1. Executive Summary

The Port of Richmond has undertaken a critical effort to assess the existing infrastructure at the Point Potrero Marine Terminal (PPMT). This assessment will be used to inform both the Port's strategic plan and the City of Richmond's goals to sustain and grow Port operations. The team, consisting of Moffatt & Nichol, Liftech Consultants, Inc., ENGEO, Inc., and Power Engineering Construction provided inspection services of the structures at the PPMT and worked to develop this condition assessment report that summarizes the findings of the inspections and provides a prioritized list of potential capital improvements projects that support ongoing Port operations and potential infrastructure improvements to increase Port revenue.

Figure 1 Outline of Areas at PPMT to be Studied

Point Potrero Marine Terminal (PPMT) is the former Historic Shipyard Number 3 at the Port of Richmond. The facility, originally constructed between 1941 and 1942, produced Liberty and Victory ships during World War II. This assessment is focused on Berths 5-8, the graving basins, and the finger piers, as well as the Whirley Crane currently at Graving Basin Number 5. Berths 5 and 6 are an inactive area, primarily used for lay berthing presently. In 2009, Shipyard No. 3 was rehabilitated into a state-of-the-art Roll On/ Roll Off (RoRo) terminal for the import of automobiles. This terminal, located at Berths 7 and 8, is currently in operation and the main use of PPMT in present day. The graving basins and finger piers support the operations of a variety of maritime-dependent uses including harbor towing, marine transportation, marine spill response, marine construction, vessel repairs, vessel lay berthing, and permanent mooring of the SS Red Oak Victory Ship Museum. These areas are outlined in Figure 1 above.

Figure 2 Primary Use for Berths 7 and 8, Roll on/off Cargo, Winter 2024

Structural assessments of the structures at PPMT were performed per the American Society of Civil Engineers Manuals and Reports on Engineering Practice 130 (ASCE MOP 130) *Waterfront Facilities Inspection and Assessment*. The damage rating criteria for reinforced concrete elements per ASCE MOP 130 is shown in Figure 3. Based on the observed damage, each structure was assigned a condition assessment rating based on the criteria outlined in Figure 4.

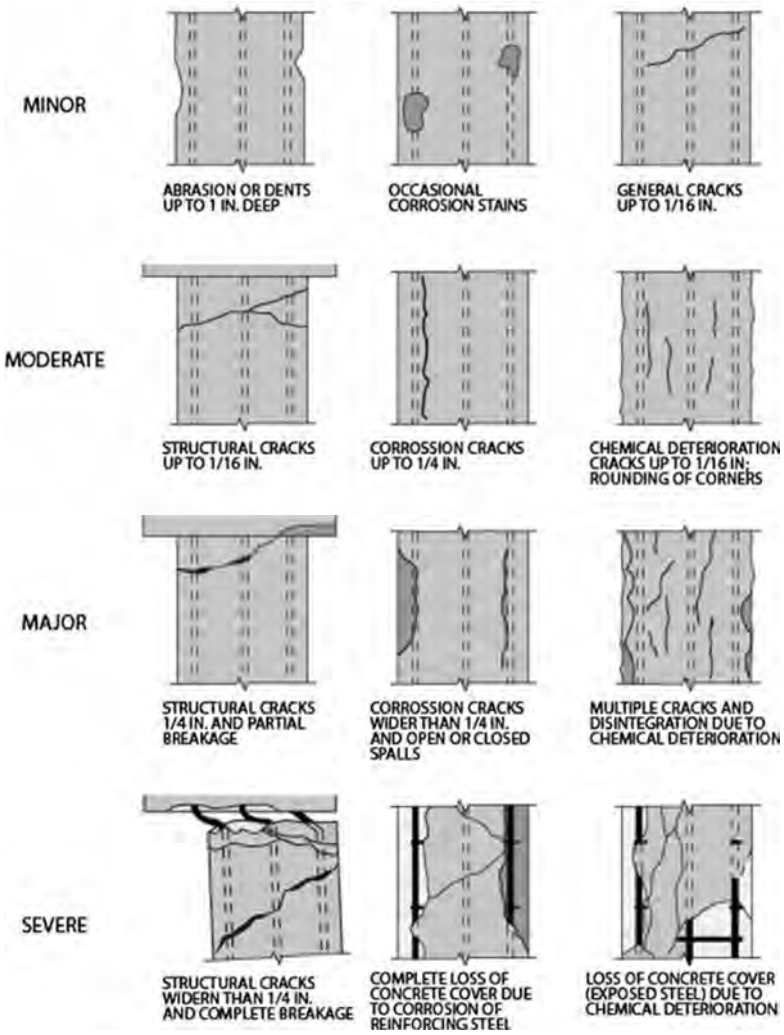


Figure 3 Damage Ratings for Reinforced Concrete Elements (per ASCE MOP 130)

Table 2-14. Condition Assessment Ratings

Rating		Description
6	Good	No visible damage or only minor damage noted. Structural elements may show very minor deterioration, but no overstressing observed. No repairs are required.
5	Satisfactory	Limited minor to moderate defects or deterioration observed but no overstressing observed. No repairs are required.
4	Fair	All primary structural elements are sound but minor to moderate defects or deterioration observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load-bearing capacity of the structure. Repairs are recommended, but the priority of the recommended repairs is low.
3	Poor	Advanced deterioration or overstressing observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.
2	Serious	Advanced deterioration, overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible, and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
1	Critical	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very high-priority basis with strong urgency.

Figure 4 Condition Assessment Ratings (per ASCE MOP 130)

Liftech Consultants, Inc., with the support of Power Engineering Construction and ENGEO, Inc., performed inspections of Berths 5-8. Overall, the wharf structures at Berths 5-8 are in poor to serious condition due to the damage observed. At the southern limit of Berth 7, localized settlement of the wharf deck was observed due to a broken support beam that was overloaded as a result of severely deteriorated/broken timber pile supports, as depicted in Photo 1.

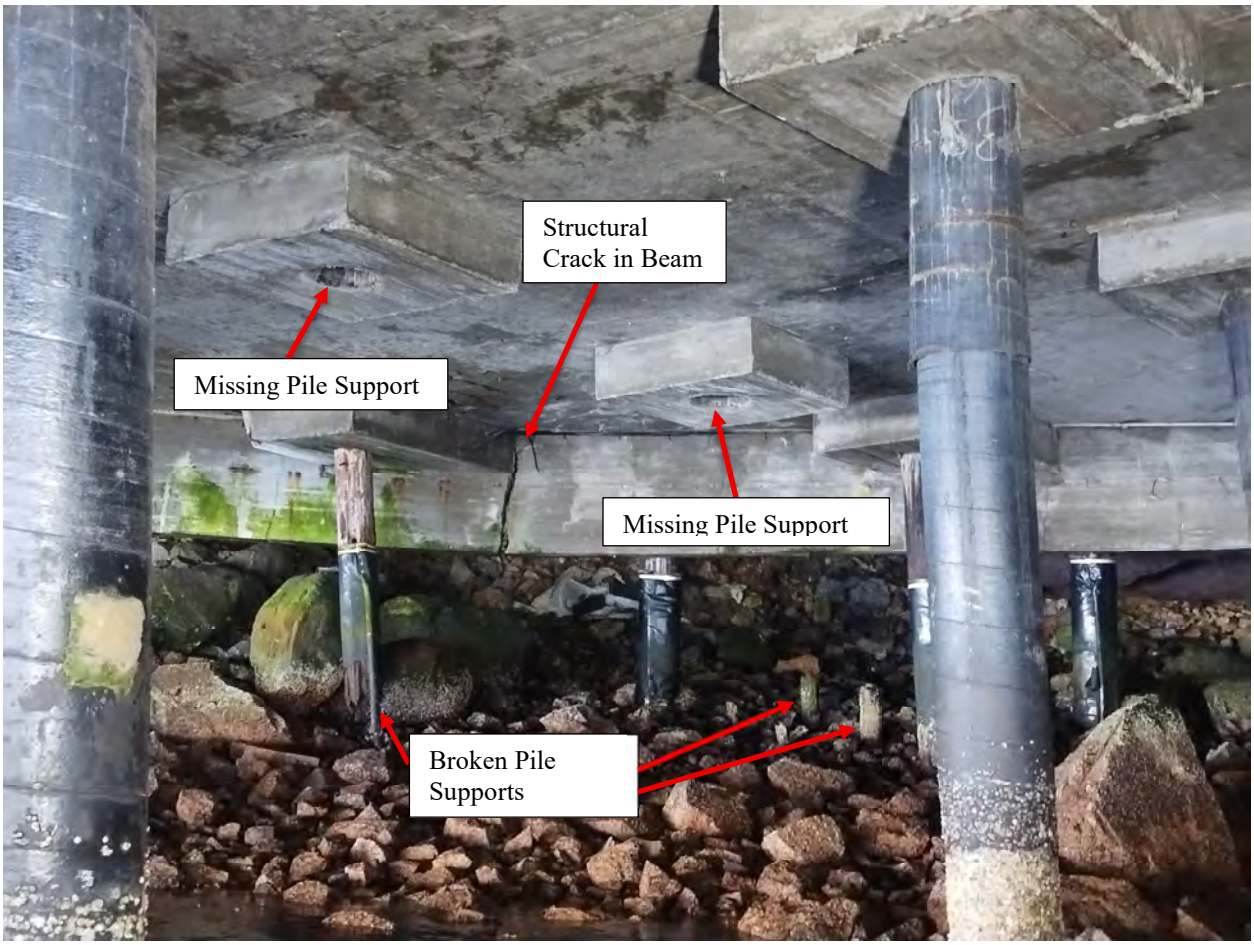


Photo 1 Broken Beam at Southern Limit of Berth 7

There is also tie beam failure and pavement settlement caused by various missing and damaged piles and soil erosion. There is typical chloride-induced corrosion deterioration of steel piles and concrete wharf structure elements, including face and crane beams and concrete struts, shown in Photo 2.

Photo 2 Exposed Reinforcing and Corrosion on Beam at Berth 7/8

Liftech Consultants also completed an inspection and visual assessment of the Whirley Crane at Graving Basin 5. The Whirley Crane has extensive coating system failure and corrosion in various areas. While the corrosion was mostly minor with major corrosion in some localized areas, there are secondary structures such as ladders, railings, and gratings with major or severe corrosion damage. As a result, these structures are falling object hazards, and areas around the crane should be restricted to public access. Liftech developed recommendations and associated high-level cost estimates for immediate and near-term risk mitigation, long-term preservation, and demolition, shown in Table 1.

Photo 3 Structural elements with corrosion damage, rivets appear unbroken

Table 1 Whirley Crane Recommendations

#	Recommendation	Cost Estimate	Comments
1	Immediate and Near-Term Risk Mitigation	$ 200,000	Falling object hazards; boom rope inspection, redundancy design, installation; crane restraint against motion.
2	Preservation On-Site with Wind and Seismic Reinforcing	$ 2,500,000	Seismic & wind analyses; corrosion abatement including permitting, rust removal, painting; allowance for unknowns. Included in cost is $1M structural reinforcing required for seismic and wind adequacy.
3	Museum Preservation Off-Site of Select Components	$ 1,400,000	Partial demolition & rigging design; site dismantling; scrap majority; abate & preserve some components; transport to museum; allowance for unknowns.
4	Demolition	$ 700,000	Demolition design & permitting; contractor dismantles using cranes; transit via barge and scrap.

Moffatt & Nichol (M&N) inspected the graving basin and finger pier structures, depicted in Photo 4 and Photo 5, respectively.

Photo 4 Graving Basin 1 looking south

Photo 5 Distal end of Finger Pier 1 looking east

Overall, the graving basin structures are in fair condition. Varying degrees of concrete deterioration were observed throughout the graving basin structures. The interior columns were generally in good condition with little to no damage observed, as shown in Photo 6. The exterior columns typically exhibited moderate to major impact and surface wearing damage from the absence of suitable mooring and fender systems. Several columns had severe damage (complete loss of bearing), likely due to impact loads from vessels; an example of a severely damaged column is shown in Photo 7. Localized concrete delaminations due to chloride-induced corrosion were observed at various locations on the soffit and slab. Additionally, potential hazards observed include 1) large quantities of paints, solvents, and environmentally hazardous chemicals being stored in the basin structures with no visible methods of containment and 2) large penetrations in the deck presenting a falling hazard generally located at the ends of the basin structures with inadequate coverings, if any (as indicated in Photo 8).

Photo 6 Interior Columns at Finger 1, Typically No Damage Noted

Photo 7 Exterior Column with Severe Damage

Photo 8 Penetration in Gallery Floor Slab, not Adequately Covered

The finger piers are in fair to poor condition due to structural deterioration of the edge beams and moderate to major damage seen in the supporting piles. Areas of significant damage were observed at the transverse and longitudinal deep beams which were delaminated and spalled with exposed reinforcing, likely due to continuous exposure during high tide levels.

Photo 9 Exposed Reinforcing in Transverse Beam

Photo 10 Severely Damaged Pile (left) and Typical Pile Damage (Right)

Load ratings were developed for the PPMT structures to support the Port in evaluating existing and proposed future uses. The load ratings presented are based on the as-built condition (e.g., no damage condition). A summary of the results of the initial condition assessment, including the load ratings, for each structure is included in Table 2.

Table 2 Condition Assessment and Load Rating Summary

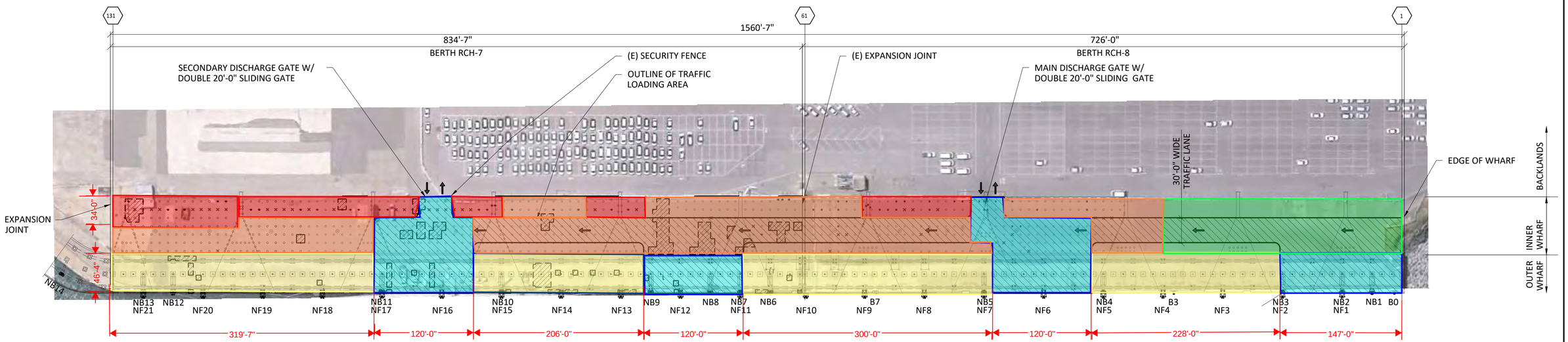
Structure	Condition Rating	Allowable Live Load	Action Required	Construction Cost Total
Berths 5-6	Poor	Not Evaluated	Pavement failure repair, general concrete wharf repairs	$68,000,000
Berths 7-8	Poor to Serious	50 psf except for at ramp loading areas: (200 psf Inner Wharf, 390 psf Outer Wharf)* AASHTO HS20-44 Vehicle Load	Critical repairs include restoring beam at southern end of Berth 7 to original position and strength, tie beam repair, and pavement failure repair	$136,900,000
Graving Basins	Fair	550 psf without load spreading (deck capacity controls) 2000 psf with load spreading that puts load directly into columns	Address potential environmental and safety hazards, develop mooring/fender system to prevent future damage to structure, restrict loading at areas where columns are in severe condition	$9,500,000
Finger Piers	Fair to Poor	500 psf†	Restore edge beams to prevent further structural deterioration and decrease in capacity, upgrade fender systems depending on projected use	$13,340,000

* Refer to figure on following page for a map of loading allowances at Berths 7/8

† Per United States Army Corps of Engineers (USACE) Port Series No. 31

1901 Harrison Street SUITE 1200, Oakland, CA 94612, 510 832-5606

APPENDIX K - WHARF DECK ALLOWABLE LIVE LOAD



WHARF PLAN

WHARF LEGEND

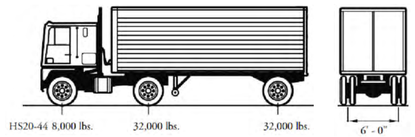
BX	(E) BOLLARD TO REMAIN
NBX	(N) BOLLARD
	TRAFFIC LOADING AREA
NFX	(N) FENDER

WHARF ALLOWABLE LIVE LOADING LEGEND

- NO LOAD ALLOWED
  SEE NOTE 1
- ALLOWABLE LIVE LOAD = 50 PSF
  VEHICLES:
  TRAFFIC = GVWR<10,000 POUNDS
  PARKED = NOT ALLOWED
  SEE NOTE 2
- ALLOWABLE LIVE LOAD = 230 PSF
  VEHICLES:
  TRAFFIC = HS20-44
  PARKED = GVWR<10,000 POUNDS
  SEE NOTE 3
- ALLOWABLE LIVE LOAD = 390 PSF AT OUTER WHARF
  ALLOWABLE LIVE LOAD = 200 PSF AT INNER WHARF
  H20-44 WHEEL LOAD
  SEE NOTE 4
- ALLOWABLE LIVE LOAD = 600 PSF
  H20-44 WHEEL LOAD
  SEE NOTE 5

NOTES:

1. DUE TO A SIGNIFICANT NUMBER OF DAMAGED AND MISSING PILES, NO LOAD IS ALLOWED UNTIL DAMAGED AND MISSING PILES ARE REPAIRED/REPLACED.
2. THIS AREA IS RECOMMENDED FOR AUTOMOBILE TRAFFIC LOADING ONLY DUE TO SPORADIC PILE DAMAGE AND MISSING PILES. LARGER LOADS MAY BE JUSTIFIED WITH FURTHER EVALUATION, E.G., LOCALIZED AREAS WHERE THERE ARE NO MISSING OR DAMAGED PILES.
3. THIS ALLOWABLE LOAD IS LIMITED TO OUTER WHARF ONLY AND ASSUMES THE UNREPAIRED CONCRETE PILES CAN SUSTAIN A DESIGN LIVE LOAD OF 250 PSF. THE 230 PSF LIVE LOAD IS TO ACCOUNT FOR THE WEIGHT OF 2" ASPHALT OVERLAY. LARGER LOADS MAY BE JUSTIFIED WITH FURTHER EVALUATION, E.G., LOCALIZED AREAS WHERE THERE ARE NO MISSING OR DAMAGED PILES, CRANE BEAMS SINCE THE BEAMS ARE SUPPORTED BY A GROUP OF PILES.
4. THE CONCRETE AND TIMBER PILES IN THESE AREAS WERE REPAIRED IN THE 2010 REPAIRS. ALLOWABLE LIVE LOADS ARE BASED ON THE STRENGTH OF THE WHARF DECK.
5. PAVEMENT OVER FILL. THE ALLOWABLE LIVE LOAD OF 600 PSF IS BASED ON THE ORIGINAL WHARF LIVE LOAD. ALLOWABLE LIVE LOADING PROBABLY LARGER.
6. LARGER LOADS MIGHT BE JUSTIFIED WITH FURTHER EVALUATION.
7. EXTENT OF AREAS SHOWN ARE APPROXIMATE BUT ADEQUATE FOR LOAD LIMITS.
8. VEHICLE SPACING FOR TRAFFIC > 15 FT, PARKED > 4 FT AND 3 FT AT SIDES.
9. THE LOADING ZONE CAN BE APPROXIMATELY IDENTIFIED BY BOLLARD OR FENDER NUMBERING IN THE LOGITUDINAL DIRECTION AND BY DIMENSIONS SHOWN IN THE WHARF CROSS SECTION SHOWN ON THE FOLLOWING SHEET.



DETAIL HS 20-44

REFERENCE NOTES:

1. REFER TO APPENDIX D, E, AND F FOR PHOTOS DOCUMENTATION OF THE PILES, BEAMS, AND SOFFIT CONDITIONS

N

No.	Revision	Date	By	Checked	Approved
1	REVISON	##/##/##	XX	XX	XX

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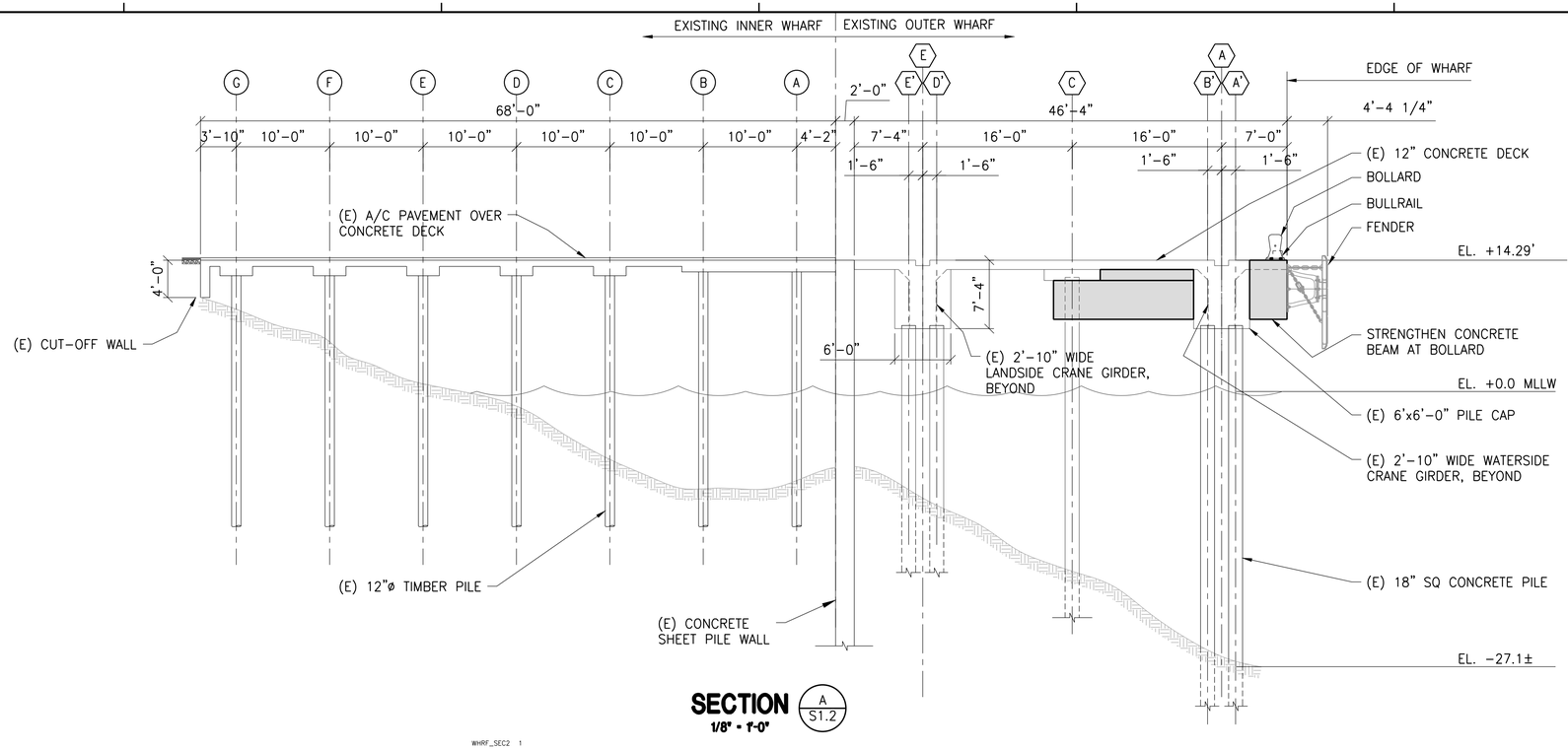
PORT OF RICHMOND
POINT POTRERO MARINE TERMINAL
WHARF CONDITION ASSESSMENT
APPENDIX K
WHARF DECK ALLOWABLE LIVE LOAD

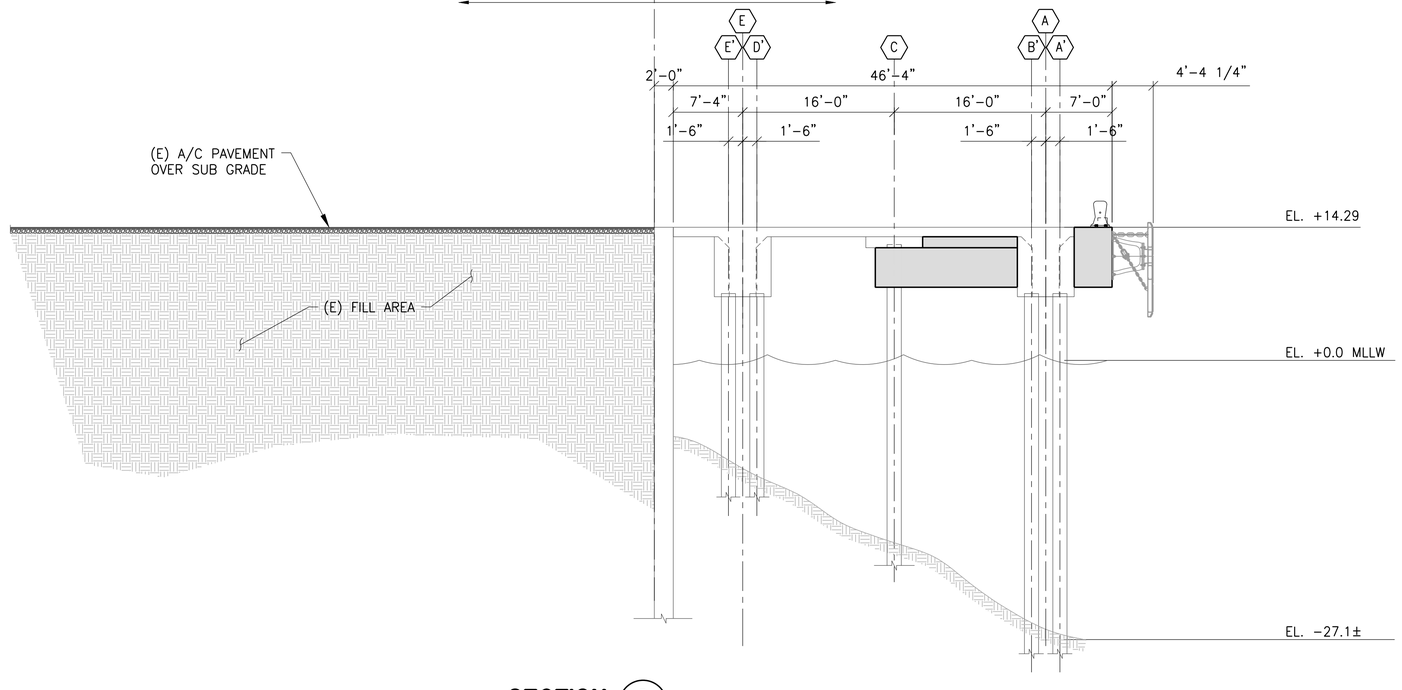
Project No.	2525				
By	SL/ALH	Checked	EGS	Sheet No.	K1
Approved	EGS			of	1
Date	7/25/25			Revision	0



SECTION A S1.2
1/8" = 1'-0"

WHRF_SEC2 1

NOTE:
AT BOLLARD USE ALTERNATE BOLLARD SUPPORT DETAILS SHOWN ON SHEET S4.13 PER PORT'S DIRECTIVE. 1



SECTION B S1.2
1/8" = 1'-0"

SEE SECTION A/S1.2 FOR INFORMATION NOT SHOWN

No.	Revision	Date	By	Checked	Approved
1	ISSUED FOR CONSTRUCTION	5/19/10	AH	TG	SL

WHRF_SEC3 1

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

ISSUED FOR CONSTRUCTION

PRINTED
1/24/2012
LIFTECH CONSULTANTS INC

Liftech
LIFTECH CONSULTANTS INC.

POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

TYPICAL WHARF SECTIONS

Project No. Z1800
By AH Checked TG/EGS Sheet No. S1.2
Approved SL of ----
Date 01/25/10 Revision 1

I:\Z1800\Dwg\Current\S1.2 TYPICAL WHARF SECTIONS.dwg 1/24/2012 3:35 PM ALVIN HOFFPAUIR

The team has recommended a total of eleven (11) improvement projects to the existing infrastructure that address critical repairs needed to restore and support ongoing operations and potentially support the expansion of operations. An abbreviated table that highlights the proposed projects in order of priority (from most critical to least critical) is shown in Table 3. Refer to Table 4 and Table 5 for project details.

Preliminary cost estimates for each of these improvement projects were developed to a Class 5 accuracy level (-30%/+50%) and are included in Table 2. Note that these budgetary estimates are based on 2025 labor and material costs and do not include escalation for work performed in the future and tariff impacts.

Table 3 Prioritized List of Proposed Projects

Priority Number	Location	Description	Schedule
1	Berth 7	Broken Beam Retrofit	Immediate / Priority
2	Berths 5-6	Pavement Settlement Repair at Wharf Interface	Immediate / Priority
3	Graving Basins	Safety Improvements Project	Near-term
4	Berths 7-8	Seismic Tie Beam Support Stabilization	Near-term
5	Berths 7-8	Pavement Settlement Repair at Wharf Interface	Near-term
6	Graving Basins	Mooring and Fender System Upgrades	Mid-term
7	Berths 7-8	Wharf Repairs	Long-term
8	Finger Piers	Fender System Upgrades	Long-term
9	Finger Piers	Concrete Repairs	Long-term
10	Graving Basins	Concrete Repairs	Long-term
11	Berths 5-6	Wharf Repairs	Long-term

Immediate/Priority (within 1 year)
Near-term (within 2 years)
Mid-term (within 3-6 years)
Long-term (within 6-10 years)

Table 4 Preliminary Cost Estimates (Berths 5-8)

Location	Description		Schedule	Cost Total (Rounded)
Berths 5-6	Project 1 Pavement Settlement Repair at Wharf Interface	• Furnish and install sheet pile walls • Furnish and install concrete beams • Excavate and control density fill • Repair damaged pavement caused by sheet pile wall construction	Within 1 year	$1,600,000
	Project 2 Wharf Repairs	• Repair concrete damage at diagonal struts on each side of the waterside rail beam • Repair concrete damage at the waterside and landside crane beams • Replace missing and damaged timber piles with concrete piers at timber pile supported deck at Berth 5 • Replace bollard and repair concrete-supporting bollard • Repair damaged concrete at the underdeck soffit and above deck	Within 6-10 years	$66,400,000
		Berths 5-6 Subtotal		**$68,000,000**
Berths 7-8	Project 3 Broken Beam Retrofit	•Alternate 1: Repair Broken Beam by installing piles on either side and directly beneath broken beam, installing support beams, and jacking the beam and slab to a level position. Add non-shrink grout for permanent beam support and replace missing and damaged timber piles •Alternate 2: Rebuild wharf deck by demolishing the section of slab affected by the broken beam and constructing a new wharf deck	Within 1 year	$1,200,000 (repair) or $5,000,000 (rebuild)
	Project 4 Seismic Tie Beam Support Stabilization	• Furnish and install steel pipe piles and support steel beams • Furnish and install steel beams and slab jacking • Add non-shrink grout for permanent beam support • Repair deck reinforcing and install grout or concrete. • Perform corrosion damage repair for the concrete tie-beam and seismic tie beam	Within 2 years	$4,600,000
	Project 5 Pavement Settlement Repair at Wharf Interface	• Furnish and install sheet pile walls • Furnish and install concrete beams • Excavate and control density fill • Repair damaged pavement caused by sheet pile wall construction	Within 2 years	$1,100,000
	Project 6 Wharf Repairs	• Remove and dispose of some existing bollards, all existing fenders, and all temporary bullrails • Furnish and install new fenders and bollards • Repair damaged wharf deck and repair/replace damaged piles at the traffic loading areas • Furnish and install sheet piles	Within 6-10 years	$130,000,000
		Berths 7-8 Subtotal		**$136,900,000**
		Total Costs		**$204,900,000†**

†Total cost assumes repair for broken beam retrofit, not rebuild

Table 5 Preliminary Cost Estimates (Graving Basins and Finger Piers)

	Description		Schedule	Cost Total (Rounded)
Graving Basins	Project 7 Safety Improvements Project	• Temporary shoring at columns with severe damage ratings • Install steel covers for small holes throughout the structures and barricade open ends of structures • Short term action by restricting access and long-term environmental survey, including development of an environmental assessment report and waste disposal	Within 2 years	$250,000
	Project 8 Mooring and Fender System Upgrades	• Install (16) (50-ton capacity) bitts per basin, including reinforcement of deck area • Install (16), 5x10 ft floating foam fenders at each basin, assume anchoring to the top of the diaphragm	Within 3-6 years	$4,500,000
	Project 9 Concrete Repairs	• Repair of columns with major damage; removing spalled concrete, cleaning corroded steel, bush hammering the surrounding concrete, fiberglass formwork (to remain in place), and pouring the new concrete • Reconstruction of all columns with severe damage • Shotcrete repairs to address soffit damage throughout structures	Within 6-10 years	$4,750,000
		Graving Basin Subtotal		**$9,500,000**
Finger Piers	Project 10 Fender System Upgrades	• Install new fendering on both longitudinal faces of the piers to provide near and continuous fendering, accommodating a wider range of vessel sizes •Two options were considered: (1) Fiber-reinforced polymer (FRP) composite piles with HDPE-sheath and (2) Steel pipe piles with 50-ft FRP camels and leg fenders at every pile Note: Cost estimate is average of both options	Within 6-10 years	$3,100,000
	Project 11 Concrete Repairs	• Beam soffit repairs • Replace center pile at south end of finger pier structure • End-of-pier fender system to protect against vessel impacts • Pile repairs: jacket and grout piles with major damage (non-structural fiberglass jackets to remain in place)	Within 6-10 years	$10,240,000
		Finger Piers Subtotal		**$13,340,000**
		Total Costs		**$22,840,000**