Supplemental Table

Table S1 Essential Genes as defined in the current study.

As described in Methods, an insertion location was not considered valid unless it was represented by at least 10 reads. Genes with three or fewer insertion locations outside the first 1% or last 10% of the gene were defined as essential, regardless of the number of reads associated with them. A requirement for more than three insertion locations in the absence of IR greatly reduces the error in fitness calculations, and conforms to recommendations derived from previous studies using this method (61). In the Table, total insertion reads are indicated in the final column on the right, and the total reads derived from any observed insertions are presented in the column immediately adjacent to it. The designation of genes with two or three insertion locations that have numerous (hundreds to thousands) associated with them as essential may be regarded as tentative.

Gene	Locus Tag	Gene Length	Insertion Reads	Insertion Locations
dnaK	b0014	1917	0	0
yaaY	b0024	219	0	0
ribF	b0025	942	0	0
ileS	b0026	2817	0	0
ispH	b0029	951	0	0
dapB	b0031	822	0	0
folA	b0048	480	0	0
mraZ	b0081	459	0	0
rsmH	b0082	942	0	0
murF	b0086	1359	0	0
mraY	b0087	1083	0	0
ftsW	b0089	1245	0	0
murC	b0091	1476	0	0
lpxC	b0096	918	0	0
secA	b0098	2706	0	0
aceF	b0115	1893	0	0
hemL	b0154	1281	0	0
erpA	b0156	345	0	0
mtn	b0159	699	0	0
dapD	b0166	825	0	0
map	b0168	795	0	0
tsf	b0170	852	0	0
ispU	b0174	762	0	0
cdsA	b0175	858	0	0
lpxB	b0182	1149	0	0
dnaE	b0184	3483	0	0
accA	b0185	960	0	0
gmhB	b0200	576	0	0
rnhA	b0214	468	0	0
lpcA	b0222	579	0	0
insO-1	b0257	426	0	0
hemB	b0369	975	0	0
yaiY	b0379	309	0	0
ribD	b0414	1104	0	0
nusB	b0416	420	0	0
thiL	b0417	978	0	0
dxs	b0420	1863	0	0
lon	b0439	2355	0	0
lpxH	b0524	723	0	0
ybcJ	b0528	213	0	0

mrdA	b0635	1902	0	0
holA	b0640	1032	0	0
lptE	b0641	582	0	0
ubiF	b0662	1176	0	0
fur	b0683	447	0	0
fldA	b0684	531	0	0
seqA	b0687	546	0	0
cydA	b0733	1569	0	0
pal	b0741	522	0	0
ybjH	b0843	285	0	0
cydD	b0887	1767	0	0
trxB	b0888	966	0	0
cmk	b0910	684	0	0
rpsA	b0911	1674	0	0
mukF	b0922	1323	0	0
mukB	b0924	4461	0	0
asnS	b0930	1401	0	0
ycbG	b0956	453	0	0
gnsA	b4517	174	0	0
lpxL	b1054	921	0	0
rpmF	b1089	174	0	0
fabF	b1095	1242	0	0
tmk	b1098	642	0	0
lolC	b1116	1200	0	0
purB	b1131	1371	0	0
icd	b1136	1251	0	0
ariR	b1166	267	0	0
ymgI	b4593	174	0	0
minE	b1174	267	0	0
minC	b1176	696	0	0
ychF	b1203	1092	0	0
lolB	b1209	624	0	0
hemA	b1210	1257	0	0
ldrA	b4419	108	0	0
ldrC	b4423	108	0	0
galU	b1236	909	0	0
tonB	b1252	720	0	0
yciG	b1259	180	0	0
pspB	b1305	225	0	0
ydaC	b1347	210	0	0
ttcC	b4638	50	0	0
ydcD	b1457	483	0	0

yddJ	b1470	1055	0	0
yddK	b1471	326	0	0
yddM	b1477	285	0	0
ydfZ	b1541	204	0	0
ydgU	b4601	84	0	0
tyrS	b1637	1275	0	0
lpp	b1677	237	0	0
pheT	b1713	2388	0	0
infC	b1718	543	0	0
nadE	b1740	828	0	0
yoaI	b1788	105	0	0
yeaZ	b1807	696	0	0
mgrB	b1826	144	0	0
zwf	b1852	1476	0	0
ruvA	b1861	612	0	0
yecJ	b4537	252	0	0
pgsA	b1912	549	0	0
yoeD	b4642	129	0	0
yehD	b2111	543	0	0
yejL	b2187	228	0	0
ypaB	b4605	144	0	0
nrdA	b2234	2286	0	0
elaD	b2269	1212	0	0
nuoI	b2281	543	0	0
ackA	b2296	1203	0	0
ubiX	b2311	570	0	0
folC	b2315	1269	0	0
accD	b2316	915	0	0
ypdK	b4680	72	0	0
ptsH	b2415	258	0	0
dapE	b2472	1128	0	0
der	b2511	1473	0	0
hscA	b2526	1851	0	0
hscB	b2527	516	0	0
iscA	b2528	324	0	0
suhB	b2533	804	0	0
tadA	b2559	504	0	0
pdxJ	b2564	732	0	0
rseA	b2572	651	0	0
trxC	b2582	420	0	0
pssA	b2585	1356	0	0
bamD	b2595	738	0	0

pheL	b2598	48	0	0
grpE	b2614	594	0	0
smpB	b2620	483	0	0
yfjO	b2631	372	0	0
csrA	b2696	186	0	0
ispF	b2746	480	0	0
yqcG	b4682	141	0	0
pyrG	b2780	1638	0	0
yqeJ	b2848	483	0	0
ygeF	b2850	490	0	0
ygeG	b2851	492	0	0
pbl	b2854	503	0	0
lysS	b2890	1518	0	0
ubiH	b2907	1179	0	0
pgk	b2926	1164	0	0
yqgF	b2949	417	0	0
ribB	b3041	654	0	0
folB	b3058	369	0	0
dnaG	b3066	1746	0	0
rpoD	b3067	1842	0	0
yhaL	b3107	165	0	0
yrbN	b4685	81	0	0
rpsO	b3165	270	0	0
rimP	b3170	453	0	0
ispB	b3187	972	0	0
accC	b3256	1350	0	0
fis	b3261	297	0	0
def	b3287	510	0	0
rpoA	b3295	990	0	0
rpsE	b3303	504	0	0
yheN	b3345	387	0	0
crp	b3357	633	0	0
trpS	b3384	1005	0	0
aroK	b3390	522	0	0
ftsE	b3463	669	0	0
sirA	b3470	246	0	0
glyS	b3559	2070	0	0
glyQ	b3560	912	0	0
yibV	b4615	336	0	0
envC	b3613	1260	0	0
rfaD	b3619	933	0	0
rfaF	b3620	1047	0	0

waaA	b3633	1278	0	0
coaD	b3634	480	0	0
rpoZ	b3649	276	0	0
dnaN	b3701	1101	0	0
rpmH	b3703	141	0	0
rnpA	b3704	360	0	0
glmS	b3729	1830	0	0
glmU	b3730	1371	0	0
atpC	b3731	420	0	0
atpH	b3735	534	0	0
atpE	b3737	240	0	0
atpB	b3738	816	0	0
ilvX	b4669	51	0	0
rho	b3783	1260	0	0
wzyE	b3793	1353	0	0
hemC	b3805	942	0	0
xerC	b3811	897	0	0
corA	b3816	951	0	0
yihA	b3865	633	0	0
tpiA	b3919	768	0	0
nusG	b3982	546	0	0
rplA	b3984	705	0	0
rplJ	b3985	498	0	0
rpoC	b3988	4224	0	0
ubiA	b4040	873	0	0
groL	b4143	1647	0	0
frdC	b4152	396	0	0
orn	b4162	546	0	0
yjeV	b4670	54	0	0
valS	b4258	2856	0	0
dnaT	b4362	540	0	0
holD	b4372	414	0	0
yqeK	b2849	426	10	1
glmM	b3176	1338	10	1
ptsN	b3204	492	10	1
rimN	b3282	573	10	1
ppiB	b0525	495	11	1
iraM	b1160	324	11	1
yefM	b2017	252	11	1
eno	b2779	1299	11	1
degS	b3235	1068	11	1
trkA	b3290	1377	11	1

murB	b3972	1029	11	1
croE	b1146	201	12	1
yddL	b1472	278	12	1
holE	b1842	231	12	1
rnc	b2567	681	12	1
ysaC	b4648	104	12	1
pstC	b3727	960	12	1
holB	b1099	1005	13	1
lolE	b1118	1245	13	1
mliC	b1639	330	13	1
nrdB	b2235	1131	13	1
yliL	b0816	270	14	1
yoeI	b4678	63	14	1
mreB	b3251	1044	14	1
yjeE	b4168	462	14	1
sapC	b1292	891	15	1
fepB	b0592	957	16	1
tatE	b0627	204	16	1
tolQ	b0737	693	16	1
yigP	b3834	606	16	1
pspD	b1307	222	17	1
ypeB	b4546	219	17	1
hemD	b3804	741	17	1
rpsG	b3341	540	18	1
uof	b4637	87	19	1
mnmA	b1133	1107	19	1
ruvB	b1860	1011	19	1
yojO	b4604	165	19	1
yrbA	b3190	255	19	1
rpe	b3386	678	19	1
yccK	b0969	330	20	1
murJ	b1069	1536	20	1
ruvC	b1863	522	21	1
gltX	b2400	1416	21	1
surA	b0053	1287	22	1
sucB	b0727	1218	22	1
tolR	b0738	429	22	1
argS	b1876	1734	22	1
hisL	b2018	51	22	1
hemG	b3850	546	22	1
ftsH	b3178	1935	23	1
rpoH	b3461	855	23	1

ybfB	b0702	327	24	1
lepB	b2568	975	24	1
dinQ	b4613	129	24	1
sdhD	b0722	348	25	1
rpsI	b3230	393	25	1
cydC	b0886	1722	26	1
yciU	b1248	330	26	1
ykfM	b4586	480	27	1
dcd	b2065	582	27	1
mnmG	b3741	1890	27	1
yhfG	b3362	168	28	1
yceD	b1088	522	29	1
nuoK	b2279	303	29	1
yheL	b3343	288	29	1
bamA	b0177	2433	30	1
obgE	b3183	1173	30	1
yehC	b2110	720	31	1
recC	b2822	3369	31	1
yceQ	b1085	321	32	1
hisS	b2514	1275	32	1
insA-7	b4294	276	32	1
secM	b0097	513	33	1
proS	b0194	1719	33	1
rpmE	b3936	213	33	1
rnt	b1652	648	35	1
atpA	b3734	1542	35	1
coaE	b0103	621	36	1
nuoH	b2282	978	36	1
ecnA	b4410	126	37	1
iscU	b2529	387	38	1
ftsQ	b0093	831	40	1
skp	b0178	486	40	1
hns	b1237	414	40	1
dgkA	b4042	369	41	1
ykgI	b0303	237	42	1
ymjD	b4673	66	42	1
marA	b1531	384	42	1
ybhT	b0762	150	43	1
ybaB	b0471	330	45	1
racC	b1351	276	45	1
ynbB	b1409	897	45	1
metJ	b3938	318	45	1

rseP	b0176	1353	46	1
ligA	b2411	2016	46	1
mntR	b0817	468	48	1
gyrB	b3699	2415	48	1
atpF	b3736	471	48	1
ybgC	b0736	405	49	1
yjbS	b4621	204	50	1
lgt	b2828	876	51	1
yfjW	b2642	1704	52	1
rpoB	b3987	4029	52	1
yhcN	b3238	264	53	1
nusA	b3169	1488	55	1
hfq	b4172	309	55	1
thrL	b0001	66	56	1
cysS	b0526	1386	58	1
ihfA	b1712	300	60	1
lptA	b3200	558	60	1
lptD	b0054	2355	61	1
ydbJ	b4529	267	61	1
ffh	b2610	1362	62	1
iscS	b2530	1215	64	1
pgm	b0688	1641	65	1
leuS	b0642	2583	68	1
yaeP	b4406	201	69	1
rpoN	b3202	1434	71	1
yciZ	b4596	174	74	1
deoR	b0840	759	76	1
mprA	b2684	531	76	1
yidC	b3705	1647	78	1
ylcI	b4589	195	79	1
miaA	b4171	951	79	1
ymgC	b1167	249	82	1
yffM	b2444	246	88	1
infB	b3168	2673	88	1
dnaC	b4361	738	89	1
ygeI	b2853	219	92	1
atpI	b3739	381	92	1
minD	b1175	813	93	1
ftsB	b2748	312	93	1
xerD	b2894	897	96	1
zipA	b2412	987	97	1
rpsD	b3296	621	97	1

rplB	b3317	822	100	1
pdxH	b1638	657	101	1
mukE	b0923	705	106	1
ralR	b1348	195	110	1
yhbY	b3180	294	112	1
yajC	b0407	333	115	1
lolD	b1117	702	118	1
polA	b3863	2787	126	1
fepG	b0589	993	128	1
murE	b0085	1488	133	1
yjeK	b4146	1029	135	1
pfkA	b3916	963	139	1
ybgT	b4515	114	140	1
yafN	b0232	294	144	1
rpsR	b4202	228	144	1
rpsT	b0023	264	145	1
ftsZ	b0095	1152	146	1
msbA	b0914	1749	146	1
appY	b0564	750	151	1
aspS	b1866	1773	162	1
thrS	b1719	1929	169	1
ymiB	b4672	105	170	1
zapA	b2910	330	179	1
ydiI	b1686	411	181	1
folE	b2153	669	185	1
fusA	b3340	2115	199	1
fepC	b0588	816	204	1
ftsY	b3464	1494	214	1
ymfR	b1150	183	236	1
metG	b2114	2034	244	1
yfiD	b2579	384	248	1
folD	b0529	867	257	1
gpsA	b3608	1020	259	1
tufB	b3980	1185	263	1
hspQ	b0966	318	283	1
pheS	b1714	984	286	1
yfgJ	b2510	216	304	1
dut	b3640	456	307	1
ydiH	b1685	189	310	1
folP	b3177	849	316	1
yacL	b0119	363	321	1
cydB	b0734	1140	325	1

srlB	b2704	372	328	1
ydgC	b1607	336	389	1
ybfQ	b4514	237	428	1
ygfY	b2897	267	431	1
murA	b3189	1260	457	1
ppa	b4226	531	461	1
yfjG	b2619	477	493	1
ymjC	b4525	139	516	1
yccE	b1001	1257	538	1
ispG	b2515	1119	543	1
yheM	b3344	360	574	1
holC	b4259	444	590	1
psd	b4160	969	718	1
poxA	b4155	978	901	1
nrdH	b2673	246	975	1
exbD	b3005	426	1171	1
lexA	b4043	609	1177	1
parE	b3030	1893	20	2
ykfF	b0249	240	21	2
marB	b1532	219	25	2
topA	b1274	2598	27	2
yniD	b4535	108	28	2
yebG	b1848	291	28	2
ydcX	b1445	174	31	2
eutN	b2456	288	31	2
slyX	b3348	219	31	2
rnb	b1286	1935	32	2
coaA	b3974	951	32	2
yccJ	b1003	228	34	2
ivbL	b3672	99	35	2
ybdD	b4512	198	36	2
lipB	b0630	642	37	2
ypeC	b2390	327	39	2
recA	b2699	1062	39	2
nuoE	b2285	501	40	2
cynT	b0339	660	41	2
yjgA	b4234	552	42	2
ymfI	b1143	342	43	2
ydiE	b1705	192	43	2
yjiX	b4353	204	47	2
ymdF	b4518	174	52	2
ptsI	b2416	1728	52	2

kdsC	b3198	567	52	2
pth	b1204	585	55	2
rof	b0189	255	57	2
ccmD	b2198	210	58	2
ypfN	b4547	201	64	2
ykfK	b4628	193	66	2
gshB	b2947	951	67	2
yceO	b1058	141	69	2
lepA	b2569	1800	69	2
yhaC	b3121	1188	69	2
ybbC	b0498	369	71	2
yeaC	b1777	273	72	2
glyA	b2551	1254	74	2
yrhD	b4612	156	74	2
matA	b0294	591	75	2
asd	b3433	1104	75	2
pstB	b3725	774	76	2
yjdK	b4128	297	76	2
kilR	b1352	222	77	2
rluD	b2594	981	77	2
sspA	b3229	639	78	2
phnG	b4101	453	81	2
yqgD	b2941	252	83	2
ynhF	b4602	90	84	2
fepD	b0590	1005	87	2
prmB	b2330	933	88	2
cyoC	b0430	615	95	2
secB	b3609	468	95	2
yibL	b3602	363	98	2
ybjK	b0846	537	100	2
ykfN	b4626	64	101	2
ydiZ	b1724	291	101	2
iscX	b2524	201	106	2
rsxG	b1631	621	110	2
osmC	b1482	432	113	2
cspD	b0880	225	121	2
sapD	b1291	993	126	2
nlpI	b3163	885	127	2
torI	b4501	201	131	2
tufA	b3339	1185	138	2
ybcV	b0558	411	143	2
ylbG	b0502	412	144	2

ftsK	b0890	3990	145	2
yjeT	b4176	198	147	2
rsxD	b1630	1059	149	2
insA-3	b0275	276	150	2
thiS	b4407	201	153	2
yoaK	b4676	99	159	2
lnt	b0657	1539	161	2
yncK	b4578	432	162	2
rraB	b4255	417	171	2
vsr	b1960	471	173	2
aceE	b0114	2664	178	2
yffS	b2450	810	180	2
dnaX	b0470	1932	182	2
rppH	b2830	531	189	2
ubiD	b3843	1494	191	2
yggX	b2962	276	192	2
ilvL	b3766	99	198	2
yohP	b4679	84	200	2
bcsF	b3537	192	200	2
yjgF	b4243	387	204	2
kdpF	b4513	90	205	2
ydhL	b1648	240	215	2
ibpA	b3687	414	225	2
mcbA	b0806	261	231	2
plsC	b3018	738	232	2
tolB	b0740	1293	236	2
racR	b1356	477	241	2
ybjQ	b0866	324	248	2
ldrB	b4421	108	248	2
ogrK	b2082	219	251	2
priA	b3935	2199	263	2
pspG	b4050	243	271	2
recB	b2820	3543	288	2
nadD	b0639	642	298	2
rbfA	b3167	402	298	2
ygdI	b2809	228	300	2
lptC	b3199	576	305	2
yneL	b1506	209	312	2
ypjI	b4644	272	320	2
ykgP	b4630	92	324	2
lpxM	b1855	972	324	2
tdcR	b3119	219	326	2

ygfZ	b2898	981	352	2
ypdJ	b4545	63	369	2
moaD	b0784	246	385	2
fbaA	b2925	1080	394	2
secG	b3175	333	395	2
dinI	b1061	246	413	2
atpD	b3732	1383	421	2
thyA	b2827	795	425	2
napD	b2207	264	439	2
ymfD	b1137	666	442	2
mazE	b2783	249	479	2
yqgB	b2939	132	479	2
yncN	b4532	177	539	2
rmf	b0953	168	565	2
yacG	b0101	198	570	2
rsgA	b4161	1053	593	2
plsB	b4041	2424	614	2
pnp	b3164	2136	679	2
hslJ	b1379	423	749	2
lipA	b0628	966	765	2
guaA	b2507	1578	767	2
proQ	b1831	699	771	2
dksA	b0145	456	820	2
oppD	b1246	1014	945	2
ypeA	b2434	426	1065	2
icdC	b4519	165	1101	2
ygiZ	b3027	333	1484	2
gloA	b1651	408	1523	2
yaaX	b0005	297	1555	2
ygjD	b3064	1014	1711	2
ribC	b1662	642	1728	2
yciB	b1254	540	1825	2
rsmA	b0051	822	40	3
ypjK	b2635	237	50	3
ynaE	b1375	267	55	3
srmB	b2576	1335	59	3
ycbK	b0926	549	60	3
yqeH	b2846	633	60	3
fliQ	b1949	270	71	3
parC	b3019	2259	72	3
ygjM	b3082	417	72	3
fre	b3844	702	72	3

chaB	b1217	231	75	3
ykgH	b0310	669	76	3
yeiW	b4502	255	78	3
folK	b0142	480	81	3
hybG	b2990	249	85	3
cheY	b1882	390	94	3
nsrR	b4178	426	96	3
acpH	b0404	582	100	3
yfjF	b2618	291	101	3
sapF	b1290	807	105	3
yegJ	b2071	462	106	3
yqaE	b2666	159	109	3
yciA	b1253	399	117	3
greA	b3181	477	122	3
atpG	b3733	864	124	3
ubiC	b4039	498	127	3
yaiZ	b0380	213	132	3
sapB	b1293	966	135	3
ydeO	b1499	762	135	3
yafQ	b0225	279	139	3
cysE	b3607	822	139	3
insA-2	b0265	276	144	3
yhcB	b3233	399	146	3
pgl	b0767	996	147	3
insA-5	b1894	276	148	3
yohO	b4542	108	152	3
grxC	b3610	252	152	3
yjcF	b4066	1293	157	3
rfaE	b3052	1434	167	3
ybaQ	b0483	342	177	3
rutB	b1011	693	178	3
glcG	b2977	405	187	3
yncJ	b1436	231	188	3
insA-1	b0022	276	191	3
yfbN	b2273	717	203	3
nrdR	b0413	450	215	3
sdhC	b0721	390	215	3
rcnR	b2105	273	215	3
rfaC	b3621	960	226	3
ybfK	b4590	258	229	3
mrdB	b0634	1113	234	3
rimL	b1427	540	235	3

yjgL	b4253	1815	238	3
cspE	b0623	210	239	3
ybaA	b0456	354	240	3
yaeH	b0163	387	259	3
yeaO	b1792	348	270	3
yncL	b4598	96	271	3
yifE	b3764	339	274	3
ydcA	b1419	174	278	3
yedN	b4495	1135	285	3
intG	b1936	125	295	3
yqjK	b3100	300	305	3
ykgS	b4688	206	306	3
yibT	b4554	210	307	3
sucA	b0726	2802	315	3
yrdF	b4697	143	332	3
yqhA	b3002	495	336	3
tatC	b3839	777	336	3
yqgC	b2940	216	337	3
fryB	b2387	327	342	3
nuoM	b2277	1530	374	3
ybiJ	b0802	261	377	3
truA	b2318	813	383	3
shoB	b4687	81	384	3
ygbF	b2754	285	384	3
ybfC	b0704	570	411	3
frwD	b3953	342	429	3
ybaM	b0466	162	432	3
crcB	b0624	384	440	3
ppiC	b3775	282	440	3
grxA	b0849	258	453	3
arcA	b4401	717	454	3
glnD	b0167	2673	456	3
yfcZ	b2343	285	456	3
purE	b0523	510	464	3
beeE	b1151	408	466	3
yjjY	b4402	141	488	3
ycfP	b1108	543	496	3
yifL	b4558	204	501	3
pgpA	b0418	519	511	3
yncK_2	b4530	168	524	3
nfuA	b3414	576	563	3
yccB	b4592	93	572	3

ldrD	b4453	108	576	3
ypfM	b4606	60	614	3
yoeB	b4539	255	622	3
pta	b2297	2145	702	3
zapB	b3928	246	702	3
wzb	b2061	444	761	3
citX	b0614	552	771	3
sbmC	b2009	474	845	3
hslR	b3400	402	888	3
ybfA	b0699	207	919	3
rlmH	b0636	468	924	3
slyA	b1642	435	974	3
umuD	b1183	420	1196	3
crr	b2417	510	1306	3
yqcA	b2790	450	1330	3
ylcG	b4509	141	1418	3
ypjJ	b4548	201	1709	3
grxD	b1654	348	1900	3
yjaA	b4011	384	2407	3
yecH	b1906	240	2411	3
tatA	b3836	270	2639	3
yoeF	b4538	183	3673	3
yoaH	b1811	180	8402	3