# Ballast calculations, Transporter information

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**OPERATION:**

**OTHER PARTICULARS:**

ramp length = 20.00 ft | 6.10 mtr | (max 15 axles long)

**Barge orientation (tick one)**

| | | | |
|---|---|---|---|
| Over Bow | | | |
| Over Stern | x | | |

**Cargo details:**

| | | | | | | |
|---|---|---|---|---|---|---|
| Weight (incl. transporters) | = | 1,002.20 | mT | 2,207.49 | KIPS | |
| Length | = | 20.80 | mtr | 68 | ft | 2.9 inch |
| Width | = | 27.40 | mtr | 89 | ft | 10.7 inch |

**(Un)-Loading operation (tick one)**

| | |
|---|---|
| Load In / Roll off (Barge to Land) | |
| Load Out / Roll on (Land to Barge) | x |

| | | | | | | |
|---|---|---|---|---|---|---|
| Height (incl. transporters) | = | 23.00 | mtr | 75 | ft | 5.5 inch |
| VCG (incl. transp./barge) | = | 13.50 | mtr | 44 | ft | 3.5 inch |

**Barge:** Marmac 400

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## TRANSPORTER INPUT:

### Transporter 1
**Support A**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TCG (C.L. transporter) | = | 10.5 | mtr | 34 | ft | 5.4 | inch |
| LCG (C.L. first axle) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| Weight per axle line | = | 3.5 | mT | 7.71 | KIPS | | |
| Weight cargo | = | 359.2 | mT | 791.19 | KIPS | | |
| # of axles lines | = | 18 | Nos. | | | | |
| Axle Configuration | = | S | ("S" single, "D" double, "T" triple, "Q" quad) | | | | |
| # of axle line rows | = | 18 | Nos. | | | | |
| Axle spacing | = | 1.4 | mtr | 4 | ft | 7.1 | inch |
| W per axle line row | = | 23.46 | mT/axle row | 51.66 | KIPS/axle row | | |

### Transporter 2
**Support B**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TCG (C.L. transporter) | = | -8.1 | mtr | -26 | ft | -6.9 | inch |
| LCG (C.L. first axle) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| Weight per axle line | = | 3.5 | mT | 7.71 | KIPS | | |
| Weight cargo | = | 496.0 | mT | 1,092.51 | KIPS | | |
| # of axles lines | = | 24 | Nos. | | | | |
| Axle Configuration | = | D | ("S" single, "D" double, "T" triple, "Q" quad) | | | | |
| # of axle line rows | = | 12 | Nos. | | | | |
| Axle spacing | = | 1.4 | mtr | 4 | ft | 7.1 | inch |
| W per axle line row | = | 48.33 | mT/axle row | 106.46 | KIPS/axle row | | |

### Transporter 3
**Not Used**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TCG (C.L. transporter) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| LCG (C.L. first axle) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| Weight per axle line | = | 0.0 | mT | 0.00 | KIPS | | |
| Weight cargo | = | 0.0 | mT | 0.00 | KIPS | | |
| # of axles lines | = | 0 | Nos. | | | | |
| Axle Configuration | = | S | ("S" single, "D" double, "T" triple, "Q" quad) | | | | |
| # of axle line rows | = | 0 | Nos. | | | | |
| Axle spacing | = | 1.4 | mtr | 4 | ft | 7.1 | inch |
| W per axle line row | = | 0.00 | mT/axle row | 0.00 | KIPS/axle row | | |

### Transporter 4
**Not Used**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TCG (C.L. transporter) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| LCG (C.L. first axle) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| Weight per axle line | = | 0.0 | mT | 0.00 | KIPS | | |
| Weight cargo | = | 0.0 | mT | 0.00 | KIPS | | |
| # of axles lines | = | 0 | Nos. | | | | |
| Axle Configuration | = | S | ("S" single, "D" double, "T" triple, "Q" quad) | | | | |
| # of axle line rows | = | 0 | Nos. | | | | |
| Axle spacing | = | 1.4 | mtr | 4 | ft | 7.1 | inch |
| W per axle line row | = | 0.00 | mT/axle row | 0.00 | KIPS/axle row | | |

### Transporter 5
**Not Used**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TCG (C.L. transporter) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| LCG (C.L. first axle) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| Weight per axle line | = | 0.0 | mT | 0.00 | KIPS | | |
| Weight cargo | = | 0.0 | mT | 0.00 | KIPS | | |
| # of axles lines | = | 0 | Nos. | | | | |
| Axle Configuration | = | Q | ("S" single, "D" double, "T" triple, "Q" quad) | | | | |
| # of axle line rows | = | 0 | Nos. | | | | |
| Axle spacing | = | 1.4 | mtr | 4 | ft | 7.1 | inch |
| W per axle line row | = | 0.00 | mT/axle row | 0.00 | KIPS/axle row | | |

### Transporter 6
**Not Used**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TCG (C.L. transporter) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| LCG (C.L. first axle) | = | 0.0 | mtr | 0 | ft | 0.0 | inch |
| Weight per axle line | = | 0.0 | mT | 0.00 | KIPS | | |
| Weight cargo | = | 0.0 | mT | 0.00 | KIPS | | |
| # of axles lines | = | 0 | Nos. | | | | |
| Axle Configuration | = | D | ("S" single, "D" double, "T" triple, "Q" quad) | | | | |
| # of axle line rows | = | 0 | Nos. | | | | |
| Axle spacing | = | 1.4 | mtr | 4 | ft | 7.1 | inch |
| W per axle line row | = | 0.00 | mT/axle row | 0.00 | KIPS/axle row | | |

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## NOTES:

1.) While rolling on 0-point is at start of ramp on land side
2.) While rolling off 0-point is at start of ramp on barge side
3.) Reference point is at mid keel at the bow
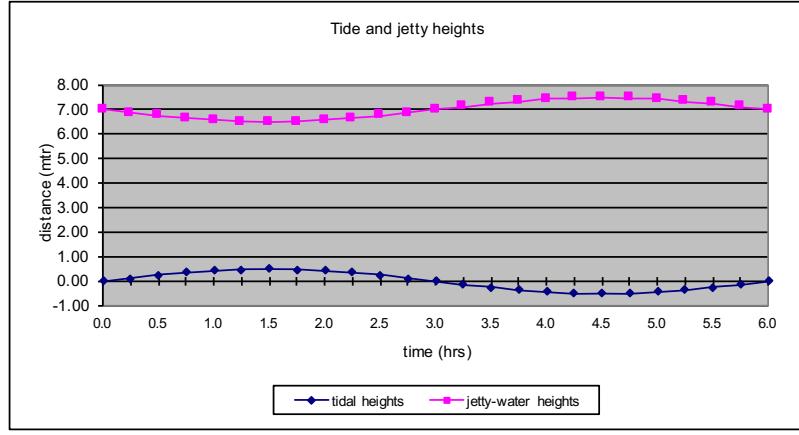4.) Port side is +, Starboard is -

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## *AXLE SEQUENCE AND LOADS:*

| Ballast steps | axle row # | Transporter 1 axle pos. mtr | Transporter 2 axle pos. mtr | Transporter 3 axle pos. mtr | Transporter 4 axle pos. mtr | Transporter 5 axle pos. mtr | Transporter 6 axle pos. mtr | Weight per row mT | Summary distances mtr | Load out / Roll on Weight on barge from ramp mT | Weight on land from ramp mT | Overall Weight on barge mT | Overall Weight on land mT | Total OK? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 71.8 | 0.0 | 0.0 | 0.0 | 0.0 | 1,002.2 | OK |
| 2 | 2 | 1.4 | 1.4 | -- | -- | -- | -- | 71.8 | 1.4 | 16.5 | 55.3 | 16.5 | 985.7 | OK |
| 3 | 3 | 2.8 | 2.8 | -- | -- | -- | -- | 71.8 | 2.8 | 49.5 | 94.1 | 49.5 | 952.7 | OK |
| 4 | 4 | 4.2 | 4.2 | -- | -- | -- | -- | 71.8 | 4.2 | 98.9 | 116.4 | 98.9 | 903.3 | OK |
| 5 | 5 | 5.6 | 5.6 | -- | -- | -- | -- | 71.8 | 5.6 | 164.9 | 122.3 | 164.9 | 837.3 | OK |
| 6 | 6 | 7.0 | 7.0 | -- | -- | -- | -- | 71.8 | 7.0 | 164.9 | 122.3 | 236.7 | 765.5 | OK |
| 7 | 7 | 8.4 | 8.4 | -- | -- | -- | -- | 71.8 | 8.4 | 164.9 | 122.3 | 308.4 | 693.8 | OK |
| 8 | 8 | 9.8 | 9.8 | -- | -- | -- | -- | 71.8 | 9.8 | 164.9 | 122.3 | 380.2 | 622.0 | OK |
| 9 | 9 | 11.2 | 11.2 | -- | -- | -- | -- | 71.8 | 11.2 | 164.9 | 122.3 | 452.0 | 550.2 | OK |
| 10 | 10 | 12.6 | 12.6 | -- | -- | -- | -- | 71.8 | 12.6 | 164.9 | 122.3 | 523.8 | 478.4 | OK |
| 11 | 11 | 14.0 | 14.0 | -- | -- | -- | -- | 71.8 | 14.0 | 164.9 | 122.3 | 595.6 | 406.6 | OK |
| 12 | 12 | 15.4 | 15.4 | -- | -- | -- | -- | 71.8 | 15.4 | 164.9 | 122.3 | 667.4 | 334.8 | OK |
| 13 | 13 | 16.8 | -- | -- | -- | -- | -- | 23.5 | 16.8 | 164.9 | 122.3 | 739.2 | 263.0 | OK |
| 14 | 14 | 18.2 | -- | -- | -- | -- | -- | 23.5 | 18.2 | 153.8 | 85.1 | 799.9 | 202.3 | OK |
| 15 | 15 | 19.6 | -- | -- | -- | -- | -- | 23.5 | 19.6 | 131.6 | 58.9 | 849.5 | 152.7 | OK |
| 16 | 16 | 21.0 | -- | -- | -- | -- | -- | 23.5 | 21.0 | 98.3 | 43.9 | 887.9 | 114.3 | OK |
| 17 | 17 | 22.4 | -- | -- | -- | -- | -- | 23.5 | 22.4 | 53.9 | 40.0 | 915.3 | 86.9 | OK |
| 18 | 18 | 23.8 | -- | -- | -- | -- | -- | 23.5 | 23.8 | 53.9 | 40.0 | 938.8 | 63.4 | OK |
| 19 | 19 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 20 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 21 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 22 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 23 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 24 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 25 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 26 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 27 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 28 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 29 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 30 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 31 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 32 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 33 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 34 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 35 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 36 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 37 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 38 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 39 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 40 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 41 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 42 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 43 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 44 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 45 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 46 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 47 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 48 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 49 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |
| | 50 | -- | -- | -- | -- | -- | -- | - | - | - | - | - | - | - |

## *TIDAL INFORMATION:*

jetty - water distance at mean tide
| 7.00 | ft | | 2.13 | mtr |

difference between high and low tide
| 1.00 | ft | | 0.30 | mtr |

Time for full tidal cycle
| 6.00 | hrs |

Tidal motion (tick one)
mean-high-mean-low-mean | x
mean-low-mean-high-mean |

**Tide and jetty heights**

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## *Ballast calculations, Summary*

| PROJECT: | Gulf Marine, Alba Module 2 | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|

**Overview**

| Barge details: | | | | | | Ballasting with: | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Name | Marmac 400 | | | | | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 |
| Length (L) | 400 | ft | 0 | inch | 121.92 mtr | Pump info: | | | | |
| Width (W) | 99 | ft | 9 | inch | 30.40 mtr | Capacity = | 2,274 | mT/hr | 5,008,811 | LBS/hr |
| Height (H) | 20 | ft | 0 | inch | 6.10 mtr | Results/output in (Tick one): | | | | |
| Max. draft | 11 | ft | 5 | inch | 5.79 mtr | Metric | | Imperial | x | |

## SUMMARY OF BALLAST STEPS:

Start, time elapsed since mean tide    0.0   hrs

| | barge jetty distance ft | Pumped Quantity LBS | Nos. pumps | time involved hrs. | time elapsed since mean tide | average draft ft | trim ft | trim angle degrees | heel ft | heel angle degrees |
|---|---|---|---|---|---|---|---|---|---|---|
| Pre-ballasting | 0.84 | 17,438,095 | 10 | 0.61 | 0.61 | 12.45 | -0.08 | -0.01 | -0.04 | -0.02 |
| Step 1 | 0.84 | 0 | 0 | 0.00 | 0.61 | 12.45 | -0.08 | -0.01 | -0.04 | -0.02 |
| Step 2 | 0.81 | 0 | 0 | 0.00 | 0.61 | 12.46 | -0.04 | -0.01 | -0.10 | -0.06 |
| Step 3 | 0.73 | 0 | 0 | 0.00 | 0.61 | 12.49 | 0.05 | 0.01 | -0.16 | -0.09 |
| Step 4 | 0.77 | 152,170 | 2 | 0.02 | 0.62 | 12.47 | 0.01 | 0.00 | -0.23 | -0.13 |
| Step 5 | 0.64 | 0 | 0 | 0.00 | 0.62 | 12.53 | 0.17 | 0.02 | -0.30 | -0.17 |
| Step 6 | 0.49 | 0 | 0 | 0.00 | 0.62 | 12.60 | 0.34 | 0.05 | -0.36 | -0.21 |
| Step 7 | 0.74 | 456,509 | 2 | 0.06 | 0.69 | 12.48 | 0.07 | 0.01 | -0.09 | -0.05 |
| Step 8 | 0.60 | 0 | 0 | 0.00 | 0.69 | 12.54 | 0.22 | 0.03 | -0.15 | -0.09 |
| Step 9 | 0.71 | 304,339 | 2 | 0.03 | 0.72 | 12.48 | 0.12 | 0.02 | -0.21 | -0.12 |
| Step 10 | 0.64 | 76,085 | 1 | 0.02 | 0.73 | 12.51 | 0.21 | 0.03 | -0.11 | -0.07 |
| Step 11 | 0.50 | 0 | 0 | 0.00 | 0.73 | 12.58 | 0.36 | 0.05 | -0.18 | -0.10 |
| Step 12 | 0.48 | 152,170 | 2 | 0.02 | 0.75 | 12.58 | 0.38 | 0.05 | -0.25 | -0.14 |
| Step 13 | 0.57 | 152,170 | 2 | 0.02 | 0.76 | 12.58 | 0.42 | 0.06 | -0.13 | -0.08 |
| Step 14 | 0.44 | 0 | 0 | 0.00 | 0.76 | 12.64 | 0.56 | 0.08 | -0.02 | -0.01 |
| Step 15 | 0.59 | 304,339 | 2 | 0.03 | 0.79 | 12.56 | 0.42 | 0.06 | 0.09 | 0.05 |
| Step 16 | 0.52 | 0 | 0 | 0.00 | 0.79 | 12.59 | 0.50 | 0.07 | 0.20 | 0.12 |
| Step 17 | 0.47 | 0 | 0 | 0.00 | 0.79 | 12.62 | 0.55 | 0.08 | 0.32 | 0.18 |
| Step 18 | 0.43 | 0 | 0 | 0.00 | 0.79 | 12.64 | 0.59 | 0.08 | 0.43 | 0.25 |
| Step 19 | 0.52 | 0 | 0 | 0.00 | 0.79 | 12.70 | 0.28 | 0.04 | -0.07 | -0.04 |
| Step 20 | 0.46 | 0 | 0 | 0.00 | 0.79 | 12.70 | 0.40 | 0.06 | -0.07 | -0.04 |
| Step 21 | 0.73 | 0 | 0 | 0.00 | 0.79 | 12.56 | 0.12 | 0.02 | 0.01 | 0.01 |
| Sailing | - | 4,617,580 | 5 | 0.30 | 0.30 | 11.91 | 4.26 | 0.61 | -0.07 | -0.04 |

## CONCLUSION:

| | | | | | |
|---|---|---|---|---|---|
| Max. barge-jetty distance | 0.84 ft | Total pumped water | 23,653,455 LBS | Time elapsed since pre-ballast | 1.10 hrs |
| Min. barge-jetty distance | 0.43 ft | Nos. of pumps required | 10 Nos. | Time elapsed since mean tide | 1.10 hrs |

| | | | | | |
|---|---|---|---|---|---|
| Max. Av. Draft | 12.70 ft | | | | |
| | | Max. trim | 4.26 ft | Max. heel | 0.43 ft |
| | | Min. trim | -0.08 ft | Min. heel | -0.36 ft |
| | | Max. trim angle | 0.61 degrees | Max. heel angle | 0.25 degrees |
| | | Min. trim angle | -0.01 degrees | Min. heel angle | -0.21 degrees |

## NOTES:

1.) Port side is +, Starboard is -
2.) Tank %-filled is never lower than 5% or higher than 95%
3.) Tank 1 is at bow
4.) If capacity is 0, this tank is not present
5.) Reference point is at mid keel at the bow
6.) Transporter movements are assumed to be timeless
7.) A negative "barge-jetty" value means barge below jetty, a positive "barge-jetty" value means barge above jetty
8.) Overall time excludes pump set-up and handling time
9.) A minumum of one pump per used ballast tank is assumed
10.) Barge is not checked for structural integrity.

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# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|

| Ballast step: | Sailing | | Last Ballast Step: | 21 | Incl Sailing (tick if yes): | x |
|---|---|---|---|---|---|---|

**Barge details:** / **Ballasting with (tick one):**

| Name | Marmac 400 | OK! | | | fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | **Pump info:** | | | | |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | Capacity = | 2,274 | mT/hr | 5,008,811 | LBS/hr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Pumps = | 1 | Nos. per tank | 5 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 50.0% | 434.09 | 11.05 | 21.34 | 1.38 | 897.49 | 390.68 | 0.17 |
| 6 | Tank 1 port center | 1503.0 | 50.0% | 770.29 | 0.00 | 21.34 | 1.50 | 3,932.49 | 693.26 | 0.30 |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 50.0% | 434.09 | -11.05 | 21.34 | 1.38 | 897.49 | 390.68 | 0.17 |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 95.0% | 656.31 | 11.05 | 108.31 | 3.47 | 1,076.98 | 310.88 | 0.14 |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 80.0% | 552.68 | -11.05 | 106.75 | 2.93 | 942.36 | 310.88 | 0.14 |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | Module 2 (with transporters) | | | 1,002.20 | -1.20 | 109.00 | 13.50 | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| | **Grand Total / System COG** | | | 11,518.22 | -0.01 | 70.87 | 3.46 | 35,428.07 | 2,096.38 | 0.30 |

## HYDROSTATICS:

| | | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Average draft | Ad = | 11.91 | ft | 3.63 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | | |
| Long. Cntr. Buoyancy | LCB = | 204.05 | ft | 62.19 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | | |
| Long. Cntr Flotation | LCF = | 205.58 | ft | 62.66 | mtr | | | | | | |
| Moment to change trim | MT1 = | 2,827.26 | ft*tons | 769.42 | mT*mtr | Transverse stability GM=KM-VCG | | 22.13 | mtr | 72.60 | ft |
| Metacentric Height | KM = | 83.95 | ft | 25.59 | mtr | Correction factor | GG' = | 3.08 | mtr | 10.09 | ft |
| | | | | | | Corrected stability | G'M = | 19.05 | mtr | 62.51 | ft | OK! |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 4.26 | ft | 1.30 | mtr | Heel = sin(Ha) * W | | -0.02 | mtr | -0.07 | ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 9.72 | ft | 2.96 | mtr | Draft Port side =Ad + Heel/2 | | 3.60 | mtr | 11.81 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 13.98 | ft | 4.26 | mtr | Draft Starboard side=Ad - Heel/2 | | 3.62 | mtr | 11.88 | ft |
| Trim angle (Ta) = | 0.61 | deg | | OK! | Heel angle (Ha) = atan(TCG/G'M) | | -0.04 | deg. | | OK! |

**NOTES:**
1.) Port side is +, Starboard is -
2.) Tank %-filled is between 5% and 95%
3.) Tank 1 is at bow
4.) If capacity is 0, this tank is not present
5.) Reference point is at mid keel at the bow
6.) Overall pump time excludes handling time
7.) Barge is not checked for structural intregrity

| | | | |
|---|---|---|---|
| Time involved to ballast sailing | 0.30 | hrs | |
| Time elapsed since pre-ballast | 0.30 | hrs | |
| Time elapsed since mean tide | 0.30 | hrs | |

**BARGE DRAFT:** 11.88 ft

| | | | |
|---|---|---|---|
| 9.75 ft | star board side | | 14.01 ft |
| 9.72 ft | bow | stern | 13.98 ft |
| 9.68 ft | port side | | 13.94 ft |
| | 11.81 ft | | |

# *Ballast calculations*

| **PROJECT:** | | Gulf Marine, Alba Module 2 | | **ENG. No.** | | 24e025 | **Rev.** | | 0 |
|---|---|---|---|---|---|---|---|---|---|

**Ballast step:**     **Pre-ballasting**

**Barge details:**

| Name | **Marmac 400** | | | | | | **Ballasting with (tick one):** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | fresh water | 1,000 | kg/m^3 | 62.37 LBS/ft^3 |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | salt water | 1,025 | kg/m^3 | 63.93 LBS/ft^3 x |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | **Pump info:** | | | |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Capacity = | 2274 | mT/hr | 5,008,811 LBS/hr |
| | | | | | | | Pumps = | 1 | Nos. per tank | 10 Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 781.36 | 0.34 |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 1386.52 | 0.61 |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 781.36 | 0.34 |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 693.41 | 0.30 |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 693.41 | 0.30 |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 647.90 | 0.28 |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 647.90 | 0.28 |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 95.0% | 656.31 | 11.05 | 108.31 | 3.47 | 1,076.98 | 621.77 | 0.27 |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 1041.50 | 0.46 |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 95.0% | 656.31 | -11.05 | 108.31 | 3.47 | 1,076.98 | 621.77 | 0.27 |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| | **Grand Total / System COG** | | | 12,094.26 | -0.01 | 62.06 | 2.74 | 35,562.69 | 7,916.90 | 0.61 |

## HYDROSTATICS:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | |
| Average draft | Ad = | 12.45 | ft | 3.79 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Long. Cntr. Buoyancy | LCB = | 204.12 | ft | 62.22 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Long. Cntr Flotation | LCF = | 205.74 | ft | 62.71 | mtr | | | | | |
| Moment to change trim | MT1 = | 2,886.27 | ft*tons | 785.48 | mT*mtr | Transverse stability GM=KM-VCG | | 22.01 | mtr | 72.22 ft |
| Metacentric Height | KM = | 81.21 | ft | 24.75 | mtr | Correction factor | GG' = | 2.94 | mtr | 9.65 ft |
| | | | | | | Corrected stability | G'M = | 19.07 | mtr | 62.57 ft   **OK!** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | -0.08 | ft | -0.02 | mtr | Heel = sin(Ha) * W | | -0.01 | mtr | -0.04 ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.49 | ft | 3.81 | mtr | Draft Port side =Ad + Heel/2 | | 3.79 | mtr | 12.43 ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF/L)) | 12.41 | ft | 3.78 | mtr | Draft Starboard side=Ad - Heel/2 | | 3.80 | mtr | 12.47 ft |
| Trim angle (Ta) = | -0.01 | deg. | **OK!** | | Heel angle (Ha) = atan(TCG/G'M) | | -0.02 | deg. | **OK!** |

| | | | | | **BARGE DRAFT BEHAVIOUR:** |
|---|---|---|---|---|---|
| Freeboard at jetty | 7.59 | ft | 2.31 | mtr | 12.47 ft |
| Jetty - water distance | 6.75 | ft | 2.06 | mtr | 12.50 ft    12.43 ft |
| Barge - Jetty distance | 0.84 | ft | 0.26 | mtr above jetty | star board side |
| Time involved to pre-ballast | 0.61 | hrs | | | 12.49 ft   bow    stern   12.41 ft |
| Start, time elapsed since mean tide | 0.0 | hrs | | | port side |
| Time elapsed since mean tide | 0.61 | hrs | | | 12.47 ft    12.39 ft |
| | | | | | 12.43 ft |

# Liberty International Underwriters
Member of Liberty Mutual Group

# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|

**Ballast step:** 1

**Barge details:**

| Name | **Marmac 400** | | | | | | Ballasting with (tick one): | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | Pump info: | | | | |
| | | | | | | | Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 95.0% | 656.31 | 11.05 | 108.31 | 3.47 | 1,076.98 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 95.0% | 656.31 | -11.05 | 108.31 | 3.47 | 1,076.98 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
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| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 1 | | | 0.00 | 0.00 | 121.92 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,094.26 | -0.01 | 62.06 | 2.74 | 35,562.69 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | |
| Average draft | Ad = | 12.45 | ft | 3.79 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. |
| Long. Cntr. Buoyancy | LCB = | 204.12 | ft | 62.22 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. |
| Long. Cntr Flotation | LCF = | 205.74 | ft | 62.71 | mtr | | | | |
| Moment to change trim | MT1 = | 2,886.27 | ft*tons | 785.48 | mT*mtr | Transverse stability GM=KM-VCG | | 22.01 | mtr | 72.22 | ft |
| Metacentric Height | KM = | 81.21 | ft | 24.75 | mtr | Correction factor | GG' = | 2.94 | mtr | 9.65 | ft |
| | | | | | | Corrected stability | G'M = | 19.07 | mtr | 62.57 | ft | OK! |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | -0.08 | ft | -0.02 | mtr | Heel = sin(Ha) * W | | -0.01 | mtr | -0.04 | ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.49 | ft | 3.81 | mtr | Draft Port side =Ad + Heel/2 | 3.79 | mtr | 12.43 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.41 | ft | 3.78 | mtr | Draft Starboard side=Ad - Heel/2 | 3.80 | mtr | 12.47 | ft |
| Trim angle (Ta) = | -0.01 | deg. | OK! | | Heel angle (Ha) = atan(TCG/G'M) | -0.02 | deg. | OK! |

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.59 | ft | 2.31 | mtr |
| Jetty - water distance | 6.75 | ft | 2.06 | mtr |
| Barge - Jetty distance | 0.84 | ft | 0.26 | mtr above jetty |
| Time involved ballast step 1 | 0.00 | hrs | | |
| Time elapsed since pre-ballast | 0.61 | hrs | | |
| Time elapsed since mean tide | 0.61 | hrs | | |

### BARGE DRAFT BEHAVIOUR:

```
                    12.47 ft
  12.50 ft    +-------------------------+   12.43 ft
             |      star board side      |
  12.49 ft   | bow                  stern|   12.41 ft
             |       port side           |
  12.47 ft    +-------------------------+   12.39 ft
                    12.43 ft
```

# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 2

| **Barge details:** | | | | | **Ballasting with (tick one):** | | | |
|---|---|---|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | **Pump info:** | | | | |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 95.0% | 656.31 | 11.05 | 108.31 | 3.47 | 1,076.98 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 95.0% | 656.31 | -11.05 | 108.31 | 3.47 | 1,076.98 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: | 2 | | 16.49 | -8.81 | 121.92 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,110.75 | -0.02 | 62.14 | 2.75 | 35,562.69 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Average draft | Ad = | 12.46 | ft | 3.80 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Long. Cntr. Buoyancy | LCB = | 204.12 | ft | 62.22 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Long. Cntr Flotation | LCF = | 205.74 | ft | 62.71 | mtr | | | | | |
| Moment to change trim | MT1 = | 2,886.27 | ft*tons | 785.48 | mT*mtr | Transverse stability GM=KM-VCG | | 22.00 | mtr | 72.17 | ft |
| Metacentric Height | KM = | 81.21 | ft | 24.75 | mtr | Correction factor | GG' = | 2.94 | mtr | 9.63 | ft |
| | | | | | | Corrected stability | G'M = | 19.06 | mtr | 62.54 | ft | OK! |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | -0.04 | ft | -0.01 | mtr | Heel = sin(Ha) * W | -0.03 | mtr | -0.10 | ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.48 | ft | 3.80 | mtr | Draft Port side =Ad + Heel/2 | 3.78 | mtr | 12.41 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF/L)) | 12.44 | ft | 3.79 | mtr | Draft Starboard side=Ad - Heel/2 | 3.81 | mtr | 12.51 | ft |
| Trim angle (Ta) = | -0.01 | deg. | OK! | | Heel angle (Ha) = atan(TCG/G'M) | -0.06 | deg. | OK! | |

**BARGE DRAFT BEHAVIOUR:**

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.56 | ft | 2.30 | mtr |
| Jetty - water distance | 6.75 | ft | 2.06 | mtr |
| Barge - Jetty distance | 0.81 | ft | 0.25 | mtr above jetty |
| Time involved ballast step 2 | 0.00 | hrs | | |
| Time elapsed since pre-ballast | 0.61 | hrs | | |
| Time elapsed since mean tide | 0.61 | hrs | | |

Barge draft behaviour diagram:
- 12.51 ft (top)
- 12.53 ft (top left) / 12.49 ft (top right)
- star board side
- 12.48 ft (left) / bow ... stern / 12.44 ft (right)
- port side
- 12.43 ft (bottom left) / 12.39 ft (bottom right)
- 12.41 ft (bottom)

# *Ballast calculations*

**Liberty International Underwriters** — Member of Liberty Mutual Group

| **PROJECT:** | Gulf Marine, Alba Module 2 | **ENG. No.** | 24e025 | **Rev.** | 0 |
|---|---|---|---|---|---|

**Ballast step:** 3

| Barge details: | | | | | | Ballasting with (tick one): | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | | fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | Pump info: | | | | |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 95.0% | 656.31 | 11.05 | 108.31 | 3.47 | 1,076.98 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 95.0% | 656.31 | -11.05 | 108.31 | 3.47 | 1,076.98 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 3 | | | 49.46 | -5.87 | 121.92 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,143.72 | -0.03 | 62.31 | 2.78 | 35,562.69 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | |
| Average draft | Ad = | 12.49 | ft | 3.81 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Long. Cntr. Buoyancy | LCB = | 204.12 | ft | 62.22 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Long. Cntr Flotation | LCF = | 205.74 | ft | 62.71 | mtr | | | | | |
| Moment to change trim | MT1 = | 2,886.27 | ft*tons | 785.48 | mT*mtr | Transverse stability GM=KM-VCG | | 21.97 | mtr | 72.08 | ft |
| Metacentric Height | KM = | 81.21 | ft | 24.75 | mtr | Correction factor | GG' = | 2.93 | mtr | 9.61 | ft |
| | | | | | | Corrected stability | G'M = | 19.04 | mtr | 62.47 | ft | **OK!** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | | 0.05 | ft | 0.01 | mtr | Heel = sin(Ha) * W | | -0.05 | mtr | -0.16 | ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | | 12.47 | ft | 3.80 | mtr | Draft Port side =Ad + Heel/2 | | 3.78 | mtr | 12.41 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | | 12.52 | ft | 3.81 | mtr | Draft Starboard side=Ad - Heel/2 | | 3.83 | mtr | 12.57 | ft |
| Trim angle (Ta) = | | 0.01 | deg. | **OK!** | | Heel angle (Ha) = atan(TCG/G'M) | | -0.09 | deg. | **OK!** | |

| | | | | | |
|---|---|---|---|---|---|
| Freeboard at jetty | | 7.48 | ft | 2.28 | mtr |
| Jetty - water distance | | 6.75 | ft | 2.06 | mtr |
| Barge - Jetty distance | | 0.73 | ft | 0.22 | mtr above jetty |
| Time involved ballast step 3 | | 0.00 | hrs | | |
| Time elapsed since pre-ballast | | 0.61 | hrs | | |
| Time elapsed since mean tide | | 0.61 | hrs | | |

### BARGE DRAFT BEHAVIOUR:

|  |  |  |
|---|---|---|
| | 12.57 ft | |
| 12.55 ft | star board side | 12.60 ft |
| 12.47 ft | bow / stern | 12.52 ft |
| 12.39 ft | port side | 12.43 ft |
| | 12.41 ft | |

# *Ballast calculations*

**Liberty International Underwriters** — Member of Liberty Mutual Group

| PROJECT: | Gulf Marine, Alba Module 2 | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|

**Ballast step:** 4

**Barge details:**

| Name | Marmac 400 | | | | |
|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 mtr |
| Width (W) | 99 | ft | 9 | inch | 30.40 mtr |
| Height (H) | 20 | ft | 0 | inch | 6.10 mtr |
| Max. draft | 19 | ft | 0 | inch | 5.79 mtr |

**Ballasting with (tick one):**

| | | | | |
|---|---|---|---|---|
| fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |

**Pump info:**

| | | | | |
|---|---|---|---|---|
| Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| Pumps = | 1 | Nos. per tank | 2 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 90.0% | 621.77 | 11.05 | 107.87 | 3.30 | 1,032.11 | 34.54 | 0.02 |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 90.0% | 621.77 | -11.05 | 107.87 | 3.30 | 1,032.11 | 34.54 | 0.02 |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | Pre-positioned cargo | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
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| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 4 | | | 98.92 | -4.40 | 121.92 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,124.10 | -0.04 | 62.24 | 2.81 | 35,472.94 | 69.08 | 0.02 |

## HYDROSTATICS:

| | | | | | |
|---|---|---|---|---|---|
| Average draft | Ad = | 12.47 | ft | 3.80 | mtr |
| Long. Cntr. Buoyancy | LCB = | 204.12 | ft | 62.22 | mtr |
| Long. Cntr Flotation | LCF = | 205.74 | ft | 62.71 | mtr |
| Moment to change trim | MT1 = | 2,886.27 | ft*tons | 785.48 | mT*mtr |
| Metacentric Height | KM = | 81.21 | ft | 24.75 | mtr |

| | | | | |
|---|---|---|---|---|
| Minimum Stability | Max G'M = | 1.00 | mtr | |
| Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Transverse stability GM=KM-VCG | | 21.95 | mtr | 72.00 ft |
| Correction factor | GG' = | 2.93 | mtr | 9.60 ft |
| Corrected stability | G'M = | 19.02 | mtr | 62.40 ft | OK! |

| | | | | | |
|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.01 | ft | 0.00 | mtr | |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.47 | ft | 3.80 | mtr | |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.48 | ft | 3.80 | mtr | |
| Trim angle (Ta) = | 0.00 | deg. | OK! | | |

| | | | | |
|---|---|---|---|---|
| Heel = sin(Ha) * W | | -0.07 | mtr | -0.23 ft |
| Draft Port side =Ad + Heel/2 | | 3.77 | mtr | 12.36 ft |
| Draft Starboard side=Ad - Heel/2 | | 3.84 | mtr | 12.59 ft |
| Heel angle (Ha) = atan(TCG/G'M) | | -0.13 | deg. | OK! |

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.52 | ft | 2.29 | mtr |
| Jetty - water distance | 6.75 | ft | 2.06 | mtr |
| Barge - Jetty distance | 0.77 | ft | 0.23 | mtr above jetty |
| Time involved ballast step 4 | 0.02 | hrs | | |
| Time elapsed since pre-ballast | 0.62 | hrs | | |
| Time elapsed since mean tide | 0.62 | hrs | | |

**BARGE DRAFT BEHAVIOUR:**

```
                    12.59 ft
  12.58 ft   +--------------------------+  12.59 ft
             |      star board side     |
  12.47 ft   | bow                 stern|  12.48 ft
             |       port side          |
  12.35 ft   +--------------------------+  12.37 ft
                    12.36 ft
```

# *Ballast calculations*

Liberty International Underwriters — Member of Liberty Mutual Group

| *PROJECT:* | Gulf Marine, Alba Module 2 | | *ENG. No.* | 24e025 | *Rev.* | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 5

**Barge details:**

| | | | | | **Ballasting with (tick one):** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | **Pump info:** | | | | |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 90.0% | 621.77 | 11.05 | 107.87 | 3.30 | 1,032.11 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 90.0% | 621.77 | -11.05 | 107.87 | 3.30 | 1,032.11 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: | 5 | | 164.87 | -3.52 | 121.92 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,190.05 | -0.05 | 62.57 | 2.86 | 35,472.94 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | |
| Average draft | Ad = | 12.53 | ft | 3.82 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 | mtr | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 | mT*mtr | Transverse stability GM=KM-VCG | | 21.12 | mtr | 69.30 | ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 | mtr | Correction factor | GG' = | 2.91 | mtr | 9.55 | ft |
| | | | | | | Corrected stability | G'M = | 18.21 | mtr | 59.75 | ft | **OK!** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.17 | ft | 0.05 | mtr | Heel = sin(Ha) * W | -0.09 | mtr | -0.30 | ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.45 | ft | 3.79 | mtr | Draft Port side =Ad + Heel/2 | 3.77 | mtr | 12.38 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.61 | ft | 3.84 | mtr | Draft Starboard side=Ad - Heel/2 | 3.86 | mtr | 12.68 | ft |
| Trim angle (Ta) = | 0.02 | deg. | OK! | | Heel angle (Ha) = atan(TCG/G'M) | -0.17 | deg. | OK! | |

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.39 | ft | 2.25 | mtr |
| Jetty - water distance | 6.75 | ft | 2.06 | mtr |
| Barge - Jetty distance | 0.64 | ft | 0.19 | mtr above jetty |
| Time involved ballast step 5 | 0.00 | hrs | | |
| Time elapsed since pre-ballast | 0.62 | hrs | | |
| Time elapsed since mean tide | 0.62 | hrs | | |

### BARGE DRAFT BEHAVIOUR:

|  | 12.68 ft | |
|---|---|---|
| 12.60 ft | | 12.76 ft |
| 12.45 ft | bow — star board side — stern | 12.61 ft |
| 12.30 ft | port side | 12.46 ft |
|  | 12.38 ft | |

# *Ballast calculations*

**Liberty International Underwriters** — Member of Liberty Mutual Group

| **PROJECT:** | Gulf Marine, Alba Module 2 | **ENG. No.** | 24e025 | **Rev.** | 0 |
|---|---|---|---|---|---|

**Ballast step:** 6

**Barge details:**

| Name | **Marmac 400** | | | | | | **Ballasting with (tick one):** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | fresh water | 1,000 | kg/m^3 | 62.37 LBS/ft^3 | |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | salt water | 1,025 | kg/m^3 | 63.93 LBS/ft^3 | x |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | **Pump info:** | | | | |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Capacity = | 2274 | mT/hr | 5,008,811 LBS/hr | |
| | | | | | | | Pumps = | 1 | Nos. per tank | 0 Nos. tanks in use | |

**BALLAST INFO:**

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 90.0% | 621.77 | 11.05 | 107.87 | 3.30 | 1,032.11 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 90.0% | 621.77 | -11.05 | 107.87 | 3.30 | 1,032.11 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 6 | | | 236.66 | -3.07 | 121.65 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,261.84 | -0.07 | 62.91 | 2.93 | 35,472.94 | 0.00 | 0.00 |

**HYDROSTATICS:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Minimum Stability | Max G'M = | 1.00 | mtr |
| Average draft | Ad = | 12.60 | ft | 3.84 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 | mtr | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 | mT*mtr | Transverse stability GM=KM-VCG | | 21.06 mtr | 69.10 ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 | mtr | Correction factor | GG' = | 2.89 mtr | 9.49 ft |
| | | | | | | Corrected stability | G'M = | 18.17 mtr | 59.60 ft | **OK!** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.34 | ft | 0.10 | mtr | Heel = sin(Ha) * W | | -0.11 mtr | -0.36 ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.42 | ft | 3.79 | mtr | Draft Port side =Ad + Heel/2 | | 3.78 mtr | 12.41 ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.76 | ft | 3.89 | mtr | Draft Starboard side=Ad - Heel/2 | | 3.89 mtr | 12.78 ft |
| Trim angle (Ta) = | 0.05 | deg. | **OK!** | | Heel angle (Ha) = atan(TCG/G'M) | | -0.21 deg. | **OK!** |

**BARGE DRAFT BEHAVIOUR:**

| | | | | | |
|---|---|---|---|---|---|
| Freeboard at jetty | 7.24 | ft | 2.21 | mtr | 12.78 ft |
| Jetty - water distance | 6.75 | ft | 2.06 | mtr | 12.61 ft |
| Barge - Jetty distance | 0.49 | ft | 0.15 | mtr above jetty | star board side |
| Time involved ballast step 6 | 0.00 | hrs | | | 12.42 ft   bow       stern   12.76 ft |
| Time elapsed since pre-ballast | 0.62 | hrs | | | port side |
| Time elapsed since mean tide | 0.62 | hrs | | | 12.24 ft   12.41 ft   12.58 ft |

# Liberty International Underwriters
Member of Liberty Mutual Group

# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|

**Ballast step:** 7

**Barge details:**

| Name | **Marmac 400** | | | | |
|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr |

**Ballasting with (tick one):**

| fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
|---|---|---|---|---|---|
| salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |

**Pump info:**

| Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
|---|---|---|---|---|
| Pumps = | 1 | Nos. per tank | 2 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 80.0% | 552.68 | 11.05 | 106.75 | 2.93 | 942.36 | 69.09 | 0.03 |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 70.0% | 483.60 | -11.05 | 105.91 | 2.55 | 852.61 | 138.17 | 0.06 |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 7 | | | 308.45 | -2.82 | 121.17 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,126.37 | -0.02 | 62.35 | 2.94 | 35,203.70 | 207.26 | 0.06 |

## HYDROSTATICS:

| | | | | | |
|---|---|---|---|---|---|
| Average draft | Ad = | 12.48 | ft | 3.80 | mtr |
| Long. Cntr. Buoyancy | LCB = | 204.12 | ft | 62.22 | mtr |
| Long. Cntr Flotation | LCF = | 205.74 | ft | 62.71 | mtr |
| Moment to change trim | MT1 = | 2,886.27 | ft*tons | 785.48 | mT*mtr |
| Metacentric Height | KM = | 81.21 | ft | 24.75 | mtr |

| Minimum Stability | Max G'M = | 1.00 | mtr |
|---|---|---|---|
| Max. Allow. Trim angle | Max Ta = | 6.00 | deg. |
| Max. Allow. Heel angle | Max Ha = | 3.00 | deg. |

| | | | | |
|---|---|---|---|---|
| Transverse stability GM=KM-VCG | | 21.82 | mtr | 71.58 | ft |
| Correction factor | GG' = | 2.90 | mtr | 9.52 | ft |
| Corrected stability | G'M = | 18.91 | mtr | 62.05 | ft | **OK!** |

| | | | | | |
|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.07 | ft | 0.02 | mtr |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.44 | ft | 3.79 | mtr |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.51 | ft | 3.81 | mtr |
| Trim angle (Ta) = | 0.01 | deg. | OK! |

| | | | | |
|---|---|---|---|---|
| Heel = sin(Ha) * W | | -0.03 | mtr | -0.09 | ft |
| Draft Port side =Ad + Heel/2 | | 3.79 | mtr | 12.43 | ft |
| Draft Starboard side=Ad - Heel/2 | | 3.82 | mtr | 12.52 | ft |
| Heel angle (Ha) = atan(TCG/G'M) | | -0.05 | deg. | OK! |

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.49 | ft | 2.28 | mtr |
| Jetty - water distance | 6.75 | ft | 2.06 | mtr |
| Barge - Jetty distance | 0.74 | ft | 0.23 | mtr above jetty |
| Time involved ballast step 7 | 0.06 | hrs |
| Time elapsed since pre-ballast | 0.69 | hrs |
| Time elapsed since mean tide | 0.69 | hrs |

### BARGE DRAFT BEHAVIOUR:

| | | 12.52 ft | | |
|---|---|---|---|---|
| | 12.48 ft | | | 12.55 ft |
| | | star board side | | |
| | 12.44 ft | bow         stern | | 12.51 ft |
| | | port side | | |
| | 12.40 ft | | | 12.47 ft |
| | | 12.43 ft | | |

# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 8

| Barge details: | | | | | Ballasting with (tick one): | | | |
|---|---|---|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | fresh water | 1,000 | kg/m^3 | 62.37 LBS/ft^3 |
| Length (L) | 400 | ft | 0 | inch | 121.92 mtr | salt water | 1,025 | kg/m^3 | 63.93 LBS/ft^3 | x |
| Width (W) | 99 | ft | 9 | inch | 30.40 mtr | **Pump info:** | | | |
| Height (H) | 20 | ft | 0 | inch | 6.10 mtr | Capacity = | 2274 | mT/hr | 5,008,811 LBS/hr |
| Max. draft | 19 | ft | 0 | inch | 5.79 mtr | Pumps = | 1 | Nos. per tank | 0 Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 80.0% | 552.68 | 11.05 | 106.75 | 2.93 | 942.36 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 70.0% | 483.60 | -11.05 | 105.91 | 2.55 | 852.61 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 8 | | | 380.24 | -2.67 | 120.62 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,198.16 | -0.03 | 62.68 | 3.00 | 35,203.70 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | |
|---|---|---|---|---|---|---|---|---|---|
| Average draft | Ad = | 12.54 | ft | 3.82 mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 mtr | | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 mT*mtr | Transverse stability GM=KM-VCG | | 20.99 | mtr | 68.86 ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 mtr | Correction factor | GG' = | 2.89 | mtr | 9.47 ft |
| | | | | | Corrected stability | G'M = | 18.10 | mtr | 59.39 ft | **OK!** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | | 0.22 | ft | 0.07 mtr | Heel = sin(Ha) * W | | -0.05 | mtr | -0.15 ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | | 12.43 | ft | 3.79 mtr | Draft Port side =Ad + Heel/2 | | 3.80 | mtr | 12.46 ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | | 12.65 | ft | 3.85 mtr | Draft Starboard side=Ad - Heel/2 | | 3.84 | mtr | 12.61 ft |
| Trim angle (Ta) = | | 0.03 | deg. | **OK!** | Heel angle (Ha) = atan(TCG/G'M) | | -0.09 | deg. | **OK!** |

| | | | | | BARGE DRAFT BEHAVIOUR: | | | |
|---|---|---|---|---|---|---|---|---|
| Freeboard at jetty | | 7.35 | ft | 2.24 mtr | | | | |
| Jetty - water distance | | 6.75 | ft | 2.06 mtr | | | | |
| Barge - Jetty distance | | 0.60 | ft | 0.18 mtr above jetty | | | | |
| Time involved ballast step 8 | | 0.00 | hrs | | | | | |
| Time elapsed since pre-ballast | | 0.69 | hrs | | | | | |
| Time elapsed since mean tide | | 0.69 | hrs | | | | | |

BARGE DRAFT BEHAVIOUR:

```
                         12.61 ft
 12.50 ft   +----------------------------+   12.72 ft
            |         star board side    |
 12.43 ft   | bow                   stern|   12.65 ft
            |         port side          |
 12.35 ft   +----------------------------+   12.57 ft
                         12.46 ft
```

# Liberty International Underwriters
Member of Liberty Mutual Group

# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 9

**Barge details:**

| Name | **Marmac 400** | | | | |
|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr |

**Ballasting with (tick one):**

| fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
|---|---|---|---|---|---|
| salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |

**Pump info:**

| Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
|---|---|---|---|---|
| Pumps = | 1 | Nos. per tank | 2 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 70.0% | 483.60 | 11.05 | 105.91 | 2.55 | 852.61 | 69.09 | 0.03 |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 60.0% | 414.51 | -11.05 | 105.74 | 2.16 | 762.86 | 69.09 | 0.03 |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
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| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 9 | | | 452.03 | -2.57 | 120.01 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,131.78 | -0.04 | 62.46 | 3.03 | 35,024.20 | 138.17 | 0.03 |

## HYDROSTATICS:

| Average draft | Ad = | 12.48 | ft | 3.80 | mtr |
|---|---|---|---|---|---|
| Long. Cntr. Buoyancy | LCB = | 204.12 | ft | 62.22 | mtr |
| Long. Cntr Flotation | LCF = | 205.74 | ft | 62.71 | mtr |
| Moment to change trim | MT1 = | 2,886.27 | ft*tons | 785.48 | mT*mtr |
| Metacentric Height | KM = | 81.21 | ft | 24.75 | mtr |

| | | | |
|---|---|---|---|
| Minimum Stability | Max G'M = | 1.00 | mtr |
| Max. Allow. Trim angle | Max Ta = | 6.00 | deg. |
| Max. Allow. Heel angle | Max Ha = | 3.00 | deg. |

| | | | | | |
|---|---|---|---|---|---|
| Transverse stability GM=KM-VCG | | 21.72 | mtr | 71.25 | ft |
| Correction factor | GG' = | 2.89 | mtr | 9.47 | ft |
| Corrected stability | G'M = | 18.83 | mtr | 61.78 | ft | **OK!** |

| | | | | |
|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.12 | ft | 0.04 | mtr |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.42 | ft | 3.78 | mtr |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.54 | ft | 3.82 | mtr |
| Trim angle (Ta) = | 0.02 | deg. | **OK!** | |

| | | | | |
|---|---|---|---|---|
| Heel = sin(Ha) * W | -0.06 | mtr | -0.21 | ft |
| Draft Port side =Ad + Heel/2 | 3.77 | mtr | 12.37 | ft |
| Draft Starboard side=Ad - Heel/2 | 3.84 | mtr | 12.59 | ft |
| Heel angle (Ha) = atan(TCG/G'M) | -0.12 | deg. | **OK!** | |

| | | | |
|---|---|---|---|
| Freeboard at jetty | 7.46 | ft | 2.27 | mtr |
| Jetty - water distance | 6.75 | ft | 2.06 | mtr |
| Barge - Jetty distance | 0.71 | ft | 0.22 | mtr above jetty |
| Time involved ballast step 9 | 0.03 | hrs | | |
| Time elapsed since pre-ballast | 0.72 | hrs | | |
| Time elapsed since mean tide | 0.72 | hrs | | |

### BARGE DRAFT BEHAVIOUR:

```
                              12.59 ft
  12.52 ft  +------------------------------------+  12.65 ft
            |           star board side          |
  12.42 ft  | bow                           stern|  12.54 ft
            |             port side              |
  12.31 ft  +------------------------------------+  12.44 ft
                              12.37 ft
```

# Liberty International Underwriters
Member of Liberty Mutual Group

# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|

**Ballast step:** 10

**Barge details:**

| | | | | | |
|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | |
| Length (L) | 400 | ft | 0 | inch | 121.92 mtr |
| Width (W) | 99 | ft | 9 | inch | 30.40 mtr |
| Height (H) | 20 | ft | 0 | inch | 6.10 mtr |
| Max. draft | 19 | ft | 0 | inch | 5.79 mtr |

**Ballasting with (tick one):**

| | | | | | |
|---|---|---|---|---|---|
| fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |

**Pump info:**

| | | | | |
|---|---|---|---|---|
| Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| Pumps = | 1 | Nos. per tank | 1 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 70.0% | 483.60 | 11.05 | 105.91 | 2.55 | 852.61 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 55.0% | 379.97 | -11.05 | 105.66 | 1.97 | 717.99 | 34.54 | 0.02 |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: | 10 | | 523.81 | -2.50 | 119.38 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,169.03 | -0.02 | 62.65 | 3.09 | 34,979.32 | 34.54 | 0.02 |

## HYDROSTATICS:

| | | | | | |
|---|---|---|---|---|---|
| Average draft | Ad = | 12.51 | ft | 3.81 | mtr |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 | mtr |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 | mtr |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 | mT*mtr |
| Metacentric Height | KM = | 78.69 | ft | 23.99 | mtr |

| | | | | |
|---|---|---|---|---|
| Minimum Stability | Max G'M = | 1.00 | mtr | |
| Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Transverse stability GM=KM-VCG | | 20.89 | mtr | 68.55 ft |
| Correction factor | GG' = | 2.87 | mtr | 9.43 ft |
| Corrected stability | G'M = | 18.02 | mtr | 59.12 ft | OK! |

| | | | | |
|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.21 | ft | 0.06 | mtr |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.41 | ft | 3.78 | mtr |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.61 | ft | 3.84 | mtr |
| Trim angle (Ta) = | 0.03 | deg. | OK! | |

| | | | | |
|---|---|---|---|---|
| Heel = sin(Ha) * W | -0.03 | mtr | -0.11 | ft |
| Draft Port side =Ad + Heel/2 | 3.80 | mtr | 12.45 | ft |
| Draft Starboard side=Ad - Heel/2 | 3.83 | mtr | 12.57 | ft |
| Heel angle (Ha) = atan(TCG/G'M) | -0.07 | deg. | OK! | |

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.39 | ft | 2.25 | mtr |
| Jetty - water distance | 6.75 | ft | 2.06 | mtr |
| Barge - Jetty distance | 0.64 | ft | 0.19 | mtr above jetty |
| Time involved ballast step 10 | 0.02 | hrs | | |
| Time elapsed since pre-ballast | 0.73 | hrs | | |
| Time elapsed since mean tide | 0.73 | hrs | | |

### BARGE DRAFT BEHAVIOUR:

|  | 12.57 ft |  |
|---|---|---|
| 12.46 ft | star board side | 12.67 ft |
| 12.41 ft | bow / stern | 12.61 ft |
| 12.35 ft | port side | 12.56 ft |
|  | 12.45 ft |  |

# *Ballast calculations*

Liberty International Underwriters (Member of Liberty Mutual Group)

| PROJECT: | Gulf Marine, Alba Module 2 | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|

**Ballast step:** 11

**Barge details:**

| | | | | | | **Ballasting with (tick one):** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | | fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| Length (L) | 400 | ft | 0 | inch | 121.92 mtr | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |
| Width (W) | 99 | ft | 9 | inch | 30.40 mtr | **Pump info:** | | | | | |
| Height (H) | 20 | ft | 0 | inch | 6.10 mtr | Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr | |
| Max. draft | 19 | ft | 0 | inch | 5.79 mtr | Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use | |

**BALLAST INFO:**

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 70.0% | 483.60 | 11.05 | 105.91 | 2.55 | 852.61 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 55.0% | 379.97 | -11.05 | 105.66 | 1.97 | 717.99 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 11 | | | 595.60 | -2.44 | 118.74 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,240.81 | -0.03 | 62.95 | 3.15 | 34,979.32 | 0.00 | 0.00 |

**HYDROSTATICS:**

| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Average draft | Ad = | 12.58 | ft | 3.83 mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | | |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | | |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 mtr | | | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 mT*mtr | Transverse stability GM=KM-VCG | | 20.83 | mtr | 68.35 | ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 mtr | Correction factor | GG' = | 2.86 | mtr | 9.38 | ft |
| | | | | | Corrected stability | G'M = | 17.98 | mtr | 58.97 | ft | OK! |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.36 | ft | 0.11 | mtr | Heel = sin(Ha) * W | -0.05 | mtr | -0.18 | ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.40 | ft | 3.78 | mtr | Draft Port side =Ad + Heel/2 | 3.81 | mtr | 12.48 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.75 | ft | 3.89 | mtr | Draft Starboard side=Ad - Heel/2 | 3.86 | mtr | 12.66 | ft |
| Trim angle (Ta) = | 0.05 | deg. | OK! | | Heel angle (Ha) = atan(TCG/G'M) | -0.10 | deg. | OK! | |

| | | | | **BARGE DRAFT BEHAVIOUR:** |
|---|---|---|---|---|
| Freeboard at jetty | 7.25 | ft | 2.21 mtr | 12.66 ft |
| Jetty - water distance | 6.75 | ft | 2.06 mtr | 12.49 ft — star board side — 12.84 ft |
| Barge - Jetty distance | 0.50 | ft | 0.15 mtr above jetty | 12.40 ft — bow / stern — 12.75 ft |
| Time involved ballast step 11 | 0.00 | hrs | | 12.31 ft — port side — 12.66 ft |
| Time elapsed since pre-ballast | 0.73 | hrs | | 12.48 ft |
| Time elapsed since mean tide | 0.73 | hrs | | |

# *Ballast calculations*

**Liberty International Underwriters** (Member of Liberty Mutual Group)

| **PROJECT:** | Gulf Marine, Alba Module 2 | | **ENG. No.** | 24e025 | **Rev.** | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 12

| Barge details: | | | | | Ballasting with (tick one): | | | |
|---|---|---|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | fresh water | 1,000 | kg/m^3 | 62.37 LBS/ft^3 |
| Length (L) | 400 | ft | 0 | inch | 121.92 mtr | salt water | 1,025 | kg/m^3 | 63.93 LBS/ft^3 | x |
| Width (W) | 99 | ft | 9 | inch | 30.40 mtr | Pump info: | | | |
| Height (H) | 20 | ft | 0 | inch | 6.10 mtr | Capacity = | 2274 | mT/hr | 5,008,811 LBS/hr |
| Max. draft | 19 | ft | 0 | inch | 5.79 mtr | Pumps = | 1 | Nos. per tank | 2 Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 65.0% | 449.05 | 11.05 | 105.82 | 2.35 | 807.74 | 34.54 | 0.02 |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 50.0% | 345.43 | -11.05 | 105.59 | 1.78 | 673.11 | 34.54 | 0.02 |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 12 | | | 667.39 | -2.39 | 118.08 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,243.52 | -0.04 | 62.99 | 3.21 | 34,889.58 | 69.09 | 0.02 |

## HYDROSTATICS:

| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | |
|---|---|---|---|---|---|---|---|---|---|
| Average draft | Ad = | 12.58 | ft | 3.83 mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 mtr | | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 mT*mtr | Transverse stability GM=KM-VCG | | 20.78 | mtr | 68.17 ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 mtr | Correction factor | GG' = | 2.85 | mtr | 9.35 ft |
| | | | | | Corrected stability | G'M = | 17.93 | mtr | 58.82 ft | **OK!** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.38 | ft | 0.12 mtr | Heel = sin(Ha) * W | | -0.07 | mtr | -0.25 ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.39 | ft | 3.78 mtr | Draft Port side =Ad + Heel/2 | | 3.80 | mtr | 12.45 ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF/L)) | 12.77 | ft | 3.89 mtr | Draft Starboard side=Ad - Heel/2 | | 3.87 | mtr | 12.70 ft |
| Trim angle (Ta) = | 0.05 | deg. | **OK!** | Heel angle (Ha) = atan(TCG/G'M) | | -0.14 | deg. | **OK!** |

**BARGE DRAFT BEHAVIOUR:**

| | | | | 12.70 ft | | |
|---|---|---|---|---|---|---|
| Freeboard at jetty | 7.23 | ft | 2.20 mtr | | | |
| Jetty - water distance | 6.75 | ft | 2.06 mtr | 12.51 ft | star board side | 12.89 ft |
| Barge - Jetty distance | 0.48 | ft | 0.15 mtr above jetty | 12.39 ft | bow      stern | 12.77 ft |
| Time involved ballast step 12 | 0.02 | hrs | | | port side | |
| Time elapsed since pre-ballast | 0.75 | hrs | | 12.26 ft | | 12.64 ft |
| Time elapsed since mean tide | 0.75 | hrs | | 12.45 ft | | |

# *Ballast calculations*

**Liberty International Underwriters** — Member of Liberty Mutual Group

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 13

**Barge details:**

| | | | | | | **Ballasting with (tick one):** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | | fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| Length (L) | 400 | ft | 0 | inch | 121.92 mtr | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |
| Width (W) | 99 | ft | 9 | inch | 30.40 mtr | **Pump info:** | | | | | |
| Height (H) | 20 | ft | 0 | inch | 6.10 mtr | Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr | |
| Max. draft | 19 | ft | 0 | inch | 5.79 mtr | Pumps = | 1 | Nos. per tank | 2 | Nos. tanks in use | |

**BALLAST INFO:**

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 60.0% | 414.51 | 11.05 | 105.74 | 2.16 | 762.86 | 34.54 | 0.02 |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 45.0% | 310.88 | -11.05 | 105.53 | 1.59 | 628.24 | 34.54 | 0.02 |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 13 | | | 739.18 | -1.83 | 118.11 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,246.22 | -0.02 | 63.07 | 3.26 | 34,799.83 | 69.09 | 0.02 |

**HYDROSTATICS:**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | | | |
| Average draft | Ad = | 12.58 | ft | 3.84 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | | | |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | | | |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 | mtr | | | | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 | mT*mtr | Transverse stability GM=KM-VCG | | 20.72 | mtr | 67.99 | ft | |
| Metacentric Height | KM = | 78.69 | ft | 23.99 | mtr | Correction factor | GG' = | 2.84 | mtr | 9.32 | ft | |
| | | | | | | Corrected stability | G'M = | 17.88 | mtr | 58.67 | ft | **OK!** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | | 0.42 | ft | 0.13 | mtr | Heel = sin(Ha) * W | | -0.04 | mtr | -0.13 ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | | 12.37 | ft | 3.77 | mtr | Draft Port side =Ad + Heel/2 | | 3.81 | mtr | 12.51 ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | | 12.79 | ft | 3.90 | mtr | Draft Starboard side=Ad - Heel/2 | | 3.85 | mtr | 12.65 ft |
| Trim angle (Ta) = | | 0.06 | deg. | **OK!** | | Heel angle (Ha) = atan(TCG/G'M) | | -0.08 | deg. | **OK!** |

| | | | | | |
|---|---|---|---|---|---|
| Freeboard at jetty | | 7.21 | ft | 2.20 | mtr |
| Jetty - water distance | | 6.65 | ft | 2.03 | mtr |
| Barge - Jetty distance | | 0.57 | ft | 0.17 | mtr above jetty |
| Time involved ballast step 13 | | 0.02 | hrs | | |
| Time elapsed since pre-ballast | | 0.76 | hrs | | |
| Time elapsed since mean tide | | 0.76 | hrs | | |

**BARGE DRAFT BEHAVIOUR:**

```
                        12.65 ft
        12.44 ft   ┌──────────────────────────┐   12.86 ft
                   │        star board side     │
        12.37 ft   │ bow                  stern │   12.79 ft
                   │        port side           │
        12.30 ft   └──────────────────────────┘   12.72 ft
                        12.51 ft
```

# *Ballast calculations*

**Liberty International Underwriters** — Member of Liberty Mutual Group

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 14

**Barge details:**

| | | | | | |
|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | |
| Length (L) | 400 | ft | 0 | inch | 121.92 mtr |
| Width (W) | 99 | ft | 9 | inch | 30.40 mtr |
| Height (H) | 20 | ft | 0 | inch | 6.10 mtr |
| Max. draft | 19 | ft | 0 | inch | 5.79 mtr |

**Ballasting with (tick one):**

| | | | | |
|---|---|---|---|---|
| fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 |
| salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 x |

**Pump info:**

| | | | | |
|---|---|---|---|---|
| Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 60.0% | 414.51 | 11.05 | 105.74 | 2.16 | 762.86 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 45.0% | 310.88 | -11.05 | 105.53 | 1.59 | 628.24 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
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| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 14 | | | 799.87 | -1.38 | 118.04 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,306.91 | 0.00 | 63.34 | 3.31 | 34,799.83 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Minimum Stability | Max G'M = | 1.00 | mtr |
| Average draft | Ad = | 12.64 ft | 3.85 mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. |
| Long. Cntr. Buoyancy | LCB = | 204.18 ft | 62.23 mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. |
| Long. Cntr Flotation | LCF = | 205.91 ft | 62.76 mtr | | | | |
| Moment to change trim | MT1 = | 2,945.56 ft*tons | 801.61 mT*mtr | Transverse stability GM=KM-VCG | | 20.67 mtr | 67.83 ft |
| Metacentric Height | KM = | 78.69 ft | 23.99 mtr | Correction factor | GG' = | 2.83 mtr | 9.28 ft |
| | | | | Corrected stability | G'M = | 17.85 mtr | 58.55 ft **OK!** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.56 ft | 0.17 mtr | Heel = sin(Ha) * W | -0.01 mtr | -0.02 ft | |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.35 ft | 3.77 mtr | Draft Port side =Ad + Heel/2 | 3.85 mtr | 12.62 ft | |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.91 ft | 3.94 mtr | Draft Starboard side=Ad - Heel/2 | 3.85 mtr | 12.64 ft | |
| Trim angle (Ta) = | 0.08 deg. | **OK!** | Heel angle (Ha) = atan(TCG/G'M) | -0.01 deg. | **OK!** | |

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.09 ft | 2.16 mtr | | |
| Jetty - water distance | 6.65 ft | 2.03 mtr | | |
| Barge - Jetty distance | 0.44 ft | 0.13 mtr above jetty | | |
| Time involved ballast step 14 | 0.00 hrs | | | |
| Time elapsed since pre-ballast | 0.76 hrs | | | |
| Time elapsed since mean tide | 0.76 hrs | | | |

### BARGE DRAFT BEHAVIOUR:

```
                         12.64 ft
        12.37 ft  ┌──────────────────────┐  12.92 ft
                  │     star board side    │
        12.35 ft  │ bow              stern │  12.91 ft
                  │      port side         │
        12.34 ft  └──────────────────────┘  12.90 ft
                         12.62 ft
```

# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 15

**Barge details:**

| Name | **Marmac 400** | | | | | | **Ballasting with (tick one):** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | **Pump info:** | | | | |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| | | | | | | | Pumps = | 1 | Nos. per tank | 2 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 50.0% | 345.43 | 11.05 | 105.59 | 1.78 | 673.11 | 69.09 | 0.03 |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 35.0% | 241.80 | -11.05 | 105.45 | 1.21 | 538.49 | 69.09 | 0.03 |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 15 | | | 849.46 | -1.01 | 117.90 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,218.33 | 0.02 | 63.07 | 3.35 | 34,620.33 | 138.17 | 0.03 |

## HYDROSTATICS:

| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Average draft | Ad = | 12.56 | ft | 3.83 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 | mtr | | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 | mT*mtr | Transverse stability GM=KM-VCG | | 20.63 | mtr | 67.70 | ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 | mtr | Correction factor | GG' = | 2.83 | mtr | 9.30 | ft |
| | | | | | | Corrected stability | G'M = | 17.80 | mtr | 58.40 | ft | **OK!** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | | 0.42 | ft | 0.13 | mtr | Heel = sin(Ha) * W | | 0.03 | mtr | 0.09 | ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | | 12.34 | ft | 3.76 | mtr | Draft Port side =Ad + Heel/2 | | 3.84 | mtr | 12.60 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | | 12.76 | ft | 3.89 | mtr | Draft Starboard side=Ad - Heel/2 | | 3.81 | mtr | 12.51 | ft |
| Trim angle (Ta) = | | 0.06 | deg. | **OK!** | | Heel angle (Ha) = atan(TCG/G'M) | | 0.05 | deg. | **OK!** |

| Freeboard at jetty | 7.24 | ft | 2.21 | mtr |
|---|---|---|---|---|
| Jetty - water distance | 6.65 | ft | 2.03 | mtr |
| Barge - Jetty distance | 0.59 | ft | 0.18 | mtr above jetty |
| Time involved ballast step 15 | 0.03 | hrs | | |
| Time elapsed since pre-ballast | 0.79 | hrs | | |
| Time elapsed since mean tide | 0.79 | hrs | | |

**BARGE DRAFT BEHAVIOUR:**

```
                          12.51 ft
   12.30 ft   +------------------------------+   12.71 ft
             |         star board side        |
   12.34 ft  | bow                       stern|  12.76 ft
             |          port side             |
   12.39 ft   +------------------------------+   12.81 ft
                          12.60 ft
```

# *Ballast calculations*

**Liberty International Underwriters** — Member of Liberty Mutual Group

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 16

| Barge details: | | | | | Ballasting with (tick one): | | | |
|---|---|---|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | fresh water | 1,000 | kg/m^3 | 62.37 LBS/ft^3 |
| Length (L) | 400 | ft | 0 | inch | 121.92 mtr | salt water | 1,025 | kg/m^3 | 63.93 LBS/ft^3 | x |
| Width (W) | 99 | ft | 9 | inch | 30.40 mtr | Pump info: | | | |
| Height (H) | 20 | ft | 0 | inch | 6.10 mtr | Capacity = | 2274 | mT/hr | 5,008,811 LBS/hr |
| Max. draft | 19 | ft | 0 | inch | 5.79 mtr | Pumps = | 1 | Nos. per tank | 0 Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 50.0% | 345.43 | 11.05 | 105.59 | 1.78 | 673.11 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 35.0% | 241.80 | -11.05 | 105.45 | 1.21 | 538.49 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 16 | | | 887.95 | -0.69 | 117.68 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,256.82 | 0.04 | 63.22 | 3.38 | 34,620.33 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | |
|---|---|---|---|---|---|---|---|---|---|
| Average draft | Ad = | 12.59 | ft | 3.84 mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 mtr | | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 mT*mtr | Transverse stability GM=KM-VCG | | 20.60 | mtr | 67.59 ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 mtr | Correction factor | GG' = | 2.82 | mtr | 9.27 ft |
| | | | | | Corrected stability | G'M = | 17.78 | mtr | 58.33 ft | **OK!** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | | 0.50 | ft | 0.15 mtr | Heel = sin(Ha) * W | | 0.06 | mtr | 0.20 ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | | 12.34 | ft | 3.76 mtr | Draft Port side =Ad + Heel/2 | | 3.87 | mtr | 12.69 ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | | 12.83 | ft | 3.91 mtr | Draft Starboard side=Ad - Heel/2 | | 3.81 | mtr | 12.49 ft |
| Trim angle (Ta) = | | 0.07 | deg. | **OK!** | Heel angle (Ha) = atan(TCG/G'M) | | 0.12 | deg. | **OK!** |

| | | | | | BARGE DRAFT BEHAVIOUR: | | |
|---|---|---|---|---|---|---|---|
| Freeboard at jetty | | 7.17 | ft | 2.18 mtr | | 12.49 ft | |
| Jetty - water distance | | 6.65 | ft | 2.03 mtr | 12.24 ft | star board side | 12.73 ft |
| Barge - Jetty distance | | 0.52 | ft | 0.16 mtr above jetty | | bow ... stern | |
| Time involved ballast step 16 | | 0.00 | hrs | | 12.34 ft | | 12.83 ft |
| Time elapsed since pre-ballast | | 0.79 | hrs | | | port side | |
| Time elapsed since mean tide | | 0.79 | hrs | | 12.44 ft | | 12.94 ft |
| | | | | | | 12.69 ft | |

# *Ballast calculations*

**Liberty International Underwriters** — Member of Liberty Mutual Group

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 17

### Barge details:

| | | | | | |
|---|---|---|---|---|---|
| Name | **Marmac 400** | | | | |
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr |

### Ballasting with (tick one):

| | | | | | |
|---|---|---|---|---|---|
| fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |

**Pump info:**

| | | | | |
|---|---|---|---|---|
| Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 50.0% | 345.43 | 11.05 | 105.59 | 1.78 | 673.11 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 35.0% | 241.80 | -11.05 | 105.45 | 1.21 | 538.49 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
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| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 17 | | | 915.33 | -0.40 | 117.39 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,284.21 | 0.06 | 63.32 | 3.41 | 34,620.33 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | |
|---|---|---|---|---|---|
| Average draft | Ad = | 12.62 | ft | 3.85 | mtr |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 | mtr |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 | mtr |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 | mT*mtr |
| Metacentric Height | KM = | 78.69 | ft | 23.99 | mtr |

| | | | | |
|---|---|---|---|---|
| Minimum Stability | Max G'M = | 1.00 | mtr | |
| Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Transverse stability GM=KM-VCG | | 20.58 | mtr | 67.52 | ft |
| Correction factor | GG' = | 2.82 | mtr | 9.25 | ft |
| Corrected stability | G'M = | 17.76 | mtr | 58.27 | ft | **OK!** |

| | | | | | |
|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | | 0.55 | ft | 0.17 | mtr |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | | 12.34 | ft | 3.76 | mtr |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | | 12.89 | ft | 3.93 | mtr |
| Trim angle (Ta) = | | 0.08 | deg. | **OK!** | |

| | | | | |
|---|---|---|---|---|
| Heel = sin(Ha) * W | | 0.10 | mtr | 0.32 | ft |
| Draft Port side =Ad + Heel/2 | | 3.89 | mtr | 12.77 | ft |
| Draft Starboard side=Ad - Heel/2 | | 3.80 | mtr | 12.45 | ft |
| Heel angle (Ha) = atan(TCG/G'M) | | 0.18 | deg. | **OK!** | |

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.11 | ft | 2.17 | mtr |
| Jetty - water distance | 6.65 | ft | 2.03 | mtr |
| Barge - Jetty distance | 0.47 | ft | 0.14 | mtr above jetty |
| Time involved ballast step 17 | 0.00 | hrs | | |
| Time elapsed since pre-ballast | 0.79 | hrs | | |
| Time elapsed since mean tide | 0.79 | hrs | | |

### BARGE DRAFT BEHAVIOUR:

```
                        12.45 ft
 12.18 ft    +-----------------------------+    12.73 ft
             |        star board side       |
 12.34 ft    | bow                    stern |    12.89 ft
             |         port side            |
 12.50 ft    +-----------------------------+    13.04 ft
                        12.77 ft
```

# Liberty International Underwriters
*Member of Liberty Mutual Group*

# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|

**Ballast step:** 18

**Barge details:**

| Name | **Marmac 400** | | | | |
|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr |

**Ballasting with (tick one):**

| fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
|---|---|---|---|---|---|
| salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |

**Pump info:**

| Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
|---|---|---|---|---|
| Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 50.0% | 345.43 | 11.05 | 105.59 | 1.78 | 673.11 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 35.0% | 241.80 | -11.05 | 105.45 | 1.21 | 538.49 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: | 18 | | 938.79 | -0.13 | 117.06 | 13.50 | | | |
| | **Grand Total / System COG** | | | 12,307.66 | 0.08 | 63.40 | 3.43 | 34,620.33 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | | |
| Average draft | Ad = | 12.64 | ft | 3.85 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 | mtr | | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 | mT*mtr | Transverse stability GM=KM-VCG | | 20.56 | mtr | 67.46 | ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 | mtr | Correction factor | GG' = | 2.81 | mtr | 9.23 | ft |
| | | | | | | Corrected stability | G'M = | 17.75 | mtr | 58.23 | ft | OK! |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.59 | ft | 0.18 | mtr | Heel = sin(Ha) * W | 0.13 | mtr | 0.43 | ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.34 | ft | 3.76 | mtr | Draft Port side =Ad + Heel/2 | 3.92 | mtr | 12.85 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF/L)) | 12.93 | ft | 3.94 | mtr | Draft Starboard side=Ad - Heel/2 | 3.79 | mtr | 12.42 | ft |
| Trim angle (Ta) = | 0.08 | deg. | OK! | | Heel angle (Ha) = atan(TCG/G'M) | 0.25 | deg. | OK! |

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.07 | ft | 2.16 | mtr |
| Jetty - water distance | 6.65 | ft | 2.03 | mtr |
| Barge - Jetty distance | 0.43 | ft | 0.13 | mtr above jetty |
| Time involved ballast step 18 | 0.00 | hrs | | |
| Time elapsed since pre-ballast | 0.79 | hrs | | |
| Time elapsed since mean tide | 0.79 | hrs | | |

### BARGE DRAFT BEHAVIOUR:

```
                        12.42 ft
  12.13 ft      +---------------------------+      12.71 ft
               |      star board side       |
               |                            |
  12.34 ft     | bow                   stern |     12.93 ft
               |                            |
               |        port side           |
  12.55 ft      +---------------------------+      13.14 ft
                        12.85 ft
```

# Liberty International Underwriters
### Member of Liberty Mutual Group

# *Ballast calculations*

| PROJECT: | Gulf Marine, Alba Module 2 | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|

**Ballast step:** 19    Module 2 on the barge

**Barge details:**

| Name | **Marmac 400** | | | | | **Ballasting with (tick one):** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | **Pump info:** | | | | |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| | | | | | | | Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 50.0% | 345.43 | 11.05 | 105.59 | 1.78 | 673.11 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 35.0% | 241.80 | -11.05 | 105.45 | 1.21 | 538.49 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | Module 2 (with transporters) | | | 1,002.00 | -1.20 | 106.00 | 13.50 | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 19 Module 2 on the barge | | | - | - | - | - | | | |
| | **Grand Total / System COG** | | | 12,370.87 | -0.01 | 62.78 | 3.48 | 34,620.33 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Average draft | Ad = | 12.70 | ft | 3.87 | mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | | |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 | mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | | |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 | mtr | | | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 | mT*mtr | Transverse stability GM=KM-VCG | | 20.51 | mtr | 67.29 | ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 | mtr | Correction factor | GG' = | 2.80 | mtr | 9.18 | ft |
| | | | | | | Corrected stability | G'M = | 17.71 | mtr | 58.11 | ft | OK! |

| | | | | | Heel = sin(Ha) * W | | -0.02 | mtr | -0.07 | ft |
|---|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.28 | ft | 0.08 | mtr | | | | | | |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.56 | ft | 3.83 | mtr | Draft Port side =Ad + Heel/2 | | 3.86 | mtr | 12.66 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.83 | ft | 3.91 | mtr | Draft Starboard side=Ad - Heel/2 | | 3.88 | mtr | 12.73 | ft |
| Trim angle (Ta) = | 0.04 | deg. | OK! | | Heel angle (Ha) = atan(TCG/G'M) | | -0.04 | deg. | OK! | |

| | | | | | |
|---|---|---|---|---|---|
| Freeboard at jetty | 7.17 | ft | 2.18 | mtr | |
| Jetty - water distance | 6.65 | ft | 2.03 | mtr | |
| Barge - Jetty distance | 0.52 | ft | 0.16 | mtr above jetty |
| Time involved ballast step 19 | 0.00 | hrs | | | |
| Time elapsed since pre-ballast | 0.79 | hrs | | | |
| Time elapsed since mean tide | 0.79 | hrs | | | |

**BARGE DRAFT BEHAVIOUR:**

| | 12.73 ft | |
|---|---|---|
| 12.59 ft | star board side | 12.87 ft |
| 12.56 ft | bow      stern | 12.83 ft |
| 12.53 ft | port side | 12.80 ft |
| | 12.66 ft | |

# *Ballast calculations*

**Liberty International Underwriters** — Member of Liberty Mutual Group

| PROJECT: | Gulf Marine, Alba Module 2 | | ENG. No. | 24e025 | Rev. | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 20 **Module 2 in final position**

**Barge details:**

| Name | **Marmac 400** | | | | |
|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr |

**Ballasting with (tick one):**

| | | | | | |
|---|---|---|---|---|---|
| fresh water | 1,000 | kg/m^3 | 62.37 | LBS/ft^3 | |
| salt water | 1,025 | kg/m^3 | 63.93 | LBS/ft^3 | x |

**Pump info:**

| | | | | |
|---|---|---|---|---|
| Capacity = | 2274 | mT/hr | 5,008,811 | LBS/hr |
| Pumps = | 1 | Nos. per tank | 0 | Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 50.0% | 345.43 | 11.05 | 105.59 | 1.78 | 673.11 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 35.0% | 241.80 | -11.05 | 105.45 | 1.21 | 538.49 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | Module 2 (with transporters) | | | 1,002.00 | -1.20 | 109.00 | 13.50 | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 20 Module 2 in final position | | | - | - | - | - | | | |
| | **Grand Total / System COG** | | | 12,370.87 | -0.01 | 63.02 | 3.48 | 34,620.33 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | |
|---|---|---|---|---|---|
| Average draft | Ad = | 12.70 | ft | 3.87 | mtr |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 | mtr |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 | mtr |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 | mT*mtr |
| Metacentric Height | KM = | 78.69 | ft | 23.99 | mtr |

| | | | | |
|---|---|---|---|---|
| Minimum Stability | Max G'M = | 1.00 | mtr | |
| Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | |
| Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | |
| Transverse stability GM=KM-VCG | | 20.51 | mtr | 67.29 | ft |
| Correction factor | GG' = | 2.80 | mtr | 9.18 | ft |
| Corrected stability | G'M = | 17.71 | mtr | 58.11 | ft | **OK!** |

| | | | | | |
|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.40 | ft | 0.12 | mtr | |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.50 | ft | 3.81 | mtr | |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.89 | ft | 3.93 | mtr | |
| Trim angle (Ta) = | 0.06 | deg. | **OK!** | | |

| | | | | |
|---|---|---|---|---|
| Heel = sin(Ha) * W | -0.02 | mtr | -0.07 | ft |
| Draft Port side =Ad + Heel/2 | 3.86 | mtr | 12.66 | ft |
| Draft Starboard side=Ad - Heel/2 | 3.88 | mtr | 12.73 | ft |
| Heel angle (Ha) = atan(TCG/G'M) | -0.04 | deg. | **OK!** | |

| | | | | |
|---|---|---|---|---|
| Freeboard at jetty | 7.11 | ft | 2.17 | mtr |
| Jetty - water distance | 6.65 | ft | 2.03 | mtr |
| Barge - Jetty distance | 0.46 | ft | 0.14 | mtr above jetty |
| Time involved ballast step 20 | 0.00 | hrs | | |
| Time elapsed since pre-ballast | 0.79 | hrs | | |
| Time elapsed since mean tide | 0.79 | hrs | | |

### BARGE DRAFT BEHAVIOUR:

```
                        12.73 ft
12.53 ft     +--------------------------------+     12.93 ft
             |          star board side       |
12.50 ft     | bow                       stern|     12.89 ft
             |          port side             |
12.46 ft     +--------------------------------+     12.86 ft
                        12.66 ft
```

# *Ballast calculations*

| **PROJECT:** | Gulf Marine, Alba Module 2 | | **ENG. No.** | 24e025 | **Rev.** | 0 |
|---|---|---|---|---|---|---|

**Ballast step:** 21 **Module 2 in final position**

**Barge details:**
| Name | **Marmac 400** | | | | | | **Ballasting with (tick one):** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Length (L) | 400 | ft | 0 | inch | 121.92 | mtr | fresh water | 1,000 | kg/m^3 | 62.37 LBS/ft^3 |
| Width (W) | 99 | ft | 9 | inch | 30.40 | mtr | salt water | 1,025 | kg/m^3 | 63.93 LBS/ft^3 x |
| Height (H) | 20 | ft | 0 | inch | 6.10 | mtr | **Pump info:** | | | |
| Max. draft | 19 | ft | 0 | inch | 5.79 | mtr | Capacity = | 2274 | mT/hr | 5,008,811 LBS/hr |
| | | | | | | | Pumps = | 1 | Nos. per tank | 0 Nos. tanks in use |

## BALLAST INFO:

| No. | Description | Capacity m^3 | %-filled | Weight mT | TCG mtr | LCG mtr | VCG mtr | Free Surface Correction mT*mtr | Pumped Quantity mT | time involved hrs |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Forepeak tank portside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | Forepeak tank center portside | 459.0 | 5.0% | 23.52 | 0.00 | 12.11 | 0.20 | 52.43 | 0.00 | |
| 3 | Forepeak tank center starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 4 | Forepeak tank starboardside | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5 | Tank 1 portside | 847.0 | 95.0% | 824.77 | 11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 6 | Tank 1 port center | 1503.0 | 95.0% | 1463.55 | 0.00 | 21.34 | 2.85 | 3,932.49 | 0.00 | |
| 7 | Tank 1 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | Tank 1 starboard side | 847.0 | 95.0% | 824.77 | -11.05 | 21.34 | 2.62 | 897.49 | 0.00 | |
| 9 | Tank 2 portside | 902.0 | 80.0% | 739.64 | 11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 10 | Tank 2 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 39.62 | 0.15 | 3,932.49 | 0.00 | |
| 11 | Tank 2 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | Tank 2 starboard side | 902.0 | 80.0% | 739.64 | -11.05 | 39.62 | 2.35 | 897.49 | 0.00 | |
| 13 | Tank 3 portside | 903.0 | 5.0% | 46.28 | 11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 14 | Tank 3 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 57.91 | 0.15 | 3,932.49 | 0.00 | |
| 15 | Tank 3 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | Tank 3 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 57.91 | 0.15 | 897.49 | 0.00 | |
| 17 | Tank 4 portside | 903.0 | 5.0% | 46.28 | 11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 18 | Tank 4 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 76.20 | 0.15 | 3,932.49 | 0.00 | |
| 19 | Tank 4 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | Tank 4 starboard side | 903.0 | 5.0% | 46.28 | -11.05 | 76.20 | 0.15 | 897.49 | 0.00 | |
| 21 | Tank 5 portside | 903.0 | 75.0% | 694.18 | 11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 22 | Tank 5 port center | 1505.0 | 5.0% | 77.13 | 0.00 | 94.49 | 0.15 | 3,932.49 | 0.00 | |
| 23 | Tank 5 starboard center | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | Tank 5 starboard side | 903.0 | 75.0% | 694.18 | -11.05 | 94.49 | 2.21 | 897.49 | 0.00 | |
| 25 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | N.A. | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | Tank 6 portside stern | 674.0 | 50.0% | 345.43 | 11.05 | 105.59 | 1.78 | 673.11 | 0.00 | |
| 30 | Tank 6 port center stern | 1129.0 | 95.0% | 1099.36 | 0.00 | 108.31 | 3.47 | 4,718.99 | 0.00 | |
| 31 | Tank 6 starboard center stern | 0.0 | 5.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 32 | Tank 6 starboard side stern | 674.0 | 35.0% | 241.80 | -11.05 | 105.45 | 1.21 | 538.49 | 0.00 | |
| 33 | | | | | | | | | | |
| 34 | Light ship | | | 3157.00 | 0.00 | 62.22 | 3.00 | | | |
| 35 | | | | | | | | | | |
| 36 | **Pre-positioned cargo** | | | | | | | | | |
| 37 | Ramps | | | 7.00 | 10.80 | 121.90 | 6.10 | | | |
| 38 | Ramps | | | 10.20 | -4.75 | 121.90 | 6.10 | | | |
| 39 | Ramps | | | 10.20 | -11.30 | 121.90 | 6.10 | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | Module 2 (w/o transporters) | | | 855.00 | -1.20 | 109.00 | 13.50 | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | Ballast step: 21 Module 2 in final position | | | - | - | - | - | | | |
| | **Grand Total / System COG** | | | 12,223.87 | 0.00 | 62.47 | 3.36 | 34,620.33 | 0.00 | 0.00 |

## HYDROSTATICS:

| | | | | | Minimum Stability | Max G'M = | 1.00 | mtr | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Average draft | Ad = | 12.56 | ft | 3.83 mtr | Max. Allow. Trim angle | Max Ta = | 6.00 | deg. | | |
| Long. Cntr. Buoyancy | LCB = | 204.18 | ft | 62.23 mtr | Max. Allow. Heel angle | Max Ha = | 3.00 | deg. | | |
| Long. Cntr Flotation | LCF = | 205.91 | ft | 62.76 mtr | | | | | | |
| Moment to change trim | MT1 = | 2,945.56 | ft*tons | 801.61 mT*mtr | Transverse stability GM=KM-VCG | | 20.63 | mtr | 67.68 | ft |
| Metacentric Height | KM = | 78.69 | ft | 23.99 mtr | Correction factor | GG' = | 2.83 | mtr | 9.29 | ft |
| | | | | | Corrected stability | G'M = | 17.80 | mtr | 58.39 ft | **OK!** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Trim = Weight*(LCG-LCB)/MT1 | 0.12 | ft | 0.04 | mtr | Heel = sin(Ha) * W | 0.00 | mtr | 0.01 | ft |
| Draft bow (Db) = Ad-(Trim*(LCF/L)) | 12.50 | ft | 3.81 | mtr | Draft Port side =Ad + Heel/2 | 3.83 | mtr | 12.57 | ft |
| Draft stern(Ds)=Ad+(Trim((L-LCF)/L)) | 12.62 | ft | 3.85 | mtr | Draft Starboard side=Ad - Heel/2 | 3.83 | mtr | 12.55 | ft |
| Trim angle (Ta) = | 0.02 | deg. | **OK!** | | Heel angle (Ha) = atan(TCG/G'M) | 0.01 | deg. | **OK!** | |

| | | | | **BARGE DRAFT BEHAVIOUR:** |
|---|---|---|---|---|
| Freeboard at jetty | 7.38 | ft | 2.25 | mtr |
| Jetty - water distance | 6.65 | ft | 2.03 | mtr |
| Barge - Jetty distance | 0.73 | ft | 0.22 | mtr above jetty |
| Time involved ballast step 21 | 0.00 | hrs | | |
| Time elapsed since pre-ballast | 0.79 | hrs | | |
| Time elapsed since mean tide | 0.79 | hrs | | |

BARGE DRAFT BEHAVIOUR:
- 12.55 ft
- 12.50 ft / 12.61 ft
- star board side
- 12.50 ft / bow — stern / 12.62 ft
- port side
- 12.51 ft / 12.63 ft
- 12.57 ft