

The background of the header section is a photograph of a turbulent ocean with white-capped waves under a clear sky. The image is split horizontally, with the top half showing the surface of the water and the bottom half showing a darker, more textured view of the waves.

Challenging wind and waves

Linking hydrodynamic research to the maritime industry

NAUTICAL AND RISK STUDIES FOR THE DELIMARA LNG TERMINAL IN MARSAXLOKK PORT, MALTA

Item 8: Additional moored ship response calculations storm mooring

Final Report

Report No. : 27689-8-P0
Date : July 2016
Version : 1.0

NAUTICAL AND RISK STUDIES FOR THE DELIMARA LNG TERMINAL IN MARSAXLOKK PORT, MALTA

Item 8: Additional moored ship response calculations storm mooring

Final Report

MARIN order No. : 27689
Number of pages : 183

Ordered by : Block D, Ta'Monita Residence
Piazza off St Joseph Street
Marsascala, MSK 1050
Malta

Reported by : Wei Xu
Reviewed by : Johan Dekker

Version	Date	Version description
Draft	July 5 th 2016	Release for review
Final	July 12 th 2016	Final version

CONTENTS	PAGE
1 INTRODUCTION.....	1
1.1 Project background.....	1
2 SIGN CONVENTION.....	5
2.1 Units.....	5
2.2 Local Coordinate System (LCS).....	5
3 APPLIED SOFTWARE.....	7
3.1 Time-domain simulation tool aNySIM.....	7
4 CONFIGURATION	9
4.1 FSU.....	9
4.2 Storm mooring system.....	10
4.2.1 Layout of the mooring lines.....	10
4.2.2 Compositions of the line.....	10
4.3 Wind load coefficients.....	12
4.4 Current load coefficients.....	12
5 SIMULATION MATRIX.....	13
6 APPROACHES AND RESULTS	15
6.1 Results of static analysis for the spread mooring.....	15
6.2 Decay tests.....	16
6.3 Simulation with extreme environments.....	19
6.3.1 Maximum line tension and offset for different return periods.....	19
6.3.2 Maximum line tensions for different mooring lines.....	22
7 CONCLUSIONS.....	25
REFERENCES	27
TABLES	29
FIGURES.....	33

Appendices:

Appendix A01	Statistics of Simulations Loaded FSU
Appendix A02	Statistics of Simulations Ballast FSU
Appendix S03	Time-domain analysis program aNySIM

REVIEW OF TABLES AND FIGURES

Tables in the report:

Table 1-1: Overview of reports.....	2
Table 4-1: Mooring lines distribution	10
Table 4-2: Fairlead and anchor locations (from [1] in system of Figure 2-1)	10
Table 4-3: Mooring line compositions	11
Table 5-1: Load cases considered in the calculations.....	14
Table 6-1: Pretension and pretension angle	15
Table 6-2: Maximum fairlead/anchor tension for different wind angles	20
Table 6-3: Maximum fairlead tension of the most critical case for different wind seeds.....	21
Table 6-4: Maximum offset for different wind angles.....	22
Table 6-5: Maximum fairlead/anchor tension for different mooring lines.....	23

Tables in the Table section:

TABLE 1	MAIN PARTICULARS – FSU.....	31
TABLE 2	MAXIMUM FAIRLEAD/ANCHOR TENSION FOR DIFFERENT DRAFTS.....	32

Figures in the report:

Figure 1-1: Marsaxlokk Port and approximate position of LNG terminal (source: Google Earth)	1
Figure 1-2: Proposed jetty configuration	2
Figure 1-3: Proposed storm mooring layout [1]	3
Figure 2-1: General OCIMF convention	5
Figure 4-1: Picture of Wakaba Maru (source: MarineTraffic.com).....	9
Figure 4-2: Mooring line profile (from [1]).	11
Figure 4-3: Mooring line shape	11
Figure 6-1: Load excursion curves in x direction – Loaded FSU	15
Figure 6-2: Load excursion curves in y direction – Loaded FSU	16
Figure 6-3: Load excursion curves in yaw direction – Loaded FSU	16
Figure 6-4: Surge decay of loaded FSU - coupled.....	17
Figure 6-5: Sway decay of loaded FSU - coupled.....	17
Figure 6-6: Sway decay of loaded FSU - coupled.....	18
Figure 6-7: Surge, sway and yaw decay of loaded FSU – uncoupled.....	18
Figure 6-8: Maximum fairlead and anchor line forces for different wind angles	19
Figure 6-9: Time traces of most critical case.....	20
Figure 6-10: Top view of the vessel at T = 0 s and T = 7239 s	21
Figure 6-11: Maximum offset for different wind angles	22
Figure 6-12: Maximum fairlead/anchor line forces for different mooring lines.....	23

Figures in the Figure section:

FIGURE 1	WIND COEFFICIENTS FOR FSU	35
FIGURE 2	CURRENT COEFFICIENTS FOR FSU	36
FIGURE 3	STATIC CURVES FOR OFFSET IN X,Y,YAW – BALLAST FSU	37
FIGURE 4	COUPLED SURGE DECAY FOR BALLAST FSU	38
FIGURE 5	COUPLED SWAY DECAY FOR BALLAST FSU	39
FIGURE 6	COUPLED YAW DECAY FOR BALLAST FSU.....	40
FIGURE 7	UNCOUPLED DECAYS FOR BALLAST FSU	41
FIGURE 8	MAXIMUM FAIRLEAD AND ANCHOR LOAD FOR LOADED FSU	42
FIGURE 9	MAXIMUM FAIRLEAD AND ANCHOR LOAD OF BALLAST FSU.....	43
FIGURE 10	MAXIMUM OFFSET FOR LOADED AND BALLAST FSU	44

1 INTRODUCTION

1.1 Project background

Enemalta is developing a new gas-fired power station near the existing Delimara Power Station on the north-eastern shore of Marsaxlokk Bay. The gas for the power plant will be imported through a new LNG terminal in Marsaxlokk Bay. Figure 1-1 shows the approximate position of the new terminal.



Figure 1-1: Marsaxlokk Port and approximate position of LNG terminal (source: Google Earth)

Enemalta has awarded the contract for design, construction and operation of the new power plant and LNG terminal to ElectroGas Malta. The LNG terminal proposed by ElectroGas consists of a jetty from the shore south of the power plant to a berth that is positioned where the bay is deeper, so that no or only limited dredging is required. On the jetty a converted LNG carrier will be permanently moored as Floating Storage Unit (FSU), delivering LNG through a cryogenic line over the jetty to the regasification unit onshore. The FSU berth has a conventional layout consisting of a platform, breasting dolphins and mooring dolphins (Figure 1-2). LNG will be imported by LNG carriers (further shortened to LNGCs) that will moor alongside the FSU. During storms from south-easterly directions, the conditions at the position of the jetty are too severe for the FSU to stay at berth. On getting storm warnings, the FSU will therefore change from the berth at the jetty to a storm mooring position some 50 to 70 m away from the jetty.

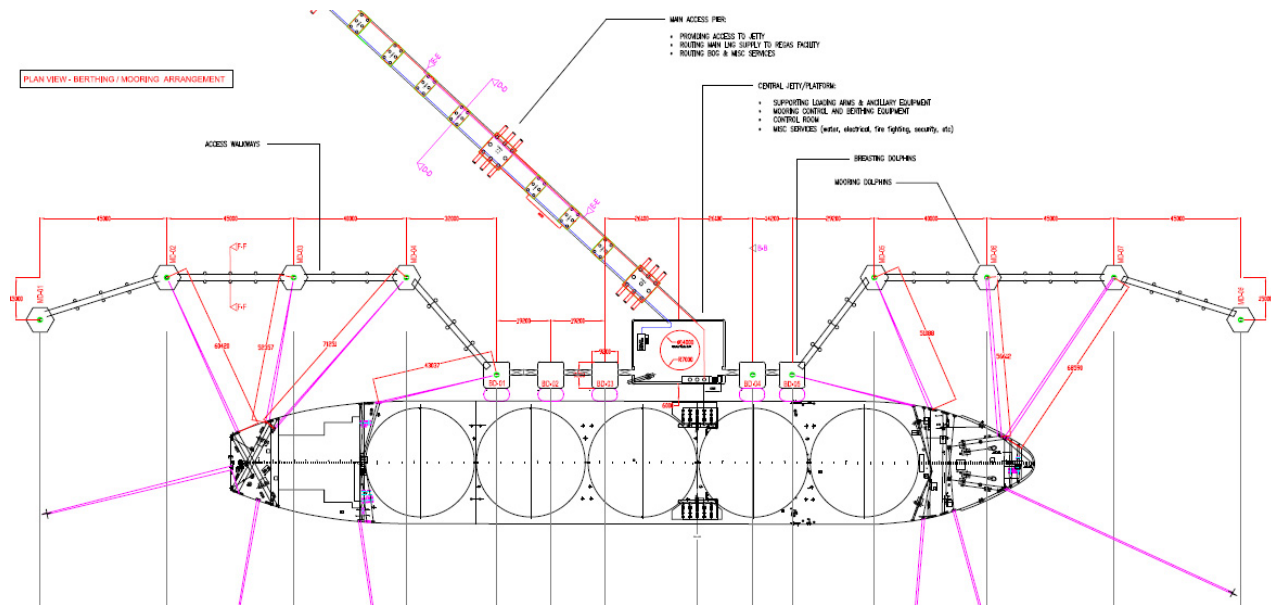


Figure 1-2: Proposed jetty configuration

In an earlier stage of the project MARIN and partners carried out a number of studies for the Enemalta and ElectroGas as input for and evaluation of the design. Table 1-1 gives an overview of the previous reports.

Table 1-1: Overview of reports

Volume	Title	Main author
27689-1-MSCN	Item 1: Wave climate study	ARCADIS
27689-2-MSCN	Item 2: Wave penetration study	ARCADIS
27689-3-PO	Item 3: Moored ship response study	MARIN
27689-4-MSCN	Item 4: Real-time manoeuvring simulations	MARIN
27689-5-MSCN	Item 5: Nautical risk study	MARIN
27689-6-MSCN	Item 6: Quantitative Risk Assessment	SGS Tecnos
27689-7-MSCN	Additional metocean analysis	ARCADIS

The moored ship response study (item 3) included a mooring analysis of the FSU storm mooring with an initial mooring design. The results of this initial analysis were not satisfactory nor conclusive. Subsequence to this, Bumi Armada, contracted by ElectroGas to supply and operate the FSU for the project, designed an updated storm mooring as part of the design studies to convert the LNGC into an FSU. The storm mooring strength analysis for the mooring design was carried out by Bumi Armada using Hydrostar/AQWA and Orcaflex [1].

ElectroGas Malta commissioned MARIN to carry out a verification analysis of this proposed mooring design for the FSU, which is shown in Figure 1-3. The figure also shows the jetty mooring position which is 70 m East of storm mooring position. Please note that the jetty mooring scenario is not analyzed in this study.

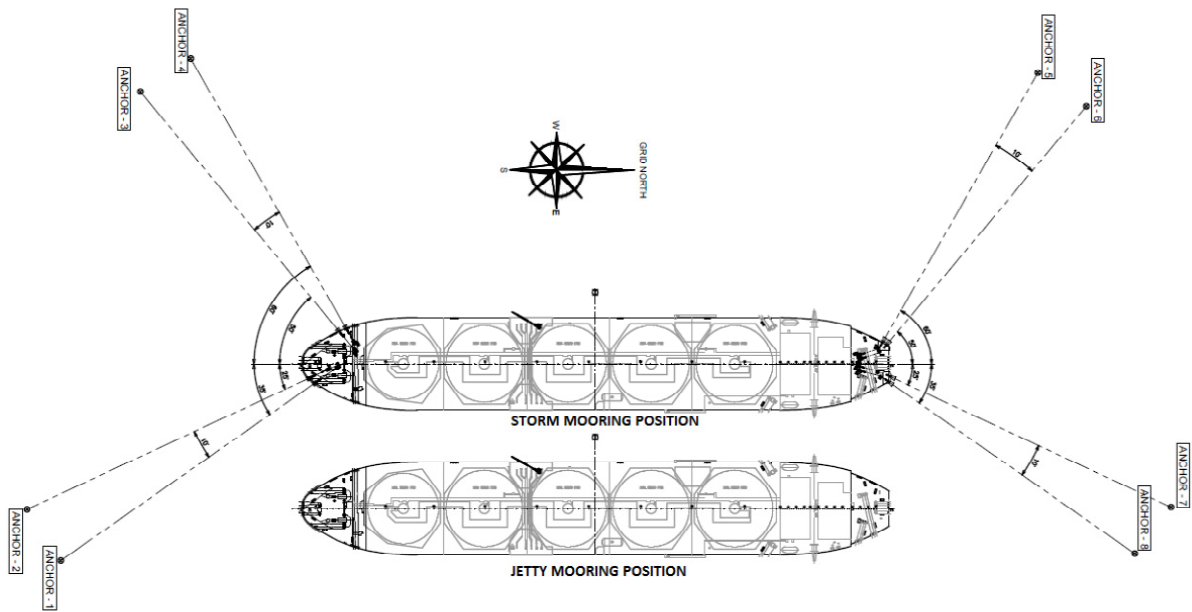


Figure 1-3: Proposed storm mooring layout [1]

2 SIGN CONVENTION

2.1 Units

The following metric (SI) units are used throughout this report unless otherwise stated:

- Motions and dimensions are given in metre [m]
- Angles are given in degrees [deg]
- Forces are given in 1,000 Newton [kN]
- Moments are given in 1,000 Newton metres [kNm]

2.2 Local Coordinate System (LCS)

The applied sign convention and coordinate system are in accordance with the OCIMF [3] standard. An overview of this standard is given in Figure 2-1. The origin of the Local Coordinate System (LCS) is located at the intersection of the keel, centreline and midships ($L_{pp}/2$). A right handed coordinate system is applied. The order of rotations is Yaw-Pitch-Roll.

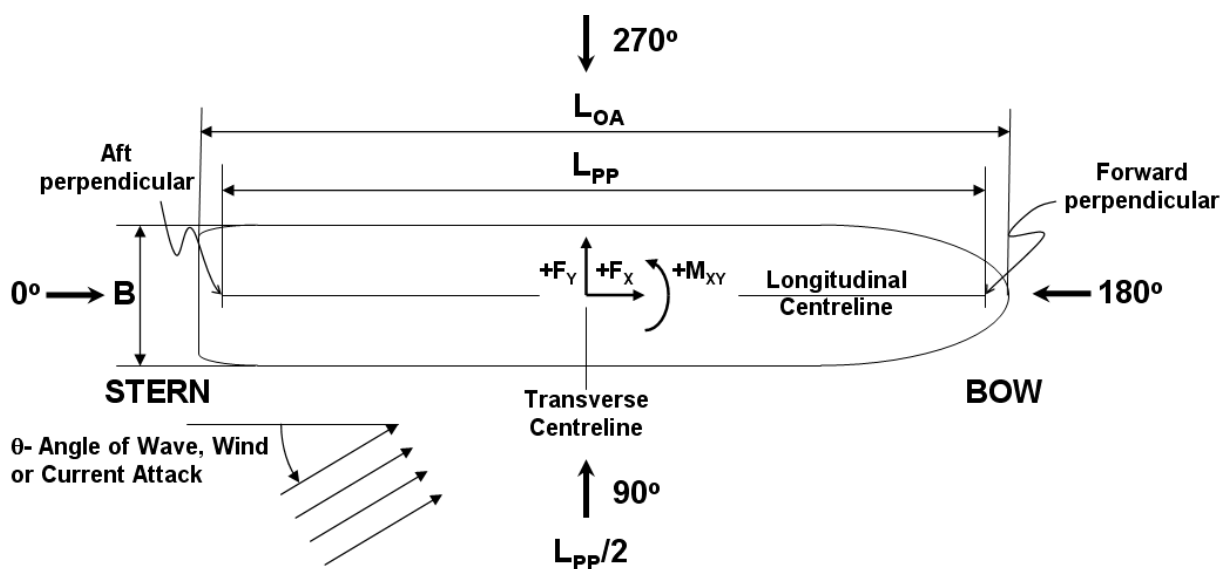


Figure 2-1: General OCIMF convention

The motions are positive in the following directions:

positive surge	(x)	: towards the bow
positive sway	(y)	: towards port side
positive heave	(z)	: upwards
positive roll	(ϕ)	: starboard side down
positive pitch	(θ)	: bow down
positive yaw	(ψ)	: bow towards port side

The forces and moments are positive in the following directions:

positive longitudinal force	(F_x)	: towards the bow
positive lateral force	(F_y)	: towards port side
positive vertical force	(F_z)	: upwards
positive roll moment	(M_x)	: starboard side down
positive pitch moment	(M_y)	: bow down
positive yaw moment	(M_z)	: bow towards port side

The relative environmental headings are defined as follows:

0 degree heading	: stern on
90 degrees heading	: starboard side on
180 degrees heading	: bow on
270 degrees heading	: port side on

3 APPLIED SOFTWARE

3.1 Time-domain simulation tool aNySIM

The time-domain simulation program aNySIM can simulate the behaviour of (multiple floating) bodies under the action of combined swell, wind seas, current and wind. The effect of mooring lines and other mechanical components on the floater motions can also be taken into account. In the simulations, the combined low frequency and wave frequency motions of each body are calculated in 6 degrees of freedom in the time-domain, using a retardation function approach. More details about time domain simulations with aNySIM are given in Appendix S03.

Equations of motion

The equations of motion derived within potential theory describe the fluid reactive forces on a floating structure under arbitrarily external loads varying in time. For 6 degrees of freedom these equations can be written as shown below.

$$\sum_{j=1}^6 (M_{kj} + m_{kj}) \ddot{x}_j + \int_{-\infty}^t R_{kj}(t - \tau) \dot{x}_j(\tau) d\tau + C_{kj} x_j = F_k(t) \quad k = 1, 2 \dots 6$$

in which:

x_j	Motion in j-th mode
$F_k(t)$	Arbitrarily in time varying external force in the k-th mode of motion
M	Inertia matrix
m	Added inertia matrix
R	Matrix of retardation functions
C	Matrix of hydrostatic restoring forces

The retardation functions R , as well as the added inertia coefficients m , are determined using the results of the diffraction calculations.

4 CONFIGURATION

4.1 FSU

The Wakaba Maru, an LNGC of 283 x 44.8 m (L_{pp} 270 m) will be used as FSU for the new terminal. To serve as FSU the Wakaba Maru will be modified to include e.g. quick release hooks (QRHs) to moor the LNGCs delivering LNG alongside. Details of the changes that will be made were not yet available when carrying out the moored ship simulations. Data received regarding the Wakaba Maru included:

- General arrangement drawing
- LNG Form B (file Wakaba Maru - LNG FORM B 2014.04.24.pdf)

Some additional data was found in the SIGTTO publication [5]. Figure 4-1 shows a picture of The Wakaba Maru. For the present study additional information on details of the proposed modifications on the FSU to accommodate the storm mooring was provided.

The loaded ($T = 10.8$ m) and ballast ($T = 9.35$ m) loading conditions are considered in this study. The main particulars of the FSU are shown in Table 1 (in the Table section). The mathematical model prepared for the earlier moored ship response study was used as basis for the present calculations. Obviously a number of items were updated to match the final design of the storm mooring.



Figure 4-1: Picture of Wakaba Maru (source: MarineTraffic.com)

4.2 Storm mooring system

4.2.1 Layout of the mooring lines

On getting storm warnings, the FSU will change from jetty position to storm mooring position and be moored by 8 spread lines. The layout of the spread mooring system can be found in Figure 1-3. It consists of 8 anchoring legs, grouped in 4 bundles of 2 lines each. The line length, line components and line azimuth angles are specified in Table 4-1. The azimuth angle is measured clockwise from North. The line fairlead location and anchor location are specified in Table 4-2. The x and y locations for both fairlead and anchor are defined in the ship-fixed coordinate system (see Figure 2-1). The z coordinate of fairlead and anchor is defined from vessel keel and water level, respectively. Note that the positions of the fairleads are different from the positions assumed for the preliminary design.

Table 4-1: Mooring lines distribution

	Anchor Radius	Line Length	Top Chain (95mm R4)	Bottom Chain (152mm R3)	Azimuth
	[m]	[m]	[m]	[m]	[deg]
L1	150.0	159.8	59.8	100.0	145.0
L2	150.0	159.4	59.4	100.0	155.0
L3	150.0	161.5	61.5	100.0	230.0
L4	150.0	161.5	61.5	100.0	240.0
L5	150.0	160.5	60.5	100.0	300.0
L6	150.0	160.3	60.3	100.0	310.0
L7	150.0	158.8	58.8	100.0	25.0
L8	150.0	158.8	58.8	100.0	35.0

Table 4-2: Fairlead and anchor locations (from [1] in system of Figure 2-1)

	Fairlead Location			Anchor Location		
	x [m]	y [m]	z [m]	x [m]	y [m]	z [m]
L1	134.03	8.33	25.20	256.90	94.40	-12.80
L2	136.79	6.29	25.20	272.70	69.70	-14.80
L3	122.93	-14.78	25.20	219.30	-129.70	-19.40
L4	119.72	-16.10	25.20	194.70	-146.00	-19.30
L5	-138.11	-10.35	23.40	-213.10	-140.30	-13.80
L6	-140.03	-9.14	23.40	-236.50	-124.00	-13.90
L7	-141.77	6.12	23.40	-277.70	69.50	-16.90
L8	-140.95	8.54	23.40	-263.80	94.60	-15.50

4.2.2 Compositions of the line

Each mooring line consists of two segments, which are (from anchor to fairlead) a 152 mm chain and a 95 mm chain segment. The length of each segment is shown in Table 4-1 and the details of the properties of each segment are tabulated in Table 4-3. A total of 12 of clump weights are attached on the 152 mm chain of each mooring line. The mooring line profile are shown in Figure 4-2. The first clump weight is present at 10 m distance from the connection point of 95 mm and 152 mm chains. The subsequent clumps are present at steps of 7 chain links. The submerged weight of each clump weight is 6.5 mT.

Table 4-3: Mooring line compositions

Parameter	95mm Chain	152mm Chain
Diameter (mm)	95	152
Grade/Type	R4	R3
Weight in air (Kg/m)	179.6	459.8
Weight in water (Kg/m)	156.2	400
Axial stiffness (kN)	7.71E+05	1.97E+06
Minimum Break Load (kN)	7682	15019

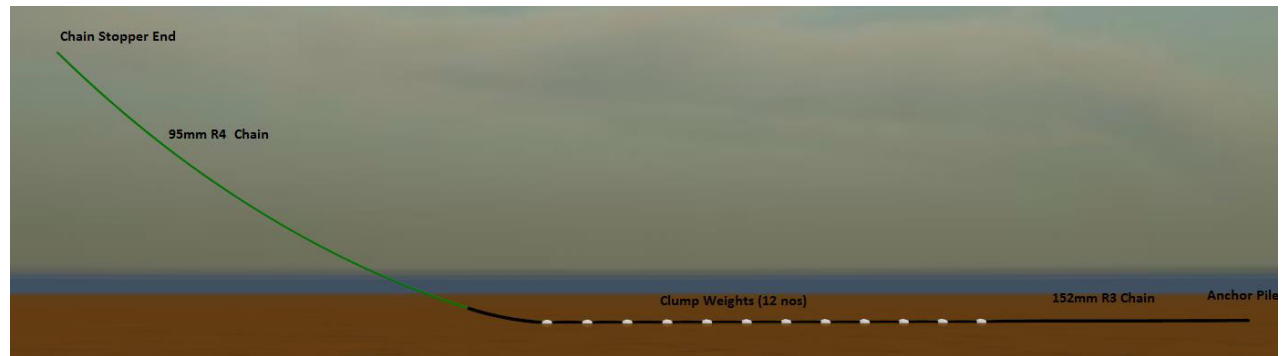


Figure 4-2: Mooring line profile (from [1]).

According to Appendix D of ref. [1], the FSU is located at a water depth of 17.5 m, and the touchdown points of all mooring lines are at a similar water depth as the FSU except for lines 3 and 4. Therefore, 17.5 m is used as the water depth to set up the mooring system, although different anchor depths are adopted. For lines 3 and 4, the touchdown points are at a deeper water depth. Thus, the water depths of the anchor locations are used. The line shapes of all mooring lines are shown in Figure 4-3. It is believed that the characteristics of the mooring system at both small and extreme offsets of the FSU can be properly modelled by using touchdown points' water depth and real anchor elevations. It should also be noted that the anchor slopes are not used in this study.

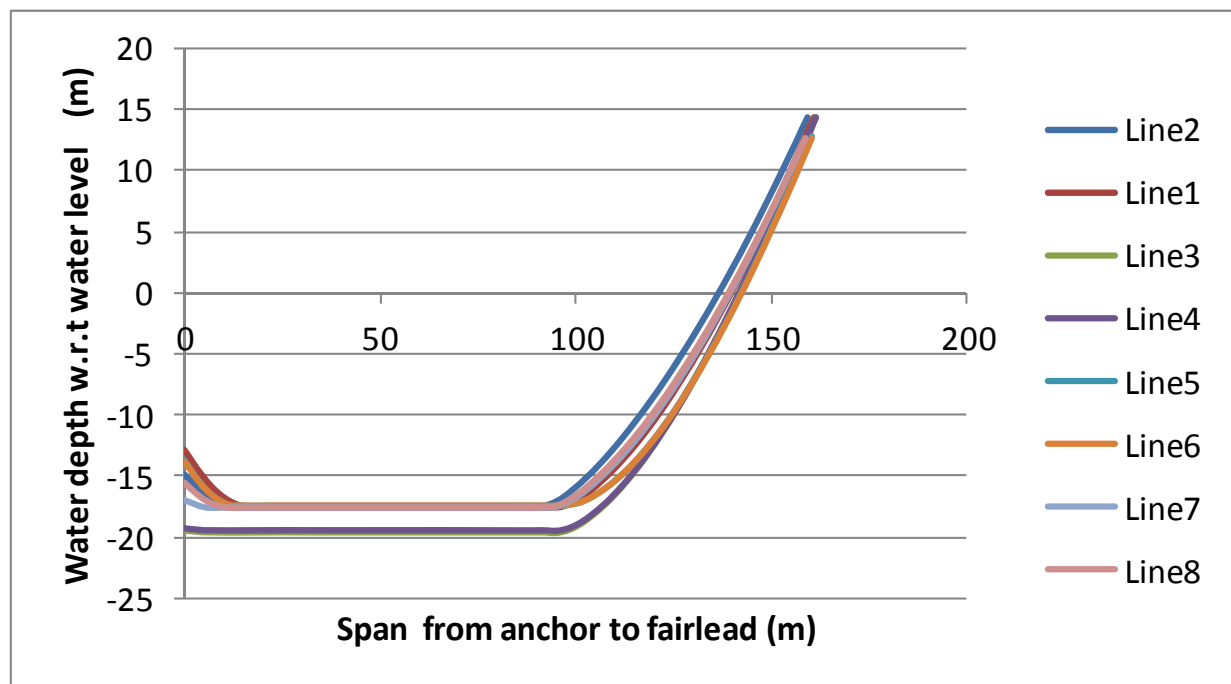


Figure 4-3: Mooring line shape

4.3 Wind load coefficients

The wind coefficient for a Moss-type LNGC from SIGTTO have been used. The wind loads are calculated with the following formulas [3]:

$$F_x = \frac{1}{2} \rho v^2 A_f C_x$$

$$F_y = \frac{1}{2} \rho v^2 A_l C_y$$

$$M_z = \frac{1}{2} \rho v^2 A_l L_{pp} C_{xy}$$

in which:

F_x	Force in longitudinal direction	[kN]
F_y	Force in transverse direction	[kN]
M_z	Moment about vertical z-axis	[kNm]
ρ	Air density (specified as 0.00125)	[tonne/m ³]
v	Wind velocity	[m/s]
A_f	Wind frontal area	[m ²]
A_l	Wind lateral area	[m ²]
L_{pp}	Length between perpendiculars	[m]
C	Dimensionless wind force coefficient	[-]

The frontal and lateral wind area are tabulated in Table 1 (in the Table section). The dimensionless wind force coefficients can be found in Figure 1 (in the Figure section).

4.4 Current load coefficients

The current coefficients from MARIN's database are adopted. The current loads are calculated with the following formulas [3]:

$$F_x = \frac{1}{2} \rho v^2 T L_{pp} C_x$$

$$F_y = \frac{1}{2} \rho v^2 T L_{pp} C_y$$

$$M_z = \frac{1}{2} \rho v^2 T L_{pp}^2 C_{xy}$$

in which:

F_x	Force in longitudinal direction	[kN]
F_y	Force in transverse direction	[kN]
M_z	Moment about vertical z-axis	[kNm]
ρ	Water density (specified as 1.025)	[tonne/m ³]
v	Current velocity	[m/s]
T	Draft	[m ²]
L_{pp}	Length between perpendiculars	[m]
C	Dimensionless current force coefficient	[-]

The dimensionless current force coefficients can be found in Figure 2 (in the Figure section).

5 SIMULATION MATRIX

Bumi Armada carried out mooring analysis calculations for the design conditions with return period of 100 years. Extreme wind was combined with associated sea, swell and current and the 100 year sea wave height was combined with associated wind, swell and current. Further sensitivity runs were included for the adopted wave period and direction.

For the present study calculations have been carried out for extreme wind for return periods of 5, 10, 25, 50 and 100 year return periods with associated sea, swell and current. Using this approach the results of the design study can be verified using the results for the 100 year return period, while the results of the lower return periods give insight in the motions and anchor loads that may be expected in the operational use of the storm mooring.

The metocean conditions were based on the results of the additional metocean analysis [4]. Extreme wind speeds for the considered return periods and the 12 direction sectors were taken from Table A-1 (Appendix 2.1) of [4]. The associated (total) height and peak period of the wind sea was determined using the relations given in Appendices 4.1 and 4.2 in [4]. For a number of wind directions, the associated wind sea consists of a component locally generated in Marsaxlokk Bay and a component penetrating through the harbour entrance. The height and period of the locally generated component was determined by scaling the height and period using relations with the wind speed derived using the hindcast formulas of the Coastal Engineering Manual. The penetrating component was then calculated by subtracting the wind wave component from the total wind sea wave height. Based on Appendix 4.3 of [4], the same swell wave height was used for all return periods. As the currents in the bay are largely wind drive, the associated current speed for lower return periods was determined from the 100 year value by linearly scaling with the wind speed. Table 5-1 summarises the metocean conditions used in the calculations.

Before carrying out the calculations for the selected conditions a few basic tests were carried out to check the response of the mooring system. This includes:

- Static load tests
- Decay tests

The results of both the basic tests and the calculations for the selected extreme conditions are presented in Chapter 6.

Table 5-1: Load cases considered in the calculations

Case #	Return period	Wind		Penetrating wind sea			Local wind sea			penetrating swell			Current	
		Dir	Vw	Dir	Hs	Tp	Dir	Hs	Tp	Dir	Hs	Tp	Dir	Vc
		[°N]	[m/s]	[°N]	[m]	[s]	[°N]	[m]	[s]	[°N]	[m]	[s]	[°N]	[m/s]
1	5	0	17.6	187	0.57	5.4	341	0.48	2.5	193	0.58	10.5	196	0.07
2	10	0	19.5	187	0.72	6.6	341	0.54	2.6	193	0.58	10.5	196	0.08
3	25	0	22.0	188	0.93	8.4	341	0.62	2.7	193	0.58	10.5	196	0.08
4	50	0	23.9	187	1.11	10.0	341	0.68	2.8	193	0.58	10.5	196	0.09
5	100	0	25.9	190	1.31	11.7	341	0.75	2.9	193	0.58	10.5	196	0.10
6	5	30	18.8	187	0.70	9.9	4	0.42	2.6	194	0.59	10.6	197	0.07
7	10	30	20.4	188	0.80	10.8	4	0.46	2.7	194	0.59	10.6	197	0.07
8	25	30	22.4	188	0.95	12.0	4	0.51	2.8	194	0.59	10.6	197	0.08
9	50	30	23.8	188	1.05	12.8	4	0.55	2.8	194	0.59	10.6	197	0.09
10	100	30	25.2	190	1.16	13.6	4	0.59	2.9	194	0.59	10.6	197	0.09
11	5	60	18.3	190.8	1.02	9.6				194	0.59	10.5	217	0.06
12	10	60	19.5	190.8	1.14	10.2				194	0.59	10.5	217	0.07
13	25	60	21.0	190.8	1.30	10.9				194	0.59	10.5	217	0.07
14	50	60	22.1	190.8	1.42	11.4				194	0.59	10.5	217	0.08
15	100	60	23.1	190.8	1.53	11.8				194	0.59	10.5	217	0.08
16	5	90	17.5	179	1.38	9.1				192	0.54	10	180	0.07
17	10	90	18.4	179	1.55	9.6				192	0.54	10	180	0.08
18	25	90	19.6	179	1.77	10.2				192	0.54	10	180	0.08
19	50	90	20.4	179	1.92	10.6				192	0.54	10	180	0.09
20	100	90	21.1	179	2.08	11.0				192	0.54	10	180	0.09
21	5	120	17.3	180	1.91	8.9				192	0.49	8.8	160	0.12
22	10	120	18.1	180	2.06	9.3				192	0.49	8.8	160	0.12
23	25	120	19.1	180	2.25	9.7				192	0.49	8.8	160	0.13
24	50	120	19.8	180	2.39	10.0				192	0.49	8.8	160	0.14
25	100	120	20.4	180	2.52	10.3				192	0.49	8.8	160	0.14
26	5	150	18.0	181	2.32	9.2				192	0.34	9.3	171	0.07
27	10	150	19.0	181	2.51	9.7				192	0.34	9.3	171	0.07
28	25	150	20.2	181	2.74	10.2				192	0.34	9.3	171	0.07
29	50	150	21.1	181	2.92	10.6				192	0.34	9.3	171	0.08
30	100	150	21.9	181	3.08	11.0				192	0.34	9.3	171	0.08
31	5	180	16.4	181	2.22	8.3				192	0.37	9.1	158	0.05
32	10	180	17.3	181	2.40	8.6				192	0.37	9.1	158	0.05
33	25	180	18.4	181	2.63	8.9				192	0.37	9.1	158	0.06
34	50	180	19.2	181	2.79	9.2				192	0.37	9.1	158	0.06
35	100	180	20.0	181	2.95	9.4				192	0.37	9.1	158	0.06
36	5	210	16.0	184	1.83	8.3				192	0.53	9.2	359	0.17
37	10	210	17.1	184	2.01	8.8				192	0.53	9.2	359	0.18
38	25	210	18.5	184	2.24	9.4				192	0.53	9.2	359	0.20
39	50	210	19.6	184	2.42	9.9				192	0.53	9.2	359	0.21
40	100	210	20.7	184	2.61	10.3				192	0.53	9.2	359	0.22
41	5	240	17.8	192	1.62	8.8				193	0.59	9.9	340	0.16
42	10	240	18.8	192	1.73	9.2				193	0.59	9.9	340	0.17
43	25	240	19.9	192	1.88	9.7				193	0.59	9.9	340	0.18
44	50	240	20.7	192	1.97	10.0				193	0.59	9.9	340	0.18
45	100	240	21.4	192	2.07	10.3				193	0.59	9.9	340	0.19
46	5	270	21.3	190	1.18	10.5	269	0.74	2.71	193	0.62	9.7	329	0.18
47	10	270	22.4	190	1.30	11.1	269	0.78	2.76	193	0.62	9.7	329	0.19
48	25	270	23.6	190	1.43	11.8	269	0.83	2.82	193	0.62	9.7	329	0.20
49	50	270	24.5	190	1.53	12.3	269	0.87	2.86	193	0.62	9.7	329	0.20
50	100	270	25.4	190	1.63	12.8	269	0.91	2.90	193	0.62	9.7	329	0.21
51	5	300	21.7	190	1.20	10.9	292	0.75	2.75	193	0.56	9.2	307	0.17
52	10	300	22.5	190	1.31	12.0	292	0.78	2.78	193	0.56	9.2	307	0.18
53	25	300	23.6	190	1.47	13.6	292	0.83	2.84	193	0.56	9.2	307	0.19
54	50	300	24.3	190	1.58	14.7	292	0.86	2.87	193	0.56	9.2	307	0.19
55	100	300	25.0	190	1.69	15.9	292	0.89	2.90	193	0.56	9.2	307	0.20
56	5	330	20.3	190	0.77	7.0	320	0.64	2.42	193	0.62	9.4	193	0.11
57	10	330	21.4	190	0.87	7.9	320	0.68	2.47	193	0.62	9.4	193	0.11
58	25	330	22.6	190	0.98	8.9	320	0.72	2.52	193	0.62	9.4	193	0.12
59	50	330	23.6	190	1.07	9.8	320	0.76	2.57	193	0.62	9.4	193	0.13
60	100	330	24.4	190	1.15	10.6	320	0.79	2.60	193	0.62	9.4	193	0.13

6 APPROACHES AND RESULTS

6.1 Results of static analysis for the spread mooring

The storm mooring system is set up in aNySIM using line particulars described in Section 4.1. The fairlead and anchor locations are used as the input. The resulting pretensions and pretension angles for all 8 mooring lines are shown in Table 6-1.

Table 6-1: Pretension and pretension angle

Line #	Pretension (kN)		Pretension angle (deg)	
	Ballast	Loaded	Ballast	Loaded
L1	189.9	163.8	44.9	46.7
L2	276.4	202.4	39.6	42.7
L3	174.8	148.0	48.2	50.6
L4	173.0	146.6	48.4	50.7
L5	157.8	138.2	47.1	48.9
L6	162.6	138.8	46.5	48.6
L7	213.5	171.1	41.6	44.2
L8	229.3	180.9	40.5	43.2

For the X and Y static load test, the ship is relocated at different distances from the origin position aligned with X and Y axis (positive X to South and positive Y to East). For the yaw static load test, the ship is rotated at different headings from the initial heading. The total restoring forces/moments are calculated for different locations/headings of the FSU. The load excursion curves (in x, y and yaw directions) from aNySIM are shown in Figure 6-1 through Figure 6-3.

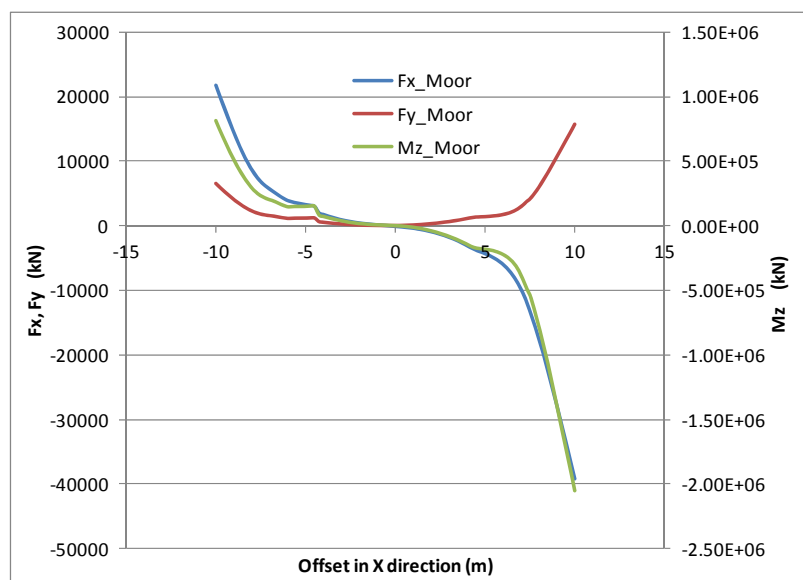


Figure 6-1: Load excursion curves in x direction – Loaded FSU

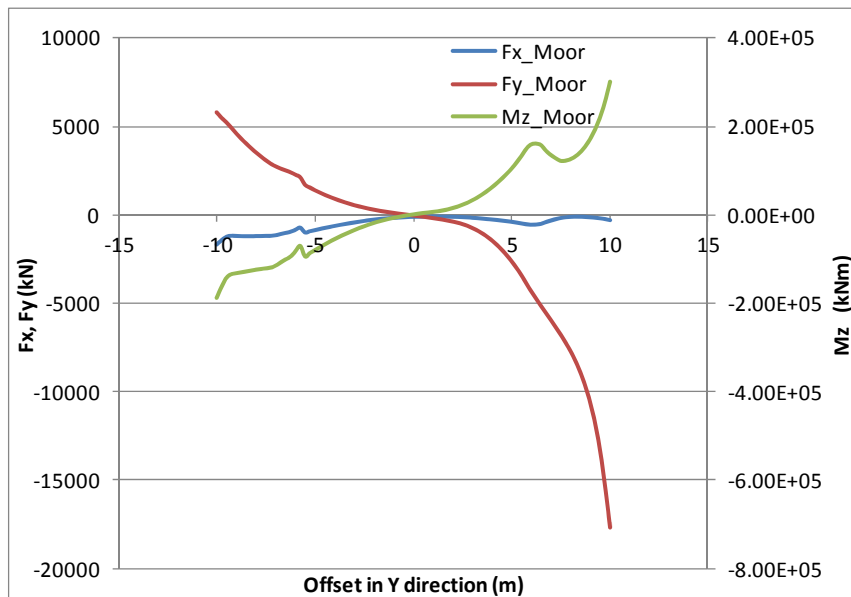


Figure 6-2: Load excursion curves in y direction – Loaded FSU

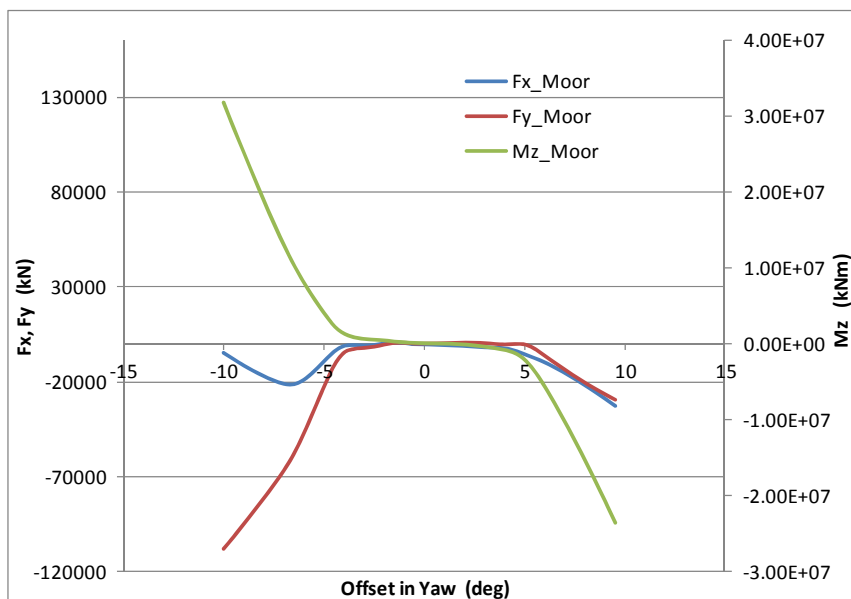


Figure 6-3: Load excursion curves in yaw direction – Loaded FSU

6.2 Decay tests

For surge and sway decay simulations, the FSU is relocated by a force and then released to decay in still water. For the yaw decay simulation, the FSU is rotated by a moment and then released to decay in still water. The surge, sway and yaw motions at the COG of the FSU are shown in Figure 6-4, Figure 6-5 and Figure 6-6, respectively. It can be seen in the figures that all three models are coupled due to the asymmetry in the mooring system. Uncoupled decay tests were also done in order to estimate the natural periods of each mode. For an uncoupled decay test, the other two modes are restrained to remove the coupled effects. The uncoupled surge, sway and yaw decays are shown in Figure 6-7. The natural periods for surge, sway and yaw can be estimated from the figure, which are about 138 s, 239 s and 115 s, respectively.

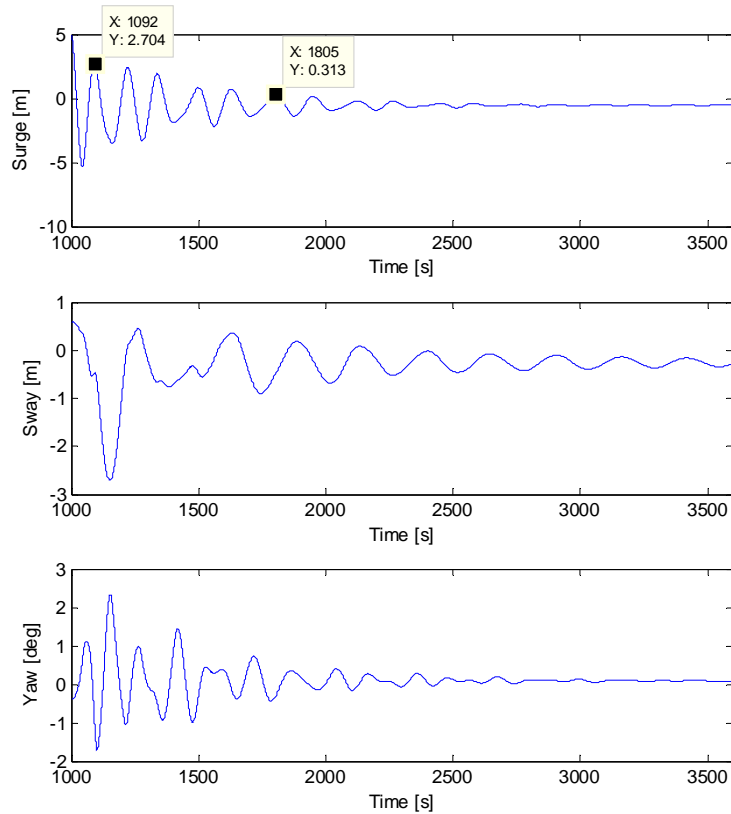


Figure 6-4: Surge decay of loaded FSU - coupled

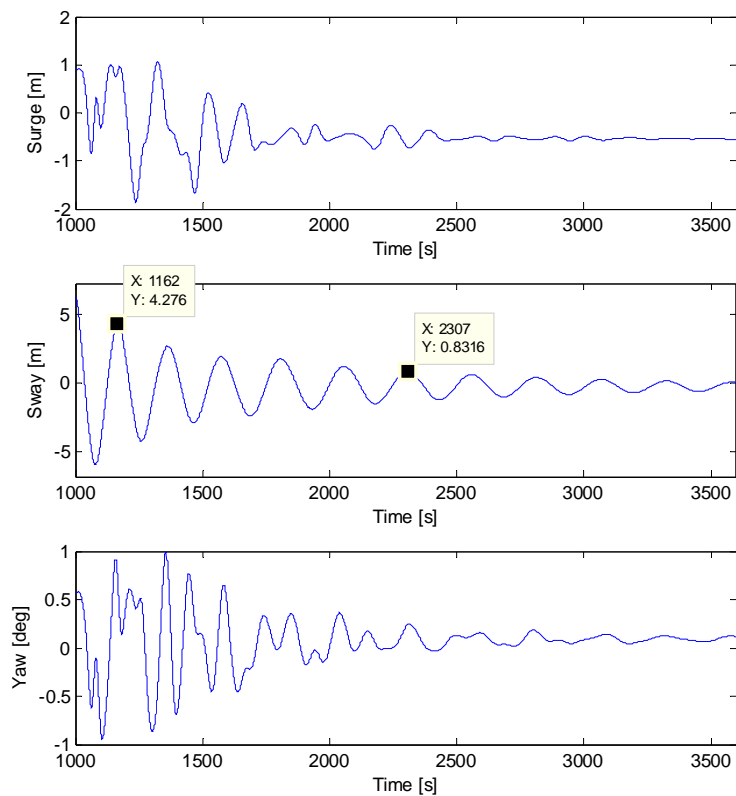


Figure 6-5: Sway decay of loaded FSU - coupled

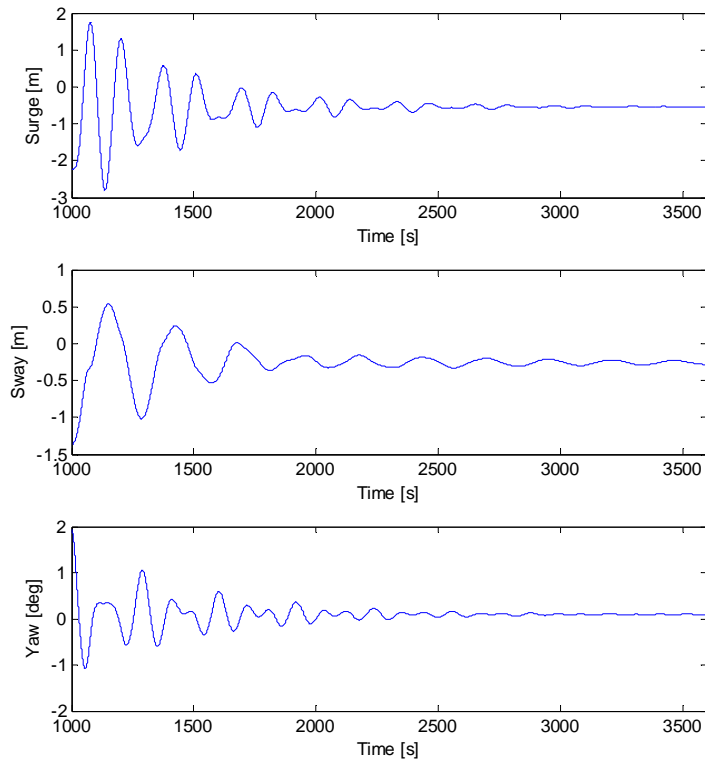


Figure 6-6: Sway decay of loaded FSU - coupled

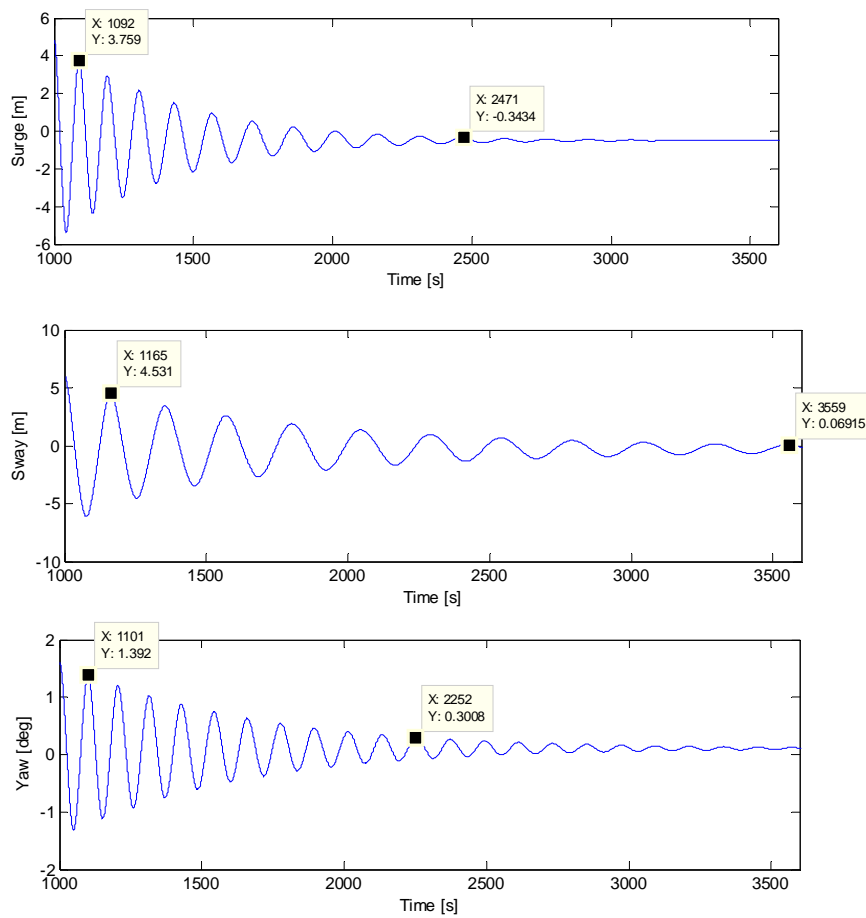


Figure 6-7: Surge, sway and yaw decay of loaded FSU – uncoupled

6.3 Simulation with extreme environments

For each loading condition of the FSU, simulations with 12 wind angles and 5 different return periods are carried out, which leads to a total of 60 cases. The detail environments of these 60 cases can be found in Section 5. For each environment, a 3.5 hours time domain simulation is carried out. All transient effect can die out in the first half hour of the run and the statistics is only based on the data of the last 3 hours of the simulation. The results of the mooring line tensions and FSU motions are discussed in this section.

6.3.1 Maximum line tension and offset for different return periods

The maximum fairlead and anchor line tensions are shown in Figure 6-8 for different wind angles and different return periods. It can be seen that higher line tensions are noticed when wind direction is close to beam on. The maximum fairlead line tensions out of all simulations is 3537 kN (360 tonnes) which occurs for the 100 yrs wind from 60°N. The 3537 kN corresponds to 46% of the MBL for a 95 mm chain. The maximum line tensions for other return periods can be found in Table 6-2. Also shown in Table 6-2 is the loading condition of the FSU for each tabulated maximum line tension. It should be noted that it is not one loading condition that governs the large line forces. The maximum line tensions in 5, 50 and 100 yrs return periods occurs with loaded FSU, while the maximum line tensions in 10 and 25 yrs return periods occurs with ballast FSU.

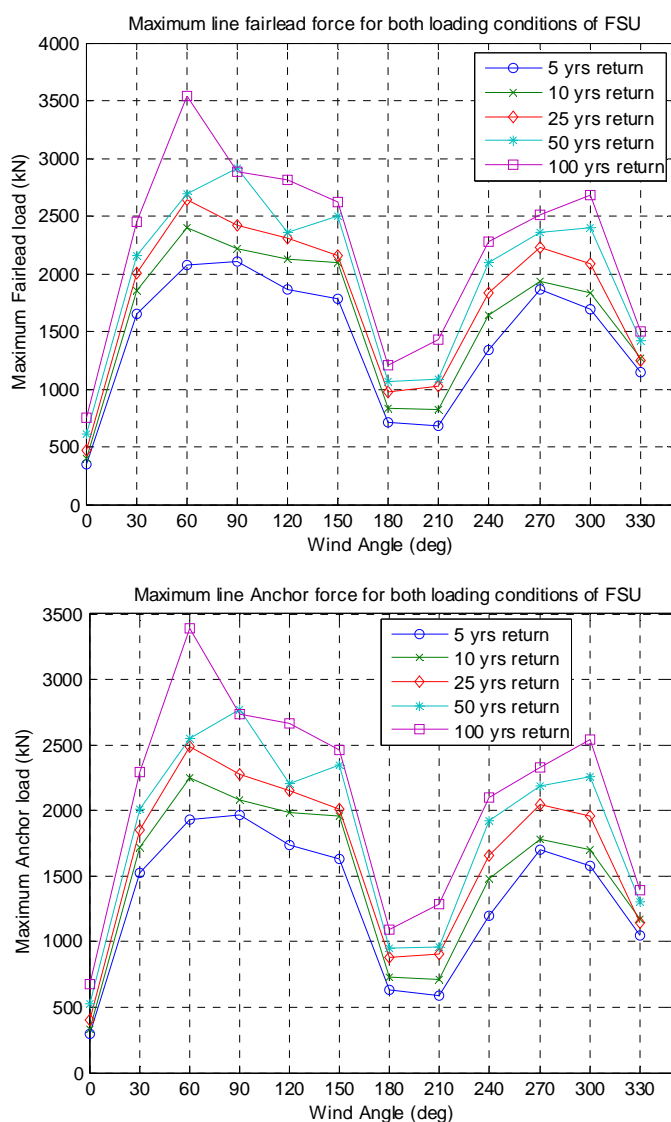


Figure 6-8: Maximum fairlead and anchor line forces for different wind angles

Table 6-2: Maximum fairlead/anchor tension for different wind angles

Wind Angle (deg)	Return period - yrs														
	5			10			25			50			100		
	T _F (kN)	T _A (kN)	LC	T _F (kN)	T _A (kN)	LC	T _F (kN)	T _A (kN)	LC	T _F (kN)	T _A (kN)	LC	T _F (kN)	T _A (kN)	LC
0	352	293	B	399	330	B	475	400	B	611	400	B	748	674	L
30	1649	1526	L	1849	1718	L	2002	1856	B	2156	1856	B	2448	2295	B
60	2074	1927	B	2398	2246	B	2645	2492	B	2689	2492	L	3537	3391	L
90	2103	1965	L	2218	2080	L	2415	2275	L	2915	2275	L	2880	2735	L
120	1864	1734	L	2123	1986	L	2304	2155	L	2355	2155	L	2808	2666	L
150	1785	1627	L	2097	1958	L	2160	2014	L	2503	2014	L	2625	2465	B
180	715	630	L	832	732	B	978	877	L	1067	877	B	1209	1093	B
210	686	588	L	824	708	B	1023	905	L	1087	905	L	1428	1288	L
240	1343	1197	B	1639	1480	B	1829	1660	B	2096	1660	B	2279	2099	B
270	1867	1697	B	1938	1781	B	2227	2049	B	2361	2049	L	2514	2331	B
300	1697	1581	L	1831	1701	B	2090	1956	B	2395	1956	B	2686	2545	B
330	1144	1050	L	1268	1169	L	1251	1145	B	1418	1145	B	1498	1388	L
Max	2103	1965		2398	2246		2645	2492		2915	2492		3537	3391	
%MBL of 95mm Chain	27.4%			31.2%			34.4%			37.9%			46.0%		

Note: T_F is the max fairlead tension, T_A is the max anchor tension, LC is the governing loading condition, B is ballast and L is loaded.

The most critical case in this study is looked into closer in this study. The maximum line tension (line 8) occurs at T = 7239 s. The time traces of the line tension, vessel Y motion, vessel yaw motion and wind speed are shown in Figure 6-9. It can be seen from the figure that the large line tension is due to the simultaneous occurrence of the large Y offset, large yaw offset and large wind speed. The topviews of the vessel at T = 0 s and T = 7239 s are shown in Figure 6-10, which indicates that the line 8 is stretched most due to large Y and Yaw offsets.

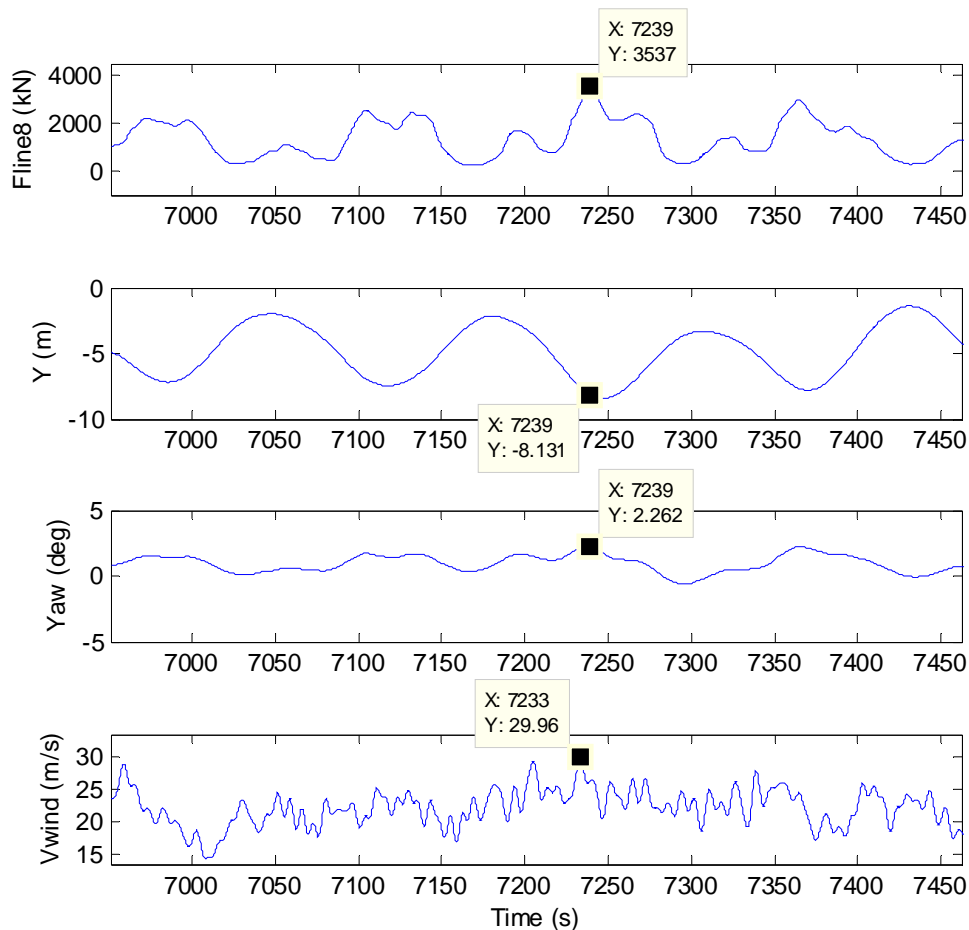


Figure 6-9: Time traces of most critical case

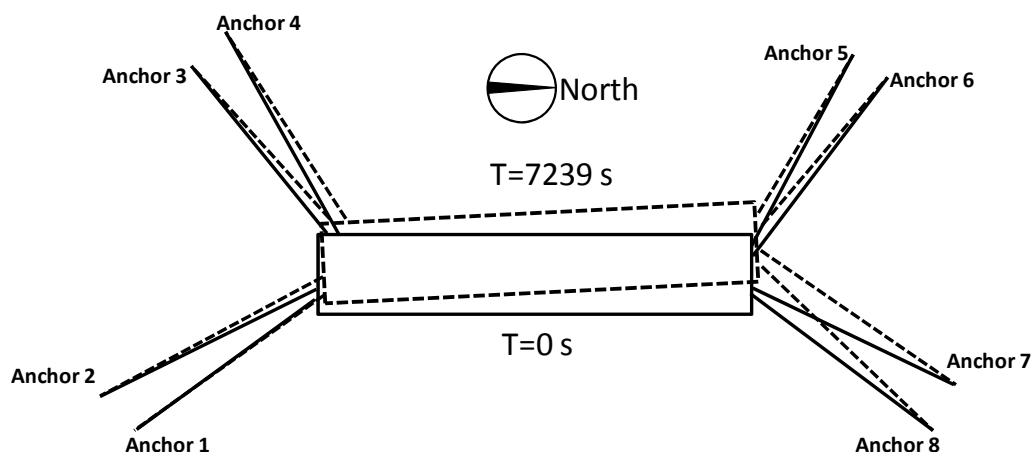


Figure 6-10: Top view of the vessel at $T = 0$ s and $T = 7239$ s

In time domain simulations, the wind speed time trace is generated based on the specified energy spectrum and a wind seed number. Different wind seed numbers can lead to different wind time trace realizations. From the investigation of the most critical case, it is found that different wind time trace realizations can have some effects on maximum line tension. Therefore, another 4 simulations are carried out for the same case but with 4 different wind seed numbers. The maximum line tensions for 5 different wind seed numbers are shown in Table 6-3. The average maximum tension is 3187 kN, which indicates that different wind speed time trace realizations can have about 10% sensitivity effects on the final results.

Table 6-3: Maximum fairlead tension of the most critical case for different wind seeds

Wind Seed #	Maximum line tension
	[kN]
1358	3537
358	2910
2358	3074
4758	3131
3172	3283
Mean	3187

The maximum horizontal offset are also calculated during each simulation and the maximum offsets for all cases are shown in Figure 6-11 and Table 6-4. Larger offset is noticed with beam on wind, and the maximum offset out of all cases is 9.3 m, which occurs in 100 yrs wind coming from 90° N. The maximum offsets for other return periods can be found in Table 6-4.

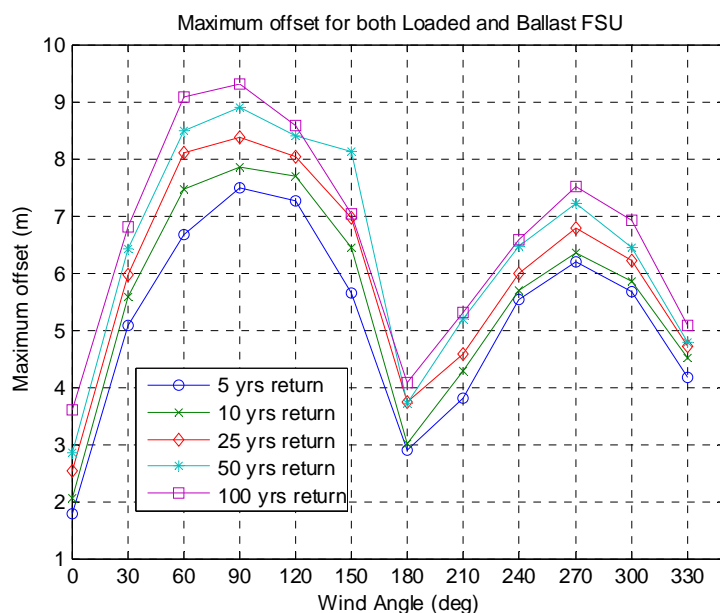


Figure 6-11: Maximum offset for different wind angles

Table 6-4: Maximum offset for different wind angles

Wind Angle (deg)	Return period - yrs				
	5	10	25	50	100
	Offset (m)	Offset (m)	Offset (m)	Offset (m)	Offset (m)
0	1.79	2.06	2.53	2.85	3.61
30	5.08	5.59	5.96	6.42	6.81
60	6.67	7.47	8.10	8.49	9.09
90	7.48	7.85	8.37	8.90	9.31
120	7.26	7.70	8.03	8.40	8.57
150	5.64	6.45	6.97	8.11	7.02
180	2.89	3.02	3.73	3.72	4.08
210	3.82	4.28	4.59	5.19	5.30
240	5.52	5.69	5.98	6.47	6.58
270	6.20	6.36	6.79	7.23	7.51
300	5.67	5.85	6.23	6.44	6.91
330	4.18	4.51	4.72	4.78	5.07

It is noticed that both the maximum line tension and maximum offset occurs for winds coming from Easterly directions (around 90 deg in the results). This is due to the fact that the mooring lines on the portside of FSU (lines 1, 2, 7 and 8) have smaller angles w.r.t the centerline of the vessel, which leads to a softer system (less restoring capability) when the vessel moves towards West. This can also be confirmed in the mooring static test (see Figure 6-2), which indicate a much lower stiffness in Y when relocating the vessel to negative y locations (towards West).

6.3.2 Maximum line tensions for different mooring lines

In this study, the maximum tensions for different mooring lines are also investigated. As shown in Figure 6-12 and Table 6-5, the line 8 is the most critical line, which has maximum line tension of 3537 kN in 100 yrs wind environment. Relative smaller line tensions are found for other wind return period, which are tabulated in Table 6-5.

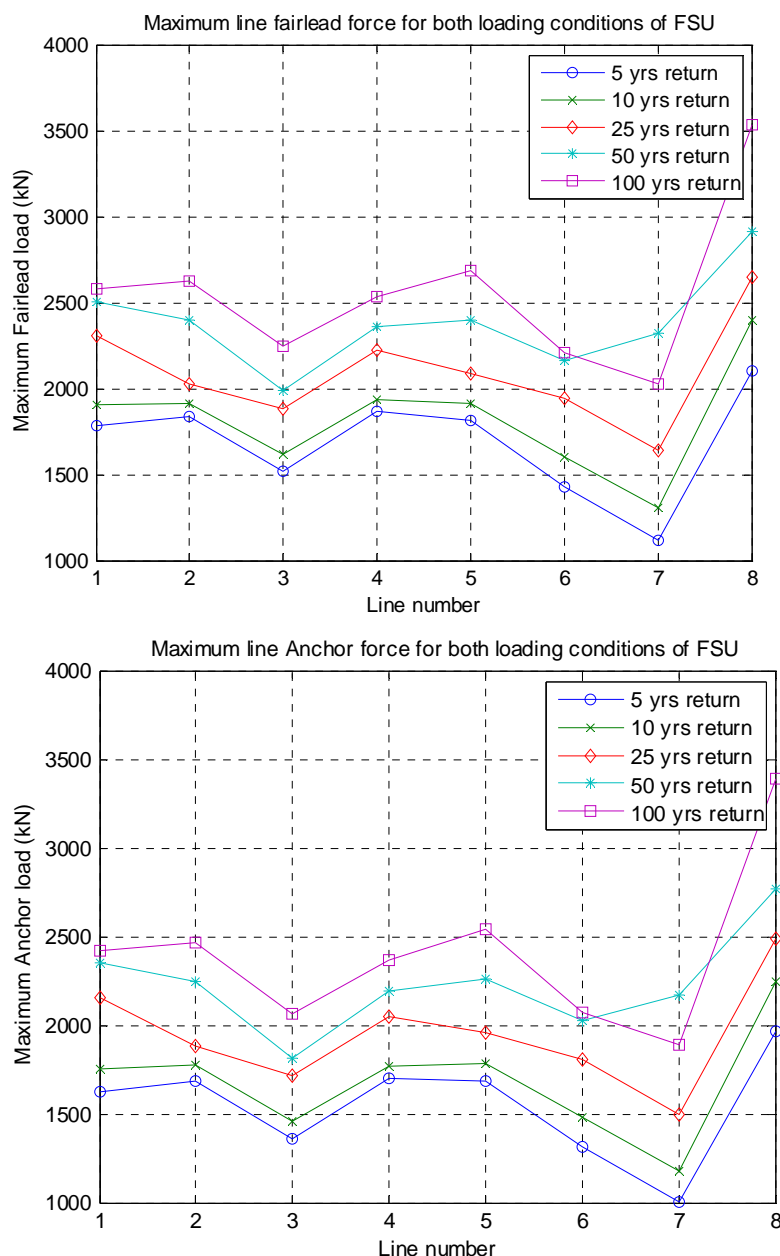


Figure 6-12: Maximum fairlead/anchor line forces for different mooring lines

Table 6-5: Maximum fairlead/anchor tension for different mooring lines

Line number	Return period - yrs									
	5		10		25		50		100	
	Tf (kN)	Ta (kN)	Tf (kN)	Ta (kN)	Tf (kN)	Ta (kN)	Tf (kN)	Ta (kN)	Tf (kN)	Ta (kN)
1	1785	1627.47	1903	1756.67	2304	2155.34	2503	2351.33	2579	2423.66
2	1840	1689.04	1915	1774.51	2027	1884.23	2400	2248.81	2625	2464.66
3	1520	1363.53	1618	1457.07	1886	1714.51	1991	1815.84	2243	2062.46
4	1867	1697.07	1938	1767.95	2227	2048.58	2361	2191	2535	2364.26
5	1812	1682.66	1912	1781.2	2090	1955.72	2395	2258.46	2686	2545.21
6	1429	1313.22	1599	1477.37	1941	1808.15	2162	2027.3	2205	2068.44
7	1118	1001.77	1307	1181.46	1639	1499.52	2318	2167.77	2029	1887.5
8	2103	1964.91	2398	2246.38	2645	2491.8	2915	2767.23	3537	3390.62

7 CONCLUSIONS

A verification analysis was carried out for the storm mooring system of the Malta FSU. Two loading conditions (loaded and ballast) are considered and a total of 60 environmental cases (5 return periods and 12 wind directions with associated wave and current conditions) are analyzed for each loading condition. The following can be concluded from the study:

- Higher line tensions and vessel offsets are noticed when wind direction is close to beam on, i.e., from 60°N to 120°N and from 240°N to 300°N.
- Relatively higher line tensions and larger offsets occur for winds coming from Easterly directions (60°N to 120°N) when comparing to Westerly directions (240°N to 300°N). This is due to the fact that the mooring lines on the Eastern side have smaller angles w.r.t the centerline of the vessel, which leads to a softer system (less restoring capability) when the vessel moves towards West.
- The maximum fairlead line tensions out of all simulations is 3537 kN (360 tonnes) which occurs for the 100 yrs wind from 60°N. The 3537 kN corresponds to 46% of the MBL for a 95 mm chain, which is well within the usually adopted limit of 55% of the MBL. The same case was repeated for 4 other different wind time trace realizations. Different realizations can have about 10% sensitivity on the maximum line tensions. The maximum line tension found in this study is comparable with the results from study of Bumi Armada.
- The maximum offset out of all simulations is 9.3 m, which occurs in 100 yrs wind coming from 90°N.
- The maximum tensions for different mooring lines are also investigated. The line 8 (35°N) is found to be the most critical line.

Wageningen, July 2016

MARITIME RESEARCH INSTITUTE NETHERLANDS



Ir. O.J. Waals
Manager Offshore

REFERENCES

- [1] Bumi Armada, 2016; "Storm Mooring Strength Analysis Report (21023-BAE-79430-MO-RP-0003_B2)".
- [2] MARIN, 2015; "Nautical and Risk Studies for the Delimara LNG Terminal in Marsaxlokk Port, Malta; Item 3: Moored ship response study", MARIN report No. 27689-3-PO, Rev. 1.0, 17 December 2015, Prepared for Enemalta.
- [3] OCIMF, 2003; "Mooring Equipment Guidelines 3rd Edition (MEG3)".
- [4] MARIN/ARCADIS, 2015; "Nautical and Risk Studies for the Delimara LNG Terminal in Marsaxlokk Port, Malta; Additional Metocean Analysis", MARIN Final report No 27689-7-MSCN-rev.2, 18 December 2015, Prepared for ElectorGas Malta.
- [5] SIGTTO, 1997; "LNG Ship Data Book", Second edition, October 1997.

TABLES

TABLE 1 MAIN PARTICULARS – FSU

Designation	Symbol	Unit	Values	
			Loaded	Ballasted
Length between Perpendiculars	L_{pp}	m	270	
Breadth	B	m	44.8	
Draft	T	m	10.8	9.35
Displacement weight	Δ	ton	95,000	80,000
Centre of Gravity above base	KG	m	20.0	13.1
Centre of Gravity forward of st10	LCG	m		
Transverse metacentric radius	KM	m	22.3	24.1
Transverse metacentric height	GMt	m	2.3	11.0
Frontal wind area	A_{wf}	m ²	1,150	1,220
Lateral wind area	A_{wl}	m ²	7,120	7,570
Roll radius of gyration	k_{xx}	m	15.7	
Pitch radius of gyration	k_{yy}	m	67.5	
Yaw radius of gyration	k_{zz}	m	67.5	

TABLE 2 MAXIMUM FAIRLEAD/ANCHOR TENSION FOR DIFFERENT DRAFTS
Loaded FSU (T_F is the max fairlead tension and T_A is the max anchor tension)

Wind Angle (deg)	Return period - yrs									
	5		10		25		50		100	
	T_F (kN)	T_A (kN)	T_F (kN)	T_A (kN)	T_F (kN)	T_A (kN)	T_F (kN)	T_A (kN)	T_F (kN)	T_A (kN)
0	305	253	336	277	424	357	540	357	748	674
30	1649	1526	1849	1718	1882	1752	2118	1752	2431	2290
60	1977	1843	2245	2107	2450	2308	2689	2308	3537	3391
90	2103	1965	2218	2080	2415	2275	2915	2275	2880	2735
120	1864	1734	2123	1986	2304	2155	2355	2155	2808	2666
150	1785	1627	2097	1958	2160	2014	2503	2014	2508	2362
180	715	630	734	648	978	877	1027	877	1207	1093
210	686	588	811	705	1023	905	1087	905	1428	1288
240	1254	1123	1364	1228	1728	1573	1880	1573	1917	1758
270	1629	1482	1825	1668	2072	1909	2361	1909	2410	2241
300	1697	1581	1718	1600	1906	1782	2190	1782	2535	2364
330	1144	1050	1268	1169	1146	1052	1197	1052	1498	1388

Ballast FSU (T_F is the max fairlead tension and T_A is the max anchor tension)

Wind Angle (deg)	Return period - yrs									
	5		10		25		50		100	
	T_F (kN)	T_A (kN)	T_F (kN)	T_A (kN)	T_F (kN)	T_A (kN)	T_F (kN)	T_A (kN)	T_F (kN)	T_A (kN)
0	352	293	399	330	475	400	611	400	705	614
30	1275	1157	1640	1507	2002	1856	2156	1856	2448	2295
60	2074	1927	2398	2246	2645	2492	2568	2492	2891	2736
90	2063	1916	2174	2026	2247	2097	2247	2097	2428	2276
120	1777	1628	1903	1757	2157	2000	2184	2000	2264	2107
150	1673	1509	1710	1551	2039	1885	2141	1885	2625	2465
180	614	529	832	732	933	827	1067	827	1209	1086
210	679	574	824	708	1013	885	1084	885	1249	1105
240	1343	1197	1639	1480	1829	1660	2096	1660	2279	2099
270	1867	1697	1938	1781	2227	2049	2322	2049	2514	2331
300	1505	1388	1831	1701	2090	1956	2395	1956	2686	2545
330	946	855	960	869	1251	1145	1418	1145	1445	1329

FIGURES

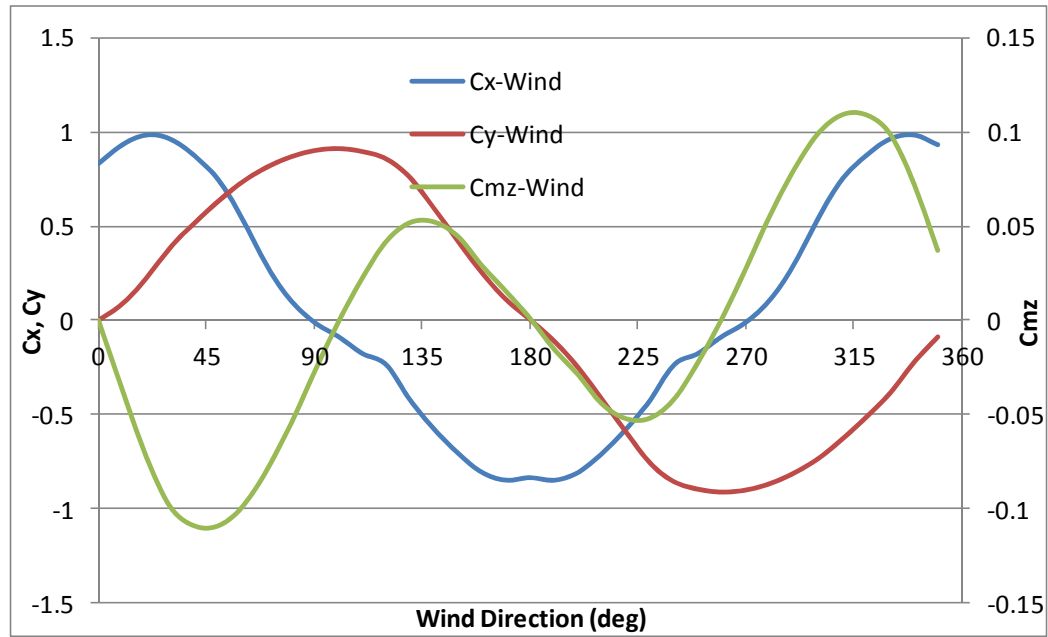
FIGURE 1 WIND COEFFICIENTS FOR FSU

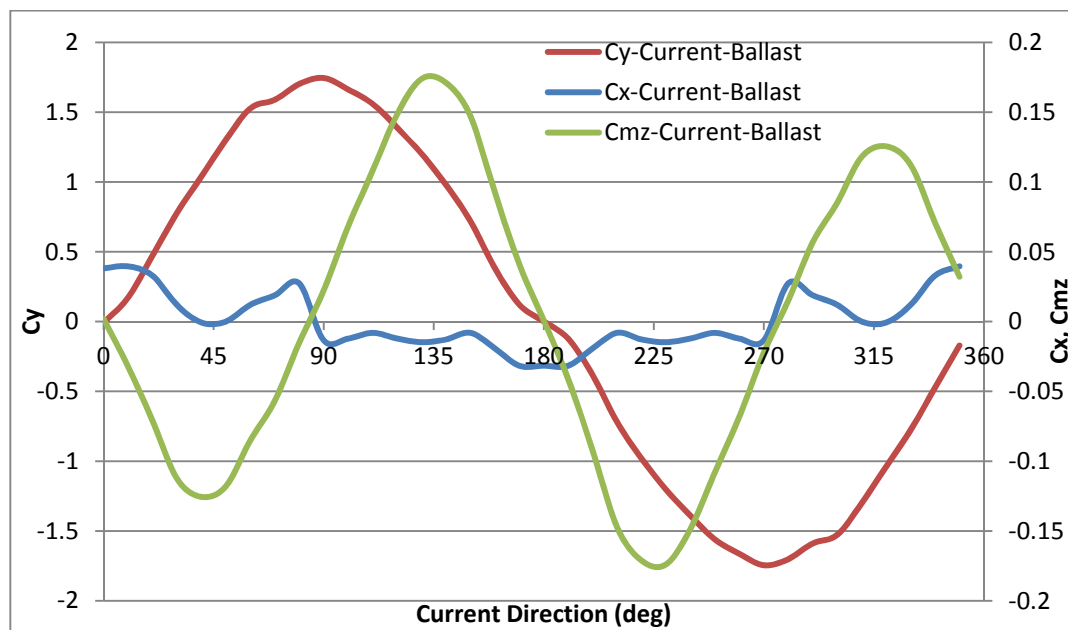
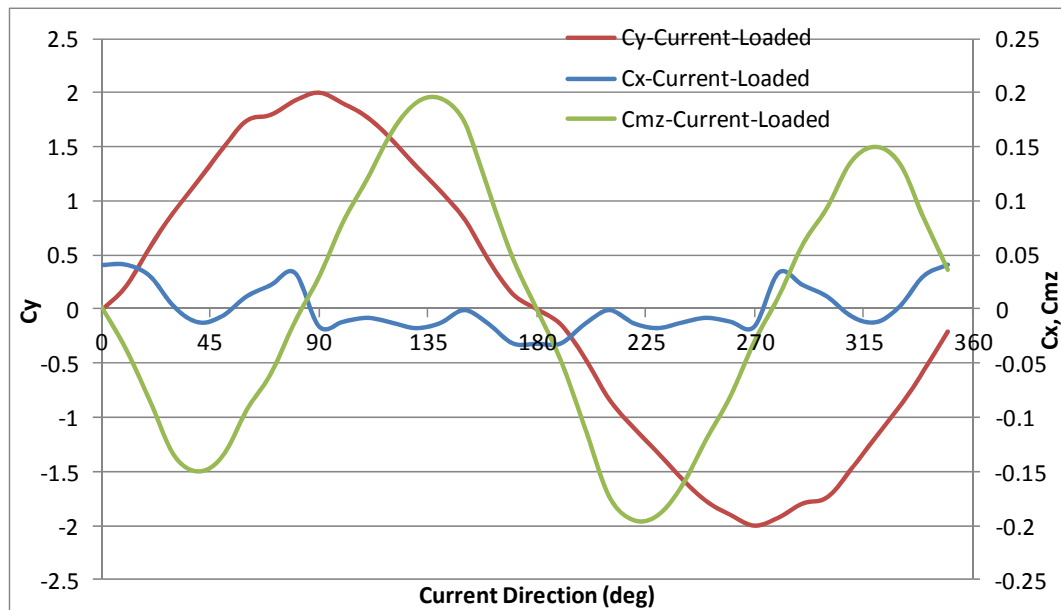
FIGURE 2 CURRENT COEFFICIENTS FOR FSU

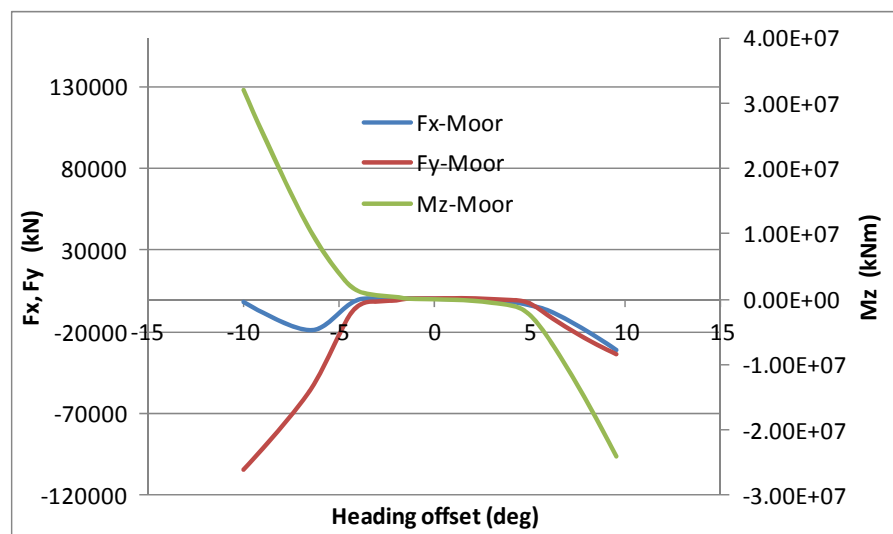
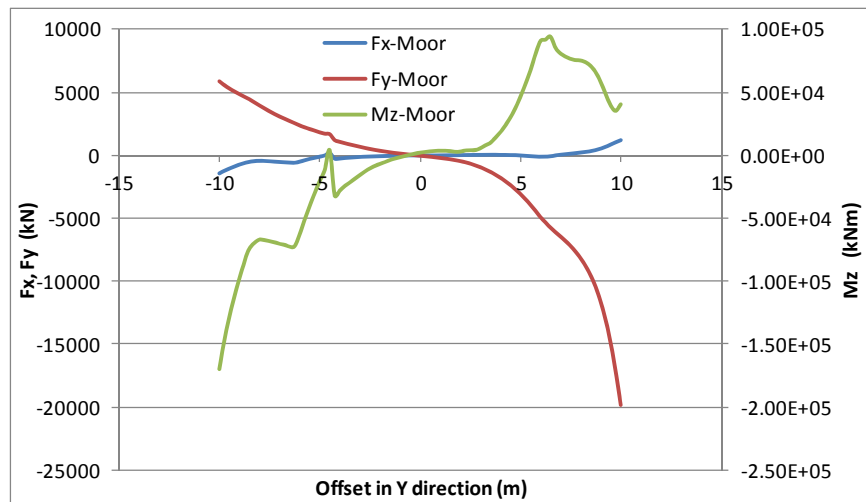
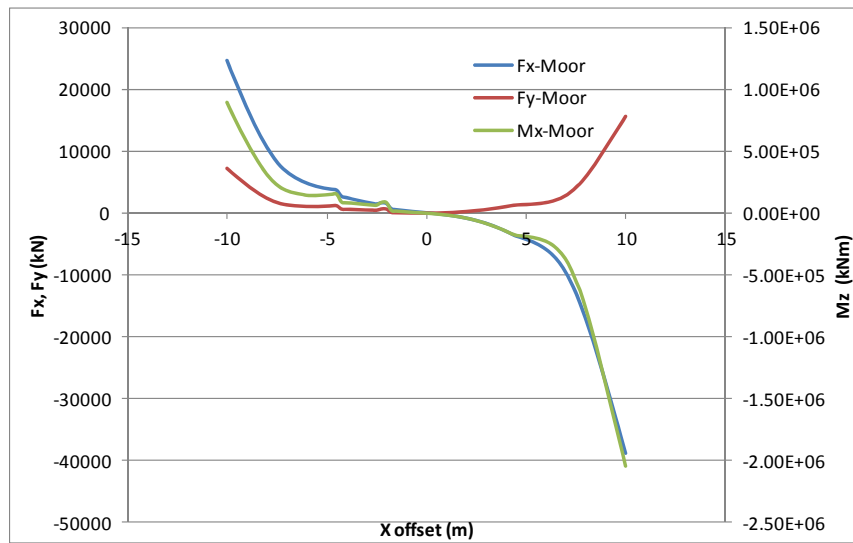
FIGURE 3 STATIC CURVES FOR OFFSET IN X,Y,YAW – BALLAST FSU

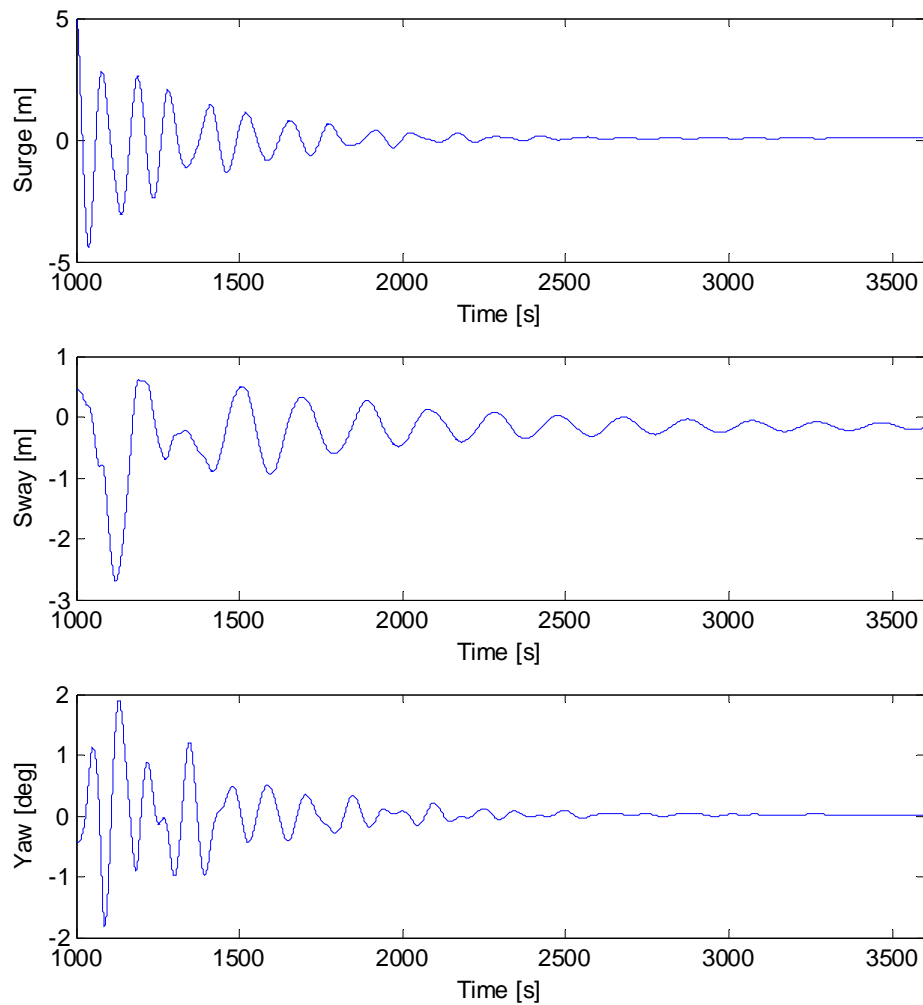
FIGURE 4 COUPLED SURGE DECAY FOR BALLAST FSU

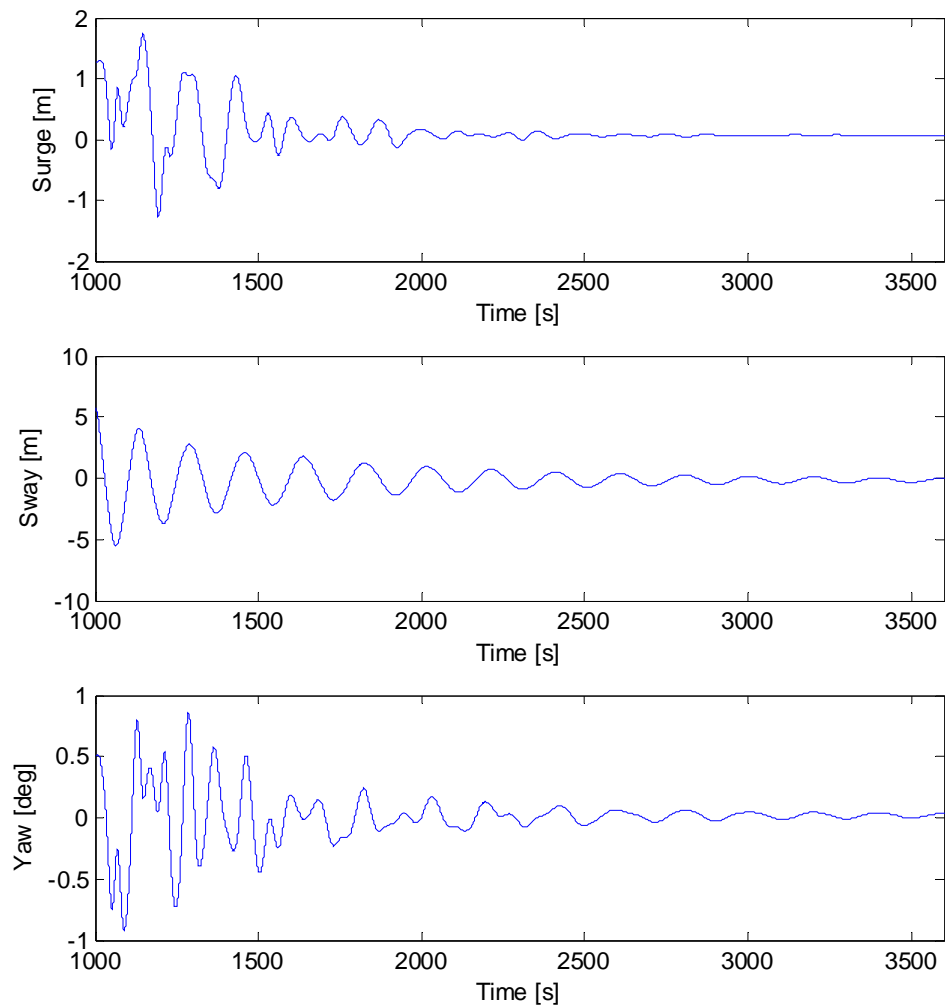
FIGURE 5 COUPLED SWAY DECAY FOR BALLAST FSU

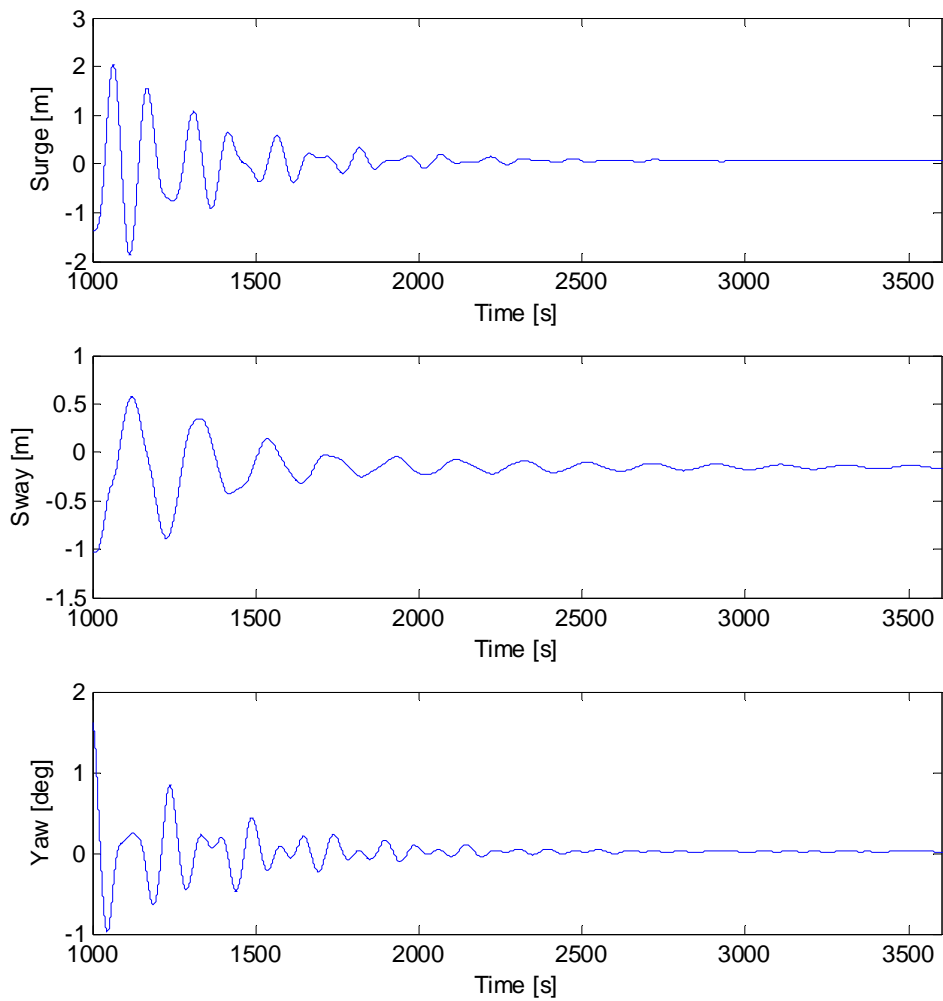
FIGURE 6 COUPLED YAW DECAY FOR BALLAST FSU

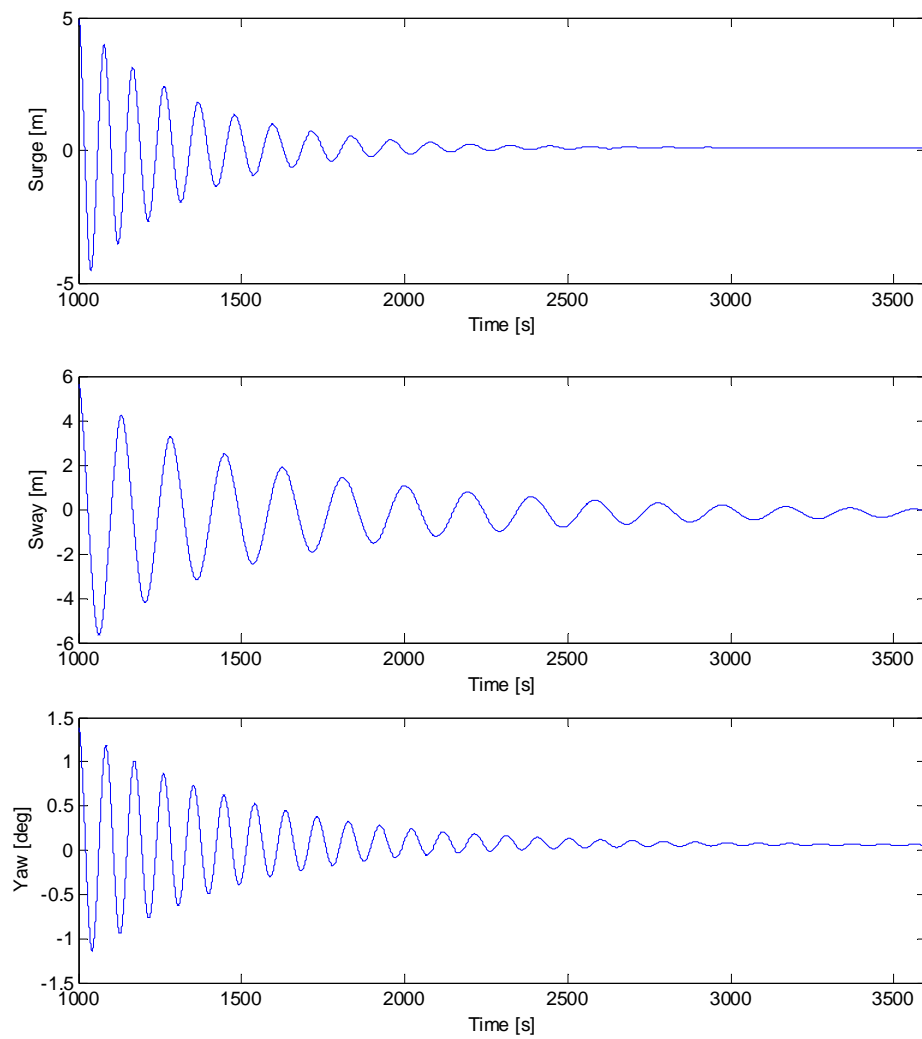
FIGURE 7 UNCOUPLED DECAYS FOR BALLAST FSU

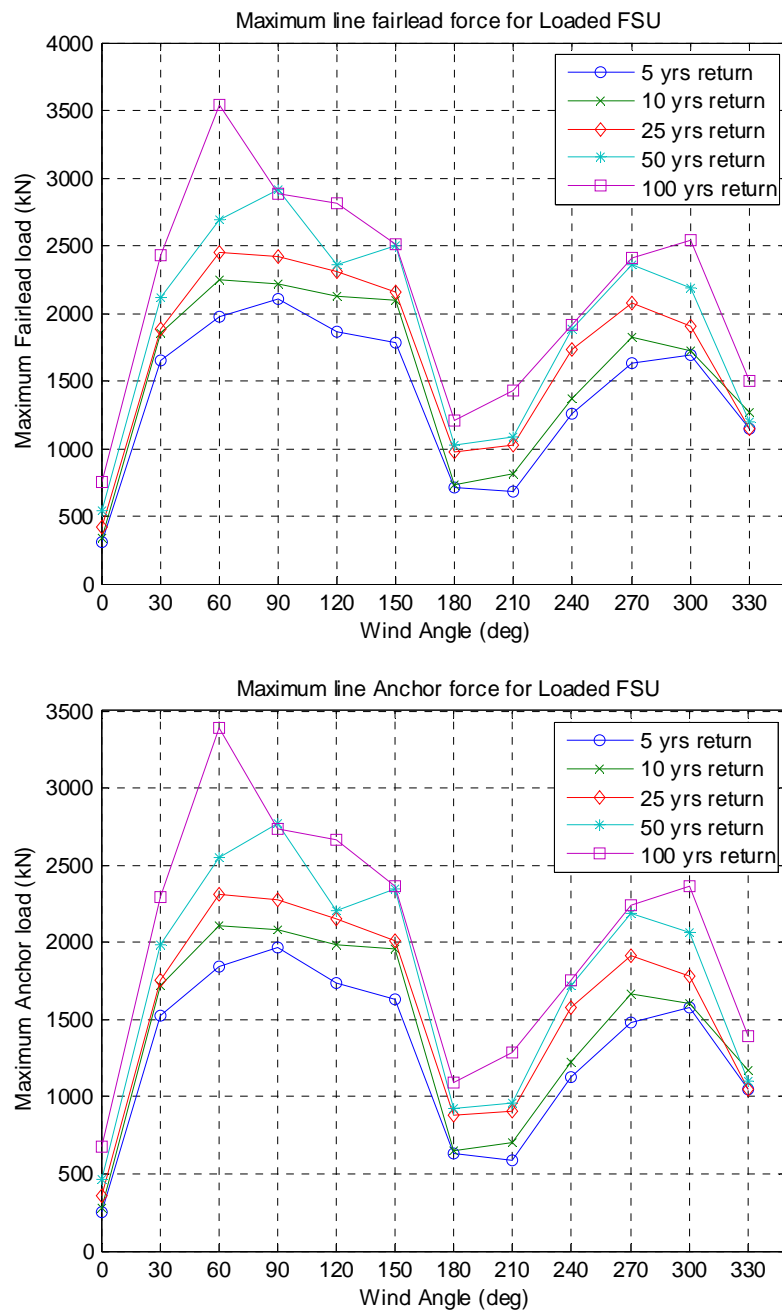
FIGURE 8 MAXIMUM FAIRLEAD AND ANCHOR LOAD FOR LOADED FSU

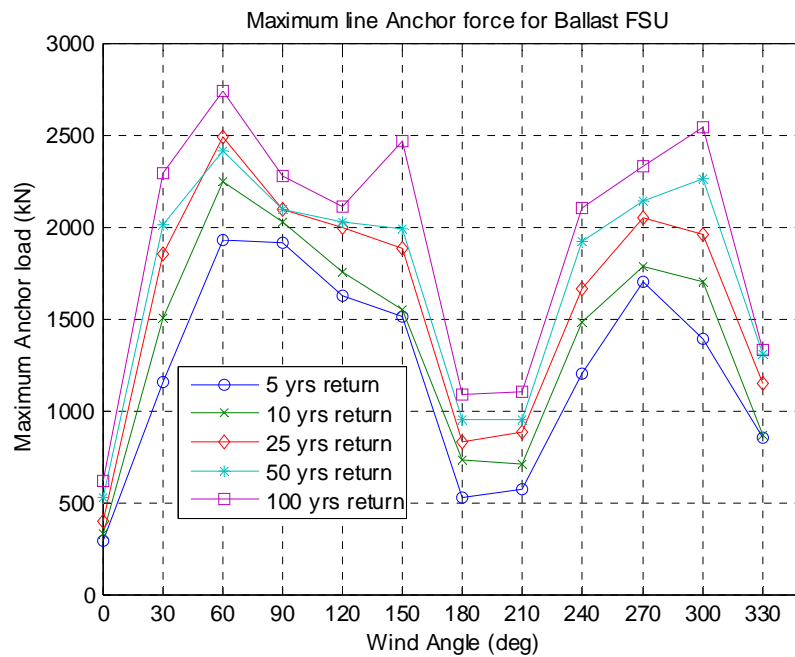
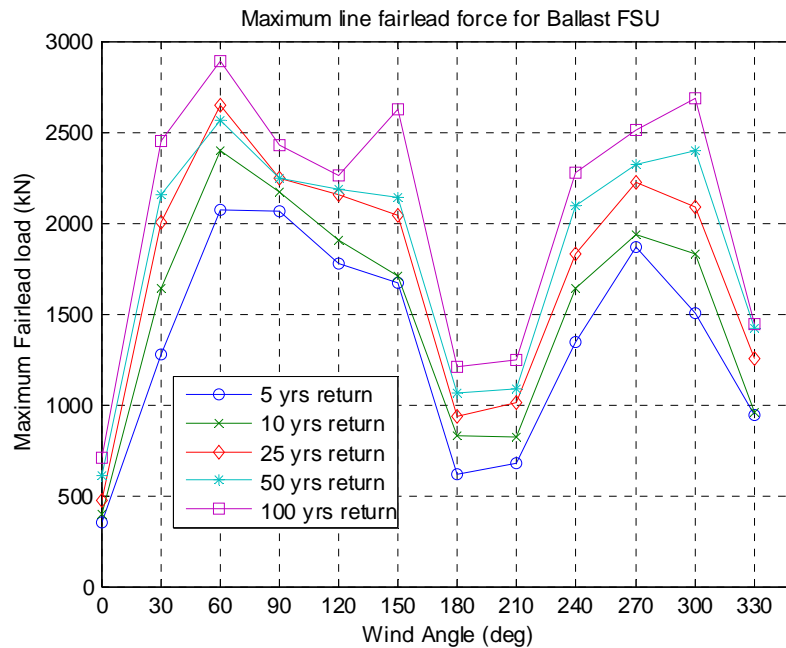
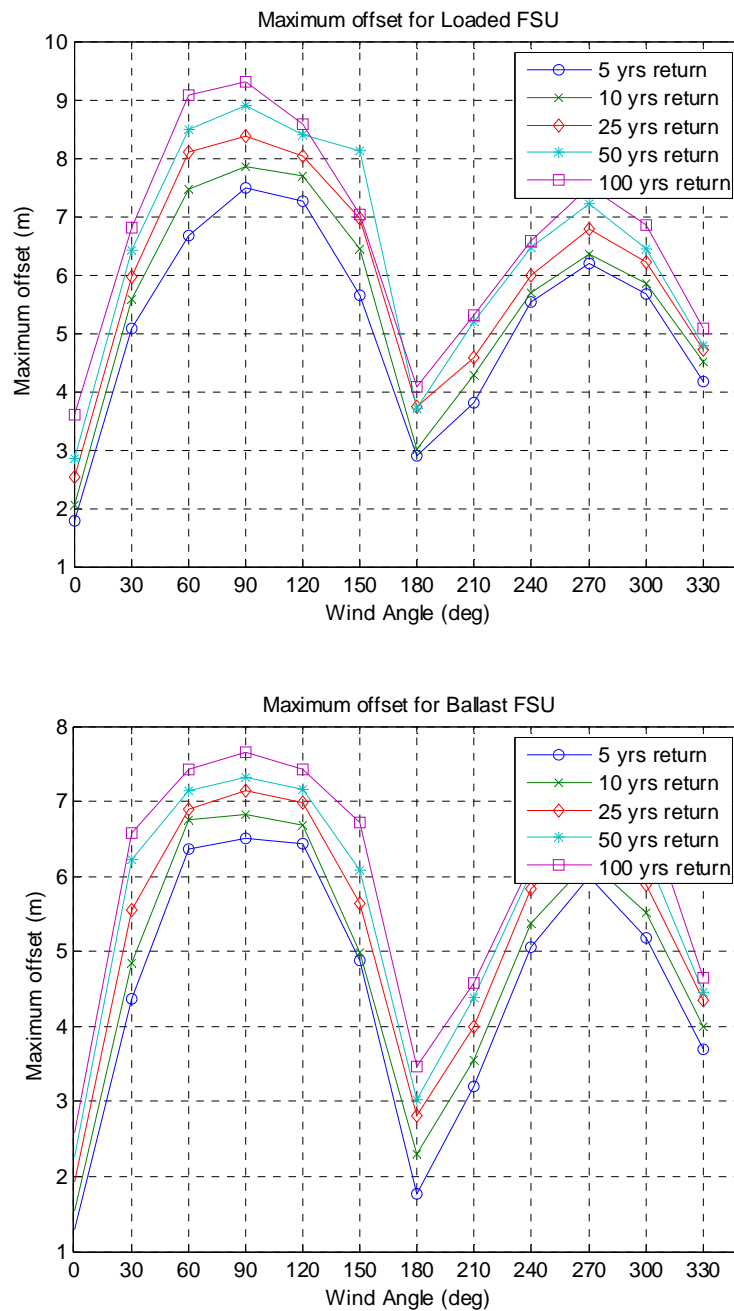
FIGURE 9 MAXIMUM FAIRLEAD AND ANCHOR LOAD OF BALLAST FSU

FIGURE 10 MAXIMUM OFFSET FOR LOADED AND BALLAST FSU

APPENDIX

APPENDIX A01

Statistics of Simulations Loaded FSU

Case: 1

Return Period: 5

FSU Draft: Loaded

Hs, Penetrating wind sea [m]: 0.57

Tp, Penetrating wind sea [s]: 5.4

Dir., Penetrating wind sea [deg N]: 187

Hs, Local wind sea [m]: 0.48

Tp, Local wind sea [s]: 2.5

Dir., Local wind sea [deg N]: 341

Hs, Penetrating swell [m]: 0.58

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 17.6

Wind Dir. [deg N]: 0

Vc [m/s]: 0.07

Current Dir. [deg N]: 196

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.078	0.299	0.363	1.777
FSU Sway	m	-0.184	0.110	-0.548	0.084
FSU Yaw	deg	-0.117	0.134	-0.530	0.236

Mooring Forces

Fairlead 1	kN	146	5	133	165
Fairlead 2	kN	168	8	147	196
Fairlead 3	kN	128	6	113	145
Fairlead 4	kN	129	6	114	145
Fairlead 5	kN	156	14	126	205
Fairlead 6	kN	162	16	130	219
Fairlead 7	kN	234	19	191	299
Fairlead 8	kN	241	16	194	305
Anchor 1	kN	112	5	99	129
Anchor 2	kN	124	8	105	151
Anchor 3	kN	73	5	59	89
Anchor 4	kN	74	5	60	90
Anchor 5	kN	120	14	92	167
Anchor 6	kN	126	15	95	180
Anchor 7	kN	182	18	141	242
Anchor 8	kN	194	15	150	253

Case: 2

Return Period: 10	Hs, Penetrating swell [m]: 0.58
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.5
Hs, Penetrating wind sea [m]: 0.72	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 6.6	Vw [m/s]: 19.5
Dir., Penetrating wind sea [deg N]: 187	Wind Dir. [deg N]: 0
Hs, Local wind sea [m]: 0.54	Vc [m/s]: 0.08
Tp, Local wind sea [s]: 2.6	Current Dir. [deg N]: 196
Dir., Local wind sea [deg N]: 341	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.265	0.365	0.277	2.061
FSU Sway	m	-0.129	0.113	-0.472	0.141
FSU Yaw	deg	-0.144	0.160	-0.551	0.283

Mooring Forces

Fairlead 1	kN	143	5	131	167
Fairlead 2	kN	162	9	143	202
Fairlead 3	kN	126	7	112	148
Fairlead 4	kN	127	6	112	149
Fairlead 5	kN	163	19	125	218
Fairlead 6	kN	171	21	128	237
Fairlead 7	kN	249	28	183	336
Fairlead 8	kN	252	22	191	320
Anchor 1	kN	108	5	97	131
Anchor 2	kN	119	9	101	156
Anchor 3	kN	71	6	57	92
Anchor 4	kN	73	6	58	93
Anchor 5	kN	127	18	90	179
Anchor 6	kN	135	21	93	198
Anchor 7	kN	196	26	134	277
Anchor 8	kN	204	21	148	268

Case: 3

Return Period: 25	Hs, Penetrating swell [m]: 0.58
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.5
Hs, Penetrating wind sea [m]: 0.93	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 8.4	Vw [m/s]: 22
Dir., Penetrating wind sea [deg N]: 188	Wind Dir. [deg N]: 0
Hs, Local wind sea [m]: 0.62	Vc [m/s]: 0.08
Tp, Local wind sea [s]: 2.7	Current Dir. [deg N]: 196
Dir., Local wind sea [deg N]: 341	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.504	0.415	0.123	2.527
FSU Sway	m	-0.020	0.158	-0.474	0.335
FSU Yaw	deg	-0.172	0.179	-0.681	0.316

Mooring Forces

Fairlead 1	kN	138	7	122	165
Fairlead 2	kN	155	11	131	202
Fairlead 3	kN	124	7	110	157
Fairlead 4	kN	126	7	111	159
Fairlead 5	kN	175	24	126	267
Fairlead 6	kN	185	29	130	301
Fairlead 7	kN	273	41	175	424
Fairlead 8	kN	268	35	180	379
Anchor 1	kN	104	6	89	129
Anchor 2	kN	112	10	90	156
Anchor 3	kN	70	7	56	101
Anchor 4	kN	72	7	57	103
Anchor 5	kN	138	23	92	225
Anchor 6	kN	148	27	95	257
Anchor 7	kN	218	38	126	357
Anchor 8	kN	219	32	136	322

Case: 4

Return Period: 50	Hs, Penetrating swell [m]: 0.58
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.5
Hs, Penetrating wind sea [m]: 1.11	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 10	Vw [m/s]: 23.9
Dir., Penetrating wind sea [deg N]: 187	Wind Dir. [deg N]: 0
Hs, Local wind sea [m]: 0.68	Vc [m/s]: 0.09
Tp, Local wind sea [s]: 2.8	Current Dir. [deg N]: 196
Dir., Local wind sea [deg N]: 341	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.665	0.467	0.392	2.828
FSU Sway	m	0.035	0.196	-0.690	0.543
FSU Yaw	deg	-0.187	0.212	-0.804	0.514

Mooring Forces

Fairlead 1	kN	135	7	117	163
Fairlead 2	kN	150	11	123	193
Fairlead 3	kN	124	8	106	164
Fairlead 4	kN	126	8	107	169
Fairlead 5	kN	184	33	124	356
Fairlead 6	kN	197	41	128	425
Fairlead 7	kN	293	54	176	540
Fairlead 8	kN	282	43	178	459
Anchor 1	kN	101	7	84	127
Anchor 2	kN	108	10	82	147
Anchor 3	kN	69	8	51	107
Anchor 4	kN	71	8	53	112
Anchor 5	kN	147	31	90	308
Anchor 6	kN	160	39	94	372
Anchor 7	kN	237	50	128	465
Anchor 8	kN	232	40	135	395

Case: 5

Return Period: 100	Hs, Penetrating swell [m]: 0.58
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.5
Hs, Penetrating wind sea [m]: 1.31	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 11.7	Vw [m/s]: 25.9
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 0
Hs, Local wind sea [m]: 0.75	Vc [m/s]: 0.1
Tp, Local wind sea [s]: 2.9	Current Dir. [deg N]: 196
Dir., Local wind sea [deg N]: 341	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.757	0.688	-0.566	3.488
FSU Sway	m	0.158	0.361	-1.006	1.028
FSU Yaw	deg	-0.148	0.317	-1.147	0.927

Mooring Forces

Fairlead 1	kN	132	11	106	192
Fairlead 2	kN	147	16	111	243
Fairlead 3	kN	126	14	92	199
Fairlead 4	kN	129	14	93	204
Fairlead 5	kN	197	57	109	595
Fairlead 6	kN	216	73	112	748
Fairlead 7	kN	318	93	145	724
Fairlead 8	kN	300	72	153	584
Anchor 1	kN	98	10	73	154
Anchor 2	kN	104	15	70	194
Anchor 3	kN	71	13	38	140
Anchor 4	kN	74	14	39	145
Anchor 5	kN	159	53	74	530
Anchor 6	kN	177	69	77	674
Anchor 7	kN	260	86	98	638
Anchor 8	kN	249	67	112	513

Case: 6

Return Period: 5	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.6
Hs, Penetrating wind sea [m]: 0.7	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 9.9	Vw [m/s]: 18.8
Dir., Penetrating wind sea [deg N]: 187	Wind Dir. [deg N]: 30
Hs, Local wind sea [m]: 0.42	Vc [m/s]: 0.07
Tp, Local wind sea [s]: 2.6	Current Dir. [deg N]: 197
Dir., Local wind sea [deg N]: 4	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.844	0.484	-2.255	0.646
FSU Sway	m	-3.413	0.514	-4.656	-2.224
FSU Yaw	deg	0.859	0.245	0.177	1.728

Mooring Forces

Fairlead 1	kN	266	61	161	586
Fairlead 2	kN	425	131	193	1000
Fairlead 3	kN	132	7	115	158
Fairlead 4	kN	126	6	112	146
Fairlead 5	kN	83	6	68	102
Fairlead 6	kN	85	6	70	105
Fairlead 7	kN	352	71	221	683
Fairlead 8	kN	734	194	318	1649
Anchor 1	kN	224	56	126	518
Anchor 2	kN	363	121	149	898
Anchor 3	kN	77	7	61	101
Anchor 4	kN	71	6	58	90
Anchor 5	kN	48	6	34	67
Anchor 6	kN	50	6	35	69
Anchor 7	kN	292	66	170	600
Anchor 8	kN	654	183	266	1526

Case: 7

Return Period: 10	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.6
Hs, Penetrating wind sea [m]: 0.8	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 10.8	Vw [m/s]: 20.4
Dir., Penetrating wind sea [deg N]: 188	Wind Dir. [deg N]: 30
Hs, Local wind sea [m]: 0.46	Vc [m/s]: 0.07
Tp, Local wind sea [s]: 2.7	Current Dir. [deg N]: 197
Dir., Local wind sea [deg N]: 4	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.966	0.572	-2.522	0.709
FSU Sway	m	-3.652	0.655	-5.216	-2.034
FSU Yaw	deg	0.959	0.267	0.124	1.948

Mooring Forces

Fairlead 1	kN	290	86	167	666
Fairlead 2	kN	472	177	202	1131
Fairlead 3	kN	133	8	111	166
Fairlead 4	kN	126	6	108	152
Fairlead 5	kN	80	7	65	99
Fairlead 6	kN	82	7	67	103
Fairlead 7	kN	383	85	205	680
Fairlead 8	kN	841	244	315	1849
Anchor 1	kN	245	79	132	592
Anchor 2	kN	406	164	158	1023
Anchor 3	kN	78	7	57	109
Anchor 4	kN	71	6	54	96
Anchor 5	kN	45	7	31	64
Anchor 6	kN	47	7	32	68
Anchor 7	kN	320	79	155	598
Anchor 8	kN	756	231	263	1718

Case: 8

Return Period: 25	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.6
Hs, Penetrating wind sea [m]: 0.95	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 12	Vw [m/s]: 22.4
Dir., Penetrating wind sea [deg N]: 188	Wind Dir. [deg N]: 30
Hs, Local wind sea [m]: 0.51	Vc [m/s]: 0.08
Tp, Local wind sea [s]: 2.8	Current Dir. [deg N]: 197
Dir., Local wind sea [deg N]: 4	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.119	0.683	-2.912	0.675
FSU Sway	m	-3.970	0.761	-5.479	-1.972
FSU Yaw	deg	1.073	0.313	0.340	2.081

Mooring Forces

Fairlead 1	kN	321	106	148	684
Fairlead 2	kN	536	216	177	1211
Fairlead 3	kN	134	9	113	177
Fairlead 4	kN	126	7	110	158
Fairlead 5	kN	78	8	63	99
Fairlead 6	kN	80	8	65	103
Fairlead 7	kN	423	96	221	726
Fairlead 8	kN	990	298	357	1882
Anchor 1	kN	274	98	114	608
Anchor 2	kN	465	201	134	1099
Anchor 3	kN	78	8	58	119
Anchor 4	kN	71	7	56	102
Anchor 5	kN	43	8	28	64
Anchor 6	kN	45	8	30	68
Anchor 7	kN	358	89	170	640
Anchor 8	kN	897	283	301	1752

Case: 9

Return Period: 50	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.6
Hs, Penetrating wind sea [m]: 1.05	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 12.8	Vw [m/s]: 23.8
Dir., Penetrating wind sea [deg N]: 188	Wind Dir. [deg N]: 30
Hs, Local wind sea [m]: 0.55	Vc [m/s]: 0.09
Tp, Local wind sea [s]: 2.8	Current Dir. [deg N]: 197
Dir., Local wind sea [deg N]: 4	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.241	0.716	-2.930	0.792
FSU Sway	m	-4.198	0.763	-5.856	-1.859
FSU Yaw	deg	1.156	0.344	0.157	2.086

Mooring Forces

Fairlead 1	kN	347	118	155	778
Fairlead 2	kN	584	235	192	1368
Fairlead 3	kN	135	11	110	182
Fairlead 4	kN	127	9	108	173
Fairlead 5	kN	76	7	62	103
Fairlead 6	kN	78	8	63	108
Fairlead 7	kN	455	117	213	887
Fairlead 8	kN	1102	342	330	2118
Anchor 1	kN	298	109	120	696
Anchor 2	kN	511	219	148	1247
Anchor 3	kN	79	11	56	123
Anchor 4	kN	72	9	54	115
Anchor 5	kN	41	7	27	68
Anchor 6	kN	43	8	29	73
Anchor 7	kN	388	109	163	792
Anchor 8	kN	1004	326	278	1980

Case: 10

Return Period: 100	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.6
Hs, Penetrating wind sea [m]: 1.16	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 13.6	Vw [m/s]: 25.2
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 30
Hs, Local wind sea [m]: 0.59	Vc [m/s]: 0.09
Tp, Local wind sea [s]: 2.9	Current Dir. [deg N]: 197
Dir., Local wind sea [deg N]: 4	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.366	0.723	-3.157	0.824
FSU Sway	m	-4.420	0.765	-6.270	-2.421
FSU Yaw	deg	1.242	0.367	-0.022	2.271

Mooring Forces

Fairlead 1	kN	375	145	161	1759
Fairlead 2	kN	632	261	192	1516
Fairlead 3	kN	136	14	105	225
Fairlead 4	kN	128	12	102	209
Fairlead 5	kN	74	7	61	99
Fairlead 6	kN	76	7	62	104
Fairlead 7	kN	488	133	194	1325
Fairlead 8	kN	1220	378	341	2431
Anchor 1	kN	324	133	127	1599
Anchor 2	kN	555	244	148	1389
Anchor 3	kN	81	14	51	164
Anchor 4	kN	73	11	48	149
Anchor 5	kN	39	7	27	64
Anchor 6	kN	41	7	28	69
Anchor 7	kN	418	124	145	1208
Anchor 8	kN	1116	361	287	2290

Case: 11

Return Period: 5	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.5
Hs, Penetrating wind sea [m]: 1.02	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 9.6	Vw [m/s]: 18.3
Dir., Penetrating wind sea [deg N]: 190.8	Wind Dir. [deg N]: 60
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.06
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 217
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.087	0.460	-2.414	0.230
FSU Sway	m	-4.707	0.781	-6.421	-3.071
FSU Yaw	deg	0.783	0.223	0.168	1.452

Mooring Forces

Fairlead 1	kN	473	167	215	1007
Fairlead 2	kN	716	243	284	1449
Fairlead 3	kN	118	5	105	148
Fairlead 4	kN	112	5	101	138
Fairlead 5	kN	77	6	65	96
Fairlead 6	kN	79	6	66	99
Fairlead 7	kN	429	74	265	718
Fairlead 8	kN	1011	276	518	1977
Anchor 1	kN	415	155	177	911
Anchor 2	kN	633	228	232	1326
Anchor 3	kN	63	5	50	91
Anchor 4	kN	57	5	46	82
Anchor 5	kN	42	6	30	60
Anchor 6	kN	44	6	32	64
Anchor 7	kN	363	69	211	633
Anchor 8	kN	916	262	452	1843

Case: 12

Return Period: 10	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.5
Hs, Penetrating wind sea [m]: 1.14	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 10.2	Vw [m/s]: 19.5
Dir., Penetrating wind sea [deg N]: 190.8	Wind Dir. [deg N]: 60
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.07
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 217
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.147	0.641	-2.678	0.769
FSU Sway	m	-4.895	1.033	-7.084	-2.522
FSU Yaw	deg	0.836	0.303	-0.206	1.634

Mooring Forces

Fairlead 1	kN	528	234	186	1367
Fairlead 2	kN	785	338	219	1915
Fairlead 3	kN	118	6	101	156
Fairlead 4	kN	112	6	97	145
Fairlead 5	kN	76	8	62	105
Fairlead 6	kN	79	9	64	109
Fairlead 7	kN	465	102	253	852
Fairlead 8	kN	1130	383	429	2245
Anchor 1	kN	466	218	150	1255
Anchor 2	kN	699	318	174	1775
Anchor 3	kN	63	6	46	99
Anchor 4	kN	57	6	43	89
Anchor 5	kN	41	8	28	70
Anchor 6	kN	44	9	29	74
Anchor 7	kN	397	95	200	758
Anchor 8	kN	1031	366	368	2107

Case: 13

Return Period: 25	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.5
Hs, Penetrating wind sea [m]: 1.3	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 10.9	Vw [m/s]: 21
Dir., Penetrating wind sea [deg N]: 190.8	Wind Dir. [deg N]: 60
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.07
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 217
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.226	0.775	-3.107	0.920
FSU Sway	m	-5.151	1.253	-7.696	-2.138
FSU Yaw	deg	0.902	0.365	-0.123	1.852

Mooring Forces

Fairlead 1	kN	601	299	153	1596
Fairlead 2	kN	875	421	184	2027
Fairlead 3	kN	118	8	100	157
Fairlead 4	kN	112	7	97	151
Fairlead 5	kN	75	9	60	105
Fairlead 6	kN	77	10	61	109
Fairlead 7	kN	518	143	211	1073
Fairlead 8	kN	1281	484	311	2450
Anchor 1	kN	534	279	120	1473
Anchor 2	kN	785	396	141	1884
Anchor 3	kN	63	8	46	100
Anchor 4	kN	57	7	42	95
Anchor 5	kN	40	9	25	69
Anchor 6	kN	42	10	26	74
Anchor 7	kN	446	134	161	969
Anchor 8	kN	1176	463	260	2308

Case: 14

Return Period: 50	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.5
Hs, Penetrating wind sea [m]: 1.42	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 11.4	Vw [m/s]: 22.1
Dir., Penetrating wind sea [deg N]: 190.8	Wind Dir. [deg N]: 60
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.08
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 217
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.282	0.879	-3.493	1.114
FSU Sway	m	-5.359	1.342	-8.032	-2.178
FSU Yaw	deg	0.948	0.422	-0.406	2.286

Mooring Forces

Fairlead 1	kN	655	341	152	1739
Fairlead 2	kN	942	469	175	2066
Fairlead 3	kN	118	9	93	156
Fairlead 4	kN	111	8	91	150
Fairlead 5	kN	74	10	58	111
Fairlead 6	kN	76	11	58	116
Fairlead 7	kN	560	167	225	1192
Fairlead 8	kN	1392	532	376	2689
Anchor 1	kN	585	318	118	1613
Anchor 2	kN	848	443	133	1922
Anchor 3	kN	63	8	39	99
Anchor 4	kN	56	7	37	94
Anchor 5	kN	39	10	23	75
Anchor 6	kN	41	11	24	81
Anchor 7	kN	486	157	174	1083
Anchor 8	kN	1283	511	320	2546

Case: 15

Return Period: 100	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10.5
Hs, Penetrating wind sea [m]: 1.53	Dir., Penetrating swell [deg N]: 194
Tp, Penetrating wind sea [s]: 11.8	Vw [m/s]: 23.1
Dir., Penetrating wind sea [deg N]: 190.8	Wind Dir. [deg N]: 60
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.08
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 217
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.315	1.017	-4.005	1.689
FSU Sway	m	-5.495	1.554	-8.517	-0.832
FSU Yaw	deg	0.993	0.485	-0.633	2.391

Mooring Forces

Fairlead 1	kN	718	417	138	2462
Fairlead 2	kN	1001	543	160	2381
Fairlead 3	kN	118	10	94	197
Fairlead 4	kN	111	9	92	173
Fairlead 5	kN	74	12	57	124
Fairlead 6	kN	76	13	57	129
Fairlead 7	kN	608	214	193	1767
Fairlead 8	kN	1497	610	265	3537
Anchor 1	kN	645	391	104	2312
Anchor 2	kN	905	513	117	2233
Anchor 3	kN	63	10	40	138
Anchor 4	kN	56	9	38	116
Anchor 5	kN	39	12	22	90
Anchor 6	kN	41	13	23	94
Anchor 7	kN	531	201	143	1635
Anchor 8	kN	1384	588	217	3391

Case: 16

Return Period: 5	Hs, Penetrating swell [m]: 0.54
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10
Hs, Penetrating wind sea [m]: 1.38	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.1	Vw [m/s]: 17.5
Dir., Penetrating wind sea [deg N]: 179	Wind Dir. [deg N]: 90
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.07
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 180
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.255	0.414	-1.247	0.897
FSU Sway	m	-5.183	1.082	-7.423	-2.785
FSU Yaw	deg	0.028	0.228	-0.698	0.625

Mooring Forces

Fairlead 1	kN	668	278	232	1561
Fairlead 2	kN	793	291	296	1701
Fairlead 3	kN	100	4	88	116
Fairlead 4	kN	95	5	84	112
Fairlead 5	kN	86	10	69	118
Fairlead 6	kN	89	10	71	122
Fairlead 7	kN	488	127	252	939
Fairlead 8	kN	962	363	344	2103
Anchor 1	kN	596	260	193	1441
Anchor 2	kN	706	273	244	1566
Anchor 3	kN	45	4	33	61
Anchor 4	kN	40	5	29	58
Anchor 5	kN	51	10	34	83
Anchor 6	kN	54	10	36	88
Anchor 7	kN	418	119	200	841
Anchor 8	kN	871	345	290	1965

Case: 17

Return Period: 10	Hs, Penetrating swell [m]: 0.54
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10
Hs, Penetrating wind sea [m]: 1.55	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.6	Vw [m/s]: 18.4
Dir., Penetrating wind sea [deg N]: 179	Wind Dir. [deg N]: 90
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.08
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 180
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.286	0.498	-1.516	1.214
FSU Sway	m	-5.408	1.159	-7.784	-2.565
FSU Yaw	deg	0.039	0.288	-0.838	0.911

Mooring Forces

Fairlead 1	kN	737	316	206	1848
Fairlead 2	kN	856	328	256	1905
Fairlead 3	kN	99	5	86	122
Fairlead 4	kN	94	5	82	116
Fairlead 5	kN	85	11	67	120
Fairlead 6	kN	88	11	69	125
Fairlead 7	kN	524	148	212	1053
Fairlead 8	kN	1053	415	282	2218
Anchor 1	kN	661	296	169	1715
Anchor 2	kN	766	309	208	1762
Anchor 3	kN	44	5	31	66
Anchor 4	kN	39	5	27	61
Anchor 5	kN	50	11	32	85
Anchor 6	kN	53	11	34	90
Anchor 7	kN	452	138	162	949
Anchor 8	kN	958	395	233	2080

Case: 18

Return Period: 25	Hs, Penetrating swell [m]: 0.54
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10
Hs, Penetrating wind sea [m]: 1.77	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 10.2	Vw [m/s]: 19.6
Dir., Penetrating wind sea [deg N]: 179	Wind Dir. [deg N]: 90
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.08
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 180
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.324	0.549	-2.152	1.258
FSU Sway	m	-5.666	1.287	-8.326	-2.549
FSU Yaw	deg	0.059	0.316	-0.958	1.240

Mooring Forces

Fairlead 1	kN	825	382	209	2085
Fairlead 2	kN	936	385	237	1953
Fairlead 3	kN	98	6	83	131
Fairlead 4	kN	93	6	79	126
Fairlead 5	kN	84	11	62	126
Fairlead 6	kN	87	12	64	133
Fairlead 7	kN	570	179	210	1212
Fairlead 8	kN	1167	488	274	2415
Anchor 1	kN	745	359	172	1939
Anchor 2	kN	841	364	190	1810
Anchor 3	kN	43	6	29	76
Anchor 4	kN	38	6	25	71
Anchor 5	kN	49	11	28	90
Anchor 6	kN	52	12	29	97
Anchor 7	kN	495	167	161	1102
Anchor 8	kN	1068	466	226	2275

Case: 19

Return Period: 50	Hs, Penetrating swell [m]: 0.54
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10
Hs, Penetrating wind sea [m]: 1.92	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 10.6	Vw [m/s]: 20.4
Dir., Penetrating wind sea [deg N]: 179	Wind Dir. [deg N]: 90
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.09
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 180
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.341	0.677	-2.286	2.196
FSU Sway	m	-5.778	1.512	-8.804	-1.504
FSU Yaw	deg	0.075	0.396	-1.140	1.180

Mooring Forces

Fairlead 1	kN	896	470	165	2502
Fairlead 2	kN	990	461	171	2243
Fairlead 3	kN	98	7	79	133
Fairlead 4	kN	93	7	77	130
Fairlead 5	kN	84	14	63	143
Fairlead 6	kN	87	14	65	156
Fairlead 7	kN	610	236	178	1698
Fairlead 8	kN	1245	585	206	2915
Anchor 1	kN	812	443	130	2351
Anchor 2	kN	894	435	128	2097
Anchor 3	kN	43	7	25	77
Anchor 4	kN	38	7	22	74
Anchor 5	kN	49	14	29	107
Anchor 6	kN	52	14	30	120
Anchor 7	kN	533	222	130	1565
Anchor 8	kN	1143	560	162	2767

Case: 20

Return Period: 100	Hs, Penetrating swell [m]: 0.54
FSU Draft: Loaded	Tp, Penetrating swell [s]: 10
Hs, Penetrating wind sea [m]: 2.08	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 11	Vw [m/s]: 21.1
Dir., Penetrating wind sea [deg N]: 179	Wind Dir. [deg N]: 90
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.09
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 180
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.364	0.789	-2.818	1.937
FSU Sway	m	-5.955	1.603	-8.981	-1.203
FSU Yaw	deg	0.087	0.483	-1.630	1.453

Mooring Forces

Fairlead 1	kN	961	516	154	2493
Fairlead 2	kN	1047	498	169	2309
Fairlead 3	kN	98	10	78	175
Fairlead 4	kN	93	9	76	172
Fairlead 5	kN	84	16	59	171
Fairlead 6	kN	87	17	61	183
Fairlead 7	kN	648	263	173	1674
Fairlead 8	kN	1322	631	201	2880
Anchor 1	kN	874	488	120	2340
Anchor 2	kN	948	471	126	2161
Anchor 3	kN	43	10	24	117
Anchor 4	kN	38	9	22	115
Anchor 5	kN	49	16	25	134
Anchor 6	kN	52	17	26	145
Anchor 7	kN	569	247	126	1543
Anchor 8	kN	1217	605	158	2735

Case: 21

Return Period: 5	Hs, Penetrating swell [m]: 0.49
FSU Draft: Loaded	Tp, Penetrating swell [s]: 8.8
Hs, Penetrating wind sea [m]: 1.91	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 8.9	Vw [m/s]: 17.3
Dir., Penetrating wind sea [deg N]: 180	Wind Dir. [deg N]: 120
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.12
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 160
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.535	0.428	-0.849	1.813
FSU Sway	m	-5.217	0.914	-7.225	-3.146
FSU Yaw	deg	-0.636	0.295	-1.510	0.415

Mooring Forces

Fairlead 1	kN	744	257	304	1642
Fairlead 2	kN	752	211	332	1401
Fairlead 3	kN	90	5	78	117
Fairlead 4	kN	86	5	75	112
Fairlead 5	kN	100	12	74	145
Fairlead 6	kN	104	12	77	156
Fairlead 7	kN	507	142	205	1103
Fairlead 8	kN	806	286	247	1864
Anchor 1	kN	667	240	259	1518
Anchor 2	kN	666	198	277	1280
Anchor 3	kN	35	5	23	62
Anchor 4	kN	32	5	21	57
Anchor 5	kN	65	12	40	110
Anchor 6	kN	69	12	42	120
Anchor 7	kN	436	133	155	997
Anchor 8	kN	723	271	200	1734

Case: 22

Return Period: 10	Hs, Penetrating swell [m]: 0.49
FSU Draft: Loaded	Tp, Penetrating swell [s]: 8.8
Hs, Penetrating wind sea [m]: 2.06	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.3	Vw [m/s]: 18.1
Dir., Penetrating wind sea [deg N]: 180	Wind Dir. [deg N]: 120
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.12
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 160
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.542	0.532	-1.390	2.348
FSU Sway	m	-5.383	1.078	-7.661	-2.775
FSU Yaw	deg	-0.652	0.364	-1.963	0.648

Mooring Forces

Fairlead 1	kN	813	314	248	1859
Fairlead 2	kN	802	259	317	1804
Fairlead 3	kN	89	6	75	121
Fairlead 4	kN	86	6	73	116
Fairlead 5	kN	100	15	71	165
Fairlead 6	kN	104	16	73	178
Fairlead 7	kN	541	174	175	1242
Fairlead 8	kN	870	353	208	2123
Anchor 1	kN	733	295	208	1725
Anchor 2	kN	714	244	264	1665
Anchor 3	kN	34	6	21	66
Anchor 4	kN	31	6	19	61
Anchor 5	kN	65	15	36	128
Anchor 6	kN	69	16	38	140
Anchor 7	kN	468	163	127	1128
Anchor 8	kN	784	335	164	1986

Case: 23

Return Period: 25	Hs, Penetrating swell [m]: 0.49
FSU Draft: Loaded	Tp, Penetrating swell [s]: 8.8
Hs, Penetrating wind sea [m]: 2.25	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.7	Vw [m/s]: 19.1
Dir., Penetrating wind sea [deg N]: 180	Wind Dir. [deg N]: 120
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.13
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 160
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.543	0.619	-1.672	2.339
FSU Sway	m	-5.620	1.101	-7.977	-3.099
FSU Yaw	deg	-0.667	0.424	-2.010	1.069

Mooring Forces

Fairlead 1	kN	898	354	255	2304
Fairlead 2	kN	864	285	298	1899
Fairlead 3	kN	88	7	72	120
Fairlead 4	kN	85	6	70	113
Fairlead 5	kN	99	17	70	203
Fairlead 6	kN	103	18	72	226
Fairlead 7	kN	582	202	182	1570
Fairlead 8	kN	948	391	238	2239
Anchor 1	kN	812	334	216	2155
Anchor 2	kN	773	268	247	1758
Anchor 3	kN	33	7	18	65
Anchor 4	kN	30	6	16	58
Anchor 5	kN	64	17	35	165
Anchor 6	kN	68	18	37	186
Anchor 7	kN	506	189	134	1443
Anchor 8	kN	858	371	192	2098

Case: 24

Return Period: 50	Hs, Penetrating swell [m]: 0.49
FSU Draft: Loaded	Tp, Penetrating swell [s]: 8.8
Hs, Penetrating wind sea [m]: 2.39	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 10	Vw [m/s]: 19.8
Dir., Penetrating wind sea [deg N]: 180	Wind Dir. [deg N]: 120
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.14
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 160
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.525	0.690	-2.027	2.804
FSU Sway	m	-5.752	1.197	-8.354	-2.744
FSU Yaw	deg	-0.664	0.473	-2.262	1.361

Mooring Forces

Fairlead 1	kN	961	405	206	2355
Fairlead 2	kN	909	320	215	1921
Fairlead 3	kN	88	9	71	170
Fairlead 4	kN	84	8	69	157
Fairlead 5	kN	98	18	67	233
Fairlead 6	kN	103	20	69	279
Fairlead 7	kN	612	233	189	1594
Fairlead 8	kN	1004	441	189	2309
Anchor 1	kN	872	383	169	2207
Anchor 2	kN	816	302	169	1778
Anchor 3	kN	33	8	17	113
Anchor 4	kN	30	8	15	101
Anchor 5	kN	63	18	32	193
Anchor 6	kN	68	20	34	236
Anchor 7	kN	535	218	140	1468
Anchor 8	kN	912	419	146	2169

Case: 25

Return Period: 100	Hs, Penetrating swell [m]: 0.49
FSU Draft: Loaded	Tp, Penetrating swell [s]: 8.8
Hs, Penetrating wind sea [m]: 2.52	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 10.3	Vw [m/s]: 20.4
Dir., Penetrating wind sea [deg N]: 180	Wind Dir. [deg N]: 120
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.14
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 160
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.508	0.837	-2.734	2.887
FSU Sway	m	-5.838	1.335	-8.571	-1.980
FSU Yaw	deg	-0.660	0.569	-2.659	1.467

Mooring Forces

Fairlead 1	kN	1024	474	181	2579
Fairlead 2	kN	953	380	197	2103
Fairlead 3	kN	88	9	71	148
Fairlead 4	kN	85	9	68	138
Fairlead 5	kN	99	23	62	390
Fairlead 6	kN	104	27	64	455
Fairlead 7	kN	645	283	146	2029
Fairlead 8	kN	1059	512	163	2808
Anchor 1	kN	933	449	146	2424
Anchor 2	kN	858	359	153	1956
Anchor 3	kN	33	9	16	91
Anchor 4	kN	30	9	14	82
Anchor 5	kN	64	23	27	340
Anchor 6	kN	69	26	28	399
Anchor 7	kN	566	266	99	1887
Anchor 8	kN	965	488	121	2666

Case: 26

Return Period: 5	Hs, Penetrating swell [m]: 0.34
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.3
Hs, Penetrating wind sea [m]: 2.32	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.2	Vw [m/s]: 18
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 150
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.07
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 171
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.130	0.611	-2.448	1.505
FSU Sway	m	-3.755	0.864	-5.643	0.218
FSU Yaw	deg	-0.270	0.418	-1.394	1.155

Mooring Forces

Fairlead 1	kN	460	154	143	1785
Fairlead 2	kN	586	166	180	1330
Fairlead 3	kN	105	14	82	242
Fairlead 4	kN	101	13	79	231
Fairlead 5	kN	101	13	74	155
Fairlead 6	kN	104	13	75	159
Fairlead 7	kN	293	88	117	799
Fairlead 8	kN	450	183	128	1371
Anchor 1	kN	403	142	109	1627
Anchor 2	kN	512	154	136	1213
Anchor 3	kN	50	13	27	179
Anchor 4	kN	46	12	25	170
Anchor 5	kN	66	13	39	118
Anchor 6	kN	69	13	40	123
Anchor 7	kN	237	82	71	709
Anchor 8	kN	389	171	87	1258

Case: 27

Return Period: 10	Hs, Penetrating swell [m]: 0.34
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.3
Hs, Penetrating wind sea [m]: 2.51	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.7	Vw [m/s]: 19
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 150
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.07
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 171
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.182	0.733	-3.681	2.578
FSU Sway	m	-3.869	1.004	-6.444	-0.297
FSU Yaw	deg	-0.260	0.507	-1.800	1.837

Mooring Forces

Fairlead 1	kN	504	201	154	1790
Fairlead 2	kN	630	209	181	1599
Fairlead 3	kN	106	16	77	234
Fairlead 4	kN	101	14	75	209
Fairlead 5	kN	101	16	68	195
Fairlead 6	kN	104	17	69	219
Fairlead 7	kN	306	112	103	1176
Fairlead 8	kN	483	227	105	2097
Anchor 1	kN	443	186	119	1633
Anchor 2	kN	553	195	137	1468
Anchor 3	kN	51	16	23	172
Anchor 4	kN	46	14	21	150
Anchor 5	kN	66	16	33	157
Anchor 6	kN	69	17	35	180
Anchor 7	kN	249	104	57	1065
Anchor 8	kN	419	212	64	1958

Case: 28

Return Period: 25	Hs, Penetrating swell [m]: 0.34
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.3
Hs, Penetrating wind sea [m]: 2.74	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 10.2	Vw [m/s]: 20.2
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 150
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.07
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 171
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.239	1.030	-3.470	2.477
FSU Sway	m	-4.040	1.041	-6.916	-0.383
FSU Yaw	deg	-0.247	0.701	-2.413	2.376

Mooring Forces

Fairlead 1	kN	563	251	156	2160
Fairlead 2	kN	688	255	196	1705
Fairlead 3	kN	108	26	76	383
Fairlead 4	kN	103	23	74	349
Fairlead 5	kN	101	21	63	377
Fairlead 6	kN	104	23	64	420
Fairlead 7	kN	330	151	117	1385
Fairlead 8	kN	526	272	121	2074
Anchor 1	kN	498	233	122	2014
Anchor 2	kN	608	239	152	1571
Anchor 3	kN	53	26	22	307
Anchor 4	kN	48	22	20	276
Anchor 5	kN	66	21	28	327
Anchor 6	kN	69	23	29	367
Anchor 7	kN	272	141	71	1267
Anchor 8	kN	460	255	81	1937

Case: 29

Return Period: 50	Hs, Penetrating swell [m]: 0.34
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.3
Hs, Penetrating wind sea [m]: 2.92	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 10.6	Vw [m/s]: 21.1
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 150
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.08
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 171
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.299	1.138	-4.739	3.699
FSU Sway	m	-3.956	1.390	-8.004	1.413
FSU Yaw	deg	-0.232	0.762	-2.219	2.436

Mooring Forces

Fairlead 1	kN	615	340	104	2503
Fairlead 2	kN	729	332	114	2400
Fairlead 3	kN	112	37	71	566
Fairlead 4	kN	107	36	69	623
Fairlead 5	kN	102	26	64	344
Fairlead 6	kN	105	28	65	419
Fairlead 7	kN	351	212	76	2318
Fairlead 8	kN	559	351	77	2445
Anchor 1	kN	547	317	72	2350
Anchor 2	kN	646	312	73	2249
Anchor 3	kN	57	35	17	476
Anchor 4	kN	52	34	15	528
Anchor 5	kN	67	26	29	295
Anchor 6	kN	70	27	31	366
Anchor 7	kN	291	199	31	2168
Anchor 8	kN	491	331	37	2302

Case: 30

Return Period: 100	Hs, Penetrating swell [m]: 0.34
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.3
Hs, Penetrating wind sea [m]: 3.08	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 11	Vw [m/s]: 21.9
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 150
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.08
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 171
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.324	1.238	-5.048	3.340
FSU Sway	m	-4.134	1.205	-6.982	-0.272
FSU Yaw	deg	-0.220	0.833	-2.741	3.003

Mooring Forces

Fairlead 1	kN	651	368	108	2485
Fairlead 2	kN	774	376	122	2508
Fairlead 3	kN	113	45	69	734
Fairlead 4	kN	106	37	67	668
Fairlead 5	kN	101	31	61	530
Fairlead 6	kN	104	32	62	693
Fairlead 7	kN	368	219	89	1817
Fairlead 8	kN	589	377	86	2489
Anchor 1	kN	581	344	76	2337
Anchor 2	kN	689	353	83	2362
Anchor 3	kN	57	42	16	629
Anchor 4	kN	51	35	14	569
Anchor 5	kN	66	30	26	468
Anchor 6	kN	69	31	27	621
Anchor 7	kN	307	205	43	1681
Anchor 8	kN	519	355	47	2346

Case: 31

Return Period: 5	Hs, Penetrating swell [m]: 0.37
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.1
Hs, Penetrating wind sea [m]: 2.22	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 8.3	Vw [m/s]: 16.4
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 180
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.05
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 158
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.166	0.472	-2.890	0.471
FSU Sway	m	-0.272	0.160	-0.831	0.267
FSU Yaw	deg	0.314	0.269	-0.552	1.264

Mooring Forces

Fairlead 1	kN	194	18	142	304
Fairlead 2	kN	304	61	170	715
Fairlead 3	kN	184	29	122	358
Fairlead 4	kN	176	25	119	333
Fairlead 5	kN	114	9	90	156
Fairlead 6	kN	113	9	90	155
Fairlead 7	kN	149	12	114	220
Fairlead 8	kN	166	16	125	251
Anchor 1	kN	157	17	108	259
Anchor 2	kN	250	56	127	630
Anchor 3	kN	126	27	67	286
Anchor 4	kN	119	23	64	263
Anchor 5	kN	79	9	56	120
Anchor 6	kN	78	9	56	119
Anchor 7	kN	101	12	67	169
Anchor 8	kN	124	15	84	203

Case: 32

Return Period: 10	Hs, Penetrating swell [m]: 0.37
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.1
Hs, Penetrating wind sea [m]: 2.4	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 8.6	Vw [m/s]: 17.3
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 180
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.05
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 158
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.260	0.611	-3.001	0.567
FSU Sway	m	-0.280	0.223	-0.993	0.217
FSU Yaw	deg	0.329	0.331	-0.764	1.476

Mooring Forces

Fairlead 1	kN	199	24	142	340
Fairlead 2	kN	322	83	171	734
Fairlead 3	kN	192	45	112	484
Fairlead 4	kN	182	37	109	407
Fairlead 5	kN	114	12	83	170
Fairlead 6	kN	113	12	83	171
Fairlead 7	kN	148	15	110	213
Fairlead 8	kN	165	19	119	258
Anchor 1	kN	161	22	108	290
Anchor 2	kN	267	76	128	648
Anchor 3	kN	134	41	58	402
Anchor 4	kN	124	34	55	331
Anchor 5	kN	79	12	49	133
Anchor 6	kN	78	12	49	134
Anchor 7	kN	100	14	64	162
Anchor 8	kN	122	18	78	209

Case: 33

Return Period: 25	Hs, Penetrating swell [m]: 0.37
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.1
Hs, Penetrating wind sea [m]: 2.63	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 8.9	Vw [m/s]: 18.4
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 180
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.06
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 158
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.363	0.762	-3.728	1.595
FSU Sway	m	-0.276	0.351	-1.524	0.568
FSU Yaw	deg	0.343	0.401	-1.001	1.929

Mooring Forces

Fairlead 1	kN	206	36	125	461
Fairlead 2	kN	348	116	145	978
Fairlead 3	kN	204	63	103	640
Fairlead 4	kN	191	51	101	571
Fairlead 5	kN	113	15	76	215
Fairlead 6	kN	112	15	77	220
Fairlead 7	kN	147	20	106	292
Fairlead 8	kN	165	26	111	316
Anchor 1	kN	168	33	92	402
Anchor 2	kN	291	107	103	877
Anchor 3	kN	145	58	49	546
Anchor 4	kN	133	48	47	483
Anchor 5	kN	79	15	41	176
Anchor 6	kN	77	15	42	181
Anchor 7	kN	99	19	60	235
Anchor 8	kN	122	25	71	263

Case: 34

Return Period: 50	Hs, Penetrating swell [m]: 0.37
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.1
Hs, Penetrating wind sea [m]: 2.79	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.2	Vw [m/s]: 19.2
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 180
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.06
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 158
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.452	0.796	-3.679	1.145
FSU Sway	m	-0.264	0.419	-1.716	1.039
FSU Yaw	deg	0.360	0.445	-1.121	1.894

Mooring Forces

Fairlead 1	kN	212	44	130	470
Fairlead 2	kN	367	138	154	1027
Fairlead 3	kN	213	73	107	760
Fairlead 4	kN	198	60	105	660
Fairlead 5	kN	113	16	74	241
Fairlead 6	kN	112	16	74	241
Fairlead 7	kN	145	21	100	263
Fairlead 8	kN	164	29	106	330
Anchor 1	kN	173	41	97	410
Anchor 2	kN	309	128	112	922
Anchor 3	kN	153	68	52	655
Anchor 4	kN	139	56	51	563
Anchor 5	kN	78	16	40	200
Anchor 6	kN	77	16	40	201
Anchor 7	kN	98	20	54	208
Anchor 8	kN	121	27	66	276

Case: 35

Return Period: 100	Hs, Penetrating swell [m]: 0.37
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.1
Hs, Penetrating wind sea [m]: 2.95	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.4	Vw [m/s]: 20
Dir., Penetrating wind sea [deg N]: 181	Wind Dir. [deg N]: 180
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.06
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 158
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.502	0.921	-4.059	1.361
FSU Sway	m	-0.274	0.502	-1.897	1.174
FSU Yaw	deg	0.361	0.494	-1.292	1.998

Mooring Forces

Fairlead 1	kN	218	55	119	544
Fairlead 2	kN	388	165	134	1207
Fairlead 3	kN	224	93	98	844
Fairlead 4	kN	206	75	96	709
Fairlead 5	kN	114	20	71	265
Fairlead 6	kN	112	20	71	276
Fairlead 7	kN	145	25	97	319
Fairlead 8	kN	165	35	99	430
Anchor 1	kN	180	51	86	478
Anchor 2	kN	328	153	93	1093
Anchor 3	kN	163	85	44	736
Anchor 4	kN	146	69	42	610
Anchor 5	kN	79	19	36	222
Anchor 6	kN	77	19	36	233
Anchor 7	kN	98	24	51	259
Anchor 8	kN	122	33	59	368

Case: 36

Return Period: 5	Hs, Penetrating swell [m]: 0.53
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 1.83	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 8.3	Vw [m/s]: 16
Dir., Penetrating wind sea [deg N]: 184	Wind Dir. [deg N]: 210
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.17
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 359
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.527	0.402	-1.579	0.747
FSU Sway	m	2.643	0.412	1.443	3.628
FSU Yaw	deg	0.150	0.184	-0.398	0.667

Mooring Forces

Fairlead 1	kN	135	10	111	181
Fairlead 2	kN	172	20	128	285
Fairlead 3	kN	317	52	199	566
Fairlead 4	kN	348	63	206	686
Fairlead 5	kN	208	40	134	441
Fairlead 6	kN	191	28	132	356
Fairlead 7	kN	129	12	103	181
Fairlead 8	kN	128	13	101	187
Anchor 1	kN	100	10	77	145
Anchor 2	kN	128	18	86	233
Anchor 3	kN	249	47	141	477
Anchor 4	kN	278	57	148	588
Anchor 5	kN	170	38	100	388
Anchor 6	kN	154	27	98	308
Anchor 7	kN	82	12	57	132
Anchor 8	kN	87	12	60	142

Case: 37

Return Period: 10	Hs, Penetrating swell [m]: 0.53
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 2.01	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 8.8	Vw [m/s]: 17.1
Dir., Penetrating wind sea [deg N]: 184	Wind Dir. [deg N]: 210
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.18
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 359
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.632	0.477	-2.139	0.833
FSU Sway	m	2.798	0.543	1.327	4.244
FSU Yaw	deg	0.129	0.230	-0.607	0.791

Mooring Forces

Fairlead 1	kN	136	12	107	193
Fairlead 2	kN	176	26	125	336
Fairlead 3	kN	348	73	193	668
Fairlead 4	kN	383	89	195	811
Fairlead 5	kN	225	62	127	509
Fairlead 6	kN	201	42	125	413
Fairlead 7	kN	126	14	98	203
Fairlead 8	kN	125	15	96	210
Anchor 1	kN	101	12	74	156
Anchor 2	kN	131	24	84	279
Anchor 3	kN	278	67	135	570
Anchor 4	kN	310	82	137	705
Anchor 5	kN	186	58	92	451
Anchor 6	kN	163	40	90	361
Anchor 7	kN	79	13	51	153
Anchor 8	kN	84	14	55	165

Case: 38

Return Period: 25	Hs, Penetrating swell [m]: 0.53
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 2.24	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.4	Vw [m/s]: 18.5
Dir., Penetrating wind sea [deg N]: 184	Wind Dir. [deg N]: 210
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.2
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 359
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.710	0.728	-3.053	1.407
FSU Sway	m	3.029	0.538	1.530	4.398
FSU Yaw	deg	0.094	0.302	-0.804	1.143

Mooring Forces

Fairlead 1	kN	137	19	99	247
Fairlead 2	kN	183	50	112	598
Fairlead 3	kN	392	107	181	857
Fairlead 4	kN	434	127	192	1023
Fairlead 5	kN	249	82	122	777
Fairlead 6	kN	216	56	122	639
Fairlead 7	kN	124	19	87	266
Fairlead 8	kN	122	19	86	271
Anchor 1	kN	103	18	65	206
Anchor 2	kN	138	47	71	520
Anchor 3	kN	318	98	124	746
Anchor 4	kN	357	117	135	905
Anchor 5	kN	209	77	87	701
Anchor 6	kN	177	52	87	572
Anchor 7	kN	77	18	40	211
Anchor 8	kN	81	18	45	221

Case: 39

Return Period: 50	Hs, Penetrating swell [m]: 0.53
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 2.42	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 9.9	Vw [m/s]: 19.6
Dir., Penetrating wind sea [deg N]: 184	Wind Dir. [deg N]: 210
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.21
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 359
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.804	0.882	-3.507	2.322
FSU Sway	m	3.171	0.645	0.888	4.817
FSU Yaw	deg	0.080	0.360	-1.031	1.297

Mooring Forces

Fairlead 1	kN	139	25	91	347
Fairlead 2	kN	192	72	100	892
Fairlead 3	kN	429	128	191	1068
Fairlead 4	kN	474	146	190	1087
Fairlead 5	kN	271	102	108	818
Fairlead 6	kN	227	65	108	605
Fairlead 7	kN	123	23	80	333
Fairlead 8	kN	121	24	80	281
Anchor 1	kN	105	24	58	296
Anchor 2	kN	147	66	59	794
Anchor 3	kN	352	118	134	943
Anchor 4	kN	394	134	133	961
Anchor 5	kN	229	95	74	741
Anchor 6	kN	188	61	74	539
Anchor 7	kN	76	23	35	273
Anchor 8	kN	80	23	39	230

Case: 40

Return Period: 100	Hs, Penetrating swell [m]: 0.53
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 2.61	Dir., Penetrating swell [deg N]: 192
Tp, Penetrating wind sea [s]: 10.3	Vw [m/s]: 20.7
Dir., Penetrating wind sea [deg N]: 184	Wind Dir. [deg N]: 210
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.22
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 359
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.853	1.046	-4.091	3.066
FSU Sway	m	3.364	0.617	1.669	5.129
FSU Yaw	deg	0.060	0.353	-0.989	1.237

Mooring Forces

Fairlead 1	kN	141	32	85	415
Fairlead 2	kN	203	101	93	1114
Fairlead 3	kN	465	133	191	1124
Fairlead 4	kN	518	161	212	1428
Fairlead 5	kN	291	116	119	917
Fairlead 6	kN	242	80	114	741
Fairlead 7	kN	122	32	79	685
Fairlead 8	kN	119	28	78	552
Anchor 1	kN	106	31	52	360
Anchor 2	kN	156	94	52	1006
Anchor 3	kN	385	122	134	996
Anchor 4	kN	435	149	153	1288
Anchor 5	kN	248	108	85	833
Anchor 6	kN	202	75	80	667
Anchor 7	kN	75	31	33	601
Anchor 8	kN	78	27	37	482

Case: 41

Return Period: 5	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.9
Hs, Penetrating wind sea [m]: 1.62	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 8.8	Vw [m/s]: 17.8
Dir., Penetrating wind sea [deg N]: 192	Wind Dir. [deg N]: 240
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.16
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 340
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.531	0.469	-1.156	1.799
FSU Sway	m	4.271	0.558	1.998	5.506
FSU Yaw	deg	0.287	0.153	-0.269	0.806

Mooring Forces

Fairlead 1	kN	108	7	92	147
Fairlead 2	kN	127	11	103	196
Fairlead 3	kN	499	123	198	996
Fairlead 4	kN	678	173	221	1254
Fairlead 5	kN	463	134	162	1029
Fairlead 6	kN	403	100	158	839
Fairlead 7	kN	140	17	104	227
Fairlead 8	kN	132	15	99	208
Anchor 1	kN	75	7	58	112
Anchor 2	kN	85	11	62	151
Anchor 3	kN	416	113	140	878
Anchor 4	kN	582	161	161	1123
Anchor 5	kN	408	126	127	941
Anchor 6	kN	352	93	123	759
Anchor 7	kN	93	16	57	175
Anchor 8	kN	91	14	58	162

Case: 42

Return Period: 10	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.9
Hs, Penetrating wind sea [m]: 1.73	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 9.2	Vw [m/s]: 18.8
Dir., Penetrating wind sea [deg N]: 192	Wind Dir. [deg N]: 240
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.17
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 340
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.552	0.544	-1.155	2.168
FSU Sway	m	4.445	0.544	2.173	5.626
FSU Yaw	deg	0.299	0.172	-0.299	0.808

Mooring Forces

Fairlead 1	kN	107	7	91	147
Fairlead 2	kN	126	13	101	199
Fairlead 3	kN	540	130	202	1033
Fairlead 4	kN	741	184	225	1364
Fairlead 5	kN	503	142	177	1107
Fairlead 6	kN	435	109	176	835
Fairlead 7	kN	140	19	102	237
Fairlead 8	kN	132	16	98	204
Anchor 1	kN	74	7	57	111
Anchor 2	kN	84	12	60	153
Anchor 3	kN	454	120	144	913
Anchor 4	kN	641	172	165	1228
Anchor 5	kN	446	133	141	1015
Anchor 6	kN	382	101	140	755
Anchor 7	kN	93	18	56	184
Anchor 8	kN	90	16	57	159

Case: 43

Return Period: 25	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.9
Hs, Penetrating wind sea [m]: 1.88	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 9.7	Vw [m/s]: 19.9
Dir., Penetrating wind sea [deg N]: 192	Wind Dir. [deg N]: 240
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.18
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 340
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.560	0.684	-2.187	2.682
FSU Sway	m	4.632	0.594	2.254	5.947
FSU Yaw	deg	0.310	0.219	-0.460	1.064

Mooring Forces

Fairlead 1	kN	107	9	84	172
Fairlead 2	kN	126	16	93	291
Fairlead 3	kN	594	156	205	1230
Fairlead 4	kN	822	223	231	1728
Fairlead 5	kN	556	173	170	1421
Fairlead 6	kN	477	136	165	1048
Fairlead 7	kN	141	25	93	348
Fairlead 8	kN	131	21	91	274
Anchor 1	kN	73	9	51	136
Anchor 2	kN	84	16	52	238
Anchor 3	kN	504	144	147	1098
Anchor 4	kN	717	209	172	1573
Anchor 5	kN	496	162	135	1315
Anchor 6	kN	422	127	130	958
Anchor 7	kN	93	24	47	287
Anchor 8	kN	90	20	50	224

Case: 44

Return Period: 50	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.9
Hs, Penetrating wind sea [m]: 1.97	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 10	Vw [m/s]: 20.7
Dir., Penetrating wind sea [deg N]: 192	Wind Dir. [deg N]: 240
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.18
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 340
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.555	0.797	-2.304	2.961
FSU Sway	m	4.753	0.646	1.986	6.266
FSU Yaw	deg	0.316	0.252	-0.596	1.058

Mooring Forces

Fairlead 1	kN	106	11	83	175
Fairlead 2	kN	126	20	91	303
Fairlead 3	kN	634	182	211	1340
Fairlead 4	kN	881	262	226	1880
Fairlead 5	kN	596	202	166	1375
Fairlead 6	kN	508	161	164	1096
Fairlead 7	kN	141	29	88	451
Fairlead 8	kN	131	23	86	346
Anchor 1	kN	73	11	49	139
Anchor 2	kN	84	19	50	250
Anchor 3	kN	541	169	153	1203
Anchor 4	kN	773	245	167	1722
Anchor 5	kN	533	190	130	1271
Anchor 6	kN	451	150	128	1005
Anchor 7	kN	93	28	42	383
Anchor 8	kN	89	22	45	290

Case: 45

Return Period: 100	Hs, Penetrating swell [m]: 0.59
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.9
Hs, Penetrating wind sea [m]: 2.07	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 10.3	Vw [m/s]: 21.4
Dir., Penetrating wind sea [deg N]: 192	Wind Dir. [deg N]: 240
Hs, Local wind sea [m]: 0	Vc [m/s]: 0.19
Tp, Local wind sea [s]: 0	Current Dir. [deg N]: 340
Dir., Local wind sea [deg N]: 0	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.563	0.847	-2.303	2.912
FSU Sway	m	4.874	0.672	2.164	6.264
FSU Yaw	deg	0.323	0.264	-0.653	1.140

Mooring Forces

Fairlead 1	kN	106	11	81	177
Fairlead 2	kN	125	21	89	307
Fairlead 3	kN	673	201	207	1354
Fairlead 4	kN	938	285	221	1917
Fairlead 5	kN	635	220	168	1444
Fairlead 6	kN	537	174	163	1224
Fairlead 7	kN	141	32	88	394
Fairlead 8	kN	131	25	85	309
Anchor 1	kN	72	11	48	140
Anchor 2	kN	83	20	49	253
Anchor 3	kN	578	187	149	1219
Anchor 4	kN	827	268	162	1758
Anchor 5	kN	570	207	133	1338
Anchor 6	kN	478	163	128	1126
Anchor 7	kN	94	31	41	331
Anchor 8	kN	89	24	44	256

Case: 46

Return Period: 5	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.7
Hs, Penetrating wind sea [m]: 1.18	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 10.5	Vw [m/s]: 21.3
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 270
Hs, Local wind sea [m]: 0.74	Vc [m/s]: 0.18
Tp, Local wind sea [s]: 2.71	Current Dir. [deg N]: 329
Dir., Local wind sea [deg N]: 269	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.099	0.292	-0.872	1.044
FSU Sway	m	4.854	0.665	2.392	6.195
FSU Yaw	deg	0.047	0.104	-0.307	0.392

Mooring Forces

Fairlead 1	kN	112	5	100	129
Fairlead 2	kN	133	7	115	167
Fairlead 3	kN	628	199	204	1264
Fairlead 4	kN	822	270	223	1629
Fairlead 5	kN	769	223	215	1504
Fairlead 6	kN	598	154	209	1125
Fairlead 7	kN	121	9	102	170
Fairlead 8	kN	114	8	97	162
Anchor 1	kN	78	5	66	94
Anchor 2	kN	91	7	73	123
Anchor 3	kN	536	185	145	1132
Anchor 4	kN	718	253	164	1482
Anchor 5	kN	696	211	177	1394
Anchor 6	kN	535	145	171	1032
Anchor 7	kN	74	8	55	121
Anchor 8	kN	73	8	56	119

Case: 47

Return Period: 10	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.7
Hs, Penetrating wind sea [m]: 1.3	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 11.1	Vw [m/s]: 22.4
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 270
Hs, Local wind sea [m]: 0.78	Vc [m/s]: 0.19
Tp, Local wind sea [s]: 2.76	Current Dir. [deg N]: 329
Dir., Local wind sea [deg N]: 269	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.083	0.368	-1.133	1.605
FSU Sway	m	5.031	0.692	2.414	6.356
FSU Yaw	deg	0.048	0.118	-0.358	0.397

Mooring Forces

Fairlead 1	kN	111	5	97	135
Fairlead 2	kN	133	9	110	172
Fairlead 3	kN	684	223	198	1414
Fairlead 4	kN	899	301	219	1825
Fairlead 5	kN	843	248	217	1717
Fairlead 6	kN	649	170	209	1296
Fairlead 7	kN	120	10	98	211
Fairlead 8	kN	113	10	93	197
Anchor 1	kN	77	5	63	100
Anchor 2	kN	91	9	69	127
Anchor 3	kN	588	208	141	1277
Anchor 4	kN	791	283	160	1668
Anchor 5	kN	766	235	180	1600
Anchor 6	kN	583	160	171	1196
Anchor 7	kN	73	10	51	160
Anchor 8	kN	72	9	52	152

Case: 48

Return Period: 25	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.7
Hs, Penetrating wind sea [m]: 1.43	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 11.8	Vw [m/s]: 23.6
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 270
Hs, Local wind sea [m]: 0.83	Vc [m/s]: 0.2
Tp, Local wind sea [s]: 2.82	Current Dir. [deg N]: 329
Dir., Local wind sea [deg N]: 269	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.063	0.458	-1.453	1.396
FSU Sway	m	5.219	0.716	2.741	6.766
FSU Yaw	deg	0.049	0.146	-0.427	0.499

Mooring Forces

Fairlead 1	kN	110	7	94	142
Fairlead 2	kN	132	12	107	188
Fairlead 3	kN	748	256	199	1622
Fairlead 4	kN	988	346	227	2072
Fairlead 5	kN	929	286	259	1840
Fairlead 6	kN	709	198	230	1386
Fairlead 7	kN	119	11	93	177
Fairlead 8	kN	112	10	88	167
Anchor 1	kN	76	7	61	106
Anchor 2	kN	90	11	66	142
Anchor 3	kN	648	239	142	1475
Anchor 4	kN	875	326	168	1909
Anchor 5	kN	848	272	218	1719
Anchor 6	kN	639	186	191	1282
Anchor 7	kN	72	11	46	128
Anchor 8	kN	71	10	47	123

Case: 49

Return Period: 50	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.7
Hs, Penetrating wind sea [m]: 1.53	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 12.3	Vw [m/s]: 24.5
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 270
Hs, Local wind sea [m]: 0.87	Vc [m/s]: 0.2
Tp, Local wind sea [s]: 2.86	Current Dir. [deg N]: 329
Dir., Local wind sea [deg N]: 269	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.055	0.519	-1.580	1.870
FSU Sway	m	5.355	0.738	3.002	7.205
FSU Yaw	deg	0.052	0.172	-0.491	0.551

Mooring Forces

Fairlead 1	kN	110	8	93	145
Fairlead 2	kN	132	13	105	204
Fairlead 3	kN	798	282	211	1864
Fairlead 4	kN	1058	382	229	2361
Fairlead 5	kN	995	321	278	2075
Fairlead 6	kN	756	225	258	1725
Fairlead 7	kN	118	12	93	181
Fairlead 8	kN	111	10	89	166
Anchor 1	kN	76	8	59	110
Anchor 2	kN	90	13	64	158
Anchor 3	kN	695	264	153	1705
Anchor 4	kN	942	361	170	2191
Anchor 5	kN	911	306	237	1951
Anchor 6	kN	684	212	218	1610
Anchor 7	kN	71	12	46	132
Anchor 8	kN	70	10	48	123

Case: 50

Return Period: 100	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.7
Hs, Penetrating wind sea [m]: 1.63	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 12.8	Vw [m/s]: 25.4
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 270
Hs, Local wind sea [m]: 0.91	Vc [m/s]: 0.21
Tp, Local wind sea [s]: 2.9	Current Dir. [deg N]: 329
Dir., Local wind sea [deg N]: 269	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.031	0.728	-2.439	2.061
FSU Sway	m	5.476	0.771	3.076	7.432
FSU Yaw	deg	0.053	0.244	-0.905	1.068

Mooring Forces

Fairlead 1	kN	110	10	87	168
Fairlead 2	kN	133	19	97	244
Fairlead 3	kN	853	318	203	2097
Fairlead 4	kN	1130	423	202	2410
Fairlead 5	kN	1066	373	221	2112
Fairlead 6	kN	804	267	196	1952
Fairlead 7	kN	119	16	84	234
Fairlead 8	kN	111	14	80	207
Anchor 1	kN	76	10	53	132
Anchor 2	kN	91	18	56	194
Anchor 3	kN	747	298	145	1935
Anchor 4	kN	1010	401	145	2241
Anchor 5	kN	979	356	182	1987
Anchor 6	kN	730	253	159	1829
Anchor 7	kN	72	16	37	181
Anchor 8	kN	70	13	39	161

Case: 51

Return Period: 5	Hs, Penetrating swell [m]: 0.56
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 1.2	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 10.9	Vw [m/s]: 21.7
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 300
Hs, Local wind sea [m]: 0.75	Vc [m/s]: 0.17
Tp, Local wind sea [s]: 2.75	Current Dir. [deg N]: 307
Dir., Local wind sea [deg N]: 292	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.054	0.348	-1.372	1.052
FSU Sway	m	4.508	0.535	2.360	5.670
FSU Yaw	deg	-0.159	0.186	-0.755	0.411

Mooring Forces

Fairlead 1	kN	118	6	104	150
Fairlead 2	kN	144	10	119	191
Fairlead 3	kN	479	146	174	1042
Fairlead 4	kN	596	192	182	1289
Fairlead 5	kN	808	256	243	1697
Fairlead 6	kN	615	183	223	1305
Fairlead 7	kN	118	8	99	159
Fairlead 8	kN	111	7	94	152
Anchor 1	kN	84	6	70	114
Anchor 2	kN	101	10	78	145
Anchor 3	kN	398	134	118	920
Anchor 4	kN	507	178	126	1155
Anchor 5	kN	733	242	204	1581
Anchor 6	kN	551	172	184	1205
Anchor 7	kN	71	8	52	111
Anchor 8	kN	70	7	53	110

Case: 52

Return Period: 10	Hs, Penetrating swell [m]: 0.56
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 1.31	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 12	Vw [m/s]: 22.5
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 300
Hs, Local wind sea [m]: 0.78	Vc [m/s]: 0.18
Tp, Local wind sea [s]: 2.78	Current Dir. [deg N]: 307
Dir., Local wind sea [deg N]: 292	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.082	0.363	-1.258	0.989
FSU Sway	m	4.631	0.559	2.359	5.839
FSU Yaw	deg	-0.167	0.183	-0.795	0.376

Mooring Forces

Fairlead 1	kN	118	6	103	146
Fairlead 2	kN	144	11	119	192
Fairlead 3	kN	507	158	173	1073
Fairlead 4	kN	635	209	180	1276
Fairlead 5	kN	864	262	235	1718
Fairlead 6	kN	653	186	222	1305
Fairlead 7	kN	116	8	98	155
Fairlead 8	kN	110	7	93	149
Anchor 1	kN	84	6	69	111
Anchor 2	kN	101	11	78	146
Anchor 3	kN	424	146	117	949
Anchor 4	kN	543	194	124	1143
Anchor 5	kN	786	248	196	1600
Anchor 6	kN	586	175	184	1203
Anchor 7	kN	70	8	52	107
Anchor 8	kN	69	7	52	107

Case: 53

Return Period: 25	Hs, Penetrating swell [m]: 0.56
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 1.47	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 13.6	Vw [m/s]: 23.6
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 300
Hs, Local wind sea [m]: 0.83	Vc [m/s]: 0.19
Tp, Local wind sea [s]: 2.84	Current Dir. [deg N]: 307
Dir., Local wind sea [deg N]: 292	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.102	0.587	-1.975	1.894
FSU Sway	m	4.799	0.576	2.502	6.185
FSU Yaw	deg	-0.173	0.223	-0.963	0.573

Mooring Forces

Fairlead 1	kN	118	11	96	179
Fairlead 2	kN	145	20	107	284
Fairlead 3	kN	549	179	162	1199
Fairlead 4	kN	690	232	169	1458
Fairlead 5	kN	945	274	268	1906
Fairlead 6	kN	705	190	230	1523
Fairlead 7	kN	116	12	89	190
Fairlead 8	kN	109	10	85	169
Anchor 1	kN	84	10	63	142
Anchor 2	kN	102	19	67	231
Anchor 3	kN	463	165	107	1070
Anchor 4	kN	595	216	114	1316
Anchor 5	kN	863	260	227	1782
Anchor 6	kN	636	179	192	1412
Anchor 7	kN	69	12	42	139
Anchor 8	kN	68	10	44	125

Case: 54

Return Period: 50	Hs, Penetrating swell [m]: 0.56
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 1.58	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 14.7	Vw [m/s]: 24.3
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 300
Hs, Local wind sea [m]: 0.86	Vc [m/s]: 0.19
Tp, Local wind sea [s]: 2.87	Current Dir. [deg N]: 307
Dir., Local wind sea [deg N]: 292	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.116	0.821	-2.535	2.567
FSU Sway	m	4.845	0.654	2.155	6.214
FSU Yaw	deg	-0.172	0.322	-1.401	1.078

Mooring Forces

Fairlead 1	kN	119	14	86	200
Fairlead 2	kN	148	29	96	408
Fairlead 3	kN	578	222	142	1508
Fairlead 4	kN	726	285	143	1944
Fairlead 5	kN	996	374	189	2190
Fairlead 6	kN	742	272	181	2031
Fairlead 7	kN	117	18	83	257
Fairlead 8	kN	110	15	80	221
Anchor 1	kN	85	14	53	162
Anchor 2	kN	105	27	56	344
Anchor 3	kN	490	206	88	1363
Anchor 4	kN	629	266	89	1784
Anchor 5	kN	912	355	152	2063
Anchor 6	kN	671	257	145	1908
Anchor 7	kN	70	18	37	202
Anchor 8	kN	69	15	39	174

Case: 55

Return Period: 100	Hs, Penetrating swell [m]: 0.56
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.2
Hs, Penetrating wind sea [m]: 1.69	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 15.9	Vw [m/s]: 25
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 300
Hs, Local wind sea [m]: 0.89	Vc [m/s]: 0.2
Tp, Local wind sea [s]: 2.9	Current Dir. [deg N]: 307
Dir., Local wind sea [deg N]: 292	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.098	1.229	-3.851	3.737
FSU Sway	m	4.923	0.704	2.025	6.643
FSU Yaw	deg	-0.166	0.439	-1.340	1.149

Mooring Forces

Fairlead 1	kN	122	26	78	363
Fairlead 2	kN	158	68	85	955
Fairlead 3	kN	607	257	137	2114
Fairlead 4	kN	768	338	143	2535
Fairlead 5	kN	1046	431	170	2400
Fairlead 6	kN	790	342	155	2124
Fairlead 7	kN	122	35	75	523
Fairlead 8	kN	113	25	74	344
Anchor 1	kN	87	25	46	310
Anchor 2	kN	115	64	45	851
Anchor 3	kN	517	239	83	1948
Anchor 4	kN	668	316	88	2364
Anchor 5	kN	960	410	134	2272
Anchor 6	kN	717	324	120	1998
Anchor 7	kN	75	33	30	447
Anchor 8	kN	71	25	33	287

Case: 56

Return Period: 5	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.4
Hs, Penetrating wind sea [m]: 0.77	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 7	Vw [m/s]: 20.3
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 330
Hs, Local wind sea [m]: 0.64	Vc [m/s]: 0.11
Tp, Local wind sea [s]: 2.42	Current Dir. [deg N]: 193
Dir., Local wind sea [deg N]: 320	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.905	0.395	-0.166	2.081
FSU Sway	m	3.048	0.447	1.887	4.124
FSU Yaw	deg	-0.135	0.227	-0.956	0.453

Mooring Forces

Fairlead 1	kN	118	7	102	139
Fairlead 2	kN	136	11	114	172
Fairlead 3	kN	214	44	137	460
Fairlead 4	kN	247	70	140	633
Fairlead 5	kN	467	149	219	1144
Fairlead 6	kN	428	128	221	951
Fairlead 7	kN	152	16	117	209
Fairlead 8	kN	142	14	111	196
Anchor 1	kN	84	7	68	104
Anchor 2	kN	94	11	73	128
Anchor 3	kN	155	41	82	379
Anchor 4	kN	185	64	85	539
Anchor 5	kN	412	139	180	1050
Anchor 6	kN	376	119	182	868
Anchor 7	kN	104	15	70	159
Anchor 8	kN	100	13	70	152

Case: 57

Return Period: 10	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.4
Hs, Penetrating wind sea [m]: 0.87	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 7.9	Vw [m/s]: 21.4
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 330
Hs, Local wind sea [m]: 0.68	Vc [m/s]: 0.11
Tp, Local wind sea [s]: 2.47	Current Dir. [deg N]: 193
Dir., Local wind sea [deg N]: 320	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.952	0.418	-0.283	2.192
FSU Sway	m	3.150	0.556	1.746	4.447
FSU Yaw	deg	-0.134	0.245	-0.977	0.475

Mooring Forces

Fairlead 1	kN	117	7	100	143
Fairlead 2	kN	134	10	112	175
Fairlead 3	kN	225	60	136	527
Fairlead 4	kN	265	92	139	724
Fairlead 5	kN	508	181	193	1268
Fairlead 6	kN	465	153	187	1050
Fairlead 7	kN	153	17	114	235
Fairlead 8	kN	142	15	108	216
Anchor 1	kN	83	7	67	108
Anchor 2	kN	92	10	71	131
Anchor 3	kN	164	55	81	442
Anchor 4	kN	201	85	85	624
Anchor 5	kN	451	170	155	1169
Anchor 6	kN	410	143	150	962
Anchor 7	kN	105	17	68	183
Anchor 8	kN	100	14	67	171

Case: 58

Return Period: 25	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.4
Hs, Penetrating wind sea [m]: 0.98	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 8.9	Vw [m/s]: 22.6
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 330
Hs, Local wind sea [m]: 0.72	Vc [m/s]: 0.12
Tp, Local wind sea [s]: 2.52	Current Dir. [deg N]: 193
Dir., Local wind sea [deg N]: 320	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.004	0.389	0.026	1.897
FSU Sway	m	3.331	0.603	1.661	4.652
FSU Yaw	deg	-0.124	0.225	-0.774	0.511

Mooring Forces

Fairlead 1	kN	115	7	102	143
Fairlead 2	kN	132	9	114	168
Fairlead 3	kN	236	67	135	482
Fairlead 4	kN	285	104	137	668
Fairlead 5	kN	556	175	246	1146
Fairlead 6	kN	506	145	231	1022
Fairlead 7	kN	152	16	120	205
Fairlead 8	kN	140	13	113	184
Anchor 1	kN	81	7	69	108
Anchor 2	kN	90	9	73	123
Anchor 3	kN	175	62	80	400
Anchor 4	kN	220	96	83	572
Anchor 5	kN	495	165	206	1052
Anchor 6	kN	448	136	192	934
Anchor 7	kN	104	15	73	154
Anchor 8	kN	99	13	72	140

Case: 59

Return Period: 50	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.4
Hs, Penetrating wind sea [m]: 1.07	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 9.8	Vw [m/s]: 23.6
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 330
Hs, Local wind sea [m]: 0.76	Vc [m/s]: 0.13
Tp, Local wind sea [s]: 2.57	Current Dir. [deg N]: 193
Dir., Local wind sea [deg N]: 320	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.018	0.430	-0.457	2.135
FSU Sway	m	3.510	0.536	2.011	4.649
FSU Yaw	deg	-0.096	0.228	-1.000	0.490

Mooring Forces

Fairlead 1	kN	113	7	97	148
Fairlead 2	kN	130	10	108	174
Fairlead 3	kN	245	63	133	583
Fairlead 4	kN	302	99	135	789
Fairlead 5	kN	597	189	227	1197
Fairlead 6	kN	541	158	218	1018
Fairlead 7	kN	151	17	116	209
Fairlead 8	kN	139	14	110	186
Anchor 1	kN	79	7	64	113
Anchor 2	kN	88	10	67	130
Anchor 3	kN	183	58	79	493
Anchor 4	kN	235	91	81	684
Anchor 5	kN	534	177	188	1100
Anchor 6	kN	481	148	180	930
Anchor 7	kN	103	16	70	158
Anchor 8	kN	97	14	69	142

Case: 60

Return Period: 100	Hs, Penetrating swell [m]: 0.62
FSU Draft: Loaded	Tp, Penetrating swell [s]: 9.4
Hs, Penetrating wind sea [m]: 1.15	Dir., Penetrating swell [deg N]: 193
Tp, Penetrating wind sea [s]: 10.6	Vw [m/s]: 24.4
Dir., Penetrating wind sea [deg N]: 190	Wind Dir. [deg N]: 330
Hs, Local wind sea [m]: 0.79	Vc [m/s]: 0.13
Tp, Local wind sea [s]: 2.6	Current Dir. [deg N]: 193
Dir., Local wind sea [deg N]: 320	

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.044	0.457	-0.433	2.216
FSU Sway	m	3.583	0.584	1.981	4.921
FSU Yaw	deg	-0.092	0.259	-0.993	0.505

Mooring Forces

Fairlead 1	kN	113	8	96	148
Fairlead 2	kN	129	11	107	175
Fairlead 3	kN	254	74	135	649
Fairlead 4	kN	318	116	137	866
Fairlead 5	kN	632	220	214	1498
Fairlead 6	kN	572	187	207	1248
Fairlead 7	kN	151	18	115	218
Fairlead 8	kN	139	15	109	196
Anchor 1	kN	79	8	63	113
Anchor 2	kN	87	10	66	130
Anchor 3	kN	191	68	81	553
Anchor 4	kN	250	107	83	757
Anchor 5	kN	567	206	177	1388
Anchor 6	kN	511	175	170	1151
Anchor 7	kN	104	17	69	167
Anchor 8	kN	97	14	67	152

APPENDIX A02

Statistics of Simulations Ballast FSU

Case: 1

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 0.57

Tp, Penetrating wind sea [s]: 5.4

Dir., Penetrating wind sea [deg N]: 187

Hs, Local wind sea [m]: 0.48

Tp, Local wind sea [s]: 2.5

Dir., Local wind sea [deg N]: 341

Hs, Penetrating swell [m]: 0.58

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 17.6

Wind Dir. [deg N]: 0

Vc [m/s]: 0.07

Current Dir. [deg N]: 196

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.762	0.242	0.154	1.289
FSU Sway	m	-0.048	0.072	-0.230	0.180
FSU Yaw	deg	-0.139	0.110	-0.430	0.163

Mooring Forces

Fairlead 1	kN	174	5	161	190
Fairlead 2	kN	220	13	192	269
Fairlead 3	kN	153	8	136	181
Fairlead 4	kN	154	7	137	182
Fairlead 5	kN	181	15	146	229
Fairlead 6	kN	192	17	152	251
Fairlead 7	kN	281	23	221	351
Fairlead 8	kN	290	19	233	352
Anchor 1	kN	135	5	124	150
Anchor 2	kN	170	12	144	214
Anchor 3	kN	95	7	79	120
Anchor 4	kN	95	7	80	121
Anchor 5	kN	142	14	109	186
Anchor 6	kN	151	16	114	206
Anchor 7	kN	222	21	167	286
Anchor 8	kN	235	18	183	293

Case: 2

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 0.72

Tp, Penetrating wind sea [s]: 6.6

Dir., Penetrating wind sea [deg N]: 187

Hs, Local wind sea [m]: 0.54

Tp, Local wind sea [s]: 2.6

Dir., Local wind sea [deg N]: 341

Hs, Penetrating swell [m]: 0.58

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 19.5

Wind Dir. [deg N]: 0

Vc [m/s]: 0.08

Current Dir. [deg N]: 196

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.908	0.290	0.118	1.532
FSU Sway	m	-0.017	0.095	-0.302	0.288
FSU Yaw	deg	-0.163	0.130	-0.488	0.238

Mooring Forces

Fairlead 1	kN	170	6	153	192
Fairlead 2	kN	212	14	181	272
Fairlead 3	kN	151	9	133	183
Fairlead 4	kN	152	9	133	183
Fairlead 5	kN	188	19	144	258
Fairlead 6	kN	201	23	150	295
Fairlead 7	kN	297	30	225	399
Fairlead 8	kN	301	25	237	387
Anchor 1	kN	132	6	116	152
Anchor 2	kN	162	13	134	217
Anchor 3	kN	92	8	75	122
Anchor 4	kN	93	8	76	122
Anchor 5	kN	149	18	107	213
Anchor 6	kN	160	22	112	247
Anchor 7	kN	237	28	170	330
Anchor 8	kN	246	23	187	324

Case: 3

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 0.93

Tp, Penetrating wind sea [s]: 8.4

Dir., Penetrating wind sea [deg N]: 188

Hs, Local wind sea [m]: 0.62

Tp, Local wind sea [s]: 2.7

Dir., Local wind sea [deg N]: 341

Hs, Penetrating swell [m]: 0.58

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 22

Wind Dir. [deg N]: 0

Vc [m/s]: 0.08

Current Dir. [deg N]: 196

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.093	0.378	-0.240	1.915
FSU Sway	m	0.035	0.133	-0.316	0.495
FSU Yaw	deg	-0.184	0.157	-0.654	0.313

Mooring Forces

Fairlead 1	kN	166	8	143	194
Fairlead 2	kN	203	17	164	294
Fairlead 3	kN	149	11	125	199
Fairlead 4	kN	150	11	126	198
Fairlead 5	kN	199	28	133	307
Fairlead 6	kN	217	36	138	351
Fairlead 7	kN	322	45	212	475
Fairlead 8	kN	318	34	229	436
Anchor 1	kN	128	7	106	153
Anchor 2	kN	154	16	118	237
Anchor 3	kN	90	10	68	137
Anchor 4	kN	92	10	69	136
Anchor 5	kN	159	26	96	259
Anchor 6	kN	175	34	100	299
Anchor 7	kN	260	41	159	400
Anchor 8	kN	261	31	180	369

Case: 4

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.11

Tp, Penetrating wind sea [s]: 10

Dir., Penetrating wind sea [deg N]: 187

Hs, Local wind sea [m]: 0.68

Tp, Local wind sea [s]: 2.8

Dir., Local wind sea [deg N]: 341

Hs, Penetrating swell [m]: 0.58

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 23.9

Wind Dir. [deg N]: 0

Vc [m/s]: 0.09

Current Dir. [deg N]: 196

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.228	0.420	-0.466	2.268
FSU Sway	m	0.079	0.164	-0.555	0.560
FSU Yaw	deg	-0.199	0.173	-0.800	0.422

Mooring Forces

Fairlead 1	kN	162	9	137	203
Fairlead 2	kN	197	21	156	319
Fairlead 3	kN	147	11	121	219
Fairlead 4	kN	149	11	121	216
Fairlead 5	kN	209	35	132	382
Fairlead 6	kN	230	46	136	448
Fairlead 7	kN	343	59	197	611
Fairlead 8	kN	333	48	215	534
Anchor 1	kN	125	9	101	161
Anchor 2	kN	148	19	111	260
Anchor 3	kN	89	11	64	156
Anchor 4	kN	91	10	64	152
Anchor 5	kN	168	32	95	328
Anchor 6	kN	187	43	98	388
Anchor 7	kN	279	54	145	526
Anchor 8	kN	275	44	167	459

Case: 5

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.31

Tp, Penetrating wind sea [s]: 11.7

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.75

Tp, Local wind sea [s]: 2.9

Dir., Local wind sea [deg N]: 341

Hs, Penetrating swell [m]: 0.58

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 25.9

Wind Dir. [deg N]: 0

Vc [m/s]: 0.1

Current Dir. [deg N]: 196

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	1.377	0.443	-0.593	2.576
FSU Sway	m	0.198	0.249	-0.634	1.136
FSU Yaw	deg	-0.192	0.192	-0.818	0.455

Mooring Forces

Fairlead 1	kN	157	11	124	219
Fairlead 2	kN	188	21	141	331
Fairlead 3	kN	148	13	118	240
Fairlead 4	kN	151	14	119	239
Fairlead 5	kN	221	42	128	449
Fairlead 6	kN	248	56	133	529
Fairlead 7	kN	366	76	187	705
Fairlead 8	kN	349	64	183	641
Anchor 1	kN	120	10	89	177
Anchor 2	kN	140	20	96	271
Anchor 3	kN	89	12	62	174
Anchor 4	kN	92	13	63	173
Anchor 5	kN	179	39	91	389
Anchor 6	kN	204	52	96	464
Anchor 7	kN	301	70	135	614
Anchor 8	kN	290	59	137	559

Case: 6

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 0.7

Tp, Penetrating wind sea [s]: 9.9

Dir., Penetrating wind sea [deg N]: 187

Hs, Local wind sea [m]: 0.42

Tp, Local wind sea [s]: 2.6

Dir., Local wind sea [deg N]: 4

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.6

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 18.8

Wind Dir. [deg N]: 30

Vc [m/s]: 0.07

Current Dir. [deg N]: 197

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.633	0.455	-1.811	0.681
FSU Sway	m	-2.626	0.648	-4.051	-1.037
FSU Yaw	deg	0.717	0.225	0.049	1.322

Mooring Forces

Fairlead 1	kN	297	73	166	609
Fairlead 2	kN	507	143	212	1060
Fairlead 3	kN	159	12	130	204
Fairlead 4	kN	152	11	126	194
Fairlead 5	kN	98	9	79	124
Fairlead 6	kN	102	10	82	131
Fairlead 7	kN	451	86	245	720
Fairlead 8	kN	777	187	335	1275
Anchor 1	kN	249	67	128	533
Anchor 2	kN	432	132	163	946
Anchor 3	kN	100	11	72	142
Anchor 4	kN	93	11	69	132
Anchor 5	kN	61	9	43	87
Anchor 6	kN	64	10	45	93
Anchor 7	kN	378	79	189	628
Anchor 8	kN	687	175	277	1157

Case: 7

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 0.8

Tp, Penetrating wind sea [s]: 10.8

Dir., Penetrating wind sea [deg N]: 188

Hs, Local wind sea [m]: 0.46

Tp, Local wind sea [s]: 2.7

Dir., Local wind sea [deg N]: 4

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.6

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 20.4

Wind Dir. [deg N]: 30

Vc [m/s]: 0.07

Current Dir. [deg N]: 197

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.763	0.507	-2.067	0.642
FSU Sway	m	-2.900	0.700	-4.520	-1.331
FSU Yaw	deg	0.822	0.235	0.196	1.468

Mooring Forces

Fairlead 1	kN	321	95	175	695
Fairlead 2	kN	555	182	222	1142
Fairlead 3	kN	159	10	134	197
Fairlead 4	kN	151	9	129	186
Fairlead 5	kN	94	9	76	120
Fairlead 6	kN	98	10	79	128
Fairlead 7	kN	489	96	284	798
Fairlead 8	kN	884	225	405	1640
Anchor 1	kN	271	87	137	612
Anchor 2	kN	477	168	172	1024
Anchor 3	kN	100	9	77	135
Anchor 4	kN	93	8	72	125
Anchor 5	kN	57	9	39	83
Anchor 6	kN	60	10	42	90
Anchor 7	kN	414	89	225	700
Anchor 8	kN	789	212	341	1507

Case: 8

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 0.95

Tp, Penetrating wind sea [s]: 12

Dir., Penetrating wind sea [deg N]: 188

Hs, Local wind sea [m]: 0.51

Tp, Local wind sea [s]: 2.8

Dir., Local wind sea [deg N]: 4

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.6

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 22.4

Wind Dir. [deg N]: 30

Vc [m/s]: 0.08

Current Dir. [deg N]: 197

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.906	0.656	-2.535	0.785
FSU Sway	m	-3.200	0.847	-5.063	-1.466
FSU Yaw	deg	0.946	0.292	0.220	1.696

Mooring Forces

Fairlead 1	kN	359	140	167	885
Fairlead 2	kN	621	255	206	1488
Fairlead 3	kN	161	10	135	216
Fairlead 4	kN	152	8	130	197
Fairlead 5	kN	90	11	71	120
Fairlead 6	kN	94	11	73	127
Fairlead 7	kN	543	122	275	986
Fairlead 8	kN	1033	304	431	2002
Anchor 1	kN	305	128	130	790
Anchor 2	kN	539	237	158	1353
Anchor 3	kN	101	9	78	152
Anchor 4	kN	93	8	73	135
Anchor 5	kN	53	11	34	83
Anchor 6	kN	57	11	36	89
Anchor 7	kN	464	113	217	878
Anchor 8	kN	930	288	366	1856

Case: 9

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.05

Tp, Penetrating wind sea [s]: 12.8

Dir., Penetrating wind sea [deg N]: 188

Hs, Local wind sea [m]: 0.55

Tp, Local wind sea [s]: 2.8

Dir., Local wind sea [deg N]: 4

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.6

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 23.8

Wind Dir. [deg N]: 30

Vc [m/s]: 0.09

Current Dir. [deg N]: 197

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.978	0.856	-3.267	1.208
FSU Sway	m	-3.371	1.027	-5.585	-1.003
FSU Yaw	deg	1.022	0.386	-0.006	2.087

Mooring Forces

Fairlead 1	kN	389	178	151	1069
Fairlead 2	kN	673	321	180	1726
Fairlead 3	kN	162	15	122	275
Fairlead 4	kN	153	12	122	215
Fairlead 5	kN	89	14	67	142
Fairlead 6	kN	93	15	69	154
Fairlead 7	kN	586	151	268	1109
Fairlead 8	kN	1147	386	373	2156
Anchor 1	kN	333	163	114	964
Anchor 2	kN	588	299	133	1582
Anchor 3	kN	103	14	66	206
Anchor 4	kN	94	11	65	151
Anchor 5	kN	52	14	30	103
Anchor 6	kN	56	15	32	115
Anchor 7	kN	504	140	211	993
Anchor 8	kN	1039	367	313	2010

Case: 10

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.16

Tp, Penetrating wind sea [s]: 13.6

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.59

Tp, Local wind sea [s]: 2.9

Dir., Local wind sea [deg N]: 4

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.6

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 25.2

Wind Dir. [deg N]: 30

Vc [m/s]: 0.09

Current Dir. [deg N]: 197

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.065	0.948	-3.088	1.403
FSU Sway	m	-3.541	1.197	-6.088	-0.486
FSU Yaw	deg	1.111	0.421	-0.044	2.240
<i>Mooring Forces</i>					
Fairlead 1	kN	423	215	136	1638
Fairlead 2	kN	724	373	162	1884
Fairlead 3	kN	165	18	128	237
Fairlead 4	kN	155	15	123	228
Fairlead 5	kN	87	14	65	143
Fairlead 6	kN	91	16	68	155
Fairlead 7	kN	635	189	214	1420
Fairlead 8	kN	1262	452	292	2448
Anchor 1	kN	364	197	101	1460
Anchor 2	kN	635	348	117	1735
Anchor 3	kN	105	17	71	172
Anchor 4	kN	96	14	67	164
Anchor 5	kN	50	14	29	105
Anchor 6	kN	54	16	31	116
Anchor 7	kN	549	176	160	1289
Anchor 8	kN	1148	431	238	2295

Case: 11

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.02

Tp, Penetrating wind sea [s]: 9.6

Dir., Penetrating wind sea [deg N]: 190.8

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 18.3

Wind Dir. [deg N]: 60

Vc [m/s]: 0.06

Current Dir. [deg N]: 217

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.906	0.648	-2.394	0.908
FSU Sway	m	-3.809	1.148	-5.972	-0.751
FSU Yaw	deg	0.700	0.291	-0.171	1.545

Mooring Forces

Fairlead 1	kN	518	225	161	1280
Fairlead 2	kN	813	334	206	1840
Fairlead 3	kN	141	8	122	196
Fairlead 4	kN	133	8	116	194
Fairlead 5	kN	91	13	70	138
Fairlead 6	kN	95	14	73	146
Fairlead 7	kN	546	119	255	945
Fairlead 8	kN	1056	362	324	2074
Anchor 1	kN	452	207	124	1162
Anchor 2	kN	718	312	157	1689
Anchor 3	kN	83	7	65	134
Anchor 4	kN	75	8	59	133
Anchor 5	kN	54	13	33	100
Anchor 6	kN	57	14	36	107
Anchor 7	kN	466	110	198	839
Anchor 8	kN	952	343	268	1927

Case: 12

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.14

Tp, Penetrating wind sea [s]: 10.2

Dir., Penetrating wind sea [deg N]: 190.8

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 19.5

Wind Dir. [deg N]: 60

Vc [m/s]: 0.07

Current Dir. [deg N]: 217

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.997	0.736	-2.792	1.248
FSU Sway	m	-4.057	1.294	-6.404	0.011
FSU Yaw	deg	0.763	0.355	-0.475	1.863

Mooring Forces

Fairlead 1	kN	577	274	142	1461
Fairlead 2	kN	889	391	168	1915
Fairlead 3	kN	141	11	116	216
Fairlead 4	kN	133	12	112	227
Fairlead 5	kN	89	15	67	176
Fairlead 6	kN	93	17	70	189
Fairlead 7	kN	593	160	238	1257
Fairlead 8	kN	1177	441	286	2398
Anchor 1	kN	506	254	106	1335
Anchor 2	kN	790	366	122	1764
Anchor 3	kN	83	11	59	152
Anchor 4	kN	75	11	55	162
Anchor 5	kN	52	15	31	136
Anchor 6	kN	56	16	33	149
Anchor 7	kN	511	149	183	1134
Anchor 8	kN	1067	419	232	2246

Case: 13

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.3

Tp, Penetrating wind sea [s]: 10.9

Dir., Penetrating wind sea [deg N]: 190.8

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 21

Wind Dir. [deg N]: 60

Vc [m/s]: 0.07

Current Dir. [deg N]: 217

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.178	0.594	-2.545	0.969
FSU Sway	m	-4.519	1.088	-6.754	-0.384
FSU Yaw	deg	0.862	0.289	-0.268	1.801
<i>Mooring Forces</i>					
Fairlead 1	kN	648	249	152	1646
Fairlead 2	kN	992	343	189	1887
Fairlead 3	kN	139	10	114	195
Fairlead 4	kN	130	10	108	193
Fairlead 5	kN	84	12	67	155
Fairlead 6	kN	88	13	70	165
Fairlead 7	kN	651	159	232	1639
Fairlead 8	kN	1339	403	313	2645
Anchor 1	kN	572	231	115	1489
Anchor 2	kN	885	323	142	1735
Anchor 3	kN	81	10	57	132
Anchor 4	kN	72	10	52	131
Anchor 5	kN	47	12	30	117
Anchor 6	kN	50	13	32	126
Anchor 7	kN	564	149	177	1500
Anchor 8	kN	1221	385	257	2492

Case: 14

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.42

Tp, Penetrating wind sea [s]: 11.4

Dir., Penetrating wind sea [deg N]: 190.8

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 22.1

Wind Dir. [deg N]: 60

Vc [m/s]: 0.08

Current Dir. [deg N]: 217

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.273	0.613	-2.918	0.824
FSU Sway	m	-4.777	1.048	-6.967	-0.503
FSU Yaw	deg	0.920	0.323	-0.221	1.931

Mooring Forces

Fairlead 1	kN	705	265	159	1648
Fairlead 2	kN	1066	360	204	1882
Fairlead 3	kN	139	12	110	237
Fairlead 4	kN	129	11	104	241
Fairlead 5	kN	82	11	67	148
Fairlead 6	kN	86	12	69	158
Fairlead 7	kN	698	186	283	1488
Fairlead 8	kN	1457	431	346	2568
Anchor 1	kN	625	247	123	1492
Anchor 2	kN	955	339	157	1732
Anchor 3	kN	80	11	53	170
Anchor 4	kN	72	11	48	174
Anchor 5	kN	45	11	30	110
Anchor 6	kN	48	11	32	119
Anchor 7	kN	608	174	224	1355
Anchor 8	kN	1334	413	288	2416

Case: 15

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.53

Tp, Penetrating wind sea [s]: 11.8

Dir., Penetrating wind sea [deg N]: 190.8

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 10.5

Dir., Penetrating swell [deg N]: 194

Vw [m/s]: 23.1

Wind Dir. [deg N]: 60

Vc [m/s]: 0.08

Current Dir. [deg N]: 217

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.352	0.662	-2.928	1.218
FSU Sway	m	-5.015	1.079	-7.298	-0.783
FSU Yaw	deg	0.976	0.352	-0.253	2.058

Mooring Forces

Fairlead 1	kN	765	294	169	2054
Fairlead 2	kN	1138	391	214	1946
Fairlead 3	kN	138	12	111	209
Fairlead 4	kN	128	11	105	181
Fairlead 5	kN	80	11	65	157
Fairlead 6	kN	84	12	68	170
Fairlead 7	kN	748	208	303	1755
Fairlead 8	kN	1571	458	388	2891
Anchor 1	kN	680	274	131	1893
Anchor 2	kN	1024	369	165	1795
Anchor 3	kN	80	12	55	145
Anchor 4	kN	71	10	48	120
Anchor 5	kN	43	11	28	118
Anchor 6	kN	46	12	30	131
Anchor 7	kN	656	195	243	1613
Anchor 8	kN	1445	439	327	2736

Case: 16

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.38

Tp, Penetrating wind sea [s]: 9.1

Dir., Penetrating wind sea [deg N]: 179

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.54

Tp, Penetrating swell [s]: 10

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 17.5

Wind Dir. [deg N]: 90

Vc [m/s]: 0.07

Current Dir. [deg N]: 180

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.264	0.495	-1.732	1.167
FSU Sway	m	-4.387	1.121	-6.494	-0.420
FSU Yaw	deg	0.038	0.295	-1.055	0.983

Mooring Forces

Fairlead 1	kN	705	263	177	1647
Fairlead 2	kN	910	297	225	1789
Fairlead 3	kN	115	9	100	161
Fairlead 4	kN	110	9	95	159
Fairlead 5	kN	100	17	73	191
Fairlead 6	kN	105	18	76	202
Fairlead 7	kN	597	142	238	1040
Fairlead 8	kN	1012	344	256	2063
Anchor 1	kN	625	245	139	1491
Anchor 2	kN	809	278	175	1640
Anchor 3	kN	58	8	43	101
Anchor 4	kN	53	9	38	100
Anchor 5	kN	63	17	37	151
Anchor 6	kN	67	18	39	161
Anchor 7	kN	514	132	183	929
Anchor 8	kN	910	325	205	1916

Case: 17

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.55

Tp, Penetrating wind sea [s]: 9.6

Dir., Penetrating wind sea [deg N]: 179

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.54

Tp, Penetrating swell [s]: 10

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 18.4

Wind Dir. [deg N]: 90

Vc [m/s]: 0.08

Current Dir. [deg N]: 180

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.307	0.476	-1.947	1.229
FSU Sway	m	-4.682	1.068	-6.821	-0.427
FSU Yaw	deg	0.054	0.290	-1.011	1.095

Mooring Forces

Fairlead 1	kN	776	267	177	1667
Fairlead 2	kN	980	291	224	1834
Fairlead 3	kN	114	9	94	162
Fairlead 4	kN	108	9	90	161
Fairlead 5	kN	97	15	72	181
Fairlead 6	kN	102	16	75	193
Fairlead 7	kN	640	147	234	1292
Fairlead 8	kN	1104	342	246	2174
Anchor 1	kN	690	249	139	1531
Anchor 2	kN	874	274	175	1683
Anchor 3	kN	56	9	37	103
Anchor 4	kN	51	9	33	101
Anchor 5	kN	60	15	35	141
Anchor 6	kN	64	16	38	152
Anchor 7	kN	555	137	179	1168
Anchor 8	kN	997	325	196	2026

Case: 18

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.77

Tp, Penetrating wind sea [s]: 10.2

Dir., Penetrating wind sea [deg N]: 179

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.54

Tp, Penetrating swell [s]: 10

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 19.6

Wind Dir. [deg N]: 90

Vc [m/s]: 0.08

Current Dir. [deg N]: 180

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.357	0.477	-1.769	1.093
FSU Sway	m	-5.009	1.027	-7.118	-0.968
FSU Yaw	deg	0.075	0.294	-0.835	1.077

Mooring Forces

Fairlead 1	kN	868	292	194	2059
Fairlead 2	kN	1066	307	268	1944
Fairlead 3	kN	112	8	93	164
Fairlead 4	kN	106	8	90	159
Fairlead 5	kN	94	13	71	180
Fairlead 6	kN	99	14	74	188
Fairlead 7	kN	695	164	219	1369
Fairlead 8	kN	1221	366	227	2247
Anchor 1	kN	776	273	155	1895
Anchor 2	kN	955	289	215	1793
Anchor 3	kN	55	8	37	103
Anchor 4	kN	49	7	33	99
Anchor 5	kN	57	13	35	140
Anchor 6	kN	61	14	38	148
Anchor 7	kN	605	153	165	1241
Anchor 8	kN	1109	348	178	2097

Case: 19

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.92

Tp, Penetrating wind sea [s]: 10.6

Dir., Penetrating wind sea [deg N]: 179

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.54

Tp, Penetrating swell [s]: 10

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 20.4

Wind Dir. [deg N]: 90

Vc [m/s]: 0.09

Current Dir. [deg N]: 180

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.397	0.481	-1.811	1.322
FSU Sway	m	-5.236	1.008	-7.315	-1.359
FSU Yaw	deg	0.093	0.306	-0.883	1.089

Mooring Forces

Fairlead 1	kN	936	307	211	2048
Fairlead 2	kN	1130	308	287	1917
Fairlead 3	kN	111	10	90	184
Fairlead 4	kN	106	9	86	177
Fairlead 5	kN	92	11	73	153
Fairlead 6	kN	97	12	76	163
Fairlead 7	kN	735	177	249	1427
Fairlead 8	kN	1308	375	334	2247
Anchor 1	kN	840	287	171	1896
Anchor 2	kN	1015	290	232	1763
Anchor 3	kN	54	9	33	123
Anchor 4	kN	48	9	29	117
Anchor 5	kN	55	11	36	115
Anchor 6	kN	59	12	39	123
Anchor 7	kN	643	166	193	1297
Anchor 8	kN	1191	357	277	2098

Case: 20

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.08

Tp, Penetrating wind sea [s]: 11

Dir., Penetrating wind sea [deg N]: 179

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.54

Tp, Penetrating swell [s]: 10

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 21.1

Wind Dir. [deg N]: 90

Vc [m/s]: 0.09

Current Dir. [deg N]: 180

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.425	0.564	-2.202	1.607
FSU Sway	m	-5.421	1.089	-7.569	-1.541
FSU Yaw	deg	0.107	0.358	-1.126	1.221

Mooring Forces

Fairlead 1	kN	1004	351	219	2258
Fairlead 2	kN	1190	346	298	2074
Fairlead 3	kN	110	10	88	167
Fairlead 4	kN	105	9	84	159
Fairlead 5	kN	91	12	69	158
Fairlead 6	kN	96	14	71	171
Fairlead 7	kN	775	201	213	1553
Fairlead 8	kN	1391	418	261	2428
Anchor 1	kN	905	330	179	2101
Anchor 2	kN	1073	327	243	1918
Anchor 3	kN	53	10	31	106
Anchor 4	kN	48	9	28	99
Anchor 5	kN	54	12	32	119
Anchor 6	kN	58	13	35	131
Anchor 7	kN	680	188	160	1419
Anchor 8	kN	1271	399	210	2276

Case: 21

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.91

Tp, Penetrating wind sea [s]: 8.9

Dir., Penetrating wind sea [deg N]: 180

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.49

Tp, Penetrating swell [s]: 8.8

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 17.3

Wind Dir. [deg N]: 120

Vc [m/s]: 0.12

Current Dir. [deg N]: 160

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.429	0.572	-1.415	2.383
FSU Sway	m	-4.379	1.050	-6.400	-0.717
FSU Yaw	deg	-0.569	0.387	-1.747	0.705

Mooring Forces

Fairlead 1	kN	775	261	201	1651
Fairlead 2	kN	877	249	255	1777
Fairlead 3	kN	104	10	87	173
Fairlead 4	kN	100	9	84	164
Fairlead 5	kN	118	24	80	228
Fairlead 6	kN	126	27	83	281
Fairlead 7	kN	603	156	196	1118
Fairlead 8	kN	861	294	227	1705
Anchor 1	kN	689	243	162	1496
Anchor 2	kN	777	233	204	1628
Anchor 3	kN	47	10	30	113
Anchor 4	kN	43	9	28	104
Anchor 5	kN	81	23	43	186
Anchor 6	kN	88	27	46	234
Anchor 7	kN	520	145	144	1002
Anchor 8	kN	768	277	178	1569

Case: 22

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.06

Tp, Penetrating wind sea [s]: 9.3

Dir., Penetrating wind sea [deg N]: 180

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.49

Tp, Penetrating swell [s]: 8.8

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 18.1

Wind Dir. [deg N]: 120

Vc [m/s]: 0.12

Current Dir. [deg N]: 160

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.442	0.590	-1.483	2.253
FSU Sway	m	-4.612	1.046	-6.619	-0.582
FSU Yaw	deg	-0.590	0.405	-1.825	0.630

Mooring Forces

Fairlead 1	kN	844	276	191	1903
Fairlead 2	kN	931	252	261	1874
Fairlead 3	kN	103	11	85	168
Fairlead 4	kN	99	10	82	164
Fairlead 5	kN	115	21	81	233
Fairlead 6	kN	123	25	84	282
Fairlead 7	kN	642	171	194	1307
Fairlead 8	kN	922	304	203	1872
Anchor 1	kN	754	258	152	1757
Anchor 2	kN	827	237	208	1721
Anchor 3	kN	46	11	28	107
Anchor 4	kN	41	10	25	104
Anchor 5	kN	78	21	44	190
Anchor 6	kN	85	24	47	234
Anchor 7	kN	556	159	142	1181
Anchor 8	kN	825	286	157	1730

Case: 23

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.25

Tp, Penetrating wind sea [s]: 9.7

Dir., Penetrating wind sea [deg N]: 180

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.49

Tp, Penetrating swell [s]: 8.8

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 19.1

Wind Dir. [deg N]: 120

Vc [m/s]: 0.13

Current Dir. [deg N]: 160

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.457	0.647	-2.014	2.547
FSU Sway	m	-4.886	1.022	-6.958	-0.813
FSU Yaw	deg	-0.613	0.443	-2.099	0.990

Mooring Forces

Fairlead 1	kN	932	302	199	2157
Fairlead 2	kN	998	272	251	1882
Fairlead 3	kN	101	10	78	164
Fairlead 4	kN	97	9	76	157
Fairlead 5	kN	114	24	76	314
Fairlead 6	kN	122	28	79	408
Fairlead 7	kN	691	188	208	1442
Fairlead 8	kN	1003	326	215	2105
Anchor 1	kN	837	284	160	2000
Anchor 2	kN	891	255	200	1729
Anchor 3	kN	44	10	22	104
Anchor 4	kN	40	9	19	98
Anchor 5	kN	77	23	39	265
Anchor 6	kN	84	27	42	350
Anchor 7	kN	602	175	155	1311
Anchor 8	kN	902	308	167	1957

Case: 24

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.39

Tp, Penetrating wind sea [s]: 10

Dir., Penetrating wind sea [deg N]: 180

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.49

Tp, Penetrating swell [s]: 8.8

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 19.8

Wind Dir. [deg N]: 120

Vc [m/s]: 0.14

Current Dir. [deg N]: 160

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.442	0.773	-2.571	2.859
FSU Sway	m	-5.066	1.012	-7.108	-0.992
FSU Yaw	deg	-0.612	0.530	-2.261	1.250

Mooring Forces

Fairlead 1	kN	997	321	202	2184
Fairlead 2	kN	1047	273	251	1941
Fairlead 3	kN	101	13	78	218
Fairlead 4	kN	97	12	76	194
Fairlead 5	kN	113	25	72	299
Fairlead 6	kN	121	30	75	389
Fairlead 7	kN	726	209	165	1552
Fairlead 8	kN	1060	335	191	2062
Anchor 1	kN	898	301	163	2029
Anchor 2	kN	937	257	200	1788
Anchor 3	kN	44	13	21	154
Anchor 4	kN	39	12	19	132
Anchor 5	kN	75	24	36	250
Anchor 6	kN	83	29	38	332
Anchor 7	kN	635	196	114	1417
Anchor 8	kN	956	317	144	1916

Case: 25

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.52

Tp, Penetrating wind sea [s]: 10.3

Dir., Penetrating wind sea [deg N]: 180

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.49

Tp, Penetrating swell [s]: 8.8

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 20.4

Wind Dir. [deg N]: 120

Vc [m/s]: 0.14

Current Dir. [deg N]: 160

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.450	0.804	-2.336	2.731
FSU Sway	m	-5.245	0.976	-7.331	-1.317
FSU Yaw	deg	-0.624	0.550	-2.251	1.111

Mooring Forces

Fairlead 1	kN	1059	334	236	2264
Fairlead 2	kN	1094	283	342	1914
Fairlead 3	kN	100	12	76	180
Fairlead 4	kN	95	11	74	166
Fairlead 5	kN	111	24	72	326
Fairlead 6	kN	119	30	75	424
Fairlead 7	kN	760	217	203	1594
Fairlead 8	kN	1116	342	245	2072
Anchor 1	kN	957	314	194	2107
Anchor 2	kN	981	266	282	1761
Anchor 3	kN	42	12	20	118
Anchor 4	kN	38	11	17	106
Anchor 5	kN	74	24	36	276
Anchor 6	kN	81	29	39	365
Anchor 7	kN	666	203	150	1456
Anchor 8	kN	1009	324	195	1923

Case: 26

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.32

Tp, Penetrating wind sea [s]: 9.2

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.34

Tp, Penetrating swell [s]: 9.3

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 18

Wind Dir. [deg N]: 150

Vc [m/s]: 0.07

Current Dir. [deg N]: 171

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.115	0.527	-2.046	1.578
FSU Sway	m	-2.959	0.691	-4.857	-1.018
FSU Yaw	deg	-0.267	0.361	-1.557	0.977

Mooring Forces

Fairlead 1	kN	487	147	189	1673
Fairlead 2	kN	682	158	266	1366
Fairlead 3	kN	123	16	94	206
Fairlead 4	kN	118	14	90	188
Fairlead 5	kN	119	15	89	226
Fairlead 6	kN	124	17	92	240
Fairlead 7	kN	358	100	150	944
Fairlead 8	kN	495	161	171	1233
Anchor 1	kN	423	135	149	1509
Anchor 2	kN	594	147	213	1235
Anchor 3	kN	65	15	37	142
Anchor 4	kN	60	14	33	126
Anchor 5	kN	82	15	53	183
Anchor 6	kN	87	16	55	196
Anchor 7	kN	292	92	100	838
Anchor 8	kN	425	149	125	1117

Case: 27

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.51

Tp, Penetrating wind sea [s]: 9.7

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.34

Tp, Penetrating swell [s]: 9.3

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 19

Wind Dir. [deg N]: 150

Vc [m/s]: 0.07

Current Dir. [deg N]: 171

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.140	0.603	-2.673	1.963
FSU Sway	m	-3.143	0.776	-4.970	-0.971
FSU Yaw	deg	-0.274	0.418	-1.511	1.082

Mooring Forces

Fairlead 1	kN	532	175	212	1710
Fairlead 2	kN	729	188	313	1482
Fairlead 3	kN	122	16	92	229
Fairlead 4	kN	116	14	89	213
Fairlead 5	kN	118	19	82	220
Fairlead 6	kN	124	21	85	250
Fairlead 7	kN	374	114	166	1014
Fairlead 8	kN	530	195	181	1413
Anchor 1	kN	464	161	172	1551
Anchor 2	kN	638	175	257	1345
Anchor 3	kN	64	15	36	163
Anchor 4	kN	59	14	32	149
Anchor 5	kN	81	18	45	178
Anchor 6	kN	86	20	47	205
Anchor 7	kN	307	105	115	903
Anchor 8	kN	458	181	135	1288

Case: 28

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.74

Tp, Penetrating wind sea [s]: 10.2

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.34

Tp, Penetrating swell [s]: 9.3

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 20.2

Wind Dir. [deg N]: 150

Vc [m/s]: 0.07

Current Dir. [deg N]: 171

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.202	0.765	-2.752	2.052
FSU Sway	m	-3.281	0.998	-5.579	-0.481
FSU Yaw	deg	-0.263	0.531	-1.852	1.642

Mooring Forces

Fairlead 1	kN	592	242	173	2039
Fairlead 2	kN	790	265	216	1876
Fairlead 3	kN	123	21	87	261
Fairlead 4	kN	117	19	83	234
Fairlead 5	kN	119	27	73	417
Fairlead 6	kN	125	30	75	488
Fairlead 7	kN	396	155	132	1113
Fairlead 8	kN	577	268	146	1849
Anchor 1	kN	520	224	137	1885
Anchor 2	kN	696	248	168	1722
Anchor 3	kN	65	20	30	191
Anchor 4	kN	59	18	27	168
Anchor 5	kN	82	27	36	360
Anchor 6	kN	87	29	38	425
Anchor 7	kN	328	143	84	995
Anchor 8	kN	502	250	102	1709

Case: 29

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.92

Tp, Penetrating wind sea [s]: 10.6

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.34

Tp, Penetrating swell [s]: 9.3

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 21.1

Wind Dir. [deg N]: 150

Vc [m/s]: 0.08

Current Dir. [deg N]: 171

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.237	0.859	-3.652	2.874
FSU Sway	m	-3.383	1.113	-5.977	-0.307
FSU Yaw	deg	-0.260	0.604	-2.106	2.150

Mooring Forces

Fairlead 1	kN	639	291	147	1908
Fairlead 2	kN	835	310	186	2019
Fairlead 3	kN	124	28	82	479
Fairlead 4	kN	118	24	79	399
Fairlead 5	kN	119	34	71	598
Fairlead 6	kN	125	36	73	600
Fairlead 7	kN	415	188	119	1490
Fairlead 8	kN	611	314	125	2141
Anchor 1	kN	564	270	112	1763
Anchor 2	kN	738	290	139	1867
Anchor 3	kN	66	27	26	388
Anchor 4	kN	60	23	23	316
Anchor 5	kN	82	32	35	527
Anchor 6	kN	87	35	37	529
Anchor 7	kN	346	174	71	1358
Anchor 8	kN	534	294	82	1991

Case: 30

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 3.08

Tp, Penetrating wind sea [s]: 11

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.34

Tp, Penetrating swell [s]: 9.3

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 21.9

Wind Dir. [deg N]: 150

Vc [m/s]: 0.08

Current Dir. [deg N]: 171

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.261	1.053	-4.041	2.866
FSU Sway	m	-3.449	1.112	-6.618	0.374
FSU Yaw	deg	-0.259	0.719	-2.438	2.248

Mooring Forces

Fairlead 1	kN	688	347	126	2486
Fairlead 2	kN	875	357	138	2625
Fairlead 3	kN	128	43	80	785
Fairlead 4	kN	121	38	77	709
Fairlead 5	kN	119	38	68	880
Fairlead 6	kN	124	40	70	708
Fairlead 7	kN	442	234	105	1790
Fairlead 8	kN	639	352	112	2204
Anchor 1	kN	610	323	91	2321
Anchor 2	kN	777	335	95	2465
Anchor 3	kN	70	41	24	671
Anchor 4	kN	63	36	21	600
Anchor 5	kN	81	36	32	791
Anchor 6	kN	86	38	33	629
Anchor 7	kN	371	218	58	1645
Anchor 8	kN	561	330	70	2055

Case: 31

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.22

Tp, Penetrating wind sea [s]: 8.3

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.37

Tp, Penetrating swell [s]: 9.1

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 16.4

Wind Dir. [deg N]: 180

Vc [m/s]: 0.05

Current Dir. [deg N]: 158

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.790	0.366	-1.757	0.280
FSU Sway	m	-0.114	0.125	-0.581	0.221
FSU Yaw	deg	0.211	0.193	-0.597	0.857

Mooring Forces

Fairlead 1	kN	215	18	169	310
Fairlead 2	kN	374	61	222	614
Fairlead 3	kN	212	31	145	343
Fairlead 4	kN	203	27	141	321
Fairlead 5	kN	136	11	107	204
Fairlead 6	kN	137	11	109	205
Fairlead 7	kN	188	16	150	261
Fairlead 8	kN	210	21	164	321
Anchor 1	kN	174	17	131	260
Anchor 2	kN	310	56	172	529
Anchor 3	kN	149	28	87	268
Anchor 4	kN	141	25	83	248
Anchor 5	kN	98	10	71	163
Anchor 6	kN	100	11	72	164
Anchor 7	kN	135	15	100	203
Anchor 8	kN	161	20	119	264

Case: 32

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.4

Tp, Penetrating wind sea [s]: 8.6

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.37

Tp, Penetrating swell [s]: 9.1

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 17.3

Wind Dir. [deg N]: 180

Vc [m/s]: 0.05

Current Dir. [deg N]: 158

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.877	0.438	-2.293	0.716
FSU Sway	m	-0.103	0.172	-0.893	0.410
FSU Yaw	deg	0.224	0.228	-0.756	0.914

Mooring Forces

Fairlead 1	kN	220	27	159	382
Fairlead 2	kN	391	84	198	832
Fairlead 3	kN	220	42	125	489
Fairlead 4	kN	210	36	122	437
Fairlead 5	kN	135	12	103	209
Fairlead 6	kN	136	13	105	219
Fairlead 7	kN	185	20	135	316
Fairlead 8	kN	208	27	147	332
Anchor 1	kN	179	24	121	325
Anchor 2	kN	326	76	151	732
Anchor 3	kN	156	38	68	401
Anchor 4	kN	147	33	65	353
Anchor 5	kN	97	12	67	168
Anchor 6	kN	98	12	68	176
Anchor 7	kN	133	19	86	252
Anchor 8	kN	159	25	103	274

Case: 33

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.63

Tp, Penetrating wind sea [s]: 8.9

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.37

Tp, Penetrating swell [s]: 9.1

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 18.4

Wind Dir. [deg N]: 180

Vc [m/s]: 0.06

Current Dir. [deg N]: 158

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.962	0.587	-2.720	1.265
FSU Sway	m	-0.143	0.212	-1.309	0.556
FSU Yaw	deg	0.231	0.303	-0.701	1.197

Mooring Forces

Fairlead 1	kN	229	36	157	450
Fairlead 2	kN	416	107	188	933
Fairlead 3	kN	232	65	129	658
Fairlead 4	kN	219	56	125	573
Fairlead 5	kN	134	16	94	239
Fairlead 6	kN	136	17	95	253
Fairlead 7	kN	184	24	129	399
Fairlead 8	kN	207	31	134	419
Anchor 1	kN	186	33	120	387
Anchor 2	kN	349	98	141	827
Anchor 3	kN	168	59	71	554
Anchor 4	kN	156	51	68	477
Anchor 5	kN	97	16	57	196
Anchor 6	kN	98	17	58	208
Anchor 7	kN	132	23	80	330
Anchor 8	kN	159	29	91	353

Case: 34

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.79

Tp, Penetrating wind sea [s]: 9.2

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.37

Tp, Penetrating swell [s]: 9.1

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 19.2

Wind Dir. [deg N]: 180

Vc [m/s]: 0.06

Current Dir. [deg N]: 158

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.034	0.654	-2.972	0.904
FSU Sway	m	-0.141	0.272	-0.866	0.704
FSU Yaw	deg	0.239	0.340	-0.892	1.208

Mooring Forces

Fairlead 1	kN	235	44	148	479
Fairlead 2	kN	435	127	179	1067
Fairlead 3	kN	242	77	128	618
Fairlead 4	kN	227	66	125	572
Fairlead 5	kN	134	18	96	230
Fairlead 6	kN	135	19	97	232
Fairlead 7	kN	183	29	118	355
Fairlead 8	kN	206	38	127	439
Anchor 1	kN	192	40	111	412
Anchor 2	kN	366	116	133	953
Anchor 3	kN	176	70	71	516
Anchor 4	kN	163	60	69	475
Anchor 5	kN	96	18	60	187
Anchor 6	kN	97	18	60	188
Anchor 7	kN	131	27	69	290
Anchor 8	kN	158	36	84	372

Case: 35

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.95

Tp, Penetrating wind sea [s]: 9.4

Dir., Penetrating wind sea [deg N]: 181

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.37

Tp, Penetrating swell [s]: 9.1

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 20

Wind Dir. [deg N]: 180

Vc [m/s]: 0.06

Current Dir. [deg N]: 158

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-1.103	0.687	-3.410	0.979
FSU Sway	m	-0.152	0.314	-1.319	0.673
FSU Yaw	deg	0.248	0.372	-1.081	1.424

Mooring Forces

Fairlead 1	kN	242	51	150	571
Fairlead 2	kN	452	142	180	1209
Fairlead 3	kN	251	91	117	800
Fairlead 4	kN	234	77	114	713
Fairlead 5	kN	133	20	91	300
Fairlead 6	kN	134	21	92	315
Fairlead 7	kN	181	30	113	403
Fairlead 8	kN	205	40	121	435
Anchor 1	kN	198	47	114	494
Anchor 2	kN	382	131	134	1086
Anchor 3	kN	184	83	60	684
Anchor 4	kN	169	71	58	605
Anchor 5	kN	96	19	54	252
Anchor 6	kN	96	20	55	266
Anchor 7	kN	129	28	64	333
Anchor 8	kN	157	37	78	369

Case: 36

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.83

Tp, Penetrating wind sea [s]: 8.3

Dir., Penetrating wind sea [deg N]: 184

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.53

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 16

Wind Dir. [deg N]: 210

Vc [m/s]: 0.17

Current Dir. [deg N]: 359

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.356	0.379	-1.339	0.705
FSU Sway	m	2.099	0.425	0.799	3.105
FSU Yaw	deg	0.121	0.165	-0.331	0.632

Mooring Forces

Fairlead 1	kN	157	12	125	199
Fairlead 2	kN	219	34	154	372
Fairlead 3	kN	358	62	233	604
Fairlead 4	kN	384	71	238	679
Fairlead 5	kN	231	45	140	405
Fairlead 6	kN	223	37	144	357
Fairlead 7	kN	163	20	125	259
Fairlead 8	kN	163	21	123	261
Anchor 1	kN	119	12	90	159
Anchor 2	kN	168	31	109	308
Anchor 3	kN	282	56	169	504
Anchor 4	kN	306	65	174	574
Anchor 5	kN	189	42	102	350
Anchor 6	kN	181	35	106	304
Anchor 7	kN	112	18	76	201
Anchor 8	kN	117	20	79	209

Case: 37

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.01

Tp, Penetrating wind sea [s]: 8.8

Dir., Penetrating wind sea [deg N]: 184

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.53

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 17.1

Wind Dir. [deg N]: 210

Vc [m/s]: 0.18

Current Dir. [deg N]: 359

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.417	0.496	-2.081	1.280
FSU Sway	m	2.274	0.471	0.730	3.442
FSU Yaw	deg	0.109	0.210	-0.488	0.756

Mooring Forces

Fairlead 1	kN	156	16	120	251
Fairlead 2	kN	223	47	142	572
Fairlead 3	kN	391	80	198	751
Fairlead 4	kN	422	90	205	824
Fairlead 5	kN	249	60	137	504
Fairlead 6	kN	236	48	141	457
Fairlead 7	kN	160	26	113	320
Fairlead 8	kN	159	27	112	309
Anchor 1	kN	119	15	84	206
Anchor 2	kN	172	43	97	491
Anchor 3	kN	312	73	137	640
Anchor 4	kN	340	82	144	708
Anchor 5	kN	205	55	100	440
Anchor 6	kN	193	44	103	396
Anchor 7	kN	109	24	64	258
Anchor 8	kN	114	26	69	253

Case: 38

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.24

Tp, Penetrating wind sea [s]: 9.4

Dir., Penetrating wind sea [deg N]: 184

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.53

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 18.5

Wind Dir. [deg N]: 210

Vc [m/s]: 0.2

Current Dir. [deg N]: 359

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.515	0.596	-2.218	1.322
FSU Sway	m	2.456	0.605	0.291	3.711
FSU Yaw	deg	0.098	0.255	-0.609	0.805

Mooring Forces

Fairlead 1	kN	157	19	116	236
Fairlead 2	kN	230	59	136	514
Fairlead 3	kN	438	113	191	870
Fairlead 4	kN	473	125	197	1013
Fairlead 5	kN	274	90	128	797
Fairlead 6	kN	252	68	131	701
Fairlead 7	kN	157	31	107	355
Fairlead 8	kN	156	34	106	405
Anchor 1	kN	120	18	81	193
Anchor 2	kN	179	54	91	438
Anchor 3	kN	355	103	131	751
Anchor 4	kN	387	114	137	885
Anchor 5	kN	228	83	91	713
Anchor 6	kN	208	63	94	623
Anchor 7	kN	106	29	58	290
Anchor 8	kN	110	32	62	340

Case: 39

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.42

Tp, Penetrating wind sea [s]: 9.9

Dir., Penetrating wind sea [deg N]: 184

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.53

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 19.6

Wind Dir. [deg N]: 210

Vc [m/s]: 0.21

Current Dir. [deg N]: 359

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.575	0.709	-2.893	1.734
FSU Sway	m	2.629	0.586	0.351	3.891
FSU Yaw	deg	0.078	0.285	-0.818	0.836

Mooring Forces

Fairlead 1	kN	158	24	109	308
Fairlead 2	kN	236	78	126	739
Fairlead 3	kN	476	132	179	1014
Fairlead 4	kN	515	141	178	1084
Fairlead 5	kN	294	100	124	854
Fairlead 6	kN	266	73	126	669
Fairlead 7	kN	154	38	99	505
Fairlead 8	kN	153	40	98	518
Anchor 1	kN	120	22	74	257
Anchor 2	kN	184	71	82	646
Anchor 3	kN	389	120	119	885
Anchor 4	kN	425	129	119	952
Anchor 5	kN	247	92	87	767
Anchor 6	kN	221	68	89	593
Anchor 7	kN	104	36	50	428
Anchor 8	kN	108	38	55	445

Case: 40

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.61

Tp, Penetrating wind sea [s]: 10.3

Dir., Penetrating wind sea [deg N]: 184

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.53

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 192

Vw [m/s]: 20.7

Wind Dir. [deg N]: 210

Vc [m/s]: 0.22

Current Dir. [deg N]: 359

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.633	0.766	-2.760	1.905
FSU Sway	m	2.754	0.697	0.046	4.294
FSU Yaw	deg	0.079	0.290	-0.769	1.016

Mooring Forces

Fairlead 1	kN	158	27	107	322
Fairlead 2	kN	243	88	121	784
Fairlead 3	kN	513	150	200	1125
Fairlead 4	kN	559	170	202	1249
Fairlead 5	kN	315	125	112	1076
Fairlead 6	kN	281	94	113	780
Fairlead 7	kN	151	33	101	471
Fairlead 8	kN	149	34	98	422
Anchor 1	kN	121	25	72	270
Anchor 2	kN	190	80	78	689
Anchor 3	kN	424	137	139	988
Anchor 4	kN	466	156	141	1105
Anchor 5	kN	266	116	75	977
Anchor 6	kN	235	88	76	697
Anchor 7	kN	100	32	52	395
Anchor 8	kN	104	32	55	356

Case: 41

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.62

Tp, Penetrating wind sea [s]: 8.8

Dir., Penetrating wind sea [deg N]: 192

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 9.9

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 17.8

Wind Dir. [deg N]: 240

Vc [m/s]: 0.16

Current Dir. [deg N]: 340

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.413	0.503	-1.357	1.888
FSU Sway	m	3.604	0.628	1.153	4.832
FSU Yaw	deg	0.224	0.151	-0.423	0.686

Mooring Forces

Fairlead 1	kN	125	11	101	186
Fairlead 2	kN	158	21	117	311
Fairlead 3	kN	568	152	206	1090
Fairlead 4	kN	712	199	219	1343
Fairlead 5	kN	487	147	175	1094
Fairlead 6	kN	459	122	175	921
Fairlead 7	kN	173	31	109	379
Fairlead 8	kN	163	27	105	323
Anchor 1	kN	89	10	66	146
Anchor 2	kN	112	19	73	252
Anchor 3	kN	474	139	145	957
Anchor 4	kN	607	184	157	1197
Anchor 5	kN	426	137	137	994
Anchor 6	kN	399	113	136	830
Anchor 7	kN	122	29	60	312
Anchor 8	kN	117	26	62	265

Case: 42

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.73

Tp, Penetrating wind sea [s]: 9.2

Dir., Penetrating wind sea [deg N]: 192

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 9.9

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 18.8

Wind Dir. [deg N]: 240

Vc [m/s]: 0.17

Current Dir. [deg N]: 340

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.438	0.518	-1.214	1.969
FSU Sway	m	3.780	0.632	1.353	5.261
FSU Yaw	deg	0.240	0.160	-0.264	0.673

Mooring Forces

Fairlead 1	kN	124	11	101	175
Fairlead 2	kN	155	20	116	258
Fairlead 3	kN	613	166	215	1182
Fairlead 4	kN	776	220	222	1639
Fairlead 5	kN	527	162	179	1172
Fairlead 6	kN	494	136	183	1066
Fairlead 7	kN	172	31	114	359
Fairlead 8	kN	161	26	110	313
Anchor 1	kN	87	10	66	136
Anchor 2	kN	109	19	72	204
Anchor 3	kN	515	153	153	1045
Anchor 4	kN	667	205	159	1480
Anchor 5	kN	463	151	141	1069
Anchor 6	kN	432	127	144	967
Anchor 7	kN	120	29	65	294
Anchor 8	kN	115	25	67	257

Case: 43

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.88

Tp, Penetrating wind sea [s]: 9.7

Dir., Penetrating wind sea [deg N]: 192

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 9.9

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 19.9

Wind Dir. [deg N]: 240

Vc [m/s]: 0.18

Current Dir. [deg N]: 340

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.468	0.564	-1.393	2.251
FSU Sway	m	3.989	0.655	1.910	5.759
FSU Yaw	deg	0.256	0.169	-0.289	0.750

Mooring Forces

Fairlead 1	kN	122	11	99	180
Fairlead 2	kN	152	21	113	300
Fairlead 3	kN	672	193	244	1353
Fairlead 4	kN	859	256	281	1829
Fairlead 5	kN	581	189	220	1340
Fairlead 6	kN	541	156	220	1168
Fairlead 7	kN	172	35	111	430
Fairlead 8	kN	159	28	107	348
Anchor 1	kN	85	11	63	140
Anchor 2	kN	106	20	69	242
Anchor 3	kN	570	178	180	1205
Anchor 4	kN	744	238	214	1660
Anchor 5	kN	514	176	179	1229
Anchor 6	kN	476	145	178	1064
Anchor 7	kN	120	32	62	358
Anchor 8	kN	114	27	64	288

Case: 44

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.97

Tp, Penetrating wind sea [s]: 10

Dir., Penetrating wind sea [deg N]: 192

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 9.9

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 20.7

Wind Dir. [deg N]: 240

Vc [m/s]: 0.18

Current Dir. [deg N]: 340

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.468	0.690	-2.493	2.270
FSU Sway	m	4.115	0.719	2.121	5.943
FSU Yaw	deg	0.264	0.211	-0.658	0.876

Mooring Forces

Fairlead 1	kN	121	14	95	202
Fairlead 2	kN	153	30	108	418
Fairlead 3	kN	716	224	243	1635
Fairlead 4	kN	920	300	262	2096
Fairlead 5	kN	622	220	211	1477
Fairlead 6	kN	575	184	210	1350
Fairlead 7	kN	173	44	96	502
Fairlead 8	kN	160	35	92	415
Anchor 1	kN	85	13	60	161
Anchor 2	kN	107	28	65	349
Anchor 3	kN	611	207	180	1474
Anchor 4	kN	802	280	197	1920
Anchor 5	kN	552	205	171	1361
Anchor 6	kN	508	172	169	1239
Anchor 7	kN	121	41	47	424
Anchor 8	kN	114	33	49	350

Case: 45

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 2.07

Tp, Penetrating wind sea [s]: 10.3

Dir., Penetrating wind sea [deg N]: 192

Hs, Local wind sea [m]: 0

Tp, Local wind sea [s]: 0

Dir., Local wind sea [deg N]: 0

Hs, Penetrating swell [m]: 0.59

Tp, Penetrating swell [s]: 9.9

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 21.4

Wind Dir. [deg N]: 240

Vc [m/s]: 0.19

Current Dir. [deg N]: 340

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.472	0.740	-1.966	2.598
FSU Sway	m	4.246	0.730	2.057	6.151
FSU Yaw	deg	0.273	0.227	-0.519	0.909

Mooring Forces

Fairlead 1	kN	120	14	94	199
Fairlead 2	kN	151	28	105	400
Fairlead 3	kN	759	244	230	1860
Fairlead 4	kN	980	323	251	2279
Fairlead 5	kN	661	236	206	1700
Fairlead 6	kN	608	196	210	1431
Fairlead 7	kN	174	49	103	592
Fairlead 8	kN	159	39	99	456
Anchor 1	kN	84	13	58	158
Anchor 2	kN	106	27	62	332
Anchor 3	kN	651	226	167	1688
Anchor 4	kN	858	302	187	2099
Anchor 5	kN	589	221	166	1573
Anchor 6	kN	539	183	169	1315
Anchor 7	kN	122	46	54	507
Anchor 8	kN	114	37	56	387

Case: 46

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.18

Tp, Penetrating wind sea [s]: 10.5

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.74

Tp, Local wind sea [s]: 2.71

Dir., Local wind sea [deg N]: 269

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.7

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 21.3

Wind Dir. [deg N]: 270

Vc [m/s]: 0.18

Current Dir. [deg N]: 329

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.126	0.284	-0.745	0.993
FSU Sway	m	4.216	0.729	2.327	5.993
FSU Yaw	deg	0.022	0.112	-0.419	0.411

Mooring Forces

Fairlead 1	kN	127	7	112	164
Fairlead 2	kN	162	11	136	229
Fairlead 3	kN	701	242	225	1520
Fairlead 4	kN	865	310	244	1867
Fairlead 5	kN	791	255	312	1812
Fairlead 6	kN	682	191	312	1429
Fairlead 7	kN	146	14	115	221
Fairlead 8	kN	137	14	109	204
Anchor 1	kN	91	7	77	125
Anchor 2	kN	116	10	92	177
Anchor 3	kN	597	224	162	1364
Anchor 4	kN	751	289	179	1697
Anchor 5	kN	711	240	264	1683
Anchor 6	kN	608	179	264	1313
Anchor 7	kN	96	14	66	166
Anchor 8	kN	92	13	65	156

Case: 47

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.3

Tp, Penetrating wind sea [s]: 11.1

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.78

Tp, Local wind sea [s]: 2.76

Dir., Local wind sea [deg N]: 269

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.7

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 22.4

Wind Dir. [deg N]: 270

Vc [m/s]: 0.19

Current Dir. [deg N]: 329

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.112	0.370	-1.316	1.386
FSU Sway	m	4.392	0.770	2.130	6.190
FSU Yaw	deg	0.024	0.150	-0.486	0.516

Mooring Forces

Fairlead 1	kN	126	8	104	163
Fairlead 2	kN	161	14	122	218
Fairlead 3	kN	762	275	193	1618
Fairlead 4	kN	944	351	203	1938
Fairlead 5	kN	866	296	298	1912
Fairlead 6	kN	740	224	285	1599
Fairlead 7	kN	145	16	106	226
Fairlead 8	kN	135	15	100	208
Anchor 1	kN	90	8	69	124
Anchor 2	kN	114	13	78	167
Anchor 3	kN	654	256	133	1457
Anchor 4	kN	825	328	142	1768
Anchor 5	kN	782	279	251	1781
Anchor 6	kN	662	210	240	1477
Anchor 7	kN	95	16	56	170
Anchor 8	kN	91	14	56	160

Case: 48

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.43

Tp, Penetrating wind sea [s]: 11.8

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.83

Tp, Local wind sea [s]: 2.82

Dir., Local wind sea [deg N]: 269

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.7

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 23.6

Wind Dir. [deg N]: 270

Vc [m/s]: 0.2

Current Dir. [deg N]: 329

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.104	0.396	-1.020	1.246
FSU Sway	m	4.581	0.835	2.043	6.540
FSU Yaw	deg	0.027	0.170	-0.599	0.646

Mooring Forces

Fairlead 1	kN	125	9	107	167
Fairlead 2	kN	159	15	128	227
Fairlead 3	kN	831	314	189	1886
Fairlead 4	kN	1037	402	194	2227
Fairlead 5	kN	952	339	272	1997
Fairlead 6	kN	807	261	287	1863
Fairlead 7	kN	143	17	106	227
Fairlead 8	kN	133	15	100	208
Anchor 1	kN	88	8	72	129
Anchor 2	kN	113	14	84	176
Anchor 3	kN	719	293	128	1715
Anchor 4	kN	912	378	133	2049
Anchor 5	kN	863	321	228	1866
Anchor 6	kN	726	246	242	1733
Anchor 7	kN	93	16	58	172
Anchor 8	kN	89	15	56	159

Case: 49

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.53

Tp, Penetrating wind sea [s]: 12.3

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.87

Tp, Local wind sea [s]: 2.86

Dir., Local wind sea [deg N]: 269

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.7

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 24.5

Wind Dir. [deg N]: 270

Vc [m/s]: 0.2

Current Dir. [deg N]: 329

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.096	0.451	-1.338	1.607
FSU Sway	m	4.730	0.872	2.417	6.849
FSU Yaw	deg	0.030	0.169	-0.639	0.557

Mooring Forces

Fairlead 1	kN	124	10	104	175
Fairlead 2	kN	158	18	121	280
Fairlead 3	kN	886	346	212	1991
Fairlead 4	kN	1109	440	231	2322
Fairlead 5	kN	1019	360	266	2112
Fairlead 6	kN	859	278	247	1949
Fairlead 7	kN	142	19	105	241
Fairlead 8	kN	132	16	98	214
Anchor 1	kN	88	9	68	136
Anchor 2	kN	112	16	77	224
Anchor 3	kN	770	322	150	1816
Anchor 4	kN	981	414	167	2142
Anchor 5	kN	927	341	222	1977
Anchor 6	kN	775	262	203	1815
Anchor 7	kN	92	18	56	184
Anchor 8	kN	88	16	55	165

Case: 50

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.63

Tp, Penetrating wind sea [s]: 12.8

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.91

Tp, Local wind sea [s]: 2.9

Dir., Local wind sea [deg N]: 269

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.7

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 25.4

Wind Dir. [deg N]: 270

Vc [m/s]: 0.21

Current Dir. [deg N]: 329

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.086	0.572	-1.743	1.966
FSU Sway	m	4.866	0.915	2.436	7.128
FSU Yaw	deg	0.034	0.212	-0.643	0.759

Mooring Forces

Fairlead 1	kN	123	12	96	218
Fairlead 2	kN	158	23	112	439
Fairlead 3	kN	945	392	219	2243
Fairlead 4	kN	1183	493	244	2514
Fairlead 5	kN	1089	413	215	2241
Fairlead 6	kN	915	327	217	2021
Fairlead 7	kN	142	22	100	347
Fairlead 8	kN	131	19	96	292
Anchor 1	kN	87	11	61	176
Anchor 2	kN	112	22	69	367
Anchor 3	kN	826	366	156	2062
Anchor 4	kN	1052	465	180	2331
Anchor 5	kN	994	392	174	2106
Anchor 6	kN	827	309	176	1887
Anchor 7	kN	92	21	52	282
Anchor 8	kN	87	18	53	237

Case: 51

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.2

Tp, Penetrating wind sea [s]: 10.9

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.75

Tp, Local wind sea [s]: 2.75

Dir., Local wind sea [deg N]: 292

Hs, Penetrating swell [m]: 0.56

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 21.7

Wind Dir. [deg N]: 300

Vc [m/s]: 0.17

Current Dir. [deg N]: 307

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.037	0.309	-1.024	1.127
FSU Sway	m	3.849	0.632	1.535	5.162
FSU Yaw	deg	-0.188	0.171	-0.739	0.364

Mooring Forces

Fairlead 1	kN	136	9	112	192
Fairlead 2	kN	176	16	135	298
Fairlead 3	kN	531	180	186	1113
Fairlead 4	kN	630	226	189	1353
Fairlead 5	kN	826	247	298	1505
Fairlead 6	kN	705	191	293	1282
Fairlead 7	kN	142	12	113	202
Fairlead 8	kN	133	11	107	184
Anchor 1	kN	99	9	77	151
Anchor 2	kN	129	14	90	239
Anchor 3	kN	440	165	125	979
Anchor 4	kN	532	209	128	1206
Anchor 5	kN	744	232	252	1388
Anchor 6	kN	629	179	246	1171
Anchor 7	kN	92	12	64	148
Anchor 8	kN	89	11	64	137

Case: 52

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.31

Tp, Penetrating wind sea [s]: 12

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.78

Tp, Local wind sea [s]: 2.78

Dir., Local wind sea [deg N]: 292

Hs, Penetrating swell [m]: 0.56

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 22.5

Wind Dir. [deg N]: 300

Vc [m/s]: 0.18

Current Dir. [deg N]: 307

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.015	0.332	-0.986	1.006
FSU Sway	m	3.962	0.664	1.709	5.478
FSU Yaw	deg	-0.194	0.189	-0.779	0.333

Mooring Forces

Fairlead 1	kN	135	9	111	192
Fairlead 2	kN	176	16	135	296
Fairlead 3	kN	563	206	182	1251
Fairlead 4	kN	669	258	190	1507
Fairlead 5	kN	883	290	305	1831
Fairlead 6	kN	746	223	305	1491
Fairlead 7	kN	141	13	113	216
Fairlead 8	kN	131	12	107	200
Anchor 1	kN	99	9	76	152
Anchor 2	kN	128	15	90	239
Anchor 3	kN	469	190	122	1109
Anchor 4	kN	569	239	130	1353
Anchor 5	kN	797	274	257	1701
Anchor 6	kN	668	210	257	1373
Anchor 7	kN	91	12	64	162
Anchor 8	kN	87	11	64	152

Case: 53

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.47

Tp, Penetrating wind sea [s]: 13.6

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.83

Tp, Local wind sea [s]: 2.84

Dir., Local wind sea [deg N]: 292

Hs, Penetrating swell [m]: 0.56

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 23.6

Wind Dir. [deg N]: 300

Vc [m/s]: 0.19

Current Dir. [deg N]: 307

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.004	0.580	-2.126	1.861
FSU Sway	m	4.108	0.699	2.032	5.870
FSU Yaw	deg	-0.192	0.274	-1.289	0.854

Mooring Forces

Fairlead 1	kN	136	16	104	241
Fairlead 2	kN	179	34	121	487
Fairlead 3	kN	607	241	179	1471
Fairlead 4	kN	727	303	185	1818
Fairlead 5	kN	962	359	188	2090
Fairlead 6	kN	807	286	190	1941
Fairlead 7	kN	141	20	101	242
Fairlead 8	kN	131	17	96	228
Anchor 1	kN	99	15	69	197
Anchor 2	kN	131	31	78	411
Anchor 3	kN	511	222	120	1315
Anchor 4	kN	622	281	126	1646
Anchor 5	kN	873	340	149	1956
Anchor 6	kN	726	269	150	1808
Anchor 7	kN	91	19	52	186
Anchor 8	kN	87	16	53	178

Case: 54

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.58

Tp, Penetrating wind sea [s]: 14.7

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.86

Tp, Local wind sea [s]: 2.87

Dir., Local wind sea [deg N]: 292

Hs, Penetrating swell [m]: 0.56

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 24.3

Wind Dir. [deg N]: 300

Vc [m/s]: 0.19

Current Dir. [deg N]: 307

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	-0.006	0.829	-2.587	2.873
FSU Sway	m	4.166	0.795	1.022	6.282
FSU Yaw	deg	-0.191	0.357	-1.492	1.031

Mooring Forces

Fairlead 1	kN	137	22	92	367
Fairlead 2	kN	185	58	103	774
Fairlead 3	kN	639	287	161	1938
Fairlead 4	kN	765	354	160	2151
Fairlead 5	kN	1013	428	147	2395
Fairlead 6	kN	852	354	147	2162
Fairlead 7	kN	144	34	94	540
Fairlead 8	kN	134	27	92	417
Anchor 1	kN	100	21	57	313
Anchor 2	kN	137	54	60	679
Anchor 3	kN	541	265	103	1765
Anchor 4	kN	659	330	102	1973
Anchor 5	kN	922	406	109	2258
Anchor 6	kN	768	334	109	2027
Anchor 7	kN	94	32	46	458
Anchor 8	kN	89	25	50	350

Case: 55

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.69

Tp, Penetrating wind sea [s]: 15.9

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.89

Tp, Local wind sea [s]: 2.9

Dir., Local wind sea [deg N]: 292

Hs, Penetrating swell [m]: 0.56

Tp, Penetrating swell [s]: 9.2

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 25

Wind Dir. [deg N]: 300

Vc [m/s]: 0.2

Current Dir. [deg N]: 307

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.012	1.065	-3.188	3.100
FSU Sway	m	4.268	0.816	1.902	6.335
FSU Yaw	deg	-0.183	0.426	-1.473	1.337

Mooring Forces

Fairlead 1	kN	139	32	87	519
Fairlead 2	kN	195	91	97	1078
Fairlead 3	kN	670	305	146	2065
Fairlead 4	kN	808	383	151	2347
Fairlead 5	kN	1068	461	134	2686
Fairlead 6	kN	900	393	135	2205
Fairlead 7	kN	150	53	89	728
Fairlead 8	kN	137	39	86	563
Anchor 1	kN	102	30	53	449
Anchor 2	kN	146	84	55	962
Anchor 3	kN	569	283	89	1888
Anchor 4	kN	698	357	94	2166
Anchor 5	kN	974	437	96	2545
Anchor 6	kN	814	371	97	2068
Anchor 7	kN	99	50	40	635
Anchor 8	kN	92	36	43	486

Case: 56

Return Period: 5

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 0.77

Tp, Penetrating wind sea [s]: 7

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.64

Tp, Local wind sea [s]: 2.42

Dir., Local wind sea [deg N]: 320

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.4

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 20.3

Wind Dir. [deg N]: 330

Vc [m/s]: 0.11

Current Dir. [deg N]: 193

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.762	0.233	0.180	1.291
FSU Sway	m	2.437	0.493	1.263	3.629
FSU Yaw	deg	-0.201	0.214	-0.839	0.281

Mooring Forces

Fairlead 1	kN	140	11	119	178
Fairlead 2	kN	173	16	144	231
Fairlead 3	kN	245	56	150	517
Fairlead 4	kN	277	79	152	659
Fairlead 5	kN	495	137	228	946
Fairlead 6	kN	488	128	229	902
Fairlead 7	kN	185	14	152	233
Fairlead 8	kN	172	13	143	223
Anchor 1	kN	103	10	83	139
Anchor 2	kN	126	15	99	179
Anchor 3	kN	179	51	92	426
Anchor 4	kN	209	72	93	557
Anchor 5	kN	433	128	186	855
Anchor 6	kN	427	118	187	812
Anchor 7	kN	133	13	102	178
Anchor 8	kN	126	12	99	174

Case: 57

Return Period: 10

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 0.87

Tp, Penetrating wind sea [s]: 7.9

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.68

Tp, Local wind sea [s]: 2.47

Dir., Local wind sea [deg N]: 320

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.4

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 21.4

Wind Dir. [deg N]: 330

Vc [m/s]: 0.11

Current Dir. [deg N]: 193

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.800	0.368	-0.261	1.708
FSU Sway	m	2.541	0.616	1.064	3.930
FSU Yaw	deg	-0.211	0.245	-0.914	0.415

Mooring Forces

Fairlead 1	kN	139	13	115	181
Fairlead 2	kN	172	19	136	236
Fairlead 3	kN	258	78	146	618
Fairlead 4	kN	295	108	147	796
Fairlead 5	kN	538	159	233	960
Fairlead 6	kN	529	146	248	915
Fairlead 7	kN	187	24	138	286
Fairlead 8	kN	172	20	129	254
Anchor 1	kN	102	12	80	142
Anchor 2	kN	125	18	91	184
Anchor 3	kN	191	71	88	519
Anchor 4	kN	225	98	89	683
Anchor 5	kN	474	148	191	869
Anchor 6	kN	464	135	204	825
Anchor 7	kN	134	22	88	226
Anchor 8	kN	126	19	86	202

Case: 58

Return Period: 25

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 0.98

Tp, Penetrating wind sea [s]: 8.9

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.72

Tp, Local wind sea [s]: 2.52

Dir., Local wind sea [deg N]: 320

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.4

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 22.6

Wind Dir. [deg N]: 330

Vc [m/s]: 0.12

Current Dir. [deg N]: 193

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.840	0.476	-0.476	1.953
FSU Sway	m	2.667	0.714	0.917	4.249
FSU Yaw	deg	-0.224	0.254	-0.921	0.351

Mooring Forces

Fairlead 1	kN	138	14	111	190
Fairlead 2	kN	170	22	128	251
Fairlead 3	kN	272	95	142	611
Fairlead 4	kN	317	131	143	786
Fairlead 5	kN	589	170	274	1251
Fairlead 6	kN	575	151	279	1052
Fairlead 7	kN	188	32	133	307
Fairlead 8	kN	172	25	124	248
Anchor 1	kN	101	14	76	150
Anchor 2	kN	123	20	84	198
Anchor 3	kN	204	86	84	512
Anchor 4	kN	245	119	85	675
Anchor 5	kN	521	159	229	1145
Anchor 6	kN	507	141	233	954
Anchor 7	kN	136	30	84	245
Anchor 8	kN	126	23	80	197

Case: 59

Return Period: 50

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.07

Tp, Penetrating wind sea [s]: 9.8

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.76

Tp, Local wind sea [s]: 2.57

Dir., Local wind sea [deg N]: 320

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.4

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 23.6

Wind Dir. [deg N]: 330

Vc [m/s]: 0.13

Current Dir. [deg N]: 193

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.864	0.530	-0.594	2.230
FSU Sway	m	2.772	0.747	1.025	4.343
FSU Yaw	deg	-0.223	0.276	-0.876	0.512

Mooring Forces

Fairlead 1	kN	136	14	108	182
Fairlead 2	kN	168	22	124	241
Fairlead 3	kN	285	105	141	639
Fairlead 4	kN	335	145	146	834
Fairlead 5	kN	632	203	224	1418
Fairlead 6	kN	615	181	232	1260
Fairlead 7	kN	189	37	127	342
Fairlead 8	kN	171	27	122	274
Anchor 1	kN	100	14	73	142
Anchor 2	kN	121	21	80	188
Anchor 3	kN	215	96	83	537
Anchor 4	kN	261	133	89	718
Anchor 5	kN	562	190	183	1305
Anchor 6	kN	545	169	190	1152
Anchor 7	kN	136	34	78	277
Anchor 8	kN	125	26	79	220

Case: 60

Return Period: 100

FSU Draft: Ballast

Hs, Penetrating wind sea [m]: 1.15

Tp, Penetrating wind sea [s]: 10.6

Dir., Penetrating wind sea [deg N]: 190

Hs, Local wind sea [m]: 0.79

Tp, Local wind sea [s]: 2.6

Dir., Local wind sea [deg N]: 320

Hs, Penetrating swell [m]: 0.62

Tp, Penetrating swell [s]: 9.4

Dir., Penetrating swell [deg N]: 193

Vw [m/s]: 24.4

Wind Dir. [deg N]: 330

Vc [m/s]: 0.13

Current Dir. [deg N]: 193

Item	Units	Mean	Std	Min	Max
<i>Vessel Motion</i>					
FSU Surge	m	0.890	0.517	-0.414	2.115
FSU Sway	m	2.854	0.801	0.621	4.552
FSU Yaw	deg	-0.220	0.283	-1.057	0.505

Mooring Forces

Fairlead 1	kN	135	14	107	184
Fairlead 2	kN	166	21	123	242
Fairlead 3	kN	295	118	126	763
Fairlead 4	kN	350	162	127	1013
Fairlead 5	kN	669	228	235	1445
Fairlead 6	kN	648	203	254	1303
Fairlead 7	kN	188	36	131	322
Fairlead 8	kN	171	28	123	265
Anchor 1	kN	98	13	72	144
Anchor 2	kN	119	19	80	189
Anchor 3	kN	224	107	70	651
Anchor 4	kN	275	148	70	886
Anchor 5	kN	596	213	194	1329
Anchor 6	kN	576	190	210	1193
Anchor 7	kN	136	33	82	259
Anchor 8	kN	125	26	80	212

APPENDIX S03

Description of the Time-domain Simulation Tool aNySIM

Revision	Date	Description of revision	Author
0	May 19, 2009	First version of the appendix	JLC
1	February 14, 2010	Review comments KH included	JLC

Description of the Time-domain Simulation Tool aNySIM

Introduction

The time-domain simulation program aNySIM can simulate the behaviour of multiple (floating) bodies under the action of combined swell, wind seas, current and wind. The effect of mooring lines and other mechanical components on the floater motions can also be taken into account. In the simulations, the combined low frequency and wave frequency motions of the floaters are calculated in 6 degrees of freedom in the time-domain, using a retardation function approach.

Equations of motion

General

The equations of motion derived within potential theory describe the fluid reactive forces on a floating structure under arbitrarily external loads varying in time. For 6 degrees of freedom, these equations can be written as follows:

$$\sum_{j=1}^6 (M_{kj} + m_{kj}) \ddot{x}_j + \int_{-\infty}^t R_{kj}(t-\tau) \dot{x}_j(\tau) d\tau + C_{kj} x_j = F_k(t) \quad k = 1, 2 \dots 6 \quad (1)$$

in which:

x_j	= motion in j-th mode
$F_k(t)$	= arbitrarily in time varying external force in the k-th mode of motion
M	= inertia matrix
m	= added inertia matrix (frequency independent)
R	= matrix of retardation functions
C	= matrix of hydrostatic restoring forces

The retardation functions R , as well as the added inertia coefficients m , are determined using the results of the diffraction calculations. The theory of diffraction calculations is further described in Appendix S01. The applied database format to store the diffraction calculation results (HYD-file) is described in Appendix S02.

Multi-body coupled equations of motion

In aNySIM a general 1, 2 or N body system of motions is simulated with 6, 12 or $6 \cdot N$ degrees of freedom respectively. All N bodies are (optionally) subject to wave induced forces, hydrodynamic reaction forces and wind loads, see the next section 'Wave exciting forces'. Any (mechanical) interaction forces between the rigid bodies may either be linear or non-linear, see the next section 'Current loads'. Mooring forces can also be included for all bodies.

As an example, the coupled equations of motion for a system of 3 bodies, giving 18 coupled differential equations, is shown below.

$$\begin{bmatrix} M_{11} & M_{12} & M_{13} \\ M_{21} & M_{22} & M_{23} \\ M_{31} & M_{32} & M_{33} \end{bmatrix} \times \begin{bmatrix} \ddot{x}_1 \\ \ddot{x}_2 \\ \ddot{x}_3 \end{bmatrix} + \begin{bmatrix} \int_0^t R_{11}(t-\tau) & \int_0^t R_{12}(t-\tau) & \int_0^t R_{13}(t-\tau) \\ \int_0^t R_{21}(t-\tau) & \int_0^t R_{22}(t-\tau) & \int_0^t R_{23}(t-\tau) \\ \int_0^t R_{31}(t-\tau) & \int_0^t R_{32}(t-\tau) & \int_0^t R_{33}(t-\tau) \end{bmatrix} \times \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} + \begin{bmatrix} c_{11} & 0 & 0 \\ 0 & c_{22} & 0 \\ 0 & 0 & c_{33} \end{bmatrix} \times \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} F_1 \\ F_2 \\ F_3 \end{bmatrix} (\underline{x}_1, \dot{\underline{x}}_1, \underline{x}_2, \dot{\underline{x}}_2, \underline{x}_3, \dot{\underline{x}}_3, t) \quad (2)$$

in which:

- M = inertia and added inertia matrix
 R = matrix of retardation functions
 C = matrix of hydrostatic restoring forces
 x = motion vector
 F = vector of external forces such as:
 - first order wave forces
 - low frequency drift forces
 - wind forces
 - non-linear viscous damping forces
 - interaction forces between the rigid bodies
 - current forces
 - mooring line forces

Wave exciting forces

The low frequency and wave frequency wave exciting forces and moments are also calculated using the diffraction calculation results. First order wave load coefficients in combination with a specified wave spectrum are used to calculate the first order wave loads. The second order wave drift forces are calculated using the quadratic transfer functions (QTFs) from the diffraction calculations.

Wind loads

The wind loads on the floating bodies are calculated using dimensionless wind load coefficients, which are defined as follows.

$$X_{\text{wind}} = 0.5 \rho_a V_{\text{wr}}^2 C_{\text{wx}}(\alpha_{\text{wr}}) A_T$$

$$Y_{\text{wind}} = 0.5 \rho_a V_{\text{wr}}^2 C_{\text{wy}}(\alpha_{\text{wr}}) A_L$$

$$N_{\text{wind}} = 0.5 \rho_a V_{\text{wr}}^2 C_{\text{wn}}(\alpha_{\text{wr}}) A_L L_{\text{PP}}$$

in which:

X_{wind}	=	Longitudinal wind force, [kN]
Y_{wind}	=	Transverse wind force, [kN]
N_{wind}	=	Wind yawing moment, [kNm]
ρ_a	=	Air density, [kg/m ³]
V_{wr}	=	Instantaneous relative wind velocity at a reference height of 10 m, [m/s]
C_w	=	Dimensionless wind force coefficients, [-]
α_{wr}	=	Ship-fixed wind direction (180 deg = head wind), [deg]
A_T	=	Transverse wind area of the floating body and superstructures, [m ²]
A_L	=	Lateral wind area of the floating body and superstructures, [m ²]
L_{PP}	=	Length between perpendiculars of the floater, [m]

For tanker-shaped vessels, often the OCIMF wind coefficients are used, see Reference [1]. It is also possible to apply user-defined coefficients, e.g. from wind tunnel tests.

During the time-domain simulations, the wind velocity and direction can be either constant, or variable. The variable wind speed can be used by applying a wind spectrum (theoretical or user-defined) or by applying a user-supplied time record of the wind.

Current loads

The current loads on the floater hull are calculated in the same manner as the wind loads. The following formulas are used.

$$X_{\text{current}} = 0.5 \rho_w V_{\text{cr}}^2 C_{\text{cx}}(\alpha_{\text{cr}}) T L_{\text{PP}}$$

$$Y_{\text{current}} = 0.5 \rho_w V_{\text{cr}}^2 C_{\text{cy}}(\alpha_{\text{cr}}) T L_{\text{PP}}$$

$$N_{\text{current}} = 0.5 \rho_w V_{\text{cr}}^2 C_{\text{cn}}(\alpha_{\text{cr}}) T L_{\text{PP}}^2$$

in which:

X_{current}	=	Longitudinal current force, [kN]
Y_{current}	=	Transverse current force, [kN]
N_{current}	=	Current yawing moment, [kNm]
ρ_w	=	Water density, [kg/m ³]
V_{cr}	=	Relative current velocity with respect to floater velocity (m/s)
C_c	=	Current force coefficients
α_{cr}	=	Relative (ship-fixed) current direction, [deg]
T	=	Vessel draft, [m]
L_{PP}	=	Length between perpendiculars of the floater, [m]

For tanker-shaped vessels, often the OCIMF wind coefficients are used, see Reference [1]. It is also possible to apply user-defined coefficients, e.g. from wind tunnel tests.

Mechanical interactions and mooring loads

Any mechanical connection between the floating bodies or between one of the bodies and the sea bottom can be modelled, as long as it can be described in terms of (relative) positions and velocities. In this manner it is possible to model e.g. mooring lines between bodies (without considering mooring line dynamics), or fenders.

Low frequency damping

Any moored object in waves will show first order wave frequency (WF) motions, caused by first order (linear) wave loads, as well as low frequency (LF) motions, caused by second order wave drift forces. The damping of the first order motions consists mainly of potential damping, due to radiated waves. The LF motions, however, show such long periods that no waves are radiated. For this reason, the LF damping is of viscous origin only and needs to be included in the simulation model explicitly. The aNySIM program can use the built-in LF damping models for tanker shaped vessels, see Reference [2], as well as formulations for wave drift damping, see Reference [3]. Alternatively, linear and/or quadratic damping contributions can be included explicitly through damping matrices.

Other external loads

Any external loads that can be described as a function of time and/or the body motions and velocities can be included in the right hand side of the coupled equations of motion. Examples of such external loads are time-records of wind or current loads (from an external calculation) or external loads applied by a tug.

Time-domain integration

The numerical solution of the 18 second order differential equations (2) is carried out according to the following global procedure. Suppose the simulation has arrived at the moment t , while Δt is the time increment applied, then the equations of motion have to be solved for the moment $t+\Delta t$. First, the velocities for $t+\Delta t'$ are predicted, in which $\Delta t'$ is a fraction of Δt depending on the chosen integration method.

Subsequently, the new position and orientation are predicted by numerical integration. For these new coordinates and time ($t+\Delta t'$) all forces can be calculated. After substitution of these forces in (2), 18 linear equations are obtained from which the accelerations \ddot{x} ($t+\Delta t$) can be found.

Finally, the predicted velocities are checked by integration of the accelerations. In case the difference is acceptable, the computation continues for the next time step; if not, the time increment has to be decreased. This process continues until the equation of motion at $t+\Delta t$ are solved correctly.

References

- [1] "Prediction of Wind and Current Loads on VLCCs", OCIMF Publication, 1994.
- [2] Wichers, J.E.W.; "Simulation Model for a Single Point Moored Tanker", Ph.D.-Thesis, Delft University of Technology, 1988.
- [3] Aranha, J.A.P.; "A Formula for Wave Drift Damping in the Drift of a Floating Body", Journal of Fluid Mechanics, 275, 1994.