



Technical Analysis on the Proposed Panama Canal Post Panamax Navigation Channel

Análisis Técnico de los Cauces de Navegación Pospanamax Propuesto del Canal de Panamá

Autoridad del Canal de Panamá

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Introducción y Resultados

TECHNICAL ANALYSIS ON THE PROPOSED PANAMA CANAL POST PANAMAX NAVIGATION CHANNEL

1 GENERAL DESCRIPTION OF THE STUDY

The construction of new Post Panamax locks at the Panama Canal would require improvements to the existing Canal navigation channels, which would involve deepening and widening work to guarantee the safe and expedite transit of Post Panamax vessels through the Canal. Preliminary analyses of Canal operations have proved that the currently used semi-convoy traffic mode is more efficient in terms of Post Panamax and Panamax throughput capacity; therefore, it is foreseen that Gaillard Cut and both Canal entrances would require as a minimum a 1-way Post Panamax channel layout, while Gatun Lake would call for a 2-way Post Panamax configuration. Additionally, if some of the current operating restrictions were lifted once the Cut straightening and widening program is complete, select Panamax ships could be allowed to conduct two-way transits through Canal entrances and the Cut.

This report includes the technical analysis to widen and deepen existing Canal navigation channels, and build new navigation channel access ways for new locks on the Atlantic and Pacific sides. The analysis includes an assessment of channel alignment and dimensions, excavation and dredging volumes, drilling and blasting requirements, channel geologic conditions, equipment and dredge selection, available and potential disposal sites, estimated execution time frames, unit and total costs, excavation and dredging work planning, contingency estimates, and cash flow development, among others.

The technical assessment for the construction of the new locks and the Pacific new lock approach channel between Gaillard Cut and the intermediate plug is reviewed in a separate report.

2 SUMMARY OF POST PANAMAX NAVIGATION CHANNEL WORK

- Following is a table for 10.4 m and 9.14 m PLD scenarios showing required excavation, drilling and blasting, and dredging activities including volume estimates, equipment productivity, and costs to execute Post Panamax navigation.

POST-PANAMAX CHANNEL WORK FOR 10.4 m PLD

Area	Dry excavation Land based D&B Land dredging Aquatic D&B Dredging				Equipment	Productivity		Dry excavation Land based D&B Land dredging Aquatic D&B Dredging				Cost million \$	Including indirect cost million \$		
	Millones m ³					m3 x week	Material	Millones \$							
Atlantic	Navigation channel				6.95	Hopper dredge	110,500	soft				20.85	20.85	23.35	
	Northern approach channel	0.90				Land equipment Rock cutter 1	34,600 60,000	dry soft rock	4.05				30.07	34.12	38.1942
	Northern plug	0.16				Land equipment Rock cutter 1	34,600 60,000	dry soft rock	0.72				2.80	3.52	3.94
	New locks														
	Southern plug	0.4				Land equipment Rock cutter 1	34,600 60,000	dry soft rock	1.80				3.17	4.97	5.56
Gatun Lake and Gaillard Cut	Gaun lake				0.80	Aquatic D&B Cutter suction MINDI Rock cutter one	24,250 50,000 67,500 37,500	soft to medium soft to medium hard				5.43	37.79	43.22	48.41
	Gaillard Cut, Chagres Crossing Reach, and Gamboa														
Pacific	Northern approach channel, north of Gaillard Cut plug	7.18	2.70		0.30	Land equipment Land D&B Aquatic D&B Dipper dredge RMC	34,600 54,000 30,000 30,000	dry medium to hard	32.31	12.14		1.68	20.33	66.46	74.27
	Gaillard Cut plug	0.51	0.58			Land equipment Land D&B Dipper dredge RMC	34,600 54,000 30,000	dry medium to hard	0.23	2.60			3.59	6.42	7.19
	Northern approach channel between Gaillard and intermediate plugs														
	Intermediate plug	0.39	0.46			Land equipment Land D&B Dipper dredge RMC	34,600 54,000 30,000	dry dry medium to hard	0.18	2.06			2.78	5.02	5.62
	New locks														
	Southern plug		0.73			Land D&B Backhoe	30,000 20,000	medium to hard		3.29			8.90	12.19	13.65
	Southern approach channel		1.41			Land D&B Rock cutter 2 Backhoe	20,000 37,500 20,000	shallow waters medium hard hard		14.08			37.21	51.29	57.44
Navigation channel				4.36	Aquatic D&B Backhoe Rock cutter 2	30,000 20,000 37,500 60,000	hard medium hard soft				24.42	68.98	93.40	104.61	
Total	9.54	5.88	0.00	5.46	35.26				39.29	34.17	0.00	31.53	236.47	341.46	382.24
ACP support to external contractors															19.16
Contingency 18.44%															74.00
TOTAL COSTS FOR POST-PANAMAX CHANNEL WORKS AT 10.14 m PLD															475.40

Table No. 45. Summary of Post Panamax channel works for scenario 10.4 m PLD elevation in Gatun Lake

POST-PANAMAX CHANNEL WORK FOR 9.14 m PLD

Area	Dry excavation Land based D&B Land dredging Aquatic D&B Dredging					Equipment	Productivity		Dry excavation Land based D&B Land dredging Aquatic D&B Dredging					Cost million \$	Including indirect cost million \$	
	Millones m ³						m3 x week	Material	Millones \$							
Atlantic	Navigation channel				6.95	Hopper dredge	110,500	soft					20.85	20.85	23.35	
	Northern approach channel	0.90			6.55	Land equipment Rock cutter 1	34,600 60,000	dry soft rock	4.05				37.6	41.65	46.63	
	Northern plug	0.16			0.61	Land equipment Rock cutter 1	34,600 60,000	dry soft rock	0.72				3.50	4.22	4.72	
	New locks															
	Southern plug	0.4			0.79	Land equipment Rock cutter 1	34,600 60,000	dry soft rock	1.80				3.63	5.43	6.07	
Gatun Lake and Gaillard Cut	Gaun lake			3.35	16.03	Aquatic D&B Cutter suction MINDI Rock cutter one	19,400 24,250 50,000 67,500 37,500	soft to medium soft to medium hard				27.52	90.66	118.18	132.36	
	Gaillard Cut, Chagres Crossing Reach, and Gamboa Reach	2.50		2.62	6.02	Land equipment Land D&B Aquatic D&B Dipper dredge RMC Rock cutter	34,600 23,500 29,500 28,000 37,500	dry medium to hard medium rock	11.25			17.54	59.95	88.74	99.33	
Pacific	Northern approach channel, north of Gaillard Cut plug	7.18	2.91	0.57	0.32	2.26	Land equipment Land D&B Land dredging Aquatic D&B Backhoe Dipper dredge RMC	34,600 54,000 25,000 30,000 20,000 28,000	dry medium to hard medium to hard medium to hard	32.31	13.10	4.28	1.81	24.30	75.80	84.73
	Gaillard Cut plug	0.17	0.62			0.39	Land equipment Land D&B Backhoe Dipper dredge RMC	34,600 54,000 20,000 28,000	dry medium to hard medium to hard	0.74	2.80		4.28	7.82	8.75	
	Northern approach channel between Gaillard and intermediate plugs															
	Intermediate plug	0.13	0.50			0.3	Land equipment Land D&B Backhoe Dipper dredge RMC	34,600 54,000 20,000 28,000	dry medium to hard medium to hard	0.58	2.23		3.32	6.13	6.86	
	New locks															
	Southern plug		0.73			0.63	Land D&B Backhoe	30,000 20,000	medium to hard		3.29		8.90	12.19	13.65	
	Southern approach channel		1.41			2.52	Land D&B Rock cutter 2 Backhoe	20,000 37,500 20,000	shallow waters medium hard hard			14.08	37.21	51.29	57.44	
Navigation channel				4.36	6.51	Aquatic D&B Backhoe Rock cutter 2	30,000 20,000 37,500 60,000	hard medium hard soft			24.42	68.98	93.40	104.61		
Total		11.44	6.17	0.57	10.65	49.56			51.45	21.42	4.28	85.37	363.18	525.70	588.53	
ACP support to external contractors															25.63	
Fuel oil adjustment															26.22	
Contingency 18.4%															117.11	
TOTAL COSTS FOR POST-PANAMAX CHANNEL WORKS AT 9.14 m PLD															757.49	

Table No. 46. Summary of Post Panamax channel works for scenario 9.14 m PLD elevation in Gatun Lake