O & M INSPECTION REPORT
FOR NAVIGATION AND SHORE PROTECTION PROJECTS

1. Project Name: Hilo Deep Draft Harbor

2. Date of Inspection: April 30, 2002

3. Inspection Personnel:

Name	Agency/Office	Telephone No.
Dan Meyers	COE	438-8875

4. Findings/Conclusions:

a. Performed the inspection of the Hilo DDH's breakwater. I met with Mr. Ian Bernie, Harbor Master, DOT-Harbors, prior to the inspection. The following are deficiencies noted during the inspection:

b. The illegal squatters that occupy much of the dredge disposal area have been moved. The splash apron is in a deteriorated state since the squatters have removed many of the stones. The painted reach markers are deteriorating or are gone in many instances. They should be repainted or GPS should be used.

b. The following is a list of items to monitor:

STATION	RIB #	SEPARATION (in)	REMARKS	TRIBAR #
0+00			START REACH 1 ROOT	
0+50 to 0+70			Tree & Bushes on side slope, harbor-side (HS) / crest, many small stones washed up @ crest	
0+60 to 1+00			Uneven side slope, ocean-side (OS)	
1+00 to 3+50			No splash apron, looks peeled off, HS	
2+60			START REACH 2A TRUNK	
3+00			Split armor stone (AS), HS	
3+50			START REACH 2B TRUNK	
5+00			START REACH 2C TRUNK	
6+00			Change in side slope, OS	
9+25			Exposed underlayer (UL), HS.	
			3 AS at toe dislodged. Settling at crest.	
10+75			Dislodged AS, OS	
10+95			START REACH 2D TRUNK	
11+15	4	4,4,6	Steepening	744,927,780
11+25	5\6		Spalling at chamfer	140
11+35	7\8		Spalling at chamfer	851
11+45	9\10	7	Spalling at chamfer, no joint material	
11+75	14\15	3	Steepening of OS Sideslope	762, 748
11+90	17	3	Air survey marker	832
11+96	18		Spalling at chamfer	
12+12	20	2		838
12+24	21\22	2		852\796
12+25	26	4”		858
12+68	27\28	6		752
12+80	30\31	2@5		761\775
12+92	32	3	Settling at bottom	953
12+98	33	4	Settling at bottom	792
13+04	34	12	Settling at bottom	738
13+10	35	24	Shank break	982
13+16	36	3	Settled and lateral movement	811
13+22	37	4		968

13+28	38	3,4		968,825
13+40	39\40	4		839
13+52	42	4	Spalling at chamfer	770
13+64	43\44	4		981
13+70	45		Spalling bottom of rib cap & chamfer.	
			Monitor nearest joint-no filler.	
13+76	46		Spalling at chamfer	
13+88	48		Spalling at chamfer	
13+94	49	12	Air survey marker, mid slope.	643
			Steepening, UL exposed.	
14+06	51\52	2		756
14+18	53	1		583
14+30	55	3		866
14+36	56	12	Spalling at chamfer.	970
			Monitor nearest joint-no filler.	
14+60	59\60		Spalling at chamfer.	
14+75			START REACH 2E TRUNK	
14+78	63	2	1st bend in rib cap	402
14+84	64		Shank break. New shank break.	513,543
14+90	65	3		516
15+02	67	4		938
15+08	68\69	7		935
15+26	70\71	0,5	Spalling at chamfer	919
15+30	71		Tribar settling **NEW SETTLING NOTED THIS INSPECTION**	906
15+32	72		Air survey marker. Monitor loss of UL **NEW SETTLING NOTED THIS INSPECTION**	
		No tribar @ cap, OS	Able to see water below cap	
15+38	73\74	12	Begin settled area. Monitor nearest joint **NEW SETTLING NOTED THIS INSPECTION**	906,420
15+50	75	2		868
15+56	76\77	5,12	End settling. Monitor tribar-tilted	905
15+74	79	12		884
15+80	80	6	Bottom corner sheared off	887
15+98	83	7,2	Old air survey marker. 856 is separated	856\889,598
			7" on one side, 18" on other side.	
			Nearest 598 shank break at WL.	

16+16	86	12		400
16+22	87	12		414
16+34	89	5		952
16+40	90	3	Gap/void between	392
16+46	91\92	1	Gap/void between.	404
			Broken tribar, HS. UL exposed.	
16+58	93	6		403
16+64	94	1		925
16+70	95	1	"Cambra", brass bolt, 2d bend, Loss of joint material	925
			Spalling at chamfer	
16+76	96	2,4		941\955
16+82	97\98		Spalling at chamfer	
17+00	100	2		997\987
17+05	102	3	Spalling	940
17+24	103\104	3		972
17+30	105	5		945
17+36	106	3		939
17+40	107\109		3 x shank break	unk\317\287
17+42	110	3		957
17+78	113	4		328
17+84	114	2		328\956
17+90	115\116	1		251
17+96	116		Air marker survey	
18+02	117	5		942
18+08	118	3		943
18+14	119	3	Loss of joint material	396
18+20	120	8	Spalling at chamfer	227
18+26	121	5		214
18+32	122	5		225
18+38	123	6		410
18+44	124	8		213
18+50	125	8		213
18+70	127	1		228
18+72	128	1		329
18+74	129	5,1		198\184
18+80	130	1		184
18+86	131	3	Loss of joint material	169
18+92	132	2	WL 2 chipped flukes	263

18+98	133	1		264
19+10	134\135	1		327
19+16	136	3		156
19+52	142	2		212
19+52	142		Shank break 7 ribs from end - 71 sliding	64
19+58	143	2	Double layer at WL, Loss of joint material	71
19+64	144	1		66
19+70	145	4		62
19+76	146	4		62
19+82	147	6		58
19+90	149	6	Rib cap end. Air survey marker.	255
19+91			START REACH 2F TRUNK	
21+90			Air survey marker	
22+90			Fractured crest stone	
23+90			Air survey marker. 50' reach. Settling, OS.	
24+90			End reach.	
25+00			START REACH 2G TRUNK	
25+30			Slight separation at crest hinge, OS.	
			Monitor possible sliding.	
25+90			Air marker survey	
27+90			Air marker survey	
28+00			OS, Sideslope steepening	
28+65			Depression on crest, 5' diameter	
28+80		PS GONE this inspection	Perched stone (PS), void at crest, UL exposed	
			Note: perched stone is gone.	
29+50			Monitor possible loss of crest elevation	
29+90			Air survey marker. End reach, 30+00	
30+00			START REACH 2H TRUNK	
30+75		Gone	Rocker on crest 2' dia.	
31+90			Air survey marker	
33+90			Air survey marker	
34+10			60' reach with settling at crest opposite	
			green can	
34+90			End reach, 35+00	
35+00			START REACH 2I TRUNK	
35+75			3'x4' void, UL exposed at crest	
35+90			Perched rock gone. 3'x4' void at crest	
36+00			Air survey marker	

36+50		4' x 2'	6' deep void at crest	
37+10			Bridging of AS.	
			Monitor slight crest settlement of side	
			slope (sliding), OS	
38+00			Air survey marker	
38+40			Settling @ crest, void, UL missing	
40+00			START REACH 2J TRUNK	
40+00			Air survey marker, end reach	
40+60			Bridging and settling at crest, shifting & bulge, OS, noted FY01 Inspection	
42+00			Air survey marker	
42+50			Possible dislodged stone at WL	
			Not noted during this inspection.	
			Continue to monitor.	
44+10			2'x3' void at crest.	
			Many 10-50 LB stones between AS for 100'	
			Slight settling at crest, bridging of AS, HS	
			High energy area?	
45+00			START REACH 2K TRUNK	
45+80			Bridging of crest stone.	
47+00			Split AS on crest.	
49+10			Split AS on crest	
50+00			START REACH 2L TRUNK	
50+00			End reach	
50+70			Bridging of crest stone.	
52+50			Bridging of crest stone and settling	
52+75			Perched stone on crest 3' diameter	
54+00			Fractured AS at crest	
55+00			START REACH 2M TRUNK	
57+00			2' separation at slope/crest hinge	
Several small			1st 100' side slope looks steeper	
UL perched			High energy area, limu on crest	
OS hinge			Frequent overtopping	
			Monitor crest settlement	
59+00		5'D x 2'W x 6'L	Void - End reach. 2d big bend in breakwater	
59+30			Bridging and settling at crest	
60+00			START REACH 2N TRUNK	
60+00			Large cavity (10'x5') due to bridging	
			Little contact at crest.	

60+90		2' x 4' x 4'	Void @ crest	
61+50			1'x3' perched stone on crest	
65+00			START REACH 2O TRUNK	
65+00			Slight settling on slope side	
			Area of wave focusing	
66+00			End reach	
66+35			2' void on crest, exposed UL	
68+00			Tombstone - flat AS flipped up	
68+45			2' void at PC of bend	
69+95			3'x4' void 10' deep down to waterline.	
			Loose AS, HS	
			PC etched into stone at 70+00	
70+00			START REACH 2P TRUNK	
70+50			Brass disk - unknown inscription.	
			20'x10' depression, OS, monitor	
71+00			Air survey marker	
71+10			3'x5' void, OS	
72+00			End reach. Slight settling at crest hinge, OS	
73+35			Slight settling at crest and bulge, HS	
73+40			Slight settling at crest and bulge, HS	
74+40			3 fractured stones at crest.	
			Not found '98 inspection.	
75+00			START REACH 2Q TRUNK	
75+20			Separation at slope-crest hinge. UL exposed	
75+85			1 small crest stone fractured. 3x	
77+00			End reach	
77+30			Bridging at crest	
80+00			START REACH 2R TRUNK	
81+20	.		Voids at crest	
81+40			Void at crest	
82+00			End reach	
82+75			Possible dislodged AS at WL	
83+00-84+00			Poor key and fit of crest stones.	
			Not interlocked/touching adjacent stones	
85+00			START REACH 2S TRUNK	
85+00 to 92+00			Bridging of crest stones, Settling hinge	
87+00			End reach, Settling hinge	
90+00			START REACH 2T TRUNK, Settling at hinge	

			w/separation	
91+25			Fractured stone at crest, Settling hinge	
92+00			End reach, Settling hinge	
92+75			**Settling hinge approx. end**	
92+20			Voids (chinker present at other areas gone)	
			Fractured crest stone, no interlock, bridging	
			AS protruding from slide slope, HS	
92+20-93+70			Noticeable 1'-2' recession at WL-150 LF	
93+90			2'x3'x10' void near crest, OS	
94+36			NOS disk "7741B 1976"	
95+00			START REACH 2U TRUNK	
95+36			NOS disk "7741A 1976"	
?			NOS disk "7741C 1976"	
100+00			START REACH 3 HEAD	
100+05			Settling, missing AS at WL, HS	
100+25			Settling, 1' gap between AS (WL to crest)	
100+35			Perched stone on crest not found FY01	
?			NOS disk "7741D 1976"	
			Monitor head closely for future changes	
			Profile appears to have changed (lost AS)	
			since last inspection	
100+55			Void	
100+65			END REACH 3 HEAD	

a. Sta. 0+50 - Sta. 0+70, Vegetation

b. Sta. 3+50, Overview

c. Sta. 8+40, OS, dislocated armor stone.

d. Sta. 10+75, OS, Monitor dislocated armor stone resting on the sideslope.

e. Sta. 11+15, OS, Monitor tribar movement.

f. Sta. 11+75, OS, Monitor tribar movement.

g. Sta. 13+10, OS, Broken Tribar # 738

h. Sta.15+30 to 15+56, OS, Monitor tribar movement.

i. Sta. 17+40, OS, Broken Tribars # 317 / 287 / ?

j. Sta. 19+52, OS, Broken Tribars # 64

k. Sta. 25+00, OS, Monitor hinge separation.

l. Sta. 25+30, OS, Monitor hinge separation.

m. Sta. 28+00, OS, Settling at hinge/sideslope

n. Sta. 28+65, OS, Settling at hinge/sideslope, UL exposed

o. Sta. 35+75, Void at crest, UL exposed thru void

p. Sta. 35+90, Void at crest, UL exposed.

q. Sta. 36+50, Void from Crest to Waterline.

r. Sta. 37+10, OS, Bridging armor stones in this area.

s. Sta. Sta. 38+40, OS, Bridging armor stones in this area, UL exposed.

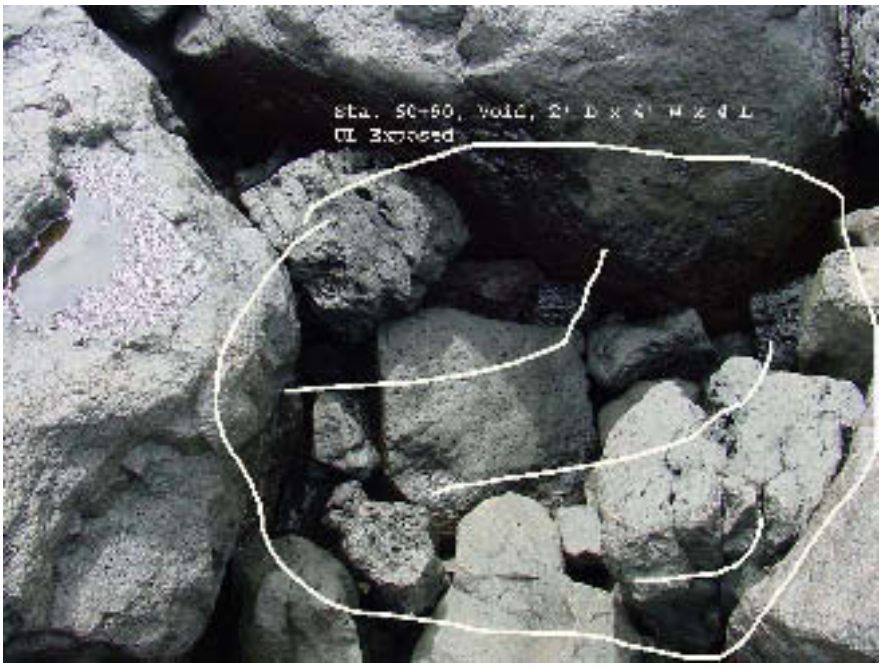
t. Sta. 47+00, Split armor stone.

u. Sta. 49+10, Split armor stone.

v. Sta. 52+75, OS, Perched armor stone resting on the crest.

w. Sta. 59+00, Water visible thru void.

x. Sta. 59+00, OS, Note small underlayer resting on OS hinge.



y. Sta. 60+90, Void at crest, UL exposed.

z. Sta. 61+50, Perched armor stone resting on crest.

aa. Sta. 68+00, Perched armor stone resting on crest, “Tombstone”.

bb. Sta. 69+95, OS, Void crest down to the waterline.

cc. Sta. 71+10, OS, Void, UL exposed.

dd. Sta. 72+00, OS, Monitor settling of the hinge.

ee. Sta. 81+20, CL, Voids at crest, UL exposed.

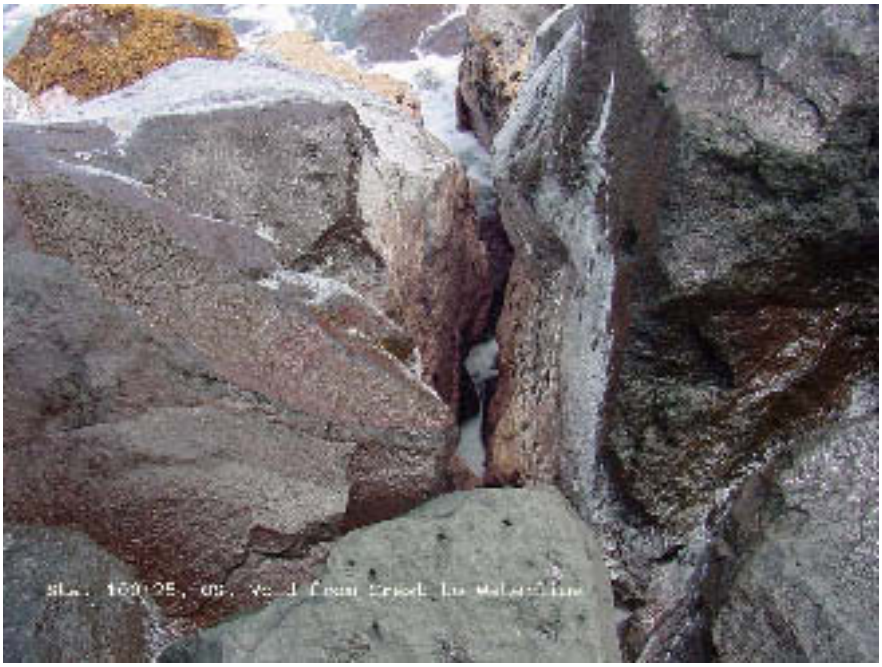
ff. Sta. 81+40, CL, Voids at crest, UL exposed.

gg. Sta. 85+00 to Sta. 92+00, Separation of the hinge at various locations.

gg. Sta. 85+00 to Sta. 92+00, Separation of the hinge at various locations.

gg. Sta. 85+00 to Sta. 92+00, Separation of the hinge at various locations.

hh. Sta. 93+90, OS, Void from the crest down to the waterline.



ii. Sta. 100+25, OS, Void from the crest down to the waterline.

jj. Sta. 100+55, OS, Missing Armor stone, void, UL exposed.

kk. Sta. 100+65, Overview OS.

ll. Sta. 100+65, Overview of Head.

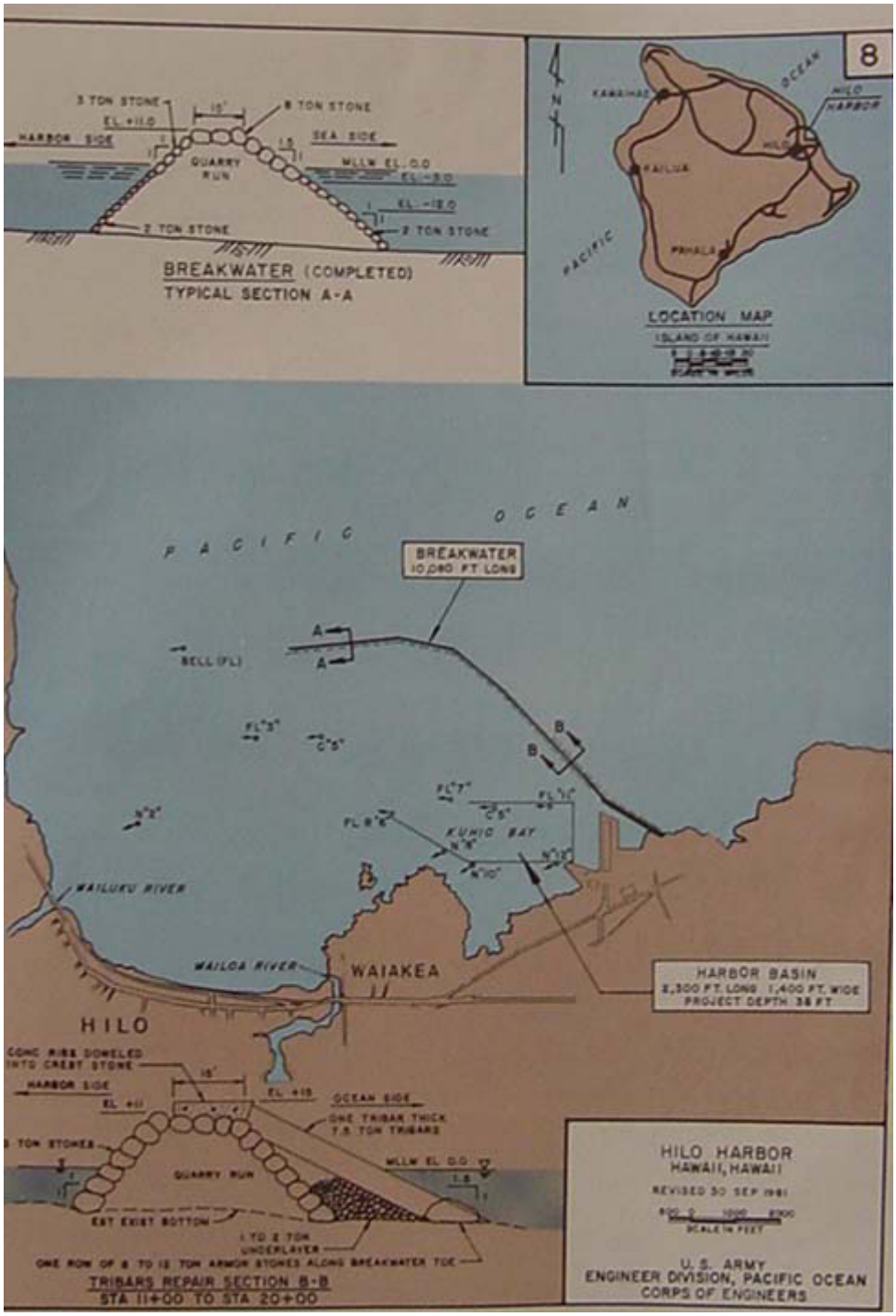
mm. Sta. 100+65, Overview HS.

5. Conclusion:

There were new deficiencies noted during this inspection. The most significant was the settling of the crest from Sta. 85+00 to Sta. 92+00 and the new voids noted at various stations identified in this report. The overall condition of the breakwater is FAIR, however the functionality is GOOD.

Signed: _____
Dan Meyers, CEPOH-EC-T

Signed: _____
Jim Pennaz P.E., Ch, CEPOH-EC-T


8
3 TON STONE
EL +11.0
15'
8 TON STONE
HARBOR SIDE
SEA SIDE
QUARRY RUN
MLLW EL. 0.0
EL -8.0
EL -12.0
2 TON STONE
2 TON STONE
BREAKWATER (COMPLETED)
TYPICAL SECTION A-A
N
KAWAIHAE
OCEAN
HILO HARBOR
HILO
KAILUA
PAHALA
PACIFIC
LOCATION MAP
ISLAND OF HAWAII
PACIFIC
OCEAN
BREAKWATER
10,080 FT. LONG
A
A
BELL (FL)
B
B
KUHIO BAY
WAILUKU RIVER
WAILOA RIVER
WAIAKEA
HILO
HARBOR BASIN
2,300 FT. LONG 1,400 FT. WIDE
PROJECT DEPTH 38 FT
CONC RIBS DOWELED INTO CREST STONE
HARBOR SIDE
15'
EL +11
EL +15
OCEAN SIDE
ONE TRIBAR THICK T.S. TON TRIBARS
8 TON STONES
QUARRY RUN
MLLW EL. 0.0
EST EXIST BOTTOM
1 TO 2 TON UNDERLAYER
ONE ROW OF 8 TO 12 TON ARMOR STONES ALONG BREAKWATER TOE
TRIBARS REPAIR SECTION B-B
STA 11+00 TO STA 20+00
HILO HARBOR
HAWAII, HAWAII
REVISED 30 SEP 1981
SCALE IN FEET
U. S. ARMY
ENGINEER DIVISION, PACIFIC OCEAN
CORPS OF ENGINEERS

HILO HARBOR, HAWAII, HAWAII

CONDITION OF IMPROVEMENT 30 SEPTEMBER 1993

PREVIOUS PROJECTS: Authorized by the River and Harbor Acts of 2 March 1907, 25 July 1912 and 3 March 1925.

EXISTING PROJECT: Modification authorized by the Water Resources Development Act of 1986 (PL 99-662), 17 November 1986, provides for deepening the entrance channel from 35 feet to 39 feet and deepening the turning basin from 35 feet to 38 feet.

PROGRESS OF WORK

Completed and Under Maintenance: Work authorized by the Acts of 1907, 1912 and 1925 was completed in 1930. Emergency breakwater repair was completed in 1968. Other breakwater repairs were completed in 1973, 1975 and 1981. Last maintenance dredging was completed in April 1990; total material dredged was 80,000 cubic yards.

Work Remaining: None. Preconstruction engineering and design on modification authorized in 1986 and initiated in FY 1990, was terminated in July 1991. Project was determined to be economically unjustifiable. Project place in deferred category in FY 1992.

COST OF CONSTRUCTION:

	New Work	Maintenance	Total
Completed Works:			
United States Funds	$5,423,440	$4,089,631	$9,513,071
Total Costs	$5,423,440	$4,089,631	$9,513,071
Uncompleted Works:			
United States Funds	$4,570,000		$4,570,000
Contributed Funds Required	1,530,000		1,530,000
Total Estimated Costs (1990)	$6,100,000		$6,100,000

RANGE OF TIDES: The range of tide between mean lower low water and mean higher high water is 2.4 feet. The extreme range is 5.4 feet.