

8.3 Graving Basin and Finger Piers Inspection Report





PORT OF RICHMOND

Point Potrero Marine Terminal Inspection Report

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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.



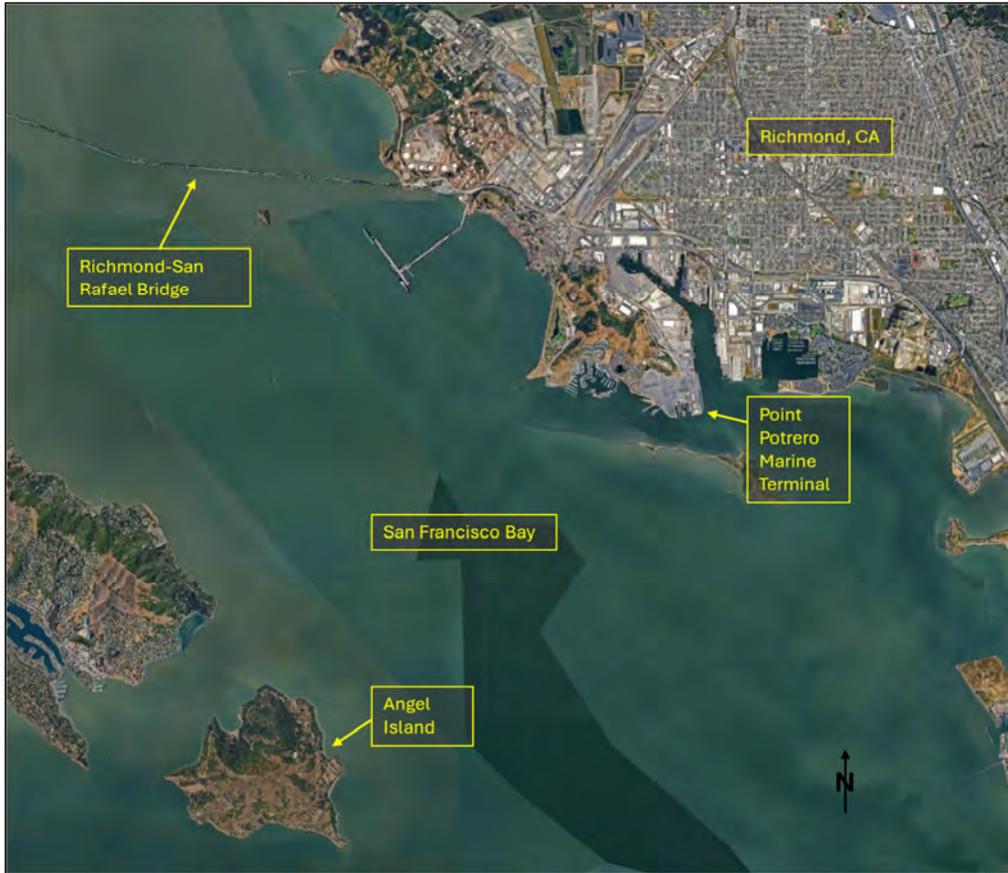


Figure 1 PPMT Location



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.

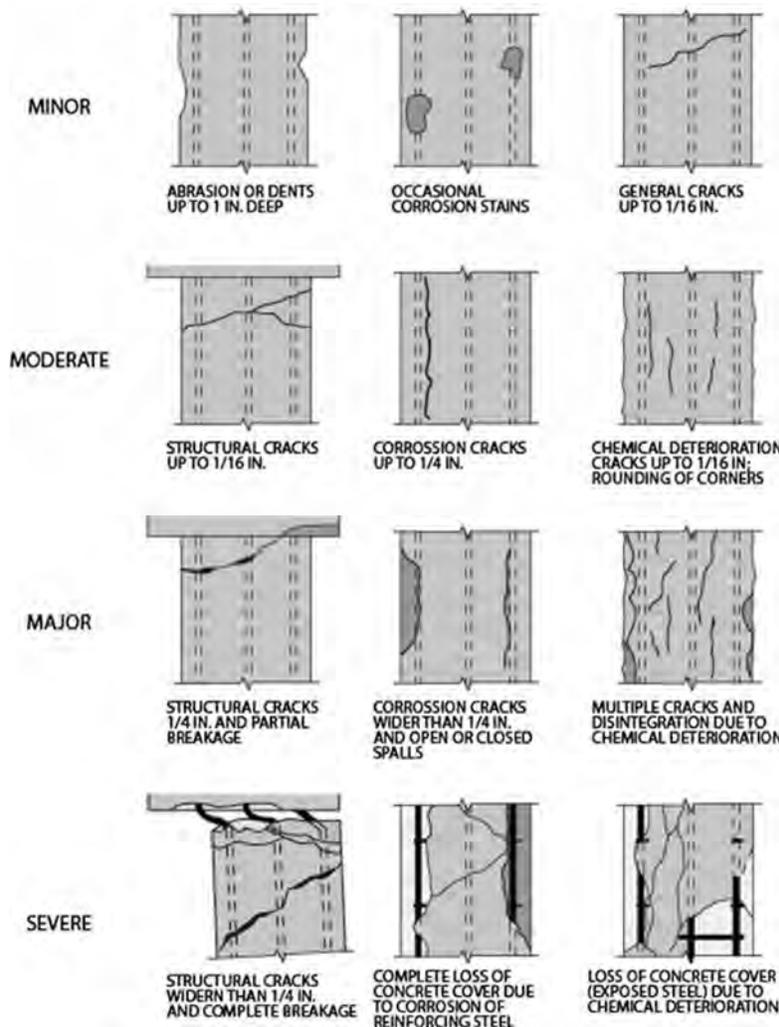


Figure 3 Damage Ratings for Reinforced Concrete Elements, per ASCE MOP 130



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).

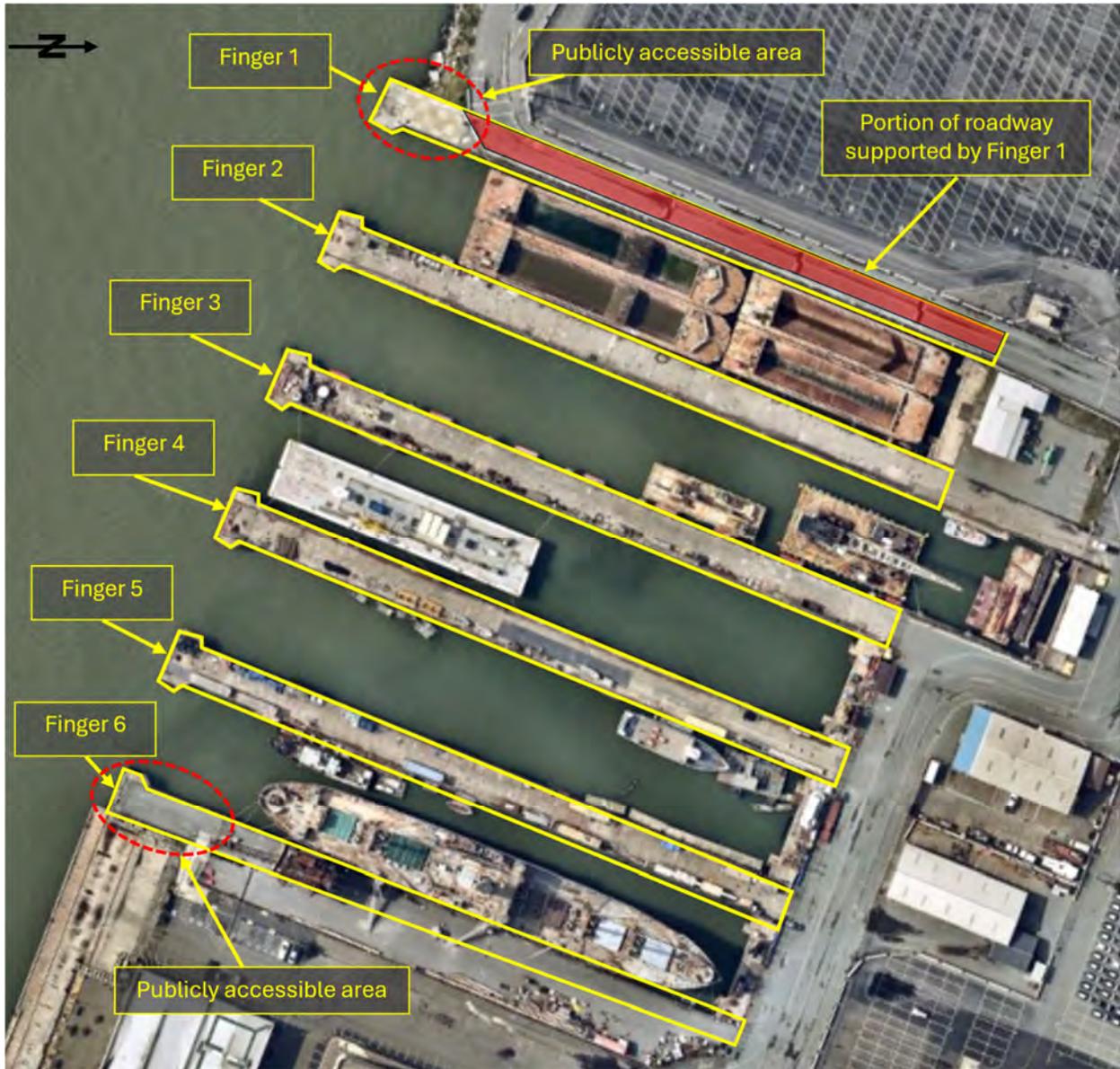


Figure 4 Graving Basin Fingers 1-6

Note, roadway supported by Finger 1 and publicly accessible areas of Fingers 1 and 6.



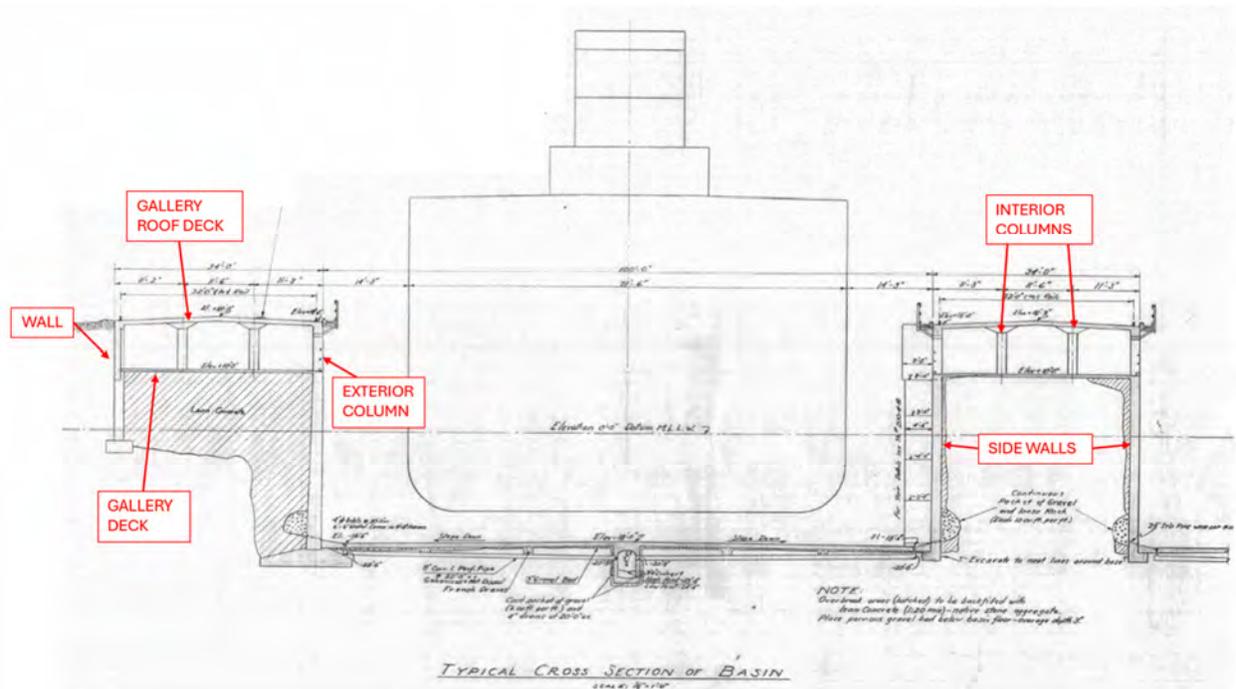


Figure 5 Typical Section of Graving Basin

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

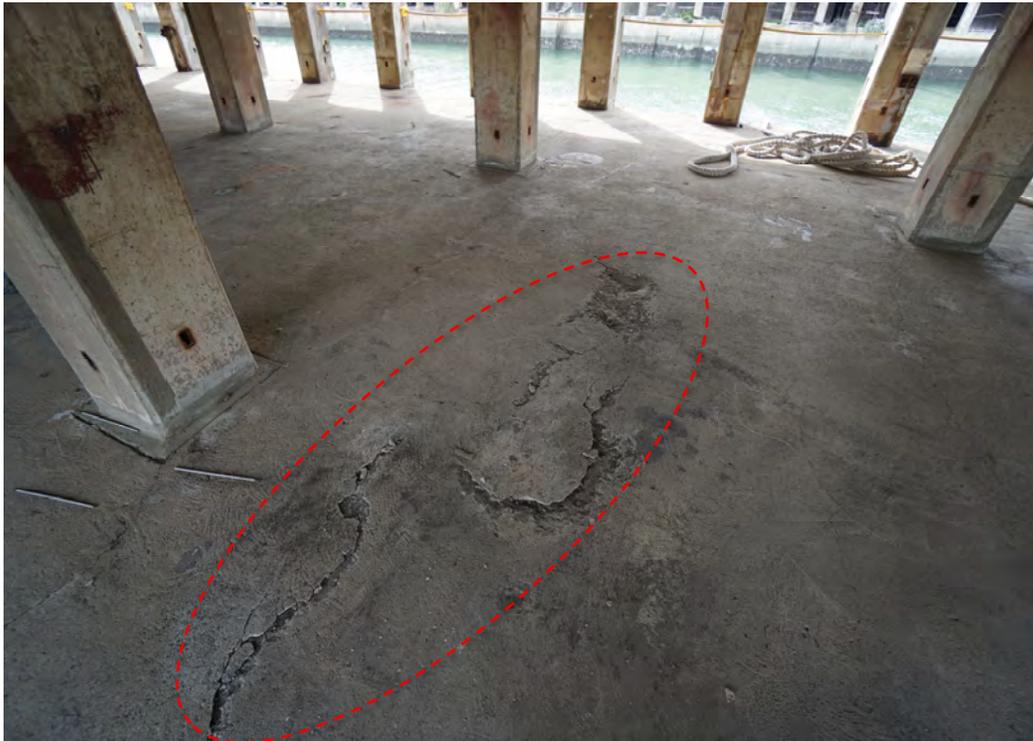


Photo 9 Gallery Slab Delamination



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.

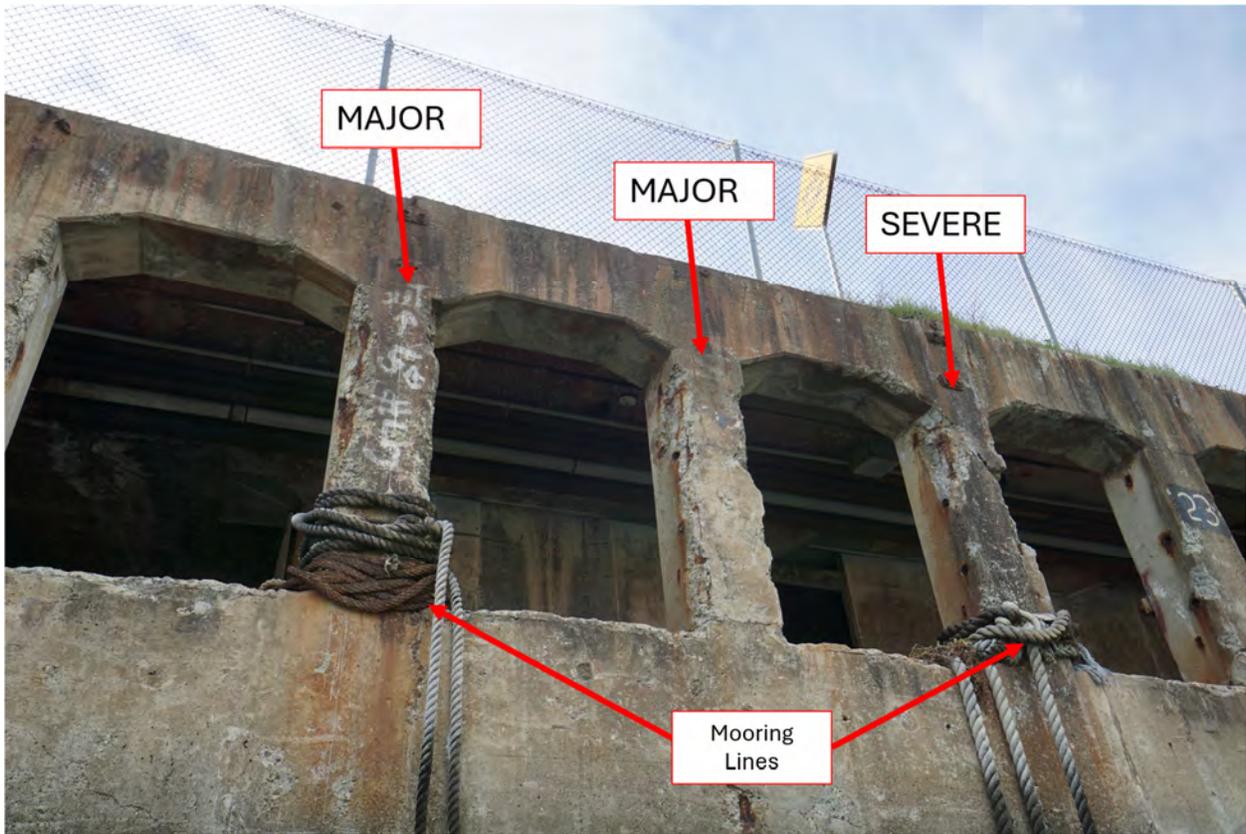
Table 3: Graving Fingers, Exterior Column Damage

Damage Rating	Finger 1		Finger 2		Finger 3		Finger 4		Finger 5		Finger 6	
	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.*



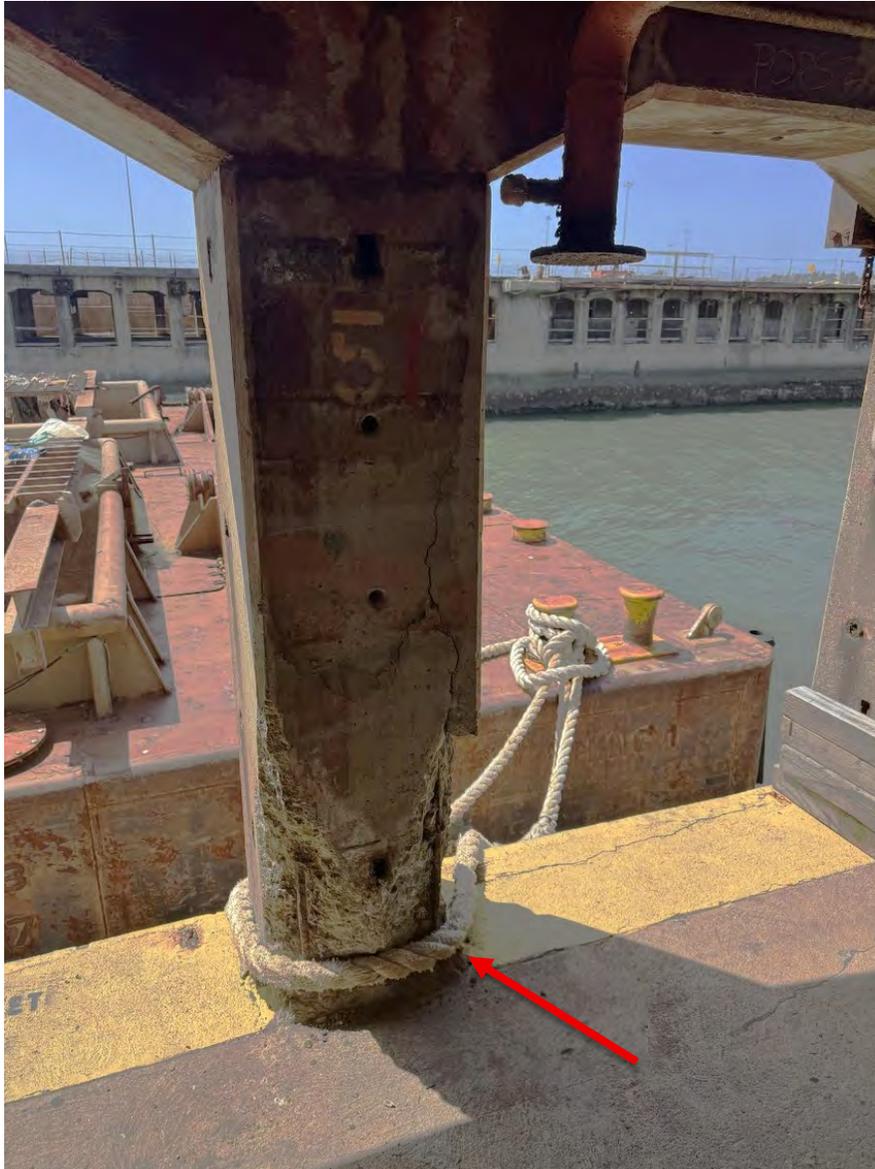
*Photo 12 Exterior Columns Used for Mooring, Major to Severe Damage
Location: Graving Basin Finger 1, Columns 33A-35A*



*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.

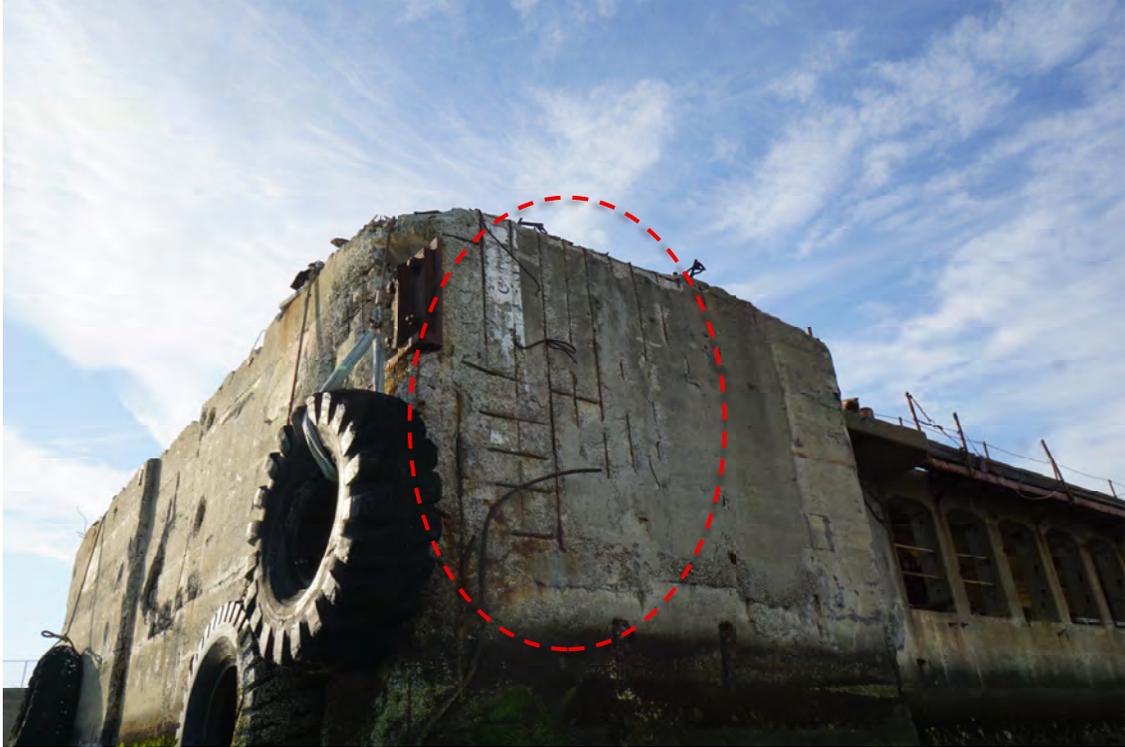


Photo 17 Exposed Reinforcing on Outside of Graving Basin



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

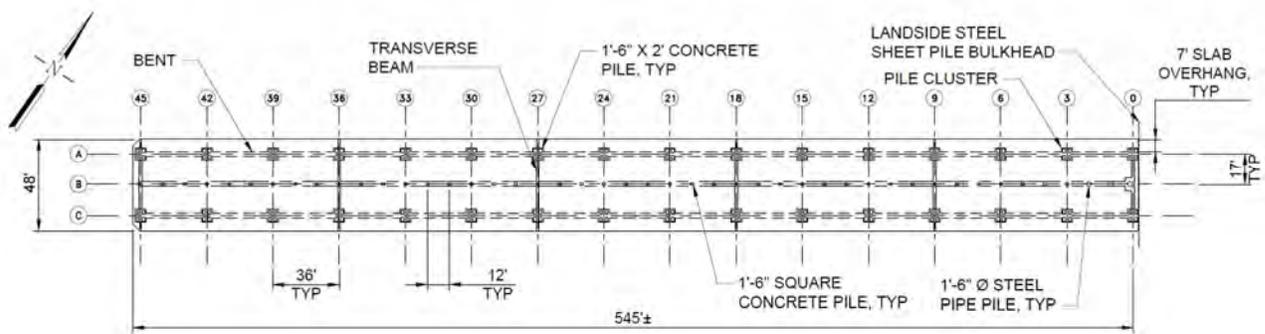


Figure 7: Typical Finger Pier Layout

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.



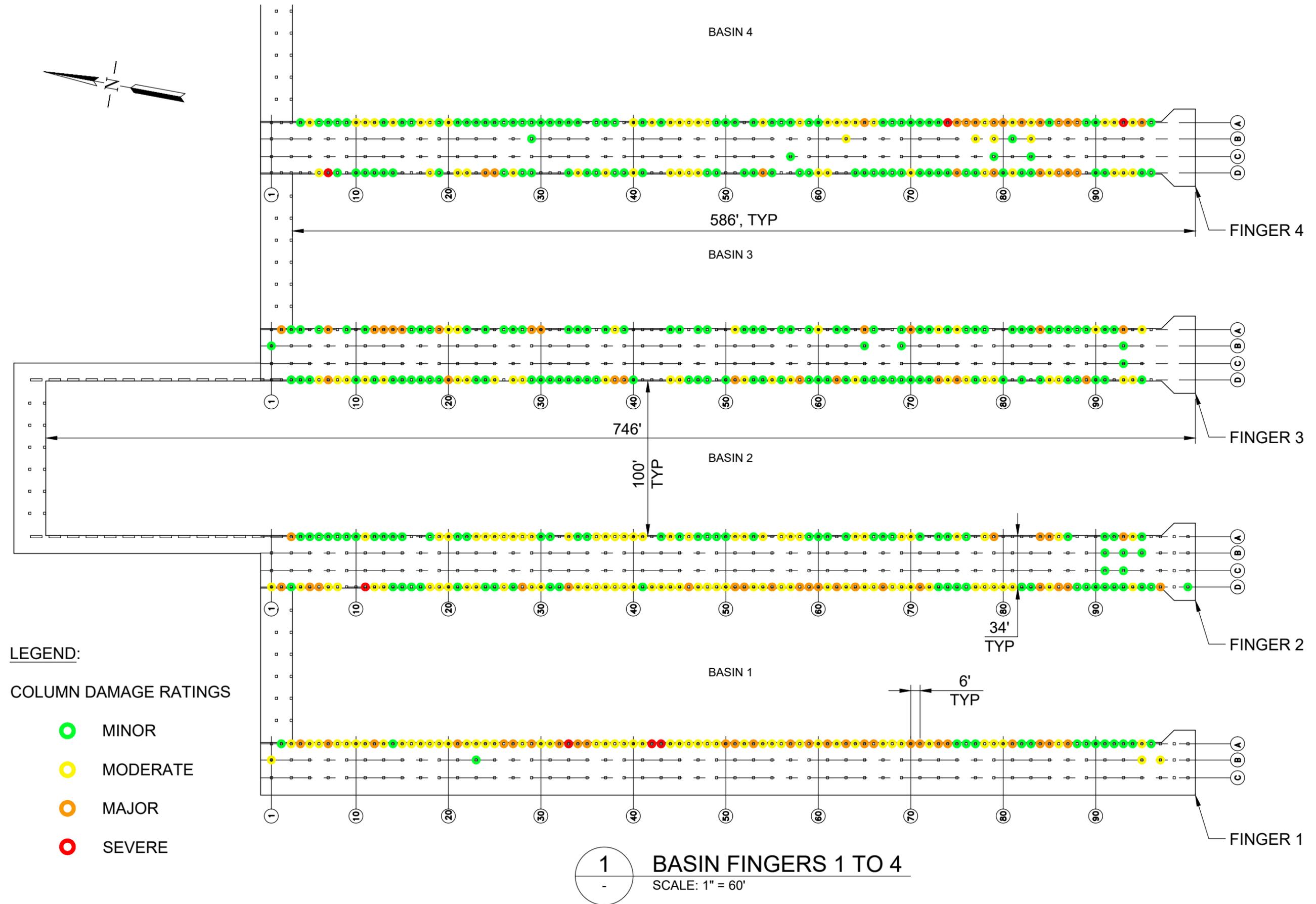
Appendix B: Combined Damage Plan





POINT POTRERO MARINE TERMINAL

Figure 1 - BASIN FINGERS 1 TO 4





LEGEND:

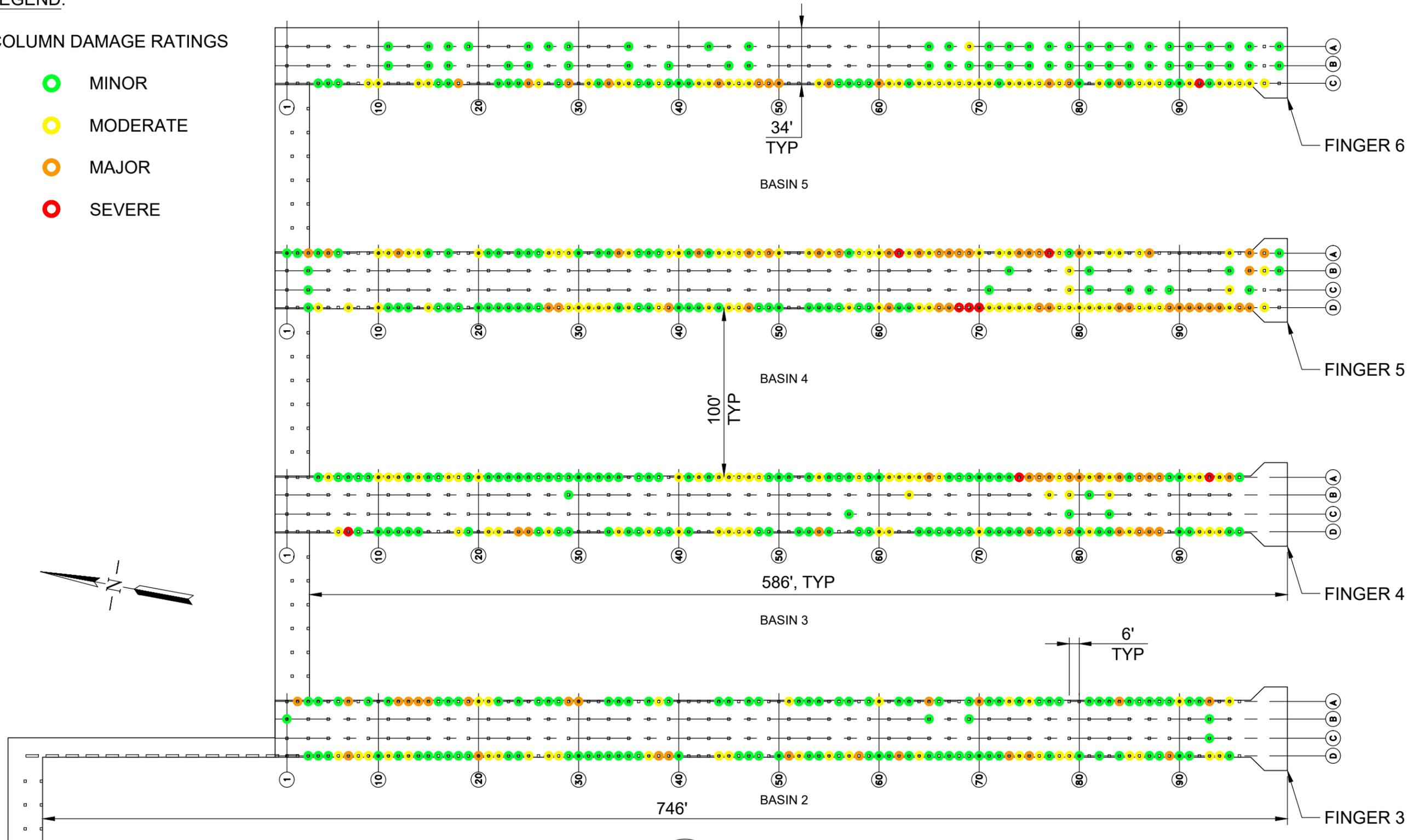
COLUMN DAMAGE RATINGS

○ MINOR

○ MODERATE

○ MAJOR

○ SEVERE



1
-
BASIN FINGERS 3 TO 6
SCALE: 1" = 60'

POINT POTRERO MARINE TERMINAL

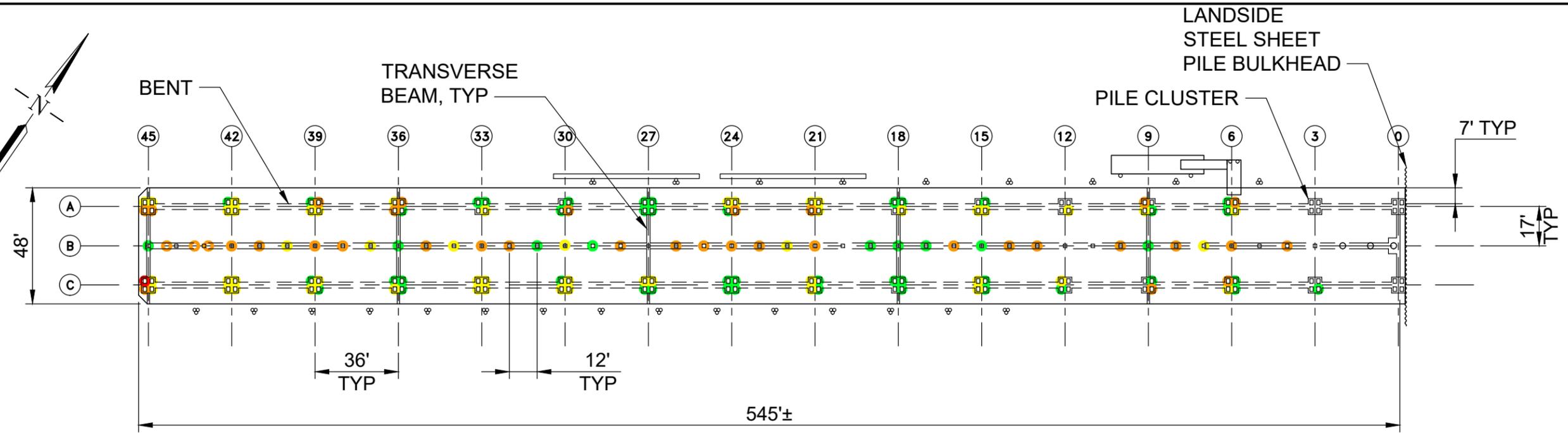
Figure 1 - BASIN FINGERS 3 TO 6



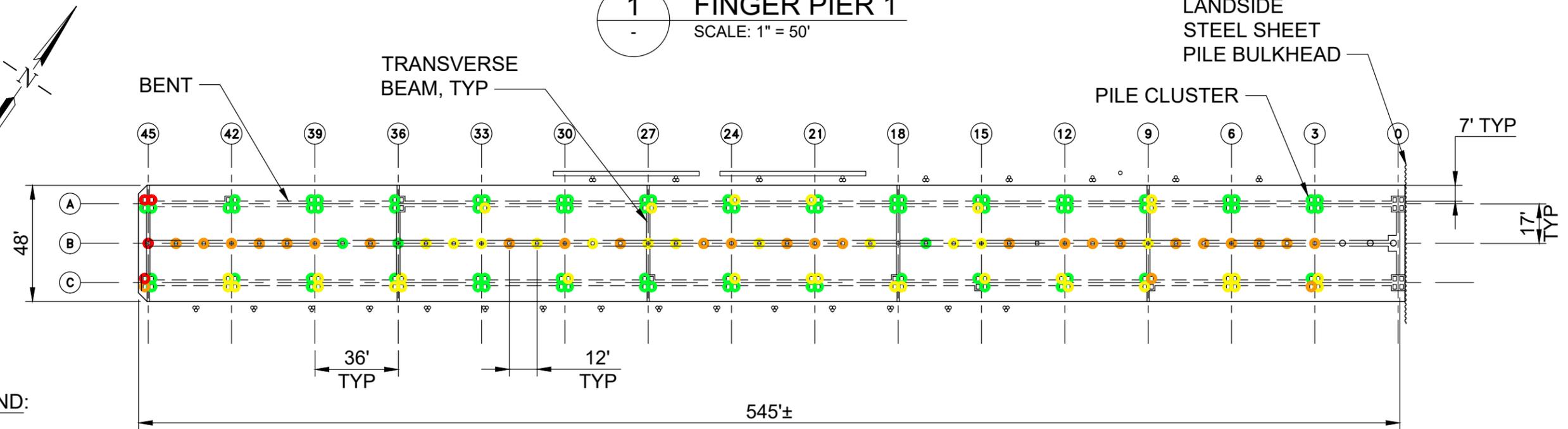


POINT POTRERO MARINE TERMINAL

Figure 3 - Pier 1 and 2



1 FINGER PIER 1
SCALE: 1" = 50'



1 FINGER PIER 2
SCALE: 1" = 50'

LEGEND:

PILE DAMAGE RATINGS

- MINOR
- MODERATE
- MAJOR
- SEVERE

PIERS, WHARVES, AND DOCKS

CORPS OF ENGRS WATERWAY CODE	82300	122-25-42W	37-57-47N	82300		
LATITUDE	37-57-20N					
LONGITUDE						
REFERENCE NUMBER ON MAP NO. 1	61	Dock Code No. 043	62	Dock Code No. 025		
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. 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	None.			One - timber frame, wood siding; asphalt-surfaced floor.		
Number and Description				188 by 70-60		
Length and Width (Feet)				14		
Height Inside (Feet)				11,300		
Floor Area for Cargo (Sq. Ft.)				350		
Load Capacity (Lbs. per Sq. Ft.)				Shipside: one, 13.5 by 11.5 and three, 9 by 12; Rear: same. Each end: one, 13.5 by 11.5.		
Cargo Doors				One 5-ton, diesel, mobile crane with 45-foot telescopic boom; and forklift trucks available as required.		
MECHANICAL HANDLING FACILITIES	None.					
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 for 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.		