



**Study of the Conventional Bulk-  
Refrigerated (Non-Containerized)  
Cargo Market Segment - General  
Cargo and Other Minor Vessel Types**

**Estudio del Segmento de Mercado de  
Carga a Granel Refrigerada (No  
Contenerizada) Convencional –  
Buques de Carga General y Otros  
Tipos de Buques Menores**

**Global Insight Co.**

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**Resumen Ejecutivo**

**FINAL REPORT**

**STUDY OF THE CONVENTIONAL BULK-REFRIGERATED  
(NON-CONTAINERIZED) CARGO MARKET SEGMENT  
CONTRACT SAA-154968**

***Volume II – General Cargo and Other Minor Vessel Types***

PREPARED FOR:



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## Executive Summary

The “Other minor vessels” analyzed in this report were divided into two groups for modelling and forecasting purposes. Group 1 includes the cargo ships and Group 2 includes the remaining minor vessels. The specific ship types in each of the two groups are identified in Table ES-1 along with their ship codes, as defined and used by the ACP, and pricing terms.

**Table ES-1  
Other Ship Types**

<i>Ship Code</i>	<i>Ship Type</i>
<b>Group 1</b>	
1	<b>General Cargo</b>
5	<b>Dry/Liquid bulk carrier</b>
6	<b>Container/Break Bulk ship</b>
10	<b>Vehicle/Dry-Bulk carrier</b>
<b>Group 2</b>	
13	<b>Barge carrier</b>
14	<b>Barge not self-propelled</b>
15	<b>Barge self-propelled</b>
16	<b>Fishing vessel</b>
17	<b>Factory ship</b>
18	<b>Tug</b>
19	<b>Research vessel</b>
20	<b>Cable Ship</b>
21	<b>Yacht</b>
22	<b>Rig Tender/Supply Ship</b>
23	<b>Tank Barge not self-propelled</b>
24	<b>Tank Barge self-propelled</b>
25	<b>Barge integrated</b>
26	<b>Tank barge integrated</b>
27	<b>Woodship</b>
50	<b>Other Vessel (PC Net)</b>
90	<b>Dredge</b>
91	<b>Floating Dry dock</b>
93	<b>Warship</b>
94	<b>Submarine</b>
99	<b>Other Displacement Vessels</b>

Transits through the Panama Canal by Group 1 ships have declined in recent years largely because of the shift to larger cargo ships as well as out of cargo ships and into container ships. While transits declined an average 2.0% per year over the 2000-2003 period, these ships’ cargo grew an average 6.1% per year, and the PCUMS units associated with the ships grew 4.5% annually. Toll increases over the period led to an even greater 8.2% annual increase in Group 1 revenues.

Tables ES-2 through ES-4 examine the FY2003 standing of the Group 1 ships.

**Table ES-2  
Group 1 Ships, Relative Importance**

<i>Ship Code</i>	<i>Ship Type</i>	<b>2003</b>			
		<i>Cargo Tons</i>	<i>PCUMS</i>	<i>Transits</i>	<i>Tolls</i>
<b>1</b>	General Cargo	6,597,628	7,252,410	833	20,219,933
<b>5</b>	Dry/Liquid bulk carrier	1,068,536	804,660	29	2,203,275
<b>6</b>	Container/Break Bulk ship	12,805,706	11,271,638	576	31,622,587
<b>10</b>	Vehicle/Dry-Bulk carrier	32,357	194,211	6	526,219
<b>Group 1</b>	<b>Total</b>	<b>20,504,227</b>	<b>19,522,919</b>	<b>1,444</b>	<b>54,572,015</b>

Source: ACP

**Table ES-3  
Group 1 Ships, Percent of Total**

<i>Ship Code</i>	<i>Ship Type</i>	<b>2003 Percent of Total</b>			
		<i>Cargo</i>	<i>PCUMS</i>	<i>Transits</i>	<i>Tolls</i>
<b>1</b>	General Cargo	32.2%	37.1%	57.7%	37.1%
<b>5</b>	Dry/Liquid bulk carrier	5.2%	4.1%	2.0%	4.0%
<b>6</b>	Container/Break Bulk ship	62.5%	57.7%	39.9%	57.9%
<b>10</b>	Vehicle/Dry-Bulk carrier	0.2%	1.0%	0.4%	1.0%

Source: ACP

**Table ES-4  
Group 1 Ships, Compound Annual Growth Rates 2000-2003**

<i>Ship Code</i>	<i>Ship Type</i>	<b>CAGR 2000-2003 (%)</b>			
		<i>Cargo</i>	<i>PCUMS</i>	<i>Transits</i>	<i>Tolls</i>
<b>1</b>	General Cargo	-1.6	-2.8	-6.2	0.6
<b>5</b>	Dry/Liquid bulk carrier	-8.4	-12.3	-12.3	-9.0
<b>6</b>	Container/Break Bulk ship	16.7	16.3	8.9	20.1
<b>10</b>	Vehicle/Dry-Bulk carrier	-65.8	-38.0	-46.0	-36.8
<b>Group 1</b>	<b>Total</b>	<b>6.1</b>	<b>4.5</b>	<b>-2.0</b>	<b>8.2</b>

Source: ACP

CAGR = Compound Annual Growth Rate

Tables ES-5 through ES-7 display the forecasts of Group 1 ships in terms of cargo tons, transits, and tolls.

**Table ES-5  
Group 1 Ships, Cargo Tons**

<i>Ship Code</i>	<i>Ship Type</i>				<b>CAGR</b>	<b>CAGR</b>
		<b>2003</b>	<b>2010</b>	<b>2025</b>	<b>2000-2003</b>	<b>2003-2025</b>
<b>1</b>	<b>General Cargo</b>	6,597,628	5,790,813	3,756,765	-2.6	-2.5
<b>5</b>	<b>Dry/Liquid bulk carrier</b>	1,068,536	829,444	454,285	-8.4	-3.8
<b>6</b>	<b>Container/Break Bulk ship</b>	12,805,706	13,657,867	11,585,922	16.7	-0.5
<b>10</b>	<b>Vehicle/Dry-Bulk carrier</b>	132,357	111,281	69,570	-45.3	-2.9
<b>Group 1</b>	<b>Total</b>	<b>20,604,227</b>	<b>20,389,405</b>	<b>15,866,542</b>	<b>5.8</b>	<b>-1.2</b>

Source: History from ACP. Forecast based on study results

**Table ES-6  
Group 1 Ships. Transits Forecasts**

<i>Ship Code</i>	<i>Ship Type</i>	<i>2003</i>	<i>2010</i>	<i>2025</i>	<i>CAGR</i>	<i>CAGR</i>
					<i>2000-2003</i>	<i>2003-2025</i>
<b>1</b>	<b>General Cargo</b>	833	745	483	-5.6	-2.4
<b>5</b>	<b>Dry/Liquid bulk carrier</b>	29	23	12	-12.3	-3.8
<b>6</b>	<b>Container/Break Bulk ship</b>	576	590	501	8.9	-0.6
<b>10</b>	<b>Vehicle/Dry-Bulk carrier</b>	6	4	2	-46.0	-4.3
<b>Group 1</b>	<b>Total</b>	<b>1,444</b>	<b>1,361</b>	<b>999</b>	<b>-1.6</b>	<b>-1.7</b>

Source: History from ACP. Forecast based on study results

**Table ES-7  
Group 1 Ships, Tolls Forecast**

<i>Ship Code</i>	<i>Ship Type</i>	<i>2003</i>	<i>2010</i>	<i>2025</i>	<i>CAGR</i>	<i>CAGR</i>
					<i>2000-2003</i>	<i>2003-2025</i>
<b>1</b>	<b>General Cargo</b>	17,379,770	18,289,908	17,255,451	-4.3	0.0
<b>5</b>	<b>Dry/Liquid bulk carrier</b>	1,907,299	1,735,237	1,382,097	-12.5	-1.5
<b>6</b>	<b>Container/Break Bulk ship</b>	26,863,124	33,475,156	41,296,129	15.8	2.0
<b>10</b>	<b>Vehicle/Dry-Bulk carrier</b>	458,913	324,309	294,851	-38.3	-2.0
<b>Group 1</b>	<b>Total</b>	<b>46,609,106</b>	<b>53,824,610</b>	<b>60,228,528</b>	<b>3.6</b>	<b>1.2</b>

Source: History from ACP. Forecast based on study results

Transits by general cargo ships, the largest ship type in Group 1, are projected to decline through the 2025 forecast end-point, averaging –2.4% per year. Tolls revenue from this type of ship is expected to show no growth at all over the forecast period, even though the model assumes tolls that increase yearly in line with the forecast global inflation rate.

The toll elasticity for both groups is extremely small (less than 0.2) so that increases in tolls are not likely to result in shifts by ship operators/owners to bypass alternative routes. Therefore, increases in tolls should be tolerated by these vessels, based on the model results.

**Table ES-8  
Group 2 Ships, Relative Importance**

<i>Ship Type</i>	<i>Unit</i>	<i>PCUMS/ Displacement Transits</i>	<i>Tolls</i>	
<b>Barge carrier</b>	PCUMS	0	0	0
<b>Barge not self-propelled</b>	PCUMS	403,405	71	1,096,773
<b>Barge self-propelled</b>	PCUMS	556	3	3,000
<b>Fishing vessel</b>	PCUMS	335,185	395	1,053,607
<b>Factory ship</b>	PCUMS	7,375	5	19,543
<b>Tug</b>	PCUMS	53,216	183	306,509
<b>Research vessel</b>	PCUMS	75,948	33	218,416
<b>Cable Ship</b>	PCUMS	134,156	15	343,970
<b>Yacht</b>	PCUMS	44,353	947	747,302
<b>Rig Tender/Supply Ship</b>	PCUMS	16,472	21	54,513
<b>Tank Barge not self-propelled</b>	PCUMS	164,328	42	437,904
<b>Tank Barge self-propelled</b>	PCUMS	1,245	1	2,764
<b>Barge integrated</b>	PCUMS	157,759	7	439,437
<b>Tank barge integrated</b>	PCUMS	437,183	22	1,223,678
<b>Woodship</b>	PCUMS	947,883	27	2,535,882
<b>Other Vessel (PC Net)</b>	PCUMS	385,376	157	1,101,470
<b>Total PCUMS</b>	<b>PCUMS</b>	<b>3,164,440</b>	<b>1,929</b>	<b>9,584,769</b>
<b>Dredge</b>	Displacement - tons	53,535	9	72,312
<b>Floating Dry dock</b>	Displacement - tons	0	0	0
<b>Warship</b>	Displacement - tons	298,328	133	514,746
<b>Submarine</b>	Displacement - tons	13,854	3	22,846
<b>Other Vessel (Displacement)</b>	Displacement - tons	10,638	5	15,057
<b>Total Displacement</b>	<b>Tons</b>	<b>376,355</b>	<b>150</b>	<b>624,961</b>
<b>Total</b>			<b>2,079</b>	<b>10,209,730</b>

Source: ACP

Of Group 2, yachts account for over 45% of the group's transits, but only for 3.4% of the group's tolls revenue, in view of the small PCUMS of typical yachts. This is shown in Table ES-9 below.

**Table ES-9  
Group 2 Ships, Percent of Group 2 Total**

<i>Ship Type</i>	<i>PCUMS/ Displacement</i>	<i>Transits</i>	<i>Tolls</i>
Barge carrier	0.0%	0.0%	0.0%
Barge not self-propelled	12.7%	3.4%	0.0%
Barge self-propelled	0.0%	0.1%	10.7%
Fishing vessel	10.6%	19.0%	0.0%
Factory ship	0.2%	0.2%	10.3%
Tug	1.7%	8.8%	0.2%
Research vessel	2.4%	1.6%	3.0%
Cable Ship	4.2%	0.7%	2.1%
Yacht	1.4%	45.6%	3.4%
Rig Tender/Supply Ship	0.5%	1.0%	7.3%
Tank Barge not self-propelled	5.2%	2.0%	0.5%
Tank Barge self-propelled	0.0%	0.0%	4.3%
Barge integrated	5.0%	0.3%	0.0%
Tank barge integrated	13.8%	1.1%	4.3%
Woodship	30.0%	1.3%	12.0%
Other Vessel (PC Net)	12.2%	7.6%	24.8%
<b>Total PCUMS</b>	<b>100.0%</b>	<b>92.8%</b>	<b>93.9%</b>
Dredge	14.2%	0.4%	10.8%
Floating Dry dock	0.0%	0.0%	0.7%
Warship	79.3%	6.4%	0.0%
Submarine	3.7%	0.1%	5.0%
Other Vessel (Displacement)	2.8%	0.2%	0.2%
<b>Total Displacement</b>	<b>100.0%</b>	<b>7.2%</b>	<b>6.1%</b>
<b>Total</b>		<b>100.0%</b>	<b>100.0%</b>

Source: ACP

**Table ES-10**  
**Group 2 Ships, Compound Annual Growth 2000-2003**

<i>Ship Type</i>	<i>PCUMS/ Displacement</i>	<i>Transits</i>	<i>Tolls</i>
Barge not self-propelled	9.8	6.6	13.6
Barge self-propelled	-14.6	-6.9	-5.0
Fishing vessel	-6.9	-4.1	-2.7
Factory ship	-17.6	-8.1	-13.9
Tug	-6.5	0.1	-1.6
Research vessel	11.9	-8.5	15.1
Cable Ship	-5.8	-11.1	-5.4
Yacht	5.8	4.6	8.9
Rig Tender/Supply Ship	10.1	15.0	17.8
Tank Barge not self-propelled	29.4	29.4	35.5
Tank Barge self-propelled	-22.4	-15.9	-23.4
Barge integrated	-10.2	-10.7	-6.6
Tank barge integrated	2.3	3.7	7.7
Woodship	-21.7	-16.3	-17.6
Other Vessel (PC Net)	-16.8	-3.9	-12.9
<b>Total PCUMS</b>	<b>-10.7</b>	<b>0.9</b>	<b>-5.6</b>
Dredge	-17.3	-6.9	-8.1
Warship	-7.0	-2.8	-1.2
Submarine	-11.9	0.0	-5.1
Other Vessel (Displacement)	-12.0	-11.1	-3.7
<b>Total Displacement</b>	<b>-9.1</b>	<b>-4.5</b>	<b>-2.3</b>
<b>Total</b>		<b>0.4</b>	<b>-5.4</b>

Source: ACP

Growing at 3.0% over the forecast period, the Group 2 transits will reach nearly 4,000 in the final year 2025, and yachts are forecast to represent 52% of the total Group 2 transits. This is shown in Table ES-12 below, for each of the vessel types.

The transits and revenues from military ships have been declining, and the forecast calls for a slower decline. The U.S. Navy's Atlantic and Pacific fleets have always operated under the assumption that the post-Panamax aircraft carriers can be maneuvered into position without having the benefit of an expanded Canal. The two fleets typically operate within their own theaters. If there is a call for one of the large carriers to be deployed to the other hemisphere, it uses a by-pass route due to its size. Forecasting the events (e.g. wars, regional conflicts) that might cause such ships to be redeployed and require a Canal transit is not the focus of this study.

**Table ES-11  
Group 2 Ships. PCUMS & Displacement Forecast**

Ship Code	Ship Type	History			CAGR	CAGR
		2003	2010	2025	2000-2003	2003-2025
27	Woodship	947,883	901,319	784,837	-21.7	-0.9
26	Tank barge integrated	437,183	547,451	860,901	2.3	3.1
14	Barge not self-propelled	403,405	540,223	981,218	9.8	4.1
50	Other Vessel (PC Net)	385,376	387,937	381,778	-16.8	0.0
16	Fishing vessel	335,185	400,320	627,434	-6.9	2.9
23	Tank Barge not self-propelled	164,328	257,803	657,769	29.4	6.5
25	Barge integrated	157,759	171,435	198,839	-10.2	1.1
20	Cable Ship	134,156	162,163	260,764	-5.8	3.1
19	Research vessel	75,948	103,675	196,222	11.9	4.4
18	Tug	53,216	61,545	81,595	-6.5	2.0
21	Yacht	44,353	57,328	96,499	5.8	3.6
22	Rig Tender/Supply Ship	16,472	23,279	52,249	10.1	5.4
17	Factory ship	7,375	7,351	7,083	-17.6	-0.2
24	Tank Barge self-propelled	1,245	1,174	1,003	-22.4	-1.0
15	Barge self-propelled	556	574	597	-14.6	0.3
13	Barge carrier	0	7,995	5,322	-100.0	NA
	<b>Total PCUMS</b>	<b>3,164,440</b>	<b>3,631,574</b>	<b>5,194,108</b>	<b>-10.7</b>	<b>2.3</b>
93	Warship	298,328	300,928	301,985	-7.0	0.1
90	Dredge	53,535	53,574	52,060	-17.3	-0.1
94	Submarine	13,854	13,196	11,711	-11.9	-0.8
99	Other Vessel (Displacement)	10,638	11,324	12,566	-12.0	0.8
91	Floating Dry dock	0	0	0	NA	NA
	<b>Total Displacement</b>	<b>376,355</b>	<b>379,022</b>	<b>378,322</b>	<b>-9.1</b>	<b>0.0</b>

Source: History from ACP. Forecast based on study results

**Table ES-12  
Group 2 Ships, Transits Forecast**

Ship Code	Ship Type	History			CAGR	CAGR
		2003	2010	2025	2000-2003	2003-2025
21	Yacht	947	1,224	2,060	6.1	3.6
16	Fishing vessel	395	472	739	-5.4	2.9
18	Tug	183	212	281	0.2	2.0
50	Other Vessel (PC Net)	157	158	156	-5.2	0.0
93	Warship	133	134	135	-3.7	0.1
14	Barge not self-propelled	71	95	173	8.9	4.1
23	Tank Barge not self-propelled	42	64	164	40.9	6.4
19	Research vessel	33	45	85	-11.1	4.4
27	Woodship	27	26	22	-21.1	-0.9
26	Tank barge integrated	22	28	43	5.0	3.1
22	Rig Tender/Supply Ship	21	30	67	20.5	5.4
20	Cable Ship	15	18	29	-14.5	3.1
90	Dredge	9	9	9	-9.1	-0.1
25	Barge integrated	7	8	9	-14.0	1.1
17	Factory ship	5	5	5	-10.6	-0.2
99	Other Vessel (Displacement)	5	5	6	-14.5	0.8
15	Barge self-propelled	3	3	3	-9.1	0.3
94	Submarine	3	3	3	0.0	-0.8
24	Tank Barge self-propelled	1	1	1	-20.6	-1.0
13	Barge carrier	0	2	1	-100.0	NA
91	Floating Dry dock	0	0	0	NA	NA
	<b>Total Transits</b>	<b>2,079</b>	<b>2,540</b>	<b>3,990</b>	<b>0.5</b>	<b>3.0</b>

Source: History from ACP. Forecast based on study results

**Table ES-13  
Group 2 Ships, Tolls Forecast**

<i>Ship Code</i>	<i>Ship Type</i>	<i>History</i>			<i>CAGR</i>	<i>CAGR</i>
		<i>2003</i>	<i>2010</i>	<i>2025</i>	<i>2000-2003</i>	<i>2003-2025</i>
13	Barge carrier	0	27,202	26,653	-100.0	NA
14	Barge not self-propelled	1,096,773	1,799,444	4,811,182	13.6	7.0
15	Barge self-propelled	3,000	3,820	5,849	-5.0	3.1
16	Fishing vessel	1,053,607	1,542,859	3,559,764	-2.7	5.7
17	Factory ship	19,543	23,866	33,848	-13.9	2.5
18	Tug	306,509	437,005	853,061	-1.6	4.8
19	Research vessel	218,416	365,359	1,017,924	15.1	7.2
20	Cable Ship	343,970	509,393	1,205,783	-5.4	5.9
21	Yacht	747,302	1,190,782	2,951,299	8.9	6.4
22	Rig Tender/Supply Ship	54,513	94,976	313,866	17.8	8.3
23	Tank Barge not self-propelled	437,904	838,794	3,150,370	35.5	9.4
24	Tank Barge self-propelled	2,764	3,192	4,018	-23.4	1.7
25	Barge integrated	439,437	585,052	998,885	-6.6	3.8
26	Tank barge integrated	1,223,678	1,877,329	4,345,794	7.7	5.9
27	Woodship	2,535,882	2,954,229	3,786,746	-17.6	1.8
50	Other Vessel (PC Net)	1,101,470	1,355,613	1,964,314	-12.9	2.7
90	Dredge	72,312	87,030	124,402	-8.1	2.5
91	Floating Dry dock	0	0	0	NA	NA
93	Warship	514,746	624,462	921,796	-1.2	2.7
94	Submarine	22,846	26,172	34,165	-5.1	1.8
99	Other Vessel (Displacement)	15,057	19,276	31,463	-3.7	3.4
	<b>Total Tolls</b>	<b>10,209,730</b>	<b>14,365,858</b>	<b>30,141,181</b>	<b>-5.4</b>	<b>5.0</b>

Source: History from ACP. Forecast based on study results

### **Conclusion**

None of the Group 1 and 2 vessels currently strain the physical limits of the Canal, and the forecast of these ships is not expected to place any requirement to expand the current Canal beyond its current dimensions. Of course, the ACP should include the forecast transits in its own capacity planning, taking into account the physical dimensions of these ships.

In view of the low elasticity of demand for both groups of vessels, the ACP should be able to raise toll levels for these ships quite substantially with little or no effect on the number of transits.