

Investment Into NSR Infrastructure to Reduce the Need for Icebreakers Support

Arctic 2030 WP6; Busan, South Korea; December 9th, 2016

Presenter

Aleksandar-Saša Milaković, MSc Nav Arch



NTNU

IB fees for vessels transiting the NSR in 2013

NSR Transit 2013

No.	Vessel and Flag	Ice class	GRT, tones	Vessel owner/operator	Cargo	Port of destination	Port and date of departure	Entry to NSR	Exit from NSR	Days spent at NSR	Average speed, knots	RUB
1	mt «Varzuga» flag RUSSIA	Arc5	11 290	MSCO / Chukotsnab	13 658 tones diesel fuel	Певек - Nakhodka	Murmansk 25.06.13 00:00	28.06.13 16:00 c. Zhelaniya	14.07.13 14:00 c. Dezhnev	15,3	7,0	7 191 955,00
2	mt «Indiga» flag RUSSIA	Arc5	11 290	MSCO / Chukotsnab	13 645 tones diesel fuel	Pevek	Murmansk 25.06.13 19:00	28.06.13 17:00 c. Zhelaniya	10.07.13 09:20 Pevek	11,7	9,2	7 191 955,00
3	mv «Nordic Orion» flag PANAMA	Ice-1A (Arc4)	40 142	Nordic Bulk Carriers	66 000 tones iron ore Eurochem	Lanshan, China	Murmansk 01.07.13 01:30	03.07.13 10:00 c. Zhelaniya	23.07.13 08:55 c. Dezhnev	19,9	5,4	16 143 506,00
4	mv «Boris Vilkitskiy» flag RUSSIA	Arc4	5 025	Khatanga Sea Merchant Port CJSC	5 996 tones diesel fuel	Khatanga Bay		13.07.13 12:00 Yugorski Shar	07.08.13 24:00 Khatanga Bay	25,2	4,3	3 233 366,00
5	mt «Indiga» flag RUSSIA	Arc5	11 290	MSCO/ Chukotsnab	ballasting, FD 22 654 tones	Ob Bay	Pevek 15.07.13 01:30	15.07.13 01:30 Pevek	24.07.13 12:50 Ob Bay	11,3	7,2	6 392 849,00
6	mt «Egvekinot» flag RUSSIA	Arc4	4 110	Sky LLC	4 646 tones diesel fuel	Ob Bay	Provideniya	17.07.13 23:00 c. Dezhnev	07.08.13 12:00	20,6	7,1	2 938 444,00
7	mv «Nordic Odyssey» flag PANAMA	Ice 1A (Arc4)	40 142	Nordic Bulk Carriers	ballasting, FD 87 216 tones	Murmansk	Beilun, China 10.07.13 02:00	18.07.13 01:00 c. Dezhnev	03.08.13 10:30 Kara Gate	16,4	8,0	14 349 560,00
8	mv «Inzhener Trubin» flag RUSSIA	Arc5	6 418	Northern Shipping Company	2 240 tones general cargo	Petropavlovsk- Kamchatsky	Arkhangelsk 19.07.13 20:30	21.07.13 20:00 Kara Gate	14.08.13 04:10 c. Dezhnev	14,1	8,0	4 088 394,00
9	mt «Bukhta Slavyanka» flag RUSSIA	Arc5	13 204	Vostokbunker CJSC	7 923 tones diesel fuel	Murmansk	Petropavlovsk- Kamchatsky	23.07.13 10:00 c. Dezhnev	11.08.13 06:00 Kara Gate	18,8	8,8	7 476 632,00
10	mv «Georgiy Ushakov» флаг РФ	Arc4	6 204	Khatanga Sea Merchant Port CJSC	6 697 tones general cargo	Anabar Bay	Arkhangelsk	23.07.13 23:00 Kara Gate	07.08.13 23:00 Anabar Bay	15,0	6,4	3 991 963,00



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11	mt «Propontis» flag GREECE	Ice 1A (Arc4)	66 919	TSAKOS COLUMBIA SM	79 846 tones naphtha	Mizushima, Japan	Mongstad, Norway 17.07.13	24.07.13 00:00 c. Zhelaniya	05.08.13 17:00 c. Dezhnev	12,7	8,2
12	mt «Kasla» flag RUSSIA	Arc 5	4 724	Sky LLC	5 486 tones diesel fuel	Ob Bay (via Yana river mouth)	Nakhodka	24.07.13 19:30 c. Dezhnev	21.08.13 07:30 Ob Bay	27,5	7,7
13	reefer «Atmoda» flag PANAMA	Ice 1A (Arc4)	12 413	Laskaridis ship. LTD	ballasting, FD 16 600 tones	Ammassalik, Iceland	Nakhodka 18.07.13 15:10	26.07.13 16:30 c. Dezhnev	14.08.13 14:00 c. Zhelaniya	18,9	9,0
14	mt «Indiga» flag RUSSIA	Arc5	11 290	Sky LLC	13 013 tones diesel fuel	Anabar Bay	Ob Bay 26.07.13 22:00	26.07.13 22:00 Ob Bay	06.08.13 24:00 Anabar Bay	11,1	6,0
15	mt "Two Million Ways" flag CYPRUS	Ice 1A (Arc4)	40 865	Reederei NORD Limited	60 818 tones gas condensate NOVATEK	Melarra, Malaysia	Murmansk 27.07.13	30.07.13 23:00 c. Zhelaniya	13.08.13 22:30 c. Dezhnev	12,9	8,4
16	LNGC «Arctic Aurora» flag Marshall Island	Ice 1A (Arc4)	102 236	Dynagas Ltd	ballasting, FD 113 826 tones	Hammerfest, Norway	Vladivostok 30.07.13 23:30	06.08.13 23:30 c. Dezhnev	18.08.13 20:40 c. Zhelaniya	11,9	9,1
17	mt «Khatanga» flag RUSSIA	Ice 3	14 937	MSCO / Chukotsnab	20 167 tones diesel fuel	Pevek	Murmansk 03.08.13 21:00	06.08.13 01:00 Kara Gate	24.08.13 13:00 Pevek	18,5	9,0
18	mv «Tekhnolog Konyukhov» flag RUSSIA	Arc5	5 370	Northern Shipping Company	1 556 tones general cargo	Pevek	Arkhangelsk 05.08.13 21:00	08.08.13 01:00 Kara Gate	18.08.13 18:30 Pevek	10,7	8,6
19	mt «SCF Yenisei» flag LIBERIA	Ice 1A (Arc4)	29 844	Sovcomflot	35 943 tones naphtha	Chiba, Japan	Murmansk	08.08.13 22:50 c. Zhelaniya	19.08.13 16:15 c. Dezhnev	10,7	10,1
20	research vessel «GEO ARCTIC» flag RUSSIA	Arc5	3 225	SMNG	reposition, FD 3 631 tones	Nor, USA	Kirkenes 07.08.13 16:25	10.08.13 02:00 Kara Gate	23.08.13 21:40 c. Dezhnev	13,8	9,0
21	mv «Mikhail Dudin» flag MALTA	Ice 3	2 319	ASPOL-Baltic Concern	120 tones general cargo	Szczecin, Poland	Tan Cang Cai Mep, Vietnam	11.08.13 03:00 c. Dezhnev	25.08.13 24:00 Kara Gate	14,8	7,6

RUB

23 921 534,00

3 343 647,00

7 099 739,00

4 794 637,00

14 608 011,00

19 186 630,00

8 970 564,00

2 993 184,00

11 201 945,00

1 997 307,00

1 740 873,00



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22	mv «Nordic Odyssey» flag PANAMA	Ice 1A (Arc4)	40 142	Nordic Bulk Carriers	70 202 tones iron ore	Qingdao, China	Murmansk 11.08.13 02:00	13.08.13 19:00 c. Zhelaniya	24.08.13 14:36 c. Dezhnev	10,8	10,0	12 556 016,00
23	mt «Marinor» flag NORWAY	Ice 1A (Arc4)	42 835	MARINVEST	58 721 tones gas condensate NOVATEK	Daesan, South Korea	Murmansk 13.08.13 01:40	15.08.13 16:00 c. Zhelaniya	28.08.13 12:15 c. Dezhnev	12,9	11,0	13 398 359,00
24	mt «Egvekinot» flag RUSSIA	Arc4	4 110	Sky LLC	4 213 tones diesel fuel	Kolyma river mouth	Ob Bay 13.08.13 12:00	13.08.13 12:00 Ob Bay	26.08.13 24:00 Kolyma mouth	13,5	7,3	2 571 133,00
25	mv «Tekhnolog Konyukhov» flag RUSSIA	Arc5	5 370	Northern Shipping Company	ballasting, FD 10 003 tones	Arkhangelsk	Pevek 19.08.13 16:00	19.08.13 16:00 Pevek	26.08.13 11:00 Kara Gate	6,8	13,3	2 993 184,00
26	PS-825 flag RUSSIA	Ice 1A (Arc4)	1 207	Coast Guard Service	reposition, FD 1 155 tones	Nevelsk	Murmansk 20.08.13 15:00	22.08.13 12:00 Kara Gate	05.09.13 07:00 c. Dezhnev	13,8	11,4	647 205,00
27	mt «Kasla» flag RUSSIA	Arc 5	4 724	Sky LLC	5 329 tones diesel fuel	Kolyma river mouth	Ob Bay 25.08.13 20:00	25.08.13 20:00 Ob Bay	05.09.13 08:00 Kolyma river mouth	10,5	7,3	2 507 735,00
28	mv «YONG SHENG» flag HONG KONG	Ice 1A (Arc4)	14 357	COSCO SHIPPING	16 651 tones general cargo	Rotterdam, Netherlands	Busan 17.08.13	26.08.13 23:30 c. Dezhnev	03.09.13 09:30 c. Zhelaniya	7,4	14,1	6 158 722,00
29	mv «Yuri Arshenevsky» flag RUSSIA	Arc7	18 574	NSC / Chukotsnab	6 799 tones general cargo	Pevek	Arkhangelsk	27.08.13 11:00 Kara Gate	06.09.13 07:30 Pevek	9,9	8,4	7 808 323,00
30	mt «Khatanga» flag RUSSIA	Ice 3	14 937	MSCO/ Chukotsnab	ballasting, FD 30 022 tones	Murmansk	Pevek 27.08.13 13:30	27.08.13 13:30 Pevek	05.09.13 12:00 Kara Gate	8,9	9,3	7 688 970,00
31	mv «Inzhener Veshnyakov» flag RUSSIA	Arc5	6 418	Northern Shipping Company	3 078 tones general cargo	c. Schmidt	Arkhangelsk 01.09.13 02:20	02.09.13 23:30 Kara Gate	12.09.13 18:20 c. Schmidt	9,8	10,4	3 066 263,00
32	mt «Indiga» flag RUSSIA	Arc5	11 290	MSCO / Chukotsnab	12 444 t diesel fuel	Pevek	Murmansk 31.08.13 08:30	03.09.13 11:00 c. Zhelaniya	12.09.13 10:10 Pevek	8,9	8,8	4 794 637,00
33	mt «Svyatoy Petr» flag RUSSIA	Arc4	6 441	Sea Standard LLC	4 000 tones diesel fuel	Arkhangelsk	Petropavlovsk-Kamchatsky 03.09.13	06.09.13 06:00 c. Dezhnev	18.09.13 03:45 Kara Gate	11,9	9,5	3 108 362,00



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							23:00				
34	tug «Vengery» flag RUSSIA	Ice 1A Super (Arc5)	1 672	FEMCO LLC	reposition, FD 3 788 tones	Murmansk	Busan	07.09.13 16:00 c. Dezhnev	20.09.13 13:50 Kara Gate	12,9	8,7
35	mt «Bukhta Slavyanka» flag RUSSIA	Arc5	13 204	Vostokbunker CJSC	11 927 tones fuel oil	Slavyanka	Murmansk 06.09.13	08.09.13 03:00 Kara Gate	21.09.13 03:00 c. Dezhnev	13	10,2
36	mv «Yuri Arshenevsky» flag RUSSIA	Arc7	18 574	NSC / Chukotsnab	ballasting, FD 33 944 tones	Arkhangelsk	Pevek 09.09.13 00:20	09.09.13 00:20 Pevek	17.09.13 13:00 Kara Gate	8,5	10,4
37	reefer «Kamchatka Harvest» flag RUSSIA	Ice 2	1 579	Bekkerev Sea Farm	ballasting, FD 2 258 tones	Petropavlovsk-Kamchatsky	Alesund, Norway	10.09.13 12:00 Kara Gate	22.09.13 02:20 c. Dezhnev	11,6	11,7
38	mt «Indiga» flag RUSSIA	Arc5	11 290	MSCO / Chukotsnab	ballasting, FD 22 654 tones	Arkhangelsk (via Ob Bay & Khatanga Bay) 11.10.13 20:00	Pevek 13.09.13 14:00	13.09.13 14:00 Pevek	09.10.13 10:00 Kara Gate	25,8	6,7
39	mv «Inzhener Veshnyakov» flag RUSSIA	Arc5	6 418	Northern Shipping Company	ballasting, FD 11 249 tones	Arkhangelsk	c. Shmidt 16.09.13 20:00	16.09.13 20:00 c. Shmidt	27.09.13 07:00 Kara Gate	10,5	12,1
40	mt «Khatanga» flag RUSSIA	Ice 3	14 937	MSCO / Chukotsnab	20 122 tones diesel fuel	Pevek	Murmansk 15.09.13 06:00	17.09.13 10:00 Kara Gate	28.09.13 04:00 Pevek	10,8	9,5
41	mt «Egvekinot» flag RUSSIA	Arc4	4 110	Sky LLC	4 086 tones diesel fuel	Kolyma river mouth	Ob Bay 18.09.13 12:00	18.09.13 08:00 Ob Bay	28.09.13 14:00 Kolyma river mouth	10,3	7,4
42	LNGC «Arctic Aurora» flag Marshall Island	Ice 1A (Arc4)	102 236	«Dynagas Ltd.»	66 868 tones LNG	Futtsu, Japan	Hammerfest, Norway 13.09.13	22.09.13 02:30 c. Zhelaniya	06.10.13 18:15 c. Dezhnev	14,7	7,1
43	mv «NS Yakutia» flag LIBERIA	Ice 3	40 972	Sovcomflot	67 237 tones iron ore Eurochem	Lanshan, China	Murmansk, 21.09.13	23.09.13 13:10 c. Zhelaniya	06.10.13 11:20 c. Dezhnev	12,9	10,5
44	mv «Inzhener Trubin» flag RUSSIA	Arc5	6 418	Northern Shinnino Company	5 078 tones general cargo	Arkhangelsk (via Ob Bay)	Petropavlovsk-Kamchatsky 10.09.13 12:50	23.09.13 18:00 c. Dezhnev	28.10.13 12:45 Kara Gate	34,8	8,7

RUB

739 642,00

4 672 895,00

6 506 843,00

917 241,00

3 995 530,00

2 555 262,00

6 407 524,00

1 836 512,00

16 445 682,00

13 181 921,00

3 066 263,00





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No.	Vessel and Flag	Ice class	GRT, tones	Vessel owner/operator	Cargo	Port of destination	Port and date of departure	Entry to NSR	Exit from NSR	Days spent at NSR	Average speed, knots	RUB
45	mt «Propontis» flag GREECE	Ice 1A (Arc4)	66 919	Tsakos Columbia Shipmanagement	109 090 tones gasoil NOVATEK	Skagen, Denmark	Ulsan, South Korea 14.09.13	25.09.13 11:45 c. Dezhnev	06.10.13 06:00 c. Zhelaniya	10,8	9,7	17 941 653,00
46	mt «Indiga» flag RUSSIA	Arc5	11 290	Khatanga Sea Merchant Port CJSC	5 348 tones diesel fuel	Khatanga Bay	Ob Bay 26.09.13 18:00	26.09.13 18:00 Ob Bay	30.09.13 15:00 Khatanga Bay	3,9	9,8	3 995 530,00
47	mt «Mari Ugland» flag NORWAY	Ice 1A (Arc4)	42 835	MARINVEST	62 147 tones naphtha NOVATEK	Mailiao, Taiwan	Mongstad, Norway 25.10.13	27.09.13 07:30 c. Zhelaniya	11.10.13 16:00 c. Dezhnev	14,4	11,1	11 484 491,00
48	mt «Stena Polaris» flag Bermuda	Ice 1A (Arc4)	36 168	STENA BULK AB	43 838 tones naphtha NOVATEK	Yosu, South Korea	Ust-Luga, 16.09.13	28.09.13 17:20 c. Zhelaniya	11.10.13 12:00 c. Dezhnev	12,7	9,3	11 636 330,00
49	research vessel «Professor Kurentsov» flag RUSSIA	Arc4	1 388	MAGE JSC	reposition, FD 1 675 tones	Okhotsk Sea	Kirkenes, Norway	29.09.13 10:00 Kara Gate	11.10.13 00:50 c. Dezhnev	11,6	10,1	744 259,00
50	mt «Khatanga» flag RUSSIA	Ice 3	14 937	MSCO / Chukotsnab	ballasting, FD 30 022 tones	Murmansk (via Ob Bay) 23.10.13	Pevek 30.09.13 08:25	Pevek 30.09.13 08:25	20.10.13 06:00 Kara Gate	19,9	8,1	7 688 970,00
51	mt «Zaliv Amurskiy» flag CYPRUS	Ice-1C (Ice 2)	60 178	PRISCO	96 131 tones gasoil NOVATEK	Rotterdam, Netherlands	Onsan, South Korea	30.09.13 17:25 c. Dezhnev	13.10.13 06:00 c. Zhelaniya	12,5	8,8	24 470 180,00
52	passenger vessel «Polaris» flag RUSSIA	Arc4	2 097	MSCO	reposition, FD 2178 tones	Korsakov	Murmansk, 01.10.13	04.10.13 04:00 Kara Gate	15.10.13 23:20 c. Dezhnev	11,8	9,5	1 124 432,00
53	mv «Nordic Bothnia» flag PANAMA	Ice-1A (Arc4)	27 078	Nordic Bulk Carriers	41 578 tones general cargo	Amsterdam, Netherlands	Xingang, China 22.09.13	05.10.13 04:30 c. Dezhnev	20.10.13 00:30 c. Zhelaniya	14,8	10,0	10 163 727,00
54	mt «Svyatoy Petro» flag RUSSIA	Arc4	6 441	Sea Standard LLC	9 374 tones diesel fuel	Petropavlovsk-Kamchatsky	Arkhangel'sk 06.10.13 20:00	09.10.13 18:30 Kara Gate	24.10.13 00:20 c. Dezhnev	14,2	7,9	3 626 411,00
55	mt «Bukhta Slavyanka» flag RUSSIA	Arc5	13 204	Vostokbunker CJSC	7 908 tones fuel oil	Murmansk 01.11.13 10:00	Petropavlovsk-Kamchatsky 04.10.13	11.10.13 22:00 c. Dezhnev	29.10.13 13:50 c. Zhelaniya	17,7	7,7	6 542 053,00
56	mt «Viktor Bakae» flag LIBERIA	1C (Ice 2)	66 855	Sovcomflot	88 024 tones jet fuel	Rotterdam, Netherlands	Yosu, South Korea 02.10.13	14.10.13 09:00 c. Dezhnev	28.10.13 11:00 c. Zhelaniya	14,1	8,5	31 068 855,00



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RUB

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57	mt «Zaliv Baikab» flag LIBERIA	Ice-1C (Ice 2)	60 178	PRISCO	79 580 tones naphtha NOVATEK	Yosu, South Korea	Ust-Luga, 30.09.13 23:00	14.10.13 16:00 c. Zhelaniya	29.10.13 21:00 c. Dezhnev	15,2	9,3
58	mv «Nordic Odyssey» flag PANAMA	Ice 1A (Arc4)	40 142	Nordic Bulk Carriers	73 500 tones coal	Pori, Finland	Vancouver 04.10.13	16.10.13 05:00 c. Dezhnev	28.10.13 10:40 c. Zhelaniya	12,2	9,1
59	mt «Varzuga» flag RUSSIA	Arc5	11 290	MSCO/ Chukotsnab	ballasting, FD 22 654 tones	Murmansk (via Pevek)	Provideniya, 16.10.13 03:20	16.10.13 21:00 c. Dezhnev	08.11.13 12:00 c. Zhelaniya	22,7	8,2
60	icebreaker «Nordica» flag FINLAND	Polar-10 Icebreaker (DNV)	9 392	Arctia Offshore Ltd.	reposition, FD 12 800 tones	Lindoe, Denmark	Dutch Harbor, USA 14.10.13	17.10.13 19:20 c. Dezhnev	29.10.13 17:10 Kara Gate	11,9	9,5
61	mt «Egvekinot» flag RUSSIA	Arc4	4 110	Sky LLC	4 574 tones diesel fuel	Magadan	Ob Bay 18.10.13 12:00	18.10.13 12:00 Ob Bay	09.11.13 02:00 c. Dezhnev	21,6	6,0
62	mv «Yuri Arshenevsky» flag RUSSIA	Arc7	18 574	MSCO	9 042 tones general cargo	Pevek	Arkhangelsk, 17.10.13 14:55	19.10.13 13:00 Kara Gate	30.10.13 16:00 Pevek	11,1	7,5
63	mv «Tekhnolog Konyukhov» flag RUSSIA	Arc5	5 370	Northern Shipping Company	2 692 tones general cargo	Pevek	Arkhangelsk 17.10.13	20.10.13 08:00 Kara Gate	05.11.13 11:00 Pevek	16,1	8,1
64	mv «HHL Hong Kong» flag LIBERIA	Ice 1A (Arc4)	17 634	Hansa Heavylift	1 742 tones general cargo	Rajin (N. Kores)	Ust-Luga, 08.10.13	25.10.13 09:30 Kara Gate	11.11.13 02:40 c. Dezhnev	16,7	6,7
65	icebreaker «Fennica» flag FINLAND	Polar-10 Icebreaker (DNV)	9 392	Arctia Offshore Ltd.	reposition, FD 12 800 tones	Kirkenes, Norway	Dutch Harbor, USA 28.10.13	31.10.13 01:45 c. Dezhnev	18.11.13 20:00 Kara Gate	18,8	7,6
66	mt «Indiga» flag RUSSIA	Arc5	11 290	MSCO / Chukotsnab	9 436 tones diesel fuel	Pevek	Murmansk 30.10.13 08:10	02.11.13 08:15 c. Zhelaniya	15.11.13 10:00 Pevek	13,1	10,6
67	mv «HHL Lagos» flag Antigua and Barbuda	Ice 1A (Arc4)	17 644	Hansa Heavylift	3 000 tones general cargo	Vladivostok	CI16 25.10.13 23:00	03.11.13 14:00 c. Zhelaniya	17.11.13 09:30 c. Dezhnev	13,8	10,1
68	mv «Yuri Arshenevsky»	Arc7	18 574	MSCO	ballasting, FD 33 944	Arkhangelsk	Pevek 06.11.13	06.11.13 16:00	17.11.13 07:40	10,7	8,2

27 965 920,00

12 556 016,00

6 392 849,00

-

2 938 444,00

-

2 993 184,00

10 085 942,00

-

6 392 849,00

10 091 662,00

-



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69	mv «Tekhnolog Konyukhov» флаг РФ	Arc5	5 370	Northern Shipping Company	ballasting, FD 10 003 т.	Arkhangelsk	Pevek 07.11.13 13:00	07.11.13 13:00 Pevek	17.11.13 08:45 c. Zhelaniya	9,8	8,9
70	mt «Bukhta Slavyanka» flag RUSSIA	Arc5	13 204	ZAO Vostokbunker	14 434 tones diesel fuel	Petropavlovsk-Kamchatsky	Murmansk 12.11.13 12:00	15.11.13 14:20 c. Zhelaniya	28.11.13 12:00 c. Dezhnev		
71	mt «Indiga» flag RUSSIA	Arc5	11 290	MSCO	ballasting, FD 22 654 tones	Murmansk	Pevek 27.11.13 12:00	17.11.13 13:15 Pevek			

RUB

3 420 797,00

7 476 632,00

6 392 849,00

IB fees for vessels transiting the NSR in 2013

Total spent on IB services in 2013

RUB	527 674 954,00
USD (2016)	8 374 201,52
USD (2013)	16 009 658,10

COST ESTIMATE OF CONCRETE SHELL

FQHA-50 @ WAINWRIGHT, ALASKA

TOTAL COST	EQUIVALENT DAY LEASE	INVESTMENT PER METER QUAY
\$12.8 M	\$2900	\$107k

FQHA-80 @ QASIGIANNGUIT, GREENLAND

TOTAL COST	EQUIVALENT DAY LEASE	INVESTMENT PER METER QUAY
\$16.6 M	\$3800	\$83k

FQHA-120 @ LONGYEARBYEN, SVALBARD

TOTAL COST	EQUIVALENT DAY LEASE	INVESTMENT PER METER QUAY
\$22.5 M	\$5100	\$58k

Floating Quay for the High Arctic (FQHA)
 (developed by Tschudi, Longyearbyen Lokalstyre
 and Dr.techn.Olav Olsen AS)