



RELATED CORRESPONDENCE

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DOCKETED
USNRC

April 10, 1987

'88 SEP 16 P12:04

David T. Case, Esq.
Kirkpatrick & Lockhart
South Lobby - 9th Floor
1800 M Street, N.W.
Washington, DC 20036-5891

In the Matter of
Long Island Lighting Company
(Shoreham Nuclear Power Station, Unit 1)
Docket No. 50-322-OL-3 (Emergency Planning)

Dear Mr. Case:

Enclosed are the calculations of Lewis G. Hulman which you requested during the deposition of March 10, 1987. Tr. 53-54. Please note that the pages should be arranged as follows:

- 1 - 5 - 9
- 2 - 6 - 10
- 3 - 7 - 11
- 4 - 8 - 12

Sincerely,

Richard G. Bachmann
Counsel for NRC Staff

cc w/encl.: J. Christman
R. Zahnleuter
W. Cumming

cc w/o encl.: Remainder of Service List

8809190183 870410
PDR ADOCK 05000322
G PDR

DS07

SHOREHAM FOOTPRINT CALCULATIONS
 BY L. G. HULMAN, USNRC
 APRIL 7, 1987

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DIRECTION      N      NNE      NE      ENE      E      ESE      SE
TWO MILE      0      7      56     1209     1832     1385     1305
TEN MILE      0      7      56     1393     11627    11429     6838
POPULATION BY SECTOR & DISTANCE FROM UPDATED FSAR, DATED DECEMB
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TWO MILE
FIVE MILE
TEN MILE
POPULATION BY DISTANCE FROM TABLE 2 OF NUREG-0348 DATED
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TWO MILE      0      7      54     1168     1586     1169     1102
FIVE MILE
TEN MILE      0      7      54     1340     10392    8769     5879
POPULATION DISTRIBUTION BY SECTOR FROM UPDATED FSAR, DATED DECEMBER, 1986
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STABILITY CLASS NUMBER OF HOURS BY DIRECTION

STABILITY CLASS	N	NNE	NE	ENE	E	ESE	SE
A	108	60	79	97	23	17	29
B	30	12	16	18	14	10	20
C	15	6	13	24	16	11	19
D	92	77	149	167	172	96	108
E	71	56	68	68	67	61	58
F & G	21	14	7	11	15	30	46

HOURLY DATA TAKEN FROM FSAR TABLE 2.3.2-7 THROUGH TABLE 2.3.2-1

NO PERSISTENCE DATA IN HOURS

NO PERSISTENCE DATA IN HOURS	N	NNE	NE	ENE	E	ESE	SE
HOURLY PERSISTENCE DATA TAKEN FROM UPDATED FSAR DATA FOR	159	134	159	100	51	67	110

WIND ROSE DATA

HOURS	DIRECTION	REVERSED
0	325	729
HOURLY WIND DIRECTION, 10/1/73 TO 9/30/74 TAKEN FROM SHOREHAM FSAR TA	898	625
	363	776
		1219

DISTANCE ACROSS FLUME CENTERLINE AT 10 MILES AND 22.5 DEGREES WIDE
 $L = 2 R \sin(22.5/2)$
 $L = 2 \times 10 \times .20364$
 $L = 4.0738 \text{ MILES}$

DISTANCE TO THE FLUME CENTERLINE
 $D = R \cos$ 11
 $D =$ 10 MILES

AVERAGE DISTANCE TO FLUME CENTERLINE
 $L' =$ 10 MILES
 $L' =$ 159 = 1592 METERS

CASE 1

THREE

THREE SIGMA

STABILITY SIGMA Y AT DISTANCES OF *****RATIO TO SECTOR WIDTH @

CLASS	MILE 2	MILES 5	MILE 10	MILE 2	MILE 5	MILE 10
A	864	1000	3000	0.259	0.305	0.462
B	648	2778	3000	0.494	0.847	0.462
C	492	2109	3000	0.375	0.643	0.462
D	348	1485	2778	0.265	0.453	0.428
E	246	1056	1974	0.188	0.322	0.304
F	171	729	1362	0.130	0.222	0.210

SIGMA Y VALUES TAKEN FROM PAVAN COMPUTER RUN DATED MARCH 20 OF 1987.
 PAVAN DOCUMENTED IN NUREG CR-2258, PNL-4413, DATED NOVEMBER, 1982

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 >>>>>> CASE 1 =====

STABILITY WEIGHTED POPULATION BY SECTOR = RATIO TO SECTOR WIDTH

CLASS	0	7	56	1563	10883	10666	6417
A	0	7	56	1563	10883	10666	6417
B	0	7	56	1563	10883	10666	6417
C	0	7	56	1563	10883	10666	6417
D	0	7	56	1367	10217	9983	6041
E	0	7	56	1321	7748	7492	4669
F	0	7	56	1286	5946	5603	3629

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 >>>>>> CASE 2 =====

STABILITY WEIGHTED POPULATION BY SECTOR = RATIO TO SECTOR WIDTH

CLASS	0	7	56	1597	22480	22558	12969
A	0	7	56	1597	22480	22558	12969
B	0	7	56	1528	18797	18781	10888
C	0	7	56	1414	12744	12574	7469
D	0	7	56	1334	8473	8195	5056
E	0	7	56	1283	5789	5443	3540
F	0	7	56	1281	5652	5302	3463

STABILITY HOURS BY DIRECTION REVERSED

CLASS	75	187	255	140	48	72	172
A	75	187	255	140	48	72	172
B	29	54	81	46	19	44	85
C	15	38	53	40	14	16	48
D	96	222	264	173	68	147	338
E	96	181	189	156	101	179	365
F	14	46	56	70	113	318	311

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 CASE 2 SORTED CASE 2

WT POP	HRS	SUM	GRAPH WTOP+DEL	HRS	SUM	GRAPH PERCENT
0	75	75	118043	97	97	1.235
7	187	262	112647	23	120	1.528
56	255	517	99853	18	138	1.757
1597	140	657	95119	14	152	1.936
22480	48	705	86516	17	169	2.152
22558	72	777	73649	10	179	2.279
12969	172	949	69161	34	203	2.585
38702	70	1019	66309	16	219	2.789
46415	46	1065	62567	46	265	3.375
41887	29	1094	55710	29	294	3.744
73949	17	1111	53972	16	310	3.948

101069	23	1134	52760	70	380	4.839
106537	97	1231	52500	11	391	4.979
0	79	1310	48337	20	411	5.234
0	60	1370	47720	167	578	7.360
0	108	1478	45984	172	750	9.550
0	29	1507	45914	32	782	9.958
7	54	1561	39844	14	796	10.136
56	81	1642	37580	96	892	11.359
1528	46	1688	36220	19	911	11.601
18797	19	1707	35551	72	983	12.518
18781	44	1751	35026	48	1031	13.129
10888	85	1836	34662	19	1050	13.371
31856	32	1868	34246	68	1118	14.237
19820	16	1884	33557	11	1129	14.377
14514	20	1904	33211	67	1196	15.230
61082	10	1914	32559	15	1211	15.421
83541	14	1928	31774	44	1255	15.981
89047	18	1946	31343	19	1274	16.223
0	16	1962	29877	80	1354	17.242
0	12	1974	28203	61	1415	18.019
0	30	2004	27724	30	1445	18.401
0	15	2019	27672	108	1553	19.776
7	38	2057	26723	132	1685	21.457
56	53	2110	26042	172	1857	23.647
1414	40	2150	25567	16	1873	23.851
12744	14	2164	25290	14	1887	24.029
12574	16	2180	23961	85	1972	25.111
7469	48	2228	23613	90	2062	26.257
20604	19	2247	23293	75	2137	27.213
25692	14	2261	22299	58	2195	27.951
22197	19	2280	22025	46	2241	28.537
19933	11	2291	21734	132	2373	30.218
54731	16	2307	2147	121	2494	31.759
57655	24	2331	21188	147	2641	33.630
0	13	2344	21019	68	2709	34.496
0	6	2350	20542	48	2757	35.108
0	15	2365	18436	179	2936	37.387
0	96	2461	18335	101	3037	38.673
7	223	2684	18295	318	3355	42.723
56	284	2948	18198	113	3468	44.161
1334	173	3121	18129	338	3806	48.466
8473	68	3189	16613	365	4171	53.113
8125	147	3336	16536	211	4382	55.800
5056	338	3674	14766	140	4522	57.583
12665	132	3806	14697	46	4568	58.169
15725	80	3885	14583	40	4608	58.678
13849	108	3994	14503	173	4781	60.881
25013	96	4090	14452	156	4937	62.868
34406	172	4262	14450	70	5007	63.759
36214	167	4429	14434	56	5063	64.472
0	149	4578	14434	81	5144	65.504
0	77	4655	14434	189	5333	67.910
0	92	4747	14434	264	5597	71.272
0	96	4843	14434	255	5852	74.519
7	181	5024	14434	53	5905	75.194
56	189	5213	14385	187	6092	77.575

1287	156	5369	14385	46	6178	78.161
5789	101	5470	14385	181	6319	80.466
5443	179	5649	14385	223	6542	83.306
3540	365	6014	14385	54	6596	83.993
7676	132	6146	14385	38	6634	84.477
9461	90	6236	14378	96	6730	85.700
8476	58	6294	14378	13	6743	85.865
15676	61	6355	14378	15	6758	86.056
21673	67	6422	14378	92	6850	87.228
22740	68	6490	14378	30	6880	87.610
0	68	6558	14378	149	7029	89.507
0	56	6614	14378	12	7041	89.660
0	71	6685	14378	56	7097	90.373
0	14	6699	14378	16	7113	90.577
7	46	6745	14378	14	7127	90.755
56	56	6801	14378	29	7156	91.124
1281	70	6871	14378	15	7171	91.315
8652	113	6984	14378	108	7279	92.691
5302	318	7302	14378	96	7375	93.913
3463	211	7513	14378	60	7435	94.677
7421	121	7634	14378	66	7503	95.543
9141	75	7709	14378	79	7582	96.549
8202	46	7755	14378	75	7657	97.504
15157	30	7785	14378	7	7664	97.593
20981	15	7800	14378	77	7741	98.574
22031	11	7811	14378	6	7747	98.650
0	7	7816	14378	71	7818	99.554
0	14	7832	14378	14	7832	99.733
0	21	7853	14378	21	7853	100.000

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NOTE: FROM THIS COLUMN TO THIS COLUMN PLACE OUTPUT SHEETS ON THE RIGHT SIDE OF THE CORRESPONDING FIRST FOUR SHEETS

««««««««

SE	S	SW	SW	WSW	W	WNW	NW
320	226	555	1811	2800	1872	0	0
18528	33086	20162	36032	49417	52149	0	0

EP. 1986 FOR THE YEAR 2020. SUMMER SUMMER

OCTOBER, 1979

270	191	468	1528	2477	2525	0	0
15899	19761	17121	30433	41827	45253	0	0

FOR THE YEAR 2000 SUMMER

46	70	172	72	48	140	255	187
16	32	85	44	19	46	81	54
14	19	48	16	14	40	53	38
80	132	338	147	68	173	264	223
90	132	365	179	101	156	189	181
75	121	211	318	113	70	56	46

FOR PERIOD FROM 10/1/73 TO 9/30/74

100	134	358	212	147	80	236	404
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BROOKHAVEN AT 37 FOOT LEVEL

506	331	280	225	307	185	332	225
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RLE 2.3.2'14

CASE 2
SIX SIGMA RATIO TO

Y	SECTOR W
MILE 10	AT MILE 10
6900	2.11
5670	1.73
3650	1.11
2220	0.68
1320	0.40
1275	0.39

SIGMA Y VALUES TAKEN FROM STANDARD PLOT SUCH
FIGURE 1 OF REGULATORY GUIDE 1.145

Y POPULATION BETWEEN 2 AND 10 MILES + 2-MILE POPULATION IN THE SECTOR

17144	21349	18672	33431	45874	48312	0	0
17144	21349	18672	33431	45874	48312	0	0
17144	21349	18672	33431	45874	48312	0	0
15906	19794	17337	31104	42704	44568	0	0
11390	14125	12476	22617	31143	32772	0	0
7967	9827	6790	16184	22379	27526	0	0

X POPULATION BETWEEN 2 AND 10 MILES + 2 MILE POPULATION IN THE SECTOR

38702	48415	41887	73949	101069	106537	0	0
31856	39820	34514	61082	83541	86047	0	0
23604	25692	22197	39933	54731	57255	0	0
12665	15725	13849	25913	34406	36214	0	0
7676	9461	8476	15636	21633	22740	0	0
7421	9141	8202	15157	20981	22051	0	0

70	46	29	17	23	97	79	60
32	16	20	10	14	18	16	12
19	14	19	11	16	24	13	8
172	80	108	96	172	167	149	77
132	90	58	61	67	68	68	56
121	75	46	30	15	11	7	14

DELTA 2 CASE 3

MILE POP	POP	DIRECTION	SORTED		CASE 1		
			HOURS BY POPULA-	GRAPH	GRAPH	PERCENT	WT POP
			TION	HRS	SUM HRS		
14378	14378	325	63555	385	385	4.90	0
14378	14378	729	60995	307	692	8.81	7
14378	14378	898	48599	225	917	11.68	56
17169	14562	625	37238	321	1278	15.76	1597
12546	24173	363	33985	280	1518	19.33	2013
13993	24422	776	32586	506	2024	25.77	22558
13073	19911	1219	24422	776	2800	35.66	12969
14058	32586	506	24173	363	3163	40.28	38702
14152	37238	321	19911	1219	4382	55.80	48415
13923	33985	280	14562	625	5007	63.76	41887
12567	48599	225	14378	332	5339	67.99	73949

14378	60995	507	14378	325	5664	72.13	101069
14378	63555	585	14378	729	6393	81.41	106537
14378	14378	332	14378	898	7291	92.84	0
14378	14378	325	14378	325	7516	95.71	0
14378	14378	337	14378	337	7653	100.00	0
14378							0
14378							7
14378							56
14169							1528
14546							18797
14993							18781
14073							10888
14058							31856
14182							39820
14823							34514
14567							61082
14578							83541
14506							88047
14378							0
14378							0
14378							0
14378							0
14378							7
14378							56
14169							1414
14546							12744
14993							12574
14073							7469
14058							20604
14182							25692
14823							22397
14567							39933
14578							54731
14506							57655
14378							0
14378							0
14378							0
14378							0
14378							7
14378							56
14169							1334
14546							8473
14993							8195
14073							5056
14058							12665
14182							15725
14823							13849
14567							25013
14578							34406
14506							36214
14378							0
14378							0
14378							0
14378							0
14378							7
14378							56

17169	1283
12546	5789
12993	5443
13073	3540
14058	7676
14152	8461
13823	8476
12567	15636
11578	21633
11506	22740
14378	0
14378	0
14378	0
14378	0
14378	7
14378	56
17169	1281
12546	5652
12993	5302
13073	3463
14058	7421
14152	9141
13823	8202
12567	15157
11578	20981
11506	22051
14378	0
14378	0
14378	0

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>>>NOTE: FROM THIS COLUMN TO THIS COLUMN <<<<<<<<<
 PLACE OUTPUT SHEETS ON THE RIGHT SIDE OF THE CORRESPONDING
 SECOND FOUR SHEETS

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LNW TOTAL
 0 14378
 0 230624

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5800
 22000
 82000

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0 12448
 49698
 0 197736

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75 1478
 29 526
 13 361
 96 2382
 96 1938
 14 1168

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317 2768

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337 7850

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108	1478
30	526
18	361
92	2182
71	1938
21	1168

WT POP+		SORTED		SUM		PERCENT		WT POP +	
HOURS	DELTA POP	HOURS	GRAPH WT POP+	HOURS	HOURS	GRAPH TIME	DEL	2MI	
75	14378	75	59818	97	97	1.24		80589	
187	14385	187	59818	24	121	1.54		77890	
255	14434	255	59818	16	139	1.77		71343	
140	14766	140	57452	23	162	2.06		67917	
48	14559	48	57452	16	178	2.27		62993	
72	35851	72	57452	14	192	2.44		57006	
172	26042	172	56474	167	359	4.57		55826	
70	52760	70	54282	172	531	6.76		55334	
46	62567	46	45998	17	548	6.98		52624	
29	55710	29	45998	10	558	7.11		48867	
17	86516	17	45998	11	569	7.25		46742	

23	112647	23	44278	68	837	8.11	45736
97	118043	97	43671	96	733	9.33	45702
79	14378	79	42721	67	800	10.19	45427
60	14378	60	35501	16	816	10.39	45075
108	14378	108	35501	46	862	10.98	44559
29	14378	29	35501	14	876	11.15	44524
54	14385	54	35184	61	937	11.93	41946
81	14434	81	35032	11	948	12.07	40357
46	14697	46	33957	15	963	12.26	38860
19	31343	19	33946	80	1043	13.28	38370
44	31774	44	32495	19	1062	13.52	38120
85	31961	85	32495	20	1082	13.78	37877
32	45914	32	32495	29	1111	14.15	37775
16	51972	16	31202	70	1181	15.04	37618
20	48337	20	31202	32	1213	15.45	37510
10	73649	10	31202	19	1232	15.69	36506
14	95119	14	31162	108	1340	17.06	36035
18	99853	18	29964	132	1472	18.74	35669
16	14378	16	28751	30	1502	19.13	35429
12	14378	12	28277	90	1592	20.27	35403
30	14378	30	26299	58	1650	21.01	34929
15	14378	15	25448	132	1782	22.69	34654
38	14385	38	23979	75	1857	23.65	34588
53	14434	53	23659	72	1929	24.56	34366
40	14583	40	23659	16	1945	24.77	33342
14	25290	14	23659	44	1989	25.33	32894
16	25567	16	23429	14	2003	25.51	32576
48	20542	48	23429	19	2022	25.75	32491
19	34662	19	23429	48	2070	26.36	32163
14	39844	14	22976	147	2217	28.23	32077
19	36320	19	22763	68	2285	29.10	32069
11	52500	11	22613	46	2331	29.68	32024
16	68309	16	22025	121	2452	31.22	31949
24	69161	24	20485	179	2531	33.50	30785
13	14378	13	20294	101	2732	34.79	30735
6	14378	6	19490	85	2817	35.87	30715
15	14378	15	19490	48	2865	36.48	30666
96	14378	96	19490	172	3037	38.67	30623
223	14385	223	19114	338	3375	42.98	29507
264	14434	264	18596	318	3693	47.03	29423
173	14503	173	18492	113	3806	48.47	29289
68	21019	68	17742	365	4171	53.11	28812
147	21188	147	16702	211	4382	55.80	28812
338	18129	338	14732	40	4422	56.31	28812
132	26723	132	14732	46	4468	56.90	28793
80	29877	80	14732	140	4608	57.68	28792
108	27672	108	14536	173	4781	60.88	28763
96	37580	96	14490	156	4937	62.87	28756
172	46984	172	14455	70	5007	63.76	28756
167	47720	167	14434	53	5060	64.43	28756
149	14378	149	14434	255	5315	67.68	28756
77	14378	77	14434	264	5579	71.04	28756
92	14378	92	14434	189	5768	73.45	28756
96	14378	96	14434	56	5824	74.16	28756
181	14385	181	14434	81	5905	75.19	28756
189	14434	189	14385	38	5943	75.68	28756

156	14452	156	14385	223	6166	78.52	28636
101	18335	101	14385	181	6347	80.82	28595
179	18436	179	14385	54	6401	81.51	28530
165	16613	365	14385	46	6447	82.10	28530
132	21734	132	14385	187	6574	84.48	28450
90	22613	90	14378	96	6700	85.70	28443
58	22299	58	14378	13	6743	85.87	28436
61	28203	61	14378	15	6758	86.06	28263
67	33211	67	14378	92	6850	87.23	28201
68	34246	68	14378	30	6880	87.61	28201
68	14378	68	14378	149	7029	89.51	28042
56	14378	56	14378	12	7041	89.66	27645
71	14378	71	14378	56	7097	90.37	27554
14	14378	14	14378	15	7113	90.58	27547
46	14385	46	14378	14	7127	90.76	27458
56	14434	56	14378	29	7156	91.12	27451
70	14450	70	14378	15	7171	91.32	27378
113	18198	113	14378	108	7279	92.69	27371
318	18295	318	14378	96	7375	93.91	27001
211	16836	211	14378	60	7435	94.68	26945
121	21479	121	14378	68	7503	95.54	26945
75	23293	75	14378	79	7582	96.55	26931
46	22025	46	14378	75	7657	97.50	26924
30	27724	30	14378	7	7684	97.59	26012
15	32859	15	14378	77	7741	98.57	25956
11	33957	11	14378	6	7747	98.65	25956
7	14378	7	14378	71	7818	99.55	25940
14	14378	14	14378	14	7832	99.73	25884
21	14378	21	14378	21	7853	100.00	25884
7853		7853		7853			

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