APPENDIX III

Following is a sample of the available output from Slope/W Version 4.2. This output includes a summary of the slip surfaces and computed factors of safety. The attached file indicates 567 slip surfaces were evaluated. The actual number of slip surfaces evaluated for the analyses included with this report is over 5,000 for each case. In addition, the attached summary only shows the results of three methods of analyses, Ordinary, Bishop and Janbu. Our analyses also included Spencer's Method as indicated in the report. However, the corresponding output was too large to include with this report. Additional digital files may be provided at your request.

Little Lake Shoreline Protection

4/4/2003
1:36:45 PM

1=METHOD 567=NO. OF SLIP SURFACES 7=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	70.000	5.000	14.000	1	0.0000	1.794	2.394
1	70.000	5.000	14.000	12	0.0000	999.000	999.000
2	70.000	5.000	15.300	1	0.0000	1.314	1.732
2	70.000	5.000	15.300	9	0.0000	999.000	999.000
3	70.000	5.000	16.600	1	0.0000	1.118	1.473
3	70.000	5.000	16.600	2	0.0000	999.000	999.000
4	70.000	5.000	17.900	1	0.0000	1.005	1.337
4	70.000	5.000	17.900	2	0.0000	999.000	999.000
5	70.000	5.000	19.200	1	0.0000	0.957	1.283
5	70.000	5.000	19.200	20	0.0000	1.339	999.000
6	70.000	5.000	20.500	1	0.0000	0.956	1.280
6	70.000	5.000	20.500	17	0.0000	999.000	999.000
7	70.000	5.000	21.800	1	0.0000	0.966	1.299
7	70.000	5.000	21.800	20	0.0000	1.384	999.000
8	72.500	5.000	14.000	1	0.0000	1.450	1.934
8	72.500	5.000	14.000	12	0.0000	999.000	999.000
9	72.500	5.000	15.300	1	0.0000	1.144	1.506
9	72.500	5.000	15.300	6	0.0000	999.000	999.000
10	72.500	5.000	16.600	1	0.0000	0.978	1.285
10	72.500	5.000	16.600	7	0.0000	999.000	999.000
11	72.500	5.000	17.900	1	0.0000	0.900	1.178
11	72.500	5.000	17.900	20	0.0000	1.304	999.000
12	72.500	5.000	19.200	1	0.0000	0.849	1.118
12	72.500	5.000	19.200	20	0.0000	1.336	999.000
13	72.500	5.000	20.500	1	0.0000	0.807	1.084
13	72.500	5.000	20.500	16	0.0000	1.278	1.148
14	72.500	5.000	21.800	1	0.0000	0.824	1.083
14	72.500	5.000	21.800	15	0.0000	1.214	1.131
15	75.000	5.000	14.000	1	0.0000	1.242	1.650
15	75.000	5.000	14.000	20	0.0000	999.000	999.000
16	75.000	5.000	15.300	1	0.0000	1.062	1.399
16	75.000	5.000	15.300	4	0.0000	999.000	999.000
17	75.000	5.000	16.600	1	0.0000	0.928	1.218
17	75.000	5.000	16.600	3	0.0000	999.000	999.000
18	75.000	5.000	17.900	1	0.0000	0.831	1.097
18	75.000	5.000	17.900	20	0.0000	1.333	999.000
19	75.000	5.000	19.200	1	0.0000	0.799	1.041
19	75.000	5.000	19.200	8	0.0000	1.283	1.168
20	75.000	5.000	20.500	1	0.0000	0.739	0.999
20	75.000	5.000	20.500	10	0.0000	1.196	1.078
21	75.000	5.000	21.800	1	0.0000	0.734	0.975
21	75.000	5.000	21.800	12	0.0000	1.118	1.036
22	77.500	5.000	14.000	1	0.0000	1.132	1.520
22	77.500	5.000	14.000	2	0.0000	999.000	999.000
23	77.500	5.000	15.300	1	0.0000	0.999	1.320
23	77.500	5.000	15.300	5	0.0000	999.000	999.000
24	77.500	5.000	16.600	1	0.0000	0.906	1.190
24	77.500	5.000	16.600	4	0.0000	999.000	999.000
25	77.500	5.000	17.900	1	0.0000	0.835	1.091
25	77.500	5.000	17.900	8	0.0000	1.364	1.216
26	77.500	5.000	19.200	1	0.0000	0.768	1.017
26	77.500	5.000	19.200	8	0.0000	1.234	1.112
27	77.500	5.000	20.500	1	0.0000	0.726	0.953
27	77.500	5.000	20.500	9	0.0000	1.120	1.041
28	77.500	5.000	21.800	1	0.0000	0.657	0.916
28	77.500	5.000	21.800	13	0.0000	1.046	0.942
29	80.000	5.000	14.000	1	0.0000	1.105	1.489
29	80.000	5.000	14.000	20	0.0000	1.927	999.000
30	80.000	5.000	15.300	1	0.0000	0.984	1.319
30	80.000	5.000	15.300	5	0.0000	999.000	999.000
31	80.000	5.000	16.600	1	0.0000	0.902	1.199
31	80.000	5.000	16.600	9	0.0000	1.441	1.266

32	80.000	5.000	17.900	1	0.0000	0.824	1.093
32	80.000	5.000	17.900	9	0.0000	1.314	1.167
33	80.000	5.000	19.200	1	0.0000	0.758	1.007
33	80.000	5.000	19.200	9	0.0000	1.204	1.088
34	80.000	5.000	20.500	1	0.0000	0.693	0.943
34	80.000	5.000	20.500	11	0.0000	1.100	0.991
35	80.000	5.000	21.800	1	0.0000	0.669	0.903
35	80.000	5.000	21.800	12	0.0000	1.029	0.937
36	82.500	5.000	14.000	1	0.0000	1.136	1.538
36	82.500	5.000	14.000	9	0.0000	1.794	1.530
37	82.500	5.000	15.300	1	0.0000	1.011	1.361
37	82.500	5.000	15.300	9	0.0000	1.569	1.355
38	82.500	5.000	16.600	1	0.0000	0.907	1.216
38	82.500	5.000	16.600	9	0.0000	1.407	1.232
39	82.500	5.000	17.900	1	0.0000	0.836	1.113
39	82.500	5.000	17.900	10	0.0000	1.291	1.144
40	82.500	5.000	19.200	1	0.0000	0.774	1.035
40	82.500	5.000	19.200	10	0.0000	1.197	1.070
41	82.500	5.000	20.500	1	0.0000	0.728	0.974
41	82.500	5.000	20.500	11	0.0000	1.122	1.023
42	82.500	5.000	21.800	1	0.0000	0.683	0.927
42	82.500	5.000	21.800	13	0.0000	1.054	0.964
43	85.000	5.000	14.000	1	0.0000	1.178	1.600
43	85.000	5.000	14.000	8	0.0000	1.752	1.505
44	85.000	5.000	15.300	1	0.0000	1.050	1.414
44	85.000	5.000	15.300	9	0.0000	1.567	1.367
45	85.000	5.000	16.600	1	0.0000	0.960	1.288
45	85.000	5.000	16.600	10	0.0000	1.434	1.257
46	85.000	5.000	17.900	1	0.0000	0.890	1.190
46	85.000	5.000	17.900	11	0.0000	1.329	1.186
47	85.000	5.000	19.200	1	0.0000	0.809	1.111
47	85.000	5.000	19.200	13	0.0000	1.240	1.093
48	85.000	5.000	20.500	1	0.0000	0.773	1.046
48	85.000	5.000	20.500	14	0.0000	1.167	1.045
49	85.000	5.000	21.800	1	0.0000	0.734	0.995
49	85.000	5.000	21.800	15	0.0000	1.107	1.009
50	87.500	5.000	14.000	1	0.0000	1.275	1.734
50	87.500	5.000	14.000	8	0.0000	1.820	1.580
51	87.500	5.000	15.300	1	0.0000	1.151	1.558
51	87.500	5.000	15.300	10	0.0000	1.654	1.445
52	87.500	5.000	16.600	1	0.0000	1.059	1.426
52	87.500	5.000	16.600	11	0.0000	1.524	1.348
53	87.500	5.000	17.900	1	0.0000	0.988	1.324
53	87.500	5.000	17.900	12	0.0000	1.422	1.266
54	87.500	5.000	19.200	1	0.0000	0.907	1.239
54	87.500	5.000	19.200	14	0.0000	1.331	1.172
55	87.500	5.000	20.500	1	0.0000	0.856	1.170
55	87.500	5.000	20.500	16	0.0000	1.256	1.113
56	87.500	5.000	21.800	1	0.0000	0.811	1.108
56	87.500	5.000	21.800	18	0.0000	1.190	1.064
57	90.000	5.000	14.000	1	0.0000	1.477	2.030
57	90.000	5.000	14.000	9	0.0000	2.021	1.773
58	90.000	5.000	15.300	1	0.0000	1.331	1.823
58	90.000	5.000	15.300	10	0.0000	1.839	1.607
59	90.000	5.000	16.600	1	0.0000	1.224	1.667
59	90.000	5.000	16.600	12	0.0000	1.696	1.491
60	90.000	5.000	17.900	1	0.0000	1.121	1.541
60	90.000	5.000	17.900	14	0.0000	1.578	1.378
61	90.000	5.000	19.200	1	0.0000	1.048	1.438
61	90.000	5.000	19.200	16	0.0000	1.478	1.297
62	90.000	5.000	20.500	1	0.0000	0.986	1.352
62	90.000	5.000	20.500	19	0.0000	1.393	1.236
63	90.000	5.000	21.800	1	0.0000	0.894	1.275
63	90.000	5.000	21.800	20	0.0000	1.313	999.000
64	70.000	6.250	15.250	1	0.0000	1.869	2.388
64	70.000	6.250	15.250	20	0.0000	3.723	999.000
65	70.000	6.250	16.550	1	0.0000	1.390	1.753
65	70.000	6.250	16.550	10	0.0000	999.000	999.000
66	70.000	6.250	17.850	1	0.0000	1.178	1.486
66	70.000	6.250	17.850	7	0.0000	999.000	999.000

67	70.000	6.250	19.150	1	0.0000	1.062	1.346
67	70.000	6.250	19.150	2	0.0000	999.000	999.000
68	70.000	6.250	20.450	1	0.0000	1.007	1.289
68	70.000	6.250	20.450	3	0.0000	999.000	999.000
69	70.000	6.250	21.750	1	0.0000	1.002	1.286
69	70.000	6.250	21.750	20	0.0000	1.346	999.000
70	70.000	6.250	23.050	1	0.0000	1.011	1.302
70	70.000	6.250	23.050	20	0.0000	1.371	999.000
71	72.500	6.250	15.250	1	0.0000	1.529	1.951
71	72.500	6.250	15.250	20	0.0000	2.904	999.000
72	72.500	6.250	16.550	1	0.0000	1.205	1.523
72	72.500	6.250	16.550	11	0.0000	999.000	999.000
73	72.500	6.250	17.850	1	0.0000	1.028	1.295
73	72.500	6.250	17.850	7	0.0000	999.000	999.000
74	72.500	6.250	19.150	1	0.0000	0.940	1.188
74	72.500	6.250	19.150	3	0.0000	999.000	999.000
75	72.500	6.250	20.450	1	0.0000	0.883	1.121
75	72.500	6.250	20.450	16	0.0000	999.000	999.000
76	72.500	6.250	21.750	1	0.0000	0.845	1.085
76	72.500	6.250	21.750	12	0.0000	1.259	1.152
77	72.500	6.250	23.050	1	0.0000	0.856	1.085
77	72.500	6.250	23.050	11	0.0000	1.203	1.133
78	75.000	6.250	15.250	1	0.0000	1.307	1.668
78	75.000	6.250	15.250	18	0.0000	2.389	2.088
79	75.000	6.250	16.550	1	0.0000	1.113	1.411
79	75.000	6.250	16.550	16	0.0000	999.000	999.000
80	75.000	6.250	17.850	1	0.0000	0.965	1.216
80	75.000	6.250	17.850	10	0.0000	1.756	1.125
81	75.000	6.250	19.150	1	0.0000	0.869	1.110
81	75.000	6.250	19.150	19	0.0000	1.298	1.177
82	75.000	6.250	20.450	1	0.0000	0.818	1.039
82	75.000	6.250	20.450	7	0.0000	1.268	1.163
83	75.000	6.250	21.750	1	0.0000	0.785	0.997
83	75.000	6.250	21.750	7	0.0000	1.184	1.107
84	75.000	6.250	23.050	1	0.0000	0.755	0.964
84	75.000	6.250	23.050	9	0.0000	1.092	1.026
85	77.500	6.250	15.250	1	0.0000	1.190	1.522
85	77.500	6.250	15.250	8	0.0000	2.042	1.784
86	77.500	6.250	16.550	1	0.0000	1.039	1.324
86	77.500	6.250	16.550	2	0.0000	999.000	999.000
87	77.500	6.250	17.850	1	0.0000	0.938	1.190
87	77.500	6.250	17.850	9	0.0000	999.000	999.000
88	77.500	6.250	19.150	1	0.0000	0.853	1.081
88	77.500	6.250	19.150	6	0.0000	1.334	1.203
89	77.500	6.250	20.450	1	0.0000	0.781	0.995
89	77.500	6.250	20.450	6	0.0000	1.198	1.096
90	77.500	6.250	21.750	1	0.0000	0.725	0.940
90	77.500	6.250	21.750	8	0.0000	1.102	1.003
91	77.500	6.250	23.050	1	0.0000	0.705	0.904
91	77.500	6.250	23.050	9	0.0000	1.035	0.968
92	80.000	6.250	15.250	1	0.0000	1.141	1.475
92	80.000	6.250	15.250	8	0.0000	1.833	1.579
93	80.000	6.250	16.550	1	0.0000	1.010	1.302
93	80.000	6.250	16.550	12	0.0000	1.592	1.393
94	80.000	6.250	17.850	1	0.0000	0.920	1.179
94	80.000	6.250	17.850	7	0.0000	1.417	1.255
95	80.000	6.250	19.150	1	0.0000	0.838	1.068
95	80.000	6.250	19.150	7	0.0000	1.285	1.159
96	80.000	6.250	20.450	1	0.0000	0.779	0.989
96	80.000	6.250	20.450	7	0.0000	1.181	1.082
97	80.000	6.250	21.750	1	0.0000	0.732	0.929
97	80.000	6.250	21.750	8	0.0000	1.085	1.004
98	80.000	6.250	23.050	1	0.0000	0.691	0.883
98	80.000	6.250	23.050	8	0.0000	1.011	0.942
99	82.500	6.250	15.250	1	0.0000	1.156	1.505
99	82.500	6.250	15.250	7	0.0000	1.727	1.489
100	82.500	6.250	16.550	1	0.0000	1.012	1.314
100	82.500	6.250	16.550	7	0.0000	1.519	1.325
101	82.500	6.250	17.850	1	0.0000	0.906	1.174
101	82.500	6.250	17.850	7	0.0000	1.366	1.209

102	82.500	6.250	19.150	1	0.0000	0.840	1.080
102	82.500	6.250	19.150	7	0.0000	1.261	1.136
103	82.500	6.250	20.450	1	0.0000	0.786	1.007
103	82.500	6.250	20.450	8	0.0000	1.176	1.068
104	82.500	6.250	21.750	1	0.0000	0.746	0.953
104	82.500	6.250	21.750	8	0.0000	1.108	1.020
105	82.500	6.250	23.050	1	0.0000	0.702	0.910
105	82.500	6.250	23.050	9	0.0000	1.038	0.960
106	85.000	6.250	15.250	1	0.0000	1.179	1.537
106	85.000	6.250	15.250	7	0.0000	1.699	1.482
107	85.000	6.250	16.550	1	0.0000	1.049	1.363
107	85.000	6.250	16.550	7	0.0000	1.526	1.343
108	85.000	6.250	17.850	1	0.0000	0.954	1.239
108	85.000	6.250	17.850	8	0.0000	1.395	1.235
109	85.000	6.250	19.150	1	0.0000	0.885	1.149
109	85.000	6.250	19.150	9	0.0000	1.298	1.162
110	85.000	6.250	20.450	1	0.0000	0.825	1.072
110	85.000	6.250	20.450	9	0.0000	1.213	1.098
111	85.000	6.250	21.750	1	0.0000	0.787	1.016
111	85.000	6.250	21.750	10	0.0000	1.148	1.046
112	85.000	6.250	23.050	1	0.0000	0.729	0.968
112	85.000	6.250	23.050	11	0.0000	1.090	0.987
113	87.500	6.250	15.250	1	0.0000	1.269	1.660
113	87.500	6.250	15.250	7	0.0000	1.771	1.561
114	87.500	6.250	16.550	1	0.0000	1.142	1.491
114	87.500	6.250	16.550	8	0.0000	1.609	1.421
115	87.500	6.250	17.850	1	0.0000	1.049	1.369
115	87.500	6.250	17.850	9	0.0000	1.486	1.321
116	87.500	6.250	19.150	1	0.0000	0.975	1.271
116	87.500	6.250	19.150	9	0.0000	1.386	1.243
117	87.500	6.250	20.450	1	0.0000	0.909	1.195
117	87.500	6.250	20.450	11	0.0000	1.303	1.165
118	87.500	6.250	21.750	1	0.0000	0.857	1.128
118	87.500	6.250	21.750	12	0.0000	1.230	1.101
119	87.500	6.250	23.050	1	0.0000	0.815	1.068
119	87.500	6.250	23.050	13	0.0000	1.166	1.063
120	90.000	6.250	15.250	1	0.0000	1.455	1.926
120	90.000	6.250	15.250	8	0.0000	1.962	1.730
121	90.000	6.250	16.550	1	0.0000	1.315	1.734
121	90.000	6.250	16.550	9	0.0000	1.788	1.581
122	90.000	6.250	17.850	1	0.0000	1.203	1.587
122	90.000	6.250	17.850	9	0.0000	1.647	1.462
123	90.000	6.250	19.150	1	0.0000	1.109	1.471
123	90.000	6.250	19.150	11	0.0000	1.536	1.360
124	90.000	6.250	20.450	1	0.0000	1.036	1.374
124	90.000	6.250	20.450	12	0.0000	1.440	1.274
125	90.000	6.250	21.750	1	0.0000	0.975	1.294
125	90.000	6.250	21.750	13	0.0000	1.357	1.213
126	90.000	6.250	23.050	1	0.0000	0.921	1.223
126	90.000	6.250	23.050	15	0.0000	1.284	1.154
127	70.000	7.500	16.500	1	0.0000	1.949	2.404
127	70.000	7.500	16.500	13	0.0000	3.576	3.137
128	70.000	7.500	17.800	1	0.0000	1.464	1.785
128	70.000	7.500	17.800	20	0.0000	2.826	999.000
129	70.000	7.500	19.100	1	0.0000	1.242	1.515
129	70.000	7.500	19.100	10	0.0000	999.000	999.000
130	70.000	7.500	20.400	1	0.0000	1.110	1.359
130	70.000	7.500	20.400	2	0.0000	999.000	999.000
131	70.000	7.500	21.700	1	0.0000	1.053	1.303
131	70.000	7.500	21.700	2	0.0000	999.000	999.000
132	70.000	7.500	23.000	1	0.0000	1.043	1.297
132	70.000	7.500	23.000	3	0.0000	999.000	999.000
133	70.000	7.500	24.300	1	0.0000	1.051	1.311
133	70.000	7.500	24.300	5	0.0000	999.000	999.000
134	72.500	7.500	16.500	1	0.0000	1.592	1.984
134	72.500	7.500	16.500	10	0.0000	2.802	2.432
135	72.500	7.500	17.800	1	0.0000	1.262	1.547
135	72.500	7.500	17.800	20	0.0000	2.282	999.000
136	72.500	7.500	19.100	1	0.0000	1.080	1.317
136	72.500	7.500	19.100	8	0.0000	999.000	999.000

137	72.500	7.500	20.400	1	0.0000	0.981	1.198
137	72.500	7.500	20.400	8	0.0000	999.000	999.000
138	72.500	7.500	21.700	1	0.0000	0.917	1.128
138	72.500	7.500	21.700	4	0.0000	999.000	999.000
139	72.500	7.500	23.000	1	0.0000	0.880	1.092
139	72.500	7.500	23.000	10	0.0000	1.250	1.160
140	72.500	7.500	24.300	1	0.0000	0.885	1.090
140	72.500	7.500	24.300	9	0.0000	1.195	1.133
141	75.000	7.500	16.500	1	0.0000	1.372	1.697
141	75.000	7.500	16.500	8	0.0000	2.310	2.031
142	75.000	7.500	17.800	1	0.0000	1.167	1.433
142	75.000	7.500	17.800	14	0.0000	1.981	1.801
143	75.000	7.500	19.100	1	0.0000	1.003	1.231
143	75.000	7.500	19.100	10	0.0000	999.000	999.000
144	75.000	7.500	20.400	1	0.0000	0.907	1.111
144	75.000	7.500	20.400	19	0.0000	999.000	999.000
145	75.000	7.500	21.700	1	0.0000	0.852	1.043
145	75.000	7.500	21.700	5	0.0000	1.261	1.179
146	75.000	7.500	23.000	1	0.0000	0.815	0.997
146	75.000	7.500	23.000	6	0.0000	1.172	1.105
147	75.000	7.500	24.300	1	0.0000	0.774	0.958
147	75.000	7.500	24.300	8	0.0000	1.076	1.012
148	77.500	7.500	16.500	1	0.0000	1.239	1.538
148	77.500	7.500	16.500	5	0.0000	1.987	1.747
149	77.500	7.500	17.800	1	0.0000	1.083	1.338
149	77.500	7.500	17.800	4	0.0000	1.715	1.532
150	77.500	7.500	19.100	1	0.0000	0.970	1.196
150	77.500	7.500	19.100	5	0.0000	1.510	1.375
151	77.500	7.500	20.400	1	0.0000	0.881	1.081
151	77.500	7.500	20.400	5	0.0000	1.316	1.209
152	77.500	7.500	21.700	1	0.0000	0.807	0.993
152	77.500	7.500	21.700	6	0.0000	1.187	1.093
153	77.500	7.500	23.000	1	0.0000	0.761	0.935
153	77.500	7.500	23.000	6	0.0000	1.094	1.022
154	77.500	7.500	24.300	1	0.0000	0.732	0.899
154	77.500	7.500	24.300	7	0.0000	1.029	0.977
155	80.000	7.500	16.500	1	0.0000	1.181	1.477
155	80.000	7.500	16.500	6	0.0000	1.780	1.547
156	80.000	7.500	17.800	1	0.0000	1.045	1.302
156	80.000	7.500	17.800	6	0.0000	1.557	1.371
157	80.000	7.500	19.100	1	0.0000	0.937	1.164
157	80.000	7.500	19.100	6	0.0000	1.392	1.244
158	80.000	7.500	20.400	1	0.0000	0.852	1.056
158	80.000	7.500	20.400	6	0.0000	1.266	1.148
159	80.000	7.500	21.700	1	0.0000	0.786	0.973
159	80.000	7.500	21.700	6	0.0000	1.159	1.066
160	80.000	7.500	23.000	1	0.0000	0.737	0.914
160	80.000	7.500	23.000	6	0.0000	1.068	0.992
161	80.000	7.500	24.300	1	0.0000	0.707	0.880
161	80.000	7.500	24.300	7	0.0000	1.008	0.946
162	82.500	7.500	16.500	1	0.0000	1.174	1.481
162	82.500	7.500	16.500	6	0.0000	1.684	1.465
163	82.500	7.500	17.800	1	0.0000	1.030	1.290
163	82.500	7.500	17.800	6	0.0000	1.489	1.315
164	82.500	7.500	19.100	1	0.0000	0.924	1.157
164	82.500	7.500	19.100	6	0.0000	1.348	1.202
165	82.500	7.500	20.400	1	0.0000	0.851	1.062
165	82.500	7.500	20.400	6	0.0000	1.243	1.122
166	82.500	7.500	21.700	1	0.0000	0.800	0.996
166	82.500	7.500	21.700	7	0.0000	1.167	1.070
167	82.500	7.500	23.000	1	0.0000	0.755	0.939
167	82.500	7.500	23.000	7	0.0000	1.096	1.017
168	82.500	7.500	24.300	1	0.0000	0.717	0.898
168	82.500	7.500	24.300	8	0.0000	1.027	0.951
169	85.000	7.500	16.500	1	0.0000	1.191	1.501
169	85.000	7.500	16.500	6	0.0000	1.667	1.468
170	85.000	7.500	17.800	1	0.0000	1.057	1.332
170	85.000	7.500	17.800	6	0.0000	1.498	1.327
171	85.000	7.500	19.100	1	0.0000	0.958	1.211
171	85.000	7.500	19.100	7	0.0000	1.372	1.226

172	85.000	7.500	20.400	1	0.0000	0.884	1.118
172	85.000	7.500	20.400	7	0.0000	1.272	1.148
173	85.000	7.500	21.700	1	0.0000	0.829	1.046
173	85.000	7.500	21.700	7	0.0000	1.195	1.089
174	85.000	7.500	23.000	1	0.0000	0.792	0.999
174	85.000	7.500	23.000	8	0.0000	1.137	1.037
175	85.000	7.500	24.300	1	0.0000	0.759	0.954
175	85.000	7.500	24.300	8	0.0000	1.082	0.998
176	87.500	7.500	16.500	1	0.0000	1.272	1.612
176	87.500	7.500	16.500	6	0.0000	1.738	1.540
177	87.500	7.500	17.800	1	0.0000	1.142	1.449
177	87.500	7.500	17.800	7	0.0000	1.580	1.408
178	87.500	7.500	19.100	1	0.0000	1.045	1.327
178	87.500	7.500	19.100	7	0.0000	1.457	1.305
179	87.500	7.500	20.400	1	0.0000	0.967	1.233
179	87.500	7.500	20.400	8	0.0000	1.358	1.214
180	87.500	7.500	21.700	1	0.0000	0.904	1.155
180	87.500	7.500	21.700	8	0.0000	1.276	1.147
181	87.500	7.500	23.000	1	0.0000	0.848	1.088
181	87.500	7.500	23.000	9	0.0000	1.203	1.092
182	87.500	7.500	24.300	1	0.0000	0.794	1.042
182	87.500	7.500	24.300	10	0.0000	1.147	1.021
183	90.000	7.500	16.500	1	0.0000	1.444	1.852
183	90.000	7.500	16.500	7	0.0000	1.919	1.707
184	90.000	7.500	17.800	1	0.0000	1.299	1.666
184	90.000	7.500	17.800	7	0.0000	1.745	1.556
185	90.000	7.500	19.100	1	0.0000	1.187	1.526
185	90.000	7.500	19.100	8	0.0000	1.609	1.430
186	90.000	7.500	20.400	1	0.0000	1.096	1.413
186	90.000	7.500	20.400	9	0.0000	1.497	1.337
187	90.000	7.500	21.700	1	0.0000	1.029	1.326
187	90.000	7.500	21.700	10	0.0000	1.410	1.257
188	90.000	7.500	23.000	1	0.0000	0.965	1.248
188	90.000	7.500	23.000	11	0.0000	1.328	1.193
189	90.000	7.500	24.300	1	0.0000	0.910	1.179
189	90.000	7.500	24.300	11	0.0000	1.257	1.135
190	70.000	8.750	17.750	1	0.0000	2.028	2.443
190	70.000	8.750	17.750	9	0.0000	3.473	3.069
191	70.000	8.750	19.050	1	0.0000	1.538	1.826
191	70.000	8.750	19.050	14	0.0000	2.747	2.546
192	70.000	8.750	20.350	1	0.0000	1.302	1.547
192	70.000	8.750	20.350	20	0.0000	2.318	999.000
193	70.000	8.750	21.650	1	0.0000	1.153	1.377
193	70.000	8.750	21.650	10	0.0000	999.000	999.000
194	70.000	8.750	22.950	1	0.0000	1.093	1.320
194	70.000	8.750	22.950	4	0.0000	999.000	999.000
195	70.000	8.750	24.250	1	0.0000	1.082	1.313
195	70.000	8.750	24.250	20	0.0000	999.000	999.000
196	70.000	8.750	25.550	1	0.0000	1.091	1.330
196	70.000	8.750	25.550	20	0.0000	1.358	999.000
197	72.500	8.750	17.750	1	0.0000	1.671	2.022
197	72.500	8.750	17.750	7	0.0000	2.742	2.412
198	72.500	8.750	19.050	1	0.0000	1.323	1.577
198	72.500	8.750	19.050	11	0.0000	2.224	2.037
199	72.500	8.750	20.350	1	0.0000	1.130	1.343
199	72.500	8.750	20.350	19	0.0000	1.889	1.789
200	72.500	8.750	21.650	1	0.0000	1.021	1.216
200	72.500	8.750	21.650	20	0.0000	1.652	999.000
201	72.500	8.750	22.950	1	0.0000	0.949	1.136
201	72.500	8.750	22.950	2	0.0000	999.000	999.000
202	72.500	8.750	24.250	1	0.0000	0.909	1.100
202	72.500	8.750	24.250	9	0.0000	1.244	1.173
203	72.500	8.750	25.550	1	0.0000	0.911	1.099
203	72.500	8.750	25.550	8	0.0000	1.190	1.127
204	75.000	8.750	17.750	1	0.0000	1.429	1.727
204	75.000	8.750	17.750	4	0.0000	2.255	1.992
205	75.000	8.750	19.050	1	0.0000	1.218	1.462
205	75.000	8.750	19.050	7	0.0000	1.936	1.751
206	75.000	8.750	20.350	1	0.0000	1.041	1.245
206	75.000	8.750	20.350	10	0.0000	1.628	1.514

207	75.000	8.750	21.650	1	0.0000	0.939	1.122
207	75.000	8.750	21.650	20	0.0000	1.422	999.000
208	75.000	8.750	22.950	1	0.0000	0.877	1.049
208	75.000	8.750	22.950	4	0.0000	1.257	1.181
209	75.000	8.750	24.250	1	0.0000	0.828	0.993
209	75.000	8.750	24.250	5	0.0000	1.157	1.099
210	75.000	8.750	25.550	1	0.0000	0.792	0.957
210	75.000	8.750	25.550	7	0.0000	1.066	1.012
211	77.500	8.750	17.750	1	0.0000	1.295	1.565
211	77.500	8.750	17.750	5	0.0000	1.950	1.728
212	77.500	8.750	19.050	1	0.0000	1.129	1.359
212	77.500	8.750	19.050	5	0.0000	1.687	1.515
213	77.500	8.750	20.350	1	0.0000	1.003	1.208
213	77.500	8.750	20.350	5	0.0000	1.487	1.348
214	77.500	8.750	21.650	1	0.0000	0.894	1.075
214	77.500	8.750	21.650	5	0.0000	1.299	1.196
215	77.500	8.750	22.950	1	0.0000	0.819	0.985
215	77.500	8.750	22.950	5	0.0000	1.172	1.095
216	77.500	8.750	24.250	1	0.0000	0.772	0.928
216	77.500	8.750	24.250	5	0.0000	1.085	1.025
217	77.500	8.750	25.550	1	0.0000	0.743	0.896
217	77.500	8.750	25.550	6	0.0000	1.025	0.969
218	80.000	8.750	17.750	1	0.0000	1.226	1.490
218	80.000	8.750	17.750	6	0.0000	1.754	1.545
219	80.000	8.750	19.050	1	0.0000	1.082	1.310
219	80.000	8.750	19.050	5	0.0000	1.541	1.380
220	80.000	8.750	20.350	1	0.0000	0.959	1.161
220	80.000	8.750	20.350	5	0.0000	1.380	1.248
221	80.000	8.750	21.650	1	0.0000	0.871	1.053
221	80.000	8.750	21.650	5	0.0000	1.259	1.153
222	80.000	8.750	22.950	1	0.0000	0.803	0.969
222	80.000	8.750	22.950	5	0.0000	1.148	1.069
223	80.000	8.750	24.250	1	0.0000	0.753	0.911
223	80.000	8.750	24.250	6	0.0000	1.062	0.992
224	80.000	8.750	25.550	1	0.0000	0.725	0.876
224	80.000	8.750	25.550	6	0.0000	1.002	0.945
225	82.500	8.750	17.750	1	0.0000	1.190	1.459
225	82.500	8.750	17.750	6	0.0000	1.654	1.459
226	82.500	8.750	19.050	1	0.0000	1.042	1.277
226	82.500	8.750	19.050	6	0.0000	1.471	1.305
227	82.500	8.750	20.350	1	0.0000	0.941	1.149
227	82.500	8.750	20.350	6	0.0000	1.338	1.203
228	82.500	8.750	21.650	1	0.0000	0.868	1.058
228	82.500	8.750	21.650	6	0.0000	1.238	1.126
229	82.500	8.750	22.950	1	0.0000	0.812	0.988
229	82.500	8.750	22.950	6	0.0000	1.159	1.067
230	82.500	8.750	24.250	1	0.0000	0.765	0.932
230	82.500	8.750	24.250	6	0.0000	1.085	1.007
231	82.500	8.750	25.550	1	0.0000	0.724	0.888
231	82.500	8.750	25.550	6	0.0000	1.016	0.946
232	85.000	8.750	17.750	1	0.0000	1.206	1.479
232	85.000	8.750	17.750	6	0.0000	1.645	1.464
233	85.000	8.750	19.050	1	0.0000	1.069	1.313
233	85.000	8.750	19.050	6	0.0000	1.481	1.324
234	85.000	8.750	20.350	1	0.0000	0.978	1.197
234	85.000	8.750	20.350	6	0.0000	1.361	1.228
235	85.000	8.750	21.650	1	0.0000	0.901	1.110
235	85.000	8.750	21.650	6	0.0000	1.267	1.142
236	85.000	8.750	22.950	1	0.0000	0.843	1.038
236	85.000	8.750	22.950	6	0.0000	1.190	1.084
237	85.000	8.750	24.250	1	0.0000	0.798	0.982
237	85.000	8.750	24.250	7	0.0000	1.125	1.039
238	85.000	8.750	25.550	1	0.0000	0.760	0.936
238	85.000	8.750	25.550	7	0.0000	1.071	0.998
239	87.500	8.750	17.750	1	0.0000	1.282	1.582
239	87.500	8.750	17.750	6	0.0000	1.717	1.535
240	87.500	8.750	19.050	1	0.0000	1.151	1.422
240	87.500	8.750	19.050	6	0.0000	1.561	1.400
241	87.500	8.750	20.350	1	0.0000	1.047	1.300
241	87.500	8.750	20.350	7	0.0000	1.438	1.294

242	87.500	8.750	21.650	1	0.0000	0.966	1.205
242	87.500	8.750	21.650	7	0.0000	1.339	1.207
243	87.500	8.750	22.950	1	0.0000	0.906	1.129
243	87.500	8.750	22.950	7	0.0000	1.258	1.145
244	87.500	8.750	24.250	1	0.0000	0.862	1.076
244	87.500	8.750	24.250	8	0.0000	1.197	1.084
245	87.500	8.750	25.550	1	0.0000	0.815	1.019
245	87.500	8.750	25.550	8	0.0000	1.135	1.037
246	90.000	8.750	17.750	1	0.0000	1.442	1.800
246	90.000	8.750	17.750	6	0.0000	1.888	1.690
247	90.000	8.750	19.050	1	0.0000	1.293	1.617
247	90.000	8.750	19.050	7	0.0000	1.715	1.537
248	90.000	8.750	20.350	1	0.0000	1.178	1.479
248	90.000	8.750	20.350	7	0.0000	1.579	1.415
249	90.000	8.750	21.650	1	0.0000	1.086	1.370
249	90.000	8.750	21.650	8	0.0000	1.469	1.314
250	90.000	8.750	22.950	1	0.0000	1.012	1.279
250	90.000	8.750	22.950	8	0.0000	1.378	1.235
251	90.000	8.750	24.250	1	0.0000	0.952	1.209
251	90.000	8.750	24.250	9	0.0000	1.302	1.172
252	90.000	8.750	25.550	1	0.0000	0.890	1.135
252	90.000	8.750	25.550	9	0.0000	1.226	1.111
253	70.000	10.000	19.000	1	0.0000	2.114	2.487
253	70.000	10.000	19.000	7	0.0000	3.425	3.072
254	70.000	10.000	20.300	1	0.0000	1.610	1.868
254	70.000	10.000	20.300	10	0.0000	2.711	2.536
255	70.000	10.000	21.600	1	0.0000	1.358	1.580
255	70.000	10.000	21.600	12	0.0000	2.271	2.172
256	70.000	10.000	22.900	1	0.0000	1.193	1.398
256	70.000	10.000	22.900	20	0.0000	1.913	999.000
257	70.000	10.000	24.200	1	0.0000	1.130	1.337
257	70.000	10.000	24.200	20	0.0000	1.689	999.000
258	70.000	10.000	25.500	1	0.0000	1.117	1.330
258	70.000	10.000	25.500	19	0.0000	999.000	999.000
259	70.000	10.000	26.800	1	0.0000	1.126	1.347
259	70.000	10.000	26.800	20	0.0000	999.000	999.000
260	72.500	10.000	19.000	1	0.0000	1.753	2.073
260	72.500	10.000	19.000	4	0.0000	2.715	2.423
261	72.500	10.000	20.300	1	0.0000	1.382	1.611
261	72.500	10.000	20.300	7	0.0000	2.188	2.015
262	72.500	10.000	21.600	1	0.0000	1.177	1.371
262	72.500	10.000	21.600	10	0.0000	1.852	1.753
263	72.500	10.000	22.900	1	0.0000	1.060	1.238
263	72.500	10.000	22.900	12	0.0000	1.614	1.551
264	72.500	10.000	24.200	1	0.0000	0.978	1.149
264	72.500	10.000	24.200	20	0.0000	1.413	999.000
265	72.500	10.000	25.500	1	0.0000	0.938	1.113
265	72.500	10.000	25.500	8	0.0000	1.244	1.178
266	72.500	10.000	26.800	1	0.0000	0.929	1.102
266	72.500	10.000	26.800	7	0.0000	1.182	1.125
267	75.000	10.000	19.000	1	0.0000	1.489	1.762
267	75.000	10.000	19.000	4	0.0000	2.225	1.980
268	75.000	10.000	20.300	1	0.0000	1.271	1.492
268	75.000	10.000	20.300	4	0.0000	1.908	1.741
269	75.000	10.000	21.600	1	0.0000	1.081	1.264
269	75.000	10.000	21.600	5	0.0000	1.599	1.483
270	75.000	10.000	22.900	1	0.0000	0.973	1.139
270	75.000	10.000	22.900	5	0.0000	1.399	1.314
271	75.000	10.000	24.200	1	0.0000	0.902	1.059
271	75.000	10.000	24.200	4	0.0000	1.257	1.186
272	75.000	10.000	25.500	1	0.0000	0.845	0.995
272	75.000	10.000	25.500	5	0.0000	1.145	1.092
273	75.000	10.000	26.800	1	0.0000	0.811	0.961
273	75.000	10.000	26.800	6	0.0000	1.062	1.007
274	77.500	10.000	19.000	1	0.0000	1.347	1.595
274	77.500	10.000	19.000	5	0.0000	1.929	1.724
275	77.500	10.000	20.300	1	0.0000	1.168	1.380
275	77.500	10.000	20.300	5	0.0000	1.671	1.507
276	77.500	10.000	21.600	1	0.0000	1.040	1.224
276	77.500	10.000	21.600	5	0.0000	1.477	1.351

277	77.500	10.000	22.900	1	0.0000	0.915	1.077
277	77.500	10.000	22.900	4	0.0000	1.288	1.193
278	77.500	10.000	24.200	1	0.0000	0.841	0.990
278	77.500	10.000	24.200	5	0.0000	1.170	1.098
279	77.500	10.000	25.500	1	0.0000	0.794	0.935
279	77.500	10.000	25.500	5	0.0000	1.086	1.031
280	77.500	10.000	26.800	1	0.0000	0.763	0.899
280	77.500	10.000	26.800	5	0.0000	1.025	0.983
281	80.000	10.000	19.000	1	0.0000	1.260	1.503
281	80.000	10.000	19.000	5	0.0000	1.737	1.545
282	80.000	10.000	20.300	1	0.0000	1.106	1.313
282	80.000	10.000	20.300	5	0.0000	1.531	1.381
283	80.000	10.000	21.600	1	0.0000	0.984	1.165
283	80.000	10.000	21.600	5	0.0000	1.376	1.256
284	80.000	10.000	22.900	1	0.0000	0.893	1.057
284	80.000	10.000	22.900	5	0.0000	1.258	1.161
285	80.000	10.000	24.200	1	0.0000	0.816	0.967
285	80.000	10.000	24.200	5	0.0000	1.140	1.065
286	80.000	10.000	25.500	1	0.0000	0.769	0.911
286	80.000	10.000	25.500	5	0.0000	1.059	1.000
287	80.000	10.000	26.800	1	0.0000	0.742	0.878
287	80.000	10.000	26.800	6	0.0000	1.004	0.951
288	82.500	10.000	19.000	1	0.0000	1.213	1.455
288	82.500	10.000	19.000	5	0.0000	1.641	1.465
289	82.500	10.000	20.300	1	0.0000	1.067	1.275
289	82.500	10.000	20.300	5	0.0000	1.464	1.321
290	82.500	10.000	21.600	1	0.0000	0.965	1.150
290	82.500	10.000	21.600	5	0.0000	1.335	1.218
291	82.500	10.000	22.900	1	0.0000	0.887	1.056
291	82.500	10.000	22.900	5	0.0000	1.236	1.137
292	82.500	10.000	24.200	1	0.0000	0.828	0.987
292	82.500	10.000	24.200	5	0.0000	1.158	1.077
293	82.500	10.000	25.500	1	0.0000	0.777	0.927
293	82.500	10.000	25.500	5	0.0000	1.078	1.010
294	82.500	10.000	26.800	1	0.0000	0.738	0.885
294	82.500	10.000	26.800	6	0.0000	1.013	0.951
295	85.000	10.000	19.000	1	0.0000	1.224	1.469
295	85.000	10.000	19.000	5	0.0000	1.633	1.468
296	85.000	10.000	20.300	1	0.0000	1.085	1.304
296	85.000	10.000	20.300	5	0.0000	1.471	1.329
297	85.000	10.000	21.600	1	0.0000	0.983	1.185
297	85.000	10.000	21.600	6	0.0000	1.350	1.220
298	85.000	10.000	22.900	1	0.0000	0.911	1.097
298	85.000	10.000	22.900	6	0.0000	1.257	1.146
299	85.000	10.000	24.200	1	0.0000	0.855	1.029
299	85.000	10.000	24.200	6	0.0000	1.183	1.088
300	85.000	10.000	25.500	1	0.0000	0.808	0.975
300	85.000	10.000	25.500	6	0.0000	1.121	1.037
301	85.000	10.000	26.800	1	0.0000	0.768	0.929
301	85.000	10.000	26.800	6	0.0000	1.061	0.987
302	87.500	10.000	19.000	1	0.0000	1.299	1.566
302	87.500	10.000	19.000	6	0.0000	1.706	1.539
303	87.500	10.000	20.300	1	0.0000	1.160	1.404
303	87.500	10.000	20.300	6	0.0000	1.548	1.397
304	87.500	10.000	21.600	1	0.0000	1.053	1.281
304	87.500	10.000	21.600	6	0.0000	1.424	1.285
305	87.500	10.000	22.900	1	0.0000	0.978	1.190
305	87.500	10.000	22.900	6	0.0000	1.328	1.203
306	87.500	10.000	24.200	1	0.0000	0.910	1.114
306	87.500	10.000	24.200	7	0.0000	1.248	1.137
307	87.500	10.000	25.500	1	0.0000	0.859	1.052
307	87.500	10.000	25.500	7	0.0000	1.180	1.083
308	87.500	10.000	26.800	1	0.0000	0.817	1.002
308	87.500	10.000	26.800	7	0.0000	1.124	1.038
309	90.000	10.000	19.000	1	0.0000	1.445	1.764
309	90.000	10.000	19.000	6	0.0000	1.865	1.681
310	90.000	10.000	20.300	1	0.0000	1.292	1.583
310	90.000	10.000	20.300	6	0.0000	1.693	1.523
311	90.000	10.000	21.600	1	0.0000	1.176	1.446
311	90.000	10.000	21.600	6	0.0000	1.557	1.400

312	90.000	10.000	22.900	1	0.0000	1.081	1.338
312	90.000	10.000	22.900	7	0.0000	1.447	1.304
313	90.000	10.000	24.200	1	0.0000	1.005	1.248
313	90.000	10.000	24.200	7	0.0000	1.357	1.226
314	90.000	10.000	25.500	1	0.0000	0.943	1.175
314	90.000	10.000	25.500	8	0.0000	1.279	1.154
315	90.000	10.000	26.800	1	0.0000	0.894	1.115
315	90.000	10.000	26.800	8	0.0000	1.215	1.098
316	70.000	11.250	20.250	1	0.0000	2.190	2.536
316	70.000	11.250	20.250	6	0.0000	3.382	3.057
317	70.000	11.250	21.550	1	0.0000	1.677	1.916
317	70.000	11.250	21.550	8	0.0000	2.680	2.514
318	70.000	11.250	22.850	1	0.0000	1.411	1.614
318	70.000	11.250	22.850	9	0.0000	2.237	2.134
319	70.000	11.250	24.150	1	0.0000	1.231	1.420
319	70.000	11.250	24.150	11	0.0000	1.864	1.812
320	70.000	11.250	25.450	1	0.0000	1.167	1.360
320	70.000	11.250	25.450	9	0.0000	1.649	1.601
321	70.000	11.250	26.750	1	0.0000	1.152	1.351
321	70.000	11.250	26.750	18	0.0000	1.520	1.465
322	70.000	11.250	28.050	1	0.0000	1.162	1.368
322	70.000	11.250	28.050	20	0.0000	1.441	999.000
323	72.500	11.250	20.250	1	0.0000	1.825	2.125
323	72.500	11.250	20.250	4	0.0000	2.701	2.425
324	72.500	11.250	21.550	1	0.0000	1.436	1.648
324	72.500	11.250	21.550	6	0.0000	2.166	2.007
325	72.500	11.250	22.850	1	0.0000	1.224	1.401
325	72.500	11.250	22.850	7	0.0000	1.829	1.729
326	72.500	11.250	24.150	1	0.0000	1.098	1.260
326	72.500	11.250	24.150	6	0.0000	1.593	1.525
327	72.500	11.250	25.450	1	0.0000	1.005	1.163
327	72.500	11.250	25.450	5	0.0000	1.379	1.326
328	72.500	11.250	26.750	1	0.0000	0.965	1.127
328	72.500	11.250	26.750	6	0.0000	1.250	1.188
329	72.500	11.250	28.050	1	0.0000	0.948	1.108
329	72.500	11.250	28.050	7	0.0000	1.181	1.126
330	75.000	11.250	20.250	1	0.0000	1.542	1.801
330	75.000	11.250	20.250	5	0.0000	2.211	1.981
331	75.000	11.250	21.550	1	0.0000	1.311	1.516
331	75.000	11.250	21.550	4	0.0000	1.885	1.722
332	75.000	11.250	22.850	1	0.0000	1.118	1.287
332	75.000	11.250	22.850	4	0.0000	1.585	1.475
333	75.000	11.250	24.150	1	0.0000	1.004	1.156
333	75.000	11.250	24.150	4	0.0000	1.389	1.306
334	75.000	11.250	25.450	1	0.0000	0.923	1.066
334	75.000	11.250	25.450	4	0.0000	1.255	1.189
335	75.000	11.250	26.750	1	0.0000	0.862	0.997
335	75.000	11.250	26.750	5	0.0000	1.137	1.087
336	75.000	11.250	28.050	1	0.0000	0.830	0.967
336	75.000	11.250	28.050	6	0.0000	1.061	1.010
337	77.500	11.250	20.250	1	0.0000	1.394	1.625
337	77.500	11.250	20.250	5	0.0000	1.920	1.726
338	77.500	11.250	21.550	1	0.0000	1.210	1.405
338	77.500	11.250	21.550	5	0.0000	1.668	1.517
339	77.500	11.250	22.850	1	0.0000	1.064	1.234
339	77.500	11.250	22.850	5	0.0000	1.468	1.351
340	77.500	11.250	24.150	1	0.0000	0.939	1.086
340	77.500	11.250	24.150	4	0.0000	1.287	1.201
341	77.500	11.250	25.450	1	0.0000	0.861	0.996
341	77.500	11.250	25.450	4	0.0000	1.169	1.102
342	77.500	11.250	26.750	1	0.0000	0.815	0.943
342	77.500	11.250	26.750	5	0.0000	1.090	1.040
343	77.500	11.250	28.050	1	0.0000	0.779	0.903
343	77.500	11.250	28.050	5	0.0000	1.021	0.981
344	80.000	11.250	20.250	1	0.0000	1.305	1.527
344	80.000	11.250	20.250	5	0.0000	1.738	1.565
345	80.000	11.250	21.550	1	0.0000	1.139	1.326
345	80.000	11.250	21.550	5	0.0000	1.534	1.398
346	80.000	11.250	22.850	1	0.0000	1.013	1.176
346	80.000	11.250	22.850	5	0.0000	1.381	1.271

347	80.000	11.250	24.150	1	0.0000	0.920	1.066
347	80.000	11.250	24.150	4	0.0000	1.259	1.170
348	80.000	11.250	25.450	1	0.0000	0.842	0.978
348	80.000	11.250	25.450	5	0.0000	1.145	1.076
349	80.000	11.250	26.750	1	0.0000	0.788	0.917
349	80.000	11.250	26.750	5	0.0000	1.062	1.007
350	80.000	11.250	28.050	1	0.0000	0.756	0.881
350	80.000	11.250	28.050	5	0.0000	1.005	0.961
351	82.500	11.250	20.250	1	0.0000	1.240	1.456
351	82.500	11.250	20.250	5	0.0000	1.635	1.476
352	82.500	11.250	21.550	1	0.0000	1.098	1.283
352	82.500	11.250	21.550	5	0.0000	1.467	1.338
353	82.500	11.250	22.850	1	0.0000	0.993	1.159
353	82.500	11.250	22.850	5	0.0000	1.341	1.234
354	82.500	11.250	24.150	1	0.0000	0.909	1.063
354	82.500	11.250	24.150	5	0.0000	1.240	1.147
355	82.500	11.250	25.450	1	0.0000	0.846	0.990
355	82.500	11.250	25.450	5	0.0000	1.161	1.084
356	82.500	11.250	26.750	1	0.0000	0.790	0.928
356	82.500	11.250	26.750	5	0.0000	1.075	1.012
357	82.500	11.250	28.050	1	0.0000	0.764	0.895
357	82.500	11.250	28.050	5	0.0000	1.019	0.968
358	85.000	11.250	20.250	1	0.0000	1.245	1.467
358	85.000	11.250	20.250	5	0.0000	1.627	1.475
359	85.000	11.250	21.550	1	0.0000	1.110	1.306
359	85.000	11.250	21.550	5	0.0000	1.471	1.341
360	85.000	11.250	22.850	1	0.0000	1.007	1.187
360	85.000	11.250	22.850	5	0.0000	1.351	1.238
361	85.000	11.250	24.150	1	0.0000	0.931	1.099
361	85.000	11.250	24.150	5	0.0000	1.258	1.161
362	85.000	11.250	25.450	1	0.0000	0.869	1.027
362	85.000	11.250	25.450	5	0.0000	1.183	1.097
363	85.000	11.250	26.750	1	0.0000	0.820	0.972
363	85.000	11.250	26.750	5	0.0000	1.120	1.046
364	85.000	11.250	28.050	1	0.0000	0.778	0.925
364	85.000	11.250	28.050	6	0.0000	1.055	0.986
365	87.500	11.250	20.250	1	0.0000	1.315	1.557
365	87.500	11.250	20.250	5	0.0000	1.698	1.545
366	87.500	11.250	21.550	1	0.0000	1.173	1.394
366	87.500	11.250	21.550	5	0.0000	1.540	1.402
367	87.500	11.250	22.850	1	0.0000	1.063	1.270
367	87.500	11.250	22.850	6	0.0000	1.415	1.284
368	87.500	11.250	24.150	1	0.0000	0.982	1.176
368	87.500	11.250	24.150	6	0.0000	1.318	1.200
369	87.500	11.250	25.450	1	0.0000	0.920	1.103
369	87.500	11.250	25.450	6	0.0000	1.241	1.137
370	87.500	11.250	26.750	1	0.0000	0.870	1.046
370	87.500	11.250	26.750	6	0.0000	1.178	1.081
371	87.500	11.250	28.050	1	0.0000	0.825	0.995
371	87.500	11.250	28.050	6	0.0000	1.120	1.034
372	90.000	11.250	20.250	1	0.0000	1.451	1.738
372	90.000	11.250	20.250	5	0.0000	1.848	1.680
373	90.000	11.250	21.550	1	0.0000	1.295	1.558
373	90.000	11.250	21.550	6	0.0000	1.676	1.517
374	90.000	11.250	22.850	1	0.0000	1.177	1.422
374	90.000	11.250	22.850	6	0.0000	1.541	1.394
375	90.000	11.250	24.150	1	0.0000	1.082	1.314
375	90.000	11.250	24.150	6	0.0000	1.432	1.294
376	90.000	11.250	25.450	1	0.0000	1.005	1.226
376	90.000	11.250	25.450	7	0.0000	1.342	1.218
377	90.000	11.250	26.750	1	0.0000	0.940	1.152
377	90.000	11.250	26.750	7	0.0000	1.263	1.150
378	90.000	11.250	28.050	1	0.0000	0.890	1.092
378	90.000	11.250	28.050	7	0.0000	1.199	1.097
379	70.000	12.500	21.500	1	0.0000	2.275	2.594
379	70.000	12.500	21.500	5	0.0000	3.374	3.078
380	70.000	12.500	22.800	1	0.0000	1.742	1.963
380	70.000	12.500	22.800	7	0.0000	2.662	2.501
381	70.000	12.500	24.100	1	0.0000	1.449	1.634
381	70.000	12.500	24.100	8	0.0000	2.205	2.124

382	70.000	12.500	25.400	1	0.0000	1.269	1.445
382	70.000	12.500	25.400	7	0.0000	1.829	1.772
383	70.000	12.500	26.700	1	0.0000	1.202	1.383
383	70.000	12.500	26.700	5	0.0000	1.623	1.571
384	70.000	12.500	28.000	1	0.0000	1.186	1.373
384	70.000	12.500	28.000	8	0.0000	1.502	1.437
385	70.000	12.500	29.300	1	0.0000	1.196	1.390
385	70.000	12.500	29.300	7	0.0000	1.436	1.366
386	72.500	12.500	21.500	1	0.0000	1.907	2.185
386	72.500	12.500	21.500	4	0.0000	2.714	2.463
387	72.500	12.500	22.800	1	0.0000	1.492	1.688
387	72.500	12.500	22.800	5	0.0000	2.158	2.009
388	72.500	12.500	24.100	1	0.0000	1.267	1.430
388	72.500	12.500	24.100	5	0.0000	1.816	1.719
389	72.500	12.500	25.400	1	0.0000	1.128	1.278
389	72.500	12.500	25.400	4	0.0000	1.572	1.506
390	72.500	12.500	26.700	1	0.0000	1.031	1.178
390	72.500	12.500	26.700	5	0.0000	1.362	1.306
391	72.500	12.500	28.000	1	0.0000	0.982	1.133
391	72.500	12.500	28.000	6	0.0000	1.244	1.183
392	72.500	12.500	29.300	1	0.0000	0.970	1.119
392	72.500	12.500	29.300	6	0.0000	1.185	1.128
393	75.000	12.500	21.500	1	0.0000	1.609	1.847
393	75.000	12.500	21.500	5	0.0000	2.216	2.007
394	75.000	12.500	22.800	1	0.0000	1.359	1.547
394	75.000	12.500	22.800	4	0.0000	1.880	1.732
395	75.000	12.500	24.100	1	0.0000	1.157	1.311
395	75.000	12.500	24.100	4	0.0000	1.583	1.481
396	75.000	12.500	25.400	1	0.0000	1.034	1.175
396	75.000	12.500	25.400	4	0.0000	1.392	1.315
397	75.000	12.500	26.700	1	0.0000	0.943	1.074
397	75.000	12.500	26.700	4	0.0000	1.256	1.197
398	75.000	12.500	28.000	1	0.0000	0.879	1.005
398	75.000	12.500	28.000	5	0.0000	1.133	1.087
399	75.000	12.500	29.300	1	0.0000	0.848	0.976
399	75.000	12.500	29.300	6	0.0000	1.063	1.015
400	77.500	12.500	21.500	1	0.0000	1.438	1.656
400	77.500	12.500	21.500	5	0.0000	1.919	1.737
401	77.500	12.500	22.800	1	0.0000	1.252	1.434
401	77.500	12.500	22.800	5	0.0000	1.675	1.535
402	77.500	12.500	24.100	1	0.0000	1.090	1.243
402	77.500	12.500	24.100	4	0.0000	1.464	1.359
403	77.500	12.500	25.400	1	0.0000	0.962	1.095
403	77.500	12.500	25.400	4	0.0000	1.288	1.211
404	77.500	12.500	26.700	1	0.0000	0.884	1.007
404	77.500	12.500	26.700	4	0.0000	1.175	1.115
405	77.500	12.500	28.000	1	0.0000	0.832	0.948
405	77.500	12.500	28.000	4	0.0000	1.093	1.044
406	77.500	12.500	29.300	1	0.0000	0.796	0.910
406	77.500	12.500	29.300	5	0.0000	1.020	0.982
407	80.000	12.500	21.500	1	0.0000	1.341	1.546
407	80.000	12.500	21.500	5	0.0000	1.741	1.582
408	80.000	12.500	22.800	1	0.0000	1.167	1.338
408	80.000	12.500	22.800	5	0.0000	1.538	1.412
409	80.000	12.500	24.100	1	0.0000	1.039	1.189
409	80.000	12.500	24.100	4	0.0000	1.386	1.282
410	80.000	12.500	25.400	1	0.0000	0.936	1.071
410	80.000	12.500	25.400	4	0.0000	1.256	1.173
411	80.000	12.500	26.700	1	0.0000	0.857	0.981
411	80.000	12.500	26.700	4	0.0000	1.144	1.079
412	80.000	12.500	28.000	1	0.0000	0.812	0.929
412	80.000	12.500	28.000	5	0.0000	1.070	1.019
413	80.000	12.500	29.300	1	0.0000	0.776	0.890
413	80.000	12.500	29.300	5	0.0000	1.012	0.971
414	82.500	12.500	21.500	1	0.0000	1.269	1.466
414	82.500	12.500	21.500	5	0.0000	1.639	1.492
415	82.500	12.500	22.800	1	0.0000	1.123	1.294
415	82.500	12.500	22.800	5	0.0000	1.473	1.351
416	82.500	12.500	24.100	1	0.0000	1.016	1.168
416	82.500	12.500	24.100	5	0.0000	1.347	1.246

417	82.500	12.500	25.400	1	0.0000	0.933	1.074
417	82.500	12.500	25.400	5	0.0000	1.248	1.163
418	82.500	12.500	26.700	1	0.0000	0.869	0.999
418	82.500	12.500	26.700	4	0.0000	1.164	1.092
419	82.500	12.500	28.000	1	0.0000	0.807	0.933
419	82.500	12.500	28.000	5	0.0000	1.076	1.016
420	82.500	12.500	29.300	1	0.0000	0.769	0.891
420	82.500	12.500	29.300	5	0.0000	1.015	0.965
421	85.000	12.500	21.500	1	0.0000	1.263	1.467
421	85.000	12.500	21.500	5	0.0000	1.624	1.480
422	85.000	12.500	22.800	1	0.0000	1.123	1.306
422	85.000	12.500	22.800	5	0.0000	1.469	1.342
423	85.000	12.500	24.100	1	0.0000	1.025	1.191
423	85.000	12.500	24.100	5	0.0000	1.353	1.246
424	85.000	12.500	25.400	1	0.0000	0.948	1.102
424	85.000	12.500	25.400	5	0.0000	1.261	1.168
425	85.000	12.500	26.700	1	0.0000	0.887	1.032
425	85.000	12.500	26.700	5	0.0000	1.187	1.107
426	85.000	12.500	28.000	1	0.0000	0.834	0.974
426	85.000	12.500	28.000	5	0.0000	1.122	1.052
427	85.000	12.500	29.300	1	0.0000	0.792	0.926
427	85.000	12.500	29.300	5	0.0000	1.053	0.995
428	87.500	12.500	21.500	1	0.0000	1.333	1.553
428	87.500	12.500	21.500	5	0.0000	1.695	1.550
429	87.500	12.500	22.800	1	0.0000	1.187	1.389
429	87.500	12.500	22.800	5	0.0000	1.536	1.405
430	87.500	12.500	24.100	1	0.0000	1.082	1.268
430	87.500	12.500	24.100	5	0.0000	1.414	1.298
431	87.500	12.500	25.400	1	0.0000	0.997	1.175
431	87.500	12.500	25.400	5	0.0000	1.318	1.210
432	87.500	12.500	26.700	1	0.0000	0.930	1.098
432	87.500	12.500	26.700	5	0.0000	1.238	1.144
433	87.500	12.500	28.000	1	0.0000	0.877	1.038
433	87.500	12.500	28.000	6	0.0000	1.173	1.084
434	87.500	12.500	29.300	1	0.0000	0.833	0.988
434	87.500	12.500	29.300	6	0.0000	1.117	1.038
435	90.000	12.500	21.500	1	0.0000	1.460	1.721
435	90.000	12.500	21.500	5	0.0000	1.837	1.678
436	90.000	12.500	22.800	1	0.0000	1.305	1.544
436	90.000	12.500	22.800	5	0.0000	1.667	1.522
437	90.000	12.500	24.100	1	0.0000	1.181	1.405
437	90.000	12.500	24.100	6	0.0000	1.529	1.390
438	90.000	12.500	25.400	1	0.0000	1.085	1.297
438	90.000	12.500	25.400	6	0.0000	1.420	1.290
439	90.000	12.500	26.700	1	0.0000	1.011	1.211
439	90.000	12.500	26.700	6	0.0000	1.332	1.214
440	90.000	12.500	28.000	1	0.0000	0.955	1.146
440	90.000	12.500	28.000	6	0.0000	1.262	1.150
441	90.000	12.500	29.300	1	0.0000	0.897	1.081
441	90.000	12.500	29.300	6	0.0000	1.193	1.091
442	70.000	13.750	22.750	1	0.0000	2.351	2.649
442	70.000	13.750	22.750	4	0.0000	3.371	3.101
443	70.000	13.750	24.050	1	0.0000	1.805	2.011
443	70.000	13.750	24.050	6	0.0000	2.654	2.508
444	70.000	13.750	25.350	1	0.0000	1.485	1.657
444	70.000	13.750	25.350	6	0.0000	2.167	2.090
445	70.000	13.750	26.650	1	0.0000	1.302	1.468
445	70.000	13.750	26.650	5	0.0000	1.802	1.742
446	70.000	13.750	27.950	1	0.0000	1.236	1.406
446	70.000	13.750	27.950	5	0.0000	1.607	1.551
447	70.000	13.750	29.250	1	0.0000	1.220	1.396
447	70.000	13.750	29.250	6	0.0000	1.497	1.428
448	70.000	13.750	30.550	1	0.0000	1.222	1.403
448	70.000	13.750	30.550	7	0.0000	1.439	1.368
449	72.500	13.750	22.750	1	0.0000	1.978	2.240
449	72.500	13.750	22.750	4	0.0000	2.723	2.485
450	72.500	13.750	24.050	1	0.0000	1.545	1.727
450	72.500	13.750	24.050	4	0.0000	2.162	2.030
451	72.500	13.750	25.350	1	0.0000	1.311	1.464
451	72.500	13.750	25.350	4	0.0000	1.814	1.726

452	72.500	13.750	26.650	1	0.0000	1.156	1.295
452	72.500	13.750	26.650	4	0.0000	1.555	1.489
453	72.500	13.750	27.950	1	0.0000	1.056	1.194
453	72.500	13.750	27.950	5	0.0000	1.355	1.301
454	72.500	13.750	29.250	1	0.0000	1.002	1.143
454	72.500	13.750	29.250	5	0.0000	1.244	1.191
455	72.500	13.750	30.550	1	0.0000	0.990	1.129
455	72.500	13.750	30.550	6	0.0000	1.190	1.135
456	75.000	13.750	22.750	1	0.0000	1.663	1.888
456	75.000	13.750	22.750	5	0.0000	2.226	2.030
457	75.000	13.750	24.050	1	0.0000	1.400	1.576
457	75.000	13.750	24.050	4	0.0000	1.879	1.740
458	75.000	13.750	25.350	1	0.0000	1.194	1.338
458	75.000	13.750	25.350	4	0.0000	1.588	1.493
459	75.000	13.750	26.650	1	0.0000	1.058	1.187
459	75.000	13.750	26.650	4	0.0000	1.395	1.326
460	75.000	13.750	27.950	1	0.0000	0.962	1.082
460	75.000	13.750	27.950	4	0.0000	1.255	1.201
461	75.000	13.750	29.250	1	0.0000	0.897	1.014
461	75.000	13.750	29.250	5	0.0000	1.134	1.091
462	75.000	13.750	30.550	1	0.0000	0.868	0.987
462	75.000	13.750	30.550	5	0.0000	1.068	1.027
463	77.500	13.750	22.750	1	0.0000	1.482	1.686
463	77.500	13.750	22.750	5	0.0000	1.925	1.754
464	77.500	13.750	24.050	1	0.0000	1.296	1.465
464	77.500	13.750	24.050	4	0.0000	1.688	1.559
465	77.500	13.750	25.350	1	0.0000	1.116	1.257
465	77.500	13.750	25.350	4	0.0000	1.468	1.371
466	77.500	13.750	26.650	1	0.0000	0.987	1.109
466	77.500	13.750	26.650	4	0.0000	1.296	1.225
467	77.500	13.750	27.950	1	0.0000	0.905	1.017
467	77.500	13.750	27.950	4	0.0000	1.180	1.126
468	77.500	13.750	29.250	1	0.0000	0.853	0.960
468	77.500	13.750	29.250	4	0.0000	1.101	1.057
469	77.500	13.750	30.550	1	0.0000	0.813	0.919
469	77.500	13.750	30.550	5	0.0000	1.022	0.986
470	80.000	13.750	22.750	1	0.0000	1.374	1.564
470	80.000	13.750	22.750	5	0.0000	1.749	1.601
471	80.000	13.750	24.050	1	0.0000	1.200	1.358
471	80.000	13.750	24.050	4	0.0000	1.549	1.431
472	80.000	13.750	25.350	1	0.0000	1.073	1.210
472	80.000	13.750	25.350	4	0.0000	1.401	1.307
473	80.000	13.750	26.650	1	0.0000	0.961	1.083
473	80.000	13.750	26.650	4	0.0000	1.262	1.188
474	80.000	13.750	27.950	1	0.0000	0.880	0.993
474	80.000	13.750	27.950	4	0.0000	1.151	1.092
475	80.000	13.750	29.250	1	0.0000	0.827	0.935
475	80.000	13.750	29.250	4	0.0000	1.073	1.024
476	80.000	13.750	30.550	1	0.0000	0.794	0.899
476	80.000	13.750	30.550	5	0.0000	1.019	0.980
477	82.500	13.750	22.750	1	0.0000	1.300	1.481
477	82.500	13.750	22.750	5	0.0000	1.648	1.511
478	82.500	13.750	24.050	1	0.0000	1.158	1.314
478	82.500	13.750	24.050	5	0.0000	1.487	1.376
479	82.500	13.750	25.350	1	0.0000	1.046	1.185
479	82.500	13.750	25.350	4	0.0000	1.358	1.264
480	82.500	13.750	26.650	1	0.0000	0.955	1.085
480	82.500	13.750	26.650	4	0.0000	1.255	1.173
481	82.500	13.750	27.950	1	0.0000	0.882	1.003
481	82.500	13.750	27.950	4	0.0000	1.163	1.095
482	82.500	13.750	29.250	1	0.0000	0.825	0.940
482	82.500	13.750	29.250	4	0.0000	1.079	1.023
483	82.500	13.750	30.550	1	0.0000	0.790	0.901
483	82.500	13.750	30.550	5	0.0000	1.022	0.977
484	85.000	13.750	22.750	1	0.0000	1.289	1.476
484	85.000	13.750	22.750	5	0.0000	1.629	1.494
485	85.000	13.750	24.050	1	0.0000	1.155	1.320
485	85.000	13.750	24.050	5	0.0000	1.480	1.366
486	85.000	13.750	25.350	1	0.0000	1.052	1.202
486	85.000	13.750	25.350	5	0.0000	1.363	1.264

487	85.000	13.750	26.650	1	0.0000	0.972	1.112
487	85.000	13.750	26.650	5	0.0000	1.270	1.184
488	85.000	13.750	27.950	1	0.0000	0.904	1.038
488	85.000	13.750	27.950	5	0.0000	1.192	1.117
489	85.000	13.750	29.250	1	0.0000	0.853	0.979
489	85.000	13.750	29.250	5	0.0000	1.125	1.060
490	85.000	13.750	30.550	1	0.0000	0.801	0.926
490	85.000	13.750	30.550	5	0.0000	1.052	0.994
491	87.500	13.750	22.750	1	0.0000	1.350	1.553
491	87.500	13.750	22.750	5	0.0000	1.694	1.556
492	87.500	13.750	24.050	1	0.0000	1.202	1.388
492	87.500	13.750	24.050	5	0.0000	1.534	1.410
493	87.500	13.750	25.350	1	0.0000	1.093	1.267
493	87.500	13.750	25.350	5	0.0000	1.413	1.301
494	87.500	13.750	26.650	1	0.0000	1.010	1.172
494	87.500	13.750	26.650	5	0.0000	1.316	1.217
495	87.500	13.750	27.950	1	0.0000	0.946	1.099
495	87.500	13.750	27.950	5	0.0000	1.240	1.153
496	87.500	13.750	29.250	1	0.0000	0.889	1.037
496	87.500	13.750	29.250	5	0.0000	1.173	1.094
497	87.500	13.750	30.550	1	0.0000	0.843	0.986
497	87.500	13.750	30.550	5	0.0000	1.117	1.046
498	90.000	13.750	22.750	1	0.0000	1.476	1.714
498	90.000	13.750	22.750	5	0.0000	1.833	1.685
499	90.000	13.750	24.050	1	0.0000	1.314	1.534
499	90.000	13.750	24.050	5	0.0000	1.660	1.522
500	90.000	13.750	25.350	1	0.0000	1.187	1.393
500	90.000	13.750	25.350	5	0.0000	1.521	1.392
501	90.000	13.750	26.650	1	0.0000	1.092	1.286
501	90.000	13.750	26.650	6	0.0000	1.412	1.292
502	90.000	13.750	27.950	1	0.0000	1.013	1.199
502	90.000	13.750	27.950	6	0.0000	1.323	1.210
503	90.000	13.750	29.250	1	0.0000	0.951	1.127
503	90.000	13.750	29.250	6	0.0000	1.249	1.146
504	90.000	13.750	30.550	1	0.0000	0.900	1.069
504	90.000	13.750	30.550	6	0.0000	1.186	1.092
505	70.000	15.000	24.000	1	0.0000	2.427	2.708
505	70.000	15.000	24.000	4	0.0000	3.377	3.123
506	70.000	15.000	25.300	1	0.0000	1.867	2.062
506	70.000	15.000	25.300	5	0.0000	2.655	2.514
507	70.000	15.000	26.600	1	0.0000	1.517	1.676
507	70.000	15.000	26.600	5	0.0000	2.133	2.054
508	70.000	15.000	27.900	1	0.0000	1.335	1.490
508	70.000	15.000	27.900	4	0.0000	1.782	1.724
509	70.000	15.000	29.200	1	0.0000	1.269	1.432
509	70.000	15.000	29.200	5	0.0000	1.599	1.541
510	70.000	15.000	30.500	1	0.0000	1.253	1.422
510	70.000	15.000	30.500	6	0.0000	1.501	1.434
511	70.000	15.000	31.800	1	0.0000	1.247	1.419
511	70.000	15.000	31.800	6	0.0000	1.446	1.372
512	72.500	15.000	24.000	1	0.0000	2.049	2.296
512	72.500	15.000	24.000	4	0.0000	2.740	2.520
513	72.500	15.000	25.300	1	0.0000	1.594	1.766
513	72.500	15.000	25.300	4	0.0000	2.163	2.036
514	72.500	15.000	26.600	1	0.0000	1.351	1.495
514	72.500	15.000	26.600	4	0.0000	1.816	1.729
515	72.500	15.000	27.900	1	0.0000	1.180	1.311
515	72.500	15.000	27.900	4	0.0000	1.541	1.477
516	72.500	15.000	29.200	1	0.0000	1.075	1.205
516	72.500	15.000	29.200	5	0.0000	1.351	1.298
517	72.500	15.000	30.500	1	0.0000	1.023	1.154
517	72.500	15.000	30.500	5	0.0000	1.247	1.197
518	72.500	15.000	31.800	1	0.0000	1.014	1.144
518	72.500	15.000	31.800	6	0.0000	1.199	1.147
519	75.000	15.000	24.000	1	0.0000	1.728	1.939
519	75.000	15.000	24.000	4	0.0000	2.247	2.064
520	75.000	15.000	25.300	1	0.0000	1.447	1.611
520	75.000	15.000	25.300	4	0.0000	1.889	1.762
521	75.000	15.000	26.600	1	0.0000	1.230	1.365
521	75.000	15.000	26.600	4	0.0000	1.597	1.510

522	75.000	15.000	27.900	1	0.0000	1.083	1.202
522	75.000	15.000	27.900	4	0.0000	1.402	1.338
523	75.000	15.000	29.200	1	0.0000	0.979	1.090
523	75.000	15.000	29.200	4	0.0000	1.250	1.201
524	75.000	15.000	30.500	1	0.0000	0.916	1.024
524	75.000	15.000	30.500	5	0.0000	1.136	1.096
525	75.000	15.000	31.800	1	0.0000	0.888	0.998
525	75.000	15.000	31.800	5	0.0000	1.074	1.035
526	77.500	15.000	24.000	1	0.0000	1.532	1.724
526	77.500	15.000	24.000	4	0.0000	1.942	1.781
527	77.500	15.000	25.300	1	0.0000	1.332	1.491
527	77.500	15.000	25.300	4	0.0000	1.703	1.582
528	77.500	15.000	26.600	1	0.0000	1.146	1.274
528	77.500	15.000	26.600	4	0.0000	1.477	1.391
529	77.500	15.000	27.900	1	0.0000	1.013	1.126
529	77.500	15.000	27.900	4	0.0000	1.306	1.241
530	77.500	15.000	29.200	1	0.0000	0.929	1.033
530	77.500	15.000	29.200	4	0.0000	1.191	1.142
531	77.500	15.000	30.500	1	0.0000	0.871	0.970
531	77.500	15.000	30.500	4	0.0000	1.105	1.064
532	77.500	15.000	31.800	1	0.0000	0.830	0.929
532	77.500	15.000	31.800	5	0.0000	1.025	0.991
533	80.000	15.000	24.000	1	0.0000	1.407	1.584
533	80.000	15.000	24.000	4	0.0000	1.760	1.620
534	80.000	15.000	25.300	1	0.0000	1.229	1.376
534	80.000	15.000	25.300	4	0.0000	1.561	1.450
535	80.000	15.000	26.600	1	0.0000	1.097	1.226
535	80.000	15.000	26.600	4	0.0000	1.412	1.322
536	80.000	15.000	27.900	1	0.0000	0.984	1.097
536	80.000	15.000	27.900	4	0.0000	1.270	1.201
537	80.000	15.000	29.200	1	0.0000	0.902	1.006
537	80.000	15.000	29.200	4	0.0000	1.160	1.107
538	80.000	15.000	30.500	1	0.0000	0.847	0.946
538	80.000	15.000	30.500	4	0.0000	1.082	1.037
539	80.000	15.000	31.800	1	0.0000	0.809	0.906
539	80.000	15.000	31.800	4	0.0000	1.025	0.986
540	82.500	15.000	24.000	1	0.0000	1.332	1.500
540	82.500	15.000	24.000	4	0.0000	1.661	1.532
541	82.500	15.000	25.300	1	0.0000	1.185	1.329
541	82.500	15.000	25.300	4	0.0000	1.498	1.391
542	82.500	15.000	26.600	1	0.0000	1.071	1.201
542	82.500	15.000	26.600	4	0.0000	1.371	1.281
543	82.500	15.000	27.900	1	0.0000	0.985	1.103
543	82.500	15.000	27.900	4	0.0000	1.270	1.196
544	82.500	15.000	29.200	1	0.0000	0.904	1.015
544	82.500	15.000	29.200	4	0.0000	1.170	1.107
545	82.500	15.000	30.500	1	0.0000	0.844	0.949
545	82.500	15.000	30.500	4	0.0000	1.086	1.033
546	82.500	15.000	31.800	1	0.0000	0.802	0.905
546	82.500	15.000	31.800	5	0.0000	1.025	0.982
547	85.000	15.000	24.000	1	0.0000	1.314	1.487
547	85.000	15.000	24.000	5	0.0000	1.637	1.511
548	85.000	15.000	25.300	1	0.0000	1.180	1.333
548	85.000	15.000	25.300	5	0.0000	1.489	1.383
549	85.000	15.000	26.600	1	0.0000	1.073	1.213
549	85.000	15.000	26.600	5	0.0000	1.371	1.278
550	85.000	15.000	27.900	1	0.0000	0.992	1.122
550	85.000	15.000	27.900	5	0.0000	1.278	1.197
551	85.000	15.000	29.200	1	0.0000	0.925	1.048
551	85.000	15.000	29.200	4	0.0000	1.200	1.128
552	85.000	15.000	30.500	1	0.0000	0.865	0.983
552	85.000	15.000	30.500	5	0.0000	1.125	1.064
553	85.000	15.000	31.800	1	0.0000	0.823	0.936
553	85.000	15.000	31.800	5	0.0000	1.058	1.006
554	87.500	15.000	24.000	1	0.0000	1.365	1.554
554	87.500	15.000	24.000	5	0.0000	1.693	1.563
555	87.500	15.000	25.300	1	0.0000	1.221	1.392
555	87.500	15.000	25.300	5	0.0000	1.537	1.421
556	87.500	15.000	26.600	1	0.0000	1.115	1.273
556	87.500	15.000	26.600	5	0.0000	1.418	1.315

557	87.500	15.000	27.900	1	0.0000	1.026	1.176
557	87.500	15.000	27.900	5	0.0000	1.320	1.225
558	87.500	15.000	29.200	1	0.0000	0.960	1.101
558	87.500	15.000	29.200	5	0.0000	1.243	1.160
559	87.500	15.000	30.500	1	0.0000	0.904	1.040
559	87.500	15.000	30.500	5	0.0000	1.177	1.102
560	87.500	15.000	31.800	1	0.0000	0.855	0.987
560	87.500	15.000	31.800	5	0.0000	1.117	1.050
561	90.000	15.000	24.000	1	0.0000	1.487	1.708
561	90.000	15.000	24.000	5	0.0000	1.829	1.688
562	90.000	15.000	25.300	1	0.0000	1.325	1.527
562	90.000	15.000	25.300	5	0.0000	1.655	1.524
563	90.000	15.000	26.600	1	0.0000	1.200	1.389
563	90.000	15.000	26.600	5	0.0000	1.519	1.398
564	90.000	15.000	27.900	1	0.0000	1.100	1.279
564	90.000	15.000	27.900	5	0.0000	1.408	1.296
565	90.000	15.000	29.200	1	0.0000	1.026	1.195
565	90.000	15.000	29.200	5	0.0000	1.322	1.222
566	90.000	15.000	30.500	1	0.0000	0.961	1.124
566	90.000	15.000	30.500	6	0.0000	1.247	1.150
567	90.000	15.000	31.800	1	0.0000	0.909	1.065
567	90.000	15.000	31.800	6	0.0000	1.184	1.096

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
     77.5000=X-COOR.      5.0000=Y-COOR.    21.8000=RADIUS       0.657=F.S.     28=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
     80.0000=X-COOR.      8.7500=Y-COOR.    25.5500=RADIUS       1.002=F.S.    224=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
     80.0000=X-COOR.      5.0000=Y-COOR.    21.8000=RADIUS       0.937=F.S.     35=SLIP#

NORMAL TERMINATION OF SLOPE
```

APPENDIX IV

EUSTIS ENGINEERING COMPANY, INC.
Geotechnical Engineers
Metairie, Louisiana

Date 2-23-03

Job 17623

Project DNR - Little Lake Shoreline Protection

By GPS

Subject Shore Protection Manual - Volume I

Checked By

1) <u>Wind Speed</u>
may be computed using section 3.4 pg 3-20

for this case use values furnished from Houma airport

adjust per Table 3-2 pg 3-29

$$\frac{\text{Wind speed @ airport}}{\text{overwater wind speed}} = 0.7$$

overwater wind speed = airport wind speed × 1.43

avg 5 knots ≃ 7.14 knots ≃ 8.2 mph
10 knots = 14.29 knots ≃ 16.44 mph

max 107 knots = 152.86 knots ≃ 175.9 mph
23 knots = 32.86 knots ≃ 37.8 mph

2) <u>Fetch</u>

estimate using furnished NOAA Chart 11352

$F \simeq$ 4 to 6 miles in length

$W \simeq$ 0.8 to 0.9 miles in width

using Fig 3-13 pg 3-31 compute F_e (conservative since shoreline is irregular)

$W/F \simeq$ $0.8/4 \simeq 0.2$ $0.9/6 \simeq 0.15$

$F_e/F \simeq$ 0.34 to 0.4

$F_{e_1} \simeq 0.4(4) \simeq 1.6$ mi {8448 ft $F_{e_2} \simeq 0.34(6) \simeq 2.04$ mi [illegible]

use $F \approx 10{,}000$ feet

Page ______

EUSTIS ENGINEERING COMPANY, INC.
Geotechnical Engineers
Metairie, Louisiana

Date ______

Job 17623

Project IHK - Little Lake

By GPS

Subject Summary of furnished data (wind speed)

Checked By ______

MHW = 1.56 MLW = 0.45

NOAA Chart 11352 ~ 3 to 6' depths

Cross sections show avg mudline @ -4, assume avg water @ +1 ⇒ 5' depth
-2 +1 ⇒ 3' depth

wind speed ⊥ to alignment

0-10° wind speeds of 5 to 10 knots most freq. (5 first, 10, second)

50-60° " " (8 first; 5 second)

max wind: 107 knots @ 20°
~23 knots in ⊥ dir (0-10 & 50-60)

avg wind: ~8 knots

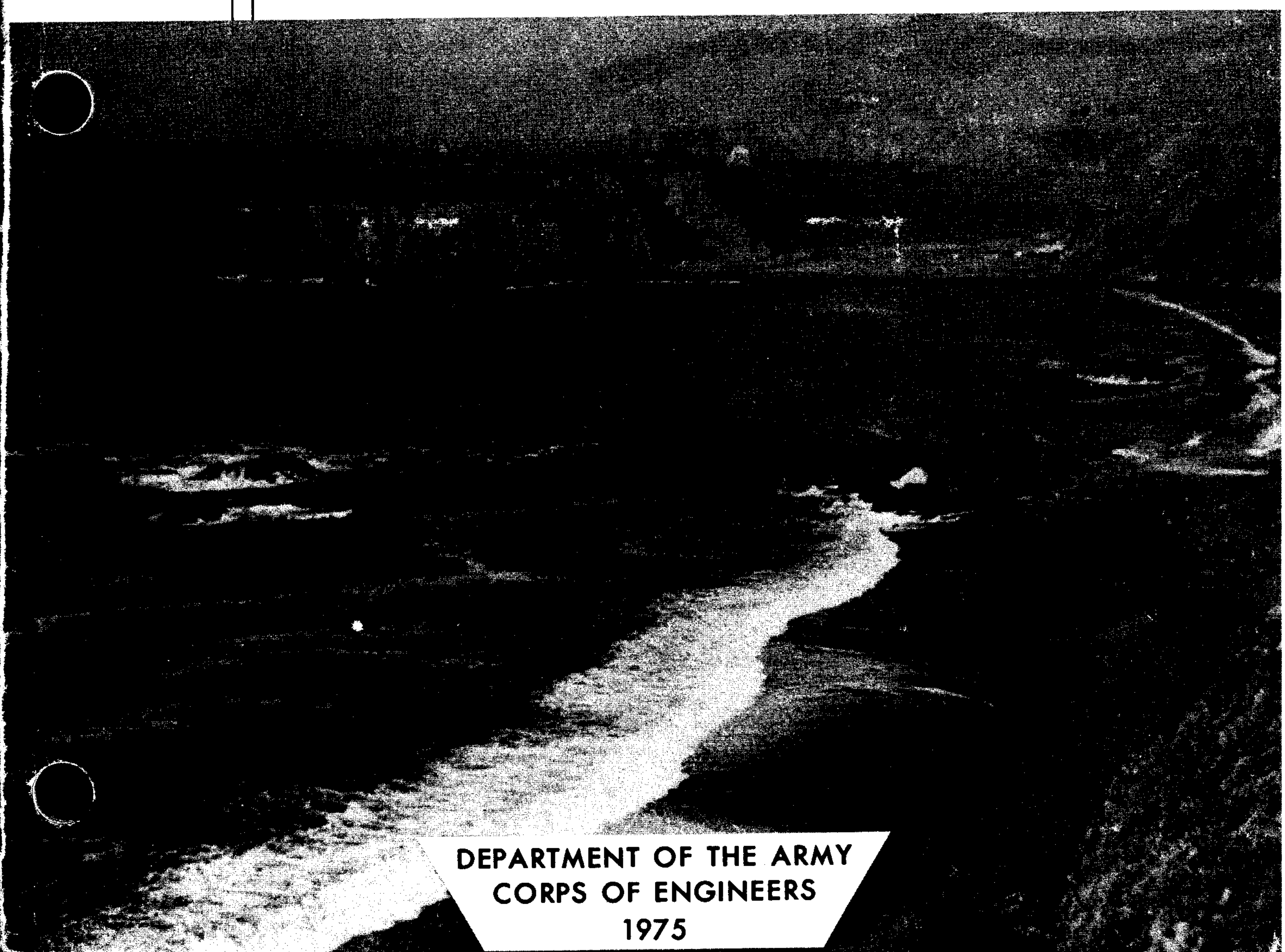
mode wind; ~5 knots ⊥
w/ 10 knots at some loc.

note - wind speeds are over land - Houma airport

U.S. Army
Coastal Engineering
Research Center

SHORE PROTECTION MANUAL

Volume I



DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
1975

may be determined by first analyzing meteorological data to find deepwater conditions. Then, by analyzing refraction (Section 2.32, General - Refraction by Bathymetry.), the changes in wave characteristics as the wave moves through shallow water to the shore may be found. In other areas, in particular along the North Atlantic coast, where the bathymetry is complex, refraction procedure results are frequently difficult to interpret, and the conversion of deepwater wave data to shallow-water and nearshore data becomes laborious and sometimes inaccurate.

Along the Gulf coast and in many inland lakes, generation of waves by wind is appreciably affected by water depth. In addition, the nature and extent of transitional and shallow-water regions complicate ordinary refraction analysis by introducing a bottom-friction factor and associated wave energy dissipation.

3.4 WIND INFORMATION NEEDED FOR WAVE PREDICTION

Wave prediction from first principles, as described above, requires very detailed specification of the wind field near the water surface. This is generally developed in two steps: (1) Estimation of the mean *free* air wind speed and direction, (This step may be omitted for reservoirs and small lakes if surface wind observations are available.), and (2) Estimation of the mean *surface* wind speed and direction.

When the full wave generation process is considered, a large capacity computer must be used for the calculations, and fairly complex procedures may be used for determining the wind field. Engineers who require wave hindcasts for only a few locations, and perhaps for only a few dates must employ simpler techniques. A brief discussion of the processes involved in determining the surface wind and techniques suitable for use in determining the characteristics of the wind field needed for the simplified wave prediction model described in Section 3.5, Simplified Wave Prediction Models, are given in this section. These procedures will be accurate (within 20 percent) about two-thirds of the time. The following discussion provides guidance for recognizing cases in which the simplified procedures are not appropriate. Errors resulting from disregarding the exceptional situations tend to be random. Thus climatological summaries, based on hindcast data, may be much more accurate than the individual values that go into them.

Wind reports from ships at sea are generally estimates based on the appearance of the waves, the drifting of smoke, or the flapping of flags-although some are anemometer measurements. Actually, even if all ships were equipped with several aneometers, the wind field over the sea would still not be known in sufficient detail or precision to permit full exploitation of modern theories for wave generation.

Fortunately, estimates of the surface wind field that are usefully accurate most of the time can be based on the isobaric pattern of synoptic weather charts.

Horizontal pressure gradients arise in the atmosphere primarily because of density differences, which in turn are generated primarily by temperature differences. Wind results from nature's efforts to eliminate the pressure gradients, but is modified by many other factors.

The pressure gradient is nearly always in approximate equilibrium with the acceleration produced by the rotation of the earth. The *geostrophic wind* is defined by assuming that exact equilibrium exists, and is given by

$$U_g = \frac{1}{\rho_a f} \frac{dp}{dn} , \tag{3-19}$$

where U_g is the wind speed, ρ_a the density of the air, f the coriolis parameter, $f = 2\omega \sin\phi$, where $\omega = 7.292 \times 10^{-5}$ radians/second and ϕ is the latitude, and dp/dn is the horizontal gradient of atmospheric pressure. A graphic solution of this equation is given in Figure 3-11, Section 3.41, Estimating the Wind Characteristics. The geostrophic wind blows parallel to the isobars with low pressure to the left, when looking in the direction toward which the wind is blowing, in the Northern Hemisphere, and low pressure to the right in the Southern Hemisphere. Geostrophic wind is usually the best simple estimate of the true wind in the free atmosphere.

When the trajectories of air particles are curved, equilibrium wind speed is called *gradient wind*. Gradient wind is stronger than geostrophic wind for flow around a high pressure area, and weaker than geostrophic wind for flow around low pressure. The magnitude of the difference between geostrophic and gradient winds is determined by the curvature of the trajectories. If the pressure pattern does not change with time and friction is neglected, trajectories are parallel with the isobars. The isobar curvature can be measured from a single weather map, but at least two maps must be used to estimate trajectory curvature. There is a tendency by some analysts to equate the isobars and trajectories at all times, and to compute the gradient wind correction from the isobar curvature. When the curvature is small, but the pressure is changing, this tendency may lead to incorrect adjustments. Corrections to the geostrophic wind that cannot be determined from a single weather map are usually neglected, even though they may be more important than the isobaric curvature effect.

The equilibrium state is further disturbed near the surface of the earth by friction. Friction causes the wind to cross the isobars toward low pressure at a speed lower than the wind speed in the free air. <u>Over water, the average surface wind speed is generally about 60 to 75 percent of the free air value</u>, and wind crosses the isobars at an angle of 10 to 20 degrees. In individual situations, the magnitude of the ratio between the surface wind speed and the computed free air speed may vary from 20 to more than 100 percent, and the crossing angle may vary from 0° to more than 90°. The magnitude of these changes is determined by the vertical temperature profile and the turbulent viscosity in the atmosphere.

3.43 FORECASTS FOR LAKES, BAYS, AND ESTUARIES

3.431 Wind Data. The techniques referred to for determination of wind speeds and directions from isobaric patterns apply generally to ocean areas. The friction that causes winds to spiral when crossing isobars and to have a velocity lower than geostrophic or gradient winds is more variable over land areas. When a fetch is close to land, this variability will alter anticipated wind directions and velocities. In enclosed or semienclosed bodies of water, such as lakes and bays, wind speeds and directions should be taken from actual weather station reports whenever possible.

In enclosed bodies of water, or in other areas where the wind blows off the land, differing frictional effects of land and water should be considered, and indicated wind speeds should be adjusted for these effects. Studies by Myers (1954) and Graham and Nunn (1959) indicate recommended adjustments in wind speeds. (See Table 3-2.) The adjustment factor may vary considerably depending on the shoreline frictional characteristics. This adjustment is used only for short fetches such as those in reservoirs and small lakes.

Often, over small or well-defined fetch areas, it is not convenient or even possible to utilize surface charts to determine wind characteristics. Where wind records exist for locations in or near a fetch area, these may be utilized. The accuracy of the forecast will depend on the completeness of the records, the extent of fetch, and the wave prediction technique employed. Where wind duration records are not available, local wind speed reports may still be utilized to forecast waves assuming unlimited durations, that is, wave growth is limited by the available fetch. Wave characteristics deduced in this way are only qualitative.

Table 3-2. Wind-Speed Adjustment, Nearshore

Wind Direction	Location of Wind Station	Ratio*
Onshore	2 to 3 miles offshore	1.0
Onshore	At coast	0.9
Onshore	5 to 10 miles inland	0.7
Offshore	At coast	0.7
Offshore	10 miles offshore	1.0

(Graham and Nunn, 1959)

*Ratio of wind speed at location to overwater wind speed (both at 30-ft. level).

3.432 Effective Fetch. The effect of fetch width or limiting ocean wave growth in a generating area may usually be neglected since nearly all ocean fetches have widths about as large as their lengths. In inland waters (bays, rivers, lakes, and reservoirs), fetches are limited by land forms surrounding the body of water. Fetches that are long in comparison to width are frequently found, and the fetch width may become quite important, resulting in wave generation significantly lower than that expected from the same generating conditions over more open waters.

Saville (1954) proposed a method to determine the effect of width on wave generation. Figure 3-13, based on this method, indicates the effective fetch for a relatively uniform fetch width. The following problem demonstrates the use of Figure 3-13.

* * * * * * * * * * * * * * EXAMPLE PROBLEM * * * * * * * * * * * * * *

GIVEN: Consider a channel with a fetch length $F = 20$ miles, a width $W = 5$ miles, an average depth $d = 35$ feet, and a windspeed $U = 50$ mph along the long axis.

FIND: Estimate the significant wave height H_s, and the significant wave period T_s.

SOLUTION: Compute $W/F = 5/20 = 0.25$

From Figure 3-13 for $W/F = 0.25$, $F_E/F = 0.45$

Compute $F_E = 0.45 \times 20 = 9$ miles or 47,500 feet.

Using the forecasting relations given in Section 3.6, Wave Forecasting for Shallow Water, for a fetch of 47,500 feet and a wind speed of 50 mph and an average uniform depth of 35 feet, the significant wave height may be determined from Figure 3-27 to be $H_s = 5.2$ feet, say 5 feet and the significant wave period will be $T_s = 4.6$ seconds, say 5 seconds.

*

The preceding example presents a simplified method of determining the effective fetch. Shorelines are usually irregular, and the uniform-width method indicated in Figure 3-13 is not applicable. A more general method must be applied. This method is based on the concept that the width of a fetch in reservoirs normally places a very definite restriction on the length of the effective fetch; the less the width-length ratio, the shorter the effective fetch. A procedure for determining the effective fetch distance is illustrated in Figure 3-14. It consists of constructing 15 radials from the wave station at intervals of 6° (limited by an angle of 45° on either side of the wind direction) and extending these radials until they first intersect the shoreline. The component of length of each radial in a direction parallel to the wind direction is measured and multiplied by the cosine of the angle between the radial and the wind direction. The resulting values for each radial are summed and divided by the sum of the cosines of all the individual angles. This method is based on the following assumptions:

(a) Wind moving over a water surface transfers energy to the water surface in the direction of the wind and in all directions within 45° on either side of the wind direction.

(b) The wind transfers a unit amount of energy to the water along the central radial in the direction of the wind and along any other radial an amount modified by the cosine of the angle between the radial and the wind direction.

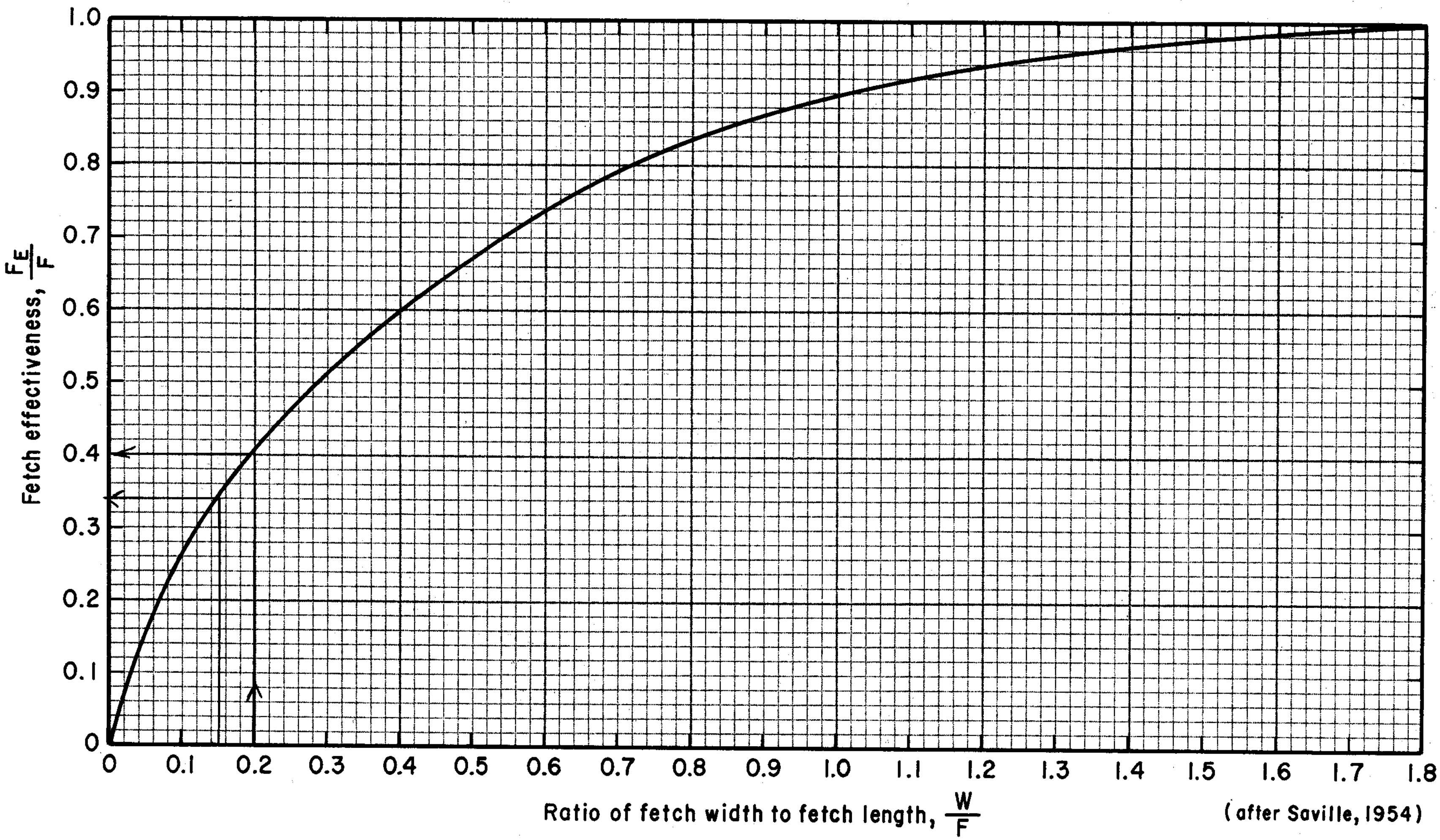


Figure 3-13. Relation of Effective Fetch to Width-Length Ratio for Rectangular Fetches

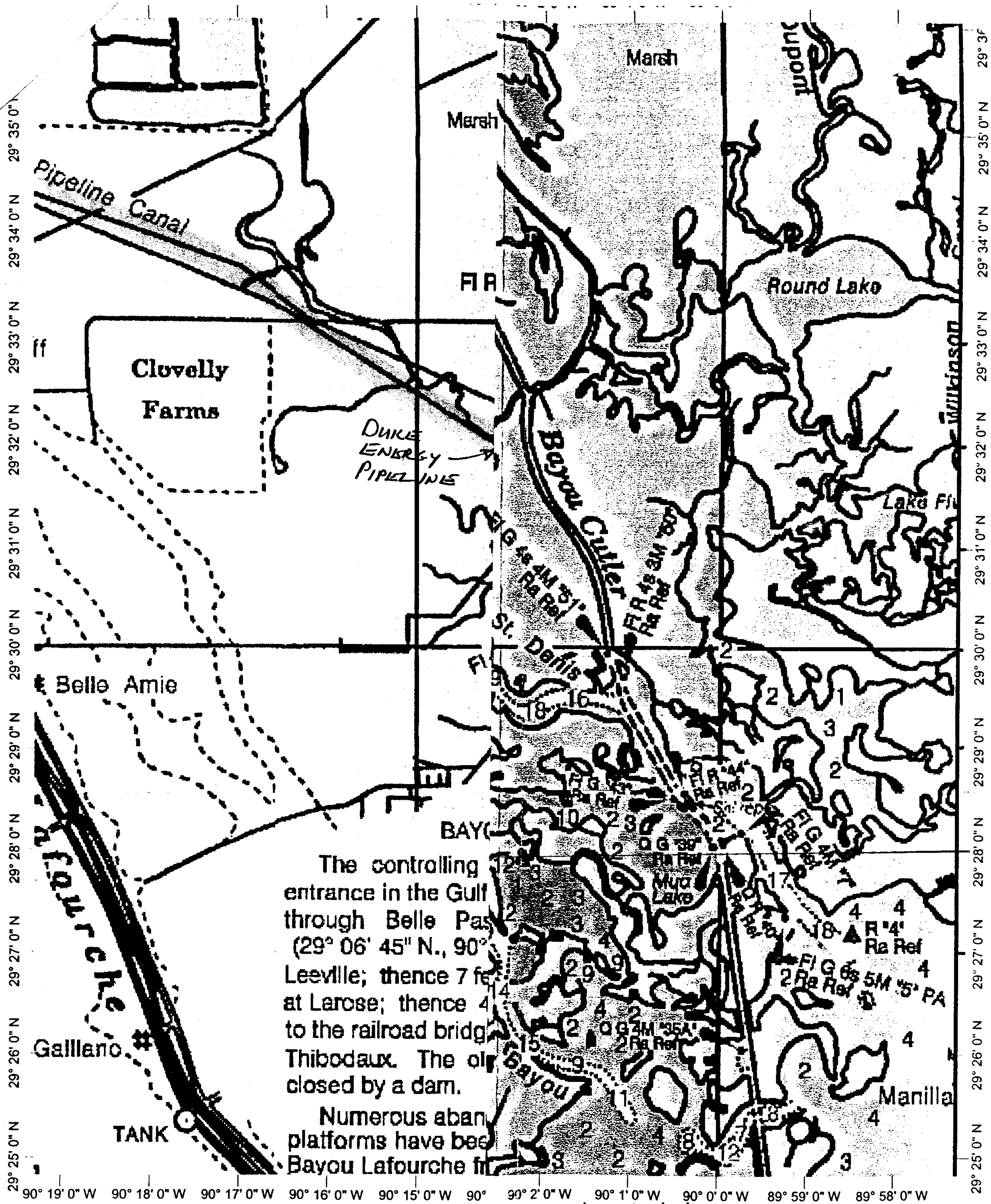


Chart Name: NEW ORLEANS TO CALCASIEU RIVE

Chart ID: 11352_1

Top Left: 29° 36' 3" N 90° 19' 18" W

Bottom Right: 29° 24' 49" N 89° 57' 16" W

rough distance in feet

0' per min ~101' per second

~85' per second or 5100' per min

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Page 27

EUSTIS ENGINEERING COMPANY, INC.
Geotechnical Engineers
Metairie, Louisiana

Date 2-23-03

Job

Project DNR - Little Lake

By GPS

Subject

Checked By

Shore Protection Manual
Vol 1 Section 3.6 pg 3-42

(1) Wave Forecasting for Shallow Water

use Fig 3-21 ; constant water depth of 5' ← this is minimum depth presented
bottom friction factor $f_f \approx 0.01$

borings were performed in ≈ 5' water
proposal says 2' water +

given fetch (F) & wind speed (U)
find wave height (H) & period (T)

min: $H \approx 0.75'$ $T \approx 1.75$ sec
max $H \approx 1.5'$ $T \approx 2.5$ sec for typical [illegible]
$H \approx 2.5'$ $T \approx 4$ sec for max. wind @ 20°

$$H_s \approx \frac{1.5 + 2.5}{2} \approx 2'$$ avg of highest waves

note - this doesn't include storm / hurricane events (?)

Service Command (1970) provides summaries of shipboard wave observations, Summary of Synoptic Meteorological Observations (SSMO) for the hatched areas indicated in Figure 3-17. Cumulative distribution functions for wave heights as determined by both hindcasting techniques and the shipboard observations are given in Figure 3-18. The average of the two forecasting methods agrees reasonably well with the shipboard observations.

3.54 ESTIMATING WAVE DECAY IN DEEP WATER

Figures 3-19 and 3-20 are used to estimate wave characteristics after the waves have left the fetch area but are still travelling in deep water. With Figure 3-19, and given H_F, T_F, F_m and D (the decay distance), it is possible to compute the ratios

$$\frac{\text{decayed wave height}}{\text{fetch wave height}} = \frac{H_D}{H_F}, \text{ and } \frac{\text{decayed wave period}}{\text{fetch wave period}} = \frac{T_D}{T_F}$$

With Figure 3-20, it is possible to compute wave travel time between a fetch and a coast, knowing the decayed wave period T_D and the decay distance D.

This *travel time* t_D is determined by dividing the decay distance by the deepwater group velocity for waves having a period equal to the decayed period T_D. These values enable the estimation of arrival times for waves at the end of the decay distance.

Waves, after leaving a generating area, will generally follow a great-circle path toward a coast. However, sufficient accuracy is usually obtained by assuming wave travel in a straight line on the synoptic chart. Decay distance is found by measuring the straight line distance between the front of a fetch and the point for which the forecast is being made. If a forecast is being made for a coastal area, the effects of shoaling, refraction, bottom friction and percolation will have to be considered in translating the deepwater forecast to the shore.

3.6 WAVE FORECASTING FOR SHALLOW WATER

3.61 FORECASTING CURVES

Water depth affects wave generation. For a given set of wind and fetch conditions, wave heights will be smaller and wave periods shorter if generation takes place in transitional or shallow water rather than in deep water. Several forecasting approaches have been made; the method given by Bretschneider as modified using the results of Ijima and Tang (1966) is presented here. Bretschneider and Reid (1953) consider bottom friction and percolation in the permeable sea bottom.

There is no single theoretical development for determining the actual growth of waves generated by winds blowing over relatively shallow water. The numerical method presented here is based on successive approximations in which wave energy is added due to wind stress and subtracted due to bottom friction and percolation. This method uses deepwater forecasting relationships originally developed by Sverdrup and Munk (1947) and revised by Bretschneider (1951) to determine the energy added due to wind stress. Wave energy lost due to bottom friction and percolation is determined from the relationships developed by Bretschneider and Reid (1953). Resultant wave heights and periods are obtained by combining the above relationships by numerical methods. The basic assumptions applicable to development of deepwater wave-generation relationships (Bretschneider, 1952b) as well as development of relationships for bottom friction loss (Putnam and Johnson, 1949) and percolation loss (Putnam, 1949) apply.

The choice of an appropriate bottom friction factor f_f for use in the forecasting technique is a matter of judgement; a value of $f_f = 0.01$ has been used for the preparation of Figures 3-21 through 3-30 which are forecasting curves for shallow-water areas of constant depth. These curves, which may be used like Figures 3-15 and 3-16, are given by the equations:

$$\frac{gH}{U^2} = 0.283 \tanh\left[0.530\left(\frac{gd}{U^2}\right)^{0.75}\right] \tanh\left\{\frac{0.0125\left(\frac{gF}{U^2}\right)^{0.42}}{\tanh\left[0.530\left(\frac{gd}{U^2}\right)^{0.75}\right]}\right\}, \quad (3\text{-}25)$$

and

$$\frac{gT}{2\pi U} = 1.20 \tanh\left[0.833\left(\frac{gd}{U^2}\right)^{0.375}\right] \tanh\left\{\frac{0.077\left(\frac{gF}{U^2}\right)^{0.25}}{\tanh\left[0.833\left(\frac{gd}{U^2}\right)^{0.375}\right]}\right\}, \quad (3\text{-}26)$$

which in deep water reduce to Equations 3-21 and 3-22 respectively.

* * * * * * * * * * * * * * EXAMPLE PROBLEM * * * * * * * * * * * * * *

GIVEN: Fetch, F = 80,000 feet, wind speed, U = 50 mph., water depth, d = 35 feet (average constant depth), bottom friction factor $f_f = 0.01$ (assumed).

FIND: Wave height H and wave period T.

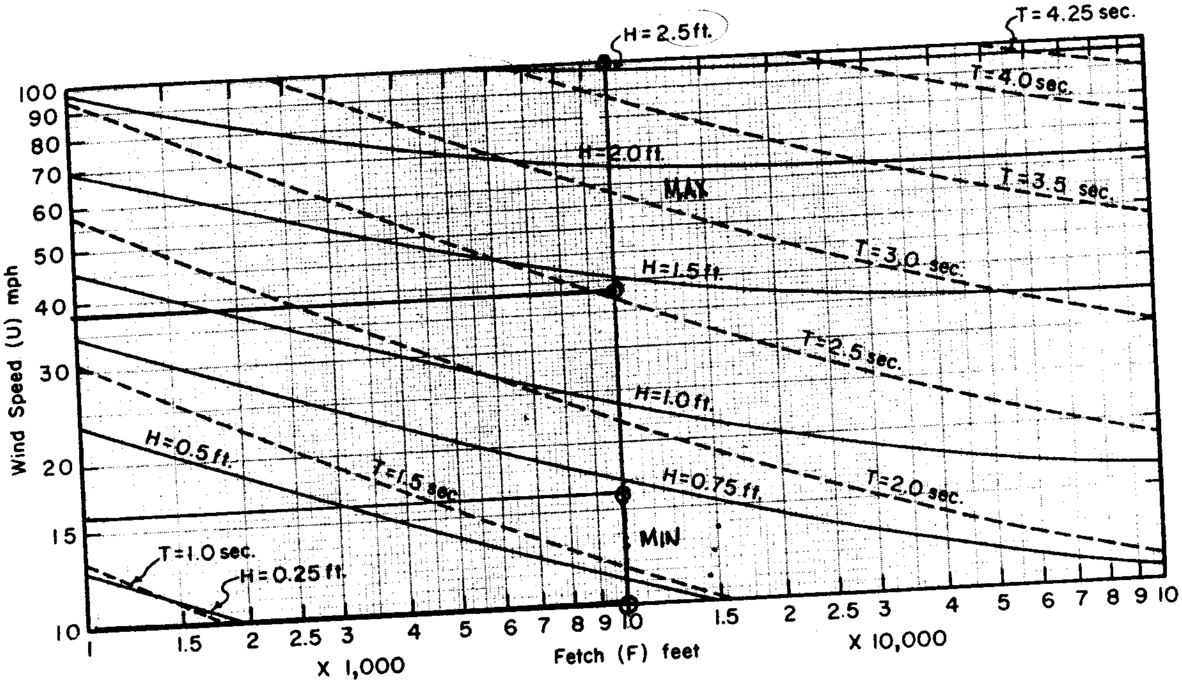


Figure 3-21. Forecasting Curves for Shallow-Water Waves Constant Depth = 5 feet.

Estimated (Effective) Fetch ≈ 10,000 feet

Estimated Wind Speed (U)

minimum ≈ 8 to 16 mph H ≈ 0.72' T ≈ 1.75 sec.

maximum ≈ 38 to 176 mph H ≈ 1.5 to 2.5' T ≈ 2.5 sec to 4 sec

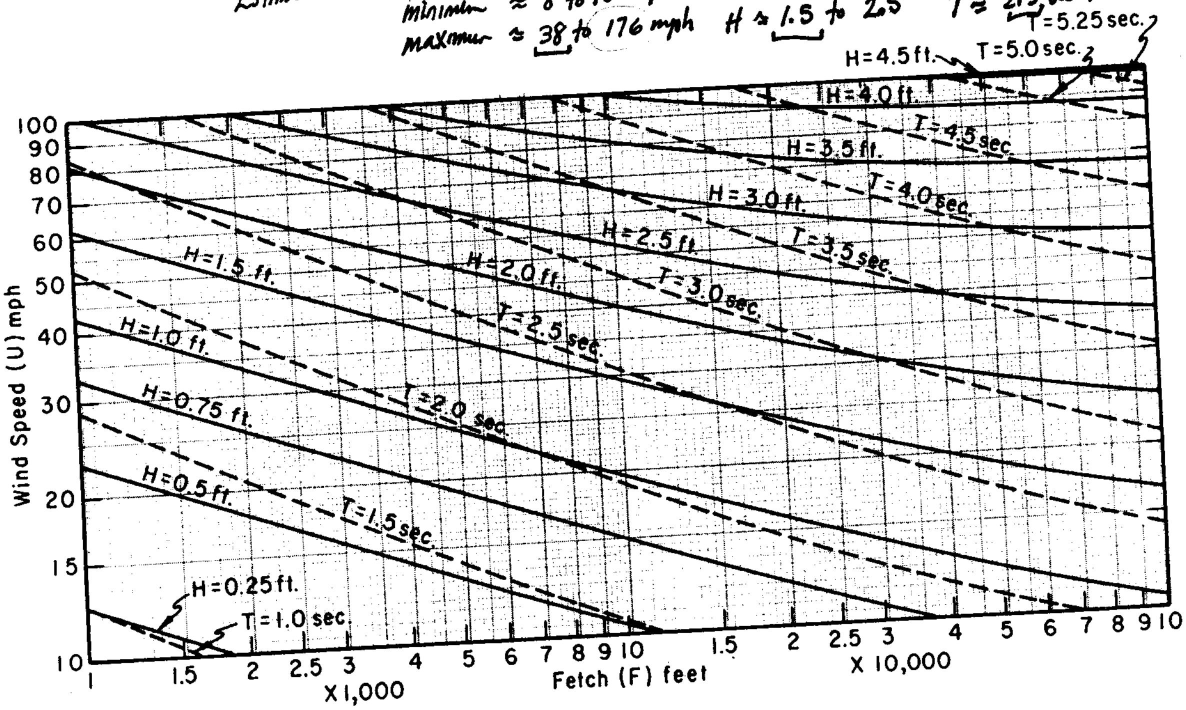


Figure 3-22. Forecasting Curves for Shallow-Water Waves Constant Depth = 10 feet.

SOLUTION: From Figure 3-27 for constant depth, d = 35 feet,

for

$$F = 80{,}000 \text{ feet},$$

and

$$U = 50 \text{ mph}.$$

Then

$$H = 5.9 \text{ feet, say 6 feet},$$

and

$$T = 5.1 \text{ seconds, say 5 seconds}.$$

* *

3.62 DECAY IN LAKES, BAYS, AND ESTUARIES

Section 3.33. Decay of A Wave Field applies to water areas contiguous with land as well as those in the open ocean. Most fetches in inland waters will be limited at the front and at the rear by a land mass and decay distances will usually be relatively small or nonexistent.

3.7 HURRICANE WAVES

did not consider hurricane or storm surges

When predicting wave generation by hurricanes, the determination of fetch and duration from a wind field is more difficult than for more normal weather conditions discussed earlier. The large changes in wind speed and direction with both location and time cause the difficulty. Estimation of the free air wind field must be approached through mathematical models, because of the scarcity of observations in severe storms. However, the vertical temperature profile and atmospheric turbulence characteristics associated with hurricanes differ less from one storm to another than for other types of storms. Thus the relation between the free air winds and the surface winds is less variable for hurricanes than for other storms.

3.71 DESCRIPTION OF HURRICANE WAVES

In hurricanes, fetch areas in which wind speed and direction remain reasonably constant are always small; a fully arisen sea state never develops. In the high-wind zones of a storm, however, long-period waves which can outrun the storm may be developed within fetches of 10 to 20 miles and over durations of 1 to 2 hours. The wave field in front, or to either side, of the storm center will consist of a locally generated sea, and a swell from other regions of the storm. Samples of wave spectra, obtained during hurricane Agnes, 1972, are shown in Figure 3-31. Most of the spectra display evidence of two or three distinct wave trains; thus, the physical implications of a *significant wave period* is not clear.

Other hurricane wave spectra computed with an analog spectrum analyzer from wave records obtained during Hurricane Donna, 1959, have been published by Bretschneider (1963). Most of the spectra also contained two distinct peaks.

APPENDIX V

Page

EUSTIS ENGINEERING COMPANY, INC.
Geotechnical Engineers
Metairie, Louisiana

Date 3-10-03

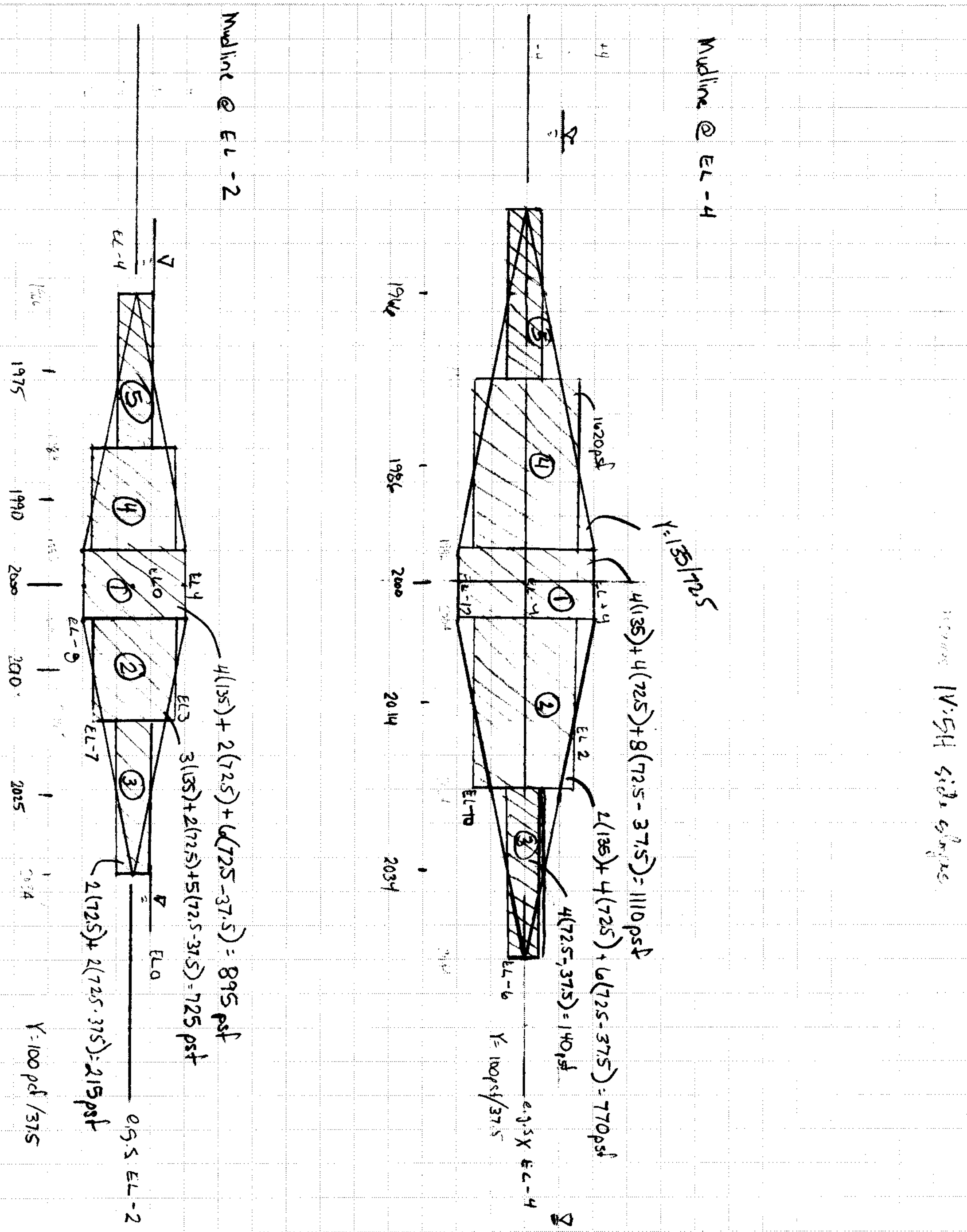
Job 17623

Project Little Lake

By SRS

Subject Model for Rock Dike

Checked By



SETTLEMENT ANALYSIS - STRESS DISTRIBUTION BY WESTERGAARD THEORY, MAGNITUDE AND RATE OF CONSOLIDATION BY TERZAGHI THEORY

Load Region Parameter	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Bearing Area Center, Xc (ft) =	2000.00	2010.00	2025.00	1990.00	1975.00	2000.00	2000.00	2000.00	2000.00	2000.00
Bearing Area Center, Yc (ft) =	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
Bearing Area Width in X-direction, B (ft) =	8.00	12.00	18.00	12.00	18.00	1.00	1.00	1.00	1.00	1.00
Bearing Area Length in Y-direction, L (ft) =	2000.00	2000.00	2000.00	2000.00	2000.00	1.00	1.00	1.00	1.00	1.00
Net Applied Pressure (psf) =	895.0	725.0	215.0	725.0	215.0	0.0	0.0	0.0	0.0	0.0
Depth of Application, Da (ft) =	6.00	5.00	2.00	5.00	2.00	0.00	0.00	0.00	0.00	0.00
Depth of Foundation, Df (ft) =	6.00	5.00	2.00	5.00	2.00	0.00	0.00	0.00	0.00	0.00
Contact Pressure Multiplier (N/D) =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Time of Application (yrs) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

			Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Sub 1	dX		4.0	-4.0	-16.0	16.0	34.0	0.5	0.5	0.5	0.5	0.5
	dY		1000.0	1000.0	1000.0	1000.0	1000.0	0.5	0.5	0.5	0.5	0.5
Sub 2	dX		4.0	-4.0	-16.0	16.0	34.0	0.5	0.5	0.5	0.5	0.5
	dY		-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-0.5	-0.5	-0.5	-0.5	-0.5
Sub 3	dX		-4.0	-16.0	-34.0	4.0	16.0	-0.5	-0.5	-0.5	-0.5	-0.5
	dY		1000.0	1000.0	1000.0	1000.0	1000.0	0.5	0.5	0.5	0.5	0.5
Sub 4	dX		-4.0	-16.0	-34.0	4.0	16.0	-0.5	-0.5	-0.5	-0.5	-0.5
	dY		-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-0.5	-0.5	-0.5	-0.5	-0.5

Strain Factor = 0.50

Abscissa for Analysis, Xa (ft) =	2000.00
Ordinate for Analysis, Ya (ft) =	2000.00
Poisson's Ratio, u (N/D) =	0.00
Recompression Factor (N/D) =	0.15
Total Settlement Multiplier (N/D) =	0.85
Stress Bulb Criterion (%) =	10.00%
Current Time (yrs) =	25.00
Depth of Wick Drains (ft) =	0.00
Wick Drain Triangular Grid Spacing (ft) =	4.00
Equivalent Drain Diameter, dw (in) =	2.060
Equivalent Mandrel Diameter, dm (in) =	3.570
Diameter of Smear Zone, ds (in) =	9.850
Drain Capacity Ratio (sqft) =	4300.0

		Ultimate Settlement Recomp Sett (in.)	Ultimate Settlement Virgin Sett (in.)	Ultimate Settlement Total Sett (in.)	Ultimate Settlement Bulb Sett (in.)	Induced Settlement Recomp Sett (in.)	Induced Settlement Virgin Sett (in.)	Induced Settlement Total Sett (in.)	Induced Settlement Bulb Sett (in.)
TOTAL	(in)	2.54	21.91	24.46	24.22	1.45	9.17	10.62	10.60
	(ft)	0.21	1.83	2.04	2.02	0.12	0.76	0.89	0.88
	%Ultimate			100.0	99.0			43.4	43.4
REDUCD	(in)	2.16	18.63	20.79	20.59	1.23	7.80	9.03	9.01
	(ft)	0.18	1.55	1.73	1.72	0.10	0.65	0.75	0.75
	%Ultimate			85.0	84.2			36.9	36.9

Group	L (ft)		Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
			25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
I	54.65	Tv	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
		Uv	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18
II	0.00	Tv	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
III	0.00	Tv	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

1.20

Str No.	Depth (ft)	γ' (pcf)	CR (N/D)	RR (N/D)	cv (sf/yr)	ch (sf/yr)	Total H (ft)	Eff Vert Stress at Mid-Stratum: Past Maximum (psf)	Zero Burden (psf)	Ultimate Change (psf)	Ultimate Value (psf)	Induced Change (psf)	Induced Value (psf)
1	0.0 1.5 3.0	17.0	0.428	0.063	3.1	6.0	3.0	480	0 26 51	2 6.3%	27	1 5.7%	27
2	6.0 9.0	37.0	0.307	0.046	9.0	15.0	6.0	480	162 273	876 540.8%	1038	615 379.7%	777
3	12.0 15.0	37.0	0.307	0.046	9.0	15.0	6.0	540	384 495	732 190.7%	1116	371 96.5%	755
4	18.5 22.0	52.0	0.352	0.053	4.0	15.0	7.0	643	677 859	577 85.2%	1254	168 24.9%	845
5	24.5 27.0	42.0	0.225	0.034	7.3	15.0	5.0	1157	964 1069	483 50.1%	1447	73 7.6%	1037
6	29.5 32.0	42.0	0.225	0.034	7.3	15.0	5.0	1409	1174 1279	424 36.1%	1598	38 3.3%	1212
7	34.5 37.0	42.0	0.225	0.034	7.3	15.0	5.0	1661	1384 1489	376 27.2%	1760	19 1.4%	1403
8	39.5 42.0	42.0	0.225	0.034	7.3	15.0	5.0	1913	1594 1699	338 21.2%	1932	9 0.6%	1603
9	44.5 47.0	42.0	0.225	0.034	7.3	15.0	5.0	2165	1804 1909	306 17.0%	2110	4 0.2%	1808
10	49.5 52.0	42.0	0.225	0.034	7.3	15.0	5.0	2417	2014 2119	280 13.9%	2294	2 0.1%	2016
11	54.5 57.0	42.0	0.225	0.034	7.3	15.0	5.0	2669	2224 2329	257 11.6%	2481	1 0.0%	2225
12	59.5 62.0	42.0	0.225	0.034	7.3	15.0	5.0	2921	2434 2539	238 9.8%	2672	0 0.0%	2434
13	64.5 67.0	42.0	0.225	0.034	7.3	15.0	5.0	3173	2644 2749	221 8.4%	2865	0 0.0%	2644
14	69.5 72.0	42.0	0.225	0.034	7.3	15.0	5.0	3425	2854 2959	206 7.2%	3060	0 0.0%	2854
15	72.3 72.5	42.0	0.000	0.000	7.3	15.0	0.5	3563	2970 2980	199 6.7%	3168	0 0.0%	2970
16	72.8 73.0	42.0	0.000	0.000	7.3	15.0	0.5	3589	2991 3001	198 6.6%	3188	0 0.0%	2991
17	73.3 73.5	42.0	0.000	0.000	7.3	15.0	0.5	3614	3012 3022	196 6.5%	3208	0 0.0%	3012
18	73.8 74.0	42.0	0.000	0.000	7.3	15.0	0.5	3639	3033 3043	195 6.4%	3228	0 0.0%	3033
19	74.5 75.0	42.0	0.000	0.000	7.3	15.0	1.0	3677	3064 3085	193 6.3%	3257	0 0.0%	3064
20	75.5 76.0	42.0	0.000	0.000	7.3	15.0	1.0	3727	3106 3127	191 6.1%	3297	0 0.0%	3106
21	76.5 77.0	42.0	0.000	0.000	7.3	15.0	1.0	3778	3148 3169	188 6.0%	3336	0 0.0%	3148
22	77.5 78.0	42.0	0.000	0.000	7.3	15.0	1.0	3828	3190 3211	186 5.8%	3376	0 0.0%	3190
23	78.5 79.0	42.0	0.000	0.000	7.3	15.0	1.0	3878	3232 3253	184 5.7%	3416	0 0.0%	3232
24	79.5 80.0	42.0	0.000	0.000	7.3	15.0	1.0	3929	3274 3295	182 5.6%	3456	0 0.0%	3274
25	80.5 81.0	42.0	0.000	0.000	7.3	15.0	1.0	3979	3316 3337	180 5.4%	3496	0 0.0%	3316

Str No.	Ultimate Settlement Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)	Induced Settlement Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)
1	0.02	0.00	(24.46) 0.02 (24.44)	(24.22) 0.00 (24.22)	0.02	0.00	(10.62) 0.02 (10.60)	(10.60) 0.00 (10.60)
2	0.83	3.92	4.75 (19.69)	4.75 (19.48)	0.83	2.45	3.28 (7.33)	3.28 (7.33)
3	0.49	6.97	7.46 (12.23)	7.46 (12.01)	0.49	3.21	3.70 (3.63)	3.70 (3.62)
4	0.00	8.57	8.57 (3.65)	8.57 (3.44)	0.00	3.51	3.51 (0.11)	3.51 (0.11)
5	0.16	1.31	1.47 (2.18)	1.47 (1.97)	0.06	0.00	0.06 (0.05)	0.06 (0.05)
6	0.16	0.74	0.90 (1.28)	0.90 (1.07)	0.03	0.00	0.03 (0.02)	0.03 (0.02)
7	0.16	0.34	0.50 (0.78)	0.50 (0.57)	0.01	0.00	0.01 (0.01)	0.01 (0.01)
8	0.16	0.06	0.22 (0.56)	0.22 (0.35)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
9	0.14	0.00	0.14 (0.42)	0.14 (0.21)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
10	0.11	0.00	0.11 (0.31)	0.11 (0.10)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
11	0.10	0.00	0.10 (0.21)	0.10 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
12	0.08	0.00	0.08 (0.13)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
13	0.07	0.00	0.07 (0.06)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
14	0.06	0.00	0.06 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
15	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
16	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
17	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
18	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
19	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
20	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
21	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
22	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
23	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
24	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
25	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)

Influence Factors (Ultimate Induced Stresses in Parentheses)

Str No.	Region 1 Iz	Region 2 Iz	Region 3 Iz	Region 4 Iz	Region 5 Iz	Region 6 Iz	Region 7 Iz	Region 8 Iz	Region 9 Iz	Region 10 Iz
1	0.000 (0)	0.000 (0)	0.004 (1)	0.000 (0)	0.004 (1)	0.116 (0)	0.116 (0)	0.116 (0)	0.116 (0)	0.116 (0)
2	0.835 (747)	0.080 (58)	0.029 (6)	0.080 (58)	0.029 (6)	0.009 (0)	0.009 (0)	0.009 (0)	0.009 (0)	0.009 (0)
3	0.481 (431)	0.188 (136)	0.067 (14)	0.188 (136)	0.067 (14)	0.002 (0)	0.002 (0)	0.002 (0)	0.002 (0)	0.002 (0)
4	0.271 (242)	0.202 (147)	0.095 (20)	0.202 (147)	0.095 (20)	0.001 (0)	0.001 (0)	0.001 (0)	0.001 (0)	0.001 (0)
5	0.189 (169)	0.184 (133)	0.110 (24)	0.184 (133)	0.110 (24)	0.001 (0)	0.001 (0)	0.001 (0)	0.001 (0)	0.001 (0)
6	0.150 (135)	0.165 (120)	0.115 (25)	0.165 (120)	0.115 (25)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
7	0.125 (112)	0.148 (107)	0.117 (25)	0.148 (107)	0.117 (25)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
8	0.106 (95)	0.133 (96)	0.116 (25)	0.133 (96)	0.116 (25)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
9	0.093 (83)	0.120 (87)	0.114 (24)	0.120 (87)	0.114 (24)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
10	0.082 (74)	0.109 (79)	0.110 (24)	0.109 (79)	0.110 (24)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
11	0.074 (66)	0.100 (73)	0.106 (23)	0.100 (73)	0.106 (23)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
12	0.067 (60)	0.092 (67)	0.102 (22)	0.092 (67)	0.102 (22)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
13	0.061 (55)	0.085 (62)	0.098 (21)	0.085 (62)	0.098 (21)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
14	0.057 (51)	0.079 (58)	0.094 (20)	0.079 (58)	0.094 (20)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
15	0.054 (48)	0.077 (56)	0.092 (20)	0.077 (56)	0.092 (20)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
16	0.054 (48)	0.076 (55)	0.091 (20)	0.076 (55)	0.091 (20)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
17	0.053 (48)	0.075 (55)	0.091 (20)	0.075 (55)	0.091 (20)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
18	0.053 (47)	0.075 (54)	0.091 (19)	0.075 (54)	0.091 (19)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
19	0.052 (47)	0.074 (54)	0.090 (19)	0.074 (54)	0.090 (19)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
20	0.052 (46)	0.073 (53)	0.089 (19)	0.073 (53)	0.089 (19)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
21	0.051 (46)	0.072 (52)	0.088 (19)	0.072 (52)	0.088 (19)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
22	0.050 (45)	0.071 (52)	0.088 (19)	0.071 (52)	0.088 (19)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
23	0.050 (44)	0.071 (51)	0.087 (19)	0.071 (51)	0.087 (19)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
24	0.049 (44)	0.070 (50)	0.086 (19)	0.070 (50)	0.086 (19)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
25	0.048 (43)	0.069 (50)	0.085 (18)	0.069 (50)	0.085 (18)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)

Rate Parameters / Percent Consolidation for Combined Drainage (Current Induced Stresses in Parentheses)

Str No.	Effective H* (ft)	Position (z*/L) (N/D)	Region 1 (N/D)	Region 2 (N/D)	Region 3 (N/D)	Region 4 (N/D)	Region 5 (N/D)	Region 6 (N/D)	Region 7 (N/D)	Region 8 (N/D)	Region 9 (N/D)	Region 10 (N/D)
1	3.00	0.027	0.90 (0)	0.90 (0)	0.90 (1)	0.90 (0)	0.90 (1)	0.90 (0)	0.90 (0)	0.90 (0)	0.90 (0)	0.90 (0)
2	3.52	0.087	0.70 (525)	0.70 (41)	0.70 (4)	0.70 (41)	0.70 (4)	0.70 (0)	0.70 (0)	0.70 (0)	0.70 (0)	0.70 (0)
3	3.52	0.152	0.51 (218)	0.51 (69)	0.51 (7)	0.51 (69)	0.51 (7)	0.51 (0)	0.51 (0)	0.51 (0)	0.51 (0)	0.51 (0)
4	6.16	0.240	0.29 (71)	0.29 (43)	0.29 (6)	0.29 (43)	0.29 (6)	0.29 (0)	0.29 (0)	0.29 (0)	0.29 (0)	0.29 (0)
5	3.26	0.326	0.15 (26)	0.15 (20)	0.15 (4)	0.15 (20)	0.15 (4)	0.15 (0)	0.15 (0)	0.15 (0)	0.15 (0)	0.15 (0)
6	3.26	0.386	0.09 (12)	0.09 (11)	0.09 (2)	0.09 (11)	0.09 (2)	0.09 (0)	0.09 (0)	0.09 (0)	0.09 (0)	0.09 (0)
7	3.26	0.446	0.05 (6)	0.05 (5)	0.05 (1)	0.05 (5)	0.05 (1)	0.05 (0)	0.05 (0)	0.05 (0)	0.05 (0)	0.05 (0)
8	3.26	0.505	0.03 (3)	0.03 (3)	0.03 (1)	0.03 (3)	0.03 (1)	0.03 (0)	0.03 (0)	0.03 (0)	0.03 (0)	0.03 (0)
9	3.26	0.565	0.01 (1)	0.01 (1)	0.01 (0)	0.01 (1)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)
10	3.26	0.624	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)
11	3.26	0.684	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
12	3.26	0.744	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
13	3.26	0.803	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
14	3.26	0.863	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
15	0.33	0.896	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
16	0.33	0.902	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
17	0.33	0.908	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
18	0.33	0.914	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
19	0.65	0.922	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
20	0.65	0.934	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
21	0.65	0.946	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
22	0.65	0.958	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
23	0.65	0.970	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
24	0.65	0.982	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
25	0.65	0.994	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)

TOTAL	(in)	2.54	21.91	24.46	24.22	1.45	9.17	10.62	10.60
	(ft)	0.21	1.83	2.04	2.02	0.12	0.76	0.89	0.88
	%Ultimate			100.0	99.0			43.4	43.4
REDUCD	(in)	2.16	18.63	20.79	20.59	1.23	7.80	9.03	9.01
	(ft)	0.18	1.55	1.73	1.72	0.10	0.65	0.75	0.75
	%Ultimate			85.0	84.2			36.9	36.9

SETTLEMENT ANALYSIS - STRESS DISTRIBUTION BY WESTERGAARD THEORY, MAGNITUDE AND RATE OF CONSOLIDATION BY TERZAGHI THEORY

Load Region Parameter	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Bearing Area Center, Xc (ft) =	2000.00	2014.00	2034.00	1986.00	1966.00	2000.00	2000.00	2000.00	2000.00	2000.00
Bearing Area Center, Yc (ft) =	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
Bearing Area Width in X-direction, B (ft) =	8.00	20.00	20.00	20.00	20.00	1.00	1.00	1.00	1.00	1.00
Bearing Area Length in Y-direction, L (ft) =	2000.00	2000.00	2000.00	2000.00	2000.00	1.00	1.00	1.00	1.00	1.00
Net Applied Pressure (psf) =	1110.0	770.0	140.0	770.0	140.0	0.0	0.0	0.0	0.0	0.0
Depth of Application, Da (ft) =	0.00	6.00	2.00	6.00	2.00	0.00	0.00	0.00	0.00	0.00
Depth of Foundation, Df (ft) =	0.00	6.00	2.00	6.00	2.00	0.00	0.00	0.00	0.00	0.00
Contact Pressure Multiplier (N/D) =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Time of Application (yrs) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Sub 1	dX	4.0	-4.0	-24.0	24.0	44.0	0.5	0.5	0.5	0.5	0.5
	dY	1000.0	1000.0	1000.0	1000.0	1000.0	0.5	0.5	0.5	0.5	0.5
Sub 2	dX	4.0	-4.0	-24.0	24.0	44.0	0.5	0.5	0.5	0.5	0.5
	dY	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-0.5	-0.5	-0.5	-0.5	-0.5
Sub 3	dX	-4.0	-24.0	-44.0	4.0	24.0	-0.5	-0.5	-0.5	-0.5	-0.5
	dY	1000.0	1000.0	1000.0	1000.0	1000.0	0.5	0.5	0.5	0.5	0.5
Sub 4	dX	-4.0	-24.0	-44.0	4.0	24.0	-0.5	-0.5	-0.5	-0.5	-0.5
	dY	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-0.5	-0.5	-0.5	-0.5	-0.5

Strain Factor = 0.50

Abscissa for Analysis, Xa (ft) =	2000.00
Ordinate for Analysis, Ya (ft) =	2000.00
Poisson's Ratio, u (N/D) =	0.00
Recompression Factor (N/D) =	0.15
Total Settlement Multiplier (N/D) =	0.85
Stress Bulb Criterion (%) =	10.00%
Current Time (yrs) =	25.00
Depth of Wick Drains (ft) =	0.00
Wick Drain Triangular Grid Spacing (ft) =	4.00
Equivalent Drain Diameter, dw (in) =	2.060
Equivalent Mandrel Diameter, dm (in) =	3.570
Diameter of Smear Zone, ds (in) =	9.850
Drain Capacity Ratio (sqft) =	4300.0

		Ultimate Settlement Recomp Sett (in.)	Ultimate Settlement Virgin Sett (in.)	Ultimate Settlement Total Sett (in.)	Ultimate Settlement Bulb Sett (in.)	Induced Settlement Recomp Sett (in.)	Induced Settlement Virgin Sett (in.)	Induced Settlement Total Sett (in.)	Induced Settlement Bulb Sett (in.)
TOTAL	(in)	2.03	23.63	25.66	25.66	0.83	10.15	10.99	10.99
	(ft)	0.17	1.97	2.14	2.14	0.07	0.85	0.92	0.92
	%Ultimate			100.0	100.0			42.8	42.8
REDUCD	(in)	1.72	20.08	21.81	21.81	0.71	8.63	9.34	9.34
	(ft)	0.14	1.67	1.82	1.82	0.06	0.72	0.78	0.78
	%Ultimate			85.0	85.0			36.4	36.4

Group	L (ft)		Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
			25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
I	53.96	Tv	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
		Uv	18.41	18.41	18.41	18.41	18.41	18.41	18.41	18.41	18.41	18.41
II	0.00	Tv	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
III	0.00	Tv	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

1.20

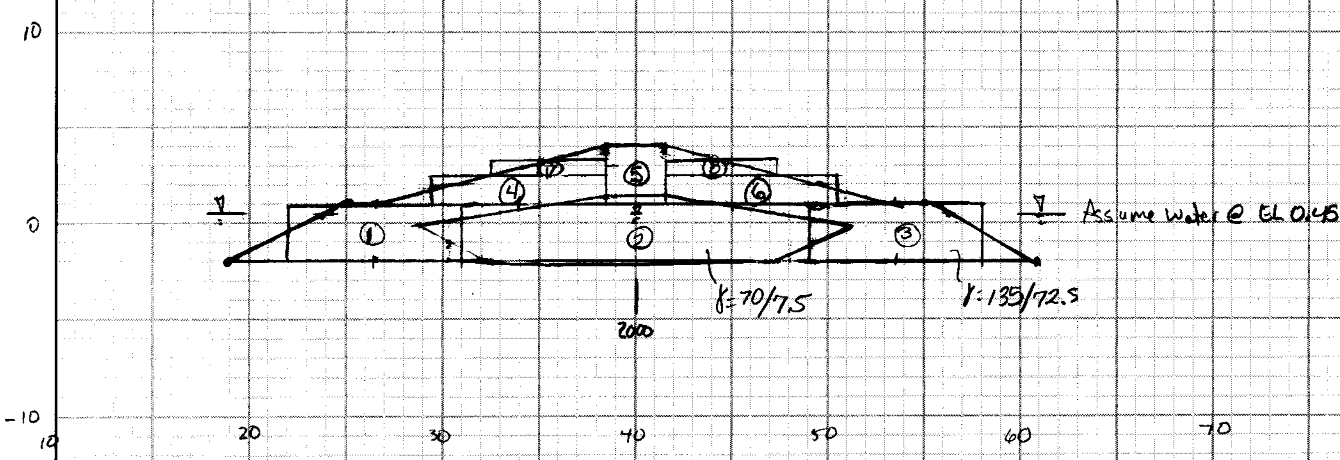
Str No.	Depth (ft)	g' (pcf)	CR (N/D)	RR (N/D)	cv (sft/yr)	ch (sft/yr)	Total H (ft)	Eff Vert Stress at Mid-Stratum: Past Maximum (psf)	Zero Burden (psf)	Ultimate Change (psf)	Ultimate Value (psf)	Induced Change (psf)	Induced Value (psf)
1	0.0 0.5 1.0	17.0	0.420	0.063	3.1	6.0	1.0	400	0 9 17	0 0.0%	9	0 0.0%	9
2	4.0 7.0	37.0	0.307	0.046	9.0	15.0	6.0	400	128 239	39 30.4%	167	32 25.1%	160
3	10.0 13.0	37.0	0.307	0.046	9.0	15.0	6.0	540	350 461	1069 305.5%	1419	656 187.5%	1006
4	16.5 20.0	52.0	0.352	0.053	4.0	15.0	7.0	643	643 825	811 126.2%	1454	301 46.9%	944
5	22.5 25.0	42.0	0.225	0.034	7.3	15.0	5.0	1116	930 1035	669 71.9%	1599	136 14.6%	1066
6	27.5 30.0	42.0	0.225	0.034	7.3	15.0	5.0	1368	1140 1245	589 51.7%	1729	74 6.5%	1214
7	32.5 35.0	42.0	0.225	0.034	7.3	15.0	5.0	1620	1350 1455	527 39.0%	1877	38 2.8%	1388
8	37.5 40.0	42.0	0.225	0.034	7.3	15.0	5.0	1872	1560 1665	476 30.5%	2036	19 1.2%	1579
9	42.5 45.0	42.0	0.225	0.034	7.3	15.0	5.0	2124	1770 1875	433 24.5%	2203	9 0.5%	1779
10	47.5 50.0	42.0	0.225	0.034	7.3	15.0	5.0	2376	1980 2085	397 20.0%	2377	4 0.2%	1984
11	52.5 55.0	42.0	0.225	0.034	7.3	15.0	5.0	2628	2190 2295	365 16.7%	2555	2 0.1%	2192
12	57.5 60.0	42.0	0.225	0.034	7.3	15.0	5.0	2880	2400 2505	338 14.1%	2738	1 0.0%	2401
13	62.5 65.0	42.0	0.225	0.034	7.3	15.0	5.0	3132	2610 2715	315 12.1%	2925	0 0.0%	2610
14	67.5 70.0	42.0	0.225	0.034	7.3	15.0	5.0	3384	2820 2925	294 10.4%	3114	0 0.0%	2820
15	70.5 71.0	42.0	0.000	0.000	7.3	15.0	1.0	3535	2946 2967	283 9.6%	3229	0 0.0%	2946
16	71.5 72.0	42.0	0.000	0.000	7.3	15.0	1.0	3586	2988 3009	279 9.3%	3267	0 0.0%	2988
17	72.5 73.0	42.0	0.000	0.000	7.3	15.0	1.0	3636	3030 3051	276 9.1%	3306	0 0.0%	3030
18	73.5 74.0	42.0	0.000	0.000	7.3	15.0	1.0	3686	3072 3093	272 8.9%	3344	0 0.0%	3072
19	74.5 75.0	42.0	0.000	0.000	7.3	15.0	1.0	3737	3114 3135	269 8.6%	3383	0 0.0%	3114
20	75.5 76.0	42.0	0.000	0.000	7.3	15.0	1.0	3787	3156 3177	266 8.4%	3422	0 0.0%	3156
21	76.5 77.0	42.0	0.000	0.000	7.3	15.0	1.0	3838	3198 3219	262 8.2%	3460	0 0.0%	3198
22	77.5 78.0	42.0	0.000	0.000	7.3	15.0	1.0	3888	3240 3261	259 8.0%	3499	0 0.0%	3240
23	78.5 79.0	42.0	0.000	0.000	7.3	15.0	1.0	3938	3282 3303	256 7.8%	3538	0 0.0%	3282
24	79.5 80.0	42.0	0.000	0.000	7.3	15.0	1.0	3989	3324 3345	253 7.6%	3577	0 0.0%	3324
25	80.5 81.0	42.0	0.000	0.000	7.3	15.0	1.0	4039	3366 3387	250 7.4%	3616	0 0.0%	3366

Str No.	Ultimate Settlement Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)	Induced Settlement Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)	Influence Factors (Ultimate Induced Stresses in Parentheses) Region 1 Iz	Region 2 Iz	Region 3 Iz	Region 4 Iz	Region 5 Iz	Region 6 Iz	Region 7 Iz	Region 8 Iz	Region 9 Iz	Region 10 Iz
			(25.66)	(25.66)			(10.99)	(10.99)										
1	0.00	0.00	0.00 (25.66)	0.00 (25.66)	0.00	0.00	0.00 (10.99)	0.00 (10.99)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.465 (0)	0.465 (0)	0.465 (0)	0.465 (0)	0.465 (0)
2	0.08	0.00	0.08 (25.57)	0.08 (25.57)	0.07	0.00	0.07 (10.92)	0.07 (10.92)	0.000 (0)	0.023 (18)	0.011 (1)	0.023 (18)	0.011 (1)	0.019 (0)	0.019 (0)	0.019 (0)	0.019 (0)	0.019 (0)
3	0.55	8.10	8.64 (16.93)	8.64 (16.93)	0.55	5.22	5.76 (5.15)	5.76 (5.15)	0.735 (616)	0.159 (122)	0.033 (5)	0.159 (122)	0.033 (5)	0.003 (0)	0.003 (0)	0.003 (0)	0.003 (0)	0.003 (0)
4	0.00	10.48	10.48 (6.45)	10.48 (6.45)	0.00	4.94	4.94 (0.22)	4.94 (0.22)	0.374 (415)	0.247 (190)	0.056 (8)	0.247 (190)	0.056 (8)	0.001 (0)	0.001 (0)	0.001 (0)	0.001 (0)	0.001 (0)
5	0.16	2.11	2.27 (4.18)	2.27 (4.18)	0.12	0.00	0.12 (0.10)	0.12 (0.10)	0.237 (263)	0.251 (193)	0.072 (10)	0.251 (193)	0.072 (10)	0.001 (0)	0.001 (0)	0.001 (0)	0.001 (0)	0.001 (0)
6	0.16	1.37	1.53 (2.65)	1.53 (2.65)	0.06	0.00	0.06 (0.04)	0.06 (0.04)	0.180 (199)	0.238 (184)	0.081 (11)	0.238 (184)	0.081 (11)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
7	0.16	0.86	1.02 (1.63)	1.02 (1.63)	0.02	0.00	0.02 (0.02)	0.02 (0.02)	0.144 (160)	0.222 (171)	0.088 (12)	0.222 (171)	0.088 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
8	0.16	0.49	0.65 (0.97)	0.65 (0.97)	0.01	0.00	0.01 (0.01)	0.01 (0.01)	0.121 (134)	0.205 (158)	0.092 (13)	0.205 (158)	0.092 (13)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
9	0.16	0.21	0.37 (0.60)	0.37 (0.60)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.103 (115)	0.189 (146)	0.094 (13)	0.189 (146)	0.094 (13)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
10	0.16	0.00	0.16 (0.44)	0.16 (0.44)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.091 (100)	0.175 (135)	0.095 (13)	0.175 (135)	0.095 (13)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
11	0.14	0.00	0.14 (0.30)	0.14 (0.30)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.080 (89)	0.162 (125)	0.095 (13)	0.162 (125)	0.095 (13)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
12	0.12	0.00	0.12 (0.19)	0.12 (0.19)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.072 (80)	0.151 (116)	0.093 (13)	0.151 (116)	0.093 (13)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
13	0.10	0.00	0.10 (0.09)	0.10 (0.09)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.066 (73)	0.140 (108)	0.092 (13)	0.140 (108)	0.092 (13)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
14	0.09	0.00	0.09 (0.00)	0.09 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.060 (67)	0.131 (101)	0.090 (13)	0.131 (101)	0.090 (13)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
15	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.057 (64)	0.126 (97)	0.088 (12)	0.126 (97)	0.088 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
16	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.057 (63)	0.125 (96)	0.088 (12)	0.125 (96)	0.088 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
17	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.056 (62)	0.123 (95)	0.087 (12)	0.123 (95)	0.087 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
18	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.055 (61)	0.122 (94)	0.087 (12)	0.122 (94)	0.087 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
19	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.054 (60)	0.120 (92)	0.086 (12)	0.120 (92)	0.086 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
20	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.053 (59)	0.119 (91)	0.086 (12)	0.119 (91)	0.086 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
21	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.052 (58)	0.117 (90)	0.085 (12)	0.117 (90)	0.085 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
22	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.052 (57)	0.116 (89)	0.085 (12)	0.116 (89)	0.085 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
23	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.051 (57)	0.114 (88)	0.084 (12)	0.114 (88)	0.084 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
24	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.050 (56)	0.113 (87)	0.084 (12)	0.113 (87)	0.084 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
25	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.050 (55)	0.112 (86)	0.083 (12)	0.112 (86)	0.083 (12)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)

Str No.	Rate Parameters Effective H* (ft)	Position (z*/L) (N/D)	Percent Consolidation for Combined Drainage (Current Induced Stresses in Parentheses) Region 1 (N/D)	Region 2 (N/D)	Region 3 (N/D)	Region 4 (N/D)	Region 5 (N/D)	Region 6 (N/D)	Region 7 (N/D)	Region 8 (N/D)	Region 9 (N/D)	Region 10 (N/D)
1	1.00	0.009	0.97 (0)	0.97 (0)	0.97 (0)	0.97 (0)	0.97 (0)	0.97 (0)	0.97 (0)	0.97 (0)	0.97 (0)	0.97 (0)
2	3.52	0.051	0.82 (0)	0.82 (15)	0.82 (1)	0.82 (15)	0.82 (1)	0.82 (0)	0.82 (0)	0.82 (0)	0.82 (0)	0.82 (0)
3	3.52	0.116	0.61 (501)	0.61 (75)	0.61 (3)	0.61 (75)	0.61 (3)	0.61 (0)	0.61 (0)	0.61 (0)	0.61 (0)	0.61 (0)
4	6.16	0.206	0.37 (154)	0.37 (71)	0.37 (3)	0.37 (71)	0.37 (3)	0.37 (0)	0.37 (0)	0.37 (0)	0.37 (0)	0.37 (0)
5	3.26	0.293	0.20 (53)	0.20 (39)	0.20 (2)	0.20 (39)	0.20 (2)	0.20 (0)	0.20 (0)	0.20 (0)	0.20 (0)	0.20 (0)
6	3.26	0.354	0.13 (25)	0.13 (23)	0.13 (1)	0.13 (23)	0.13 (1)	0.13 (0)	0.13 (0)	0.13 (0)	0.13 (0)	0.13 (0)
7	3.26	0.414	0.07 (12)	0.07 (12)	0.07 (1)	0.07 (12)	0.07 (1)	0.07 (0)	0.07 (0)	0.07 (0)	0.07 (0)	0.07 (0)
8	3.26	0.475	0.04 (5)	0.04 (6)	0.04 (1)	0.04 (6)	0.04 (1)	0.04 (0)	0.04 (0)	0.04 (0)	0.04 (0)	0.04 (0)
9	3.26	0.535	0.02 (2)	0.02 (3)	0.02 (0)	0.02 (3)	0.02 (0)	0.02 (0)	0.02 (0)	0.02 (0)	0.02 (0)	0.02 (0)
10	3.26	0.595	0.01 (1)	0.01 (1)	0.01 (0)	0.01 (1)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)
11	3.26	0.656	0.00 (0)	0.00 (1)	0.00 (0)	0.00 (1)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
12	3.26	0.716	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
13	3.26	0.777	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
14	3.26	0.837	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
15	0.65	0.873	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
16	0.65	0.885	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
17	0.65	0.897	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
18	0.65	0.909	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
19	0.65	0.921	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
20	0.65	0.934	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
21	0.65	0.946	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
22	0.65	0.958	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
23	0.65	0.970	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
24	0.65	0.982	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
25	0.65	0.994	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)

TOTAL	(in)	2.03	23.63	25.66	25.66	0.83	10.15	10.99	10.99
	(ft)	0.17	1.97	2.14	2.14	0.07	0.85	0.92	0.92
	%Ultimate			100.0	100.0			42.8	42.8
REDUCD	(in)	1.72	20.08	21.81	21.81	0.71	8.63	9.34	9.34
	(ft)	0.14	1.67	1.82	1.82	0.06	0.72	0.78	0.78
	%Ultimate			85.0	85.0			36.4	36.4

Region	Intensity (psf)	Center (x,y)	Width (x)	Width (y)
①	248.75	1986.5	9	1000
②	53.75	2000	18	1000
③	248.75	2013.5	9	1000
④	202.5	1994	9	1000
⑤	372.5	2000	3	1000
⑥	202.5	2006	9	1000
⑦	135	1995.5	6	1000
⑧	135	2004.5	6	1000



①;③ $2.5(72.5) + .5(135) = 248.75$

② $2.5(7.5) + .5(70) = 53.75$

④;⑥ $1.5(135) = 202.5$

⑤ $2.5(135) + .5(70) = 372.5$

⑦;⑧ $1(135) = 135$

Little Lake

Model of Furrow Rock Dike
for Settlement Analysis

EE 17623
4/1/03 SRS.

SETTLEMENT ANALYSIS - STRESS DISTRIBUTION BY WESTERGAARD THEORY, MAGNITUDE AND RATE OF CONSOLIDATION BY TERZAGHI THEORY

Lightweight Fill
[illegible] 21-2

Load Region Parameter	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Bearing Area Center, Xc (ft) =	1986.50	2000.00	2013.50	1994.00	2000.00	2006.00	1995.50	2004.50	2000.00	2000.00
Bearing Area Center, Yc (ft) =	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
Bearing Area Width in X-direction, B (ft) =	9.00	18.00	9.00	9.00	3.00	9.00	6.00	6.00	1.00	1.00
Bearing Area Length in Y-direction, L (ft) =	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	1.00	1.00
Net Applied Pressure (psf) =	248.8	53.8	248.8	202.5	372.5	202.5	135.0	135.0	0.0	0.0
Depth of Application, Da (ft) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depth of Foundation, Df (ft) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contact Pressure Multiplier (N/D) =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Time of Application (yrs) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Sub 1 dX	18.0	9.0	-9.0	10.5	1.5	-1.5	7.5	-1.5	0.5	0.5
Sub 1 dY	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	0.5	0.5
Sub 2 dX	18.0	9.0	-9.0	10.5	1.5	-1.5	7.5	-1.5	0.5	0.5
Sub 2 dY	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-0.5	-0.5
Sub 3 dX	9.0	-9.0	-18.0	1.5	-1.5	-10.5	1.5	-7.5	-0.5	-0.5
Sub 3 dY	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	0.5	0.5
Sub 4 dX	9.0	-9.0	-18.0	1.5	-1.5	-10.5	1.5	-7.5	-0.5	-0.5
Sub 4 dY	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-1000.0	-0.5	-0.5

Strain Factor = 0.50

Abecissa for Analysis, Xa (ft) =	2000.00
Ordinate for Analysis, Ya (ft) =	2000.00
Poisson's Ratio, u (N/D) =	0.00
Recompression Factor (N/D) =	0.15
Total Settlement Multiplier (N/D) =	0.85
Stress Bulb Criterion (%) =	10.00%
Current Time (yrs) =	25.00
Depth of Wick Drains (ft) =	0.00
Wick Drain Triangular Grid Spacing (ft) =	4.00
Equivalent Drain Diameter, dw (in) =	2.060
Equivalent Mandrel Diameter, dm (in) =	3.570
Diameter of Smear Zone, ds (in) =	8.850
Drain Capacity Ratio (sqft) =	4300.0

18.18

		Ultimate Settlement Recomp Sett (in.)	Ultimate Virgin Sett (in.)	Ultimate Total Sett (in.)	Ultimate Bulb Sett (in.)	Induced Settlement Recomp Sett (in.)	Induced Virgin Sett (in.)	Induced Total Sett (in.)	Induced Bulb Sett (in.)
TOTAL	(in)	5.84	6.44	12.28	11.89	4.71	1.93	6.64	6.63
	(ft)	0.49	0.54	1.02	0.99	0.39	0.16	0.55	0.55
	%Ultimate			100.0	96.9			54.1	54.0
REDUCD	(in)	4.96	5.48	10.44	10.11	4.01	1.64	5.65	5.64
	(ft)	0.41	0.46	0.87	0.84	0.33	0.14	0.47	0.47
	%Ultimate			85.0	82.3			46.0	45.9

Group	L (ft)		Region 1 25.00	Region 2 25.00	Region 3 25.00	Region 4 25.00	Region 5 25.00	Region 6 25.00	Region 7 25.00	Region 8 25.00	Region 9 25.00	Region 10 25.00
I	54.65	Tv	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
		Uv	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18
II	0.00	Tv	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
III	0.00	Tv	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

1.20

Str No.	Depth (ft)	g' (pcf)	CR (N/D)	RR (N/D)	cv (sft/yr)	ch (sft/yr)	Total H (ft)	Eff Vert Stress at Mid-Stratum: Past Maximum (psf)	Zero Burden (psf)	Ultimate Change (psf)	Ultimate Value (psf)	Induced Change (psf)	Induced Value (psf)	Ultimate Settlement: Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)	Induced Settlement: Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)
1	0.0 1.5 3.0	17.0	0.420	0.063	3.1	6.0	3.0	400	0 26 51	393 1540.1%	418	355 1392.4%	381	2.91	0.00	(12.28) 2.91 (9.37)	(11.89) 2.91 (8.99)	2.81	0.00	(6.64) 2.81 (3.83)	(6.63) 2.81 (3.83)
2	6.0 9.0	37.0	0.307	0.046	9.0	15.0	6.0	400	162 273	323 199.4%	485	227 140.0%	389	1.73	0.11	1.84 (7.53)	1.84 (7.15)	1.39	0.00	1.39 (2.44)	1.39 (2.43)
3	12.0 15.0	37.0	0.307	0.046	9.0	15.0	6.0	540	384 495	259 67.4%	643	131 34.1%	515	0.54	1.84	2.38 (5.15)	2.38 (4.77)	0.46	0.00	0.46 (1.98)	0.46 (1.97)
4	18.5 22.0	52.0	0.352	0.053	4.0	15.0	7.0	643	677 859	209 30.9%	886	61 9.0%	738	0.00	4.49	4.49 (0.66)	4.49 (0.28)	0.00	1.93	1.93 (0.05)	1.93 (0.04)
5	24.5 27.0	42.0	0.225	0.034	7.3	15.0	5.0	1157	964 1069	175 18.2%	1139	27 2.8%	991	0.16	0.00	0.16 (0.50)	0.16 (0.12)	0.03	0.00	0.03 (0.02)	0.03 (0.01)
6	29.5 32.0	42.0	0.225	0.034	7.3	15.0	5.0	1409	1174 1279	154 13.1%	1328	14 1.2%	1188	0.12	0.00	0.12 (0.38)	0.12 (0.00)	0.01	0.00	0.01 (0.01)	0.01 (0.00)
7	34.5 37.0	42.0	0.225	0.034	7.3	15.0	5.0	1661	1384 1489	136 9.8%	1520	7 0.5%	1391	0.09	0.00	0.09 (0.30)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
8	39.5 42.0	42.0	0.225	0.034	7.3	15.0	5.0	1913	1594 1699	122 7.7%	1716	3 0.2%	1597	0.07	0.00	0.07 (0.23)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
9	44.5 47.0	42.0	0.225	0.034	7.3	15.0	5.0	2165	1804 1909	110 6.1%	1914	1 0.1%	1805	0.06	0.00	0.06 (0.17)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
10	49.5 52.0	42.0	0.225	0.034	7.3	15.0	5.0	2417	2014 2119	101 5.0%	2115	1 0.0%	2015	0.05	0.00	0.05 (0.12)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
11	54.5 57.0	42.0	0.225	0.034	7.3	15.0	5.0	2669	2224 2329	92 4.2%	2316	0 0.0%	2224	0.04	0.00	0.04 (0.08)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
12	59.5 62.0	42.0	0.225	0.034	7.3	15.0	5.0	2921	2434 2539	85 3.5%	2519	0 0.0%	2434	0.03	0.00	0.03 (0.05)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
13	64.5 67.0	42.0	0.225	0.034	7.3	15.0	5.0	3173	2644 2749	79 3.0%	2723	0 0.0%	2644	0.03	0.00	0.03 (0.02)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
14	69.5 72.0	42.0	0.225	0.034	7.3	15.0	5.0	3425	2854 2959	74 2.6%	2928	0 0.0%	2854	0.02	0.00	0.02 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
15	72.3 72.5	42.0	0.000	0.000	7.3	15.0	0.5	3563	2970 2980	71 2.4%	3041	0 0.0%	2970	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
16	72.8 73.0	42.0	0.000	0.000	7.3	15.0	0.5	3589	2991 3001	71 2.4%	3061	0 0.0%	2991	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
17	73.3 73.5	42.0	0.000	0.000	7.3	15.0	0.5	3614	3012 3022	70 2.3%	3082	0 0.0%	3012	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
18	73.8 74.0	42.0	0.000	0.000	7.3	15.0	0.5	3639	3033 3043	70 2.3%	3102	0 0.0%	3033	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
19	74.5 75.0	42.0	0.000	0.000	7.3	15.0	1.0	3677	3064 3085	69 2.3%	3133	0 0.0%	3064	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
20	75.5 76.0	42.0	0.000	0.000	7.3	15.0	1.0	3727	3106 3127	68 2.2%	3174	0 0.0%	3106	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
21	76.5 77.0	42.0	0.000	0.000	7.3	15.0	1.0	3778	3148 3169	67 2.1%	3215	0 0.0%	3148	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
22	77.5 78.0	42.0	0.000	0.000	7.3	15.0	1.0	3828	3190 3211	67 2.1%	3257	0 0.0%	3190	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
23	78.5 79.0	42.0	0.000	0.000	7.3	15.0	1.0	3878	3232 3253	66 2.0%	3298	0 0.0%	3232	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
24	79.5 80.0	42.0	0.000	0.000	7.3	15.0	1.0	3929	3274 3295	65 2.0%	3339	0 0.0%	3274	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
25	80.5 81.0	42.0	0.000	0.000	7.3	15.0	1.0	3979	3316 3337	64 1.9%	3380	0 0.0%	3316	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)

Influence Factors (Ultimate Induced Stresses in Parentheses)

Str No.	Region 1 Iz	Region 2 Iz	Region 3 Iz	Region 4 Iz	Region 5 Iz	Region 6 Iz	Region 7 Iz	Region 8 Iz	Region 9 Iz	Region 10 Iz
1	0.019 (5)	0.925 (50)	0.019 (5)	0.164 (33)	0.608 (227)	0.164 (33)	0.151 (20)	0.151 (20)	0.116 (0)	0.116 (0)
2	0.067 (17)	0.720 (39)	0.067 (17)	0.270 (55)	0.216 (81)	0.270 (55)	0.228 (31)	0.228 (31)	0.009 (0)	0.009 (0)
3	0.100 (25)	0.519 (28)	0.100 (25)	0.228 (46)	0.111 (41)	0.228 (46)	0.175 (24)	0.175 (24)	0.002 (0)	0.002 (0)
4	0.108 (27)	0.384 (21)	0.108 (27)	0.179 (36)	0.073 (27)	0.179 (36)	0.129 (17)	0.129 (17)	0.001 (0)	0.001 (0)
5	0.104 (26)	0.305 (16)	0.104 (26)	0.146 (30)	0.055 (20)	0.146 (30)	0.103 (14)	0.103 (14)	0.001 (0)	0.001 (0)
6	0.097 (24)	0.259 (14)	0.097 (24)	0.126 (25)	0.046 (17)	0.126 (25)	0.087 (12)	0.087 (12)	0.000 (0)	0.000 (0)
7	0.090 (22)	0.225 (12)	0.090 (22)	0.110 (22)	0.039 (15)	0.110 (22)	0.075 (10)	0.075 (10)	0.000 (0)	0.000 (0)
8	0.083 (21)	0.198 (11)	0.083 (21)	0.097 (20)	0.034 (13)	0.097 (20)	0.066 (9)	0.066 (9)	0.000 (0)	0.000 (0)
9	0.077 (19)	0.177 (10)	0.077 (19)	0.087 (18)	0.030 (11)	0.087 (18)	0.059 (8)	0.059 (8)	0.000 (0)	0.000 (0)
10	0.071 (18)	0.160 (9)	0.071 (18)	0.079 (16)	0.027 (10)	0.079 (16)	0.054 (7)	0.054 (7)	0.000 (0)	0.000 (0)
11	0.066 (16)	0.146 (8)	0.066 (16)	0.072 (15)	0.025 (9)	0.072 (15)	0.049 (7)	0.049 (7)	0.000 (0)	0.000 (0)
12	0.062 (15)	0.134 (7)	0.062 (15)	0.066 (13)	0.023 (8)	0.066 (13)	0.045 (6)	0.045 (6)	0.000 (0)	0.000 (0)
13	0.058 (14)	0.124 (7)	0.058 (14)	0.061 (12)	0.021 (8)	0.061 (12)	0.041 (6)	0.041 (6)	0.000 (0)	0.000 (0)
14	0.054 (13)	0.115 (6)	0.054 (13)	0.057 (12)	0.019 (7)	0.057 (12)	0.038 (5)	0.038 (5)	0.000 (0)	0.000 (0)
15	0.052 (13)	0.111 (6)	0.052 (13)	0.055 (11)	0.019 (7)	0.055 (11)	0.037 (5)	0.037 (5)	0.000 (0)	0.000 (0)
16	0.052 (13)	0.110 (6)	0.052 (13)	0.055 (11)	0.019 (7)	0.055 (11)	0.037 (5)	0.037 (5)	0.000 (0)	0.000 (0)
17	0.052 (13)	0.109 (6)	0.052 (13)	0.054 (11)	0.018 (7)	0.054 (11)	0.037 (5)	0.037 (5)	0.000 (0)	0.000 (0)
18	0.051 (13)	0.109 (6)	0.051 (13)	0.054 (11)	0.018 (7)	0.054 (11)	0.036 (5)	0.036 (5)	0.000 (0)	0.000 (0)
19	0.051 (13)	0.108 (6)	0.051 (13)	0.053 (11)	0.018 (7)	0.053 (11)	0.036 (5)	0.036 (5)	0.000 (0)	0.000 (0)
20	0.050 (13)	0.106 (6)	0.050 (13)	0.053 (11)	0.018 (7)	0.053 (11)	0.035 (5)	0.035 (5)	0.000 (0)	0.000 (0)
21	0.050 (12)	0.105 (6)	0.050 (12)	0.052 (11)	0.018 (7)	0.052 (11)	0.035 (5)	0.035 (5)	0.000 (0)	0.000 (0)
22	0.049 (12)	0.103 (6)	0.049 (12)	0.051 (10)	0.017 (6)	0.051 (10)	0.035 (5)	0.035 (5)	0.000 (0)	0.000 (0)
23	0.049 (12)	0.102 (5)	0.049 (12)	0.051 (10)	0.017 (6)	0.051 (10)	0.034 (5)	0.034 (5)	0.000 (0)	0.000 (0)
24	0.048 (12)	0.101 (5)	0.048 (12)	0.050 (10)	0.017 (6)	0.050 (10)	0.034 (5)	0.034 (5)	0.000 (0)	0.000 (0)
25	0.047 (12)	0.100 (5)	0.047 (12)	0.050 (10)	0.017 (6)	0.050 (10)	0.033 (4)	0.033 (4)	0.000 (0)	0.000 (0)

Rate Parameters / Percent Consolidation for Combined Drainage (Current Induced Stresses in Parentheses)

Str No.	Effective H* (ft)	Position (z*/L) (N/D)	Region 1 (N/D)	Region 2 (N/D)	Region 3 (N/D)	Region 4 (N/D)	Region 5 (N/D)	Region 6 (N/D)	Region 7 (N/D)	Region 8 (N/D)	Region 9 (N/D)	Region 10 (N/D)
1	3.00	0.027	0.90 (4)	0.90 (45)	0.90 (4)	0.90 (30)	0.90 (205)	0.90 (30)	0.90 (18)	0.90 (18)	0.90 (0)	0.90 (0)
2	3.52	0.087	0.70 (12)	0.70 (27)	0.70 (12)	0.70 (38)	0.70 (57)	0.70 (38)	0.70 (22)	0.70 (22)	0.70 (0)	0.70 (0)
3	3.52	0.152	0.51 (13)	0.51 (14)	0.51 (13)	0.51 (23)	0.51 (21)	0.51 (23)	0.51 (12)	0.51 (12)	0.51 (0)	0.51 (0)
4	6.16	0.240	0.29 (8)	0.29 (6)	0.29 (8)	0.29 (11)	0.29 (8)	0.29 (11)	0.29 (5)	0.29 (5)	0.29 (0)	0.29 (0)
5	3.26	0.326	0.15 (4)	0.15 (2)	0.15 (4)	0.15 (4)	0.15 (3)	0.15 (4)	0.15 (2)	0.15 (2)	0.15 (0)	0.15 (0)
6	3.26	0.386	0.09 (2)	0.09 (1)	0.09 (2)	0.09 (2)	0.09 (2)	0.09 (2)	0.09 (1)	0.09 (1)	0.09 (0)	0.09 (0)
7	3.26	0.446	0.05 (1)	0.05 (1)	0.05 (1)	0.05 (1)	0.05 (1)	0.05 (1)	0.05 (1)	0.05 (1)	0.05 (0)	0.05 (0)
8	3.26	0.505	0.03 (1)	0.03 (0)	0.03 (1)	0.03 (1)	0.03 (0)	0.03 (1)	0.03 (0)	0.03 (0)	0.03 (0)	0.03 (0)
9	3.26	0.565	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)
10	3.26	0.624	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)
11	3.26	0.684	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
12	3.26	0.744	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
13	3.26	0.803	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
14	3.26	0.863	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
15	0.33	0.896	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
16	0.33	0.902	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
17	0.33	0.908	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
18	0.33	0.914	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
19	0.65	0.922	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
20	0.65	0.934	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
21	0.65	0.946	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
22	0.65	0.958	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
23	0.65	0.970	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
24	0.65	0.982	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
25	0.65	0.994	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)

		Ultimate Recomp Sett	Ultimate Virgin Sett	Ultimate Total Sett	Ultimate Bulb Sett	Induced Recomp Sett	Induced Virgin Sett	Induced Total Sett	Induced Bulb Sett
TOTAL	(in)	5.84	6.44	12.28	11.89	4.71	1.93	6.64	6.63
	(ft)	0.49	0.54	1.02	0.99	0.39	0.16	0.55	0.55
	%Ultimate			100.0	96.9			54.1	54.0
REDUCD	(in)	4.96	5.48	10.44	10.11	4.01	1.64	5.65	5.64
	(ft)	0.41	0.46	0.87	0.84	0.33	0.14	0.47	0.47
	%Ultimate			85.0	82.3			46.0	45.9

SETTLEMENT ANALYSIS - STRESS DISTRIBUTION BY WESTERGAARD THEORY, MAGNITUDE AND RATE OF CONSOLIDATION BY TERZAGHI THEORY

Load Region Parameter	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Bearing Area Center, Xc (ft) =	2000.00	3000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
Bearing Area Center, Yc (ft) =	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
Bearing Area Width in X-direction, B (ft) =	16.00	2000.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bearing Area Length in Y-direction, L (ft) =	4000.00	4000.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Net Applied Pressure (psf) =	400.0	240.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Depth of Application, Da (ft) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depth of Foundation, Df (ft) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contact Pressure Multiplier (N/D) =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Time of Application (yrs) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Sub 1 dX	1016.0	1000.0	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5
Sub 1 dY	2000.0	2000.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sub 2 dX	1016.0	1000.0	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5
Sub 2 dY	-2000.0	-2000.0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Sub 3 dX	1000.0	-1000.0	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5
Sub 3 dY	2000.0	2000.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sub 4 dX	1000.0	-1000.0	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5
Sub 4 dY	-2000.0	-2000.0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5

Strain Factor = 0.50

Abscissa for Analysis, Xa (ft) =	3000.00
Ordinate for Analysis, Ya (ft) =	2000.00
Poisson's Ratio, u (N/D) =	0.00
Recompression Factor (N/D) =	0.15
Total Settlement Multiplier (N/D) =	0.85
Stress Bulb Criterion (%) =	10.00%
Current Time (yrs) =	25.00
Depth of Wick Drains (ft) =	0.00
Wick Drain Triangular Grid Spacing (ft) =	4.00
Equivalent Drain Diameter, dw (in) =	2.000
Equivalent Mandrel Diameter, dm (in) =	3.570
Diameter of Smear Zone, ds (in) =	9.850
Drain Capacity Ratio (sqft) =	4300.0

100.00

22.94

			Ultimate Settlement				Induced Settlement			
			Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)	Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)
TOTAL	(in)		4.95	3.49	8.44	8.21	4.19	2.79	6.99	6.98
	(ft)		0.41	0.29	0.70	0.68	0.35	0.23	0.58	0.58
	%Ultimate				100.0	97.3			82.8	82.7
REDUCD	(in)		4.21	2.96	7.18	6.96	3.56	2.38	5.94	5.94
	(ft)		0.35	0.25	0.60	0.58	0.30	0.20	0.49	0.49
	%Ultimate				85.0	82.7			70.4	70.3

Group	L (ft)		Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
			25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
I	4.00	Tv	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
II	43.31	Tv	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
		Uv	22.94	22.94	22.94	22.94	22.94	22.94	22.94	22.94	22.94	22.94
III	0.00	Tv	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

1.20

Str No.	Depth (ft)	g' (pcf)	CR (N/D)	RR (N/D)	cv (sft/yr)	ch (sft/yr)	Total H (ft)	Eff Vert Stress at Mid-Stratum: Past Maximum (psf)	Zero Burden (psf)	Ultimate Change (psf)	Ultimate Value (psf)	Induced Change (psf)	Induced Value (psf)	Ultimate Settlement: Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)	Induced Settlement: Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)
	0.0								0							(8.44)	(8.21)			(6.99)	(6.98)
1	4.0	17.0	0.420	0.063	3.1	6.0	8.0	480	68	240	308	240	308	3.96	0.00	3.96	3.96	3.96	0.00	3.96	3.96
	8.0								136	352.2%		352.2%				(4.48)	(4.25)			(3.02)	(3.02)
2	12.5	52.0	0.000	0.000	99999.0	99999.0	9.0	740	370	239	609	239	609	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	17.0								604	64.5%		64.5%				(4.48)	(4.25)			(3.02)	(3.02)
3	20.5	52.0	0.352	0.053	4.0	15.0	7.0	786	786	238	1024	191	977	0.00	3.39	3.39	3.39	0.00	2.79	2.79	2.79
	24.0								968	30.2%		24.3%				(1.09)	(0.86)			(0.23)	(0.22)
4	27.0	42.0	0.225	0.034	7.3	15.0	6.0	1313	1094	237	1331	122	1216	0.19	0.10	0.29	0.29	0.11	0.00	0.11	0.11
	30.0								1220	21.6%		11.1%				(0.80)	(0.57)			(0.12)	(0.11)
5	32.5	42.0	0.225	0.034	7.3	15.0	5.0	1590	1325	236	1561	82	1407	0.14	0.00	0.14	0.14	0.05	0.00	0.05	0.05
	35.0								1430	17.8%		6.2%				(0.65)	(0.43)			(0.06)	(0.06)
6	37.5	42.0	0.225	0.034	7.3	15.0	5.0	1842	1535	236	1771	54	1589	0.13	0.00	0.13	0.13	0.03	0.00	0.03	0.03
	40.0								1640	15.3%		3.5%				(0.53)	(0.30)			(0.03)	(0.03)
7	42.5	42.0	0.225	0.034	7.3	15.0	5.0	2094	1745	235	1980	34	1779	0.11	0.00	0.11	0.11	0.02	0.00	0.02	0.02
	45.0								1850	13.5%		1.9%				(0.42)	(0.19)			(0.02)	(0.01)
8	47.5	42.0	0.225	0.034	7.3	15.0	5.0	2346	1955	234	2189	20	1975	0.10	0.00	0.10	0.10	0.01	0.00	0.01	0.01
	50.0								2060	12.0%		1.0%				(0.32)	(0.09)			(0.01)	(0.00)
9	52.5	42.0	0.225	0.034	7.3	15.0	5.0	2598	2165	234	2399	11	2176	0.09	0.00	0.09	0.09	0.00	0.00	0.00	0.00
	55.0								2270	10.8%		0.5%				(0.23)	(0.00)			(0.00)	(0.00)
10	57.5	42.0	0.225	0.034	7.3	15.0	5.0	2850	2375	233	2608	6	2381	0.08	0.00	0.08	0.08	0.00	0.00	0.00	0.00
	60.0								2480	9.8%		0.2%				(0.15)	(0.00)			(0.00)	(0.00)
11	62.5	42.0	0.225	0.034	7.3	15.0	5.0	3102	2585	233	2818	3	2588	0.06	0.00	0.06	0.06	0.00	0.00	0.00	0.00
	65.0								2690	9.0%		0.1%				(0.07)	(0.00)			(0.00)	(0.00)
12	66.5	42.0	0.225	0.034	7.3	15.0	3.0	3304	2753	232	2985	2	2755	0.04	0.00	0.04	0.04	0.00	0.00	0.00	0.00
	68.0								2816	8.4%		0.1%				(0.03)	(0.00)			(0.00)	(0.00)
13	68.5	42.0	0.225	0.034	7.3	15.0	1.0	3404	2837	232	3069	1	2838	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00
	69.0								2858	8.2%		0.0%				(0.01)	(0.00)			(0.00)	(0.00)
14	69.5	42.0	0.225	0.034	7.3	15.0	1.0	3455	2879	232	3111	1	2880	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00
	70.0								2900	8.0%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
15	70.5	42.0	0.000	0.000	7.3	15.0	1.0	3505	2921	232	3153	1	2922	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	71.0								2942	7.9%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
16	71.5	42.0	0.000	0.000	7.3	15.0	1.0	3556	2963	231	3194	1	2964	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	72.0								2984	7.8%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
17	72.5	42.0	0.000	0.000	7.3	15.0	1.0	3606	3005	231	3236	1	3006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	73.0								3026	7.7%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
18	73.5	42.0	0.000	0.000	7.3	15.0	1.0	3656	3047	231	3278	0	3047	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	74.0								3068	7.6%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
19	74.5	42.0	0.000	0.000	7.3	15.0	1.0	3707	3089	231	3320	0	3089	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	75.0								3110	7.5%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
20	75.5	42.0	0.000	0.000	7.3	15.0	1.0	3757	3131	231	3362	0	3131	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	76.0								3152	7.4%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
21	76.5	42.0	0.000	0.000	7.3	15.0	1.0	3808	3173	231	3404	0	3173	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	77.0								3194	7.3%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
22	77.5	42.0	0.000	0.000	7.3	15.0	1.0	3858	3215	231	3446	0	3215	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	78.0								3236	7.2%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
23	78.5	42.0	0.000	0.000	7.3	15.0	1.0	3908	3257	231	3488	0	3257	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	79.0								3278	7.1%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
24	79.5	42.0	0.000	0.000	7.3	15.0	1.0	3959	3299	231	3530	0	3299	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80.0								3320	7.0%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)
25	80.5	42.0	0.000	0.000	7.3	15.0	1.0	4009	3341	230	3571	0	3341	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	81.0								3362	6.9%		0.0%				(0.00)	(0.00)			(0.00)	(0.00)

Str No.	Influence Factors (Ultimate Induced Stresses in Parentheses): Region 1 Iz	Region 2 Iz	Region 3 Iz	Region 4 Iz	Region 5 Iz	Region 6 Iz	Region 7 Iz	Region 8 Iz	Region 9 Iz	Region 10 Iz	Rate Parameters: Effective H* (ft)	Position (z*/L) (N/D)
1	0.000	0.996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.00	1.000
	(0)	(240)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
2	0.000	0.994	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000
	(0)	(238)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
3	0.000	0.990	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.16	0.071
	(0)	(238)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
4	0.000	0.986	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.91	0.187
	(0)	(237)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
5	0.000	0.984	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.26	0.270
	(0)	(236)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
6	0.000	0.981	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.26	0.345
	(0)	(235)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
7	0.000	0.979	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.26	0.421
	(0)	(235)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
8	0.000	0.976	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.26	0.496
	(0)	(234)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
9	0.000	0.974	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.26	0.571
	(0)	(234)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
10	0.000	0.971	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.26	0.646
	(0)	(233)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
11	0.000	0.969	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.26	0.722
	(0)	(232)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
12	0.000	0.967	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.95	0.782
	(0)	(232)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
13	0.000	0.966	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.812
	(0)	(232)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
14	0.000	0.965	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.827
	(0)	(232)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
15	0.000	0.965	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.842
	(0)	(231)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
16	0.000	0.964	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.857
	(0)	(231)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
17	0.000	0.964	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.872
	(0)	(231)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
18	0.000	0.963	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.887
	(0)	(231)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
19	0.000	0.963	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.902
	(0)	(231)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
20	0.000	0.962	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.917
	(0)	(231)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
21	0.000	0.962	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.932
	(0)	(231)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
22	0.000	0.961	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.947
	(0)	(231)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
23	0.000	0.961	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.962
	(0)	(231)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
24	0.000	0.960	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.977
	(0)	(230)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		
25	0.000	0.960	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.65	0.992
	(0)	(230)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)		

Str No.	Percent Consolidation for Combined Drainage (Current Induced Stresses in Parentheses): Region 1 (N/D)	Region 2 (N/D)	Region 3 (N/D)	Region 4 (N/D)	Region 5 (N/D)	Region 6 (N/D)	Region 7 (N/D)	Region 8 (N/D)	Region 9 (N/D)	Region 10 (N/D)
1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	(0)	(240)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	(0)	(238)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
3	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
	(0)	(191)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
4	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	(0)	(122)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
5	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
	(0)	(82)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
6	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	(0)	(54)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
7	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	(0)	(34)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
8	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	(0)	(20)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
9	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	(0)	(11)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
10	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	(0)	(6)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
11	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(0)	(3)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
12	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(0)	(2)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)

TOTAL	(in)	4.95	3.49	8.44	8.21	4.19	2.79	6.99	6.98
	(ft)	0.41	0.29	0.70	0.68	0.35	0.23	0.58	0.58
	%Ultimate			100.0	97.3			82.8	82.7
REDUCD	(in)	4.21	2.96	7.18	6.96	3.56	2.38	5.94	5.94
	(ft)	0.35	0.25	0.60	0.58	0.30	0.20	0.49	0.49
	%Ultimate			85.0	82.7			70.4	70.3

SETTLEMENT ANALYSIS - STRESS DISTRIBUTION BY WESTERGAARD THEORY, MAGNITUDE AND RATE OF CONSOLIDATION BY TERZAGHI THEORY

Load Region Parameter	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Bearing Area Center, Xc (ft) =	2000.00	3000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
Bearing Area Center, Yc (ft) =	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
Bearing Area Width in X-direction, B (ft) =	16.00	2000.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bearing Area Length in Y-direction, L (ft) =	4000.00	4000.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Net Applied Pressure (psf) =	400.0	240.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Depth of Application, Da (ft) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depth of Foundation, Df (ft) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contact Pressure Multiplier (N/D) =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Time of Application (yrs) =	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

			Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Sub 1	dX		1016.0	1000.0	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5
	dY		2000.0	2000.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sub 2	dX		1016.0	1000.0	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5	1008.5
	dY		-2000.0	-2000.0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Sub 3	dX		1000.0	-1000.0	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5
	dY		2000.0	2000.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sub 4	dX		1000.0	-1000.0	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5	1007.5
	dY		-2000.0	-2000.0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5

Strain Factor = 0.50

Abecissa for Analysis, Xa (ft) =	3000.00
Ordinate for Analysis, Ya (ft) =	2000.00
Poisson's Ratio, u (N/D) =	0.00
Recompression Factor (N/D) =	0.15
Total Settlement Multiplier (N/D) =	0.85
Stress Bulb Criterion (%) =	10.00%
Current Time (yrs) =	25.00
Depth of Wick Drains (ft) =	0.00
Wick Drain Triangular Grid Spacing (ft) =	4.00
Equivalent Drain Diameter, dw (in) =	2.000
Equivalent Mandrel Diameter, dm (in) =	3.570
Diameter of Smear Zone, ds (in) =	9.850
Drain Capacity Ratio (sqft) =	4300.0

19.18

		Ultimate Settlement Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)	Induced Settlement Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)
TOTAL	(in)	5.30	3.49	8.79	8.56	3.66	1.30	4.96	4.96
	(ft)	0.44	0.29	0.73	0.71	0.31	0.11	0.41	0.41
	%Ultimate			100.0	97.4			56.5	56.4
REDUCD	(in)	4.51	2.96	7.47	7.28	3.11	1.11	4.22	4.22
	(ft)	0.38	0.25	0.62	0.61	0.26	0.09	0.35	0.35
	%Ultimate			85.0	82.8			48.0	48.0

Group	L (ft)		Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
			25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
I	51.79	Tv	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
		Uv	19.18	19.18	19.18	19.18	19.18	19.18	19.18	19.18	19.18	19.18
II	0.00	Tv	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
III	0.00	Tv	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Uv	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

1.20

Str No.	Depth (ft)	g' (pcf)	CR (N/D)	RR (N/D)	cv (sft/yr)	ch (sft/yr)	Total H (ft)	Eff Vert Stress at Mid-Stratum Past Maximum (psf)	Zero Burden (psf)	Ultimate Change (psf)	Ultimate Value (psf)	Induced Change (psf)	Induced Value (psf)
1	0.0 4.0 8.0	17.0	0.420	0.063	3.1	6.0	8.0	400	0 68 136	240 352.2%	308	179 263.5%	247
2	12.5 17.0	52.0	0.100	0.015	1085.0	1642.5	9.0	740	370 604	239 64.5%	609	121 32.8%	491
3	20.5 24.0	52.0	0.352	0.053	4.8	15.0	7.0	786	786 968	238 30.2%	1024	84 10.7%	870
4	27.0 30.0	42.0	0.225	0.034	7.3	15.0	6.0	1313	1094 1220	237 21.6%	1331	43 4.0%	1137
5	32.5 35.0	42.0	0.225	0.034	7.3	15.0	5.0	1590	1325 1430	236 17.8%	1561	25 1.9%	1350
6	37.5 40.0	42.0	0.225	0.034	7.3	15.0	5.0	1842	1535 1640	236 15.3%	1771	14 0.9%	1549
7	42.5 45.0	42.0	0.225	0.034	7.3	15.0	5.0	2094	1745 1850	235 13.5%	1980	8 0.4%	1753
8	47.5 50.0	42.0	0.225	0.034	7.3	15.0	5.0	2346	1955 2060	234 12.0%	2189	4 0.2%	1959
9	52.5 55.0	42.0	0.225	0.034	7.3	15.0	5.0	2598	2165 2270	234 10.8%	2399	2 0.1%	2167
10	57.5 60.0	42.0	0.225	0.034	7.3	15.0	5.0	2850	2375 2480	233 9.8%	2608	1 0.0%	2376
11	62.5 65.0	42.0	0.225	0.034	7.3	15.0	5.0	3102	2585 2690	233 9.0%	2818	0 0.0%	2585
12	66.5 68.0	42.0	0.225	0.034	7.3	15.0	3.0	3304	2753 2816	232 8.4%	2985	0 0.0%	2753
13	68.5 69.0	42.0	0.225	0.034	7.3	15.0	1.0	3404	2837 2858	232 8.2%	3069	0 0.0%	2837
14	69.5 70.0	42.0	0.225	0.034	7.3	15.0	1.0	3455	2879 2900	232 8.0%	3111	0 0.0%	2879
15	70.5 71.0	42.0	0.000	0.000	7.3	15.0	1.0	3505	2921 2942	232 7.9%	3153	0 0.0%	2921
16	71.5 72.0	42.0	0.000	0.000	7.3	15.0	1.0	3556	2963 2984	231 7.8%	3194	0 0.0%	2963
17	72.5 73.0	42.0	0.000	0.000	7.3	15.0	1.0	3606	3005 3026	231 7.7%	3236	0 0.0%	3005
18	73.5 74.0	42.0	0.000	0.000	7.3	15.0	1.0	3656	3047 3068	231 7.6%	3278	0 0.0%	3047
19	74.5 75.0	42.0	0.000	0.000	7.3	15.0	1.0	3707	3089 3110	231 7.5%	3320	0 0.0%	3089
20	75.5 76.0	42.0	0.000	0.000	7.3	15.0	1.0	3757	3131 3152	231 7.4%	3362	0 0.0%	3131
21	76.5 77.0	42.0	0.000	0.000	7.3	15.0	1.0	3808	3173 3194	231 7.3%	3404	0 0.0%	3173
22	77.5 78.0	42.0	0.000	0.000	7.3	15.0	1.0	3858	3215 3236	231 7.2%	3446	0 0.0%	3215
23	78.5 79.0	42.0	0.000	0.000	7.3	15.0	1.0	3908	3257 3278	231 7.1%	3488	0 0.0%	3257
24	79.5 80.0	42.0	0.000	0.000	7.3	15.0	1.0	3959	3299 3320	231 7.0%	3530	0 0.0%	3299
25	80.5 81.0	42.0	0.000	0.000	7.3	15.0	1.0	4009	3341 3362	230 6.9%	3571	0 0.0%	3341

Str No.	Ultimate Settlement Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)	Induced Settlement Recomp Sett (in.)	Virgin Sett (in.)	Total Sett (in.)	Bulb Sett (in.)
1	3.96	0.00	(8.79) 3.96 (4.83)	(8.56) 3.96 (4.60)	3.39	0.00	(4.96) 3.39 (1.57)	(4.96) 3.39 (1.57)
2	0.35	0.00	0.35 (4.48)	0.35 (4.25)	0.20	0.00	0.20 (1.37)	0.20 (1.37)
3	0.00	3.39	3.39 (1.09)	3.39 (0.86)	0.00	1.30	1.30 (0.07)	1.30 (0.07)
4	0.19	0.10	0.29 (0.80)	0.29 (0.57)	0.04	0.00	0.04 (0.03)	0.04 (0.03)
5	0.14	0.00	0.14 (0.65)	0.14 (0.43)	0.02	0.00	0.02 (0.01)	0.02 (0.01)
6	0.13	0.00	0.13 (0.53)	0.13 (0.30)	0.01	0.00	0.01 (0.01)	0.01 (0.01)
7	0.11	0.00	0.11 (0.42)	0.11 (0.19)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
8	0.10	0.00	0.10 (0.32)	0.10 (0.09)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
9	0.09	0.00	0.09 (0.23)	0.09 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
10	0.08	0.00	0.08 (0.15)	0.08 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
11	0.06	0.00	0.06 (0.07)	0.06 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
12	0.04	0.00	0.04 (0.03)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
13	0.01	0.00	0.01 (0.01)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
14	0.01	0.00	0.01 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
15	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
16	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
17	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
18	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
19	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
20	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
21	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
22	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
23	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
24	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)
25	0.00	0.00	0.00 (0.00)	0.00 (0.00)	0.00	0.00	0.00 (0.00)	0.00 (0.00)

Str No.	Influence Factors (Ultimate Induced Stresses in Parentheses) Region 1 Iz	Region 2 Iz	Region 3 Iz	Region 4 Iz	Region 5 Iz	Region 6 Iz	Region 7 Iz	Region 8 Iz	Region 9 Iz	Region 10 Iz
1	0.000 (0)	0.998 (240)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
2	0.000 (0)	0.994 (238)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
3	0.000 (0)	0.990 (238)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
4	0.000 (0)	0.986 (237)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
5	0.000 (0)	0.984 (236)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
6	0.000 (0)	0.981 (235)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
7	0.000 (0)	0.979 (235)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
8	0.000 (0)	0.976 (234)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
9	0.000 (0)	0.974 (234)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
10	0.000 (0)	0.971 (233)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
11	0.000 (0)	0.969 (232)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
12	0.000 (0)	0.967 (232)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
13	0.000 (0)	0.966 (232)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
14	0.000 (0)	0.965 (232)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
15	0.000 (0)	0.965 (231)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
16	0.000 (0)	0.964 (231)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
17	0.000 (0)	0.964 (231)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
18	0.000 (0)	0.963 (231)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
19	0.000 (0)	0.963 (231)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
20	0.000 (0)	0.962 (231)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
21	0.000 (0)	0.962 (231)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
22	0.000 (0)	0.961 (231)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
23	0.000 (0)	0.961 (231)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
24	0.000 (0)	0.960 (230)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)
25	0.000 (0)	0.960 (230)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)	0.000 (0)

Str No.	Rate Parameters Effective H* (ft)	Position (z*/L) (N/D)	Percent Consolidation for Combined Drainage (Current Induced Stresses in Parentheses) Region 1 (N/D)	Region 2 (N/D)	Region 3 (N/D)	Region 4 (N/D)	Region 5 (N/D)	Region 6 (N/D)	Region 7 (N/D)	Region 8 (N/D)	Region 9 (N/D)	Region 10 (N/D)
1	8.00	0.077	0.75 (0)	0.75 (179)	0.75 (0)	0.75 (0)	0.75 (0)	0.75 (0)	0.75 (0)	0.75 (0)	0.75 (0)	0.75 (0)
2	0.48	0.159	0.51 (0)	0.51 (121)	0.51 (0)	0.51 (0)	0.51 (0)	0.51 (0)	0.51 (0)	0.51 (0)	0.51 (0)	0.51 (0)
3	6.16	0.223	0.35 (0)	0.35 (84)	0.35 (0)	0.35 (0)	0.35 (0)	0.35 (0)	0.35 (0)	0.35 (0)	0.35 (0)	0.35 (0)
4	3.91	0.320	0.18 (0)	0.18 (43)	0.18 (0)	0.18 (0)	0.18 (0)	0.18 (0)	0.18 (0)	0.18 (0)	0.18 (0)	0.18 (0)
5	3.26	0.390	0.11 (0)	0.11 (25)	0.11 (0)	0.11 (0)	0.11 (0)	0.11 (0)	0.11 (0)	0.11 (0)	0.11 (0)	0.11 (0)
6	3.26	0.453	0.06 (0)	0.06 (14)	0.06 (0)	0.06 (0)	0.06 (0)	0.06 (0)	0.06 (0)	0.06 (0)	0.06 (0)	0.06 (0)
7	3.26	0.516	0.03 (0)	0.03 (8)	0.03 (0)	0.03 (0)	0.03 (0)	0.03 (0)	0.03 (0)	0.03 (0)	0.03 (0)	0.03 (0)
8	3.26	0.578	0.02 (0)	0.02 (4)	0.02 (0)	0.02 (0)	0.02 (0)	0.02 (0)	0.02 (0)	0.02 (0)	0.02 (0)	0.02 (0)
9	3.26	0.641	0.01 (0)	0.01 (2)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)	0.01 (0)
10	3.26	0.704	0.00 (0)	0.00 (1)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
11	3.26	0.767	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
12	1.95	0.818	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
13	0.65	0.843	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
14	0.65	0.855	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
15	0.65	0.868	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
16	0.65	0.880	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
17	0.65	0.893	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
18	0.65	0.906	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
19	0.65	0.918	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
20	0.65	0.931	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
21	0.65	0.943	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
22	0.65	0.956	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
23	0.65	0.969	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
24	0.65	0.981	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
25	0.65	0.994	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)

TOTAL	(in)	5.30	3.49	8.79	8.56	3.66	1.30	4.96	4.96
	(ft)	0.44	0.29	0.73	0.71	0.31	0.11	0.41	0.41
	%Ultimate			100.0	97.4			56.5	56.4
REDUCD	(in)	4.51	2.96	7.47	7.28	3.11	1.11	4.22	4.22
	(ft)	0.38	0.25	0.62	0.61	0.26	0.09	0.35	0.35
	%Ultimate			85.0	82.8			48.0	48.0

APPENDIX VI

Product Specification - Structural Geogrid BX1500

Tensar Earth Technologies, Inc. reserves the right to change its product specifications at any time. It is the responsibility of the specifier and purchaser to ensure that product specifications used for design and procurement purposes are current and consistent with the products used in each instance. Please contact Tensar Earth Technologies, Inc. at 800-836-7271 for assistance

The structural geogrid shall be an integrally formed grid structure manufactured of a stress resistant polypropylene material with molecular weight and molecular characteristics which impart: (a) high resistance to loss of load capacity or structural integrity when the geogrid is subjected to mechanical stress in installation; (b) high resistance to deformation when the geogrid is subjected to applied force in use; and (c) high resistance to loss of load capacity or structural integrity when the geogrid is subjected to long-term environmental stress.

The structural geogrid shall accept applied force in use by positive mechanical interlock (i.e. by direct mechanical keying) with: (a) compacted soil or construction fill materials; (b) contiguous sections of itself when overlapped and embedded in compacted soil or construction fill materials; and (c) rigid mechanical connectors such as bodkins, pins or hooks. The structural geogrid shall possess sufficient cross sectional profile to present a substantial abutment interface to compacted soil or particulate construction fill materials and to resist movement relative to such materials when subject to applied force. The structural geogrid shall possess sufficient true initial modulus to cause applied force to be transferred to the geogrid at low strain levels without material deformation of the reinforced structure. The structural geogrid shall possess complete continuity of all properties throughout its structure and shall be suitable for reinforcement of compacted soil or particulate construction fill materials to improve their long term stability in structural load bearing applications such as earth retention systems. The structural geogrid shall otherwise have the following characteristics:

Product Type: **Integrally Formed Structural Geogrid**
Load Transfer Mechanism: **Positive Mechanical Interlock**

Product Properties

Index Properties	**Units**	**MD Values[1]**	**XMD Values[1]**
▪ Aperture Dimensions[2]	mm (in)	25 (1.0)	30.5 (1.2)
▪ Minimum Rib Thickness[2]	mm (in)	1.78 (0.07)	1.78 (0.07)
Load Capacity			
▪ True Initial Modulus in Use[3]	kN/m(lb/ft)	500 (34,270)	625 (42,840)
▪ True Tensile Strength @2% Strain[3]	kN/m(lb/ft)	8.5 (580)	10.0 (690)
▪ True Tensile Strength @5% Strain[3]	kN/m(lb/ft)	17.5 (1,200)	20.0 (1,370)
Structural Integrity			
▪ Junction Efficiency[4]	%	93	
▪ Flexural Stiffness[5]	mg-cm	2,000,000	
▪ Aperture Stability[6]	kg-cm/deg	7.5	
Durability			
▪ Resistance to Installation Damage[7]	%SC / %SW / %GP	91 / 91 / 85	
▪ Resistance to Long Term Degradation[8]	%	100	
▪ Carbon Black Content	%	2.0	

Dimensions and Delivery

The structural geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 4.0 meters (13.1 feet) in width and 50.0 meters (164 feet) in length. A typical truckload quantity is 150 rolls. On special request, the structural geogrid may also be custom cut to specific lengths or widths to suit site specific engineering designs.

Notes

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D-4759. Brief descriptions of test procedures are given in the following notes. Complete descriptions of test procedures are available on request from Tensar Earth Technologies, Inc.
2. Nominal Dimensions.
3. True resistance to elongation when initially subjected to a load measured via ASTM D6637 without deforming test materials under load before measuring such resistance or employing "secant" or "offset" tangent methods of measurement so as to overstate tensile properties.
4. Load transfer capability measured via GRI-GG2-87. Expressed as a percentage of ultimate tensile strength.
5. Resistance to bending force measured via ASTM D-5732-95, using specimens of width two ribs wide, with transverse ribs cut flush with exterior edges of longitudinal ribs (as a "ladder"), and of length sufficiently long to enable measurement of the overhang dimension. The overall Flexural Stiffness is calculated as the square root of the product of machine-and cross-machine-direction Flexural Stiffness values.
6. Resistance to in-plane rotational movement measured by applying a 20 kg-cm moment to the central junction of a 9 inch x 9 inch specimen restrained at its perimeter (U.S. Army Corps of Engineers Methodology for measurement of Torsional Rigidity).
7. Resistance to loss of load capacity or structural integrity when subjected to mechanical installation stress in clayey sand (SC), well graded sand (SW), and crushed stone classified as poorly graded gravel (GP). The geogrid shall be sampled in accordance with ASTM D5818 and load capacity shall be measured in accordance with ASTM D6637.
8. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments measured via EPA 9090 immersion testing.

Tensar Earth Technologies, Inc.
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(800) 836-7271

March 15, 2002
This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped to jobsite prior to March 15, 2002.

Product Specification - Structural Geogrid UX1700HS

Tensar Earth Technologies, Inc. reserves the right to change its product specifications at any time. It is the responsibility of the specifier and purchaser to ensure that product specifications used for design and procurement purposes are current and consistent with the products used in each instance. Please contact Tensar Earth Technologies, Inc. at 800-836-7271 for assistance

The structural geogrid shall be an integrally formed grid structure manufactured of a stress resistant high density polyethylene material with molecular weight and molecular characteristics which impart: (a) high resistance to loss of load capacity or structural integrity when the geogrid is subjected to mechanical stress in installation; (b) high resistance to deformation when the geogrid is subjected to applied force in use; and (c) high resistance to loss of load capacity or structural integrity when the geogrid is subjected to long-term environmental stress.

The structural geogrid shall accept applied force in use by positive mechanical interlock (i.e. by direct mechanical keying) with: (a) compacted soil or construction fill materials; (b) contiguous sections of itself when overlapped and embedded in compacted soil or construction fill materials; and (c) rigid mechanical connectors such as bodkins, pins or hooks. The structural geogrid shall possess sufficient cross sectional profile to present a substantial abutment interface to compacted soil or particulate construction fill materials and to resist movement relative to such materials when subject to applied force. The structural geogrid shall possess sufficient true initial modulus to cause applied force to be transferred to the geogrid at low strain levels without material deformation of the reinforced structure. The structural geogrid shall possess complete continuity of all properties throughout its structure and shall be suitable for reinforcement of compacted soil or particulate construction fill materials to improve their long term stability in structural load bearing applications such as earth retention systems. The structural geogrid shall otherwise have the following characteristics:

Product Type: **Integrally Formed Structural Geogrid**
Load Transfer Mechanism: **Positive Mechanical Interlock**

Product Properties

Load Capacity	**Units**	**MD Values[1]**
▪ True Initial Modulus in Use[2]	kN/m(lb/ft)	2,350 (161,070)
▪ Tensile Strength @5% Strain[2]	kN/m(lb/ft)	75 (5,140)
▪ Ultimate Tensile Strength[2]	kN/m(lb/ft)	175 (11,990)
▪ Long-Term Allowable Load in Sands, Silts & Clay[3]	kN/m(lb/ft)	75.1 (5,140)
▪ Long-Term Allowable Load in Well Graded Sand[3]	kN/m(lb/ft)	73.0 (5,000)
▪ Long-Term Allowable Load in Aggregate[3]	kN/m(lb/ft)	71.7 (4,910)
Integrity of Product Structure		
▪ Junction Strength[4]	kN/m(lb/ft)	160 (10,970)
▪ Flexural Stiffness[5]	X1000 mg-cm	9,075
Durability		
▪ Resistance to Installation Damage[6]	%SC / %SW / %GP	95 / 92 / 90
▪ Resistance to Long Term Degradation[7]	%	100

Dimensions and Delivery

The structural geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 1.33 meters (4.36 feet) in width and 61.0 meters (200.0 feet) in length. A typical truckload quantity is 144 rolls. On special request, the structural geogrid may also be custom cut to specific lengths or widths to suit site specific engineering designs.

Notes

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D-4759. Brief descriptions of test procedures are given in the following notes. Complete descriptions of test procedures are available on request from Tensar Earth Technologies, Inc.
2. True resistance to elongation when initially subjected to a load measured via ASTM D6637 without deforming test materials under load before measuring such resistance or employing "secant" or "offset" tangent methods of measurement so as to overstate tensile properties.
3. True strength available for resisting force in long-term load bearing applications is determined by reducing ultimate tensile strength by state-of-practice factors for installation damage, degradation in use, product integrity limitations and long-term product deformation per GRI-GG4.
4. Load transfer capability measured via GRI-GG2-87.
5. Resistance to bending force measured via ASTM D-5732-95, using specimen dimensions of 864 millimeters in length by 1 aperture in width.
6. Resistance to loss of load capacity or structural integrity when subjected to mechanical installation stress in clayey sand (SC), well graded sand (SW), and crushed stone classified as poorly graded gravel (GP). The material shall be sampled in accordance with ASTM D5818 and load capacity measured in accordance with ASTM D6637.
7. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments measured via EPA 9090 immersion testing.

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328-5363
(800) 836-7271

September 1, 2002

This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped to jobsite prior to September 1, 2002.

APPENDIX VII

Page

EUSTIS ENGINEERING COMPANY, INC.

Geotechnical Engineers
Metairie, Louisiana

Date 2-28-03

Job 17623

Project DNR - Little Lake Shoreline Protection

By GPS

Subject

Checked By

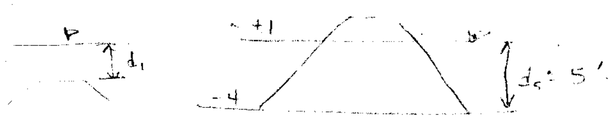
Shore Protection Manual Volume II Chapter 7

Structural Design

Select 2' as design wave height H_s (or 2.5')

this project is "freshwater" condition near shore

assume broken waves



$d_1 = 0$

$d_1 / d_s = 0$

N_s^3 = stability number ≈ 4.5

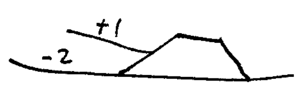
fig 7-99 pg 7-202

armor stone pg 7-203

$$W = \frac{w_r H^3}{N_s^3 (S_r - 1)^3} \approx \frac{150 (2)^3}{4.5 (2.4-1)^3} \approx 97 \text{ lbs}$$ mean weight of armor unit

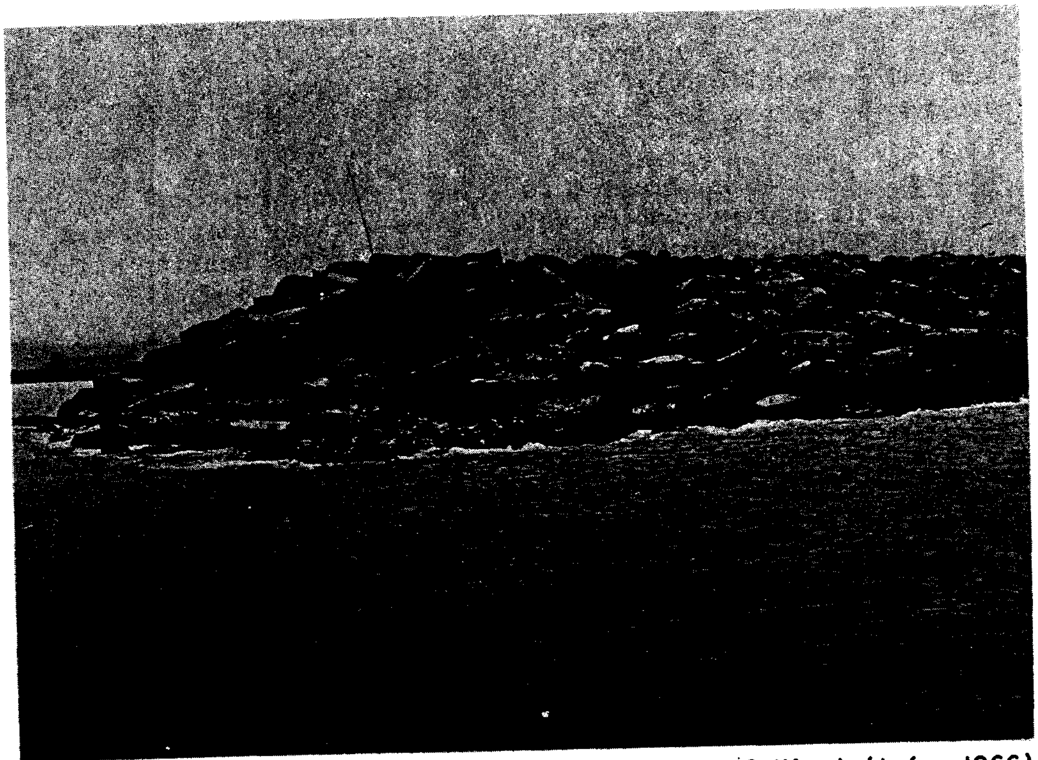
$$\frac{150 (2.5)^3}{4.5 (2.4-1)^3} \approx 190 \text{ lbs}$$ mean

1.5 - high water wave height of storm

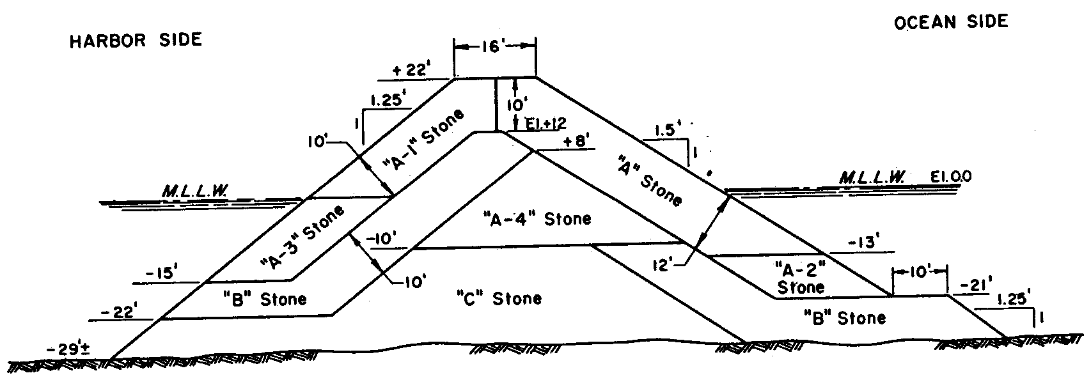


$d_s = 3'$	$d_s = 5'$
$H_s = 2.5'$	$H_s = 2.5'$
1.3(2.5) = 3.25	
3 < 3.35	5 ≮ 3.25

may be subjected to breaking waves



Marina Del Rey, Venice, California (before 1966)



"A" Stone — 16 tons or greater.

"A-1" Stone — 13 tons or greater.

"A-2" Stone — 8 tons or greater.

"A-3" Stone — 6 tons or greater.

"A-4" Stone — 500 lbs. to 8 tons.

"B" Stone — Core stone varies from quarry-run stone to pieces of 1 ton to 4 tons.

"C" Stone — Core stone varies from quarry-waste to pieces of 1,500 lbs. to 4 tons.

Figure 6-72. Rubble-Mound Breakwater

CHAPTER 7

STRUCTURAL DESIGN - PHYSICAL FACTORS

7.1 WAVE CHARACTERISTICS

Wind-generated waves produce the most critical forces to which coastal structures are subjected (except for seismic sea waves). A structure exposed to wave action should be designed to withstand the highest wave expected at the structure, if such a design is economically justified. Economic evaluations depend on frequency of occurrence of extreme events such as, height and duration of extreme waves, damage potential of high waves, and permissible risk. Wave characteristics are normally determined for deep water, and then propagated shoreward to the structure. Deepwater significant wave height H_o and significant wave period T_s may be determined if wind speed, wind duration, and fetch length are known. (See Sections 3.5 and 3.6) This information, with water-level data, is used with refraction analyses to determine wave conditions at the site.

Wave conditions at a structure site at any time depend critically on the water level. Consequently, a design stillwater level (SWL) or range of water levels must be established in determining wave forces on a structure. Structures may be subjected to radically different types of wave action as the water level at the site varies. A given structure might be subjected to nonbreaking, breaking, and broken waves during different stages of a tidal cycle. The wave action a structure is subjected to may also vary along its length at a given time. This is true for structures oriented perpendicular to the shoreline such as groins and jetties. The critical section of these structures may be shoreward of the seaward end of the structure depending on structure crest elevation, tidal range, and bottom profile.

Detailed discussion of the effects of astronomical tides and wind-generated surges in establishing water levels is presented in Chapter 3, WAVE AND WATER LEVEL PREDICTIONS. In Chapter 7, it is assumed that the methods of Chapter 3 have been applied to determine design water levels.

The wave height usually obtained from statistical analysis of synoptic weather charts is the significant height, H_s. Assuming a Rayleigh wave-height distribution, H_s may be further defined in approximate relation to other height parameters of the statistical wave-height distribution:

$H_{1/3}$ or H_s = average of highest 1/3 of all waves,

$H_{10} \approx 1.27\ H_s$ = average of highest 10 percent of all waves (7-1)

$H_1 \approx 1.67\ H_s$ = average of highest 1 percent of all waves (7-2)

7.11 DETERMINATION OF WAVE CONDITIONS

All wave data applicable to the project site should be evaluated for possible use as design criteria. Visual observation of storm waves, while difficult to confirm, may provide an indication of wave height, period, direction, storm duration, and frequency of occurrence. Instrumentation has been developed for recording wave height and period at a point. Instrumentation for recording wave direction is presently in the development stage, thus direction data must be obtained from visual observations. Wave direction is usually necessary for design analysis. If reliable visual shore or ship observations of wave direction are not available, hindcast procedures (Sec. 3.5, SIMPLIFIED WAVE PREDICTION MODELS) must be used. Where reliable, statistical deepwater wave data are available, these can provide the necessary shallow-water wave data. If wave data are not directly available at the site, the best available procedure must be employed, with sound engineering judgment, to transform available deepwater and extreme offshore wave data to the structure site. (See Section 2.238, Wave Energy and Power, and Sections 2.3, WAVE REFRACTION, and 2.4, WAVE DIFFRACTION.)

7.12 SELECTION OF DESIGN WAVE

The choice of a design wave height depends on whether the structure is subjected to the attack of nonbreaking, breaking, or broken waves and on the geometrical and porosity characteristics of the structure. (Jackson, 1968a.) Once wave characteristics are known, the next step is to determine if wave height at the site is controlled by water depth. (See Section 2.6, BREAKING WAVES.) The type of wave action experienced by a structure may vary with position along the structure, and with water level and time at a given structure section. For this reason, wave conditions should be determined at various points along a structure and for various water levels. Critical wave conditions that result in maximum forces on structures like groins and jetties may be found at a location other than the seaward end of the structure. The possibility of such conditions should be considered in establishing design waves and water levels.

If breaking in shallow water does not limit wave height, a nonbreaking wave condition exists. For nonbreaking waves, the design height is selected from a statistical height distribution. The selected design height depends on whether the structure is defined as *rigid*, *semirigid*, or *flexible*. As a rule of thumb, the design wave is selected as follows. For *rigid* structures, such as cantilever steel sheet-pile walls, where a high wave within the wave train might cause faulure of the entire structure, the design wave is normally based on H_1, the average height of the highest 1 percent of all waves. For *semirigid* structures, the design wave is selected from a range of H_{10} to H_1. Steel sheet-pile cell structures are semirigid, and can absorb wave pounding; therefore, a design wave height of H_{10} may be used. For *flexible* structures, such as rubble-mound or riprap structures, the design height is usually the significant height H_s. Waves higher than H_s impinging on flexible structures seldom create serious damage for short durations of extreme wave action. When an individual stone or armor unit is displaced by a high wave, smaller waves of the train may move it to a more stable position on the slope.

Damage to rubble-mound structures is usually progressive, and an extended period of destructive wave action is required before a structure ceases to provide protection. It is therefore necessary in selecting a design wave to consider both frequency of occurrence of damaging waves and economics of construction, protection, and maintenance. On the Atlantic and Gulf coasts of the United States, hurricanes may provide the design criteria. The frequency of occurrence of the design hurricane at any site may range from once in 20 to once in 100 years. It may be uneconomical to build a structure that would withstand the hurricane conditions without damage, hence H_s may be a more reasonable design wave height. On the North Pacific coast of the United States, the weather pattern is more uniform; severe storms are likely each year. The use of H_s as a design height under these conditions could result in extensive annual damage and frequent maintenance because of the higher frequency and duration of waves greater than H_s in the spectrum. Here, a higher design wave of about H_{10} may be advisable. Selection of the design height between H_s and H_{10} is based on the following factors:

(a) degree of structure damage allowable and associated maintenance costs,

(b) availability of armor materials, and

(c) comparative alternate size or type of armor unit and their costs.

7.121 Breaking Waves. Selection of a design wave height also depends on whether a structure is subject to attack by breaking waves. It has been commonly assumed that a structure sited at a water depth d_s (measured at design water stage), will be subjected to breaking waves if $d_s \leq 1.3\ H$ where H = design wave height. Study of the breaking process indicates that this assumption is not always valid. The breaking point is defined as the point where foam first appears on the wave crest, where the front face of the wave first becomes vertical, or where the wave crest first begins to curl over the face of the wave. (See Section 2.6, BREAKING WAVES.) The breaking point is an intermediate point in the breaking process between the first stages of instability and the area of complete breaking. Therefore, the depth that initiates breaking directly against a structure is actually some distance seaward of the structure and not necessarily the depth at the structure toe. The presence of a structure on a beach also modifies the breaker location and height. Jackson (1968a), has evaluated the effect of rubble structures on the breaking process. Additional research is required to fully evaluate the influence of structures.

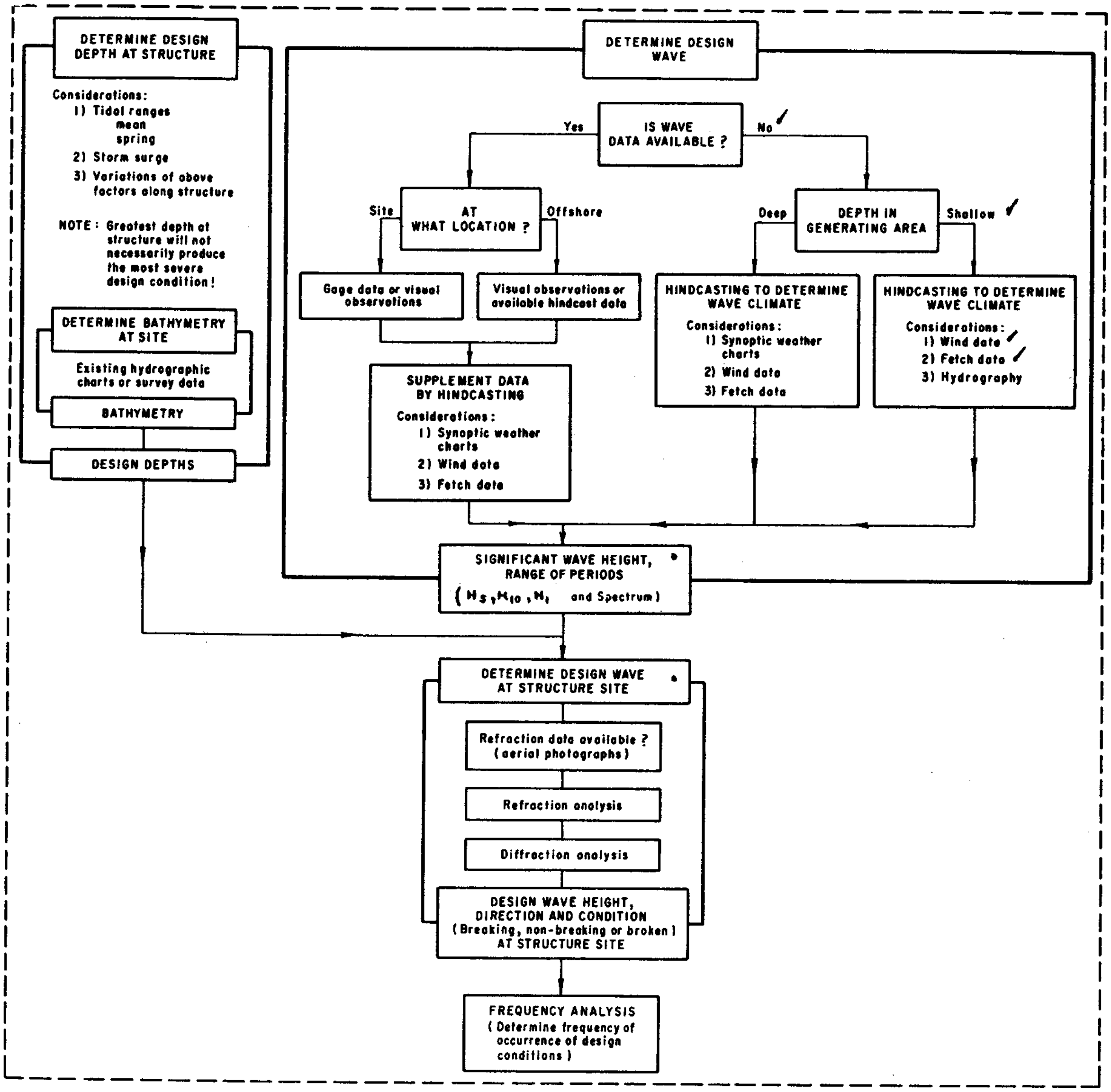


Figure 7-6. Logic Diagram for Evaluation of Marine Environment

Applying the reduction of Equation 7-103 for the angle of wave approach, with

$$R_m = R\,,$$

$$R' = R_m \sin^2 \alpha = 16{,}900\,(\sin 80^\circ)^2\,,$$

$$R' = 16{,}900\,(0.985)^2 = 16{,}400 \text{ lbs./ft.}$$

Similarly,

$$M' = M_m \sin^2 \alpha = 126{,}800\ (\sin 80^\circ)^2\,,$$

$$M' = 126{,}800\ (0.985)^2 = 123{,}000\ \frac{\text{lb.-ft.}}{\text{ft.}}\,.$$

Applying the reduction for a nonvertical wall, the angle the face of the wall makes with the vertcal is,

$$\theta = \arctan\ (10) \approx 84^\circ\,.$$

Applying Equation 7-104,

$$R'' = R' \sin^2 \theta = 16{,}400\ (\sin 84^\circ)^2\,,$$

$$R'' = 16{,}400\ (0.995)^2 = 16{,}200 \text{ lbs./ft.}$$

Similarly for the moment,

$$M'' = M' \sin^2 \theta = 123{,}000\ (\sin 84^\circ)^2\,,$$

$$M'' = 123{,}000\ (0.995)^2 = 121{,}800\ \frac{\text{lb.-ft.}}{\text{ft.}}\,.$$

The total force and overturning moment are given by the sums of the reduced dynamic components and the unreduced hydrostatic components. Therefore,

$$R_t = 16{,}200 + 4{,}400 = 20{,}600 \text{ lb./ft.,}$$

$$M_t = 121{,}800 + 17{,}100 = 138{,}900\ \frac{\text{lb.-ft.}}{\text{ft.}}\,.$$

* *

7.37 STABILITY OF RUBBLE STRUCTURES

7.371 General. A rubble structure is composed of several layers of random-shaped and random-placed stones, protected with a cover layer of selected armor units of either quarry stones or specially shaped concrete units. Armor units in the cover layer may be placed in an orderly manner to obtain good wedging or interlocking action between individual units, or they may be placed at random. Present technology does not provide guidance to determine the forces required to displace individual armor units from the cover layer. Armor units may be displaced either over a large area of the cover layer sliding down the slope *en masse*, or individual armor units may be lifted and rolled either up or down the slope. Empirical methods have been developed that, if used with care, will give a satisfactory determination of the stability characteristics of these structures, when under attack by storm waves.

A series of basic decisions must be made in designing a rubble structure. Those decisions are discussed in succeeding sections.

7.372 Design Factors. A primary factor influencing wave conditions at a structure site is the bathymetry in the general vicinity of the structure. Depths will partly determine whether a structure is subjected to breaking, nonbreaking, or broken waves for a particular design wave condition. (See Section 7.1, WAVE CHARACTERISTICS.)

Variation in water depth along the structure axis must also be considered as it affects wave conditions, being more critical where breaking waves occur than where the depth may allow only nonbreaking waves or waves that overtop the structure.

When waves impinge on rubble structures, they may:

(a) break completely, projecting a jet of water roughly perpendicular to the slope,

(b) partially break with a poorly defined jet, or

(c) establish an oscillatory motion of the water particles up or down the structure slope, similar to the motion of a clapotis at a vertical wall.

The design wave for a rubble structure is usually the significant wave. Damage from waves higher than the significant wave is progressive, but the displacement of several individual armor units will not necessarily result in the complete loss of protection. A logic diagram for the evaluation of the marine envrionment is presented in Figure 7-6, and summarizes factors involved in selecting the design water depth and wave conditions to be used in the analysis of a rubble structure. pg 7-16

don't have enough data for statistical analysis

7.373 Hydraulics of Cover Layer Design. Until about 1930, design of rubble structures was based only on experience and general knowledge of site conditions. Empirical formulas subsequently developed are generally expressed in terms of the stone weight required to withstand design wave conditions. These formulas have been partially substantiated in model studies. They are guides, and must be used with experience and engineering judgment.

Following work by Iribarren (1938, 1950), comprehensive investigations were made by Hudson (1953, 1959, 1961 a, and 1961 b) at the U.S. Army Engineer Waterways Experiment Station (WES), and a formula was developed to determine the stability of armor units on rubble structures. The stability formula, based on the results of extensive small-scale model testing and some preliminary verification by large-scale model testing is

$$W = \frac{w_r \, H^3}{K_D \, (S_r - 1)^3 \, \cot \theta} \qquad (7\text{-}105)$$

where

W = weight in pounds of an individual armor unit in the primary cover layer. (When the cover layer is two quarry stones in thickness, the stones comprising the primary cover layer can range from about 0.75 W to 1.25 W with about 75 percent of the individual stones weighing more than W. The maximum weight of individual stones depends on the size or shape of the unit. The unit should not be of such a size as to extend an appreciable distance above the average level of the slope.)

w_r = unit weight (saturated surface dry) of armor unit, lbs./ft.^{3}, ≈ 140 pcf

H = design wave height at the structure site in feet. $H = 2.5'$
(See Section 7.372.),

S_r = specific gravity of armor unit, relative to the water at the structure, ($S_r = w_r/w_w$). $S_r \approx 140/62.4 \approx 2.24$

w_w = unit weight of water, fresh water = 62.4 lbs./ft.^{3}, sea water = 64.0 lbs./ft.^{3},

θ = angle of structure slope measured from horizontal in degrees,
1 on 5 slope $\theta = \tan^{-1}(\frac{1}{5}) \approx 11.3^\circ$

and

K_D = stability coefficient that varies primarily with the shape of the armor units, roughness of the armor unit surface, sharpness of edges and degree of interlocking obtained in placement. (See Table 7-6.)

Equation 7-105 is intended for conditions when the crest of the structure is high enough to prevent major overtopping. Also the slope of the cover layer will be partly determined on the basis of stone sizes economically available. Cover layer slopes steeper than 1 on 1.5 are not recommended by the Corps of Engineers. Figures 7-83 through 7-86 provide a graphical solution of Equation 7-105.
↳ these are for slopes of 1 on 1.5, 1 on 2 & 1 on 3

$$W \approx \frac{140\,(2.5)^3}{K_D\,(1.24)^3\left(\frac{1}{\tan 11.3^\circ}\right)} \approx \frac{2187.5}{9.6\,K_D} \approx \frac{227.5}{K_D}$$

$K_D \approx 2^+$

$W \approx 113.7$ lbs.

Table 7-6. Suggested K_D Values for Use in Determining Armor Unit Weight

No-Damage Criteria and Minor Overtopping							
Armor Units	n *	Placement	Structure Trunk		Structure Head		
			K_D §		K_D		Slope
			Breaking wave	Nonbreaking wave	Breaking wave	Nonbreaking wave	cot θ
Quarrystone							
Smooth rounded	2	random	2.1	2.4	1.7	1.9	1.5 to 3.0
Smooth rounded	>3	random	2.8	3.2	2.1	2.3	‖
Rough angular	1	random †	†	2.9	†	2.3	‖
Rough angular	2	random	3.5	4.0	2.9 2.5 2.0	3.2 2.8 2.3	1.5 2.0 3.0
Rough angular	>3	random	3.9	4.5	3.7	4.2	‖
Rough angular	2	special ‡	4.8	5.5	3.5	4.5	‖
Tetrapod and Quadripod	2	random	7.2	8.3	5.9 5.5 4.0	6.6 6.1 4.4	1.5 2.0 3.0
Tribar	2	random	9.0	10.4	8.3 7.8 7.0	9.0 8.5 7.7	1.5 2.0 3.0
Dolos	2	random	22.0 ¶	25.0 ¶	15.0 13.5	16.5 15.0	2.0 £ 3.0
Modified Cube	2	random	6.8	7.8	——	5.0	‖
Hexapod	2	random	8.2	9.5	5.0	7.0	‖
Tribar	1	uniform	12.0	15.0	7.5	9.5	‖
Quarrystone (K_{RR}) Graded angular	–	random	2.2	2.5			

* n is the number of units comprising the thickness of the armor layer.

† The use of single layer of quarrystone armor units subject to breaking waves is not recommended, and only under special conditions for nonbreaking waves. When it is used, the stone should be carefully placed.

‡ Special placement with long axis of stone placed perpendicular to structure face.

§ Applicable to slopes ranging from 1 on 1.5 to 1 on 5.

‖ Until more information is available on the variation of K_D value with slope, the use of K_D should be limited to slopes ranging from 1 on 1.5 to 1 on 3. Some armor units tested on a structure head indicate a K_D-slope dependence.

¶ Data only available for 1 on 2 slope.

£ Slopes steeper than 1 on 2 not recommended at the present time.

be placed and the size of quarrystone used, but should not be less than 12 inches to ensure that bottom irregularities are completely covered. It is common practice to extend the bedding layer at least 5 feet beyond the toe of the cover stone. Details of typical rubble structures are shown in Chapter 6, STRUCTURAL FEATURES.

7.38 STABILITY OF RUBBLE FOUNDATIONS AND TOE PROTECTION

Forces of waves on rubble structures have been studied by several investigators. (See Section 7.37.) Brebner and Donnelly (1962) studied stability criteria for random-placed rubble of uniform shape and size used as foundation and toe protection at vertical-faced, composite structures. In their experiments, the shape and size of the rubble units were uniform, that is, subrounded to subangular beach gravel of 2.65 specific gravity. In practice, the rubble foundation and toe protection would be constructed with a core of dumped quarry-run material. The superstructure might consist of concrete or timber cribs founded on the core material. Finally, the apron and side slope of the core would be protected from erosion by a cover layer of armor units. The cover layer should have a minimum thickness of two armor units. An alternative method of constructing the superstructure would be to drive a pair of parallel-tied walls of steel sheet piling into the rubble core.

7.381 Design Wave Heights. For a composite breakwater with the superstructure resting directly on a rubble-mound foundation, structural integrity may depend on the ability of the foundation to resist the erosive scour by the highest waves. Therefore, for design of such structures, it is suggested that the selected design wave height H should be based on the following:

(1) For critical structures at open exposed sites where failure would be disastrous, and in the absence of reliable wave records, the design wave height H should be the average height of the highest 1 percent of all waves H_1 expected, based on the significant deepwater wave height H_o corrected for refraction and shoaling. (Early breaking might prevent the 1-percent wave from reaching the structure; if so, the maximum wave that could reach the structure should be taken for the design value of H.)

(2) For less critical structures, where some risk of exceeding design assumptions is allowable, wave heights between H_{10} and H_1 are acceptable.

The design wave for rubble toe protection is also between H_{10} and H_1.

7.382 Stability Number. The stability number is primarily affected by the depth of the rubble foundation and toe protection below the still-water level d_1, and by the water depth at the structure site, d_s. The relation between the depth ratio, d_1/d_s, and N_s^3 is indicated in Figure 7-99. The cube value of the stability number has been used in the figure to facilitate its substitution in Equation 7-110.

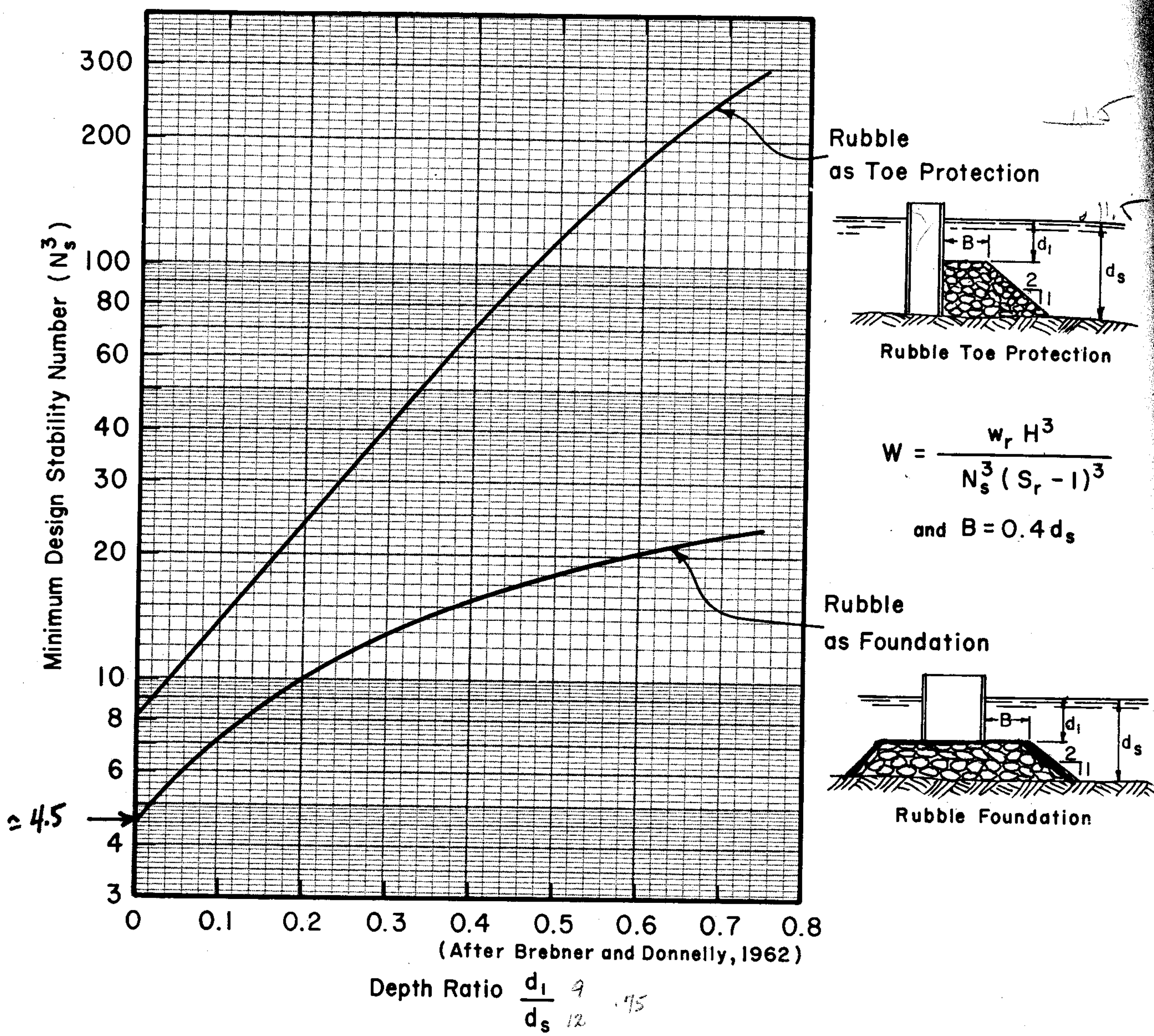


Figure 7-99. Stability Number for Rubble Foundation and Toe Protection

7.383 Armor Stone. The equation used to determine the armor stone weight is a form of Equation 7-105,

$$W = \frac{w_r \; H^3}{N_s^3 \left(S_r - 1\right)^3} , \qquad (7\text{-}110)$$

where,

W = mean weight of individual armor unit, lbs.

w_r = unit weight of rock (saturated surface dry), lbs./ft.^{3}

H = design wave height (the incident wave height causing no damage to the structure).

S_r = specific gravity of rubble or armor stone relative to the water on which the structure is situated ($S_r = w_r/w_w$).

w_w = unit weight of water, fresh water = 62.4 lbs./ft.^{3} sea water = 64.0 lbs./ft.^{3}

N_s = design stability number for rubble foundations and toe protection. (See Figure 7-99.)

7.4 VELOCITY FORCES--STABILITY OF CHANNEL REVETMENTS

In the design of channel revetments, the armor stone along the channel slope should be able to withstand anticipated current velocities without being displaced. (Cox, 1958, and Cambell, 1966.) The maximum velocity of tidal currents in midchannel through a navigation opening as given by Sverdrup, Johnson. and Fleming (1942), can be approximated by the following formula:

$$V = \frac{4 \; \pi \; A \; h}{3 \; T \; S} , \qquad (7\text{-}111)$$

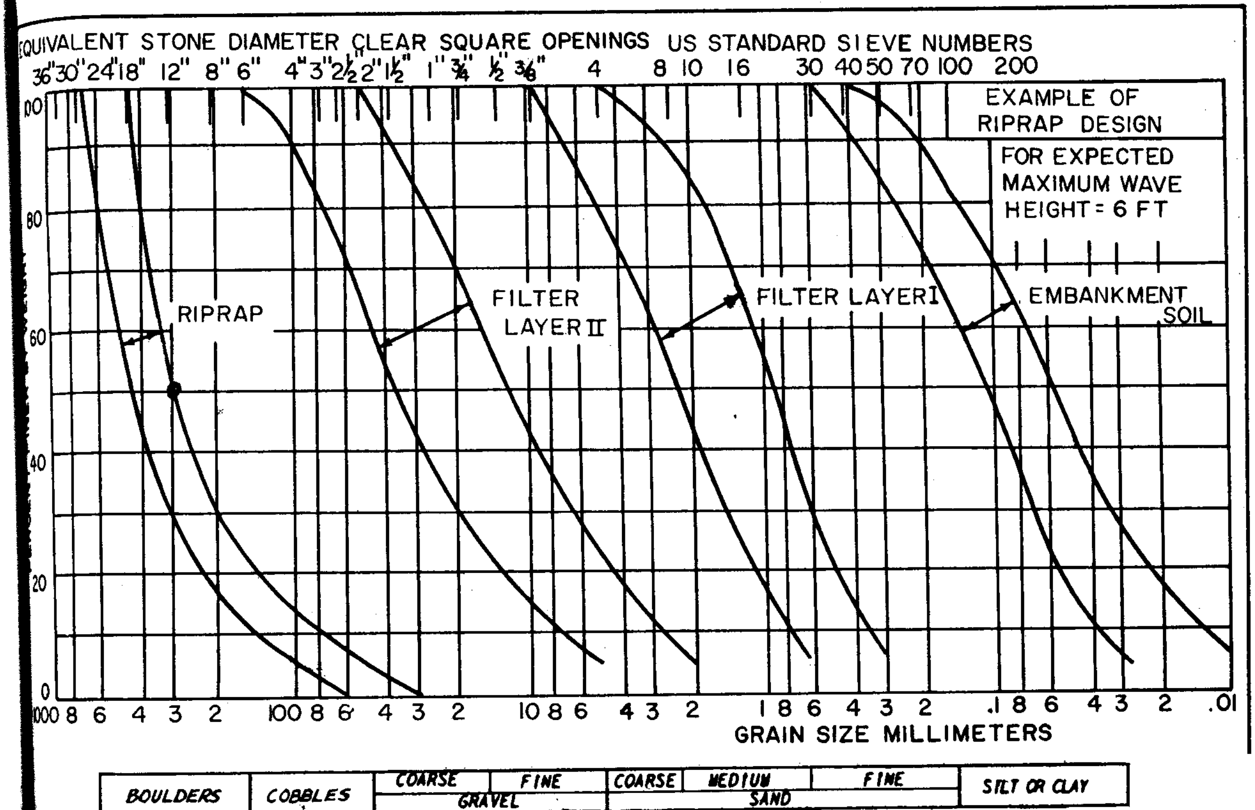
where V is the maximum velocity of tidal current at the center of the opening, T is the period of tide, A is the surface area of harbor basin, S is the cross-section area of openings, and h is the range of tide in the basin. The current in midchannel is about one-third swifter than at each side of the channel.

If the stable stone weight

$$W = \frac{\pi}{6} \, d_g^3 \; w_r , \qquad (7\text{-}112)$$

where d_g is the diameter of a stone sphere of equivalent weight, and

$$V = y \; \left(2_g\right)^{1/2} \left(\frac{w_r - w_w}{w_w}\right)^{1/2} (\cos\theta - \sin\theta)^{1/2} \; d_g^{\,1/2} \quad , \qquad (7\text{-}113)$$



GENERAL REQUIREMENTS:

1. FOR EMBANKMENT SLOPES BETWEEN 1:2 AND 1:4 DUMPED RIPRAP SHALL MEET THE FOLLOWING CRITERIA:

MAXIMUM WAVE HEIGHT FT	AVERAGE ROCK SIZE D_{50} IN.	MAXIMUM ROCK SIZE POUNDS	LAYER THICKNESS IN.
0 TO 1	8	100	12
1 TO 2	10	200	15
2 TO 4	12	500	18
4 TO 6	15	1500	24
6 TO 8	18	2500	30
8 TO 10	24	4000	36

2. RIPRAP SHALL BE WELL GRADED FROM A MAXIMUM SIZE AT LEAST 1.5 TIMES AVERAGE ROCK SIZE, TO 1 IN. SPALLS SUITABLE TO FILL VOIDS BETWEEN ROCKS.
3. RIPRAP BLANKET SHALL EXTEND TO AT LEAST 8 FT BELOW LOWEST LOW WATER.
4. UNDER THE MOST EXTREME ICING AND TEMPERATURE CHANGES, ROCK SHOULD MEET SOUNDNESS AND DENSITY REQUIREMENTS FOR CONCRETE AGGREGATE. OTHERWISE, ANY UNWEATHERED ROCK WITH $G > 2.60$, OTHER THAN ARGILLACEOUS TYPES, ARE SUITABLE.
5. FILTER SHALL BE PROVIDED BETWEEN RIPRAP AND EMBANKMENT SOILS TO MEET THE FOLLOWING CRITERIA:

MAXIMUM WAVE HEIGHT, FT	FILTER D_{85} SIZE AT LEAST:
0 TO 4	1 TO 1½ IN.
4 TO 10	1½ TO 2 IN.

NO FILTER IS NEEDED IF EMBANKMENT MEETS THE ABOVE REQUIREMENTS FOR D_{85} SIZE.

FILTER MAY NOT BE REQUIRED IF EMBANKMENT CONSISTS OF CH OR CL WITH $LL > 30$, RESISTANT TO SURFACE EROSION. IF A FILTER IS USED IN THIS CASE IT ORDINARILY MEETS FILTER CRITERIA AGAINST RIPRAP ONLY.

IF EMBANKMENT CONSISTS OF NONPLASTIC SOILS WHERE SEEPAGE WILL MOVE FROM EMBANKMENT AT LOW WATER, 2 FILTER LAYERS MAY BE REQUIRED WHICH SHALL MEET FILTER CRITERIA AGAINST BOTH EMBANKMENT AND RIPRAP. (EXAMPLE IS SHOWN ABOVE).

6. MINIMUM THICKNESS OF SINGLE LAYER FILTERS ARE AS FOLLOWS:

MAXIMUM WAVE HEIGHT, FT	FILTER THICKNESS, IN.
0 TO 4	6
4 TO 8	9
8 TO 12	12

DOUBLE FILTER LAYERS SHOULD BE AT LEAST 6 IN. THICK.

FIGURE 9-1

Design Criteria for Riprap on Earth Embankments