

**Culebra Ferryboat Cargo Ramp  
Repair/Reconstruction**  
Technical Note Assessment Existing  
Conditions  
Puerto Rico Ports Authority

November 25 2013

# Notice

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## Document history

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## Client signoff

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Project	Culebra Ferryboat Cargo Ramp Repair/Reconstruction
Document title	Design Assessment Technical Note
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# Technical note

<b>Project:</b>	Culebra Ferryboat Terminal Cargo Ramp Repair/Reconstruction (AP-13-14-5-034)	<b>To:</b>	Autoridad de los Puertos
<b>Subject:</b>	Assessment Existing Cargo Ramp	<b>From:</b>	Arturo Santiago-Rivera
<b>Date:</b>	Nov 25, 2013	<b>cc:</b>	Flavio Silva, Romel Pedraza

## BACKGROUND

On April, 2013 the Puerto Rico Ports Authority (PRPA) request Atkins Caribe LLP (ATKINS) to present a scope and economic proposal for the partial repair/reconstruction of the ferryboat cargo ramp at the Culebra Passenger and cargo Terminal Facilities of the Maritime Transportation Authority at Culebra, Puerto Rico. On October 14, 2013, PRPA enter in agreement with ATKINS to provide design services and to proceed and initiated the analysis, design, and contract documents for the project.

Pursuant to the emergency situation occurred at the Culebra Passenger Ferry Terminal Platform after the passing of Hurricane Earl this past August 30, 2010, Atkins Caribe were asked to evaluate the structural condition of the terminal platform for passenger vessels. As part of the evaluation of the terminal platform, a general visual inspection of the conditions of the complete plaza platform and cargo ramp platform was executed. A report was prepared and submitted to MTAPR on the same year documenting the finding of the observed conditions and structural conditions.

Part of the condition observed reflects multiple spalling of deck slab and concrete beams in the terminal platform and the cargo ramp platform. Specifically for the cargo platform, some areas have lost the concrete and reinforcing bars are hanging from the remaining concrete parts. Steel piles have moderate damage. While this condition may appeared to have some type of patching and repair capability, any repairs attempted for this facility would be of short-term duration. By inspection, the corrosion observed has probably spread to the entire concrete surfaces.

Puerto Rico Ports Authority (PRPA) has requested FEMA funding under their Hazard Mitigation Grant Program (HMGP) to reconstruct/repair the existing cargo platform of the Municipality of Culebra. The cargo platform is deteriorate due to the past hurricanes and waves action that has impact the concrete structure. If the structural condition is not soon attended, there might be a possibility of having a failure that can leave the inhabitants of Culebra without this crucial service.

PRPA designed the actual cargo platform/pier back in 1989 with construction completed circa 1990. The cargo ramp consisted of a reinforced concrete slab 12" in thickness on top of reinforced concrete beams. Pile foundations consisted of HP 14 x 73 x 40' long steel piles in plumb and batter configuration. A steel sheet pile PZ-27 was installed on the east section of the ramp. The cargo pier is 39 feet by 70 feet long and included a rest area of 14 feet by 28 feet.

## EXISTING CARGO RAMP ASSESSMENT

This task comprises the visual inspection of the 3,122 square foot cargo ramp underside structure. Cores of the concrete deck were taken (5 EA) to determine strength and chloride content. Ultrasonic thickness measurements as well as tape measurements of the steel pile webs and flanges were taken above and underwater. The underwater evaluation and inspection was performed by Underwater Engineering & Research Corporation.

# Technical note

- Concrete slab underside - The typical condition shows severe spalling of the concrete cover and corroded reinforcement. Other areas are showing imminent spalling as puffing of the cover can be observed. Please refer to the attached photographs.
- Concrete Beams - All five beams have severe spalling of the concrete cover and heavily corroded horizontal and transverse reinforcement. In many cases the main horizontal reinforcement is missing or separated from the concrete. The vertical reinforcement is broken in many cases, breaking continuity of this reinforcement with the bottom portion of the beam. Please refer to the attached photographs.
- Steel Piles - There are 27 piles in the support system. Piles are HP. 14 X 73. Piles typically show significant deterioration from the beam interface to the splash zone. Some piles have lost most of the web and/or flange material at the beam interface. Condition improves as pile gets closer the mud line level. Measurements made with an electronic underwater thickness gauge (Checkline TI-25 M) indicated flange thicknesses ranging from 0.25 inches to 0.45 inches. Web measurements were around 0.43 inches. Original thickness should be 0.51 inches for both areas.

The structure is considered unsuitable to perform the current operation due to the condition described above. Repairs must be performed immediately or the ramp will have to be closed and another method of loading and unloading cargo will need to be used. See appendix A for detailed ramp damaged areas and condition photos.

## DESIGN AND ENGINEERING

The scope of work proposed and contracted is the partial re-construction of the existing platform. This partial reconstruction will require the contractor to work in phases to guarantee the cargo operations at Culebra. Construction would require the partial demolition of the existing concrete deck, expose the concrete beams, and remove the concrete debris outside the platform area, formwork for new concrete platform, new reinforcing steel, concrete deposit with corrosion inhibitor additives and new fenders and bollards.

Per the assessment and visual inspection executed in November 2013, the condition of the slab and beams are considered beyond economical repairs because the difficulty and phasing time to complete will make the cost prohibitive. In addition, the quality of expected results would be difficult to attain and the durability could be limited. Demolition of the entire deck structure and replacement with a pre-cast system, similar to the structure of the passenger terminal deck, is the preferred alternative because it will ensure a durable solution for many years. In addition, the time to complete this option will be less than a repair/reconstruction option.

For the piles, the recommendation is to remove the portions of all piles to a depth of 3 feet to 4 feet below the mud line (assumed location of sound HP pile section) level with a new pile segment. With the appropriate connection the pile will essentially become a new member. Protection of the new pile segments with a fiberglass or PVC jacket system filled with epoxy grout and reinforces steel is required to insure durability of the piles.

Construction time for the suggested new cargo ramp deck and piles reconstruction is estimated in 8 months.

## PROBABLE PROJECT CONSTRUCTION COST

Preparation of the construction cost estimate is a critical component of the PS&E (Plans, Specifications, and Estimate) process. Throughout the project development process several different construction cost estimates of the project will be prepared both for design and bidding purposes.

# Technical note

At this stage, designer probable construction cost estimate for the new construction of the cargo ramp platform is in the figure of **\$2,424,353.06**.

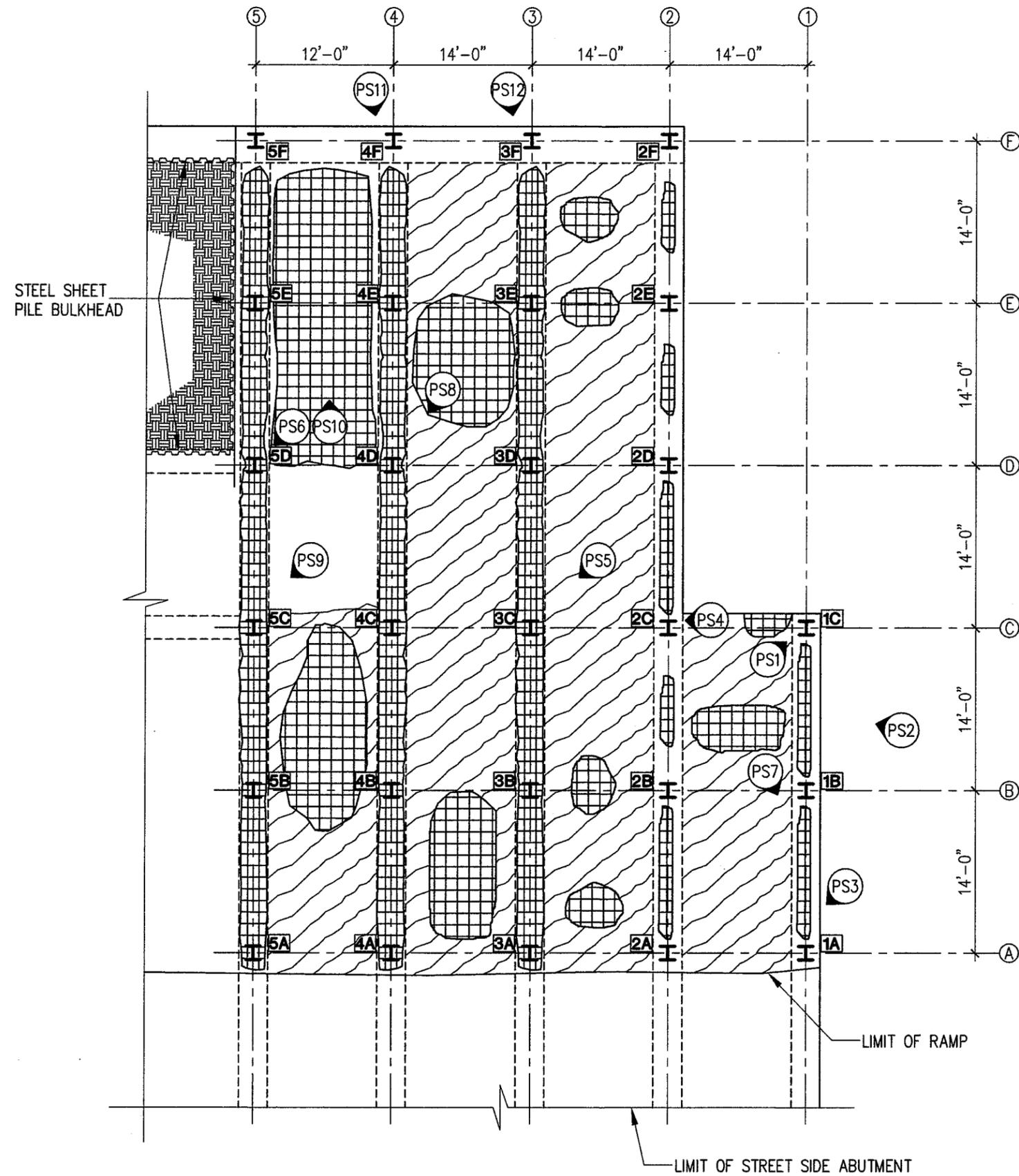
The probable cost estimate is determined by the findings of the executed assessment of the existing cargo ramp and the structural critical condition of the ramp elements not recommended to viable for repair/reconstruction. See Appendix B for cost estimated breakdown.

## DESIGN PROGRESS SCHEDULE

The overall design progress is in 16% complete. The design phase includes several tasks performed with the assistance of three local consulting firms. To date, the design phase has been 26% complete base on the following tasks % complete:

<u>Task Name</u>	<u>% Complete</u>
Engineering Studies	55
Environmental Compliance	18
Design/Engineering	05
Permitting	00
Bidding	00

**ATTACHMENT A**



**LEGEND:**

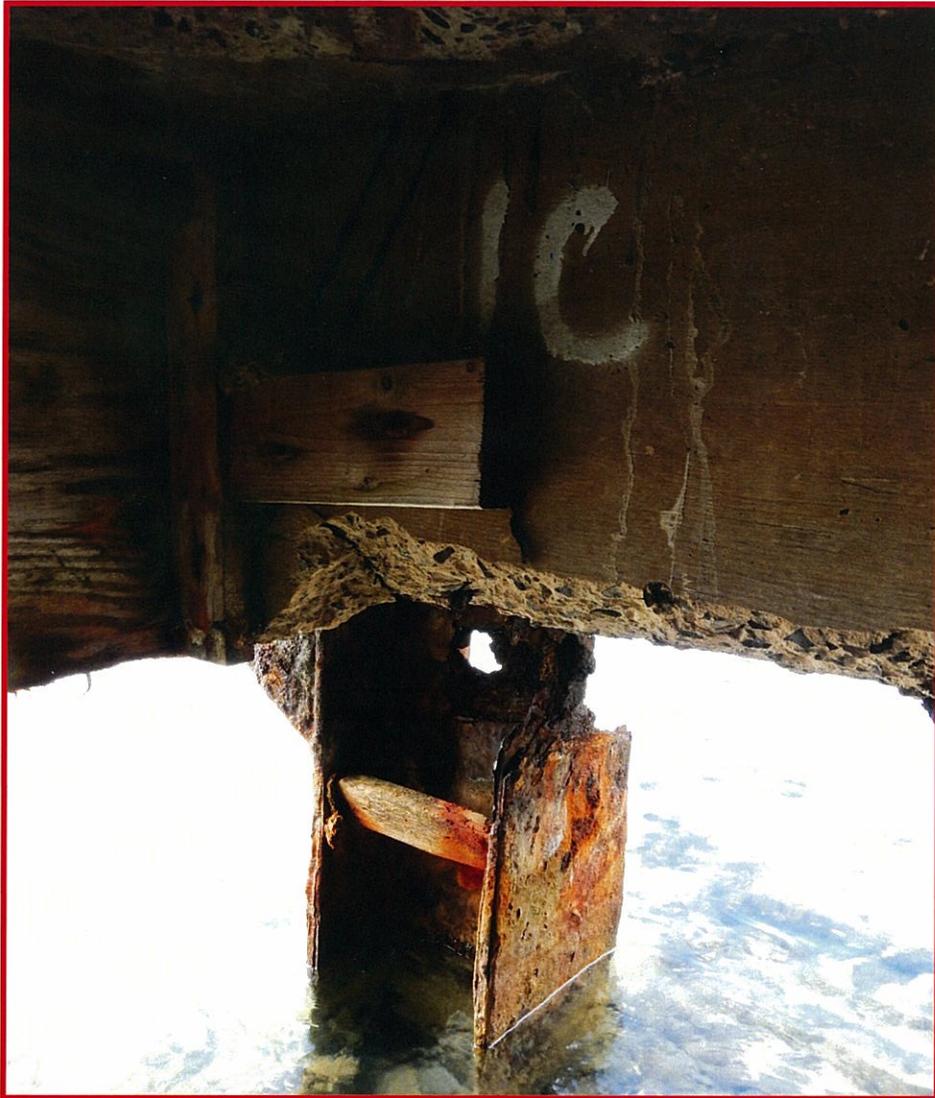
- PS PHOTO SHEET
- APPROXIMATE DIRECTION OF PHOTOGRAPH
- SPALLING OF CONCRETE COVER.
- IMMINENT SPALLING OF DECK COVER

**CARGO RAMP UNDERSIDE EXISTING CONDITION**  
SCALE 3/16" = 1'-0"



**EXISTING CONDITIONS**

<b>U</b>	UNDERWATER ENGINEERING AND RESEARCH CORP.
	CULEBRA FERRY TERMINAL CARGO RAMP



**HP PILE WITH SIGNIFICANT DAMAGE OF THE  
CROSS SECTION OF PILE 1C**



**SIDE VIEW OF BEAM AT AXIS 1**



□

**CONDITION OF PILE AT LOCATION 1 A. NOTE CONDITION SIGNIFICANT  
REDUCTION OF FLANGE THICKNESS OF PILE AND HOLE**

**PHOTO SHEET 3**



**CONDITION OF PILE AT LOCATION 2 C NOTE CONDITION  
SIGNIFICANT REDUCTION OF PILE WEB THICKNESS AND HOLE**



**VIEW OF PILE AT LOCATION 3 C.**



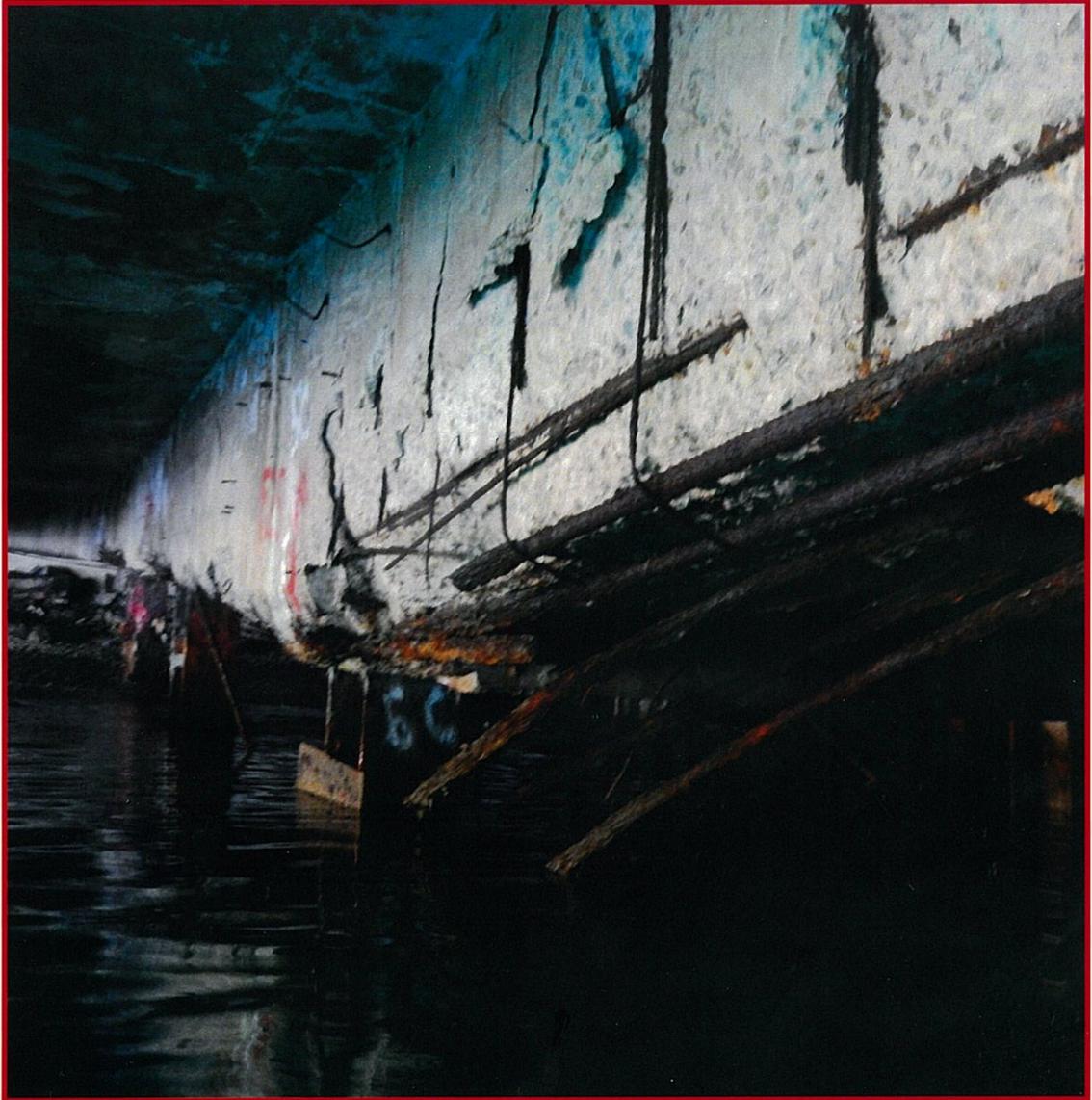
**VIEW OF PILE AT LOCATION 5 D.**



**BEAM CONDITION WITH CONCRETE COVER SPALLING  
AND REINFORCEMENT WITH SIGNIFICANT DAMAGE.  
BEAM IS AXIS 1 AND PILE BEYOND IS 1A**



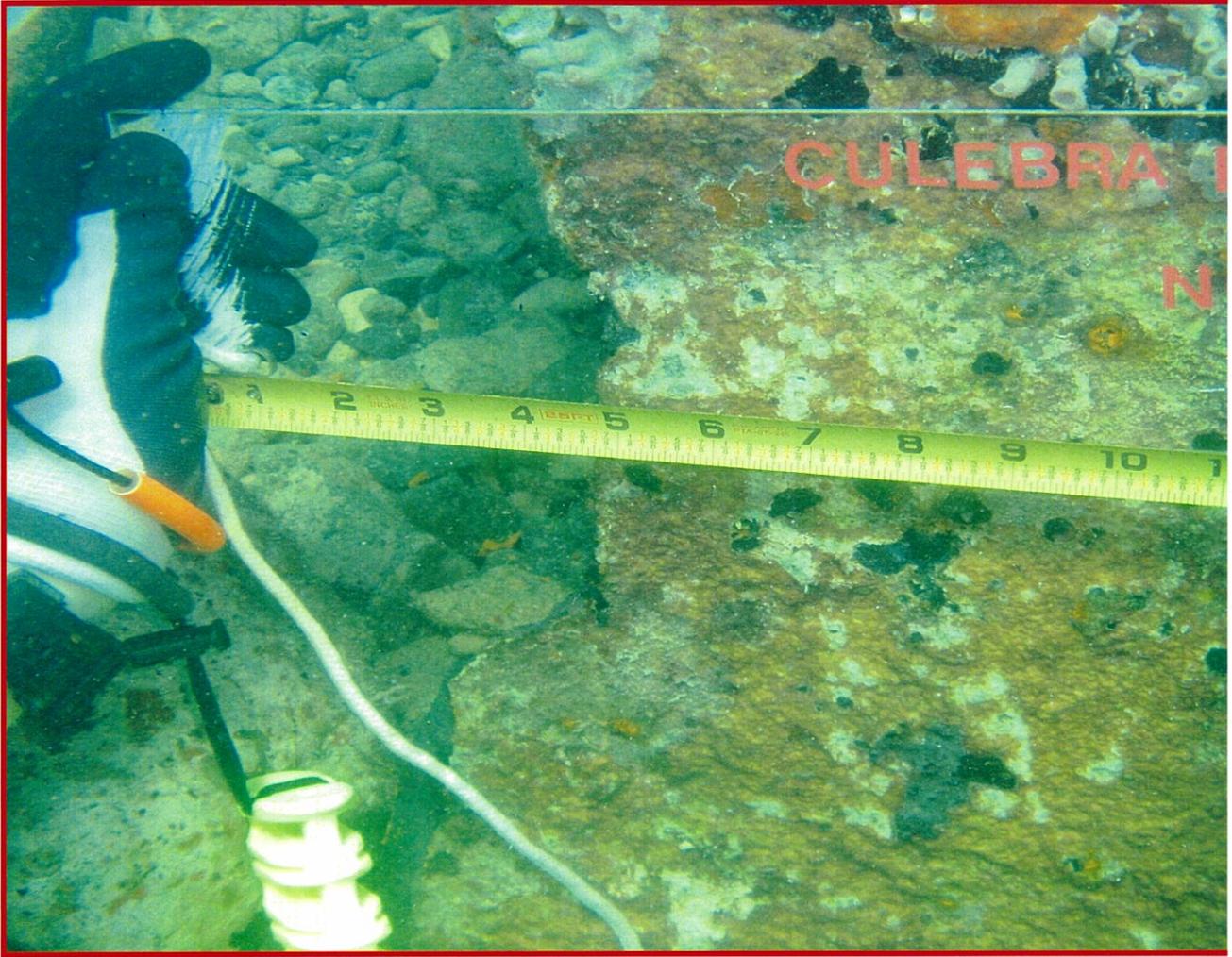
**VIEW OF BEAM AT AXIS 4**



**VIEW OF BEAM AT AXIS 5**



**VIEW OF DECK CONDITION BETWEEN AXES 4 AND 5  
(LOOKING TOWARD THE WATER SIDE)**



□

**VIEW OF PILE 4 F AT THE MUDLINE LEVEL  
NOTE REDUCTION OF FLANGE PLATE WIDTH**



**VIEW OF PILE 3 F AT THE MUDLINE LEVEL  
(THICKNESS OF FLANGES BEING MEASURED)**

**ATTACHMENT B**

# CONSTRUCTION COST ESTIMATE NEW CARGO RAMP PLATFORM

Ferryboat Cargo Ramp Repair/Reconstruction  
Culebra Ferryboat Terminal Facilities  
Maritime Transportation Authority  
Culebra, Puerto Rico



ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT COST	TOTAL ITEM COST
1	Municipal Taxes	ls	1	\$100,533.35	\$ 100,533.35
2	Insurances	ls	1	\$11,617.42	\$ 11,617.42
3	Mobilization and Barge Rent	ls	1	\$315,000.00	\$ 315,000.00
4	Demolition and Debris Disposition	sf	3122	\$65.00	\$ 202,930.00
5	Turbidity Barrier	ls	1	\$35,000.00	\$ 35,000.00
6	Construction Security Fence	ls	1	\$6,000.00	\$ 6,000.00
7	Existing Piles Refurbish	ea	27	\$2,200.00	\$ 59,400.00
8	Pile Caps Construction	ea	27	\$4,000.00	\$ 108,000.00
9	Existing Piles Protection Jackets	ea	27	\$4,000.00	\$ 108,000.00
10	Prefabricated Slabs	sf	3122	\$50.00	\$ 156,100.00
11	4-inch Concrete Finish Slab	sf	3122	\$30.00	\$ 93,660.00
12	Reinforce Steel	ls	1	\$161,562.00	\$ 161,562.00
13	Pier Fenders, Cleat, Bollards	ls	1	\$65,000.00	\$ 65,000.00
14	Disassemble and Transportation of Public Art Structure	ls	1	\$65,000.00	\$ 65,000.00
15	Transportation of Public Art Structure and Assemble	ls	1	\$65,000.00	\$ 65,000.00
<b>Subtotal Direct Construction Costs -----</b>				<b>64.05%</b>	<b>\$1,552,802.77</b>
	Remoteness Factor	15.00%		\$1,552,802.77	\$232,920.42
	State & Local Taxes	7.00%		\$803,575.43	\$56,250.28
	Contingencies	10.00%		\$1,841,973.46	\$184,197.35
<b>Total Direct Construction Costs -----</b>				<b>75.98%</b>	<b>\$1,841,973.46</b>
	Government General Conditions	7.00%		\$1,841,973.46	\$128,938.14
	Federal Government Compliances	5.00%		\$1,970,911.61	\$98,545.58
<b>Subtotal Net Construction Cost -----</b>				<b>81.30%</b>	<b>\$1,970,911.61</b>
	Overhead	7.00%		\$1,970,911.61	\$137,963.81
	Profit	8.00%		\$2,108,875.42	\$168,710.03
<b>Estimated Net Construction Cost -----</b>				<b>93.95%</b>	<b>\$2,277,585.45</b>
	Underwater Construction Inspection Services	1.00%		\$2,277,585.45	\$22,775.85
	A/E Admin Construction Services	3.00%		\$2,277,585.45	\$68,327.56
	Inflation Escalation (1 Year)	2.35%		\$2,368,688.87	\$55,664.19
<b>TOTAL ESTIMATED NET COST OF CONSTRUCTION -----</b>					<b>\$2,424,353.06</b>