VESSEL PARTICULARS (FORM C)
LPG/C 3517.382 M^3
ECO LUCIDITY

Specifications of the vessel and the gas installation which are representations by the Owners, given in good faith but wog.

(A) VESSEL'S CHARACTERISTICS

PREAMBLE

Name	:	**ECO LUCIDITY**
Owner	:	**COLORADO OIL AND GAS INC.**
Flag	:	**MARSHALL ISLANDS**
Build	:	**HIGAKI SHIPBUILDING CO. LTD.**
Date on Service	:	**09/01/2015**
Class	:	**NKK**

GRT International	:	**Abt. 3,992 ton**	Suez	:	**TBA ton**
			Panama	:	**TBA m^3**
NRT International	:	**Abt. 1192 ton**	Suez	:	**TBA ton**
			Panama	:	**TBA ton**

Is vessel build according to	USCG regulations?	:	**Yes**
	RINA regulations?	:	**N/A**
	Japanese regulation?	:	**JIS**
Has vessel received	USCG approval?	:	**YES (for foreign vessel in US water)**
	RINA approval?	:	**N/A**

HULL

LOA	:	**99.92**	**M**
LBP	:	**92.90**	**M**
Breadth	:	**17.00**	**M**
Depth	:	**7.20**	**M**
Summer Draft	:	**5.40**	**M corresponding to Summer DWT = abt. 3841.88**

Estimated draft with full cargo and full bunkers are as follows.

Product	Draft Fore' (m)	Draft Aft' (m)	Draft Mean (m)	Corresponding Deadweight (t)
Propane (98%)	3.52	5.65	4.03	2043.3
Butadiene (94%)	2.88	5.66	4.27	2361.1
VCM (64%)	2.97	6.19	4.58	2784.3

Propeller immersion :

At draft	**6.19 m**	**At**	**correspond. :**	**105.96 %**
At draft	**5.50 m**	**At**	**correspond. :**	**86.91 %**

COMMUNICATION EQUIPMENT

Call letter		:	**V7CC9**
Radio Station normally watched		:	**GMDSS**
Radio MF/HF NBDP		:	**538006120**
Radio MF/HFTEL/DSC		:	**538006120**
VHF		:	**Primary & Duplicated system**
Satellite Communication	**Inmarsat 'C'**	:	453840951
	Inmarsat 'FBB'	:	Voice +870 773213618
		:	(Fax) +870 783230450
		:	(E-mail) ecolucidity@stealth.gr

MACHINERY

Main Engine x 1	. Type and make	:	**MAKITA-MITSUI-MAN, B & W 5L35MC6.1**
	. Service power	:	**2.500 KW x 202 rpm (100 % NCR)**
	No of Cylinders		**5**
	Cyl Bore x Stroke		**350 mm x 1050 mm**
	. Grade of fuel used	:	**HFO having a viscosity of not more than 380cst @ 50°C**
Auxiliaries	Type and make (Electrical)		**Yanmar (6NY 16L - EW)**
			rated 441 Kw x 1200 min-1
	(Mechanical)		**6 Cyl., stroke 160mm x 200mm**
	Grade of fuel used		**MDO (DMA/DMB)**
	No off		**2**
Emergency Gen	Type		**MITSUI ZOSEN MAC., F6L912 – 52Kw, AC 450V, 3 phase, 60 Hz**
	No off		**1**
Boiler	Type		**MIURA (GK-1424-600/300)**
			Fully automatic smoke-tube composite boiler
	Evaporation		**650/ 350 Kg/Hr (Oil fired / Exhaust gas)**
	Max Design Pressure		**0.7 Mpa Saturated**
	Feed Water Temp		**60°C**
	No off		**1**
Air Compressors (Main)	Type / Capacity		**MATSUBARA MH108 - Vertical, Electric Motor – driven, 2-stage, F.W. cooled type / 45.0 m^3 / Hr**

	No off	**2**
Air Compressors (Emergency)	Type	**NO.2 Main air compressor will serve as an emergency during black out driven by emergency generator.**
	No off	
Fuel Oil Purifier	Type	**Mitsubishi SJ15H – Centrifugal**
	No off	**2**
	Capacity	**1,400 Ltrs / Hr at 380 mm^2/s at 50°C**
Lub Oil Purifier	Type	**Mitsubishi SJ15H – Centrifugal**
	No off	**1**
	Capacity	**1,400 Ltrs / Hr at 40°C**
Evaporator	Type	**MIURA CO., LTD. (WM-10DK) – Waste heat recovery**
	Capacity	**1 x 10 t/day**
Fresh Water Sterilizer	Type	**USUSHIO USS -500 ULTRA VIOLET**
	Capacity	**TBA**
Waste Oil Incinerator (IMO MEPC 76 (40))	Type	**MIURA CO., LTD. (BGW-10N)**
	Capacity	**Oil @ 100,000 kcal/h & Solids @ 5 Kg/h, 13kg/h Per burner (Waste oil)**
Oily Water Separator	Type	**TAIKO KIKAI INDUSTRIES CO., LTD. (USH-10) –**
	Capacity	**1 x 1.0 m^3/h ,15ppm**
Sewage Treatment plant	Type	**TAIKO KIKAI INDUSTRIES CO., LTD. (SBH-25)- Activated sludge aeration (Biological) – USCG certified**
	Capacity	**1 x 25 persons per day**
Hot Water Set (Calorifier unit)	No off	**HARISON SANGYO CO., LTD. (CFT-300XX-S) 300L/h, 70°C SET / 1 set**
Bow Thruster	Type	**Kawasaki Heavy Industries, Ltd. (KT-32B3)- 260kW x 1,800 min^{-1} (synchronous speed)**
Steering Gear	Type	**Kawasaki Heavy Industries, Ltd. Electro-Hydraulic system (RV21-010-H) with 2-pump units (dual system) – (one pump to be able to supply full power)**
	Duty Capacity	**105 KN-m (10.7 t-m)**
	Hydraulic pump unit	**Electric motor driven, 2 x 3.7 Kw**

Speed

In Moderate weather:

About: SPEED @ NCR & scantling Draft: abt. 13.5 kts

CONSUMPTION/ DAY

Main Engine	HFO	@ NCR & scantling Draft: abt.	Cons.: Abt. 9.5MT/day
		@ Scantling Draft & 1760 kW	Cons. Abt. 7.8 MT/day
Auxiliary Engine	DO		Cons. Abt 0.8-1MT/day

Permanent bunker capacity (100%)

HFO : **355.54 m³ (*Fuel oil bunker tanks to be DH)***
Diesel : **107.78 m³ (*Diesel oil bunker tanks are DH)***
Fresh Water : **167.10 m³**

(B) CARGO INSTALLATIONS

1. Transportable products and respective quantities, calculated in accordance with IMO – maximum filling formula. (Tonnes)

	100% (CBM)	98% (CBM)
NO.1 CARGO TANK	1758.647	1723.474
NO.2 CARGO TANK	1758.735	1723.560
T O T A L	3517.382	3447.034

	SPSV (bar g)	Ref. Temp. (deg. C.)	Density at (Ref. Temp.)	Corresponding Quantity (MT)
Propane	17.65	45.0	0.459	1574
Propylene			0.470	1612
B/P Mixture			-	-
I-Butane			0.526	1804
N-Butane			0.548	1878
Butylenes			0.565	1936
Butadiene			0.588	2016
V.C.M.			0.872	2990
Isoprene			0.656	2250
Pentanes			0.600	2058
Pentene			0.611	2094

Note(1): In case of there is no request by USCG, setting pressure of safety valve may use 17.65 bar g. Propylene, Propane and Butane/Propane Mixtures are to be carried. In case of there is request by USCG, propylene, propane and Butane/Propane mixtures are not to be carried except the vapour pressure of Butane/Propane mixtures is not more than 12.75 bar g, (1.275 MPa g) @ 45 °C

Note(2): On and after, the pressure value in parentheses is shown as a conversion value

Mixing ratio of above mentioned B/P mixtures is as follows:

Butane 35 wt% and propane 65 wt%

Note (3): Figures are preliminary

*Subject to change according to displacement

2. Other transportable products N/A

	SPSV	Ref. Temp. (°C.)	Density at Ref. Temp.	Corresponding Quantity (MT)
Raffinate 1	**TBA**	**TBA**	**TBA**	**TBA**
Raffinate 2	**TBA**	**TBA**	**TBA**	**TBA**
C4	**TBA**	**TBA**	**TBA**	**TBA**

3. TANKS

3.1	Design pressure (Vapour) – BV-IGC	:	**17.65 bar g (1.765 MPag)**
	- USCG	:	**12.75 bar g (1.275 MPag)**
3.2	Valve setting	:	**17.65 bar g (1.765 MPag) / 12.75 bar g (1.275 MPag)**
3.3	Maximum vacuum obtainable	:	**Atmospheric**
3.5	Maximum temperature acceptable	:	**45 °C**
3.6	Minimum temperature acceptable	:	**-10 °C**
3.7	Hydrostatic Test Pressure	:	**26.48 bar g (2.648 MPag)**

4. LOADING RATE (TONS/HOUR) – For Full Cargo Parcels

Ex-atmospheric storage with gas Return	1 tank	:	**806**
	2 tanks	:	**1612**

Remarks:

* If cargo temperature is less than -10 °C, shore heater to be used. If ship heater used, max rate is **250 m^3** per hour.
***** Based on maximum velocity of 6.5 metres/sec except VCM, and 5.0 meters/sec for VCM in the liquid piping.
***** Loading by shore pump only, proper size gas return line to be connected
***** Subject to both ship and shore tanks being under favourable conditions

5. CARGO PUMPS

5.1	Type	:	**Deepwell type of vertical centrifugal multistage design**
	Make	:	**WARTSILA SVANEH ϕ J A/S**
	How many	:	**1 set per tank (2 sets)**
	Maximum specific gravity	:	**0. 601(LPG) / 0.965 (VCM)**
5.2	Capacity (CMB/Hour)	:	**300 m^3/hr at 110 m (SG 0.610)** **250 m^3/hr at 130 m (SG 0.948)**
	Two speed or variable speed	:	**Single Speed 132m (0.965)**
	Rated kW (each)		**130 kW**
	Working pressure maximum	:	**TBA**
5.3	Location	:	**At each cargo tank**
	Removable	:	**Not removable**
5.4	Booster pumps	:	**1 set**
	Type	:	**Horizontal**
	Maker	:	**WARTSILA SVANEH ϕ J A/S**
5.5	Capacity (CMB/Hour)	:	**300m^3/hr at 110 m (SG 0.610)**
	Working pressure	:	**TBA**
5.6	Location	:	**Aft part of Starboard side manifold platform**
5.7	Time to discharge a full liquid cargo using all pumps against back pressure at pump		
	1 bar	:	**Abt. 12 hrs**
	5 bars	:	**Abt. 16 hrs**
	10 bars	:	**-------**

5.8	Nominal back pressure when working	:	**TBA**
	In series corresponding head	:	**TBA**
	Maximum back pressure	:	**TBA**
	Nominal pressure at rail (propane)	:	**TBA**

5.9 What amount of cargo remains in tanks after completion pumping before stripping:

- liquid	:	**About 0.164 m3**
- vapour	:	**TBA**

6. STRIPPING

6.1	Stripping system, if any	:	**Nil**

6.2 Time required to remove all traces of liquid cargo as stated in 5.9 for:

- LPG : TBA :

7. CARGO COMPRESSORS

7.1	Type	:	**Vertical water cooled 1 stage double acting**
	Make	:	**TANABE PNEUMATIC MACHINERY CO., LTD**
	How many	:	**2 sets**
	Piston displacement		**460m3/h**
	Rated Kw		**75 kW**
	Stroke		**177.8 mm**
	Max discharge pressure		**20 bar g**
	Pressure differential		**4 bar**
			Max 7 bar at single action
	No of Revolutions		**540 rpm**
7.2	Are compressors oil free	:	**Yes**
7.3	Can they reliquefy VCM without risk	:	**N/A**
7.4	State time to bring full cargo of butane to atmospheric pressure from	:	**N/A**

8. INERT GAS SYSTEM

8.1	Does the vessel use inert gas?	:	**Yes (N2 Generator)**
	If so, state utilization and quantities (type) /quantity	:	**MR – 130M x 1set**
8.2	Can the vessel produce inert gas?	:	**Yes (N2)**

If so, state type and composition of gas produce:

Nitrogen: 97 % to 99.9%	**Capacity (discharge) @ 97.00% N2 is 260 Nm3/h** **Capacity (discharge) @ 99.50% N2 is 185 Nm3/h** **Capacity (discharge) @ 99.90% N2 is 130 Nm3/h**
Oxygen: 1.0 % to 0.05%	**N2 purity at flow rate of 260 Nm3/h = 99.06 Vol% or more , 0.94 vol% or less**
Discharge Capacity	**N2 purity at flow rate of 185 Nm3/h = 99.820 Vol% or more , 0.180 vol% or less** **N2 purity at flow rate of 130 Nm3/h = 99.975 Vol% or more , 0.025 vol% or less**

8.3	Maximum production obtainable	:	**99.975 vol% or more ,0.025 vol% or less**

NOTE:- Above quantities obtained at engine room temperature 24.5° C

8.4 State if there are storage facilities for inert gas onboard: **N/A**

- Size : **N/A**
- Pressure : **N/A**

8.5 State if any shore supply of nitrogen may be required: : **N/A**

- for what purpose : **N/A**
- what quantities : **N/A**

9. GAS FREEING

9.1 State method used giving all details : **Nitrogen Plant / Fans**

9.2 State time required including stripping : **TBA**

10. CHANGING GRADE

10.1 From completion discharge of cargo Propane, time required in hours and inert gas in CBM required to reach a tank and gas installation atmosphere of less than 100 ppm of Propane in Vapour phase.:TBA

10.2 Can this operation be carried out at sea? : **Yes**

10.3 Can the ship measure the number of ppm in vapour phase? : **Yes**

10.4 Has vessel deck tank for changing grade/cooling operations? : **No**

10.5 Deck tanks : **NIL**
Capacity :
Purpose :

11. COOLING BEFORE LOADING :

12. CARGO HEATER

12.1	Type :	**Horizontal Shell and Tube type**
12.2	Inside Diameter	**700 mm**
12.3	Overall length	**6430 mm**
12.4	Cargo flow rate	**250 m3/h (Propane)**
12.5	Min Inlet Temp	**-48 °C**
12.6	Min Outlet Temp	**6 °C**
12.7	Required Sea water Capacity	**450 m3/h (Min 16°C)**
12.8	Design Pressure	**20 bar g**
12.9	Hydrostatic Test Pressure	**30 bar g**
12.10	Tightness Test Pressure	**20 bar g**

12.0 State discharging rate for propane to be brought from atmospheric pressure **NA**
Loading rate for Propane – **minus 42** ° C /(**minus10** ° C: **450 m3/hr in one tank**)

13. CARGO VAPORIZER

In case vapour gas is needed to feed compressors, can vessel produce its own if no shore available:

No

14. REFRIGERATING APPARATUS **NA**

14.1 Is it independent of cargo? : **NA**
Is so, state cooling agents : **NA**

14.2 What minimum temperature can be maintained : **NA**

14.3 What time required at sea to lower by 1°C the full cargo of : **NA**

15. MEASURING APPARATUS

What gauges on board?
Type : **Float type level gauge**
Location : **Tank 1 & 2 near cargo pump disch valve.**

16. SAMPLES

16.1 State how tank atmosphere samples can be taken and where from?
Sample points at tank bottom, mid and top

Standard of fitting? : **JIS PT1/2 thread**

16.2 Same question for cargo : **TBA**

16.3 Are sample bottles available on board? : **No**

17. CARGO LINES

17.1 Is ship fitted with a port and starboard cargo manifold? : **Yes**

17.2 Position of cargo manifold

- distance from sterrn (AP) (S / P)	:	**53.28**	**M**
- distance form stem (FP) (S / P)	:	**46.64**	**M**
- height above deck	:	**1.30**	**m for Liquid manifold**
- distance from ship's rail	:	**2.80**	**M**
- underside keel to manifold	:	**8.70**	**M**

17.3 Liquid line

- flange-size : **8 in.**
- type : **8" ANSI 300LB**

Gas line

- flange-size : **5 in.**
- type : **5" ANSI 300LB**

17.4 What reducers on board? : **(NK) STEEL**

For Liquid line (low temp - 48 C TO +45 C)

Ship Side	Terminal side	(L mm)	Wt (kg/l.)	Qty
200 A(8B) X ANSI 300 lbs	+ 250A(10B) x ANSI300 lbs	250	105	1
200 A(8B) X ANSI 300 lbs	+ 150A(6B) x ANSI300 lbs	250	66	1
200 A(8B) X ANSI 300 lbs	+ 125A(5B) x ANSI300 lbs	250	59	1
200 A(8B) X ANSI 300 lbs	+ 100A(4B) x ANSI300 lbs	250	53	1
200 A(8B) X ANSI 300 lbs	+ 80A(3B) x ANSI300 lbs	250	48	1
200 A(8B) X ANSI 300 lbs	+ 200A(8B) x ANSI300 lbs	250	63	1
200 A(8B) X ANSI 300 lbs	+ 150A(6B) x ANSI300 lbs	250	53	1
200 A(8B) X ANSI 300 lbs	+ 100A(4B) x ANSI300 lbs	250	4	1
200 A(8B) X ANSI 300 lbs	+ 200A(8B) x JIS 20K	250	65	1
200 A(8B) X ANSI 300 lbs	+ 150A(6B) x JIS 20K	250	60	1
200 A(8B) X ANSI 300 lbs	+ 100A(4B) x JIS 20K	250	48	1
		Total		11

For Vapor line (normal temp. - 10 C to + 45 C)

For Liquid line (low temp - 48 C TO +45 C)

Ship Side	Terminal side	(L mm)	Wt (kg/l.)	Qty
125 A(5B) X ANSI 300 lbs	+ 100A(4B) x ANSI300 lb	250	31	1
125 A(5B) X ANSI 300 lbs	+ 80A(3B) x ANSI300 lb	250	26	1
125 A(5B) X ANSI 300 lbs	+ 50A(2B) x ANSI300 lb	250	22	1
125 A(5B) X ANSI 300 lbs	+ 150A(6B) x ANSI150 lb	250	27	1
125 A(5B) X ANSI 300 lbs	+ 125A(5B) x ANSI150 lb	250	26	1
125 A(5B) X ANSI 300 lbs	+ 80A(3B) x ANSI150 lb	250	23	1
125 A(5B) X ANSI 300 lbs	+ 50A(2B) x ANSI150 lb	250	22	1
125 A(5B) X ANSI 300 lbs	+ 125A(5B) x JIS 20K	250	26	1
125 A(5B) X ANSI 300 lbs	+ 100A(4B) x JIS20K	250	24	1
125 A (5B) X ANSI 300 lbs	+ 150A(6B) x ANSI 300lbs	250	42	1
		Total		10

Total reducers 10 pcs.

Cover Flange for shore connection

Ship Side	Size	Wt (kg/l.)	Qty
200 A(8B) X ANSI 300 lbs	LIQUID T 41.5mm x D 381 mm	37 /1P	2
125 A(5B) X ANSI 300 lbs	VAPOR T 35.5mm x D 270 mm	17 /1P	4

For VCS /VCS (-10 C to +45 C)

Ship Side	Terminal side	(L mm)	Wt (kg/l.)	Qty
125 A(5B) X ANSI 300 lbs	+ 150A (6B) X ANSI 150lb	200	28	1
125 A(5B) X ANSI 300 lbs	+ 100A (4B) X ANSI 150lb	200	24	1

17.5 Is ship fitted with stern discharge? **No**

- Liquid line - diameter : **N/A**
- flange – size : **N/A**
- type : **N/A**

18. HOSES

Are serviceable hoses available on board? : **None**

18.1 Two pieces, each : **TBA – Owners**

Length : **TBA – Owners**

	Diameter	:	**TBA – Owners**
	Flange-size	:	**TBA – Owners**
	Type	:	**TBA – Owners**
	Bending radius	:	**TBA – Owners**
18.2	Minimum temperature acceptable	:	**TBA – Owners**
	Maximum pressure acceptable	:	**TBA – Owners**
18.3	For what products are hoses suitable?	:	**TBA - Owners**

19. DERRICKS

- Hose cranes	:	**1 set**
- Where situated	:	**Frame 72**
- Lifting capacity	:	**4.0 tons @ 0.167m/sec**
- Working radius	:	**16.0m**

20. SPECIAL FACILITIES

20.1	How many grades can be segregated?	:	**Single Grade**
20.2	How many cooled?	:	**N/A**
20.3	Can vessel sail with slack cargo tanks?	:	**Yes**