

GUEMES ISLAND FERRY REPLACEMENT Weight and Stability

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References

1. *Guemes Island Ferry, General Arrangement*, Glosten Inc., Drawing No. 17097.02-070-01
2. 46 CFR, *Shipping*. 2020.
3. General HydroStatics (GHS) [software], Creative Systems Inc. v 17.00.
4. *Weight Estimating and Margin Manual for Marine Vehicles*, International Society of Allied Weight Engineers, Inc., Recommended Practice Number 14, 2001.
5. *Guemes Island Ferry Replacement, Lines Plan*, Glosten, Drawing No. 17097.02-070-03.

Summary

The Guemes Island Ferry Replacement vessel preliminary design intact and damage stability were evaluated against the required stability criteria and determined to be satisfactory. The subject vessel is characterized as a Subchapter T small passenger vessel, operating on partially protected waters according to Reference 2.

The results of the intact and damage stability analyses are summarized by a plot of the maximum allowable vertical center of gravity measured from the keel (VCG) versus the full range of vessel operating displacements and trims (see Figure 6). This curve of maximum allowable VCG forms the basis for evaluating compliance of vessel loading conditions with the stability criteria. Figure 6 shows that the representative loading condition VCGs are located below the curve of maximum allowable VCG. This demonstrates that the vessel meets the stability criteria.

All loading conditions are detailed in Appendix A.

General

Principal Characteristics

Vessel particulars are as follows:

Length, molded (ft)	160.0
Length, waterline (ft)	152.5
Beam, molded (ft)	53.0
Beam, waterline (ft)	39.1
Depth, at centerline (ft)	13.45
Depth, at deck edge (ft)	13.0
Draft, design waterline (ft)	7.41
Displacement, design waterline (LT SW)	505.6
Block coefficient	0.40

Subdivision

Frame 0 is assumed to be at amidships, and the frame locations forward (f) and aft (a) of amidships are symmetric about amidships. Main transverse watertight bulkheads (MTWBs) are located at Frames 16a, 12a, 6a, 6f, 12f, and 16f following this convention with a 4'-0" transverse frame spacing.

As a double-ended ferry, the bulkheads at Frames 16a and 16f are required to be collision bulkheads per 46 CFR 171.060(d). In addition, the vessel is subjected to requirements of Type II subdivision per 46 CFR 171.070 and must satisfy two-compartment flooding at the ends and one-compartment flooding otherwise.

A draft of ~8' corresponds to the maximum load condition (see the Loading Conditions section). The allowable operating static trim ranges from 1.0° by the bow through 1.0° by the stern. The permeability is assumed to be 95% for all spaces for conservatism. The resulting floodable length curves are shown in Figure 1 with the bulkheads at Frames 16a and 16f removed to represent the required two-compartment flooding.

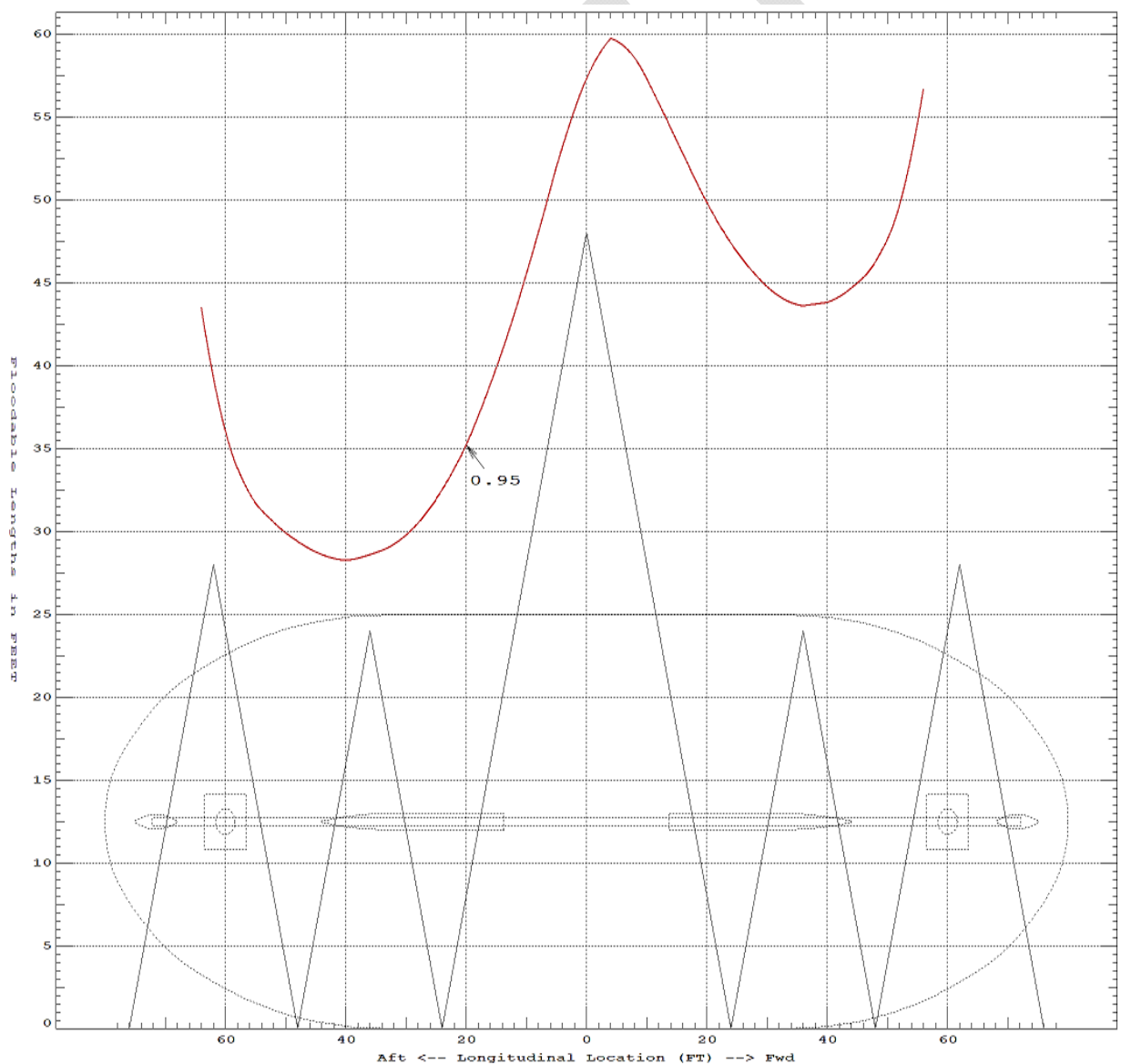


Figure 1 Floodable length curves by permeability, initial draft = 7.94 ft at 1 degrees aft trim, Min GM = 5.10 ft

Downflooding Points

The following table shows the locations of the downflooding points used in the stability analysis. All downflooding points have been assumed symmetric about the centerline for intact stability analysis purposes.

Table 1 Downflooding points

Downflooding Point	Longitudinal Location ft + aft Fr. 0	Transverse Location ft + stbd. CL	Vertical Location ft + abv. BL
Battery Bank 1 Outlet	2	-25.27	16.5
Battery Bank 2 Outlet	6	-25.27	16.5
Switchboard Room Inlet	-10.46	12.46	16.7
Generator Room Inlet	15.75	12.46	17.25

All other compartments are fitted with watertight closures at the compartment vents and thus are not downflooding points per 46 CFR 170.055(i).

Tank Capacities

Tank capacities are shown in Table 2.

Table 2 Tank Capacities

Tank Name	Capacity @ 100% (gal)	Specific Gravity	LCG (ft)	TCG (ft)	VCG (ft)	Max Free Surface (LT-ft)
Fuel	1650.2	0.87	28.00a	0.00	8.98	8.2
Sanitary	538.6	1.00	12.06a	13.92s	6.99	0.6
Potable	538.6	1.00	4.10a	13.92s	6.99	0.6

Hydrostatic Model

All stability calculations were performed using General Hydrostatics (GHS) software (Reference 3). All windage areas above the main deck not included in buoyant volume are modeled as sail components. The hydrostatic model is shown in Figure 2.

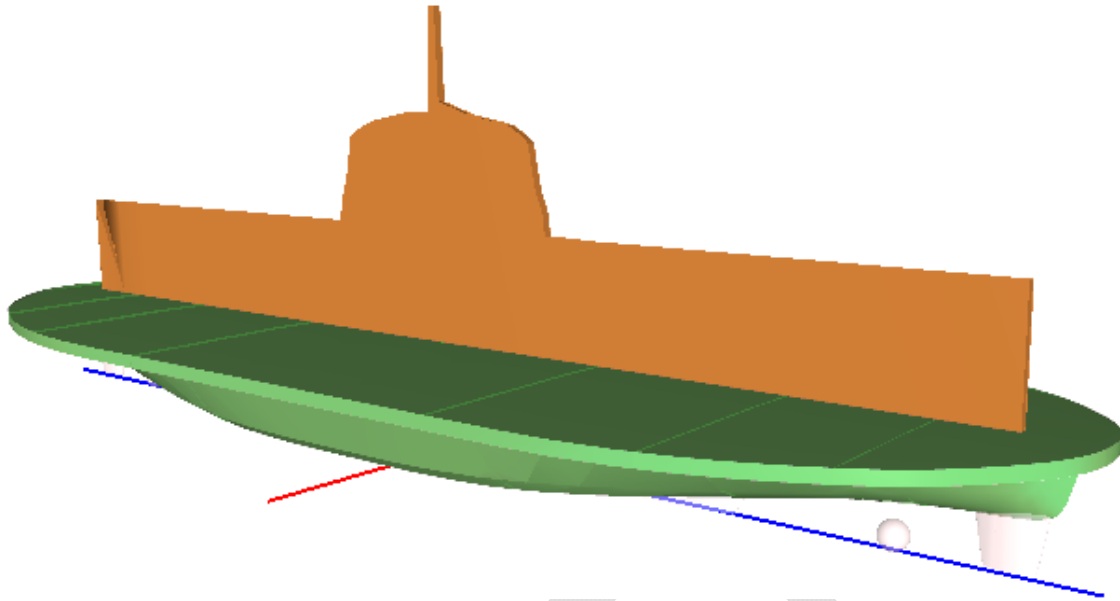


Figure 2 Hydrostatic model with sail area representing a full load of vehicles

Hydrostatics

Vessel hydrostatics over the operating range of displacements and drafts are given in Table 3.

Table 3 Hydrostatics at zero trim, zero heel

Displ LT SW	Draft ft	LCB ft +aft Fr. 0	VCB ft +abv. BL	TPI LT/in	LCF ft +aft Fr. 0	MCT1° LT-ft/deg	KM _L ft	KM _T ft
375	6.284	0	4.09	8.88	0	1902.91	290.7	29.55
400	6.516	0	4.24	9.08	0.01	2014.96	288.6	28.94
425	6.744	0	4.38	9.27	0	2115.69	285.2	28.41
450	6.966	0	4.52	9.44	0.01	2209.33	281.3	27.94
475	7.185	0	4.65	9.6	0	2295.28	276.8	27.53
500	7.397	0	4.78	9.96	0	2532.91	290.2	27.17
525	7.605	0	4.91	10.1	0	2605.63	284.3	26.84
550	7.81	0	5.04	10.24	0	2674.54	278.6	26.54
575	8.012	0	5.16	10.37	0	2739.98	273	26.28
600	8.212	0	5.29	10.49	0	2803.2	267.7	26.06

Weight

Lightship Weight

The estimated lightship weight is shown in Table 4. This weight estimate uses the weight and VCG margins set forth in Reference 4, consistent with the level of design completion.

Table 4 Lightship weight summary

SWBS No.	Group Description	Margin %	Weight LT	Margin LT	LCG ft +Aft Fr 0	TCG ft +Stbd CL	VCG ft +Abv BL	Notes
100	Hull and House Structure	8.00%	241.71	19.34	0.31	0.64	10.04	
200	Propulsion Plant	9.00%	30.38	2.73	0.00	-0.08	8.00	
300	Electric Plant	12.00%	31.74	3.81	-4.32	1.48	10.96	
400	Command and Surveillance	12.00%	0.61	0.07	0.00	16.50	25.72	
500	Auxiliary Systems	12.00%	18.65	2.24	2.95	2.07	9.31	
600	Outfit and Furnishings	12.00%	23.29	2.80	0.05	6.21	13.38	
	Lightship (Without Margins)		346.39		-0.02	1.14	10.16	
	Design and Build Weight Margin (Total)	8.21%	30.99					% of Weight
	Design and Build VCG Margin	9.00%					0.91	% of VCG
	Contract Mods. Weight Margin	0.93%	3.49					% of Weight
	Contract Mods. VCG Margin	0.78%					0.08	% of VCG
	Lightship (Without Ballast)		380.87		-0.02	1.15	11.16	
	Fixed Ballast		13.00		0.00	-23.36	12.00	
	Lightship (Total)		393.87		-0.02	0.34	11.19	

Loading Conditions

Four loading conditions were evaluated as follows:

- Light Operating – 10% fuel, 10% potable water, 10% sanitary, no passengers nor vehicles
- Most Probable – 50% fuel, 50% potable water, 50% sanitary, 42 passengers, 21 passenger vehicles
- Full Operating – 95% fuel, 100% potable water, 0% sanitary, 110 passengers, 1 truck, 25 passenger vehicles
- Max Load – 95% fuel, 100% potable water, 100% sanitary, 150 passengers, 3 trucks, 19 passenger vehicles

Details of each loading condition can be found in Appendix A. Each loading condition is corrected for free surface, which is caused by liquids in partially filled tanks (slack tanks) shifting transversely in the direction of heel. The reduction in stability is accounted for by a virtual increase in VCG of the loading condition. The free surface correction is based on the maximum free surface moment of all tanks on the vessel.

Stability Calculations

Intact Stability

This section summarizes the intact stability criteria. The allowable operating static trim ranges from 1.0° by the bow through 1.0° by the stern. According to Reference 2, a subchapter T small passenger vessel is required to comply with the applicable requirements of:

- 46 CFR§170.170 Weather Criteria;
- 46 CFR§170.173(e) Righting Energy;
- 46 CFR§171.050 Passenger Heel (zero trim only).

Each of the intact stability criteria was evaluated over a range of displacements from 350 LT to 650 LT in increments of 25 LT.

46 CFR§170.170 Weather Criteria

Wind pressure for service on partially protected waters is defined as follows:

$$P = 0.0033 + \left(\frac{L}{14200}\right)^2 \left[LT/\text{ft}^2\right]$$

where: L = LBP [ft].

This pressure is used to develop a minimum GM_t for every displacement evaluated. The expression for GM_t is shown below:

$$GM_t \geq \frac{PAH}{W \tan(T)},$$

where: A = projected lateral area of vessel above waterline;
 H = height between lateral area above and below the waterline;
 W = vessel displacement;
 T = angle where one half of the freeboard is submerged.

The minimum GM_t is used to calculate the maximum allowable VCG using the expression:

$$VCG = VCB + BM_t - GM_t.$$

46 CFR§170.173(e) Righting Energy Criteria

The righting energy criteria for vessels operating on partially protected routes are excerpted below:

- (e) (1) For partially protected routes, there must be—
(i) Positive rights arms to at least 35 degrees of heel;
(ii) No down flooding point to at least 20 degrees; and
(iii) At least 15 foot-degrees of energy to the smallest of the following angles:
(A) Angle of maximum right arm.
(B) Angle of down flooding.
(C) 40 degrees.

46 CFR§171.050 Passenger Heel Criteria

A minimum required GM_t based on passenger heeling is evaluated for each displacement. The expression for GM_t is shown below:

$$GM_t = [(W/\Delta)(2/3)(b)]/(\tan T)$$

where: W = total weight of persons other than required crew incl. personal effects;
 Δ = vessel displacement;
 b = distance from the vessel centerline to the geometric center of the passenger deck on one side of centerline;
 T = 14° or the angle of heel at which the deck edge is submerged, whichever is less.

The minimum GM_t is used to calculate the maximum allowable VCG using the expression:

$$VCG = VCB + BM_t - GM_t.$$

This criterion has been evaluated at an even keel only (zero trim) since it is based on metacentric height.

Damage Stability

This section summarizes the damage stability criteria and assumptions. The allowable operating trim ranges from 1.0° by the bow through 1.0° by the stern. The damage stability criteria were evaluated over a range of displacements from 350 LT to 650 LT in increments of 25 LT.

Damage stability was calculated based on the following criteria:

- 46 CFR§171.080(f) Damage Stability.

46 CFR§171.080(f) Damage Stability Criteria

The damage criteria defined in 46 CFR§171.080(f) for all new vessels for service on partially protected waters were applied. The damage criteria are paraphrased by paragraph as follows:

- (1) Positive righting arm for a minimum range of 10 degrees beyond the angle of equilibrium
- (2) No downflooding that occurs within 10 degrees of equilibrium
- (3) Area under each righting arm curve at least 2.82 ft-deg, measured from equilibrium to the smallest of:
 - (i) Downflooding angle
 - (ii) Angle of vanishing stability
- (4) GZ equal to or greater than 0.328 ft or

$$GZ = C \left(\frac{\text{Heeling Moment}}{\Delta} + 0.04 \right)$$

where: $C = 0.75$ for vessels on partially protected waters;

$\Delta =$ intact displacement.

The heeling moment is defined as the largest of:

- (A) Passenger heeling moment
 - (B) Heeling moment due to asymmetric escape routes
 - (C) Heeling moment due to survival craft launching
 - (D) Wind heeling moment
- (5) Not applicable; no exemption from (4) requested.
 - (6) Angle of equilibrium that does not exceed:
 - (i) 7 degrees for one-compartment flooding
 - (ii) 12 degrees for flooding of two compartments; or
 - (iii) A maximum of 15 degrees for one- or two-compartment flooding where:
 - (A) Positive righting arm for 20 degrees beyond equilibrium
 - (B) Area under each righting arm curve greater than or equal to:

$$A \geq 0.4700 (\theta - 1)$$

where: $A =$ area (ft-deg) under each righting-arm curve measured from the angle of equilibrium to the smaller of either the downflooding angle or the angle of vanishing stability;

$\theta =$ angle of equilibrium in degrees.

- (7) The margin line must not be submerged at equilibrium

The damage calculations incorporate both 46 CFR§171.080 (f)(6)(i) and 46 CFR§171.080 (f)(6)(iii), meaning that the vessel was allowed to heel to a final equilibrium of 15° provided that 46 CFR§171.080 (f)(6)(iii)(A) and (B) were satisfied.

Margin Line

The margin line is defined in accordance with 46 CFR§171.015(b) for a vessel with a continuous bulkhead deck and insufficient shear (see Figure 3) with the margin line 9" below top of deck amidships as per Reference 2, Table 171.015.

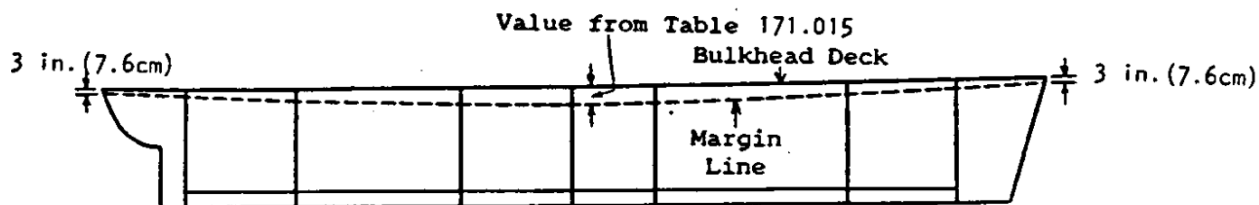


Figure 3 Margin line for a vessel with a continuous bulkhead deck and insufficient shear (Reference 2)

Extent of Damage

For the calculation of extent and character of damage, 46 CFR§179.212(a) requires that the vessel comply with Type II subdivision. A combination of one- and two-compartment standard of flooding is required by 46 CFR§171.070(b). The extent and character of damage is from Table 171.080(a) for Category Y vessels. The extent of damage is shown in Table 5 below. The character of damage assumes damage to only the collision bulkheads at each end.

Table 5 Damage extent

Direction	Extent of Damage	Value
Longitudinal	10 ft + 0.03*LBP or 35 ft, whichever is less	14.55 ft
Transverse	B/5, where B is the beam of the vessel at the subdivision load line (BWL)	7.88 ft
Vertical	Upward from baseline without limit	Unlimited

Permeability

The permeability of each space in the vessel is shown in Table 6. These values are applied in accordance with 46 CFR§171.080(c).

Table 6 Compartment permeability

Space Designation	Permeability (%)	Compartments in GHS Model
Accommodations	95	N/A
Machinery	85	MACHY_SPACE
Tanks		
Voids	95	VOID1, VOID2...VOID5, VOID6
FOT	95	FOT
FW, SAN	95	FW, SAN
Permanent Ballast	0	BALLAST

Damage Case Matrix

The vessel is divided into seven zones by the main transverse watertight bulkheads (MTWBs). These zones are approximately symmetric about amidships. For simplicity, only the forward end is analyzed with respect to damage stability with each damage case reflecting the damage to the compartment(s) in those zones. Table 7 describes the damage cases. Due to symmetry, only starboard damage is considered.

Table 7 Damage case matrix

Damage Case	Compartments Flooded	GHS Parts	Zone Boundary
A	Void 1	VOID1.C	Stem to FR 17f
B	Drive Room 1	VOID2.C	FR 17f to 12f
C	Void 1, Drive Room 1	VOID1.C, VOID2.C	Stem to FR 12f
D	Void 2 (no FOT)	VOID3.C	FR 12f to 6f
E	Machinery Space	MACHY_SPACE.C	FR 6f to 6a

Maximum VCG Results

The following sections contain the curves of maximum VCG that satisfy the intact and damage stability criteria.

Intact Stability

Figure 4 shows the maximum allowable VCG based on each intact stability criterion.

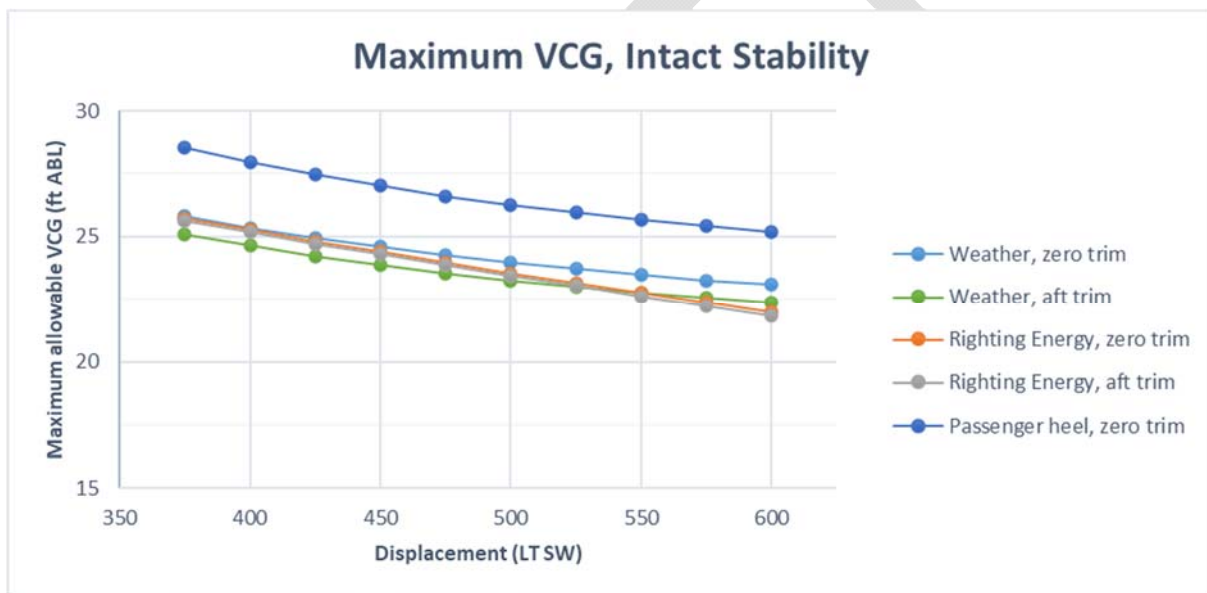


Figure 4 Maximum allowable VCG for intact stability criteria

Damage Stability

Figure 5 shows the maximum allowable VCG for all damage cases, where the A, Z, or F additions to the damage case indicate the vessel trim (Aft, Zero, or Forward).

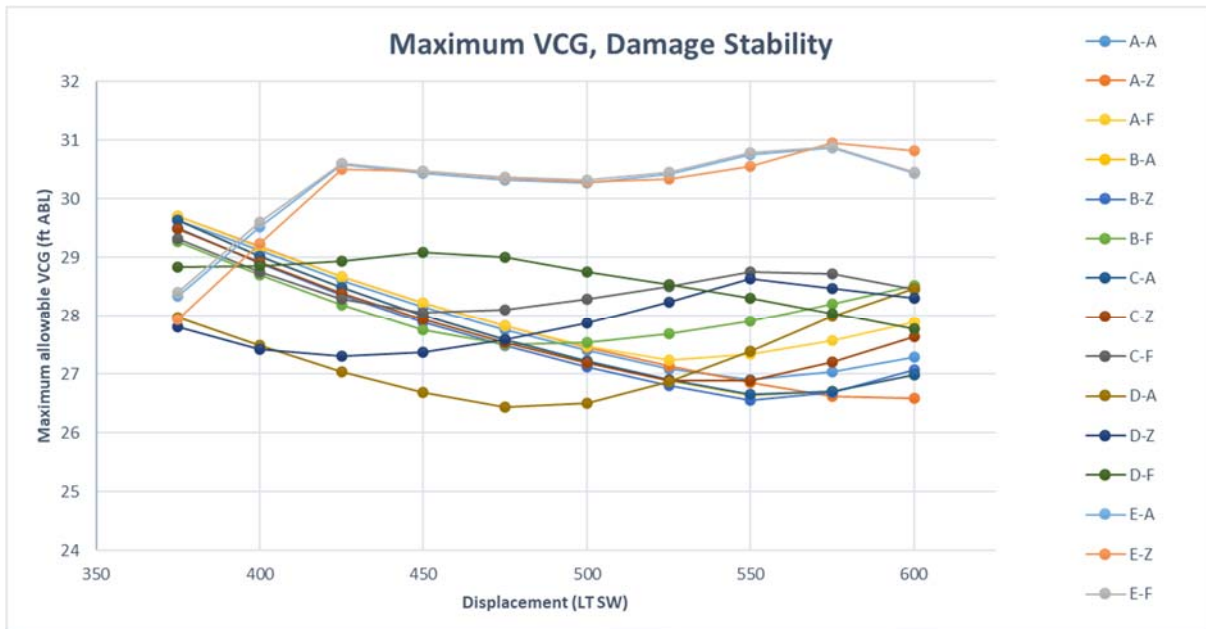


Figure 5 Maximum allowable VCG for damage stability criteria

Composite Maximum VCG Results

The limiting values from the intact and damage stability analysis are combined to form the governing maximum VCG curve as shown in Figure 6. This figure also shows the load conditions as discussed in the Loading Conditions section. Note that the maximum VCG curve does not include a free surface correction. Therefore, each loading condition is corrected for free surface when plotted on the graph. Values of the maximum allowable VCG curve are also given in tabular form (see Table 8). The intact stability requirements are governing the maximum VCG for the entire range of operating displacements.

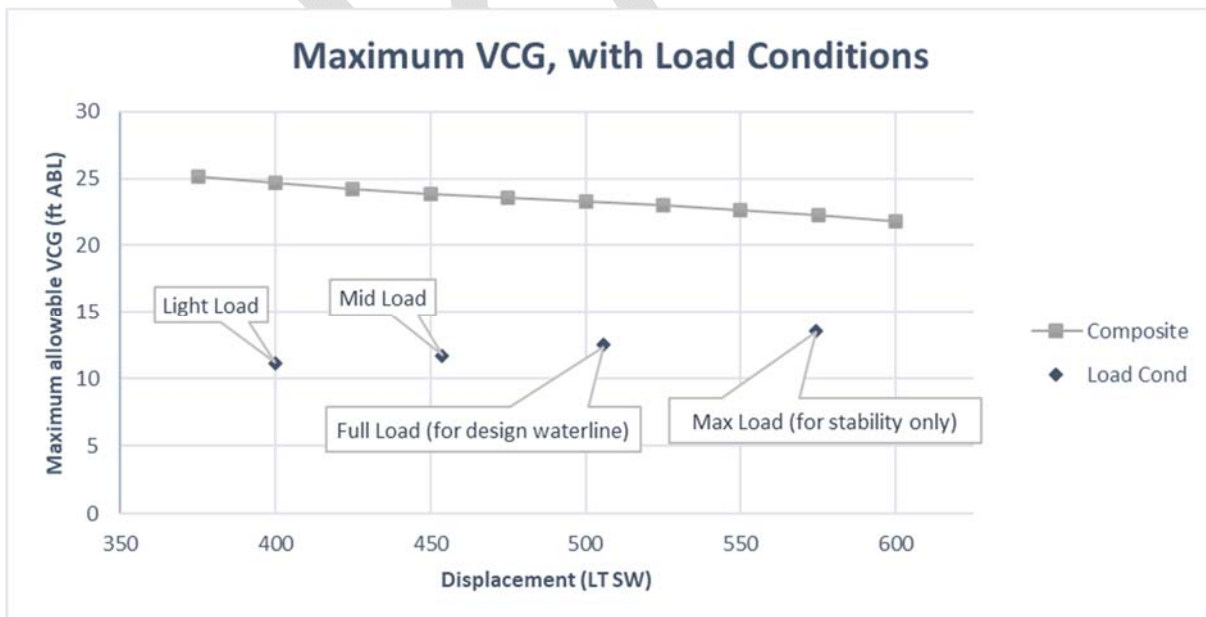


Figure 6 Maximum allowable VCG for intact and damage criteria forming the composite curve with load conditions plotted

Table 8 Values of maximum allowable VCG curves shown in Figure 6

Displ. (LT SW)	Maximum VCG (ft ABL)		
	Intact	Damage	Composite
375	25.1	27.8	25.1
400	24.7	27.4	24.7
425	24.2	27.0	24.2
450	23.9	26.7	23.9
475	23.5	26.4	23.5
500	23.3	26.5	23.3
525	23.0	26.8	23.0
550	22.6	26.6	22.6
575	22.2	26.6	22.2
600	21.8	26.6	21.8

DRAFT

Appendix A Loading Conditions

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LIGHTSHIP WEIGHT ONLY

WEIGHT STATUS

Trim: 0.00 deg., Heel: Stbd 1.08 deg.

Part-----	Weight (LT)	LCG	TCG	VCG	FSM	
WEIGHT	393.87	0.02f	0.34s	11.19		
	Load-----	SpGr-----	Weight (LT)	LCG	TCG	VCG
Total Tanks----->	--- Included in Fixed Weight ---				9.4*	
Total Weight----->	393.87	0.02f	0.34s	11.19		
Free Surface Adjustment----->				0.02		
Adjusted CG----->		0.02f	0.34s	11.21		
Distances in FEET.-----				Moments in Ft-LT.		

Note: FSM values marked with an asterisk (*) are formal values which are not the same as the true values in the present condition.

HYDROSTATIC PROPERTIES

Trim: 0.00 deg., Heel: Stbd 1.08 deg., VCG = 11.19

LCF	Displacement	Buoyancy-Ctr.	Weight/	Moment/				
Draft----	Weight (LT)	LCB-----	VCB-----	Inch-----	LCF--	Deg trim----	GML-----	GMT
6.419	393.87	0.02f	4.17	9.04	0.02f	1910.71	277.9	17.89
Distances in FEET.-----				Specific Gravity = 1.025.-----		Moment in Ft-LT.		
Draft is from Baseline.				Formal Free Surface included.				

Note: GMT includes the formal free surface moment 9.4 Ft-LT

HYDROSTATIC PROPERTIES

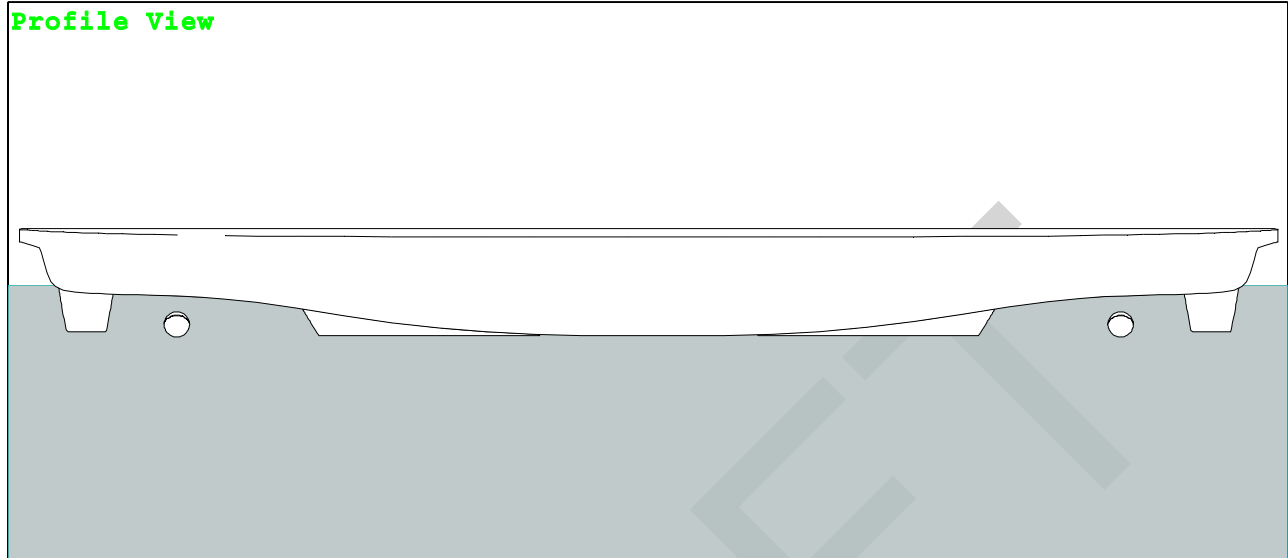
Trim: 0.00 deg., Heel: Stbd 1.08 deg.

Origin	Displacement	Center of Buoyancy						
Depth----	Weight (LT)	LCB-----	TCB-----	VCB-----	WPA-----	LCF-----	BML-----	BMT
6.418	393.87	0.02f	0.47s	4.17	3797	0.02f	284.9	24.92
Distances in FEET.-----				Specific Gravity = 1.025.----		Formal Free Surface included.		

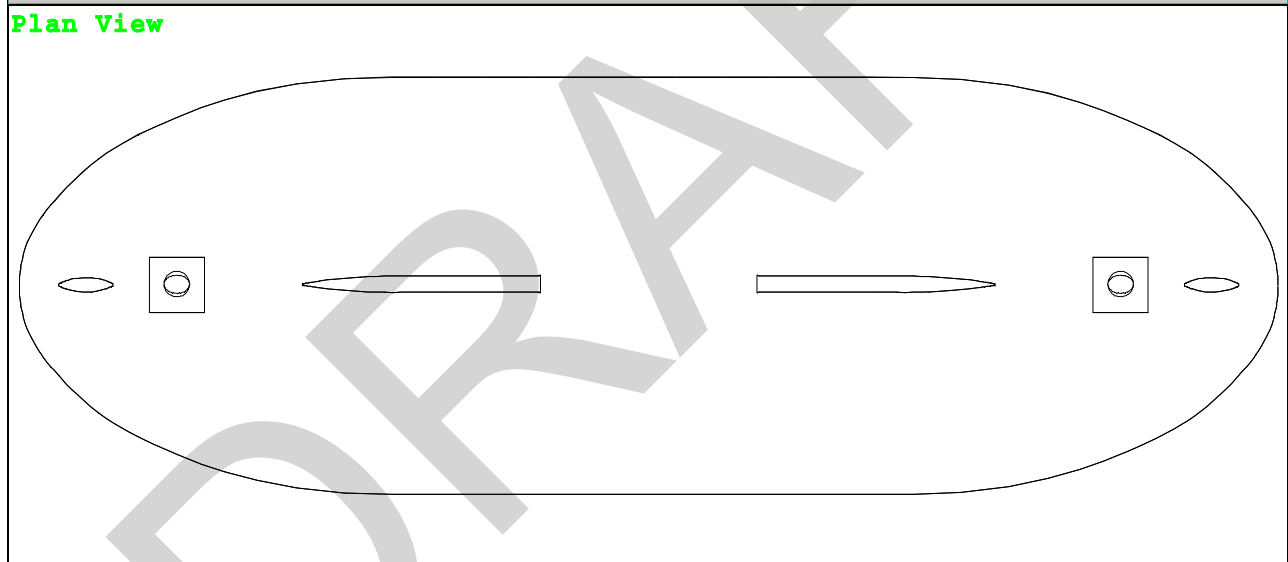
Note: BMT includes the formal free surface moment 9.4 Ft-LT

CG - Draft: 6.42 @ 0.00 Trim: 0.00 deg. Heel: stbd 1.08 deg.

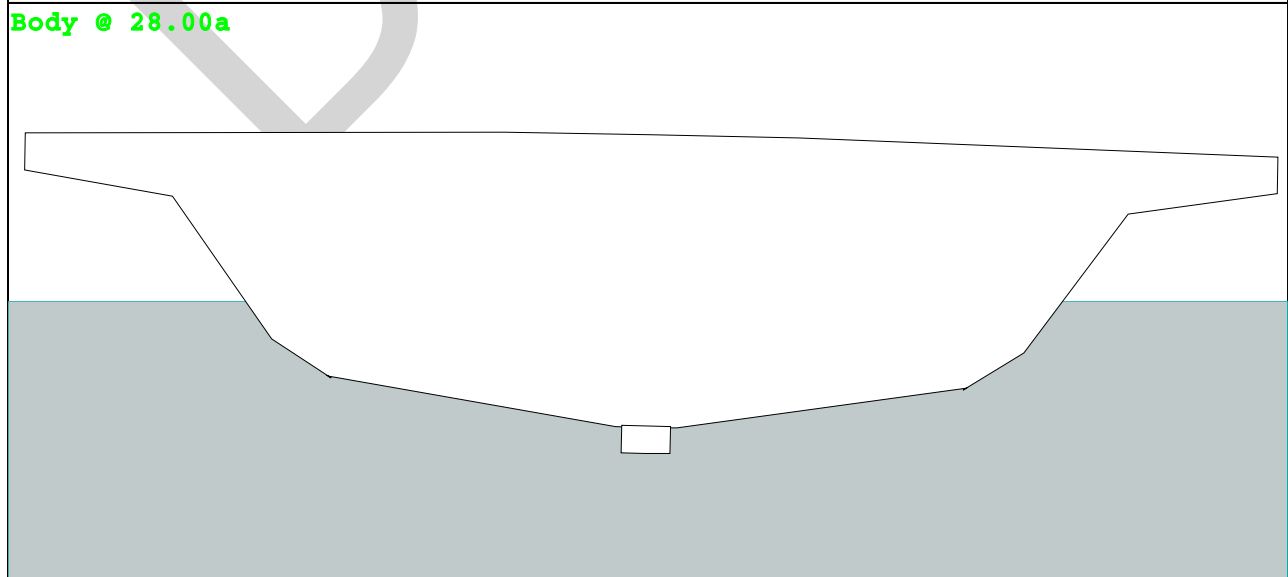
Profile View



Plan View



Body @ 28.00a



LIGHT OPERATING, 10% FUEL, NO PASSENGERS, NO CARS

WEIGHT STATUS

Trim: Aft 0.01 deg., Heel: Stbd 1.27 deg.

Part-----	Weight (LT)	LCG-----	TCG-----	VCG-----	FSM-----		
LIGHT SHIP	393.87	0.02f	0.34s	11.19			
Crew and Effects	0.30	0.00	15.42s	24.68			
General Stores	0.45	0.00	15.42s	15.42			
Crew Stores	0.45	0.00	15.42s	23.68			
Ships Stores and Spares	4.00	0.00	0.00	5.75			
Total Fixed----->	399.06	0.02f	0.38s	11.16			
	Load-----	SpGr-----	Weight (LT)	LCG-----	TCG-----	VCG-----	FSM-----
FOT.C	0.100	0.870	0.53	28.00a	0.34s	7.41	8.2
SAN.S	0.100	1.000	0.20	12.06a	13.98s	4.97	0.6
PW.S	0.100	1.000	0.20	4.10a	13.98s	4.97	0.6
Total Tanks----->			0.94	19.46a	6.19s	6.36	9.4*
Total Weight----->			400.00	0.03a	0.40s	11.15	
Free Surface Adjustment----->						0.02	
Adjusted CG----->				0.03a	0.39s	11.18	
Distances in FEET.-----				Moments in Ft-LT.			

Note: FSM values marked with an asterisk (*) are formal values which are not the same as the true values in the present condition.

HYDROSTATIC PROPERTIES

Trim: Aft 0.01 deg., Heel: Stbd 1.27 deg., VCG = 11.15

LCF	Displacement	Buoyancy-Ctr.	Weight/	Moment/				
Draft----	Weight (LT)	LCB-----	VCB-----	Inch-----	LCF--Deg trim----	GML-----	GMT	
6.474	400.00	0.03a	4.20	9.09	0.02a	1935.46	277.2 17.79	
Distances in FEET.-----				Specific Gravity = 1.025.-----				Moment in Ft-LT.
Draft is from Baseline.				Formal Free Surface included.				

Note: GMT includes the formal free surface moment 9.4 Ft-LT

HYDROSTATIC PROPERTIES

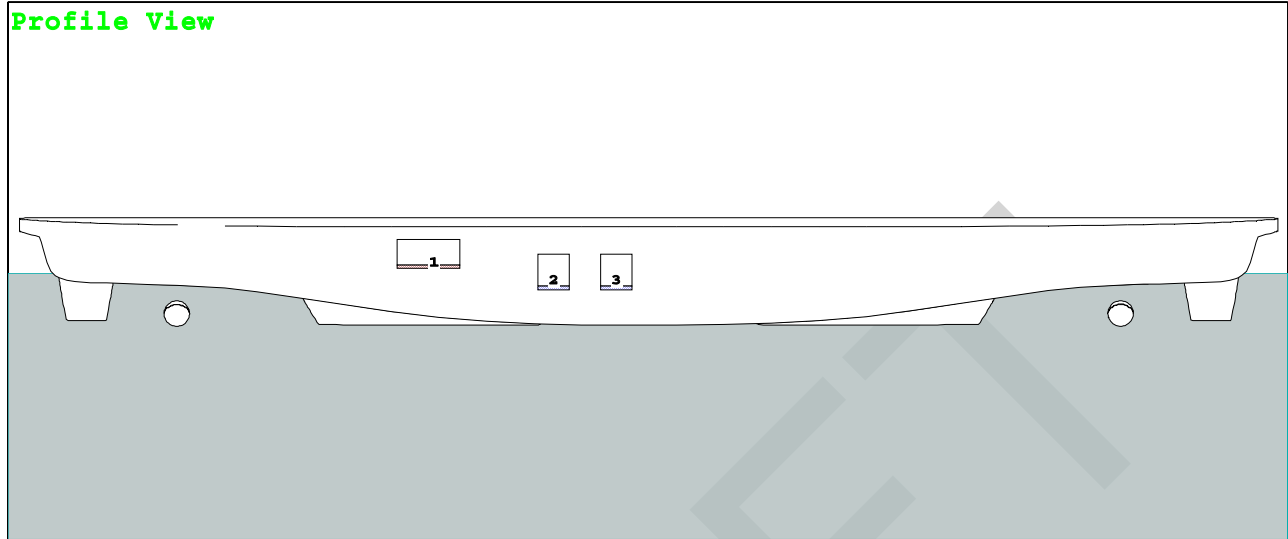
Trim: Aft 0.01 deg., Heel: Stbd 1.27 deg.

Origin	Displacement	Center of Buoyancy			WPA-----	LCF-----	BML-----	BMT
Depth----	Weight (LT)	LCB-----	TCB-----	VCB-----	WPA-----	LCF-----	BML-----	BMT
6.473	400.00	0.03a	0.55s	4.20	3817	0.02a	284.2	24.74
Distances in FEET.-----				Specific Gravity = 1.025.---				Formal Free Surface included.

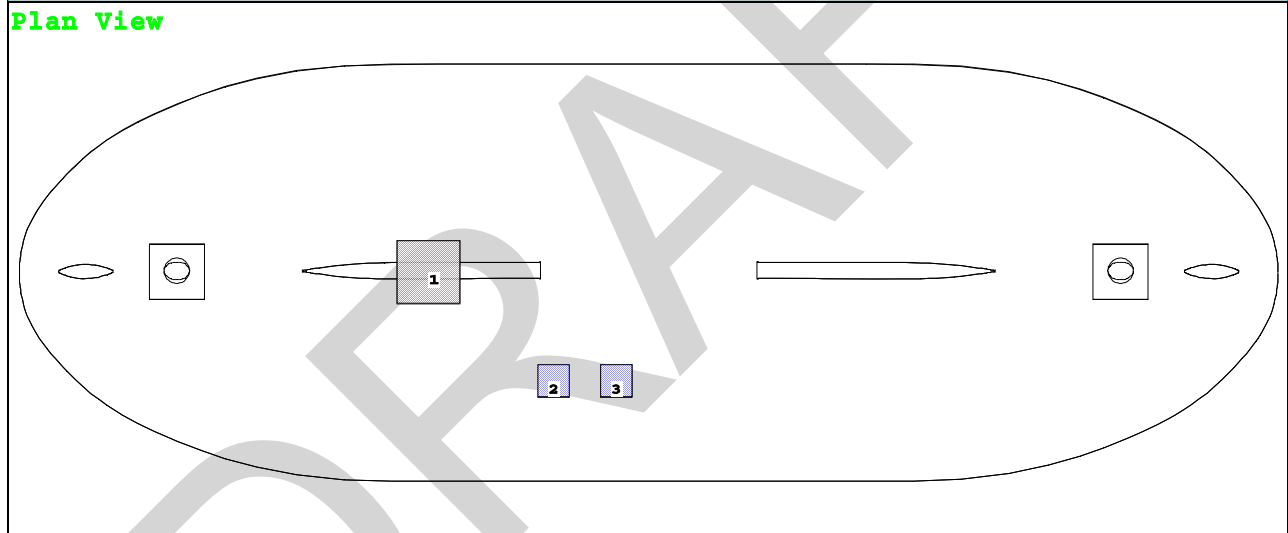
Note: BMT includes the formal free surface moment 9.4 Ft-LT

CG - Draft: 6.47 @ 0.00 Trim: aft 0.01 deg. Heel: stbd 1.27 deg.

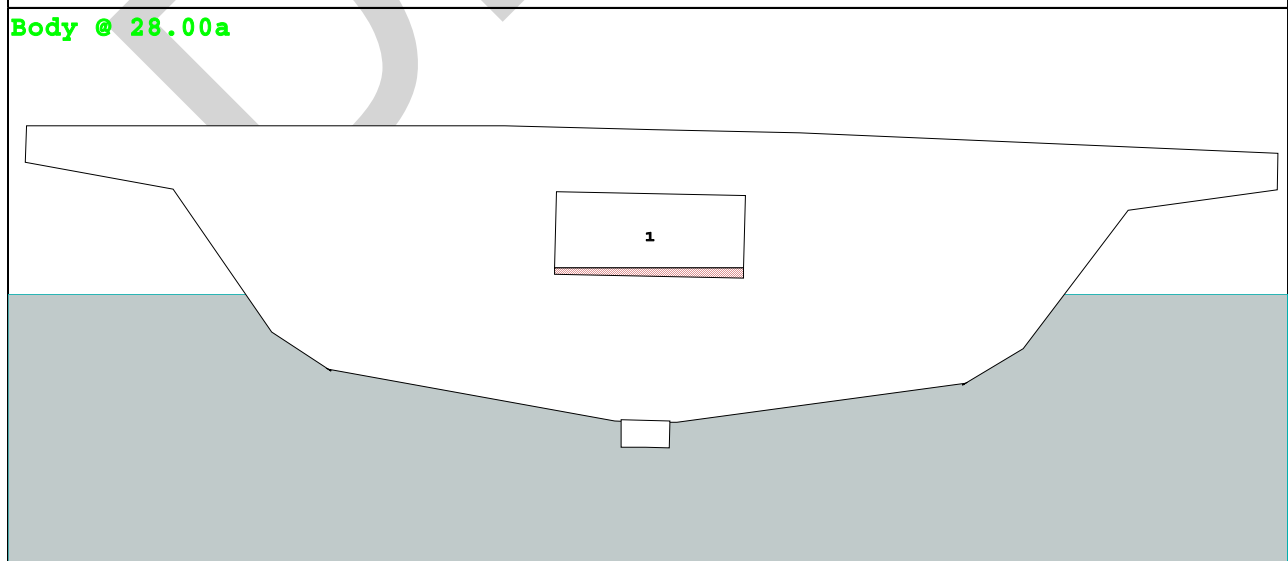
Profile View



Plan View



Body @ 28.00a

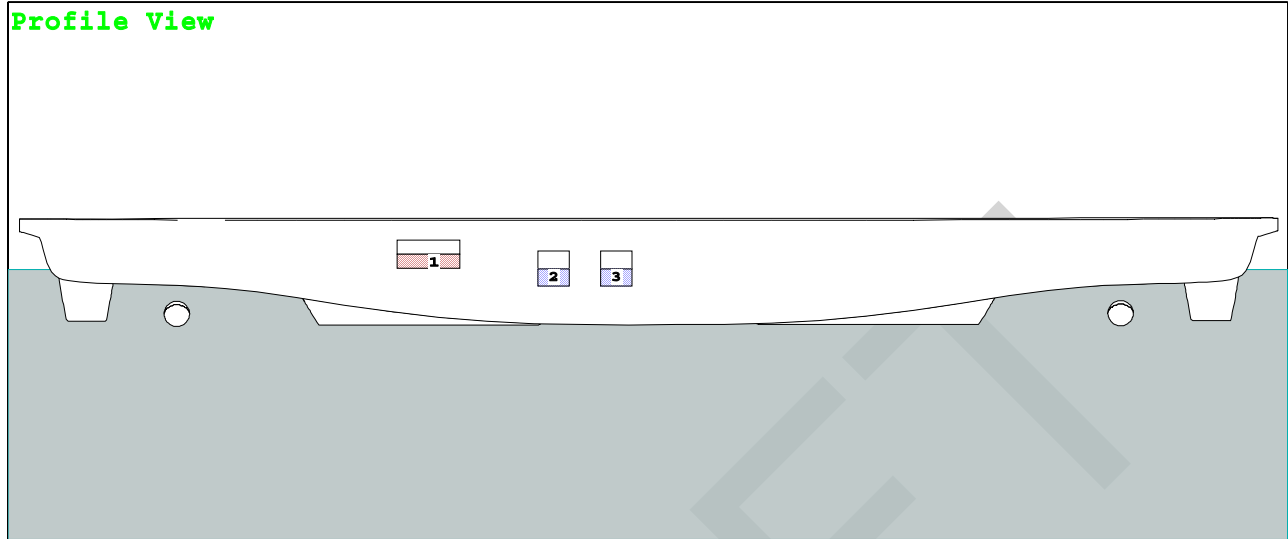


Tanks

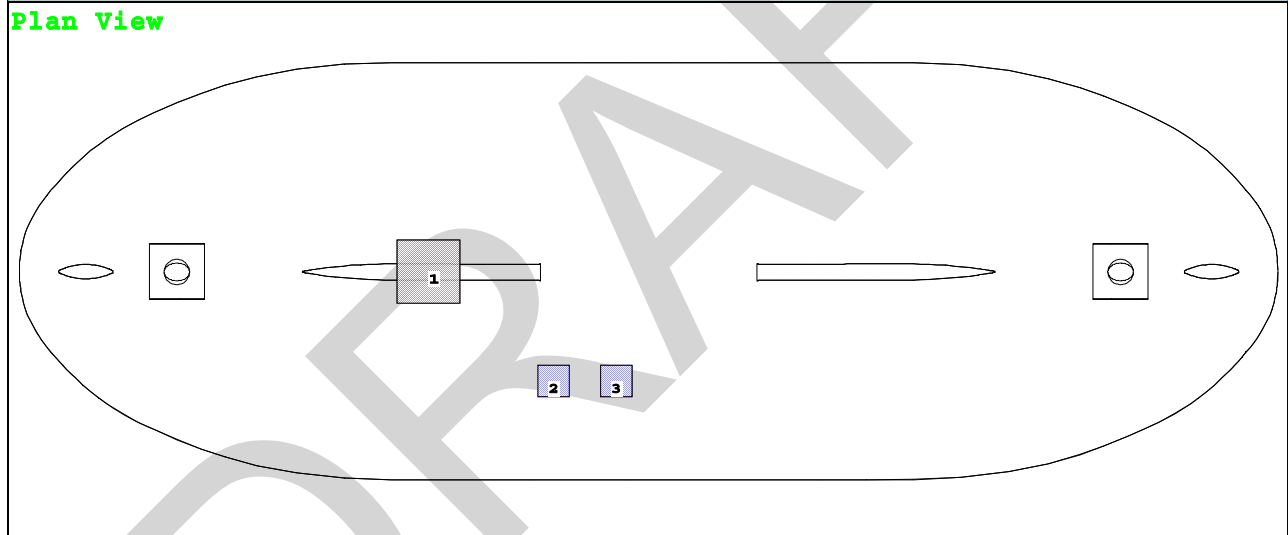
1 FOT.C..10% FUEL OIL 2 SAN.S..10% FRESH WATER 3 PW.S...10% FRESH WATER

CG - Draft: 6.96 @ 0.00 Trim: aft 0.04 deg. Heel: port 0.53 deg.

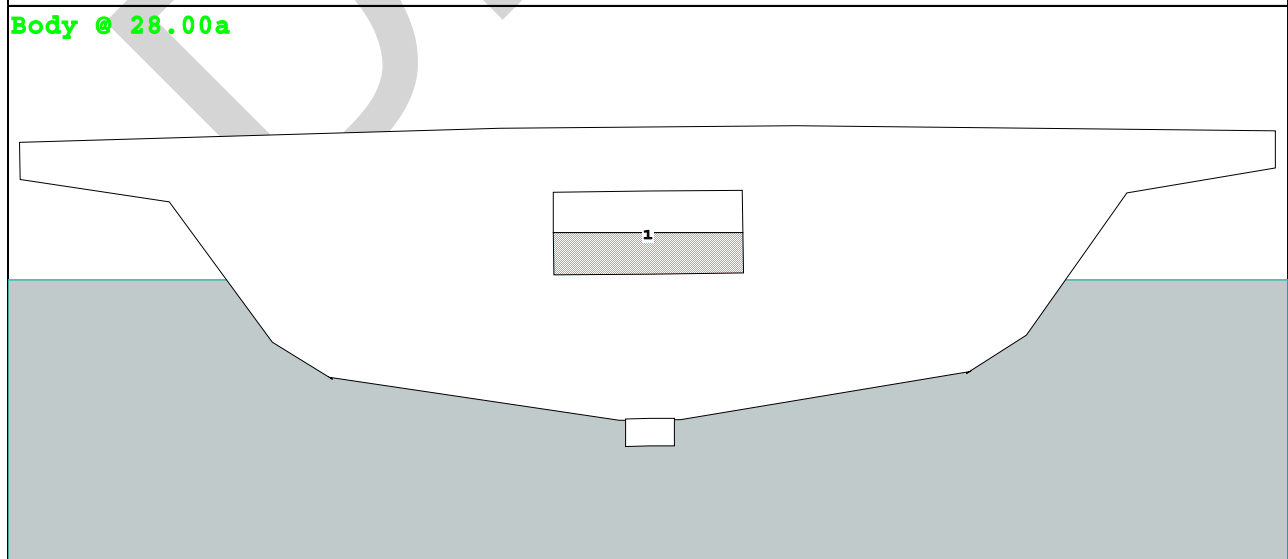
Profile View



Plan View



Body @ 28.00a



Tanks

1 FOT.C..50% FUEL OIL 2 SAN.S..50% FRESH WATER 3 PW.S...50% FRESH WATER

 FULL OPERATING, 95% FUEL, 1 TRUCK ON MD
 25 CARS ON MD, 100 PASS ON MD

WEIGHT STATUS

Trim: Aft 0.06 deg., Heel: Port 0.91 deg.

Part-----	Weight (LT)	LCG	TCG	VCG			
LIGHT SHIP	393.87	0.02f	0.34s	11.19			
Crew and Effects	0.30	0.00	15.42s	24.68			
General Stores	0.45	0.00	15.42s	15.42			
Crew Stores	0.45	0.00	15.42s	23.68			
Ships Stores and Spares	4.00	0.00	0.00	5.75			
MD Pax on Deck	3.63	0.00	5.65p	16.42			
MD Pax around House	5.45	0.00	17.25s	16.42			
Pass Vehicles	54.69	0.00	5.65p	16.42			
Trucks 51'-8	35.71	0.00	1.75p	21.17			
Total Fixed----->	498.55	0.02f	0.29p	12.55			
	Load-----	SpGr-----	Weight (LT)	LCG	TCG	VCG	FSM
FOT.C	0.950	0.870	5.08	28.00a	0.03p	8.89	8.2
PW.S	1.000	1.000	2.01	4.10a	13.92s	6.99	0.0
Total Tanks----->			7.09	21.24a	3.92s	8.35	9.4*
Total Weight----->			505.64	0.28a	0.23p	12.49	
Free Surface Adjustment----->						0.02	
Adjusted CG----->				0.28a	0.23p	12.51	
Distances in FEET.-----							Moments in Ft-LT.

Note: FSM values marked with an asterisk (*) are formal values which are not the same as the true values in the present condition.

HYDROSTATIC PROPERTIES

Trim: Aft 0.06 deg., Heel: Port 0.91 deg., VCG = 12.49

LCF	Displacement	Buoyancy-Ctr.	Weight/	Moment/				
Draft	Weight (LT)	LCB	VCB	Inch	LCF	Deg trim	GML	GMT
7.405	505.64	0.29a	4.78	10.00	0.17a	2439.58	276.4	14.59
Distances in FEET.-----								Moment in Ft-LT.
Draft is from Baseline.								Formal Free Surface included.

Note: GMT includes the formal free surface moment 9.4 Ft-LT

HYDROSTATIC PROPERTIES

Trim: Aft 0.06 deg., Heel: Port 0.91 deg.

Origin	Displacement	Center of Buoyancy						
Depth	Weight (LT)	LCB	TCB	VCB	WPA	LCF	BML	BMT
7.403	505.64	0.29a	0.36p	4.78	4201	0.17a	284.1	22.31

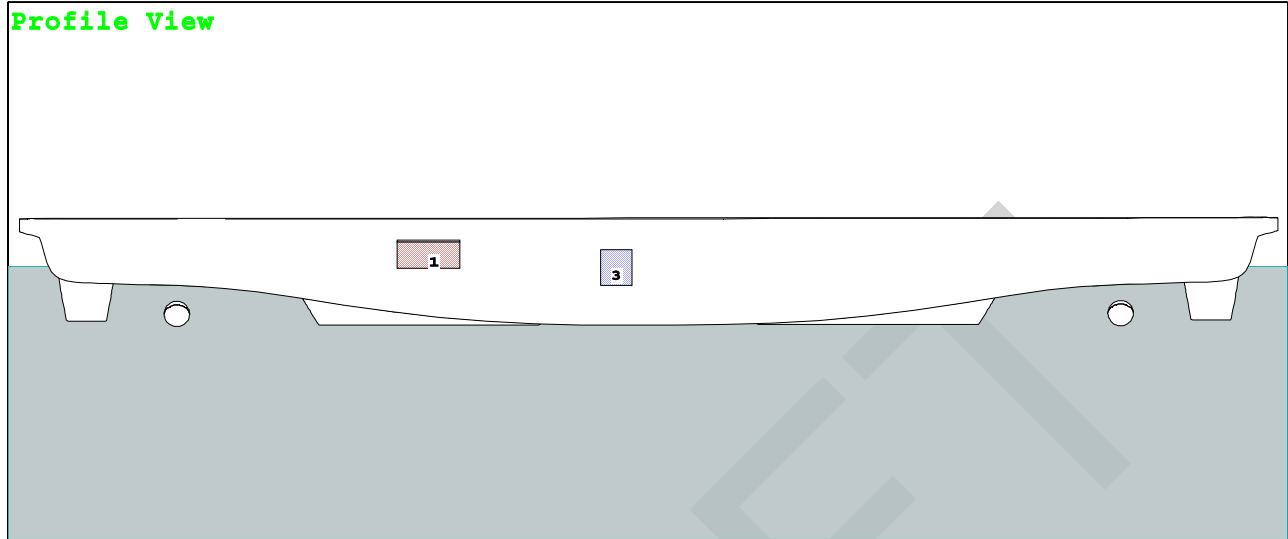
Distances in FEET.----Specific Gravity = 1.025.---Formal Free Surface included.

Note: BMT includes the formal free surface moment 9.4 Ft-LT

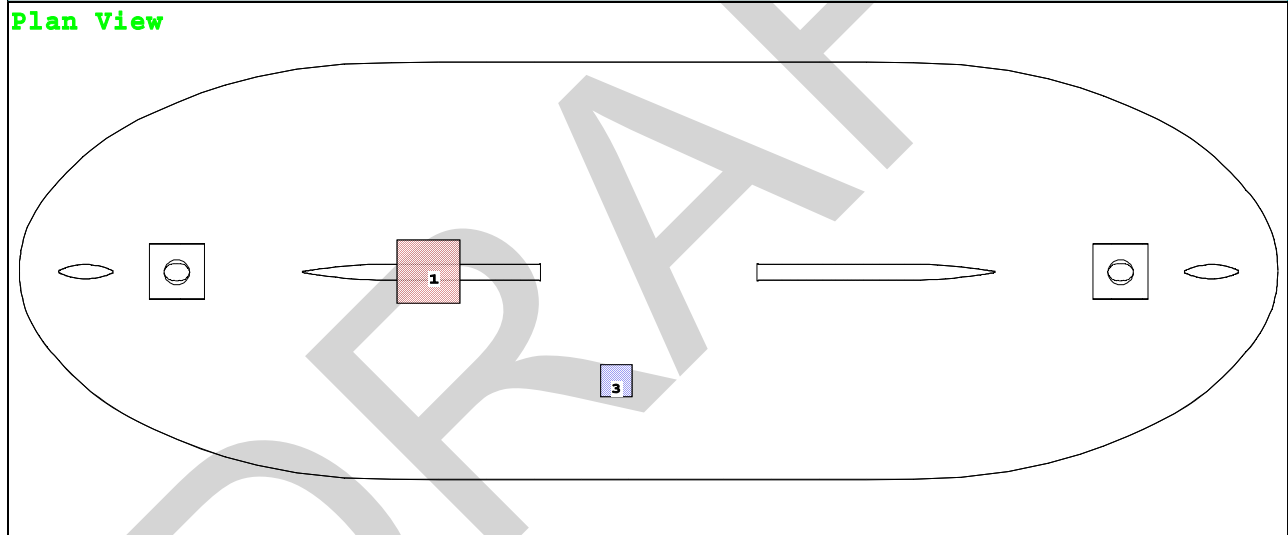
DRAFT

CG - Draft: 7.40 @ 0.00 Trim: aft 0.06 deg. Heel: port 0.91 deg.

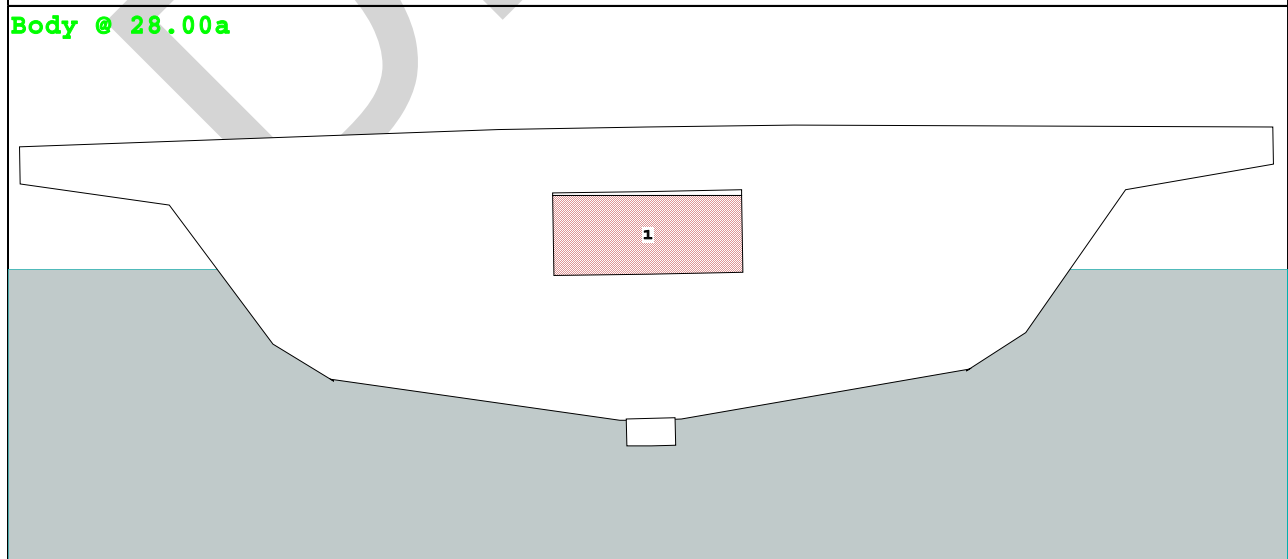
Profile View



Plan View



Body @ 28.00a



Tanks

1 FOT.C..95% FUEL OIL Intact

3 PW.S..100% FRESH WATER Intact

 MAXIMUM OPERATING, 98% FUEL, 3 TRUCKS ON MD
 19 CARS ON MD, 150 PASS ON MD

WEIGHT STATUS

Trim: Aft 0.06 deg., Heel: Port 1.35 deg.

Part-----	Weight (LT)	LCG	TCG	VCG			
LIGHT SHIP	393.87	0.02f	0.34s	11.19			
Crew and Effects	0.30	0.00	15.42s	24.68			
General Stores	0.45	0.00	15.42s	15.42			
Crew Stores	0.45	0.00	15.42s	23.68			
Ships Stores and Spares	4.00	0.00	0.00	5.75			
MD Pax on Deck	6.19	0.00	5.65p	16.42			
MD Pax around House	6.19	0.00	17.25s	16.42			
Pass Vehicles	46.65	0.00	5.65p	16.42			
Trucks 51'-8	107.14	0.00	1.75p	21.17			
Total Fixed----->	565.25	0.01f	0.40p	13.61			
	Load-----	SpGr-----	Weight (LT)	LCG	TCG	VCG	FSM
FOT.C	0.950	0.870	5.08	28.00a	0.04p	8.89	8.2
SAN.S	0.950	1.000	1.91	12.06a	13.91s	6.88	0.6
PW.S	1.000	1.000	2.01	4.10a	13.92s	6.99	0.0
Total Tanks----->			8.99	19.29a	6.03s	8.04	9.4*
Total Weight----->			574.24	0.29a	0.30p	13.52	
Free Surface Adjustment----->						0.02	
Adjusted CG----->				0.29a	0.30p	13.54	
Distances in FEET.-----							Moments in Ft-LT.

Note: FSM values marked with an asterisk (*) are formal values which are not the same as the true values in the present condition.

HYDROSTATIC PROPERTIES

Trim: Aft 0.06 deg., Heel: Port 1.35 deg., VCG = 13.52

LCF	Displacement	Buoyancy-Ctr.	Weight/	Moment/				
Draft----	Weight (LT)	LCB-----	VCB-----	Inch-----	LCF--	Deg trim----	GML-----	GMT
7.964	574.24	0.30a	5.13	10.37	0.16a	2604.45	259.8	12.78
Distances in FEET.-----								Moment in Ft-LT.
Draft is from Baseline.								Formal Free Surface included.

Note: GMT includes the formal free surface moment 9.4 Ft-LT

HYDROSTATIC PROPERTIES

Trim: Aft 0.06 deg., Heel: Port 1.35 deg.

Origin	Displacement	Center of Buoyancy						
Depth	Weight (LT)	LCB	TCB	VCB	WPA	LCF	BML	BMT
7.961	574.24	0.30a	0.50p	5.13	4358	0.16a	268.2	21.18

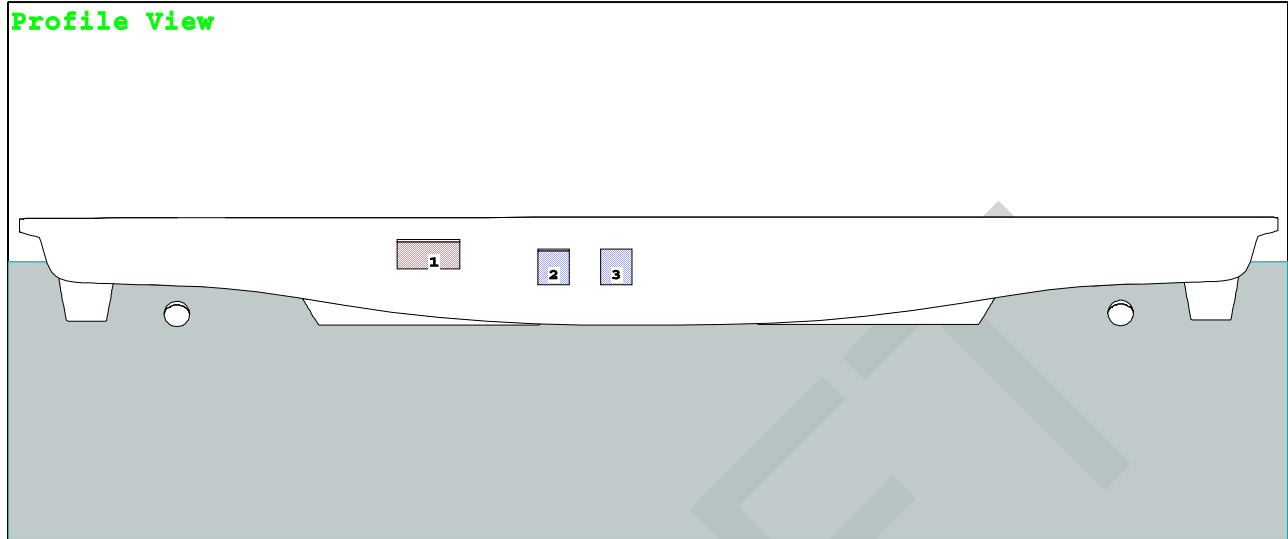
Distances in FEET.----Specific Gravity = 1.025.---Formal Free Surface included.

Note: BMT includes the formal free surface moment 9.4 Ft-LT

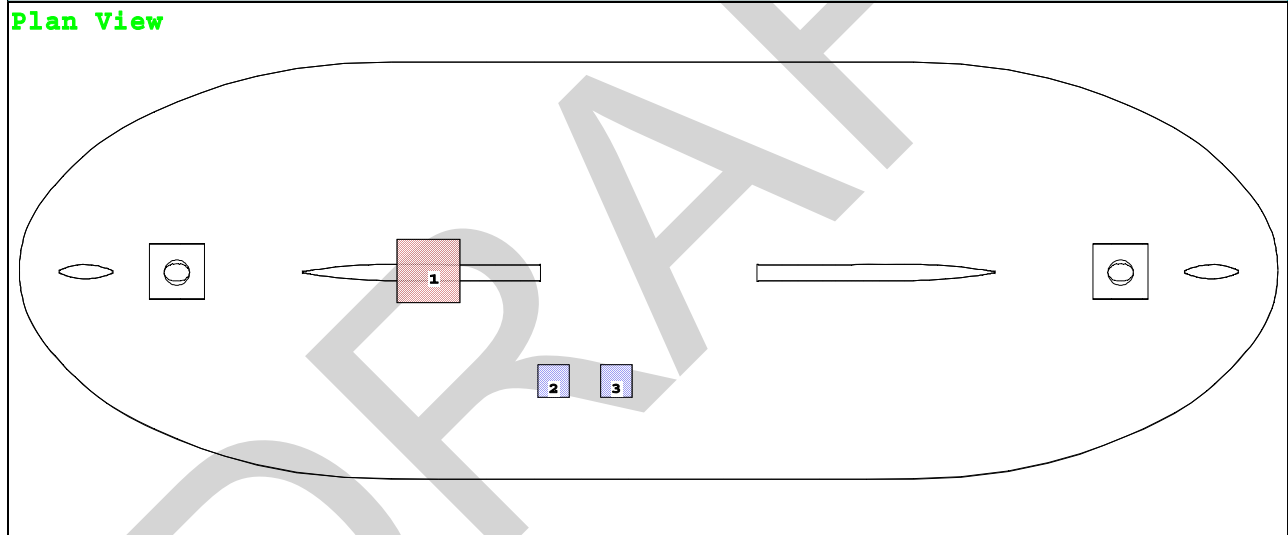
DRAFT

CG - Draft: 7.96 @ 0.00 Trim: aft 0.06 deg. Heel: port 1.35 deg.

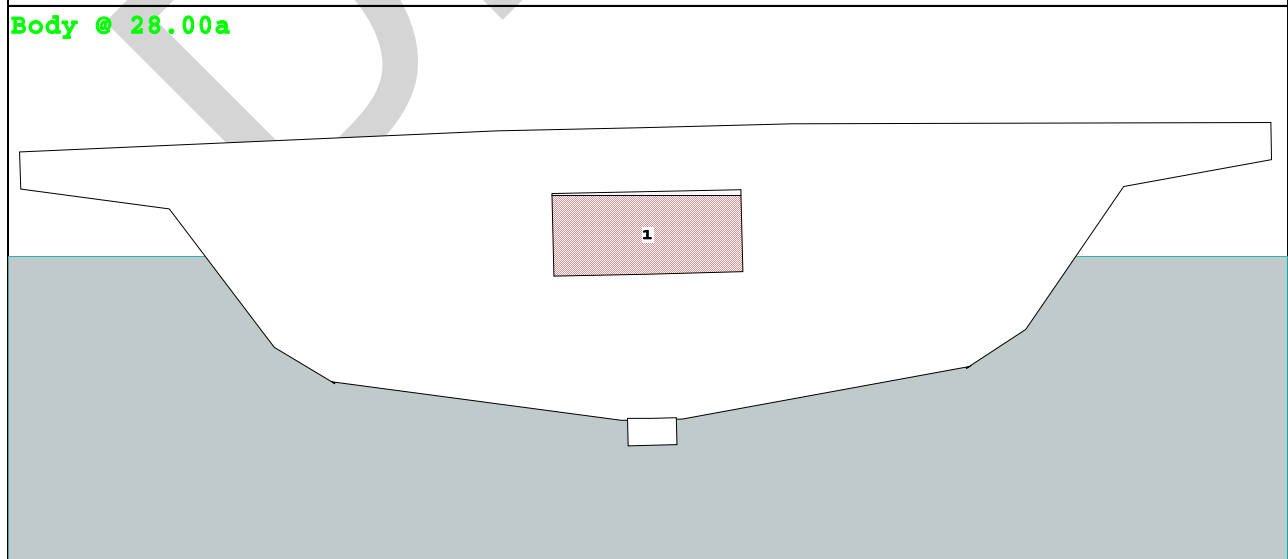
Profile View



Plan View



Body @ 28.00a



Tanks

1 FOT.C..95% FUEL OIL 2 SAN.S..95% FRESH WATER 3 PW.S..100% FRESH WATER