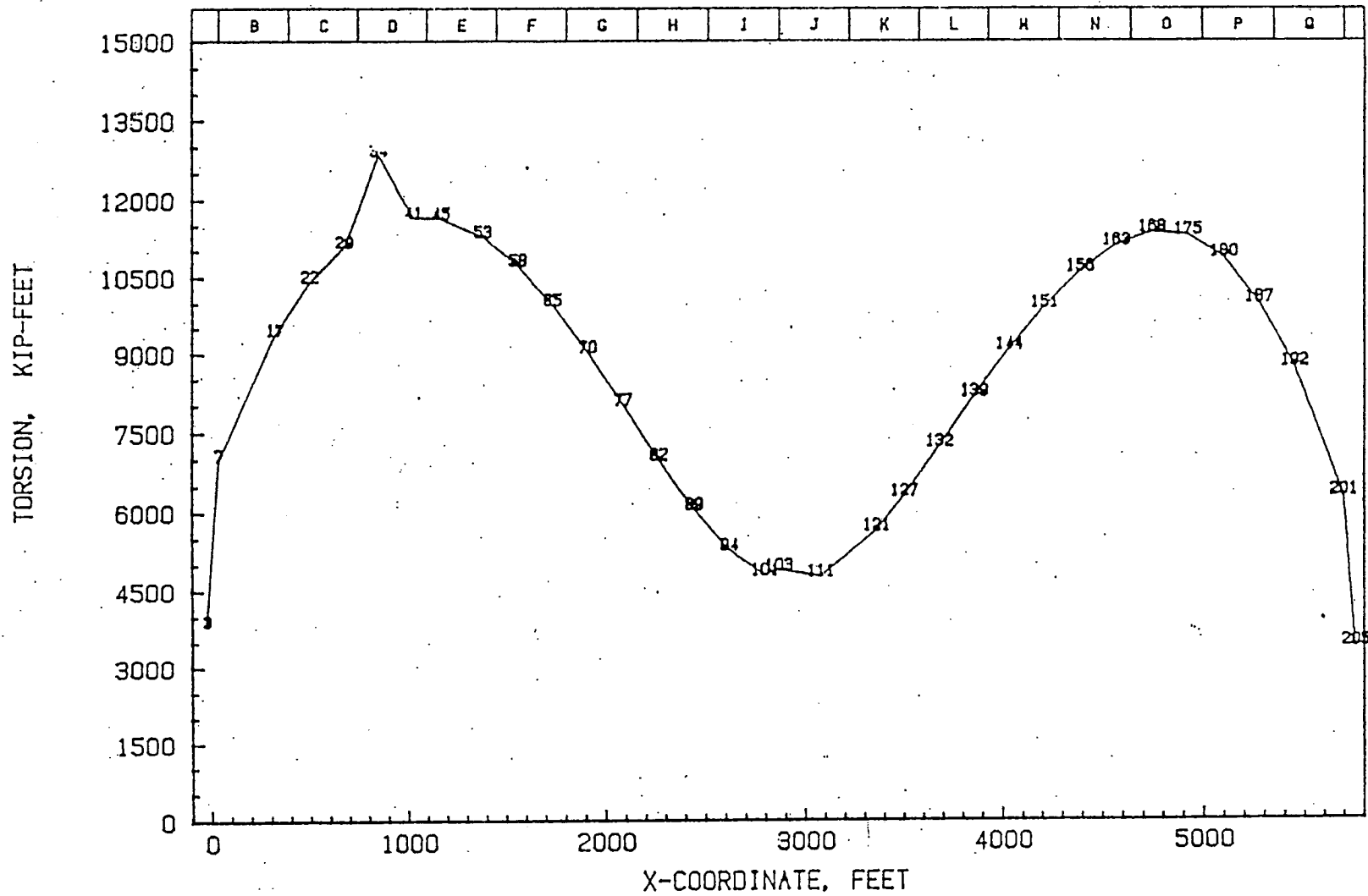


# NEW I-90 BRIDGE



SIG. WAVE HEIGHT = 2.15 FEET    MODAL PERIOD = 2.707 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES ( WIND FROM SOUTH )  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

THE GLOSTEN ASSOCIATES, Inc.  
 10 MAY 1983

FIGURE 15-15

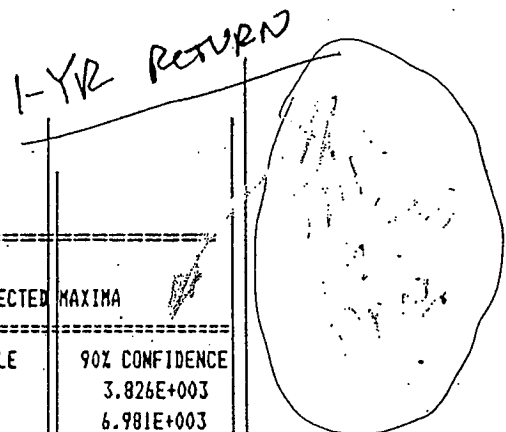
*1-YR RETURN*

FIGURE 15-15

TABLE 15-16

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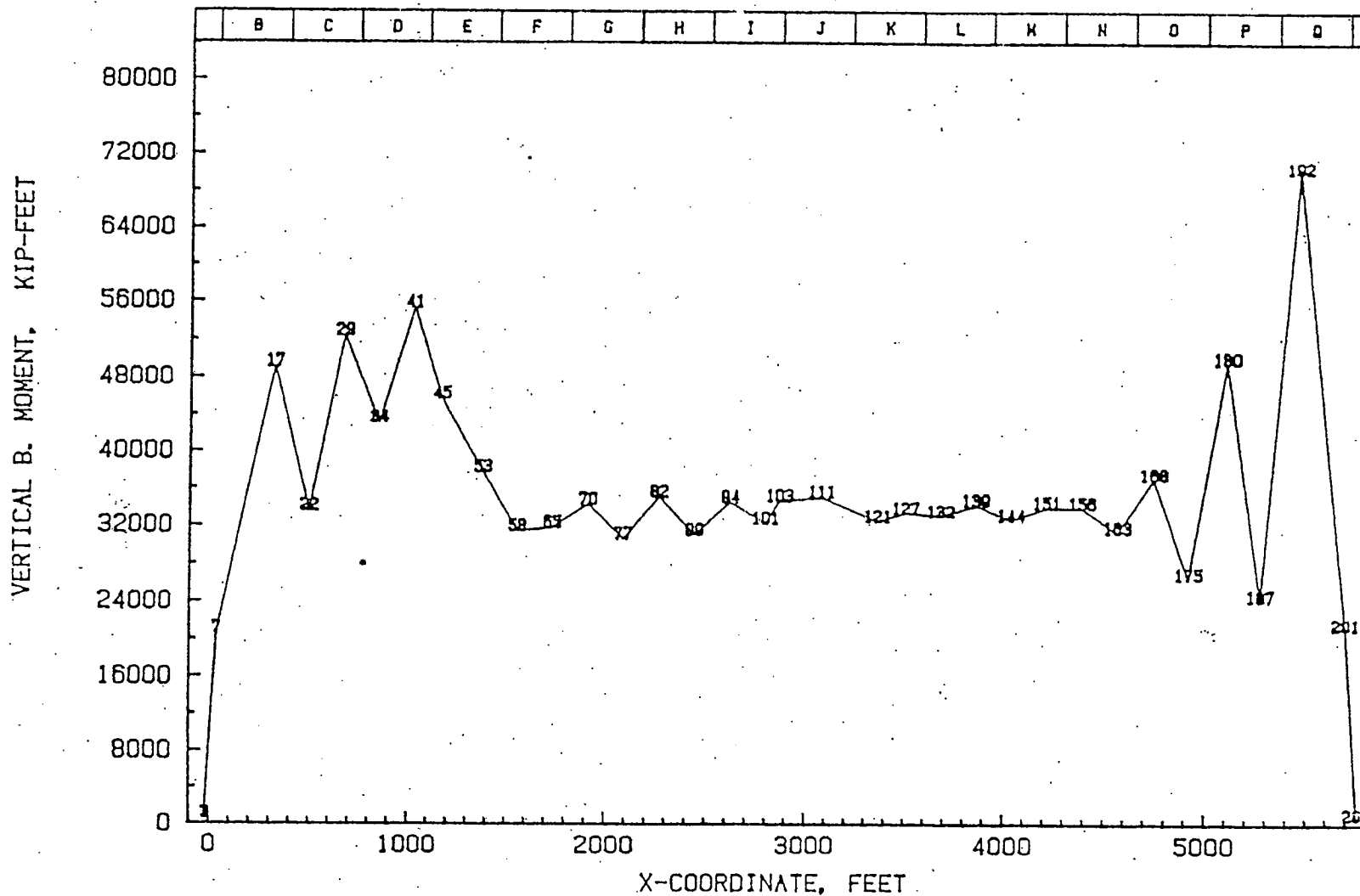
SIGNIFICANT WAVE HEIGHT = 2.15 FEET  
 MODAL WAVE PERIOD = 2.707 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%



TORSION (KIP-FEET)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	8.783E+002	1.757E+003	2.240E+003	3.330E+003	3.826E+003
7	1.603E+003	3.206E+003	4.087E+003	6.075E+003	6.981E+003
17	2.155E+003	4.309E+003	5.494E+003	8.163E+003	9.382E+003
22	2.396E+003	4.791E+003	6.109E+003	9.069E+003	1.043E+004
29	2.549E+003	5.098E+003	6.501E+003	9.643E+003	1.109E+004
34	2.958E+003	5.916E+003	7.542E+003	1.117E+004	1.285E+004
41	2.684E+003	5.367E+003	6.843E+003	1.013E+004	1.165E+004
45	2.680E+003	5.361E+003	6.835E+003	1.011E+004	1.163E+004
53	2.601E+003	5.202E+003	6.633E+003	9.901E+003	1.128E+004
58	2.475E+003	4.950E+003	6.312E+003	9.319E+003	1.073E+004
65	2.300E+003	4.601E+003	5.866E+003	8.655E+003	9.964E+003
70	2.086E+003	4.171E+003	5.318E+003	7.846E+003	9.033E+003
77	1.851E+003	3.702E+003	4.721E+003	6.969E+003	8.022E+003
82	1.611E+003	3.222E+003	4.108E+003	6.077E+003	6.991E+003
89	1.393E+003	2.786E+003	3.552E+003	5.274E+003	6.063E+003
94	1.210E+003	2.421E+003	3.087E+003	4.605E+003	5.287E+003
101	1.097E+003	2.194E+003	2.797E+003	4.192E+003	4.807E+003
103	1.118E+003	2.237E+003	2.852E+003	4.275E+003	4.902E+003
111	1.091E+003	2.183E+003	2.783E+003	4.174E+003	4.786E+003
121	1.298E+003	2.596E+003	3.310E+003	4.935E+003	5.667E+003
127	1.453E+003	2.905E+003	3.704E+003	5.504E+003	6.325E+003
132	1.669E+003	3.338E+003	4.256E+003	6.300E+003	7.247E+003
139	1.888E+003	3.777E+003	4.815E+003	7.112E+003	8.185E+003
144	2.100E+003	4.200E+003	5.355E+003	7.900E+003	9.095E+003
151	2.290E+003	4.580E+003	5.840E+003	8.613E+003	9.917E+003
156	2.449E+003	4.898E+003	6.244E+003	9.215E+003	1.061E+004
163	2.562E+003	5.124E+003	6.533E+003	9.650E+003	1.111E+004
168	2.619E+003	5.237E+003	6.678E+003	9.873E+003	1.136E+004
175	2.605E+003	5.210E+003	6.642E+003	9.829E+003	1.131E+004
180	2.504E+003	5.008E+003	6.385E+003	9.454E+003	1.087E+004
187	2.303E+003	4.607E+003	5.874E+003	8.701E+003	1.001E+004
192	2.016E+003	4.033E+003	5.142E+003	7.619E+003	8.763E+003
201	1.457E+003	2.915E+003	3.716E+003	5.508E+003	6.334E+003
205	7.887E+002	1.577E+003	2.011E+003	2.984E+003	3.431E+003

# NEW I-90 BRIDGE.



SIG. WAVE HEIGHT = 2.15 FEET    MODAL PERIOD = 2.707 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES ( WIND FROM SOUTH )  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2X

THE GLOSTEN ASSOCIATES, Inc.  
 10 MAY 1983

FIGURE 15-17

*1-YR RETURN*

FIGURE 15-17

TABLE 15-18

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SIGNIFICANT WAVE HEIGHT = 2.15 FEET  
 MODAL WAVE PERIOD = 2.707 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

1-YR RETURN

VERTICAL B. MOMENT (KIP-FEET)

NODE	AVERAGES			EXPECTED	MAXIMA
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.517E+002	3.034E+002	3.869E+002	5.818E+002	6.667E+002
7	4.711E+003	9.422E+003	1.201E+004	1.800E+004	2.064E+004
17	1.129E+004	2.257E+004	2.878E+004	4.277E+004	4.915E+004
22	7.640E+003	1.528E+004	1.948E+004	2.936E+004	3.363E+004
29	1.202E+004	2.404E+004	3.066E+004	4.567E+004	5.245E+004
34	9.857E+003	1.971E+004	2.514E+004	3.762E+004	4.316E+004
41	1.262E+004	2.525E+004	3.219E+004	4.833E+004	5.540E+004
45	1.049E+004	2.099E+004	2.676E+004	3.979E+004	4.572E+004
53	8.617E+003	1.723E+004	2.197E+004	3.303E+004	3.786E+004
58	7.217E+003	1.443E+004	1.840E+004	2.744E+004	3.151E+004
65	7.272E+003	1.454E+004	1.854E+004	2.780E+004	3.188E+004
70	7.855E+003	1.571E+004	2.003E+004	2.997E+004	3.438E+004
77	7.023E+003	1.405E+004	1.791E+004	2.680E+004	3.075E+004
82	8.043E+003	1.609E+004	2.051E+004	3.071E+004	3.523E+004
89	7.117E+003	1.423E+004	1.815E+004	2.716E+004	3.116E+004
94	7.917E+003	1.583E+004	2.019E+004	3.023E+004	3.467E+004
101	7.400E+003	1.480E+004	1.887E+004	2.825E+004	3.241E+004
103	7.953E+003	1.591E+004	2.028E+004	3.037E+004	3.484E+004
111	8.048E+003	1.610E+004	2.052E+004	3.072E+004	3.524E+004
121	7.452E+003	1.490E+004	1.900E+004	2.846E+004	3.264E+004
127	7.661E+003	1.532E+004	1.953E+004	2.924E+004	3.354E+004
132	7.582E+003	1.516E+004	1.933E+004	2.894E+004	3.320E+004
139	7.855E+003	1.571E+004	2.003E+004	3.001E+004	3.442E+004
144	7.508E+003	1.502E+004	1.914E+004	2.861E+004	3.283E+004
151	7.796E+003	1.559E+004	1.988E+004	2.981E+004	3.419E+004
156	7.804E+003	1.561E+004	1.990E+004	2.974E+004	3.413E+004
163	7.199E+003	1.440E+004	1.836E+004	2.749E+004	3.154E+004
168	8.497E+003	1.699E+004	2.167E+004	3.246E+004	3.723E+004
175	6.123E+003	1.225E+004	1.561E+004	2.322E+004	2.668E+004
180	1.133E+004	2.266E+004	2.889E+004	4.337E+004	4.972E+004
187	5.595E+003	1.119E+004	1.427E+004	2.119E+004	2.435E+004
192	1.602E+004	3.205E+004	4.086E+004	6.118E+004	7.018E+004
201	4.851E+003	9.703E+003	1.237E+004	1.857E+004	2.129E+004
205	1.416E+002	2.833E+002	3.612E+002	5.436E+002	6.228E+002

15.3 Motion Responses . . . . .

Bridge motion and higher order time derivatives (acceleration and jerk) are presented for selected locations. These values are of interest for several purposes:

(1) design of the transfer span bearings, which must accommodate the expected maximum dynamic motions in addition to static excursions, and

(2) As a measure of motorist comfort and safety. Analytical results for the two existing bridges (in Volumes III and IV of this report) together with subjective experience on these structures in storm conditions, will provide a comparative basis for judging the motion response characteristics of the ~~new design.~~

Five degree of freedom motion response statistics (for sway, heave, roll, pitch and yaw) at selected nodes have been transformed to appropriate vertical locations and tabulated as follows:

<u>From node</u>	<u>To vertical location</u>	
	<u>Z, above DWL</u>	<u>relative to roadway</u>
3	36.80 ft	At span bearings
65	10.20 ft	3 ft above
101	10.20 ft	3 ft above
156	10.20 ft	2 ft above
206	10.72 ft	At span bearings

← 205

<u>Motion response statistics for:</u>	<u>Given in Table</u>	
	<u>100 yr storm</u>	<u>1 yr storm</u>
Sway	15-34	15-39
Heave	15-35	15-40
Roll	15-36	15-41
Pitch	15-37	15-42
Yaw	15-38	15-43

Example motion spectra, for in 100 year storm conditions, are shown in figures 15-44 through 15-52.

TABLE 15-34

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SIGNIFICANT WAVE HEIGHT = 3.37 FEET  
 MODAL WAVE PERIOD = 3.396 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

SWAY (FEET)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	8.781E-002	1.756E-001	2.239E-001	3.255E-001	3.761E-001
65	6.944E-002	1.389E-001	1.771E-001	2.583E-001	2.982E-001
101	5.842E-002	1.168E-001	1.490E-001	2.177E-001	2.512E-001
156	5.591E-002	1.118E-001	1.426E-001	2.073E-001	2.395E-001
205	8.546E-002	1.709E-001	2.179E-001	3.169E-001	3.662E-001

SWAY ACCELERATION (FT/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	2.631E-001	5.262E-001	6.709E-001	9.833E-001	1.134E+000
65	2.254E-001	4.508E-001	5.748E-001	8.439E-001	9.727E-001
101	2.004E-001	4.007E-001	5.110E-001	7.523E-001	8.665E-001
156	1.695E-001	3.390E-001	4.322E-001	6.361E-001	7.327E-001
205	2.586E-001	5.172E-001	6.594E-001	9.670E-001	1.115E+000

SWAY JERK (FT/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	4.962E-001	9.924E-001	1.265E+000	1.865E+000	2.147E+000
65	4.351E-001	8.702E-001	1.109E+000	1.637E+000	1.884E+000
101	4.026E-001	8.053E-001	1.027E+000	1.521E+000	1.749E+000
156	3.380E-001	6.760E-001	8.619E-001	1.283E+000	1.474E+000
205	4.913E-001	9.826E-001	1.253E+000	1.849E+000	2.128E+000

TABLE 15-35

\*\*\*\*\*

SIGNIFICANT WAVE HEIGHT = 3.37 FEET  
 MODAL WAVE PERIOD = 3.396 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

HEAVE (FEET)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	3.787E-002	7.575E-002	9.658E-002	1.411E-001	1.629E-001
65	5.270E-002	1.054E-001	1.344E-001	1.954E-001	2.258E-001
101	5.353E-002	1.071E-001	1.365E-001	1.983E-001	2.292E-001
156	5.553E-002	1.111E-001	1.416E-001	2.055E-001	2.376E-001
205	3.741E-002	7.481E-002	9.538E-002	1.392E-001	1.607E-001

HEAVE ACCELERATION (FT/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.310E-001	2.620E-001	3.340E-001	4.926E-001	5.672E-001
65	1.675E-001	3.350E-001	4.272E-001	6.328E-001	7.277E-001
101	1.651E-001	3.303E-001	4.211E-001	6.229E-001	7.166E-001
156	1.658E-001	3.316E-001	4.228E-001	6.242E-001	7.185E-001
205	1.284E-001	2.567E-001	3.273E-001	4.840E-001	5.569E-001

HEAVE JERK (FT/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	2.690E-001	5.381E-001	6.861E-001	1.018E+000	1.171E+000
65	3.665E-001	7.330E-001	9.346E-001	1.398E+000	1.604E+000
101	3.541E-001	7.082E-001	9.030E-001	1.351E+000	1.550E+000
156	3.460E-001	6.920E-001	8.823E-001	1.316E+000	1.511E+000
205	2.737E-001	5.474E-001	6.979E-001	1.040E+000	1.195E+000

TABLE 15-36

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SIGNIFICANT WAVE HEIGHT = 3.37 FEET  
 MODAL WAVE PERIOD = 3.396 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

ROLL (RADIAN)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	6.906E-004	1.381E-003	1.761E-003	2.556E-003	2.955E-003
65	5.447E-004	1.089E-003	1.389E-003	2.034E-003	2.346E-003
101	1.123E-003	2.246E-003	2.863E-003	4.202E-003	4.844E-003
156	7.556E-004	1.511E-003	1.927E-003	2.777E-003	3.215E-003
205	1.140E-003	2.279E-003	2.906E-003	4.208E-003	4.867E-003

ROLL ACCELERATION (RAD/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	2.035E-003	4.069E-003	5.188E-003	7.613E-003	8.776E-003
65	2.006E-003	4.012E-003	5.116E-003	7.557E-003	8.697E-003
101	4.215E-003	8.430E-003	1.075E-002	1.581E-002	1.821E-002
156	1.879E-003	3.758E-003	4.792E-003	7.036E-003	8.110E-003
205	3.156E-003	6.311E-003	8.047E-003	1.178E-002	1.359E-002

ROLL JERK (RAD/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PRDBABLE	90% CONFIDENCE
3	3.894E-003	7.788E-003	9.930E-003	1.464E-002	1.686E-002
65	4.223E-003	8.446E-003	1.077E-002	1.601E-002	1.839E-002
101	8.338E-003	1.668E-002	2.126E-002	3.132E-002	3.607E-002
156	3.629E-003	7.258E-003	9.254E-003	1.376E-002	1.581E-002
205	5.848E-003	1.170E-002	1.491E-002	2.192E-002	2.526E-002

TABLE 15-37

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SIGNIFICANT WAVE HEIGHT = 3.37 FEET  
 MODAL WAVE PERIOD = 3.396 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

PITCH (RADIAN)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	3.892E-004	7.783E-004	9.924E-004	1.451E-003	1.674E-003
65	3.292E-004	6.583E-004	8.394E-004	1.226E-003	1.415E-003
101	3.239E-004	6.479E-004	8.260E-004	1.209E-003	1.394E-003
156	3.289E-004	6.578E-004	8.387E-004	1.229E-003	1.417E-003
205	3.303E-004	6.606E-004	8.423E-004	1.232E-003	1.422E-003

PITCH ACCELERATION (RAD/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.426E-003	2.852E-003	3.636E-003	5.404E-003	6.210E-003
65	1.204E-003	2.407E-003	3.070E-003	4.570E-003	5.250E-003
101	1.249E-003	2.498E-003	3.186E-003	4.749E-003	5.453E-003
156	1.320E-003	2.641E-003	3.367E-003	5.028E-003	5.772E-003
205	1.278E-003	2.556E-003	3.259E-003	4.865E-003	5.585E-003

PITCH JERK (RAD/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	3.272E-003	6.543E-003	8.343E-003	1.251E-002	1.435E-002
65	2.835E-003	5.671E-003	7.230E-003	1.087E-002	1.245E-002
101	2.995E-003	5.991E-003	7.638E-003	1.147E-002	1.315E-002
156	3.245E-003	6.490E-003	8.275E-003	1.245E-002	1.427E-002
205	3.121E-003	6.241E-003	7.958E-003	1.197E-002	1.372E-002

TABLE 15-38

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SIGNIFICANT WAVE HEIGHT = 3.37 FEET  
 MODAL WAVE PERIOD = 3.396 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

YAW (RADIANS)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	2.648E-004	5.296E-004	6.752E-004	9.854E-004	1.138E-003
65	1.132E-004	2.265E-004	2.888E-004	4.209E-004	4.860E-004
101	1.421E-004	2.841E-004	3.623E-004	5.272E-004	6.090E-004
156	1.633E-004	3.267E-004	4.165E-004	6.086E-004	7.023E-004
205	2.468E-004	4.935E-004	6.293E-004	9.187E-004	1.060E-003

YAW ACCELERATION (RAD/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	8.835E-004	1.767E-003	2.253E-003	3.319E-003	3.823E-003
65	3.756E-004	7.512E-004	9.578E-004	1.418E-003	1.631E-003
101	4.420E-004	8.841E-004	1.127E-003	1.660E-003	1.912E-003
156	5.556E-004	1.111E-003	1.417E-003	2.083E-003	2.400E-003
205	8.330E-004	1.666E-003	2.124E-003	3.131E-003	3.606E-003

YAW JERK (RAD/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.792E-003	3.583E-003	4.568E-003	6.786E-003	7.799E-003
65	8.163E-004	1.633E-003	2.081E-003	3.116E-003	3.574E-003
101	8.918E-004	1.784E-003	2.274E-003	3.381E-003	3.885E-003
156	1.097E-003	2.194E-003	2.798E-003	4.132E-003	4.756E-003
205	1.702E-003	3.403E-003	4.339E-003	6.450E-003	7.412E-003

TABLE 15-39

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SIGNIFICANT WAVE HEIGHT = 2.15 FEET  
 MODAL WAVE PERIOD = 2.707 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

SWAY (FEET)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	2.493E-002	4.985E-002	6.356E-002	9.389E-002	1.081E-001
65	2.352E-002	4.703E-002	5.997E-002	8.866E-002	1.020E-001
101	2.325E-002	4.651E-002	5.930E-002	8.779E-002	1.010E-001
156	1.527E-002	3.054E-002	3.893E-002	5.769E-002	6.634E-002
205	2.501E-002	5.002E-002	6.378E-002	9.427E-002	1.085E-001

SWAY ACCELERATION (FT/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.153E-001	2.306E-001	2.940E-001	4.372E-001	5.023E-001
65	1.103E-001	2.206E-001	2.813E-001	4.181E-001	4.805E-001
101	1.130E-001	2.259E-001	2.880E-001	4.287E-001	4.925E-001
156	8.037E-002	1.607E-001	2.050E-001	3.075E-001	3.526E-001
205	1.178E-001	2.356E-001	3.004E-001	4.472E-001	5.137E-001

SWAY JERK (FT/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	2.667E-001	5.333E-001	6.800E-001	1.016E+000	1.166E+000
65	2.536E-001	5.073E-001	6.468E-001	9.657E-001	1.109E+000
101	2.648E-001	5.296E-001	6.752E-001	1.010E+000	1.159E+000
156	2.118E-001	4.236E-001	5.402E-001	9.160E-001	9.340E-001
205	2.760E-001	5.520E-001	7.038E-001	1.053E+000	1.208E+000

TABLE 15-40

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SIGNIFICANT WAVE HEIGHT = 2.15 FEET  
 MODAL WAVE PERIOD = 2.707 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

HEAVE (FEET)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.372E-002	2.744E-002	3.499E-002	5.183E-002	5.961E-002
65	1.584E-002	3.167E-002	4.038E-002	6.022E-002	6.915E-002
101	1.631E-002	3.262E-002	4.160E-002	6.189E-002	7.110E-002
156	1.728E-002	3.457E-002	4.407E-002	6.557E-002	7.533E-002
205	1.407E-002	2.815E-002	3.589E-002	5.329E-002	6.125E-002

HEAVE ACCELERATION (FT/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	6.915E-001	1.383E-001	1.763E-001	2.633E-001	3.022E-001
65	9.872E-002	1.974E-001	2.517E-001	3.786E-001	4.338E-001
101	9.598E-002	1.920E-001	2.447E-001	3.679E-001	4.216E-001
156	9.972E-002	1.994E-001	2.543E-001	3.814E-001	4.373E-001
205	7.624E-002	1.525E-001	1.944E-001	2.910E-001	3.338E-001

HEAVE JERK (FT/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.694E-001	3.387E-001	4.319E-001	6.478E-001	7.428E-001
65	2.695E-001	5.389E-001	6.872E-001	1.036E+000	1.187E+000
101	2.598E-001	5.195E-001	6.624E-001	9.998E-001	1.145E+000
156	2.611E-001	5.222E-001	6.658E-001	1.002E+000	1.148E+000
205	1.939E-001	3.879E-001	4.946E-001	7.434E-001	8.520E-001

TABLE 15-41

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SIGNIFICANT WAVE HEIGHT = 2.15 FEET  
 MODAL WAVE PERIOD = 2.707 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

ROLL (RADIAN)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.774E-004	3.549E-004	4.525E-004	6.677E-004	7.686E-004
65	1.947E-004	3.895E-004	4.966E-004	7.359E-004	8.463E-004
101	4.025E-004	8.054E-004	1.026E-003	1.513E-003	1.742E-003
156	1.525E-004	3.050E-004	3.888E-004	5.771E-004	6.634E-004
205	2.654E-004	5.307E-004	6.767E-004	9.975E-004	1.149E-003

ROLL ACCELERATION (RAD/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	7.912E-004	1.582E-003	2.018E-003	2.997E-003	3.445E-003
65	1.001E-003	2.002E-003	2.553E-003	3.817E-003	4.380E-003
101	1.705E-003	3.414E-003	4.349E-003	6.430E-003	7.398E-003
156	8.367E-004	1.673E-003	2.133E-003	3.202E-003	3.671E-003
205	1.137E-003	2.274E-003	2.899E-003	4.294E-003	4.938E-003

ROLL JERK (RAD/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.807E-003	3.613E-003	4.607E-003	6.886E-003	7.902E-003
65	2.512E-003	5.025E-003	6.406E-003	9.633E-003	1.104E-002
101	3.633E-003	7.266E-003	9.264E-003	1.375E-002	1.580E-002
156	2.213E-003	4.426E-003	5.644E-003	8.516E-003	9.751E-003
205	2.481E-003	4.962E-003	6.327E-003	9.406E-003	1.081E-002

TABLE 15-42

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SIGNIFICANT WAVE HEIGHT = 2.15 FEET  
 MODAL WAVE PERIOD = 2.707 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

PITCH (RADIANs)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.534E-004	3.069E-004	3.913E-004	5.829E-004	6.695E-004
65	1.392E-004	2.784E-004	3.550E-004	5.289E-004	6.074E-004
101	1.392E-004	2.784E-004	3.550E-004	5.301E-004	6.085E-004
156	1.357E-004	2.713E-004	3.459E-004	5.170E-004	5.933E-004
205	1.393E-004	2.785E-004	3.551E-004	5.306E-004	6.090E-004

PITCH ACCELERATION (RAD/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	9.281E-004	1.856E-003	2.367E-003	3.559E-003	4.078E-003
65	8.439E-004	1.688E-003	2.152E-003	3.237E-003	3.709E-003
101	8.919E-004	1.784E-003	2.274E-003	3.422E-003	3.921E-003
156	9.035E-004	1.807E-003	2.304E-003	3.476E-003	3.980E-003
205	9.158E-004	1.832E-003	2.335E-003	3.519E-003	4.030E-003

PITCH JERK (RAD/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	2.523E-003	5.047E-003	6.434E-003	9.713E-003	1.112E-002
65	2.309E-003	4.618E-003	5.888E-003	8.894E-003	1.018E-002
101	2.444E-003	4.889E-003	6.233E-003	9.404E-003	1.077E-002
156	2.575E-003	5.151E-003	6.567E-003	9.936E-003	1.137E-002
205	2.565E-003	5.130E-003	6.540E-003	9.885E-003	1.131E-002

TABLE 15-43

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SIGNIFICANT WAVE HEIGHT = 2.15 FEET  
 MODAL WAVE PERIOD = 2.707 SECONDS  
 CENTRAL HEADING ANGLE = 90.0 DEGREES (WIND FROM THE SOUTH)  
 COSINE-POWER SPREADING TO 12th POWER  
 HYSTERETIC STRUCTURAL DAMPING = 2%

YAW (RADIAN)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	9.259E-005	1.852E-004	2.361E-004	3.498E-004	4.023E-004
65	3.717E-005	7.435E-005	9.479E-005	1.411E-004	1.621E-004
101	4.040E-005	8.079E-005	1.030E-004	1.529E-004	1.758E-004
156	6.136E-005	1.227E-004	1.565E-004	2.316E-004	2.664E-004
205	8.875E-005	1.775E-004	2.263E-004	3.354E-004	3.857E-004

YAW ACCELERATION (RAD/SEC^2)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	4.710E-004	9.419E-004	1.201E-003	1.794E-003	2.059E-003
65	2.199E-004	4.399E-004	5.608E-004	8.434E-004	9.665E-004
101	2.218E-004	4.435E-004	5.655E-004	8.478E-004	9.723E-004
156	2.958E-004	5.916E-004	7.543E-004	1.122E-003	1.289E-003
205	4.543E-004	9.086E-004	1.158E-003	1.731E-003	1.987E-003

YAW JERK (RAD/SEC^3)

NODE	AVERAGES			EXPECTED MAXIMA	
	RMS	SIGNIFICANT	Avg 1/10 th	MOST PROBABLE	90% CONFIDENCE
3	1.167E-003	2.334E-003	2.976E-003	4.473E-003	5.126E-003
65	5.989E-004	1.198E-003	1.527E-003	2.308E-003	2.642E-003
101	5.779E-004	1.156E-003	1.474E-003	2.218E-003	2.541E-003
156	6.836E-004	1.367E-003	1.743E-003	2.600E-003	2.986E-003
205	1.128E-003	2.257E-003	2.877E-003	4.325E-003	4.957E-003

Pontoon Node	ULTIMATE CAPACITIES			
	Vertical Shear [kip]	Vertical Bending Moment		Torsion [kip-ft]
		Positive [kip-ft]	Negative [kip-ft]	
A 3	—	—	—	—
A 5	—	—	—	—
A/B 7	37900	732000	732000	611500
B 8	12800	627000	616000	81300
B 9	12800	627000	616000	81300
B 10	12800	627000	616000	81300
B 11	12800	627000	616000	81300
B 12	12800	627000	616000	81300
B 15	12800	627000	616000	81300
B 16	12800	627000	616000	81300
B 17	12800	627000	616000	81300
B 18	12800	627000	616000	81300
B/C 19	37900	732000	732000	611500
C 20	12800	627000	616000	81300
C 21	12800	627000	616000	81300
C 22	12800	627000	616000	81300
C 23	12800	627000	616000	81300
C 24	12800	627000	616000	81300
C 27	12800	627000	616000	81300
C 28	12800	627000	616000	81300
C 29	12800	627000	616000	81300
C 30	12800	627000	616000	81300
C/D 31	37900	732000	732000	611500
D 32	12800	627000	616000	81300
D 33	12800	627000	616000	81300
D 34	12000	552000	560000	71000
D 35	12000	552000	560000	71000
D 36	12000	552000	560000	71000
D 39	12000	552000	560000	71000
D 40	12000	552000	560000	71000
D 41	12000	552000	560000	71000
D 42	12000	552000	560000	71000
D/E 43	28500	581000	581000	415300
E 44	9000	340000	350000	53800
E 45	9000	340000	350000	53800
E 46	9000	340000	350000	53800
E 47	9000	340000	350000	53800
E 48	9000	340000	350000	53800
E 51	9000	340000	350000	53800
E 52	9000	340000	350000	53800
E 53	9000	340000	350000	53800
E 54	9000	340000	350000	53800
E/F 55	17300	244000	231000	131000
F 56	3800	208000	127000	45500
F 57	3800	208000	127000	45500

Pontoon Node	ULTIMATE CAPACITIES			
	Vertical Shear [kip]	Vertical Bending Moment		Torsion [kip-ft]
		Positive [kip-ft]	Negative [kip-ft]	
F 58	3800	208000	127000	45500
F 59	3800	208000	127000	45500
F 60	3800	208000	127000	45500
F 63	3800	208000	127000	45500
F 64	3800	208000	127000	45500
F 65	3800	208000	127000	45500
F 66	3800	208000	127000	45500
F/G 67	17300	244000	231000	131000
G 68	3800	208000	127000	45500
G 69	3800	208000	127000	45500
G 70	3800	208000	127000	45500
G 71	3800	208000	127000	45500
G 72	3800	208000	127000	45500
G 75	3800	208000	127000	45500
G 76	3800	208000	127000	45500
G 77	3800	208000	127000	45500
G 78	3800	208000	127000	45500
G/H 79	17300	244000	231000	131000
H 80	3800	208000	127000	45500
H 81	3800	208000	127000	45500
H 82	3800	208000	127000	45500
H 83	3800	208000	127000	45500
H 84	3800	208000	127000	45500
H 87	3800	208000	127000	45500
H 88	3800	208000	127000	45500
H 89	3800	208000	127000	45500
H 90	3800	208000	127000	45500
H/I 91	17300	244000	231000	131000
I 92	3800	208000	127000	45500
I 93	3800	208000	127000	45500
I 94	3800	208000	127000	45500
I 95	3800	208000	127000	45500
I 96	3800	208000	127000	45500
I 99	3800	208000	127000	45500
I 100	3800	208000	127000	45500
I 101	3800	208000	127000	45500
I 102	3800	208000	127000	45500
I/J 103	17300	244000	231000	131000
J 104	4200	236000	15200	50400
J 105	4200	236000	15200	50400
J 106	4200	236000	15200	50400
J 109	4200	236000	15200	50400
J 110	4200	236000	15200	50400
J 111	4200	236000	15200	50400
J 112	4200	236000	-15200	50400

zero MISSING

*Zero moment*

ULTIMATE CAPACITIES					ULTIMATE CAPACITIES						
Pontoon Node	Node	Vertical Shear [kip]	Vertical Bending Moment		Torsion [kip-ft]	Pontoon Node	Node	Vertical Shear [kip]	Vertical Bending Moment		Torsion [kip-ft]
			Positive [kip-ft]	Negative [kip-ft]					Positive [kip-ft]	Negative [kip-ft]	
J	115	4200	236000	15200	50400	N	161	3800	208000	127000	45500
J	116	4200	236000	15200	50400	N	162	3800	208000	127000	45500
J/K	117	17300	244000	231000	131000	N	163	3800	208000	127000	45500
K	118	3800	208000	127000	45500	N	164	3800	208000	127000	45500
K	119	3800	208000	127000	45500	N/O	165	17300	244000	231000	131000
K	120	3800	208000	127000	45500	O	166	3800	208000	127000	45500
K	121	3800	208000	127000	45500	O	167	3800	208000	127000	45500
K	122	3800	208000	127000	45500	O	168	3800	208000	127000	45500
K	125	3800	208000	127000	45500	O	169	3800	208000	127000	45500
K	126	3800	208000	127000	45500	O	170	3800	208000	127000	45500
K	127	3800	208000	127000	45500	O	173	3800	208000	127000	45500
K	128	3800	208000	127000	45500	O	174	3800	208000	127000	45500
K/L	129	17300	244000	231000	131000	O	175	3800	208000	127000	45500
L	130	3800	208000	127000	45500	O	176	3800	208000	127000	45500
L	131	3800	208000	127000	45500	O/P	177	17300	244000	231000	131000
L	132	3800	208000	127000	45500	P	178	9000	340000	350000	53800
L	133	3800	208000	127000	45500	P	179	9000	340000	350000	53800
L	134	3800	208000	127000	45500	P	180	9000	340000	350000	53800
L	137	3800	208000	127000	45500	P	181	9000	340000	350000	53800
L	138	3800	208000	127000	45500	P	182	9000	340000	350000	53800
L	139	3800	208000	127000	45500	P	185	9000	340000	350000	53800
L	140	3800	208000	127000	45500	P	186	9000	340000	350000	53800
L/M	141	17300	244000	231000	131000	P	187	9000	340000	350000	53800
M	142	3800	208000	127000	45500	P	188	9000	340000	350000	53800
M	143	3800	208000	127000	45500	P/Q	189	28500	581000	581000	415300
M	144	3800	208000	127000	45500	Q	190	12000	552000	560000	71000
M	145	3800	208000	127000	45500	Q	191	12000	552000	560000	71000
M	146	3800	208000	127000	45500	Q	192	12000	552000	560000	71000
M	149	3800	208000	127000	45500	Q	193	12000	552000	560000	71000
M	150	3800	208000	127000	45500	Q	194	12000	552000	560000	71000
M	151	3800	208000	127000	45500	Q	197	12000	552000	560000	71000
M	152	3800	208000	127000	45500	Q	198	12000	552000	560000	71000
M/N	153	17300	244000	231000	131000	Q	199	12800	627000	616000	81300
N	154	3800	208000	127000	45500	Q	200	12800	627000	616000	81300
N	155	3800	208000	127000	45500	Q/R	201	37900	732000	732000	611500
N	156	3800	208000	127000	45500	R	203	—	—	—	—
N	157	3800	208000	127000	45500	R	205	—	—	—	—
N	158	3800	208000	127000	45500						

Note: Capacities for end pontoons (A and R) were not available for this study.