

APPENDIX F

Hydraulic Model Output

Concord River Diadromous Fish Restoration Feasibility Study

List of Tables

Table F-1: Existing Model Output Parameters at Key Locations.....	2
Table F-2: Existing Fish Passage Parameters at Low and High Migration Season Flows	8
Table F-3: Proposed Model Output Parameters at Key Locations for the Dam Removal Alternative.....	11
Table F-4: Proposed Fish Passage Parameters at Low and High Migration Season Flows for the Dam Removal Alternative	15

List of Abbreviations

ac	acres
ac-ft	acre-feet
cfs	cubic feet per second
ch	channel
D/S	downstream
elev	elevation
ft	feet
ft/s	feet per second
H	high
L	low
max	maximum
mig	migration
min	minimum
NWR	National Wildlife Refuge
Rd	road
Rte	route
St	street
sta	station
tot	total
U/S	upstream
vel	velocity
W.S.	water surface
yr	year

Table F-1: Existing Model Output Parameters at Key Locations

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)*	Volume (ac-ft)*
Confluence of Sudbury & Assabet Rivers	85935	Low	33	102.42	112.18	9.76	0.03	394	160	429	2150
		U/S Mig L	100	102.42	113.37	10.95	0.07	970	160	704	2759
		Normal	439	102.42	113.57	11.15	0.31	1115	160	1214	4188
		U/S Mig H	1549	102.42	116.27	13.85	0.57	2146	160	1968	8803
		2-yr Flood	2381	102.42	117.92	15.50	0.62	2521	160	2251	12023
		100-yr Flood	5399	102.42	120.08	17.66	0.77	3010	160	2636	18550
		500-yr Flood	7987	102.42	122.69	20.27	0.76	3513	160	2897	25417
U/S Lowell Rd	85496	Low	33	103.70	112.18	8.48	0.04	427	130	425	2139
		U/S Mig L	100	103.70	113.37	9.67	0.11	780	130	695	2741
		Normal	439	103.70	113.56	9.86	0.45	790	130	1205	4169
		U/S Mig H	1549	103.70	116.24	12.54	1.10	1253	130	1952	8750
		2-yr Flood	2381	103.70	117.88	14.18	1.41	1853	130	2231	11940
		100-yr Flood	5399	103.70	120.04	16.34	1.58	2432	130	2612	18420
		500-yr Flood	7987	103.70	122.67	18.97	1.44	2828	130	2869	25217
D/S Lowell Rd; U/S Minute Man National Park	85225	Low	33	102.71	110.79	8.08	0.04	187	151	424	2134
		U/S Mig L	100	102.71	111.97	9.26	0.10	240	152	694	2735
		Normal	439	102.71	113.56	10.85	0.34	732	152	1203	4161
		U/S Mig H	1549	102.71	116.20	13.49	0.90	1480	152	1949	8734
		2-yr Flood	2381	102.71	117.82	15.11	1.20	1583	152	2227	11918
		100-yr Flood	5399	102.71	119.86	17.15	1.17	1893	152	2606	18387
		500-yr Flood	7987	102.71	122.64	19.93	1.21	2242	152	2862	25166
U/S Pedestrian Bridge	83593	Low	33	102.89	110.79	7.90	0.05	225	131	417	2106
		U/S Mig L	100	102.89	111.97	9.08	0.12	391	131	684	2697
		Normal	439	102.89	113.54	10.65	0.39	505	131	1169	4085
		U/S Mig H	1549	102.89	116.16	13.27	0.82	978	131	1906	8553
		2-yr Flood	2381	102.89	117.77	14.88	0.93	1015	131	2182	11666
		100-yr Flood	5399	102.89	119.80	16.91	1.33	1067	131	2559	18041
		500-yr Flood	7987	102.89	122.58	19.69	1.39	1155	131	2808	24679
D/S Pedestrian Bridge	83534	Low	33	102.62	110.34	7.72	0.05	145	126	417	2105
		U/S Mig L	100	102.62	111.52	8.90	0.13	162	132	684	2696
		Normal	439	102.62	113.10	10.48	0.43	187	139	1169	4084
		U/S Mig H	1549	102.62	116.15	13.53	0.93	698	139	1905	8550
		2-yr Flood	2381	102.62	117.76	15.14	1.11	760	139	2181	11662
		100-yr Flood	5399	102.62	119.76	17.14	1.76	946	139	2558	18037
		500-yr Flood	7987	102.62	122.55	19.93	1.80	1091	139	2806	24668
U/S Monument St; D/S Minute Man National Park	82381	Low	33	101.58	110.34	8.76	0.05	164	129	412	2083
		U/S Mig L	100	101.58	111.52	9.94	0.12	272	135	679	2668
		Normal	439	101.58	113.09	11.51	0.42	431	136	1162	4046
		U/S Mig H	1549	101.58	116.11	14.53	1.02	487	136	1892	8479
		2-yr Flood	2381	101.58	117.70	16.12	1.34	502	136	2167	11569
		100-yr Flood	5399	101.58	119.57	17.99	2.59	518	136	2542	17913
		500-yr Flood	7987	101.58	122.46	20.88	2.02	717	136	2788	24495
D/S Monument St	82261	Low	33	102.34	109.34	7.00	0.05	138	138	412	2081
		U/S Mig L	100	102.34	110.46	8.12	0.11	155	146	678	2666
		Normal	439	102.34	111.99	9.65	0.40	270	149	1161	4043
		U/S Mig H	1549	102.34	114.95	12.61	0.99	308	149	1891	8475
		2-yr Flood	2381	102.34	116.50	14.16	1.30	321	149	2166	11563
		100-yr Flood	5399	102.34	119.32	16.98	2.33	477	149	2541	17906
		500-yr Flood	7987	102.34	121.83	19.49	2.46	615	149	2787	24486
U/S Great Meadows NWR	80321	Low	33	101.29	109.34	8.05	0.04	150	150	406	2048
		U/S Mig L	100	101.29	110.46	9.17	0.10	160	159	671	2625
		Normal	439	101.29	111.97	10.68	0.35	362	160	1144	3984
		U/S Mig H	1549	101.29	114.91	13.62	0.61	1225	160	1857	8338
		2-yr Flood	2381	101.29	116.46	15.17	0.61	1300	160	2130	11373
		100-yr Flood	5399	101.29	119.28	17.99	0.78	1399	160	2501	17609
		500-yr Flood	7987	101.29	121.79	20.50	0.80	1429	160	2743	24084
West Concord Impoundment	77896	Low	33	100.65	109.34	8.69	0.03	746	171	381	1987
		U/S Mig L	100	100.65	110.46	9.81	0.05	1166	178	635	2530
		Normal	439	100.65	111.96	11.31	0.13	1681	178	1089	3818
		U/S Mig H	1549	100.65	114.90	14.25	0.19	2839	178	1747	7923
		2-yr Flood	2381	100.65	116.46	15.81	0.20	3037	178	2013	10779
		100-yr Flood	5399	100.65	119.27	18.62	0.28	3128	178	2378	16676
		500-yr Flood	7987	100.65	121.78	21.13	0.31	3175	178	2618	22841
East Concord Impoundment	74744	Low	33	100.85	109.34	8.49	0.07	436	91	347	1923
		U/S Mig L	100	100.85	110.46	9.61	0.11	1380	95	565	2411
		Normal	439	100.85	111.96	11.11	0.18	2330	95	980	3554
		U/S Mig H	1549	100.85	114.90	14.05	0.18	3562	95	1575	7231
		2-yr Flood	2381	100.85	116.45	15.60	0.19	3919	95	1826	9807
		100-yr Flood	5399	100.85	119.26	18.41	0.26	4099	95	2184	15167
		500-yr Flood	7987	100.85	121.77	20.92	0.28	4187	95	2420	20838

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)*	Volume (ac-ft)*
East Concord Impoundment (at dike)	72510	Low	33	100.85	109.34	8.49	0.03	203	203	333	1883
		U/S Mig L	100	100.85	110.45	9.60	0.08	557	205	526	2346
		Normal	439	100.85	111.95	11.10	0.24	1194	205	910	3399
		U/S Mig H	1549	100.85	114.89	14.04	0.43	1271	205	1480	6824
		2-yr Flood	2381	100.85	116.45	15.60	0.51	1299	205	1723	9245
		100-yr Flood	5399	100.85	119.25	18.40	0.80	1370	205	2076	14309
		500-yr Flood	7987	100.85	121.76	20.91	0.92	1423	205	2310	19706
U/S Bedford Rd/Carlisle Rd (Rte 225)	60443	Low	34	98.17	109.34	11.17	0.01	324	309	223	1298
		U/S Mig L	102	98.17	110.45	12.28	0.04	774	315	296	1594
		Normal	449	98.17	111.93	13.76	0.14	1367	316	515	2168
		U/S Mig H	1584	98.17	114.84	16.67	0.37	2604	316	846	4056
		2-yr Flood	2435	98.17	116.38	18.21	0.51	3639	316	976	5401
		100-yr Flood	5522	98.17	119.11	20.94	0.97	5287	316	1223	8250
		500-yr Flood	8168	98.17	121.65	23.48	0.61	6293	316	1388	11431
D/S Bedford Rd/Carlisle Rd (Rte 225)	60144	Low	34	99.81	109.34	9.53	0.02	331	277	222	1286
		U/S Mig L	102	99.81	110.45	10.64	0.05	1016	283	292	1580
		Normal	449	99.81	111.93	12.12	0.17	1594	283	509	2147
		U/S Mig H	1584	99.81	114.83	15.02	0.44	2650	283	837	4016
		2-yr Flood	2435	99.81	116.36	16.55	0.59	3603	283	964	5345
		100-yr Flood	5522	99.81	119.05	19.24	1.08	5398	283	1206	8154
		500-yr Flood	8168	99.81	121.61	21.80	0.58	6044	283	1352	11249
U/S Nashua Rd (Rte 4); D/S Great Meadows NWR	49630	Low	35	99.19	109.34	10.15	0.02	366	251	130	708
		U/S Mig L	105	99.19	110.45	11.26	0.05	386	255	142	879
		Normal	461	99.19	111.92	12.73	0.18	413	258	191	1098
		U/S Mig H	1628	99.19	114.79	15.60	0.49	498	258	317	1763
		2-yr Flood	2503	99.19	116.31	17.12	0.67	530	258	370	2234
		100-yr Flood	5675	99.19	118.92	19.73	1.26	815	258	481	3289
		500-yr Flood	8395	99.19	121.47	22.28	1.52	1084	258	547	4422
D/S Nashua Rd (Rte 4)	49390	Low	35	100.04	109.34	9.30	0.02	298	251	129	700
		U/S Mig L	105	100.04	110.45	10.41	0.05	315	259	141	869
		Normal	461	100.04	111.91	11.87	0.20	338	262	190	1087
		U/S Mig H	1628	100.04	114.76	14.72	0.52	662	262	315	1747
		2-yr Flood	2503	100.04	116.28	16.24	0.70	971	262	368	2216
		100-yr Flood	5675	100.04	118.82	18.78	1.32	1277	262	479	3264
		500-yr Flood	8395	100.04	121.27	21.23	1.41	1350	262	543	4390
U/S Route 3	43510	Low	35	101.64	109.34	7.70	0.05	169	169	93	489
		U/S Mig L	105	101.64	110.45	8.81	0.11	183	183	102	617
		Normal	461	101.64	111.89	10.25	0.38	194	194	130	769
		U/S Mig H	1628	101.64	114.68	13.04	0.91	218	208	236	1233
		2-yr Flood	2503	101.64	116.15	14.51	1.19	319	212	279	1575
		100-yr Flood	5675	101.64	118.49	16.85	2.18	571	212	382	2393
		500-yr Flood	8395	101.64	120.84	19.20	2.70	767	212	440	3276
D/S Route 3	43243	Low	35	101.77	109.34	7.57	0.05	165	165	92	485
		U/S Mig L	105	101.77	110.45	8.68	0.11	178	178	101	611
		Normal	461	101.77	111.89	10.12	0.39	192	189	129	761
		U/S Mig H	1628	101.77	114.66	12.89	0.95	346	189	235	1223
		2-yr Flood	2503	101.77	116.13	14.36	1.25	590	189	277	1563
		100-yr Flood	5675	101.77	118.40	16.63	2.31	747	189	381	2378
		500-yr Flood	8395	101.77	120.71	18.94	2.87	840	189	438	3258
U/S Abandoned Bridge	41859	Low	35	99.88	109.34	9.46	0.02	217	217	84	444
		U/S Mig L	105	99.88	110.45	10.57	0.06	230	224	93	562
		Normal	461	99.88	111.88	12.00	0.22	250	224	118	698
		U/S Mig H	1628	99.88	114.64	14.76	0.59	544	224	217	1122
		2-yr Flood	2503	99.88	116.09	16.21	0.81	855	224	254	1430
		100-yr Flood	5675	99.88	118.33	18.45	1.38	1197	224	352	2186
		500-yr Flood	8395	99.88	120.65	20.77	1.54	1251	224	409	2998
D/S Abandoned Bridge	41771	Low	35	99.82	109.33	9.51	0.02	220	220	84	442
		U/S Mig L	105	99.82	110.44	10.62	0.06	236	224	92	559
		Normal	461	99.82	111.88	12.06	0.21	253	224	118	695
		U/S Mig H	1628	99.82	114.62	14.80	0.58	631	224	216	1117
		2-yr Flood	2503	99.82	116.07	16.25	0.79	732	224	252	1425
		100-yr Flood	5675	99.82	118.28	18.46	1.37	1158	224	350	2178
		500-yr Flood	8395	99.82	120.62	20.80	1.55	1233	224	406	2985
U/S River St	39621	Low	35	101.95	109.33	7.38	0.03	263	203	73	383
		U/S Mig L	105	101.95	110.44	8.49	0.08	280	203	81	488
		Normal	461	101.95	111.86	9.91	0.27	520	203	102	603
		U/S Mig H	1628	101.95	114.57	12.62	0.71	1055	203	185	962
		2-yr Flood	2503	101.95	116.00	14.05	0.96	1113	203	214	1220
		100-yr Flood	5675	101.95	118.14	16.19	1.44	1197	203	307	1883
		500-yr Flood	8395	101.95	120.49	18.54	1.42	1252	203	355	2579
D/S River St	39416	Low	35	102.66	109.33	6.67	0.03	270	220	72	378
		U/S Mig L	105	102.66	110.44	7.78	0.07	284	220	80	482

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)*	Volume (ac-ft)*
		Normal	461	102.66	111.86	9.20	0.26	465	220	100	596
		U/S Mig H	1628	102.66	114.56	11.90	0.66	965	220	183	950
		2-yr Flood	2503	102.66	115.97	13.31	0.88	981	220	212	1204
		100-yr Flood	5675	102.66	118.05	15.39	1.35	1004	220	304	1862
		500-yr Flood	8395	102.66	120.43	17.77	1.43	1051	220	352	2552
Pinewood Ave Private Gage	37622	Low	35	100.28	109.33	9.05	0.02	276	276	61	314
		U/S Mig L	105	100.28	110.44	10.16	0.05	297	285	68	405
		Normal	461	100.28	111.86	11.58	0.19	565	285	80	499
		U/S Mig H	1628	100.28	114.54	14.26	0.45	1285	285	144	768
		2-yr Flood	2503	100.28	115.95	15.67	0.56	1316	285	171	966
		100-yr Flood	5675	100.28	117.99	17.71	0.96	1357	285	261	1537
		500-yr Flood	8395	100.28	120.37	20.09	1.08	1440	285	307	2121
U/S Boston Rd (Rte 3A)	33130	Low	35	99.67	109.33	9.66	0.03	178	175	29	118
		U/S Mig L	105	99.67	110.44	10.77	0.08	197	182	34	173
		Normal	461	99.67	111.85	12.18	0.29	217	190	38	215
		U/S Mig H	1628	99.67	114.49	14.81	0.77	244	190	69	325
		2-yr Flood	2503	99.67	115.87	16.20	1.05	260	190	84	409
		100-yr Flood	5675	99.67	117.74	18.07	2.04	506	190	158	791
		500-yr Flood	8395	99.67	120.07	20.40	2.51	712	190	186	1111
D/S Boston Rd (Rte 3A)	33047	Low	35	96.59	107.46	10.87	0.03	168	168	29	117
		U/S Mig L	105	96.59	108.64	12.05	0.09	178	178	34	171
		Normal	461	96.59	110.11	13.52	0.31	187	184	37	212
		U/S Mig H	1628	96.59	112.78	16.19	0.81	244	185	68	321
		2-yr Flood	2503	96.59	114.15	17.56	1.10	275	185	84	405
		100-yr Flood	5675	96.59	117.66	21.07	1.90	334	185	157	786
		500-yr Flood	8395	96.59	119.73	23.14	2.38	807	185	185	1105
Abandoned Bridge Pier	32728	Low	35	104.81	107.46	2.65	0.22	100	100	28	112
		U/S Mig L	105	104.81	108.64	3.83	0.37	118	118	33	165
		Normal	461	104.81	110.08	5.27	1.00	121	121	36	205
		U/S Mig H	1628	104.81	112.68	7.87	2.08	176	126	67	311
		2-yr Flood	2503	104.81	113.99	9.18	2.64	293	126	81	392
		100-yr Flood	5675	104.81	117.32	12.51	4.07	469	127	154	762
		500-yr Flood	8395	104.81	119.27	14.46	4.91	688	142	177	1070
Billerica Water Supply Intake	31902	Low	35	101.12	107.46	6.34	0.04	183	183	25	103
		U/S Mig L	105	101.12	108.64	7.52	0.10	197	197	30	153
		Normal	461	101.12	110.07	8.95	0.35	215	215	33	188
		U/S Mig H	1628	101.12	112.63	11.51	0.84	550	220	61	283
		2-yr Flood	2503	101.12	113.94	12.82	1.07	684	220	73	355
		100-yr Flood	5675	101.12	117.31	16.19	1.54	1830	220	135	680
		500-yr Flood	8395	101.12	119.30	18.18	1.82	2260	220	154	947
U/S Pollard St; Fordway Bar	28107	Low	35	106.24	107.34	1.10	0.47	112	112	13	58
		U/S Mig L	105	106.24	108.59	2.35	0.41	164	164	16	92
		Normal	461	106.24	109.87	3.63	0.99	167	167	18	108
		U/S Mig H	1628	106.24	112.08	5.84	1.93	182	174	35	157
		2-yr Flood	2503	106.24	113.20	6.96	2.40	197	174	40	191
		100-yr Flood	5675	106.24	116.23	9.99	3.55	212	174	51	308
		500-yr Flood	8395	106.24	118.04	11.80	4.35	233	174	59	400
D/S Pollard St	28020	Low	35	106.59	107.22	0.63	0.78	107	107	13	57
		U/S Mig L	105	106.59	108.58	1.99	0.46	146	146	16	92
		Normal	461	106.59	109.83	3.24	1.12	149	149	18	107
		U/S Mig H	1628	106.59	111.98	5.39	2.21	159	152	35	156
		2-yr Flood	2503	106.59	113.08	6.49	2.76	168	153	39	190
		100-yr Flood	5675	106.59	116.02	9.43	4.10	207	153	50	305
		500-yr Flood	8395	106.59	117.76	11.17	4.99	298	153	59	396
Grade Control D/S of Fordway Bar	27311	Low	35	105.60	106.15	0.55	3.12	37	37	12	57
		U/S Mig L	105	105.60	108.46	2.86	0.61	117	117	13	88
		Normal	461	105.60	109.37	3.77	1.56	160	152	15	100
		U/S Mig H	1628	105.60	111.26	5.66	2.52	209	184	31	141
		2-yr Flood	2503	105.60	112.27	6.67	2.96	242	184	35	171
		100-yr Flood	5675	105.60	115.15	9.55	3.98	299	184	45	272
		500-yr Flood	8395	105.60	116.78	11.18	4.74	398	184	51	351
Floating Towpath Peninsula	25698	Low	35	94.70	105.98	11.28	0.02	316	316	4	26
		U/S Mig L	105	94.70	108.46	13.76	0.04	349	340	5	37
		Normal	461	94.70	109.33	14.63	0.16	396	340	5	41
		U/S Mig H	1628	94.70	111.01	16.31	0.46	677	340	7	51
		2-yr Flood	2503	94.70	111.89	17.19	0.65	799	340	7	57
		100-yr Flood	5675	94.70	114.40	19.70	1.19	901	340	8	77
		500-yr Flood	8395	94.70	116.05	21.35	1.56	971	340	9	91
U/S Talbot Mills Dam	25129	Low	35	102.00	105.97	3.97	0.93	46	34		
		U/S Mig L	105	102.00	108.46	6.46	0.28	170	158		
		Normal	461	102.00	109.31	7.31	0.90	177	162		
		U/S Mig H	1628	102.00	110.92	8.92	2.11	183	162		

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)*	Volume (ac-ft)*
		2-yr Flood	2503	102.00	111.74	9.74	2.76	187	162		
		100-yr Flood	5675	102.00	114.02	12.02	4.43	235	162		
		500-yr Flood	8395	102.00	115.47	13.47	5.50	338	162		
D/S Talbot Mills Dam; U/S Faulkner St	25081	Low	35	95.48	97.59	2.11	1.04	45	45		
		U/S Mig L	105	95.48	98.19	2.71	1.60	61	61		
		Normal	461	95.48	99.71	4.23	2.59	80	80		
		U/S Mig H	1628	95.48	102.54	7.06	3.83	95	95		
		2-yr Flood	2503	95.48	103.90	8.42	4.48	102	102		
		100-yr Flood	5675	95.48	108.00	12.52	5.67	145	107		
D/S Faulkner St	25043	Low	35	95.58	97.35	1.77	1.73	29	29		
		U/S Mig L	105	95.58	97.70	2.12	3.26	40	40		
		Normal	461	95.58	99.12	3.54	4.76	50	50		
		U/S Mig H	1628	95.58	101.82	6.24	5.97	93	93		
		2-yr Flood	2503	95.58	103.17	7.59	6.24	98	98		
		100-yr Flood	5675	95.58	106.95	11.37	7.14	132	105		
U/S Interstate 495	13464	Low	35	92.07	97.33	5.26	0.03	290	290		
		U/S Mig L	106	92.07	97.53	5.46	0.08	291	291		
		Normal	465	92.07	98.32	6.25	0.31	310	310		
		U/S Mig H	1641	92.07	100.31	8.24	0.75	737	351		
		2-yr Flood	2523	92.07	101.52	9.45	0.95	1086	351		
		100-yr Flood	5721	92.07	105.16	13.09	1.41	1844	351		
D/S Interstate 495	12748	Low	35	90.60	97.19	6.59	0.04	211	211		
		U/S Mig L	106	90.60	97.39	6.79	0.12	214	214		
		Normal	465	90.60	98.20	7.60	0.43	228	228		
		U/S Mig H	1641	90.60	100.16	9.56	1.04	522	266		
		2-yr Flood	2523	90.60	101.36	10.76	1.29	584	266		
		100-yr Flood	5721	90.60	104.94	14.34	1.84	1123	266		
U/S Railroad Bridge	11994	Low	35	89.39	97.19	7.80	0.02	292	292		
		U/S Mig L	106	89.39	97.39	8.00	0.06	295	294		
		Normal	465	89.39	98.19	8.80	0.24	306	294		
		U/S Mig H	1641	89.39	100.14	10.75	0.65	405	294		
		2-yr Flood	2523	89.39	101.33	11.94	0.87	418	294		
		100-yr Flood	5721	89.39	104.89	15.50	1.44	450	294		
D/S Railroad Bridge	11729	Low	35	87.60	97.19	9.59	0.05	176	176		
		U/S Mig L	106	87.60	97.39	9.79	0.13	180	180		
		Normal	465	87.60	98.17	10.57	0.49	195	195		
		U/S Mig H	1641	87.60	100.01	12.41	1.24	210	204		
		2-yr Flood	2523	87.60	101.09	13.49	1.63	247	204		
		100-yr Flood	5721	87.60	104.16	16.56	2.59	393	204		
U/S Railroad Bridge	9416	Low	35	85.77	97.19	11.42	0.02	192	192		
		U/S Mig L	106	85.77	97.39	11.62	0.07	197	194		
		Normal	465	85.77	98.16	12.39	0.29	216	202		
		U/S Mig H	1641	85.77	99.95	14.18	0.82	259	218		
		2-yr Flood	2523	85.77	100.99	15.22	1.13	275	218		
		100-yr Flood	5721	85.77	103.96	18.19	1.94	316	218		
D/S Railroad Bridge	9322	Low	35	84.24	97.19	12.95	0.03	156	156		
		U/S Mig L	106	84.24	97.39	13.15	0.09	158	158		
		Normal	465	84.24	98.16	13.92	0.35	165	165		
		U/S Mig H	1641	84.24	99.91	15.67	1.01	204	174		
		2-yr Flood	2523	84.24	100.93	16.69	1.39	222	174		
		100-yr Flood	5721	84.24	103.80	19.56	2.41	251	174		
U/S Lawrence St	8589	Low	35	94.13	97.19	3.06	0.17	126	125		
		U/S Mig L	106	94.13	97.38	3.25	0.45	128	127		
		Normal	465	94.13	98.09	3.96	1.42	134	131		
		U/S Mig H	1641	94.13	99.63	5.50	3.09	139	131		
		2-yr Flood	2523	94.13	100.51	6.38	3.89	143	131		
		100-yr Flood	5721	94.13	102.98	8.85	5.80	153	131		
D/S Lawrence St	8488	Low	35	94.39	97.19	2.80	0.18	121	119		
		U/S Mig L	106	94.39	97.37	2.98	0.49	126	123		
		Normal	465	94.39	97.96	3.57	1.58	141	137		
		U/S Mig H	1641	94.39	99.20	4.81	3.50	149	137		
		2-yr Flood	2523	94.39	99.88	5.49	4.46	153	137		
		100-yr Flood	5721	94.39	101.69	7.30	6.90	164	137		

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)*	Volume (ac-ft)*
		500-yr Flood	8463	94.39	102.82	8.43	8.49	172	137		
U/S Centennial Falls Dam	8187	Low	35	94.27	97.18	2.91	0.07	213	213		
		U/S Mig L	106	94.27	97.36	3.09	0.21	216	216		
		Normal	465	94.27	97.91	3.64	0.73	226	226		
		U/S Mig H	1641	94.27	99.01	4.74	1.83	274	233		
		2-yr Flood	2523	94.27	99.63	5.36	2.40	279	233		
		100-yr Flood	5721	94.27	101.30	7.03	3.83	292	233		
		500-yr Flood	8463	94.27	102.40	8.13	4.72	301	233		
D/S Centennial Falls Dam	7946	Low	35	89.02	89.98	0.96	1.92	33	33		
		U/S Mig L	106	89.02	90.49	1.47	2.78	46	46		
		Normal	465	89.02	91.69	2.67	4.28	67	67		
		U/S Mig H	1641	89.02	93.91	4.89	5.92	83	81		
		2-yr Flood	2523	89.02	95.04	6.02	6.81	88	81		
		100-yr Flood	5721	89.02	98.37	9.35	8.81	94	81		
		500-yr Flood	8463	89.02	100.38	11.36	10.27	212	81		
U/S Rogers St	5306	Low	35	68.64	70.25	1.61	0.24	149	149		
		U/S Mig L	106	68.64	70.78	2.14	0.46	161	161		
		Normal	465	68.64	72.01	3.37	1.06	174	174		
		U/S Mig H	1641	68.64	73.89	5.25	2.13	181	179		
		2-yr Flood	2523	68.64	74.80	6.16	2.69	187	179		
		100-yr Flood	5721	68.64	77.73	9.09	3.87	225	179		
		500-yr Flood	8463	68.64	79.57	10.93	4.56	250	179		
D/S Rogers St	5142	Low	35	67.44	69.16	1.72	0.32	98	98		
		U/S Mig L	106	67.44	69.81	2.37	0.60	112	112		
		Normal	465	67.44	71.27	3.83	1.32	124	124		
		U/S Mig H	1641	67.44	73.42	5.98	2.61	134	134		
		2-yr Flood	2523	67.44	74.45	7.01	3.29	144	135		
		100-yr Flood	5721	67.44	77.08	9.64	5.02	185	135		
		500-yr Flood	8463	67.44	78.63	11.19	6.10	198	135		
USGS Gage at Lowell	4921	Low	35	68.00	69.11	1.11	0.66	67	67		
		U/S Mig L	106	68.00	69.72	1.72	1.09	78	78		
		Normal	465	68.00	71.05	3.05	2.18	95	95		
		U/S Mig H	1641	68.00	72.95	4.95	4.02	114	105		
		2-yr Flood	2523	68.00	73.81	5.81	5.02	121	105		
		100-yr Flood	5721	68.00	76.03	8.03	7.47	164	105		
		500-yr Flood	8463	68.00	77.28	9.28	9.00	176	105		
U/S Church St	3076	Low	35	54.98	58.72	3.74	0.11	179	179		
		U/S Mig L	106	54.98	59.17	4.19	0.27	189	189		
		Normal	465	54.98	60.40	5.42	0.74	202	202		
		U/S Mig H	1641	54.98	62.49	7.51	1.53	228	214		
		2-yr Flood	2523	54.98	62.87	7.89	2.18	232	216		
		100-yr Flood	5721	54.98	66.06	11.08	3.02	246	216		
		500-yr Flood	8463	54.98	68.41	13.43	3.45	253	216		
D/S Church St	2755	Low	35	54.23	57.66	3.43	0.16	128	128		
		U/S Mig L	106	54.23	58.10	3.87	0.37	142	142		
		Normal	465	54.23	59.25	5.02	1.00	175	172		
		U/S Mig H	1641	54.23	61.22	6.99	1.97	199	187		
		2-yr Flood	2523	54.23	62.18	7.95	2.47	207	191		
		100-yr Flood	5721	54.23	64.63	10.40	3.75	223	191		
		500-yr Flood	8463	54.23	66.37	12.14	4.46	234	191		
U/S Middlesex Falls	2423	Low	35	57.20	57.51	0.31	2.93	45	45		
		U/S Mig L	106	57.20	57.81	0.61	3.90	58	58		
		Normal	465	57.20	58.55	1.35	5.47	94	94		
		U/S Mig H	1641	57.20	60.32	3.12	5.51	113	111		
		2-yr Flood	2523	57.20	61.10	3.90	6.11	118	111		
		100-yr Flood	5721	57.20	63.00	5.80	7.89	127	111		
		500-yr Flood	8463	57.20	64.35	7.15	9.24	133	111		
Middlesex Dam (breached)	2308	Low	35	51.17	52.34	1.17	0.64	61	61		
		U/S Mig L	106	51.17	52.83	1.66	1.16	84	84		
		Normal	465	51.17	53.87	2.70	2.54	89	89		
		U/S Mig H	1641	51.17	55.30	4.13	4.73	92	92		
		2-yr Flood	2523	51.17	56.02	4.85	5.73	93	93		
		100-yr Flood	5721	51.17	58.04	6.87	7.79	107	104		
		500-yr Flood	8463	51.17	59.65	8.48	9.06	110	104		
D/S Middlesex Falls	2293	Low	35	51.20	52.12	0.92	2.88	27	27		
		U/S Mig L	106	51.20	52.59	1.39	2.95	93	93		
		Normal	465	51.20	53.61	2.41	3.72	135	135		
		U/S Mig H	1641	51.20	55.08	3.88	5.36	142	142		
		2-yr Flood	2523	51.20	55.90	4.70	6.02	145	144		
		100-yr Flood	5721	51.20	58.31	7.11	7.43	155	144		
		500-yr Flood	8463	51.20	60.08	8.88	8.53	162	144		

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)*	Volume (ac-ft)*
U/S East Merrimack St	1441	Low	35	45.07	46.60	1.53	0.68	54	54		
		U/S Mig L	106	45.07	47.21	2.14	1.22	63	63		
		Normal	465	45.07	48.64	3.57	2.34	90	90		
		U/S Mig H	1641	45.07	50.89	5.82	3.85	111	109		
		2-yr Flood	2523	45.07	52.02	6.95	4.58	114	111		
		100-yr Flood	5721	45.07	54.95	9.88	6.47	120	111		
		500-yr Flood	8463	45.07	56.92	11.85	7.60	123	111		
D/S East Merrimack St	1334	Low	35	45.53	46.33	0.80	1.38	52	52		
		U/S Mig L	106	45.53	46.87	1.34	1.84	67	67		
		Normal	465	45.53	48.20	2.67	2.88	85	85		
		U/S Mig H	1641	45.53	50.29	4.76	4.56	102	102		
		2-yr Flood	2523	45.53	51.35	5.82	5.37	107	107		
		100-yr Flood	5721	45.53	54.04	8.51	7.47	113	111		
		500-yr Flood	8463	45.53	55.77	10.24	8.82	115	111		
U/S of Confluence with Merrimack River	606	Low	35	42.59	43.51	0.92	1.20	64	64		
		U/S Mig L	106	42.59	43.96	1.37	1.66	85	85		
		Normal	465	42.59	45.01	2.42	2.79	105	103		
		U/S Mig H	1641	42.59	46.82	4.23	4.54	114	106		
		2-yr Flood	2523	42.59	47.79	5.20	5.38	118	106		
		100-yr Flood	5721	42.59	50.44	7.85	7.38	130	106		
		500-yr Flood	8463	42.59	52.19	9.60	8.57	131	106		

*Surface area and volume parameters are cumulative values upstream of Talbot Mills Dam.

Table F-2: Existing Fish Passage Parameters at Low and High Migration Season Flows

Location	River Station (ft)	Average Channel Velocity (ft/s)		Max Channel Water Depth (ft)		Wetted Channel Top Width (ft)	
		Low	High	Low	High	Low	High
Confluence of Sudbury & Assabet Rivers	85935	0.1	0.6	11.0	13.9	160	160
	85496	0.1	1.1	9.7	12.5	130	130
Lowell Rd	85349						
Minute Man National Park	85225	0.1	0.9	9.3	13.5	152	152
Minute Man National Park	84894	0.1	0.7	9.4	13.7	160	160
Minute Man National Park	83593	0.1	0.8	9.1	13.3	131	131
Pedestrian Bridge	83564						
Minute Man National Park	83534	0.1	0.9	8.9	13.5	132	139
Minute Man National Park	83140	0.1	0.7	9.1	13.7	190	190
Minute Man National Park	82742	0.1	0.7	9.1	13.7	172	172
Minute Man National Park	82381	0.1	1.0	9.9	14.5	135	136
Monument St	82325						
	82261	0.1	1.0	8.1	12.6	146	149
	81430	0.1	0.6	8.7	13.2	159	165
U/S Extent of Great Meadows NWR	80321	0.1	0.6	9.2	13.6	159	160
West Concord Impoundment	77896	0.1	0.2	9.8	14.3	178	178
East Concord Impoundment	74744	0.1	0.2	9.6	14.1	95	95
East Concord Impoundment (at dike)	72510	0.1	0.4	9.6	14.0	205	205
	71553	0.0	0.3	9.5	13.9	398	406
	70916	0.0	0.3	8.8	13.3	421	421
	69822	0.1	0.4	8.6	13.1	193	193
	68947	0.0	0.3	9.8	14.2	393	393
	67500	0.0	0.3	9.6	14.0	420	420
	65823	0.0	0.2	10.1	14.5	407	407
	62142	0.0	0.3	10.1	14.5	395	395
	60443	0.0	0.4	12.3	16.7	315	316
Bedford Rd/Carlisle Rd (Route 225)	60352						
	60144	0.1	0.4	10.6	15.0	283	283
	59022	0.0	0.3	10.9	15.3	329	329
	57314	0.1	0.3	10.9	15.2	324	327
	56182	0.0	0.2	10.8	15.2	485	485
	54675	0.0	0.3	10.8	15.1	461	461
	52382	0.0	0.2	10.9	15.2	510	510
	51565	0.1	0.3	11.0	15.3	326	326
	49861	0.0	0.4	11.4	15.8	340	340
D/S Extent of Great Meadows NWR	49630	0.1	0.5	11.3	15.6	255	258
Nashua Rd (Route 4)	49505						
	49390	0.1	0.5	10.4	14.7	259	262
	48032	0.1	0.5	10.1	14.4	240	240
	46753	0.1	0.5	10.1	14.4	284	284
	44901	0.1	0.5	10.0	14.2	300	300
	44098	0.1	0.4	9.9	14.1	324	324
	43510	0.1	0.9	8.8	13.0	183	208
Route 3	43448						
	43243	0.1	1.0	8.7	12.9	178	189
	42548	0.1	0.5	8.7	12.9	275	275
	41859	0.1	0.6	10.6	14.8	224	224
Abandoned Bridge	41819						
	41771	0.1	0.6	10.6	14.8	224	224
	41025	0.1	0.6	9.2	13.3	264	264
	40299	0.1	0.8	9.4	13.6	170	170
	39621	0.1	0.7	8.5	12.6	203	203
River Street	39526						
	39416	0.1	0.7	7.8	11.9	220	220
	39094	0.1	0.5	9.9	14.0	266	266
Pinewood Ave Private Gage	37622	0.1	0.5	10.2	14.3	285	285
	36622	0.0	0.3	9.9	14.0	432	441
	34943	0.1	0.6	10.0	14.1	253	261
	33823	0.1	0.5	10.3	14.3	320	335
	33284	0.1	0.5	11.2	15.2	288	292
	33130	0.1	0.8	10.8	14.8	182	190
Boston Road/Route 3A	33086						
	33047	0.1	0.8	12.1	16.2	178	185
Abandoned Bridge Pier	32728	0.4	2.1	3.8	7.9	118	126
Billerica Water Supply Intake	31902	0.1	0.8	7.5	11.5	197	220
	31023	0.1	1.2	7.5	11.4	139	155
	29534	0.1	1.1	8.3	12.1	158	175
	28338	0.5	2.0	2.4	5.9	148	174

Location	River Station (ft)	Average Channel Velocity (ft/s)		Max Channel Water Depth (ft)		Wetted Channel Top Width (ft)	
		Low	High	Low	High	Low	High
Fordway Bar	28107	0.4	1.9	2.4	5.8	164	174
Pollard St	28064						
	28020	0.5	2.2	2.0	5.4	146	152
	27851	0.4	2.1	2.8	6.1	143	160
Grade Control D/S of Fordway Bar	27311	0.6	2.5	2.9	5.7	117	184
	27185	0.2	2.1	6.2	8.9	103	110
	26520	0.1	1.3	7.1	9.8	180	195
	26072	0.1	1.2	10.0	12.5	163	163
Floating Towpath Peninsula	25698	0.0	0.5	13.8	16.3	340	340
	25396	0.0	0.5	14.0	16.5	261	261
	25328	0.1	0.7	12.6	15.1	235	236
	25218	0.1	0.8	11.0	13.5	209	234
	25168	0.1	0.9	9.5	12.0	197	197
	25129	0.3	2.1	6.5	8.9	158	162
Talbot Mills Dam	25121						
	25081	1.6	3.8	2.7	7.1	61	95
Faulkner St	25063						
	25043	3.3	6.0	2.1	6.2	40	93
	25000	1.4	5.0	2.5	6.5	47	77
	24695	0.7	3.8	3.3	6.7	72	81
	24510	0.2	2.2	5.8	9.1	91	91
	24039	0.2	1.3	6.0	9.3	182	211
	23036	0.1	1.0	6.3	9.4	231	259
	21794	0.1	0.9	6.5	9.6	215	237
	20235	0.1	0.6	7.1	10.1	349	370
	19614	0.1	0.9	7.3	10.2	233	264
	19182	0.1	0.6	7.7	10.6	304	304
	18894	0.1	0.6	7.5	10.4	288	298
	17508	0.1	0.9	7.4	10.3	212	220
	15836	0.1	0.7	7.4	10.2	303	322
	14405	0.1	0.5	7.5	10.3	398	450
	13464	0.1	0.8	5.5	8.2	291	351
Interstate 495	13159						
	12748	0.1	1.0	6.8	9.6	214	266
	12545	0.1	0.7	7.1	9.9	276	292
	12397	0.1	0.6	7.3	10.1	344	351
	11994	0.1	0.7	8.0	10.8	294	294
Railroad Bridge	11876						
	11729	0.1	1.2	9.8	12.4	180	204
	10958	0.1	0.6	10.3	12.9	312	330
	10057	0.1	0.8	10.5	13.1	213	228
	9738	0.1	0.7	10.7	13.3	252	264
	9507	0.1	0.7	11.2	13.8	221	271
	9416	0.1	0.8	11.6	14.2	194	218
Railroad Bridge	9361						
	9322	0.1	1.0	13.2	15.7	158	174
	9207	0.1	0.8	13.7	16.2	177	185
	8968	0.1	1.1	9.9	12.4	167	182
	8788	0.2	1.5	6.7	9.2	161	179
	8677	0.2	1.9	5.2	7.6	150	150
	8589	0.5	3.1	3.3	5.5	127	131
Lawrence St	8537						
	8488	0.5	3.5	3.0	4.8	123	137
	8404	0.4	3.0	3.5	5.2	137	143
	8274	0.2	2.0	4.7	6.4	145	147
	8187	0.2	1.8	3.1	4.7	216	233
Centennial Falls Dam	8170						
	7946	2.8	5.9	1.5	4.9	46	81
	7522	2.1	4.2	1.5	5.9	50	97
	6927	3.1	8.7	2.3	6.2	27	45
	6540	4.6	9.7	1.0	4.0	34	58
	6394	3.3	12.7	1.5	3.7	35	51
	6277	2.7	8.4	1.3	4.2	44	61
	6151	2.7	6.5	1.2	4.1	54	86
	6051	1.5	4.8	1.2	4.1	77	105
	5929	1.7	5.1	1.4	4.0	71	124
	5781	3.3	3.0	0.8	4.3	78	194
	5306	0.5	2.1	2.1	5.3	161	179
Rogers St	5221						

Location	River Station (ft)	Average Channel Velocity (ft/s)		Max Channel Water Depth (ft)		Wetted Channel Top Width (ft)	
		Low	High	Low	High	Low	High
	5142	0.6	2.6	2.4	6.0	112	134
	4921	1.1	4.0	1.7	5.0	78	105
	4763	1.3	4.1	1.5	4.5	80	124
	4525	3.2	6.7	0.8	2.8	76	132
	4347	3.5	8.9	0.9	3.3	54	74
	4220	4.8	9.8	1.2	4.3	32	56
	4123	1.7	2.7	1.4	4.9	77	114
	3518	0.6	1.9	1.8	5.2	155	224
	3076	0.3	1.5	4.2	7.5	189	214
Church St	2922						
	2755	0.4	2.0	3.9	7.0	142	187
	2547	0.4	2.6	4.0	6.9	106	128
U/S End of Middlesex Falls	2423	3.9	5.5	0.6	3.1	58	111
	2366	1.0	3.8	2.1	5.1	88	123
	2343	3.3	7.0	1.2	2.6	101	153
Middlesex Dam (breached)	2308	1.2	4.7	1.7	4.1	84	92
D/S End of Middlesex Falls	2293	3.0	5.4	1.4	3.9	93	142
	2012*	16.9	17.0	0.2	1.3	48	102
	1728	4.3	4.3	1.1	4.9	43	122
	1441	1.2	3.9	2.1	5.8	63	109
East Merrimack St	1394						
	1334	1.8	4.6	1.3	4.8	67	102
	1077	2.1	5.5	1.7	4.8	54	96
U/S of Confluence with Merrimack River	606	1.7	4.5	1.4	4.2	85	106
	MIN	0.0	0.2	0.6	2.6	27	45
	MAX	4.8	12.7	14.0	16.7	510	510
	AVG	0.6	2.0	6.9	10.4	193	210

Key

- Exceeds low target fish passage thresholds (5 ft/s velocity or 0.67 ft depth)
- Exceeds high target fish passage thresholds (7 ft/s velocity or 0.5 ft depth)

*High velocity and low depth values reported at XS 2012 (downstream of Middlesex Falls) are due to a transition from supercritical to subcritical flow, which results in a hydraulic jump. Additional survey data would be needed in this area to determine whether a true velocity/depth barrier exists. These values were not included in the statistics at the bottom of the table.

Table F-3: Proposed Model Output Parameters at Key Locations for the Dam Removal Alternative

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)	Volume (ac-ft)
Confluence of Sudbury & Assabet Rivers	85935	Low	33	102.42	112.10	9.68	0.03	381	160	411	2110
		U/S Mig L	100	102.42	112.69	10.27	0.08	551	160	489	2358
		Normal	439	102.42	114.37	11.95	0.26	1620	160	1014	3492
		U/S Mig H	1549	102.42	115.60	13.18	0.69	1949	160	1788	7441
		2-yr Flood	2381	102.42	117.14	14.72	0.76	2283	160	2096	10165
		100-yr Flood	5399	102.42	119.35	16.93	1.16	2837	160	2498	16124
		500-yr Flood	7987	102.42	121.95	19.53	0.91	3483	160	2786	22712
U/S Lowell Rd	85496	Low	33	103.70	112.10	8.40	0.04	416	130	407	2099
		U/S Mig L	100	103.70	112.69	8.99	0.12	585	130	484	2344
		Normal	439	103.70	114.36	10.66	0.40	837	130	1003	3464
		U/S Mig H	1549	103.70	115.57	11.87	1.21	1144	130	1773	7398
		2-yr Flood	2381	103.70	117.08	13.38	1.55	1561	130	2078	10098
		100-yr Flood	5399	103.70	119.29	15.59	1.91	2273	130	2475	16011
		500-yr Flood	7987	103.70	121.92	18.22	1.74	2735	130	2758	22532
D/S Lowell Rd; U/S Minute Man National Park	85225	Low	33	102.71	110.72	8.01	0.04	182	151	406	2095
		U/S Mig L	100	102.71	111.30	8.59	0.11	213	152	483	2339
		Normal	439	102.71	112.95	10.24	0.37	585	152	1001	3456
		U/S Mig H	1549	102.71	115.53	12.82	0.97	1409	152	1770	7384
		2-yr Flood	2381	102.71	117.02	14.31	1.29	1535	152	2074	10079
		100-yr Flood	5399	102.71	118.98	16.27	2.48	1757	152	2470	15982
		500-yr Flood	7987	102.71	121.86	19.15	1.41	2153	152	2752	22486
U/S Pedestrian Bridge	83593	Low	33	102.89	110.72	7.83	0.05	217	131	399	2066
		U/S Mig L	100	102.89	111.30	8.41	0.14	337	131	474	2307
		Normal	439	102.89	112.93	10.04	0.44	441	131	974	3399
		U/S Mig H	1549	102.89	115.48	12.59	0.97	937	131	1728	7232
		2-yr Flood	2381	102.89	116.96	14.07	1.12	1000	131	2030	9862
		100-yr Flood	5399	102.89	118.88	15.99	1.61	1037	131	2423	15678
		500-yr Flood	7987	102.89	121.80	18.91	1.62	1130	131	2699	22041
D/S Pedestrian Bridge	83534	Low	33	102.62	110.27	7.65	0.05	144	126	399	2066
		U/S Mig L	100	102.62	110.85	8.23	0.15	152	129	474	2306
		Normal	439	102.62	112.48	9.86	0.48	176	138	974	3398
		U/S Mig H	1549	102.62	115.46	12.84	1.06	654	139	1728	7230
		2-yr Flood	2381	102.62	116.95	14.33	1.28	730	139	2029	9859
		100-yr Flood	5399	102.62	118.82	16.20	2.20	829	139	2423	15674
		500-yr Flood	7987	102.62	121.75	19.13	2.09	1068	139	2697	22031
U/S Monument St; D/S Minute Man National Park	82381	Low	33	101.58	110.27	8.69	0.05	139	128	395	2044
		U/S Mig L	100	101.58	110.85	9.27	0.14	217	132	469	2281
		Normal	439	101.58	112.47	10.89	0.46	412	136	967	3364
		U/S Mig H	1549	101.58	115.42	13.84	1.10	479	136	1715	7168
		2-yr Flood	2381	101.58	116.88	15.30	1.45	495	136	2015	9777
		100-yr Flood	5399	101.58	118.60	17.02	2.82	510	136	2408	15565
		500-yr Flood	7987	101.58	121.65	20.07	2.25	560	136	2679	21873
D/S Monument St	82261	Low	33	102.34	109.27	6.93	0.05	138	138	394	2042
		U/S Mig L	100	102.34	109.81	7.47	0.13	143	143	469	2279
		Normal	439	102.34	111.38	9.04	0.43	178	148	967	3361
		U/S Mig H	1549	102.34	114.26	11.92	1.06	298	149	1715	7163
		2-yr Flood	2381	102.34	115.70	13.36	1.41	314	149	2015	9772
		100-yr Flood	5399	102.34	118.45	16.11	2.50	376	149	2407	15559
		500-yr Flood	7987	102.34	120.96	18.62	2.70	568	149	2679	21864
U/S Great Meadows NWR	80321	Low	33	101.29	109.27	7.98	0.04	149	149	388	2009
		U/S Mig L	100	101.29	109.81	8.52	0.11	154	154	462	2243
		Normal	439	101.29	111.36	10.07	0.39	211	160	954	3312
		U/S Mig H	1549	101.29	114.21	12.92	0.76	1130	160	1683	7049
		2-yr Flood	2381	101.29	115.65	14.36	0.79	1263	160	1980	9610
		100-yr Flood	5399	101.29	118.39	17.10	0.97	1383	160	2368	15297
		500-yr Flood	7987	101.29	120.92	19.63	0.96	1420	160	2636	21499
West Concord Impoundment	77896	Low	33	100.65	109.27	8.62	0.03	723	170	364	1950
		U/S Mig L	100	100.65	109.81	9.16	0.07	977	175	431	2170
		Normal	439	100.65	111.35	10.70	0.17	1600	178	905	3178
		U/S Mig H	1549	100.65	114.20	13.55	0.24	2714	178	1579	6709
		2-yr Flood	2381	100.65	115.64	14.99	0.26	2978	178	1865	9112
		100-yr Flood	5399	100.65	118.38	17.73	0.35	3103	178	2247	14472
		500-yr Flood	7987	100.65	120.91	20.26	0.37	3157	178	2512	20364
East Concord Impoundment	74744	Low	33	100.85	109.27	8.42	0.07	144	90	339	1888
		U/S Mig L	100	100.85	109.81	8.96	0.17	710	94	384	2087
		Normal	439	100.85	111.34	10.49	0.28	2098	95	804	2978
		U/S Mig H	1549	100.85	114.20	13.35	0.25	3443	95	1413	6135
		2-yr Flood	2381	100.85	115.63	14.78	0.25	3706	95	1685	8290

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)	Volume (ac-ft)
		100-yr Flood	5399	100.85	118.38	17.53	0.33	4071	95	2054	13134
		500-yr Flood	7987	100.85	120.90	20.05	0.34	4163	95	2315	18533
East Concord Impoundment (at dike)	72510	Low	33	100.85	109.27	8.42	0.03	202	202	330	1850
		U/S Mig L	100	100.85	109.80	8.95	0.09	216	205	365	2039
		Normal	439	100.85	111.33	10.48	0.28	1105	205	741	2865
		U/S Mig H	1549	100.85	114.19	13.34	0.51	1256	205	1321	5793
		2-yr Flood	2381	100.85	115.62	14.77	0.61	1283	205	1587	7812
		100-yr Flood	5399	100.85	118.36	17.51	0.94	1342	205	1948	12371
		500-yr Flood	7987	100.85	120.88	20.03	1.06	1400	205	2206	17497
U/S Bedford Rd/Carlisle Rd (Rte 225)	60443	Low	34	98.17	109.27	11.10	0.01	318	308	221	1272
		U/S Mig L	102	98.17	109.80	11.63	0.04	393	312	237	1400
		Normal	449	98.17	111.31	13.14	0.15	1293	316	409	1858
		U/S Mig H	1584	98.17	114.13	15.96	0.40	2330	316	743	3454
		2-yr Flood	2435	98.17	115.55	17.38	0.55	2864	316	893	4568
		100-yr Flood	5522	98.17	118.20	20.03	1.03	5020	316	1127	7070
		500-yr Flood	8168	98.17	120.76	22.59	0.70	5679	316	1319	10017
D/S Bedford Rd/Carlisle Rd (Rte 225)	60144	Low	34	99.81	109.27	9.46	0.02	307	276	219	1261
		U/S Mig L	102	99.81	109.80	9.99	0.05	650	281	235	1387
		Normal	449	99.81	111.31	11.50	0.19	1305	283	404	1840
		U/S Mig H	1584	99.81	114.12	14.31	0.47	2393	283	736	3419
		2-yr Flood	2435	99.81	115.53	15.72	0.64	3039	283	883	4521
		100-yr Flood	5522	99.81	118.13	18.32	1.17	5104	283	1111	6990
		500-yr Flood	8168	99.81	120.66	20.85	0.69	5703	283	1288	9866
U/S Nashua Rd (Rte 4); D/S Great Meadows NWR	49630	Low	35	99.19	109.27	10.08	0.02	364	251	129	689
		U/S Mig L	105	99.19	109.80	10.61	0.06	378	254	134	764
		Normal	461	99.19	111.29	12.10	0.20	402	258	156	971
		U/S Mig H	1628	99.19	114.07	14.88	0.53	489	258	273	1515
		2-yr Flood	2503	99.19	115.46	16.27	0.72	513	258	325	1893
		100-yr Flood	5675	99.19	117.99	18.80	1.35	697	258	437	2769
		500-yr Flood	8395	99.19	120.50	21.31	1.65	953	258	507	3793
D/S Nashua Rd (Rte 4)	49390	Low	35	100.04	109.27	9.23	0.02	297	250	127	681
		U/S Mig L	105	100.04	109.80	9.76	0.06	306	254	133	756
		Normal	461	100.04	111.29	11.25	0.21	326	262	155	960
		U/S Mig H	1628	100.04	114.05	14.01	0.55	541	262	271	1501
		2-yr Flood	2503	100.04	115.44	15.40	0.75	692	262	323	1876
		100-yr Flood	5675	100.04	117.92	17.88	1.41	1158	262	435	2747
		500-yr Flood	8395	100.04	120.27	20.23	1.57	1327	262	503	3765
U/S Route 3	43510	Low	35	101.64	109.27	7.63	0.05	168	168	91	473
		U/S Mig L	105	101.64	109.80	8.16	0.13	175	175	95	528
		Normal	461	101.64	111.27	9.63	0.42	190	190	112	675
		U/S Mig H	1628	101.64	113.96	12.32	0.99	210	205	198	1041
		2-yr Flood	2503	101.64	115.30	13.66	1.30	247	210	238	1309
		100-yr Flood	5675	101.64	117.56	15.92	2.36	492	212	341	1962
		500-yr Flood	8395	101.64	119.81	18.17	2.91	750	212	402	2753
D/S Route 3	43243	Low	35	101.77	109.27	7.50	0.05	164	164	90	468
		U/S Mig L	105	101.77	109.80	8.03	0.13	170	170	94	523
		Normal	461	101.77	111.27	9.50	0.43	188	188	111	668
		U/S Mig H	1628	101.77	113.94	12.17	1.03	261	189	197	1032
		2-yr Flood	2503	101.77	115.27	13.50	1.36	426	189	237	1298
		100-yr Flood	5675	101.77	117.46	15.69	2.50	714	189	339	1948
		500-yr Flood	8395	101.77	119.68	17.91	3.09	786	189	401	2736
U/S Abandoned Bridge	41859	Low	35	99.88	109.27	9.39	0.02	217	217	83	428
		U/S Mig L	105	99.88	109.80	9.92	0.06	221	221	87	479
		Normal	461	99.88	111.26	11.38	0.24	241	224	100	611
		U/S Mig H	1628	99.88	113.92	14.04	0.63	478	224	181	942
		2-yr Flood	2503	99.88	115.23	15.35	0.87	791	224	216	1184
		100-yr Flood	5675	99.88	117.37	17.49	1.67	1012	224	313	1782
		500-yr Flood	8395	99.88	119.61	19.73	1.78	1245	224	371	2507
D/S Abandoned Bridge	41771	Low	35	99.82	109.26	9.44	0.02	220	220	83	426
		U/S Mig L	105	99.82	109.79	9.97	0.06	225	224	86	477
		Normal	461	99.82	111.26	11.44	0.23	246	224	100	608
		U/S Mig H	1628	99.82	113.89	14.07	0.62	528	224	180	939
		2-yr Flood	2503	99.82	115.21	15.39	0.85	666	224	214	1179
		100-yr Flood	5675	99.82	117.30	17.48	1.64	982	224	311	1776
		500-yr Flood	8395	99.82	119.56	19.74	1.78	1210	224	369	2497
U/S River St	39621	Low	35	101.95	109.26	7.31	0.03	262	203	72	367
		U/S Mig L	105	101.95	109.79	7.84	0.09	273	203	75	412
		Normal	461	101.95	111.24	9.29	0.30	491	203	85	526

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)	Volume (ac-ft)
		U/S Mig H	1628	101.95	113.83	11.88	0.77	941	203	153	805
		2-yr Flood	2503	101.95	115.13	13.18	1.04	1075	203	180	1006
		100-yr Flood	5675	101.95	117.12	15.17	1.65	1184	203	269	1523
		500-yr Flood	8395	101.95	119.40	17.45	1.65	1213	203	320	2144
		Low	35	102.66	109.26	6.60	0.03	269	220	71	363
		U/S Mig L	105	102.66	109.79	7.13	0.08	276	220	74	407
		Normal	461	102.66	111.24	8.58	0.28	295	220	84	520
		U/S Mig H	1628	102.66	113.82	11.16	0.72	951	220	151	794
		2-yr Flood	2503	102.66	115.10	12.44	0.96	972	220	178	992
		100-yr Flood	5675	102.66	117.01	14.35	1.55	992	220	267	1505
		500-yr Flood	8395	102.66	119.28	16.62	1.66	1038	220	318	2120
		Low	35	100.28	109.26	8.98	0.02	275	275	60	300
		U/S Mig L	105	100.28	109.79	9.51	0.06	281	281	63	338
		Normal	461	100.28	111.23	10.95	0.20	407	285	70	433
		U/S Mig H	1628	100.28	113.80	13.52	0.51	1182	285	114	640
		2-yr Flood	2503	100.28	115.07	14.79	0.65	1295	285	139	789
		100-yr Flood	5675	100.28	116.93	16.65	1.12	1329	285	225	1225
		500-yr Flood	8395	100.28	119.21	18.93	1.27	1394	285	273	1741
		Low	35	99.67	109.26	9.59	0.03	177	174	28	106
		U/S Mig L	105	99.67	109.79	10.12	0.09	185	177	30	127
		Normal	461	99.67	111.22	11.55	0.31	209	190	34	174
		U/S Mig H	1628	99.67	113.74	14.07	0.83	236	190	44	252
		2-yr Flood	2503	99.67	114.98	15.31	1.13	251	190	59	305
		100-yr Flood	5675	99.67	116.65	16.98	2.23	337	190	132	583
		500-yr Flood	8395	99.67	118.85	19.18	2.80	561	190	162	867
		Low	35	96.59	107.38	10.79	0.03	167	167	28	104
		U/S Mig L	105	96.59	107.95	11.36	0.10	172	172	30	125
		Normal	461	96.59	109.46	12.87	0.34	184	183	34	171
		U/S Mig H	1628	96.59	112.03	15.44	0.88	220	185	44	248
		2-yr Flood	2503	96.59	113.28	16.69	1.19	261	185	59	302
		100-yr Flood	5675	96.59	116.58	19.99	2.06	301	185	131	579
		500-yr Flood	8395	96.59	118.67	22.08	2.64	481	185	162	862
		Low	35	104.81	107.38	2.57	0.23	98	98	27	100
		U/S Mig L	105	104.81	107.95	3.14	0.50	109	109	29	121
		Normal	461	104.81	109.42	4.61	1.21	120	120	32	165
		U/S Mig H	1628	104.81	111.90	7.09	2.38	124	124	43	239
		2-yr Flood	2503	104.81	113.08	8.27	3.01	211	126	57	290
		100-yr Flood	5675	104.81	116.15	11.34	4.61	430	126	128	559
		500-yr Flood	8395	104.81	118.07	13.26	5.61	536	127	157	834
		Low	35	101.12	107.38	6.26	0.05	182	182	24	91
		U/S Mig L	105	101.12	107.94	6.82	0.12	188	188	26	110
		Normal	461	101.12	109.41	8.29	0.39	207	207	29	150
		U/S Mig H	1628	101.12	111.85	10.73	0.95	485	220	38	216
		2-yr Flood	2503	101.12	113.02	11.90	1.23	569	220	51	260
		100-yr Flood	5675	101.12	116.14	15.02	1.84	1407	220	113	497
		500-yr Flood	8395	101.12	118.13	17.01	2.12	1947	220	137	737
		Low	35	106.24	107.24	1.00	0.56	108	108	13	46
		U/S Mig L	105	106.24	107.74	1.50	0.85	137	137	14	59
		Normal	461	106.24	109.08	2.84	1.37	165	165	15	80
		U/S Mig H	1628	106.24	111.10	4.86	2.41	172	172	17	109
		2-yr Flood	2503	106.24	112.00	5.76	3.01	181	174	23	127
		100-yr Flood	5675	106.24	114.57	8.33	4.40	206	174	42	222
		500-yr Flood	8395	106.24	116.40	10.16	5.17	212	174	49	303
		Low	35	106.59	107.08	0.49	1.16	91	91	12	46
		U/S Mig L	105	106.59	107.64	1.05	1.10	134	134	13	58
		Normal	461	106.59	109.00	2.41	1.60	147	147	15	79
		U/S Mig H	1628	106.59	110.97	4.38	2.80	153	151	17	107
		2-yr Flood	2503	106.59	111.81	5.22	3.53	158	152	23	125
		100-yr Flood	5675	106.59	114.24	7.65	5.22	183	153	42	220
		500-yr Flood	8395	106.59	115.99	9.40	6.13	206	153	49	300
		Low	35	105.60	106.15	0.55	3.12	37	37	11	46
		U/S Mig L	105	105.60	106.48	0.88	4.15	47	47	12	57
		Normal	461	105.60	107.40	1.80	5.92	71	71	13	75
		U/S Mig H	1628	105.60	108.88	3.28	7.22	145	138	14	98
		2-yr Flood	2503	105.60	109.98	4.38	6.24	196	184	19	113
		100-yr Flood	5675	105.60	112.97	7.37	5.83	258	184	37	197
		500-yr Flood	8395	105.60	114.92	9.32	6.18	295	184	43	267
Floating Towpath Peninsula	25698	Low	35	94.10	104.40	10.30	0.02	302	302	4	24

Location	River Sta (ft)	Flow Profile	Total Flow (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Max Ch Depth (ft)	Ch Vel (ft/s)	Tot Top Width (ft)	Ch Top Width (ft)	Surface Area (ac)	Volume (ac-ft)
		U/S Mig L	105	94.10	105.40	11.30	0.06	308	308	4	28
		Normal	461	94.10	106.87	12.77	0.21	328	328	4	35
		U/S Mig H	1628	94.10	108.66	14.56	0.57	354	340	5	43
		2-yr Flood	2503	94.10	109.66	15.56	0.79	500	340	6	48
		100-yr Flood	5675	94.10	112.40	18.30	1.37	861	340	8	66
		500-yr Flood	8395	94.10	114.20	20.10	1.76	887	340	8	80
U/S Talbot Mills Dam	25129	Low	35	101.00	104.17	3.17	3.67	14	14		
		U/S Mig L	105	101.00	105.02	4.02	4.72	47	34		
		Normal	461	101.00	106.20	5.20	6.26	108	96		
		U/S Mig H	1628	101.00	108.11	7.11	5.65	174	162		
		2-yr Flood	2503	101.00	108.97	7.97	6.29	176	162		
		100-yr Flood	5675	101.00	111.32	10.32	7.90	185	162		
		500-yr Flood	8395	101.00	112.94	11.94	8.52	195	162		

*Surface area and volume parameters are cumulative values upstream of Talbot Mills Dam.

Table F-4: Proposed Fish Passage Parameters at Low and High Migration Season Flows for the Dam Removal Alternative

Location	River Station (ft)	Average Channel Velocity (ft/s)		Max Channel Water Depth (ft)		Wetted Channel Top Width (ft)	
		Low Flow (105 cfs)	High Flow (1628 cfs)	Low Flow (105 cfs)	High Flow (1628 cfs)	Low Flow (105 cfs)	High Flow (1628 cfs)
Confluence of Sudbury & Assabet Rivers	85935	0.1	0.7	10.3	13.2	160	160
	85496	0.1	1.2	9.0	11.9	130	130
Lowell Rd	85349						
Minute Man National Park	85225	0.1	1.0	8.6	12.8	152	152
Minute Man National Park	84894	0.1	0.8	8.8	13.0	160	160
Minute Man National Park	83593	0.1	1.0	8.4	12.6	131	131
Pedestrian Bridge	83564						
Minute Man National Park	83534	0.2	1.1	8.2	12.8	129	139
Minute Man National Park	83140	0.1	0.7	8.4	13.0	190	190
Minute Man National Park	82742	0.1	0.8	8.4	13.0	170	172
Minute Man National Park	82381	0.1	1.1	9.3	13.8	132	136
Monument St	82325						
	82261	0.1	1.1	7.5	11.9	143	149
	81430	0.1	0.7	8.0	12.5	154	165
Concord Impoundments (west end)	80321	0.1	0.8	8.5	12.9	154	160
Concord Impoundments	77896	0.1	0.2	9.2	13.6	175	178
Concord Impoundments	74744	0.2	0.3	9.0	13.4	94	95
Concord Impoundments (east end)	72510	0.1	0.5	9.0	13.3	205	205
	71553	0.1	0.4	8.8	13.2	378	406
	70916	0.0	0.3	8.2	12.6	411	421
	69822	0.1	0.5	8.0	12.4	193	193
	68947	0.0	0.3	9.2	13.5	390	393
	67500	0.0	0.3	8.9	13.3	420	420
	65823	0.0	0.3	9.5	13.8	403	407
	62142	0.0	0.3	9.4	13.8	392	395
	60443	0.0	0.4	11.6	16.0	312	316
Bedford Rd/Carlisle Rd	60352						
	60144	0.1	0.5	10.0	14.3	281	283
	59022	0.1	0.3	10.2	14.5	320	329
	57314	0.1	0.4	10.2	14.5	313	327
	56182	0.0	0.3	10.2	14.5	450	485
	54675	0.0	0.3	10.1	14.4	457	461
	52382	0.0	0.3	10.2	14.5	510	510
	51565	0.1	0.4	10.3	14.6	316	326
	49861	0.0	0.4	10.8	15.1	340	340
	49630	0.1	0.5	10.6	14.9	254	258
Nashua Rd	49505						
	49390	0.1	0.6	9.8	14.0	254	262
	48032	0.1	0.6	9.5	13.7	237	240
	46753	0.1	0.6	9.4	13.7	274	284
	44901	0.1	0.5	9.3	13.5	295	300
	44098	0.1	0.5	9.2	13.4	316	324
	43510	0.1	1.0	8.2	12.3	175	205
Route 3	43448						
	43243	0.1	1.0	8.0	12.2	170	189
	42548	0.1	0.6	8.0	12.2	267	275
	41859	0.1	0.6	9.9	14.0	221	224
Abandoned Bridge	41819						
	41771	0.1	0.6	10.0	14.1	224	224
	41025	0.1	0.6	8.5	12.6	258	264
	40299	0.1	0.9	8.8	12.8	167	170
	39621	0.1	0.8	7.8	11.9	203	203
River Street	39526						
	39416	0.1	0.7	7.1	11.2	220	220
	39094	0.1	0.6	9.2	13.3	264	266
	37622	0.1	0.5	9.5	13.5	281	285
	36622	0.0	0.4	9.2	13.2	427	441
	34943	0.1	0.6	9.4	13.4	245	261
	33823	0.1	0.5	9.6	13.6	310	335
	33284	0.1	0.5	10.5	14.5	286	292
	33130	0.1	0.8	10.1	14.1	177	190
Boston Road/Route 3A	33086						
	33047	0.1	0.9	11.4	15.4	172	185
Abandoned Bridge Pier	32728	0.5	2.4	3.1	7.1	109	124
Billerica Water Supply Intake	31902	0.1	1.0	6.8	10.7	188	220
	31023	0.2	1.4	6.8	10.6	133	155
	29534	0.1	1.2	7.6	11.2	151	175

Location	River Station (ft)	Average Channel Velocity (ft/s)		Max Channel Water Depth (ft)		Wetted Channel Top Width (ft)	
		Low Flow (105 cfs)	High Flow (1628 cfs)	Low Flow (105 cfs)	High Flow (1628 cfs)	Low Flow (105 cfs)	High Flow (1628 cfs)
	28338	0.9	2.5	1.7	5.1	120	174
Fordway Bar	28107	0.9	2.4	1.5	4.9	137	172
Pollard St	28064						
	28020	1.1	2.8	1.1	4.4	134	151
	27851	0.9	2.7	1.8	5.1	115	160
Grade Control D/S of Fordway Bar	27311	4.2	7.2	0.9	3.3	47	138
	27185	0.6	3.1	3.1	6.6	88	105
	26520	0.3	1.9	4.1	7.4	132	184
	26072	0.2	1.4	6.9	10.2	160	163
Floating Towpath Peninsula	25698	0.1	0.6	11.3	14.6	308	340
	25396	0.1	0.6	11.1	14.4	252	261
	25328	0.1	0.7	9.9	13.2	224	236
	25218	0.1	0.9	8.7	12.0	182	234
	25168	0.1	1.1	6.8	10.0	191	197
	25129	4.7	5.7	4.0	7.1	34	162
Talbot Mills Dam	25121						
	MIN	0.0	0.2	0.9	3.3	34	95
	MAX	4.7	7.2	11.6	16.0	510	510
	AVG	0.3	1.0	8.3	12.3	230	244

Key

- Exceeds low target fish passage thresholds (5 ft/s velocity or 0.67 ft depth)
- Exceeds high target fish passage thresholds (7 ft/s velocity or 0.5 ft depth)