004924699,1,0.00515659,0.955030178,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,79,\N,42,0,3,2012,4,0,0.012521633,1,0.00515659,2.428277721,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,79,\N,42,0,3,2012,3,0,0.012521633,1,0.00515659,2.428277721,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,79,\N,42,0,3,2012,2,0,0.012521633,1,0.00515659,2.428277721,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,79,\N,42,0,3,2012,5,0,0.098494194,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,79,\N,42,0,3,2012,5,0,0.039397575,1,0.00515659,7.640237814,g,mi

Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,79,\N,42,0,3,2012,5,0,0.003551621,1,0.00515659,0.688753743,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,79,\N,42,0,3,2012,5,0,0.003946252,1,0.00515659,0.765283181,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,79,\N,42,0,3,2012,5,0,0.004439529,1,0.00515659,0.860942686,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,79,\N,42,0,3,2012,5,0,0.005073751,1,0.00515659,0.98393526,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,79,\N,42,0,3,2012,5,0,0.005919358,1,0.00515659,1.147920933,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,79,\N,42,0,3,2012,5,0,0.010017326,1,0.00515659,1.942626006,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,79,\N,42,0,3,2012,5,0,0.012521633,1,0.00515659,2.428277721,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,79,\N,42,0,3,2012,5,0,0.016695613,1,0.00515659,3.237723495,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,79,\N,42,0,3,2012,5,0,0.025043467,1,0.00515659,4.856594453,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,79,\N,42,0,3,2012,5,0,0.050086934,1,0.00515659,9.713188906,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,31,\N,42,0,3,2012,5,0,1.91086E-05,1,0.00515659,0.003705666,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,31,\N,42,0,3,2012,4,0,2.17975E-05,1,0.00515659,0.004227115,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,31,\N,42,0,3,2012,3,0,2.17975E-05,1,0.00515659,0.004227115,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,31,\N,42,0,3,2012,2,0,2.17975E-05,1,0.00515659,0.004227115,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,31,\N,42,0,3,2012,5,0,0.000382174,1,0,\N,g,mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,31,\N,42,0,3,2012,5,0,0.000152869,1,0.00515659,0.029645367,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,31,\N,42,0,3,2012,5,0,9.27047E-06,1,0.00515659,0.001797791,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,31,\N,42,0,3,2012,5,0,1.03005E-05,1,0.00515659,0.001997541,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,31,\N,42,0,3,2012,5,0,1.15881E-05,1,0.00515659,0.002247241,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,31,\N,42,0,3,2012,5,0,1.32435E-05,1,0.00515659,0.002568267,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,31,\N,42,0,3,2012,5,0,1.54507E-05,1,0.00515659,0.002996302,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,31,\N,42,0,3,2012,5,0,1.7438E-05,1,0.00515659,0.003381692,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,31,\N,42,0,3,2012,5,0,2.17975E-05,1,0.00515659,0.004227115,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,31,\N,42,0,3,2012,5,0,2.90634E-05,1,0.00515659,0.005636166,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,31,\N,42,0,3,2012,5,0,4.3595E-05,1,0.00515659,0.00845423,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,31,\N,42,0,3,2012,5,0,8.71901E-05,1,0.00515659,0.01690848,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,6,\N,42,0,3,2012,5,0,0.000433068,1,0.00515659,0.083983404,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,6,\N,42,0,3,2012,4,0,0.000433068,1,0.00515659,0.083983404,g,mi

Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,6,\N,42,0,3,2012,3,0,0.000433068,1,0.0051
5659,0.083983404,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,6,\N,42,0,3,2012,2,0,0.000433068,1,0.0051
5659,0.083983404,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,6,\N,42,0,3,2012,5,0,0.00866138,1,0,\N,g,
mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,6,\N,42,0,3,2012,5,0,0.00346454,1,0.00515
659,0.671866468,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,6,\N,42,0,3,2012,5,0,0.000173228,1,0.0051
5659,0.033593519,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,6,\N,42,0,3,2012,5,0,0.000192475,1,0.005156
59,0.037326022,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,6,\N,42,0,3,2012,5,0,0.000216534,1,0.005156
59,0.041991702,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,6,\N,42,0,3,2012,5,0,0.000247468,1,0.005156
59,0.04799063,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,6,\N,42,0,3,2012,5,0,0.000288712,1,0.005156
59,0.055988938,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,6,\N,42,0,3,2012,5,0,0.000346454,1,0.005156
59,0.067186648,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,6,\N,42,0,3,2012,5,0,0.000433068,1,0.005156
59,0.083983404,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,6,\N,42,0,3,2012,5,0,0.000577426,1,0.005156
59,0.11197826,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,6,\N,42,0,3,2012,5,0,0.000866138,1,0.005156
59,0.167967204,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,6,\N,42,0,3,2012,5,0,0.00173228,1,0.0051565
9,0.335935175,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,5,\N,42,0,3,2012,5,0,0.115189701,1,0.0051
5659,22.33834729,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,5,\N,42,0,3,2012,4,0,0.292884707,1,0.0051
5659,56.79813591,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,5,\N,42,0,3,2012,3,0,0.292884707,1,0.0051
5659,56.79813591,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,5,\N,42,0,3,2012,2,0,0.292884707,1,0.0051
5659,56.79813591,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,5,\N,42,0,3,2012,5,0,2.303803921,1,0,\N,g,
mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,5,\N,42,0,3,2012,5,0,0.921519637,1,0.0051
5659,178.7071713,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,5,\N,42,0,3,2012,5,0,0.083073281,1,0.0051
5659,16.110119,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,5,\N,42,0,3,2012,5,0,0.092303738,1,0.005156
59,17.9001502,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,5,\N,42,0,3,2012,5,0,0.103841849,1,0.005156
59,20.13769679,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,5,\N,42,0,3,2012,5,0,0.118676119,1,0.005156
59,23.01445633,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,5,\N,42,0,3,2012,5,0,0.138454795,1,0.005156
59,26.85006781,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,5,\N,42,0,3,2012,5,0,0.234307557,1,0.005156
59,45.43846827,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,5,\N,42,0,3,2012,5,0,0.292884707,1,0.005156
59,56.79813591,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,5,\N,42,0,3,2012,5,0,0.390515655,1,0.005156
59,75.73137381,g,mi

Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,5,\N,42,0,3,2012,5,0,0.585772455,1,0.005156
59,113.5968613,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,5,\N,42,0,3,2012,5,0,1.171542883,1,0.005156
59,227.1933296,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,3,\N,42,0,3,2012,5,0,0.008568003,1,0.0051
5659,1.661563672,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,3,\N,42,0,3,2012,4,0,0.006654836,1,0.0051
5659,1.290549774,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,3,\N,42,0,3,2012,3,0,0.006654836,1,0.0051
5659,1.290549774,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,3,\N,42,0,3,2012,2,0,0.006654836,1,0.0051
5659,1.290549774,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,3,\N,42,0,3,2012,5,0,0.17136085,1,0,\N,g,
mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,3,\N,42,0,3,2012,5,0,0.068544045,1,0.0051
5659,13.29251371,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,3,\N,42,0,3,2012,5,0,0.001904916,1,0.0051
5659,0.369413912,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,3,\N,42,0,3,2012,5,0,0.002116575,1,0.005156
59,0.410460133,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,3,\N,42,0,3,2012,5,0,0.002381145,1,0.005156
59,0.461767407,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,3,\N,42,0,3,2012,5,0,0.002721309,1,0.005156
59,0.527734153,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,3,\N,42,0,3,2012,5,0,0.003174847,1,0.005156
59,0.615687287,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,3,\N,42,0,3,2012,5,0,0.005323873,1,0.005156
59,1.032440578,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,3,\N,42,0,3,2012,5,0,0.006654836,1,0.005156
59,1.290549774,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,3,\N,42,0,3,2012,5,0,0.008873154,1,0.005156
59,1.720740678,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,3,\N,42,0,3,2012,5,0,0.013309733,1,0.005156
59,2.581111288,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,3,\N,42,0,3,2012,5,0,0.026619466,1,0.005156
59,5.162222576,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,2,\N,42,0,3,2012,5,0,0.04179002,1,0.00515
659,8.104196495,g,mi
"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,2,\N,42,0,3,2012,4,0,0.05912523,1,0.00515
659,11.46595485,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,2,\N,42,0,3,2012,3,0,0.05912523,1,0.00515
659,11.46595485,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,2,\N,42,0,3,2012,2,0,0.05912523,1,0.00515
659,11.46595485,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,2,\N,42,0,3,2012,5,0,0.83580339,1,0,\N,g,
mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,2,\N,42,0,3,2012,5,0,0.334320754,1,0.0051
5659,64.83368755,g,mi
"2,1,2020,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,10,2,\N,42,0,3,2012,5,0,0.032926515,1,0.0051
5659,6.385327099,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,2,\N,42,0,3,2012,5,0,0.036585014,1,0.005156
59,7.094807487,g,mi
"2,1,2020,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,8,2,\N,42,0,3,2012,5,0,0.041158091,1,0.005156
59,7.98164876,g,mi
"2,1,2020,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,7,2,\N,42,0,3,2012,5,0,0.047037844,1,0.005156
59,9.121889148,g,mi

Table I-9 MOVES3.0.3 Sample Output File for 2020

"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,2,\N,42,0,3,2012,5,0,0.054877322,1,0.005156
59,10.64217258,g,mi
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59,9.172763594,g,mi
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9,11.46595485,g,mi
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59,15.28800338,g,mi
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59,22.93190971,g,mi
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59,45.86401303,g,mi
"2,1,2020,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,17,1,\N,42,0,3,2012,5,0,0.120114863,1,0.0051
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"2,1,2020,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",2,1,2020,7,5,16,25,25025,250250,16,1,\N,42,0,3,2012,4,0,0.305406839,1,0.0051
5659,59.22651025,g,mi
"2,1,2020,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",2,1,2020,7,5,16,25,25025,250250,15,1,\N,42,0,3,2012,3,0,0.305406839,1,0.0051
5659,59.22651025,g,mi
"2,1,2020,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",2,1,2020,7,5,16,25,25025,250250,14,1,\N,42,0,3,2012,2,0,0.305406839,1,0.0051
5659,59.22651025,g,mi
"2,1,2020,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,12,1,\N,42,0,3,2012,5,0,2.402297258,1,0,\N,g,
mi
"2,1,2020,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,11,1,\N,42,0,3,2012,5,0,0.96091789,1,0.00515
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659,16.79888218,g,mi
"2,1,2020,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,9,1,\N,42,0,3,2012,5,0,0.096249945,1,0.005156
59,18.6654248,g,mi
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59,20.99850736,g,mi
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59,23.9984605,g,mi
"2,1,2020,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,6,1,\N,42,0,3,2012,5,0,0.144374907,1,0.005156
59,27.99813504,g,mi
"2,1,2020,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,5,1,\N,42,0,3,2012,5,0,0.244325086,1,0.005156
59,47.38113365,g,mi
"2,1,2020,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,4,1,\N,42,0,3,2012,5,0,0.305406839,1,0.005156
59,59.22651025,g,mi
"2,1,2020,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,3,1,\N,42,0,3,2012,5,0,0.407211185,1,0.005156
59,78.96908105,g,mi
"2,1,2020,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,2,1,\N,42,0,3,2012,5,0,0.610815704,1,0.005156
59,118.4534135,g,mi
"2,1,2020,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",2,1,2020,7,5,16,25,25025,250250,1,1,\N,42,0,3,2012,5,0,1.221635342,1,0.005156
59,236.9075899,g,mi

Source: CMT and Massport, 2022.

Table I-10 MOVES3.0.3 Sample Input File for 2021

```
<runspec version="MOVES3.0.3">
    <description><![CDATA[Summer 2021 EDR TB]]></description>
    <models>
        <model value="ONROAD"/>
    </models>
    <modelscale value="Inv"/>
    <modeldomain value="PROJECT"/>
    <geographicselections>
        <geographicselection type="COUNTY" key="25025" description="Suffolk County, MA (25025)"/>
    </geographicselections>
    <timespan>
        <year key="2021"/>
        <month id="7"/>
        <day id="5"/>
        <beginhour id="16"/>
        <endhour id="16"/>
        <aggregateBy key="Hour"/>
    </timespan>
    <onroadvehicleselections>
        <onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="42"
sourcetypename="Transit Bus"/>
        <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="42" sourcetypename="Transit Bus"/>
        <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="42" sourcetypename="Transit Bus"/>
    </onroadvehicleselections>
    <offroadvehicleselections>
    </offroadvehicleselections>
    <offroadvehiclesccs>
    </offroadvehiclesccs>
    <roadtypes>
        <roadtype roadtypeid="1" roadtypename="Off-Network" modelCombination="M1"/>
        <roadtype roadtypeid="2" roadtypename="Rural Restricted Access" modelCombination="M1"/>
        <roadtype roadtypeid="3" roadtypename="Rural Unrestricted Access" modelCombination="M1"/>
        <roadtype roadtypeid="4" roadtypename="Urban Restricted Access" modelCombination="M1"/>
        <roadtype roadtypeid="5" roadtypename="Urban Unrestricted Access" modelCombination="M1"/>
    </roadtypes>
    <pollutantprocessassociations>
        <pollutantprocessassociation pollutantkey="90" pollutantname="Atmospheric CO2" processkey="1" processname="Running
Exhaust"/>
        <pollutantprocessassociation pollutantkey="90" pollutantname="Atmospheric CO2" processkey="2" processname="Start
Exhaust"/>
        <pollutantprocessassociation pollutantkey="90" pollutantname="Atmospheric CO2" processkey="90" processname="Extended
Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="90" pollutantname="Atmospheric CO2" processkey="91" processname="Auxiliary
Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="98" pollutantname="CO2 Equivalent" processkey="1" processname="Running
Exhaust"/>
        <pollutantprocessassociation pollutantkey="98" pollutantname="CO2 Equivalent" processkey="2" processname="Start
Exhaust"/>
        <pollutantprocessassociation pollutantkey="98" pollutantname="CO2 Equivalent" processkey="90" processname="Extended
Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="98" pollutantname="CO2 Equivalent" processkey="91" processname="Auxiliary
Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="1"
processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="15"
processname="Crankcase Running Exhaust"/>
```

Table I-10 MOVES3.0.3 Sample Input File for 2021


```
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="2" processname="Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="16" processname="Crankcase Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="90" processname="Extended Idle Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
	<pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="91" processname="Auxiliary Power Exhaust"/>
	<pollutantprocessassociation pollutantkey="118" pollutantname="Composite - NonECPM" processkey="1" processname="Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="118" pollutantname="Composite - NonECPM" processkey="2" processname="Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="118" pollutantname="Composite - NonECPM" processkey="90" processname="Extended Idle Exhaust"/>
	<pollutantprocessassociation pollutantkey="118" pollutantname="Composite - NonECPM" processkey="91" processname="Auxiliary Power Exhaust"/>
	<pollutantprocessassociation pollutantkey="112" pollutantname="Elemental Carbon" processkey="1" processname="Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="112" pollutantname="Elemental Carbon" processkey="2" processname="Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="112" pollutantname="Elemental Carbon" processkey="90" processname="Extended Idle Exhaust"/>
	<pollutantprocessassociation pollutantkey="112" pollutantname="Elemental Carbon" processkey="91" processname="Auxiliary Power Exhaust"/>
	<pollutantprocessassociation pollutantkey="119" pollutantname="H2O (aerosol)" processkey="1" processname="Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="119" pollutantname="H2O (aerosol)" processkey="2" processname="Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="119" pollutantname="H2O (aerosol)" processkey="90" processname="Extended Idle Exhaust"/>
	<pollutantprocessassociation pollutantkey="119" pollutantname="H2O (aerosol)" processkey="91" processname="Auxiliary Power Exhaust"/>
	<pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="1" processname="Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="15" processname="Crankcase Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="2" processname="Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="16" processname="Crankcase Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="90" processname="Extended Idle Exhaust"/>
	<pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
	<pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="91" processname="Auxiliary Power Exhaust"/>
	<pollutantprocessassociation pollutantkey="6" pollutantname="Nitrous Oxide (N2O)" processkey="1" processname="Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="6" pollutantname="Nitrous Oxide (N2O)" processkey="15" processname="Crankcase Running Exhaust"/>
	<pollutantprocessassociation pollutantkey="6" pollutantname="Nitrous Oxide (N2O)" processkey="2" processname="Start Exhaust"/>
	<pollutantprocessassociation pollutantkey="6" pollutantname="Nitrous Oxide (N2O)" processkey="16" processname="Crankcase Start Exhaust"/>
```

Table I-10 MOVES3.0.3 Sample Input File for 2021


```
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="1"
processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="15"
processname="Crankcase Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="2"
processname="Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="16"
processname="Crankcase Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="17"
processname="Crankcase Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="91"
processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="11"
processname="Evap Permeation"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="13"
processname="Evap Fuel Leaks"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="18"
processname="Refueling Displacement Vapor Loss"/>
        <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="19"
processname="Refueling Spillage Loss"/>
        <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="1"
processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="15"
processname="Crankcase Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="2" processname="Start
Exhaust"/>
        <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="16"
processname="Crankcase Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="17"
processname="Crankcase Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="91"
processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10  - Total" processkey="1"
processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10  - Total" processkey="15"
processname="Crankcase Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10  - Total" processkey="2"
processname="Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10  - Total" processkey="16"
processname="Crankcase Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10  - Total" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10  - Total" processkey="17"
processname="Crankcase Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10  - Total" processkey="91"
processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="1"
processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="15"
processname="Crankcase Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="2"
processname="Start Exhaust"/>
```

Table I-10 MOVES3.0.3 Sample Input File for 2021


```
        <pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="16"
processname="Crankcase Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="17"
processname="Crankcase Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="91"
processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="106" pollutantname="Primary PM10 - Brakewear Particulate" processkey="9"
processname="Brakewear"/>
        <pollutantprocessassociation pollutantkey="107" pollutantname="Primary PM10 - Tirewear Particulate" processkey="10"
processname="Tirewear"/>
        <pollutantprocessassociation pollutantkey="116" pollutantname="Primary PM2.5 - Brakewear Particulate" processkey="9"
processname="Brakewear"/>
        <pollutantprocessassociation pollutantkey="117" pollutantname="Primary PM2.5 - Tirewear Particulate" processkey="10"
processname="Tirewear"/>
        <pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="1" processname="Running
Exhaust"/>
        <pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="2" processname="Start
Exhaust"/>
        <pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="91" processname="Auxiliary
Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="1" processname="Running
Exhaust"/>
        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="15"
processname="Crankcase Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="2" processname="Start
Exhaust"/>
        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="16"
processname="Crankcase Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="17"
processname="Crankcase Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="91"
processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="1"
processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="2"
processname="Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="91"
processname="Auxiliary Power Exhaust"/>
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processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="15"
processname="Crankcase Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="2"
processname="Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="16"
processname="Crankcase Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="90"
processname="Extended Idle Exhaust"/>
```

Table I-10 MOVES3.0.3 Sample Input File for 2021

```
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processname="Crankcase Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="91"
processname="Auxiliary Power Exhaust"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="11"
processname="Evap Permeation"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="13"
processname="Evap Fuel Leaks"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="18"
processname="Refueling Displacement Vapor Loss"/>
        <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="19"
processname="Refueling Spillage Loss"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="1"
processname="Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="15"
processname="Crankcase Running Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="2"
processname="Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="16"
processname="Crankcase Start Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="90"
processname="Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="17"
processname="Crankcase Extended Idle Exhaust"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="91"
processname="Auxiliary Power Exhaust"/>
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processname="Evap Permeation"/>
        <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="13"
processname="Evap Fuel Leaks"/>
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processname="Refueling Displacement Vapor Loss"/>
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processname="Refueling Spillage Loss"/>
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    </databaseselections>
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    </internalcontrolstrategies>
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    <uncertaintyparameters uncertaintymodeenabled="false" numberofrunspersimulation="0" numberofsimulations="0"/>
    <geographicoutputdetail description="LINK"/>
    <outputemissionsbreakdownselection>
        <modelyear selected="true"/>
        <fueltype selected="true"/>
        <fuelsubtype selected="false"/>
        <emissionprocess selected="false"/>
        <onroadoffroad selected="false"/>
        <roadtype selected="true"/>
        <sourceusetype selected="true"/>
        <movesvehicletype selected="false"/>
        <onroadscc selected="false"/>
        <estimateuncertainty selected="false" numberOfIterations="2" keepSampledData="false" keepIterations="false"/>
        <sector selected="false"/>
        <engtechid selected="false"/>
        <hpclass selected="false"/>
        <regclassid selected="false"/>
```

Table I-10 MOVES3.0.3 Sample Input File for 2021

```
    </outputemissionsbreakdownselection>
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    <outputtimestep value="Hour"/>
    <outputvmtdata value="true"/>
    <outputsho value="true"/>
    <outputsh value="true"/>
    <outputshp value="true"/>
    <outputshidling value="true"/>
    <outputstarts value="true"/>
    <outputpopulation value="true"/>
    <scaleinputdatabase servername="localhost" databasename="bos_edr_2021_summer_tb_in" description=""/>
    <pmsize value="0"/>
    <outputfactors>
        <timefactors selected="true" units="Hours"/>
        <distancefactors selected="true" units="Miles"/>
        <massfactors selected="true" units="Grams" energyunits="Million BTU"/>
    </outputfactors>
    <savedata>

    </savedata>

    <donotexecute>

    </donotexecute>

    <generatordatabase shouldsave="false" servername="" databasename="" description=""/>
        <donotperformfinalaggregation selected="false"/>
    <lookuptableflags scenarioid="" truncateoutput="true" truncateactivity="true" truncatebaserates="true"/>
</runspec>
```

Source: CMT and Massport, 2022.

Table I-11 MOVES3.0.3 Sample Output File for 2021

MasterKey,MOVESRunID,iterationID,yearID,monthID,dayID,hourID,stateID,countyID,zoneID,linkID,pollutantID,processID,sourceTypeID,regClassId,fuelTypeID,modelYearID,roadTypeID,SCC,emissionQuant,activityTypeID,activity,emissionRate,massUnits,distanceUnits
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Table I-11 MOVES3.0.3 Sample Output File for 2021

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Table I-11 MOVES3.0.3 Sample Output File for 2021

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34,0.312435094,g,mi
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34,0.624870188,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,115,\N,42,0,3,2012,5,0,9.71608E-
08,1,0.00375534,2.58727E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,115,\N,42,0,3,2012,4,0,3.09147E-
07,1,0.00375534,8.2322E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,115,\N,42,0,3,2012,3,0,3.09147E-
07,1,0.00375534,8.2322E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,115,\N,42,0,3,2012,2,0,3.09147E-
07,1,0.00375534,8.2322E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,115,\N,42,0,3,2012,5,0,1.94322E-
06,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,115,\N,42,0,3,2012,5,0,7.77287E-
07,1,0.00375534,0.000206982,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,115,\N,42,0,3,2012,5,0,1.75773E-
07,1,0.00375534,4.68061E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,115,\N,42,0,3,2012,5,0,1.95303E-
07,1,0.00375534,5.20067E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,115,\N,42,0,3,2012,5,0,2.19716E-
07,1,0.00375534,5.85076E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,115,\N,42,0,3,2012,5,0,2.51104E-
07,1,0.00375534,6.68659E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,115,\N,42,0,3,2012,5,0,2.92955E-
07,1,0.00375534,7.80103E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,115,\N,42,0,3,2012,5,0,2.47318E-
07,1,0.00375534,6.58577E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,115,\N,42,0,3,2012,5,0,3.09147E-
07,1,0.00375534,8.2322E-05,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,115,\N,42,0,3,2012,5,0,4.12198E-
07,1,0.00375534,0.000109763,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,115,\N,42,0,3,2012,5,0,6.18295E-
07,1,0.00375534,0.000164644,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,115,\N,42,0,3,2012,5,0,1.23659E-
06,1,0.00375534,0.000329288,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,112,\N,42,0,3,2012,5,0,9.46346E-
07,1,0.00375534,0.000252,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,112,\N,42,0,3,2012,4,0,3.40685E-
06,1,0.00375534,0.000907202,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,112,\N,42,0,3,2012,3,0,3.40685E-
06,1,0.00375534,0.000907202,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,112,\N,42,0,3,2012,2,0,3.40685E-
06,1,0.00375534,0.000907202,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,112,\N,42,0,3,2012,5,0,1.89269E-
05,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,112,\N,42,0,3,2012,5,0,7.57077E-
06,1,0.00375534,0.002016001,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,112,\N,42,0,3,2012,5,0,1.8927E-
06,1,0.00375534,0.000504002,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,112,\N,42,0,3,2012,5,0,2.103E-
06,1,0.00375534,0.000560003,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,112,\N,42,0,3,2012,5,0,2.36587E-
06,1,0.00375534,0.000630002,g,mi

Table I-11 MOVES3.0.3 Sample Output File for 2021

"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,112,\N,42,0,3,2012,5,0,2.70386E-06,1,0.00375534,0.000720004,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,112,\N,42,0,3,2012,5,0,3.1545E-06,1,0.00375534,0.000840004,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,112,\N,42,0,3,2012,5,0,2.72548E-06,1,0.00375534,0.000725761,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,112,\N,42,0,3,2012,5,0,3.40685E-06,1,0.00375534,0.000907202,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,112,\N,42,0,3,2012,5,0,4.54248E-06,1,0.00375534,0.001209606,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,112,\N,42,0,3,2012,5,0,6.8137E-06,1,0.00375534,0.001814403,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,112,\N,42,0,3,2012,5,0,1.36274E-05,1,0.00375534,0.003628806,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,110,\N,42,0,3,2012,5,0,9.27418E-06,1,0.00375534,0.002469598,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,110,\N,42,0,3,2012,4,0,2.99044E-05,1,0.00375534,0.007963167,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,110,\N,42,0,3,2012,3,0,2.99044E-05,1,0.00375534,0.007963167,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,110,\N,42,0,3,2012,2,0,2.99044E-05,1,0.00375534,0.007963167,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,110,\N,42,0,3,2012,5,0,0.000185484,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,110,\N,42,0,3,2012,5,0,7.41935E-05,1,0.00375534,0.0197568,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,110,\N,42,0,3,2012,5,0,1.69585E-05,1,0.00375534,0.004515836,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,110,\N,42,0,3,2012,5,0,1.88428E-05,1,0.00375534,0.005017602,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,110,\N,42,0,3,2012,5,0,2.11981E-05,1,0.00375534,0.005644789,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,110,\N,42,0,3,2012,5,0,2.42264E-05,1,0.00375534,0.006451187,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,110,\N,42,0,3,2012,5,0,2.82642E-05,1,0.00375534,0.007526402,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,110,\N,42,0,3,2012,5,0,2.39236E-05,1,0.00375534,0.006370555,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,110,\N,42,0,3,2012,5,0,2.99044E-05,1,0.00375534,0.007963167,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,110,\N,42,0,3,2012,5,0,3.98727E-05,1,0.00375534,0.010617601,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,110,\N,42,0,3,2012,5,0,5.98089E-05,1,0.00375534,0.015926361,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,110,\N,42,0,3,2012,5,0,0.000119618,1,0.00375534,0.031852776,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,107,\N,42,0,3,2012,5,0,9.62624E-05,1,0.00375534,0.025633473,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,107,\N,42,0,3,2012,4,0,9.62624E-05,1,0.00375534,0.025633473,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,107,\N,42,0,3,2012,3,0,9.62624E-05,1,0.00375534,0.025633473,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,107,\N,42,0,3,2012,2,0,9.62624E-05,1,0.00375534,0.025633473,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,107,\N,42,0,3,2012,5,0,0,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,107,\N,42,0,3,2012,5,0,0.000240694,1,0.00375534,0.0640938,g,mi

Table I-11 MOVES3.0.3 Sample Output File for 2021

"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,107,\N,42,0,3,2012,5,0,6.1563E-05,1,0.00375534,0.016393456,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,107,\N,42,0,3,2012,5,0,6.63198E-05,1,0.00375534,0.017660133,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,107,\N,42,0,3,2012,5,0,7.14521E-05,1,0.00375534,0.0190268,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,107,\N,42,0,3,2012,5,0,7.6985E-05,1,0.00375534,0.020500142,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,107,\N,42,0,3,2012,5,0,8.29185E-05,1,0.00375534,0.022080159,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,107,\N,42,0,3,2012,5,0,8.93526E-05,1,0.00375534,0.023793479,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,107,\N,42,0,3,2012,5,0,9.62624E-05,1,0.00375534,0.025633473,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,107,\N,42,0,3,2012,5,0,0.000103698,1,0.00375534,0.02761348,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,107,\N,42,0,3,2012,5,0,0.000111709,1,0.00375534,0.029746708,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,107,\N,42,0,3,2012,5,0,0.000120347,1,0.00375534,0.0320469,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,106,\N,42,0,3,2012,5,0,7.50909E-05,1,0.00375534,0.019995767,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,106,\N,42,0,3,2012,4,0,0.00469319,1,0.00375534,1.249737771,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,106,\N,42,0,3,2012,3,0,0.00469319,1,0.00375534,1.249737771,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,106,\N,42,0,3,2012,2,0,0.00469319,1,0.00375534,1.249737771,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,106,\N,42,0,3,2012,5,0,0.00150182,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,106,\N,42,0,3,2012,5,0,0.000600728,1,0.00375534,0.159966339,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,106,\N,42,0,3,2012,5,0,0.00120333,1,0.00375534,0.320431715,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,106,\N,42,0,3,2012,5,0,0.00133704,1,0.00375534,0.356037009,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,106,\N,42,0,3,2012,5,0,0.00150417,1,0.00375534,0.400541643,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,106,\N,42,0,3,2012,5,0,0.00171905,1,0.00375534,0.457761493,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,106,\N,42,0,3,2012,5,0,0.00200555,1,0.00375534,0.534052879,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,106,\N,42,0,3,2012,5,0,0.00375456,1,0.00375534,0.9997923,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,106,\N,42,0,3,2012,5,0,0.00469319,1,0.00375534,1.249737771,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,106,\N,42,0,3,2012,5,0,0.00625762,1,0.00375534,1.666325915,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,106,\N,42,0,3,2012,5,0,0.00938639,1,0.00375534,2.499478271,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,106,\N,42,0,3,2012,5,0,0.0187728,1,0.00375534,4.998961502,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,100,\N,42,0,3,2012,5,0,1.04838E-05,1,0.00375534,0.002791705,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,100,\N,42,0,3,2012,4,0,3.38049E-05,1,0.00375534,0.009001822,g,mi

Table I-11 MOVES3.0.3 Sample Output File for 2021

"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,100,\N,42,0,3,2012,3,0,3.38049E-05,1,0.00375534,0.009001822,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,100,\N,42,0,3,2012,2,0,3.38049E-05,1,0.00375534,0.009001822,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,100,\N,42,0,3,2012,5,0,0.000209676,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,100,\N,42,0,3,2012,5,0,8.38706E-05,1,0.00375534,0.02233369,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,100,\N,42,0,3,2012,5,0,1.91704E-05,1,0.00375534,0.005104838,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,100,\N,42,0,3,2012,5,0,2.13005E-05,1,0.00375534,0.005672057,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,100,\N,42,0,3,2012,5,0,2.3963E-05,1,0.00375534,0.006381047,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,100,\N,42,0,3,2012,5,0,2.73863E-05,1,0.00375534,0.007292629,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,100,\N,42,0,3,2012,5,0,3.19507E-05,1,0.00375534,0.008508072,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,100,\N,42,0,3,2012,5,0,2.70439E-05,1,0.00375534,0.007201452,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,100,\N,42,0,3,2012,5,0,3.38049E-05,1,0.00375534,0.009001822,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,100,\N,42,0,3,2012,5,0,4.50733E-05,1,0.00375534,0.012002455,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,100,\N,42,0,3,2012,5,0,6.76097E-05,1,0.00375534,0.018003616,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,100,\N,42,0,3,2012,5,0,0.00013522,1,0.00375534,0.036007395,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,98,\N,42,0,3,2012,5,0,4.792290211,1,0.00375534,1276.12689,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,98,\N,42,0,3,2012,4,0,8.355190277,1,0.00375534,2224.882575,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,98,\N,42,0,3,2012,3,0,8.355190277,1,0.00375534,2224.882575,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,98,\N,42,0,3,2012,2,0,8.355190277,1,0.00375534,2224.882575,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,98,\N,42,0,3,2012,5,0,95.84570313,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,98,\N,42,0,3,2012,5,0,38.3382988,1,0.00375534,10209.00902,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,98,\N,42,0,3,2012,5,0,2.805520058,1,0.00375534,747.0748699,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,98,\N,42,0,3,2012,5,0,3.117249966,1,0.00375534,830.084642,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,98,\N,42,0,3,2012,5,0,3.506910086,1,0.00375534,933.8462539,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,98,\N,42,0,3,2012,5,0,4.007890224,1,0.00375534,1067.250993,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,98,\N,42,0,3,2012,5,0,4.675879955,1,0.00375534,1245.128296,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,98,\N,42,0,3,2012,5,0,6.684169769,1,0.00375534,1779.910733,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,98,\N,42,0,3,2012,5,0,8.355190277,1,0.00375534,2224.882575,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,98,\N,42,0,3,2012,5,0,11.1402998,1,0.00375534,2966.522374,g,mi

Table I-11 MOVES3.0.3 Sample Output File for 2021

"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,98,\N,42,0,3,2012,5,0,16.71039963,1,0.00375534,4449.770229,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,98,\N,42,0,3,2012,5,0,33.42089844,1,0.00375534,8899.566868,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,91,\N,42,0,3,2012,5,0,4.22008E-05,1,0.00375534,0.011237544,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,91,\N,42,0,3,2012,4,0,4.8139E-05,1,0.00375534,0.012818804,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,91,\N,42,0,3,2012,3,0,4.8139E-05,1,0.00375534,0.012818804,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,91,\N,42,0,3,2012,2,0,4.8139E-05,1,0.00375534,0.012818804,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,91,\N,42,0,3,2012,5,0,0.000844015,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,91,\N,42,0,3,2012,5,0,0.000337607,1,0.00375534,0.089900454,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,91,\N,42,0,3,2012,5,0,2.04735E-05,1,0.00375534,0.00545184,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,91,\N,42,0,3,2012,5,0,2.27483E-05,1,0.00375534,0.006057581,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,91,\N,42,0,3,2012,5,0,2.55918E-05,1,0.00375534,0.006814781,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,91,\N,42,0,3,2012,5,0,2.92478E-05,1,0.00375534,0.007788332,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,91,\N,42,0,3,2012,5,0,3.41225E-05,1,0.00375534,0.009086383,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,91,\N,42,0,3,2012,5,0,3.85112E-05,1,0.00375534,0.010255058,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,91,\N,42,0,3,2012,5,0,4.8139E-05,1,0.00375534,0.012818804,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,91,\N,42,0,3,2012,5,0,6.41855E-05,1,0.00375534,0.017091797,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,91,\N,42,0,3,2012,5,0,9.62783E-05,1,0.00375534,0.02563771,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,91,\N,42,0,3,2012,5,0,0.000192557,1,0.00375534,0.051275421,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,90,\N,42,0,3,2012,5,0,2.628410101,1,0.00375534,699.9127056,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,90,\N,42,0,3,2012,4,0,2.998260021,1,0.00375534,798.3991094,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,90,\N,42,0,3,2012,3,0,2.998260021,1,0.00375534,798.3991094,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,90,\N,42,0,3,2012,2,0,2.998260021,1,0.00375534,798.3991094,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,90,\N,42,0,3,2012,5,0,52.56819916,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,90,\N,42,0,3,2012,5,0,21.02729988,1,0.00375534,5599.306724,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,90,\N,42,0,3,2012,5,0,1.275159955,1,0.00375534,339.5591327,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,90,\N,42,0,3,2012,5,0,1.416839957,1,0.00375534,377.2867436,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,90,\N,42,0,3,2012,5,0,1.593950033,1,0.00375534,424.4489397,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,90,\N,42,0,3,2012,5,0,1.821660042,1,0.00375534,485.0852644,g,mi

Table I-11 MOVES3.0.3 Sample Output File for 2021

"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,90,\N,42,0,3,2012,5,0,2.12526989,1,0.00375534,565.9327661,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,90,\N,42,0,3,2012,5,0,2.398610115,1,0.00375534,638.7198462,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,90,\N,42,0,3,2012,5,0,2.998260021,1,0.00375534,798.3991094,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,90,\N,42,0,3,2012,5,0,3.997699976,1,0.00375534,1064.537458,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,90,\N,42,0,3,2012,5,0,5.996520042,1,0.00375534,1596.798219,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,90,\N,42,0,3,2012,5,0,11.99310017,1,0.00375534,3193.612436,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,87,\N,42,0,3,2012,5,0,0.003335424,1,0.00375534,0.888181656,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,87,\N,42,0,3,2012,4,0,0.008480707,1,0.00375534,2.258306156,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,87,\N,42,0,3,2012,3,0,0.008480707,1,0.00375534,2.258306156,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,87,\N,42,0,3,2012,2,0,0.008480707,1,0.00375534,2.258306156,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,87,\N,42,0,3,2012,5,0,0.066708483,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,87,\N,42,0,3,2012,5,0,0.026683433,1,0.00375534,7.105464162,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,87,\N,42,0,3,2012,5,0,0.002405448,1,0.00375534,0.640540783,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,87,\N,42,0,3,2012,5,0,0.00267272,1,0.00375534,0.71171194,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,87,\N,42,0,3,2012,5,0,0.003006813,1,0.00375534,0.80067663,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,87,\N,42,0,3,2012,5,0,0.003436359,1,0.00375534,0.915059351,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,87,\N,42,0,3,2012,5,0,0.00400909,1,0.00375534,1.067570575,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,87,\N,42,0,3,2012,5,0,0.00678459,1,0.00375534,1.806651373,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,87,\N,42,0,3,2012,5,0,0.008480707,1,0.00375534,2.258306156,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,87,\N,42,0,3,2012,5,0,0.011307617,1,0.00375534,3.011076776,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,87,\N,42,0,3,2012,5,0,0.016961476,1,0.00375534,4.516628679,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,87,\N,42,0,3,2012,5,0,0.033922952,1,0.00375534,9.033257359,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,79,\N,42,0,3,2012,5,0,0.003586475,1,0.00375534,0.955033281,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,79,\N,42,0,3,2012,4,0,0.009119043,1,0.00375534,2.428287026,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,79,\N,42,0,3,2012,3,0,0.009119043,1,0.00375534,2.428287026,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,79,\N,42,0,3,2012,2,0,0.009119043,1,0.00375534,2.428287026,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,79,\N,42,0,3,2012,5,0,0.071729496,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,79,\N,42,0,3,2012,5,0,0.028691797,1,0.00375534,7.640266247,g,mi

Table I-11 MOVES3.0.3 Sample Output File for 2021

"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,79,\N,42,0,3,2012,5,0,0.002586507,1,0.00375534,0.688754436,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,79,\N,42,0,3,2012,5,0,0.002873891,1,0.00375534,0.765281267,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,79,\N,42,0,3,2012,5,0,0.003233131,1,0.00375534,0.86094244,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,79,\N,42,0,3,2012,5,0,0.003695009,1,0.00375534,0.983934528,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,79,\N,42,0,3,2012,5,0,0.004310842,1,0.00375534,1.147923295,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,79,\N,42,0,3,2012,5,0,0.007295263,1,0.00375534,1.94263721,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,79,\N,42,0,3,2012,5,0,0.009119043,1,0.00375534,2.428287026,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,79,\N,42,0,3,2012,5,0,0.012158805,1,0.00375534,3.237737446,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,79,\N,42,0,3,2012,5,0,0.018238207,1,0.00375534,4.856606292,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,79,\N,42,0,3,2012,5,0,0.036476318,1,0.00375534,9.713186793,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,31,\N,42,0,3,2012,5,0,1.39161E-05,1,0.00375534,0.003705683,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,31,\N,42,0,3,2012,4,0,1.58743E-05,1,0.00375534,0.004227128,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,31,\N,42,0,3,2012,3,0,1.58743E-05,1,0.00375534,0.004227128,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,31,\N,42,0,3,2012,2,0,1.58743E-05,1,0.00375534,0.004227128,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,31,\N,42,0,3,2012,5,0,0.000278322,1,0,\N,g,mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,31,\N,42,0,3,2012,5,0,0.000111329,1,0.00375534,0.029645519,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,31,\N,42,0,3,2012,5,0,6.75132E-06,1,0.00375534,0.001797792,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,31,\N,42,0,3,2012,5,0,7.50147E-06,1,0.00375534,0.001997548,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,31,\N,42,0,3,2012,5,0,8.43915E-06,1,0.00375534,0.00224724,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,31,\N,42,0,3,2012,5,0,9.64474E-06,1,0.00375534,0.002568274,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,31,\N,42,0,3,2012,5,0,1.12522E-05,1,0.00375534,0.00299632,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,31,\N,42,0,3,2012,5,0,1.26994E-05,1,0.00375534,0.003381691,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,31,\N,42,0,3,2012,5,0,1.58743E-05,1,0.00375534,0.004227128,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,31,\N,42,0,3,2012,5,0,2.11658E-05,1,0.00375534,0.005636188,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,31,\N,42,0,3,2012,5,0,3.17485E-05,1,0.00375534,0.008454228,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,31,\N,42,0,3,2012,5,0,6.34972E-05,1,0.00375534,0.01690851,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,6,\N,42,0,3,2012,5,0,0.000315387,1,0.00375534,0.083983611,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,6,\N,42,0,3,2012,4,0,0.000315387,1,0.00375534,0.083983611,g,mi

Table I-11 MOVES3.0.3 Sample Output File for 2021

"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,6,\N,42,0,3,2012,3,0,0.000315387,1,0.0037
5534,0.083983611,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,6,\N,42,0,3,2012,2,0,0.000315387,1,0.0037
5534,0.083983611,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,6,\N,42,0,3,2012,5,0,0.00630774,1,0,\N,g,
mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,6,\N,42,0,3,2012,5,0,0.0025231,1,0.003755
34,0.671869945,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,6,\N,42,0,3,2012,5,0,0.000126155,1,0.0037
5534,0.033593499,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,6,\N,42,0,3,2012,5,0,0.000140172,1,0.003755
34,0.037326047,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,6,\N,42,0,3,2012,5,0,0.000157694,1,0.003755
34,0.041991937,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,6,\N,42,0,3,2012,5,0,0.000180221,1,0.003755
34,0.047990597,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,6,\N,42,0,3,2012,5,0,0.000210258,1,0.003755
34,0.055989074,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,6,\N,42,0,3,2012,5,0,0.00025231,1,0.0037553
4,0.067186998,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,6,\N,42,0,3,2012,5,0,0.000315387,1,0.003755
34,0.083983611,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,6,\N,42,0,3,2012,5,0,0.000420517,1,0.003755
34,0.111978412,g,mi
"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,6,\N,42,0,3,2012,5,0,0.000630774,1,0.003755
34,0.167967223,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,6,\N,42,0,3,2012,5,0,0.00126155,1,0.0037553
4,0.335934973,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,5,\N,42,0,3,2012,5,0,0.083888501,1,0.0037
5534,22.33845762,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,5,\N,42,0,3,2012,4,0,0.213296831,1,0.0037
5534,56.79827581,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,5,\N,42,0,3,2012,3,0,0.213296831,1,0.0037
5534,56.79827581,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,5,\N,42,0,3,2012,2,0,0.213296831,1,0.0037
5534,56.79827581,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,5,\N,42,0,3,2012,5,0,1.677768111,1,0,\N,g,
mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,5,\N,42,0,3,2012,5,0,0.6711092,1,0.003755
34,178.7079784,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,5,\N,42,0,3,2012,5,0,0.060498983,1,0.0037
5534,16.11012172,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,5,\N,42,0,3,2012,5,0,0.067221053,1,0.003755
34,17.90012488,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,5,\N,42,0,3,2012,5,0,0.075623825,1,0.003755
34,20.13767794,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,5,\N,42,0,3,2012,5,0,0.08642707,1,0.0037553
4,23.01444684,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,5,\N,42,0,3,2012,5,0,0.10083174,1,0.0037553
4,26.85022998,g,mi
"1,1,2021,7,5,16,25,25025,250250,5,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,5,5,\N,42,0,3,2012,5,0,0.17063807,1,0.0037553
4,45.43878175,g,mi
"1,1,2021,7,5,16,25,25025,250250,4,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,4,5,\N,42,0,3,2012,5,0,0.213296831,1,0.003755
34,56.79827581,g,mi
"1,1,2021,7,5,16,25,25025,250250,3,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,3,5,\N,42,0,3,2012,5,0,0.284397155,1,0.003755
34,75.73140211,g,mi

Table I-11 MOVES3.0.3 Sample Output File for 2021

"1,1,2021,7,5,16,25,25025,250250,2,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,2,5,\N,42,0,3,2012,5,0,0.426594675,1,0.003755
34,113.5968214,g,mi
"1,1,2021,7,5,16,25,25025,250250,1,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,1,5,\N,42,0,3,2012,5,0,0.853190362,1,0.003755
34,227.1939127,g,mi
"1,1,2021,7,5,16,25,25025,250250,17,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,17,3,\N,42,0,3,2012,5,0,0.006239749,1,0.0037
5534,1.661567176,g,mi
"1,1,2021,7,5,16,25,25025,250250,16,42,0,3,2012,4,00",1,1,2021,7,5,16,25,25025,250250,16,3,\N,42,0,3,2012,4,0,0.004846464,1,0.0037
5534,1.290552668,g,mi
"1,1,2021,7,5,16,25,25025,250250,15,42,0,3,2012,3,00",1,1,2021,7,5,16,25,25025,250250,15,3,\N,42,0,3,2012,3,0,0.004846464,1,0.0037
5534,1.290552668,g,mi
"1,1,2021,7,5,16,25,25025,250250,14,42,0,3,2012,2,00",1,1,2021,7,5,16,25,25025,250250,14,3,\N,42,0,3,2012,2,0,0.004846464,1,0.0037
5534,1.290552668,g,mi
"1,1,2021,7,5,16,25,25025,250250,12,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,12,3,\N,42,0,3,2012,5,0,0.12479499,1,0,\N,g,
mi
"1,1,2021,7,5,16,25,25025,250250,11,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,11,3,\N,42,0,3,2012,5,0,0.049918097,1,0.0037
5534,13.29256419,g,mi
"1,1,2021,7,5,16,25,25025,250250,10,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,10,3,\N,42,0,3,2012,5,0,0.001387276,1,0.0037
5534,0.369414105,g,mi
"1,1,2021,7,5,16,25,25025,250250,9,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,9,3,\N,42,0,3,2012,5,0,0.001541422,1,0.003755
34,0.410461315,g,mi
"1,1,2021,7,5,16,25,25025,250250,8,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,8,3,\N,42,0,3,2012,5,0,0.001734099,1,0.003755
34,0.461768948,g,mi
"1,1,2021,7,5,16,25,25025,250250,7,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,7,3,\N,42,0,3,2012,5,0,0.001981819,1,0.003755
34,0.527733603,g,mi
"1,1,2021,7,5,16,25,25025,250250,6,42,0,3,2012,5,00",1,1,2021,7,5,16,25,25025,250250,6,3,\N,42,0,3,2012,5,0,0.002312122,1,0.003755
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Table I-11 MOVES3.0.3 Sample Output File for 2021

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Source: CMT and Massport, 2022.

Fuel Storage and Handling

As in previous years, VOC emissions from fuel storage and handling were calculated using methods based on EPA's AP-42[7] document. Calculations account for evaporative emissions from breathing losses, working losses, and spillage from aboveground storage tanks, underground storage tanks, and aircraft refueling. **Table I-12** presents the fuel storage and handling fuel throughputs by fuel category that were used in the analyses as well as prior inventories (i.e., 1999 through 2021).

Stationary Sources

Stationary source emissions include the Central Heating and Cooling Plant, emergency generators, snow melters, space heaters, boilers, and sources associated with the fire training facility. Emission factors from EPA's AP-42 and/or NO_X Reasonably Available Control Technology (RACT) compliance testing were combined with the actual 2020 and 2021 fuel throughputs of the stationary sources to obtain emissions of VOCs, NO_X, CO, and $PM_{10}/PM_{2.5}$. Emissions from fire training fuel used at Logan Airport (i.e., Tek Flame®) was calculated using default emission factors from AEDT and actual annual fuel usage.

Title V of the 1990 Clean Air Act (CAA) Amendments requires facilities with air emissions to document their emissions and obtain a single permit combining all sources. The permitting program ensures that all emission sources are accounted for, the proper permits have been received, and permit conditions are being followed. A Title V Air Operating Permit covers all the stationary sources at Logan Airport including boilers, emergency generators, snow melters, fire training, cooling towers, paint booths, deicing facilities, and storage tanks. **Table I-13** presents Logan Airport's stationary sources fuel throughputs by fuel category from 1999 through 2021.

7 U.S. Environmental Protection Agency, "AP-42: Compilation of Air Pollutant Emission Factors," updated March 22, 2022, https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors.

Table I-12 Fuel Storage and Handling Fuel Throughputs by Fuel Category (gallons)

Fuel Category	1999	2000	2001	2002	2003	2004	2005
Jet Fuel	354,095,516	441,901,932	416,748,819	358,190,362	319,439,910	373,996,141	368,645,392
Aviation Gas	99,726	90,922	60,691	35,111	32,515	34,717	52,487
Auto Gas	7,200,000	7,569,206	6,181,472	5,754,740	5,436,322	5,803,442	5,903,424
Diesel	768,106	839,751	1,239,904	1,067,847	1,030,185	1,078,665	1,567,688
Heating Oil No. 2	480,733	494,500	582,283	340,492	370,903	381,852	367,899
Heating Oil No. 6	1,600,893	1,555,527	1,641,693	1,079,283	1,122,975	2,940,752	3,098,126
Fuel Category	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Jet Fuel	364,450,864	367,585,187	345,631,788	327,358,619	335,693,997	340,421,373	343,731,127
Aviation Gas	35,098	29,067	25,037	18,238	15,268	14,064	12,306
Auto Gas	6,028,931	6,022,237	5,693,178	5,736,724	5,696,505	5,487,952	6,694,626
Diesel	1,164,493	1,141,335	1,071,707	1,121,241	1,168,761	1,099,720	878,499
Heating Oil No. 2	259,768	423,181	303,143	409,049	319,727	384,906	210,794
Heating Oil No. 6	1,396,529	1,073,260	16,385	368,690	9,010	11,285	6,786
Fuel Category	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Jet Fuel	349,397,940	370,222,342	374,985,216	456,003,328	484,310,931	507,833,269	542,314,657
Aviation Gas	14,422	12,514	10,225	10,654	11,075	8,559	7,608
Auto Gas	6,800,936	7,007,591	7,432,165	7,794,957	7,737,865	6,739,001	7,411,444
Diesel	1,094,714	1,178,805	1,473,720	1,233,200	1,272,828	1,404,583	1,270,852
Heating Oil No. 2	289,665	289,956	294,704	520,977	213,279	25,664	20,000
Heating Oil No. 6[1]	17,721	77,146	0	0	0	0	0
Fuel Category	**2020**	**2021**					
Jet Fuel	220,004,260	302,650,342					
Aviation Gas	4,305	5,898					
Auto Gas	3,204,579	4,840,631					
Diesel	773,590	660,178					
Heating Oil No. 2	6,156	16,534					
Heating Oil No. 6[1]	0	0					

Source: Massport, 2022.

1 Effective November 2014, Massport no longer uses No. 6 heating oil at the Central Heating and Cooling Plant as it was replaced with No. 2 heating oil.

Table I-13 Stationary Source Fuel Throughputs by Fuel Category (gallons)

Fuel Category	1999	2000	2001	2002	2003	2004	2005
Natural Gas (ft^3)	183,943,000	283,720,049	199,500,000	268,359,282	201,714,114	62,610,000	92,460,000
Heating Oil No. 2	480,733	494,500	582,283	340,492	370,903	381,852	367,899
Heating Oil No. 6[1]	1,600,893	1,555,527	1,641,693	1,079,283	1,122,975	2,940,752	3,098,126
Diesel Fuel[2]	57,441	N/A	N/A	N/A	N/A	67,198	77,848
Fire Training Fuel[3]	23,000	N/A	N/A	N/A	13,719	12,227	8,105

Fuel Category	2006	2007	2008	2009	2010	2011	2012
Natural Gas (ft^3)	112,390,000	338,430,000	458,680,000	430,810,000	449,640,000	479,830,000	360,523,000
Heating Oil No. 2	259,768	423,181	303,143	409,050	319,727	384,906	210,794
Heating Oil No. 6[1]	1,396,529	1,073,260	16,385	368,690	9,010	11,285	6,786
Diesel Fuel[2]	77,848	258,606	146,718	145,778	116,511	218,081	42,109
Fire Training Fuel[3]	5,000	8,631	5,971	3,510	800	3,810	2,587

Fuel Category	2013	2014	2015	2016	2017	2018	2019
Natural Gas (ft^3)	402,496,000	418,805,000	463,170,000	429,502,000	491,356,303	422,549,485	515,029,176
Heating Oil No. 2	289,665	289,956	294,704	520,977	115,878	25,664	52,491
Heating Oil No. 6[1]	17,721	77,146	0	0	0	0	0
Diesel Fuel[2]	231,130	124,480	381,581	90,850	157,243	220,928	165,208
Fire Training Fuel[3]	5,400	3,753	7,619	6,153	5,211	7,366	7,375

Fuel Category	2020	2021
Natural Gas (ft^3)	407,657,000	401,934,668
Heating Oil No. 2	20,435	16,534
Heating Oil No. 6[1]	0	0
Diesel Fuel[2]	87,553	123,608
Fire Training Fuel[3]	6,460	7,757

Source: Massport, 2022.
N/A - Not available.

1 Effective November 2014, Massport no longer uses No. 6 heating oil at the Central Heating and Cooling Plant as it was replaced with No. 2 heating oil.

2 Diesel fuel was from the stationary snow melter usage. Starting in 2007, portable snow melter usage was also included. Starting in 2018 and 2019 emergency generators usage was also included.

3 Fire training fuel used in 1999-2002 was Jet A Fuel while in 2003 through 2015 it was Tek-Flame®. Starting in 2012 AvGas usage was also included. In 2020 and 2021 AvGas usage amounts to 304 gallons and 953 gallons, respectively.

1993 – 2009 Criteria Air Pollutant Emissions Inventories

Tables I-14 and **I-15** present the estimated VOC emissions for Logan Airport for the years 1993 through 2001 and 2002 through 2009, respectively. The emissions inventories from 2010 to 2021 are presented in Chapter 7, *Air Quality/Emissions Reduction*.

Table I-14 Estimated VOC Emissions (kg/day) at Logan Airport 1993-2001[1]

Aircraft/GSE Model:	**Logan Dispersion Modeling System (LDMS)**					**EDMS v3.22**	**EDMS v4.21**	**EDMS v4.03**	
Motor Vehicle Model:	**MOBILE5a**					**MOBILE 5a_h**	**MOBILE 6.2.03**	**MOBILE 6.0**	
Year:	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999[2]**	**2000**	**2001**
Aircraft Sources									
Air carriers	1,958	1,554	1,407	1,390	1,227	736	653	514	374
Commuter aircraft	943	543	531	622	498	154	196	140	113
Cargo aircraft	89	244	236	214	207	43	318	207	149
General aviation	51	48	36	24	27	13	141	42	43
Total aircraft sources	3,041	2,389	2,210	2,250	1,959	946	1,308	903	679
Ground Support Equipment[3]	636	533	521	497	530	145	243	153	143
Motor Vehicles									
Ted Williams Tunnel through-traffic	N/A	N/A	N/A	N/A	N/A	N/A	15	12	10
Parking/curbside	173	148	127	102	102	118	101	89	77
On-airport vehicles[4]	238	215	179	223	205	258	256	206	170
Total motor vehicle sources	411	363	306	325	307	376	372	307	257
Other Sources									
Fuel storage/handling	408	434	318	356	381	372	352	412	372
Miscellaneous sources[5]	5	5	5	6	6	2	16	2	2
Total other sources	413	439	323	362	387	374	368	414	374
Total Airport Sources	**4,501**	**3,724**	**3,360**	**3,434**	**3,183**	**1,841**	**2,291**	**1,777**	**1,453**

Source: CMT and Massport. 2022.

Notes: GSE – ground service equipment; N/A – not available; VOC – volatile organic compounds; EDMS – Emissions and Dispersion Modeling System.
kg/day – kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).

1 The emissions inventory for 1990 is shown in Chapter 7, *Air Quality/Emissions Reduction*. Emission inventories for 1991 and 1992 were not prepared.

2 Year 1999 emissions were last re-calculated using EDMS v4.21 in the *2004 ESPR* Air Quality Analysis.

3 Beginning in 1996 and later, emissions include vehicles and equipment converted to alternative fuels. Auxiliary power unit (APU) emissions are also included.

4 1999 emissions inventory include reductions attributable to compressed natural gas (CNG) shuttle buses.

5 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources. Fire training emissions were included in 1999. Diesel snow melter usage was added in 1999.

Table I-15 Estimated VOC Emissions (kg/day) at Logan Airport 2002-2009

Aircraft/GSE Model:	**EDMS v4.11**		**EDMS v4.21**	**EDMS v4.5**		**EDMS v5.0.1**	**EDMS v5.0.2**		**EDMS v5.1**		**EDMS v5.1.2**
Motor Vehicle Model:	**MOBILE 6.0**	**MOBILE 6.2.01**	**MOBILE 6.2.03**								
Year:	**2002**	**2003**	**2004**	**2005**	**2006**		**2007**		**2008**		**2009**
Aircraft Sources											
Air carriers	248	208	292	271	227	511	435	381	324	286	237	235
Commuter aircraft	75	95	127	140	125	371	479	409	253	176	131	133
Cargo aircraft	127	94	110	41	19	46	129	112	107	70	71	71
General aviation	52	61	127	147	147	236	226	206	201	171	78	78
Total aircraft sources	502	458	656	599	518	1,164[1]	1,269	1,108	885	703	517	517
Ground Support Equipment[2]	247	227	187	178	167	77	78	78	66	66	56	56
Motor Vehicles												
Ted Williams Tunnel through-traffic[3]	9	0	0	0	0	0	0	0	0	0	0	0
Parking/curbside[4]	51	45	38	37	33	33	31	31	25	25	22	22
On-airport vehicles	152	135	129	118	106	106	104	104	82	82	71	71
Total motor vehicle sources	212	180	167	155	139	139	135	135	107	107	93	93
Other Sources												
Fuel storage/handling	329	297	341	340	336	336	338	338	320	320	307	307
Miscellaneous sources[5]	2	3	9	13	8	8	14	14	13	12	7	7
Total other sources	331	300	350	353	344	344	352	352	333	332	314	314
Total Airport Sources	**1,292**	**1,165**	**1,360**	**1,285**	**1,168**	**1,724**	**1,834**	**1,673**	**1,391**	**1,208**	**980**	**980**

Source: CMT and Massport, 2022.

Notes: GSE – ground service equipment; VOC – volatile organic compound.
Years 2006 to 2009 were computed with previous years EDMS version to provide for a common basis of comparison.
Kg/day – kilograms per day. One kg/day is equivalent to approximately 0.40234 tons per year (tpy).

1 The 2006 increase in aircraft VOC emissions is largely attributable to the addition of aircraft main engine startup emissions.

2 GSE emissions include aircraft auxiliary power units (APUs) as well as vehicles and equipment converted to alternative fuels.

3 Due to the modified roadway configuration and opening of the Ted Williams Tunnel, there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.

4 Parking/curbside is based on vehicle miles traveled (VMT) analysis.

5 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Tables I-16 and **I-17** present the estimated NO_X emissions for Logan Airport for the years 1993 through 2001 and 2002 through 2009, respectively. The emissions inventories from 2010 to 2021 are presented in Chapter 7, *Air Quality/Emissions Reduction*.

Table I-16 Estimated NO_X Emissions (kg/day) at Logan Airport 1993-2001[1]

Aircraft/GSE Model:	**Logan Dispersion Modeling System (LDMS)**					**EDMS v3.22**	**EDMS v4.21**	**EDMS v4.03**	
Motor Vehicle Model:	**MOBILE5a**					**MOBILE 5a_h**	**MOBILE 6.2.03**	**MOBILE 6.0**	
Year:	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999[2]**	**2000**	**2001**
Aircraft Sources									
Air carriers	4,271	4,317	3,861	3,781	4,150	4,471	4,183	4,202	3,707
Commuter aircraft	202	158	192	137	159	203	166	125	233
Cargo aircraft	213	257	332	363	262	254	286	284	267
General aviation	13	13	17	18	21	5	12	49	34
Total aircraft sources	4,699	4,745	4,402	4,299	4,592	4,933	4,647	4,660	4,241
Ground Support Equipment[3]	722	617	607	588	622	317	444	333	305
Motor Vehicles									
Ted Williams Tunnel through-traffic	N/A	N/A	N/A	N/A	N/A	N/A	28	26	22
Parking/curbside	25	24	24	24	24	37	39	52	46
On-airport vehicles[4]	240	239	229	257	244	372	449	425	369
Total motor vehicle sources	265	263	253	281	268	409	516	503	437
Other Sources									
Fuel storage/handling[5]	0	0	0	0	0	0	0	0	0
Miscellaneous sources[6]	278	330	320	275	244	284	165	211	185
Total other sources	278	330	320	275	244	284	165	211	185
Total Airport Sources	**5,964**	**5,955**	**5,582**	**5,443**	**5,726**	**5,943**	**5,772**	**5,707**	**5,168**

Sources: CMT and Massport, 2022.

Notes: GSE – ground service equipment; N/A – not available; NO_X – oxides of nitrogen; EDMS – Emissions and Dispersion Modeling System.

Kg/day Kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).

1 The emissions inventory for 1990 is shown in Chapter 7, *Air Quality/Emissions Reduction*. Emission inventories for 1991 and 1992 were not prepared.

2 Year 1999 emissions were last re-calculated using EDMS v4.21 in the 2004 ESPR Air Quality Analysis.

3 Beginning in 1996 and later, emissions include vehicles and equipment converted to alternative fuels. Auxiliary power unit (APU) emissions are also included.

4 1999 emissions inventory include reductions attributable to compressed natural gas (CNG) shuttle buses.

5 Fuel storage and handling facilities are not sources of NO_X emissions.

6 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources. Fire training emissions were included in 1999. Diesel snow melter usage was added in 1999.

Table I-17 Estimated NO_X Emissions (kg/day) at Logan Airport 2002-2009

Aircraft/GSE Model:	**EDMS v4.11**		**EDMS v4.21**	**EDMS v4.5**		**EDMS v5.0.1**	**EDMS v5.0.2**		**EDMS v5.1**		**EDMS v5.1.2**
Motor Vehicle Model:	**MOBILE 6.0**	**MOBILE 6.2.01**	**MOBILE 6.2.03**								
Year:	**2002**	**2003**	**2004**	**2005**	**2006**		**2007**		**2008**		**2009**
Aircraft Sources											
Air carriers	2,721	2,479	2,949	2,880	2,849	3,044	3,120	3,121	3,031	3,031	2,944	2,952
Commuter aircraft	208	185	245	225	195	256	353	354	319	319	309	234
Cargo aircraft	246	213	215	211	192	125	248	248	233	233	215	204
General aviation	38	45	49	50	49	60	56	56	43	43	27	23
Total aircraft sources	3,213	2,922	3,458	3,366	3,285	3,485	3,777	3,779	3,626	3,626	3,495	3,413
Ground Support Equipment[1]	322	291	333	312	280	300	299	299	257	257	219	219
Motor Vehicles												
Ted Williams Tunnel through-traffic[2]	20	0	0	0	0	0	0	0	0	0	0	0
Parking/curbside[3]	32	28	21	22	19	19	18	18	15	15	13	13
On-airport vehicles	341	302	267	269	238	238	233	233	182	182	153	153
Total motor vehicle sources	393	330	288	291	257	257	251	251	197	197	166	166
Other Sources												
Fuel storage/handling[4]	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous sources[5]	175	151	211	218	109	109	128	128	124	124	181	181
Total other sources	175	151	211	218	109	109	128	128	124	124	181	181
Total Airport Sources	**4,103**	**3,694**	**4,290**	**4,187**	**3,931**	**4,151**	**4,455**	**4,457**	**4,204**	**4,204**	**4,061**	**3,979**

Source: CMT and Massport, 2022.

Notes: GSE – ground service equipment; NO_X – oxides of nitrogen; EDMS – Emissions and Dispersion Modeling System.
Years 2006 to 2009 were computed with previous years EDMS version to provide for a common basis of comparison.

Kg/day Kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).

1 GSE emissions include auxiliary power units (APUs) as well as vehicles and equipment converted to alternative fuels.

2 Due to the modified roadway configuration and opening of the Ted Williams Tunnel, there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.

3 Parking/curbside data is based on vehicle miles traveled (VMT) analysis.

4 Fuel storage/handling facilities are not a source of NO_X emissions.

5 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Tables I-18 and **I-19** present the estimated CO emissions for Logan Airport for the years 1993 through 2001 and 2002 through 2009, respectively. The emissions inventories from 2010 to 2021 are presented in Chapter 7, *Air Quality/Emissions Reduction*.

Table I-18 Estimated CO Emissions (kg/day) at Logan Airport 1993-2001[1]

Aircraft/GSE Model:	**Logan Dispersion Modeling System (LDMS)**					**EDMS v3.22**	**EDMS v4.21**	**EDMS v4.03**	
Motor Vehicle Model:	**MOBILE5a**					**MOBILE 5a_h**	**MOBILE 6.2.03**	**MOBILE 6.0**	
Year:	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999[2]**	**2000**	**2001**
Aircraft Sources									
Air carriers	5,663	4,660	4,691	4,812	4,698	3,079	3,754	2,994	2,475
Commuter aircraft	1,309	927	934	859	770	482	1,404	1,188	1,072
Cargo aircraft	344	572	598	580	514	218	503	400	323
General aviation	353	356	339	549	654	269	940	295	407
Total aircraft sources	7,669	6,515	6,562	6,800	6,636	4,048	6,601	4,877	4,277
Ground Support Equipment[3]	7,482	6,187	6,029	5,740	6,098	5,113	4,532	5,335	5,193
Motor Vehicles									
Ted Williams Tunnel through-traffic	N/A	N/A	N/A	N/A	N/A	N/A	151	133	121
Parking/curbside	952	820	650	644	586	772	437	495	440
On-airport vehicles[4]	1,575	1,451	1,087	1,514	1,283	1,883	2,547	2,245	2,001
Total motor vehicle sources	2,527	2,271	1,737	2,158	1,869	2,655	3,135	2,873	2,562
Other Sources									
Fuel storage/handling[5]	0	0	0	0	0	0	0	0	0
Miscellaneous sources[6]	26	30	29	39	37	37	168	27	24
Total other sources	26	30	29	39	37	37	168	27	24
Total Airport Sources	**17,704**	**15,003**	**14,357**	**14,737**	**14,640**	**11,853**	**14,436**	**13,112**	**12,056**

Source: CMT and Massport, 2022.
Notes: CO – carbon monoxide; GSE – ground service equipment; N/A – not available.
Kg/day Kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).
1 The emissions inventory for 1990 is shown in Chapter 7, *Air Quality/Emission Reduction*. Emission inventories for 1991 and 1992 were not prepared.
2 Year 1999 emissions were last re-calculated using EDMS v4.21 in the 2004 ESPR Air Quality Analysis.
3 Beginning in 1996 and later, emissions include vehicles and equipment converted to alternative fuels. Auxiliary power unit (APU) emissions are also included.
4 1999 emission inventory include reductions attributable to compressed natural gas (CNG) shuttle buses.
5 Fuel storage and handling facilities are not sources of CO emissions.
6 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources. Fire training emissions were included in 1999. Diesel snow melter usage was added in 1999.

Table I-19 Estimated CO Emissions (kg/day) at Logan Airport 2002-2009

Aircraft/GSE Model:	**EDMS v4.11**		**EDMS v4.21**	**EDMS v4.5**	**EDMS v5.0.1**		**EDMS v5.0.2**		**EDMS v5.1**		**EDMS v5.1.2**
Motor Vehicle Model:	**MOBILE 6.0**	**MOBILE 6.2.01**	**MOBILE 6.2.03**								
Year:	**2002**	**2003**	**2004**	**2005**	**2006**		**2007**		**2008**		**2009**
Aircraft Sources											
Air carriers	2,156	2,128	2,985	2,895	2,828	3,167	2,973	2,973	2,710	2,710	2,460	2,448
Commuter aircraft	783	846	1,010	1,010	950	1,587	2,484	2,484	2,436	2,436	2,364	2,795
Cargo aircraft	285	209	229	174	138	158	241	241	255	255	256	266
General aviation	256	276	416	437	398	442	401	403	345	345	145	150
Total aircraft sources	3,480	3,459	4,640	4,516	4,314	5,354	6,099	6,101	5,746	5,746	5,225	5,659
Ground Support Equipment[1]	5,170	4,758	3,586	3,531	3,409	1,586	1,904	1,904	1,609	1,609	1,364	1,364
Motor Vehicles												
Ted Williams Tunnel through-traffic[2]	112	0	0	0	0	0	0	0	0	0	0	0
Parking/curbside[3]	295	253	180	179	144	144	139	139	117	117	107	107
On-airport vehicles	1,872	1,685	1,412	1,290	1,036	1,036	1,038	1,038	834	834	740	740
Total motor vehicle sources	2,279	1,938	1,592	1,469	1,180	1,180	1,177	1,177	951	951	847	847
Other Sources												
Fuel storage/handling[4]	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous sources[5]	23	22	33	40	24	24	51	51	55	55	55	55
Total other sources	23	22	33	40	24	24	51	51	55	55	55	55
Total Airport Sources	**10,952**	**10,177**	**9,851**	**9,556**	**8,927**	**8,144**	**9,231**	**9,233**	**8,361**	**8,361**	**7,491**	**7,925**

Source: CMT and Massport, 2022.

Notes: CO – carbon monoxide; GSE – ground service equipment; EDMS – Emissions and Dispersion Modeling System.
Kg/day – kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).
Years 2006 to 2009 were computed with previous years EDMS version to provide for a common basis of comparison.

1 GSE emissions include auxiliary power units (APUs) as well as vehicles and equipment converted to alternative fuels.

2 Due to the modified roadway configuration and opening of the Ted Williams Tunnel, there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.

3 Parking/curbside information is based on vehicle miles traveled (VMT) analysis.

4 Fuel storage/handling facilities are not a source of carbon monoxide (CO) emissions.

5 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Table I-20 Estimated $PM_{10}/PM_{2.5}$ Emissions (kg/day) at Logan Airport, 2005-2009[1]

Aircraft/GSE Model:	**EDMS v4.5**		**EDMS v5.0.1**		**EDMS v5.0.2**		**EDMS v5.1**		**EDMS v5.1.2**
Motor Vehicle Model:	**MOBILE 6.2.03**								
Year:	**2005**	**2006**		**2007**		**2008**		**2009**	
Aircraft Sources									
Air carriers	25	25	38	35	67	63	42	43	36
Commuter aircraft	1	1	2	6	14	11	6	5	5
Cargo aircraft	2	3	2	3	6	5	4	4	3
General aviation	2	2	2	2	5	5	4	2	2
Total aircraft sources	30	31	44	46	92	84	56	54	46
Ground Support Equipment[2]	11	9	9	10	10	8	15	14	14
Motor Vehicles									
Parking/curbside[3]	1	1	1	<1	<1	<1	<1	<1	<1
On-airport vehicles	8	8	8	9	9	7	7	6	6
Total motor vehicle sources	9	9	9	9	9	7	7	6	6
Other Sources									
Fuel storage/handling[4]	0	0	0	0	0	0	0	0	0
Miscellaneous sources[5]	34	16	16	17	17	3	3	5	5
Total other sources	34	16	16	17	17	3	3	5	5
Total Airport Sources	**84**	**65**	**78**	**82**	**128**	**102**	**81**	**79**	**71**

Source: CMT and Massport, 2022.

Notes: GSE – ground service equipment; $PM_{10}/PM_{2.5}$ – particulate matter equal to or less than 10 microns in diameter (PM_{10}) and equal to or less than 2.5 microns in diameter ($PM_{2.5}$); EDMS – Emissions and Dispersion Modeling System.
Kg/day – kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).
Years 2006 to 2009 were computed with previous years EDMS version to provide for a common basis of comparison.

1 2005 is the first year that $PM_{10}/PM_{2.5}$ emissions were included in the Logan Airport ESPR/EDR emission inventories.

2 GSE emissions include auxiliary power units (APUs) as well as vehicles and equipment converted to alternative fuels.

3 Parking/curbside is based on vehicle miles traveled (VMT) analysis.

4 Fuel storage and handling facilities are not sources of $PM_{10}/PM_{2.5}$ emissions.

5 Includes the Central Heating and Cooling Plant, emergency electricity generation, fire training, snow melters, and other stationary sources.

Greenhouse Gas (GHG) Emissions Inventory for 2020 and 2021

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) has published the Massachusetts Environmental Policy Act (MEPA) *Greenhouse Gas Emissions Policy and Protocol*.[8] These guidelines require the quantification of greenhouse gases (GHGs) for certain proposed projects and the identification of measures to avoid, minimize, or mitigate increases in GHGs.[9] Even though the purpose of the *2020/2021 EDR* is not the assessment of a proposed project(s) and is therefore not subject to the GHG policy, Massport has prepared an emission inventory of GHG emissions directly and indirectly associated with Logan Airport.

In April 2009, the Transportation Research Board Airport Cooperative Research Program (ACRP) published a *Guidebook on Preparing Airport Greenhouse Gas Emission Inventories (ACRP Report 11)*. The guidebook provides recommended instructions to airport operators on how to prepare an airport-specific GHG emissions inventory.[10] The 2020 and 2021 GHG emissions estimates for Logan Airport are prepared for aircraft (emissions occurring within the ground taxi/delay mode and up to 3,000 feet in altitude), GSE, APU, motor vehicles, a variety of stationary sources, and emissions that result from the generation of electricity. Aircraft cruise emissions that occur above 3,000 feet in altitude are not estimated. The GHG emission estimates were prepared following the EEA, ACRP, and Airports Council International (ACI) Airport Carbon Accreditation (ACA) Program[11] guidelines and emission factors considered appropriate for preparing GHG inventories that are approved by the EPA and available within the GHG Emissions Factors Hub database.[12]

Methodology

Airport GHG emissions are calculated the same way as emissions of the criteria air pollutants/precursors, are calculated. In other words, emissions are calculated using input data such as activity levels or material throughput rates (e.g., fuel usage, VMT, electrical consumption) that are applied to appropriate emission factors (in units of GHG emissions per gallon of fuel).

For the 2020/2021 GHG emission estimates, the input data were either based on Massport records or data and information derived from the latest version of the FAA's AEDT. **Table I-21** summarizes the data and information used to prepare the 2020/2021 GHG emission inventories.

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8 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Revised MEPA Greenhouse Gas Emissions Policy and Protocol, effective May 5, 2010, https://www.mass.gov/files/documents/2016/08/rp/ghg-policy-final-summary.pdf.

9 These GHGs are comprised primarily of carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O), and three groups of fluorinated gases (i.e., sulfur hexafluoride [SF_6], hydrofluorocarbons [HFCs], and perfluorocarbons [PFCs]). GHG emission sources associated with airports are generally limited to CO_2, CH_4, and N_2O.

10 National Academies of Sciences, Engineering, and Medicine 2009, Transportation Research Board, Airport Cooperative Research Program, Report 11: *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*, 2009, Washington, DC: The National Academies Press, https://nap.nationalacademies.org/catalog/14225/guidebook-on-preparing-airport-greenhouse-gas-emissions-inventories

11 Airport Carbon Accreditation (ACA), https://aci-lac.aero/airport-carbon-accreditation/.

12 U.S. Environmental Protection Agency, GHG Emissions Factors Hub (26 March 2020) for the 2020 analysis, and GHG Emissions Factors Hub (15 September 2021) for the 2021 analysis, https://www.epa.gov/climateleadership/ghg-emission-factors-hub.

Table I-21 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information for 2020 and 2021

Activity		Fuel Type	2020 Usage	2021 Usage	Units	Source
Aircraft						
Aircraft Taxi		Jet A[1]	8,613,009	10,752,040	gallons	AEDT 3d
		AvGas[2]	39,968	50,001	gallons	AEDT 3d
Engine Startup		Jet A	237,759	307,376	gallons	AEDT 3d
Aircraft AGL to 3,000 feet		Jet A[1]	12,788,507	15,923,992	gallons	AEDT 3d
		AvGas[2]	75,778	93,986	gallons	AEDT 3d
Aircraft Support Equipment						
Ground Service Equipment (GSE)		Diesel	503,942	376,451	gallons	Massport
		Gasoline	412,585	514,515	gallons	Massport
		Propane	0	0	gallons	Massport
		CNG	0	0	ft^3	Massport
Auxiliary Power Units (APU)		Jet A	655,951	796,930	gallons	AEDT 3d
Motor Vehicles						
On-airport Vehicles		Composite[3]	19,269,690	43,411,871	VMT	Massport
On-airport Parking/Curbsides		Composite[3]	417,925	707,853	hours	Massport
Massport Shuttle Bus		CNG	148,073	128,286	GEG	Massport
		Diesel	Defleeted in 2014	Defleeted in 2014	gallons	Massport
Massport Express Bus		Diesel	247,515	233,415	gallons	Massport
NABI Articulated Buses		Diesel	137,500	100,000	gallons	Massport
Massport Fire Rescue		Diesel	9,002	8,000	gallons	Massport
Agricultural Equipment		Diesel[4]	0	0	gallons	Massport
Massport Fleet Vehicles	Honda Civic, etc.	CNG	0	0	GEG	Massport
	Fueled Onsite	Gasoline	168,230	167,612	gallons	Massport
		Diesel	36,898	44,800	gallons	Massport
	Fueled Offsite	Gasoline	66,058	57,222	gallons	Massport
Off-airport Vehicles	Public	Composite[3]	21,802,761	88,280,474	VMT	Massport
	Airport Employees	Composite[3]	3,840,642	3,219,786	VMT	Massport
	Tenant Employees	Composite[3]	36,269,519	38,937,754	VMT	Massport

Table I-21 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information for 2020 and 2021 (Continued)

Activity		Fuel Type	2020 Usage	2021 Usage	Units	Source
Stationary Sources						
Boilers and Space Heaters		No. 2 Oil	20,435	16,534	gallons	Massport
		No. 6 Oil	0	0	gallons	Massport
		Natural Gas	403	400	million ft^3	Massport
Generators		ULSD	27,373	43,914	gallons	Massport
		Natural Gas	0	0	million ft^3	Massport
Snow melters		ULSD	60,180	79,694	gallons	Massport
		Natural Gas	5.0	2.2	million ft^3	Massport
Fire Training Facility		Tekflame	6,156	6,804	gallons	Massport
		AvGas	304	953	gallons	Massport
Electrical Consumption	Massport	-	14,459,611	12,638,056	kWh	Massport
	Tenant/Common Area	-	152,496,875	160,222,373	kWh	Massport

Source: Massport and CMT, 2022.

Notes: AGL – above ground level; AvGas – Aviation Gasoline; CNG – compressed natural gas; ft^3 – cubic feet; GEG – gasoline equivalent gallons; kWh – kilowatt hours; ULSD – ultra low sulfur diesel; VMT – vehicle miles traveled; AEDT – Aviation Environmental Design Tool.

1 Jet A density of 6.84 pounds per gallon.

2 AvGas density of 6.0 pounds per gallon.

3 Composite means gasoline, diesel, and ethanol fueled motor vehicles.

4 Usage included in Massport's diesel fleet vehicles fueled onsite.

Emission factors were obtained from the latest available versions of EPA's MOVES and GHG Emission Factors Hub. **Tables I-22** and **I-23** respectively provide the emission factors for carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) that were used to prepare the 2020 and 2021 inventories.

Table I-22 Greenhouse Gas (GHG) Emission Factors for 2020

Sources	Fuel	CO_2	N_2O	CH_4	Units
Aircraft[1]	Jet A	21.5	0.00066	-[4]	lb/gallon
	AvGas	18.3	0.00024	0.01556	lb/gallon
Ground Support Equipment (GSE)/ Auxiliary Power Units (APUs)[1]	Diesel	22.5	0.00108	0.00037	lb/gallon
	Gasoline	19.4	0.00055	0.00569	lb/gallon
	CNG	120	0.00023	0.00226	lb/1000 ft^3
	Propane	12.5	0.00090	0.00073	lb/gallon
	Jet A	21.5	0.00066	-[4]	lb/gallon
Motor Vehicles[1,2]	Composite	227	0.00214	0.00733	g/mile
	Composite	3,660	0.05196	0.06157	g/hour-vehicle
	CNG	120	0.00023	0.00226	lb/1000 ft^3
	Diesel (on-road)	22.5	0.00018	0.00090	lb/gallon
	Diesel (off-road)	22.5	0.00108	0.00062	lb/gallon
	Gasoline	19.4	0.00055	0.00569	lb/gallon
Stationary Sources[1]	No. 2 Oil	22.5	0.00018	0.00090	lb/gallon
	Natural Gas	120	0.00023	0.00226	lb/1000 ft^3
	ULSD	22.5	0.00018	0.00090	lb/gallon
Fire Training Facility[1]	Tekflame[3]	12.5	0.00090	0.00073	lb/gallon
	AvGas	18.3	0.00024	0.01556	lb/gallon
Electrical Consumption[1]	-	0.52	0.00001	0.00008	lb/kWh

Source: Massport and CMT, 2022.

Notes: CNG – compressed natural gas; ULSD – Ultra Low Sulfur Diesel; CO_2 – carbon dioxide; N_2O – nitrous oxides; CH_4 – methane; g – grams; ft^3 – cubic feet; kWh – kilowatt hour; lb – pound.

1 U.S. Environmental Protection Agency (EPA), GHG Emissions Factors Hub (March 2020).

2 EPA, MOVES3.0.3.

3 As propane.

4 Contributions of CH_4 emissions from commercial aircraft are reported as zero. Years of scientific measurement campaigns conducted at the exhaust exit plane of commercial aircraft gas turbine engines have repeatedly indicated that CH_4 emissions are consumed over the full emission flight envelope [Reference: Aircraft Emissions of Methane and Nitrous Oxide during the Alternative Aviation Fuel Experiment, Santoni et al., Environ. Sci. Technol., July 2011, Volume 45, pp. 7075-7082]. As a result, EPA published that: "…methane is no longer considered to be an emission from aircraft gas turbine engines burning Jet A at higher power settings and is, in fact, consumed in net at these higher powers." [Reference: EPA, Recommended Best Practice for Quantifying Speciated Organic Gas Emissions from Aircraft Equipped with Turbofan, Turbojet, and Turboprop Engines, May 27, 2009 [EPA-420-R-09-901], http://www.epa.gov/otaq/aviation.htm. In accordance with the following statements in the 2006 IPCC Guidelines (IPCC 2006), FAA does not calculate CH_4 emissions for either the domestic or international bunker commercial aircraft jet fuel emissions inventories. "Methane (CH_4) may be emitted by gas turbines during idle and by older technology engines, but recent data suggest that little or no CH_4 is emitted by modern engines." "Current scientific understanding does not allow other gases (e.g., N_2O and CH_4) to be included in calculation of cruise emissions." (IPCC 1999).

Table I-23 Greenhouse Gas (GHG) Emission Factors for 2021

Sources	Fuel	CO_2	N_2O	CH_4	Units
Aircraft[1]	Jet A	21.5	0.00066	-[4]	lb/gallon
	AvGas	18.3	0.00024	0.01556	lb/gallon
Ground Support Equipment (GSE)/ Auxiliary Power Units (APUs)[1]	Diesel	22.5	0.00108	0.00037	lb/gallon
	Gasoline	19.4	0.00055	0.00569	lb/gallon
	CNG	120.0	0.00023	0.00226	lb/1,000 ft^3
	Propane	12.5	0.00090	0.00073	lb/gallon
	Jet A	21.5	0.00066	-[4]	lb/gallon
Motor Vehicles[1,2]	Composite	221	0.00205	0.00673	g/mile
	Composite	3,568	0.04986	0.05687	g/hour-vehicle
	CNG	120.0	0.00023	0.00226	lb/1,000 ft^3
	Diesel (on-road)	22.5	0.00018	0.00037	lb/gallon
	Diesel (off-road)	22.5	0.00108	0.00062	lb/gallon
	Gasoline	19.4	0.00055	0.00569	lb/gallon
Stationary Sources[1]	No. 2 Oil	22.5	0.00018	0.00090	lb/gallon
	Natural Gas	120.0	0.00023	0.00226	lb/1,000 ft^3
	ULSD	22.5	0.00018	0.00090	lb/gallon
Fire Training Facility[1]	Tekflame[3]	12.5	0.00090	0.00073	lb/gallon
	AvGas	18.3	0.00024	0.01556	lb/gallon
Electrical Consumption[1]	-	0.49	0.00001	0.00008	lb/kWh

Source: Massport and CMT, 2022.

Notes: CNG – compressed natural gas; ULSD – Ultra Low Sulfur Diesel; CO_2 – carbon dioxide; N_2O – nitrous oxides; CH_4 – methane; g – grams; ft^3 – cubic feet; kWh – kilowatt hour; lb – pound.

1 U.S. Environmental Protection Agency, GHG Emissions Factors Hub (September 2021).

2 U.S. Environmental Protection Agency, MOVES3.03.

3 As propane.

4 Contributions of CH_4 emissions from commercial aircraft are reported as zero. Years of scientific measurement campaigns conducted at the exhaust exit plane of commercial aircraft gas turbine engines have repeatedly indicated that CH_4 emissions are consumed over the full emission flight envelope [Reference: Aircraft Emissions of Methane and Nitrous Oxide during the Alternative Aviation Fuel Experiment, Santoni et al., Environ. Sci. Technol., July 2011, Volume 45, pp. 7075-7082]. As a result, EPA published that: "…methane is no longer considered to be an emission from aircraft gas turbine engines burning Jet A at higher power settings and is, in fact, consumed in net at these higher powers." [Reference: EPA, Recommended Best Practice for Quantifying Speciated Organic Gas Emissions from Aircraft Equipped with Turbofan, Turbojet, and Turboprop Engines, May 27, 2009 [EPA-420-R-09-901], http://www.epa.gov/otaq/aviation.htm]. In accordance with the following statements in the 2006 IPCC Guidelines (IPCC 2006), FAA does not calculate CH_4 emissions for either the domestic or international bunker commercial aircraft jet fuel emissions inventories. "Methane (CH_4) may be emitted by gas turbines during idle and by older technology engines, but recent data suggest that little or no CH_4 is emitted by modern engines." "Current scientific understanding does not allow other gases (e.g., N_2O and CH_4) to be included in calculation of cruise emissions." (IPCC 1999).

Results

Tables I-24 and **I-25** present the 2020 and 2021 GHG emissions inventories for Logan Airport, respectively. The results are presented in the standard reporting unit for GHGs expressed as metric tons of total CO_2 equivalent (MT CO_2e) by emission source (e.g., aircraft, GSE, motor vehicles, and stationary sources) and also by compound (CO_2, N_2O, and CH_4).

Table I-24 Greenhouse Gas (GHG) Emissions (MT CO_2e) for 2020

Activity	CO_2	N_2O	CH_4	Total
Aircraft Sources				
Aircraft Taxi	84,309	686	8	85,003
Engine Startup	2,318	19	-	2,340
Aircraft AGL to 3,000 Feet	125,318	1,019	15	126,351
Aircraft Support Equipment				
Ground Service Equipment (GSE)	8,768	93	32	8,893
Auxilary Power Unit (APU)	6,396	52	-	6,455
Motor Vehicles				
On-Airport Vehicles	4,373	11	4	4,388
On-Airport Parking/Curbsides	1,530	6	1	1,536
Massport Shuttle Buses	3,827	42	12	3,881
Massport Fleet Vehicles	3,930	39	18	3,987
Off-Airport Vehicles (Public)	4,948	12	4	4,965
Off-Airport Vehicles (Airport Employees)	872	2	1	875
Off-Airport Vehicles (Tenant Employees)	8,232	21	7	8,260
Stationary Sources				
Boilers	22,129	11	12	22,152
Generators, Snow Melters, etc.	1,166	2	1	1,169
Fire Training Facility	37	1	0	38
Electrical Consumption	39,554	221	174	39,949
Total Airport Sources	**317,706**	**2,236**	**299**	**320,242**

Source: Massport and CMT, 2022.
Notes: AGL – above ground level; CO_2 – carbon dioxide; N_2O – nitrous oxides; CH_4 – methane.
MT CO_2e – metric tons of CO_2 equivalent (1 metric ton = 1.1 short tons).

Table I-25 Greenhouse Gas (GHG) Emissions (MT CO_2e) for 2021

Activity	CO_2	N_2O	CH_4	Total
Aircraft Sources				
Aircraft Taxi	105,248	856	10	106,114
Engine Startup	2,997	24	-	3,025
Aircraft AGL to 3,000 Feet	156,040	1,269	19	157,327
Aircraft Support Equipment				
Ground Service Equipment (GSE)	8,361	83	39	8,483
Auxilary Power Unit (APU)	7,770	63	-	7,843
Motor Vehicles				
On-Airport Vehicles	9,606	24	8	9,638
On-Airport Parking/Curbsides	2,526	9	1	2,536
Massport Shuttle Buses	3,510	39	10	3,559
Massport Fleet Vehicles	3,534	35	17	3,586
Off-Airport Vehicles (Public)	19,535	48	17	19,599
Off-Airport Vehicles (Airport Employees)	712	2	1	715
Off-Airport Vehicles (Tenant Employees)	8,616	21	7	8,645
Stationary Sources				
Boilers	21,932	11	12	21,955
Generators, Snow Melters, etc.	1,380	3	1	1,384
Fire Training Facility	47	1	0	48
Electrical Consumption	38,334	208	169	38,711
Total Airport Sources	**390,147**	**2,695**	**324**	**393,166**

Source: Massport and CMT, 2022.
Notes: AGL – above ground level; CO_2 – carbon dioxide; N_2O – nitrous oxides; CH_4 – methane.
MT CO_2e – metric tons of CO_2 equivalent (1 metric ton = 1.1 short tons).

Table I-26 compares the total GHG emissions from Logan Airport to the total GHG emissions for Massachusetts for the years 2020 and 2021. Massachusetts state totals are based on the latest available GHG inventory (i.e., calendar year 2019) from Massachusetts Department of Environmental Protection's (MassDEP's) *2nd Addendum to the Statewide Greenhouse Gas Emissions Level: 1990 Baseline Update* (June 2022).

Table I-26 Logan Airport Greenhouse Gas (GHG) Emissions Compared to Massachusetts Totals (MMT of CO_2e)[1]

Emission Source	CO_2	N_2O	CH_4	Totals
Logan Airport (2020)[2]	0.32	<0.01	<0.01	0.32
Logan Airport (2021)[2]	0.39	<0.01	<0.01	0.39
Massachusetts[3,4]	-	-	-	71.60
Percent of Logan Airport to Massachusetts[5]	-	-	-	<1%

Sources: Massport and CMT, 2022.
Notes: CO_2 – carbon dioxide; N_2O – nitrous oxides; CH_4 – methane.
1 Totals expressed in units of million metric tons of CO_2 equivalents (MMT CO_2e): 1 metric ton = 1.1 short tons.
2 Total from Massport, tenants, and public categories.
3 Commonwealth of Massachusetts, Department of Environmental Protection, *2nd Addendum to the Statewide Greenhouse Gas Emissions Level: 1990 Baseline Update*, June 2022, https://www.mass.gov/doc/2nd-addendum-to-statewide-ghg-level-proposed-1990-baseline-update-june-2022/download.
4 Totals include CO_2, CH_4, N_2O and other GHG gases.
5 Percentages represent the relative amount Logan Airport-related emissions compared to the state totals.

2007-2021 Greenhouse Gas (GHG) Emissions Inventories

Table I-27 presents the Airport-related GHG emissions inventories for direct (i.e., aircraft, GSE/APUs, on-site motor vehicles, and other sources) and indirect sources (i.e., aircraft, off-site motor vehicles, and electrical consumption) from 2007 through 2021. Direct aircraft emissions are based on engine start-up, taxi-in, taxi-out and ground-based delay emissions. Indirect aircraft emissions are based on take-off, climb-out and landing emissions which occur up to an altitude of 3,000 feet, the limits of the LTO cycle.

Table I-27 Estimated Total Greenhouse Gas (GHG) Emissions (MMT of CO_2e) at Logan Airport – 2007 through 2021[1]

Source	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Direct Emissions[2]															
Aircraft[3]	0.22	0.21	0.19	0.18	0.19	0.19	0.19	0.20	0.21	0.19	0.21	0.22	0.24	0.09	0.11
GSE/APUs	0.08	0.08	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.03	0.03	0.03	0.02	0.02
Motor vehicles[4]	0.03	0.03	0.03	0.03	0.04	0.03	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.01	0.02
Other sources[5]	0.04	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02
Total Direct Emissions	**0.37**	**0.35**	**0.27**	**0.27**	**0.28**	**0.26**	**0.29**	**0.29**	**0.32**	**0.29**	**0.32**	**0.34**	**0.36**	**0.14**	**0.17**
Indirect Emissions[6]															
Aircraft[7]	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.22	0.24	0.26	0.26	0.13	0.16
Motor vehicles[8]	0.05	0.05	0.05	0.05	0.06	0.05	0.08	0.07	0.08	0.09	0.10	0.14	0.15	0.01	0.03
Electrical consumption[9]	0.09	0.08	0.07	0.07	0.08	0.08	0.06	0.06	0.06	0.06	0.05	0.04	0.04	0.04	0.04
Total Indirect Emissions	**0.32**	**0.30**	**0.29**	**0.29**	**0.30**	**0.30**	**0.31**	**0.30**	**0.32**	**0.36**	**0.39**	**0.44**	**0.45**	**0.18**	**0.22**
Total Emissions[10]	**0.69**	**0.65**	**0.56**	**0.56**	**0.58**	**0.57**	**0.60**	**0.60**	**0.63**	**0.65**	**0.71**	**0.78**	**0.81**	**0.32**	**0.39**
Percent of State Totals[11]	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**1**	**1**	**<1**	**<1**

Source: Massport and CMT, 2022.

Notes: Totals may not add exactly due to rounding.
GSE – ground service equipment; APU – auxiliary power unit; CO_2 – carbon dioxide.

1 For ease of comparison to prior year inventories, GHG emissions are presented in million metric (MMT) tons of CO_2 equivalents (CO_2e). MMT – million metric tons of CO_2e (1 MMT = 1.1M Short Tons). CO_2e are bases for reporting the three primary GHGs (CO_2, N_2O and CH_4) in common units. Quantities are reported as "rounded" and truncated values for ease of addition.

2 Direct emissions are those that occur in areas located within the Airport's geographic boundaries.

3 Direct aircraft emissions-based engine start-up, taxi-in, taxi-out and ground-based delay emissions.

4 Direct motor vehicle emissions based on on-site vehicle miles traveled (VMT).

5 Other sources include Central Heating and Cooling Plant, emergency generators, snow melters, space heaters and live fire training activities.

6 Indirect emissions are those that occur off the Airport site.

7 Indirect aircraft emissions are based on take-off, climb-out and landing emissions which occur up to an altitude of 3,000 ft., the limits of the landing and takeoff (LTO) cycle.

8 Indirect motor vehicle emissions based on off-site Airport-related VMT and an average round trip distance of approximately 60 miles.

9 Electrical consumption emissions occur off-airport at power generating plants.

10 Total Emissions = Direct + Indirect.

11 2020 and 2021 percentages are based on relative amount of Airport total of direct emissions to 2019 statewide totals. 2019 statewide totals are derived from: Commonwealth of Massachusetts, Department of Environmental Protection, *2nd Addendum to the Statewide Greenhouse Gas Emissions Level: 1990 Baseline Update,* June 2022, https://www.mass.gov/doc/2nd-addendum-to-statewide-ghg-level-proposed-1990-baseline-update-june-2022/download.

J

Environmental Compliance and Management/Water Quality

This appendix provides detailed information in support of Chapter 8, *Environmental Compliance and Management/Water Quality*:

- Table J-1 Logan Airport National Pollutant Discharge Elimination System (NPDES) Permit (No. MA0000787) Stormwater Outfall Monitoring Requirements (2007)
- Table J-2 Fire Training Facility NPDES Permit (No. MA0032751) Stormwater Outfall Monitoring Requirements (2014)
- Table J-3 Fire Training Facility NPDES Permit (No. MA0032751) Stormwater Outfall Monitoring Requirements (2021)
- Table J-4 Logan Airport 2020 Monthly Monitoring Results for First Quarter — North, West, and Maverick Street Stormwater Outfalls
- Table J-5 Logan Airport 2020 Monthly Monitoring Results for First Quarter — Porter Street Stormwater Outfall
- Table J-6 Logan Airport 2020 Monthly Monitoring Results for Second Quarter — North, West, and Maverick Street Stormwater Outfalls
- Table J-7 Logan Airport 2020 Monthly Monitoring Results for Second Quarter — Porter Street Stormwater Outfall
- Table J-8 Logan Airport 2020 Monthly Monitoring Results for Third Quarter — North, West, and Maverick Street Stormwater Outfalls
- Table J-9 Logan Airport 2020 Monthly Monitoring Results for Third Quarter — Porter Street Stormwater Outfall
- Table J-10 Logan Airport 2020 Monthly Monitoring Results for Fourth Quarter — North, West, and Maverick Street Stormwater Outfalls
- Table J-11 Logan Airport 2020 Monthly Monitoring Results for Fourth Quarter — Porter Street Stormwater Outfall
- Table J-12 Logan Airport 2020 Quarterly Wet Weather Monitoring Results — North, West, Maverick Street, and Porter Street Stormwater Outfalls
- Table J-13 Logan Airport 2020 Quarterly Wet Weather Monitoring Results — Northwest and Runway/Perimeter Stormwater Outfalls

Table J-1 Logan Airport National Pollutant Discharge Elimination System (NPDES) Permit (No. MA0000787) Stormwater Outfall Monitoring Requirements (2007)

Monitoring Event	North Outfall 001		West Outfall 002		Maverick Outfall 003	
	Field Measurement	**Laboratory Analysis**	**Field Measurement**	**Laboratory Analysis**	**Field Measurement**	**Laboratory Analysis**
Monthly Dry Weather	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform *Enterococcus*	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform *Enterococcus*	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform *Enterococcus*
Monthly Wet Weather	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform *Enterococcus*	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform *Enterococcus*	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform *Enterococcus*
Quarterly Wet Weather	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene
Deicing Episode (2/Deicing Season)	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolyltriazole	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolyltriazole	Not Required	Not Required
Whole Effluent Toxicity (1st and 3rd Year Deicing Season)	Not Required	Menidia beryllina Arbacia punctulata	Not Required	Menidia beryllina Arbacia punctulata	Not Required	Not Required
Treatment System Sampling (Internal Outfalls)[7]	pH Quantity, Gallons	Oil and Grease TSS[1] Benzene[2]	Not Required	Not Required	Not Required	Not Required

Table J-1 Logan Airport NPDES Permit (No. MA0000787) Stormwater Outfall Monitoring Requirements (2007) (Continued)

Monitoring Event	Northwest Outfall 005		Porter Outfall 003 (3 upstream locations)		Select Runway/Perimeter Outfalls	
	Field Measurement	**Laboratory Analysis**	**Field Measurement**	**Laboratory Analysis**	**Field Measurement**	**Laboratory Analysis**
Monthly Dry Weather	Not Required	Not Required	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform *Enterococcus*	Not Required	Not Required
Monthly Wet Weather	Not Required	Not Required	pH Flow Rate	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform *Enterococcus*	Not Required	Not Required
Quarterly Wet Weather	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2]	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene	pH	Oil and Grease TSS[1] Benzene[2]
Deicing Episode (2/Deicing Season)	Not Required	Not Required	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolytriazole	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolytriazole
Whole Effluent Toxicity (1st and 3rd Year Deicing Season)	Not Required	Not Required	Not Required	Menidia beryllina Arbacia punctulata	Not Required	Not Required
Treatment System Sampling (Internal Outfalls)[7]	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required

Source: Massport

Notes: Requirements are from NPDES Permit MA0000787, issued July 31, 2007.

1 TSS - Total Suspended Solids

2 Benzene must be collected with HDPE bailer.

3 PAH - Polycyclic Aromatic Hydrocarbons

4 BOD - Biological Oxygen Demand

5 COD - Chemical Oxygen Demand

6 Flow Rate will be estimated based on measured precipitation and the hydraulic model developed for the Logan Airport drainage system.

7 Outfalls 001D and 001E samples collected by Swissport.

Table J-2 Fire Training Facility NPDES Permit (No. MA0032751) Stormwater Outfall Monitoring Requirements (2014)

Monitoring Event	**Outfall Serial Number 001**	
	Field Measurement	**Laboratory Analysis**
Each Discharge Event[1]	Flow Rate[2] pH	TSS[3] Oil and Grease[4] Total BTEX[5] Toluene Benzene Ethylbenzene Xylene PAHs[5,6]
Whole Effluent Toxicity (once per year during discharge event)	Not Required	Acute Toxicity[7]

Source: Massport

Notes: Requirements are from NPDES Permit MA0032751, issued August 15, 2014.
All samples, except for wet testing, shall be collected after treatment and prior to discharge from above ground holding tank.

1 Flows from more than one training session may be held in treatment train for several weeks. Treatment and subsequent discharge through Outfall 001 is usually triggered by tank levels. Sampling will be conducted during each discharge event with the sampling point after the GAC unit and prior to discharge from the above ground holding tank. Each sample shall be a composite of three equally weighted (same volume) grab samples taken at the bottom, middle, and top of the above ground tank.

2 Total flow volume shall be reported monthly in gallons and the maximum flow rate in gallons per minute shall be reported for each month.

3 TSS - Total Suspended Solids

4 Oil and grease is measured using EPA Method 1664.

5 BTEX and PAH compounds shall be analyzed using EPA approved methods. Testing method used and method detection level for each parameter will be included in each DMR submittal.

6 PAH - Polycyclic Aromatic Hydrocarbons

7 The permittee shall conduct one acute toxicity test per year. The test results shall be submitted by the last day of the full month following completion of the test in accordance with protocols defined in the permit.

Table J-3 Fire Training Facility NPDES Permit (No. MA0032751) Stormwater Outfall Monitoring Requirements (2021)

Monitoring Event	**Outfall Serial Number 001**	
	Field Measurement	**Laboratory Analysis**
Each Discharge Event[1]	Flow Rate[2] pH	TSS[3] Fecal Coliform Bacteria *Enterococcus Bacteria* Oil and Grease[4] Total BTEX[5] Toluene Benzene Ethylbenzene Xylene PAHs,Total,Group I[5,6] Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene Dibenzo(a,h)anthracene Indeno(1,2,3-cd)pyrene PAHs, Total, Group II[5,6] Acenaphthylene Anthracene Benzo(g,h,i)perylene Fluoranthene Fluorene Naphthalene Phenanthrene Pyrene Perfluorohexanesulfonic acid (PFHxS)[7] Perfluoroheptanoic acid (PFHpA) Perfluoranonanoic acid (PFNA) Perfluorooctanesulfonic acid (PFOS) Perfluorooctanoic acid (PFOA) Perfluorodecanoic acid (PFDA)
Whole Effluent Toxicity (once per year during discharge event)	Not Required	Acute Toxicity[8]

Source: Massport

Notes: Requirements are from NPDES Permit MA0032751, issued January 27, 2021.
All samples, except for wet testing, shall be collected after treatment and prior to discharge from above ground holding tank.

1 Flows from more than one training session may be held in treatment train for several weeks. Treatment and subsequent discharge through Outfall 001 is usually triggered by tank levels. Except for WET samples, sampling will be conducted during each discharge event with the sampling point after the GAC unit and prior to discharge from the above ground holding tank. Each sample shall be a grab sample collected from the above ground tank. WET sampling shall occur from the outfall discharge.

2 Total flow volume shall be reported monthly in average gallons per day and the maximum flow rate in gallons per day shall be reported for each month.

3 TSS - Total Suspended Solids

4 Oil and grease is measured using EPA Method 1664.

5 BTEX and PAH compounds shall be analyzed using EPA approved methods. Testing method used and method detection level for each parameter will be included in each DMR submittal.

6 PAH - Polycyclic Aromatic Hydrocarbons

7 The reporting requirements for the listed PAH parameters takes effect six months after EPA's multi-lab validated method for wastewater is made available to the public on EPA's CWA methods program website.

8 The permittee shall conduct one acute toxicity test per year. The test results shall be submitted by the last day of the full month following completion of the test in accordance with protocols defined in the permit.

Table J-4 Logan Airport 2020 Monthly Monitoring Results for First Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	1/26/2020[2]	Wet Weather	1.625	0.246	7.34	<4.0	17	<1.0	0.070	NA	NA	NA
002A – West Outfall	1/26/2020[2]	Wet Weather	7.441	0.563	7.76	<4.0	40	<1.0	0.120	NA	NA	NA
004A – Maverick Street Outfall	1/26/2020[2]	Wet Weather	5.650	0.015	7.53	<4.0	6	<1.0	0.060	NA	NA	NA
001C – North Outfall	1/8/2020	Dry Weather				<4.0	19	<1.0	0.060	<10	<10	NA
002C – West Outfall	1/8/2020	Dry Weather				<4.0	15	<1.0	0.060	100	10	NA
004C – Maverick Street Outfall	1/8/2020	Dry Weather				<4.0	23	<1.0	<0.050	40	<10	NA
001A – North Outfall	2/6/2020	Wet Weather	2.501	0.373	7.28	<4.0	26	<20	0.110	90	460	NA
002A – West Outfall	2/6/2020	Wet Weather	8.808	1.296	6.77	<4.0	30	<20	0.140	500	230	NA
004A – Maverick Street Outfall	2/6/2020	Wet Weather	0.651	0.065	6.89	<4.0	13	<1.0	0.070	70	160	NA
001C – North Outfall	2/4/2020	Dry Weather				<4.0	16	<2.0	0.070	<10	10	NA
002C – West Outfall	2/4/2020	Dry Weather				<4.0	15	<1.0	0.100	50	10	NA
004C – Maverick Street Outfall	2/4/2020	Dry Weather				<4.0	7.4	<1.0	0.110	10	<10	NA
001A – North Outfall	---	Wet Weather	3.531	0.401	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	13.677	1.368	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	0.997	0.082	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	3/3/2020	Dry Weather				<4.0	17	<1.0	<0.050	<10	<10	NA
002C – West Outfall	3/3/2020	Dry Weather				<4.0	22	<1.0	<0.050	45	10	NA
004C – Maverick Street Outfall	3/3/2020	Dry Weather				<4.0	28	<1.0	<0.050	<10	<10	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	

Source: Massport.
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
2 January 2020 wet weather bacteria samples were collected on 1/25/2020.
NA Not Analyzed
NS Not Sampled
TSS Total Suspended Solids

Table J-5 Logan Airport 2020 Monthly Monitoring Results for First Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	1/26/2020[1]	Wet Weather	--	--	7.25	<4.0	34	<1.0	0.070	NA	NA
003 - Porter Street Outfall 2	1/26/2020[1]	Wet Weather	--	--	7.81	<4.0	<5.0	<1.0	0.070	NA	NA
003 - Porter Street Outfall 3	1/26/2020[1]	Wet Weather	--	--	7.14	<4.0	<5.0	<1.0	0.070	NA	NA
003 - Porter Street Outfall Average		Wet Weather	1.665	0.108	7.40	4.0	15	1.0	0.070	NA	NA
003 - Porter Street Outfall 1	1/8/2020	Dry Weather				<4.0	28	<1.0	0.090	100	250
003 - Porter Street Outfall 2	1/8/2020	Dry Weather				<4.0	5	<1.0	0.180	<10	20
003 - Porter Street Outfall 3	1/8/2020	Dry Weather				<4.0	<5.0	<1.0	0.080	<10	<10
003 - Porter Street Outfall Average		Dry Weather				4.0	13	1.0	0.117	22	37
003 - Porter Street Outfall 1	2/6/2020	Wet Weather	---	---	5.95	<4.0	61	<10	0.130	180	230
003 - Porter Street Outfall 2	2/6/2020	Wet Weather	---	---	7.89	4.4	7	<1.0	0.100	<10	<10
003 - Porter Street Outfall 3	2/6/2020	Wet Weather	---	---	7.28	<4.0	9	<1.0	<0.050	<10	<10
003 - Porter Street Outfall Average		Wet Weather	1.815	0.280	7.04	4.1	26	4.0	0.093	26	28
003 - Porter Street Outfall 1	2/4/2020	Dry Weather				<4.0	15	<1.0	0.150	<10	<10
003 - Porter Street Outfall 2	2/4/2020	Dry Weather				<4.0	16	<1.0	0.520	<10	<10
003 - Porter Street Outfall 3	2/4/2020	Dry Weather				<4.0	6.6	<1.0	0.120	<10	<10
003 - Porter Street Outfall Average		Dry Weather				4.0	13	1.0	0.263	10	10
003 - Porter Street Outfall 1	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Wet Weather	4.094	0.275	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	3/3/2020	Dry Weather				<4.0	31	<1.0	0.060	10	20
003 - Porter Street Outfall 2	3/3/2020	Dry Weather				<4.0	16	<1.0	<0.050	<10	<10
003 - Porter Street Outfall 3	3/3/2020	Dry Weather				<4.0	<5.0	<1.0	0.070	<10	<10
003 - Porter Street Outfall Average		Dry Weather				4.0	17	1.0	0.060	10	13
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfalls 001, 002, 003 and 004 by using the SWMM model developed for Logan Airport.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

1 January 2020 wet weather bacteria samples were collected on 1/25/2020.

TSS Total Suspended Solids

NA Not Analyzed

NS Not Sampled

Table J-6 Logan Airport 2020 Monthly Monitoring Results for Second Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	---	Wet Weather	2.472	0.564	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	8.078	1.538	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	2.460	0.243	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
002C – West Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
004C – Maverick Street Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
001A – North Outfall	---	Wet Weather	2.460	0.243	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	8.128	0.809	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	0.597	0.036	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
002C – West Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
004C – Maverick Street Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
001A – North Outfall	---	Wet Weather	3.802	0.269	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	12.955	0.909	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	0.936	0.045	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
002C – West Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
004C – Maverick Street Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	

Source: Massport.
Notes: Flow rates were estimated for outfalls 001, 002, 003 and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids
NA Not Analyzed
NS Not Sampled

Table J-7 Logan Airport 2020 Monthly Monitoring Results for Second Quarter — Porter Street Stormwater Outfall

	Date		Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	---		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average			Wet Weather	1.296	0.327	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	---		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average			Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	---		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average			Wet Weather	1.554	0.180	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	---		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average			Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	---		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---		Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average			Wet Weather	2.483	0.187	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	---		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average			Dry Weather				NS	NS	NS	NS	NS	NS
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily				Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly				Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfalls 001, 002, 003, and 0034 by using the SWMM model developed for Logan Airport.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids

NS Not Sampled

Table J-8 Logan Airport 2020 Monthly Monitoring Results for Third Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	---	Wet Weather	1.939	0.154	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	5.599	0.552	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	0.492	0.016	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
002C – West Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
004C – Maverick Street Outfall	---	Dry Weather				NS	NS	NS	NS	NS	NS	NS
001A – North Outfall	---	Wet Weather	3.687	0.188	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	14.423	0.707	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	1.321	0.032	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	8/12/2020	Dry Weather				<3.6	20	<1.0	0.080	150	100	NA
002C – West Outfall	8/12/2020	Dry Weather				<4.0	14	<1.0	0.060	7,500	150	NA
004C – Maverick Street Outfall	8/12/2020	Dry Weather				<4.0	42	<1.0	0.070	6,900	660	NA
001A – North Outfall	9/2/2020	Wet Weather	1.225	0.091	7.10	<4.0	10	<1.0	0.130	3,400	1,800	NA
002A – West Outfall	9/2/2020	Wet Weather	4.274	0.302	7.61	<4.0	19	<1.0	0.210	2,100	660	NA
004A – Maverick Street Outfall	9/2/2020	Wet Weather	0.186	-0.003	7.07	<4.0	25	<1.0	0.100	5,700	1,700	NA
001C – North Outfall	9/9/2020	Dry Weather				<4.0	9	<1.0	0.070	110	10	NA
002C – West Outfall	9/9/2020	Dry Weather				<4.0	8	<1.0	0.080	50	50	NA
004C – Maverick Street Outfall	9/9/2020	Dry Weather				<4.0	18	<1.0	0.080	820	90	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	Report

Source: Massport
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids
NA Not Analyzed
NS Not Sampled

Table J-9 Logan Airport 2020 Monthly Monitoring Results for Third Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Wet Weather	1.057	0.139	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	---	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Wet Weather	3.123	0.155	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	8/12/2020	Dry Weather				<4.0	6.8	<1.0	0.130	4,600	160
003 - Porter Street Outfall 2	8/12/2020	Dry Weather				<4.0	13	<5.0	0.060	<10	<10
003 - Porter Street Outfall 3	---	Dry Weather				DRY	DRY	DRY	DRY	DRY	DRY
003 - Porter Street Outfall Average		Dry Weather				4.0	10	3.0	0.095	214	40
003 - Porter Street Outfall 1	9/2/2020	Wet Weather	---	---	6.66	<3.6	5	<1.0	0.080	2900	1,300
003 - Porter Street Outfall 2	9/2/2020	Wet Weather	---	---	7.70	6.50	<5.0	<1.0	0.050	21,000	12,000
003 - Porter Street Outfall 3	9/2/2020	Wet Weather	---	---	7.46	<4.0	<5.0	<1.0	0.060	590	1,000
003 - Porter Street Outfall Average		Wet Weather	0.317	0.072	7.27	4.7	5	1.0	0.063	3,300	2,499
003 - Porter Street Outfall 1	9/9/2020	Dry Weather				<4.0	14	<1.0	0.100	90	40
003 - Porter Street Outfall 2	9/9/2020	Dry Weather				<4.0	9.5	<1.0	<0.050	90	10
003 - Porter Street Outfall 3	9/9/2020	Dry Weather				NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Dry Weather				4.0	12	1.0	0.075	90	20
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfall 003 by using the SWMM model developed for Logan Airport.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids

NS Not Sampled

Table J-10 Logan Airport 2020 Monthly Monitoring Results for Fourth Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	---	Wet Weather	5.170	0.555	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	19.819	1.829	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	1.187	0.100	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	10/8/2020	Dry Weather				<4.0	16	<1.0	0.260	4,800	650	NA
002C – West Outfall	10/8/2020	Dry Weather				<4.0	8	<1.0	0.150	260	150	NA
004C – Maverick Street Outfall	10/8/2020	Dry Weather				<4.0	7.9	<1.0	0.060	1,500	340	NA
001A – North Outfall	11/23/2020	Wet Weather	6.419	0.433	7.04	<4.0	28	<1.0	0.060	590	1,300	NA
002A – West Outfall	11/23/2020	Wet Weather	21.788	1.410	7.20	<4.0	18	<1.0	<0.050	400	710	NA
004A – Maverick Street Outfall	11/23/2020	Wet Weather	1.587	0.090	7.14	<4.0	16	<1.0	<0.050	600	910	NA
001C – North Outfall	11/5/2020	Dry Weather				<4.0	<5.0	<1.0	0.050	40	<10	NA
002C – West Outfall	11/5/2020	Dry Weather				<4.0	6	<1.0	0.080	180	<10	NA
004C – Maverick Street Outfall	11/5/2020	Dry Weather				<4.0	8.0	<1.0	0.070	300	60	NA
001A – North Outfall	---	Wet Weather	7.676	1.120	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	19.943	2.485	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	1.482	0.123	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	12/9/2020	Dry Weather				<4.0	15	<1.0	0.070	4,400	670	NA
002C – West Outfall	12/9/2020	Dry Weather				<4.0	9	<1.0	0.050	60	20	NA
004C – Maverick Street Outfall	12/9/2020	Dry Weather				<3.6	11	<1.0	0.100	30	10	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	Report

Source: Massport.
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids
NA Not Analyzed
NS Not Sampled

Table J-11 Logan Airport 2020 Monthly Monitoring Results for Fourth Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Wet Weather	4.438	0.373	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	10/8/2020	Dry Weather				<4.0	60	<1.0	0.240	15,000	270
003 - Porter Street Outfall 2	10/8/2020	Dry Weather				<4.0	5.8	<1.0	0.190	16,000	330
003 - Porter Street Outfall 3	10/8/2020	Dry Weather				<4.0	6.9	<1.0	0.180	100	900
003 - Porter Street Outfall Average		Dry Weather				4.0	24	1.0	0.203	2,884	431
003 - Porter Street Outfall 1	11/23/2020	Wet Weather	---	---	7.33	<3.6	45	<1.0	<0.050	620	2,200
003 - Porter Street Outfall 2	11/23/2020	Wet Weather	---	---	7.17	28	22	<1.0	0.140	45	10
003 - Porter Street Outfall 3	11/23/2020	Wet Weather	---	---	7.27	<4.0	5	<1.0	<0.050	110	160
003 - Porter Street Outfall Average		Wet Weather	3.228	0.307	7.26	11.9	24	1.0	0.080	145	152
003 - Porter Street Outfall 1	11/5/2020	Dry Weather				<4.0	27	<1.0	0.090	100	<10
003 - Porter Street Outfall 2	11/5/2020	Dry Weather				<4.0	<5.0	<1.0	<0.050	<10	510
003 - Porter Street Outfall 3	11/5/2020	Dry Weather				<3.6	<5.0	<1.0	0.090	<10	<10
003 - Porter Street Outfall Average		Dry Weather				3.9	12.3	1.0	0.077	22	37
003 - Porter Street Outfall 1	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Wet Weather	3.380	0.458	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	12/9/2020	Dry Weather				<3.6	<5.0	<1.0	0.120	<10	<10
003 - Porter Street Outfall 2	12/9/2020	Dry Weather				<4.0	10.0	<1.0	<0.050	70	430
003 - Porter Street Outfall 3	12/9/2020	Dry Weather				<4.0	<5.0	<1.0	0.090	<10	<10
003 - Porter Street Outfall Average		Dry Weather				3.9	6.7	1.0	0.087	19	35
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfall 003 using the SWMM model developed for Logan Airport.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids

NS Not Sampled

Table J-12 Logan Airport 2020 Quarterly Wet Weather Monitoring Results – North, West, Maverick Street, and Porter Street Stormwater Outfalls

	Date	pH (S.U.)	Benzo(a)-anthracene (µg/L)	Benzo(a)-pyrene (µg/L)	Benzo(b)-fluoranthene (µg/L)	Benzo(k)-fluoranthene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h,)-anthracene (µg/L)	Indeno(1,2,3-cd)-pyrene (µg/L)	Naphthalene (µg/L)	Total PAHs (µg/L)
001Q - North Outfall	2/6/2020	7.28	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
002Q - West Outfall	2/6/2020	6.77	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
004Q - Maverick Street Outfall	2/6/2020	6.89	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 1	2/6/2020	5.95	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
003Q - Porter Street Outfall 2	2/6/2020	7.89	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
003Q - Porter Street Outfall 3	2/6/2020	7.28	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
003Q - Porter Street Outfall Average		7.04	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
001Q - North Outfall	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
002Q - West Outfall	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
004Q - Maverick Street Outfall	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003Q - Porter Street Outfall 1	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003Q - Porter Street Outfall 2	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003Q - Porter Street Outfall 3	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003Q - Porter Street Outfall Average		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
001Q - North Outfall	9/30/2020	7.58	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
002Q - West Outfall	9/30/2020	6.80	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
004Q - Maverick Street Outfall	9/30/2020	6.65	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 1	9/30/2020	6.35	2.43	3.12	3.83	<2.00	2.85	<2.00	2.06	<2.00	14.29
003Q - Porter Street Outfall 2	9/30/2020	8.31	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 3	9/30/2020	6.42	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall Average		7.03	2.1	2.4	2.6	2.0	2.3	2.0	2.0	2.0	6.1
001Q - North Outfall	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
002Q - West Outfall	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
004Q - Maverick Street Outfall	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003Q - Porter Street Outfall 1	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003Q - Porter Street Outfall 2	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003Q - Porter Street Outfall 3	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
003Q - Porter Street Outfall Average		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily		6.0 to 8.5	Report	Report	Report	Report	Report	Report	Report	Report	Total

Source: Massport
Notes: For averaging calculations, a value of zero was employed for those results measures below the laboratory detection limit.
PAHs Polynuclear Aromatic Hydrocarbons
ND Not Detected
NS Not Sampled

Table J-13 Logan Airport 2020 Quarterly Wet Weather Monitoring Results – Northwest and Runway/Perimeter Stormwater Outfalls

	Date	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (SU)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)
005Q - Northwest Outfall	2/26/2020	0.324	0.048	7.00	4.5	31	<1.0
006Q- Runway/ Perimeter Outfall (A9)	2/26/2020	0.200	0.031	7.34	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A15)	2/26/2020	0.069	0.010	7.38	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A19)	2/26/2020	0.028	0.004	7.30	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A21)	2/26/2020	1.606	0.241	7.55	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A28)	2/26/2020	0.108	0.019	7.48	<4.0	9.0	<1.0
006Q- Runway/ Perimeter Outfall (A33)	2/26/2020	0.139	0.024	7.10	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A38)	2/26/2020	0.198	0.030	7.79	<4.0	7.5	<1.0
006Q- Runway/Perimeter Outfall Average		0.335	0.051	7.42	4.0	5.9	1.0
005Q - Northwest Outfall	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A9)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A16)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A19)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A21)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A23)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A33)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A38)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/Perimeter Outfall Average		NS	NS	NS	NS	NS	NS
005Q - Northwest Outfall	9/30/2020	0.163	0.012	6.98	<4.0	45	<1.0
006Q- Runway/ Perimeter Outfall (A8)	9/30/2020	0.051	0.005	7.07	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A19)	9/30/2020	0.012	0.001	7.68	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A21)	9/30/2020	0.464	0.042	7.37	<4.0	9.6	<1.0
006Q- Runway/ Perimeter Outfall (A22)	9/30/2020	0.101	0.008	7.28	<4.0	5.5	<1.0
006Q- Runway/ Perimeter Outfall (A31)	9/30/2020	0.045	0.003	7.47	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A34)	9/30/2020	0.016	0.012	7.39	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A38)	9/30/2020	0.054	0.005	7.39	<4.0	10.0	<1.0
006Q- Runway/Perimeter Outfall Average		0.106	0.011	7.38	4.0	6.4	1.0
005Q - Northwest Outfall	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A9)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A16)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A20)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A21)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A23)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A33)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A38)	---	NS	NS	NS	NS	NS	NS
006Q- Runway/Perimeter Outfall Average		NS	NS	NS	NS	NS	NS
Discharge Limitations		Report	Report	Report	Report	Report	Report

Source: Massport
Notes: For averaging calculations, a value of zero was employed for those results measures below the laboratory detection limit.
Requirements are from NPDES Permit MA 0000787, issued July 31, 2007.
TSS Total Suspended Solids
NS Not Sampled

Table J-14 Logan Airport February 2020 Wet Weather Deicing Monitoring Results – North, West, Porter Street, and Runway/Perimeter Stormwater Outfalls

	Date	Ethylene Glycol, Total (mg/L)	Propylene Glycol, Total (mg/L)	BOD5 (mg/L)	COD (mg/L)	Ammonia Nitrogen (mg/L)	Nonylphenol (µg/L)	4-Methyl-1-H-benzotriazole (µg/L)	5-Methyl-1-H-benzotriazole (µg/L)	Tolytriazole (µg/L)
001B - North Outfall	2/6/2020	<80.0	2,270	2,200	4,800	0.423	<48	NA	NA	70
002B - West Outfall	2/6/2020	<200	4,980	7,200	13,000	0.567	<48	NA	NA	88
003B - Porter Street Outfall 1	2/6/2020	9.97	89.2	250	550	0.374	<47	NA	NA	71
003B - Porter Street Outfall 2	2/6/2020	8.36	3.97	17.	<20	<0.075	<4.8	NA	NA	<50
003B - Porter Street Outfall 3	2/6/2020	<2.00	3	5	<20	<0.075	<4.9	NA	NA	<50
003B - Porter Street Outfall Average		6.8	32	127	197	0.175	19	NA	NA	57
006B- Runway/ Perimeter (A9)	2/6/2020	<2.00	<2.00	170	210	0.204	<48	NA	NA	<50
006B- Runway/ Perimeter (A15)	2/6/2020	<2.00	<2.00	230	290	0.08	<48	NA	NA	<50
006B- Runway/ Perimeter (A19)	2/6/2020	<2.00	<2.00	230	290	0.201	<49	NA	NA	61
006B- Runway/ Perimeter (A21)	2/6/2020	<2.00	22.2	250	280	0.166	<48	NA	NA	<50
006B- Runway/ Perimeter (A28)	2/6/2020	<2.00	<2.00	<2.0	<20	1.1	<48	NA	NA	<50
006B- Runway/ Perimeter (A33)	2/6/2020	<2.00	<2.00	310	420	0.084	<49	NA	NA	58
006B- Runway/ Perimeter (A38)	2/6/2020	<2.00	<2.00	2.2	52	0.127	<48	NA	NA	<50
006B- Runway/Perimeter Outfall Average		2.00	4.89	171	223	0.28	4.8	NA	NA	53
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.										
Discharge Limitations										
Average Monthly		Report	Report	Report	Report	Report	Report	Report	Report	Report
Maximum Daily		Report	Report	Report	Report	Report	Report	Report	Report	Report

Source: Massport
Notes: For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit.
J = value is an estimate calculated by the lab from the response factors of the other two triazole compounds.
Tolytriazole concentrations calculated as sum of 4-Methly-1-H-benzotriazole and 5-Methyl-1-H-benzotriazole.
BOD5 Five-day Biochemical Oxygen Demand
COD Chemical Oxygen Demand
NA Not Analyzed

Table J-15 Logan Airport 2021 Monthly Monitoring Results for First Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella* (cfu/100mL)[1]
001A – North Outfall	1/27/2021	Wet Weather	3.653	0.314	7.28	<4.0	49	1.40	0.330	60	<10	NA
002A – West Outfall	1/27/2021	Wet Weather	12.464	0.790	7.31	<4.0	23	<1.0	<0.250	20	30	NA
004A – Maverick Street Outfall	1/27/2021	Wet Weather	0.945	0.038	7.82	<4.0	13	<1.0	0.110	<10	<10	NA
001C – North Outfall	1/6/2021	Dry Weather				<4.0	15	<5.0	0.070	70	2,000	NA
002C – West Outfall	1/6/2021	Dry Weather				<4.0	15	<1.0	0.050	50	<10	NA
004C – Maverick Street Outfall	1/6/2021	Dry Weather				<4.0	12	<1.0	0.080	160	40	NA
001A – North Outfall	2/16/2021	Wet Weather	3.035	0.974	7.55	7.1	**150**	<1.0	0.120	50	110	NA
002A – West Outfall	2/16/2021	Wet Weather	7.150	1.172	7.05	<4.0	90	<1.0	0.110	180	550	NA
004A – Maverick Street Outfall	2/16/2021	Wet Weather	0.558	0.033	6.58	<4.0	76	<1.0	0.110	120	250	NA
001C – North Outfall	2/26/2021	Dry Weather				<4.0	18	<1.0	0.050	1,200	1,100	NA
002C – West Outfall	2/26/2021	Dry Weather				<4.0	21	<1.0	0.050	<2.0	20	NA
004C – Maverick Street Outfall	2/26/2021	Dry Weather				<4.0	18	<1.0	<0.050	100	31	NA
001A – North Outfall	3/25/2021	Wet Weather	1.996	0.234	7.22	<4.0	7.8	<1.0	0.330	60	160	NA
002A – West Outfall	3/25/2021	Wet Weather	4.927	0.663	7.46	<4.0	12	<1.0	0.260	30	30	NA
004A – Maverick Street Outfall	3/25/2021	Wet Weather	0.521	0.030	7.75	<3.6	13	<1.0	0.050	560	220	NA
001C – North Outfall	3/5/2021	Dry Weather				<4.0	22	<1.0	0.060	390	5,600	NA
002C – West Outfall	3/5/2021	Dry Weather				<4.0	12	<1.0	0.120	<10	<10	NA
004C – Maverick Street Outfall	3/5/2021	Dry Weather				<4.0	16	<1.0	0.060	60	10	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	

Source: Massport.
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
NA Not Analyzed
TSS Total Suspended Solids

Table J-16 Logan Airport 2021 Monthly Monitoring Results for First Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	1/27/2021	Wet Weather	---	---	6.99	<4.0	60	<1.0	0.460	<10	30
003 - Porter Street Outfall 2	1/27/2021	Wet Weather	---	---	8.35	<4.0	22	<1.0	0.370	<10	30
003 - Porter Street Outfall 3	1/27/2021	Wet Weather	---	---	7.84	<4.0	13	<1.0	<0.250	<10	<10
003 - Porter Street Outfall Average		Wet Weather	1.994	0.161	7.73	4.0	32	1.0	0.360	10	21
003 - Porter Street Outfall 1	1/6/2021	Dry Weather				<4.0	31	<2.0	0.100	40.0	<10
003 - Porter Street Outfall 2	1/6/2021	Dry Weather				<3.6	<5.0	<1.0	0.100	<10	<10
003 - Porter Street Outfall 3	1/6/2021	Dry Weather				<4.0	<5.0	<1.0	0.110	<10	<10
003 - Porter Street Outfall Average		Dry Weather				3.9	14	1.0	0.103	20.0	10
003 - Porter Street Outfall 1	2/16/2021	Wet Weather	---	---	6.94	<4.0	80	<1.0	0.120	80	1700
003 - Porter Street Outfall 2	2/16/2021	Wet Weather	---	---	7.73	11	7.6	<1.0	0.050	<10	<10
003 - Porter Street Outfall 3	2/16/2021	Wet Weather	---	---	7.82	<4.0	31	<1.0	<0.050	<10	10
003 - Porter Street Outfall Average		Wet Weather	0.788	0.155	7.50	6.3	40	1.0	0.073	20	55
003 - Porter Street Outfall 1	2/26/2021	Dry Weather				<4.0	19	<1.0	0.120	<2.0	<10
003 - Porter Street Outfall 2	2/26/2021	Dry Weather				24.0	1,200	<2.5	0.170	5.0	50
003 - Porter Street Outfall 3	2/26/2021	Dry Weather				<4.0	23.0	<1.0	0.050	<2.0	63
003 - Porter Street Outfall Average		Dry Weather				10.7	414	1.5	0.113	2.7	32
003 - Porter Street Outfall 1	3/25/2021	Wet Weather	---	---	7.22	<4.0	29	<1.0	0.340	45	140
003 - Porter Street Outfall 2	3/25/2021	Wet Weather	---	---	7.94	<3.6	5.8	<1.0	0.280	<10	50
003 - Porter Street Outfall 3	3/25/2021	Wet Weather	---	---	7.06	<3.6	5.3	<1.0	0.150	<10	<10
003 - Porter Street Outfall Average		Wet Weather	1.264	0.140	7.41	3.7	13.4	1.0	0.257	17	41
003 - Porter Street Outfall 1	3/5/2021	Dry Weather				<4.0	64	<1.0	0.110	30	30
003 - Porter Street Outfall 2	3/5/2021	Dry Weather				18	820	<1.0	<0.500	<10	<10
003 - Porter Street Outfall 3	3/5/2021	Dry Weather				<4.0	<5.0	<1.0	0.070	<10	<10
003 - Porter Street Outfall Average		Dry Weather				8.7	296	1.0	0.227	14.4	14
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfalls 001, 002, 003 and 004 by using the SWMM model developed for Logan Airport.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit. For averaging calculations beginning March 2019, the reporting limit was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) beginning in March 2019, the reporting limit was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids

Table J-17 Logan Airport 2021 Monthly Monitoring Results for Second Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	4/16/2021	Wet Weather	5.616	0.503	7.50	<4.0	5.0	<1.0	<0.050	150	550	NA
002A – West Outfall	4/16/2021	Wet Weather	19.987	1.730	7.20	<4.0	34	<1.0	0.060	2,300	2,000	NA
004A – Maverick Street Outfall	4/16/2021	Wet Weather	1.412	0.101	7.14	<4.0	61	<1.0	<0.050	70	410	NA
001C – North Outfall	4/7/2021	Dry Weather				<4.0	16	<1.0	<0.050	80	270	NA
002C – West Outfall	4/7/2021	Dry Weather				<4.0	11	<1.0	<0.050	10	<10	NA
004C – Maverick Street Outfall	4/7/2021	Dry Weather				<4.0	14	<1.0	<0.050	20	<10	NA
001A – North Outfall	5/10/2021	Wet Weather	5.611	0.513	7.61	<3.6	5.4	<1.0	0.050	80	220	NA
002A – West Outfall	5/10/2021	Wet Weather	24.229	1.786	7.30	<4.0	14	<1.0	0.090	440	820	NA
004A – Maverick Street Outfall	5/10/2021	Wet Weather	1.084	0.111	7.35	<4.0	9.6	<1.0	0.050	2,200	5,300	NA
001C – North Outfall	5/18/2021	Dry Weather				<4.0	14	<1.0	<0.050	20	<10	NA
002C – West Outfall	5/18/2021	Dry Weather				<3.6	8.6	<1.0	0.060	560	<10	NA
004C – Maverick Street Outfall	5/18/2021	Dry Weather				<4.0	10.0	<1.0	<0.050	260	100	NA
001A – North Outfall	6/22/2021	Wet Weather	2.509	0.259	6.25	<4.0	22	<1.0	0.080	340	6,600	NA
002A – West Outfall	6/22/2021	Wet Weather	6.467	0.871	7.39	<4.0	**140**	<1.0	0.150	990	2,000	NA
004A – Maverick Street Outfall	6/22/2021	Wet Weather	0.511	0.041	7.40	<4.4	**220**	<1.0	0.260	2,600	14,000	NA
001C – North Outfall	6/3/2021	Dry Weather				<4.0	8.3	<1.0	0.050	120	40	NA
002C – West Outfall	6/3/2021	Dry Weather				<4.0	16	<1.0	0.050	150	<10	NA
004C – Maverick Street Outfall	6/3/2021	Dry Weather				<4.0	15	<1.0	0.090	350	80	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	

Source: Massport.
Notes: Flow rates were estimated for outfalls 001, 002, 003 and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids
NA Not Analyzed

Table J-18 Logan Airport 2021 Monthly Monitoring Results for Second Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	4/16/2021	Wet Weather	---	---	7.36	<4.0	28	<1.0	<0.050	11,000	280
003 - Porter Street Outfall 2	4/16/2021	Wet Weather	---	---	7.19	<4.0	7.0	<1.0	<0.050	<10	<10
003 - Porter Street Outfall 3	4/16/2021	Wet Weather	---	---	8.07	<4.0	7.0	<1.0	<0.050	<10	<10
003 - Porter Street Outfall Average		Wet Weather	3.326	0.349	7.54	4.0	14	1.0	0.050	103	30
003 - Porter Street Outfall 1	4/7/2021	Dry Weather				<4.0	13	<1.0	0.050	<10	10
003 - Porter Street Outfall 2	4/7/2021	Dry Weather				11	320	<5.0	4.91	>80,000	>80,000
003 - Porter Street Outfall 3	4/7/2021	Dry Weather				<3.6	<5.0	<1.0	0.060	<10	<10
003 - Porter Street Outfall Average		Dry Weather				6.2	113	2.3	1.673	200	200
003 - Porter Street Outfall 1	5/10/2021	Wet Weather	---	---	7.25	<4.0	6.3	<1.0	0.070	1,200	510
003 - Porter Street Outfall 2	5/10/2021	Wet Weather	---	---	7.62	<4.0	23.0	<1.0	<0.050	100	3,200
003 - Porter Street Outfall 3	5/10/2021	Wet Weather	---	---	7.06	<4.0	<5.0	<1.0	<0.050	<10	100
003 - Porter Street Outfall Average		Wet Weather	4.546	0.375	7.31	4.0	11.4	1.0	0.056	106	546
003 - Porter Street Outfall 1	5/18/2021	Dry Weather				<4.0	39	<1.0	0.080	<10	<10
003 - Porter Street Outfall 2	5/18/2021	Dry Weather				4.0	23	<1.0	2.10	10	210
003 - Porter Street Outfall 3	5/18/2021	Dry Weather				<4.0	<5.0	<1.0	0.100	<10	<10
003 - Porter Street Outfall Average		Dry Weather				4.0	22	1.0	0.760	10.0	28
003 - Porter Street Outfall 1	6/22/2021	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	6/22/2021	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	6/22/2021	Wet Weather	---	---	7.44	<4.4	15	<1.0	<0.050	180	68
003 - Porter Street Outfall Average		Wet Weather	2.475	0.202	7.44	<4.4	15	<1.0	<0.050	180	68
003 - Porter Street Outfall 1	6/3/2021	Dry Weather				<4.0	6.2	<1.0	<0.050	70	60
003 - Porter Street Outfall 2	6/3/2021	Dry Weather				<4.0	7.4	<1.0	<0.050	<10	<10
003 - Porter Street Outfall 3	6/3/2021	Dry Weather				<4.4	<5.0	<1.0	0.110	<10	<10
003 - Porter Street Outfall Average		Dry Weather				4.1	6.2	1.0	0.070	19	18
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfalls 001, 002, 003 and 004 by using the SWMM model developed for Logan Airport.
For averaging calculations beginning March 2019, the reporting limit was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) beginning in March 2019, the reporting limit was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids

NS Not Sampled

Table J-19 Logan Airport 2021 Monthly Monitoring Results for Third Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	---	Wet Weather	6.794	1.063	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	23.730	3.596	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	1.661	0.248	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	7/16/2021	Dry Weather				<3.6	22	<1.0	0.070	30	90	NA
002C – West Outfall	7/16/2021	Dry Weather				<4.0	14	<1.0	0.050	200	70	NA
004C – Maverick Street Outfall	7/16/2021	Dry Weather				<4.0	13.0	<1.0	0.050	2,400	560	NA
001A – North Outfall	8/5/2021	Wet Weather	6.059	0.783	7.72	<4.0	<5.0	<1.0	0.090	1,300	3,000	NA
002A – West Outfall	8/5/2021	Wet Weather	23.027	2.675	7.39	<4.0	<5.0	<1.0	<0.050	13,000	5,100	NA
004A – Maverick Street Outfall	8/5/2021	Wet Weather	1.434	0.171	7.23	<4.0	17	<1.0	0.120	430	190	NA
001C – North Outfall	8/13/2021	Dry Weather				<4.0	16	<1.0	0.050	230	20	NA
002C – West Outfall	8/13/2021	Dry Weather				<4.0	9.4	<1.0	0.080	200	50	NA
004C – Maverick Street Outfall	8/13/2021	Dry Weather				<4.0	10	<1.0	0.070	330	80	NA
001A – North Outfall	9/9/2021	Wet Weather	9.831	0.809	8.06	<3.6	5.5	<1.0	0.140	4,200	1,500	NA
002A – West Outfall	9/9/2021	Wet Weather	35.133	2.701	6.83	<3.6	22	<1.0	0.160	3,800	4,000	NA
004A – Maverick Street Outfall	9/9/2021	Wet Weather	2.553	0.191	6.94	<4.0	7.2	<1.0	0.650	250	3,700	NA
001C – North Outfall	9/15/2021	Dry Weather				<4.0	5.3	<1.0	0.100	170	70	NA
002C – West Outfall	9/15/2021	Dry Weather				<4.0	11	<1.0	0.150	180	10	NA
004C – Maverick Street Outfall	9/15/2021	Dry Weather				<4.0	13	<1.0	0.120	230	100	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	Report

Source: Massport.
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids
NA Not Analyzed
NS Not Sampled

Table J-20 Logan Airport 2021 Monthly Monitoring Results for Third Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---	Wet Weather	---	---	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Wet Weather	4.864	0.752	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	7/16/2021	Dry Weather				<3.6	5.3	<1.0	0.070	240	30
003 - Porter Street Outfall 2	7/16/2021	Dry Weather				20.0	1100	<1.0	0.63	>80,000	32,000
003 - Porter Street Outfall 3	7/16/2021	Dry Weather				<3.6	5.1	<1.0	0.100	40	20
003 - Porter Street Outfall Average		Dry Weather				9.1	370.1	1.0	0.267	916	268
003 - Porter Street Outfall 1	8/5/2021	Wet Weather	---	---	7.12	<4.0	19.00	<1.0	0.070	5300	6400
003 - Porter Street Outfall 2	8/5/2021	Wet Weather	---	---	8.04	<4.0	<5.0	<1.0	<0.050	510	120
003 - Porter Street Outfall 3	8/5/2021	Wet Weather	---	---	7.33	<4.0	<5.0	<1.0	<0.050	360	400
003 - Porter Street Outfall Average		Wet Weather	4.207	0.575	7.50	4.0	10	1.0	0.056	991	675
003 - Porter Street Outfall 1	8/13/2021	Dry Weather				<4.0	<5.0	<1.0	0.080	250	120
003 - Porter Street Outfall 2	8/13/2021	Dry Weather				<4.0	26	<1.0	<0.050	310	<10
003 - Porter Street Outfall 3	8/13/2021	Dry Weather				<4.0	5.7	<1.0	0.120	10	<10
003 - Porter Street Outfall Average		Dry Weather				4.0	12.2	1.0	0.083	92	23
003 - Porter Street Outfall 1	9/9/2021	Wet Weather	---	---	7.38	<4.0	8.1	<1.0	0.220	11,000	5700
003 - Porter Street Outfall 2	9/9/2021	Wet Weather	---	---	7.86	<4.0	<5.0	<1.0	0.270	36,000	700
003 - Porter Street Outfall 3	9/9/2021	Wet Weather	---	---	6.75	<4.0	<5.0	<1.0	0.130	510	40
003 - Porter Street Outfall Average		Wet Weather	7.720	0.602	7.33	4.0	6	1.0	0.207	5,867	542
003 - Porter Street Outfall 1	9/15/2021	Dry Weather				<4.0	5.5	<1.0	0.120	390	20
003 - Porter Street Outfall 2	9/15/2021	Dry Weather				<3.6	<5.0	<1.0	0.060	3,200	10
003 - Porter Street Outfall 3	9/15/2021	Dry Weather				<3.6	<5.0	<1.0	0.170	20	20
003 - Porter Street Outfall Average		Dry Weather				3.7	5.2	1.0	0.117	292	16
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfall 003 by using the SWMM model developed for Logan Airport.
For averaging calculations beginning March 2019, the reporting limit was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) beginning in March 2019, the reporting limit was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids

NS Not Sampled

Table J-21 Logan Airport 2021 Monthly Monitoring Results for Fourth Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	10/25/2021	Wet Weather	3.261	0.546	7.48	<4.0	6.1	<1.0	0.090	4,500	1,800	NA
002A – West Outfall	10/25/2021	Wet Weather	11.225	1.949	6.84	<4.0	17	<1.0	0.310	250	3,700	NA
004A – Maverick Street Outfall	10/25/2021	Wet Weather	0.821	0.116	7.47	<4.0	79	<1.0	0.130	600	1,000	NA
001C – North Outfall	10/21/2021	Dry Weather				<4.0	6.4	<1.0	0.090	10	70	NA
002C – West Outfall	10/21/2021	Dry Weather				<4.0	8.4	<1.0	0.090	4,000	700	NA
004C – Maverick Street Outfall	10/21/2021	Dry Weather				<4.0	22	<1.0	0.060	130	20	NA
001A – North Outfall	11/12/2021	Wet Weather	1.624	0.153	7.32	<3.6	12.0	<1.0	0.070	30	10	NA
002A – West Outfall	11/12/2021	Wet Weather	5.242	0.568	7.10	<4.0	20	<1.0	0.210	3,500	720	NA
004A – Maverick Street Outfall	11/12/2021	Wet Weather	0.402	0.014	7.45	<4.0	18	<1.0	0.050	120	120	NA
001C – North Outfall	11/3/2021	Dry Weather				<4.0	16	<1.0	0.050	70	40	NA
002C – West Outfall	11/3/2021	Dry Weather				<3.6	24	<1.0	0.060	40	45	NA
004C – Maverick Street Outfall	11/3/2021	Dry Weather				<4.0	44	<1.0	<0.050	90	70	NA
001A – North Outfall	12/16/2021	Wet Weather	2.901	0.327	7.37	<4.0	9.7	<1.0	0.190	1,900	540	NA
002A – West Outfall	12/16/2021	Wet Weather	9.544	0.828	6.73	<4.0	12	<1.0	0.170	200	90	NA
004A – Maverick Street Outfall	12/16/2021	Wet Weather	0.331	0.031	7.40	<4.0	14	<1.0	<0.050	80	20	NA
001C – North Outfall	12/2/2021	Dry Weather				<4.0	13	<1.0	0.070	<10	<10	NA
002C – West Outfall	12/2/2021	Dry Weather				<4.0	9.7	<1.0	0.080	20	60	NA
004C – Maverick Street Outfall	12/2/2021	Dry Weather				<4.0	8.8	<1.0	0.050	4,800	80	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	Report

Source: Massport.
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids
NA Not Analyzed

Table J-22 Logan Airport 2021 Monthly Monitoring Results for Fourth Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	10/25/2021	Wet Weather	---	---	7.02	<4.0	140	<1.0	0.130	19,000	4,700
003 - Porter Street Outfall 2	10/25/2021	Wet Weather	---	---	7.91	<4.0	8.4	<1.0	0.050	210	60
003 - Porter Street Outfall 3	10/25/2021	Wet Weather	---	---	6.17	<3.6	<5.0	<1.0	<0.050	10	130
003 - Porter Street Outfall Average		Wet Weather	2.693	0.414	7.03	3.9	51	1.0	0.077	342	332
003 - Porter Street Outfall 1	10/21/2021	Dry Weather				<4.0	<5.0	<1.0	0.100	390	<10
003 - Porter Street Outfall 2	10/21/2021	Dry Weather				<4.0	<5.0	<1.0	<0.050	680	10
003 - Porter Street Outfall 3	10/21/2021	Dry Weather				<3.6	11	<1.0	0.130	630	30
003 - Porter Street Outfall Average		Dry Weather				3.9	7.0	1.0	0.093	551	14
003 - Porter Street Outfall 1	11/12/2021	Wet Weather	---	---	8.07	<3.6	26	<1.0	0.100	5,100	4,100
003 - Porter Street Outfall 2	11/12/2021	Wet Weather	---	---	6.99	18	34	<1.0	1.89	1,900	380
003 - Porter Street Outfall 3	11/12/2021	Wet Weather	---	---	7.07	<4.0	<5.0	<1.0	<0.050	60	220
003 - Porter Street Outfall Average		Wet Weather	0.991	0.148	7.38	8.5	22	1.0	0.680	835	700
003 - Porter Street Outfall 1	11/3/2021	Dry Weather				<4.0	21	<1.0	0.080	4,300	430
003 - Porter Street Outfall 2	11/3/2021	Dry Weather				<4.0	<5.5	<1.0	<0.050	<10	<10
003 - Porter Street Outfall 3	11/3/2021	Dry Weather				<4.0	12	<1.0	0.120	40	120
003 - Porter Street Outfall Average		Dry Weather				4.0	12.8	1.0	0.083	120	80
003 - Porter Street Outfall 1	12/16/2021	Wet Weather	---	---	7.80	<4.0	19	<1.0	0.200	330	590
003 - Porter Street Outfall 2	12/16/2021	Wet Weather	---	---	7.48	<4.0	20	<1.0	0.140	20	10
003 - Porter Street Outfall 3	12/16/2021	Wet Weather	---	---	7.66	<4.0	<5.0	<1.0	0.100	380	1,200
003 - Porter Street Outfall Average		Wet Weather	1.639	0.168	7.65	4.0	15	1.0	0.147	136	192
003 - Porter Street Outfall 1	12/2/2021	Dry Weather				<4.0	<5.0	<1.0	0.060	20	120
003 - Porter Street Outfall 2	12/2/2021	Dry Weather				<4.0	33	<1.0	1.13	50	100
003 - Porter Street Outfall 3	12/2/2021	Dry Weather				<3.6	8.5	<1.0	0.060	<10	10
003 - Porter Street Outfall Average		Dry Weather				3.9	15.5	1.0	0.417	27	77
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfall 003 by using the SWMM model developed for Logan Airport.
For averaging calculations beginning March 2019, the reporting limit was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) beginning in March 2019, the reporting limit was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids

Table J-23 Logan Airport 2021 Quarterly Wet Weather Monitoring Results – North, West, Maverick Street, and Porter Street Stormwater Outfalls

	Date	pH (S.U.)	Benzo(a)-anthracene (µg/L)	Benzo(a)-pyrene (µg/L)	Benzo(b)-fluoranthene (µg/L)	Benzo(k)-fluoranthene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h,)-anthracene (µg/L)	Indeno(1,2,3-cd)-pyrene (µg/L)	Naphthalene (µg/L)	Total PAHs (µg/L)
001Q - North Outfall	2/16/2021	7.55	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
002Q - West Outfall	2/16/2021	7.05	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
004Q - Maverick Street Outfall	2/16/2021	6.58	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 1	2/16/2021	6.94	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 2	2/16/2021	7.73	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 3	2/16/2021	7.82	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall Average		7.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
001Q - North Outfall	8/19/2021	6.65	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
002Q - West Outfall	8/19/2021	6.52	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
004Q - Maverick Street Outfall	8/19/2021	6.23	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 1	8/19/2021	7.22	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 2	8/19/2021	6.39	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 3	8/19/2021	6.26	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall Average		6.62	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
001Q - North Outfall	11/12/2021	7.32	<2.00	<2.00	2.22	<2.00	<2.00	<2.00	<2.00	<2.00	2.22
002Q - West Outfall	11/12/2021	7.32	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
004Q - Maverick Street Outfall	11/12/2021	7.45	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 1	11/12/2021	8.07	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 2	11/12/2021	6.99	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall 3	11/12/2021	7.07	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
003Q - Porter Street Outfall Average		7.38	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily		6.0 to 8.5	Report	Report	Report	Report	Report	Report	Report	Report	Total

Source: Massport
Notes: For averaging calculations starting March 2019, the reporting limit was employed for those results measured below the laboratory detection limit.
PAHs Polynuclear Aromatic Hydrocarbons

Table J-24 Logan Airport 2021 Quarterly Wet Weather Monitoring Results – Northwest and Runway/Perimeter Stormwater Outfalls

	Date	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (SU)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)
005Q - Northwest Outfall	2/16/2021	0.252	0.029	6.63	5.5	25	<1.0
006Q- Runway/ Perimeter Outfall (A9)	2/16/2021	0.160	0.023	7.13	<4.0	7.2	<1.0
006Q- Runway/ Perimeter Outfall (A15)	2/16/2021	0.057	0.007	7.12	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A20(1))	2/16/2021	0.084	0.009	7.41	<4.0	30	<1.0
006Q- Runway/ Perimeter Outfall (A21)	2/16/2021	1.288	0.163	7.21	<4.0	11	<1.0
006Q- Runway/ Perimeter Outfall (A23)	2/16/2021	0.138	0.017	6.74	<4.0	8.6	<1.0
006Q- Runway/ Perimeter Outfall (A33)	2/16/2021	0.104	0.016	7.24	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A38)	2/16/2021	0.154	0.021	7.51	<4.0	26.0	<1.0
006Q- Runway/Perimeter Outfall Average		0.283	0.037	7.19	4.0	13.3	1.0
005Q - Northwest Outfall	8/19/2021	0.756	0.105	6.35	<4.0	110	<1.0
006Q- Runway/ Perimeter Outfall (A9)	8/19/2021	0.538	0.064	6.68	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A16)	8/19/2021	0.185	0.026	6.63	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A19(2))	8/19/2021	0.071	0.010	7.03	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A21)	8/19/2021	4.046	0.503	6.59	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A23)	8/19/2021	0.420	0.048	7.02	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A33)	8/19/2021	0.276	0.034	7.31	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A38)	8/19/2021	0.577	0.070	7.08	<4.0	6.3	<1.0
006Q- Runway/Perimeter Outfall Average		0.873	0.108	6.91	4.0	5.2	1.0
005Q - Northwest Outfall	11/12/2021	NS	NA	NA	NA	NA	NA
006Q- Runway/ Perimeter Outfall (A40)	11/12/2021	0.722	0.190	7.34	<4.0	82	<1.0
Discharge Limitations		Report	Report	Report	Report	Report	Report

Source: Massport
Notes: For averaging calculations starting March 2019, the reporting limit was employed for those results measured below the laboratory detection limit.
Requirements are from NPDES Permit MA 0000787, issued July 31, 2007.
TSS Total Suspended Solids
NA Not Analyzed
NS Not sampled

Table J-25 Logan Airport January 2021 Wet Weather Deicing Monitoring Results – North, West, Porter Street, and Runway/Perimeter Stormwater Outfalls

	Date	Ethylene Glycol, Total (mg/L)	Propylene Glycol, Total (mg/L)	BOD5 (mg/L)	COD (mg/L)	Ammonia Nitrogen (mg/L)	Nonylphenol (µg/L)	4-Methyl-1-H-benzotriazole (µg/L)	5-Methyl-1-H-benzotriazole (µg/L)	Tolytriazole (µg/L)
001B - North Outfall	1/27/2021	<400	12,900	13,000	21,000	0.915	<20	NA	NA	NA
002B - West Outfall	1/27/2021	<100	2,520	2,300	5,600	0.875	<19	NA	NA	NA
003B - Porter Street Outfall 1	1/27/2021	<2.00	7.6	<200	2,100	2.510	<19	NA	NA	NA
003B - Porter Street Outfall 2	1/27/2021	23.2	701	850	2,000	0.153	<19	NA	NA	NA
003B - Porter Street Outfall 3	1/27/2021	<2.00	<2.00	<2	210	0.258	<4.9	NA	NA	NA
003B - Porter Street Outfall Average	1/27/2021	9.1	237	351	1,437	0.974	14	NA	NA	NA
006B- Runway/ Perimeter (A23)	1/27/2021	<2.00	<2.00	<5.0	330	2.13	<4.8	NA	NA	NA
006B- Runway/ Perimeter (A21)	1/27/2021	<2.00	21.4	31	330	0.400	<4.9	NA	NA	NA
006B- Runway/ Perimeter (A9)	1/27/2021	<2.00	<2.00	<2.0	51	0.526	<5.0	NA	NA	NA
006B- Runway/ Perimeter (A15)	1/27/2021	<2.00	<2.00	<2.0	<20	0.401	<4.8	NA	NA	NA
006B- Runway/ Perimeter (A25)	1/27/2021	<2.00	<2.00	<2.0	21	0.286	<4.8	NA	NA	NA
006B- Runway/ Perimeter (A34)	1/27/2021	<2.00	<2.00	<2.0	43	2.79	<4.9	NA	NA	NA
006B- Runway/ Perimeter (A38)	1/27/2021	<2.00	<2.00	<2.0	52	0.188	<4.9	NA	NA	NA
006B- Runway/Perimeter Outfall Average		2.00	4.77	7	121	0.96	4.9	NA	NA	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.										
Discharge Limitations										
Average Monthly		Report	Report	Report	Report	Report	Report	Report	Report	Report
Maximum Daily		Report	Report	Report	Report	Report	Report	Report	Report	Report

Source: Massport
Notes: For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit.
J = value is an estimate calculated by the lab from the response factors of the other two triazole compounds.
Tolytriazole concentrations calculated as sum of 4-Methly-1-H-benzotriazole and 5-Methyl-1-H-benzotriazole.
BOD5 Five-day Biochemical Oxygen Demand
COD Chemical Oxygen Demand
NA Not Analyzed

Table J-26 Logan Airport March 2021 Wet Weather Deicing Monitoring Results – North, West, Porter Street, and Runway/Perimeter Stormwater Outfalls

	Date	Ethylene Glycol, Total (mg/L)	Propylene Glycol, Total (mg/L)	BOD5 (mg/L)	COD (mg/L)	Ammonia Nitrogen (mg/L)	Nonylphenol (µg/L)	4-Methyl-1-H-benzotriazole (µg/L)	5-Methyl-1-H-benzotriazole (µg/L)	Tolytriazole (µg/L)
001B - North Outfall	3/19/2021	<2.00	13.6	43	74	0.380	<4.8	NA	NA	NA
002B - West Outfall	3/19/2021	<2.00	50.8	81	130	0.191	<4.8	NA	NA	NA
003B - Porter Street Outfall 1	3/19/2021	<2.00	<2.00	4.8	74	0.137	<4.8	NA	NA	NA
003B - Porter Street Outfall 2	3/19/2021	<2.00	<2.00	14	42	<0.075	<4.9	NA	NA	NA
003B - Porter Street Outfall 3	3/19/2021	5.82	<2.00	<2.0	63	0.575	<4.8	NA	NA	NA
003B - Porter Street Outfall Average		3.3	2	7	60	0.262	4.8	NA	NA	NA
006B- Runway/ Perimeter (A9)	3/19/2021	<2.00	<2.00	<2.0	<20	0.272	<4.8	NA	NA	NA
006B- Runway/ Perimeter (A15)	3/19/2021	<2.00	<2.00	4.0	31	4.0	<4.9	NA	NA	NA
006B- Runway/ Perimeter (A19(2))	3/19/2021	<2.00	<2.00	3.2	27	0.344	<5.0	NA	NA	NA
006B- Runway/ Perimeter (A21)	3/19/2021	<2.00	<2.00	2.6	24	0.222	<4.9	NA	NA	NA
006B- Runway/ Perimeter (A23)	3/19/2021	<2.00	<2.00	3.0	33	0.364	<5.0	NA	NA	NA
006B- Runway/ Perimeter (A34)	3/19/2021	<2.00	<2.00	9.1	35	0.407	<4.8	NA	NA	NA
006B- Runway/ Perimeter (A38)	3/19/2021	<2.00	<2.00	2.9	65	0.187	<5.0	NA	NA	NA
006B- Runway/Perimeter Outfall Average		2.00	2.00	4.1	34	0.83	4.9	NA	NA	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.										
Discharge Limitations										
Average Monthly		Report	Report	Report	Report	Report	Report	Report	Report	Report
Maximum Daily		Report	Report	Report	Report	Report	Report	Report	Report	Report

Source: Massport.
Notes: For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit.
Tolytriazole concentrations calculated as sum of 4-Methly-1-H-benzotriazole and 5-Methyl-1-H-benzotriazole.
BOD5 Five-day Biochemical Oxygen Demand
COD Chemical Oxygen Demand
NA Not Analyzed

Table J-27 Logan Airport Stormwater Outfall NPDES Water Quality Monitoring Results – 1993 to 2021

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
# / # = Number of samples at or below NPDES limits / Total number of samples taken[1]																							
Oil and Grease (mg/L)																							
North Outfall	30/31	35/36	33/35	29/35	30/35	35/36	29/30	34/36	28/28	36/36	30/32	32/34	33/35	33/33	29/29	23/23	24/24	24/24	24/24	21/21	20/20	21/21	19/20
West Outfall	29/30	36/36	34/34	36/36	34/35	36/36	30/30	35/35	27/28	36/36	31/32	33/34	35/35	32/33	28/28	22/23	24/24	24/24	22/24	21/21	21/21	21/21	19/19
Maverick Street Outfall	29/29	36/36	35/35	36/36	35/35	35/36	30/30	34/34	26/28	35/36	32/32	34/34	35/35	32/33	29/29	22/23	20/21	19/19	23/23	15/15	4/4	20/20	18/18
Settable Solids[2] (mg/L)																							
North Outfall	19/19	34/35	34/35	32/35	31/34	34/36	30/30	34/36	29/29	32/36	32/32	34/34	33/35	32/34	22/22	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
West Outfall	19/19	32/36	34/34	35/36	34/34	35/36	29/30	36/36	27/28	36/36	31/32	34/34	32/35	33/33	22/22	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TSS (mg/L)																							
North Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6/6	24/24	24/24	22/23	24/24	21/21	20/21	21/21	20/20
West Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5/6	24/24	24/24	23/23	22/24	20/22	21/21	20/21	18/19
Maverick Street Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4/6	22/24	20/21	18/19	20/23	14/15	4/4	19/20	18/18
pH																							
North Outfall	34/35	33/36	35/35	35/35	35/35	36/36	30/30	36/36	29/29	36/36	32/32	34/34	35/35	34/34	26/26	12/12	16/16	11/11	12/12	9/9	8/8	8/8	8/8
West Outfall	34/34	28/36	33/34	35/36	35/35	36/36	30/30	36/36	29/29	36/36	32/32	34/34	35/35	33/33	26/26	12/12	16/16	11/11	12/12	9/9	9/9	8/8	8/8
Porter Street Outfall	35/35	30/36	34/34	36/36	35/35	36/36	30/30	36/36	28/28	36/36	32/32	34/34	35/35	33/33	22/22	21/21	48/48	24/24	23/23	26/27	24/27	24/24	19/23
Maverick Street Outfall	35/35	35/36	35/35	36/36	34/35	36/36	30/30	35/35	28/28	36/36	32/32	34/34	35/35	33/33	26/26	10/10	16/16	10/10	11/11	6/6	2/2	7/7	7/7

Table J-27 Logan Airport Stormwater Outfall NPDES Water Quality Monitoring Results – 1993 to 2021 (Continued)

	2016	2017	2018	2019	2020	2021
# / # = Number of samples at or below NPDES limits / Total number of samples taken[1]						
Oil and Grease (mg/L)						
North Outfall	23/23	23/23	21/21	21/21	12/12	23/23
West Outfall	23/23	22/22	20/21	19/20	12/12	23/23
Maverick Street Outfall	23/23	23/23	21/21	21/21	12/12	23/23
Settable Solids[2] (mg/L)						
North Outfall	N/A	N/A	N/A	N/A	N/A	N/A
West Outfall	N/A	N/A	N/A	N/A	N/A	N/A
TSS (mg/L)						
North Outfall	23/23	23/23	19/21	21/21	12/12	22/23
West Outfall	23/23	22/22	21/21	20/21	12/12	22/23
Maverick Street Outfall	22/23	23/23	19/21	21/21	12/12	22/23
pH						
North Outfall	10/11	8/8	9/9	9/9	4/4	11/11
West Outfall	11/11	7/7	9/9	10/10	4/4	11/11
Porter Street Outfall	33/33	33/33	27/27	28/28	12/12	31/31
Maverick Street Outfall	10/11	8/8	9/9	10/10	4/4	11/11

Source: Massport

Notes: Sampling requirements changed in 2007 with the issuance of a new NPDES permit. Results through 2007 are based on NPDES Permit MA0000787, issued March 1, 1978. Stormwater outfall water quality monitoring results collected in accordance with the requirements of former NPDES permit. A portion of the Porter Street Drainage Area was incorporated into the West Drainage Area as part of roadway construction projects at Logan Airport.

N/A Not Analyzed

1 The total number of samples at each outfall varies year to year. In some years, fewer samples are taken due to factors such as construction, weather, and/or tidal conditions.

2 Settleable solids analyses were replaced with TSS in 2008.

Table J-28 Logan Airport Oil and Hazardous Material Spills[1] and Jet Fuel Handling – 1990 to 2021

Year	Total Number of all Spills	Total Number of all Spills >10 gallons	Total Volume of all Spills (Gallons)	Estimated Volume of Jet Fuel Handled (Gallons)	Total Volume of Jet Fuel Spilled (Gallons)
1990	173	N/A	N/A	438,100,000	3,745
1991	186	N/A	N/A	N/A	2,471
1992	195	N/A	N/A	N/A	4,355
1993	188	N/A	N/A	451,900,000	3,131
1994	217	N/A	N/A	476,700,000	4,046
1995	161	N/A	N/A	309,200,000	21,412[2]
1996	159	N/A	N/A	346,700,000	1,321
1997	147	N/A	N/A	377,488,161	2,029[3]
1998	191	N/A	N/A	387,224,004	10,047[4]
1999	196	43	7,151	425,937,051	7,012[5]
2000	136	20	1,318	441,901,932	1,227
2001	139	37	1,924	416,748,819	1,771
2002	101	16	653	358,190,362	559
2003	128	19	10,364	319,439,910	10,188[6]
2004	126	18	894	373,996,141	574
2005	97	15	2,319	368,645,932	585
2006	92	11	752	364,450,864	644
2007	108	7	604	367,585,187	361
2008	99	20	944	345,631,788	662
2009	95	6	1004	327,358,619	915
2010	87	15	476	335,693,997	360
2011	108	12	572	340,421,373	337
2012	132	5	593	343,731,127	439
2013	94	6	452	349,397,940	351
2014	129	17	2,785	370,222,342	785
2015	196	16	1,278	374,985,216	885
2016	231	14	1,158	456,003,328	558
2017	176	8	2,310[7]	472,229,047	315

Table J-28 Logan Airport Oil and Hazardous Material Spills[1] and Jet Fuel Handling – 1990 to 2021 (Continued)

Year	Total Number of all Spills	Total Number of all Spills >10 gallons	Total Volume of all Spills (Gallons)	Estimated Volume of Jet Fuel Handled (Gallons)	Total Volume of Jet Fuel Spilled (Gallons)
2018	189	8	7,660	521,056,895	7,383
2019	152	22	799	542,314,657	514
2020	67	4	352	220,004,260	179
2021	152	4	787	302,650,342	514

Source: Massport Fire-Rescue Department.

Notes:

N/A Not available.

1 Materials include: jet fuel, hydraulic oil, diesel fuel, gasoline, and other materials such as glycol and paint.

2 One tenant spill, which occurred on October 15, 1995, totaled 18,000 gallons (84 percent of the annual spill total). The spill did not enter the Airport's storm drain system.

3 On October 23, 1997, a fuel line on an aircraft failed, resulting in the release of approximately 2,500 gallons, all but 60 gallons of which were recovered in drums before reaching the ground. Only the 60 gallons is included in the 1997 total.

4 Includes a 7,200-gallon spill that was discovered on September 2, 1998, and a 1,300-gallon spill that occurred on June 3, 1998. Neither spill entered the Airport's storm drain system.

5 Includes a 5,000-gallon spill, none of which entered the Airport's storm drainage system.

6 In 2003, one fuel spill comprised 9,460 gallons or 94 percent of the total volume of the MassDEP/MCP reportable spills that year. The fuel spill was contained and did not enter the drainage system.

7 Includes 1,750 gallons of deicing fluid.

Table J-29 Type and Quantity of Oil and Hazardous Material Spills at Logan Airport – 1999 to 2021

	Jet Fuel			Hydraulic Oil			Diesel Fuel			Gasoline			Other		
Year	No. of Spills	Quantity (Gallons)	No. of Spills ≥ 10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ≥ 10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ≥ 10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ≥ 10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ≥ 10 Gallons
1999	151	7,012	40	24	67	1	13	49	2	5	7	0	3	16	0
2000	115	1,227	18	8	59	2	3	11	0	8	16	0	2	5	0
2001	104	1,771	32	21	92	3	5	30	1	6	26	1	3	5	0
2002	79	559	15	7	38	0	8	37	18	4	8	0	3	11	0
2003	89	10,188	15	15	91	3	15	30	0	7	24	0	2	31	1
2004	82	574	12	17	189	4	14	52	0	7	26	0	6[1]	53[2]	2[3]
2005	66	585	12	14	78	1	7	1,610	2	7	45	0	3[4]	1	0
2006	65	644	9	10	25	0	6	57	1	4	9	0	7	17	1
2007	66	361	4	16	37	0	16	57	1	3	8	0	7	141[5]	2
2008	74	662	19	15	56	2	5	14	0	1	7	0	4	205[6]	1
2009	95	915	6	21	51	0	9	20	0	3	3	0	11	15	0
2010	54	360	12	17	50	1	5	56	2	2	3	0	7	7	0
2011	69	337	10	21	149	1	7	55	1	4	16	0	7	15	0
2012	80	439	4	25	79	1	17	38	0	2	12	0	8	25	0
2013	56	351	5	15	51	0	13	32	0	2	<2	0	7	10	0
2014	81	785	13	24	98	1	17	1,810	2	4	9	0	3	83	1
2015	110	885	10	43	149	3	16	151	2	7	46	1	20	47	0
2016	94	558	8	73	224	4	30	300	2	6	12	0	28	64	0
2017	103	315	5	36	101	1	13	59	2	4	14	0	20	1,821[7]	0
2018	111	7,383[8]	6	39	93	0	14	127	2	2	5	0	23	52	0
2019	77	514	17	41	156	3	13	57	1	9	41	1	12	31	0
2020	35	179	3	13	66	1	9	34	0	4	25	0	6	48[9]	0
2021	77	514	3	18	35	1	13	48	0	9	41	0	35	149	0

Source: Massport

1 Includes two Unknown spills (14 gallons), plus one spill of each of the following: Ethylene Glycol, Propylene Glycol, AVGAS, and Paint.

2 Ethylene Glycol (25 gallons), Propylene Glycol (10 gallons), AVGAS (1 gallon) and Paint (3 gallons).

3 One spill of Ethylene Glycol; one spill of Propylene Glycol.

4 Includes two spills of an unknown substance and volume.

5 Includes one spill of motor oil (4 gallons); one spill of kerosene (5 gallons); one spill of cooking oil (120 gallons); one spill of fuel oil (10 gallons); one spill from a battery (1 gallon); two spills of an unknown substance (1 gallon).

6 Includes one spill of transformer oil (200 gallons).

7 Includes 1,750 gallons of deicing fluid (vehicle accident).

8 7,000 gallons of jet fuel were released during a construction related incident involving a fuel hydrant installation project.

9 Includes one spill of AvGas (2 gallons); two spills of motor oil (2 gallons); one spill not otherwise specified (two gallons); one spill of deicing fluid (40 gallons); one spill of transmission fluid (3 gallons).

Table J-30 Massport Contingency Plan (MCP) Closed Sites at Logan Airport

Location (RTN) and MassDEP Reporting Status	Action/Status
1. North Outfall (3-4837) – CLOSED 12/27/2012	
Phase II and Phase III Reports filed in March 1997	Indicated petroleum contamination present at the site was likely the result of decades of airport operation; risk assessment reported no significant risk to human health, or to the aquatic and avian community.
RAO submitted in March 1998	Class C RAO using a Temporary Solution (periodic site monitoring and assessment); remediation steps included (not limited to) installation of a new fuel distribution system and decommissioning of certain fuel lines, and natural biodegradation processes; goal is to have petroleum contamination reduced to an area less than 1,000 square feet. Installation of the new fuel distribution system and decommissioning of sections of the old system were completed. Massport initiated site evaluation to document the reduction of petroleum contamination following the decommissioning of the North Fuel Farm and fuel distribution system.
Post Class C RAO evaluation report submitted in December 2002	Massport has eliminated substantial hazards at this site and submitted a Class C RAO statement. In accordance with applicable regulations, Massport will conduct a periodic evaluation at five-year intervals until a Permanent Solution has been achieved. The next periodic evaluation was scheduled for 2007.
2004	Evaluation report indicated that a "Condition of No Significant Risk" has not been achieved at this site. Massport scheduled another assessment in 2007.
2005	No change in status for 2005.
2006	Massport prepared the five-year review of the Class C RAO for this site, which was due in December 2007.
2007	Massport completed its five-year review of the Class C RAO and transmitted it to MassDEP in December 2007. It was determined that a "Condition of No Significant Risk" has not been achieved at this site at this time. The next five-year re-evaluation will be conducted in 2012.
2008	No change in status.
2009	No change in status.
2010	No change in status.
2011	No change in status. Massport provided updated data for the MassDEP website.
2012	Response Action Outcome submitted to MassDEP on December 27, 2012. No further MCP response action is required.
2. Former Robie Park (3-10027) - CLOSED 09/21/2016	
2005	A Phase I was completed in 2005 with a RAO retraction. The RAO had been completed by the former property owner.
2006	No change in status for 2006.
2007	No change in status for 2007.
2008	A Phase II Scope of Work was prepared on May 9, 2008. A RAM Plan was submitted to MassDEP on September 16, 2008.
2009	A Phase V Remedy Operation Status Plan was submitted on March 31, 2010.
2010	Two Remedy Operation Status Reports were submitted on September 29, 2010 and March 28, 2011. The next status report was scheduled for September 30, 2011.
2011	Phase IV Project Status Reports 2 and 3 were submitted in March and September 2011, respectively.
2012	Phase V Status Reports 4 and 5 were submitted in March and September 2012, respectively.
2013	Phase V Status Reports 6 and 7 were submitted in March and September 2013, respectively.
2014	Phase V Status Reports 8 and 9 were submitted in March and September 2014, respectively.
2015	Phase V Reports 10 and 11 were submitted in March and September 2015, respectively.
2016	A Permanent Solution Statement was submitted in 2016.
3. Former Robie Property (3-23493) - CLOSED 01/04/2010	
2005	A Phase I was completed in 2005.
2006	No change in status for 2006.
2007	No change in status for 2007.
2008	A Phase II was submitted to MassDEP on October 21, 2008.
2009	An Activity and Use Limitation (AUL) was recorded with the Suffolk County Registry of Deeds for the site on December 16, 2009.

Table J-30 Massport Contingency Plan (MCP) Closed Sites at Logan Airport (Continued)

Location (RTN) and MassDEP Reporting Status	Action/Status
3. Former Robie Property (3-23493) - CLOSED 01/04/2010 (Continued)	
2010	A Class A-3 RAO was submitted on January 4, 2010, corresponding with the recording of an AUL. On May 21, 2010, a RAM Plan for the Economy Parking Structure was submitted. The first RAM Status Report was submitted on September 21, 2010. An AUL Amendment was recorded on December 9, 2010.
2011	A RAM Completion Statement was submitted on March 15, 2011. Regulatory closure has been achieved. No further response actions are required.
4. Tomahawk Drive (3-27068) - CLOSED 08/20/2008	
2007	Release notification form submitted in August 2007.
2008	A Class B-1 RAO was submitted to MassDEP on January 9, 2009. No further response actions were required.
2009	No further response actions were required.
2011	No further response actions required.
5. Southwest Service Area Overflow Lot/Tomahawk Drive (3-28792) – CLOSED 10/18/2018	
2009	Release notification form was submitted to MassDEP/BWSC on October 8, 2009.
2010	A Class B-1 RAO was submitted to MassDEP on October 18, 2010. No further response actions required.
2011	No further response actions required.
6. Taxiway D (3-29716) – CLOSED 12/21/2011	
2010	Release notification form was submitted on December 22, 2010.
2011	A Class A-1 RAO was submitted on December 23, 2011. No further response actions required.
7. West Outfall Release (3-29792) – CLOSED 02/07/2012	
2011	Release notification form was submitted on April 8, 2011. Two IRA Status Reports were submitted to MassDEP on June 9 and December 5, 2011. A RAO was submitted on February 13, 2012. No further response actions required.
8. Hertz Parking Lot Site (3-30260) – CLOSED 09/05/2012	
2011	Release notification form was submitted on August 29, 2011. A RAM Plan was submitted to MassDEP on September 1, 2011.
2012	A Class A-2 RAO was submitted on September 10, 2012. No Further response actions required.
9. Former Butler Aviation Hangar (3-30654) – CLOSED 11/12/2014	
2012	Verbal notification of a release was provided to MassDEP on February 14, 2012, when Rental Car Center construction encountered an unidentified underground storage, and a Release Notification Form was submitted on April 23, 2012. An IRA Plan was submitted May 21, 2012 and IRA Status Reports were submitted on June 18 and December 26, 2012.
2013	Phase I Report and Tier Classification submitted February 21, 2013 and IRA Completion Report submitted on July 11, 2013.
2014	A Permanent Solution Statement was submitted in October 2014. No further response actions required.
10. Southwest Service Area/Porter Street @ Harborside Drive (3-32022) – CLOSED 11/20/2017	
2014	MassDEP notified of 72-hour Reportable Condition on March 10, 2014
2015	Phase I Report and Tier Classification submitted March 9, 2015.
2016	Permanent Solution Statement scheduled to be submitted in 2017
2017	A Permanent Solution Statement and AUL were submitted November 2017.
11. Former Hangar Building 16 (3-32351) – CLOSED 01/21/2016	
2014	Release Notification Form Submitted August 4, 2014.
2015	A RAM Plan was submitted on January 29, 2015; a Phase I Report and Tier Classification were submitted on August 3, 2015; a RAM Completion Report was submitted November 16, 2015.
2016	A Permanent Solution Statement was submitted on January 21, 2016. No further response actions are required.

Table J-30 Massport Contingency Plan (MCP) Closed Sites at Logan Airport (Continued)

Location (RTN) and MassDEP Reporting Status	Action/Status
12. Terminal B Gate 29 RTN (3-35608) – CLOSED 05/07/2020	
2019	Release Notification in May 2019 due to elevated vapors during removal of an underground storage tank; IRA Plan submitted in July 2019; IRA Status Report submitted in September 2019.
2020	A Permanent Solution Statement was submitted in May 2020 so the site is now closed.

Source: Massport

Notes: RTN = Release Tracking Number. This list includes Massport MCP sites only. Additional sites are the responsibility of Logan Airport tenants. Refer to Figure 8-2 in Chapter 8, *Environmental Compliance and Management/Water Quality,* for location of active MCP sites.

AUL Activity and Use Limitation
FDS Fuel Distribution System
IRA Immediate Response Action
MCP Massachusetts Contingency Plan
Phase I Initial Site Investigation
Phase II Comprehensive Site Assessment
Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Actions
Phase IV Implementation of Selected Remediation Action
Phase V Operation, Maintenance and/or Monitoring
RAM Release Abatement Measure
RAO Response Action Outcome

FIGURE J-1 **Massachusetts Contingency Plan Sites (Closed)**

2020/2021 Environmental Data Report

1. North Outfall (3-4837)
2. Former Robie Park (3-10027)
3. Former Robie Property (3-23493)
4. Tomahawk Drive (3-27068)
5. Southwest Service Area Overflow Lot/ Tomahawk Drive (3-28792)
6. Taxiway D (3-29716)
7. West Outfall Release (3-29792)
8. Hertz Parking Lot Site (3-30260)
9. Former Butler Aviation Hangar (3-30654)
10. Southwest Service Area/Porter Street @ Harborside Drive (3-32022)
11. Former Hangar Building 16 (3-32351)
12. Terminal B Gate 29 (3-35608)

0 450 900 1800 Feet

K

Peak Period Pricing Monitoring Reports

- 2020 Peak Period Pricing Monitoring Report
- 2021 Peak Period Pricing Monitoring Report
- Memorandum from Edward C. Freni, Massport Director of Aviation, to the Boston Airline Committee (BAC), Regarding Boston-Logan International Airport Peak Period Surcharge Regulation Monitoring Report. Dated June 17, 2022
- 2022 Peak Period Pricing Monitoring Report

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BOSTON-LOGAN INTERNATIONAL AIRPORT MONITORING REPORT ON SCHEDULED AND NON-SCHEDULED FLIGHT ACTIVITY

Peak Period Surcharge Regulation 740 CMR 27:00: Massachusetts Port Authority

Report Number:	**017**
Monitoring Period:	**June-July 2020**
Report Issue Date:	**June 2020**

Note: This report reflects the Boston-Logan Airport flight activity monitoring under 740 CMR 27.03 Peak Period Surcharge Regulation on Aircraft Operations at Boston-Logan International Airport.

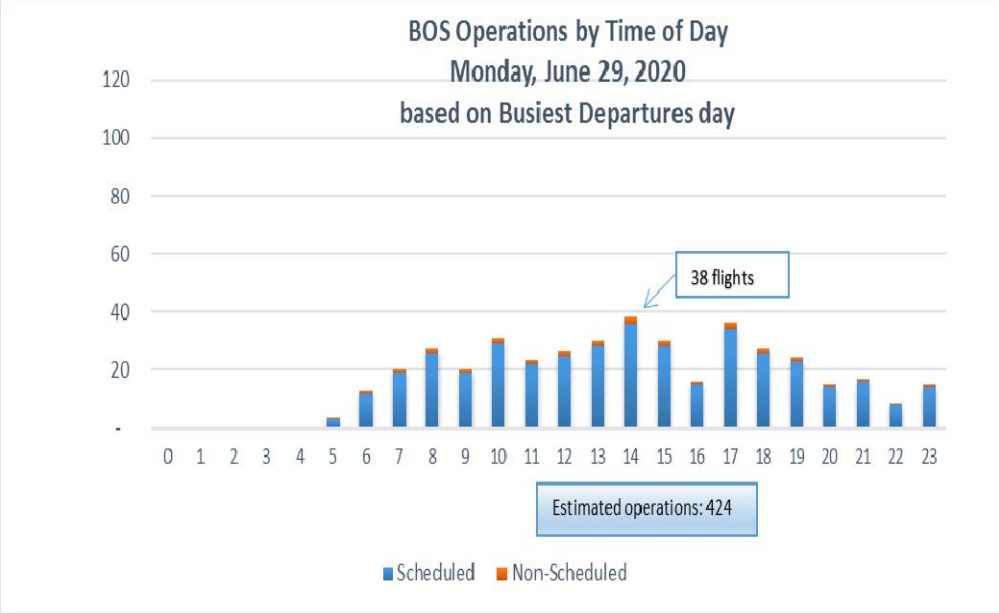
Due to the Corona virus disruption, significant drop in flight operations, and continued uncertainty in flight schedules, this report is limited to reporting on traffic at Logan for June and July 2020. In the event demand conditions change significantly from expected, updates to this report will be issued.

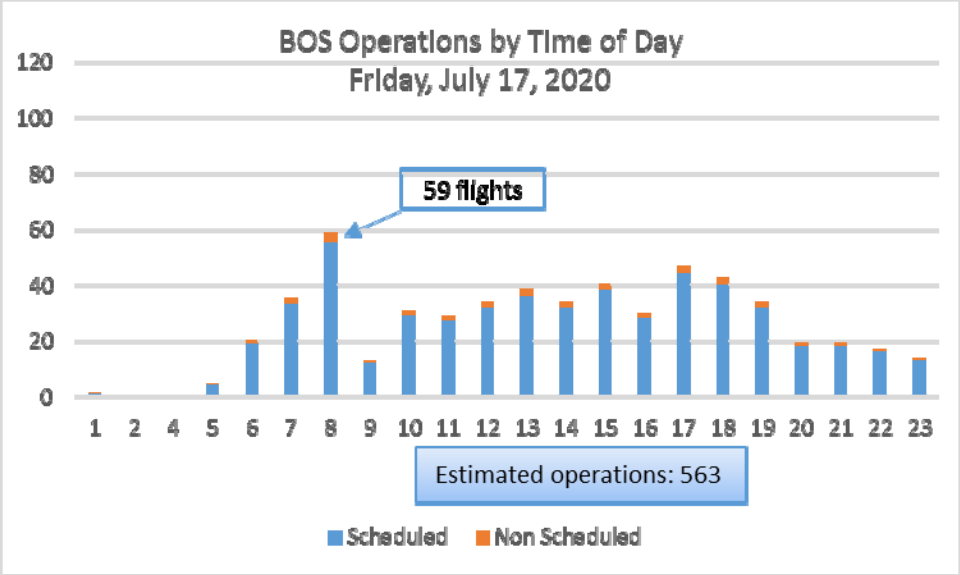
Findings: Current and projected near-term flight levels at Boston Logan are well below Logan's good weather (VFR) throughput of approximately 120 flights per hour. **As a result, average VFR delays are projected to be minimal and well below the 15 minutes threshold through the analysis period.**

Massport Contact:

Mr. Flavio Leo
Director, Aviation Planning and Strategy
617-568-3528
fleo@massport.com

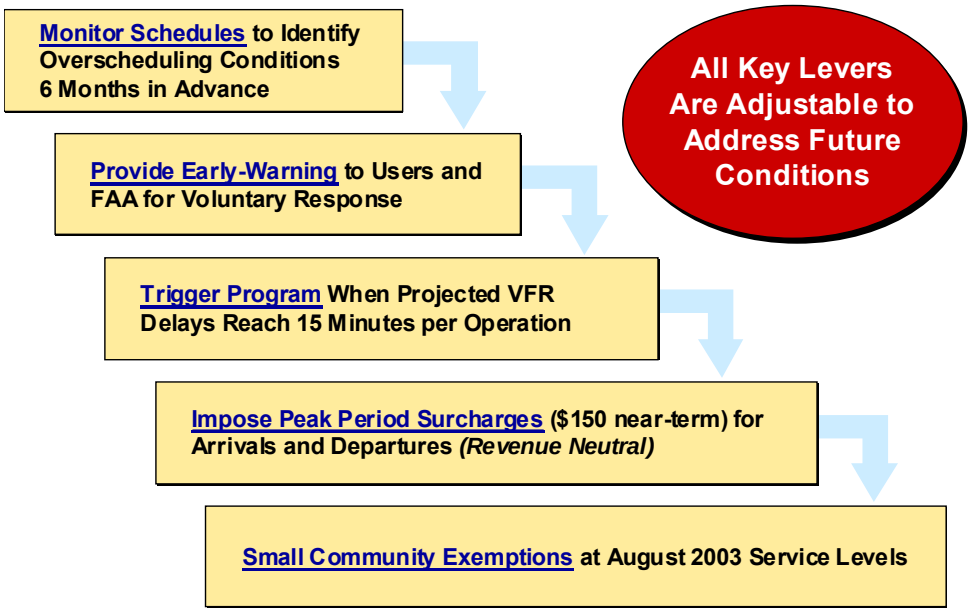
Projected Traffic June and July*





*Note due to the Corona virus disruption, air carrier schedules are subject to change.

Table 1: Summary Overview of Peak Period Surcharge Program



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BOSTON-LOGAN INTERNATIONAL AIRPORT MONITORING REPORT ON SCHEDULED AND NON-SCHEDULED FLIGHT ACTIVITY

Peak Period Surcharge Regulation 740 CMR 27:00: Massachusetts Port Authority

Monitoring Period: June-July 2021

Report Issue Date: June 2021

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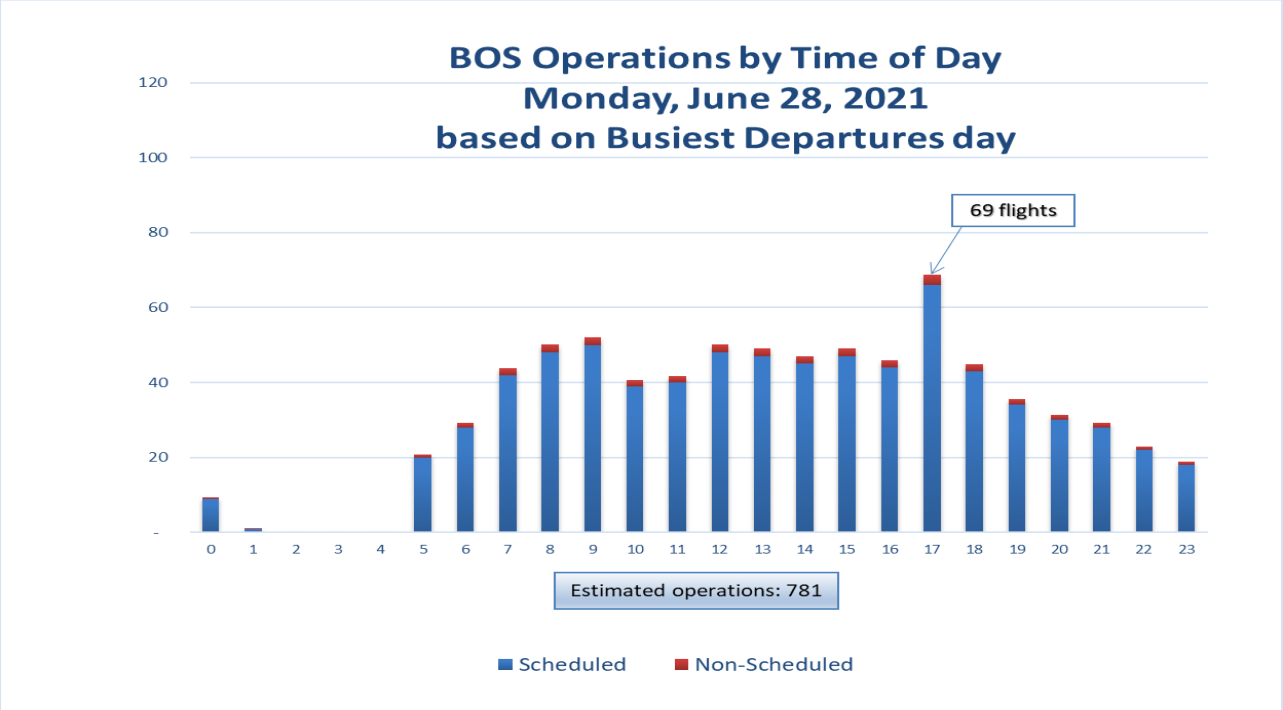
Due to the Corona virus disruption, significant drop in flight operations, and continued uncertainty in flight schedules, this report is limited to reporting on traffic at Logan for June and July 2021. This report will be updated if demand conditions change significantly from expected.

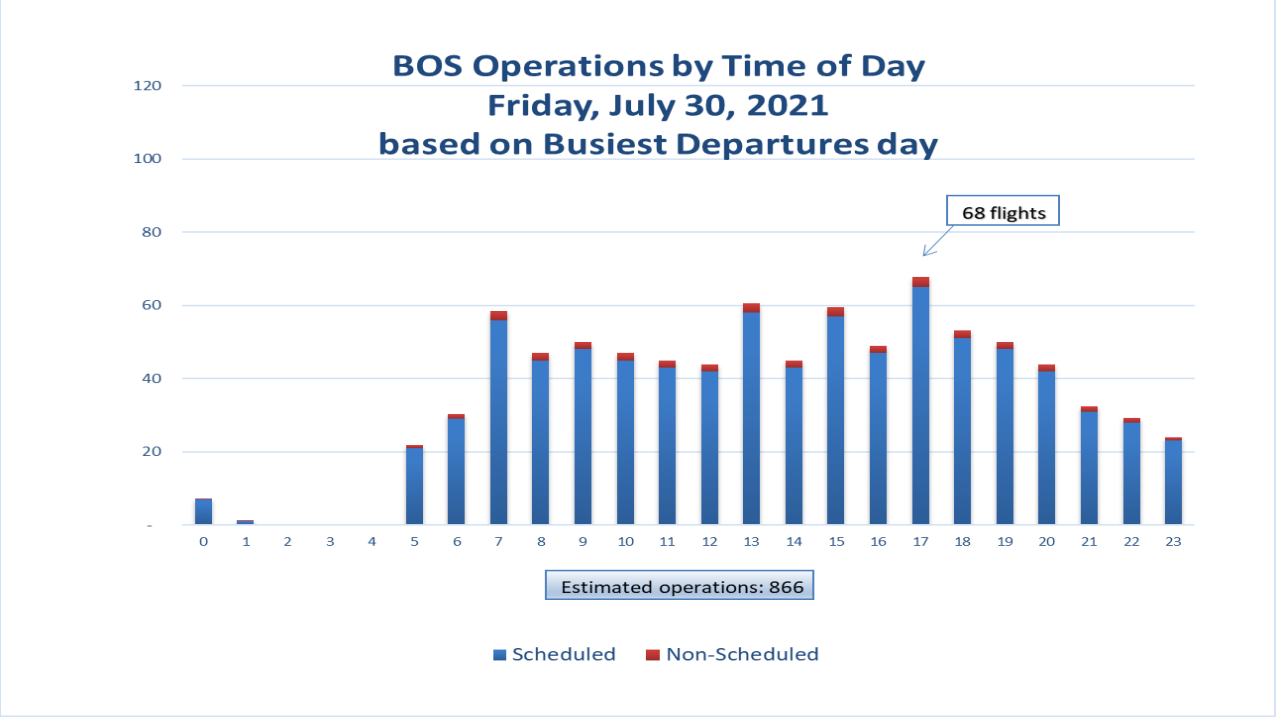
Findings: Current and projected near-term flight levels at Boston Logan are well below Logan's good weather (VFR) throughput of approximately 120 flights per hour. **As a result, average VFR delays are projected to be minimal and well below the 15 minutes threshold through the analysis period.**

Massport Contact:

Mr. Flavio Leo
Director, Aviation Planning and Strategy
617-568-3528
fleo@massport.com

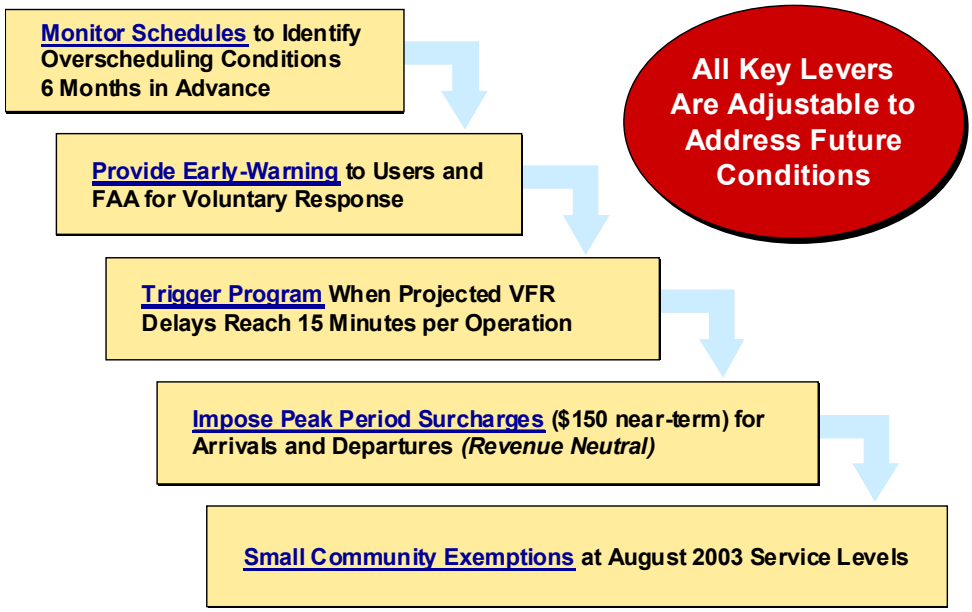
Figure 1: Projected Traffic June and July 2021*





*Note due to the COVID 19 recovery uncertainty, air carrier schedules may change significantly.

Figure 2: Summary Overview of Peak Period Surcharge Program



Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909
Telephone (617) 568-5000
www.massport.com

June 17, 2022

Boston Airline Committee (BAC)
c/o Eric Capps
Manager of Properties
jetBlue Airways Corporation
27-01 Queens Plaza North
Long Island City, New York 11101

Re: Boston-Logan International Airport Peak Period Surcharge Regulation Monitoring Report

Dear Mr. Capps:

The Massachusetts Port Authority (Massport) has completed the Peak Period Pricing Monitoring Report for 2022, in compliance with Massport's Peak Period Surcharge Regulation (740 CMR 27.03) ("Regulation"). The Regulation requires that Massport monitor published scheduled and expected non-scheduled aircraft activity at Logan and report to airfield-users the implication of the total projected aircraft activity on Logan's good weather delays. I have attached a copy of the Monitoring Report.

The report concludes that current and projected near-term flight levels at Boston-Logan are well below Logan's good weather (VFR) throughput of approximately 120 flights per hour. As a result, average VFR (good weather) delays based on the expected demand are projected to be minimal through the analysis period and well below the 15 minutes threshold of the Peak Period Surcharge Regulation.

Please forward a copy of this Monitoring Report to the BAC membership. If you have any questions please feel free to contact Flavio Leo at 617-568-3528.

Sincerely,

Edward C. Freni
Director of Aviation

cc: Todd Smith, Daniel Gallagher, Flavio Leo

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BOSTON-LOGAN INTERNATIONAL AIRPORT MONITORING REPORT ON SCHEDULED AND NON-SCHEDULED FLIGHT ACTIVITY

Peak Period Surcharge Regulation 740 CMR 27:00: Massachusetts Port Authority

Monitoring Period: Through Sept. 2022

Report Issue Date: June 2022

Note: This report reflects the Boston-Logan Airport flight activity monitoring under 740 CMR 27.03 Peak Period Surcharge Regulation on Aircraft Operations at Boston-Logan International Airport.

Findings: This report includes actual and projected activity data **through September 2022**. Current and projected near-term flight levels at Boston Logan are well below Logan's good weather (VFR) throughput of approximately 120 flights per hour. **As a result, average VFR delays are projected to be minimal and well below the 15 minutes threshold through the analysis period.**

In the event demand conditions at the airport change significantly from the current projection, Massport will issue updates to this report.

Attachments

Table 1: Summary Overview of Peak Period Surcharge Program

Table 2: Summary Overview of Forecast Methodology

Table 3: Projected Aircraft Operations at Logan Airport Projected

Table 4: Projected Hourly Operations, Average Weekday

Table 5: Forecast Logan Average Weekday Operations

Massport Contact:

Mr. Flavio Leo
Director, Aviation Planning and Strategy
617-568-3528
fleo@massport.com

Table 1: Summary Overview of Peak Period Surcharge Program

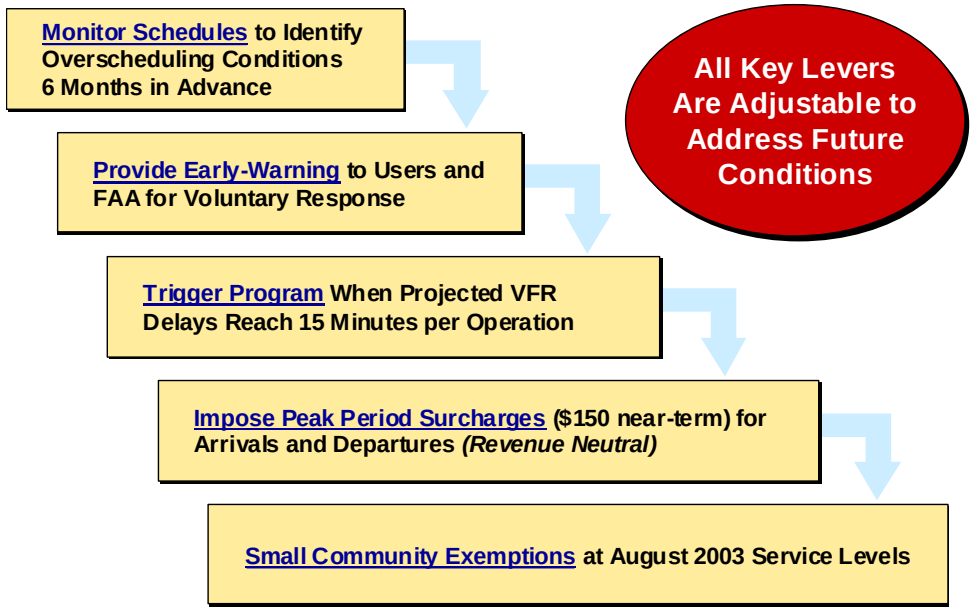

Table 2: Summary Overview of Forecast Methodology

- Scheduled passenger airline flights represent about 93 percent of total aircraft operations. Passenger airline activity for the Spring and Summer periods were projected based on published advance airline schedules
- Forecasts of monthly activity for other segments (GA, Cargo, Charter) are based on the past three months of actual flight volume and historic patterns of monthly seasonality
- Day-of-week and time of day distributions for non-scheduled segments are based on analysis of Logan radar data
- Projections for each segment were combined to produce the forecast pattern of hourly flight activity for an average weekday, Saturday, and Sunday for the period from February through September

Table 3: Aircraft Operations at Logan Airport

Note: Actual Operations are based on Massport data/air carrier reports and reflect flight cancellations due to weather and other operational impacts. Projections, scheduled activity only.

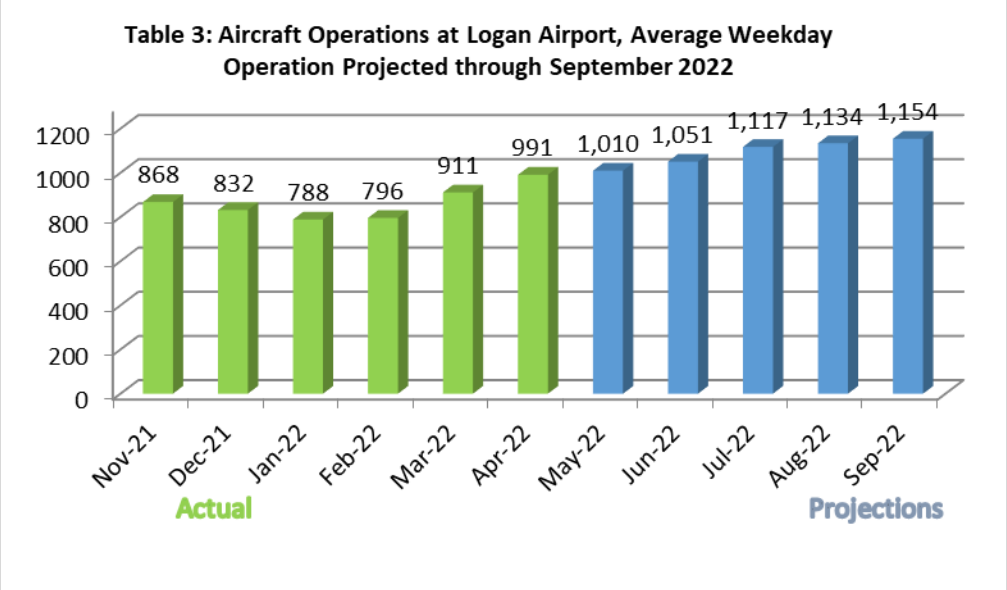

Table 4: Projected Hourly Operations

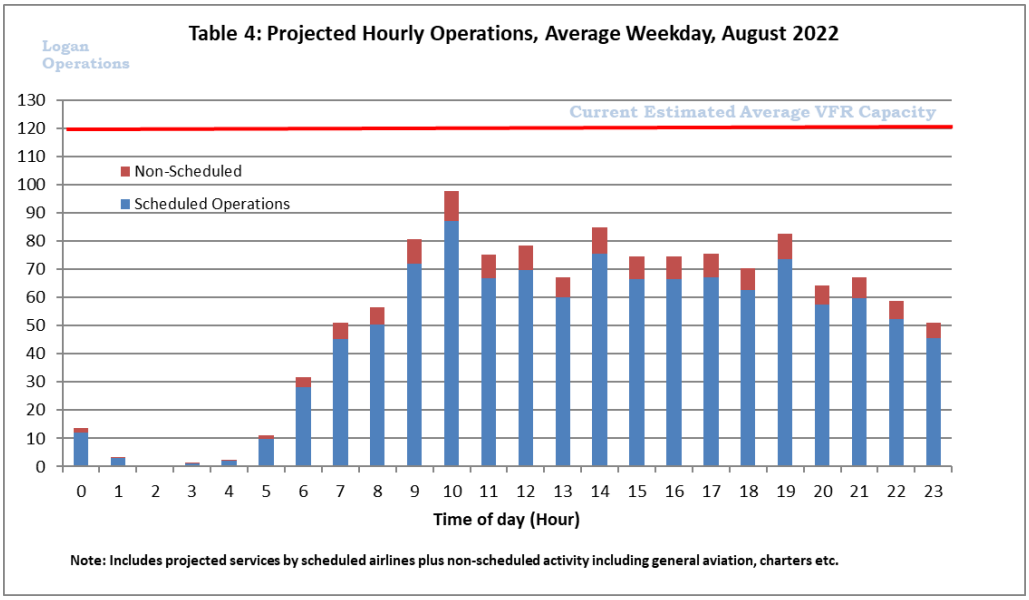

Table 5: Forecast Logan Average Weekday Operations, *Feb. – Sep.*

Forecast Daily Operations								
Hour Range	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
0	11	14	13	13	11	11	12	13
1	4	5	4	1	2	3	3	1
2	1	2	2	1	0	0	0	2
3	1	1	1	1	1	1	1	0
4	4	4	5	2	2	2	2	4
5	14	17	17	7	9	10	10	11
6	28	31	40	16	25	25	28	26
7	46	56	62	47	44	44	45	46
8	45	52	57	53	48	48	50	57
9	47	63	59	59	67	71	72	71
10	43	50	56	74	82	88	87	83
11	42	48	46	63	63	67	67	70
12	39	44	50	56	65	70	70	69
13	42	42	50	58	57	59	60	59
14	42	47	51	69	66	76	75	77
15	43	50	54	57	61	64	66	72
16	54	58	60	53	57	64	66	68
17	51	57	59	61	66	68	67	68
18	57	61	66	61	59	63	63	66
19	53	59	65	72	69	71	73	71
20	40	52	57	52	51	59	57	62
21	29	36	40	48	49	58	60	54
22	34	30	40	47	54	51	52	51
23	27	33	36	41	44	45	45	51
Total	**796**	**911**	**991**	**1,010**	**1,051**	**1,117**	**1,134**	**1,154**

February - Apr are actual data

May - September is forecast data

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