



ΠΙΣΤΟΠΟΙΗΤΙΚΟ ΕΓΚΡΙΣΗΣ ΤΥΠΟΥ ΓΙΑ ΤΟ ΣΥΣΤΗΜΑ ΔΙΑΧΕΙΡΙΣΗΣ ΘΑΛΑΣΣΙΟΥ ΕΡΜΑΤΟΣ *Type Approval Certificate of Ballast Water Management System*

Το παρόν πιστοποιεί ότι το σύστημα διαχείρισης θαλασσίου έρματος που εκτίθεται παρακάτω έχει εξεταστεί και δοκιμαστεί σύμφωνα με τις απαιτήσεις των προδιαγραφών που περιέχονται στις Οδηγίες που περιέχονται στα ψηφίσματα του IMO MEPC 174(58) και MEPC 169(57). Το πιστοποιητικό είναι έγκυρο μόνο για το σύστημα διαχείρισης θαλασσίου έρματος που αναφέρεται παρακάτω.

This is to certify that the ballast water management system listed below has been examined and tested in accordance with the requirements of the specifications contained in the Guidelines contained in IMO resolutions MEPC 174(58) and MEPC 169(57). This certificate is valid only for the ballast water management system referred to below.

Σύστημα διαχείρισης θαλασσίου έρματος εφοδιασμένο από την:	Ecochlor, Inc.		
<i>Ballast water management system supplied by</i>			
Όνομασία συστήματος	Ecochlor®		
<i>Name of the system</i>			
Ενσωματώνοντας το εξής μοντέλο:	με λειτουργική παροχή επεξεργασίας	500-	m³/h
<i>Incorporating the following model:</i>	Ecochlor® BWMS	16200	m³/h
	Series 75 - 300		
Σύστημα διαχείρισης θαλασσίου έρματος κατασκευασμένο από την	Ecochlor, Inc.		
<i>Ballast water management System is manufactured by</i>			
με σχέδιο εξοπλισμού / συναρμολόγησης αριθ.	See Appendix to the Certificate		
<i>to equipment/assembly drawing No.:</i>			
Λοιπός εξοπλισμός κατασκευασμένος από	-		
<i>Other equipment manufactured by:</i>			
με σχέδιο εξοπλισμού / συναρμολόγησης αριθ.:	-		
<i>to equipment/assembly drawing No.:</i>			
Λειτουργική παροχή επεξεργασίας:	-		
<i>Treatment rated capacity:</i>			

Αντίγραφο αυτού του Πιστοποιητικού Έγκρισης Τύπου, πρέπει να φέρεται σε κάθε πλοίο που έχει εγκατεστημένο αυτό το σύστημα επεξεργασίας θαλασσίου έρματος ανά πάσα στιγμή. Μία αναφορά στο πρωτόκολλο δοκιμής και ένα αντίγραφο των αποτελεσμάτων δοκιμών πρέπει να είναι διαθέσιμα για έλεγχο επί του πλοίου.

Στην περίπτωση που το Πιστοποιητικό Έγκρισης Τύπου εκδίδεται βασισμένο σε έγκριση άλλης Αρχής, πρέπει να γίνεται αναφορά στο συγκεκριμένο Πιστοποιητικό Έγκρισης Τύπου.

A copy of this Type Approval Certificate should be carried on board a vessel fitted with this ballast water management system at all times. A reference to the test protocol and a copy of the test results should be available for inspection on board the vessel.

If the Type Approval Certificate is issued based on approval by another Administration, reference to that Type Approval Certificate shall be made.

Οι περιοριστικές προϋποθέσεις που τίθενται περιγράφονται στο Προσάρτημα του παρόντος εγγράφου.

The limiting conditions imposed are described in the appendix to this document.

ισχύει έως **28 October 2020**

This certificate is valid until

Εκδόθηκε στον/στην/στο **Southampton**

Issued at

την
on

08 January 2018

Sahan Abeysekera
Southampton GTC Office Office
Lloyd's Register EMEA

LR031.1.2016.06



SahanAbeysekera

Lead Specialist to LR EMEA

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Προσάρτημα *Appendix*

1. Περιορισμοί συστήματος
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Not applicable

2. Λίστα πιστοποιημένων τύπων
2. List of certified types

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Προσάρτημα
Appendix





Appendix 1

System Limitations

Not Applicable.

Appendix 2

List of Certified Types

Ecochlor® Series	Maximum TRC m ³ /h	Filtration unit	ClO ₂ concentration (mg/L)
75	500	BS-025 – BS-200	4.25
100	1300	BS-025 – BS-400T	4.25
150	3500	BS-025 – BS-1406	4.25
200	6900	BS-025 – BS-1406T	4.25
250	12200	BS-025 – BS-1406T	4.25
300	16200	BS-025 – BS-1406T	4.25

Appendix 3

Summary of Land-Based and Shipboard Test Results

Test No.	Model	Test Items	Date	Results
Shipboard JSB1	Series 75- Filtersafe BS- 150H-T-10	Commissioning and 1 st consecutive successful shipboard test	8-9 April 2015	Valid successful
Land-based JLB1-JLB2	Series 75- Filtersafe BS- 150H-T-10	1 st - 2 nd consecutive successful brackish water tests	13-14 April 2015	Valid successful
Land-based JLB3-JLB4	Series 75- Filtersafe BS- 150H-T-10	1 st - 2 nd consecutive successful marine water tests	20-21 April 2015	Valid successful
Shipboard JSB2-JSB4	Series 75- Filtersafe BS- 150H-T-10	3 consecutive successful shipboard tests	28 May - 27 June 2015	Valid successful
Land-based JLB5-JLB6	Series 75- Filtersafe BS- 150H-T-10	3 rd - 4 th consecutive successful marine water tests	01-03 September 2015	Valid successful
Land-based JLB7-JLB8	Series 75- Filtersafe BS- 150H-T-10	2 nd - 4 th consecutive successful brackish water tests	08-09 September 2015	Valid successful
Land-based JLB9-JLB10	Series 75- Filtersafe BS- 150H-T-10	5 th - 6 th consecutive successful marine water tests	15-16 September 2015	Valid successful
Land-based JLB11-JLB12	Series 75- Filtersafe BS- 150H-T-10	5 th - 6 th consecutive successful brackish water tests	22-23 September 2015	Valid successful
Shipboard JSB5	Series 75- Filtersafe BS- 150H-T-10	5 th consecutive successful shipboard test	11-15 October 2015	Valid successful
Land-based JLB13-JLB16	Series 75- Filtersafe BS- 150H-T-10	1 st to 4 th consecutive successful fresh water tests	08-16 December 2015	Valid successful
Land-based JLB17-JLB18	Series 75- Filtersafe BS- 150H-T-10	Invalid inlet challenge condition; organism counts too low and DOC extremely high; discharge standard not met.	31 March - 05 April 2016	Invalid
Land-based JLB19-JLB20	Series 75- Filtersafe BS- 150H-T-10	5 th - 6 th successful freshwater tests	15-20 April 2016	Valid successful

Summary of Challenge Water Quality Uptake Parameters (Land-Based)

Test	Flow Rate (m ³ /hr)	Water Temp (°C)	Salinity Average (ppt)	Turbidity (NTU)	DO (mg/L)	POC (mg/L)	DOC (mg/L)	TSS (mg/L)	MM ^a (mg/L)	pH
USCG Challenge Criteria	N.R.	4 -35	Marine: 28-36 Brackish: 10-20 Fresh: <1	N.R.	N.R.	>4	>6	>24	>20	N.R.
Marine Water										
JLB3 & JLB4 Control	401.6 ^b	16.6	24.3	33.1	8.9	6.9	7.4	133.6	126	8.0
JLB3 Uptake	394.7 ^b	15.9	23.9	25.7	8.9	5.9	5.9	109.0	103	8.0
JLB4 Uptake	401.2	16.5	24.0	30.7	9.1	7.9	7.7	129.1	121	8.0
JLB5 & JLB6 Control	390.0	21.8	26.6	23.8	7.8	8.6	9.0	95.4	86.9	8.1
JLB5 Uptake	401.6	20.4	26.1	11.3	8.7	9.2	8.9	60.2	51.1	8.1
JLB6 Uptake	403.6	21.6	26.0	16.6	8.3	8.4	8.8	60.7	52.3	8.1
JLB9 & JLB10 Control	406.1	20.4	27.6	12.8	7.8	7.5	7.0	131.2	123	8.0
JLB9 Uptake	398.4	18.7	28.6	12.4	8.6	6.6	7.2	126.4	119	8.0
JLB10 Uptake	398.0	20.1	28.7	12.1	8.2	7.5	7.2	114.5	106	8.0

Test	Flow Rate (m ³ /hr)	Water Temp (°C)	Salinity Average (ppt)	Turbidity (NTU)	DO (mg/L)	POC (mg/L)	DOC (mg/L)	TSS (mg/L)	MM ^a (mg/L)	pH
USCG Challenge Criteria	N.R.	4 -35	Marine: 28-36 Brackish: 10-20 Fresh: <1	N.R.	N.R.	>4	>6	>24	>20	N.R.
Brackish Water										
JLB1 & JLB2 Control	399.4	17.1	20.1	15.9	7.5	4.2	7.0	63.4	59.2	8.1
JLB1 Uptake	401.8	16.2	20.2	16.7	9.3	3.6 ^c	6.7	55.3	51.7	8.1
JLB2 Uptake	400.6	16.3	20.2	17.6	9.5	4.1 ^c	6.8	52.6	48.5	8.1
JLB7 & JLB8 Control	382.4	21.8	21.0	18.3	8.0	8.0	8.8	102.2	94.2	8.0
JLB7 Uptake	394.7	21.2	21.3	15.2	8.3	7.1	8.3	75.4	68.3	8.0
JLB8 Uptake	397.5	21.6	21.6	15.4	8.6	7.3	8.3	76.1	68.8	8.0
JLB11 & JLB12 Control	402.7	20.5	21.4	26.4	7.3	7.1	8.0	101.1	94.0	8.0
JLB11 Uptake	396.4	19.8	21.5	25.0	8.4	6.7	8.0	70.9	64.2	8.0
JLB12 Uptake	396.2	20.4	22.0	25.8	7.9	6.8	8.0	75.7	68.9	8.0

Test	Flow Rate (m ³ /hr)	Water Temp (°C)	Salinity Average (ppt)	Turbidity (NTU)	DO (mg/L)	POC (mg/L)	DOC (mg/L)	TSS (mg/L)	MM ^a (mg/L)	pH
USCG Challenge Criteria	N.R.	4 -35	Marine: 28-36 Brackish: 10-20 Fresh: <1	N.R.	N.R.	>4	>6	>24	>20	N.R.
Fresh Water										
JLB13 & JLB14 Control	395	11.71	0.8	32.4	11.2	7.2	8.5	47.1	39.9	8.2
JLB13 Uptake	401	11.93	0.7	28.3	11.6	6.0	7.4	37.5	31.5	8.3
JLB14 Uptake	395.7	11.7	0.8	29.7	11.3	6.7	7.8	43.8	37.1	8.2
JLB15 & JLB16 Control	401.9	11.9	0.3	37.5	11.0	7.2	9.3	57.8	50.6	8.1
JLB15 Uptake	400.8	11.6	0.3	35.0	11.3	7.0	8.9	53.7	46.7	8.1
JLB16 Uptake	401.2	10.0	0.3	35.8	10.9	6.8	9.1	55.6	48.8	8.0
JLB17 & JLB18 Control	400.3	10.0	0.6	28.6	N.A.	5.1	13.0	41.2	36.1	8.1
JLB17 Uptake	400	9.9	0.8	33.1	N.A.	5.0	12.7	41.6	36.6	8.2
JLB18 Uptake	402.1	15.9	0.6	24.4	N.A.	5.0	13.0	34.7	29.7	8.1
JLB19 & JLB20 Control	403.2	15.9	0.9	26.0	9.6	7.4	5.8	57.6	50.2	8.2
JLB19 Uptake	402.2	15.9	1.0	25.9	9.6	6.4	6.1	51.4	45.1	8.2
JLB20 Uptake	370.9	17.2	0.7	22.6	9.7	6.6	6.0	48.4	41.9	8.2

a = MM is reported as TSS – POM (as POC)

b = Mean flow rates are weighted with respect to time

c = POC results are the average of two replicates due to outliers

N.R. = Not required; N.A. = Not Analysed

Summary of Biological Efficacy Results (Land-Based)

Test	≥50 µm	<50 µm & ≥10 µm	Indicator Microbes		
	(orgs./m ³) ^a	(orgs./mL) ^{a,b}	E. coli (CFU/100 mL)	Enterococci (CFU/100 mL)	Heterotrophic Plate Counts (CFU/mL)
Uptake					
USCG Challenge Criteria	>100,000	>1,000	N.R.	N.R.	>1,000
Marine Water					
JLB3 & JLB4 Control	101212	4032	16.70	465	4900
JLB3 Uptake	157374	8691	13.47	148	3867
JLB4 Uptake	130909	1946	17.43	314	2550
JLB5 & JLB6 Control	405253	1340 ^c	1278	130	1031
JLB5 Uptake	450657	1285 ^c	1933	359	1471
JLB6 Uptake	475859	1455 ^c	821	169	796
JLB9 & JLB10 Control	462424	4705	>2420**	130	9788
JLB9 Uptake	528081	2920	>2420**	95.10	6879
JLB10 Uptake	395758	4004	>2420**	213	6142
Time Zero					
JLB3 Treatment	<78.43*	<1.00*	<1.00*	18.50	<12.50*
JLB4 Treatment	<78.43*	<1.00*	<1.00*	15.60	<12.50*
JLB5 Treatment	<43.29*	2.54 ^c	<1.00*	<1.00*	<12.50*
JLB6 Treatment	<43.29*	2.54 ^c	<1.00*	1.00	<12.50*
JLB9 Treatment	<66.67*	<1.00*	<1.00*	49.50	<12.50*
JLB10 Treatment	66.67	<1.00*	<1.00*	8.60	<12.50*
Treatment Discharge					
USCG Discharge Standard	<10	<10	<250	<100	N.R.
JLB3 & JLB4 Control	14227	2557	21.33	156	>15000**
JLB3 Treatment	<0.09*	<0.33*	<1.00*	1.67	<12.50*
JLB4 Treatment	<0.09*	0.67	<1.00*	1.33	<12.50*
JLB5 & JLB6 Control	399242	877 ^c	>2420**	99.10	>15000**
JLB5 Treatment	<0.09*	2.08 ^c	<1.00*	<1.00*	<12.50*
JLB6 Treatment	<0.09*	2.31 ^c	<1.00*	<1.00*	<12.50*
JLB9 & JLB10 Control	344747	884	>2420**	>2420**	>15000**
JLB9 Treatment	<0.09*	<0.33*	3.47	2.55	<12.50*
JLB10 Treatment	<0.09*	<0.33*	8.00	2.55	<12.50*

Test	≥50 µm	<50 µm & ≥10 µm	Indicator Microbes		
	(orgs./m ³) ^a	(orgs./mL) ^{a,b}	E. coli (CFU/100 mL)	Enterococci (CFU/100 mL)	Heterotrophic Plate Counts (CFU/mL).
Uptake					
USCG Challenge Criteria	>100,000	>1,000	N.R.	N.R.	>1,000
Brackish Water					
JLB1 & JLB2 Control	110859	2627	18.13	86.40	10529
JLB1 Uptake	117980	5527	19.00	248	5900
JLB2 Uptake	172020	2462	16.10	140	6900
JLB7 & JLB8 Control	211313	2683	>2420**	>2420**	4371
JLB7 Uptake	205859	2891	>2420**	>2420**	4558
JLB8 Uptake	211515	2092	>2420**	>2420**	3271
JLB11 & JLB12 Control	215051	5400	>2420**	>2420**	8967
JLB11 Uptake	211414	8070	>2420**	>2420**	49067
JLB12 Uptake	193535	3390	>2420**	>2420**	9129
Time Zero					
JLB1 Treatment	<118*	N.D.	<1.00*	68.90	<12.50*
JLB2 Treatment	<118*	N.D.	<1.00*	65.00	<12.50*
JLB7 Treatment	<43.29*	2.00	<1.00*	48.80	37.50
JLB8 Treatment	43.29	1.00	<1.00*	59.40	<12.50*
JLB11 Treatment	66.67	1.00	<1.00*	67.00	<12.50*
JLB12 Treatment	200	<1.00*	<1.00*	44.10	<12.50*
Treatment Discharge					
USCG Discharge Standard	<10	<10	<250	<100	N.R.
JLB1 & JLB2 Control	122020	2118	93.23	85.93	>15000**
JLB1 Treatment	0.38	<0.33*	<1.00*	<1.00*	<12.50*
JLB2 Treatment	<0.10*	0.67	<1.00*	<1.00*	<12.50*
JLB7 & JLB8 Control	77172	1281	>2420**	>2420**	>15000**
JLB7 Treatment	<0.10*	<0.33*	109	24.37	942
JLB8 Treatment	<0.10*	0.33	<1.00* ^d	31.03	2946
JLB11 & JLB12 Control	136263	2910	>2420**	>2420**	>15000**
JLB11 Treatment	<0.18	1.00	9.70	10.03	167
JLB12 Treatment	<0.09*	4.33	1.00* ^d	27.60	1067

Test	≥50 µm	<50 µm & ≥10 µm	Indicator Microbes		
	(orgs./m ³) ^a	(orgs./mL) ^{a,b}	E. coli (CFU/100 mL)	Enterococci (CFU/100 mL)	Heterotrophic Plate Counts (CFU/mL).
Uptake					
USCG Challenge Criteria	>100,000	>1,000	N.R.	N.R.	>1,000
Fresh Water					
JLB13 & JLB14 Control	102323	3073	107	7.17	7150
JLB13 Uptake	149899	2010	78.17	1.00	6017
JLB14 Uptake	183232	3614	77.43	<1.00*	5550
JLB15 & JLB16 Control	109597	2643	92.50	20.83	6883
JLB15 Uptake	118586	2937	44.83	94.57	10100
JLB16 Uptake	129268	2136	61.13	8.47	6383
JLB17 & JLB18 Control	230303	527	8.40	13.53	633
JLB17 Uptake	62424	401	8.03	9.77	458
JLB18 Uptake	133737	693	7.37	14.97	767
JLB19 & JLB20 Control	128384	2680	56.07	38.23	3217
JLB19 Uptake	118384	1258	63.47	34.13	>15000**
JLB20 Uptake	117980	1390	77.90	30.17	>15000**
Time Zero					
JLB13 Treatment	<60.61*	<1.00*	<1.00*	<1.00*	<12.50*
JLB14 Treatment	<133*	<1.00*	<1.00*	<1.00*	<12.50*
JLB15 Treatment	<133*	<1.00*	<1.00*	<1.00*	<12.50*
JLB16 Treatment	<133*	<1.00*	<1.00*	<1.00*	<12.50*
JLB17 Treatment	20.00	<1.00*	<1.00*	<1.00*	50.00
JLB18 Treatment	30.00	<1.00*	<1.00*	<1.00*	25.00
JLB19 Treatment	60.00	<1.00*	<1.00*	9.60	<12.50*
JLB20 Treatment	60.00	1.00	<1.00*	7.50	<12.50*
Treatment Discharge					
USCG Discharge Standard	<10	<10	<250	<100	N.R.
JLB13 & JLB14 Control	74646	1420	148	24.27	3442
JLB13 Treatment	0.09	0.67	<1.00*	1.00	37.50
JLB14 Treatment	<0.09*	<0.33*	<1.00*	<1.00*	20.83
JLB15 & JLB16 Control	63434	781	52.33	101	17233
JLB15 Treatment	0.18	9.00	<1.00*	<1.00*	<12.50*

JLB16 Treatment	<0.09*	<0.33*	<1.00*	<1.00*	<12.50*
JLB17 & JLB18 Control	58182	673	<1.00*	2.00	3933
JLB17 Treatment	19.22	<0.33*	<1.00*	<1.00*	16500
JLB18 Treatment	12.36	<0.33*	<1.00*	1.33	12633
JLB19 & JLB20 Control	129141	1407	1.33	5.93	1621
JLB19 Treatment	0.46	3.00	<1.00*	1.67	13867
JLB20 Treatment	0.13	6.67	<1.00*	2.70	9433

a = For treatment discharge results, Poisson standard deviation = (total live counts)^{0.5} / (total volume analyzed).

b = The sum of autotrophic and heterotrophic <50 µm and ≥10 µm live organisms is provided and thus, constitutes the total live protist concentration.

c = Results from corroborative flow cytometry analysis reported due to undercount of organisms <50 & ≥10 µm in epifluorescent microscopy. Microscopy discharge values: JLB5/6DC=432; JLB5DT=0.33; JLB6=<0.33*

d = Time Zero results are provided in the treatment discharge results showing no detection (*<1 CFU/mL) of *E. coli* when the tests were applied immediately on the day of uptake after treatment, and thus allowed no time for the putative 'false-positive' species to proliferate after exposure to artificial DOC augmentation (lignin sulfonate/tri-sodium citrate).

*No live organisms detected, minimum detection level reported; **Maximum detection limit reported; N.R. = Not Required;

N.D. = No Data

Summary of Challenge Water Quality Uptake Parameters (Shipboard)

Test (Harbour Location)	Flow Rate (m ³ /hr)	Water Temp (°C)	Salinity Average (ppt)	Turbidity (NTU)	DO (mg/L)	POC (mg/L)	DOC (mg/L)	TSS (mg/L)	MM ^a (mg/L)	pH
JSB1 (Vallejo, CA)	400	15.8	15.9	29.7	8.5	1.0	3.0	55.9	54.9	7.9
JSB2 (Barcelona, Spain)	398 ^b	18.6	37.9	7.0	8.1	0.4	1.3	23.2	22.8	8.1
JSB3 (Naples, Italy)	399 ^b	19.5	36.6	2.8	7.6	0.8	1.7	17.5	16.7	8.0
JSB4 (Boston, MA)	405 ^b	15.8	30.9	2.6	7.6	0.5	1.7	23.2	22.6	7.9
JSB5 (San Francisco, CA)	398	17.8	30.3	9.5	17.8	1.0	1.7	17.4	16.4	8.0

a = MM is reported as TSS – POM (as POC)

b = Mean flow rates are weighted with respect to time

Summary of Biological Efficacy Results (Shipboard)

Test	≥50 μm	<50 μm & ≥10 μm	Indicator Microbes		
	(orgs./m ³) ^a	(orgs./mL) ^{a,b}	E. coli (CFU/100 mL)	Enterococci (CFU/100 mL)	Heterotrophic Plate Counts (CFU/mL) ^c
Uptake					
USCG Challenge Criteria	>100	>100	N.R.	N.R.	>1,000
JSB1	70380	297	42.30	22.70	421
JSB2	143838	291	107	29.50	246
JSB3	87374	749	63.80	66.50	1933
JSB4	141400	147	12.80	119	550
JSB5	83030	154	19.80	107	912
Treatment Discharge					
USCG Discharge Standard	<10	<10	<250	<100	N.R.
JSB1	0.11	1.33	<1.0*	1.30	204
JSB2	0.21	<0.33*	<1.0*	<1.0*	<4.17*
JSB3	0.32	0.67	<1.0*	1.0	<4.17*
JSB4	<0.11*	0.67	<1.0*	<1.0*	104
JSB5	<0.11*	<0.33*	1.0	1.0	8.3

a = For treatment discharge results, Poisson standard deviation = (total live counts)^{0.5} / (total volume analyzed).

b = The sum of autotrophic and heterotrophic $<50 \mu\text{m}$ and $\geq 10 \mu\text{m}$ live organisms is provided and thus, constitutes the total live protist concentration.

c = Method performed as a corroborative analysis.

*No live organisms detected, minimum detection level reported; N.R. = Not Required



Appendix 4

Approval Documentation

Document No.	Rev.	Title
-	-	Request for Marine Services
-	-	List of Documents Summary
EE-003	C	Pipe Material Specification Summary
SOUTSO/19807859/ENG	2	General Approval of Filtration Units BS031 (BS031-T), 061(061-T), 101(101-T), 151(151-T) & 201(201-T)
SOUTSO/18940362/ENG	6	General Approval of Filtration Units BS603 (BS603-T), 804(804-T), 1004(1004-T) & 1204(1204-T)
SOUTSO/11127144/ENG	1	General Approval of Filtration Units BS025 (BS025-T), 050(050-T), 100(100-T), 200(200-T), 300(300-T) & 400(400-T)
-	C	STD Mechanical Bill of Material
-	B	Ecochlor® Ballast Water Treatment System Operation and Maintenance Manual (ES-NonTanker & ET-Tanker)
104770	-	ISO 9001:2008 Certificate Fluidtech environmental & equipment technology Co., Ltd.
-	8	Ecochlor® Ballast Water Treatment System Electrical Control Functional Specification
-	B	STD Electrical Bill of Materials
-	A	Ecochlor BWTS Zone 1 & Zone 0 Electrical Components
IECEX BAS 09.0092X	4	Type 28, 78, 88 & 98 Solenoid Operator
IECEX BVS 06.0003	4	Inductive proximity switches types N*50*A, NN5013, NN5017, NN5018, N95001, N*500*, KI5030
IECEX BVS 13.0031X	0	Terminal box GHG 72 *** **
TUV 99 ATEX 1487X	-	I/P converter TEIP11
IECEX FME 09.0003X	12	2600 Pressure transmitter, Model 266
IECEX CSA 07.0008	6	EJX/EJA Series pressure transmitter
IECEX KEM 05.0003	8	Distributed I/O System type ET 200Isp, Base-system formed by TM-PS-, TM-./.. ... and AM
IECEX KEM 05.0006	5	Module 4AI I 2WIRE HART, type 6ES7 134-7TD00-0AB0
IECEX KEM 05.0007	5	Module 4AI I 4WIRE HART, type 6ES7 134-7TD50-0AB0
IECEX KEM 05.0012	5	Module 4AO I HART, type 6ES7 135-7TD00-0AB0
Exd JB 1 screen + VLS_2AI	5A	Junction box for Exd
-	0	Ecochlor BWTS Zone 1 Electrical Components
IECEX EXA 16.0006X	0	Three-phase and single phase motors, brake motors
IECEX LCI 10.0010X	1	Solenoid valve
IECEX ITS 14.0028X	0	XA/XS valves
IECEX KEM 10.0039X	0	Limit switch types GXA... and GXE...
CESI 13 ATEX 007 X	-	Three-phase asynchronous motors
IECEX CES 14.0029X	0	Three-phase asynchronous motors
BVS 02 ATEX E 121 X	-	I/P Converter type DOC.900771
IECEX FMG 11.0018X	0	2600T Pressure transmitter Model 266

FM11ATEX0047X	-	2600T Pressure transmitter, Model 266
IECEX FME 08.0004X	12	HygienicMaster and ProcessMaster Electromagnetic Flowmeters
IECEX CSA 07.0006X	2	I/P modules types 3622, 582i, 3722, 3661 and 646
IECEX TUN 12.0028X	5	Electro pneumatic position controllers SIEMENS SIPART PS2 and SITRANS VP160
IECEX CSA 04.0004X	12	DVC6000 Series Digital Valve Controllers
EC0107	2	Ecochlor® Ballast Water Treatment System Environmental Test Plan
-	3	Ecochlor® Ballast Water Treatment System Software Quality Assurance Plan
-	-	Datalog report generation
MEPC 61/2/21	-	Report of the fourteenth meeting of the GESAMP-Ballast Water Working Group
TAP00000ZS	1	DNV GL Type Approval Certificate

Drawing No.	Rev	Description
ES04075H01	H	Series 75 ClO2 Treatment System P&ID
ES04100H01	G	Series 100 ClO2 Treatment System P&ID
ES04150H01	G	Series 150 ClO2 Treatment System P&ID
ES04200H01	H	Series 200 ClO2 Treatment System P&ID
ES04250H01	G	Series 250 ClO2 Treatment System P&ID
ES04300H01	H	Series 300 ClO2 Treatment System P&ID
ES04075H02	J	Series 75 Filtration System P&ID
ES04100H02	J	Series 100 Filtration System P&ID
ES04150H02	J	Series 150 Filtration System P&ID
ES04200H02	J	Series 200 Filtration System P&ID
ES04250H02	J	Series 250 Filtration System P&ID
ES04300H02	J	Series 300 Filtration System P&ID
ES04075H12-ES04300H12	A	Main Filtration System P&ID Two Filter
ES04075H22-ES04300H22	A	Main Filtration System P&ID Single Filter
ES04075H32-ES04300H32	A	Main Filtration System P&ID Single Filter & Injection
ET04075H42-ET04300H42	A	Main Filtration System P&ID Zone 0 Hazardous Area
ES04800H01	H	P&ID legend & symbols
ES04800H05	A	Motive water P&ID
ES05400H01 to ES05400H22	C	BWTS Standard filtration system
ES05400H32 to ES05400H55	A	BWTS Standard treatment system
ET05400H01-ET05400H55	B	BWTS Electrical-Zone 0 Installation
ES05400H63-ES05400H77	B	Aft Peak Filtration
ES04800H03	A	BWTS Process overview
ES04800H13	A	BWTS Process overview
ES04800H23	A	BWTS Process overview
ES04800H33	A	BWTS Process overview

ET04800H43	A	BWTS Process overview
ET04800H53	B	BWTS Process overview
ET04800H63	A	BWTS Process overview
ET04800H73	A	BWTS Process overview
ES04075H04	A	APT Filtration P&ID-Series 75
ES04100H04	A	APT Filtration P&ID-Series 100
ES04150H04	C	APT Filtration P&ID-Series 150
ES04200H04	C	APT Filtration P&ID-Series 200
ES04250H04	A	APT Filtration P&ID-Series 250
ES04300H04	A	APT Filtration P&ID-Series 300

Appendix 5

Test Reports

Document No.	Rev.	Title
R-15756-3	-	Test report for BWTS by Retlif Testing Laboratories
262.1-019159-J-61	0	Final Evaluation Test Report - Type approval testing of Ecochlor BWTS®
-	0	Final Land-based Ballast Water Management Report - According to USCG Final Rule
-	0	Final Shipboard Ballast Water Management Report - According to USCG Final Rule