

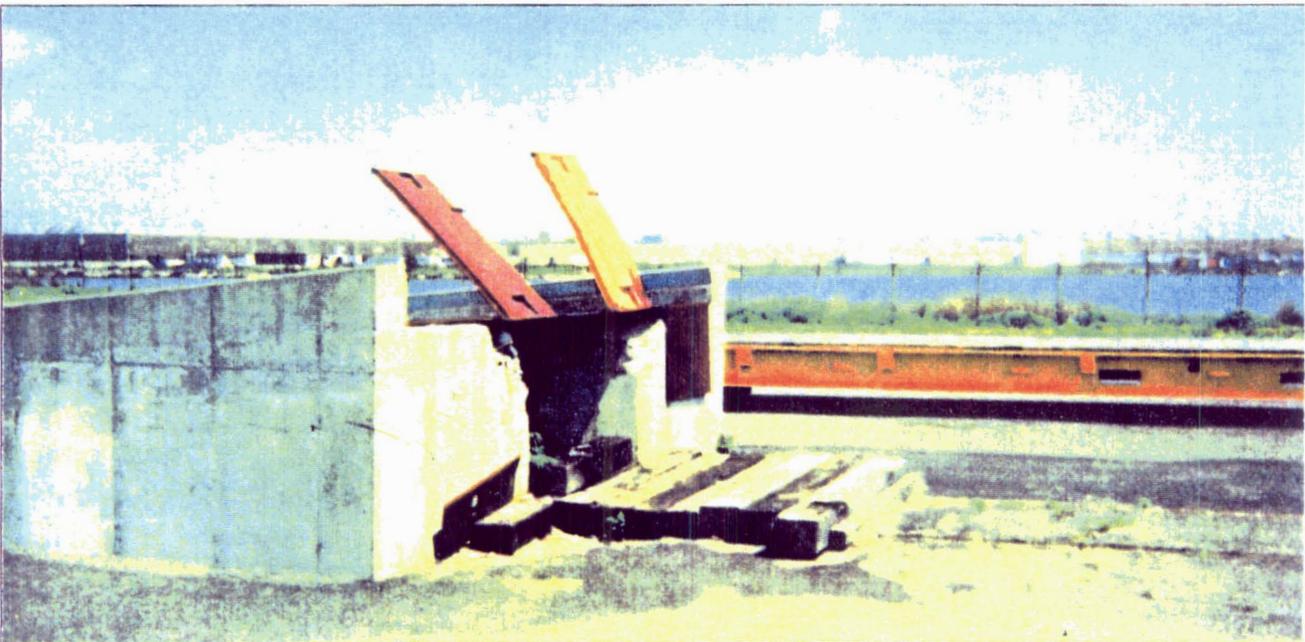


Rail Upgrade Work Underway At MOTBY

The terminal has two permanent rail end-ramps. Two rail spurs, each 2,160 feet in length, serve these ramps.

Operators can unload at least two strings of 22 each 89 foot railcars over these ramps in four hours, for a daily total of about 220 cars. Terminal operators state that they can secure as many as four (4) additional portable end ramps for rail unloading if required.

Terminal operations personnel say that they can unload about 100 bi-level cars daily. They plan to do this using the terminal's bi-level rail ramp. The ramp is portable and is employable in various locations around the terminal. The terminal's stevedore contractor can provide an additional bi-level ramp if required.



Rail End Ramp

AIRCRAFT

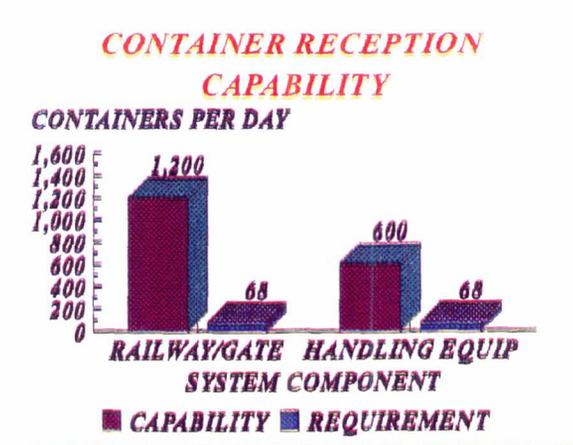
Helicopters fly directly into the terminal, and land in one of several areas. Operations personnel indicate that they prefer to have aircraft arrive in the open space between buildings 100 and 101 and berth N1. The area between building 14 and berth N2 is also a preferred area. Either of these

areas will support the aircraft that will deploy with the division. Once the helicopters have landed, shipment processing (shrink wrap operations) takes place in the 40,000 square foot sized building 14. From there, personnel move the helicopters to vessel side or to a staging area as required.

CONTAINERS

Containers enter the terminal by either highway or rail. Once personnel complete documentation checks, they move them to Lot 25 for unloading and staging. This lot, customarily used to store containers, contains two acres. Two-high storage in this area, the preferred method, provides capacity to stage about 520 TEU's. This is significantly greater than the expected 68 a day the division plans to ship. The area can support about 140 TEU's of containers stored on chassis. This also satisfies the

unit's container shipping requirement. The terminal has access to at least two top-pick container handlers. Each item of this equipment can unload and store over 100 containers that arrive COFC per eight hour shift. This is more than enough capacity to handle the division's 68 containers each day. Operations' personnel at the terminal indicate that, if required, they can secure additional container handling equipment.



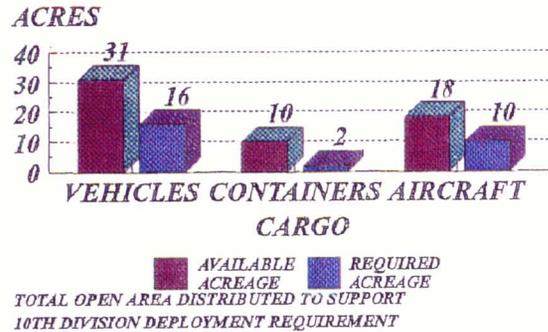
NOTE: Railway/Gate Total of 1200 is Nominal Total For Both Subsystems. Actual Capacity is Greater.

STAGING

The Military Ocean Terminal, Bayonne has over 50 acres of open staging area. The terminal normally uses some of this space to stage POV's awaiting shipment or pick-up. Most of the space is usually available, and more than adequate to support the division's deploying equipment. Two unpaved sites, normally used for recreation, can provide as much as 11 acres of additional open staging area if more staging area is absolutely necessary. This is more than the approximately 16 acres needed to support FSS/LMSR vessel operations.

Several warehouses together provide over 1,000,000 square feet of covered space. While the terminal uses much of this area for the storage of other commodities, the

AVAILABLE OPEN STAGING AND WORK AREA



available covered staging capacity is more than adequate to support the deploying unit's requirements.



Staging Area With New Lighting

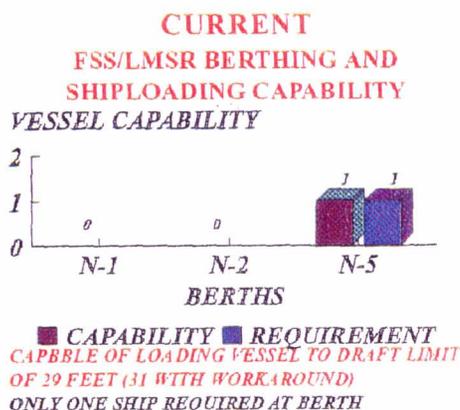
SHIP LOADING

The ASMP identifies FSS or LMSR as the vessels that will deploy the division's equipment. MTMCTEA's Transportation Analysis Reports Generator (TARGET) determined that the division will need 2.7 (3) FSS's or 1.8 (2) LMSR's to deploy. This means that the terminal will need to load one vessel over two days to meet the ASMP shipping requirement.

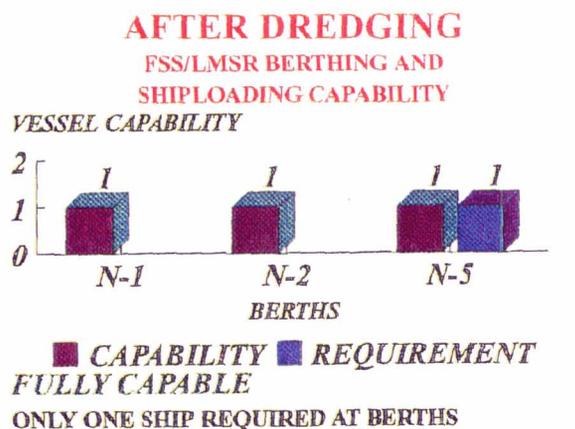
Ordinarily, the terminal would have no trouble meeting these shipping requirements. The terminal has three operational berths: N1, 1251 feet, N2, 1251 feet, and N5, 1575 feet (with western end of N4) lengths respectively, with (normally) 35 feet of water alongside at MLW.

The terminal could work the required vessel at either of these 3 berths. However, because of silting, two of these berths cannot accommodate and load a vessel of the required type to its maximum draft. Existing depths alongside now are: N1, 24 feet, N2, 19 feet, and N5, 31 feet. This means that only berth N5 is currently capable of accommodating the required vessel, and only to the draft limit of 31 feet. Operators at the terminal can work around the restriction by loading the vessel to the draft limit and sailing the vessel at high tide. Terminal operators have scheduled maintenance dredging to begin later this year (1994). The project will return the depth alongside to 35 feet.

Once completed, depth alongside will again provide sufficient water to load the required types of vessels, although not to the FSS's maximum draft. The FSS's fully loaded maximum draft is 37.5 feet.



The LMSR will have a maximum draft of 35 feet. Engineers at Bayonne have proposed a project to dredge the channel and berths at the terminal from the 35 foot depth to 40 feet. This project, once completed, will make the berths capable of loading both types of ships to their maximum load limits.



CONCLUSION

The Military Ocean Terminal, Bayonne can support the ASMP requirement to move the 10th Infantry Division. Inadequate depth alongside the berths prevents ships of the required size and type from loading to their maximum capacity.

RECOMMENDATIONS

Complete the scheduled dredging projects as soon as possible. These projects will provide sufficient depth alongside the berths to make the terminal fully capable of supporting not only the ASMP requirement, but other, OPLAN generated requirements as well. Efficient operation dictates the completion of *both* projects, however, the **maintenance dredging is absolutely necessary** if the terminal is to support work on more than one vessel at a time.

10/10/10

PORT OF PHILADELPHIA (1990)

A. GENERAL

1. Location and Harbor Description

The Port of Philadelphia (fig II-PHI-1) is along the Delaware River. It is about 80 nautical miles above the Delaware Capes. Camden, New Jersey, is on the east bank of the Delaware River, opposite Philadelphia. From the 10-mile-wide entrance to the Delaware Bay, a 40-foot-deep channel leads upstream to the terminals. Three bridges span the Delaware River - Delaware Memorial, Walt Whitman, and Benjamin Franklin Bridges. These bridges impose height restrictions on vessels sailing into port. The Delaware Memorial Bridge at Wilmington, Delaware, imposes a 175-foot-mean high water (MHW) vertical restriction for all vessels entering the Port of Philadelphia. The Walt Whitman Bridge has a 150-foot vertical clearance at the port's southern end. Vessels continuing to the Tioga Marine Terminals must pass beneath the Benjamin Franklin Bridge, which has a 135-foot-MHW vertical clearance. Anchorage is available in the river and in the bay.

This report looks at four terminal complexes within the Port of Philadelphia. Three of these complexes are along the west bank of the Delaware River: piers 80, 82, 84, and 96; Tioga Marine Terminals; and Packer Avenue Marine Terminal. The fourth complex is on the east bank of the river and beneath the Walt Whitman Bridge - Holt Marine Terminal.

The mean tidal range is 6 feet at the Port of Philadelphia. The velocity of spring tidal currents at the terminals is 2-1/2 knots.

2. Highway Access

Interstate Route 95 from the north and south and Interstate Route 76 from the east and west serve the port. Delaware Avenue, a four-lane urban street, connects all the terminals on the west side of the river.

Entry to the Packer Avenue Terminal is 1 mile south of the Walt Whitman Bridge. Piers 80, 82, 84, and 96 are 2 miles north of this bridge, on Delaware Avenue. The Tioga Marine Terminals are on both sides of Delaware Avenue, 20 miles past the Benjamin Franklin Bridge.

From the city of Philadelphia, access to the Holt Marine Terminal, in Gloucester City, New Jersey, is via I-76 across the Walt Whitman Bridge to the Morgan Boulevard exit ramp. This exit leads into the terminal.

3. Rail Access

Three trunkline railroads serve the city of Philadelphia: Conrail, Chesapeake and Ohio Railway (Chessie System), and Baltimore and Ohio Railroad. The city has one belt line, the Philadelphia Belt Line Railroad, that performs switching and operates transfer facilities for the railroad lines with the city.

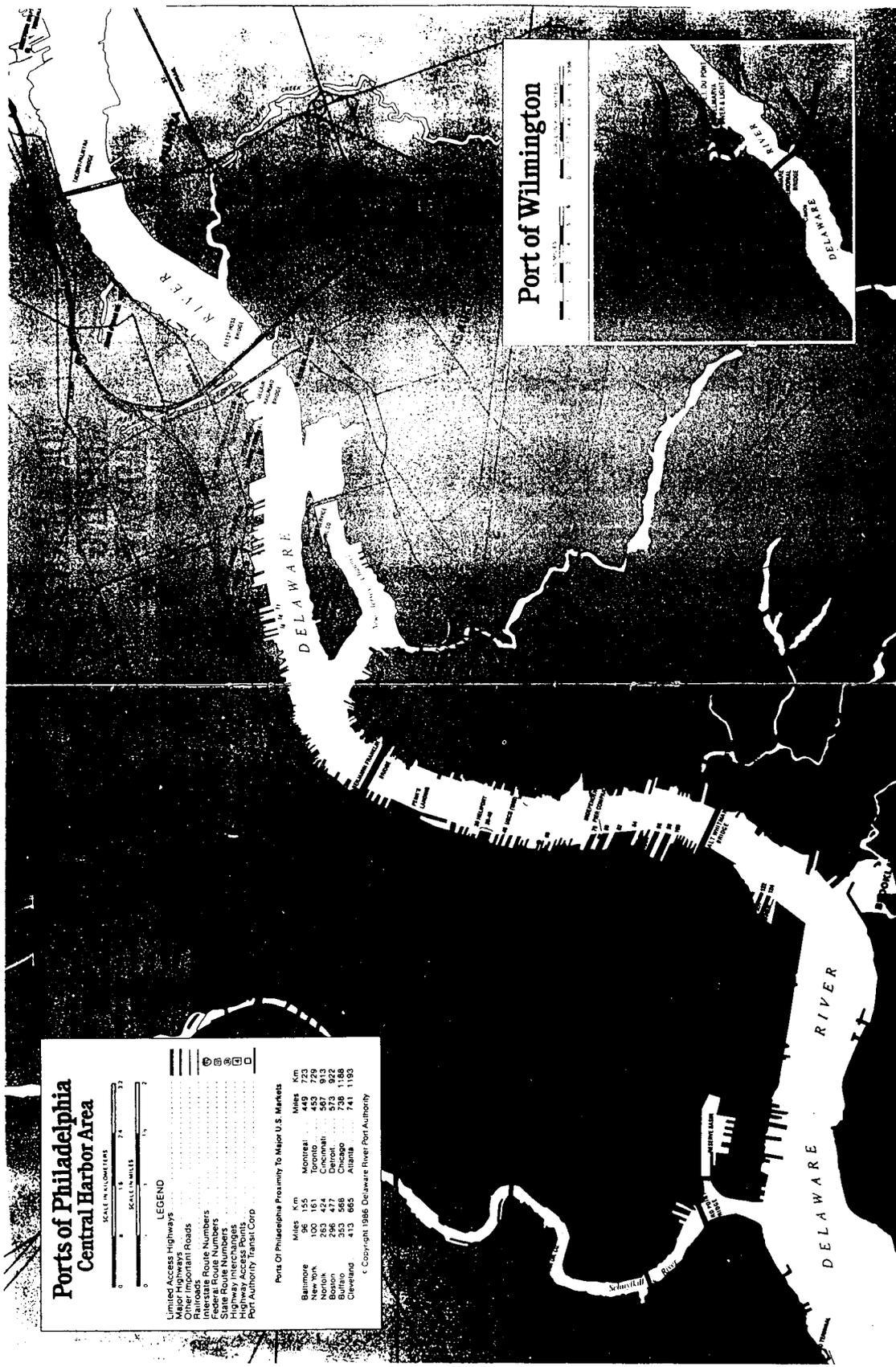


Figure II-PHI-1. Site map of Port of Philadelphia.

Philadelphia has four major classification yards: 44th Street, Frankford Junction, Pavonia, and Greenwich. The Greenwich yard can store 1,800 cars. The other three have a combined capacity of 5,000 cars.

4. Airports

Philadelphia has two commercial airports that could receive incoming military aircraft. One is the Philadelphia International Airport, located southwest of the Packer Avenue Terminal, is near all the terminals. The other is Northeast Philadelphia Airport, which is the closer airport to the Tioga Marine Terminals.

B. PORT FACILITIES

1. Packer Avenue Marine Terminal (fig II-PHI-2)

The Packer Avenue Marine Terminal is owned by the Philadelphia Regional Port Authority and operated by Holt Cargo Systems, Inc. Typical cargoes include containers, steel products, and RORO.

a. Berthing. The Packer Avenue Marine Terminal has five contiguous berths that form 3,916 feet of marginal wharf. The south side of the terminal has an 816-foot-long RORO berth. Berths 1 and 2 are breakbulk berths with a 40-foot-wide apron. Berths 3, 4, and 5 are container berths served by three container cranes. These container berths have open aprons. Tables II-PHI-1 and II-PHI-2 show the berthing characteristics and capabilities of the terminal. The terminal's ability to support various shipping modes is described below.

(1) Breakbulk Operations. Breakbulk operations could be conducted at all six berths. Mobile cranes would be necessary at berths 1 and 2 and the RORO berth.

(2) LASH and SEABEE Operations. The terminal has sufficient berthing to provide 26 LASH lighter or 19 SEABEE barge loading positions. Berths 1, 2, and 6 would require mobile cranes.

(3) RORO and FSS Operations. Berth 6, the 816-foot-long side berth with a stern ramp, is normally used for RORO operations. However, container berths 3 through 5 can also support side-loading RORO vessels. The narrow apron along breakbulk berths 1 and 2 precludes RORO operations there. FSS ships are well suited for container berths 3 through 5. Vessels can use the container cranes and open apron.

(4) Container Operations. Two container vessels can operate along berths 3 through 5. Ships load using three 45-ton-capacity container cranes. All container handling machines are the latest generation models and equipped with 30/40-foot hydraulic spreaders. The terminal has the ability to stack containers three high.

b. Materials Handling Equipment (MHE). Sufficient fork-lifts are available with capacities ranging from 2,000 to 95,000 pounds. Local stevedoring contractors can supply additional MHE as required.

II-PHI-4

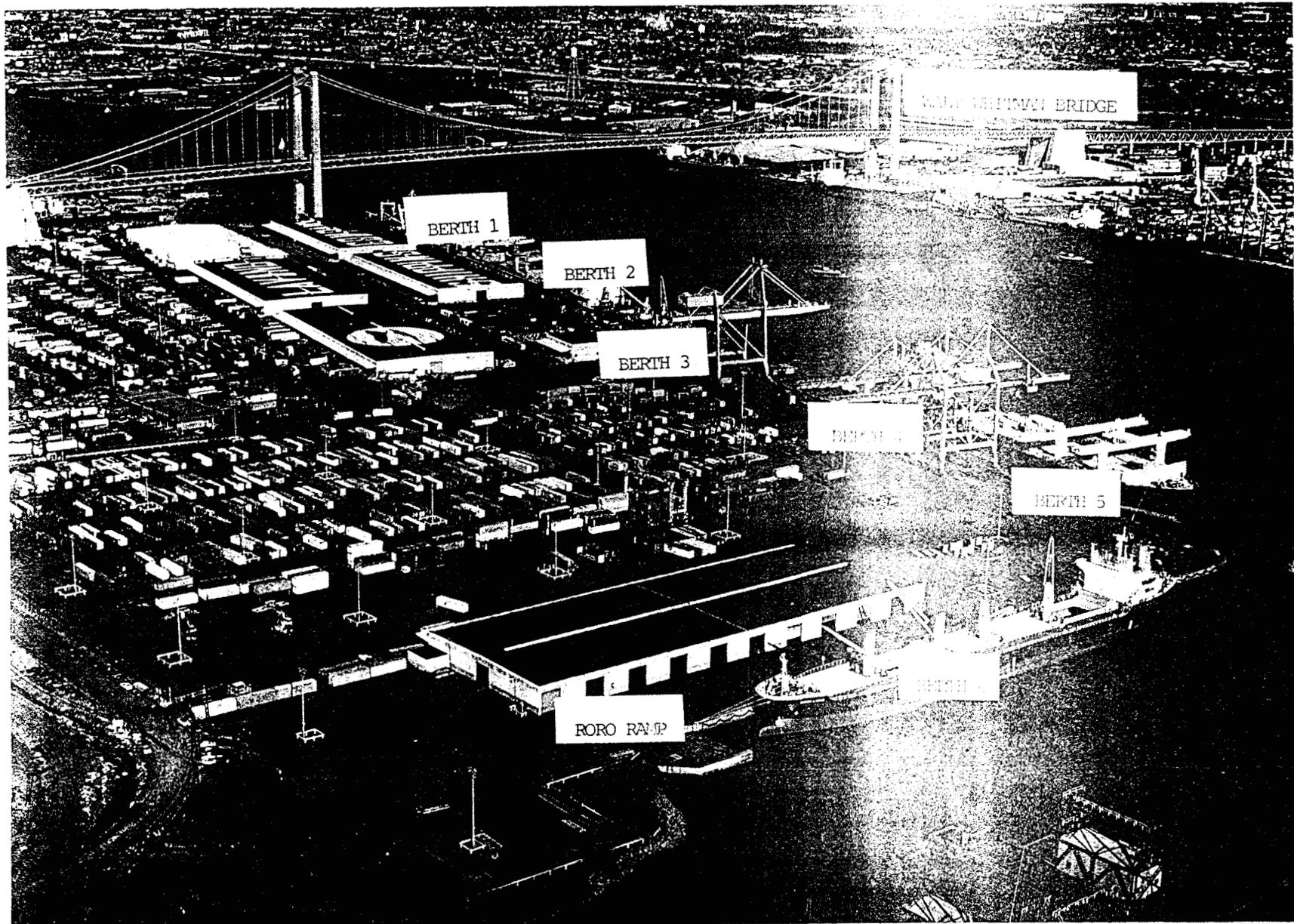


Figure II-PHI-2. Aerial view of Port of Philadelphia.

TABLE II-PHI-1
PORT OF PHILADELPHIA
BERTH CHARACTERISTICS OF PACKER AVENUE MARINE TERMINAL

Characteristics	Berths		
	Cntnr 3-5	RORO 6	1-2
Length (ft)	1,860	816	1,240
Depth alongside at MLW (ft)	40	40	40
Deck strength (psf)	1,000	1,000	1,000
Apron width (ft)	Open	Open	40
Apron height above MLW (ft)	13	13	13
Number of container cranes	3	0	0
Number of wharf cranes	0	0	0
Apron lighting	Yes	Yes	Yes
Straight-stern RORO facilities	No	Yes	No
Apron length served by rail (ft)	1,860	0	0

Notes:

1. Terminal open storage area is 63 acres
2. Terminal covered storage area is 600000 square feet

c. Staging

(1) Open Storage. The terminal has 63 acres of paved open storage. Lighting enhances nighttime visibility.

(2) Covered Storage. Two transit sheds and a storage warehouse comprise 600,000 square feet of covered storage.

d. Security. Chain link fencing surrounds the terminal. Entry is via a security-guarded main gate.

e. Rail Operations. Conrail, CSX, and Philadelphia Belt Line Railroad serve the terminal. These railroads have direct links to the railroad networks in North America. All berths have rail access and apron track. Transit sheds along berths 1 and 2 have rail docks. No rail end ramps are within the terminal, but they could be constructed in a nearby railyard or within the terminal.

TABLE II-PHI-2
PORT OF PHILADELPHIA
SUMMARY OF BERTHING CAPABILITIES OF PACKER AVENUE MARINE TERMINAL

Vessel	Berths		
	Cntnr 3-5	RORO 6	1-2
Breakbulk			
C3-S-33a	3	1	2
C3-S-37c	3	1	2
C3-S-37d	3	1	2
C3-S-38a	3	1	2
C4-S-1a	3	1	2
C4-S-1qb and 1u	3	1	2
C4-S-58a	3	1	2
C4-S-65a	3	1	2
C4-S-66a	3	1	2
C4-S-69b	3	1	2
Seatrail			
GA and PR-class	3	1	2
Barge			
LASH C8-S-81b	a, f, g	a, c, f, g	a, f, g
LASH C9-S-81d	2	c	1
LASH lighter	13	5	8
SEABEE C8-S-82a	2	c	1
SEABEE barge	9	4	6
RORO			
Comet	d, i, j	i, j	d, o
C7-S-95a/Maine-class	2	1	b
Ponce-class	h	h	b, h
Great Land-class	h	h	b, h
Cygnus/Pilot-class	2	1	b
Meteor	d, i, j	i, j	d, o
AmEagle/Condor	i, j	i, j	b
MV Ambassador	d	1, m	d
FSS-class	1	c	b
Cape D-class	i, j	i, j	b
Cape H-class	2	1	b
Container			
C6-S-1w	2	1, e	1, e
C7-S-68e	2	1, e	1, e
C8-S-85c	2	c, e	1, e
Combination			
C5-S-78a	2	1, e	1, e
C5-S-37e	3	1, e	2, e

- a = maximum vessel draft limited to berth depth
- b = inadequate apron width
- c = inadequate berth length
- d = no straight stern-ramp facilities
- e = no container-handling equipment
- f = inadequate berth depth, adequate anchorage depth
- g = inadequate channel depth
- h = no shore-based ramps available
- i = insufficient ramp clearance at low tide
- j = insufficient ramp clearance at high tide
- k = excessive ramp angle at low tide
- m = excessive ramp angle at high tide
- n = parallel ramp operation only
- o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

() indicates vessels assigned by analyst

f. Truck Operations. A reconstructed gate provides 10 lanes for increased throughput and faster turnaround time. Each building has ample docking. The terminal has close access to I-95, I-76, and other major highways.

g. Helicopter Operations. The terminal is not an ideal helicopter landing site. Obstructions (for example, the Walt Whitman Bridge and lighting poles) pose a collision threat to aircraft. Helicopter activities may be better conducted off the terminal. Philadelphia International Airport, only 3 miles away, could land helicopters.

2. Holt Marine Terminal (fig II-PHI-3)

a. Berthing. The privately owned Holt Marine Terminal is a modern, multimode marine terminal located in Gloucester City, New Jersey. The terminal has 4,725 feet of wharfage served by two container cranes, a 300-STON mobile crane, and a 170-STON mobile crane. Tables II-PHI-3 and II-PHI-4 show the berthing characteristics and capabilities of the terminal.

(1) Breakbulk Operations. Berths 7A, 7B, and 7C are normally used for breakbulk loading. These berths can serve three breakbulk vessels at the same time. Cargo loading would mainly be with ship's gear, with some assistance from the terminal's two large mobile cranes.

(2) LASH and SEABEE Operations. The terminal has 32 LASH lighter or 22 SEABEE barge loading positions. The terminal's two mobile cranes would have to be supplemented with rental cranes to support the LASH lighter loading operations. The loading of lighters onto mother ships could take place at wharfside or at a nearby downstream anchorage.

(3) RORO and FSS Operations. Most of the side-loading vessels in the representative fleet shown in appendix A can berth at the terminal. However, the terminal does not have special ramps for loading Ponce and Great Land-class vessels. The container berths are long enough to berth and load FSS vessels. Because the continuity of berths 7A and 7B is broken by the overhead Walt Whitman Bridge, FSS vessels cannot use the combined length of these berths.

(4) Container Operations. Berthing exists for up to three container vessels. Two container cranes can serve these vessels. FSS vessels are unrestricted from utilizing the container berths.

b. Materials Handling Equipment (MHE). Two mobile cranes with up to 300 tons of lifting capacity are available. Other equipment may be obtained from local stevedore contractors.

c. Staging

(1) Open Storage. The terminal has 104 acres of paved, open storage. Containers stored on chassis normally occupy this area. All the areas are well lighted.

(2) Covered Storage. The terminal has 800,000 square feet of covered storage.



Figure II-PHI-3. Holt Marine Terminal.

TABLE II-PHI-3
PORT OF PHILADELPHIA
BERTH CHARACTERISTICS OF HOLT MARINE TERMINAL

Characteristics	Berths			
	Cntnr	7A	7B	7C
Length (ft)	2,100	900	1,325	400
Depth alongside at MLW (ft)	40	40	40	40
Deck strength (psf)	1,000	1,000	1,000	1,000
Apron width (ft)	Open	75	75	Open
Apron height above MLW (ft)	12	12	12	12
Number of container cranes	2	0	0	0
Number of wharf cranes	0	0	0	0
Apron lighting	Yes	Yes	Yes	Yes
Straight-stern RORO facilities	No	No	No	No
Apron length served by rail (ft)	0	0	0	0

Notes:

1. Terminal open storage area is 104 acres
2. Terminal covered storage area is 800000 square feet

d. Security. An 8-foot chain link fence encloses the terminal. The Holt Corporation provides its own 24-hour gate and patrol security.

e. Rail Operations. Three rail spurs from the main Conrail line serve the terminal. Portable end ramps could be located at the end of any of the spurs. The terminal's locomotive switches cars within the terminal.

The warehouses do not have depressed tracks for unloading boxcars. Temporary ramps could be set up for boxcar unloading. The berth aprons do not have rail access.

f. Truck Operations. Trucks enter the terminal via a controlled gate. Once inside, they have access to all points within the terminal. Warehouses have truck docks for trailer unloading. However, no truck end ramps were identified.

TABLE II-PHI-4
PORT OF PHILADELPHIA
SUMMARY OF BERTHING CAPABILITIES OF HOLT MARINE TERMINAL

Vessel	Berths			
	Cntnr	7A	7B	7C
Breakbulk				
C3-S-33a	4	1	2	c
C3-S-37c	4	1	2	c
C3-S-37d	4	1	2	c
C3-S-38a	4	1	2	c
C4-S-1a	3	1	2	c
C4-S-1qb and 1u	3	1	2	c
C4-S-58a	3	1	2	c
C4-S-65a	3	1	2	c
C4-S-66a	3	1	2	c
C4-S-69b	3	1	2	c
Seatrain				
GA and PR-class	3	1	2	c
Barge				
LASH C8-S-81b	a, f, g	a, f, g	a, f, g	a, c, f, g
LASH C9-S-81d	2	1	1	c
LASH lighter	15	6	9	2
SEABEE C8-S-82a	2	1	1	c
SEABEE barge	10	4	6	2
RORO				
Comet	4, d, i	1, d, i	2, d, i	c, d
C7-S-95a/Maine-class	2	1	1	c
Ponce-class	h	b, h	b, h	c, h
Great Land-class	h	b, h	b, h	c, h
Cygnus/Pilot-class	3	1	2	c
Meteor	d, i, j	d, o	d, o	c, d
AmEagle/Condor	3, i	1, i	2, i	c
MV Ambassador	d	d	d	c, d
FSS-class	2	c	1, n	c
Cape D-class	2, i	1, i	1, i	c
Cape H-class	2	1	1	c
Container				
C6-S-1w	3	1, e	1, e	c, e
C7-S-68e	2	1, e	1, e	c, e
C8-S-85c	2	1, e	1, e	c, e
Combination				
C5-S-78a	3	1, e	2, e	c, e
C5-S-37e	3	1, e	2, e	c, e

- a = maximum vessel draft limited to berth depth
- b = inadequate apron width
- c = inadequate berth length
- d = no straight stern-ramp facilities
- e = no container-handling equipment
- f = inadequate berth depth, adequate anchorage depth
- g = inadequate channel depth
- h = no shore-based ramps available
- i = insufficient ramp clearance at low tide
- j = insufficient ramp clearance at high tide
- k = excessive ramp angle at low tide
- m = excessive ramp angle at high tide
- n = parallel ramp operation only
- o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

() indicates vessels assigned by analyst

*

g. Helicopter Operations. The terminal does not have a dedicated helicopter landing and staging area. However, a portion of the container storage yard could be cleared for this purpose.

3. Piers 80, 82, 84, and 96 (figs II-PHI-4 through II-PHI-6)

a. Berthing. Pier 80 is owned by the Philadelphia Port Authority and operated by Independent Pier Company. The pier specializes in paper products. RORO ramps at the ends of each side of pier 80 make it useful.

Piers 82 and 84, operated by Seagate Corporation, mainly handle fruit. Both piers have a large transit shed with a 30-foot apron and apron track. These two piers are suited for breakbulk activity.

Pier 96, operated by Pasha Auto, is an automobile terminal. Vehicles discharge from vessels via straight stern ramp to a 58-acre storage yard.

Tables II-PHI-5 and II-PHI-6 show the berthing characteristics and berthing capabilities of each pier. The terminal's ability to support various shipping modes is described below.

(1) Breakbulk Operations. The 4 piers can berth up to 10 breakbulk vessels at a time. Ships's gear normally would be used for loading. However, mobile cranes could be used effectively for loading operations on the wide aprons at the south side of pier 82. The relatively shallow water depth at the piers restricts the loading of deep-draft breakbulk vessels.

(2) LASH and SEABEE Operations. The 23-foot-wide wharf aprons at pier 84 are considered too narrow for lighter loading. At piers 80 and 82, 29 LASH lighters or 18 SEABEE barges could be loaded at the same time. Loading of lighters aboard their mother vessels would have to take place instream because the water depth at the piers is inadequate.

(3) RORO and FSS Operations. Pier 96 could load a small stern-loading RORO vessel such as MV Ambassador, but will experience excessive ramp angle problems at high tide. FSS vessels are prohibited from the piers because of their draft.

(4) Container Operations. The piers are not equipped for container operations. However, small-scale container loading could be carried out at pier 82 south with mobile cranes.

b. MHE. Each pier has its own MHE. Additional equipment is obtainable from local stevedoring companies.

c. Staging

(1) Open Storage. A total area of 75 acres is available. This is the combined amount from each terminal.

(2) Covered Storage. Pier 82 has a 78,000-square-foot, single-deck transit shed on its north half. Pier 84 has a double-deck transit shed with 503,000 square feet of storage. This transit shed has four 5-STON elevators and a truck ramp to the second floor. Pier 80 has a 456,000-square-foot transit shed.

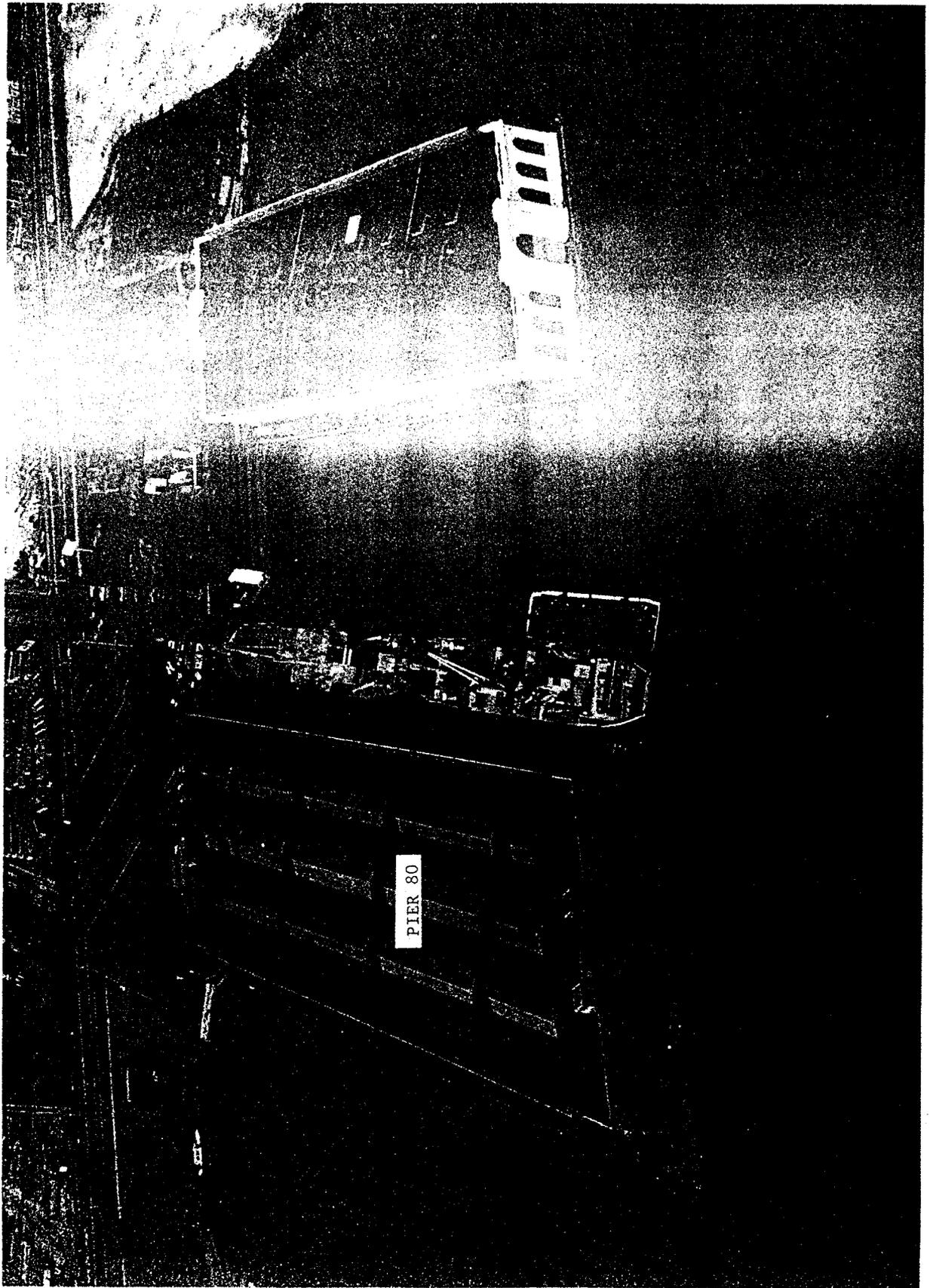


Figure II-PHI-4. Pier 80.

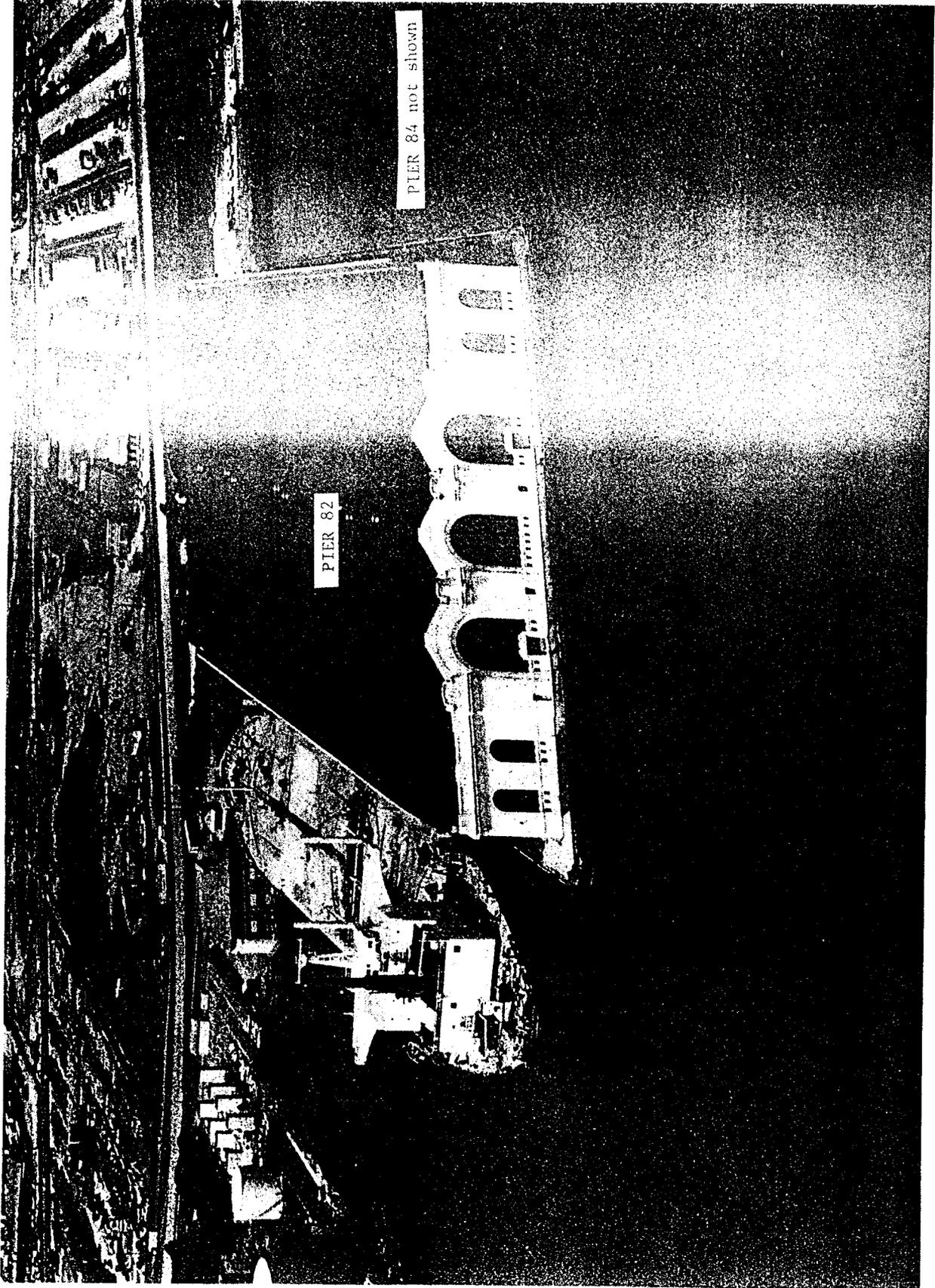


Figure II-PHI-5. Piers 82 and 84 south.



Figure II-PHI-6. Auto Terminal.

TABLE II-PHI-5
 PORT OF PHILADELPHIA
 BERTH CHARACTERISTICS OF PIERS 80, 82, 84 AND 96

Characteristics	Berths						Berths
	Pier 80-N	Pier 80-S	Pier 82-N	Pier 82-S	Pier 84-N	Pier 84-S	Pier 96-N
Length (ft)	994	1,144	1,139	855	855	855	1,320
Depth alongside at MLW (ft)	30	30	30	30	30	30	32
Deck strength (psf)	1,000	1,000	800	800	800	800	500
Apron width (ft)	38	38	30	Open	23	23	Open
Apron height above MLW (ft)	11	11	12	8	10	10	14
Number of container cranes	0	0	0	0	0	0	0
Number of wharf cranes	0	0	0	0	0	0	0
Apron lighting	Yes						
Straight-stern RORO facilities	Yes	Yes	No	No	No	No	Yes
Apron length served by rail (ft)	994	1,144	1,139	855	0	0	1,220

Notes:

1. Terminal open storage area is 75 acres
2. Terminal covered storage area is 1037000 square feet

TABLE II-PHI-6
PORT OF PHILADELPHIA
SUMMARY OF BERTHING CAPABILITIES OF PIERS 80, 82, 84 AND 96

Vessel	Berths					
	Pier 80-N	Pier 80-S	Pier 82-N	Pier 82-S	Pier 84-N	Pier 84-S
Breakbulk						
C3-S-33a	a	a	a	a	a	a
C3-S-37c	a	a	a	a	a	a
C3-S-37d	1	2	2	1	1	1
C3-S-38a	1	2	2	1	1	1
C4-S-1a	1	1	1	1	1	1
C4-S-1qb and 1u	a	a	a	a	a	a
C4-S-58a	a	a	a	a	a	a
C4-S-65a	1	1	1	1	1	1
C4-S-66a	a	a	a	a	a	a
C4-S-69b	a	a	a	a	a	a
Seatrain						
GA and PR-class	1	1	1	1	1	1
Barge						
LASH C8-S-81b	a, f, g					
LASH C9-S-81d	a	a	a	a, c	a, c	a, c
LASH lighter	7	8	8	6	6	6
SEABEE C8-S-82a	a	a	a	a, c	a, c	a, c
SEABEE barge	4	5	5	4	4	4
RORO						
Comet	1, i	2, i	d, o	1, d, i	d, o	d, o
C7-S-95a/Maine-class	a, b	a, b	a, b	a	a, b	a, b
Ponce-class	b, h	b, h	b, h	h	b, h	b, h
Great Land-class	b, h	b, h	b, h	h	b, h	b, h
Cygnus/Pilot-class	b	b	b	1	b	b
Meteor	i, j	i, j	d, o	1, d, i	d, o	d, o
AmEagle/Condor	b	b	b	1, i	b	b
MV Ambassador	1, m	1, m	d	d	d	d
FSS-class	a, b	a, b	a, b	a, c	a, b, c	a, b, c
Cape D-class	a, b	a, b	a, b	a	a, b	a, b
Cape H-class	a, b	a, b	a, b	a	a, b	a, b
Container						
C6-S-1w	1, e					
C7-S-68e	a, e					
C8-S-85c	a, e					
Combination						
C5-S-78a	a, e					
C5-S-37e	1, e					

- a = maximum vessel draft limited to berth depth
- b = inadequate apron width
- c = inadequate berth length
- d = no straight stern-ramp facilities
- e = no container-handling equipment
- f = inadequate berth depth, adequate anchorage depth
- g = inadequate channel depth
- h = no shore-based ramps available
- i = insufficient ramp clearance at low tide
- j = insufficient ramp clearance at high tide
- k = excessive ramp angle at low tide
- m = excessive ramp angle at high tide
- n = parallel ramp operation only
- o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

() indicates vessels assigned by analyst

TABLE II-PHI-6 (CONTINUED)
 PORT OF PHILADELPHIA
 SUMMARY OF BERTHING CAPABILITIES OF PIERS 80, 82, 84 AND 96

Vessel	Berths
	Pier 96-N
Breakbulk	
C3-S-33a	2
C3-S-37c	2
C3-S-37d	2
C3-S-38a	2
C4-S-1a	2
C4-S-1qb and 1u	2
C4-S-58a	2
C4-S-65a	2
C4-S-66a	a
C4-S-69b	2
Seatrain	
GA and PR-class	2
Barge	
LASH C8-S-81b	a, f, g
LASH C9-S-81d	a
LASH lighter	9
SEABEE C8-S-82a	a
SEABEE barge	6
RORO	
Comet	i, j
C7-S-95a/Maine-class	a
Ponce-class	h
Great Land-class	h
Cygnus/Pilot-class	2
Meteor	i, j
AnEagle/Condor	i, j
MV Ambassador	2, m
FSS-class	a
Cape D-class	a
Cape H-class	a
Container	
C6-S-1w	1, e
C7-S-68e	1, e
C8-S-85c	a, e
Combination	
C5-S-78a	a, e
C5-S-37e	2, e

- a = maximum vessel draft limited to berth depth
- b = inadequate apron width
- c = inadequate berth length
- d = no straight stern-ramp facilities
- e = no container-handling equipment
- f = inadequate berth depth, adequate anchorage depth
- g = inadequate channel depth
- h = no shore-based ramps available
- i = insufficient ramp clearance at low tide
- j = insufficient ramp clearance at high tide
- k = excessive ramp angle at low tide
- m = excessive ramp angle at high tide
- n = parallel ramp operation only
- o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

() indicates vessels assigned by analyst

d. Security. Piers 82 and 84 are enclosed by 8-foot chain link fencing. In-house security personnel provide gate and patrol security services when the terminal is operational.

e. Rail Operations. The open south apron of pier 82 is served by rail tracks. Twin railroad tracks serve the 30-foot-wide north wharf apron. The transit shed on the pier has one set of depressed tracks running along its center line. Pier 84 has three short, depressed tracks inside its transit shed. The terminal does not have fixed or portable rail end ramps.

f. Truck Operations. The pier 82 transit shed has 24 van-loading positions on its south side. The transit shed on pier 84 has 12 cargo doors and a continuous dock at its inshore end. It also has an entry ramp for trucks. The terminal does not have fixed or portable end ramps.

g. Helicopter Operations. The terminal does not have a designated location to receive and stage helicopters.

4. Tioga Marine Terminals (figs II-PHI-8 and II-PHI-9)

a. Berthing. The Tioga Marine Terminals are in north Philadelphia. Berths 1 and 2 form the Tioga Fruit Terminal. This terminal is specifically designed for the highly efficient movement of time-sensitive fruit cargoes. The Tioga Container Terminal is next to the fruit terminal. It is a dedicated container terminal with 50 acres of paved marshaling area and two container cranes. It features seven berths, including one RORO and two container berths.

Tables II-PHI-7 through II-PHI-8 show the berthing characteristics and capabilities of the Tioga Marine Terminals. The ability of these terminals to support various shipping modes is described below.

(1) Breakbulk Operations. Berths 1 through 3 are considered the most suitable breakbulk berths at the Tioga Container Terminal. The berths are supported by a transit shed and have apron rail tracks. The berths do not have gantry crane service. Ship's gear or mobile cranes are needed for cargo loading.

Berth 1 is the preferred breakbulk berth at the Tioga Fruit Terminal. Ship's gear would be needed for loading at this berth. Berth 2 at the Tioga Fruit Terminal is also suitable for breakbulk operations.

(2) Barge Operations. The Tioga Marine Terminals have 40 LASH lighter or 27 SEABEE barge loading positions. The water depths are not sufficient to load mother ships dockside at either terminal. However, loading could be done at anchorages in the Delaware River.

(3) RORO and FSS Operations. Berth B and RORO A berths are too shallow for RORO operations. Berths 1 through 5 are suitable for side-loading RORO vessels. Berths 4 and 5 are more suitable than berths 1 through 3 because of their greater apron widths. Berth 1 at the Tioga Fruit Terminal can berth and load smaller RORO vessels such as the Cygnus/Pilot-class. It is not long enough for larger RORO vessels, such as FSS. FSS operations are most suited to berths 4 and 5.

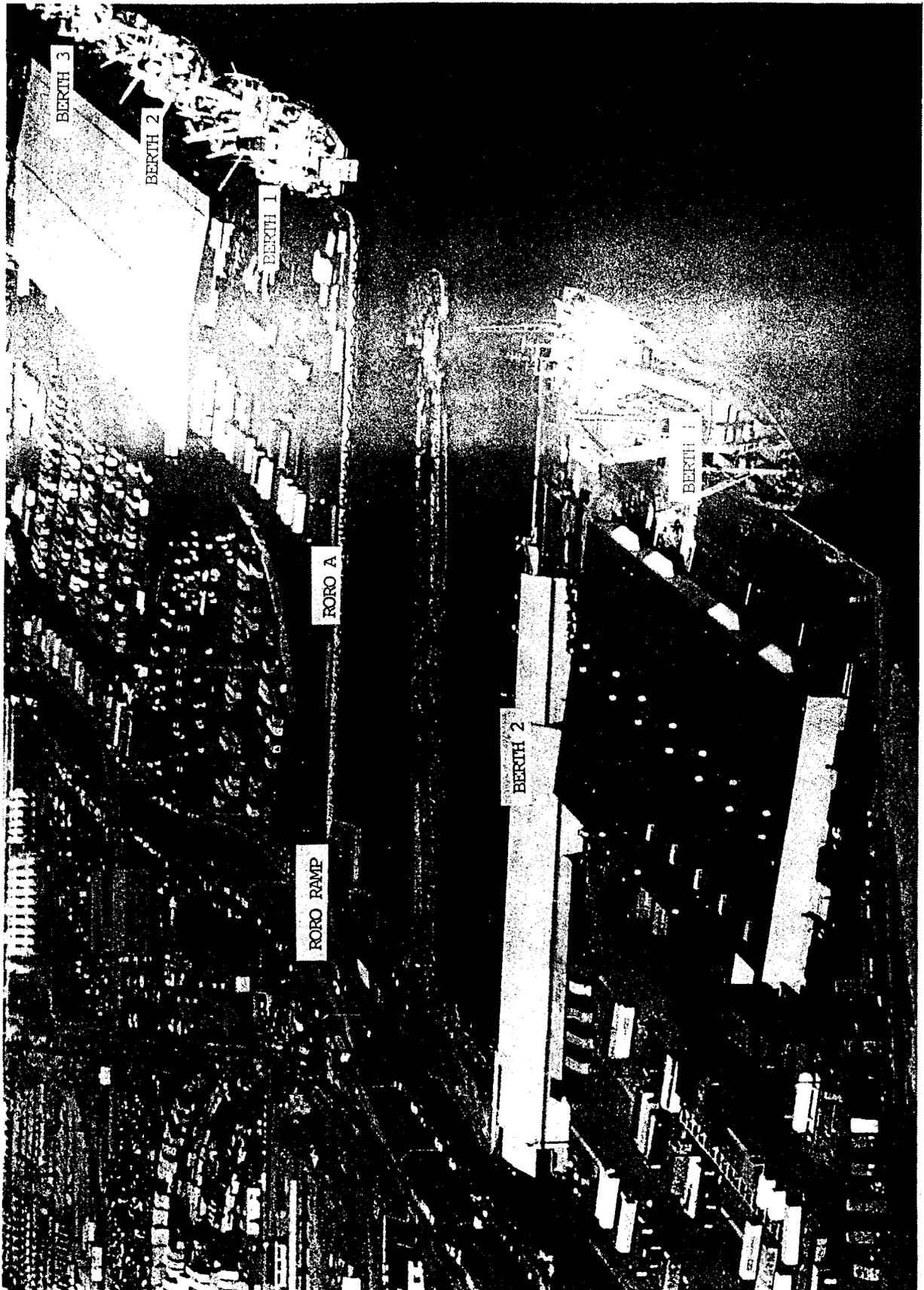


Figure II-PHI-7. Tioga Fruit Terminal.

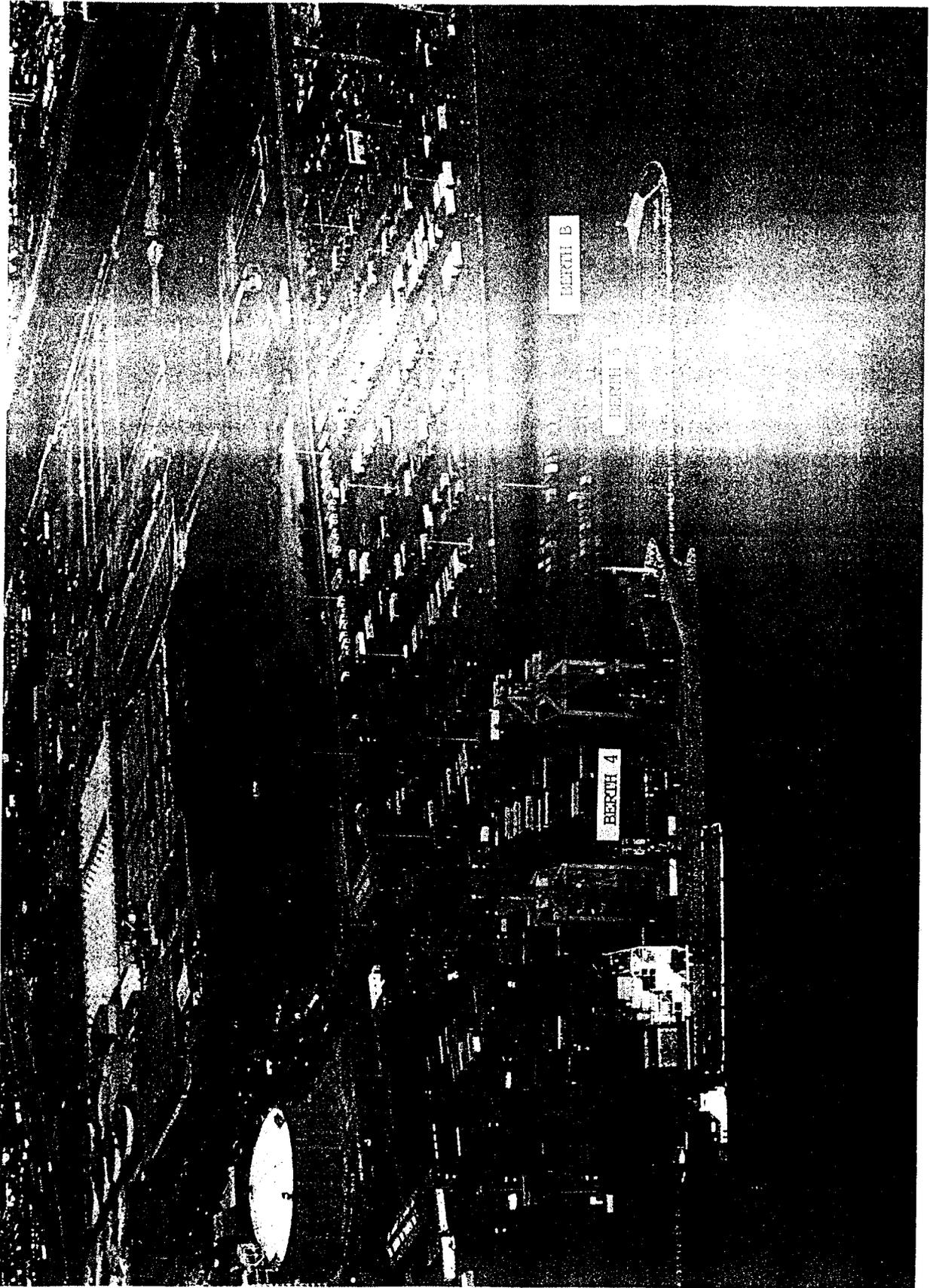


Figure II-PHI-8. Tioga Container Terminal.

TABLE II-PHI-7
PORT OF PHILADELPHIA
BERTH CHARACTERISTICS OF TIOGA MARINE TERMINALS

Characteristics	Berths					
	Berth B	RORO A	1-3	4-5	1	2
Length (ft)	725	610	1,902	1,268	736	620
Depth alongside at MLW (ft)	28	28	37	40	32	32
Deck strength (psf)	1,000	1,000	1,000	1,000	1,000	1,000
Apron width (ft)	Open	Open	100	Open	Open	45
Apron height above MLW (ft)	12	12	12	12	11	11
Number of container cranes	0	0	0	2	0	0
Number of wharf cranes	0	0	0	0	0	0
Apron lighting	Yes	Yes	Yes	Yes	Yes	Yes
Straight-stern RORO facilities	No	Yes	No	No	No	No
Apron length served by rail (ft)	725	610	1,902	1,268	736	620

Notes:

1. Terminal open storage area is 0 acres
2. Terminal covered storage area is 0 square feet

(4) Container Operations. Berths 4 and 5 at the Tioga Container Terminal have two container cranes and can load one container vessel. None of the other berths are suitable for container operations.

b. MHE. The Tioga Container Terminal has four 50-ton top loaders, one 25-ton forklift, and 25 yard hustlers. Additional MHE is available through local stevedoring agencies.

c. Staging

(1) Open Storage. The Tioga Fruit Terminal has 47 acres of paved, open storage. The Tioga Container Terminal has 50 acres of paved, open storage.

(2) Covered Storage. The transit shed at the Tioga Fruit Terminal has 300,000 square feet of heated cargo storage

TABLE II-PHI-8
PORT OF PHILADELPHIA
SUMMARY OF BERTHING CAPABILITIES OF TIOGA MARINE TERMINALS

Vessel	Berths					
	Berth B	RORO A	1-3	4-5	1	2
Breakbulk						
C3-S-33a	a	a	3	2	1	1
C3-S-37c	a	a	3	2	1	1
C3-S-37d	a	a	3	2	1	1
C3-S-38a	1	1	3	2	1	1
C4-S-1a	a	a	3	2	1	1
C4-S-1qb and 1u	a	a	3	2	1	1
C4-S-58a	a	a	3	2	1	1
C4-S-65a	a	a	3	2	1	1
C4-S-66a	a	a	3	2	a	a
C4-S-69b	a	a	3	2	1	1
Seatrain						
GA and PR-class	1	1	3	2	1	1
Barge						
LASH C8-S-81b	a,c,f,g	a,c,f,g	a,f,g	a,f,g	a,c,f,g	a,c,f,g
LASH C9-S-81d	a,c	a,c	a	1	a,c	a,c
LASH lighter	5	4	13	9	5	4
SEABEE C8-S-82a	a,c	a,c	a	1	a,c	a,c
SEABEE barge	3	3	9	6	3	3
RORO						
Comet	1,d,i	1,i	3,d,i	2,d,i	1,d,i	d,o
C7-S-95a/Maine-class	a,c	a,c	2	1	a	a,b,c
Ponce-class	h	c,h	h	h	h	b,c,h
Great Land-class	c,h	c,h	h	h	c,h	b,c,h
Cygnus/Pilot-class	1	c	2	1	1	b,c
Meteor	a,d	a,i,j	d,i,j	d,i,j	d,i,j	d,o
AmEagle/Condor	a	a,c	2,i	1,i	1,i	b,c
MV Ambassador	d	1,m	d	d	d	d
FSS-class	a,c	a,c	1,n	1	a,c	a,b,c
Cape D-class	a	a,c	2,i	1,i	a	a,b,c
Cape H-class	a,c	a,c	2	1	a,c	a,b,c
Container						
C6-S-1w	a,e	a,c,e	2,e	1	1,e	c,e
C7-S-68e	a,e	a,c,e	2,e	1	1,e	c,e
C8-S-85c	a,c,e	a,c,e	2,e	1	a,c,e	a,c,e
Combination						
C5-S-78a	a,e	a,e	3,e	2	a,e	a,e
C5-S-37e	a,e	a,e	3,e	2	1,e	1,e

- a = maximum vessel draft limited to berth depth
- b = inadequate apron width
- c = inadequate berth length
- d = no straight stern-ramp facilities
- e = no container-handling equipment
- f = inadequate berth depth, adequate anchorage depth
- g = inadequate channel depth
- h = no shore-based ramps available
- i = insufficient ramp clearance at low tide
- j = insufficient ramp clearance at high tide
- k = excessive ramp angle at low tide
- m = excessive ramp angle at high tide
- n = parallel ramp operation only
- o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

() indicates vessels assigned by analyst

area. The Tioga Fruit Terminal has a 25,000-square-foot container freight station at berth 1.

d. Security. Chain link fencing encloses both terminals. The terminals provide their own patrol and gate security personnel.

e. Rail Operations. Rail tracks serve the transit shed with depressed rails. All berths have apron tracks. Although no end ramps exist, several suitable locations are available for erecting temporary end ramps.

f. Truck Operations. The rear of the Tioga Fruit Terminal transit shed has 100 truck docks. Neither terminal has temporary end ramps.

g. Helicopter Operations. The Tioga Marine Terminals do not have a dedicated helicopter landing and staging area. A vacant container storage location at the north end of container berth 5 could possibly be used for these operations.

C. SUPPORT SERVICES

1. Pilotage

Pilots from the Delaware Bay and River Pilots Association provide pilotage for the Port of Philadelphia. Pilots board incoming vessels at the mouth of the Delaware Bay, off Cape Henlopen, between entrance buoys 5 and 6. The association currently has eight pilot boats.

2. Harbor Craft

The following companies provide docking and towing services along the Delaware River:

- Curtis Bay Towing Company of Pennsylvania.
- McAllister Brothers, Inc.
- Taylor and Anderson Towing and Lighthouse Company.

These companies operate 17 vessels ranging from 800 to 3,000 horsepower.

3. Stevedores

The following companies provide stevedoring services at the port:

- Delaware Operating Company.
- Independent Pier Company.
- ITO Corporation.
- Northern Shipping.
- Holt Terminals.

4. Heavy-Lift Equipment

No floating heavy-lift cranes are dedicated to the port. Terminals such as the Holt and Packer Avenue Marine Terminals have their own heavy-lift gantry and mobile cranes. In special cases, the floating 350-STON crane at the Naval Shipyard may be used.

D. INTERMODAL CONTAINER TRANSFER FACILITY (ICTF)

Holt Marine Terminal is an ICTF. The terminal is in Gloucester City, New Jersey. It has good highway connections to the New Jersey Turnpike (I-95) and the Pennsylvania Turnpike (I-76). Conrail and CSX are the rail carriers serving the port. The terminal has adequate container handling equipment.

E. FUTURE DEVELOPMENT

No improvements are planned that will significantly improve the throughput of this port.

MTMC International Traffic has determined that sufficient longshoremen would be available at the Port of Philadelphia to meet mobilization needs.

F. REQUIREMENTS AND RECOMMENDATIONS

1. Requirements

The berthing requirements for outloading a notional heavy mechanized infantry division are considered at the Port of Philadelphia. The vessels required to support this unit movement are shown in appendix A. In summary, the vessel requirements are:

- Ship mix 1 (modern ships): 10 vessels.
- Ship mix 2 (combination of ship types): 13 vessels.
- Ship mix 3 (older ships): 28 vessels.
- Ship mix 4 (fast sealift ships): 8 plus 2* vessels from another ship mix.

*The division's ship requirement exceeds the current inventory. Two additional vessels are required to deploy the division.

2. Recommendations

Tables II-PHI-9 through II-PHI-12 show the recommended berths for ship mixes 1 through 4. They also show the estimated berthing time for each vessel.

The Port of Philadelphia offers good facilities for outloading large military units. The versatile Packer Avenue and Holt Marine Terminals are the preferred locations for loading any type of cargo. The Tioga Fruit Terminal, farther upriver, would be the next choice. Piers 82, 84, and 96 should be brought into service, as needed, to add breakbulk berths.

*
 TABLE II-PHI-9
 BERTHING RECOMMENDATIONS FOR SHIP MIX 1
 (MECHANIZED INFANTRY DIVISION)

Ship Mix 1 (Modern ships)				
Terminal: Berth:	Packer Cntnr 3-5	Packer RoRo 6	Holt 7A	Holt Container
Day 1	FSS-1	MV Ambassador	Cape H-1	Cape D-1
Day 2				Cape D-2
Day 3	FSS-2		Cape H-2	
Day 4				FSS-3
Day 5			Am Eagle Am Condor	

TABLE II-PHI-10
 BERTHING RECOMMENDATIONS FOR SHIP MIX 2
 (MECHANIZED INFANTRY DIVISION)

Ship Mix 2 (Combination of ship types)								
Terminal: Berth:	Packer Cntnr 3-5	Packer RoRo 6	Holt 7A	Holt 7B	Holt 7C	Philadelphia Pier 82-S	Philadelphia Pier 84-N	Philadelphia Pier 84-S
Day 1	FSS-1	MV Ambassador	Cape H-1	C3-S-37d C3-S-58a	Cape D-1	C4-S-65a	C3-S-37d	C3-S-38a
Day 2		C3-S-33a			Cape D-2			
Day 3	FSS-2		Am Eagle					
Day 4								
Day 5								

II-PHI-26

TABLE II-PHI-11
 BERTHING RECOMMENDATIONS FOR SHIP MIX 3
 (MECHANIZED INFANTRY DIVISION)

Ship Mix 3 (Breakbulk ships)															
Terminal: Berth:	Packer 1-2	Packer Cntnr 3-5	Packer RoRo 6	Holt 7A	Holt 7B	Holt Cntnr	Pier 82N	Philadelphia Pier 82S	Pier 84N	Pier 84S	Tioga RoRo A	Tioga 1-3	Tioga 4-5	Tioga 1	Tioga 2
Day 1	C3-S-33a C3-S-33a	C4-S-65a C4-S-65a C4-S-65a	C3-S-38a	C4-S-65a	C3-S-33a C3-S-33a	C4-S-65a C4-S-1a C4-S-1a	C3-S-38a C3-S-38a	C3-S-38a	C3-S-37a	C4-S-65a	C4-S-58a	C3-S-37c C3-S-37d C4-S-58a	C4-S-58a	C3-S-37c	C3-S-37c
Day 2															
Day 3															
Day 4															
Day 5															

TABLE II-PHI-12
 BERTHING RECOMMENDATIONS FOR SHIP MIX 4
 (MECHANIZED INFANTRY DIVISION)

Ship Mix 4 (Fast sealift ships)			
Terminal:	Packer	Holt	Tioga
Berth:	Container (3-5)	Container	4-5
Day 1	FSS-1	FSS-3 FSS-4	FSS-7
Day 2			
Day 3	FSS-2	FSS-5 FSS-6	FSS-8
Day 4			
Day 5			

PORT OF SAVANNAH (1990)

A. GENERAL

1. Location and Harbor Description (fig II-SAV-1)

The Port of Savannah is on the Savannah River, about 15 miles from the Atlantic Ocean. The port is 102 nautical miles south of Charleston, South Carolina, and 145 miles north of Jacksonville, Florida. Its two main facilities, Ocean Terminal and Containerport/Garden City Terminal, are on the right bank of the river. Ocean Terminal is about 4 miles downstream from the Containerport/Garden City Terminal.

The deepwater entrance to the mouth of the Savannah River is across the ocean bar through Tybee Roads. At the ocean bar, the channel is 40 feet deep and 600 feet wide. From the ocean bar to the first turning basin, about 1 mile below Ocean Terminal, the channel is 38 feet deep and 500 feet wide. From the turning basin to the Containerport/Garden City Terminal, the channel is 38 feet deep and 400 feet wide. The mean tidal variation is about 7 feet. Silting is a serious problem in the Savannah River. Dredging is carried out on a continuous basis. Floodgates and a sediment basin are also used in the Back River to reduce silt buildup in the main channel of the Savannah River. A fixed bridge (Talmadge Memorial Bridge) at the Ocean Terminal location restricted channel sailing headroom to a vertical clearance of 135 feet at mean high water (MHW). This bridge has been replaced by a new structure that provides 175 feet of clearance.

The characteristics of the turning basins in the Savannah River are outlined below:

<u>Turning Basin</u>	<u>Length</u> <u>(ft)</u>	<u>Width</u> <u>(ft)</u>	<u>Depth</u> <u>(ft)</u>
Kings Island	1,600	1,500	38
Marsh Island	1,000	900	34
Fig Island	1,000	900	34
Argyle Island	600	600	30
Port Wentworth	600	600	30

The Atlantic Intracoastal Waterway crosses the Savannah River about 11 miles below Ocean Terminal. A shallow-draft vessel channel extends 181 miles up the Savannah River to Augusta, Georgia. The channel's controlling depth is 9 feet, while its controlling width is 90 feet.

A LASH lighter fleeting area is in slip 3, just across from the Ocean Terminal and slightly downriver. The Back River area is also used for lighter marshaling. LASH lighter marshaling and loading at the mooring dolphins downriver near Cockspur Island have been discontinued because of strong currents at the dolphins.

No anchorages are available in the Savannah River. Vessels may anchor outside the ocean bar northward or northwestward of the Tybee sea buoy, in water depths of 19 to 45 feet.

II-SAV-2

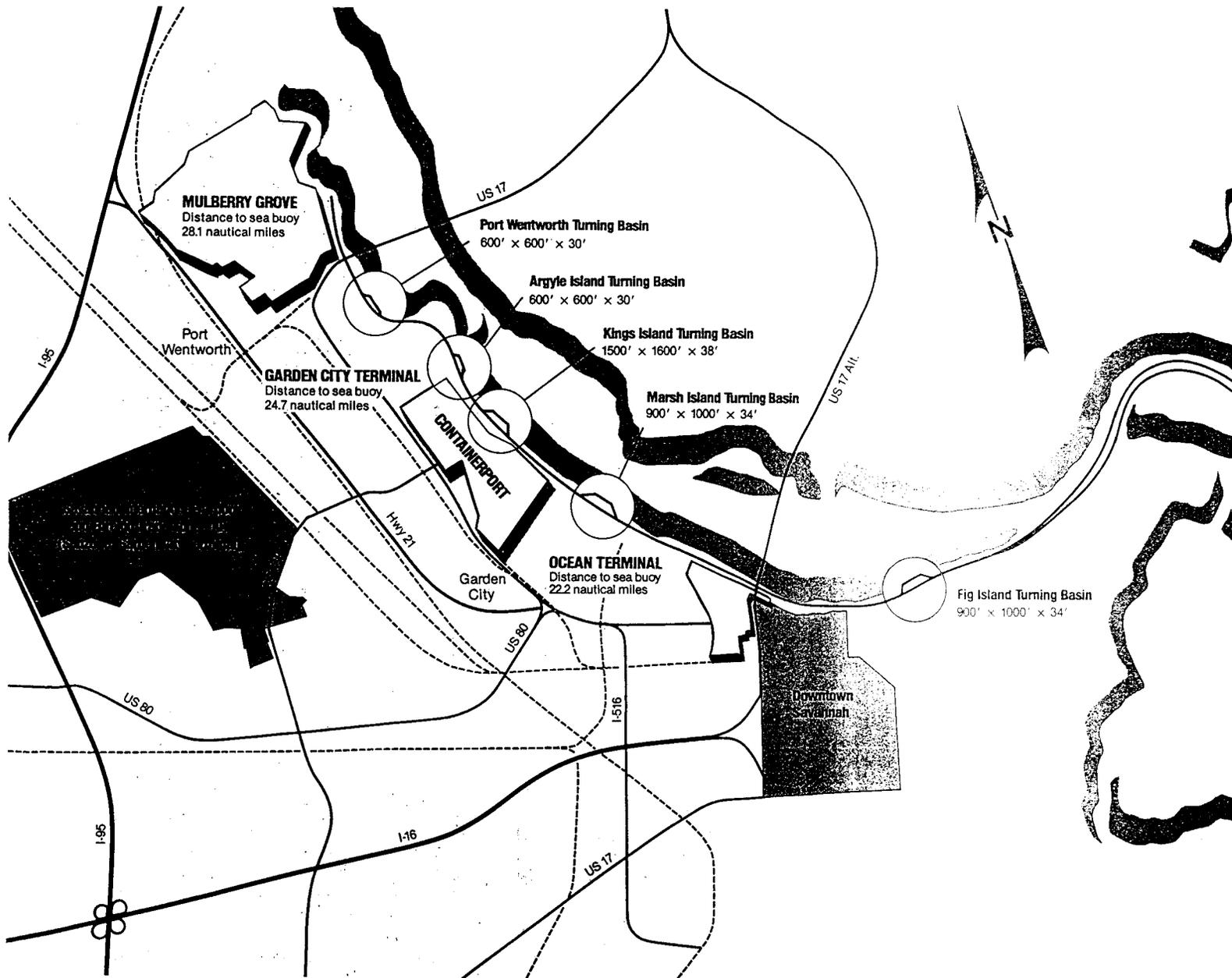


Figure II-SAV-1. Port of Savannah.

2. Highway Access

The major highway access to the port is Interstate Route 16. I-16 continues to Macon, Georgia, where it joins Interstate Route 75 to Atlanta, Georgia. Just a few miles from Savannah, I-16 joins Interstate Route 95, the major north-south corridor on the east coast. To reach the Ocean Terminal from I-16, exit onto four-lane Georgia Route 21 north and then exit onto two-lane Lathrop Avenue. Lathrop Avenue leads to the main gate on River Street. The Containerport/Garden City Terminal may be reached from either I-95 or I-16 using Georgia 21. From I-95, take the Georgia 21 south exit, and from I-16, take the Georgia 21 north exit. Then take two-lane Georgia Route 307 to the terminal.

3. Rail Access

The Norfolk Southern Railway and CSX serve Savannah. The Savannah State Docks Railroad performs switching at the Containerport/Garden City Terminal. This terminal has a 600-car holding capacity. Ocean Terminal has no railcar holding capacity, although the adjacent Norfolk Southern Railway yard can hold 600 cars.

4. Airports

Savannah International Airport is 5 miles west of the Containerport/Garden City Terminal. The airport is about 10 miles northwest of the Ocean Terminal. The two other airports in the area are Travis Field and Hunter Army Airfield.

B. PORT FACILITIES

1. Containerport/Garden City Terminal (figs II-SAV-2 and II-SAV-3)

a. Berthing. The Containerport/Garden City Terminal is separated into two areas. A container facility, called Containerport, has five berths totaling 4,675 linear feet. These berths have open wharf aprons. Next to the container berths are two general cargo berths totaling 1,447 linear feet with aprons of 46 feet. Tables II-SAV-1 and II-SAV-2 show the berthing characteristics and capabilities of the Containerport/Garden City Terminal. Containerport has nine 45-STON container cranes. Two 35-STON gantry cranes and two mobile cranes ranging in capacity from 100 to 300 tons assist ship's gear in loading at the breakbulk berths. The terminal's ability to support various modes of shipping is described below.

(1) Breakbulk Operations. Berths 50 through 53 are equipped to handle breakbulk operations. The container berths at Containerport also can be used for breakbulk operations. All breakbulk vessels listed in appendix A may berth and fully load at any of the terminal's berths. Breakbulk operations are aided by two 35-ton gantry cranes, a 100-ton mobile crane, and a 300-ton mobile crane.

(2) LASH and SEABEE Operations. Although the terminal has no specific facility to handle LASH and SEABEE operations, it can easily accommodate them. The terminal has 43 LASH lighter or 30 SEABEE barge loading positions. The maximum draft of SEABEE and some LASH vessels is restricted by the channel and berth depths.

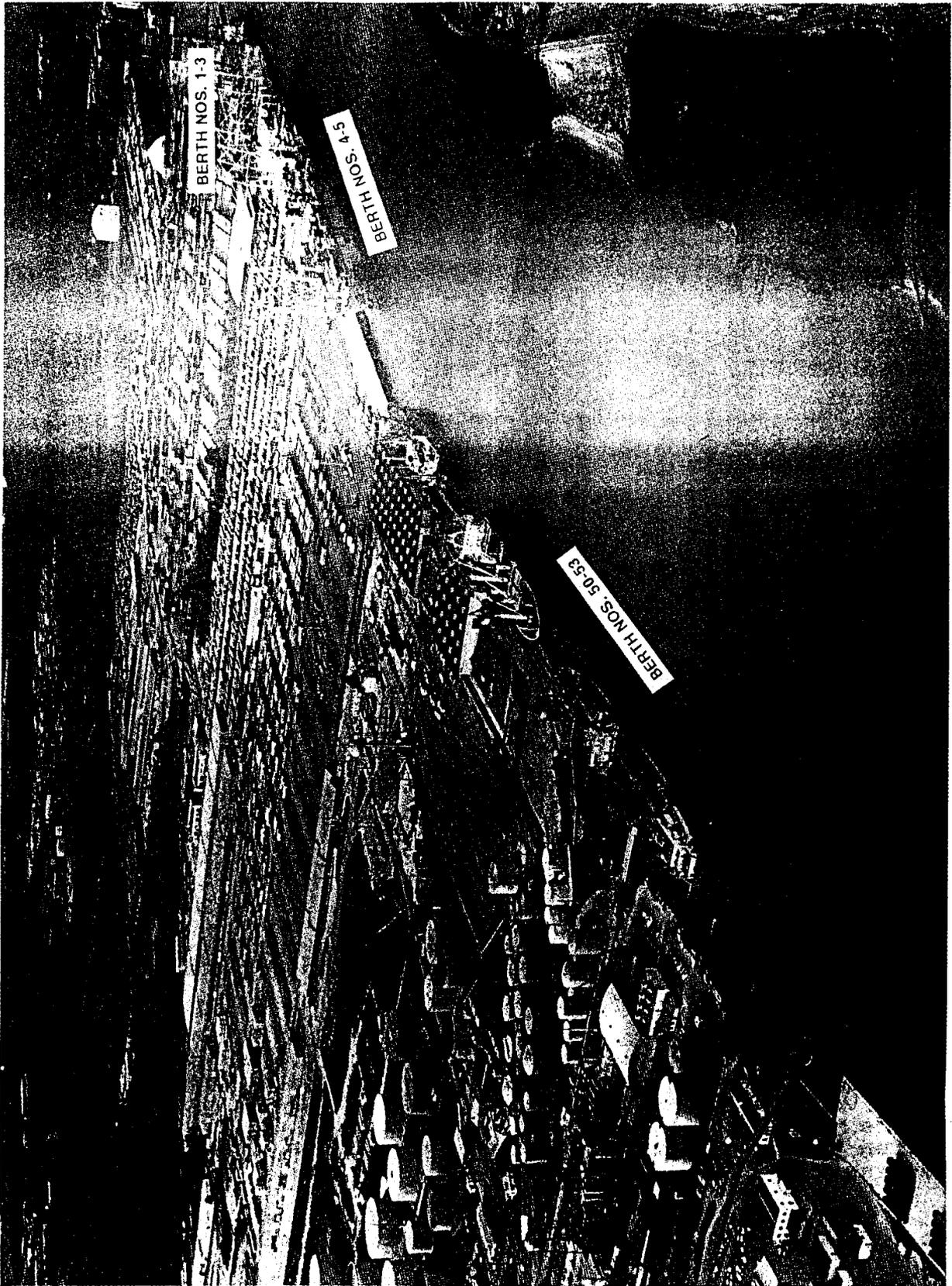


Figure II-SAV-2. Aerial view of Containerport/Garden City Terminal.

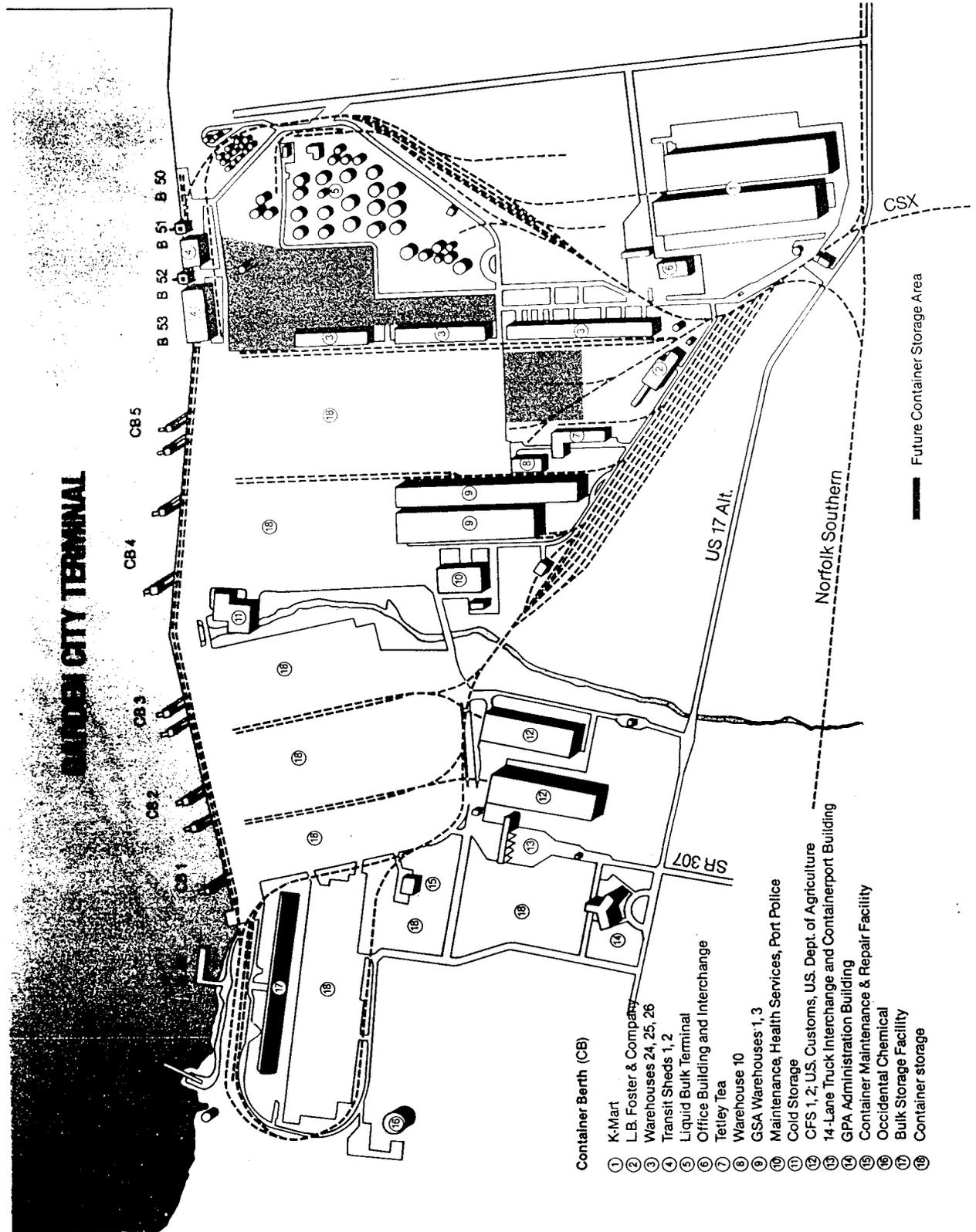


Figure II-SAV-3. Site map of Containerport/Garden City Terminal.

TABLE II-SAV-1
PORT OF SAVANNAH
BERTH CHARACTERISTICS OF CONTAINER PORT/GARDEN CITY TERMINAL

Characteristics	Berths		
	1-3	4-5	50-53
Length (ft)	2,402	2,273	1,447
Depth alongside at MLW (ft)	38	38	36
Deck strength (psf)	1,000	1,000	750
Apron width (ft)	Open	Open	46
Apron height above MLW (ft)	8	8	15
Number of container cranes	5	4	0
Number of wharf cranes	0	0	2
Apron lighting	Yes	Yes	Yes
Straight-stern RORO facilities	Yes	No	No
Apron length served by rail (ft)	2,402	2,273	1,447

Notes:

1. Terminal open storage area is 306 acres
2. Terminal covered storage area is 200500 square feet

(3) RORO and FSS Operations. The Containerport/Garden City Terminal can accommodate side-, stern-, and slewed-stern-ramp RORO vessels. The Containerport berths, with their open aprons, are adequate for side-ramp and slewed-ramp RORO operations. The terminal also has one stern dock at berth 1 for stern-ramp RORO vessels. The breakbulk berths are not adequate for RORO operations, because their aprons are too narrow. FSS vessels have no restrictions at berths 1 through 5. Sufficient berth lengths exist for two vessels at berths 1 through 3 and at berths 4 and 5. However, berths 50 through 53 do not provide enough apron width to properly handle FSS vessels.

(4) Container Operations. The five berths that make up Containerport are well suited to container operations. Up to six container vessels could berth and load concurrently at the container berths. These vessels are loaded by nine container cranes. The Containerport's nine straddle cranes can stack containers up to four high. Fifteen top-lift trucks with capacities from 26 to 55 tons can stack containers up to three

TABLE II-SAV-2
PORT OF SAVANNAH
SUMMARY OF BERTHING CAPABILITIES OF CONTAINER PORT/GARDEN CITY TERMINAL

Vessel	Berths		
	1-3	4-5	50-53
Breakbulk			
C3-S-33a	4	4	2
C3-S-37c	4	4	2
C3-S-37d	4	4	2
C3-S-38a	4	4	2
C4-S-1a	4	3	2
C4-S-1qb and 1u	4	3	2
C4-S-58a	4	3	2
C4-S-65a	4	3	2
C4-S-66a	4	4	2
C4-S-69b	3	3	2
Seatrail			
GA and PR-class	4	3	2
Barge			
LASH C8-S-81b	a,g	a,g	a,g
LASH C9-S-81d	2	2	a
LASH lighter	17	16	10
SEABEE C8-S-82a	a,g	a,g	a,g
SEABEE barge	12	11	7
RORO			
Comet	4,i	4,d,i	d,o
C7-S-95a/Maine-class	3	2	b
Ponce-class	h	h	b,h
Great Land-class	h	h	b,h
Cygnus/Pilot-class	3	3	b
Meteor	4,i	4,d,i	d,o
AmEagle/Condor	3,i	3,i	b
MV Ambassador	k,m	d	d
FSS-class	2	2	b
Cape D-class	3,i	3,i	b
Cape H-class	3	2	b
Container			
C6-S-1w	3	3	2,e
C7-S-68e	3	3	1,e
C8-S-85c	2	2	1,e
Combination			
C5-S-78a	3	3	2,e
C5-S-37e	3	3	2,e

- a = maximum vessel draft limited to berth depth
- b = inadequate apron width
- c = inadequate berth length
- d = no straight stern-ramp facilities
- e = no container-handling equipment
- f = inadequate berth depth, adequate anchorage depth
- g = inadequate channel depth
- h = no shore-based ramps available
- i = insufficient ramp clearance at low tide
- j = insufficient ramp clearance at high tide
- k = excessive ramp angle at low tide
- m = excessive ramp angle at high tide
- n = parallel ramp operation only
- o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

() indicates vessels assigned by analyst

high. These top-lift trucks adjust to 20-, 35- and 40-foot containers.

b. Materials Handling Equipment (MHE). Containerport has specialized rigging attachments available, including buckets, slings, and roll lifts. Additional MHE is available from local stevedore contractors as needed.

c. Staging

(1) Open Storage. The terminal has 306 acres of paved, open storage. Most of this storage, which is behind the five container berths, is used for chassis and stacked-container storage.

(2) Covered Storage. The port has 1,637,800 square feet of covered storage. Two transit sheds at berths 50 through 53, comprising 77,000 square feet, contribute to this total. The terminal's two container stuffing/stripping sheds add another 402,800 square feet. The remaining 1,158,000 square feet of covered storage is in the six dry-cargo warehouses at the terminal.

d. Security. Chain link fencing encloses the terminal, except at rail access points. All gates are controlled 24 hours a day by armed Georgia Port Authority Police. A security and fire protection unit patrols the terminal 24 hours a day.

e. Rail Operations. The Savannah State Docks Railroad provides all rail switching services within the terminal areas. The aprons of the breakbulk berths have two surface tracks. Two platform-level tracks run along the rear of the two transit sheds. Twin surface tracks along the length of the apron provide rail access to the berths. The port has no fixed or portable rail end ramps. For previous military exercises, earth ramps were temporarily constructed at end spurs for offloading flatcars.

f. Truck Operations. The six warehouses at the terminal provide 124 platform-height loading positions for trucks. The terminal has one truck end ramp.

g. Helicopter Operations. The terminal has no designated helicopter landing area, but it has sufficient open storage to support helicopter operations. A recommended location is at the rear of container berth 1.

h. Marshaling Areas. No designated marshaling areas exist outside the terminal complex.

2. Ocean Terminal (figs II-SAV-4 and II-SAV-5)

a. Berthing. A total of 10 berths provide 6,166 feet of berthing at the Ocean Terminal. This terminal, just north of downtown Savannah, is designed mainly to handle breakbulk cargo. Berths 1, 2, 13, and 18 through 20 are all marginal wharfs. Berths 14 through 17 enclose a large slip. Berth 13 has an open apron, while all the others have 52-foot-wide aprons in front of transit sheds. Water depths vary from 32 feet at berths 14 through 17 to 38 feet at berths 1, 2, and 13. Tables II-SAV-3 and II-SAV-4 show the berthing characteristics and capabilities of this terminal. The terminal's ability to support various shipping modes is described below.



Figure II-SAV-4. Aerial view of Ocean Terminal.

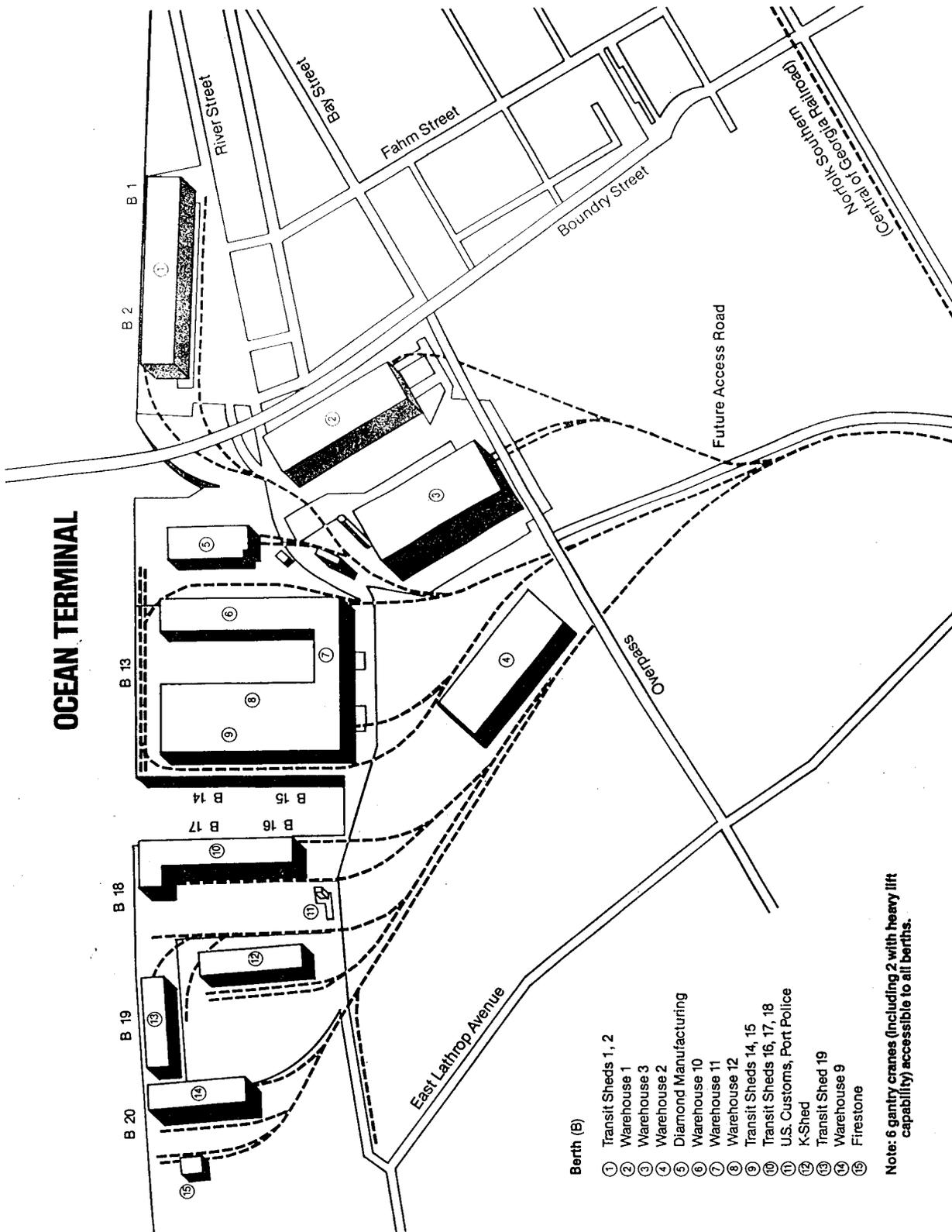


Figure II-SAV-5. Site map of Ocean Terminal.

TABLE II-SAV-3
PORT OF SAVANNAH
BERTH CHARACTERISTICS OF OCEAN TERMINAL

Characteristics	Berths				
	1-2	13	14-15	16-17	18-20
Length (ft)	1,178	1,100	1,143	1,046	1,699
Depth alongside at MLW (ft)	38	38	32	32	34
Deck strength (psf)	1,000	1,000	1,000	1,000	1,000
Apron width (ft)	52	Open	52	52	52
Apron height above MLW (ft)	15	15	15	15	15
Number of container cranes	0	0	0	0	0
Number of wharf cranes	1	2	1	1	1
Apron lighting	Yes	Yes	Yes	Yes	Yes
Straight-stern RORO facilities	No	No	Yes	Yes	No
Apron length served by rail (ft)	1,178	1,100	1,143	1,046	0

Notes:

1. Terminal open storage area is 138 acres
2. Terminal covered storage area is 1822760 square feet

(1) Breakbulk Operations. The terminal is designed mainly for breakbulk operations. All berths can be used for breakbulk loading. Breakbulk ships load using either ship's gear or the terminal's cranes. The terminal has six gantry cranes with capacities of 30 to 175 tons. The Ocean Terminal also uses a 30-ton mobile crane and a 100-ton mobile crane for ship loading.

(2) LASH and SEABEE Operations. Although the terminal has no specific facility for LASH and SEABEE operations, it can accommodate them. However, the water depths at some berths would limit the loading of deep-draft mother ships. As shown in table II-SAV-4, 40 LASH lighter or 27 SEABEE barge loading positions are available.

(3) RORO and FSS Operations. RORO operations are quite limited at this terminal. Problems range from inadequate apron widths, shallow water depth, insufficient ramp clearances, and no straight-stern ramp facilities. FSS vessels are also quite limited at the Ocean Terminal. The restrictions of inadequate apron width apply at all berths, except berth 13.

TABLE II-SAV-4
PORT OF SAVANNAH
SUMMARY OF BERTHING CAPABILITIES OF OCEAN TERMINAL

Vessel	Berths				
	1-2	13	14-15	16-17	18-20
Breakbulk					
C3-S-33a	2	2	2	2	3
C3-S-37c	2	2	2	2	3
C3-S-37d	2	2	2	2	3
C3-S-38a	2	2	2	2	3
C4-S-1a	2	1	1	1	2
C4-S-1qb and 1u	1	1	1	1	2
C4-S-58a	1	1	1	1	2
C4-S-65a	2	1	1	1	2
C4-S-66a	2	1	a	a	3
C4-S-69b	1	1	1	1	2
Seatrain					
GA and PR-class	2	1	1	1	2
Barge					
LASH C8-S-81b	a,g	a,g	a,g	a,g	a,g
LASH C9-S-81d	1	1	a	a	a
LASH lighter	8	7	8	7	12
SEABEE C8-S-82a	a,g	a,g	a,g	a,g	a,g
SEABEE barge	5	5	5	5	8
RORO					
Comet	d,o	d,i,j	i,j	i,j	d,o
C7-S-95a/Maine-class	b	1	a,b	a,b	b
Ponce-class	b,h	h	b,h	b,h	b,h
Great Land-class	b,h	h	b,h	b,h	b,h
Cygnus/Pilot-class	b	1	b	b	b
Meteor	d,o	d,i,j	i,j	i,j	d,o
AmEagle/Condor	b	i,j	b	b	b
MV Ambassador	d	d	1,m	1,m	d
FSS-class	b	1,i	a,b	a,b	b
Cape D-class	b	i,j	a,b	a,b	b
Cape H-class	b	1,i	a,b	a,b	a,b
Container					
C6-S-1w	1,e	1,e	1,e	1,e	2,e
C7-S-68e	1,e	1,e	1,e	1,e	2,e
C8-S-85c	1,e	1,e	a,e	a,e	1,e
Combination					
C5-S-78a	1,e	1,e	a,e	a,e	2,e
C5-S-37e	1,e	1,e	1,e	1,e	2,e

- a = maximum vessel draft limited to berth depth
- b = inadequate apron width
- c = inadequate berth length
- d = no straight stern-ramp facilities
- e = no container-handling equipment
- f = inadequate berth depth, adequate anchorage depth
- g = inadequate channel depth
- h = no shore-based ramps available
- i = insufficient ramp clearance at low tide
- j = insufficient ramp clearance at high tide
- k = excessive ramp angle at low tide
- m = excessive ramp angle at high tide
- n = parallel ramp operation only
- o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

() indicates vessels assigned by analyst

(4) Container Operations. All berths at this terminal could accommodate container shipping. However, no container handling equipment is at the terminal.

b. MHE. An extensive lift-truck fleet with capacities to 50 tons assists the terminal. Miscellaneous equipment, including payloaders, tractors, trailers, and specialized lift accessories, are available also. Other equipment requirements of the terminal are supplied by stevedore contractors.

c. Staging

(1) Open Storage. The terminal contains about 138 acres of paved, open storage at several locations. This consists of 29 acres of dockside open storage and 109 acres of backup open storage.

(2) Covered Storage. The terminal has eight transit sheds with 907,160 square feet of capacity. The Ocean Terminal's seven warehouses provide an additional 915,600 square feet of storage.

d. Security. The terminal is completely fenced. All gates are controlled 24 hours a day by armed Georgia Port Authority Police. A security and fire protection unit patrols the terminal 24 hours a day.

e. Rail Operations. Track in the terminal connects with either CSX or Norfolk Southern Railway. Onsite switching is performed by the port-owned and operated Savannah State Docks Railroad. This railroad operates three switch engines at the terminal. All aprons have twin surface tracks for their entire length. All warehouses and transit sheds at the terminal have either side or central platform-level docks for boxcar unloading.

f. Truck Operations. The transit sheds and warehouses at the terminal provide 108 platform-height loading positions for trucks. No truck end ramps are available.

g. Helicopter Operations. Insufficient open storage areas exist at the Ocean Terminal to support helicopter operations.

h. Marshaling Areas. No designated marshaling areas exist outside the terminal complex.

C. SUPPORT SERVICES

1. Pilotage

Pilots from the Savannah Pilots Association board all incoming vessels 1 mile outside the channel entrance buoy. Docking services are provided by the Georgia Docking Pilots, Inc, as required.

2. Harbor Craft

Atlantic Towing Company performs most of the towing and docking services in the port area. The company operates six tugs with ratings up to 3,900 horsepower. Crescent Towing, Falcon Towing, and Savannah Marine also operate tugs in the harbor area.

3. Stevedores

Among the stevedore contractors providing services in the area are Carolina Shipping Company, Ceres Corporation, Eller and Company, Smith and Kelly Company, and Ryan Walsh, Inc. The number of longshoremen in the Savannah International Longshoreman's Association (ILA) Local was not available for this report. MTMC International Traffic has determined that enough longshoremen will be available to meet mobilization needs.

4. Heavy-Lift Equipment

The port has no specialized heavy-lift equipment.

D. INTERMODAL CONTAINER TRANSFER FACILITY (ICTF)

Two ICTFs are in the Savannah area. The Norfolk Southern Railway operates a facility at the Dillard yard, about 3 miles from the port. A straddle crane is available for container-on-flatcar (COFC) and trailer-on-flatcar (TOFC) operations. CSX Transportation operates the Savannah yard. This yard is about 1 mile southwest of the Ocean Terminal. It has two container forklifts for loading COFC.

E. FUTURE DEVELOPMENTS

A cable-stayed bridge has replaced Talmadge Bridge. This bridge has a minimum of 175 feet of sailing headroom at MHW.

Located 2 miles upriver from Containerport, the Georgia Port Authority's Mulberry Grove property is slated for future development as a complete intermodal facility. Preliminary plans call for up to eight container berths, with construction to begin in the 1990's. Each completed berth will be supported by 100 acres of paved storage. The 2,200-acre Mulberry Grove property will have easy access to I-95 and onsite rail connections.

F. REQUIREMENTS AND RECOMMENDATIONS

1. Requirements

This section analyzes the deployment of a mechanized infantry division through the Port of Savannah. The deployment time is 5 days. The vessels necessary to support ship movement are listed in appendix A. The vessel requirements for each ship mix are:

- Ship Mix 1 (modern ships): 10 ships.
- Ship Mix 2 (combination of ship types): 13 ships.
- Ship Mix 3 (breakbulk ships): 28 ships.
- Ship Mix 4 (fast sealift ships): 8 + 2* ships
from another ship mix

*Unit shipping requirements exceed the current inventory of this ship mix. The use of two additional ships is necessary to deploy the division.

2. Recommendations

Tables II-SAV-5 through II-SAV-7 show the berthing recommendations for ship mixes 1, 2, and 4. When augmented by two side-ramp or slewed-ramp RORO ships, ship mix 4 can deploy the division within 5 days. The use of ship mix 1 results in a deployment time of 8 days; ship mix 2 results in a deployment time of 6 days. This happens because the port has only one straight-stern RORO ramp.

Also, the deployment time exceeds 5 days when ship mix 3 vessels are used. The division's vessel requirement is 28 ships. However, only 20 berths are available.

We recommend that multiple ports of debarkation (such as Charleston, Savannah, and Jacksonville) be used to deploy the division when either ship mix 1, 2, or 3 is used.

TABLE II-SAV-5
 BERTHING RECOMMENDATIONS FOR SHIP MIX 1
 (MECHANIZED INFANTRY DIVISION)

Ship Mix 1 (Modern Ships)		
Terminal:	Garden City Terminal	
Berth:	1-3	4-5
Day 1	Cape D-1	FSS-1 FSS-2
Day 2	Cape H-1	
Day 3		FSS-3 Am Condor
Day 4		Am Eagle
Day 5	Cape D-2	
Day 6	MV Ambassador	
Day 7	Cape H-2	
Day 8		
Day 9		

TABLE II-SAV-6
 BERTHING RECOMMENDATIONS FOR SHIP MIX 2
 (MECHANIZED INFANTRY DIVISION)

Ship Mix 2 (Combination of Ship Types)				
Terminal:	Garden City	Garden City	Garden City	Ocean
Berth:	1-3	4-5	50-53	1-2
Day 1	Cape H-1 FSS-1	FSS-3	C4-S-58a C3-S-33a	C3-S-37c C4-S-65a
Day 2				
Day 3	Cape D-1 FSS-2			
Day 4				
Day 5	Cape D-2 Am Eagle			
Day 6	MV Ambassador			
Day 7				

TABLE II-SAV-7
 BERTHING RECOMMENDATIONS FOR SHIP MIX 4
 (MECHANIZED INFANTRY DIVISION)

Ship Mix 4 (Fast Sealift Ships)			
Terminal:	Garden City	Garden City	Ocean
Berth:	1-3	4-5	13
Day 1	FSS-1 FSS-2 	FSS-3 FSS-4 	Am Eagle
Day 2			Am Condor
Day 3	FSS-5 FSS-6 	FSS-7 FSS-8 	
Day 4			
Day 5			

PORT OF WILMINGTON, NORTH CAROLINA (1990)

A. GENERAL

1. Location and Harbor Description (fig II-WNC-1)

The Port of Wilmington is on the east bank of the Cape Fear River, about 3 miles south of the junction of the Cape Fear and Northeast Cape Fear Rivers. It is 25 miles from the sea and 17 miles north of the Military Ocean Terminal, Sunny Point. The Port of Charleston lies 170 miles to the southwest. The Port of Morehead City is 100 miles to the northeast.

Access to the port from the Atlantic Ocean is via a 40-foot-deep and 500-foot-wide channel. From Southport, North Carolina, to the anchorage basin at the Port of Wilmington, the channel is 400 feet wide and 38 feet deep. The anchorage basin is about 2,000 feet long, 38 feet deep, and from 1,000 to 1,200 feet wide. Good anchorage is also available downstream in the Southport area of the river. Both anchorages are suitable for instream loading operations.

A 38-foot-deep, 1,200-foot-long, and 800-foot-wide turning basin lies off the north end of the terminal. The basin extends to 1,350 feet, with a depth of 35 feet, beyond the 1,200-foot limits.

The mean tidal range at Port of Wilmington is 4.2 feet, with tidal currents averaging 1.7 knots at floodtide, and 1.5 knots at ebftide.

The port maintains a continuous water depth monitoring program and dredges as necessary. Berths A and B have significant silting and require annual dredging.

No bridges cross the Cape Fear River downstream of the terminal. However, a power cable crosses the river about 2-1/2 miles south of the port, restricting sailing headroom to 175 feet 6 inches above mean high water (MHW).

2. Highway Access

The main highways into city of Wilmington are US Route 17 from the north and south, US Route 421 from the north, and US Routes 74 and 76 from the west. Interstate Route 95, the nearest major north-south artery, is about 75 miles to the west.

The intersection of the main highways into the city of Wilmington is about 1.5 miles north of the port. From this intersection, traffic usually takes Front Street and Burnett Boulevard to the port entrances.

3. Rail Access

The Seaboard System (CSX) serves the port with one rail line. The Davisville yard at Navassa, about 25 miles west of the port, is the nearest classification yard.

II-WNC-2

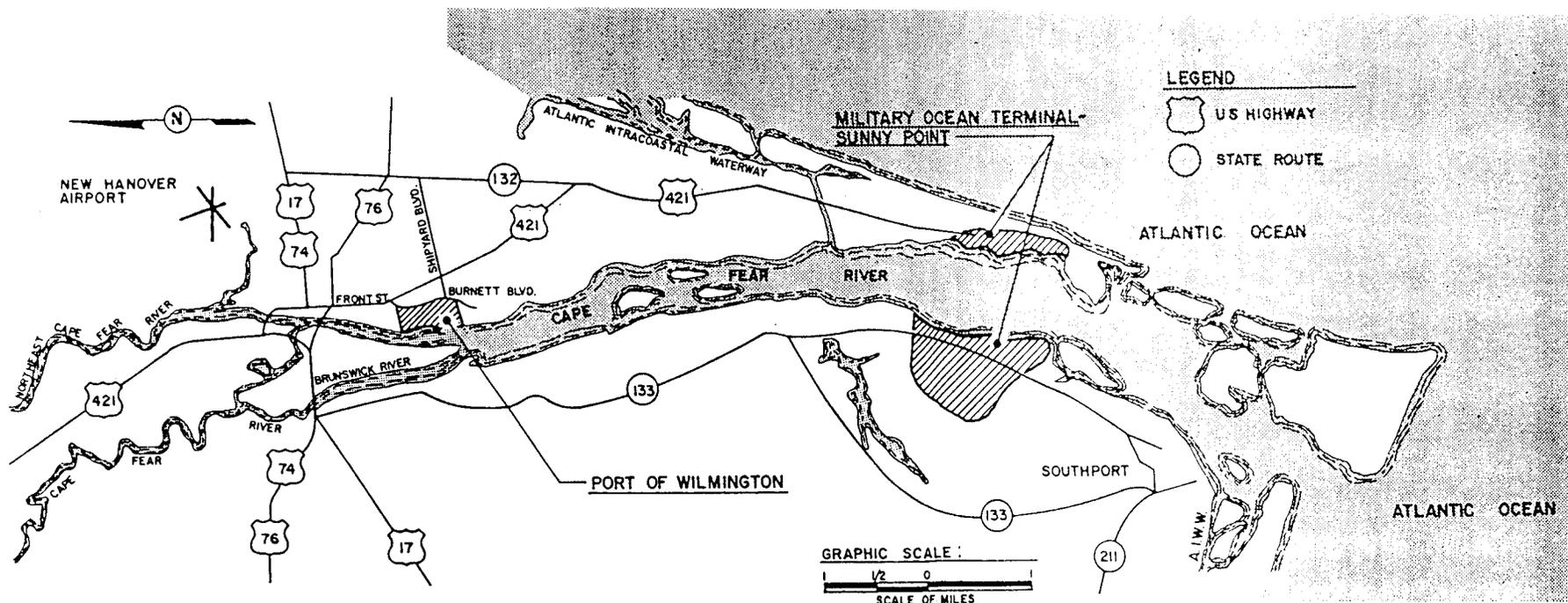


Figure II-WNC-1. Port of Wilmington.

4. Airports

The New Hanover County Airport is about 6 miles north of the port. This airport can handle large cargo carriers and helicopters.

B. PORT FACILITIES (figs II-WNC-2 through II-WNC-4)

1. Berthing

The Port of Wilmington has 6,742 feet of continuous concrete wharf, with 11 berths along the east bank of the Cape Fear River. The berths range in length from 583 to 900 feet. Wharf construction is concrete piling with a compacted-fill apron or concrete apron fronted with a rubber fender system. Dock height averages 12 feet above mean low water (MLW), and the berth depths are 38 feet MLW. Apron widths range from 44 feet, along berths 1 through 4, to 100 feet or more, along the other berths.

Berths A and B and 1 through 5 have two 25-STON, one 115-STON, and one 225-STON gantry cranes for cargo operations.

Berths 5 through 9 have three 40-LTON and two 50-LTON container cranes. The northernmost container crane has an articulated chassis. It can traverse the bend in the crane rails and serve other upstream berths if required. Besides these cranes, the port has a rubber-tired, 140-STON mobile crane.

Adequate fixed lighting is available at each berth for night operations.

Tables II-WNC-1 and II-WNC-2 show the berthing characteristics and capabilities of the terminal. The terminal's ability to support various shipping modes is as follows:

a. Breakbulk Operations. Normally, breakbulk ships load at berths 1 through 5 because they are well supported by transit sheds and gantry cranes. All US-flag vessels listed in appendix A can load at these berths.

b. LASH and SEABEE Operations. The optimal loading locations for LASH lighters and SEABEE barges are berths A and B, where open storage space is available. These berths can support the loading of eight LASH lighters or six SEABEE barges.

The channel and berth depths may restrict pierside loading operations for the SEABEE and large LASH ships. However, these ships can conduct loading operations at the Wilmington anchorage basin or the Southport anchorage.

c. RORO and FSS Operations. Open berths A, B, 7, and 9 are the best areas for loading RORO ships. These berths can load side- and slewed-ramp RORO ships. However, operations on Ponce and Great Land-class and stern-ramp vessels are not possible, because special ramps are not available. Also, tidal variations may limit the loading cycle of some RORO ships because of ramp angle. These restrictions are shown in the berthing capabilities table. One FSS vessel can load at berths A and B, and up to two FSSs can load concurrently at berths 7 through 9, if necessary.

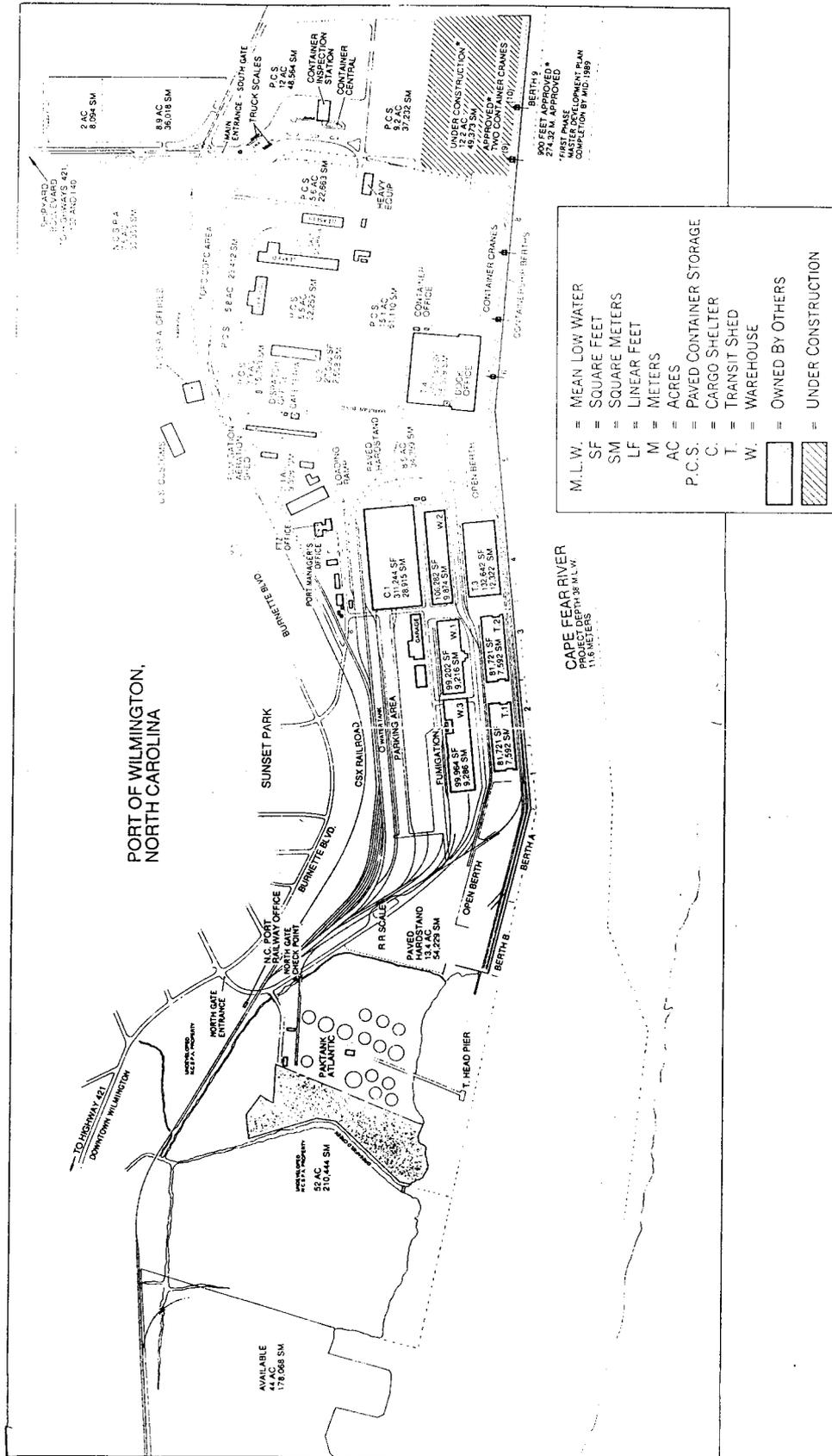


Figure II-WNC-2. Port of Wilmington.

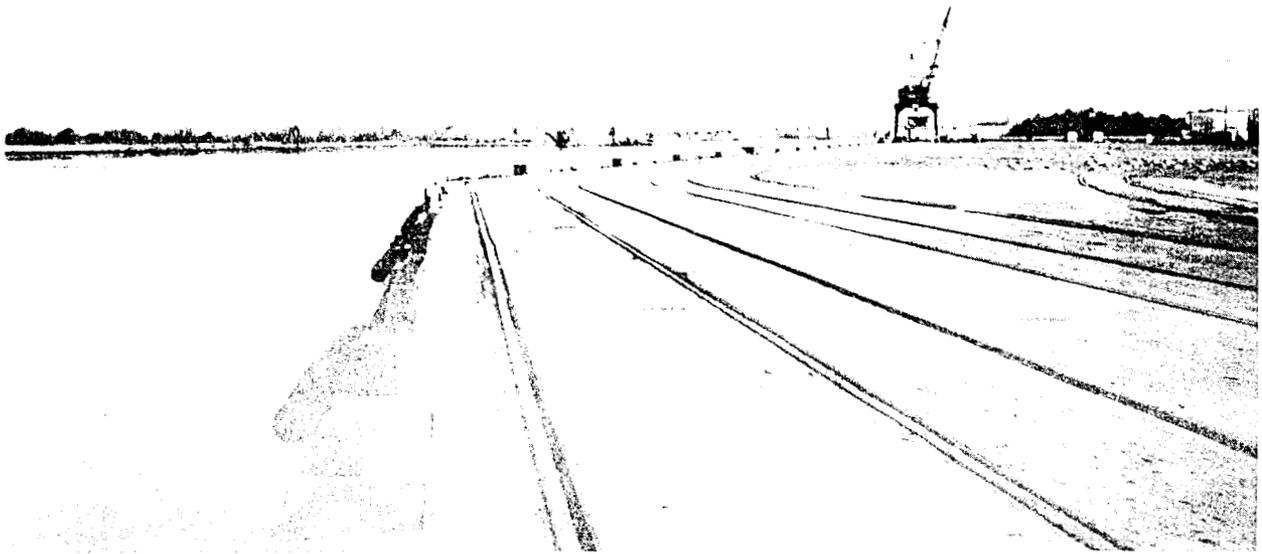


Figure II-WNC-3. Berths A and B.

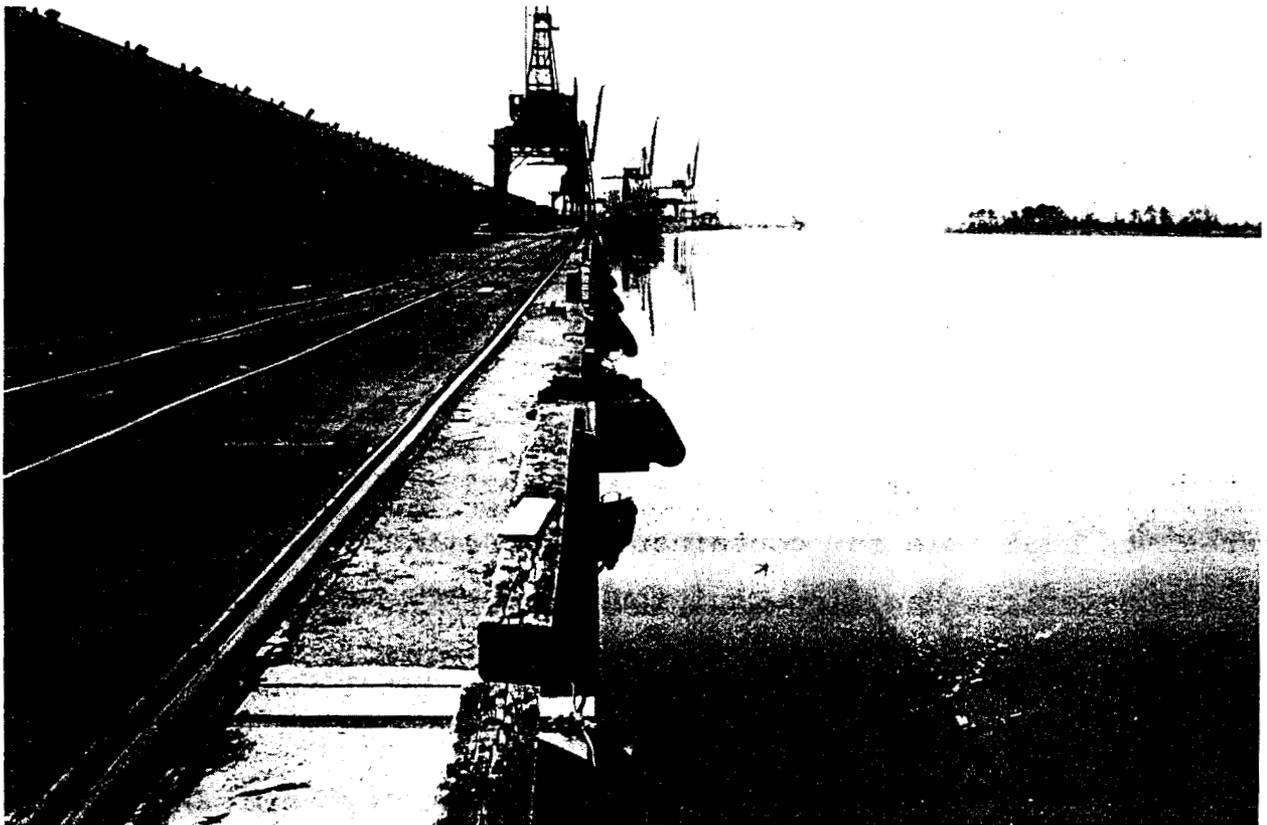


Figure II-WNC-4. Berths 1 through 9.

TABLE II-WNC-1
PORT OF WILMINGTON
BERTH CHARACTERISTICS OF WILMINGTON

Characteristics	Berths				
	A & B	1-4	5	6	7-9
Length (ft)	1,213	2,100	780	583	2,066
Depth alongside at MLW (ft)	38	38	38	38	38
Deck strength (psf)	500	500	500	800	800
Apron width (ft)	Open	44	Open	100	Open
Apron height above MLW (ft)	12	12	12	12	12
Number of container cranes	0	0	1	1	3
Number of wharf cranes	2	1	1	0	0
Apron lighting	Yes	Yes	Yes	Yes	Yes
Straight-stern RORO facilities	No	No	No	No	No
Apron length served by rail (ft)	1,213	2,100	780	583	2,066

Notes:

1. Terminal open storage area is 109 acres
2. Terminal covered storage area is 1212959 square feet

d. Container Operations. Berths 5 through 9 provide the best container berths. They have good rail and truck access and access to paved storage next to the berths. Also, five container cranes are available for container operations.

2. Materials Handling Equipment (MHE)

The MHE owned by the Port of Wilmington is in table II-WNC-3. Additional MHE is available from local contractors.

3. Staging

a. Open Storage. The port has about 109 acres of paved, or marl-surfaced, open staging areas. These areas are shown in figure II-WNC-2.

b. Covered Storage. The port has more than 1,212,000 square feet of covered space. Specific characteristics of these facilities are in table II-WNC-4. All warehouses and transit sheds have both road and rail access.

**TABLE II-WNC-2
PORT OF WILMINGTON
SUMMARY OF BERTHING CAPABILITIES OF WILMINGTON**

Vessel	Berths				
	A & B	1-4	5	6	7-9
Breakbulk					
C3-S-33a	2	4	1	1	4
C3-S-37c	2	4	1	1	3
C3-S-37d	2	4	1	1	3
C3-S-38a	2	4	1	1	3
C4-S-1a	2	3	1	1	3
C4-S-1qb and 1u	2	3	1	1	3
C4-S-58a	2	3	1	1	3
C4-S-65a	2	3	1	1	3
C4-S-66a	2	3	1	1	3
C4-S-69b	2	3	1	1	3
Seatrain					
GA and PR-class	2	3	1	1	3
Barge					
LASH C8-S-81b	a,g	a,g	a,c,g	a,c,g	a,g
LASH C9-S-81d	1	2	c	c	2
LASH lighter	8	15	5	4	14
SEABEE C8-S-82a	a,g	a,g	a,c,g	a,c,g	a,g
SEABEE barge	6	10	3	2	10
RORO					
Comet	d,i,j	d,o	d,i,j	d,i,j	d,i,j
C7-S-95a/Maine-class	1	b	1	c	2
Ponce-class	h	b,h	h	c,h	h
Great Land-class	h	b,h	c,h	c,h	h
Cygnus/Pilot-class	1	b	1	c	3
Meteor	d,i,j	d,o	d,i,j	d,i,j	d,i,j
AmEagle/Condor	i,j	b	i,j	c	i,j
MV Ambassador	d	d	d	d	d
FSS-class	1	b	c	c	2
Cape D-class	i,j	b	i,j	c	i,j
Cape H-class	1	b	1	c	2
Container					
C6-S-1w	1,e	3,e	1	c	3
C7-S-68e	1,e	2,e	1	c	2
C8-S-85c	1,e	2,e	c	c	2
Combination					
C5-S-78a	1,e	3,e	1	c	3
C5-S-37e	1,e	3,e	1	c	3

- a = maximum vessel draft limited to berth depth
- b = inadequate apron width
- c = inadequate berth length
- d = no straight stern-ramp facilities
- e = no container-handling equipment
- f = inadequate berth depth, adequate anchorage depth
- g = inadequate channel depth
- h = no shore-based ramps available
- i = insufficient ramp clearance at low tide
- j = insufficient ramp clearance at high tide
- k = excessive ramp angle at low tide
- m = excessive ramp angle at high tide
- n = parallel ramp operation only
- o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

() indicates vessels assigned by analyst

TABLE II-WNC-3
MATERIALS HANDLING EQUIPMENT

Type of Equipment	Capacity (STON)	Quantity
Mobile crane	140	1
Cherry picker hydraulic crane	7	1
Forklift	26	2
Forklift	7.5-10	20
Forklift	2-5	52
Straddle carrier	30	6
Yard hustler tractor	30	8
Flatbed trailer, 40-ft	22.5	16
Road trailer, 40-ft, with tractor	22.5	5
Van, 40-ft, with tractor	20	1
Flatbed trailer, 60-ft	25	1
Trucks	0.5-3	57

TABLE II-WNC-4
COVERED STORAGE

Storage Facility Designation	Area (square feet)	Number of Unloading Positions (nonconcurrent use)		Current Use
		Trucks	Railcars	
T-shed 1	81,721	6	8	General cargo
T-shed 2	81,721	6	8	General cargo
T-shed 3	132,642	6	9	General cargo
T-shed 4	273,183	6	6	General cargo
Warehouse 1	99,202	12	9	General cargo
Warehouse 2	106,282	18	11	General cargo
Warehouse 3	99,964	4	11	General cargo
Cargo shelter C-1	311,244	10	0	General cargo
Cargo shelter C-2	27,000	10	0	Trailers

4. Security

A 6-foot chain link fence topped with three strands of barbed wire provides terminal perimeter security. Some areas of the perimeter fence do not have lighting. However, the North Carolina State Port Police provides 24-hour patrol service and gate security.

5. Rail Operations

Three 1,200-horsepower, diesel-electric locomotives or a trackmobile move railcars within the terminal area. The railcar holding capacity is 400 railcars. The switching yard at Navassa has a capacity for an additional 1,750 railcars.

Depressed tracks serve the rear of the transit sheds and at least one side of each warehouse. All ship berths have twin marginal tracks.

A portable steel end ramp, a fixed concrete ramp, and several spanner sets are available for circus-style offloading. The locations of the end ramps appear in figure II-WNC-2.

6. Truck Operations

Commercial trucks usually enter and leave the port through the two-lane Main Gate or the new eight-lane South Gate. North Gate is mainly an exit. All of these gate areas have a weight scale.

All warehouses and transit sheds have multiple depressed roadway stations for offloading. A dock is available at open berths A and B to offload trucks.

7. Helicopter Operations

No adequate areas exist for landing helicopters. However, space is available to stage helicopters near the open berths.

8. Marshaling Areas

Three sites are available near the port for marshaling areas. The Legion Stadium area, consisting of 27.5 acres, is 2 miles from the port. New Hanover County Fairgrounds has 20 unpaved acres. It is 3 miles south of Legion Stadium, on Carolina Beach Road. The National Guard Armory, on North Kerr Avenue, is a 40-acre complex. It consists of a three-story masonry building, 14 primary storage areas, and an ammunition storage area. The complex also has its own water supply treatment plant and emergency power supply.

C. SUPPORT SERVICES

1. Pilotage

Commercial pilots meet all incoming vessels at the sea buoy.

2. Harbor Craft

Two companies in the port area provide shifting, docking, and towing services to the port. Tugboat sizes range from 600 to 4,100 horsepower.

3. Stevedores

Up to 25 stevedore gangs are available in the local area. However, the Military Ocean Terminal, Sunny Point, with its considerably higher wages, may reduce the manpower availability at the Port of Wilmington during an emergency.

MTMC International Traffic has determined that enough long-shoremen are available to meet mobilization needs.

4. Heavy-Lift Equipment

The port owns and operates four gantry cranes, ranging from 25-STON to 225-STON capacity.

D. INTERMODAL CONTAINER TRANSFER FACILITIES (ICTF)

Except for the trailer-on-flatcar/container-on-flatcar (TOFC/COFC) area in the port complex, no ICTFs are in the Wilmington area. However, the North Carolina State Ports Authority does operate an ICTF at Greensboro and Charlotte. CSX provides scheduled service from these facilities to the Port of Wilmington.

E. FUTURE DEVELOPMENT

Interstate Route 40 between Raleigh and Wilmington is under construction and scheduled for completion in late 1990. This route will also intersect Interstate Route 95 and significantly improve highway access to Wilmington.

F. REQUIREMENTS AND RECOMMENDATIONS

1. Requirements

This section analyzes the deployment of a light infantry division from the port of Wilmington. The outloading time is 5 days. The vessels necessary to support deployment are listed in appendix A. The vessel requirements for each ship mix are:

- Ship mix 1 (modern ships): 3 ships.
- Ship mix 2 (combination of ship types): 5* ships.
- Ship mix 3 (breakbulk ships): 9 ships.
- Ship mix 4 (fast sealift ships): 3 ships.

*When FSS or RORO vessels are available, only three ships are required.

2. Recommendations

Tables II-WNC-5 and II-WNC-6 show the berthing recommendations for all ship mixes. The port can load all ship mixes within 5 days. When FSS vessels are not available for ship mixes 1 and 2, slewed- or side-ramp RORO ships permit timely loading.

TABLE II-WNC-5
 BERTHING RECOMMENDATIONS FOR SHIP MIXES 1, 2 AND 4
 (LIGHT INFANTRY DIVISION)

Ship Mixes: 1 (Modern ships) 2 (Combination of ships types) 4 (Fast sealift ships)		
Terminal:	Wilmington	Wilmington
Berth:	A and B	7 - 9
Day 1	FSS-1 	FSS-1 FSS-3
Day 2		
Day 3		
Day 4		
Day 5		

TABLE II-WNC-6
 BERTHING RECOMMENDATIONS FOR SHIP MIX 3
 (LIGHT INFANTRY DIVISION)

Ship Mix 3 (Breakbulk ships)					
Terminal:	Wilmington				
Berth:	A and B	1 to 4	5	6	7 to 9
Day 1	C3-S-33a C3-S-33a	C4-S-65a C4-S-65a	C4-S-65a	C4-S-58a	C3-S-33a C4-S-58a C4-S-65a
Day 2					
Day 3					
Day 4					
Day 5					

APPENDIX

EAST COAST UNIT SEALIFT REQUIREMENTS

A. GENERAL

This appendix describes the basic sealift requirements for each type of unit identified to deploy through the east coast ports analyzed in this study (table A-1). The number and possible names of vessels for several representative ship mixes are identified. Also, the associated vessel support systems for each representative ship mix are noted in the ship mix tables. This report concentrates on division-level movements through the east coast ports.

TABLE A-1
EAST COAST UNIT EQUIPMENT QUANTITIES

Unit/Toe No.	Maneuver Units	Supplies and Equipment	Qty	Helo Landing and Processing Area	Unit (ft)	Staging Area for 100 Pct of Unit (sq ft)	MTON	STON
Light Inf Div 77000L000	9 Inf Bn	Vehicles	2,922	5	313,731	392,164	49,488	10,056
		Aircraft	115		32,809	52,494	6,995	234
		MILVANS	389		31,123	46,995	4,063	709
		Other			25,765	32,206	3,607	1,282
					403,428	523,860	64,153	12,281
Airborne Div 57000L000	9 Inf Bn	Vehicles	4,608	5	422,568	528,210	63,648	12,552
		Aircraft	119		35,580	56,928	7,689	431
		MILVANS	545		44,353	66,973	6,404	1,232
		Other			23,906	29,882	4,352	1,560
					526,407	681,993	82,093	15,775
Air Assault Div 67000L100	9 Inf Bn	Vehicles	5,766	5	614,562	768,202	100,431	20,561
		Aircraft	386		127,508	204,013	28,956	1,427
		MILVANS	957		76,490	115,500	9,288	1,579
		Other			45,072	56,340	6,155	1,798
					863,632	1,144,055	144,830	25,365
Armored Div 87000J430	6 Tank Bn 4 Mech Bn	Vehicles	7,752	5	1,231,187	1,538,984	239,630	79,853
		Aircraft	127		37,707	60,331	8,112	447
		MILVANS	710		56,744	85,683	7,095	1,397
		Other	12		57,058	71,322	9,348	2,481
					1,382,697	1,756,320	264,186	84,178
Armored Cavalry Regt 17051H010	NA	Vehicles	1,616	5	256,248	320,310	50,143	17,113
		Aircraft	81		21,794	34,870	4,713	155
		MILVANS	137		10,948	16,531	1,233	279
		Other			19,391	24,239	2,588	764
					308,381	395,950	58,677	18,311
Heavy Mech Div 87000J420	5 Tank Bn 5 Mech Bn	Vehicles	7,656	5	1,169,500	1,461,875	230,359	71,048
		Aircraft	141		38,268	61,229	8,283	311
		MILVANS	12		56,197	84,857	7,243	1,236
		Other			64,092	80,115	9,654	2,568
					1,328,058	1,688,076	255,539	75,163

B. VESSELS AND BERTH REQUIREMENTS

The number of vessels required for each ship mix is determined by a vessel loading simulation (table A-2). The berth requirements for east coast ports are based on the ships' characteristics. The vessels are listed in tables A-3 through A-6. Ships are drawn from the Military Sealift Command (MSC), the Ready Reserve Force (RRF), and the Sealift Readiness Program (SRP). All ships used in this appendix are described in MTMCTEA Pamphlet 700-4, Vessel Characteristics for Shiploading, September 1991, and are expected to be available for east coast use. The ship mixes consist of the following elements:

TABLE A-2
EAST COAST VESSEL REQUIREMENTS

Number of Ships Required for Movement Through Port				
Unit	Ship Mix 1 (ships)	Ship Mix 2 (ships)	Ship Mix 3 (ships)	Ship Mix 4 (ships)
Armored Div	9	12	27	8
Air Assault Div	6	9	18	6
Infantry Mech Div	10	13	28	8+2*
Light Infantry Div	3	5	9	3

*Unit shipping requirement exceeds current inventories of this ship mix. The current ship inventory and the additional ships needed are indicated.

TABLE A-3
EAST COAST VESSEL AND BERTH REQUIREMENTS
SHIP MIX 1 (MODERN SHIPS)

Representative Ship	Berth Required for Each Ship (ft)	Days Required to Load Each Ship	Minimum Apron Width (ft)	Minimum Depth Alongside (ft)	Cargo-Handling Requirements
FSS - USNS Algol	995	2	60	38	a
FSS - USNS Denebola	995	2	60	38	a
Cape Decision	730	1.5	80	35	b
American Eagle	685	1	100	32	a
Cape Henry	800	2	100	38	b
Cape Domingo	730	1.5	80	35	b
American Condor	685	1	100	32	a
MV Ambassador	605	1	80	32	b
FSS - USNS Capella	995	2	60	38	a
Cape Horn	800	2	100	38	b

Legend:
a - Shoreside cranes with container-handling apparatus are desirable.
b - Ship requires stern-ramp compatibility at seaports of embarkation/debarkation.

TABLE A-4
EAST COAST VESSEL AND BERTH REQUIREMENTS
SHIP MIX 2 (COMBINATION OF SHIP TYPES)

Representative Ship	Berth Required for Each Ship (ft)	Days Required to Load Each Ship	Minimum Apron Width (ft)	Minimum Depth Alongside (ft)	Cargo-Handling Requirement
C3-S-37D	545	4	20	32	Standard ship gear
FSS - USNS Algol	995	2	60	38	a
C4-S-58A	625	4	20	33	Standard ship gear
C3-S-33A	535	4	20	33	Standard ship gear
American Eagle	685	1	100	32	a
Cape Domingo	730	1.5	80	35	b
FSS - USNS Denebola	995	2	60	38	a
C4-S-65A	610	4	20	32	Standard ship gear
C3-S-37C	545	4	20	34	Standard ship gear
MV Ambassador	605	1	80	32	b
FSS - USNS Capella	995	2	60	38	a
Cape Henry	800	2	100	38	b
Cape Decision	730	1.5	80	35	b
C3-S-38A	535	4	20	30	Standard ship gear
C4-S-58A	625	4	20	33	Standard ship gear

Legend:
a - Shoreside cranes with container-handling apparatus are desirable.
b - Ship requires stern-ramp compatibility at seaports of embarkation/debarkation.

TABLE A-5
EAST COAST VESSEL AND BERTH REQUIREMENTS
SHIP MIX 3 (OLDER BREAKBULK SHIPS)

Representative Ship	Berth Required for Each Ship (ft)	Days Required to Load Each Ship	Minimum Apron Width (ft)	Minimum Depth Alongside (ft)	Cargo-Handling Requirement
C4-S-65A	610	4	20	32	All vessels have standard ship gear.
C4-S-65A	610	4	20	32	
C4-S-65A	610	4	20	32	
C3-S-33A	535	4	20	33	
C3-S-33A	535	4	20	33	
C3-S-37D	645	4	20	32	
C3-S-37D	645	4	20	32	
C3-S-37D	645	4	20	32	
C3-S-37C	645	4	20	34	
C4-S-58A	725	4	20	33	
C4-S-58A	725	4	20	33	
C4-S-58A	725	4	20	33	
C3-S-38A	535	4	20	30	
C3-S-38A	535	4	20	30	
C3-S-38A	535	4	20	30	
C4-S-65A	610	4	20	32	
C4-S-65A	610	4	20	32	
C4-S-65A	610	4	20	32	
C3-S-33A	535	4	20	33	
C3-S-33A	535	4	20	33	
C3-S-37D	545	4	20	32	
C3-S-37D	545	4	20	32	
C3-S-37C	545	4	20	34	
C3-S-37C	545	4	20	34	
C4-S-58A	625	4	20	33	
C4-S-58A	625	4	20	33	
C4-S-1U	615	4	20	34	
C3-S-38A	535	4	20	30	
C4-S-1A	615	4	20	32	
C4-S-1A	615	4	20	32	

TABLE A-6
EAST COAST VESSEL AND BERTH REQUIREMENTS
SHIP MIX 4 (FAST SEALIFT SHIPS)

Representative Ship	Berth Required for Each Ship (ft)	Days Required to Load Each Ship	Minimum Apron Width (ft)	Minimum Depth Alongside (ft)	Cargo-Handling Requirement
FSS - USNS Algol	995	2	60	38	Shoreside cranes with container-handling apparatus are desirable.
FSS - USNS Denebola	995	2	60	38	
FSS - USNS Capella	995	2	60	38	
FSS - USNS Bellatrix	995	2	60	38	
FSS - USNS Regulus	995	2	60	38	
FSS - USNS Altair	995	2	60	38	
FSS - USNS Antares	995	2	60	38	
FSS - USNS Pollux	995	2	60	38	

- Ship Mix 1 (table A-3) - several types of modern ships that might arrive at an east coast port for a deployment. Ship mix 1 has a priority for the use of more modern ships, such as RORO, combination, and other selected ships.

- Ship Mix 2 (table A-4) - combination of ship types.
- Ship Mix 3 (table A-5) - older breakbulk vessels.
- Ship Mix 4 (table A-6) - fast sealift ships (FSS).

C. SUMMARY

The ships used for the previous analyses were selected at random. Requirements may vary based on the actual vessels used and cargo to be transported.

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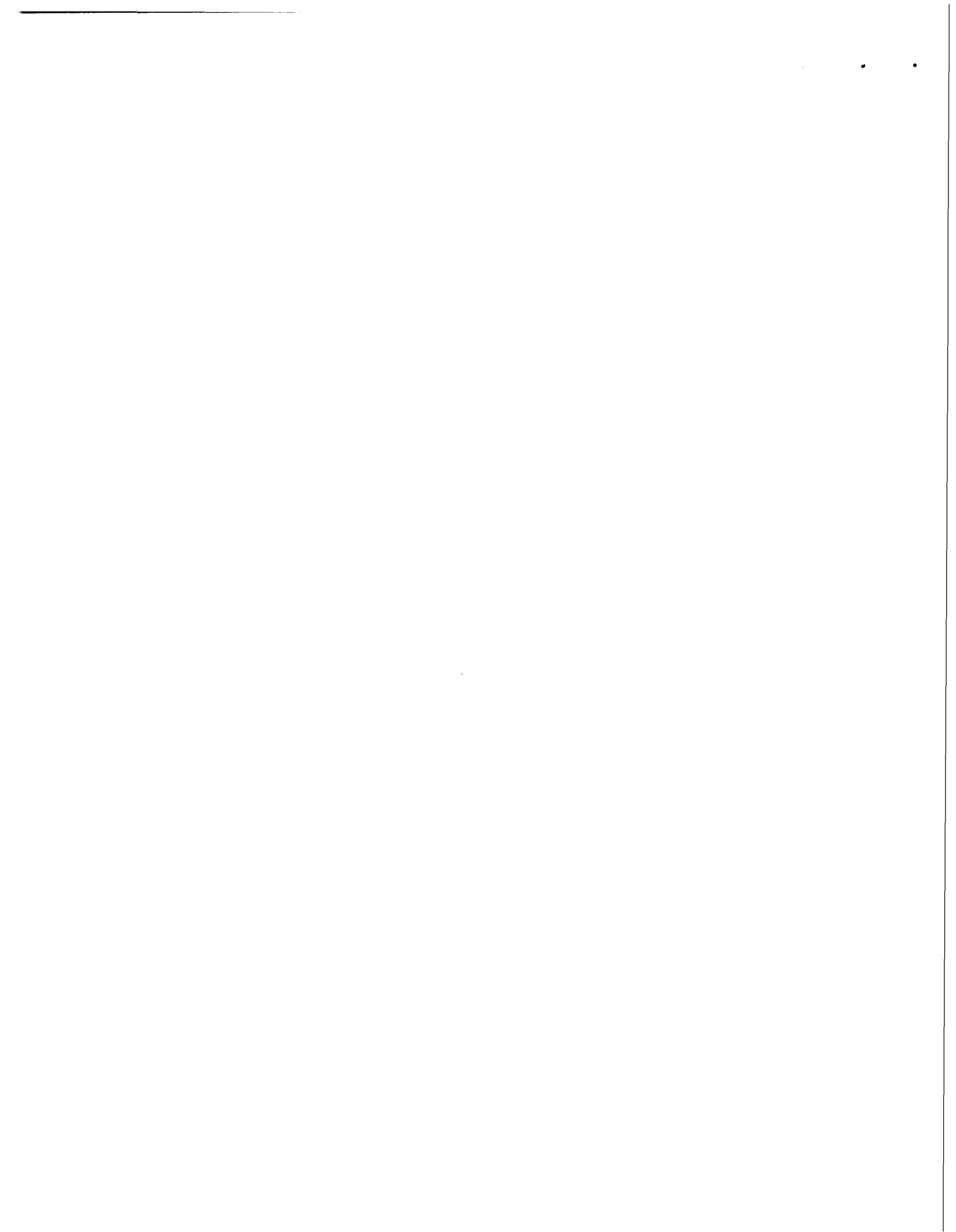
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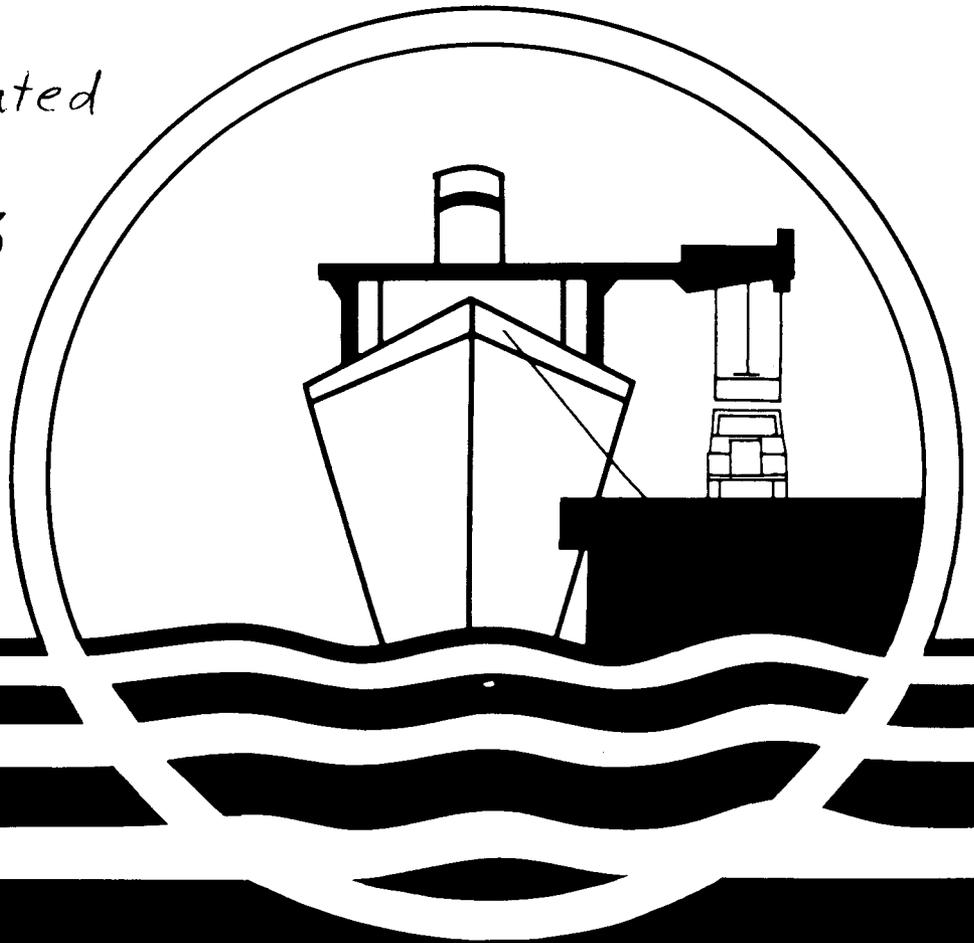


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GULF COAST PORTS FOR NATIONAL DEFENSE

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An Analysis of Unit Deployments Through US Ports

OCTOBER 1989



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11

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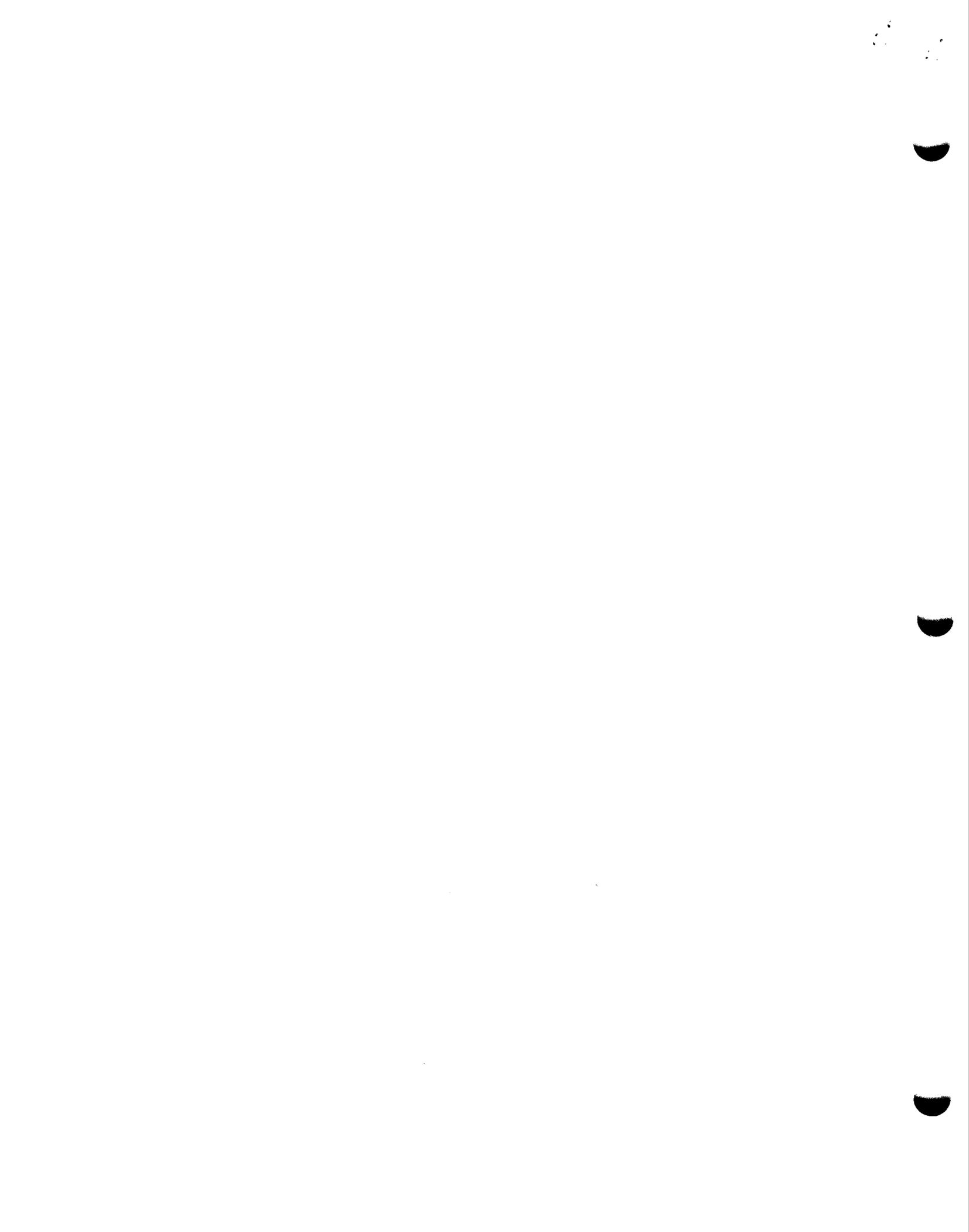
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PORT OF CORPUS CHRISTI (1988)

A. GENERAL

1. *Location and Harbor Description (fig IV-COR-1)*

The Port of Corpus Christi, Texas, is in the southeast portion of the State, about 21 miles west of the Gulf of Mexico, at the Corpus Christi Inner Harbor (CCIH). Corpus Christi Bay separates the CCIH from the Gulf of Mexico. Corpus Christi Bay is about 14 miles long and about 12 miles wide. The entrance to the CCIH is at the extreme western portion of the bay. Mustang Island protects Corpus Christi from the open waters of the Gulf of Mexico.

The CCIH consists of 9 miles of dredged channels and basins. Port facilities are along both the south and north banks of the harbor. The CCIH includes five turning basins. These turning basins average 1,000 feet in diameter and have drafts of 42 to 45 feet mean low water (MLW).

Access to the Port of Corpus Christi is via the Corpus Christi Ship Channel. This channel extends from the Gulf of Mexico, through the Aransas Pass, across the Corpus Christi Bay, and into the CCIH. The channel width varies from 400 to 700 feet. It has a project depth of 45 feet MLW.

Vessels can anchor in the Gulf of Mexico off Aransas Pass, in the pass fairway anchorages. When special circumstances arise, vessels may anchor for a short time in the turning basins.

The mean tidal range for the Port of Corpus Christi is about 1.5 feet with an extreme of 2.0 feet.

The only bridge that crosses the Corpus Christi ship channel is the Corpus Christi Harbor Bridge (US Route 181). This fixed, cantilevered bridge crosses the channel at the mouth of the CCIH. It has a vertical clearance of 138 feet mean high water (MHW).

2. *Highway Access*

The Port of Corpus Christi has access to Interstate Route 37, US 181, and Texas Routes 44, 407, and 286. Access to the south bank facilities from I-37 is via North Port Avenue to Harbor Drive. Access to the north bank facilities from US 181 is via the East Causeway to Market Street to Navigation Boulevard. Traffic flow to and from the port is very smooth, with little traffic congestion.

3. *Rail Access*

The Corpus Christi Terminal Association (CCTA) serves the public docks at the Port of Corpus Christi. The CCTA is composed of the Southern Pacific Transportation, the Texas-Mexican Railway, and the Union Pacific Railroad Companies. The CCTA provides the port with 26 miles of rail trackage. One 65-ton, one 45-ton, and one 25-ton diesel locomotive serve the port.

The four port storage railyards are the CCTA Interchange, Grain Elevator, North Bank, and Bulk Materials. Capacity of these railyards ranges from 75 to 200 railcars.

Switching responsibilities are rotated on an annual basis.

4. *Airports*

Two main airfields serve the Port of Corpus Christi. These are Corpus Christi International Airport and Corpus Christi Naval Air Station.

Corpus Christi International Airport is about 6 miles southwest of the port. The airport has two asphalt runways. The longer runway is 7,508 feet long by 150 feet wide.

Corpus Christi Naval Air Station is about 11 miles southeast of the port. The air station has four asphalt runways. The longest runway is 8,000 feet long by 200 feet wide.

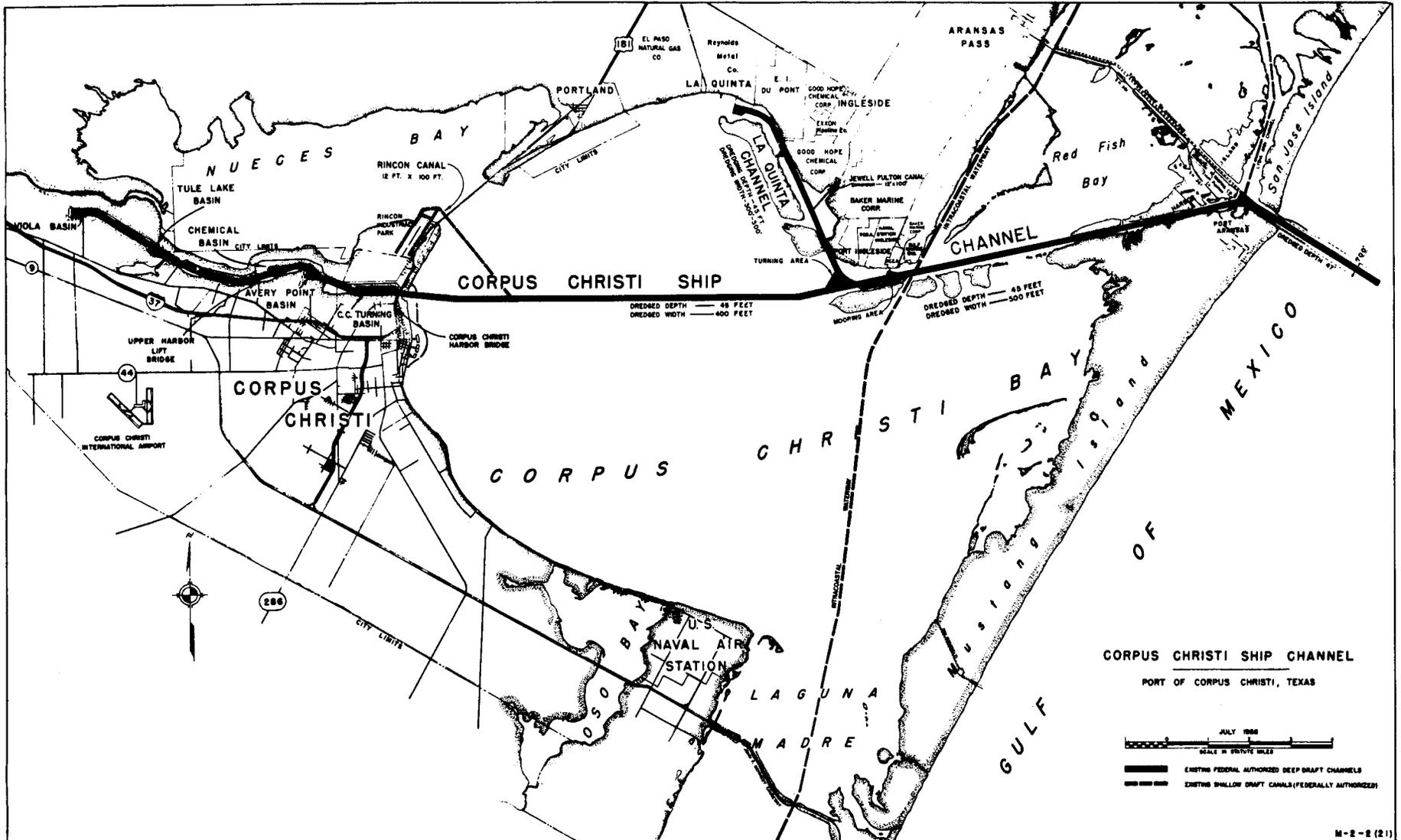


Figure IV-COR-1. Port of Corpus Christi.

B. PORT FACILITIES (fig IV-COR-2)

1. Berthing

The public, general cargo docks at the Port of Corpus Christi consist of 3 marginal wharves with a total of 13 berths (fig IV-COR-3). On the south bank of the CCIH are cargo docks 1 through 6, 8, 14, and 15 (figs IV-COR-4 and IV-COR-5). Cargo docks 1 through 6 provide 1,824 feet of continuous berthing space. Cargo docks 8, 14, and 15 provide 1,315 feet of continuous berthing space.

Cargo docks 9 through 12 are on the north bank (fig IV-COR-6). Cargo dock 9 is 660 feet long. Cargo docks 10 and 11 provide 662 feet of continuous berthing space. Cargo dock 12, which is used as a barge loading station, is 200 feet long (fig IV-COR-7).

Apron width ranges from 22 feet to open. Apron height averages 15 feet above MLW. Cargo docks 1 through 6 and 9 through 11 have transit sheds running their entire length.

Wharf construction consists of timber or concrete piles supporting concrete-decked wharves. All berths are fronted by a timber fendering system. Deck strengths range from 500 to 800 pounds per square foot.

The public cargo docks are served by eight diesel locomotive cranes (fig IV-COR-8). Cargo dock 14 has a 100-ton electric, stiff-leg crane (fig IV-COR-9).

Each wharf is adequately lit for night operations. Tables IV-COR-1 and IV-COR-2 show the berthing characteristics and capabilities of the port. The port's ability to support various shipping modes is described below.

a. Breakbulk Operations. Breakbulk operations can be performed at all docks. Cargo docks 1 through 6, 9 through 11, and 15 are well supported with transit sheds. Ship's gear and mobile cranes are the methods used for handling cargo.

b. LASH and SEABEE Operations. All cargo docks have LASH and SEABEE lighter loading capability. The port has 31 LASH lighter or 22 SEABEE barge loading positions. Because of channel and harbor draft limitations, mother ships would have to discharge and retrieve their respective lighters instream. Instream operations would have to be conducted east of the Aransas Pass in the Gulf of Mexico.

c. RORO and FSS Operations. RORO operations are restricted to C7-S-95a/Maine-class and Cygnus/Pilot-class RORO vessels. These vessels can dock at cargo docks 8 through 15. The port has no straight stern ramp facilities or portable side RORO ramps. Cargo docks 8 through 15 are also the best location for FSS operations. Table IV-COR-2 gives detailed information on the RORO berthing capabilities of the port. It also lists any restrictions that may apply.

d. Container Operations. Limited container operations are conducted at cargo dock 14. Containers are discharged or loaded from flatbeds and chassis. Container handling equipment includes a 77,000-pound-capacity Kalmar top-lift and a 100-ton stiff-leg crane.

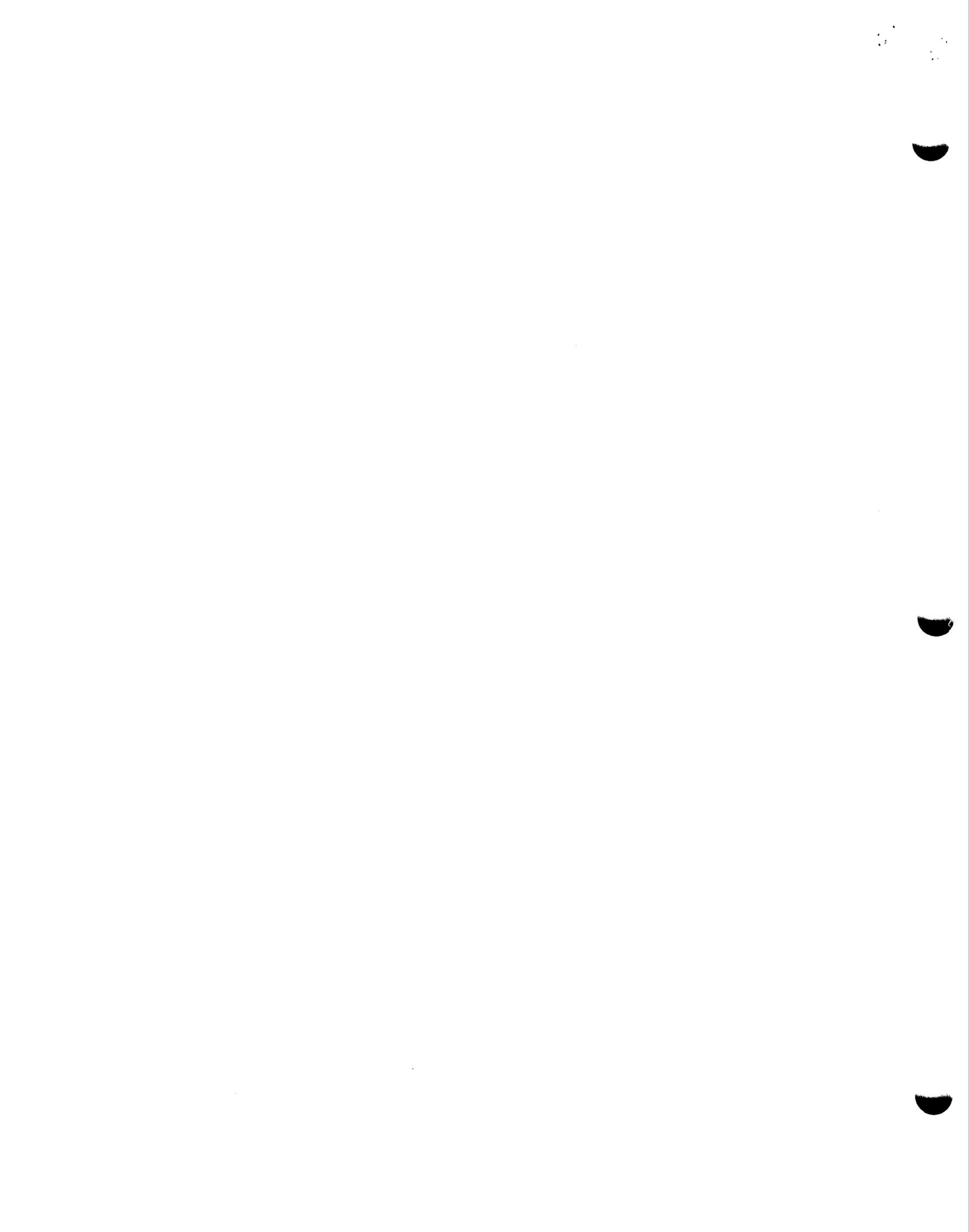
2. Materials Handling Equipment (MHE)

Table IV-COR-3 summarizes the MHE currently in use at the port. Additional MHE is readily available from any one of three stevedoring companies serving the port.

3. Staging

a. Open Storage. The Port of Corpus Christi has 43 acres of open storage. Most of the open storage areas are across from cargo docks 9 through 11 and 15 and the Rincon Industrial Park. These areas are mainly used for storing of steel piping.

Behind cargo dock 14 is a recently constructed container storage yard. This 6-acre paved storage area is completely fenced and lit.



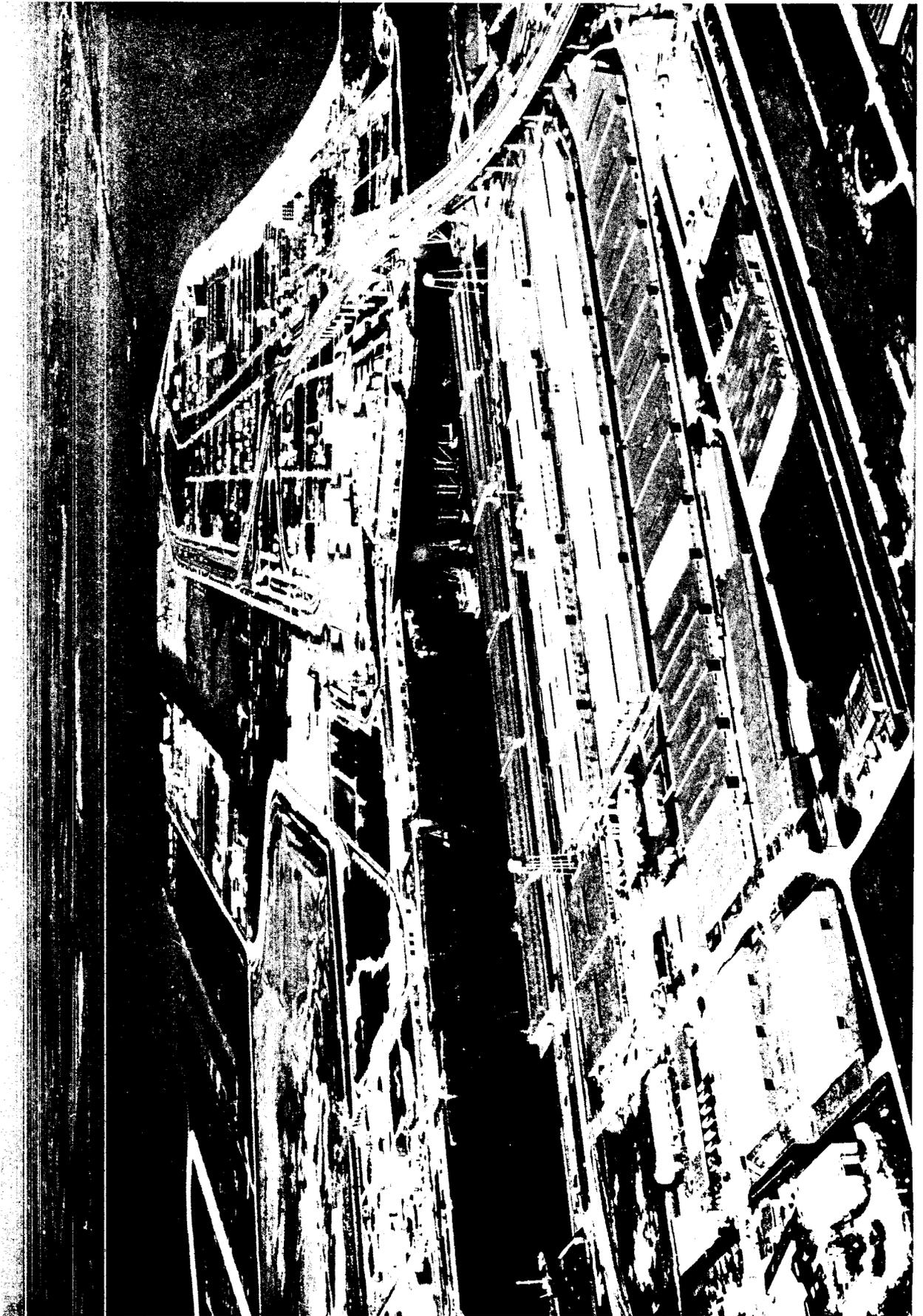


Figure IV-COR-3. Aerial view of Corpus Christi inner harbor, public docks.



Figure IV-COR-4. Cargo docks 1 through 6.

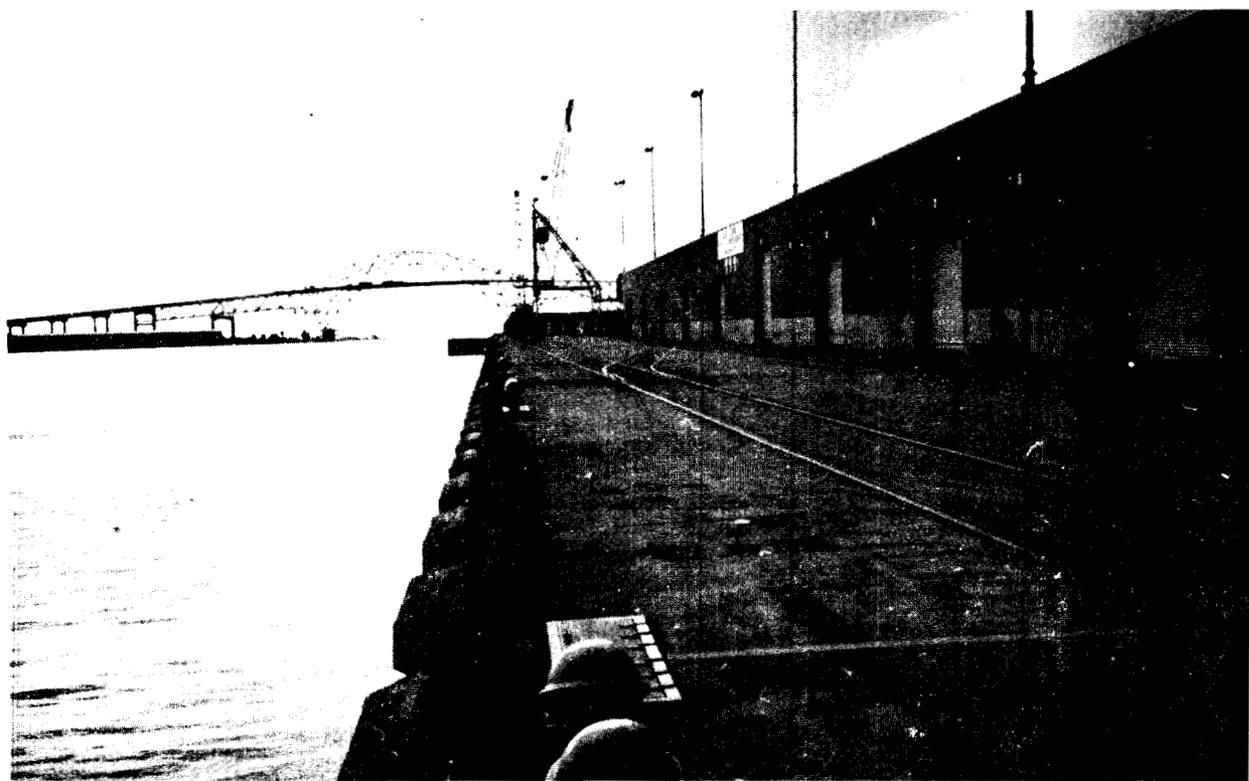


Figure IV-COR-5. Cargo docks 8, 14, and 15.

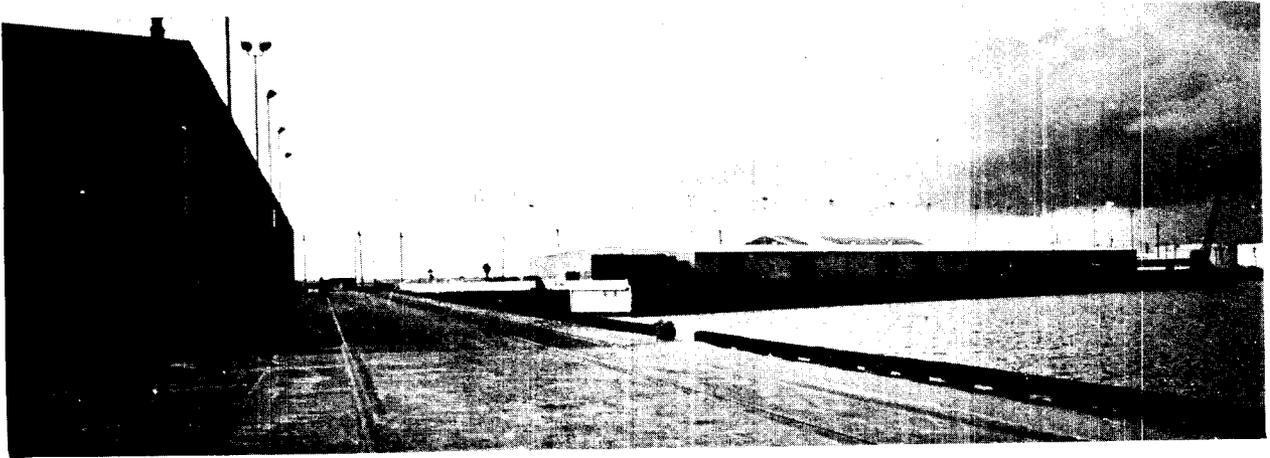


Figure IV-COR-6. Cargo docks 9 through 11.

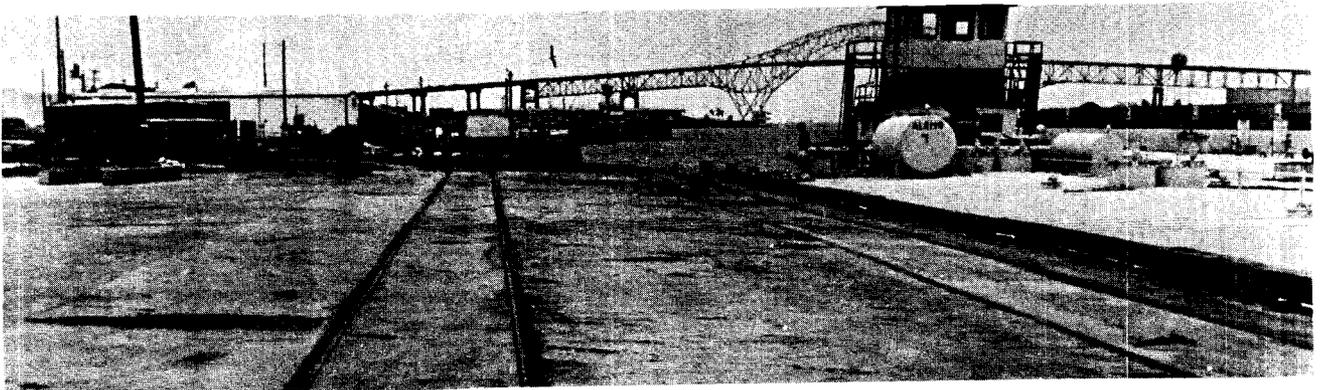


Figure IV-COR-7. Cargo dock 12.

IV-COR-9

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Figure IV-COR-8. Locomotive crane.

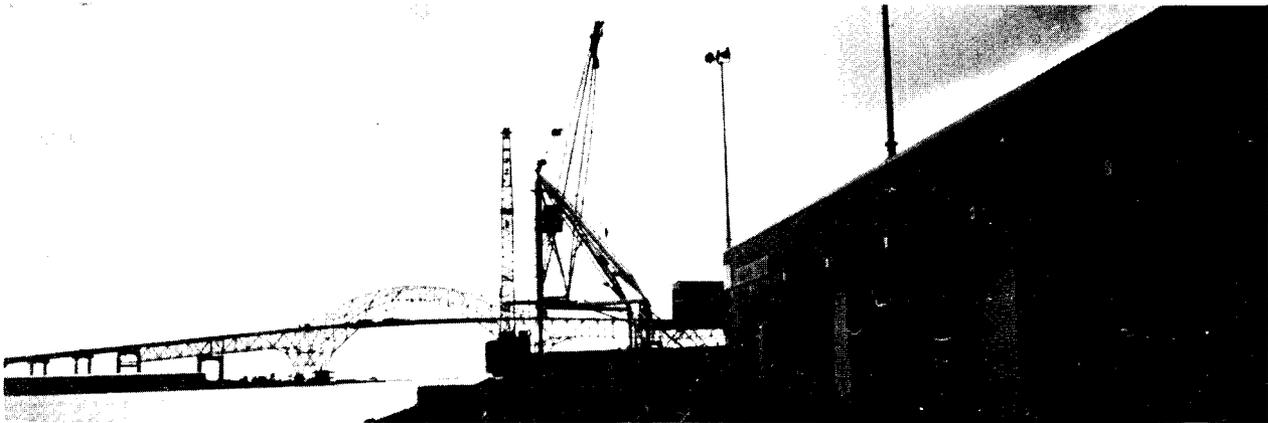


Figure IV-COR-9. Stiff-leg crane.

IV-COR-10

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TABLE VI-COR-1
PORT OF CORPUS CHRISTI
DOCK CHARACTERISTICS OF CORPUS CHRISTI HARBOR

Characteristics	Docks				
	1-6	8-15	9	10-11	12
Length (ft)	1,824	1,315	600	662	200
Depth alongside at MLLW (ft)	30	35	32	30	26
Deck strength (psf)	500	750	500	700	800
Apron width (ft)	22	Open	38	39	Open
Apron height above MLLW (ft)	15	15	15	15	12
Number of container cranes	0	0	0	0	0
Number of wharf cranes	0	3	2	2	1
Apron lighting	Yes	Yes	Yes	Yes	Yes
Straight-stern RORO facilities	No	No	No	No	No
Apron length served by rail (ft)	0	1,315	600	662	200

Notes:

1. Terminal open storage area is 43 acres
2. Terminal covered storage area is 1744480 square feet

b. Covered Storage. The Port of Corpus Christi has 1,744,480 square feet of covered storage. Covered storage consists of 10 transit sheds and 4 multiunit warehouses.

The transit sheds and warehouses have rail platforms. These platforms provide more than 100 boxcar handling positions. Table IV-COR-4 describes in detail the characteristics of these facilities.

4. Security

A 7-foot chain link fence encloses the general cargo docks. No perimeter lighting exists. Unarmed, contracted security guards provide 24-hour security services. These services include gate control and roving patrols within the terminal.

5. Rail Operations

Cargo docks 8, 9, 12, 14, and 15 are served by double shipside (apron) rail tracks. Cargo docks 10 and 11 are served by a single shipside rail track. All of the transit sheds are served by rear single or double rail tracks next to 10-foot-wide rail platforms.

TABLE VI-COR-2
PORT OF CORPUS CHRISTI
SUMMARY OF BERTHING CAPABILITIES OF CORPUS CHRISTI HARBOR

Vessel	Docks				
	1-6	8-15	9	10-11	12
Breakbulk					
C3-S-33a	a	2	1	a	a,c
C3-S-37c	a	2	1	a	a,c
C3-S-37d	3	2	1	1	a,c
C3-S-38a	3	2	1	1	a,c
C4-S-1a	3	2	1	1	a,c
C4-S-1gb and lu	a	2	1	a	a,c
C4-S-58a	a	2	1	a	a,c
C4-S-65a	3	2	1	1	a,c
C4-S-66a	a	2	a	a	a,c
C4-S-69b	a	2	1	a	a,c
Seatrail					
GA and PR-class	3	2	1	1	a,c
Barge					
LASH C8-S-81b	a,f	a,f	a,c,f	a,c,f	a,c,f
LASH C9-S-81d	a	a	a,c	a,c	a,c
LASH lighter	13	9	4	4	1
SEABEE C8-S-82a	a	a	a,c	a,c	a,c
SEABEE barge	9	6	3	3	1
RORO					
Comet	d,o	d,i,j	d,o	d,o	a,c,d
C7-S-95a/Maine-class	a,b	1	a,b,c	a,b,c	a,c
Ponce-class	b,h	h	b,c,h	b,c,h	a,c,h
Great Land-class	b,h	h	b,c,h	b,c,h	a,c,h
Cygnus/Pilot-class	b	1	b,c	b	a,c
Meteor	d,o	d,i,j	d,o	d,o	a,c,d
AmEagle/Condor	b	i,j	b,c	b	a,c
MV Ambassador	0,d	0,d	0,d	0,d	c,d
FSS-class	a,b	1,i	a,b,c	a,b,c	a,c
Cape D-class	a,b	i,j	a,b,c	a,b,c	a,c
Cape H-class	a,b	a	a,b,c	a,b,c	a,c
Container					
C6-S-1w	2,e	1,e	c,e	1,e	a,c,e
C7-S-68e	a,e	1,e	c,e	a,c,e	a,c,e
C8-S-85c	a,e	1,e	a,c,e	a,c,e	a,c,e
Combination					
C5-S-78a	a,e	2,e	a,c,e	a,e	a,c,e
C5-S-37e	2,e	2,e	1,e	1,e	a,c,e

a = maximum vessel draft limited to berth depth
b = inadequate apron width
c = inadequate berth length
d = no straight stern-ramp facilities
e = no container-handling equipment
f = inadequate berth depth, adequate anchorage depth
g = inadequate channel depth
h = no shore-based ramps available
i = insufficient ramp clearance at low tide
j = insufficient ramp clearance at high tide
k = excessive ramp angle at low tide
m = excessive ramp angle at high tide
n = parallel ramp operation only
o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

TABLE IV-COR-3
MATERIALS HANDLING EQUIPMENT

Type of Equipment	Capacity (STON)	Quantity
Stiff-leg crane	100	1
Diesel locomotive crane	30	5
Diesel locomotive crane	35	1
Diesel locomotive crane	45	1
Diesel locomotive crane	65	1
Top-lift crane	38.5	1

TABLE IV-COR-4
COVERED STORAGE

Storage Facility Designation	Floor Area (ft ²)	Number of Unloading Positions (nonconcurrent use)		Current Use
		Trucks	Railcars	
Cargo dock 1	46,200	0	6	General cargo
Cargo dock 2	46,018	0	6	General cargo
Cargo dock 3	47,210	0	6	General cargo
Cargo dock 4	43,400	0	6	General cargo
Cargo dock 5	45,393	0	6	General cargo
Cargo dock 6	46,010	0	6	General cargo
Cargo dock 8	60,640	0	7	General cargo
Cargo dock 9	51,930	0	12	General cargo
Cargo dock 10	42,720	0	13	General cargo
Cargo dock 15	106,559	48	11	General cargo
Unit 1	343,900	100	54	General cargo
Unit 2	355,300	100	0	General cargo
Unit 3	419,200	100	32	General cargo
Unit 4	90,000	0	0	General cargo

6. Truck Operations

Commercial trucks enter and leave the south bank facilities by way of Harbor Drive and either Gate 1 or 15 (figs IV-COR-10 and IV-COR-11). These gates have two lanes and trucks must stop at the guardhouses for processing.

Access to the north bank facilities is by way of Navigation Boulevard and Gate 10 (fig IV-COR-12). Gate 10 is a two-lane, manned entry point.

The port has a 100-ton truck scale. The transit shed at cargo dock 15 has a seven-position self-leveling, truck end ramp platform (fig IV-COR-13). The rail platforms at the rear of the transit sheds and warehouses could double as truck loading docks.

7. Helicopter Operations

Besides the Corpus Christi International Airport and Corpus Christi Naval Air Station, the only other possible location for helicopter operations and staging would be the container storage yard or the hardstands at the Rincon Industrial Park.

8. Marshaling Area

Rincon Industrial Park is an excellent auxiliary staging area for the port. It is located on a peninsula of land next to the north bank facilities. These large hardstand areas have access to highway and rail connections.

C. SUPPORT SERVICES

1. Pilotage

The Aransas-Corpus Christi Pilots Association provides pilotage for the Port of Corpus Christi. Twelve pilots are in the association with six pilots available at any time. Service is available 24 hours a day. Pilots pick up vessels at the anchorage bar at the mouth of the Corpus Christi ship channel (CCSC). Passage time from one end to the other of the CCSC is about 4 hours.

2. Harbor Craft

Four towing companies offer regular shifting, docking, and towing service for the Port of Corpus Christi. These companies are Bay Houston Towing Company, G & H Towing Company, Intracoastal Towing and Transportation Company, and Suderman-Young Towing Company. Each of these companies maintains from one to three tugboats. The capacity of these tugs ranges from 1,700 to 3,200 horsepower.

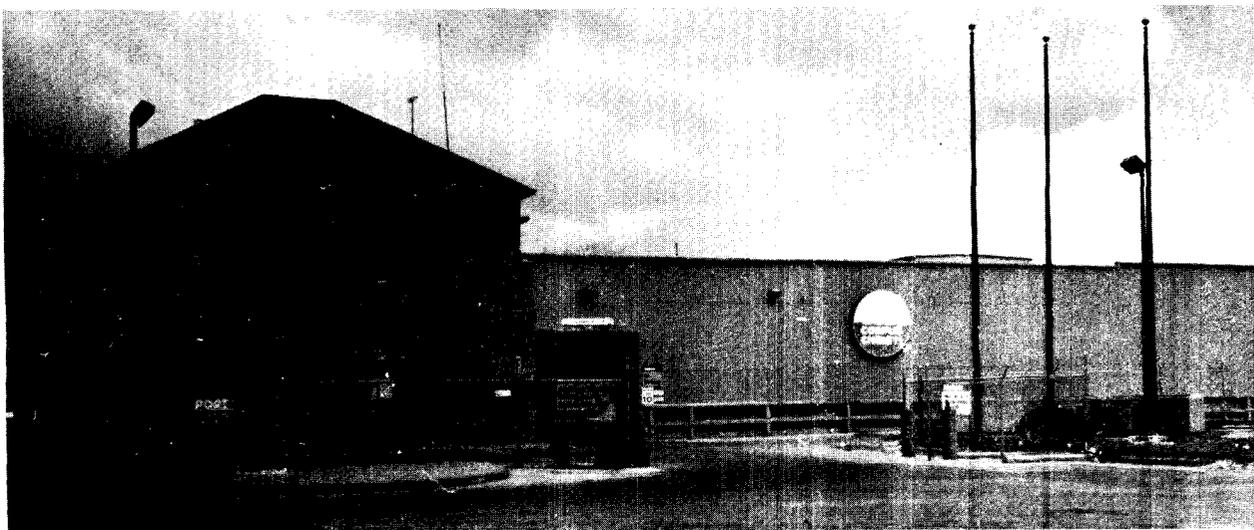


Figure IV-COR-10. Gate 1.

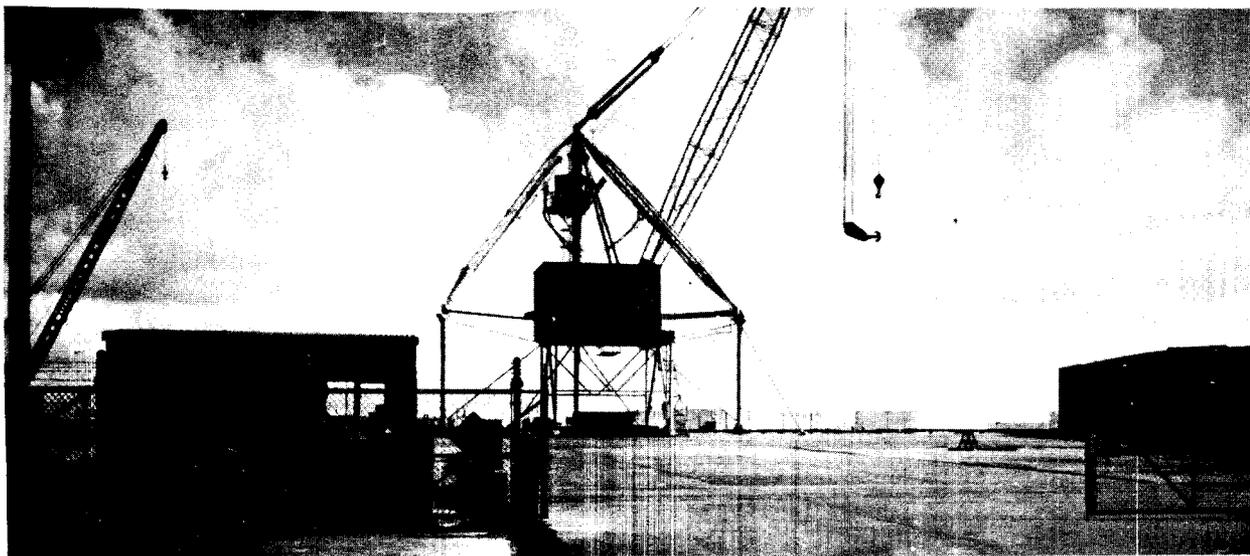


Figure IV-COR-11. Gate 15.



Figure IV-COR-12. Gate 10.

3. Stevedores

Three main companies provide contracted stevedoring services to the port. They are Boyd-Campbell Company, Inc; Dix Shipping Company; and International Terminal Operators Corporation. About 150 stevedores are on the locals roll. The average gang size is 12 persons.

4. Heavy-Lift Equipment

The leasing of heavy-lift MHE is not a problem in the port area. Besides the 100-ton stiff-leg derrick crane at cargo dock 14, heavy-lift mobile and floating assets are readily available from local stevedores.

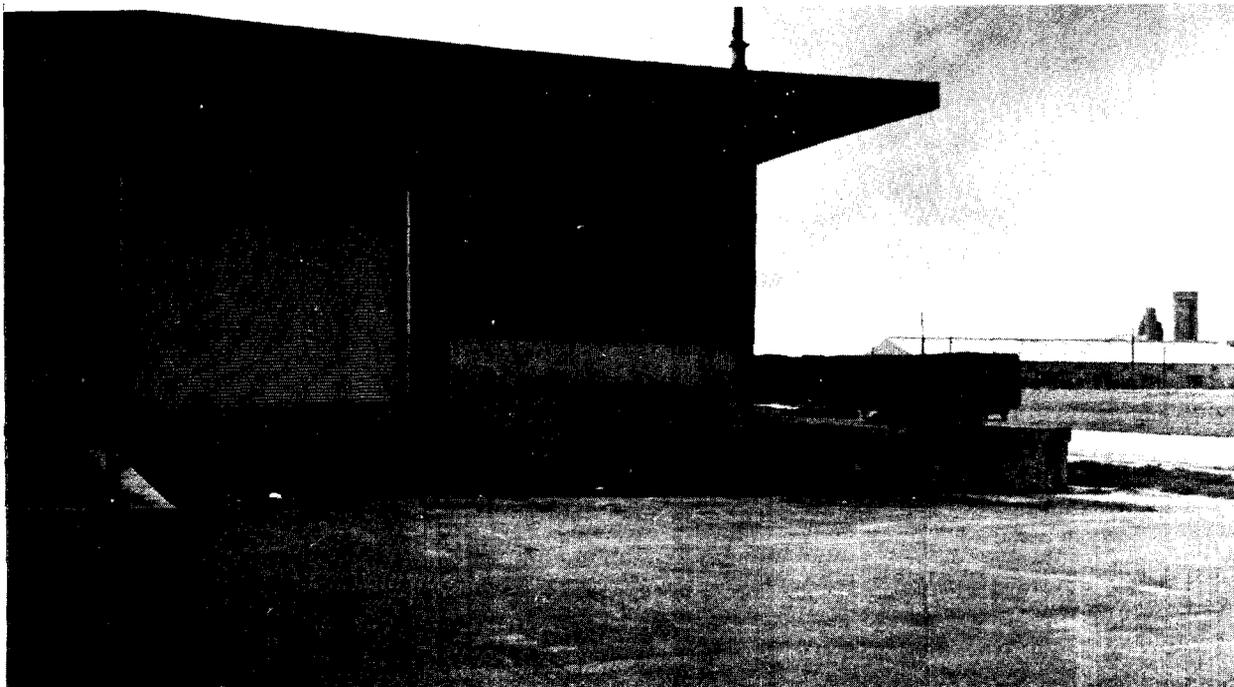


Figure IV-COR-13. Truck end ramp platform.

D. FUTURE DEVELOPMENT

The major future development of the port is the Navy Homeport Program. The culmination of this program will be the construction of Naval Station, Ingleside.

The Port of Corpus Christi continues its project to deepen the entire ship channel to 45 feet. Three-quarters of the channel is complete and the remaining 2 miles are expected to be completed by 1990.

E. REQUIREMENTS AND RECOMMENDATIONS

At the time this report was written and published, no basic movement requirements existed for the Port of Corpus Christi.

PORT OF PENSACOLA (1988)

A. GENERAL

1. Location and Harbor Description (fig IV-PEN-1)

The Port of Pensacola, Florida, is on the north side of Pensacola Bay. It is on the Florida panhandle in the extreme northwestern part of the State. Santa Rosa Island separates Pensacola Bay from the Gulf of Mexico.

Entrance to the port is via a series of three channels: the Caucus, Eastern, and Western. The Caucus Channel is 35 feet deep mean low water (MLW) and 500 feet wide. It extends from the Gulf of Mexico northward 5 miles to the lower reaches of the Pensacola Bay. The Eastern Channel picks up at this point and provides passage to the inner harbor. This is a distance of about 2.1 miles. Within the inner harbor, the Western Channel branches off the Eastern Channel and runs parallel for 1.4 miles. Both channels are 33 feet deep MLW and 300 feet wide. These two channels provide approaches to opposite ends of the inner harbor.

Pensacola Bay offers a safe, natural harbor with good holding ground. Vessels usually anchor east of the channel safety fairway just off the city of Pensacola. Other deepwater anchorages are south of Santa Rosa Island in the Gulf of Mexico. The mean tidal range at the Port of Pensacola is 0.5 foot with an extreme of 2 feet.

No bridges cross the main ship channels between the Gulf of Mexico and Pensacola. However, northeast of the port, the Pensacola Bay Bridge crosses Pensacola Bay. This bridge has a vertical clearance of 50 feet at mean high water (MHW) and a horizontal clearance of 125 feet.

2. Highway Access

An excellent network of highways serves the Port of Pensacola. The port has access to Interstate Routes 10 and 110 and US Routes 90, 98, and 29. Entrance to the port is at the end of Barracks Street. Since Barracks Street can be accessed only from Main Street, all port traffic must be routed to Main Street. From Main Street, connections to all major highways are ample. There is very little traffic congestion.

3. Rail Access

The Seaboard System Railroad (SSR) (part of the CSX network) and the Burlington Northern Railroad (BNR) provide rail service for the Port of Pensacola. The trackage is active and generally in good condition. An SSR crew handles all railcar switching operations at the port. The SSR switching yard is within the port. Because of the partial blocking of Main Street during switching operations, all railcar switching is done at night. The port switching yard can accommodate up to 45 railcars (fig IV-PEN-2). Also, a CSX railyard about 1 mile from the port has a capacity of 650 railcars.

4. Airports

The Pensacola Municipal Airport is about 5 miles northeast of the Port of Pensacola. It has two commercial runways. One runway is 6,000 feet long by 150 feet wide, and the other is 7,000 feet long by 150 feet wide. Four Navy military airfields are within a 10-mile radius of the port area. These include Ellyson Field, Saufley Field, Corry Field, and Pensacola Naval Air Station.



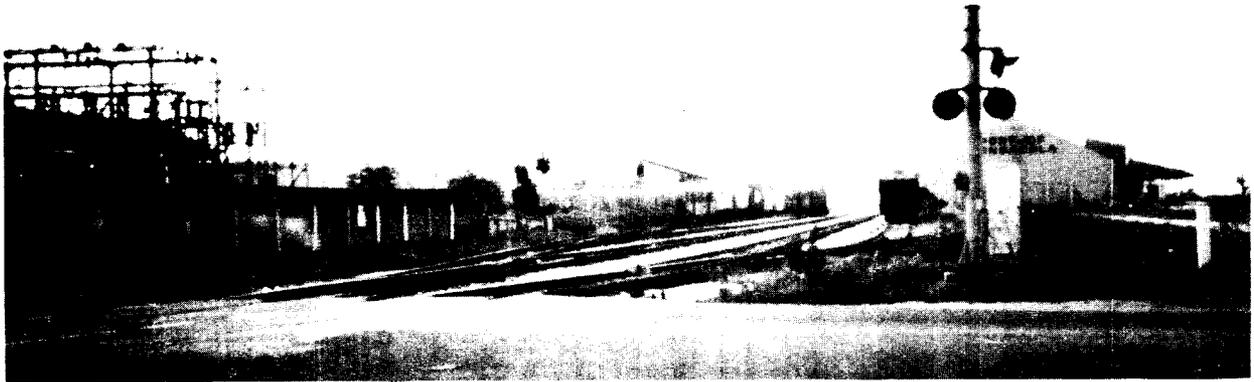


Figure IV-PEN-2. Port switching yard.

B. PORT FACILITIES (fig IV-PEN-3)

1. Berthing

The marine terminal at the Port of Pensacola comprises two marginal wharves with a total of five berths. Berths 1 and 2 provide 1,040 feet of continuous berthing space, and berths 3, 5, and 6 provide 1,430 feet of continuous berthing space (figs IV-PEN-4 and IV-PEN-5). Apron width ranges from 50 to 65 feet. The apron height averages 11 feet above MLW. The depth alongside all berths is currently 33 feet MLW. Berths 1, 5, and 6 have transit sheds running their entire lengths.

Wharf construction for berths 2 through 6 consists of concrete retaining walls with concrete-surfaced solid fill resting on a prestressed concrete relieving platform. Prestressed concrete pilings support the platform. Timber fendering fronts all of the berth structures. The construction of berth 1 is steel sheet pile bulkheads with concrete-surfaced solid fill. It is also fronted by a timber fender system. All decking at the berths has been upgraded and resurfaced within the last 5 years. The deck capacity of all the berths is 1,000 pounds per square foot.

Only mobile materials handling equipment serves the berths. The port has no traveling gantry or container cranes. Each wharf is adequately lit for night operations.

Tables IV-PEN-1 and IV-PEN-2 show the berthing characteristics and capabilities of the port. The port's ability to support various shipping modes is described below.

a. Breakbulk Operations. Breakbulk operations can be performed at berths 1 through 6. These berths are well supported with transit sheds and open storage areas. Ship's gear and mobile cranes are the main methods for handling cargo. All US-flag breakbulk vessels listed in appendix A can be fully loaded at these berths without restrictions.

b. LASH and SEABEE Operations. All berths have LASH and SEABEE lighter loading capability. The terminal has 17 LASH lighter or 12 SEABEE barge loading positions. Because of channel and harbor draft limitations, mother ships would have to discharge and retrieve their respective lighters instream. Instream operations would have to be conducted south of the Caucus Channel in the Gulf of Mexico.

Two locations could be used for barge marshaling. One area is across the harbor basin from berths 1 and 2 at the Municipal Auditorium. Three barge berths are at this location. The other barge marshaling area is at the old rail coal depot, east of the port.

c. RORO and FSS Operations. RORO operations are restricted to Cygnus/Pilot-class, American Eagle/Condor, and MV Ambassador RORO vessels. The Cygnus/Pilot-class and American Eagle/Condor-type RORO vessels can dock at berths 1 through 6. Also, berths 1 and 2 have stern ramp handling capabilities for the MV Ambassador. The 33-foot-channel and berth depths at the port are the major restrictions for FSS operations. Table IV-PEN-2 gives detailed information on the RORO berthing capabilities of the port. It also lists any restrictions that may apply.

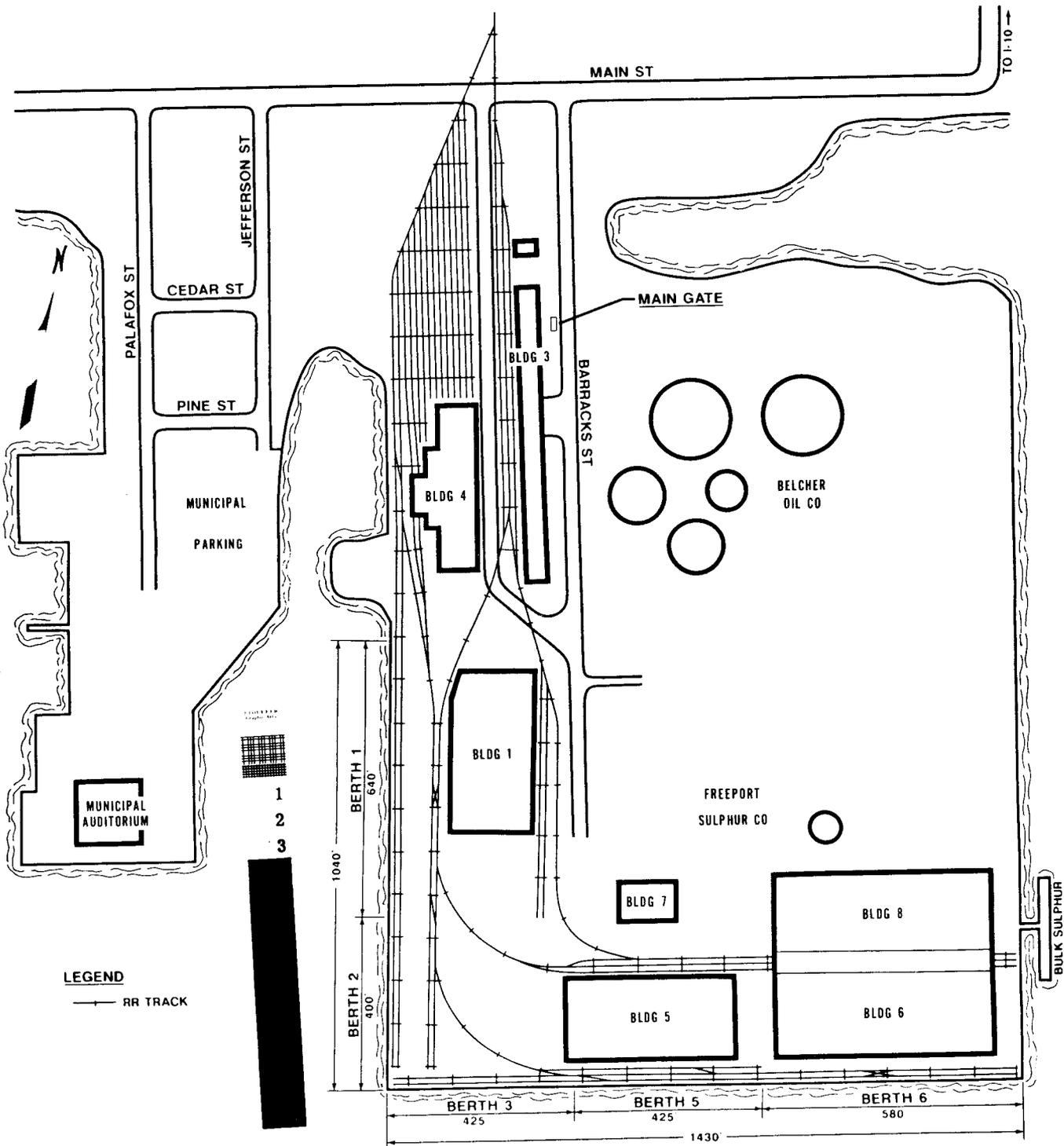


Figure IV-PEN-3. Plan of the Port of Pensacola.

IV-PEN-6

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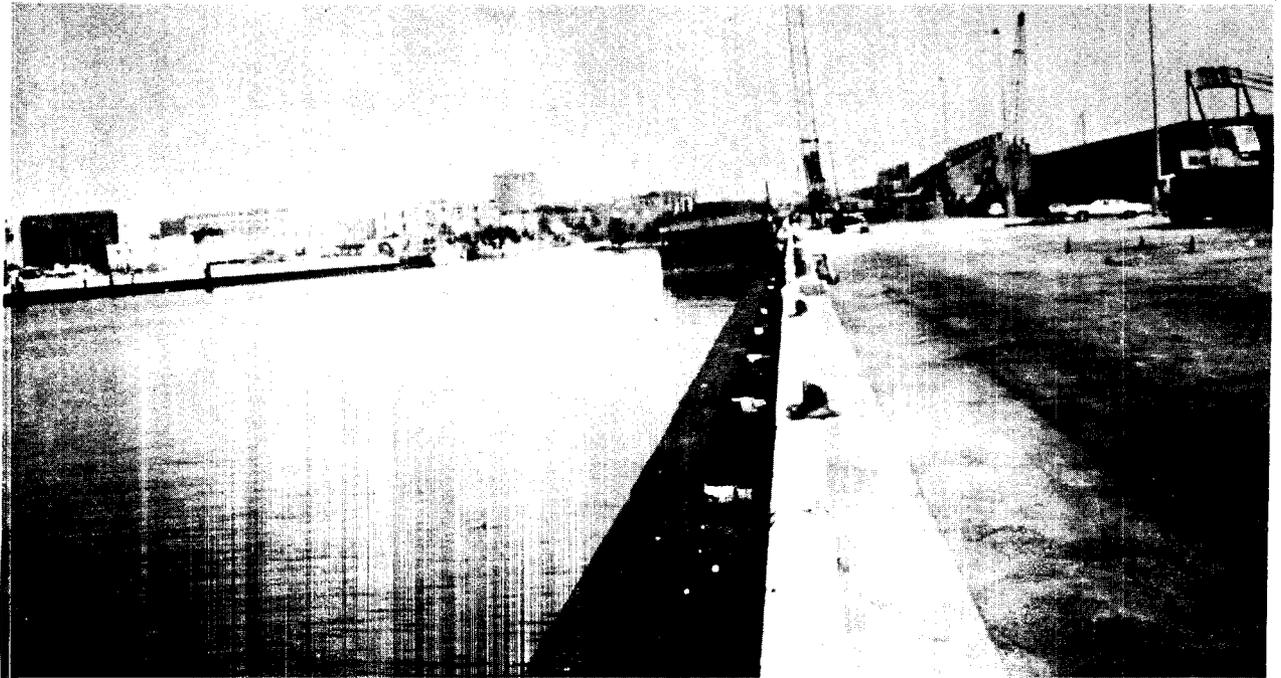


Figure IV-PEN-4. Berths 1-2.

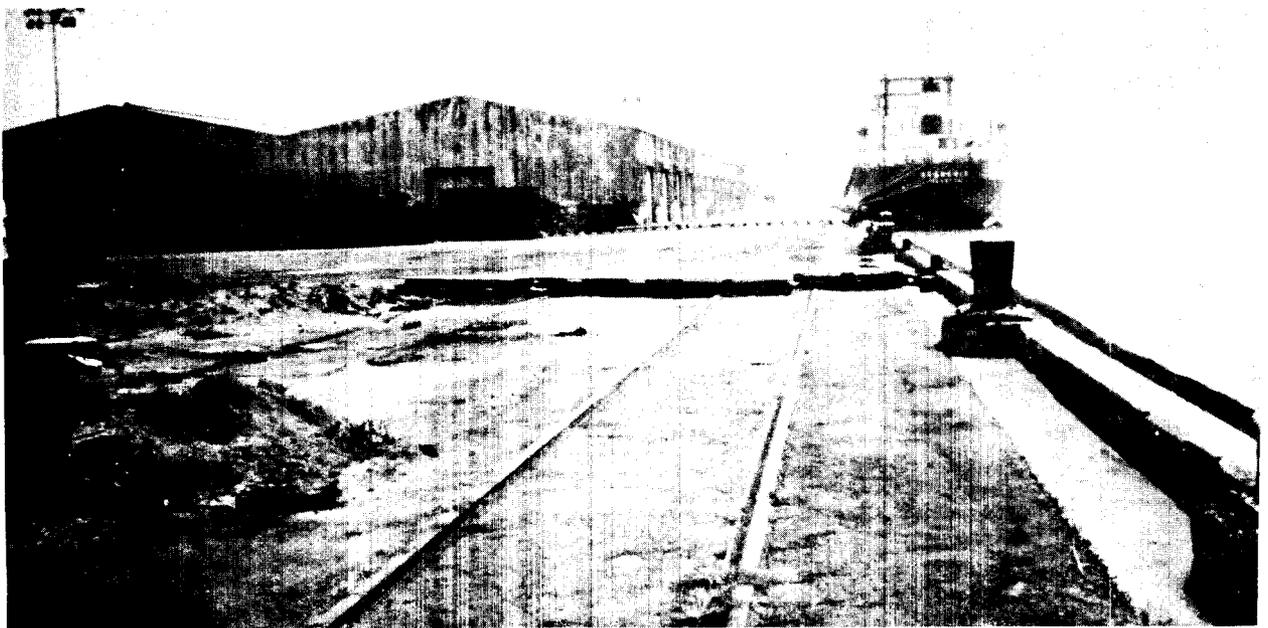


Figure IV-PEN-5. Berths 3, 5, and 6.

TABLE IV-PEN-1
 PORT OF PENSACOLA
 BERTH CHARACTERISTICS OF PENSACOLA

Characteristics	Berths	
	1-2	3-6
Length (ft)	1,040	1,430
Depth alongside at MLLW (ft)	33	33
Deck strength (psf)	1,000	1,000
Apron width (ft)	65	50
Apron height above MLLW (ft)	11	11
Number of container cranes	0	0
Number of wharf cranes	0	0
Apron lighting	Yes	Yes
Straight-stern RORO facilities	Yes	No
Apron length served by rail (ft)	1,040	1,430

Notes:

1. Terminal open storage area is 6 acres
2. Terminal covered storage area is 306000 square feet

d. Container Operations. The Port of Pensacola is not equipped for container operations, because of the lack of container handling cranes and equipment.

2. Materials Handling Equipment (MHE)

Table IV-PEN-3 summarizes the MHE currently in use at the port. Additional MHE is readily available from any one of seven stevedoring companies that serve the port. Land-based mobile and floating cranes are available in capacities ranging from 20 to 300 STON.

3. Staging

a. Open Storage. The Port of Pensacola has 6 acres of paved (asphalt), open storage. The primary locations of these open storage areas are behind Building 5 and an area next to berths 2 and 3. These areas are well lit for night operations. The open storage is mainly used for lumber, forest products, steel, and general cargo.

b. Covered Storage. Covered storage consists of three warehouses and four transit sheds. The three warehouses are set up for bulk products, such as fertilizer and soda. The four transit sheds (1, 5, 6, and 8) are

TABLE IV-PEN-2
PORT OF PENSACOLA
SUMMARY OF BERTHING CAPABILITIES OF PENSACOLA

Vessel	Berths	
	1-2	3-6
Breakbulk		
C3-S-33a	2	2
C3-S-37c	2	2
C3-S-37d	2	2
C3-S-38a	2	2
C4-S-1a	1	2
C4-S-1qb and 1u	1	2
C4-S-58a	1	2
C4-S-65a	1	2
C4-S-66a	1	2
C4-S-69b	1	2
Seatrail		
GA and PR-class	1	2
Barge		
LASH C8-S-81b	a,g	a,g
LASH C9-S-81d	a,g	a,g
LASH lighter	7	10
SEABEE C8-S-82a	a,g	a,g
SEABEE barge	5	7
RORO		
Comet	i,j	d,o
C7-S-95a/Maine-class	a,g	a,b,g
Ponce-class	b,h	b,h
Great Land-class	b,h	b,h
Cygnus/Pilot-class	1	b
Meteor	i,j	d,o
AmEagle/Condor	(1)	(1)
MV Ambassador	1	0,d
FSS-class	a,g	a,b,g
Cape D-class	i,j	b
Cape H-class	a,g	a,b,g
Container		
C6-S-1w	1,e	2,e
C7-S-68e	1,e	1,e
C8-S-85c	1,e	1,e
Combination		
C5-S-78a	a,e,g	a,e,g
C5-S-37e	1,e	2,e

- a = maximum vessel draft limited to berth depth
- b = inadequate apron width
- c = inadequate berth length
- d = no straight stern-ramp facilities
- e = no container-handling equipment
- f = inadequate berth depth, adequate anchorage depth
- g = inadequate channel depth
- h = no shore-based ramps available
- i = insufficient ramp clearance at low tide
- j = insufficient ramp clearance at high tide
- k = excessive ramp angle at low tide
- m = excessive ramp angle at high tide
- n = parallel ramp operation only
- o = insufficient apron width for side-ramp operation

Note: Ramp clearance and ramp angle based on maximum vessel draft.

() indicates vessels assigned by analyst

**TABLE IV-PEN-3
MATERIALS HANDLING EQUIPMENT**

Type of Equipment	Capacity (STON)	Quantity
Mobile crane	80	1
Mobile crane	60	1
Mobile crane	40	1
Mobile crane	35	1
Mobile crane	20	1
Forklift	7.5	2
Forklift	4.5	8
Forklift	3	18
Railcar pusher	NA	1
Sweeper	NA	2
Scrubber	NA	1

used for palletized bagged products and general cargo (fig IV-PEN-6). The transit sheds offer a total of 306,000 square feet of covered storage. Between transit sheds 6 and 8 is a covered, double-track, rail loading platform with a 16-railcar capacity. All the transit sheds have rear rail platforms that run the entire length of the buildings.

4. Security

A 7-foot chain link fence topped with three strands of barbed wire encloses the terminal. Unarmed security guards control Main Gate 24-hours a day. Terminal roving patrols provide additional security.

5. Rail Operations

Each berth apron has two surface tracks. Also, two platform-level tracks run along the rear of the transit sheds (fig IV-PEN-7).

No rail end ramps are at the port. However, numerous sites are available for constructing temporary rail end ramps should the need arise.

6. Truck Operations

Commercial trucks enter and leave the port by way of Barracks Street and Main Gate (fig IV-PEN-8). Main Gate has two lanes, and trucks must stop at the guardhouse for processing. No truck end ramps are at the port. The rail platforms at transit sheds 1, 5, and 8 can also double as truck loading docks.

7. Helicopter Operations

Two possible locations are available for helicopter staging and operations. One is the open storage beside berths 2 and 3. The other is the Municipal Auditorium parking lot (fig IV-PEN-9). This parking lot, opposite

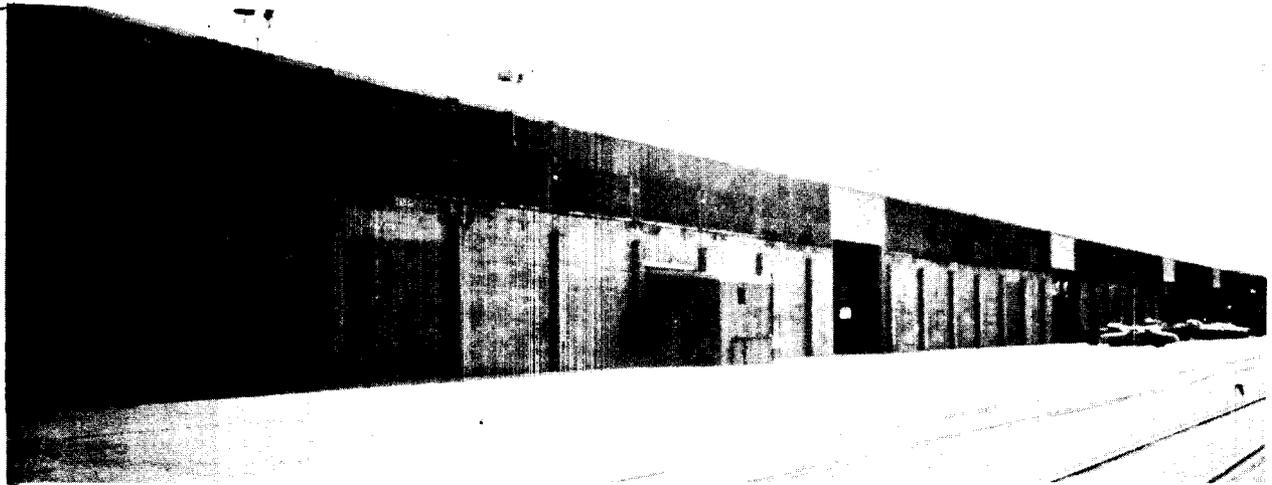


Figure IV-PEN-6. Transit shed 5.

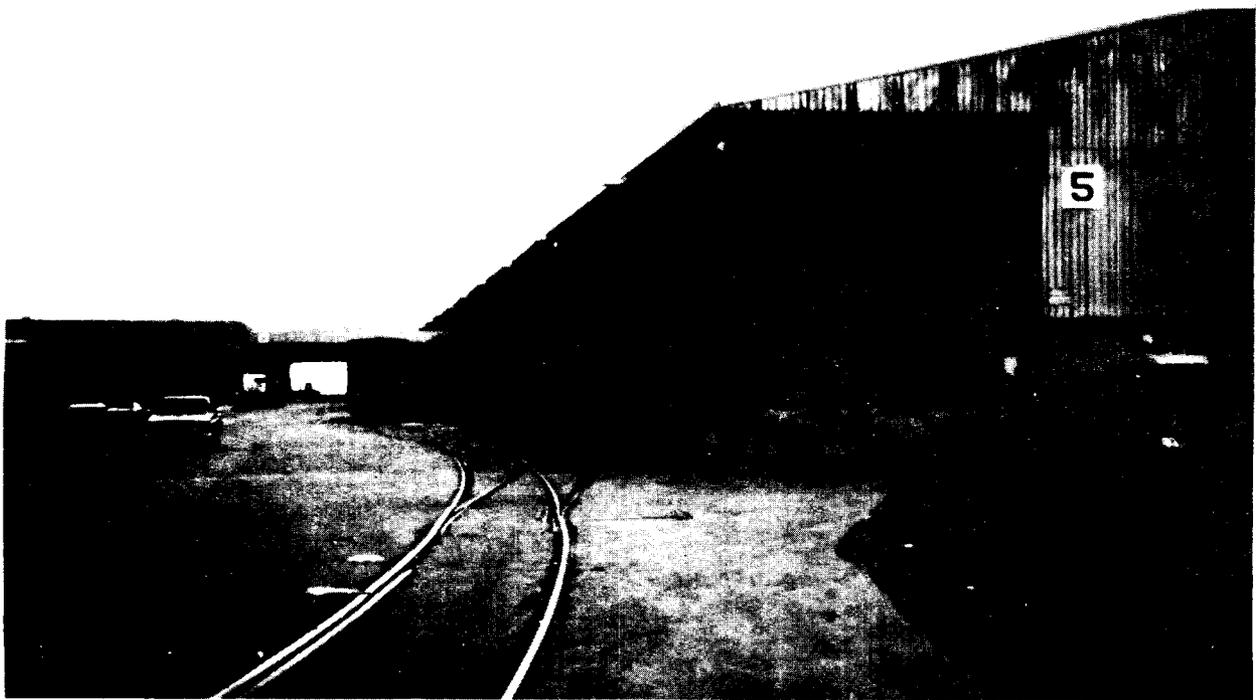


Figure IV-PEN-7. Platform-level tracks at the rear of transit shed 5.

berths 1 and 2 on the other side of harbor basin, is less than one-quarter mile from the port. The parking lot has mast lighting and is paved (asphalt). The parking lot has an area of 4 acres.

8. Marshaling Area

The Municipal Auditorium parking lot is an excellent staging area for the port. It is paved, well lit, and very close to the port. It would be very easy to secure because three sides of the area are surrounded by water.



Figure IV-PEN-8. Barracks Street and Main Gate..

C. SUPPORT SERVICES

1. Pilotage

The Pensacola Bay and Harbor Pilots Association provides pilotage for the Port of Pensacola. Two pilots are available and service is provided 24 hours a day. Pilots usually pick up vessels at the seabuoy at the entrance of the Caucus Channel. Pilots are mandatory for any vessel with a draft of more than 7 feet.

2. Harbor Craft

Four tug/barge companies offer regular shifting, docking, and towing service for the Port of Pensacola. These are Admiral Towing and Barge Company; Brown Marine Service Company; McKenzie Services

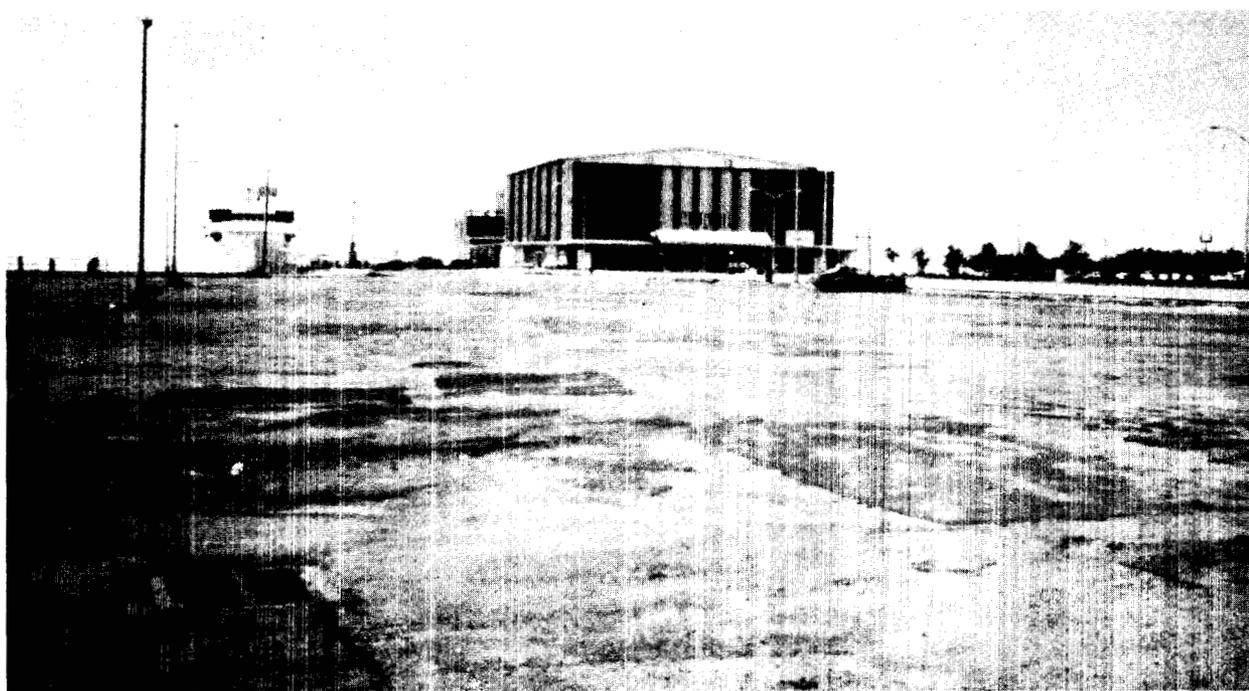


Figure IV-PEN-9. Municipal Auditorium parking lot.

Company, Inc; and Parker Towing Company. Each maintains a fleet of a dozen or more tugboats. The use of tugboats while docking is not mandatory and is up to the discretion of the ship's master.

3. Stevedores

Ryan-Walsh Stevedoring Company, Inc, and Atlantic and Gulf Stevedores (ITO) are the two main companies providing stevedoring services to the port. About 400 stevedores are on the local's roll. However, no more than ten 18-member gangs can currently be filled.

4. Heavy-Lift Equipment

Procurement of heavy-lift MHE is not a problem in the port area. Coastal Cranes, Inc, will have a 300-STON heavy-lift crane within the year.

D. FUTURE DEVELOPMENT

The top priority in the future development of the port is the Navy Homeport Program. The Port of Pensacola is slated as the new homeport for the aircraft carrier Lexington. Harbor improvements such as the dredging of berths 1 and 2 are underway.

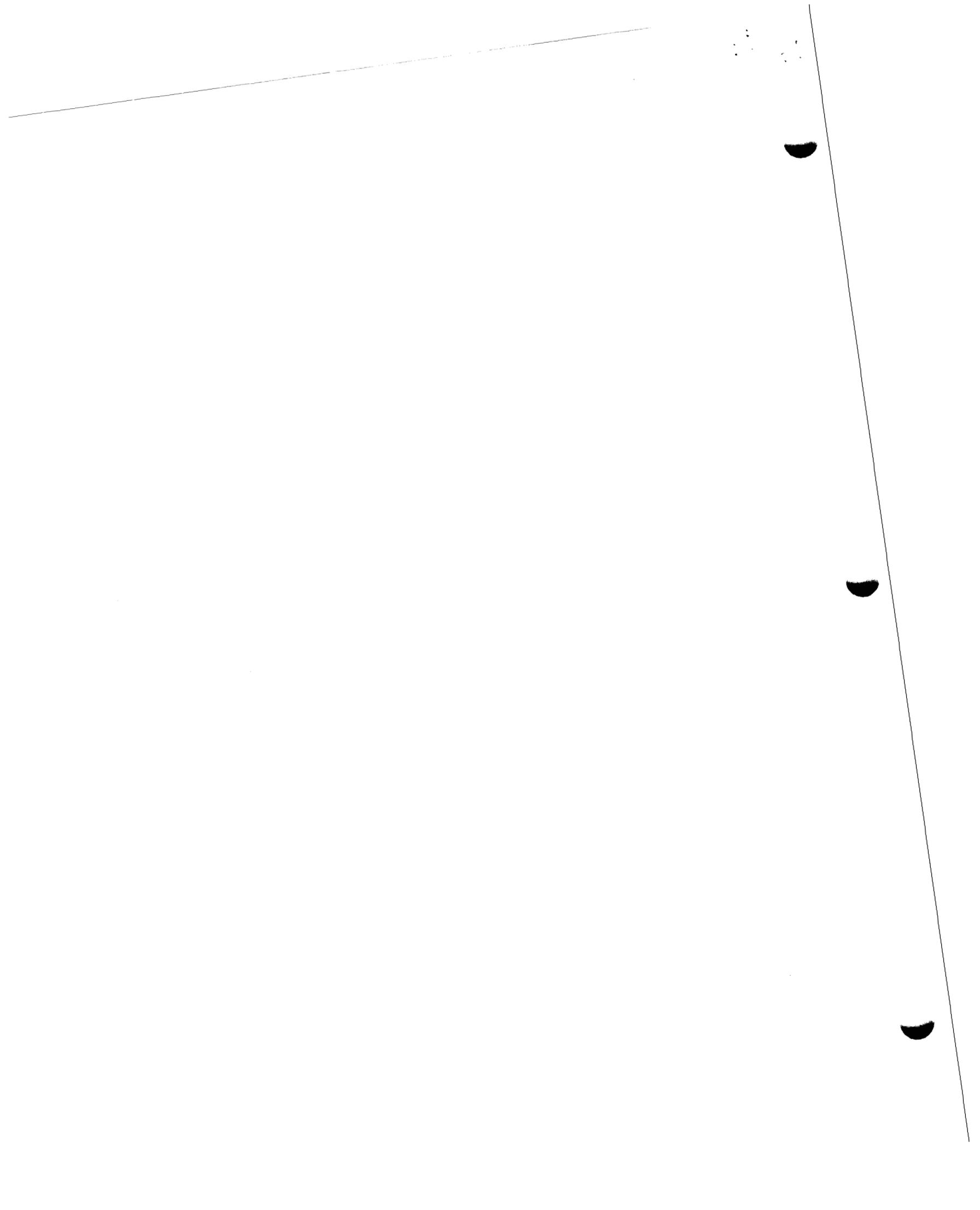
The DuPont Company is also interested in property next to the port (fig IV-PEN-10). The development of a facility there could bring 100 more ships a year to the port.

E. REQUIREMENTS AND RECOMMENDATIONS

At the time this report was written and published, no basic movement requirements existed at the Port of Pensacola.



Figure IV-PEN-10. Site for future development.



APPENDIX C

GULF COAST UNIT MOVEMENT REQUIREMENTS

A. GENERAL

This appendix describes the basic movement requirements for each type of unit that could possibly deploy through the gulf coast ports analyzed in this study. It also identifies the number and possible names of vessels for several representative ship mixes. The associated vessel support systems for each representative ship mix are listed. The report concentrates on division- and lower-level movements through gulf coast ports.

This appendix is only a guide. If a particular unit is projected to deploy through a certain gulf coast port, the unit should do the following:

1. Determine its actual table of organization and equipment (TOE) number and equipment characteristics, such as those listed in table C-1.
2. Identify the actual sea port of embarkation (SPOE). Review the port's characteristics described in section IV of this report.
3. Identify the actual ships to be loaded at the port.
4. Determine if the unit can be loaded in the required amount of time.

B. UNIT EQUIPMENT QUANTITIES (table C-1)

Unit movement requirements are based on TOE as of October 1988 and Type Unit Characteristics (TUCHA) files as of January 1989. Table C-1 shows the types of units with their TOE numbers and associated equipment.

Units with staging area requirements of less than 125,000 square feet would not tax the staging resources of a terminal. These units are therefore not included in table C-1 with the larger units.

1. *Unit/TOE Number*

Representative units and their respective Standard Requirements Codes (SRC) are listed.

2. *Maneuver Units*

Quantities of infantry, mechanized infantry, and armor battalions are listed.

3. *Supplies and Equipment/Quantities*

Total quantities of vehicles, aircraft, MILVANs (20-foot) and other (floating craft and cargo unable to be containerized) equipment are listed.

a. MILVANs/VEHCAR/Other. The MILVAN quantities are based on cargo that will fit into an 8- by 8- by 20-foot container. This cargo consists solely of cargo not previously designated as a secondary load on unit vehicles by vehicle cargo (VEHCAR). VEHCAR is a computerized simulation that uses the carrying capability of cargo vehicles organic to a force. General-purpose cargo will be loaded within the vehicles' offroad weight capacity and cargo compartment cubic capacity. VEHCAR maintains unit integrity between vehicles and secondary loads.

Cargo not loaded by VEHCAR is loaded in containers. Cargo too large for containers will be listed as other.

TABLE C-1
EQUIPMENT QUANTITIES
GULF COAST UNIT

Unit/TOE No.	Maneuver Units	Supplies and Equipment	Quantities	Helicopter Landing and Processing Area	Unit (ft ²)	Staging Area for 100% of Unit (ft ²)	MTON	STON	MTON/STON
Air Assault Div 67000L100	9 Inf Bn	Vehicles	5,766	5	614,562	768,202	100,431	20,561	5.71
		Aircraft	386		127,508	204,013	28,956	1,427	
		MILVANS	957		76,490	115,500	9,288	1,579	
		Other			45,072	56,340	6,155	1,798	
					<u>863,632</u>	<u>1,144,055</u>	<u>144,830</u>	<u>25,365</u>	
Armored Div 87000J430	6 Tank Bn	Vehicles	7,752	5	1,231,187	1,538,984	239,630	79,853	3.14
	4 Mech Bn	Aircraft	127		37,707	60,331	8,112	447	
		MILVANS	710		56,744	85,683	7,095	1,397	
		Other	12		57,058	71,322	9,348	2,481	
					<u>1,382,697</u>	<u>1,756,320</u>	<u>264,186</u>	<u>84,178</u>	
Armored Cavalry Regt 17051H010	NA	Vehicles	1,616	5	256,248	320,310	50,143	17,113	3.20
		Aircraft	81		21,794	34,870	4,713	155	
		MILVANS	137		10,948	16,531	1,233	279	
		Other			19,391	24,239	2,588	764	
					<u>308,381</u>	<u>395,950</u>	<u>58,677</u>	<u>18,311</u>	
Heavy Mech Div 87000J420	5 Tank Bn	Vehicles	7,656	5	1,169,500	1,461,875	230,359	71,048	3.40
	5 Mech Bn	Aircraft	141		38,268	61,229	8,283	311	
		MILVANS	12		56,197	84,857	7,243	1,236	
		Other			64,092	80,115	9,654	2,568	
					<u>1,328,058</u>	<u>1,688,076</u>	<u>255,539</u>	<u>75,163</u>	
Infantry Brigade 07100H020	1 Ar Cav	Vehicles	923	5	134,168	167,710	24,504	6,272	4.03
	Tp	Aircraft	14		3,300	5,280	709	33	
		MILVANS	344		27,508	41,537	1,731	455	
		Other	8		10,283	12,854	1,681	350	
					<u>175,259</u>	<u>227,380</u>	<u>28,626</u>	<u>7,110</u>	
Armored Brigade 17100H020	1 Ar Cav	Vehicles	945	5	145,847	182,308	28,218	7,838	3.70
	Tp	Aircraft	11		2,688	4,301	579	29	
		MILVANS	345		27,567	41,626	1,796	464	
		Other	6		9,296	11,620	1,523	356	
					<u>185,398</u>	<u>239,856</u>	<u>32,116</u>	<u>8,687</u>	

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b. Accompanying Supplies and Ammunition. The unit's accompanying supplies and ammunition are based on TUCHA file averages from Army Force Planning Data and Assumptions for FY 87-96. Each person is allotted 232.05 pounds for supplies and ammunition. This represents 1 to 15 days of consumables, less Class VII.

4. Helicopter Landing and Processing Area

Units with helicopters will require a large, open area for landing at the port. The helicopter arrivals will be spread over a period of days. However, the port must have the capability to receive and process five incoming helicopters every 30 minutes. Besides the required helicopter equipment-staging area (table C-1), a 5-acre open area with good flight approaches is required for normal division-size helicopter operations.

5. Unit Staging Area

Unit square footage is the actual number of square feet that the equipment will occupy on the ground. Normally, units will arrive over a period of days and the entire staging area will not be required at any one time. In any event, the percentage of unit cargo present in the staging area at one time depends on the port's and ships' capacities.

For ship stowage, MILVANs are considered to be stacked two high. For example, 389 MILVANs implies 20 feet long by 8 feet wide x $389 \div 2 = 31,120$ square feet for area calculations. The staging area considered is for 100 percent of the unit equipment. The staging area is based on an allowance of 125 percent for vehicles, 160 percent for aircraft, 151 percent for MILVANs, and 125 percent for other equipment.

C. MOVEMENT REQUIREMENTS TO GULF COAST SPOE

1. Mode of Movement to the Port

Units based within a 1-day road march of the SPOE will convoy to the SPOE, except for nonroadable vehicles and helicopters (AR 700-9). Nonroadable vehicles will be transported to the SPOE by motor transporters, railcars, or both. Units based more than a 1-day road march from the SPOE will normally transport all unit equipment, except helicopters, by rail. Rail requirements are based on various mixes of railcars for the different divisions. Motor requirements are based on a convoy/motor move.

Railcars are prioritized as 89-, 60-, and 68-foot flatcars for armor and mechanized infantry divisions and separate infantry and armored brigades. Railcars are prioritized as 89-, 60-, and 54-foot flatcars for air assault divisions. The armored cavalry regiment uses 60-, 89-, and 68-foot flatcars. The requirements are summarized in table C-2.

2. Truck and Railcar Receiving/Holding Requirements

The SPOE must have the capability to receive, hold, and unload the specified number of motor transporters and railcars per day for the designated unit. Daily rates are summarized in table C-2. It is assumed that the activity will be steady over a 5-day period, except for the armored cavalry regiment, which is planned for 3 days. Small units, such as construction companies or battalions, do not present significant movement problems. Therefore, these units are not included in table C-2.

3. Arrival Helicopter

A nearby airport (within 50 miles) is required to facilitate helicopter arrivals. The instrument approach capability is required for night and inclement weather operations. Helicopters will be refueled as required, and aircrews will be briefed on entry into the port area.

TABLE C-2
RAILCAR CONVOY, MOTOR TRANSPORT
REQUIREMENTS FOR MOVEMENT TO THE GULF COAST SPOE

Unit	1-Day Road March to SPOE			More Than 1-Day Road March to SPOE	Receiving, Holding, and Unloading Daily Rates	
	Vehicle Convoys	Motor Transporters	Railcars	Railcars	Motor Transporters	Railcars
Air Assault Div	5,478	691	239	1,291	139	259
Armored Div	6,044	2,105	860	2,264	421	453
Armored Cavalry Regt	1,081	529	269	636	177	212
Heavy Mech Div	5,912	2,013	775	2,136	403	428
Infantry Brigade	866	252	95	318	84	106
Armored Brigade	803	320	127	338	107	113

Notes:

1. For all units, the motor asset priority of use was: (1) 40-foot flatbeds and (2) heavy-equipment transporters.
2. For the air assault divisions, the railcar priority of use was: (1) 89-foot flatcars, (2) 60-foot flatcars, and (3) 54-foot DODX flatcars.
3. For the armored division, heavy mechanized divisions, and the separate infantry brigade and armored brigade, the railcar priority of use was: (1) 89-foot flatcars, (2) 60-foot flatcars, and (3) 68-foot DODX flatcars.
4. For the armored cavalry regiment, the railcar priority of use was: (1) 60-foot flatcars, (2) 89-foot flatcars, and (3) 68-foot DODX flatcars.
5. All units are based on a 5-day unloading schedule, except for the armored cavalry regiment, separate infantry brigades, and the armored brigade, which is based on a 3-day unloading schedule.

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D. VESSELS AND BERTH REQUIREMENTS

The number of vessels required for each ship mix was determined through a vessel loading simulation. The berth requirements for gulf coast ports are based on the ships' characteristics. The vessels are listed in tables C-3 through C-6. Ships are drawn from the Military Sealift Command (MSC), the Ready Reserve Force (RRF), and the Sealift Readiness Program (SRP). All ships used in this appendix are described in appendix A and could be expected to be available for gulf coast use. The ship mixes consist of the following elements:

- Ship Mix 1 (table C-3) - several types of modern ships that might arrive at an east coast port for a deployment. Ship mix 1 has a priority for the use of more modern ships, such as RORO, combination, and other selected ships.
- Ship Mix 2 (table C-4) - combination of ship types.
- Ship Mix 3 (table C-5) - older breakbulk vessels.
- Ship Mix 4 (table C-6) - fast sealift ships (FSS).

Users of this manual should not be overly concerned with the ship mixes or the actual ships selected in this appendix. The ships in this appendix were selected at random. Their main value is for comparison of deployment requirements for various operations.

The vessel requirements considered only square footage requirements for each division. That assumes that a ship will exceed its space capacity before exceeding its tonnage capacity. A 75-percent stowage factor was used for all ship requirements of all divisions.

Table C-7 lists the number of ships required for each division to be loaded by a particular ship mix.

TABLE C-3
GULF COAST VESSEL AND BERTH REQUIREMENTS
SHIP MIX 1 (MODERN SHIPS)

Representative Ship	Berth Required for Each Ship (ft)	Days Required to Load Each Ship	Minimum Apron Width (ft)	Minimum Depth Alongside (ft)	Cargo-Handling Requirements
FSS - USNS Algol	995	2	60	38	a
FSS - USNS Denebola	995	2	60	38	a
Cape Decision	730	1.5	80	35	b
American Eagle	685	1	100	32	a
Cape Henry	800	2	100	38	b
Cape Domingo	730	1.5	80	35	b
American Condor	685	1	100	32	a
MV Ambassador	605	1	80	32	b
FSS - USNS Capella	995	2	60	38	a
Cape Horn	800	2	100	38	b

Legend:
a - Shoreside cranes with container-handling apparatus are desirable.
b - Ship requires stern ramp compatibility at SPOE and SPOD.

TABLE C-4
 GULF COAST VESSEL AND BERTH REQUIREMENTS
 SHIP MIX 2 (COMBINATION OF SHIP TYPES)

Representative Ship	Berth Required for Each Ship (ft)	Days Required to Load Each Ship	Minimum Apron Width (ft)	Minimum Depth Alongside (ft)	Cargo-Handling Requirement
C3-S-37D	545	4	20	32	Standard ship's gear
FSS - USNS Algol	995	2	60	38	a
C4-S-58A	625	4	20	33	Standard ship's gear
C3-S-33A	535	4	20	33	Standard ship's gear
American Eagle	685	1	100	32	a
Cape Domingo	730	1.5	80	35	b
FSS - USNS Denebola	995	2	60	38	a
C4-S-65A	610	4	20	32	Standard ship's gear
C3-S-37C	545	4	20	34	Standard ship's gear
MV Ambassador	605	1	80	32	b
FSS - USNS Capella	995	2	60	38	a
Cape Henry	800	2	100	38	b
Cape Decision	730	1.5	80	35	b
C3-S-38A	535	4	20	30	Standard ship's gear
C4-S-58A	625	4	20	33	Standard ship's gear

Legend:
 a - Shoreside cranes with container-handling apparatus are desirable.
 b - Ship requires stern ramp compatibility at SPOE and SPOD.

TABLE C-5
 GULF COAST VESSEL AND BERTH REQUIREMENTS
 SHIP MIX 3 (OLDER BREAKBULK SHIPS)

Representative Ship	Berth Required for Each Ship (ft)	Days Required to Load Each Ship	Minimum Apron Width (ft)	Minimum Depth Alongside (ft)	Cargo-Handling Requirement
C4-S-65A	610	4	20	32	All vessels have standard ship's gear.
C4-S-65A	610	4	20	32	
C4-S-65A	610	4	20	32	
C3-S-33A	535	4	20	33	
C3-S-33A	535	4	20	33	
C3-S-37D	645	4	20	32	
C3-S-37D	645	4	20	32	
C3-S-37D	645	4	20	32	
C3-S-37C	645	4	20	34	
C4-S-58A	725	4	20	33	
C4-S-58A	725	4	20	33	
C4-S-58A	725	4	20	33	
C3-S-38A	535	4	20	30	
C3-S-38A	535	4	20	30	
C3-S-38A	535	4	20	30	
C4-S-65A	610	4	20	32	
C4-S-65A	610	4	20	32	
C4-S-65A	610	4	20	32	
C3-S-33A	535	4	20	33	
C3-S-33A	535	4	20	33	
C3-S-37D	545	4	20	32	
C3-S-37D	545	4	20	32	
C3-S-37C	545	4	20	34	
C3-S-37C	545	4	20	34	
C4-S-58A	625	4	20	33	
C4-S-58A	625	4	20	33	
C4-S-1U	615	4	20	34	
C3-S-38A	535	4	20	30	
C4-S-1A	615	4	20	32	
C4-S-1A	615	4	20	32	

TABLE C-6
 GULF COAST VESSEL AND BERTH REQUIREMENTS
 SHIP MIX 4 (FAST SEALIFT SHIPS)

Representative Ship	Berth Required for Each Ship (ft)	Days Required to Load Each Ship	Minimum Apron Width (ft)	Minimum Depth Alongside (ft)	Cargo-Handling Requirement
FSS - USNS Algol	995	2	60	38	Shoreside cranes with container-handling apparatus are desirable.
FSS - USNS Denebola	995	2	60	38	
FSS - USNS Capella	995	2	60	38	
FSS - USNS Bellatrix	995	2	60	38	
FSS - USNS Regulus	995	2	60	38	
FSS - USNS Altair	995	2	60	38	
FSS - USNS Antares	995	2	60	38	
FSS - USNS Poll	995	2	60	38	

TABLE C-7
GULF COAST VESSEL REQUIREMENTS

Number of Ships Required for 5-Day Movement Through Port				
Unit	Ship Mix 1 (ships)	Ship Mix 2 (ships)	Ship Mix 3 (ships)	Ship Mix 4 (ships)
Air Assault Div	6	11	19	6
Armored Div	10	15	30	8+ *
Armored Cav Regt	2	5	8	2
Heavy Mech Div	10	14	29	8+ *
Separate Infantry Brigade	2	2	4	2
Armored Brigade	2	2	4	2

*Eight and one-third FSS's are required to meet this ship mix. Since the current inventory has only 8 FSS's, one additional ship from another ship mix is needed.

44

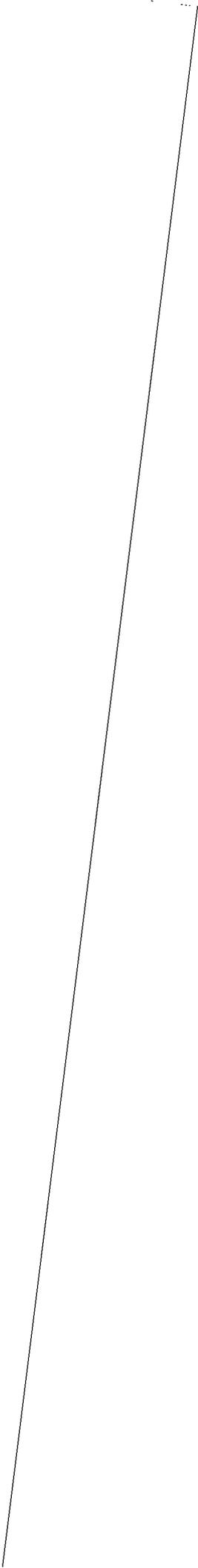
1

2

3

4

5



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This page is a map of the Major
Railroads Operating in the United States.
The map is too large to be scanned in to
view electronically.

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**MILITARY TRAFFIC MANAGEMENT COMMAND
TRANSPORTATION ENGINEERING AGENCY**

**GULF COAST
PORTS FOR NATIONAL DEFENSE**

**PAUL BURGNER
A. GREY MARSH**

SEPTEMBER 1993

CONTENTS

INTRODUCTION

PORT OF BEAUMONT

PORT OF GALVESTON

PORT OF GULFPORT

PORT OF HOUSTON

PORT OF LAKE CHARLES

PORT OF MOBILE

PORT OF NEW ORLEANS

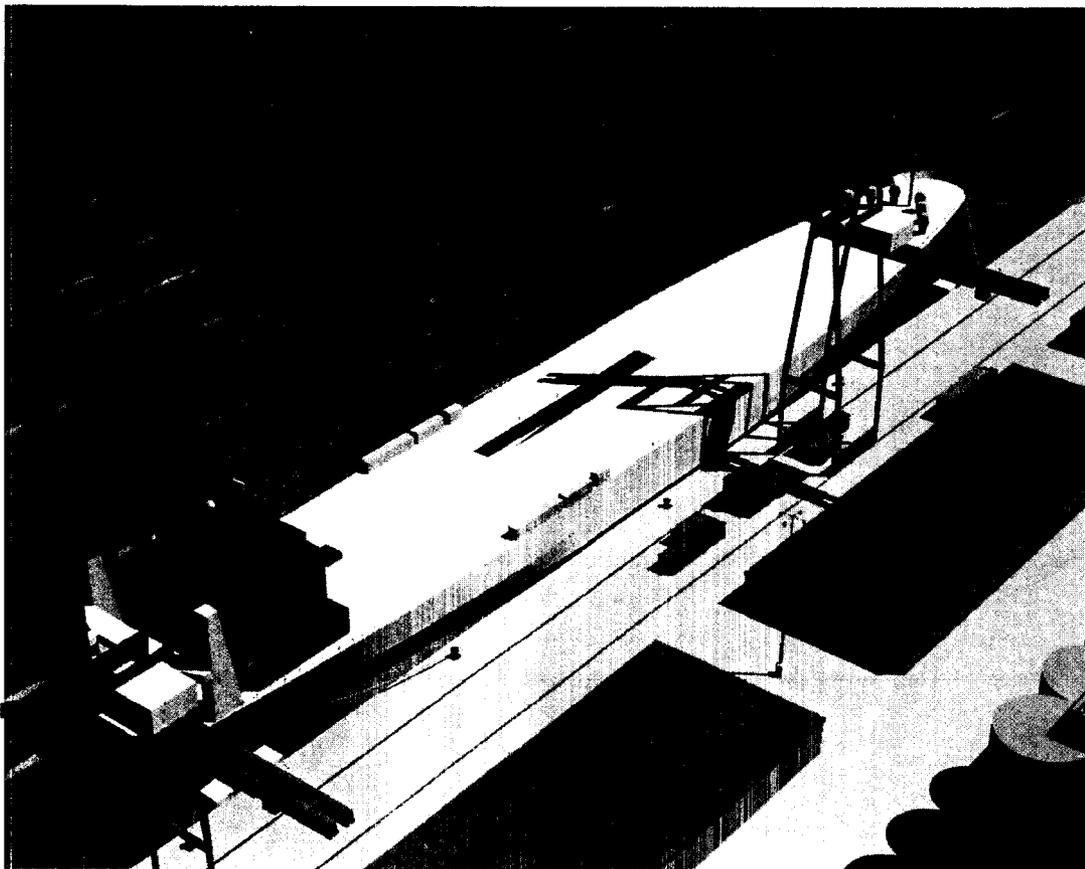
PORT OF PASCAGOULA

PORT OF PORT ARTHUR

APPENDIX

DISTRIBUTION

INTRODUCTION



As part of the ongoing Ports for National Defense (PND) Program, the Military Traffic Management Command Transportation Engineering Agency (MTMCTEA) revised information for selected gulf coast ports. The objectives of this report are too:

- *Identify* the port facilities and equipment needed to support a deployment.
- *Determine* the port throughput capability in STON per day.
- *Determine* the ability of the MARAD designated facilities to meet the deployment of specific units.

