moffatt & nichol

# PORT OF RICHMOND

## Point Potrero Marine Terminal

## Condition Assessment Report

Produced for the Port of Richmond
August 22, 2025

# Document Verification

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# 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.

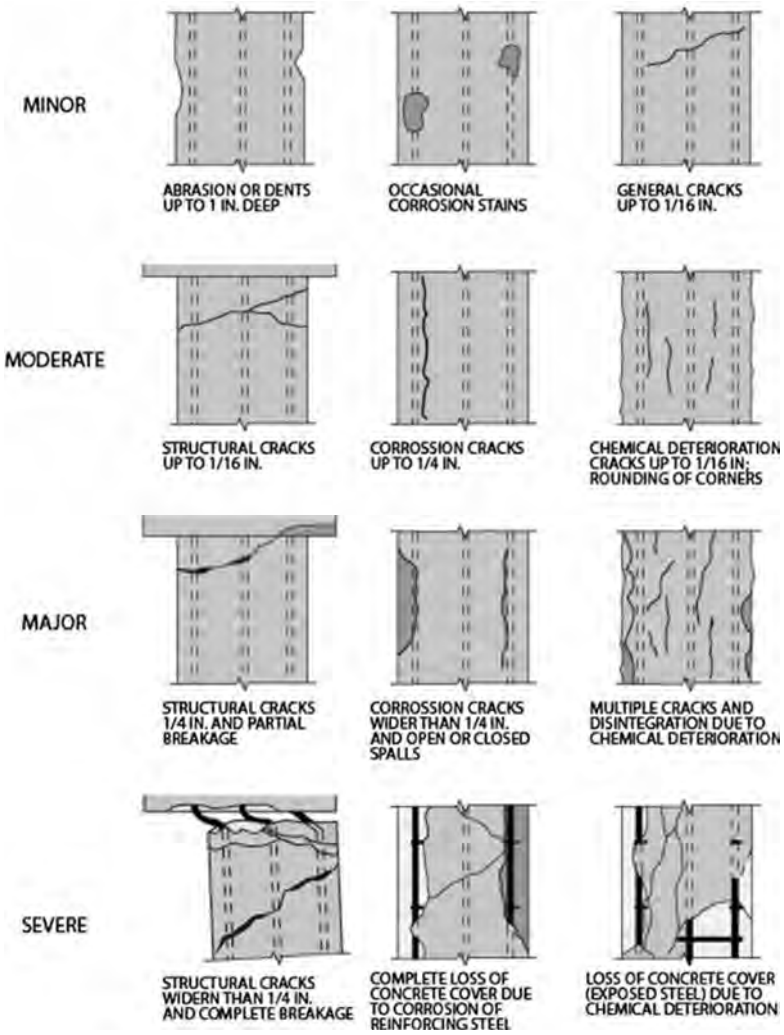



*Figure 3 Damage Ratings for Reinforced Concrete Elements (per ASCE MOP 130)*

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.

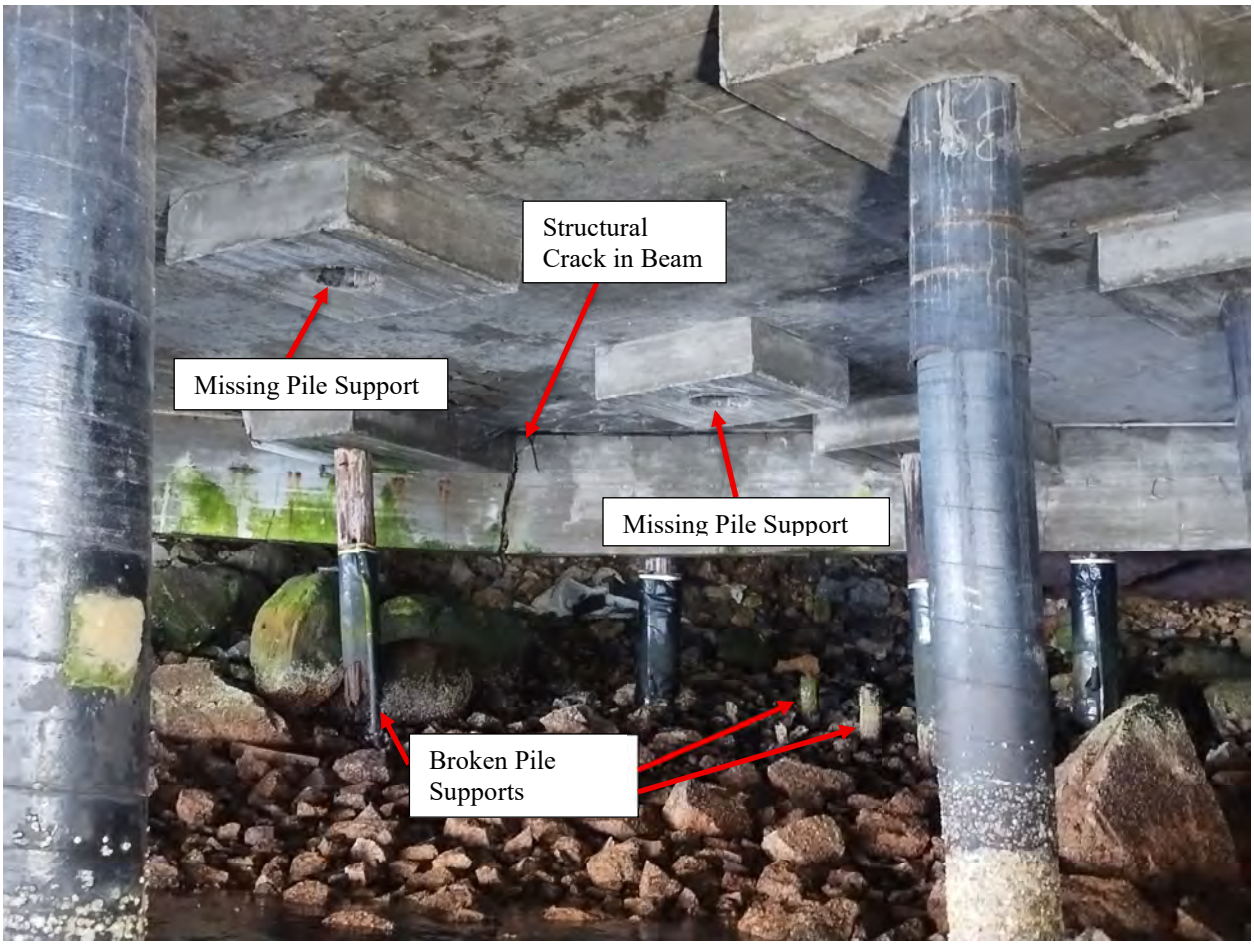



*Photo 1 Broken Beam at Southern Limit of Berth 7*

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)*<br><br>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)<br><br>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

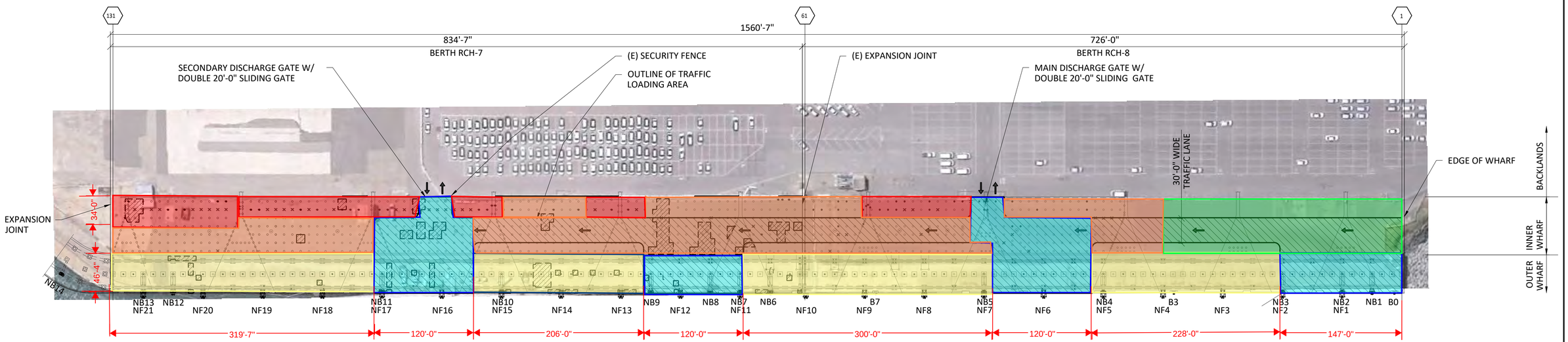
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# APPENDIX K - WHARF DECK ALLOWABLE LIVE LOAD




## WHARF PLAN

### WHARF LEGEND

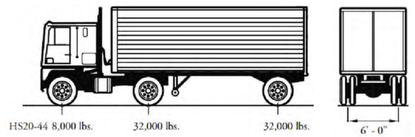
| | |
|---|---|
| BX | (E) BOLLARD TO REMAIN |
| NBX | (N) BOLLARD |
| | TRAFFIC LOADING AREA |
| NFX | (N) FENDER |

### 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

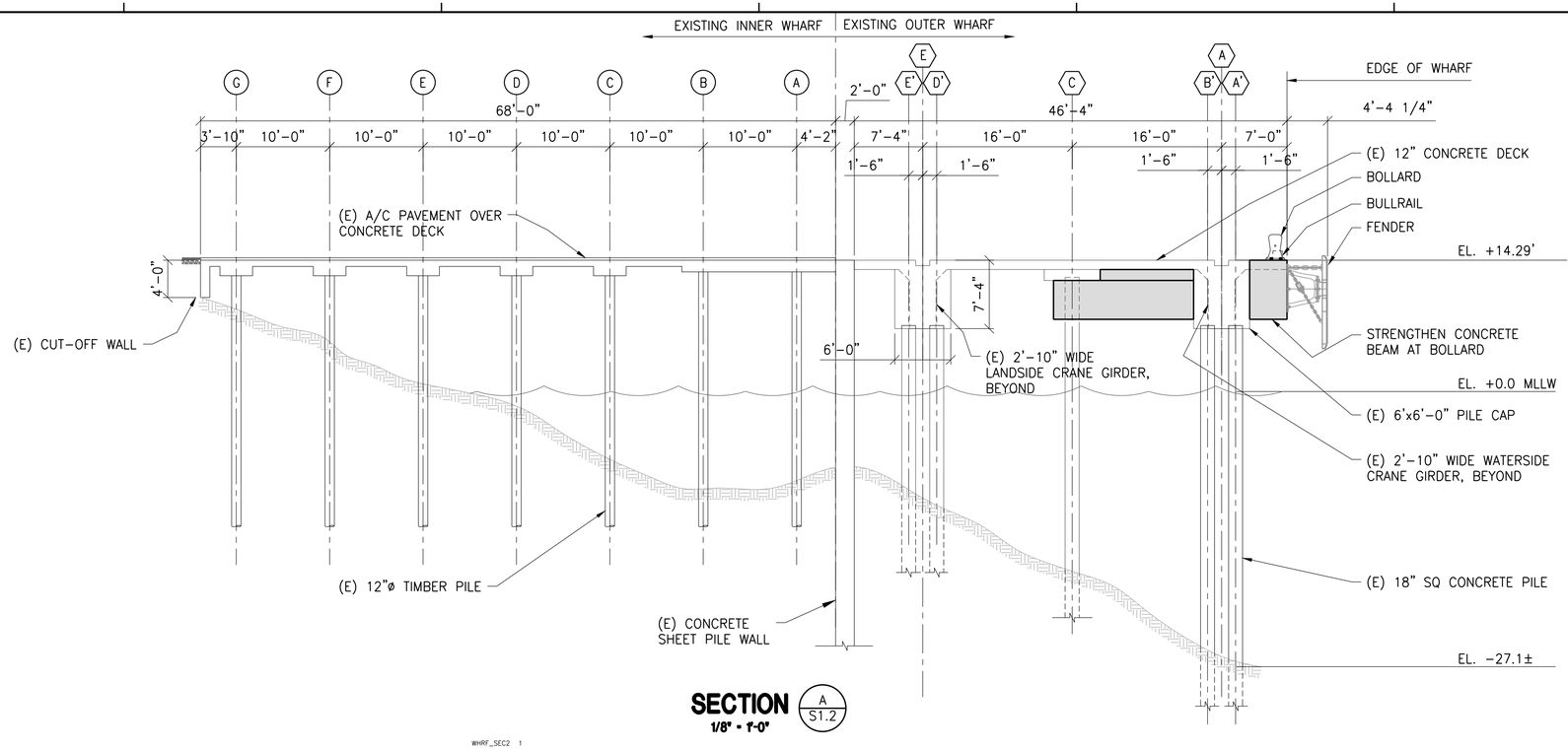
| No. | Revision | Date | By | Checked | Approved |
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| 1 | REVISON | ##/##/## | XX | XX | XX |

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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 |

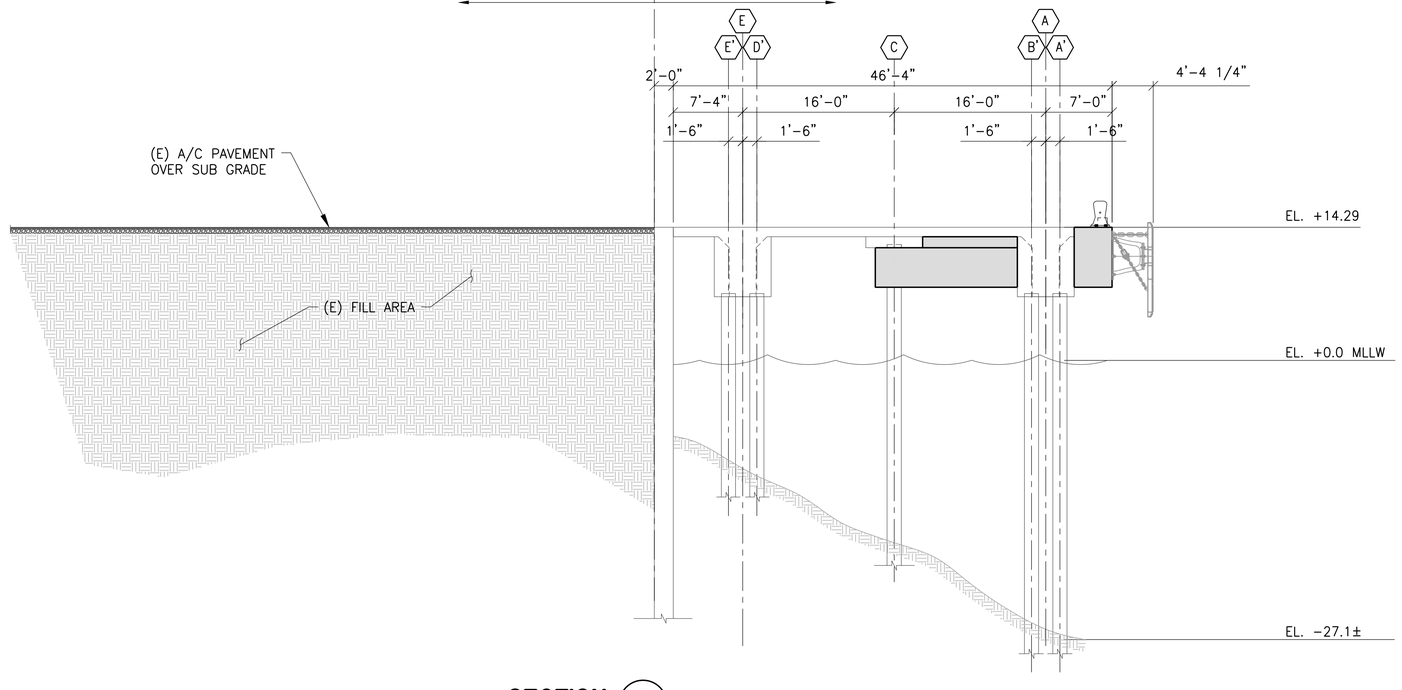
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**SECTION** A S1.2
1/8" = 1'-0"

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<br>• Furnish and install concrete beams<br>• Excavate and control density fill<br>• 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<br>• Repair concrete damage at the waterside and landside crane beams<br>• Replace missing and damaged timber piles with concrete piers at timber pile supported deck at Berth 5<br>• Replace bollard and repair concrete-supporting bollard<br>• 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<br>•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<br>• Furnish and install steel beams and slab jacking<br>• Add non-shrink grout for permanent beam support<br>• Repair deck reinforcing and install grout or concrete.<br>• 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<br>• Furnish and install concrete beams<br>• Excavate and control density fill<br>• 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<br>• Furnish and install new fenders and bollards<br>• Repair damaged wharf deck and repair/replace damaged piles at the traffic loading areas<br>• 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<br>• Install steel covers for small holes throughout the structures and barricade open ends of structures<br>• 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<br>• 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<br>• Reconstruction of all columns with severe damage<br>• 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<br>•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<br>Note: Cost estimate is average of both options | Within 6-10 years | $3,100,000 |
| | Project 11 Concrete Repairs | • Beam soffit repairs<br>• Replace center pile at south end of finger pier structure<br>• End-of-pier fender system to protect against vessel impacts<br>• 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** |

# 2. Project Background

## 2.1. Facility Description

Point Potrero Marine Terminal (PPMT) is the former Historic Shipyard Number 3 at the Port of Richmond. The facility was originally constructed between 1941 and 1942 as one of four shipyards where Liberty and Victory ships were constructed during World War II. Immediately following the war, Shipyard No. 3 was converted to a ship repair facility and was rehabilitated in 2009 into a state-of-the-art Roll On/Roll Off (RoRo) terminal for the import of automobiles. This assessment is focused on the conditions of Berths 5-8, the graving basins, and the finger piers at PPMT. Berths 5 and 6 have seen limited use over the last forty years and are primarily used as lay berthing currently. Berths 7 and 8 are an active area, currently leased to Auto Warehousing Company for the import of vehicles from Korea and Japan and is the primary use of the PPMT today. The graving basins and finger piers are used for the berthing of vessels such as the Red Oak Victory ship and other operating commercial vessels in support of the tenants' maritime operations, including harbor towing, marine transportation, marine spill response, marine construction, vessel repairs, and vessel lay berthing. Finally, the Richmond Museum Association owns a wheeled revolver crane, referred to as the Whirley Crane, which is currently stored at the PPMT. Although the crane itself has been inoperable for several decades, it was once a critical piece in the shipbuilding efforts that took place during World War II.

## 2.2. Project Goals and Objectives

Both the Port of Richmond and City Council have an invested interest in the Port's potential as an economic engine for the City of Richmond (City). This condition assessment is the first step in support of long-term, strategic planning to align the Port's practices with the long-term goals of the City. The project team was first tasked with assessing the general condition of all structures at PPMT and assigning condition ratings. The project team used these condition ratings to develop a prioritized list of projects that the Port can invest in and complete over the next 5 to 10 years. This included providing input on the sequencing of necessary repairs and upgrades in terms of critical infrastructure needs and accommodation of current operational activities and variables. Additionally, the team developed preliminary cost estimates of these proposed projects that will either support ongoing operations or expand those operations to increase Port revenue long-term.

# 3. Inspection Summary

Structural inspections were performed per American Society of Civil Engineers Manuals and Reports on Engineering Practice No 130, *Waterfront Facilities Inspection and Assessment*. Above-water, underdeck and above-deck inspections were performed. No underwater inspection was performed; the inspection was visual / tactile only (no material testing/sampling was performed).

An inspection team consisting of Liftech, Power Engineering Construction (Power, PEC), and ENGEO staff performed inspections of Berths 5-8 between March 18 and 19, 2025. On March 18, Liftech performed above-water inspections the outer wharf conditions including piles, soffit, face beams, sheet pile walls, and fenders using a work boat provided by PEC. Additionally, Liftech observed bollard and pavement conditions from above deck. ENGEO's assessment of the structure was limited to below deck and above water. On March 19, Liftech observed the inner wharves. As the inner wharf of Berths 7 and 8 is a confined space, Power provided safety training and supervision for working within this confined space. Liftech observed the timber piles, soffit, beams, and seismic tie beams. ENGEO observed the embankment that caused the pavement failure from above deck. Specifics of this inspection can be found in Attachment 8.2.

M&N staff performed inspections of the Graving Basin and Finger Pier structures on five separate days between February 27 and April 25, 2025.

The inspection was divided into two parts:

1) An "above water" visual and tactile inspection was performed from a small work boat. The exterior face and exterior columns of the graving basin structures and the concrete piles, beams, and underside of deck of the finger piers were observed. No destructive testing was performed as part of this inspection effort.

2) An "above deck" visual and tactile inspection was performed by walking inside the graving basin structures and on the topside of the deck of both basin and finger pier structures to observe the general condition. No destructive testing was part of this inspection effort.

Details of this inspection can be found in Section 5.

On March 27, 2025, Liftech staff performed a visual assessment of the Whirley Crane. Details of this inspection are included in Attachment 8.3.

# 4. Inspection Results

The inspection findings summarized below have informed the projects that the team recommends the Port of Richmond pursues in order to continue and potentially expand operations. Details of the inspection findings for Berths 5-8 can be found in Section 8.2. Details of the Whirley Crane assessment can be found in Section 8.3. Details of the inspection findings for the graving basin and finger piers are Attachment 8.4.

## 4.1. Graving Basins

The graving basin structures are rated as fair overall. Various levels of concrete deterioration were observed at the graving basin structures through cracks, exposed reinforcing steel, and delaminations. However, the overall condition rating for the graving basin structures is fair due to the large bearing capacity of the rock foundation. The condition rating of structural components is summarized in Table 6.

*Table 6 Condition Rating Summary: Graving Basins*

| Structure or Structural Element | Condition Rating |
|---|---|
| Columns | Fair to Poor |
| Slab and Soffit | Fair to Poor |
| Deck | Fair to Poor |
| Overall Structure | Fair |

## 4.2. Finger Piers

The finger pier structures are rated as fair to poor. The inspection team observed concrete delaminations, spalling, and exposed reinforcing at the soffit and up to 50% of the exterior face at the deep longitudinal and transverse beams at the finger piers. This is likely due to the continual exposure of the beams during high tide levels. Additionally, the internal row of piles typically exhibited moderate to major damage, and two piles at the south ends of the piers exhibited severe damage likely due to impact. The finger piers were rated as fair to poor due to structural deterioration of deep beams, which are typically delaminated and spalled with exposed reinforcing. The condition rating of these structures and their components is summarized in Table 7.

*Table 7 Condition Rating Summary: Finger Piers*

| Structure or Structural Element | Condition Rating |
|---|---|
| Piles | Fair to Poor |
| Beams | Poor |
| Soffit | Good |
| Deck | Fair |
| Overall Structure | Fair to Poor |

## 4.3. Berths 5-6

The structure at Berths 5-6 is in poor condition. There is corrosive damage of several structural elements throughout the wharf structure, including face and crane beams, concrete struts, and steel piles. The double bitt bollards are severely corroded and have limited capacity. The inspection findings are discussed in detail in Attachment 8.2.

## 4.4. Berths 7-8

The overall condition rating at Berths 7 and 8 ranges from poor to serious. The beam failure at the southernmost tip of Berth 7 is due to overloading caused by severely deteriorated/broken timber pile supports. Additionally, seismic tie beam failure and pavement settlement are caused by various missing

and damaged piles and soil erosion. Damage was observed throughout the structure at concrete and timber piles, the wharf soffit, the concrete sheet pile wall, crane girders, and face beams and seismic tie beams. Damage observed includes corrosion damage with exposed reinforcing. The inspection findings are discussed in detail in Attachment 8.2.

## 4.5. Whirley Crane Assessment

Liftech completed a visual assessment of the Whirley Crane. The team found that the primary crane structure has extensive corrosion and coating system failure, mostly minor with some localized areas with major corrosion and other damage. Some secondary structures including ladders, railings, and gratings are hazards for access and falling due to major or severe corrosion damage; **public access on or under the crane should not be allowed**. Overall, the crane is obsolete, has negative value, and is not practical to restore for operation. The team provided recommendations for immediate, short-term, and long-term actions regarding the crane and accompanying cost estimates, detailed in Attachment 8.3.

# 5. Repair Recommendations

Based on the findings from the inspection reports, the team has worked to develop eleven (11) potential projects that address critical repairs needed to restore and support ongoing operations as well as improvements to existing infrastructure that can support the expansion of operations with minimal capital investment. Class 5 conceptual estimates with an expected accuracy range of +50% to -30%, appropriate for early-stage planning were developed through collaborative work using Engineer input, estimator judgment, and high-level assumptions to define scope and costs. As the project scope evolves, the estimate should be refined to improve accuracy. All pricing is based on 2025 labor and material costs and does not include escalation for work performed in the future years and tariff impact. Details of the cost estimate methodology and assumptions used are included in Attachment 8.2 for Berths 5-8 and Attachment 8.5 for the Graving Basins and Finger Piers.

## 5.1. Berths 5-6

### 5.1.1. Pavement Settlement Repair

During site inspections at Berths 5-6, it was identified that the pavement behind the wharf has settled due to soil erosion. Work to stabilize the soil and prevent further pavement settlement includes the following scope:

1. Furnish and install sheet pile walls.
2. Furnish and install concrete beams.
3. Excavate and control density fill.
4. Repair damaged pavement caused by sheet pile wall construction.

### 5.1.2. Wharf Repairs

The objective of this project will be to repair the damaged concrete at various areas around Berths 5-6, restoring the structure to the original design intent. The scope of work includes the following:

1. Repair concrete damage at diagonal struts on each side of the waterside rail beam.
2. Repair concrete damage at the waterside and landside crane beams.
3. Replace missing and damaged timber piles with concrete piers at timber pile supported deck at Berth 5.
4. Replace bollard and repair concrete-supporting bollard.
5. Repair damaged concrete at the underdeck soffit and above deck.

## 5.2. Berths 7-8

### 5.2.1. Broken Beam Retrofit

Structural inspections determined that the sagging slab at the southern limit of Berth 7 is caused by beam failure below. Additionally, there are many damaged and missing timber piles, so the substructure does not provide adequate support. Immediate action should be taken to restore the beam to its original position and strength. Two alternative projects have been recommended. Alternate 1 is a repair concept which consists of the following scope of work:

1. Repair the broken beam by installing piles at (3) locations, installing support beams, and jacking the beam and slab to a level position.
2. Add non-shrink grout for permanent beam support.
3. Replace the missing and damaged timber piles.

Alternate 2 is a rebuild concept consisting of the following scope of work:

1. Demolish the section of slab affected by the broken beam.
2. Construct a new wharf deck, assuming 9,000 square feet of concrete-pile supported wharf deck.

### 5.2.2. Seismic Tie Beam Support Stabilization

The tie beam support at Berths 7-8 is overstressed due to missing and damaged adjacent piles. Additionally, some settlement was observed at the pavement surface. The scope of work to stabilize the seismic tie beam supports includes the following:

1. Furnish and install steel pipe piles and support steel beams.
2. Furnish and install steel beams and slab jacking.
3. Add non-shrink grout for permanent beam support.
4. Repair deck reinforcing and install grout or concrete.
5. Perform corrosion damage repair for the concrete tie-beam and seismic tie beam.

### 5.2.3. Pavement Settlement Repair

The pavement failure at Berths 7 and 8 is caused by soil erosion behind the wharf. Liftech performed work in 2010 that identified segments of at the wharf that require soil settlement stabilization to prevent further pavement settlement at the landside edge of the inner wharf. The scope of work includes the following:

1. Furnish and install sheet pile walls.
2. Furnish and install concrete beams.
3. Excavate and control density fill.
4. Repair damaged pavement caused by sheet pile wall construction.

It should be noted that these repairs are less urgent than those at Berths 5-6 due to the area at Berths 7-8 being more protected and not widely used.

### 5.2.4. Wharf Repairs

A project to address general wharf repairs at Berths 7-8 would address areas around the structure:

1. Remove and dispose of some existing bollards, all existing fenders, and all temporary bullrails.
2. Furnish and install new fenders and bollards.
3. Repair damaged wharf deck and repair/replace damaged piles at the traffic loading areas.
4. Furnish and install sheet piles.

*Table 8 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<br>• Furnish and install concrete beams<br>• Excavate and control density fill<br>• 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<br>• Repair concrete damage at the waterside and landside crane beams<br>• Replace missing and damaged timber piles with concrete piers at timber pile supported deck at Berth 5<br>• Replace bollard and repair concrete-supporting bollard<br>• 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<br>•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<br>• Furnish and install steel beams and slab jacking<br>• Add non-shrink grout for permanent beam support<br>• Repair deck reinforcing and install grout or concrete.<br>• 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<br>• Furnish and install concrete beams<br>• Excavate and control density fill<br>• 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<br>• Furnish and install new fenders and bollards<br>• Repair damaged wharf deck and repair/replace damaged piles at the traffic loading areas<br>• 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

## 5.3. Graving Basins

### 5.3.1. Project 1: Safety Improvements

A safety improvements project would address load restrictions at areas where exterior columns are severely damaged and potential environmental and safety hazards, including large holes in the deck not properly covered, and large quantities of points, solvents, and other environmentally hazardous chemicals stored with no visible methods of containment. The scope of this project includes the following:

1. Crib the edge beams at locations where columns are severely damaged, consisting of 12x12 mass timber members, with two beams per vertical column that will comply with applicable load restrictions.
2. Install steel covers at holes located towards the south ends of the basin fingers and securely barricade the structures where the south ends are completely open.
3. Implement short-term actions by restricting access to areas where there is storage of paints, solvents, and other chemicals. Long-term environmental survey and waste disposal will require the development of an environmental assessment report to quantify existing contamination throughout the structures and plan for removal.

### 5.3.2. Project 2: Mooring and Fender System Upgrades

A project to upgrade the existing mooring and fender systems at the graving basins will eliminate the usage of exterior columns as mooring/fendering points, thus preventing future damage. The scope of this project includes the following:

1. Remove existing mooring bitts no longer in use and install (16) 50-ton capacity bitts per basin at the same locations.
2. Install (16) 5x10 ft floating foam fenders per basin that are anchored to the top of the deck diaphragm.

### 5.3.3. Project 3: Concrete Repairs

The Port should plan to fund a project to provide general, non-critical concrete repairs at the graving basins. These repairs will prevent further deterioration of the various concrete elements throughout the structure. The scope of this project includes:

1. Address concrete spalling, cracks, and exposed reinforcing steel of columns with major damage by removing the spalled concrete, cleaning corroded steel, bush-hammering the surrounding concrete, and adding fiberglass formwork (to remain in place) before pouring the new concrete.
2. Full reconstruction of all columns with severe damage.
3. Provide shotcrete repairs to address soffit damage at various locations throughout the finger structures.

It should be noted that M&N recommends that a dive inspection be performed prior to any concrete repair efforts of the graving basin walls to assess the extent of structural damage.

## 5.4. Finger Piers

### 5.4.1. Project 4: Fender System Upgrades

The Port should plan to upgrade the fender systems at both finger pier structures. The scope of this project includes:

1. Install new continuous fendering on both longitudinal faces of the piers to accommodate a wider range of vessel sizes.

### 5.4.2. Project 5: Concrete Repairs

This project will address the corrosion and soffit damage on the deep beams and piles with major damage through non-critical concrete repairs. Its scope includes:

1. Perform beam soffit repairs on the longitudinal and transverse beams to address delaminations and spalling. Concrete repairs should include anodes to prevent future corrosion of reinforcing steel as a result of exposure at high tide levels.
2. Install non-structural fiberglass jackets and grout piles with major damage.
3. Remove and replace center pile severely damaged, likely through impact.
4. Provide composite FRP fender piles at the south end of the finger pier structures to prevent further impact damage to piles.

*Table 9 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<br>• Install steel covers for small holes throughout the structures and barricade open ends of structures<br>• 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<br>• 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<br>• Reconstruction of all columns with severe damage<br>• 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<br>•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<br>Note: Cost estimate is average of both options | Within 6-10 years | $3,100,000 |
| | Project 11 Concrete Repairs | • Beam soffit repairs<br>• Replace center pile at south end of finger pier structure<br>• End-of-pier fender system to protect against vessel impacts<br>• 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** |

# 6. Load Rating

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 load rating results for each structure is included in Table 10. Details for the Berth 5-8 load ratings are included in Attachment 8.2. Detailed calculations for the graving basin and finger pier structures are included in Attachment 8.6.

*Table 10 Load Rating Summary*

| Structure | Allowable Live Load |
|---|---|
| Berths 5-6 | Not Evaluated |
| Berths 7-8 | 50 psf except for at ramp loading areas:<br>(200 psf Inner Wharf,<br>390 psf Outer Wharf)<br><br>AASHTO HS20-44 Vehicle Load |
| Graving Basins | 550 psf without load spreading (deck capacity controls)<br><br>2000 psf with load spreading that puts load directly into columns |
| Finger Piers | 500 psf† |

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

# 7. Geotechnical Characterization Report

ENGEO provided a report to characterize the subsurface conditions at PPMT based on field assessments, existing construction documentation, geotechnical reports, and other documents for geotechnical and geological data. The Berth 7 area is underlain by Young Bay Mud over a thin layer of sandy clay atop bedrock. At Berth 8, there is Young Bay Mud and a layer Old Bay Clay below the sandy clay. The graving basins sit on excavated bedrock or lean cement fill placed on top of bedrock. The area around the finger piers is underlain by Young Bay Mud (likely on the order of 20 feet thick) over bedrock. The team did not observe any areas of potential slope movement or obvious slope instability.

Additionally, ENGEO provided estimates of foundation capacity for the purpose of evaluating existing conditions and planning upgrades. In general, retrofit piles should be driven to refusal in bedrock in order to achieve significant capacity. The preliminary capacities are 100 kips per square foot of end area for concrete or timber piles and 600 kips for steel pipe piles. In areas of Berth 8 an additional capacity of 700 pounds per square foot (psf) of surface area could be achieved in skin friction in the Old Bay Clay. If greater capacity is necessary, predrilling approximately 10 feet into the bedrock prior to driving piles to refusal would achieve a higher end bearing capacity. These capacities assume dead-plus-live loading and should be reevaluated based on pile location once a pile demand is developed. Based on rock outcrops, the bearing capacity at the graving basins is an estimated 8,000 pounds per square foot (psf) for dead-plus-live loading for elements bearing on the bedrock. For load combinations that include seismic loading, this allowable capacity can be increased to 10,500 psf.

ENGEO performed an underdeck geotechnical inspection at Berths 5-8 to assess the geotechnical conditions beneath the wharf area. The pavement settlement at Berth 5 is caused by the erosion of soil/weathered bedrock at the top of the slope below the wharf. Similarly, at areas below the deck of Berths 7 and 8, pavement settlement observed at the interface between the land and wharf is due to soil erosion in areas without a headwall. It is likely that the eroded soil at this area is utility trench backfill due to utility penetration. ENGEO recommends installing a confinement structure at the top of the slope to retain and protect fill from erosion and backfilling the area of lost ground so the pavement can be restored and stabilized.

Details of this report can be found in Attachment 8.6

# 8. List of Attachments

## 8.1. Berths 5-8 Condition Assessment Report

## 8.2. Whirley Crane Assessment

## 8.3. Graving Basin and Finger Piers Inspection Report

## 8.4. Detailed Cost Estimates – Graving Basins / Finger Piers

## 8.5. Load Rating – Graving Basins and Finger Piers

## 8.6. Geotechnical Characterization Report

## 8.1 Berths 5-8 Condition Assessment Report

# POINT POTRERO MARINE TERMINAL
# BERTHS 5 TO 8 WHARF CONDITION ASSESSMENT
# PORT OF RICHMOND
# FOR MOFFATT & NICHOL
# SITE VISIT DATE: MARCH 18 & 19, 2025















**August 22, 2025**
**Project 2525**

Liftech
LIFTECH CONSULTANTS INC.

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# POINT POTRERO MARINE TERMINAL
# BERTHS 5 TO 8 WHARF STRUCTURES CONDITION ASSESSMENT
# PORT OF RICHMOND

## FOR MOFFATT & NICHOL

## SITE VISIT DATE: MARCH 18 & 19, 2025

**Prepared by Liftech Consultants Inc.**

**August 22, 2025**

**Project No. 2525**

*Quality Assurance Review*
*for Liftech Consultants Inc.*

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## APPENDICES

Appendix A – Liftech Wharf Repair for Honda Project 2010

Appendix B – Vortex Pile Repair As-Built Drawings 2012

Appendix C – Berths 5–8 Original Drawings

Appendix D – Berths 7-8 and Part of 6 Inner Wharf Documentation Photographs

Appendix E – Berths 7–8 Outer Wharf Soffit Documentation Photographs

Appendix F – Berths 7–8 Outer Wharf Pile Documentation Photographs

Appendix G – Berths 5–6 Pile and Soffit Documentation Photographs

Appendix H – ASCE 130 Damage Rating Guidance

Appendix I – ENGEO PPMT Underdeck Geotechnical Inspection

Appendix J – Liftech Concept Repair Projects and Budgetary Cost Estimates

Appendix K – Wharf Deck Allowable Live Load

## EXECUTIVE SUMMARY

The purpose of the limited and cursory wharf condition assessment is to evaluate the wharf condition and assist the Port to prioritize the capital improvement projects based on the Port's needs and the repair costs. The following are initial conceptual level assessments of the condition and repairs, which will be refined in the next design phase after Port feedback.

Liftech engineered Berths 7 and 8 modifications and repairs in 2010 for TransDevelopment Group to support Ro-Ro automobile import operations.

Liftech Consultants Inc. and ENGEO Incorporated, as a subconsultant to Moffatt & Nichol (M&N), performed a limited above water visual inspection of Berths 5–8. Inspections and assessments are in accordance with ASCE 130 (see Appendix H).

### Berths 7 and 8

The wharf structure is rated between poor and serious in accordance with ASCE 130 Table 2-14. Damage was observed at concrete and timber piles, the wharf soffit (underside of superstructure), concrete sheet pile wall, crane girders, face beams, and seismic tie beams, i.e., all beams. The wharf has many missing and severely damaged timber piles. Many seismic tie beams have settled due to their compromised pile supports. Bollards and fenders are in satisfactory condition with limited localized damage.

There is a significant large area of deck depression observed from above at the southern end of Berth 7. The deck depression was caused by a broken concrete beam at adjacent Berth 6 as shown in Photograph 1. All load should be removed from the depressed deck and over the beam. No construction equipment should be located near the break. This beam repair requires new piling, jacking, and grouting for leveling support.



Photograph 1: Broken concrete beam, damaged and missing timber piles

Since the pile condition is similar to after the 2010 repair work where many damaged or missing piles were left unrepaired, the wharf deck loading limitation as shown in Liftech's 2010 construction drawings should be strictly enforced. This limits the allowed loading locations on the wharf deck as described in Figure 1 and below.

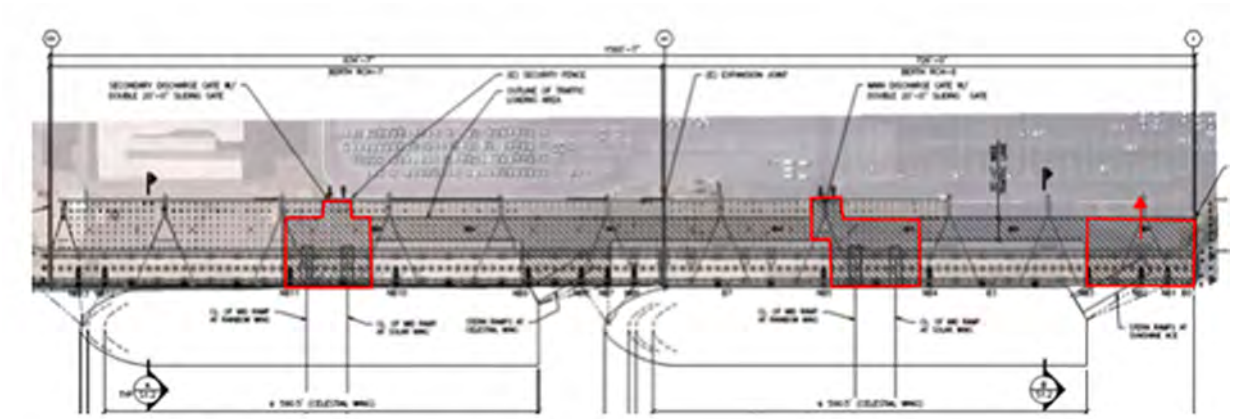


Figure 1: Automobile loading zone shown in cross hatch area, ship ramp landing zones in red

In 2010, the piles where the ship ramps land were repaired as indicated in red areas in Figure 1 above. These areas are adequate for the AASHTO design HS20-44 truck loading. Refer to Appendix K for the current justified allowable wharf deck live load.

Recommended repairs include seismic tie beam support piling at beams 4 through 7, repair of all severely damaged or missing piles, and corrosion repairs or mitigation based on further evaluation.

### Berths 5 and 6

The wharf at Berths 5 and 6 is in poor condition. There is significant corrosion damage ranging from major-to-severe throughout the wharf structure including face beams, concrete struts, soffit, crane beams, steel piles, and the concrete deck surface. Since Berths 5 and 6 have not been in operation, the wharf has not been subjected to cargo loadings, only its own weight. There is no effective fender system at Berths 5 and 6, only a couple of tires. The double bitt bollards are severely corroded, including the bolts and damage to the concrete base, and have limited capacity.

There is no significant structural distress except for a concrete beam at Berth 6 that is broken due to multiple support pile failures.

The pavement at the landside wharf edge has failed at several locations due to embankment erosion below. Refer to Appendix I for ENGEO's report for detailed clarification. This should be repaired by driving a steel sheet pile wall, backfilling, and repairing pavement.

This wharf has not been evaluated to determine an acceptable load capacity. If the Port plans for cargo handling operations, a structural evaluation will be required.

### All Berths

Considering the age of wharves and the significant damage, corrosion and pile damage repair and mitigation measures should be evaluated. One hundred percent (100%) Level 1 inspection including underwater pile inspection should be performed with future periodic inspections every three years for

Berths 7 and 8 and five years for Berths 5 and 6 to monitor the progression of the corrosion and piling damage.

Based on the severity of structural damage and repair priority, six projects are identified with repair priority and budgetary cost estimates as shown in Table 1.

**Table 1: Project Priority, Description, and Budgetary Costs**

Budgetary Cost Estimates Summary

| Project No: | Repair Priority | Descriptions | Budgetary Cost |
|---|---|---|---|
| 1 | Immediate/Priority | Berth 6 & 7 - Broken Concrete Beam Retrofit | **$1,200,000** |
| 2A | Immediate/Priority | Berths 5 & 6 - Sheet Pile Wall Installation and Pavement Settlement Repairs | **$1,550,000** |
| 2B | Near term | Berths 7 & 8 - Sheet Pile Wall Installation and Pavement Settlement Repairs | **$1,150,000** |
| 3 | Near term | Berths 7 & 8 - Seismic Tie-Beam Support Stabilization | **$4,600,000** |
| 4 | Long term - Based on usage and available funding | Berths 7 & 8 Damaged Concrete Piles, Beams, and Deck Repairs | **$130,000,000** |
| 5 | Long term - Based on usage and available funding | Berths 5 & 6 - Damaged Concrete Beams, Deck Repairs, and Missing Piles Replacement | **$61,000,000** |
| 6 | Long term - Based on usage and available funding | Berths 5 & 6 - Discrete Fender and Bollard Upgrades | **$5,400,000** |

Notes:

1. The budgetary cost is based on 2025 labor and material costs and does not include escalation for work performed in the future years and tariff impact.

Refer to Appendix J for detailed scope description for repairs and cost estimate breakdowns.

## INTRODUCTION

Point Potrero Marine Terminal (PPMT) is a major revenue generating facility for the Port of Richmond (Port).

In 2010, the Port undertook a major construction project to improve the PPMT yard facility into an automobile (auto) terminal with on-dock rail connection to the BNSF rail yard and the wharf structure at Berths 7 and 8 for berthing roll-on roll-off (Ro-Ro) auto carrier vessels to offload imported autos. An overview of the terminal is shown in Figure 2.




Figure 2: Point Potrero Marine Terminal overview

TransDevelopment Group was the project developer for Auto Warehouse Company (AWC), the current operator of the auto terminal. Liftech Consultants Inc. (Liftech), as a subconsultant to TransDevelopment Group, performed the wharf improvement design. Liftech retained Collins Engineers, Inc. to perform Berths 7 and 8 wharf inspections including underwater pile inspection. Liftech prepared the construction documents titled, "Point Potrero Wharf Repair for Honda Automotive Facility, Port of Richmond," dated January 25, 2010, for repairing damage in select areas and upgrading fenders and bollards. Refer to Appendix A. Vortex Marine Construction (Vortex) was the contractor who performed the repairs. Due to budget limitations, some wharf areas were not repaired and limits on traffic locations were specified. Refer to Appendix B for pile repair as-built drawings by Vortex. Refer to Appendix A, sheet S1.1 for the designated traffic areas.

In 2024, the Port retained Liftech, as a subconsultant to Moffatt & Nichol (M&N), to perform a condition assessment of Berths 7 and 8 and Berths 5 and 6. It was reported that a section of the wharf concrete slab between Berths 6 and 7 had settled. It was also reported that a section of the asphalt pavement had failed at the edge of the concrete wharf near the Rigger Loft building.

The purpose of assessment is to determine the wharf structure condition and develop priorities for capital improvements. ENGEO provided geotechnical advice.

Liftech performed two days of site condition review. The condition review was limited and cursory in nature, visual from above the water and from the top of the wharf deck. Underwater pile inspection was not performed. The inspection is intended to:

> Verify the previous, circa 2010, inspection findings by Collins Engineers, which are summarized in Liftech's construction documents listed in Appendix A.
>
> Identify and document any significant condition changes from the 2010 inspection.

## WHARF DESCRIPTION

Berths 5 to 8 were constructed in the 1940s and consist of an outer wharf and inner wharf. The inner wharf is intermittent at Berths 5 and 6.

### Berths 7 and 8 Structure

The outer waterside wharf for Berths 7 and 8 consists of a concrete deck supported by concrete piles. The inner landside wharf consists of a concrete deck supported by timber piles. There is a concrete sheet pile wall separating the outer and inner wharves. See Figure 3. Refer to Appendix A for additional wharf structure details.

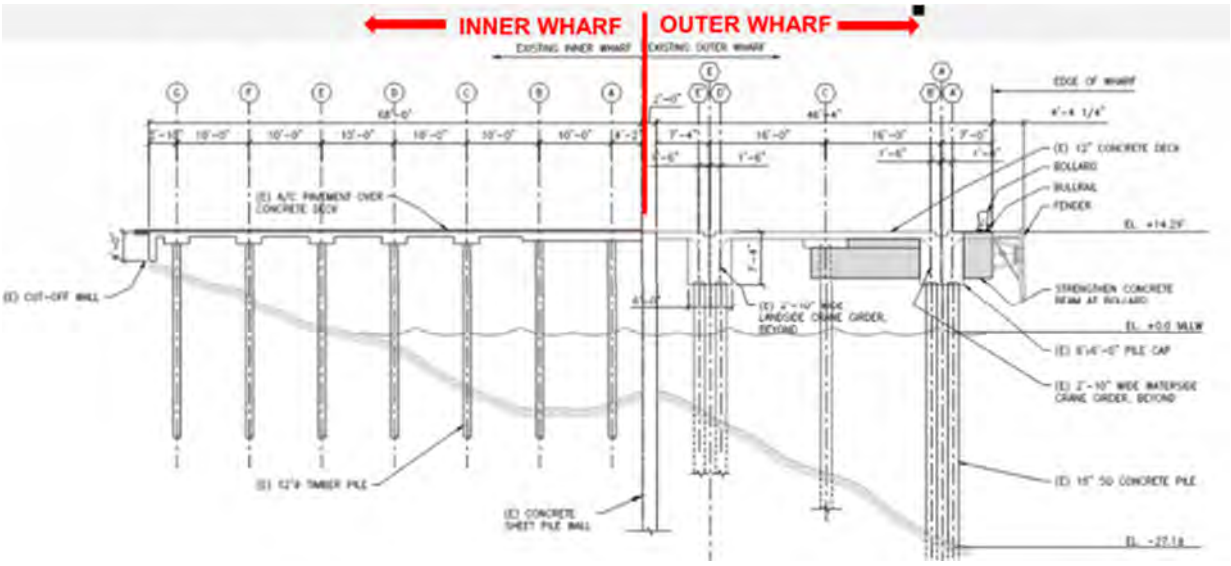



Figure 3: Berths 7 and 8 Wharf Cross Section, water to the right, fender and bollard strengthening beams in gray

The following photographs show the underside of Berths 7 and 8 inner and outer wharves:




Photographs 1 and 2: Berth 7 Inner Wharf Underside (left) and Outer Wharf Underside (right), water to right

It was observed that the fender and bollard strengthening beam between Rows B & C as shown in Figure 3 from the 2010 modification work was not installed.

**Berths 5 and 6 Structure**

The outer waterside wharf of Berths 5 and 6 consists of a concrete deck supported by steel piles spaced 36 feet on center. At some locations there is an inner wharf. At locations without an inner wharf, the outer wharf was constructed so it butted into the soil at its landside.

The inner landside wharf, not shown in the figure below, consists of a concrete deck supported by timber piles. However, there is no wall between the outer and the inner wharf. Concrete struts are provided spaced 18 feet along the waterside girder to support the cantilevered wharf deck. Refer to Appendices A and C for additional details of the wharf structure.

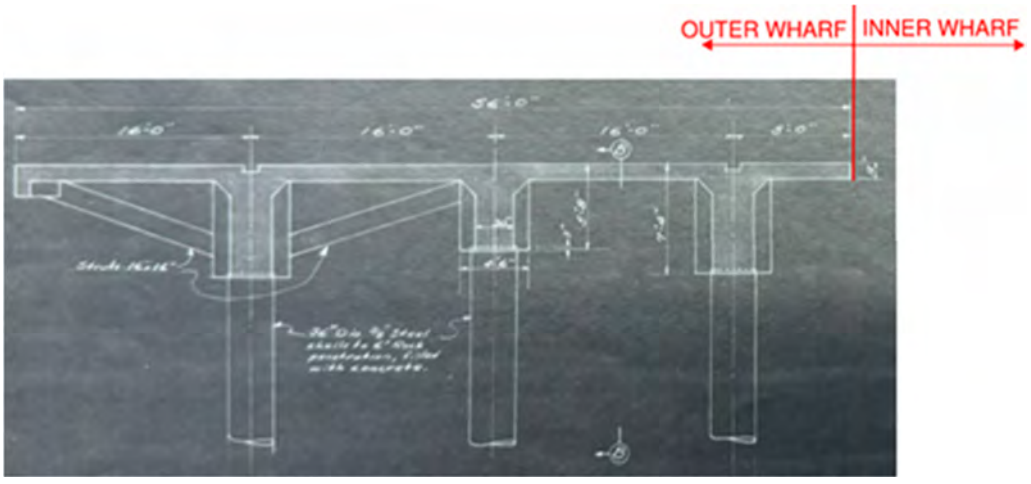



Figure 4: Berths 5 and 6 wharf cross section, water on the left side, inner wharf at some locations (not all)

This is what the outer and inner wharf boundary looks like at Berth 6:




Photograph 3: Inner and outer wharf boundary at Berth 6, water to left, inner wharf at some locations (not all)

### Berths 5 to 8 Fendering and Bollards

Berths 7 and 8 have cone fenders with front panels and double bitt bollards. Berths 5 and 6 typically have no fenders and some double bitt bollards from the original construction. There are a couple of locations with tire fenders.

## CONDITION ASSESSMENT SCOPE

Liftech and ENGEO conducted the following condition assessment on March 18 and 19, 2025.

> March 18 included the outer wharf from a boat, provided by Power Engineering Construction Company (PEC), to observe the outer wharf condition from above water including piles, soffit, face beams, sheet pile walls, and fenders. Liftech observed bollard and pavement conditions from above deck. ENGEO's assessment was limited to below deck and above water.
>
> March 19 included the inner wharves. The inner wharf of Berths 7 and 8 is a confined space with the entrance through a manhole. PEC provided safety training and supervision for working in the confined space. Liftech observed the timber piles, soffit, beams, and seismic tie beams. ENGEO observed the embankment that caused the pavement failure from on top of the deck.

On March 27, 2025, Liftech performed the above deck assessment for Berths 5 and 6 that included the wharf deck and bollards.

Underwater inspection was not performed.

## FINDINGS

### Berths 7 and 8

*General*

In 2010, Liftech prepared construction documents for Berths 7 and 8 wharf repairs that addressed areas that require repair, upgrade, or both. The work was performed primarily to address the auto carrier

vessel berthing requirements. The improvement work included upgrading bollards and fenders and repairing select piles and select wharf deck damage. Due to budget limitations, a significant amount of damage identified for repair was not repaired, e.g., piles, soffit areas, face beam areas. At the inner wharf, many damaged and missing piles were not repaired. The top concrete deck damage was covered by asphalt pavement. Due to the limited repairs, traffic areas were limited to portions of the wharf deck. Refer to drawing S1.1 in Appendix A.

In general, the repair work performed in 2010 to bollards, fenders, and concrete piles is in satisfactory condition with localized damage, such as missing UHMW panels at fender frontal panels. The wharf corrosion damage that was not repaired in 2010 has worsened. There are more missing piles than those left unrepaired in 2010. Overall, the outer concrete wharf is in poor condition, and the inner wharf is in poor-to-serious condition due to significant damage to the timber piles and missing piles.

*Concrete Deck Depression at Southern end of Berth 7*

A major longitudinal concrete beam supporting the inner wharf deck is broken, resulting in excessive settlement observable from above deck. The timber piles supporting the beam are compromised. Additionally, there are missing piles and damaged timber piles in the adjacent bays, adding more weight on the beam. The loss of pile support caused it to be overloaded, to break, and to displace. The impact of this beam failure that occurred at Berth 6 extends to the southern end of Berth 7, which has deflected downward. This is observable from the above deck. See Photograph 4.



Photograph 4: Broken concrete beam, damaged and missing timber piles

Photographs of select components and structures are provided below. See Appendices D, E, and F for more damage details including locations with images.

*Select Damage Locations*

Damage ratings have been assigned for each observed structural component and the overall wharf in accordance with ASCE Manuals and Reports on Engineering Practice No. 130 – Waterfront Facilities

Inspection and Assessment. Pertinent sections of the ASCE damage ratings are provided in Appendix H.

| Item | Damage Rating | Comments |
|---|---|---|
| 2010 Bollard | | |
|  | Moderate | Loss of coating and minor surface corrosion.<br>Concrete cracks at bollard base. |
| 2010 Fender | | |
|  | Moderate | Missing UHMW panels at several fender locations.<br>No damage observed at rubber fender cone.<br>Minor corrosion at some of the support chains. |
| Seismic Tie Beam Pavement Crack | | |
|  | Major | Some of the seismic tie beams project to the wharf deck as pavement cracks indicating downward displacement of some of the seismic beams. |

| Item | Damage Rating | Comments |
|---|---|---|
| Seismic Tie Beam Support | | |
|  | Severe | Missing support pile at seismic tie beam. |
|  | Severe | Concrete pier adjacent to seismic tie beam. The vertical cracking indicates overstressing. |
| 2010 Bull rail | | |
|  | Major | Section of concrete bull rail failed with exposed rebar. |
| 2010 Repaired Concrete Piles | | |
|  | No damage/defects observed at piles repaired in 2010. | Condition appears favorable; however, condition below water was not evaluated. |

| Item | Damage Rating | Comments |
|---|---|---|
| Damaged Concrete Piles – Outer Wharf | | |
|  | Major | Crack and delamination along pile corners (corrosion damage). |
| Missing Piles – Inner Wharf | | |
|  | Severe | Many missing piles. Inner wharf. Mostly in Row F and under tiebacks. Also see Appendix D. |
| Sheet Pile Wall | | |
|  | Major | Concrete cracking and delamination at wall (corrosion damage). |
| Interior Soffit Damage | | |
|  | Major | Corrosion damage with loss of concrete cover (spalling) and exposed corroded rebars. |

| Item | Damage Rating | Comments |
|---|---|---|
| Edge of Deck and Waterside Crane Beam Damage | | |
|  | Major | Corrosion damage with concrete spalling and exposed rebars. |
| Expansion Joint Beam Damage | | |
|  | Major | Corrosion damage with concrete spalling and exposed rebars. |

**Berths 5 and 6**

*General*

Berths 5 and 6 are currently not being used. There are no fendering systems except a few rubber tires mounted on the wharf face. The mooring bollard bitts have significant corrosion with significant concrete damage at the bollard bitts. There is significant corrosion damage to the concrete structure at the soffit, wharf face, deck support struts, and piles. The inner wharf has missing piles, soffit damage, a damaged beam, and eroding soil along the landside edge of portions of the outer wharf where there is no inner wharf. See sections below and Appendices D and G.

*Pavement Failure Along Landside Wharf Edge - Erosion*

Pavement is failing along portions of the landside edge of the outer wharf at locations without the inner wharf because the soil below is eroding.

Since there is no seawall to protect the soil, the soil has eroded causing the pavement to lose support. The gap between the concrete deck edge and the soil grew bigger over time, requiring steel plates covering the gap as shown in the photograph below. Refer to Appendix I for embankment soil failure in the ENGEO report.







Photographs 5 and 6: Below deck, erosion and pavement failure, outer wharf and water to left, land to right

*Select Component and Structure Damage*

| Item | Damage Rating | Comments |
|---|---|---|
| Berth 5 End Strut | | |
|  | Major | Loss of concrete cover with exposed corroded rebars.<br>Concrete spalling at bottom deck. |
| Face Beam, Diagonal Strut, Soffit, and Waterside Crane Beam | | |
|  | Major | Damaged face beam.<br>Corrosion damage with exposed corroded rebar at diagonal struts.<br>Concrete cracks and initial delamination at the bottom of the waterside crane beam. |

| Item | Damage Rating | Comments |
|---|---|---|
| Temporary Steel Pile Fendering | | |
|  | Major | Significant damage to the face beam, probably caused by vessel impact. |
| Spalled Beams and Struts | | |
|  | Major | Corrosion of concrete and rebar leading to spalling of beams and struts in multiple places. Outer wharf, Berths 5 and 6. |
|   | | |

| Item | Damage Rating | Comments |
|---|---|---|
| Waterside Crane Girder | | |
|  | Major | Concrete cracks at the bottom of the crane girder and concrete delamination. |
| Inner Wharf – Timber Piles Supported Wharf | | |
|  | Severe | Berth 5 missing a row of timber piles (5 total). Also piles missing under Berth 6 inner wharf. |
|  | Major | Same location as photograph above. Showing condition at wharf joint between Berth 5 inner and outer wharf |

| Item | Damage Rating | Comments |
|---|---|---|
| Damaged Soffit | | |
|  | Major | Corrosion damage with a section of concrete cover spalled with exposed corroded rebars. Multiple locations, Berths 5 and 6. |
| Damaged and Missing Timber Piles | | |
|  | Severe | Damaged and missing timber piles adjacent to the concrete deck joint. |
| Steel Piles | | |
|  | Major | Significant corrosion damage with wall thickness loss. |

| Item | Damage Rating | Comments |
|---|---|---|
| Bollards | | |
|  | Severe | Significant corrosion damage at bollard bitts and anchor bolts with spalled concrete base and exposed corroded rebars. |
| Top Deck | | |
|  | Major | Sections of the deck have corrosion damage with loss of concrete cover and exposed corroded slab rebars.<br>Some sections of the slab indicate concrete delamination. |
|  | Moderate | |
| Pavement Settlement at South End of Berth 5 | | |
|  | Major | Pavement settlement up to three (3) inches observed at the edge of the concrete deck. |

| Item | Damage Rating | Comments |
|---|---|---|
| Pavement Failure North of Berths 5 and 6 | | |
|  | Major | Pavement failure covered with steel plates. |
|  | Major | |

See Appendices for more details.

## DISCUSSION

### Berths 7 and 8

Overall, the outer concrete wharf is in poor condition and the inner wharf is in serious condition due to significant damage to the timber piles and missing piles.

Considering the current operations of offloading automobiles, which is a relatively light loading, the wharf loading limitation shown in the Liftech 2010 construction documents (Appendix A) and as shown in the cross hatch area in Figure 5 is still reasonable and shall be enforced. However, improvements to the support of some of the seismic tie beams should be implemented in the next couple of years.

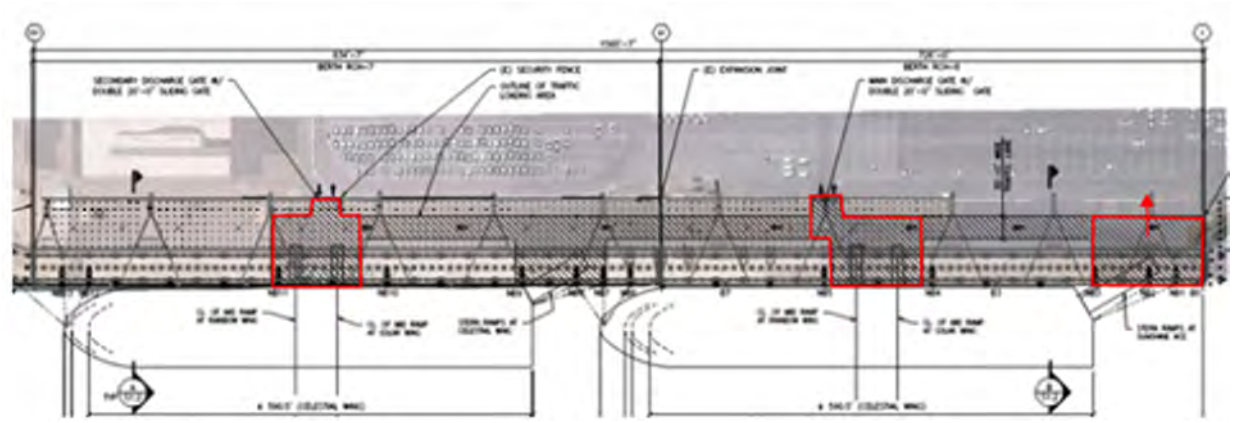


Figure 5: Automobile loading zone shown in cross hatch area, ship ramp landing zones in red

In 2010, the piles where the ship ramps land were repaired as indicated in red areas in Figure 1 above. These areas are adequate for the AASHTO design HS20-44 truck loading. Refer to Appendix K for the currently justified allowable wharf deck live loads.

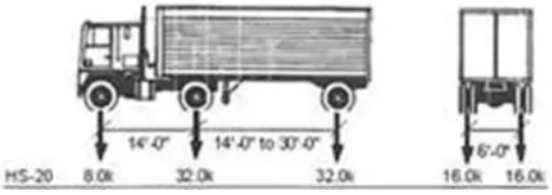



Figure 6: AASHTO HS20-44 design truck loading

Wharf deck slab thicknesses, typical pile spacings, and Liftech calculated allowable uniform live loads are provided below.

| Location – Ship Ramp Landing Zone | Slab thickness, inches | Pile spacing, ft | Uniform Loads, psf |
|---|---|---|---|
| Outer Wharf | 12 | 12 x 16 | 390 |
| Inner Wharf | 8 | 10 x 10 | 200 |

Notes:
1. The allowable loads do not apply to areas outside of ramp landing zone as the damaged and missing piles have not yet been repaired.
2. Capacities based on half of the top reinforcing not effective due to damage. Larger load capacities might be justified with more refined evaluation of the reinforcing damage and more refined calculations.

The broken beam that occurred at Berth 6 has significant impact to the deck capacity at the southern end of Berth 7. Any deck load in the impacted area that can be removed should be removed as soon as practical. Equipment loads should be prevented until shoring or repairs. Repairs should be made with immediate priority.

### Berths 5 and 6

Overall, the outer concrete wharf is in poor condition with significant corrosion damage at the top deck surface, underdeck soffit, face beam, diagonal concrete struts, crane beams, and interior concrete beams. The steel pipe piles have corrosion damage with thickness lost above the tidal zone.

The inner wharf that was supported by timber piles is in poor condition due to many missing and damaged timber piles.

The wharf has not been used for cargo handling for a long time and, as such, the current wharf structure has not been subjected to significant live loading, mostly its self-weight. We did not observe overstressing of structural members, such as excessive concrete wharf deflections, except the broken beam at Berth 6, which also has caused the deflection of the deck slab at the southern end of Berth 7.

This wharf has not been evaluated to determine an acceptable load capacity. If the Port plans for cargo handling operations, a structural evaluation will be required.

Repairs, including corrosion mitigation measures, should be evaluated based on planned berth usage.

## CAPITAL IMPROVEMENT PROJECTS PRIORITY

Based on the severity of structural damage and potential impact to operations, we recommend the following capital improvement projects:

| Project No: | Priority | Description |
|---|---|---|
| 1 | Immediate/priority | Berth 6 & 7 – Repair broken concrete beams. |
| 2A | Immediate/priority | Berths 5& 6, – Install sheet piles to prevent further soil/embankment erosion causing pavement failure/settlement. |
| 2B | Near term | Berths 7, & 8 – Install sheet piles to prevent further soil/embankment erosion causing pavement failure/settlement. |
| 3 | Near term | Berth 7 & 8 – Stabilize seismic tie beam support to prevent further settlement. |
| 4 | Long term – based on usage and available funding | Berths 7 & 8, inner and outer wharf – Repair concrete piles, beams, soffit, top deck, timber piles, and replace missing timber piles. |
| 5 | Long term – based on usage and available funding | Berths 5 & 6, inner and outer wharf – Repair beams, diagonal struts, soffit, top deck, timber piles, and replace missing timber piles. |
| 6 | Long term – based on usage and available funding | Berths 5 &6 Fenders and Bollards – Install discrete fenders to serve barges and replace existing bollards with new. |

For each project, Liftech developed a scope of work with concept repair scheme and quantity take-off to obtain a rough order of magnitude (ROM) of construction cost estimates. Liftech worked with Power Engineering Construction (PEC) for the ROM cost estimates. To arrive at budgetary cost estimates,

construction cost estimates were increased by 30% to account for soft cost, such as EIR, engineering, the exclusions listed in PEC's estimates, and a reasonable contingency. The budgetary cost estimates are based on 2025 labor and material rates and exclude escalation to account for work being performed in the future, e.g., inflation, tariff impact.

Refer to Appendix J for detailed descriptions of scope of work and budgetary cost estimates computation. A summary follows:

Budgetary Cost Estimates Summary

| Project No: | Repair Priority | Descriptions | Budgetary Cost |
|---|---|---|---|
| 1 | Immediate/Priority | Berth 6 & 7 - Broken Concrete Beam Retrofit | $1,200,000 |
| 2A | Immediate/Priority | Berths 5 & 6 - Sheet Pile Wall Installation and Pavement Settlement Repairs | $1,550,000 |
| 2B | Near term | Berths 7 & 8 - Sheet Pile Wall Installation and Pavement Settlement Repairs | $1,150,000 |
| 3 | Near term | Berths 7 & 8 - Seismic Tie-Beam Support Stabilization | $4,600,000 |
| 4 | Long term - Based on usage and available funding | Berths 7 & 8 Damaged Concrete Piles, Beams, and Deck Repairs | $130,000,000 |
| 5 | Long term - Based on usage and available funding | Berths 5 & 6 - Damaged Concrete Beams, Deck Repairs, and Missing Piles Replacement | $61,000,000 |
| 6 | Long term - Based on usage and available funding | Berths 5 & 6 - Discrete Fender and Bollard Upgrades | $5,400,000 |

Notes:
1. The budgetary cost is based on 2025 labor and material costs and does not include escalation for work performed in the future years and tariff impact.

## RECOMMENDATIONS

We recommend the following actions:

### Berths 7 and 8

1. General: Ensure, at all times, that the equipment loading plan included in Liftech's 2010 repair drawings is being followed. Refer to Appendix K for the allowable wharf deck loading.
2. Depressed Deck: Remove non-fixed loads over the depressed deck, including removing K-rails, the container if practical, or contents of the container. Do not allow equipment to travel within 20 feet of the low point (break). If it is not practical to keep equipment off the beam, perform a structural evaluation to confirm if acceptable or install temporary shoring until long-term repairs can be implemented.
3. Seismic Tie Beams 4, 5, 6, and 7: Improve support by installing piles through the deck, installing jacking beams between them, jack to load piles and restore to original elevation, shim and grout.
4. Complete the repairs called out in Liftech's construction documents (see Appendix A).
5. Repair bollard coatings.
6. Repair fender frontal frame UHMW panels.
7. Consider/evaluate corrosion repairs including mitigation measures. Perform corrosion repairs and mitigation as worthwhile.
8. Perform comprehensive 100% Level 1 inspection including underwater pile inspection to accurately understand the current condition.
9. Monitor damage with above water Level 1 visual inspection every three years.

**Berths 5 and 6 & Partial 7**

1. Repair broken beam and relevel deck.
2. Repair eroded embankment and gaps between landside of outer wharf and yard pavement by installing sheet piles, cap beam, fill, and repair pavement.
3. Consider/evaluate corrosion repairs including mitigation measures. Perform corrosion repairs and mitigation as worthwhile.
4. If using the wharf (more significant loading) is of interest:
    i. Perform comprehensive 100% Level 1 inspection, including underwater pile inspection, to accurately understand the current condition.
    ii. Evaluate wharf structure as other repairs may be required or worthwhile.
5. Monitor damage with above water Level 1 visual inspection every five years.

# APPENDIX A – LIFTECH WHARF REPAIR FOR HONDA PROJECT 2010

# POINT POTRERO WHARF REPAIR
# FOR HONDA AUTOMOTIVE FACILITY
# PORT OF RICHMOND

## PREPARED FOR

TRANSDEVELOPMENT GROUP

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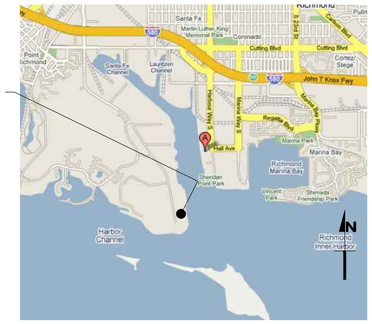
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**LOCATION MAP**




**VICINITY MAP**






**DRAWING INDEX**

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| G1 | TITLE SHEET AND DRAWING INDEX |
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| G3 | GENERAL NOTES – 2 |
| G4 | DESIGN LOAD CRITERIA |
| STRUCTURAL | |
| S1.1 | SITE PLAN |
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| S2.1 | PARTIAL WHARF PLAN – DEMOLITION – 1 |
| S2.2 | PARTIAL WHARF PLAN – DEMOLITION – 2 |
| S2.3 | PARTIAL WHARF PLAN – DEMOLITION – 3 |
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| S3.5 | CONCRETE PILE REPAIR DETAILS |
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| S4.14 | BOLLARD 14 DETAILS |

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 2 | ADDED SHEET FOR BOLLARD 14 | 06/11/10 | AH | TG | |
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

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Liftech
LIFTECH CONSULTANTS INC

POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
TITLE SHEET AND DRAWING INDEX

Project No. Z1800
By AH Checked TG/EGS Sheet No. G1
Approved SL of ----
Date 01/25/2010 Revision 2

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## SCOPE OF WORK

The project includes demolition and work necessary to upgrade the wharf structure at Berths RCH-7 and RCH-8, Pt Potrero Marine Terminal, for berthing and mooring auto carrier vessels and for loading and unloading automobiles from the vessels. The existing wharf structure was constructed in 1940's.

The wharf upgrade work includes:

Remove and dispose of some existing bollards, all existing fenders, and all temporary bullrails
Furnish and install new fenders
Furnish and install new bollards
Repair damaged wharf deck at the traffic loading area
Repair and replace damaged piles at the traffic loading area
Furnish and install sheet piles

The wharf upgrade work is limited to certain locations. Access shall be restricted to wharf areas with unacceptable damage that are not repaired. Seismic upgrades to improve seismic performance is not part of the scope of work.

## PROJECT REFERENCES

1. Proposed Recommendations for Pt. Potrero Wharf Repair, Port of Richmond, prepared by Liftech Consultants Inc, dated December 11, 2009
2. Inspection Report for Berth RCH-7 and Berth RCH-8 at Point Potrero in the Port of Richmond, California, prepared for Liftech Consultants, by Collins Engineers, Inc., September 10, 2009
3. Above and Underwater Inspection Report of Berth 7, Shipyard No. 3, Port of Richmond, CA, prepared for The Pasha Group, by Han Padron Associates Engineers, Inc., August 2001
4. Drawings for "Fitting-Out Dock", Kaiser Company Inc, Richmond, California, by L. H. Nishkian Consulting Eng'r, dated August, 1942
5. Field Review of the Existing Outfitting Dock, Shipyard No. 3, Richmond, CA, prepared for The Pasha Group, by Jordan|Casper|Woodman|Dobson, May 6, 1985
6. Report of the Allowable Loading Capacity of the Existing Outfitting Dock, Kaiser Engineers, May 1974 (bound as an appendix to reference 5)
7. Berth 6C, 6D and 7 of the Point Potrero Marine Terminal, Condition Survey, Port of Richmond, prepared for Pasha Group, by Vickerman Zachery Miller Engineering Architecture, June 1990
8. Load Testing Observations – Berth 7, Port of Richmond, CA, by Jordan Woodman Dobson, April 7, 2000

## SPECIAL INSPECTION

Special inspection shall be provided in accordance with the requirements in CBC, Chapter 17, including:

Concrete construction
Steel construction
Epoxy anchor and dowel installation in concrete
Wharf Deck Piling repair and installation
Pile and sheet pile installation by geotechnical engineer
See Inspector Requirements on Sheet S3.4

The Client will retain the Special Inspector for the above inspections. Inspection reports shall be submitted to the Client, the Port, and the Engineer.

## STRUCTURAL OBSERVATION

Contractor shall notify the engineer of record at least two working days prior to each of the following construction stages so that a registered design professional can perform a visual observation of the structural system for general conformance to the approved construction documents.

Installation of the steel fender support frame

Prior to pouring concrete for reinforcing steel and anchor bolt review:
Deck Repair
Fender Support
Bollard Beam

Deck and Pile Repair

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## GENERAL NOTES

### GENERAL

All work shall conform to all applicable codes and ordinances including OSHA and the Port of Richmond requirements

Contractor shall visit the site and verify that all existing conditions, elevations, dimensions, and construction are consistent with these drawings and notify the Client and Engineer of any discrepancies before proceeding with the work.

Contractor is responsible to secure all required permits to perform demolition and repair in the marine environment.

### CONSTRUCTION STAGING AREA

Contractor shall coordinate with Client and Port for construction staging area. Contractor shall note the following:

1. Construction loading shall be prohibited at the "restricted loading area" shown on drawing S3.1 and S3.2.
2. Construction loading outside the "restricted loading area" shall be limited to 125 psf.
3. If heavy construction equipment, such as erection cranes and heavy wheel loads, are mobilized onto wharf area, contractor shall submit calculations, performed by a licensed engineer, to demonstrate the wharf deck is adequate to support such loading.

### CIVIL

There may be below deck or underground obstructions, such as utilities, that are not shown on these drawings. If such obstructions are discovered, Contractor shall notify the Client and the Port. Contractor shall stop work in the affected area until notified by the Client.

If hazardous material is found in the work area, the Contractor shall notify the Client and the Port. Contractor shall stop work in the affected area until notified by the Client.

Contractor shall provide dust, erosion, and runoff control measures to the satisfaction of the Port. The control measures shall be reviewed by the Port before starting work.

Contractor shall provide shoring for the under deck work in accordance with OSHA requirements.

### STRUCTURAL CONCRETE

#### Concrete Work

Concrete work shall conform to ACI 301-05 and ACI 318-08.

#### Strength

Concrete shall have a minimum compressive strength, $f_c'$, of 4000 psi in 28 days. Mix design shall be submitted to the Engineer for review at least two weeks prior to pouring concrete.

#### Slump

Concrete slump shall be a minimum of 5". The slump shall be determined in accordance with ASTM C143-08

#### Cement Content

The minimum cement content shall be 564 pounds (6 sacks) per cubic yard. Fly ash may be substituted for no more than 15% of the cement content. The maximum water-cement ratio shall vary with respect to maximum aggregate size as follows:

| Maximum Aggregate Size | Maximum W/C Ratio |
|---|---|
| 1-1/2 inch | 0.400 |
| 1 inch | 0.385 |
| ¾ inch | 0.375 |

#### Construction Joints

Concrete construction joints, both horizontal and vertical, shall be thoroughly cleaned by wet sandblasting, exposing firmly embedded aggregates. The blasting shall be followed by washing to remove all loose particles. Prior to placing concrete, the surface of the construction joint shall be thoroughly cleaned and wetted. Joints shall be continuously moist cured between concrete placings.

#### Concrete Cover and Chamfer

Concrete cover shall be 3" minimum unless noted otherwise. All chamfer shall be ¾" unless otherwise noted.

#### Reinforcing Steel

Reinforcing steel shall be deformed steel bars conforming to ASTM A 615-08A, Grade 60, unless otherwise shown. Bars shall be continuous around corners and lapped at splices as shown on sheet G3 unless otherwise shown. Submit shop drawings and mill certificates to the Engineer for review prior to fabrication.

#### Grout
#### Anchor bolts and dowels

Epoxy for anchor bolts and dowels into the existing concrete shall be Simpson SET High Strength Epoxy or approved equal. Installation shall be in accordance with the manufacturer's recommendations.

#### Bollards and others

Grout shall be high strength non-shrink grouting, Masterflow 928, suitable for marine environment by BASF Construction Chemicals or an approved equivalent.

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GENERAL NOTES – 1

| | | |
|---|---|---|
| Project No. Z1800 | | |
| By AH | Checked TG/EGS | Sheet No. G2 |
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## STRUCTURAL STEEL

### Workmanship for Steel Structures

Work shall conform to the requirements of the AISC 360-05 "Specification for Structural Steel Buildings", March 9, 2005, including current supplements and AWS D1.1/D1.1M:2008, "Structural Welding Code - Steel" including Section 6 and provisions applicable to dynamically loaded structures.

Electrodes shall be in accordance with the notes below under Welding.

### Material

Structural steel shall conform to the following unless otherwise noted:

| | |
|---|---|
| W-Shapes | ASTM A992-06 or<br>ASTM A572-07 Grade 50 |
| Plate, bar, and sheet pile: | ASTM A572-07 Gr50 |
| Angles & Channels: | ASTM A36-05 |
| Anchor Bolts | ASTM F1554-07A Grade 105 unless otherwise noted |
| Structural bolts | ASTM A325 Type 1 |

*Material Substitution*

Contractor may propose substitution of material and shall submit all necessary information to demonstrate that the material is equivalent to the material specified. The Engineer may reject any substitution.

### Fabrication and Erection

Shop drawings shall be submitted to the Engineer for review prior to fabrication.

### Sheet Piles

The sheet pile driving procedure shall be submitted to the Engineer for review. A vibrodriver or impact hammer may be used at Contractor's option.

### Galvanizing

All steel components shall be hot dipped zinc coated to not less than two ounces per square foot. Galvanizing shall comply to ASTM A123-02 for fabricated items and ASTM A153-05 for hardware including the referenced ASTM A143-07 to avoid hydrogen embrittlement. Damaged surfaces shall be repaired using either a zinc–based alloy or a paint containing zinc dust in accordance with ASTM A780-01. The repair shall be in accordance with the manufacturer's recommendations.

### Welding

*Welders*

Welders and welding operators shall have current AWS certificates for the materials and processes being used. The Contractor shall maintain current files of these certificates and shall provide them to the Port upon request.

*Procedures*

Weld Procedures shall be qualified in accordance with AWS D1.1. The Contractor shall maintain current files of weld procedure specifications and test results. Weld procedures and test results shall be verified by the Contractor prior to making repairs.

*Wraparound Welds*

Unless otherwise noted, all fillet welds which occur on opposite sides of a common plane shall be interrupted at the corner common to both welds. Refer to AWS D1.1 Section 2.8.3.5. See Figure 1.

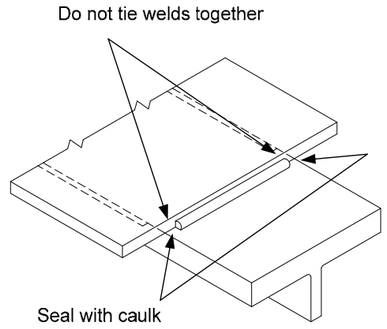



Figure 1

*Seal Welding*

All welded joints shall be seal welded except fillet welds occurring on opposite sides of a common plane as shown in Figure 1. Those joints shall be sealed with caulking.

*Preheat and Interpass Temperatures*

Weld preheat and interpass temperatures shall comply with Table 3.2 of AWS D1.1.

*Electrodes*

Electrodes shall be low hydrogen and shall be in accordance with Table 3.1 of AWS D1.1 except E60xx rods shall not be used. For base metals with yield strengths less than 70 ksi electrodes shall be H16.

*CJP Welds*

Welds shown as CJP shall be made without backup bars unless otherwise noted. Detail drawings shall show the weld details.

*Cracks*

Cracks shall be removed using air carbon arc or grinding. MT inspection method shall be used to determine the extent of the cracks. Unless otherwise noted, the root pass of the repair welds shall be inspected by VT and MT.

*Weld Inspection*

All welds shall be visually inspected (VT). All full penetration welds shall be inspected by VT and UT unless otherwise shown. Additional NDT shall be performed as indicated on the drawings. The Client may perform verification NDT other than visual even though this inspection is not indicated on the drawings. It shall be the Contractor's responsibility to ensure that all welds meet the acceptance requirements of AWS D1.1 section 6, "Inspection." The Contractor shall allow unrestricted access for inspection by the Port.

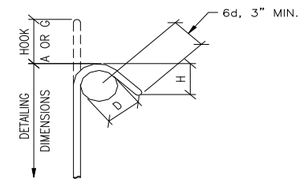
## MEANS, METHODS, AND JOBSITE SAFETY

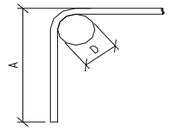
At all times, the Contractor shall be solely and completely responsible for means, methods, sequences, and procedures of work, and conditions of the jobsite including safety of persons and property, and for all necessary independent engineering review of these conditions. The Engineer's jobsite review is not intended to include review of the adequacy of the Contractor's safety measures.

## RECORD DRAWINGS

The Contractor shall submit a set of record drawings to the Client after completion of construction. The record drawings shall show deviations to the contract documents.

## TYPICAL REINFORCING DETAILS

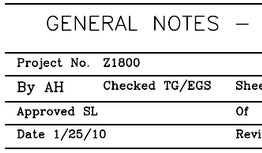



| 135° Hooks | | | |
|---|---|---|---|
| Bar Size | D | A or G | H Approx. |
| #3 | 1 ½" | 4 ¼" | 3" |
| #4 | 2" | 4 ½" | 3" |
| #5 | 2 ½" | 5 ½" | 3 3/4" |
| #6 | 4 ½" | 8" | 4 ½" |
| #7 | 5 ¼" | 9" | 5 ¼" |
| #8 | 6" | 10 ½" | 6" |

| 90° Hooks | | |
|---|---|---|
| Bar Size | D | A |
| #3 | 2 ¼" | 6" |
| #4 | 3" | 8" |
| #5 | 3 3/4" | 10" |
| #6 | 4 ½" | 1'-0" |
| #7 | 5 ¼" | 1'-2" |
| #8 | 6" | 1'-4" |
| #9 | 9 ½" | 1'-7" |
| #10 | 10 3/4" | 1'-10" |
| #11 | 1'-0" | 2'-0" |




| Typical Lap Splice | | |
|---|---|---|
| Bar Size | C | |
| | Top Reinf. | Bott. Reinf. |
| #3 | 1'-7" | 1'-4" |
| #4 | 2'-1" | 1'-7" |
| #5 | 2'-7" | 2'-0" |
| #6 | 3'-2" | 2'-5" |
| #7 | 4'-7" | 3'-6" |
| #8 | 5'-3" | 4'-0" |
| #9 | 5'-10" | 4'-6" |
| #10 | 6'-6" | 5'-0" |
| #11 | 7'-2" | 5'-6" |

| Bar Development | | |
|---|---|---|
| Bar Size | ld | |
| | Top Reinf, | Bott. Reinf. |
| #3 | 1'-2" | 1'-0" |
| #4 | 1'-7" | 1'-3" |
| #5 | 2'-0" | 1'-6" |
| #6 | 2'-5" | 1'-10" |
| #7 | 3'-6" | 2'-8" |
| #8 | 4'-0" | 3'-1" |
| #9 | 4'-6" | 3'-6" |
| #10 | 5'-0" | 3'-10" |
| #11 | 5'-6" | 4'-3" |

Notes:

1. ACI 318-08 applies unless otherwise noted.
2. Concrete strength f'c = 4000 psi minimum.
3. Center to center reinf. > 6" and center of bar to concrete surface > 2"
4. Top reinforcement: Horizontal reinforcement so placed that more than 12" of fresh concrete is cast below the development length or splice.
5. Concentric mechanical and weld splices in compliance with ACI 318-08 are acceptable alternatives to lap splices.

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# DESIGN CRITERIA

## CODES

Design Code: 2007 California Building Code (CBC)

## TECHNICAL REFERENCES

1. American Concrete Institute, Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary (ACI 318R-08). Farmington Hills, MI: American Concrete Institute, 2008.

2. American Concrete Institute, Specifications for Structural Concrete (ACI 301-05). Farmington Hills, MI: American Concrete Institute, 2005

3. American Concrete Institute, Concrete Repair Guide (ACI 546R-04). Farmington Hills, MI: American Concrete Institute, 2004.

4. American Concrete Institute, Surface Repair Using Form-and-Pump Techniques (ACI RAP-5). Farmington Hills, MI: American Concrete Institute, 2003.

5. American Institute of Steel Construction, Inc., Steel Construction Manual, 13th Edition (AISC). Chicago, IL: American Institute of Steel Construction, Inc., 2005.

6. American Welding Society, AWS D1.1/D1.1M:2008, Structural Welding Code – Steel, 21st Edition (AWS). Miami, FL: American Welding Society, 2008.

7. American Association of State Highway and Transportation Officials, Inc., AASHTO LRFD Bridge Design Specifications, 4th Edition (AASHTO). Washington, DC: AASHTO, 2007.

8. American Society of Civil Engineers, ASCE/SEI Standard 7-05, Minimum Design Loads for Buildings and Other Structures (ASCE). American Society of Civil Engineers, 2006.

9. Working Group 33 of the Maritime Navigation Commission, Guidelines for the Design of Fender Systems: 2002 (PIANC). Brussels, Belgium: International Navigation Association, 2002.

10. International Concrete Repair Institute, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (Guideline No. 310.1R-2008). Des Plaines, IL: International Concrete Repair Institute (ICRI), 2008.

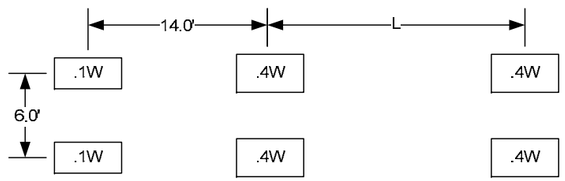
# DESIGN LOAD CRITERIA

### Basic Loads

DL Dead Load
Weight of wharf structure, density of reinforced concrete = 150 pcf

LL Live Load
Live Loads include the following individual non-concurrent loads:

1. Uniform Live Load on deck = 250 PSF
2. AASHTO HS20-44 Truck Wheel Loading, see below




W = 40 kips x 1.25 impact
L = Spacing between 14' and 30' producing maximum stress

BL Berthing Load

Angle berthing on one fender: The maximum fender reaction = 200 Kips combined with orthogonal friction load. Friction load is based on a coefficient of friction, u = 0.25 orthogonal to the fender compression force in either vertical or horizontal direction.

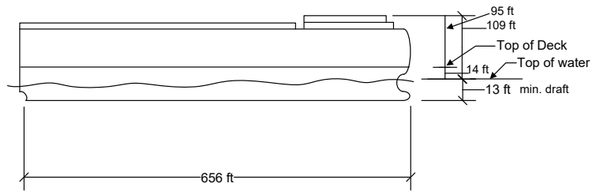
ML Mooring Load
Determined based on 85 mph wind, 3 second gust, exposure "C" in accordance with ASCE/SEI 7-05 on Sunshine Ace Vessel.

Maximum bollard horizontal load = 440 kips in any direction within 180 degrees toward waterside.

Maximum bollard vertical reaction = 300 kips

Breasting lines at each end of the design vessel must be attached to at least three new bollards to resist the design wind force.

Design Wind Area:




### Factored Load Combination

| | Load Combinations | | |
|---|---|---|---|
| Basic Loads | OP1 | OP2 | OP3 |
| DL Dead Load | 1.2 | 1.2 | 1.2 |
| LL Live Load | 1.6 | 1.6 | 1.6 |
| BL Berthing Load | | 1.6 | |
| ML Mooring Load | | | 1.6 |

### Pile Loading: Unfactored Vertical Load

New piles are designed to support dead load of structure plus a uniform live load of 500 psf

### Fender System Design Criteria

| Vessel Name | Sunshine Ace |
|---|---|
| Maximum Displacement | 46,000 metric tons |
| Length Overall (LOA) | 199.95 m (656 ft) |
| Beam Width | 32.2 m (105.6 ft) |
| Maximum Draft | 9.82 m (32.2 ft) |
| Stern Ramp | 7 m x 32.34 m (23 ft x 106 ft) |
| Center Ramp | 4.5 m x 16.78 m (14.8 ft x 55 ft) |
| Maximum Berthing Velocity Normal to wharf | 0.15 m/s (0.50 FPS) |
| Berthing Angle | 0 – 10 degrees |
| Minimum Berthing Energy per fender | 425 kN-m (313 ft-k) |
| Maximum Hull Pressure | 200 kN/m$^2$ (4.2 ksf) |
| Berthing Point Fore/Aft of Midship | LOA/4 |

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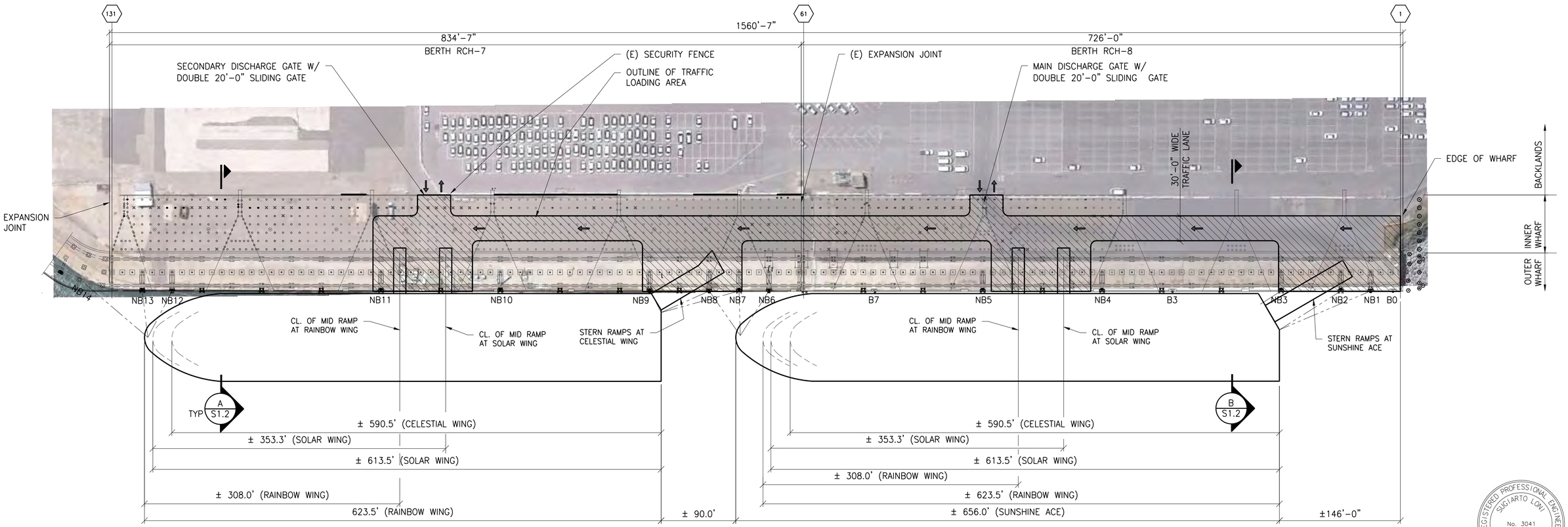
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DESIGN LOAD CRITERIA

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## SITE PLAN

1" = 60'-0"

1 S1.1

N

**LEGEND**

BX (E) BOLLARD TO REMAIN

NBX (N) BOLLARD

TRAFFIC LOADING AREA

NOTES:

1. VESSEL DATA WERE PROVIDED BY TRANSDEVELOPMENT/AWC. VESSEL BERTHING POSITION MAY VARY FROM THE POSITION SHOWN ABOVE AND SHALL BE VERIFIED BY THE TERMINAL OPERATOR.
2. REFER TO SHEETS S2.1–S2.7 FOR EXTENT OF DEMOLITION.
3. REFER TO SHEETS S3.1 AND S3.2 FOR EXTENT OF DECK AND PILE DAMAGE AND EXTENT OF DECK AND PILE REPAIRS.
4. REFER TO SHEETS S4.1–S4.7 FOR BOLLARD, FENDER AND SHEET PILE WALL LOCATIONS.
5. CONTRACTOR SHALL COORDINATE WITH TERMINAL OPERATOR FOR LOCATION OF SLIDING GATES.
6. USE EXISTING BOLLARDS ONLY FOR SPRING LINES. USE NEW BOLLARDS FOR SPRING AND BREASTING LINES.
7. SEE SHEET G4 FOR MOORING LINE REQUIREMENTS.

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0' 60' 120' 180'
SCALE: 1" = 60'

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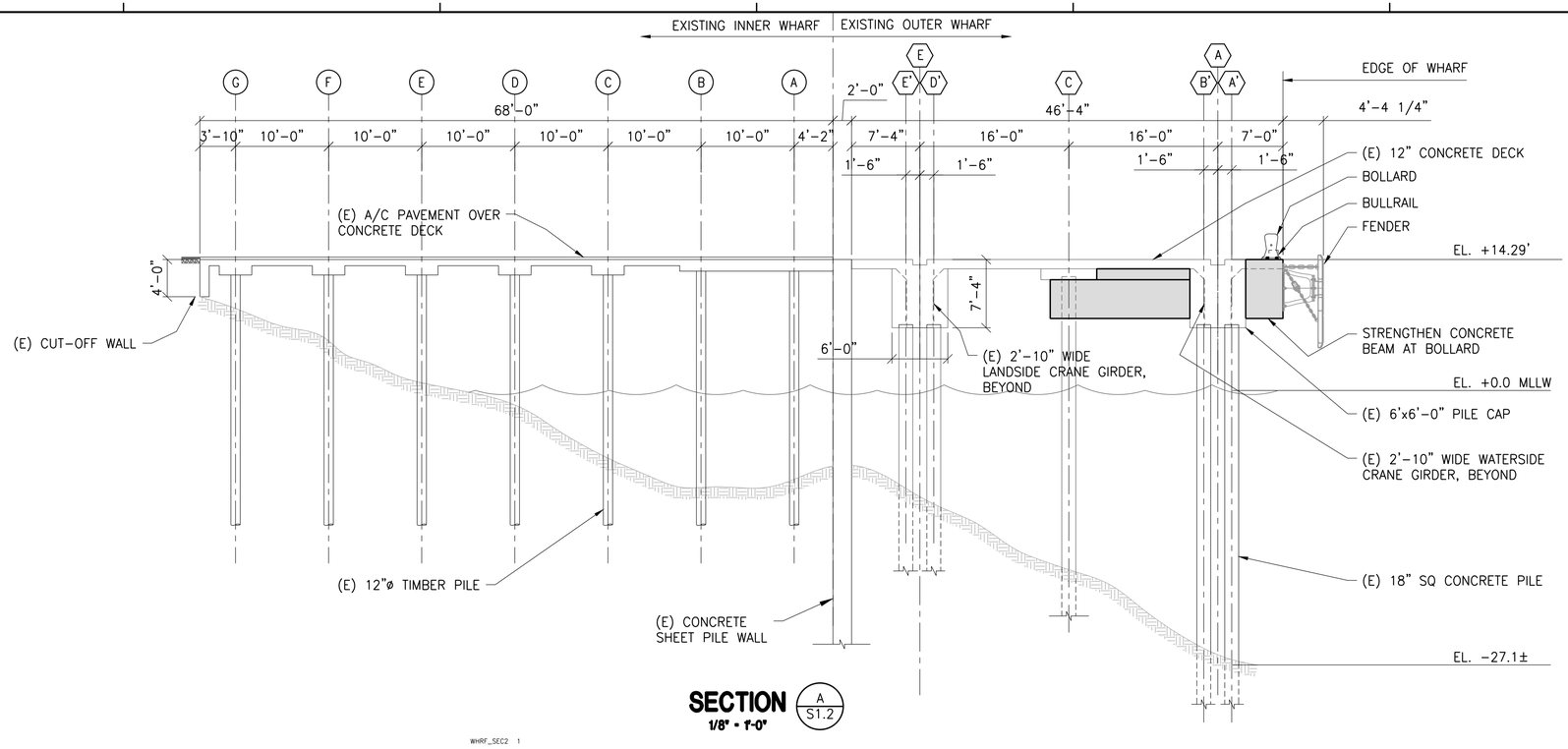
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SITE PLAN

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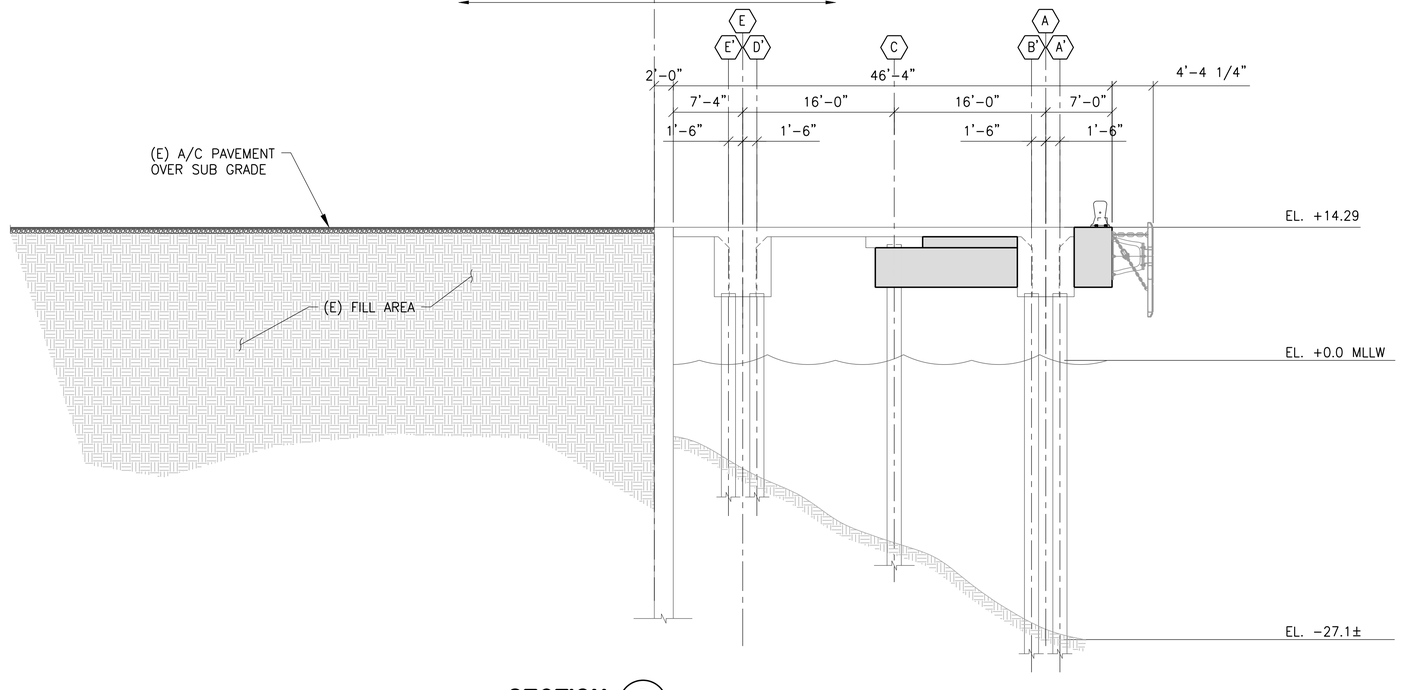
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**SECTION** A S1.2
1/8" = 1'-0"

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

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WHRF_SEC3 1

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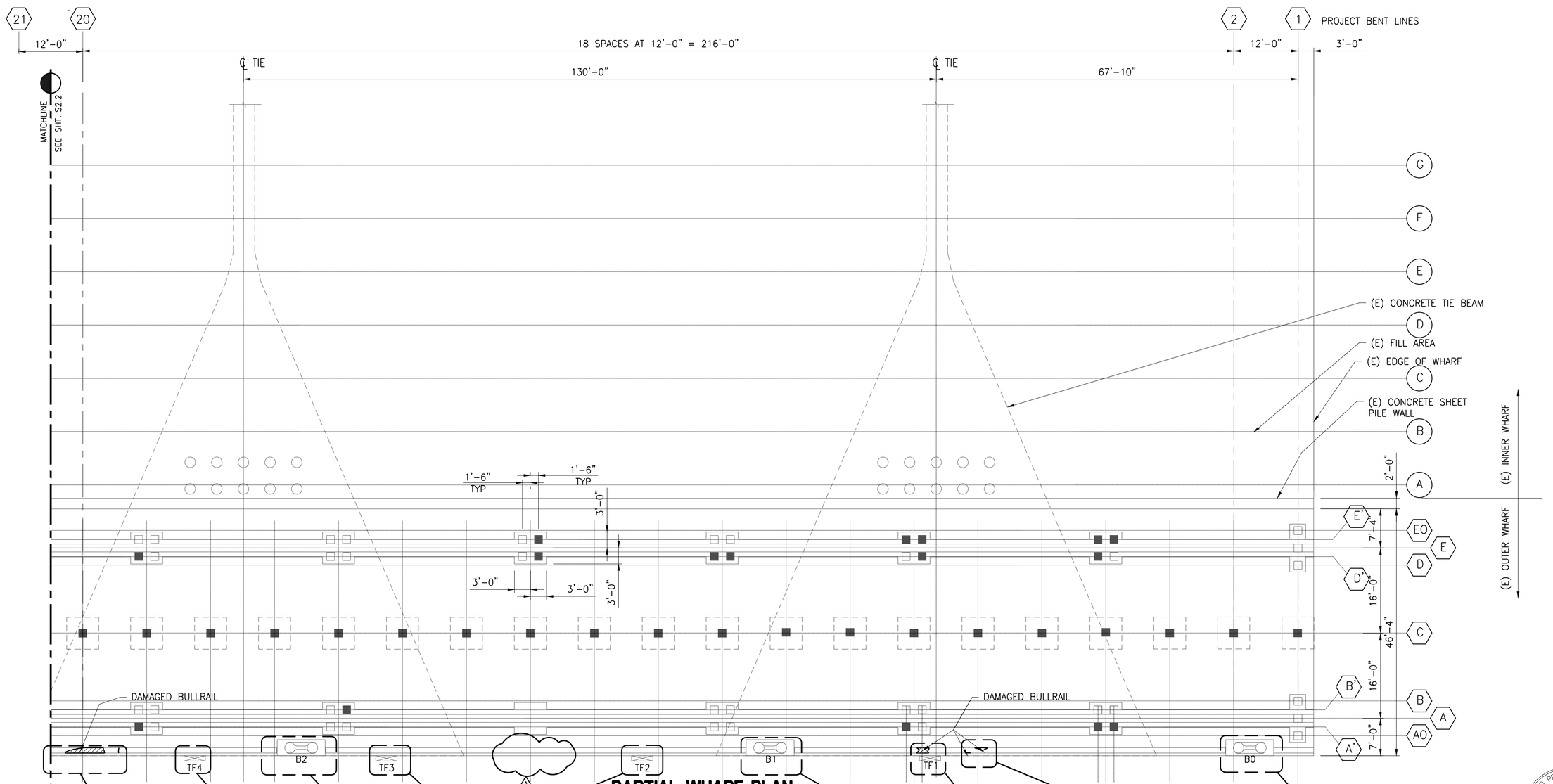
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TYPICAL WHARF SECTIONS

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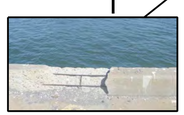
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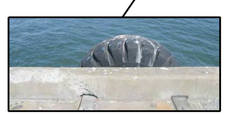



# PARTIAL WHARF PLAN - DEMOLITION - 1

1" = 10'-0"



REPAIR DAMAGED BULLRAIL AS REQUIRED. LENGTH = 14'-0"



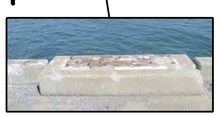
REMOVE AND DISPOSE OF TIRE FENDER



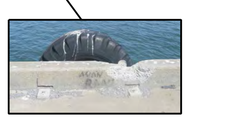
REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF TIRE FENDER



REMOVE AND DISPOSE OF TIRE FENDER



REPAIR DAMAGED BULLRAIL AS REQUIRED. LENGTH = 5'-0"



(E) BOLLARD TO REMAIN

**DEMOLITION NOTES:**

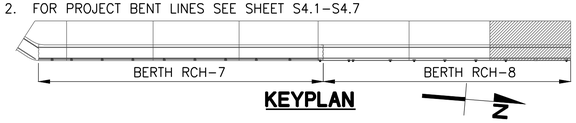
1. ALL DEMOLITION WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF RICHMOND CONSTRUCTION DEMOLITION ORDINANCE.
2. ADDITIONAL CONCRETE DEMOLITION IS REQUIRED FOR BOLLARD INSTALLATION. SEE DRAWING SHEETS S4.1 – S4.6 FOR BOLLARD LOCATION AND S4.7–S4.10 FOR BOLLARD DETAILS.
3. SEE SHT S3.1–S3.2 FOR ADDITIONAL DEMOLITION NOTES FOR CONCRETE DECK REPAIR.
4. (E) STEEL FENDER SUPPORTS SHALL BE REMOVED WHEN REMOVING FENDER.

**LEGEND**

- BX — (E) BOLLARD
- TF1 — (E) TIRE FENDER
- SF5 — (E) FOAM FILLED FENDER
- (E) TOP DECK SURFACE DAMAGED AREA
- (E) TIMBER PILE
- (E) DAMAGED TIMBER PILE
- (E) MISSING TIMBER PILE
- (E) DAMAGED CONCRETE PILE

**NOTES:**

1. CONCRETE PEDESTAL OF REMOVED BOLLARDS CAN REMAIN PROVIDED THAT TOP ELEVATION OF THE PEDESTAL IS APPROXIMATELY THE SAME AS BULLRAIL. IF THE PEDESTAL IS REMOVED, NEW BULLRAIL SHALL BE INSTALLED PER SECTION E/S4.8. IF BOLLARD PEDESTAL IS REMOVED OR SHORTENED, PROVIDE SMOOTH SURFACE TO TOP OF CONCRETE.
2. FOR PROJECT BENT LINES SEE SHEET S4.1–S4.7




**KEYPLAN**

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|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

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No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

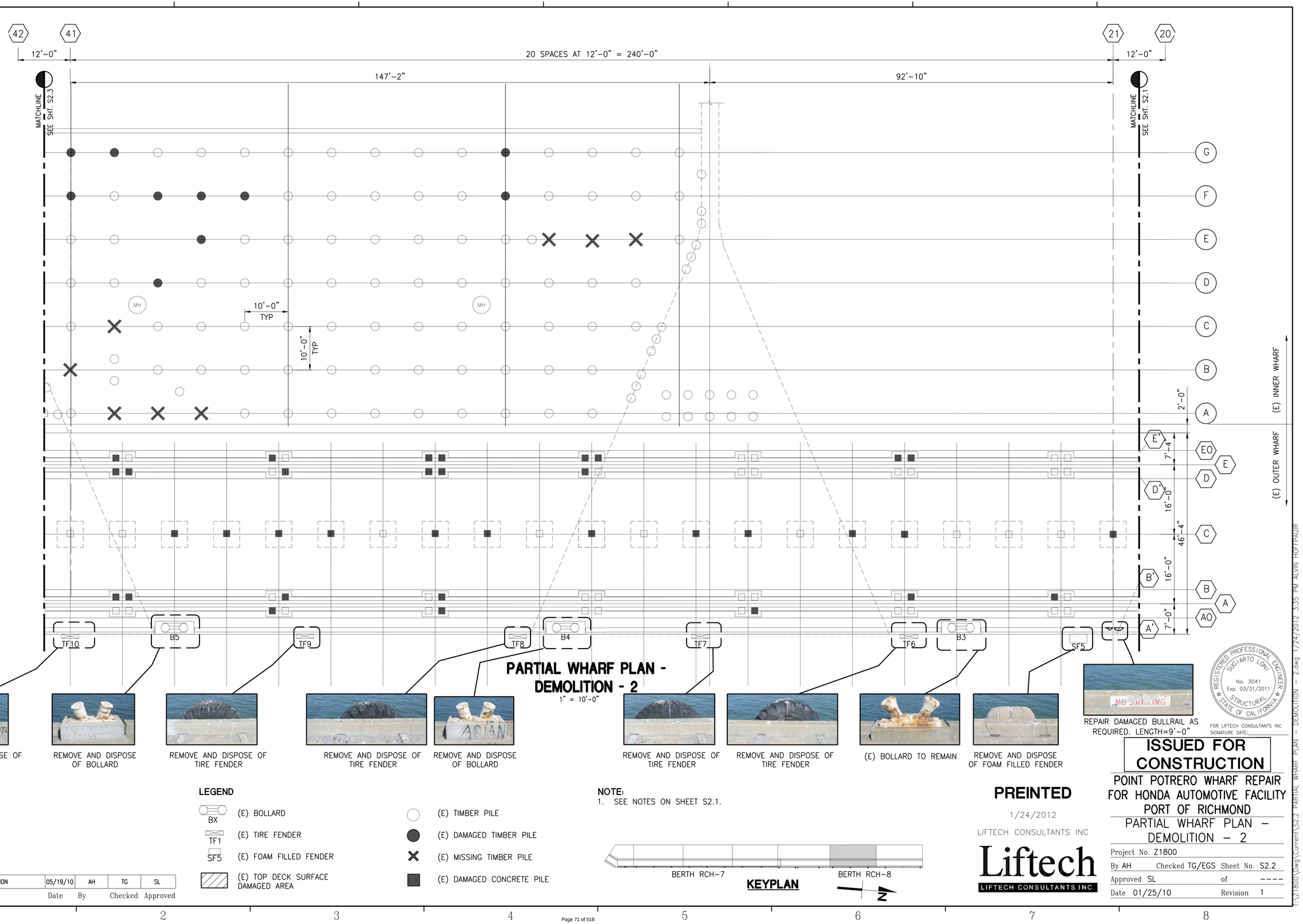
PARTIAL WHARF PLAN – DEMOLITION – 1

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S2.1 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |



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## PARTIAL WHARF PLAN - DEMOLITION - 2

1" = 10'-0"

REMOVE AND DISPOSE OF TIRE FENDER

REMOVE AND DISPOSE OF BOLLARD

REMOVE AND DISPOSE OF TIRE FENDER

REMOVE AND DISPOSE OF TIRE FENDER

REMOVE AND DISPOSE OF BOLLARD

REMOVE AND DISPOSE OF TIRE FENDER

REMOVE AND DISPOSE OF TIRE FENDER

(E) BOLLARD TO REMAIN

REMOVE AND DISPOSE OF FOAM FILLED FENDER

REPAIR DAMAGED BULLRAIL AS REQUIRED. LENGTH=9'-0"

**LEGEND**

- BX — (E) BOLLARD
- TF1 — (E) TIRE FENDER
- SF5 — (E) FOAM FILLED FENDER
- (E) TOP DECK SURFACE DAMAGED AREA
- (E) TIMBER PILE
- (E) DAMAGED TIMBER PILE
- (E) MISSING TIMBER PILE
- (E) DAMAGED CONCRETE PILE

**NOTE:**
1. SEE NOTES ON SHEET S2.1.

BERTH RCH-7 — BERTH RCH-8

**KEYPLAN**

N

| No. | Revision | Date | By | Checked | Approved |
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FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

PARTIAL WHARF PLAN – DEMOLITION – 2

Project No. Z1800
By AH Checked TG/EGS Sheet No. S2.2
Approved SL of ----
Date 01/25/10 Revision 1

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64 63 62 61 42 41

12'-0" 12'-0" 6'-0" 19 SPACES AT 12'-0" = 228'-0" 12'-0"

94'-2" 142'-0" 9'-10"

MATCHLINE SEE SHT. S2.4

MATCHLINE SEE SHT. S2.2

G F E D C B A

E' EO E D' D C B' B A' A AO

2'-0"

7'-4" 16'-0" 46'-4" 16'-0" 7'-0"

(E) INNER WHARF

(E) OUTER WHARF

MH MH MH

10'-0" TYP 10'-0" TYP 1

95' SQ FT

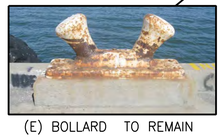
B9 TF15 TF14 B7 TF13 TF12 B6 TF11



REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF TIRE FENDER



(E) BOLLARD TO REMAIN



REMOVE AND DISPOSE OF TIRE FENDER



REMOVE AND DISPOSE OF BOLLARD

## PARTIAL WHARF PLAN - DEMOLITION - 3

1" = 10'-0"



REMOVE AND DISPOSE OF TIRE FENDER



REMOVE AND DISPOSE OF TIRE FENDER




REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF TIRE FENDER

**LEGEND**

- BX — (E) BOLLARD
- TF1 — (E) TIRE FENDER
- SF5 — (E) FOAM FILLED FENDER
- (E) TOP DECK SURFACE DAMAGED AREA
- (E) TIMBER PILE
- (E) DAMAGED TIMBER PILE
- (E) MISSING TIMBER PILE
- (E) DAMAGED CONCRETE PILE

**NOTE:**
1. SEE NOTES ON SHEET S2.1.

BERTH RCH-7 BERTH RCH-8

**KEYPLAN**

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FOR LIFTECH CONSULTANTS INC
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POINT POTRERO WHARF REPAIR
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PORT OF RICHMOND
PARTIAL WHARF PLAN – DEMOLITION – 3

Project No. Z1800
By AH Checked TG/EGS Sheet No. S2.3
Approved SL of ----
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85 84 64 63

12'-0" | 20 SPACES AT 12'-0" = 240'-0" | 12'-0"

46'-11 5/8" | 145'-2" | 47'-10"

MATCHLINE SEE SHT. S2.5

MATCHLINE SEE SHT. S2.3

G F E D C B A

MH MH MH

2'-0"

E' EO E D D' C B' B A A' AO

7'-4" 16'-0" 46'-4" 16'-0" 7'-0"

(E) INNER WHARF

(E) OUTER WHARF

312

B11 B10

# PARTIAL WHARF PLAN - DEMOLITION - 4

1" = 10'-0"



REMOVE AND DISPOSE OF TEMPORARY RAIL, PRECAST CONCRETE, AND PLASTIC PIPE



REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF TEMPORARY RAIL, PLASTIC PIPE



REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF TEMPORARY STEEL RAIL

## LEGEND

- BX — (E) BOLLARD
- TF1 — (E) TIRE FENDER
- SF5 — (E) FOAM FILLED FENDER
- (E) TOP DECK SURFACE DAMAGED AREA
- (E) TIMBER PILE
- (E) DAMAGED TIMBER PILE
- (E) MISSING TIMBER PILE
- (E) DAMAGED CONCRETE PILE

**NOTE:**
1. SEE NOTES ON SHEET S2.1.

BERTH RCH-7 — BERTH RCH-8

**KEYPLAN**

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PARTIAL WHARF PLAN – DEMOLITION – 4

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106 105 85 84

12'-0" | 20 SPACES AT 12'-0" = 240'-0" | 12'-0"

145'-4" | 93'-6 3/8"

MATCHLINE SEE SHT. S2.6

MATCHLINE SEE SHT. S2.4

G F E D C B A

MH MH

2'-0"

E' 7'-4" EO E D' 16'-0" 46'-4" C B' 16'-0" B A AO 7'-0"

(E) INNER WHARF

(E) OUTER WHARF

B14 TF20

B13 TF19

A' TF18

# PARTIAL WHARF PLAN - DEMOLITION - 5

1" = 10'-0"



REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF TEMPORARY STEEL RAIL



REMOVE AND DISPOSE OF BOLLARD

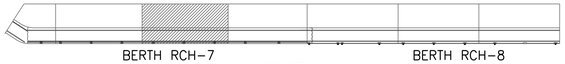


REMOVE LADDER AND STEEL FRAME

**LEGEND**

- BX — (E) BOLLARD
- TF1 — (E) TIRE FENDER
- SF5 — (E) FOAM FILLED FENDER
- (E) TOP DECK SURFACE DAMAGED AREA
- (E) TIMBER PILE
- (E) DAMAGED TIMBER PILE
- (E) MISSING TIMBER PILE
- (E) DAMAGED CONCRETE PILE

**NOTE:**
1. SEE NOTES ON SHEET S2.1.




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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN – DEMOLITION – 5

Project No. Z1800
By AH Checked TG/EGS Sheet No. S2.5
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127 126 106 105

12'-0" | 20 SPACES AT 12'-0" = 240'-0" | 12'-0"

93'-10 5/8" | 146'-1 3/8"

MATCHLINE SEE SHT. S2.7

MATCHLINE SEE SHT. S2.5

G F E D C B A

MH MH MH

99' SQ FT

195' SQ FT

126' SQ FT

72' SQ FT

12' SQ FT

6' SQ FT

B17

B16 TF22

B15 SF21

2'-0"

E' 7'-4" EO E

D' 16'-0" 46'-4" D C

B' 16'-0" B A

A' 7'-0" AO

(E) INNER WHARF

(E) OUTER WHARF

# PARTIAL WHARF PLAN - DEMOLITION - 6

1" = 10'-0"



REMOVE AND DISPOSE OF TEMPORARY STEEL RAIL



REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF TIRE FENDER



REMOVE AND DISPOSE OF BOLLARD

**LEGEND**

- BX — (E) BOLLARD
- TF1 — (E) TIRE FENDER
- SF5 — (E) FOAM FILLED FENDER
- (E) TOP DECK SURFACE DAMAGED AREA
- (E) TIMBER PILE
- (E) DAMAGED TIMBER PILE
- (E) MISSING TIMBER PILE
- (E) DAMAGED CONCRETE PILE

**NOTE:**
1. SEE NOTES ON SHEET S2.1.

BERTH RCH-7 | BERTH RCH-8

**KEYPLAN**

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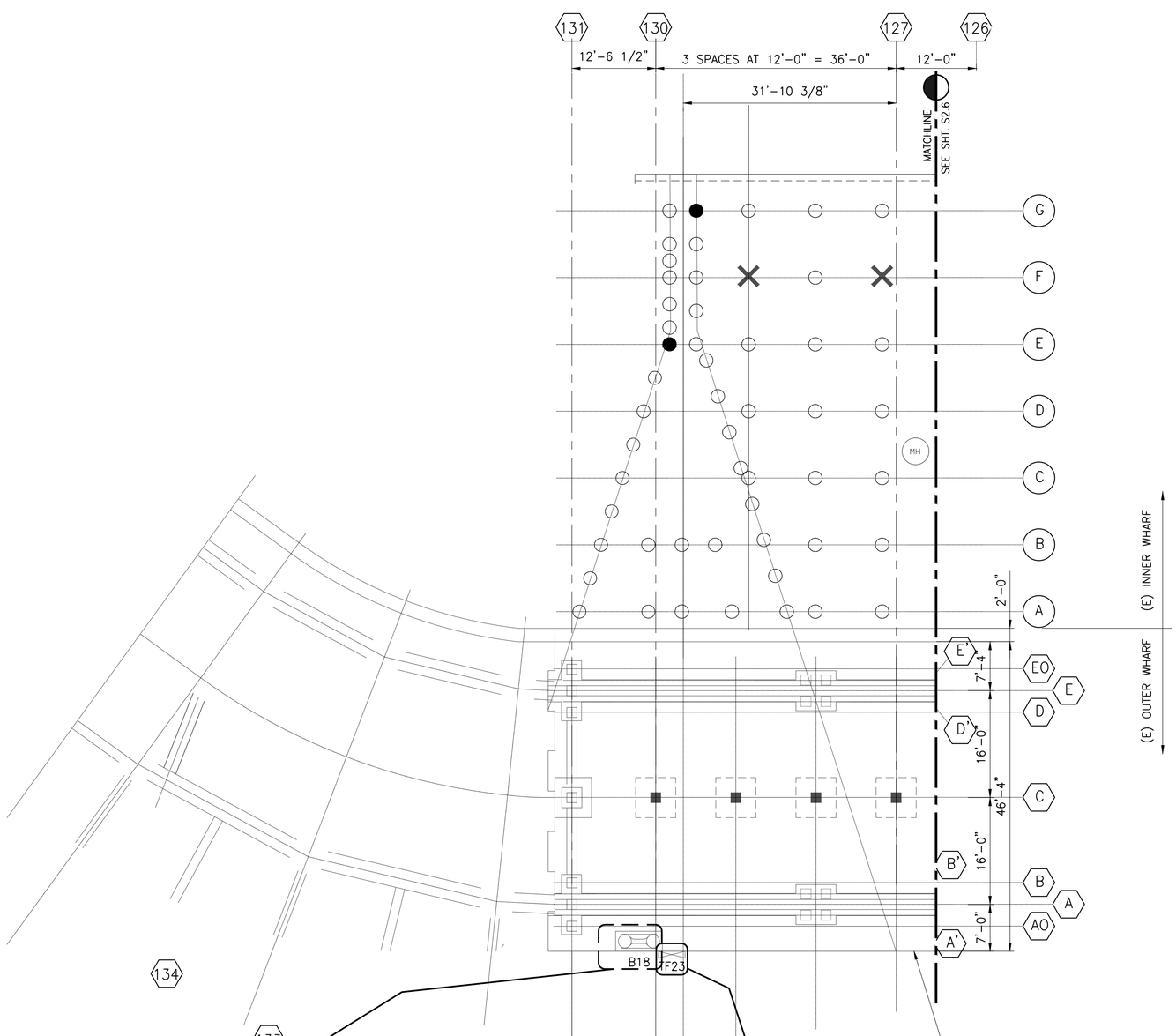
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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN – DEMOLITION – 6

Project No. Z1800
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REMOVE AND DISPOSE OF BOLLARD



REMOVE AND DISPOSE OF TIRE FENDER



REMOVE AND DISPOSE OF TEMPORARY STEEL RAIL



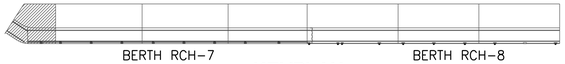
## PARTIAL WHARF PLAN - DEMOLITION - 7

1" = 10'-0"

**LEGEND**

- BX — (E) BOLLARD
- TF1 — (E) TIRE FENDER
- SF5 — (E) FOAM FILLED FENDER
- (E) TOP DECK SURFACE DAMAGED AREA
- (E) TIMBER PILE
- (E) DAMAGED TIMBER PILE
- (E) MISSING TIMBER PILE
- (E) DAMAGED CONCRETE PILE

**NOTE:**
1. SEE NOTES ON SHEET S2.1.




**KEYPLAN**

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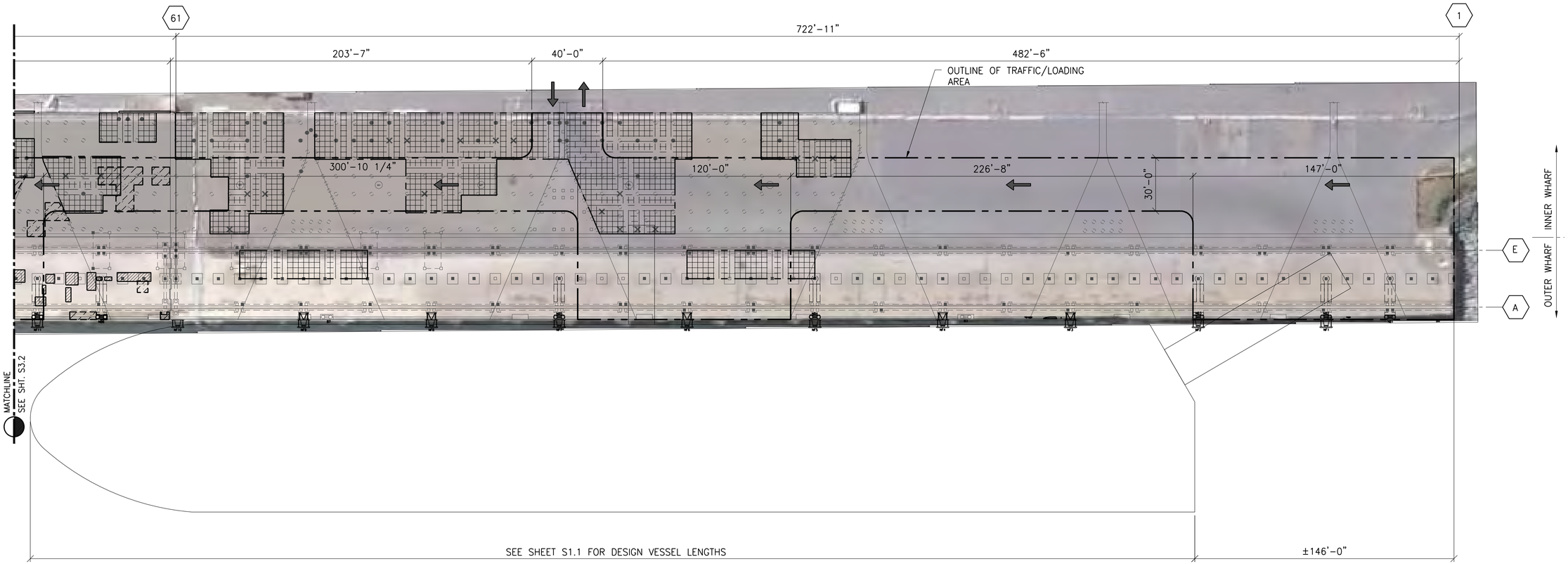
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# POINT POTRERO WHARF REPAIR FOR HONDA AUTOMOTIVE FACILITY PORT OF RICHMOND

## PARTIAL WHARF PLAN – DEMOLITION – 7

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S2.7 |
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# PARTIAL PLAN AT BERTH RCH-8 - DAMAGED DECK AREAS AND PILES

1" = 30'-0"

EFULL 1

N

## LEGEND

- RESTRICTED LOADING AREA
- DAMAGED TOP DECK SURFACE AREA, SEE SECTION A/S3.3 FOR REPAIR.
- DAMAGED BOTTOM DECK SURFACE AREA, SEE SECTION B/S3.3 FOR REPAIR DETAILS.
- MISSING TIMBER PILE SEE SHEET S3.6 AND S3.7 FOR REPAIR DETAILS.
- DAMAGED TIMBER PILE SEE SHEET S3.6 FOR REPAIR DETAILS.
- DAMAGED CONCRETE PILE SEE SHEET S3.5 FOR REPAIR DETAILS.
- LIMIT OF TRAFFIC LOADING AREA

## NOTES:

1. THE DAMAGED PILES, THE MISSING PILES, AND THE DAMAGED AREAS FOR BOTTOM DECK SURFACES SHOWN ARE BASED ON THE "INSPECTION REPORT FOR BERTH RCH-7 AND BERTH RCH-8" PREPARED BY COLLINS ENGINEERS, INC. DATED SEPTEMBER 10, 2009 AND "THE ABOVE AND UNDER WATER INSPECTION REPORT OF BERTH 7" PREPARED BY HAN PADRON ASSOCIATES DATED AUGUST 2001.
2. AT THE OUTER WHARF OF BERTH RCH-7, THE REPAIR AREAS FOR TOP DECK SURFACE WERE FIELD MEASURED. ONLY DECK DAMAGE AREAS IDENTIFIED AS "MODERATE" OR "WORSE", IN ACCORDANCE WITH THE CLASSIFICATIONS LISTED IN THE INSPECTION REPORT, ARE SHOWN. REFER TO DRAWING SHEETS S3.1 AND S3.2 AND ENLARGED PLANS, DRAWING SHEETS S2.3, S2.4, S2.5, AND S2.6. THE LOCATION AND SIZE OF THE DAMAGED AREAS ARE APPROXIMATE.
3. AT THE INNER WHARF OF BERTH RCH-7 AND RCH-8, THE TOP DECK SURFACES ARE COVERED WITH ASPHALT. THE TOP DECK SURFACE CONDITION IS ASSUMED ADEQUATE. NO REPAIRS ARE REQUIRED.
4. AT THE OUTER WHARF OF BERTH RCH-8, THE TOP DECK SURFACE CONDITION IS ASSUMED ADEQUATE. NO REPAIRS ARE REQUIRED.
5. AT BERTH RCH-7, THE DAMAGE AREAS FOR BOTTOM DECK SURFACE ARE SHOWN ON SHEET S3.2 AND "DECK INSPECTION PLAN" PREPARED BY COLLINS ENGINEERS, DATED 10/19/09, SHEET 6 THROUGH 9. THE LOCATION AND SIZE OF THE DAMAGED AREAS ARE APPROXIMATE.
6. AT BERTH RCH-8, THE DAMAGED AREAS FOR BOTTOM DECK SURFACE WERE NOT SURVEYED AND ARE ASSUMED IN SIMILAR CONDITION AS BERTH RCH-7. THE CONTRACTOR SHALL FIELD LOCATE THE DAMAGED AREAS FOR THE BOTTOM DECK SURFACE.
7. PHASE 1 REPAIRS: WITHIN THE TRAFFIC LOADING AREA, DAMAGED DECK AREAS, DAMAGED PILES, AND MISSING PILES SHALL BE REPAIRED. OUTSIDE THE TRAFFIC LOADING AREA, PILES AT NEW BOLLARDS AND FENDER SHALL BE REPAIRED. REFER TO DRAWING SHEET S3.3 FOR DECK REPAIR DETAILS AND DRAWING SHEETS S3.4 TO S3.8 FOR PILE REPAIR AND REPLACEMENT SCHEDULE AND DETAILS.
8. PHASE 2 REPAIRS: DAMAGED DECK AREAS, DAMAGED PILES, AND MISSING PILES NOT INCLUDED IN PHASE 1 SHALL BE REPAIRED. UNTIL REPAIRED, THE FOLLOWING SHALL APPLY.

   AT THE INNER WHARF, UNREPAIRED DAMAGED AREAS SHALL BE FENCED OFF TO PREVENT ACCESS.

   AT THE OUTER WHARF, OPERATIONS MAY CONTINUE PROVIDED THE DESIGN LOADING IS REDUCED. CONTACT ENGINEER IF REDUCED LOADS ARE DESIRED.
9. PRIOR TO BOTTOM DECK REPAIRS. PERFORM DELAMINATION SURVEY FOR ENTIRE PHASE 1 AND PHASE 2 AREAS. SEE NOTE 3 ON SHEET S3.3.
10. FOR THE WHARF DECK REPAIR SCHEDULE SEE SHEET S3.2.

0' 30' 60' 90'

SCALE: 1" = 30'

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

RCH-8 DAMAGED AND REPAIR AREAS

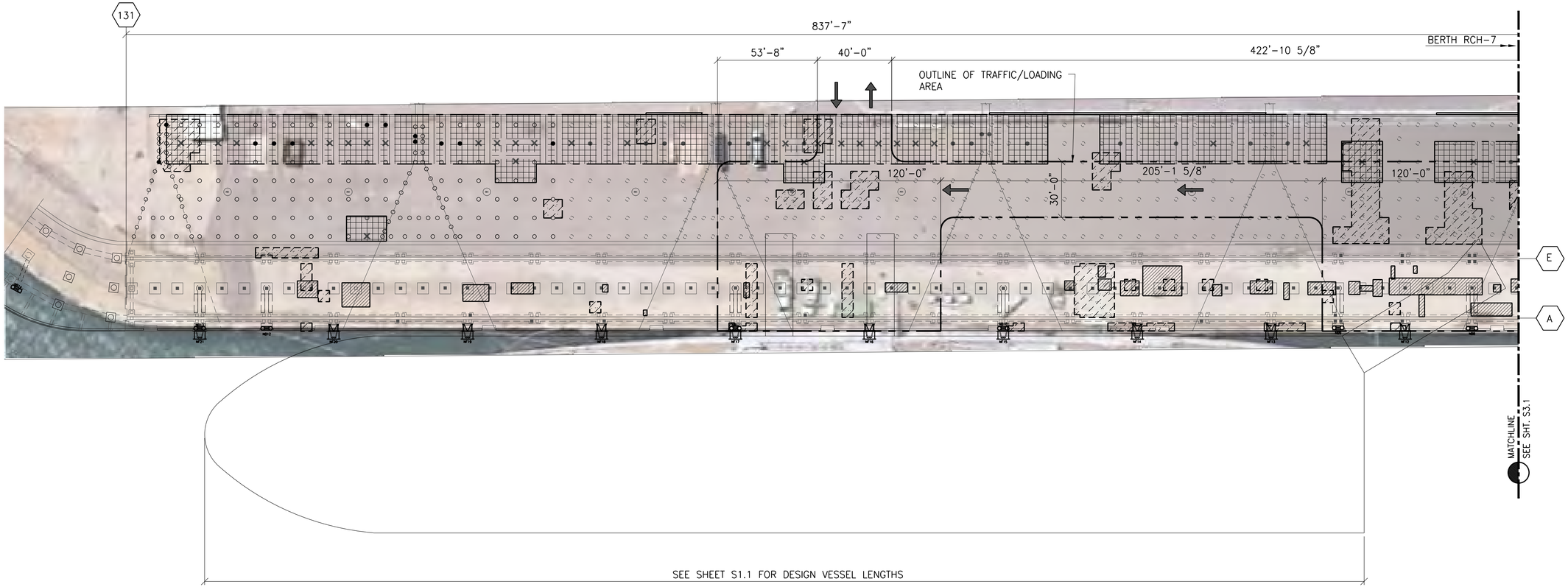
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|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S3.1 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

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I:\Z1800\Dwg\Current\S3.2 RCH-7 DAMAGED AND REPAIR AREAS.dwg 1/24/2012 3:36 PM ALVIN HOFFPAUIR




# PARTIAL PLAN AT BERTH RCH-7 - DAMAGED DECK AREAS AND PILES

1" = 30'-0"

BFULL 1

N

## LEGEND

- RESTRICTED LOADING AREA
- DAMAGED TOP DECK SURFACE AREA, SEE SECTION A/S3.3 FOR REPAIR.
- DAMAGED BOTTOM DECK SURFACE AREA, SEE SECTION B/S3.3 FOR REPAIR DETAILS.
- MISSING TIMBER PILE SEE SHEET S3.6 AND S3.7 FOR REPAIR DETAILS.
- DAMAGED TIMBER PILE SEE SHEET S3.6 FOR REPAIR DETAILS.
- DAMAGED CONCRETE PILE SEE SHEET S3.5 FOR REPAIR DETAILS.
- LIMIT OF TRAFFIC LOADING AREA

## NOTE:

SEE NOTES ON S3.1

## WHARF DECK REPAIR SCHEDULE

| | PHASE I | | PHASE II | |
|---|---|---|---|---|
| | TOP DECK SURFACE (SQ FT) | BOTTOM DECK SURFACE (SQ FT) | TOP DECK SURFACE (SQ FT) | BOTTOM DECK SURFACE (SQ FT) |
| BERTH RCH-7 | | | | |
| DECK DAMAGED AREAS | 1060 | 3900 | 1420 | 2500 |
| 20% CONTINGENCY | 212 | 780 | 284 | 500 |
| TOTAL DAMAGED AREAS | 1272 | 4680 | 1704 | 3000 |
| BERTH RCH-8 | | | | |
| TOTAL DAMAGED AREAS | NONE | 2500 (SEE NOTE 3) | NONE | 1600 (SEE NOTE 3) |

NOTES:
1. PHASE I IS ALL REPAIR WORK WITHIN THE TRAFFIC LOADING AREA
2. PHASE II IS ALL REPAIR WORK OUTSIDE THE TRAFFIC LOADING AREA
3. THE DAMAGED AREA FOR RCH-8 IS ESTIMATED BASED ON THE PERCENT OF THE RCH-7 DECK THAT IS DAMAGED.

0' 30' 60' 90'
SCALE: 1" = 30'

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 5/19/201 | AH | TG | SL |

REGISTERED PROFESSIONAL ENGINEER
SUGIARTO LONY
No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:_____

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POINT POTRERO WHARF REPAIR
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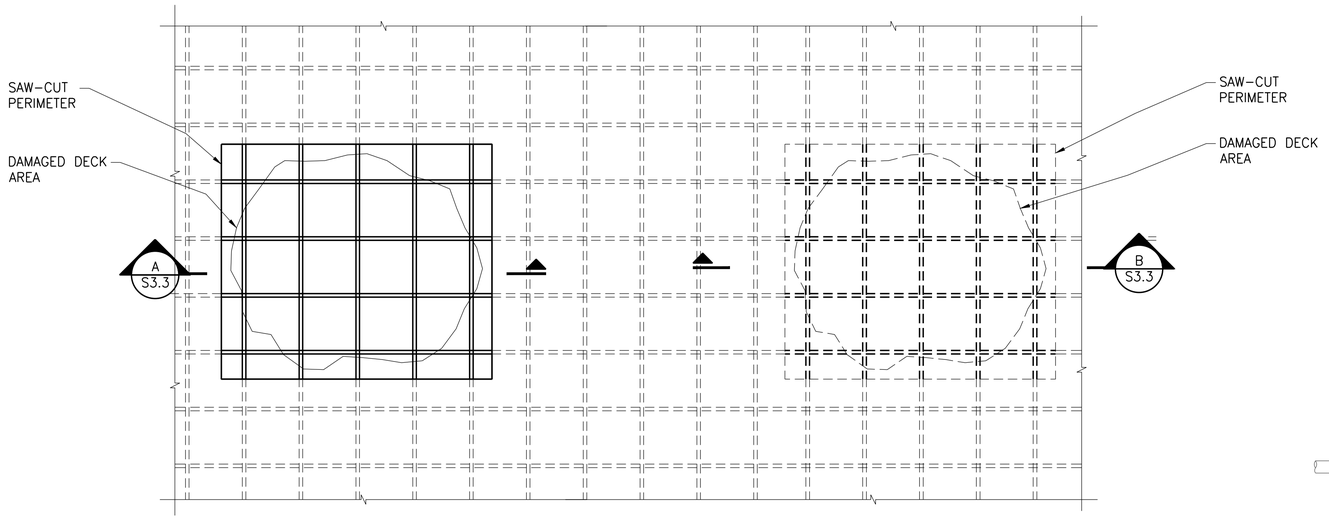
RCH-7 DAMAGED AND REPAIR AREAS

Project No. Z1800
By AH Checked TG/EGS Sheet No. S3.2
Approved SL of ----
Date 01/25/10 Revision 1

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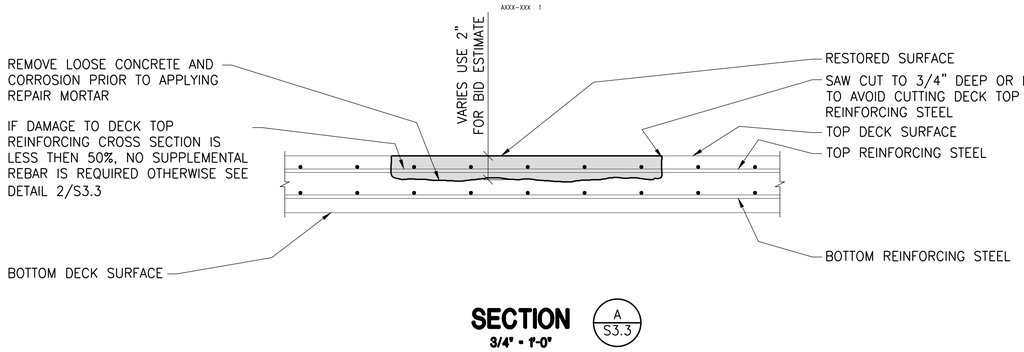



DAMAGED TOP DECK SURFACE REPAIR

DAMAGED BOTTOM DECK SURFACE REPAIR

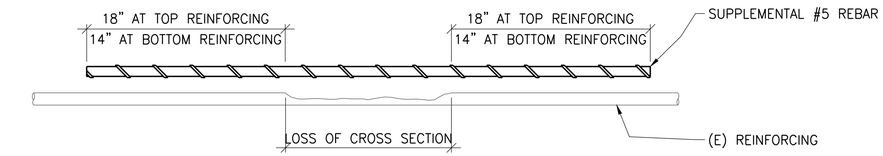
## CONCRETE REMOVAL AND SURFACE PREPARATION (1/S3.3)

3/4" = 1'-0"




## SECTION (A/S3.3)

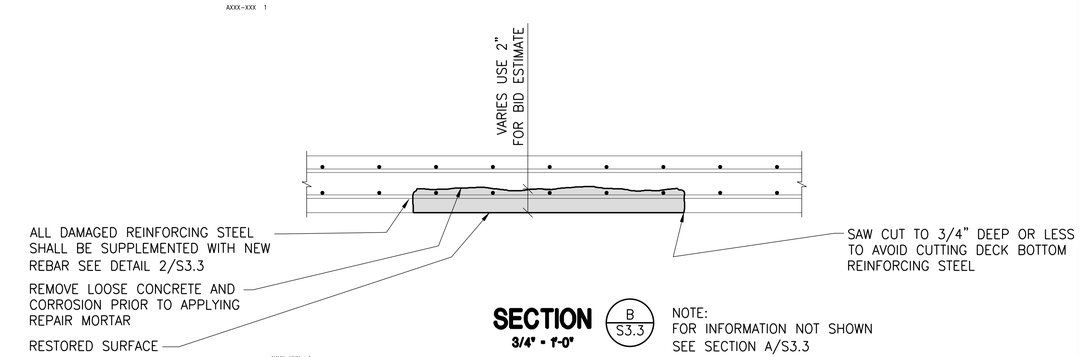
3/4" = 1'-0"




PLAN

## SUPPLEMENTAL REBAR DETAIL (2/S3.3)

DO NOT SCALE




## SECTION (B/S3.3)

3/4" = 1'-0"

NOTE:
FOR INFORMATION NOT SHOWN SEE SECTION A/S3.3

## WHARF DECK REPAIR NOTES:

1. THE PURPOSE OF THE WHARF DECK REPAIR IS TO RESTORE THE WHARF STRUCTURAL STRENGTH TO SUPPORT A DESIGN LIVE LOAD OF 250 PSF AND TO EXTEND THE SERVICE LIFE OF THE STRUCTURE.
2. THE DECK REPAIR WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
   a. AMERICAN CONCRETE INSTITUTE, CONCRETE REPAIR GUIDE. FARMINGTON HILLS, MI: AMERICAN CONCRETE INSTITUTE, 2004.
   b. AMERICAN CONCRETE INSTITUTE, SURFACE REPAIR USING FORM-AND-PUMP TECHNIQUES. FARMINGTON HILLS, MI: AMERICAN CONCRETE INSTITUTE, 2003.
   c. INTERNATIONAL CONCRETE REPAIR INSTITUTE, GUIDE FOR SURFACE PREPARATION FOR THE REPAIR OF DETERIORATED CONCRETE RESULTING FROM REINFORCING STEEL CORROSION (GUIDELINE NO. 310.1R-2008). DES PLAINES, IL: INTERNATIONAL CONCRETE REPAIR INSTITUTE, 2008..
3. AT REPAIR AREAS CONTRACTOR SHALL PERFORM SOUNDING OR OTHER APPROPRIATE NON-DESTRUCTIVE CONCRETE TESTING TO LOCATE AREAS OF DELAMINATION FOR THE TOP AND BOTTOM DECK SURFACES OF INNER AND OUTER WHARVES FOR BERTH RCH-7 AND RCH-8.
4. CONTRACTOR SHALL MARK THE PERIMETER OF THE DECK REPAIR AREAS TO BE SAW CUT. LAYOUT SHALL BE SQUARE OR RECTANGULAR IN SHAPE. NOTIFY THE ENGINEER FOR REVIEW OF THE PERIMETER TO BE SAW CUT AREA PRIOR TO THE CUTTING.
5. SPECIAL INSPECTION IS REQUIRED FOR SURFACE PREPARATION PRIOR TO INSTALLATION OF STRUCTURAL REPAIR CONCRETE.
6. THE WHARF DECK REPAIR SYSTEM CONSISTING OF REBAR PROTECTION AND MORTAR SHALL BE COMPATIBLE AND SHALL BE SUPPLIED BY A SINGLE SOURCE SO THAT THE REPAIR SYSTEM PERFORMS AS WARRANTIED BY THE PRODUCTS MANUFACTURER
7. THE FOLLOWING CONCRETE AND TIMBER PILE REPAIR PRODUCTS ARE ACCEPTABLE:

   BASF CONSTRUCTION CHEMICAL, LLC
   EMACO S66 CI, FLOWABLE STRUCTURAL-REPAIR CONCRETE WITH INTEGRAL CORROSION INHIBITOR, FOR TOP DECK SURFACE REPAIR

   EMACO S88 CI, SPRAYABLE FIBER-REINFORCED STRUCTURAL REPAIR MORTAR WITH INTEGRAL CORROSION INHIBITOR FOR BOTTOM DECK SURFACE REPAIR.

   MASTERSEAL CP, ADVANCED CORROSION INHIBITOR TREATMENT FOR STEEL REINFORCED CONCRETE, APPLIED TO REPAIRED AREAS.

   SIKA CORPORATION
   SIKA ARMATEC 110 EPOCEM

   SIKAREPAIR 222 FOR TOP SURFACE

   SIKAREPAIR 223 FOR BOTTOM SURFACE

   CONTRACTOR MAY SUBMIT ALTERNATE EQUIVALENT WHARF DECK REPAIR SYSTEM TO THE ENGINEER AND PORT FOR REVIEW AND APPROVAL. THE PRODUCTS INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
8. SEE NOTES ON SHEET S2.1 AND GENERAL NOTES.

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|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

WHARF DECK REPAIR NOTES AND DETAILS

| | | | |
|---|---|---|---|
| Project No. | Z1800 | | |
| By AH | Checked TG/EGS | Sheet No. | S3.3 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

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## CONCRETE PILE REPAIR SCHEDULE AT OUTER WHARF

| PHASE 1 | | | PHASE II | | |
|---|---|---|---|---|---|
| ROW NO. | BENT NO. | COMMENTS | ROW NO. | BENT NO. | COMMENTS |
| **BERTH RCH-8** | | | BERTH RCH -8 | | |
| | | See Partial Wharf Repair Plan, Drawing S4.1 for pile locations | | | See Partial Wharf Repair Plan, Drawing S4.1 for piles locations |
| A' | 3.9, 4.1 | | B' | 15.9 | |
| A' | 7.1 | | D' | 19.1 | |
| A' | 19.1 | | C | 15 to 20 | |
| C | 1 to 14 | | | | |
| D' | 4.1 | | | | |
| E' | 3.9, 4.1 | | | | |
| D' | 6.9 | | | | |
| E' | 6.9. 7.1 | | | | |
| D' | 9.9, 10.1 | | | | |
| D', E' | 12.9 | | | | |
| | | See Partial Wharf Repair Plan, Drawing S4.2 for and pile locations | | | See Partial Wharf Repair Plan, Drawing S4.2 for pile locations |
| B' | 24.9 | | B' | 22.1 | |
| A' | 37.1 | | A' | 27.9 | |
| B' | 36.9 | | C | 21, 25 | |
| C | 31 | | C | 26, 28 | |
| C | 33, 34 | | C | 29 | |
| C | 36 to 39 | | E' | 24.9, 25.1 | |
| A', B' | 33.9 | | D' | 31.1 | |
| B' | 39.9, 40.1 | | E' | 30.9, 31.1 | |
| D', E' | 33.9, 34.1 | | | | |
| D' | 36.9 | | | | |
| E' | 37.1 | | | | |
| D' | 39.9,40.1 | | | | |
| E' | 40.1 | | | | |
| | | See Partial Wharf Repair Plan, Drawing S4.3 and pile locations | | | See Partial Wharf Repair Plan, Drawing S4.3 for pile locations |
| B' | 55.1 | | B' | 45.9, 46.1 | |
| C | 43 | | B' | 51.9 | |
| | | | B' | 57.9 | |
| | | | C | 44, 45 | |
| | | | C | 47 to 61 | |
| | | | D' | 42.9 | |
| | | | D' | 46.1 | |
| | | | E' | 45.9, 46.1 | |
| | | | D'. E' | 48.9, 49.1 | |
| | | | D', E' | 51.9, 52.1 | |
| | | | D', E' | 54.9, 55.1 | |
| | | | D', E' | 57.9,58.1 | |
| | | | D, E, E0 | 61 | |
| PHASE 1 - TOTAL NUMBER OF PILES = 53 | | | PHASE II - TOTAL NUMBER OF PILES = 64 | | |
| **BERTH RCH-7** | | | BERTH RCH -7 | | |
| | | See Partial Wharf Repair Plan, Dwg S4.3 & S4.4 for pile location | | | See Partial Wharf Repair Plan, Dwg S4.3 & S4.4 for pile locations |
| B' | 65.1 | | A' | 83.1 | |
| A' | 74.1 | | D, E | 62 | |
| A' | 76.0, 77.1 | | D', E' | 64.9, 65.1 | |
| B' | 77.1 | | C | 62, 63, 64 | |
| C | 65 | | C | 79 to 84 | |
| C | 67 TO 78 | | | | |
| D', E' | 70.9, 71.1 | | | | |
| D', E' | 74.1 | | | | |
| E' | 76.9 | | | | |
| | | See Partial Wharf Repair Plan, Drawing S4.5 for Pile locations | | | See Partial Wharf Repair Plan, Drawing S4.5 for pile locations |
| C | 92 | | C | 85 to 91 | |
| B' | 100.9 | | C | 93, 94 | |
| C | 95 to 105 | | | | |
| | | See Partial Wharf Repair Plan, Drawing S4.6 for Pile locations | | | See Partial Wharf Repair Plan, Drawing S4.6 for pile locations |
| | | | A' | 119.1 | |
| A' | 109.1 | | C | 106 to 120 | |
| A' | 113.1 | | C | 122, 123, 124,126 | |
| B' | 115.9 | | | | |
| C | 125 | | | | |
| | | See Partial Wharf Repair Plan, Drawing S4.7 for pile locations | | | See Partial Wharf Repair Plan, Drawing S4.7 for pile locationS |
| C | C128, 134 | | C | 127, 129, 130 | |
| PHASE 1 - TOTAL NUMBER OF PILES = 44 | | | PHASE II - TOTAL NUMBER OF PILES = 48 | | |

NOTE:

1. REFER TO DRAWING SHEET S3.5 FOR CONCRETE PILE REPAIR DETAILS

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|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

## TIMBER PILE REPAIR SCHEDULE AT INNER WHARF

| PHASE 1 | | | PHASE II | | |
|---|---|---|---|---|---|
| ROW NO. | BENT NO. | COMMENTS | ROW NO. | BENT NO. | COMMENTS |
| **BERTH RCH-8** | | | **BERTH RCH -8** | | |
| | | See Partial Wharf Repair Plan Drawing S4.2 for pile locations | | | See Partial Wharf Repair Plan Drawing S4.2 for pile locations |
| A | 12, 13, 14 | Missing Piles | F | 5, 11, 12, 13, 15 | Damaged piles |
| B | 15 | Missing Pile | G | 5, 14, 15 | Damaged piles |
| E | 2, 3, 4 | Missing Piles | | | |
| F | 15,15.9,16.1,19 | Damaged pile | | | |
| G | 15,15.9,16.1,19 | Damaged pile | | | |
| ⚠1 | | See Partial Wharf Repair Plan, Drawing S4.3 for pile locations | | | See Partial Wharf Repair Plan Drawing S4.3 for pile locations. |
| A | 36 | Missing Piles | AT TIE BACK #4 AT LINE F | 16.9, 17.1 | Damaged piles |
| C | 25, 34, 35 | Missing Piles | F | 19 | Damaged piles |
| D | 35 | Damaged pile | F | 20, 21, 23 | Missing Piles |
| E | 35, 36 | Damaged piles | F | 22, 24 | Damaged piles |
| AT TIE BACK #5, BETWEEN D& E | 32 | Damaged piles | F | 26,27 | Missing Piles |
| | | | F | 28, 29, 30 | Damaged piles |
| | | | AT TIE BACK #5 BETWEEN F&G | 31, 32 | Damaged piles |
| | | | F | 32, 35, 37, 38 | Damaged piles |
| | | | G | 16, 19, 21, 24,27, 28, 34, 35 | Damaged piles |
| PHASE 1 - TOTAL NUMBER OF PILES = 16 | | | PHASE II - TOTAL NUMBER OF PILES = 38 | | |
| **BERTH RCH-7** | | | **BERTH RCH -7** | | |
| | | See Partial Wharf Repair Plan Dwg S4.3 & S4.4 for pile locations. | | | See Partial Wharf Repair Plan Dwg S4.3 & S4.4 for pile locations |
| C | 44 | Damaged pile | F | 59 | Missing Pile |
| D | 43, 45 | Missing Piles | F | 60, 61 | Damaged piles |
| AT TIE BACK #6 AT LINE D | 48 | Damaged pile | F | 63 | Missing piles |
| E | 47, 48 | Damaged piles | F | 65 | Damaged pile |
| E | 50 | Missing pile | G | 41,42 | Damaged piles |
| E | 56 | Missing Pile | | | |
| | | See Partial Wharf Repair Plan Drawing S4.5 for pile locations | | | See Partial Wharf Repair Plan Drawing S4.5 for pile locations |
| E | 85 | Damaged pile | F | 68, 73, 76, 77 | Damaged pile |
| F | 80,80,82,83,84 | Missing Piles | F | 78 to 84 | Missing Piles |
| ⚠1 | | | F | 85 | Damaged pile |
| | | | F | 86, 87 | Missing Piles |
| | | | F | 88, 89 | Damaged piles |
| | | | AT TIE BACK #8 BETWEEN F&G | 75.1, 75.3 | Damaged piles |
| | | See Partial Wharf Repair Plan Drawing S4.6 for pile locations | | | See Partial Wharf Repair Plan Drawing S4.6 for pile locations |
| A | 105 | Damaged pile | F | 90, 91, 92 | Damaged Piles |
| E | 99 | Missing pile | F | 93 | Missing pile |
| | | | F | 95 | Damaged Pile |
| | | | F | 96 | Missing Pile |
| | | | F | 97 | Damaged Pile |
| | | | F | 98, 99, 100, 101 | Missing Piles |
| | | | F | 102, 103 | Damaged Piles |
| | | | F | 104 to 108 | Missing Piles |
| | | | F | 109, 110, 111 | Damaged Piles |
| | | | F | 112 | Missing pile |
| | | | AT TIE BACK #10 BETWEEN F&G | 103, 104 | Damaged Pile |
| | | | G | 104, 105 | Damaged piles |
| NONE | | | | | See Partial Wharf Repair Plan Drawing S4.7 for pile locations. |
| | | | F | 113, 115 | Missing Piles |
| | | | AT TIE BACK #11 AT LINE G | 116 | Damaged piles |
| PHASE 1 - TOTAL NUMBER OF PILES = 11 | | | PHASE II - TOTAL NUMBER OF PILES= 55 | | |

NOTES

1. REFER TO DRAWING SHEET S3.6 FOR TIMBER PILE REPAIR DETAILS, SEE DETAIL 2/S3.5 ⚠1
2. REFER TO DRAWING SHEETS S3.6 TO S3.7 FOR PILE REPLACEMENT DETAILS. CONTRACTOR SHALL USE EITHER DETAIL 3/S3.6 OR 1/S3.7 FOR PILE REPLACEMENT

## Concrete and Timber Pile Repair Notes

1. The purpose of the pile repair is to restore the structural strength of the piles so that they will support a design live load of 250 psf on the wharf deck and to extend the pile service life.
2. Contractor shall refer to the following wharf inspection reports for the conditions of pile damage:
   a. Inspection Report for Berth RCH–7 and Berth RCH–8 at Point Potrero in the Port of Richmond, California, prepared for Liftech Consultants Inc. by Collins Engineers, Inc., September 10, 2009.
   b. Above and Underwater Inspection Report of Berth 7, Shipyard No. 3, Port of Richmond, CA, prepared for The Pasha Group by Han Padron Associates Engineers, Inc., August 2001.
3. The pile repair at Berth RCH–7 is limited to the piles with at least "Moderate Damage" in accordance with the Collins inspection report. Piles with less than moderate damage are adequate for supporting the design live load.
4. The pile repair at Berth RCH–8 is limited to the piles with at least "Advanced Damage" in accordance with the Han Padron inspection report. Piles with less than advanced damage are adequate for supporting the design live load.
5. Missing piles shall be replaced, refer to detail 3/S3.6. ⚠1
6. The pile repair work shall be performed in accordance with the following applicable specifications:
   a. American Concrete Institute, Concrete Repair Guide. Farmington Hills, MI: American Concrete Institute, 2004.
   b. American Concrete Institute, Surface Repair Using Form–and–Pump Techniques. Farmington Hills, MI: American Concrete Institute, 2003.
   c. International Concrete Repair Institute, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (Guideline No. 310.1R–2008). Des Plaines, IL: International Concrete Repair Institute, 2008.
7. The contractor shall have at least five years of experience with concrete and timber pile repair projects.
8. The pile repair work shall be inspected by a special inspector with a minimum of two years experience with the pile repair work. Refer to the General Notes for additional special inspection report requirements.
9. The pile repair will be performed in phases. Phase I consists of repairing the damaged piles in the Traffic Loading area, as shown on Drawings S3.1, and S3.2 and piles at new bollard and fender supports. Phase II consists of repairing the remaining damaged piles. Refer to the Concrete Repair Piles Schedule on this sheet.
10. The concrete pile repair concepts are shown on Drawing Sheet S3.5. The timber pile repair concepts are shown on Drawing Sheet S3.6. The contractor may submit alternate repair concepts to the Engineer and the Port for review and approval.
11. Contractor shall submit the repair procedures, proposed jacket and grout specifications to the Engineer and the Port for review and approval prior to commencing the repair work. If shoring is required, contractor shall submit shoring design calculations, signed by a licensed engineer, and in conformance with OSHA requirements.
12. The concrete and timber pile repair system consisting of protective jacket, grout, and epoxy shall be compatible and shall be supplied by a single source so that the repair system performs as warrantied by the products manufacturer.
13. The following concrete and timber pile repair products are acceptable:

    Fox Industries Inc
    FX–70 Inert Corrosion–Free jacket with minimum 1/8" wall thickness
    FX–70–6 Hydro–Ester MP Marine Epoxy Grout
    FX–225 Non–Shrink Non–Metallic Underwater Grout
    FX–763 Low Modulus Hydro–Ester Trowel Grate Epoxy
    Sika Corporation
    Fiberglass Reinforced Plastic (FRP) pile sleeve with minimum 1/8" wall thickness
    Sika MonoTop 611 and Sikament 100 SC for concrete pile
    Sikadur 35, Hi–Mod LV LPL or SikaGrout 212 for timber pile
    Sikadur Injection Gel for sealant
    SikaRepair 223 for patching

    Contractor may submit an equivalent wharf deck repair system to the Engineer and Port for review and approval. The products installation shall be in accordance with manufacturer's recommendations.

REGISTERED PROFESSIONAL ENGINEER — SIGIARTO LOW — No. 3041 — Exp. 03/31/2011 — STRUCTURAL — STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

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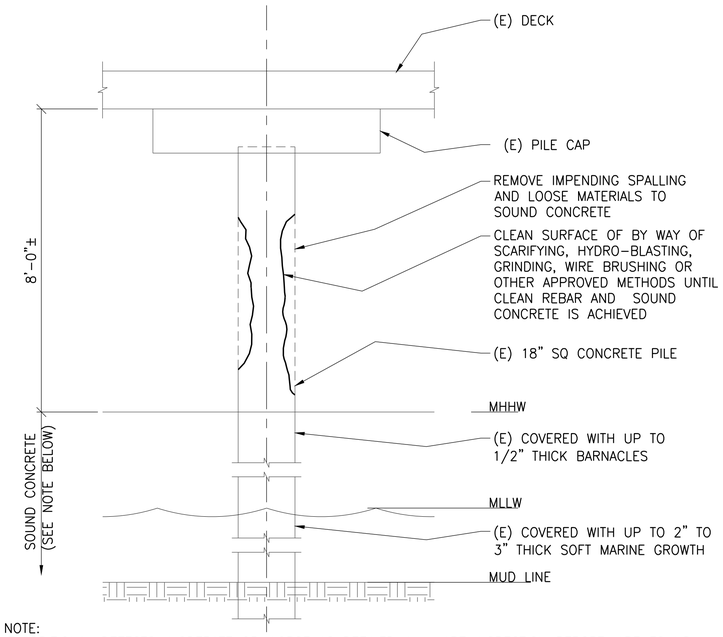
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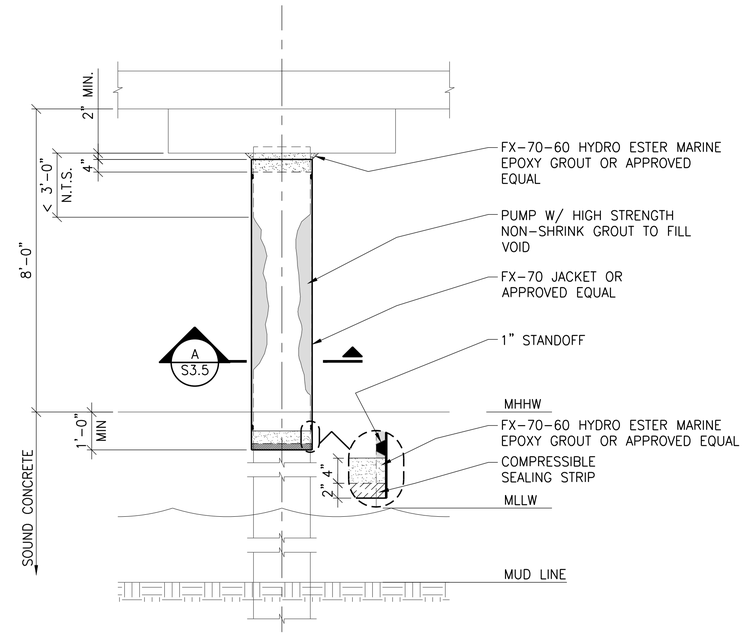



NOTE:
IF ADDITIONAL DEFECTS, MODERATE OR WORSE AS DEFINED IN WHARF INSPECTION REPORT, ARE FOUND BELOW MHHW, NOTIFY ENGINEER AND PORT. ADDITIONAL REPAIRS MAY BE REQUIRED.

## TYPICAL CONCRETE PILE DAMAGED SURFACE PREPARATION (1/S3.5)

1/2" = 1'-0"

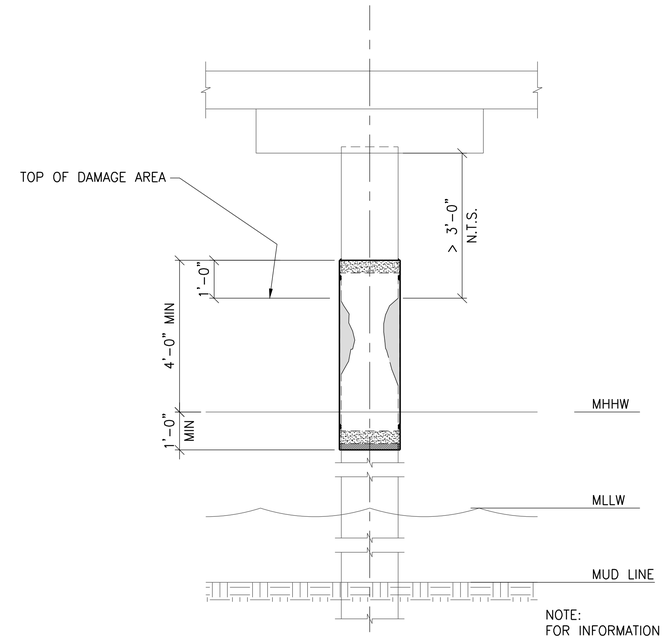
AXXX-XXX 1




## TYPICAL CONCRETE PILE REPAIR DETAIL - 1 (2/S3.5)

1/2" = 1'-0"

PILE_REPAIR-1 1

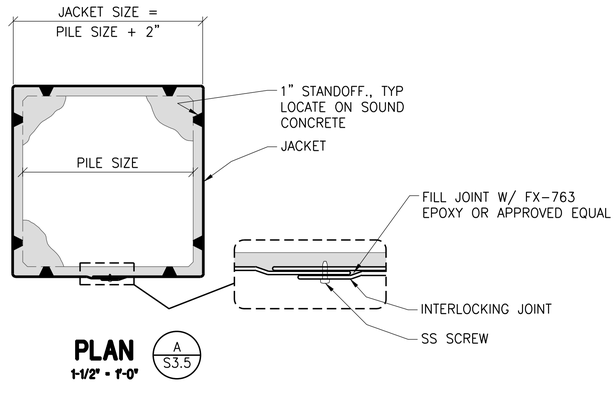



NOTE:
FOR INFORMATION NOT SHOWN SEE DETAIL 2/S3.5

## TYPICAL CONCRETE PILE REPAIR DETAIL - 2 (3/S3.5)

1/2" = 1'-0"

PILE_REPAIR-1 1




## PLAN (A/S3.5)

1-1/2" = 1'-0"

AXXX-XXX 1

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FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

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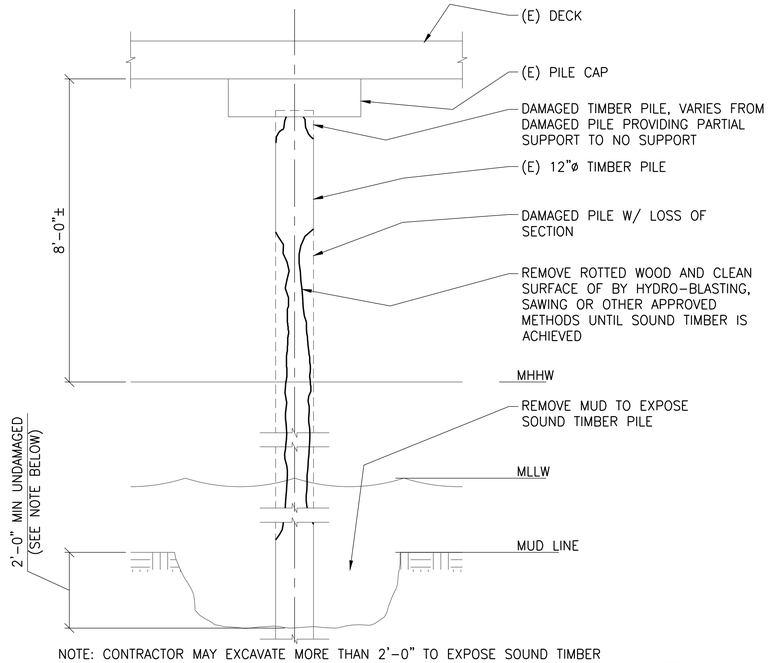
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CONCRETE PILE REPAIR DETAILS

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S3.5 |
| Approved SL | | of | ---- |
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I:\Z1800\Dwg\Current\S3.5 CONCRETE PILE REPAIR DETAILS.dwg 1/24/2012 3:36:48 PM ALVIN HOFFPAUIR

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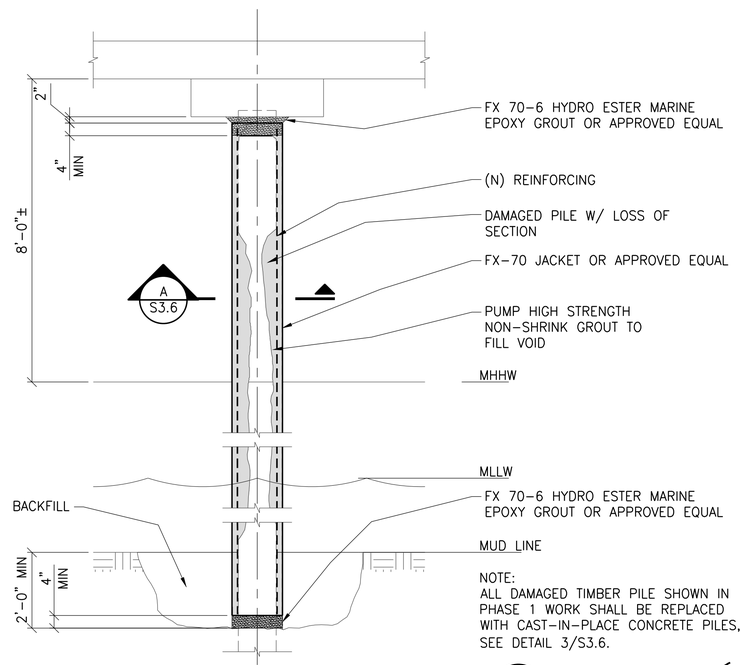

NOTE: CONTRACTOR MAY EXCAVATE MORE THAN 2'-0" TO EXPOSE SOUND TIMBER

## TYPICAL TIMBER PILE DAMAGED SURFACE PREPARATION

1/2" = 1'-0"

1 / S3.6

AXXX-XXX 1




NOTE:
ALL DAMAGED TIMBER PILE SHOWN IN PHASE 1 WORK SHALL BE REPLACED WITH CAST-IN-PLACE CONCRETE PILES, SEE DETAIL 3/S3.6.

## TYPICAL TIMBER PILE REPAIR DETAIL

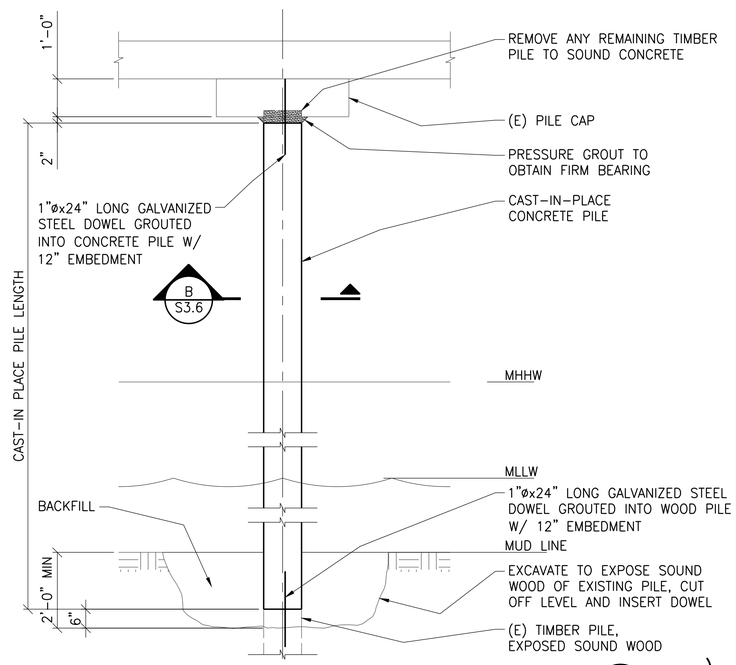
1/2" = 1'-0"

2 / S3.6

TIM_PILE_REPAIR-1 1

NOTE:
CONTRACTOR HAS THE OPTION TO REPAIR TIMBER PILE OR REPLACE DAMAGED PILE WITH CAST-IN-PLACE CONCRETE PILE PER DETAIL 3/S3.6

1




## (N) CAST-IN-PLACE PILE TO REPLACE MISSING PILES

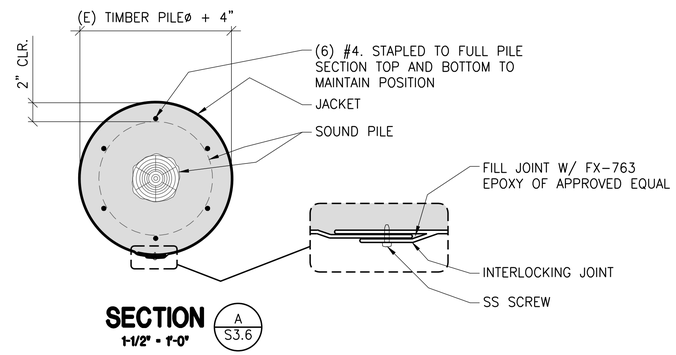
1/2" = 1'-0"

3 / S3.6

TIM_PILE_REPAIR-1 1

NOTES:
1. IF CAST-IN-PLACE CONCRETE PILE LENGTH IS 24'-0" OR LESS, USE 12" DIAMETER PILE
2. IF CAST-IN-PLACE CONCRETE PILE LENGTH IS BETWEEN 24'-0" AND 28'-0", USE 14" DIAMETER PILE.

1

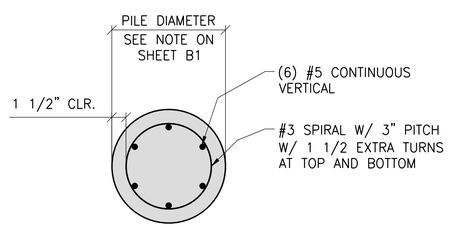



## SECTION

1-1/2" = 1'-0"

A / S3.6

AXXX-XXX 1




## SECTION

1-1/2" = 1'-0"

B / S3.6

AXXX-XXX 1

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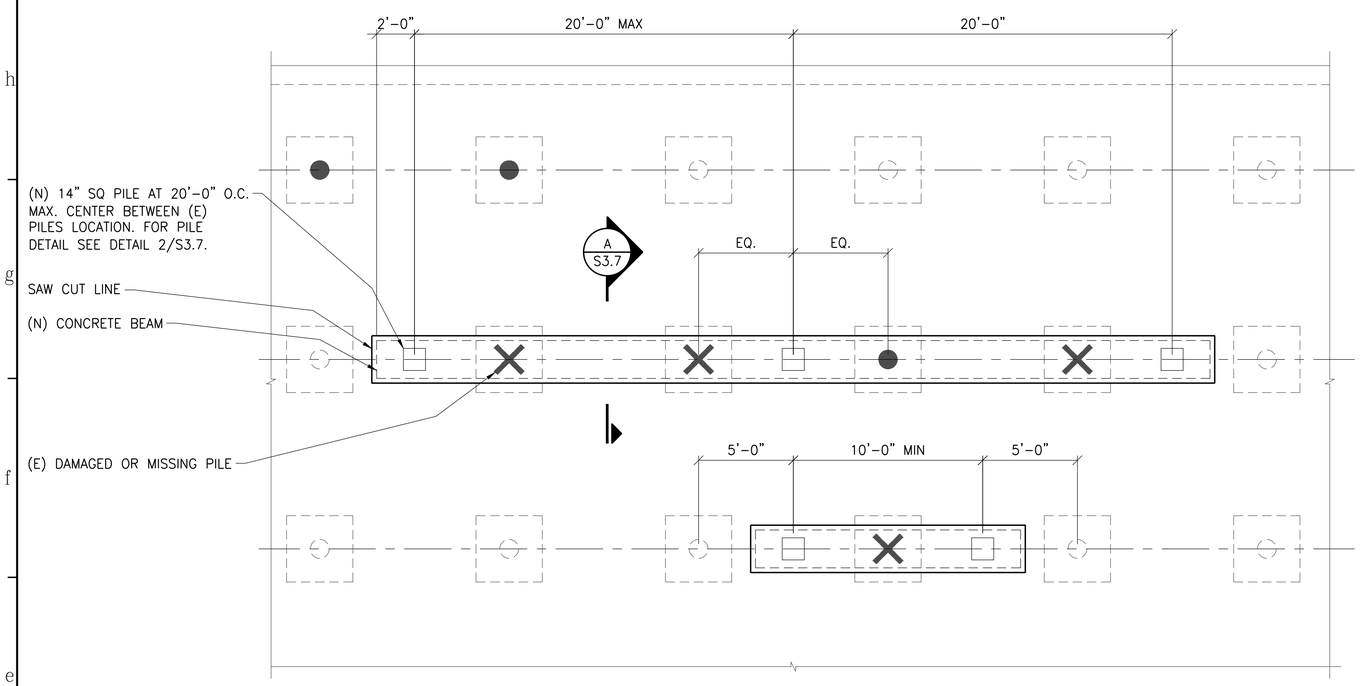
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PORT OF RICHMOND

TIMBER PILE REPAIR AND REPLACEMENT DETAILS

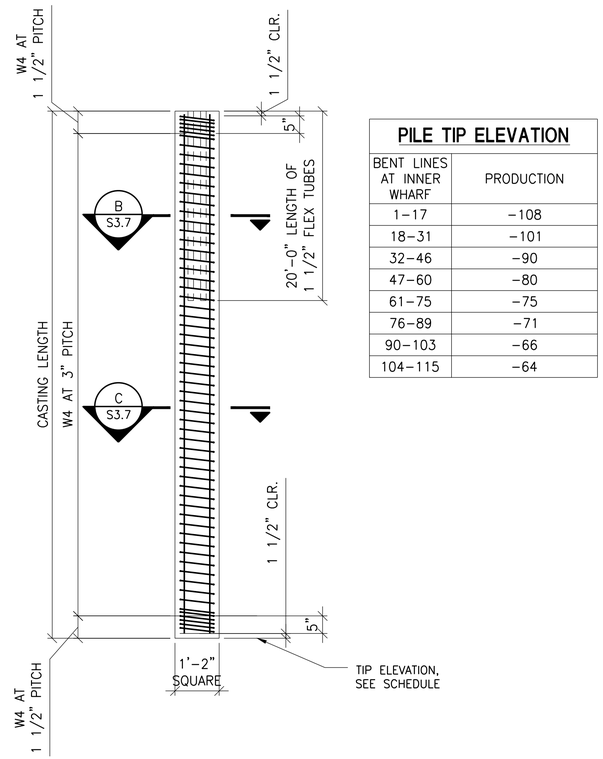
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|---|---|---|---|
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| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |



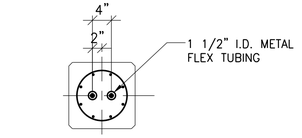
I:\Z1800\Dwg\Current\S3.6 TIMBER PILE REPAIR AND REPLACEMENT DETAILS.dwg 1/24/2012 3:36:53 PM ALVIN HOFFPAUIR




## PLAN AT PILE REPAIR (1 / S3.7)
1/4" = 1'-0"

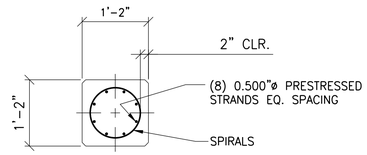



| PILE TIP ELEVATION | |
|---|---|
| BENT LINES AT INNER WHARF | PRODUCTION |
| 1–17 | –108 |
| 18–31 | –101 |
| 32–46 | –90 |
| 47–60 | –80 |
| 61–75 | –75 |
| 76–89 | –71 |
| 90–103 | –66 |
| 104–115 | –64 |

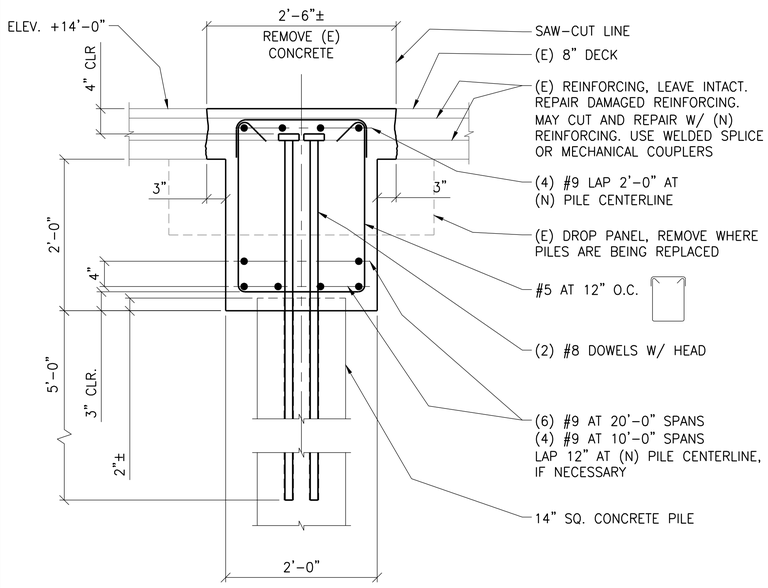



NOTE:
FOR INFORMATION NOT SHOWN SEE DETAIL C/S3.7

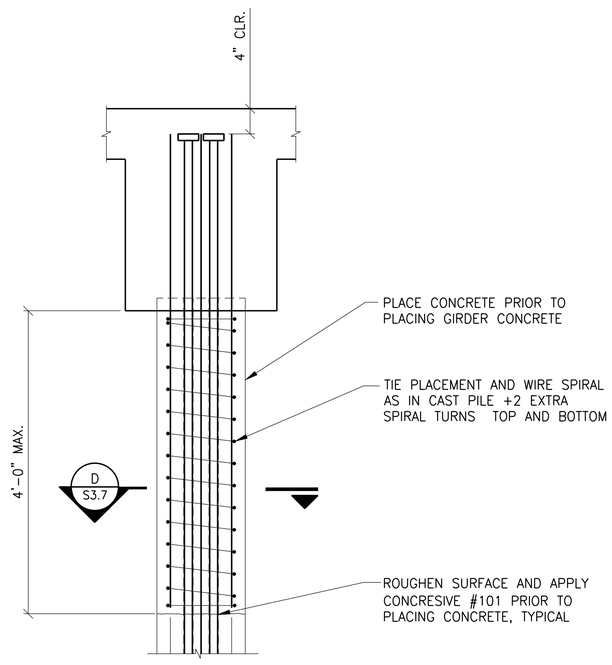
## SECTION (B / S3.7)
3/4" = 1'-0"




## 14" SQ PRESTRESSED CONCRETE PILE DETAIL (2 / S3.7)
DO NOT SCALE



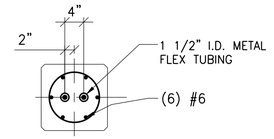

## SECTION (A / S3.7)
1" = 1'-0"




## CAST IN PLACE PILE EXTENSION (B / S3.7)
1" = 1'-0"

### PRESTRESSED PILE NOTES:
1. MINIMUM CONCRETE COMPRESSIVE STRENGTH SHALL BE F'C = 6000 PSI AT 28 DAYS AND F'C AT TRANSFER OF STRESS F'C = 4000 PSI.
2. MATERIALS
   - CEMENT SHALL BE TYPE II OR MODIFIED TYPE II
   - AGGREGATES SHALL BE PER ASTM C33 3/4" MAX.
   - PRESTRESSED STRANDS SHALL BE ASTM A416 LOW RELAXATION 7-WIRE STRANDS WITH MIN. BREAKING STRENGTH OF 270 KSI.
   - MILD REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60.
   - SPIRAL BARS SHALL BE ASTM A82 COLD DRAWN WIRE WITH MINIMUM YIELD STRENGTH OF 70 KSI.
   - HEADED REINFORCEMENT SHALL CONFORM TO ASTM A970-08
3. MINIMUM CONCRETE COVER OVER SPIRAL SHALL BE 2".
4. MAXIMUM JACKING FORCE PER STRAND SHALL BE 28.9 KIPS.
5. MINIMUM EFFECTIVE PRESTRESS IN CONCRETE, AFTER LOSSES = 800 PSI.
6. PILES SHALL BE DRIVEN TO REFUSAL. THE REQUIRED BLOW COUNT WILL BE DETERMINED BY FUGRO AFTER SUBMISSION OF THE PROPOSED PILE DRIVING HAMMER. THE TIP ELEVATIONS HAVE BEEN SET SO PILES ARE EMBEDDED 3'-0" INTO BED ROCK. PILES MAY HAVE TO BE CUT-OFF OR EXTENDED IF BEDROCK ELEVATIONS VARIES FROM ESTIMATED.
7. PILES HAVE BEEN PROPORTIONED FOR A DEAD LOAD PLUS LIVE LOAD ALLOWABLE COMPRESSIVE CAPACITY OF 130 KIPS IN ACCORDANCE WITH THE FOUNDATION RECOMMENDATION BY FUGRO, INC. REFER TO FUGRO'S LETTER REPORT DATED 01/27/10, FUGRO PROJECT NO. 1413.005.
8. ELEVATIONS ARE WITH REFERENCE TO MLLW.

NOTE:
THIS SHEET IS NOT USED FOR PHASE 1 WORK.




NOTE:
FOR INFORMATION NOT SHOWN SEE DETAIL C/S3.7

## SECTION (C / S3.7)
3/4" = 1'-0"

## SECTION (D / S3.7)
3/4" = 1'-0"

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PORT OF RICHMOND

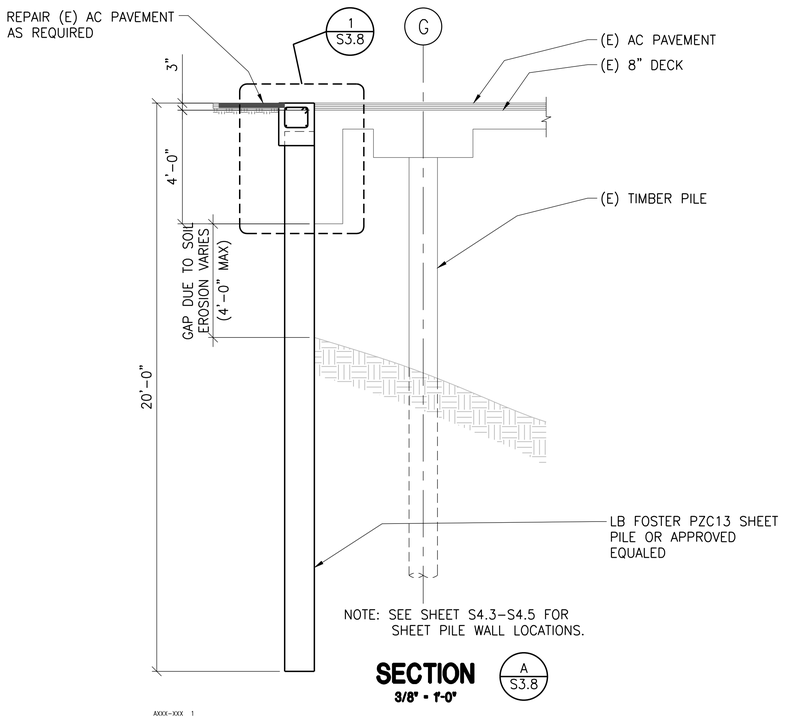
ALTERNATE TIMBER PILE REPLACEMENT DETAILS

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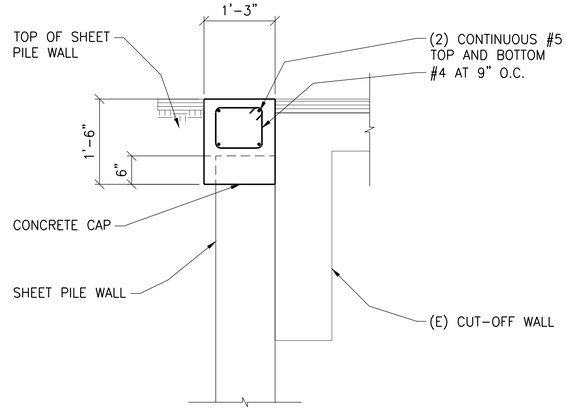


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**SECTION** A S3.8
3/8" = 1'-0"

AXXX-XXX 1




**DETAIL** 1 S3.8
3/4" = 1'-0"

AXXX-XXX 1

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PORT OF RICHMOND

SHEET PILE DETAIL

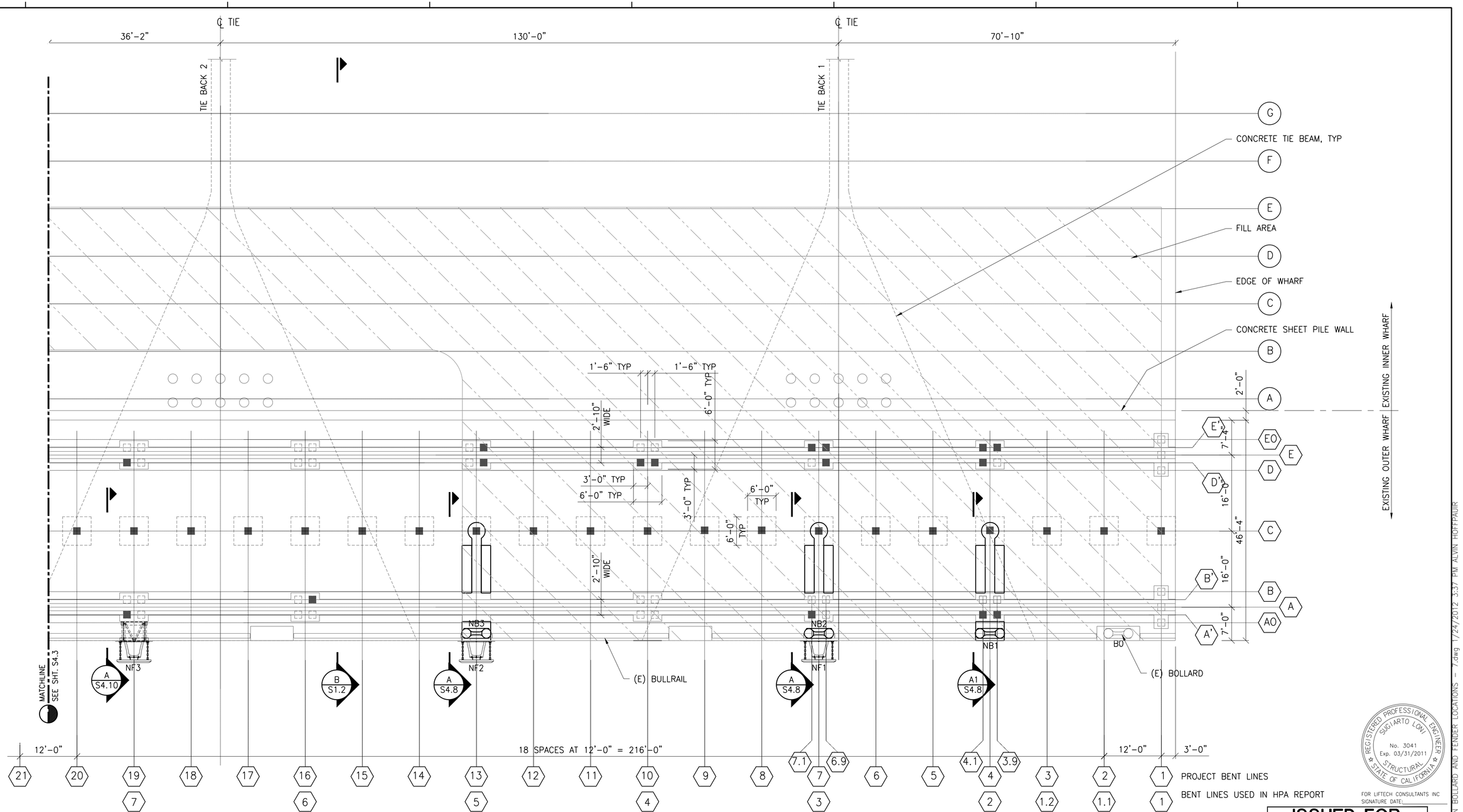
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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 1

1" = 10'-0"

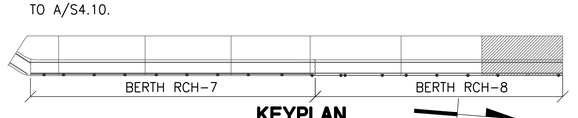
**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

0' 10' 20' 30'
SCALE: 1" = 10'




**KEYPLAN**

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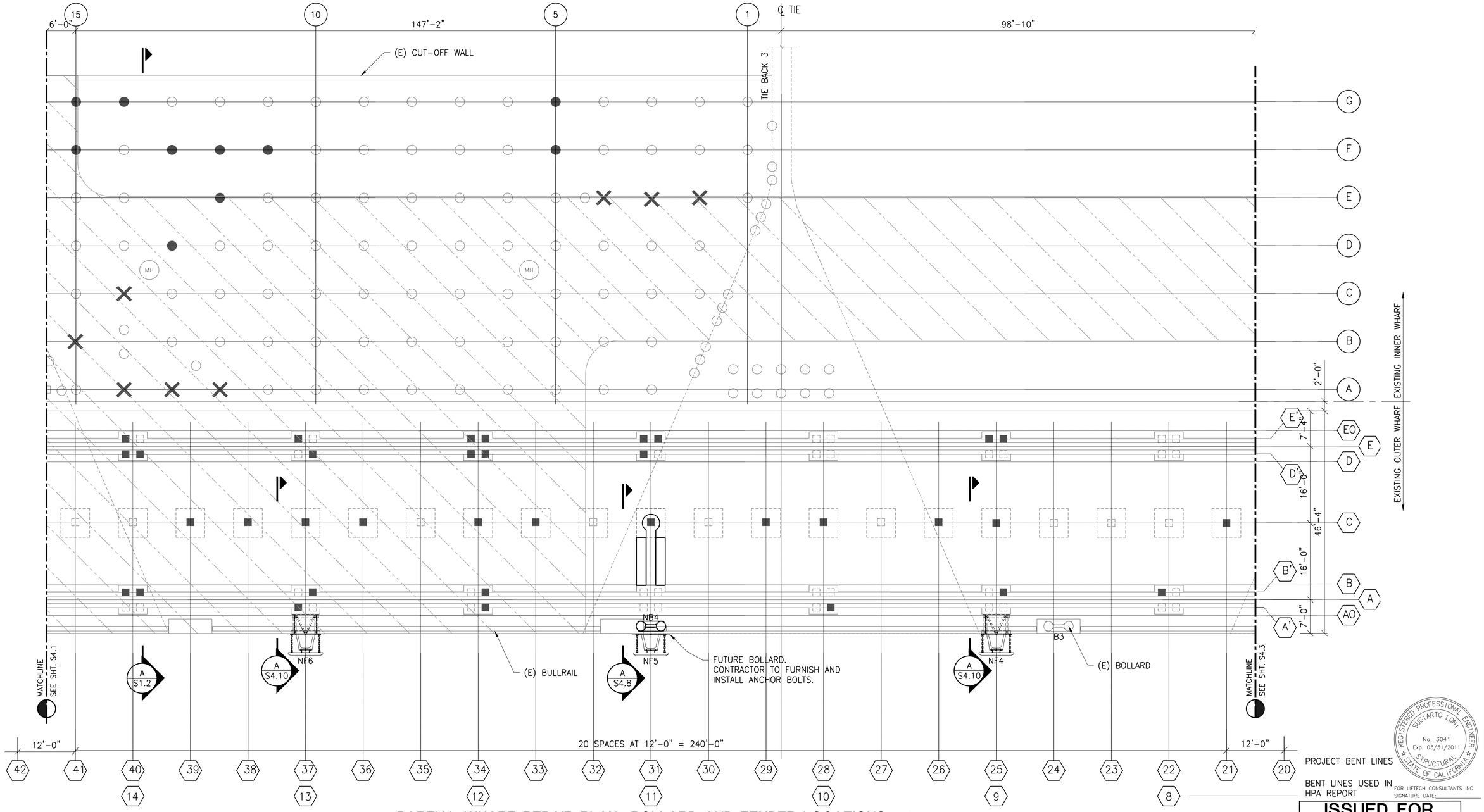
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PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 1

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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 2

1" = 10'-0"

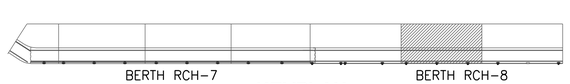
**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

0' 10' 20' 30'
SCALE: 1" = 10'




**KEYPLAN**

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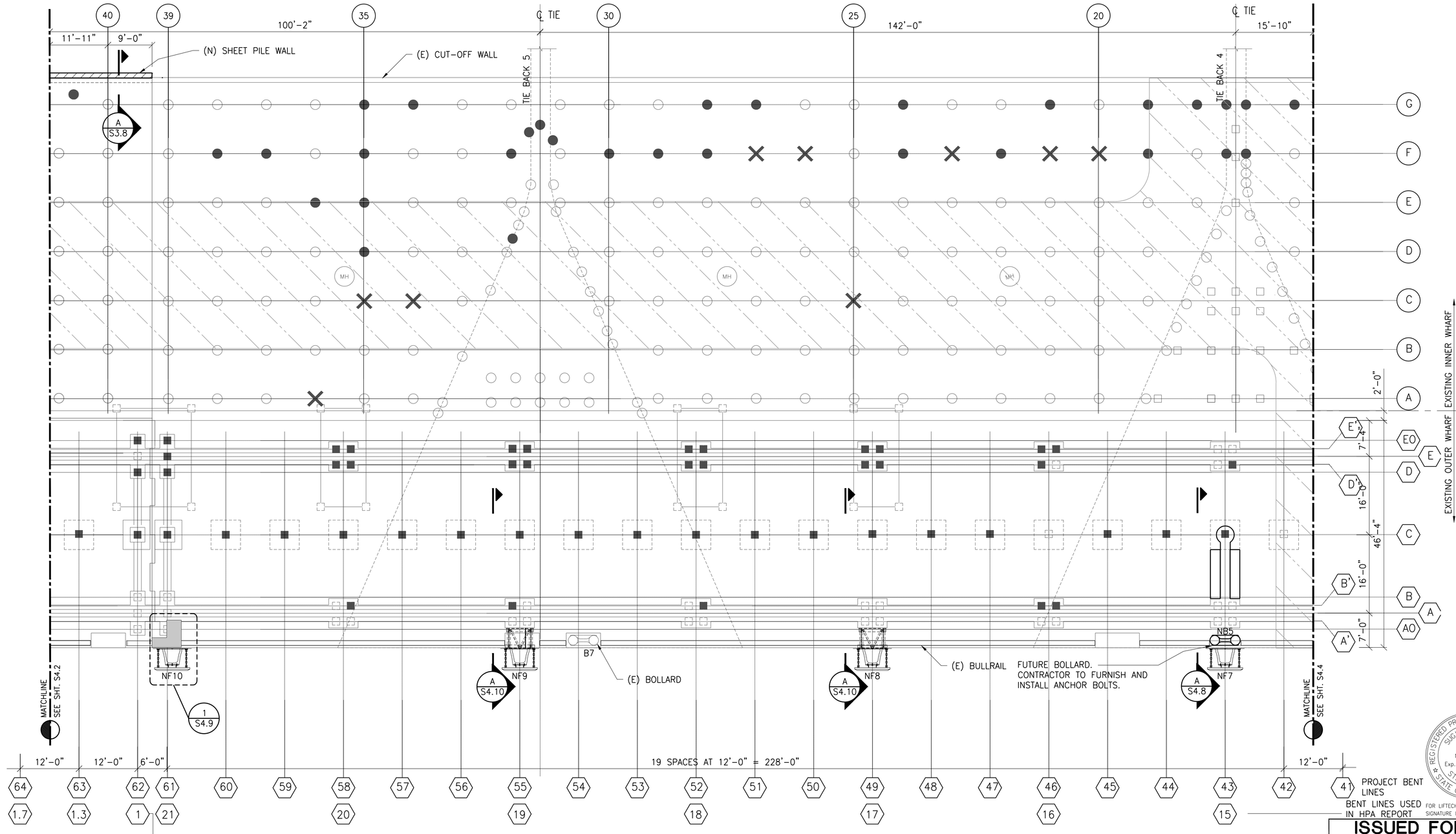
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PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 2

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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 3

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

- NBX / NFX — (N) BOLLARD / (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

0' 10' 20' 30'
SCALE: 1" = 10'




**KEYPLAN**

N

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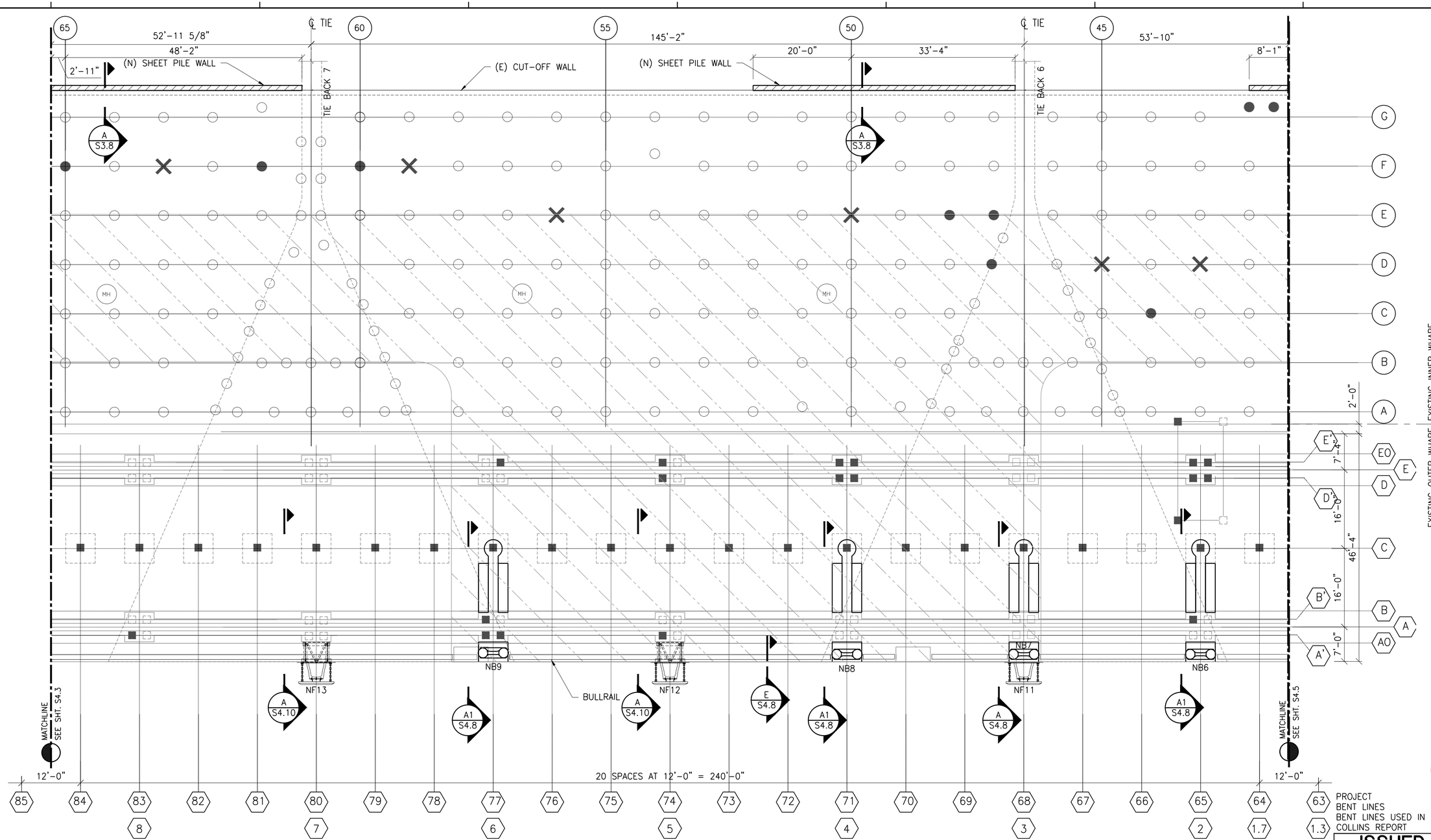
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PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 3

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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 4

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

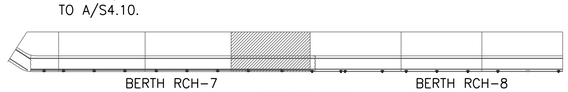
| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.




**KEYPLAN**

0' 10' 20' 30'
SCALE: 1" = 10'

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REGISTERED PROFESSIONAL ENGINEER
SIGI LARTO LONI
No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

**ISSUED FOR CONSTRUCTION**

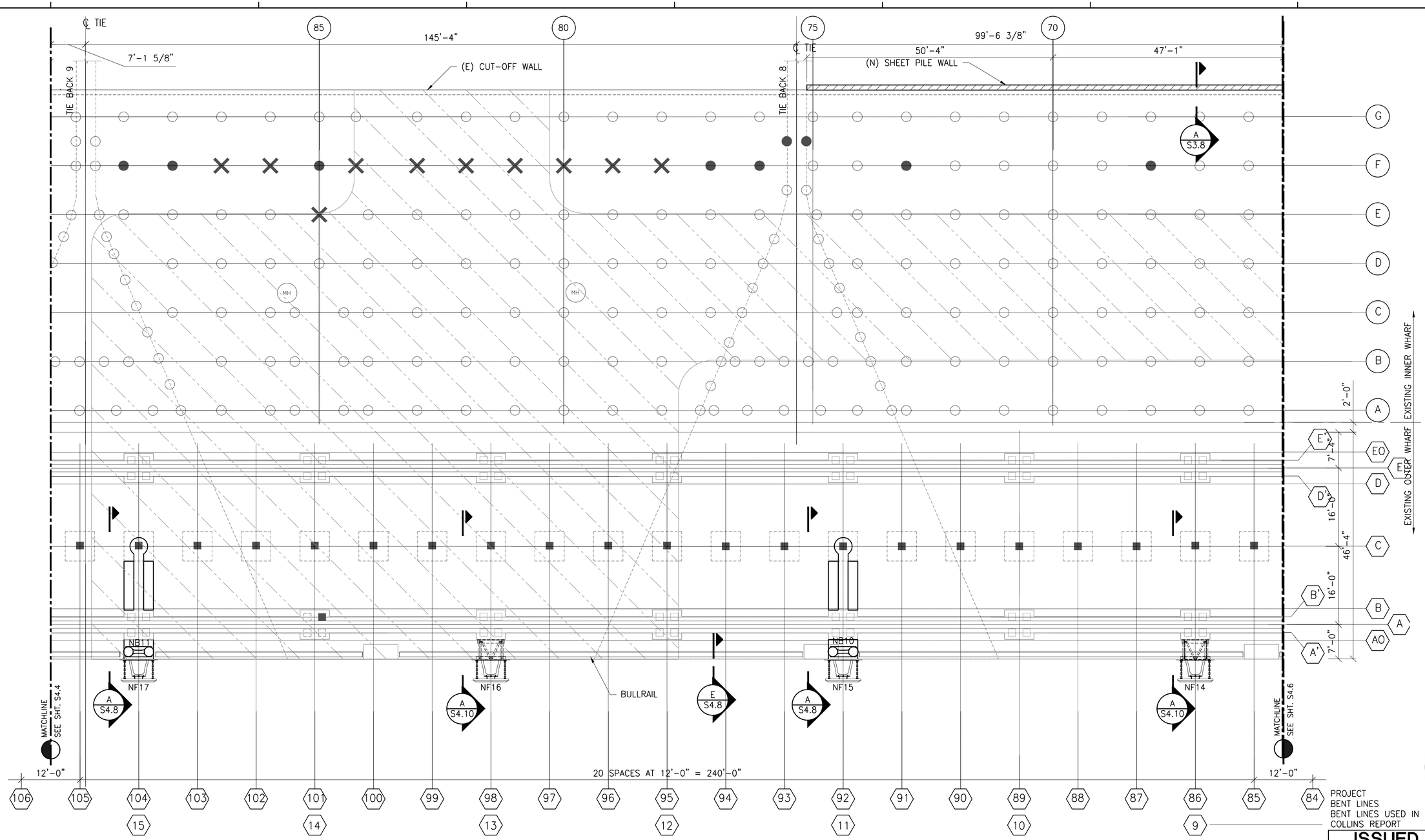
POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 4

| | | | |
|---|---|---|---|
| Project No. | Z1800 | | |
| By AH | Checked TG/EGS | Sheet No. | S4.4 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 5

1" = 10'-0"

**SHEET PILE WALL NOTE:**

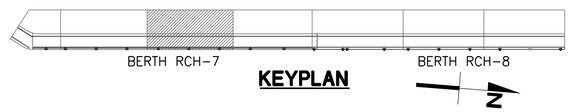
1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

- NBX / NFX — (N) BOLLARD / (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.




**KEYPLAN**

0' 10' 20' 30'
SCALE: 1" = 10'

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

PROJECT
BENT LINES
BENT LINES USED IN COLLINS REPORT

REGISTERED PROFESSIONAL ENGINEER — SIGIARTO LOW — No. 3041 — Exp. 03/31/2011 — STRUCTURAL — STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 5

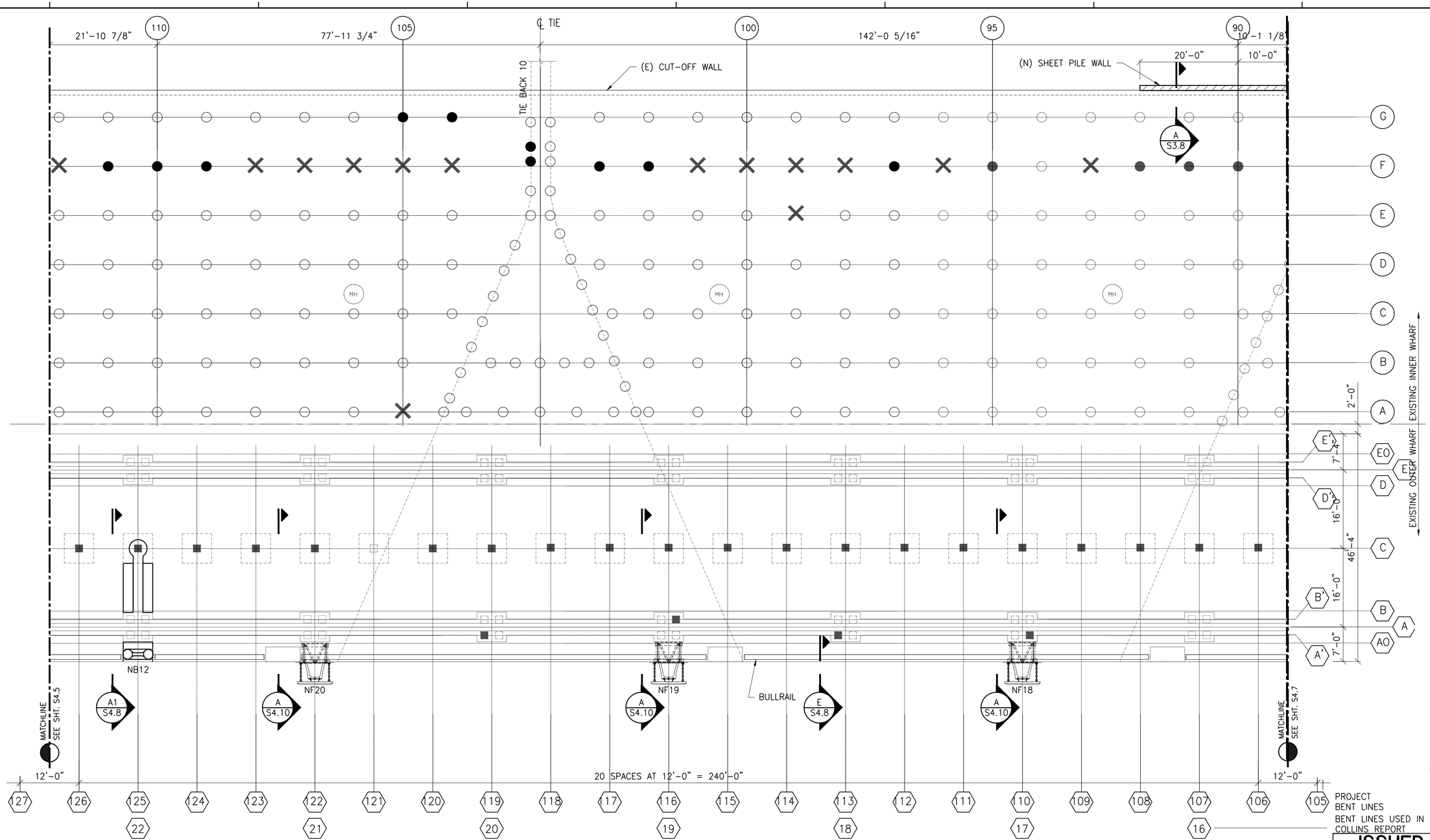
Project No. Z1800
By AH Checked TG/EGS Sheet No. S4.5
Approved SL of ----
Date 01/25/10 Revision 1

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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 6

1" = 10'-0"

**SHEET PILE WALL NOTE:**

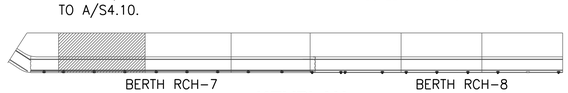
1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.




**KEYPLAN**

0' 10' 20' 30'
SCALE: 1" = 10'

| No. | Revision | Date | By | Checked | Approved |
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Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

PROJECT
BENT LINES
BENT LINES USED IN COLLINS REPORT

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

**ISSUED FOR CONSTRUCTION**

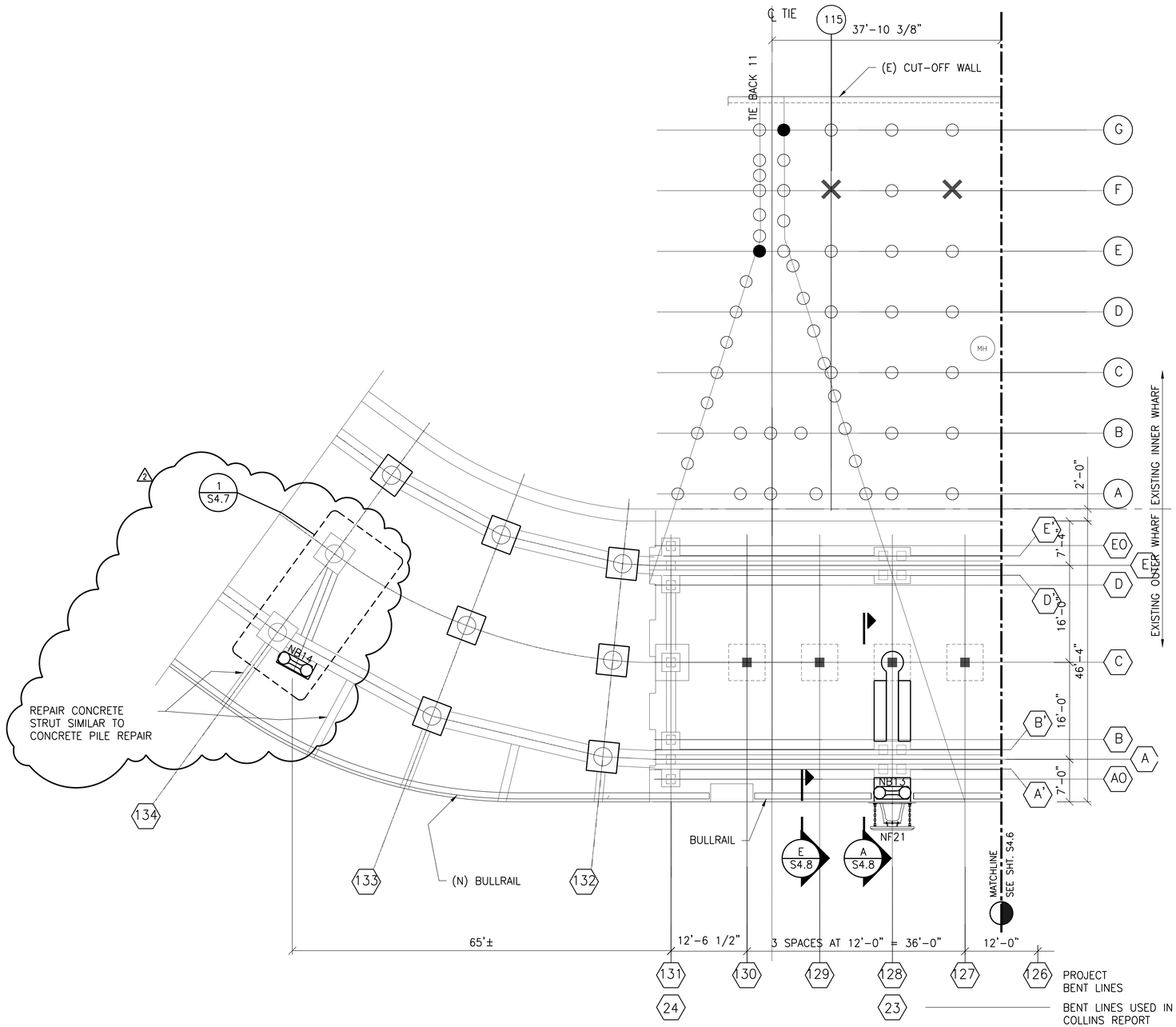
POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 6

| | | | |
|---|---|---|---|
| Project No. | Z1800 | | |
| By AH | Checked TG/EGS | Sheet No. | S4.6 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |



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## PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 7

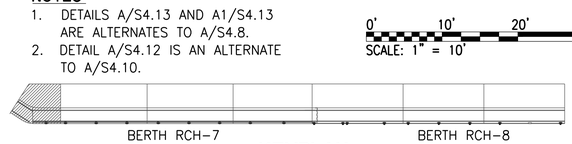
1" = 10'-0"

**LEGEND**

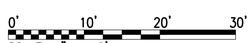
- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.




**KEYPLAN**




| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 2 | BOLLARD NO. 14 SUPPORT | 06/11/10 | LMK/AH | TG | SL |
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |




FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

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1/24/2012
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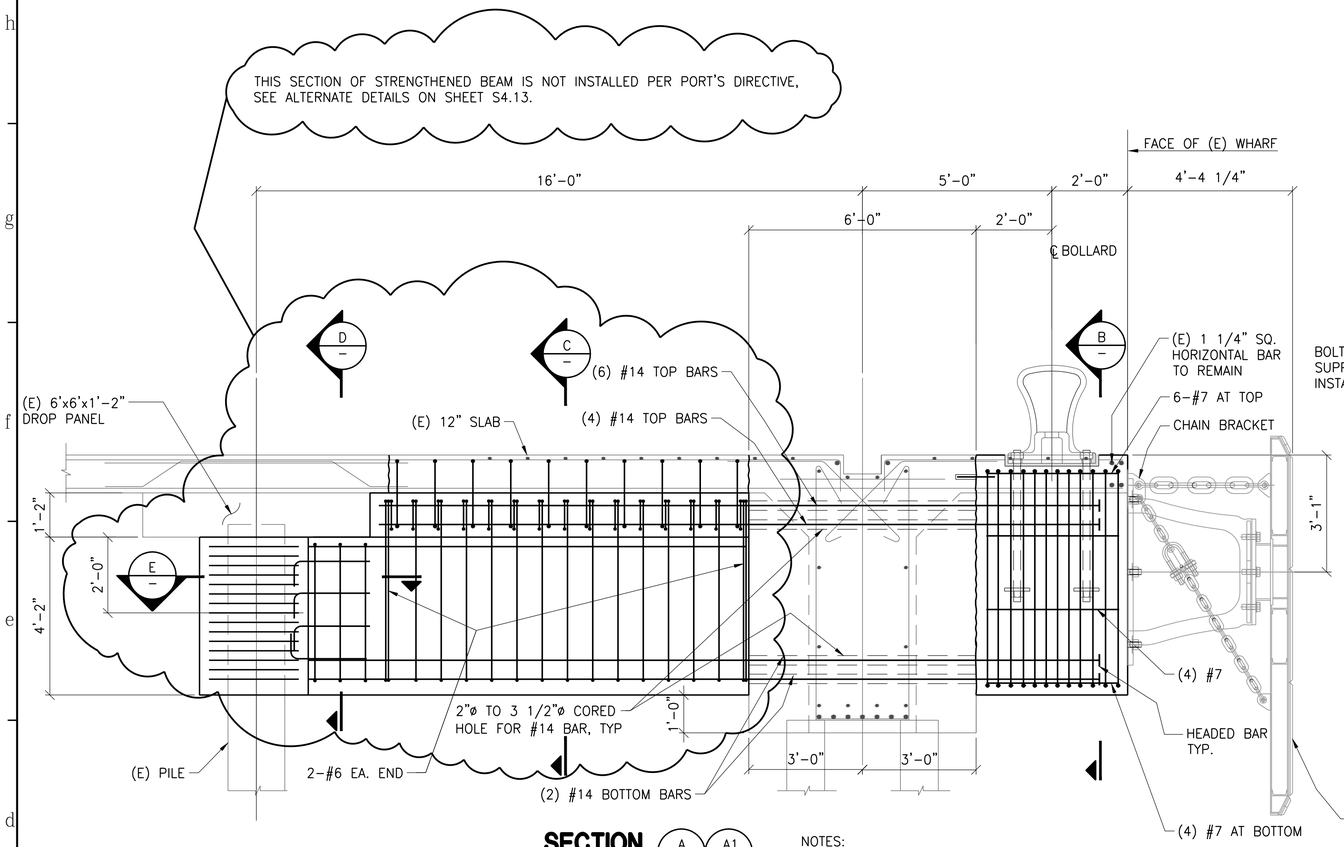
POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 7

Project No. Z1800
By AH Checked TG/EGS Sheet No. S4.7
Approved SL of ----
Date 01/25/10 Revision 2

I:\Z1800\Dwg\current\S4.7 PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 7.dwg 1/24/2012 3:37 PM ALVIN HOFFPAUIR

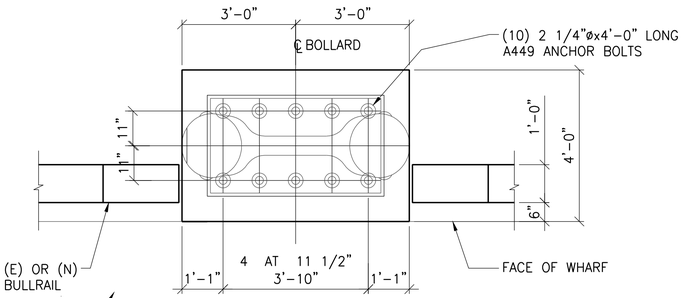
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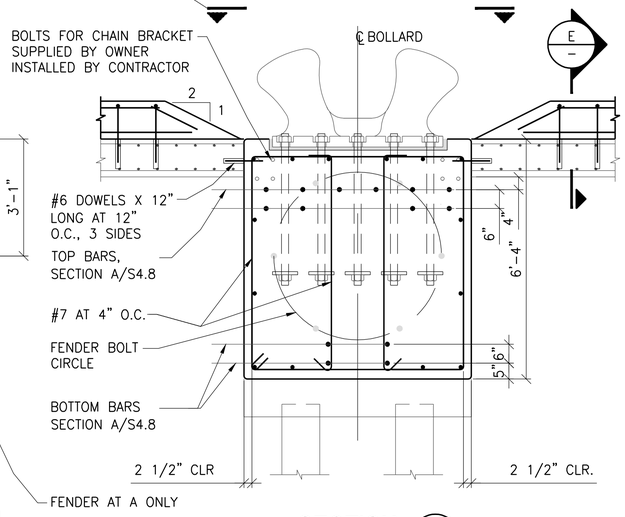
THIS SECTION OF STRENGTHENED BEAM IS NOT INSTALLED PER PORT'S DIRECTIVE, SEE ALTERNATE DETAILS ON SHEET S4.13.



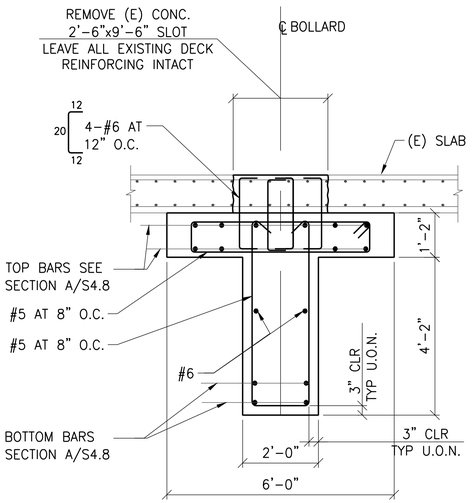

**SECTION** A S4.8 / A1 S4.8
1/2" = 1'-0"

NOTES:
1. BOLLARD AND ANCHOR BOLTS ARE SUPPLIED BY OTHERS AND INSTALLED BY THE CONTRACTOR. CONTRACTOR TO COORDINATE WITH THE BOLLARD SUPPLIER FOR INSTALLATION PROCEDURES

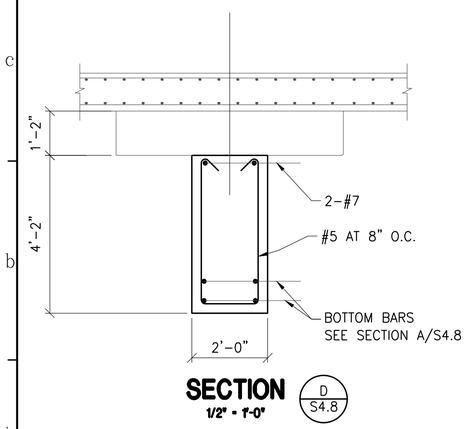


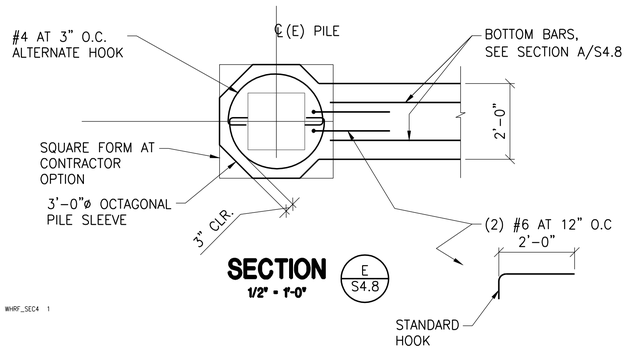

**SECTION** B S4.8
1/2" = 1'-0"



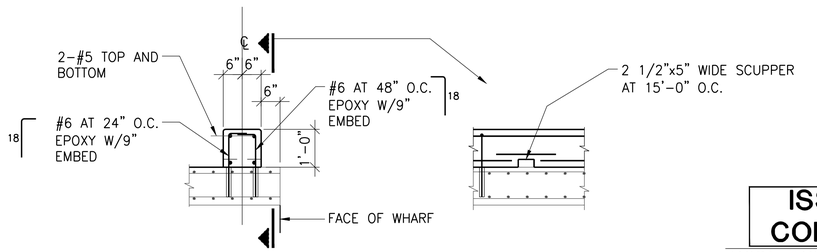

**SECTION** C S4.8
1/2" = 1'-0"




**SECTION** D S4.8
1/2" = 1'-0"




**SECTION** E S4.8
1/2" = 1'-0"




**SECTION** E S4.8
1/2" = 1'-0"

NOTES:
1. SECTION A1/S4.8 IS DESIGNED FOR THE MOORING LOADS SHOWN ON SHEET G4.
2. CONTRACTOR SHALL INCLUDE SECTION A/S4.8 AND A1/S4.8 AS PHASE 1 BASE BID ITEM.

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

REGISTERED PROFESSIONAL ENGINEER
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No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
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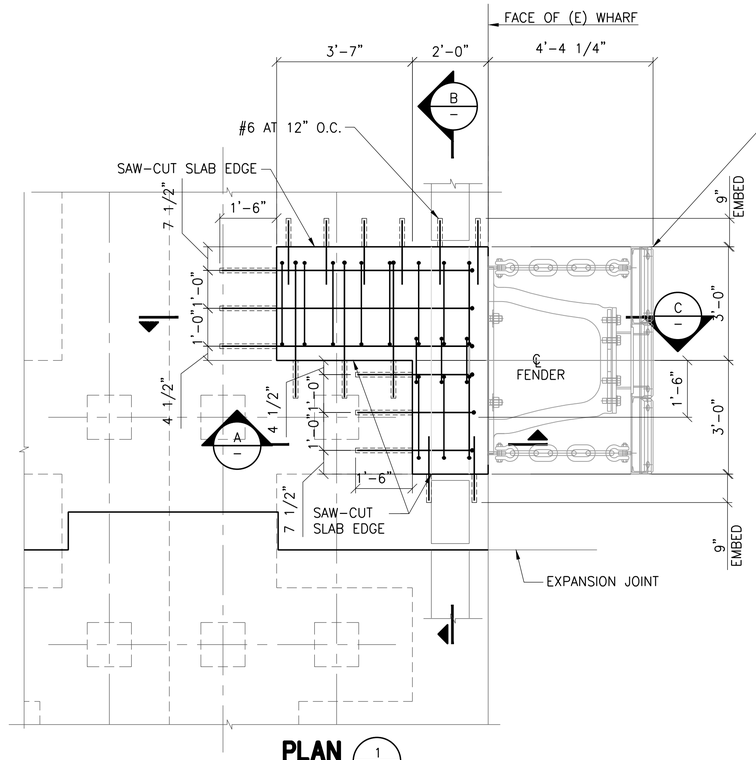
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# POINT POTRERO WHARF REPAIR FOR HONDA AUTOMOTIVE FACILITY PORT OF RICHMOND
## NEW BOLLARD AND FENDER DETAIL

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S4.8 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

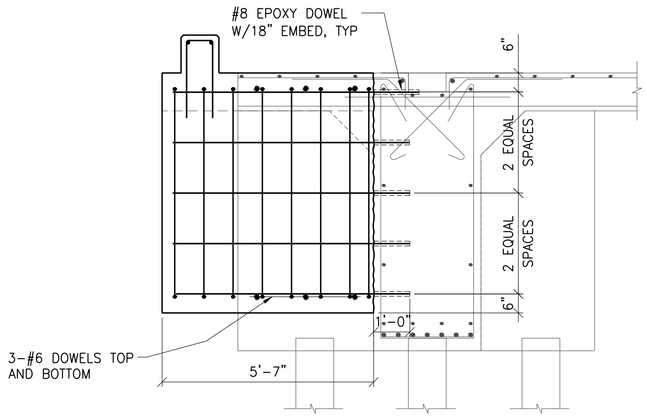


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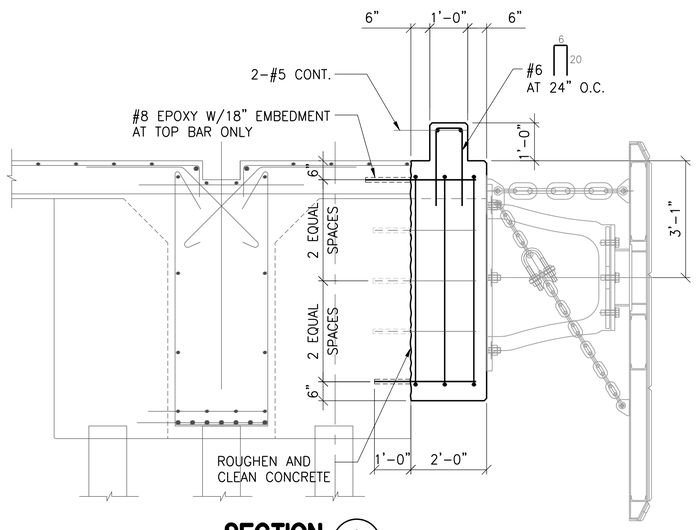

**PLAN** 1/S4.9
1/2" = 1'-0"

WHRF_SEC6 1



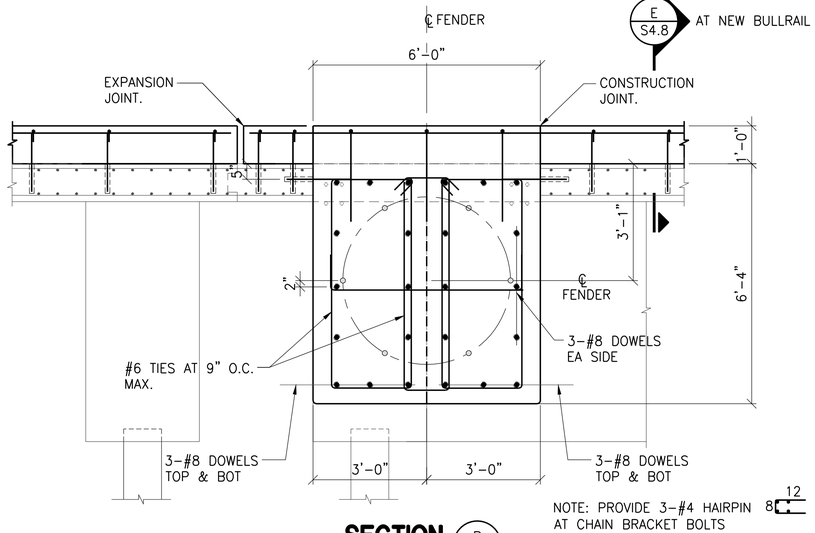

**SECTION** C/S4.9
1/2" = 1'-0"

WHRF_SEC6 1




**SECTION** A/S4.9
1/2" = 1'-0"

WHRF_SEC6 1




NOTE: PROVIDE 3-#4 HAIRPIN AT CHAIN BRACKET BOLTS

**SECTION** B/S4.9
1/2" = 1'-0"

WHRF_SEC6 1

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|---|---|---|---|---|---|
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No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

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# POINT POTRERO WHARF REPAIR FOR HONDA AUTOMOTIVE FACILITY PORT OF RICHMOND

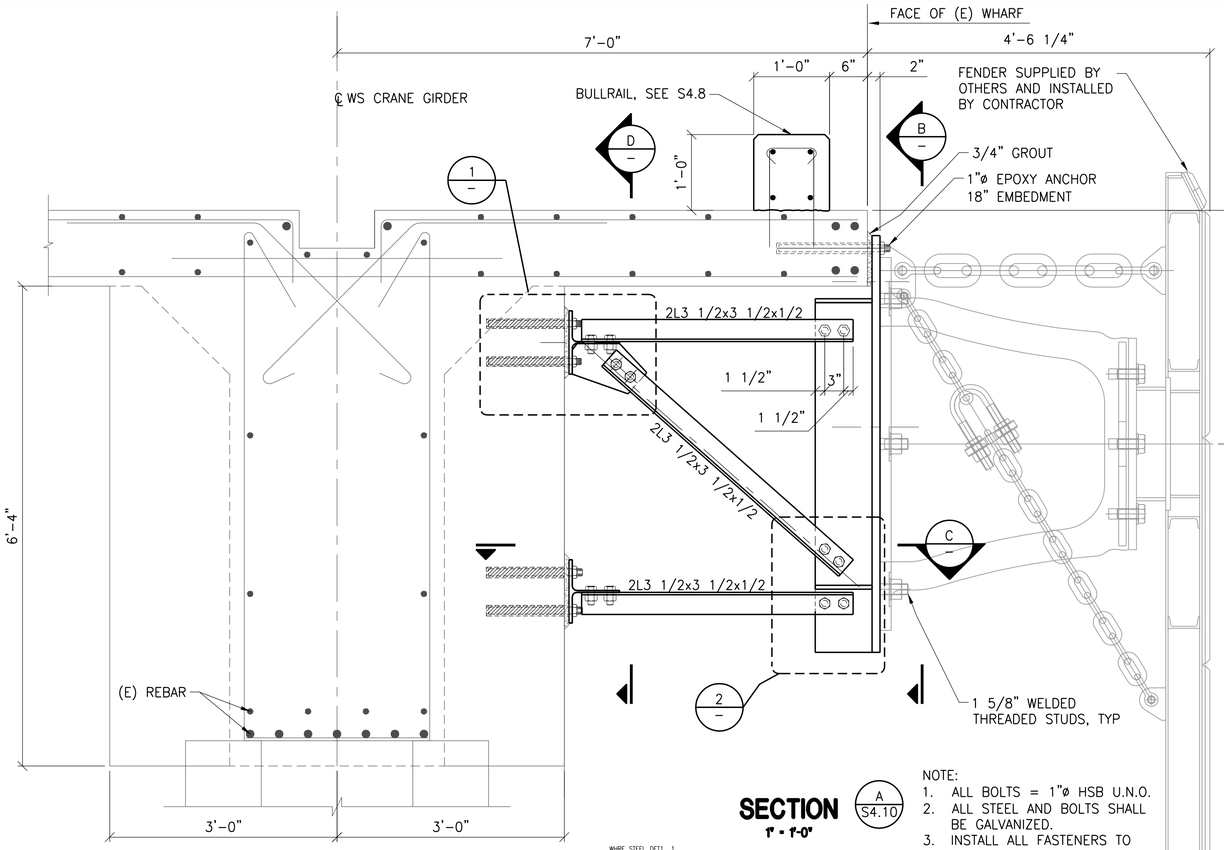
## NEW FENDER AT EXPANSION JOINT

Project No. Z1800
By AH Checked TG/EGS Sheet No. S4.9
Approved SL of ----
Date 01/25/10 Revision 1

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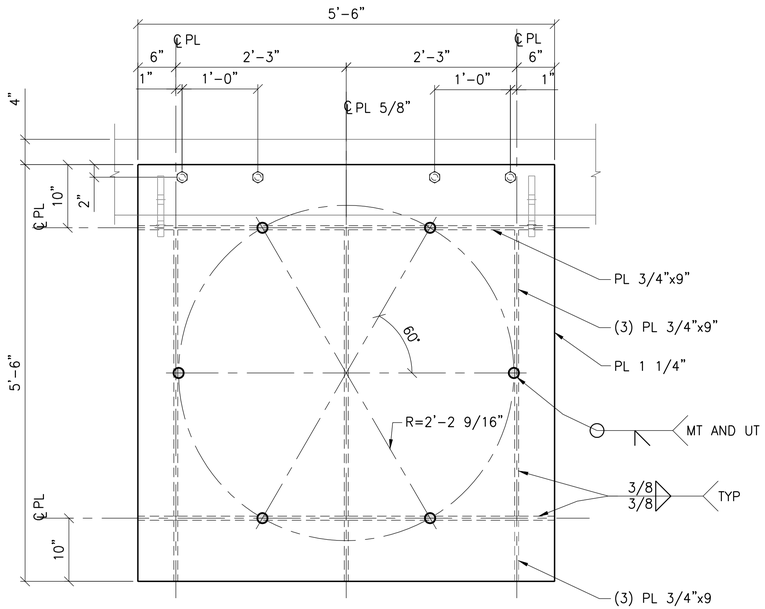
I:\Z1800\Dwg\Current\S4.9 NEW FENDER AT EXPANSION JOINT.dwg 1/24/2012 3:37 PM ALVIN HOFFPAUIR

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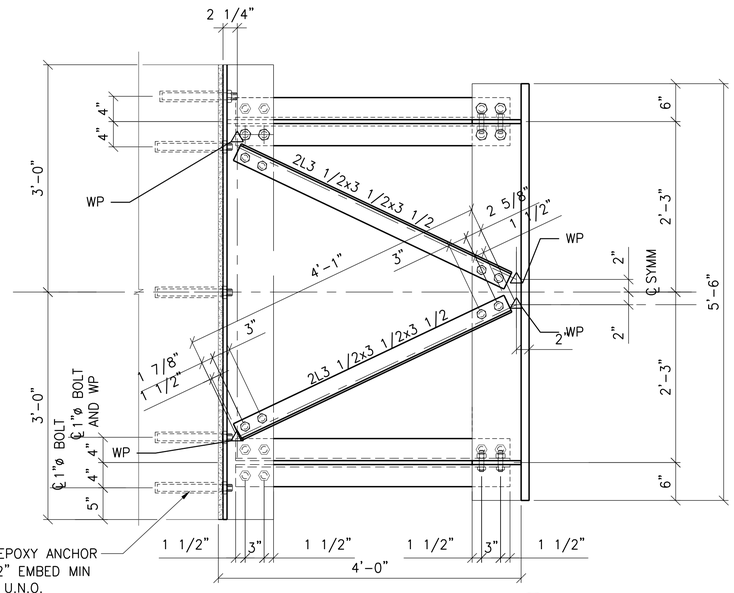

SECTION A S4.10
1" = 1'-0"

NOTE:
1. ALL BOLTS = 1"ø HSB U.N.O.
2. ALL STEEL AND BOLTS SHALL BE GALVANIZED.
3. INSTALL ALL FASTENERS TO SLIP CRITICAL CONDITION U.O.N.

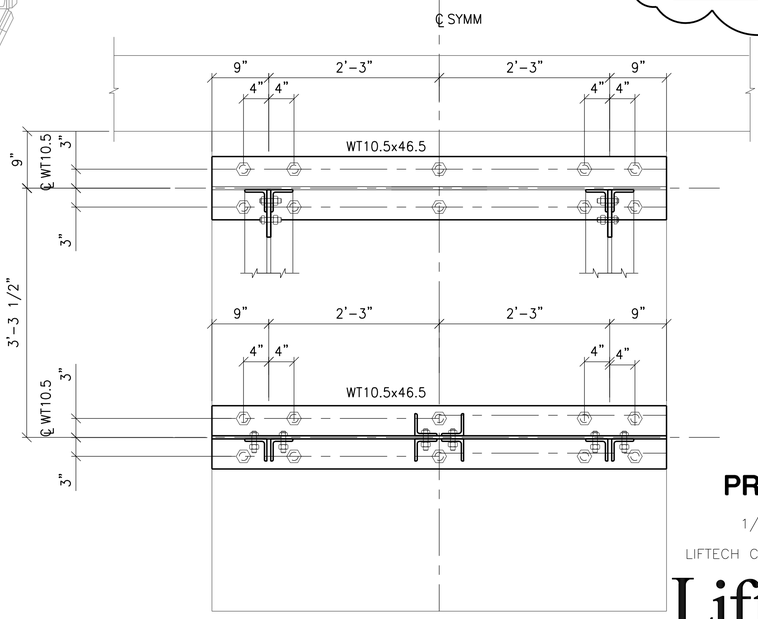



SECTION B S4.10
1" = 1'-0"

THIS SHEET IS NOT USED SEE SHEET S4.8,S4.9,S4.12, AND S4.13




SECTION C S4.10
1" = 1'-0"




SECTION D S4.10
1" = 1'-0"

NOTE:
CONTRACTOR SHALL INCLUDE SECTION A/S4.10 AS PHASE 1 BASE BID ITEM.

REGISTERED PROFESSIONAL ENGINEER
SUGIARTO LONY
No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
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**ISSUED FOR CONSTRUCTION**

POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
NEW FENDER WITH
STEEL SUPPORT – 1

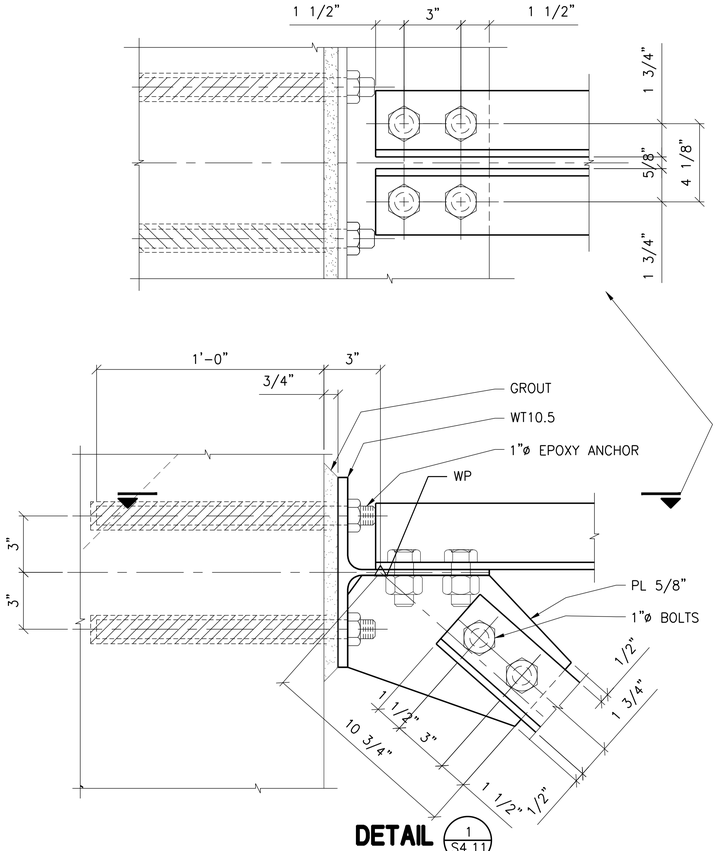
Project No. Z1800
By AH Checked TG/EGS Sheet No. S4.10
Approved SL of ----
Date 01/25/10 Revision 1

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

WHARF_STEEL_DET1 1

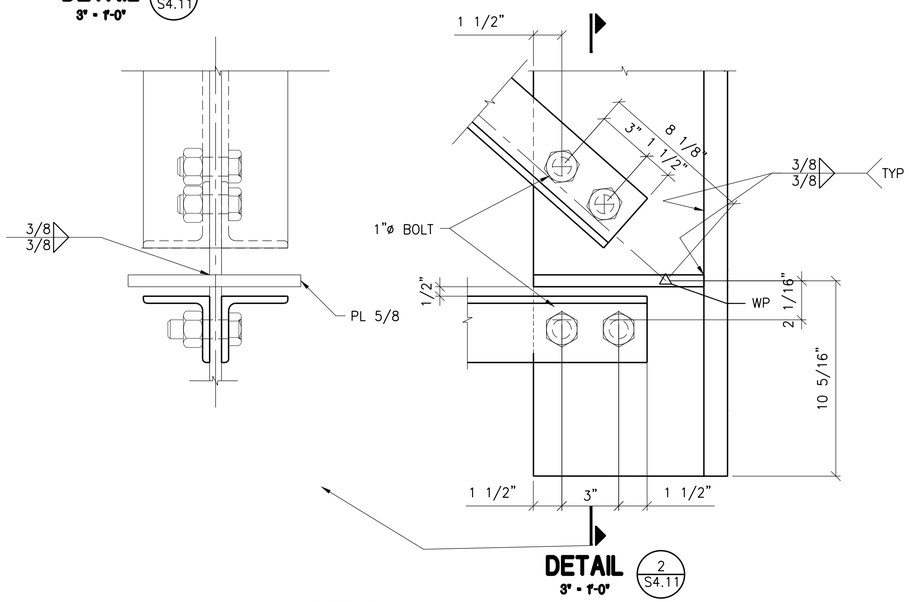


I:\Z1800\Dwg\Current\S4.10 NEW FENDER WITH STEEL SUPPORT – 1.dwg 1/24/2012 3:37 PM ALVIN HOFFPAUIR




**DETAIL** 1 / S4.11
3" = 1'-0"

WHRF_STEEL_DET1a 16




**DETAIL** 2 / S4.11
3" = 1'-0"

WHRF_STEEL_DET1a 1

THIS SHEET IS
NOT USED SEE SHEET
S4.8,S4.9,S4.12, AND S4.13

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

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SUGIARTO LONI
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Exp. 03/31/2011
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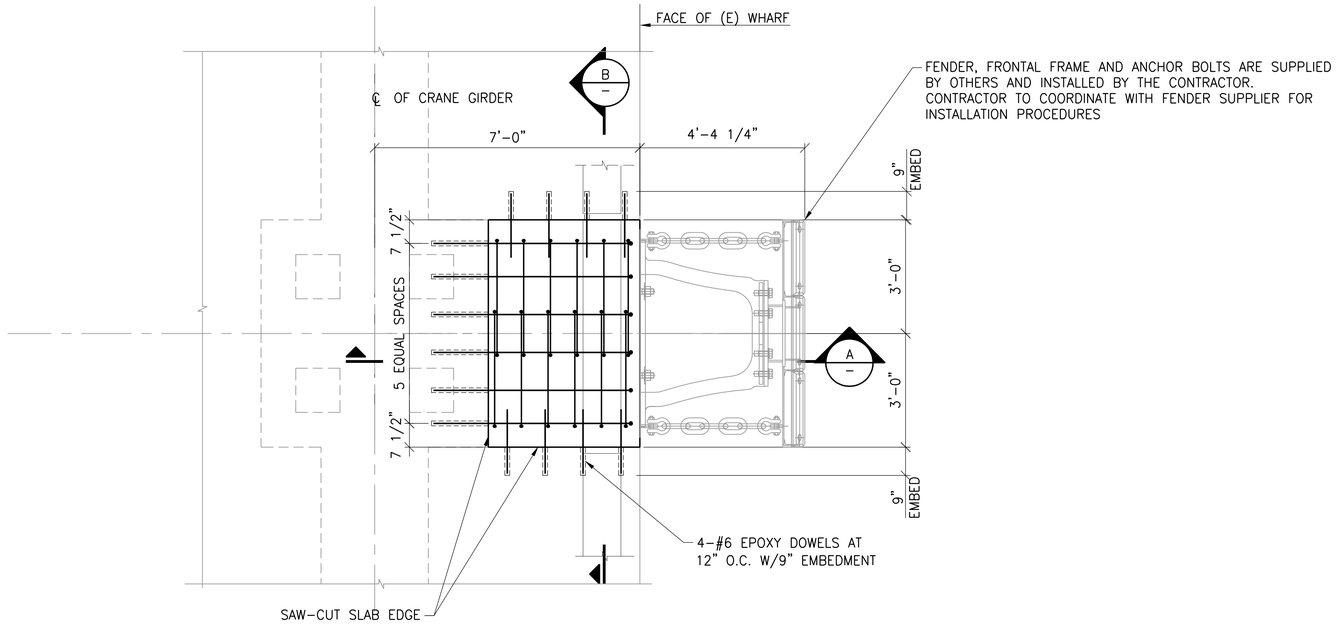
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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
NEW FENDER WITH STEEL SUPPORT – 2

Project No. Z1800
By AH Checked TG/EGS Sheet No. S4.11
Approved SL of ----
Date 01/25/10 Revision 1

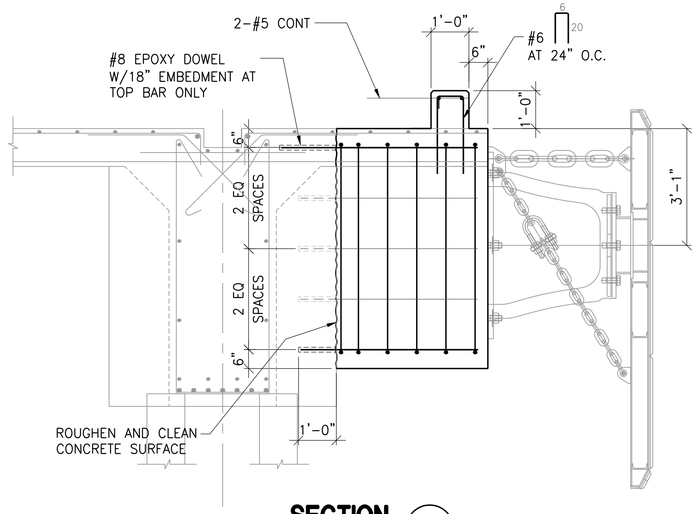
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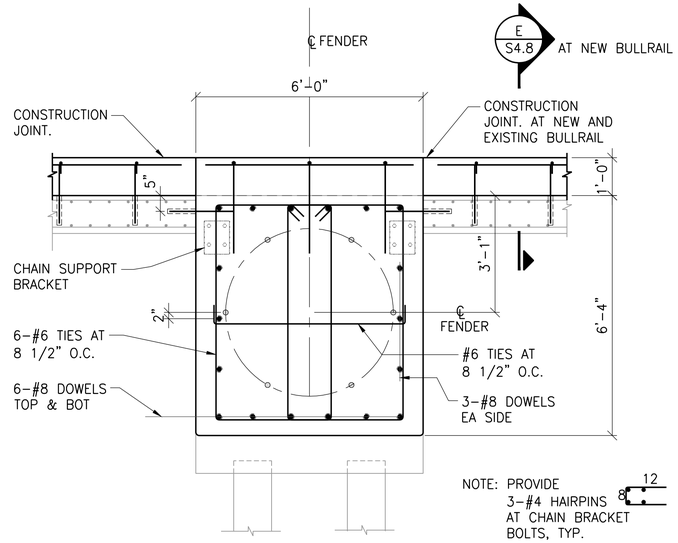

**PLAN** 1/S4.12
1/2" = 1'-0"

WHRF_SEC4 1




**SECTION** A/S4.12
1/2" = 1'-0"

WHRF_SEC4 1




**SECTION** B/S4.12
1/2" = 1'-0"

WHRF_SEC4 1

NOTE:
CONTRACTOR SHALL INCLUDE SECTION A/S4.12 AS PHASE 1 ALTERNATE BID ITEM.

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STATE OF CALIFORNIA

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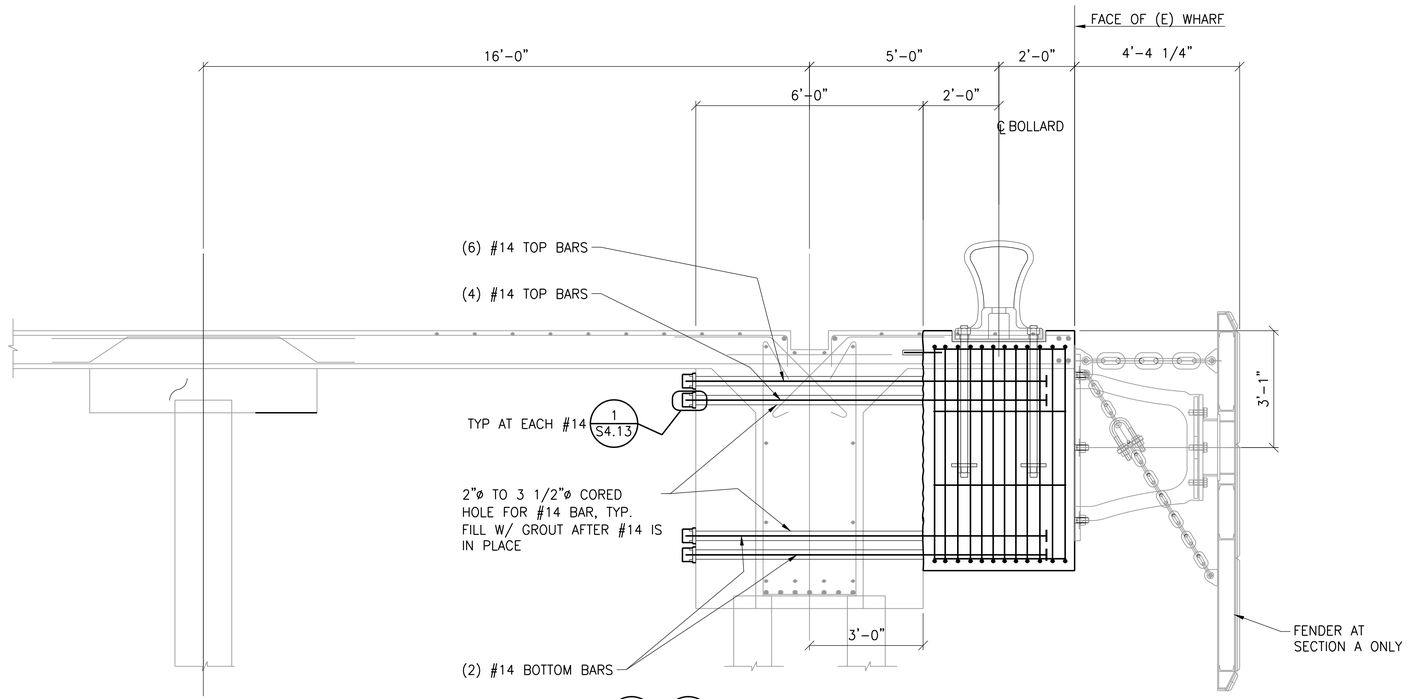
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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
ALTERNATE FENDER SUPPORT DETAIL

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| By AH | Checked TG/EGS | Sheet No. | S4.12 |
| Approved SL | | of | ---- |
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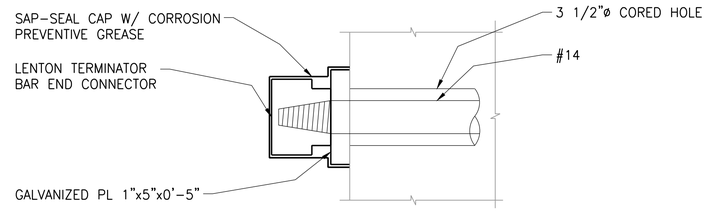
I:\Z1800\Dwg\Current\S4.12 ALTERNATE FENDER SUPPORT DETAIL.dwg 1/24/2012 3:38 PM ALVIN HOFFPAUIR




**SECTION** A S4.13 / A1 S4.13
1/2" = 1'-0"

NOTES:
1. FOR INFORMATION NOT SHOWN SEE SECTIONS A/S4.8 AND A1/S4.8.

WHRF_SEC4 1




NOTE:
1. PAINT EXPOSED STEEL W/ ZINC RICH PAINT
2. SEAL ALL JOINTS W. SILICONE CAULK

**DETAIL** 1 S4.13
3" = 1'-0"

WHRF_SEC4 1

NOTES:
1. SECTION A/S4.13 IS DESIGNED FOR 1/2 THE MOORING LOAD ON SHEET G4, WHICH REDUCES THE DESIGN WIND FROM 85 MPH TO 60 MPH.
2. CONTRACTOR SHALL INCLUDE SECTION A/S4.13 AND A1/S4.13 AS PHASE 1 ALTERNATE BID ITEM.

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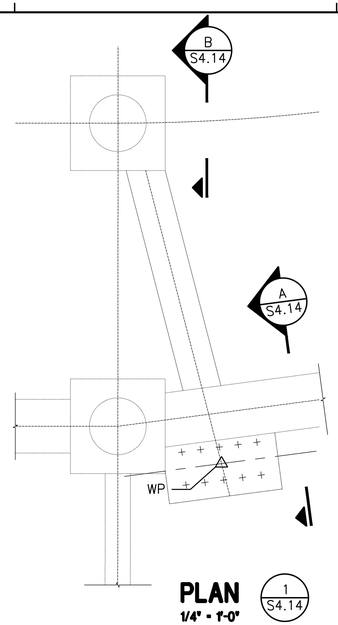
POINT POTRERO WHARF REPAIR
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PORT OF RICHMOND
ALTERNATE BOLLARD SUPPORT DETAIL

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| By AH | Checked TG | Sheet No. | S4.13 |
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| Date 02/05/2010 | | Revision | 1 |

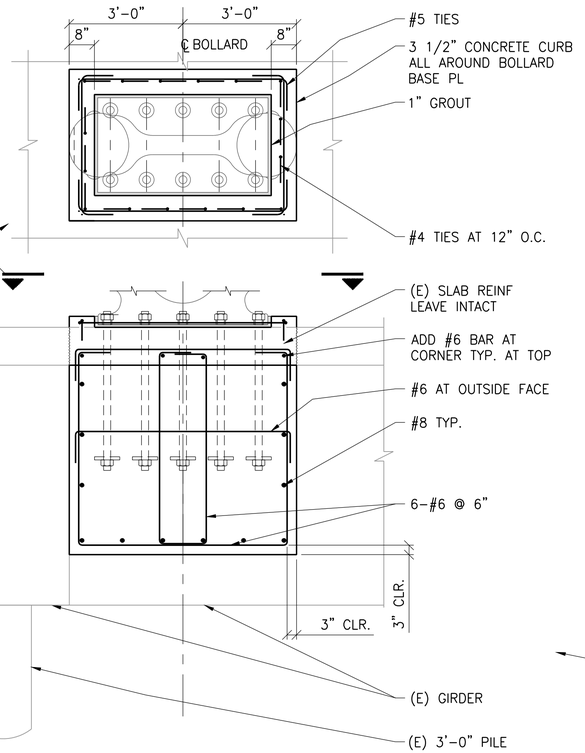
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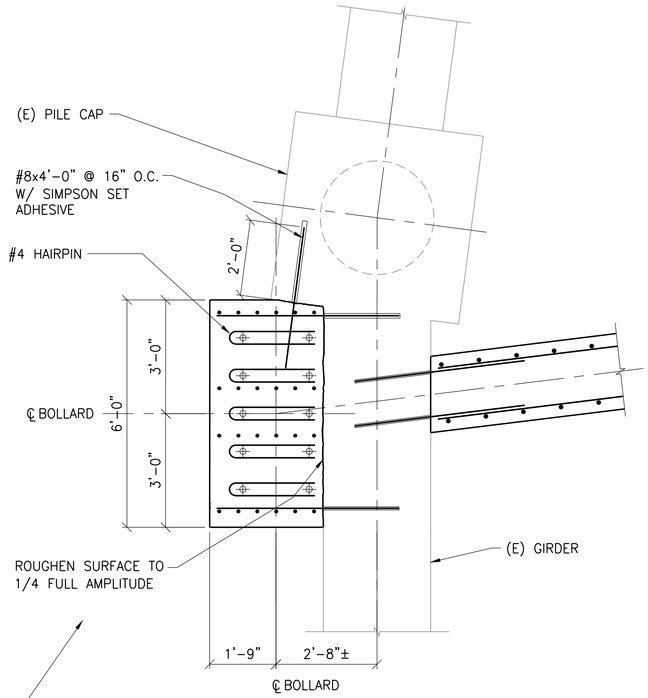


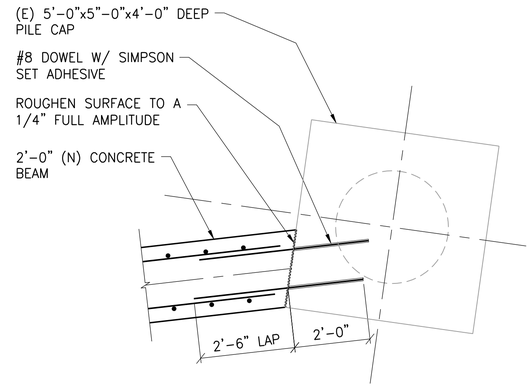
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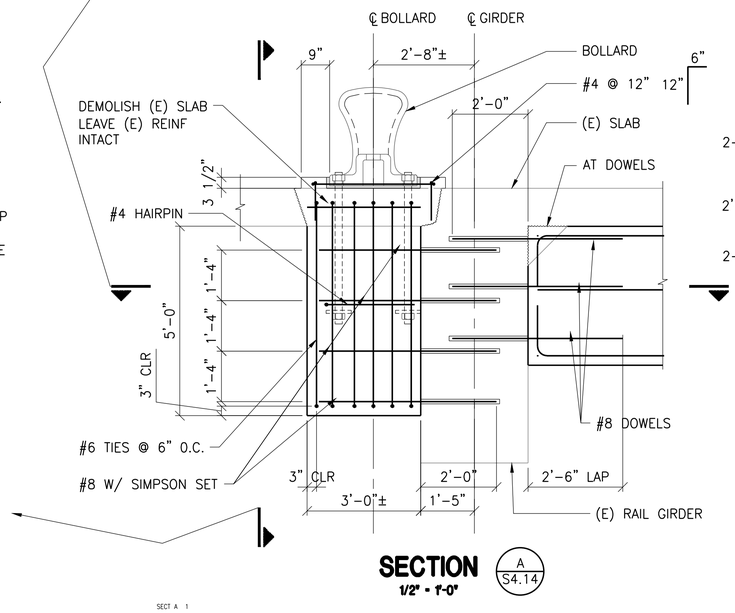



**PLAN** (1 / S4.14)
1/4" = 1'-0"

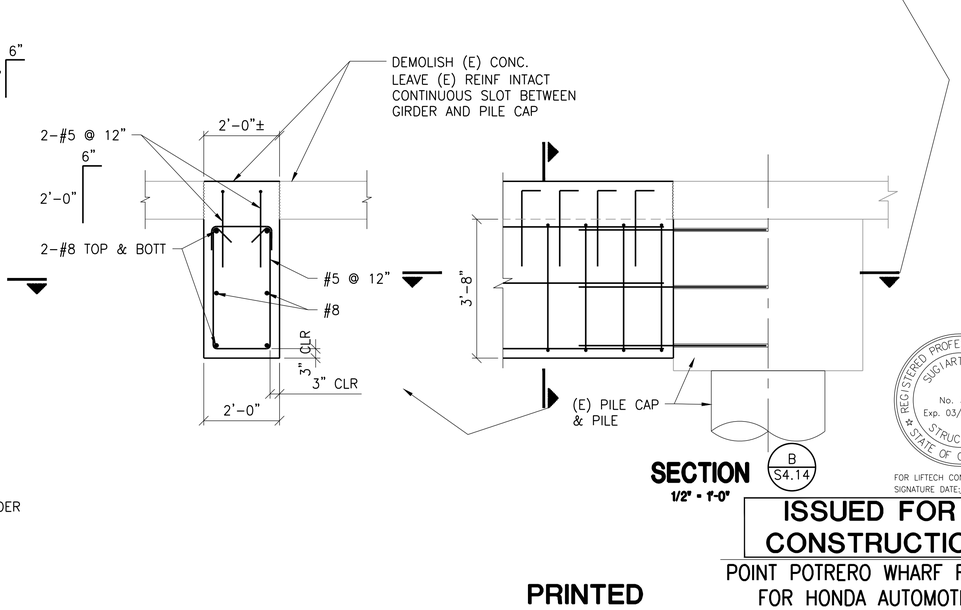



**SECTION** (A / S4.14)
1/2" = 1'-0"




**SECTION** (B / S4.14)
1/2" = 1'-0"

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE
FACILITY PORT OF RICHMOND

BOLLARD 14 DETAILS

| | | | |
|---|---|---|---|
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| By AH | Checked TG | Sheet No. | S4.14 |
| Approved SL | | of | ---- |
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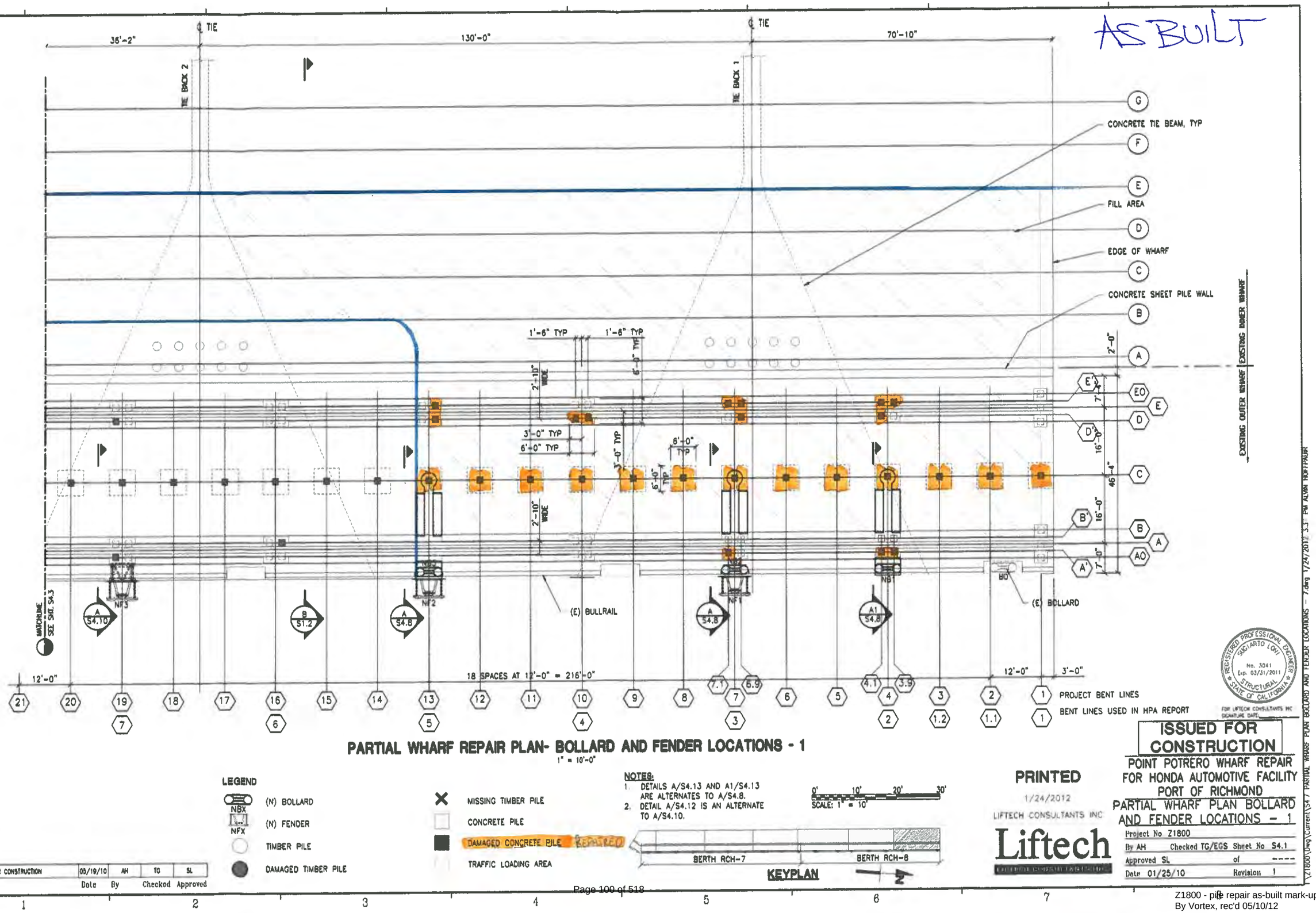
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# APPENDIX B – VORTEX PILE REPAIR AS-BUILT DRAWINGS 2012

AS BUILT




## PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 1

1" = 10'-0"

LEGEND

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE REPAIRED
- TRAFFIC LOADING AREA

NOTES:
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'




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FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 1

| | | | |
|---|---|---|---|
| Project No | Z1800 | | |
| By | AH | Checked | TG/EGS Sheet No S4.1 |
| Approved | SL | of | ---- |
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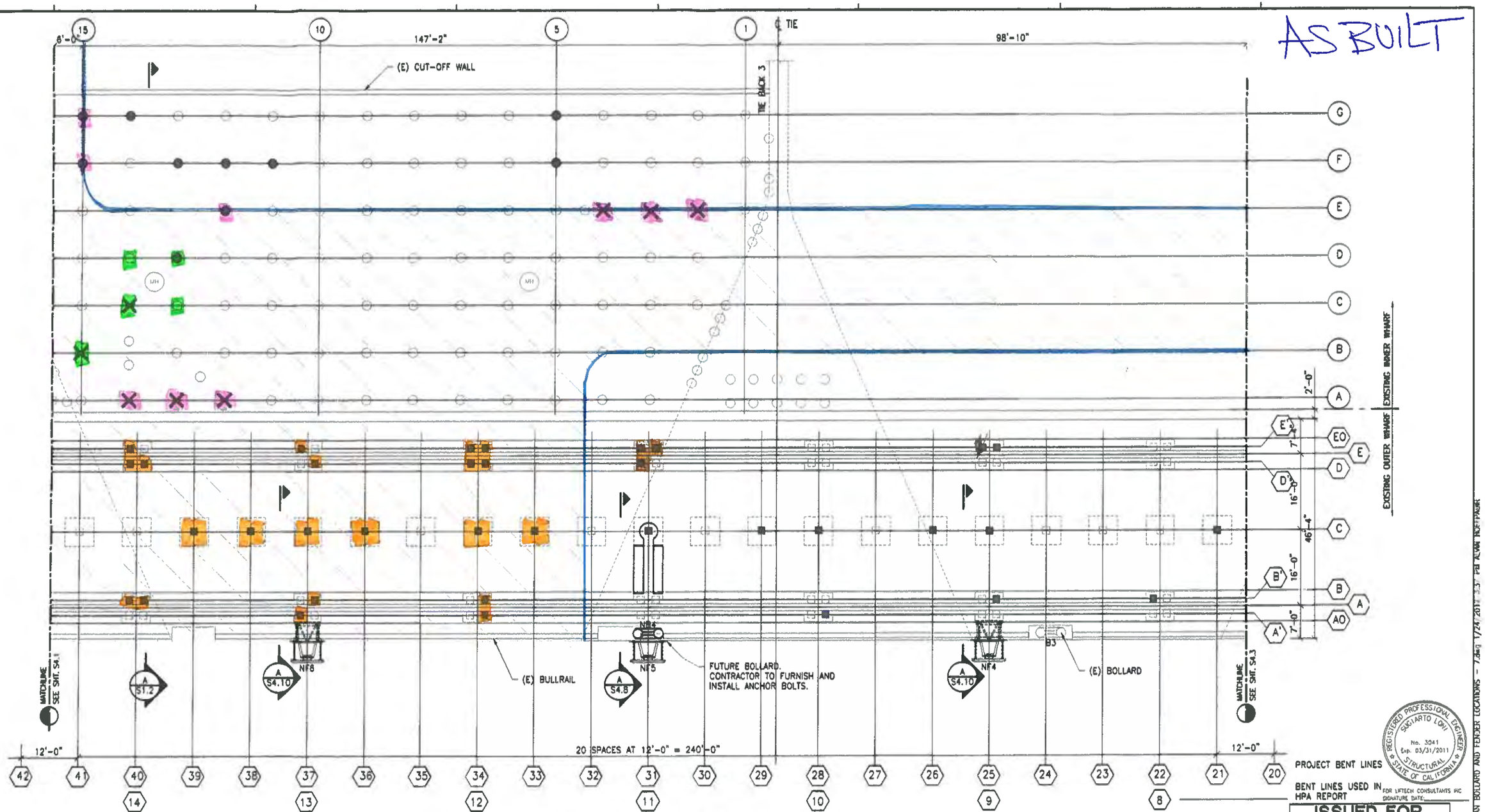
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Original border size 525 x 612 mm



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By Vortex, rec'd 05/10/12

AS BUILT




## PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 2

1" = 10'-0"

LEGEND

- NBX (N) BOLLARD
- NFX (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE REPAIRED
- TRAFFIC LOADING AREA
- UNREPAIRED

NOTES:
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10' (0', 10', 20', 30')

KEYPLAN: BERTH RCH-7, BERTH RCH-8

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PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 2

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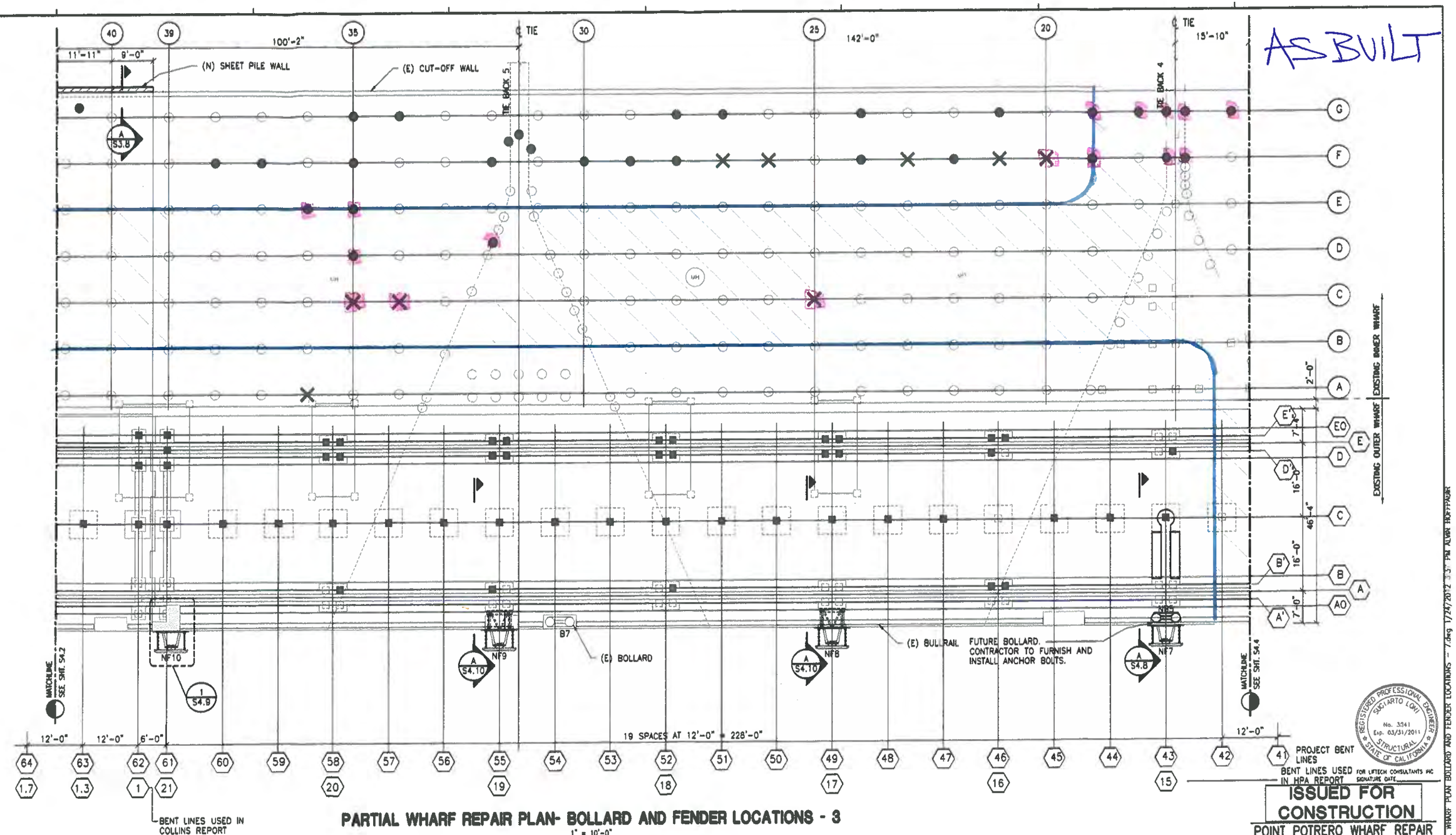
344 - 20th STREET SUITE 360, Oakland, CA 94612, 510 832-5606 Original border size 525 x 812 mm.

I:\Z1800\Dwg\Current\S4.7 PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 2.dwg 1/24/2012 3:5" Plot Area: Not Plotted



Z1800 - pile repair as-built mark-ups
By Vortex, rec'd 05/10/12

ASBUILT




# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 3

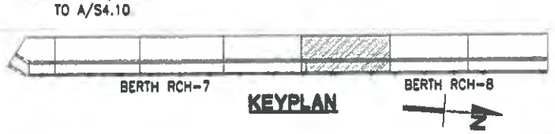
1" = 10'-0"

**SHEET PILE WALL NOTE:**
1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**
- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE REPAIRED
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10

SCALE: 1" = 10'




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FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 3

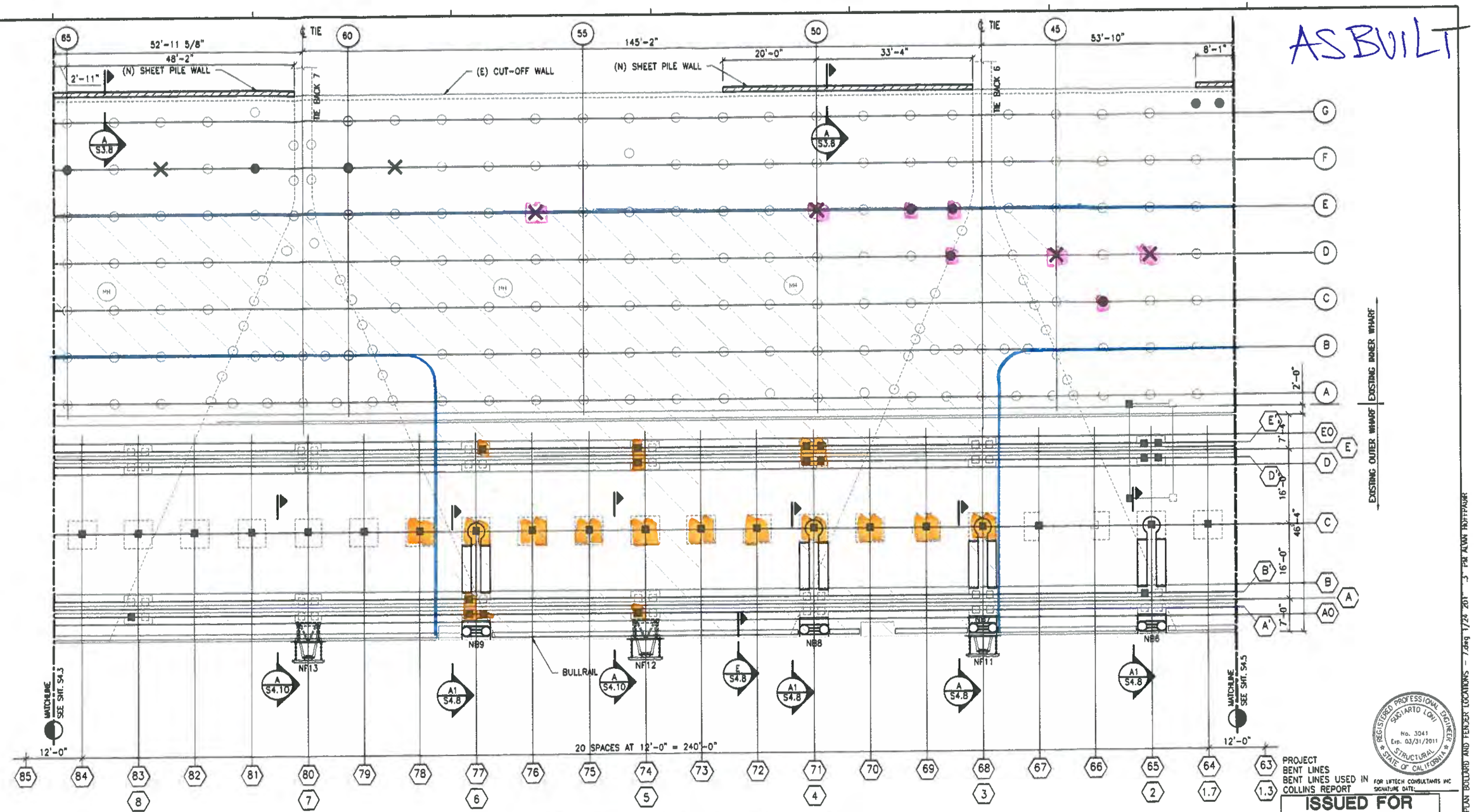
Project No. Z1800
By AH Checked TG/EGS Sheet No S4.3
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Date 01/25/10 Revision 1

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Z1800 - pile repair as-built mark-ups
By Vortex, rec'd 05/10/12

ASBUILT




## PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 4

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

- (N) BOLLARD (NBX)
- (N) FENDER (NFX)
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE — REPAIRED
- CONCRETE PILE
- DAMAGED CONCRETE PILE — REPAIRED
- TRAFFIC LOADING AREA — DECIMATED BLUE

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'

BERTH RCH-7 BERTH RCH-8

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PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 4

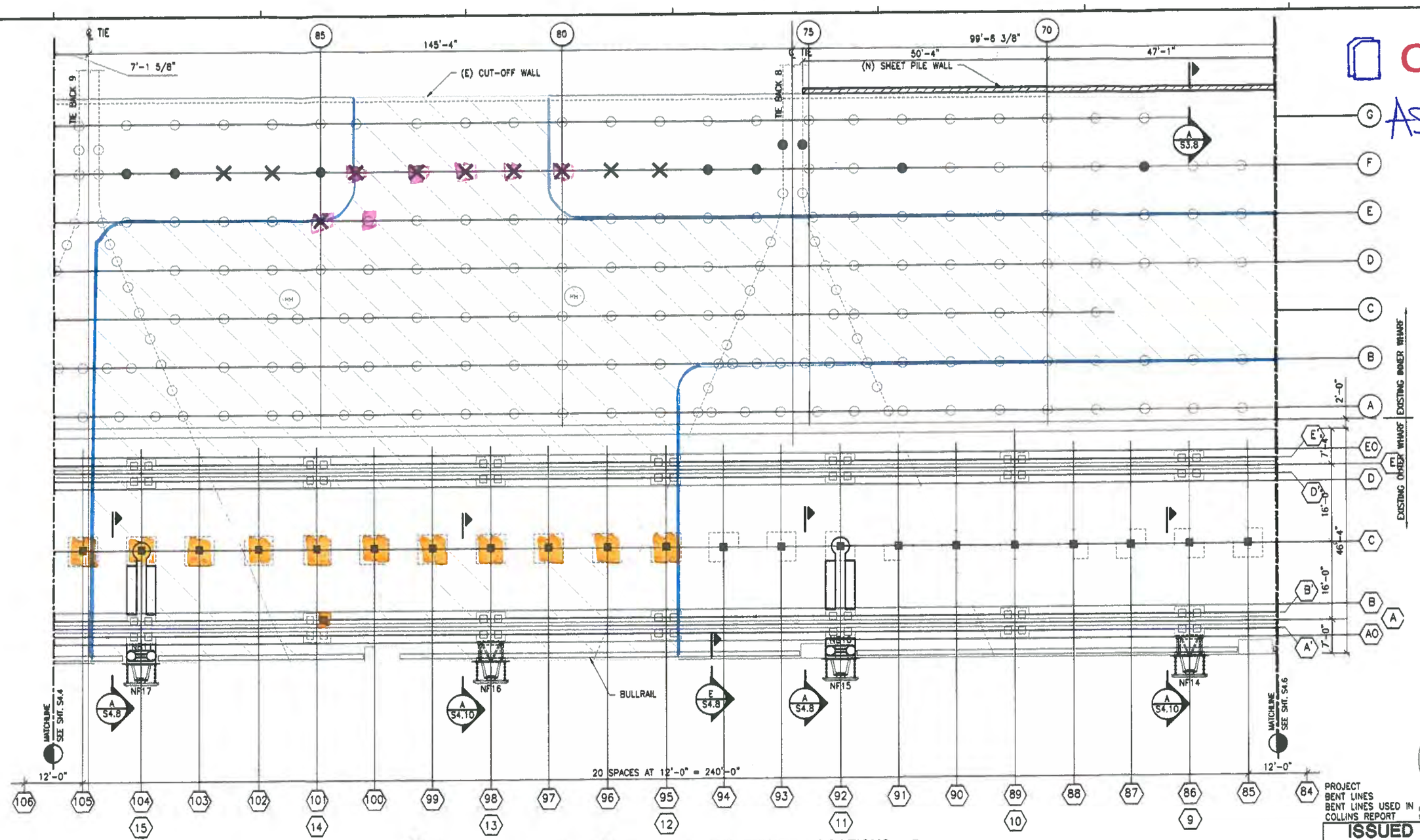
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## PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 5

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE REPAIRED
- CONCRETE PILE
- DAMAGED CONCRETE PILE REPAIRED
- TRAFFIC LOADING AREA DELINIATED BLUE

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'

BERTH RCH-7 BERTH RCH-8

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FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 5

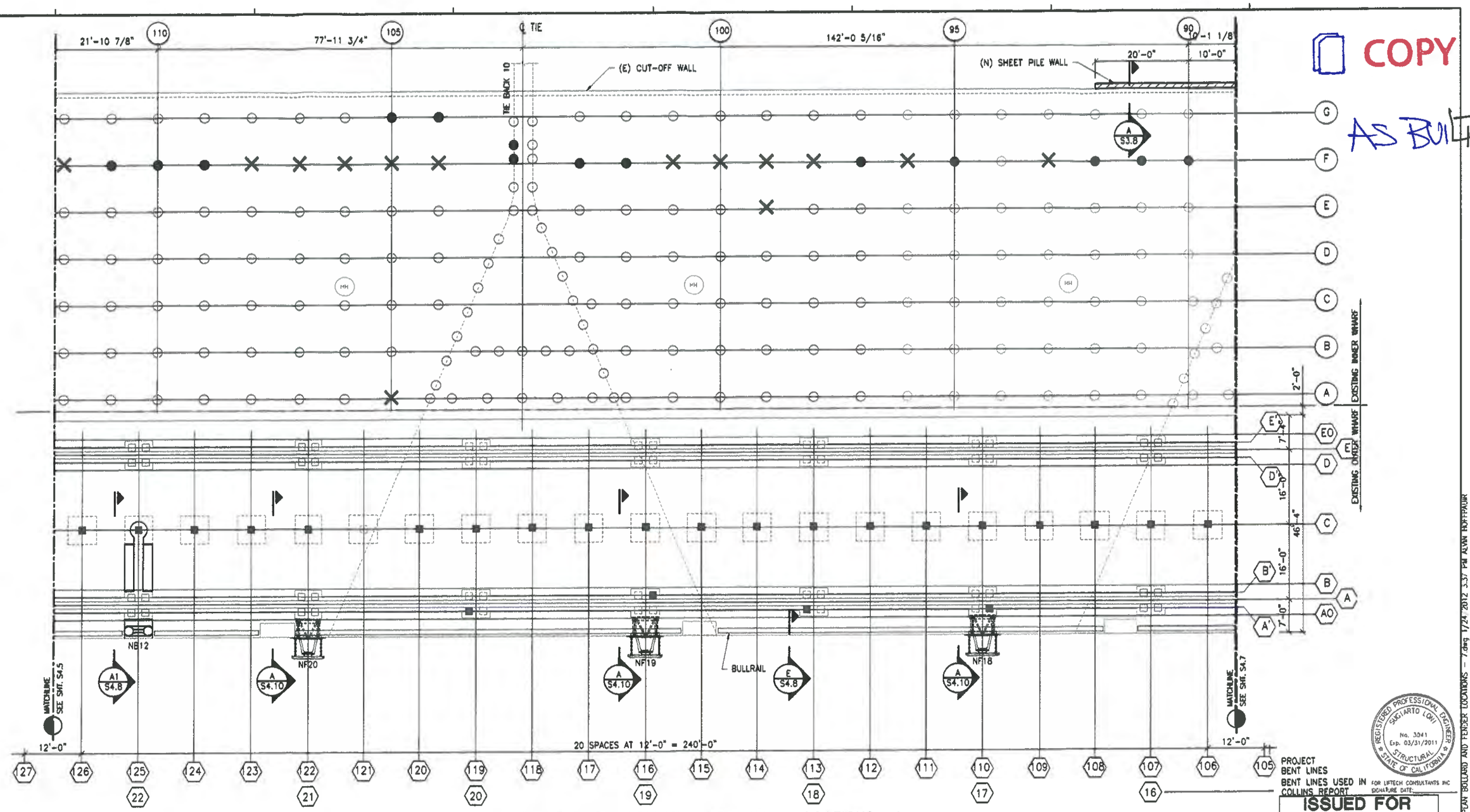
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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 6

1" = 10'-0"

**SHEET PILE WALL NOTE:**
1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

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**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'




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FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

**ISSUED FOR CONSTRUCTION**

POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 6

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No | S4.6 |
| Approved SL | | of | ----- |
| Date 01/25/10 | | Revision | 1 |

I:\Z1800\Dwg\Current\S4.7 PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 7.dwg 1/24/2012 3:37 PM ALVAN HOFFAUER

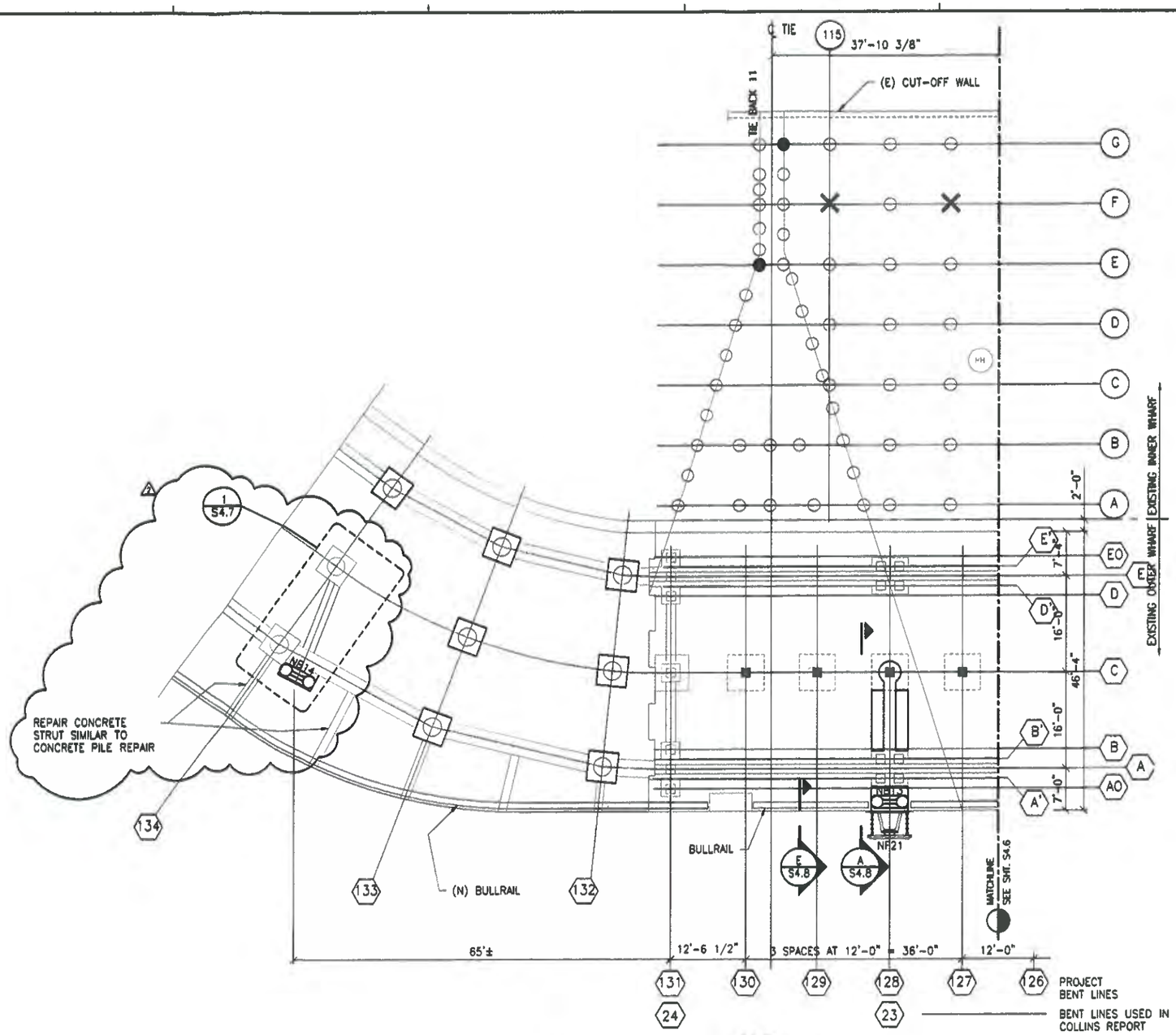
COPY

AS BUILT



Z1800 - pile repair as-built mark-ups
By Vortex, rec'd 05/10/12

COPY
AS-BUILT




## PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 7

1" = 10'-0"

**LEGEND**

- (N) BOLLARD (NBX)
- (N) FENDER (NFX)
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'




KEYPLAN

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 2 | BOLLARD NO. 14 SUPPORT | 06/11/10 | LMK/AH | TG | SL |
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

PRINTED
1/24/2012
LIFTECH CONSULTANTS INC

Liftech CONSULTANTS INC

REGISTERED PROFESSIONAL ENGINEER SIGGIARTO LONI No. 3041 Exp. 03/31/2011 STRUCTURAL STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE

**ISSUED FOR CONSTRUCTION**

POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 7

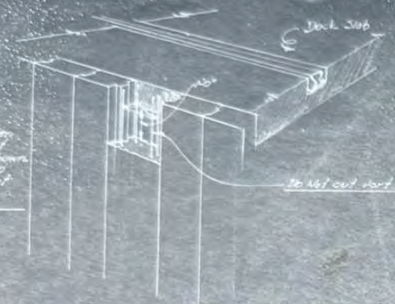
Project No. Z1800
By AH Checked TG/EGS Sheet No. S4.7
Approved SL of ----
Date 01/25/10 Revision 2

Copyright © 2012 by Liftech Consultants Inc A California Corporation All rights reserved
344 – 20th STREET SUITE 360, Oakland, CA 94612, 510 832-5606 Original border size 525 x 812 mm.



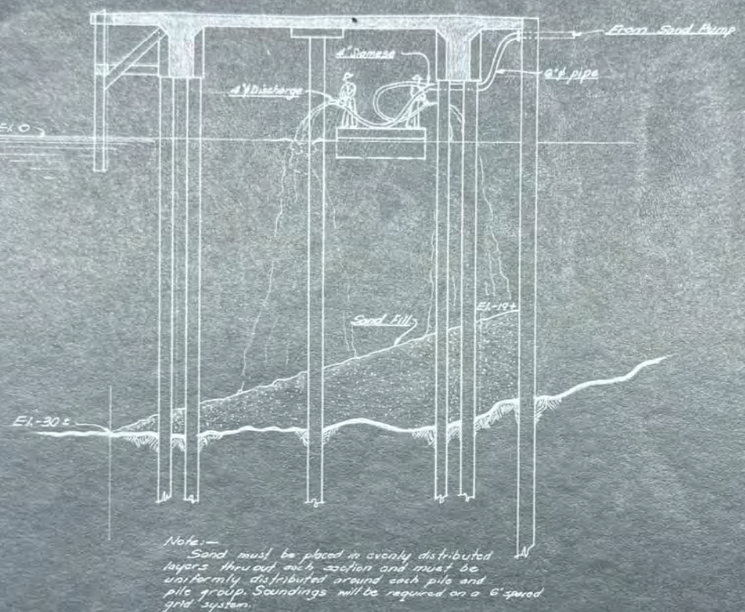
Z1800 - pile repair as-built mark-ups
By Vortex, rec'd 05/10/12

# APPENDIX C – BERTHS 5–8 ORIGINAL DRAWINGS




Note:—
If pile obstructs as shown, chip 8"x 8" hole thru sheet pile or remove concrete as shown. Top pile at 8'x hole to be no higher than bottom of deck at that location. When pipe is removed portion sheet pile

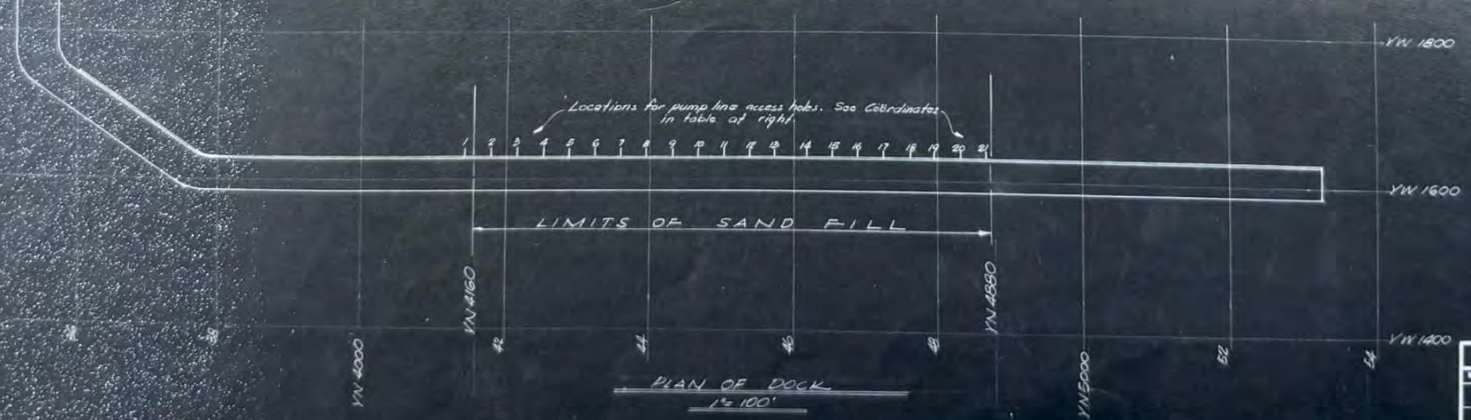
METHOD OF CHIPPING SHEET PILE FOR PUMP PIPE ACCESS HOLE
ALTERNATE




Note:—
Sand must be placed in evenly distributed layers thru out each section and must be uniformly distributed around each pile and pile group. Soundings will be required on a 6' spaced grid system.

METHOD OF PLACING SAND FILL
1/8"= 1:0"

Note:—
In order to provide access for pump line it is suggested that one sheet pile be driven 1' below the bottom of the deck floor slab at the location desired. Should the pile be too tight for further driving, the concrete may be chipped out as shown by sketch at extreme left.




PLAN OF DOCK
1"= 100'

| HOLE NO. | NORTH COORDINATE |
|---|---|
| 1 | 4143 |
| 2 | 4179 |
| 3 | 4216 |
| 4 | 4251 |
| 5 | 4287 |
| 6 | 4323 |
| 7 | 4359 |
| 8 | 4395 |
| 9 | 4431 |
| 10 | 4467 |
| 11 | 4503 |
| 12 | 4539 |
| 13 | 4575 |
| 14 | 4617 |
| 15 | 4653 |
| 16 | 4689 |
| 17 | 4725 |
| 18 | 4761 |
| 19 | 4797 |
| 20 | 4833 |
| 21 | 4869 |

If necessary to change location to bit of pile move north as required.

| REVISIONS | | | |
|---|---|---|---|
| NO. | DATE | BY | OK |
| | | | |

KAISER COMPANY, INC.
RICHMOND, CALIFORNIA

METHOD OF PLACING SAND FILL UNDER PO. DOCK

DATE 12-8-42 SUBMITTED
SCALE NOTED APPROVED
DRAWN BY BAL
CHECKED BY

Rip Rap to extend under relieving platform as required.

SHEET METAL, ETC.

PIPE SHOP

ELECTRIC SHOP

FITTINGS OFFICE

FITTINGS WAREHOUSE

Sheet Piling

G.R.P.E.

YW2000

YW1800

YW1600

YN3800 YN4000 YN4200 YN4400 YN4600 YN4800 YN5000 YN5200

## PLAN OF RELIEVING PLATFORM

SCALE 1" = 60'-0"

LEGEND

- EXISTING STRUCTURE
- DOCK TO BE BUILT
- SUPPORTING SLAB
- RIP RAP

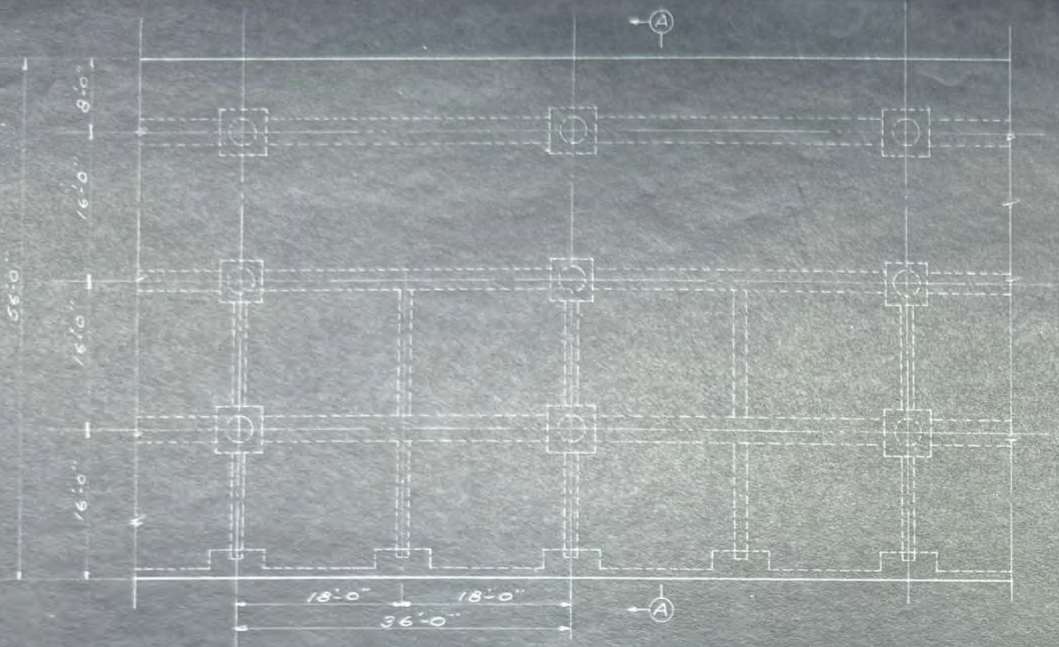


| REVISIONS | | | |
|---|---|---|---|
| MK. | DATE | BY | OK |
| | | | |

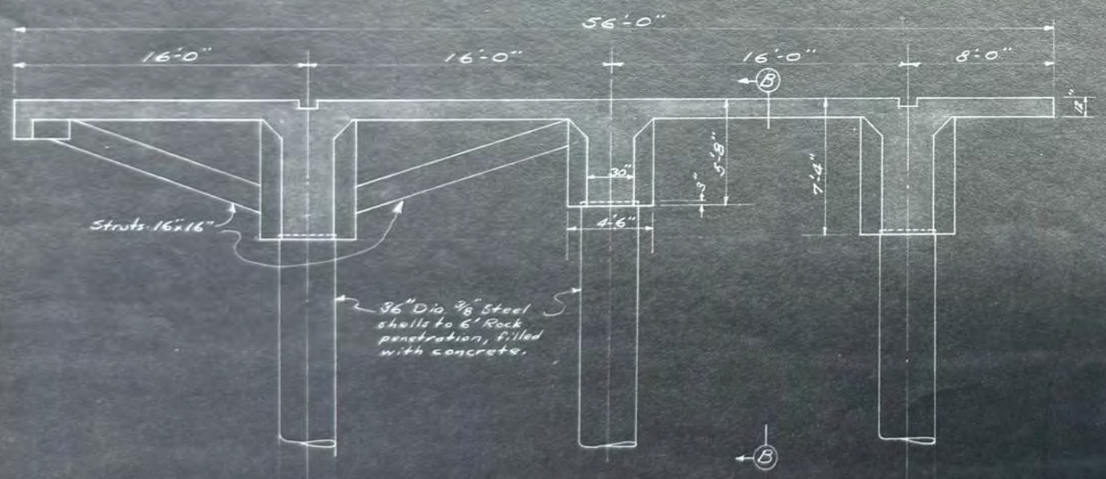
**KAISER COMPANY, INC.**
RICHMOND, CALIFORNIA

RELIEVING PLATFORM
FITTING OUT DOCK AT
RICHMOND YARD No 3

| | |
|---|---|
| DATE JAN 25, 1943 | SUBMITTED |
| SCALE 1" = 60'-0" | APPROVED |




PLAN
scale 1/8" = 1'-0"




SECTION A-A
1/4" = 1'-0"




SECTION B-B
1/4" = 1'-0"

| REVISIONS | | | |
|---|---|---|---|
| MK. | DATE | BY | OK |
| | | | |

**KAISER COMPANY, INC.**
RICHMOND, CALIFORNIA

FITTING OUT DOCK
SOUTH END
CYLINDER SCHEME DETAILS

| | |
|---|---|
| DATE 2-10-43 | SUBMITTED |
| SCALE Noted | APPROVED |

N 3660

82° 28'-30"

N 3626.92
W 1701.00

87°

8°

16'

N 1100

P.I. D=11°

N 1100

N 3513.84
W 1748.70

P.I.

N 1700

N 1500

82'-0"

86'-0"

2'-8"

40'-0"

2'-6"

32'-0"

N 1500

W 1600

267.70'

P.I. to P.I.

N 3773.84
W 1692.00

37°-01'-40"

N 3746.96
W 1656.37

74'

Centerline Joint

35'-0"

7'-0"

68.21'

R=1145'

C=1131.37'

P.I.

N 3737.06
W 1781.25

N 1000 W

KAHLER CO. INC.

F.O. DOCK

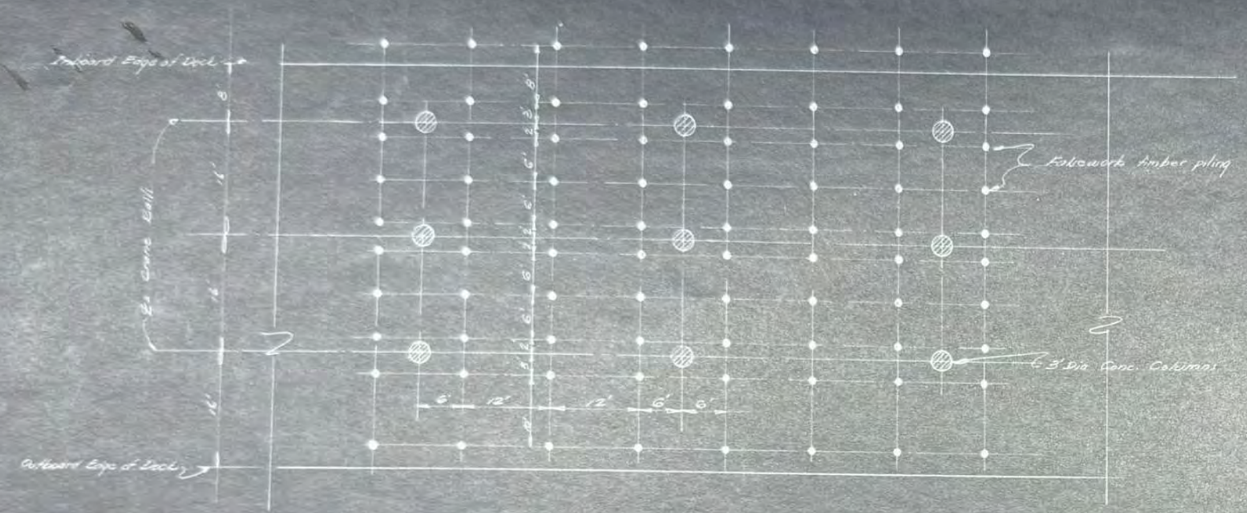
LAYOUT OF SOUTH CORNER

2-17-42

220-1-31

CHECKED BY

220-1-55

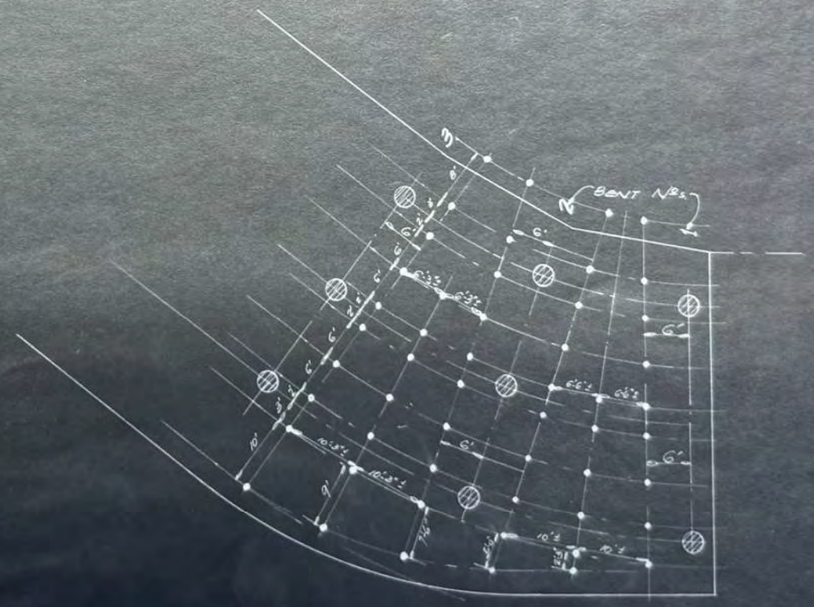



PLAN
1"= 10'-0"

TYPICAL FOR BENTS 3 TO 8 INC & 10 TO 21 INC.




PLAN
1"= 10'
FOR BENTS SHOWN



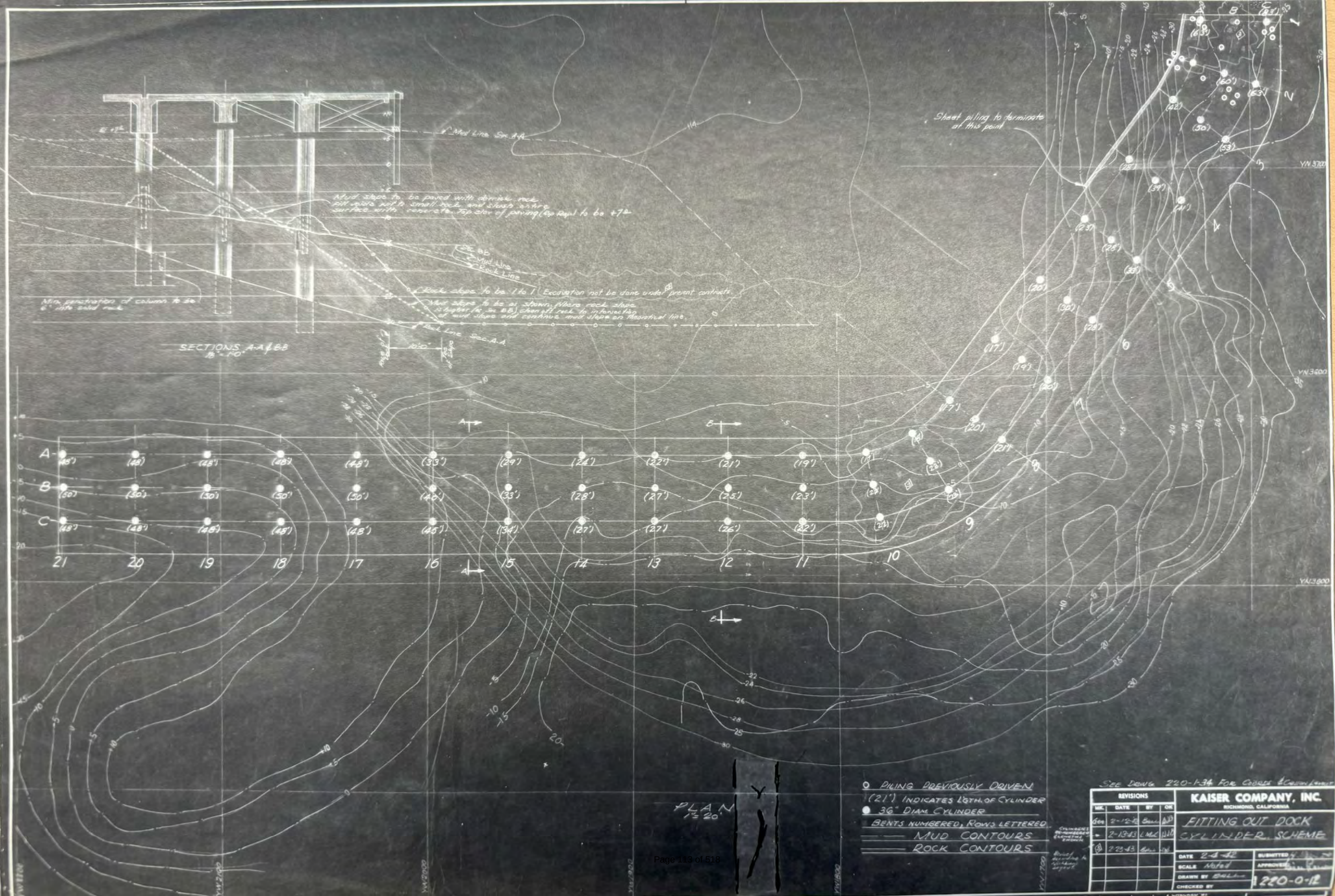

PLAN
1"= 10'
FOR BENTS SHOWN

| REVISIONS | | | |
|---|---|---|---|
| NO. | DATE | BY | OK |
| 2 | 2-22-43 | | |
| 3 | 3-4-43 | | |

KAISER COMPANY, INC.
RICHMOND, CALIFORNIA

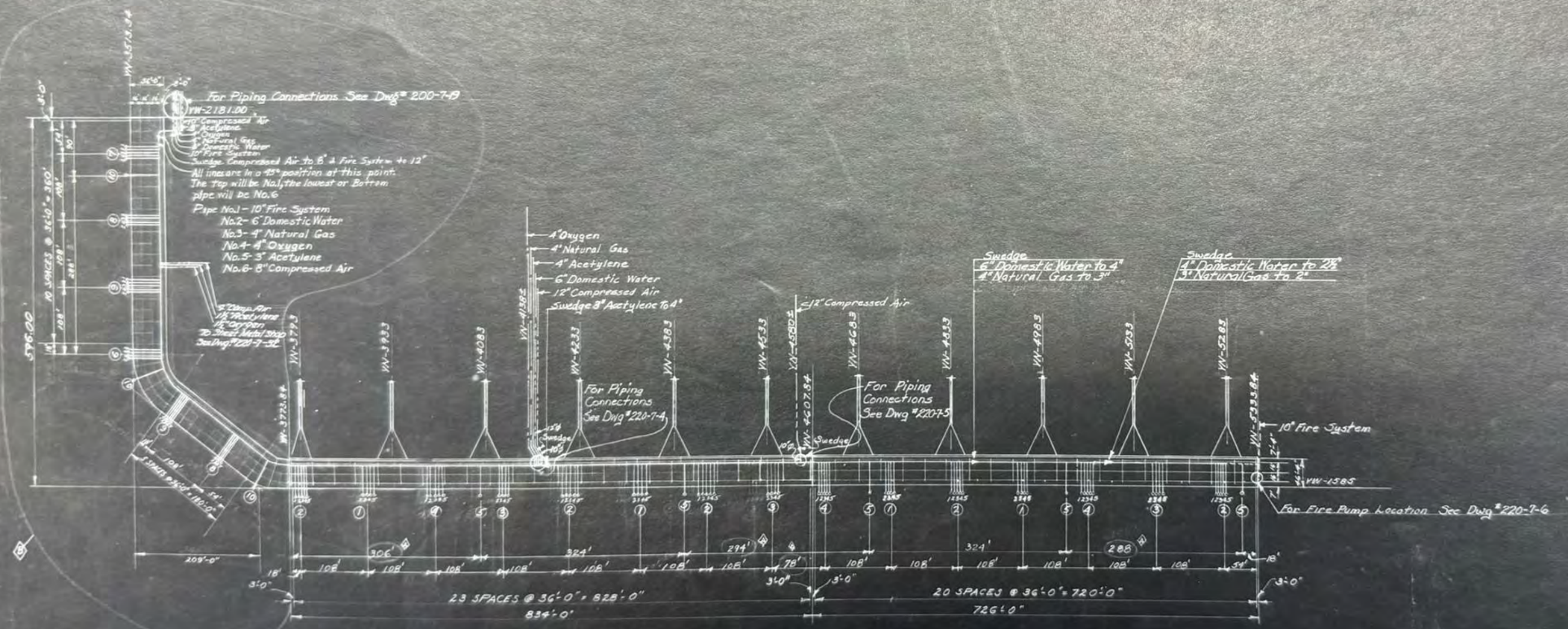
E.O. DOCK
PILE LAYOUT & FALSEWORK

DATE 2-22-43 SUBMITTED
SCALE 1"=10' APPROVED
DRAWN BY [illegible] 202-1-23


Mud Line Sec. A-A
Mud slope to be paved with derrick rock. Fill voids with small rock and slush entire surface with concrete. Top slope of paving (Top Rip) to be +7±
Sec. B-B
Mud Line
Rock Line
Rock slope to be 1 to 1 ( Excavation not be done under present contracts
Mud slope to be as shown. Where rock slope is flatter (as Sec. B-B) chase all rock to intersection of mud slope and continue mud slope on theoretical line.
Rock Line Sec. A-A
Min. penetration of column to be 6' into solid rock
SECTIONS A-A & B-B
1/8" = 1'-0"
Sheet piling to terminate at this point
Y.N. 3700
Y.N. 3600
PLAN
1" = 20'
PILING PREVIOUSLY DRIVEN
(21') INDICATES LGTH. OF CYLINDER
36" DIAM. CYLINDER
BENTS NUMBERED, ROWS LETTERED
MUD CONTOURS
ROCK CONTOURS
See Dwng. 220-1-34 For Cables & Caisson Layout
REVISIONS
KAISER COMPANY, INC.
RICHMOND, CALIFORNIA
FITTING OUT DOCK
CYLINDER SCHEME
DATE 2-4-42
SCALE Noted
DRAWN BY
CHECKED BY
220-0-12

LEGEND

Acetylene
Oxygen
Natural Gas
Compressed Air
Domestic Water
Fire System




| PIPE No | RISERS ① (6) | ② (7) | ③ (8) | ④ (9) | ⑤ (10) |
|---|---|---|---|---|---|
| 1 | | 2½" Domestic Water | | 2½" Domestic Water | 4" Fire System |
| 2 | 1" Natural Gas | 1" Natural Gas | 2" Natural Gas | 2" Natural Gas | |
| 3 | 1" Oxygen | 1" Oxygen | 1" Oxygen | 1" Oxygen | |
| 4 | 1" Acetylene | 1" Acetylene | 1" Acetylene | 1" Acetylene | |
| 5 | 2½" Compressed Air | 2½" Compressed Air | 2½" Compressed Air | 2½" Compressed Air | |

NOTE
DO NOT SCALE

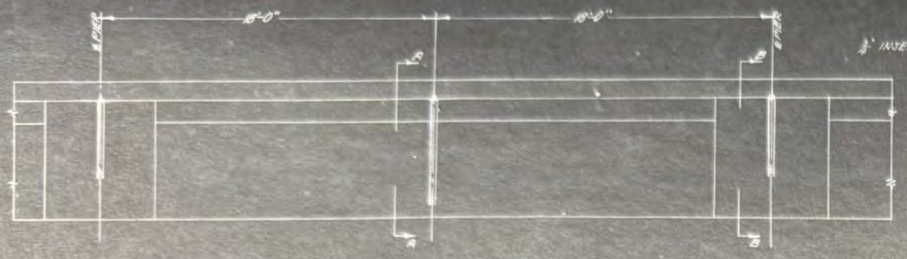


| REVISIONS | | | |
|---|---|---|---|
| NO. | DATE | BY | OK |
| A | 9/17/42 | | |
| B | 3/26-43 | | |

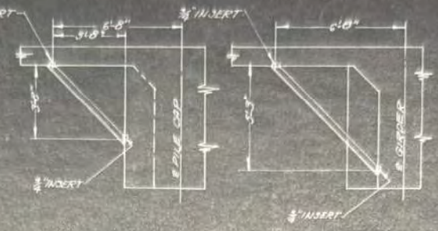
KAISER COMPANY, INC.
RICHMOND, CALIFORNIA

FITTING OUT DOCK
PIPING LAYOUT

DATE 9/10/42 SUBMITTED
SCALE 1"=100' APPROVED
DRAWN BY 220-7-1



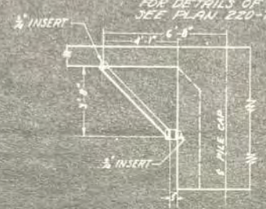

SCALE: 1/4" = 1 FT.
TYPICAL LOCATION OF PIPE HANGERS
ELEVATION



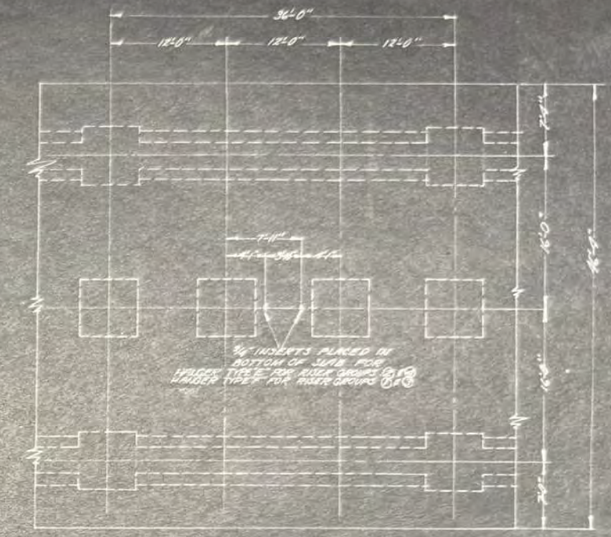

TYPE "A-1" HANGER
TYPE "B-1" HANGER
TYPE "C-1" HANGER
TYPE "X-1" HANGER
SECTION A-A

TYPE "A" HANGER
TYPE "B" HANGER
TYPE "C" HANGER
TYPE "X" HANGER
SECTION B-B

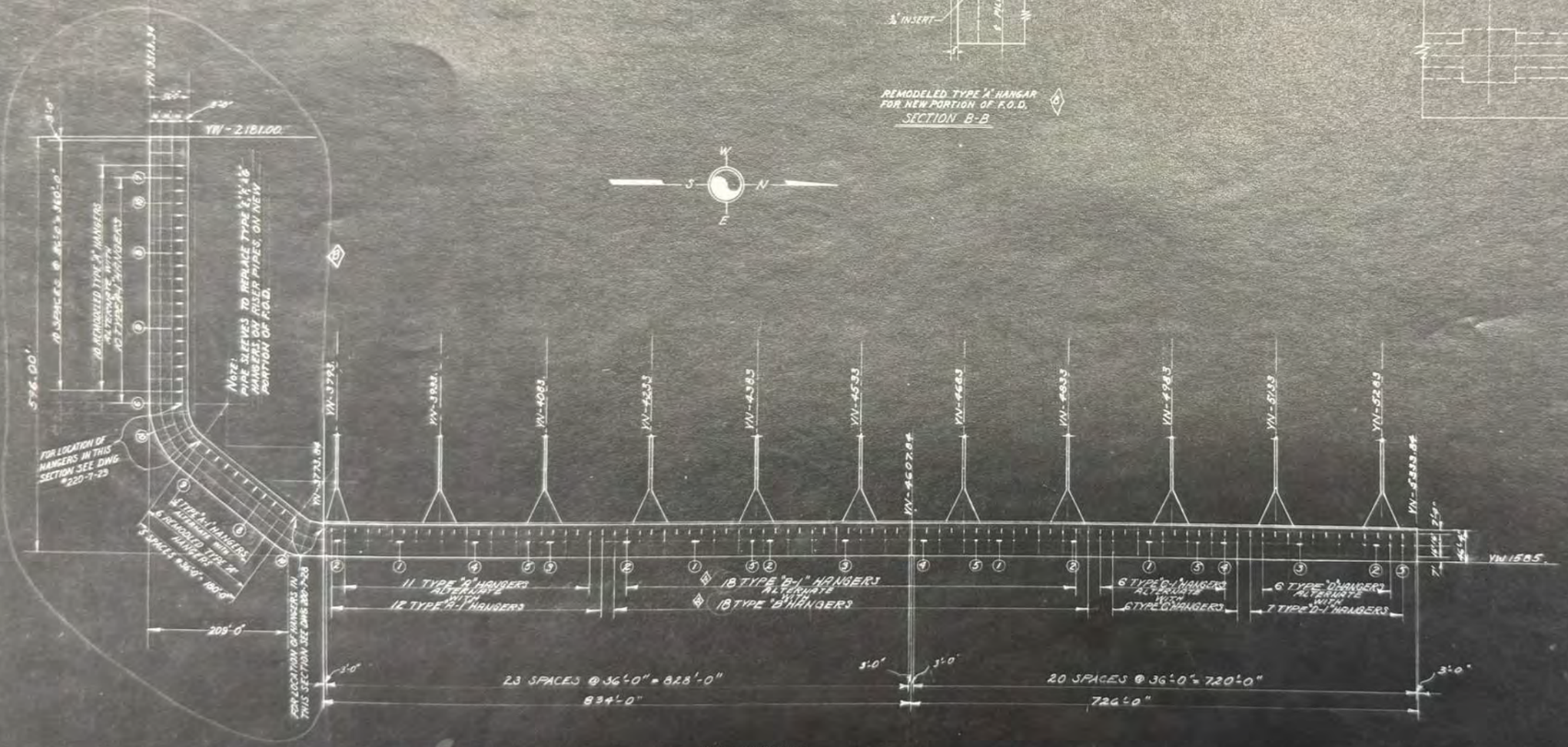
FOR DETAILS OF PIPE HANGERS
SEE PLAN 220-7-9



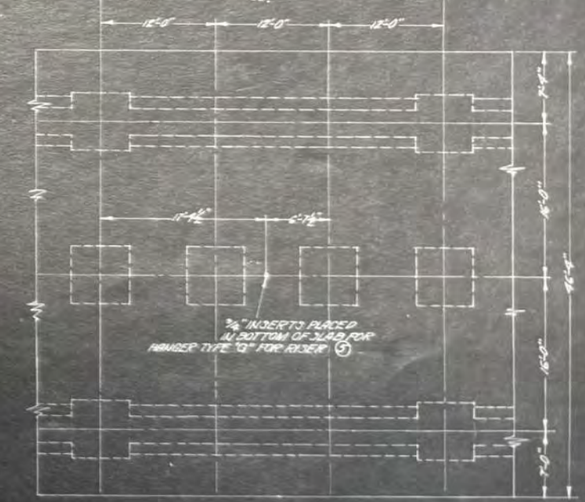

REMODELED TYPE 'A' HANGAR
FOR NEW PORTION OF F.O.D.
SECTION B-B




PLAN




SCALE: 1"=100'
FITTING OUT DOCK




PLAN

FOR DETAILS OF TRANSVERSE PIPE HANGERS SEE PLAN 220-7-13

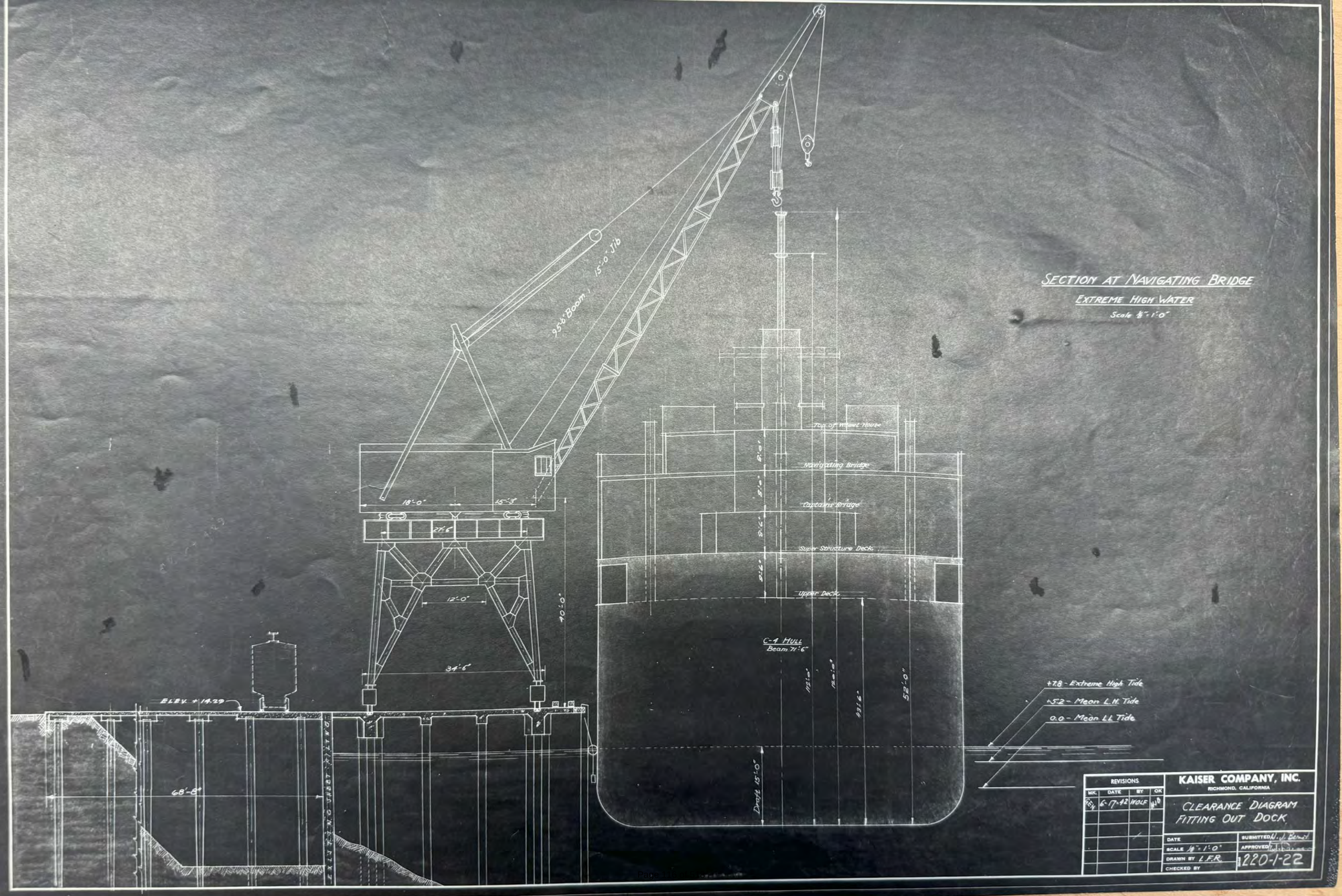
NOTE
DO NOT SCALE

| REVISIONS | | | | KAISER COMPANY, INC. RICHMOND, CALIFORNIA |
|---|---|---|---|---|
| MK. | DATE | BY | OK | |
| A | 9/17/42 | C.M.C. | F.G. | FITTING OUT DOCK. LOCATION OF PIPE HANGERS |
| B | 5/23/43 | C.M.C. | F.G. | |
| | | | | DATE 9-14-42 SUBMITTED |
| | | | | SCALE AS SHOWN APPROVED |
| | | | | DRAWN BY C.M.C. 220-7-2 |

# SECTION AT NAVIGATING BRIDGE

EXTREME HIGH WATER

Scale ⅛" = 1'-0"




| REVISIONS | | | |
|---|---|---|---|
| NO. | DATE | BY | OK |
| REV | 6-17-42 | WOLF | MJD |

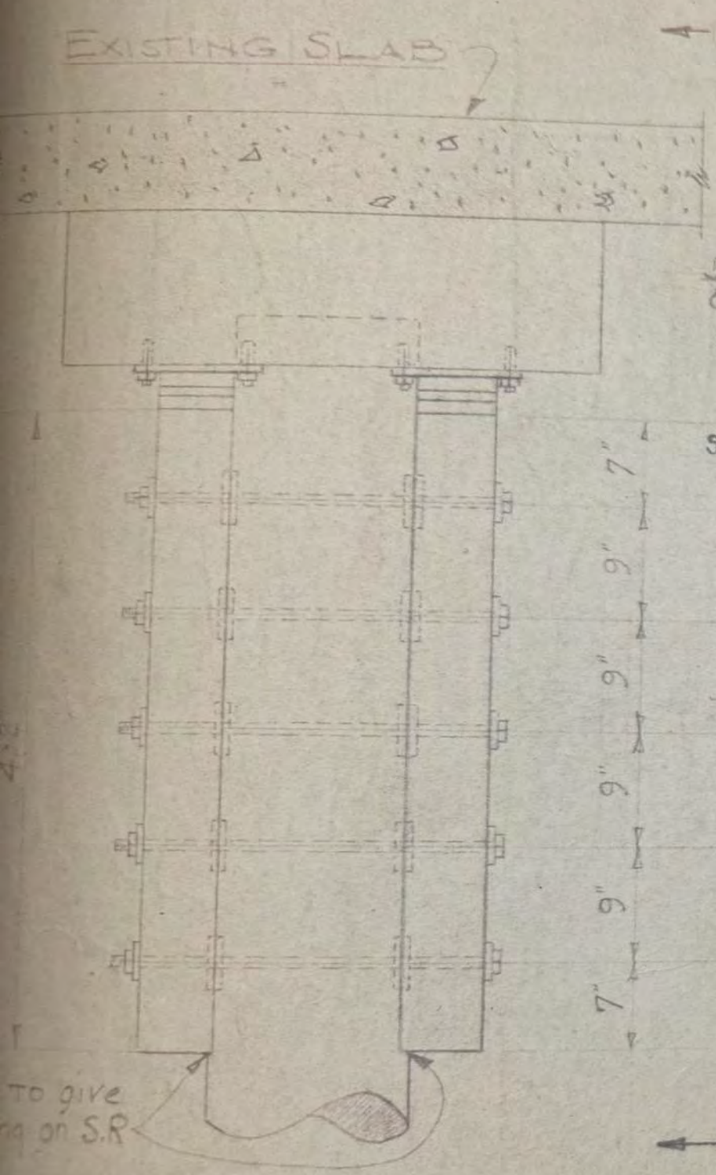
KAISER COMPANY, INC.
RICHMOND, CALIFORNIA

CLEARANCE DIAGRAM
FITTING OUT DOCK

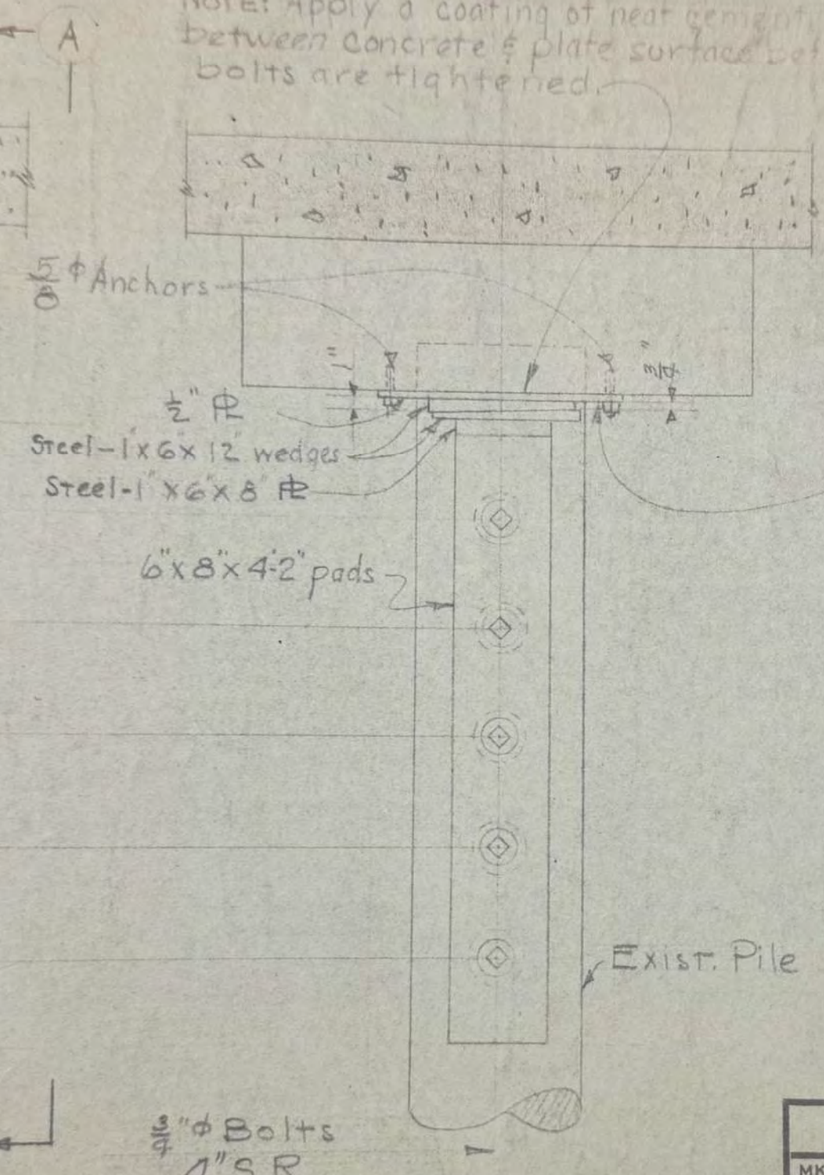
DATE
SCALE ⅛" = 1'-0"
DRAWN BY L.F.R.
CHECKED BY

SUBMITTED
APPROVED

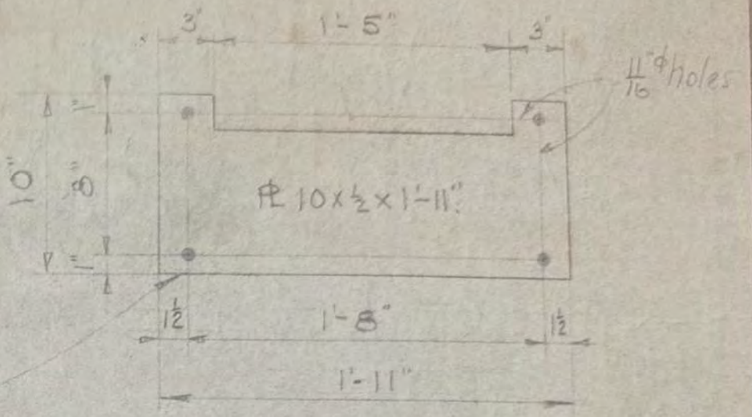
1220-1-22




TYPICAL ELEVATION
1"=1'-0"




SECTION A-A




PLAN
2 Req. Each Pile
1½"=1'-0"

| REVISIONS | | | |
|---|---|---|---|
| MK. | DATE | BY | OK |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**KAISER COMPANY, INC.**
RICHMOND, CALIFORNIA

FITTING OUT DOCK
YARD #3
SHIM FOR SUBSIDING PILES

DATE 6-2-44 | SUBMITTED W. Burns
SCALE Shown | APPROVED Bennett
DRAWN BY F.B.C. | No. 220-414
CHECKED BY

# COMPARATIVE AREAS AND COSTS

| No. | BUILDING | SQ. FT. ESTIMATE JANUARY-42 | EST. COST JANUARY-42 | COST per SQ. FT. | SQ. FT. ESTIMATE FEB. 22-42 | EST. COST FEB. 22-42 | COST per SQ. FT. | SQ. FT. ESTIMATE APRIL 15-42 | EST. COST APRIL 15-42 | COST per SQ. FT. | AREA CONSTRUCTED | ACTUAL COST | COST per SQ. FT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 301 | ADMINISTRATION | 14,250. | $101,000. | $7.09 | 23,750. | $168,355. | $7.09 | 36,280. | $220,000. | $6.06 | 36,280. | $225,157. | $6.21 |
| 302 | CHECK STATION & GUARD | 6,630. | $12,475. | $1.88 | 11,050. | $20,800. | $1.88 | 3,958. | $20,800. | $5.26 | 3,504. | $62,801. | $17.92 |
| 303 | PLATE SHOP | 95,325. | $484,714. | $5.08 | 158,875. | $672,186. | $4.23 | 214,640. | $672,186. | $3.13 | 216,400. | $831,272. | $3.84 |
| 304 | MACHINE SHOP | 23,925. | $164,368. | $6.87 | 39,875. | $273,944. | $6.87 | 46,475. | $284,044. | $6.11 | 44,260. | $283,080. | $6.40 |
| 305 | FORGE SHOP | 1,575. | $11,000. | $6.98 | 2,625. | $18,329. | $6.98 | 5,000. | $26,350. | $5.27 | 5,000. | $66,567. | $13.31 |
| 306 | PAINT & SHEET MT & RIGGERS LOFT | 16,400. | $26,000. | $1.58 | 27,388. | $43,471. | $1.59 | 26,560. | $43,471. | $1.64 | 26,240. | $109,590. | $4.18 |
| 307 | YARD OFFICE | 2,375. | $20,000. | $8.42 | 3,958. | $33,333. | $8.42 | 10,414. | $41,633. | $4.00 | 10,414. | $77,711. | $7.46 |
| 308 | MAINTENANCE | NONE | — | — | 1,000. | $6,760. | $6.76 | 3,225. | $12,510. | $3.88 | 3,225. | $22,562. | $7.00 |
| 309 | FIRST AID | 1,200. | $10,000. | $8.33 | 2,000. | $16,667. | $8.33 | 4,434. | $30,000. | $6.77 | 4,443. | $41,405. | $9.32 |
| 310 | SWITCH HOUSE | 400. | $3,011. | $7.53 | 443. | $3,331. | $7.52 | 429. | $3,331. | $7.76 | 432. | $13,599. | $31.48 |
| 311 | ACETYLENE | 1,273. | $9,076. | $7.13 | 2,530. | $18,054. | $7.13 | 1,517. | $18,054. | $11.90 | 1,500. | $37,635. | $25.09 |
| 12 314 | PIPE SHOP | 5,850. | $21,000. | $3.59 | 9,750. | $35,040. | $3.59 | 27,400. | $78,000. | $2.85 | 28,800. | $149,875. | $5.20 |
| 14 316 | FITTINGS OFFICE | NONE | — | — | 1,600. | $9,600. | $6.00 | 3,200. | $9,600. | $3.00 | AS DESIGNED 4,320. | NOT BUILT | |
| 15 317 | COMPRESSOR | 1,750. | $6,000. | $3.42 | 3,500. | $12,000. | $3.43 | 5,105. | $35,550. | $6.57 | 5,066. | $83,358 | $16.45 |
| V 16 318 | MAINTENANCE GARAGE | NONE | — | — | 2,200. | $16,300. | $7.40 | 4,985. | $16,300 | $3.27 | 4,985. | $36,887 | $7.40 |
| 23 319 | CAFETERIA | NONE | — | — | 6,276. | $30,000. | $4.78 | AS DESIGNED 6,276. | $30,000. | $4.78 | AS DESIGNED 6,276. | NOT BUILT | |
| 24 350 | GENERAL WAREHOUSE | 112,000. | $335,464. | $3.00 | 146,000. | $437,464. | $3.00 | 146,926. | $475,697. | $3.24 | 146,926. | $507,081. | $3.45 |
| 25 351 | FITTINGS WAREHOUSE | 22,800. | $63,250. | $2.77 | 22,800. | $63,250. | $2.77 | 58,320. | $200,418. | $3.44 | 58,320 | $200,554. | $3.44 |
| 352 | BRICK & INSULATION STORAGE | } | | | | | | | | | 4,000. | $12,080. | $3.02 |
| 355-57 | WELDING & BURNER SCHOOL | } | $62,438. | | | $104,063. | | | $104,063. | | 10,078. | $30,435 | $3.02 |
| | MISC. BUILDINGS | } | | | | | | | | | 30,774. | | |

| REVISIONS | | | |
|---|---|---|---|
| MK. | DATE | BY | OK |
| | | | |
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| | | | |

**KAISER COMPANY, INC.**
RICHMOND, CALIFORNIA

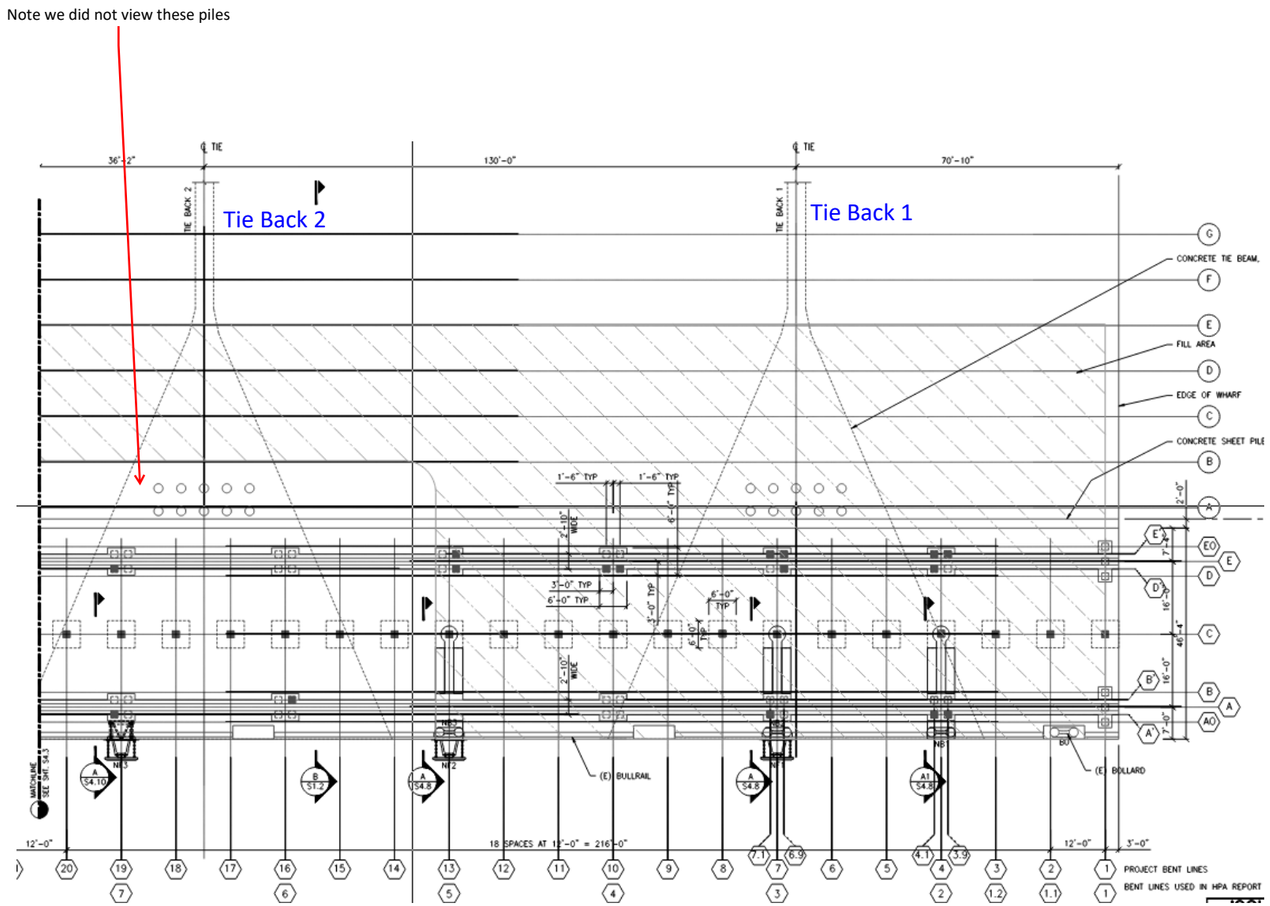
COMPARATIVE AREAS AND COSTS

DATE July 18-42 — SUBMITTED
SCALE — APPROVED E.T. LARSEN
DRAWN BY Cerruti.
CHECKED BY

2048

# APPENDIX D – BERTHS 7–8 AND PART OF 6 INNER WHARF DOCUMENTATION PHOTOGRAPHS

# Port of Richmond - Berths 7 & 8 Inner Wharf




**LEGEND**

- (N) BOLLARD
- (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA




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Ph: (510) 832-5606


**PORT OF RICHMOND**
**WHARF INSPECTION**

Berths 7 & 8
Inner Wharf Condition

| | | | |
|---|---|---|---|
| *Project No.* 2525 | | | |
| *By* TBS | *Checked* SL | *Sheet No.* | 1 |
| *Approved* SL | | *of* | 8 |
| *Date* 05/12/25 | | *Revision* | ## |

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

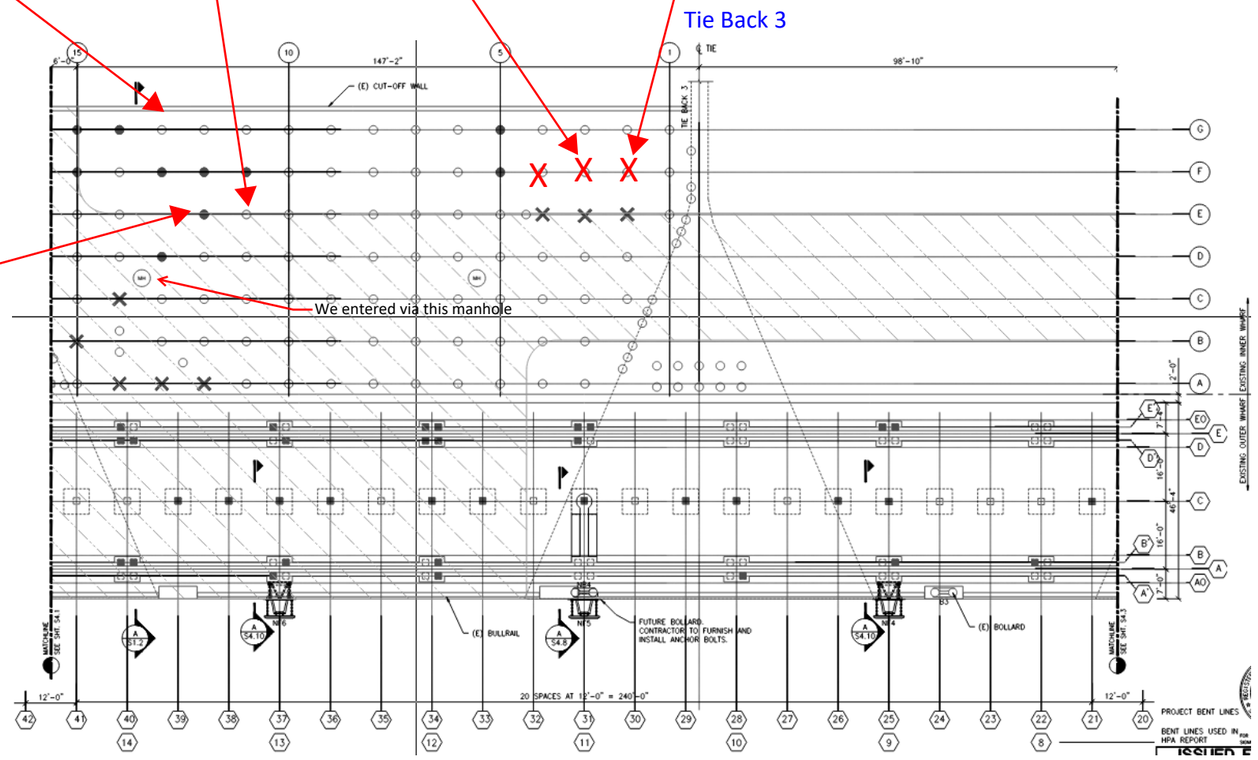

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# Port of Richmond - Berths 7 & 8 Inner Wharf








Notes:
1. Background plan drawings are from the Liftech drawings "Point Potrero Wharf Repair for Honda Automotive Facility, Port of Richmond," dated January 25, 2010 (Liftech 2010 Drawings). Piles observed to be in worse condition from 2010 damage drawings are indicated as such in red. Some piles repaired since 2010 are visible in photos, but not indicated on the Liftech 2010 Drawings. Refer to the pile as-built drawings by Vortex, 2012.

2. Significant damage observed at Tieback 5
3. Row F piles most commonly having damage or are missing.
4. Tiebacks 1 and 2 not observed as these are behind a wall
5. In photos, Tie Back 5 marked as 7 and Tie Back 7 marked as 5 due to different numbering systems.

**LEGEND**

- (N) BOLLARD
- (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA




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**PORT OF RICHMOND**
**WHARF INSPECTION**

Berths 7 & 8
Inner Wharf Condition

| | | | |
|---|---|---|---|
| Project No. | 2525 | | |
| By | TBS | Checked SL | Sheet No. 2 |
| Approved | SL | | of 8 |
| Date | 05/12/25 | | Revision ## |

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# Port of Richmond - Berths 7 & 8 Inner Wharf







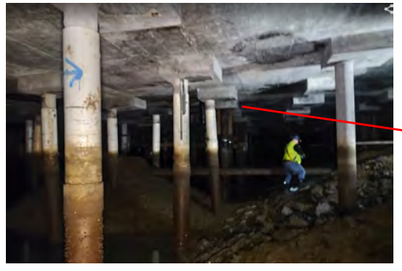




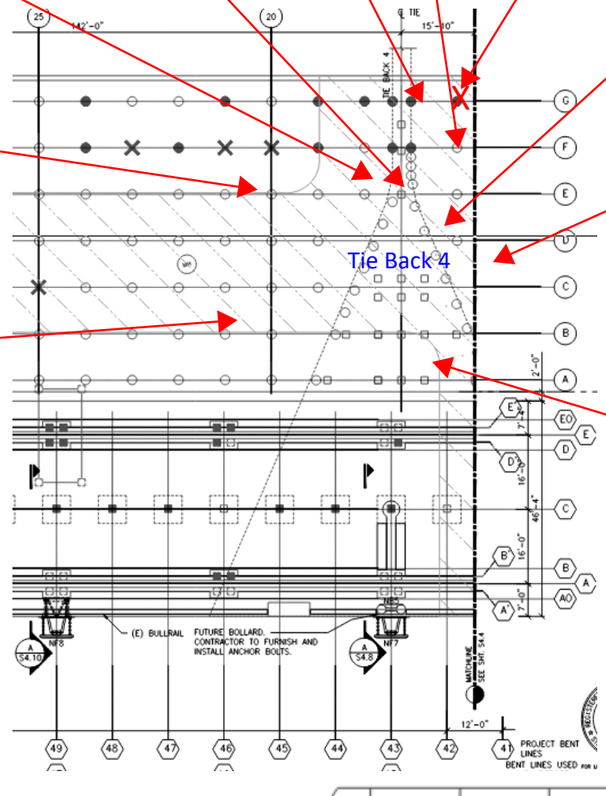




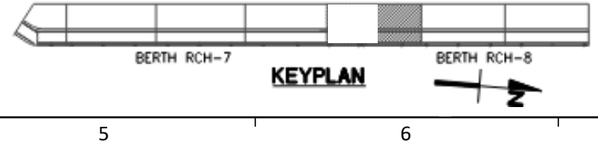











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**PORT OF RICHMOND WHARF INSPECTION**

Berth 7 & 8
Inner Wharf Condition

| | | | |
|---|---|---|---|
| Project No. | 2525 | | |
| By TBS | Checked SL | Sheet No. | 3 |
| Approved SL | | of | 8 |
| Date 05/12/25 | | Revision | ## |

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# Port of Richmond - Berths 7 & 8 Inner Wharf

repaired concrete piles on bent 35

Side view of Tieback 5

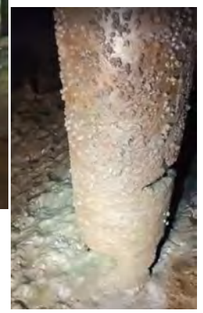
Repaired Piles, Row G 18, 19

Pile rotted out at bottom

Newer Concrete Piles, Row F 18 19

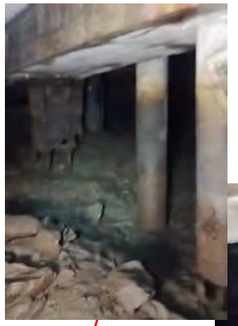


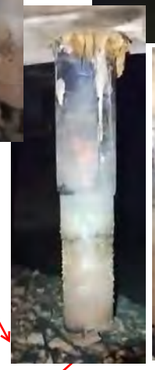












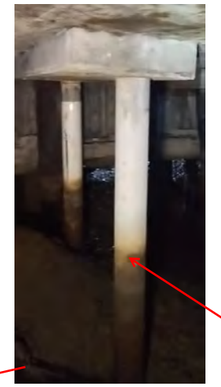




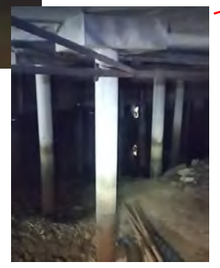








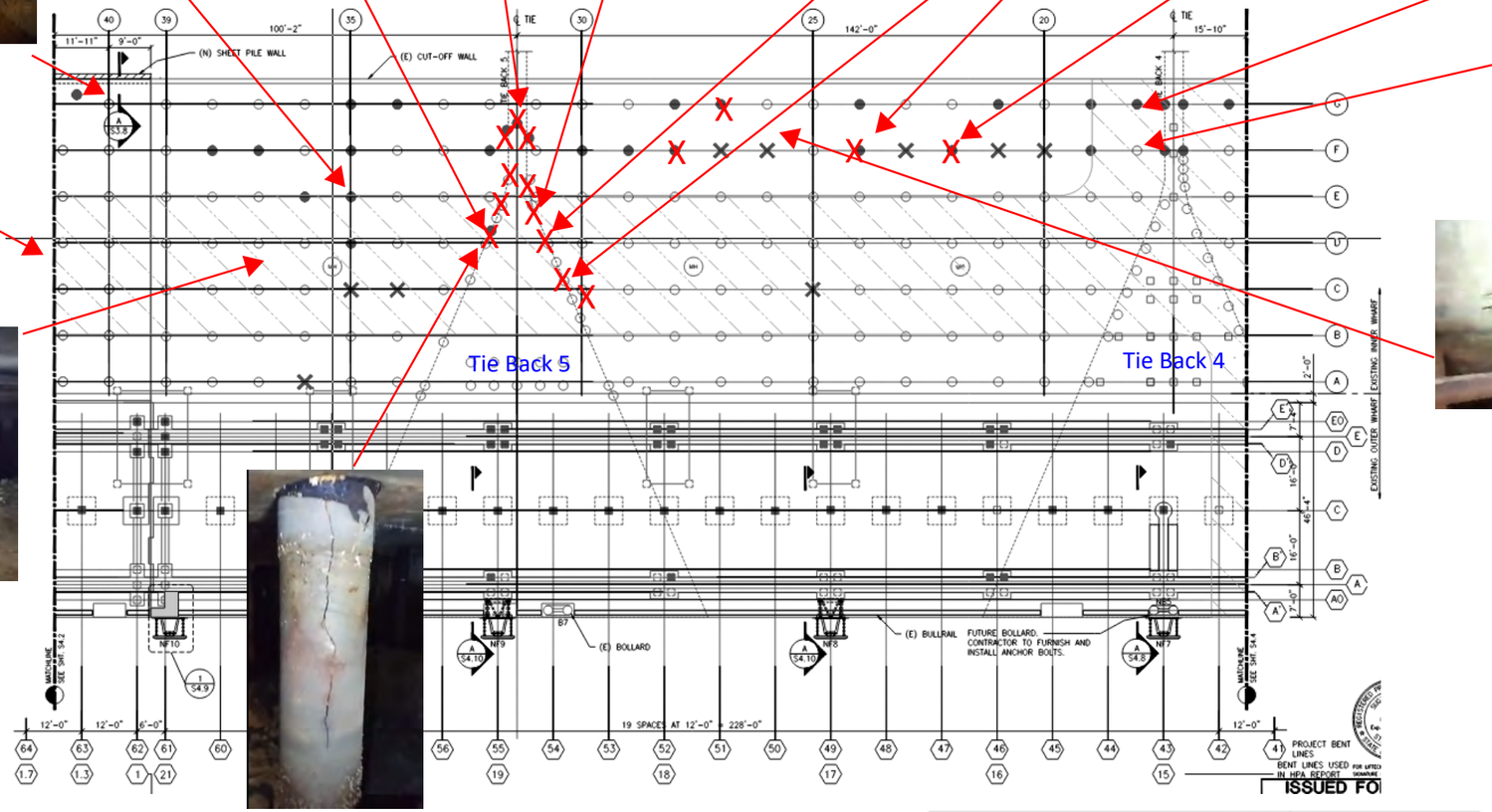













LEGEND

- (N) BOLLARD
- (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

BERTH RCH-7 — BERTH RCH-8

KEYPLAN

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**PORT OF RICHMOND WHARF INSPECTION**

Berths 7 & 8
Inner Wharf Condition

| | | | |
|---|---|---|---|
| Project No. | 2525 | | |
| By | TBS | Checked | SL |
| Approved | SL | | |
| Date | 05/12/25 | | |
| Sheet No. | 4 | | |
| of | 8 | | |
| Revision | ## | | |

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# Port of Richmond - Berths 7 & 8 Inner Wharf









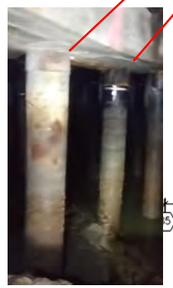








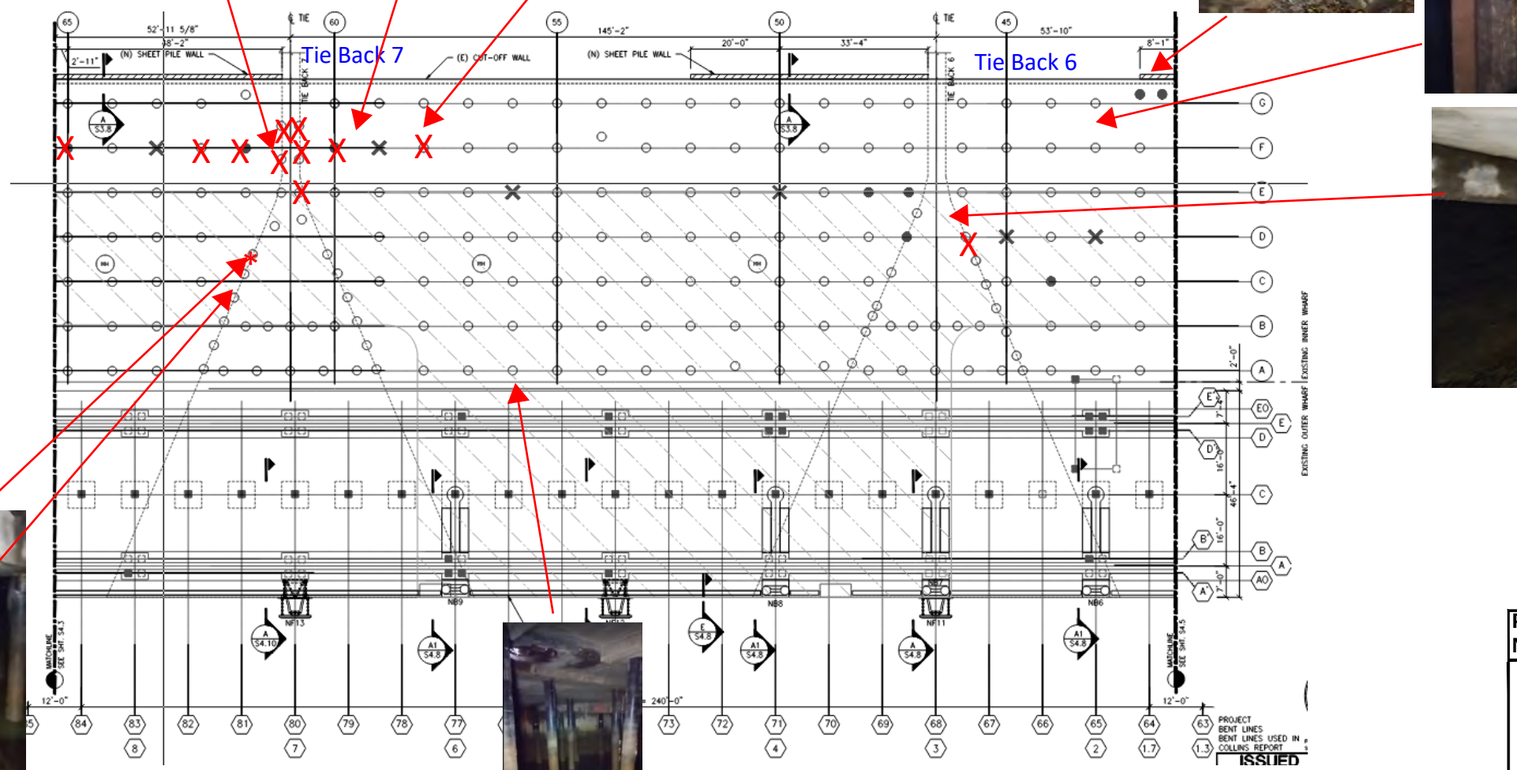






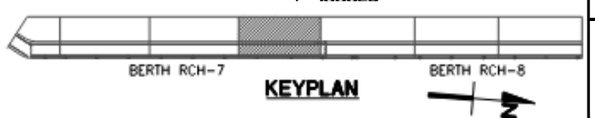
Tie Back 7

Tie Back 6




**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA




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**PORT OF RICHMOND**
**WHARF INSPECTION**

Berths 7 & 8
Inner Wharf Condition

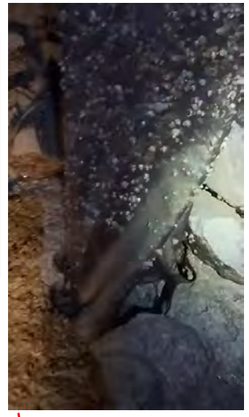
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| By | TBS | Checked | SL |
| Approved | SL | Sheet No. | 5 of 8 |
| Date | 05/12/25 | Revision | ## |

| No. | Revison | Date | By | Checked | Approved |
|---|---|---|---|---|---|
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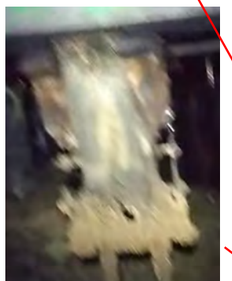
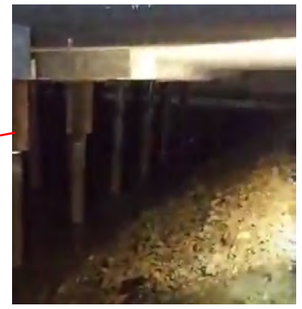
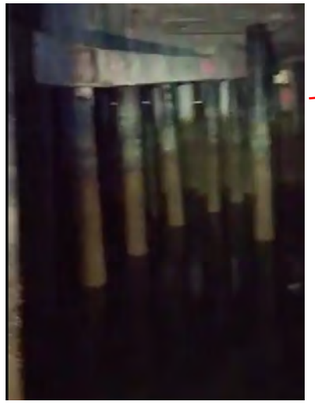

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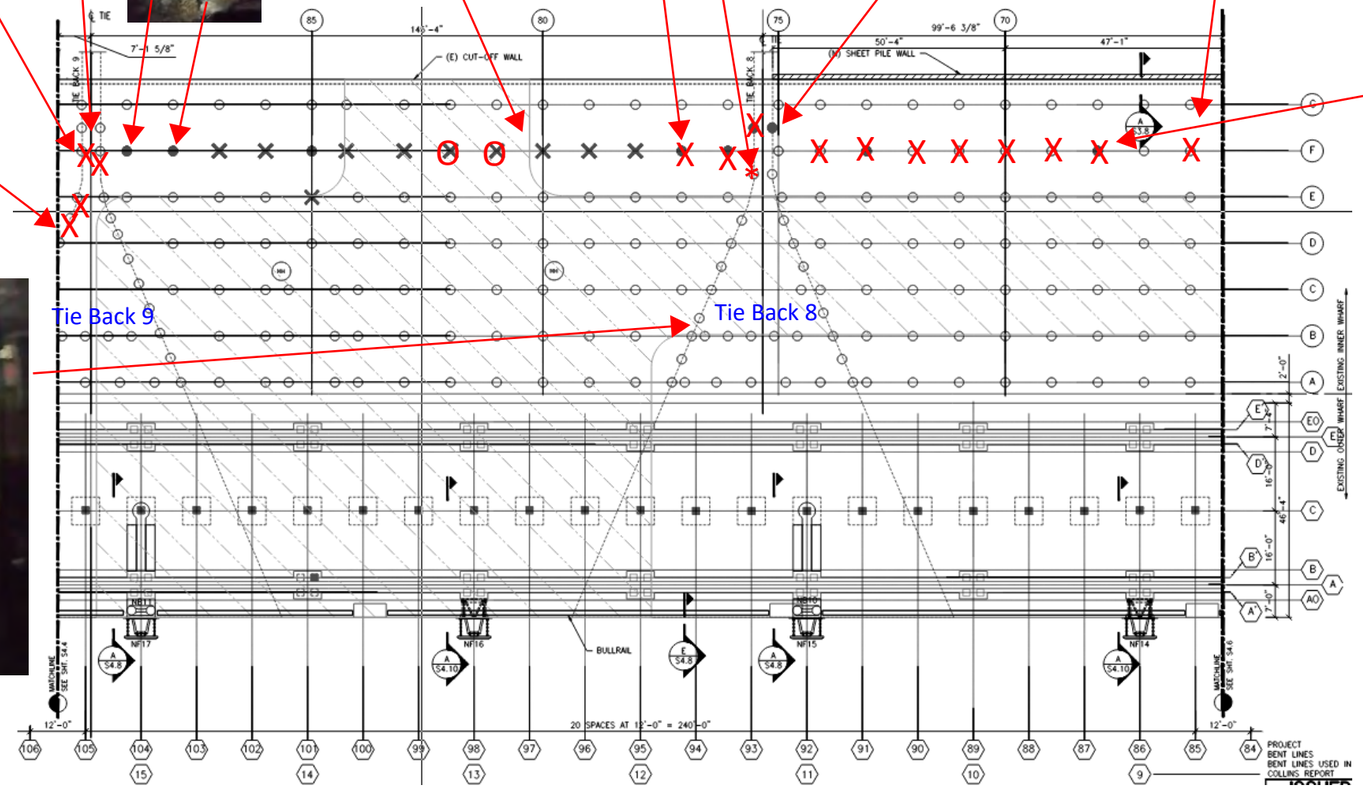
# Port of Richmond - Berths 7 & 8 Inner Wharf













KEYPLAN

**LEGEND**

- (N) BOLLARD
- (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

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**PORT OF RICHMOND**
**WHARF INSPECTION**

Berths 7 & 8
Inner Wharf Condition

| | | | |
|---|---|---|---|
| Project No. | 2525 | | |
| By | TBS | Checked | SL |
| Approved | SL | | |
| Date | 05/12/25 | | |
| Sheet No. | 6 | | |
| of | 8 | | |
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# Port of Richmond - Berths 7 & 8 Inner Wharf





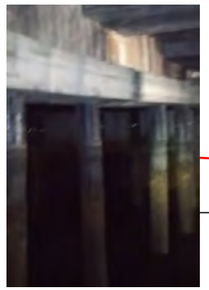




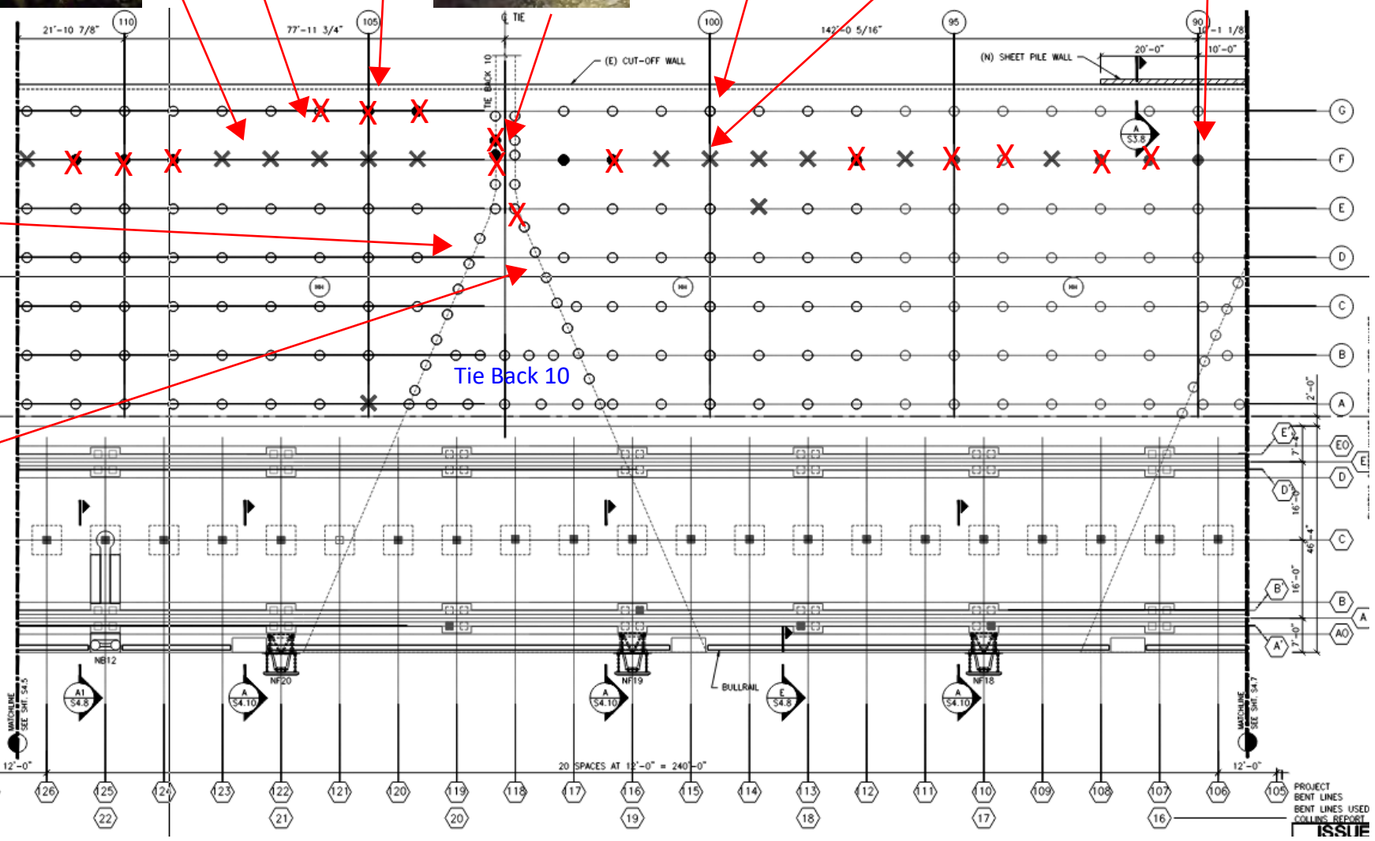






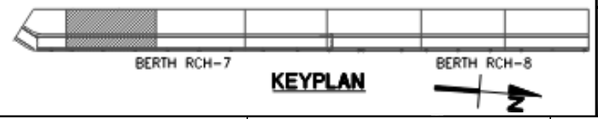







**LEGEND**

- (N) BOLLARD
- (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA




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**PORT OF RICHMOND**
**WHARF INSPECTION**

Berths 7 & 8
Inner Wharf Condition

| | | | |
|---|---|---|---|
| Project No. | 2525 | | |
| By | TBS | Checked | SL |
| Approved | SL | | |
| Date | 05/12/25 | | |
| Sheet No. | 7 | | |
| of | 8 | | |
| Revision | ## | | |

| No. | Revison | Date | By | Checked | Approved |
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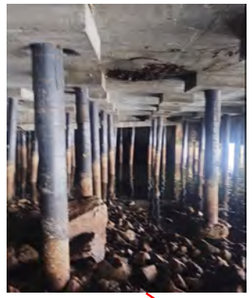

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# Port of Richmond - Berths 6 & 7 Inner Wharf



Space behind cracked beam



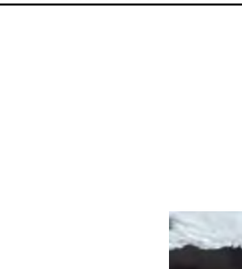


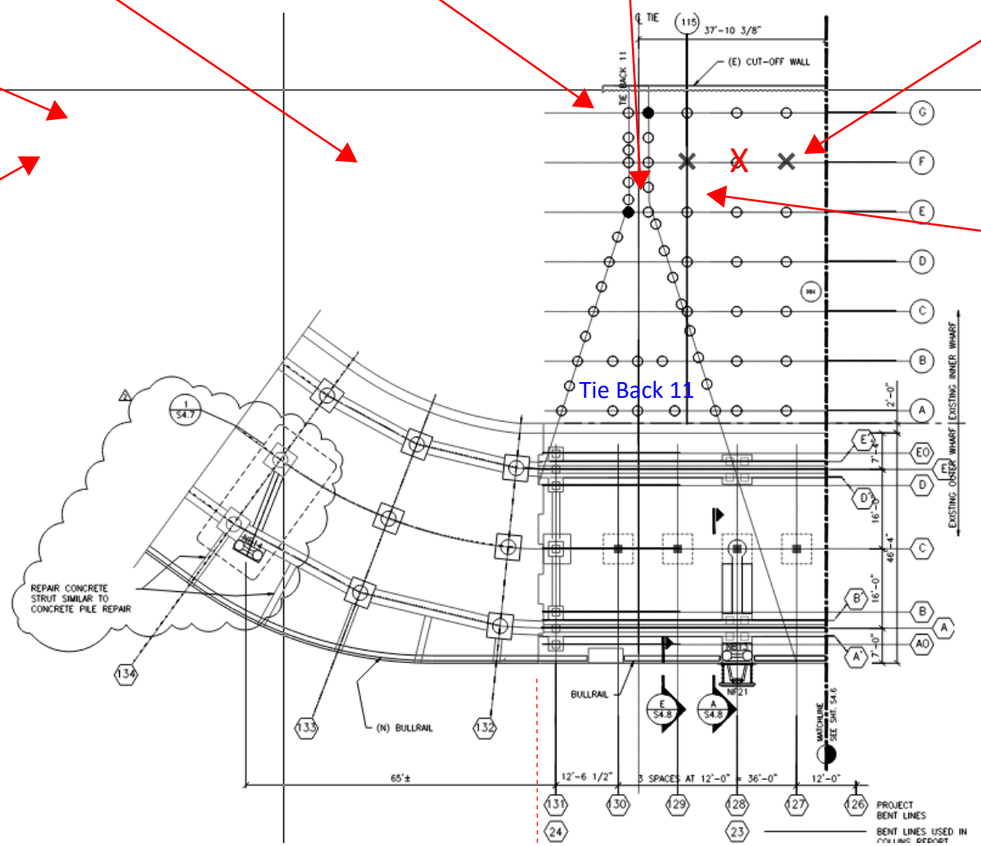













Note:
1. See Appendix G for additional photos of Berths 5-6.




Berth 6 Berth 7

LEGEND

- (N) BOLLARD
- (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

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

LIFTECH CONSULTANTS INC.

| | |
|---|---|
| **Job No.** 2525 | |
| **Project** P/Richmond wharf Inspection | |
| **By** TBS **Chkd** SL | **Approved** SL |
| **Date** 05/08/2025 | **Sheet** 8 **of** 8 |
| Note 1 | |

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**PORT OF RICHMOND INNER WHARF CONDITION**

Berths 6 & 7
Inner Wharf Condition

| | | | |
|---|---|---|---|
| *Project No.* 2525 | | | |
| *By* TBS | *Checked* SL | *Sheet No.* 8 | |
| *Approved* SL | | *of* 8 | |
| *Date* 05/12/25 | | *Revision* ## | |

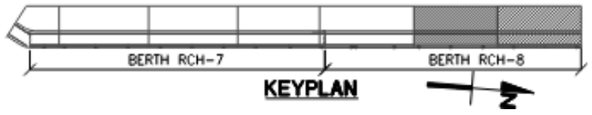
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# APPENDIX E – BERTHS 7-8 OUTER WHARF SOFFIT DOCUMENTATION PHOTOGRAPHS

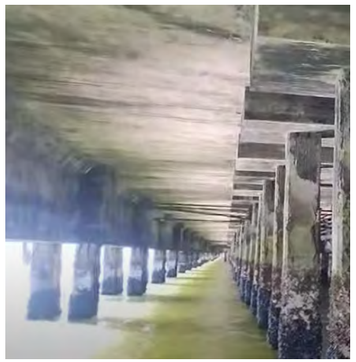
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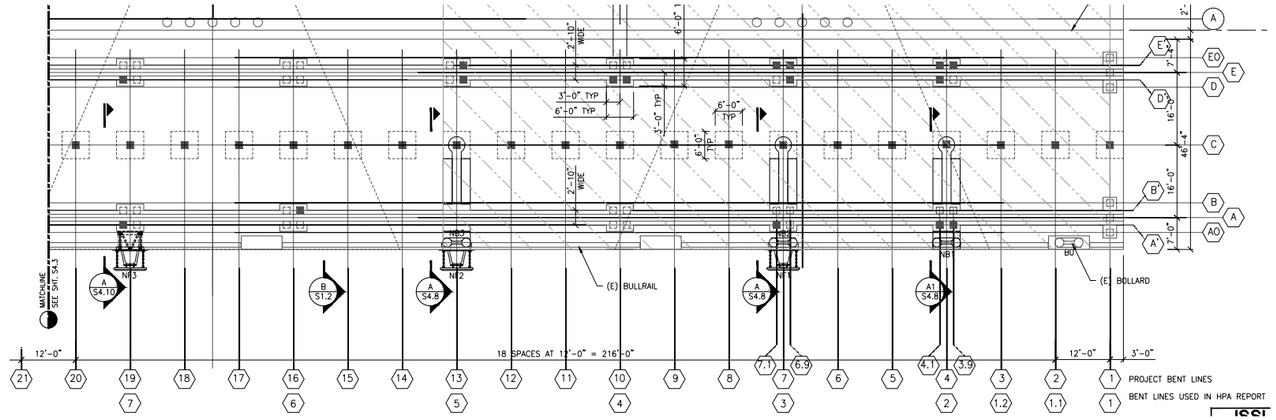
# Port of Richmond - Berths 7 & 8

## Soffit Damage Bents 1-42




View looking South
Soffit in good condition

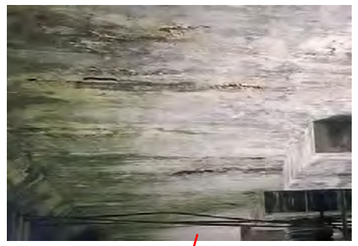





Example of soffit in good condition:

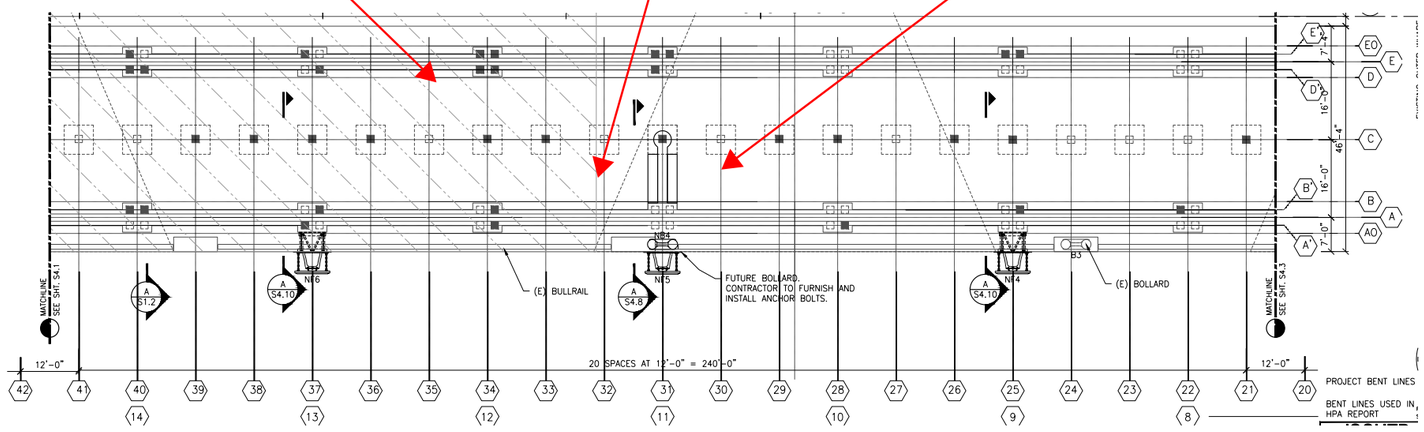








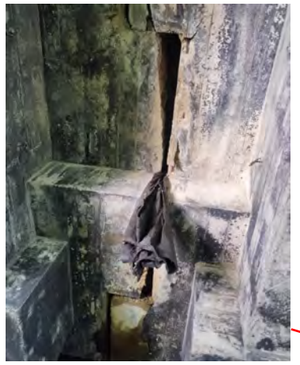
Spalled Concrete



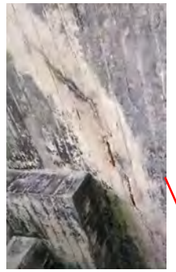

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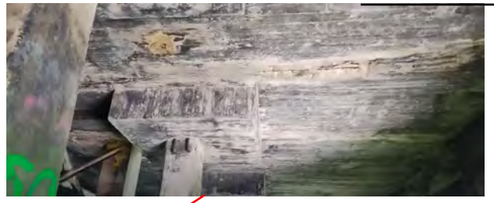
# Port of Richmond - Berths 7 & 8





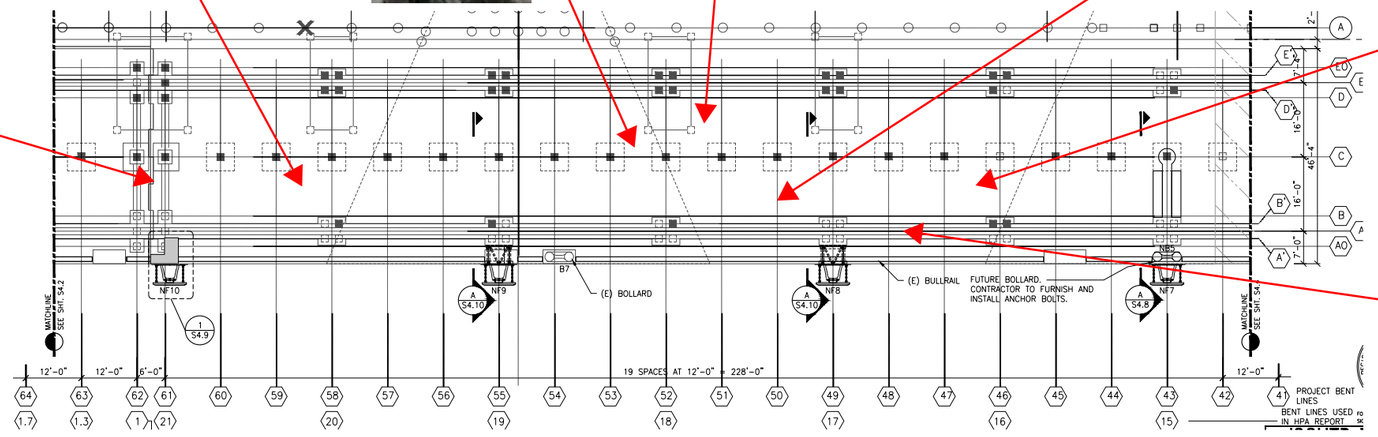


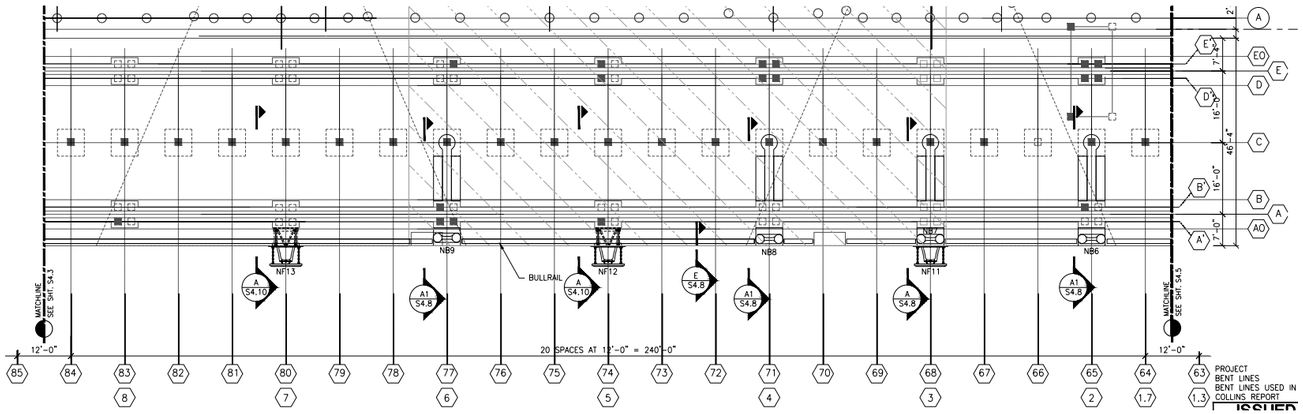














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# Port of Richmond - Berths 7 & 8



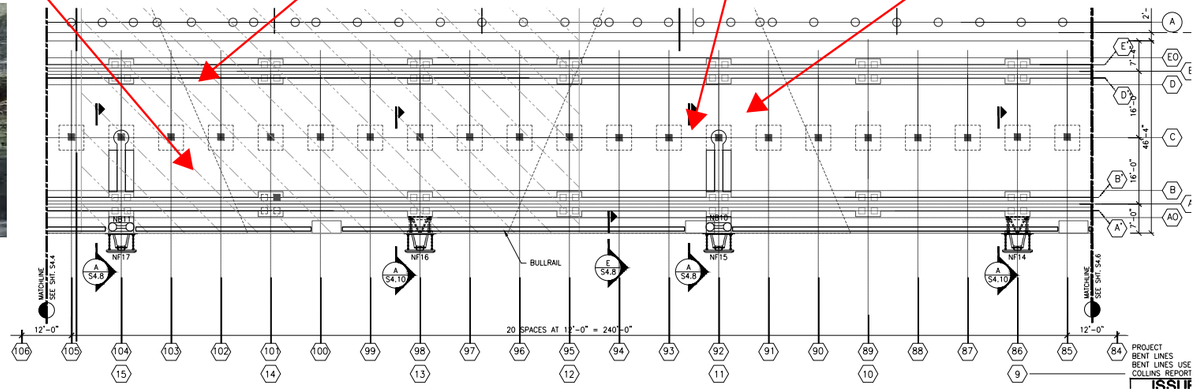










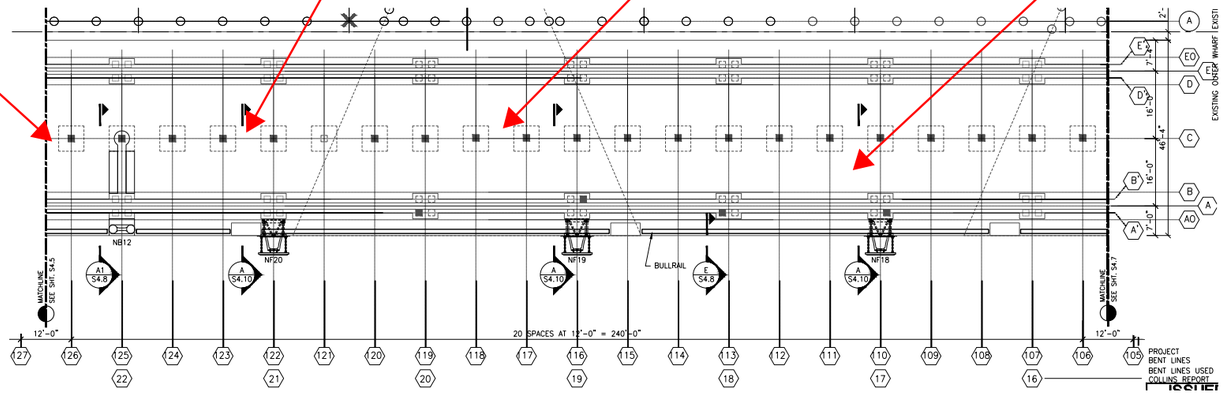













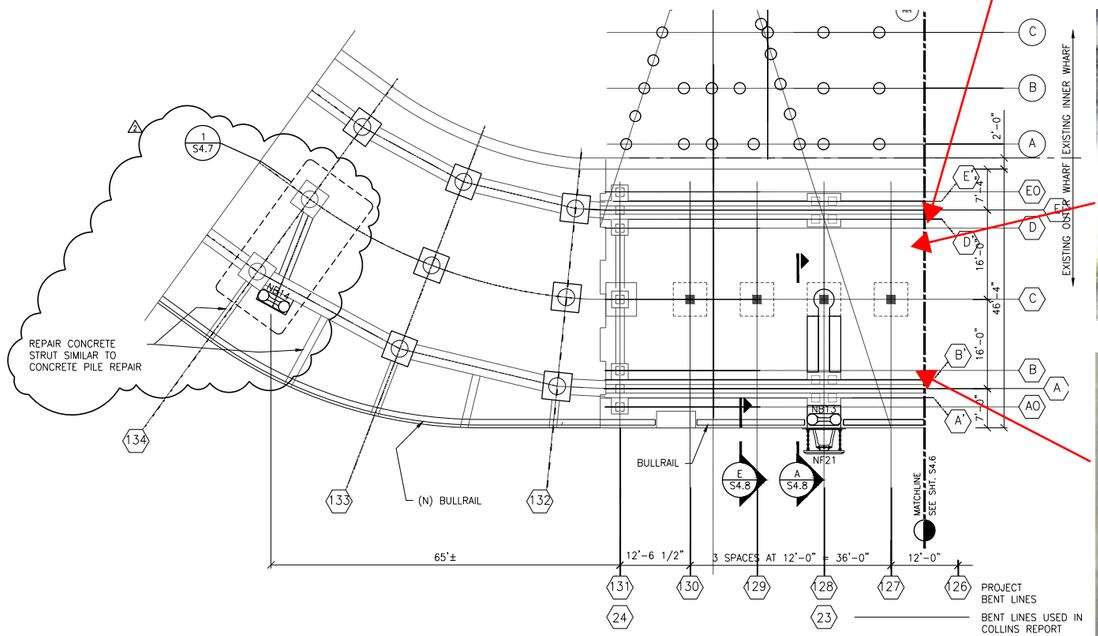

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# Port of Richmond - Berths 7 & 8










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# APPENDIX F – BERTHS 7-8 OUTER WHARF PILE DOCUMENTATION PHOTOGRAPHS

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# Port of Richmond - Berths 7 & 8

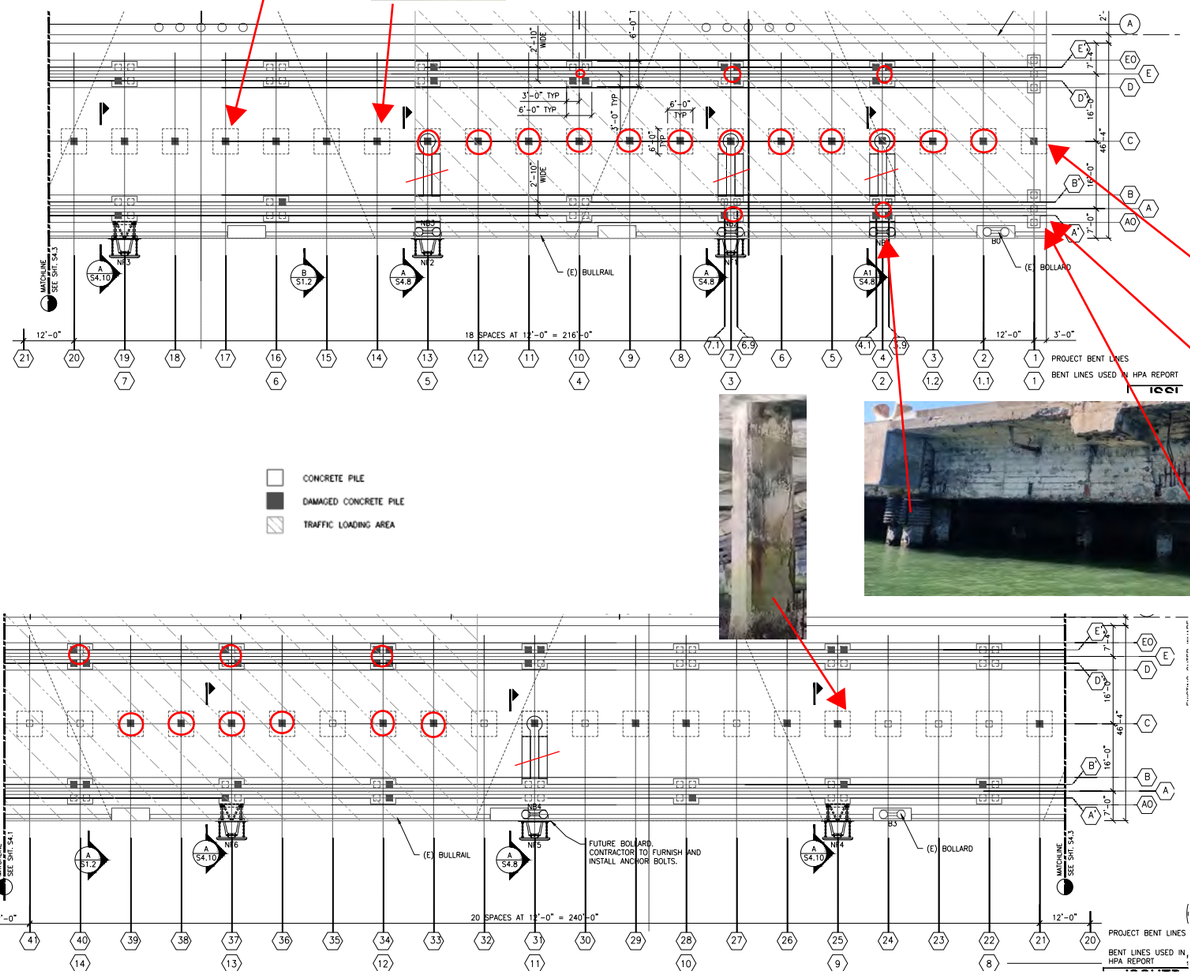
## Pile Condition Bents 1-41

In general
- Repaired piles in good condition
- Many damaged piles





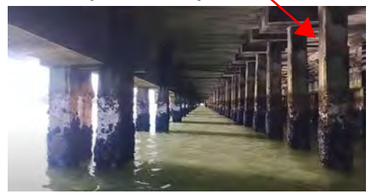



Repaired piles



Unrepaired piles









CONCRETE PILE
DAMAGED CONCRETE PILE
TRAFFIC LOADING AREA
Repaired Concrete Pile

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# Port of Richmond - Berths 7 & 8

## Pile Condition Bents 42-84

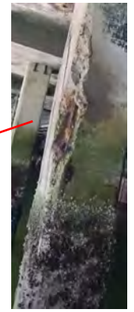






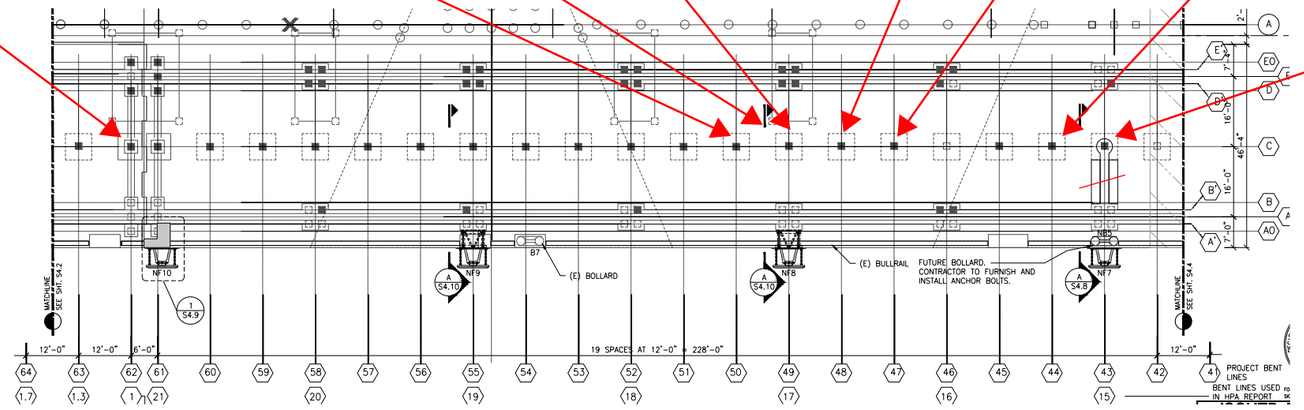


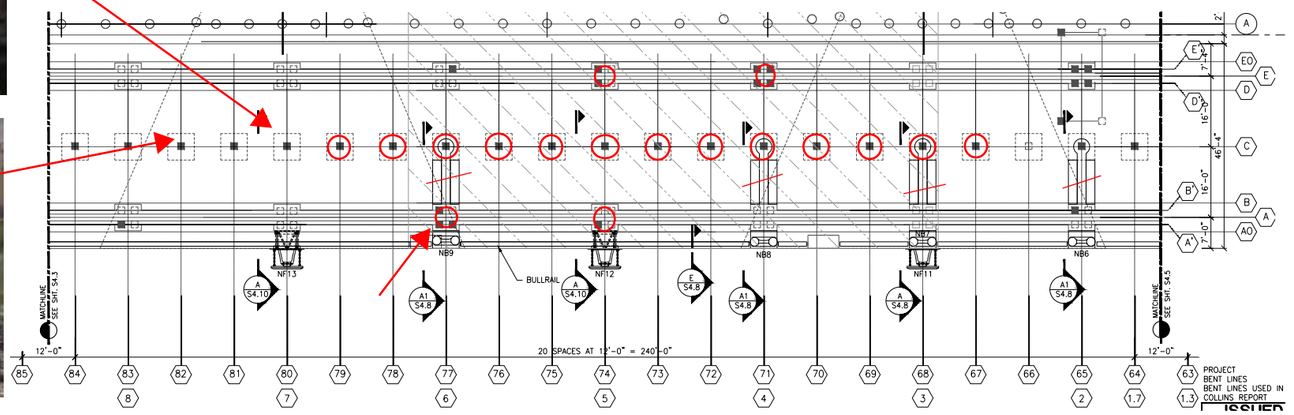












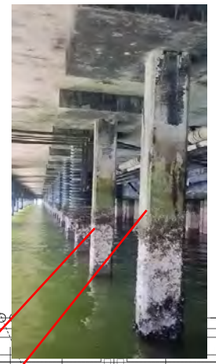
CONCRETE PILE
DAMAGED CONCRETE PILE
TRAFFIC LOADING AREA
Repaired Concrete Pile

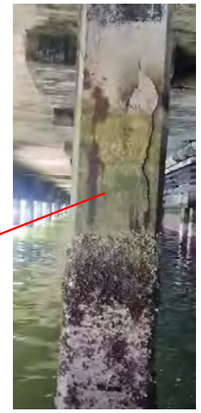
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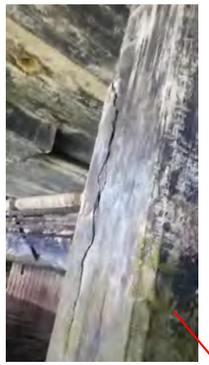
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# Port of Richmond - Berths 7 & 8

## Pile Condition Bents 85-126







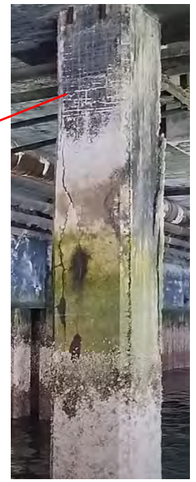


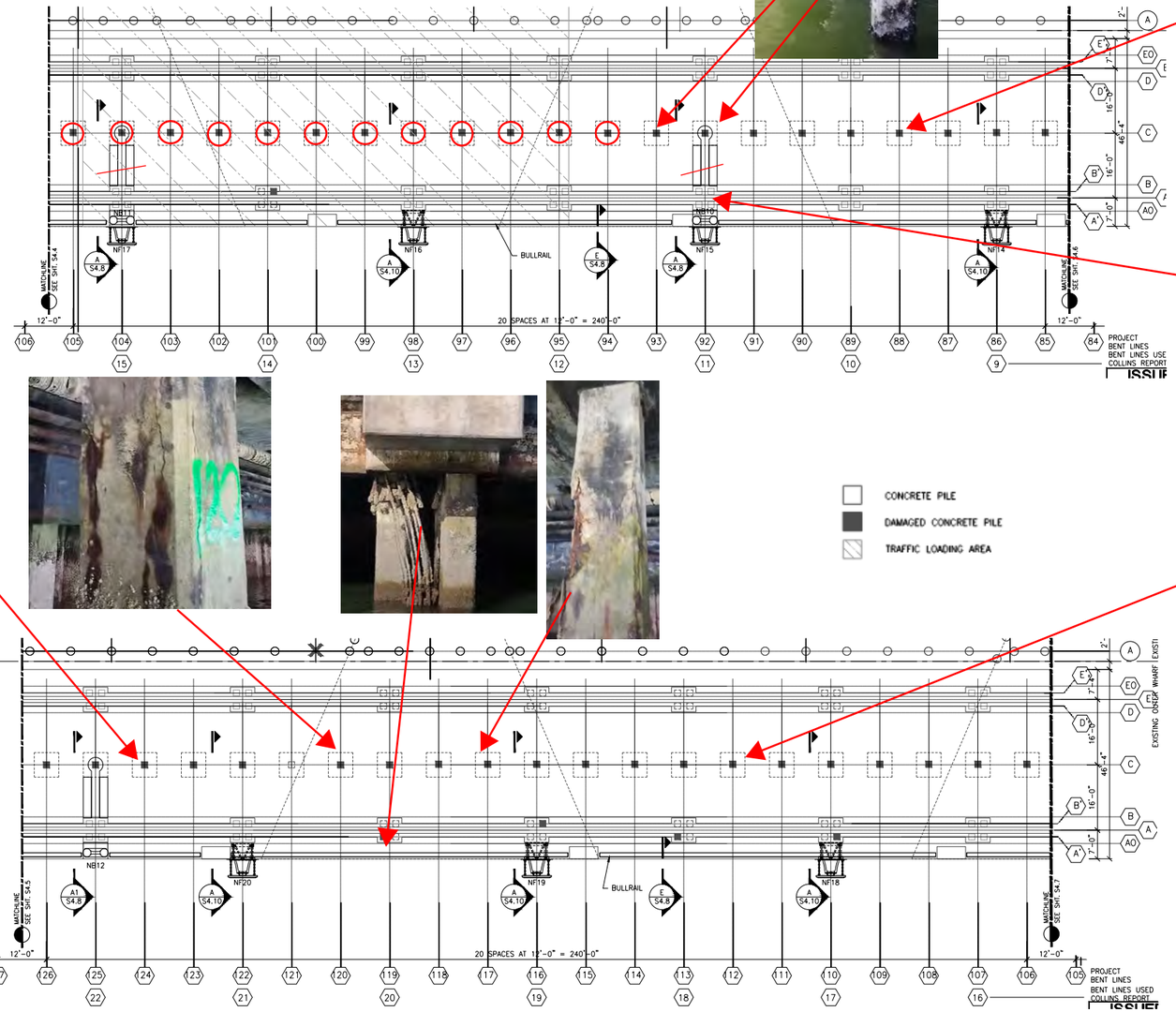
















CONCRETE PILE

DAMAGED CONCRETE PILE

TRAFFIC LOADING AREA



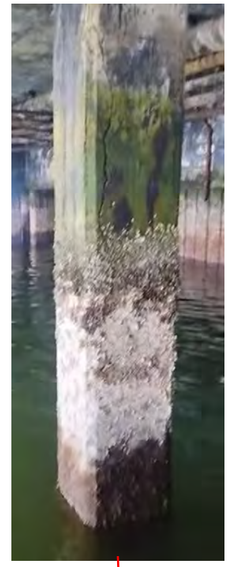



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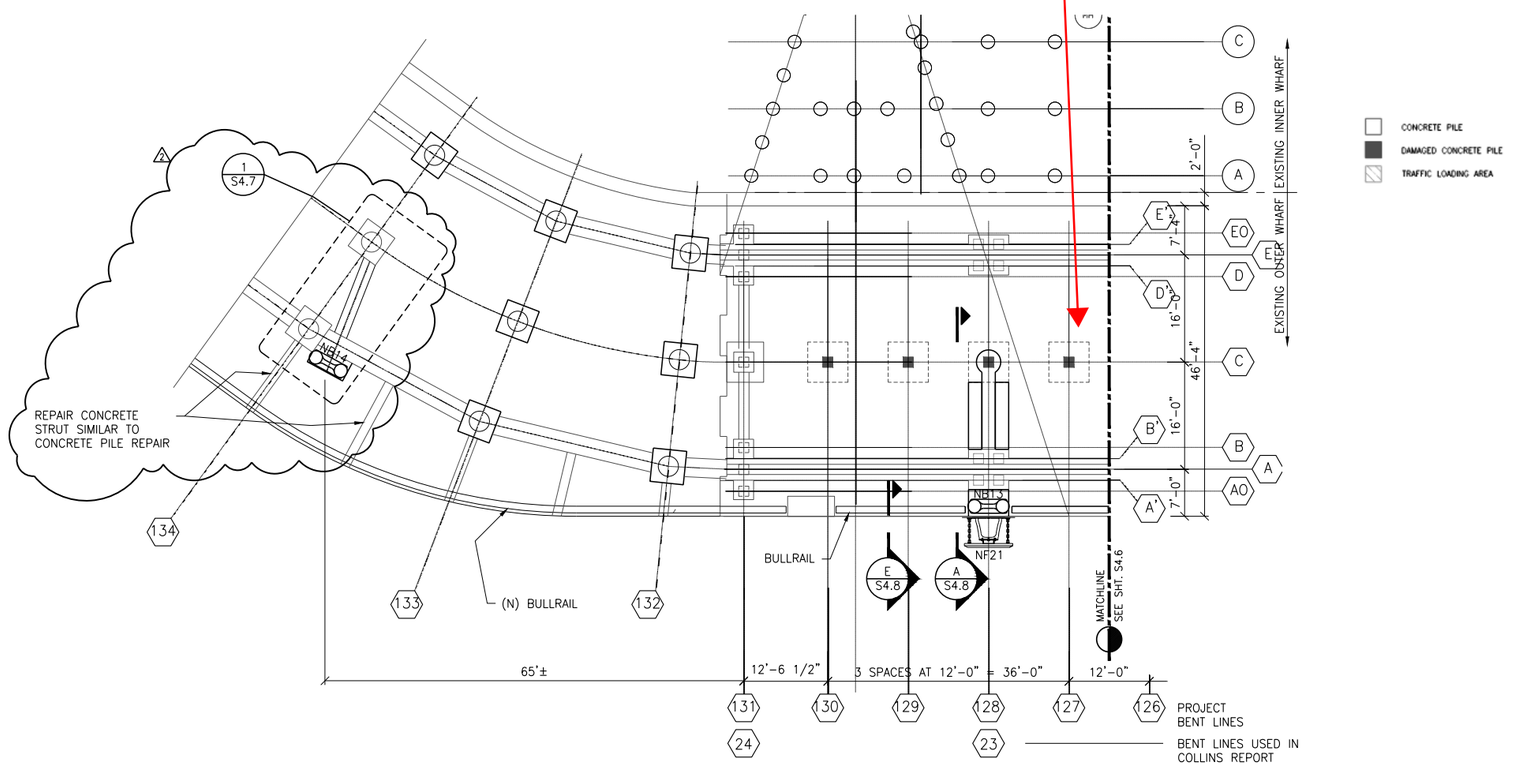
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# Port of Richmond - Berths 7 & 8

## Pile Condition Bents 127-131 and Turn






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# APPENDIX G – BERTHS 5–6 PILE AND SOFFIT DOCUMENTATION PHOTOGRAPHS

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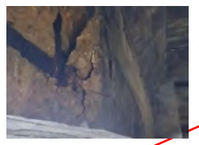




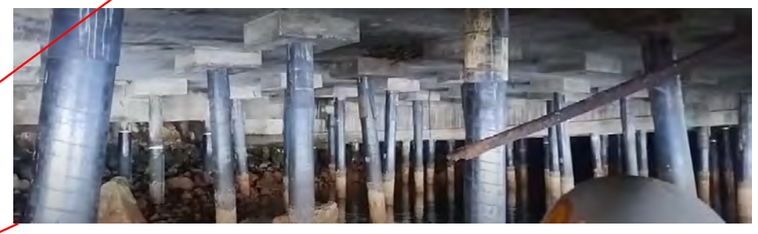


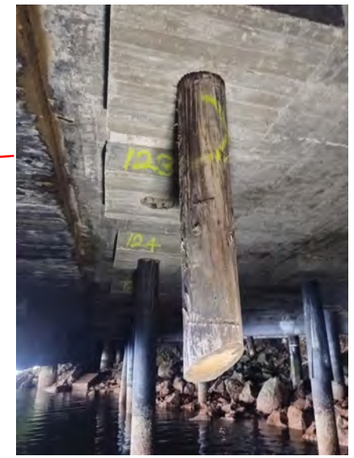






















## Port of Richmond - Berths 5 & 6

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# APPENDIX H – ASCE 130 DAMAGE RATING GUIDANCE

ASCE Manuals and Reports on Engineering Practice No. 130

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# Waterfront Facilities Inspection and Assessment

Waterfront Facility Inspection Committee

Edited by
Ronald E. Heffron, P.E.

Sponsored by
Technical Committee on Ports and Harbors of the
Coasts, Oceans, Ports, and Rivers Institute of the
American Society of Civil Engineers

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Table 2-6. Damage Ratings for Reinforced Concrete Elements

| Damage Rating | | Existing Damage[a] | Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)] |
|---|---|---|---|
| NI | Not Inspected | • Not inspected, inaccessible, or passed by[b] | |
| ND | No Defects | • Good original hard surface, hard material, sound | |
| MN | Minor | • Mechanical abrasion or impact spalls up to 1 in. in depth<br>• Occasional corrosion stains or small pop-out corrosion spalls<br>• General cracks up to 1/16 in. in width | Minor damage not appropriate if<br>• Structural damage<br>• Corrosion cracks<br>• Chemical deterioration[c] |
| MD | Moderate | • Structural cracks up to 1/16 in. in width<br>• Corrosion cracks up to 1/4 in. in width<br>• Chemical deterioration: Random cracks up to 1/16 in. in width; "Soft" concrete and/or rounding of corners up to 1 in. deep<br>• Mechanical abrasion or impact spalls greater than 1 in. in depth | Moderate damage not appropriate if<br>• Structural breakage and/or spalls<br>• Exposed reinforcement<br>• Loss of cross section due to chemical deterioration beyond rounding of corner edges |

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| | | | |
|---|---|---|---|
| MJ | Major | • Structural cracks 1/16 in. to 1/4 in. in width and partial breakage (through section cracking with structural spalls)<br>• Corrosion cracks wider than 1/4 in. and open or closed corrosion spalls (excluding pop-outs)<br>• Multiple cracks and disintegration of surface layer due to chemical deterioration<br>• Mechanical abrasion or impact spalls exposing the reinforcing | Major damage not appropriate if<br>• Loss of cross section exceeding 30% due to any cause |
| SV | Severe | • Structural cracks wider than 1/4 in. or complete breakage<br>• Complete loss of concrete cover due to corrosion of reinforcing steel with more than 30% of diameter loss for any main reinforcing bar<br>• Loss of bearing and displacement at connections<br>• Loss of concrete cover (exposed steel) due to chemical deterioration<br>• Loss of more 30% of cross section due to any cause | |

[a]Any defect listed is sufficient to identify relevant damage grade.
[b]If not inspected due to inaccessibility or passed by, note as such.
[c]Chemical deterioration: Sulfate attack, alkali-silica reaction, alkali-aggregate reaction, alkali-carbonate reaction ettringite distress, or other chemical/concrete deterioration.

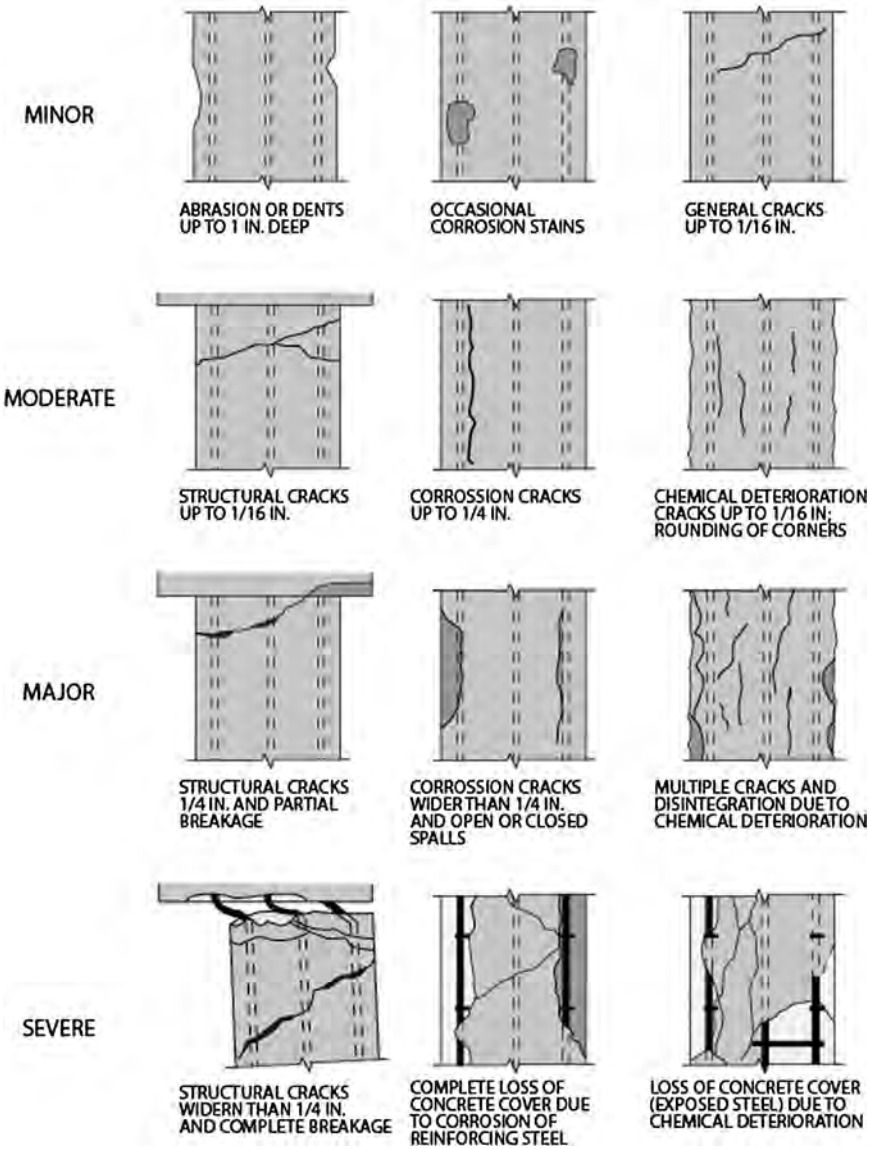



*Fig. 2-4. Damage ratings for reinforced concrete elements*
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Table 2-7. Damage Ratings for Prestressed Concrete Elements

| Damage Rating | | Existing Damage[a] | Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)] |
|---|---|---|---|
| NI | Not Inspected | • Not inspected, inaccessible, or passed by[b] | |
| ND | No Defects | • Good original hard surface, hard material, sound | |
| MN | Minor | • Minor mechanical or impact spalls up to 0.5 in. deep | Minor damage not appropriate if<br>• Structural damage<br>• Corrosion damage<br>• Chemical deterioration[c]<br>• Cracks of any type or size |
| MD | Moderate | • Structural cracks up to 1/32 in. in width<br>• Chemical deterioration: Random cracks up to 1/32 in. in width | Moderate damage not appropriate if<br>• Structural breakage and/or spalls<br>• Corrosion cracks<br>• Loss of cross section in any form<br>• "Softening" of concrete |

*(Continued)*

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Table 2-7. Damage Ratings for Prestressed Concrete Elements *(Continued)*

| Damage Rating | | Existing Damage[a] | Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)] |
|---|---|---|---|
| MJ | Major | • Structural cracks 1/32 in. to 1/8 in. in width<br>• Any corrosion cracks generated by strands or cables<br>• Chemical deterioration: cracks wider than 1/8 in.<br>• "Softening" of concrete up to 1 in. deep | Major damage not appropriate if<br>• Exposed prestressing steel |
| SV | Severe | • Structural cracks wider than 1/8 in. and at least partial breakage or loss of bearing<br>• Corrosion spalls over any prestressing steel<br>• Partial spalling and loss of cross section due to chemical deterioration | |

[a]Any defect listed is sufficient to identify relevant damage grade.
[b]If not inspected due to inaccessibility or passed by, note as such.
[c]Chemical deterioration: Sulfate attack, alkali-silica reaction, alkali-aggregate reaction, alkali-carbonate reaction ettringite distress, or other chemical/concrete deterioration.

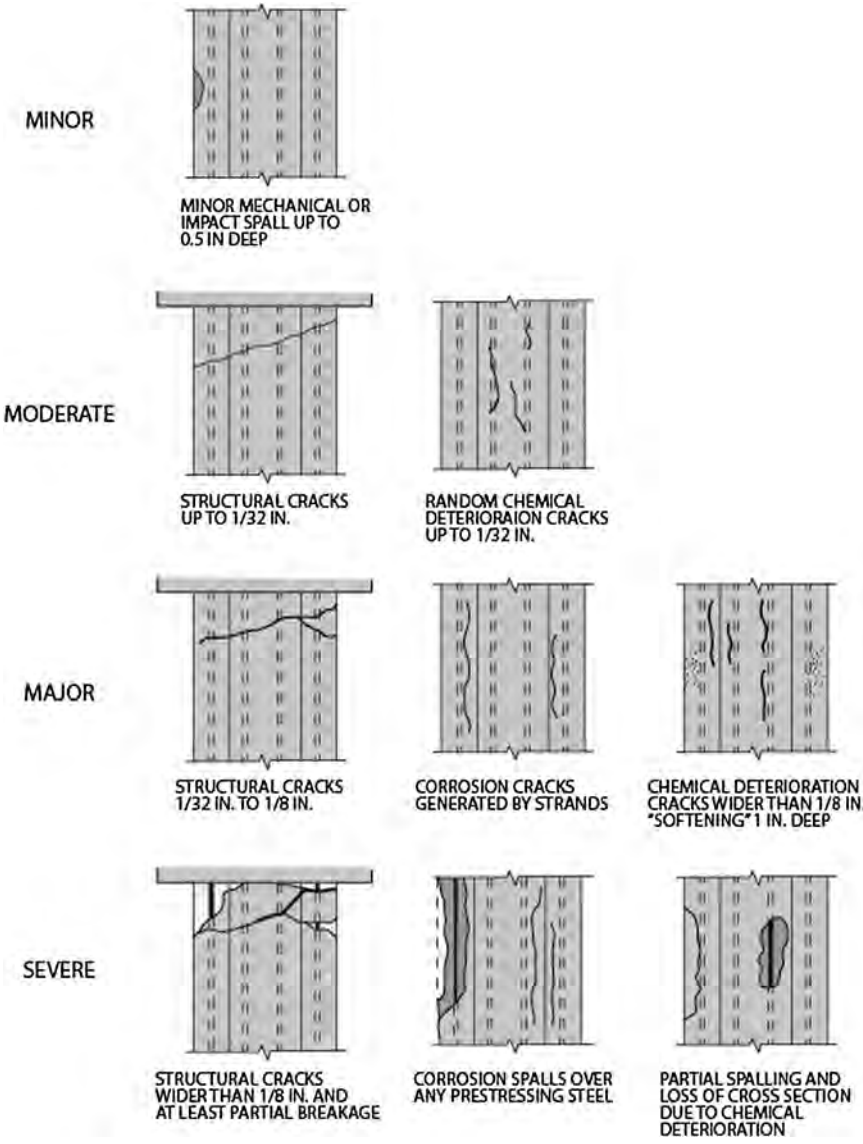



*Fig. 2-5. Damage ratings for prestressed concrete elements*
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Table 2-8. Damage Ratings for Mooring Hardware

| Damage Rating | | Existing Damage[a] | Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)] |
|---|---|---|---|
| NI | Not Inspected | • Not inspected, inaccessible, or passed by[b] | |
| ND | No Defects | • Material sound, surfaces smooth without indications of corrosion, surface coating in good condition, connections sound<br>• Bolt countersinks grouted or sealed. | No Defects Rating not appropriate if<br>• Surface coatings worn or damaged<br>• Visible corrosion on fasteners |
| MN | Minor | • Fitting has surface corrosion over 10 to 25% of its area.<br>• Minor wear marks or pitting on surface of fitting are less than 1/8-in. deep<br>• Fasteners have minor corrosion with no significant loss of section | Minor Rating not appropriate if<br>• Deep pits, gouges, or wear on fitting surfaces<br>• Any noticeable loss of section on fastener threads, if visible |
| MD | Moderate | • Fitting has moderate surface corrosion with loose scale over less than 50% of its area<br>• Significant surface wear marks or pitting on fitting are up to 1/4-in. deep<br>• Fasteners have corrosion with less than 25% loss of section | Moderate Rating not appropriate if<br>• Loose scale on fasteners<br>• Inability to remove fasteners due to heavy corrosion, if accessible |

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| | | | |
|---|---|---|---|
| MJ | Major | • Fitting has surface corrosion with loose scale over 50% or more of its surface area and/or less than 25% section loss<br>• Significant surface wear marks or pitting on fitting are 1/4-in. deep or greater<br>• Fasteners have corrosion with loose scale or loss of section greater than 25% | Major Rating not appropriate if<br>• Displaced, damaged, or broken fitting components<br>• Loose or missing fasteners |
| SV | Severe | • Fitting has heavy surface corrosion and loose scale with greater than 25% loss of section at critical areas of the fitting<br>• Structural displacement, deformation, or rotation of the fitting are present; fitting components are broken, cracked, or delaminated<br>• Loose, broken, or missing fasteners | |

[a]Any defect listed is sufficient to identify relevant damage grade.
[b]If not inspected due to inaccessibility or passed by, note as such.

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Table 2-9. Damage Ratings for Mooring Foundations

| Damage Rating | | Existing Damage[a] | Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)] |
|---|---|---|---|
| NI | Not Inspected | • Not inspected, inaccessible, or passed by[b] | |
| ND | No Defects | • Good original hard surface, hard material, sound | No Defects not appropriate if<br>• Weathering on timber, steel, or composite elements<br>• Hairline cracks in concrete elements |
| MN | Minor | • Timber Foundations: Weathered timber; evidence of fungal decay; minor checks, splits, and gouges up to 1/4-in. wide<br>• Steel Foundations: Weathering of steel coating, light surface corrosion<br>• Concrete Foundations: No significant section loss to load-bearing areas, hairline cracking of the concrete due to corrosion of the mooring hardware<br>• Composites: Weathered surfaces | Minor Rating not appropriate if<br>• Load-bearing areas around mooring hardware not sound<br>• Displacements, loss of bearing, or connections<br>• Fungal decay, insect infestation within or adjacent to the bearing area on timber elements<br>• Corrosion loss exceeding fabrication tolerances (at any location)<br>• Structural damage or corrosion cracking of concrete elements |

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| | | | |
|---|---|---|---|
| MD | Moderate | • Timber cracked and checked up to 1/2-in. wide; weathered surfaces; fungal decay under or adjacent to the mooring hardware, with loss of section (max 1 in.)<br>• Corrosion of steel with less than 10 to 25% section loss at any location<br>• Noticeable cracking of concrete, larger than hairline but with no loss of interlock | Moderate Rating not appropriate if<br>• Displacements, loss of bearing, or connections<br>• Changes in straight-line configuration or local buckling<br>• Loss of thickness exceeding 30% of nominal at any location for steel elements<br>• Structural breakage, spalls, or corrosion cracks in concrete elements<br>• Chemical deterioration[c] or "softening" of concrete elements |
| MJ | Major | • Timber cracked and checked greater than 1/2-in. wide; weathered; fungal decay present (max 3 in. depth); up to 25% loss of bearing<br>• Steel corrosion with 25 to 50% section loss at any location<br>• Noticeable cracking of concrete, resulting in loss of interlock<br>• Composite elements cracked or split | Major Rating not appropriate if<br>• Breakage or displacement of any element<br>• Exposed steel strands in prestressed concrete elements<br>• Perforations or loss of section exceeding 50% on steel elements |

*(Continued)*

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Table 2-9. Damage Ratings for Mooring Foundations *(Continued)*

| Damage Rating | | Existing Damage[a] | Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)] |
|---|---|---|---|
| SV | Severe | • Displacement/yielding of any support members<br>• Loss of full bearing of fitting under hardware<br>• Fungal decay of timber members (greater than 3 in. depth)<br>• Significant corrosion of steel members with greater than 50% section loss at any location<br>• Cracking or spalling of concrete base under hardware<br>• Composite broken or damaged | |

[a]Any defect listed is sufficient to identify relevant damage grade.
[b]If not inspected due to inaccessibility or passed by, note as such.
[c]Chemical deterioration: Sulfate attack, alkali-silica reaction, alkali-aggregate reaction, alkali-carbonate reaction ettringite distress, or other chemical/concrete deterioration.

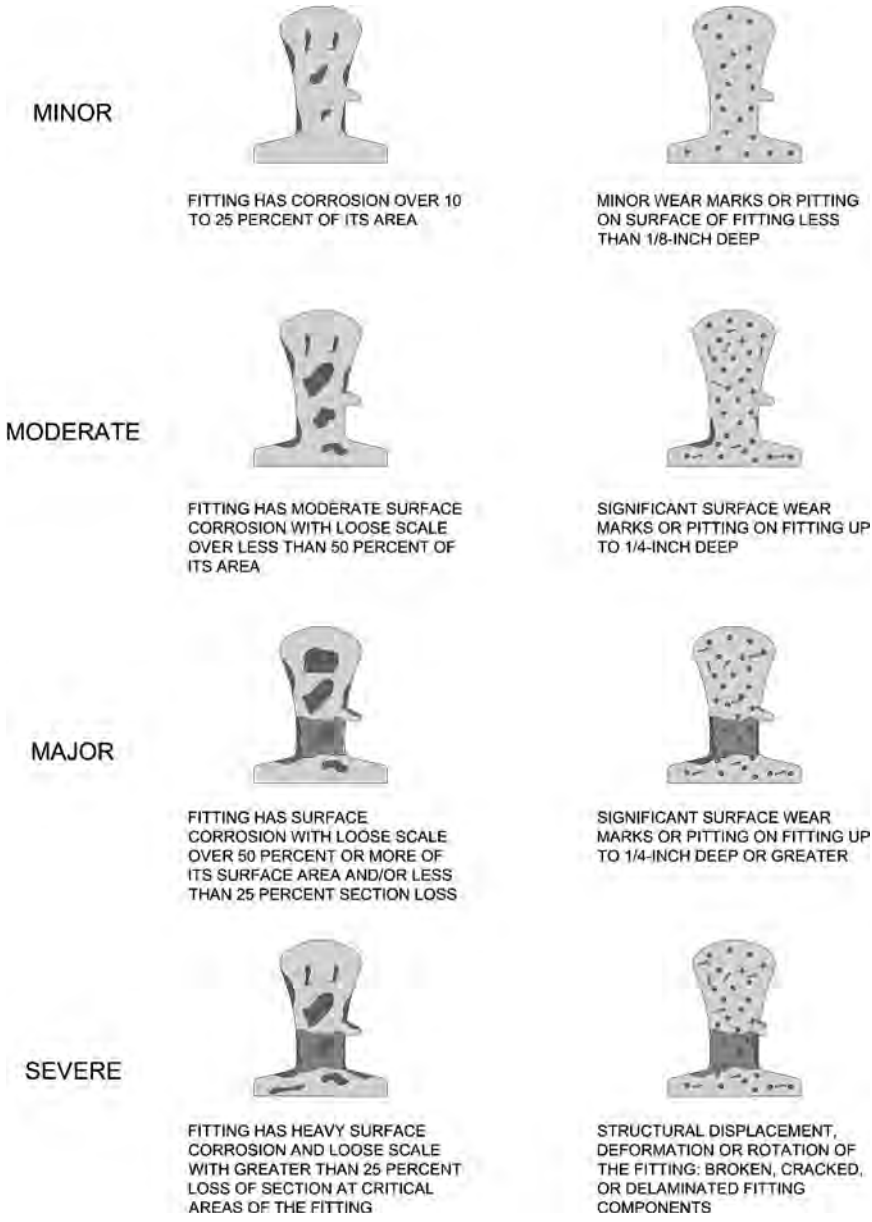



*Fig. 2-6. Damage ratings for mooring hardware elements*
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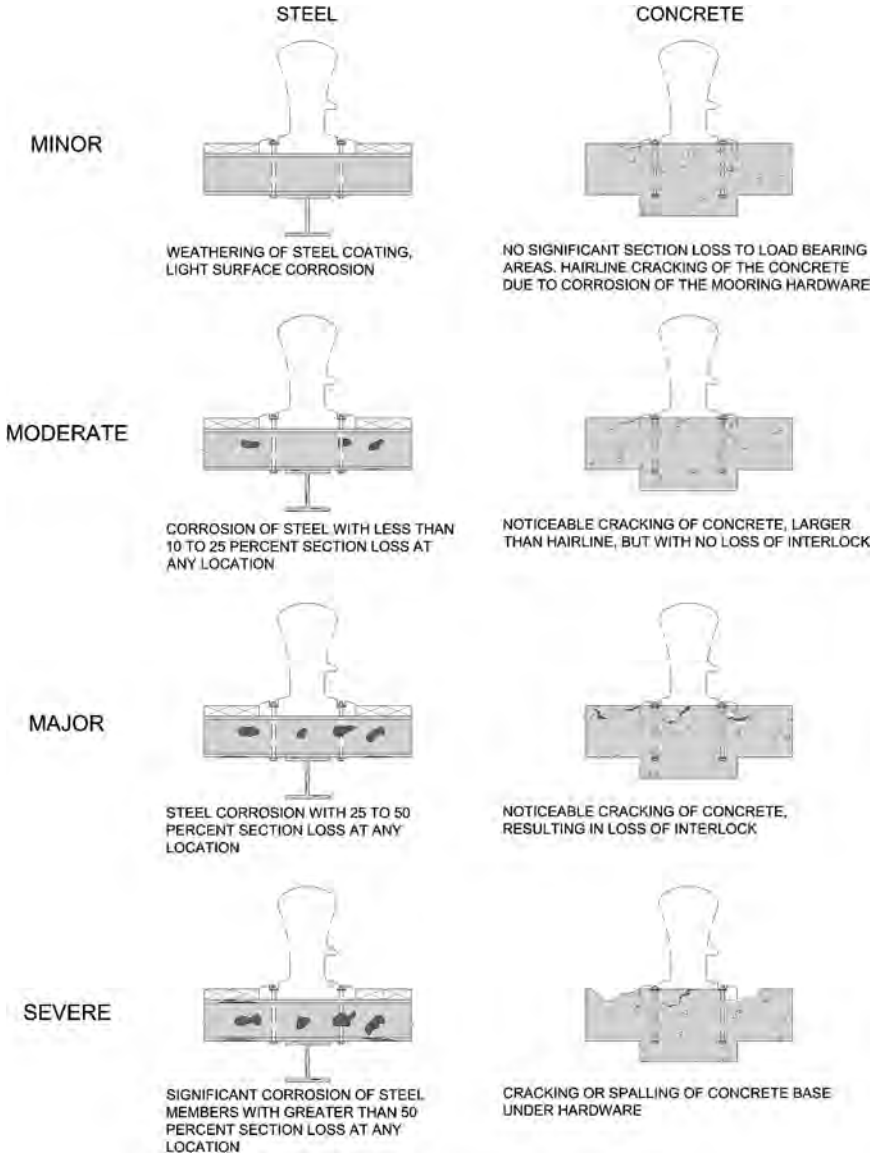



*Fig. 2-8. Damage ratings for mooring hardware elements*
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Table 2-12. Damage Ratings for Rubber Fender Elements

| Damage Rating | | Existing Damage[a] | Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)] |
|---|---|---|---|
| NI | Not Inspected | • Not inspected, inaccessible, or passed by[b] | |
| ND | No Defects | • Good original surface, sound<br>• Connections intact and tight | No Defects Rating not appropriate if:<br>• Noticeable abrasion or wear of rubber surfaces |
| MN | Minor | • Small gouges or surface defects present less than 10% of nominal depth<br>• Connection intact, tight with light corrosion (less than 10% section loss at any location) | Minor Rating not appropriate if:<br>• Surface cracking or degradation of rubber components |
| MD | Moderate | • Gouges, wear, or tears less than 25% of nominal depth<br>• Rubber damaged at the connectors or connection plates<br>• Connections loose, a bolt missing, or corrosion with 10 to 25% section loss at any location | Moderate Rating not appropriate if:<br>• Permanent deformation or misalignment of rubber elements |

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| | | | |
|---|---|---|---|
| MJ | Major | • Cracks, gouges, or tears between 25 and 50% of nominal depth<br>• Rubber torn at the connectors or connection plates<br>• Connections loose, two bolts missing, or corrosion with 25 to 50% section loss at any location | Major Rating not appropriate if:<br>• Rubber element is split or torn through |
| SV | Severe | • Cracks, gouges, or tears greater than 50% of nominal depth<br>• Rubber torn through at the connectors or connection plates<br>• Connections with loose or missing bolts, or corrosion with greater than 50% section loss at any location | |

[a]Any defect listed is sufficient to identify relevant damage grade.
[b]If not inspected due to inaccessibility or passed by, note as such.

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Table 2-13. Damage Ratings for Fender Panels

| Damage Rating | | Existing Damage[a] | Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)] |
|---|---|---|---|
| NI | Not Inspected | • Not inspected, inaccessible, or passed by[b] | |
| ND | No Defects | • Good original surfaces<br>• All connections intact<br>• Backing panel sound<br>• Support chains intact and in good condition | No Defects Rating not appropriate if<br>• Coatings damaged<br>• Visible surface corrosion |
| MN | Minor | • Small cracks or gouges (less than 10% of nominal)<br>• 90% of panel connections intact<br>• Backing frame with surface corrosion with no significant loss of section<br>• Support chains intact with light surface corrosion | Minor Rating not appropriate if<br>• Panels worn or damaged |
| MD | Moderate | • Cracks or gouges (less than 25% of nominal)<br>• 75% of panel connections intact<br>• Panels displaced from the backing panel<br>• Backing frame corroded<br>• Support chains intact, with less than 25% section loss | Moderate Rating not appropriate if<br>• Panels displaced or misaligned<br>• Any loose or missing hardware |

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| | | | |
|---|---|---|---|
| MJ | Major | • Cracks or gouges (less than 50% of nominal)<br>• 50% of the panel connections intact or multiple panels displaced from the backing panel<br>• Backing frame corroded with loose scale, but panel substantially in place<br>• Support chains heavily corroded with more than 25% section loss | Major Rating not appropriate if<br>• Panel/frame system sagging, misaligned, or with limited bearing |
| SV | Severe | • Cracks or gouges (greater than 50% of nominal)<br>• Less than 50% of the panel connections intact or multiple panels displaced from the backing panel<br>• Backing frame heavily corroded with loose scale<br>• Sagging/displacement of panel/frame system<br>• Support chains heavily corroded with loose scale and/or missing or broken | |

[a]Any defect listed is sufficient to identify relevant damage grade.
[b]If not inspected due to inaccessibility or passed by, note as such.

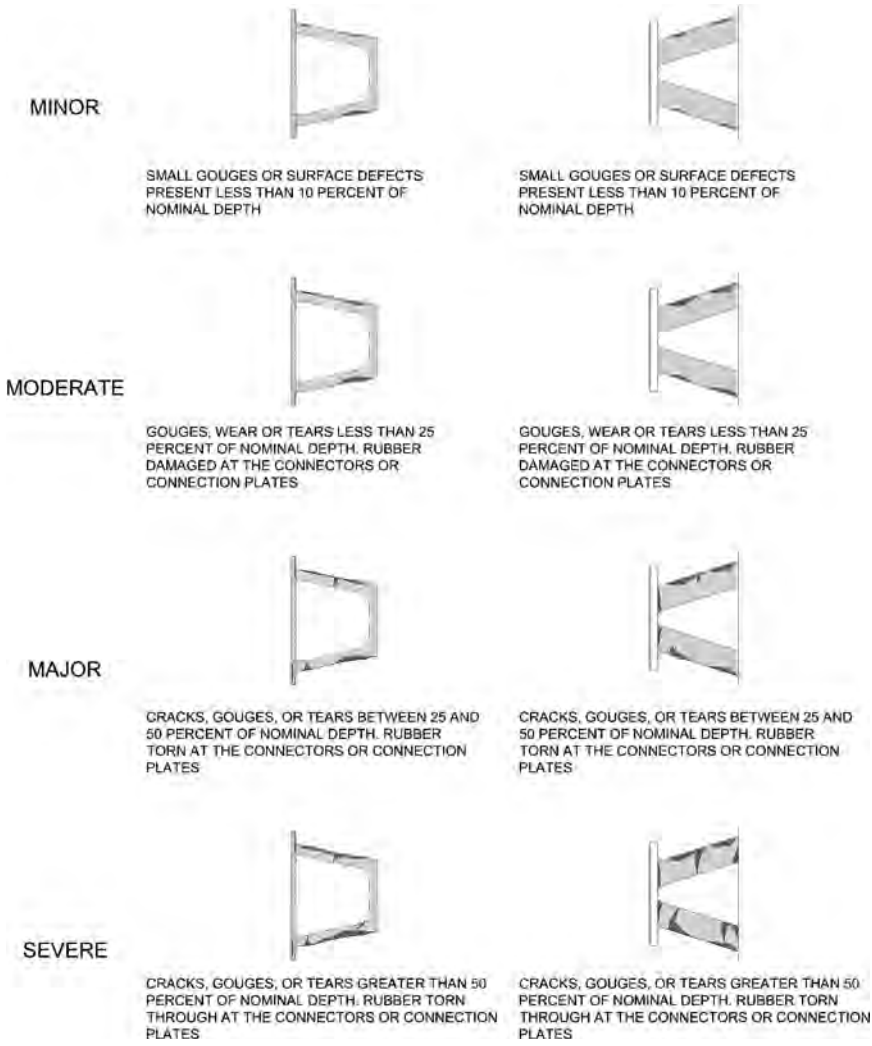



*Fig. 2-13. Damage ratings for rubber fender elements*
*Source: Courtesy of Moffatt & Nichol, Inc., reproduced with permission.*

Table 2-14. The ratings are important in establishing the priority of follow-up actions to be taken. This is particularly true when many structures are included in an inspection program, and follow-up activities must be ranked or prioritized due to limited resources.

The rating system used for Post-Event Inspections differs from that used for Routine Inspections because Post-Event Inspection ratings must focus on



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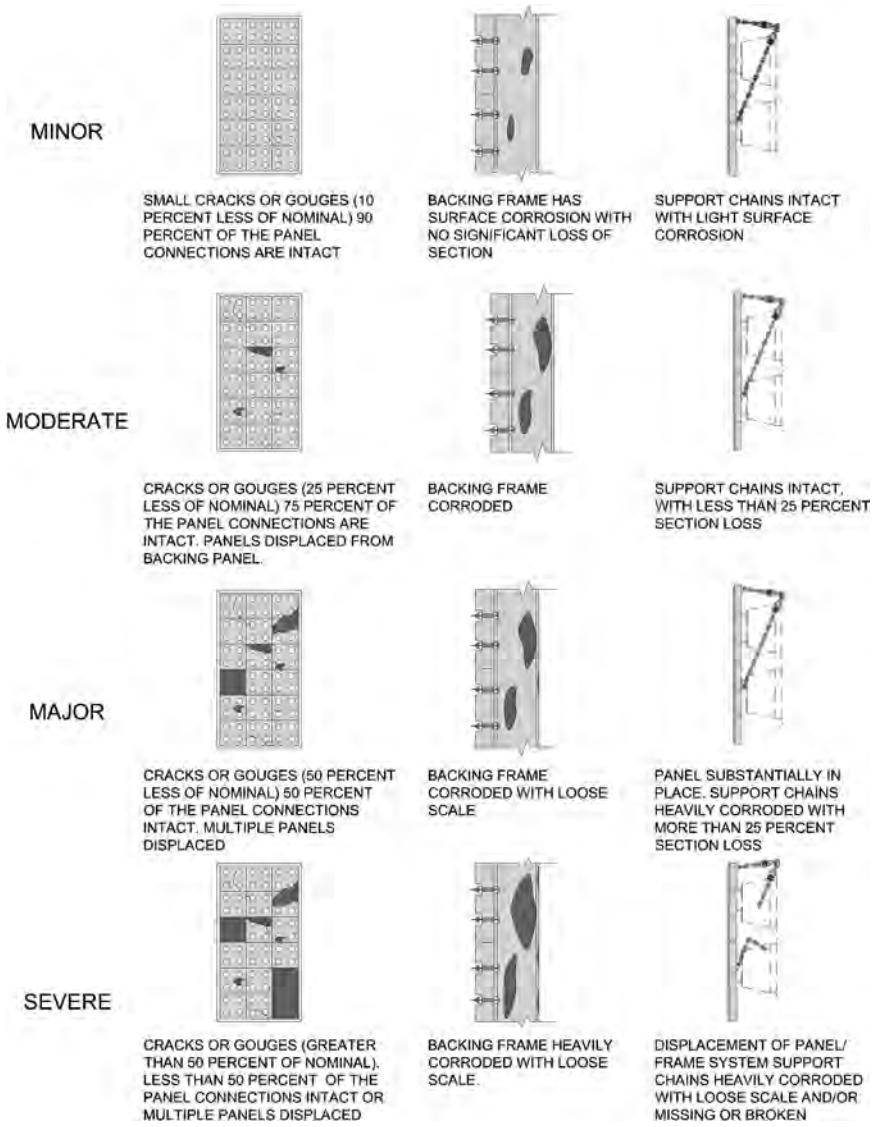



*Fig. 2-14. Damage ratings for fender panel elements*
*Source: Courtesy of Moffatt & Nichol, Inc., reproduced with permission.*

event-induced damage only, excluding long-term defects such as corrosion deterioration. An alphabetical scale is used for Post-Event Inspections to distinguish from the numerical condition assessment scale used for Routine Inspections, as shown in Table 2-15.



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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. |

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### 2.6.2 Condition Assessment Ratings

The Condition Assessment Rating should be assigned upon completion of the Routine Inspection and remain associated with the structural unit (as defined in Section 3.1.1) until the structure is rerated following a quantitative engineering evaluation and repairs, or upon completion of the next

Table 2-15. Post-event Damage Ratings

| Rating | Description |
|---|---|
| A | No significant event-induced damage observed; no further action is required |
| B | Minor to moderate event-induced damage observed, but all primary structural elements are sound. Repairs may be required, but the priority of repairs is low |
| C | Moderate to major event-induced damage observed that may have significantly affected the load-bearing capacity of primary structural elements. Repairs are necessary on a priority basis |
| D | Major event-induced damage has resulted in localized or widespread failure of primary structural components. Additional failures are possible or likely to occur. Urgent remedial attention is necessary |

scheduled Routine Inspection. The ratings should be assigned against distinct structural units, groups of units, and the overall facility.

A scale of 1 to 6 is used for the rating system, as shown in Table 2-14. A rating of 6 represents a structure in good condition, whereas a rating of 1 represents a structure in critical condition. Other suitable rating systems may be substituted for a particular owner's purpose as appropriate.

Understanding that ratings are used to describe the existing in-place structure relative to its condition when newly built is important. The fact that the structure was designed for loads that are lower than the current standards for design shall have no influence on the ratings.

Equally important is understanding that the correct assignment of ratings requires both experience and an understanding of the structural system. Judgment must be applied in considering

- Scope of damage (total number of defects),
- Severity of damage (type and size of defects),
- Distribution of damage (local vs. general),
- Types of components affected (their structural "sensitivity"),
- Location of defect on component (relative to point of maximum moment/shear), and
- Serviceability.

The qualifications of individuals assigning ratings are important in ensuring that the ratings are assigned consistently and uniformly in accordance with sound engineering principles and the guidelines provided herein. The team leader, with oversight from the project manager, should verify that the assigned ratings are appropriate.



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### 2.6.3 Post-Event Damage Ratings

The post-event damage rating should be assigned upon completion of the Post-Event Inspection, preferably prior to leaving the site. The rating should be used to reflect whether additional attention is necessary and, if so, at what priority level. Table 2-15 shows the four post-event damage ratings. A rating of "A" indicates no further action is required, whereas a rating of "D" indicates major structural damage requiring urgent attention.

The following guiding principles should be followed when assigning post-event damage ratings:

- Ratings should reflect only damage that was likely caused by the event. Long-term or preexisting deterioration such as corrosion damage should be ignored unless the structural integrity of the structure is immediately threatened.
- Ratings are used to describe the existing in-place structure as compared with the structure when new. The fact that the structure was designed for loads that are lower than the current standards for design should have no influence on the ratings.
- Assignment of ratings should reflect an overall characterization of the entire structure being rated. Correct assignment of a rating should consider both the severity of the deterioration and the extent to which it is widespread throughout the structure.
- The assignment of rating codes will require judgment. Use of standard rating guidelines is intended to make assignment of these ratings uniform among inspection personnel.

## 2.7 RECOMMENDED ACTION GUIDELINES

Whereas condition assessment and post-event damage ratings describe the urgency with which or *when* follow-up action should be taken, the recommended actions describe *what* specific actions should be taken. Recommended actions are assigned upon completion of each inspection type described in Section 2.1, with the exception that new construction inspections and repair construction inspections are in-process activities that typically require immediate follow-up action in the event of nonconformance.

A description of each recommended action choice is provided in Table 2-16. Typical recommended action options for each inspection type are depicted in Fig. 2-15. Multiple recommended actions may be assigned upon completion of each inspection; however, guidance should be provided to indicate the order in which the recommended actions should be carried out. For example, a structure that has received a Routine Inspection may be assigned recommended actions of an Emergency Inspection (due to broken piles), Repair or Upgrade Design Inspection (due to deteriorated and broken

# APPENDIX I – ENGEO PPMT UNDERDECK GEOTECHNICAL INSPECTION

Project No.
**26829.000.001**

April 28, 2025
Revised July 2, 2025

Mr. Matt Trowbridge
Moffatt & Nichol
1300 Clay Street, Suite 350
Oakland, CA 94612

Subject: Port of Richmond Point Potrero Marine Terminal
Richmond, California

**UNDERDECK GEOTECHNICAL INSPECTION**

Dear Mr. Trowbridge:

We prepared this letter to document our observations during underdeck inspections at the Point Potrero Marine Terminal at the Port of Richmond in Richmond, California. As you know, we joined Liftech Consultants Inc. (Liftech) for an inspection of the conditions below the deck of the existing Marine Terminal. We performed our underdeck inspections both from boat and on foot.

On March 18, we observed the conditions below Berths 5 and 6 during a boat inspection; Power Engineering Construction (Power) provided the boat and pilot and Liftech performed structural inspections. The purpose of our inspection was to observe geotechnical conditions. In particular, we were interested to see the conditions along Berth 5 where collapse of the pavement occurred along the interface of land and the wharf structure, and a portion of Berth 6 where the deck structure has settled.

During our inspection, we observed existing weathered rock outcropping and rock-derived fill covering the surface of the slope below the marginal wharf structures. Portions of the ground along Berth 5 are protected by variably sized riprap revetment. As shown in Exhibit 1, the area of the settled wharf appears to be a result of a crack through the support beam. There is no evidence that any of the piles in this area have plunged, though there are several piles that have been removed and not replaced. A structural fix will be necessary in this area. Likely the replacement of missing piles will be required to perform this repair.

Along much of the wharf, there is a headwall at the interface of the wharf structure and the land. However, in the area of the settled pavement at Berth 5, there is no headwall, and the soil/weathered bedrock appears to be eroding at the top of the slope below the wharf (as shown in Exhibit 2). In this area, we recommend creating a confinement structure at the top of the slope to retain and protect fill from erosion and backfilling the area of lost ground so the pavement can be restored and stabilized.



Job 2524 Received on 07/02/25 from ENGEO

**EXHIBIT 1: Area of Settled Wharf – Berth 6**



**EXHIBIT 2: Area of Settled Pavement Behind Wharf – Berth 5**



On May 19, 2025, we performed an inspection below the deck of Berths 7 and 8 with Liftech. We performed this inspection between the existing sheet pile wall and the landward slope. We entered the area through manholes in the deck; Power provided assistance with access and site safety monitoring. During our inspection, we again observed stable slope conditions below the wharf and no evidence of pile plunging. Again in areas where pavement settlement was observed at the interface between the land and the wharf, this appeared to be due to erosion of the top of the slope in areas without a headwall; in one area this lack of wall appeared to be due to utility penetration and the eroded soil was likely utility trench backfill. We recommend a similar fix in this area.



Job 2524 Received on 07/02/25 from ENGEO

If you have any questions or comments regarding this letter, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated




Jeff Fippin, GE

Robert H. Boeche, CEG

jf/rhb/cb



Job 2524 Received on 07/02/25 from ENGEO

# APPENDIX J – LIFTECH CONCEPT REPAIR PROJECTS AND BUDGETARY COST ESTIMATES

# PROJECT NO. 1: BROKEN CONCRETE BEAM AND DECK DEPRESSION REPAIR AT BERTH 6/7

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# Project No: 1 - Broken Beam Retrofit at Berths 6 & 7 - Alternate 1 & 2

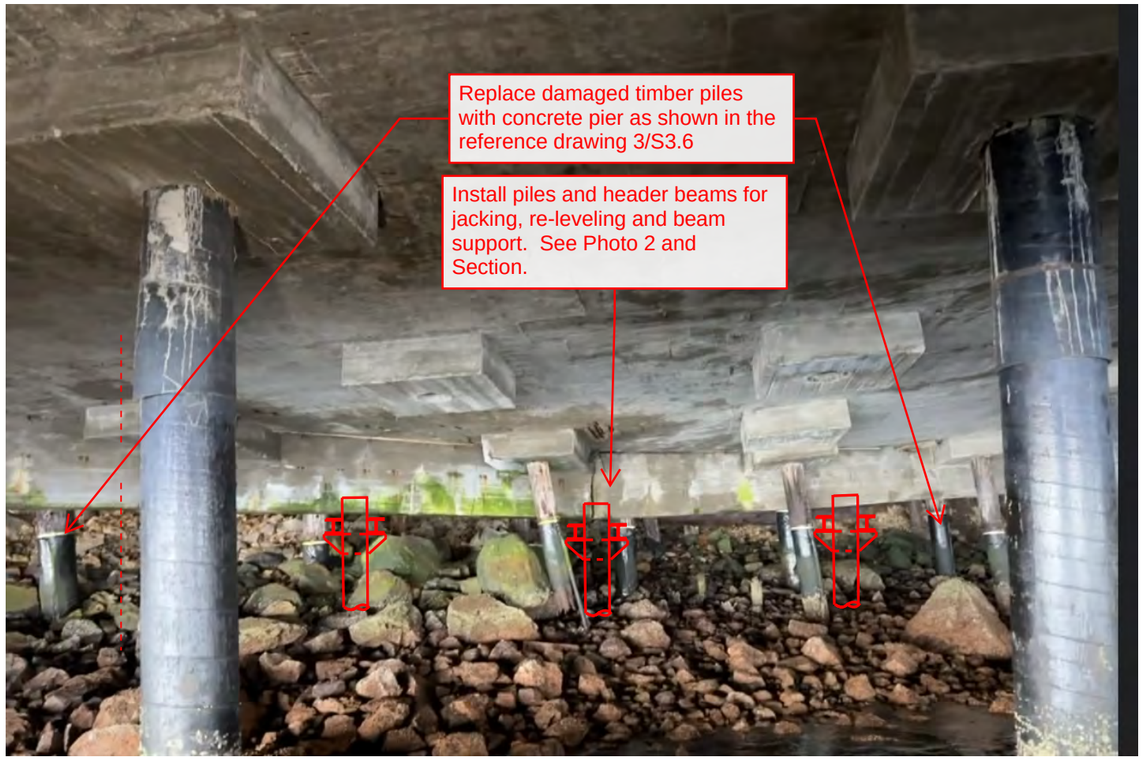
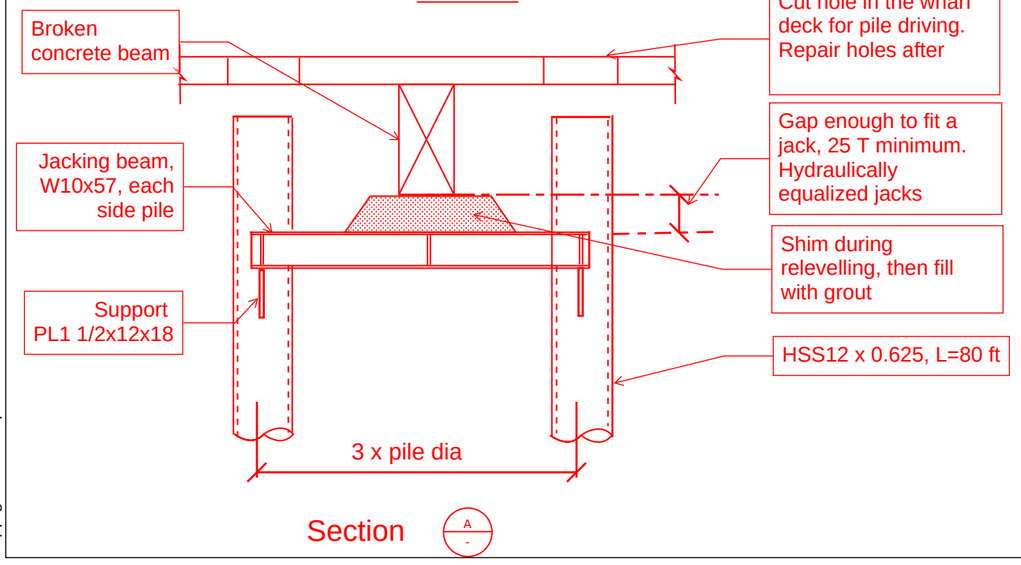



Photo 1




Photo 2




Section A -

Scope of Work:

Alternate 1 - Retrofit Concept

1. Cut holes at wharf deck for pile installation.
2. Install pile each side of the broken beams (3 locations as shown on Photo 1)
3. Install beam support plates.
4. Install jacking/support beams
5. Jack the beam and slab to level position using shim plates.
6. Remove jacks
7. Add non-shrink grout for permanent beam support.
8. Install concrete pier at missing and damage timber piles, See reference drawings 3/S3.6 (Sht. 5) for details. Assume 10 locations.
9. Repair deck reinforcing at holes and install grout or concrete.

Alternate 2: Demo and Rebuild Inner Wharf

1. Demo the section of the slab that effected by the broken beam.
2. Construct a new wharf deck, assume 9000 SF of concrete pile supported wharf deck.

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# Project No: 1 - Budgetary Cost Estimates

## Estimated Quantity Take-off for Construction Cost Estimates for Broken Concrete Beam and Deck Depression Repair at Berth 6/7

| Item | Description | Quantity | Unit | Total Quantity | Comments |
|---|---|---|---|---|---|
| **Alternate 1 - Broken Beam Retrofit** | | | | | |
| 1 | Cut holes in the deck | 6 | EA | 6 | Refer to scope of work description |
| 2 | Furnish and install steel pipe piles and steel support beams | 6 | EA | 6 | Refer to scope of work description |
| 3 | Furnish and install steel beams and slab jacking | 6 | EA | 6 | Refer to scope of work description |
| 4 | Furnish and install concrete pier to replace damaged timber or missing piles | 10 | EA | 10 | Refer to scope of work description & reference drawing on sheet 5 |
| 5 | In-fill holes with continuity slab rebars | 6 | EA | 6 | Refer to scope of work description |
| **Alternate 2 - Demo and Rebuild Inner Wharf** | | | | | |
| 1 | Demo existing dock | 9000 | SF | 9000 | See sheet 4 for demo area |
| 2 | Construct a new dock | 9000 | SF | 9000 | |

## Budgetary Cost for Broken Concrete Beam and Deck Depression Repair at Berth 6/7

| Item | Description | Quantity | Unit | ROM Cost | |
|---|---|---|---|---|---|
| **Alternate 1 - Broken Beam Retrofit** | | | | | |
| 1 | Construction cost estimates based on 2025 labor and material costs | 1 | EA | $906,653 | Refer to sheet 3 for Power Engineering Construction cost estimates. |
| 2 | Soft cost and contingency - 30% | 1 | EA | $271,996 | Refer to sheet 3 for assumptions and exclusions. The 30% add is to account for the cost associated with the exclusions and reasonable contingency. |
| | Total | | | $1,178,649 | |
| | Budgetary Cost Estimates | | | **$1,200,000** | |
| **Alternate 2 - Demo and Rebuild Inner Wharf** | | | | | |
| 1 | Construction cost estimates based on 2025 labor and material costs | 1 | EA | $5,040,000 | Refer to sheet 3 for Power Engineering Construction cost estimates. |
| 2 | Soft cost and contingency - 30% | 1 | EA | $1,512,000 | Refer to sheet 3 for exclusions. The 30% add is to account for the cost associated with the exclusions and reasonable contingency. |
| | Total | | | $6,552,000 | |
| | **Budgetary Cost Estimates** | | | **$6,600,000** | |

Notes:
1. The budgetary cost is based on 2025 labor and material costs and does not include escalation for work performed in the future years and tariff impact.

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**Project No. 1: Broken Beam Retrofit in Berths 6 & 7 - Alternate 1, Version 1**
**Richmond, California**

## ROM Budget for Project 1, Broken Beam Retrofit in Berth 6 & 7 - Version 1

**Date: May 13, 2025**

| | Description | Quantity | Units | $/Unit | Total | Comments | Working Days |
|---|---|---|---|---|---|---|---|
| **Base Scope** | | | | | | | |
| 1 | Mobilize/Demobilize | 1 | LS | $ 135,239 | $ 135,239 | | 7 |
| 2 | Cut Holes in Deck | 6 | EA | $ 2,017 | $ 12,102 | | 1 |
| 3 | Furnish & Install Steel Pipe Piles and Support Steel Beam Brackets | 6 | EA | $ 45,063 | $ 270,378 | | 10 |
| 4 | Furnish & Install Steel Beams and Slab Jacking | 6 | EA | $ 54,142 | $ 324,852 | | 18 |
| 5 | F&I Fiberglass Jacket (with Rebar) to Encase Existing Timber Pile - assume 10' Jacket + 2' of Embedment | 6 | EA | $ 24,893 | $ 149,358 | | 8 |
| 6 | Infill Pile Driving Access Holes | 6 | EA | $ 2,454 | $ 14,724 | | 1 |
| | | | **Total Base Scope:** | | **$ 906,653** | | **45** |
| **Bid Alternates** | | | | | | | |
| AA1 | Demolish Existing Deck & Piles | 9,000 | SF | $ 60 | $ 540,000 | | 12 |
| AA2 | Construct New Pipe Supported Concrete Wharf Deck | 9,000 | SF | $ 500 | $ 4,500,000 | | 30 |
| | | | **Total Bid Alternates:** | | **$ 5,040,000** | | **42** |

**Project Assumptions**

1 A working day is defined as an 8-hour weekday between the hours of 6 AM - 5 PM.
2 The working days do not include fabrication times for materials.
3 Only one mobilization is assumed, with continuous work until project completion.
4 All pricing is in current dollars.
5 No contingency is included in this budget.

**Schedule Milestones**

1 We estimate the on-site construction for the base scope will take approximately 10 weeks for a single crew.

**Design Assumption**

1 Per Liftech Sketches, May 2025

**Subcontractors**

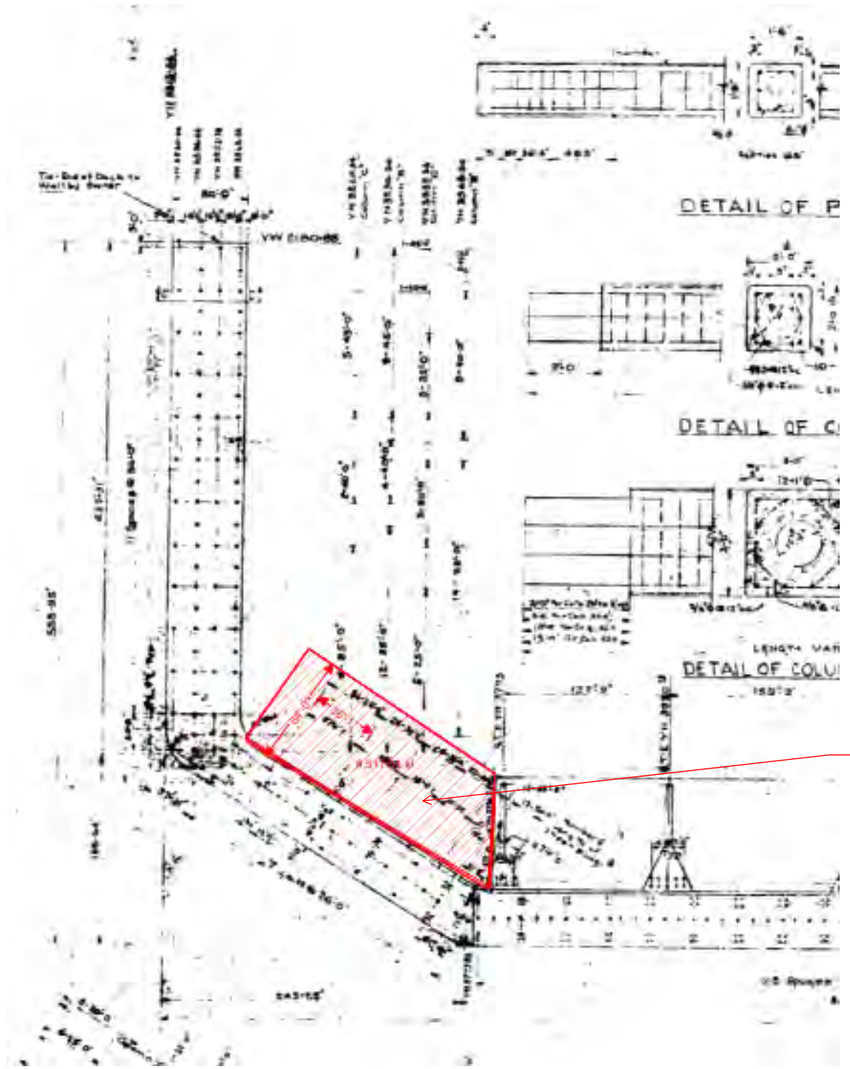
1 None assumed.

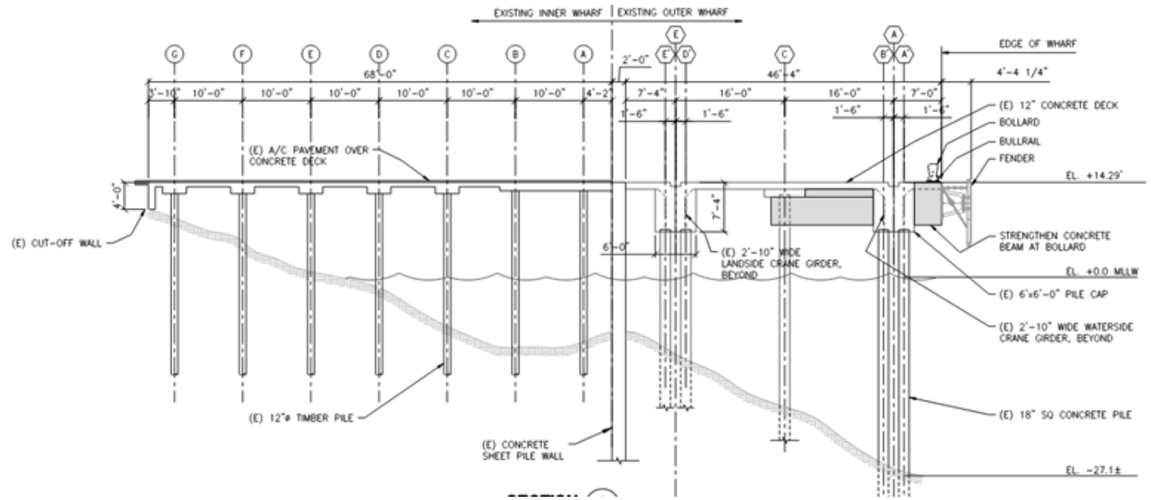
**Proposal Exclusions**

1 Payment and Performance Bonds (available at 1.5% of final contract amount)
2 Builders Risk Insurance (can be provided on a per-project basis)
3 Permits and Permit Fees
4 Engineering or Design
5 Utility Relocation unless Listed Above
6 Site Survey, Lines, Grade
7 Hazardous Materials Handling/Abatement/Removal
8 Special Inspection or Testing Fees
9 Vibration or Damage Monitoring
10 Any Repairs to the Existing Structures, Interior or Exterior, either prior to, during, or after Construction
11 Temporary Power & Lighting Install and Supply
12 Industrial Hygienist or Inspection Services
13 Silt Curtain, Bubble Curtain, or other regulatory requirements not normally encountered.

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# Alternate 2 - Demo and Reconstruct wharf Deck at Berth 6

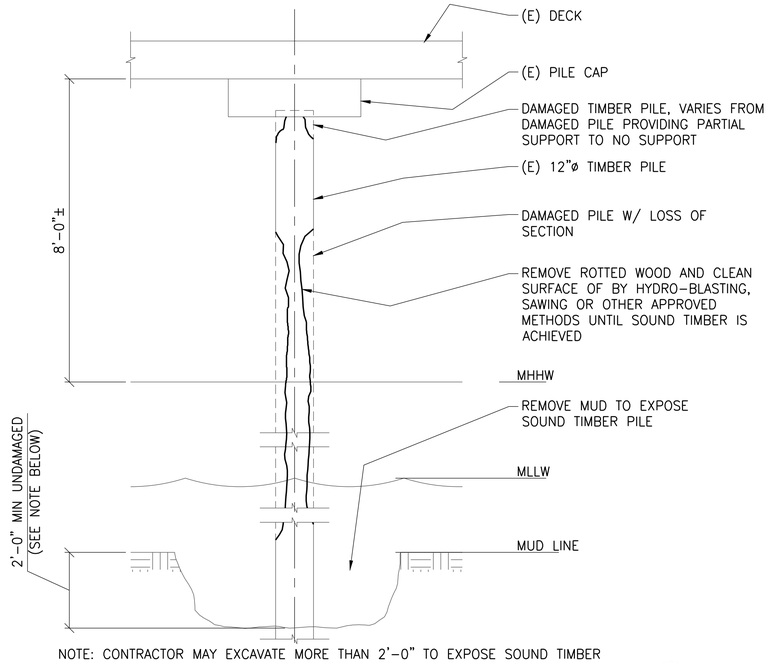



BERTHS 7 AND 8 WHARF CROSS SECTIONS FOR REFERENCE

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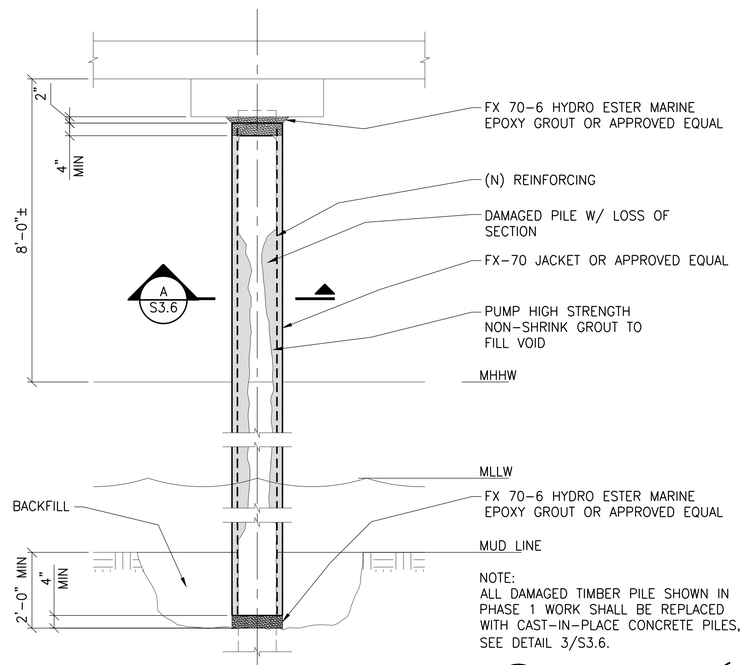

NOTE: CONTRACTOR MAY EXCAVATE MORE THAN 2'-0" TO EXPOSE SOUND TIMBER

## TYPICAL TIMBER PILE DAMAGED SURFACE PREPARATION

1/2" = 1'-0"

1 / S3.6

AXXX-XXX 1




NOTE:
ALL DAMAGED TIMBER PILE SHOWN IN PHASE 1 WORK SHALL BE REPLACED WITH CAST-IN-PLACE CONCRETE PILES, SEE DETAIL 3/S3.6.

## TYPICAL TIMBER PILE REPAIR DETAIL

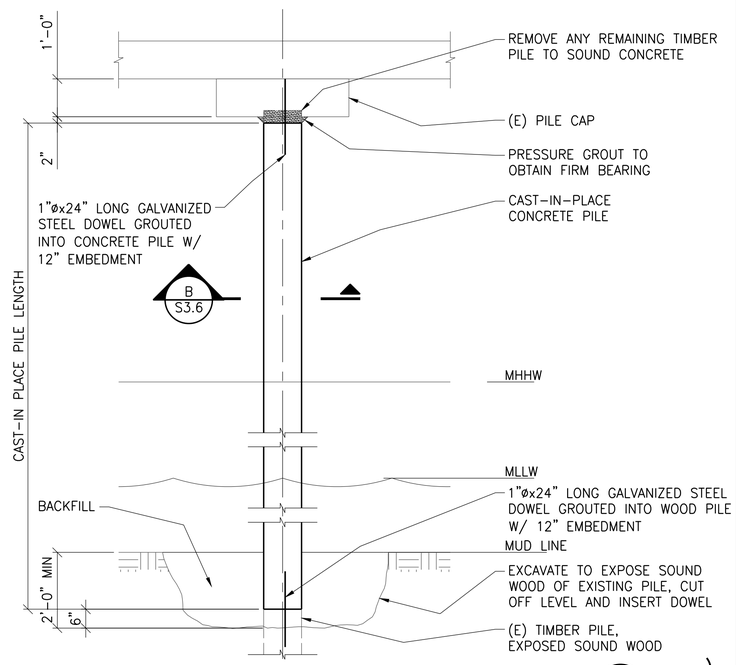
1/2" = 1'-0"

2 / S3.6

TIM_PILE_REPAIR-1 1

NOTE:
CONTRACTOR HAS THE OPTION TO REPAIR TIMBER PILE OR REPLACE DAMAGED PILE WITH CAST-IN-PLACE CONCRETE PILE PER DETAIL 3/S3.6

1




## (N) CAST-IN-PLACE PILE TO REPLACE MISSING PILES

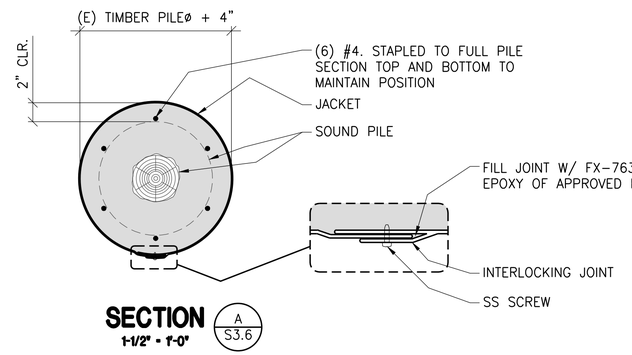
1/2" = 1'-0"

3 / S3.6

TIM_PILE_REPAIR-1 1

NOTES:
1. IF CAST-IN-PLACE CONCRETE PILE LENGTH IS 24'-0" OR LESS, USE 12" DIAMETER PILE
2. IF CAST-IN-PLACE CONCRETE PILE LENGTH IS BETWEEN 24'-0" AND 28'-0", USE 14" DIAMETER PILE.

1

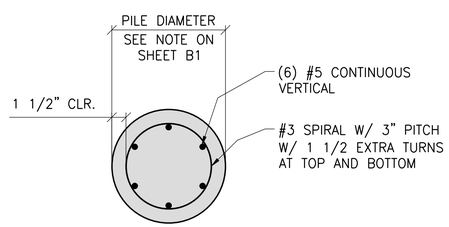



## SECTION

1-1/2" = 1'-0"

A / S3.6

AXXX-XXX 1




## SECTION

1-1/2" = 1'-0"

B / S3.6

AXXX-XXX 1

REFERENCE DRAWING

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

REGISTERED PROFESSIONAL ENGINEER
SIGIARTO LONI
No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

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

TIMBER PILE REPAIR AND REPLACEMENT DETAILS

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S3.6 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |



I:\Z1800\Dwg\Current\S3.6 TIMBER PILE REPAIR AND REPLACEMENT DETAILS.dwg 1/24/2012 3:36:53 PM ALVIN HOFFPAUIR

# PROJECT NO. 2: SHEET PILE WALL INSTALLATION & PAVEMENT SETTLEMENT REPAIR

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## Estimated Quantity Take-off for Construction Cost Estimates for Sheet Pile Wall Installation & Pavement Settlement Repair

| Item | Description | Quantity | Unit | Total Quantity | Comments |
|---|---|---|---|---|---|
| **Berths 7 & 8 - Sheet Pile Wall Installation** | | | | | |
| 1 | Furnish and install sheet pile walls, 228' x 20' | 4560.0 | SF | 4560.0 | Refer to reference drawing S4.3 to S4.6 for location and S3.8 for details |
| 2 | Furnish and install concrete beams, 1'-3" x 1'-6" x 228' | 15.8 | CY | 15.8 | See notes above |
| 3 | Excavate and control density fill, 3' x 8' x 228' | 202.7 | CY | 202.7 | See drawing sheet S3.8 for extent of density fill |
| 4 | Pavement repair, 5' x 288' | 1440.0 | SF | 1440.0 | Repair damaged pavement caused by sheet pile wall construction |
| **Berths 5 & 6 - Sheet Pile Wall Installation** | | | | | |
| 1 | Furnish and install sheet pile wall, (375'+120') x 10' | 4950.0 | SF | 4950.0 | Refer to sheet 12 for approximate location and reference drawing S3.8 for details |
| 2 | Furnish and install concrete beams, 1'-3" X 1'-6" x (375'+120') | 34.4 | CY | 34.4 | See notes above |
| 3 | Excavate and control density fill, 3'x8' x (375'+120') | 440.0 | CY | 440.0 | See drawing sheet S3.8 for extent of density fill |
| 4 | Pavement repair, 5' x (375'+120') | 2475.0 | SF | 2475.0 | Repair damaged pavement caused by sheet pile wall construction |

## Budgetary Cost for Sheet Pile Wall Installation & Pavement Settlement Repair

| Item | Description | Quantity | Unit | Total Quantity | Comments |
|---|---|---|---|---|---|
| **Berths 7 & 8 - Sheet Pile Wall Installation & Pavement** | | | | | |
| 1 | Construction cost estimates based on 2025 labor and material costs | One | EA | $884,450 | Refer to sheet 2 for Power Engineering Construction cost estimates based on adjusted cost and 50% of mob/demob. |
| 2 | Soft cost and contingency - 30% | One | EA | $265,335 | Refer to sheet 2 for assumptions and exclusions. The 30% add is to account for the cost associated with the exclusions and reasonable contingency. |
| | Subtotal | | | $1,149,785 | |
| **Berths 5 & 6 - Sheet Pile Wall Installation & Pavement** | | | | | |
| 1 | Construction cost estimates based on 2025 labor and material costs | One | EA | $1,191,438 | Refer to sheet 2 for Power Engineering Construction cost estimates and 50% of mob/demob. |
| 2 | Soft cost and contingency - 30% | One | EA | $357,431 | Refer to sheet 2 for assumptions and exclusions. The 30% add is to account for the cost associated with the exclusions and reasonable contingency. |
| | Subtotal | | | $1,548,869 | |
| | Total - Berths 5 to 8 | | | $2,698,654 | |
| | **Budgetary Cost Estimates** | | | **$2,700,000** | |

Notes:
1. The budgetary cost is based on 2025 labor and material costs and does not include escalation for work performed in the future years and tariff impact.

# Project No: 2 - Budgetary Cost Estimates for Sheet Pile Installation and Pavement Settlement Repair

Scope of Work:

In 2010 project, it was identified segments of Berths 7 and 8 requires soils settlement stabilization to prevent further pavement settlement at the landside edge of the inner wharf. This repair work was not performed in 2010 but required. Refer to reference drawings S4.3 to S4.6 for location and drawing S3.8 for repair details.

On 05/18/2025, a site inspection was performed below deck at Berths 5 & 6, it was noted that the soils/weathered bedrock eroded at the top of the slope causing significant pavement settlement. Refer to ENGEO report (Sheet 2 to 3) for a detail description and recommendation.




Photo 1 - Below Deck, Erosion and Pavement Failure

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**Project 2: Pavement Settlement Repairs at Berths 6, 7, & 8, Version 1**
**Richmond, California**

## ROM Budget for Pavement Settlement Repairs in Berths 6, 7, & 8, Version 1

**Date: May 14, 2025**

| | Description | Quantity | Units | | $/Unit | | Total | Comments | Working Days |
|---|---|---|---|---|---|---|---|---|---|
| **Mobilization Allowance** | | | | | | | | | |
| 1 | Mobilize/Demobilize | 1 | LS | $ | 205,596 | $ | 205,596 | | 7 |
| **Berth 7 & 8: Sheet Pile Wall Installation** | | | | | | | | Adjusted cost | |
| 2 | Furnish & Install Sheet Pile Walls (228' x 20' Long) - Assume PZC 13 Sheets | 4,560 | SF | $ | 74 | $ | 337,440 | $425,440 | 6 |
| 3 | Furnish & Install Concrete Beams (1' 3" x 1' 6" x 228') | 16 | CY | $ | 6,350 | $ | 101,600 | $128,100 | 7 |
| 4 | Excavate and Place Control Density Fill (3' x 8' x 228') | 203 | CY | $ | 720 | $ | 146,160 | $164,750 | 9 |
| 5 | Pavement Repair (5' x 288') - Assume 10" AC Lift | 1,440 | SF | $ | 44 | $ | 63,360 | | 2 |
| **Berth 6: Sheet Pile Wall Installation** | | | | | | | | | |
| 6 | Furnish & Install Sheet Pile Wall ((375' + 120') x 10' Long) - Asssume PZC 13 Sheets | 4,950 | SF | $ | 89 | $ | 440,550 | | 10 |
| 7 | Furnish & Install Concrete Beams (1' 3" x 1' 6" x (375' + 120')) | 35 | CY | $ | 6,354 | $ | 222,390 | | 15 |
| 8 | Excavate and Place Control Density Fill (3' x 8' x (375'+120')) | 440 | CY | $ | 720 | $ | 316,800 | | 19 |
| 9 | Pavement Repair (5' x 375' + 120')) - Assume 10" AC Lift | 2,475 | SF | $ | 44 | $ | 108,900 | | 4 |
| | **Total Base Scope:** | | | | | **$** | **1,942,796** | | **78** |

Revised length 257 ft

**Project Assumptions**

1 A working day is defined as an 8-hour weekday between the hours of 6 AM - 5 PM.
2 The working days do not include fabrication times for materials.
3 Only one mobilization is assumed, with continuous work until project completion.
4 All pricing is in current dollars.
5 No contingency is included in this budget.

**Schedule Milestones**

1 We estimate the on-site construction for the base scope will take approximately 14 weeks for a single crew.

**Design Assumption**

1 Per Liftech Sketches, May 2025

**Subcontractors**

1 None assumed.

**Proposal Exclusions**

1 Payment and Performance Bonds (available at 1.5% of final contract amount)
2 Builders Risk Insurance (can be provided on a per-project basis)
3 Permits and Permit Fees
4 Engineering or Design
5 Utility Relocation unless Listed Above
6 Site Survey, Lines, Grade
7 Hazardous Materials Handling/Abatement/Removal
8 Special Inspection or Testing Fees
9 Vibration or Damage Monitoring
10 Any Repairs to the Existing Structures, Interior or Exterior, either prior to, during, or after Construction.
11 Temporary Power & Lighting Install and Supply
12 Industrial Hygienist or Inspection Services
13 Silt Curtain, Bubble Curtain, or other regulatory requirements not normally encountered.

Project No.
**26829.000.001**

April 28, 2025
Revised July 2, 2025

Mr. Matt Trowbridge
Moffatt & Nichol
1300 Clay Street, Suite 350
Oakland, CA 94612

Subject: Port of Richmond Point Potrero Marine Terminal
Richmond, California

**UNDERDECK GEOTECHNICAL INSPECTION**

Dear Mr. Trowbridge:

We prepared this letter to document our observations during underdeck inspections at the Point Potrero Marine Terminal at the Port of Richmond in Richmond, California. As you know, we joined Liftech Consultants Inc. (Liftech) for an inspection of the conditions below the deck of the existing Marine Terminal. We performed our underdeck inspections both from boat and on foot.

On March 18, we observed the conditions below Berths 5 and 6 during a boat inspection; Power Engineering Construction (Power) provided the boat and pilot and Liftech performed structural inspections. The purpose of our inspection was to observe geotechnical conditions. In particular, we were interested to see the conditions along Berth 5 where collapse of the pavement occurred along the interface of land and the wharf structure, and a portion of Berth 6 where the deck structure has settled.

During our inspection, we observed existing weathered rock outcropping and rock-derived fill covering the surface of the slope below the marginal wharf structures. Portions of the ground along Berth 5 are protected by variably sized riprap revetment. As shown in Exhibit 1, the area of the settled wharf appears to be a result of a crack through the support beam. There is no evidence that any of the piles in this area have plunged, though there are several piles that have been removed and not replaced. A structural fix will be necessary in this area. Likely the replacement of missing piles will be required to perform this repair.

Along much of the wharf, there is a headwall at the interface of the wharf structure and the land. However, in the area of the settled pavement at Berth 5, there is no headwall, and the soil/weathered bedrock appears to be eroding at the top of the slope below the wharf (as shown in Exhibit 2). In this area, we recommend creating a confinement structure at the top of the slope to retain and protect fill from erosion and backfilling the area of lost ground so the pavement can be restored and stabilized.



1630 San Pablo Avenue, Suite 200 • Oakland, CA 94612 • (925) 866-9000 • info@engeo.com
www.engeo.com



Job 2524 Received on 07/02/25 from ENGEO

**EXHIBIT 1: Area of Settled Wharf – Berth 6**



**EXHIBIT 2: Area of Settled Pavement Behind Wharf – Berth 5**



On May 19, 2025, we performed an inspection below the deck of Berths 7 and 8 with Liftech. We performed this inspection between the existing sheet pile wall and the landward slope. We entered the area through manholes in the deck; Power provided assistance with access and site safety monitoring. During our inspection, we again observed stable slope conditions below the wharf and no evidence of pile plunging. Again in areas where pavement settlement was observed at the interface between the land and the wharf, this appeared to be due to erosion of the top of the slope in areas without a headwall; in one area this lack of wall appeared to be due to utility penetration and the eroded soil was likely utility trench backfill. We recommend a similar fix in this area.



Job 2524 Received on 07/02/25 from ENGEO

If you have any questions or comments regarding this letter, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated




Jeff Fippin, GE

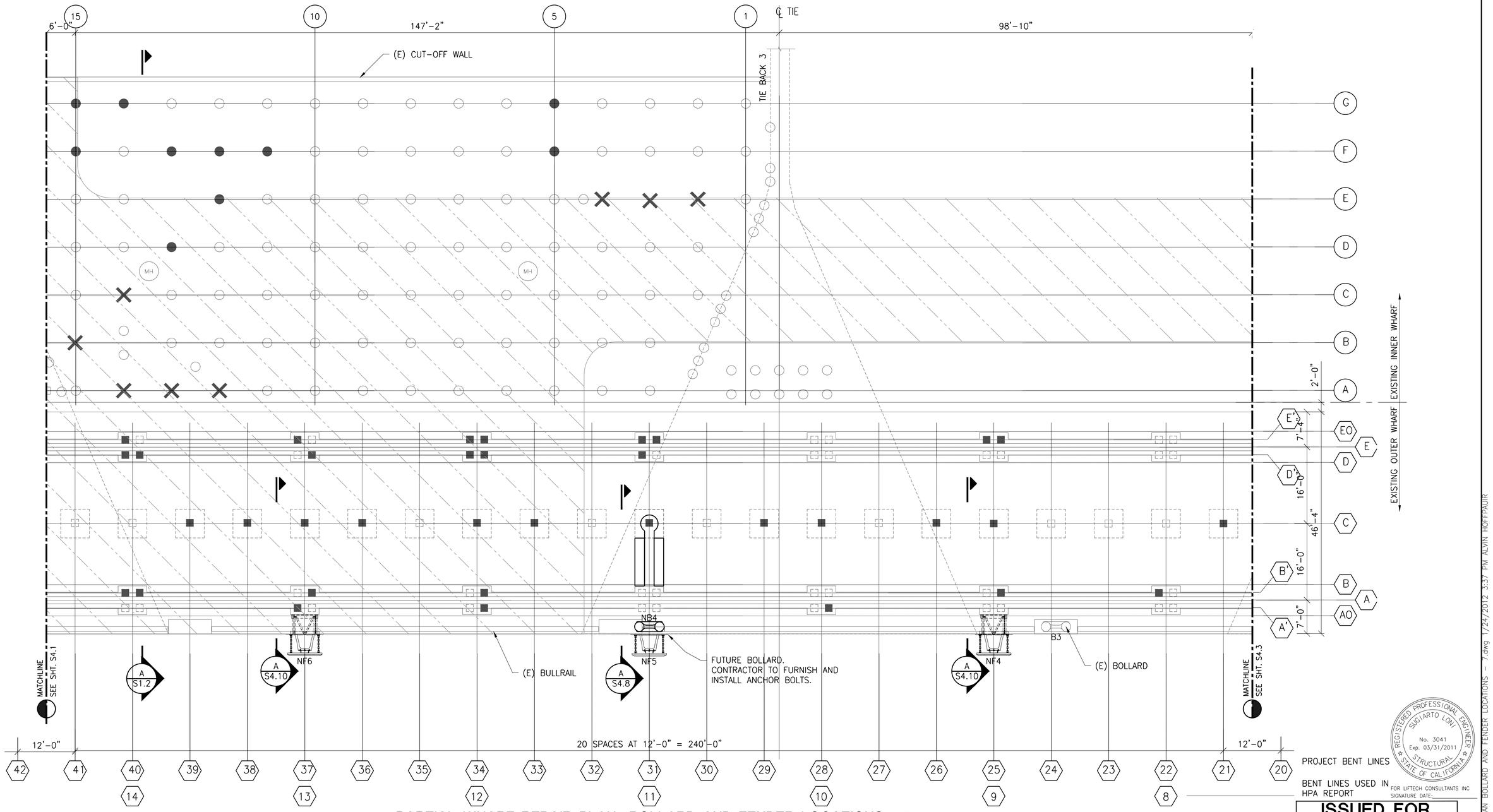
Robert H. Boeche, CEG

jf/rhb/cb



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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 2

1" = 10'-0"

**LEGEND**

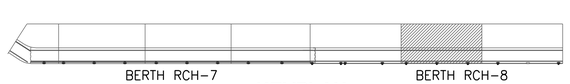
- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

0' 10' 20' 30'
SCALE: 1" = 10'

**REFERENCE DRAWING**




**KEYPLAN**

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

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SIGI LARTO LONI
No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

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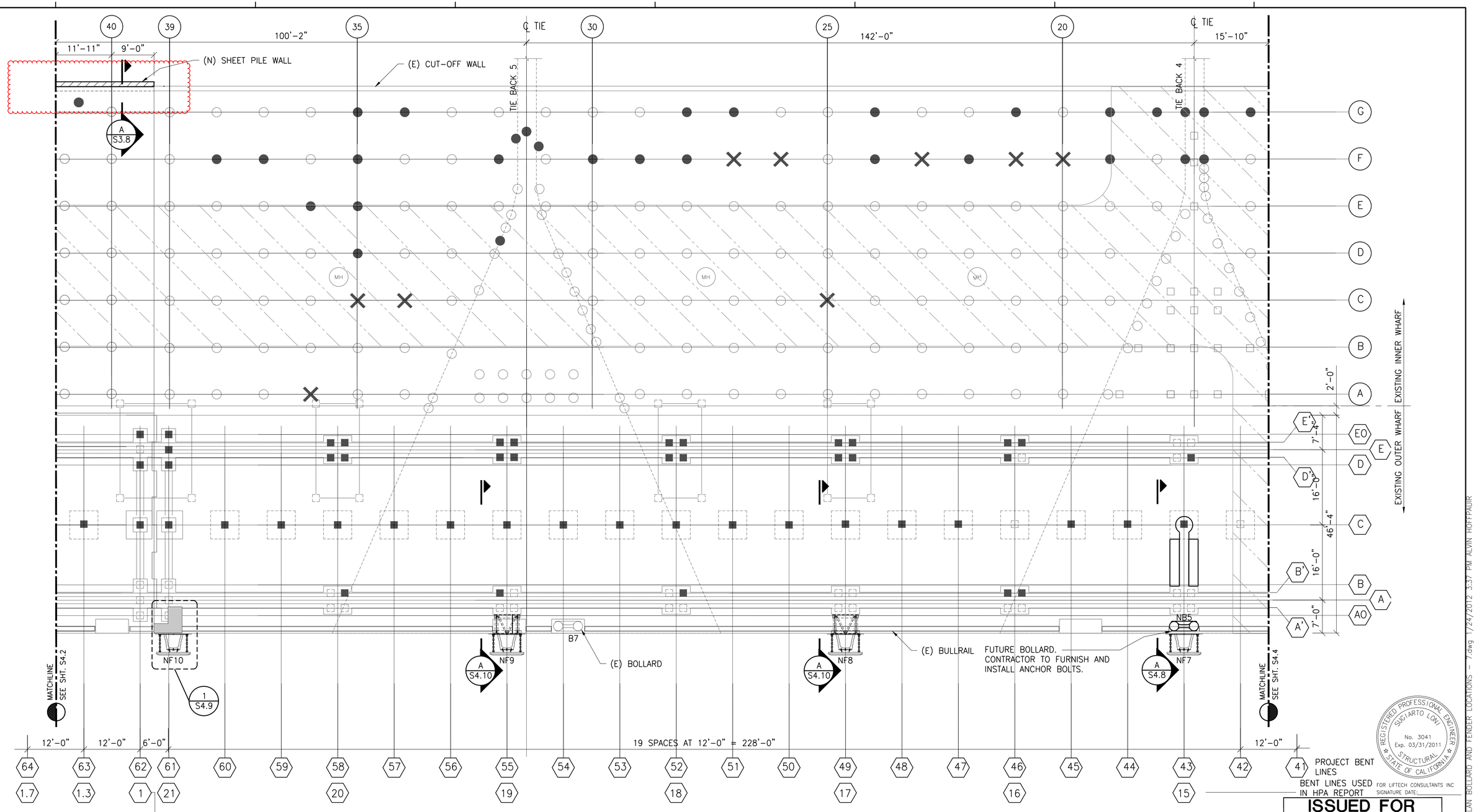
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POINT POTRERO WHARF REPAIR
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PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 2

| | | | |
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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 3

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

0' 10' 20' 30'
SCALE: 1" = 10'

BERTH RCH-7 BERTH RCH-8

**REFERENCE DRAWING**

**KEYPLAN**

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65 60 55 50 45

52'-11 5/8" 48'-2" 2'-11" (N) SHEET PILE WALL ℄ TIE TIE BACK 7

(E) CUT-OFF WALL

145'-2" (N) SHEET PILE WALL 20'-0" 33'-4" ℄ TIE TIE BACK 6

53'-10" 8'-1"

A S3.8 A S3.8

MH MH MH

G F E D C B A

2'-0" EXISTING INNER WHARF EXISTING OUTER WHARF

E' 7'-4" EO E D D' 16'-0" 46'-4" C B' 16'-0" B A AO A' 7'-0"

NB9 NB8 NB7 NB6

NF13 NF12 NF11

BULLRAIL

A S4.10 A S4.10 A1 S4.8 A1 S4.8 E S4.8 A S4.8 A1 S4.8

MATCHLINE SEE SHT. S4.3 MATCHLINE SEE SHT. S4.5

12'-0" 20 SPACES AT 12'-0" = 240'-0" 12'-0"

85 84 83 82 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63 PROJECT BENT LINES

8 7 6 5 4 3 2 1.7 1.3 BENT LINES USED IN COLLINS REPORT

# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 4

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

| No. | Revision | Date | By | Checked | Approved |
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**LEGEND**

- NBX (N) BOLLARD
- NFX (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

**KEYPLAN**

BERTH RCH-7 BERTH RCH-8 N

0' 10' 20' 30' SCALE: 1" = 10'

REFERENCE DRAWING

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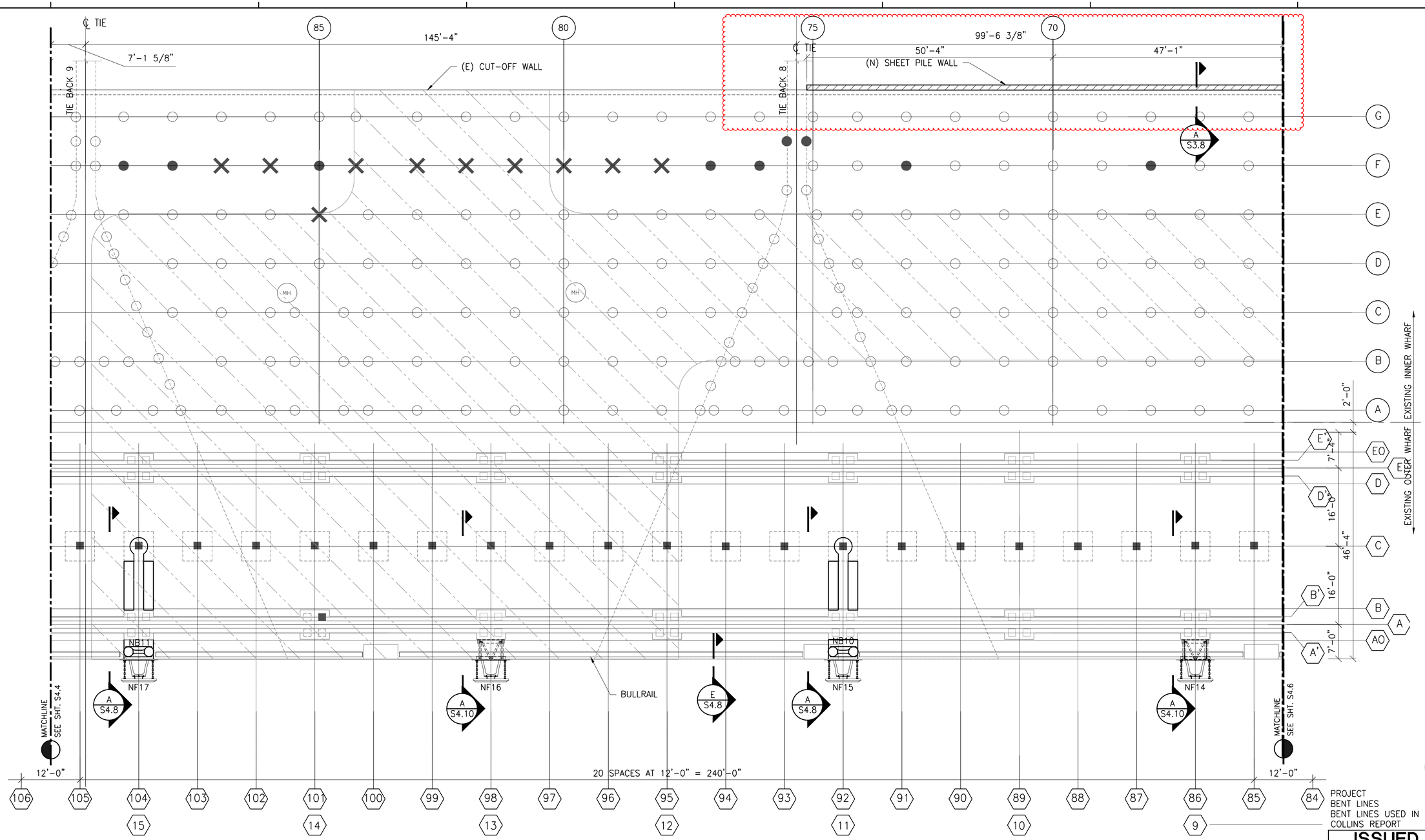
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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 5

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

- NBX / NFX — (N) BOLLARD / (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

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2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.




**KEYPLAN**




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BENT LINES
BENT LINES USED IN COLLINS REPORT

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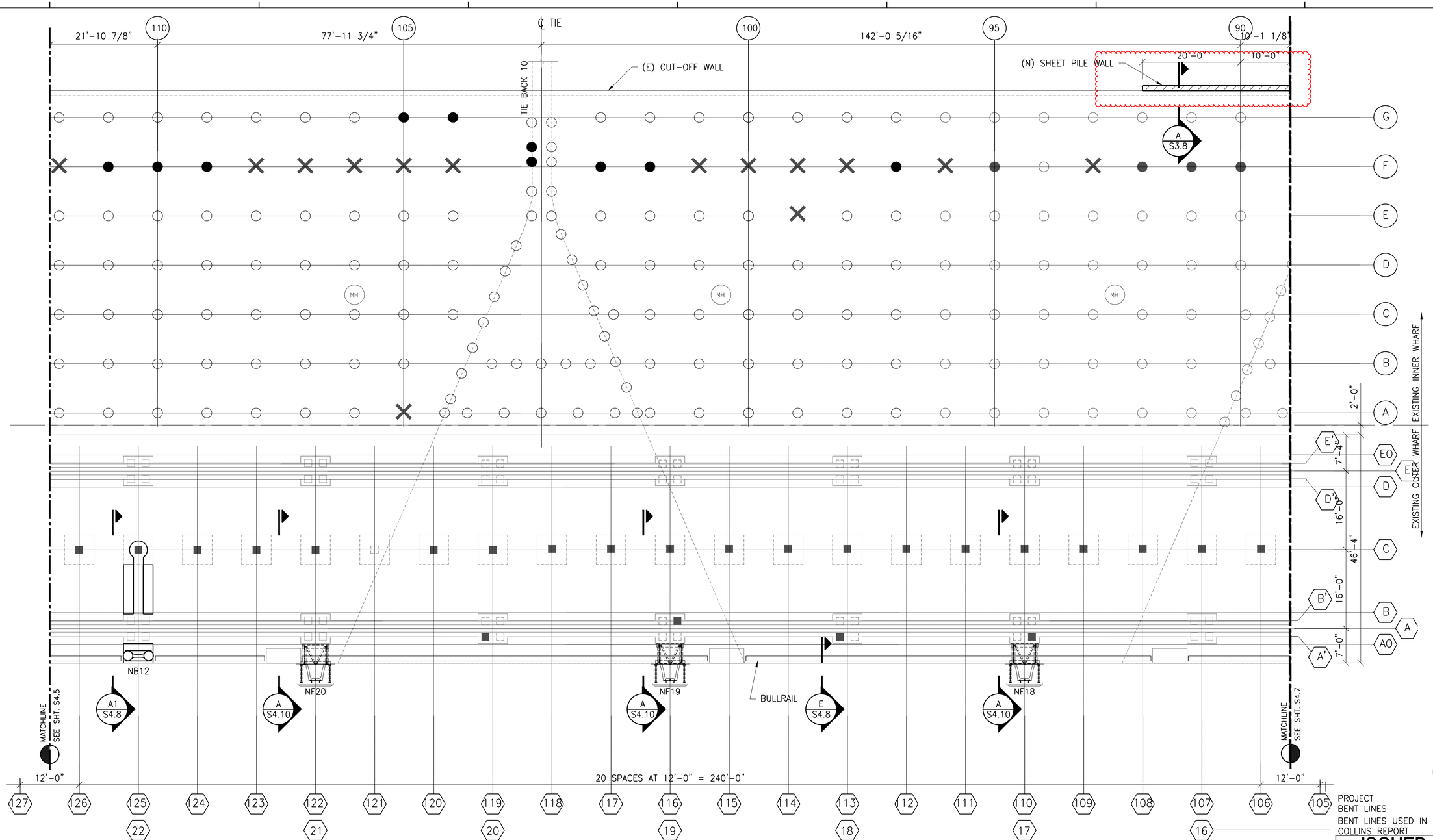
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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 6

1" = 10'-0"

**SHEET PILE WALL NOTE:**

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2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

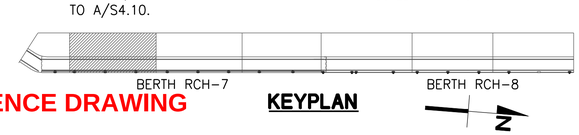
- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

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2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

0' 10' 20' 30'
SCALE: 1" = 10'

**KEYPLAN**




REFERENCE DRAWING

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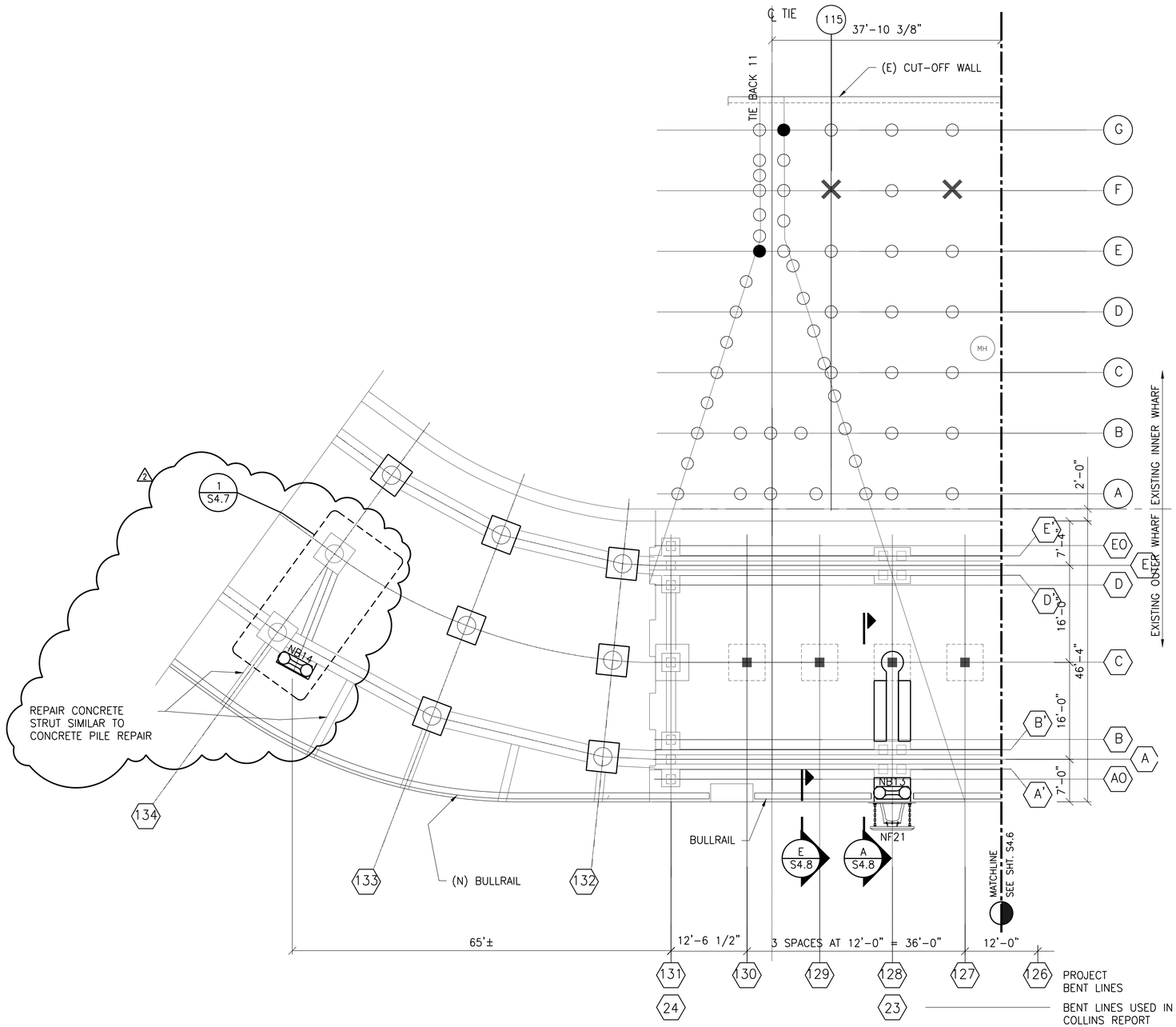
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PORT OF RICHMOND
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| By AH | Checked TG/EGS | Sheet No. | S4.6 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 7

1" = 10'-0"

**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

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2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

0' 10' 20' 30'
SCALE: 1" = 10'

BERTH RCH-7 BERTH RCH-8

**REFERENCE DRAWING** **KEYPLAN**

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 2 | BOLLARD NO. 14 SUPPORT | 06/11/10 | LMK/AH | TG | SL |
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

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PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 7

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By AH Checked TG/EGS Sheet No. S4.7
Approved SL of ----
Date 01/25/10 Revision 2

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Timber piles supported deck

65'-0"

120'-0"

375'-0"

325'-0"

200'-0"

SHEET METAL, ETC.

PIPE SHOP

ELECTRIC SHOP

FITTINGS OFFICE

FITTINGS WAREHOUSE

Sheet Piling

R.R.

YW2000

YW1800

YW1600

YN3600

YN4000

YN4200

YN4400

YN4600

YN4800

YN5000

YN5200

PLAN OF RELIEVING PLATFORM

SCALE 1" = 60'-0"

LEGEND

- EXISTING STRUCTURE
- DOCK TO BE BUILT
- SUPPORTING SLAB
- RIP RAP

REFERENCE DRAWING

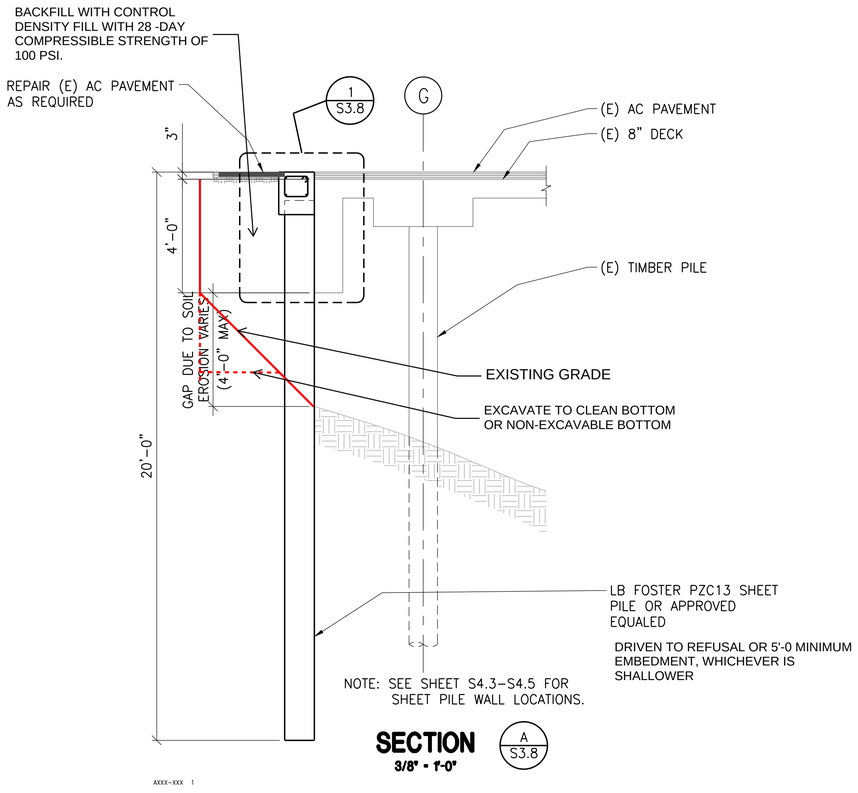
Sht 12 of 13

| REVISIONS | | | |
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KAISER COMPANY, INC.
RICHMOND, CALIFORNIA

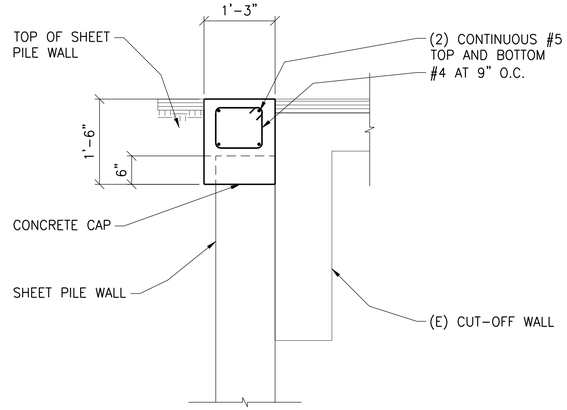
RELIEVING PLATFORM
FITTING OUT DOCK AT
RICHMOND YARD No 3

| | |
|---|---|
| DATE JAN 28, 1943 | SUBMITTED |
| SCALE 1" = 60'-0" | APPROVED |




**SECTION** A S3.8
3/8" = 1'-0"

AXXX-XXX 1




**DETAIL** 1 S3.8
3/4" = 1'-0"

AXXX-XXX 1

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

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STRUCTURAL
STATE OF CALIFORNIA

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**ISSUED FOR CONSTRUCTION**

POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

SHEET PILE DETAIL

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S3.8 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

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\\Woe\z1800\Dwg\Current\S3.8 SHEET PILE DETAIL.dwg 1/24/2012 3:55:15 PM ALVIN HOFFPAUIR

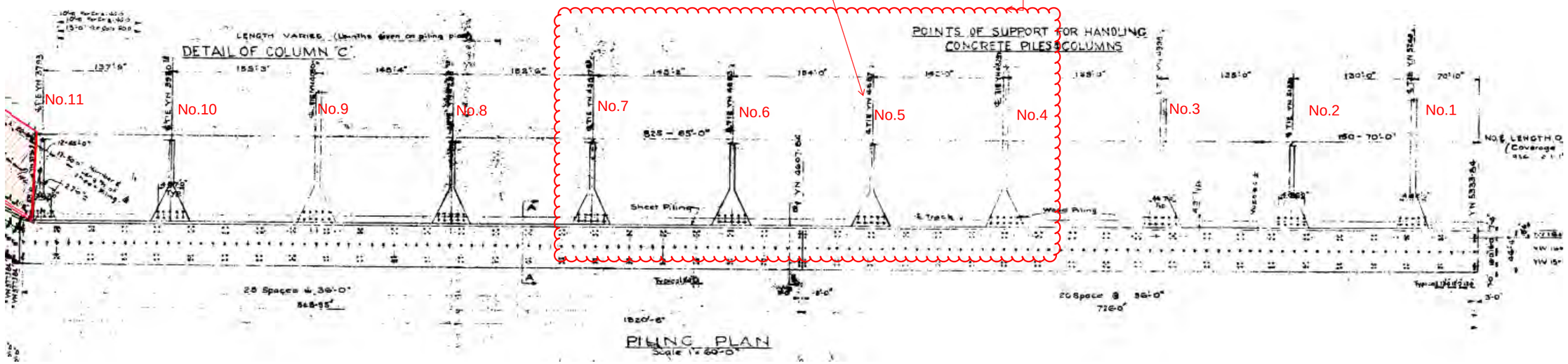
# PROJECT NO. 3: SEISMIC TIE BEAM SUPPORT STABILIZATION

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# Project #3 - Stabilize Tie-Beam Supports for Tie Beam No. 4 to 7

Tie-beam support is overstressed due to damaged adjacent piles. See photos below.

Seismic tie-beams to be repaired









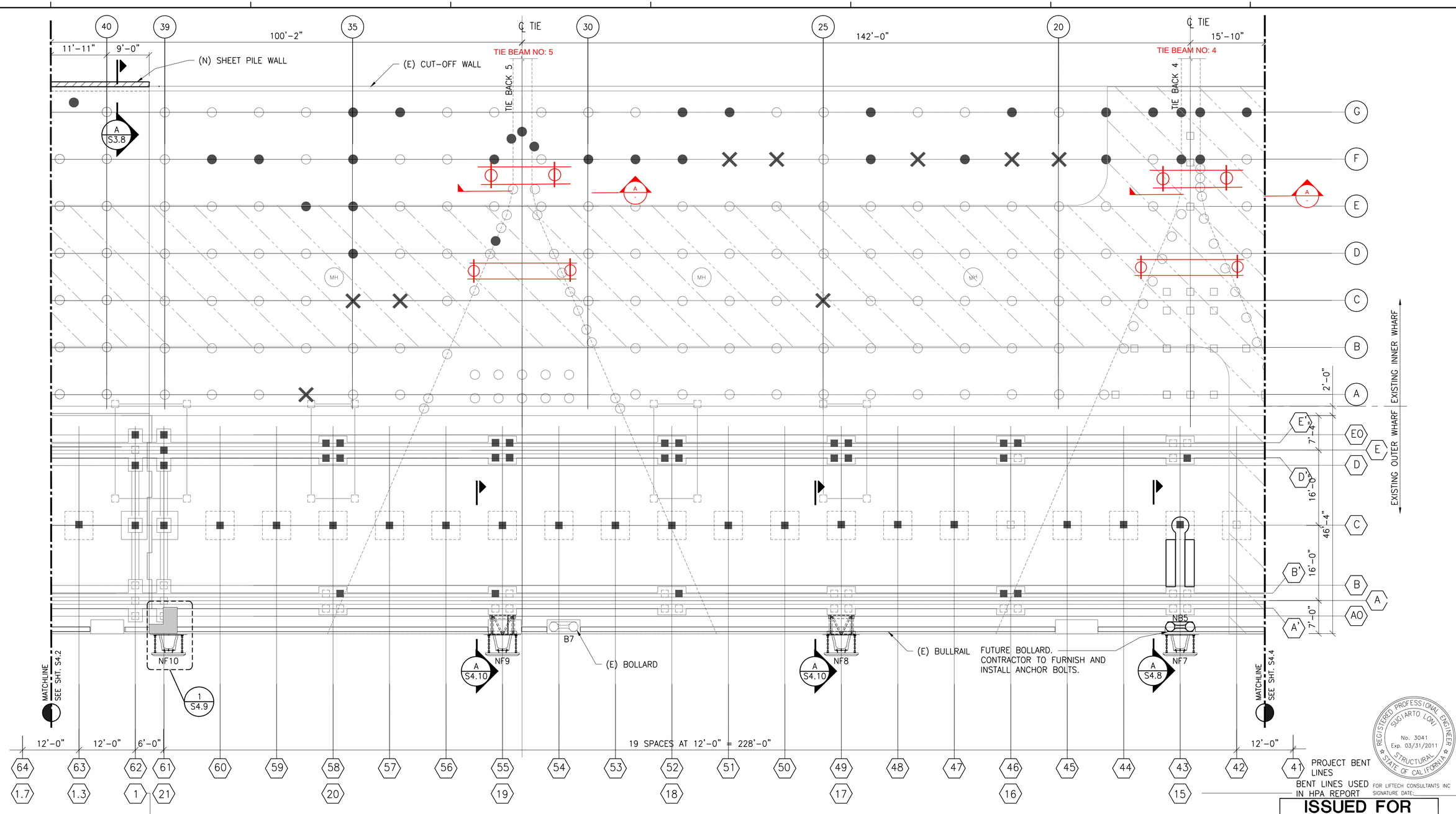

Missing piules

Pile overstreesing




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# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 3

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

- NBX / NFX — (N) BOLLARD
- (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

REFERENCE DRAWING




**KEYPLAN**







| No. | Revision | Date | By | Checked | Approved |
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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 3

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S4.3 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

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65 60 55 50 45

52'-11 5/8" | 48'-2" | 145'-2" | 20'-0" | 33'-4" | 53'-10" | 8'-1"

2'-11"

(N) SHEET PILE WALL

TIE BEAM NO: 7

TIE BACK 7

(E) CUT-OFF WALL

(N) SHEET PILE WALL

TIE BEAM NO: 6

TIE BACK 6

℄ TIE

A S3.8

A S3.8

A

A1

A

MH

MH

MH

G F E D C B A

EXISTING INNER WHARF

EXISTING OUTER WHARF

2'-0"

E' 7'-4"

EO E

D

D' 16'-0"

C 46'-4"

B' 16'-0"

B A

AO

A' 7'-0"

NB9 NB8 NB7 NB6

NF13 NF12 NF11

BULLRAIL

A S4.10

A1 S4.8

A S4.10

E S4.8

A1 S4.8

A S4.8

A1 S4.8

MATCHLINE SEE SHT. S4.3

MATCHLINE SEE SHT. S4.5

12'-0" | 20 SPACES AT 12'-0" = 240'-0" | 12'-0"

85 84 83 82 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63

8 7 6 5 4 3 2 1.7 1.3

PROJECT BENT LINES
BENT LINES USED IN COLLINS REPORT

# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 4

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

**LEGEND**

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

BERTH RCH-7 | BERTH RCH-8

REFERENCE DRAWING KEYPLAN

0' 10' 20' 30'
SCALE: 1" = 10'

N

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FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 4

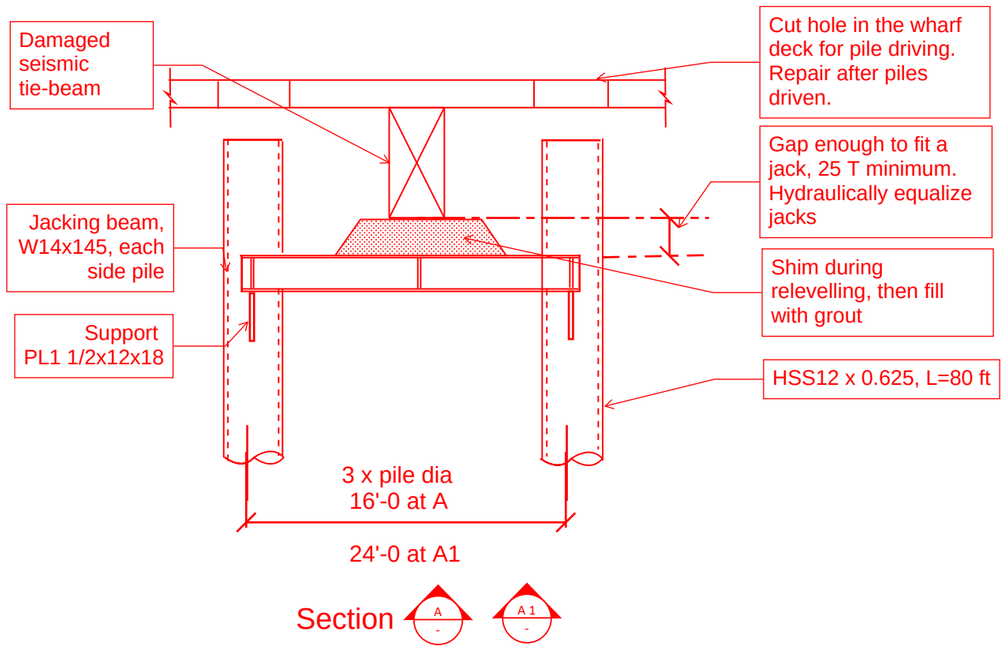
| | | | |
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| Project No. | Z1800 | | |
| By AH | Checked TG/EGS | Sheet No. | S4.4 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |



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# Project #3 - Stabilize Tie-Beam Supports for Tie Beam No. 4 to 7




Note:
The section shown above is not to scale and schematic in nature to convey the repair concepts. Refer to repair concept notes this sheet.

Scope of Work:

Repair concept:
1. Cut holes at wharf deck for pile and beam installation.
2. Install pile each side of the deflected beams (4 locations per tie-beam as shown on plan. Total 4 - seismic tie beams)
3. Install beam support plates
4. Install jacking/support beams
5. Jack the beam and slab to a level position using shim plates.
6. Remove jacks
7. Add non-shrink grout for permanent beam support.
8. Perform corrosion damage repair for the concrete tie-beam.
9. Repair deck reinforcing at holes and install grout or concrete.
10. Repair corrosion damage at seismic tie-beam. Refer to reference drawing S3.3 for similar repair.

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# Project #3 - Budgetary Cost Estimates

## Estimated Quantity Take-off for Construction Cost Estimates for Seismic Tie-beam Support Stabilization

| Item | Description | Quantity | Unit | Total Quantity | Comments |
|---|---|---|---|---|---|
| **Seismic Tie-beam Support Stabilization** | | | | | |
| 1 | Cut holes in the deck | 16 | EA | 16 | Refer to scope of work description |
| 2 | Furnish and install steel pipe piles and steel support beams | 16 | EA | 16 | Refer to scope of work description |
| 3 | Furnish and install steel beams and slab jacking | 16 | EA | 16 | Refer to scope of work description |
| 4 | In-fill holes with continuity slab rebars | 16 | EA | 16 | Refer to scope of work description |
| 5 | Repair concrete beams | 1200 | SF | 1200 | Assume 300 SF of beam areas have corrosion damage/tie-beam. |

## Budgetary Cost for Seismic Tie-beam Support Stabilization

| Item | Description | Quantity | Unit | ROM Cost | Comments |
|---|---|---|---|---|---|
| **Seismic Tie-beam Support Stabilization** | | | | | |
| 1 | Construction cost estimates based on 2025 labor and material costs | One | EA | $3,565,255 | Refer to sheet 6 for Power Engineering Construction cost estimates. |
| 2 | Soft cost and contingency - 30% | One | EA | $1,069,577 | Refer to sheet 6 for assumptions and exclusions. The 30% add is to account for the cost associated with the exclusions and reasonable contingency. |
| | Total | | | $4,634,832 | |
| | **Budgetary Cost Estimates** | | | **$4,600,000** | |

Notes:
1. The budgetary cost is based on 2025 labor and material costs and does not include escalation for work performed in the future years and tariff impact.

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# Project No: 3 - Construction Cost Estimates and Duration prepared by Power Engineering Company

**Project No. 3 - Stabilize Tie-Beam Supports for Tie Beam No. 4 to 7**
**Richmond, California**

## ROM Budget for Project 3 to Stabilize Tie-Beam Supports for Tie Beam No. 4 to 7

**Date: May 15, 2025**

| | Description | Quantity | Units | $/Unit | Total | Comments | Working Days |
|---|---|---|---|---|---|---|---|
| **Base Scope** | | | | | | | |
| 1 | Mobilize/Demobilize | 1 | LS | $ 135,239 | $ 135,239 | | 7 |
| 2 | Cut Holes on the Deck | 16 | EA | $ 2,017 | $ 32,272 | | 1 |
| 3 | Furnish & Install Steel Pipe Piles and Support Steel Beam Brackets | 16 | EA | $ 45,063 | $ 721,008 | | 26 |
| 4 | Furnish & Install Steel Beams and Slab Jacking | 16 | EA | $ 54,142 | $ 866,272 | | 48 |
| 5 | Infill Pile Driving Access Holes | 16 | EA | $ 2,454 | $ 39,264 | | 1 |
| 6 | Repair Concrete Beam - assume 300 SF of Beam Area has Corrosion and Repair Depth = 8" | 1,200 | SF | $ 1,476 | $ 1,771,200 | | 56 |
| | | | **Total Base Scope:** | | **$ 3,565,255** | | **140** |

**Project Assumptions**

1 A working day is defined as an 8-hour weekday between the hours of 6 AM - 5 PM.
2 The working days do not include fabrication times for materials.
3 Only one mobilization is assumed, with continuous work until project completion.
4 All pricing is in current dollars.
5 No contingency is included in this budget.

**Schedule Milestones**

1 We estimate the on-site construction for the base scope will take approximately 26 weeks for a single crew.

**Design Assumption**

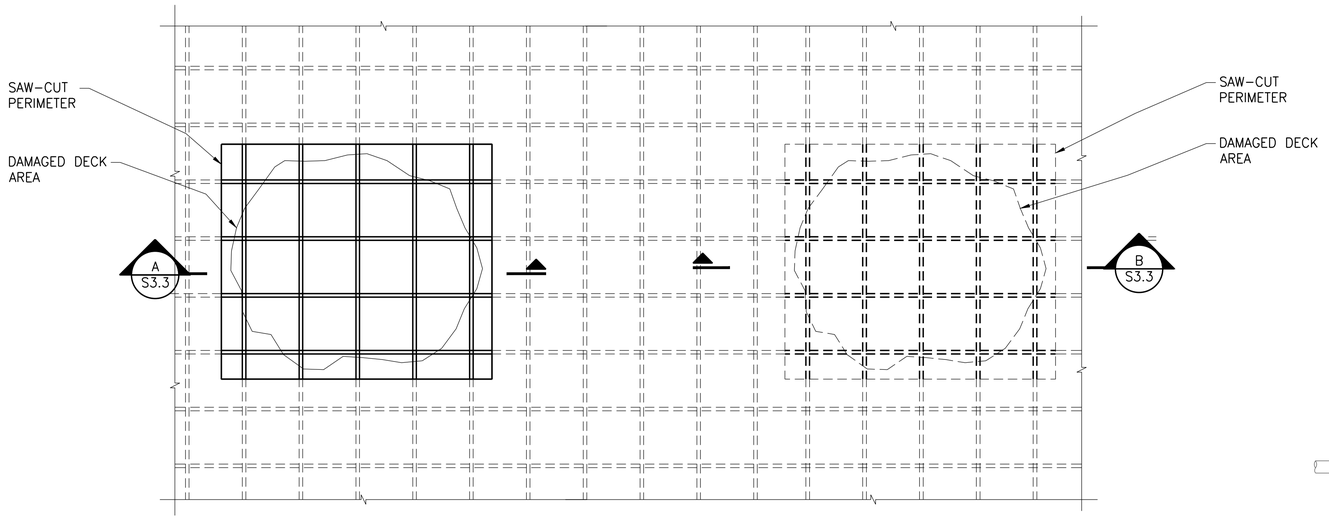
1 Per Liftech Sketches, May 2025

**Subcontractors**

1 None assumed.

**Proposal Exclusions**

1 Payment and Performance Bonds (available at 1.5% of final contract amount)
2 Builders Risk Insurance (can be provided on a per-project basis)
3 Permits and Permit Fees
4 Engineering or Design
5 Utility Relocation unless Listed Above
6 Site Survey, Lines, Grade
7 Hazardous Materials Handling/Abatement/Removal
8 Special Inspection or Testing Fees
9 Vibration or Damage Monitoring
10 Any Repairs to the Existing Structures, Interior or Exterior, either prior to, during, or after Construction
11 Temporary Power & Lighting Install and Supply
12 Industrial Hygienist or Inspection Services
13 Silt Curtain, Bubble Curtain, or other regulatory requirements not normally encountered.

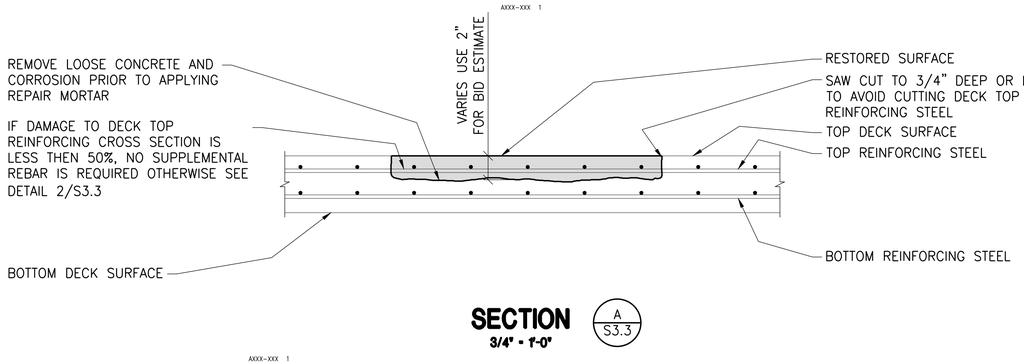



DAMAGED TOP DECK SURFACE REPAIR

DAMAGED BOTTOM DECK SURFACE REPAIR

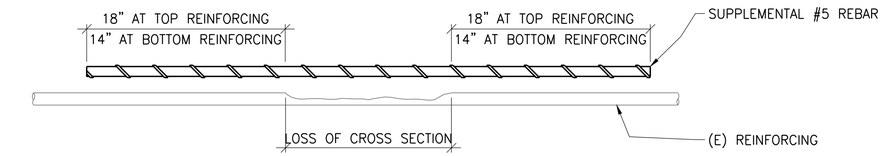
## CONCRETE REMOVAL AND SURFACE PREPARATION (1/S3.3)

3/4" = 1'-0"




## SECTION (A/S3.3)

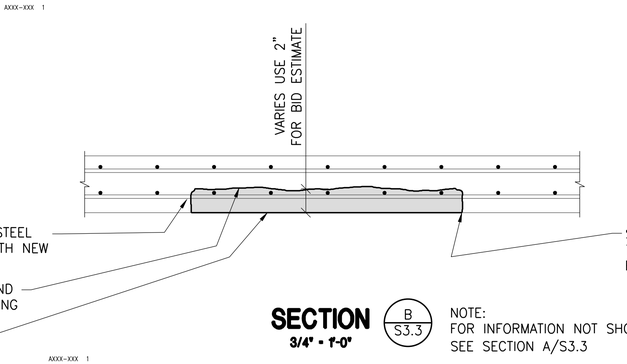
3/4" = 1'-0"




PLAN

## SUPPLEMENTAL REBAR DETAIL (2/S3.3)

DO NOT SCALE




## SECTION (B/S3.3)

3/4" = 1'-0"

NOTE:
FOR INFORMATION NOT SHOWN
SEE SECTION A/S3.3

## WHARF DECK REPAIR NOTES:

1. THE PURPOSE OF THE WHARF DECK REPAIR IS TO RESTORE THE WHARF STRUCTURAL STRENGTH TO SUPPORT A DESIGN LIVE LOAD OF 250 PSF AND TO EXTEND THE SERVICE LIFE OF THE STRUCTURE.
2. THE DECK REPAIR WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
   a. AMERICAN CONCRETE INSTITUTE, CONCRETE REPAIR GUIDE. FARMINGTON HILLS, MI: AMERICAN CONCRETE INSTITUTE, 2004.
   b. AMERICAN CONCRETE INSTITUTE, SURFACE REPAIR USING FORM-AND-PUMP TECHNIQUES. FARMINGTON HILLS, MI: AMERICAN CONCRETE INSTITUTE, 2003.
   c. INTERNATIONAL CONCRETE REPAIR INSTITUTE, GUIDE FOR SURFACE PREPARATION FOR THE REPAIR OF DETERIORATED CONCRETE RESULTING FROM REINFORCING STEEL CORROSION (GUIDELINE NO. 310.1R-2008). DES PLAINES, IL: INTERNATIONAL CONCRETE REPAIR INSTITUTE, 2008..
3. AT REPAIR AREAS CONTRACTOR SHALL PERFORM SOUNDING OR OTHER APPROPRIATE NON-DESTRUCTIVE CONCRETE TESTING TO LOCATE AREAS OF DELAMINATION FOR THE TOP AND BOTTOM DECK SURFACES OF INNER AND OUTER WHARVES FOR BERTH RCH-7 AND RCH-8.
4. CONTRACTOR SHALL MARK THE PERIMETER OF THE DECK REPAIR AREAS TO BE SAW CUT. LAYOUT SHALL BE SQUARE OR RECTANGULAR IN SHAPE. NOTIFY THE ENGINEER FOR REVIEW OF THE PERIMETER TO BE SAW CUT AREA PRIOR TO THE CUTTING.
5. SPECIAL INSPECTION IS REQUIRED FOR SURFACE PREPARATION PRIOR TO INSTALLATION OF STRUCTURAL REPAIR CONCRETE.
6. THE WHARF DECK REPAIR SYSTEM CONSISTING OF REBAR PROTECTION AND MORTAR SHALL BE COMPATIBLE AND SHALL BE SUPPLIED BY A SINGLE SOURCE SO THAT THE REPAIR SYSTEM PERFORMS AS WARRANTIED BY THE PRODUCTS MANUFACTURER
7. THE FOLLOWING CONCRETE AND TIMBER PILE REPAIR PRODUCTS ARE ACCEPTABLE:

   BASF CONSTRUCTION CHEMICAL, LLC
   EMACO S66 CI, FLOWABLE STRUCTURAL-REPAIR CONCRETE WITH INTEGRAL CORROSION INHIBITOR, FOR TOP DECK SURFACE REPAIR

   EMACO S88 CI, SPRAYABLE FIBER-REINFORCED STRUCTURAL REPAIR MORTAR WITH INTEGRAL CORROSION INHIBITOR FOR BOTTOM DECK SURFACE REPAIR.

   MASTERSEAL CP, ADVANCED CORROSION INHIBITOR TREATMENT FOR STEEL REINFORCED CONCRETE, APPLIED TO REPAIRED AREAS.

   SIKA CORPORATION
   SIKA ARMATEC 110 EPOCEM

   SIKAREPAIR 222 FOR TOP SURFACE

   SIKAREPAIR 223 FOR BOTTOM SURFACE

   CONTRACTOR MAY SUBMIT ALTERNATE EQUIVALENT WHARF DECK REPAIR SYSTEM TO THE ENGINEER AND PORT FOR REVIEW AND APPROVAL. THE PRODUCTS INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
8. SEE NOTES ON SHEET S2.1 AND GENERAL NOTES.

**REFERENCE DRAWING**

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

REGISTERED PROFESSIONAL ENGINEER
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Exp. 03/31/2011
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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

WHARF DECK REPAIR NOTES AND DETAILS

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S3.3 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

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I:\Z1800\Dwg\Current\S3.3 WHARF DECK REPAIR NOTES AND DETAILS.dwg 1/24/2012 3:36 PM ALVIN HOFFPAUIR

# PROJECT NO. 4: DAMAGED CONCRETE PILES, BEAMS, AND DECK REPAIRS AT BERTHS 7 & 8

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# Project No: 4 - Damaged Concrete Piles, Beams, and Deck Repairs Berths 7 and 8

## Estimated Quantity Take-off for Construction Cost Estimates for Damaged Concrete Piles, Beams, and Deck Repairs at Berths 7 & 8

| Item | Description | Quantity | Unit | Damaged Factor | Total Quantity | Comments |
|---|---|---|---|---|---|---|
| Outer Wharf Concrete Piles, Beams, and Deck Repairs | | | | | | |
| 1 | Concrete piles | 120 | EA | 1.25 | 150 | Refer to as-built drawings for the quantity of the un-repaired concrete piles. Refer to reference drawing S3.5 for repair details. |
| 2 | WS Crane Beam, outer face - 6.3' deep x 1540' long | 9,702 | SF | 0.33 | 3,202 | Refer to reference drawing sheet S3.3 for similar concrete repair details. |
| 3 | WS Crane Beam, inner face - 6.3' deep x 1540' long | 9,702 | SF | 0.33 | 3,202 | Same notes above as item 2 |
| 4 | LS Crane Beam, outer face - 6.3' deep x 1540' long | 9,702 | SF | 0.33 | 3,202 | Same notes above as item 2 |
| 5 | LS Crane Beam, inner face - 6.3' deep x 1540' long | 9,702 | SF | 0.33 | 3,202 | Same notes above as item 2 |
| 6 | Underdeck soffit - 46.3' x 1540' | 71,302 | SF | 0.2 | 14,260 | Same notes above as item 2 |
| 7 | Deck top - 46.3 x 1540' | 71,302 | SF | 0.3 | 21,391 | Same notes above as item 2 |
| Inner Wharf - Concrete Pier and Deck Repairs | | | | | | |
| 1 | Install concrete piers for missing timber piles | 26 | EA | 1.25 | 33 | Refer to as-built drawings for the quantity of the un-repaired missing timber piles. Refer to reference drawing sheet S3.6 for repair details. |
| 2 | Repair damaged timber piles | 55 | EA | 1.25 | 69 | Refer to as-built drawings for the quantity of the un-repaired damaged timber piles. Refer to reference drawing S3.6 for repair details. |
| 3 | Underdeck soffit - 68' x 1540' | 104,720 | SF | 0.2 | 20,944 | Refer to repair details on reference drawing S3.3. |
| 4 | Deck top - 68' x 1540 | 104,720 | SF | 0.3 | 31,416 | Same notes above as item 3. |

## Budgetary Cost for Damaged Concrete Piles, Beams, and Deck Repairs at Berths 7 & 8

| Item | Description | Quantity | Unit | ROM Cost | Comments |
|---|---|---|---|---|---|
| Outer and Inner Wharf Concrete Piles, Beams, and Deck Repairs | | | | | |
| 1 | Construction cost estimates based on 2025 labor and material costs | One | EA | $99,927,461 | Refer to sheet 2 for Power Engineering Construction cost estimates. |
| 2 | Soft cost and contingency - 30% | One | EA | $29,978,238 | Refer to sheet 2 for assumptions and exclusions. The 30% add is to account for the cost associated with the exclusions and reasonable contingency. |
| | Total | | | $129,905,699 | |
| | **Budgetary Cost Estimates** | | | **$130,000,000** | |

Notes:
1. The budgetary cost is based on 2025 labor and material costs and does not include escalation for work performed in the future years and tariff impact.

Scope of Work:

Outer Wharf
1. Repair concrete piles identified in 2010 project but not repaired at that time.
2. Repair face beam corrosion damage identified in 2010 project but not repaired at that time.
3. Repair under deck soffit and top deck slab damage in accordance with reference drawing S3.3.

Inner Wharf
1. Install concrete piers at the missing timber piles in accordance with detail 3/S3.6 shown in reference drawing S3.6.
2. Repair damage timber piles in accordance with detail 2/S3.6 shown in reference drawing S3.6.
3. Repair damage under deck soffit and top deck in accordance to reference drawing S3.3

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# Project No: 4 - Construction Cost Estimates and Duration prepared by Power Engineering Company

**Project 4: Pile and Soffit Repair in Berth 7 & 8**
**Richmond, California**

## ROM Budget for Project 4: Pile and Soffit Repair in Berth 7 & 8

**Date: May 16, 2025**

| | Description | Quantity | Units | $/Unit | Total | Comments | Working Days |
|---|---|---|---|---|---|---|---|
| **Mobilization Allowance** | | | | | | | |
| 1 | Mobilize/Demobilize | 1 | LS | $ 560,000 | $ 560,000 | | 24 |
| | | Revised Quantity = 150 | | | | Adjusted Price: | |
| **Outer Wharf** | | | | | | | |
| 2 | F&I Fiberglass Jacket (with Rebar) to Encase Existing Concrete Pile - assume 10' Jacket + 2' of Embedment | 181 | EA | $ 24,500 | $ 4,434,500 | $3,675,000 | 42 |
| 3 | WS Crane Beam, outer face - 6' 3" deep x 1,540' long: Spall Repair | 3,202 | SF | $ 1,476 | $ 4,726,152 | | 27 |
| 4 | WS Crane Beam, inner face - 6' 3" deep x 1,540' long: Spall Repair | 3,202 | SF | $ 1,476 | $ 4,726,152 | | 27 |
| 5 | LS Crane Beam, outer face - 6' 3" deep x 1,540' long: Spall Repair | 3,202 | SF | $ 1,476 | $ 4,726,152 | | 27 |
| 6 | LS Crane Beam, inner face - 6' 3" deep x 1,540' long: Spall Repair | 3,202 | SF | $ 1,476 | $ 4,726,152 | | 26 |
| 7 | Underdeck Soffit - 46.3' x 1,540': Spall Repair | 14,260 | SF | $ 1,337 | $ 19,065,620 | | 107 |
| 8 | Deck Top - 46.3' x 1,540': Spall Repair | 21,391 | SF | $ 515 | $ 11,016,365 | | 122 |
| | | Revised Quantity = 33 | | | | | |
| **Inner Wharf** | | | | | | | |
| 9 | F&I Fiberglass Jacket (with Rebar) to Repair Missing Timber Pile - assume 10' Jacket + 2' of Embedment | 61 | EA | $ 24,750 | $ 1,509,750 | $ 816,750 | 14 |
| 10 | F&I Fiberglass Jacket (with Rebar) to Encase Existing Timber Pile - assume 10' Jacket + 2' of Embedment | 91 | EA | $ 24,750 | $ 2,252,250 | $1,707,750 | 21 |
| 11 | Underdeck Soffit - 68' x 1,540': Spall Repair | 20,944 | SF | $ 1,337 | $ 28,002,128 | | 157 |
| | | Revised Quantity = 69 | | | | | |
| 12 | Deck Top - 68' x 1,540': Spall Repair | 31,416 | SF | $ 515 | $ 16,179,240 | | 88 |
| | **Total Base Scope:** | | | **$** | **101,924,461** | $99,927,461 | **682** |

**Project Assumptions**

1 A working day is defined as an 8-hour weekday between the hours of 6 AM - 5 PM.
2 The working days do not include fabrication times for materials.
3 Only one mobilization is assumed, with continuous work until project completion.
4 All pricing is in current dollars.
5 No contingency is included in this budget.

**Schedule Milestones**

1 We estimate the on-site construction would take approximately 2.6 years with an average crew of 84 craft workers.

**Design Assumption**

1 Per Liftech Sketches, May 2025

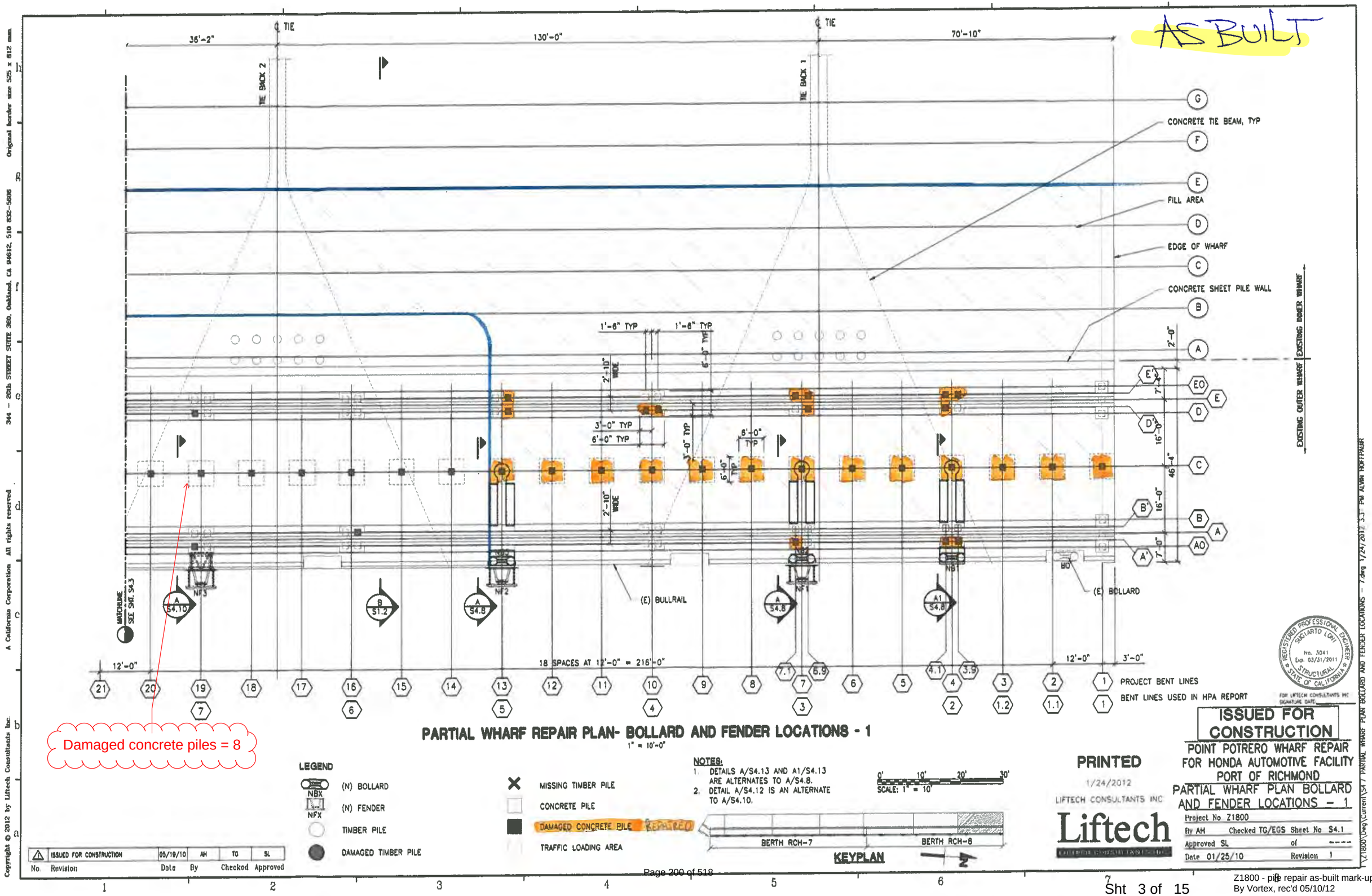
**Subcontractors**

1 None assumed.

**Proposal Exclusions**

1 Payment and Performance Bonds (available at 1.5% of final contract amount)
2 Builders Risk Insurance (can be provided on a per-project basis)
3 Permits and Permit Fees
4 Engineering or Design
5 Utility Relocation unless Listed Above
6 Site Survey, Lines, Grade
7 Hazardous Materials Handling/Abatement/Removal
8 Special Inspection or Testing Fees
9 Vibration or Damage Monitoring
10 Any Repairs to the Existing Structures, Interior or Exterior, either prior to, during, or after Construction
11 Temporary Power & Lighting Install and Supply
12 Industrial Hygienist or Inspection Services
13 Silt Curtain, Bubble Curtain, or other regulatory requirements not normally encountered.

AS BUILT




Damaged concrete piles = 8

## PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 1

1" = 10'-0"

LEGEND

- NBX (N) BOLLARD
- NFX (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE REPAIRED
- TRAFFIC LOADING AREA

NOTES:
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'




KEYPLAN

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/10/10 | AH | TG | SL |

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 1

| | |
|---|---|
| Project No | Z1800 |
| By AH | Checked TG/EGS Sheet No S4.1 |
| Approved SL | of ----- |
| Date 01/25/10 | Revision 1 |

REGISTERED PROFESSIONAL ENGINEER SHAHARTO LOWI No. 3041 Exp. 03/31/2011 STRUCTURAL STATE OF CALIFORNIA

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344 - 20th STREET SUITE 350, Oakland, CA 94612, 510 832-5606

Original border size 525 x 612 mm

Z:\Z1800\Dwg\Current\S4.1 PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 1.dwg 1/24/2012 3:3 PM ALVIN HOFFMAN

AS BUILT

Damaged concrete piles =11
Damaged timber piles = 6

# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 2

1" = 10'-0"

LEGEND

- (N) BOLLARD (NBX)
- (N) FENDER (NFX)
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE REPAIRED
- TRAFFIC LOADING AREA
- UNREPAIRED

NOTES:
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'

KEYPLAN

BERTH RCH-7 BERTH RCH-8

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 2

Project No. Z1800
By AH Checked TG/EGS Sheet No S4.2
Approved SL of ----
Date 01/25/10 Revision 1

PROJECT BENT LINES
BENT LINES USED IN HPA REPORT
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Z1800 - pile repair as-built mark-ups
By Vortex, rec'd 05/10/12

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ASBUILT

(N) SHEET PILE WALL

(E) CUT-OFF WALL

TIE BACK 5

TIE BACK 4

TIE

100'-2"

142'-0"

15'-10"

11'-11"

9'-0"

Damaged concrete piles = 50
Damaged timber piles = 19
Missing timber piles = 4

EXISTING OUTER WHARF

EXISTING INNER WHARF

2'-0"

7'-4"

16'-0"

46'-4"

16'-0"

7'-10"

NF10

NF9

NF8

NF7

B7

(E) BOLLARD

(E) BULLRAIL

FUTURE BOLLARD. CONTRACTOR TO FURNISH AND INSTALL ANCHOR BOLTS.

MATCHLINE SEE SHT. S4.2

MATCHLINE SEE SHT. S4.4

12'-0" 12'-0" 6'-0" 19 SPACES AT 12'-0" = 228'-0" 12'-0"

64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41

1.7 1.3 1 21 20 19 18 17 16 15

BENT LINES USED IN COLLINS REPORT

PROJECT BENT LINES

BENT LINES USED IN HPA REPORT

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SIGNATURE DATE

# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 3

1" = 10'-0"

**SHEET PILE WALL NOTE:**
1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

LEGEND
- (N) BOLLARD (NBX)
- (N) FENDER (NFX)
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE REPAIRED
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10

SCALE: 1" = 10'

KEYPLAN: BERTH RCH-7, BERTH RCH-8

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 3

Project No. Z1800
By AH Checked TG/EGS Sheet No S4.3
Approved SL of ----
Date 01/25/10 Revision 1

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Z1800 - pile repair as-built mark-ups
By Vortex, rec'd 05/10/12

ASBUILT

Damaged concrete piles = 15
Damaged timber piles = 5
Missing timber piles = 2

# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 4

1" = 10'-0"

**SHEET PILE WALL NOTE:**
1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**
- (N) BOLLARD (NBX)
- (N) FENDER (NFX)
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE REPAIRED
- CONCRETE PILE
- DAMAGED CONCRETE PILE REPAIRED
- TRAFFIC LOADING AREA DESIGNATED BLUE

**NOTES:**
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'

**KEYPLAN**

| No | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

PROJECT BENT LINES
BENT LINES USED IN COLLINS REPORT

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FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 4

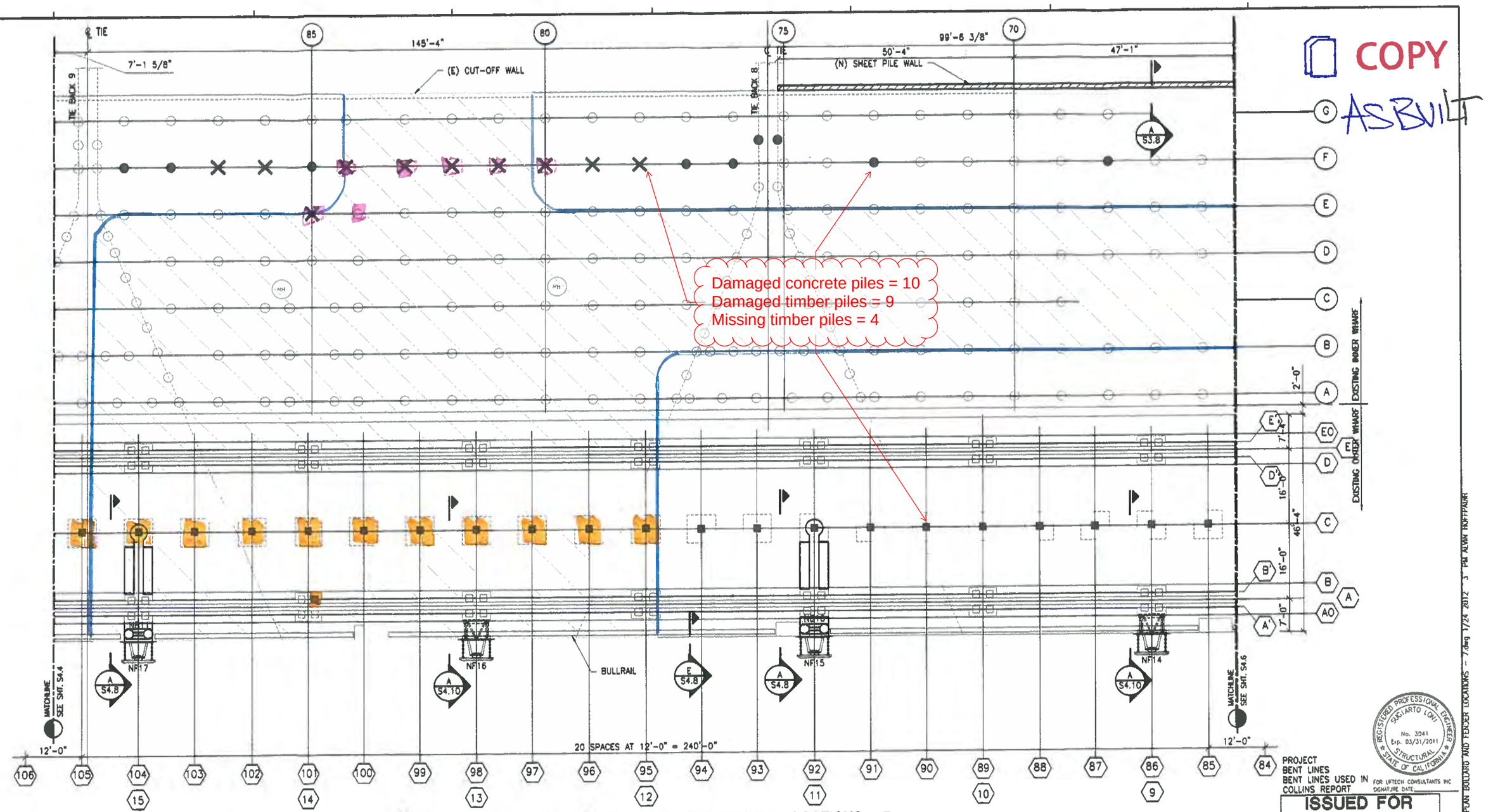
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By AH Checked TG/EGS Sheet No S4.4
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Date 01/25/10 Revision 1

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COPY
ASBUILT




# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 5

1" = 10'-0"

**SHEET PILE WALL NOTE:**

1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

**LEGEND**

- (N) BOLLARD (NBX)
- (N) FENDER (NFX)
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE REPAIRED
- CONCRETE PILE
- DAMAGED CONCRETE PILE REPAIRED
- TRAFFIC LOADING AREA DELINIATED BLUE

**NOTES:**

1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'

BERTH RCH-7 BERTH RCH-8

KEYPLAN

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BENT LINES
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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 5

Project No. Z1800
By AH Checked TG/EGS Sheet No S4.5
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COPY

AS BUILT

21'-10 7/8" | 77'-11 3/4" | 142'-0 5/16" | 10'-1 1/8"

110 | 105 | 100 | 95 | 90

℄ TIE

TIE BACK 10

(E) CUT-OFF WALL

(N) SHEET PILE WALL

20'-0" | 10'-0"

A S3.8

Damaged concrete piles = 22
Damaged timber piles = 14
Missing timber piles = 14

G | F | E | D | C | B | A

2'-0"

E' | EO | E | D | D' | C | B' | B | A | AO | A'

7'-4" | 16'-0" | 46'-4" | 16'-0" | 17'-0"

EXISTING OUTER WHARF | EXISTING INNER WHARF

NB12 | NF20 | NF19 | NF18

A1 S4.8 | A S4.10 | A S4.10 | E S4.8 | A S4.10

BULLRAIL

MATCHLINE SEE SHT. S4.5

MATCHLINE SEE SHT. S4.7

12'-0" | 20 SPACES AT 12'-0" = 240'-0" | 12'-0"

27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05

22 | 21 | 20 | 19 | 18 | 17 | 16

# PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 6

1" = 10'-0"

**SHEET PILE WALL NOTE:**
1. IF THE INSTALLATION OF THE SHEET PILE WALL IS DEFERRED THEN 10'-0" WIDTH OF THE AREA TO THE WEST OF THE WALL SHALL BE BLOCKED OF FROM USE.
2. REMOVE EXISTING FIRE HYDRANT BOLLARD, WHERE OCCURS, FOR SHEET PILE INSTALLATION.

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|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 5/19/10 | AH | TG | SL |

LEGEND

- NBX — (N) BOLLARD
- NFX — (N) FENDER
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

**NOTES:**
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10' (0' 10' 20' 30')

BERTH RCH-7 | BERTH RCH-8

KEYPLAN

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PROJECT
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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS - 6

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No | S4.6 |
| Approved SL | | of | ----- |
| Date 01/25/10 | | Revision | 1 |

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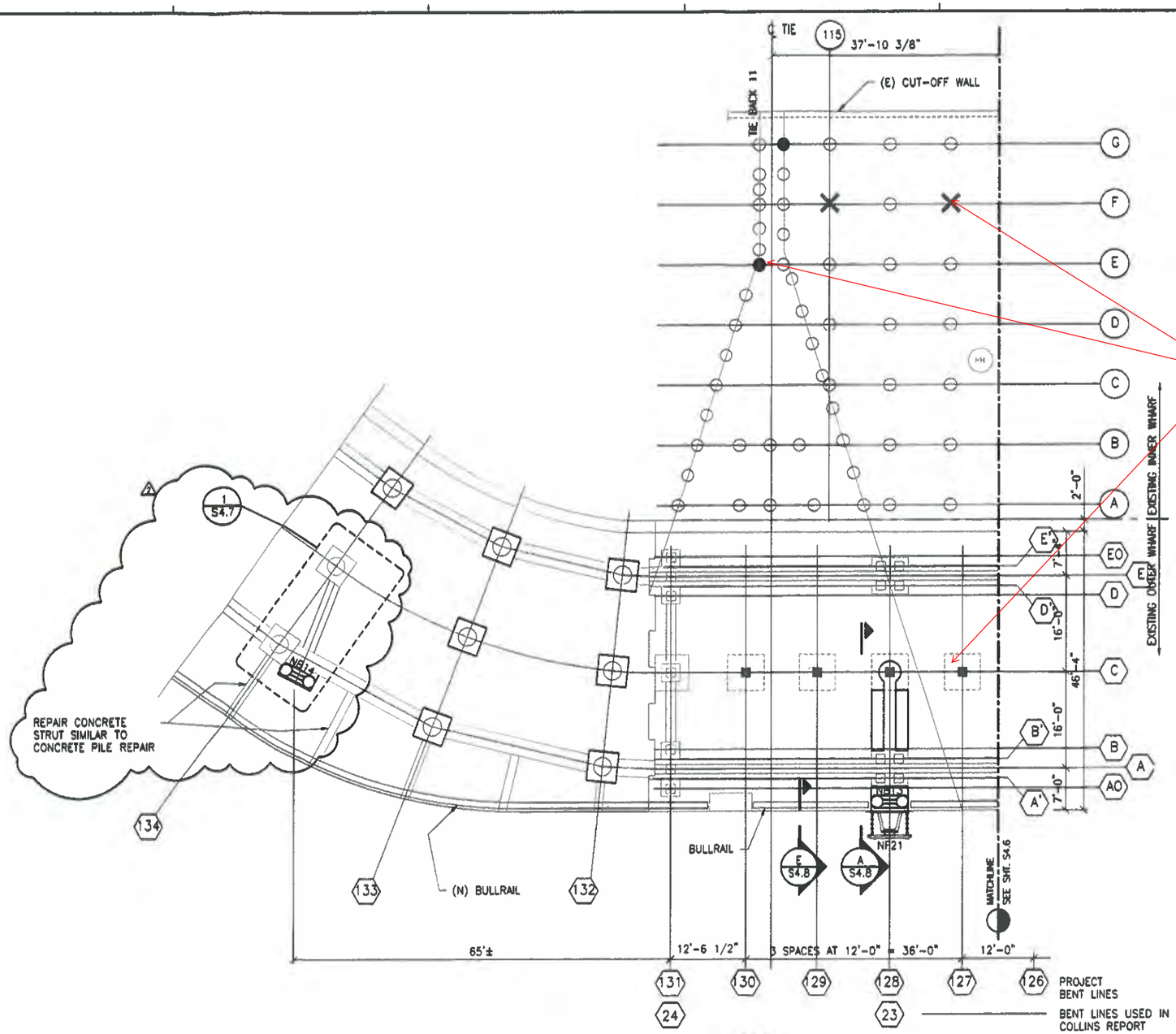


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AS-BUILT




Damaged concrete piles = 4
Damaged timber piles = 2
Missing timber piles = 2

Total damaged concrete piles
=(8+11+50+15+10+22+4)=120

Total damaged timber piles:
=(6+19+5+9+14+2) = 55

Total missing timber piles:
=(4+2+4+14+2) = 26

## PARTIAL WHARF REPAIR PLAN- BOLLARD AND FENDER LOCATIONS - 7

1" = 10'-0"

LEGEND

- (N) BOLLARD (NBX)
- (N) FENDER (NFX)
- TIMBER PILE
- DAMAGED TIMBER PILE
- MISSING TIMBER PILE
- CONCRETE PILE
- DAMAGED CONCRETE PILE
- TRAFFIC LOADING AREA

NOTES:
1. DETAILS A/S4.13 AND A1/S4.13 ARE ALTERNATES TO A/S4.8.
2. DETAIL A/S4.12 IS AN ALTERNATE TO A/S4.10.

SCALE: 1" = 10'

KEYPLAN: BERTH RCH-7 — BERTH RCH-8

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 2 | BOLLARD NO. 14 SUPPORT | 06/11/10 | LMK/AH | TG | SL |
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FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
PARTIAL WHARF PLAN BOLLARD AND FENDER LOCATIONS – 7

Project No. Z1800
By AH Checked TG/EGS Sheet No. S4.7
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By Vortex, rec'd 05/10/12

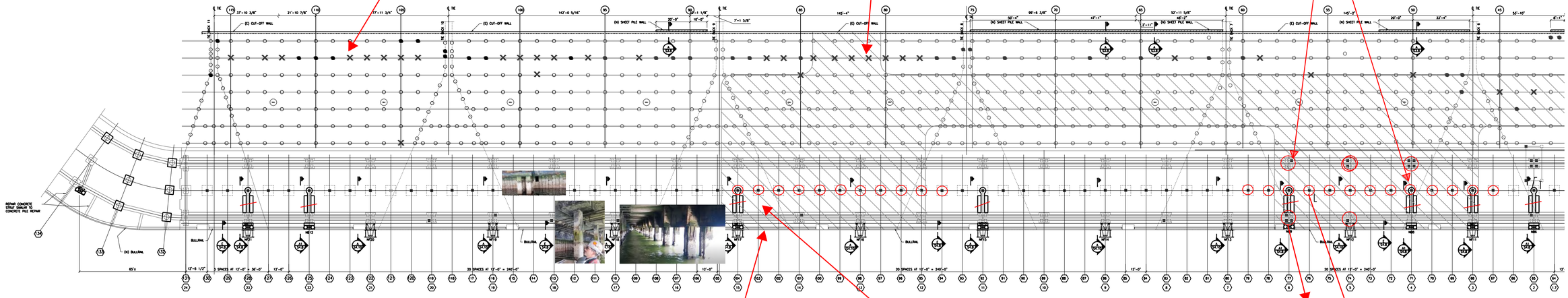
| LIFTECH CONSULTANTS INC. | |
|---|---|
| **Job No.** 2525 | |
| **Project** Port of Richmond | |
| **By** SL **Chkd** XXX | **Approved** XXX |
| **Date** 04/24/2025 | **Sheet** XX **of** XX |
| Pile and soffit repair quantity | |
| | |
| | |






Nearly entire row of piles missing between tie-backs

Piles circled in red were repaired in 2010 project. Typical.



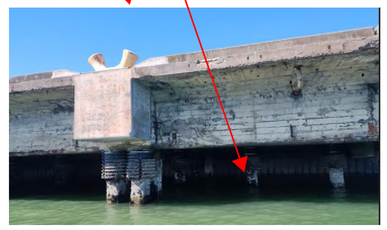





Delamination and Spalling Concrete near Wharf Face



Delamination and Spalling Concrete at Soffit

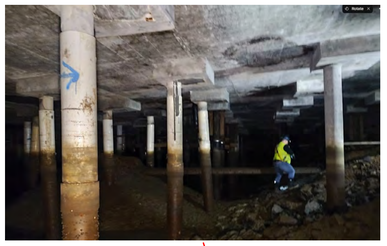


**Project No: 4 - Pile and Soffit Repair**
**Berths 7 and 8**

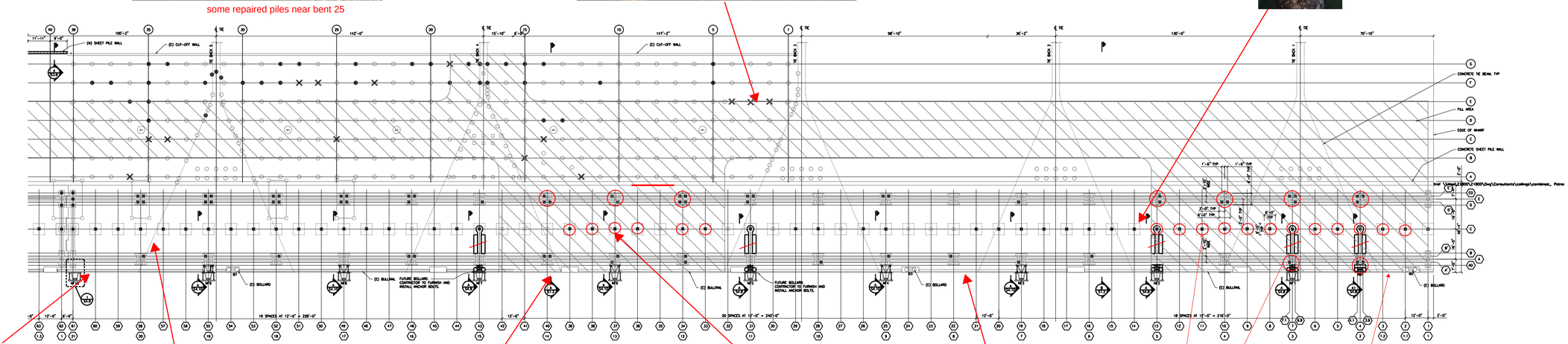
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|---|---|
| **Job No.** 2525 | |
| **Project** Port of Richmond | |
| **By** SL **Chkd** XXX | **Approved** XXX |
| **Date** 04/24/2025 | **Sheet** XX **of** XX |
| Pile and soffit repair quantity | |
| | |
| | |

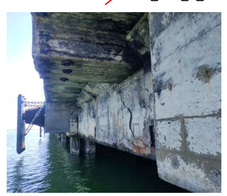


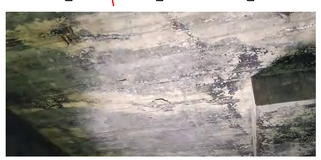
some repaired piles near bent 25

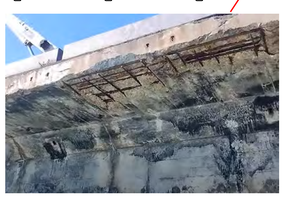


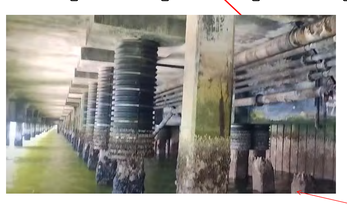


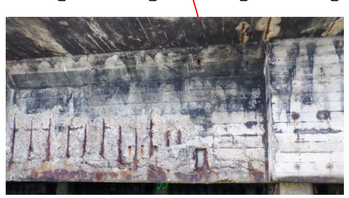




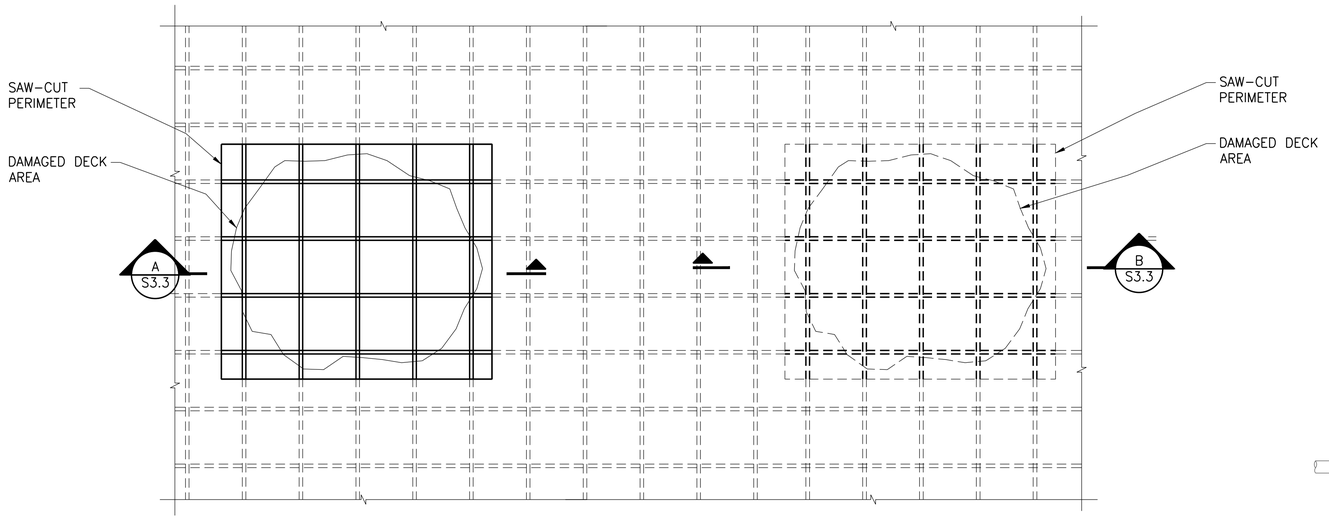








Piles circled in red were repaired in 2010 project. See photo. Typical

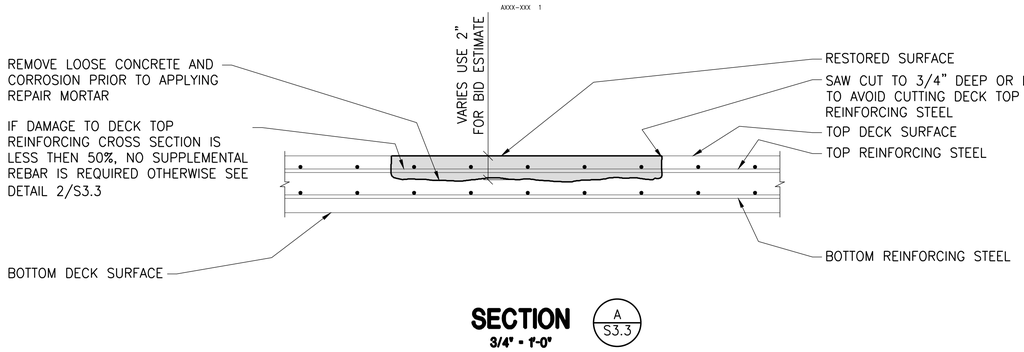



DAMAGED TOP DECK SURFACE REPAIR

DAMAGED BOTTOM DECK SURFACE REPAIR

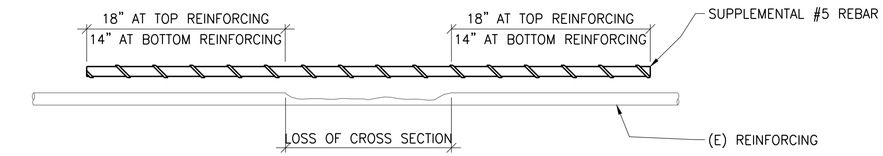
## CONCRETE REMOVAL AND SURFACE PREPARATION (1 / S3.3)

3/4" = 1'-0"




## SECTION (A / S3.3)

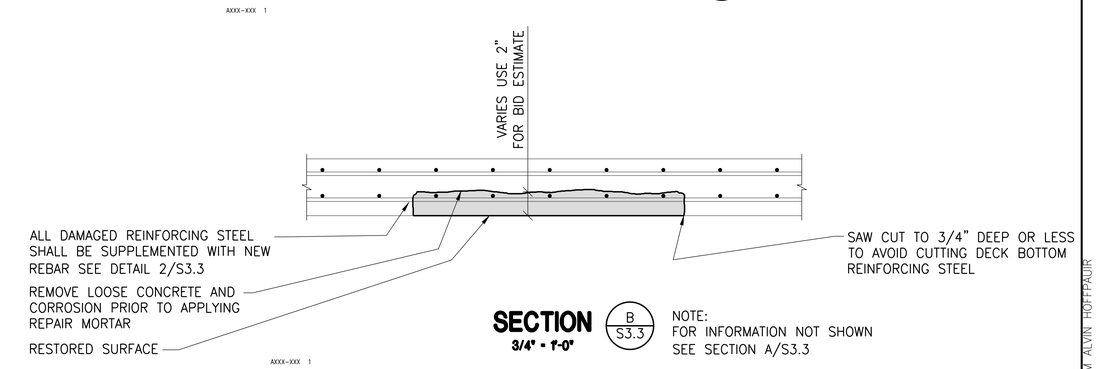
3/4" = 1'-0"




PLAN

## SUPPLEMENTAL REBAR DETAIL (2 / S3.3)

DO NOT SCALE




## SECTION (B / S3.3)

3/4" = 1'-0"

NOTE:
FOR INFORMATION NOT SHOWN SEE SECTION A/S3.3

## WHARF DECK REPAIR NOTES:

1. THE PURPOSE OF THE WHARF DECK REPAIR IS TO RESTORE THE WHARF STRUCTURAL STRENGTH TO SUPPORT A DESIGN LIVE LOAD OF 250 PSF AND TO EXTEND THE SERVICE LIFE OF THE STRUCTURE.
2. THE DECK REPAIR WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
   a. AMERICAN CONCRETE INSTITUTE, CONCRETE REPAIR GUIDE. FARMINGTON HILLS, MI: AMERICAN CONCRETE INSTITUTE, 2004.
   b. AMERICAN CONCRETE INSTITUTE, SURFACE REPAIR USING FORM-AND-PUMP TECHNIQUES. FARMINGTON HILLS, MI: AMERICAN CONCRETE INSTITUTE, 2003.
   c. INTERNATIONAL CONCRETE REPAIR INSTITUTE, GUIDE FOR SURFACE PREPARATION FOR THE REPAIR OF DETERIORATED CONCRETE RESULTING FROM REINFORCING STEEL CORROSION (GUIDELINE NO. 310.1R-2008). DES PLAINES, IL: INTERNATIONAL CONCRETE REPAIR INSTITUTE, 2008..
3. AT REPAIR AREAS CONTRACTOR SHALL PERFORM SOUNDING OR OTHER APPROPRIATE NON-DESTRUCTIVE CONCRETE TESTING TO LOCATE AREAS OF DELAMINATION FOR THE TOP AND BOTTOM DECK SURFACES OF INNER AND OUTER WHARVES FOR BERTH RCH-7 AND RCH-8.
4. CONTRACTOR SHALL MARK THE PERIMETER OF THE DECK REPAIR AREAS TO BE SAW CUT. LAYOUT SHALL BE SQUARE OR RECTANGULAR IN SHAPE. NOTIFY THE ENGINEER FOR REVIEW OF THE PERIMETER TO BE SAW CUT AREA PRIOR TO THE CUTTING.
5. SPECIAL INSPECTION IS REQUIRED FOR SURFACE PREPARATION PRIOR TO INSTALLATION OF STRUCTURAL REPAIR CONCRETE.
6. THE WHARF DECK REPAIR SYSTEM CONSISTING OF REBAR PROTECTION AND MORTAR SHALL BE COMPATIBLE AND SHALL BE SUPPLIED BY A SINGLE SOURCE SO THAT THE REPAIR SYSTEM PERFORMS AS WARRANTIED BY THE PRODUCTS MANUFACTURER
7. THE FOLLOWING CONCRETE AND TIMBER PILE REPAIR PRODUCTS ARE ACCEPTABLE:

   BASF CONSTRUCTION CHEMICAL, LLC
   EMACO S66 CI, FLOWABLE STRUCTURAL-REPAIR CONCRETE WITH INTEGRAL CORROSION INHIBITOR, FOR TOP DECK SURFACE REPAIR

   EMACO S88 CI, SPRAYABLE FIBER-REINFORCED STRUCTURAL REPAIR MORTAR WITH INTEGRAL CORROSION INHIBITOR FOR BOTTOM DECK SURFACE REPAIR.

   MASTERSEAL CP, ADVANCED CORROSION INHIBITOR TREATMENT FOR STEEL REINFORCED CONCRETE, APPLIED TO REPAIRED AREAS.

   SIKA CORPORATION
   SIKA ARMATEC 110 EPOCEM

   SIKAREPAIR 222 FOR TOP SURFACE

   SIKAREPAIR 223 FOR BOTTOM SURFACE

   CONTRACTOR MAY SUBMIT ALTERNATE EQUIVALENT WHARF DECK REPAIR SYSTEM TO THE ENGINEER AND PORT FOR REVIEW AND APPROVAL. THE PRODUCTS INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
8. SEE NOTES ON SHEET S2.1 AND GENERAL NOTES.

**REFERENCE DRAWING**

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

REGISTERED PROFESSIONAL ENGINEER
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No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

WHARF DECK REPAIR NOTES AND DETAILS

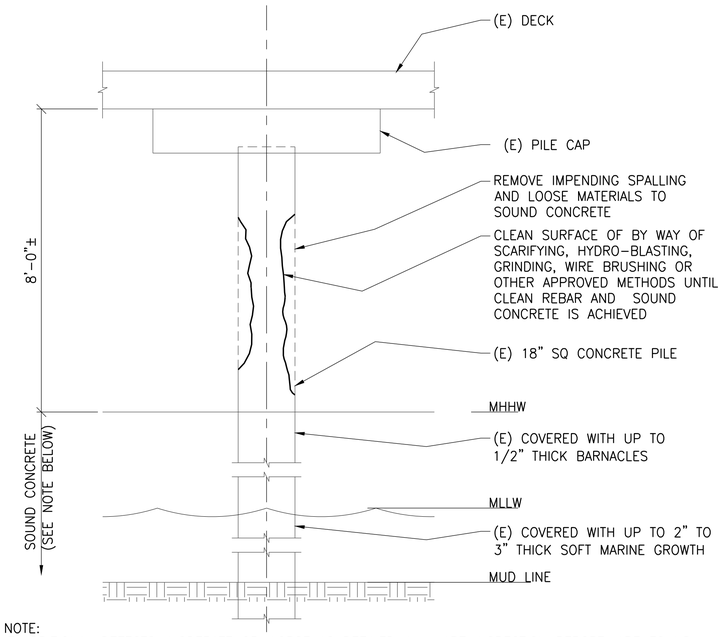
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|---|---|---|---|
| Project No. | Z1800 | | |
| By AH | Checked TG/EGS | Sheet No. | S3.3 |
| Approved SL | | of | ---- |
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Sht 12 of 15

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I:\Z1800\Dwg\Current\S3.3 WHARF DECK REPAIR NOTES AND DETAILS.dwg 1/24/2012 3:36 PM ALVIN HOFFPAUIR



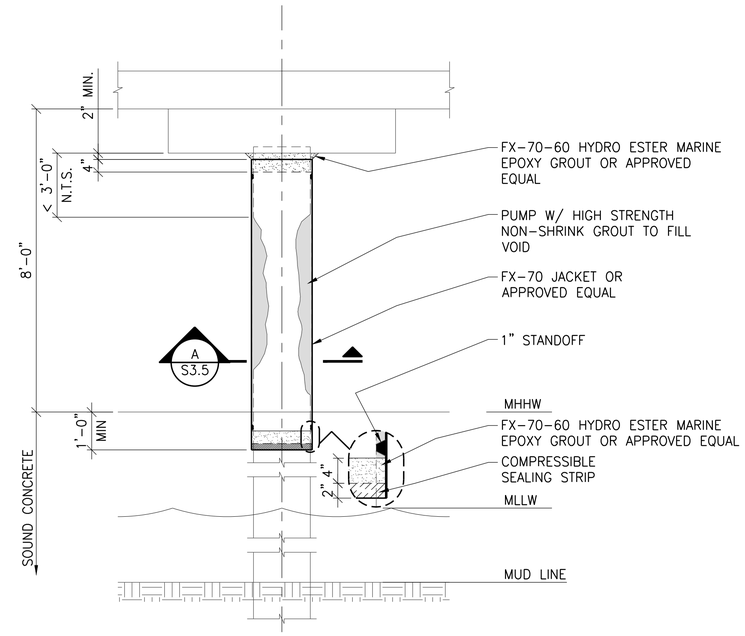

NOTE:
IF ADDITIONAL DEFECTS, MODERATE OR WORSE AS DEFINED IN WHARF INSPECTION REPORT, ARE FOUND BELOW MHHW, NOTIFY ENGINEER AND PORT. ADDITIONAL REPAIRS MAY BE REQUIRED.

## TYPICAL CONCRETE PILE DAMAGED SURFACE PREPARATION

1/2" = 1'-0"

1 / S3.5

AXXX-XXX 1

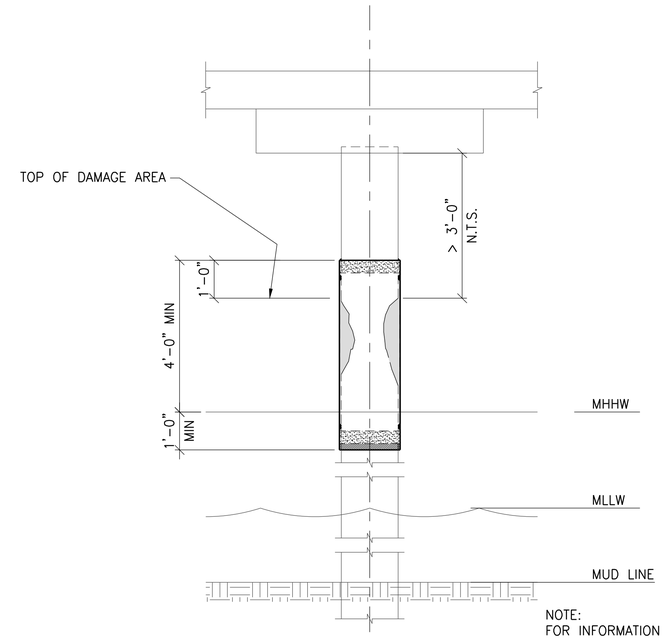



## TYPICAL CONCRETE PILE REPAIR DETAIL - 1

1/2" = 1'-0"

2 / S3.5

PILE_REPAIR-1 1



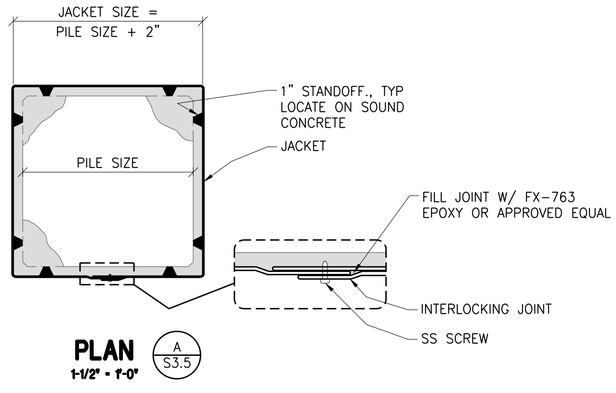

NOTE:
FOR INFORMATION NOT SHOWN SEE DETAIL 2/S3.5

## TYPICAL CONCRETE PILE REPAIR DETAIL - 2

1/2" = 1'-0"

3 / S3.5

PILE_REPAIR-1 1




## PLAN

1-1/2" = 1'-0"

A / S3.5

AXXX-XXX 1

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

CONCRETE PILE REPAIR DETAILS

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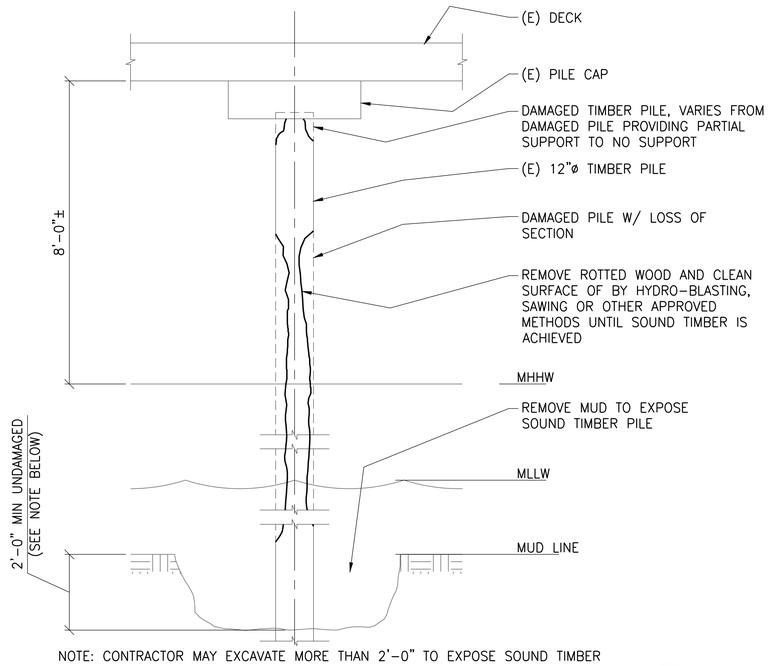
Project No. Z1800
By AH Checked TG/EGS Sheet No. S3.5
Approved SL of ----
Date 01/25/10 Revision 1

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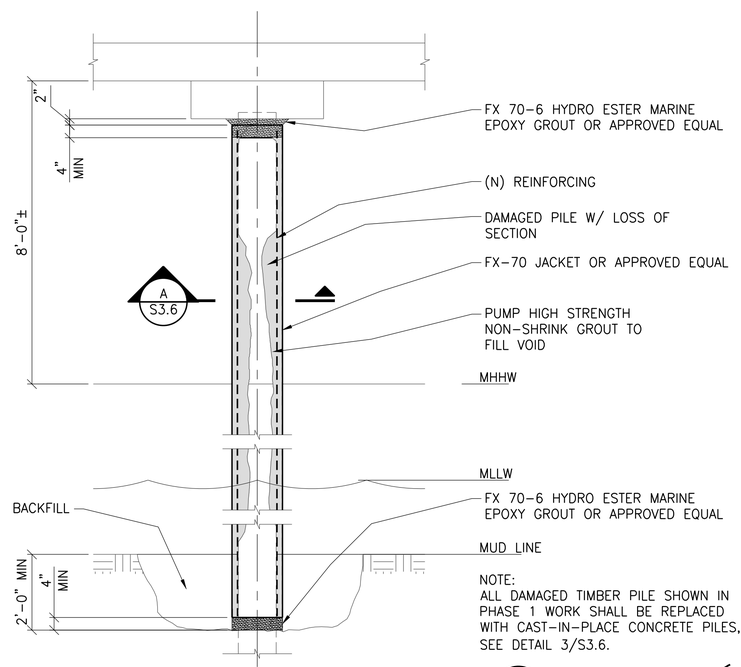

NOTE: CONTRACTOR MAY EXCAVATE MORE THAN 2'-0" TO EXPOSE SOUND TIMBER

## TYPICAL TIMBER PILE DAMAGED SURFACE PREPARATION

1/2" = 1'-0"

1 / S3.6

AXXX-XXX 1




NOTE:
ALL DAMAGED TIMBER PILE SHOWN IN PHASE 1 WORK SHALL BE REPLACED WITH CAST-IN-PLACE CONCRETE PILES, SEE DETAIL 3/S3.6.

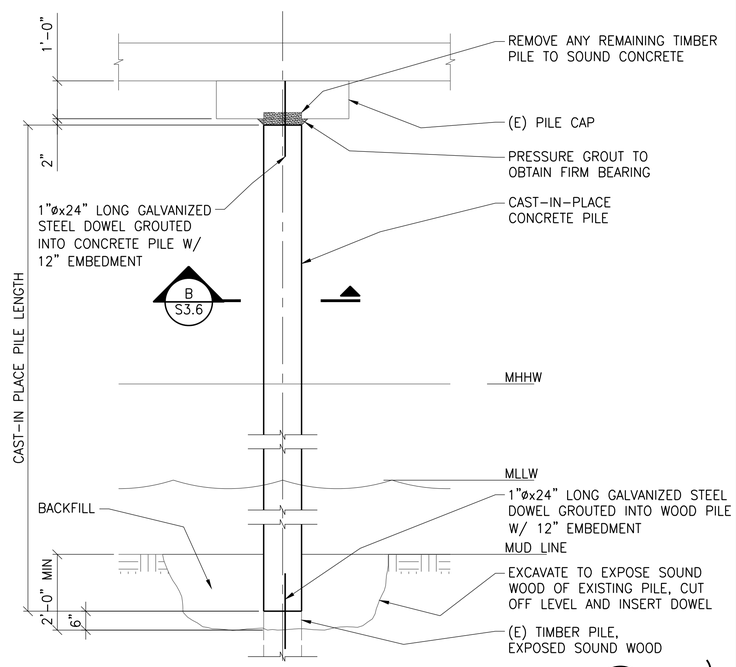
## TYPICAL TIMBER PILE REPAIR DETAIL

1/2" = 1'-0"

2 / S3.6

TIM_PILE_REPAIR-1 1

NOTE:
CONTRACTOR HAS THE OPTION TO REPAIR TIMBER PILE OR REPLACE DAMAGED PILE WITH CAST-IN-PLACE CONCRETE PILE PER DETAIL 3/S3.6



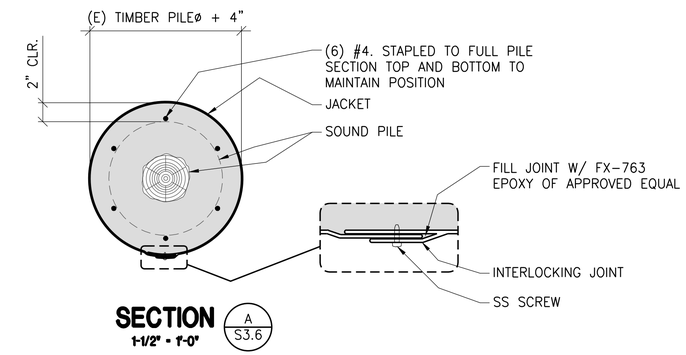

## (N) CAST-IN-PLACE PILE TO REPLACE MISSING PILES

1/2" = 1'-0"

3 / S3.6

TIM_PILE_REPAIR-1 1

NOTES:
1. IF CAST-IN-PLACE CONCRETE PILE LENGTH IS 24'-0" OR LESS, USE 12" DIAMETER PILE
2. IF CAST-IN-PLACE CONCRETE PILE LENGTH IS BETWEEN 24'-0" AND 28'-0", USE 14" DIAMETER PILE.

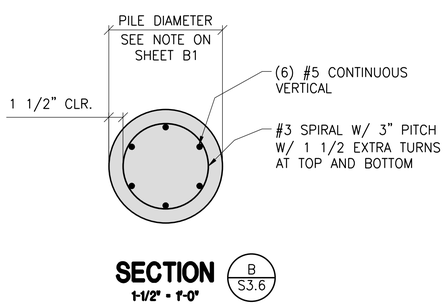



## SECTION

1-1/2" = 1'-0"

A / S3.6

AXXX-XXX 1




## SECTION

1-1/2" = 1'-0"

B / S3.6

AXXX-XXX 1

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

TIMBER PILE REPAIR AND REPLACEMENT DETAILS

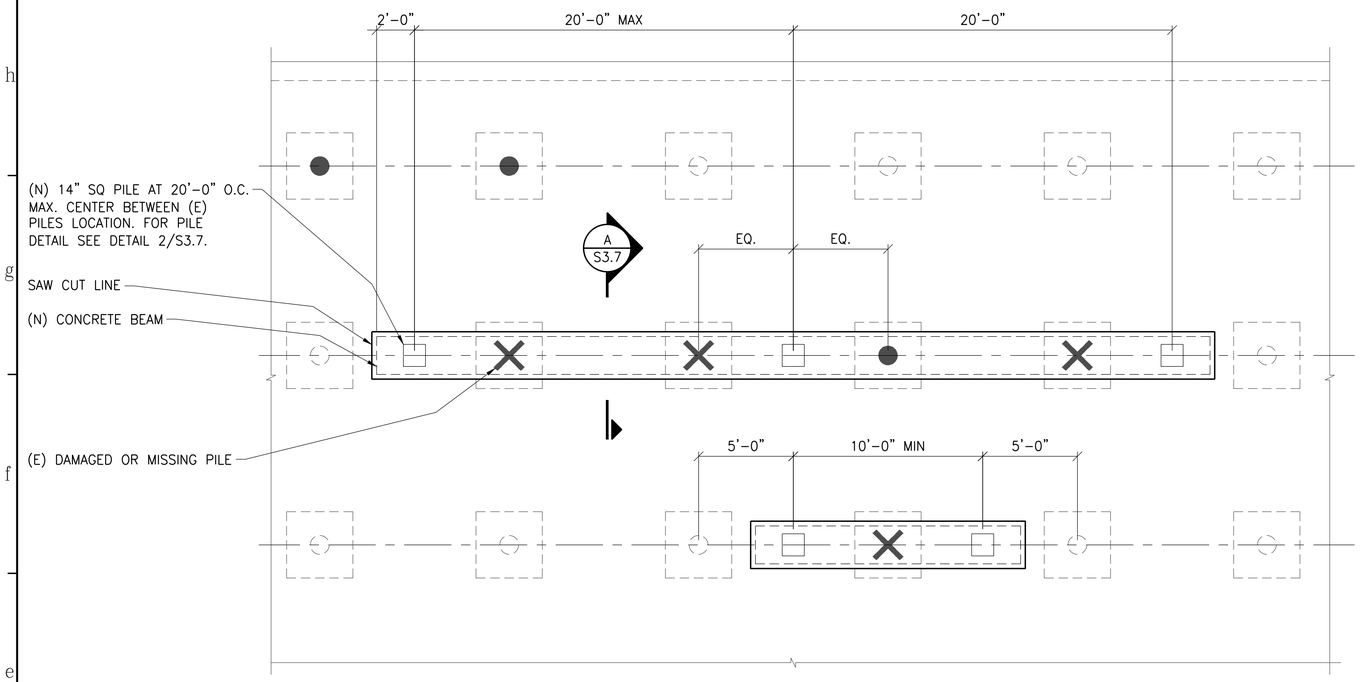
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| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S3.6 |
| Approved SL | | of | ---- |
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Sht 14 of 15

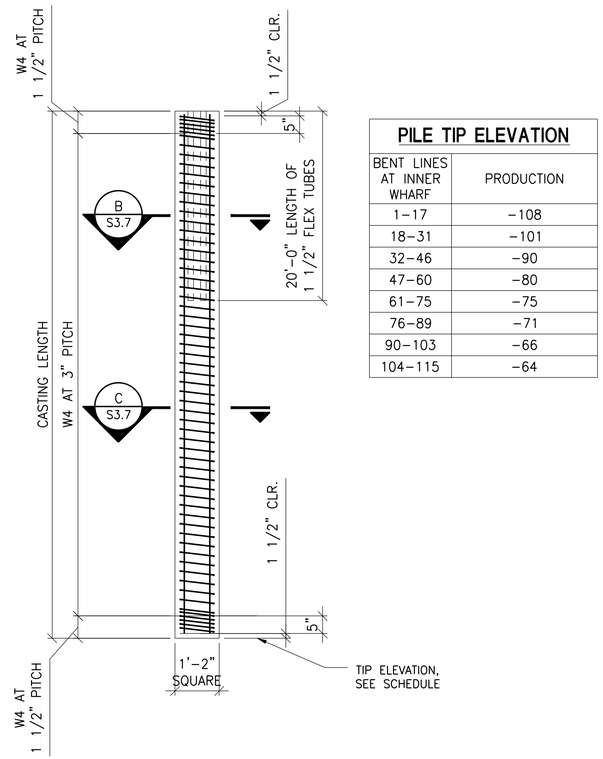
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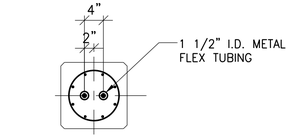
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## PLAN AT PILE REPAIR (1 / S3.7)
1/4" = 1'-0"

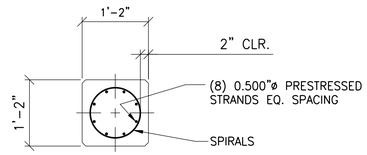



| PILE TIP ELEVATION | |
|---|---|
| BENT LINES AT INNER WHARF | PRODUCTION |
| 1–17 | –108 |
| 18–31 | –101 |
| 32–46 | –90 |
| 47–60 | –80 |
| 61–75 | –75 |
| 76–89 | –71 |
| 90–103 | –66 |
| 104–115 | –64 |

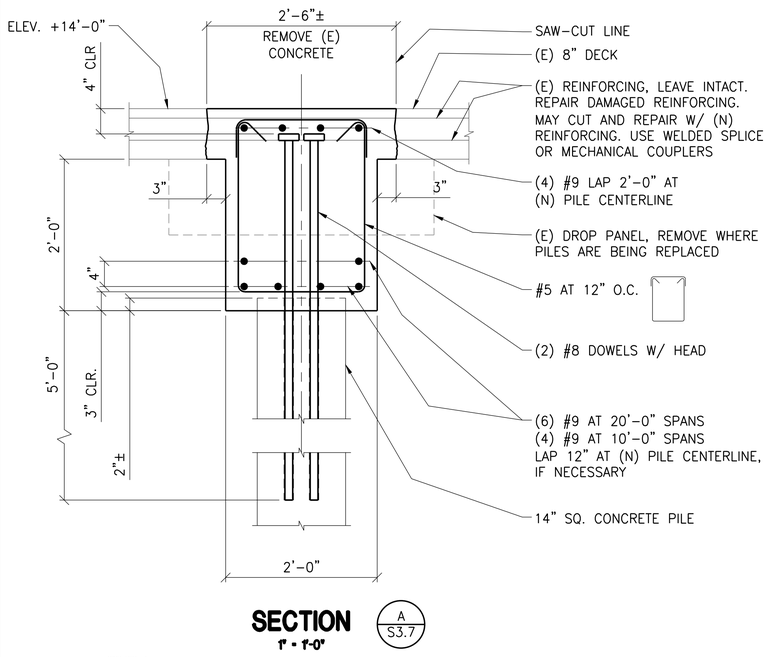



NOTE:
FOR INFORMATION NOT SHOWN SEE DETAIL C/S3.7

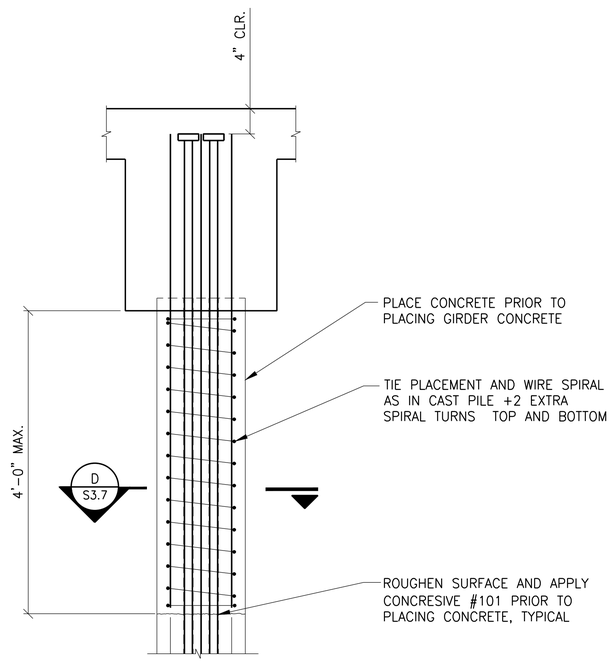
## SECTION (B / S3.7)
3/4" = 1'-0"




## 14" SQ PRESTRESSED CONCRETE PILE DETAIL (2 / S3.7)
DO NOT SCALE



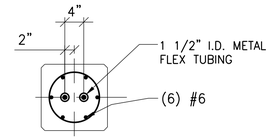

## SECTION (A / S3.7)
1" = 1'-0"




## CAST IN PLACE PILE EXTENSION (B / S3.7)
1" = 1'-0"

### PRESTRESSED PILE NOTES:
1. MINIMUM CONCRETE COMPRESSIVE STRENGTH SHALL BE F'C = 6000 PSI AT 28 DAYS AND F'C AT TRANSFER OF STRESS F'C = 4000 PSI.
2. MATERIALS
   - CEMENT SHALL BE TYPE II OR MODIFIED TYPE II
   - AGGREGATES SHALL BE PER ASTM C33 3/4" MAX.
   - PRESTRESSED STRANDS SHALL BE ASTM A416 LOW RELAXATION 7-WIRE STRANDS WITH MIN. BREAKING STRENGTH OF 270 KSI.
   - MILD REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60.
   - SPIRAL BARS SHALL BE ASTM A82 COLD DRAWN WIRE WITH MINIMUM YIELD STRENGTH OF 70 KSI.
   - HEADED REINFORCEMENT SHALL CONFORM TO ASTM A970-08
3. MINIMUM CONCRETE COVER OVER SPIRAL SHALL BE 2".
4. MAXIMUM JACKING FORCE PER STRAND SHALL BE 28.9 KIPS.
5. MINIMUM EFFECTIVE PRESTRESS IN CONCRETE, AFTER LOSSES = 800 PSI.
6. PILES SHALL BE DRIVEN TO REFUSAL. THE REQUIRED BLOW COUNT WILL BE DETERMINED BY FUGRO AFTER SUBMISSION OF THE PROPOSED PILE DRIVING HAMMER. THE TIP ELEVATIONS HAVE BEEN SET SO PILES ARE EMBEDDED 3'-0" INTO BED ROCK. PILES MAY HAVE TO BE CUT-OFF OR EXTENDED IF BEDROCK ELEVATIONS VARIES FROM ESTIMATED.
7. PILES HAVE BEEN PROPORTIONED FOR A DEAD LOAD PLUS LIVE LOAD ALLOWABLE COMPRESSIVE CAPACITY OF 130 KIPS IN ACCORDANCE WITH THE FOUNDATION RECOMMENDATION BY FUGRO, INC. REFER TO FUGRO'S LETTER REPORT DATED 01/27/10, FUGRO PROJECT NO. 1413.005.
8. ELEVATIONS ARE WITH REFERENCE TO MLLW.

NOTE:
THIS SHEET IS NOT USED FOR PHASE 1 WORK.




NOTE:
FOR INFORMATION NOT SHOWN SEE DETAIL C/S3.7

## SECTION (C / S3.7)
3/4" = 1'-0"

## SECTION (D / S3.7)
3/4" = 1'-0"

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No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND
ALTERNATE TIMBER PILE REPLACEMENT DETAILS

Project No. Z1800
By AH Checked TG/EGS Sheet No. S3.7
Approved SL of ----
Date 01/25/10 Revision 1

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# PROJECT NO. 5: DAMAGED CONCRETE BEAMS, DECK REPAIRS, AND MISSING PILES REPLACEMENT AT BERTHS 5 & 6

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# Project No: 5 - Damaged Concrete Beams, Deck Repairs and Missing Piles Replacement at Berths 5 & 6

## Estimated Quantity Take-off for Construction Cost Estimates for Damaged Concrete Beams, Deck Repairs, and Missing Piles Replacement at Berths 5 & 6

| Item | Description | Quantity | Unit | Damaged Factor | Total Quantity | Comments |
|---|---|---|---|---|---|---|
| | | | | | | |
| Outer Wharf - Concrette Beams and Deck Repairs. Replace Mising Piles. | | | | | | |
| 1 | Steel piles | 0 | EA | 1.00 | 0 | Steel pipe piles wrapped with protective cover. Unable to determine the condition and is assumed good. |
| 2 | WS Crane Beam, outer face - 6.0' deep x 700' long | 4200 | SF | 33% | 1386 | Refer to similar repair details on reference drawing sheet S3.3 |
| 3 | WS Crane Beam, inner face - 6.0' deep x 700' long | 4200 | SF | 33% | 1386 | Refer to similar repair details on reference drawing sheet S3.3 |
| 4 | WS Crane Beam, bottom face - 5'-6" x 700 | 3850 | SF | 33% | 1271 | Refer to similar repair details on reference drawing sheet S3.3 |
| 5 | LS Crane Beam, outer face - 6.0' deep x 700' long | 4200 | SF | 33% | 1386 | Refer to similar repair details on reference drawing sheet S3.3 |
| 6 | LS Crane Beam, inner face - 6.0' deep x 700' long | 4200 | SF | 33% | 1386 | Refer to similar repair details on reference drawing sheet S3.3 |
| 7 | LS Crane Beam, bottom face - 5'-6 x 700' long | 3850 | SF | 33% | 1271 | Refer to similar repair details on reference drawing sheet S3.3 |
| 8 | Repair damaged concrete at underdeck soffit - 56' x 700' | 39200 | SF | 33% | 12936 | Refer to repair details on reference drawing S3.3 |
| 9 | Repair damaged concrete at above deck - 56' x 700' | 39200 | SF | 33% | 12936 | Refer to repair details on reference drawing S3.3 |
| 10 | Diagonal struts - 16" x 16" x 13'-0 at 18'-0 oc | 76 | EA | 100% | 76 | Refer to repair details on reference drawing S3.5 |
| | | | | | | Accounted for in Project No. 6 |
| Inner Wharf - Timber Piles Repairs and Replacement and Deck Repairs | | | | | | |
| 1 | Berth 6 - See Project No 1 | | | | 0 | Accounted for in Project No. 1 |
| | Berth 5 | | | | | |
| 2 | Replace missing or damaged timber piles, assume 10 | 10 | EA | 100% | 10 | Refer to repair details on reference drawing S3.6 |
| 3 | Repair damaged concrete at underdeck soffit - 65' x 120' | 7800 | SF | 50% | 3900 | Refer to repair details on reference drawing S3.3 |
| 4 | Repair damaged concrete at above deck - 65' x 120' | 7800 | SF | 50% | 3900 | Refer to repair details on reference drawing S3.3 |

## Budgetary Cost for Damaged Concrete Beams, Deck Repairs, and Missing Piles Replacement at Berths 5 & 6

| Item | Description | Quantity | Unit | ROM Cost | Comments |
|---|---|---|---|---|---|
| | | | | | |
| Outer and Inner Wharf Concrete Beams and Deck Repairs. Piles Replacement | | | | | |
| 1 | Construction cost estimates based on 2025 labor and material costs | One | EA | $46,739,868 | Refer to sheet 2 for Power Engineering Construction cost estimates. |
| 2 | Soft cost and contingency - 30% | One | EA | $14,021,960 | Refer to sheet 2 for assumptions and exclusions. The 30% add is to account for the cost associated with the exclusions and reasonable contingency. |
| | Total | | | $60,761,828 | |
| | **Budgetary Cost Estimates** | | | **$61,000,000** | |

Notes:
1. The budgetary cost is based on 2025 labor and material costs and does not include escalation for work performed in the future years and tariff impact.

Scope of Work:

Objective: Repair damaged concrete to restore to the original design intent.

1. Repair concrete damage at diagonal struts each side of the waterside rail beam.
2. Repair concrete damage at waterside crane beam.
3. Repair concrete damage at landside crane beam.
4. Replace missing and damaged timber piles with concrete piers at Berth 5 (Note: Berth 6 is accounted for in Project No. 1).
5. Repair damaged concrete at underdeck soffit.
6. Repair damaged concrete at above deck

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# Project No: 5 - Construction Cost Estimates and Duration prepared by Power Engineering Company

**Project No. 5: Wharf Repair for Concrete Damage at Berths 5 & 6**
**Richmond, California**

## ROM Budget for Project 5: Wharf Repair for Concrete Damage at Berths 5 & 6

**Date: May 16, 2025**

| | Description | Quantity | Units | $/Unit | Total | Comments | Working Days |
|---|---|---|---|---|---|---|---|
| **Mobilization Allowance** | | | | | | | |
| 1 | Mobilize/Demobilize | 1 | LS | $ 560,000 | $ 560,000 | | 24 |
| **Outer Wharf - Steel Pile Supported Wharf** | | | | | | | |
| 2 | WS Crane Beam, outer face - 6' 0" Deep & 700' Long | 1,386 | SF | $ 1,476 | $ 2,045,736 | | 26 |
| 3 | WS Crane Beam, inner face - 6' 0" Deep & 700' Long | 1,386 | SF | $ 1,476 | $ 2,045,736 | | 26 |
| 4 | WS Crane Beam, bottom face - 5' 6" Deep & 700' Long | 1,271 | SF | $ 1,476 | $ 1,875,996 | | 24 |
| 5 | LS Crane Beam, outer face - 6' 0" Deep & 700' Long | 1,386 | SF | $ 1,476 | $ 2,045,736 | | 26 |
| 6 | LS Crane Beam, inner face - 6' 0" Deep & 700' Long | 1,386 | SF | $ 1,476 | $ 2,045,736 | | 26 |
| 7 | LS Crane Beam, bottom face - 5' 6" Deep & 700' Long | 1,271 | SF | $ 1,476 | $ 1,875,996 | | 24 |
| 8 | Repair Damaged Concrete Underdeck Soffitt - 56' x 700' | 12,936 | SF | $ 1,337 | $ 17,295,432 | | 195 |
| 9 | Repair Damaged Concrete Above Deck - 56' x 700' | 12,936 | SF | $ 515 | $ 6,662,040 | | 74 |
| 10 | Replace Existing Diagonal Concrete Struts - 16" x 16" x 13' 0" at 18' 0" OC | 76 | EA | $ 29,935 | $ 2,275,060 | | 29 |
| ~~11~~ | ~~Remove & Replace 200MT Bollard and Repair Concrete Support~~ | ~~8~~ | ~~EA~~ | ~~$ 50,225~~ | ~~$ 401,800~~ | Accounted for in Project No. 6 | ~~17~~ |
| **Inner Wharf - Timber Pile Supported Wharf** | | | | | | | |
| 12 | Berth 6: See Project No. 1 | 1 | LS | $ - | $ - | | - |
| 13 | F&I Fiberglass Jacket (with Rebar) to Repair Missing Timber Pile - assume 10' Jacket + 2' of Embedment | 10 | EA | $ 24,750 | $ 247,500 | | 14 |
| 14 | Berth 5: Repair Damaged Concrete at Underdeck Soffit - 65' x 120' | 3,900 | SF | $ 1,476 | $ 5,756,400 | | 64 |
| 15 | Berth 5: Repair Damaged Concrete Above Deck - 65' x 120' | 3,900 | SF | $ 515 | $ 2,008,500 | | 23 |
| | **Total Base Scope:** | | | **$** | ~~**47,141,668**~~ ($46,739,868) | | **593** |

**Project Assumptions**

1 A working day is defined as an 8-hour weekday between the hours of 6 AM - 5 PM.
2 The working days do not include fabrication times for materials.
3 Only one mobilization is assumed, with continuous work until project completion.
4 All pricing is in current dollars.
5 No contingency is included in this budget.

**Schedule Milestones**

1 We estimate the on-site construction would take approximately 2 years with an average crew of 42 craft workers.

**Design Assumption**

1 Per Liftech Sketches, May 2025

**Subcontractors**

1 None assumed.

**Proposal Exclusions**

1 Payment and Performance Bonds (available at 1.5% of final contract amount)
2 Builders Risk Insurance (can be provided on a per-project basis)
3 Permits and Permit Fees
4 Engineering or Design
5 Utility Relocation unless Listed Above
6 Site Survey, Lines, Grade
7 Hazardous Materials Handling/Abatement/Removal
8 Special Inspection or Testing Fees
9 Vibration or Damage Monitoring
10 Any Repairs to the Existing Structures, Interior or Exterior, either prior to, during, or after Construction
11 Temporary Power & Lighting Install and Supply
12 Industrial Hygienist or Inspection Services
13 Silt Curtain, Bubble Curtain, or other regulatory requirements not normally encountered.

Timber piles supported deck

65'-0"

120'-0"

375'-0"

325'-0"

200'-0"

SHEET METAL, ETC.

PIPE SHOP

ELECTRIC SHOP

FITTINGS OFFICE

FITTINGS WAREHOUSE

YW2000

YW1800

YW1600

Sheet Piling

R.R.

YN3800

YN4000

YN4200

YN4400

YN4600

YN4800

YN5000

YN5200

PLAN OF RELIEVING PLATFORM

SCALE 1" = 60'-0"

LEGEND

- EXISTING STRUCTURE
- DOCK TO BE BUILT
- SUPPORTING SLAB
- RIP RAP

| REVISIONS | | | |
|---|---|---|---|
| MK. | DATE | BY | OK |
| | | | |

KAISER COMPANY, INC.
RICHMOND, CALIFORNIA

RELIEVING PLATFORM
FITTING OUT DOCK AT
RICHMOND YARD No 3

DATE JAN 28, 1943 | SUBMITTED
SCALE 1" = 60'-0" | APPROVED

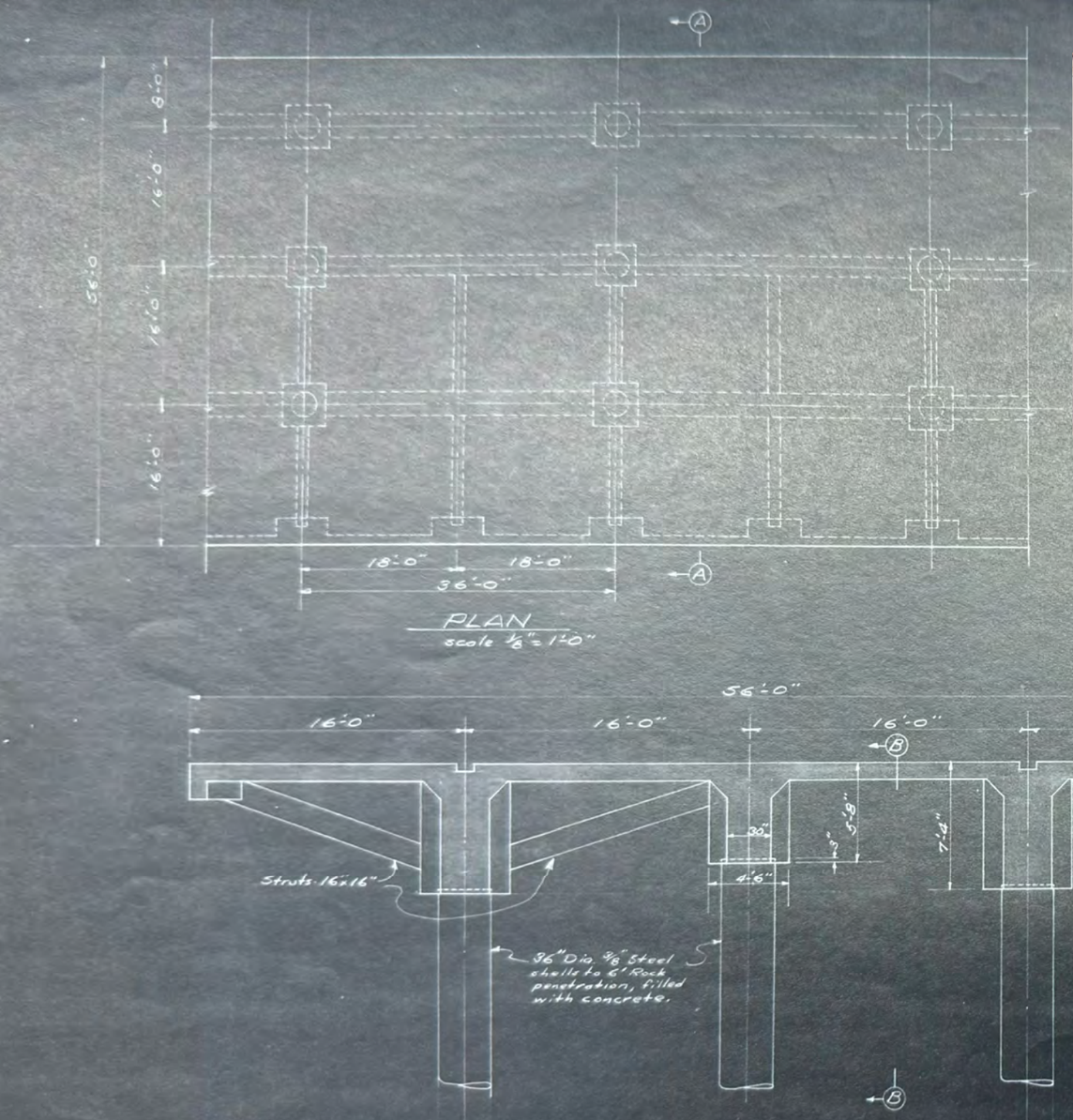
Sht 3 of 10

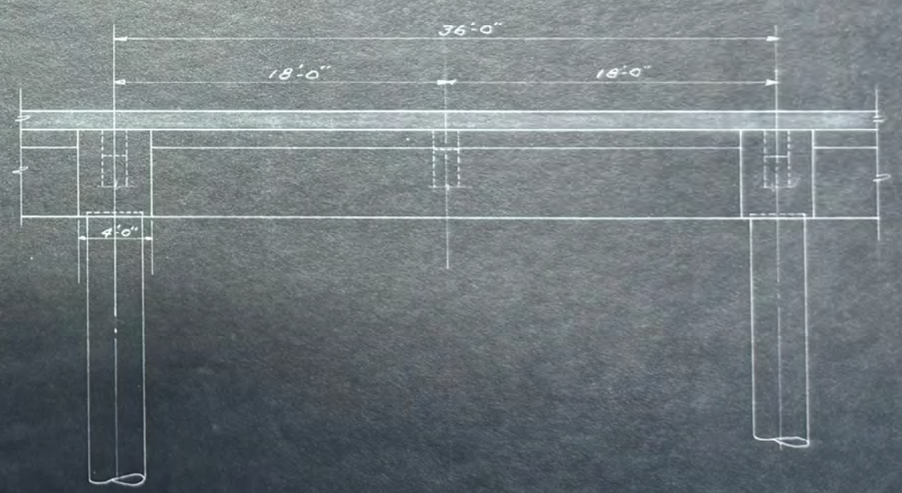


Pavement Settlement




Concrete Deck Condition



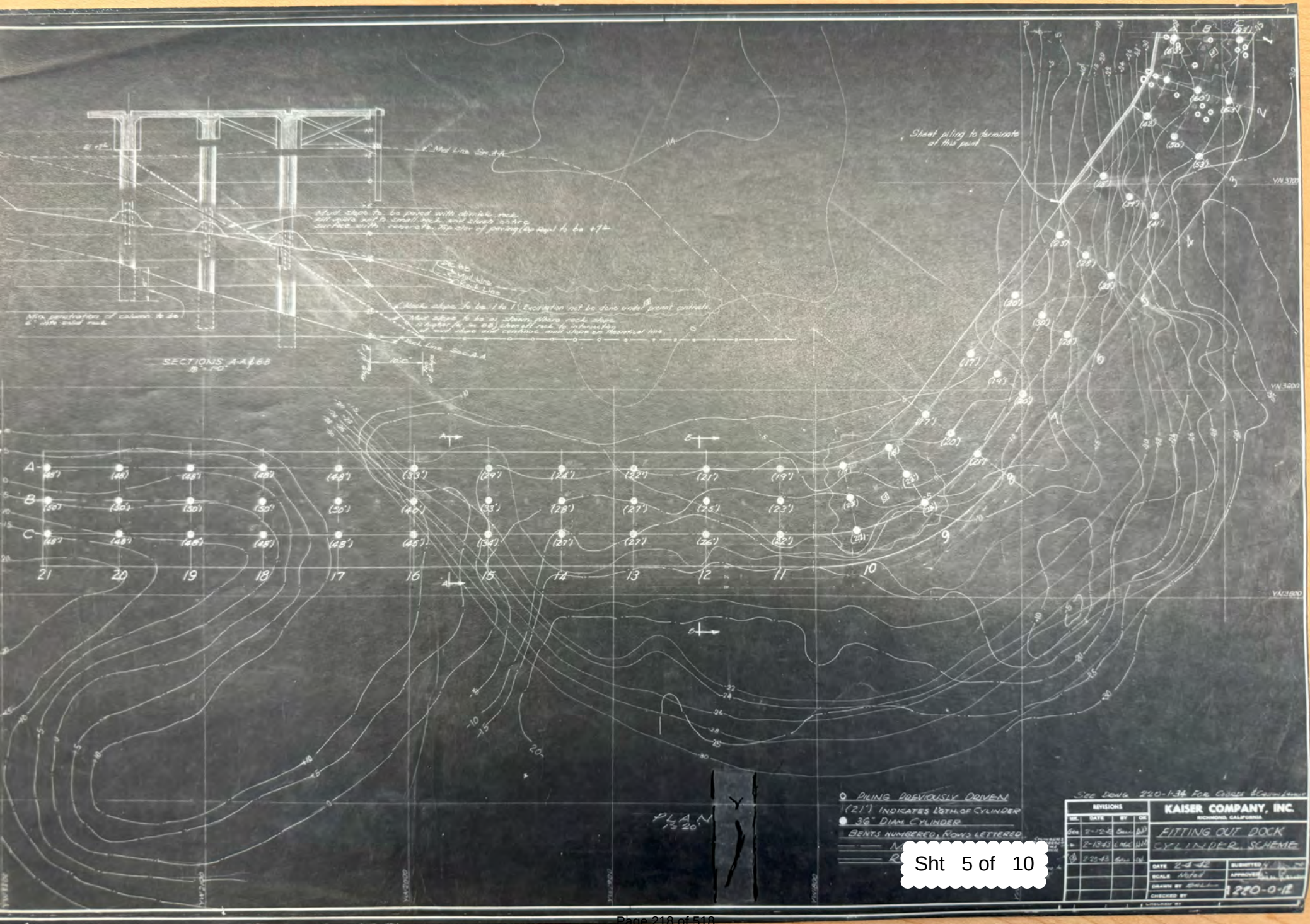

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| MK. | DATE | BY | OK |
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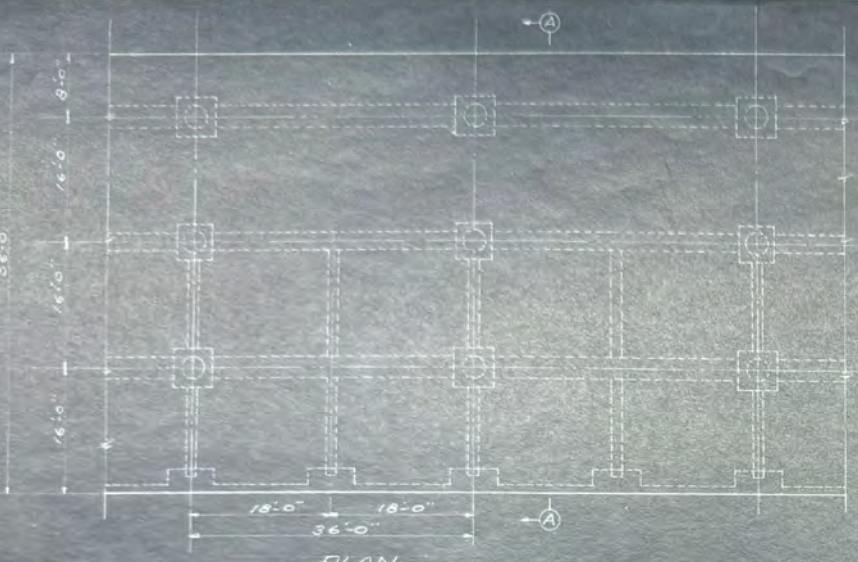
**KAISER COMPANY, INC.**
RICHMOND, CALIFORNIA

FITTING OUT DOCK
SOUTH END
CYLINDER SCHEME DETAILS

| | |
|---|---|
| DATE 2-10-43 | SUBMITTED |
| SCALE Noted | APPROVED |

Sht 4 of 10

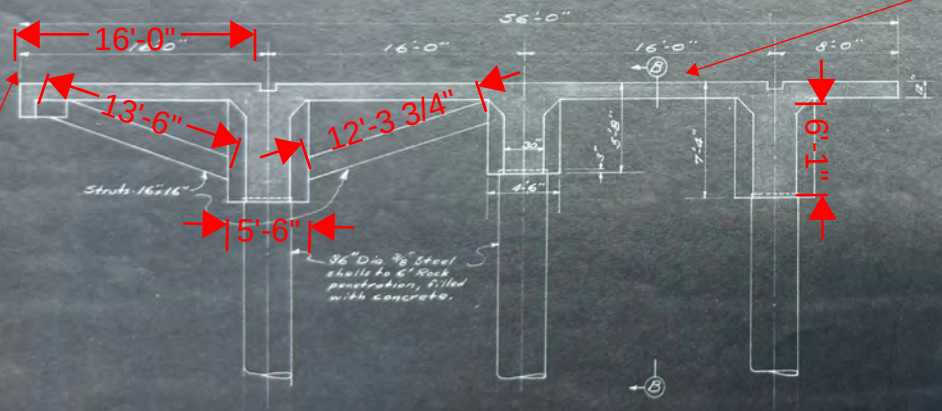

SECTIONS A-A & B-B
PLAN
Sheet piling to terminate at this point
Mud Line Sec A-A
Rock slope to be 1 to 1
Mud slope to be as shown. Where rock slope together is less than 45° rock is intruding
SEE DWG 220-1-34 FOR CYLINDER ARRANGEMENT
PILING PREVIOUSLY DRIVEN
(21') INDICATES LENGTH OF CYLINDER
36" DIAM CYLINDER
BENTS NUMBERED, ROWS LETTERED
KAISER COMPANY, INC.
RICHMOND, CALIFORNIA
FITTING OUT DOCK
CYLINDER SCHEME
220-0-12
Sht 5 of 10




PLAN
scale 1/8" = 1'-0"



Concrete Deck Condition




SECTION A-A
1/8" = 1'-0"




SECTION B-B
1/8" = 1'-0"



| REVISIONS | | | |
|---|---|---|---|
| NO. | DATE | BY | CK |
| | | | |

KAISER COMPANY, INC.
RICHMOND, CALIFORNIA

FITTING OUT DOCK
SOUTH END
CYLINDER SCHEME DETAILS

DATE 2-10-43 | SUBMITTED
SCALE Noted | APPROVED
DRAWN BY L. McC | 1220-0-20
CHECKED BY

Sht 6 of 10

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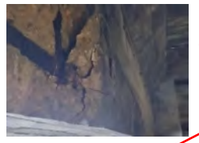








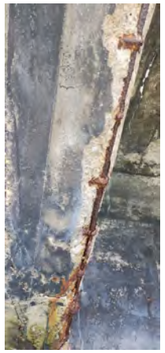










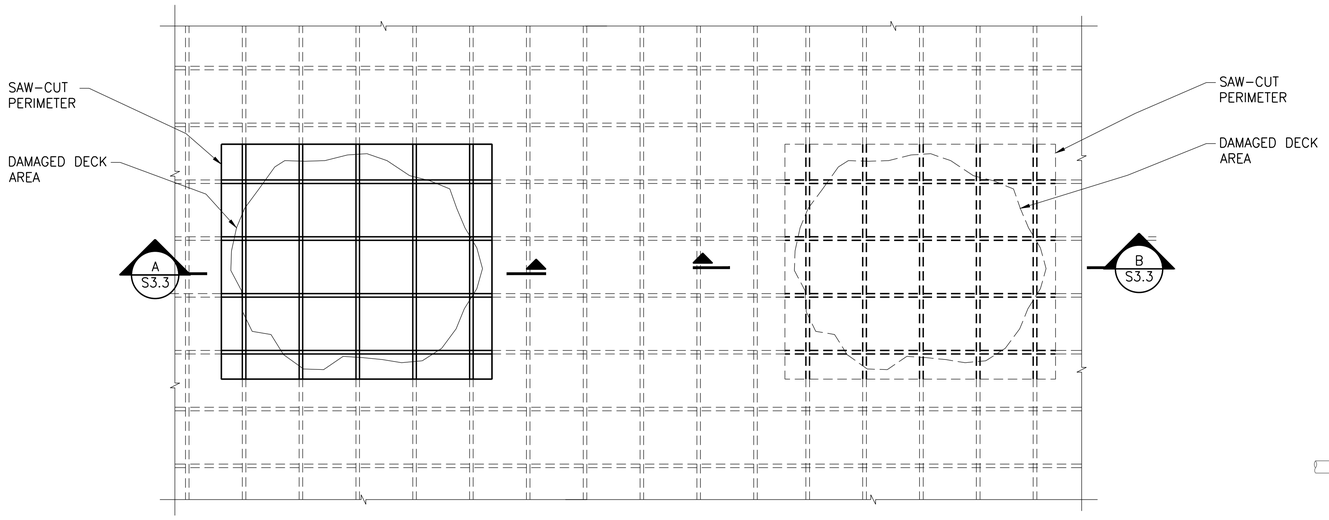








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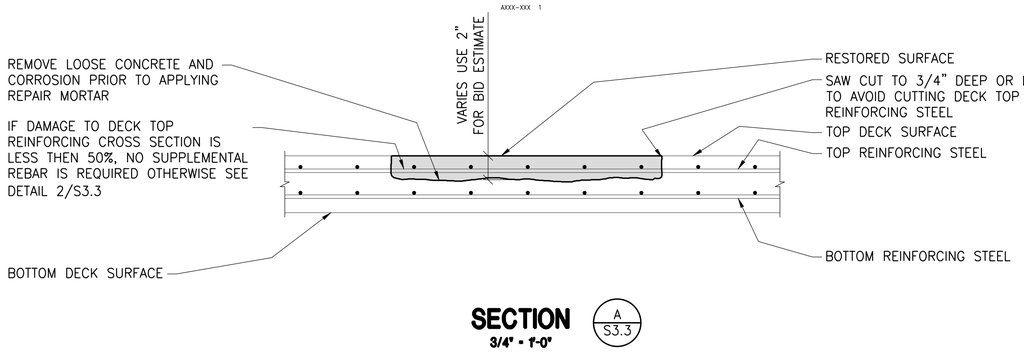



DAMAGED TOP DECK SURFACE REPAIR

DAMAGED BOTTOM DECK SURFACE REPAIR

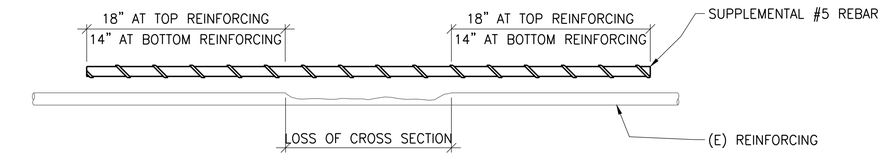
## CONCRETE REMOVAL AND SURFACE PREPARATION (1 / S3.3)

3/4" = 1'-0"




## SECTION (A / S3.3)

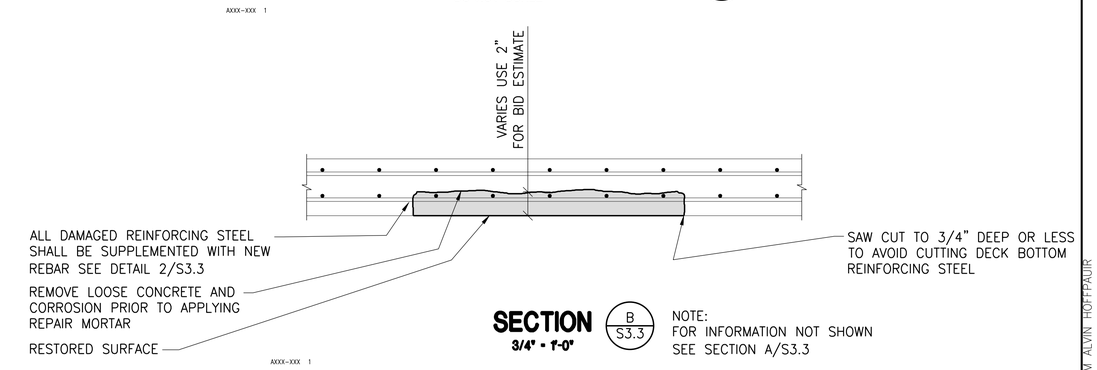
3/4" = 1'-0"




PLAN

## SUPPLEMENTAL REBAR DETAIL (2 / S3.3)

DO NOT SCALE




## SECTION (B / S3.3)

3/4" = 1'-0"

NOTE:
FOR INFORMATION NOT SHOWN
SEE SECTION A/S3.3

## WHARF DECK REPAIR NOTES:

1. THE PURPOSE OF THE WHARF DECK REPAIR IS TO RESTORE THE WHARF STRUCTURAL STRENGTH TO SUPPORT A DESIGN LIVE LOAD OF 250 PSF AND TO EXTEND THE SERVICE LIFE OF THE STRUCTURE.
2. THE DECK REPAIR WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
   a. AMERICAN CONCRETE INSTITUTE, CONCRETE REPAIR GUIDE. FARMINGTON HILLS, MI: AMERICAN CONCRETE INSTITUTE, 2004.
   b. AMERICAN CONCRETE INSTITUTE, SURFACE REPAIR USING FORM-AND-PUMP TECHNIQUES. FARMINGTON HILLS, MI: AMERICAN CONCRETE INSTITUTE, 2003.
   c. INTERNATIONAL CONCRETE REPAIR INSTITUTE, GUIDE FOR SURFACE PREPARATION FOR THE REPAIR OF DETERIORATED CONCRETE RESULTING FROM REINFORCING STEEL CORROSION (GUIDELINE NO. 310.1R-2008). DES PLAINES, IL: INTERNATIONAL CONCRETE REPAIR INSTITUTE, 2008..
3. AT REPAIR AREAS CONTRACTOR SHALL PERFORM SOUNDING OR OTHER APPROPRIATE NON-DESTRUCTIVE CONCRETE TESTING TO LOCATE AREAS OF DELAMINATION FOR THE TOP AND BOTTOM DECK SURFACES OF INNER AND OUTER WHARVES FOR BERTH RCH-7 AND RCH-8.
4. CONTRACTOR SHALL MARK THE PERIMETER OF THE DECK REPAIR AREAS TO BE SAW CUT. LAYOUT SHALL BE SQUARE OR RECTANGULAR IN SHAPE. NOTIFY THE ENGINEER FOR REVIEW OF THE PERIMETER TO BE SAW CUT AREA PRIOR TO THE CUTTING.
5. SPECIAL INSPECTION IS REQUIRED FOR SURFACE PREPARATION PRIOR TO INSTALLATION OF STRUCTURAL REPAIR CONCRETE.
6. THE WHARF DECK REPAIR SYSTEM CONSISTING OF REBAR PROTECTION AND MORTAR SHALL BE COMPATIBLE AND SHALL BE SUPPLIED BY A SINGLE SOURCE SO THAT THE REPAIR SYSTEM PERFORMS AS WARRANTIED BY THE PRODUCTS MANUFACTURER
7. THE FOLLOWING CONCRETE AND TIMBER PILE REPAIR PRODUCTS ARE ACCEPTABLE:

   BASF CONSTRUCTION CHEMICAL, LLC
   EMACO S66 CI, FLOWABLE STRUCTURAL-REPAIR CONCRETE WITH INTEGRAL CORROSION INHIBITOR, FOR TOP DECK SURFACE REPAIR

   EMACO S88 CI, SPRAYABLE FIBER-REINFORCED STRUCTURAL REPAIR MORTAR WITH INTEGRAL CORROSION INHIBITOR FOR BOTTOM DECK SURFACE REPAIR.

   MASTERSEAL CP, ADVANCED CORROSION INHIBITOR TREATMENT FOR STEEL REINFORCED CONCRETE, APPLIED TO REPAIRED AREAS.

   SIKA CORPORATION
   SIKA ARMATEC 110 EPOCEM

   SIKAREPAIR 222 FOR TOP SURFACE

   SIKAREPAIR 223 FOR BOTTOM SURFACE

   CONTRACTOR MAY SUBMIT ALTERNATE EQUIVALENT WHARF DECK REPAIR SYSTEM TO THE ENGINEER AND PORT FOR REVIEW AND APPROVAL. THE PRODUCTS INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
8. SEE NOTES ON SHEET S2.1 AND GENERAL NOTES.

**REFERENCE DRAWING**

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

REGISTERED PROFESSIONAL ENGINEER
SUGIARTO LONI
No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

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

WHARF DECK REPAIR NOTES AND DETAILS

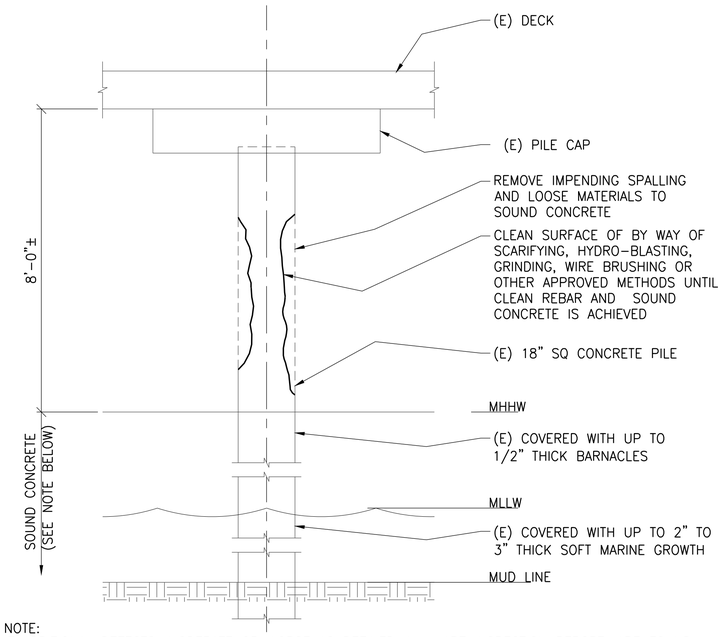
| | | | |
|---|---|---|---|
| Project No. | Z1800 | | |
| By AH | Checked TG/EGS | Sheet No. | S3.3 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

Sht 8 of 10

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344 - 20th STREET SUITE 360, Oakland, CA 94612, 510 832-5606 Original border size 525 x 812 mm.



I:\Z1800\Dwg\Current\S3.3 WHARF DECK REPAIR NOTES AND DETAILS.dwg 1/24/2012 3:36 PM ALVIN HOFFPAUIR



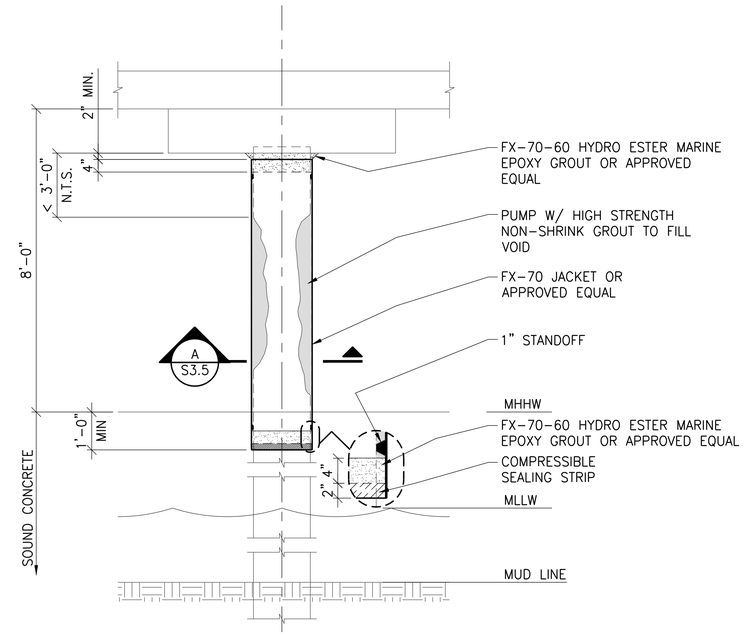

NOTE:
IF ADDITIONAL DEFECTS, MODERATE OR WORSE AS DEFINED IN WHARF INSPECTION REPORT, ARE FOUND BELOW MHHW, NOTIFY ENGINEER AND PORT. ADDITIONAL REPAIRS MAY BE REQUIRED.

## TYPICAL CONCRETE PILE DAMAGED SURFACE PREPARATION

1/S3.5

1/2" = 1'-0"

AXXX-XXX 1

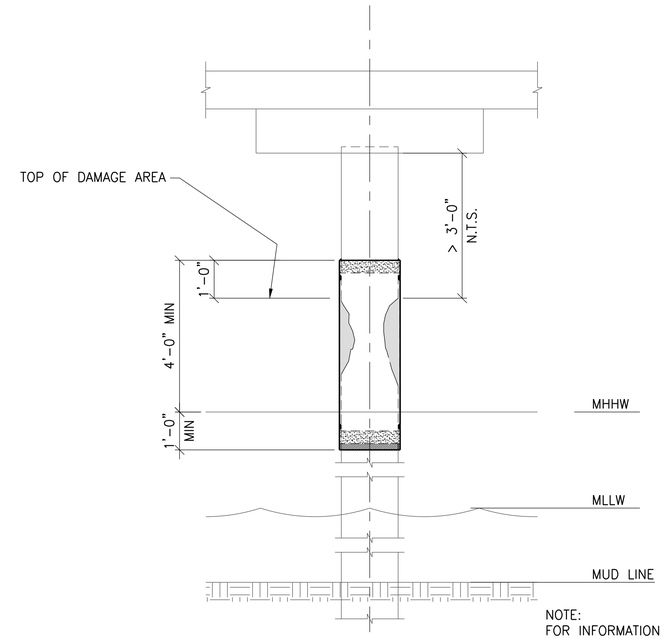



## TYPICAL CONCRETE PILE REPAIR DETAIL - 1

2/S3.5

1/2" = 1'-0"

PILE_REPAIR-1 1



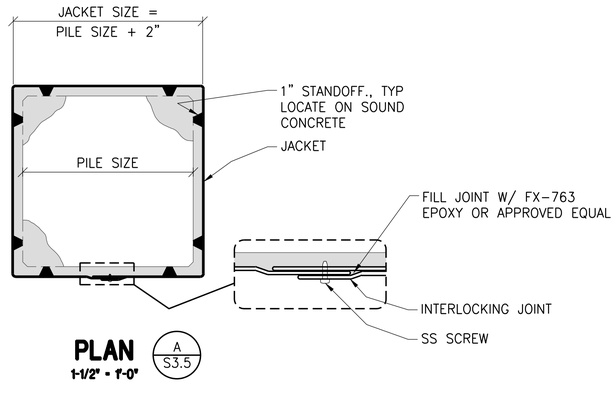

NOTE:
FOR INFORMATION NOT SHOWN SEE DETAIL 2/S3.5

## TYPICAL CONCRETE PILE REPAIR DETAIL - 2

3/S3.5

1/2" = 1'-0"

PILE_REPAIR-1 1




## PLAN

A/S3.5

1-1/2" = 1'-0"

AXXX-XXX 1

REFERENCE DRAWING

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

REGISTERED PROFESSIONAL ENGINEER — SUGIARTO LONI — No. 3041 Exp. 03/31/2011 — STRUCTURAL — STATE OF CALIFORNIA

**ISSUED FOR CONSTRUCTION**

POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

**PRINTED**
1/24/2012

LIFTECH CONSULTANTS INC

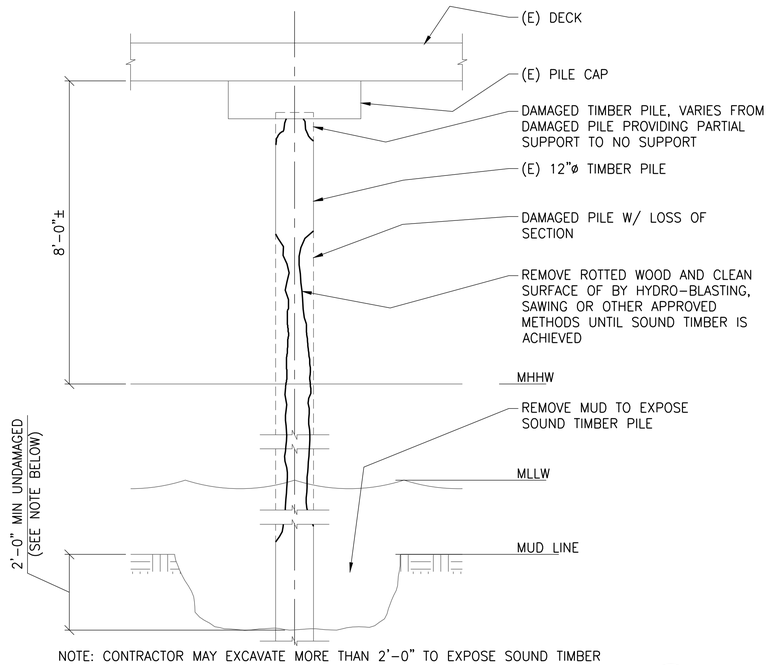
Liftech
LIFTECH CONSULTANTS INC.

CONCRETE PILE REPAIR DETAILS

Project No. Z1800
By AH Checked TG/EGS Sheet No. S3.5
Approved SL of ----
Date 01/25/10 Revision 1

Original border size 525 x 812 mm.
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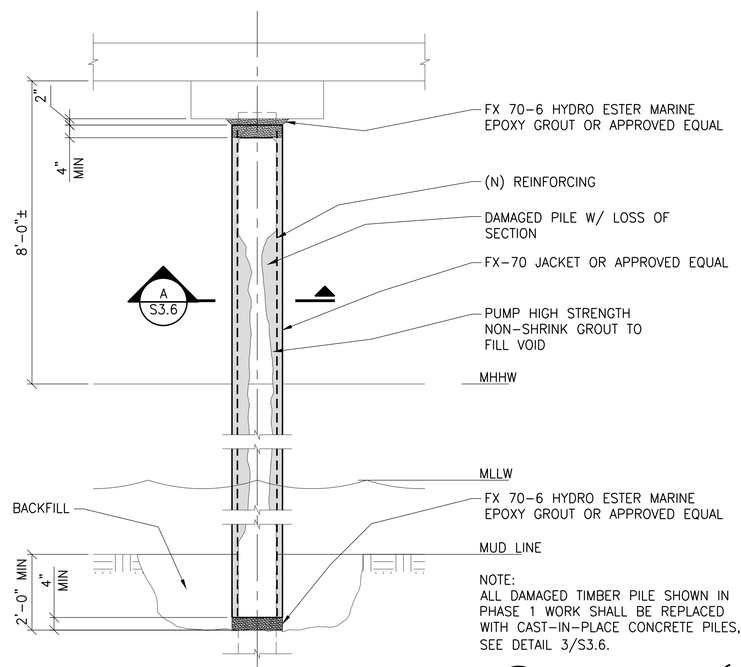

NOTE: CONTRACTOR MAY EXCAVATE MORE THAN 2'-0" TO EXPOSE SOUND TIMBER

## TYPICAL TIMBER PILE DAMAGED SURFACE PREPARATION

1/2" = 1'-0"

1 / S3.6

AXXX-XXX 1




NOTE:
ALL DAMAGED TIMBER PILE SHOWN IN PHASE 1 WORK SHALL BE REPLACED WITH CAST-IN-PLACE CONCRETE PILES, SEE DETAIL 3/S3.6.

## TYPICAL TIMBER PILE REPAIR DETAIL

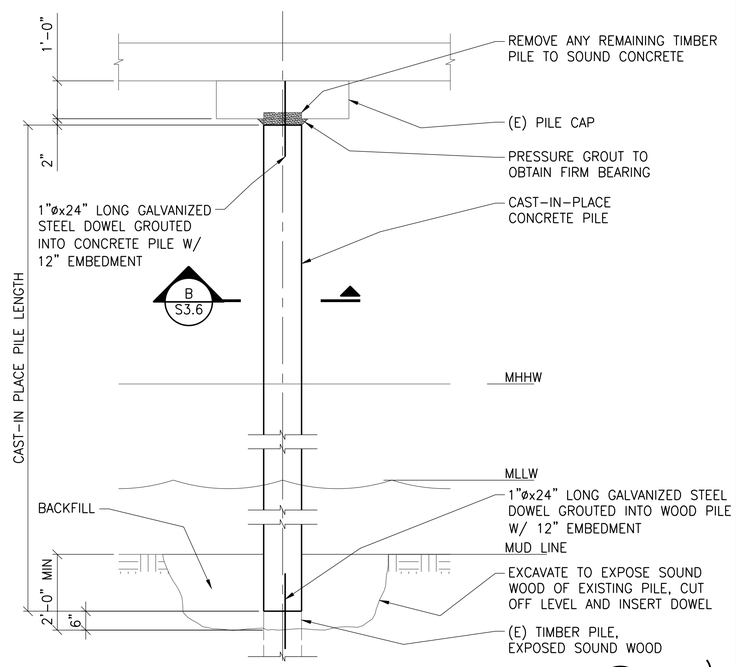
1/2" = 1'-0"

2 / S3.6

TIM_PILE_REPAIR-1 1

NOTE:
CONTRACTOR HAS THE OPTION TO REPAIR TIMBER PILE OR REPLACE DAMAGED PILE WITH CAST-IN-PLACE CONCRETE PILE PER DETAIL 3/S3.6

1




## (N) CAST-IN-PLACE PILE TO REPLACE MISSING PILES

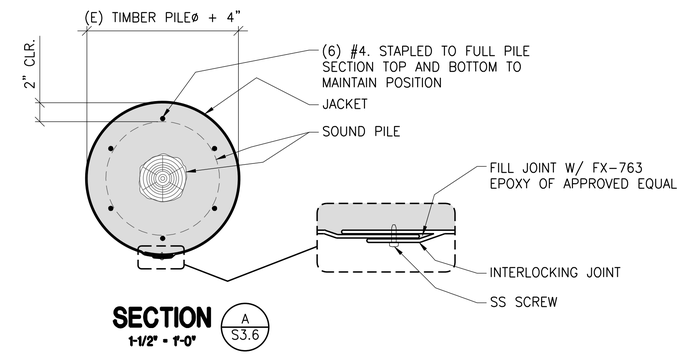
1/2" = 1'-0"

3 / S3.6

TIM_PILE_REPAIR-1 1

NOTES:
1. IF CAST-IN-PLACE CONCRETE PILE LENGTH IS 24'-0" OR LESS, USE 12" DIAMETER PILE
2. IF CAST-IN-PLACE CONCRETE PILE LENGTH IS BETWEEN 24'-0" AND 28'-0", USE 14" DIAMETER PILE.

1

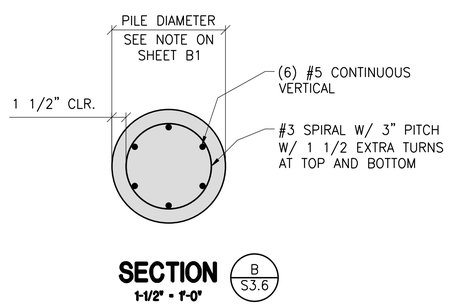



## SECTION

1-1/2" = 1'-0"

A / S3.6

AXXX-XXX 1




## SECTION

1-1/2" = 1'-0"

B / S3.6

AXXX-XXX 1

REGISTERED PROFESSIONAL ENGINEER
SIGI ARTO LONI
No. 3041
Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

**ISSUED FOR CONSTRUCTION**

**PRINTED**

1/24/2012

LIFTECH CONSULTANTS INC

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POINT POTRERO WHARF REPAIR
FOR HONDA AUTOMOTIVE FACILITY
PORT OF RICHMOND

TIMBER PILE REPAIR AND REPLACEMENT DETAILS

| | | | |
|---|---|---|---|
| Project No. Z1800 | | | |
| By AH | Checked TG/EGS | Sheet No. | S3.6 |
| Approved SL | | of | ---- |
| Date 01/25/10 | | Revision | 1 |

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| 1 | ISSUED FOR CONSTRUCTION | 05/19/10 | AH | TG | SL |

REFERENCE DRAWING

Sht 10 of 10

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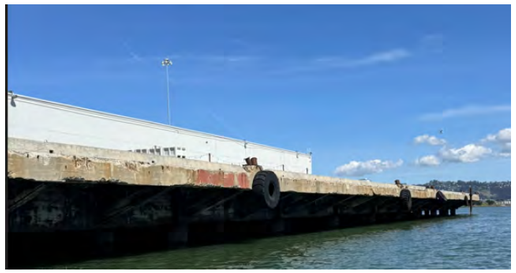


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# PROJECT NO. 6: DISCRETE FENDER AND BOLLARD UPGRADES AT BERTHS 5 & 6

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# Project No: 6 - Bollards and Fenders Upgrades at Berths 5 & 6













Photos Showing Current Fender and Bollard Conditions at Berths 5 & 6

Scope of Work:

Objective: To install discrete fenders and bollards to serve various size of barges and tug boats

1. Demo existing bollards and fenders
2. Install three discrete fenders at Berth 5. Refer to reference drawing S2.02 on sheet 5
3..Install two discrete fenders at Berth 6
4. Install five bollards at Berth 5 with strengthened beams, equally spaced.
   Refer to reference drawing S5.01 on sheet 6
5. Install four bollards at Berth 6 with strengthened beams, equally spaced.

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# Project No: 6 - Budgetary Cost Estimate

## Estimated Quantity Take-off for Construction Cost Estimates for Discrete Fender and Bollard Upgrades at Berths 5 & 6

| Item | Description | Quantity | Unit | Total Quantity | Comments |
|---|---|---|---|---|---|
| **Discrete Fender and Bollard Upgrades at Berths 5 & 6** | | | | | |
| 1 | Site preparation | One | EA | One | Refer to scope of work description |
| 2 | Furnish and install five discrete fenders | 5 | EA | 5 | Refer to sheet 4 for approximate fender locations and reference drawings S2.02 on sheet 5 |
| 3 | Furnish and install nine bollards | 9 | EA | 9 | Refer to reference drawing S5.01 on sheet 6 for bollard |
| 4 | Misc concrete repair including bull rails | One | EA | One | |

## Budgetary Cost for Discrete Fender and Bollard Upgrades at Berths 5 & 6

| Item | Description | Quantity | Unit | ROM Cost | Comments |
|---|---|---|---|---|---|
| **Discrete Fender and Bollard Upgrades at Berths 5 & 6** | | | | | |
| 1 | Construction cost estimates based on 2023 contractor bid price for reference project at Port of Oakland | One | EA | $4,122,133 | Refer to bid prices for Port of Oakland B10 project, which has similar scope of work. See sheet 3. |
| 2 | Soft cost and contingency - 30% | One | EA | $1,236,640 | The 30% add is to account for the cost associated with escalation and reasonable contingency. |
| | Total | | | $5,358,773 | |
| | Budgetary Cost Estimates | | | **$5,400,000** | |

Notes:

1. The budgetary cost is based on 2025 labor and material costs and does not include escalation for work performed in the future years and tariff impact.

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REPLACEMENT OF BERTH 10 FENDERS AND BOLLARDS
OAKLAND, CALIFORNIA

**REFERENCE BID PRICE`**

19 December 2023

| | | | | BIDDERS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Contractor #1 | | Contractor #2 | | Contractor #3 | | Contractor #4 | | Contractor #5 | |
| ITEM | DESCRIPTION | EST. QTY | UNIT | UNIT PRICE | TOTAL | UNIT PRICE | TOTAL | UNIT PRICE | TOTAL | UNIT PRICE | TOTAL | UNIT PRICE | TOTAL |
| 1. | Mobilization and Demobilization | Lump Sum | | | $213,000.00 | | $400,000.00 | | $500,000.00 | | $230,000.00 | | $360,000.00 |
| 2. | Perform all General Condition Work Other than Work Separately Provided for under Other Bid | Lump Sum | | | $770,000.00 | | $325,000.00 | | $500,000.00 | | $92,000.00 | | $60,000.00 |
| 3. | Site Preparation | Lump Sum | | | $132,000.00 | | $500,000.00 | | $240,000.00 | | $233,000.00 | | $460,000.00 |
| 4. | Scanning for Rebar and Underground Utilities | Lump Sum | | | $16,000.00 | | $75,000.00 | | $250,000.00 | | $24,000.00 | | $12,500.00 |
| 5. | Demolish and Repair Concrete at Bollard | 231 | Linear Feet | $2,200.00 | $508,200.00 | $3,000.00 | $693,000.00 | $2,500.00 | $577,500.00 | $2,550.00 | $589,050.00 | $3,100.00 | $716,100.00 |
| 6. | Demolish and Repair Concrete at Fender | 120 | Linear Feet | $1,850.00 | $222,000.00 | $2,500.00 | $300,000.00 | $2,500.00 | $300,000.00 | $2,000.00 | $240,000.00 | $3,200.00 | $384,000.00 |
| 7. | Furnish Fenders | 6 | Each | $19,500.00 | $117,000.00 | $20,000.00 | $120,000.00 | $35,000.00 | $210,000.00 | $34,000.00 | $204,000.00 | $29,000.00 | $174,000.00 |
| 8. | Furnish Fender Pile Support System | 5 | Each | $286,200.00 | $1,431,000.00 | $125,000.00 | $625,000.00 | $300,000.00 | $1,500,000.00 | $200,000.00 | $1,000,000.00 | $275,000.00 | $1,375,000.00 |
| 9. | Install Fenders | 5 | Each | $20,300.00 | $101,500.00 | $12,000.00 | $60,000.00 | $30,000.00 | $150,000.00 | $35,000.00 | $175,000.00 | $10,000.00 | $50,000.00 |
| 10. | Install Bollards | 11 | Each | $20,900.00 | $229,900.00 | $10,000.00 | $110,000.00 | $20,000.00 | $220,000.00 | $9,000.00 | $99,000.00 | $12,000.00 | $132,000.00 |
| 11. | Furnish and Install Steel Spreader Beams | 22 | Each | $11,000.00 | $242,000.00 | $7,000.00 | $154,000.00 | $15,000.00 | $330,000.00 | $11,000.00 | $242,000.00 | $6,000.00 | $132,000.00 |
| 12. | Furnish and Install Misc. Metals | Lump Sum | | | $28,200.00 | | $500,000.00 | | $10,000.00 | | $20,000.00 | | $38,000.00 |
| 13. | Allowance for Repairs to Concrete Wharf Structure | Allowance | | | $200,000.00 | | $200,000.00 | | $200,000.00 | | $200,000.00 | | $200,000.00 |
| | **TOTAL BID PRICE:** | | | | $4,210,800.00 | | $4,062,000.00 | | $4,987,500.00 | | $3,348,050.00 | | $4,093,600.00 |
| | **BID BOND AMOUNT:** | | | | 10% | | 10% | | 10% | | 10% | | 10% |

* Bidder's calculations were corrected per the provisions of Document 00200, Instructions to Bidders, page 00200-11, subparagraph 24.c.

Liftech Note:
Excluding High and Low, Average bid:$4,122,133.

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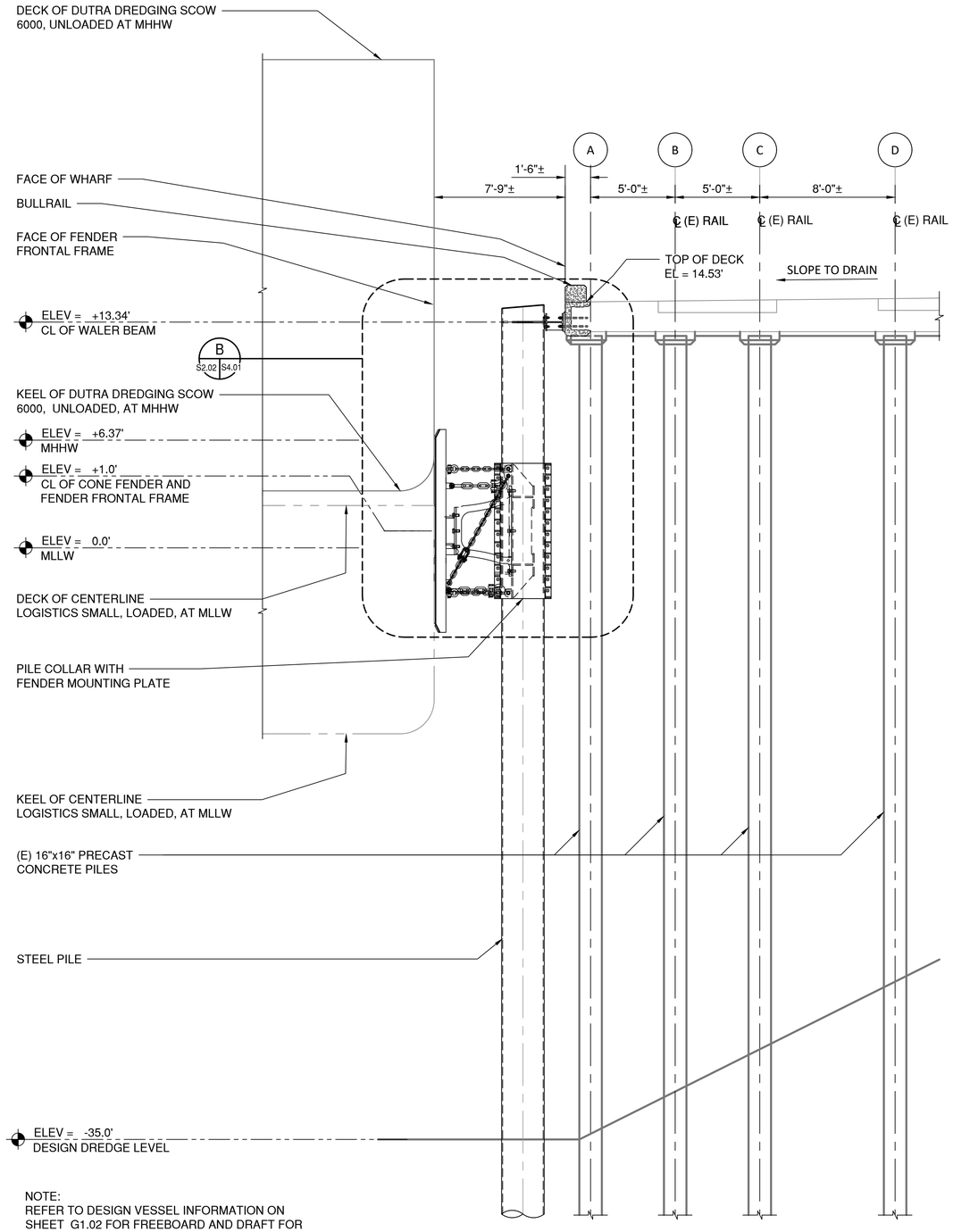
# Project No: 6 - Bollards and Fenders Upgrades at Berths 5 & 6




New Discrete Fender

Proposed Fender Location

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NOTE:
REFER TO DESIGN VESSEL INFORMATION ON SHEET G1.02 FOR FREEBOARD AND DRAFT FOR OTHER VESSELS

A (S2.01 | S2.02) BERTH 10 SECTION
1/4" = 1'-0"

**REFERENCE DRAWING**

CAUTION: THIS PLAN MAY BE REDUCED
0 1" 2" ORIGINAL SCALE

PROJECT #M23002

REFERENCES:
PLANS
AS-BUILT PLANS
FIELD BOOKS

CAUTION:
CHECK TRACING FOR LATEST REVISIONS

| NO. | REVISIONS | DATE | REV'D | APP'D |
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| | | | | |

DRAWN ALVIN HOFFPAUIR
DESIGNED DI LIU C84419 (REG. ENGINEER NO.)
CHECKED SUGI LONI S3041 (REG. ENGINEER NO.)

PORT OF OAKLAND
530 WATER ST. OAKLAND, CALIFORNIA

Liftech CONSULTANTS INC.
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Job # - 2424

REGISTERED PROFESSIONAL ENGINEER
SUGIARTO LONI
No. 3041
Exp. 03/31/2025
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE: 11/02/23

OUTER HARBOR CHANNEL

**REPLACEMENT OF BERTH 10 FENDERS AND BOLLARDS**

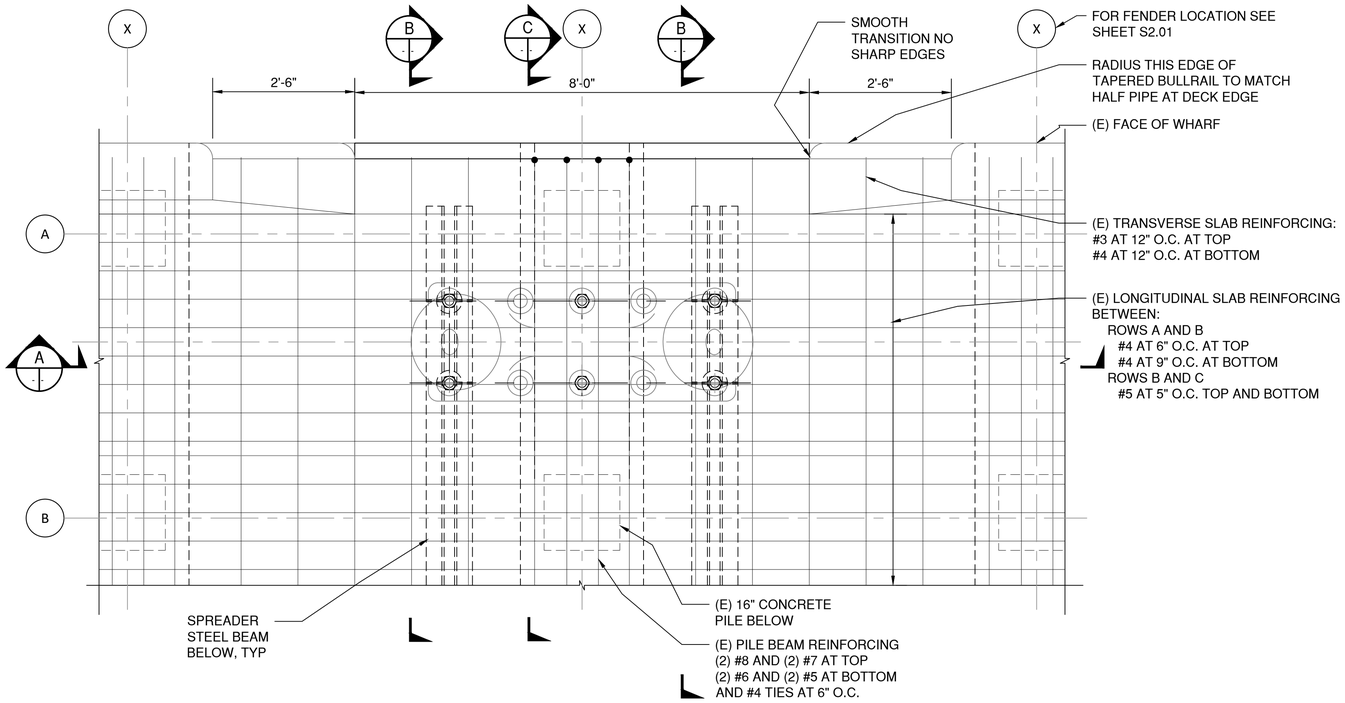
FENDER AND WHARF SECTION

DATE: 11/02/23
SCALE: AS SHOWN
SHEET: 11 OF 19 SHEETS
S2.02 | AA-4353



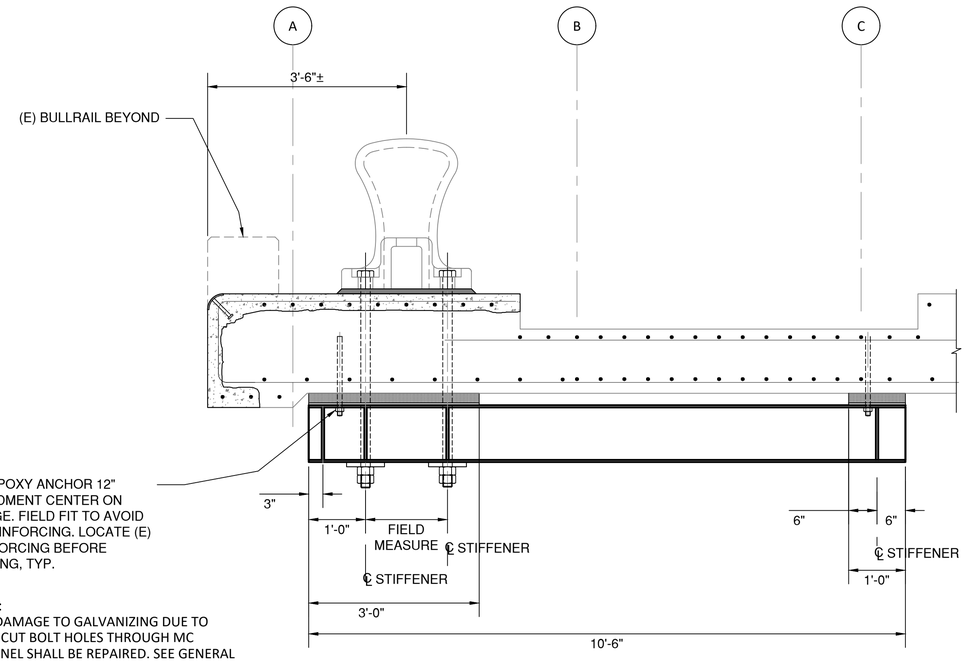
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1 / S2.01 S5.01 BERTH 10 WITH PORT FURNISHED BOLLARD - TYPICAL PLAN

3/4" = 1'-0"



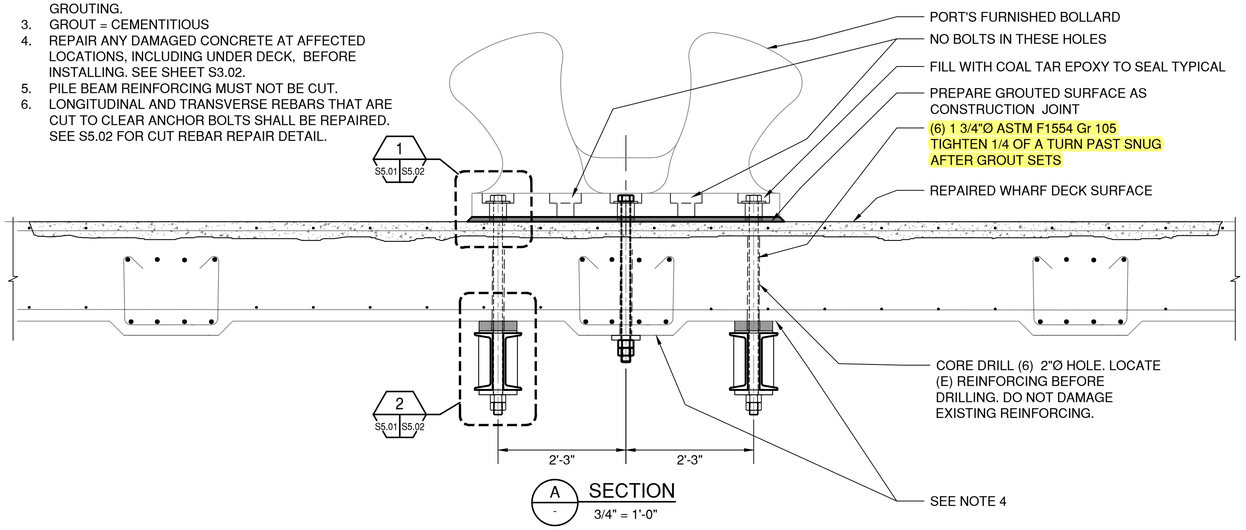

NOTE:
ANY DAMAGE TO GALVANIZING DUE TO FIELD CUT BOLT HOLES THROUGH MC CHANNEL SHALL BE REPAIRED. SEE GENERAL NOTES.

B / - SECTION

3/4" = 1'-0"

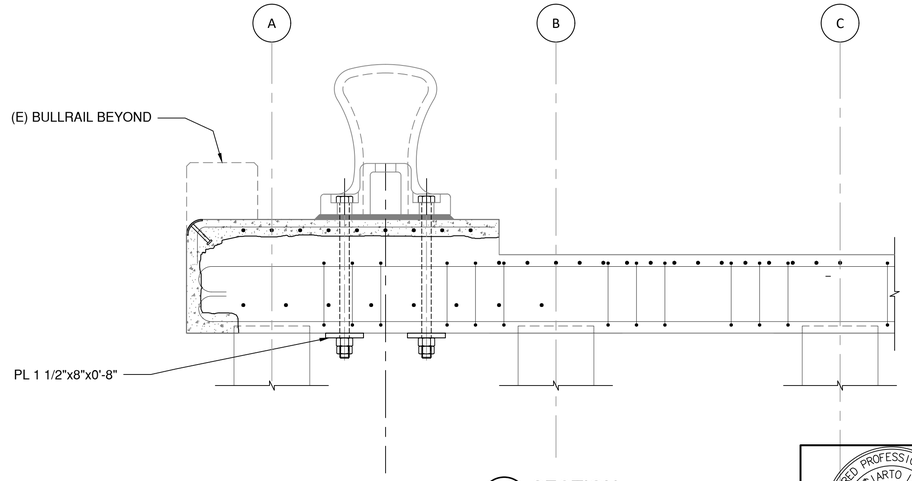
## NOTES:

1. PREPARE ALL GROUTED SURFACES AS CONSTRUCTION JOINT.
2. FOLLOW MANUFACTURERS' REQUIREMENTS FOR GROUTING.
3. GROUT = CEMENTITIOUS
4. REPAIR ANY DAMAGED CONCRETE AT AFFECTED LOCATIONS, INCLUDING UNDER DECK, BEFORE INSTALLING. SEE SHEET S3.02.
5. PILE BEAM REINFORCING MUST NOT BE CUT.
6. LONGITUDINAL AND TRANSVERSE REBARS THAT ARE CUT TO CLEAR ANCHOR BOLTS SHALL BE REPAIRED. SEE S5.02 FOR CUT REBAR REPAIR DETAIL.




A / - SECTION

3/4" = 1'-0"




C / - SECTION

3/4" = 1'-0"

**REFERENCE DRAWING**

REGISTERED PROFESSIONAL ENGINEER
SUGIARTO LONI
No. 3041
Exp. 03/31/2025
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE: 11/02/23

PROJECT #M23002

CAUTION: THIS PLAN MAY BE REDUCED 0 1" 2" ORIGINAL SCALE

REFERENCES:
PLANS
AS-BUILT PLANS
FIELD BOOKS

CAUTION:
CHECK TRACING FOR LATEST REVISIONS

| NO. | REVISIONS | DATE | REV'D | APP'D |
|---|---|---|---|---|
| | | | | |

DRAWN ALVIN HOFFPAUIR
DESIGNED DI LIU C84419 REG. ENGINEER NO.
CHECKED SUGI LONI S3041 REG. ENGINEER NO.

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Job # - 2424

OUTER HARBOR CHANNEL

**REPLACEMENT OF BERTH 10 FENDERS AND BOLLARDS**

BOLLARD DETAILS - 1

DATE: 11/02/23
SCALE: AS SHOWN
SHEET: 17 OF 19 SHEETS
S5.01 AA-4353

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# APPENDIX K – WHARF DECK ALLOWABLE LIVE LOAD

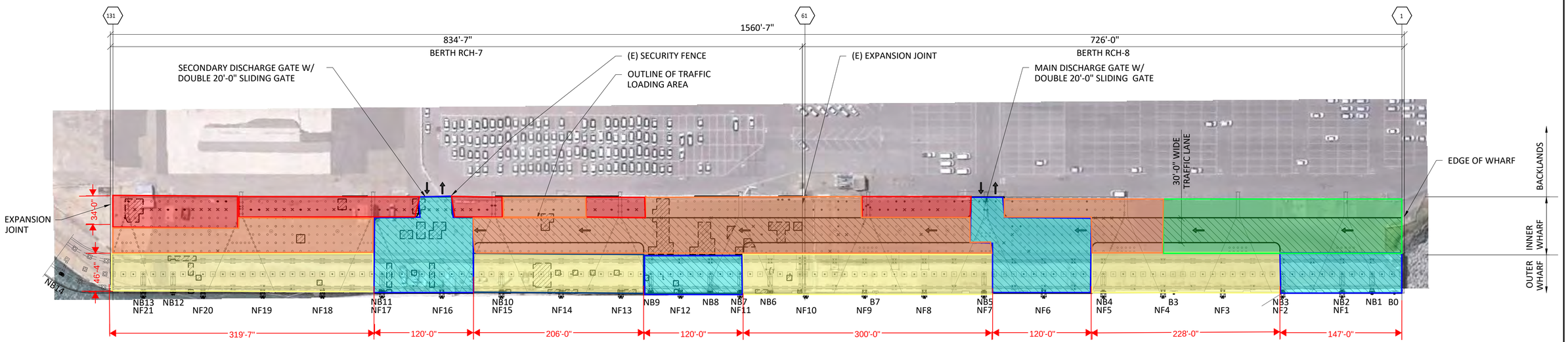
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# APPENDIX K - WHARF DECK ALLOWABLE LIVE LOAD




## WHARF PLAN

### WHARF LEGEND

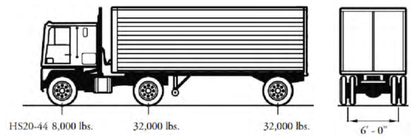
| | |
|---|---|
| BX | (E) BOLLARD TO REMAIN |
| NBX | (N) BOLLARD |
| | TRAFFIC LOADING AREA |
| NFX | (N) FENDER |

### 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

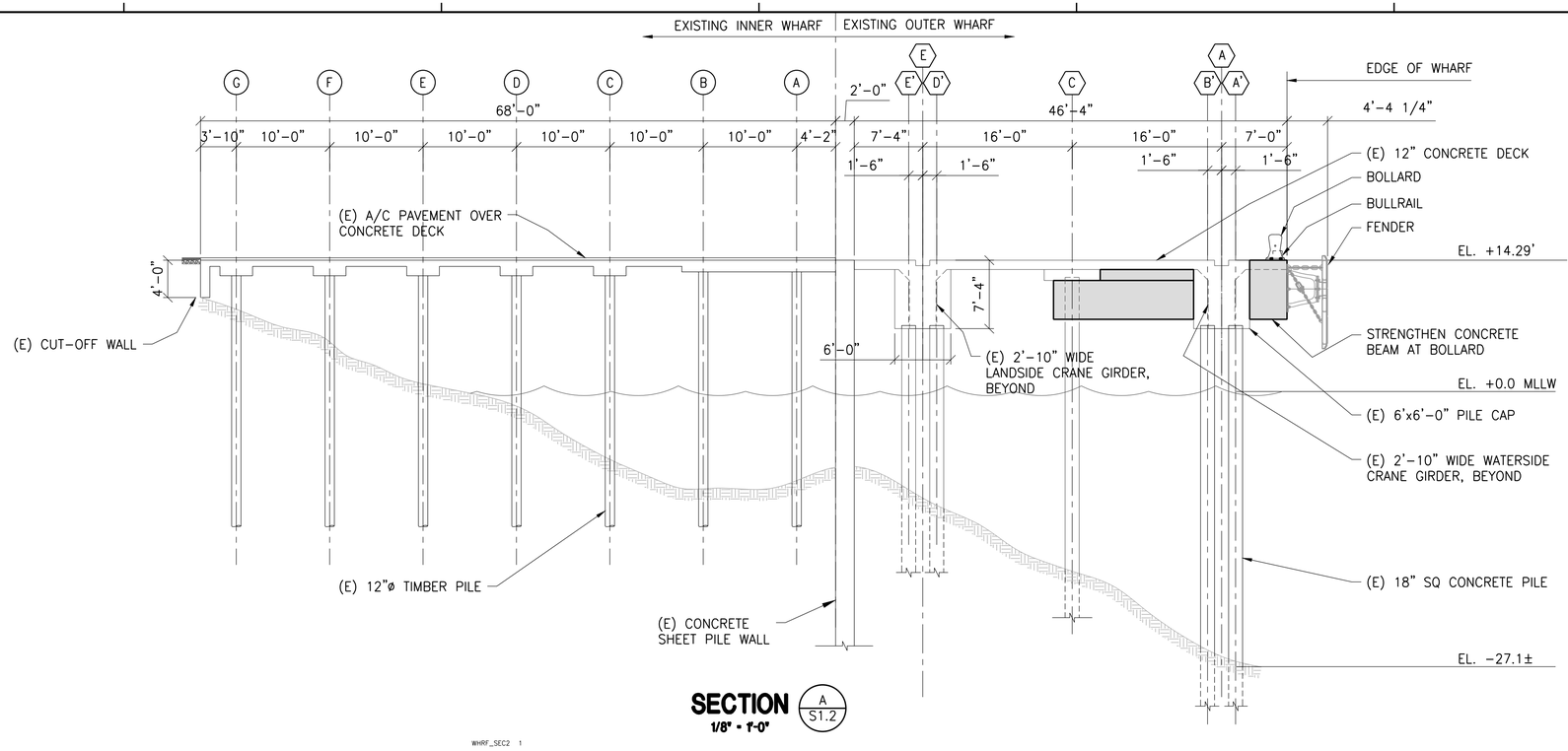
| No. | Revision | Date | By | Checked | Approved |
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| 1 | REVISON | ##/##/## | XX | XX | XX |

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

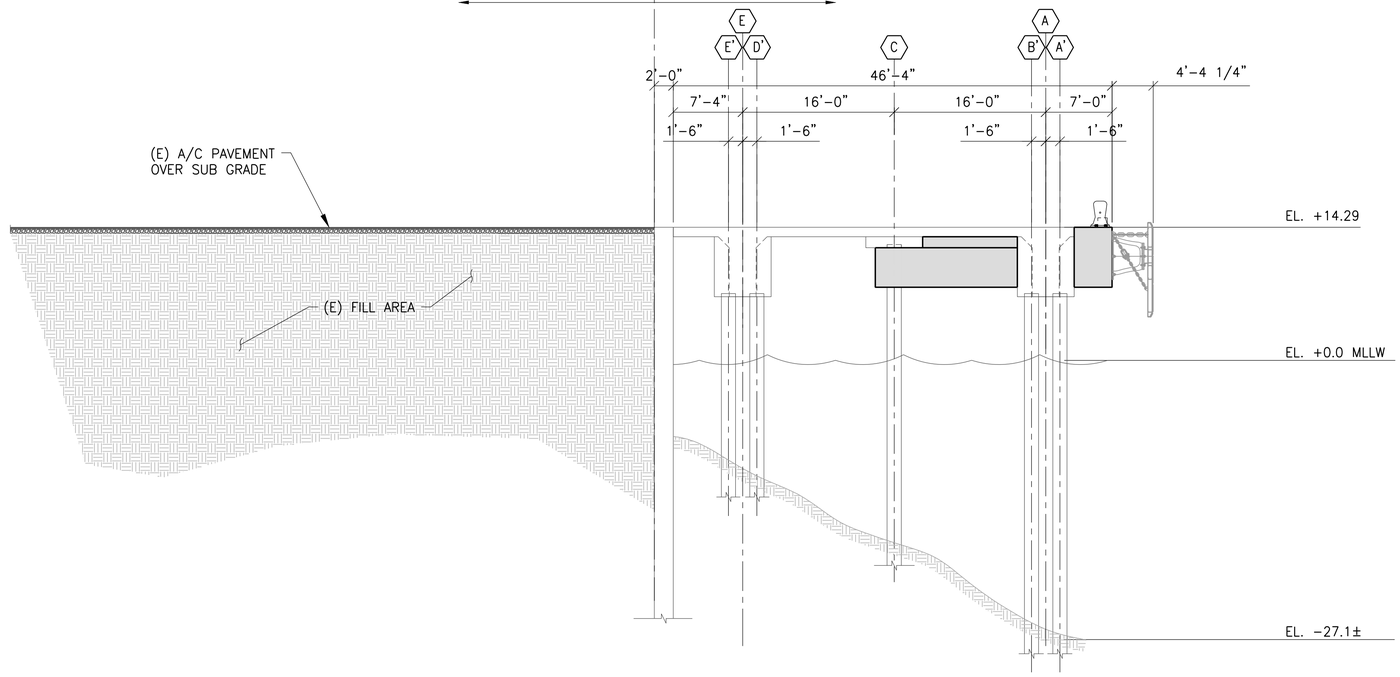
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| Project No. | 2525 | | | | |
| By | SL/ALH | Checked | EGS | Sheet No. | K1 |
| Approved | EGS | | | of | 1 |
| Date | 7/25/25 | | | Revision | 0 |

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

WHRF_SEC2 1




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

SEE SECTION A/S1.2 FOR INFORMATION NOT SHOWN

WHRF_SEC3 1

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

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

REGISTERED PROFESSIONAL ENGINEER
SUGIARTO LONI
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Exp. 03/31/2011
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE:

**ISSUED FOR CONSTRUCTION**

**PRINTED**
1/24/2012
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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

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## 8.2 Whirley Crane Assessment

Liftech
LIFTECH CONSULTANTS INC.

# SITE VISIT REPORT
# CONDITION ASSESSMENT OF WHIRLEY CRANE AT POINT POTRERO, RICHMOND, CA

## FOR THE CITY OF RICHMOND
## PRIME CONSULTANT: MOFFATT & NICHOL

## VISIT DATE: MARCH 27, 2025

**Prepared by Liftech Consultants Inc.**
**June 26, 2025**

**Project No. 2525**

*Quality Assurance Review*
*for Liftech Consultants Inc.*

| | | | |
|---|---|---|---|
| *Author:* | *Steven Martinez* | *Mechanical Engineer, M34675* | S.M. |
| *Editor:* | *Linda Weber* | *Technical Support* | |
| | *Sugi Loni* | *California Structural Engineer, S3041* | SL |
| *Principal:* | *Erik Soderberg* | *California Structural Engineer, S4426* | E.S. |

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## BACKGROUND

The Richmond Museum Association owns a wheeled revolver crane, commonly known as the Whirley Crane. This crane is currently stored at the Port of Richmond's Point Potrero Marine Terminal (PPMT, Port), at Basin Number 5 near the SS *Red Oak Victory*. It is representative of the equipment used during World War II for ship construction at PPMT and has been inoperable for several decades.

As part of the marine structures condition assessment, the Port requested that Liftech Consultants Inc. (Liftech), supporting Moffatt & Nichol (M&N), perform a preliminary condition assessment of the crane. The purpose of this investigation is to determine whether the crane poses a hazard to life or property and to provide recommendations for future action.

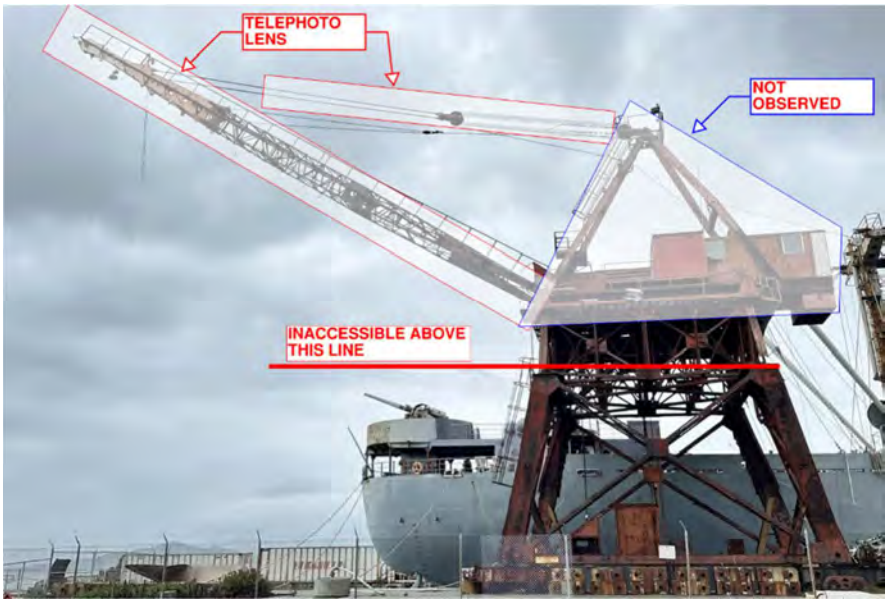
Liftech conducted a visual assessment of the crane in areas where access was feasible, using a tape measure and ultrasonic thickness gauge to evaluate conditions. Where access was restricted due to safety concerns, the team relied on Port-provided and telephoto images. The assessment did not include a review of original design calculations or a full structural analysis. Based on our observations, we offer conclusions and recommendations to support future decision making regarding the crane, including options for preserving it in place, dismantling and preserving it in whole or in part for museum display, or proceeding with demolition.

Steven Martinez, Liftech mechanical engineer, performed the visual assessment on March 27, 2025, with support from Sugi Loni, Liftech structural engineer, who was conducting wharf assessments.

### Site Visit Attendees

| Firm | Person |
|---|---|
| Liftech | Steven Martinez, Senior Mechanical Engineer, PE |
| Liftech | Sugi Loni, Principal, Senior Structural Engineer, PE |
| *Lizeht Zepeda from the City of Richmond facilitated our time on-site. She was not part of the crane walkthrough itself.* | |

## COMPONENTS OBSERVED



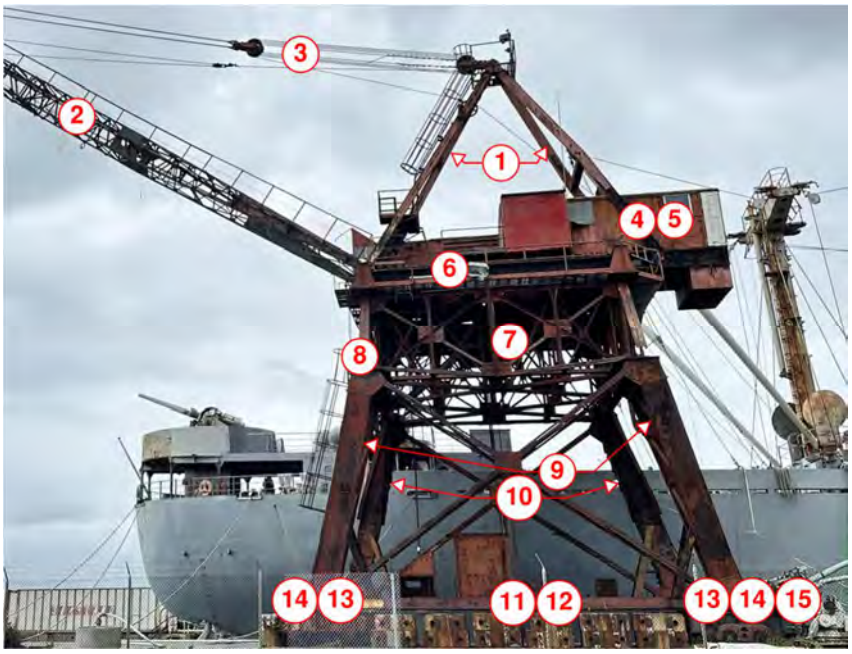

Photograph 1: Crane accessibility overview

Access was limited due to ladder damage. The second ladder to the machinery level was hazardous due to degraded and missing attachment welds. See Photograph 1. Inaccessible areas were photographed using a telephoto lens from different vantages, including the adjacent *Red Oak Victory* ship. No internal areas were observed, e.g., the machinery house.

Table 1 shows the components observed including comments on the extent of observation and condition. Review is for the exterior of components unless otherwise noted.

**Table 1: Observed Components**

| # | Component | Observed | Comments |
|---|---|---|---|
| | | ✓ Yes<br>A From afar, via telephoto lens<br>N Not Observed | |
| 1 | A-frame Pylons | A | Limited vantage; no comment. |
| 2 | Boom | A | Minor corrosion damage. |
| 3 | Boom Reeving | A | Minor corrosion damage, remaining strength unknown. |
| 4 | M-House Interior | N | Not accessed. |
| 5 | M-House Exterior | A | Limited vantage. No major damage observed. |
| 6 | Slewing Mechanism | A | Limited vantage. Unknown condition. |
| 7 | Portal Truss Structure | ✓ | Minor corrosion damage. |
| 8 | Portal Accessways | ✓ | Major to severe corrosion damage. Unsafe. |
| 9 | Left Legs and Diagonals | ✓ | Minor corrosion with some local major corrosion damage. |
| 10 | Right Legs and Diagonals | ✓ | Minor corrosion with some local major corrosion damage. |
| 11 | Left Sill Beam | ✓ | Minor corrosion with some local major corrosion damage. |
| 12 | Right Sill Beam | ✓ | Minor corrosion with some local major corrosion damage. |
| 13 | Gantry Equalizers | ✓ | Minor corrosion damage. |
| 14 | Gantry Trucks | ✓ | Minor corrosion damage. |
| 15 | Gantry Machinery | ✓ | Corrosion damage, not serviceable. |



Photograph 2: Indexing of observed areas

## Photographs

The following photographs represent the observed condition of the crane. The City of Richmond (City) also provided reference photographs to Liftech, taken in 2024. Since some areas of the crane, such as the machinery house, were not accessible during Liftech's site visit, select photographs (as noted in the captions) were used to support the assessment.



Photograph 3: Leg 4 – typical leg and sill beam.



Photograph 4: Corrosion jacking; rivets appear unbroken.



Photograph 5: Example of section loss near connection plate joints.



Photograph 6: Kingpin to gantry equalizers; corrosion and section loss.



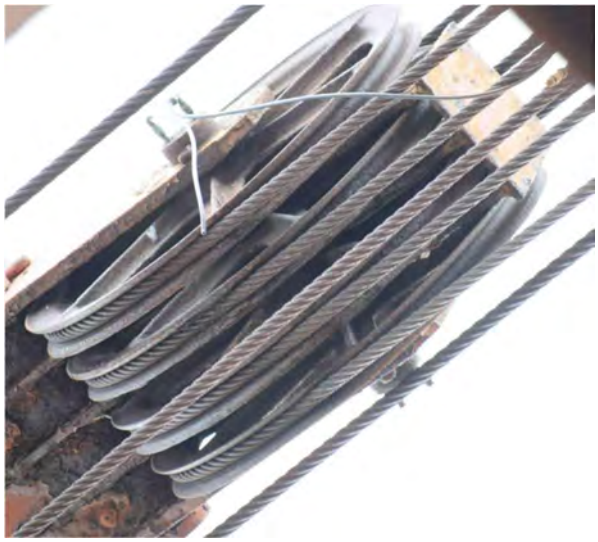
Photograph 7: Longitudinal sill beams with minor corrosion damage.



Photograph 8: Sill beam structural reinforcing is detached.



Photograph 9: Walkway grating has significant corrosion and is unreliable.



Photograph 10: Wire rope, no signs of broken wires or significant corrosion; condition of core (internal) unknown.



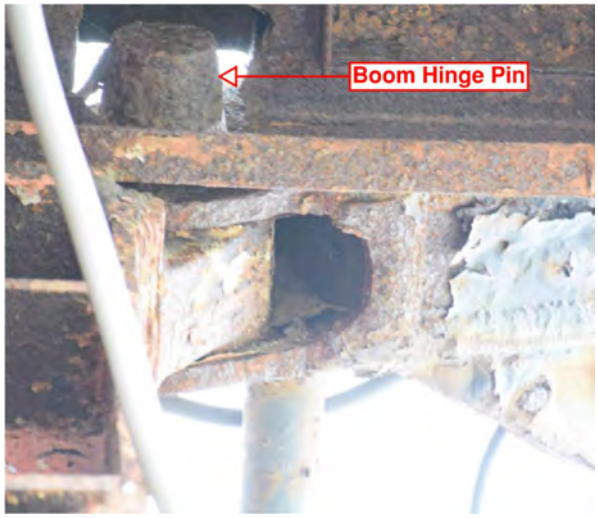
Photograph 11: Boom reeving is not redundant; it is supported by one rope (photograph courtesy of the City's 2024 walkthrough).



Photograph 12: Hoist and boom machinery in the machinery house (photograph courtesy of City's 2024 walkthrough).



Photograph 13: Slewing arrangement (photograph courtesy of City's 2024 walkthrough).




Photograph 14: Boom hinge pin with significant corrosion, but with significant thickness remaining.



Photograph 15: Typical truss structural joint with limited corrosion damage to members. Rivets appear unbroken.




Photograph 16: Thickness measurement of structural lap plate. Fifty percent thickness loss measured near the corroded drain hole.

## FINDINGS

### Failed Painting System and General Corrosion

The crane's painting system has mostly failed; most the crane's steel is exposed. All areas observed have corrosion damage. The crane's structure will continue to corrode and deteriorate.

### Primary Structure

*Frame*

All structural components of the primary structure have general corrosion damage and some locations also have localized corrosion damage; however, no signs were observed of significant distress, which would raise concerns about global stability.

There is significant corrosion jacking at most riveted connection plates. Corrosion jacking is caused by the expansion of rust between plates, resulting in local plastic deformation of the connection plates. No broken rivets were observed. We could not observe the inner surfaces of rivets between the connection plates and members.

The kingpin joints of the equalizer assemblies have major corrosion damage and have lost significant material and strength.

All joint connections to the gantry system that collect water have major to severe local corrosion.

The upper structure appears to have only minor corrosion damage based on observation from a distance.

*Boom and Reeving*

The boom structure including reeving appears adequate for its non-operating condition.

The boom structure has minor corrosion damage. The boom hinge has major to severe corrosion but still has substantial diameter remaining.

The wire ropes supporting the boom appear to have only minor corrosion with no signs of external wire breaks. Since the boom is at a stowage position with no live load, the rope load is small compared to its design operating load. However, it cannot be assumed the rope is uncompromised. Given the exposure of the ropes to weather and the potential for internal water entrapment, there is a risk of hidden corrosion that cannot be assessed visually. An internally compromised rope can have a significant reduction in strength. In addition, the boom reeving is not redundant, meaning that the boom is supported by only one rope. Any failure along its entire length would release the boom.

### Secondary Structure

Many of the thinner secondary structural components, including handrails, walkways, and ladder systems, have major and severe corrosion damage and are not suitable for safe access. Many expanded metal walkways appear unsuitable for supporting people. Several handrails are detached and several failed ladder welds were observed.

***There is a significant risk that these deteriorated components could detach and fall from the crane. Access beneath and on the crane should be restricted until the conditions are addressed.***

### Machinery

#### *Gantry*

The gantry machinery is no longer operational and restoration for service is not feasible.

#### *Machinery House and Machinery*

These areas were not observed during the site visit. Comments are based on a review of 2024 photographs provided by the City.

Overall, the indoor environment has contributed to better preservation of the machinery house relative to the crane structure. Corrosion is evident on thinner sheet metal, particularly at joints, but the machinery deck structure, enclosure, and plate flooring appear to remain structurally sound.

The hoist machinery is unloaded, with ropes spooled onto the drums. Motors are absent; only the drums remain. The design is outdated and lacks functional utility.

As noted in the Boom and Reeving section, the boom drum is currently supporting the boom load. A pawl and band brake system provides redundancy for load holding; however, given the system's age, it should not be considered reliable for long-term load support.

Other observed components include the operator’s cabin and a rack of resistor banks, which offer limited remaining value.

In general, the machinery house and associated components may hold some historical or aesthetic interest if appropriately refurbished for display.

### Crane Motion Restraints

The crane is currently restrained from movement by two passive measures. At the elevated rotating (whirling) level, chocking wedges are placed between the steel wheels and rails to inhibit rotation. At the gantry level, where the crane can roll along the wharf, the steel wheels are partially buried in gravel to discourage translational movement. While these measures provide some resistance, they are informal and not engineered to reliably prevent displacement under environmental or seismic loads.

There is a risk of unintended crane movement, either rotating or translating, if these passive restraints become dislodged, deteriorate, or are otherwise compromised over time. Uncontrolled crane motion could pose a hazard to nearby structures or people.

We recommend installing positive, engineered restraints to ensure the crane remains securely fixed in place. Options include pinning or welding the wheel assemblies to the rails, installing structural stops or brackets, or fabricating custom cradle supports to secure both the gantry and slewing bases. These measures should be designed by a structural engineer and verified in the field to ensure long-term stability and safety.

## COMMENTS AND RECOMMENDATIONS

### Immediate Risk Mitigation

We recommend some immediate actions to reduce risks to the public.

1. Access:
   a. **Do not allow people access on or under any part the crane.**
   b. Before ladders and walkways are used, repair or replace areas with major corrosion. Some engineering input will be required during the design, and to review the completed repairs.
2. Falling objects: Related to item 1a above, confirm that areas below secondary components with major corrosion damage are blocked off. Repair, or if not needed, remove compromised components with significant corrosion damage that may fall, e.g., compromised ladders, railings, and gratings. Have an engineer design and review completed repairs, determine what to remove, or both.

### Near-Term Risk Mitigation

We recommend several actions be implemented soon to evaluate and mitigate risks.

1. Boom rope inspection and secondary support: Have a qualified rope inspector inspect the rope, e.g., for internal corrosion, broken wires, and loss of cross-sectional area, and advise if replacement is necessary and feasible. If the ropes are found to be significantly compromised, install a new rope, or install a redundant support in addition to the existing to provide redundant support. Replacing the existing rope may not be feasible if the reeving system is compromised, e.g., seized bearings or excessive corrosion.
2. Crane restraints: Install engineered restraints to prevent movement of the crane and slewing of its upper works. Options may include pinning or welding the wheels to the rails, installing structural stops or brackets, or fabricating custom cradles to secure the crane in place.

### Crane Functionality

The crane has been inoperable for decades and parts are no longer available. From an economic perspective, the crane is obsolete and has negative value. It would not make economic sense to restore the crane for any use.

### Long-Term Preservation for Historic Reasons

If the crane needs to be preserved, the crane should be retrofitted so it is safe for public viewing, access, or both as desired. If public access on the crane is desired, significant effort and cost will be

required to retrofit the crane to bring it to the standards required by today's regulatory agencies such as Cal/OSHA, ADA, etc.

*Structural Analyses*

Perform an engineering assessment to determine the adequacy of the structure. The assessment should consider modern wind and earthquake loading criteria and the crane's current condition, and determine what repairs and modifications are required. If the public will not be on or under the crane, this will lessen the required analyses, repairs, and modifications.

*Modifications*

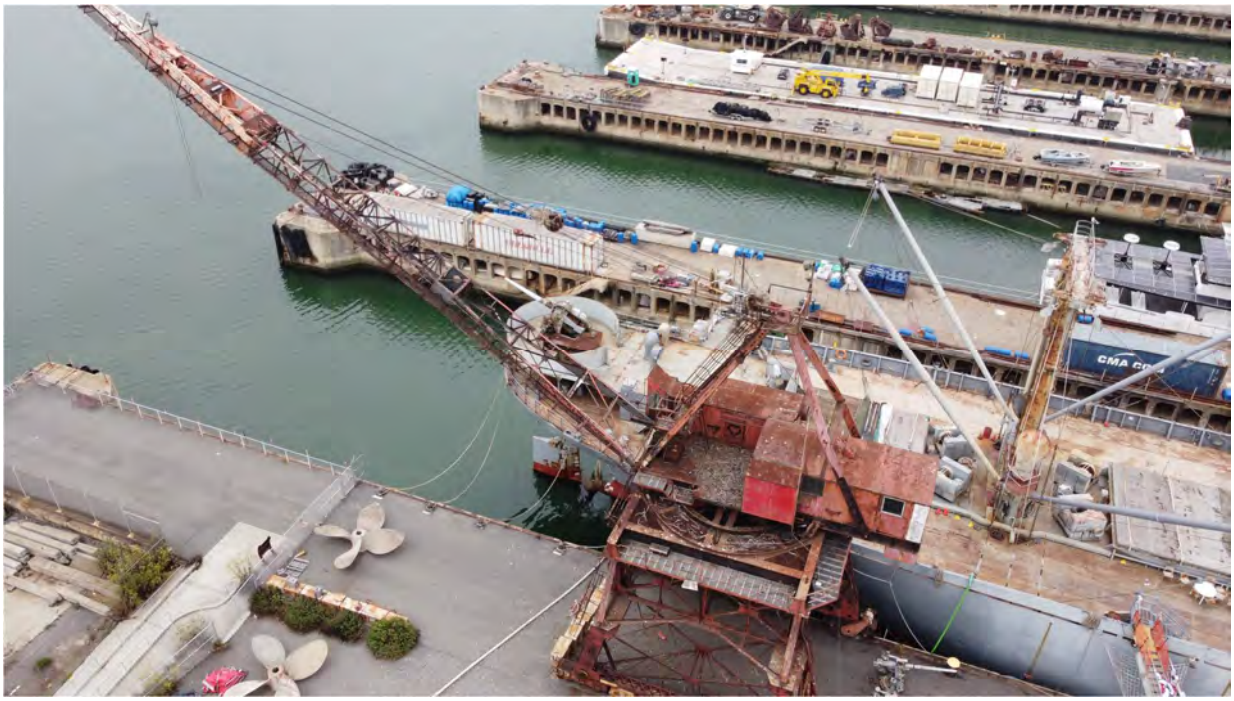
Based on structural analyses and this condition assessment, a scope of modifications for long-term preservation can be determined. Examples include corrosion repairs (removal or replacement of damaged secondary components), coating repairs (new coating), and strengthening of select portions of the crane structure. Other non-structural improvements will be required.

*Corrosion and Coating Repair*

Corrosion and coating repair/replacement will require surface preparation including removal of the remainder of the existing coating system. Given the age of the structure, lead-based paint probably exists, requiring special protocols. Surface preparation and installation of a new coating will require permits and oversight related to stormwater runoff, air quality, and hazardous materials.

**Demolition**

Demolition will require significantly less cost than preservation. Similar to preservation, demolition will probably require lead paint abatement. To limit costs, it may be favorable to dismantle the crane into large sections and truck them to a recycler, such as SIMS or Snitzer Steel, who can handle most of the paint abatement at their facility. Although less probable, if the crane can be moved close to the south edge of the wharf, it may be practical for a marine contractor, such as Manson Construction Company or Power Engineering Construction Company, to lift the entire crane with one of their floating cranes, set it on their barge deck, and then offload the entire crane at a local metal recycler such as SIMS or Schnitzer. See photograph 17.



Photograph 17: Whirley crane position near the edge of the wharf.

## COST ESTIMATES

For reference, Liftech developed high-level cost estimates for the above recommendations. This is based on Liftech's experience with limited input from contractors. We recommend including a minimum 20% contingency to these estimates for budgeting.

**Table 2: Cost Estimates in 2025 Dollars**

| # | 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. |

## CONCLUSION

The Point Potrero Whirley Crane has extensive coating system failure and corrosion damage. Corrosion is mostly minor with some localized areas with major corrosion or other damage. Some secondary structures, such as ladders, railings, and gratings, have major or severe corrosion damage and are a hazard for access and for falling. These hazards should be addressed if access must be maintained or if the areas below are not restricted.

The crane does not appear to be at significant risk of collapse from the observed corrosion damage. The boom support rope has minor external corrosion, but a rope inspector should evaluate it to confirm the rope is not significantly compromised by significant internal damage, e.g., corrosion. If needed, the rope can be replaced, or a new redundant rope or chain system can be installed.

If the crane coating system is not repaired, corrosion and deterioration will continue.

The crane is obsolete, has negative value not considering historic value, and is not practical to restore for operation. Preserving the crane for historic reasons will require significant effort and cost to bring the crane to meet today's safety standard, including a structural evaluation to develop repair designs and possible strengthening modifications, repair of the coating system by removing the remaining coating system and corrosion, and installing a new coating system and, if public access is required, other safety improvements for safety and regulatory compliance like OSHA.

Demolishing the crane will require much less cost than preservation. This will probably require lead abatement, which we expect can be handled mostly at a recycling facility already set up to handle it, e.g., SIMS Steel in Richmond or Schnitzer Steel in Oakland.

## NEXT STEPS WITH STAKEHOLDERS AND TIMELINE

We suggest developing a plan through a working session with M&N and the Port to align priorities and determine next steps. We recommend the following schedule:

**Table 3: Recommended Schedule**

| Timeline | Item |
|---|---|
| Immediate | Restrict access on or under the crane to qualified personnel. |
| Near Term, Within 6 Months | Complete near-term risk mitigation steps. |
| Within 1 Year | Develop long-term preservation or demolition approach. |

This concludes our report.

## 8.3 Graving Basin and Finger Piers Inspection Report

moffatt & nichol

# PORT OF RICHMOND

## Point Potrero Marine Terminal

## Inspection Report

Produced for the Port of Richmond
August 19, 2025

# Document Verification

| | |
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| **Document title** | Inspection Report |
| **Status** | Final |
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| B | Inspection Report - Final | Damilola Taiwo | 08/18/2025 | Matt Trowbridge |

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# 1. Executive Summary

Moffatt & Nichol (M&N) staff performed above-water and above-deck inspections of the graving basin and finger pier structures on five separate days between February 27 and April 25, 2025. The graving basins and finger piers are located at Point Potrero Marine Terminal (PPMT) at the Port of Richmond. Originally construction between 1941 and 1942 to support shipbuilding during World War II, these structures are presently used as berthing locations for a variety of vessels in support of tenant operations.

Varying degrees of concrete damage was observed throughout the graving basin structures. The interior columns were generally in good condition with little to no damage observed. The exterior columns typically exhibited moderate to major damage due to usage for mooring and fendering systems, and inadequate concrete cover. Several columns had severe damage (complete loss of bearing), likely due to impact loads from vessels. Concrete delaminations were observed at various locations on the soffit and slab, although it should be noted that these will likely not contribute to significant loss of strength of the structure. Additionally, potential hazards observed include large quantities of paints, solvents, and environmentally hazardous chemicals being stored in the basin structures with no visible methods of containment and large holes in the deck generally located at the ends of the basin structures with inadequate cover, if any. Overall, the graving basin structures are in fair condition; concrete damage was observed throughout, but there is a high bearing capacity of the rock foundation beneath the structure. The condition rating of the structural components is summarized in Table 1.

*Table 1 Condition Rating Summary: Graving Basins*

| Structure or Structural Element | Condition Rating |
|---|---|
| Columns | Fair to Poor |
| Slab and Soffit | Fair to Poor |
| Deck | Fair to Poor |
| Overall Structure | Fair |

At the finger piers, the piles generally exhibited moderate to major damage. 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. 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. The condition rating of the structural components is summarized in Table 2.

*Table 2 Condition Rating Summary: Finger Piers*

| Structure or Structural Element | Condition Rating |
|---|---|
| Piles | Fair to Poor |
| Beams | Poor |
| Soffit | Good |
| Deck | Fair |
| Overall Structure | Fair to Poor |

# 2. Introduction

This report summarizes the above water inspections of the graving basins and finger piers at the Point Potrero Marine Terminal at the Port of Richmond. The primary objectives of the inspection were to:

1) Assess the general structural condition of each structure
2) Assign a condition assessment rating
3) Develop a prioritized list of potential upgrades based on inspection findings

## 2.1. Facility Description

Point Potrero Marine Terminal (PPMT) is the former Historic Shipyard Number 3 at the Port of Richmond. The facility was originally constructed between 1941 and 1942 as one of four shipyards where vessels were constructed during World War II. Immediately following the war, Shipyard No. 3 was converted to a ship repair facility and was rehabilitated in 2009 into a Roll On/Roll Off (RoRo) terminal for the import of automobiles.

This report is focused on the graving basins and finger piers at PPMT.

- There are five graving basins; basins 1,3,4 and 5 are 576 feet long, and basin 2 was upgraded circa 1969 and is 748 feet long. All basins are 100 feet wide. The graving basins are delimited by six basin fingers approximately 610-feet-long by 35-feet-wide each. The graving basin structures consist primarily of a base slab at -30-ft MLLW, cast-in-place walls and two working levels above water. The lower level is at the top of the graving basin side walls, elevation +10-ft MLLW. This is referred to as the gallery deck. The upper level is at the grade of the back lands, elevation +18.5 MLLW. The upper deck is referred to as the gallery roof deck. The gallery roof deck is supported by (2) exterior 18" square columns spaced at 6.5 feet on-center (OC) and (2) internal 18” square columns spaced at 13 feet on-center. Fingers 1 and 6 each have a wall on their west and east sides, respectively, instead of exterior columns. The graving basins are currently used for the berthing of vessels such as the Red Oak Victory ship, scow barges and other vessels. Note that for the numbering of the graving basin structures used in this report, 1 is the west-most structure and 6 is the east most structure, as outlined in Figure 4.
- Two finger piers approximately 545-feet-long by 48-feet-wide are located on west end of the PPMT facility. Both piers are constructed similarly. A 12" concrete deck is supported by three concrete bents running the length of the pier. The external bents are supported by clusters of 4 concrete piles at 36 feet OC. Each concrete pile within the clusters is 1'-6" by 2'. The central bent is supported by 18" square concrete piles at 12 ft OC, typical. The first three shoreside piles supporting the central bent are 1'-6" diameter steel pipe piles. The external bents are approximately 2'-8" wide by 5' deep. Transverse beams approximately 1'-7" wide by 5' deep exist at 108' OC (every two pile clusters). A concrete slab apron cantilevers out approximately 7' on the longitudinal sides of the pier and 2' on the transverse waterside. The shoreline edge at the landside of the piers is maintained by a steel sheet pile bulkhead fronted by rip rap.




*Figure 1 PPMT Location*




*Figure 2 Outline of Areas at PPMT to be Studied*



*Photo 1 Graving Basin 1 looking south*




*Photo 2 Distal end of Finger Pier 1 looking east*

## 2.2. Methodology

M&N staff J. Brady, S. Hart, and D. Taiwo performed a rapid structural assessment of the Graving Basins and Finger Pier structures per American Society of Civil Engineers Manuals and Reports on Engineering Practice No 130, *Waterfront Facilities Inspection and Assessment*, on five separate days between February 27 and April 25, 2025. As detailed below, above-water, underdeck and above-deck inspections were performed. No underwater inspection was performed; the inspection was visual / tactile only (no material testing/sampling was performed). Damage rating criteria per ASCE MOP 130 is shown in Figure 3.

The inspection was divided into two parts:

1) An “above water” visual and tactile inspection was performed from a small work boat. The exterior face and exterior columns of the graving basin structures and the concrete piles, beams, and underside of deck of the finger piers were observed. During this inspection, the tide level varied from +0.4 feet MLLW to +6.5 feet MLLW on Day One, -0.1 feet MLLW to +2.8 feet MLLW on Day Two, and +0.5 feet MLLW to +3.1 feet MLLW on Day Three. No destructive testing was performed as part of this inspection effort.
2) An “above deck” visual and tactile inspection was performed by walking within the graving basin finger galleries and the topside of the deck of both basin and finger pier structures to observe their general condition. No destructive testing was part of this inspection effort.

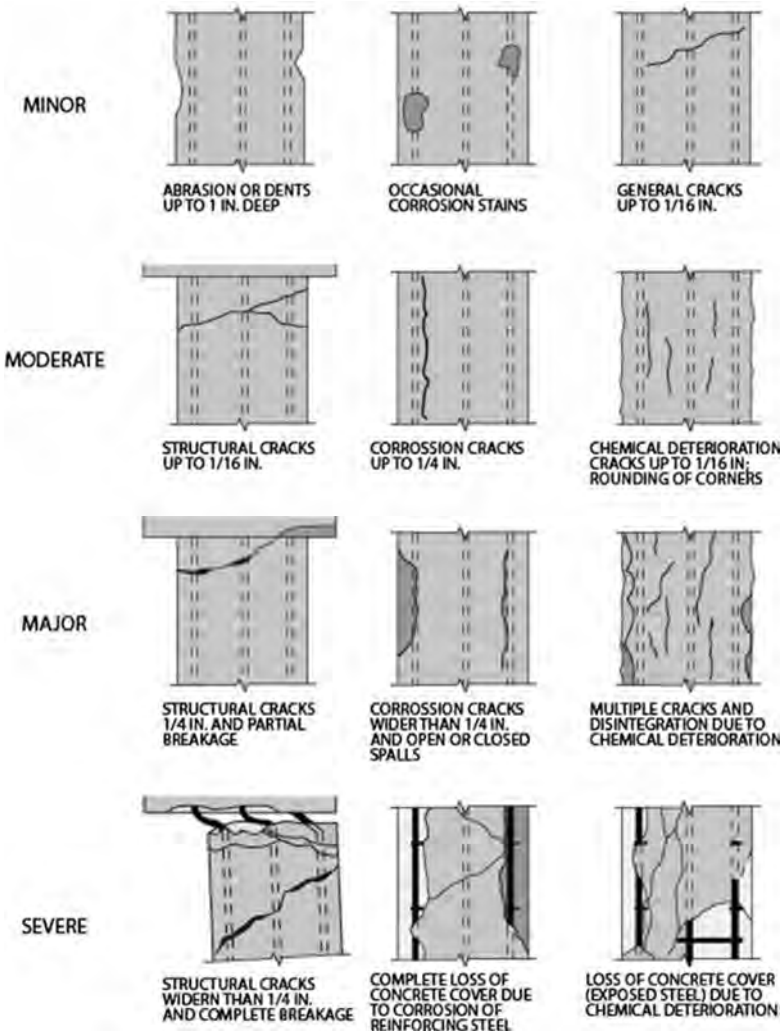



*Figure 3 Damage Ratings for Reinforced Concrete Elements, per ASCE MOP 130*

# 3. Observed Conditions

## 3.1. Graving Basins

The slab, soffit, columns, and exterior face of the graving basin structures were observed. The graving basin structures will be referred to as “fingers,” as outlined in Figure 4 below. The existing tenants of the graving basins are as follows: The Dutra Group (Basins 1 and 2), National Response Corporation Environmental Service (Basin 3), Alcatraz Cruises (Basin 4), and the Red Oak Victory Ship (Basin 5).

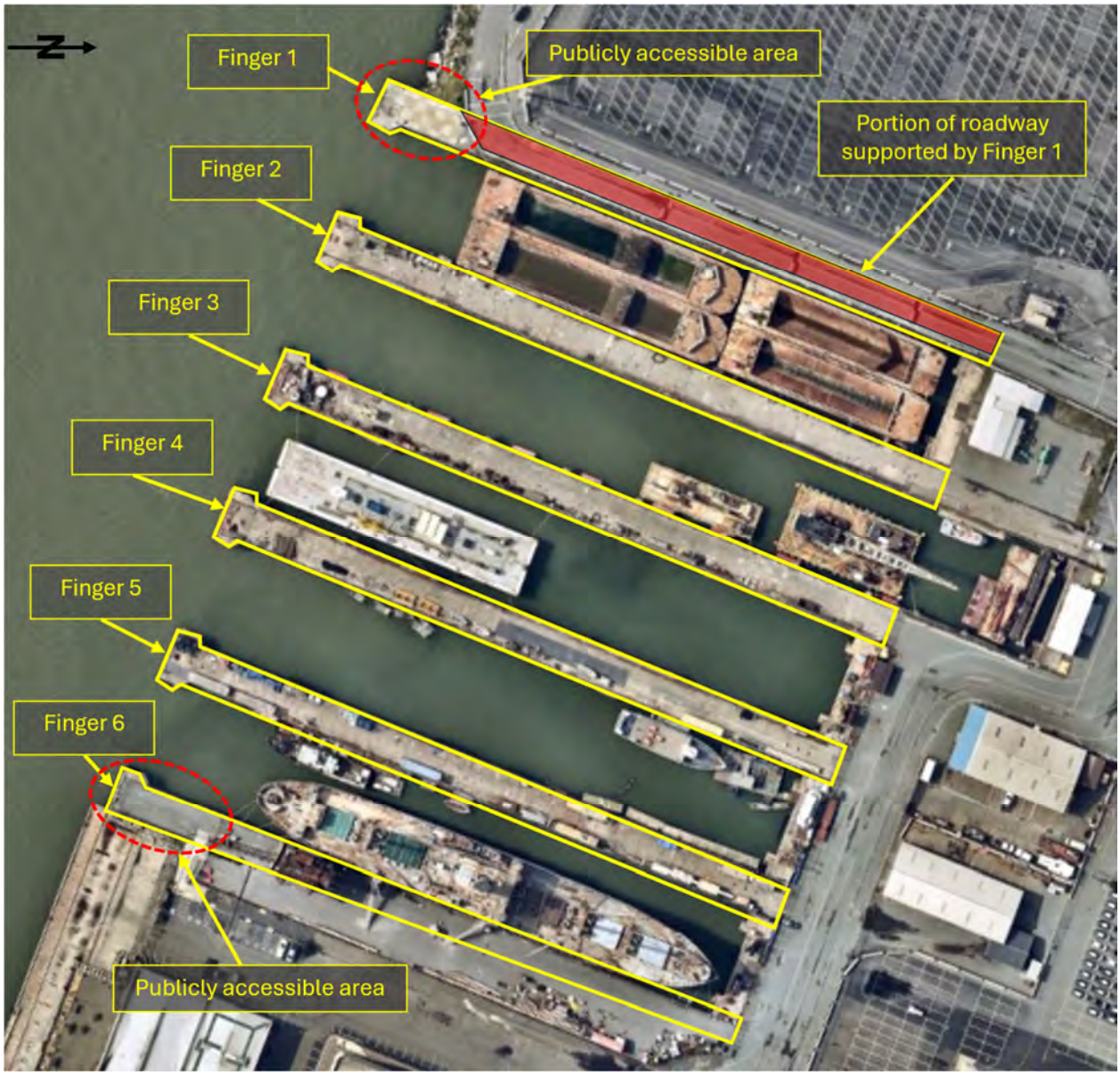



*Figure 4 Graving Basin Fingers 1-6*
*Note, roadway supported by Finger 1 and publicly accessible areas of Fingers 1 and 6.*

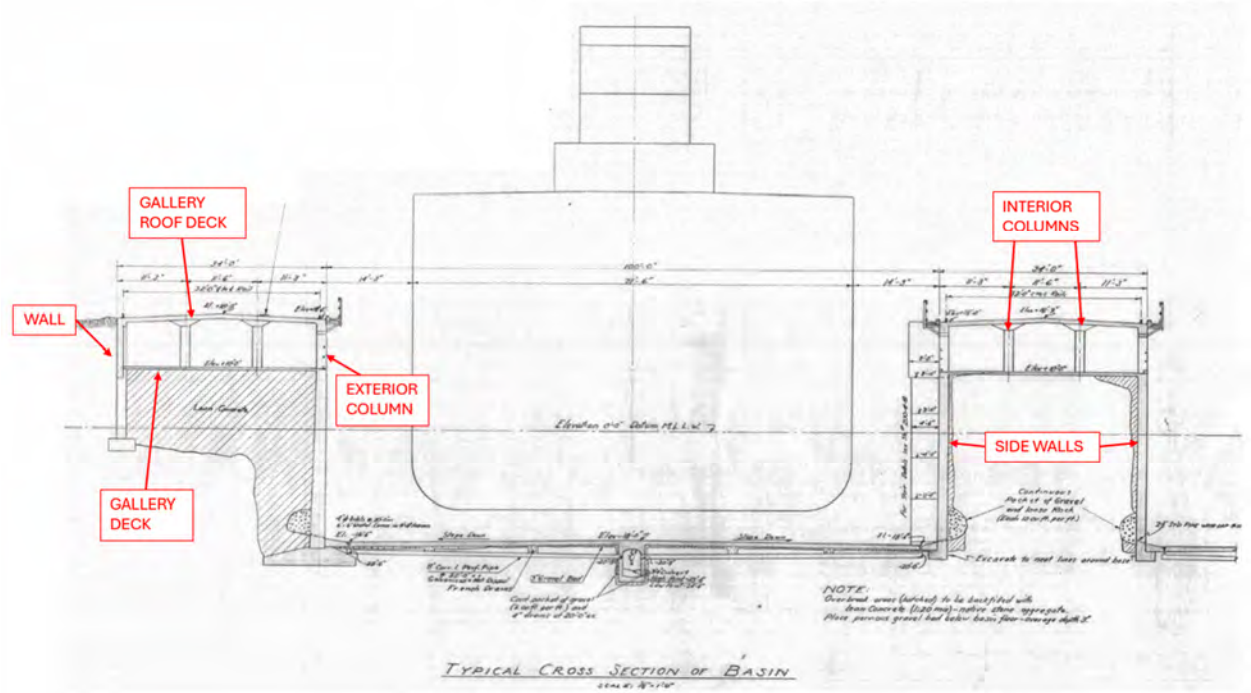



*Figure 5 Typical Section of Graving Basin*

### 3.1.1. Gallery Roof Deck

The gallery roof deck of the graving basin fingers has asphalt overlay measured at ±2 inches atop of a concrete deck surface. Mild to moderate damage was observed on the topside of the deck of the graving basin fingers. There were areas of localized depressions in the asphalt surface, delaminations, cracks, and exposed reinforcing. At several locations, installations made after initial construction, such as bollards, have led to underside deck damage, as depicted in Photo 6 and Photo 7.



*Photo 3 Typical Gallery Roof Deck Damage to Deck Asphalt at Graving Basin Fingers*



*Photo 4  Deck Damage with Exposed Reinforcing*



*Photo 5  Typical Post Construction installed Bollard*



*Photo 6  Underside of Gallery Roof Deck at Post Construction Bollard Location*




*Photo 7 Gallery Roof Deck Damage due to Installation Post-Construction*

### 3.1.2. Slab and Soffit

There were delaminations and spalling observed at various locations throughout the soffit and slab. Delamination occurs when the outer layer of a concrete slab separates from the rest of the slab body, most commonly caused by expansive corrosion of reinforcing steel that exerts pressure on concrete, causing it to crack and flake off. Delamination is indicated when tapping the concrete surface produces a dull or hollow sound. For slabs on grade at the gallery deck level, delaminations pose a safety risk in some areas, as they can potentially cause slips, trips, and/or falls, they likely will not significantly alter the strength of the structure. This is because the concrete slab rests directly on the rock layer below; as a result, the capacity of the structure is dependent on the bearing capacity of the rock beneath the graving basins. Additionally, the exposed reinforcing at areas on the soffit were likely caused by lack of adequate concrete cover.



*Photo 8 Typical Soffit Delamination*

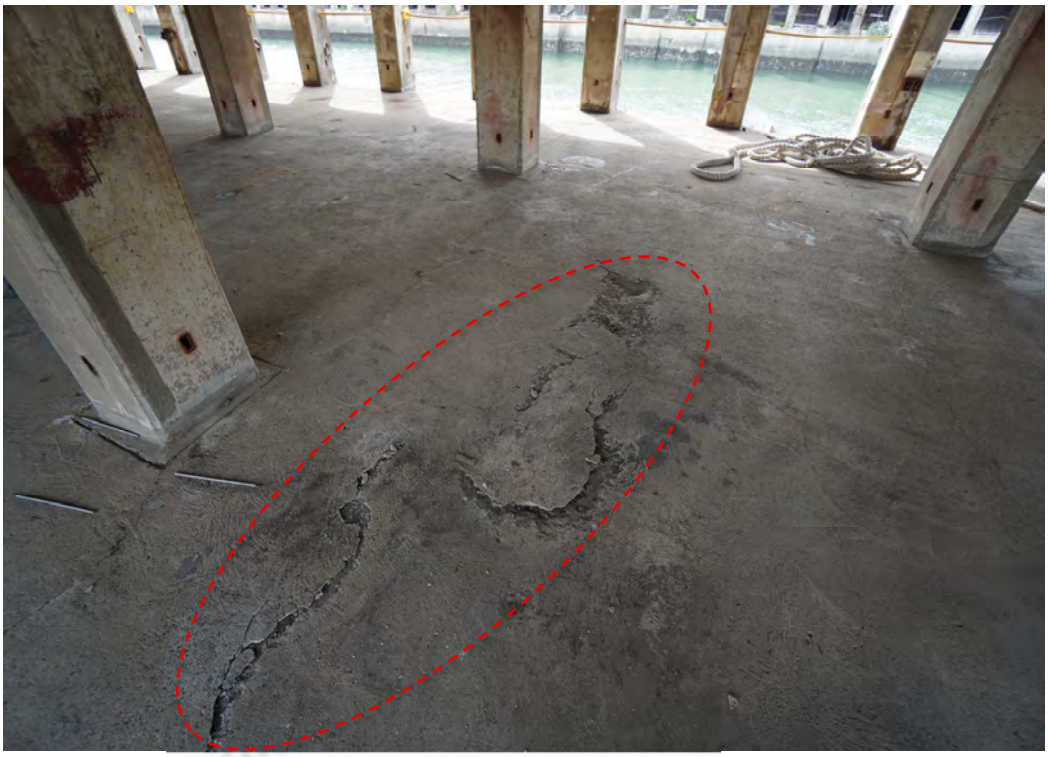


*Photo 9 Gallery Slab Delamination*



*Photo 10 Spalled Soffit with Exposed Reinforcing*

### 3.1.3. Columns

The columns were rated from minor to severe based on damage as described in ASCE MOP 130, shown in Figure 3. The interior columns are in good condition, as they generally exhibit no to minor damage. The exterior columns generally exhibited more moderate damage with some showing major damage, likely due to their exposure, usage for mooring and fendering systems, and inadequate cover. Some columns observed displayed severe damage, likely due to impact loads from vessels. Examples of columns rated as severely damaged are depicted in Photo 13 and Photo 14.

The inspection figures summarizing the damage observed for each graving basin finger is shown in Appendix B. The inspection figures depict the column damage observed and hatching where significant soffit damage was observed. Interior columns are not rated as they generally showed primarily minor damage. A summary of the exterior column damage for each graving basin finger is in Table 3. As depicted, the majority of the damage observed to the exterior columns is minor or moderate. Where there are severely damaged columns, Moffatt & Nichol recommends posting loads restrictions to the supported areas.

*Table 3: Graving Fingers, Exterior Column Damage*

| | Finger 1 | | Finger 2 | | Finger 3 | | Finger 4 | | Finger 5 | | Finger 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Damage Rating | Pile Count | % of Exterior Columns | Pile Count | % of Exterior Columns | Pile Count | % of Exterior Columns | Pile Count | % of Exterior Columns | Pile Count | % of Exterior Columns | Pile Count | % of Exterior Columns |
| No Damage | 4 | 4% | 19 | 10% | 35 | 18% | 26 | 14% | 30 | 15% | 15 | 16% |
| Minor | 15 | 15% | 67 | 35% | 98 | 52% | 90 | 48% | 54 | 28% | 27 | 28% |
| Moderate | 50 | 51% | 81 | 42% | 34 | 18% | 49 | 26% | 66 | 34% | 40 | 42% |
| Major | 27 | 27% | 25 | 13% | 23 | 12% | 21 | 11% | 41 | 21% | 13 | 14% |
| Severe | 3 | 3% | 1 | 1% | 0 | 0% | 3 | 2% | 5 | 3% | 1 | 1% |
| Total | 99 | 100% | 193 | 100% | 190 | 100% | 189 | 100% | 196 | 100% | 96 | 100% |



*Photo 11 Interior Columns at Finger 1, Typically No Damage Noted.*
*Note, dirt floor between grade beams at Finger 1 only.*

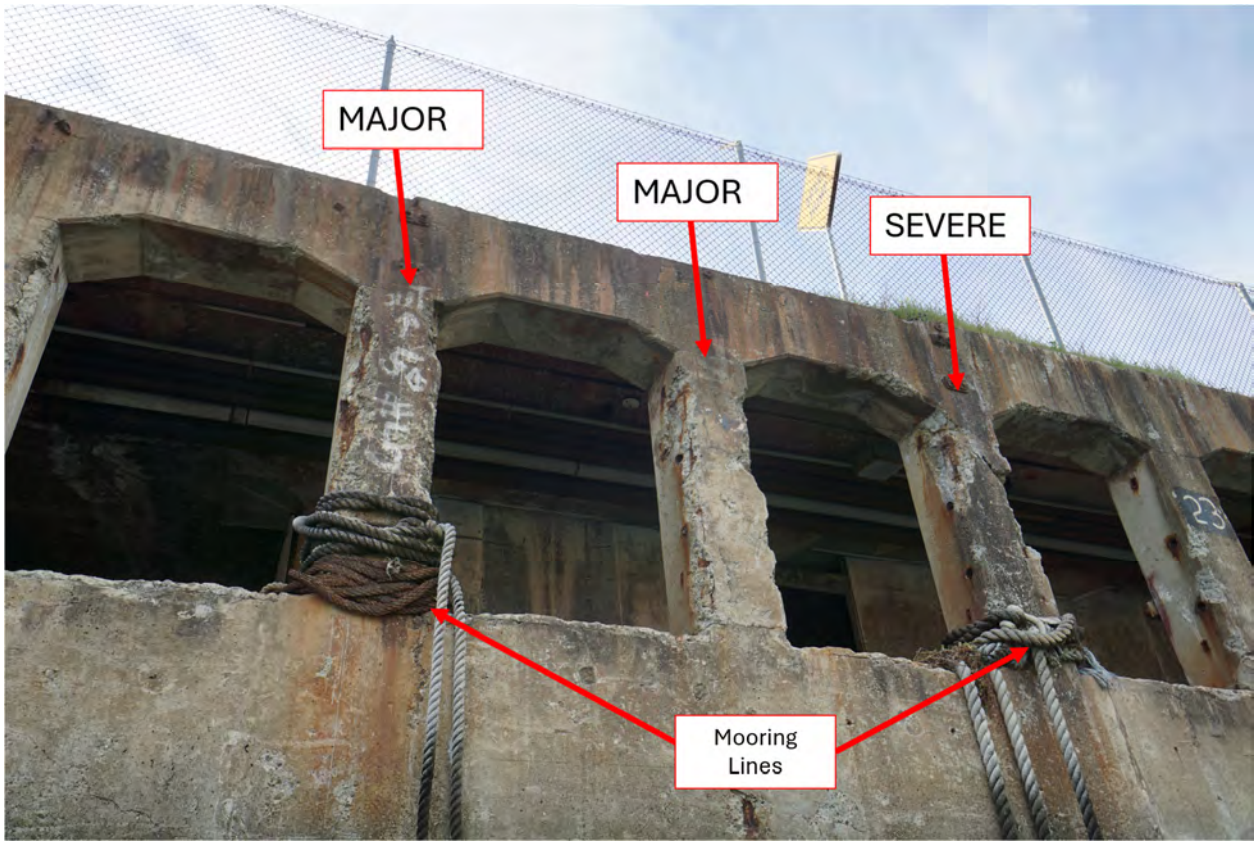



*Photo 12  Exterior Columns Used for Mooring, Major to Severe Damage*
*Location: Graving Basin Finger 1, Columns 33A-35A*




*Photo 13 Exterior Column with Severe Damage*
*Location: Graving Basin Finger 1, Column 43A*

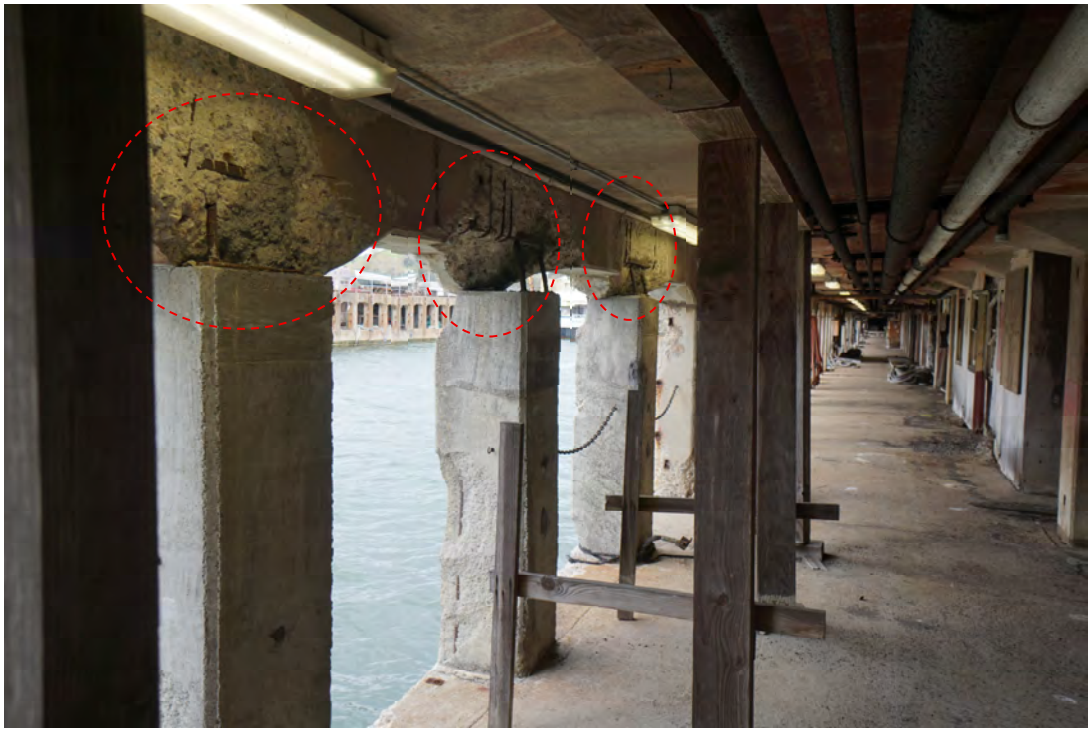


*Photo 14  Exterior Columns with Severe Damage*
*Note: Temporary Timber Supports*
*Location: Graving Basin Finger 5, Columns 68D-70D*



*Photo 15  Typical Exterior Column with Major Damage Caused by Mooring Lines*
*Location: Graving Basin Finger 3, Column 51D*



*Photo 16 Damaged Grade Beam with Exposed Reinforcing*

### 3.1.4. Basin Walls

Typical damage observed to the graving basin walls included cracks, exposed reinforcing steel, and delaminations, shown in Photo 17 and Photo 18. This damage was likely caused by exposure to salt water, lack of adequate cover, and vessel impacts, but does not significantly reduce the capacity of the structure.

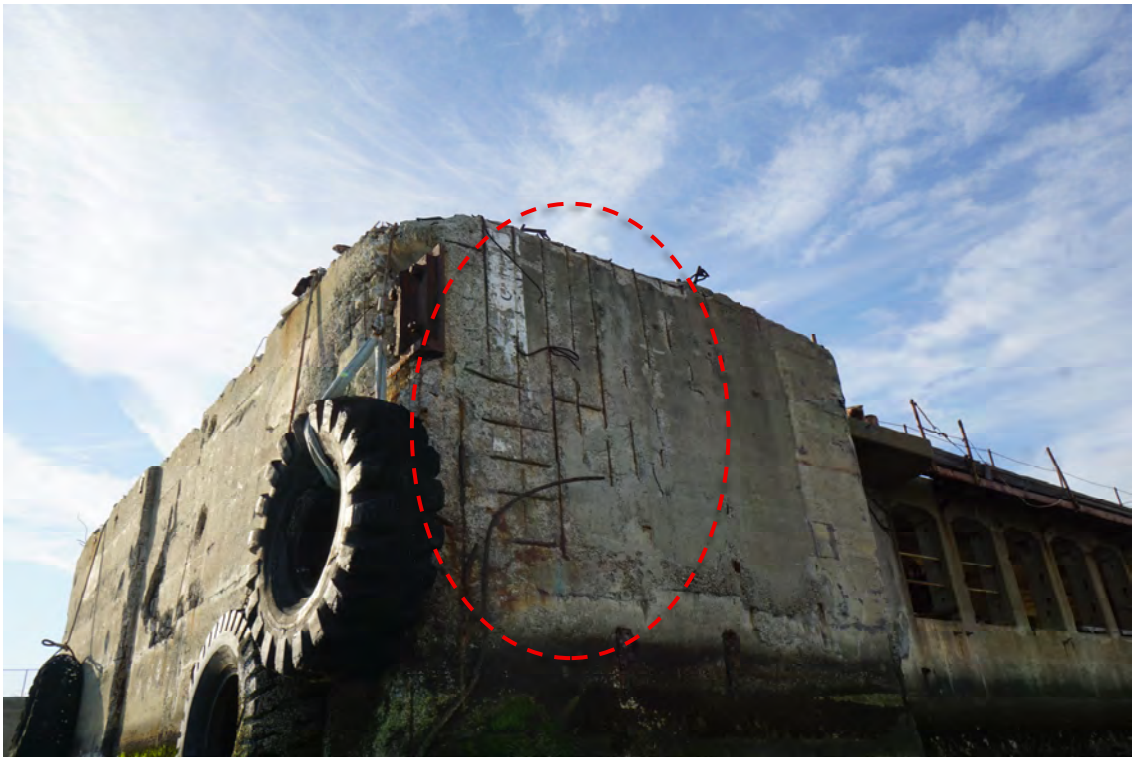


*Photo 17  Exposed Reinforcing on Outside of Graving Basin*



*Photo 18  Exposed Reinforcing on Outside of Graving Basin*

### 3.1.5. Other Observations

In Graving Finger 1, there are round columns added between Rows 55 and 57, likely for additional support. The columns were measured at ±16 inches, and the foundation was measured at ±114 inches by ±36 inches. It should be noted that a portion of the publicly accessible Canal Blvd is supported by the Finger 1 (as shown in Figure 4) and is therefore subject to unrestricted vehicle loading (see Photo 20).




*Photo 19 Round Columns at Graving Finger 1*

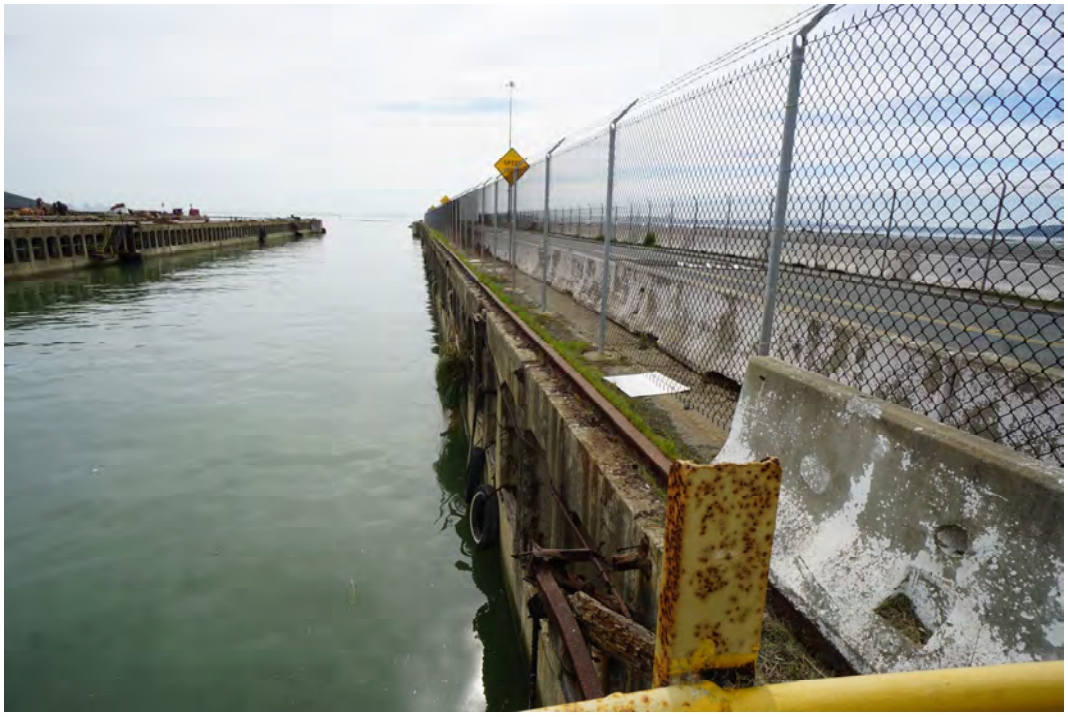


*Photo 20  Portion of Canal Blvd Supported by Finger 1*

Potential hazards were observed at a few locations of the graving basins. This includes large quantities of paints, solvents, and environmentally hazardous chemicals being stored with no visible methods of containment. Additionally, there are large penetrations in the gallery roof deck and gallery floor slab, generally located at the ends of the basin fingers, which are not properly covered. In places where the holes were covered, the material used did not provide adequate cover and support.



*Photo 21  Potential Hazards, Uncontained Environmentally Hazardous Chemicals*



*Photo 22 Penetrations in Gallery Floor Slab, not Adequately Covered*

## 3.2. Finger Piers

The substructure of the finger piers, including the piles, beams, and soffit, and the deck were observed. The finger piers will be referred to as “Finger Pier 1” and “Finger Pier 2,” as outlined in Figure 6. Marine Spill Response Corporation and Foss Maritime are the existing tenants at piers 1 and 2, respectively.




*Figure 6 Outline of Finger Piers*

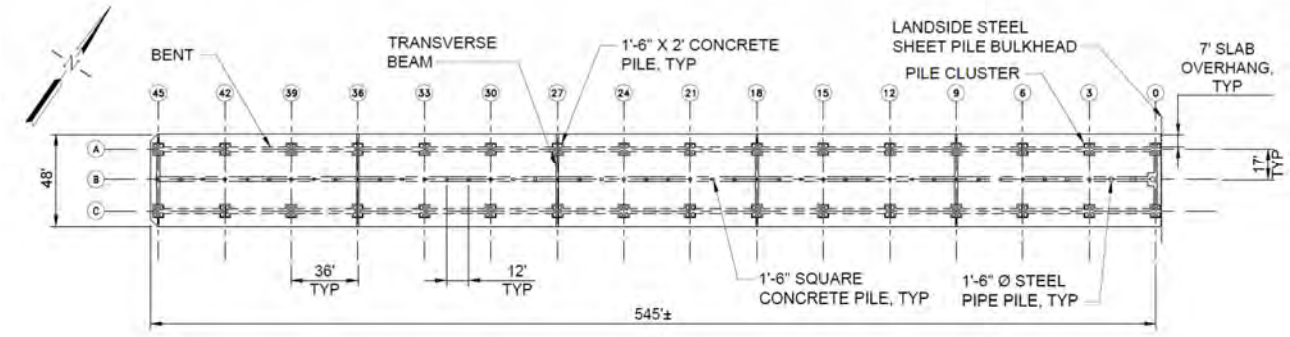



*Figure 7: Typical Finger Pier Layout*

### 3.2.1. Deck

There was some minor damage observed on the deck of the finger piers, most noticeably at Finger Pier 1 where there were deck abrasions caused by crawler crane loading, shown in Photo 23.



*Photo 23  Deck Abrasion Damage Caused by Crawler Crane at Finger Pier 1*



*Photo 24  Minimal Deck Damage at Finger Pier 2*

### 3.2.1. Slab Soffit and Beams

The soffit of the finger piers exhibited no or very minimal damage. The deep longitudinal and transverse beams were typically delaminated or spalled from the soffit up to approximately halfway of the exterior face. There was also exposed reinforcing at the bottom of the transverse beams. It is likely that the deep beams are deteriorated due to continual exposure during high tide levels.



*Photo 25 No / Very Minimal Damage on Slab Soffit*



*Photo 26  Typical Delamination of Beam Soffit of Transverse Beam*



*Photo 27  Exposed Transverse Beam Bottom Layer of Reinforcing Steel*

The tide elevation in Photo 28 is at 5.9' MLLW, and the water level is within 2 inches from the beam soffit. It should be noted that the tide reached 6.5' that day (MHHW = 6.04'). It can be concluded that, on average, the deep longitudinal and transverse beams are wet at least once a day for half of the year.



*Photo 28  Beam Exposure at 5.9' MLLW*

### 3.2.2. Piles

Similar to the columns of the graving basin, damage ratings were applied to the piles of the finger piers based on ASCE MOP 130. The pile clusters along the edge of the pier were typically in minor to moderate condition, while the square piles in the internal row were typically in moderate to major condition. The piles with major or severe damage, likely due to impact, were located at the south end of the piers.



*Photo 29  Severely Damaged Pile at South End of Finger Pier 2*



*Photo 30  Typical Pile Damage, Middle Row*

# 4. Inspection Summary

Per the visual inspection of the graving basin and finger pier structures, the conditions of the structural components are summarized in Table 4 and Table 5. Although the graving basin structures present varying levels of damage, the overall structure condition rating is Fair due to the bearing capacity of the rock foundation beneath. In the graving basin fingers, signs of concrete deterioration were noticeable in spalls, delaminations, cracks, and exposed reinforcing. The majority of the exterior columns exhibit minor to major damage. At the few locations where there are severely damaged columns, Moffatt & Nichol will recommend posting load restrictions at those areas.

The overall condition of the finger piers ranges from fair to poor. While there is minimal damage on the soffit, the deep beams have spalling, delaminations, and exposed reinforcing, likely due to continued exposure. In addition, the external pile clusters typically have minor or moderate damage, with one or two piles severely damaged due to impact loading, while the middle row of piles show moderate to major damage. Moffatt & Nichol will recommend restoring the edge beams to prevent further structural deterioration and decrease in capacity.

*Table 4 Condition Rating Summary: Graving Basins*

| Structure or Structural Element | Condition Rating |
|---|---|
| Columns | Fair to Poor |
| Slab and Soffit | Fair to Poor |
| Deck | Fair to Poor |
| Overall Structure | Fair |

*Table 5 Condition Rating Summary: Finger Piers*

| Structure or Structural Element | Condition Rating |
|---|---|
| Piles | Fair to Poor |
| Beams | Poor |
| Soffit | Good |
| Deck | Fair |
| Overall Structure | Fair to Poor |

# Appendix A: References

*Manual of Practice No. 130: Waterfront Facilities Inspection and Assessment* – ASCE Waterfront Facility Inspection Committee, 2015.

“Basins Reference Drawings” – Kaiser Company, Inc., 1942.

“Basin #2 Extension Reference Drawings” – Guy F. Atkinson Company, 1969.

“Preliminary Inspection Plans, MSRC Richmond Pier Inspection and Assessment” – COWI, 2015.

# Appendix B: Combined Damage Plan

BASIN 4

586', TYP

FINGER 4

BASIN 3

746'

FINGER 3

BASIN 2

100'
TYP

34'
TYP

FINGER 2

BASIN 1

6'
TYP

FINGER 1

LEGEND:

COLUMN DAMAGE RATINGS

- MINOR
- MODERATE
- MAJOR
- SEVERE

1
-

# BASIN FINGERS 1 TO 4

SCALE: 1" = 60'

POINT POTRERO MARINE TERMINAL

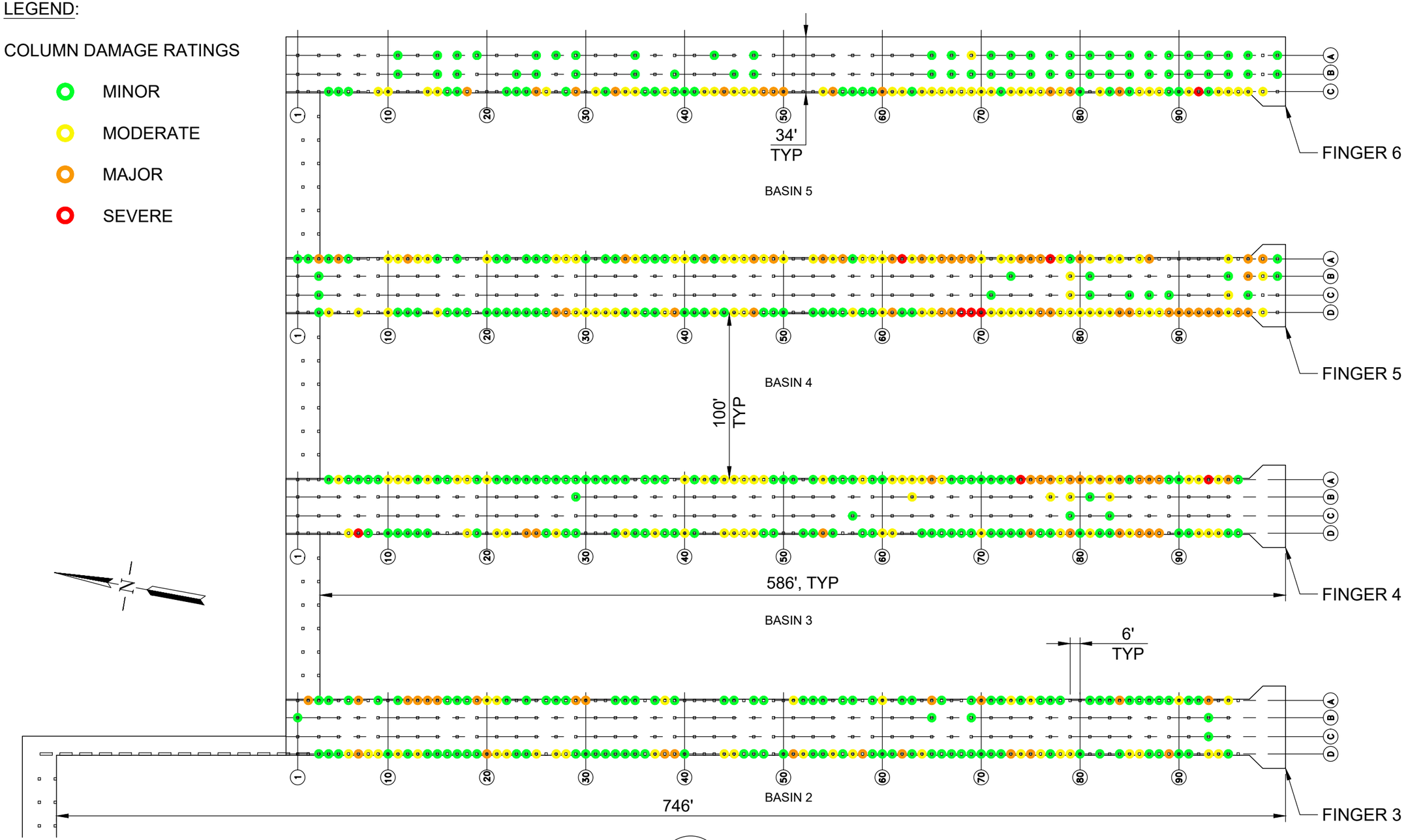
Figure 1 - BASIN FINGERS 1 TO 4

moffatt & nichol

LEGEND:

COLUMN DAMAGE RATINGS

- MINOR
- MODERATE
- MAJOR
- SEVERE



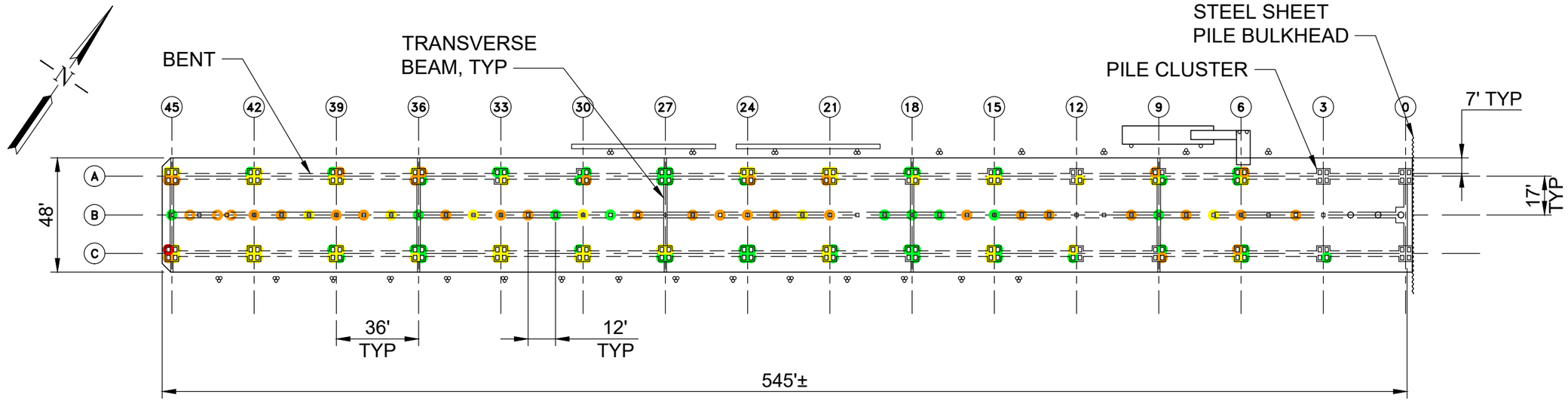

1 - BASIN FINGERS 3 TO 6

SCALE: 1" = 60'

POINT POTRERO MARINE TERMINAL

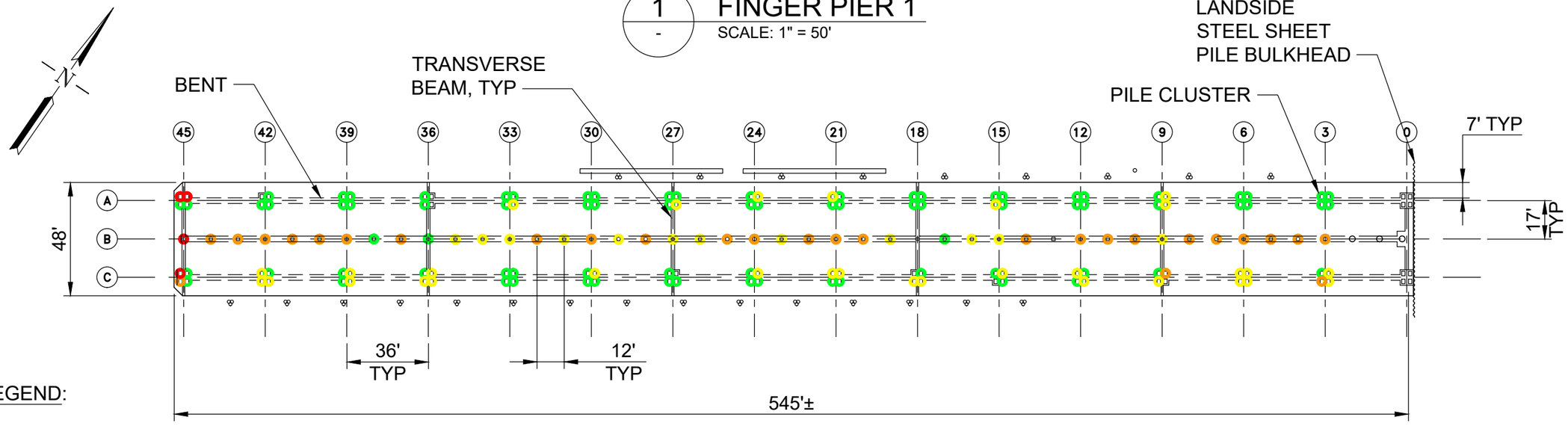
Figure 1 - BASIN FINGERS 3 TO 6

moffatt & nichol




1 / - FINGER PIER 1

SCALE: 1" = 50'




1 / - FINGER PIER 2

SCALE: 1" = 50'

LEGEND:

PILE DAMAGE RATINGS

- MINOR
- MODERATE
- MAJOR
- SEVERE

POINT POTRERO MARINE TERMINAL

Figure 3 - Pier 1 and 2

moffatt & nichol

## 8.4 Detailed Cost Estimates – Graving Basins / Finger Piers

**BID TOTALS**

| Biditem | Description | Status - Rnd | Quantity | Units | Unit Price | Bid Total |
|---|---|---|---|---|---|---|
| | Project 10 | | | | | |
| 1010 | Cribbing | | 26.000 | LOC | 3,685.63 | 95,826.38 |
| 1020 | Steel Covers | | 6.000 | LOC | 14,379.42 | 86,276.52 |
| | | | Project 10 | | | $182,102.90 |
| | Project 11 | | | | | |
| 2100 | Mooring Hardware | | 80.000 | EA | 14,169.70 | 1,133,576.00 |
| 2200 | Foam Filled Fenders | | 80.000 | EA | 26,430.28 | 2,114,422.40 |
| | | | Project 11 | | | $3,247,998.40 |
| | Project 12 | | | | | |
| 3010 | Column Repairs | | 151.000 | LOC | 18,584.73 | 2,806,294.23 |
| 3020 | Soffitt Repairs (Shotcrete) | | 138.000 | LOC | 3,885.45 | 536,192.10 |
| 3030 | Column Replacement | | 13.000 | LOC | 10,320.27 | 134,163.51 |
| | | | Project 12 | | | $3,476,649.84 |
| | Project 13 | | | | | |
| 4010 | 18" Diameter FRP Pile | | 1,080.000 | LF | 2,208.44 | 2,385,115.20 |
| 4020 | 16" Diameter Steel Pile | | 1,080.000 | LF | 2,076.09 | 2,242,177.20 |
| | | | Project 13 | | | $4,627,292.40 |
| | Project 14 | | | | | |
| 5010 | Logitudinal Beams (F&P) Repair | | 60.000 | LOC | 83,738.52 | 5,024,311.20 |
| 5020 | Transverse Beams (F&P) Repair | | 10.000 | LOC | 100,469.92 | 1,004,699.20 |
| 5030 | 18" Pile Replacement | | 1.000 | LOC | 278,761.61 | 278,761.61 |
| 5040 | End of Pier Fender Piles | | 50.000 | LF | 2,748.97 | 137,448.50 |
| 5050 | Nonstructural Pile Jacket | | 48.000 | EA | 22,304.18 | 1,070,600.64 |

**BID TOTALS**

| Biditem | Description | Status - Rnd | Quantity | Units | Unit Price | Bid Total |
|---|---|---|---|---|---|---|
| | | | Project 14 | | | $7,515,821.15 |
| | | | Bid Total | ========> | | $19,049,864.69 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 1010** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = Cribbing | | | | | Unit = LOC | Takeoff Quan: 26.000 | | | | Engr Quan: 26.000 | | |
| **1000.01** | **Materials** | | | | **Quan: 26.00 LOC** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | |
| 2-12X12TIMBE | 12 x 12 Timber@109.75% | 1.00 | 78.00 EA | | 350.000 | | 29,962 | | | | | 29,962 |
| 2-3/4"ALL | 3/4" All Threa@109.75% | 1.00 | 156.00 EA | | 30.000 | | 5,136 | | | | | 5,136 |
| 2-3/4NUT | 3/4" Nut@109.75% | 1.00 | 312.00 EA | | 1.500 | | 514 | | | | | 514 |
| 2-3/4WASH | 3/4" Washers@109.75% | 1.00 | 156.00 EA | | 1.000 | | 171 | | | | | 171 |
| 2-ULTRABOND1 | Ultrabond 1@109.75% | 1.00 | 156.00 EA | | 55.000 | | 9,417 | | | | | 9,417 |
| $45,199.44 | | | | | [ ] | | 45,199 | | | | | 45,199 |
| **1000.02** | **Drill and Epoxy Holes** | | | | **Quan: 156.00 EA** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | |
| Figure 5 Mins/Hole * 156 = 780 Mins = 13 HRs | | | | | | | | | | | | |
| CRIB | Cribbin Crew | | | 13.00 CH | **Prod: 12.0000 UH** | | Lab Pcs: 5.00 | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 13.00 HR | | 36.929 | | | | 105 | 421 | | 527 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 13.00 HR | | 53.353 | | | | 301 | 460 | | 761 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 13.00 HR | | 3.830 | | | | 12 | 43 | | 55 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 13.00 HR | | 34.824 | | | | 63 | 433 | | 497 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 13.00 HR | | 42.485 | | | | 327 | 279 | | 606 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 13.00 HR | | 13.000 | | | | 169 | | | 169 |
| CA01 | Carpenter Foreman | 1.00 | 13.00 MH | | 70.410 | 1,851 | | | | | | 1,851 |
| CA02 | Carpenter | 4.00 | 52.00 MH | | 64.010 | 6,899 | | | | | | 6,899 |
| $11,364.51 | 0.4166 MH/EA | | 65.0000MH | | [ 29.925 ] | 8,750 | | | 978 | 1,637 | | 11,365 |
| **1000.03** | **Install Cribbing** | | | | **Quan: 26.00 LOC** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | |
| CRIB | Cribbin Crew | | | 26.00 CH | **Prod: 1.0000 HU** | | Lab Pcs: 5.00 | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 26.00 HR | | 36.929 | | | | 211 | 843 | | 1,054 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 26.00 HR | | 53.353 | | | | 603 | 920 | | 1,522 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 26.00 HR | | 3.830 | | | | 24 | 85 | | 109 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 26.00 HR | | 34.824 | | | | 127 | 867 | | 994 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 26.00 HR | | 42.485 | | | | 654 | 559 | | 1,212 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 26.00 HR | | 13.000 | | | | 338 | | | 338 |
| CA01 | Carpenter Foreman | 1.00 | 26.00 MH | | 70.410 | 3,701 | | | | | | 3,701 |
| CA02 | Carpenter | 4.00 | 104.00 MH | | 64.010 | 13,798 | | | | | | 13,798 |
| $22,729.16 | 5.0000 MH/LOC | | 130.0000MH | | [ 359.095 ] | 17,500 | | | 1,956 | 3,273 | | 22,729 |

**=====> Item Totals: 1010 - Cribbing**

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 1010** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = Cribbing | | | | Unit = LOC | Takeoff Quan: 26.000 | | | Engr Quan: 26.000 | | | |
| $79,293.11 | 7.5000 MH/LOC | | 195.00MH | [ 538.642 ] | 26,250 | 45,199 | | 2,934 | 4,910 | | **79,293** |
| 3,049.735 | 26 LOC | | | | 1,009.60 | 1,738.44 | | 112.85 | 188.84 | | 3,049.74 |
| **BID ITEM = 1020** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = Steel Covers | | | | Unit = LOC | Takeoff Quan: 6.000 | | | Engr Quan: 6.000 | | | |
| **1010.01** | **Steel Covers Materials** | | | **Quan: 30.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 2-PLTSTL | Steel Cover Pl@109.75% | 1.00 | 1,026.00 LB | 10.000 | | 11,260 | | | | | 11,260 |
| 2-SSTANCHO | SST Titan HD A@109.75% | 1.00 | 120.00 EA | 10.000 | | 1,317 | | | | | 1,317 |
| 2-STLFRT | Steel Freight @109.75% | 1.00 | 1.00 EA | 5,000.000 | | 5,488 | | | | | 5,488 |
| $18,064.85 | | | | [ ] | | 18,065 | | | | | 18,065 |
| **1010.02** | **Unload Trucks** | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| CRIB | Cribbin Crew | | 1.00 CH | **Prod: 1.0000 HU** | Lab Pcs: 5.00 | | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 1.00 HR | 36.929 | | | | 8 | 32 | | 41 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 1.00 HR | 53.353 | | | | 23 | 35 | | 59 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 1.00 HR | 3.830 | | | | 1 | 3 | | 4 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 1.00 HR | 34.824 | | | | 5 | 33 | | 38 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 1.00 HR | 42.485 | | | | 25 | 21 | | 47 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 1.00 HR | 13.000 | | | | 13 | | | 13 |
| CA01 | Carpenter Foreman | 1.00 | 1.00 MH | 70.410 | 142 | | | | | | 142 |
| CA02 | Carpenter | 4.00 | 4.00 MH | 64.010 | 531 | | | | | | 531 |
| $874.09 | 5.0000 MH/EA | | 5.0000MH | [ 359.09 ] | 673 | | | 75 | 126 | | 874 |
| **1010.03** | **Clean off and Install Cover Plates** | | | **Quan: 30.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| CRIB | Cribbin Crew | | 60.00 CH | **Prod: 2.0000 HU** | Lab Pcs: 5.00 | | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 60.00 HR | 36.929 | | | | 487 | 1,945 | | 2,432 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 60.00 HR | 53.353 | | | | 1,391 | 2,122 | | 3,513 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 60.00 HR | 3.830 | | | | 55 | 197 | | 252 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 60.00 HR | 34.824 | | | | 293 | 2,000 | | 2,293 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 60.00 HR | 42.485 | | | | 1,508 | 1,289 | | 2,798 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 60.00 HR | 13.000 | | | | 780 | | | 780 |
| CA01 | Carpenter Foreman | 1.00 | 60.00 MH | 70.410 | 8,541 | | | | | | 8,541 |
| CA02 | Carpenter | 4.00 | 240.00 MH | 64.010 | 31,843 | | | | | | 31,843 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 1020** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Steel Covers | | | | Unit = LOC | Takeoff Quan: | 6.000 | | Engr Quan: | 6.000 | | |
| $52,452.07 | 10.0000 MH/EA | | 300.0000MH | | [ 718.19 ] | 40,384 | | | 4,514 | 7,554 | | 52,452 |
| **=====> Item Totals:** | **1020 - Steel Covers** | | | | | | | | | | | |
| $71,391.01 | 50.8333 MH/LOC | | 305.00MH | | [ 3650.798 ] | 41,057 | 18,065 | | 4,589 | 7,680 | | **71,391** |
| 11,898.502 | 6 LOC | | | | | 6,842.85 | 3,010.81 | | 764.90 | 1,279.94 | | 11,898.50 |
| **BID ITEM = 2100** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Mooring Hardware | | | | Unit = EA | Takeoff Quan: | 80.000 | | Engr Quan: | 80.000 | | |
| **2100.01** | **Materials** | | | | **Quan: 80.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 2-BITBOLLARD | 50 Ton Bit Bol@109.75% | 1.00 | 80.00 EA | | 5,000.000 | | 439,000 | | | | | 439,000 |
| 2-ULTRABOND1 | Ultrabond 1@109.75% | 1.00 | 1,920.00 EA | | 55.000 | | 115,896 | | | | | 115,896 |
| 2C0006 | 5000 PSI Concr@109.75% | 1.00 | 48.00 CY | | 225.000 | | 11,853 | | | | | 11,853 |
| 2C0010 | Delivery Charg@109.75% | 1.00 | 5.00 LD | | 200.000 | | 1,098 | | | | | 1,098 |
| 2C0FUEL/ENV | Concrete Fuel/@109.75% | 1.00 | 48.00 CY | | 10.000 | | 527 | | | | | 527 |
| 2CCGROUTC | Cementitous Gr@109.75% | 1.00 | 40.00 CF | | 20.000 | | 878 | | | | | 878 |
| 2CR060 | Gr 60 Rebar@109.75% | 1.00 | 2.88 TON | | 2,000.000 | | 6,322 | | | | | 6,322 |
| 2CRACC | Rebar Accessor@109.75% | 1.00 | 2.88 TON | | 100.000 | | 316 | | | | | 316 |
| 3F120 | Wood Wall Form@109.75 | 1.00 | 1,280.00 SF | | 8.000 | | | 11,238 | | | | 11,238 |
| 3FA100 | Formwork Acces@109.75% | 1.00 | 1,280.00 SF | | 1.000 | | | 1,405 | | | | 1,405 |
| 3P&PSUP | Point & Patch @109.75% | 1.00 | 2,560.00 SF | | 0.500 | | | 1,405 | | | | 1,405 |
| $589,936.98 | | | | | [ ] | | 575,889 | 14,048 | | | | 589,937 |
| **2100.02** | **Fab Forms** | | | | **Quan: 1,280.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Figure 4'x4'x1' | | | | | | | | | | | | |
| CRIB | Cribbin Crew | | | 40.00 CH | **Prod: 32.0000 UH** | | Lab Pcs: 5.00 | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 40.00 HR | | 36.929 | | | | 325 | 1,297 | | 1,621 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 40.00 HR | | 53.353 | | | | 927 | 1,415 | | 2,342 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 40.00 HR | | 3.830 | | | | 37 | 131 | | 168 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 40.00 HR | | 34.824 | | | | 195 | 1,334 | | 1,529 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 40.00 HR | | 42.485 | | | | 1,006 | 860 | | 1,865 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 40.00 HR | | 13.000 | | | | 520 | | | 520 |
| CA01 | Carpenter Foreman | 1.00 | 40.00 MH | | 70.410 | 5,694 | | | | | | 5,694 |
| CA02 | Carpenter | 4.00 | 160.00 MH | | 64.010 | 21,228 | | | | | | 21,228 |
| $34,968.01 | 0.1562 MH/SF | | 200.0000MH | | [ 11.222 ] | 26,923 | | | 3,009 | 5,036 | | 34,968 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 2100** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Mooring Hardware | | | Unit = | EA | Takeoff Quan: | 80.000 | | Engr Quan: | 80.000 | | |
| **2100.025** | **Set Forms** | | | | **Quan: 1,280.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| CRIB | Cribbin Crew | | 40.00 CH | | **Prod: 32.0000 UH** | Lab Pcs: 5.00 | | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 40.00 HR | | 36.929 | | | | 325 | 1,297 | | 1,621 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 40.00 HR | | 53.353 | | | | 927 | 1,415 | | 2,342 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 40.00 HR | | 3.830 | | | | 37 | 131 | | 168 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 40.00 HR | | 34.824 | | | | 195 | 1,334 | | 1,529 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 40.00 HR | | 42.485 | | | | 1,006 | 860 | | 1,865 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 40.00 HR | | 13.000 | | | | 520 | | | 520 |
| CA01 | Carpenter Foreman | 1.00 | 40.00 MH | | 70.410 | 5,694 | | | | | | 5,694 |
| CA02 | Carpenter | 4.00 | 160.00 MH | | 64.010 | 21,228 | | | | | | 21,228 |
| $34,968.01 | 0.1562 MH/SF | | 200.0000MH | | [ 11.222 ] | 26,923 | | | 3,009 | 5,036 | | 34,968 |
| **2100.03** | **Drill & Epoxy Dowels** | | | | **Quan: 1,920.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Figure 5 Mins/EA * 1920 = 9600 Mins = 160 Hrs | | | | | | | | | | | | |
| CRIB | Cribbin Crew | | 160.00 CH | | **Prod: 12.0000 UH** | Lab Pcs: 5.00 | | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 160.00 HR | | 36.929 | | | | 1,298 | 5,187 | | 6,485 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 160.00 HR | | 53.353 | | | | 3,710 | 5,659 | | 9,369 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 160.00 HR | | 3.830 | | | | 147 | 525 | | 673 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 160.00 HR | | 34.824 | | | | 781 | 5,334 | | 6,115 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 160.00 HR | | 42.485 | | | | 4,022 | 3,438 | | 7,460 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 160.00 HR | | 13.000 | | | | 2,080 | | | 2,080 |
| CA01 | Carpenter Foreman | 1.00 | 160.00 MH | | 70.410 | 22,777 | | | | | | 22,777 |
| CA02 | Carpenter | 4.00 | 640.00 MH | | 64.010 | 84,914 | | | | | | 84,914 |
| $139,872.28 | 0.4166 MH/EA | | 800.0000MH | | [ 29.925 ] | 107,691 | | | 12,038 | 20,144 | | 139,872 |
| **2100.04** | **Unload & Handle Rebar** | | | | **Quan: 2.88 TN** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| CRIB | Cribbin Crew | | 0.23 CH | | **Prod: 12.5000 UH** | Lab Pcs: 5.00 | | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 0.23 HR | | 36.929 | | | | 2 | 7 | | 9 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 0.23 HR | | 53.353 | | | | 5 | 8 | | 13 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 0.23 HR | | 3.830 | | | | | 1 | | 1 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 0.23 HR | | 34.824 | | | | 1 | 8 | | 9 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 0.23 HR | | 42.485 | | | | 6 | 5 | | 11 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 0.23 HR | | 13.000 | | | | 3 | | | 3 |
| CA01 | Carpenter Foreman | 1.00 | 0.23 MH | | 70.410 | 33 | | | | | | 33 |
| CA02 | Carpenter | 4.00 | 0.92 MH | | 64.010 | 122 | | | | | | 122 |

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 2100** | Land Item | SCHEDULE: 1 100 | | | | | | | | | |
| Description = | Mooring Hardware | | Unit = EA | Takeoff Quan: 80.000 | | | | Engr Quan: 80.000 | | | |
| $200.99 | 0.3993 MH/TN | | 1.1500MH | [ 28.677 ] | 155 | | | 17 | 29 | | 201 |
| **2100.05** | **Install Rebar** | | **Quan: 5,760.00 LBS** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |
| 4REBAR | Rebar Sub | 1.00 | 5,760.00 LBS | 2.000 | | | | | | 11,520 | 11,520 |
| **2100.06** | **Pour & Finish Pedestal** | | **Quan: 80.00 EA** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |
| Figure Pour & Finish Each Pedistal at 0.5 HRS/EA | | | | | | | | | | | |
| CRIB | Cribbin Crew | | 40.00 CH | **Prod: 0.5000 HU** | | Lab Pcs: 5.00 | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 40.00 HR | 36.929 | | | | 325 | 1,297 | | 1,621 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 40.00 HR | 53.353 | | | | 927 | 1,415 | | 2,342 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 40.00 HR | 3.830 | | | | 37 | 131 | | 168 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 40.00 HR | 34.824 | | | | 195 | 1,334 | | 1,529 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 40.00 HR | 42.485 | | | | 1,006 | 860 | | 1,865 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 40.00 HR | 13.000 | | | | 520 | | | 520 |
| CA01 | Carpenter Foreman | 1.00 | 40.00 MH | 70.410 | 5,694 | | | | | | 5,694 |
| CA02 | Carpenter | 4.00 | 160.00 MH | 64.010 | 21,228 | | | | | | 21,228 |
| $34,968.01 | 2.5000 MH/EA | | 200.0000MH | [ 179.548 ] | 26,923 | | | 3,009 | 5,036 | | 34,968 |
| **2100.07** | **Strip Forms** | | **Quan: 1,280.00 SF** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |
| CRIB | Cribbin Crew | | 20.00 CH | **Prod: 64.0000 UH** | | Lab Pcs: 5.00 | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 20.00 HR | 36.929 | | | | 162 | 648 | | 811 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 20.00 HR | 53.353 | | | | 464 | 707 | | 1,171 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 20.00 HR | 3.830 | | | | 18 | 66 | | 84 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 20.00 HR | 34.824 | | | | 98 | 667 | | 764 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 20.00 HR | 42.485 | | | | 503 | 430 | | 933 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 20.00 HR | 13.000 | | | | 260 | | | 260 |
| CA01 | Carpenter Foreman | 1.00 | 20.00 MH | 70.410 | 2,847 | | | | | | 2,847 |
| CA02 | Carpenter | 4.00 | 80.00 MH | 64.010 | 10,614 | | | | | | 10,614 |
| $17,483.99 | 0.0781 MH/SF | | 100.0000MH | [ 5.611 ] | 13,461 | | | 1,505 | 2,518 | | 17,484 |
| **2100.08** | **Point & Patch** | | **Quan: 2,560.00 SF** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |
| P&P | Point & Patch Crew | | 10.24 CH | **Prod: 250.0000 UH** | | Lab Pcs: 3.00 | | Eqp Pcs: 4.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 10.24 HR | 36.929 | | | | 83 | 332 | | 415 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 10.24 HR | 3.830 | | | | 9 | 34 | | 43 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 10.24 HR | 34.824 | | | | 50 | 341 | | 391 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 10.24 HR | 13.000 | | | | 133 | | | 133 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 2100** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Mooring Hardware | | | Unit = EA | Takeoff Quan: 80.000 | | | Engr Quan: 80.000 | | | |
| CM01 | Cement Mason Foreman | 1.00 | 10.24 MH | 49.000 | 1,075 | | | | | | 1,075 |
| CM02 | Cement Mason | 2.00 | 20.48 MH | 47.000 | 2,087 | | | | | | 2,087 |
| $4,144.42 | 0.0120 MH/SF | | 30.7200MH | [ 0.629 ] | 3,162 | | | 276 | 707 | | 4,144 |
| **2100.09** | **Unload & Install Bollards** | | | **Quan: 80.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| CRIB | Cribbin Crew | | 80.00 CH | **Prod: 1.0000 HU** | Lab Pcs: 5.00 | | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 80.00 HR | 36.929 | | | | 649 | 2,593 | | 3,242 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 80.00 HR | 53.353 | | | | 1,855 | 2,830 | | 4,684 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 80.00 HR | 3.830 | | | | 74 | 263 | | 336 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 80.00 HR | 34.824 | | | | 390 | 2,667 | | 3,058 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 80.00 HR | 42.485 | | | | 2,011 | 1,719 | | 3,730 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 80.00 HR | 13.000 | | | | 1,040 | | | 1,040 |
| CA01 | Carpenter Foreman | 1.00 | 80.00 MH | 70.410 | 11,389 | | | | | | 11,389 |
| CA02 | Carpenter | 4.00 | 320.00 MH | 64.010 | 42,457 | | | | | | 42,457 |
| $69,936.10 | 5.0000 MH/EA | | 400.0000MH | [ 359.095 ] | 53,845 | | | 6,019 | 10,072 | | 69,936 |
| **=====> Item Totals:** | **2100 - Mooring Hardware** | | | | | | | | | | |
| $937,998.79 | 24.1483 MH/EA | | 1,931.87MH | [ 1726.868 ] | 259,082 | 575,889 | 14,048 | 28,883 | 48,577 | 11,520 | **937,999** |
| 11,724.985 | 80 EA | | | | 3,238.53 | 7,198.61 | 175.60 | 361.03 | 607.21 | 144.00 | 11,724.98 |
| **BID ITEM = 2200** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Foam Filled Fenders | | | Unit = EA | Takeoff Quan: 80.000 | | | Engr Quan: 80.000 | | | |
| **2200.01** | **Materials** | | | **Quan: 80.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 2MFNDR3 | Foam Filled Fe@109.75% | 1.00 | 80.00 EA | 15,000.000 | | 1,317,000 | | | | | 1,317,000 |
| 2PADEYES | Weldable Padey@109.75% | 1.00 | 160.00 EA | 150.000 | | 26,340 | | | | | 26,340 |
| $1,343,340.00 | | | | [ ] | | 1,343,340 | | | | | 1,343,340 |
| **2200.02** | **Install Padeyes** | | | **Quan: 160.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| FENDER | Foam Fender Crew | | 160.00 CH | **Prod: 1.0000 HU** | Lab Pcs: 7.00 | | | Eqp Pcs: 7.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 160.00 HR | 36.929 | | | | 1,298 | 5,187 | | 6,485 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 160.00 HR | 27.908 | | | | 794 | 4,107 | | 4,901 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 160.00 HR | 114.119 | | | | 12,615 | 7,424 | | 20,039 |
| 814CD10WB | Work Barge | 1.00 | 160.00 HR | 11.745 | | | | 1,335 | 727 | | 2,062 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 2200** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Foam Filled Fenders | | | | Unit = EA | Takeoff Quan: | 80.000 | | Engr Quan: | 80.000 | | |
| 814CD10WT | Work Tugboat | 1.00 | 160.00 | HR | 190.674 | | | | 2,117 | 31,366 | | 33,482 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 160.00 | HR | 19.056 | | | | 373 | 2,973 | | 3,346 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 160.00 | HR | 15.000 | | | | 2,400 | | | 2,400 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 160.00 | MH | 63.550 | 20,879 | | | | | | 20,879 |
| COE09 | Engr. Oiler | 1.00 | 160.00 | MH | 55.840 | 19,013 | | | | | | 19,013 |
| COE14 | Deck Engineer | 1.00 | 160.00 | MH | 57.460 | 19,405 | | | | | | 19,405 |
| IB03 | Mate | 1.00 | 160.00 | MH | 57.310 | 13,867 | | | | | | 13,867 |
| IB04 | Deckhand | 1.00 | 160.00 | MH | 57.480 | 13,908 | | | | | | 13,908 |
| PD01 | Piledriver Foreman | 1.00 | 160.00 | MH | 64.620 | 21,918 | | | | | | 21,918 |
| PD02 | Piledriver | 1.00 | 160.00 | MH | 62.620 | 21,434 | | | | | | 21,434 |
| $203,139.75 | 7.0000 MH/EA | | 1,120.0000 | MH | [ 460.768 ] | 130,424 | | | 20,932 | 51,784 | | 203,140 |
| **2200.03** | **Install Fenders** | | | | **Quan: 80.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| FENDER | Foam Fender Crew | | | 160.00 CH | **Prod: 2.0000 HU** | | Lab Pcs: 7.00 | | Eqp Pcs: 7.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 160.00 | HR | 36.929 | | | | 1,298 | 5,187 | | 6,485 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 160.00 | HR | 27.908 | | | | 794 | 4,107 | | 4,901 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 160.00 | HR | 114.119 | | | | 12,615 | 7,424 | | 20,039 |
| 814CD10WB | Work Barge | 1.00 | 160.00 | HR | 11.745 | | | | 1,335 | 727 | | 2,062 |
| 814CD10WT | Work Tugboat | 1.00 | 160.00 | HR | 190.674 | | | | 2,117 | 31,366 | | 33,482 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 160.00 | HR | 19.056 | | | | 373 | 2,973 | | 3,346 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 160.00 | HR | 15.000 | | | | 2,400 | | | 2,400 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 160.00 | MH | 63.550 | 20,879 | | | | | | 20,879 |
| COE09 | Engr. Oiler | 1.00 | 160.00 | MH | 55.840 | 19,013 | | | | | | 19,013 |
| COE14 | Deck Engineer | 1.00 | 160.00 | MH | 57.460 | 19,405 | | | | | | 19,405 |
| IB03 | Mate | 1.00 | 160.00 | MH | 57.310 | 13,867 | | | | | | 13,867 |
| IB04 | Deckhand | 1.00 | 160.00 | MH | 57.480 | 13,908 | | | | | | 13,908 |
| PD01 | Piledriver Foreman | 1.00 | 160.00 | MH | 64.620 | 21,918 | | | | | | 21,918 |
| PD02 | Piledriver | 1.00 | 160.00 | MH | 62.620 | 21,434 | | | | | | 21,434 |
| $203,139.75 | 14.0000 MH/EA | | 1,120.0000 | MH | [ 921.536 ] | 130,424 | | | 20,932 | 51,784 | | 203,140 |
| **=====> Item Totals:** | **2200 - Foam Filled Fenders** | | | | | | | | | | | |
| $1,749,619.50 | 28.0000 MH/EA | | 2,240.00 | MH | [ 1843.072 ] | 260,848 | 1,343,340 | | 41,864 | 103,567 | | **1,749,620** |
| 21,870.244 | 80 EA | | | | | 3,260.60 | 16,791.75 | | 523.30 | 1,294.59 | | 21,870.24 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3010** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = Column Repairs | | | | | Unit = LOC | Takeoff Quan: 151.000 | | | Engr Quan: 151.000 | | | |
| **3010.01** | **Materials (Perm)** | | **Quan: 151.00** | **LOC** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |
| Figure 151 Columns @ 0.4 CY/LOC = 60.4 CY Conc | | | | | | | | | | | | |
| Rebar = 22.6 LBS/LOC * 151 = 3,412.6 LBS = 1.71 TNs | | | | | | | | | | | | |
| Fiberglass Forms = 60 SF/LOC * 151 = 9,060 SF | | | | | | | | | | | | |
| 2C0006 | 5000 PSI Concr@109.75% | 1.00 | 60.40 | CY | 225.000 | | 14,915 | | | | | 14,915 |
| 2C0010 | Delivery Charg@109.75% | 1.00 | 7.00 | LD | 200.000 | | 1,537 | | | | | 1,537 |
| 2C0FUEL/ENV | Concrete Fuel/@109.75% | 1.00 | 60.40 | CY | 10.000 | | 663 | | | | | 663 |
| 2CR060 | Gr 60 Rebar@109.75% | 1.00 | 1.71 | TON | 2,000.000 | | 3,753 | | | | | 3,753 |
| 2CRACC | Rebar Accessor@109.75% | 1.00 | 1.71 | TON | 100.000 | | 188 | | | | | 188 |
| 3FA100 | Formwork Acces@109.75% | 1.00 | 9,060.00 | SF | 1.000 | | | 9,943 | | | | 9,943 |
| 3FIBERFORM | Fiberglass SIP@109.75% | 1.00 | 9,060.00 | SF | 15.000 | | | 149,150 | | | | 149,150 |
| 3SAND | Sandblasting S@109.75% | 1.00 | 9,060.00 | SF | 5.000 | | | 49,717 | | | | 49,717 |
| $229,865.89 | | | | | [ ] | | 21,056 | 208,810 | | | | 229,866 |
| **3010.03** | **Sawcut** | | **Quan: 5,738.00** | **LF** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |
| 8' x 18" Square | | | | | | | | | | | | |
| Figure 19 Ft/Side * 2 Sides = 38 LF * 151 EA = 5,738 LF of Saw Cutting | | | | | | | | | | | | |
| Sawcut a minimum 1" deep around the perimeter of the repair area to allow for clean face of concrete. Total sawcut length for repairs is 5,738 FT. | | | | | | | | | | | | |
| Allow 2 Carpenters sawcutting with right angle grinders w/diamond wheels. Allow production at 10 lf/hr. | | | | | | | | | | | | |
| CARPB | Carpenter Barge Crew | | 573.80 | CH | **Prod: 10.0000 UH** | Lab Pcs: 10.00 | | | Eqp Pcs: 7.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 573.80 | HR | 36.929 | | | | 4,656 | 18,600 | | 23,256 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 573.80 | HR | 27.908 | | | | 2,847 | 14,728 | | 17,575 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 573.80 | HR | 114.119 | | | | 45,240 | 26,626 | | 71,866 |
| 814CD10WB | Work Barge | 1.00 | 573.80 | HR | 11.745 | | | | 4,789 | 2,607 | | 7,396 |
| 814CD10WT | Work Tugboat | 1.00 | 573.80 | HR | 190.674 | | | | 7,590 | 112,486 | | 120,076 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 573.80 | HR | 19.056 | | | | 1,338 | 10,663 | | 12,000 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 573.80 | HR | 15.000 | | | | 8,607 | | | 8,607 |
| CA01 | Carpenter Foreman | 1.00 | 573.80 | MH | 70.410 | 81,684 | | | | | | 81,684 |
| CA02 | Carpenter | 4.00 | 2,295.20 | MH | 64.010 | 304,522 | | | | | | 304,522 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 573.80 | MH | 63.550 | 74,877 | | | | | | 74,877 |
| COE09 | Engr. Oiler | 1.00 | 573.80 | MH | 55.840 | 68,187 | | | | | | 68,187 |
| COE14 | Deck Engineer | 1.00 | 573.80 | MH | 57.460 | 69,592 | | | | | | 69,592 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3010** | Land Item | SCHEDULE: 1 100 | | | | | | | | | |
| Description = | Column Repairs | Unit = LOC | Takeoff Quan: 151.000 | | Engr Quan: 151.000 | | | | | | |
| IB03 | Mate | 1.00 | 573.80 MH | 57.310 | 49,730 | | | | | | 49,730 |
| IB04 | Deckhand | 1.00 | 573.80 MH | 57.480 | 49,877 | | | | | | 49,877 |
| $959,245.08 | 1.0000 MH/LF | | 5,738.0000MH | [ 67.99 ] | 698,469 | | | 75,067 | 185,709 | | 959,245 |
| **3010.04** | **Demo Bad Concrete to Rebar** | **Quan: 1,223.10 CF** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | | |

Figure 0.3 CY of concrete Removal per location * 151 Locations = 45.3 CY = 1,223.1 CF

Remove concrete spall area to sound concrete.
Assume production at 3 cft/hr

| CARPB | Carpenter Barge Crew | | 407.70 CH | **Prod: 3.0000 UH** | Lab Pcs: 10.00 | Eqp Pcs: 7.00 | | |
|---|---|---|---|---|---|---|---|---|
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 407.70 HR | 36.929 | | 3,308 | 13,216 | 16,524 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 407.70 HR | 27.908 | | 2,023 | 10,465 | 12,487 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 407.70 HR | 114.119 | | 32,144 | 18,918 | 51,063 |
| 814CD10WB | Work Barge | 1.00 | 407.70 HR | 11.745 | | 3,403 | 1,852 | 5,255 |
| 814CD10WT | Work Tugboat | 1.00 | 407.70 HR | 190.674 | | 5,393 | 79,924 | 85,317 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 407.70 HR | 19.056 | | 950 | 7,576 | 8,527 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 407.70 HR | 15.000 | | 6,116 | | 6,116 |
| CA01 | Carpenter Foreman | 1.00 | 407.70 MH | 70.410 | 58,039 | | | 58,039 |
| CA02 | Carpenter | 4.00 | 1,630.80 MH | 64.010 | 216,371 | | | 216,371 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 407.70 MH | 63.550 | 53,202 | | | 53,202 |
| COE09 | Engr. Oiler | 1.00 | 407.70 MH | 55.840 | 48,448 | | | 48,448 |
| COE14 | Deck Engineer | 1.00 | 407.70 MH | 57.460 | 49,447 | | | 49,447 |
| IB03 | Mate | 1.00 | 407.70 MH | 57.310 | 35,334 | | | 35,334 |
| IB04 | Deckhand | 1.00 | 407.70 MH | 57.480 | 35,439 | | | 35,439 |
| $681,568.87 | 3.3333 MH/CF | | 4,077.0000MH | [ 226.633 ] | 496,280 | 53,337 | 131,951 | 681,569 |
| **3010.05** | **Sandblast Rebar** | **Quan: 8,541.00 SF** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | |

This activity is to sandblast the exposed rebar to clean the scale and rust off of it. Production will be limited by moving from one location to the other. Allow for 0.5 hour at each location plus 0.5 hour for moves. 151 locations x 1 = 151 hours

| CARPB | (Mod) Carpenter Barge Crew | | 151.00 CH | **Prod: 56.5629 UH** | Lab Pcs: 10.00 | Eqp Pcs: 8.00 | | |
|---|---|---|---|---|---|---|---|---|
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 151.00 HR | 36.929 | | 1,225 | 4,895 | 6,120 |
| 803PSM007 | Port Sandblasting Mach | 1.00 | 151.00 HR | 3.473 | | 418 | 157 | 576 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 151.00 HR | 27.908 | | 749 | 3,876 | 4,625 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 151.00 HR | 114.119 | | 11,905 | 7,007 | 18,912 |
| 814CD10WB | Work Barge | 1.00 | 151.00 HR | 11.745 | | 1,260 | 686 | 1,946 |
| 814CD10WT | Work Tugboat | 1.00 | 151.00 HR | 190.674 | | 1,997 | 29,602 | 31,599 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 151.00 HR | 19.056 | | 352 | 2,806 | 3,158 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 151.00 HR | 15.000 | | 2,265 | | 2,265 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3010** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Column Repairs | | | Unit = LOC | Takeoff Quan: 151.000 | | | Engr Quan: 151.000 | | | |
| CA01 | Carpenter Foreman | 1.00 | 151.00 MH | 70.410 | 21,496 | | | | | | 21,496 |
| CA02 | Carpenter | 4.00 | 604.00 MH | 64.010 | 80,137 | | | | | | 80,137 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 151.00 MH | 63.550 | 19,704 | | | | | | 19,704 |
| COE09 | Engr. Oiler | 1.00 | 151.00 MH | 55.840 | 17,944 | | | | | | 17,944 |
| COE14 | Deck Engineer | 1.00 | 151.00 MH | 57.460 | 18,314 | | | | | | 18,314 |
| IB03 | Mate | 1.00 | 151.00 MH | 57.310 | 13,087 | | | | | | 13,087 |
| IB04 | Deckhand | 1.00 | 151.00 MH | 57.480 | 13,126 | | | | | | 13,126 |
| $253,008.42 | 0.1767 MH/SF | | 1,510.0000MH | [ 12.02 ] | 183,808 | | | 20,173 | 49,028 | | 253,008 |
| **3010.06** | **Form Repair Area** | | | **Quan: 9,060.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Allow for installation of average approx. 60 sf of forms at 1 locations. Assume 30 minutes per location x 151 = 75.5 hours | | | | | | | | | | | |
| CARPB | Carpenter Barge Crew | | 75.50 CH | **Prod: 120.0000 UH** | Lab Pcs: 10.00 | | | Eqp Pcs: 7.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 75.50 HR | 36.929 | | | | 613 | 2,447 | | 3,060 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 75.50 HR | 27.908 | | | | 375 | 1,938 | | 2,312 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 75.50 HR | 114.119 | | | | 5,953 | 3,503 | | 9,456 |
| 814CD10WB | Work Barge | 1.00 | 75.50 HR | 11.745 | | | | 630 | 343 | | 973 |
| 814CD10WT | Work Tugboat | 1.00 | 75.50 HR | 190.674 | | | | 999 | 14,801 | | 15,799 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 75.50 HR | 19.056 | | | | 176 | 1,403 | | 1,579 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 75.50 HR | 15.000 | | | | 1,133 | | | 1,133 |
| CA01 | Carpenter Foreman | 1.00 | 75.50 MH | 70.410 | 10,748 | | | | | | 10,748 |
| CA02 | Carpenter | 4.00 | 302.00 MH | 64.010 | 40,069 | | | | | | 40,069 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 75.50 MH | 63.550 | 9,852 | | | | | | 9,852 |
| COE09 | Engr. Oiler | 1.00 | 75.50 MH | 55.840 | 8,972 | | | | | | 8,972 |
| COE14 | Deck Engineer | 1.00 | 75.50 MH | 57.460 | 9,157 | | | | | | 9,157 |
| IB03 | Mate | 1.00 | 75.50 MH | 57.310 | 6,543 | | | | | | 6,543 |
| IB04 | Deckhand | 1.00 | 75.50 MH | 57.480 | 6,563 | | | | | | 6,563 |
| $126,216.41 | 0.0833 MH/SF | | 755.0000MH | [ 5.666 ] | 91,904 | | | 9,877 | 24,435 | | 126,216 |
| **3010.07** | **Install Rebar** | | | **Quan: 3,412.60 LBS** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 4REBAR | Rebar Sub | 1.00 | 3,412.60 LBS | 2.000 | | | | | | 6,825 | 6,825 |
| **3010.08** | **Pump Concrete** | | | **Quan: 151.00 LOC** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 151 Locations with Average Volume of 0.4 CY/Location<br>Assume 15 minutes per location x 151 = 37.75 hour | | | | | | | | | | | |
| CARPB | (Mod) Carpenter Barge Crew | | 37.75 CH | **Prod: 0.0000** | Lab Pcs: 10.00 | | | Eqp Pcs: 8.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 37.75 HR | 36.929 | | | | 306 | 1,224 | | 1,530 |
| 807TRMCP045 | SCHWNG BPA500 Trl Pu | 1.00 | 37.75 HR | 55.116 | | | | 770 | 1,513 | | 2,283 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3010** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Column Repairs | | | | Unit = LOC | Takeoff Quan: 151.000 | | | Engr Quan: 151.000 | | | |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 37.75 | HR | 27.908 | | | | 187 | 969 | | 1,156 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 37.75 | HR | 114.119 | | | | 2,976 | 1,752 | | 4,728 |
| 814CD10WB | Work Barge | 1.00 | 37.75 | HR | 11.745 | | | | 315 | 172 | | 487 |
| 814CD10WT | Work Tugboat | 1.00 | 37.75 | HR | 190.674 | | | | 499 | 7,400 | | 7,900 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 37.75 | HR | 19.056 | | | | 88 | 702 | | 789 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 37.75 | HR | 15.000 | | | | 566 | | | 566 |
| CA01 | Carpenter Foreman | 1.00 | 37.75 | MH | 70.410 | 5,374 | | | | | | 5,374 |
| CA02 | Carpenter | 4.00 | 151.00 | MH | 64.010 | 20,034 | | | | | | 20,034 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 37.75 | MH | 63.550 | 4,926 | | | | | | 4,926 |
| COE09 | Engr. Oiler | 1.00 | 37.75 | MH | 55.840 | 4,486 | | | | | | 4,486 |
| COE14 | Deck Engineer | 1.00 | 37.75 | MH | 57.460 | 4,578 | | | | | | 4,578 |
| IB03 | Mate | 1.00 | 37.75 | MH | 57.310 | 3,272 | | | | | | 3,272 |
| IB04 | Deckhand | 1.00 | 37.75 | MH | 57.480 | 3,281 | | | | | | 3,281 |
| $65,391.65 | 2.5000 MH/LOC | | 377.5000 | MH | [ 169.975 ] | 45,952 | | | 5,709 | 13,731 | | 65,392 |
| **=====> Item Totals:** | **3010 - Column Repairs** | | | | | | | | | | | |
| $2,322,121.52 | 82.5000 MH/LOC | | 12,457.50 | MH | [ 5609.167 ] | 1,516,412 | 21,056 | 208,810 | 164,163 | 404,856 | 6,825 | **2,322,122** |
| 15,378.288 | 151 LOC | | | | | 10,042.46 | 139.44 | 1,382.85 | 1,087.17 | 2,681.16 | 45.20 | 15,378.29 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3020** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Soffitt Repairs (Shotcrete) | | | | Unit = LOC | Takeoff Quan: 138.000 | | | Engr Quan: 138.000 | | | |
| **3020.01** | **Sawcut** | | | | **Marine Quan: 1,504.20 LF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |

**Unreviewed

Sawcut a minimum 1" deep around the perimeter of the repair area to allow for clean face of concrete. Total sawcut length for repairs is 1,504.2 FT. Allow 2 men sawcutting with right angle grinders w/diamond wheels. Allow production at 10 lf/hr.

| CONREP | Concrete Repair Crew | | 150.42 | CH | **Prod: 10.0000 UH** | Lab Pcs: 8.00 | | | Eqp Pcs: 13.00 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 150.42 | HR | 36.929 | | | | 1,220 | 4,876 | 6,096 |
| 803PSM007 | Port Sandblasting Mach | 1.00 | 150.42 | HR | 3.473 | | | | 417 | 157 | 573 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 150.42 | HR | 84.726 | | | | 4,651 | 9,336 | 13,987 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 150.42 | HR | 3.830 | | | | 138 | 494 | 632 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 150.42 | HR | 114.119 | | | | 11,860 | 6,980 | 18,839 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 150.42 | HR | 137.358 | | | | 4,159 | 18,517 | 22,676 |
| 814RUN016 | Runabout 16ft | 1.00 | 150.42 | HR | 30.216 | | | | 154 | 4,834 | 4,988 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 150.42 | HR | 12.781 | | | | 316 | 1,794 | 2,110 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 150.42 | HR | 34.824 | | | | 734 | 5,015 | 5,749 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 150.42 | HR | 26.000 | | | | 3,911 | | 3,911 |

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3020** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Soffitt Repairs (Shotcrete) | | | Unit = LOC | Takeoff Quan: 138.000 | | | Engr Quan: 138.000 | | | |
| 822_DEMO | Demo Small Tools | 1.00 | 150.42 HR | 14.000 | | | | 2,106 | | | 2,106 |
| 822_GRTPUMP | Chemgrout CG555 Pump & | 1.00 | 150.42 HR | 15.000 | | | | 2,256 | | | 2,256 |
| 822_WRKFLOT | 9 x 20 Work Float | 1.00 | 150.42 HR | 10.000 | | | | 1,504 | | | 1,504 |
| CA02 | Carpenter | 1.00 | 150.42 MH | 64.010 | 19,957 | | | | | | 19,957 |
| COE10 | Crane Operator (GR 3) (<45 | 1.00 | 150.42 MH | 61.870 | 19,247 | | | | | | 19,247 |
| LA01 | Laborer Foreman | 1.00 | 150.42 MH | 40.450 | 13,778 | | | | | | 13,778 |
| LA06 | Laborer (Gr 5) (updtd 4_24) | 4.00 | 601.68 MH | 0.000 | | | | | | | |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 150.42 MH | 56.030 | 17,918 | | | | | | 17,918 |
| $156,329.18 | 0.8000 MH/LF | | 1,203.3600MH | [ 24.46 ] | 70,900 | | | 33,426 | 52,003 | | 156,329 |
| **3020.02** | **Demo Bad Concrete to Rebar** | | **Marine** | **Quan: 21.14 CF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| | | | | | | | | | | | **Unreviewed |
| Remove concrete spall area to sound concrete. Spall depth at the repair areas is 6" deep. Total amount of concrete to be removed is 21.14 cft. Assume production at 3 cft/hr | | | | | | | | | | | |
| CONREP | Concrete Repair Crew | | | 7.04 CH | **Prod: 3.0000 UH** | | Lab Pcs: 8.00 | | Eqp Pcs: 13.00 | | |
| 3511 | Disposal Fee-2@109.75% | 1.00 | 0.16 LD | 2,400.000 | | | 421 | | | | 421 |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 7.05 HR | 36.929 | | | | 57 | 229 | | 286 |
| 803PSM007 | Port Sandblasting Mach | 1.00 | 7.05 HR | 3.473 | | | | 20 | 7 | | 27 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 7.05 HR | 84.726 | | | | 218 | 438 | | 656 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 7.05 HR | 3.830 | | | | 6 | 23 | | 30 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 7.05 HR | 114.119 | | | | 556 | 327 | | 883 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 7.05 HR | 137.358 | | | | 195 | 868 | | 1,063 |
| 814RUN016 | Runabout 16ft | 1.00 | 7.05 HR | 30.216 | | | | 7 | 227 | | 234 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 7.05 HR | 12.781 | | | | 15 | 84 | | 99 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 7.05 HR | 34.824 | | | | 34 | 235 | | 269 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 7.05 HR | 26.000 | | | | 183 | | | 183 |
| 822_DEMO | Demo Small Tools | 1.00 | 7.05 HR | 14.000 | | | | 99 | | | 99 |
| 822_GRTPUMP | Chemgrout CG555 Pump & | 1.00 | 7.05 HR | 12.000 | | | | 85 | | | 85 |
| 822_WRKFLOT | 9 x 20 Work Float | 1.00 | 7.05 HR | 10.000 | | | | 71 | | | 71 |
| CA02 | Carpenter | 1.00 | 7.05 MH | 64.010 | 935 | | | | | | 935 |
| COE10 | Crane Operator (GR 3) (<45 | 1.00 | 7.05 MH | 61.870 | 902 | | | | | | 902 |
| LA01 | Laborer Foreman | 1.00 | 7.05 MH | 40.450 | 646 | | | | | | 646 |
| LA06 | Laborer (Gr 5) (updtd 4_24) | 4.00 | 28.19 MH | 0.000 | | | | | | | |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 7.05 MH | 56.030 | 840 | | | | | | 840 |
| $7,727.16 | 2.6674 MH/CF | | 56.3900MH | [ 81.57 ] | 3,323 | | 421 | 1,545 | 2,437 | | 7,727 |
| **3020.03** | **Sandblast Rebar** | | **Marine** | **Quan: 1,007.40 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| | | | | | | | | | | | **Unreviewed |
| This activity is to sandblast the exposed rebar to clean the scale and rust off of it. Production will be limited by moving from one location to | | | | | | | | | | | |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3020** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Soffitt Repairs (Shotcrete) | | | Unit = | LOC Takeoff Quan: 138.000 | | | | Engr Quan: | 138.000 | | |
| the other. Allow for 0.5 hour at each location plus 0.5 hour for moves. 580 locations x 1 = 580 hours | | | | | | | | | | | | |
| CONREP | Concrete Repair Crew | | | 21.52 | CH **Prod: 46.7955 UH** | | | Lab Pcs: 8.00 | | Eqp Pcs: 13.00 | | |
| 3SAND | Sandblasting S@109.75% | 1.00 | 1,007.40 SF | | 5.000 | | | 5,528 | | | | 5,528 |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 21.53 HR | | 36.929 | | | | 175 | 698 | | 873 |
| 803PSM007 | Port Sandblasting Mach | 1.00 | 21.53 HR | | 3.473 | | | | 60 | 22 | | 82 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 21.53 HR | | 84.726 | | | | 666 | 1,336 | | 2,002 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 21.53 HR | | 3.830 | | | | 20 | 71 | | 90 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 21.53 HR | | 114.119 | | | | 1,697 | 999 | | 2,697 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 21.53 HR | | 137.358 | | | | 595 | 2,650 | | 3,246 |
| 814RUN016 | Runabout 16ft | 1.00 | 21.53 HR | | 30.216 | | | | 22 | 692 | | 714 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 21.53 HR | | 12.781 | | | | 45 | 257 | | 302 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 21.53 HR | | 34.824 | | | | 105 | 718 | | 823 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 21.53 HR | | 0.000 | | | | | | | |
| 822_DEMO | Demo Small Tools | 1.00 | 21.53 HR | | 0.000 | | | | | | | |
| 822_GRTPUMP | Chemgrout CG555 Pump & | 1.00 | 21.53 HR | | 0.000 | | | | | | | |
| 822_WRKFLOT | 9 x 20 Work Float | 1.00 | 21.53 HR | | 0.000 | | | | | | | |
| CA02 | Carpenter | 1.00 | 21.53 MH | | 64.010 | 2,857 | | | | | | 2,857 |
| COE10 | Crane Operator (GR 3) (<45 | 1.00 | 21.53 MH | | 61.870 | 2,755 | | | | | | 2,755 |
| LA01 | Laborer Foreman | 1.00 | 21.53 MH | | 40.450 | 1,972 | | | | | | 1,972 |
| LA06 | Laborer (Gr 5) (updtd 4_24) | 4.00 | 86.11 MH | | 0.000 | | | | | | | |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 21.53 MH | | 56.030 | 2,565 | | | | | | 2,565 |
| $26,504.34 | 0.1709 MH/SF | | 172.2300MH | | [ 5.227 ] | 10,148 | | 5,528 | 3,385 | 7,443 | | 26,504 |
| **3020.04** | **F&I Shotcrete** | | | **Marine** | **Quan: 1,007.40 SF Hrs/Shft: 10.00 Cal: 50S WC: MARINE** | | | | | | | |
| | | | | | | | | | | | | **Unreviewed |
| Allow for placement of shotcrete at concrete spall repair locations. Based on costs from FDOT repair projects the average cost for shotcrete was $380/cf. adjusted to California labor rates of $418/cf. Include additional crew for cleaning overspray and rebound off the surrounding areas. | | | | | | | | | | | | |
| SHOTS | Shotcrete Support Crew | | | 50.37 | CH **Prod: 20.0000 UH** | | | Lab Pcs: 4.00 | | Eqp Pcs: 9.00 | | |
| 4F&ISC | SHOTCRETE SUB | 1.00 | 503.70 CF | | 418.000 | | | | | | 210,547 | 210,547 |
| 807TRMCP045 | SCHWNG BPA500 Trl Pu | 1.00 | 50.37 HR | | 55.116 | | | | 1,027 | 2,019 | | 3,047 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 50.37 HR | | 84.726 | | | | 1,558 | 3,126 | | 4,684 |
| 811SGS2500D | 2500w Small GenSet %50 | 1.00 | 50.37 HR | | 3.830 | | | | 46 | 83 | | 129 |
| 814RUN016 | Runabout 16ft %50 | 1.00 | 50.37 HR | | 30.216 | | | | 52 | 809 | | 861 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 50.37 HR | | 34.824 | | | | 246 | 1,679 | | 1,925 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 50.37 HR | | 26.000 | | | | 1,310 | | | 1,310 |
| 822_DEMO | Demo Small Tools | 1.00 | 50.37 HR | | 14.000 | | | | 705 | | | 705 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 100.74 HR | | 10.000 | | | | 1,007 | | | 1,007 |
| LA01 | Laborer Foreman | 1.00 | 50.37 MH | | 40.450 | 4,614 | | | | | | 4,614 |
| LA06 | Laborer (Gr 5) (updtd 4_24) | 2.00 | 100.74 MH | | 40.000 | 5,440 | | | | | | 5,440 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3020** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Soffitt Repairs (Shotcrete) | | | Unit = LOC | Takeoff Quan: 138.000 | | | Engr Quan: 138.000 | | | |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 50.37 MH | 56.030 | 6,000 | | | | | | 6,000 |
| $240,268.38 | 0.2000 MH/SF | | 201.4800MH | [ 9.706 ] | 16,054 | | | 5,951 | 7,717 | 210,547 | 240,268 |
| **3020.05** | **Cure, Clean** | | **Marine** | **Quan: 1,007.40 SF** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | |
| | | | | | | | | | | | **Unreviewed |
| Allow for crew to point and patch all shotcrete surfaces. | | | | | | | | | | | |
| SHOTPP | Shotcrete Point & Cure | | 20.14 CH | **Prod: 50.0000 UH** | Lab Pcs: 3.00 | | | Eqp Pcs: 3.00 | | | |
| 3CONCCURE | Concrete Cure@109.75% | 1.00 | 1,007.40 SF | 5.000 | | | 5,528 | | | | 5,528 |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 20.15 HR | 36.929 | | | | 163 | 653 | | 817 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 20.15 HR | 3.830 | | | | 19 | 66 | | 85 |
| 822_WRKFLOT | 9 x 20 Work Float | 1.00 | 20.15 HR | 10.000 | | | | 202 | | | 202 |
| CM01 | Cement Mason Foreman | 1.00 | 20.15 MH | 49.000 | 2,115 | | | | | | 2,115 |
| CM02 | Cement Mason | 2.00 | 40.30 MH | 47.000 | 4,107 | | | | | | 4,107 |
| $12,852.88 | 0.0600 MH/SF | | 60.4500MH | [ 3.146 ] | 6,222 | | 5,528 | 384 | 719 | | 12,853 |
| **=====> Item Totals:** | **3020 - Soffitt Repairs (Shotcrete)** | | | | | | | | | | |
| $443,681.94 | 12.2747 MH/LOC | | 1,693.91MH | [ 411.091 ] | 106,647 | | 11,478 | 44,691 | 70,319 | 210,547 | **443,682** |
| 3,215.087 | 138 LOC | | | | 772.81 | | 83.17 | 323.85 | 509.56 | 1,525.70 | 3,215.09 |
| **BID ITEM = 3030** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Column Replacement | | | Unit = LOC | Takeoff Quan: 13.000 | | | Engr Quan: 13.000 | | | |
| **3030.01** | **Materials (Perm)** | | | **Quan: 13.00 LOC** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | |
| Figure 13 Columns @ 1.2 CY/LOC = 15.6 CY Conc | | | | | | | | | | | |
| Rebar = 1000 LBS/LOC * 13 = 13,000 LBS = 6.5 TNs | | | | | | | | | | | |
| Fiberglass Forms = 60 SF/LOC * 13 = 780 SF | | | | | | | | | | | |
| 2-ULTRABOND1 | Ultrabond 1@109.75% | 1.00 | 104.00 EA | 55.000 | | 6,278 | | | | | 6,278 |
| 2C0006 | 5000 PSI Concr@109.75% | 1.00 | 15.60 CY | 225.000 | | 3,852 | | | | | 3,852 |
| 2C0010 | Delivery Charg@109.75% | 1.00 | 2.00 LD | 200.000 | | 439 | | | | | 439 |
| 2C0FUEL/ENV | Concrete Fuel/@109.75% | 1.00 | 15.60 CY | 10.000 | | 171 | | | | | 171 |
| 2CR060 | Gr 60 Rebar@109.75% | 1.00 | 6.50 TON | 2,000.000 | | 14,268 | | | | | 14,268 |
| 2CRACC | Rebar Accessor@109.75% | 1.00 | 6.50 TON | 100.000 | | 713 | | | | | 713 |
| 3FA100 | Formwork Acces@109.75% | 1.00 | 780.00 SF | 1.000 | | | 856 | | | | 856 |
| 3FIBERFORM | Fiberglass SIP@109.75% | 1.00 | 780.00 SF | 15.000 | | | 12,841 | | | | 12,841 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Column Replacement | | | | Unit = LOC | Takeoff Quan: | 13.000 | | Engr Quan: | 13.000 | | |
| $39,417.82 | | | | | [ ] | | 25,721 | 13,697 | | | | 39,418 |
| **3030.02** | **Wiresaw Columns** | | | | **Quan: 13.00 LOC** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Figure 18" x 18" = 1.5 * 1.5 = 2.25 SF * 2 = 4.5 SF Per column | | | | | | | | | | | | |
| 4.5 SF * 13 Locations = 58.5 SF | | | | | | | | | | | | |
| Figure 100$/SF bump to $125 to include MOB | | | | | | | | | | | | |
| 4WIRESAW | Wiresaw Sub | 1.00 | 58.50 | SF | 125.000 | | | | | | 7,313 | 7,313 |
| **3030.03** | **Chip & Dispose of Existing Columns** | | | | **Quan: 15.60 CY** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Figure 1.2 CY of Concrete per Column for removal | | | | | | | | | | | | |
| 1.2 CY * 13 = 15.6 CY =421.2 CF | | | | | | | | | | | | |
| Figure Demo & Dispose at 6 CY/HR | | | | | | | | | | | | |
| CRIB | (Mod) Cribbin Crew | | | 2.60 CH | **Prod: 6.0000 UH** | | Lab Pcs: 5.00 | | Eqp Pcs: 7.00 | | | |
| 3511 | Disposal Fee-2@109.75% | 1.00 | 4.00 | LD | 2,400.000 | | | 10,536 | | | | 10,536 |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 2.60 | HR | 36.929 | | | | 21 | 84 | | 105 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 2.60 | HR | 53.353 | | | | 60 | 92 | | 152 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 2.60 | HR | 3.830 | | | | 2 | 9 | | 11 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 2.60 | HR | 34.824 | | | | 13 | 87 | | 99 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 2.60 | HR | 42.485 | | | | 65 | 56 | | 121 |
| 822_SKIDHAMM | John Deere 323E Skidst | 1.00 | 2.60 | HR | 65.000 | | | | 169 | | | 169 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 2.60 | HR | 13.000 | | | | 34 | | | 34 |
| CA01 | Carpenter Foreman | 1.00 | 2.60 | MH | 70.410 | 370 | | | | | | 370 |
| CA02 | Carpenter | 4.00 | 10.40 | MH | 64.010 | 1,380 | | | | | | 1,380 |
| $12,977.86 | 0.8333 MH/CY | | 13.0000 | MH | [ 59.849 ] | 1,750 | | 10,536 | 365 | 327 | | 12,978 |
| **3030.04** | **Dowel in Rebar** | | | | **Quan: 104.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 8 Dowels / Column | | | | | | | | | | | | |
| Figure 5 Mins/Hole * 104 = 520 Mins = 8.67 HRs => Say 9 HRs | | | | | | | | | | | | |
| CRIB | Cribbin Crew | | | 9.00 CH | **Prod: 0.0000** | | Lab Pcs: 5.00 | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 9.00 | HR | 36.929 | | | | 73 | 292 | | 365 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 9.00 | HR | 53.353 | | | | 209 | 318 | | 527 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 9.00 | HR | 3.830 | | | | 8 | 30 | | 38 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Column Replacement | | | | Unit = LOC | Takeoff Quan: | 13.000 | | Engr Quan: | 13.000 | | |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 9.00 HR | | 34.824 | | | | 44 | 300 | | 344 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 9.00 HR | | 42.485 | | | | 226 | 193 | | 420 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 9.00 HR | | 13.000 | | | | 117 | | | 117 |
| CA01 | Carpenter Foreman | 1.00 | 9.00 MH | | 70.410 | 1,281 | | | | | | 1,281 |
| CA02 | Carpenter | 4.00 | 36.00 MH | | 64.010 | 4,776 | | | | | | 4,776 |
| $7,867.72 | 0.4326 MH/EA | | 45.0000MH | | [ 31.076 ] | 6,058 | | | 677 | 1,133 | | 7,868 |
| **3030.05** | **Form Column** | | | | **Quan: 780.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Allow for installation of average approx. 7.3 sf of forms at 1 locations. Assume 30 minutes per location + 30 Mins Move Time x 13 = 13 hours | | | | | | | | | | | | |
| CRIB | Cribbin Crew | | | 13.00 CH | **Prod: 60.0000 UH** | | Lab Pcs: 5.00 | | Eqp Pcs: 6.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 13.00 HR | | 36.929 | | | | 105 | 421 | | 527 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 13.00 HR | | 53.353 | | | | 301 | 460 | | 761 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 13.00 HR | | 3.830 | | | | 12 | 43 | | 55 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 13.00 HR | | 34.824 | | | | 63 | 433 | | 497 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 13.00 HR | | 42.485 | | | | 327 | 279 | | 606 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 13.00 HR | | 13.000 | | | | 169 | | | 169 |
| CA01 | Carpenter Foreman | 1.00 | 13.00 MH | | 70.410 | 1,851 | | | | | | 1,851 |
| CA02 | Carpenter | 4.00 | 52.00 MH | | 64.010 | 6,899 | | | | | | 6,899 |
| $11,364.51 | 0.0833 MH/SF | | 65.0000MH | | [ 5.985 ] | 8,750 | | | 978 | 1,637 | | 11,365 |
| **3030.06** | **Install Rebar** | | | | **Quan: 13,000.00 LBS** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 4REBAR | Rebar Sub | 1.00 | 13,000.00 LBS | | 2.000 | | | | | | 26,000 | 26,000 |
| **3030.07** | **Pump Concrete** | | | | **Quan: 15.60 CY** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 13 Locations with Average Volume of 1.2 CY/Location<br>Assume 30 minutes per location x 13 = 6.5 hour | | | | | | | | | | | | |
| CRIB | (Mod) Cribbin Crew | | | 6.50 CH | **Prod: 0.0000** | | Lab Pcs: 5.00 | | Eqp Pcs: 7.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 6.50 HR | | 36.929 | | | | 53 | 211 | | 263 |
| 807TRMCP045 | SCHWNG BPA500 Trl Pu | 1.00 | 6.50 HR | | 55.116 | | | | 133 | 261 | | 393 |
| 809SSL0262C | CAT 262C Skid Steer Lo | 1.00 | 6.50 HR | | 53.353 | | | | 151 | 230 | | 381 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 6.50 HR | | 3.830 | | | | 6 | 21 | | 27 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 6.50 HR | | 34.824 | | | | 32 | 217 | | 248 |
| 822_45'ML | 45' Articulating Manli | 1.00 | 6.50 HR | | 42.485 | | | | 163 | 140 | | 303 |
| 822_SMTOOL-2 | Small Tools_Concrete | 1.00 | 6.50 HR | | 13.000 | | | | 85 | | | 85 |
| CA01 | Carpenter Foreman | 1.00 | 6.50 MH | | 70.410 | 925 | | | | | | 925 |
| CA02 | Carpenter | 4.00 | 26.00 MH | | 64.010 | 3,450 | | | | | | 3,450 |
| $6,075.43 | 2.0833 MH/CY | | 32.5000MH | | [ 149.623 ] | 4,375 | | | 622 | 1,079 | | 6,075 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 3030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Column Replacement | | | Unit = LOC | Takeoff Quan: 13.000 | | Engr Quan: 13.000 | | | | | |
| **=====> Item Totals:** | **3030 - Column Replacement** | | | | | | | | | | | |
| $111,015.84 | 11.9615 MH/LOC | | 155.50MH | | [ 859.065 ] | 20,932 | 25,721 | 24,233 | 2,641 | 4,176 | 33,313 | **111,016** |
| 8,539.680 | 13 LOC | | | | | 1,610.18 | 1,978.54 | 1,864.06 | 203.18 | 321.21 | 2,562.50 | 8,539.68 |

**BID ITEM = 4010** Land Item SCHEDULE: 1 100
Description = 18" Diameter FRP Pile Unit = LF Takeoff Quan: 1,080.000 Engr Quan: 1,080.000

18" Diameter FRP @ 6' OC x 70 feet long

1080/6' = 180 EA + 2 EA end pcs = 182 EA

**4010.01 Materials** **Quan: 1,080.00 LF** **Hrs/Shft: 10.00** **Cal: 50S** **WC: MARINE**

See BI note for EA quantity of fender pile.

182 EA x 60 LF/EA = 10920 LF

Assume 30' long HDPE pipe for sheath at $30/LF

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2FRPPILES | FRP Pile@109.75% | 1.00 | 10,920.00 | LF | 65.000 | | 779,006 | | | | | 779,006 |
| 2FRPSHEATH | 30' Long HDPE @109.75% | 1.00 | 182.00 | EA | 900.000 | | 179,771 | | | | | 179,771 |
| 3RIGGING | Rigging@109.75% | 1.00 | 1.00 | LS | 5,000.000 | | | 5,488 | | | | 5,488 |
| 5FREIGHT | Pile Freight | 1.00 | 182.00 | EA | 500.000 | | | 91,000 | | | | 91,000 |
| $1,055,263.50 | | | | | [ ] | | 958,776 | 96,488 | | | | 1,055,264 |

**4010.02 Remove Existing Fender System** **Quan: 75.00 EA** **Hrs/Shft: 10.00** **Cal: 50S** **WC: MARINE**

Assume existing fender system at 6' OC +/- and can dry pull 15 fenders per shift = 90 LF per shift.

| PDFNDR | Pile Drive Crew - Fender | | 50.00 | CH | **Prod: 15.0000 US** | | Lab Pcs: 10.00 | | Eqp Pcs: 10.00 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 50.00 | HR | 30.150 | | | | 258 | 1,397 | 1,654 |
| 811SGS15000D | 15000w Small GenSet | 1.00 | 50.00 | HR | 20.164 | | | | 291 | 816 | 1,106 |
| 813CMLBC555 | MANITOWOC 555 150t | 1.00 | 50.00 | HR | 293.633 | | | | 7,788 | 8,325 | 16,113 |
| 814CB150 | Crane Barge - 150 Ton | 1.00 | 50.00 | HR | 251.276 | | | | 9,304 | 4,485 | 13,789 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 50.00 | HR | 137.358 | | | | 1,382 | 6,155 | 7,538 |
| 815DH01842 | DELMAG D19-42 Dsl Ham | 1.00 | 50.00 | HR | 79.836 | | | | 2,075 | 2,306 | 4,381 |
| 815SL1133363 | Swinging Lead 11x33x36 | 3.00 | 150.00 | HR | 4.330 | | | | 713 | | 713 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 50.00 | HR | 12.781 | | | | 105 | 596 | 701 |
| COE04 | Crane Operator (GR 1) (>10 | 1.00 | 50.00 | MH | 65.370 | 6,662 | | | | | 6,662 |
| COE06 | Engr. Oiler (GR 1) | 1.00 | 50.00 | MH | 56.110 | 5,962 | | | | | 5,962 |
| COE14 | Deck Engineer | 1.00 | 50.00 | MH | 57.460 | 6,064 | | | | | 6,064 |

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 4010** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Diameter FRP Pile | | | Unit = LF | Takeoff Quan: 1,080.000 | | | Engr Quan: 1,080.000 | | | |
| IB01 | Captain | 1.00 | 50.00 MH | 61.410 | 4,643 | | | | | | 4,643 |
| IB03 | Mate | 1.00 | 50.00 MH | 57.310 | 4,333 | | | | | | 4,333 |
| PD01 | Piledriver Foreman | 1.00 | 50.00 MH | 64.620 | 6,849 | | | | | | 6,849 |
| PD02 | Piledriver | 4.00 | 200.00 MH | 62.620 | 26,793 | | | | | | 26,793 |
| $107,302.64 | 6.6666 MH/EA | | 500.0000MH | [ 449.357 ] | 61,307 | | | 21,915 | 24,080 | | 107,303 |
| **4010.03** | **Process & Dispose Existing Fender System** | | **Quan: 132.00 TN** | | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | |

```
Existing fender system

20 EA steel pipe @ 60'
33 EA timber @ 60'
10EA steel pipe piles @ 60'

Assume pipe piles are 16" Diameter x .375" WT = 1.878 TN/EA
30 x 1.878 TN = 56.34TN Steel

33 EA timber @ 84CF per each
Timber pile weight at 55 pounds per CF = 2.3 TN/EA

33EA x 2.3 TN/EA = 75.9 TN

Assume loadout of 1 trucks an hour at 10 TN/EA
Assume recycle steel pipe piles - minimal credit back
```

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRCDIS | Process & Dispose | | 13.20 CH | **Prod: 10.0000 UH** | | Lab Pcs: 5.00 | | Eqp Pcs: 1.00 | | | |
| 3S4002 | Sm Tools - Dem@109.75% | 1.00 | 13.20 CH | 25.000 | | 362 | | | | | 362 |
| 4TIPTWW | TWW Tipping Fee | 1.00 | 75.90 TN | 80.000 | | | | | | 6,072 | 6,072 |
| 5HAULHR | Haul (hourly) | 1.00 | 40.00 HR | 125.000 | | 5,000 | | | | | 5,000 |
| 810_330WHAM | CAT 330 Excavator w/ H | 1.00 | 13.20 HR | 146.432 | | | | 1,449 | 673 | | 2,121 |
| LA01 | Laborer Foreman | 1.00 | 13.20 MH | 40.450 | 1,209 | | | | | | 1,209 |
| LA04 | Laborer (Gr 3) | 3.00 | 39.60 MH | 37.500 | 3,451 | | | | | | 3,451 |
| OE04 | Operator (GR 3) (Exc <3.5 | 1.00 | 13.20 MH | 61.140 | 1,674 | | | | | | 1,674 |
| $19,889.62 | 0.5000 MH/TN | | 66.0000MH | [ 23.55 ] | 6,334 | | 5,362 | 1,449 | 673 | 6,072 | 19,890 |
| **4010.04** | **Install & Connect Fender System** | | **Quan: 182.00 EA** | | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | |
| PDFNDR | Pile Drive Crew - Fender | | 364.00 CH | **Prod: 2.0000 HU** | | Lab Pcs: 10.00 | | Eqp Pcs: 10.00 | | | |
| 3S4000 | Sm Tools - Gen@109.75% | 1.00 | 364.00 CH | 25.000 | | 9,987 | | | | | 9,987 |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 364.00 HR | 30.150 | | | | 1,875 | 10,169 | | 12,045 |
| 811SGS15000D | 15000w Small GenSet | 1.00 | 364.00 HR | 20.164 | | | | 2,117 | 5,938 | | 8,055 |
| 813CMLBC555 | MANITOWOC 555 150t | 1.00 | 364.00 HR | 293.633 | | | | 56,695 | 60,609 | | 117,303 |

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 4010** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Diameter FRP Pile | | | | Unit = LF | Takeoff Quan: 1,080.000 | | | Engr Quan: 1,080.000 | | | |
| 814CB150 | Crane Barge - 150 Ton | 1.00 | 364.00 | HR | 251.276 | | | | 67,730 | 32,653 | | 100,382 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 364.00 | HR | 137.358 | | | | 10,063 | 44,810 | | 54,873 |
| 815DH01842 | DELMAG D19-42 Dsl Ham | 1.00 | 364.00 | HR | 79.836 | | | | 15,108 | 16,785 | | 31,894 |
| 815SL1133363 | Swinging Lead 11x33x36 | 3.00 | 1,092.00 | HR | 4.330 | | | | 5,189 | | | 5,189 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 364.00 | HR | 12.781 | | | | 765 | 4,341 | | 5,106 |
| COE04 | Crane Operator (GR 1) (>10 | 1.00 | 364.00 | MH | 65.370 | 48,501 | | | | | | 48,501 |
| COE06 | Engr. Oiler (GR 1) | 1.00 | 364.00 | MH | 56.110 | 43,404 | | | | | | 43,404 |
| COE14 | Deck Engineer | 1.00 | 364.00 | MH | 57.460 | 44,147 | | | | | | 44,147 |
| IB01 | Captain | 1.00 | 364.00 | MH | 61.410 | 33,804 | | | | | | 33,804 |
| IB03 | Mate | 1.00 | 364.00 | MH | 57.310 | 31,547 | | | | | | 31,547 |
| PD01 | Piledriver Foreman | 1.00 | 364.00 | MH | 64.620 | 49,863 | | | | | | 49,863 |
| PD02 | Piledriver | 4.00 | 1,456.00 | MH | 62.620 | 195,050 | | | | | | 195,050 |
| $791,150.91 | 20.0000 MH/EA | | 3,640.0000 | MH | [ 1348.072 ] | 446,316 | | 9,987 | 159,542 | 175,305 | | 791,151 |
| **=====> Item Totals:** | **4010 - 18" Diameter FRP Pile** | | | | | | | | | | | |
| $1,973,606.67 | 3.8944 MH/LF | | 4,206.00 | MH | [ 261.259 ] | 513,957 | 958,776 | 111,837 | 182,906 | 200,058 | 6,072 | **1,973,607** |
| 1,827.414 | 1080 LF | | | | | 475.89 | 887.76 | 103.55 | 169.36 | 185.24 | 5.62 | 1,827.41 |

**BID ITEM = 4020** Land Item SCHEDULE: 1 100
Description = 16" Diameter Steel Pile Unit = LF Takeoff Quan: 1,080.000 Engr Quan: 1,080.000

**4020.01 Materials** **Quan: 1,080.00 LF** **Hrs/Shft: 10.00** **Cal: 50S** **WC: MARINE**

```
1080 LF @ 12'OC = 90
90 + 2 end pcs = 92 EA at 60 long

16" diameter x 3/8" thick = 1.878 TN/EA

92 EA x 1.878 = 172.78 TN

Pile coating quantity assumes bottom 20' uncoated
```

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2CAMEL | FRP Camel@109.75% | 1.00 | 1,080.00 | LF | 100.000 | | 118,530 | | | | | 118,530 |
| 2COATING | Pipe Pile Coat@109.75% | 1.00 | 15,414.00 | SF | 9.000 | | 152,252 | | | | | 152,252 |
| 2LEGFNDR | Leg Fender@109.75% | 1.00 | 92.00 | EA | 5,000.000 | | 504,850 | | | | | 504,850 |
| 2PILE | 16" Dia x .375@109.75% | 1.00 | 172.78 | TN | 2,400.000 | | 455,103 | | | | | 455,103 |
| 3RIGGING | Rigging@109.75% | 1.00 | 1.00 | LS | 5,000.000 | | | 5,488 | | | | 5,488 |
| 5FREIGHT | Pile Freight | 1.00 | 92.00 | EA | 1,000.000 | | | 92,000 | | | | 92,000 |

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 4020** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 16" Diameter Steel Pile | | | Unit = | LF | Takeoff Quan: | 1,080.000 | | Engr Quan: | 1,080.000 | | |
| $1,328,221.81 | | | | | [ ] | | 1,230,734 | 97,488 | | | | 1,328,222 |
| **4020.02** | **Remove Existing Fender System** | | | | **Quan: 75.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| | | | | | | | | | | | | **Unreviewed |
| Assume existing fender system at 6' OC +/- and can dry pull 15 fenders per shift = 90 LF per shift. | | | | | | | | | | | | |
| PDFNDR | Pile Drive Crew - Fender | | | 50.00 CH | **Prod: 15.0000 US** | | | | Lab Pcs: 10.00 | Eqp Pcs: 10.00 | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 50.00 HR | | 30.150 | | | | 258 | 1,397 | | 1,654 |
| 811SGS15000D | 15000w Small GenSet | 1.00 | 50.00 HR | | 20.164 | | | | 291 | 816 | | 1,106 |
| 813CMLBC555 | MANITOWOC 555 150t | 1.00 | 50.00 HR | | 293.633 | | | | 7,788 | 8,325 | | 16,113 |
| 814CB150 | Crane Barge - 150 Ton | 1.00 | 50.00 HR | | 251.276 | | | | 9,304 | 4,485 | | 13,789 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 50.00 HR | | 137.358 | | | | 1,382 | 6,155 | | 7,538 |
| 815DH01842 | DELMAG D19-42 Dsl Ham | 1.00 | 50.00 HR | | 79.836 | | | | 2,075 | 2,306 | | 4,381 |
| 815SL1133363 | Swinging Lead 11x33x36 | 3.00 | 150.00 HR | | 4.330 | | | | 713 | | | 713 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 50.00 HR | | 12.781 | | | | 105 | 596 | | 701 |
| COE04 | Crane Operator (GR 1) (>10 | 1.00 | 50.00 MH | | 65.370 | 6,662 | | | | | | 6,662 |
| COE06 | Engr. Oiler (GR 1) | 1.00 | 50.00 MH | | 56.110 | 5,962 | | | | | | 5,962 |
| COE14 | Deck Engineer | 1.00 | 50.00 MH | | 57.460 | 6,064 | | | | | | 6,064 |
| IB01 | Captain | 1.00 | 50.00 MH | | 61.410 | 4,643 | | | | | | 4,643 |
| IB03 | Mate | 1.00 | 50.00 MH | | 57.310 | 4,333 | | | | | | 4,333 |
| PD01 | Piledriver Foreman | 1.00 | 50.00 MH | | 64.620 | 6,849 | | | | | | 6,849 |
| PD02 | Piledriver | 4.00 | 200.00 MH | | 62.620 | 26,793 | | | | | | 26,793 |
| $107,302.64 | 6.6666 MH/EA | | 500.0000MH | | [ 449.357 ] | 61,307 | | | 21,915 | 24,080 | | 107,303 |
| **4020.03** | **Process & Dispose Existing Fender System** | | | | **Quan: 132.00 TN** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| | | | | | | | | | | | | **Unreviewed |

Existing fender system

20 EA steel pipe @ 60'
33 EA timber @ 60'
10EA steel pipe piles @ 60'

Assume pipe piles are 16" Diameter x .375" WT = 1.878 TN/EA
30 x 1.878 TN = 56.34TN Steel

33 EA timber @ 84CF per each
Timber pile weight at 55 pounds per CF = 2.3 TN/EA

33EA x 2.3 TN/EA = 75.9 TN

Assume loadout of 1 trucks an hour at 10 TN/EA

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 4020** | Land Item SCHEDULE: 1 100 | | | | | | | | | | |
| Description = | 16" Diameter Steel Pile | | Unit = LF | Takeoff Quan: 1,080.000 | | | Engr Quan: 1,080.000 | | | | |
| Assume recycle steel pipe piles - minimal credit back | | | | | | | | | | | |
| PRCDIS | Process & Dispose | | 13.20 CH | **Prod: 10.0000 UH** | | Lab Pcs: 5.00 | | Eqp Pcs: 1.00 | | | |
| 3S4002 | Sm Tools - Dem@109.75% | 1.00 | 13.20 CH | 25.000 | | | 362 | | | | 362 |
| 4TIPTWW | TWW Tipping Fee | 1.00 | 75.90 TN | 80.000 | | | | | | 6,072 | 6,072 |
| 5HAULHR | Haul (hourly) | 1.00 | 40.00 HR | 125.000 | | | 5,000 | | | | 5,000 |
| 810_330WHAM | CAT 330 Excavator w/ H | 1.00 | 13.20 HR | 146.432 | | | | 1,449 | 673 | | 2,121 |
| LA01 | Laborer Foreman | 1.00 | 13.20 MH | 40.450 | 1,209 | | | | | | 1,209 |
| LA04 | Laborer (Gr 3) | 3.00 | 39.60 MH | 37.500 | 3,451 | | | | | | 3,451 |
| OE04 | Operator (GR 3) (Exc <3.5 | 1.00 | 13.20 MH | 61.140 | 1,674 | | | | | | 1,674 |
| $19,889.62 | 0.5000 MH/TN | | 66.0000MH | [ 23.55 ] | 6,334 | | 5,362 | 1,449 | 673 | 6,072 | 19,890 |
| **4020.04** | **Install & Connect Fender System** | | **Quan: 92.00 EA** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |
| PDFNDR | Pile Drive Crew - Fender | | 184.00 CH | **Prod: 2.0000 HU** | | Lab Pcs: 10.00 | | Eqp Pcs: 10.00 | | | |
| 3S4000 | Sm Tools - Gen@109.75% | 1.00 | 184.00 CH | 25.000 | | | 5,049 | | | | 5,049 |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 184.00 HR | 30.150 | | | | 948 | 5,141 | | 6,088 |
| 811SGS15000D | 15000w Small GenSet | 1.00 | 184.00 HR | 20.164 | | | | 1,070 | 3,002 | | 4,072 |
| 813CMLBC555 | MANITOWOC 555 150t | 1.00 | 184.00 HR | 293.633 | | | | 28,659 | 30,637 | | 59,296 |
| 814CB150 | Crane Barge - 150 Ton | 1.00 | 184.00 HR | 251.276 | | | | 34,237 | 16,506 | | 50,743 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 184.00 HR | 137.358 | | | | 5,087 | 22,651 | | 27,738 |
| 815DH01842 | DELMAG D19-42 Dsl Ham | 1.00 | 184.00 HR | 79.836 | | | | 7,637 | 8,485 | | 16,122 |
| 815SL1133363 | Swinging Lead 11x33x36 | 3.00 | 552.00 HR | 4.330 | | | | 2,623 | | | 2,623 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 184.00 HR | 12.781 | | | | 387 | 2,194 | | 2,581 |
| COE04 | Crane Operator (GR 1) (>10 | 1.00 | 184.00 MH | 65.370 | 24,517 | | | | | | 24,517 |
| COE06 | Engr. Oiler (GR 1) | 1.00 | 184.00 MH | 56.110 | 21,940 | | | | | | 21,940 |
| COE14 | Deck Engineer | 1.00 | 184.00 MH | 57.460 | 22,316 | | | | | | 22,316 |
| IB01 | Captain | 1.00 | 184.00 MH | 61.410 | 17,088 | | | | | | 17,088 |
| IB03 | Mate | 1.00 | 184.00 MH | 57.310 | 15,947 | | | | | | 15,947 |
| PD01 | Piledriver Foreman | 1.00 | 184.00 MH | 64.620 | 25,206 | | | | | | 25,206 |
| PD02 | Piledriver | 4.00 | 736.00 MH | 62.620 | 98,597 | | | | | | 98,597 |
| $399,922.38 | 20.0000 MH/EA | | 1,840.0000MH | [ 1348.072 ] | 225,610 | | 5,049 | 80,648 | 88,616 | | 399,922 |
| **=====> Item Totals:** | **4020 - 16" Diameter Steel Pile** | | | | | | | | | | |
| $1,855,336.45 | 2.2277 MH/LF | | 2,406.00MH | [ 148.919 ] | 293,252 | 1,230,734 | 107,898 | 104,012 | 113,369 | 6,072 | **1,855,336** |
| 1,717.904 | 1080 LF | | | | 271.53 | 1,139.57 | 99.91 | 96.31 | 104.97 | 5.62 | 1,717.90 |

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5010** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = Logitudinal Beams (F&P) Repair | | | | | Unit = LOC | Takeoff Quan: 60.000 | | | Engr Quan: 60.000 | | | |
| **5010.01** | **Materials (Perm)** | | **Quan: 60.00 LOC** | | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |
| Figure 60 Beams @ 1.8 CY/LOC = 108 CY Conc | | | | | | | | | | | | |
| Rebar = 356 LBS/LOC * 60 LOC = 21,360 LBS = 10.68 TNs | | | | | | | | | | | | |
| Fiberglass Forms = 456 SF/LOC * 60 = 27,360 SF | | | | | | | | | | | | |
| 2C0006 | 5000 PSI Concr@109.75% | 1.00 | 108.00 | CY | 225.000 | | 26,669 | | | | | 26,669 |
| 2C0010 | Delivery Charg@109.75% | 1.00 | 11.00 | LD | 200.000 | | 2,415 | | | | | 2,415 |
| 2C0FUEL/ENV | Concrete Fuel/@109.75% | 1.00 | 108.00 | CY | 10.000 | | 1,185 | | | | | 1,185 |
| 2CR060 | Gr 60 Rebar@109.75% | 1.00 | 10.68 | TON | 2,000.000 | | 23,443 | | | | | 23,443 |
| 2CRACC | Rebar Accessor@109.75% | 1.00 | 10.68 | TON | 100.000 | | 1,172 | | | | | 1,172 |
| 3FA100 | Formwork Acces@109.75% | 1.00 | 27,360.00 | SF | 1.000 | | | 30,028 | | | | 30,028 |
| 3FIBERFORM | Fiberglass SIP@109.75% | 1.00 | 27,360.00 | SF | 15.000 | | | 450,414 | | | | 450,414 |
| 3SAND | Sandblasting S@109.75% | 1.00 | 27,360.00 | SF | 5.000 | | | 150,138 | | | | 150,138 |
| $685,463.38 | | | | | [ ] | | 54,884 | 630,580 | | | | 685,463 |
| **5010.02** | **Sawcut** | | **Quan: 9,281.00 LF** | | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |
| 5' x 32" x 36' | | | | | | | | | | | | |
| Figure 77.34 Ft/Side * 2 Sides = 154.68 LF * 60 EA = 9,281 LF of Saw Cutting | | | | | | | | | | | | |
| Sawcut a minimum 1" deep around the perimeter of the repair area to allow for clean face of concrete. Total sawcut length for repairs is 9,281 FT. | | | | | | | | | | | | |
| Allow 2 Carpenters sawcutting with right angle grinders w/diamond wheels. Allow production at 10 lf/hr. | | | | | | | | | | | | |
| CARPB | Carpenter Barge Crew | | 928.10 | CH | **Prod: 10.0000 UH** | Lab Pcs: 10.00 | | | Eqp Pcs: 7.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 928.10 | HR | 36.929 | | | | 7,530 | 30,085 | | 37,615 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 928.10 | HR | 27.908 | | | | 4,605 | 23,822 | | 28,427 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 928.10 | HR | 114.119 | | | | 73,174 | 43,066 | | 116,240 |
| 814CD10WB | Work Barge | 1.00 | 928.10 | HR | 11.745 | | | | 7,746 | 4,217 | | 11,963 |
| 814CD10WT | Work Tugboat | 1.00 | 928.10 | HR | 190.674 | | | | 12,277 | 181,942 | | 194,219 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 928.10 | HR | 19.056 | | | | 2,163 | 17,247 | | 19,410 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 928.10 | HR | 15.000 | | | | 13,922 | | | 13,922 |
| CA01 | Carpenter Foreman | 1.00 | 928.10 | MH | 70.410 | 132,121 | | | | | | 132,121 |
| CA02 | Carpenter | 4.00 | 3,712.40 | MH | 64.010 | 492,553 | | | | | | 492,553 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 928.10 | MH | 63.550 | 121,110 | | | | | | 121,110 |
| COE09 | Engr. Oiler | 1.00 | 928.10 | MH | 55.840 | 110,289 | | | | | | 110,289 |
| COE14 | Deck Engineer | 1.00 | 928.10 | MH | 57.460 | 112,563 | | | | | | 112,563 |

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5010** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Logitudinal Beams (F&P) Repair | | | Unit = LOC | Takeoff Quan: 60.000 | | | Engr Quan: 60.000 | | | |
| IB03 | Mate | 1.00 | 928.10 MH | 57.310 | 80,436 | | | | | | 80,436 |
| IB04 | Deckhand | 1.00 | 928.10 MH | 57.480 | 80,674 | | | | | | 80,674 |
| $1,551,543.06 | 1.0000 MH/LF | | 9,281.0000MH | [ 67.99 ] | 1,129,747 | | | 121,418 | 300,378 | | 1,551,543 |
| **5010.03** | **Demo Bad Concrete to Rebar** | | **Quan: 2,916.00 CF** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | | |

Figure 1.8 CY of concrete Removal per location * 60 Locations = 108 CY = 2,916 CF

Remove concrete spall area to sound concrete.
Assume production at 3 cft/hr

| CARPB | Carpenter Barge Crew | | 972.00 CH | **Prod: 3.0000 UH** | Lab Pcs: 10.00 | Eqp Pcs: 7.00 | | |
|---|---|---|---|---|---|---|---|---|
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 972.00 HR | 36.929 | | 7,887 | 31,508 | 39,395 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 972.00 HR | 27.908 | | 4,823 | 24,949 | 29,771 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 972.00 HR | 114.119 | | 76,636 | 45,103 | 121,739 |
| 814CD10WB | Work Barge | 1.00 | 972.00 HR | 11.745 | | 8,113 | 4,416 | 12,529 |
| 814CD10WT | Work Tugboat | 1.00 | 972.00 HR | 190.674 | | 12,858 | 190,548 | 203,405 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 972.00 HR | 19.056 | | 2,266 | 18,063 | 20,328 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 972.00 HR | 15.000 | | 14,580 | | 14,580 |
| CA01 | Carpenter Foreman | 1.00 | 972.00 MH | 70.410 | 138,370 | | | 138,370 |
| CA02 | Carpenter | 4.00 | 3,888.00 MH | 64.010 | 515,851 | | | 515,851 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 972.00 MH | 63.550 | 126,839 | | | 126,839 |
| COE09 | Engr. Oiler | 1.00 | 972.00 MH | 55.840 | 115,506 | | | 115,506 |
| COE14 | Deck Engineer | 1.00 | 972.00 MH | 57.460 | 117,887 | | | 117,887 |
| IB03 | Mate | 1.00 | 972.00 MH | 57.310 | 84,240 | | | 84,240 |
| IB04 | Deckhand | 1.00 | 972.00 MH | 57.480 | 84,490 | | | 84,490 |
| $1,624,932.51 | 3.3333 MH/CF | | 9,720.0000MH | [ 226.633 ] | 1,183,185 | 127,162 | 314,586 | 1,624,933 |
| **5010.04** | **Sandblast Rebar** | | **Quan: 27,360.00 SF** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | |

This activity is to sandblast the exposed rebar to clean the scale and rust off of it. Production will be limited by moving from one location to the other. Allow for 0.5 hour at each location plus 0.5 hour for moves. 60 locations x 1 = 60 hours

| CARPB | (Mod) Carpenter Barge Crew | | 60.00 CH | **Prod: 456.0000 UH** | Lab Pcs: 10.00 | Eqp Pcs: 8.00 | | |
|---|---|---|---|---|---|---|---|---|
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 60.00 HR | 36.929 | | 487 | 1,945 | 2,432 |
| 803PSM007 | Port Sandblasting Mach | 1.00 | 60.00 HR | 3.473 | | 166 | 63 | 229 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 60.00 HR | 27.908 | | 298 | 1,540 | 1,838 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 60.00 HR | 114.119 | | 4,731 | 2,784 | 7,515 |
| 814CD10WB | Work Barge | 1.00 | 60.00 HR | 11.745 | | 501 | 273 | 773 |
| 814CD10WT | Work Tugboat | 1.00 | 60.00 HR | 190.674 | | 794 | 11,762 | 12,556 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 60.00 HR | 19.056 | | 140 | 1,115 | 1,255 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 60.00 HR | 15.000 | | 900 | | 900 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5010** | Land Item | SCHEDULE: 1 | 100 | | | | | | | | | |
| Description = | Logitudinal Beams (F&P) Repair | | | Unit = | LOC | Takeoff Quan: | 60.000 | | Engr Quan: | 60.000 | | |
| CA01 | Carpenter Foreman | 1.00 | 60.00 | MH | 70.410 | 8,541 | | | | | | 8,541 |
| CA02 | Carpenter | 4.00 | 240.00 | MH | 64.010 | 31,843 | | | | | | 31,843 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 60.00 | MH | 63.550 | 7,830 | | | | | | 7,830 |
| COE09 | Engr. Oiler | 1.00 | 60.00 | MH | 55.840 | 7,130 | | | | | | 7,130 |
| COE14 | Deck Engineer | 1.00 | 60.00 | MH | 57.460 | 7,277 | | | | | | 7,277 |
| IB03 | Mate | 1.00 | 60.00 | MH | 57.310 | 5,200 | | | | | | 5,200 |
| IB04 | Deckhand | 1.00 | 60.00 | MH | 57.480 | 5,215 | | | | | | 5,215 |
| $100,533.06 | 0.0219 MH/SF | | 600.0000 | MH | [ 1.491 ] | 73,036 | | | 8,016 | 19,481 | | 100,533 |
| **5010.05** | **Form Repair Area** | | **Quan:** | **27,360.00** | **SF** | **Hrs/Shft:** | **10.00** | **Cal:** | **50S** | **WC:** | **MARINE** | |
| Allow for installation of average approx. 456 sf of forms at 1 locations. Assume 60 minutes per location x 60 = 60 hours | | | | | | | | | | | | |
| CARPB | Carpenter Barge Crew | | 60.00 | CH | **Prod:** | **456.0000** | **UH** | Lab Pcs: | 10.00 | Eqp Pcs: | 7.00 | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 60.00 | HR | 36.929 | | | | 487 | 1,945 | | 2,432 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 60.00 | HR | 27.908 | | | | 298 | 1,540 | | 1,838 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 60.00 | HR | 114.119 | | | | 4,731 | 2,784 | | 7,515 |
| 814CD10WB | Work Barge | 1.00 | 60.00 | HR | 11.745 | | | | 501 | 273 | | 773 |
| 814CD10WT | Work Tugboat | 1.00 | 60.00 | HR | 190.674 | | | | 794 | 11,762 | | 12,556 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 60.00 | HR | 19.056 | | | | 140 | 1,115 | | 1,255 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 60.00 | HR | 15.000 | | | | 900 | | | 900 |
| CA01 | Carpenter Foreman | 1.00 | 60.00 | MH | 70.410 | 8,541 | | | | | | 8,541 |
| CA02 | Carpenter | 4.00 | 240.00 | MH | 64.010 | 31,843 | | | | | | 31,843 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 60.00 | MH | 63.550 | 7,830 | | | | | | 7,830 |
| COE09 | Engr. Oiler | 1.00 | 60.00 | MH | 55.840 | 7,130 | | | | | | 7,130 |
| COE14 | Deck Engineer | 1.00 | 60.00 | MH | 57.460 | 7,277 | | | | | | 7,277 |
| IB03 | Mate | 1.00 | 60.00 | MH | 57.310 | 5,200 | | | | | | 5,200 |
| IB04 | Deckhand | 1.00 | 60.00 | MH | 57.480 | 5,215 | | | | | | 5,215 |
| $100,304.37 | 0.0219 MH/SF | | 600.0000 | MH | [ 1.491 ] | 73,036 | | | 7,849 | 19,419 | | 100,304 |
| **5010.06** | **Install Rebar** | | **Quan:** | **21,360.00** | **LBS** | **Hrs/Shft:** | **10.00** | **Cal:** | **50S** | **WC:** | **MARINE** | |
| 4REBAR | Rebar Sub | 1.00 | 21,360.00 | LBS | 2.000 | | | | | | 42,720 | 42,720 |
| **5010.07** | **Pump Concrete** | | **Quan:** | **60.00** | **LOC** | **Hrs/Shft:** | **10.00** | **Cal:** | **50S** | **WC:** | **MARINE** | |
| 60 Locations with Average Volume of 1.8 CY/Location<br>Assume 30 minutes per location x 60 = 30 hours | | | | | | | | | | | | |
| CARPB | (Mod) Carpenter Barge Crew | | 30.00 | CH | **Prod:** | **0.0000** | | Lab Pcs: | 10.00 | Eqp Pcs: | 8.00 | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 30.00 | HR | 36.929 | | | | 243 | 972 | | 1,216 |
| 807TRMCP045 | SCHWNG BPA500 Trl Pu | 1.00 | 30.00 | HR | 55.116 | | | | 612 | 1,203 | | 1,815 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5010** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Logitudinal Beams (F&P) Repair | | | | Unit = LOC | Takeoff Quan: | 60.000 | | Engr Quan: | 60.000 | | |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 30.00 | HR | 27.908 | | | | 149 | 770 | | 919 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 30.00 | HR | 114.119 | | | | 2,365 | 1,392 | | 3,757 |
| 814CD10WB | Work Barge | 1.00 | 30.00 | HR | 11.745 | | | | 250 | 136 | | 387 |
| 814CD10WT | Work Tugboat | 1.00 | 30.00 | HR | 190.674 | | | | 397 | 5,881 | | 6,278 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 30.00 | HR | 19.056 | | | | 70 | 557 | | 627 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 30.00 | HR | 15.000 | | | | 450 | | | 450 |
| CA01 | Carpenter Foreman | 1.00 | 30.00 | MH | 70.410 | 4,271 | | | | | | 4,271 |
| CA02 | Carpenter | 4.00 | 120.00 | MH | 64.010 | 15,921 | | | | | | 15,921 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 30.00 | MH | 63.550 | 3,915 | | | | | | 3,915 |
| COE09 | Engr. Oiler | 1.00 | 30.00 | MH | 55.840 | 3,565 | | | | | | 3,565 |
| COE14 | Deck Engineer | 1.00 | 30.00 | MH | 57.460 | 3,639 | | | | | | 3,639 |
| IB03 | Mate | 1.00 | 30.00 | MH | 57.310 | 2,600 | | | | | | 2,600 |
| IB04 | Deckhand | 1.00 | 30.00 | MH | 57.480 | 2,608 | | | | | | 2,608 |
| $51,966.85 | 5.0000 MH/LOC | | 300.0000 | MH | [ 339.95 ] | 36,518 | | | 4,537 | 10,912 | | 51,967 |
| **=====> Item Totals:** | **5010 - Logitudinal Beams (F&P) Repair** | | | | | | | | | | | |
| $4,157,463.23 | 341.6833 MH/LOC | | 20,501.00 | MH | [ 23231.016 ] | 2,495,522 | 54,884 | 630,580 | 268,982 | 664,777 | 42,720 | **4,157,463** |
| 69,291.054 | 60 LOC | | | | | 41,592.03 | 914.73 | 10,509.66 | 4,483.03 | 11,079.61 | 712.00 | 69,291.05 |

**BID ITEM = 5020** Land Item SCHEDULE: 1 100
Description = Transverse Beams (F&P) Repair Unit = LOC Takeoff Quan: 10.000 Engr Quan: 10.000

**5020.01 Materials (Perm) Quan: 10.00 LOC Hrs/Shft: 10.00 Cal: 50S WC: MARINE**

```
Figure 10 Beams @ 1.5 CY/LOC = 15 CY Conc

Rebar = 293 LBS/LOC * 10 LOC = 2,930 LBS = 1.47 TNs

Fiberglass Forms = 580 SF/LOC * 10 = 5,800 SF
```

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2C0006 | 5000 PSI Concr@109.75% | 1.00 | 15.00 | CY | 225.000 | | 3,704 | | | | | 3,704 |
| 2C0010 | Delivery Charg@109.75% | 1.00 | 2.00 | LD | 200.000 | | 439 | | | | | 439 |
| 2C0FUEL/ENV | Concrete Fuel/@109.75% | 1.00 | 15.00 | CY | 10.000 | | 165 | | | | | 165 |
| 2CR060 | Gr 60 Rebar@109.75% | 1.00 | 1.47 | TON | 2,000.000 | | 3,227 | | | | | 3,227 |
| 2CRACC | Rebar Accessor@109.75% | 1.00 | 1.47 | TON | 100.000 | | 161 | | | | | 161 |
| 3FA100 | Formwork Acces@109.75% | 1.00 | 5,800.00 | SF | 1.000 | | | 6,366 | | | | 6,366 |
| 3FIBERFORM | Fiberglass SIP@109.75% | 1.00 | 5,800.00 | SF | 15.000 | | | 95,483 | | | | 95,483 |
| 3SAND | Sandblasting S@109.75% | 1.00 | 5,800.00 | SF | 5.000 | | | 31,828 | | | | 31,828 |

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5020** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Transverse Beams (F&P) Repair | | | Unit = | LOC | Takeoff Quan: | 10.000 | | Engr Quan: | 10.000 | | |
| $141,371.17 | | | | | [ ] | | 7,696 | 133,676 | | | | 141,371 |

**5020.02 Sawcut** — **Quan: 2,463.00 LF** — **Hrs/Shft: 10.00** — **Cal: 50S** — **WC: MARINE**

5' x 19" x 50'

Figure 123.16 Ft/Side * 2 Sides = 246.32 LF * 10 EA = 2,463 LF of Saw Cutting

Sawcut a minimum 1" deep around the perimeter of the repair area to allow for clean face of concrete. Total sawcut length for repairs is 2,463 FT.
Allow 2 Carpenters sawcutting with right angle grinders w/diamond wheels. Allow production at 10 lf/hr.

| CARPB | Carpenter Barge Crew | | 246.30 CH | **Prod:** | **10.0000 UH** | Lab Pcs: | 10.00 | Eqp Pcs: | 7.00 | |
|---|---|---|---|---|---|---|---|---|---|---|
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 246.30 HR | 36.929 | | | | 1,998 | 7,984 | 9,982 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 246.30 HR | 27.908 | | | | 1,222 | 6,322 | 7,544 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 246.30 HR | 114.119 | | | | 19,419 | 11,429 | 30,848 |
| 814CD10WB | Work Barge | 1.00 | 246.30 HR | 11.745 | | | | 2,056 | 1,119 | 3,175 |
| 814CD10WT | Work Tugboat | 1.00 | 246.30 HR | 190.674 | | | | 3,258 | 48,284 | 51,542 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 246.30 HR | 19.056 | | | | 574 | 4,577 | 5,151 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 246.30 HR | 15.000 | | | | 3,695 | | 3,695 |
| CA01 | Carpenter Foreman | 1.00 | 246.30 MH | 70.410 | | 35,062 | | | | 35,062 |
| CA02 | Carpenter | 4.00 | 985.20 MH | 64.010 | | 130,714 | | | | 130,714 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 246.30 MH | 63.550 | | 32,140 | | | | 32,140 |
| COE09 | Engr. Oiler | 1.00 | 246.30 MH | 55.840 | | 29,269 | | | | 29,269 |
| COE14 | Deck Engineer | 1.00 | 246.30 MH | 57.460 | | 29,872 | | | | 29,872 |
| IB03 | Mate | 1.00 | 246.30 MH | 57.310 | | 21,346 | | | | 21,346 |
| IB04 | Deckhand | 1.00 | 246.30 MH | 57.480 | | 21,409 | | | | 21,409 |
| $411,749.84 | 1.0000 MH/LF | | 2,463.0000MH | [ 67.99 ] | | 299,813 | | 32,222 | 79,715 | 411,750 |

**5020.03 Demo Bad Concrete to Rebar** — **Quan: 405.00 CF** — **Hrs/Shft: 10.00** — **Cal: 50S** — **WC: MARINE**

Figure 1.5 CY of concrete Removal per location * 10 Locations = 15 CY = 405 CF

Remove concrete spall area to sound concrete.
Assume production at 3 cft/hr

| CARPB | Carpenter Barge Crew | | 135.00 CH | **Prod:** | **3.0000 UH** | Lab Pcs: | 10.00 | Eqp Pcs: | 7.00 | |
|---|---|---|---|---|---|---|---|---|---|---|
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 135.00 HR | 36.929 | | | | 1,095 | 4,376 | 5,471 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 135.00 HR | 27.908 | | | | 670 | 3,465 | 4,135 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 135.00 HR | 114.119 | | | | 10,644 | 6,264 | 16,908 |
| 814CD10WB | Work Barge | 1.00 | 135.00 HR | 11.745 | | | | 1,127 | 613 | 1,740 |
| 814CD10WT | Work Tugboat | 1.00 | 135.00 HR | 190.674 | | | | 1,786 | 26,465 | 28,251 |

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5020** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Transverse Beams (F&P) Repair | | | | Unit = LOC | Takeoff Quan: 10.000 | | | Engr Quan: 10.000 | | | |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 135.00 | HR | 19.056 | | | | 315 | 2,509 | | 2,823 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 135.00 | HR | 15.000 | | | | 2,025 | | | 2,025 |
| CA01 | Carpenter Foreman | 1.00 | 135.00 | MH | 70.410 | 19,218 | | | | | | 19,218 |
| CA02 | Carpenter | 4.00 | 540.00 | MH | 64.010 | 71,646 | | | | | | 71,646 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 135.00 | MH | 63.550 | 17,617 | | | | | | 17,617 |
| COE09 | Engr. Oiler | 1.00 | 135.00 | MH | 55.840 | 16,043 | | | | | | 16,043 |
| COE14 | Deck Engineer | 1.00 | 135.00 | MH | 57.460 | 16,373 | | | | | | 16,373 |
| IB03 | Mate | 1.00 | 135.00 | MH | 57.310 | 11,700 | | | | | | 11,700 |
| IB04 | Deckhand | 1.00 | 135.00 | MH | 57.480 | 11,735 | | | | | | 11,735 |
| $225,685.00 | 3.3333 MH/CF | | 1,350.0000 | MH | [ 226.633 ] | 164,331 | | | 17,661 | 43,692 | | 225,685 |
| **5020.04** | **Sandblast Rebar** | | | | **Quan: 5,800.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| This activity is to sandblast the exposed rebar to clean the scale and rust off of it. Production will be limited by moving from one location to the other. Allow for 0.5 hour at each location plus 0.5 hour for moves. 60 locations x 1 = 60 hours | | | | | | | | | | | | |
| CARPB | (Mod) Carpenter Barge Crew | | | | 12.71 CH | **Prod: 455.9999 UH** | | | Lab Pcs: 10.00 | Eqp Pcs: 8.00 | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 12.72 | HR | 36.929 | | | | 103 | 412 | | 516 |
| 803PSM007 | Port Sandblasting Mach | 1.00 | 12.72 | HR | 3.473 | | | | 35 | 13 | | 48 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 12.72 | HR | 27.908 | | | | 63 | 326 | | 390 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 12.72 | HR | 114.119 | | | | 1,003 | 590 | | 1,593 |
| 814CD10WB | Work Barge | 1.00 | 12.72 | HR | 11.745 | | | | 106 | 58 | | 164 |
| 814CD10WT | Work Tugboat | 1.00 | 12.72 | HR | 190.674 | | | | 168 | 2,494 | | 2,662 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 12.72 | HR | 19.056 | | | | 30 | 236 | | 266 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 12.72 | HR | 15.000 | | | | 191 | | | 191 |
| CA01 | Carpenter Foreman | 1.00 | 12.72 | MH | 70.410 | 1,811 | | | | | | 1,811 |
| CA02 | Carpenter | 4.00 | 50.88 | MH | 64.010 | 6,751 | | | | | | 6,751 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 12.72 | MH | 63.550 | 1,660 | | | | | | 1,660 |
| COE09 | Engr. Oiler | 1.00 | 12.72 | MH | 55.840 | 1,512 | | | | | | 1,512 |
| COE14 | Deck Engineer | 1.00 | 12.72 | MH | 57.460 | 1,543 | | | | | | 1,543 |
| IB03 | Mate | 1.00 | 12.72 | MH | 57.310 | 1,102 | | | | | | 1,102 |
| IB04 | Deckhand | 1.00 | 12.72 | MH | 57.480 | 1,106 | | | | | | 1,106 |
| $21,312.96 | 0.0219 MH/SF | | 127.2000 | MH | [ 1.491 ] | 15,484 | | | 1,699 | 4,130 | | 21,313 |
| **5020.05** | **Form Repair Area** | | | | **Quan: 5,800.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Allow for installation of average approx. 580 sf of forms at 1 locations. Assume 60 minutes per location x 10 = 10 hours | | | | | | | | | | | | |
| CARPB | Carpenter Barge Crew | | | | 10.00 CH | **Prod: 580.0000 UH** | | | Lab Pcs: 10.00 | Eqp Pcs: 7.00 | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 10.00 | HR | 36.929 | | | | 81 | 324 | | 405 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 10.00 | HR | 27.908 | | | | 50 | 257 | | 306 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 10.00 | HR | 114.119 | | | | 788 | 464 | | 1,252 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5020** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Transverse Beams (F&P) Repair | | | | Unit = LOC | Takeoff Quan: 10.000 | | | Engr Quan: 10.000 | | | |
| 814CD10WB | Work Barge | 1.00 | 10.00 | HR | 11.745 | | | | 83 | 45 | | 129 |
| 814CD10WT | Work Tugboat | 1.00 | 10.00 | HR | 190.674 | | | | 132 | 1,960 | | 2,093 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 10.00 | HR | 19.056 | | | | 23 | 186 | | 209 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 10.00 | HR | 15.000 | | | | 150 | | | 150 |
| CA01 | Carpenter Foreman | 1.00 | 10.00 | MH | 70.410 | 1,424 | | | | | | 1,424 |
| CA02 | Carpenter | 4.00 | 40.00 | MH | 64.010 | 5,307 | | | | | | 5,307 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 10.00 | MH | 63.550 | 1,305 | | | | | | 1,305 |
| COE09 | Engr. Oiler | 1.00 | 10.00 | MH | 55.840 | 1,188 | | | | | | 1,188 |
| COE14 | Deck Engineer | 1.00 | 10.00 | MH | 57.460 | 1,213 | | | | | | 1,213 |
| IB03 | Mate | 1.00 | 10.00 | MH | 57.310 | 867 | | | | | | 867 |
| IB04 | Deckhand | 1.00 | 10.00 | MH | 57.480 | 869 | | | | | | 869 |
| $16,717.35 | 0.0172 MH/SF | | 100.0000 | MH | [ 1.172 ] | 12,173 | | | 1,308 | 3,236 | | 16,717 |
| **5020.06** | **Install Rebar** | | | | **Quan: 2,930.00 LBS** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 4REBAR | Rebar Sub | 1.00 | 2,930.00 | LBS | 2.000 | | | | | | 5,860 | 5,860 |
| **5020.07** | **Pump Concrete** | | | | **Quan: 10.00 LOC** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 60 Locations with Average Volume of 1.8 CY/Location<br>Assume 30 minutes per location x 60 = 30 hours | | | | | | | | | | | | |
| CARPB | (Mod) Carpenter Barge Crew | | | 5.00 CH | **Prod: 0.0000** | | Lab Pcs: 10.00 | | Eqp Pcs: 8.00 | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 5.00 | HR | 36.929 | | | | 41 | 162 | | 203 |
| 807TRMCP045 | SCHWNG BPA500 Trl Pu | 1.00 | 5.00 | HR | 55.116 | | | | 102 | 200 | | 302 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 5.00 | HR | 27.908 | | | | 25 | 128 | | 153 |
| 814CB050 | Crane Barge - 50 Ton | 1.00 | 5.00 | HR | 114.119 | | | | 394 | 232 | | 626 |
| 814CD10WB | Work Barge | 1.00 | 5.00 | HR | 11.745 | | | | 42 | 23 | | 64 |
| 814CD10WT | Work Tugboat | 1.00 | 5.00 | HR | 190.674 | | | | 66 | 980 | | 1,046 |
| 818PW500S | Portable Welder Skid 5 | 1.00 | 5.00 | HR | 19.056 | | | | 12 | 93 | | 105 |
| 822_SMTOOLP | Pile Small Tools | 1.00 | 5.00 | HR | 15.000 | | | | 75 | | | 75 |
| CA01 | Carpenter Foreman | 1.00 | 5.00 | MH | 70.410 | 712 | | | | | | 712 |
| CA02 | Carpenter | 4.00 | 20.00 | MH | 64.010 | 2,654 | | | | | | 2,654 |
| COE07 | Crane Operator (GR 2) (45- | 1.00 | 5.00 | MH | 63.550 | 652 | | | | | | 652 |
| COE09 | Engr. Oiler | 1.00 | 5.00 | MH | 55.840 | 594 | | | | | | 594 |
| COE14 | Deck Engineer | 1.00 | 5.00 | MH | 57.460 | 606 | | | | | | 606 |
| IB03 | Mate | 1.00 | 5.00 | MH | 57.310 | 433 | | | | | | 433 |
| IB04 | Deckhand | 1.00 | 5.00 | MH | 57.480 | 435 | | | | | | 435 |
| $8,661.07 | 5.0000 MH/LOC | | 50.0000 | MH | [ 339.951 ] | 6,086 | | | 756 | 1,819 | | 8,661 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5020** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Transverse Beams (F&P) Repair | | | Unit = LOC | Takeoff Quan: 10.000 | | Engr Quan: 10.000 | | | | |
| **=====> Item Totals: 5020 - Transverse Beams (F&P) Repair** | | | | | | | | | | | |
| $831,357.39 | 409.0200 MH/LOC | | 4,090.20MH | [ 27809.232 ] | 497,887 | 7,696 | 133,676 | 53,647 | 132,592 | 5,860 | **831,357** |
| 83,135.739 | 10 LOC | | | | 49,788.71 | 769.57 | 13,367.55 | 5,364.70 | 13,259.21 | 586.00 | 83,135.74 |
| **BID ITEM = 5030** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | Unit = LOC | Takeoff Quan: 1.000 | | Engr Quan: 1.000 | | | | |
| **5030.01** | **Pile Materials** | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| 2PCPILE18SQ | PC/PS Concrete@109.75% | 1.00 | 70.00 LF | 125.000 | | 9,603 | | | | | 9,603 |
| 3BUBBLEC | Bubble Curtain@109.75% | 1.00 | 1.00 LS | 25,000.000 | | | 27,438 | | | | 27,438 |
| 3L3100 | Cushion blk - @109.75% | 1.00 | 1.00 EA | 50.000 | | | 55 | | | | 55 |
| 3PILETEMP | Pile Template@109.75% | 1.00 | 1.00 LS | 5,000.000 | | | 5,488 | | | | 5,488 |
| 5PILEFRT | Pile Freight | 1.00 | 1.00 EA | 2,500.000 | | | 2,500 | | | | 2,500 |
| $45,083.01 | | | | [ ] | | 9,603 | 35,480 | | | | 45,083 |
| **5030.02** | **Core Drill Though Existing What Deck and** | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Figure Concrete Coring Sub to come in and Drill 1 EA - 36" Holes into deck & Beam for access to install Pile | | | | | | | | | | | |
| 4-36"CD | 36" Diameter Core Drill (S | 1.00 | 1.00 EA | 7,500.000 | | | | | | 7,500 | 7,500 |
| 819WT09000 | ==> Water Trailer 9K gal | 1.00 | 1.00 HR | 21.728 | | | | 14 | 10 | | 24 |
| LA02 | ==> Laborer (CS) | 2.00 | 2.00 MH | 38.450 | 177 | | | | | | 177 |
| $7,701.00 | 2.0000 MH/EA | | 2.0000MH | [ 84.59 ] | 177 | | | 14 | 10 | 7,500 | 7,701 |
| **5030.03** | **Drill Dowel Holes Into Pile Cap for Cap** | | | **Quan: 28.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Figure Existing Cap Dimension is 2' x 1' | | | | | | | | | | | |
| Spacing There will be 11 Dowel Holes Per Cap End 11 Holes * 2 Ends = 22 Holes | | | | | | | | | | | |
| Figure Drill dowel Holes 6" Deep. Figure due to age of concrete Figure 15 Mins/Holes =22 Holes @ 0.25 HRS/Hole = 5.5 HRs/2 Drillers = 2.75 HRS | | | | | | | | | | | |
| PDEMO1 | Pile Demo Crew 1 | | 3.50 CH | **Prod: 8.0000 UH** | Lab Pcs: 6.00 | | Eqp Pcs: 9.00 | | | | |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 3.50 HR | 36.929 | | | | 28 | 113 | | 142 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 3.50 HR | 3.830 | | | | 3 | 11 | | 15 |
| 814CD10WB | Work Barge | 1.00 | 3.50 HR | 11.745 | | | | 29 | 16 | | 45 |
| 814CD10WT | Work Tugboat | 1.00 | 3.50 HR | 190.674 | | | | 46 | 686 | | 732 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 3.50 HR | 34.824 | | | | 17 | 117 | | 134 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 3.50 HR | 26.000 | | | | 91 | | | 91 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | | Unit = LOC | Takeoff Quan: 1.000 | | | Engr Quan: 1.000 | | | |
| 822_DEMO | Demo Small Tools | 1.00 | 3.50 | HR | 14.000 | | | | 49 | | | 49 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 7.00 | HR | 12.000 | | | | 84 | | | 84 |
| CA01 | Carpenter Foreman | 1.00 | 3.50 | MH | 70.410 | 498 | | | | | | 498 |
| CA02 | Carpenter | 4.00 | 14.00 | MH | 64.010 | 1,857 | | | | | | 1,857 |
| IB04 | Deckhand | 1.00 | 3.50 | MH | 57.480 | 304 | | | | | | 304 |
| $3,951.79 | 0.7500 MH/EA | | 21.0000 | MH | [ 52.79 ] | 2,660 | | | 348 | 944 | | 3,952 |
| **5030.04** | **MOB Crane Barge to Site for Pile Install** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | |
| Figure Contractor will Mob a Crane Barge & Equipment into Project for Installation of Piles and Concrete Repairs. | | | | | | | | | | | | |
| Figure 1 Day for Barge Setup and 1 Day Mobilization to project this can occur prior to start of work | | | | | | | | | | | | |
| PILEC | Pile Crew | | | | 20.00 CH **Prod: 2.0000 S** | | Lab Pcs: 9.00 | | Eqp Pcs: 11.00 | | | |
| 3RIGGING | Rigging@109.75% | 1.00 | 0.50 | LS | 20,000.000 | | 10,975 | | | | | 10,975 |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 20.00 | HR | 30.150 | | | | 103 | 559 | | 662 |
| 803AC1200 | Portable Air Comp - 13 | 2.00 | 40.00 | HR | 170.886 | | | | 1,238 | 6,264 | | 7,502 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 20.00 | HR | 27.908 | | | | 99 | 513 | | 613 |
| 813CMLBC777 | MANITOWOC 777 S2 200 | 1.00 | 20.00 | HR | 392.769 | | | | 4,397 | 4,224 | | 8,621 |
| 814CB200 | Crane Barge - 200 Ton | 1.00 | 20.00 | HR | 300.939 | | | | 4,478 | 2,127 | | 6,606 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 20.00 | HR | 137.358 | | | | 553 | 2,462 | | 3,015 |
| 815DH03032 | DELMAG D30-32 Dsl Ham | 1.00 | 20.00 | HR | 98.333 | | | | 1,129 | 1,029 | | 2,158 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 20.00 | HR | 12.781 | | | | 42 | 239 | | 281 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 20.00 | HR | 46.798 | | | | 138 | 889 | | 1,027 |
| 822_DEMO | Demo Small Tools | 1.00 | 20.00 | HR | 14.000 | | | | 280 | | | 280 |
| COE01 | Crane Operator (GR A-1) ( | 1.00 | 20.00 | MH | 66.120 | 2,688 | | | | | | 2,688 |
| COE11 | Truck Crane Oiler (GR 3) | 1.00 | 20.00 | MH | 57.850 | 2,437 | | | | | | 2,437 |
| IB01 | Captain | 1.00 | 20.00 | MH | 61.410 | 1,857 | | | | | | 1,857 |
| IB04 | Deckhand | 1.00 | 20.00 | MH | 57.480 | 1,738 | | | | | | 1,738 |
| PD01 | Piledriver Foreman | 1.00 | 20.00 | MH | 64.620 | 2,740 | | | | | | 2,740 |
| PD02 | Piledriver | 4.00 | 80.00 | MH | 62.620 | 10,717 | | | | | | 10,717 |
| $63,916.88 | 180.0000 MH/EA | | 180.0000 | MH | [ 12275.12 ] | 22,178 | | 10,975 | 12,458 | 18,306 | | 63,917 |
| **5030.05** | **Unload Pile from Truck** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | **Cal: 50S** | **WC: MARINE** | | | | |
| PILEC | Pile Crew | | | | 0.50 CH **Prod: 0.5000 HU** | | Lab Pcs: 9.00 | | Eqp Pcs: 11.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 0.50 | HR | 30.150 | | | | 3 | 14 | | 17 |
| 803AC1200 | Portable Air Comp - 13 | 2.00 | 1.00 | HR | 170.886 | | | | 31 | 157 | | 188 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 0.50 | HR | 27.908 | | | | 2 | 13 | | 15 |
| 813CMLBC777 | MANITOWOC 777 S2 200 | 1.00 | 0.50 | HR | 392.769 | | | | 110 | 106 | | 216 |
| 814CB200 | Crane Barge - 200 Ton | 1.00 | 0.50 | HR | 300.939 | | | | 112 | 53 | | 165 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | | Unit = LOC | Takeoff Quan: | 1.000 | | Engr Quan: | 1.000 | | |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 0.50 | HR | 137.358 | | | | 14 | 62 | | 75 |
| 815DH03032 | DELMAG D30-32 Dsl Ham | 1.00 | 0.50 | HR | 98.333 | | | | 28 | 26 | | 54 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 0.50 | HR | 12.781 | | | | 1 | 6 | | 7 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 0.50 | HR | 46.798 | | | | 3 | 22 | | 26 |
| 822_DEMO | Demo Small Tools | 1.00 | 0.50 | HR | 14.000 | | | | 7 | | | 7 |
| COE01 | Crane Operator (GR A-1) ( | 1.00 | 0.50 | MH | 66.120 | 67 | | | | | | 67 |
| COE11 | Truck Crane Oiler (GR 3) | 1.00 | 0.50 | MH | 57.850 | 61 | | | | | | 61 |
| IB01 | Captain | 1.00 | 0.50 | MH | 61.410 | 46 | | | | | | 46 |
| IB04 | Deckhand | 1.00 | 0.50 | MH | 57.480 | 43 | | | | | | 43 |
| PD01 | Piledriver Foreman | 1.00 | 0.50 | MH | 64.620 | 68 | | | | | | 68 |
| PD02 | Piledriver | 4.00 | 2.00 | MH | 62.620 | 268 | | | | | | 268 |
| $1,323.41 | 4.5000 MH/EA | | 4.5000 | MH | [ 306.88 ] | 554 | | | 311 | 458 | | 1,323 |
| **5030.06** | **Remove Existing Pile** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILEC | Pile Crew | | | 2.00 CH | **Prod: 2.0000 HU** | Lab Pcs: 9.00 | | Eqp Pcs: 11.00 | | | | |
| 3511 | Disposal Fee-2@109.75% | 1.00 | 1.00 | LD | 2,700.000 | | | 2,963 | | | | 2,963 |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 2.00 | HR | 30.150 | | | | 10 | 56 | | 66 |
| 803AC1200 | Portable Air Comp - 13 | 2.00 | 4.00 | HR | 170.886 | | | | 124 | 626 | | 750 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 2.00 | HR | 27.908 | | | | 10 | 51 | | 61 |
| 813CMLBC777 | MANITOWOC 777 S2 200 | 1.00 | 2.00 | HR | 392.769 | | | | 440 | 422 | | 862 |
| 814CB200 | Crane Barge - 200 Ton | 1.00 | 2.00 | HR | 300.939 | | | | 448 | 213 | | 661 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 2.00 | HR | 137.358 | | | | 55 | 246 | | 301 |
| 815DH03032 | DELMAG D30-32 Dsl Ham | 1.00 | 2.00 | HR | 98.333 | | | | 113 | 103 | | 216 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 2.00 | HR | 12.781 | | | | 4 | 24 | | 28 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 2.00 | HR | 46.798 | | | | 14 | 89 | | 103 |
| 822_DEMO | Demo Small Tools | 1.00 | 2.00 | HR | 14.000 | | | | 28 | | | 28 |
| COE01 | Crane Operator (GR A-1) ( | 1.00 | 2.00 | MH | 66.120 | 269 | | | | | | 269 |
| COE11 | Truck Crane Oiler (GR 3) | 1.00 | 2.00 | MH | 57.850 | 244 | | | | | | 244 |
| IB01 | Captain | 1.00 | 2.00 | MH | 61.410 | 186 | | | | | | 186 |
| IB04 | Deckhand | 1.00 | 2.00 | MH | 57.480 | 174 | | | | | | 174 |
| PD01 | Piledriver Foreman | 1.00 | 2.00 | MH | 64.620 | 274 | | | | | | 274 |
| PD02 | Piledriver | 4.00 | 8.00 | MH | 62.620 | 1,072 | | | | | | 1,072 |
| $8,257.36 | 18.0000 MH/EA | | 18.0000 | MH | [ 1227.51 ] | 2,218 | | 2,963 | 1,246 | 1,831 | | 8,257 |
| **5030.07** | **Install New Piles** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILEC | Pile Crew | | | 2.50 CH | **Prod: 2.5000 HU** | Lab Pcs: 9.00 | | Eqp Pcs: 11.00 | | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 2.50 | HR | 30.150 | | | | 13 | 70 | | 83 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | | Unit = LOC | Takeoff Quan: | 1.000 | | Engr Quan: | 1.000 | | |
| 803AC1200 | Portable Air Comp - 13 | 2.00 | 5.00 | HR | 170.886 | | | | 155 | 783 | | 938 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 2.50 | HR | 27.908 | | | | 12 | 64 | | 77 |
| 813CMLBC777 | MANITOWOC 777 S2 200 | 1.00 | 2.50 | HR | 392.769 | | | | 550 | 528 | | 1,078 |
| 814CB200 | Crane Barge - 200 Ton | 1.00 | 2.50 | HR | 300.939 | | | | 560 | 266 | | 826 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 2.50 | HR | 137.358 | | | | 69 | 308 | | 377 |
| 815DH03032 | DELMAG D30-32 Dsl Ham | 1.00 | 2.50 | HR | 98.333 | | | | 141 | 129 | | 270 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 2.50 | HR | 12.781 | | | | 5 | 30 | | 35 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 2.50 | HR | 46.798 | | | | 17 | 111 | | 128 |
| 822_DEMO | Demo Small Tools | 1.00 | 2.50 | HR | 14.000 | | | | 35 | | | 35 |
| COE01 | Crane Operator (GR A-1) ( | 1.00 | 2.50 | MH | 66.120 | 336 | | | | | | 336 |
| COE11 | Truck Crane Oiler (GR 3) | 1.00 | 2.50 | MH | 57.850 | 305 | | | | | | 305 |
| IB01 | Captain | 1.00 | 2.50 | MH | 61.410 | 232 | | | | | | 232 |
| IB04 | Deckhand | 1.00 | 2.50 | MH | 57.480 | 217 | | | | | | 217 |
| PD01 | Piledriver Foreman | 1.00 | 2.50 | MH | 64.620 | 342 | | | | | | 342 |
| PD02 | Piledriver | 4.00 | 10.00 | MH | 62.620 | 1,340 | | | | | | 1,340 |
| $6,617.66 | 22.5000 MH/EA | | 22.5000 | MH | [ 1534.4 ] | 2,772 | | | 1,557 | 2,288 | | 6,618 |
| **5030.08** | **Cut Off Pile** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILEC | Pile Crew | | | 1.00 CH | **Prod: 1.0000 HU** | | Lab Pcs: 9.00 | | Eqp Pcs: 11.00 | | | |
| 3511 | Disposal Fee-2@109.75% | 1.00 | 0.50 | LD | 2,700.000 | | | 1,482 | | | | 1,482 |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 1.00 | HR | 30.150 | | | | 5 | 28 | | 33 |
| 803AC1200 | Portable Air Comp - 13 | 2.00 | 2.00 | HR | 170.886 | | | | 62 | 313 | | 375 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 1.00 | HR | 27.908 | | | | 5 | 26 | | 31 |
| 813CMLBC777 | MANITOWOC 777 S2 200 | 1.00 | 1.00 | HR | 392.769 | | | | 220 | 211 | | 431 |
| 814CB200 | Crane Barge - 200 Ton | 1.00 | 1.00 | HR | 300.939 | | | | 224 | 106 | | 330 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 1.00 | HR | 137.358 | | | | 28 | 123 | | 151 |
| 815DH03032 | DELMAG D30-32 Dsl Ham | 1.00 | 1.00 | HR | 98.333 | | | | 56 | 51 | | 108 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 1.00 | HR | 12.781 | | | | 2 | 12 | | 14 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 1.00 | HR | 46.798 | | | | 7 | 44 | | 51 |
| 822_DEMO | Demo Small Tools | 1.00 | 1.00 | HR | 14.000 | | | | 14 | | | 14 |
| COE01 | Crane Operator (GR A-1) ( | 1.00 | 1.00 | MH | 66.120 | 134 | | | | | | 134 |
| COE11 | Truck Crane Oiler (GR 3) | 1.00 | 1.00 | MH | 57.850 | 122 | | | | | | 122 |
| IB01 | Captain | 1.00 | 1.00 | MH | 61.410 | 93 | | | | | | 93 |
| IB04 | Deckhand | 1.00 | 1.00 | MH | 57.480 | 87 | | | | | | 87 |
| PD01 | Piledriver Foreman | 1.00 | 1.00 | MH | 64.620 | 137 | | | | | | 137 |
| PD02 | Piledriver | 4.00 | 4.00 | MH | 62.620 | 536 | | | | | | 536 |
| $4,128.61 | 9.0000 MH/EA | | 9.0000 | MH | [ 613.76 ] | 1,109 | | 1,482 | 623 | 915 | | 4,129 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = 18" Pile Replacement | | | | | Unit = LOC | Takeoff Quan: 1.000 | | | Engr Quan: 1.000 | | | |
| **5030.09** | **DeMOB Crane Barge Back to Yard** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Figure 1 Day for Barge Loading & Unloading and 1 Day Mobilization back to yard. | | | | | | | | | | | | |
| PILEC | Pile Crew | | 20.00 | CH | **Prod: 2.0000 S** | Lab Pcs: 9.00 | | | Eqp Pcs: 11.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 20.00 | HR | 30.150 | | | | 103 | 559 | | 662 |
| 803AC1200 | Portable Air Comp - 13 | 2.00 | 40.00 | HR | 170.886 | | | | 1,238 | 6,264 | | 7,502 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 20.00 | HR | 27.908 | | | | 99 | 513 | | 613 |
| 813CMLBC777 | MANITOWOC 777 S2 200 | 1.00 | 20.00 | HR | 392.769 | | | | 4,397 | 4,224 | | 8,621 |
| 814CB200 | Crane Barge - 200 Ton | 1.00 | 20.00 | HR | 300.939 | | | | 4,478 | 2,127 | | 6,606 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 20.00 | HR | 137.358 | | | | 553 | 2,462 | | 3,015 |
| 815DH03032 | DELMAG D30-32 Dsl Ham | 1.00 | 20.00 | HR | 98.333 | | | | 1,129 | 1,029 | | 2,158 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 20.00 | HR | 12.781 | | | | 42 | 239 | | 281 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 20.00 | HR | 46.798 | | | | 138 | 889 | | 1,027 |
| 822_DEMO | Demo Small Tools | 1.00 | 20.00 | HR | 14.000 | | | | 280 | | | 280 |
| COE01 | Crane Operator (GR A-1) ( | 1.00 | 20.00 | MH | 66.120 | 2,688 | | | | | | 2,688 |
| COE11 | Truck Crane Oiler (GR 3) | 1.00 | 20.00 | MH | 57.850 | 2,437 | | | | | | 2,437 |
| IB01 | Captain | 1.00 | 20.00 | MH | 61.410 | 1,857 | | | | | | 1,857 |
| IB04 | Deckhand | 1.00 | 20.00 | MH | 57.480 | 1,738 | | | | | | 1,738 |
| PD01 | Piledriver Foreman | 1.00 | 20.00 | MH | 64.620 | 2,740 | | | | | | 2,740 |
| PD02 | Piledriver | 4.00 | 80.00 | MH | 62.620 | 10,717 | | | | | | 10,717 |
| $52,941.88 | 180.0000 MH/EA | | 180.0000MH | | [ 12275.12 ] | 22,178 | | | 12,458 | 18,306 | | 52,942 |
| **5030.10** | **Install Pile Dowels for Cap Tie-In** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Figure sleeves are cast into pile Installing 8 Dowel Bars / Pile * 1 Piles = 8 Holes | | | | | | | | | | | | |
| Figure Dowels are #5 Bars with 3' Embedment into Pile & 4' Exposed = 7LF Total | | | | | | | | | | | | |
| 8 EA * 7 LF = 56 LF @ 1.043 #/LF = 58.408 LBS | | | | | | | | | | | | |
| Figure Procuess: | | | | | | | | | | | | |
| 1) Blow Out Holes | | | | | | | | | | | | |
| 2) Install Epoxy | | | | | | | | | | | | |
| 3) Install Dowel | | | | | | | | | | | | |
| Figure 1 HR/Pile | | | | | | | | | | | | |
| PILECO | Pile Concrete Crew | | 1.00 | CH | **Prod: 1.0000 HU** | Lab Pcs: 6.00 | | | Eqp Pcs: 9.00 | | | |
| 2-ULTRABOND1 | Ultrabond 1@109.75% | 1.00 | 8.00 | EA | 40.000 | 351 | | | | | | 351 |

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | Unit = LOC | Takeoff Quan: | 1.000 | | Engr Quan: | 1.000 | | |
| 2CR060 | Gr 60 Rebar@109.75% | 1.00 | 58.41 LBS | 2.000 | | 128 | | | | | 128 |
| 2CRACC | Rebar Accessor@109.75% | 1.00 | 58.41 LBS | 0.500 | | 32 | | | | | 32 |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 1.00 HR | 30.150 | | | | 5 | 28 | | 33 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 1.00 HR | 84.726 | | | | 31 | 62 | | 93 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 1.00 HR | 27.908 | | | | 5 | 26 | | 31 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 1.00 HR | 12.781 | | | | 2 | 12 | | 14 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 1.00 HR | 46.798 | | | | 7 | 44 | | 51 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 1.00 HR | 26.000 | | | | 26 | | | 26 |
| 822_DEMO | Demo Small Tools | 1.00 | 1.00 HR | 14.000 | | | | 14 | | | 14 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 2.00 HR | 12.000 | | | | 24 | | | 24 |
| CA01 | Carpenter Foreman | 1.00 | 1.00 MH | 70.410 | 142 | | | | | | 142 |
| CA02 | Carpenter | 4.00 | 4.00 MH | 64.010 | 531 | | | | | | 531 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 1.00 MH | 56.030 | 119 | | | | | | 119 |
| $1,589.66 | 6.0000 MH/EA | | 6.0000MH | [ 420.72 ] | 792 | 511 | | 114 | 172 | | 1,590 |
| **5030.11** | **Chip out Existing Concrete** | | | **Quan:** | **1.00 EA** | **Hrs/Shft:** | **10.00** | **Cal: 50S** | **WC: MARINE** | | |
| Figure Chipping out Existing Beams & Dispose | | | | | | | | | | | |
| Figure 1 Shift per Location | | | | | | | | | | | |
| PILECO | Pile Concrete Crew | | | 10.00 CH | **Prod:** | **1.0000 S** | Lab Pcs: | 6.00 | Eqp Pcs: | 9.00 | |
| 3511 | Disposal Fee-2@109.75% | 1.00 | 0.50 LD | 2,700.000 | | | | 1,482 | | | 1,482 |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 10.00 HR | 30.150 | | | | | 52 | 279 | 331 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 10.00 HR | 84.726 | | | | | 309 | 621 | 930 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 10.00 HR | 27.908 | | | | | 50 | 257 | 306 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 10.00 HR | 12.781 | | | | | 21 | 119 | 140 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 10.00 HR | 46.798 | | | | | 69 | 445 | 514 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 10.00 HR | 26.000 | | | | | 260 | | 260 |
| 822_DEMO | Demo Small Tools | 1.00 | 10.00 HR | 14.000 | | | | | 140 | | 140 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 20.00 HR | 12.000 | | | | | 240 | | 240 |
| CA01 | Carpenter Foreman | 1.00 | 10.00 MH | 70.410 | 1,424 | | | | | | 1,424 |
| CA02 | Carpenter | 4.00 | 40.00 MH | 64.010 | 5,307 | | | | | | 5,307 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 10.00 MH | 56.030 | 1,191 | | | | | | 1,191 |
| $12,264.39 | 60.0000 MH/EA | | 60.0000MH | [ 4207.28 ] | 7,922 | | 1,482 | 1,140 | 1,721 | | 12,264 |
| **5030.12** | **Pile Cap / Build up Permanent Materials** | | | **Quan:** | **1.00 EA** | **Hrs/Shft:** | **10.00** | **Cal: 50S** | **WC: MARINE** | | |
| 2-ULTRABOND1 | Ultrabond 1@109.75% | 1.00 | 30.00 EA | 40.000 | | 1,317 | | | | | 1,317 |
| 2C0006 | 5000 PSI Concr@109.75% | 1.10 | 1.10 CY | 225.000 | | 272 | | | | | 272 |
| 2C0FUEL/ENV | Concrete Fuel/@109.75% | 1.10 | 1.10 CY | 10.000 | | 12 | | | | | 12 |

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | Unit = | LOC | Takeoff Quan: | 1.000 | | Engr Quan: | 1.000 | | |
| 2CR060 | Gr 60 Rebar@109.75% | 1.00 | 12.50 LB | | 2.000 | | 27 | | | | | 27 |
| 2CRACC | Rebar Accessor@109.75% | 1.00 | 12.50 LB | | 0.500 | | 7 | | | | | 7 |
| $1,635.00 | | | | | [ ] | | 1,635 | | | | | 1,635 |
| **5030.13** | **Pile Cap / Build up Construction Materia** | | | | **Quan:** | **1.00 EA** | **Hrs/Shft:** | **10.00** | **Cal: 50S** | **WC: MARINE** | | |

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---------- Pile Cap Formwork ----------


Bent  Lenght  Width  Height  Soffitt Form  Side Form  Form Oil    Cure        P+P
116   5       2      1.00    10.00         20.00      30.00       10.00       40.00
                             ----------    ----------  ----------  ----------  ----------
                             10            20          30          10          40


----------- End Calculation -----------
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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2CT10 | Form Oil@109.75% | 1.00 | 30.00 SF | | 0.500 | | 16 | | | | | 16 |
| 3CONCURE | Concrete Cure @109.75% | 1.00 | 10.00 SF | | 0.500 | | | 5 | | | | 5 |
| 3F120 | Wood Wall Form@109.75 | 1.00 | 20.00 SF | | 10.000 | | | 220 | | | | 220 |
| 3F140 | Wood Soffit Fo@109.75% | 1.00 | 10.00 SF | | 15.000 | | | 165 | | | | 165 |
| 3FA100 | Formwork Acces@109.75% | 1.00 | 30.00 SF | | 1.000 | | | 33 | | | | 33 |
| 3P&PSUP | Point & Patch @109.75% | 1.00 | 40.00 SF | | 0.500 | | | 22 | | | | 22 |
| $460.96 | | | | | [ ] | | 16 | 445 | | | | 461 |
| **5030.14** | **Pile Cap / Build up Falsework Materials** | | | | **Quan:** | **1.00 EA** | **Hrs/Shft:** | **10.00** | **Cal: 50S** | **WC: MARINE** | | |

```
Friction Collar Assume C8x21.4 --> 18" Pile Figure 3 LF/EA @ 21.4#/LF = 64.2#/EA
Pile Angles Assume L5x5x3/8 --> 18" Pile Figure 8EA @ 8" 12.3#/LF = 8.24#/EA

1" Coil Rod 36"/Rod * 2/EA
1" Coil Rod Nut * 4/EA
1" Voil Rod Washer * 2/EA

Neoprene Pads Figure 2 SF/Collar * 4 = 8 SF/Pile

Figure 2 Friction Collars / Pile
```

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3-18"FRICTIO | 18" Friction C@109.75% | 1.00 | 2.00 EA | | 600.000 | | | 1,317 | | | | 1,317 |
| 3-GLUAM | Glulam Beams@109.75% | 1.00 | 3.00 EA | | 400.000 | | | 1,317 | | | | 1,317 |
| 3-HORSECOLLA | 12x12 Horse Co@109.75% | 1.00 | 1.00 EA | | 550.000 | | | 604 | | | | 604 |
| 3-NEOPAD | Neoprene Pads@109.75% | 1.00 | 8.00 SF | | 25.000 | | | 220 | | | | 220 |
| 3-W18X65BEAM | W18x65 Distrib@109.75% | 1.00 | 2.00 EA | | 3,500.000 | | | 7,683 | | | | 7,683 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | Unit = | LOC | Takeoff Quan: | 1.000 | | Engr Quan: | 1.000 | | |
| $11,139.63 | | | | | [ ] | | | 11,140 | | | | 11,140 |
| **5030.15** | **Install, Torque & Remove Friction Collar** | | | | **Quan: 2.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| Assume 2 collars per Pile. 1 Piles, Furnish & Install 2 EA, Temporary Pile Collars to Support the Temporary Formwork for the Pile Caps Retrofit. Use Neoprene Pads between Pile Collar & Pile to protect concrete. | | | | | | | | | | | | |
| PILECO | Pile Concrete Crew | | | 0.50 CH | **Prod: 0.2500 HU** | Lab Pcs: 6.00 | | | Eqp Pcs: 9.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 0.50 HR | | 30.150 | | | | 3 | 14 | | 17 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 0.50 HR | | 84.726 | | | | 15 | 31 | | 46 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 0.50 HR | | 27.908 | | | | 2 | 13 | | 15 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 0.50 HR | | 12.781 | | | | 1 | 6 | | 7 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 0.50 HR | | 46.798 | | | | 3 | 22 | | 26 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 0.50 HR | | 26.000 | | | | 13 | | | 13 |
| 822_DEMO | Demo Small Tools | 1.00 | 0.50 HR | | 14.000 | | | | 7 | | | 7 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 1.00 HR | | 12.000 | | | | 12 | | | 12 |
| CA01 | Carpenter Foreman | 1.00 | 0.50 MH | | 70.410 | 71 | | | | | | 71 |
| CA02 | Carpenter | 4.00 | 2.00 MH | | 64.010 | 265 | | | | | | 265 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 0.50 MH | | 56.030 | 60 | | | | | | 60 |
| $539.08 | 1.5000 MH/EA | | 3.0000MH | | [ 105.185 ] | 396 | | | 57 | 86 | | 539 |
| **5030.16** | **Install Horse Collars & Stacking Beams** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILECO | Pile Concrete Crew | | | 1.00 CH | **Prod: 1.0000 HU** | Lab Pcs: 6.00 | | | Eqp Pcs: 9.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 1.00 HR | | 30.150 | | | | 5 | 28 | | 33 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 1.00 HR | | 84.726 | | | | 31 | 62 | | 93 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 1.00 HR | | 27.908 | | | | 5 | 26 | | 31 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 1.00 HR | | 12.781 | | | | 2 | 12 | | 14 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 1.00 HR | | 46.798 | | | | 7 | 44 | | 51 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 1.00 HR | | 26.000 | | | | 26 | | | 26 |
| 822_DEMO | Demo Small Tools | 1.00 | 1.00 HR | | 14.000 | | | | 14 | | | 14 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 2.00 HR | | 12.000 | | | | 24 | | | 24 |
| CA01 | Carpenter Foreman | 1.00 | 1.00 MH | | 70.410 | 142 | | | | | | 142 |
| CA02 | Carpenter | 4.00 | 4.00 MH | | 64.010 | 531 | | | | | | 531 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 1.00 MH | | 56.030 | 119 | | | | | | 119 |
| $1,078.20 | 6.0000 MH/EA | | 6.0000MH | | [ 420.72 ] | 792 | | | 114 | 172 | | 1,078 |
| **5030.17** | **Fab Soffit Panels** | | | | **Quan: 10.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILECO | Pile Concrete Crew | | | 0.31 CH | **Prod: 32.0000 UH** | Lab Pcs: 6.00 | | | Eqp Pcs: 9.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 0.31 HR | | 30.150 | | | | 2 | 9 | | 10 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | | Unit = LOC | Takeoff Quan: | 1.000 | | Engr Quan: | 1.000 | | |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 0.31 | HR | 84.726 | | | | 10 | 19 | | 29 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 0.31 | HR | 27.908 | | | | 2 | 8 | | 9 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 0.31 | HR | 12.781 | | | | 1 | 4 | | 4 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 0.31 | HR | 46.798 | | | | 2 | 14 | | 16 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 0.31 | HR | 26.000 | | | | 8 | | | 8 |
| 822_DEMO | Demo Small Tools | 1.00 | 0.31 | HR | 14.000 | | | | 4 | | | 4 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 0.63 | HR | 12.000 | | | | 8 | | | 8 |
| CA01 | Carpenter Foreman | 1.00 | 0.31 | MH | 70.410 | 44 | | | | | | 44 |
| CA02 | Carpenter | 4.00 | 1.25 | MH | 64.010 | 166 | | | | | | 166 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 0.31 | MH | 56.030 | 37 | | | | | | 37 |
| $335.64 | 0.1870 MH/SF | | 1.8700 | MH | [ 13.113 ] | 247 | | | 35 | 53 | | 336 |
| **5030.18** | **Set Soffit Panels** | | | | **Quan: 10.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILECO | Pile Concrete Crew | | | 0.31 CH | **Prod: 32.0000 UH** | | Lab Pcs: 6.00 | | Eqp Pcs: 9.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 0.31 | HR | 30.150 | | | | 2 | 9 | | 10 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 0.31 | HR | 84.726 | | | | 10 | 19 | | 29 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 0.31 | HR | 27.908 | | | | 2 | 8 | | 9 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 0.31 | HR | 12.781 | | | | 1 | 4 | | 4 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 0.31 | HR | 46.798 | | | | 2 | 14 | | 16 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 0.31 | HR | 26.000 | | | | 8 | | | 8 |
| 822_DEMO | Demo Small Tools | 1.00 | 0.31 | HR | 14.000 | | | | 4 | | | 4 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 0.63 | HR | 12.000 | | | | 8 | | | 8 |
| CA01 | Carpenter Foreman | 1.00 | 0.31 | MH | 70.410 | 44 | | | | | | 44 |
| CA02 | Carpenter | 4.00 | 1.25 | MH | 64.010 | 166 | | | | | | 166 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 0.31 | MH | 56.030 | 37 | | | | | | 37 |
| $335.64 | 0.1870 MH/SF | | 1.8700 | MH | [ 13.113 ] | 247 | | | 35 | 53 | | 336 |
| **5030.19** | **Fab Side Forms** | | | | **Quan: 20.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILECO | Pile Concrete Crew | | | 0.62 CH | **Prod: 32.0000 UH** | | Lab Pcs: 6.00 | | Eqp Pcs: 9.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 0.63 | HR | 30.150 | | | | 3 | 18 | | 21 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 0.63 | HR | 84.726 | | | | 19 | 39 | | 59 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 0.63 | HR | 27.908 | | | | 3 | 16 | | 19 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 0.63 | HR | 12.781 | | | | 1 | 8 | | 9 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 0.63 | HR | 46.798 | | | | 4 | 28 | | 32 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 0.63 | HR | 26.000 | | | | 16 | | | 16 |
| 822_DEMO | Demo Small Tools | 1.00 | 0.63 | HR | 14.000 | | | | 9 | | | 9 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 1.25 | HR | 12.000 | | | | 15 | | | 15 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | Unit = LOC | Takeoff Quan: 1.000 | | | Engr Quan: 1.000 | | | |
| CA01 | Carpenter Foreman | 1.00 | 0.63 MH | 70.410 | 90 | | | | | | 90 |
| CA02 | Carpenter | 4.00 | 2.50 MH | 64.010 | 332 | | | | | | 332 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 0.63 MH | 56.030 | 75 | | | | | | 75 |
| $676.49 | 0.1880 MH/SF | | 3.7600MH | [ 13.183 ] | 496 | | | 72 | 108 | | 676 |
| **5030.20** | **Set Pile Cap / Pile Build-up forms** | | | **Quan: 30.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILECO | Pile Concrete Crew | | 1.00 CH | **Prod: 30.0000 UH** | Lab Pcs: 6.00 | | | Eqp Pcs: 9.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 1.00 HR | 30.150 | | | | 5 | 28 | | 33 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 1.00 HR | 84.726 | | | | 31 | 62 | | 93 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 1.00 HR | 27.908 | | | | 5 | 26 | | 31 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 1.00 HR | 12.781 | | | | 2 | 12 | | 14 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 1.00 HR | 46.798 | | | | 7 | 44 | | 51 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 1.00 HR | 26.000 | | | | 26 | | | 26 |
| 822_DEMO | Demo Small Tools | 1.00 | 1.00 HR | 14.000 | | | | 14 | | | 14 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 2.00 HR | 12.000 | | | | 24 | | | 24 |
| CA01 | Carpenter Foreman | 1.00 | 1.00 MH | 70.410 | 142 | | | | | | 142 |
| CA02 | Carpenter | 4.00 | 4.00 MH | 64.010 | 531 | | | | | | 531 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 1.00 MH | 56.030 | 119 | | | | | | 119 |
| $1,078.20 | 0.2000 MH/SF | | 6.0000MH | [ 14.024 ] | 792 | | | 114 | 172 | | 1,078 |
| **5030.21** | **Unload & Handle Rebar** | | | **Quan: 0.01 TN** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILECO | Pile Concrete Crew | | 0.04 CH | **Prod: 4.3500 HU** | Lab Pcs: 6.00 | | | Eqp Pcs: 9.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 0.04 HR | 30.150 | | | | | 1 | | 1 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 0.04 HR | 84.726 | | | | 1 | 2 | | 4 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 0.04 HR | 27.908 | | | | | 1 | | 1 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 0.04 HR | 12.781 | | | | | | | 1 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 0.04 HR | 46.798 | | | | | 2 | | 2 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 0.04 HR | 26.000 | | | | 1 | | | 1 |
| 822_DEMO | Demo Small Tools | 1.00 | 0.04 HR | 14.000 | | | | 1 | | | 1 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 0.09 HR | 12.000 | | | | 1 | | | 1 |
| CA01 | Carpenter Foreman | 1.00 | 0.04 MH | 70.410 | 6 | | | | | | 6 |
| CA02 | Carpenter | 4.00 | 0.17 MH | 64.010 | 23 | | | | | | 23 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 0.04 MH | 56.030 | 5 | | | | | | 5 |
| $44.51 | 25.0000 MH/TN | | 0.2500MH | [ 1754 ] | 33 | | | 5 | 7 | | 45 |
| **5030.22** | **Install Rebar** | | | **Quan: 12.50 LBS** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | | Unit = LOC | Takeoff Quan: 1.000 | | | Engr Quan: 1.000 | | | |
| 4REBAR | Rebar Sub | 1.00 | 12.50 | LBS | 3.000 | | | | | | 38 | 38 |
| **5030.23** | **Prep for Pile Cap / Pile Build-up Pour** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILECO | Pile Concrete Crew | | | 2.50 CH | **Prod: 0.2500 S** | Lab Pcs: 6.00 | | Eqp Pcs: 9.00 | | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 2.50 HR | | 30.150 | | | 13 | 70 | | | 83 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 2.50 HR | | 84.726 | | | 77 | 155 | | | 232 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 2.50 HR | | 27.908 | | | 12 | 64 | | | 77 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 2.50 HR | | 12.781 | | | 5 | 30 | | | 35 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 2.50 HR | | 46.798 | | | 17 | 111 | | | 128 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 2.50 HR | | 26.000 | | | 65 | | | | 65 |
| 822_DEMO | Demo Small Tools | 1.00 | 2.50 HR | | 14.000 | | | 35 | | | | 35 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 5.00 HR | | 12.000 | | | 60 | | | | 60 |
| CA01 | Carpenter Foreman | 1.00 | 2.50 MH | | 70.410 | 356 | | | | | | 356 |
| CA02 | Carpenter | 4.00 | 10.00 MH | | 64.010 | 1,327 | | | | | | 1,327 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 2.50 MH | | 56.030 | 298 | | | | | | 298 |
| $2,695.65 | 15.0000 MH/EA | | 15.0000MH | | [ 1051.82 ] | 1,980 | | 285 | 430 | | | 2,696 |
| **5030.24** | **Pour & Finish Pile Build-up and Pile Cap** | | | | **Quan: 1.10 CY** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |

Assume Concrete delivery to pull up to holes cut into deck, and chute concrete into forms below deck.

Each Location is 1.1 CY/EA

Figure Pour time at 1 HR / Location Includes Pour, Finish, Cure, and Point & Patch.

| PILECO | Pile Concrete Crew | | | 1.00 CH | **Prod: 1.1000 UH** | Lab Pcs: 6.00 | | Eqp Pcs: 9.00 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 1.00 HR | | 30.150 | | | 5 | 28 | | | 33 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 1.00 HR | | 84.726 | | | 31 | 62 | | | 93 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 1.00 HR | | 27.908 | | | 5 | 26 | | | 31 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 1.00 HR | | 12.781 | | | 2 | 12 | | | 14 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 1.00 HR | | 46.798 | | | 7 | 44 | | | 51 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 1.00 HR | | 26.000 | | | 26 | | | | 26 |
| 822_DEMO | Demo Small Tools | 1.00 | 1.00 HR | | 14.000 | | | 14 | | | | 14 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 2.00 HR | | 12.000 | | | 24 | | | | 24 |
| CA01 | Carpenter Foreman | 1.00 | 1.00 MH | | 70.410 | 142 | | | | | | 142 |
| CA02 | Carpenter | 4.00 | 4.00 MH | | 64.010 | 531 | | | | | | 531 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 1.00 MH | | 56.030 | 119 | | | | | | 119 |
| $1,078.20 | 5.4545 MH/CY | | 6.0000MH | | [ 382.473 ] | 792 | | 114 | 172 | | | 1,078 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5030** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | 18" Pile Replacement | | | Unit = | LOC | Takeoff Quan: | 1.000 | | Engr Quan: | 1.000 | | |
| **5030.25** | **Strip Falsework Complete** | | | | **Quan: 1.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILECO | Pile Concrete Crew | | | 1.00 CH | **Prod: 1.0000 HU** | | Lab Pcs: 6.00 | | Eqp Pcs: 9.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 1.00 HR | | 30.150 | | | | 5 | 28 | | 33 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 1.00 HR | | 84.726 | | | | 31 | 62 | | 93 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 1.00 HR | | 27.908 | | | | 5 | 26 | | 31 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 1.00 HR | | 12.781 | | | | 2 | 12 | | 14 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 1.00 HR | | 46.798 | | | | 7 | 44 | | 51 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 1.00 HR | | 26.000 | | | | 26 | | | 26 |
| 822_DEMO | Demo Small Tools | 1.00 | 1.00 HR | | 14.000 | | | | 14 | | | 14 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 2.00 HR | | 12.000 | | | | 24 | | | 24 |
| CA01 | Carpenter Foreman | 1.00 | 1.00 MH | | 70.410 | 142 | | | | | | 142 |
| CA02 | Carpenter | 4.00 | 4.00 MH | | 64.010 | 531 | | | | | | 531 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 1.00 MH | | 56.030 | 119 | | | | | | 119 |
| $1,078.20 | 6.0000 MH/EA | | 6.0000MH | | [ 420.72 ] | 792 | | | 114 | 172 | | 1,078 |
| **5030.26** | **Strip Forms** | | | | **Quan: 30.00 SF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| PILECO | Pile Concrete Crew | | | 0.62 CH | **Prod: 48.0000 UH** | | Lab Pcs: 6.00 | | Eqp Pcs: 9.00 | | | |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 0.63 HR | | 30.150 | | | | 3 | 18 | | 21 |
| 809FEL950 | CAT 950H F.E. Loader 4 | 1.00 | 0.63 HR | | 84.726 | | | | 19 | 39 | | 59 |
| 811LGS0020D | 20kW Large GenSet | 1.00 | 0.63 HR | | 27.908 | | | | 3 | 16 | | 19 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 0.63 HR | | 12.781 | | | | 1 | 8 | | 9 |
| 820OHLDTC42 | LD Truck 4x2 1.75t | 1.00 | 0.63 HR | | 46.798 | | | | 4 | 28 | | 32 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 0.63 HR | | 26.000 | | | | 16 | | | 16 |
| 822_DEMO | Demo Small Tools | 1.00 | 0.63 HR | | 14.000 | | | | 9 | | | 9 |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 1.25 HR | | 12.000 | | | | 15 | | | 15 |
| CA01 | Carpenter Foreman | 1.00 | 0.63 MH | | 70.410 | 90 | | | | | | 90 |
| CA02 | Carpenter | 4.00 | 2.50 MH | | 64.010 | 332 | | | | | | 332 |
| OE08 | Operator (GR 7) (Pvmt Bre | 1.00 | 0.63 MH | | 56.030 | 75 | | | | | | 75 |
| $676.49 | 0.1253 MH/SF | | 3.7600MH | | [ 8.788 ] | 496 | | | 72 | 108 | | 676 |
| **=====> Item Totals:** | **5030 - 18" Pile Replacement** | | | | | | | | | | | |
| $230,665.04 | 556.5100 MH/LOC | | 556.51MH | | [ 38175.68 ] | 69,625 | 11,766 | 63,966 | 31,286 | 46,485 | 7,538 | **230,665** |
| 230,665.040 | 1 LOC | | | | | 69,624.79 | 11,766.05 | 63,965.52 | 31,286.40 | 46,484.78 | 7,537.50 | 230,665.04 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5040** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = End of Pier Fender Piles | | | | Unit = LF | Takeoff Quan: 50.000 | | Engr Quan: 50.000 | | | | | |
| **** Notes from copying **** | | | | | | | | | | | | |
| 18" Diameter FRP @ 6' OC x 70 feet long | | | | | | | | | | | | |
| 50/6' = 9 EA + 2 EA end pcs = 11 EA | | | | | | | | | | | | |
| **4010.01** | **Materials** | | | | **Quan: 50.00 LF** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| | | | | | | | | | | | | **Unreviewed |
| 11 ea @ 70 ft long = 770 LF | | | | | | | | | | | | |
| 2FRPPILES | FRP Pile@109.75% | 1.00 | 770.00 | LF | 65.000 | | 54,930 | | | | | 54,930 |
| 3RIGGING | Rigging@109.75% | 1.00 | 1.00 | LS | 5,000.000 | | | 5,488 | | | | 5,488 |
| 5FREIGHT | Pile Freight | 1.00 | 11.00 | EA | 500.000 | | | 5,500 | | | | 5,500 |
| $65,917.38 | | | | | [ ] | | 54,930 | 10,988 | | | | 65,917 |
| **4010.04** | **Install & Connect Fender System** | | | | **Quan: 11.00 EA** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| | | | | | | | | | | | | **Unreviewed |
| PDFNDR | Pile Drive Crew - Fender | | 22.00 | CH | **Prod: 2.0000 HU** | Lab Pcs: 10.00 | | 604 | Eqp Pcs: 10.00 | | | |
| 3S4000 | Sm Tools - Gen@109.75% | 1.00 | 22.00 | CH | 25.000 | | | 604 | | | | 604 |
| 803AC0185 | Portable Air Comp - 18 | 1.00 | 22.00 | HR | 30.150 | | | | 113 | 615 | | 728 |
| 811SGS15000D | 15000w Small GenSet | 1.00 | 22.00 | HR | 20.164 | | | | 128 | 359 | | 487 |
| 813CMLBC555 | MANITOWOC 555 150t | 1.00 | 22.00 | HR | 293.633 | | | | 3,427 | 3,663 | | 7,090 |
| 814CB150 | Crane Barge - 150 Ton | 1.00 | 22.00 | HR | 251.276 | | | | 4,094 | 1,974 | | 6,067 |
| 814ITB0250 | Inland Tug - 250hp | 1.00 | 22.00 | HR | 137.358 | | | | 608 | 2,708 | | 3,317 |
| 815DH01842 | DELMAG D19-42 Dsl Ham | 1.00 | 22.00 | HR | 79.836 | | | | 913 | 1,014 | | 1,928 |
| 815SL1133363 | Swinging Lead 11x33x36 | 3.00 | 66.00 | HR | 4.330 | | | | 314 | | | 314 |
| 818PW350S | Portable Welder Skid 3 | 1.00 | 22.00 | HR | 12.781 | | | | 46 | 262 | | 309 |
| COE04 | Crane Operator (GR 1) (>10 | 1.00 | 22.00 | MH | 65.370 | 2,931 | | | | | | 2,931 |
| COE06 | Engr. Oiler (GR 1) | 1.00 | 22.00 | MH | 56.110 | 2,623 | | | | | | 2,623 |
| COE14 | Deck Engineer | 1.00 | 22.00 | MH | 57.460 | 2,668 | | | | | | 2,668 |
| IB01 | Captain | 1.00 | 22.00 | MH | 61.410 | 2,043 | | | | | | 2,043 |
| IB03 | Mate | 1.00 | 22.00 | MH | 57.310 | 1,907 | | | | | | 1,907 |
| PD01 | Piledriver Foreman | 1.00 | 22.00 | MH | 64.620 | 3,014 | | | | | | 3,014 |
| PD02 | Piledriver | 4.00 | 88.00 | MH | 62.620 | 11,789 | | | | | | 11,789 |
| $47,816.75 | 20.0000 MH/EA | | 220.0000 | MH | [ 1348.071 ] | 26,975 | | 604 | 9,643 | 10,595 | | 47,817 |
| =====> **Item Totals:** | **5040 - End of Pier Fender Piles** | | | | | | | | | | | |
| $113,734.13 | 4.4000 MH/LF | | 220.00 | MH | [ 296.576 ] | 26,975 | 54,930 | 11,591 | 9,643 | 10,595 | | **113,734** |
| 2,274.683 | 50 LF | | | | | 539.50 | 1,098.60 | 231.82 | 192.85 | 211.91 | | 2,274.68 |

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|

**BID ITEM = 5050** Land Item SCHEDULE: 1 100
Description = Nonstructural Pile Jacket Unit = EA Takeoff Quan: 48.000 Engr Quan: 48.000

48 ea locations x 15' long = 720 LF. Pricing logic per past project, adjusted to reflect rough quantities associated with LF of nonstructural jackets.

**40020.01 18" Jacket Material Quan: 720.00 LF Hrs/Shft: 10.00 Cal: 50S WC: MARINE**

**Unreviewed

---------- 18IN Jacket Material ----------

48 Number of Pile
48 Number of Bents

480 LF of Pile Repairs above Water
240 LF of Pile Repairs Below Water

| | | Repair HGT | Jacket HGT | Total Repair | Total Jacket |
|---|---|---|---|---|---|
| 48 | Above Water Pile Repairs | 10 | 10 | 480 | 480 |
| 48 | Below Water Repairs | 5 | 5 | 240 | 240 |
| 0 | Below Water Repairs | 15.4 | 16 | 0 | 0 |
| | | | | 720 | 720 |

| | Area Top | Height | CF/EA | Piles | Total CF |
|---|---|---|---|---|---|
| Marine Epoxy Grout (Seal) | 2 | 0.6 | 1.2 | 48 | 57.6 |

| | Area Top | Lenght/EA | Piles | Total LF |
|---|---|---|---|---|
| Backer Rod | 2 | 8.00 | 48 | 384.00 |

| N/S Grout (Jacket Fill) | Area Top | Lenght | EA | CF/EA | Total CF |
|---|---|---|---|---|---|
| Above Water | 2 | 10 | 48 | 20 | 960 |
| Below Water | 2 | 5 | 48 | 10 | 480 |
| Below Water | 0 | 0 | 0 | 0 | 0 |
| | | | | | 1440 |

| Trowel Grade Epoxy | Area Top | Height | CF | Piles | Total CF |
|---|---|---|---|---|---|
| | 2 | 0.58 | 1.17 | 48 | 56 |

| Tongue & Groove Adhesive | Lenght | EA | Total LF |
|---|---|---|---|
| Above Water | 10 | 48 | 480 |
| Below Water | 5 | 48 | 240 |
| Below Water | 0 | 0 | 0 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**BID ITEM = 5050** Land Item SCHEDULE: 1 100
Description = Nonstructural Pile Jacket Unit = EA Takeoff Quan: 48.000 Engr Quan: 48.000

720

Rebar

| #5 Vertical | Lenght | EA | Total LF | #/LF | Total LBS | Total TNs |
|---|---|---|---|---|---|---|
| Above Water | 10 | 0 | 0 | 1.043 | 0.00 | 0.00 |
| Below Water | 5 | 0 | 0 | 1.043 | 0.00 | 0.00 |
| Below Water | 0 | 0 | 0 | 1.043 | 0.00 | 0.00 |
| | | | | | 0.00 | 0.00 |

| #4 Hoops | Jacket Lenght | Band Lenght | EA | Total LF | #/LF | Total LBS | Total TNs |
|---|---|---|---|---|---|---|---|
| Above Water | 10 | 7 | 0 | 0 | 0.668 | 0.00 | 0.00 |
| Below Water | 5 | 7 | 0 | 0 | 0.668 | 0.00 | 0.00 |
| Below Water | 0 | 7 | 0 | 0 | 0.668 | 0.00 | 0.00 |
| | | | | | | 0.00 | 0.00 |

| Rebar Total | Piles | Jacket Lenght | #5 Vert LBS | #4 Bands LBS | Total LBS | Total TNs |
|---|---|---|---|---|---|---|
| Above Water | 0 | 10 | 0.00 | 0.00 | 0.00 | 0.00 |
| Below Water | 0 | 5 | 0.00 | 0.00 | 0.00 | 0.00 |
| Below Water | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | 0.00 | 0.00 |

| SS Self-Tapping Screws | Jacket Lenght | Screws/Pile | Piles | Total Screws |
|---|---|---|---|---|
| Above Water | 10 | 20 | 48 | 960 |
| Below Water | 5 | 10 | 48 | 480 |
| Below Water | 0 | 0 | 0 | 0 |
| | | | | 1,440 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ---------- End Calculation ---------- | | | | | | | | | | | |
| 2-BACKERD4" | 4" Backer Rod@109.75% | 1.05 | 384.00 | LF | 13.782 | | 5,809 | | | | 5,809 |
| 2-FX70JACK18 | FX-70 Jacket f@109.75% | 1.10 | 720.00 | LF | 79.387 | | 62,732 | | | | 62,732 |
| 2-JACKFRT | Jacket Materia@109.75% | 1.00 | 48.00 | EA | 0.000 | | | | | | |
| 2-JACKGRT | Jacket Grout@109.75% | 1.10 | 1,440.00 | CF | 49.617 | | 78,415 | | | | 78,415 |
| 2-PUMPPORTS | Pumping Ports@109.75% | 1.10 | 720.00 | LF | 4.410 | | 3,485 | | | | 3,485 |
| 2-SEALGRT | Marine Epoxy S@109.75% | 1.10 | 57.60 | CF | 220.519 | | 13,940 | | | | 13,940 |
| 2-SSTAPSCREW | SS Self-Tappin@109.75% | 1.05 | 1,440.00 | EA | 0.551 | | 871 | | | | 871 |
| 2-TNG&GVADH | Tongue & Groov@109.75% | 1.10 | 720.00 | LF | 4.410 | | 3,485 | | | | 3,485 |
| 2-TRLEPOXY | Trowel Grade E@109.75% | 1.00 | 56.00 | CF | 970.287 | | 59,634 | | | | 59,634 |
| 2CR060 | Gr 60 Rebar@109.75% | 1.05 | 0.00 | LB | 2.000 | | | | | | |

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5050** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Nonstructural Pile Jacket | | | | Unit = EA | Takeoff Quan: 48.000 | | | Engr Quan: 48.000 | | | |
| 2CRACC | Rebar Accessor@109.75% | 1.05 | 0.00 | LB | 0.500 | | | | | | | |
| $228,370.61 | | | | | [ ] | | 228,371 | | | | | 228,371 |
| **40020.02** | **Demo Bad Concrete Above WL** | | **Quan:** | **172.80** | **CF** | **Hrs/Shft:** | **10.00** | **Cal:** | **50S** | **WC:** | **MARINE** | |

**Unreviewed

Figure on Average Chipping 1" of Concrete Around Pile on all sides to loosen bad concrete if not roughen surface for grout to bond to existing pile.

Typical Production for Hand Chipping is Appx 1 CF/MH Figure 2 Men Chipping & 2 Stand-by Rotating.

120 CF/ 2 CF/MH = 60 CH
Figure 1 HR/Bent for Setup & Breakdown * 12 Bents = 12 HRS

60 Chipping HRS + 12 Setup/Breakdown Hours = 72 CH
---------- 16in Pile Demo Concrete ----------

18" Piles
Piles 48 EA
Bents 48 EA
Piles/Bent 1

| | | | Top Area | CF/EA | Piles | Total CF | #/CF | #/Pile | Total # | Total Ton |
|---|---|---|---|---|---|---|---|---|---|---|
| Avg Lenght | 10 | LF Repair Height | 0.5 | 3.6 | 48 | 172.80 | 150 | 540 | 25920 | 12.96 |
| Avg Lenght | 10 | LF Jacket Height | 0.5 | 3.6 | 48 | 172.8 | 150 | 540 | 25920 | 12.96 |

-------------- End Calculation --------------

| PDEMO | Pile Demo Crew | | 103.68 | CH | **Prod:** | **1.6667** | **UH** | Lab Pcs: 6.00 | Eqp Pcs: 10.00 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3511 | Disposal Fee-2@109.75% | 1.00 | 1.44 | LD | 2,700.000 | | | 4,267 | | | 4,267 |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 103.68 | HR | 36.929 | | | | 841 | 3,361 | 4,202 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 103.68 | HR | 3.830 | | | | 95 | 340 | 436 |
| 814CD10WB | Work Barge | 1.00 | 103.68 | HR | 11.745 | | | | 865 | 471 | 1,336 |
| 814CD10WT | Work Tugboat | 1.00 | 103.68 | HR | 190.674 | | | | 1,371 | 20,325 | 21,697 |
| 814RUN016 | Runabout 16ft | 1.00 | 103.68 | HR | 30.216 | | | | 106 | 3,332 | 3,438 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 103.68 | HR | 34.824 | | | | 506 | 3,457 | 3,963 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 103.68 | HR | 0.000 | | | | | | |
| 822_DEMO | Demo Small Tools | 1.00 | 103.68 | HR | 0.000 | | | | | | |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 207.36 | HR | 0.000 | | | | | | |
| CA01 | Carpenter Foreman | 1.00 | 103.68 | MH | 70.410 | 14,759 | | | | | 14,759 |
| CA02 | Carpenter | 2.00 | 207.36 | MH | 64.010 | 27,512 | | | | | 27,512 |
| IB04 | Deckhand | 1.00 | 103.68 | MH | 57.480 | 9,012 | | | | | 9,012 |
| LA02 | Laborer (CS) | 1.00 | 103.68 | MH | 38.450 | 9,183 | | | | | 9,183 |
| LA03 | Laborer (Gr 2) | 1.00 | 103.68 | MH | 37.600 | 9,050 | | | | | 9,050 |

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5050** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Nonstructural Pile Jacket | | Unit = EA | Takeoff Quan: 48.000 | | | | Engr Quan: 48.000 | | | |
| $108,855.98 | 3.6000 MH/CF | | 622.0800MH | [ 219.094 ] | 69,517 | | 4,267 | 3,786 | 31,286 | | 108,856 |

**40020.03 Demo Bad Concrete Below WL** **Quan: 86.40 CF** **Hrs/Shft: 10.00** **Cal: 50S** **WC: MARINE**

**Unreviewed

Above Water crew to assist Dive Crew.

Figure on Average Chipping 1" of Concrete Around Pile on all sides to loosen bad concrete if not roughen surface for grout to bond to existing pile.

Typical Production for Hand Chipping is Appx 1 CF/MH Figure 2 Men Chipping & 2 Stand-by Rotating.

118.80 CF/ 2 CF/MH = 59.4 CH
Figure 1 HR/Bent for Setup & Breakdown * 12 Bents = 12 HRS

59.4 Chipping HRS + 12 Setup/Breakdown Hours = 71.4 CH

Figure Divers on 8 HR Days = 71.4 HRS/8 = 8.925 Day Figure 9 Days

---------- 16in Demo Below Water ----------

18" Piles
Piles 48 EA
Bents 48 EA
Piles/Bent 1

| | | | | | Top Area | CF/EA | Piles | Total CF | #/CF | #/Pile | Total # | Total Ton |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pile 1 | Avg Lenght 5 | LF | Repair Height | | 0.3 | 1.8 | 48 | 86.4 | 150 | 270 | 12960 | 6.48 |
| | Avg Lenght 5 | LF | Jacket Height | | 0.3 | 1.8 | 48 | 86.4 | 150 | 270 | 12960 | 6.48 |
| | | | | | Top Area | CF/EA | Piles | Total CF | #/CF | #/Pile | Total # | Total Ton |
| Pile 2 | Avg Lenght 0 | LF | Repair Height | | 0.3 | 0 | 48 | 0 | 150 | 0 | 0 | 0.00 |
| | Avg Lenght 0 | LF | Jacket Height | | 0.3 | 0 | 48 | 0 | 150 | 0 | 0 | 0.00 |
| | | | | | | | Piles | Total CF | | | Total # | Total Ton |
| Pile Totals | | | | | | | 96 | 86.4 | | | 12960 | 6.48 |

---------- End Calculation ----------

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DIVEAS | Diver Assist Crew | 51.92 CH | **Prod:** | **1.6639 UH** | Lab Pcs: 5.00 | Eqp Pcs: 11.00 | |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5050** | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Nonstructural Pile Jacket | | | Unit = EA | Takeoff Quan: | 48.000 | | Engr Quan: | 48.000 | | |
| 3511 | Disposal Fee-2@109.75% | 1.00 | 0.73 LD | 2,700.000 | | | 2,163 | | | | 2,163 |
| 4DIVE | Diving Sub | 1.00 | 6.55 DAY | 5,500.000 | | | | | | 36,025 | 36,025 |
| 4DIVEAIRTOOL | Diver Air Tools | 1.00 | 6.55 DAY | 500.000 | | | | | | 3,275 | 3,275 |
| 4DIVEBURNRIG | Diver Burning Rig | 1.00 | 6.55 DAY | 250.000 | | | | | | 1,638 | 1,638 |
| 4DIVECHIP | Diver Chipping Guns | 1.00 | 6.55 DAY | 150.000 | | | | | | 983 | 983 |
| 4DIVEDREDGE | Diver 6" Hydraulic Dredge | 1.00 | 6.55 DAY | 800.000 | | | | | | 5,240 | 5,240 |
| 4DIVEHYDGRIN | Hydraulic Grinder | 1.00 | 6.55 DAY | 125.000 | | | | | | 819 | 819 |
| 4DIVEHYDHOSE | Diver Hydraulic Hose 300' | 1.00 | 6.55 DAY | 120.000 | | | | | | 786 | 786 |
| 4DIVEHYDRAUL | Diver Hydraulic Unit | 1.00 | 6.55 DAY | 250.000 | | | | | | 1,638 | 1,638 |
| 4DIVEJET | Diver Jet Pump | 1.00 | 6.55 DAY | 125.000 | | | | | | 819 | 819 |
| 4DIVETRAILER | Dive Gear Trailer | 1.00 | 6.55 DAY | 100.000 | | | | | | 655 | 655 |
| 4DIVEWATBLST | Diver Water Blaster | 1.00 | 6.55 DAY | 200.000 | | | | | | 1,310 | 1,310 |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 51.93 HR | 36.929 | | | | 421 | 1,683 | | 2,105 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 51.93 HR | 3.830 | | | | 48 | 171 | | 218 |
| 814CD10WB | Work Barge | 1.00 | 51.93 HR | 11.745 | | | | 433 | 236 | | 669 |
| 814CD10WT | Work Tugboat | 1.00 | 51.93 HR | 190.674 | | | | 687 | 10,180 | | 10,867 |
| 814RUN016 | Runabout 16ft | 1.00 | 51.93 HR | 30.216 | | | | 53 | 1,669 | | 1,722 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 51.93 HR | 34.824 | | | | 253 | 1,731 | | 1,985 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 51.93 HR | 0.000 | | | | | | | |
| 822_DEMO | Demo Small Tools | 1.00 | 51.93 HR | 0.000 | | | | | | | |
| 822_GRTPUMP | Chemgrout CG555 Pump & | 1.00 | 51.93 HR | 0.000 | | | | | | | |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 103.85 HR | 0.000 | | | | | | | |
| CA01 | Carpenter Foreman | 1.00 | 51.93 MH | 70.410 | 7,393 | | | | | | 7,393 |
| CA02 | Carpenter | 1.00 | 51.93 MH | 64.010 | 6,890 | | | | | | 6,890 |
| IB04 | Deckhand | 1.00 | 51.93 MH | 57.480 | 4,514 | | | | | | 4,514 |
| LA02 | Laborer (CS) | 1.00 | 51.93 MH | 38.450 | 4,600 | | | | | | 4,600 |
| LA03 | Laborer (Gr 2) | 1.00 | 51.93 MH | 37.600 | 4,533 | | | | | | 4,533 |
| $100,844.45 | 3.0052 MH/CF | | 259.6500MH | [ 177.154 ] | 27,929 | | 2,163 | 1,896 | 15,670 | 53,186 | 100,844 |
| **40020.04** | **High-Pressure Blast Rebar** | | | **Quan: 24.00 BENT** | **Hrs/Shft: 10.00** | | **Cal: 50S** | **WC: MARINE** | | | |
| | | | | | | | | | | | **Unreviewed |
| Allow for High-Pressure Waterblast to clean exposed rebar and conrete. | | | | | | | | | | | |
| DIVEAS | Diver Assist Crew | | | 72.00 CH **Prod: 3.0000 HU** | | Lab Pcs: 5.00 | | Eqp Pcs: 11.00 | | | |
| 4DIVE | Diving Sub | 1.00 | 10.00 DAY | 5,500.000 | | | | | | 55,000 | 55,000 |
| 4DIVEAIRTOOL | Diver Air Tools | 1.00 | 10.00 DAY | 500.000 | | | | | | 5,000 | 5,000 |
| 4DIVEBURNRIG | Diver Burning Rig | 1.00 | 10.00 DAY | 250.000 | | | | | | 2,500 | 2,500 |
| 4DIVECHIP | Diver Chipping Guns | 1.00 | 10.00 DAY | 150.000 | | | | | | 1,500 | 1,500 |
| 4DIVEDREDGE | Diver 6" Hydraulic Dredge | 1.00 | 10.00 DAY | 800.000 | | | | | | 8,000 | 8,000 |
| 4DIVEHYDGRIN | Hydraulic Grinder | 1.00 | 10.00 DAY | 125.000 | | | | | | 1,250 | 1,250 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5050** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Nonstructural Pile Jacket | | | | Unit = EA | Takeoff Quan: | 48.000 | | Engr Quan: | 48.000 | | |
| 4DIVEHYDHOSE | Diver Hydraulic Hose 300' | 1.00 | 10.00 | DAY | 120.000 | | | | | | 1,200 | 1,200 |
| 4DIVEHYDRAUL | Diver Hydraulic Unit | 1.00 | 10.00 | DAY | 250.000 | | | | | | 2,500 | 2,500 |
| 4DIVEJET | Diver Jet Pump | 1.00 | 10.00 | DAY | 125.000 | | | | | | 1,250 | 1,250 |
| 4DIVETRAILER | Dive Gear Trailer | 1.00 | 10.00 | DAY | 100.000 | | | | | | 1,000 | 1,000 |
| 4DIVEWATBLST | Diver Water Blaster | 1.00 | 10.00 | DAY | 200.000 | | | | | | 2,000 | 2,000 |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 72.00 | HR | 36.929 | | | | 584 | 2,334 | | 2,918 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 72.00 | HR | 3.830 | | | | 66 | 236 | | 303 |
| 814CD10WB | Work Barge | 1.00 | 72.00 | HR | 11.745 | | | | 601 | 327 | | 928 |
| 814CD10WT | Work Tugboat | 1.00 | 72.00 | HR | 190.674 | | | | 952 | 14,115 | | 15,067 |
| 814RUN016 | Runabout 16ft | 1.00 | 72.00 | HR | 30.216 | | | | 74 | 2,314 | | 2,388 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 72.00 | HR | 34.824 | | | | 351 | 2,400 | | 2,752 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 72.00 | HR | 0.000 | | | | | | | |
| 822_DEMO | Demo Small Tools | 1.00 | 72.00 | HR | 0.000 | | | | | | | |
| 822_GRTPUMP | Chemgrout CG555 Pump & | 1.00 | 72.00 | HR | 0.000 | | | | | | | |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 144.00 | HR | 0.000 | | | | | | | |
| CA01 | Carpenter Foreman | 1.00 | 72.00 | MH | 70.410 | 10,250 | | | | | | 10,250 |
| CA02 | Carpenter | 1.00 | 72.00 | MH | 64.010 | 9,553 | | | | | | 9,553 |
| IB04 | Deckhand | 1.00 | 72.00 | MH | 57.480 | 6,259 | | | | | | 6,259 |
| LA02 | Laborer (CS) | 1.00 | 72.00 | MH | 38.450 | 6,377 | | | | | | 6,377 |
| LA03 | Laborer (Gr 2) | 1.00 | 72.00 | MH | 37.600 | 6,285 | | | | | | 6,285 |
| $144,278.33 | 15.0000 MH/BENT | | 360.0000 | MH | [ 884.235 ] | 38,723 | | | 2,629 | 21,726 | 81,200 | 144,278 |

**40020.06 Install Pile Jackets** **Quan: 720.00 LF** **Hrs/Shft: 10.00** **Cal: 50S** **WC: MARINE**

**Unreviewed

Allow for crew to Install fx-70 Fiberglass Jackets including bottom seals, grout, and other materials. Non-shrink grout will be mixed and pumped inside the jackets.

Figure Topside crew to assist divers in fabricating jackets and mixing grout in pump.

Figure Install at 5 VF/HR
636 LF @ 5 VF/HR = 127.2 CH

Figure 0.5 HRS/Pile for Move Time = 0.5 * 24 = 12 HRS

127.2 HRS + 12 HRS = 139.2 CH

Figure Divers on 8 HR Days = 139.2 HRS/8 = 17.4 Days Figure 18 Days

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIVEAS | Diver Assist Crew | | | | 157.58 | CH | **Prod: 4.5690 UH** | | Lab Pcs: 5.00 | Eqp Pcs: 11.00 | | |
| 4DIVE | Diving Sub | 1.00 | 20.38 | DAY | 5,500.000 | | | | | | 112,090 | 112,090 |
| 4DIVEAIRTOOL | Diver Air Tools | 1.00 | 20.38 | DAY | 500.000 | | | | | | 10,190 | 10,190 |

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity | Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BID ITEM = 5050** | | | | Land Item | SCHEDULE: 1 100 | | | | | | | |
| Description = | Nonstructural Pile Jacket | | | | Unit = EA | Takeoff Quan: | 48.000 | | Engr Quan: | 48.000 | | |
| 4DIVEBURNRIG | Diver Burning Rig | 1.00 | 20.38 | DAY | 250.000 | | | | | | 5,095 | 5,095 |
| 4DIVECHIP | Diver Chipping Guns | 1.00 | 20.38 | DAY | 150.000 | | | | | | 3,057 | 3,057 |
| 4DIVEDREDGE | Diver 6" Hydraulic Dredge | 1.00 | 20.38 | DAY | 800.000 | | | | | | 16,304 | 16,304 |
| 4DIVEHYDGRIN | Hydraulic Grinder | 1.00 | 20.38 | DAY | 125.000 | | | | | | 2,548 | 2,548 |
| 4DIVEHYDHOSE | Diver Hydraulic Hose 300' | 1.00 | 20.38 | DAY | 120.000 | | | | | | 2,446 | 2,446 |
| 4DIVEHYDRAUL | Diver Hydraulic Unit | 1.00 | 20.38 | DAY | 250.000 | | | | | | 5,095 | 5,095 |
| 4DIVEJET | Diver Jet Pump | 1.00 | 20.38 | DAY | 125.000 | | | | | | 2,548 | 2,548 |
| 4DIVETRAILER | Dive Gear Trailer | 1.00 | 20.38 | DAY | 100.000 | | | | | | 2,038 | 2,038 |
| 4DIVEWATBLST | Diver Water Blaster | 1.00 | 20.38 | DAY | 200.000 | | | | | | 4,076 | 4,076 |
| 803AC0250 | Portable Air Comp - 25 | 1.00 | 157.58 | HR | 36.929 | | | | 1,279 | 5,108 | | 6,387 |
| 811SGS2500D | 2500w Small GenSet | 1.00 | 157.58 | HR | 3.830 | | | | 145 | 517 | | 662 |
| 814CD10WB | Work Barge | 1.00 | 157.58 | HR | 11.745 | | | | 1,315 | 716 | | 2,031 |
| 814CD10WT | Work Tugboat | 1.00 | 157.58 | HR | 190.674 | | | | 2,084 | 30,891 | | 32,976 |
| 814RUN016 | Runabout 16ft | 1.00 | 157.58 | HR | 30.216 | | | | 162 | 5,064 | | 5,226 |
| 820OHLDTC421 | LD Truck 4x2 1t | 1.00 | 157.58 | HR | 34.824 | | | | 769 | 5,254 | | 6,023 |
| 822_CARPBARG | Barge Carpenter 12x40 | 1.00 | 157.58 | HR | 0.000 | | | | | | | |
| 822_DEMO | Demo Small Tools | 1.00 | 157.58 | HR | 0.000 | | | | | | | |
| 822_GRTPUMP | Chemgrout CG555 Pump & | 1.00 | 157.58 | HR | 0.000 | | | | | | | |
| 822_WRKFLOT | 9 x 20 Work Float | 2.00 | 315.17 | HR | 0.000 | | | | | | | |
| CA01 | Carpenter Foreman | 1.00 | 157.58 | MH | 70.410 | 22,433 | | | | | | 22,433 |
| CA02 | Carpenter | 1.00 | 157.58 | MH | 64.010 | 20,907 | | | | | | 20,907 |
| IB04 | Deckhand | 1.00 | 157.58 | MH | 57.480 | 13,698 | | | | | | 13,698 |
| LA02 | Laborer (CS) | 1.00 | 157.58 | MH | 38.450 | 13,957 | | | | | | 13,957 |
| LA03 | Laborer (Gr 2) | 1.00 | 157.58 | MH | 37.600 | 13,755 | | | | | | 13,755 |
| $303,539.72 | 1.0943 MH/LF | | 787.9000 | MH | [ 64.508 ] | 84,750 | | | 5,754 | 47,551 | 165,486 | 303,540 |
| =====> **Item Totals:** | **5050 - Nonstructural Pile Jacket** | | | | | | | | | | | |
| $885,889.09 | 42.2839 MH/EA | | 2,029.63 | MH | [ 2517.355 ] | 220,919 | 228,371 | 6,430 | 14,064 | 116,233 | 299,872 | **885,889** |
| 18,456.023 | 48 EA | | | | | 4,602.48 | 4,757.72 | 133.96 | 293.00 | 2,421.53 | 6,247.33 | 18,456.02 |
| $**15,763,173.71** | *** **Report Totals** *** | | 52,988.12 | MH | | 6,349,366 | 4,576,426 | 1,324,546 | 954,305 | 1,928,194 | 630,337 | **15,763,174** |

**>>> indicates Non Additive Activity**

------Report Notes:------

The estimate was prepared with TAKEOFF Quantities.

This report shows TAKEOFF Quantities with the resources.

**Cost Report**

| Activity / Resource | Description | Pcs | Quantity / Unit | Unit Cost | Labor | Perm Material | Constr Matl/Exp | Equipment Ownership | Equipment Operation | Sub-Contract | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|

**BID ITEM = 5050** Land Item SCHEDULE: 1 100
Description = Nonstructural Pile Jacket Unit = EA Takeoff Quan: 48.000 Engr Quan: 48.000

'Unreviewed' Activities are marked.

Bid Date: Owner: Engineering Firm:
Estimator-In-Charge:

**JOB NOTES**

```
Estimate created on: 12/20/2017 by User#: 0 -
Source used: C:\HBSOURCE\COMPLETE SOURCE\COMPLETETRUNKSOURCE\UTILITY\BLANK\BLANK.zip (a backup) from 10/18/2016  12:28:49 PM

************Estimate created on: 05/30/2018 by User#: 0 -
Source used: C:\HEAVYBID\COMP\UTILITY\BLANK\BLANK.zip (a backup) from 05/24/2018  8:52:18

************Estimate created on: 03/19/2025 by User#: 16 - Brian Watts
Source used: L:\HEAVYBID\UTILITY\BLANK\BLANK.zip (a backup) from 08/07/2024 10:44:22 AM

************Estimate created on: 03/19/2025 by User#: 16 - Brian Watts
Source estimate used: L:\HEAVYBID\EST\BLANK

************Estimate created on: 06/03/2025 by User#: 16 - Brian Watts
Source estimate used: L:\HEAVYBID\EST\2024-NOCALFX
```

* on units of MH indicate average labor unit cost was used rather than base rate.
[ ] in the Unit Cost Column = Labor Unit Cost Without Labor Burdens
In equipment resources, rent % and EOE % not = 100% are represented as XXX%YYY where XXX=Rent% and YYY=EOE%

------Calendar Codes------

| | |
|---|---|
| 40D | 5 x 8 Hr - Double |
| 40S | 5 x 8 Hr - Single Shift |
| 40T | 5 x 8 Hr - Triple |
| 50D | 5 x 10 Hr - Double |
| **50S** | **5 x 10 Hr - Single (Default Calendar)** |
| 56S | 7 x 8-hr - Single |
| 724 | 7 Days x 24 Hrs |
| 84S | 7 x 12-hr Single |
| OS | Off Shift (Midnight to 6 AM) |
| R48 | Rolling 48 Hr Schedule |
| S24 | 24 Hr Shipping Schedule |

## 8.5 Load Rating – Graving Basins and Finger Piers

moffatt & nichol

# PORT OF RICHMOND

## Point Potrero Marine Terminal

## Load Rating Report

Produced for the Port of Richmond
August 19, 2025

# Document Verification

| | |
|---|---|
| **Client** | Port of Richmond |
| **Project name** | Point Potrero Marine Terminal |
| **Document title** | Load Rating Report |
| **Status** | Final |
| **Date** | August 19, 2025 |
| **Project number** | 241984 |

| Revision | Description | Issued by | Date | Checked |
|---|---|---|---|---|
| A | Load Rating Report - Draft | Damilola Taiwo | 07/21/2025 | Jim Brady, Matt Trowbridge |
| B | Load Rating Report - Final | Damilola Taiwo | 08/19/2025 | Matt Trowbridge |

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# 1. Executive Summary

A load rating was developed for the Graving Basin and Finger Pier structures to support the Port in evaluating existing and proposed future uses. The load ratings presented are based on as-built conditions (e.g., no damage condition). At the graving basin structures, the allowable distributed live load, governed by slab bending, is **550 psf**. With load spreading that puts the load directly into the columns, the capacity is approximately 2000 psf. For the finger pier structures, the published load capacity of each pier is **500 psf**, according to the United States Army Corps of Engineers (USACE) Port Series No. 31, 2000. The load rating is summarized in Table 1 and Table 2.

*Table 1: Load Rating at Graving Basins*

| Structural Element / Failure Modes | | Allowable Distributed Live Load (psf) |
|---|---|---|
| SLAB (Transverse) | **BENDING** | **550** |
| | SHEAR | 700 |
| SLAB (Longitudinal) | BENDING | 650 |
| | SHEAR | 750 |
| SLAB | PUNCHING SHEAR | 1100 |
| EDGE BEAM | BENDING | 31000 |
| | SHEAR | 8000 |
| COLUMN | AXIAL | 2300 |
| BEARING / FOUNDATION | BEARING | 8000 (dead + live)<br>10,500 (incl. seismic) |
| Graving Basin Controlling Load | | 550 |

*Table 2: Load Rating Summary*

| STRUCTURE | Allowable Distributed Live Load (psf) | Governed By |
|---|---|---|
| Graving Basin | **550** | Deck Capacity (bending) |
| Finger Pier | **500**[†] | -- |

[†]Per USACE Port Series No. 31 (2000)

# 2. Introduction

The purpose of this report is to summarize load rating results for the Graving Basin and Finger Pier structures at the Port of Richmond's Point Potrero Marine Terminal (PPMT).

# 3. Graving Basins

## 3.1. Assumptions

The following general assumptions were made regarding the load capacity assessment of the graving basin structures:

- Section properties and overall structural configurations were based on the construction drawings and references provided by the Port.
- The member capacity analysis assumes that neither chloride ion-induced corrosion of the reinforcing steel nor concrete degradation have reduced the member capacities from their original design values.
- The unit weight of concrete was taken at 150 pounds per cubic foot (pcf), and the unit weight of asphalt paving was taken at 145 pcf.
- There is 2" thick asphalt overlay.
- Reinforcing steel properties were based on Concrete Reinforcing Steel Institute (CRSI) *Evaluation of Reinforcing Bars in Old Reinforced Concrete Structures*.
- The concrete compressive strength used in the deck capacity calculations is 5,000 psi. The results of concrete coring tests performed in 2012 state a compressive strength of 7,480 psi (5000 psi was used conservatively).
- Concrete properties were based on American Concrete Institute (ACI) 318-41.
- The following load combinations were evaluated based on United Facilities Criteria (UFC) 4-152-01:
    - 1.2 Dead + 1.6 (Uniform Live Load)

The allowable uniform live load was taken from the controlling capacity of the following:

- Deck capacity (including punching shear)
- Edge beam capacity
- Column axial capacity
- Foundation / bearing capacity
    - The bearing capacity is approximately 8,000 psf for dead plus live load and 10,500 psf for load combinations including seismic loading, as documented in the Geotechnical Characterization Report in Section 9.1. This value is well above the uniform live load capacity based on structural capacity; thus, it can be assumed that the capacity of the concrete deck will control.

## 3.2. Structural Configuration

There are five graving basins; basins 1,3,4 and 5 are 576 feet long, and basin 2 was upgraded circa 1969 and is 748 feet long. All basins are 100 feet wide. The graving basins are delimited by six basin fingers approximately 610-feet-long by 35-feet-wide each. The graving basin structures consist primarily of a base slab at -30-ft MLLW, cast-in-place walls and two working levels above water. The lower level is at the top of the graving basin side walls, elevation +10-ft MLLW. This is referred to as the gallery deck. The upper level is at the grade of the back lands, elevation +18.5 MLLW. The upper deck is referred to as the gallery roof deck. The gallery roof deck is supported by (2) exterior 18" square columns spaced at 6.5 feet on-center (OC) and (2) internal 18" square columns spaced at 13 feet on-center. Fingers 1 and 6 each have a wall on their west and east sides, respectively, instead of exterior columns. An edge beam 24" deep and 18" wide runs longitudinally along the exterior sides of the basin fingers. The gallery roof deck consists of an 8" thick concrete slab with an asphalt overlay topping (approximately 2" thick).

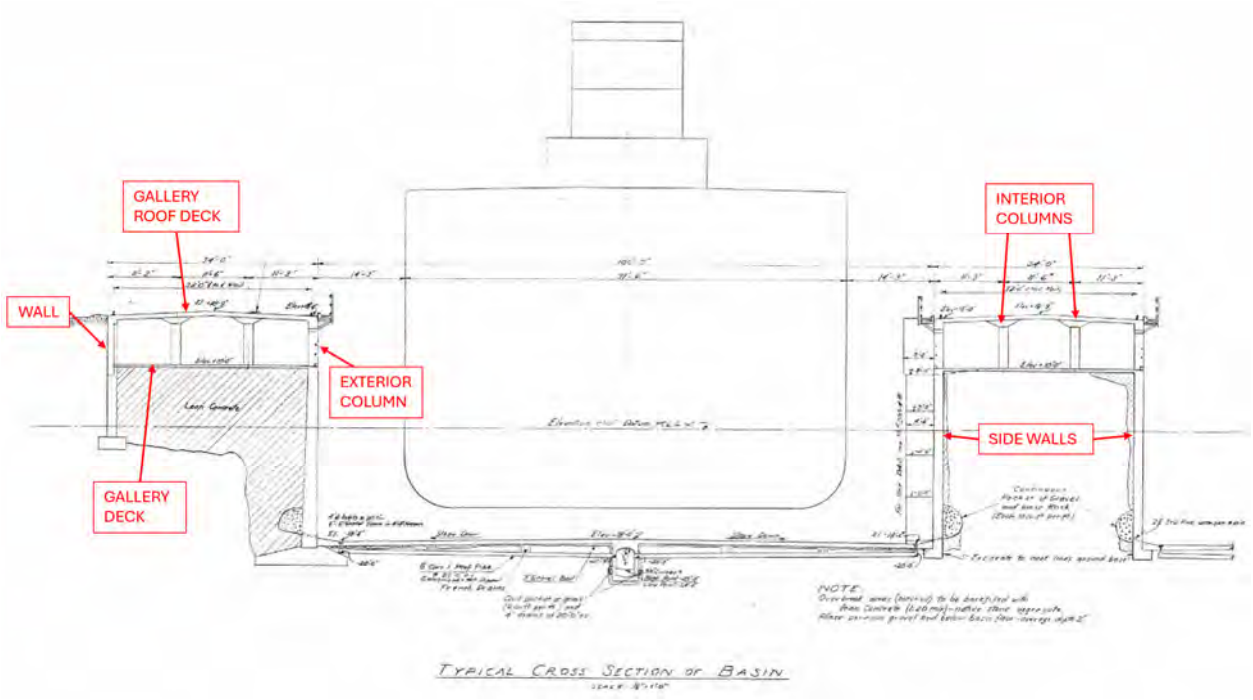



*Figure 1: Typical Section of Graving Basin*

It is unknown what uniform live and vehicle loading the graving basin fingers were originally designed to support. However, the U.S. Army Corps of Engineers (USACE) Port Series No. 31 *The Ports of Oakland-Alameda, Richmond, and Ports on Carquinez Strait, California* (Revised 2000), states that crane service included (4) 60-ton and (2) 45-ton electric, traveling, full-portal, gantry cranes that traveled on top of walls between the graving docks. This reference is included in Appendix D.

## 3.3. Load Capacity Summary

The allowable distributed live load, governed by slab bending, is **550 psf**. With load spreading that puts the load directly into the columns, the capacity is approximately 2000 psf. A summary of the allowable distributed live loads according to each considered failure mode is summarized in Table 3. Supporting calculations can be found in Appendix A.

*Table 3: Load Capacity Summary – Graving Basins*

| Structural Element / Failure Modes | | Capacity (Dead + Live Loading) | | Allowable Distributed Live Load (psf) |
|---|---|---|---|---|
| SLAB (Transverse) | **BENDING** | **11.74** | **kip-ft/ft** | **550** |
| | SHEAR | 6.39 | kip/ft | 700 |
| SLAB (Longitudinal) | BENDING | 15.52 | kip-ft/ft | 650 |
| | SHEAR | 7.32 | kip/ft | 750 |
| SLAB | PUNCHING SHEAR | 282 | kip | 1100 |
| EDGE BEAM | BENDING | 230.5 | kip-ft/ft | 31000 |
| | SHEAR | 39.7 | kip/t | 8000 |
| COLUMN | AXIAL | 564 | kip | 2300 |
| BEARING / FOUNDATION | BEARING | 8000 | psf | -- |

# 4. Finger Piers

No load rating of the finger pier structures was performed.

- Since original construction drawings of the finger pier structures could not be located, the structural configuration of the piers (including reinforcing layout) could not be confirmed.

The published capacity of each finger pier can be found in the United States Army Corps of Engineers (USACE) Port Series No. 31, 2000. According to this document, the capacity is **500 psf**. This reference can be found in Appendix C.

## 4.1. Structural Configuration

There are two finger piers, approximately ±545 feet long by 48 feet wide, located on west end of the PPMT facility. Both finger piers have the same configuration, consisting of a 12" concrete deck supported by three concrete bents running the length of the pier. The external bents are supported by clusters of 4 concrete piles at 36 feet on-center (OC). Each concrete pile within the clusters is18" x 24". The central bent is supported by 18" square concrete piles at 12 feet OC, typical. The first three shoreside piles supporting the central bent are 18" diameter steel pipe piles. The external bents are approximately 32" wide by 5' deep. The transverse beams placed at 108 feet OC (every two pile clusters) are approximately 19" wide by 5' deep. A concrete slab apron cantilevers out approximately 7' on the longitudinal sides of the pier and 2' on the transverse waterside. The shoreline edge at the landside of the piers is maintained by a steel sheet pile bulkhead fronted by rip rap. A plan view of the finger pier is depicted in Figure 2.The reinforcing layout was determined based on the minimum reinforcement specified in ACI 318-41 as no drawings were available.

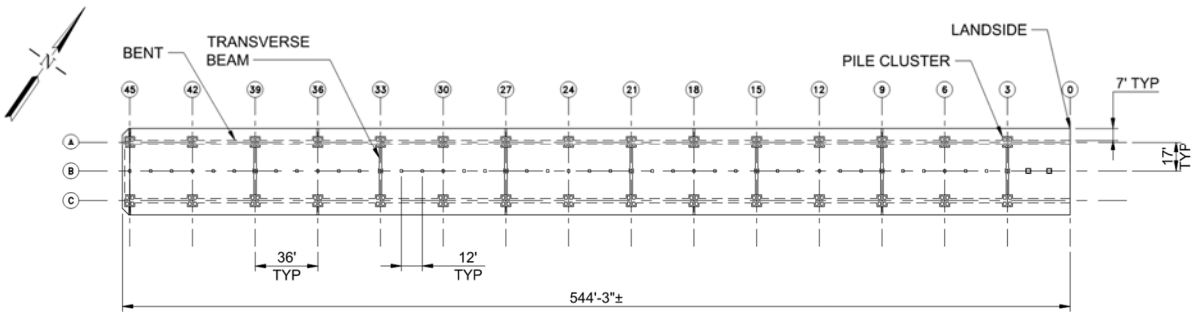



*Figure 2: Typical Finger Pier Layout*

# 5. Load Rating Summary

*Table 4: Load Rating Summary*

| STRUCTURE | Allowable Distributed Live Load (psf) | Governed By |
|---|---|---|
| Graving Basin | **550** | Deck Capacity (bending) |
| Finger Pier | **500**[†] | -- |

[†]Per USACE Port Series No. 31 (2000)

# Appendix A: Graving Basin Load Rating Calculations

| moffatt & nicho | | | | | PAGE OF |
|---|---|---|---|---|---|
| CLIENT: | Port of Richmond | JOB NO.: | 241984 | | |
| PROJECT: | Point Potrero Marine Terminal | DESIGNER: | DBT (D. Taiwo) | DATE: | Jul-25 |
| SUBJECT: | Graving Basin | CHECKER: | JB (J. Brady) | DATE: | 7/20/2025 |
| | Slab Capacity - Transverse Span | | | | |

**BEAM SECTION PROPERTIES**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $b_w$ = | 12 in | $\varepsilon_{cu}$ = | 0.003 | Rebar Type | $f_y$ = | 33 | ksi |
| depth = | 8 in | $E_c$ = | 4030.5 ksi | US/Soft | $\varepsilon_y$ = | 0.00114 | |
| $f_c'$ = | 5 ksi | $\beta_1$ = | 0.80 | Metric | $E_s$ = | 29000 | ksi |
| $\varepsilon_c'$ = | 0.00222 | Total Slot Width = | in | | $d_c$ cover = | 2.00 | in |
| $\phi_f$ = | 0.900 | Total Slot Depth = | in | | side cover = | 2.00 | in |

REINFORCEMENT

FLEXURAL REINFORCEMENT: (Layered reinforcing input from top to bottom)

No. of Layers = 2

| Top/Bot | Layer | No. of Bars | Bar Size (#5,#6,etc) | $A_s$ ($in^2$) | $d_{from\ top}$ (in) |
|---|---|---|---|---|---|
| Top | 1 | 3 | #5 | 0.93 | 1.8125 |
| Bottom | 2 | 2 | #5 | 0.62 | 6.1875 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

If $As_{min}$ = N/A then provided reinforcement meets ACI 318-19 9.6.1.3.

| | | |
|---|---|---|
| $As_{min,\ top}$ = | N/A | $in^2$ |
| $As_{min,\ bottom}$ = | N/A | $in^2$ |
| $As_{max,\ top}$ = | 4.16 | $in^2$ |
| $As_{max,\ bottom}$ = | 4.16 | $in^2$ |

CALCULATED MOMENTS & SUMMARY OF RESULTS

ULTIMATE VALUES:

Calculated Capacity

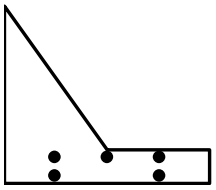
$-\phi Mn$ = **15.10 k-ft**

$+\phi Mn$ = **11.74 k-ft**

Factored Moments from Analysis

$-Mu_{max}$ = k-ft

$+Mu_{max}$ = k-ft



SERVICE VALUES:

Calculated Crack Widths

| | Gergley-Lutz Eqtn | AASHTO 7th Ed. 5.7.3.4 | |
|---|---|---|---|
| $-\omega$ = | 0.0000 | 0.0000 | in |
| $+\omega$ = | 0.0000 | 0.0000 | in |

Service Moments from Analysis

$-Ms_{max}$ = k-ft

$+Ms_{max}$ = k-ft

Tolerable Crack Widths

$\omega_{allow,\ top}$ = 0.006 in

$\omega_{allow,\ bottom}$ = 0.006 in

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: | Port of Richmond | JOB NO.: | 241984 | | |
| PROJECT: | Point Potrero Marine Terminal | DESIGNER: | DBT | DATE: | Jul-25 |
| SUBJECT: | Graving Basin | CHECKER: | JB | DATE: | 7/20/2025 |
| | Slab Capacity - Transverse Span | | | | |

**EVALUATION OF POSITIVE MOMENT CAPACITY:**

ULTIMATE CAPACITY

$M_u$ = k-ft (applied)

CONCRETE COMPRESSION:

c = 1.254 in "d" = 6.1875 in

$a = \beta_1 c$ = 1.003 in z = 0.501 in

$Cc = 0.85 f_c' * b_w * a$ = 51.2 kips (Crane Rail Slot is removed)

FORCES IN REINFORCING: ( '-' COMPRESSION, '+' TENSION)

| Layer | $A_s$ ($in^2$) | $d_{from\ top}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 1 | 0.93 | 1.8125 | 0.001337 | 33.00 | 30.7 | 55.6 |
| 2 | 0.62 | 6.1875 | 0.011806 | 33.00 | 20.5 | 126.6 |

FORCE EQUILIBRIUM:

C = 51.15 kips

T = 51.15 kips

NOMINAL MOMENT CAPACITY:

$\phi Mn$ = 11.74 k-ft

CHECK CRACK WIDTH FOR SERVICEABILITY

$d_c$ = 2.313 in $M_{s,\ max}$ = k-ft (applied)

m = 2 (No. of bars) $\beta$ = 1.391

$A = 2 d_c * b_w / m$ = 27.8 $in^2$ $\beta_s$ = 1.418 AASHTO 7th Ed. - 5.7.3.4

Spacing = 6.125 in/bars

STRESS/STRAIN COMPATIBILITY:

c = 1.555 in A = 1.49328

$\varepsilon_{c,\ max}$ = 0.00000 B = 0.44241

$Cc = 0.5 (f_{c,\ max} * c * b_w)$ = 0.00 kips $f_{c,\ max}$ = 0.000 ksi

$\varepsilon_s$ = 0.00000 $f_{c,\ slot}$ = 0.000 ksi

"d" = 6.1875 in z = 0.518 in

| Layer | $A_s$ ($in^2$) | $d_{from\ top}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 1 | 0.93 | 1.8125 | 0.000000 | 0.00 | 0.0 | 0.0 |
| 2 | 0.62 | 6.1875 | 0.000000 | 0.00 | 0.0 | 0.0 |

FORCE EQUILIBRIUM:

C = 0.00 kips

T = 0.00 kips

SERVICE MOMENT CAPACITY:

Ms = 0.00 k-ft (capacity)

CRACK WIDTH:

Gergley-Lutz Equation

$\omega = 0.076 \beta * f_s * (d_c * A)^{1/3} / 1000$ = 0.0000 in

AASHTO 7th Ed. - 5.7.3.4

$\omega_e = 0.017 * (S + 2 * dc) / 700 * \beta_s * f_{ss}$ = 0.0000 in

$\omega_{allow}$ = 0.006 in

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: | Port of Richmond | JOB NO.: | 241984 | | |
| PROJECT: | Point Potrero Marine Terminal | DESIGNER: | DBT | DATE: | Jul-25 |
| SUBJECT: | Graving Basin | CHECKER: | JB | DATE: | 7/20/2025 |
| | Slab Capacity - Transverse Span | | | | |

**EVALUATION OF NEGATIVE MOMENT CAPACITY:**

ULTIMATE CAPACITY

$M_u$ = k-ft (applied)

CONCRETE COMPRESSION:

c = 1.254 in "d" = 6.1875 in

$a = \beta_1 c$ = 1.003 in

$Cc = 0.85 f_c' * b_w * a$ = 51.2 kips

FORCES IN REINFORCING: ( '-' COMPRESSION, '+' TENSION)

| Layer | $A_s$ ($in^2$) | $d_{from\ bot}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 2 | 0.62 | 1.8125 | 0.001337 | 33.00 | 20.5 | 37.1 |
| 1 | 0.93 | 6.1875 | 0.011806 | 33.00 | 30.7 | 189.9 |

FORCE EQUILIBRIUM:

C = 51.15 kips

T = 51.15 kips

NOMINAL MOMENT CAPACITY:

$\phi Mn$ = 15.099593 k-ft

CHECK CRACK WIDTH FOR SERVICEABILITY

$d_c$ = 2.313 in $M_{s,\ max}$ = k-ft (applied)

m = 3 (No. of bars) $\beta$ = 1.482

$A = 2d_c * (b_w - slot)/m$ = 18.5 $in^2$ $\beta_s$ = 1.418 AASHTO 7th Ed. - 5.7.3.4

Spacing = 3.063 in

STRESS/STRAIN COMPATIBILITY:

c = 2.430 in A = 1.49328

$\varepsilon_{c,\ max}$ = 0.00000 B = 0.44241

$Cc = 0.5(f_{c,\ max} * c * b_w)$ = 0.00 kips $f_{c,\ max}$ = 0.000 ksi

$\varepsilon_s$ = 0.00000 "d" = 6.1875 in

| Layer | $A_s$ ($in^2$) | $d_{from\ bot}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 2 | 0.62 | 1.8125 | 0.000000 | 0.00 | 0.0 | 0.0 |
| 1 | 0.93 | 6.1875 | 0.000000 | 0.00 | 0.0 | 0.0 |

FORCE EQUILIBRIUM:

C = 0.00 kips

T = 0.00 kips

SERVICE MOMENT CAPACITY:

Ms = 0.00 k-ft (capacity)

CRACK WIDTH:

Gergley-Lutz Equation

$\omega = 0.076\beta * f_s * (d_c * A)^{1/3}/1000$ = 0.0000 in

AASHTO 7th Ed. - 5.7.3.4

$\omega_e = 0.017 * (S + 2*dc)/700 * \beta_s * f_{ss}$ = 0.0000 in

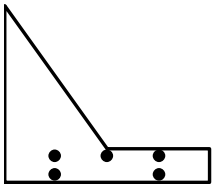
$\omega_{allow}$ = 0.006 in

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: | Port of Richmond | JOB NO.: | 241984 | | |
| PROJECT: | Point Potrero Marine Terminal | DESIGNER: | DBT | DATE: | Jul-25 |
| SUBJECT: | Graving Basin | CHECKER: | JB | DATE: | Jul-25 |
| | Slab Capacity - Transverse Span | | | | |

**BEAM SECTION PROPERTIES**

$b_w$ = 12 in
depth = 8 in
$f_c'$ = 5 ksi
$f_y$ = 33 ksi

$\phi_s$ = 0.75
$L_n$ = 138 in
Beam Shear Design: NORMAL BEAM SHEAR



REINFORCEMENT

SHEAR REINFORCEMENT:

VERTICAL:
No. of Stirrup Legs =
Bar Size (#4,#5,etc) = #5
Stirrup Spacing = 12.00 in
$A_v/s$ = in²/ft

*HORIZONTAL:
No. of Bars Ea. Layer =
Bar Size (#4,#5,etc) = #5
Horiz. Bar Spacing = 6.00 in
$A_{vh}/s_2$ = in²/ft

$(A_v/s)_{reqd}$ = None in²/ft
$(A_v/s)_{min}$ = 0.231 in²/ft
$s_{max}$ = 3.09 in

$(A_{vh}/s_2)_{min}$ = N/A in²/ft
$s_{2max}$ = N/A in

TOTAL SHEAR REINFOCEMENT RATIO (ACI 318-14 23.5.3): (DEEP BEAM SHEAR DESIGN)
Angle of Inclination = 5.00 (5.0 <= $\gamma_1$ <= 65.0)
$\Sigma A_{si}/bs$ (sin $\gamma_i$) = **N/A**

APPLIED SHEAR AND MOMENTS & SUMMARY OF RESULTS

ULTIMATE VALUES:
**$\phi V_n$ = 6.39 kips**
**$Vu_{max}$ = kips**
$Nu_v$ = kips (Compression is positive)

Notes: * Bottom flexural reinforcement must be fully developed at supports per code requirements (ACI 318-14 9.9.4.5).

This analysis does not include a design check of the stresses associated with the tension tie that would be a part of Strut-&-Tie Modeling as reinforcement for crack control in flexural design typically controls.

**EVALUATION OF SHEAR CAPACITY:**

APPLIED SHEAR = kips ASSOC. AXIAL = k-ft

NORMAL BEAM SHEAR CAPACITY: (ACI 318-19 22.5.5.1)

$Vc = [2.0*\lambda*(f'_c)^{1/2}+N_u/(6*A_g)]*b_w*d$ = 10.50 kips (a) When Av >= $Av_{min}$

$Vc = [8.0*\lambda*(\rho_w)^{1/3}*(f'_c)^{1/2}+N_u/(6*A_g)]*b_w*d$ = 8.52 kips (b) When Av >= $Av_{min}$

$Vc = [8.0*\lambda_s*\lambda*(\rho_w)^{1/3}*(f'_c)^{1/2}+N_u/(6*A_g)]*b_w*d$ = 8.52 kips (c) When Av < $Av_{min}$

$Vc_{max} = [5.0*\lambda*(f'_c)^{1/2}]*b_w*d$ = 26.25 kips (22.5.5.1.1)

$Nu/(6*A_g) <= 0.05*f'c$ = psi (22.5.5.1.2)

$\lambda_s = (2/(1+d/10))^{1/2}$ = 1.0000 (22.5.5.1.3)

Top Steel Ratio $\rho_w = As/(b_w*d)$ = 0.0125 Use minimum steel ratio for

Bottom Steel Ratio $\rho_w = As/(b_w*d)$ = 0.0084 equations b and c

STIRRUP REINFORCEMENT SHEAR CAPACITY: (ACI 318-19 22.5.8.5.3)

$(A_v/s)_{reqd} = (Vu - \phi Vc)/(\phi f_y d)$ = None $in^2/ft$

$Vs = MIN(A_v/s\ (f_y*d), 8(f'_c)^{1/2}*b_w*d)$ = kips

MINIMUM REINFORCEMENT: (ACI 318-19 9.6.3)

$(A_v/s)_{min} = 0.75*(f'_c)^{1/2}*b_w/f_y$ (>= $50*b_w/f_y$) = 0.231 $in^2/ft$ (Table 9.6.3.4)

Smax = MIN(d/2, 24in) = 3.09 in (ACI 318-14 9.7.6.2.2)

ULTIMATE SHEAR CAPACITY:

$\phi Vn = \phi(Vc + Vs)$ = 6.39 kips Where Vc is from equation c

DEEP BEAM SHEAR CAPACITY: (ACI 318-19 9.9)

$L_n/depth$ = 17.25

MAXIMUM SHEAR STRENGTH LIMITATION: (ACI 318-19 9.9.2.1)

$Vn_{max} <= 10*(f'_c)^{1/2}*b_w*d$ = 52.50 kips

MINIMUM REINFORCEMENT: (ACI 318-19 9.9.3.1 & 9.9.4.3)

$(A_v/s)_{min} = 0.0025*b_w$ = 0.360 $in^2/ft$

$s_{max} = MIN(d/5, 12in)$ = 1.24 in

$(A_{vh}/s_2)_{min} = 0.0025*b_w$ = 0.360 $in^2/ft$

$s_{2max} = MIN(d/5, 12in)$ = 1.24 in

CHECK WORST CASE COMBINED SHEAR REINFORCEMENT RATIO: (ACI 318-14 23.5.3)

$\gamma_1$ = 5.00 Degrees $\gamma_2$ = 85.00 Degrees

HORIZONTAL SHEAR REINFORCEMENT RATIO:

$A_{vh}/bs_2(\sin \gamma_2)$ =

VERTICAL SHEAR REINFORCEMENT RATIO:

$A_v/bs(\sin \gamma_1)$ =

$\Sigma A_{si}/bs\ (\sin \gamma_i)$ = < 0.003 - UNACCEPTABLE!

| moffatt & nicho | | | | | PAGE | OF |
|---|---|---|---|---|---|---|
| CLIENT: | Port of Richmond | JOB NO.: | 241984 | | | |
| PROJECT: | Point Potrero Marine Terminal | DESIGNER: | DBT | DATE: | Jul-25 | |
| SUBJECT: | Graving Basin | CHECKER: | JB | DATE: | Jul-25 | |
| | Slab Capacity - Longitudinal Span | | | | | |

**BEAM SECTION PROPERTIES**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $b_w$ = | 12 in | $\varepsilon_{cu}$ = | 0.003 | Rebar Type | $f_y$ = | 33 | ksi |
| depth = | 8 in | $E_c$ = | 4030.5 ksi | US/Soft | $\varepsilon_y$ = | 0.00114 | |
| $f_c'$ = | 5 ksi | $\beta_1$ = | 0.80 | Metric | $E_s$ = | 29000 | ksi |
| $\varepsilon_c'$ = | 0.00222 | Total Slot Width = | in | | $d_c$ cover = | 2.00 | in |
| $\phi_f$ = | 0.900 | Total Slot Depth = | in | | side cover = | 2.00 | in |

REINFORCEMENT

FLEXURAL REINFORCEMENT: (Layered reinforcing input from top to bottom)

No. of Layers = 2

| Top/Bot | Layer | No. of Bars | Bar Size (#5,#6,etc) | $A_s$ ($in^2$) | $d_{from\ top}$ (in) |
|---|---|---|---|---|---|
| Top | 1 | 4 | #5 | 1.24 | 1.8125 |
| Bottom | 2 | 3 | #5 | 0.93 | 6.1875 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

If $As_{min}$ = N/A then provided reinforcement meets ACI 318-19 9.6.1.3.

| | | |
|---|---|---|
| $As_{min,\ top}$ = | N/A | $in^2$ |
| $As_{min,\ bottom}$ = | N/A | $in^2$ |
| $As_{max,\ top}$ = | 4.16 | $in^2$ |
| $As_{max,\ bottom}$ = | 4.16 | $in^2$ |

CALCULATED MOMENTS & SUMMARY OF RESULTS

ULTIMATE VALUES:

Calculated Capacity

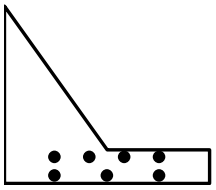
$-\phi Mn$ = **18.93 k-ft**

$+\phi Mn$ = **15.52 k-ft**

Factored Moments from Analysis

$-Mu_{max}$ = k-ft

$+Mu_{max}$ = k-ft



SERVICE VALUES:

Calculated Crack Widths

| | Gergley-Lutz Eqtn | AASHTO 7th Ed. 5.7.3.4 | |
|---|---|---|---|
| $-\omega$ = | 0.0000 | 0.0000 | in |
| $+\omega$ = | 0.0000 | 0.0000 | in |

Service Moments from Analysis

$-Ms_{max}$ = k-ft

$+Ms_{max}$ = k-ft

Tolerable Crack Widths

$\omega_{allow,\ top}$ = 0.006 in

$\omega_{allow,\ bottom}$ = 0.006 in

**EVALUATION OF POSITIVE MOMENT CAPACITY:**

ULTIMATE CAPACITY

$M_u$ = k-ft (applied)

CONCRETE COMPRESSION:

c = 1.439 in "d" = 6.1875 in

$a = \beta_1 c$ = 1.151 in z = 0.576 in

$Cc = 0.85 f_c' * b_w * a$ = 58.7 kips (Crane Rail Slot is removed)

FORCES IN REINFORCING: ( '-' COMPRESSION, '+' TENSION)

| Layer | $A_s$ ($in^2$) | $d_{from\ top}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 1 | 1.24 | 1.8125 | 0.000779 | 22.59 | 28.0 | 50.8 |
| 2 | 0.93 | 6.1875 | 0.009901 | 33.00 | 30.7 | 189.9 |

FORCE EQUILIBRIUM:

C = 58.71 kips

T = 58.71 kips

NOMINAL MOMENT CAPACITY:

$\phi Mn$ = 15.52 k-ft

CHECK CRACK WIDTH FOR SERVICEABILITY

$d_c$ = 2.313 in $M_{s,\ max}$ = k-ft (applied)

m = 3 (No. of bars) $\beta$ = 1.364

$A = 2 d_c * b_w / m$ = 18.5 $in^2$ $\beta_s$ = 1.418 AASHTO 7th Ed. - 5.7.3.4

Spacing = 3.063 in/bars

STRESS/STRAIN COMPATIBILITY:

c = 1.206 in A = 1.49328

$\varepsilon_{c,\ max}$ = 0.00000 B = 0.44241

$Cc = 0.5 (f_{c,\ max} * c * b_w)$ = 0.00 kips $f_{c,\ max}$ = 0.000 ksi

$\varepsilon_s$ = 0.00000 $f_{c,\ slot}$ = 0.000 ksi

"d" = 6.1875 in z = 0.402 in

| Layer | $A_s$ ($in^2$) | $d_{from\ top}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 1 | 1.24 | 1.8125 | 0.000000 | 0.00 | 0.0 | 0.0 |
| 2 | 0.93 | 6.1875 | 0.000000 | 0.00 | 0.0 | 0.0 |

FORCE EQUILIBRIUM:

C = 0.00 kips

T = 0.00 kips

SERVICE MOMENT CAPACITY:

Ms = 0.00 k-ft (capacity)

CRACK WIDTH:

Gergley-Lutz Equation

$\omega = 0.076 \beta * f_s * (d_c * A)^{1/3} / 1000$ = 0.0000 in

AASHTO 7th Ed. - 5.7.3.4

$\omega_e = 0.017 * (S + 2 * dc) / 700 * \beta_s * f_{ss}$ = 0.0000 in

$\omega_{allow}$ = 0.006 in

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: | Port of Richmond | JOB NO.: | 241984 | | |
| PROJECT: | Point Potrero Marine Terminal | DESIGNER: | DBT | DATE: | Jul-25 |
| SUBJECT: | Graving Basin | CHECKER: | JB | DATE: | Jul-25 |
| | Slab Capacity - Longitudinal Span | | | | |

**EVALUATION OF NEGATIVE MOMENT CAPACITY:**

ULTIMATE CAPACITY

$M_u$ = k-ft (applied)

CONCRETE COMPRESSION:

c = 1.468 in "d" = 6.1875 in

$a = \beta_1 c$ = 1.174 in

$Cc = 0.85 f_c' * b_w * a$ = 59.9 kips

FORCES IN REINFORCING: ( '-' COMPRESSION, '+' TENSION)

| Layer | $A_s$ ($in^2$) | $d_{from\ bot}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 2 | 0.93 | 1.8125 | 0.000704 | 20.41 | 19.0 | 34.4 |
| 1 | 1.24 | 6.1875 | 0.009644 | 33.00 | 40.9 | 253.2 |

FORCE EQUILIBRIUM:

C = 59.90 kips

T = 59.90 kips

NOMINAL MOMENT CAPACITY:

$\phi Mn$ = 18.931254 k-ft

CHECK CRACK WIDTH FOR SERVICEABILITY

$d_c$ = 2.313 in $M_{s,\ max}$ = k-ft (applied)

m = 4 (No. of bars) $\beta$ = 1.586

$A = 2d_c * (b_w - slot)/m$ = 13.9 $in^2$ $\beta_s$ = 1.418 AASHTO 7th Ed. - 5.7.3.4

Spacing = 2.042 in

STRESS/STRAIN COMPATIBILITY:

c = 3.094 in A = 1.49328

$\varepsilon_{c,\ max}$ = 0.00000 B = 0.44241

$Cc = 0.5(f_{c,\ max} * c * b_w)$ = 0.00 kips $f_{c,\ max}$ = 0.000 ksi

$\varepsilon_s$ = 0.00000 "d" = 6.1875 in

| Layer | $A_s$ ($in^2$) | $d_{from\ bot}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 2 | 0.93 | 1.8125 | 0.000000 | 0.00 | 0.0 | 0.0 |
| 1 | 1.24 | 6.1875 | 0.000000 | 0.00 | 0.0 | 0.0 |

FORCE EQUILIBRIUM:

C = 0.00 kips

T = 0.00 kips

SERVICE MOMENT CAPACITY:

Ms = 0.00 k-ft (capacity)

CRACK WIDTH:

Gergley-Lutz Equation

$\omega = 0.076\beta * f_s * (d_c * A)^{1/3}/1000$ = 0.0000 in

AASHTO 7th Ed. - 5.7.3.4

$\omega_e = 0.017 * (S + 2*dc)/700 * \beta_s * f_{ss}$ = 0.0000 in

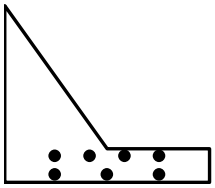
$\omega_{allow}$ = 0.006 in

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: | Port of Richmond | JOB NO.: | 241984 | | |
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| | Slab Capacity - Longitudinal Span | | | | |

**BEAM SECTION PROPERTIES**

$b_w$ = 12 in
depth = 8 in
$f_c'$ = 5 ksi
$f_y$ = 33 ksi

$\phi_s$ = 0.75
$L_n$ = 138 in
Beam Shear Design: NORMAL BEAM SHEAR



REINFORCEMENT

SHEAR REINFORCEMENT:

VERTICAL:

No. of Stirrup Legs =
Bar Size (#4,#5,etc) = #5
Stirrup Spacing = 12.00 in
$A_v/s$ = in$^2$/ft

*HORIZONTAL:

No. of Bars Ea. Layer =
Bar Size (#4,#5,etc) = #5
Horiz. Bar Spacing = 6.00 in
$A_{vh}/s_2$ = in$^2$/ft

| | | | | | |
|---|---|---|---|---|---|
| $(A_v/s)_{reqd}$ = | None | in$^2$/ft | $(A_{vh}/s_2)_{min}$ = | N/A | in$^2$/ft |
| $(A_v/s)_{min}$ = | 0.231 | in$^2$/ft | $s_{2max}$ = | N/A | in |
| $s_{max}$ = | 3.09 | in | | | |

TOTAL SHEAR REINFOCEMENT RATIO (ACI 318-14 23.5.3): (DEEP BEAM SHEAR DESIGN)

Angle of Inclination = 5.00 (5.0 <= $\gamma_1$ <= 65.0)

$\Sigma A_{si}/bs$ (sin $\gamma_i$) = **N/A**

APPLIED SHEAR AND MOMENTS & SUMMARY OF RESULTS

ULTIMATE VALUES:

**$\phi$Vn = 7.32 kips**

**$Vu_{max}$ = kips**

$Nu_v$ = kips (Compression is positive)

Notes: * Bottom flexural reinforcement must be fully developed at supports per code requirements (ACI 318-14 9.9.4.5).

This analysis does not include a design check of the stresses associated with the tension tie that would be a part of Strut-&-Tie Modeling as reinforcement for crack control in flexural design typically controls.

**EVALUATION OF SHEAR CAPACITY:**

APPLIED SHEAR = kips ASSOC. AXIAL = k-ft

NORMAL BEAM SHEAR CAPACITY: (ACI 318-19 22.5.5.1)

$Vc = [2.0*\lambda*(f'_c)^{1/2}+N_u/(6*A_g)]*b_w*d$ = 10.50 kips (a) When Av >= $Av_{min}$

$Vc = [8.0*\lambda*(\rho_w)^{1/3}*(f'_c)^{1/2}+N_u/(6*A_g)]*b_w*d$ = 9.75 kips (b) When Av >= $Av_{min}$

$Vc = [8.0*\lambda_s*\lambda*(\rho_w)^{1/3}*(f'_c)^{1/2}+N_u/(6*A_g)]*b_w*d$ = 9.75 kips (c) When Av < $Av_{min}$

$Vc_{max} = [5.0*\lambda*(f'_c)^{1/2}]*b_w*d$ = 26.25 kips (22.5.5.1.1)

$Nu/(6*A_g) <= 0.05*f'c$ = psi (22.5.5.1.2)

$\lambda_s = (2/(1+d/10))^{1/2}$ = 1.0000 (22.5.5.1.3)

Top Steel Ratio $\rho_w = As/(b_w*d)$ = 0.0167 Use minimum steel ratio for

Bottom Steel Ratio $\rho_w = As/(b_w*d)$ = 0.0125 equations b and c

STIRRUP REINFORCEMENT SHEAR CAPACITY: (ACI 318-19 22.5.8.5.3)

$(A_v/s)_{reqd} = (Vu - \phi Vc)/(\phi f_y d)$ = None $in^2/ft$

$Vs = MIN(A_v/s\ (f_y*d), 8(f'_c)^{1/2}*b_w*d)$ = kips

MINIMUM REINFORCEMENT: (ACI 318-19 9.6.3)

$(A_v/s)_{min} = 0.75*(f'_c)^{1/2}*b_w/f_y$ (>= $50*b_w/f_y$) = 0.231 $in^2/ft$ (Table 9.6.3.4)

Smax = MIN(d/2, 24in) = 3.09 in (ACI 318-14 9.7.6.2.2)

ULTIMATE SHEAR CAPACITY:

$\phi Vn = \phi(Vc + Vs)$ = 7.32 kips Where Vc is from equation c

DEEP BEAM SHEAR CAPACITY: (ACI 318-19 9.9)

$L_n/depth$ = 17.25

MAXIMUM SHEAR STRENGTH LIMITATION: (ACI 318-19 9.9.2.1)

$Vn_{max} <= 10*(f'_c)^{1/2}*b_w*d$ = 52.50 kips

MINIMUM REINFORCEMENT: (ACI 318-19 9.9.3.1 & 9.9.4.3)

$(A_v/s)_{min} = 0.0025*b_w$ = 0.360 $in^2/ft$

$s_{max} = MIN(d/5, 12in)$ = 1.24 in

$(A_{vh}/s_2)_{min} = 0.0025*b_w$ = 0.360 $in^2/ft$

$s_{2max} = MIN(d/5, 12in)$ = 1.24 in

CHECK WORST CASE COMBINED SHEAR REINFORCEMENT RATIO: (ACI 318-14 23.5.3)

$\gamma_1$ = 5.00 Degrees $\gamma_2$ = 85.00 Degrees

HORIZONTAL SHEAR REINFORCEMENT RATIO:

$A_{vh}/bs_2(\sin \gamma_2)$ =

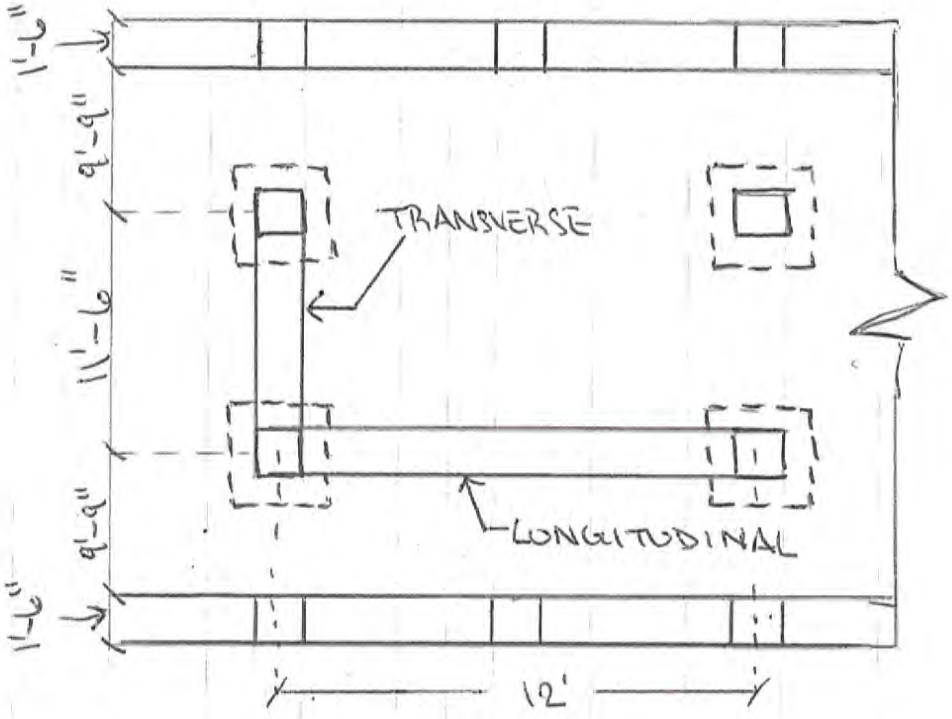
VERTICAL SHEAR REINFORCEMENT RATIO:

$A_v/bs(\sin \gamma_1)$ =

$\Sigma A_{si}/bs\ (\sin \gamma_i)$ = < 0.003 - UNACCEPTABLE!

| | | | |
|---|---|---|---|
| moffatt & nichol | CLIENT PORT OF RICHMOND | JOB NO. 241984 | |
| | PROJECT PPMT | SHEET 1 OF 3 | |
| | DESIGN FOR SLAB CAPACITY GRAVING BASINS | DESIGNER DBT | DATE JUL 2025 |
| | | CHECKER JB | DATE JUL 2025 |

Calculate: Allowable uniform live load




Note:

① Assume $M_u^+ = \frac{wl^2}{9}$

- Simply supported beam, $M_u = \frac{wl^2}{8}$ (too conservative)
- Continuous beam (3) equal spans
  $M_u^+ = 0.08wl^2$

$$0.08wl^2 < \frac{wl^2}{9} < \frac{wl^2}{8}$$

① Transverse Span, Bending Capacity

$\phi M_n = 11.74$ kip-ft/ft (from spreadsheet)

$\phi M_n \geq \frac{wl^2}{9}$ → $l = 10'$ (clear span)

$w$: $1.2DL + 1.6LL$

$DL: \underbrace{\left(150 \text{ pcf} \times \frac{8''}{12}\right)}_{\text{concrete}} + \underbrace{\left(145 \text{ pcf} \times \frac{2''}{12}\right)}_{\text{asphalt}}$

$DL: 0.124$ ksf

$11.74 \text{ k-ft/ft} \geq [1.2(0.124 \text{ ksf}) + 1.6(LL)] \times \frac{(10 \text{ ft})^2}{9}$

$1.056 \text{ ksf} \geq 0.1488 \text{ ksf} + 1.6(LL)$

$LL \leq 0.567$ ksf → say | LL < 550 psf |

② Transverse Span, Shear Capacity

$\phi V_n = 6.39$ kip/ft of slab (from spreadsheet)

$\phi V_n \geq (1.2DL + 1.6LL) \times \frac{l}{2}$

$DL = 0.124$ ksf

$l = 10$ ft

$6.39 \text{ k/ft} \geq [1.2(0.124 \text{ ksf}) + 1.6LL] \times \frac{10 \text{ ft}}{2}$

$1.1292 \text{ ksf} \geq 1.6LL$

$LL < 706$ psf → say | LL < 700 psf |

③ Longitudinal Span, Bending Capacity

$\phi M_n$ = 15.52 k-ft/ft (from spreadsheet)

$$15.52 \text{ k-ft/ft} \geq [1.2(0.124 \text{ ksf}) + 1.6(LL)] \times \frac{(10.5 \text{ ft})^2}{9}$$

$$LL \leq \frac{0.69}{0.78} \text{ ksf} \rightarrow \text{say } \boxed{LL < 650 \text{ psf}}$$

④ Longitudinal Span, Shear Capacity

$\phi V_n$ = 7.32 kip/ft of slab (from spreadsheet)

$$7.32 \text{ k-ft/ft} \geq [1.2(0.124 \text{ ksf}) + 1.6LL] \times \frac{10.5 \text{ ft}}{2}$$

$$LL < 0.78 \text{ ksf} \rightarrow \text{say } \boxed{LL < 750 \text{ psf}}$$

**Methodology:**

The following calculations follow the provisions of ACI 318−19 to check the two−way shear (punching shear) capacity of the concrete slab at the Graving Basin structures.

**Material Properties:**

$f'_c = 5000\text{psi}$ — Concrete compressive strength, per ACI 318−41, Table 302(a)

**Deck Dimensions:**

$h = 8\text{in}$ — Deck slab thickness

$c_c = \frac{3}{4}\text{in}$ — Concrete cover

$d_v = \text{bar}_5 = 0.63 \cdot \text{in}$ — Shear reinforcing, #5 at 12″ spacing

$d_l = \text{bar}_4 = 0.50 \cdot \text{in}$ — Longitudinal reinforcing, #4 at 12″ spacing

$d = h - c_c - d_v - \frac{d_l}{2} = 6 \cdot \text{in}$ — Distance from extreme compression fiber to centroid of of longitudinal tension reinforcement

$\lambda = 1$ — Modification factor, assume normalweight concrete, 19.2.4.3

$\lambda_s = \min\left(1, \sqrt{\frac{2}{1 + \frac{d}{10\text{in}}}}\right) = 1.00$ — Size effect factor, 22.5.5.1.3

**Punching Shear Calculations:**

$\beta = 1$ — Ratio of long side to short side of effective loaded area, assume square loaded area

*Interior Column:*

$s_{col} = 18\text{in}$ — Square column dimensions

$s_{cap} = 5.5\text{ft}$ — Square capital dimenisons

$\alpha_s = 40$ — Value of $\alpha_s$ for interior columns, 22.6.5.3

$b_o = 4 \cdot (s_{cap} + d) = 290 \cdot \text{in}$ — Critical section perimeter for interior column, 22.6.4.1a

$$V_{c.int} = \min\left[\begin{array}{l} 4\cdot\lambda\cdot\lambda_s\cdot\sqrt{f'_c\cdot psi}\cdot b_o\cdot d \\ \left(2+\frac{4}{\beta}\right)\cdot\lambda_s\cdot\lambda\cdot\sqrt{f'_c\cdot psi}\cdot b_o\cdot d \\ \left(2+\frac{\alpha_s\cdot d}{b_o}\right)\cdot\lambda_s\cdot\lambda\cdot\sqrt{f'_c\cdot psi}\cdot b_o\cdot d \end{array}\right] = 376\cdot kip$$

Punching shear strength, Table 22.6.5.2

**Two–Way Shear Strength:**

$\phi_v = 0.75$ Strength reduction factor, Section 21.2

$\boxed{\phi V_c = \phi_v\cdot V_{c.int} = 282\cdot kip}$ Nominal strength for two–way members

**Allowable Distributed Live Load:**

$\phi V_c \geq 1.2(Dead) + 1.6(Live)$

$A_{trib} = 12ft\cdot 12ft = 144ft^2$ Tributary area

$\gamma_c = 150pcf$ Concrete unit weight

$h = 8\cdot in$ Deck thickness

$\gamma_a = 145pcf$ Asphalt unit weight

$t_a = 2in$ Asphalt overlay thickness

$Dead = \left(\gamma_c\cdot h + \gamma_a\cdot t_a\right)\cdot A_{trib} = 18\cdot kip$ Dead load acting over tributary area

$$Live = \frac{\left(\phi V_c - 1.2\cdot Dead\right)}{1.6} = 163\cdot kip$$

Allowable concentrated live load

$$LL = \frac{Live}{A_{trib}} = 1131\cdot psf$$

Allowable distributed live load

$\boxed{LL < 1100\ psf}$

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: | Port of Richmond | JOB NO.: | 241984 | | |
| PROJECT: | Point Potrero Marine Terminal | DESIGNER: | DBT | DATE: | Jul-25 |
| SUBJECT: | Graving Basin | CHECKER: | JB | DATE: | |
| | Edge Beam Capacity | | | | |

**BEAM SECTION PROPERTIES**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $b_w$ = | 18 in | $\varepsilon_{cu}$ = | 0.003 | Rebar Type | $f_y$ = | 33 | ksi |
| depth = | 24 in | $E_c$ = | 3490.5 ksi | US/Soft | $\varepsilon_y$ = | 0.00114 | |
| $f_c'$ = | 3.75 ksi | $\beta_1$ = | 0.85 | Metric | $E_s$ = | 29000 | ksi |
| $\varepsilon_c'$ = | 0.00208 | Total Slot Width = | in | | $d_c$ cover = | 2.00 | in |
| $\phi_f$ = | 0.900 | Total Slot Depth = | in | | side cover = | 2.00 | in |

REINFORCEMENT

FLEXURAL REINFORCEMENT: (Layered reinforcing input from top to bottom)

No. of Layers = 2

| Top/Bot | Layer | No. of Bars | Bar Size (#5,#6,etc) | $A_s$ ($in^2$) | $d_{from\ top}$ (in) |
|---|---|---|---|---|---|
| Top | 1 | 2 | #9 | 2.00 | 2.064 |
| Bottom | 2 | 2 | #14 | 4.50 | 21.936 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

If $As_{min}$ = N/A then provided reinforcement meets ACI 318-19 9.6.1.3.

| | | |
|---|---|---|
| $As_{min,\ top}$ = | N/A | $in^2$ |
| $As_{min,\ bottom}$ = | N/A | $in^2$ |
| $As_{max,\ top}$ = | 17.63 | $in^2$ |
| $As_{max,\ bottom}$ = | 17.63 | $in^2$ |

CALCULATED MOMENTS & SUMMARY OF RESULTS

ULTIMATE VALUES:

Calculated Capacity

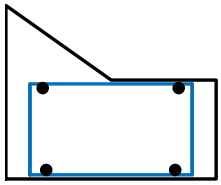
$-\phi Mn$ = **107.14 k-ft**

$+\phi Mn$ = **230.49 k-ft**

Factored Moments from Analysis

$-Mu_{max}$ = k-ft

$+Mu_{max}$ = k-ft



SERVICE VALUES:

Calculated Crack Widths

| | Gergley-Lutz Eqtn | AASHTO 7th Ed. 5.7.3.4 | |
|---|---|---|---|
| $-\omega$ = | 0.0000 | 0.0000 | in |
| $+\omega$ = | 0.0000 | 0.0000 | in |

Service Moments from Analysis

$-Ms_{max}$ = k-ft

$+Ms_{max}$ = k-ft

Tolerable Crack Widths

$\omega_{allow,\ top}$ = 0.006 in

$\omega_{allow,\ bottom}$ = 0.006 in

**EVALUATION OF POSITIVE MOMENT CAPACITY:**

ULTIMATE CAPACITY

$M_u$ = k-ft (applied)

CONCRETE COMPRESSION:

c = 2.465 in "d" = 21.936 in

$a = \beta_1 c$ = 2.095 in z = 1.048 in

$Cc = 0.85\ f_c' * b_w * a$ = 120.2 kips (Crane Rail Slot is removed)

FORCES IN REINFORCING: ( '-' COMPRESSION, '+' TENSION)

| Layer | $A_s$ ($in^2$) | $d_{from\ top}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 1 | 2.00 | 2.064 | 0.000488 | -14.15 | -28.3 | -58.4 |
| 2 | 4.50 | 21.936 | 0.023699 | 33.00 | 148.5 | 3257.5 |

FORCE EQUILIBRIUM:

C = 148.50 kips

T = 148.50 kips

NOMINAL MOMENT CAPACITY:

$\phi Mn$ = 230.49 k-ft

CHECK CRACK WIDTH FOR SERVICEABILITY

$d_c$ = 2.847 in $M_{s,\ max}$ = k-ft (applied)

m = 2 (No. of bars) $\beta$ = 1.145

$A = 2d_c * b_w / m$ = 51.2 $in^2$ $\beta_s$ = 1.134 AASHTO 7th Ed. - 5.7.3.4

Spacing = 11.057 in/bars

STRESS/STRAIN COMPATIBILITY:

c = 7.661 in A = #N/A

$\varepsilon_{c,\ max}$ = 0.00000 B = #N/A

$Cc = 0.5(f_{c,\ max} * c * b_w)$ = 0.00 kips $f_{c,\ max}$ = 0.000 ksi

$\varepsilon_s$ = 0.00000 $f_{c,\ slot}$ = 0.000 ksi

"d" = 21.936 in z = 2.554 in

| Layer | $A_s$ ($in^2$) | $d_{from\ top}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 1 | 2.00 | 2.064 | 0.000000 | 0.00 | 0.0 | 0.0 |
| 2 | 4.50 | 21.936 | 0.000000 | 0.00 | 0.0 | 0.0 |

FORCE EQUILIBRIUM:

C = 0.00 kips

T = 0.00 kips

SERVICE MOMENT CAPACITY:

Ms = 0.00 k-ft (capacity)

CRACK WIDTH:

Gergley-Lutz Equation

$\omega = 0.076\beta * f_s * (d_c * A)^{1/3} / 1000$ = 0.0000 in

AASHTO 7th Ed. - 5.7.3.4

$\omega_e = 0.017 * (S + 2*dc) / 700 * \beta_s * f_{ss}$ = 0.0000 in

$\omega_{allow}$ = 0.006 in

**EVALUATION OF NEGATIVE MOMENT CAPACITY:**

ULTIMATE CAPACITY

$M_u$ = k-ft (applied)

CONCRETE COMPRESSION:

c = 1.926 in "d" = 21.936 in

$a = \beta_1 c$ = 1.637 in

$Cc = 0.85 f_c' * b_w * a$ = 94.0 kips

FORCES IN REINFORCING: ( '-' COMPRESSION, '+' TENSION)

| Layer | $A_s$ ($in^2$) | $d_{from\ bot}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 2 | 4.50 | 2.064 | 0.000214 | 6.21 | 28.0 | 57.7 |
| 1 | 2.00 | 21.936 | 0.031160 | 33.00 | 66.0 | 1447.8 |

FORCE EQUILIBRIUM:

C = 93.95 kips

T = 93.95 kips

NOMINAL MOMENT CAPACITY:

$\phi Mn$ = 107.14087 k-ft

CHECK CRACK WIDTH FOR SERVICEABILITY

$d_c$ = 2.564 in $M_{s,\ max}$ = k-ft (applied)

m = 2 (No. of bars) $\beta$ = 1.121

$A = 2d_c * (b_w - slot)/m$ = 46.2 $in^2$ $\beta_s$ = 1.134 AASHTO 7th Ed. - 5.7.3.4

Spacing = 11.622 in

STRESS/STRAIN COMPATIBILITY:

c = 4.889 in A = #N/A

$\varepsilon_{c,\ max}$ = 0.00000 B = #N/A

$Cc = 0.5(f_{c,\ max} * c * b_w)$ = 0.00 kips $f_{c,\ max}$ = 0.000 ksi

$\varepsilon_s$ = 0.00000 "d" = 21.936 in

| Layer | $A_s$ ($in^2$) | $d_{from\ bot}$ (in) | Strain $\varepsilon_s$ | Stress $f_s$ (ksi) | Force (kips) | Moment (k-in) |
|---|---|---|---|---|---|---|
| 2 | 4.50 | 2.064 | 0.000000 | 0.00 | 0.0 | 0.0 |
| 1 | 2.00 | 21.936 | 0.000000 | 0.00 | 0.0 | 0.0 |

FORCE EQUILIBRIUM:

C = 0.00 kips

T = 0.00 kips

SERVICE MOMENT CAPACITY:

Ms = 0.00 k-ft (capacity)

CRACK WIDTH:

Gergley-Lutz Equation

$\omega = 0.076\beta * f_s * (d_c * A)^{1/3}/1000$ = 0.0000 in

AASHTO 7th Ed. - 5.7.3.4

$\omega_e = 0.017 * (S+2*dc)/700 * \beta_s * f_{ss}$ = 0.0000 in

$\omega_{allow}$ = 0.006 in

| moffatt & nichol | CLIENT Port of Richmond | JOB NO. 241984 | |
|---|---|---|---|
| | PROJECT PPMT | SHEET 1 OF 1 | |
| | DESIGN FOR Beam Capacity Graving Basins | DESIGNER DBT | DATE July 2025 |
| | | CHECKER JB | DATE July 2025 |

FIND: Uniform live load (allowable) per edge beam capacity

① Beam Capacity, Bending

$\phi M_n = 230$ k-ft/ft (from spreadsheet)

$\phi M_n \geq \frac{w l^2}{8}$ : $l = 6'$ (beam span)

$w$: $1.2DL + 1.6LL$

$DL = \underbrace{\left(150 pcf \times \frac{24"}{12}\right)}_{\text{concrete}} + \underbrace{\left(145 pcf \times \frac{2"}{12}\right)}_{\text{asphalt}}$

$DL = 0.324$ ksf

$51$ ksf $\geq 1.2(0.324$ ksf$) + 1.6LL$

$LL < 31.7$ ksf → say $\boxed{LL < 31{,}000 \text{ psf}}$

② Beam Capacity, Shear

Note: The following calculations do not consider shear steel.

$V_c = 2 \cdot \lambda \cdot \sqrt{f'_c} \cdot b_w \cdot d$ (ACI 318-19, 22.5.5.1)

$\lambda = 1.0$ (normalweight concrete)

$f'_c = 3750$ psi

$b_w = 18$ in $\quad d = 24$ in

$V_c = 53$ kip/ft → $\phi V_c = 0.75 \times 53$ kip/ft $= 39.7$ k/ft

$\phi V_c \geq [(1.2 \times 0.324$ ksf$) + 1.6LL] \times \frac{l}{2}$

$12.8$ ksf $\geq 1.6LL$

$LL < 8.02$ ksf → say $\boxed{LL < 8000 \text{ psf}}$

Beam capacity does not control allowable uniform live load at graving basins.

**Methodology:**

The following calculations follow the provisions of ACI 318−19 to check the axial capacity of the interior columns at the graving basins.

**Material Properties:**

$f'_c = 3750\text{psi}$ — Concrete compressive strength

$\gamma_c = 150\text{pcf}$ — Concrete unit weight

$E_{c.} = 57 \cdot \sqrt{f'_c \cdot \text{psi}}$

$E_c = 3491\text{ksi}$ — Concrete modulus of elasticity

$f_y = 33\text{ksi}$ — Steel yield strength

**Section Properties:**

$s_{col} = 18\text{in}$ — Column dimensions, 18in x 18 in square

$A_g = s_{col}^2 = 324 \cdot \text{in}^2$ — Gross area of concrete column section

$A_{st} = 4 \cdot 0.44\text{in}^2 = 1.76 \cdot \text{in}^2$ — Total area of longitudinal reinforcement, (4) No.6 bars

**Axial Strength:**

$P_o = 0.85 \cdot f'_c \cdot \left(A_g - A_{st}\right) + f_y \cdot A_{st} = 1085 \cdot kip$ Nominal axial strength, 22.4.2.2

$P_{n.max} = 0.80 \cdot P_o = 868 \cdot kip$ Maximum nominal axial compressive strength, Table 22.4.2.1

$\phi = 0.65$ Strength reduction factor, assume compression−controlled, Table 21.2.2

$\phi P_n = \phi \cdot P_{n.max} = 564 \cdot kip$ Axial compressive strength of interior column

**Allowable Distributed Live Load (Interior Column):**

$\phi P_n \geq 1.2(\text{Dead}) + 1.6(\text{Live})$

$A_{trib} = 12ft \cdot 12ft = 144ft^2$ Tributary area

$\gamma_c = 150pcf$ Concrete unit weight

$h = 8in$ Deck thickness

$\gamma_a = 145pcf$ Asphalt unit weight

$t_a = 2in$ Asphalt overlay thickness

$h_{col} = 18.5ft - 10ft = 9ft$ Interior column height

$col_{weight} = \gamma_c \cdot A_g = 0.34 \cdot klf$ Column self weight (per column length)

$\text{Dead} = \left(\gamma_c \cdot h + \gamma_a \cdot t_a\right) \cdot A_{trib} + \left(col_{weight} \cdot h_{col}\right) = 21 \cdot kip$ Dead load acting over tributary area

$$\text{Live} = \frac{\left(\phi P_n - 1.2 \cdot \text{Dead}\right)}{1.6} = 337 \cdot kip$$

$$LL_{int} = \frac{\text{Live}}{A_{trib}} = 2341 \cdot psf$$ Allowable distributed live load

**Allowable Distributed Live Load (Exterior Column):**

$A_{trib.ext} = 6ft \cdot 10.5ft = 63ft^2$ Tributary area

$h_{col.ext} = 16ft - 10ft = 6ft$ Exterior column height

$Dead_{ext} = \left(\gamma_c \cdot h + \gamma_a \cdot t_a\right) \cdot A_{trib.ext} + \left(col_{weight} \cdot h_{col.ext}\right) = 10 \cdot kip$ Dead load acting over tributary area

$$Live_{ext} = \frac{\left(\phi P_n - 1.2 \cdot Dead_{ext}\right)}{1.6} = 345 \cdot kip$$

$$LL_{ext} = \frac{Live_{ext}}{A_{trib.ext}} = 5481 \cdot psf$$ Allowable distributed live load

$LL = \min\left(LL_{int},\ LL_{ext}\right) = 2341 \cdot psf$

$LL < 2300\ psf$

# Appendix B: Historical Structural Drawings

PULL-BOX. FOR DETS. SEE DWG. L63-10

SECT. A-A
3/8" = 1'-0"

SECT. B-B
3/8" = 1'-0"

PULL-BOX. FOR DETS. See Dwg. L63-10

APPROX. OUTLINE OF EXIST. SLAB AFTER REMOVAL

TYP. COL. FTG.

| | | | | |
|---|---|---|---|---|
| 1 | 5-12-70 | JAR | REV. FOR AS BUILT COND. | |
| 0 | 10/29/69 | KE-H | ISSUED FOR CONSTR'N | |
| REV. NO. | DATE | BY | DESCR'N. OF REVISION | APVD |

DWG. NO. | TITLE

REFERENCE DRAWINGS

GUY F. ATKINSON COMPANY
CONTRACTORS AND ENGINEERS
SOUTH SAN FRANCISCO
LONG BEACH PORTLAND SEATTLE DENVER

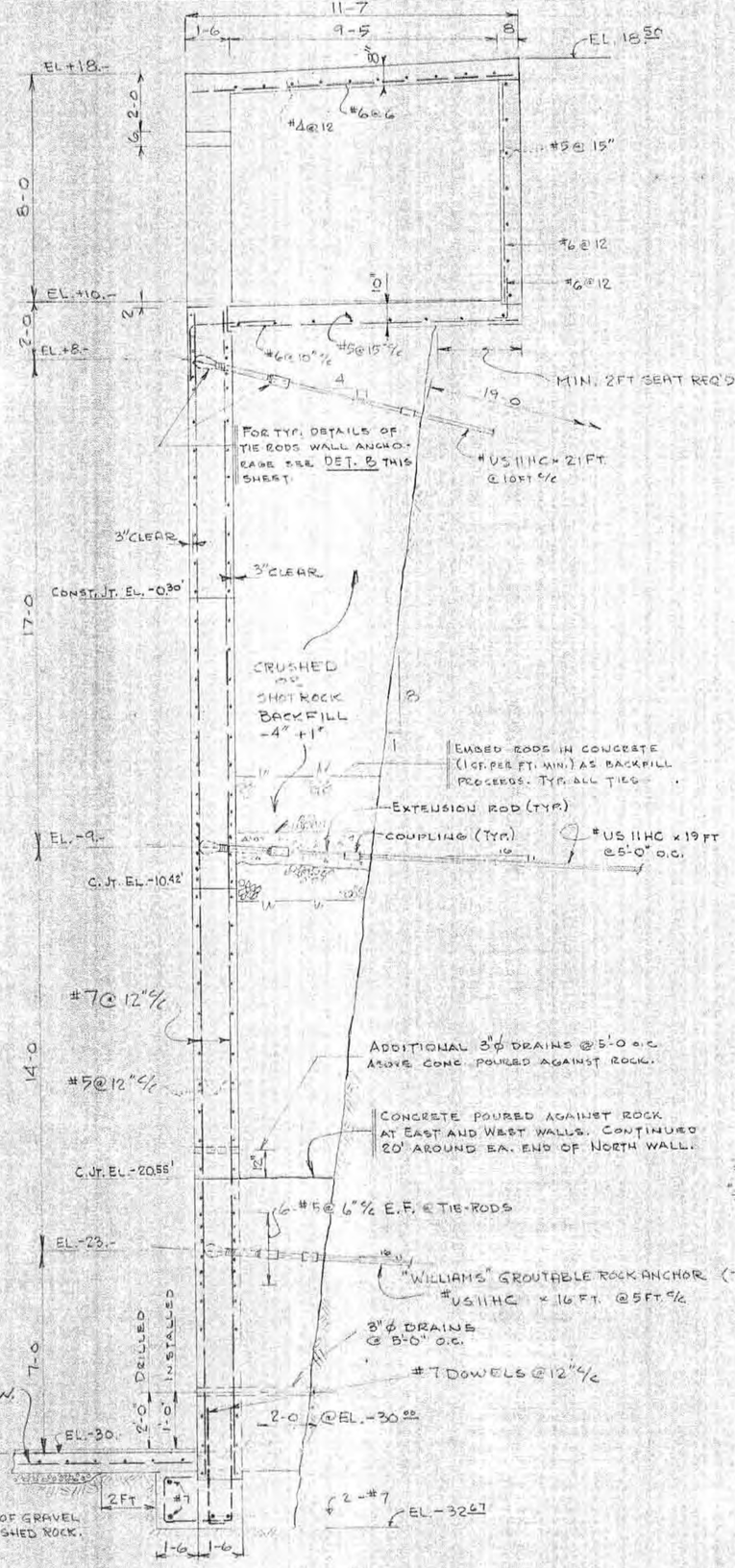
GALLERY FLOOR @ EL. +10.00

RE: WISCO-RICHMOND BASIN #2 EXTENSION

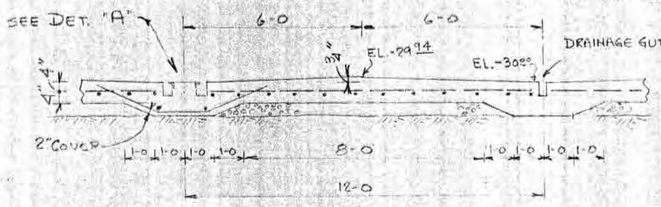
DRAWN KE-H 23OCT69 | APPROVED

CKD. | BY | DATE | DATE

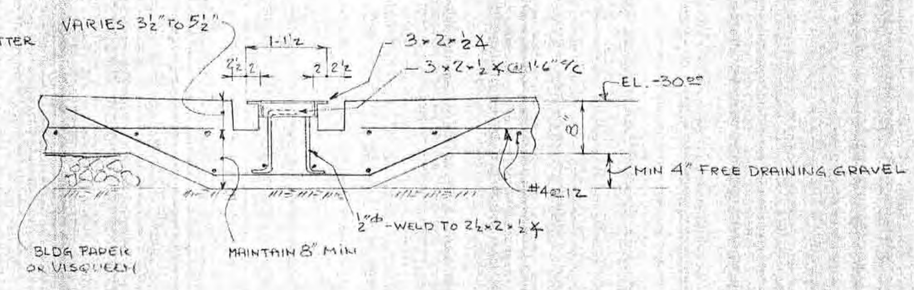
1/8" = 1'-0" U.N. | 2266-H-W-X-L63-8



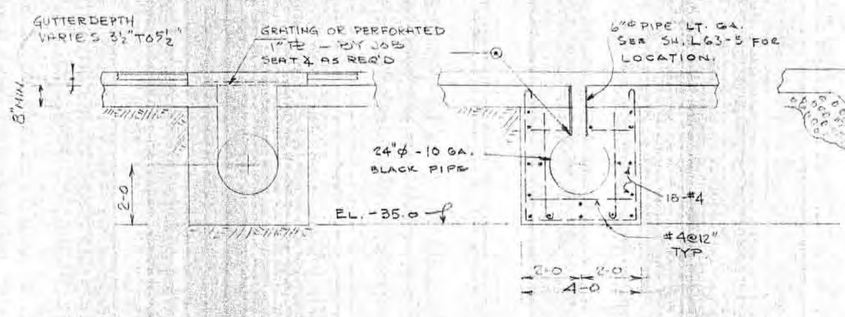

SECT. "A-A" (L63-5) 3/8" = 1'-0




SECT. "B-B" DWG. 5

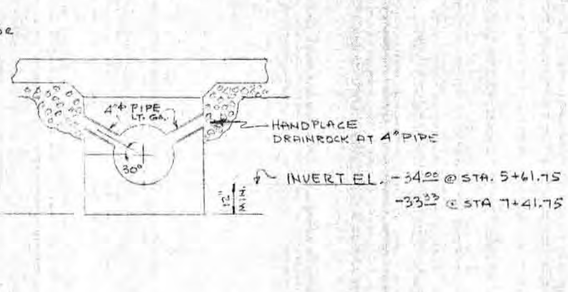



DETAIL "A"
1"=1'-0"

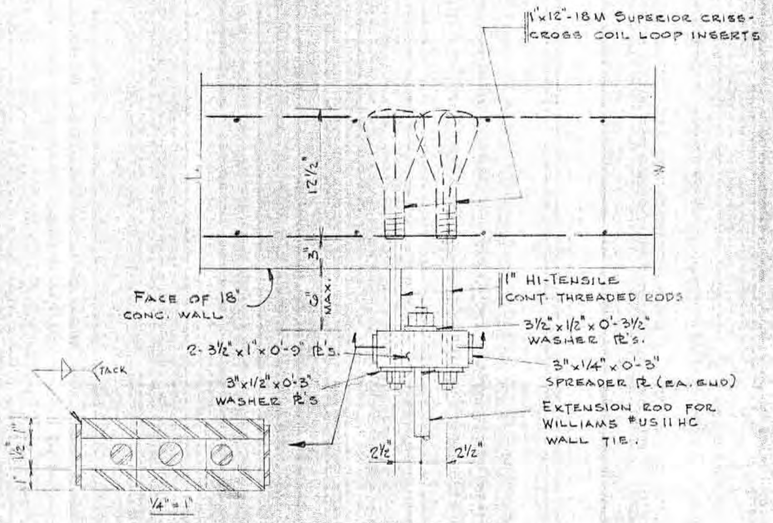



SECT. "C-C" DWG 5
(@ CLEANOUT)

SECT. "D-D" DWG 5
(@ 6"ø GUTTER DRAIN)




SECT. "E-E" DWG 5
(@ 4"ø UNDERDRAINS)




DETAIL B
PLAN
1/8"=1"

| DWG. NO. | TITLE |
|---|---|
| | REFERENCE DRAWINGS |

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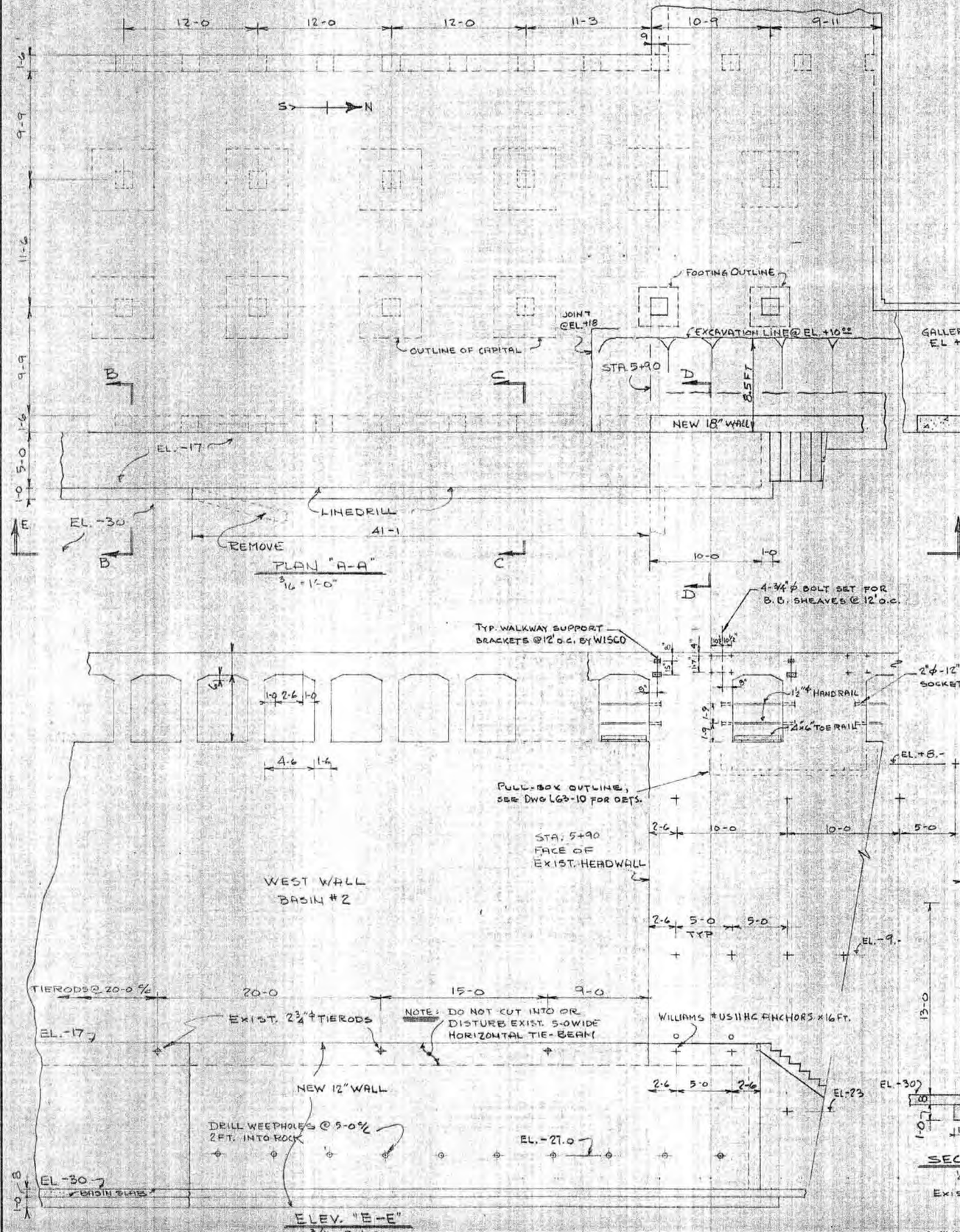
STRUCTURAL DETAILS

RE: WISCO-RICHMOND BASIN #2 EXTENSION

DRAWN KE-H 29SEP69 | CKD. ____ | APPROVED 9-29-69

| REV. NO. | DATE | BY | DESC'N. OF REVISION | APVD. |
|---|---|---|---|---|
| 1 | 4-20-70 | J.A.R. | REV. FOR AS BUILT COND. | |
| 0 | 10/29/69 | KE-H | ISSUED FOR CONSTRUCTION | |
| Δ | 10/15/69 | KE-H | RE-ST'L EL. GAL. ROOF | |
| Δ | 9/29/69 | KE-H | ORIGINAL ISSUE | Knoll |

SCALE: AS NOTED | 2266-H-V-X-L63-7




| DWG. NO. | TITLE |
|---|---|
| | REFERENCE DRAWINGS |

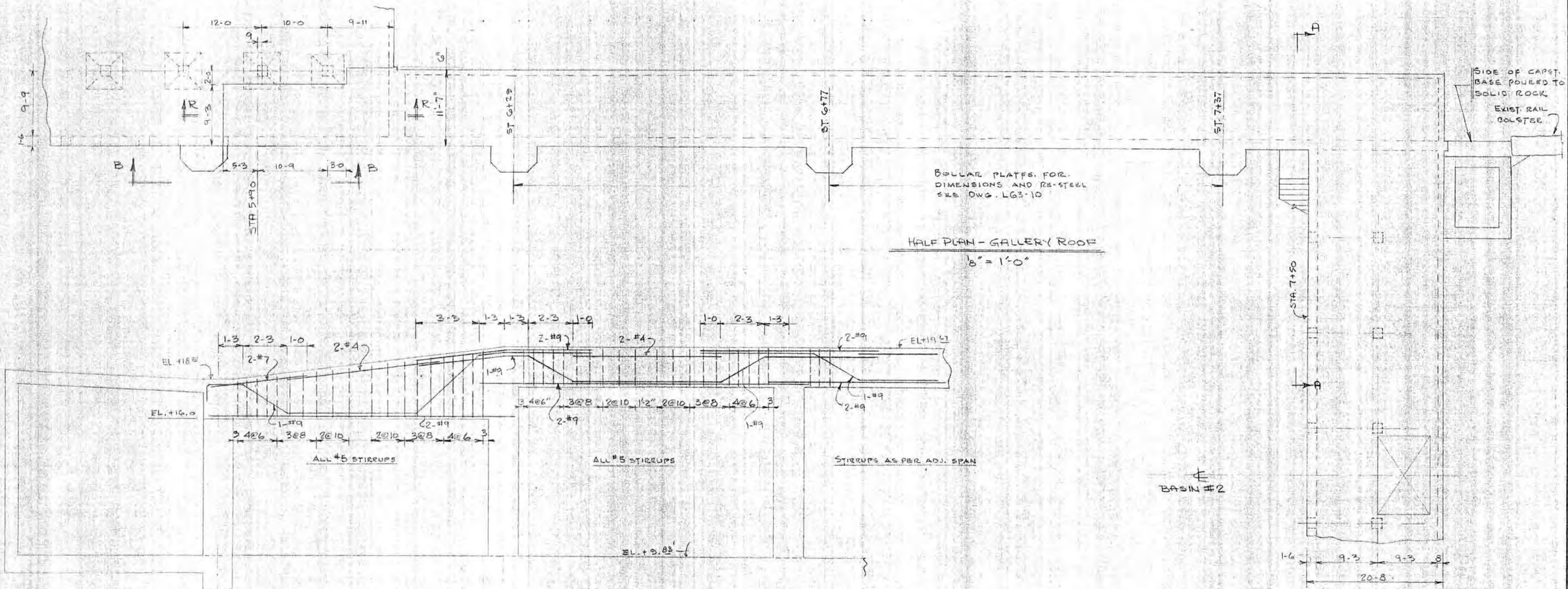
GUY F. ATKINSON COMPANY
CONTRACTORS AND ENGINEERS
SOUTH SAN FRANCISCO
LONG BEACH · PORTLAND · SEATTLE · DENVER

DETAILS AT EXISTING HEADWALL
RE: WISCO-RICHMOND BASIN #2 EXTENSION

| | | | |
|---|---|---|---|
| DRAWN | KE-H | 29SEP69 | W F Hennessy Jr |
| CHD. | | | APPROVED |
| BY | | DATE | DATE 9-29-69 |

| REV. NO. | DATE | BY | DESC'N. OF REVISION | APVD. |
|---|---|---|---|---|
| 1 | 4/20/70 | J.A.R. | REV. FOR AS BUILT COND. | |
| 0 | 9/29-69 | KE-H | 155'D FOR CONSTR'N. | |
| Δ | 9/29-69 | KE-H | ORIGINAL ISSUE | WF |

3/16" = 1'-0" UNLESS NOTED | 2266-H-V-X-L63-6




| DWG. NO. | TITLE |
|---|---|
| | REFERENCE DRAWINGS |

GUY F. ATKINSON COMPANY
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SOUTH SAN FRANCISCO
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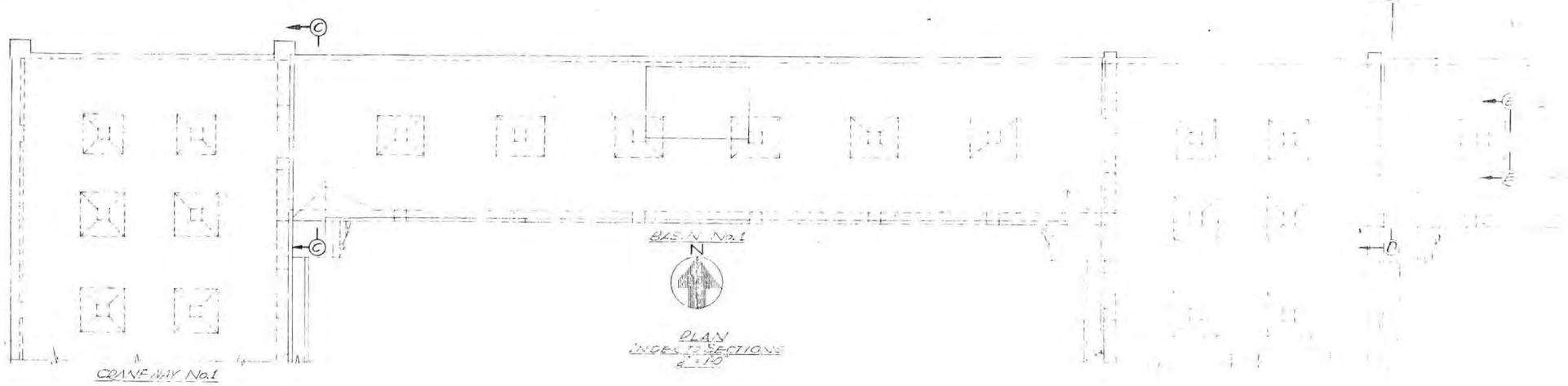
CRANE RAIL BEAMS & GALLERY COL'S

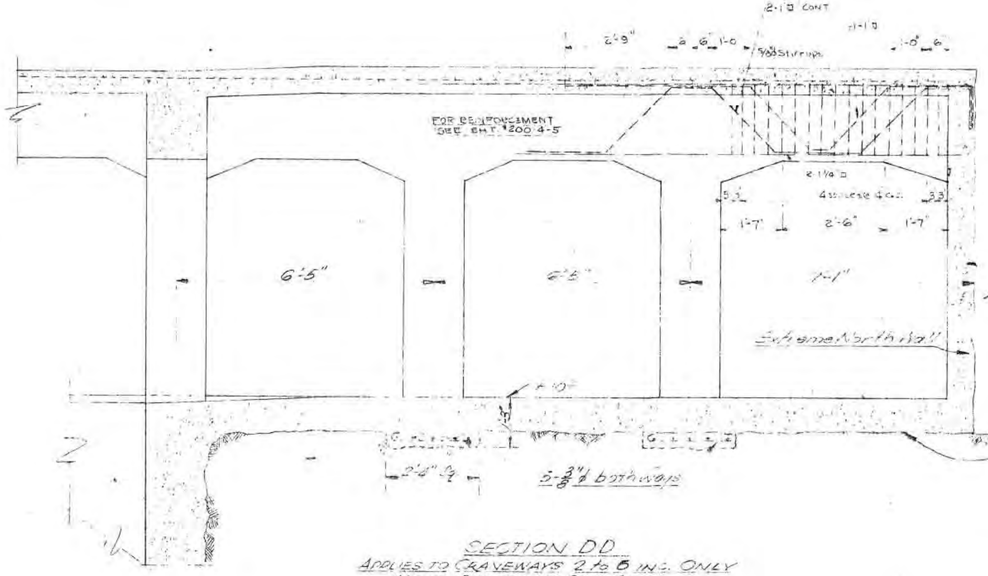
RE: WISCO-RICHMOND - BASIN #2 EXTENSION

| | BY | DATE | APPROVED |
|---|---|---|---|
| DRAWN | KE-H | 10/29-69 | |
| CKD. | | | |

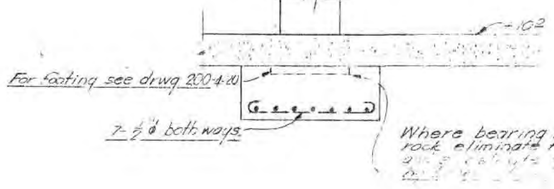
| REV. NO | DATE | BY | DESIGN OF REVISION | APVD. |
|---|---|---|---|---|
| 1 | 5-8-70 | JAR | REV. FOR AS BUILT COND. | |
| 0 | 11/29/69 | KE-H | ISSUED FOR CONSTRN | |

SCALE: AS N.  2266-H-W-X-L63-9

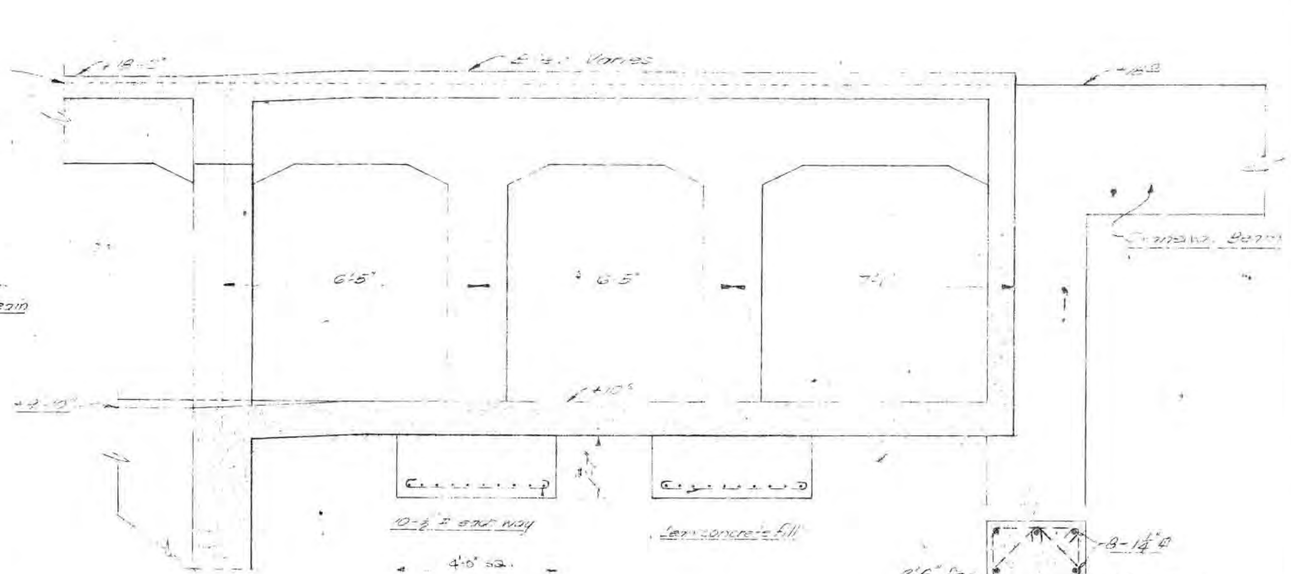


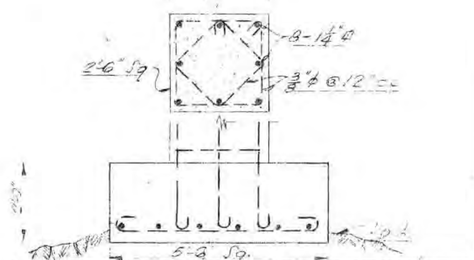

SECTION DD
APPLIES TO CRANEWAYS 2 to 6 INC. ONLY
WHERE BEARING ON SOUND ROCK
½" = 1'-0"




SECTION E-E
APPLIES TO SECTIONS BETWEEN CRANEWAYS
½" = 1'-0"




SECTION C-C
APPLIES TO CRANEWAY #1 ONLY
½" = 1'-0"




Note:
This 2' wide shelf to carry information as given on drawing 200-4-5.

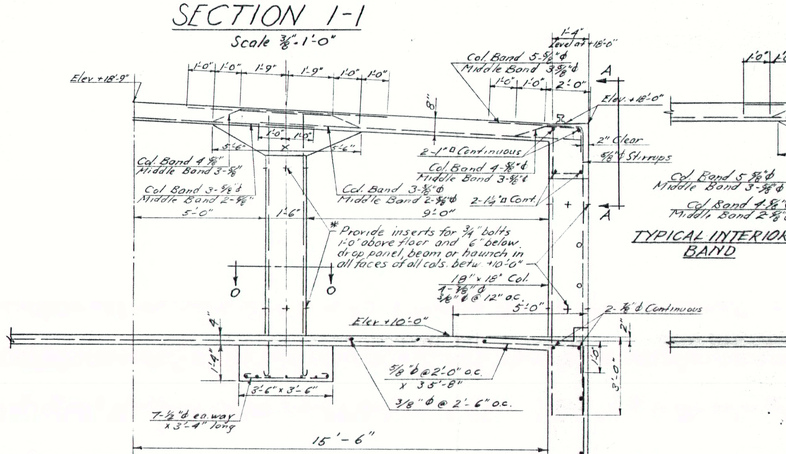
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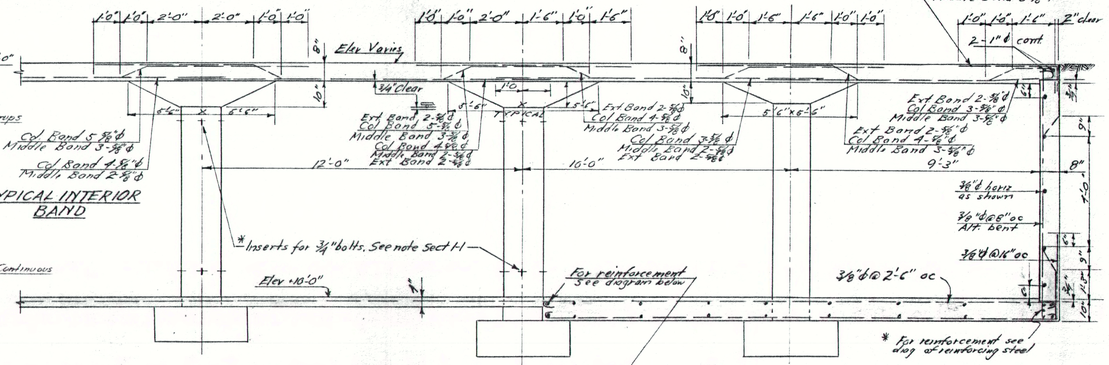
**KAISER COMPANY, INC.**
RICHMOND, CALIFORNIA

BASINS
CRANEWAY COLUMNS, WALL PILASTER & FOOTING DETAILS

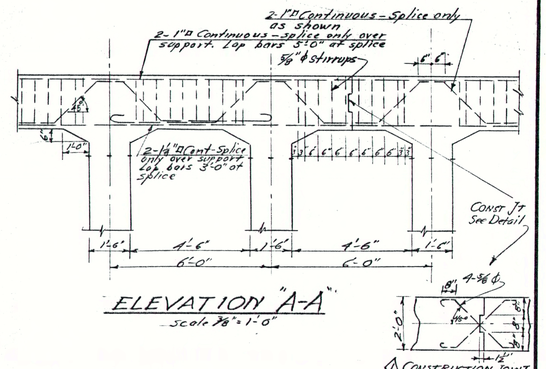
DATE 5-23-42 SUBMITTED
SCALE Noted APPROVED
DRAWN BY
CHECKED BY
200-4-21

# SECTION 1-1
Scale 3/8"=1'-0"



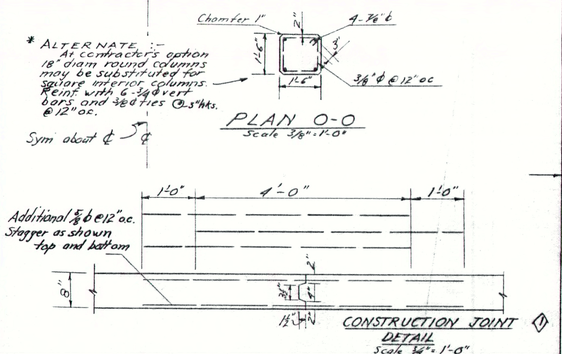

TYPICAL INTERIOR BAND




ELEVATION "A-A"
Scale 3/8"=1'-0"

CONSTRUCTION JOINT
Scale 3/8"=1'-0"

# SECTION 2-2
Scale 3/8"=1'-0"



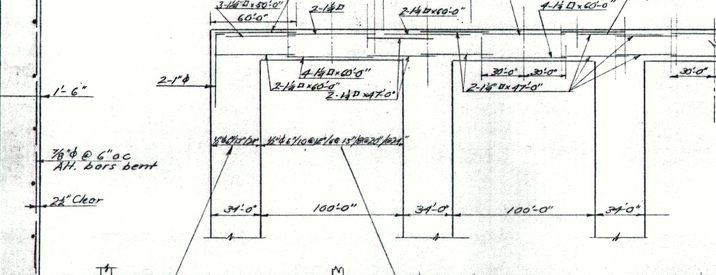

* ALTERNATE :- At contractor's option 18" diam round columns may be substituted for square interior columns. Reinf with 6-¾" vert bars and 3/8" ϕ ties @ 3" ctrs, @ 12" oc.

PLAN O-O
Scale 3/8"=1'-0"

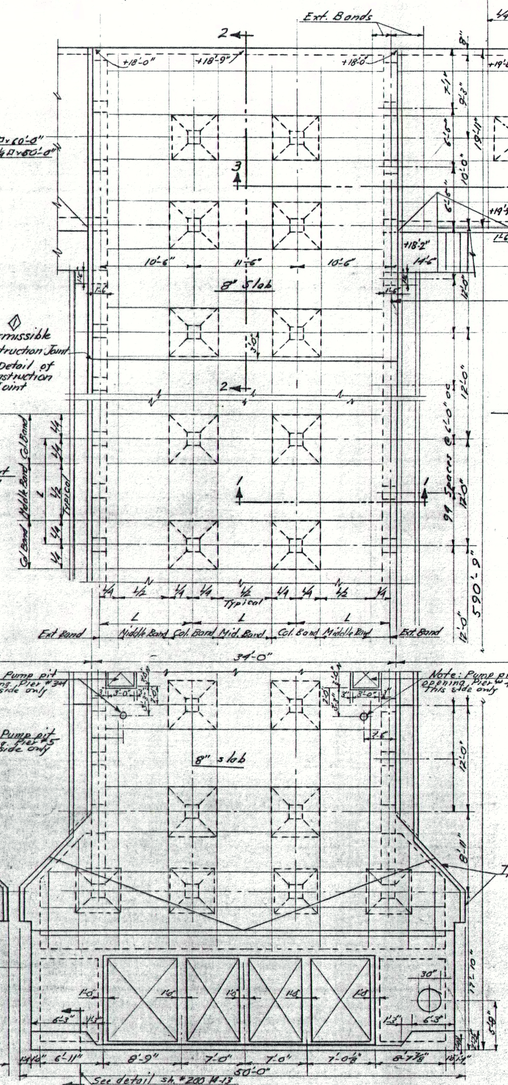
Sym about ℄




CONSTRUCTION JOINT DETAIL
Scale ½"=1'-0"




REINFORCING STEEL IN SLAB AT EL +10'-0"
NORTH END OF DOCKS


Ext Bands
+18'-0"
+18'-9"
+18'-6"
+19'-8"
8" s/lab
12'-0"
8'-0"
See Sh 200-4-1
Typical rail
10'-6"
11'-6"
10'-6"
14'-6"
14'-6"
7'-3"
Symm about ℄ of Basin
80'-9"
Permissible Construction Joint See Detail of Construction Joint
Col Band
Middle Band
Col Band
Ext Band
Middle Band
Col Band
Middle Band
Ext Band
L
L
L

RAIL, SEE SH. 200-4-3

SEE SH 200-4-4

12'-0"

+18'-9"

+18'-5"

3x10, SEE SH 300-4-3

Bkt 12'-0" o.c. SEE SH. 200-4-4.

INSERTS FOR ¾" BOLTS SEE NOTE SECT. 1-1 SHEET NO. 200-4-2

6'-0" 6'-0" 6'-0" 6'-0"

+18'-9" +18'-0"

8'-9"

10'-0"

12" TRUSS T2 9'-4" 12" TRUSS T2 6'-6" 8" 8'-11" 8'-0" SLOPE FACE 3"

SEE SH. 200-4-9

+10'-0"

TRUSS T1

+8'-5"

2'-0" 1'-7" 13/16" 5 1/16"

1'-4½" 13'-3" 3'-10½"

¾

SEE SH. 200-5-1 FOR REMOVABLE DAM, TRUSSES ETC.,

6"x6"x⅜"L

1'-4½" 2½" 12" 4" DEEP POCKET 5" 5"

REM. GUIDE.

DAM

SECTION Z-Z.
1" = 1'-0"

38'-9" 25'-0" 23'-11"

6'-8" 1'-4½" 3'-0" 18'-6" 14'-1½" 8'-0"

REM. GUIDE DAM Z Z

4'-0" 3'-0"

¾"ϕ @12" o.c.

⅞"ϕ @12" o.c.

⅝"ϕ SPACERS AS SHOWN

-15'-0" 5'-0" 2'-0" 1'-4" 9" 11" 5'-0"

-20'-0" 4'-0"

2-1"ϕ

1'-4" 4'-0" MIN. 2'-0" 7'-4" 2'-0"

ROCE DRAIN

8" DIA. DRAINS @10'-0" o.c.

-24'-0"

-26'-9"

10'-4½" 7'-0" 2'-6" 2'-6" PASSAGE WAY 2¼" 2½" 5'-4½" FRAME SEE DET. SH #200-5-2 8" 7'-0½" 3'-0" 2" 1'-6"

SEE SH. 200-4-9

F

½"ϕ@10" o.c.

½"ϕ@6" o.c.

½"ϕ@8" o.c.

¾"ϕ@12" c.c. BOTH WAYS

½"ϕ@10" o.c. -26'-3"

½"ϕ x 11'-6" @10" o.c.

-18'-0" -18'-6"

1'-4" 2'-0" 2'-0" 10" ½"ϕ @10" o.c.

SEE SH. 200-4-9.

-25'-0"

½"ϕ @10" o.c.

½"ϕ CONT. AS SHOWN

ALL LONGIT ½"ϕ AS SHOWN.

½"ϕ @10" o.c

-28'-0"

SEE SH. 200-4-9

F

SECTION 7-7.
⅜" = 1'-0"

℄ MAIN CHANNEL

30'-0" 7'-6"

10" 2'-0" 2'-0" 3'-6" 2'-0" 2'-0" 10" 7'-6"

SEE SHEET 7-7 FOR TRANS

-24'-6"

½"ϕ @12" c.c. BOTH WAYS

TYPICAL REINF SEE SECTION SH #200-4-3

6'-0" 6'-0"

℄ BASIN

-24'-6"

TYP ℄ REINF SEE SEC Y-Y

8"ϕ PIPE DRAINS

8"ϕ Pipe Drain

PLAN
⅜" = 1'-0"

℄ MAIN CHANNEL

-18'-0"

½"ϕ @10" o.c.

12" HOOKS ½"ϕ @6" o.c. 12" HOOKS ½"ϕ @10" o.c. 10"

5'-4" 5'-0" 2'-6" 1'-6" 2'

½"ϕ @8" o.c.

½"ϕ @10" o.c.

-24'-6"

-26'-3"

½"ϕ @10" o.c.

ALL LONGIT. BARS ½"ϕ AS SHOWN.

SECTION Y-Y.
⅜" = 1'-0"

FOR REINF. SEE SECT. A-A SH 200-4-10

⅝"ϕ SPACERS

¾"ϕ @12" c.c.

3'-3" THICK WALL

-18'-11"

1'-4" 2'-0" 4'-0" 1'-4" 3'-7"

¾"ϕ @12" c.c.

¾"ϕ @24" c.c. BOTH WAYS

3'-3" THICK WALL

2-1"ϕ

-24'-0"

2'-0" 6'-8" 2'-0"

SECTION L-L. (SEE SH. 200-4-9)
⅜" = 1'-0"

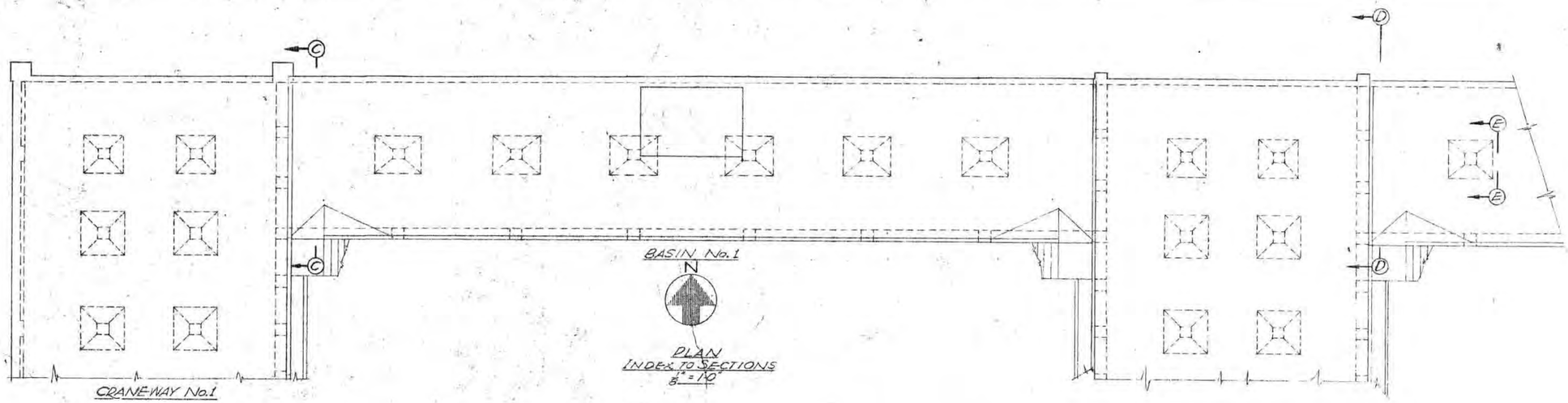
200-4-7

| REVISIONS | | | |
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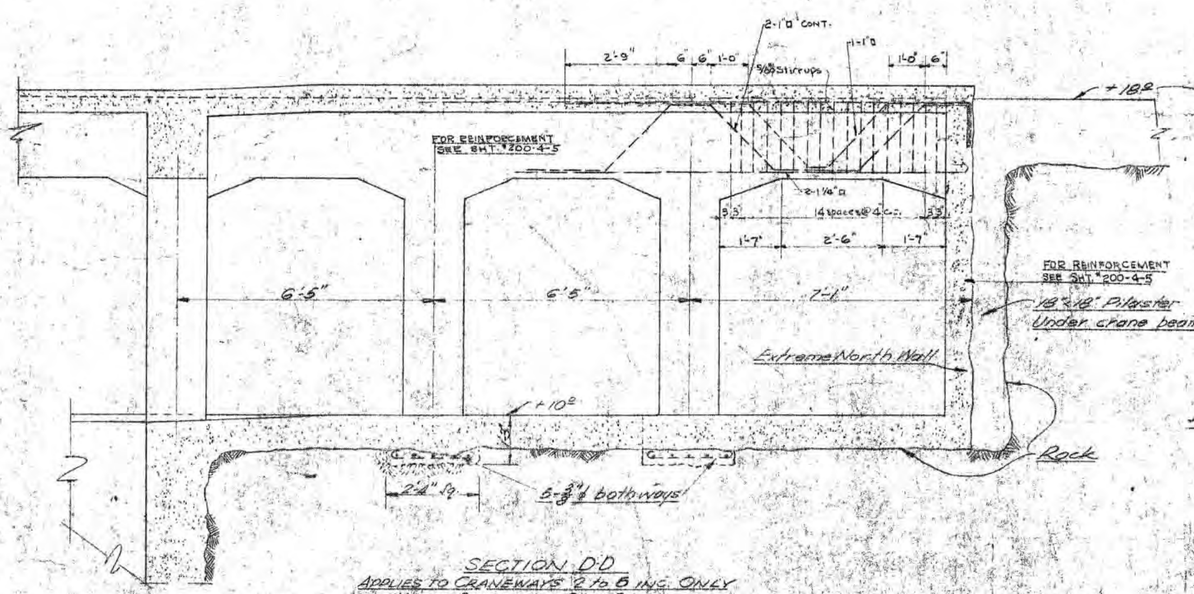
**KAISER COMPANY, INC.**
RICHMOND, CALIFORNIA

STRUCTURAL DETAILS
BASINS

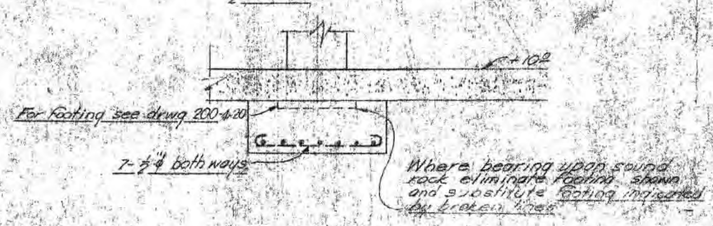
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|---|---|
| DATE JULY 22, 1942 | SUBMITTED |
| SCALE ½" = 1'-0" | APPROVED |
| DRAWN BY OLSEN | 2048 200-4-28 |
| CHECKED BY | |



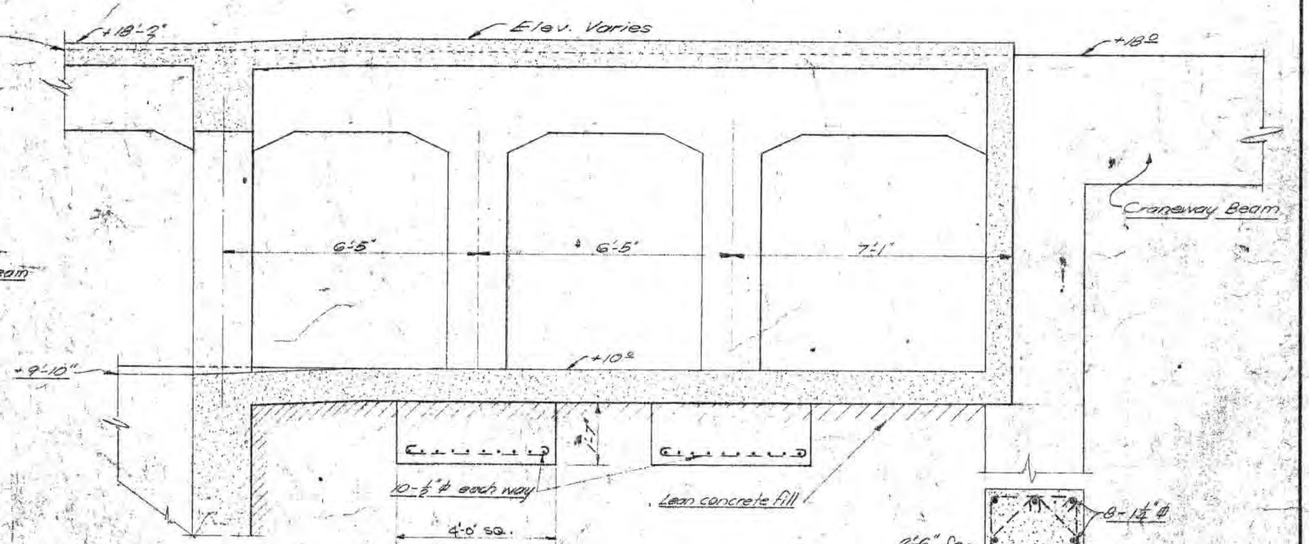

PLAN
INDEX TO SECTIONS
1" = 10'




SECTION D-D
APPLIES TO CRANEWAYS 2 to 6 INC. ONLY
WHERE BEARING ON SOUND ROCK
1/2" = 1'-0"




SECTION E-E
APPLIES TO SECTIONS BETWEEN CRANEWAYS
1/2" = 1'-0"




SECTION C-C
APPLIES TO CRANEWAY #1 ONLY
1/2" = 1'-0"

Note:
This drawing supplants similar information as given on drawing 200-4-5.

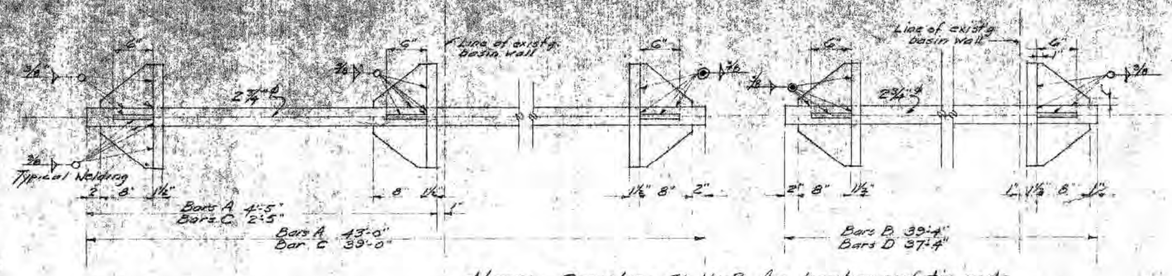
| REVISIONS | | | |
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| MK. | DATE | BY. | OK |
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**KAISER COMPANY, INC.**
RICHMOND, CALIFORNIA

BASINS
CRANEWAY COLUMNS, WALL PILASTER & FOOTING DETAILS

DATE 5-23-42 SUBMITTED
SCALE Noted APPROVED
DRAWN BY EAL
CHECKED BY

200-4-21



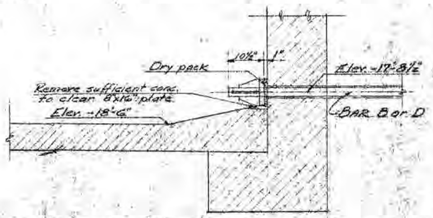

NOTE:- See plan - Sh. No. 3 for locations of tie rods

BAR A (27 REQ'D) BAR C (1 REQ'D) BAR B (54 REQ'D) BAR D (2 REQ'D)

## END DETAILS OF TIE RODS

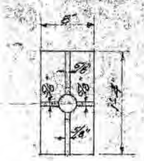
Scale:- 1"=1'-0"

NOTE:- Paint rods and plates after assembly with "Bitumastic" (or equal) asphaltic paint.

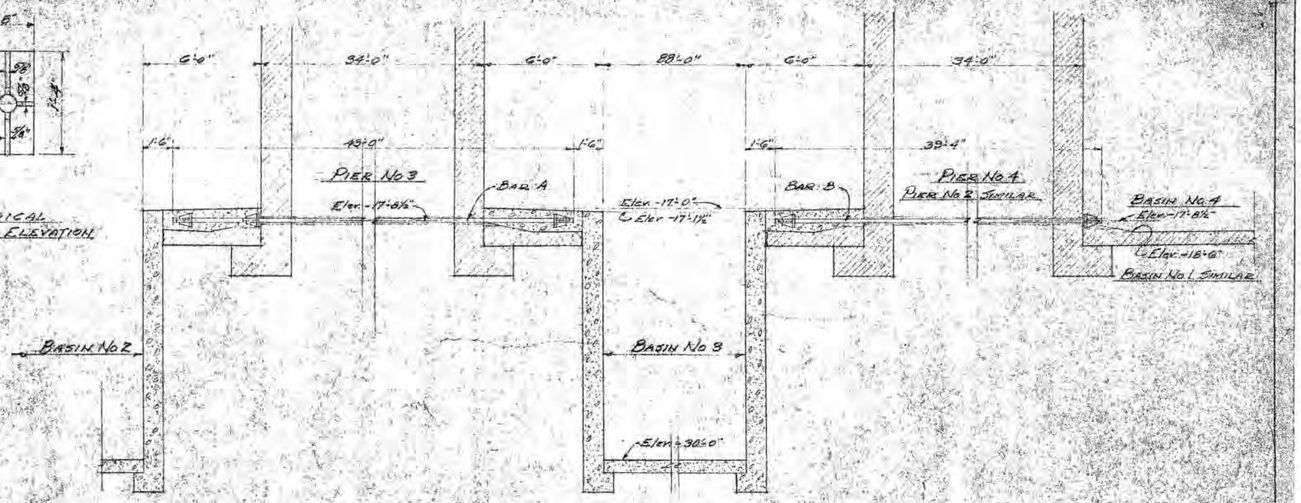



DETAIL OF TIE ROD ANCHORING AT UNDEEPENED SIDES OF PIERS 2 & 4

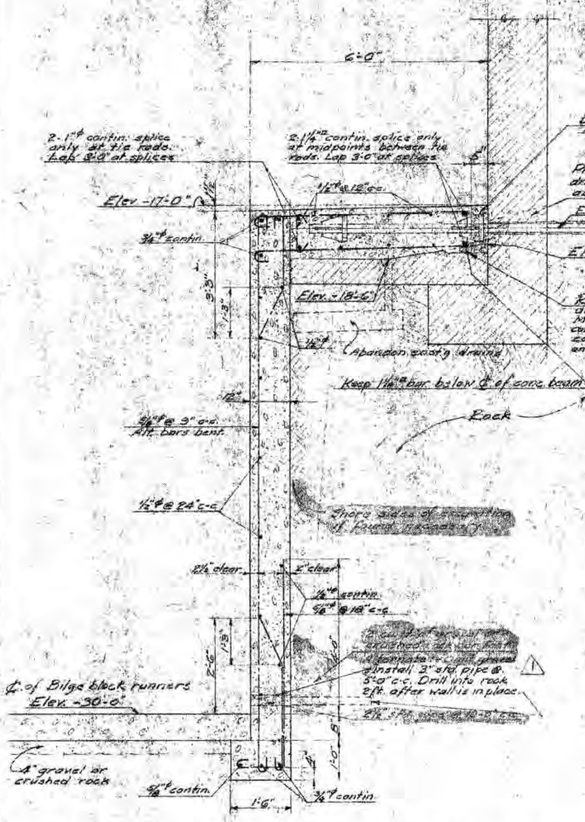
Scale:- ½"=1'-0"



TYPICAL END ELEVATION



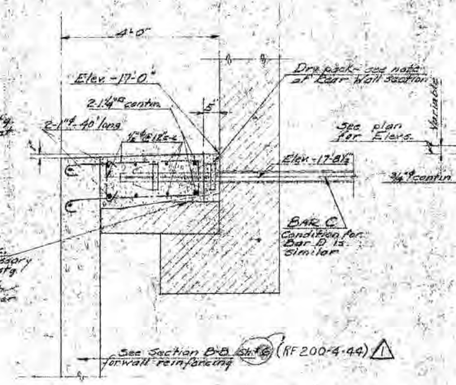

DIAGRAMMATIC SECTION SHOWING PLACEMENT OF TIE RODS Scale:- 1/4"=1'-0"




SECTION THRU PIER No. 3 WALL OF BASIN No. 2

Scale:- ½"=1'-0"

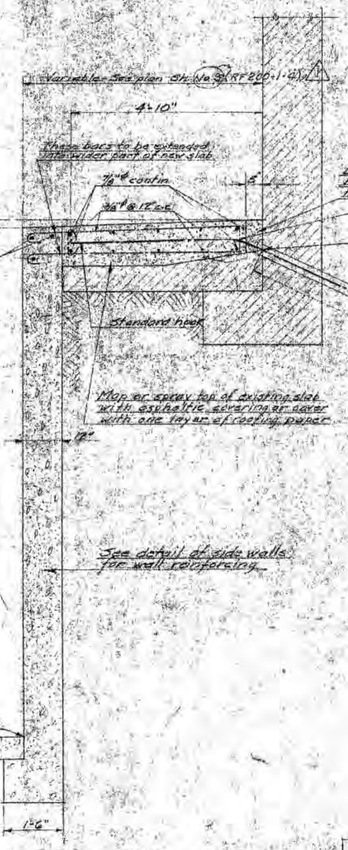
OTHER SIDE WALLS OF BASINS No. 2 AND No. 3 ARE SIMILAR




DETAIL OF BEAM ADJACENT SIDE WALL STAIRWAYS

Scale:- ½"=1'-0"

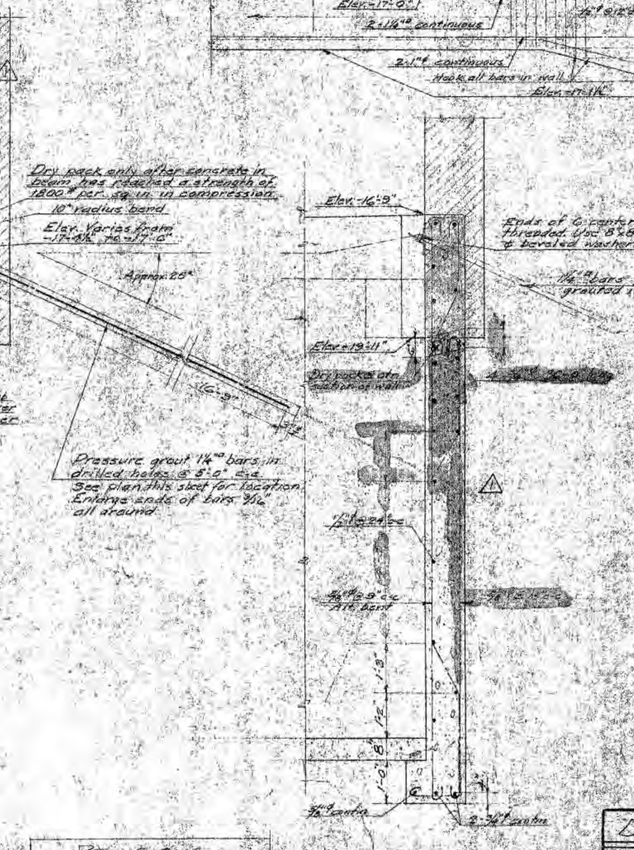
NOTE:- Elevations at top of new basin slab varies. See Sh. No. 10 (RF 200-4-42) for slab details. Elev. -30'-0" as indicated hereon applies on ℄ of Bilge block runners only.




SECTION THRU REAR WALL OF BASINS

Scale:- ½"=1'-0"

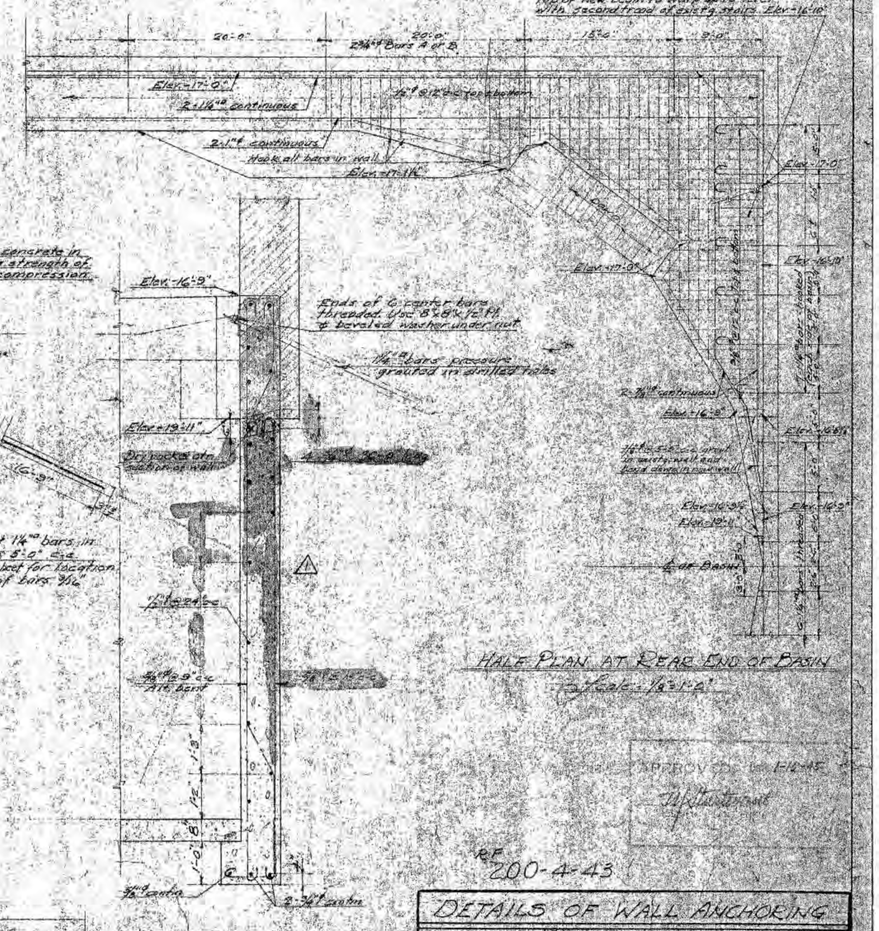
TYPICAL CONDITION FOR HOOKED 1¼" TIE RODS




SECTION THRU REAR WALL AT ℄ OF BASINS

Scale:- ½"=1'-0"

APPLIES 210' EACH SIDE OF ℄ OF BASIN




HALF PLAN AT REAR END OF BASIN

Scale:- ½"=1'-0"

APPROVED 1-12-45

RF 200-4-43

| REVISIONS | | | | |
|---|---|---|---|---|
| MARK | DATE | BY | OK | REMARKS |
| 1 | 6-20-45 | FBC | | General |

DETAILS OF WALL ANCHORING
DEEPENING OF EXISTING SHIP BASINS
KAISER CO INC YARD No 3
RICHMOND CALIFORNIA

L. H. NISHKIAN CONSULTING ENGINEER
155 SANSOME ST. SAN FRANCISCO

JOB NO. 224 SHEET NO. 25

DRAWN H.L.M. CHECKED DATE

TRACED SCALE As Noted

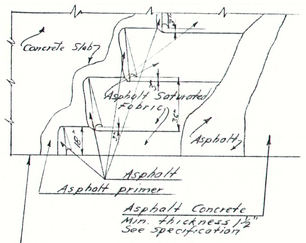
## APPLICATION OF MEMBRANE

Preparation of concrete slab –
Surface shall be firm, smooth, and thoroughly dry, and free from all dust, loose and foreign materials.

Application –
Coat the entire surface on which waterproofing is to be applied with a minimum of one(1) gallon per 100 sq.ft. of primer.

Over this primed surface, mop hot asphalt using not less than forty (40) pounds per 100 sq.ft.

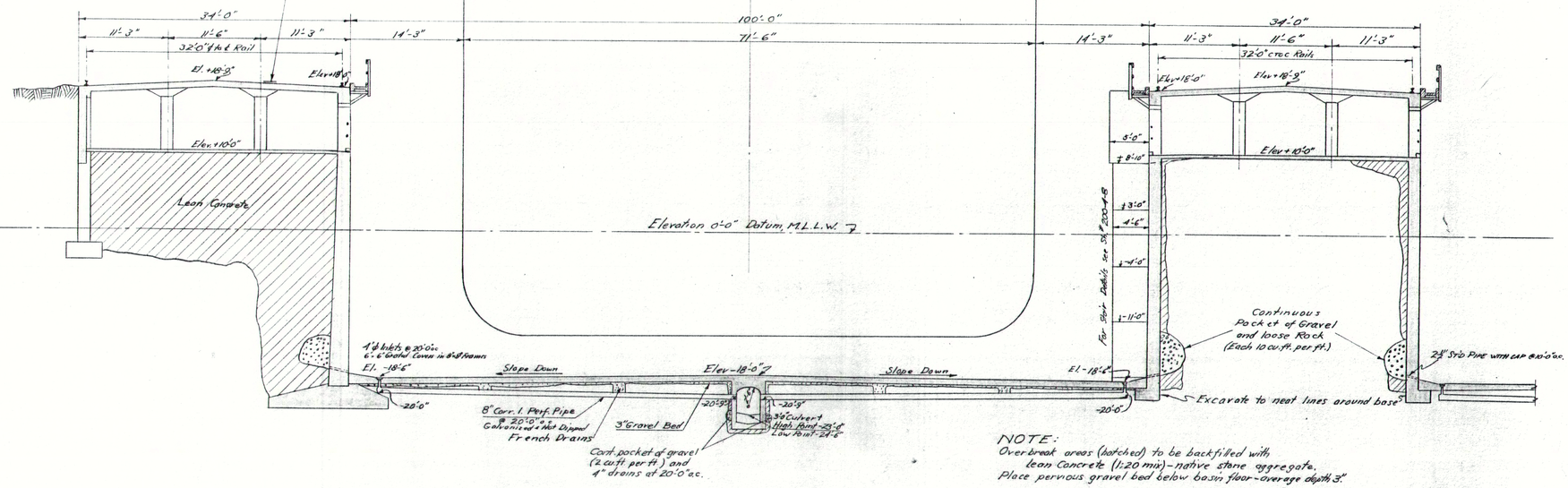
Into the asphalt while hot, embed one (1) layer of asphalt saturated fabric, and thoroughly and uniformly mop down with hot asphalt using not less than forty (40) pounds per 100 sq.ft. Fabric shall be free from wrinkles and all air bubbles and in absolute conformity with contour of surface. Fabric shall be covered completely with asphalt. All work shall be so regulated that at the close of each day's work the final mopping of asphalt shall have been applied to all fabric in place. Special care shall be taken at all laps to see that they are thoroughly sealed down. End laps shall be six inches.




## MEMBRANE

Materials –
Primer shall be in accordance with A.S.T.M. Designation D 27-26 for use with asphalt in damp-proofing and waterproofing below, above ground.
Asphalt shall be in accordance with A.S.T.M. Designation. D 449-25 for use in damp-proofing and waterproofing above ground level.
Asphalt Saturated Fabric shall be in accordance with A.S.T.M. Designation D 173-27 for woven cotton fabric saturated with Bituminous substances for use in waterproofing

Waterproofing membrane over entire supported top deck around Basin
½ Asphaltic Concrete over membrane




NOTE:
Over-break areas (hatched) to be backfilled with lean Concrete (1:20 mix) – native stone aggregate.
Place pervious gravel bed below basin floor – average depth 3"

## TYPICAL CROSS SECTION OF BASIN

SCALE: ⅜" = 1'-0"

## GENERAL NOTES

Concrete –
All footings shall be carried down to solid rock or to lean concrete, which has been carried to solid rock.
Lean concrete shall develop not less than 300 pounds per square inch, ultimate strength, at 28 days. Lean concrete shall be mixed in the proportion of one part of cement to 20 parts of aggregate but not less than two sacks of cement shall be used per yard of concrete. Use available bank sand of the site, as fine aggregate and native rock crushed and graded from ¼" to 1" as coarse aggregate.
Concrete for basin slabs shall be mixed in proportion of one part cement to 6½ parts of aggregate, but in no case shall less than 5½ sacks of cement be used per yard of concrete. Not more than 5½ gallons of water shall be used per sack of cement.
All other concrete up to and including elevation plus 10 shall be mixed in the proportion of 1 part cement to 6 parts of aggregate, but in no case shall less than 6 sacks be used per yard of concrete. Not more than 5½ gallons of water shall be used per sack of cement.
All concrete above elevations plus 10 shall be mixed in the proportion of 1 part cement to 5¾ parts of aggregate, but in no case shall less than 6¾ sacks of cement be used per yard of concrete. Not more than 5 gallons of water shall be used per sack of cement.
Fine aggregate shall range in size from ¼ of an inch, to that passing a 50 mesh sieve. Coarse aggregate shall range in size from ¼ of an inch to 1½ inches for Basin slabs, from ¼ of an inch to 2 inches for all other concrete below elevation plus 10, and from ¼ of an inch to 3½ inches for all concrete above elevation plus 10. Aggregates shall be graded to give a minimum of voids.
All cement shall conform to A.S.T.M. specifications for Portland Cement.
Portland Cement (A.S.T.M. C150-41 Type I) shall be used in all concrete work except in walls slabs, etc, in continuous contact with sea water where Moderate Sulphate Resisting Cement (A.S.T.M. C150-41 Type II) shall be used.
Concrete shall be placed immediately after mixing in layers of such thickness as may be directed and it shall be compacted throughout the mass by means of mechanical vibrators. Where necessary, mechanical vibrators shall be supplemented by manual rod vibrating to produce concrete free from pockets.

REINFORCING STEEL –
All reinforcing bars shall be corrugated and conform to A.S.T.M. specifications for structural grade reinforcing steel.
Unless otherwise shown or noted all bars shall be lapped not less than 40 diams. at splice points. Splices shall be well staggered with 1½" minimum clearances between bars of laps.
Unless otherwise shown or noted all horizontal wall, wall beam, and wall footing bars shall be continuous from end to end of wall carried to within 2 inches of end face and bent 12 inches around all corners; bars shall run thru columns and column footings.
Provide tie bars and supports of an approved type to hold all reinforcing bars accurately and rigidly in place at all times.

Traced from Richmond Dwg

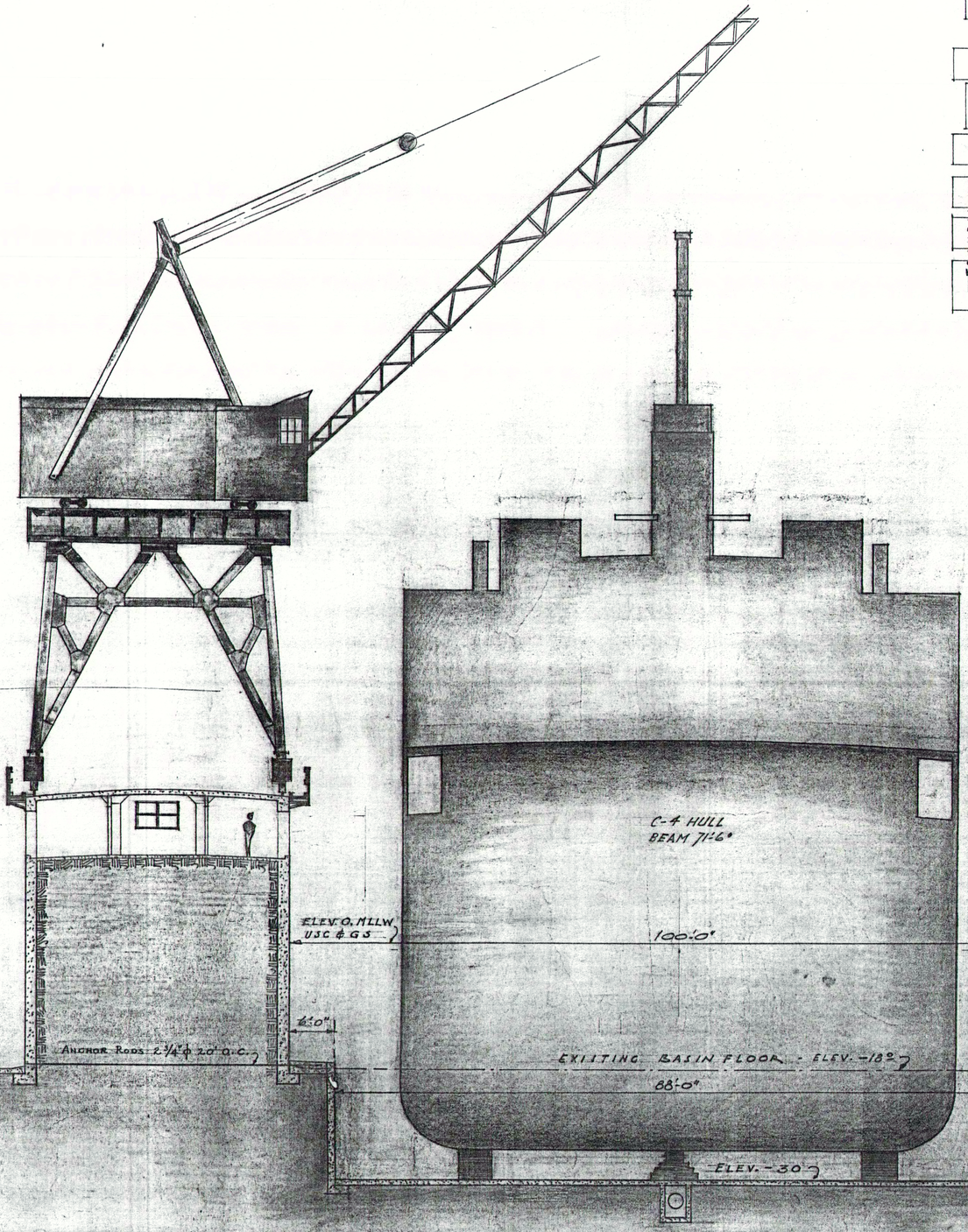
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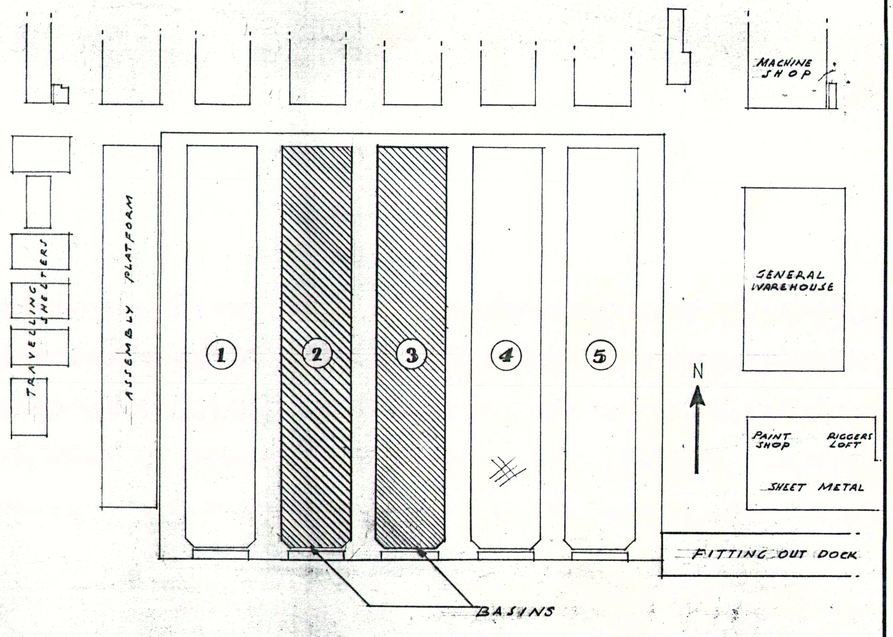
**KAISER COMPANY, INC.**
RICHMOND, CALIFORNIA

CROSS SECTION
BASINS

| | |
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| DATE | SUBMITTED |
| SCALE ⅜" = 1'-0" | APPROVED |
| DRAWN BY | |
| CHECKED BY | 200-42 |

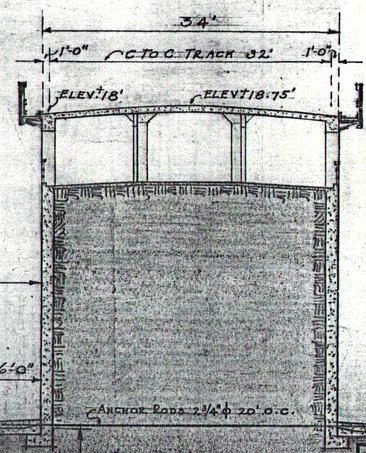
Thos. Vail




GENERAL LAYOUT
1" = 100'-0"

# SECTION SHOWING DEEPENED BASINS 2 & 3



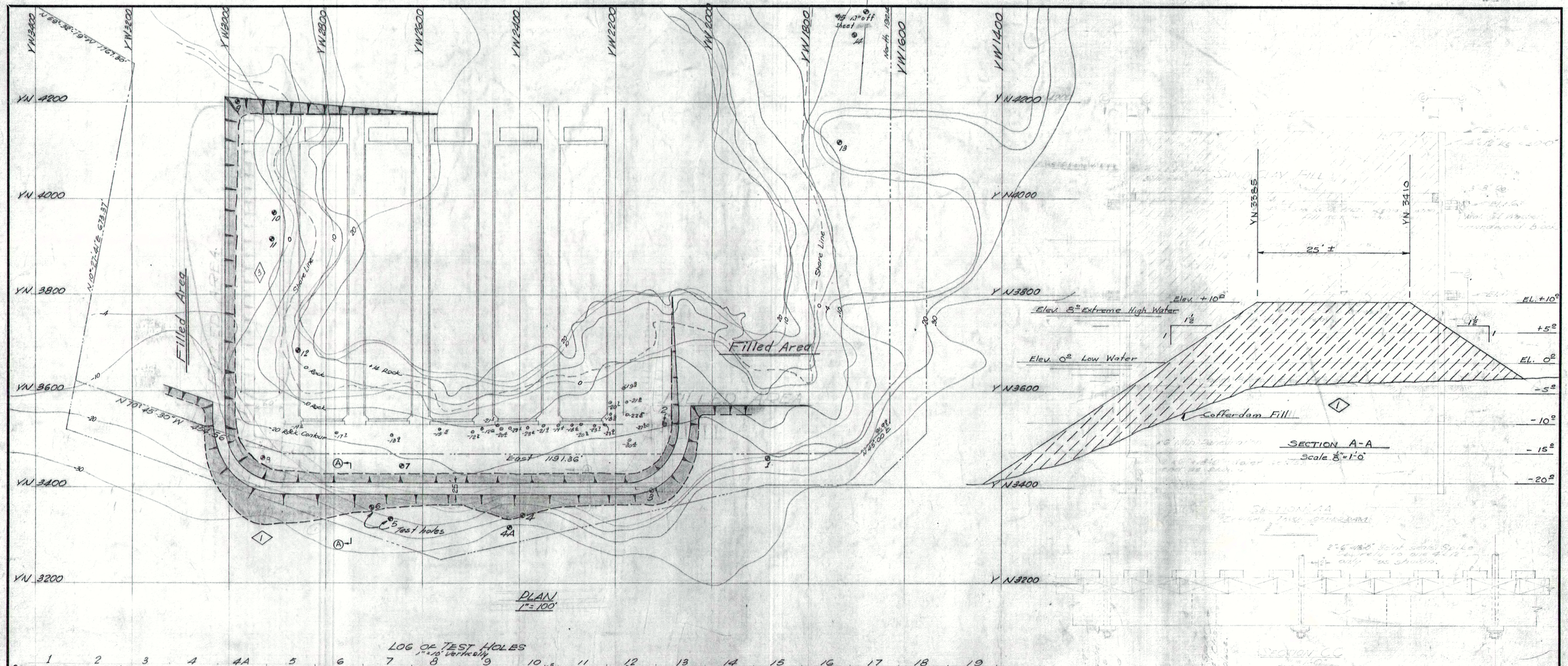

GRAPHIC SCALE
5 0 5 10 15 20

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| MK. | DATE | BY. | OK |
| 1 | 4-12-44 | HM | WD |

KAISER COMPANY, INC.
RICHMOND, CALIFORNIA

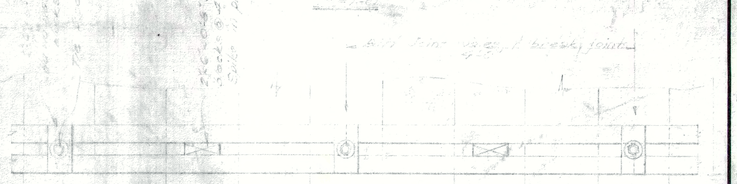
PROPOSED BASIN ALTERATION

| | |
|---|---|
| DATE 1-11-43 | SUBMITTED |
| SCALE 1/8" = 1'-0" | APPROVED Bernat |
| DRAWN BY W O L F | 200-0-7 |
| CHECKED BY | |

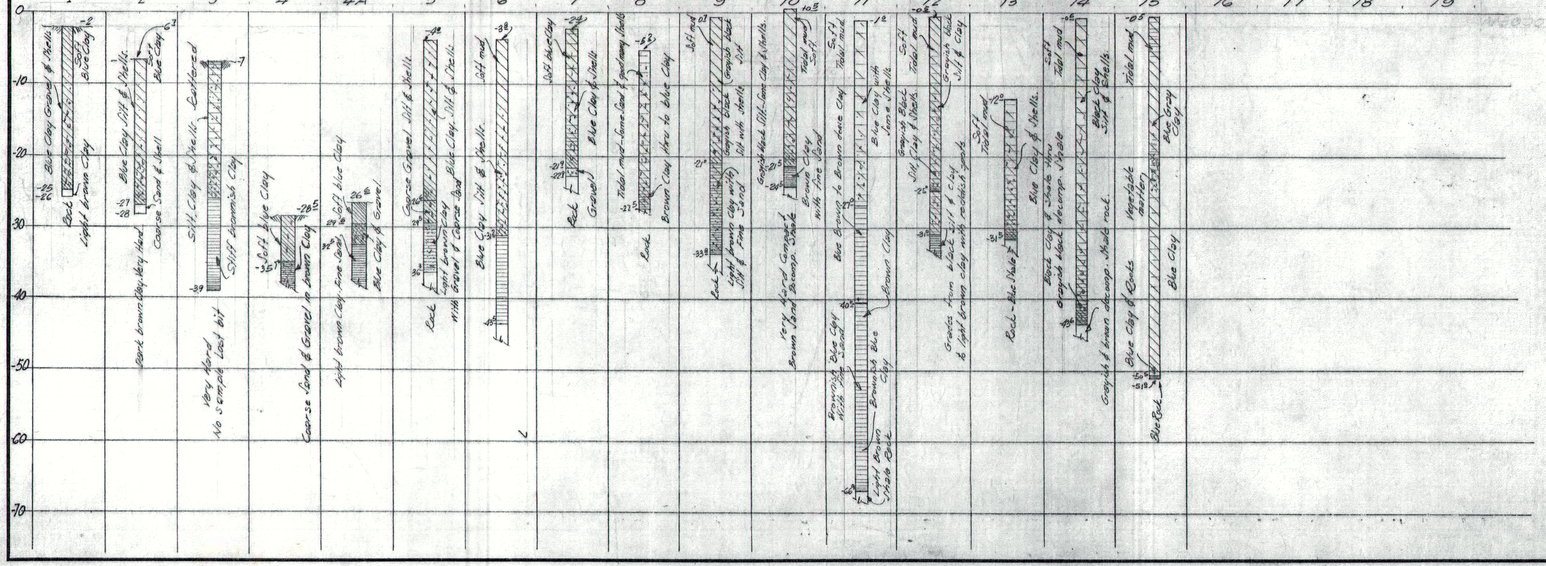








LOG OF TEST HOLES
1"=10' Vertically




Note: Toe of Slope of excavation within Cofferdam at elev. -20 shall be 60' from toe of slope of Cofferdam embankment at el. -4.

(2)

Added Assembly Pattern No. 8

| REVISIONS | | | |
|---|---|---|---|
| MK. | DATE | BY | OK |
| (1) | 2-11-42 | Kahl | ETL |
| (2) | 2-18-42 | Bernat | ETL |
| (3) | 4-29-42 | Ball | ETL |

KAISER CO. INC.
RICHMOND, CALIFORNIA

# COFFERDAM

DATE 2-9-42 | SUBMITTED
SCALE Shown | APPROVED J.O. Kaiser
DRAWN BY Bernat
CHECKED BY
200-9-1



BRUNING 334 FRENCHVEL...B

## INDEX

| | | | | |
|---|---|---|---|---|
| FOR SECTION | 1-1 | SEE SHEET | 200-4-3 |
| " " | 2-2 | " " | 200-4-3 |
| " " | 3-3 | " " | 200-4-1 |
| " " | 4-4 | " " | 200-4-4 |
| " " | 5-5 | " " | 200-4-5 |
| " " | 6-6 | " " | 200-4-6 |
| " " | 7-7 | " " | 200-4-7 |

FOR DETAIL "A" SEE SHEET 200-4-9, 200-4-10, 200-4-10A
" " "B" " " 200-4-11, 200-4-12
" " "C" " " 200-4-13
" " "D" " " 200-4-14

# ~ PLAN OF BASINS ~

Scale 1/32" = 1'0"

CRANEWAY No.1 · BASIN No.1 · CRANEWAY No.2 · BASIN No.2 · CRANEWAY No.3 · BASIN No.3 · CRANEWAY No.4 · BASIN No.4 · CRANEWAY No.5 · BASIN No.5 · CRANEWAY No.6

32'-0" ℄ to ℄ Rails

34'-0" · 100'-0" · 34'-0" · 100'-0" · 34'-0" · 100'-0" · 34'-0" · 100'-0" · 34'-0" · 100'-0" · 34'-0"

704'-0"

DETAIL "A" · DETAIL "B" · DETAIL "C" · DETAIL "D"

Slope · Drainage Typical for all 5 Basins · Typical for Sect. 1-1

El-18'-0" · El-17'9" · El-18'6"

12" Corr. Pipe Drain

Stair details See 200-4-8

57'-6" · 55'-2" · 50'-0" · 50'-0" · 50'-0

# Appendix C: USACE Port Series References

OHR
387 1
PORTS
2000

L.O.
Depo.

D103.8
31
2000

# PORTS OF OAKLAND, ALAMEDA, AND RICHMOND, AND PORTS ON CARQUINEZ STRAIT, CALIFORNIA

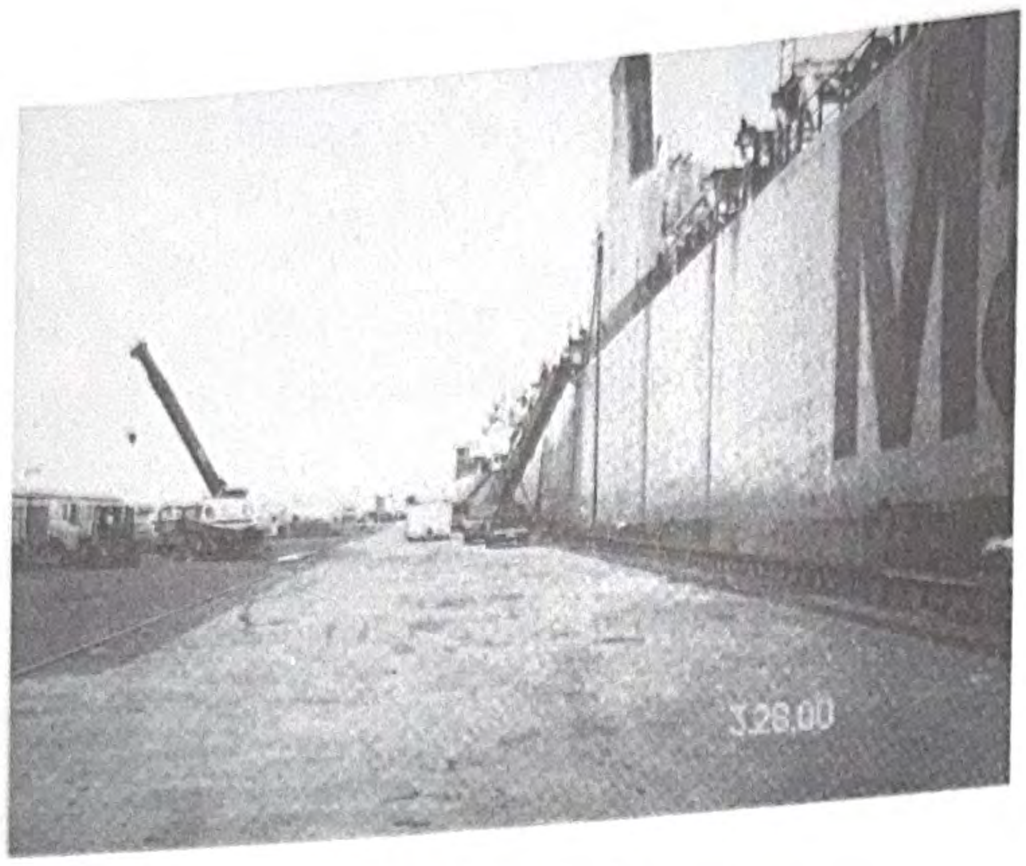
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OAKLAND PUBLIC LIBRARY

PORT SERIES N0. 31
REVISED 2000

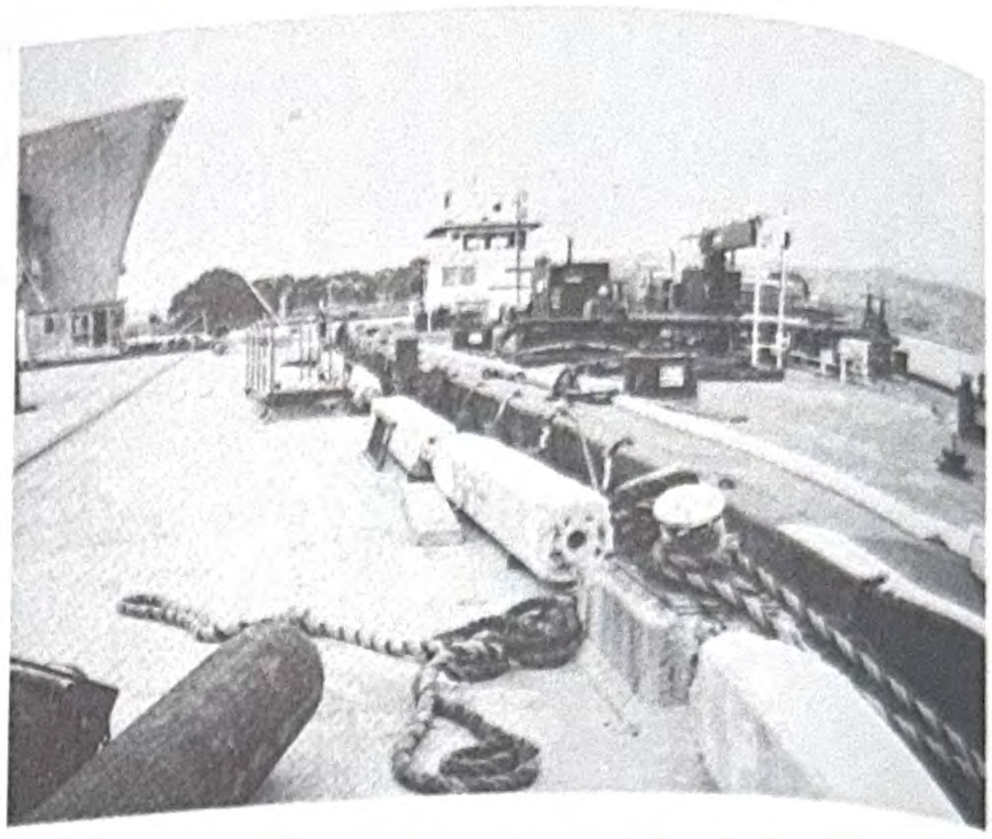


U.S. ARMY CORPS OF ENGINEERS

NDC-00-P-7



Port of Richmond,
Point Potrero Marine Terminal No. 7 Wharf
(P.W.D. Ref. No. 53)



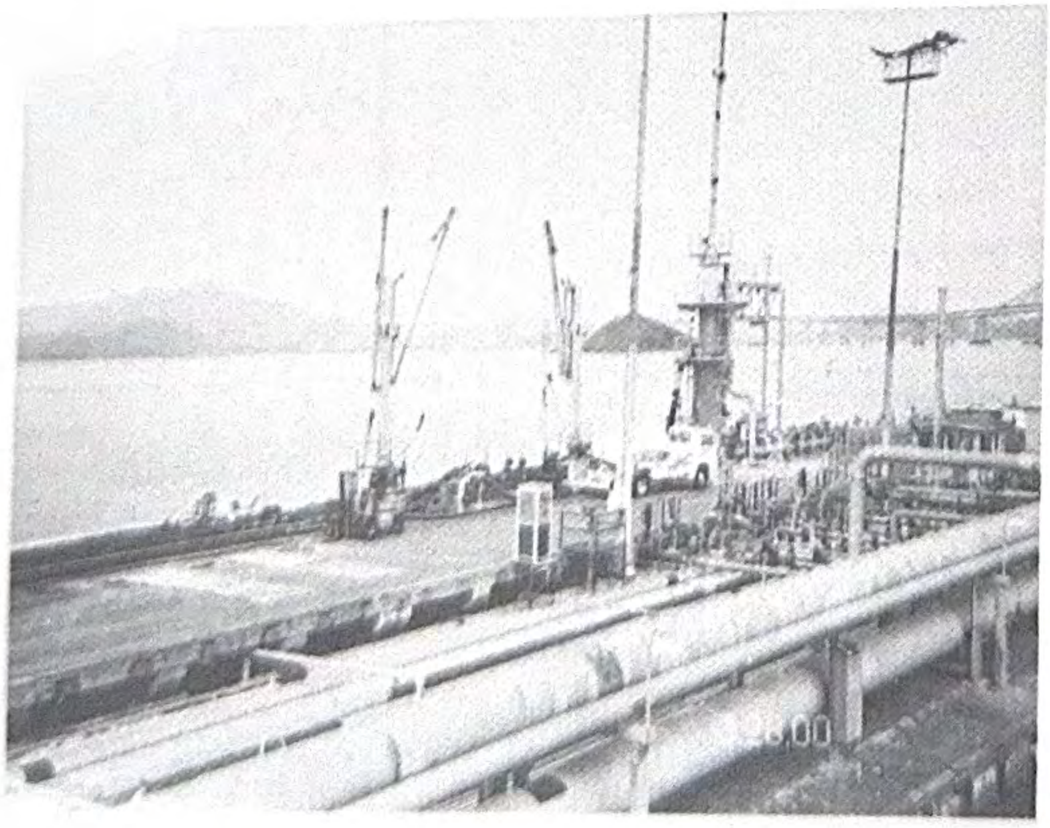
Port of Richmond,
Point Potrero Marine Terminal No. 6 Wharf
(P.W.D. Ref. No. 54)




Port of Richmond,
Point Potrero Marine Terminal, Finger Pier 1
(P.W.D. Ref. No. 56)




Port of Richmond,
Point Potrero Marine Terminal, Finger Pier 2
(P.W.D. Ref. No. 57)



*Chevron Products Co., Richmond Long Wharf*
(P.W.D. Ref. No. 59)



Port of Richmond, Terminal No. 4 Wharf
(P.W.D. Ref. No. 62)

# THE PORT OF RICHMOND, CALIFORNIA

## PORT AND HARBOR FACILITIES

### PIERS, WHARVES, AND DOCKS

A total of 28 piers, wharves, and docks are described in this section of the report for the Port of Richmond, California. Two facilities are located north of the Richmond-San Rafael Bridge – one at Point San Pablo and one at Point Orient; two immediately south of the bridge; one at Port Richmond; four at Point Potrero; one at the entrance of the Ford Channel; nine on the Inner Harbor Channel's north section; seven on the Santa Fe Channel; and two on the west side of the Lauritzen Channel.

Commodities handled at the Port of Richmond consist primarily of crude oil, petroleum products, and miscellaneous dry and liquid bulk cargoes; containerized general cargo is handled at Terminal No. 3, owned by the Port of Richmond. Six oil companies have wharves, pipelines, and storage facilities for the receipt and shipment of crude oil, petroleum, and petroleum products.

Each facility is described under a separate reference number in the table of "Piers, Wharves, and Docks" beginning on page 71. These reference numbers designate facility locations on the accompanying Port Facilities Map.

The numerous waterfront facilities in the port area used exclusively by recreational or active military craft are not included in this report.

The table on the following page summarizes the functional uses of the various piers, wharves, and docks (P.W.D.s) in Richmond. Many of these facilities are used for multiple purposes, as indicated in the table; each can be identified by its respective P.W.D. reference number.

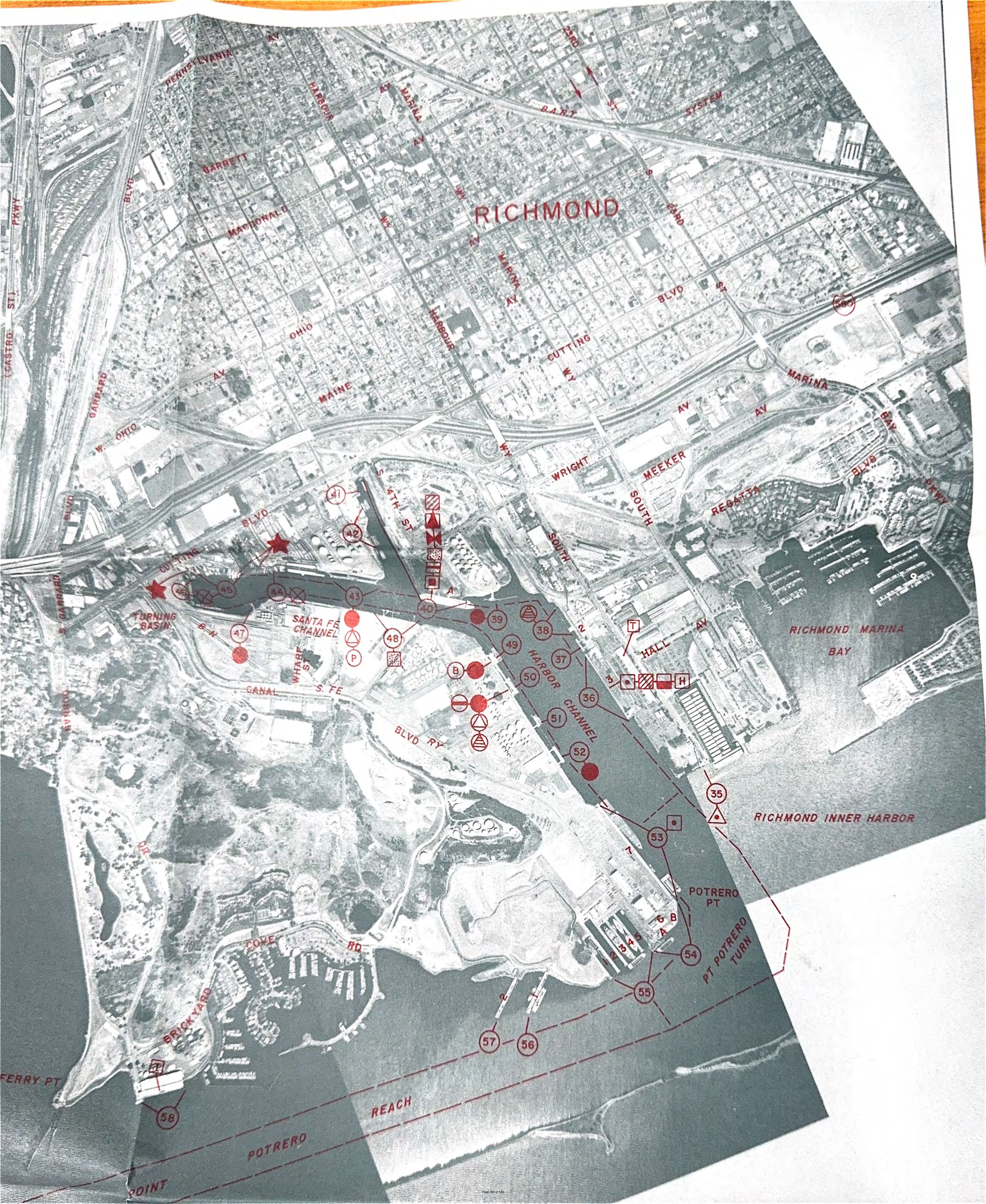
The Port of Richmond owns the only facilities – Terminal No. 3 Wharf (P.W.D. Ref. No. 36) and Terminal No. 7 Wharf (P.W.D. Ref. No. 53) – engaged in handling general cargo in the port. Terminal No. 3, located on the east side of the Richmond Inner Harbor Channel, is a concrete pile, concrete-decked, marginal type of wharf which has 1,109 feet of berthing space with depths alongside of 38 feet. The terminal has two 37-ton container-handling cranes and includes approximately 18 acres of paved, open storage area. Terminal No. 7, located on the right side of the entrance to the Richmond Inner Harbor Channel, is a concrete pile, concrete-decked wharf which has 1,615 feet of berthing space with depths alongside of 38 feet. The terminal includes approximately 40 acres of paved, open storage area.

# PURPOSE FOR WHICH USED

| LOCATION | A | B | | | | C | D | | SANTA FE CHANNEL | | | | | | INNER HARBOR CHANNEL | | | | | | | | | E | F | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P.W.D. REFERENCE NUMBER | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 |
| Cargo handling: | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| General cargo: | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conventional | | • | | | | | | | | | | | | | | | | | • | | | | | | | | | |
| Heavy lift items | | • | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bauxite | | | | | | • | | | | | | | | | | | | | | | | | | | | | | |
| Bulk cargo (dry misc.) | | | | | | • | | | | | | | | | | | | | | | | | | | | | | |
| Bulk cargo (liquid misc.) | | | | | | | | | | | | | | | | • | | | | | | | | | | | | • |
| Caustic soda | | | | | | | | | • | | | | | | | • | | | | | | | | | | | | |
| Chemicals | | | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| Coconut oil | | | | | | | | | | | | | | | | • | | | | | | | | | | | | |
| Crude oil | | | | | | | | | | | | | | | | | | | | | | | | | • | | | |
| Gypsum rock | | | | | | | | | | | | | | • | | | | | | | | | | | | | | |
| Limestone | | | | | | • | | | | | | | | | | | | | | | | | | | | | | |
| Livestock feed | | | | | | • | | | | | | | | | | | | | | | | | | | | | | |
| Oil (edible/vegetable) | | | | • | | | | | | | | | | | | • | | | | | | | | | | | | |
| Petrochemicals | | | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| Petroleum coke | | | | | | • | | | | | | | | | | | | | | | | | | | | | | • |
| Petroleum products | | | | | • | | | | • | | | | • | | • | • | | • | | | | | | | | | | |
| Scrap metal | | | | | | • | | | | | | | | | | | | | | | | | | | • | | | • |
| Steel | | • | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wax (paraffin) | | | | | | | | | • | | | | | | | | | | | | | | | | | | | |
| Wood products | | • | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bunkering vessels | | | | | | | | | | | | | | | | | | | | | | | | | • | | | |
| Handling construction materials, supplies, and equipment | | | | | | | | • | | | | | | | | | | | | | | | | | | | | |
| Landing for passenger ferries | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Loading bunkering bages | | | | | | | | | | | | | | | • | | | | | | | | | | | | | |
| Marine repair | | | | | | | | | | • | • | • | | | | | | | | | | | | | | | | |
| Mooring: | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Company-owned equipment | | | | | | | • | • | | | | | | | | | | | | | • | | • | | | | | |
| Floating drydocks | | | | | | | | | | | • | | | | | | | | | | | | | | | | | |
| Miscellaneous | | | | | | | | | | | | | | | | | | | | | | • | | | | | | |
| Oil-spill response vessels | | | | | | | | | | | | | | | | | | • | | | | | • | | | | | |
| *SS Red Oak Victory* | | | | | | | | | | | | | | | | | | | | | | | | | • | | | |
| Tugboats | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Not operated or used | | | • | | | | | | | | | | | | | | | | | | | | | | | | | |

A - FORD CHANNEL  B - INNER HARBOR CHANNEL  C - SANTA FE CHANNEL  D - LAURITZEN CHANNEL  E - POINT RICHMOND  F - RICHMOND OUTER HARBOR

Page 395 of 518


RICHMOND
PENNSYLVANIA AV
HARBOUR WY
MARINA AV
BART
23RD ST
SYSTEM
BARRETT
MACDONALD BLVD
23RD ST
MARINA AV
HARBOUR WY
OHIO AV
MAINE
CUTTING BLVD
23RD ST
MARINA BLVD
580
CASTRO ST
PKWY
GARRARD BLVD
W. OHIO
CUTTING BLVD
TURNING BASIN
S. 4TH ST
SANTA FE CHANNEL
WHARF ST
CANAL
S. FE
WRIGHT WY
MEEKER AV
SOUTH 2
HARBOR CHANNEL
HALL AV
REGATTA BLVD
PKWY
RICHMOND MARINA BAY
BLVD RY
RICHMOND INNER HARBOR
POTRERO PT
PT POTRERO TURN
COVE RD
BRICKYARD CR
FERRY PT
POTRERO REACH
POINT

| CORPS OF ENGRS WATERWAY CODE<br>LATITUDE LONGITUDE | 82300<br>37-54-34N 122-21-36W | 82300<br>37-54-47N 122-21-42W | 82300<br>37-54-55N 122-21-44W | |
|---|---|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 35 Dock Code No. 596 | 36 Dock Code No. 575 | 37 Dock Code No. 573 | |
| NAME | Red and White Fleet, Richmond Ferry Dock. | Port of Richmond, Terminal No. 3 Wharf. | Port of Richmond, Terminal No. 2, Lower Wharf. | |
| LOCATION ON WATERFRONT | West entrance to Ford Channel, at foot of Harbour Way South.<br>1453 Harbour Way South. | Left bank, Inner Harbor Channel, approximately 1,000 feet above entrance, at foot of Hall Avenue extended.<br>1411 Harbour Way South. | Left bank, Inner Harbor Channel, approximately 400 feet above foot of Hall Avenue extended. | |
| OWNED BY | City of Richmond. | City of Richmond. | City of Richmond. | |
| OPERATED BY | Red and White Fleet. | Stevedoring Services of America. | Not operated. | |
| PURPOSE FOR WHICH USED | Landing for passenger ferries serving San Francisco. | Receipt and shipment of conventional general cargo, including steel, wood products, and heavy lift items. | Not used. | |
| TYPE OF CONSTRUCTION | Steel float moored to steel piles with a 50- by 4-foot, steel ramp approach. | Concrete pile, asphalt-surfaced, concrete-decked wharf; fronted by steel, concrete, and rubber fender system; one breasting dolphin on lower side in line with face, and one mooring bollard on shore at rear. | Timber pile, asphalt-surfaced, timber-decked offshore wharf with one 50- by 30-foot and one 50- by 45-foot approaches from concrete bulkhead. | |
| DESCRIPTION | Float | Face | Face | North side |
| Dimensions (Feet) | 80 by 20 | 1,009 | 192 | 30 |
| Depth Alongside at MLLW (Feet) | 14-16 | 38 | 38 | - |
| Breasting Distance (Feet) | 80 | 1,009 | 192 | - |
| Total Berthing Space (Feet) | 80 | 1,109 w/dolphin. | 192* | - |
| Width of Apron (Feet) | Open. | Open. | 28 & open. | |
| Height of Deck at MLLW (Feet) | - | 13 | 13 | |
| Load Capacity (Lbs. per Sq. Ft.) | - | 1,000 | - | |
| Lighted or Unlighted | Lighted. | Lighted. | Lighted. | |
| TRANSIT SHEDS<br>Number and Description | None. | One - steel frame, metal siding, with asphalt floor. | None. | |
| Length and Width (Feet) | | 800 by 100 | | |
| Height Inside (Feet) | | 27 | | |
| Floor Area for Cargo (Sq. Ft.) | | 80,000 | | |
| Load Capacity (Lbs. per Sq. Ft.) | | 1,000 | | |
| Cargo Doors | | Shipside: four, 24 by 24 and six, 20 by 20; Ends: one, each 24 by 24. | | |
| MECHANICAL HANDLING FACILITIES | None. | Two 37-ton, electric, traveling, container-handling cranes, each with hinged boom having 110-foot outboard reach and 30-foot back reach. Fourteen 4- to 26-ton, diesel, forklift trucks. Additional equipment is available as required. | None. | |
| RAILWAY CONNECTIONS | None. | None. | None. | |
| HIGHWAY CONNECTIONS | Via driveway, asphalt, 24 feet wide; from foot of Harbour Way South, asphalt, 52 feet wide. | Via Harbour Way South, asphalt, 52 feet wide. | Via Harbour Way South, asphalt, 52 feet wide. | |
| WATER SUPPLY (For Vessels) | None. | Through five 2-inch lines. | None. | |
| ELECTRIC CURRENT (For Vessels) | A.C., 110 volts. | A.C., 120/240 volts. | None. | |
| FIRE PROTECTION<br>(Other than City) | Hand extinguishers. | Hydrants, hose, hand extinguishers, and security patrol. | Hydrants, hand extinguishers, and security patrol. | |
| REMARKS | Vessels operate to Fisherman's Wharf (Pier 43 1/2) and to Ferry Building (Pier 1/2) in San Francisco. Parking lot is located at rear. | Face of wharf is in line with face of adjacent wharves (Ref. Nos. 37 and 38), providing approximately 1,780 feet of continuous berthing.<br>Approximately 18 acres of paved, open storage area are located in rear. | *Face of wharf is in line with face of adjacent wharves (Ref. Nos. 36 and 38), providing approximately 1,780 feet of continuous berthing space. | |

| CORPS OF ENGRS WATERWAY CODE / LATITUDE / LONGITUDE | 82300 / 37-54-59N / 122-21-44W | 82300 / 37-55-05N / 122-21-51W | 82300 / 37-55-16N / 122-22-01W | |
|---|---|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 38 Dock Code No. 573 | 39 Dock Code No. 556 | 40 Dock Code No. 547 | |
| NAME | Port of Richmond, Terminal No. 2, Upper Wharf. | Shore Terminals, Richmond Wharf. | Levin-Richmond Terminal Corp., Richmond Wharf, Berths A, B, and C. | |
| LOCATION ON WATERFRONT | Left bank, Inner Harbor Channel, approximately 900 feet above foot of Hall Avenue extended.<br>1145 Harbour Way South. | North side of junction of Inner Harbor Channel and Santa Fe Channel.<br>488 Wright Avenue. | North side of Santa Fe Channel, and left bank of Lauritzen Canal.<br>402 Wright Avenue. | |
| OWNED BY | City of Richmond. | Shore Terminals LLC. | Levin-Richmond Terminal Corp. | |
| OPERATED BY | California Oils Corp. | Shore Terminals LLC. | Levin-Richmond Terminal Corp. | |
| PURPOSE FOR WHICH USED | Receipt and shipment of edible oils. | Receipt and shipment of petroleum products. | Shipment of scrap metal and petroleum coke; receipt of miscellaneous dry bulk commodities, including coke, bauxite, limestone, and livestock feed. | |
| TYPE OF CONSTRUCTION | Concrete pile, concrete-decked wharf fronted by timber fender system; 2 concrete breasting dolphins in line with face on upper side, connected by concrete pile, timber-decked catwalk. | Steel pile, concrete-decked, offshore wharf with 100- by 12-foot approach, fronted by timber fender system; 2 steel pile breasting dolphins on each side in line with face; and one steel pile mooring dolphin at rear of face and one mooring bollard on shore at rear. | Timber pile, timber-decked wharf fronted by timber fender system. | |
| DESCRIPTION | Face | Face | Berth A | Berths B & C |
| Dimensions (Feet) | 55 | 70 | 600 | 1,835 |
| Depth Alongside at MLLW (Feet) | 38 | 33 | 37 | 34 |
| Breasting Distance (Feet) | 300 w/dolphins. | 210 w/dolphins. | 600 | 850 |
| Total Berthing Space (Feet) | 300* | 700 w/dolphins. | 600 | 850 |
| Width of Apron (Feet) | Open. | Open. | Open. | Open. |
| Height of Deck at MLLW (Feet) | 13 | 12 | 13 | 13 |
| Load Capacity (Lbs. per Sq. Ft.) | - | 1,000 | 500 | - |
| Lighted or Unlighted | Lighted. | Lighted. | Lighted. | |
| MECHANICAL HANDLING FACILITIES | None. | None. | Three 50-ton, diesel-hydraulic, and two 25-ton, electric, traveling, full-portal gantry cranes, each with 100- to 110-foot boom; one diesel, mobile ship-loader with 48-inch conveyor having approximately 35-foot outboard reach, served by eighteen, 48-inch, portable conveyors, loading rate approximately 600 tons per hour; two 15-ton, diesel, forklift trucks; and six 12- and four 7-cubic-yard, diesel, front-end loaders. All cranes are equipped with magnets, slings, and buckets. | |
| RAILWAY CONNECTIONS | Surface track serving terminal at rear; connects with Burlington Northern Santa Fe Railway and Union Pacific Railroad. | One 3-car-capacity surface track serving tank car loading rack at west side of terminal connects with Parr Terminal Railroad, Burlington Northern Santa Fe Railway, and Union Pacific Railroad. | One surface track on inner section of wharf joins additional tracks serving yard; connect with Parr Terminal Railroad, Burlington Northern Santa Fe Railway, and Union Pacific Railroad. | |
| HIGHWAY CONNECTIONS | Via Harbour Way South, asphalt, 52 feet wide. | Via Wright Avenue, asphalt, 40 feet wide. | Via Wright Avenue, asphalt, 40 feet wide. | |
| WATER SUPPLY (For Vessels) | None. | Through 2-inch line. | Eight 2 1/2-inch lines. | |
| ELECTRIC CURRENT (For Vessels) | A.C., 110/220 volts. | A.C., 110/220 volts. | None. | |
| FIRE PROTECTION (Other than City) | Hydrants, hose, hand extinguishers, and security patrol. | Hydrants, hose, hand extinguishers, and chemical carts. | Hydrants, hose, hand extinguishers, sprinkler system under wharf deck, and security patrol. | |
| REMARKS | *Face of wharf is in line with face of adjacent wharves (Ref. Nos. 36 and 37), providing approximately 1,780 feet of continuous berthing space.<br>Three 6-inch pipelines extend from wharf to 10 storage tanks located at processing plant in rear, total capacity 2,000,000 gallons. | Five 10- and one 8-inch pipelines extend from wharf to 25 steel storage tanks, total capacity 618,000 barrels. | Approximately 5 acres of open storage area are located at rear of face, and an additional 10 acres are located at rear. | |

| CORPS OF ENGRS WATERWAY CODE<br>LATITUDE LONGITUDE | 82300<br>37-55-27N 122-22-02W | 82300<br>37-55-22N 122-22-03W | 82300<br>37-55-16N 122-22-09W |
|---|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 41 Dock Code No. 530 | 42 Dock Code No. 530 | 43 Dock Code No. 515 |
| NAME | Manson Construction Co., Richmond Mooring. | Manson Construction Co., Richmond Wharf. | IMTT-Richmond-CA, Richmond Wharf. |
| LOCATION ON WATERFRONT | Inner end, west side of Lauritzen Canal.<br><br>200 Cutting Boulevard. | West side, Lauritzen Canal, approximately 500 feet above entrance.<br><br>200 Cutting Boulevard. | Left bank, Santa Fe Channel, above entrance to Lauritzen Canal.<br><br>100 Cutting Boulevard. |
| OWNED BY | Jim Peterson and Manson Construction Co. | Jim Peterson and Manson Construction Co. | IMTT-Richmond-CA. |
| OPERATED BY | Manson Construction Co. | Manson Construction Co. | IMTT-Richmond-CA. |
| PURPOSE FOR WHICH USED | Mooring company-owned floating equipment. | Mooring company-owned floating equipment; handling construction materials, supplies, and equipment. | Receipt and shipment of petroleum products; receipt of caustic soda and paraffin wax. |
| TYPE OF CONSTRUCTION | Steel deck barge fronting row of 2 timber breasting dolphins. | One 15- by 25- and one 25- by 80-foot, steel pile, steel-decked loading platforms; timber and concrete pile, timber-decked wharf fronted by timber fender system; row of steel pile breasting dolphins on lower side. | Timber pile, timber-decked, offshore wharf with one 35- by 15-foot, and one 75- by 15-foot, angular, vehicle approaches to each end, and catwalk approach to center; one steel breasting dolphin at each end in line with face, connected by catwalk. |
| DESCRIPTION | Face | Face | Face |
| Dimensions (Feet) | 200 | 240+133 | 600 |
| Depth Alongside at MLLW (Feet) | 10-15 | 15-20 | 38 |
| Breasting Distance (Feet) | 200 | 640+133 w/dolphins. | 650 w/dolphins. |
| Total Berthing Space (Feet) | 200 | 640+133 w/dolphins. | 650 w/dolphins. |
| Width of Apron (Feet) | Open. | Open. | Open. |
| Height of Deck at MLLW (Feet) | - | 7 | 8 |
| Load Capacity (Lbs. per Sq. Ft.) | - | - | - |
| Lighted or Unlighted | Unlighted. | Partly lighted. | Lighted. |
| MECHANICAL HANDLING FACILITIES | None. | One 60-ton, floating, revolving crane with 110-foot boom. Additional floating cranes up to 600-ton capacity are available as required. | Three electric, hose-handling cranes, each with 40-foot boom. |
| RAILWAY CONNECTIONS | None. | None. | None. |
| HIGHWAY CONNECTIONS | Via private road, partly paved, 20 feet wide; from Cutting Boulevard, asphalt, 70 feet wide. | Via private road, partly paved, 20 feet wide; from Cutting Boulevard, asphalt, 70 feet wide. | Via terminal road, asphalt, 15 feet wide; from Cutting Boulevard, asphalt, 70 feet wide. |
| WATER SUPPLY (For Vessels) | None. | Through 1 1/2-inch line. | Through 4-inch line with 2-inch connection. |
| ELECTRIC CURRENT (For Vessels) | None. | A.C., 110/220/440 volts. | None. |
| FIRE PROTECTION (Other than City) | Hand extinguishers. | Hand extinguishers. | Hydrants, under deck fire curtain, electric pump with 8-inch salt water line, hand extinguishers, and security patrol. |
| REMARKS | - | Contractor's storage yard is located at rear. | One 12-, two 10-, three 8-, and nine 6-inch pipelines extend from wharf to 38 petroleum products storage tanks in rear, total capacity 441,200 barrels, to one 4,200,000-gallon caustic soda storage tank, and to three paraffin wax storage tanks, total capacity 2,520,000 gallons. A 21-foot boom boat and 1,650 feet of floating boom for pollution containment is stored on wharf. |

| CORPS OF ENGRS WATERWAY CODE 82300<br>LATITUDE LONGITUDE | 37-55-23N 122-22-19W | 37-55-26N 122-22-26W | 37-55-28N 122-22-32W |
|---|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 44 Dock Code No. 503 | 45 Dock Code No. 500 | 46 Dock Code No. 497 |
| NAME | Bay Ship & Yacht Co., Richmond Wharf. | Keefe Kaplan Maritime Wharf. | Richmond Boat Works Wharf. |
| LOCATION ON WATERFRONT | Left bank, Santa Fe Channel, at entrance to Richmond Yacht Harbor.<br><br>310 West Cutting Boulevard. | Left bank, Santa Fe Channel, approximately 0.5 mile from entrance.<br><br>530 West Cutting Boulevard. | Left bank, inner end, at head of Santa Fe Channel.<br><br>616 West Cutting Boulevard. |
| OWNED BY | Bay Ship & Yacht Co. | Keefe Kaplan Maritime, Inc. | Maritime Transit Corp. |
| OPERATED BY | Bay Ship & Yacht Co. | Keefe Kaplan Maritime, Inc. | Maritime Transit Corp., d.b.a. Richmond Boat Works, Inc. |
| PURPOSE FOR WHICH USED | Mooring small vessels for repair. | Mooring small vessels for repair; mooring floating drydocks. | Mooring small vessels for repair. |
| TYPE OF CONSTRUCTION | Series of timber floats with two timber ramps extending from concrete bulkhead; steel pile, steel-decked piers for vertical boat lift are located at lower side of floats. | Timber pile, timber-decked wharf, fronted by 4-foot-wide timber floats; upper and lower ends: steel sheet pile bulkhead with concrete-surfaced solid fill; two 85- by 3-foot, concrete pile, concrete-decked piers for vertical boat lift, and 3-foot walkway alongside at upper end. | Timber pile, timber-decked pier. A 90- by 65-foot, T-shaped, timber float with three parallel, 30- to 35-foot, small boat stalls on inner side of cross arm extends from face. |

| DESCRIPTION | Floats | Face | Pier | Float, face |
|---|---|---|---|---|
| Dimensions (Feet) | 120 by 4 | 80+500+70 | 60 by 10 | 65 |
| Depth Alongside at MLLW (Feet) | 20 | 20 | 5 | 20 |
| Breasting Distance (Feet) | 120 | 500+drydocks. | - | 65 |
| Total Berthing Space (Feet) | 120 | 500+drydocks. | - | 65 |
| Width of Apron (Feet) | Open. | Open. | Open. | |
| Height of Deck at MLLW (Feet) | - | 8 | 8 | |
| Load Capacity (Lbs. per Sq. Ft.) | - | 500 | - | |
| Lighted or Unlighted | Partly lighted. | Lighted. | Lighted. | |

| | | | |
|---|---|---|---|
| MECHANICAL HANDLING FACILITIES | One 77-ton, diesel, mobile, vertical boat lift; one 10-ton, diesel, mobile crane with 40-foot telescopic boom. | One 88- and one 60-ton, mobile, vertical boat lifts; one 15-ton, diesel, mobile crane with 90-foot boom and 20-foot jib; and one 2-ton, diesel, forklift truck. | One 1/2-ton, pneumatic, timber, mast-and-boom derrick with 25-foot boom. |
| RAILWAY CONNECTIONS | None. | None. | None. |
| HIGHWAY CONNECTIONS | Via private road, asphalt, 24 feet wide; from Cutting Boulevard, asphalt, 70 feet wide. | Via driveway, asphalt, 34 feet wide; from Cutting Boulevard, asphalt, 70 feet wide. | Via Cutting Boulevard, asphalt, 70 feet wide. |
| WATER SUPPLY (For Vessels) | Through 1 1/4-inch line with 3/4-inch hose connection. | Through 2-inch line with 3/4-inch hose connection. | Through 1-inch line with 3/4-inch hose connection. |
| ELECTRIC CURRENT (For Vessels) | A.C., 110/220 volts. | A.C., 110/220 volts. | A.C., 110 volts. |
| FIRE PROTECTION (Other than City) | Hose, hand extinguishers, and security system. | Hydrant, hose, pumps, hand extinguishers, and security patrol. | Hose and hand extinguishers. |
| REMARKS | One 20-ton, mobile, vertical boat lift serves yard at rear. | One 200- and one 100-ton floating drydocks are located at lower end of and perpendicular to wharf. | One 20-ton marine railway is located on lower side of wharf. |

| CORPS OF ENGRS WATERWAY CODE / LONGITUDE / LATITUDE | 82300 / 122-22-26W / 37-55-21N | 82300 / 122-22-06W / 37-55-10N | 82300 / 122-21-56W / 37-54-58N |
|---|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 47 Dock Code No. 488 | 48 Dock Code No. 470 | 49 Dock Code No. 458 |
| NAME | Castrol North America, Richmond Wharf. | National Gypsum Co., Richmond Dock. | Tosco Refining Co., Richmond Barge Wharf. |
| LOCATION ON WATERFRONT | Right bank, near head of Santa Fe Channel. 801 Wharf Street. | Right bank, Santa Fe Channel, opposite entrance to Lauritzen Canal. 1040 Canal Boulevard. | Right bank, Inner Harbor Channel, south of entrance to Santa Fe Channel. 1300 Canal Boulevard. |
| OWNED BY | Castrol North America, Inc. | National Gypsum Co., Gold Bond Building Products. | Tosco Refining Co., a division of Tosco Corp. |
| OPERATED BY | Castrol North America, Inc. | National Gypsum Co., Gold Bond Building Products. | Tosco Refining Co. |
| PURPOSE FOR WHICH USED | Receipt and shipment of petroleum products by barge and vessel. | Receipt of gypsum rock by self-unloading vessel. | Shipment and occasional receipt of petroleum products; loading barges for bunkering vessels at berth. |
| TYPE OF CONSTRUCTION | Timber pile, timber-decked, offshore wharf with 138- by 14-foot curved approach; one timber pile breasting dolphin on each side in line with face, connected by catwalks, and one mooring dolphin on each side, connected to shore by catwalks. | Three steel pile, concrete-capped, breasting dolphins with rubber and timber fender system, connected by 3 1/2-foot-wide, steel beam, timber-decked walkways, which in turn are connected to shore by 67- by 6-foot walkways of same construction; one similar breasting dolphin on lower side in line with face, with catwalk approach from shore. | Concrete pile, concrete-decked, offshore wharf, with one 50- by 22-foot approach; row of 3 timber breasting dolphins at lower end and one steel pile breasting dolphin at upper end with steel catwalk approach; wharf fronted by timber fender system. Lower side of wharf is connected to Tanker Dock (Ref. No. 50) by a concrete pile, timber-decked walkway. |

| DESCRIPTION | Face | Breasting dolphins | Face | Upper side | Lower side |
|---|---|---|---|---|---|
| Dimensions (Feet) | 38 | 233 | 148 | 36 | 50 |
| Depth Alongside at MLLW (Feet) | 32 | 38 | 37 | - | - |
| Breasting Distance (Feet) | 207 w/dolphins. | 600 w/dolphins. | 300 w/dolphins. | - | - |
| Total Berthing Space (Feet) | 700 w/dolphins. | 600 w/dolphins. | 836 w/Ref. No. 50 | - | - |
| Width of Apron (Feet) | Open. | Open. | Open. | | |
| Height of Deck at MLLW (Feet) | 7 | 9, dolphins; 11, walkway. | 12 | | |
| Load Capacity (Lbs. per Sq. Ft.) | 400 | - | - | | |
| Lighted or Unlighted | Lighted. | Lighted. | Lighted. | | |

| | | | |
|---|---|---|---|
| MECHANICAL HANDLING FACILITIES | One pneumatically operated, mast-and-boom derrick with 25-foot boom for handling hoses. | Receiving hopper on center dolphin for self-unloading vessels serves a 36-inch, electric, belt-conveyor system extending to one steel storage dome, maximum rate 1,400 tons per hour, normal rate 1,000 tons per hour. Material is reclaimed by bulldozers into a ground-level hopper serving an electric, belt-conveyor system extending to plant in rear. | Mobile hoist for handling hose. |
| RAILWAY CONNECTIONS | None. | Two platform-level tracks inside warehouse in rear connect with Burlington Northern Santa Fe Railway. | Tracks serving loading racks and warehouse at plant in rear connect with Burlington Northern Santa Fe Railway. |
| HIGHWAY CONNECTIONS | Via private road, asphalt, 15 feet wide; from Wharf Street, asphalt, 50 feet wide; and Canal Boulevard. | Via Canal Boulevard, asphalt, dual lane. | Via private road, asphalt, 25 feet wide; from Canal Boulevard, asphalt, 50 feet wide. |
| WATER SUPPLY (For Vessels) | Through 3-inch line. | Through 2 1/2-inch line. | Through 3-inch line. |
| ELECTRIC CURRENT (For Vessels) | A.C., 110/440 volts. | A.C., 110 volts. | A.C., 110/440 volts. |
| FIRE PROTECTION (Other than City) | Hydrants, hose, hand extinguishers, and security patrol. | Automatic fire detection system, portable pumps, hose, and hand extinguishers. | One 6-inch fire line, pumps, monitor nozzles, hand extinguishers, hydrant, monitors, and security patrol. |
| REMARKS | Two 6- and twelve 4-inch pipelines extend from wharf to 53 steel storage tanks located at rear, total capacity 85,000 barrels. | Gypsum rock is obtained from San Marco Island, Baja California, Mexico. Storage dome located at rear has capacity for 40,000 tons of gypsum rock. | One 6-inch pipeline extends from wharf to one 5,000-barrel-capacity slop tank at rear. Ten 6-inch pipelines extend to storage tanks described under Ref. No. 50. Terminal is connected by pipeline with company-owned refinery at Rodeo, California. (See Ref. No. 63 in the Carquinez Strait section of this report.) |

| CORPS OF ENGRS WATERWAY CODE 82300<br>LATITUDE LONGITUDE | 37-54-54N 122-21-55W | 37-54-48N 122-21-54W | 37-54-43N 122-21-53W |
|---|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 50 Dock Code No. 462 | 51 Dock Code No. 454 | 52 Dock Code No. 450 |
| NAME | Tosco Refining Co., Richmond Tanker Wharf. | ARCO Products Co., Richmond Barge Wharf. | ARCO Products Co., Richmond Tanker Wharf. |
| LOCATION ON WATERFRONT | Right bank, Inner Harbor Channel, approximately 0.1 mile below entrance to Santa Fe Channel.<br><br>1300 Canal Boulevard. | Right bank, Inner Harbor Channel, approximately 0.2 mile below entrance to Santa Fe Channel.<br><br>1306 Canal Boulevard. | Right bank, Inner Harbor Channel, approximately 0.3 mile below entrance to Santa Fe Channel.<br><br>1306 Canal Boulevard. |
| OWNED BY | Tosco Refining Co., a division of Tosco Corp. | ARCO Products Co. | ARCO Products Co. |
| OPERATED BY | Tosco Refining Co. and GATX Terminals Corp. | ARCO Products Co. | ARCO Products Co. |
| PURPOSE FOR WHICH USED | Receipt and shipment of petroleum products and liquid bulk products, including solvents, vegetable oils, coconut oil, and caustic soda. | Mooring oil-spill response vessel *Clean Bay I.* | Receipt and occasional shipment of petroleum products. |
| TYPE OF CONSTRUCTION | Concrete pile, concrete-decked, offshore wharf with two 48- by 20-foot truck approaches from shore; 3 timber breasting dolphins in line with face on upper side; wharf is fronted by timber fender system with steel coil springs. | Concrete pile, concrete-decked, offshore wharf with one 58- by 18-foot approach; fronted by timber fender system. Lower side of wharf is connected to Tanker Wharf (Ref. No. 52) by a concrete pile, timber-decked walkway; fronted by 2 timber mooring dolphins. | Concrete pile, concrete-decked, offshore wharf with two 65- by 17-foot truck approaches from shore; wharf fronted by rubber fender system. |

| DESCRIPTION | Face | Sides | Face | Sides | Face | Sides |
|---|---|---|---|---|---|---|
| Dimensions (Feet) | 228 | 50, each. | 151 | 30, each. | 247 | 40, each. |
| Depth Alongside at MLLW (Feet) | 37 | - | 35 | - | 38 | - |
| Breasting Distance (Feet) | 370 w/dolphins. | - | 151 | - | 247 | - |
| Total Berthing Space (Feet) | 836 w/Ref. No. 49 | - | 710 w/Ref. No. 52 | - | 710 w/Ref. No. 51 | - |
| Width of Apron (Feet) | Open. | | Open. | | Open. | |
| Height of Deck at MLLW (Feet) | 12 | | 12 | | 12 | |
| Load Capacity (Lbs. per Sq. Ft.) | - | | - | | - | |
| Lighted or Unlighted | Lighted. | | Lighted. | | Lighted. | |

| | | | |
|---|---|---|---|
| MECHANICAL HANDLING FACILITIES | Mobile hoist for handling hose. | None. | One mobile hoist with 45-foot retractable boom for handling hoses. |
| RAILWAY CONNECTIONS | Tracks serving loading racks and warehouse at plant in rear; connect with Burlington Northern Santa Fe Railway. | Tracks serving tank car loading racks in rear connect with Burlington Northern Santa Fe Railway. | Tracks serving tank car loading racks in rear connect with Burlington Northern Santa Fe Railway. |
| HIGHWAY CONNECTIONS | Via private road, asphalt, 25 feet wide; from Canal Boulevard, asphalt, 50 feet wide. | Via private road, asphalt, 25 feet wide; from Canal Boulevard, asphalt, 50 feet wide. | Via private road, asphalt, 25 feet wide; from Canal Boulevard, asphalt, 50 feet wide. |
| WATER SUPPLY (For Vessels) | Through 3-inch line. | Through 2 1/2-inch line. | Through 2 1/2-inch line with 2- and 3/4-inch connections. |
| ELECTRIC CURRENT (For Vessels) | A.C., 110/440 volts. | A.C., 110/220 volts. | A.C., 110/220 volts. |
| FIRE PROTECTION (Other than City) | One 6-inch fire line, pumps, monitor nozzles, hand extinguishers, hydrant, monitors, and security patrol. | Pumps, hydrants, hand extinguishers, fireboat connection, and security patrol. | Pumps, hydrants, hand extinguishers, fireboat connection, and security patrol. |
| REMARKS | Wharf is connected to Barge Wharf (Ref. No. 49) by a walkway.<br>Tosco Refining Co.: Two 10- and six 8-inch pipelines extend from wharf to 82 steel storage tanks located at rear, total capacity 237,300 barrels.<br>GATX Terminals Corp.: Six 8- and sixteen 6-inch pipelines extend from wharf to 135 steel storage tanks located at rear, total capacity 620,000 barrels. Facility is operated as a public liquid bulk terminal. | Nine 8-inch pipelines extending from wharf to storage tanks described under Ref. No. 52 were not in use at time of survey (2000). | Wharf is connected to Barge Wharf (Ref. No. 51) by a walkway. Ten 6- (not in use at time of survey 2000) and five 8-inch pipelines extend from wharf to 46 steel storage tanks located at rear, total capacity 737,000 barrels. Storage tanks at terminal are connected with interstate pipeline system of Kinder Morgan Energy Partners LLC. |

| CORPS OF ENGRS WATERWAY CODE<br>LATITUDE LONGITUDE | 82300<br>37-54-27N 122-21-50W | 82300<br>37-54-18N 122-21-51W | 82300<br>37-54-17N 122-21-59W |
|---|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 53 Dock Code No. 442 | 54 Dock Code No. 430 | 55 Dock Code No. 420 |
| NAME | Port of Richmond, Point Potrero Marine Terminal, No. 7 Wharf. | Port of Richmond, Point Potrero Marine Terminal, No. 6 Wharf. | Port of Richmond, Point Potrero Marine Terminal, Berths Nos. R6-1 thru R6-5. |
| LOCATION ON WATERFRONT | Right side of entrance to Inner Harbor Channel, east side of Point Potrero.<br><br>1301 Canal Boulevard. | Inner Harbor Channel, south side of Point Potrero.<br><br>1318 Canal Boulevard. | Inner Harbor Channel, south side of Point Potrero.<br><br>1313 Canal Boulevard. |
| OWNED BY | City of Richmond. | City of Richmond. | City of Richmond. |
| OPERATED BY | Pasha Group. | Marin Tug & Barge, Inc. | Port of Richmond. |
| PURPOSE FOR WHICH USED | Occasional receipt and shipment of general cargo. | Mooring company-owned tug and bunkering barge. | Mooring vessels. |
| TYPE OF CONSTRUCTION | Concrete pile, asphalt-surfaced, concrete-decked wharf; fronted by timber and rubber fender system. | Concrete pile, part asphalt-surfaced, concrete-decked wharf; fronted by part timber and part rubber fender system. | Five slips, formerly graving docks, formed by concrete walls and four concrete piers. |

| DESCRIPTION | Face | Inner end, Berth B | Outer end, Berth A | Berths R6-1, 4 & 5 | Berth R6-2 | Berth R6-3 |
|---|---|---|---|---|---|---|
| Dimensions (Feet) | 1,615 | 266 | 450 | 576 by 84 | 748 by 84 | 587 by 84 |
| Depth Alongside at MLLW (Feet) | 38 | 32 | 24 | 15* | 27* | 27* |
| Breasting Distance (Feet) | 1,615 | 266 | 450 | 576, each. | 748 | 587 |
| Total Berthing Space (Feet) | 1,615 | 266 | 450 | 576, each. | 748 | 587 |
| Width of Apron (Feet) | Open. | Open. | | Open. | Open. | Open. |
| Height of Deck at MLLW (Feet) | 12 | 12 | | 12 | 12 | 12 |
| Load Capacity (Lbs. per Sq. Ft.) | - | - | | - | - | *over sill |
| Lighted or Unlighted | Lighted. | Partly lighted. | | Lighted. | | |
| MECHANICAL HANDLING FACILITIES | Stevedore equipment is available as required. | None. | | None. | | |
| RAILWAY CONNECTIONS | Trackage serving terminal in rear connects with Burlington Northern Santa Fe Railway. | Trackage serving terminal in rear connects with Burlington Northern Santa Fe Railway. | | None. | | |
| HIGHWAY CONNECTIONS | Via terminal road, asphalt, various widths; from foot of Canal Boulevard, asphalt, 50 feet wide. | Via terminal road, asphalt, various widths; from foot of Canal Boulevard, asphalt, 50 feet wide. | | Via terminal road, asphalt, various widths; from foot of Canal Boulevard, asphalt, 50 feet wide. | | |
| WATER SUPPLY (For Vessels) | Through 3-inch line with 2 1/2-inch connection. | Through 2 1/2-inch and 3/4-inch connections. | | Through 2 1/2-inch and 3/4-inch connections. | | |
| ELECTRIC CURRENT (For Vessels) | A.C., 110 volts. | A.C., 110/220/440 volts. | | A.C., 110/220/440 volts. | | |
| FIRE PROTECTION (Other than City) | Hydrants, hose, hand extinguishers, and security patrol. | Hydrants, hose, hand extinguishers, and security patrol. | | Hydrants, hose, hand extinguishers, and security patrol. | | |
| REMARKS | Pasha Group has preferential berthing at terminal. There are 40 acres of paved, open storage area for automobiles at rear and an additional 50 acres of unpaved area owned by the Port of Richmond. | Dispatch office is located at rear. | | Berth R6-1 (Dock No. 1) is on the west end, Berth R6-5 (Dock No. 5) on the east end. | | |

| CORPS OF ENGRS WATERWAY CODE<br>LATITUDE LONGITUDE | 82300<br>37-54-18N 122-22-18W | 82300<br>37-54-20N 122-22-23W | 82300<br>37-54-30N 122-23-13W |
|---|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 56 Dock Code No. 403 | 57 Dock Code No. 401 | 58 Dock Code No. 356 |
| NAME | Port of Richmond, Point Potrero Marine Terminal, Finger Pier 1. | Port of Richmond, Point Potrero Marine Terminal, Finger Pier 2. | Port of Richmond Terminal, No. 1 Wharf. |
| LOCATION ON WATERFRONT | North side, Inner Harbor Channel, approximately 0.4 mile west of Point Potrero.<br><br>1314 Canal Boulevard. | North side, Inner Harbor Channel, approximately 0.4 mile west of Point Potrero.<br><br>1316 Canal Boulevard. | Point Richmond, east of foot of Garrard Boulevard.<br><br>860 S. Garrard Boulevard. |
| OWNED BY | City of Richmond. | City of Richmond. | City of Richmond. |
| OPERATED BY | Marine Spill Response Corp. | Foss Maritime Co. | City of Richmond. |
| PURPOSE FOR WHICH USED | Mooring oil-spill response vessels. | Mooring company-owned floating equipment, including tugs and bunkering barges. | Mooring *SS Red Oak Victory.* |
| TYPE OF CONSTRUCTION | Concrete pile, concrete-decked pier; fronted by steel, timber, and rubber fender system. | Concrete pile, concrete-decked pier; fronted by steel and timber fender system. | Concrete pile, asphalt-surfaced, concrete-decked wharf; fronted by timber fender system. |

| DESCRIPTION | | Face | Lower side | Upper side | Pier | Face | Sides |
|---|---|---|---|---|---|---|---|
| Dimensions | (Feet) | 48 | 547 | 547 | 547 by 48 | 557 | 90, each. |
| Depth Alongside at MLLW | (Feet) | 30 | 12 | 30 | 10-19 | 29 | - |
| Breasting Distance | (Feet) | 48 | 522 | 472 | 547+547 | 557 | - |
| Total Berthing Space | (Feet) | 48 | 522 | 472 | 547+547 | 557 | - |
| Width of Apron | (Feet) | Open. | Open. | Open. | Open. | 18 | |
| Height of Deck at MLLW | (Feet) | 12 | | | 12 | 13.5 | |
| Load Capacity | (Lbs. per Sq. Ft.) | 500 | | | 500 | 1,000 | |
| Lighted or Unlighted | | Lighted. | | | Lighted. | Lighted. | |
| TRANSIT SHEDS Number and Description | | None. | | | None. | One - steel frame, concrete walls; asphalt-surfaced, concrete floor. | |
| Length and Width | (Feet) | | | | | 525 by 67 | |
| Height Inside | (Feet) | | | | | 23 | |
| Floor Area for Cargo | (Sq. Ft.) | | | | | 34,075 | |
| Load Capacity | (Lbs. per Sq. Ft.) | | | | | 1,000 | |
| Cargo Doors | | | | | | Shipside: nineteen; Rear: same; all 16 by 24, steel roll-up type. | |
| MECHANICAL HANDLING FACILITIES | | None. | | | None. | None. | |
| RAILWAY CONNECTIONS | | None. | | | None. | None. | |
| HIGHWAY CONNECTIONS | | Via terminal road, asphalt, various widths; from foot of Canal Boulevard, asphalt, 50 feet wide. | | | Via terminal road, asphalt, various widths; from foot of Canal Boulevard, asphalt, 50 feet wide. | Via Brickyard Cove Road, asphalt, 25 feet wide; from foot of Garrard Boulevard, asphalt, 48 feet wide. | |
| WATER SUPPLY | (For Vessels) | Through 2 1/2-inch and 3/4-inch connections. | | | Through 2 1/2-inch and 3/4-inch connections. | Through 2-inch line. | |
| ELECTRIC CURRENT | (For Vessels) | A.C., 110/220/440 volts. | | | A.C., 110/220/440/460 volts. | A.C., 110/220 volts. | |
| FIRE PROTECTION (Other than City) | | Hydrants, hose, and hand extinguishers. | | | Hydrants, hose, and hand extinguishers. | Hydrants, hose, hand extinguishers, and security patrol. | |
| REMARKS | | Pier forms 280-foot-wide slip with Finger Pier 2 (Ref. No. 57). Pacific Responder and MSRC-452 are based at pier. | | | Pier forms 280-foot-wide slip with Finger Pier 1 (Ref. No. 56). Dispatch office is located at rear. | - | |

| CORPS OF ENGRS WATERWAY CODE<br>LATITUDE LONGITUDE | 82300<br>37-55-19N 122-24-39W | 82300<br>37-55-18N 122-24-30W |
|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 59 Dock Code No. 214 | 60 Dock Code No. 214 |
| NAME | Chevron Products Co., Richmond Long Wharf. | Chevron Products Co., Richmond Long Wharf Mooring Dock. |
| LOCATION ON WATERFRONT | Easterly side, Richmond Outer Harbor Maneuvering Area, approximately 0.8 mile south of Richmond-San Rafael Bridge.<br><br>841 Chevron Way. | Richmond Outer Harbor, on southeast side of Long Wharf (Ref. No. 59) approach, 275 feet in rear of face of main wharf.<br><br>841 Chevron Way. |
| OWNED BY | Chevron Products Co. | Chevron Products Co. |
| OPERATED BY | Chevron Products Co. | Chevron Products Co. |
| PURPOSE FOR WHICH USED | Receipt of crude oil; receipt and shipment of petroleum products; bunkering vessels; loading bunkering barges. | Mooring tugs. |
| TYPE OF CONSTRUCTION | Concrete pile, asphalt-surfaced, concrete-decked offshore wharf with 4,200- by 26-foot approach; 3 concrete breasting dolphins on north side and one on south side in line with face, and one concrete mooring dolphin on each end, all connected by catwalks. Width of wharf varies from 112 and 132 feet at south and north ends, respectively, with 60-foot width through central section. | Concrete pile, concrete-decked pier with timber fender system along sides; pier extends from south side of approach to Long Wharf (Ref. No. 59). |

| DESCRIPTION | | Face, Berths 1 thru 4 | Rear of face, Berth 5 | Rear of face, Berths 9 and 11 | Outer side | Face | Inner side |
|---|---|---|---|---|---|---|---|
| Dimensions | (Feet) | 2,463 | 630 | 1,660 | 451 | 53 | 425 |
| Depth Alongside at MLLW | (Feet) | 40-50 | 20 | 20 | 15 | 15 | 15 |
| Breasting Distance | (Feet) | 3,065 w/dolphins. | 630 | 1,660 | 451 | 53 | 425 |
| Total Berthing Space | (Feet) | 3,065 | 630 | 1,660 | 451 | 53 | 425 |
| Width of Apron | (Feet) | Open. | | | Open. | | |
| Height of Deck at MLLW | (Feet) | 15 | 15 | 13 | 15 | | |
| Load Capacity | (Lbs. per Sq. Ft.) | 300 & 450 | | | 350 | | |
| Lighted or Unlighted | | Lighted. | | | Lighted. | | |

| | | |
|---|---|---|
| MECHANICAL HANDLING FACILITIES | Five 16-, three 14- (vapor recovery), eight 12-, and two 8-inch, swivel-jointed, pipeline loading arms; and 4 pneumatic, mast-and-boom derricks. | One 5-ton, electric, pedestal crane with 35-foot telescopic boom. Forklift trucks, mobile cranes, and other equipment are available as required. |
| RAILWAY CONNECTIONS | Tracks serving terminal at rear connect with Burlington Northern Santa Fe Railway and Union Pacific Railroad. | Tracks serving terminal at rear connect with Burlington Northern Santa Fe Railway and Union Pacific Railroad. |
| HIGHWAY CONNECTIONS | Via Chevron Way (private road), asphalt, 24 feet wide. | Via Chevron Way (private road), asphalt, 24 feet wide. |
| WATER SUPPLY (For Vessels) | Through 6-inch line with 1 1/2-inch hose connections. | Through 6-inch line with 1 1/2-inch hose connections. |
| ELECTRIC CURRENT (For Vessels) | A.C., 120/480 volts. | A.C., 120/480 volts. |
| FIRE PROTECTION (Other than City) | Pumps, hydrants, hose, foam generators, hand extinguishers, security patrol, and plant fire department. | Pumps, hydrants, hose, foam generators, hand extinguishers, security patrol, and plant fire department. |
| REMARKS | Tankers and barges berth at face, and barges at rear of face. One 36-, one 30-, two 16-, fourteen 12-, nine 8-, five 6-, and two 4-inch pipelines extend from wharf to approximately 350 steel storage tanks at refinery in rear; total capacity 20,280,000 barrels. | Buildings located along the main wharf approach contain offices. |

| CORPS OF ENGRS WATERWAY CODE / LATITUDE / LONGITUDE | 82300 / 37-57-20N / 122-25-42W | 82300 / 37-57-47N / 122-25-46W |
|---|---|---|
| REFERENCE NUMBER ON MAP NO. 1 | 61 | 62 |
| NAME | Chevron Products Co., Richmond Point Orient Wharf. | Port of Richmond, Terminal No. 4 Wharf. |
| LOCATION ON WATERFRONT | San Francisco Bay, Richmond Outer Harbor; Point Orient, approximately 1.8 miles north of Richmond-San Rafael Bridge. | San Francisco Bay, Richmond Outer Harbor, Point San Pablo, approximately 2.1 miles north of Richmond-San Rafael Bridge.<br>2101 Western Drive. |
| OWNED BY | Chevron Products Co. | City of Richmond. |
| OPERATED BY | Not operated. | Paktank Corp. |
| PURPOSE FOR WHICH USED | Not used. | Receipt and shipment of liquid bulk products, including petroleum products, petrochemicals, chemicals, and vegetable oils. |
| TYPE OF CONSTRUCTION | Timber pile, part asphalt-surfaced, timber-decked offshore wharf with 1,200- by 14-foot approach; fronted by timber fender system with steel coil springs along face. | Offshore wharf, timber pile (some concrete-jacketed) with asphalt-surfaced timber deck; fronted by timber fender system. Concrete dolphin at north end, connected to wharf by timber walkway. |

| DESCRIPTION | | Face, Ship Berth | Rear of face, Barge Berth | Ends | Face | South side | North side |
|---|---|---|---|---|---|---|---|
| Dimensions | (Feet) | 504 | 464 | 60, each. | 1,047 | 139 | 100 |
| Depth Alongside at MLLW | (Feet) | 36 | 18 | 36 | 35 | - | 32 |
| Breasting Distance | (Feet) | 504 | 464 | 60, each. | 1,047 | - | - |
| Total Berthing Space | (Feet) | 504 | 464 | 60, each. | 1,047 | - | - |
| Width of Apron | (Feet) | Open. | - | - | Open. | | |
| Height of Deck at MLLW | (Feet) | 14 | | | 14 | | |
| Load Capacity | (Lbs. per Sq. Ft.) | 300 | | | 350 | | |
| Lighted or Unlighted | | Lighted. | | | Partly lighted. | | |
| TRANSIT SHEDS Number and Description | | None. | | | One - timber frame, wood siding; asphalt-surfaced floor. | | |
| Length and Width | (Feet) | | | | 188 by 70-60 | | |
| Height Inside | (Feet) | | | | 14 | | |
| Floor Area for Cargo | (Sq. Ft.) | | | | 11,300 | | |
| Load Capacity | (Lbs. per Sq. Ft.) | | | | 350 | | |
| Cargo Doors | | | | | Shipside: one, 13.5 by 11.5 and three, 9 by 12; Rear: same; Each end: one, 13.5 by 11.5. | | |
| MECHANICAL HANDLING FACILITIES | | None. | | | One 5-ton, diesel, mobile crane with 45-foot telescopic boom; and forklift trucks available as required. | | |
| RAILWAY CONNECTIONS | | None. | | | Two surface tracks on north side of Western Avenue, one serving tank car loading racks; connect with Burlington Northern Santa Fe Railway and Union Pacific Railroad. | | |
| HIGHWAY CONNECTIONS | | Via Western Drive, asphalt, 24 feet wide. | | | Via Western Drive, asphalt, 24 feet wide. | | |
| WATER SUPPLY | (For Vessels) | None. | | | Through 4-inch line with 2-inch connections. | | |
| ELECTRIC CURRENT | (For Vessels) | None. | | | A.C., 220/440 volts. | | |
| FIRE PROTECTION (Other than City) | | Hydrants, hose, and security patrol. | | | Hydrants, fire hose connections, chemical carts, suction line to fire truck pumper, hand extinguishers, and security patrol. | | |
| REMARKS | | At time of survey (2000), all pipelines had been disconnected at wharf. | | | One 12-, one 10-, seventeen 6-, and one 4-inch pipelines extend from wharf to 79 storage tanks located at rear, total capacity 504,500 barrels. Facility is operated as a public liquid bulk terminal. | | |

## 8.6 Geotechnical Characterization Report




# PORT OF RICHMOND POINT POTRERO MARINE TERMINAL

RICHMOND, CALIFORNIA

## GEOTECHNICAL CHARACTERIZATION REPORT

SUBMITTED TO
Mr. Matt Trowbridge PE, SE
Moffatt & Nichol
1300 Clay Street, Suite 350
Oakland, CA 94612

PREPARED BY
ENGEO Incorporated

July 17, 2025
Revised July 25, 2025

PROJECT NO.
26829.000.001

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ENGEO
Expect Excellence

Project No.
**26829.000.001**

July 17, 2025
Revised July 25, 2025

Mr. Matt Trowbridge PE, SE
Project Manager/Vice President
Moffatt & Nichol
1300 Clay Street, Suite 350
Oakland, CA 94612

Subject: Port of Richmond Point Potrero Marine Terminal
1322 Canal Blvd
Richmond, California

## GEOTECHNICAL CHARACTERIZATION REPORT

Dear Mr. Trowbridge:

We prepared this geotechnical characterization report for the Point Potrero Marine Terminal at the Port of Richmond as outlined in our agreement dated February 14, 2025. The purpose of this report is to provide a summary of the geotechnical conditions at the terminal property based on historical explorations and review of other historical data.

If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

REGISTERED PROFESSIONAL ENGINEER
JEFFREY A. FIPPIN
No. 2631
GEOTECHNICAL
STATE OF CALIFORNIA

Jeff Fippin, GE

Robert H. Boeche, CEG

jaf/rhb/jf

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# 1.0 INTRODUCTION

## 1.1 PURPOSE AND SCOPE

We prepared this geotechnical characterization report for the Port of Richmond Point Potrero Marine Terminal in Richmond, California. As outlined in our agreement dated February 14, 2025, Moffatt & Nichol (M&N) authorized ENGEO to conduct the following scope of services.

- Review historical geotechnical explorations
- Review historical aerial photographs and maps
- Perform a site visit
- Perform limited analyses
- Prepare this report

For our use, we received the following geotechnical documents via email.

1. Fugro West, Inc. 2002. Conceptual Level Geotechnical Investigation, Aggregate Storage Facility, Port of Richmond, Richmond, California. November 19, 2002. Project No. 1484.002.
2. Fugro West, Inc. 2003a. Geotechnical Study, Operable Unit No. 1 Surface Improvements, Port of Richmond, Richmond, California. February 21, 2003. Report No. 1111.002.
3. Fugro West, Inc. 2003b. Geotechnical Investigation, Hanson Aggregates, Port of Richmond, Richmond, California. March 21, 2003. Project Number 1484.004.
4. Cornerstone Earth Group. 2008. Memorandum, Preliminary Long-Term Settlement, Honda Rail Expansion – Port of Richmond. September 16, 2008. Project No. 281-1-1.
5. Cornerstone Earth Group. 2009a. Memorandum, Honda Rail Expansion – Port of Richmond. January 23, 2009. Project No. 281-1-3.
6. Cornerstone Earth Group. 2009b (Draft). Geotechnical Investigation, Honda Port of Entry, Canal Boulevard, Richmond, California. September 9, 2009. Project Number 281-1-3.
7. Fugro West, Inc. 2010. Geotechnical Recommendations for Proposed Point Potrero Wharf Repair Project, Honda Automotive Facility, Port of Richmond, California. January 27, 2010. Project No. 1413.005.
8. Cornerstone Earth Group. 2010. Geotechnical Consultation, Parcel 7 Parking Lot Pavement Study, Canal Boulevard – Port of Richmond, Richmond, California. August 6, 2010. Project No. 281-1-7.

We also received the following plans for various projects via email.

1. Guy F. Atkinson Company. WISCO – Richmond. September 29, 1969.
2. Kaiser Company, Inc. Basins. May 23, 1942.
3. Kaiser Company, Inc. Various plans for Fitting Out Dock at Richmond Yard No. 3. Various dates 1942 to 1944.
4. L.H. Nishkian Consulting Engineer. Deepening of Existing Ship Basins, Kaiser Co. Inc. Yard No. 3, Richmond, California. June 20, 1945.
5. Liftech Consultants Inc. Point Potrero Wharf Repair for Honda Automotive Facility, Port of Richmond, Issued for Construction. Project No. Z1800. January 25, 2010.

6. Liftech Consultants Inc. Point Potrero Pile Replacement for Honda Automotive Facility, Port of Richmond. Project No. Z1800. February 8, 2012.

This report was prepared for the exclusive use of our client, the Port of Richmond, and their consultants for the purpose of documenting the known geotechnical conditions at the Potrero Point Marine Terminal site. We also provide estimates of foundation capacity for the purpose of evaluating the existing conditions and planning upgrades. In the event a retrofit is pursued, a report should be prepared specifically for the retrofit concept and the locations of any retrofit foundations. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without our express written consent.

### 1.2 PROJECT LOCATION

Figure 1 displays a Site Vicinity Map. The Point Potrero Marine Terminal site (Site) is located southwest of the Richmond Harbor Channel and includes Berths 5 and 6, and 7 and 8 along the southeastern and eastern edges of the shoreline, respectively. To the west of Berth 5, there are former graving basins. Along the eastern shoreline, there are two finger piers. Canal Boulevard forms most of the western and northern boundary of the Site (except for the previously mentioned finger piers). A rail spur enters the Site from the north. Figure 2 shows the site boundaries.

## 2.0 FINDINGS

### 2.1 SITE HISTORY

Portions of the Site are beyond the historical shoreline mapped in 1874; The blue dashed line on Figure 2 shows the approximate location of the historical shoreline. The area inland of the historical shoreline was a ridge that sloped into the San Francisco Bay. Portions of the site on the waterside of the historical shoreline are former shallow water areas and marshlands. An aerial photograph from 1939 (Exhibit 2.1-1) shows that portions of the current land have been filled. We understand that the Kaiser Shipbuilding Company developed the site in 1942 to create a private shipyard. By the time of a 1946 photograph, all the land comprising the Site had been reclaimed, and much of the Site had been developed for shipbuilding. Based on historical records, the Site was in use to construct Liberty Ships for World War II. The 1946 aerial photograph shows the site occupied with buildings, a marginal wharf along the southeast and eastern shore, five graving basins along the southern shore, and two finger piers along the western shore. We understand that the shipyard was closed after World War II, and an aerial photograph from 1958 shows the site with no shipbuilding activity evident. A 1965 aerial photograph shows the site in use as ship storage with what appears to be stockpiled material in various places. One of the reports we reviewed indicated that the site was used for ship dismantling, and much of the site was used as a scrap yard up until the 1980s.

**EXHIBIT 2.1-1 Aerial Photograph with Site Boundary in Black (1939)**

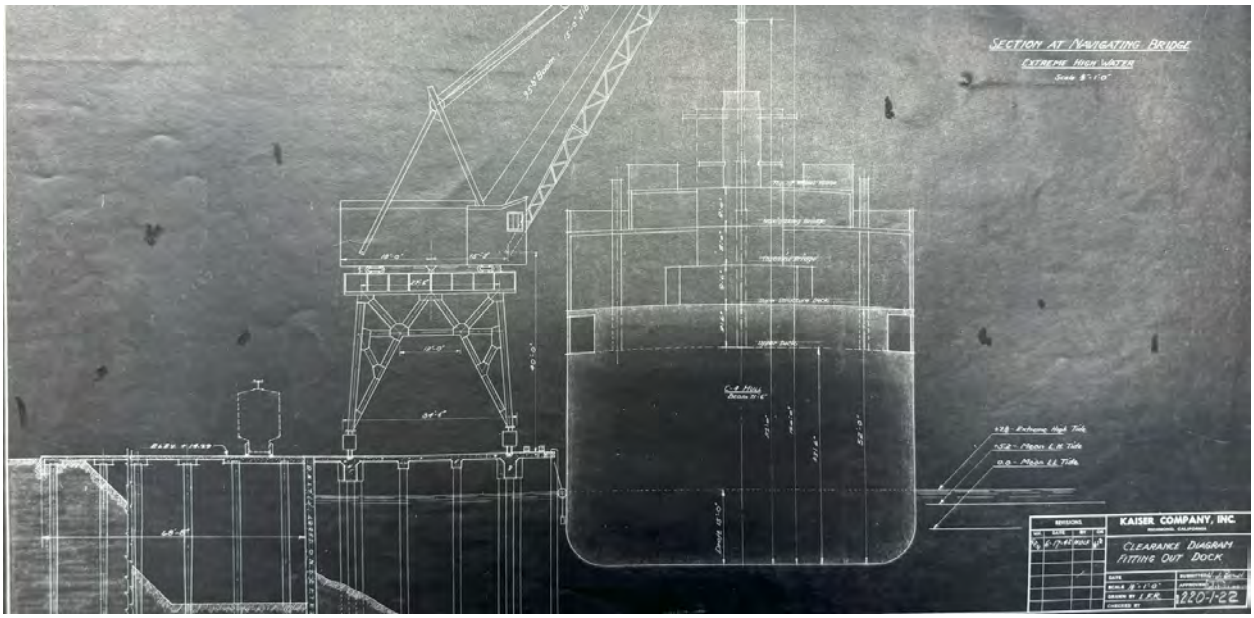


The Port of Richmond redeveloped approximately 52 acres of the Site, creating the paved parking lot on the western side. This work included placing over 375,000 cubic yards of dredged material and then removing and recompacting that material. The purpose of this fill was to cap contaminated fill that was left in place. Other improvements at the time included repairs to the Berths 7 and 8 wharf to allow importing of Kia and Hyundai and storage on the Site before loading onto trucks for delivery to a BNSF terminal located north of Cutting Boulevard. In 2009 and 2010, additional improvements were performed, including extending BNSF tracks into the northern portion of the site for transfer of vehicles to rail, additional structural repairs to the wharf, access road improvements, new lighting, extension of the Bay Trail, and new entrance gate and employee parking. These improvements were called the Honda Port of Entry Project and facilitated importing Honda automobiles to the Site. In 2011, Subaru began using the terminal for importing vehicles.

The site currently retains buildings constructed during the shipbuilding days, including the four-story concrete General Warehouse and the single-story building that formerly occupied the Sheet Metal Shop, Riggers Loft, and Paint Shop. A historical Whirley Crane (formerly operated at the Port of Richmond's Shipyard No. 1) was relocated to the Site in 2005. The Red Oak Victory, a liberty ship constructed at the former shipyard and launched in 1944, was reclaimed from the Naval Reserve Fleet in Suisun Bay in 1998 and moved to the Site; it is moored in Graving Basin 5.

Exhibit 2.1-2 shows a cross-section of the marginal wharf along the Berths 7 and 8 segment from the 1942 plans by Kaiser Company, Inc. Other plans indicate that the structure comprised from left to right in Exhibit 2.1-1, a 68¾-foot-wide cast-in-place concrete deck supported on timber plumb piles, a concrete sheet pile wall, and a 46½-foot-wide cast-in-place concrete deck supported on pre-cast-concrete plumb piles. The plans show the pre-cast piles as 18-inch square sections with chamfered corners. A plan sheet from 1942 indicates sand fill was placed below the water surface in front of the sheet pile wall between pile lines 40 and 50.

**EXHIBIT 2.1-2: Section of Berths 7/8 Area (Kaiser Company, Inc., 1942)**




According to a report titled “Berths 6C, 6D, and 7 of the Point Potrero Marine Terminal Condition Survey,” by Vickerman/ Zachary/Miller, Inc., dated July 2, 1990, the area between the shoreline below the wharf and the sheet piles was originally planned to be backfilled. Due to low blow counts during driving the sheets and concerns about their ability to laterally support the soil backfill, only the northernmost 320 feet of Berth 8 was constructed with backfill behind the sheets. In this area, the report indicates the portion of the structure west of the sheets is not supported on piles, and the concrete deck sits on the backfill.

The plans (Sheet 220-0-12) indicate that the “South End” of the structure, which is the current day Berth 5 and 6 area, is a cast-in-place concrete deck that is approximately 60 feet wide. The South End was supported by concrete columns cast inside of a 36-inch-diameter steel shell that penetrated 6 feet minimum into “solid rock.”

The plans include various repairs performed, including the replacement of select piles in support of the Honda Port of Entry Project. One of the plan sets shows placement of steel wedges at the tops of piles and support of those wedges with 6-inch-wide-by-8-inch-thick-by-4-foot-long pads bolted on opposite sides of piles for a retrofit. The plans indicate this retrofit was performed to address subsiding piles, though the locations of the repairs

The graving basins are located immediately west of the end of Berth 5. They are numbered 1 through 5 from west to east. The various plans for the graving basins indicate they are precast concrete structures. The basins are formed by concrete walls on the northern, western, and eastern sides of each. Between each basin is a 34-foot-wide concrete structure formerly used to support crane rails. The columns supporting the structure and the walls sit on footings. The various plans indicate the footings sit on excavated bedrock or lean cement fill placed on top of the bedrock where the bedrock dips below the foundation depth. The basins have a concrete slab-on-grade floor. A 1943 plan sheet by the Kaiser Company, Inc. indicates that the original construction of the basins included a floor at Elevation -18 feet (Datum: Elevation 0 feet = Mean Lower Low Water). Basins 2 and 3 were deepened and the new floor slab was set at Elevation -30 feet. Each Basin is 100 feet wide with the deepened portion of Basins 2 and 3 being 88 feet wide.

## 2.2 SURFACE CONDITIONS

We performed several site visits at various times during 2025. In two of those visits, we performed underdeck observations. On March 18, 2025, we participated in a structural inspection below Berths 5 and 6 from a boat. On March 19, 2025, we participated in a structural inspection below Berths 7 and 8 from land. The purpose of both our observations was to check for geotechnical conditions and any soil-related distress to the structures.

During our site visits, we observed areas of the ground surface where the ground surface had settled either at the interface of the land and the marginal wharf (Berths 5, 7, and 8) or where the deck of the wharf settled (Berth 6). There are two prominent locations where we observed ground settlement and deck settlement in the areas of Berths 5 and 6. Exhibit 2.2-1 shows an aerial photograph with these areas approximately outlined.

**EXHIBIT 2.2-1: Aerial Photograph with Prominent Areas of Surface Distress**




## 2.3 GEOLOGY AND SEISMICITY

### 2.3.1 Regional Geology

The site is located within the Coast Ranges geomorphic province of California. The Coast Ranges province is typified by a system of northwest-trending, fault-bounded mountain ranges and intervening alluvial valleys. More specifically, the site is located at the southern end of a northwest-oriented, resistant ridge located adjacent to the San Francisco Bay.

Bedrock in the Coast Ranges comprises igneous, metamorphic, and sedimentary rocks that range in age from Jurassic to Pleistocene. The present physiography and geology of the Coast Ranges are the result of deformation and deposition along the tectonic boundary between the North American plate and the Pacific plate. Plate boundary fault movements are largely concentrated along the well-known fault zones, which in the area include the San Andreas, Calaveras, and Hayward faults, as well as other lesser-order faults.

### 2.3.2 Site Geology

According to published maps covering the site by Dibblee (1980) and Graymer (2000), the Site is capped by artificial fill. The adjacent hillside northwest of the Site is mapped by Graymer as primarily underlain by Late Cretaceous metasandstone associated with the Franciscan complex (Figure 3). Graymer describes the sandstone as a distinctly bedded to massive, fine- to coarse-grained, mica bearing, lithic wacke. Based on the development of the site described in Section 2.1, we anticipate that the shallowest bedrock at the site is the metasandstone of the adjacent hillside. Based on the historical lands reclamation, in the portions of the site on the waterside of the historical shoreline, the fill is likely underlain by Holocene Bay Deposits over the bedrock.

### 2.3.3 Seismicity

The site is located in a seismically active area that contains numerous faults. Small earthquakes occur every year in the San Francisco Bay Area and larger earthquakes have been recorded and can be expected to occur in the future. Faults have been cataloged and mapped by the United States Geological Survey (USGS) in the Quaternary Fault and Fold Database of the United States. An active fault is defined by the California Geologic Survey as one that experienced surface displacement within Holocene time (about the last 11,700 years) (CGS, 2018). Figure 4 shows the approximate locations of known active faults along with other Quaternary faults based on the USGS Quaternary Fault and Fold Database as well as significant historical earthquakes recorded within the San Francisco Bay Area.

To identify nearby faults that are capable of generating strong seismic ground shaking at the site, we utilized the USGS Earthquake Hazard Toolbox and the 2023 National Seismic Hazard Model (NSHM) to perform a disaggregation of the seismic hazard at the peak ground acceleration (PGA) for a return period of 2,475 years. The resulting faults are listed in Table 2.3.3-1.

**TABLE 2.3.3-1: Faults Considered Capable of Producing Strong Ground Shaking at the Site***

| SOURCE NAME | RUPTURE DISTANCE, $R_{RUP}$ | | MOMENT MAGNITUDE, $M_W$ |
|---|---|---|---|
| | (km) | (mi) | |
| Hayward (north) (4) | 7.7 | 6.3 | 7.2 |
| Hayward (north) (3) | 7.7 | 14.6 | 6.8 |
| Hayward (north) (5) | 8.7 | 5.9 | 6.5 |
| Hayward (north) (2) | 9.5 | 4.8 | 6.9 |
| Hayward (north) (1) | 13.1 | 16.3 | 6.9 |
| San Andreas (Peninsula) (14) | 23.6 | 4.8 | 7.9 |
| San Gregorio (north) (2) | 26.2 | 5.4 | 7.9 |

*Based on USGS Earthquake Hazard Toolbox: NSHM Conterminous U.S. 2023

These results represent known fault sources contributing at least 1 percent to the seismic hazard at the site considering the peak ground acceleration (PGA). The rupture distances ($R_{RUP}$) and mean moment magnitudes ($M_W$) listed are based on values assigned according to the 2023 NSHM, and the numbers in parentheses after the fault names correspond to fault subsections assigned by the NSHM. The above fault table is not an exhaustive list and other faults in the region may generate seismic shaking at the project site.

## 2.4 SUBSURFACE CONDITIONS

The site has been explored several times by various geotechnical engineers for different purposes/projects. The eight reports listed in Section 1.1 include logs of explorations comprising both borings and cone penetration tests (CPTs). The historical explorations we identified in our file review are shown in Figure 2. We broke the site into subareas based on existing geotechnical data and subsurface conditions.

### 2.4.1 Operable Unit No. 1

The area of the Site referred to as Operable Unit No. 1 (OU-1) is approximately shown in Figure 2. The majority of OU-1 is currently used as parking and is bounded on the north, west, and south by Canal Boulevard. The report by Fugro West, Inc. (Fugro, 2003b) in this area includes borings by Peter Kaldveer and Associates, Inc. (PKA) from 1987, before the dredged fill discussed in Section 2.1 was placed in this area. This report also includes the locations of borings by Hart Crowser and Subsurface Consultants that we have not located at this time. The borings by PKA generally encountered fill. The majority of the borings are shallower than 5 feet. Most of the borings terminated in the fill at shallow depths, and several encountered bedrock or refusal conditions at the bottom of the boring. The fill described in the boring logs generally comprises a heterogeneous mix of loose to very dense sand and gravel. The fill is also described to contain debris such as metal, concrete, and wood. A limited number of deeper borings, such as PB-77 and PB-78 encountered layers of Bay sediments and alluvium below the fill. The ground surface elevation reported by PKA on the boring logs ranges from Elevation 11 feet to 19 feet. Fugro describes the fill as ranging from 1 to 10 feet in thickness. Generally, based on site development history, the fill was approximately 1 to 4 feet thick in the eastern portions of OU-1 over shallow bedrock with the depth to bedrock increasing to the south and west.

Subsequent to the time the PKA borings were drilled, perimeter containment berms were constructed, and several episodes of placement of dredged material occurred. The dredged material is described by Fugro as mostly clayey." At the time of the Fugro 2003b report, the ground surface in OU-1 ranged from Elevation 16 feet to Elevation 27 feet. The Fugro report recommends removal of the dredged material and recompacting it as engineered fill at a minimum relative density of 92 percent of ASTM D1557. The original "bottoms" fill was not to be removed due to contamination issues.

### 2.4.2 Graving Basins

Portions of the graving basins are excavated into the formerly shallow bedrock (on the east) while portions are located in areas of dipping bedrock (on the west). The as-built plans indicate that where the bedrock surface was deeper than the base of the excavation for basin construction, the soil above the bedrock was removed and the area between the excavated bedrock and the graving basin foundation was backfilled with lean concrete fill with a minimum 28-day compressive strength of 300 pounds per square inch (Sheet 200-4-2, Kaiser Company, Inc., undated).

### 2.4.3 Berths 5 and 6

The former ridgeline that was excavated to create the Site ends north of the Berths 5/6 area. We did not find boring logs in this area during our data review. Based on our underdeck observations in this area, the embankment slope under the deck generally comprises exposed bedrock. Sheet 220-0-12 (Kaiser Company, Inc. 1943), indicates that at the western end of Berth 5, the bedrock is approximately 45 feet below the top of pile based on the indicated length of cylinder

and minimum 6-foot embedment into rock. Near the middle of Berth 5, the same sheet indicates that the bedrock sits at the mudline based on contours of mudline and bedrock depth. The mudline then dips rapidly at the eastern end of Berth 6 near the transition to Berth 7.

Our local experience indicates that the majority of the soil between the mudline and bedrock is likely Young Bay Mud and other Bay deposits.

### 2.4.4 Berths 7 and 8

We were provided with undated and untitled plan and profile cross-section based on borings by Harding-Lawson & Associates (HLA, 1975) and Dames & Moore (D&M, 1942). A similar figure is described by Fugro (2010), and this plan and profile is likely an attachment to the Fugro memorandum. We do not have logs of these borings with the exception of HLA's Boring 4, but we geolocated them in Figure 2 based on the locations shown on this plan and profile. The profiles, which appear to be based on MLLW datum, indicate that the Berth 7 area is underlain by Young Bay Mud (generally 20 to 30 feet in thickness) over a thin layer of sandy clay (depicted as approximately 5 feet in thickness) over shale bedrock. The profile shows the Berth 8 area with an increasing thickness of Young Bay Mud (up to 40 feet thick) at the northern end, as well as a layer of Old Bay Clay below the sandy clay that is also up to 40 feet thick at the northern end. The profile terminates approximately 300 feet south of the end of the wharf at the location where fill was placed behind the sheet pile wall.

### 2.4.5 Rail Extension Area

Cornerstone Earth Group (Cornerstone, 2009a) drilled five borings in the northeastern portion of the site in support of expansion of the BNSF rail spur to create an approximately 6,600-foot-long extension of the BNSF rail by adding new loading tracks and vehicle loading pads. The boring logs indicate between 2 and 10 feet of loose to dense gravel and clay fill over up to 40 feet of Young Bay Mud over alluvium. Cornerstone encountered shallow bedrock in the western side of the area.

Fugro (2002, 2003b) drilled several borings and performed several CPTs in the southern portion of this area in 2002 and 2003 in support of an aggregate storage facility that was not constructed. Their explorations encountered medium dense to dense gravel fill. In the western portions of their study area, the fill was 2 to 4 feet in thickness and directly over bedrock. In the eastern portions of their study area, they encountered fill over Young Bay Mud over Old Bay Clay and alluvium over bedrock. In the easternmost portion of their study area, Fugro drilled a 100-foot-deep boring that did not encounter bedrock.

### 2.4.6 Finger Piers

The facility includes two finger piers that are constructed along the western shoreline. The piers are cast-in-place concrete decks, approximately 540 feet long and approximately 50 feet wide and supported on precast concrete plumb piles. At the time of this report, we do not have pile records of borings in this area. Based on proximity to the OU-1 area, it is likely that this area is underlain by Young Bay Mud over bedrock. Plate 4 of the California Division of Mines and Geology's Special Report 97, "Geologic and Engineering Aspects of San Francisco Bay Fill," indicated Young Bay Mud in this area is likely on the order of 20 feet in thickness.

### 2.5 GROUNDWATER CONDITIONS

Bedrock was not logged on all of the borings; however, where encountered at the time of drilling, it was generally encountered at approximately Elevation 5 to 7 feet (MLLW datum). Due to proximity to the San Francisco Bay, it is reasonable to assume that the groundwater is tidally influenced and fluctuates with tide.

### 2.6 UNDERDECK SLOPE STABILITY

As discussed in our letter titled “Port of Richmond, Point Potrero Marine Terminal, Richmond, California, Underdeck Geotechnical Inspection,” dated April 28, 2025, we performed a site walk and visual observation of the area under the Berth 7 and 8 deck west of the sheet pile wall on March 19, 2025. We also observed the conditions under the deck of Berths 5 and 6 areas from a boat on March 18, 2025.

During our observations, we did not observe any areas of potential slope movement or obvious slope instability. We observed areas where there was no headwall at the interface between the slope and wharf structure and erosion at the top of the slope resulted in settlement of the pavement where it directly abuts the wharf structure. We recommend a conceptual fix to address these areas of settlement and limit their recurrence in the future in the referenced letter.

## 3.0 PILES

We understand that the design team has identified a need for new pile foundations in various areas of the Site. On a preliminary basis, we understand that the following piles are being considered to address visually identified deficiencies.

- Precast, prestressed concrete piles (18-inch-square) at the finger piers and outer wharf of Berths 7 and 8
- Timber piles (12-inch-diameter) inner wharf at Berths 5 and 8
- Steel pipe piles (30-inch-diameter) outer wharf at Berths 5 and 6

In general, new piles for retrofit should be driven to refusal in the shallow bedrock. Piles driven to refusal in bedrock will achieve significant capacity. On a preliminary basis, it would be reasonable to assume that a precast concrete or timber pile driven to refusal in bedrock would have an allowable bearing capacity on the order of 100 kips per square foot of end area. This capacity would apply to most of the site. In the northern end of Berth 8, there is a substantial amount of Old Bay Clay between the mudline and the bedrock, in these areas, additional capacity could be achieved in skin friction in the Old Bay Clay. On a preliminary basis, the mobilized allowable skin friction of a precast driven pile in the Old Bay Clay could be assumed to be 700 pounds per square foot of surface area.

Driven steel piles will likely be able to penetrate deeper into the bedrock. Our experience indicates that steel pipe piles driven to refusal conditions in bedrock would likely have capacities of at least 600 kips.

If greater capacity is necessary for pipes, our experience indicates that predrilling approximately 10 feet into the rock and then driving the pile to refusal would achieve a higher end bearing capacity. Pile driving analysis (PDA) should be used during pile driving to confirm the pile capacity.

These capacities assume dead-plus-live loading and are provided for conceptual purposes only. Once a pile demand is developed, these capacities should be reevaluated based on the location of the pile.

# 4.0 BEARING CAPACITY – GRAVING BASINS

As previously mentioned, the footings for the walls and columns at the graving basin either sit on excavated bedrock or on lean concrete placed on excavated bedrock. Based on the rock outcrops in this area, we recommend using an allowable bearing capacity of 8,000 pounds per square foot (psf) for dead-plus-live loading for elements bearing on the bedrock. For load combinations that include seismic loading, this allowable capacity can be increased to 10,500 psf. These elements were heavily loaded by the shipbuilding activities that historically occurred at the site. If back analysis of shipbuilding loading can demonstrate higher bearing loads than these capacities, we can reevaluate the maximum values.

# 5.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical characterization and recommendations for the Point Potrero Marine Terminal at the Port of Richmond in Richmond, California. If additional subsurface information becomes available, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers.

We strive to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data collected by others. We assumed that the subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, we must be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our geotechnical exploration did not include work to assess the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials must be notified immediately.

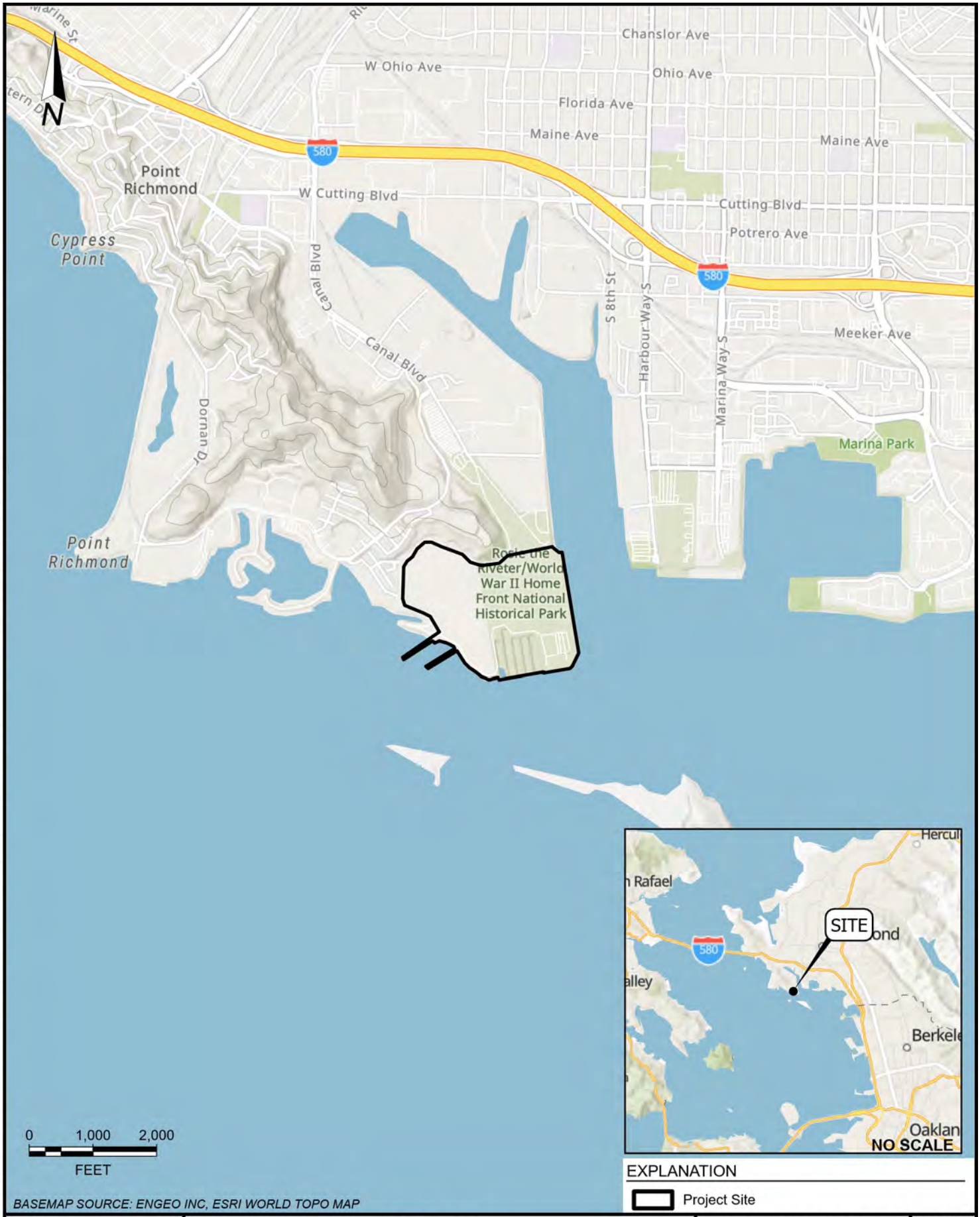
This document must not be subject to unauthorized reuse, that is, reusing without our written authorization. Such authorization is essential because it requires us to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications, or other changes to our documents. Therefore, we must be engaged to prepare the necessary clarifications, adjustments, modifications, or other changes before construction activities commence or further activity proceeds. If our scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, we cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.




## FIGURES

FIGURE 1: Vicinity Map
FIGURE 2: Site Plan
FIGURE 3: Regional Geologic Map (Graymer, 2000)
FIGURE 4: Regional Faulting and Seismicity Map
FIGURE 5: Seismic Hazard Zones Map




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# VICINITY MAP

PORT OF RICHMOND - POINT POTRERO MARINE TERMINAL

RICHMOND, CALIFORNIA

| | | |
|---|---|---|
| PROJECT NO.: 26829.000.001 | | FIGURE NO. 1 |
| SCALE: AS SHOWN | | |
| DRAWN BY: JAF | CHECKED BY: RHB | |



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ORIGINAL FIGURE PRINTED IN COLOR




BASEMAP SOURCE: GOOGLE EARTH MAPPING SERVICE, 2024

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SITE PLAN
PORT OF RICHMOND - POINT POTRERO MARINE TERMINAL
RICHMOND, CALIFORNIA

PROJECT NO.: 26829.000.001
SCALE: AS SHOWN
DRAWN BY: NWC
CHECKED BY: RHB

FIGURE NO. 2

ORIGINAL FIGURE PRINTED IN COLOR

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LAYOUT: 02. SITE PLAN 11X17 LANDSCAPE USER: NCLOUGH




BASEMAP SOURCE: ENGEO INC, ESRI WORLD TOPO MAP

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# REGIONAL GEOLOGIC MAP

PORT OF RICHMOND - POINT POTRERO MARINE TERMINAL

RICHMOND, CALIFORNIA

| | | |
|---|---|---|
| PROJECT NO.: 26829.000.001 | | FIGURE NO. 3 |
| SCALE: AS SHOWN | | |
| DRAWN BY: NWC | CHECKED BY: RHB | |

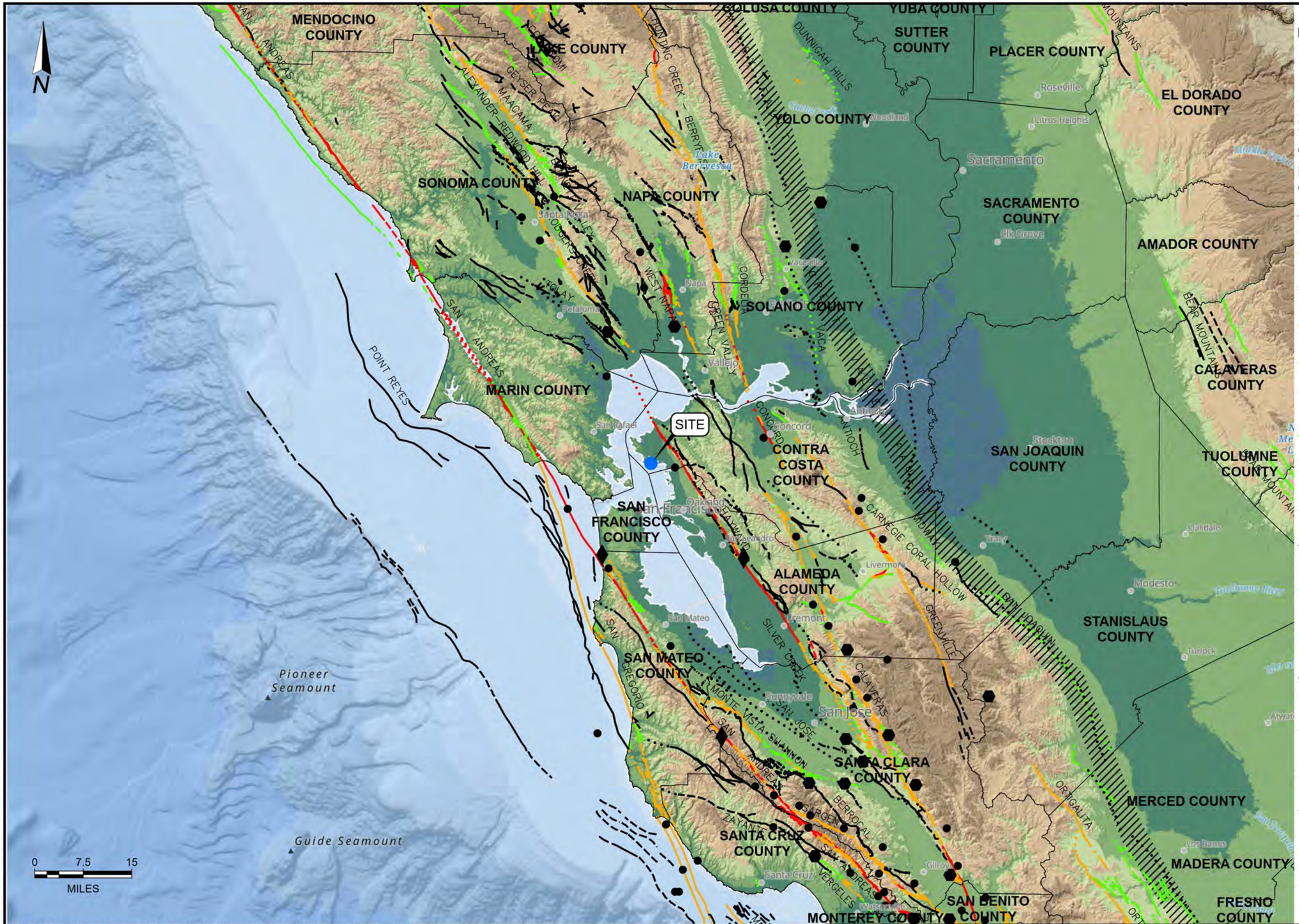
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LAYOUT: 03. GEOLOGIC 8.5 X 11 PORTRAIT USER: NCLOUGH

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## EXPLANATION

**HISTORICAL EARTHQUAKE EPICENTERS**

- Magnitude 5-6
- Magnitude 6-7
- Magnitude 7+
- Historical Blind Thrust Fault Zone

**QUATERNARY FAULTS 2018-2020**

Based on time of most recent surface deformation

- Historical (<150 Years), Well Constrained Location
- Historical (<150 Years), Moderately Constrained Location
- Historical (<150 Years), Inferred Location
- Latest Quaternary (<15,000 Years), Well Constrained Location
- Latest Quaternary (<15,000 Years), Moderately Constrained Location
- Latest Quaternary (<15,000 Years), Inferred Location
- Late Quaternary (<130,000 Years), Well Constrained Location
- Late Quaternary (<130,000 Years), Moderately Constrained Location
- Late Quaternary (<130,000 Years), Inferred Location
- Middle And Late Quaternary (<750,000 Years), Well Constrained Location
- Middle And Late Quaternary (<750,000 Years), Moderately Constrained Location
- Middle And Late Quaternary (<750,000 Years), Inferred Location
- Undifferentiated Quaternary(<1.6 Million Years), Well Constrained Location
- Undifferentiated Quaternary(<1.6 Million Years), Moderately Constrained Location
- Undifferentiated Quaternary(<1.6 Million Years), Inferred Location
- Class B (Various Age), Well Constrained Location
- Class B (Various Age), Moderately Constrained Location
- Class B (Various Age), Inferred Location

*BASE MAP SOURCE: ESRI, GEBCO, GARMIN, NATURALVUE, COUNTY OF MARIN, CALIFORNIA STATE PARKS, ESRI, TOMTOM, GARMIN, SAFEGRAPH, FAO, METI/NASA, USGS, BUREAU OF LAND MANAGEMENT, EPA, NPS, USFWS*
*COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION*
*U.S.G.S. QUATERNARY FAULT DATABASE, 2020*
*C.G.S. HISTORIC EARTHQUAKE DATABASE*

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# REGIONAL FAULTING & SEISMICITY MAP

PORT OF RICHMOND - POINT POTRERO MARINE TERMINAL
RICHMOND, CALIFORNIA

| | |
|---|---|
| PROJECT NO.: 26829.000.001 | FIGURE NO. 4 |
| SCALE: AS SHOWN | |
| DRAWN BY: NWC | CHECKED BY: RHB |

ORIGINAL FIGURE PRINTED IN COLOR



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LAYOUT: 04. FAULT&SEISMICITY 11 X 17 LANDSCAPE USER: NCLOUGH




EXPLANATION

Project Site

Liquefaction Zones
Areas Where The Historical Occurrence Of Liquefaction, Or Local Geological, Geotechnical And Groundwater Conditions Indicate A Potential For Permanent Ground Displacements Such That Mitigation As Defined In Public Resources Code Section 2693(C) Would Be Required

Earthquake-Induced Landslide Zones
Areas Where The Previous Occurrence Of Landslide Movement, Or Local Topographic, Geological, Geotechnical And Subsurface Water Conditions Indicate A Potential For Permanent Ground Displacements Such That Mitigation As Defined In Public Resources Code Section 2693(C) Would Be Required.

*BASEMAP SOURCE: GOOGLE EARTH MAPPING SERVICE 2022*

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# SEISMIC HAZARD ZONES MAP

PORT OF RICHMOND - POINT POTRERO MARINE TERMINAL

RICHMOND, CALIFORNIA

| | | |
|---|---|---|
| PROJECT NO.: 26829.000.001 | | FIGURE NO. 5 |
| SCALE: AS SHOWN | | |
| DRAWN BY: JAF | CHECKED BY: RHB | |

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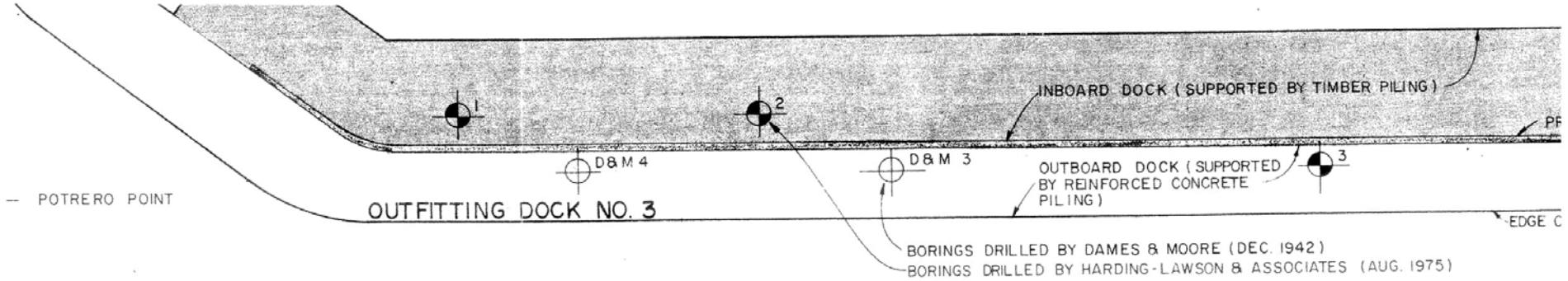
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ORIGINAL FIGURE PRINTED IN COLOR




# APPENDIX A

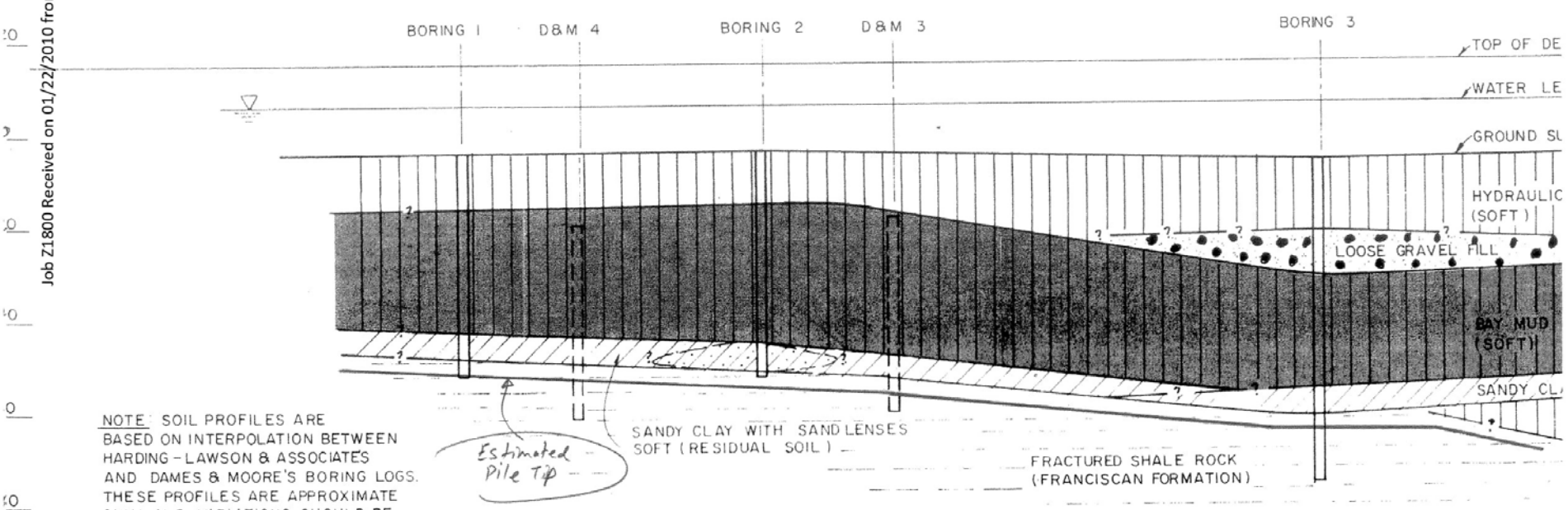
## HISTORICAL BORING LOGS AND CPTS




## SITE PLAN AND BORING LOCATIONS

0 50' 100'
SCALE

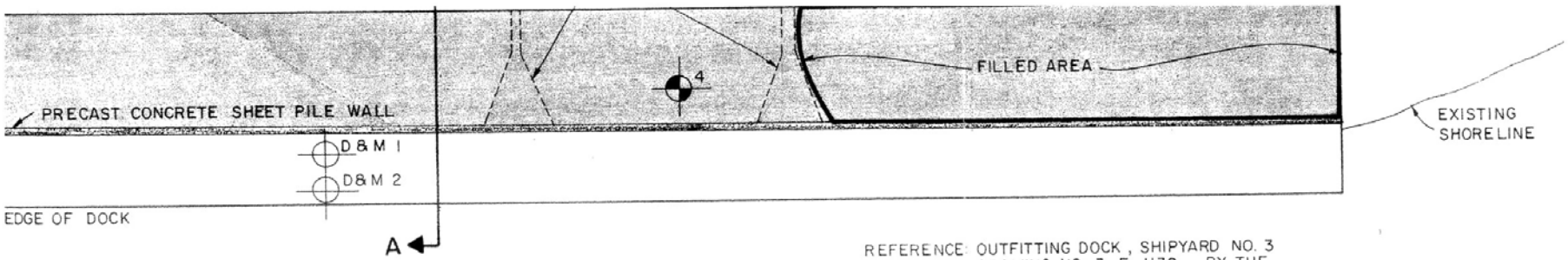
Job Z1800 Received on 01/22/2010 from Fugro



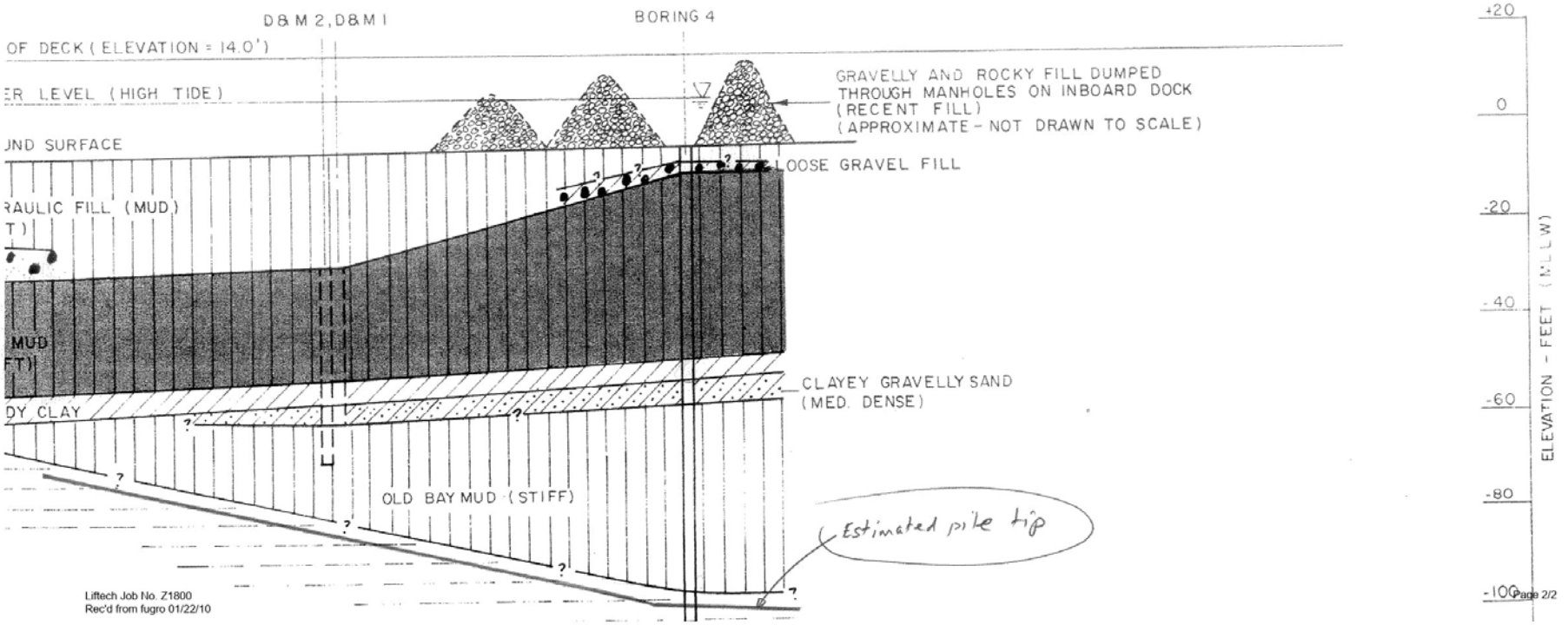

NOTE: SOIL PROFILES ARE BASED ON INTERPOLATION BETWEEN HARDING-LAWSON & ASSOCIATES AND DAMES & MOORE'S BORING LOGS. THESE PROFILES ARE APPROXIMATE ONLY AND VARIATIONS SHOULD BE EXPECTED.

Liftech Job No. Z1800
Rec'd from fugro 01/22/10

Page 1/2




REFERENCE: OUTFITTING DOCK, SHIPYARD NO. 3 DRAWING NO. 3-E-1139, BY THE CITY OF RICHMOND, DATED 1-25-75.




Liftech Job No. Z1800
Rec'd from fugro 01/22/10

Job Z1800 Received on 01/22/2010 from Fugro

# LOG OF BORING 4

Equipment Rotary Wash

Elevation +14 Date 8/11/75

| Shear Strength (lbs/sq ft) | Blows/ft | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample |
|---|---|---|---|---|---|
| | | | | 0 | |
| | | | | | CONCRETE DECK (8 Inches) |
| | | | | 5 | |
| | | | | 10 | |
| | | | | | water level 8/11/75 |
| | | | | 15 | |
| | | | | | -4.0 MLLW |
| | | | | | BLACK CLAYEY SANDY SILT (MH) very soft, saturated, with gray sand lenses |
| | 16 | | | 20 | |
| | | | | | BROWN CLAYEY GRAVEL (GC) loose, saturated, with small pieces of wood |
| | 3 | 38.9 | 82 | 25 | |
| | | | | | GRAY CLAYEY SANDY SILT (MH) medium stiff, saturated, with shell fragments |
| | | | | | becoming soft @ 29' |
| | Push | | | 30 | |
| | Push | 41.9 | 73 | 35 | |
| | | | | 40 | |

FILL

| Shear Strength (lbs/sq ft) | Blows/ft | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample |
|---|---|---|---|---|---|
| 2000 1500 1000 500 0 | | | | | (Continuation of Log) |
| * Consolidation Test | | | | 40 | |
| UU 975 | Push | 79.7 | 52 | 45 * | no longer sandy below 44' |
| | Push | | | 50 | slightly peaty @ 49' |
| | Push | | | 55 | |
| UU 3500 | Push | 92.8 | 46 | 60 | |
| | 7 | | | 65 | BLACK SANDY CLAY (CL) soft to medium stiff, saturated, with occasional peat, small pebbles, and lenses of soft brown-gray peaty clay becoming medium stiff to stiff @ 65' |
| UU 4000 **Particle Size Analysis | 28 | 10.2 | 130 | 70 ** | MOTTLED GRAY CLAYEY GRAVELLY SAND (SC)- medium dense, saturated, with brown clay lenses |
| UU 2300 | 13 | 48.7 | 73 | 75 | GRAY CLAYEY SILT (MH) stiff, saturated, with peat (Old Bay Mud) with small lense of clayey sand @ 77' |
| | | | | 80 | |

(Continued on Plate 7 )

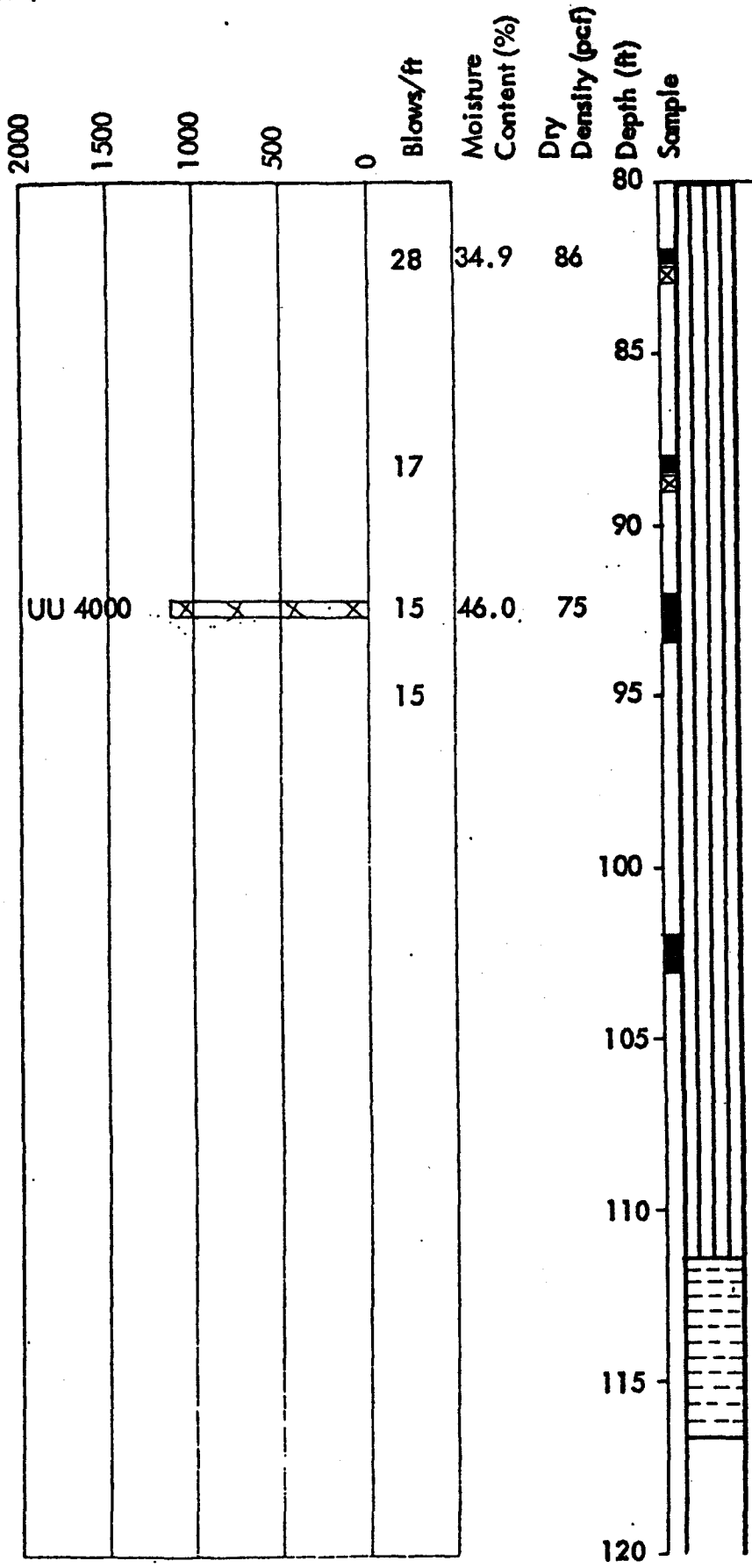
HARDING-LAWSON ASSOCIATES
*Consulting Engineers and Geologists*

Job No. 8003,008.04 Appr. Date 8/22/75

LOG OF BORING 4
Outfitting Dock, Shipyard No. 3
Port of Richmond
Richmond, California

PLATE 6

## LOG OF BORING 4 cont'd




medium stiff to stiff, with abundant shell fragments & pebbles from 78' to 90'

DARK GRAY SHALE
intensely fractured (Franciscan Formation)

HARDING-LAWSON ASSOCIATES
*Consulting Engineers and Geologists*

8003.008.04 Appr. Date 8/22/75

LOG OF BORING 4
Outfitting Dock, Shipyard No. 3
Port of Richmond
Richmond, California

PLATE 7

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±15 Feet | LOGGED BY | JN |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 9/9/86 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| 3" AC over 5" Baserock | | | | | | | | | |
| GRAVEL (fine-coarse grained), some sand (fine-coarse grained) silt (FILL) | tan grey | dense | GP | 1 | | 50*/6" | | | |
| SILTSTONE | tan orange | medium hard | BED-ROCK | 2 | | | | | |
| | | | | 3 | | 50*/5" | 8 | | |
| | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
| | | | | 10 | | | | | |
| | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
| | | | | 14 | | 50*/3" | | | |
| Bottom of Boring = 13½ Feet | | | | 15 | | | | | |
| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

Notes:
1. The stratification lines represent the approximate boundaries between material types and the transition may be gradual.
2. For an explanation of penetration resistance values marked with an asterisk (*) see first page, Appendix A.

**PETER KALDVEER AND ASSOCIATES, INC.**
*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 23 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±16 Feet | LOGGED BY | JN |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 9/9/86 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| 2½" AC over 4" Baserock | | | | | | | | | |
| GRAVEL (fine-coarse grained), sandy (fine-coarse grained), trace of silt | tan | dense | GW | 1 | | | | | |
| | | | | 2 | X | 50* | | | |
| | | | | 3 | | | | | |
| (grading 3"+ cobbles) (rock fragments) | | medium dense | | 4 | X | 30* | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| (interbedded moist sand lense) | | | | 8 | | | | | |
| | | | | 9 | | | | | |
| (FILL) | | | | 10 | | | | | |
| Bottom of Boring = 10 Feet | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
| Notes: 1. The stratification line represents the approximate boundary between soil types and the transition may be gradual. 2. For an explanation of penetration resistance values marked with an asterisk (*) see first page, Appendix A. | | | | 14 | | | | | |
| | | | | 15 | | | | | |
| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

**PETER KALDVEER AND ASSOCIATES, INC.**
*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 25 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±16 Feet | LOGGED BY | JN |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 9/9/86 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| 2" AC over 3" Baserock | | | | | | | | | |
| GRAVEL (fine-coarse grained), with cobbles & debris (FILL) | grey | medium dense | GP | 1 | | | | | |
| Bottom of Boring = 1 Foot (refusal*) | | | | 2 | | | | | |
| | | | | 3 | | | | | |
| | | | | 4 | | | | | |
| * 3 additional borings were drilled within a 50 foot radius of this boring, and the holes were logged with approximately the same A.C. section and refusal at approximately 1 foot. | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 9 | | | | | |
| | | | | 10 | | | | | |
| | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
| | | | | 14 | | | | | |
| | | | | 15 | | | | | |
| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

**PETER KALDVEER AND ASSOCIATES, INC.**
*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 26 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±16 Feet | LOGGED BY | JN |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 9/9/86 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| GRAVEL (coarse grained), with sand (fine-medium grained) (FILL) | brown grey | medium dense | GP | 1 2 3 | | | | | |
| SAND (fine-medium grained), trace of gravels (fine grained) (FILL) | brown | medium dense | SP | 4 5 | | | | | |
| Bottom of Boring = 5 Feet (refusal)<br><br>Note:<br>The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | |

**PETER KALDVEER AND ASSOCIATES, INC.**
*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 28 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±19 Feet | LOGGED BY | JN |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 9/10/86 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| ½" AC over 3" Baserock | | | | | | | | | |
| GRAVEL (fine-coarse grained), sandy (fine-coarse grained) (FILL) | grey | medium dense | GP | 1 | | | | | |
| SILT, some sand (fine-coarse grained), trace of clay | orange tan | hard | ML | 2 | | 40 | | | |
| | | | | 3 | | | | | |
| CLAY, silty, trace of sand (fine-medium grained)<br>Liquid Limit = 23%<br>Plasticity Index = 8%<br>Passing #200 Sieve = 75% | mottled orange tan | very stiff | CL | 4 | | 29 | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | 55 | | | |
| Bottom of Boring = 9½ Feet | | | | 10 | | | | | |
| | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| Note:<br>The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. | | | | 13 | | | | | |
| | | | | 14 | | | | | |
| | | | | 15 | | | | | |
| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

**PETER KALDVEER AND ASSOCIATES, INC.**
*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 38 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±13 Feet | LOGGED BY JN |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 9/10/86 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| SAND (fine-coarse grained), with silt, trace of gravel (fine grained) | brown | very dense | SM | 1 | | 23/2" | | | |
| | | | | 2 | | | | | |
| | | | | 3 | | | | | |
| (grading silty) | | | SM ML | 4 | | 26/4" | 7 | | |
| GRAVELS (4"+) (FILL) | grey | medium dense | GP | 5 | | | | | |
| Bottom of Boring = 5½ Feet (refusal) | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 10 | | | | | |
| | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
| | | | | 14 | | | | | |
| | | | | 15 | | | | | |
| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

**PETER KALDVEER AND ASSOCIATES, INC.**
*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 41 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±15 Feet | LOGGED BY | JN |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 9/10/86 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| SAND (fine-coarse grained), silty, trace of gravel (fine-coarse grained) (FILL) | brown | very dense | SP | 1 | | 50/6" | | | |
| GRAVEL (fine-coarse grained), sandy (fine-coarse grained) (FILL) | grey | medium dense | GP | 3 | | | | | |
| SILT, some sand (very fine-medium grained), clay (sample is moist) | orange brown | stiff | ML-SM | 5 | | 14 | 16 | | |
| | | firm | | 9 | | 6* | 19 | 108 | |
| Bottom of Boring = 10 Feet | | | | 10 | | | | | |

Notes:
1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. For an explanation of penetration resistance values marked with an asterisk (*) see first page, Appendix A.

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 42 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±12 Feet | LOGGED BY JN |
|---|---|---|
| DEPTH TO GROUNDWATER 9' (see note 2) | BORING DIAMETER 6 Inches | DATE DRILLED 9/10/86 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| GRAVEL (fine-coarse grained), sandy (fine-coarse grained) (crushed rock) (FILL) | grey | dense | GP | 1–3 | | 35 | | | |
| CLAY, some silt, sand (fine-coarse grained), gravel (fine-coarse grained) (FILL) | brown | very stiff | CL | 3–7 | | 25 | 9 | | |
| GRAVEL (fine-coarse grained), some sand (fine-coarse grained) (FILL) | brown grey | loose | GP | 7–10 | | 6 | ▽ | | |
| Bottom of Boring = 10 Feet | | | | 10–20 | | | | | |

Notes:
1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. Groundwater level was measured at 9 feet at time of drilling.

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 43 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±14 Feet | LOGGED BY JN |
|---|---|---|
| DEPTH TO GROUNDWATER 9½" (see note 2) | BORING DIAMETER 6 Inches | DATE DRILLED 9/10/86 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| 2" AC over 4" Baserock | | | | | | | | | |
| GRAVEL (fine-coarse grained), some sand (fine-coarse grained | grey | very dense | GP | 1 | | 55/9" | | | |
| | | | | 2 | | | | | |
| | | | | 3 | | | | | |
| (grading some clay) | | medium dense | GC | 4 | | 20 | 8 | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | GC | 9 | | | | | |
| (FILL) | | loose | CL | 10 | | 9 | ▽ | | |
| Bottom of Boring = 10 Feet | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
| | | | | 14 | | | | | |
| | | | | 15 | | | | | |
| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

Notes:
1. The stratification line represents the approximate boundary between soil types and the transition may be gradual.
2. Groundwater level was measured at 9½ feet at time of drilling.

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*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 44 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±17 Feet | LOGGED BY JN |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 9/10/86 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| GRAVEL (fine-coarse grained) (FILL) | | | | | | | | | |
| SILT, some sand (fine-coarse grained) trace of clay (Bedrock Debris) | orange yellow | hard | ML | 1–2 | | 50 | | | |
| SILTSTONE | yellow orange grey | soft-rock hardness | BED-ROCK | 3–5 | | 50/2" | 11 | | |
| Bottom of Boring = 5½ Feet | | | | 6–20 | | | | | |

Note:
The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 45 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±16 Feet | LOGGED BY JN |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 9/10/86 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| GRAVEL (fine-coarse grained), sandy (fine-coarse grained)<br><br>(gravels to 3"+) | grey | medium dense | GP | 1–4 | | | | | |
| SAND (fine-medium grained), some gravels (fine grained)<br><br>(grading gravelly)<br><br>(FILL) | tan | medium dense | SP<br>SP-GP | 5–10 | | | | | |
| Bottom of Boring = 10 Feet<br><br>Note:<br>The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 11–20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 47 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±16 Feet | LOGGED BY JN |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 9/10/86 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| GRAVEL (fine-coarse grained) (concrete debris) (FILL) | grey | medium dense | GP | 1–6 | | | | | |
| Bottom of Boring = 6 Feet (refusal) | | | | 7–20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 50 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±16 Feet | LOGGED BY BK |
|---|---|---|
| DEPTH TO GROUNDWATER ½' (see note) | BORING DIAMETER 6 Inches | DATE DRILLED 3/11/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| GRAVEL (fine-coarse grained), clayey with sand (fine-coarse grained) (FILL) | brown | medium | GC | 1 2 3 4 | | | ▽ | | |
| Bottom of Boring = 4 Feet<br><br>Note:<br>Groundwater level was measured at time of drilling. | | | | 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 56 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±15 Feet | LOGGED BY BK |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 3/12/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| GRAVEL (fine-coarse grained), some clay, some sand (fine-coarse grained), some debris | light brown | very dense | GM GC | 1 | | 40/6" | | | |
| GRAVEL (fine-coarse grained), some asphalt and debris | grey | very dense | GM | 2 | | 45/6" | 4 | | |
| SAND (fine-coarse grained), clayey with gravel (fine grained) Passing #200 Sieve = 14% (FILL) | yellow | dense | SC | 3<br>4 | | 30/6" | | | |
| Bottom of Boring = 4½ Feet | | | | 5 | | | | | |
| Note: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. | | | | 6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 58 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±15 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/12/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| CLAY, silty, gravel (fine-coarse grained) with debris (pieces of metal 4-5" wide, 1/8" thick) Passing #200 Sieve = 19% | brown | hard | CL | 1 | | 10/1" | | | |
| | | | | 2 | | 27/6" | | | |
| GRAVEL (fine-coarse grained), clayey, some sand (fine-coarse grained) (grading with less debris) | brown | dense | GC | 3 4 | | 36/6" | 9 | | |
| GRAVEL (coarse grained) (FILL) | grey | very dense | GP | 5 | | 22/4" | | | |
| Bottom of Boring = 5½ Feet | | | | 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | |

Note:
The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 59 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±14 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/12/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| GRAVEL (fine-coarse grained), clayey, some sand (fine-coarse grained), with debris | brown | dense | GC | 1 | | 27/6" | 13 | | |
| | | | | 2 | | 42/6" | 6 | | |
| GRAVEL (coarse grained), with debris (FILL) | grey | very dense | GP | 3 | | 10/1" | | | |
| Bottom of Boring = 3½ Feet | | | | 4 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
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| | | | | 9 | | | | | |
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| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 60 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±14 Feet | LOGGED BY BK |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 3/12/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| GRAVEL (fine-coarse grained), some clay, some sand (fine-coarse grained) | yellow brown | dense | GM | 1 | | 25/6" | 7 | | |
| GRAVEL (fine-coarse grained) (FILL) | grey | very dense | GP | 2 | | 54/9" | 2 | | |
| Bottom of Boring = 2½ Feet | | | | 3 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
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| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
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| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 61 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±15 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/11/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| GRAVEL (fine-coarse grained), some clay, some sand (fine-coarse grained) | yellow brown | very dense | GC-GM | 1 | | 38/6" | 8 | | |
| GRAVEL (fine-coarse grained) (FILL) | grey | very dense | GP | 2–3 | | 10/1" | | | |
| Bottom of Boring = 3 Feet | | | | 4–20 | | | | | |

Note:
The stratification line represents the approximate boundary between soil types and the transition may be gradual.

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 63 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±14 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/11/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| GRAVEL, some clay, some sand | yellow brown | very dense | GC-GM | 1 | | 40/6" | | | |
| | | | | 2 | | | | | |
| Passing #200 Sieve = 13% | | | | 3 | | 51 | | | |
| | | | | 4 | | | | | |
| (FILL) | | | | 5 | | 35 | | | |
| Bottom of Boring = 5½ Feet | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
| | | | | 10 | | | | | |
| | | | | 11 | | | | | |
| | | | | 12 | | | | | |
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| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 64 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±12 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/12/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| SAND (fine-coarse grained), some gravel (fine grained), some clay<br>Passing #200 Sieve = 7%<br>(FILL) | yellow brown | dense | SM-SC | 1 | | 49/10" | | | |
| Bottom of Boring = 2 Feet | | | | 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 65 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±14 Feet | LOGGED BY BK |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 3/12/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| CLAY, silty with gravel (fine-coarse grained), and with debris<br>Passing #200 Sieve = 6% | black | firm | CL | 1<br>2<br>3<br>4 | | 43 | | | |
| (FILL) | | | | 5 | | 4/4" | 30 | | |
| Bottom of Boring = 5½ Feet | | | | 6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 66 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±12 Feet | LOGGED BY BK |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 3/11/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| GRAVEL (fine-coarse grained), clayey, some sand (fine-coarse grained), with debris | brown | very dense | GC | 1 | | 13/2" | | | |
| Passing #200 Sieve = 24% | yellow brown | | | 2 3 4 | | 40/10" | | | |
| CLAY, sandy (fine-coarse grained), trace of gravel (coarse grained) Passing #200 Sieve = 25% (FILL) | yellow brown | very stiff | CL | 5 6 | | 24 | | | |
| Bottom of Boring = 6 Feet | | | | 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | |

Note:
The stratification line represents the approximate boundary between soil types and the transition may be gradual.

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 67 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±15 Feet. | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| GRAVEL (fine grained), sandy (fine-coarse grained) | light brown | dense | GM | 1 | | 38 | 3 | | |
| (grading trace of clay) | yellow brown | very dense | | 2 | | 36/3" | 7 | | |
| (FILL) | | | | 3 | | 32 | | | |
| Bottom of Boring = 3½ Feet | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
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| | | | | 20 | | | | | |

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*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 68 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±12 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| GRAVEL (fine-coarse grained), sandy (fine-coarse grained) Passing #200 Sieve = 12% | dark brown | dense | GM | 1 | | 37 | | | |
| SAND (fine-coarse grained), clayey with gravel (fine grained) | yellow brown | medium dense | SC | 2 | | 18 | 9 | | |
| GRAVEL (coarse grained) (FILL) | grey | very dense | GP | 4 | | 20 | | | |
| Bottom of Boring = 4½ Feet | | | | 5 | | | | | |
| Note: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. | | | | 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | |

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*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 69 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±12 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| Wood, Debris and Gravel (fine-coarse grained) | brown | medium dense | GM | 1 | | 56/10" | | | |
| GRAVEL (fine grained), sandy (fine-coarse grained) | grey black | medium dense | GM | 2 | | | | | |
| SAND (fine-coarse grained), clayey trace of gravel (fine grained) | yellow brown | dense | SC | 3 | | 34 40/2" | 1 | | |
| GRAVEL (fine-coarse grained) (FILL) | grey | dense | GP | | | | | | |
| Bottom of Boring = 3 Feet | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| Note: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. | | | | 8 | | | | | |
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| | | | | 20 | | | | | |

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*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 70 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±11 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| GRAVEL (fine-coarse grained), some clay | dark brown | dense | GC | 1 | | 30/6" | 15 | | |
| SAND (fine-coarse grained), some white marble chips (FILL) | red & yellow | dense | SM | | | | | | |
| Bottom of Boring = 1 Foot | | | | 2 | | | | | |
| | | | | 3 | | | | | |
| | | | | 4 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 5 | | | | | |
| | | | | 6 | | | | | |
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| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 71 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±11 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| CLAY, sandy (fine-coarse grained) | brown | stiff | CL | | | | | | |
| SAND (fine-coarse grained), trace of gravel (fine grained) Passing #200 Sieve = 19% | yellow brown | medium dense | SC | 1 | | 25/6" | | | |
| GRAVEL (coarse grained) (FILL) | grey | very dense | GP | 2 | | | | | |
| Bottom of Boring = 1 Foot | | | | 3 | | | | | |
| | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| Note: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
| | | | | 10 | | | | | |
| | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
| | | | | 14 | | | | | |
| | | | | 15 | | | | | |
| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

**DESCRIPTION AND CLASSIFICATION**

**PETER KALDVEER AND ASSOCIATES, INC.**
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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 72 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±12 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| GRAVEL (fine-coarse grained), sandy (fine-coarse grained) | grey | medium dense | GM | 1 | | 23 | 10 | | |
| SAND (fine-coarse grained), clayey with gravel (fine grained) (FILL) | yellow brown | dense | SC | 2 | | 36/4" | | | |
| Bottom of Boring = 2½ Feet | | | | 3 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 73 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±11 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| SAND (fine-medium grained), trace of clay<br>Passing #200 Sieve = 8% | brown | medium dense | SM | 1 | | 13 | | | |
| GRAVEL (fine grained), clayey, sandy (fine-coarse grained)<br>Passing #200 Sieve = 19% (FILL) | yellow brown | very dense | GC-GM | 2<br>3 | | 50 | | | |
| Bottom of Boring = 3 Feet | | | | 4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20 | | | | | |

Note:
The stratification line represents the approximate boundary between soil types and the transition may be gradual.

**PETER KALDVEER AND ASSOCIATES, INC.**
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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 74 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±11 Feet | LOGGED BY BK |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 3/18/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| SAND (fine-medium grained), with debris | rust brown | dense | SM | 1 | | 32 | 16 | | |
| SAND (fine-coarse grained), trace of clay | grey brown | medium dense | SM | 2 | | 29 | 13 | | |
| SAND (fine-coarse grained), clayey, trace of gravel (fine grained) (FILL) | yellow | medium | SC | 3 | | 36/5" | 8 | | |
| Bottom of Boring = 4 Feet | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
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| | | | | 11 | | | | | |
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| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

Note:
The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 75 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±14 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| 2" Asphalt | | | | | | | | | |
| SAND (fine-medium grained) 2" (FILL) | | | | 1 | | | | | |
| Bottom of Boring = ½ Foot (concrete) | | | | 2 | | | | | |
| | | | | 3 | | | | | |
| | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
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| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 76 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±15 Feet | LOGGED BY BK |
|---|---|---|
| DEPTH TO GROUNDWATER 17' (see note 3) | BORING DIAMETER 6 Inches | DATE DRILLED 3/18/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| Ground covered with Gravel (fine grained) | grey | | | | | | | | |
| SAND (fine-medium grained), clayey, trace of gravel (fine grained) (FILL) | yellow | medium dense | SC-CL | 1 | | 17 | 14 | | |
| | | | | 2 | | 26 | 15 | | |
| | | | | 3 | | | | | |
| CLAY, sandy (fine-medium grained) | blue grey | very stiff | CL | 4 | | 22 | 17 | | |
| (grading silty) | | | CH | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| (grading with oil) | | firm | | 9 | | | | | |
| | | | | 10 | | 11* | 81 | 52 | |
| Notes:<br>1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.<br>2. For an explanation of penetration resistance values marked with an asterisk (*) see first page, Appendix A.<br>3. Groundwater level was measured at time of drilling. | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
| | | | | 14 | | | | | |
| | | | | 15 | | | | | |
| | | | | 16 | | | | | |
| | | | | 17 | | | ▽ | | |
| | | | | 18 | | | | | |
| CLAY, silty, sandy (fine-medium grained), some pea gravel | yellow | stiff | CL | 19 | | | | | |
| Bottom of Boring = 20½ Feet | | | | 20 | | 27* | 15 | 117 | 0.7 |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 77 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±15 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| Gravel on Surface (fine grained) | | | | | | | | | |
| SAND (fine-coarse grained), clayey, trace of gravel (fine grained) Passing #200 Sieve = 62% (FILL) | yellow | medium dense | SC | 1 | | 22 | | | |
| | | | | 2 | | 18 | 19 | | |
| SILT, some clay | grey brown | stiff | ML | 3 | | | | | |
| SAND (fine-coarse grained), clayey Passing #200 Sieve = 37% | yellow | dense | SC | 4 | | 37 | 10 | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| CLAY, silty, with shells | grey black | | | 9 | | | | | |
| | | | | 10 | | 8 | 19 | | |
| CLAY, silty | olive grey | firm | CL | 11 | | | | | |
| | yellow | | | 12 | | | | | |
| | | | | 13 | | | | | |
| | | stiff | | 14 | | 33* | | | |
| | | | | 15 | | | | | |
| Bottom of Boring = 15½ Feet | | | | 16 | | | | | |
| Notes: | | | | 17 | | | | | |
| 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. | | | | 18 | | | | | |
| 2. For an explanation of penetration resistance values marked with an asterisk (*) see first page, Appendix A. | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 78 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±16 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| GRAVEL (fine-coarse grained), with sand (fine-coarse grained), trace of clay | grey & brown | very dense | GM | 1 | | | | | |
| SAND (fine-medium grained), clayey, gravelly (fine grained) Passing #200 Sieve = 16% (FILL) | yellow | medium | SC | 2 | | 56 | | | |
| | | | | 3 | | | | | |
| | | | | 4 | | 13 | 7 | | |
| Bottom of Boring = 4½ Feet | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 9 | | | | | |
| | | | | 10 | | | | | |
| | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
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| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 79 |

| DRILL RIG Continuous Flight Auger | SURFACE ELEVATION ±15 Feet | LOGGED BY BK |
|---|---|---|
| DEPTH TO GROUNDWATER Not Established | BORING DIAMETER 6 Inches | DATE DRILLED 3/18/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| SAND (fine-medium grained) | brown & white | medium dense | SP | 1 | | 22 | 44 | | |
| CLAY, silty | blue grey | stiff | CL | 2 | | | | | |
| SAND (fine-coarse grained) | dark orange brown | medium dense | SM | 3 | | 10 | 8 | | |
| SAND (fine-coarse grained), clayey, some gravel (fine grained) | yellow brown | medium dense | SC | 4 | | 23/9" | | | |
| GRAVEL (fine-coarse grained) Passing #200 Sieve = 13% (FILL) | grey | medium dense | GP | 5 6 | | 15 | | | |
| Bottom of Boring = 6½ Feet | | | | 7 | | | | | |
| Note: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. | | | | 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 80 |

| DRILL RIG | Continous Flight Auger | SURFACE ELEVATION | ± 10 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/19/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| SAND (fine-medium grained), some clay, some gravel (fine grained) Passing #200 Sieve = 9% | dark brown | dense | SC | 1 | | 35/4" | | | |
| SAND (fine-medium grained), with clay and gravel (fine grained) (FILL) | black | very dense | SC | 2 | | 25/2" | 12 | | |
| Bottom of Boring = 1½ Feet | | | | 3 | | | | | |
| | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
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| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 81 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±15 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/19/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| SAND (fine-medium grained), clayey | dark brown | medium dense | SC | 1 | | 36/4" 12/1" | 5 | | |
| SAND (fine-medium grained), with gravel (FILL) | light yellow | very dense | SM | 2 | | | | | |
| Bottom of Boring = 1 Foot | | | | 3 | | | | | |
| | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
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| | | | | 10 | | | | | |
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| | | | | 13 | | | | | |
| | | | | 14 | | | | | |
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| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 82 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±14 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/19/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| SAND (fine-medium grained), with clay, some gravel (fine-coarse grained) | brown | dense | SC-SM | 1 | | 57/11" | 7 | | |
| GRAVEL (fine-coarse grained) (FILL) | grey | very dense | GP | | | | | | |
| Bottom of Boring = 1 Foot | | | | 2 | | | | | |
| | | | | 3 | | | | | |
| | | | | 4 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
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| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 83 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±14 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/19/87 |

| DESCRIPTION AND CLASSIFICATION | | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | | | | | | |
| CLAY, silty, sandy (fine-coarse grained), some gravel (fine grained) | brown | firm | CL | 1 | | 57/11" | 18 | | |
| SAND (fine-medium grained), some clay with some gravel (fine-coarse grained) (some pieces of metal 3"+) (FILL) | black | stiff | SC | 2 | | | | | |
| Bottom of Boring = 1 Foot | | | | 3 | | | | | |
| | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| Note: The stratification line represents the approximate boundary between soil types and the transition may be gradual. | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
| | | | | 10 | | | | | |
| | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
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| | | | | 16 | | | | | |
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| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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*Geotechnical Consultants*

**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 84 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±15 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/19/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| GRAVEL (fine grained), some sand (fine-medium grained) (grading without sand) (FILL) | grey | dense | GM GP | 1 2 | | 36/5" 30/2" | 2 | | |
| Bottom of Boring = 2 Feet | | | | 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 85 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±12 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| SAND (fine-medium grained), clayey | brown | medium dense | SC | 1 | | 54 | | | |
| SAND (fine-medium grained), some clay with gravel (fine grained) Passing #200 Sieve = 3% | black yellow | dense | SM-SC | 2 | | 20/1" | | | |
| GRAVEL (fine-coarse grained) (FILL) | grey | very dense | GP | 3 | | | | | |
| Bottom of Boring = 1½ Feet | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| Note: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
| | | | | 10 | | | | | |
| | | | | 11 | | | | | |
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| | | | | 16 | | | | | |
| | | | | 17 | | | | | |
| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 86 |

| DRILL RIG | Continuous Flight Auger | SURFACE ELEVATION | ±15 Feet | LOGGED BY | BK |
|---|---|---|---|---|---|
| DEPTH TO GROUNDWATER | Not Established | BORING DIAMETER | 6 Inches | DATE DRILLED | 3/18/87 |

| DESCRIPTION AND REMARKS | COLOR | CONSIST. | SOIL TYPE | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT.) | WATER CONTENT (%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) |
|---|---|---|---|---|---|---|---|---|---|
| SAND (fine-medium grained) | brown white | medium dense | SP | 1 | | 47 | | | |
| SAND (fine-medium grained), with debris | black | medium dense | SM | 2 | | | | | |
| SAND (fine-medium grained), with debris and white powder | white & blue black | medium dense | SM | 3 | | 47 | | | |
| SAND (fine-medium grained), with debris | black | dense | SM | 4 | | | | | |
| SAND (fine-coarse grained), with gravel (fine grained), some clay Passing #200 Sieve = 6% | yellow | dense | SM | 5 | | 15/3" | 4 | | |
| GRAVEL (fine-coarse grained) (FILL) | grey | dense | GP | 6 | | | | | |
| Bottom of Boring = 5 Feet | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
| Note: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. | | | | 10 | | | | | |
| | | | | 11 | | | | | |
| | | | | 12 | | | | | |
| | | | | 13 | | | | | |
| | | | | 14 | | | | | |
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| | | | | 18 | | | | | |
| | | | | 19 | | | | | |
| | | | | 20 | | | | | |

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**EXPLORATORY BORING LOG**

PROPOSED PASHA CAR TERMINAL
Richmond, California

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| K431-81 | June 1987 | 87 |

| DRILL RIG | Failing 750, Rotary | SURFACE ELEVATION | 11.2 Feet | LOGGED BY | JCH |
|---|---|---|---|---|---|
| DEPTH TO GROUND WATER | Not Encountered | BORING DIAMETER | 5-inch | DATE DRILLED | 8/26/02 |

| DESCRIPTION AND CLASSIFICATION | | | DEPTH | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT) | WATER CONTENT(%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | CONSIST | SOIL TYPE | (FEET) | | | | | | |
| **PAVEMENT: 2 inches Asphalt Concrete over 8 inches Aggregate Baserock** | | | | | | | | | |
| **FILL: GRAVEL (GC)**, light brown, fine to medium, subangular, sandy (fine- to medium- grained), trace clay, damp | Medium Dense | | | | 22 | | | | |
| | Loose | | | | 8 | | | | |
| | | | 5 | | | | | | |
| grading some cobbles (up to 5 inches) at 6 feet | | | | | | | | | |
| grading coarse gravel and rock fragments at 8½ feet | | | | | 11 | | | | |
| | | | 10 | | | | | | |
| **BAY MUD: CLAY (CH)**, gray, silty, trace shell fragments, wet | Very Soft | | | | 2 | 28 | 93 | | PP = 250 tsf |
| | | | 15 | | | | | | |
| grading with shells at 18½ feet | | | | | 300 psi | | | | PP = 500 psf |
| | | | 20 | | | | | | |
| grading trace shells at 23½ feet | | | | | 2 | 53 | 70 | | |
| | | | 25 | | | | | | |
| | | | | | 125 psi | | | | |

FUGRO

1000 Broadway
Ste. 200, Oakland
California 94607

## EXPLORATORY BORING LOG

**AGGREGATE STORAGE FACILITY, PORT OF RICHMOND**
**Richmond, California**

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| 1484.002 | August 2002 | B-1 |

File Name: G:\ENGINEERING\NTWPROJECTS\1484-002.GPJ Report Template: FUGRO Output Date: 9/24/02

| DRILL RIG | Failing 750, Rotary | SURFACE ELEVATION | 11.2 Feet | LOGGED BY | JCH |
|---|---|---|---|---|---|
| DEPTH TO GROUND WATER | Not Encountered | BORING DIAMETER | 5-inch | DATE DRILLED | 8/26/02 |

| DESCRIPTION AND CLASSIFICATION | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT) | WATER CONTENT(%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | CONSIST | SOIL TYPE | | | | | | | |
| **SAND (SM)**, gray, silty, wet | Loose | | | | 3 | | | | PP = 2,500 psf |
| **BAY MUD: CLAY (CH)**, gray, silty, wet | Very Soft | | | | | | | | PP = 1,500 psf |
| | Soft | | 35 | | 5 | 95 | 46 | | PP = 1,500 psf |
| grading some brown organics at 36 feet | | | | | | | | | |
| | | | 40 | | 5 | 67 | 60 | | PP = 1,000 psf |
| | | | 45 | | 6 | 69 | 59 | | PP = 1,000 psf |
| | | | 50 | | | | | | |
| **CLAY (CL)**, greenish gray, sandy (fine-grained), wet | Very Stiff | | 55 | | 34 | 28 | 98 | | PP = 6,000 psf |

Bottom of Boring = 55 feet

Notes:

1. The stratification lines represent the approximate boundaries between material types and the transition may be gradual.
2. For an explanation of the penetration resistance values see the first page of Appendix A.
3. A 140-lb safety hammer was used to advance the sampler. The hammer was raised using a rope and cathead.
4. PP = Pocket Penetrometer (undrained shear strength).

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California 94607

## EXPLORATORY BORING LOG

**AGGREGATE STORAGE FACILITY, PORT OF RICHMOND**
**Richmond, California**

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| 1484.002 | August 2002 | B-1 |

File Name: G:\ENGINEER\GINT\WPROJECTS\1484-002.GPJ Report Template: FUGRO Output Date: 9/24/02

| DRILL RIG | Failing 750, Rotary | SURFACE ELEVATION | 12.5 Feet | LOGGED BY | JCH |
|---|---|---|---|---|---|
| DEPTH TO GROUND WATER | Not Encountered | BORING DIAMETER | 5-inch | DATE DRILLED | 8/26/02 |

| DESCRIPTION AND CLASSIFICATION | | | DEPTH | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT) | WATER CONTENT(%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | CONSIST | SOIL TYPE | (FEET) | | | | | | |
| **PAVEMENT: 3 inches Asphalt Concrete over 3 inches Aggregate Baserock** | | | | | | | | | |
| **FILL: GRAVEL (GC)**, brown, fine to coarse, subrounded to subangular, some clay, damp, some sand (fine- to coarse-grained), damp | Loose | | 5 | | 14 | 10 | 121 | | |
| **SILT (ML)**, greenish gray, sandy (fine-grained), trace clay, wet | Firm | | 10 | | 8 | | | | Passing #200 Sieve = 91% |
| **BAY MUD: CLAY (CH)**, dark gray, silty, wet | Very Soft | | 15 | | 2 | 55 | 68 | | PP = 400 psf |
| Six-inch lense of some shells and gravel (medium, subrounded) at 18 feet<br>grading trace to some organics at 18½ feet | | | 20 | | 2 | | | | |
| | | | 25 | | 100 psi | 61 | 67 | | Consolidation Test (see figure B-1)<br>TX = 984 psf<br>PP = 400 psf |
| grading sandy (fine- grained), with shells at 29 feet | Soft | | | | 5 | 30 | 93 | | PP = 400 psf |

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## EXPLORATORY BORING LOG

**AGGREGATE STORAGE FACILITY, PORT OF RICHMOND**
**Richmond, California**

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| 1484.002 | August 2002 | B-2 |

File Name: G:\ENGINEER\GINTWPROJECTS\1484-002.GPJ Report Template: FUGRO Output Date: 9/24/02

| DRILL RIG | Failing 750, Rotary | SURFACE ELEVATION | 12.5 Feet | LOGGED BY | JCH |
|---|---|---|---|---|---|
| DEPTH TO GROUND WATER | Not Encountered | BORING DIAMETER | 5-inch | DATE DRILLED | 8/26/02 |

| DESCRIPTION AND CLASSIFICATION | | | DEPTH | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT) | WATER CONTENT(%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) | OTHER |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | CONSIST | SOIL TYPE | (FEET) | | | | | | TESTS |
| **BAY MUD: CLAY (CH)**, dark gray, sandy (fine- grained), with shells, wet | Soft | | | | | | | | |
| grading trace sand, silty at 32 feet | | | 35 | | 120 psi | 72 | 60 | | TX = 801 psf<br>PP = 800 psf |
| | | | 40 | | 4 | 83 | 51 | | PP = 1,000 psf |
| | | | 45 | | | | | | |
| **GRAVEL (GC)**, greenish gray, fine to coarse, angular, some clay, wet | Dense | | 50 | | 50/5" | | | | |
| **BEDROCK** | | | | | | | | | |

Bottom of Boring = 50½ feet

Notes:

1. The stratification lines represent the approximate boundaries between material types and the transition may be gradual.
2. For an explanation of the penetration resistance values see the first page of Appendix A.
3. A 140-lb safety hammer was used to advance the sampler. The hammer was raised using a rope and cathead.
4. PP = Pocket Penetrometer (undrained shear strength), TX = Triaxial Compression Test (peak deviator stress).

File Name: G:\ENGINEER\GINTW\PROJECTS\1484-002.GPJ Report Template: FUGRO Output Date: 9/24/02

FUGRO
1000 Broadway
Ste. 200, Oakland
California 94607

EXPLORATORY BORING LOG

**AGGREGATE STORAGE FACILITY, PORT OF RICHMOND**
**Richmond, California**

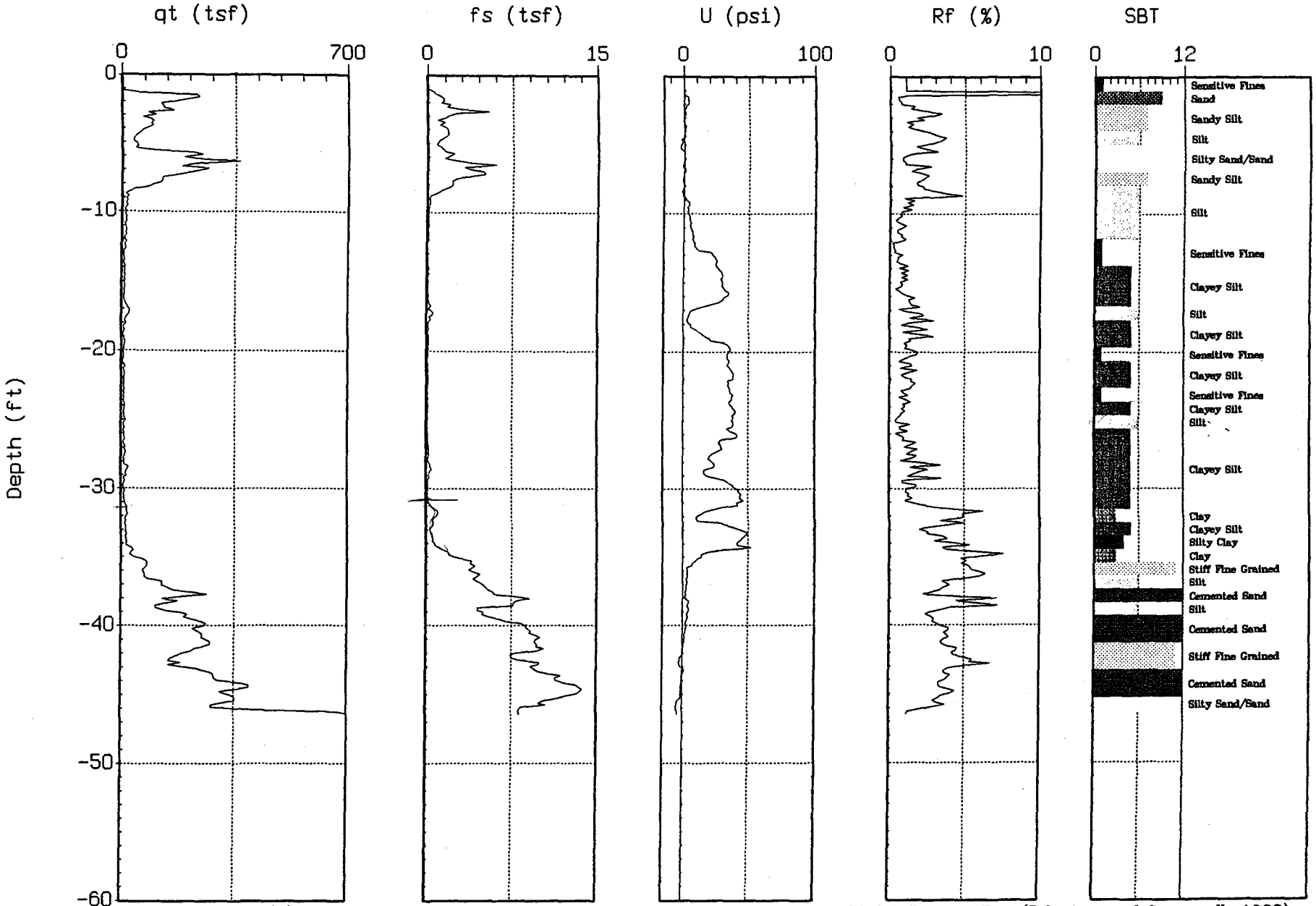
| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| 1484.002 | August 2002 | B-2 |

GREGG

# FUGRO

Site : PASHA
Location : CPT-01

Geologist : M. STANLEY
Date : 08:22:02 08:33




Max. Depth: 46.42 (ft)

Depth Inc.: 0.164 (ft)

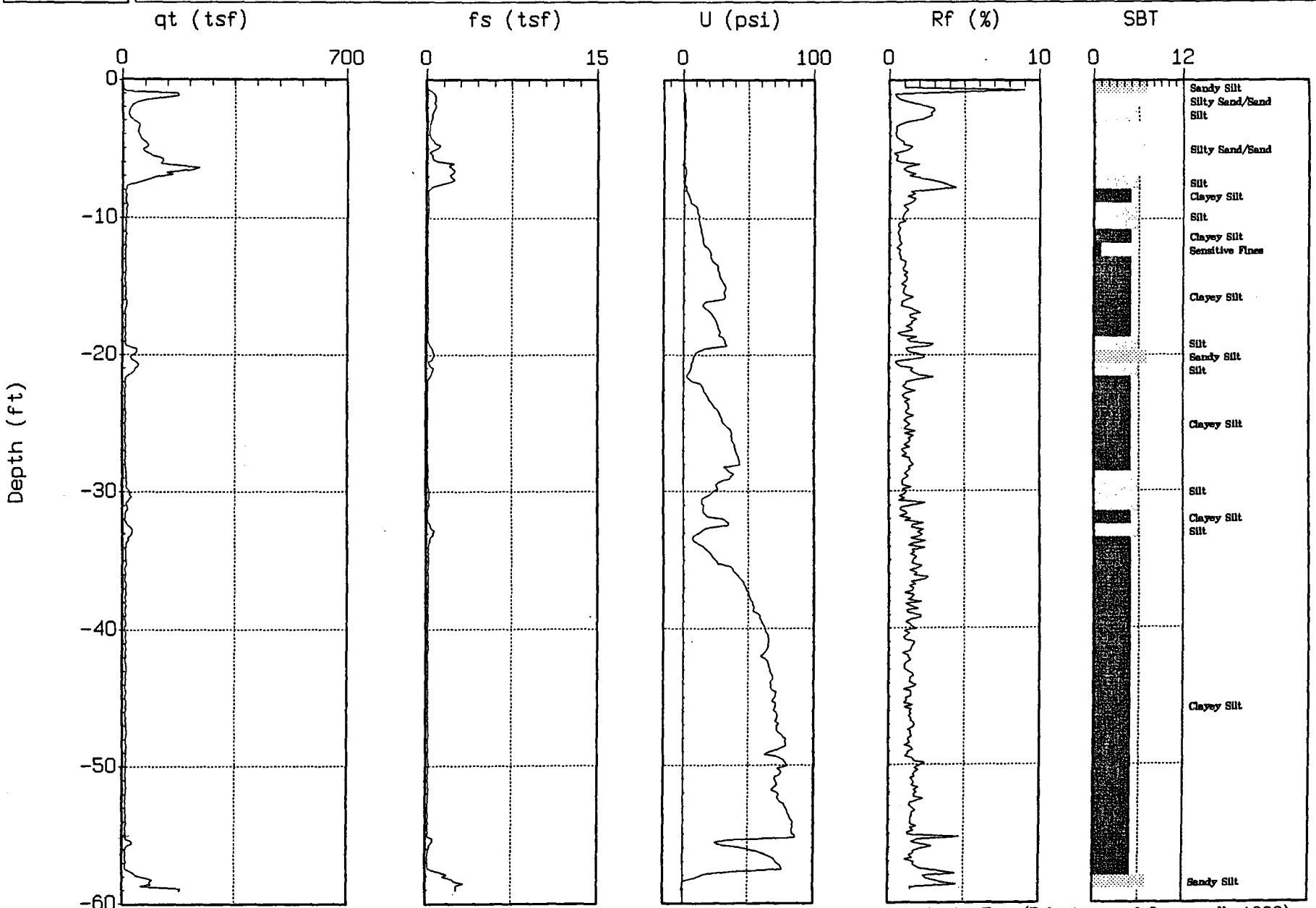
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

# FUGRO

Site : PASHA
Location : CPT-02

Geologist : M. STANLEY
Date : 08:22:02 10:24




Max. Depth: 59.05 (ft)

Depth Inc.: 0.164 (ft)

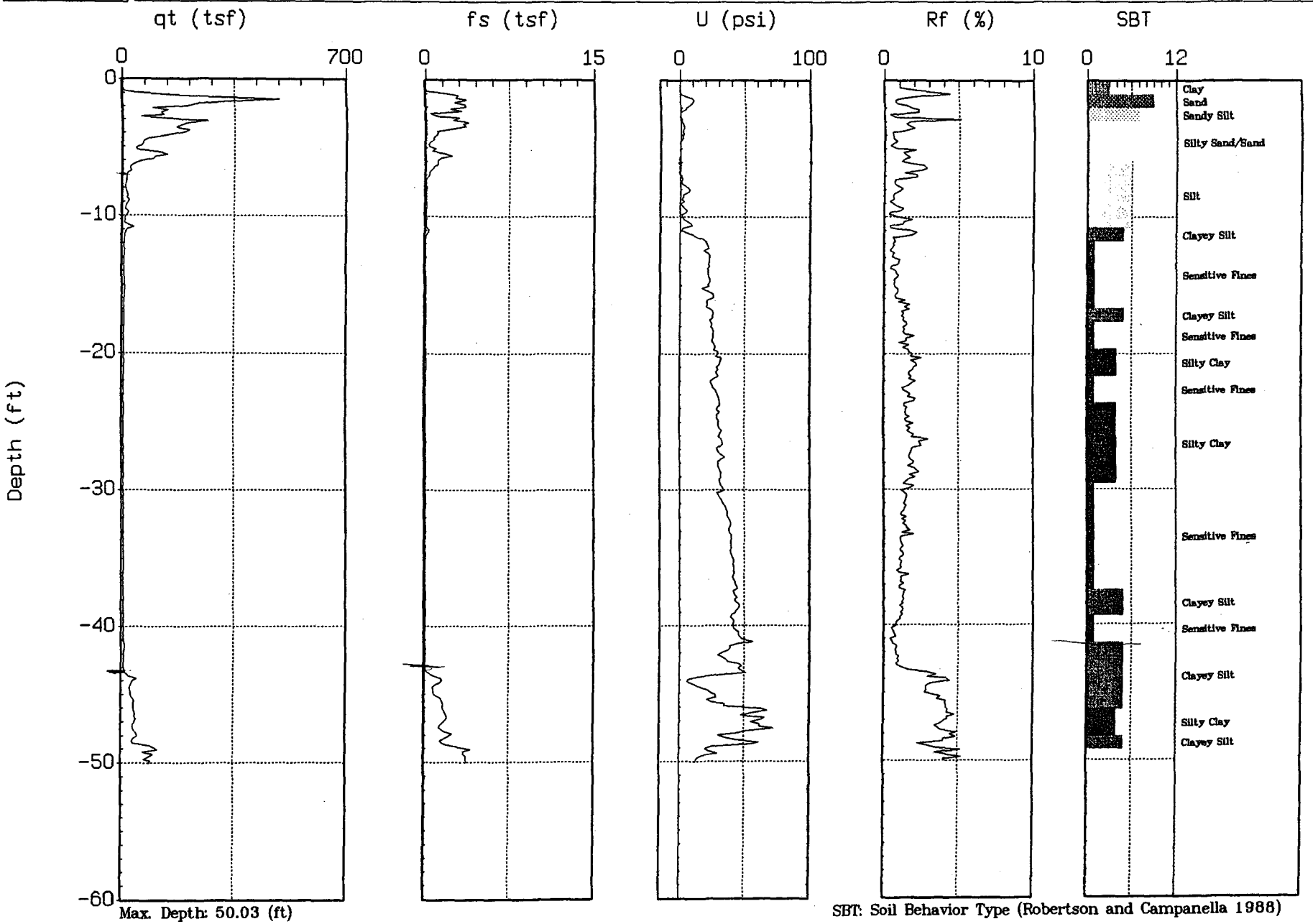
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

# FUGRO

Site : PASHA
Location : CPT-03

Geologist : M. STANLEY
Date : 08:22:02 11:48




Max. Depth: 50.03 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

| DRILL RIG | Failing 750, Rotary | SURFACE ELEVATION | 11.2 Feet | LOGGED BY | JCH |
|---|---|---|---|---|---|
| DEPTH TO GROUND WATER | Not Encountered | BORING DIAMETER | 5-inch | DATE DRILLED | 8/26/02 |

| DESCRIPTION AND CLASSIFICATION | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT) | WATER CONTENT(%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | CONSIST | SOIL TYPE | | | | | | | |
| **PAVEMENT: 2 inches Asphalt Concrete over 8 inches Aggregate Baserock** | | | | | | | | | |
| **FILL: GRAVEL (GC)**, light brown, fine to medium, subangular, sandy (fine- to medium- grained), trace clay, damp | Medium Dense | | | | 22 | | | | |
| | Loose | | | | 8 | | | | |
| | | | 5 | | | | | | |
| grading some cobbles (up to 5 inches) at 6 feet | | | | | | | | | |
| grading coarse gravel and rock fragments at 8½ feet | | | | | 11 | | | | |
| | | | 10 | | | | | | |
| **BAY MUD: CLAY (CH)**, gray, silty, trace shell fragments, wet | Very Soft | | | | 2 | 28 | 93 | | PP = 250 tsf |
| | | | 15 | | | | | | |
| grading with shells at 18½ feet | | | | | 300 psi | | | | PP = 500 psf |
| | | | 20 | | | | | | |
| grading trace shells at 23½ feet | | | | | 2 | 53 | 70 | | |
| | | | 25 | | | | | | |
| | | | | | 125 psi | | | | |

FUGRO
1000 Broadway
Ste. 200, Oakland
California 94607

# EXPLORATORY BORING LOG

**AGGREGATE STORAGE FACILITY, PORT OF RICHMOND**
**Richmond, California**

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| 1484.002 | August 2002 | B-1 |



File Name: G:\ENGINEERING\NTWPROJECTS\1484-002.GPJ Report Template: FUGRO Output Date: 9/24/02

| DRILL RIG | Failing 750, Rotary | SURFACE ELEVATION | 11.2 Feet | LOGGED BY | JCH |
|---|---|---|---|---|---|
| DEPTH TO GROUND WATER | Not Encountered | BORING DIAMETER | 5-inch | DATE DRILLED | 8/26/02 |

| DESCRIPTION AND CLASSIFICATION | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT) | WATER CONTENT(%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | CONSIST | SOIL TYPE | | | | | | | |
| **SAND (SM)**, gray, silty, wet | Loose | | | | 3 | | | | PP = 2,500 psf |
| **BAY MUD: CLAY (CH)**, gray, silty, wet | Very Soft | | | | | | | | PP = 1,500 psf |
| | Soft | | 35 | | 5 | 95 | 46 | | PP = 1,500 psf |
| grading some brown organics at 36 feet | | | 40 | | 5 | 67 | 60 | | PP = 1,000 psf |
| | | | 45 | | 6 | 69 | 59 | | PP = 1,000 psf |
| **CLAY (CL)**, greenish gray, sandy (fine-grained), wet | Very Stiff | | 50 | | 34 | 28 | 98 | | PP = 6,000 psf |
| | | | 55 | | | | | | |

Bottom of Boring = 55 feet

Notes:

1. The stratification lines represent the approximate boundaries between material types and the transition may be gradual.
2. For an explanation of the penetration resistance values see the first page of Appendix A.
3. A 140-lb safety hammer was used to advance the sampler. The hammer was raised using a rope and cathead.
4. PP = Pocket Penetrometer (undrained shear strength).

FUGRO
1000 Broadway
Ste. 200, Oakland
California 94607

EXPLORATORY BORING LOG

**AGGREGATE STORAGE FACILITY, PORT OF RICHMOND**
**Richmond, California**

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| 1484.002 | August 2002 | B-1 |



File Name: G:\ENGINEER\GINTW\PROJECTS\1484-002.GPJ Report Template: FUGRO Output Date: 9/24/02

| DRILL RIG | Failing 750, Rotary | SURFACE ELEVATION | 12.5 Feet | LOGGED BY | JCH |
|---|---|---|---|---|---|
| DEPTH TO GROUND WATER | Not Encountered | BORING DIAMETER | 5-inch | DATE DRILLED | 8/26/02 |

| DESCRIPTION AND CLASSIFICATION | | | DEPTH (FEET) | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT) | WATER CONTENT(%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | CONSIST | SOIL TYPE | | | | | | | |
| **PAVEMENT: 3 inches Asphalt Concrete over 3 inches Aggregate Baserock** | | | | | | | | | |
| **FILL: GRAVEL (GC)**, brown, fine to coarse, subrounded to subangular, some clay, damp, some sand (fine- to coarse-grained), damp | Loose | | 5 | | 14 | 10 | 121 | | |
| **SILT (ML)**, greenish gray, sandy (fine-grained), trace clay, wet | Firm | | 10 | | 8 | | | | Passing #200 Sieve = 91% |
| **BAY MUD: CLAY (CH)**, dark gray, silty, wet | Very Soft | | 15 | | 2 | 55 | 68 | | PP = 400 psf |
| Six-inch lense of some shells and gravel (medium, subrounded) at 18 feet | | | | | | | | | |
| grading trace to some organics at 18½ feet | | | 20 | | 2 | | | | |
| | | | 25 | | 100 psi | 61 | 67 | | Consolidation Test (see figur B-1) TX = 984 psf PP = 400 psf |
| grading sandy (fine- grained), with shells at 29 feet | Soft | | | | 5 | 30 | 93 | | PP = 400 psf |

File Name: G:\ENGINEERING\NTWPROJECTS\1484-002.GPJ Report Template: FUGRO Output Date: 9/24/02

FUGRO
1000 Broadway
Ste. 200, Oakland
California 94607

EXPLORATORY BORING LOG

**AGGREGATE STORAGE FACILITY, PORT OF RICHMON**
**Richmond, California**

| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| 1484.002 | August 2002 | B-2 |

| DRILL RIG | Failing 750, Rotary | SURFACE ELEVATION | 12.5 Feet | LOGGED BY | JCH |
|---|---|---|---|---|---|
| DEPTH TO GROUND WATER | Not Encountered | BORING DIAMETER | 5-inch | DATE DRILLED | 8/26/02 |

| DESCRIPTION AND CLASSIFICATION | | | DEPTH | SAMPLER | PENETRATION RESISTANCE (BLOWS/FT) | WATER CONTENT(%) | DRY DENSITY (PCF) | UNCONFINED COMPRESSIVE STRENGTH (KSF) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION AND REMARKS | CONSIST | SOIL TYPE | (FEET) | | | | | | |
| **BAY MUD: CLAY (CH)**, dark gray, sandy (fine- grained), with shells, wet | Soft | | | | | | | | |
| grading trace sand, silty at 32 feet | | | 35 | | 120 psi | 72 | 60 | | TX = 801 psf<br>PP = 800 psf |
| | | | 40 | | 4 | 83 | 51 | | PP = 1,000 psi |
| **GRAVEL (GC)**, greenish gray, fine to coarse, angular, some clay, wet | Dense | | 45 | | | | | | |
| **BEDROCK** | | | 50 | | 50/5" | | | | |

Bottom of Boring = 50½ feet

Notes:

1. The stratification lines represent the approximate boundaries between material types and the transition may be gradual.
2. For an explanation of the penetration resistance values see the first page of Appendix A.
3. A 140-lb safety hammer was used to advance the sampler. The hammer was raised using a rope and cathead.
4. PP = Pocket Penetrometer (undrained shear strength), TX = Triaxial Compression Test (peak deviator stress).

File Name: G:\ENGINEERING\NTWPROJECTS\1484-002.GPJ Report Template: FUGRO Output Date: 9/24/02

FUGRO
1000 Broadway
Ste. 200, Oakland
California 94607

EXPLORATORY BORING LOG

**AGGREGATE STORAGE FACILITY, PORT OF RICHMON**
**Richmond, California**

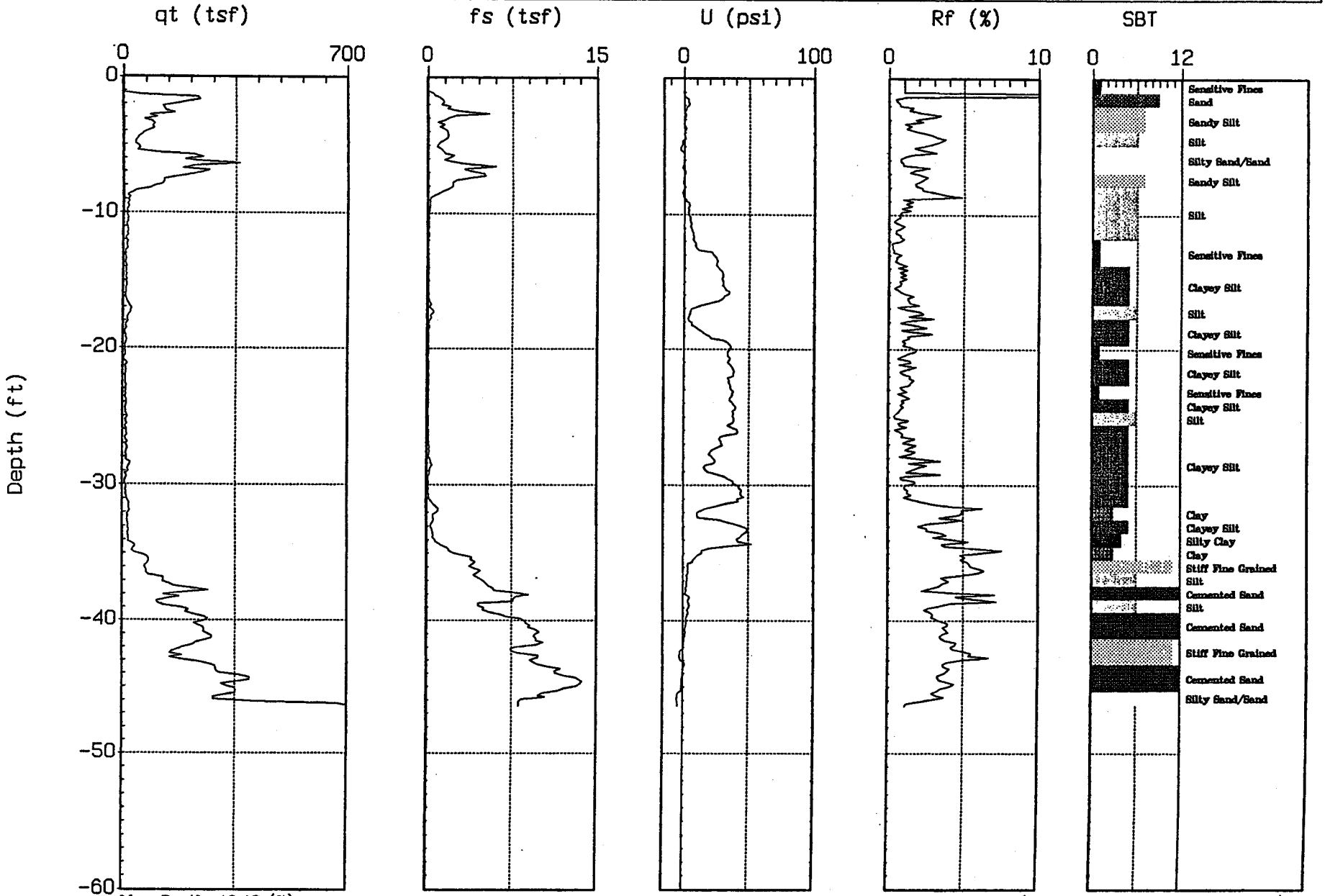
| PROJECT NO. | DATE | BORING NO. |
|---|---|---|
| 1484.002 | August 2002 | B-2 |

GREGG

# FUGRO

Site : PASHA
Location : CPT-01

Geologist : M. STANLEY
Date : 08:22:02 08:33




Max. Depth: 46.42 (ft)

Depth Inc.: 0.164 (ft)

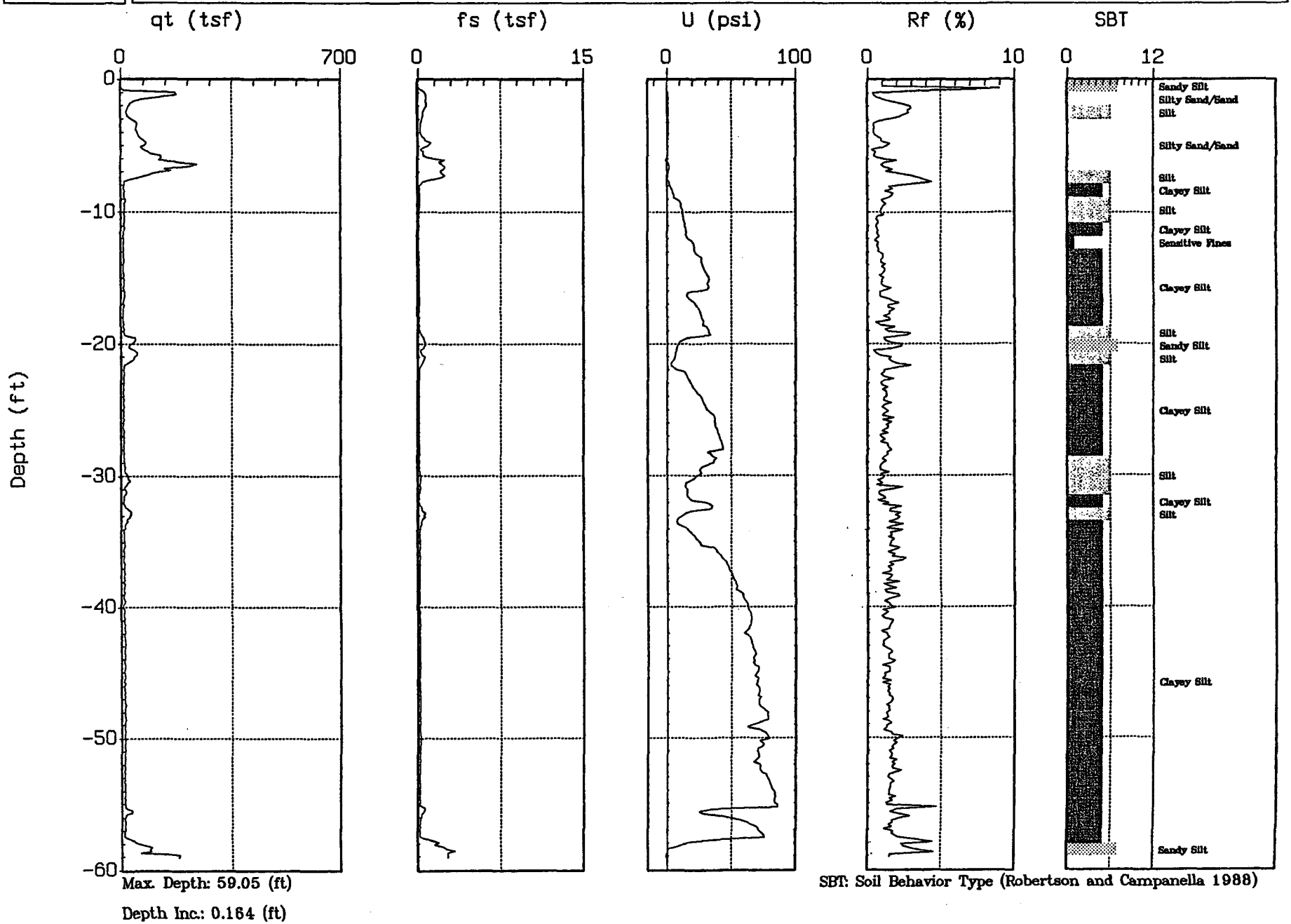
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

# FUGRO

Site : PASHA
Location : CPT-02

Geologist : M. STANLEY
Date : 08:22:02 10:24




Max. Depth: 59.05 (ft)

Depth Inc.: 0.164 (ft)

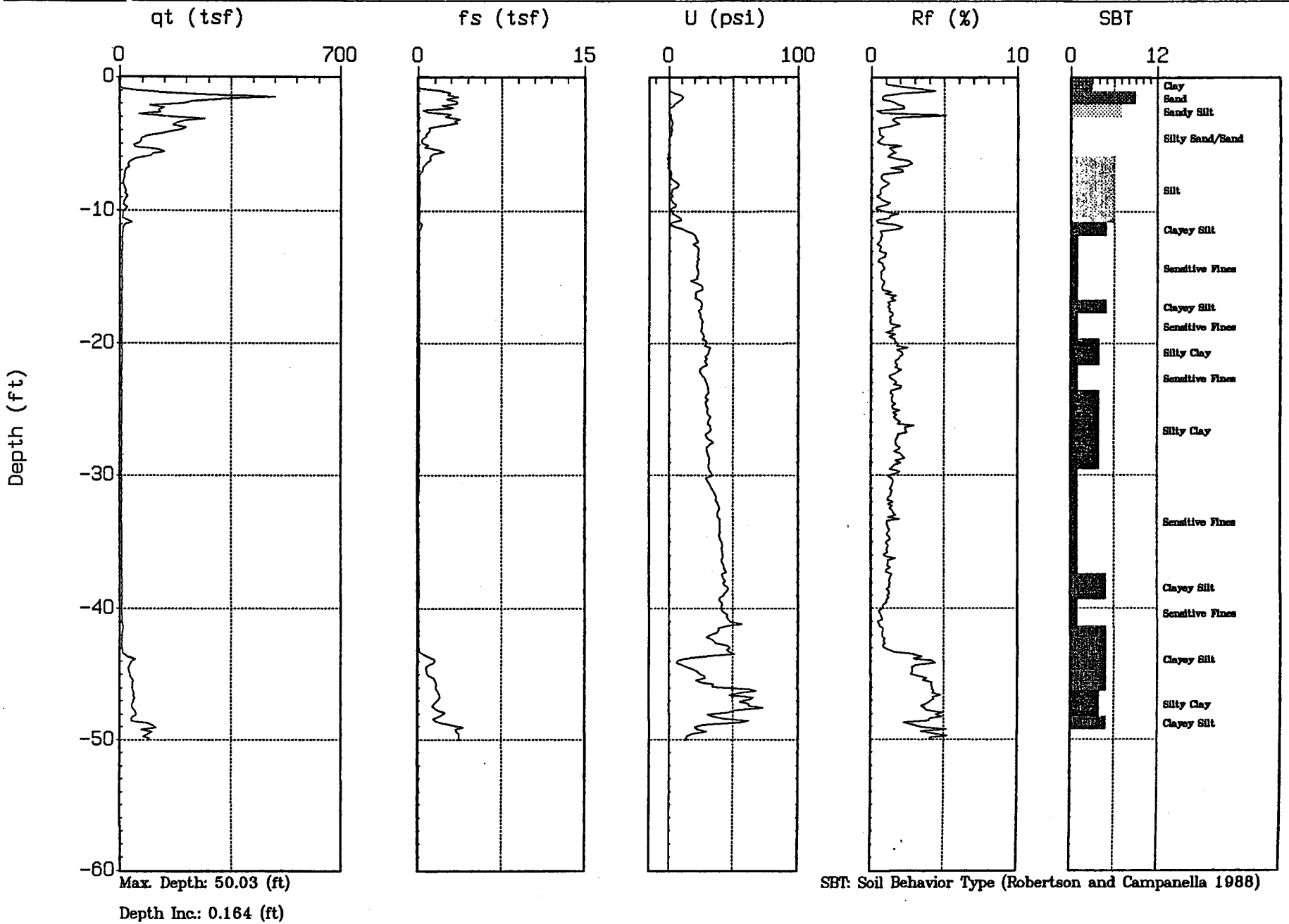
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

# FUGRO

Site : PASHA
Location : CPT-03

Geologist : M. STANLEY
Date : 08:22:02 11:48




Max. Depth: 50.03 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

LOCATION: Hopper (160 feet west of wharf edge and 142 feet south of the north wharf edge)

SURFACE EL: ft +/- (rel. MSL datum)

| DEPTH, ft | SAMPLE NO. | SAMPLER TYPE | SAMPLER BLOW COUNT/ PRESSURE, psf | MATERIAL DESCRIPTION | DRY UNIT WEIGHT, pcf | WATER CONTENT, % | % PASSING #200 SIEVE | LIQUID LIMIT, % | PLASTICITY INDEX | UNDRAINED SHEAR STRENGTH, $S_u$, ksf | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Asphalt Concrete (AC), 2 Inches | | | | | | | |
| | 1 | | (43) | Sandy GRAVEL (GW): medium dense, brown, moist, fine to coarse (gravel to 3 inches), angular (rock fragments), fine- to coarse-grained sand, trace silt (FILL) | | | | | | | |
| 5 | 2 | | (30) | | | | | | | | MA |
| 10 | | | (26) | | | | | | | | |
| | 3 | | 36 | | | | | | | | |
| 15 | 4 | | 26 | CLAY (CL): firm, light brown mixed with gray, moist to wet, with fine- to medium-grained sand (BAY MUD) | | | | | | | |
| 20 | 5 | | (9) | | | | | | | | |
| | 6 | | | some shells below 21 feet | 100 | 26 | | | | 1.6 P<br>0.5 P | |
| 25 | 7 | | (6) | | | 54 | | 46 | 25 | 0.8 P | |
| | | | | Silty CLAY (CH): soft to firm, gray, wet, some shell fragments | | | | | | | |
| 30 | 8 | | 80 psi | | 88 | 35 | | | | | |
| 35 | 9 | | (17) | | | | | | | | |
| | 10 | | | | 92 | 30 | | | | 0.6 P<br>2.5 P | |
| 40 | 11 | | 8 | some shell fragments below 21 feet | | | | | | | |

Continued

BORING DEPTH: 101.5 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Neat Cement
COMPLETION DATE: January 23, 2003
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5.25-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead
RIG TYPE: Failing 1500
DRILLED BY: Pitcher, Ralph & Larry
LOGGED BY: J. Hagen

## LOG OF BORING NO. B-3

Hanson Aggregates
Richmond, California

LOCATION: Hopper (160 feet west of wharf edge and 142 feet south of the north wharf edge)

SURFACE EL: ft +/- (rel. MSL datum)

| DEPTH, ft | MATERIAL SYMBOL | SAMPLE NO. | SAMPLER TYPE | SAMPLER BLOW COUNT/ PRESSURE, psf | MATERIAL DESCRIPTION | DRY UNIT WEIGHT, pcf | WATER CONTENT, % | % PASSING #200 SIEVE | LIQUID LIMIT, % | PLASTICITY INDEX | UNDRAINED SHEAR STRENGTH, $S_u$, ksf | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 12 | | (14) | | 63 | 62 | | | | 2.0 P | |
| 50 | | | | | grades to sandy, greenish-gray | | | | | | | |
| | | 13 | | (40) | | 108 | 21 | 43 | | | 1.5 P | |
| | | 14 | | | Clayey SAND (SC): medium dense, bluish-gray, wet, fine- to coarse-grained, high plasticity fines | | | | | | | |
| 55 | | | | | - logged cuttings from 57 to 100 feet | | | | | | | |
| 60 | | | | | | | | | | | | |
| 65 | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | |
| 75 | | | | | | | | | | | | |
| 80 | | | | | | | | | | | | |
| 85 | | | | | | | | | | | | |

Continued

BORING DEPTH: 101.5 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Neat Cement
COMPLETION DATE: January 23, 2003
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5.25-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead
RIG TYPE: Failing 1500
DRILLED BY: Pitcher, Ralph & Larry
LOGGED BY: J. Hagen

## LOG OF BORING NO. B-3

Hanson Aggregates
Richmond, California

LOCATION: Hopper (160 feet west of wharf edge and 142 feet south of the north wharf edge)

SURFACE EL: ft +/- (rel. MSL datum)

| DEPTH, ft | MATERIAL SYMBOL | SAMPLE NO. | SAMPLER TYPE | SAMPLER BLOW COUNT/ PRESSURE, psf | MATERIAL DESCRIPTION | DRY UNIT WEIGHT, pcf | WATER CONTENT, % | % PASSING #200 SIEVE | LIQUID LIMIT, % | PLASTICITY INDEX | UNDRAINED SHEAR STRENGTH, $S_u$, ksf | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | | | | | | | | | | | | |
| 100 | | 15<br>16 | | (25) | | 73 | 50 | | | | 1.8 P<br>2.0 P | |
| 105 | | | | | | | | | | | | |
| 110 | | | | | | | | | | | | |
| 115 | | | | | | | | | | | | |
| 120 | | | | | | | | | | | | |
| 125 | | | | | | | | | | | | |
| 130 | | | | | | | | | | | | |

BORING DEPTH: 101.5 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Neat Cement
COMPLETION DATE: January 23, 2003
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5.25-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead
RIG TYPE: Failing 1500
DRILLED BY: Pitcher, Ralph & Larry
LOGGED BY: J. Hagen

## LOG OF BORING NO. B-3

Hanson Aggregates
Richmond, California

FUGRO



LOCATION: Proposed column support #3 (about 175 feet west of Hopper)

SURFACE EL: ft +/- (rel. MSL datum)

| DEPTH, ft | SAMPLE NO. | SAMPLER TYPE | SAMPLER BLOW COUNT/ PRESSURE, psf | MATERIAL DESCRIPTION | DRY UNIT WEIGHT, pcf | WATER CONTENT, % | % PASSING #200 SIEVE | LIQUID LIMIT, % | PLASTICITY INDEX | UNDRAINED SHEAR STRENGTH, $S_u$, ksf | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Asphalt Concrete (AC), 3 inches | | | | | | | |
| | 1 | | (64) | GRAVEL (GP): dense to very dense, brown, damp, fine to coarse, gravel to 3 inches, some sand (fine- to coarse-grained), trace clay (FILL) | | | | | | | MA |
| 5 | 2 | | (36) | | | | | | | | |
| | | | | Sandy SILT (ML): stiff, dark gray, wet, fine-grained (BAY MUD) | | | | | | | |
| 10 | | | (18) | | | | | | | | |
| | 3 | | (24) | | | | | | | | |
| | 4 | | | | 98 | 27 | | | | 3.0 P<br>5.5 P | |
| 15 | | | | CLAY (CH): soft to firm, dark gray, moist to wet, trace silt | | | | | | | |
| | 5 | | (6) | | | | | | | | |
| | 6 | | | | 72 | 52 | | | | 0.2 P | |
| 20 | 7 | | 70 psi | grading silty, some shells at 20 feet | 86 | 38 | | | | | |
| 25 | 8 | | (8) | grading trace shell fragments | | | | | | | |
| | 9 | | | | 76 | 47 | | | | 0.6 P | |
| 30 | 10 | | (7) | | 77 | 44 | | | | 0.5 P | |
| 35 | 11 | | (11) | Silty CLAY (CL-ML): stiff, dark gray, moist to wet, with sand (fine-grained), trace shell fragments | | | | | | | |
| | 12 | | | | 91 | 31 | | | | 1.6 P<br>1.8 P | |
| 40 | 13 | | (9) | Silty CLAY (CH): firm to stiff, gray, moist to wet, some fine-grained sand, some brown organics - decreasing sand and silt content with depth | | | | | | | |
| | 14 | | | | 49 | 86 | | | | 1.6 P<br>1.8 P | |

Continued

BORING DEPTH: 83.0 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Neat Cement
COMPLETION DATE: January 24, 2003
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5.25-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead
RIG TYPE: Failing 1500
DRILLED BY: Pitcher, Ralph & Larry
LOGGED BY: J. Hagen

## LOG OF BORING NO. B-4

Hanson Aggregates
Richmond, California

FUGRO



LOCATION: Proposed column support #3 (about 175 feet west of Hopper)

SURFACE EL: ft +/- (rel. MSL datum)

| DEPTH, ft | MATERIAL SYMBOL | SAMPLE NO. | SAMPLER TYPE | SAMPLER BLOW COUNT/ PRESSURE, psf | MATERIAL DESCRIPTION | DRY UNIT WEIGHT, pcf | WATER CONTENT, % | % PASSING #200 SIEVE | LIQUID LIMIT, % | PLASTICITY INDEX | UNDRAINED SHEAR STRENGTH, $S_u$, ksf | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 15<br>16 | | (16) | | 50 | 85 | | | | 1.5 P | |
| 50 | | 17<br>18 | | (14) | | 61 | 65 | | | | 0.8 P | |
| 55 | | | | | - logged cuttings from 55 to 80 feet | | | | | | | |
| 60 | | | | | | | | | | | | |
| 65 | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | |
| 75 | | | | | | | | | | | | |
| 80 | | | | | | | | | | | | |
| | | 19 | | 50/6" | Sandy GRAVEL (GP): very dense, brown, moist, fine to coarse, coarse-grained sand | | | | | | | |
| 85 | | | | | | | | | | | | |

BORING DEPTH: 83.0 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Neat Cement
COMPLETION DATE: January 24, 2003
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5.25-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead
RIG TYPE: Failing 1500
DRILLED BY: Pitcher, Ralph & Larry
LOGGED BY: J. Hagen

## LOG OF BORING NO. B-4

Hanson Aggregates
Richmond, California

Project No. 1484.004

FUGRO



LOCATION: East retaining wall (about 820 feet west of Hopper)

SURFACE EL: ft +/- (rel. MSL datum)

| DEPTH, ft | MATERIAL SYMBOL | SAMPLE NO. | SAMPLER TYPE | SAMPLER BLOW COUNT/ PRESSURE, psf | MATERIAL DESCRIPTION | DRY UNIT WEIGHT, pcf | WATER CONTENT, % | % PASSING #200 SIEVE | LIQUID LIMIT, % | PLASTICITY INDEX | UNDRAINED SHEAR STRENGTH, $S_u$, ksf | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | (50/6") | Asphalt Concrete (1 inch)<br>Clayey GRAVEL (GC): very dense, brown, moist, fine to coarse (FILL) | | | | | | | |
| 5 | | | | 50/3" | SANDSTONE: hard to very hard, gray, fresh to slightly weathered, fine-grained sand | | | | | | | |
| 10 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |

BORING DEPTH: 5.5 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Neat Cement
COMPLETION DATE: January 24, 2003
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5.25-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead
RIG TYPE: Failing 1500
DRILLED BY: Pitcher, Ralph & Larry
LOGGED BY: J. Hagen

## LOG OF BORING NO. B-5

Hanson Aggregates

Richmond, California

Project No. 1484.004

FUGRO



LOCATION: Edge of parking lot, next to dredge spoils (about 1020 feet west of Hopper)

SURFACE EL: ft +/- (rel. MSL datum)

| DEPTH, ft | MATERIAL SYMBOL | SAMPLE NO. | SAMPLER TYPE | SAMPLER BLOW COUNT/ PRESSURE, psf | MATERIAL DESCRIPTION | DRY UNIT WEIGHT, pcf | WATER CONTENT, % | % PASSING #200 SIEVE | LIQUID LIMIT, % | PLASTICITY INDEX | UNDRAINED SHEAR STRENGTH, $S_u$, ksf | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (83/10") | Asphalt Concrete (AC), 1 inch<br>Clayey GRAVEL (GC): very dense, brown, damp, fine to coarse, some clay (FILL) | | | | | | | |
| | | | | 50/3" | SANDSTONE: hard to very hard, gray, fresh to slightly weathered, fine-grained sand | | | | | | | |
| 5 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |

BORING DEPTH: 4.0 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Neat Cement
COMPLETION DATE: January 24, 2003
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5.25-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead
RIG TYPE: Failing 1500
DRILLED BY: Pitcher, Ralph & Larry
LOGGED BY: J. Hagen

## LOG OF BORING NO. B-6

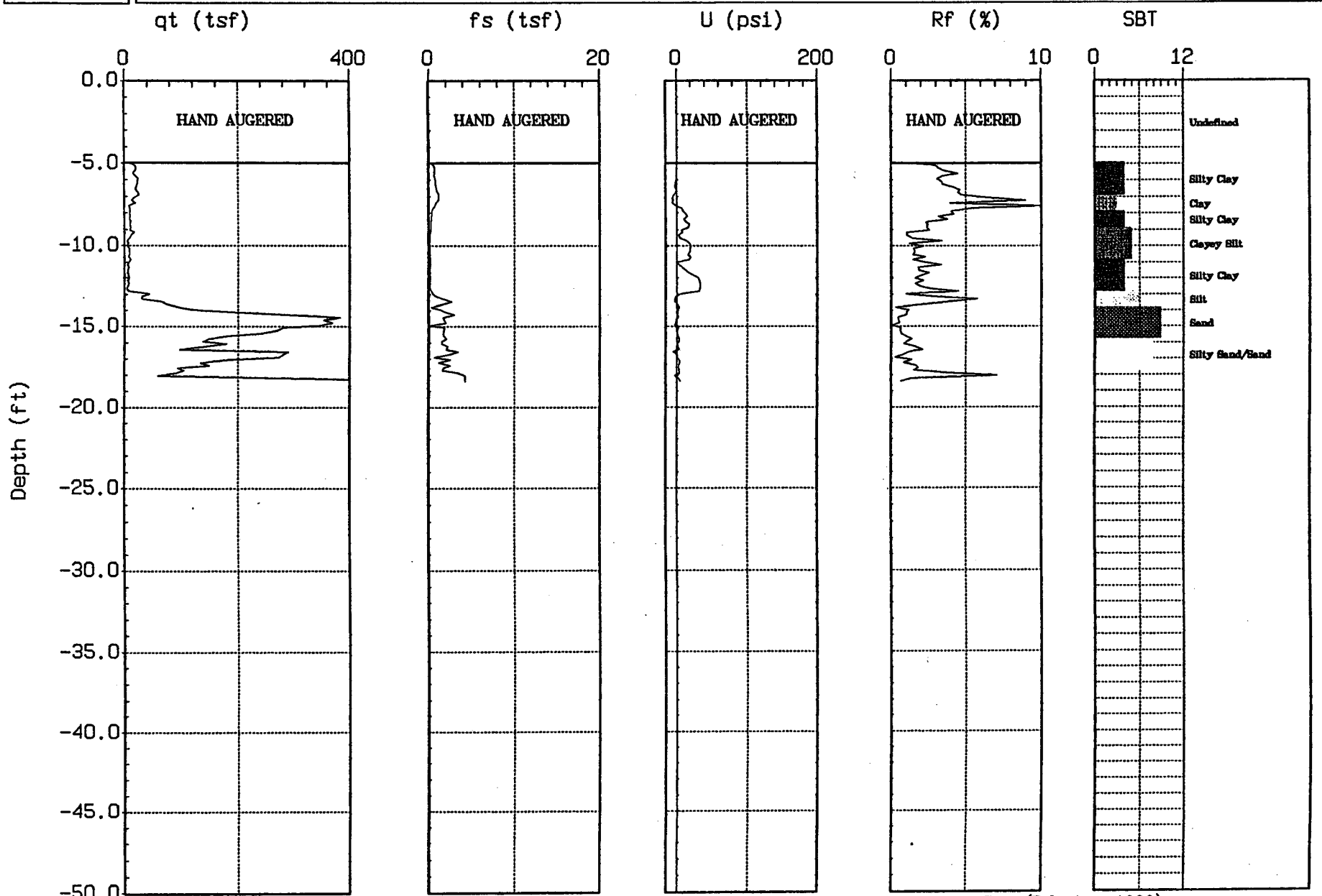
Hanson Aggregates
Richmond, California

GREGG

# FUGRO

Site : PT. POTRERO
Location : CPT-01

Engineer : J. HAGEN
Date : 01:22:03 07:56




Max. Depth: 18.37 (ft)

Depth Inc.: 0.164 (ft)

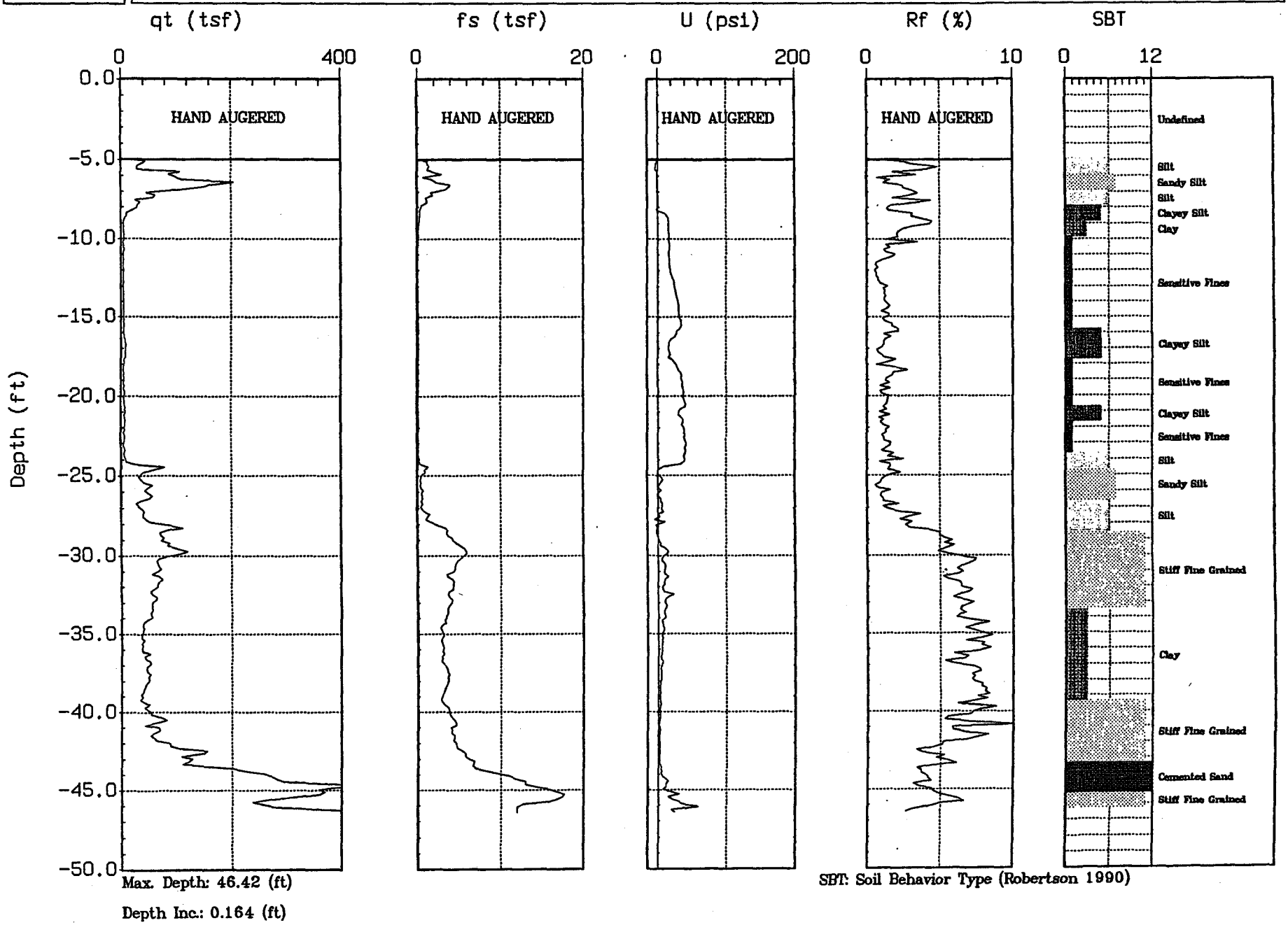
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# FUGRO

Site : PT. POTRERO
Location : CPT-03

Engineer : J. HAGEN
Date : 01:22:03 09:46




Max. Depth: 46.42 (ft)

Depth Inc.: 0.164 (ft)

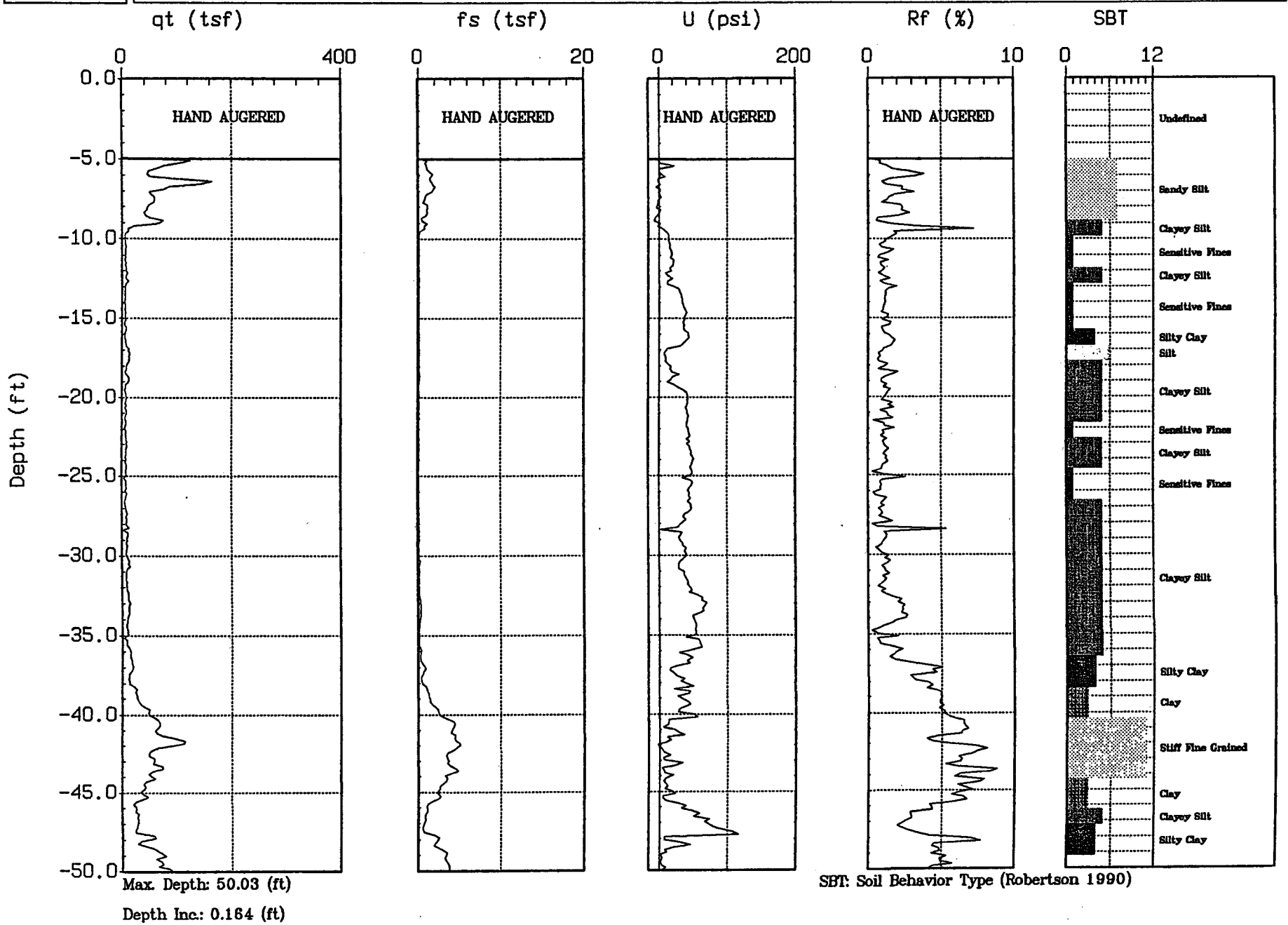
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# FUGRO

Site : PT. POTRERO
Location : CPT-04

Engineer : J. HAGEN
Date : 01:22:03 11:21




Max. Depth: 50.03 (ft)

Depth Inc.: 0.164 (ft)

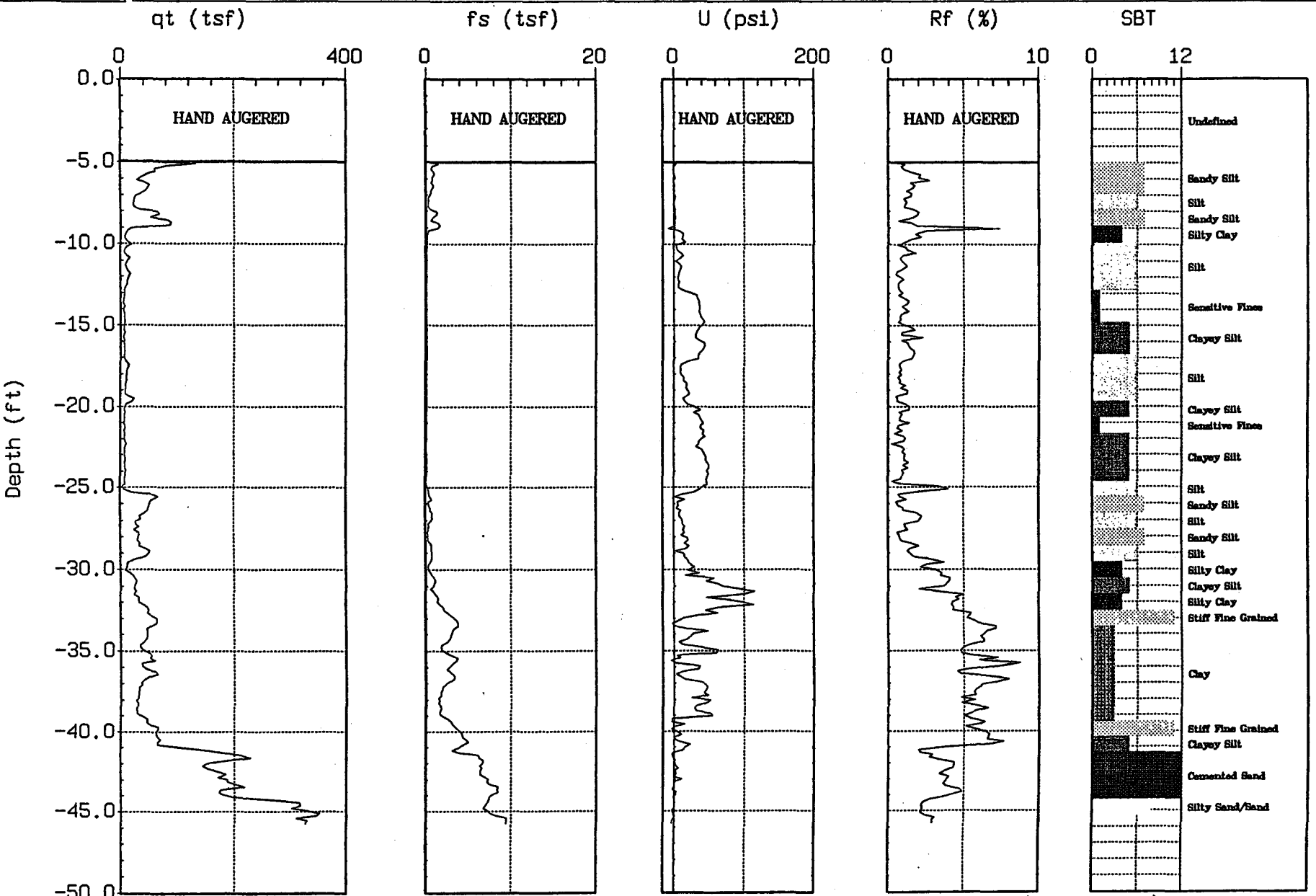
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# FUGRO

Site : PT. POTRERO
Location : CPT-05

Engineer : J. HAGEN
Date : 01:22:03 12:25




Max. Depth: 45.77 (ft)

Depth Inc.: 0.164 (ft)

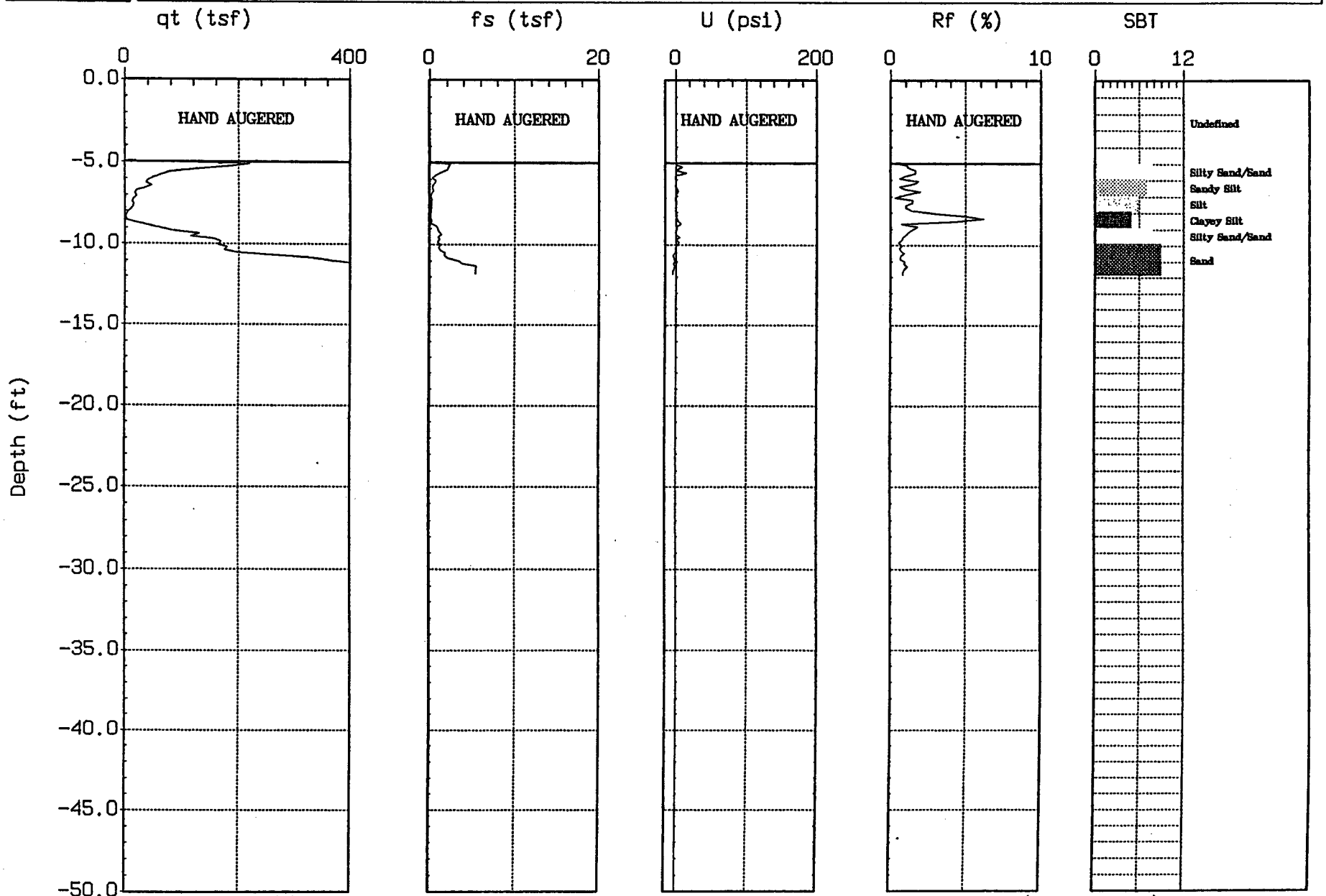
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# FUGRO

Site : PT. POTRERO
Location : CPT-06

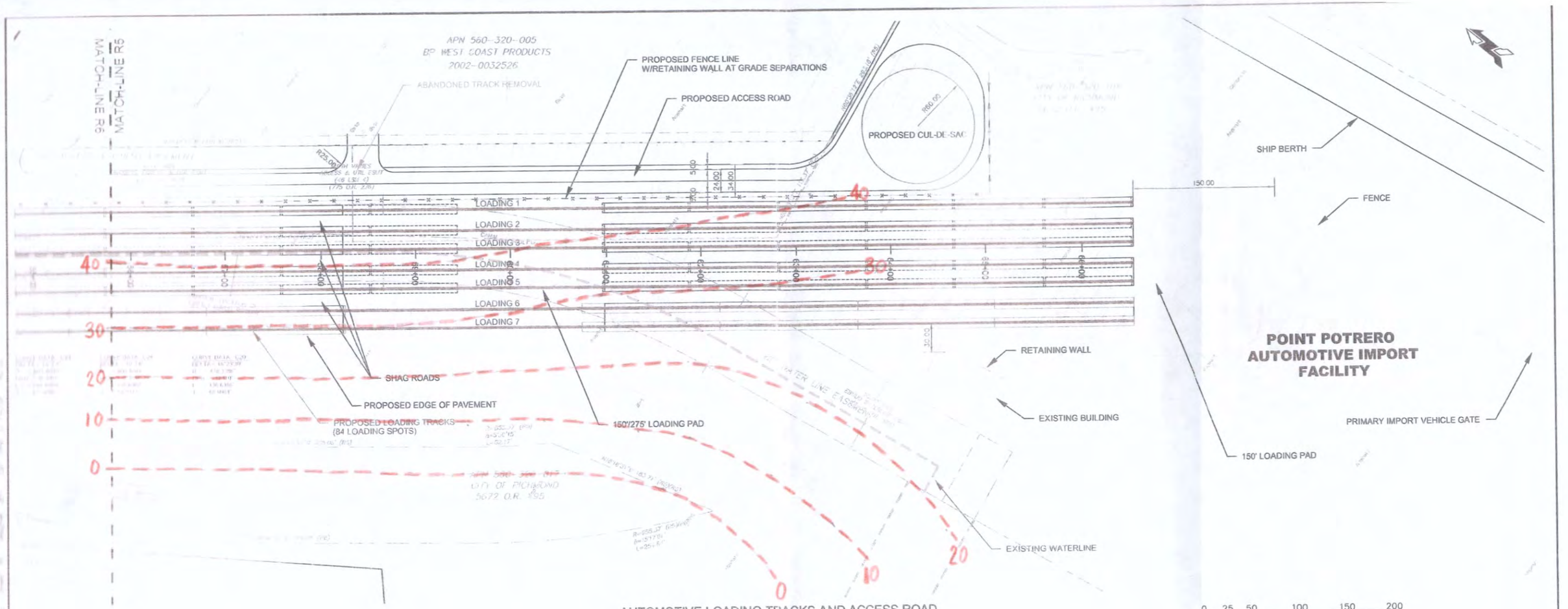
Engineer : J. HAGEN
Date : 01:22:03 13:44




Max. Depth: 11.81 (ft)

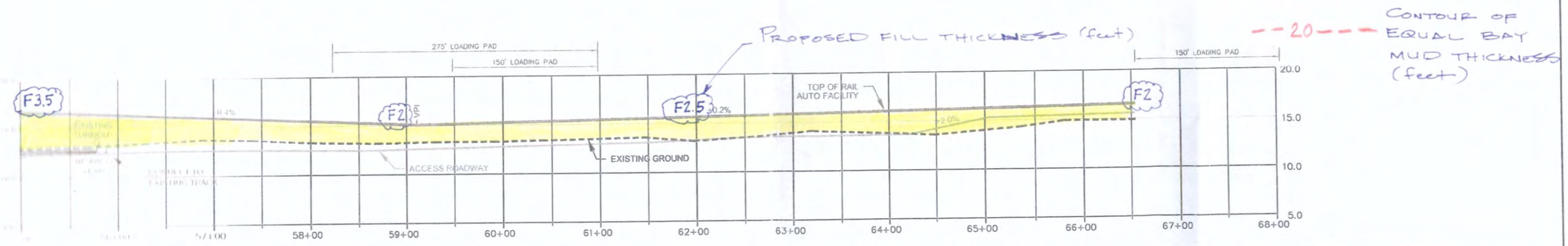
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)




AUTOMOTIVE LOADING TRACKS AND ACCESS ROAD

0 25 50 100 150 200
GRAPHIC SCALE




PROFILE - LOADING TRACK 3
(1 HORIZONTAL UNIT = 10 VERTICAL UNITS)

TRANSDEVELOPMENT GROUP

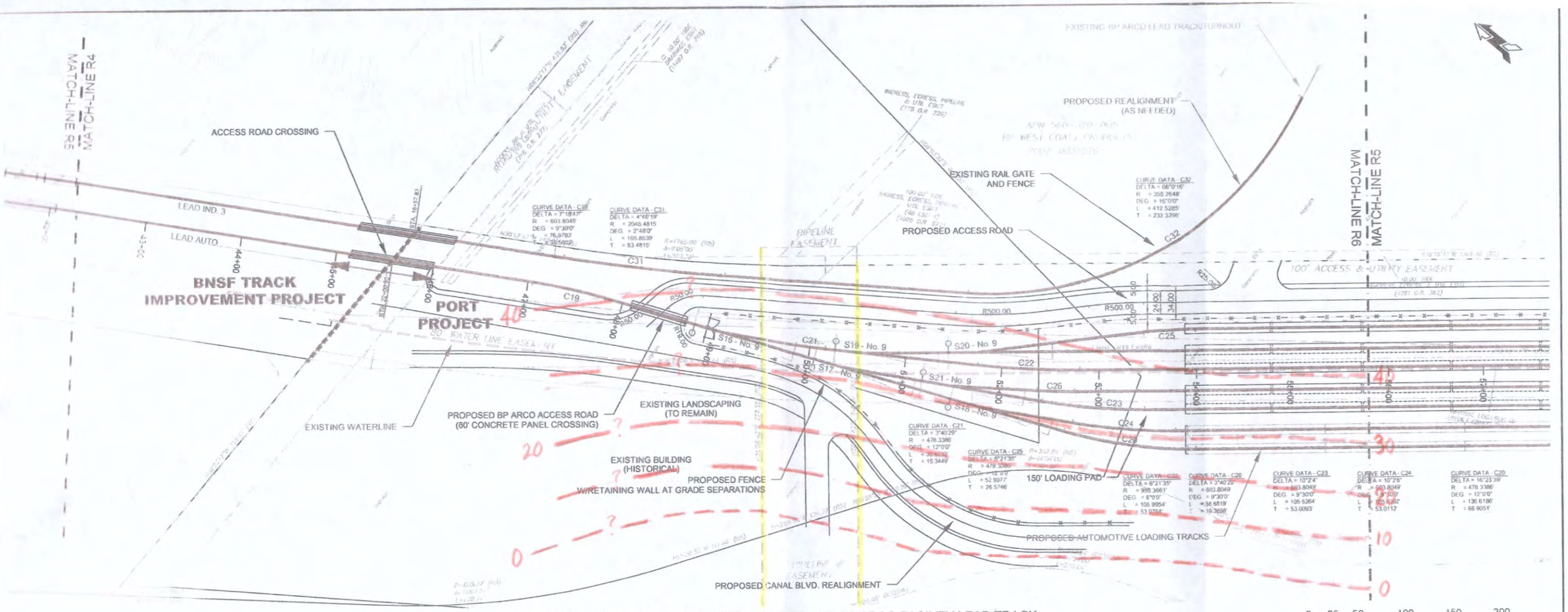
HONDA

BNSF RAILWAY

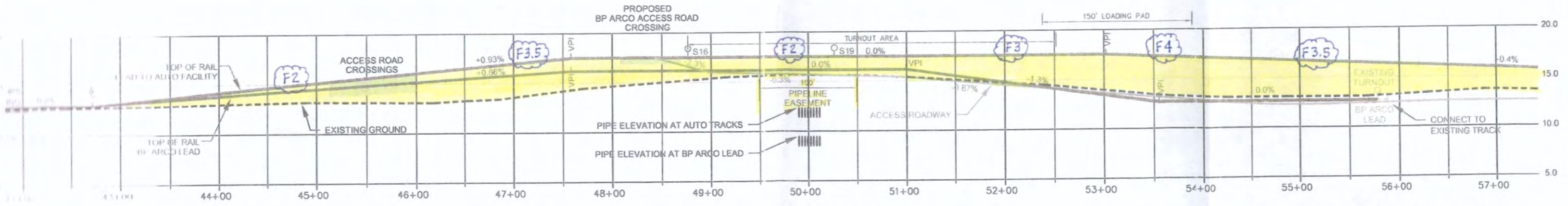
FOR REVIEW

**R6 - AUTOMOTIVE LOADING TRACKS**
**RAIL EXPANSION PROJECT**
PORT OF RICHMOND, CALIFORNIA
*July 2008*

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AUTOMOTIVE LOADING TRACKS, ACCESS ROAD AND BP ARCO FACILITY LEAD TRACK




PROFILE - LOADING TRACK 3 AND INDUSTRY LEAD

(1 HORIZONTAL UNIT = 10 VERTICAL UNITS)

FOR REVIEW

**R5 - AUTO AND INDUSTRIAL LEAD TRACKS RAIL EXPANSION PROJECT**

PORT OF RICHMOND, CALIFORNIA

*July 2008*

TRANSDEVELOPMENT GROUP

HONDA

BNSF RAILWAY

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# BORING NUMBER EB-1



CORNERSTONE EARTH GROUP

PROJECT NAME Honda Port of Entry
PROJECT NUMBER 281-1-3
PROJECT LOCATION Richmond, CA
DATE STARTED 11/6/08 DATE COMPLETED 11/6/08
GROUND ELEVATION 15 FT +/- BORING DEPTH 20 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc. LATITUDE LONGITUDE
DRILLING METHOD Mobile B-60, 8 inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLF
AT TIME OF DRILLING Not Encountered
NOTES
AT END OF DRILLING Not Encountered

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| ELEVATION (ft) | DEPTH (ft) | DESCRIPTION | N-Value (uncorrected) blows per foot | SAMPLES TYPE AND NUMBER | DRY UNIT WEIGHT PCF | NATURAL MOISTURE CONTENT, % | PLASTICITY INDEX, % | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| 15.0 | 0 | 3 inches asphalt concrete over 6 inches aggregate base | | | | | | |
| 14.8 | | | | | | | | |
| 14.3 | | **Clayey Gravel with Sand (GC) [Fill]** dense to loose, moist, light brown | 67 | MC | | | | |
| | | | 15 | MC-2 | 106 | 9 | | |
| | 5 | | | | | | | |
| 9.5 | | **Sandy Lean Clay (CL) [Fill]** medium stiff, wet, light gray with olive and brown mottles | 28 | MC-3B | 59 | 64 | | |
| 6.5 | | **Silty Sand (SM)** very loose, wet, dark gray, some shell fragments | 6 | MC-4 | | 24 | | 38 |
| | 10 | | | | | | | |
| 2.5 | | **Fat Clay with Sand (CH) [Bay Mud]** soft, wet, dark gray, fine sand, some shell fragments, high plasticity | 5 | MC-5 | 93 | 32 | | 80 |
| | 15 | | | | | | | |
| | | | | ST-6 | 67 | 56 | | |
| -5.0 | 20 | Bottom of Boring at 20.0 feet. | | | | | | |
| | 25 | | | | | | | |
| | 30 | | | | | | | |
| | 35 | | | | | | | |

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0 5.0

CORNERSTONE EARTH GROUP - CORNERSTONE.GDT - 1/15/09 09:21 - P:\DRAFTING\GINT FILES\281-1-3.GPJ

# BORING NUMBER EB-2



CORNERSTONE EARTH GROUP

PROJECT NAME Honda Port of Entry
PROJECT NUMBER 281-1-3
PROJECT LOCATION Richmond, CA
DATE STARTED 11/6/08 DATE COMPLETED 11/6/08
GROUND ELEVATION 15 FT +/- BORING DEPTH 15 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc. LATITUDE LONGITUDE
DRILLING METHOD Mobile B-60, 8 inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLF
AT TIME OF DRILLING Not Encountered
NOTES
AT END OF DRILLING Not Encountered

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| ELEVATION (ft) | DEPTH (ft) | DESCRIPTION | N-Value (uncorrected) blows per foot | SAMPLES TYPE AND NUMBER | DRY UNIT WEIGHT PCF | NATURAL MOISTURE CONTENT, % | PLASTICITY INDEX, % | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| 15.0 | 0 | ½ inch asphalt concrete | | | | | | |
| 14.5 | | **Clayey Gravel with Sand (GC) [Fill]** medium dense to loose, moist, light brown to dark gray (petroleum odor) | 25 | MC | | | | |
| | | | 11 | MC-2A | 97 | 7 | | |
| | 5 | | | | | | | |
| 9.5 | | **Fat Clay (CH) [Bay Mud]** soft, wet, dark gray, trace fine sand, high plasticity | 4 | MC-3B | 69 | 47 | | 91 |
| | | | 2 | NR | | | | |
| | 10 | | | | | | | |
| | | | 5 | MC-4 | 61 | 62 | | 96 |
| 0.0 | 15 | Bottom of Boring at 15.0 feet. | | | | | | |
| | 20 | | | | | | | |
| | 25 | | | | | | | |
| | 30 | | | | | | | |
| | 35 | | | | | | | |

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0 5.0

CORNERSTONE EARTH GROUP - CORNERSTONE.GDT - 1/15/09 09:22 - P:\DRAFTING\GINT FILES\281-1-3.GPJ

# BORING NUMBER EB-3



CORNERSTONE EARTH GROUP

PROJECT NAME Honda Port of Entry
PROJECT NUMBER 281-1-3
PROJECT LOCATION Richmond, CA

DATE STARTED 11/6/08 DATE COMPLETED 11/6/08
GROUND ELEVATION 16 FT +/- BORING DEPTH 13.5 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc.
LATITUDE LONGITUDE
DRILLING METHOD Mobile B-60, 8 inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLF
▽ AT TIME OF DRILLING Not Encountered
NOTES
▼ AT END OF DRILLING Not Encountered

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| ELEVATION (ft) | DEPTH (ft) | DESCRIPTION | N-Value (uncorrected) blows per foot | SAMPLES TYPE AND NUMBER | DRY UNIT WEIGHT PCF | NATURAL MOISTURE CONTENT, % | PLASTICITY INDEX, % | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| 16.0 | 0 | 6 inches asphalt concrete | | | | | | |
| 15.5 | | **Clayey Gravel with Sand (GC) [Fill]** medium dense to very dense, moist, light brown | 24 | MC-1B | | | | |
| | | | 11 | MC | | | | |
| | 5 | some cobbles | 50/6" | MC-3 | | 12 | | |
| 8.5 | | **Fat Clay (CH) [Bay Mud]** very soft, wet, gray, high plasticity | 6 | MC-4 | 74 | 43 | | |
| 2.5 | 10 | Bottom of Boring at 13.5 feet. | | | | | | |
| | 15 | | | | | | | |
| | 20 | | | | | | | |
| | 25 | | | | | | | |
| | 30 | | | | | | | |
| | 35 | | | | | | | |

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0 5.0

CORNERSTONE EARTH GROUP - CORNERSTONE.GDT - 1/15/09 09:22 - P:\DRAFTING\GINT FILES\281-1-3.GPJ

# BORING NUMBER EB-4



CORNERSTONE EARTH GROUP

PROJECT NAME Honda Port of Entry
PROJECT NUMBER 281-1-3
PROJECT LOCATION Richmond, CA

DATE STARTED 11/6/08 DATE COMPLETED 11/6/08
GROUND ELEVATION 14.5 FT +/- BORING DEPTH 40 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc. LATITUDE _____ LONGITUDE _____
DRILLING METHOD Mobile B-60, 8 inch Hollow-Stem Auger GROUND WATER LEVELS:
LOGGED BY JLF ▽ AT TIME OF DRILLING Not Encountered
NOTES _____ ▼ AT END OF DRILLING Not Encountered

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| ELEVATION (ft) | DEPTH (ft) | DESCRIPTION | N-Value (uncorrected) blows per foot | SAMPLES TYPE AND NUMBER | DRY UNIT WEIGHT PCF | NATURAL MOISTURE CONTENT, % | PLASTICITY INDEX, % | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| 14.5 | 0 | 6 inches asphalt concrete | | | | | | |
| 14.0 | | **Clayey Sand (SC) [Fill]** medium dense, wet, dark gray, subrounded | 15 | MC-1A | | | | |
| 12.5 | | **Clayey Gravel with Sand (GC) [Fill]** medium dense, moist, light brown | 8 | MC-2A | 109 | 15 | | |
| | 5 | | 12 | MC-3 | 110 | 17 | | |
| 8.5 | | **Gravelly Lean Clay (CL) [Fill]** soft, moist, dark gray with olive and brown mottles | | | | | | |
| 6.0 | | **Fat Clay (CH) [Bay Mud]** very soft, wet, dark gray with olive mottles, high plasticity | 5 | MC-4 | 59 | 70 | | 99 |
| | 10 | | | | | | | |
| | | | 4 | MC-5 | 72 | 47 | | |
| | 15 | | | | | | | |
| | 20 | | | ST-5 | 70 | 52 | | |
| | 25 | | | | | | | |
| | 30 | | | ST-6 | 49 | 90 | | |
| -20.5 | 35 | | | | | | | |

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0 5.0

*Continued Next Page*

CORNERSTONE EARTH GROUP - CORNERSTONE.GDT - 1/15/09 09:22 - P:\DRAFTING\GINT FILES\281-1-3.GPJ

# BORING NUMBER EB-4



CORNERSTONE EARTH GROUP

**PROJECT NAME** Honda Port of Entry

**PROJECT NUMBER** 281-1-3

**PROJECT LOCATION** Richmond, CA

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| ELEVATION (ft) | DEPTH (ft) | SYMBOL | DESCRIPTION | N-Value (uncorrected) blows per foot | SAMPLES TYPE AND NUMBER | DRY UNIT WEIGHT PCF | NATURAL MOISTURE CONTENT, % | PLASTICITY INDEX, % | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|---|
| -20.5 | 35 | | **Fat Clay (CH) [Bay Mud]**<br>very soft, wet, dark gray with olive mottles, high plasticity | | | | | | |
| -25.5 | 40 | | Bottom of Boring at 40.0 feet. | 8 | SPT-7 | | 77 | | |
| | 45 | | | | | | | | |
| | 50 | | | | | | | | |
| | 55 | | | | | | | | |
| | 60 | | | | | | | | |
| | 65 | | | | | | | | |
| | 70 | | | | | | | | |
| | 75 | | | | | | | | |

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0 5.0

CORNERSTONE EARTH GROUP - CORNERSTONE.GDT - 1/15/09 09:22 - P:\DRAFTING\GINT FILES\281-1-3.GPJ

# BORING NUMBER EB-5



CORNERSTONE EARTH GROUP

PROJECT NAME Honda Port of Entry
PROJECT NUMBER 281-1-3
PROJECT LOCATION Richmond, CA

DATE STARTED 11/6/08 DATE COMPLETED 11/6/08
GROUND ELEVATION 17 FT +/- BORING DEPTH 4 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc. LATITUDE LONGITUDE
DRILLING METHOD Mobile B-60, 8 inch Hollow-Stem Auger GROUND WATER LEVELS:
LOGGED BY JLF ▽ AT TIME OF DRILLING Not Encountered
NOTES ▼ AT END OF DRILLING Not Encountered

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| ELEVATION (ft) | DEPTH (ft) | SYMBOL | DESCRIPTION | N-Value (uncorrected) blows per foot | SAMPLES TYPE AND NUMBER | DRY UNIT WEIGHT PCF | NATURAL MOISTURE CONTENT, % | PLASTICITY INDEX, % | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|---|
| 17.0 | 0 | | 9 inches asphalt concrete | | | | | | |
| 16.3 | | | **Clayey Gravel with Sand (GC) [Fill]** very dense, dry to moist, light brown | 50/6" | MC | | | | |
| 14.8 | | | **Sandstone / Shale [Franciscan formation]** gray, hard, moderately strong | 50/1" | NR | | | | |
| 12.8 | | | | 50/1" | NR | | | | |
| | 5 | | Bottom of Boring at 4.0 feet. | | | | | | |
| | 10 | | | | | | | | |
| | 15 | | | | | | | | |
| | 20 | | | | | | | | |
| | 25 | | | | | | | | |
| | 30 | | | | | | | | |
| | 35 | | | | | | | | |

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0 5.0

CORNERSTONE EARTH GROUP - CORNERSTONE.GDT - 1/15/09 09:22 - P:\DRAFTING\GINT FILES\281-1-3.GPJ

# BORING NUMBER EB-6



CORNERSTONE EARTH GROUP

PROJECT NAME Honda Port of Entry
PROJECT NUMBER 281-1-3
PROJECT LOCATION Richmond, CA

DATE STARTED 11/6/08 DATE COMPLETED 11/6/08
GROUND ELEVATION 15 FT +/- BORING DEPTH 10 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc. LATITUDE LONGITUDE
DRILLING METHOD Mobile B-60, 8 inch Hollow-Stem Auger GROUND WATER LEVELS:
LOGGED BY JLF ▽ AT TIME OF DRILLING Not Encountered
NOTES ▼ AT END OF DRILLING Not Encountered

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| ELEVATION (ft) | DEPTH (ft) | SYMBOL | DESCRIPTION | N-Value (uncorrected) blows per foot | SAMPLES TYPE AND NUMBER | DRY UNIT WEIGHT PCF | NATURAL MOISTURE CONTENT, % | PLASTICITY INDEX, % | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|---|
| 15.0 | 0 | | 9 inches asphalt concrete | | | | | | |
| 14.3 | | | **Clayey Gravel with Sand (GC) [Fill]** medium dense, moist, light brown | 38 | MC-1B | 85 | 7 | | |
| | | | | 15 | MC-2B | | 12 | | |
| 11.0 | | | **Poorly Graded Sand (SP) [Fill]** | | | | | | |
| 10.0 | 5 | | medium dense, moist, light gray and brown mottled | 6 | MC-3B | | 26 | | 47 |
| 8.0 | | | **Silty Sand (SM)** very loose, wet, dark gray, some shell fragments | | | | | | |
| 5.0 | 10 | | **Sandy Lean Clay (CL) [Bay Mud Crust]** soft, wet, dark gray, some shell fragments, moderate plasticity | 6 | MC-4 | 80 | 33 | | 51 |
| | | | Bottom of Boring at 10.0 feet. | | | | | | |

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0 5.0

15 20 25 30 35

CORNERSTONE EARTH GROUP - CORNERSTONE.GDT - 1/15/09 09:22 - P:\DRAFTING\GINT FILES\281-1-3.GPJ

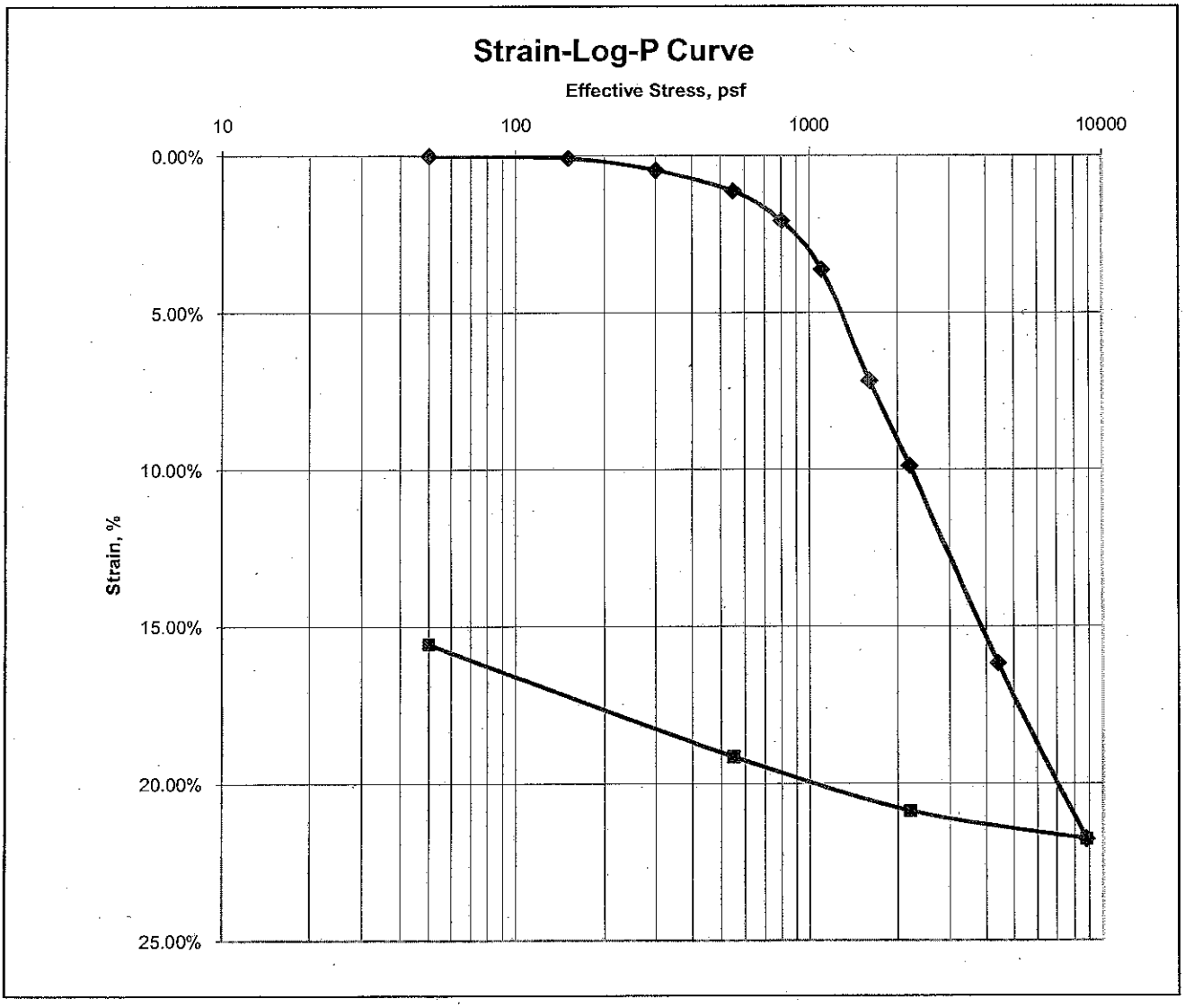



# APPENDIX B

## HISTORICAL LABORATORY TEST DATA

# Consolidation Test
## ASTM D2435

| | | | | | |
|---|---|---|---|---|---|
| **Job No.:** | 640-113 | **Boring:** | EB-1 | **Run By:** | MD |
| **Client:** | Cornerstone Earth Group | **Sample:** | 6 | **Reduced:** | PJ |
| **Project:** | Honda Rail Expansion - 281-1-1 | **Depth, ft.:** | 17.5 | **Checked:** | PJ/DC |
| **Soil Type:** | Gray CLAY w/ shell fragments & pockets of Silt & Sand | | | **Date:** | 11/21/2008 |



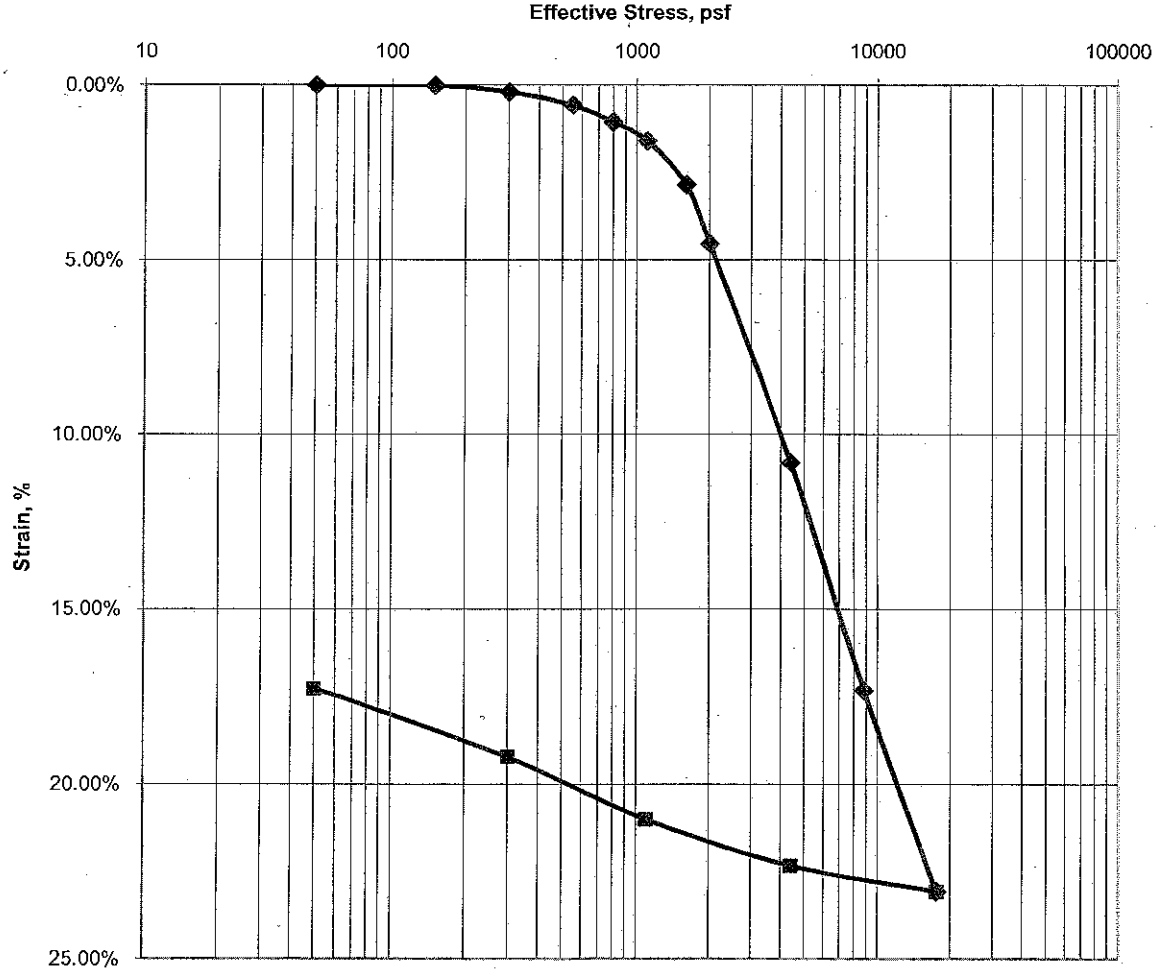

| Ass. Gs = 2.7 | Initial | Final |
|---|---|---|
| Moisture %: | 55.7 | 41.6 |
| Dry Density, pcf: | 67.1 | 79.4 |
| Void Ratio: | 1.510 | 1.122 |
| % Saturation: | 99.5 | 100 |

**Remarks:**

# Consolidation Test
## ASTM D2435

| | | | | | |
|---|---|---|---|---|---|
| **Job No.:** | 640-113 | **Boring:** | EB-4 | **Run By:** | MD |
| **Client:** | Cornerstone Earth Group | **Sample:** | 5 | **Reduced:** | PJ |
| **Project:** | Honda Rail Expansion - 281-1-1 | **Depth, ft.:** | 22.5 | **Checked:** | PJ/DC |
| **Soil Type:** | Gray CLAY, trace organics & shell fragments (strong petrol odor)(Silty) | | | **Date:** | 11/21/2008 |

## Strain-Log-P Curve

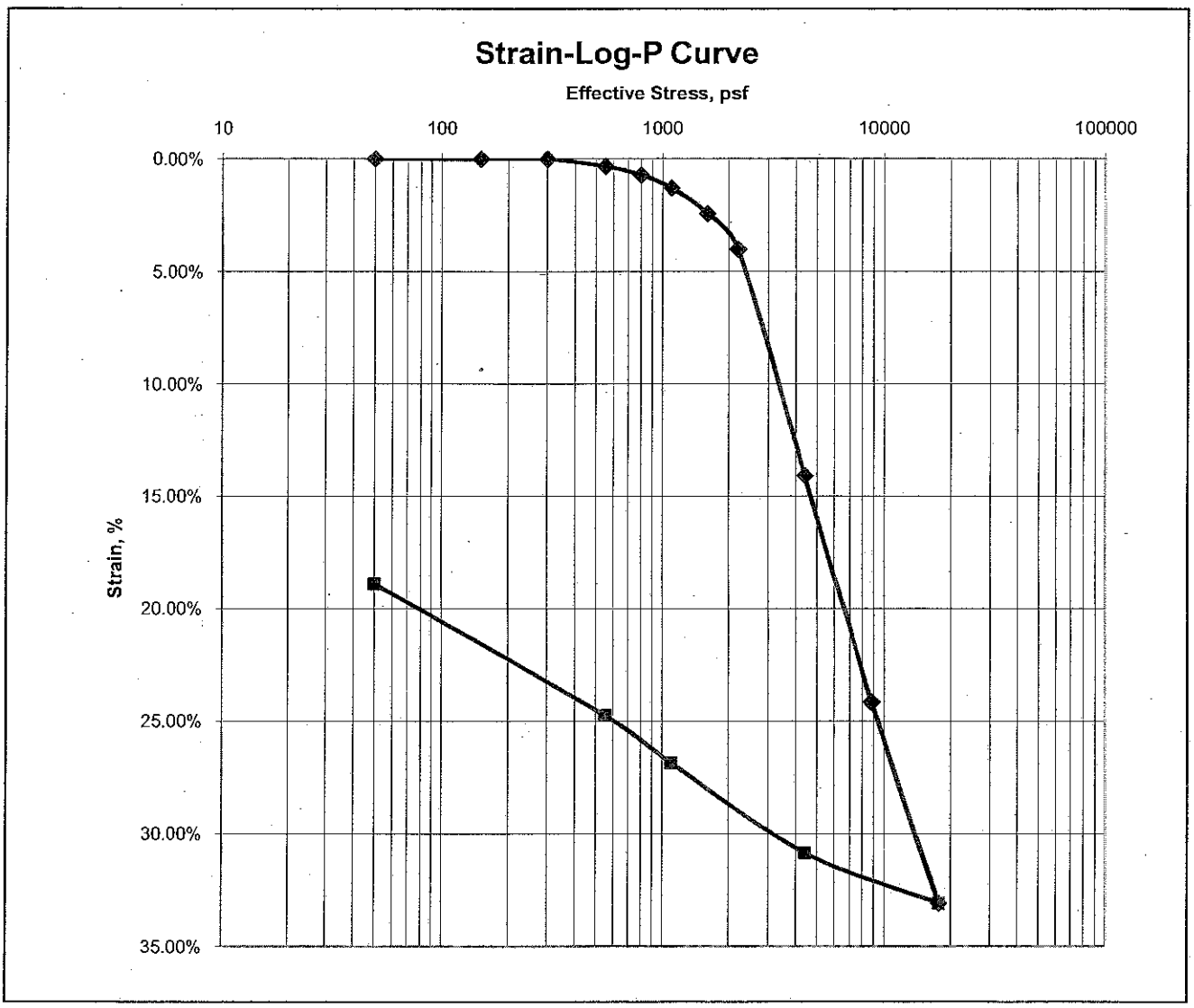



| Ass. Gs = 2.7 | Initial | Final |
|---|---|---|
| **Moisture %:** | 52.3 | 36.8 |
| **Dry Density, pcf:** | 69.8 | 84.6 |
| **Void Ratio:** | 1.415 | 0.992 |
| **% Saturation:** | 99.7 | 100 |

**Remarks:**

# Consolidation Test
## ASTM D2435

| | | | | | |
|---|---|---|---|---|---|
| **Job No.:** | 640-113 | **Boring:** | EB-4 | **Run By:** | MD |
| **Client:** | Cornerstone Earth Group | **Sample:** | 6 | **Reduced:** | PJ |
| **Project:** | Honda Rail Expansion - 281-1-1 | **Depth, ft.:** | 32.5 | **Checked:** | PJ/DC |
| **Soil Type:** | Gray CLAY w/ organics, trace shell fragments (strong petrol odor) | | | **Date:** | 11/21/2008 |




| Ass. Gs = 2.7 | Initial | Final |
|---|---|---|
| **Moisture %:** | 89.9 | 66.7 |
| **Dry Density, pcf:** | 48.9 | 60.2 |
| **Void Ratio:** | 2.444 | 1.799 |
| **% Saturation:** | 99.3 | 100 |

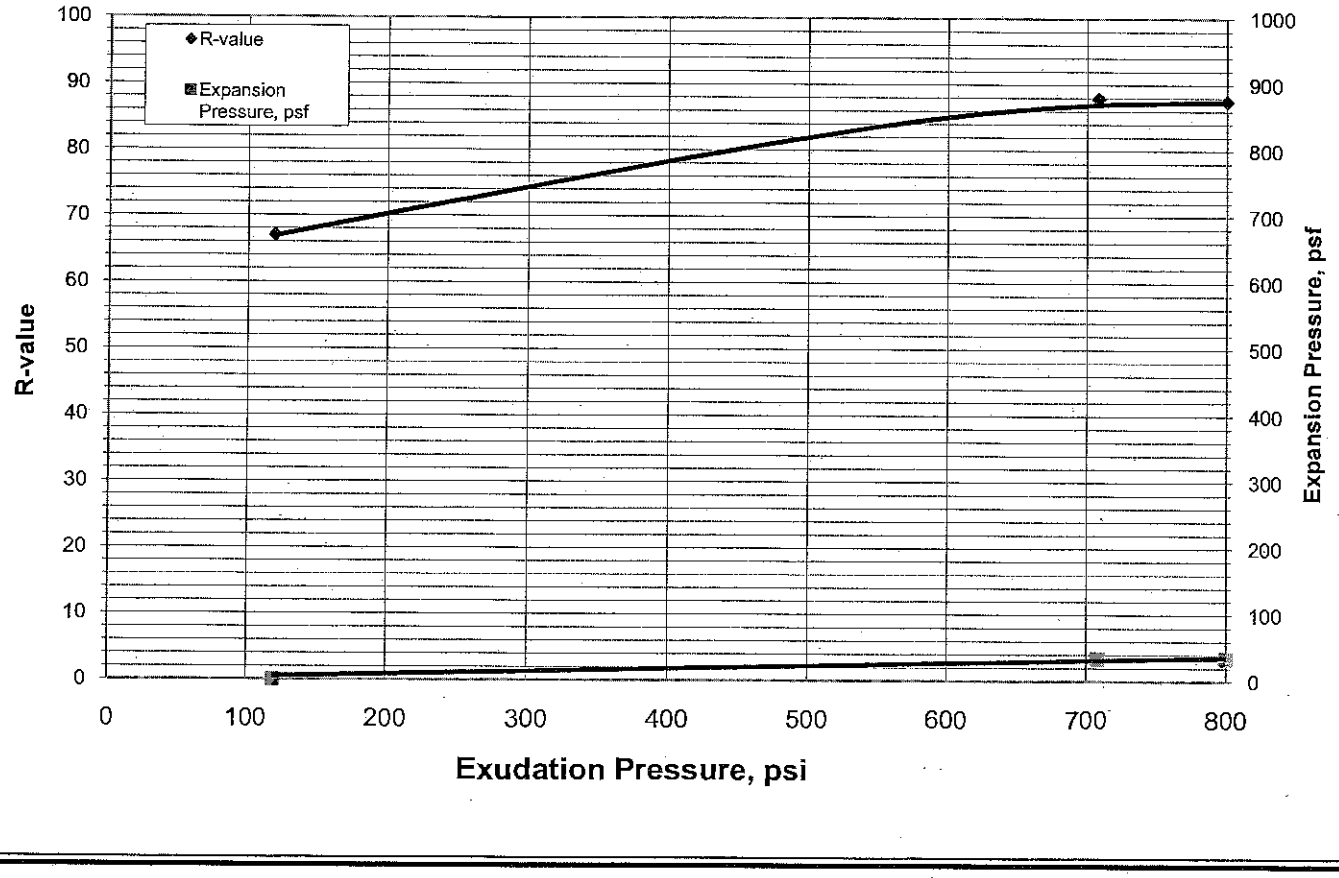
**Remarks:**

# R-value Test Report (Caltrans 301)

| | | | | | |
|---|---|---|---|---|---|
| Job No.: | 640-113 | Date: | 11/13/08 | Initial Moisture, | 1.8% |
| Client: | Cornerstone Earth Group | Tested | MD | R-value by Stabilometer | 74 |
| Project: | Honda Rail Expansion - 281-1-1 | Reduced | RU | | |
| Sample | EB-3 & 5 | Checked | DC | Expansion Pressure | 20 psf |
| Soil Type: | Gray GRAVEL w/ Sand | | | | |

| Specimen Number | A | B | C | D |
|---|---|---|---|---|
| Exudation Pressure, psi | 119 | 800 | 708 | |
| Prepared Weight, grams | 1300 | 1300 | 1300 | |
| Final Water Added, grams/cc | 70 | 47 | 55 | |
| Weight of Soil & Mold, grams | 3266 | 3221 | 3279 | |
| Weight of Mold, grams | 2079 | 2099 | 2085 | |
| Height After Compaction, in. | 2.46 | 2.42 | 2.51 | |
| Moisture Content, % | 7.3 | 5.5 | 6.1 | |
| Dry Density, pcf | 136.2 | 133.1 | 135.7 | |
| Expansion Pressure, psf | 0.0 | 34.4 | 34.4 | |
| Stabilometer @ 1000 | | | | |
| Stabilometer @ 2000 | 35 | 8 | 10 | |
| Turns Displacement | 4.37 | 6.47 | 5.22 | |
| R-value | 67 | 87 | 88 | |

Remarks:

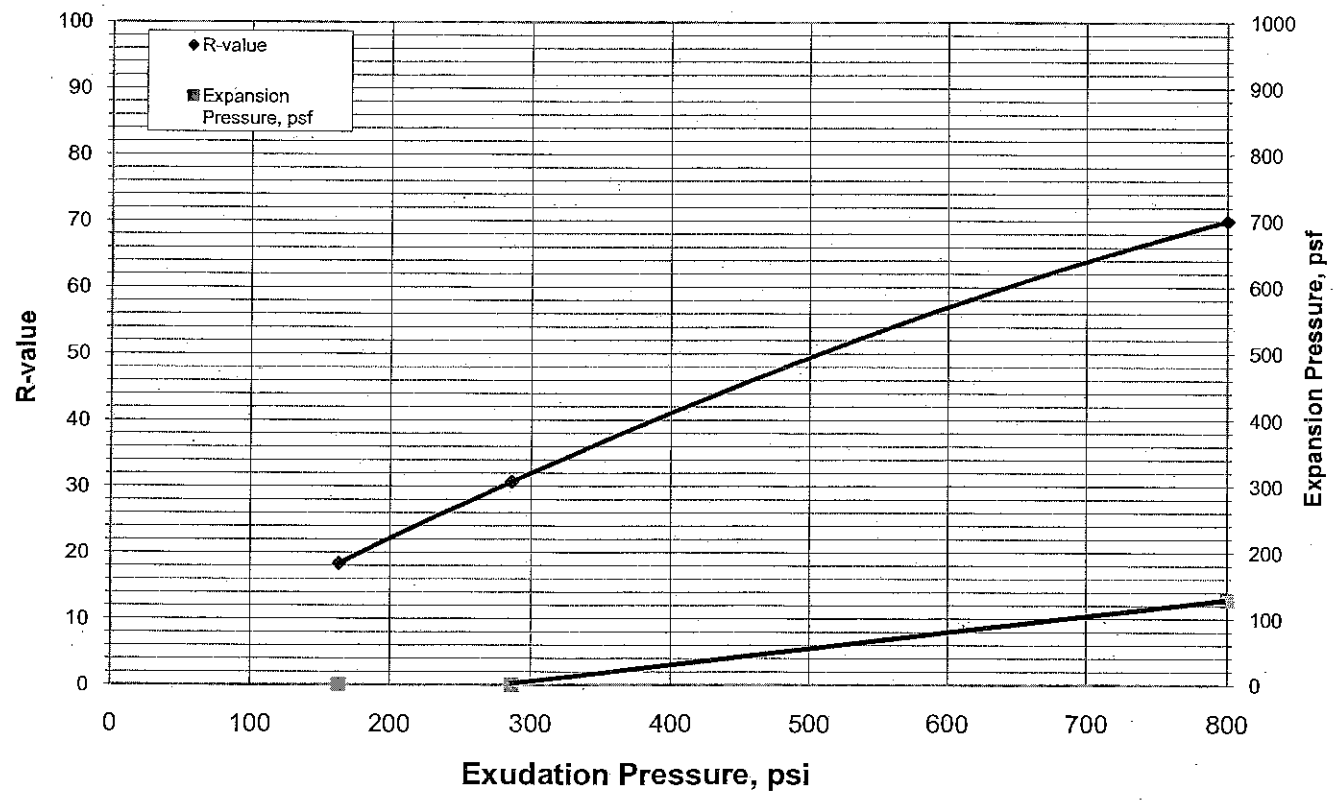


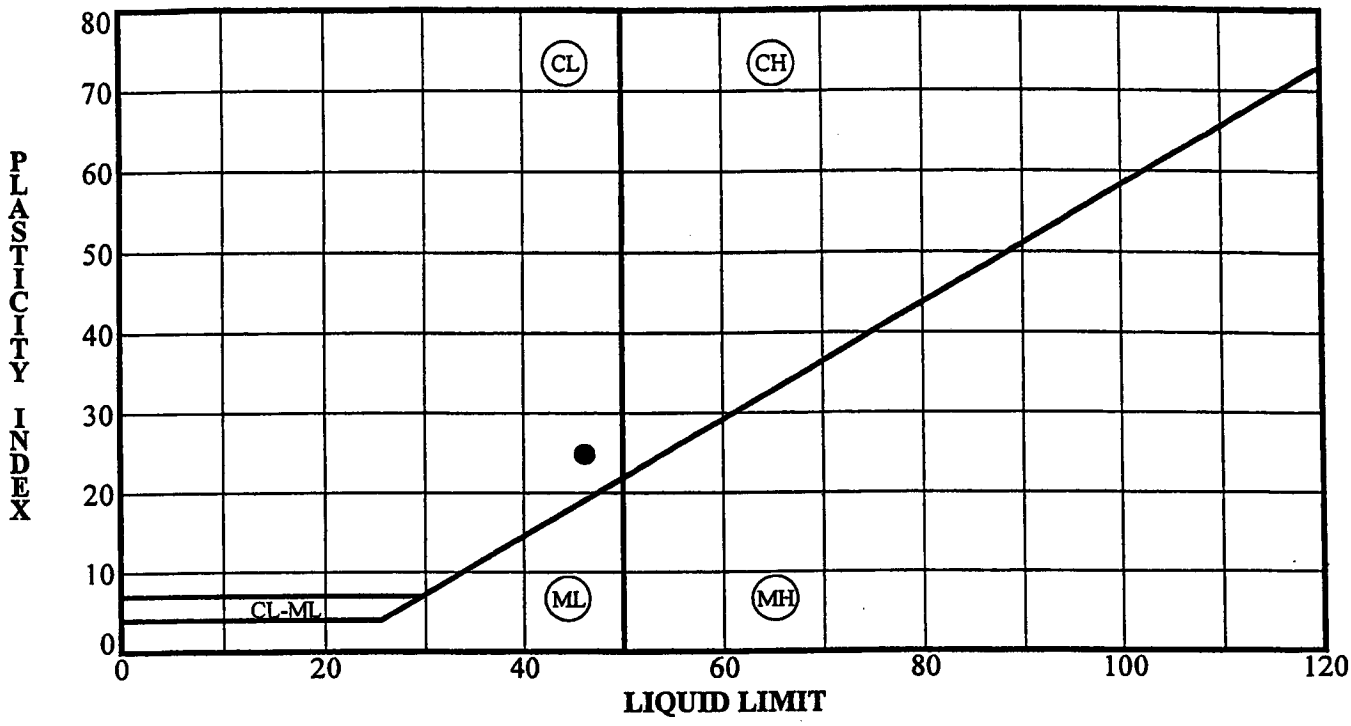
# R-value Test Report (Caltrans 301)

| | | | | | |
|---|---|---|---|---|---|
| **Job No.:** | 640-113 | **Date:** | 11/14/08 | **Initial Moisture,** | 2.2% |
| **Client:** | Cornerstone Earth Group | **Tested** | MD | **R-value by Stabilometer** | 32 |
| **Project:** | Honda Rail Expansion - 281-1-1 | **Reduced** | RU | | |
| **Sample** | EB-6 | **Checked** | DC | **Expansion Pressure** | 5 psf |
| **Soil Type:** Brown Clayey SAND w/ Gravel | | | | | |

| Specimen Number | A | B | C | D |
|---|---|---|---|---|
| Exudation Pressure, psi | 286 | 800 | 163 | |
| Prepared Weight, grams | 1300 | 1300 | 1300 | |
| Final Water Added, grams/cc | 72 | 57 | 79 | |
| Weight of Soil & Mold, grams | 3315 | 3283 | 3308 | |
| Weight of Mold, grams | 2104 | 2099 | 2079 | |
| Height After Compaction, in. | 2.47 | 2.46 | 2.54 | |
| Moisture Content, % | 7.9 | 6.7 | 8.4 | |
| Dry Density, pcf | 137.6 | 136.6 | 135.2 | |
| Expansion Pressure, psf | 0.0 | 129.0 | 0.0 | |
| Stabilometer @ 1000 | | | | |
| Stabilometer @ 2000 | 96 | 32 | 120 | |
| Turns Displacement | 3.67 | 4.24 | 3.83 | |
| R-value | 31 | 70 | 18 | |

**Remarks:**






| Key Symbol | Boring No. | Depth (Feet) | Liquid Limit | Plasticity Index | Liquidity Index | Water Content (%) | % Passing #200 Sieve | USCS |
|---|---|---|---|---|---|---|---|---|
| ● | B1 | 25.5 | 46 | 25 | 1.321 | 54 | | CL |
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File Name: H:\ENGINEER\GINTW\PROJECTS\1484004.GPJ Report Template: ATT_B Output Date: 2/14/03

FUGRO

PREP'D BY:
APP'D BY:
DATE: 2/14/03
DWG FILE: 1484004.GPJ

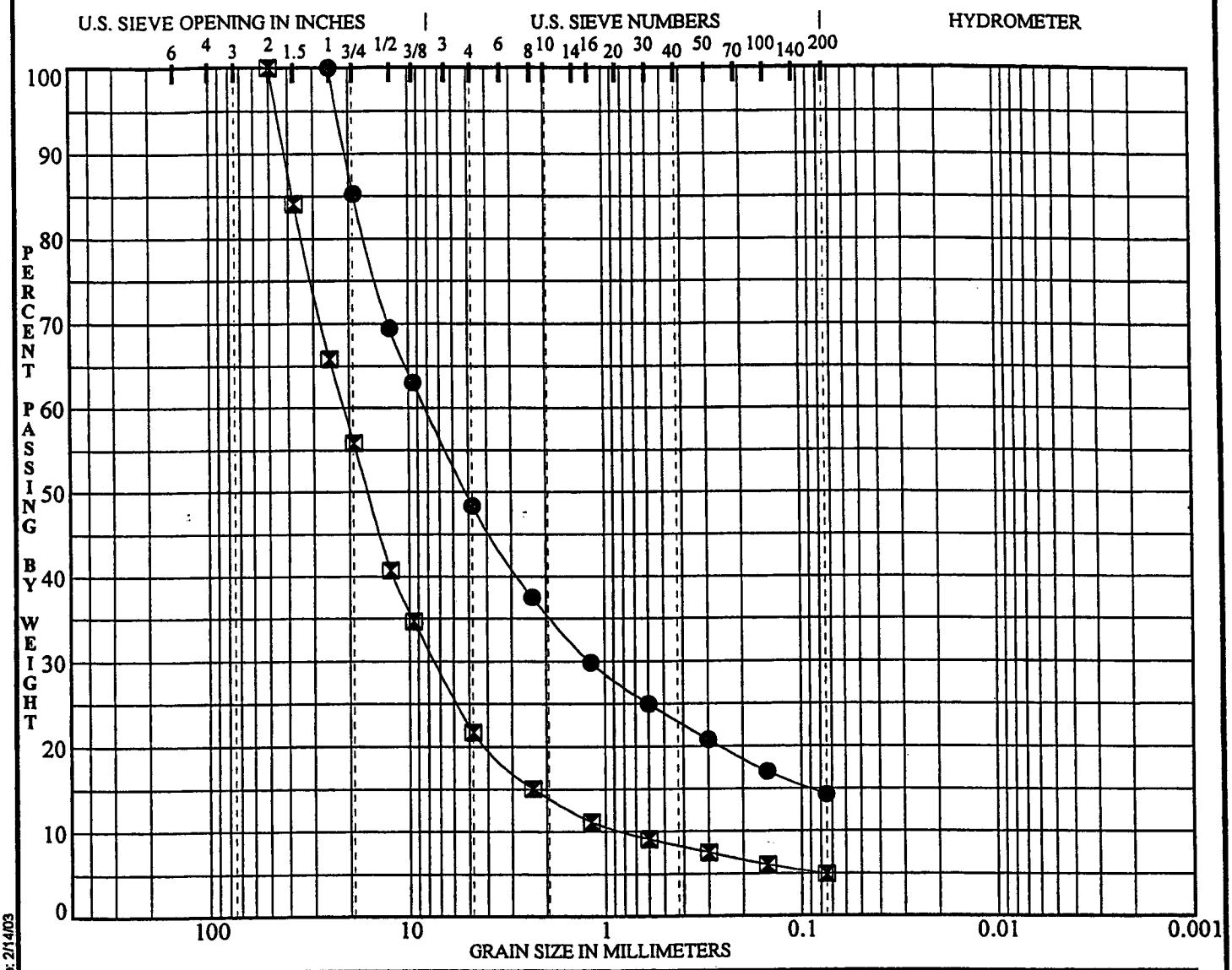
PLASTICITY CHART AND DATA

HANSON AGGREGATES
Port of Richmond, California



FIGURE
B-1

PROJECT No.
1484.004




| Cobbles | Gravel | | Sand | | | Silt and Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Key Symbol | Boring No. | Depth (Feet) | % Passing No. 200 Sieve | % Passing No. 4 Sieve | Sample Descsription | USCS |
|---|---|---|---|---|---|---|
| ● | B1 | 5.5 | 14 | 48 | Brown sandy GRAVEL, trace silt | GM |
| ⊠ | B2 | 1.5 | 5 | 22 | Rust brown GRAVEL, some sand | GP |
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File Name: H:\ENGINEERING\NWPROJECTS\1484004.GPJ Report Template: GRADATION_B Output Date: 2/14/03

FUGRO

PREP'D BY:
APP'D BY:
DATE: 2/14/03
CWG FILE: 1484004.GPJ

GRADATION TEST DATA

HANSON AGGREGATES
Port of Richmond, California

FIGURE
B-2
PROJECT No.
1484.004


PORT OF RICHMOND
POINT POTRERO
HISTORIC RICHMOND SHIPYARD NUMBER THREE